aprilia

SERVICE STATION MANUAL

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SHIVER 900

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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.aprilia.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.

While the basic features as described and illustrated in this manual remain unchanged, Piaggio & C. S.p.A. reserves the right, at any time and without being required to update this publication beforehand, to make any changes to components, parts or accessory supplies which it deems necessary to improve the product, or which are required for manufacturing or commercial reasons.

Not all versions/models shown in this publication are available in all countries. The availability of individual versions/models should be confirmed with the official Aprilia sales network.

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SERVICE STATION MANUAL
SHIVER 900

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.

CAUTION 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.

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

Vehicle intactness The incomplete or non-observance of these regulations leads to the risk of serious damage to the vehicle and sometimes even the invalidity of the guarantee

INDEX OF TOPICS

INDEX OF TOPICS

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.

CAUTION

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

Fuel

CAUTION

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.

CAUTION

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

CAUTION

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 and clutch fluid

BRAKE AND CLUTCH FLUIDS CAN DAMAGE THE PLASTIC OR RUBBER PAINTED SURFACES. WHEN SERVICING THE BRAKING OR THE CLUTCH SYSTEM PROTECT THESE COMPONENTS WITH A CLEAN CLOTH. ALWAYS WEAR PROTECTIVE GOGGLES WHEN SERVICING THESE SYSTEMS. BRAKE AND CLUTCH FLUIDS ARE EXTREMELY HARMFUL FOR YOUR EYES. IN THE EVENT OF ACCIDENTAL CONTACT WITH THE EYES, RINSE THEM IMMEDIATELY WITH PLENTY OF COLD, CLEAN WATER AND SEEK MEDICAL ADVICE.
KEEP OUT OF THE REACH OF CHILDREN.

Battery electrolyte and hydrogen gas

CAUTION

THE BATTERY ELECTROLYTE IS TOXIC, CORROSIVE AND AS IT CONTAINS SULPHURIC ACID, IT CAN CAUSE BURNS WHEN IN 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. IF THE FLUID GETS IN CONTACT WITH YOUR EYES, WASH WITH ABUNDANT 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 COMPONENTS

CAUTION

BEARINGS MUST ROTATE FREELY, WITHOUT JAMMING AND/OR NOISE, OTHERWISE, THEY NEED TO BE REPLACED.

- Only use ORIGINAL Aprilia SPARE PARTS.
- Comply with lubricant and consumables use guidelines.
- Lubricate parts (whenever possible) before reassembling them.
- When tightening nuts and screws, start either from the components with the largest diameter or from the innermost components, proceeding diagonally. Tighten nuts and screws in successive steps before applying the tightening torque.
- Always replace self-locking nuts, washers, sealing rings, circlips, O-rings (OR), cotter pins and screws with new parts if the thread is damaged.
- When assembling the bearings, make sure to lubricate them well.
- Check that each component is assembled correctly.
- After a repair or routine maintenance, carry out pre-ride checks and test the vehicle on private grounds or in an area with low traffic.
- Clean all mating surfaces, oil seal rims and gaskets before refitting. Smear a thin layer of lithium-based grease on the oil seal rims. Reassemble oil seals and bearings with the brand or batch number facing outward (visible side).

ELECTRICAL CONNECTORS

Electric connectors must be disconnected as described below; failure to comply with this procedure causes irreparable damage to both the connector and the wiring harness:

Press the relative safety clips, if applicable.

- Grip the two connectors and disconnect them by pulling them in opposite directions.
- If any signs of dirt, rust, moisture, etc. are noted, clean the inside of the connector carefully with a jet of compressed air.
- Ensure that the cables are correctly fastened to the internal connector terminals.
- Then connect the two connectors, ensuring that they couple correctly (if fitted with clips, you will hear them "click" into place).

CAUTION

DO NOT DISCONNECT CONNECTORS BY PULLING THE CABLES.

NOTE

THE TWO CONNECTORS CAN ONLY BE CONNECTED IN ONE DIRECTION: CONNECT THEM THE RIGHT WAY ROUND.

TIGHTENING TORQUES

CAUTION

IF UNSCREWING A SELF-LOCKING NUT, IT MUST BE REPLACED WITH A NEW ONE.

CAUTION

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.

CAUTION

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 (62.14 miles) use the brakes gently, avoiding sudden or prolonged braking. That is to permit the adequate adjustment of the pad friction material to the brake discs.
- It is recommended that during the first 250 km (155.34 mi) not to exceed 6500 rpm and not to fully open the gas knob for prolonged periods. For the subsequent km, up to approximately 1000 km (621.37 mi), progressively increase rpm and "full gas" periods.

CAUTION

TO PREVENT THE RISK OF INJURY TO YOURSELF OR OTHERS AND/OR DAMAGE TO THE VEHICLE, HAVE THE CHECKS LISTED IN THE SCHEDULED MAINTENANCE TABLE OF THE

MAINTENANCE PROGRAMME SECTION CARRIED OUT AT THE SPECIFIED MILEAGE INTERVALS.

Vehicle identification

Write down the chassis and engine number in the specific space in this booklet. The chassis number is handy when purchasing spare parts.

CAUTION

THE MODIFICATION OF THE IDENTIFICATION CODES IS A SERIOUS PUNISHABLE CRIME. HOWEVER, THE LIMITED WARRANTY FOR NEW VEHICLES WILL BE VOID IF THE VEHICLE IDENTIFICATION NUMBER (VIN) HAS BEEN MODIFIED OR NOT PROMPTLY DETERMINED.

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

ZD4RKH000YSXXXXXX

KEY:

ZD4: WMI (World manufacturer identifier) code;

KH: model;

000: RF or RR (Europe);

0: free digit;

Y: year of manufacture;

S: production plant (S= Scorzè);

XXXXXX: serial number (6 digits);

FRAME NUMBER

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

Chassis No. .....

ENGINE NUMBER

The engine number is printed on the base of the engine crankcase, left hand side.

Engine No. .....

Dimensions and mass

WEIGHT AND DIMENSIONS

Specification	Desc./Quantity
Max. length	2130 mm (83.86 in)
Max. width	810 mm (31.89 in)
Max height (at handlebar)	1110 mm (43.70 in)
Wheelbase	1465 mm (57.68 in)
Kerb weight	218 Kg (481 lb)
Weight fully loaded	435 kg (959 lb)

Engine

ENGINE

Specification	Desc./Quantity
Model	M55CM
Type	Four-stroke longitudinal 90° V twin-cylinder with 4 valves per cylinder, 2 cam shafts at the big end.
Cylinder number	2
Total engine capacity	896.1 cm³ (54.68 cu in)
Bore / stroke	92 x 67.4 mm (3.62 x 2.65 in)
Compression ratio	11.5: 1
Start-up	Electric
Intake valve clearance	0.10 - 0.15 mm (0.0039 - 0.0059 in)
Exhaust valve clearance	0.15 - 0.20 mm (0.0059 - 0.0078 in)
Engine idle speed	1450 +/- 100 rpm
Rpm of the engine at full power	8750 +/- 100 rpm
Clutch	Multi plate wet clutch with mechanical control lever on left side of the handlebar.
Lubrication	Wet crankcase. Pressure-fed, controlled by trochoidal pump
Air filter	With dry filter cartridge
Cooling	Liquid

GEARBOX

Specification	Desc./Quantity
Type	Mechanical, 6 speeds with foot lever on the left hand side of the engine

Transmission

DRIVE RATIOS

Specification	Desc./Quantity
Drive ratio	Primary gear 40/69
Drive ratio, 1st gear	14/36 (secondary)
Drive ratio, 2nd gear	17/32 (secondary)
Drive ratio, 3rd gear	20/30 (secondary)
Drive ratio, 4th gear	22/28 (secondary)
Drive ratio, 5th gear	23/26 (secondary)
Drive ratio, 6th gear	24/25 (secondary)
Final drive ratio	16/44

Capacities

CAPACITY

Specification	Desc./Quantity
Fuel (reserve included)	14.5 l (3.19 UK gal; 3.83 US gal)

Specification	Desc./Quantity
Fuel reserve	3 l (0.66 UK gal; 0.79 US gal)
Engine oil	3.0 l (without oil filter change) (0.66 Uk gal; 0.79 US gal) 3.2 l (with oil filter change) (0.70 Uk gal; 0.85 US gal)
Coolant	1.8 l (0.40 UK gal; 0.48 US gal)
Seats	2
Maximum weight limit	215 kg (474 lb) (rider + passenger + luggage)

Drive chain

DRIVE CHAIN

Specification	Desc./Quantity
Type	Endless (without chain hammerlocks) and with sealed links. No. of links 108
Model	525 ZRPK

Electrical system

ELECTRICAL SYSTEM

Specification	Desc./Quantity
Battery	12 V - 10 Ah YTX 12 - BS Alternative solution: 12 V - 12 Ah YTX 14 - BS
Main fuses	30 A, 5 A
Secondary fuses	7,5 A (2), 10 A, 15 A (3)
ABS fuses	20 A
Alternator (permanent magnet)	13.5 V - 450 W at 6000 rpm
Ignition	Electronic, inductive, high efficiency ignition, integrated with the injection system, with variable advance and separate H.V. coil.
Ignition advance	Three-dimensional map managed by control unit.

SPARK PLUGS

BRAND	TYPE	RESISTANCE	ELECTRODE GAP
NGK-R	CR8EKB	5 kOhm	0.6 - 0.7 mm (0.024 - 0.028 in)
(*) NGK-R	CR7EKB	5 kOhm	0.6 - 0.7 mm (0.024 - 0.028 in)
(*) NGK IR	MR8BI-8	7.5 KOhm (MAX) / 3KOhm (MIN)	0.8 mm (0.031 in)

(*) Alternative solution

BULBS

Specification	Desc./Quantity
Low beam light	12 V - 55 W H7
High beam light	12 V - 55 W H7
Front DRL	12V- 5W x 2
Turn indicators	12V - 10W
Licence plate light	12 V - 5 W
Rear daylight running light /stop light	12V- 5/21W x 2

INDICATOR LAMPS

Specification	Desc./Quantity
ABS	LED
High beam light	LED
Fuel reserve	LED
Turn indicators	LED
Overspeed threshold/shift light	LED
Immobilizer	LED
MI	LED
General warning	LED
Side stand	LED
ATC	LED

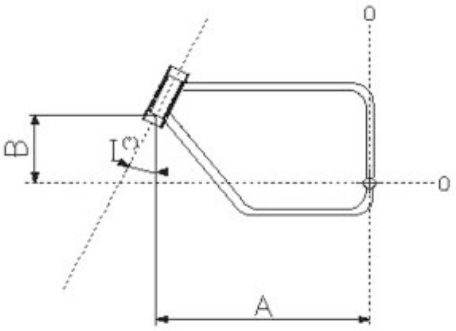
Frame and suspensions

FRAME

Specification	Desc./Quantity
Type	Die-cast aluminium plates and high-yield strength steel frame.
Steering inclination angle (with extended suspensions)	26°
Trail	114 mm (4.49 in)

SUSPENSIONS

Specification	Desc./Quantity
Front	Telescopic upside-down hydraulic fork, stems diam 41 mm (1.61 in)
Travel	127 mm (5.00 in)
Rear	Swingarm and adjustable hydraulic monoshock
Travel	43 +/- 1 mm (1.69 +/- 0.039 in)



SIZES A AND B

Specification	Desc./Quantity
Size A	... mm (... in)
Size B	... mm (... in)

Brakes

BRAKES

Specification	Desc./Quantity
Front	Double floating disc - Ø 320 mm (12.60 in), radially-mounted calliper with 2 Ø 27 mm (1.06 in) pistons; 2 diam. 32.03 mm (1.26 in) and 4 pads
Rear	Disc brake - diam. 240 mm (9.45 in), single piston calliper - diam. 35 mm (1.38 in)

Wheels and tyres

WHEELS

Specification	Desc./Quantity
Type	In light alloy with extractable pin
Front	3.50 x 17"
Rear	6.00 x 17"

TYRES

Specification	Desc./Quantity
Front	120/70 ZR17" (58W)
Inflation pressure	1 passenger: 2.3 bar (230 KPa) (33.36 PSI) 2 passengers: 2.5 bar (250 KPa) (36.26 PSI)
Rear	180/55 ZR17" (73W)
Inflation pressure	1 passenger: 2.5 bar (250 kPa) (36.26 PSI) 2 passengers: 2.8 bar (280 kPa) (40.61 PSI)

Supply

FUEL SUPPLY SYSTEM

Specification	Desc./Quantity
Type	Electronic injection (Multipoint)
Throttle valve diameter	Diam. 52 mm (2.05 in)
Fuel	Unleaded petrol max E10 (95 RON).

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

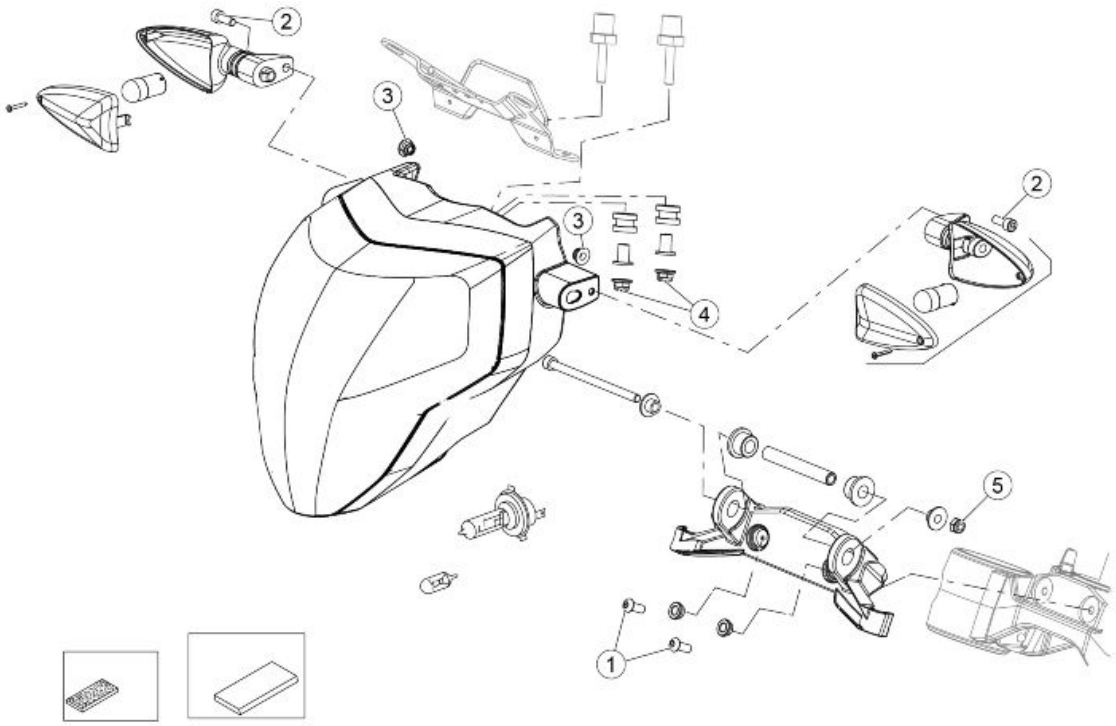
	M4	M5	M6	M8	M10	M12
Metric tightening torque: TE - TEFL - SHC - TBEI - TCC - TS	3 Nm (2.21 lb ft)	6 Nm (4.43 lb ft)	10 Nm (7.38 lb ft)	25 Nm (18.44 lb ft)	50 Nm (36.88 lb ft)	80 Nm (59.00 lb ft)

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)

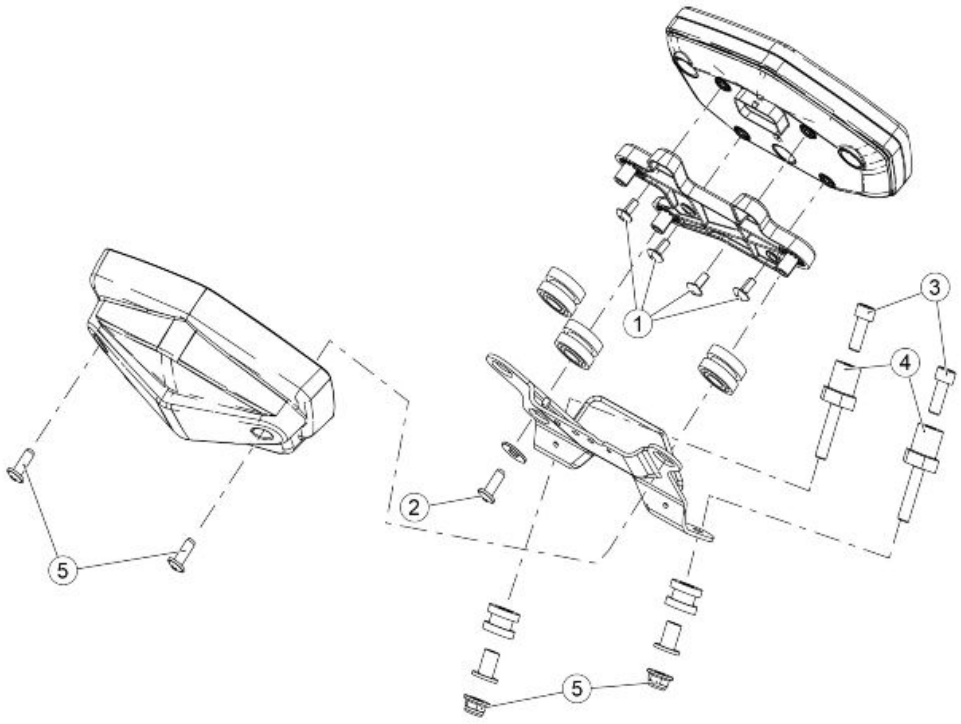
Chassis

Front side



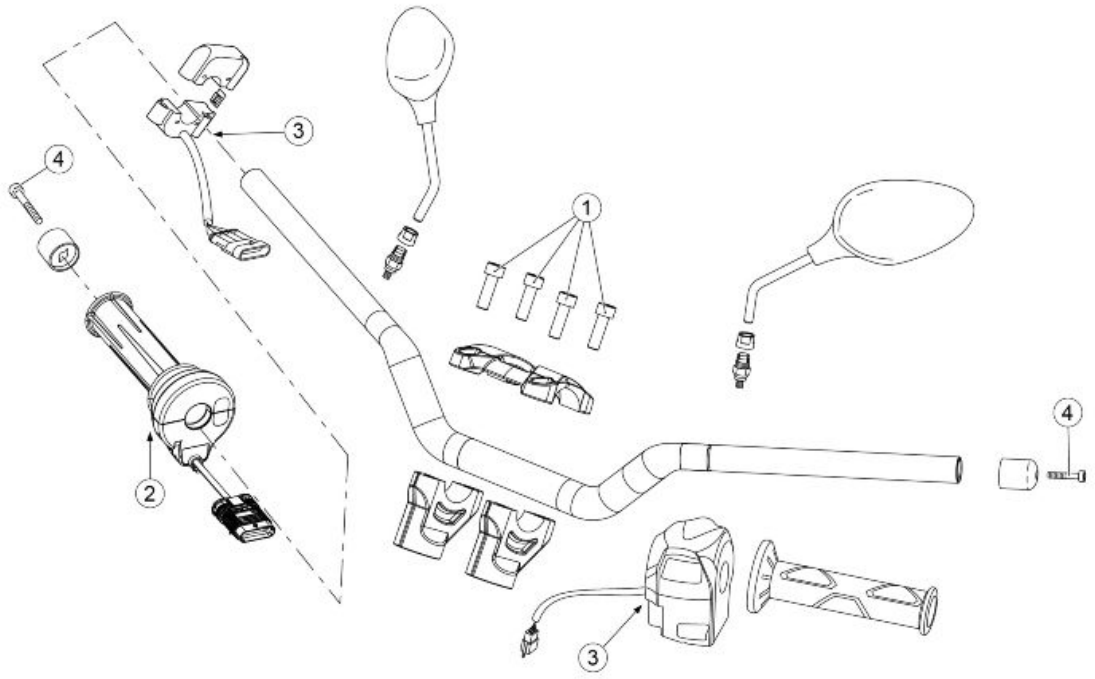
HEADLAMP

Pos.	Description	Type	Quantity	Torque	Notes
1	Button head, hex. socket screws used to fasten the headlight bracket to the bottom yoke	M6x15	2	10 Nm (7.38 lb ft)	-
2	Button head, hex. socket screws used to fasten the direction indicators	M5x16	2	3 Nm (2.21 lb ft)	-
3	Self-locking, flanged direction indicator fastening nuts	M5	2	2 Nm (1.48 lb ft)	-
4	Flanged, self-locking upper headlight fastening nuts	M6	2	10 Nm (7.38 lb ft)	-
5	Flanged, self-locking lower headlight fastening nut	M6	1	10 Nm (7.38 lb ft)	-



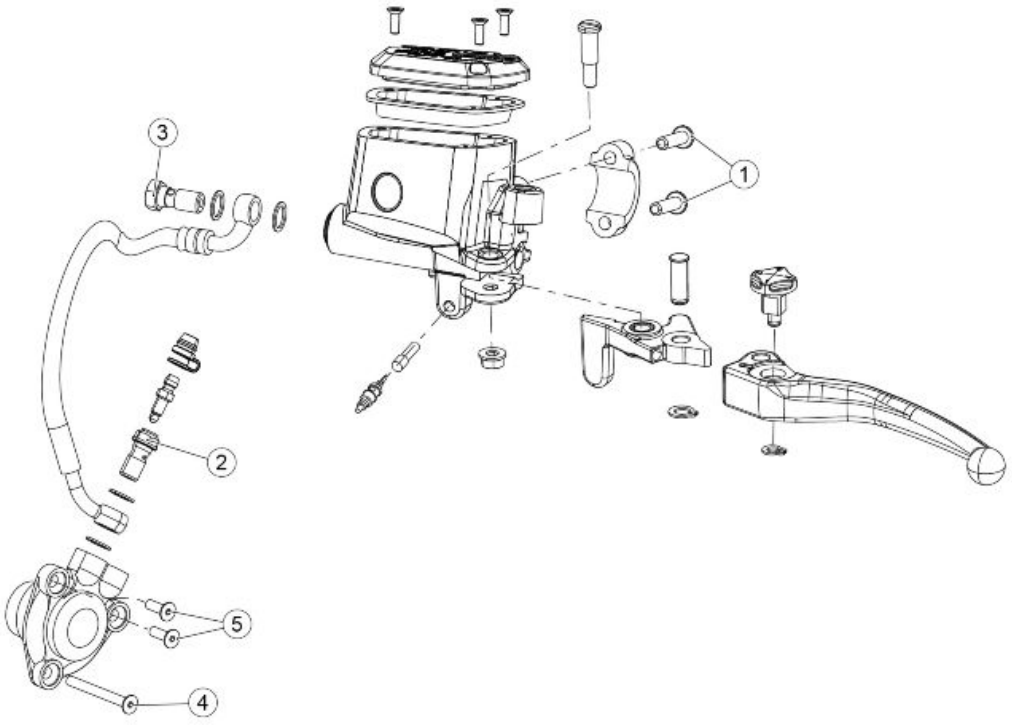
INSTRUMENTS

Pos.	Description	Type	Quantity	Torque	Notes
1	Button head, hex. socket instrument panel adapter fastening screws	M5x12	4	3 Nm (2.21 lb ft)	-
2	Self-tapping, SWP screws used to fasten the instrument cluster and cover to the support plate	5x14	3	3 Nm (2.21 lb ft)	-
3	Button head, hex. socket screws for fastening the steering plate to the instrument panel plate	M6x16	2	10 Nm (7.38 lb ft)	-
4	Special screws for fastening the steering plate to the instrument panel support plate	M6	2	10 Nm (7.38 lb ft)	-
5	Flanged, self-locking upper headlight fastening nuts	M6	2	10 Nm (7.38 lb ft)	-



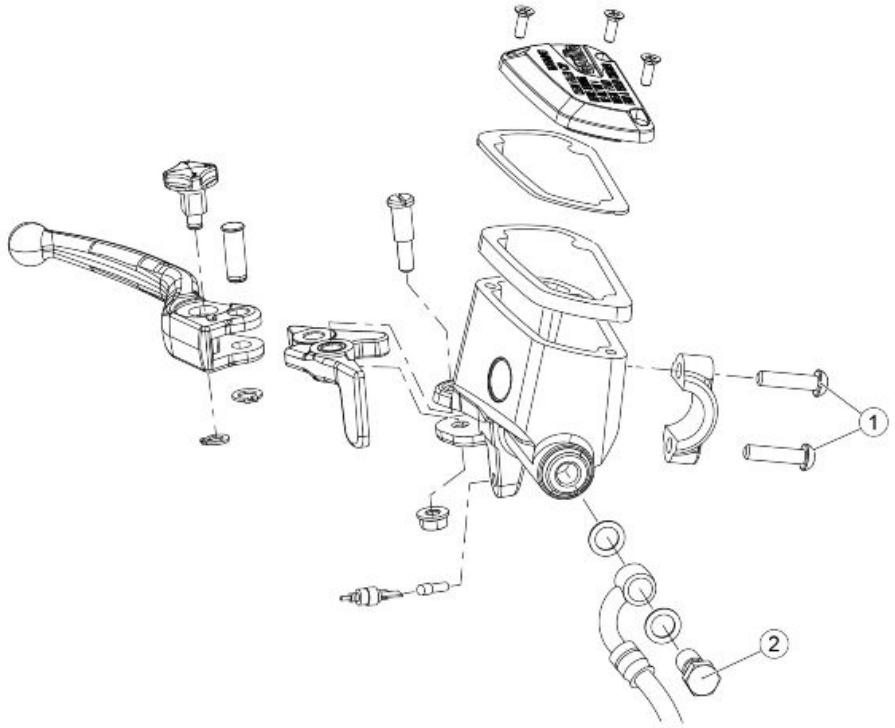
HANDLEBAR-CONTROLS

Pos.	Description	Type	Quantity	Torque	Notes
1	Stainless steel, cyl. head Pozidriv screws used for fastening the upper U-bolt to the lower U-bolt	M8x25	4	25 Nm (18.44 lb ft)	-
2	Electronic accelerator control fastening screws	-	1	4 Nm (2.95 lb ft)	-
3	Light switch fastening screws	-	2	1.5 Nm (1.11 lb ft)	-
4	Cyl. head, hex. socket anti-vibration counterweight fastener screws	M6x45	2	10 Nm (7.38 lb ft)	-



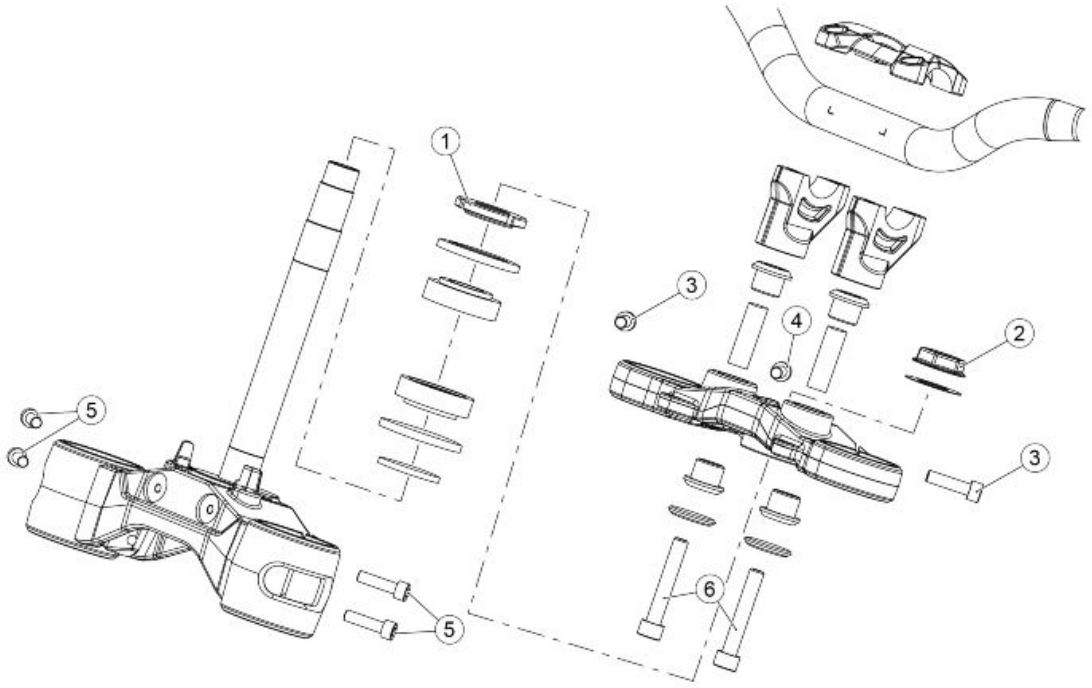
CLUTCH CONTROL

Pos.	Description	Type	Quantity	Torque	Notes
1	Clutch pump U-bolt fastening screws	-	2	10 Nm (7.38 lb ft)	-
2	Special screw for fastening the pipe to the clutch cylinder	M10	1	25 Nm (18.44 lb ft)	-
3	Special screw for fastening the pipe to the clutch pump	M10	1	25 Nm (18.44 lb ft)	-
4	Countersunk, hex. socket screws used for fastening the clutch actuator cylinder	M6x75	1	8 Nm (5.90 lb ft)	Perform two tightening cycles
5	Countersunk, hex. socket screws used for fastening the clutch actuator cylinder	M6x20	2	8 Nm (5.90 lb ft)	Perform two tightening cycles



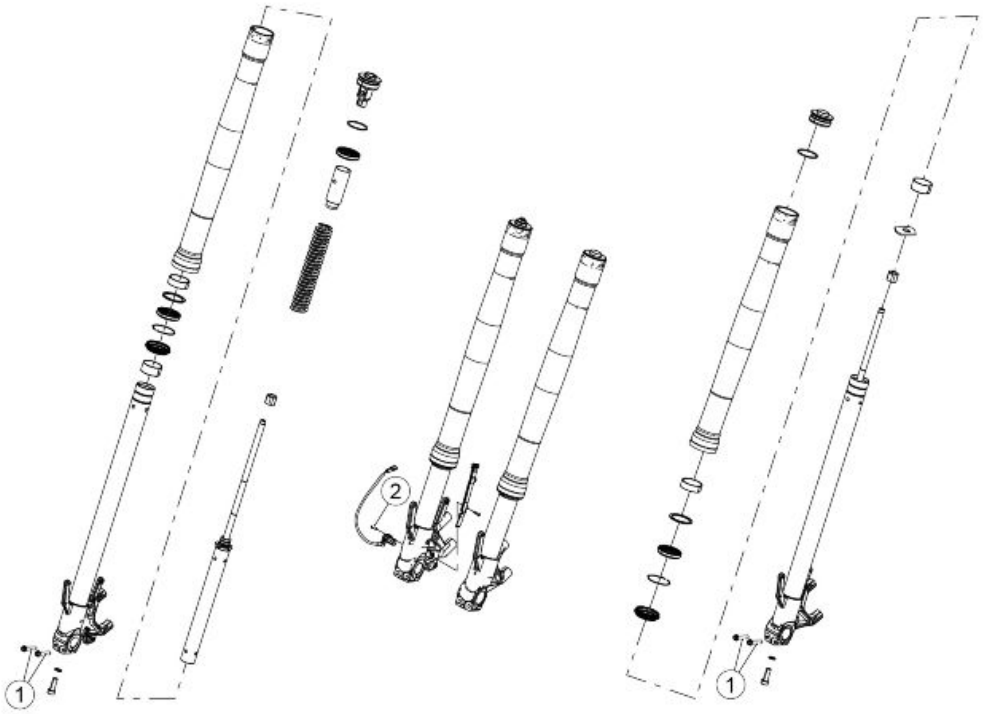
FRONT BRAKE MASTER CYLINDER

Pos.	Description	Type	Quantity	Torque	Notes
1	Brake pump U-bolt fixing screws	-	2	10 Nm (7.38 lb ft)	-
2	Special screw for fastening the pipe to the brake pump	M10	1	25 Nm (18.44 lb ft)	-



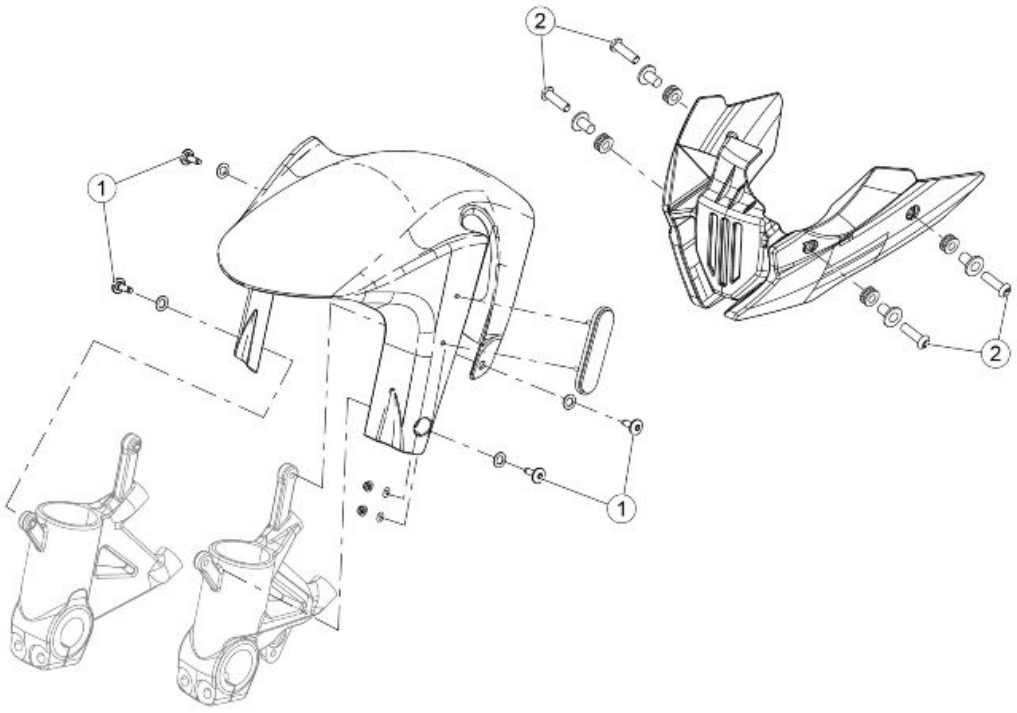
STEERING

Pos.	Description	Type	Quantity	Torque	Notes
1	Headstock ferrule (pre-tightening)	M25	1	50 Nm (36.88 lb ft)	Steering assembly settling
1	Headstock ferrule (tightening)	M25	1	15 Nm (11.06 lb ft)	-
2	Flanged upper steering plate fastening nut (stop)	M22	1	25 Nm (18.44 lb ft)	-
2	Flanged upper steering plate fastening nut (pre-tightening)	M22	1	25 Nm (18.44 lb ft)	Loct. 243
2	Flanged upper steering plate fastening nut (tightening)	M22	1	25 Nm (18.44 lb ft)	-
3	Cyl. head, hex. socket screws used for fastening the fork stanchions to the upper plate	M8x30	2	25 Nm (18.44 lb ft)	-
4	Low profile, cyl. head, hex. socket screw used for fastening the steering headstock to the upper plate	M8x30	1	25 Nm (18.44 lb ft)	-
5	Cyl. head, hex. socket screws used for fastening the fork stanchions to the lower plate	M8x35	4	25 Nm (18.44 lb ft)	-
6	Cyl. head, hex. socket screws for fastening the lower U-bolt to the upper steering plate	M10x60	2	50 Nm (36.88 lb ft)	Loct. 243



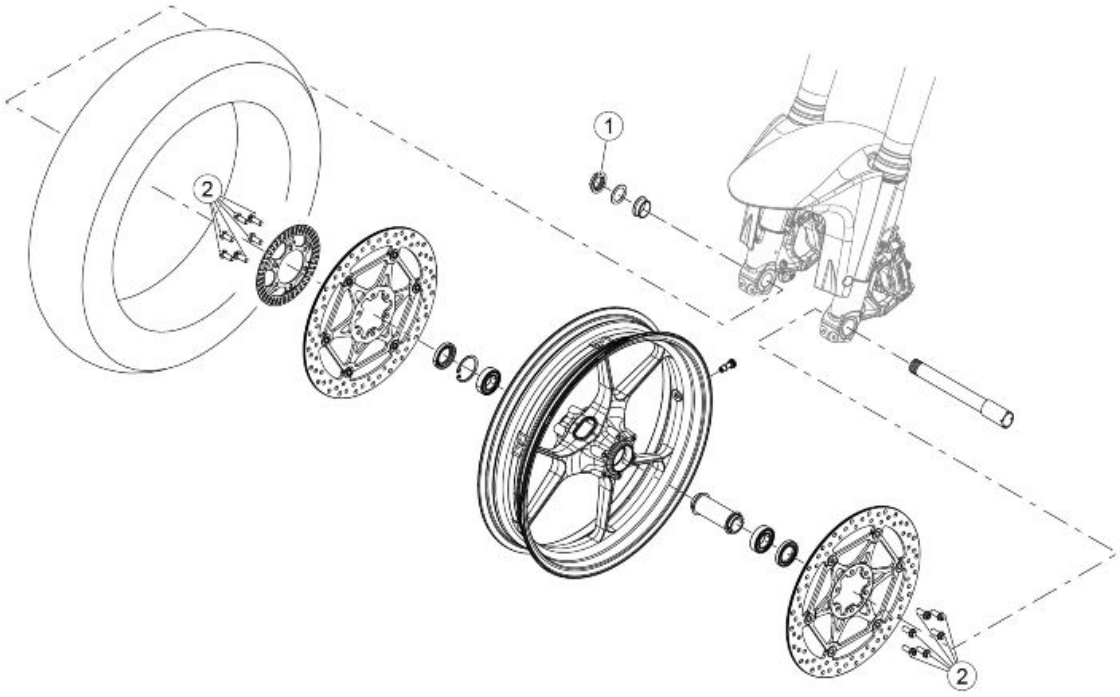
FRONT FORK

Pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head screws used for closing the fork feet	M6x40	4	10 Nm (7.38 lb ft)	-
2	Button head, hex. socket screws used for fastening the sensor to the right hand fork foot	M5x16	1	6 Nm (4.43 lb ft)	-



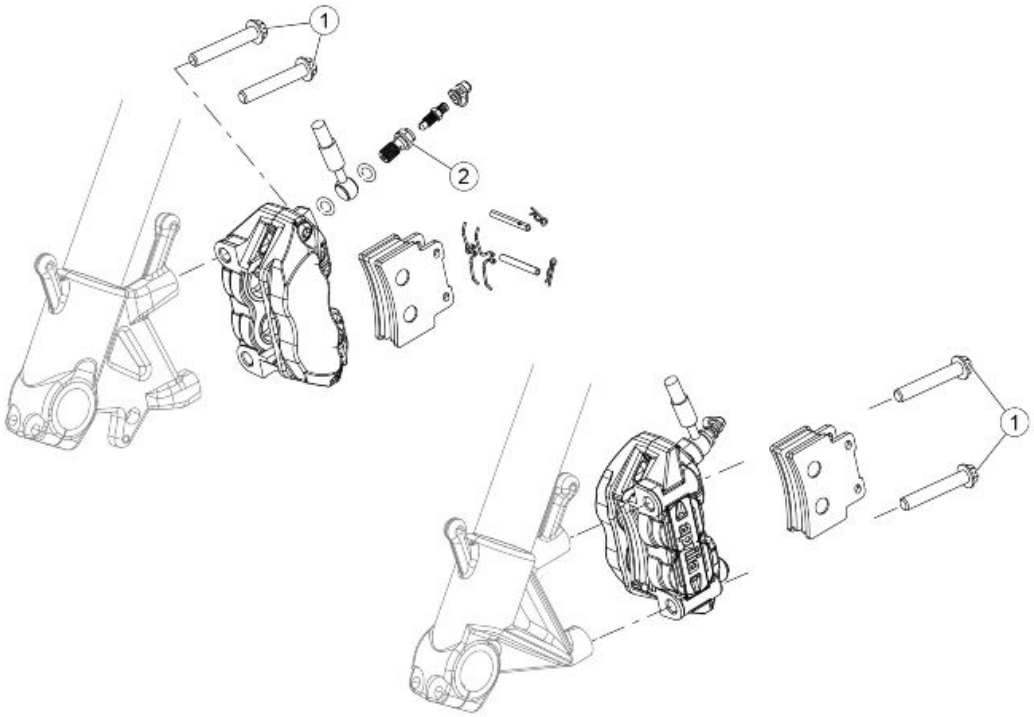
FRONT MUDGUARD - ENGINE FAIRING

Pos.	Description	Type	Quantity	Torque	Notes
1	Button head hex. socket screws used to fasten the mudguard to the calliper mounting bracket	M5x9	4	4 Nm (2.95 lb ft)	Loct. 243
2	Button head hex. socket screws for fastening the engine fairing to the support	M6x20	4	10 Nm (7.38 lb ft)	-



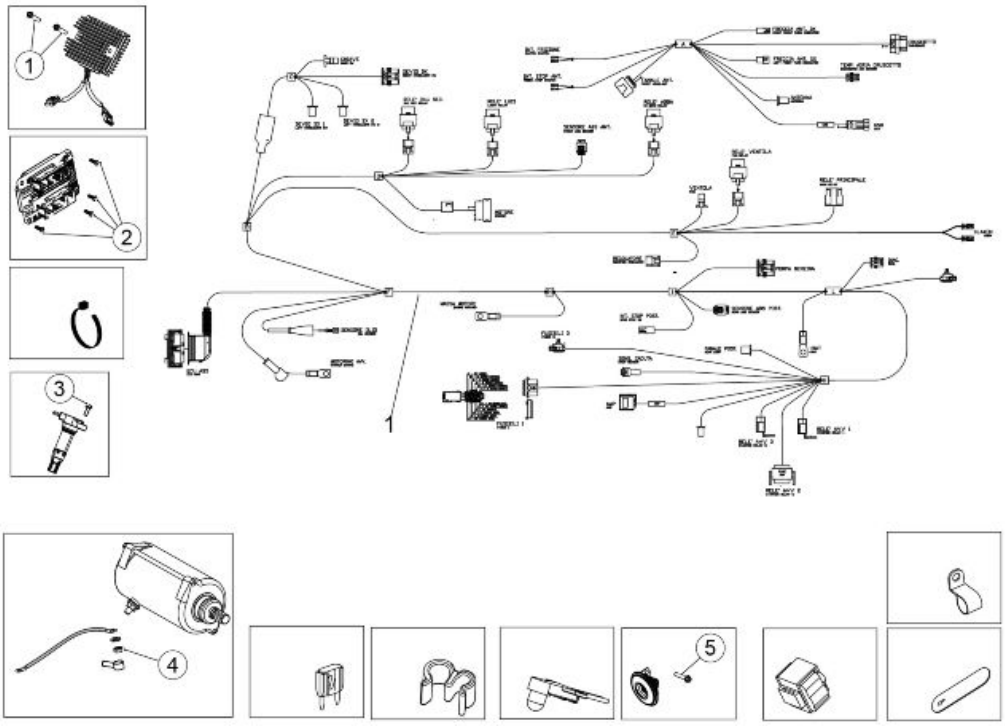
FRONT WHEEL

Pos.	Description	Type	Quantity	Torque	Notes
1	Wheel axle nut	-	1	80 Nm (59.00 lb ft)	-
2	Flanged, hex. head phonic wheel and brake discs fixing screws	M8x20	12	30 Nm (22.13 lb ft)	Pre-impregnated screws



FRONT BRAKE CALLIPERS

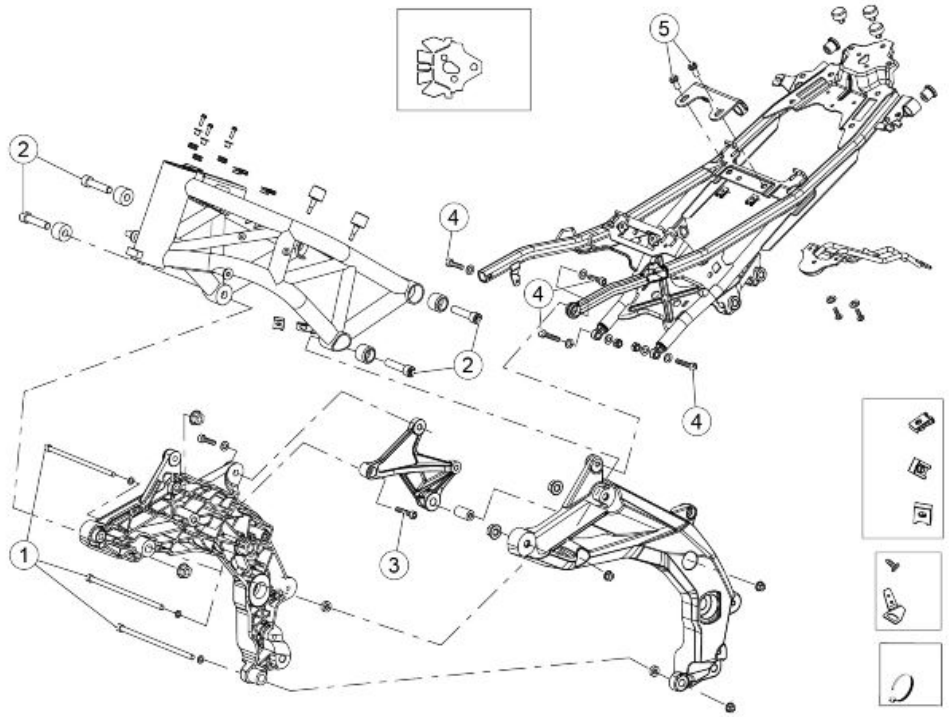
Pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head screws for fastening the brake callipers to the fork stanchions	M10x1.25	4	50 Nm (36.88 lb ft)	-
2	Special screws for fastening the brake pipe to the callipers	M10	2	25 Nm (18.44 lb ft)	-



FRONT ELECTRICAL SYSTEM

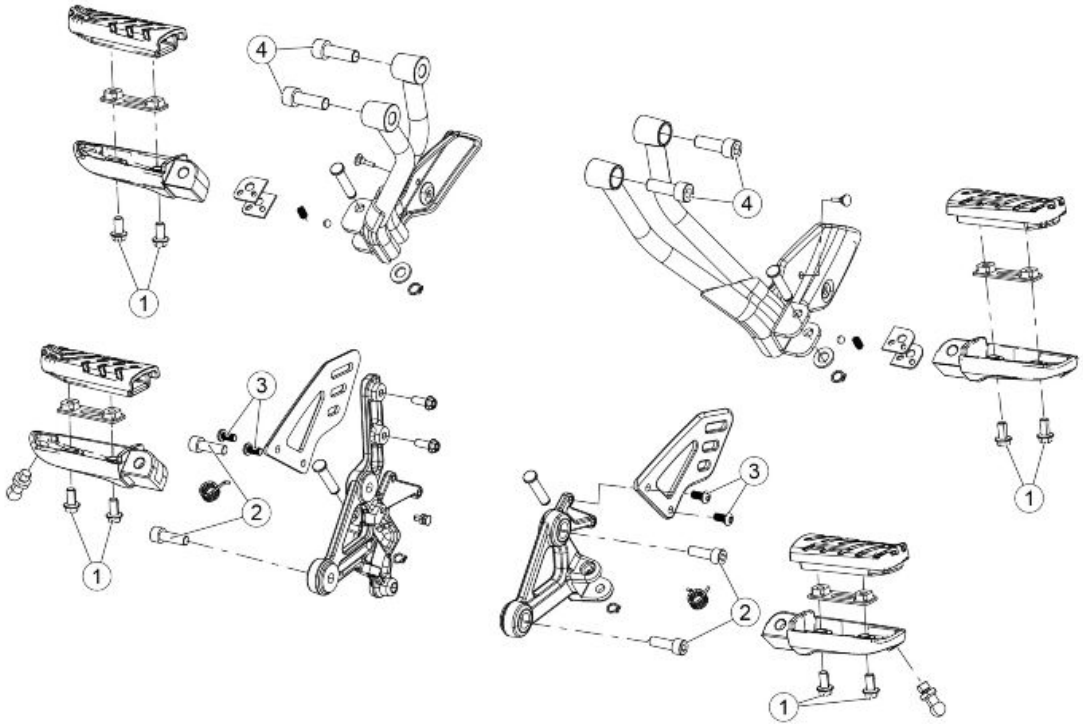
Pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head screws for fastening the voltage regulator to the frame	M6x20	2	10 Nm (7.38 lb ft)	-
2	Flanged SWP screws for fastening the control unit to the base of the filter box	M5x20	4	2.5 Nm (1.84 lb ft)	-
3	Screws used for fastening the coils to the heads	M6	2	5 Nm (3.69 lb ft)	-
4	Nut used for fastening the power supply cable to the starter motor	M6	1	10 Nm (7.38 lb ft)	-
5	Horn fixing screw	M6x25	1	10 Nm (7.38 lb ft)	-

Central part



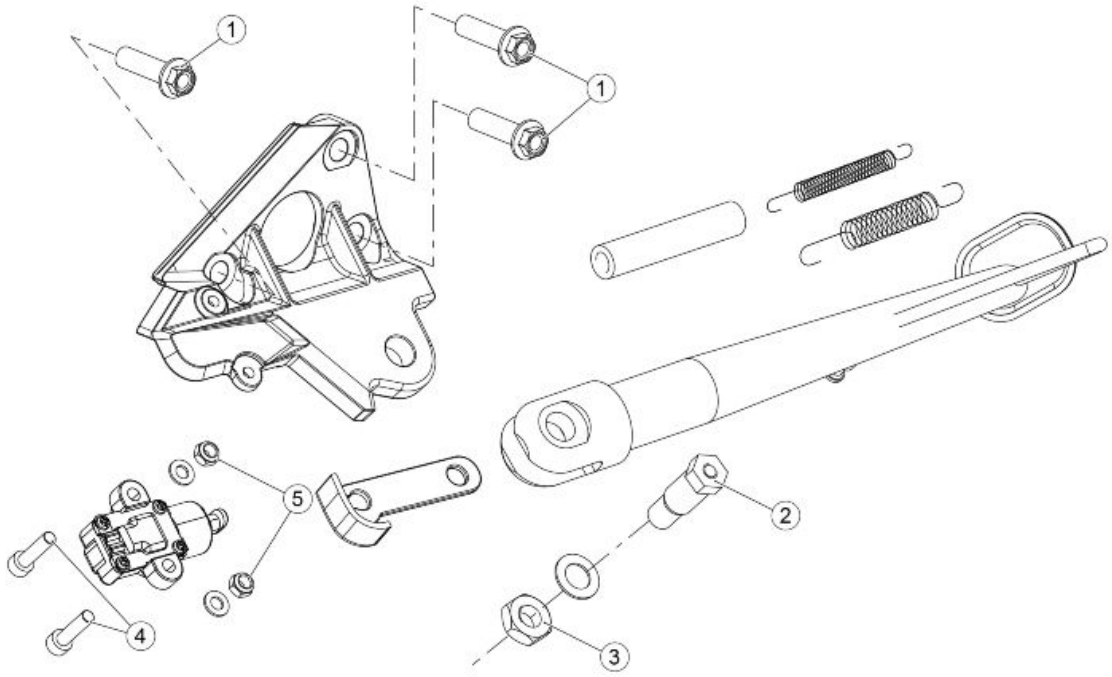
CHASSIS

Pos.	Description	Type	Quantity	Torque	Notes
1	Cyl. head, hex. socket screws used for fastening the side fairings to the engine	M12x282	3	80 Nm (59.00 lb ft)	-
2	TORX cyl. head screws used for fastening the trellis to the frame side fairings	M12x53	4	80 Nm (59.00 lb ft)	-
3	Cyl. head, hex. socket screw used for fastening the shock absorber counter-plate to the right hand frame side fairing	M10x30	1	50 Nm (36.88 lb ft)	Pre-impregnated screw
4	Cyl. head, hex. socket screws used for fastening the saddle support to the frame	M8x35	4	35 Nm (25.81 lb ft)	Pre-impregnated screws
5	Flanged, hex. head screws used for fastening the silencer support bracket to the saddle support	M8x20	2	25 Nm (18.44 lb ft)	-



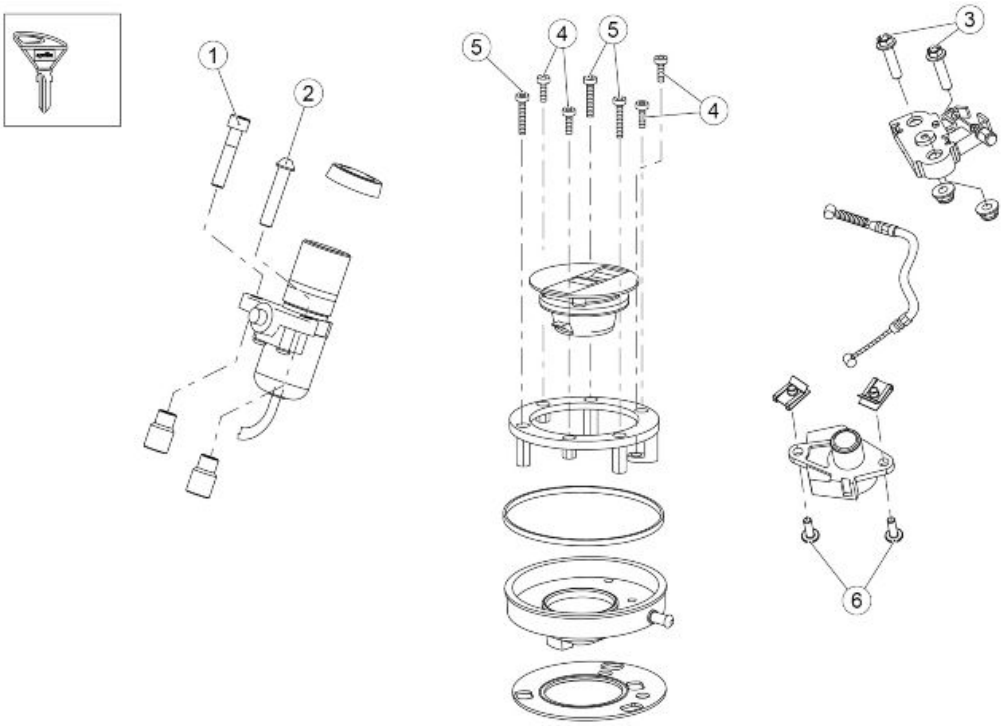
FOOTRESTS

Pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head screws used for fastening the rider/passenger rubber footrests	M6x12	8	10 Nm (7.38 lb ft)	-
2	Cyl. head, hex. socket screws used for fastening the rider's footrest support to the frame plates	M8x25	4	18 Nm (13.28 lb ft)	Loct. 243
3	Button head, hex. socket screws used for fastening the luggage rack to the rider's footrest support	M6x12	4	8 Nm (5.90 lb ft)	-
4	Cyl. head, hex. socket screws used for fastening the passenger footrest supports to the saddle support	M10x30	4	50 Nm (36.88 lb ft)	Loct. 243



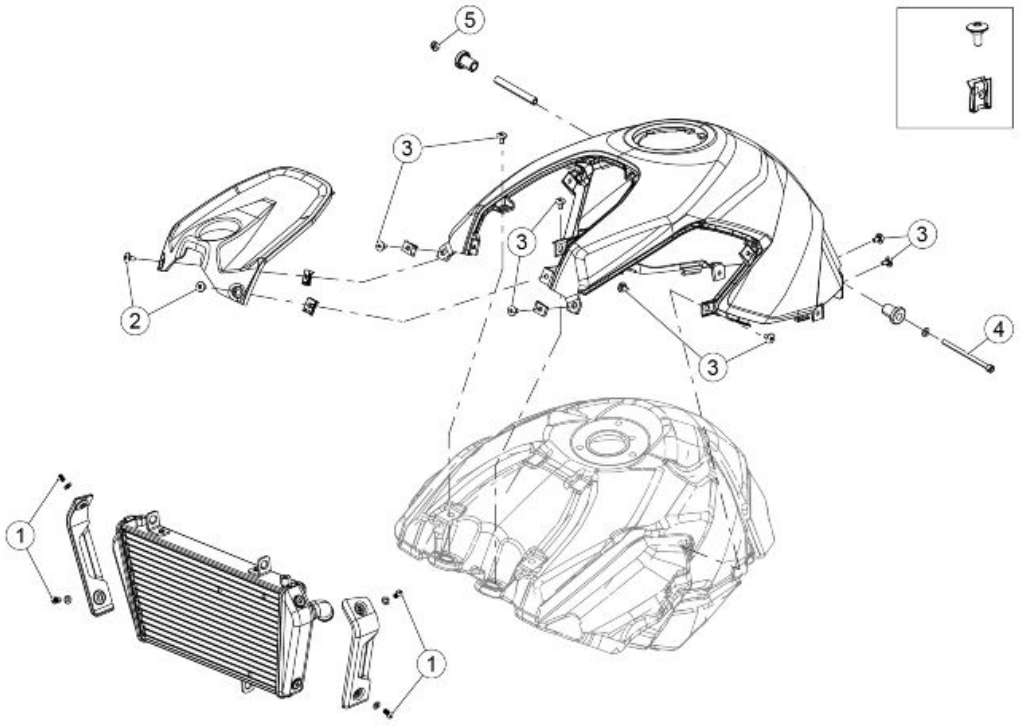
STAND

Pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head screws used for fastening the stand plate to the engine	M8x30	3	25 Nm (18.44 lb ft)	-
2	Screw for fastening the stand to the plate	M10x1.25	1	10 Nm (7.38 lb ft)	-
3	Low profile nut used for fastening the stand to the plate	M10x1.25	1	30 Nm (22.13 lb ft)	-
4	Cyl. head, hex. socket screws used for fastening the stand switch	M5x16	2	7 Nm (5.16 lb ft)	-
5	Self-locking, low profile nut used for fastening the stand switch	M5x16	2	7 Nm (5.16 lb ft)	-



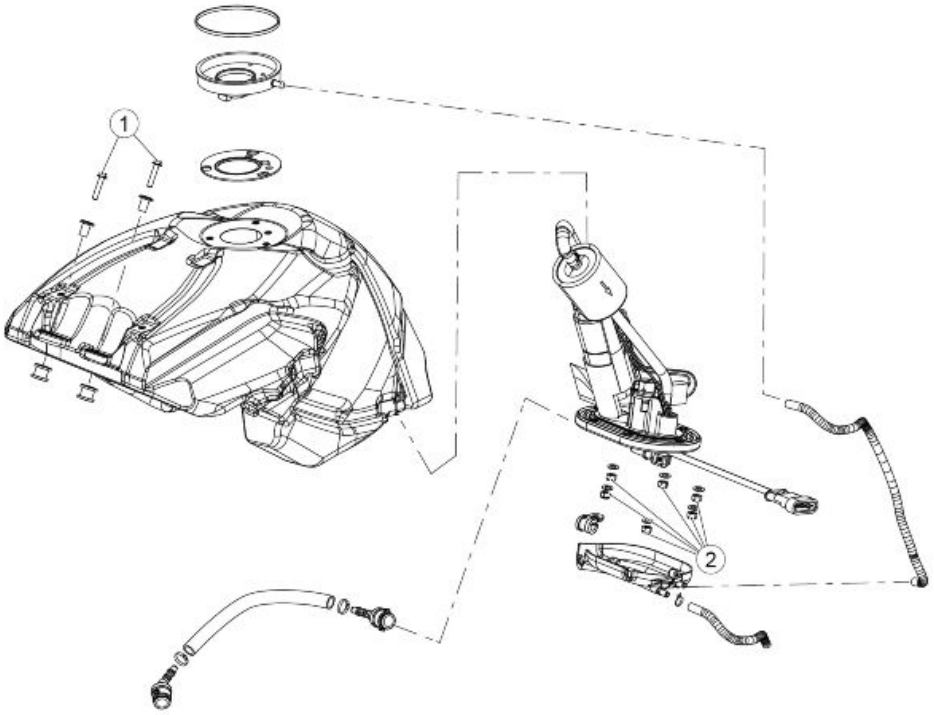
LOCKS

Pos.	Description	Type	Quantity	Torque	Notes
1	Button head, hex. socket ignition lock fastening screw	M8x40	1	25 Nm (18.44 lb ft)	-
2	Ignition lock fastening shear head screw	-	1	Manual	-
3	Flanged, hex. head screws used to fasten the saddle lock to the saddle	M6x25	2	10 Nm (7.38 lb ft)	-
4	Cyl. head, hex. socket screws used to fasten the filler cap to the fuel tank	M5x16	4	5 Nm (3.69 lb ft)	-
5	Cyl. head, hex. socket screws used to fasten the filler cap to the fuel tank	M5x30	4	5 Nm (3.69 lb ft)	-
6	Cyl. head, hex. socket for fastening the saddle to the tail fairing	M5x16	4	4 Nm (2.95 lb ft)	-



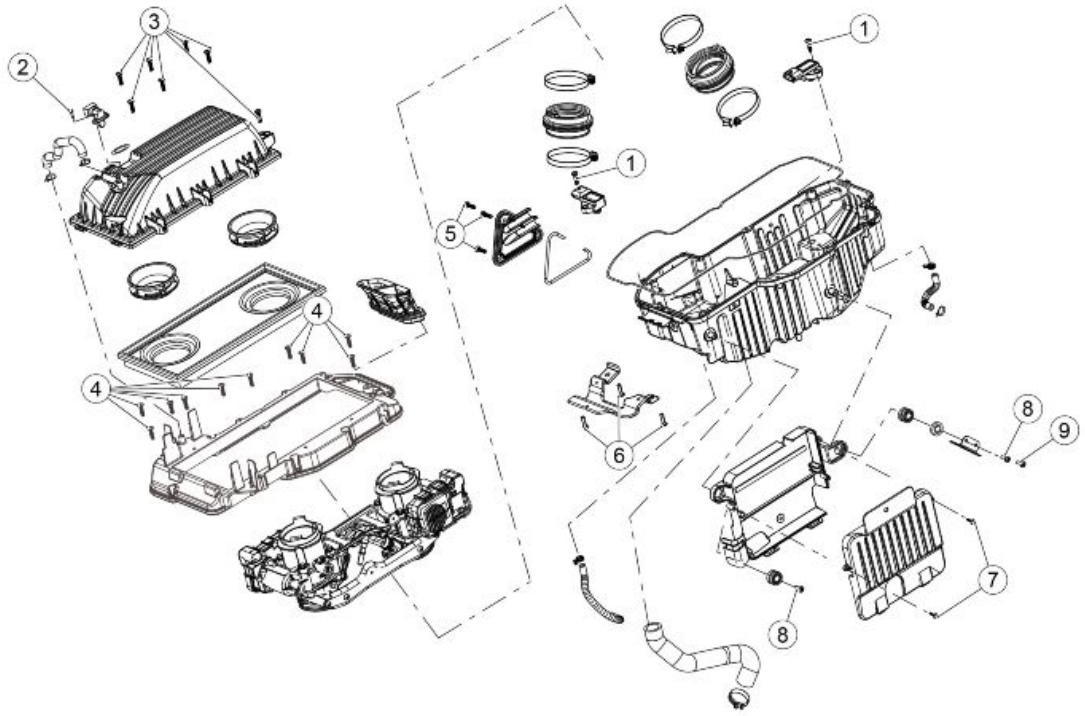
FUEL TANK COVER

Pos.	Description	Type	Quantity	Torque	Notes
1	Button head, hex. socket screws used to fasten the radiator guard to the radiator	M6x12	4	10 Nm (7.38 lb ft)	-
2	Button head, hex. socket block lid/ fuel tank cover fastening screws	M5x9	2	10 Nm (7.38 lb ft)	-
3	Button head, hex. socket fuel tank cover fastening screws	M5x9	8	4 Nm (2.95 lb ft)	-
4	Cyl. head, hex. socket rear fuel tank cover fastening screw	M6x90	1	12 Nm (8.85 lb ft)	-
5	Self-locking rear fuel tank cover fastening nut	M6	1	12 Nm (8.85 lb ft)	-



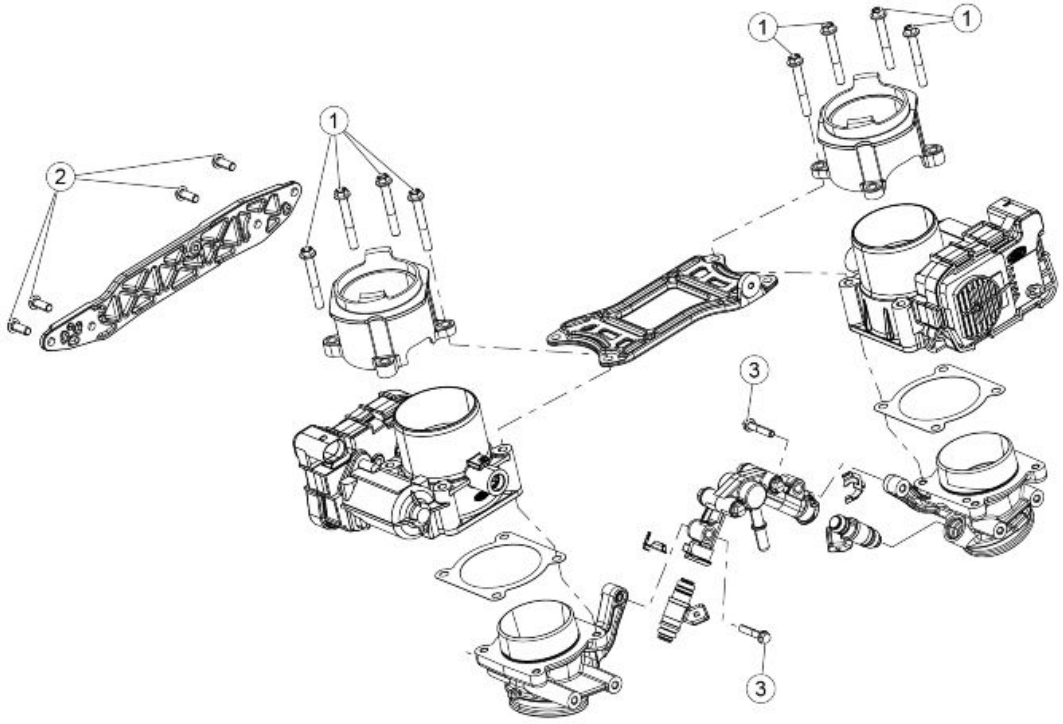
TANK

pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head front fuel tank fastening screws	M6x30	2	6 Nm (4.43 lb ft)	-
2	Fuel pump fastening nuts	M5	6	6 Nm (4.43 lb ft)	-



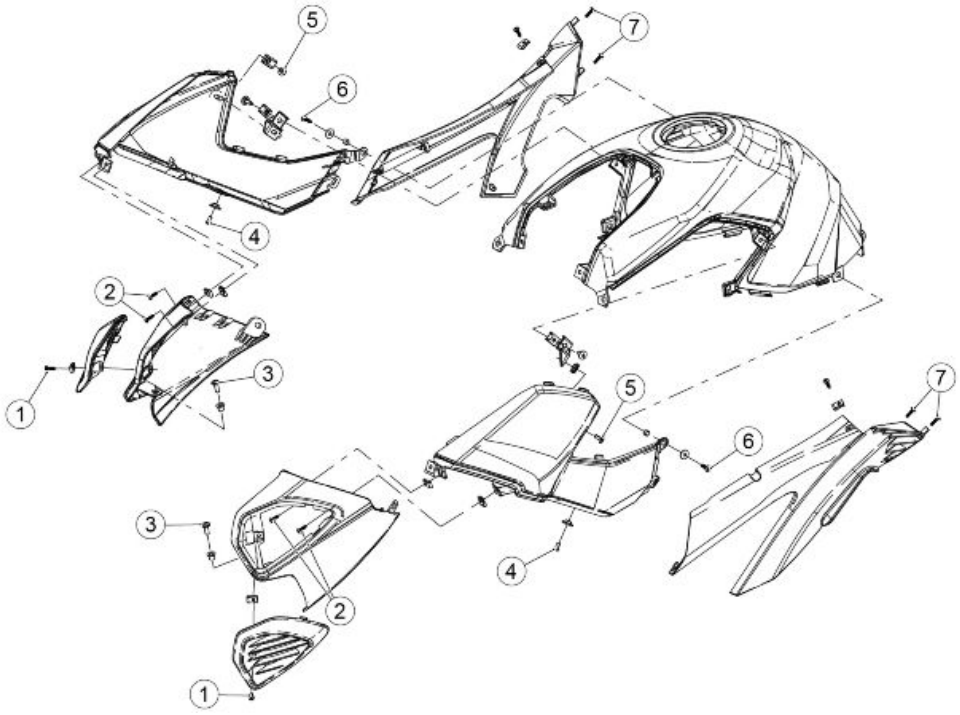
AIR FILTER CASING

Pos.	Description	Type	Quantity	Torque	Notes
1	Self-tapping, SWP air pressure sensor fastening screws	5x20	2	2 Nm (1.48 lb ft)	-
2	Self-tapping air temperature sensor fastening screws	2.9x12	2	2 Nm (1.48 lb ft)	-
3	SWP filter box lid fastening screws	5x20	8	2 Nm (1.48 lb ft)	-
4	SWP screws used to fasten the upper part of the filter box	5x20	10	2 Nm (1.48 lb ft)	-
5	SWP screws used to fasten the filter box side cover	5x20	3	2 Nm (1.48 lb ft)	-
6	SWP wiring harness support bracket fastening screws	5x20	3	2 Nm (1.48 lb ft)	-
7	SWP control unit cover fastening screws	3.9x14	2	2 Nm (1.48 lb ft)	-
8	SWP control unit support fastening screws	5x14	2	2 Nm (1.48 lb ft)	-



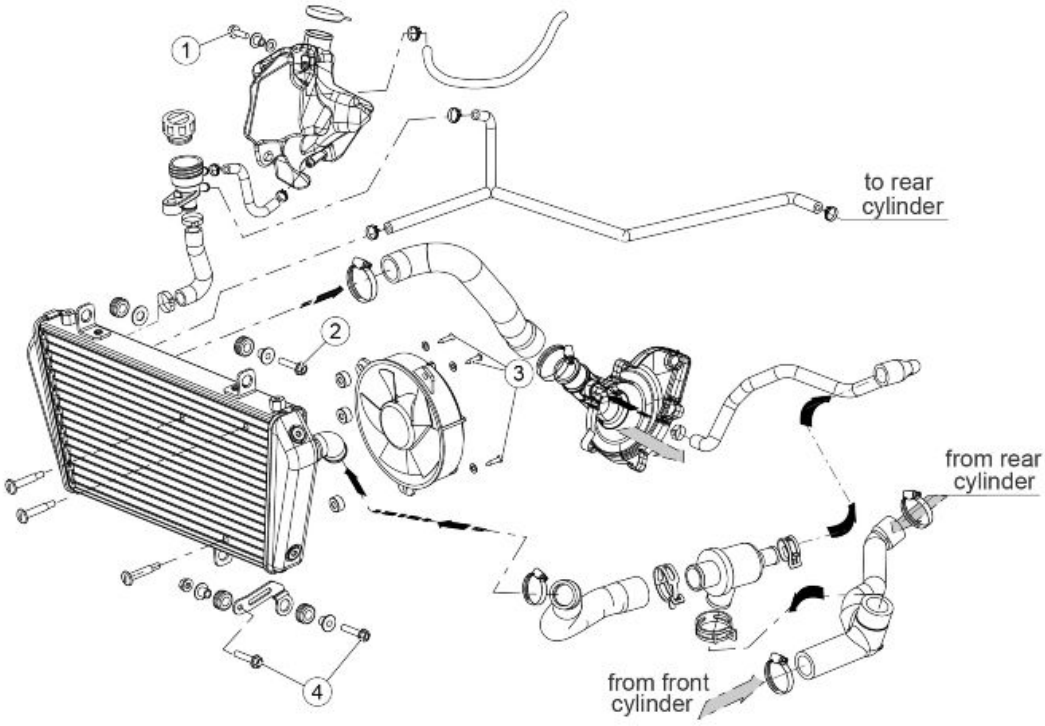
THROTTLE BODY

Pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head screws used for fastening the inlet coupling	M6x60	8	12 Nm (8.85 lb ft)	Loct. 242
2	Button head, hex. socket screws used for fastening the throttle body to the bracket	M6	8	12 Nm (8.85 lb ft)	Loct. 242
3	Flanged, hex. head screws used for fastening the Injectors	M6	2	12 Nm (8.85 lb ft)	Loct. 242



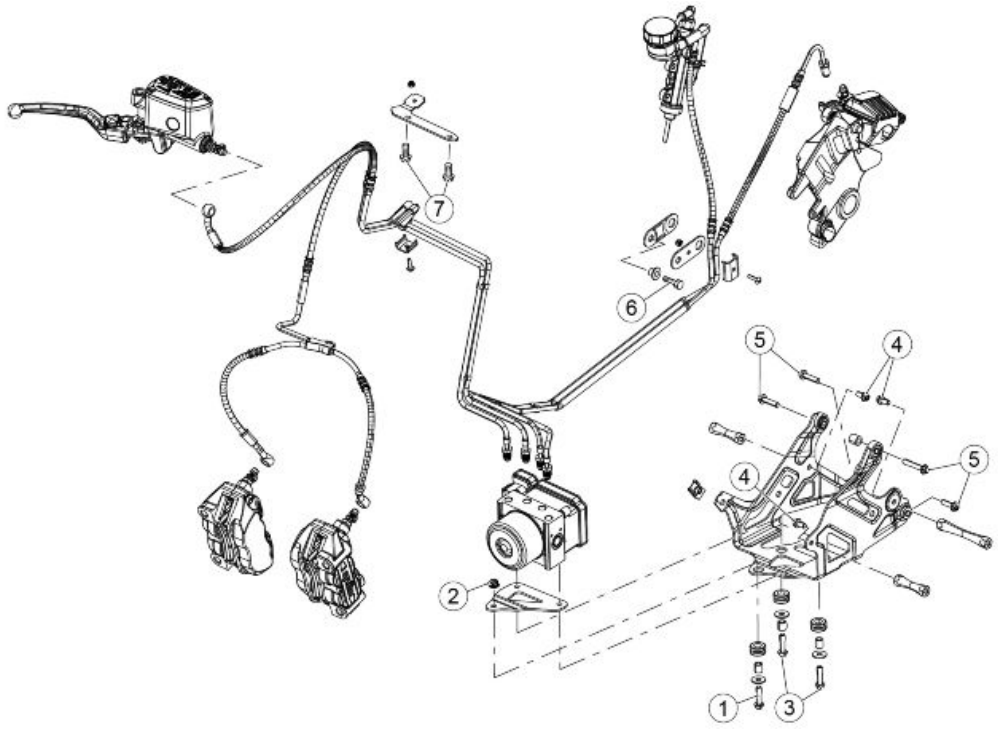
SIDE FAIRINGS

Pos.	Description	Type	Quantity	Torque	Notes
1	Self-tapping, cyl. head slot drive screws used for fastening the grilles to the duct covers	4.2x16	2	3 Nm (2.21 lb ft)	-
2	Self-tapping, cyl. head slot drive screws used for fastening the duct covers to the ducts	4.2x16	4	3 Nm (2.21 lb ft)	-
3	Button head, hex. socket screws used to fasten the duct covers to the radiator	M6x16	2	7 Nm (5.16 lb ft)	-
4	Button head, hex. socket screws for fastening the conveyors to the tank	M5x10	2	4 Nm (2.95 lb ft)	-
5	Button head, hex. socket screws for fastening the conveyors to the bracket	M5x12	2	4 Nm (2.95 lb ft)	-
6	Self-tapping screws used for fastening the tank/fuel tank cover/ducts	2.9x20	2	2 Nm (1.48 lb ft)	-
7	Self-tapping, cyl. head, slot drive screws used for fastening the side/ tail fairings	2.9x20	4	2 Nm (1.48 lb ft)	-



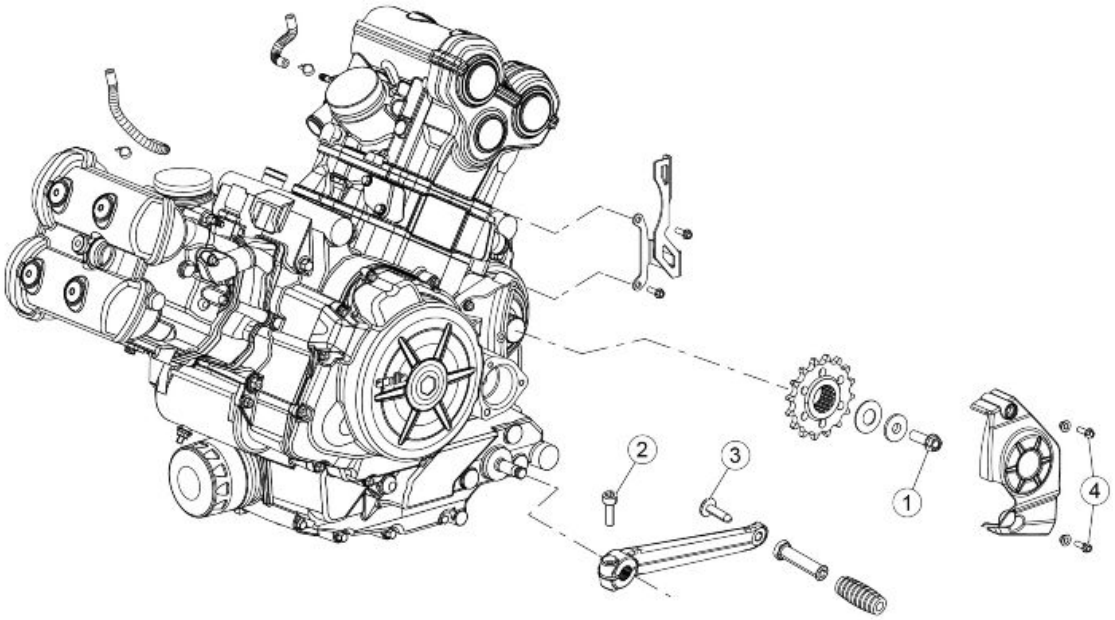
COOLING SYSTEM

Pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head used for fastening the trellis expansion tank	M6x20	1	10 Nm (7.38 lb ft)	-
2	Flanged, hex. head screw used for fastening the trellis radiator	M6x25	1	10 Nm (7.38 lb ft)	-
3	Button cyl. head screw used for fastening the electric fan to the radiator	4.2x20	3	3 Nm (2.21 lb ft)	-
4	Flanged, hex. head screws used for fastening the radiator bracket	M6x25	2	10 Nm (7.38 lb ft)	-



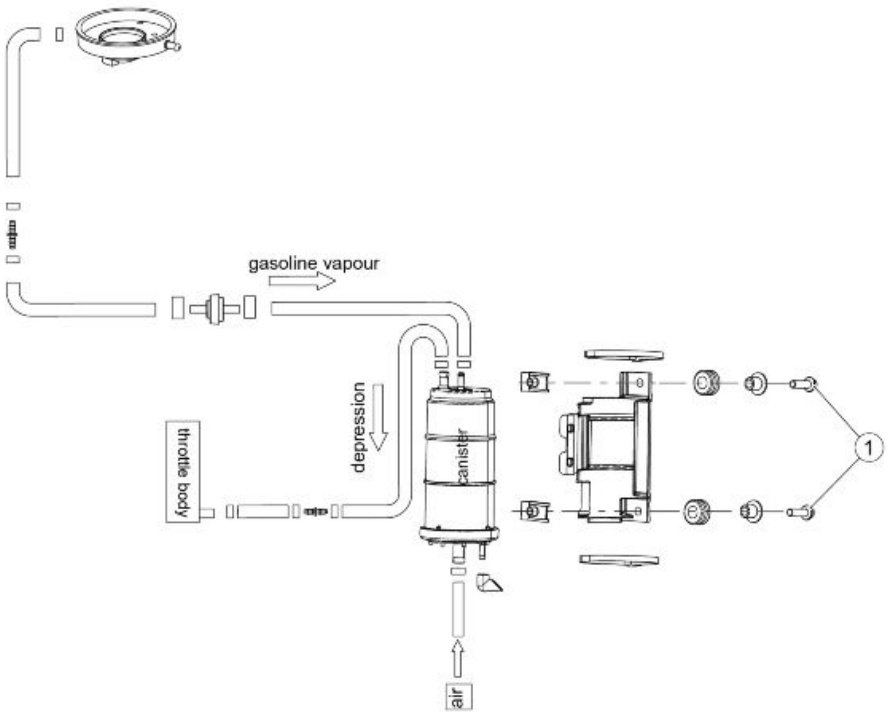
ABS BRAKING SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head screw used for fastening the ABS control unit on the support	M6x25	1	10 Nm (7.38 lb ft)	-
2	Front fastening, flanged self-locking nut	M6	1	10 Nm (7.38 lb ft)	-
3	Flanged, hex. head screw used for fastening the ABS control unit on the support	M6x25	2	10 Nm (7.38 lb ft)	Loct. 270
4	Flanged, hex. head screws used for fastening the spacers on the ABS support	M6x12	3	10 Nm (7.38 lb ft)	-
5	Flanged, hex. head screws used for fastening the ABS support on the engine	M6x25	3	10 Nm (7.38 lb ft)	-
6	Flanged, hex. head screws for fastening the spacer plate on the frame plate	M8x25	1	25 Nm (18.44 lb ft)	Loct. 243
7	Cyl. head, hex. socket screws used for fastening the pipes under the steering headstock	M6x16	2	10 Nm (7.38 lb ft)	-



ENGINE - ACCESSORIES - LEVER MECHANISMS

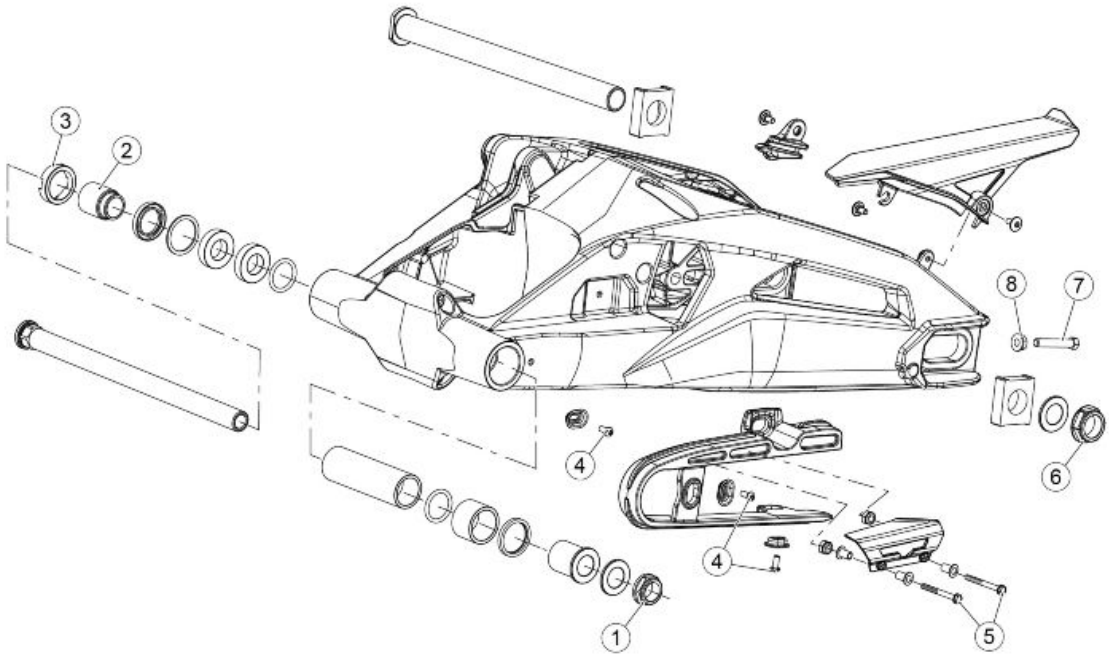
Pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head screw used for fastening the pinion	M10x1.25x26	1	50 Nm (36.88 lb ft)	Pre-impregnated screw
2	Cyl. head, hex. socket screw used for fastening the gear lever to the gearbox output shaft	M6x20	1	10 Nm (7.38 lb ft)	-
3	TORX screw used for fastening the gear lever pedal	M6x22	1	8 Nm (5.90 lb ft)	Loct. 270
4	Flanged, hex. head screws used for fastening the pinion cover guard	M6x12	2	10 Nm (7.38 lb ft)	-



PETROL VAPOUR RECOVERY SYSTEM

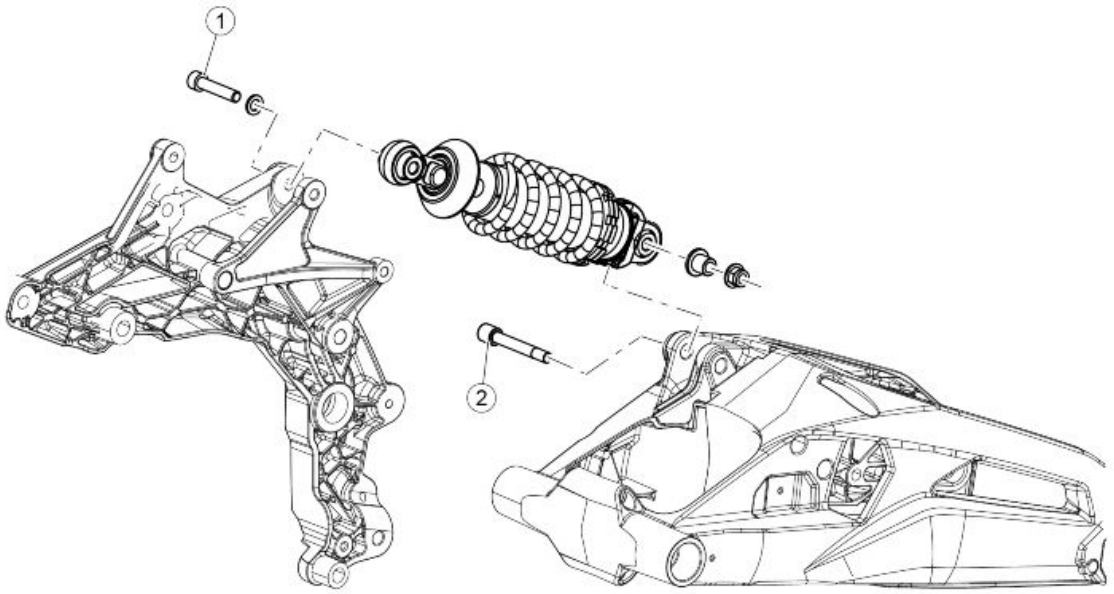
Pos.	Description	Type	Quantity	Torque	Notes
1	Cyl. head, hex. socket screws used for fastening the pinion cover guard	M6x25	2	4 Nm (2.95 lb ft)	-

Back side



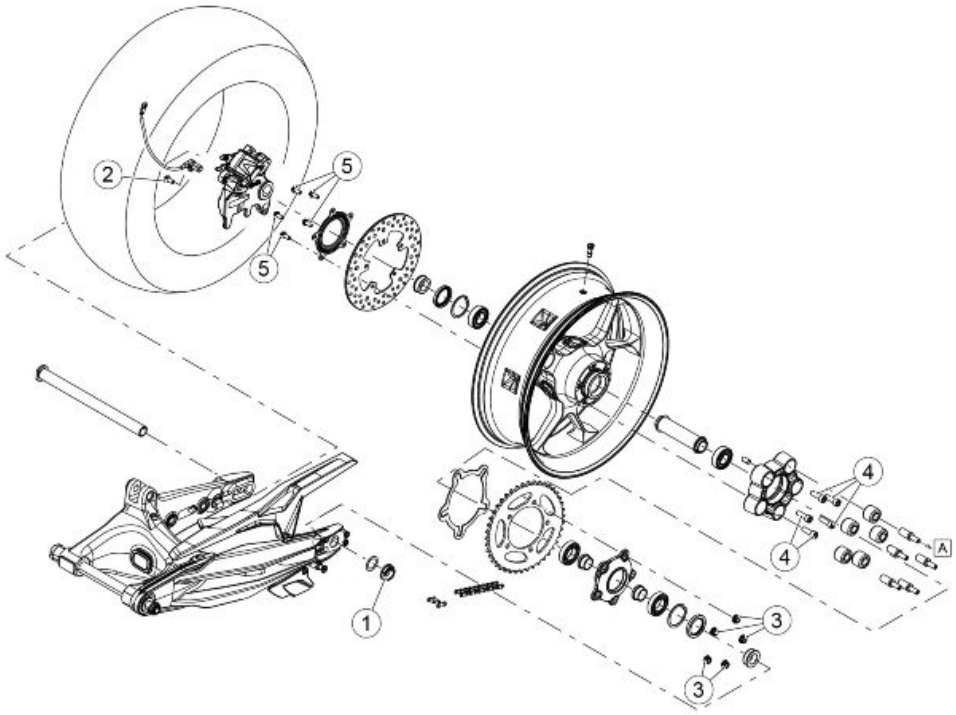
SWINGARM

Pos.	Description	Type	Quantity	Torque	Notes
1	Swingarm pivot bolt fastening nut	-	1	90 Nm (66.38 lb ft)	-
2	Swingarm pivot bolt fastening nut swingarm bolt regulator bushing	-	1	12 Nm (8.85 lb ft)	-
3	Swingarm pivot bolt fastening swing-arm bolt ferrule	-	1	60 Nm (44.25 lb ft)	-
4	Button head, hex. socket shoe cap fastening screws	M5x12	3	6 Nm (4.43 lb ft)	-
5	Button head, hex. socket screws used for fastening the chain guard on the chain guide shoe	M6x35	2	10 Nm (7.38 lb ft)	-
6	Wheel axle nut	M25x1.5	1	120 Nm (88.51 lb ft)	-
7	Chain tensioner adjustment screws	-	2	Manual	-
8	Flanged, self-locking nut on the chain tensioner shoe regulator screw	M8	2	Manual	-



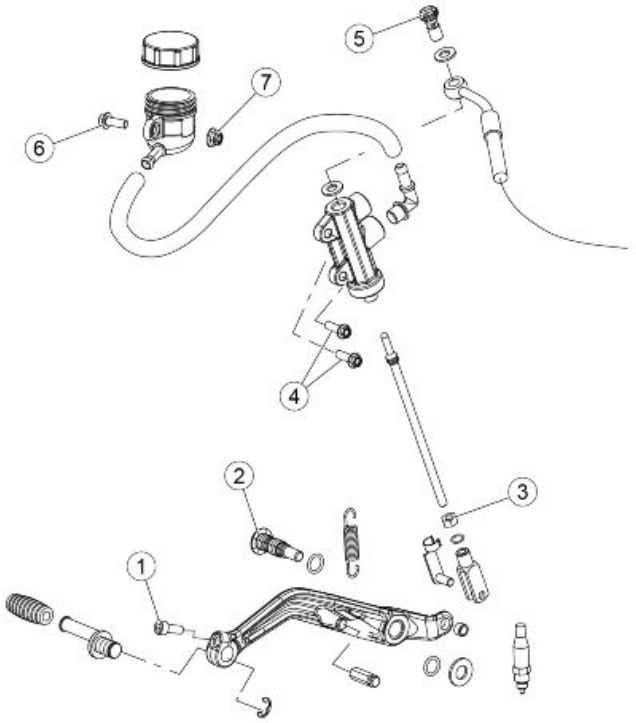
SHOCK ABSORBER

Pos.	Description	Type	Quantity	Torque	Notes
1	Cyl head, hex. socket upper shock absorber fastening screw	M10x50	1	50 Nm (36.88 lb ft)	Pre-impregnated screw
2	Cyl head, hex. socket lower shock absorber fastening screw	M10x59	1	50 Nm (36.88 lb ft)	-



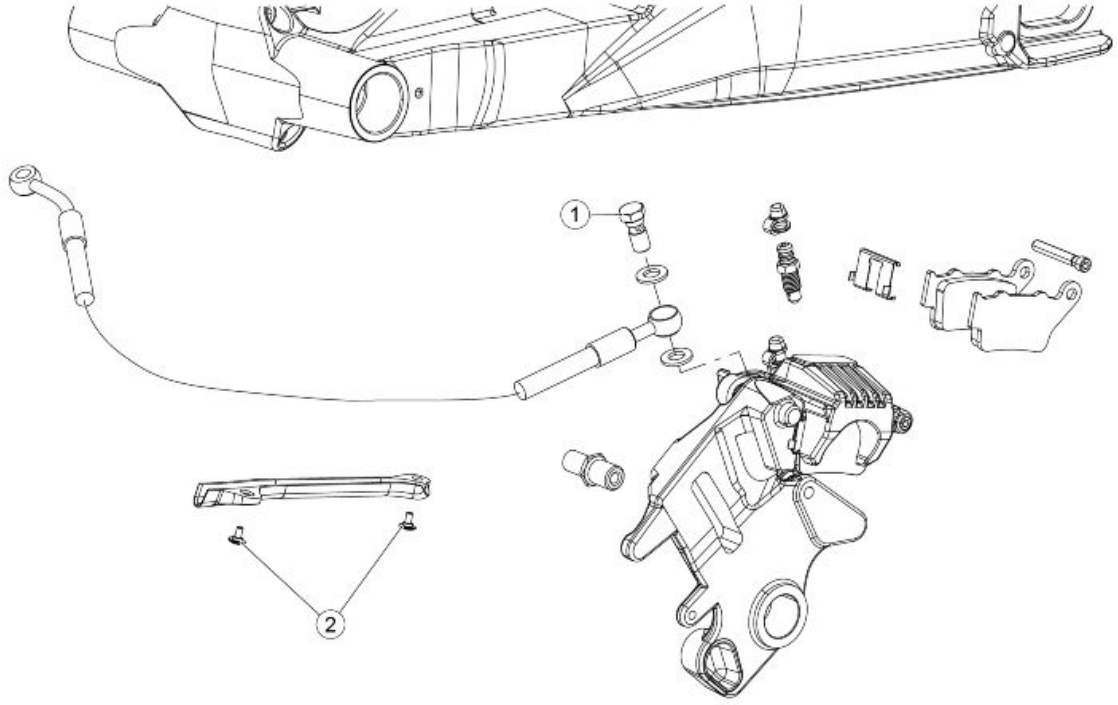
REAR WHEEL

Pos.	Description	Type	Quantity	Torque	Notes
1	Wheel axle nut	M25x1.5	1	120 Nm (88.51 lb ft)	-
2	Button head, hex. socket screw used for fastening the sensor to the brake calliper support	M5x16	1	6 Nm (4.43 lb ft)	-
3	DAX nut for fastening the crown gear on the hub	M10x1.25	5	50 Nm (36.88 lb ft)	-
4	Cyl. head, hex. socket screws used for fastening the cush to the wheel	M10x30	5	50 Nm (36.88 lb ft)	Pre-impregnated screws
5	Flanged, hex. head screws used for fastening the brake disc to the wheel	M8x18	5	30 Nm (22.13 lb ft)	Pre-impregnated screws



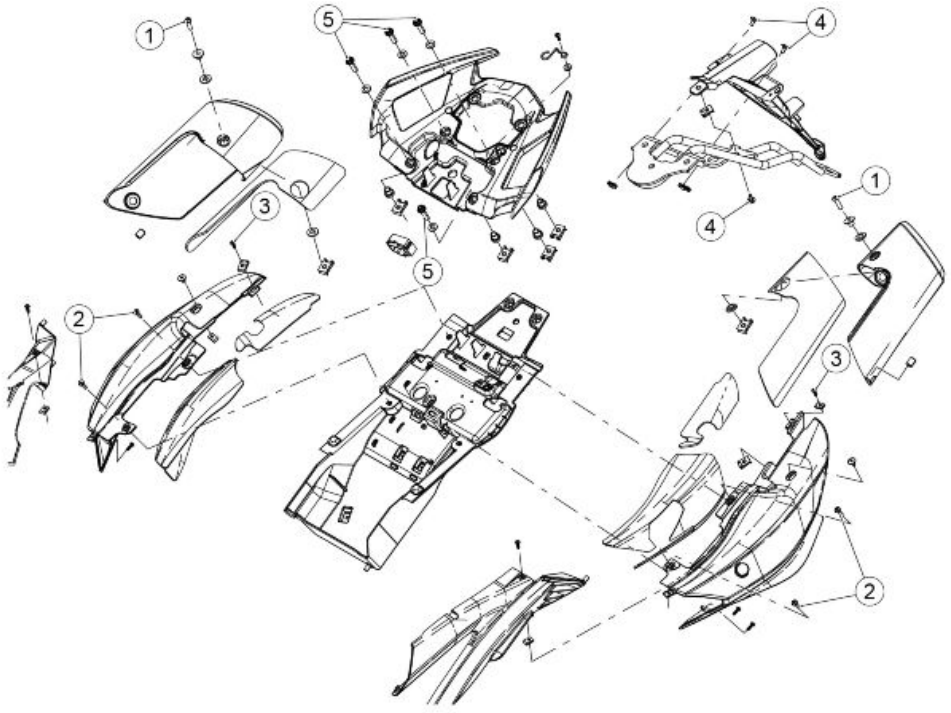
REAR BRAKE MASTER CYLINDER

Pos.	Description	Type	Quantity	Torque	Notes
1	Cyl. head, hex. socket screw used for fastening the peg to the gearshift lever	M6x16	1	10 Nm (7.38 lb ft)	-
2	Pin used to fasten the lever to the footrest support	-	1	25 Nm (18.44 lb ft)	-
3	Lock-nut for pump shaft fork	M6	1	10 Nm (7.38 lb ft)	-
4	Cyl. head, hex. socket screws used for fastening the pump to the footrest support	M6x16	2	10 Nm (7.38 lb ft)	-
5	Special brake pipe coupling fastening screw	M10x1	1	10 Nm (7.38 lb ft)	-
6	Flanged, hex. head screw used for fastening the brake fluid tank to the saddle support	M6x16	1	10 Nm (7.38 lb ft)	-
7	Flanged, self-locking nut used for fastening the brake fluid tank to the saddle support	M6	1	10 Nm (7.38 lb ft)	-



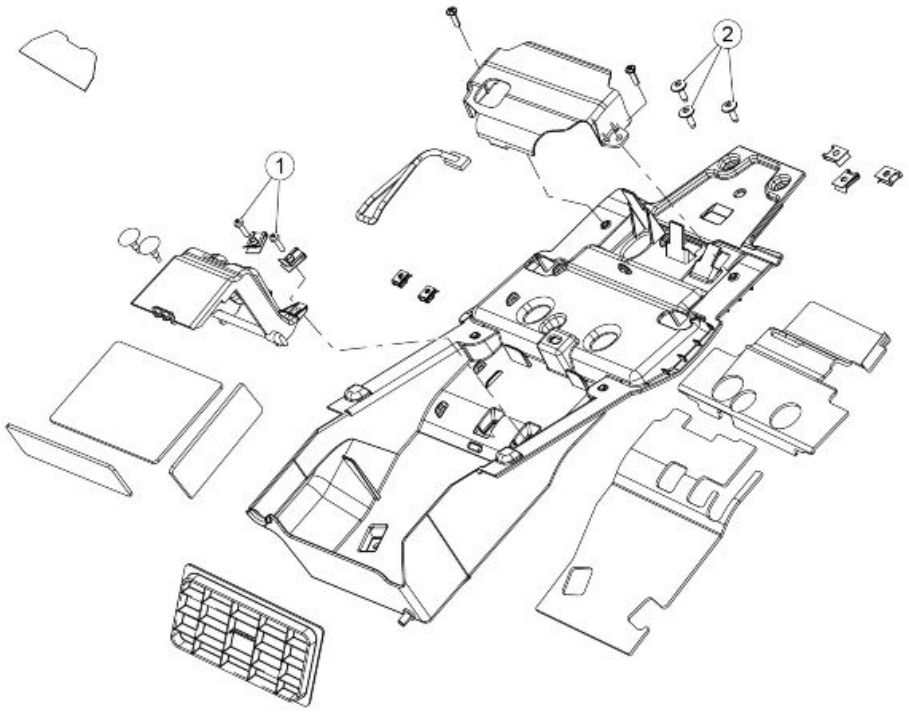
REAR BRAKE CALLIPER

Pos.	Description	Type	Quantity	Torque	Notes
1	Special brake pipe coupling fastening screw	M10x1	1	10 Nm (7.38 lb ft)	-
2	Button head, hex. socket screws used for fastening the brake pipe protection	M5x9	1	4 Nm (2.95 lb ft)	-



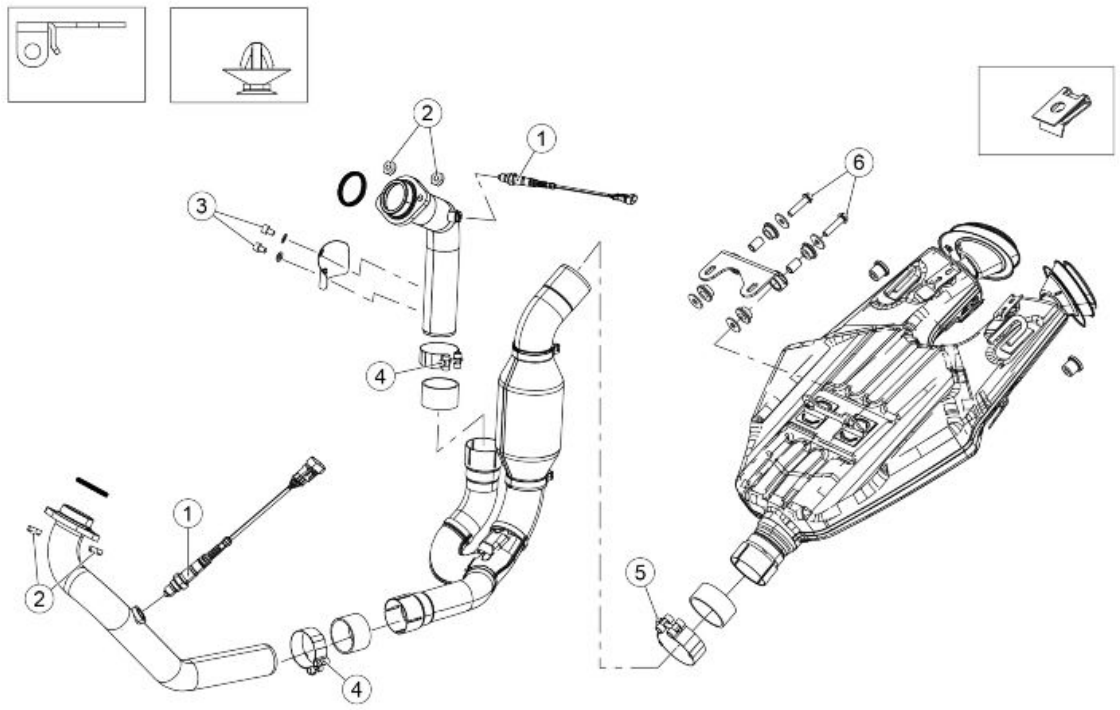
REAR BODYWORK

Pos.	Description	Type	Quantity	Torque	Notes
1	Button head, hex. socket screws used for fastening the covers to the terminal	M6x20	6	10 Nm (7.38 lb ft)	-
2	Self-tapping screws used for fastening the tail fairings to the battery compartment	M5x19	4	4 Nm (2.95 lb ft)	-
3	Self-tapping, cyl. head Pozidriv screws used for fastening the grab-bar to the tail fairings	4.2x16	2	3 Nm (2.21 lb ft)	-
4	Button head, hex. socket screws used for fastening the number plate holder to the number plate holder support	M5x9	3	4 Nm (2.95 lb ft)	-
5	Flanged, hex. head screws used for fastening the grab-bar support to the grab bar and the saddle support	M8x30	4	22 Nm (16.23 lb ft)	-



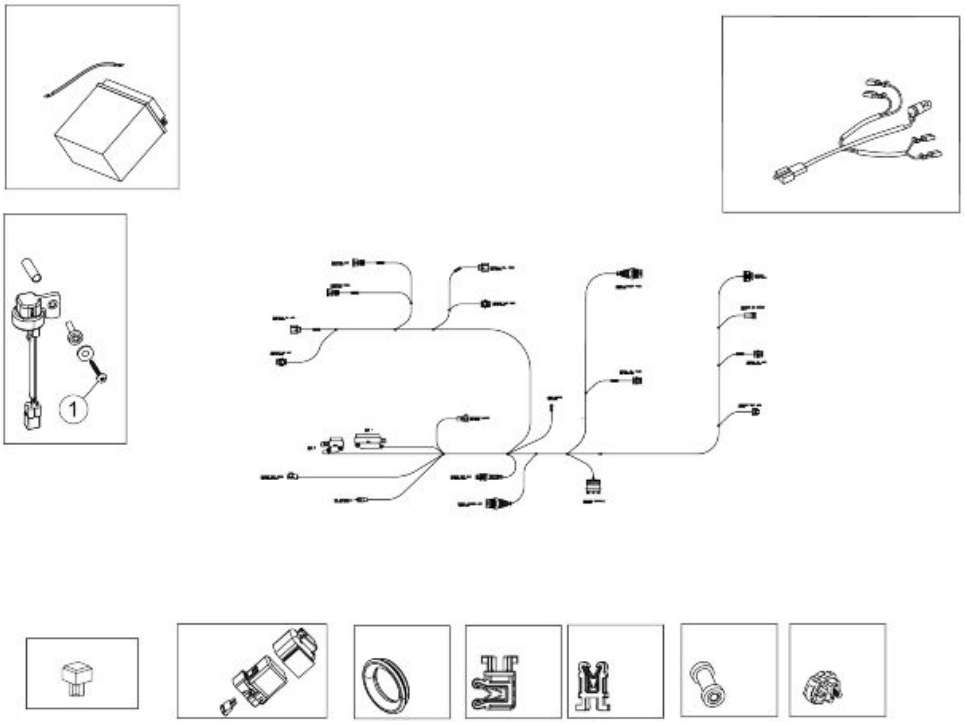
UNDER-SADDLE COMPARTMENT

Pos.	Description	Type	Quantity	Torque	Notes
1	Button cyl. head screws used for fastening the battery cover	M4x16	2	3 Nm (2.21 lb ft)	-
2	Flanged button head, hex. socket screws used for fastening the number plate holder support to the saddle support	M5	3	5 Nm (3.69 lb ft)	-



SILENCER

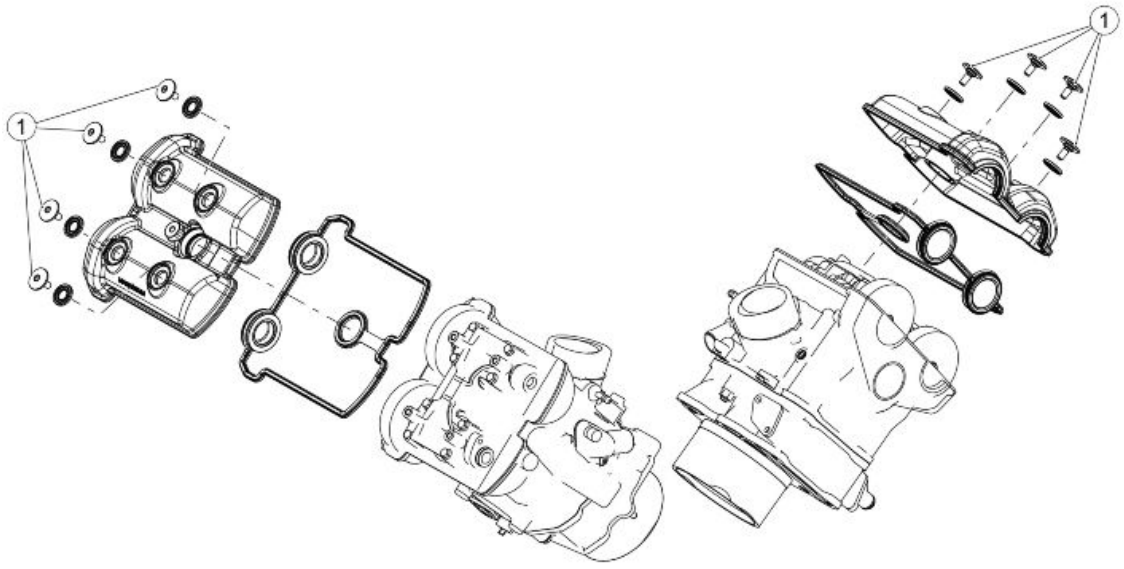
Pos.	Description	Type	Quantity	Torque	Notes
1	Lambda probes	-	2	40 Nm (29.50 lb ft)	-
2	Flanged, self-locking used for fastening the exhaust flanges to the big ends	M8	4	12.5 Nm (9.22 lb ft)	-
3	Cyl. head, hex. socket screws used for fastening the shock absorber protection	M4x6	2	3 Nm (2.21 lb ft)	-
4	Manifold fastening clamps	M6	2	7 Nm (5.16 lb ft)	-
5	Terminal fastening clamp	M6	1	7 Nm (5.16 lb ft)	-
6	Flanged, hex. head screws used for fastening the terminal front coupling to the support bracket	M8x35	2	18 Nm (13.28 lb ft)	-



REAR ELECTRICAL SYSTEM

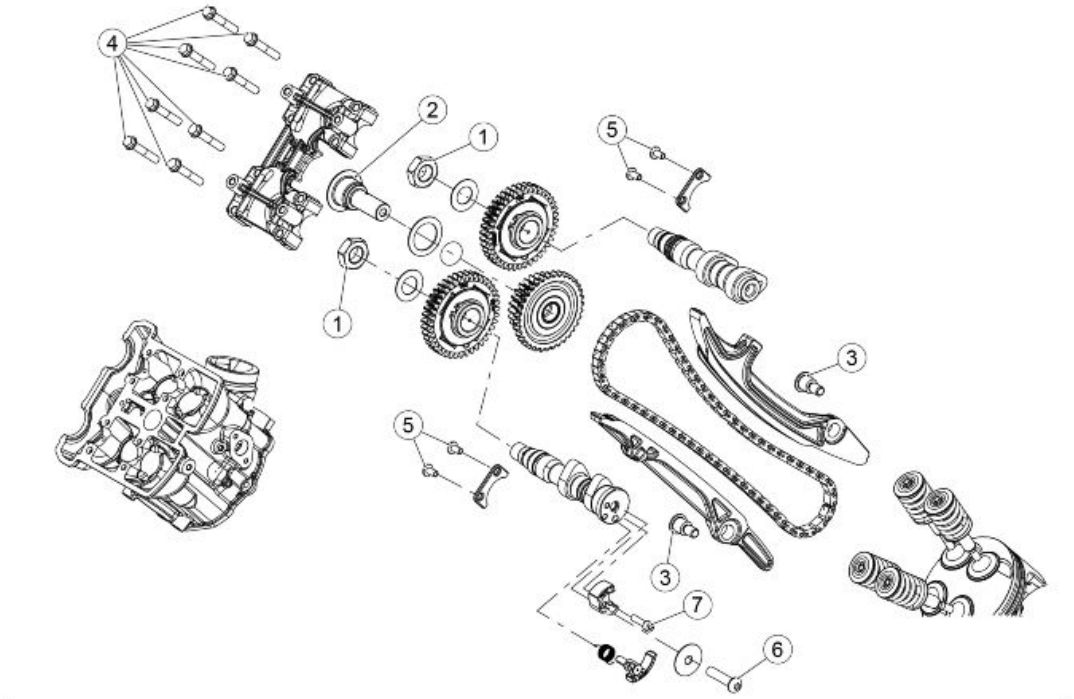
Pos.	Description	Type	Quantity	Torque	Notes
1	Button head, hex. socket screw used for fastening the anti-rollover sensor	M5x35	1	3 Nm (2.21 lb ft)	-

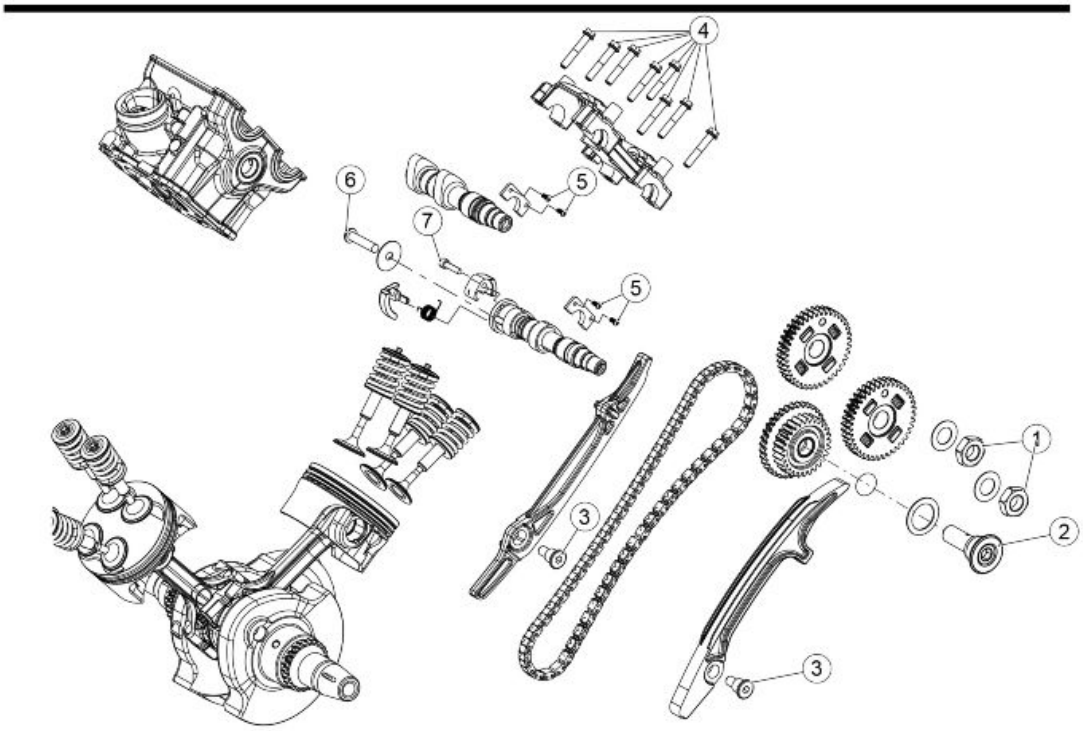
Engine



HEAD COVER

Pos.	Description	Type	Quantity	Torque	Notes
1	Special head cover fastening screw	M6	8	9 Nm (6.64 lb ft)	-

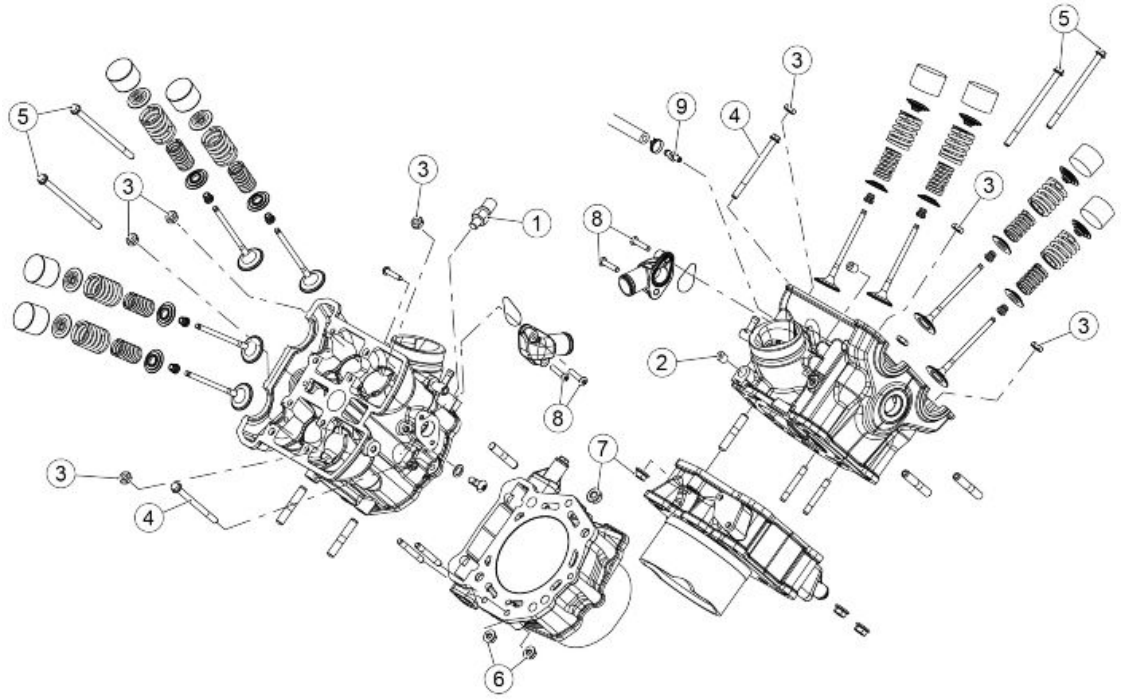




TIMING SYSTEM

Pos.	Description	Type	Quantity	Torque	Notes
1	Cam shaft gear fastening nut	M15x1	4	88 Nm (64.91 lb ft)	Thoroughly de-grease both of the coupling surfaces

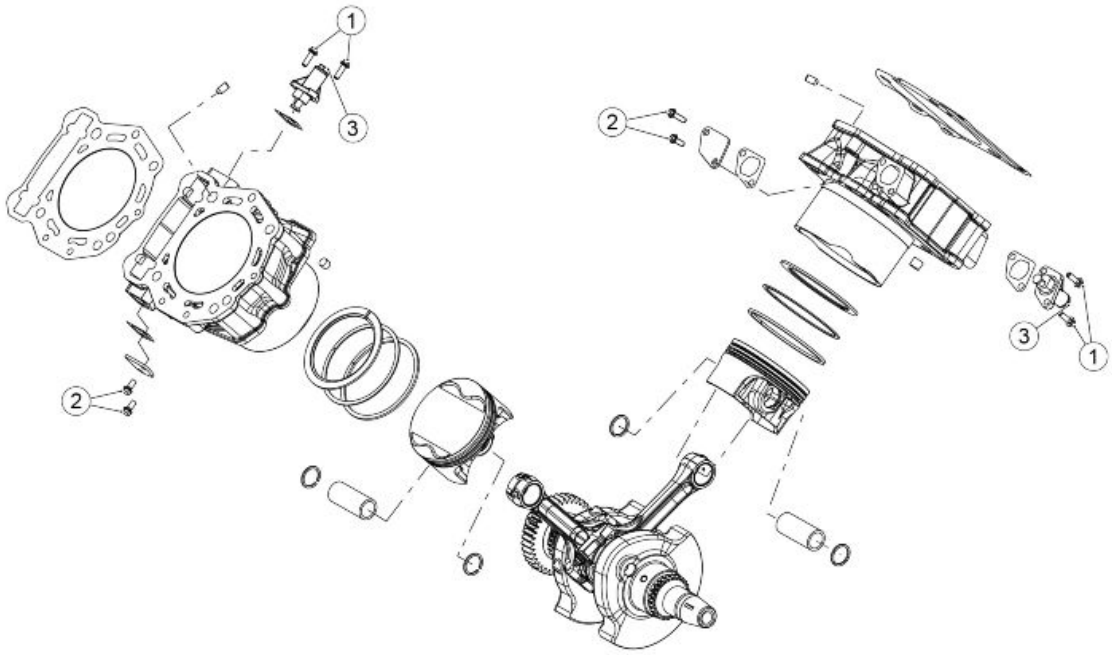
Pos.	Description	Type	Quantity	Torque	Notes
					(axle cone and gear cone)
2	Timing lay shaft fastening screw	M24x1.5	2	88 Nm (64.91 lb ft)	3M SCOTCH GRIP 2353
3	Special mobile / fixed slider fastening screw	M8	4	18 Nm (13.28 lb ft)	3M SCOTCH GRIP 2353
4	Cam tower / head fastening screws	M6x37	16	13 Nm (9.59 lb ft)	Follow the numbering sequence stamped on the cam towers
5	Cam tower / plate fastening screws	M4x10	8	3 Nm (2.21 lb ft)	3M SCOTCH GRIP 2353
6	Decompressor fastening screws	M8	2	28 Nm (20.65 lb ft)	3M SCOTCH GRIP 2353 or Loct. DRI-LOC 2045 BLUE
7	Decompressor fastening screw	M5x12.9	2	5 Nm (3.69 lb ft)	3M SCOTCH GRIP 2353 or Loct. DRI-LOC 2045 BLUE



HEAD

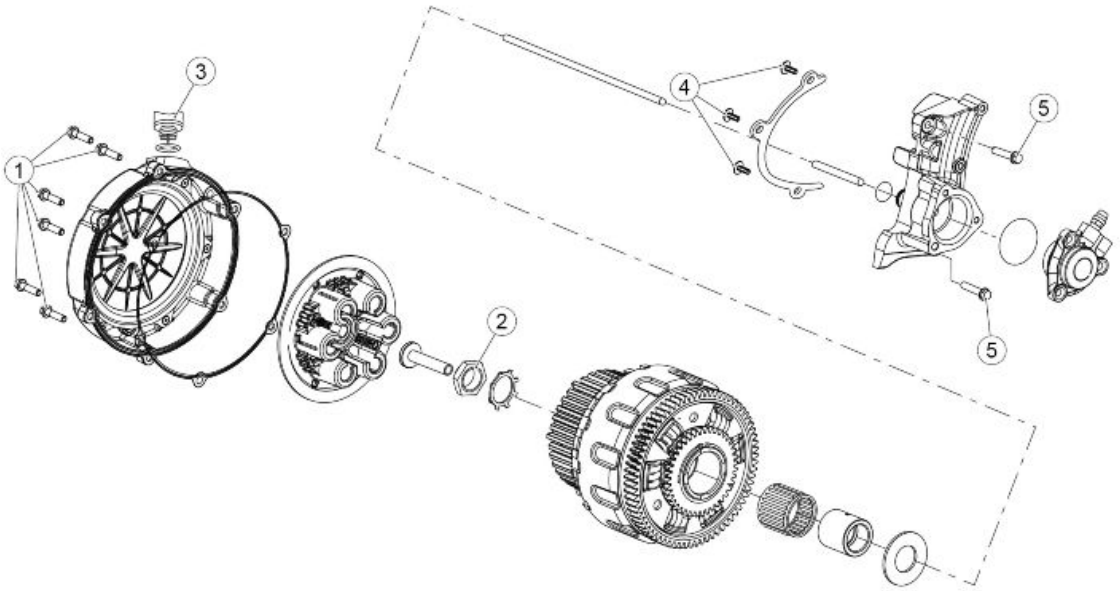
Pos.	Description	Type	Quantity	Torque	Notes
1	Water Temperature Sensor	M12x1.5	1	20 Nm (14.75 lb ft)	-
2	Threaded plug	M12x1.5	1	10 Nm (7.38 lb ft)	Loct. drise AL 506
3	Nut for fastening the stud bolts to the head - Pre-tightening	M10x1.25	8	13 Nm (9.59 lb ft)	Lubricate the threads before tightening
3	Nut for fastening the stud bolts to the head - Tightening	M10x1.25	8	135° + 135°	-
4	Head / Cylinder / Crankcase fastening outside	M6x75	2	13 Nm (9.59 lb ft)	-
5	Head / Cylinder / Crankcase fastening inside	M6x125	4	13 Nm (9.59 lb ft)	-
6	Nut for fastening the Stud bolts to the Head	M6	4	12 Nm (8.85 lb ft)	-
7	Nut for fastening the Stud bolts to the Head	M8x1.25	2	25 Nm (18.44 lb ft)	-
8	Screw for fastening the connector to the discharge	M5	4	6 Nm (4.43 lb ft)	Loct. dry loc 2040

Pos.	Description	Type	Quantity	Torque	Notes
9	Water vent connector	M6	1	3 Nm (2.21 lb ft)	Loct. 262



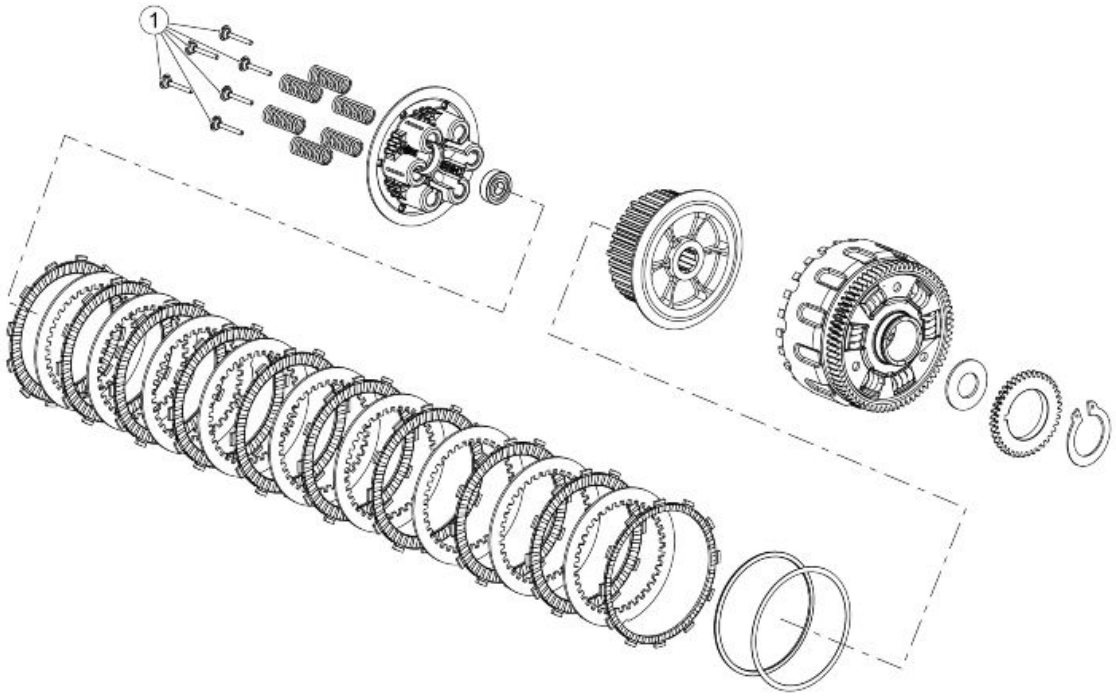
CYLINDER

Pos.	Description	Type	Quantity	Torque	Notes
1	Chain tensioner fastener screw	M6x30	4	13 Nm (9.59 lb ft)	-
2	Cylinder plate fastening screw	M6x16	4	9 Nm (6.64 lb ft)	-
3	Chain tensioner adjustment screw	M6	2	5 Nm (3.69 lb ft)	-



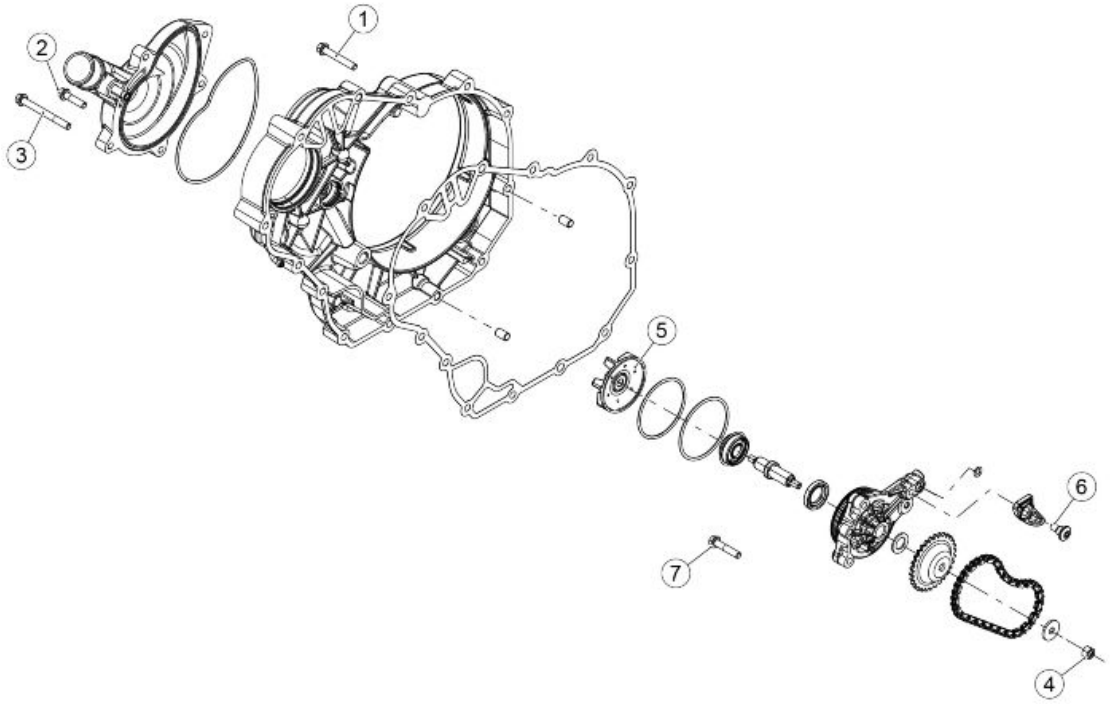
CLUTCH COVER

Pos.	Description	Type	Quantity	Torque	Notes
1	Clutch cover / Clutch side cover fastening screw	M6	6	13 Nm (9.59 lb ft)	-
2	Clutch fastening nut	M24x1.5	1	177 Nm (130.55 lb ft)	Chamfer
3	Oil filler cap on clutch cover	M25x1.25	1	2 Nm (1.48 lb ft)	-
4	Clutch Control Plate / Support countersunk hex head fastening screw	M5x12	3	5 Nm (3.69 lb ft)	3M SCOTCH GRIP 2353
5	Flywheel side clutch control support / half-crankcase fastening screw	M6	2	13 Nm (9.59 lb ft)	-



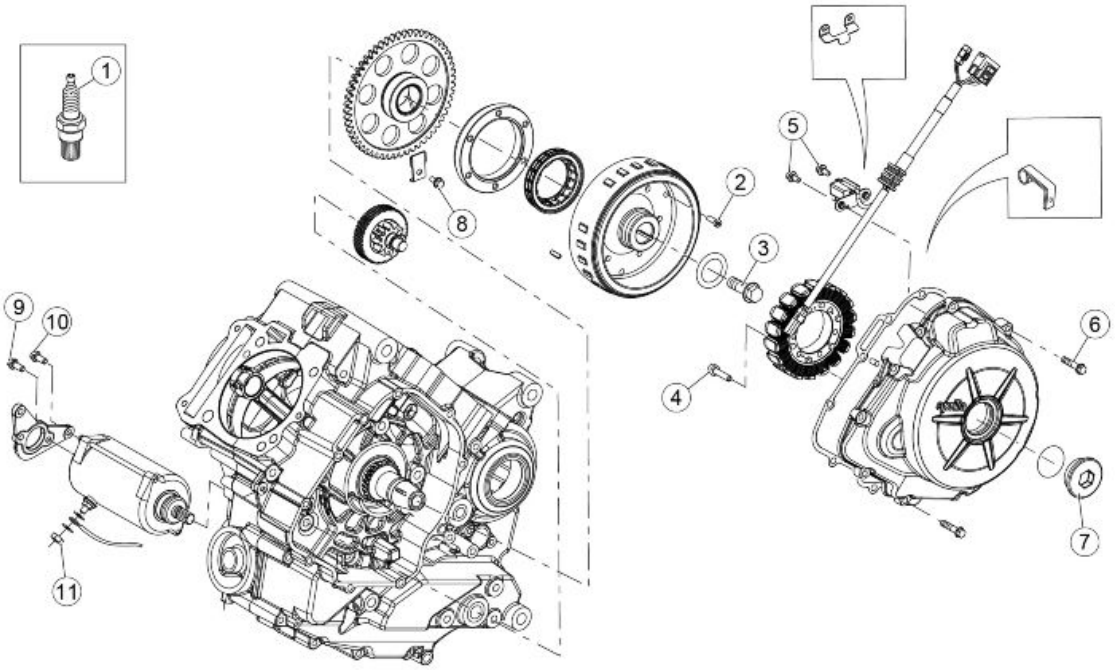
CLUTCH

Pos.	Description	Type	Quantity	Torque	Notes
1	Clutch spring fastening screw	M6	6	12 Nm (8.85 lb ft)	-



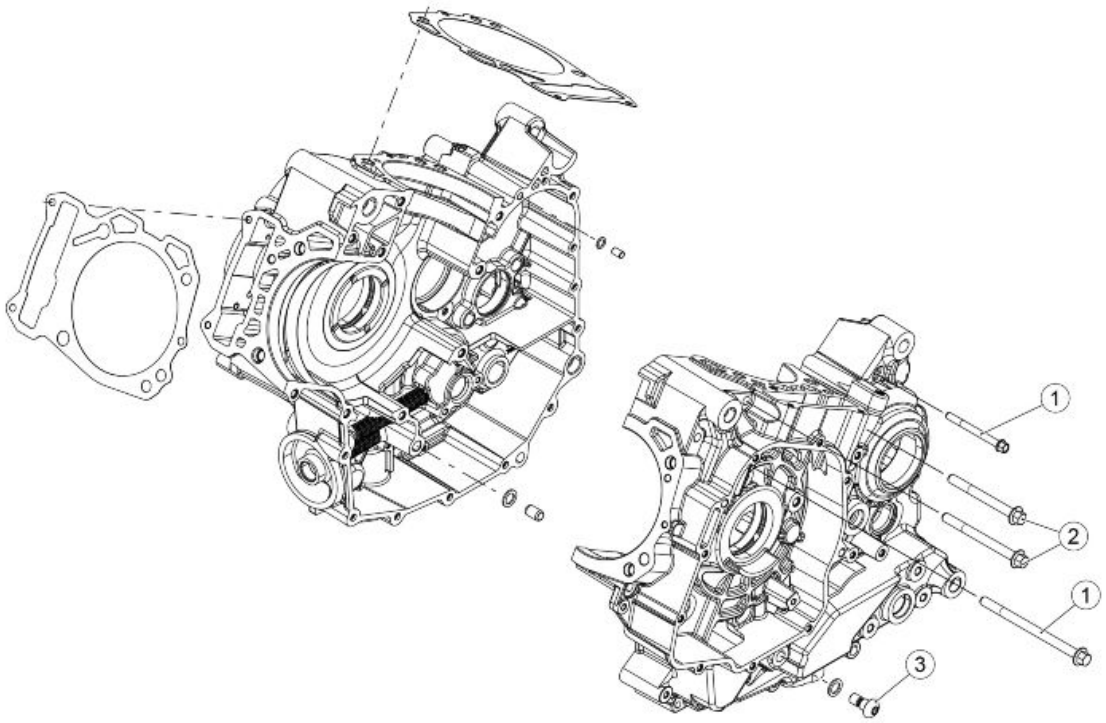
WATER PUMP

Pos.	Description	Type	Quantity	Torque	Notes
1	Clutch side cover fixing screw	M6x40	13	13 Nm (9.59 lb ft)	-
2	Pump cover / Clutch side cover fastening screw	M6x25	3	13 Nm (9.59 lb ft)	-
3	Pump cover / Clutch cover / clutch side half-crankcase fastening screw	M6x60	2	13 Nm (9.59 lb ft)	-
4	Water pump control crown fastening nut	M6	1	12 Nm (8.85 lb ft)	Loct. 244
5	Water pump impeller (brass insert)	M6	1	4 Nm (2.95 lb ft)	-
6	Flanged hex head screw for fastening the chain tensioner slider	M6x12	1	9 Nm (6.64 lb ft)	Loct. 242
7	Pump support fastening screw	M6x30	3	12 Nm (8.85 lb ft)	-



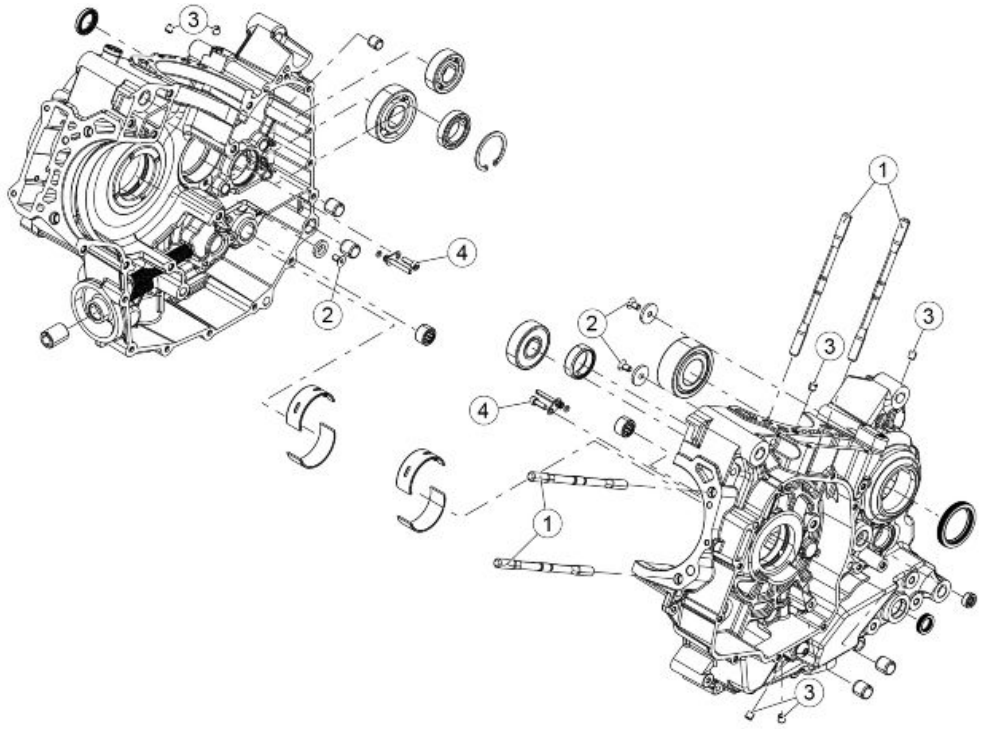
IGNITION

Pos.	Description	Type	Quantity	Torque	Notes
1	Spark plug	-	2	13 Nm (9.59 lb ft)	-
2	Free wheel ring fastening screw	M6x18	6	14 Nm (10.33 lb ft)	3M SCOTCH GRIP 2353
3	Rotor fastening screw - Crankshaft	M14x1.5	1	191 Nm (140.87 lb ft)	Thoroughly de-grease both of the coupling surfaces
4	Stator fastening screw / Flywheel cover	M6x30	3	9 Nm (6.64 lb ft)	-
5	Pick-up fastening screw / Flywheel cover	M5x14	2	3 Nm (2.21 lb ft)	Loct. 270
6	Flywheel cover fastening screw	M6x30	10	13 Nm (9.59 lb ft)	-
7	Crankshaft access plug	-	1	4 Nm (2.95 lb ft)	-
8	Crown containment plate fastening screw	M6x12	1	8 Nm (5.90 lb ft)	-
9	Bracket to starter motor fastening screw	M6x14	2	7 Nm (5.16 lb ft)	Loct. 242
10	Starter motor bracket to crankcase fastening screw	M6x16	2	13 Nm (9.59 lb ft)	-



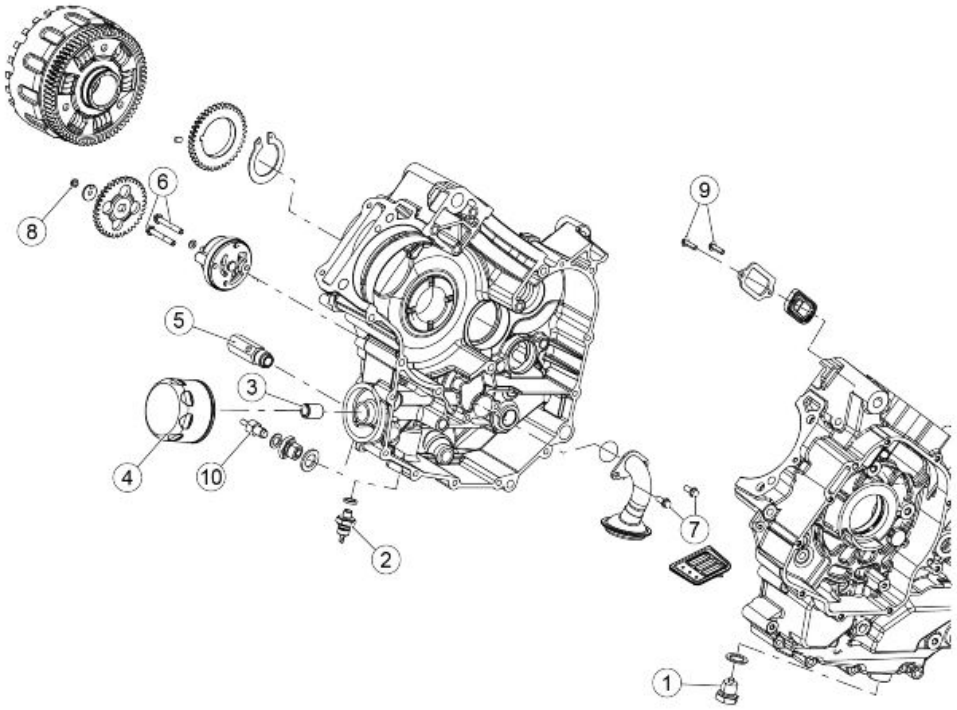
CRANKCASE II

Pos.	Description	Type	Quantity	Torque	Notes
1	Half-crankcase coupling screw	M8x80	9	28 Nm (20.65 lb ft)	-
2	Half-crankcase coupling screw	M6x65	8	13 Nm (9.59 lb ft)	-
3	Special oil calibration screw	M10x1	1	14 Nm (10.33 lb ft)	-



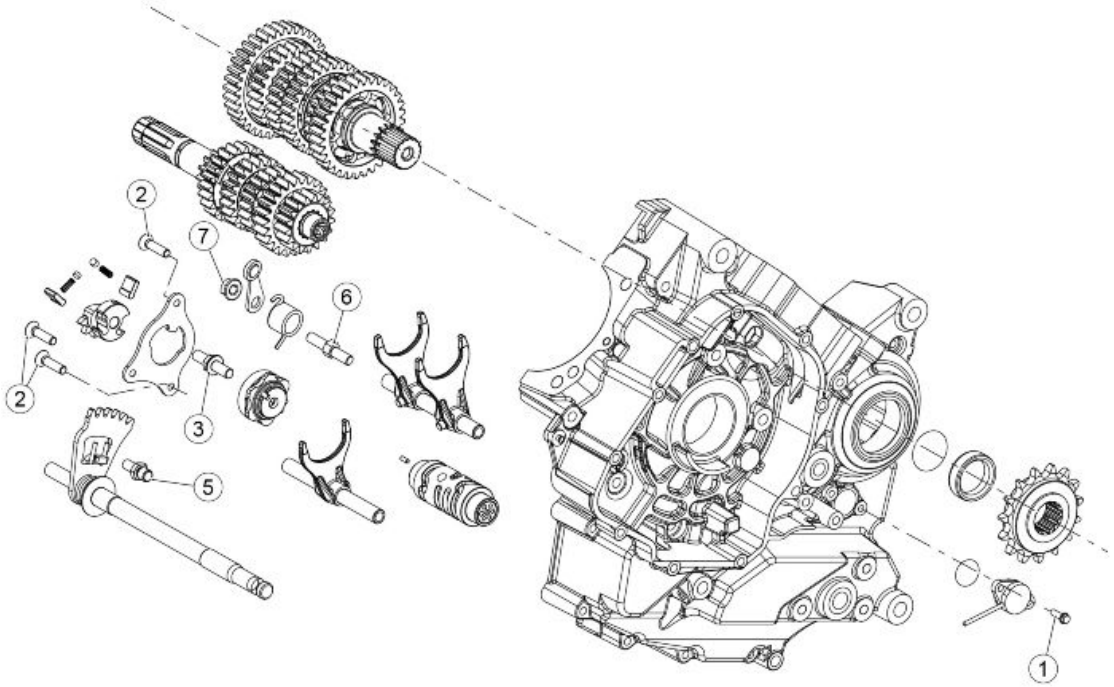
CRANKCASE I

Pos.	Description	Type	Quantity	Torque	Notes
1	Crankcase-cylinder-head fastening stud bolts	M10x1.25x166	8	Distance-based tightening	SCOTCH GRIP 2510 GREEN
2	Bearing retainer fastening screws	M6x12	3	10 Nm (7.38 lb ft)	3M SCOTCH GRIP 2353 or Loct. DRI-LOC 2045 BLUE
3	Threaded plug	M8x1	5	15 Nm (11.06 lb ft)	3M SCOTCH GRIP 2353
4	Piston oil jet fastening screw	M5x16	2	5 Nm (3.69 lb ft)	3M SCOTCH GRIP 2353 or Loct. DRI-LOC 2045 BLUE



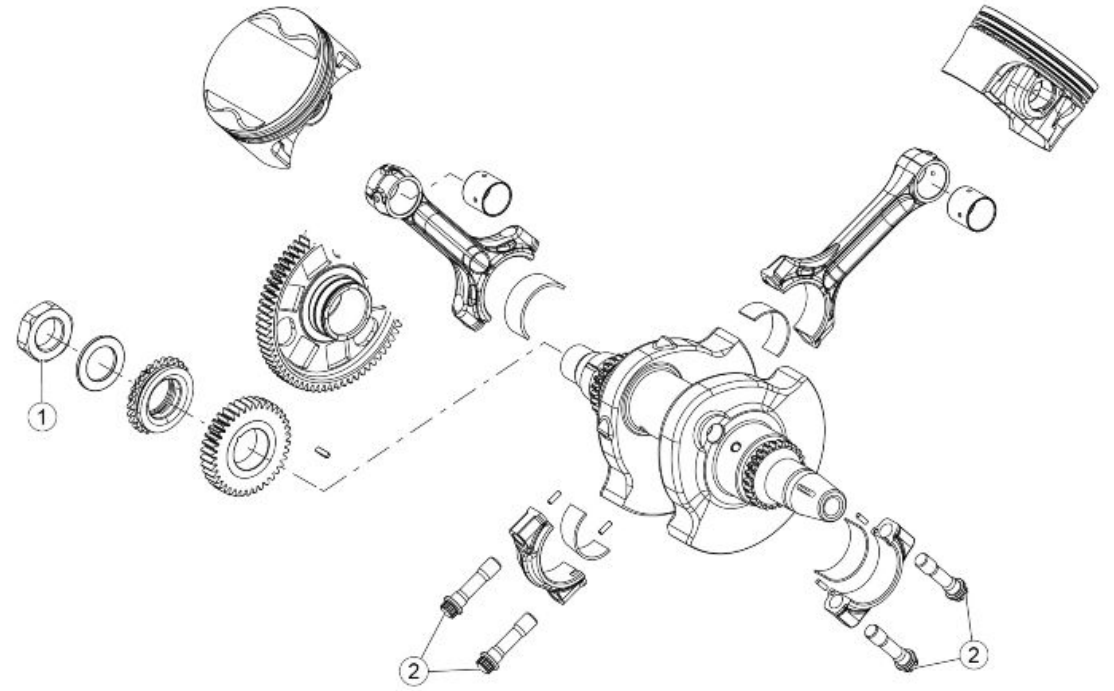
LUBRICATION

Pos.	Description	Type	Quantity	Torque	Notes
1	Oil drainage plug	M16x1.5	1	17 Nm (12.54 lb ft) +/- 15%	-
2	Oil pressure sensor	M10x1	1	13 Nm (9.59 lb ft)	-
3	Fitting fixing of the oil filter	-	1	20 Nm (14.75 lb ft)	-
4	Oil filter	-	1	14 Nm (10.33 lb ft)	-
5	Oil pressure regulation valve	M16x1.5	1	41 Nm (30.24 lb ft)	-
6	Oil pump / bulkhead fastening screws	M6x45	2	5 Nm (3.69 lb ft)	3M SCOTCH GRIP 2353
7	Strainer fastening screws	-	2	12 Nm (8.85 lb ft)	-
8	Oil pump gear fastener nut	M6	1	11 Nm (8.11 lb ft)	-
9	Gear sensor fastening screws	M5x16	2	5 Nm (3.69 lb ft)	3M SCOTCH GRIP 2353
10	Oil temperature sensor	M10x1	1	13 Nm (9.59 lb ft)	-



GEAR SELECTOR

Pos.	Description	Type	Quantity	Torque	Notes
1	Gear sensor fastening screw	M5	2	6 Nm (4.43 lb ft)	Loct. 270
2	Selector plate fastening screw	M5x12	3	5 Nm (3.69 lb ft)	3M SCOTCH GRIP 2353
3	Desmodromic drum/sprocket fastening screw	M8x1.25x17	1	15 Nm (11.06 lb ft)	3M SCOTCH GRIP 2353
4	Selector pin fastening screw	M10x1.5	1	16 Nm (11.80 lb ft)	Loct. 242
5	Ratchet pin fastening screw	M6	1	12 Nm (8.85 lb ft)	Loct. dry loc 2040



CRANKSHAFT

Pos.	Description	Type	Quantity	Torque	Notes
1	Primary crankshaft fastening net	M24x1.5	1	294 Nm (216.84 lb ft)	Thoroughly degrease both of the coupling surfaces (shaft cone and gear cone)
2	Connecting rod fastening screws - Pre-torque	M10x1x40	4	15 Nm (11.06 lb ft)	Lubricate the threads before tightening
2	Connecting rod fastening screws - Torque	M10x1x40	4	30 Nm (22.13 lb ft) + 50° +/- 2°	-
2	Connecting rod fastening screws - Control	M10x1x40	4	70 Nm (51.63 lb ft)	-

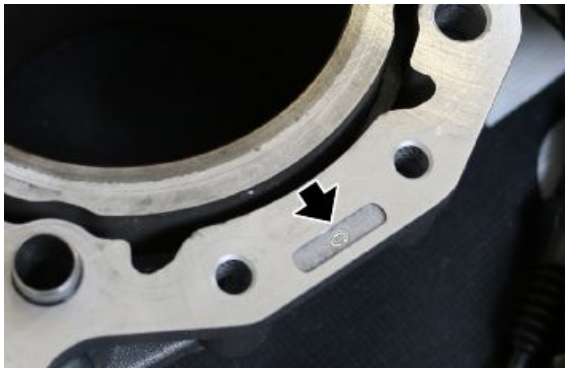
Overhaul data

Assembly clearances

Cylinder - piston assy.

The pistons are available in four size types (A, B, C, D) to be coupled to the four cylinder types (A, B, C, D).

Only one type of piston ring is available.



PISTON - CYLINDER COUPLING

Specification	Desc./Quantity
Cylinder-piston class A coupling	Cylinder: 91.990 - 91.997 mm (3.6216 - 3.6219 in) Piston: 91.933 - 91.940 mm (3.6217 - 3.6197 in)
Cylinder-piston class B coupling	Cylinder: 91.997 - 92.004 mm (3.6219 - 3.6222 in) Piston: 91.940 - 91.947 mm (3.6197 - 3.6199 in)
Cylinder-piston class C coupling	Cylinder: 92.004 - 92.011 mm (3.6222 - 3.6225 in) Piston: 91.947 - 91.954 mm (3.6199 - 3.6202 in)
Cylinder-piston class D coupling	Cylinder: 92.011 - 92.018 mm (3.6225 - 3.6227 in) Piston: 91.954 - 91.961 mm (3.6202 - 3.6205 in)

Specification	Desc./Quantity
Fitting clearance	0.050 - 0.064 mm (0.00197 - 0.00252 in)

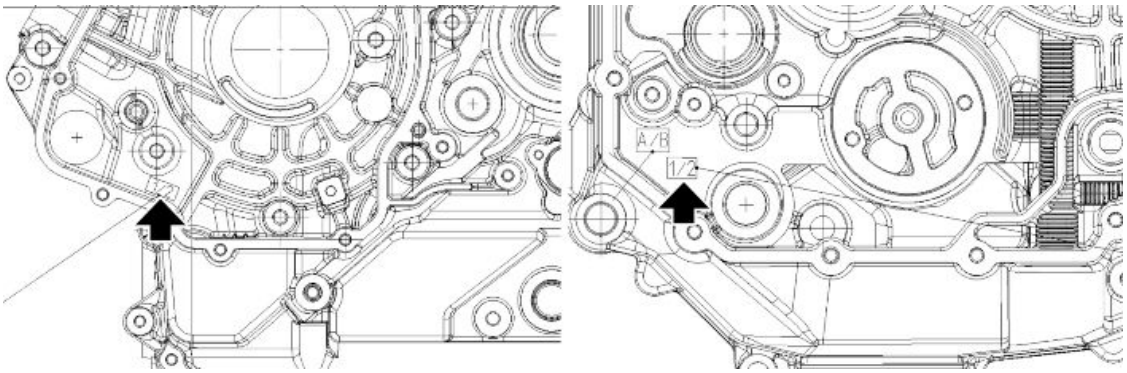
Crankcase - crankshaft - connecting rod

MARKINGS ON THE INSIDE OF THE CRANKCASES

Crankcases selectable in two classes (1 or 2), based on the diameter of the main housing.

The categories are indicated on both half-crankcases:

- In the area of the starter gears on the flywheel side crankcase.
- In the area of the gearshift control devices on the clutch side crankcase.



CRANKCASE SELECTION CLASSES

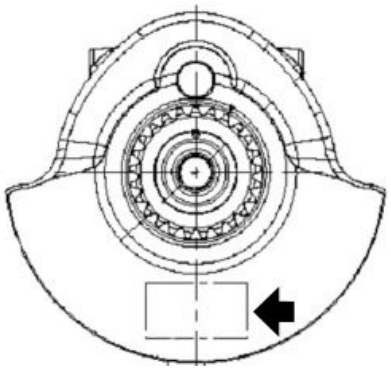
Specification	Desc./Quantity
Crankcase class 1	Bearing housing diameter: 53.954 - 53.960 mm (2.1241 - 2.1244 in)
Crankcase class 2	Bearing housing diameter: 53.960 - 53.966 mm (2.1244 - 2.1246 in)

CRANKSHAFT

There are three crankshaft selection classes for each capacity:

- 4 - 5 - 6 for the flywheel side;
- 7 - 8 - 9 for the clutch side;

The category type is stamped on the outside of the crankshaft's counterweight.



NOTE

THE SHAFT CAN HAVE TWO DIFFERENT CLASSES FOR THE TWO CAPACITIES.

CRANKSHAFT SELECTION CLASSES

Specification	Desc./Quantity
Crankshaft class 4 - 7	Main journals - diameter: 49.978 - 49.984 mm (1.9676 - 1.9679 in)
Crankshaft class 5 - 8	Main journals - diameter: 49.972 - 49.978 mm (1.9674 - 1.9676 in)
Crankshaft class 6 - 9	Main journals - diameter: 49.990 - 49.984 mm (1.9681 - 1.9679 in)

After having determined the categories of:

- crankcase
- flywheel side block journal
- clutch side block journal

the bearings to be used for their coupling can be selected based on the following table.

MAIN BEARINGS

Block journal	Crankcase class 1	Crankcase class 2
Block journal class 4 (l.v.)	Half bearings A (red)	Half bearings B (blue)
Block journal class 5 (l.v.)	Half bearings B (blue)	Half bearings C (yellow)
Block journal class 6 (l.v.)	Half bearings E (green)	Half bearings A (red)
Block journal class 7 (l.f.)	Half bearings A (red)	Half bearings B (blue)
Block journal class 8 (l.f.)	Half bearings B (blue)	Half bearings C (yellow)
Block journal class 9 (l.f.)	Half bearings E (green)	Half bearings A (red)

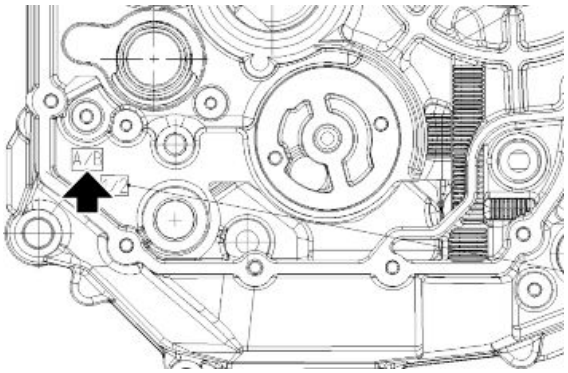
See also

Removing the flywheel cover

PRIMARY GEAR CATEGORY

Crankcase selectable in two classes (A or B) based on the centre distance between the primary reduction gears.

The categories are indicated on the clutch side half-crankcase, in the area of the gearshift control devices.



NOTE

IF THE CRANKCASE IS REPLACED, IT WILL BE SUPPLIED WITH THE PRIMARY REDUCTION GEAR ALREADY COUPLED.

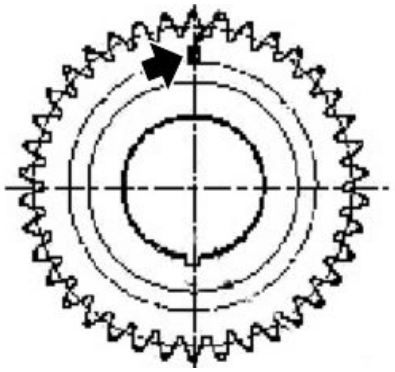
CRANKCASE-PRIMARY GEAR SELECTION CLASSES

Specification	Desc./Quantity
Crankcase class A	Centre distance: 110.50 - 110.54 mm (4.3504 - 4.3519 in)
Crankcase class B	Centre distance: 110.46 - 110.50 mm (4.3488 - 4.3504 in)

PRIMARY CATEGORY

Pinion selectable in two classes (A or B) based on the centre distance between the primary reduction gears.

The categories of the class B pinions are indicated on the pinions themselves.



CRANKSHAFT CATEGORY (CRANK PIN)

Shaft selectable in four classes (4, 5, 6, 7) based on the diameter of the crank pin.

Shaft selectable in seven classes (E1, E2, ...) based on the weight of the connecting rods.

Key:

* Connecting rod selection class.

** Crank pin selection class.

*** Progressive traceability number and date.

SHAFT CATEGORY

Class	Crank pin diameter (mm)
0	42.000 - 42.006 mm (1.65354 - 1.65377 in)
1	41.994 - 42.000 mm (1.65330 - 1.65354 in)
2	41.988 - 41.994 mm (1.65307 - 1.65330 in)
3	41.982 - 41.988 mm (1.65283 - 1.65307 in)

See also

Removing the flywheel cover

BEARINGS

Since the connecting rod has only one size category, the bearing must be selected based exclusively on the crank pin's size class.

BEARINGS

Crank pin diameter	Connecting rod class 1
Shaft class 0	Half bearings E (green)
Shaft class 1	Half bearings A (red)
Shaft class 2	Half bearings B (blue)
Shaft class 3	Half bearings C (yellow)

CONNECTING RODS

Spare parts are not available for all the weight classes, but only the four most significant; for the selection, please refer to the following table:

CONNECTING RODS

Class by shaft weight	Weight range (g)
E1	450-455
E2	455-460
E3	460-465
E4	465-470
E5	470-475
E6	475-480
E7	480-485

CAUTION

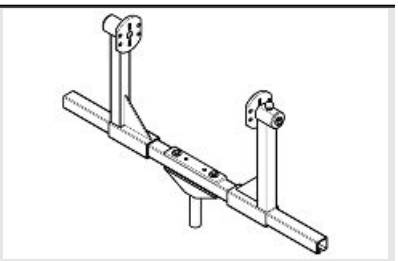
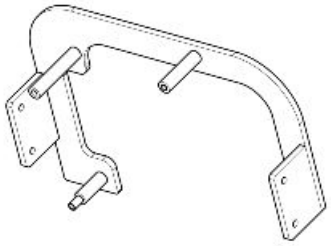
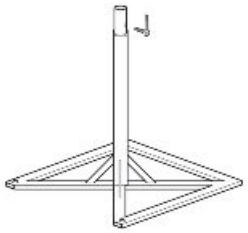
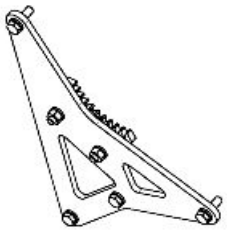
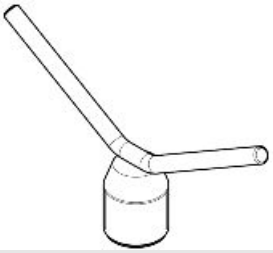
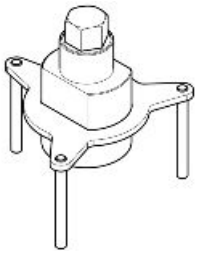
THE CONNECTING RODS FOR THE SAME CRANKSHAFT MUST BE OF THE SAME WEIGHT CLASS AND MUST HAVE THE SAME TYPE OF CRANKSHAFT COUPLING.
DURING RE-ASSEMBLY, ALSO MAKE SURE THAT THE HALF BEARINGS ARE OF THE SAME CLASS.

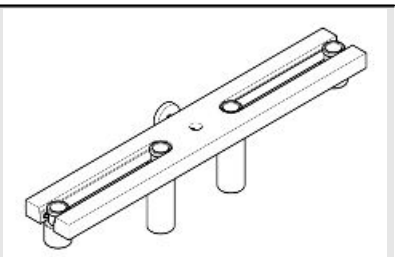
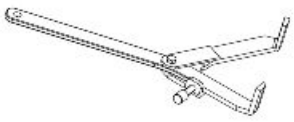
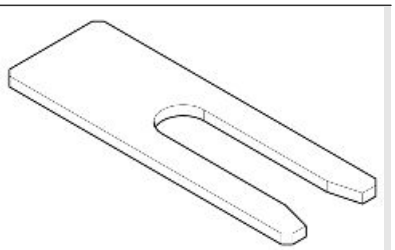
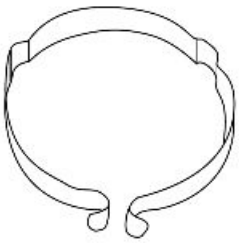
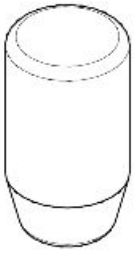
See also

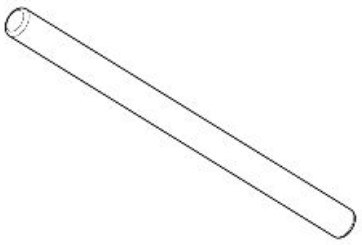
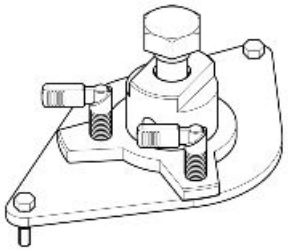
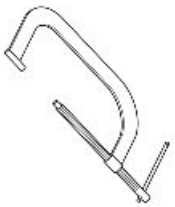
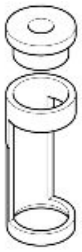
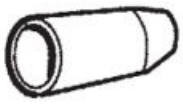
Removing the flywheel cover

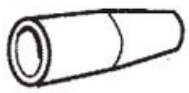
INDEX OF TOPICS

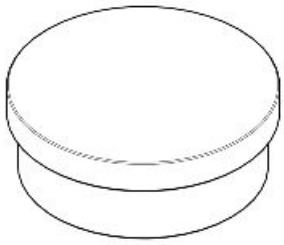
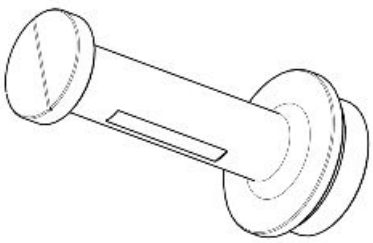
SPECIAL TOOLS

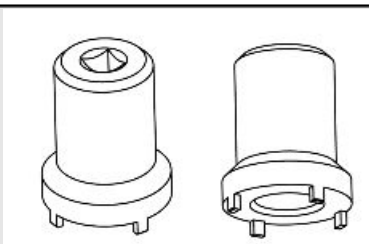
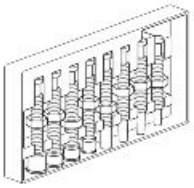
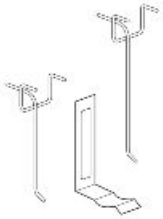
Stores code	Description	
020709Y	Engine support	
020710Y	Engine plate	
AP8140187	U-bolt for motor support	
020850Y	Primary gear lock	
020712Y	Handle for removing the flywheel cover	
020713Y	Flywheel extractor	

Stores code	Description	
020714Y	Dial gauge mount	
9100896	Clutch bell stopper	
020716Y	Connecting stem lock	
020470Y	Pin snap ring fitting tool	
AP8140302	tool for installing seal rings	
020718Y	Camshaft gearwheel alignment pin	

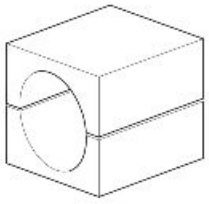
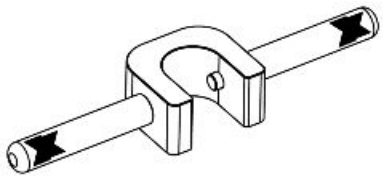
Stores code	Description	
020719Y	Timing pin	
020720Y	Timing tool	
AP8140179	Valve springs compressor	
020721Y	Valve removal adaptor	
020376Y	Adaptor handle	
020629Y	8 mm guide (0.31 in)	
020412Y	15mm oil seal guide	

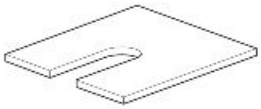
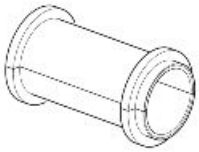
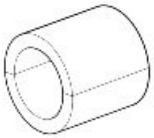
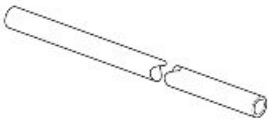
Stores code	Description	
020439Y	17mm oil seal guide	
020263Y	Driven pulley assembly sheath	
020365Y	22 mm guide (0.87 in)	
020364Y	25-mm guide	
020483Y	30-mm guide	
020441Y	Oil seals punch	

Stores code	Description	
020358Y	37 x 40 mm Adaptor	
020357Y	32 x 35-mm Adaptor	
020359Y	42 x 47 mm Adaptor	
020360Y	52 x 55-mm Adaptor	
020724Y	Punch cage with rollers gearbox control stem	
020726Y	Bushing extractor	
020727Y	Bushing punch	

Stores code	Description	
020884Y	46 mm wrench for steering ferrule	
AP8140180	Bearing extractor	
AP8140199	Tool storage panel	
8140426	Hooks for panel	

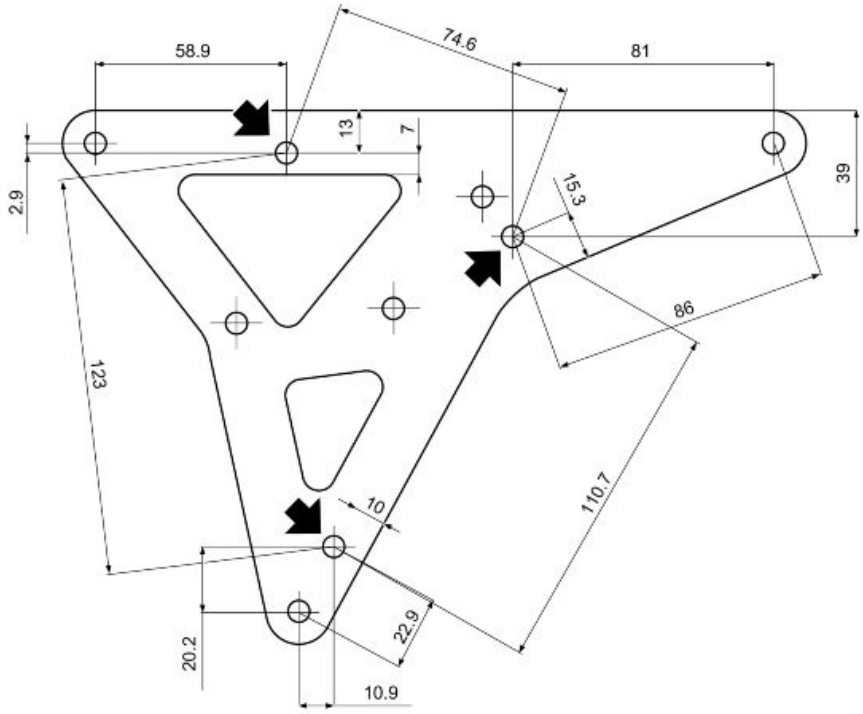
FORK

Stores code	Description	
AP8140149	Guard for assembly operations	
020888Y	Pre-load pipe clamp	

Stores code	Description	
AP8140148	Plunger-spacer separator plate	
AP8140189	Tool for fitting oil seal for 43 mm (1.69 in) diameter hole	
AP8140146	Weight	
AP8140150	Bored shaft for bleeding plunger air	

CAUTION

BEFORE USING THE "PRIMARY GEARWHEEL LOCK TOOL - 020850Y", IT IS NECESSARY TO MAKE THREE HOLES SO THAT IT MAY BE POSITIONED CORRECTLY ON THE ENGINE GUARD. THE HOLES ARE ILLUSTRATED IN THE FOLLOWING IMAGE.


58.9
74.6
81
13
7
2.9
39
15.3
86
123
110.7
10
20.2
22.9
10.9

INDEX OF TOPICS

Scheduled maintenance table

NOTE

CARRY OUT MAINTENANCE OPERATIONS AT HALF THE INTERVALS SPECIFIED IF THE VEHICLE IS USED IN PARTICULAR RAINY OR DUSTY CONDITIONS, OFF ROAD OR FOR TRACK USE.

NOTE

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

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

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

(1) Check and clean, adjust or replace, if necessary, every 1,000 Km (621 mi)

(2) Replace every 4 years

(3) At each engine start

(4) Check every month

(5) Check at every change of the rear tyre

(6) Replace at whichever of the following occurs first: 40,000 km (24,854 mi) or 4 years

(7) Check before each trip.

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)			I		I	I	I
Spark plug			R		R		
Drive chain (1)	I		I		I	I	I
Steering bearings and steering clearance	I		I		I	I	I
Wheel bearings - Wheels			I		I	I	I
Diagnosis by tool	I	I	I	I	I	I	I
Brake discs - Brake pads wear (7)	I		I		I	I	I
Air filter		I	R	I	R		
Engine oil filter	R		R		R	R	R
Fork			I		I	I	I
General operation of the vehicle	I		I		I	I	I
Valve clearance			A		A		
Cooling system			I		I		
Braking systems	I		I		I	I	I
Light circuit	I		I		I	I	I
Safety switches (stand, stop, clutch, extra negative stroke, gas control)	I	I	I	I	I	I	I
Clutch control fluid	I		I		I	I	R
Brake fluid	I		I		I	I	R
Coolant	I		I		I	I	R
Fork oil (6)					R		
Engine oil	R	I	R	I	R	R	R
Headlight aiming			I		I		
Fork oil seals			I				
Flexible couplings (5)			I		I		
Tyres - pressure / wear (4)	I	I	I	I	I	I	I
Bolts and nuts tightening	I		I		I		
Suspension and setting	I		I		I		
Fault indicator light on dashboard (3)							
Fuel lines (2)			I		I	I	I
Clutch wear			I		I		
Labour time (minutes)	80	70	230	70	320	70	100

SCHEDULED MAINTENANCE TABLE RESERVED FOR THE USA-LATAM MARKET

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

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

(1) Check and clean, adjust or replace, if necessary, every 1000 Km (621 mi)

(2) Replace every 2 years

(3) Replace every 4 years

(4) At each engine start

(5) Check every month

(6) Check at every change of the rear tyre

(7) Replace at whichever of the following occurs first: 40,000 km (24,854 mi) or 4 years

(8) Check before each trip.

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)
Rear shock absorber (bearings)			I		I
Spark plug			R		R
Drive chain (1)	I		I		I
Steering bearings and steering clearance	I		I		I
Wheel bearings - Wheels			I		I
Diagnosis by tool	I	I	I	I	I
Brake discs - Brake pads wear (8)	I		I		I
Air filter		I	R	I	R
Engine oil filter	R		R		R
Fork			I		I
General operation of the vehicle	I		I		I
Valve clearance			A		A
Cooling system			I		I
Braking systems	I		I		I
Light circuit	I		I		I
Safety switches (stand, stop, clutch, extra negative stroke, gas control)	I	I	I	I	I
Clutch control fluid (2)	I		I		I
Brake fluid (2)	I		I		I
Coolant (2)	I		I		I
Fork oil (7)					R
Engine oil	R	I	R	I	R
Headlight aiming			I		I
Fork oil seals			I		
Flexible couplings (6)			I		I
Tyres - pressure/wear (5)	I	I	I	I	I
Bolts and nuts tightening	I		I		I
Suspension and setting	I		I		I
Fault indicator light on dashboard (4)					
Fuel lines (3)			I		I
Clutch wear			I		I
Labour time (minutes)	80	70	230	70	320

NOTE

AT EACH SCHEDULED MAINTENANCE MUST BE VERIFIED WITH THE DIAGNOSTIC TOOL IF THERE ARE ERRORS AND THE IF THE PARAMETERS ARE CORRECT.

Recommended products

Piaggio Group recommends the products of its "Castrol Official Partner" for the scheduled maintenance of its vehicles.

Use lubricants and liquids having specifications that are equivalent, or superior, to the recommended products. These indications also apply when topping up fluid levels.

TABLE OF RECOMMENDED PRODUCTS

Product	Description	Specifications
Engine oil 15W-50	Synthetic-based lubricant for four-stroke engines.	SAE 15W-50, JASO MA, MA2; API SJ; ACEA A3
Fork oil 10W	Fork oil.	SAE 10W
Brake fluid DOT 4	Synthetic brake fluid.	SAE J 1703; FMVSS 116; ISO 4925; CUNA NC 956 DOT4
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
Lithium-based grease	Lithium-calcium soap based grease	colour - black, contains EP (Extreme Pressure) additives, excellent water-repellent properties

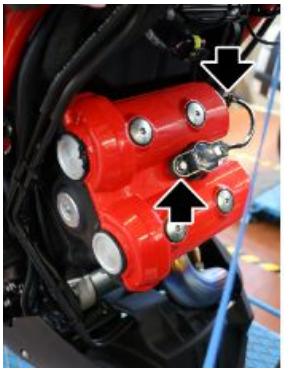
Spark plug

Periodically remove the spark plugs, clean them of carbon deposits and, if necessary, replace them.

CAUTION

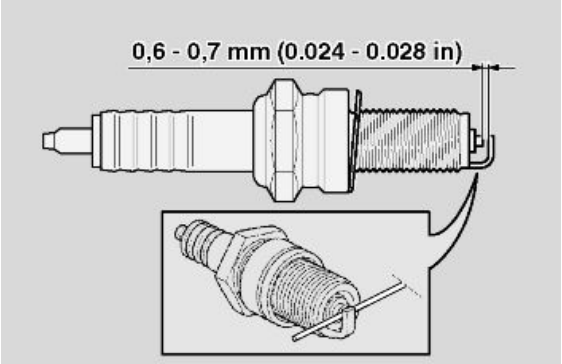
EVEN IF A SINGLE SPARK PLUG REQUIRES REPLACING, ALWAYS REPLACE BOTH SPARK PLUGS.

- Remove the saddle, tank, side panels and the radiator.
- Disconnect the ignition coil connectors and remove the screw fixing the plugs to the big end covers.



- Remove the ignition coils.
- Remove the spark plugs using a special key.

- Check the distance between the electrodes using a thread thickness gauge.



CAUTION

DO NOT ATTEMPT IN ANY WAY TO CHANGE THE DISTANCE BETWEEN THE ELECTRODES.

Characteristic

Spark plug electrode gap

0.6 ÷ 0.7 mm (0.024 ÷ 0.028 in)

If the distance between the electrodes is different, replace the spark plug.

- Make sure the washer is in good conditions.

For installation:

- With the washer mounted, manually screw the spark plug completely with caution to avoid damaging the thread.
- With a suitable key, tighten by performing a 1/2 turn to each spark plug to compress the washer.
- Loosen and tighten again the spark plug to the specified torque.

CAUTION

TIGHTEN THE SPARK PLUG CORRECTLY. OTHERWISE, THE ENGINE MAY OVERHEAT AND GET IRRETRIEVABLE DAMAGED.
USE ONLY THE RECOMMENDED TYPE OF SPARK PLUG, OTHERWISE, ENGINE DURATION AND PERFORMANCE COULD BE COMPROMISED.

If the distance between the electrodes is different, replace the spark plug.

- Make sure the washer is in good conditions.

For installation:

- With the washer mounted, manually screw the spark plug completely with caution to avoid damaging the thread.
- With a suitable key, tighten by performing a 1/2 turn to each spark plug to compress the washer.

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TIGHTEN THE SPARK PLUG CORRECTLY. OTHERWISE, THE ENGINE MAY OVERHEAT AND GET IRRETRIEVABLE DAMAGED.
USE ONLY THE RECOMMENDED TYPE OF SPARK PLUG, OTHERWISE, ENGINE DURATION AND PERFORMANCE COULD BE COMPROMISED.

Engine oil

Check

Check the engine oil level frequently.

NOTE

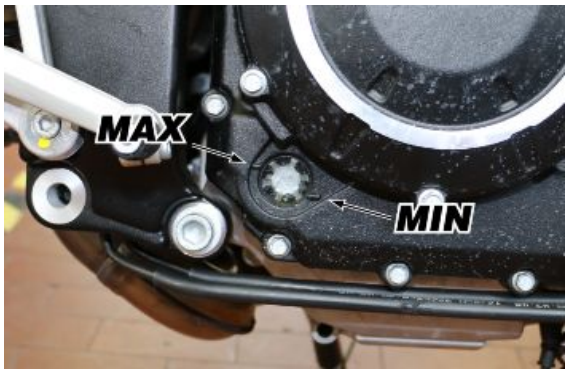
CARRY OUT MAINTENANCE OPERATIONS AT HALF THE INTERVALS SPECIFIED IF THE VEHICLE IS USED IN PARTICULAR RAINY OR DUSTY CONDITIONS, OFF ROAD OR FOR TRACK USE.

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

CAUTION

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.
- Keep the vehicle upright with both wheels on the earth.
- Using the relative opening on the engine casing, check the oil level.



MAX (top notch) = maximum level.

MIN (bottom notch) = minimum level

- The level is correct if it reaches the "MAX" level.

Replacement

Check the engine oil level frequently.

To change:

CAUTION

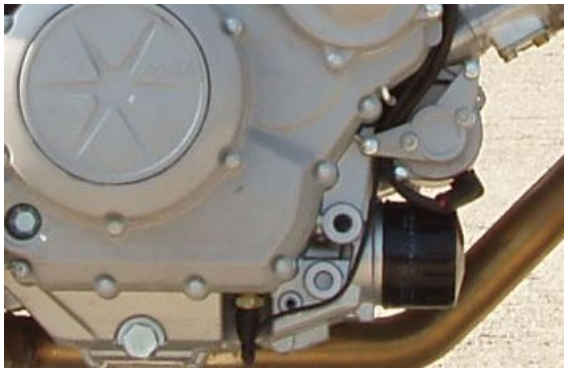
HOT OIL IS MORE FLUID AND WILL DRAIN OUT MORE EASILY AND COMPLETELY; IDEAL TEMPERATURE IS REACHED AFTER THE ENGINE HAS RUN FOR ABOUT TWENTY MINUTES.

OIL BECOMES VERY HOT WHEN THE ENGINE IS HOT; BE CAREFUL NOT TO GET BURNED WHEN CARRYING OUT THE OPERATIONS DESCRIBED BELOW.

- Using a cloth, carefully clean the area of any dirt deposits around the filling cap (1).
- Place a container with a capacity of more than 4000 cm^3 (244 cu in) under the drainage plug (2).
- Unscrew and remove the drainage plug (2).
- Unscrew and remove the filler plug (1).
- Drain the oil into the container; allow several minutes for oil to drain out completely.
- Replace the drainage plug sealing washer (2).
- Remove any metal scrap attached to the drainage plug (2) magnet.
- Screw and tighten the drainage plug (2).
- Replace the oil filter.
- Restore the correct engine oil level, using the recommended engine oil.

Engine oil filter

- Move the ABS control unit.
- Drain the motor oil.
- Remove the oil filter.
- Screw a new engine oil filter.
- Restore the correct engine oil level.



CAUTION

NEVER REUSE AN OLD FILTER.

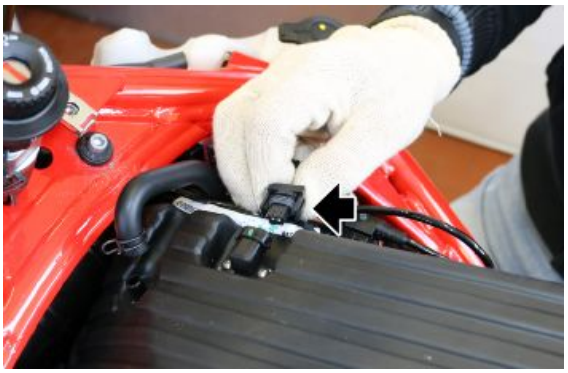
See also

Replacement

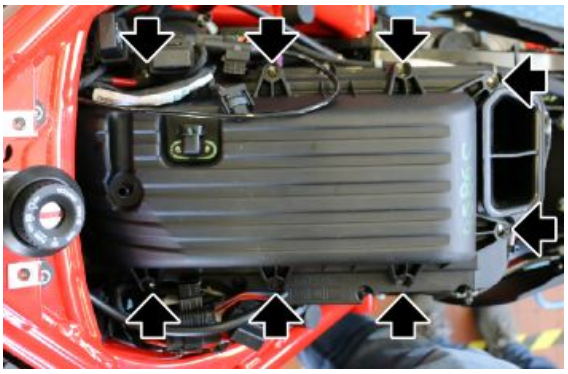
Air filter

- Remove the fuel tank.
- Disconnect the vapour recovery tube.

- Disconnect the air temperature sensor.



- Remove the eight screws fixing the air filter cover.



- Remove the filter case cover.

- Operating from both ducts, turn the upper part of the intake duct anticlockwise and remove it.

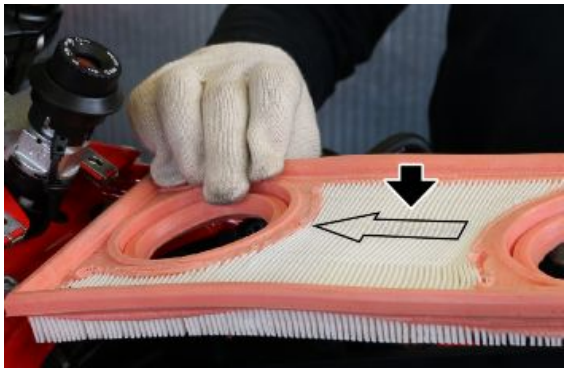
- Remove the filter element.

COVER THE INTAKE DUCTS WITH A CLEAN CLOTH TO PREVENT FOREIGN BODIES FROM ENTERING THE INTAKE DUCTS. UPON REFITTING, BEFORE REPLACING THE FILTER CASE COVER , MAKE SURE THAT THE CLOTH OR OTHER OBJECTS ARE NOT LEFT INSIDE. MAKE SURE THAT THE FILTER ELEMENT IS CORRECTLY POSITIONED, SO NO UNFILTERED AIR CAN PASS. DO NOT FORGET THAT THE EARLY USE OF THE PISTON AND CYLINDER SEGMENTS CAN BE CAUSED BY A FAULTY OR MISPLACED FILTER ELEMENT.

REFITTING

- When replacing, pay attention to the introduction of the intake ducts, making sure that the bayonet plug is snapped after each duct is inserted and rotated.

- Check the correct positioning of the filter, making sure that the arrow printed on it is directed toward the steering clutch.



Checking the valve clearance

- Remove the fuel tank and the radiator.
- Disconnect the coils and remove the spark plugs.
- Remove the covers from the heads and measure the distance between the camshaft nose cone and the valve tappets using a feeler gauge.
- make a note of the measurement

Characteristic

Intake valve clearance

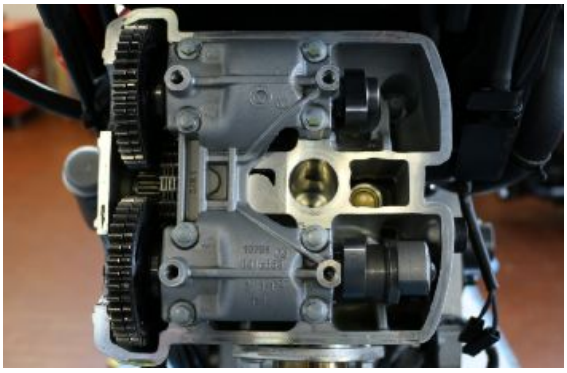
0.10 - 0.15 mm (0.0039 - 0.0059 in)

Exhaust valve clearance

0.15 - 0.20 mm (0.0059 - 0.0078 in)

If the valve clearance is out of tolerance, carry out the adjustment procedure, as follows:

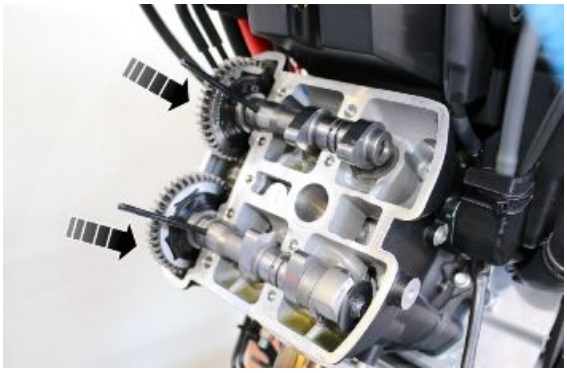
- Position the front cylinder at TDC.
- Remove the cam tower by unscrewing and removing the 8 fastening screws in the order indicated on the cam tower itself.



- Secure the cam shafts in position using the dedicated timing pins.

Specific tooling

020719Y Timing pin

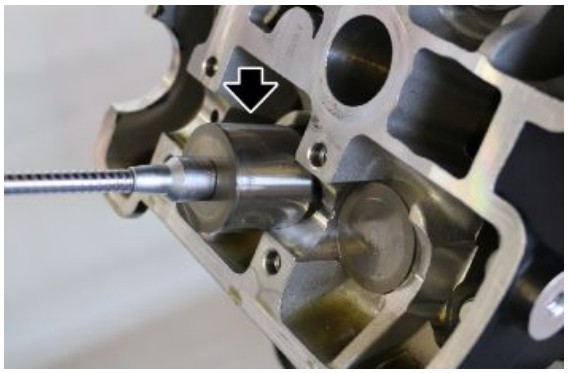


- Remove one cam shaft at a time
- leave the other camshaft in position and secured by the timing pin.

CAUTION

IF BOTH CAMSHAFTS ARE REMOVED AT THE SAME TIME, THE ENGINE COULD ROTATE, RENDERING IT NECESSARY TO RETIME IT.

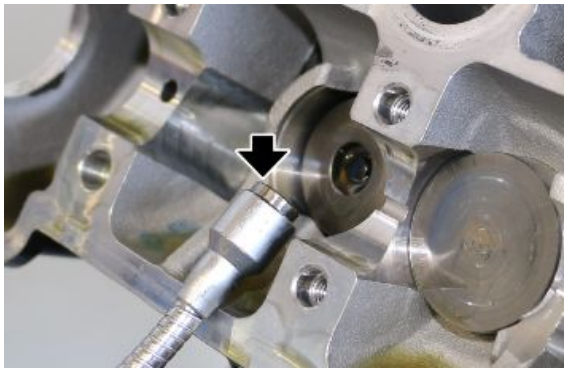
- Extract the bucket tappets.



NOTE

EACH TIME THE BUCKET TAPPETS ARE EXTRACTED, ENSURE THE COMPONENT IS ADEQUATELY GREASED.

- Replace the calibrated pad with a pad having suitable thickness to compensate for the valve clearance measured earlier.
- List of calibrated pads:



1. Calibrated pad 2.50
2. Calibrated pad 2.55
3. Calibrated pad 2.60
4. Calibrated pad 2.65
5. Calibrated pad 2.70
6. Calibrated pad 2.75
7. Calibrated pad 2.80
8. Calibrated pad 2.85
9. Calibrated pad 2.90
10. Calibrated pad 2.95
11. Calibrated pad 3.00
12. Calibrated pad 3.05
13. Calibrated pad 3.10
14. Calibrated pad 3.15
15. Calibrated pad 3.20
16. Calibrated pad 3.25
17. Calibrated pad 3.30
18. Calibrated pad 3.35
19. Calibrated pad 3.40

- if it is necessary to adjust the valve clearance on the rear big end, repeat the procedure described above.

CAUTION

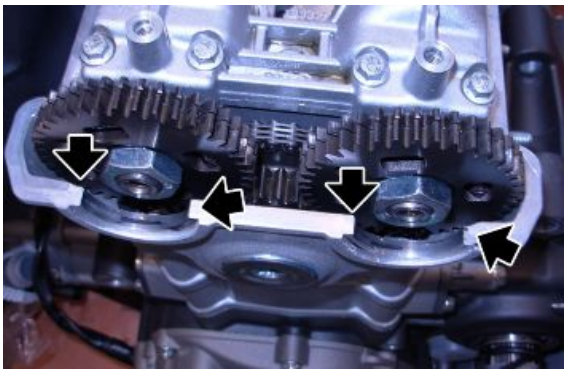
BEFORE REMOVING THE BIG END COVERS, CAREFULLY CLEAN THE SURFACES OF THE BIG END AND THE COVER.

CAUTION

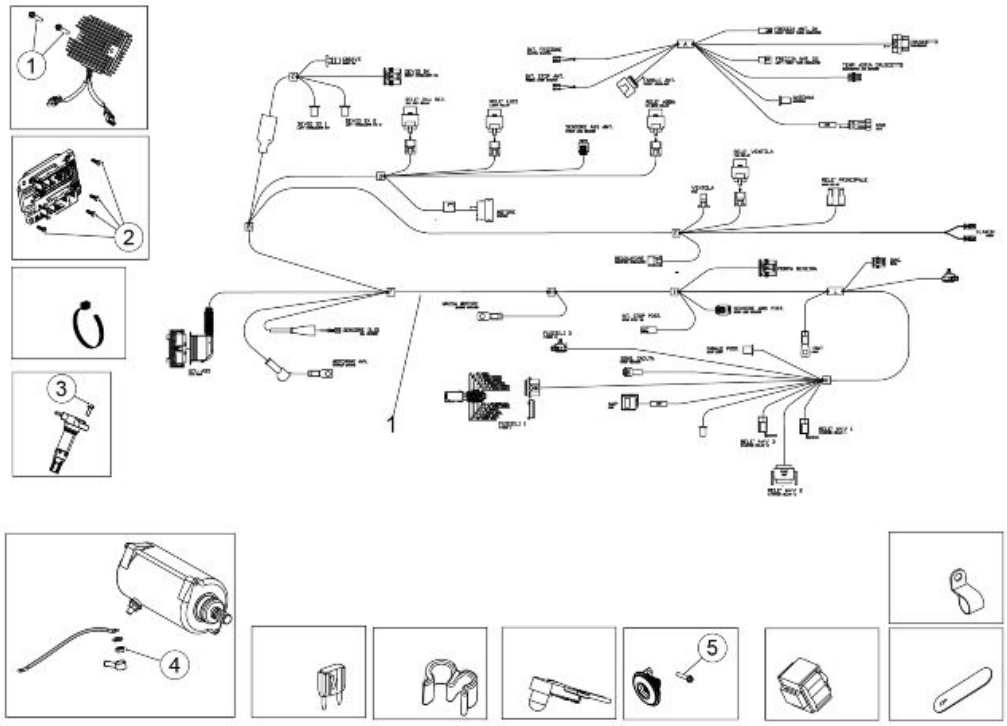
REPLACE THE FOUR RUBBER INSERTS AND THE GASKET EACH TIME THE BIG END COVER IS REMOVED.

- Apply THREEBOND around the perimeter of the big end cover along the gasket housings.

- Apply THREEBOND to the head at the points indicated in figure.

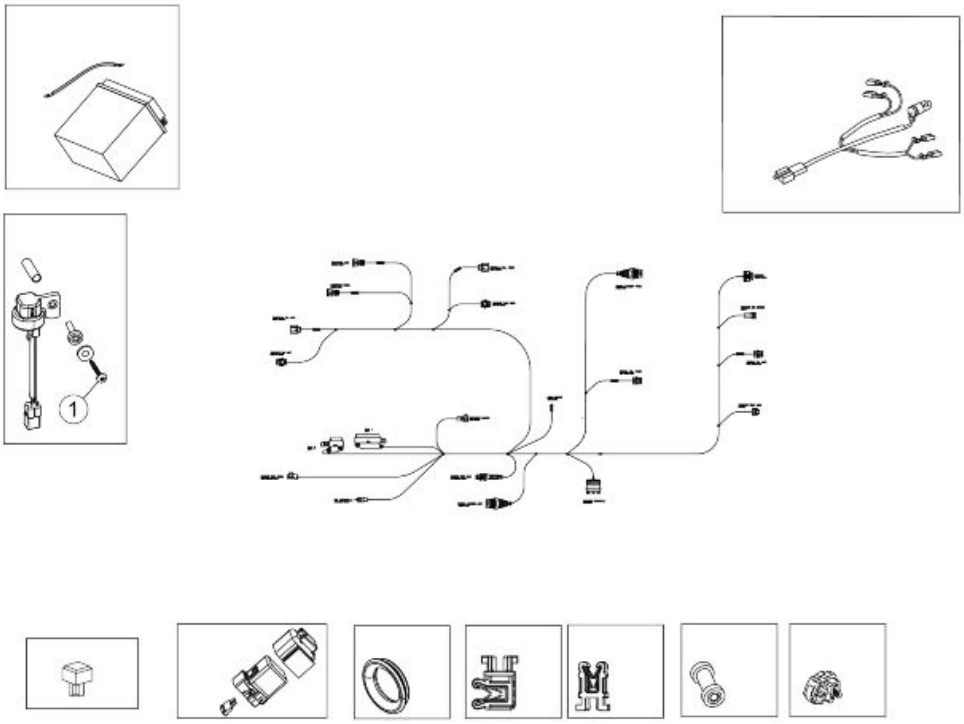


INDEX OF TOPICS



FRONT ELECTRICAL SYSTEM

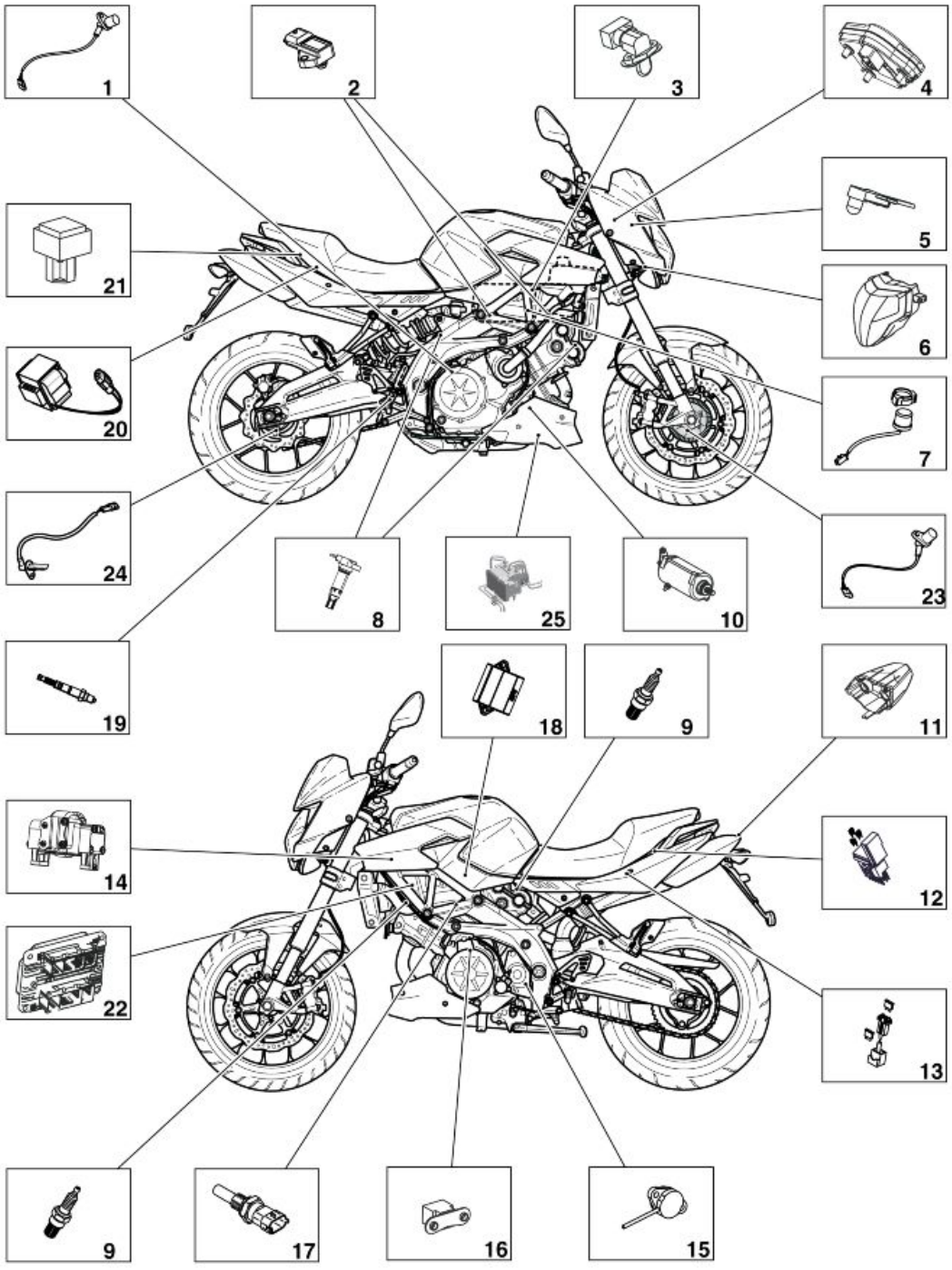
Pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head screws for fastening the voltage regulator to the frame	M6x20	2	10 Nm (7.38 lb ft)	-
2	Flanged SWP screws for fastening the control unit to the base of the filter box	M5x20	4	2.5 Nm (1.84 lb ft)	-
3	Screws used for fastening the coils to the heads	M6	2	5 Nm (3.69 lb ft)	-
4	Nut used for fastening the power supply cable to the starter motor	M6	1	10 Nm (7.38 lb ft)	-
5	Horn fixing screw	M6x25	1	10 Nm (7.38 lb ft)	-



REAR ELECTRICAL SYSTEM

Pos.	Description	Type	Quantity	Torque	Notes
1	Button head, hex. socket screw used for fastening the anti-rollover sensor	M5x35	1	3 Nm (2.21 lb ft)	-

Components arrangement



Key

1. Engine speed sensor
2. intake air pressure sensor
3. Intake air temperature sensor
4. Instrument panel

5. Air temperature sensor for instrument panel indication
6. Headlamp
7. Starter relay
8. Coils
9. Spark plugs
10. Starter motor
11. Taillight
12. Secondary fuses
13. Main fuses
14. Handle position sensor
15. Gearbox in neutral sensor
16. Rpm sensor - pick up
17. Engine temperature sensor
18. Throttle valve management control unit
19. Lambda probe
20. Fall sensor
21. Main injection relay
22. Engine control unit
23. Front speed sensor
24. Rear speed sensor
25. Electronic control unit

THE IDENTIFICATION OF THE RELAY CANNOT BE CARRIED OUT JUST ON THE BASIS OF THE INDICATIONS BELOW: IN ANY EVENT IT SHOULD OCCUR WITH THE IDENTIFICATION OF THE COLOUR OF THE RELAY CABLES.

RELAY LAYOUT

Location of the component in the electrical circuit diagram	Component name	Position on the vehicle:
7	High beam lights relay	Right front side of the filter housing
8	Light relay	Right front side of the filter housing
17	Main injection relay	Left front side of the filter housing
31	Start-up relay	Left front side of the filter housing
35	Secondary injection relay	Right front side of the filter housing
38	Fan control relay	Left front side of the filter housing

Electrical system installation

INTRODUCTION

Scope and applicability

The position of the wiring harnesses, how they are fixed to the motorcycle and potential problems are defined on the following sections in order to reach the objectives of vehicle reliability.

Motorcycle division

The wiring timing is subdivided in three essential sections, as indicated in the figure.

1. Front section
2. Central section
3. Rear section

SPECIAL CHECKS FOR THE CORRECT CONNECTION AND LAYING OF CABLES

Once the electrical system has been replaced, the connectors have been reconnected and the various clamps and fasteners have been repositioned, carry out the checks described below.

- Check that the following connectors have been connected correctly and that appropriate tightening torque has been applied when securing them to the connector block.

1. Instrument panel connector: FRONT SECTION - TABLE B4.
2. Ride By Wire Connector: CENTRAL SECTION - TABLE A4.
3. Timing sensor connector: CENTRAL SECTION - TABLE M2.
4. Side stand switch connector: CENTRAL SECTION - TABLE O2
5. Voltage regulator connector: CENTRAL SECTION - TABLE M2-M3.
6. Front cylinder coil and rear cylinder coil connectors: ENGINE, TABLE A12.
7. Main wiring harness connector: CENTRAL SECTION - TABLE A1.
8. Control unit connector: ENGINE, TABLE A14.
9. Earth: CENTRAL SECTION, TABLE B
10. Fuel pump connector: CENTRAL SECTION, TABLE B.
11. Key Connector - RH Column light switch connectors - LH Column light switch connectors: Connectors housed inside the hood behind the radiator: FRONT SECTION - TABLE A3
12. ABS control unit connector.
13. Front and rear speed sensor connectors: FRONT SECTION, TABLE C3 and REAR SECTION, TABLE A3
14. Secondary fuses (correct position)

- THE LISTED CONNECTORS ARE CONSIDERED TO BE THE MOST CRITICAL IN COMPARISON WITH ANY OTHER BECAUSE THE VEHICLE WILL STOP IF THEY ARE ACCIDENTALLY DISCONNECTED.
- Undoubtedly the connection of the rest of connectors is also important and essential for the correct operation of the vehicle.

Front side

TABLE A - COLUMN LIGHT SWITCH / RIDE BY WIRE

- Route the right hand column switch (1) and Ride by Wire gas control grip (2) wiring harness behind the front brake pipe (3).
- Route the left hand column switch wiring (4) behind the clutch pipe (5).

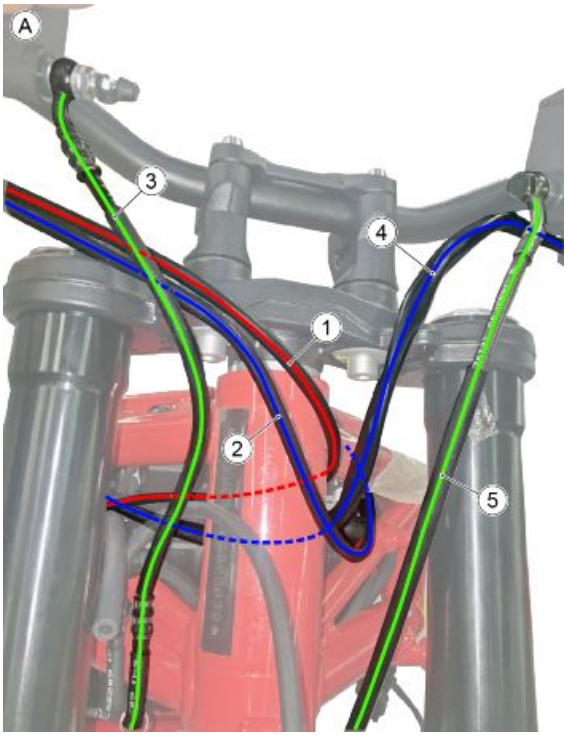
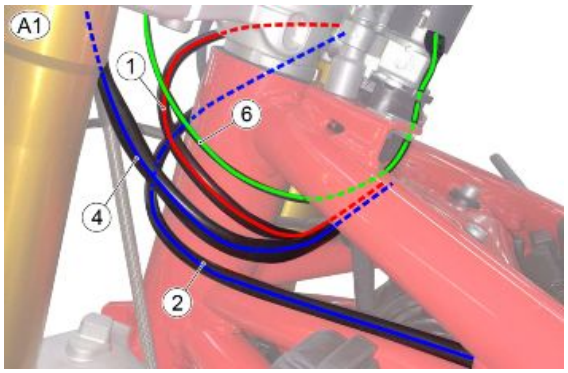


TABLE A1 - COLUMN LIGHT SWITCH / RIDE BY WIRE

- The wiring harnesses must be routed to the left of the steering headstocks, in particular column switch wiring harnesses must subsequently be routed underneath the headstock so that are fed out of the right hand side of the motorcycle.



1) RH column light switch wiring harness.
2) GAS control grip wiring harness.
4) LH column light switch wiring harness.
6) Immobilizer antenna wiring harness.

TABLE A2 - COLUMN LIGHT SWITCH / RIDE BY WIRE

- Secure the various wiring harnesses using a rubber clamp (7).

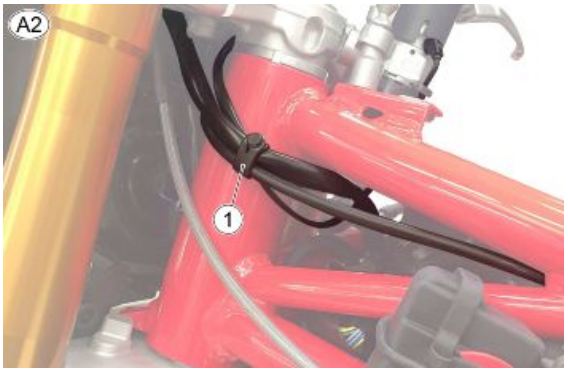


TABLE A3 - COLUMN LIGHT SWITCH / RIDE BY WIRE

- Connect the connectors and insert them in the safety cap (8).
- Using a clamp (9), secure the various wiring harnesses as indicated, and then position the connectors assembly under the steering headstock, inside the frame.

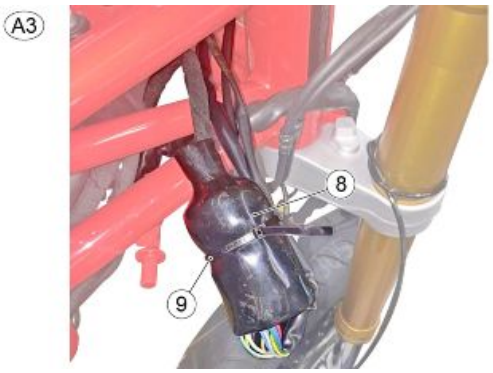


TABLE A4 - COLUMN LIGHT SWITCH / RIDE BY WIRE

- The Ride By Wire gas control connector must be connected correctly and fastened to the edges support (10), while the wiring harness must be fastened to the edges support (12) using a clamp (11).

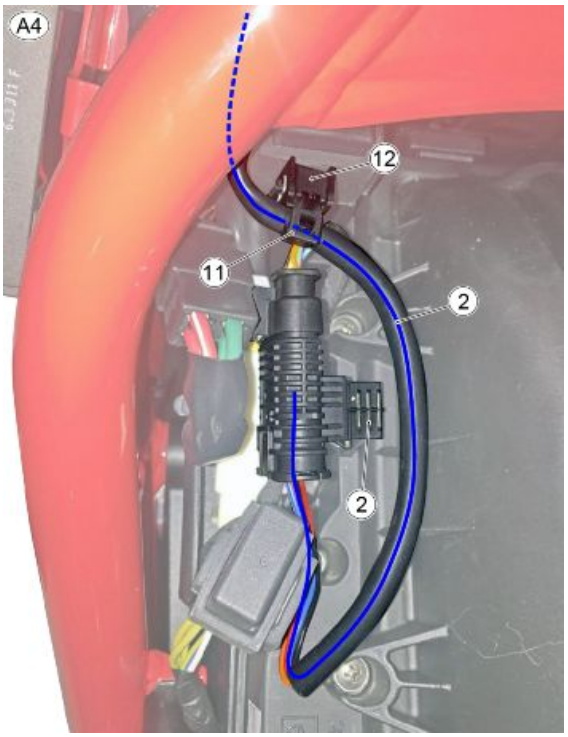


TABLE B - INSTRUMENT PANEL

- The clutch switch wiring harness (1), which may be identified by the grey tape, and the front stop switch wiring harness (2) must be routed over the column switch wiring harness and the brake/clutch pipes.

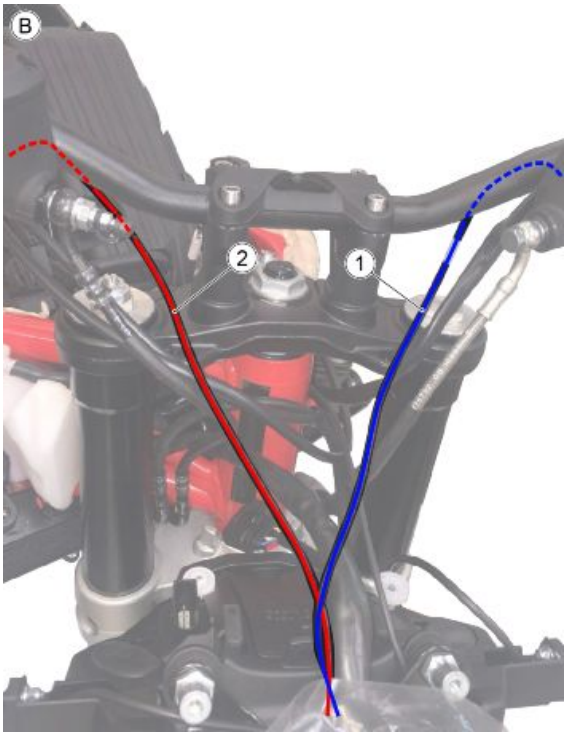


TABLE B1 - INSTRUMENT PANEL

- The front indicator cables (3) must be routed as shown in the photo in order to avoid pinching when the front head light is fastened to the steering plate.

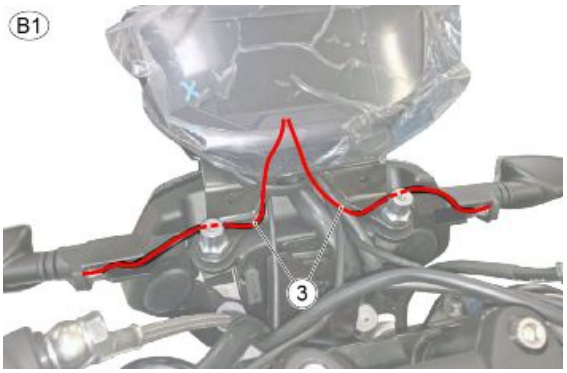


TABLE B2 - INSTRUMENT PANEL

- After fastening the ambient air temperature sensor (4) and securing the respective wiring harness (5), route the wiring harness behind the instrument panel support (7) using a clamp (6).

TABLE B3 - INSTRUMENT PANEL

- Position a clamp (8) on the instrument panel in order to fasten the various wiring harnesses.

TABLE B4 - INSTRUMENT PANEL

- After connecting the ambient air temperature sensor, the USB option connector (9), the instrument panel connector (10), the indicator connectors (11) and the immobilizer antenna connector (12), close the clamp that was positioned on the support earlier.

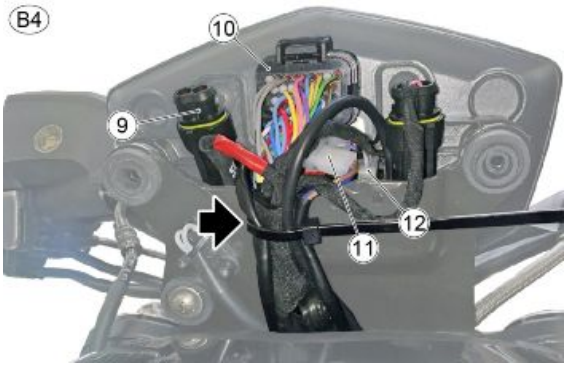


TABLE C - FRONT ABS SENSOR

- using the cable clamp (1) fasten the ABS sensor (3) wiring harness (2) and route it through the hole on the right hand fork foot.

TABLE C1 - FRONT ABS SENSOR

- Fasten the ABS sensor wiring harness at the rear mudguard fastening point, using a clamp (4).

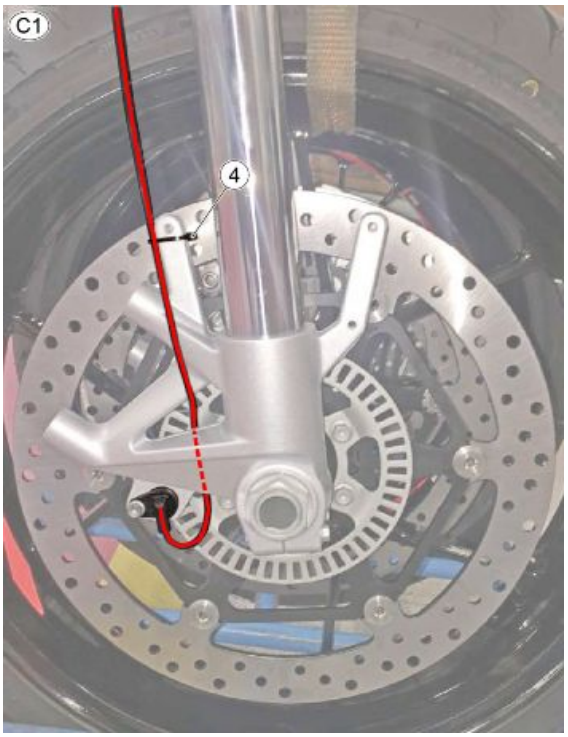


TABLE C2 - FRONT ABS SENSOR

- Fasten the ABS sensor wiring harness to the brake pipe using the cable clamps (5) and two clamps (6), under the lower steering plate and in alignment with the brake pipe fastening plate, under the steering headstock.

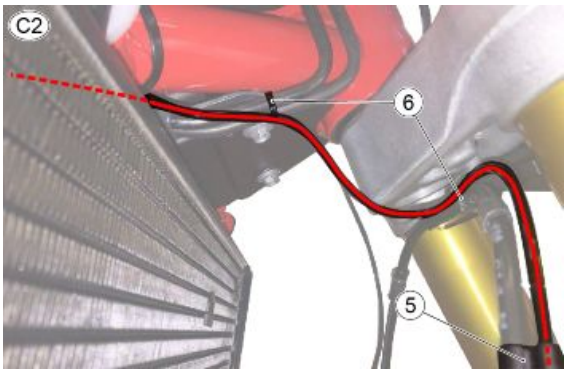


TABLE C3 - FRONT ABS SENSOR

- Check that the front ABS sensor connector is inserted correctly and coupled to the respective support positioned under the filter box.

Central part

CAUTION

THE FOLLOWING IMAGES ILLUSTRATE THE MAIN/ENGINE WIRING HARNESS INSTALLED ON THE ENGINE, COMPLETE WITH THE FILTER BOX. IF NECESSARY, WHEN CARRYING OUT MAINTENANCE WORK, THE WIRING HARNESS MUST BE INSTALLED AFTER POSITIONING THE ENGINE ON THE FRAME.

TABLE A - MAIN WIRING HARNESS - ENGINE WIRING HARNESS

- The main wiring harness (1) must be positioned on the right hand side of the motorcycle/engine, as indicated

TABLE A1 - MAIN WIRING HARNESS - ENGINE WIRING HARNESS

- The connector that units main wiring harness (1) with the engine wiring harness (2) must be inserted correctly, making sure that the purple shoe is pushed in as far as it will go.

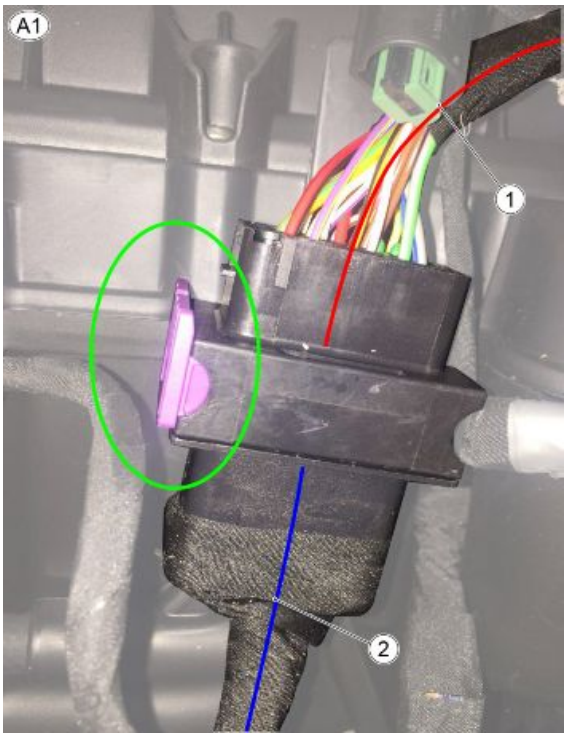


TABLE A2 - MAIN WIRING HARNESS - ENGINE WIRING HARNESS

- Connect the main wiring harness (1) to the engine wiring harness (2) using a clamp (3) at the point indicated by the grey tape.

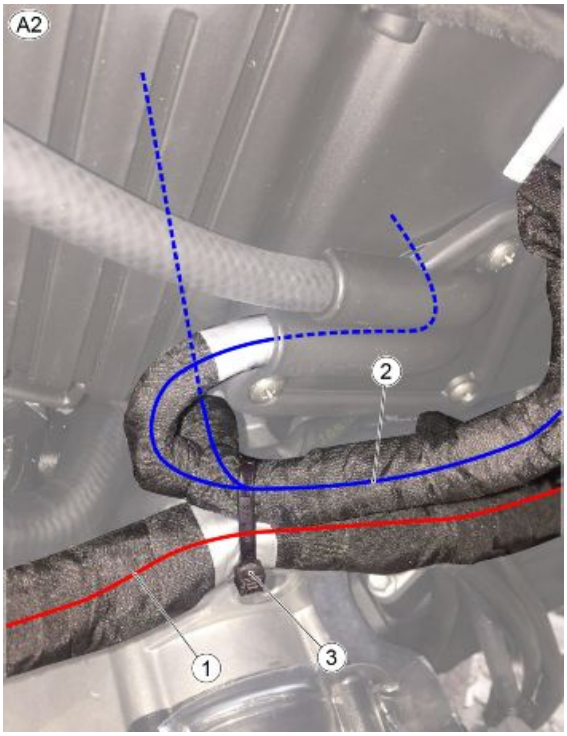


TABLE A3 - MAIN WIRING HARNESS - ENGINE WIRING HARNESS

- Secure the main wiring harness (1) using two clamps (4) on the cannister support, at the point indicated by the grey tape.

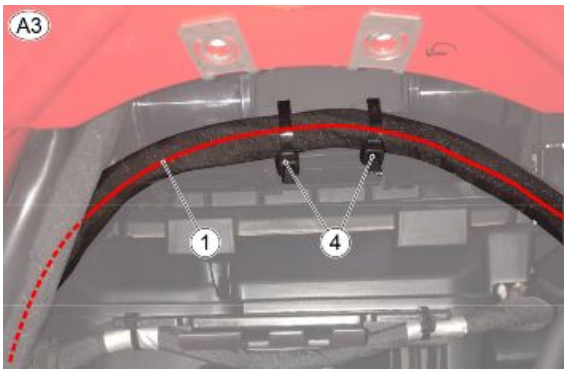


TABLE B - ENGINE EARTH

- It is important to respect the output direction of the battery earth (1), main wiring harness earth (2) and engine wiring harness earth (3) cables.
- After fitting an elastic washer and the appropriate screw, tighten the latter, applying the pre-defined torque.

CAUTION

IF THE SCREW IS NOT FASTENED CORRECTLY IT MAY CAUSE THE VEHICLE TO CATCH FIRE

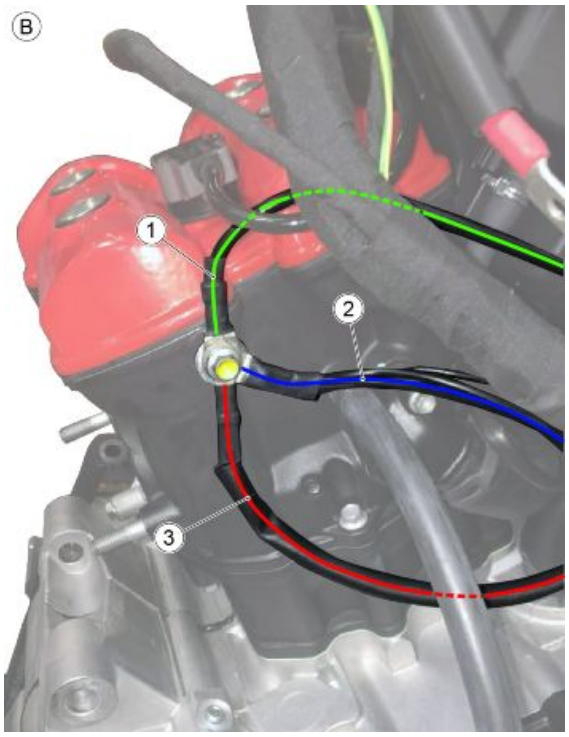


TABLE C - RELAYS ON FILTER BOX

- Arrange the relays on the right hand side of the filter box, in accordance with the coloured reference indicators.
- The highbeam headlight relay (1), identified by the white tape, must be secured to the respective fastening point using the rubber support.
- The headlight relay (2), identified by the red tape, must be secured to the respective fastening point using the rubber support.
- The secondary injection relay (3), identified by the blue tape, must be secured to the respective fastening point using the rubber support. The wiring harness must be routed behind the blow-bay vapour recovery pipe.

TABLE C1 - RELAYS ON FILTER BOX

- The main injection relay (4), fan control relay (5) and starter relay (6), which are located on the left hand side of the filter box, must be secured to their respective fastening points using the rubber supports.

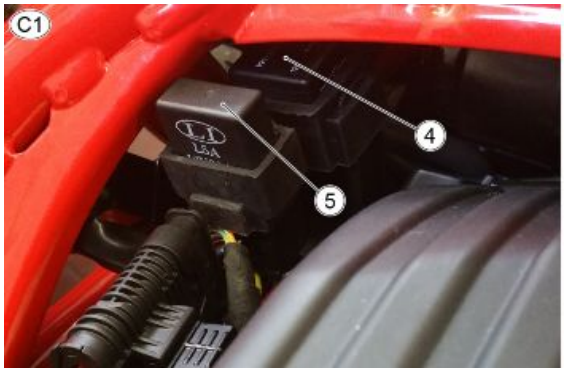


TABLE D - STARTER MOTOR CABLE

- The starter motor power supply cable lug (1) must be fastened to the starter motor using two electric washers (2) and secured using serrated washer, applying the pre-defined torque.

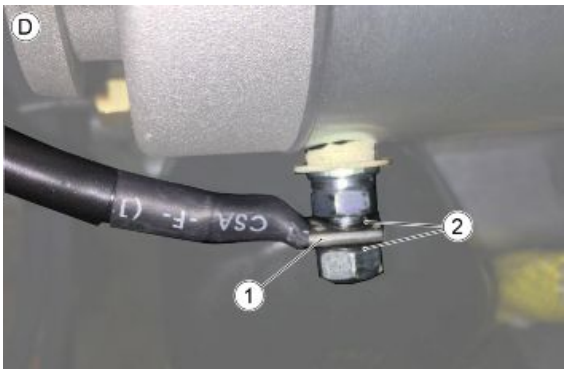


TABLE D1 - STARTER MOTOR CABLE

- Cover the starter motor nut and the square terminal using water-repellent, dielectric grease.
- If the starter motor cable is not routed or fastened correctly, it may cause the vehicle to catch fire.

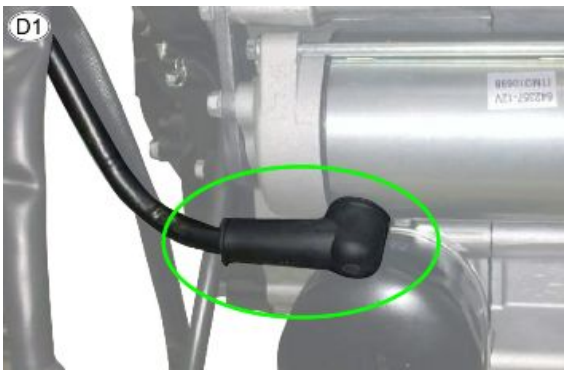


TABLE E - OIL PRESSURE BULB

- Check that the terminal is connected and that the hood is inserted in the bulb correctly, and apply a clamp so that cap leg is bent by 180°, as illustrated.

TABLE F - PRE-ASSEMBLING THE ABS SUPPORT BRACKET

- Pre-assemble the supports (1) for the connectors on the ABS support bracket (2) and the seal (3).

TABLE G - PROCEDURE FITTING THE ABS CONTROL UNIT CONNECTOR CORRECTLY

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

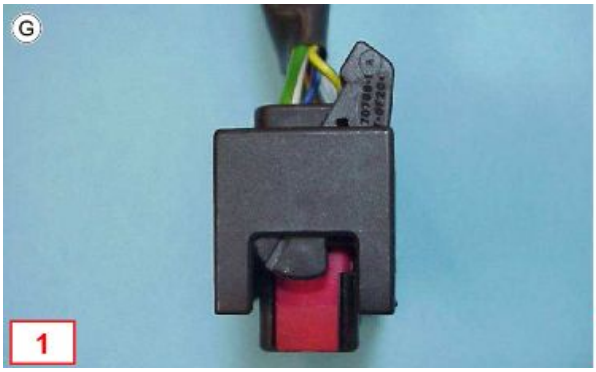


TABLE G1 - PROCEDURE FITTING THE ABS CONTROL UNIT CONNECTOR CORRECTLY

- 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.

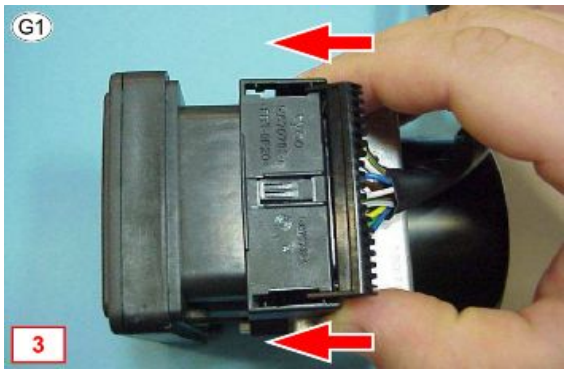


TABLE G2 - PROCEDURE FITTING THE ABS CONTROL UNIT CONNECTOR CORRECTLY

- When the connector has been inserted fully, the distance measured between it and the ABS control unit must be 7.5 mm

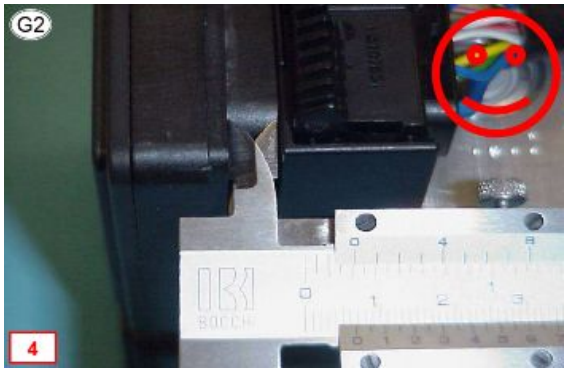


TABLE G3 - PROCEDURE FITTING THE ABS CONTROL UNIT CONNECTOR CORRECTLY

- If the initial position of the lever is not as indicated in the "TABLE G", 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 G1/G2"
- We recommend creating a template in order to ensure that the connector is inserted correctly.

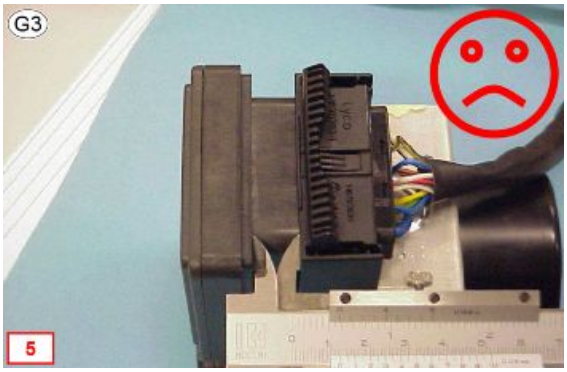


TABLE H - ABS CONTROL UNIT

- After making sure that the ABS control unit (2) connector (1) has been inserted correctly, fasten the wiring harness (3) to the brake pipes using two clamps (4).

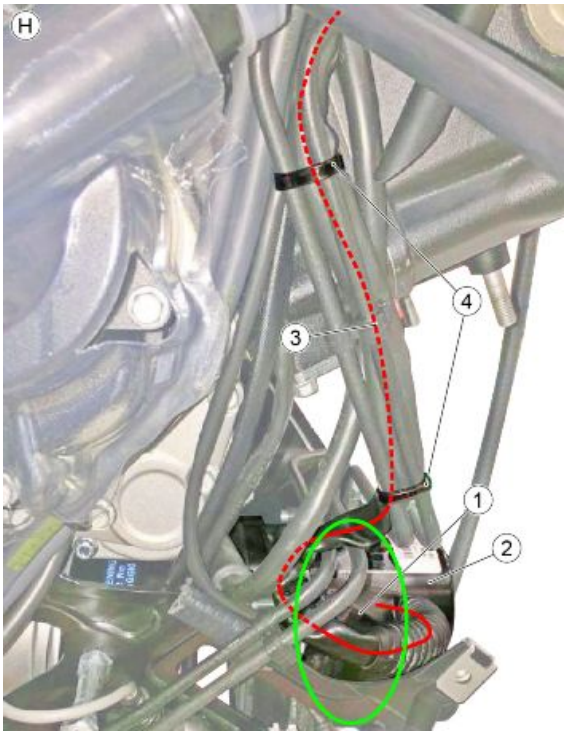


TABLE H1 - ABS CONTROL UNIT

- The wiring harness (3) must be routed behind the brake pipes, as indicated.

TABLE I - OIL TEMPERATURE SENSOR

- Connect the oil temperature sensor connector (1) to the corresponding connector on the intermediate wiring harness (2) and attach it to the dedicated support mounted on the ABS support bracket.

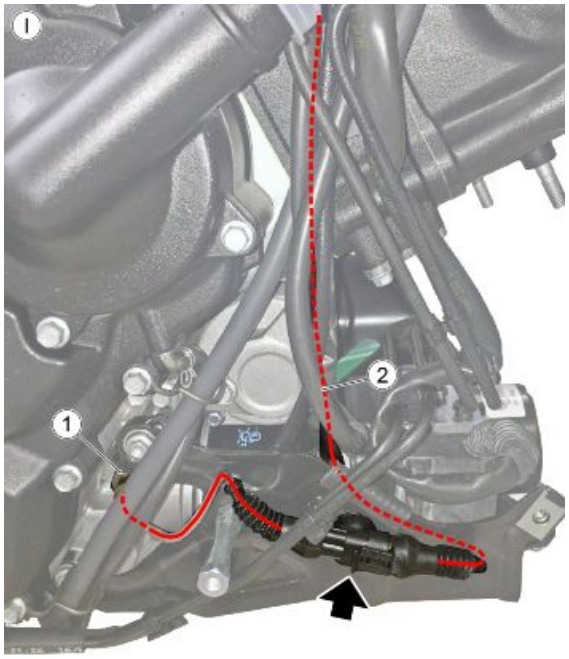


TABLE I1 - OIL TEMPERATURE SENSOR

- Connect the intermediate wiring harness connector (2) to the corresponding connector on the main wiring harness (3), which must be attached to the dedicated support mounted on the base of the filter box.

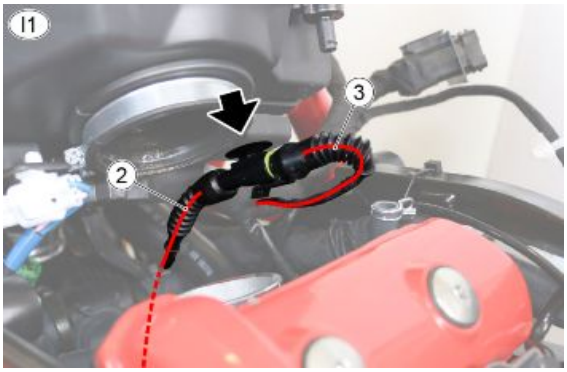


TABLE L - FAN

- Connect the fan connector to the water radiator using a large clamp.

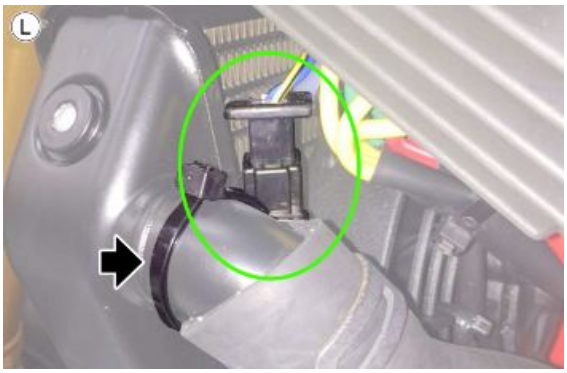


TABLE M - VOLTAGE REGULATOR/TIMING SENSOR

- After fastening the voltage regulator (1) to the frame, secure the "timing sensor regulator" wiring harness (2) and the "main wiring harness regulator" wiring harness (3) using a clamp (4).

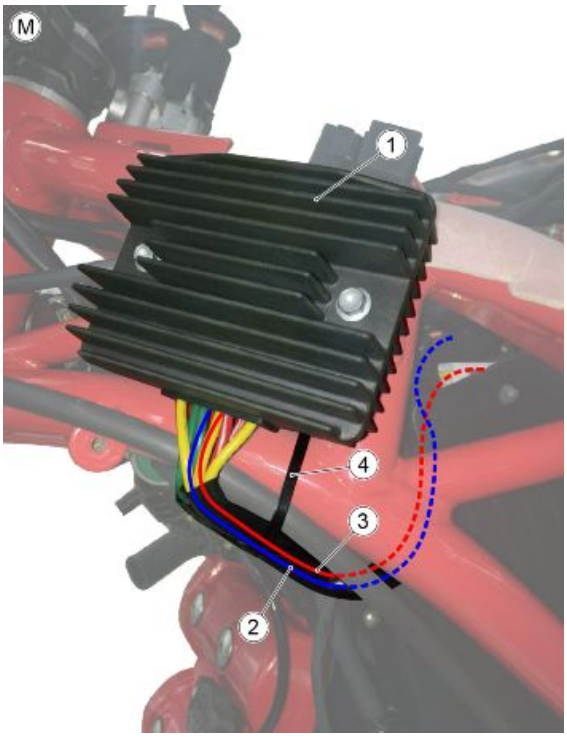


TABLE M1 - VOLTAGE REGULATOR/TIMING SENSOR

- The voltage regulator wiring harnesses must be routed internally through the frame, as indicated.

TABLE M2 - VOLTAGE REGULATOR/TIMING SENSOR

- The timing sensor regulator connector must be connected correctly and fastened to the support (5) inserted on the control unit cover.

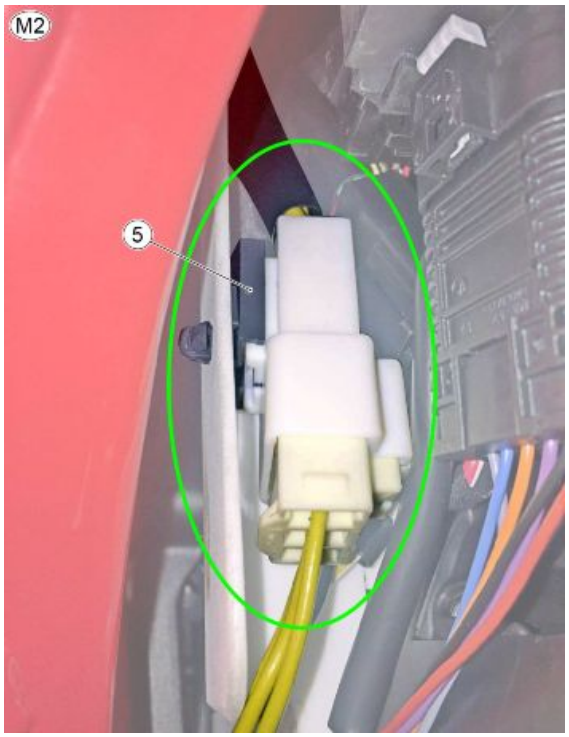


TABLE M3 - VOLTAGE REGULATOR/TIMING SENSOR

- The main wiring cabinet regulator connector must be connected correctly and positioned above the timing sensor regulator connector.

TABLE N - HORN

- The horn must be fastened to its support bracket and, once its connectors have been inserted, must not be in contact with any other component.

TABLE O - SIDE STAND

- After fastening the side support strut to the stand support, secure the sensor (1) wiring harness using a clamp (2).

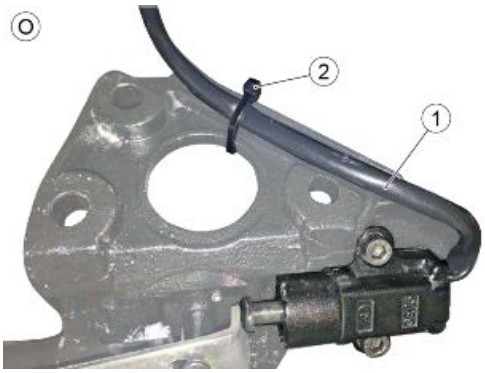


TABLE O1 - SIDE STAND

- Install the side stand and route the side strut sensor wiring harness (1) as indicated, fastening it to the gear sensor (4) wiring harness using a clamp (3).

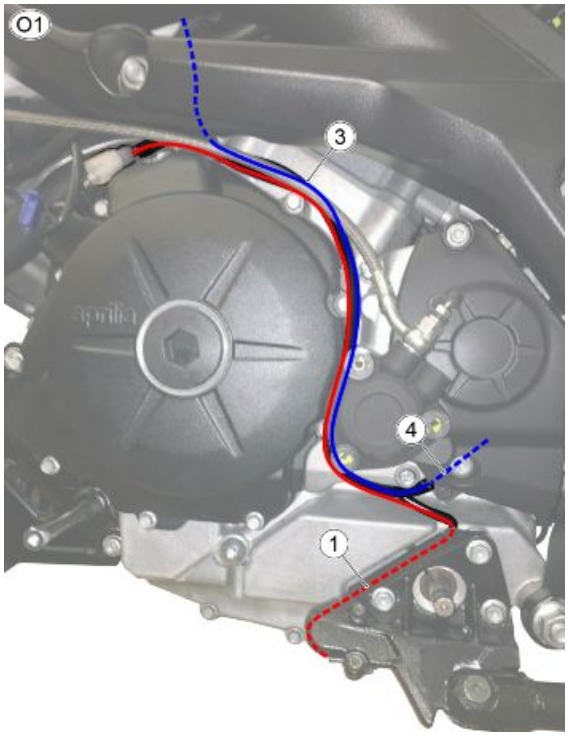


TABLE O2 - SIDE STAND

- Check that the side stand connector (5) is connected correctly and fasten the wiring harness to the flywheel wiring harness cable clamp using a clamp (6).

TABLE O3 - SIDE STAND

- After twisting the wiring harness, feed it into the cavity inside the frame.

TABLE P - FRONT LAMBDA PROBE

- Connect the front lambda probe connector (1) correctly, then fasten it to the cable clamp pre-installed on the ABS control unit support .

TABLE P1 - FRONT LAMBDA PROBE

- Using a clip (2), fasten the lambda probe wiring harness to the ABS control unit support.

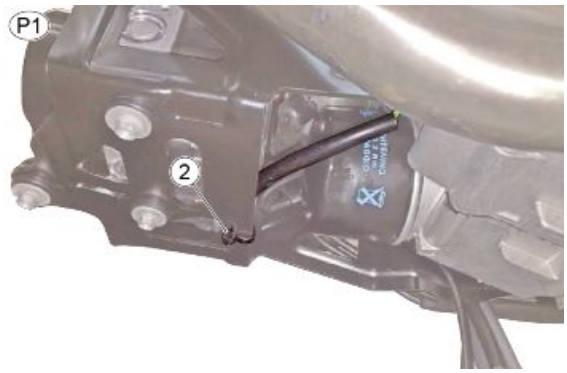


TABLE P2 - FRONT LAMBDA PROBE

- Using a clip (3), fasten the lambda probe wiring harness (4) to the ABS control unit support.

TABLE Q - REAR LAMBDA PROBE

- Connect the rear lambda probe connector correctly, then secure the probe wiring harness (2) using a clip (1).

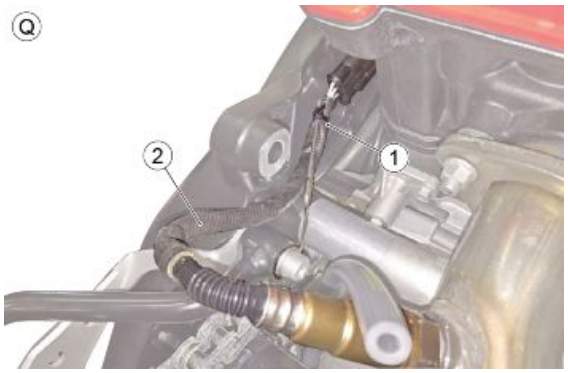


TABLE Q1 - REAR LAMBDA PROBE

- Using a clip (3), fasten the rear lambda probe wiring harness (2) to the saddle support frame.

Back side

TABLE A - REAR BRAKE SWITCH-REAR ABS SENSOR

- Secure the rear ABS sensor wiring harness (1) using the cable clamp (2) mounted on the brake calliper support.

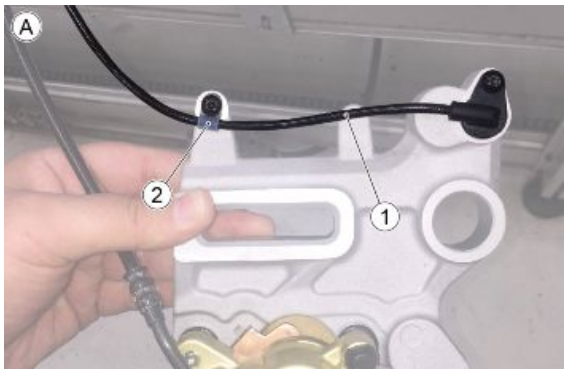
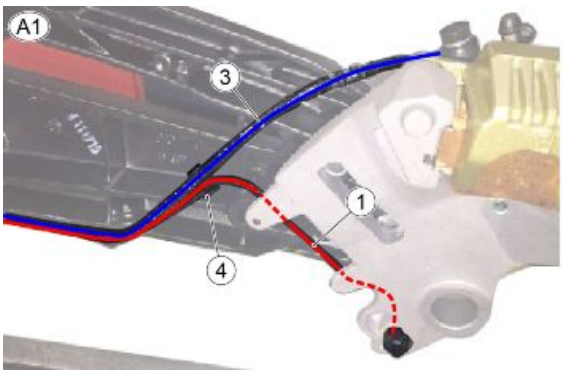


TABLE A1 - REAR BRAKE SWITCH-REAR ABS SENSOR

- Secure the ABS sensor wiring harness (1) to the rear brake pipe (3) using the cable clamp (4), and then route it through the plastic cable clamp (5) mounted on the swingarm.



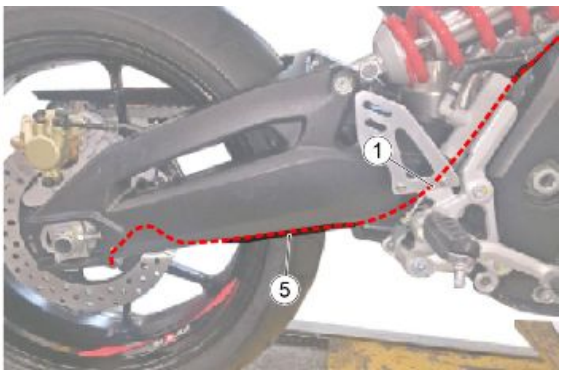


TABLE A2 - REAR BRAKE SWITCH-REAR ABS SENSOR

- Secure the rear ABS sensor (1) and rear brake switch (7) wiring harness to the rear brake pipes (3) using the clamps (6).

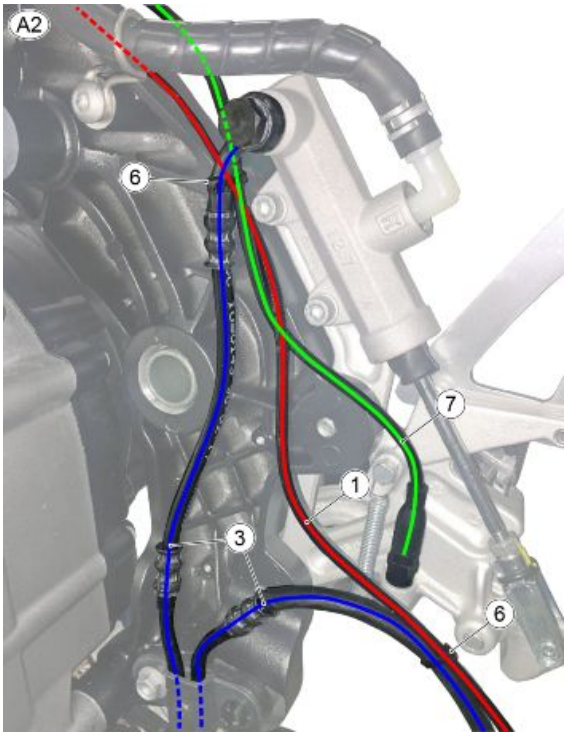


TABLE A3 - REAR BRAKE SWITCH-REAR ABS SENSOR

- Check that the rear ABS sensor connector is connected securely and positioned underneath the main wiring harness.

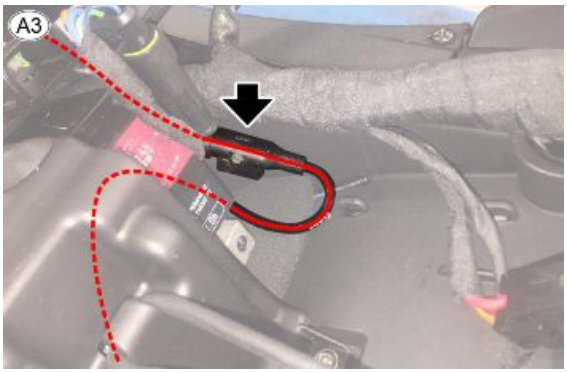


TABLE B - MAIN SADDLE SUPPORT WIRING HARNESS

- Fasten the main wiring harness (1) to the saddle support frame using two clamps (2).

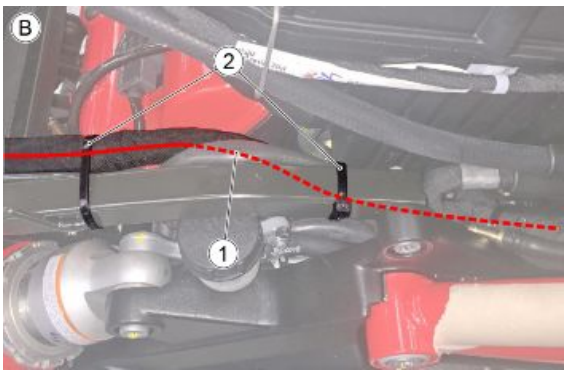


TABLE B1 - MAIN SADDLE SUPPORT WIRING HARNESS

- The main wiring harness (1) must be routed under saddle support frame crossbar.

TABLE C - STARTER RELAY

- Check that the two screws used for fastening the cables are secured correctly. Failure to secure them correctly may result in fires and vehicle malfunctions.

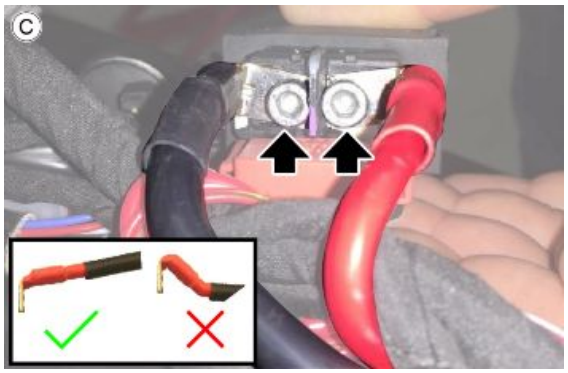


TABLE D - SADDLE SUPPORT ZONE

- Position a large clamp (1), and then, after connecting the read light assembly connector (2), position it as indicated.

TABLE D1 - SADDLE SUPPORT ZONE

- After connecting the license plate light connector (3) and positioning it above the rear light assembly connector (2), fasten the wiring harnesses to the rear grab bar using a clamp (4).

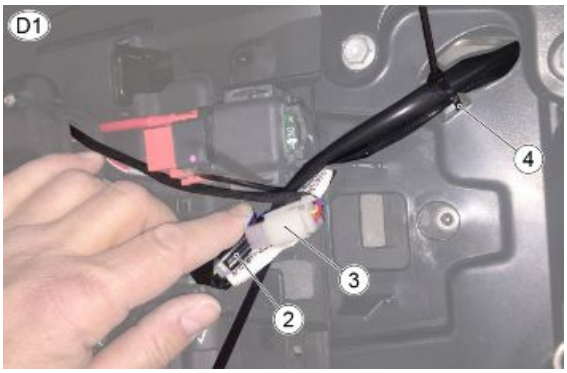


TABLE D2 - SADDLE SUPPORT ZONE

- Position the fall sensor (5) and after connecting the connector, close all the connectors that were positioned earlier.

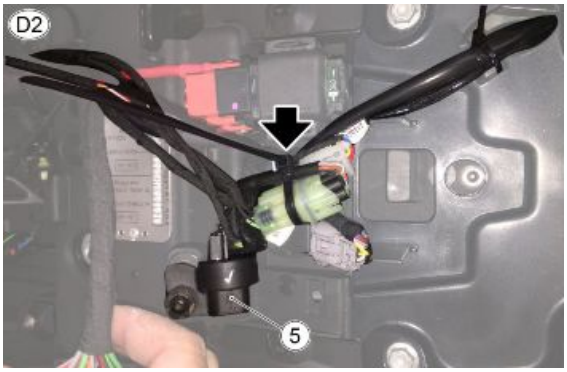


TABLE D3 - SADDLE SUPPORT ZONE

- Insert the AMP (Aprilia Multimedia Platform) connector (6) in the dedicated space and the main fuse (7), connecting it to the support saddle support.

TABLE D4 - SADDLE SUPPORT ZONE

- Position the secondary fuses (8), coupling the rubber support to the tabs present on the saddle support.
- fasten the branch of the main wiring harness (9) using two clamps (10). Position the ABS fuse (11) and the reprogramming connector (12) in the respective housings.

TABLE D5 - SADDLE SUPPORT ZONE

- After positioning the relay on its base and connecting it, bend the cables that leave the connector by 90° in order to create an "S", as illustrated.

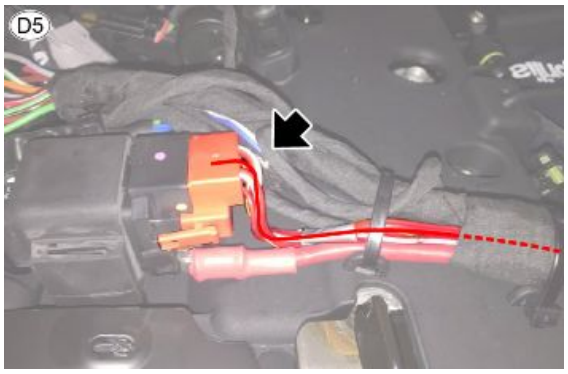


TABLE D6 - SADDLE SUPPORT ZONE

- After fastening the plastic cover that hides the various connections, check that the "Red White" starter relay cables are not in contact with the plastic at the point indicated.

TABLE E - NUMBER PLATE HOLDER

- Fasten the direction indicator and license plate light wiring harnesses to the number plate holder frame using two clamps.

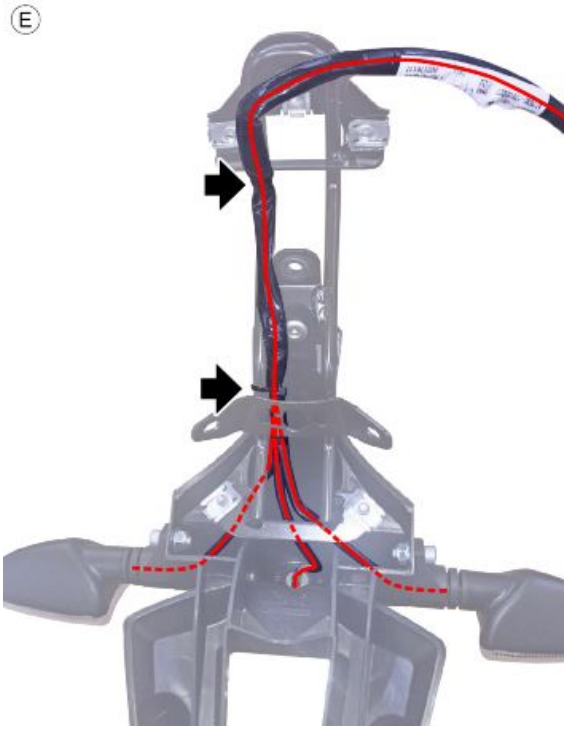


TABLE E1 - NUMBER PLATE HOLDER

- Make sure that the anti-vibration foam is fitted on the number plate light.

Engine

TABLE A - ENGINE WIRING HARNESS ON THROTTLE BODY AND FILTER BOX

- Fasten the engine wiring harness (1), centring it under the conduit (2) using the grey reference points.

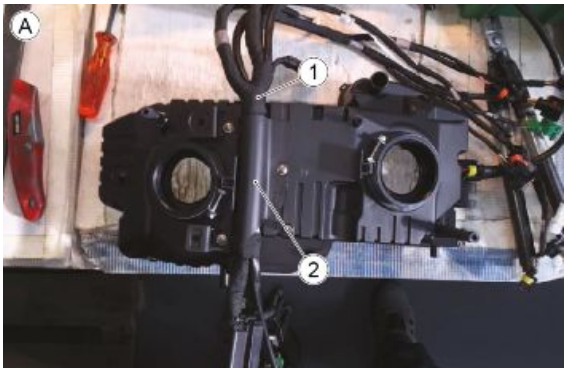


TABLE A1 - ENGINE WIRING HARNESS ON THROTTLE BODY AND FILTER BOX

- Route the branch with the throttle body connections through the lateral opening.

TABLE A2 - ENGINE WIRING HARNESS ON THROTTLE BODY AND FILTER BOX

- Connect the front injector (3 - green) and rear injector (4 - black) connectors.

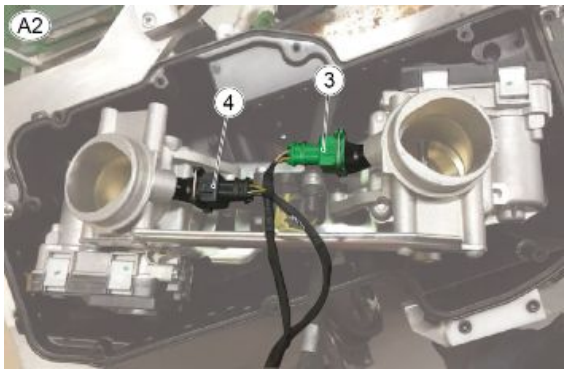


TABLE A3 - ENGINE WIRING HARNESS ON THROTTLE BODY AND FILTER BOX

- After fastening the throttle body to the base of the filter box, connect the cylinder pressure sensors (5) and the throttle body connectors (6).

CAUTION

THE FRONT THROTTLE BODY AND FRONT CYLINDER PRESSURE SENSOR WIRING HARNESSES ARE MARKED WITH THE INDICATION "FRONT", WHILE THE REAR THROTTLE BODY AND REAR CYLINDER PRESSURE SENSOR WIRING HARNESSES ARE MARKED WITH THE INDICATION "REAR",
INVERTING THESE CONNECTORS WOULD RESULT IN MOTORCYCLE MALFUNCTIONS.

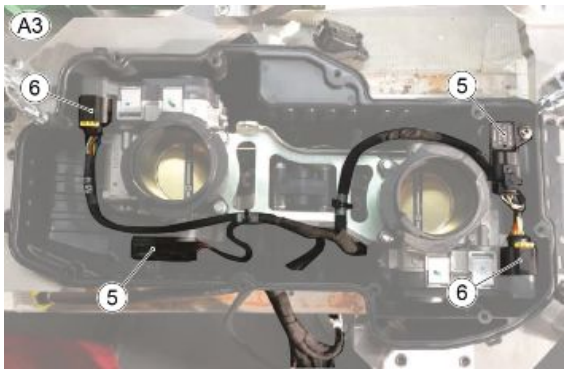


TABLE A4 - ENGINE WIRING HARNESS ON THROTTLE BODY AND FILTER BOX

- Fasten the wiring harness to the throttle bodies connection bracket inside the filter box using two clamps (7), at the points identified by the grey tape.

TABLE A5 - ENGINE WIRING HARNESS ON THROTTLE BODY AND FILTER BOX

- Fit the filter box side cover, position the engine wiring harness (1) using the grey reference point that can just be distinguished from outside the cover.

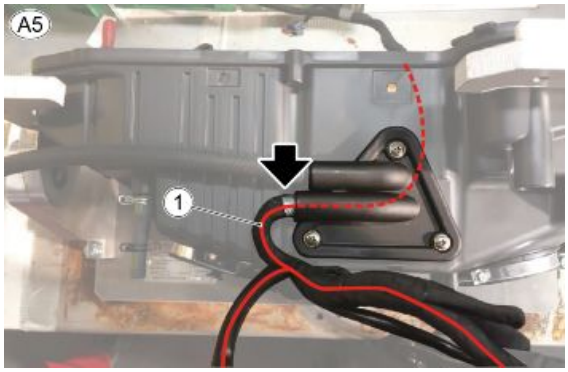


TABLE A6 - ENGINE WIRING HARNESS ON THROTTLE BODY AND FILTER BOX

- Connect the engine wiring harness connector (8) to its support (9) and check that it has been coupled correctly to the base of the filter box.

TABLE A7 - ENGINE WIRING HARNESS ON THROTTLE BODY AND FILTER BOX

- Connect the coil wiring harnesses to the filter box, using the clamps (10) positioned at the points indicated by the grey tape.

CAUTION

THE CLAMPS POSITIONED ON THE LOWER PART OF THE FILTER BOX MUST BE MOUNTED SO THAT THE "HEAD" IS FACING DOWNWARDS AND RESTING AGAINST THE WALL OF THE FILTER BOX.

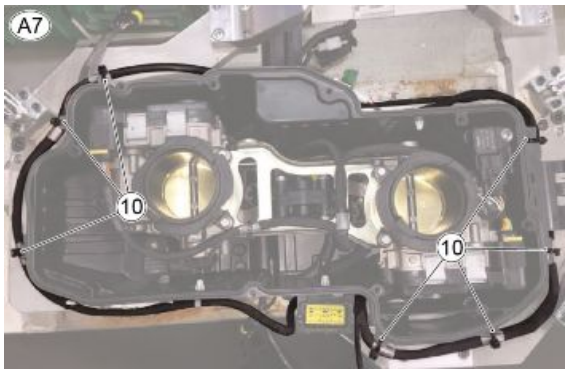


TABLE A8 - ENGINE WIRING HARNESS ON THROTTLE BODY AND FILTER BOX

- Take care to position the branch from the wiring harness next to the connector and not externally.

TABLE A9 - ENGINE WIRING HARNESS ON THROTTLE BODY AND FILTER BOX

- Attach the cable clamp (11) already mounted on the coil wiring harnesses to the base of the filter box, in correspondence with the holes.

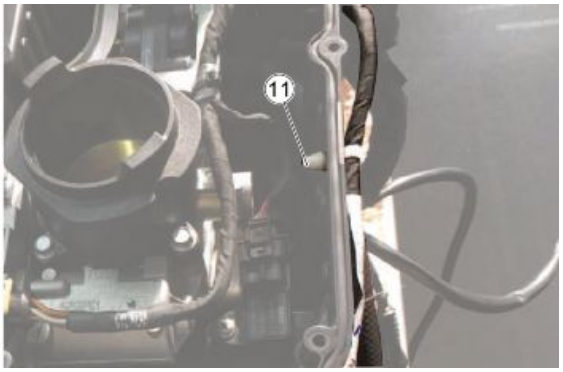


TABLE A10 - ENGINE WIRING HARNESS ON THROTTLE BODY AND FILTER BOX

- Install the air temperature sensor (12) and connect it to the engine wiring harness.

TABLE A11 - ENGINE WIRING HARNESS ON THROTTLE BODY AND FILTER BOX

- After reassembling the filter box, complete with air filter and intake ducts, and before inserting it, connect the water temperature sensor connector (13).

TABLE A12 - ENGINE WIRING HARNESS ON THROTTLE BODY AND FILTER BOX

- Connect the coil connectors (14) and attach them to the supports positioned on the base of the filter box.

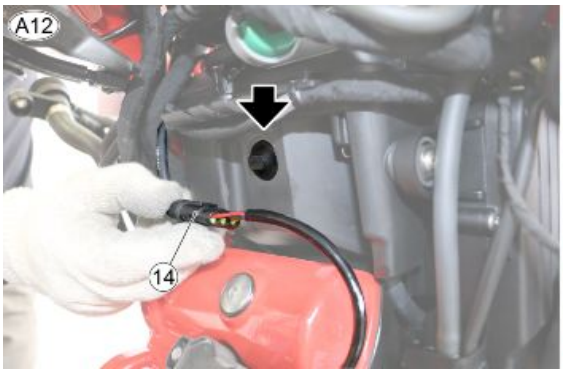


TABLE A13 - ENGINE WIRING HARNESS ON THROTTLE BODY AND FILTER BOX

- Route the flywheel wiring harness (15) under the tab on the control unit support box.

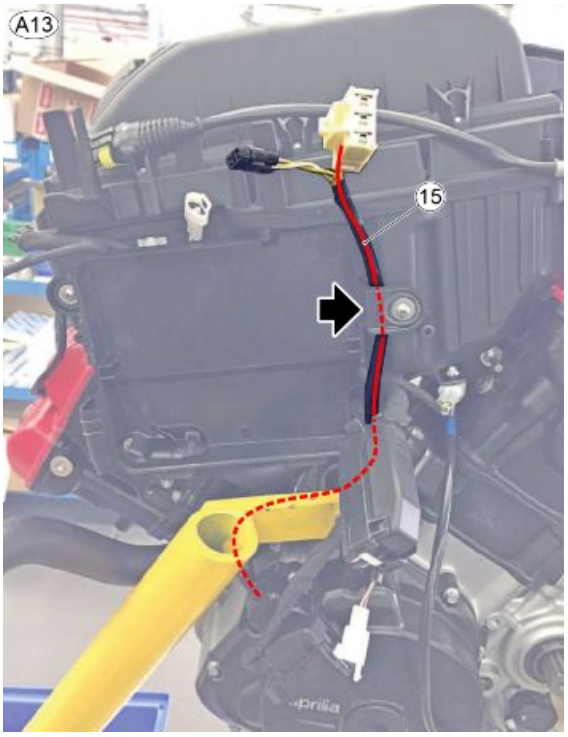


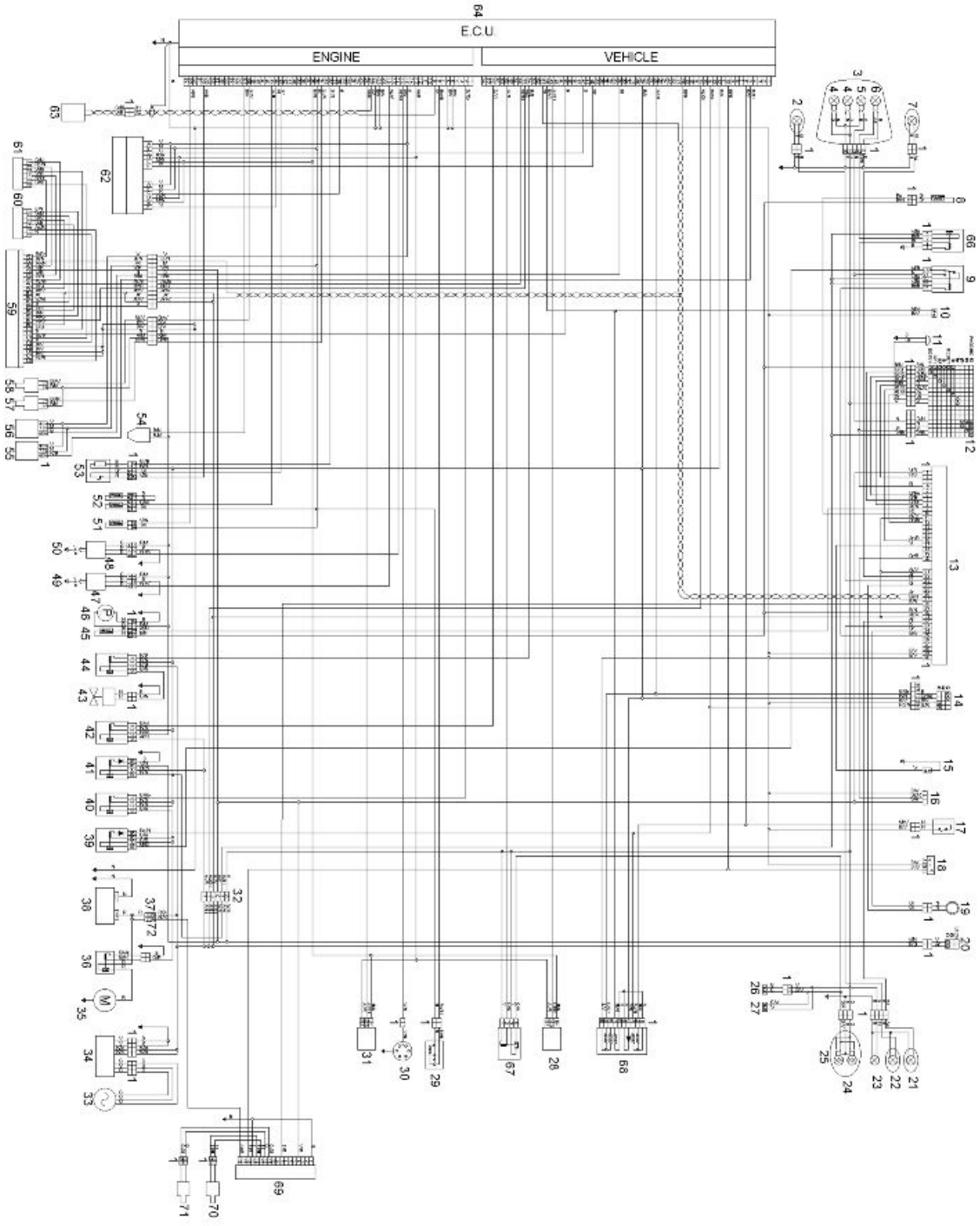
TABLE A14 - ENGINE WIRING HARNESS ON THROTTLE BODY AND FILTER BOX

- Connect control unit connectors (16) and apply a clamp (17) on the small connector so that the wiring harness remains inside the support box.

TABLE A15 - ENGINE WIRING HARNESS ON THROTTLE BODY AND FILTER BOX

- After connecting the gear sensor connector (18), attach it to the support on the base of the filter box (19).
- Using a clamp (20), fasten the flywheel, gear sensor and side stand switch wiring harnesses together.

General wiring diagram



Key:

1. MULTIPLE CONNECTORS
2. FRONT RIGHT TURN INDICATOR
3. COMPLETE HEADLAMP
4. FRONT LEFT TURN INDICATOR

5. LOW BEAM LIGHT BULB
6. FRONT POSITION LIGHT BULB
7. HIGH BEAM LIGHT RELAY
8. LIGHTS RELAY
9. HORN
10. LEFT LIGHT SWITCH
11. STOP/POSITION BULB
12. INSTRUMENT PANEL
13. FRONT STOP SWITCH
14. REAR STOP SWITCH
15. CLUTCH SWITCH
16. IGNITION SWITCH
17. MAIN INJECTION RELAY
18. IMMOBILIZER ANTENNA
19. REAR LEFT TURN INDICATOR
20. REAR RIGHT TURN INDICATOR
21. LICENCE PLATE LIGHT
22. TAILLIGHT
23. INSTRUMENT PANEL FUSE
24. SECONDARY FUSES
25. ABS CONTROL UNIT
26. FRONT ABS SENSOR
27. REAR ABS SENSOR
28. VOLTAGE REGULATOR
29. ALTERNATOR
30. STARTER MOTOR
31. START-UP RELAY
32. ABS CONTROL UNIT FUSE
33. MAIN FUSE
34. BATTERY
35. SECONDARY INJECTION RELAY
36. OIL PRESSURE SENSOR
37. FAN
38. FAN CONTROL RELAY
39. RIGHT LIGHT SWITCH
40. BLUEDASCH SET-UP (OPTIONAL)
41. FUEL RESERVE SENSOR
42. FUEL PUMP

43.USB PORT (OPTIONAL)
44.DIAGNOSTICS SOCKET
45.FALL SENSOR
46.SIDE STAND SWITCH
47.GEAR SENSOR
48.REAR CYLINDER PRESSURE SENSOR
49.FRONT CYLINDER PRESSURE SENSOR
50.REAR CYLINDER MOTORISED THROTTLE VALVE
51.FRONT CYLINDER MOTORISED THROTTLE VALVE
52.INTAKE AIR TEMPERATURE SENSOR
53.WATER TEMPERATURE SENSOR
54.7SM ENGINE CONTROL UNIT
55.HANDLE POSITION SENSOR
56.ENGINE SPEED SENSOR
57.FRONT CYLINDER COIL
58.REAR CYLINDER COIL
59.SPARK PLUG
60.FRONT CYLINDER INJECTOR
61.REAR CYLINDER INJECTOR
62.REAR CYLINDER LAMBDA PROBE
63.FRONT CYLINDER LAMBDA PROBE
64.HIGH BEAM LIGHT BULB
65.AIR TEMPERATURE SENSOR
66.OIL TEMPERATURE SENSOR

Colour key:

Ar Orange
Az Light blue
B Blue
Bi White
G Yellow
Gr Grey
M Brown
N Black
R Red
Ro Pink
V Green
Vi Violet

Conceptual diagrams

Checks and inspections

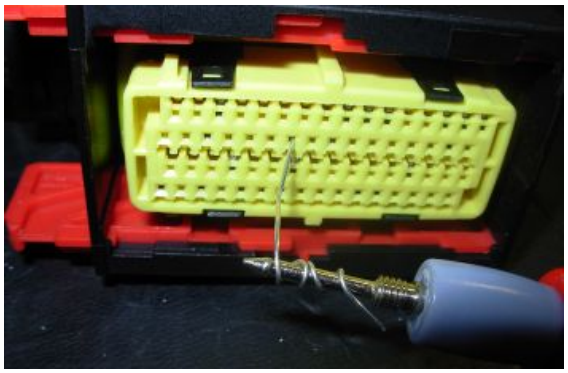
GENERAL NOTIONS FOR TROUBLESHOOTING ELECTRICAL FAULTS

THE SECTIONS RELATIVE TO THE ELECTRICAL SYSTEM CONTAIN DRAWINGS OF CONNECTORS; NOTE THAT THE DRAWING ALWAYS DEPICT THE CONNECTOR/COMPONENT VIEWED FROM THE WIRING HARNESS SIDE, I.E. FROM THE SIDE ON WHICH THE CABLES LEADING FROM THE MAIN WIRING HARNESS ENTER THE CONNECTOR/COMPONENT.

CAUTION

BEFORE STARTING ANY TROUBLESHOOTING PROCEDURES ON THE VEHICLE, CHECK THAT THE BATTERY VOLTAGE IS ABOVE 12V.

CONNECTOR CHECK PROCEDURE



The procedure includes the following checks:

1. Observation and check of the connector correct position on the component or on the coupling connector, making sure that the locking catch is released.

2. Observation of the terminals on the connector: no rust marks or dirt should be present and it is important to check terminal correct positioning on the connector (i.e., all terminals aligned at the same depth) and terminal integrity (i.e., that terminals are not loose, open/bent, etc.). For connectors whose terminals are not visible (e.g. Marelli control unit) use a metal cable of suitable diameter and introduce it carefully in the connector slot at the same depth as for the other terminals of the connector.

CAUTION

IN THE CASE OF SPORADIC FAULTS, MOVE OR WIGGLE THE RELATIVE WIRING HARNESS SLIGHTLY WHILE PERFORMING EACH OF THE CHECKS INDICATED FOR TROUBLESHOOTING.

3. Pull cables gently from the back of the connector to check that the terminals are fitted correctly on the connector and that the wires are fastened correctly to the terminals.

Checking electrical CONTINUITY

Purpose of check: the purpose of this check is ensure that there are no interruptions or excess resistance (due to corroded terminals, for example) in the circuit under inspection.

Tester: set the tester selector to the "continuity" symbol and place the probes of the tested at the two ends of the circuit. Normally, the tester will sound an audible signal to confirm continuity in the section

of circuit tested. Continuity may also be tested by setting the tester selector to the "Ohm" symbol and checking that the resistance in the circuit is zero or of a few tenths of an Ohm.

IMPORTANT: THE CIRCUIT MUST BE UNPOWERED DURING THIS TEST. IF THE CIRCUIT IS POWERED, THE RESULTS OF THIS TEST ARE MEANINGLESS.

Checking GROUND CONNECTION

Purpose of check: the purpose of this check is to verify that a cable or circuit is correctly connected to the ground (-) of the vehicle.

Tester: set the tester selector to the "continuity" symbol and place one of the tester probes on the vehicle ground point (or on the battery negative pole) and the other probe on the cable under inspection. Normally, the tester will sound an audible signal to confirm continuity in the section of circuit tested. Continuity may also be tested by setting the tester selector to the "Ohm" symbol and checking that the resistance in the circuit is zero or of a few tenths of an Ohm.

IMPORTANT: WHERE GROUND IS PROVIDED BY THE ECU, CHECK THAT THE ECU IS EFFECTIVELY PROVIDING THE GROUND CONNECTION FOR THE CIRCUIT DURING THE TEST.

Checking VOLTAGE

Purpose of check: the purpose of this check is to determine if a cable is carrying voltage, in other terms, to verify whether it powered by the battery or ECU.

Tester: set the tester selector to the "DC voltage" symbol and place the red tester probe on the cable under inspection and the black tester probe on the vehicle ground point (or on the battery negative pole).

CAUTION

IN THE CASE OF SPORADIC FAULTS, MOVE OR WIGGLE THE RELATIVE WIRING HARNESS SLIGHTLY WHILE PERFORMING EACH OF THE CHECKS INDICATED FOR TROUBLESHOOTING.

Immobiliser

System components

Function

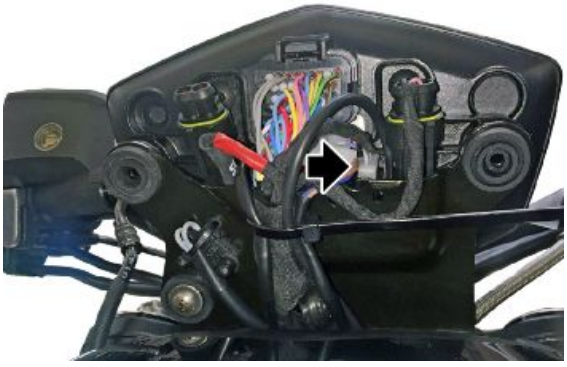
detects the transponder code in the key and sends it to the instrument panel

Level in electrical circuit diagram:

Immobilizer

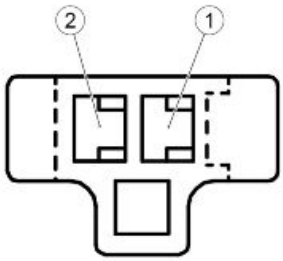
Position:

- on the vehicle: in the ignition switch assembly
- connector: two way, grey colour, behind the instrument panel



Electrical specifications

- 14 Ohm



Pin out

1. Grey colour, from the instrument panel to the antenna - Section 0.5

2. Grey colour, from the instrument panel to the antenna - Section 0.5

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

INSTRUMENT PANEL: ERRORS

B0003 Immobilizer fault

- key code read but not recognised

Error cause

- The read code is not stored in the instrument panel memory

Troubleshooting

- Carry out key data storage procedure

B0004 Immobilizer fault

- read key code not read (key not present or transponder not working)

Error cause

- Key transponder does not communicate its own code

Troubleshooting

- Replace the key

B0005 Immobilizer fault

- Immobilizer fault: aerial not working (open or short-circuited)

Error cause

- An electric interruption or a ground short circuit or voltage to the circuit have been detected

Troubleshooting

- Check the sensor connector on the cable harness and the instrument panel connector. If not OK, restore; if OK, check electrical characteristics and aerial circuit continuity from the instrument panel connector on PIN 2 and 3: if not OK, restore cable harness; if OK, check circuit ground insulation: if not ground insulated, restore cable harness; if insulated, with key ON, with instrument panel connector disconnected, check that there is not voltage at the circuit ends: if there is voltage, restore the cable harness

B0006 Internal controller fault

Error cause

- There is a fault in the instrument panel

Troubleshooting

- Replace the instrument panel

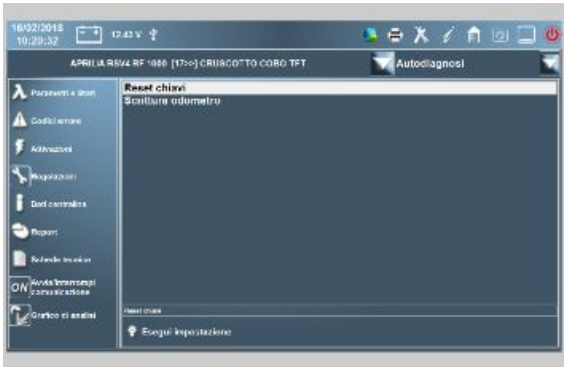
System not programmed

Storing new keys

NOTE

REGARDLESS OF THE LANGUAGE SET IN THE DASHBOARD FUNCTIONS, THE KEY PROGRAMMING PROCEDURE CAN ONLY BE VIEWED IN ENGLISH.

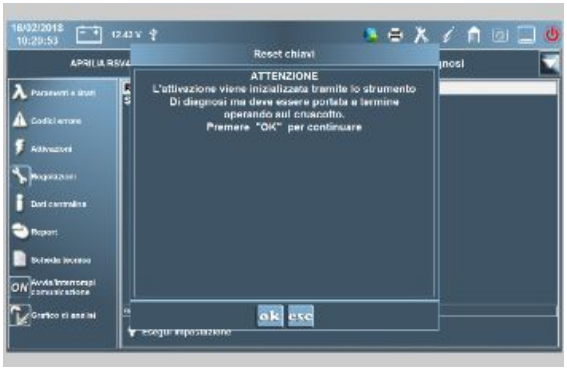
- To carry out the one or more key programming procedures, up to a maximum of four, you must connect the motorcycle to the diagnostic tool.
- Turn key to "ON" and insert the USER CODE where required.
- Carry out the self-diagnosis of the dashboard and enter the "SETTINGS" section by clicking on "RESET KEYS".



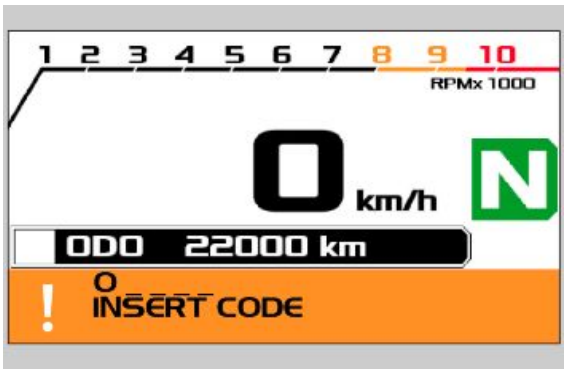
- At this point, a screen with a warning message will be visible. Press "OK" and start programming the keys.

NOTE

IF THE IMMOBILIZER ANTENNA IS DISCONNECTED, YOU WILL NOT BE ABLE TO START KEY PROGRAMMING.



- Enter the USER CODE to continue.
- If the code entered is correct, the first key is stored.



- At this point, on the digital display of the motorcycle, after the automatic restart of the dynamic presentation screen, a message will appear with a countdown of 20 seconds to insert the second key to be programmed.
- Set key to "OFF", insert the second key and set to "ON".

CAUTION

IF YOU DO NOT HAVE A SECOND KEY OR YOU DON'T WANT TO STORE ONE, THE DIAGNOSTIC TOOL WILL SHOW AN ERROR SAYING "1 KEY STORED"

- The second key is stored and you will be asked to enter the third key (if you have one). The same operation will be repeated to store the fourth key.
- To complete AND end the memorisation procedure, set key to "OFF".
- You should then test the correct functioning of all keys stored.

Diagnosis

- In case of malfunction of certain organs, the digital display of the instrument panel may display errors. To check and diagnose the specific component, check the dedicated section.

Azzeramento icona manutenzione

The system displays the function as follows:

- After the maintenance interval thresholds are exceeded (excepting the first), an icon with the adjustable wrench is shown on the digital display.

To reset Service proceed as follows:

- Connect the diagnostic tool;
- Select the concerned model;
- Enter in the "INSTRUMENT PANEL" section;
- Select "SELF-DIAGNOSIS";
- Select "ACTIVATIONS";
- Enable the command "SERVICE RESET".

Battery recharge circuit

RECHARGING SYSTEM

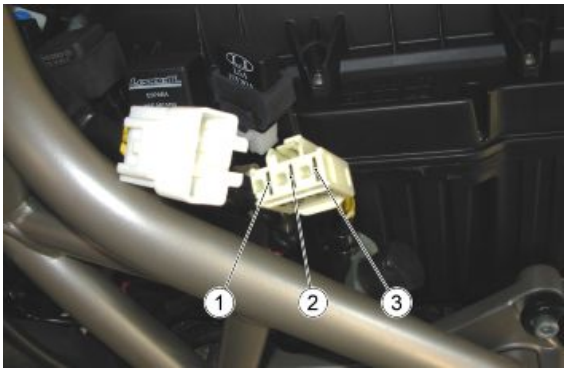
- Remove the tank and the filter casing;
- Disconnect the three-way connector (1) (white).

NOTE

THE ENGINE SIDE IS IDENTIFIED WITH THE LETTER "A"

Measurement of resistance (with engine off)

- For a correct detection of the alternator resistance, an ambient temperature measurement must be carried out and afterwards a heat stabilisation (after turning fan on) by using a tester, using alternatively the 3 connector pins: stage "1" (pin 1-2), stage "2" (pin 1-3), stage "3" (pin 2-3).



- Take the measurement; The correct value is determined by the value measured for each stage in which from time to time the resistance of the tester wires is subtracted, obtained by touching the two lugs.

Example:

- Resistance of stage 1 read on the display = 0.65 Ohm

- Resistance of the wires read on the display = 0.47 Ohm

- Effective resistance stage 1 = 0.65-0.47 = 0.18 Ohm
- If there is a significant difference between one stage and another (other than 0.15 Ohm), this means that the alternator is defective and must be replaced.

RESISTANCE MEASUREMENT

Winding stage	Ambient temperature (ohm)	Afterwards heat stabilisation (ohm)
Stage 1	0.15 - 0.20	0.18 - 0.23
Stage 2	0.15 - 0.20	0.18 - 0.23
Stage 3	0.15 - 0.20	0.18 - 0.23

Zero load voltage

- Disconnect the three-way connector (1);
- For a correct detection of the alternator voltage, a measurement must be carried out using alternatively the 3 engine side connector pins: stage "1" (pin 1-2), stage "2" (pin 1-3), stage "3" (pin 2-3)
- Take the measurements;
- If there is a significant difference between one stage and another (other than 15 V), this means that the alternator is defective and must be replaced.

CAUTION

WITH THE ENGINE HOT THE VALUES RECORDED ARE ON AVERAGE 4-5 V LESS THAN THOSE DETECTED WITH THE ENGINE COLD.

EMPTY VOLTAGE

rpm	2000	6000	8000
Vm linked voltage Reference values (V rms)	20 - 30	75 - 85	95 - 105

Short-circuit current

- For a correct detection of the short-circuit current, a connector must be prepared that generates a downstream short circuit between the three alternator cables;
- Start the engine and with an ammeter clamp measure each single cable.
- If there is a significant difference between the measure of the single cables (other than 10 A), this means that the alternator is defective and must be replaced.

CAUTION

WITH THE ENGINE HOT THE VALUES RECORDED ARE ON AVERAGE 2-3 A LESS THAN THOSE DETECTED WITH THE ENGINE COLD.

WARNING

NEVER KEEP THE ENGINE RUNNING FOR MORE THAN ONE MINUTE; FAILURE TO DO SO COULD CAUSE SERIOUS OVERHEATING DAMAGES TO THE MOTORCYCLE CIRCUITS.

COLD SHORT CIRCUIT CURRENT

RPM	2000	4000	6000	8000
RMS DC current (Arms) (average of the 3 stage currents)	26 - 31	26 - 31	26 - 31	26 - 31

Voltage on battery poles with engine speed always between 3000 - 5000 RPM

- Start the engine, after about one minute of operating bring the speed to 3000-5000 RPM, then measure with a tester the voltage at the battery poles that must always be between 13V and 15V. Otherwise, if the correct operation of the alternator has already been checked, replace the regulator.

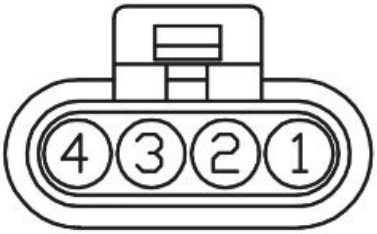
CAUTION

PERFORM THE CHECK DESCRIBED ABOVE WITH A BATTERY IN GOOD CONDITION (START VOLTAGE ABOUT 13V) MAKING SURE THAT THERE ARE NO ELEMENTS IN THE SHORT CIRCUIT.

Start-up system check

Function

Communicates to the control unit the will to start-up the engine.

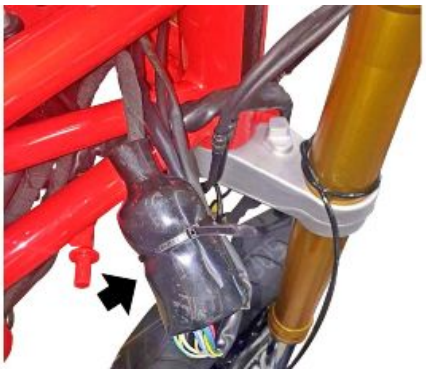


Operation / Operating principle

Press the start-up button to close the specific circuit taking the PIN 58 of the control unit to a voltage equal to zero (ground closing).

Level in electrical circuit diagram:

Start enable switches



Position:

- on the vehicle: Right hand light switch.
- connector: behind the steering headstock, inside the protection case (black colour, 4 way).

Electrical specifications:

- key released: open circuit
- key pressed: closed circuit

Pin out:

1. - Green/pink colour from the RH lights switch to the clutch switch - Section 0.5

2. Voltage + 5V - Pink/Brown colour from the RH lights switch to 7SM control unit PIN 58 (engine start) - Section 0.5

3. Ground - Green/pink colour from the engine to the clutch switch - Section 0.5

4. - Yellow/pink colour from the RH lights switch to the 7SM control unit PIN 78 (engine stop) - Section 0.5

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

P0615 Starter relay

- short circuit to positive / open circuit, short circuit to negative.

Error cause

- Short-circuit to positive: excessive voltage identified at PIN 69, at the command time; If open circuit, short circuit to negative: a voltage close to zero was identified when there is no command to the start-up relay.

DIAGNOSTIC TOOL: LOGIC ERRORS

P0512 Starter switch

- signal not plausible.

Error cause

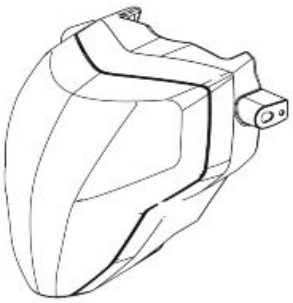
- Fault in the switch (lock) of the engine start-up. A continuous voltage close to 0 was detected for a certain time (e.g. locked button).
- The instrument panel does not indicate the presence of this error even in the ATT status.

Troubleshooting

- Check the locking cause and restore.

Lights list

Front headlamp



Characteristic

Front daylight running light

12V - 5W x 2

Low beam light

12 V - 55 W H7

High beam light

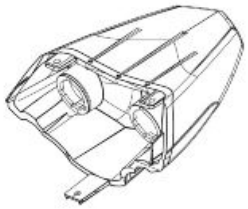
12 V - 55 W H7

Rear light

Characteristic

Rear daylight running light /stop light

12V - 5/21W x 2



Fuses

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

Check the auxiliary 15A fuses first, then the main 30A fuse.

CAUTION

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.

NOTE

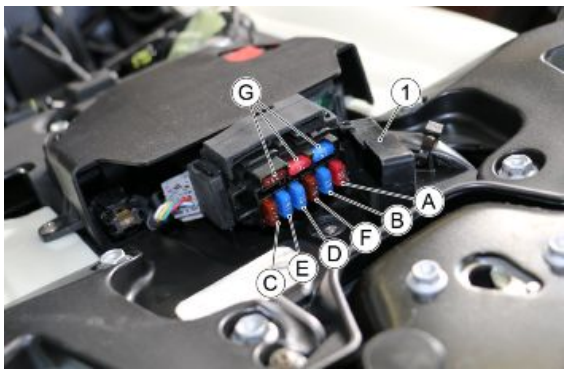
A FUSE THAT BLOWS FREQUENTLY MAY INDICATE A SHORT CIRCUIT OR OVERLOAD.

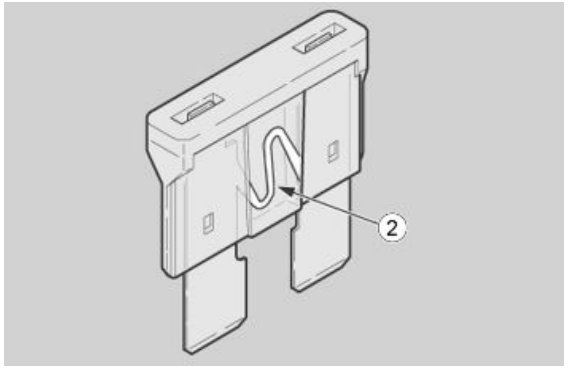
SECONDARY FUSES

Before replacing the fuse, find, if possible, the cause of the problem.

To check the secondary fuses:

- To avoid an accidental short-circuit, place the power switch to "OFF".
- Remove the rider saddle.
- Open the cover of the secondary fuse box (1).
- Take out one fuse at a time and check whether the filament (2) is broken. In this case change the fuse with one of the same amperage.





NOTE

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

AUXILIARY FUSES DISTRIBUTION

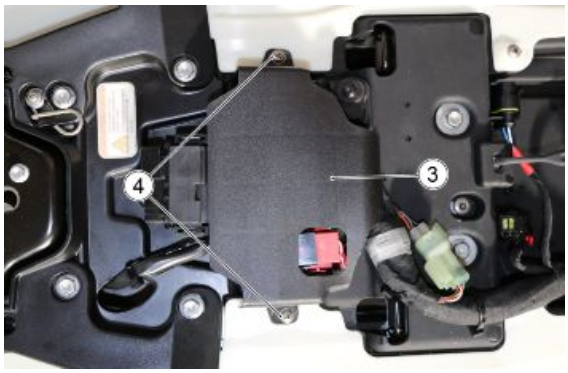
Specification	Desc./Quantity
A) 10A fuse	Lights relay/high beam relay, buttons and brake lights/horn, daylight running lights (front, rear)/license plate
B) 15A fuse	ECU live positive lead
F) 7,5A fuse	ECU permanent positive lead
D) 15A fuse	Coils, injectors, fuel pump, secondary injection relay
E) 15A fuse	Low beam/high beam lights
C) 7.5A fuse	Fan
G) spare fuses	-

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

MAIN FUSES

To check the main fuse (H)

- Remove the protective cover (3), unscrewing the two screws (4).



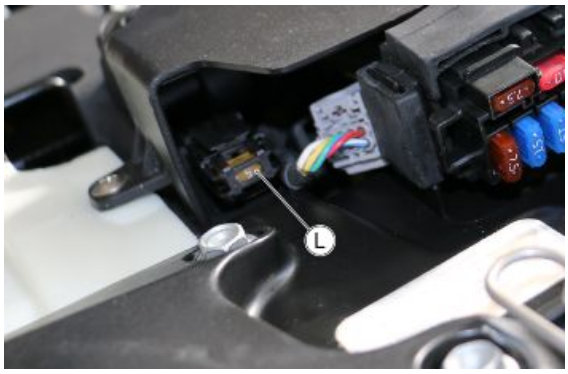
- Remove the protective cover, take out the fuse (H) and check whether the filament (2) is broken. In this case change it with one of the same amperage.

CAUTION

REMOVING THE 30A FUSE RESETS THESE FUNCTIONS ON THE DASHBOARD:

To check the main fuse (L)

- Remove the protective cover, take out the fuse (L) and check whether the filament (2) is broken. In this case change it with one of the same amperage.



To check the ABS fuse (I)

- Remove the protective cover, take out the fuse (I) and check whether the filament (2) is broken. In this case change it with one of the same amperage.

MAIN FUSES DISTRIBUTION

Specification	Desc./Quantity
H) 30A fuse	Recharge, "F-D-C positive fuses", key positive, main relay, 5A positive fuse (dashboard)
I) 20A fuse	ECU ABS permanent positive
L) 5A fuse	dashboard permanent positive
M) spare fuse	-

The main fuses are located in the central part of the motorcycle, under the rider saddle.

Control unit

- To remove the control unit, refer to chapter " Bodywork", "Air filter housing" section.

CONTROL UNIT - Diagnosis

Function

It manages the Ride by wire system, the injection/ignition, the system safety checks and the self-diagnosis function

Level in electrical circuit diagram:

Each level in which the main component involves the control unit

Position:

- on the vehicle: to the left of the filter housing
- connector: on the control unit connector from 52 PIN ENGINE, connector from 28 PIN VEHICLE

Pin out: See CONNECTORS paragraph

DIAGNOSTIC TOOL:INFO

(screen page/example values with key ON)

- ISO code / -
- Drawing number / - (identified inserted by the manufacturer)

- HW number/ - (indicates the Hardware number)
- Approval number / -
- Author of the latest progr. / - (author of the latest programming)
- Mapping / - (indicates the mapping number)
- Programming date / - (control unit programming date)
- NIP code / - (internal code identifying the control unit)
- VIN / - (vehicle identification number

DIAGNOSTIC TOOL:PARAMETERS AND STATUSES

PARAMETERS:

- Engine rpm / - (engine rpm)
- Air temperature / - (indicates the air temperature)
- Water temperature/ - (indicates the water temperature)
- Throttle valve angle / - (throttle vale opening angle)
- Actuated advance / - (value of the real advance, seen from the control unit)
- Injection time / - (indicates the electric injector opening time)
- Battery voltage / - (indicates the battery voltage)
- Lambda probe control / - (indicates the lambda probe correction percent)
- Lambda probe voltage / - (indicates the value of the lambda probe voltage)
- Atmospheric pressure / - (indicates the atmospheric pressure)
- Objective minimum speed / - (minimum rpm required by the control unit)
- Stepper CI.Loop Opening / - (Stepper Closed Loop opening)
- Intake manifold pressure / - (measure at the intake manifold)
- Scheduled advance / - (value of the desire advance for the control unit)
- Vehicle speed / - (indicates the actual speed of the vehicle)
- Lambda adaptive gain / - (lambda adaptive gain)
- Stepper equiv. throttle valve / - (stepper equivalent throttle valve angle)
- Base Stepper opening / - (base stepper opening)
- Stepper regulat. opening / - (stepper regulator opening)
- KON count / - (key ON count)
- Coil Dwell / -
- Injector bleed / -

STATUSES:

- Engine status / - (indicates the engine status)
- Throttle valve status / - (indicates if the throttle valve is open or closed)
- RUN - OFF switch / -
- Start enable / - (indicates if the control unit allows the start up)
- Ratio control status / -

- Lambda probe / - (indicates if the lambda probe is operating)
- Engine mode / -
- Tone wheel / - (tone wheel status)
- Ign. Activ. rec. status / - (ignition activation recognition status)
- Fan relay / - (status of the cooling fan relay)
- Engine stepper status / - (engine stepper status)
- Start-up request / -
- Clutch / -
- Gearbox in neutral / -

DIAGNOSTIC TOOL:ACTIVATIONS

- Coil / (coil actuator)
- Fuel pump / (fuel pump activation)
- Injector activation / (injector activation)
- Warning light / (warning light activation)
- Stepper circuit / (stepper circuit electric test)
- Fan activation / (fan connection activation)
- Headlights relay / (activates the headlight relay)

DIAGNOSTIC TOOL: ADJUSTMENTS

- Self-adaptive param. reset / (self-adaptive parameter reset)
- Saved data download / (save data files download)
- TPS reset

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

P0601 EEPROM error

Electrical diagnosis:

- Circuit not functioning

Error cause:

- Replace the injection control unit.

The instrument cluster indicates the presence of this error with the MI warning light on fixed.

NOTE

THIS ERROR GENERATES THE RECOVERY STATUS AND ENGINE SHUT-DOWN.

P0604 RAM Error

Electrical diagnosis:

- Circuit not functioning

Error cause:

- Replace the injection control unit.

The instrument cluster indicates the presence of this error with the MI warning light on fixed.

NOTE

THIS ERROR GENERATES THE RECOVERY STATUS AND ENGINE SHUT-DOWN.

P0605 ROM Error

Electrical diagnosis:

- Circuit not functioning

Error cause:

- Replace the injection control unit.

The instrument cluster indicates the presence of this error with the MI warning light on fixed.

NOTE

THIS ERROR GENERATES THE RECOVERY STATUS AND ENGINE SHUT-DOWN.

P060B A/D converter

Electrical diagnosis:

- Circuit not functioning

Error cause:

- Replace the injection control unit.

The instrument panel indicates this error by lighting up in a fixed manner the MI warning light and by flashing the general warning light.

NOTE

THIS ERROR GENERATES THE RECOVERY STATUS AND ENGINE SHUT-DOWN.

DIAGNOSTIC TOOL: LOGIC ERRORS

P160C Level 2 safety reset

Error cause:

- Due to the fact that the level 2 safety system (comparison between requested torque and calculated torque) detected a fault, the control unit reset the engine (severity C).

The instrument panel does not indicate the presence of this error even in the ATT status.

Troubleshooting:

- Perform the troubleshooting for the other detected errors

P060C Safety Engine Stop

Error cause:

- Due to the fact that the safety system detected a serious fault, the control unit has stopped the engine.

The instrument panel indicates this error by lighting up in a fixed manner the MI warning light and the general warning light.

Troubleshooting:

- Perform the troubleshooting for the other detected errors.

NOTE

THIS ERROR GENERATES THE RECOVERY STATUS AND ENGINE SHUT-DOWN.

P1606 Hardware and software incompatibility

Error cause

- Incorrect engine control unit mapping

This error is indicated by lighting up in a fixed manner the general warning light.

Troubleshooting

- Call the Help Desk

NOTE

THIS ERROR DETERMINES THE ENGINE STOP AN THE DEACTIVATION OF THE STARTER MOTOR.

P1607 Saved data file (for safety reasons)

Electrical diagnosis:

- Filled

Error cause

- This indication appears only if the Level 2 safety has reset the engine (C gravity).

The instrument panel does not indicate the presence of this error even in the ATT status

Troubleshooting

- Perform the troubleshooting for the other detected errors.

P1650 Engine events configuration Checksum calculation error

Error cause:

- Corrupt Flash-eeprom (hardware problem).
- Upload (e.g. in service) of an incompatible software version, therefore missing the reference check-sum.

This error is indicated by lighting up in a fixed manner the general warning light.

Troubleshooting:

- Call the Help Desk.

Errori di errata configurazione

P1901 Ax acceleration sensor plausibility

Functional diagnosis:

- Incorrect control unit set up

Error cause:

Probably there is an attempt to set up the control unit with an inadequate map.

NOTE: The instrument panel does not indicate the presence of this error even in the ATT status.

NOTE

THIS ERROR DISABLES THE TRACTION CONTROL.

P1902 Az acceleration sensor plausibility

Functional diagnosis:

- Incorrect control unit set up

Error cause:

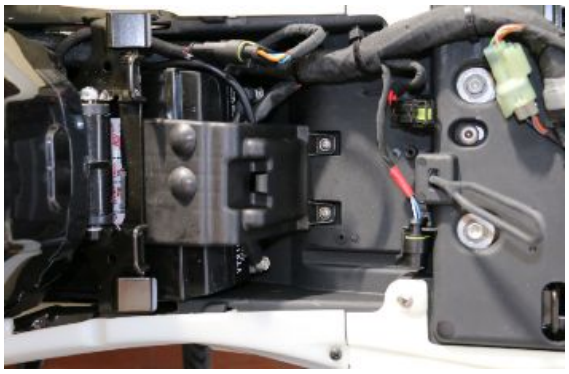
Probably there is an attempt to set up the control unit with an inadequate map.

NOTE: The instrument panel does not indicate the presence of this error even in the ATT status.

NOTE

THIS ERROR DISABLES THE TRACTION CONTROL.

Battery



Function

Provides electrical power to vehicle: the YTZ 12 BS battery is already activated, charged and sealed;

Level in electrical circuit diagram:

Battery charge

Position:

- on the vehicle: under the saddle
- connector: on the battery

Electrical specifications:12 V / 10 Ah

Pin out:

1. Positive pole (red): approx. 12,6 V
2. negative pole (black): ground lead

DIAGNOSTIC TOOL:PARAMETERS

Battery voltage

- Example value with key ON: 12.0 V
- Example value with engine on: 14.2 V

This is one of the values set by the ECU in the event of recovery mode

Battery voltage before prior to Recovery mode

- Example value with key ON: 12.0 V
- Example value with engine on: 14.2 V

Value determined from signal read without taking considering whether recovery mode is implemented

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTIC TOOL: LOGIC ERRORS

P0560 Battery voltage

- too high/too low

Error cause

- If too high: too high a voltage has been detected at PIN 42. If too low: too low a voltage has been detected at PIN 42.

The instrument cluster indicates the presence of this error with the MI warning light on fixed.

Troubleshooting

- If too high: check that the voltage regulator is working correctly.
- If too low: check voltage regulator connectors, engine-vehicle wiring harness connector and ECU connector (check in particular for oxidation): if not OK, repair. If OK, check that resistance of the Red/White cable from the voltage regulator connector to the ECU connector is a few tenths of an Ohm; if not OK, repair the wiring harness. If OK, check that the alternator is working correctly: if not OK, repair. If OK, check that the voltage regulator is working correctly

P1560 Low battery voltage error - GCC error

Functional diagnosis:

- low voltage

Error cause

- The error is enabled if, after 5 seconds from the key to ON, the battery voltage is judged low by the ECU.
- Low voltage detected to PIN 52 of the Marelli ECU.

The presence of this error is signalled by the fixed lighting of the general warning light.

Troubleshooting

- Try charging / replacing the battery: if NOT OK, carry out the check procedure for the alternator connector and the control unit connector (paying particular attention to any oxidation): if not OK, restore. If OK, check that cable resistance between the alternator cable and the control unit is a few tenths of Ohm: if not OK, repair the wiring harness; if OK, check that the alternator is working correctly: Restore if not OK.

NOTE

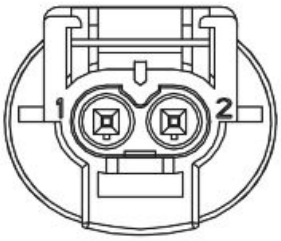
THE PRESENCE OF THIS ERROR DETERMINE THE DEACTIVATION OF THE TRACTION CONTROL AND THE CRUISE CONTROL.

Speed sensor

FRONT VEHICLE ABS SENSOR

Function:

Generates a signal used by the ABS control unit to determine the speed value of the wheel.



Operation / Operating principle:

Magneto-resistive sensor: generates a square wave signal with an amplitude of approximately 1V between PIN13 and PIN14 of the ABS control unit.

Electrical circuit diagram - Level in electrical circuit diagram:

ABS system

Position on vehicle:

On right-hand stanchion of fork, near the brake calliper mounting bracket.

Position of connector (if applicable):

On the filter housing, right side.

Pin-out:

- PIN1 - Power feed negative/Signal negative (white)
- PIN2 - Power feed positive/Signal positive (white/brown)

DIAGNOSTIC TOOL

Parameters: Speed (km/h) - Vehicle speed.

ELECTRICAL ERRORS

Speed sensor

5D90 electric malfunction: Electrical fault in sensor or wiring harness.

Troubleshooting: Check the sensor connector and the ABS control unit connector. If they are not OK, restore the connectors. If they are OK, check continuity of the white/brown cable between PIN 2 of the sensor on the wiring harness side and PIN 14 of the ABS control unit connector. If there is no continuity, restore them. If there is, PIN 2 of the sensor on the wiring harness side, with the sensor disconnected and key set to ON, must have 12V voltage approximately: if there is no voltage, check PIN 2 for continuity with the vehicle ground connection: if it is grounded, restore the wiring harness. If OK, replace the control unit. If PIN 2 has approx. 12 V, check the continuity of the white cable between PIN 1 of the sensor on the wiring harness side and PIN 13 of the ABS control unit connector. If there is no continuity, restore the wiring harness. If there is, replace the logic errors sensor.

P0501 Front wheel speed sensor/signal

- Connect to the ABS control unit diagnosis.

LOGIC ERRORS

Speed sensor

5D91 the signal changes in intermittent manner

- faulty sensor or signal interference.

Troubleshooting:

- Check speed sensor retainer. If it is not OK, restore it. If it is OK, check if the tone wheel is dirty, deformed or wrongly fixed. If any of this happens, replace the tone wheel. Otherwise, replace the speed sensor.

5D92 the signal becomes weak periodically

- Possible tone wheel fault due to deformations or dirt; the surface of the wheel bearings may be deteriorated. In very rare cases, abnormal tone wheel vibrations.

Troubleshooting:

- Check if the tone wheel is dirty, deformed or wrongly fixed. If the tone wheel is not OK, replace it. If it is OK, check for possible faults in the wheel bearings and if it is not OK, replace the bearings.

5D93 no signal or speed to low compared to the rear wheel

- Faulty sensor or missing sensor/tone wheel. Or excessive distance between the sensor and the tone wheel or tone wheel with wrong number of teeth.

Troubleshooting:

- Check that the speed sensor and the tone wheel are installed. If they are not, install them. If they are, check the speed sensor retainer. If it is not OK, restore it. If it is, check if the tone wheel has the correct number of teeth or if it is dirty, deformed or wrongly fixed. If it is not OK, replace the tone wheel and if it is OK, replace the speed sensor.

5D94 no acceleration after pressure reduction

- Faulty sensor or missing sensor/tone wheel or excessive distance between the sensor and the tone wheel.

Troubleshooting:

- Check that the speed sensor and the tone wheel are installed. If they are not, install them. If they are, check the speed sensor retainer. If it is not OK, restore it. If it is, check if the tone wheel has the correct number of teeth or if it is dirty, deformed or wrongly fixed. If it is not OK, replace the tone wheel and if it is OK, replace the speed sensor.

5D95 excessive measured speed

- Faulty sensor or tone wheel, or tone wheel with wrong number of teeth or wrong tyre size.

Troubleshooting:

- Check that the speed sensor and the tone wheel are installed. If they are not, install them. If they are, check the speed sensor retainer. If it is not OK, restore it. If it is, check if the tone wheel has the correct number of teeth or if it is dirty, deformed or wrongly fixed. If it is not OK, replace the tone wheel and if it is OK, check that the tyre size is the correct one. If it is not OK, replace it. If it is OK, check that the tyre pressure is the correct one. If it is not OK, restore it; if it is OK, replace the speed sensor.

P2162 Wheel speed plausibility

Error cause:

- ABS system malfunction

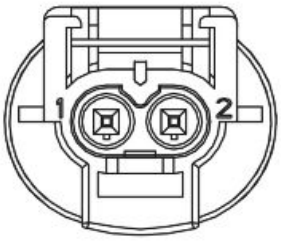
Troubleshooting:

- Connect to the ABS control unit diagnosis.

REAR ABS VEHICLE SENSOR

Function:

Generates a signal used by the ABS control unit to determine the speed value of the wheel.

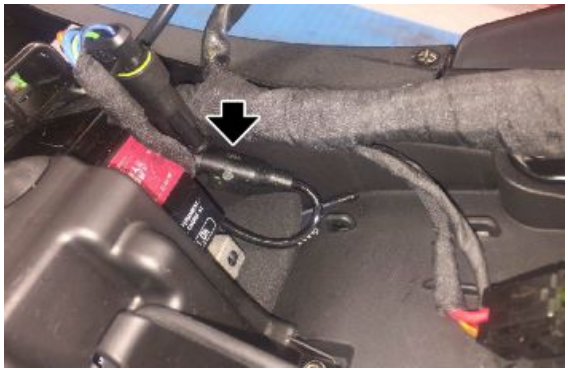


Operation / Operating principle:

Magneto-resistive sensor: generates a square wave signal with an amplitude of approximately 1V between PIN11 and PIN12 of the ABS control unit.

Electrical circuit diagram - Level in electrical circuit diagram:

ABS system



Position on vehicle:

On the rear brake calliper support plate.

Position of connector (if applicable):

Under the saddle, on the left side, between the battery and the seat supporting frame.

Pin-out:

- PIN1 - Power feed negative/Signal negative (yellow)
- PIN2 - Power feed positive/Signal positive (yellow/brown)

DIAGNOSTIC TOOL

Parameters: Speed (km/h) - Vehicle speed.

ELECTRICAL ERRORS

Speed sensor

5DA0 electric malfunction

- Electrical fault in sensor or wiring harness.

Troubleshooting:

- Check the sensor connector and the ABS control unit connector. If they are not OK, restore the connectors. If they are OK, check continuity of the yellow/brown cable between PIN 2 of the sensor on the wiring harness side and PIN 11 of the ABS control unit connector. If there is no continuity, restore them. If there is, PIN 2 of the sensor on the wiring harness side, with the sensor disconnected and key set to ON, must have 12V voltage approximately: if there is no voltage, check PIN 2 for continuity with the vehicle ground connection: if it is grounded, restore the wiring harness. If OK, replace the control unit. If PIN 2 has approx. 12 V, check continuity of the yellow cable between PIN 1 of the sensor on the wiring harness side and PIN 12 of the ABS control unit connector. If this is not OK, restore the wiring harness. If it is OK, replace the sensor.

P2158 Rear wheel speed sensor/signal

- Connect to the ABS control unit diagnosis.

LOGIC ERRORS

Engine speed sensor

5DA1 the signal changes in intermittent manner

- faulty sensor or signal interference.

Troubleshooting:

- Check speed sensor retainer. If it is not OK, restore it. If it is OK, check if the tone wheel is dirty, deformed or wrongly fixed. If any of this happens, replace the tone wheel. Otherwise, replace the speed sensor.

5DA2 the signal becomes weak periodically

- Possible tone wheel fault due to deformations or dirt; the surface of the wheel bearings may be deteriorated. In very rare cases, abnormal tone wheel vibrations.

Troubleshooting:

- Check if the tone wheel is dirty, deformed or wrongly fixed. If the tone wheel is not OK, replace it. If it is OK, check for possible faults in the wheel bearings and if it is not OK, replace the bearings.

5DA3 no signal or speed to low compared to the front wheel

- Faulty sensor or missing sensor/tone wheel. Or excessive distance between the sensor and the tone wheel or tone wheel with wrong number of teeth.

Troubleshooting:

- Check that the speed sensor and the tone wheel are installed. If they are not, install them. If they are, check the speed sensor retainer. If it is not OK, restore it. If it is, check if the tone

wheel has the correct number of teeth or if it is dirty, deformed or wrongly fixed. If it is not OK, replace the tone wheel and if it is OK, replace the speed sensor.

5DA4 no acceleration after pressure reduction

- Faulty sensor or missing sensor/tone wheel or excessive distance between the sensor and the tone wheel.

Troubleshooting:

- Check that the speed sensor and the tone wheel are installed. If they are not, install them. If they are, check the speed sensor retainer. If it is not OK, restore it. If it is, check if the tone wheel has the correct number of teeth or if it is dirty, deformed or wrongly fixed. If it is not OK, replace the tone wheel and if it is OK, replace the speed sensor.

5DA5 excessive measured speed:

- Faulty sensor or tone wheel, or tone wheel with wrong number of teeth or wrong tyre size.

Troubleshooting:

- Check that the speed sensor and the tone wheel are installed. If they are not, install them. If they are, check the speed sensor retainer. If it is not OK, restore it. If it is, check if the tone wheel has the correct number of teeth or if it is dirty, deformed or wrongly fixed. If it is not OK, replace the tone wheel and if it is OK, check that the tyre size is the correct one. If it is not OK, replace it. If it is OK, check that the tyre pressure is the correct one. If it is not OK, restore it; if it is OK, replace the speed sensor.

P2162 Wheel speed plausibility

Error cause:

- ABS system malfunction

Troubleshooting:

- Connect to the ABS control unit diagnosis.

Engine rpm sensor

Function

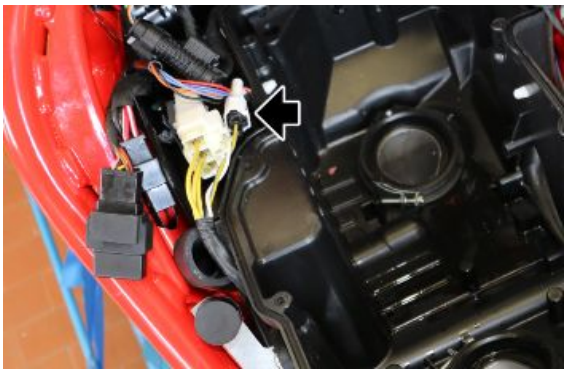
indicates the position and speed of the crankshaft at the Marelli control unit

Operation / Operating principle

Inductive sensor: sinusoidal-type generated voltage; two teeth are missing on the flywheel for the reference position

Level in electrical circuit diagram:

Engine speed sensor



Position:

- on the vehicle: on the flywheel cover
- connector: under the tank, on the left side, between the filter housing an the frame (2 way white connector)

Electrical specifications:

0.79 kohm at ambient temperature

Pin out:

1. positive signal
2. negative signal

DIAGNOSTIC TOOL:PARAMETERS

Engine rpm:rpm

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTIC TOOL: STATUSES

Synchronised panel

- No_in analysis_awaiting_Yes

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

CAUTION

NO ERROR IS GENERATED IF THE ELECTRICAL CIRCUIT IS INTERRUPTED OR SHORT CIRCUITED. CARRY OUT THE MARELLI CONTROL UNIT AND RPM SENSOR CONNECTORS CHECK PROCEDURE: IF THE CONNECTORS ARE NOT OK, REPAIR OR REPLACE THEM AS NECESSARY, IF THEY ARE OK CHECK THE SENSOR CONFORMS TO THE ELECTRICAL SPECIFICATIONS: IF NECESSARY, REPLACE THE SENSOR, IF IT IS OK, CHECK THE CONTINUITY ON THE TWO CABLES, VERIFYING THAT THEY ISOLATED FROM THE POWER SUPPLY AND EARTH. CARRY OUT THE TESTS ON THE CONNECTOR OF THE SENSOR TOWARDS THE SENSOR, IF IT IS NOT OK REPAIR THE WIRING/REPLACE THE SENSOR, IF IT IS OK, CARRY OUT THE TEST ON PINS 20 TO 35 OF THE MARELLI CONTROL UNIT ENGINE CONNECTOR.

DIAGNOSTIC TOOL: LOGIC ERRORS

P0336 Engine rpm sensor

Functional diagnosis:

- Signal not plausible

Error causes:

- Potential false contact in the electrical circuit detected at PIN 20 - 35 of the marelli control unit ENGINE connector

This error is indicated by lighting up in a fixed manner the general warning light.

Troubleshooting:

- Check the integrity of the electrical circuit, the cleanliness of the flywheel teeth and the correct positioning of the sensor in its seat: if not ok restore; if ok, replace the sensor.

NOTE

THIS ERROR GENERATES THE RECOVERY STATUS AND ENGINE SHUT-DOWN.

Twistgrip position sensor

HANDLE POSITION SENSOR

Function

The handle command is used to convert the driver's power demand to an electrical signal to be sent to the electronic control unit.

Operation / Operating principle

in the handle command there is an integrated double track potentiometer through which the torque demand is read (and verified). The potentiometer is watertight and magnetically controlled (contactless), it cannot be overhauled or replaced.

Level in electrical circuit diagram

Check of the throttle valves and handle sensor

Position:

- on the vehicle: integrated in the handle command
- connector: on the left side of the filter housing

Electrical specifications:

- -

Pin-out

1. A track power supply (orange/white cable)
2. Sensors 1 ground (green/pink cable)
3. A track signal (yellow/blue cable)
4. B track power supply (orange/black cable)
5. Sensors 2 ground (pink/black cable)
6. B track signal (light blue cable)

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

P0225 Track A handle position sensor

Electrical diagnosis:

- short circuit to positive / open circuit, short circuit to negative

Error cause

- Short-circuit to positive: an excessive voltage was detected at PIN 39 of the ENGINE connector.

- If open circuit, short circuit to negative: a voltage equal to zero was detected at PIN 39 of the ENGINE connector.

This error is indicated by flashing the general warning light and by lighting up in a fixed manner the MI warning light.

Troubleshooting

- Short-circuit to positive: check the value indicated by the parameter handle position sensor track A: disconnect the connector and read the value indicated by the diagnostic tool: if the voltage does not vary, there is a short circuit on the wiring harness of the relative cable, if the voltage goes to zero, replace the handle sensor.
- open circuit, short circuit to negative: check the handle sensor connector and engine control unit connector, if not ok restore, if ok check cable continuity between the two terminals, if not ok restore, if ok check the ground insulation of the cable (from the handle sensor connector or control unit connector): if not ground insulated, restore the wiring harness, if ground insulated check, with key ON, that power supply is present at PIN 1 of the potentiometer and that the ground is present at PIN 2, if present correctly replace the handle sensor, if not present check the continuity of the malfunctioning cable: if the continuity is present replace the control unit, if not present replace the wiring harness

P2130 Track B handle position sensor

Electrical diagnosis:

- short circuit to positive / open circuit, short circuit to negative

Error cause

- Short-circuit to positive: an excessive voltage was detected at PIN 13 of the ENGINE connector.
- If open circuit, short circuit to negative: voltage equal to zero was detected at PIN 13 of the ENGINE connector

This error is indicated by flashing the general warning light and by lighting up in a fixed manner the MI warning light

Troubleshooting

- short circuit to positive:check the value indicated by the parameter handle position sensor track B: disconnect the connector and read the value indicated by the diagnostic tool: if the voltage does not vary, there is a short circuit on the wiring harness of the relative cable, if the voltage goes to zero, replace the handle sensor.
- open circuit, short circuit to negative: check the handle sensor connector and Marelli control unit connector, if not ok restore, if ok check cable continuity between the two terminals, if not ok restore, if ok check the ground insulation of the cable (from the handle sensor connector or control unit connector): if not ground insulated, restore the wiring harness, if ground insulated check, with key ON, that power supply is present at PIN 4 of the potentiometer

and that the ground is present at PIN 5, if present correctly replace the handle sensor, if not present check the continuity of the malfunctioning cable: if the continuity is present replace the control unit, if not present replace the wiring harness

DIAGNOSTIC TOOL: LOGIC ERRORS

P1227 Tracks A-B handle position sensor

Functional diagnosis:

- Signal not congruent

Error cause:

- Detected two voltages signals at PIN 39 and 13 of the ENGINE connector (tracks A-B)

This error is indicated by flashing the general warning light and by lighting up in a fixed manner the MI warning light.

Troubleshooting:

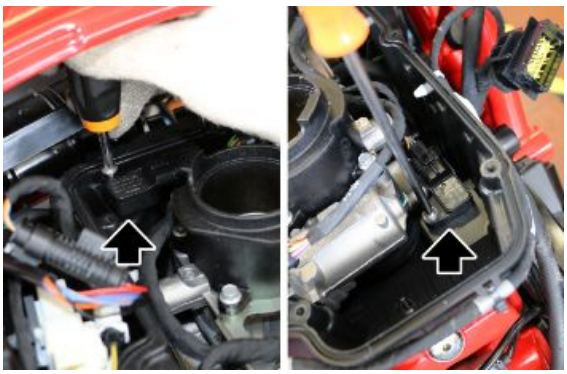
- Check the parameters for the track A and track B Handle position sensor. The values detected on track A must be comprised between 1 V (gas throttle completely closed) and 4 V (gas throttle completely open). The values detected on track B must be comprised between 0.5 V (gas throttle completely closed) and 2 V (gas throttle completely open). If one of these values differs significantly from the indicated value, it means that the potentiometer is faulty. check the handle sensor connector and control unit connector; if not OK, restore. If OK, check that cable resistance between the handle sensor cable and the control unit is a few tenths of Ohm; otherwise, restore the wiring harness; if ok, replace the complete handle command.

Intake pressure sensor

INTAKE AIR PRESSURE SENSOR

Function

The pressure sensors (one per cylinder) are essential not only for the injection map at low an stabilised speeds, but also for the Ride by Wire system control: their signal is introduced in a TORQUE CHIN to check the correct opening of the throttle valves.



Operation / Operating principle

Membrane sensor that converts the membrane position, in contact with the intake air, to electric voltage.

Level in electrical circuit diagram:

intake air pressure sensor

Location:

- on the vehicle: inside the filter housing
- connector: on the sensor

Pins:

1. Power supply
2. Ground
3. Output signal

DIAGNOSTIC TOOL: PARAMETERS

Front cylinder intake sensor

Example value: 1003 mbar

Pressure read through the front sensor.

Rear cylinder intake sensor

Example value: 1004 mbar

Pressure read through the rear sensor.

Front cylinder intake estimated pressure

Example value: 1003 mbar

Pressure estimated by the control unit, based on the throttle valve position

Rear cylinder intake estimated pressure

Example value: 1004 mbar

Pressure estimated by the control unit, based on the throttle valve position

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

P0105 Front cylinder air pressure sensor

Electrical diagnosis:

- short circuit to positive / open circuit, short circuit to negative, signal not plausible.

Error cause:

- Short-circuit to positive: excessive voltage detected at PIN 24 of the Marelli ECU detected.
- If open circuit, short circuit to negative: voltage equal to zero detected at PIN 24 of the Marelli ECU.

This error is indicated by the steady on MI indicator light.

Troubleshooting:

- Short-circuit to positive: on the diagnostic tool, observe the front cylinder air pressure sensor, which will display a value of approx. 1200 mbar; disconnect the sensor connector: if the value does not change, this means there is a short circuit in the cable between the control unit connector and the sensor connector; restore the wiring harness; if the value changes, replace the sensor.

- If open circuit, short circuit to negative: check the Marelli control unit connector and the sensor connector; if NOT OK restore, if everything is OK, with key OFF, check the continuity between Marelli control unit connector PIN 24 and the sensor connector PIN 3: if there is no continuity, restore the wiring harness, if there is continuity, check the ground insulation of the cable: if there is continuity to ground, restore the wiring harness, if there is no continuity, check (with key in ON position) that there is a voltage of approx. 5 V present at PIN 1 on the sensor connector: if NOT OK, turn the key to OFF and check the continuity between the ENGINE connector PIN 25 and PIN 1 on the sensor connector: if NOT OK, restore the wiring harness; if ok, replace the control unit; if a voltage of 5 V is present at PIN 1, check (with key in ON position) for continuity between PIN 3 on the sensor connector and ground: if NOT OK, restore the wiring harness; if OK, replace the sensor.

P1105 Rear cylinder air pressure sensor

Electrical diagnosis:

- short circuit to positive / open circuit, short circuit to negative, signal not plausible.

Error cause

- Short-circuit to positive: excessive voltage detected at PIN 49 of the Marelli ECU detected.
- If open circuit, short circuit to negative: voltage equal to zero detected at PIN 49 of the Marelli ECU.

This error is indicated by lighting up in a fixed manner the MI warning light.

Troubleshooting

- Short-circuit to positive: verify that the parameter of the rear cylinder air Pressure Sensor on the diagnosis instrument is approx. 1200 mbar; disconnect the sensor connector: if the value does not change, this means there is a short circuit in the cable between the Marelli control unit connector and the sensor connector; restore the wiring harness; if the value changes, replace the sensor.
- If open circuit, short circuit to negative: check the Marelli control unit connector and the sensor connector; if NOT OK restore, if everything is OK, with key OFF, check the continuity between Marelli control unit connector PIN 49 and the sensor connector PIN 3: if there is no continuity, restore the wiring harness, if there is continuity, check the ground insulation of the cable: if there is continuity to ground, restore the wiring harness, if there is no continuity, check (with key in ON position) that there is a voltage of approx. 5 V present at PIN 1 on the sensor connector: if NOT OK, turn the key to OFF and check the continuity between ENGINE connector PIN 25 and PIN 1 on the sensor connector: if NOT OK, restore the wiring harness; if OK, replace the control unit; if a voltage of 5 V is present at PIN 1, check (with key in ON position) for continuity between PIN 3 on the sensor connector and ground: if NOT OK, restore the wiring harness; if OK, replace the sensor.

DIAGNOSTIC TOOL: LOGIC ERRORS

P1600 Error due to unexpected air intake in the front cylinder manifold

Functional diagnosis:

- signal not plausible.

Error cause:

- Small difference detected between the estimated pressure and the measured pressure: the measured pressure is higher than the estimated one (for example, the pipe between sensor and throttle body is squashed or there is a hole in the intake manifold).

This error is indicated by flashing the general warning light and by lighting up in a fixed manner the MI warning light.

Troubleshooting:

- Check the pneumatic system between the pressure sensor and the socket to read pressure on the throttle body; check that the intake manifold is in good conditions and the pressure reading hole is clean.

P1601 Error due to unexpected air intake in the rear cylinder manifold

Functional diagnosis:

- signal not plausible.

Error cause:

- Small difference detected between the estimated pressure and the measured pressure: the measured pressure is higher than the estimated one (for example, the pipe between sensor and throttle body is squashed or there is a hole in the intake manifold).

This error is indicated by flashing the general warning light and by lighting up in a fixed manner the MI warning light.

Troubleshooting:

- Check the pneumatic system between the pressure sensor and the socket to read pressure on the throttle body; check that the intake manifold is in good conditions and the pressure reading hole is clean.

P1602 Estimation error for front cylinder intake manifold pressure

Functional diagnosis:

- pressure too high/pressure too low.

Error cause:

- A substantial difference between the estimated pressure and the measured pressure has been detected (for example, the pipe between sensor and throttle body is fully detached/ clogged or squashed).

This error is indicated by flashing the general warning light and by lighting up in a fixed manner the MI warning light.

Troubleshooting:

- Check the pneumatic system between the pressure sensor and the socket to read pressure on the throttle body; check that the intake manifold is in good conditions and the pressure reading hole is clean: there is a very evident defect in the intake and pressure reading system.

P1603 Estimation error for rear cylinder intake manifold pressure

Functional diagnosis:

- pressure too high/pressure too low.

Error cause:

- A substantial difference between the estimated pressure and the measured pressure has been detected (for example, the pipe between sensor and throttle body is fully detached/ clogged or squashed).

This error is indicated by flashing the general warning light and by lighting up in a fixed manner the MI warning light.

Troubleshooting:

- Check the pneumatic system between the pressure sensor and the socket to read pressure on the throttle body; check that the intake manifold is in good conditions and the pressure reading hole is clean: there is a very evident defect in the intake and pressure reading system.

P1604 Front manifold pressure too low error

Functional diagnosis:

- signal not plausible.

Error cause:

- Small difference detected between the estimated pressure and the measured pressure: the measured pressure is below the estimated one (for example, smeared throttle body).

This error is indicated by flashing the general warning light and by lighting up in a fixed manner the MI warning light.

Troubleshooting:

- Check the pneumatic system between the pressure sensor and the socket to read pressure on the throttle body; check that the intake manifold is in good conditions and the pressure reading hole is clean.

P1605 Rear manifold pressure too low error

Functional diagnosis:

- signal not plausible.

Error cause:

- Small difference detected between the estimated pressure and the measured pressure: the measured pressure is below the estimated one (for example, smeared throttle body).

This error is indicated by flashing the general warning light and by lighting up in a fixed manner the MI warning light.

Troubleshooting:

- Check the pneumatic system between the pressure sensor and the socket to read pressure on the throttle body; check that the intake manifold is in good conditions and the pressure reading hole is clean.

Engine temperature sensor

Function

Serves the purpose of communicating the engine temperature to the control unit in order to optimise performance.

Operation / Operating principle

NTC type sensor (resistance sensor, inversely variable with temperature).

Level in electrical circuit diagram:

Temperature sensors

Position:

- On the vehicle: on the front cylinder on the internal side facing the rear cylinder
- Connector: on the sensor

Electrical specifications:

- Resistance at 25°: 2.05 kOhm +/- 100%
- Resistance at 60°: 575 Ohm +/- 15%
- Resistance at 90°: 230 Ohm +/- 5%

Pin-out:

1. Brown yellow: 0-5 V signal
2. Black
3. Green/Pink: Ground
4. Black

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

P0115 Engine temperature sensor

- open circuit, shorted to positive / shorted to negative.

Error cause

- If open circuit, short circuit to positive: an excessive voltage was detected at PIN 12 of the ENGINE connector. If short circuit to negative: voltage equal to zero has been detected. The instrument panel indicates this error by lighting up in a fixed manner the MI warning light.

Troubleshooting

- If open circuit, short circuit to positive: check the sensor connector and the Marelli control unit connector. If they are OK, check sensor continuity: replace the sensor if not OK; if OK, check continuity between the ENGINE connector PIN 12 and the sensor PIN 3: If continuity is absent, restore the wiring harness; if ok reconnect the control unit connector and with key ON check the continuity between PIN 1 of the sensor connector and vehicle ground: if OK, it means that the error is caused by the cable being shorted to positive and it is necessary to restore the cable harness between ENGINE PIN 12 and sensor PIN 3; if there is no continuity to ground, check the sensor connector and the Marelli control unit connector. If not OK, restore the cable harness. If OK, check for continuity between the ENGINE connector PIN 6 or 17 and the sensor connector PIN 1: restore the cable harness if there is not continuity. If there is, it means that the control unit does not supply the ground connection and therefore should be replaced.
- If short circuit to negative, check the correct resistance of the sensor: if resistance is null, replace the sensor; if resistance is correct, it means that the Yellow/Brown cable has ground connection: restore the cable harness

DIAGNOSTIC TOOL: LOGIC ERRORS

P0116 Engine temperature sensor

Signal not plausible.

Error cause

- An excessive temperature variation was detected: the cause could be a contact resistance between the terminals, for example. The instrument panel indicates this error by lighting up in a fixed manner the MI warning light.

Troubleshooting

- Check the sensor connector and the ENGINE connector of the Marelli control unit.

NOTES

No error is detected if the sensor does not work correctly or the control unit connector or sensor terminals are rusty: then use the diagnostic tool to check if the temperature indicated is the same as the engine temperature. Check also that the sensor electrical characteristics are observed: replace the sensor if not OK; if it is OK, check the sensor connector and the Marelli control unit connector.

Air temperature sensor

Function

indicates to the control unit the temperature of the intake air, used to calculate the oxygen, to optimise the required fuel quantity for the correct combustion

Operation / Operating principle

NTC type sensor (resistance sensor, inversely variable with temperature)

Level in the electrical circuit diagram:

Temperature sensors

Position:

- sensor: on the rear side of the filter housing
- connector: on the sensor

Electrical specifications: Resistance

- at 0 °C (32 °F): 32.5 kΩ ± 5%
- at 25 °C (77 °F): 10.0 kΩ ± 5%

Pin out:

1. 0-5 V signal
2. Ground

DIAGNOSTIC TOOL:PARAMETERS

Air temperature

Example value with key ON: 26 °C (78.8 °F):

This is one of the values set by the ECU in the event of recovery mode

Air temperature before Recovery

Example value with key ON: -40 °C (-40.0 °F):

Value determined from the signal read without taking into consideration the recovery mode: the illustrative value refers to an open circuit

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

P0110 Air temperature sensor

- open circuit, short circuit to positive / short circuit to negative

Error cause

- If open circuit, short circuit to positive: an excessive voltage was detected at PIN 37 of the ENGINE connector. If short circuit to negative: zero voltage detected. The instrument panel indicates this error by lighting up in a fixed manner the MI warning light.

Troubleshooting

- If open circuit, short circuit to positive: check the sensor connector and the Marelli control unit connector. If they are OK, check sensor continuity: replace the sensor if not OK; if OK, check continuity between the ENGINE connector PIN 37 and the sensor PIN 1: If continuity is absent, restore the wiring harness; if ok reconnect the control unit connector and with key ON check the continuity between PIN 2 of the sensor connector and vehicle ground: if OK, it means that the error is caused by the cable being shorted to positive and it is necessary to restore the cable harness between ENGINE PIN 37 and sensor PIN 1; check the sensor connector and the Marelli control unit connector. If not OK, restore the cable harness. If OK, check for continuity between the ENGINE connector PIN 6 or 17 and the sensor connector PIN 2: restore the cable harness if there is no continuity. If there is, it means that the control unit does not supply the ground connection and therefore should be replaced
- If short circuit to negative, check the correct resistance of the sensor: if the resistance is null, replace the sensor; if the resistance is correct, it means that the Green/Pink cable is grounded: restore the cable harness

Lambda sensor

(FRONT CYLINDER)

Function

In charge of telling the control unit whether the mixture is lean or rich

Operation / Operating principle

The Marelli injection control unit reads and interprets a voltage generated by the difference in oxygen content between the exhaust fumes and the ambient. It does not require an external supply source but, in order to work properly, it should reach a high operating temperature: that is why there is a heating circuit inside

Level in electrical circuit diagram:

Lambda probe

Position:

- on manifold: left side of the vehicle
- connector: on the ABS support modulator (4 way black connector)

Electrical specifications

- Heater circuit: 7-9Ω at ambient temp.

Pin out:

1. Sensor signal + (black wire)
2. Sensor signal - (grey wire)
3. Heater ground connection (white cable)
4. Heater power supply (white cable)

DIAGNOSTIC TOOL:PARAMETERS

Lambda probe

- Example value with key ON: about 3300 mV
- Example value with engine on: 100-1000 mV

If there is a short circuit at + 5 V or higher, the lambda probe parameter is not equal to the value read by the control unit, but a recovery value is displayed

Lambda correction

- Example value with key ON: 0 %
- Example value with engine on: -10% / +10%

In closed loop, the value must be close to 1.00 (values not within the -15% / +15% interval indicate a fault). In an open circuit, the lambda probe signal is too low. Therefore, the control unit takes it as a lean mixture condition and will try to enrich it. The value read will be +25%: once this value is reached and kept unchanged for a certain time, the function diagnosis of the lambda probe is activated with following deactivation of it.

This diagnosis is activated when the correction constantly arrives -25%.

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTIC TOOL: STATUSES

Lambda probe: Start-up_Lean_Rich_Fault due to rich titre_Fault due to lean air-fuel mixture

- If the probe connector is disconnected (voltage almost equal to zero) it switches to the state of Fault due to lean air-fuel mixture

Lambda check: Open loop/Closed loop/Rich in closed loop/Lean in closed loop/enriched

- Closed loop indicates that the control unit is using the lambda probe signal to keep the combustion is close as possible to the stoichiometric value.

DIAGNOSTIC TOOL: ACTIVATIONS

Lambda probe heater

- The injection relay (No. 17 in the electrical circuit diagram, placed under the left side tank, CHECK, however, the identification of the relay with the colour of the cables) is energised and the heating circuit is closed to ground 5 times (Pin 3 of the Lambda probe connector).

Electrical continuity is required in the wiring for the relay to activate correctly: no errors are generated in case of no activation.

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

P0130 Front lambda probe

Electrical diagnosis:

- Short circuit to positive.

Error cause:

- Excessive voltage detected (battery voltage) at PIN 10 and 22 of the ENGINE connector. Caution: the "lambda probe" parameter is not the actual read value but a recovery value is displayed.

The instrument panel indicates this error by lighting up in a fixed manner the MI warning light.

Troubleshooting:

- Short-circuit to positive: with key set to ON, disconnect the sensor connector and measure PIN 1 voltage on the cable harness side (yellow/orange cable): if the voltage (5 or 12 V) is present, restore the wiring harness, if the voltage is absent replace the lambda probe.

P0135 Front lambda probe heating

Electrical diagnosis:

- short circuit to positive/ open circuit / short circuit to negative

Error cause

- Short-circuit to positive: an excessive voltage was detected at PIN 32 of the ENGINE connector.
- If open circuit, short circuit to negative: a voltage equal to zero was detected at PIN 32 of the ENGINE connector.

The instrument panel indicates this error by lighting up in a fixed manner the MI warning light.

Troubleshooting

- Short-circuit to positive: disconnect the probe connector and check the correct sensor resistance: if NOT OK, replace the sensor; if OK, restore the wiring harness (Green/Black cable).
- If open circuit, short circuit to negative: check the continuity from the probe connector (PIN 3 and 4) to the probe: if NOT OK, replace the probe; if ok, perform the check procedure for the sensor connector and for the Marelli control unit connector: if NOT OK restore; if OK, with the key ON and the sensor connector disconnected, check if there is battery voltage at PIN 4: if NOT OK, check the continuity of the Red/Brown cable between the probe connector and the injection relay (no. 17 in the electrical circuit diagram, position under the left side of the tank; however, CHECK the relay identification with the cable colours); if there are also errors regarding the coils, injectors and secondary air, check the relay and its energy and power line; if there is voltage at PIN 4, check ground insulation of the Green/Black cable

(PIN 3): if NOT OK, restore the wiring harness; if OK, check the continuity of the Green/ Black cable (between PIN 3 of the sensor connector and ENGINE PIN 32) and restore the wiring harness.

- If open circuit, short circuit to negative: check the continuity from the probe connector (PIN 3 and 4) to the probe: if NOT OK, replace the probe; if ok, perform the check procedure for the sensor connector and for the Marelli control unit connector: if NOT OK restore; if OK, with the key ON and the sensor connector disconnected, check if there is battery voltage at PIN 4: if NOT OK, check the continuity of the Red/Brown cable between the probe connector and the injection relay (no. 17 in the electrical circuit diagram, position under the left side of the tank; however, CHECK the relay identification with the cable colours); if there are also errors regarding the coils, injectors and secondary air, check the relay and its energy and power line; if there is voltage at PIN 4, check ground insulation of the Green/Black cable (PIN 3): if NOT OK, restore the wiring harness; if OK, check the continuity of the Green/ Black cable (between PIN 3 of the sensor connector and ENGINE PIN 32) and restore the wiring harness.

WARNING

The control unit does not detect the following malfunctions of the lambda probe circuit relative to the signal: interrupted circuit, short circuit to ground or malfunction of the sensor (for example, voltage not variable). If the indication is abnormal, perform the troubleshooting indicated below.

Troubleshooting

- Check the continuity of the circuit from the probe connector (PIN 1 and PIN 2) towards the probe: replace the lambda probe if there is no continuity; if there is continuity, check the sensor connector and the Marelli control unit connector: if NOT OK, restore; if OK, check the continuity between the ENGINE connector PIN 10 and PIN 22 and restore the wiring harness.

DIAGNOSTIC TOOL: LOGIC ERRORS

P0134 Front lambda probe

Functional diagnosis:

- no switching from high / no switching from low

Error cause:

- If no switching from high: is shown when the ratio control is in closed loop and when the secondary air valve is not operating. The error is validated if the engine is in CUTOFF status and the probe signal is close to 1V, or if the engine is in another operating condition that requires the injection but the switching from the"HIGH RATIO" to "LOW RATIO" is missing for a certain"adjusted" number of dead points (PMS or TDC).
- If no switching from low: is shown when the ratio control is in closed loop and when the secondary air valve is not operating. The error is validated if during the ratio control stage,

the switching from "HIGH RATIO" to "LOW RATIO" is missing for a certain"adjusted" number of upper dead points (PMS or TDC).

The instrument panel indicates this error by lighting up in a fixed manner the MI warning light.

Troubleshooting:

- If no switching from high: the fault may be generated in the supply system (poor pin sealing) or in the probe. Check the wiring harness. if NOT OK restore; if OK, replace the lambda probe.
- If no switching from low: the fault may be generated in the supply system (dirty injector, low fuel supply system pressure) or in the probe. Check the wiring harness. if NOT OK restore; if OK, replace the lambda probe.
- For the (non polarised) type of probes, this error may be caused also by a short circuit to the wiring harness ground.

NOTE

THIS ERROR DISABLES THE RATIO CONTROL IN CLOSED LOOP.

(REAR CYLINDER)

Function

In charge of telling the control unit whether the mixture is lean or rich

Operation / Operating principle

The Marelli injection control unit reads and interprets a voltage generated by the difference in oxygen content between the exhaust fumes and the ambient. It does not require an external supply source but, in order to work properly, it should reach a high operating temperature: that is why there is a heating circuit inside

Level in electrical circuit diagram:

Lambda probe

Position:

- on manifold: on the rear part of the vehicle in correspondence with the shock absorber
- connector: on the left side, between the rear cylinder an the frame (4 way black connector)

Electrical specifications

- Heater circuit: 7-9Ω at ambient temp.

Pin out:

1. Sensor signal + (black wire)
2. Sensor signal - (grey wire)
3. Heater ground connection (white cable)
4. Heater power supply (white cable)

DIAGNOSTIC TOOL:PARAMETERS

Lambda probe

- Example value with key ON: about 3300 mV
- Example value with engine on: 100-1000 mV

If there is a short circuit at + 5 V or higher, the lambda probe parameter is not equal to the value read by the control unit, but a recovery value is displayed

Lambda correction

- Example value with key ON: 0 %
- Example value with engine on: -10% / +10%

In closed loop, the value must be close to 1.00 (values not within the -15% / +15% interval indicate a fault). In an open circuit, the lambda probe signal is too low. Therefore, the control unit takes it as a lean mixture condition and will try to enrich it. The value read will be +25%: once this value is reached and remains unchanged for a certain time, the lambda probe functional diagnosis is activated, resulting in it being deactivated.

This diagnosis is activated when the correction constantly arrives -25%.

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTIC TOOL: STATUSES

Lambda probe: Start-up_Lean_Rich_Fault due to rich titre_Fault due to lean air-fuel mixture

- If the probe connector is disconnected (voltage almost equal to zero) it switches to the state of Fault due to lean air-fuel mixture

Lambda check: Open loop/Closed loop/Rich in closed loop/Lean in closed loop/enriched

- Closed loop indicates that the control unit is using the lambda probe signal to keep the combustion is close as possible to the stoichiometric value.

DIAGNOSTIC TOOL: ACTIVATIONS

Lambda probe heater

- The injection relay (No. 17 in the electrical circuit diagram, placed under the left side tank, CHECK, however, the identification of the relay with the colour of the cables) is energised and the heating circuit is closed to ground 5 times (Pin 3 of the Lambda probe connector). Electrical continuity is required in the wiring for the relay to activate correctly: no errors are generated in case of no activation.

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

P0150 Rear lambda probe

Electrical diagnosis:

- Short circuit to positive

Error cause:

- Excessive voltage detected (battery voltage) at PIN 9 and 38 of the ENGINE connector. Caution: the "lambda probe" parameter is not the actual read value but a recovery value is displayed.

The instrument panel indicates this error by lighting up in a fixed manner the MI warning light.

Troubleshooting:

- Short-circuit to positive: with key ON, disconnect the sensor connector and measure the voltage at PIN 1, wiring harness side (grey cable): if the voltage (5 or 12 V) is present, restore the wiring harness, if the voltage is absent replace the lambda probe

P0155 Rear lambda probe heating

Electrical diagnosis:

- short circuit to positive/ open circuit, short circuit to negative

Error cause:

- Short-circuit to positive: an excessive voltage was detected at PIN 44 of the ENGINE connector.
- If open circuit, short circuit to negative: a voltage equal to zero was detected at PIN 44 of the ENGINE connector.

The instrument panel indicates this error by lighting up in a fixed manner the MI warning light.

Troubleshooting:

- Short-circuit to positive: disconnect the probe connector and check the correct sensor resistance: if Not OK, replace the sensor; if OK, restore the wiring harness (Green/Red cable).
- If open circuit, short circuit to negative: check the continuity from the probe connector (PIN 3 and 4) to the probe: if NOT OK, replace the probe; if ok, perform the check procedure for the sensor connector and for the Marelli control unit connector: if NOT OK restore; if OK, with the key ON and the sensor connector disconnected, check if there is battery voltage at PIN 4: if NOT OK, check the continuity of the Red/Brown cable between the probe connector and the injection relay (no. 17 in the electrical circuit diagram, position under the tank, on the left side of the filter housing; however, CHECK the relay identification with the cable colours); if there are also errors regarding the coils, injectors and secondary air, check the relay and its energy and power line; if there is voltage at PIN 4, check ground insulation of the Green/Re cable (PIN 3): if NOT OK, restore the wiring harness; if OK, check the continuity of the Green/Red cable (between PIN 3 of the sensor connector and ENGINE PIN 44) and restore the wiring harness.

WARNING

The control unit does not detect the following malfunctions of the lambda probe circuit relative to the signal: interrupted circuit, short circuit to ground or malfunction of the sensor (for example, voltage not variable). If the indication is abnormal, perform the troubleshooting indicated below.

Troubleshooting

- Check the continuity of the circuit from the probe connector (PIN 1 and PIN 2) towards the probe: replace the lambda probe if there is no continuity; if there is continuity, check the sensor connector and the Marelli control unit connector: if NOT OK, restore; if OK, check the continuity between the ENGINE connector PIN 9 and PIN 38 and restore the wiring harness.

DIAGNOSTIC TOOL: LOGIC ERRORS

P0154 Rear lambda probe

Functional diagnosis:

- no switching from high / no switching from low

Error cause:

- If no switching from high: is shown when the ratio control is in closed loop and when the secondary air valve is not operating. The error is validated if the engine is in CUTOFF status and the probe signal is close to 1V, or if the engine is in another operating condition that requires the injection but the switching from the"HIGH RATIO" to "LOW RATIO" is missing for a certain"adjusted" number of dead points (PMS or TDC).
- If no switching from low: is shown when the ratio control is in closed loop and when the secondary air valve is not operating. The error is validated if during the ratio control stage, the switching from "HIGH RATIO" to "LOW RATIO" is missing for a certain"adjusted" number of upper dead points (PMS or TDC).

The instrument panel indicates this error by lighting up in a fixed manner the MI warning light.

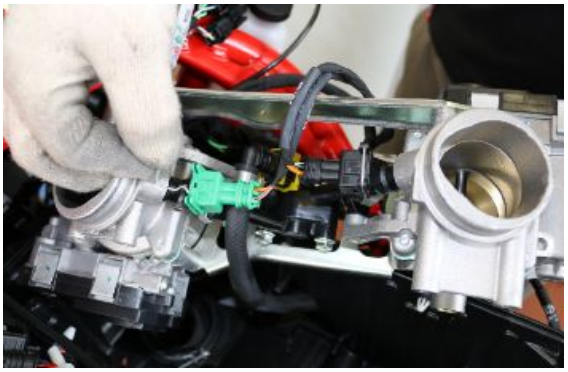
Troubleshooting:

- If no switching from high: the fault may be generated in the supply system (poor pin sealing) or in the probe. Check the wiring harness. if NOT OK restore; if OK, replace the lambda probe.
- If no switching from low: the fault may be generated in the supply system (dirty injector, low fuel supply system pressure) or in the probe. Check the wiring harness. if NOT OK restore; if OK, replace the lambda probe.
- For the (non polarised) type of probes, this error may be caused also by a short circuit to the wiring harness ground.

NOTE

THIS ERROR DISABLES THE RATIO CONTROL IN CLOSED LOOP.

Injector



Function

Provide the correct amount of fuel at the correct time.

Operation / Operating principle

Injector coil is energised for the petrol passage to open

Level in electrical circuit diagram:

Coils and injectors

Position:

- on the vehicle: on the throttle body
- connector: on injectors

Electrical specifications:

12.5 Ω ± 10% (at ambient temp.)

Pin out:

- "+": supply
- " ": ground

DIAGNOSTIC TOOL:PARAMETERS

Cylinder injection time 1

- Example value with engine on: 1.9 ms

Cylinder injection time 2

- Example value with engine on: 1.9 ms

CAUTION

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DIAGNOSTIC TOOL: ACTIVATIONS

Front cylinder injector

- The secondary injection relay (no. 35 in the electrical circuit diagram, placed under the fuel tank, on the right side of the filter housing; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the injector cable connected to the control unit is closed to ground for 4 ms per each second. It is recommended to disconnect the 4-way connector of the fuel pump to be able to hear the relay and injector activation. Electrical continuity is required in the wiring for the relay to activate correctly: no errors are generated in case of no activation.

Rear cylinder injector

- The secondary injection relay (no. 35 in the electrical circuit diagram, placed under the fuel tank, on the right side of the filter housing; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the injector cable connected to the control unit is closed to ground for 4 ms per each second. It is recommended to disconnect the 4-way connector of the fuel pump to be able to hear the relay and injector activation. Electrical continuity is required in the wiring for the relay to activate correctly: no errors are generated if the relay fails to activate

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

P0201 Front cylinder injector

- Short circuit to positive / short circuit to negative / open circuit

Error cause:

- Short-circuit to positive: excessive voltage has been detected on VEHICLE PIN 53.
- If short circuit to negative: no voltage has been detected.
- If open circuit: an interruption has been detected

Troubleshooting:

- Short-circuit to positive: disconnect the injector connector, turn the key to ON, activate the component with the diagnostic tool and check if there is voltage on the grey/red cable, on the injector connector: if there is, restore the wiring harness of the filter housing; if not, replace the sensor.
- If short circuit to negative: disconnect the injector connector, turn the key to On and check if there is ground connection in the cable grey/red: if the connection is present, restore the wiring harness, if not present replace the injector
- If open circuit: check the component correct electrical characteristic: if it is not the correct one, replace the component; if it is correct, check the connector on the component and the Marelli control unit connector: if not ok, restore; if ok, check the continuity of the cable between the VEHICLE PIN 53 and PIN 2 of the component and restore the wiring harness.

P0202 Rear cylinder injector

- Short circuit to positive / short circuit to negative / open circuit

Error cause:

- Short-circuit to positive: excessive voltage has been detected on VEHICLE PIN 67.
- If short circuit to negative: no voltage has been detected.
- If open circuit: an interruption has been detected.

Troubleshooting:

- Short-circuit to positive: disconnect the injector connector, turn the key to ON, activate the component with the diagnostic tool and check if there is voltage on the white/black cable,

on the injector connector: if there is, restore the wiring harness of the filter housing; if not, replace the sensor.

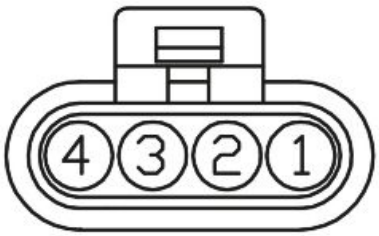
- If short circuit to negative: disconnect the injector connector, turn the key to ON and check if there is ground connection in the cable white/black: if the connection is present, restore the wiring harness, if not present replace the injector
- If open circuit: check the component correct electrical characteristic: if it is not the correct one, replace the component; if it is correct, check the connector on the component and the Marelli control unit connector: if not ok, restore; if ok, check the continuity of the cable between the VEHICLE PIN 67 and PIN 2 of the component and restore the wiring harness.

Fuel pump

Function

Fuel pump: keeps pressure of the injectors supply duct.

Low fuel: tells to the instrument panel about low fuel



Operation / Operating principle

Low fuel: it is a resistance that if correctly supplied varies its electrical resistance if it is damped or not by petrol.

Level in electrical circuit diagram:

Injection loads relay.

Position:

- On the vehicle: on the tank.
- Connector: under the saddle, on RH side (black colour 4 way)

Electrical specifications:

PIN 1-2: 0,5- 1 Ohm PIN 3-4: there is no need to measure the electrical resistance of the component because its correct operation occurs only with a proper power supply delivered by the instrument panel.

Check the correct operation as follows: connect in series a bulb of approximately 2 W: it must light up if the tank is in reserve; otherwise, it must stay off.

Pin out:

1. + 12 V - Orange/Green colour, from the fuel pump to the power supply
2. ground - Blue colour - Section 1.5
3. + 12 V (signal) reserve sensor - Green/Grey colour - Section 0.5
4. reserve sensor ground, from PIN 4 to PIN 34 of the instrument panel - Blue/black colour - Section 0.5

CAUTION

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DIAGNOSTIC TOOL: ACTIVATIONS

Fuel pump

NOTES: Energy is applied for 30 seconds to the secondary injection relay (35 in the electrical circuit diagram, located in the filter housing, right side; however, CHECK the identification of the relay with the colour of the cables). Electrical continuity is required in the wiring for the relay to activate correctly: no errors are generated in case of no activation.

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

Fuel pump relay command P0230

- short circuit to positive/ open circuit, short circuit to negative

Error cause

- Short-circuit to positive: excessive voltage has been detected at PIN 73 of the VEHICLE connector. If open circuit, short circuit to negative: a voltage equal to zero was detected at PIN 73 of the ENGINE connector.

Troubleshooting

- Short-circuit to positive: check the relay electrical specifications are correct by disconnecting it from the cable harness. If not OK, replace the relay; if OK, restore the cable harness (Brown/Black cable).
- If open circuit, short circuit to negative: check the relay electrical characteristics are correct by disconnecting it from the cable harness; if it is not OK, replace the relay, if it is OK, check relay connector, engine-vehicle cable harness connector and VEHICLE connector of the Marelli control unit: if not OK, restore; if OK, check continuity of cable harness (Brown/Black cable)

Coil

Function

Spark generation

Operation / Operating principle

With inductive discharge

Level in electrical circuit diagram:

Coils and injectors

Position:

- on the vehicle: on the big end covers.
- connector: For each coil 3 way black connector. Front coil on the front side filter housing; rear coil on the rear side of the filter housing.

Electrical specifications:

0.7- 0.9 Ω at ambient temperature

Pin out:

1. Power supply +Vbatt
2. Secondary circuit ground
3. Activation from the control unit

DIAGNOSTIC TOOL:PARAMETERS

Example value with key ON: Actual start-up advance

Example value with engine on: Indicates the advance of the cylinder in which the combustion will take place.

CAUTION

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DIAGNOSTIC TOOL: ACTIVATIONS

Front coil:

The secondary injection relay (no. 35 in the electrical circuit diagram, placed under the fuel tank, on the right side of the filter housing. However, CHECK the relay identification with the cables colour - blue taping) for 5 seconds and the pink coil cable is closed to ground for 2 ms per each second. It is recommended to disconnect the 4-way connector of the fuel pump to be able to hear the relay and injector activation. Electrical continuity is required in the wiring for the relay to activate correctly: no errors are generated in case of no activation.

Rear coils:

The secondary injection relay (no. 35 in the electrical circuit diagram, placed under the fuel tank, on the right side of the filter housing. However, CHECK the relay identification with the cables colour - blue taping) for 5 seconds and the violet/grey coil cable is closed to ground for 2 ms per each second. It is recommended to disconnect the 4-way connector of the fuel pump to be able to hear the relay and injector activation. Electrical continuity is required in the wiring for the relay to activate correctly: no errors are generated in case of no activation.

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

P0351 Front coil

Electrical diagnosis:

short circuit to positive / short circuit to negative, open circuit.

Error cause:

- Short-circuit to positive: an excessive voltage was detected at PIN 28 of the ENGINE connector.
- If open circuit, short circuit to negative: a voltage equal to zero was detected at PIN 28 of the ENGINE connector.

Troubleshooting:

- Short-circuit to positive: disconnect the coil connector, turn the key to ON, activate the coil with the diagnostic tool and check the voltage at PIN 28 of the connector: if there is voltage, restore the wiring harness, if the voltage is 0, replace the coil.
- If open circuit, short circuit to negative: check the electrical characteristics of the coil: if not ok, replace the coil; if ok, perform the check procedure for the coil connector and for the Marelli control unit connector; if not ok restore; if everything is ok, check the continuity of the cable between the two ends of the cable: if there is no continuity, restore the wiring harness; if there is continuity, with key ON, check the cable ground insulation (from the coil connector or control unit connector); if not ok, restore the wiring harness.

P0352 Rear coil

Electrical diagnosis:

short circuit to positive / short circuit to negative, open circuit.

Error cause:

- Short-circuit to positive: an excessive voltage was detected at PIN 27 of the ENGINE connector.
- If open circuit, short circuit to negative: a voltage equal to zero was detected at PIN 27 of the ENGINE connector.

Troubleshooting:

- Short-circuit to positive: disconnect the coil connector, turn the key to ON, activate the coil with the diagnostic tool and check the voltage at PIN 27 of the connector: if there is voltage, restore the wiring harness, if the voltage is 0, replace the coil.
- If open circuit, short circuit to negative: check the electrical characteristics of the coil: if not ok, replace the coil; if ok, perform the check procedure for the coil connector and for the Marelli control unit connector; if not ok restore; if everything is ok, check the continuity of the cable between the two ends of the cable: if there is no continuity, restore the wiring harness; if there is continuity, with key ON, check the cable ground insulation (from the coil connector or control unit connector); if not ok, restore the wiring harness.

Throttle body

Function

Sends to the injection control unit the throttle position and activates the throttle according to the control unit

Operation / Operating principle

All the unit internal components (potentiometer and electric motor) are contactless; therefore, no electrical diagnosis is possible for the throttle body, but for the circuits connected to it only.

Level in electrical circuit diagram:

Throttle check and handle grip sensor (Demand)

Position:

- on the vehicle: inside the filter box
- connector: on the throttle body, in lower position, near the throttle motors

Pin out:

1. potentiometer signal 1
2. supply voltage + 5V
3. throttle valve control command (+)
4. potentiometer signal 2
5. throttle valve control command (-)
6. ground lead

DIAGNOSTIC TOOL:PARAMETERS

Front cylinder throttle valve correction

- Example value with key ON: 0,0°
- Example value with engine on: 0.4°

Reading the intake pressures, the system tries to balance the intake pressures through the front and rear cylinder, operating on the throttle valves positions: an acceptable value should be between -0.5 and +0.5

Rear cylinder throttle valve correction

- Example value with key ON: 0,0°
- Example value with engine on: -0.2°

Reading the intake pressures, the system tries to balance the intake pressure through the front and rear cylinder, operating on the throttle valves positions: an acceptable value should be between -0.5 and +0.5

Potentiometer front throttle valve (degrees)

- Example value with key ON: 7.8°
- Example value with engine on: 1.4°

With key set to ON, the throttle is kept in position by the springs (around 5 -7°). After the engine starts up at idle, the throttle is kept close to the mechanical minimum (above or equal to 0.5°). When the gear is not engaged, at approximately ???? rpm the throttle valves opening s very small and the requested torque is very low (approximately 5-7°)

Potentiometer rear throttle valve (degrees)

- Example value with key ON: 8°
- Example value with engine on: 1.5°

With key set to ON, the throttle is kept in position by the springs (around 5 -7°). After the engine starts up at idle, the throttle is kept close to the mechanical minimum (above or equal to 0.5°). When the gear is not engaged, at approximately ???? rpm the throttle valves opening s very small and the requested torque is very low (approximately 5-7°)

Potentiometer 1 front throttle valve (voltage)

- Example value with key ON: 873 mV
- Example value with engine on: 561 mV

Potentiometer 1 rear throttle valve (voltage)

- Example value with key ON: 883 mV
- Example value with engine on: 536 mV

Potentiometer 2 front throttle valve (voltage)

- Example value with key ON: 4123 mV
- Example value with engine on: 4426 mV

Potentiometer 2 rear throttle valve (voltage)

- Example value with key ON: 4113 mV
- Example value with engine on: 4455 mV

Potentiometer 2 front throttle valve (degrees)

- Example value with key ON: 8.0°
- Example value with engine on: 1.5°

With key set to ON, the throttle is kept in position by the springs (around 5 -7°). After the engine starts up at idle, the throttle is kept close to the mechanical minimum (above or equal to 0.5°). When the gear

is not engaged, at approximately ???? rpm the throttle valves opening s very small and the requested torque is very low (approximately 5-7°)

Potentiometer 2 rear throttle valve (degrees)

- Example value with key ON: 8.2°
- Example value with engine on: 1.6°

With key set to ON, the throttle is kept in position by the springs (around 5 -7°). After the engine starts up at idle, the throttle is kept close to the mechanical minimum (above or equal to 0.5°). When the gear is not engaged, at approximately ???? rpm the throttle valves opening s very small and the requested torque is very low (approximately 5-7°)

Front cylinder throttle valve Limp Home position

- Example value with key ON: 878 mV

Voltage stored in the control unit corresponding to the Limp home position

Rear cylinder throttle valve Limp Home position

- Example value with key ON: 888 mV

Voltage stored in the control unit corresponding to the Limp home position

Front throttle valve lower position

- Example value with key ON: 502 mV

Voltage stored in the control unit corresponding to the throttle mechanical minimum position

Rear throttle valve lower position

- Example value with key ON: 492 mV

Voltage stored in the control unit corresponding to the throttle mechanical minimum position

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTIC TOOL: STATUSES

Front throttle valve automatic self-learning

- Ice/Interrupted/Performed/Limp home/Throttle valve stopper closed/Spring check/Limp home acquisition/Initialization

Indicates if the self-learning performed by the control unit was performed/not performed: this is fundamental for understanding if the acquisition was successful at the last key ON

Rear throttle valve automatic self-learning

- Ice/Interrupted/Performed/Limp home/Throttle valve stopper closed/Spring check/Limp home acquisition/Initialization

Indicates if the self-learning performed by the control unit was performed/not performed: this is fundamental for understanding if the acquisition was successful at the last key ON

Throttle self-learning with diagnostics instrument

- Performed/Not performed

Indicates if the self-learning with the diagnostic tool was performed/not performed: if it was performed one time, it will always remain performed unless a control unit EEPROM reset is carried out

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

CAUTION

IF ERRORS ARE DETECTED ON BOTH THROTTLE BODIES, CHECK ALSO THE CORRECT SUPPLY OF THE CONTROL UNIT TO PIN 42.

P0120 Front throttle valve position potentiometer sensor

Electrical diagnosis:

- short circuit to positive / open circuit, short circuit to negative

Error cause:

- Short-circuit to positive: excessive voltage has been detected on PIN 48. If open circuit, short circuit to negative: voltage equal to zero detected at PIN 48.

Troubleshooting:

- Short-circuit to positive: check the value indicated by the Potentiometer 1 front Throttle valve parameter (voltage): disconnect the connector and read the value indicated in the diagnostic tool: if the voltage does not vary, there is a short circuit in the concerned cable; replace the throttle body if the voltage drops to zero
- If open circuit, short circuit to negative: perform the check procedure for the throttle body connector and control unit connector; if not ok, restore, if everything is ok, check the continuity of the circuit between the two ends; if not ok, restore the wiring harness, if ok, check the ground insulation of the circuit (from the throttle body connector or control unit connector); if ground insulated, check that at PIN 2of the throttle boy connector there is power supply (+5 V) and that at PIN 6 there is ground; if they are correct, replace the throttle body.

P2120 Rear throttle valve position potentiometer 1 sensor

Electrical diagnosis:

- short circuit to positive / open circuit, short circuit to negative

Error cause:

- Short-circuit to positive: excessive voltage has been detected on PIN 36. If open circuit, short circuit to negative: voltage equal to zero detected at PIN 36.

Troubleshooting:

- Short-circuit to positive: check the value indicated by the Potentiometer 1 rear Throttle valve parameter (voltage): disconnect the connector and read the value indicated in the diagnostic tool: if the voltage does not vary, there is a short circuit in the concerned cable; replace the throttle body if the voltage drops to zero
- If open circuit, short circuit to negative: perform the check procedure for the throttle body connector and control unit connector; if not ok, restore, if everything is ok, check the con-

tinuity of the circuit between the two ends; if not ok, restore the wiring harness, if ok, check the ground insulation of the circuit (from the throttle body connector or control unit connector); if ground insulated, check that at PIN 2of the throttle boy connector there is power supply (+5 V) and that at PIN 6 there is ground; if they are correct, replace the throttle body.

P0220 Front throttle valve position potentiometer sensor

Electrical diagnosis:

- Short circuit to positive / open circuit, short circuit to negative.

Error cause:

- Short-circuit to positive: excessive voltage has been detected on PIN 48. If open circuit, short circuit to negative: voltage equal to zero detected at PIN 48.

Troubleshooting:

- Short-circuit to positive: check the value indicated by the Potentiometer 1 front Throttle valve parameter (voltage): disconnect the left side connector and read the value indicated in the diagnostic tool: if the voltage does not vary, there is a short circuit in the cable wiring; replace the throttle body if the voltage drops to zero
- If open circuit, short circuit to negative: perform the check procedure for the throttle body connector and control unit connector; if not ok, restore, if everything is ok, check the continuity of the circuit between the two ends; if not ok, restore the wiring harness, if ok, check the ground insulation of the circuit (from the throttle body connector or control unit connector); if ground insulated, check that at PIN 2of the throttle boy connector there is power supply (+5 V) and that at PIN 6 there is ground; if they are correct, replace the throttle body.

P2125 Rear throttle valve position potentiometer 2 sensor

Electrical diagnosis:

- short circuit to positive / open circuit, short circuit to negative.

Error cause:

- Short-circuit to positive: excessive voltage has been detected on PIN 21. If open circuit, short circuit to negative: voltage equal to zero detected at PIN 21.

Troubleshooting:

- Short-circuit to positive: check the value indicated by the Potentiometer 2 rear Throttle valve parameter (voltage): disconnect the left side connector and read the value indicated in the diagnostic tool: if the voltage does not vary, there is a short circuit in the cable wiring; replace the throttle body if the voltage drops to zero
- If open circuit, short circuit to negative: perform the check procedure for the throttle body connector and control unit connector; if not ok, restore, if everything is ok, check the continuity of the circuit between the two ends; if not ok, restore the wiring harness, if ok, check the ground insulation of the circuit (from the throttle body connector or control unit connec-

tor); if ground insulated, check that at PIN 2of the throttle boy connector there is power supply (+5 V) and that at PIN 6 there is ground; if they are correct, replace the throttle body.

P2119 Front throttle valve command circuit

Electrical diagnosis:

- Short circuit to positive / short circuit to negative / open circuit, excessive internal temperature over-current.

Error cause:

- Short-circuit to positive: excessive voltage detected on PIN 29 or 41 of the 7SM control unit. If short circuit to negative: no voltage has been detected. If open circuit: an interruption of an excessive Ampere consumption or control unit overheating was detected.

Troubleshooting:

- Short-circuit to positive: disconnect the throttle body connector, turn the key OK and check the voltage at PIN 3: if a voltage greater than or equal to 5 V is read, there is a short circuit of the relative cable, if the voltage is zero, replace the throttle body
- If short circuit to negative: disconnect the throttle body connector, turn the key ON and check if PIN 3 has continuity with the vehicle ground: if there is continuity restore the wiring harness, if there is no continuity replace the throttle body
- If open circuit, excessive internal temperature over-current: check the throttle body connector and the control unit connector: if not ok restore, if everything is ok disconnect the connector of the throttle body and the control unit connector and check cable continuity; if there is no continuity, restore the cable harness. If there is continuity, with the throttle body connector connected, check that the resistance, from the throttle control unit connector, between PIN 29 and 41 is within 1 and 2.5 Ohm; if not ok replace the throttle body, if ok check that the throttle body is not mechanically blocked: if blocked, remove the cause or replace the body; if not blocked, replace the control unit.

DIAGNOSTIC TOOL: LOGIC ERRORS

P0121 Front throttle valve position potentiometer 1 sensor

Electrical diagnosis:

- Signal not plausible.

Error cause:

- Signal outside the specified value determined based on the values of the intake pressure.

Troubleshooting:

- Check the parameter of the Potentiometer 1 front throttle valve (voltage) to know which signal the control unit receives and to compare it to the Potentiometer 1 rear throttle valve (voltage). Check the throttle body connector and the control unit connector. Check that cable resistance between the throttle body connector (PIN 1) and the control unit (PIN48) is a few

tenths of an Ohm. Otherwise, restore the wiring harness; if ok, replace the complete throttle body.

P2126 Rear throttle body potentiometer 2

Functional diagnosis:

- Signal not plausible.

Error cause:

- Signal outside the specified value determined based on the values of the intake pressure.

Troubleshooting:

- Check the parameter of the Potentiometer 2 rear throttle valve (voltage) to know which signal the control unit receives and to compare it to the Potentiometer 2 front throttle valve (voltage). Check the throttle body connector and the control unit connector. Check that cable resistance between the throttle body connector (PIN 4) and the throttle control unit (PIN 21) is a few tenths of an Ohm. Otherwise, restore the wiring harness; if ok, replace the complete throttle body.

P1400 Front throttle valve Limp Home self-learning

Functional diagnosis:

- Test failed.

Error cause:

- Position of the throttle valve, maintained by the springs, outside the specified range (at each key ON).

The instrument panel indicates this error by lighting up in a fixed manner the MI warning light.

Troubleshooting:

- Check the cleanliness of the throttle body and the intake duct. If ok, replace the throttle body.

P1405 Front throttle valve mechanical (re-closing) springs self-learning

Functional diagnosis:

- Test failed.

Error cause:

- Throttle valve return time, in the position maintained by the springs, outside of the specified limits: the causes can be a deterioration of spring performance or excessive throttle valve friction (at each key ON).

Troubleshooting:

- Check the cleanliness of the throttle body and the intake duct. If ok, replace the throttle body.

P1402 Front throttle valve minimum mechanical position self-learning

Functional diagnosis:

- Test failed.

Error cause:

- Position of the throttle valve stopper outside of the specified range (at each key ON).

Troubleshooting:

- Check the cleanliness of the throttle body and the intake duct. If ok, replace the throttle body.

P1403 Front throttle valve recovery conditions detection (Tair,Twater)

Functional diagnosis:

- Ice possibly present.

Error cause:

- in conditions of low ambient temperature and engine temperature, a correct throttle valve rotation was not detected: possible presence of ice in the duct (at each key ON).

The instrument panel indicates this error by lighting up in a fixed manner the MI warning light.

Troubleshooting:

- Check the cleanliness of the throttle body and that there is no ice or condensate in the intake duct. If ok, replace the throttle body.

P1404 Front throttle valve power supply voltage during self-learning.

Functional diagnosis:

- Low power supply voltage.

Error cause:

- The throttle valve power supply voltage is too low to correctly perform the self-learning test (at each key ON).

The instrument panel indicates this error by lighting up in a fixed manner the MI warning light.

Troubleshooting:

- Remove the presence of errors that prevent throttle self-learning.

P0638 Front throttle valve position error - EPOS error

- Misalignment between control and activation.

Error cause:

- The throttle valve mechanical control could be damaged.

Troubleshooting:

- Replace the throttle body.

P1406 Rear throttle valve Limp Home self-learning

Functional diagnosis:

- Test failed.

Error cause:

- Position of the throttle valve, maintained by the springs, outside the specified range (at each key ON). The instrument panel indicates this error by lighting up in a fixed manner the MI warning light.

Troubleshooting:

- Check the cleanliness of the throttle body and the intake duct. If ok, replace the throttle body.

P1411 Rear throttle valve mechanical (re-closing) springs self-learning

Functional diagnosis:

- Test failed.

Error cause

- Throttle valve return time, in the position maintained by the springs, outside of the specified limits: the causes can be a deterioration of spring performance or excessive throttle valve friction (at each key ON).

Troubleshooting:

- Check the cleanliness of the throttle body and the intake duct. If ok, replace the throttle body.

P1408 Rear throttle valve minimum mechanical position self-learning

Functional diagnosis:

- Test failed.

Error cause:

- Position of the throttle valve stopper outside of the specified range (at each key ON).

Troubleshooting:

- Check the cleanliness of the throttle body and the intake duct. If ok, replace the throttle body.

P1409 Rear throttle valve recovery conditions detection (Tair,Twater)

Functional diagnosis:

- Ice possibly present.

Error cause:

- in conditions of low ambient temperature and engine temperature, a correct throttle valve rotation was not detected: possible presence of ice in the duct (at each key ON). The instrument panel indicates this error by lighting up in a fixed manner the MI warning light.

Troubleshooting:

- Check the cleanliness of the throttle body and that there is no ice or condensate in the intake duct. If ok, replace the throttle body.

P1410 Rear throttle valve power supply voltage during self-learning

Functional diagnosis:

- Low power supply voltage.

Error cause:

- The throttle valve power supply voltage is too low to correctly perform the self-learning test (at each key ON). The instrument panel indicates this error by lighting up in a fixed manner the MI warning light.

Troubleshooting:

- Remove the presence of errors that prevent throttle self-learning.

P0639 Rear throttle valve position error - EPOS error

- Misalignment between control and activation

Error cause:

- The throttle valve mechanical control could be damaged.

Troubleshooting:

- Replace the throttle body.

P1401 Rear throttle valve mechanical springs self-learning (opening)

Functional diagnosis:

- Test failed

Error cause:

- The recognition of this error is enabled during the throttle self-learning procedure.
- Throttle valve return time, in the position maintained by the springs, outside of the specified limits: the causes can be a deterioration of spring performance or excessive throttle valve friction (at each key ON)

This error is indicated by lighting up in a fixed manner the MI warning light.

Troubleshooting:

- Using the diagnostic tool, erase the error, then perform the throttle self-learning procedure. If the error is displayed again, it may mean a mechanical problem at the throttle boy.
- Check the cleanliness of the throttle body and the intake duct. Check if there are any mechanical ruptures. Replace the throttle body, if necessary.

P1407 Front throttle valve mechanical springs self-learning (opening)

Functional diagnosis:

- Test failed

Error cause:

- The recognition of this error is enabled during the throttle self-learning procedure.
- Throttle valve return time, in the position maintained by the springs, outside of the specified limits: the causes can be a deterioration of spring performance or excessive throttle valve friction (at each key ON)

This error is indicated by lighting up in a fixed manner the MI warning light.

Troubleshooting:

- Using the diagnostic tool, erase the error, then perform the throttle self-learning procedure. If the error is displayed again, it may mean a mechanical problem at the throttle boy.
- Check the cleanliness of the throttle body and the intake duct. Check if there are any mechanical ruptures. Replace the throttle body, if necessary.

DIAGNOSTIC TOOL: ADJUSTABLE PARAMETERS

Throttle self-learning.

NOTE

AT EVERY "KEY ON", THE CONTROL UNIT PERFORMS A TEST ON THE THROTTLE VALVES TO CHECK THEIR MOBILITY, ASSESSING THE NECESSARY FORCE TO MOVE THEM AN THE POTENTIAL PRESENCE OF OBSTACLES. AT EVERY 150 "KEY ON", THE SYSTEM PERFORMS A STOPPER LEARNING FOR EACH THROTTLE BODY; IF START-UP IS ATTEMPTED DURING THIS PROCEDURE (THAT REQUIRES APPROXIMATELY 3 SECONDS), THE ENGINE WILL NOT START.

THROTTLE BODY RESET PROCEDURE

If a throttle body is replaced, or if it needs to perform automatic learning, proceed as follows:
After key ON, do not start the engine for the next 3 seconds, during which the throttle automatic learning is performed by the control unit: according to the throttle body concerned, check that the "Front throttle automatic self-learning" or the "Rear throttle automatic self-learning" status indicates: "completed". If the indication is not "completed", remove any errors that may exist on the vehicle and at the next key On check that the statuses are "completed". Where appropriate, perform the throttle self-learning from the "settings" screen and check that the "Throttle self-learning with diagnostics instrument" status indicates: "completed" and that the "Front throttle automatic self-learning" or "Rear throttle automatic self-learning" statuses indicate: "completed".

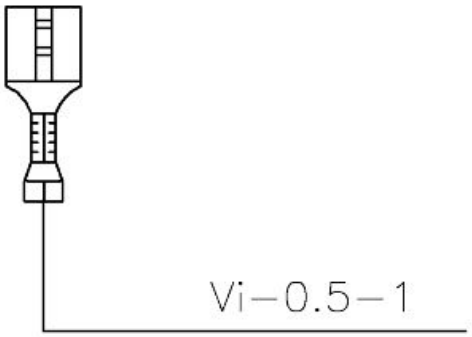
Engine oil pressure sensor

Function

Indicates the instrument panel if there is enough oil pressure (0.5 +/-0.2 bar) in the engine.

Operation / Operating principle

Switch normally closed (control unit signal to ground). The switch opens at pressure values above 0.5 ± 0.2 bar.



Level in electrical circuit diagram:

Low fuel and oil pressure

Position:

- on the vehicle: front side of the engine, next to the oil filter.
- connector: on the sensor.

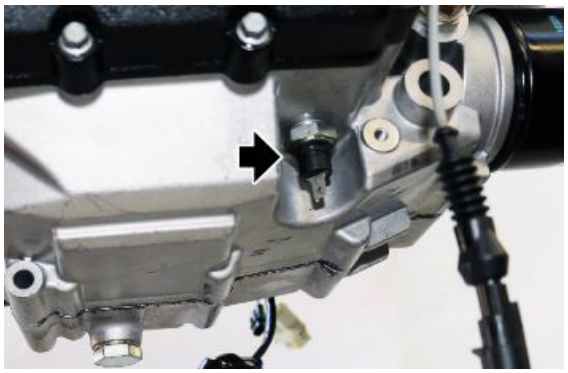
Electrical specifications: -

Pin out:

1. Voltage: 5 V

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.



Dashboard

Oil sensor FAULT error B0001

Error cause

- An oil sensor fault is signalled when, with engine off, it is detected that the sensor circuit is open. The test is performed only once when the key is set to ON. There is an error when the general warning light turns on.

Troubleshooting

- Check the sensor connector and the instrument panel connector (PIN 13): if they are not OK, restore. If OK, check continuity of the purple cable between the sensor connector and the instrument panel connector PIN 13: if not OK, restore the wiring harness; if OK, replace the sensor.

Oil pressure FAULT error B0002

Error cause

- An oil sensor fault is signalled when, with engine running, it is detected that the sensor circuit is closed. There is an error when the general warning light turns on.

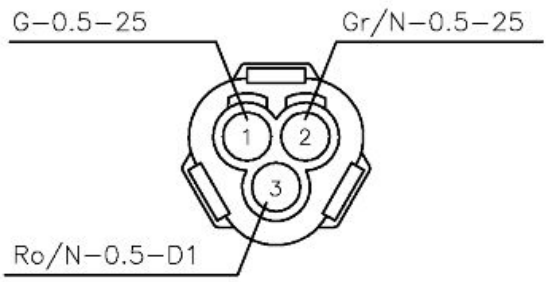
Troubleshooting

- Check if oil pressure is low with the specific gauge.

Neutral sensor

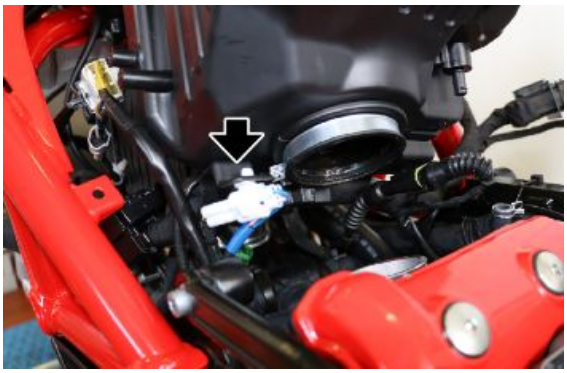
Function

Indicates to the control unit the position of the gearbox, from 1st gear to 6th gear, and if the gearbox is in neutral or drive.



Operation / Operating principle

The sensor is comprised of 2 circuits: one to indicate the gear engaged, whose resistance varies depending on the engaged gear: in this way, the injection control unit, depending on the detected



electric voltage, identifies the engaged gear and transmits the information via CAN to the instrument panel, the other for the idle indication whose voltage is reduced to zero if in the neutral position.

Level in electrical circuit diagram:

Start enable switches

Position:

- on the vehicle: under the chain pinion, behind the pinion cover.
- connector: fitted under the filter housing, left side (3 way white connector).

Electrical specifications:

PIN 64:

- neutral indication: closed circuit (continuity);
- gear engaged: open circuit (infinite resistance).

Gear circuit resistance:

- 1st gear\: 0.8 kohm;
- 2nd gear: 0.5 kohm;
- 3rd gear: 15.0 kohm;
- 4th gear: 6.9 kohm;
- 5th gear: 2.8 kohm;
- 6th gear: 1.5 kohm;

Pin out:

From the sensor to the connector:

- White/black: ground from ECU
- Light blue: + 12V from ECU (neutral)
- Pink: + 5V from ECU (drive).

From the connector to the wiring harness:

- Pink/black: ground from ECU
- Yellow: + 12V from ECU (neutral)
- Grey/Black: + 5V from ECU (drive).

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTIC TOOL: STATUSES

Gearbox in neutral

- Yes/No

gear engaged: 0 - 1 - 2- 3 - 4 - 5 - 6

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

P0914 Gear sensor

- short circuit to positive or open circuit/ short circuit to negative.

Error cause

- If open circuit, short circuit to positive: excessive voltage has been detected on PIN 72.
- If short circuit to negative: voltage equal to zero detected at PIN 72.

Troubleshooting

- If open circuit, short circuit to positive: the error is detected only with a gear engaged. check the sensor connector and the VEHICLE connector of the control unit: if not OK, restore. if ok, check the continuity of the Grey/Black cable between the two connectors: if not OK, restore. if ok, with key ON and with the control unit connector disconnected, check from the control unit connector side if the cable is energised: if energised, disconnect the sensor connector and check if the cable is energised: in this case, restore the wiring harness; if not energised, replace the sensor (there is an interruption or a short circuit to positive of the White/Black cable on the segment that goes from the sensor connector to the sensor or inside the sensor).
- If short circuit to negative: Disconnect the sensor connector and, with key ON, check the voltage of the Grey/Black cable: if it is zero, restore the wiring harness; if it approximately 5 V, replace the sensor (there is short circuit to ground of the Pink cable on the segment that goes from the sensor connector to the sensor or inside the sensor).

Clutch lever sensor

Function

Indicates the clutch lever position to the control unit.

Operation / Operating principle

If a gear is engaged but the clutch is engaged, that is circuit closed to ground, there is consent to start the vehicle.

Level in electrical circuit diagram:

Start enable switches

Position:

- on the vehicle: on the handlebar.
- connector: on the sensor.

Electrical specifications:

- Clutch engaged: closed circuit (continuity)
- Clutch released: open circuit (infinite resistance).

Pin out:

1. voltage 5V
2. ground lead

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTIC TOOL: LOGIC ERRORS

P0704 Clutch switches plausibility error

Diagnosis:

- signal not plausible.

Error cause:

- If there is one contact: the plausibility diagnosis cannot occur only at key ON but during operation. The control unit logic requires that the released/engaged and engaged/released witching time does not exceed a certain threshold. If the operating time is too long, the error is shown. To check the origin of the problem, it is enough to connect the diagnostic tool to see if , despite the clutch lever operations, the status remains "ENGAGED". Check the wiring harness or the sensor.
- If there are two contacts: the plausibility diagnosis can occur at key ON. Since there are two contacts that cannot be both "CLOSED" or both "OPEN" (excepting fraction of a second while switching from "RELEASED" to "ENGAGED" and vice versa), if they are, the error is shown.

The presence of this error is signalled by the fixed lighting of the general warning light.

Troubleshooting:

- If the error is active only with the lever released: the problem is generated by the released clutch contact of the which is interrupted or by the engaged clutch contact which is in short circuit to ground.

- If the error is active only with the lever engaged: the problem is generated by the engaged clutch contact of the which is interrupted or by the released clutch contact which is in short circuit to ground.
- If the error is always active: both contacts are open or in short circuit to ground.

Depending on the case, check the concerned parts of the wiring harness and the sensor.

NOTE

THIS ERROR DISABLES THE CRUISE CONTROL.

Side stand sensor

Funzione

indica alla centralina la posizione del cavalletto laterale

Funzionamento / Principio di funzionamento

Se innestata la marcia ed il cavalletto è aperto, quindi circuito aperto, la centralina impedisce l'avviamento o effettua lo spegnimento del motore se in rotazione

Livello appartenenza schema elettrico:

Consensi all'avviamento

Posizione:

- sul veicolo: sul cavalletto
- connettore: tra il telaio e il motore, lato destro, sopra al coperchio volano (connettore bianco a 2 vie)

Pin out:

1. Massa
2. Tensione 12V

Caratteristiche elettriche:

- Cavalletto su: circuito chiuso (continuità)
- Cavalletto giù: circuito aperto (resistenza infinita)

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTIC TOOL: LOGIC ERRORS

P1850 Side stand diagnosis

Side stand functional diagnosis:

up/down

Troubleshooting:

- Indication on the diagnostic tool always down: perform the connector check procedure: if not ok, restore; if ok, disconnect the two ends from the sensor and check the PIN 1 continuity to ground: if there is no continuity, restore cable harness; if there is, replace the sensor
- Indication on the diagnostic tool always up: disconnect the two ends from the sensor and check if, with the stand down, there is continuity between the two PINS: if there is continuity replace the sensor; if open circuit, it means that there is short circuit to ground of the brown/ green cable that goes from PIN 2 of the sensor to PIN 70 of the VEHICLE connector: restore the wiring harness

Bank angle sensor

Function

indicates the vehicle position to the control unit.

Operation / Operating principle

When the sensor is in reverse position, the ground circuit is closed: detecting this ground, the Marelli control unit prevents the start-up or stops the engine.

Level in electrical circuit diagram:start enable switches

Position:

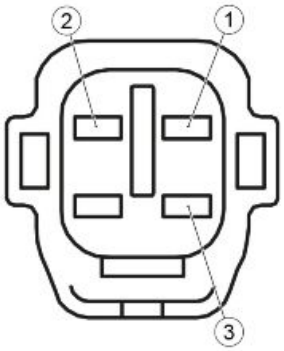
- on the vehicle: under the saddle
- connector: close to the sensor

Electrical specifications:

- Vertical sensor: open circuit (62 kohm resistance)
- Reverse sensor: closed circuit (continuity)

Pin-out:

1. Voltage - Orange/Black colour, from VEHICLE PIN 63 to the fall sensor, passing through multiple connector - Section 0.5

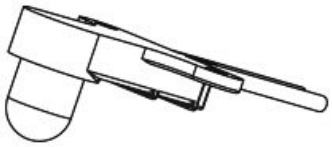


2. Signal - Pink/White colour, from VEHICLE PIN 65 to the fall sensor, passing through multiple connector - Section 0.5
3. Ground - Green/Pink colour, from ENGINE PIN6/PIN17 to the fall sensor, passing through multiple connector - Section 0.5

Air temperature sensor - instrument panel

Function

Indicates the ambient air temperature to the instrument panel.



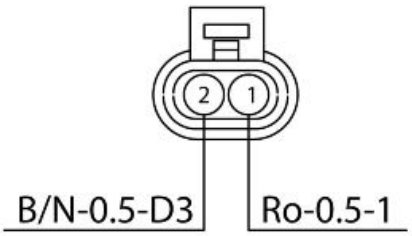
Operation / Operating principle

NTC type sensor (resistance sensor, inversely variable with temperature).

Level in electrical circuit diagram: Temperature sensors

Position:

- on the vehicle: in the front urn indicators support, under the headlamp.
- connector: behind the headlamp.



Electrical specifications:

- Resistance at 0 °C (32 °F) : 32.5 kOhm +/- 5%
- Resistance at 25 °C (77 °F) : 10.0 kOhm +/- 5%

Pin-out:

1. 5 V voltage
2. Ground

DIAGNOSTIC TOOL: PARAMETERS

Troubleshooting:

- Check the sensor connector and the instrument panel connector (PIN 5 and 34): if not ok, restore; if ok, check the continuity of the pink cable between the sensor connector and PIN 5 of the instrument panel connector: if not ok, restore the wiring harness; if ok, check if the sensor resistance is correct: if not ok, replace the sensor; if ok, check the continuity of the blue/black cable between the sensor connector and PIN 34 of the instrument panel connector: if not ok, restore the wiring harness; if ok, check (with key ON) the voltage at PIN 1 of the sensor connector: if there is no voltage, replace the instrument panel; if there is ap-

proximately 12 V, restore the wiring harness (there is a short circuit to battery); if 5 V, connect a 10 kohm resistance to PIN 1 of the sensor connector and to he vehicle ground: if, with key ON, the measured voltage upstream the resistance decreases, replace the instrument panel; if it continues to be 5 V, restore the pink cable (there is a short circuit at + 5V)

Notes

In case of short circuit to ground detected at PIN 5 of the instrument panel connector, the display shows the "-" indication for the air temperature.

Check the ground insulation of the sensor connector pink cable: if connected to ground, restore the wiring harness; if insulated from the ground, check if the sensor resistance is correct: if not ok, replace the sensor; if ok, replace the instrument panel.

Electric fan circuit

Function

Activates coolant radiator fan

Operation / Operating principle

When the ECU detects a temperature of approximately 101°C, it closes the connection between the fan control relay excitation circuit and ground

Level in electrical circuit diagram:

electric fan

Position:

- sensor: relay located in the front recess of the chassis, to the right
- connector: on relay

Electrical specifications:

- relay normally open;
- drive coil resistance 110 Ohm (+/- 10 %)

DIAGNOSTIC TOOL:STATUSES

Fan relay

- on/off

DIAGNOSTIC TOOL:ACTIVATIONS

Fan

- Energy is applied for 10 seconds to the fan relay (36 in the electrical circuit diagram, position in the steering headstock recess, to the right; however,

CHECK the identification of the relay with the colour of the cables). Electrical continuity is required in the wiring for the relay to activate correctly: no errors are generated if the relay fails to activate

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

P0480 Cooling fan command

Electrical diagnosis:

- short circuit to positive/ short circuit to negative / open circuit

Error cause:

- Short-circuit to positive: excessive voltage has been detected at PIN 61 of the VEHICLE connector.
- If short circuit to negative: no voltage has been detected.
- If open circuit: 5V voltage has been detected. Error recognition carries out only when the fan relay is activated.

Troubleshooting:

- Short-circuit to positive: check the relay electrical specifications are correct by disconnecting it from the cable harness. If not OK, replace the relay; if OK, restore the cable harness (Brown cable)
- If short circuit to negative: check the relay electrical specifications are correct by disconnecting it from the cable harness. If not OK, replace the relay; if OK, restore the cable harness (Brown cable)
- If open circuit: check the relay electrical characteristics are correct by disconnecting it from the cable harness; if it is not OK, replace the relay, if it is OK, check relay connector, engine-vehicle cable harness connector and VEHICLE connector of the Marelli control unit: if not OK, restore; if OK, check continuity of cable harness (Brown cable)

RUN/STOP switch

Function

Indicates the control unit if the rider wishes to enable engine start-up or to keep the engine running.

Operation / Operating principle

If you want to stop the engine or to prevent it from starting, the switch must be open, meaning that PIN 78 of the VEHICLE connector of the Marelli control unit must not be grounded.

Level in electrical circuit diagram:

Start enable switches

Position:

- on the vehicle: Right hand light switch.
- connector: under the steering headstock, inside the protection case (black colour, 4 way).

Electrical specifications:

- STOP position: open circuit
- RUN position: closed circuit (continuity)

Pin out:

1. Ground - Green/Pink colour
2. 5V signal - Engine start-up - Pink/Brown colour
3. Ground - Green/Pink colour
4. 5V signal - Engine stop - Pink/Yellow colour

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTIC TOOL: STATUSES

RUN/STOP switch

- Run/Stop

NOTES

- Indication on the diagnostic tool always STOP: disconnect the connector and check with the RUN switch if there is continuity towards the two Blue/Green and Yellow/Red cables: if it is missing, replace the sensor; if there is, perform the connector check procedure: if not ok, restore the wiring harness; if ok, check with the key ON if there is voltage on the Yellow/Red

cable: if it is missing, restore the wiring harness; if there is, check the ground insulation of the Yellow/Red cable: if there is continuity with the ground, restore the wiring harness; if ok, turn the key to OFF and perform the VEHICLE connector and engine-vehicle wiring harness connector check: if not ok, restore; if ok, check the continuity of the Yellow/Pink cable between the switch connector and the VEHICLE connector PIN C7 and PIN 78: if not ok, restore the wiring harness; if ok, replace the Marelli control unit.

- Indication on the diagnostic tool always RUN: disconnect the connector and check with the switch in STOP of there is continuity between the two cables of the switch: if there is, replace the switch, if there is no continuity it means that, with the key ON, the Yellow/Pink cable (between the switch and PIN C7 of the engine-vehicle wiring harness connector or between the latter and PIN 78 of the control unit connector) is in short circuit to positive: restore the wiring harness.

Throttle control unit

THROTTLE CONTROL UNIT

Function

It receives the throttles target position from the Marelli control unit and it moves them so that they reach that target by reading their position through the potentiometers (2 per throttle body).

Level in wiring diagram:throttle control unit

Location:

- on the vehicle: inside the filter casing
- connector: on the control unit

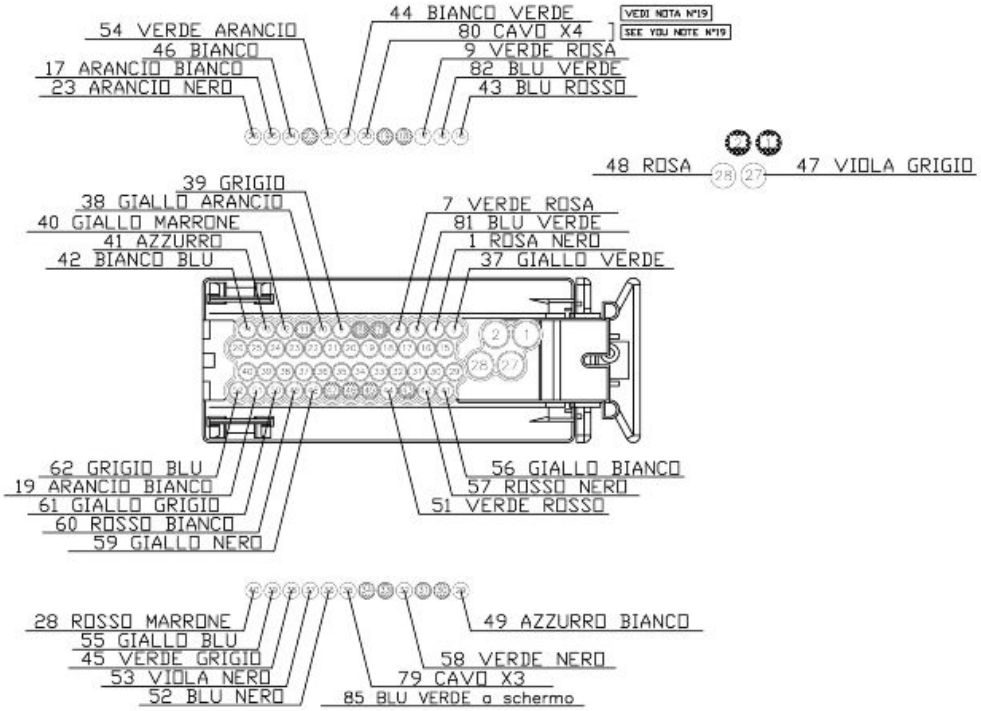
Pin-out: see the CONNECTORS section

See also

Throttle control unit

Connectors

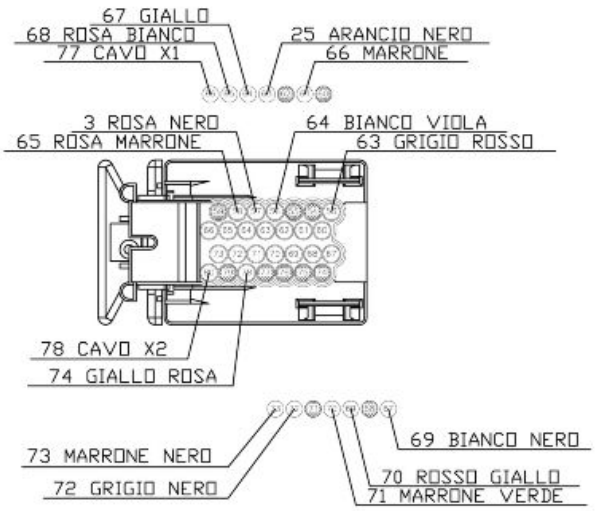
ECU



Engine pinout key:

- PIN 1 -
- PIN 2 -
- PIN 3 - Motorised throttle valve (+) (rear cylinder)
- PIN 4 - Analogic ground 2
- PIN 5 - Power ground
- PIN 6 - Analogic ground 1
- PIN 7 -
- PIN 8 -
- PIN 9 - Rear cylinder lambda probe (+)
- PIN 10 - Front cylinder lambda probe (+)
- PIN 11 -
- PIN 12 - Water temperature sensor input
- PIN 13 - B handle input
- PIN 14 - Serial line
- PIN 15 - Motorised throttle valve (-) (rear cylinder)
- PIN 16 - Power ground
- PIN 17 - Analogic ground 1
- PIN 18 -
- PIN 19 -

- PIN 20 - Engine rpm sensor (-)
- PIN 21 - Throttle valve potentiometer 2 signal (rear cylinder)
- PIN 22 - Front cylinder lambda probe (-)
- PIN 23 -
- PIN 24 - Intake pressure sensor signal (front cylinder)
- PIN 25 - 1 reference voltage output
- PIN 26 - 2 reference voltage output
- PIN 27 - Rear cylinder coil
- PIN 28 - Front cylinder coil
- PIN 29 - Motorised throttle valve (-) (front cylinder)
- PIN 30 -
- PIN 31 -
- PIN 32 - Front cylinder lambda probe heater
- PIN 33 -
- PIN 34 -
- PIN 35 - Engine rpm sensor (+)
- PIN 36 - Throttle valve potentiometer 1 signal (rear cylinder)
- PIN 37 - Air temperature sensor input
- PIN 38 - Rear cylinder lambda probe (-)
- PIN 39 - A handle input
- PIN 40 - Ignition switched live
- PIN 41 - Motorised throttle valve (+) (front cylinder)
- PIN 42 - Ignition switched live
- PIN 43 -
- PIN 44 - Rear cylinder lambda probe heater
- PIN 45 -
- PIN 46 -
- PIN 47 -
- PIN 48 - Throttle valve potentiometer 1 signal (front cylinder)
- PIN 49 - Intake pressure sensor signal (rear cylinder)
- PIN 50 - Throttle valve potentiometer 2 signal (front cylinder)
- PIN 51 - 1 reference voltage output
- PIN 52 - Battery power supply



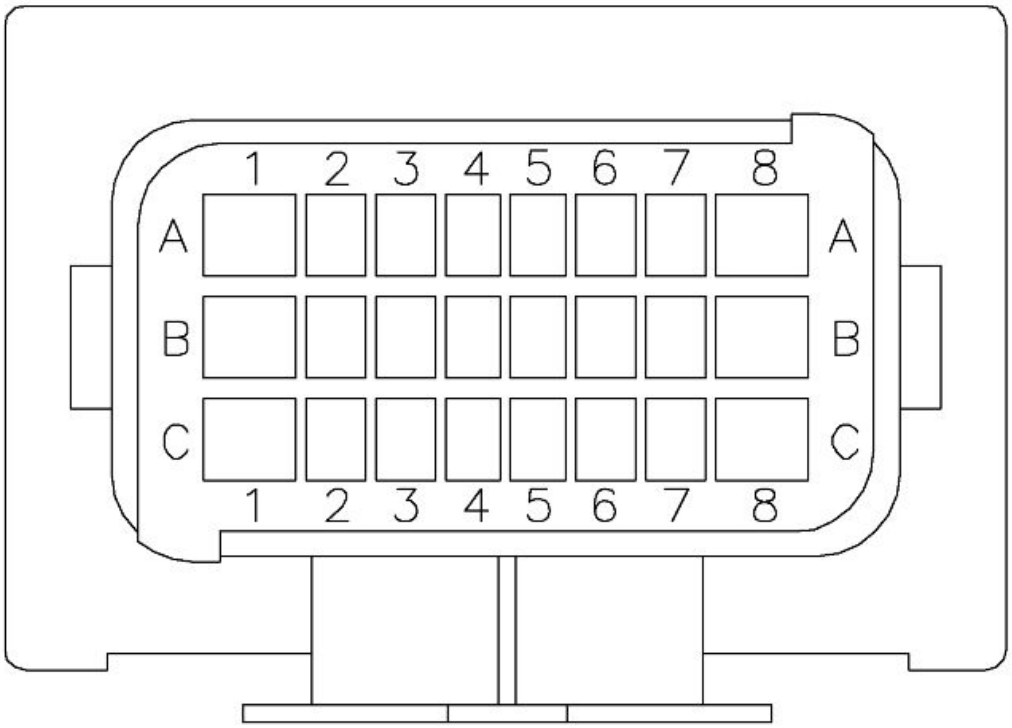
Vehicle pinout key:

- PIN 53 - Front cylinder injector
- PIN 54 -
- PIN 55 -
- PIN 56 - Clutch sensor
- PIN 57 - Analogic ground 2
- PIN 58 - Engine start-up
- PIN 59 -
- PIN 60 -
- PIN 61 - Fan command relay
- PIN 62 -
- PIN 63 - 2 reference voltage output
- PIN 64 - Neutral input
- PIN 65 - Fall sensor input
- PIN 66 - L CAN line
- PIN 67 - Rear cylinder injector
- PIN 68 -
- PIN 69 - Start-up enable
- PIN 70 - Side stand input
- PIN 71 -
- PIN 72 - Gear input
- PIN 73 - Secondary injection relay command output

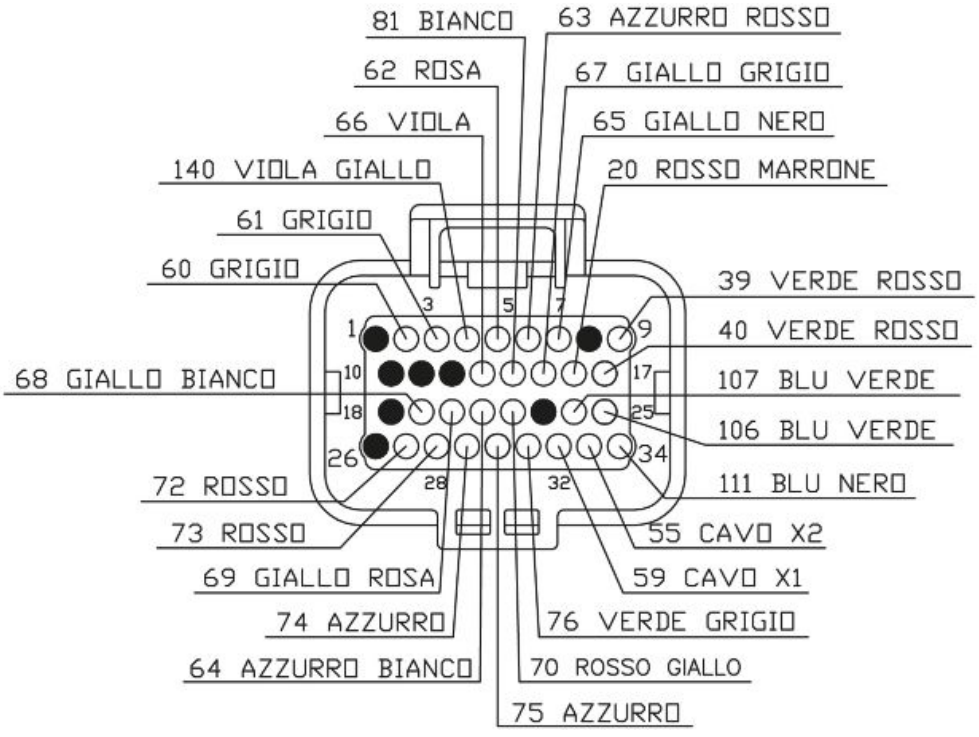
- PIN 74 -
- PIN 75 -
- PIN 76 -
- PIN 77 -
- PIN 78 - Engine stop input
- PIN 79 -
- PIN 80 - H CAN line

Engine-vehicle connector pinout key:

- PIN A1 - Key (+)
- PIN A2 - Oil temperature sensor
- PIN A3 -
- PIN A4 - 2 reference voltage output
- PIN A5 - Fall sensor
- PIN A6 -
- PIN A7 - Analogic ground
- PIN A8 - Battery
- PIN B1 - Injection power supply
- PIN B2 - CAN line (high)
- PIN B3 - CAN line (low)
- PIN B4 - Key
- PIN B5 - Electric fan relay control
- PIN B6 -
- PIN B7 -
- PIN B8 - Power ground 1
- PIN C1 - Injection power supply
- PIN C2 - K serial line for diagnosis
- PIN C3 - Clutch engaged
- PIN C4 - "Start engine" button
- PIN C5 - Start-up
- PIN C6 - Injection relay
- PIN C7 - Engine stop
- PIN C8 - Power ground 2



Dashboard

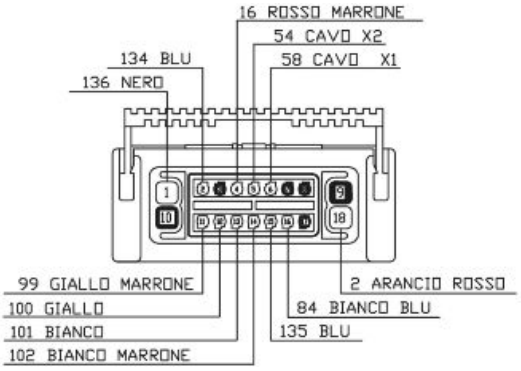


Instrument panel pinout key:

- PIN 1 -
- PIN 2 - Antenna 1
- PIN 3 - Antenna 2

- PIN 4 - Oil temperature sensor
- PIN 5 - Air temperature sensor
- PIN 6 - Arrow reset
- PIN 7 - Light relay
- PIN 8 -
- PIN 9 - Battery positive
- PIN 10 -
- PIN 11 -
- PIN 12 -
- PIN 13 - Oil pressure
- PIN 14 - High beam lights IN
- PIN 15 - Mode UP
- PIN 16 - Key positive
- PIN 17 - Battery positive
- PIN 18 -
- PIN 19 - Mode DOWN
- PIN 20 - Mode SET
- PIN 21 - LH arrow control
- PIN 22 - RH arrow control
- PIN 23 -
- PIN 24 - Ground
- PIN 25 - Ground
- PIN 26 -
- PIN 27 - RH front arrow
- PIN 28 - RH rear arrow
- PIN 29 - LH front arrow
- PIN 30 - LH rear arrow
- PIN 31 - Fuel reserve
- PIN 32 - L CAN line (high speed)
- PIN 33 - H CAN line (high speed)
- PIN 34 - Sensor ground

ABS Modulator



ABS control unit pinout key:

- PIN 1 - Power ground 1
- PIN 2 - Power ground 2
- PIN 3 -
- PIN 4 - Ignition switched live
- PIN 5 - H CAN line
- PIN 6 - CAN L line
- PIN 7 -
- PIN 8 -
- PIN 9 -
- PIN 10 -
- PIN 11 - Rear ABS sensor positive
- PIN 12 - Rear ABS sensor negative
- PIN 13 - Rear ABS sensor negative
- PIN 14 - Front ABS sensor positive
- PIN 15 - Power ground 3
- PIN 16 - Serial line
- PIN 17 -
- PIN 18 - Battery positive

Can line

Function

Allows the communication between the Marelli injection control unit, the instrument panel, the ABS modulator.

Operation / Operating principle

CAN SYSTEM ADVANTAGES

A CAN line (Area network controller) is a connection between various electronic devices of a vehicle, set up as a computer network (internet). The CAN network allowed to significantly simplify the layout

of the electric system and consequently its total mass. With this communication line, it was possible to avoid useless duplications of various sensors on the motorcycle, since the signals coming from them are divided among the three electronic processing units (instrument panel, control unit and ABS).

- Cable number reduction: The CAN line travels through a twisted cable to several nodes.
- These nodes can also isolate the errors without causing a system breakdown (FaultsConfination).
- Immunity to interference: the signal travels through two cables and the signal reading is differential (voltage difference between the two signals on both cables). If the two signals are disturbed by an external factor, their difference remains unaltered.
- Communication speed: The messages travel at a bit rate of approximately 500 kbps (depending on the sent data package, the information may arrive at the nodes in a time carrying from 4 ms to 100 ms).

CAN PROTOCOL (CONT. NETWORK AREA)

The communication protocol is CSMA/CD (Carrier Sense Multiple Access w/ Collision Detection).
In order to transmit, every nod must first check that the BUS (the connection among all devices) is free before attempting to send a message with BUS (Carrier Sense).
If during this period there is no activity on BUS, every nod has the same chance to send a message (Multiple Access). If two nodes start transmitting simultaneously, the nodes recognise the "collision" (Collision Detection) and initiate an exchange action based on message priority (messages remain unaltered during exchange and there is no delay for high priority messages).
CAN protocol is based on messages and not on addresses. The message itself is divided into several parts (frames), each of which has a meaning: message priority, data contained, error detection, reception confirmation, etc.
Every network nod receives all the messages sent through the BUS (with reception confirmation or error messages) and each nod decides if the message is to be processed or rejected. Besides, every nod can request information from the other nodes (RTR = Remote Transmit Request).

Level in electrical circuit diagram:

CAN Line

Electrical specifications:

- between PIN 66 and 80 of the control unit: approx. 120 Ohm
- between PIN 32 and 33 of the instrument panel: approx. 120 Ohm

Pin out:

- Line L: cable X1 between ABS control unit PIN 66, instrument panel PIN 32 and ABS modulator PIN 6.
- Line H: cable X2 between Marelli control unit PIN 80, instrument panel PIN 33 and ABS modulator PIN 5.

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

U1125 Frame counter "Sensor Box" CAN line diagnosis

Electrical diagnosis:

- Intermittent signal or communication error

Error cause:

- Probable bad contact in the CAN line.

This error is not indicated even in the ATT status.

Troubleshooting:

- Perform the check procedure for the VEHICLE connector at PIN 66 and PIN 80 and of the engine-vehicle wiring harness connector at PIN B2 and B3; if NOT OK, restore; if ok, check the general operation of the Marelli control unit; in case of anomalies, replace it.

NOTE

THIS ERROR DISABLES THE TRACTION CONTROL.

DIAGNOSTIC TOOL: LOGIC ERRORS

U1121 Diagnosis of "ABS control unit" CAN line or CLF frame counter

Functional diagnosis:

- Signal absent

Error cause:

- If there is no signal, no signal is received from the ABS control unit.

This error is indicated by lighting up in a fixed manner the MI warning light.

Troubleshooting:

- Missing signal - Perform the check procedure for PIN 5 and PIN 6 of the ABS control unit connector, for PIN 66 and PIN 80 of the Marelli control unit vehicle connector: if NOT OK, restore; if OK with key OFF, disconnect the ABS control unit connector; if NOT OK replace the wiring harness, if OK check the correct power supply to PIN 18 (12V) and the grounding of ABS control unit PIN 1; if NOT OK, restore the wiring harness, if OK, replace the ABS control unit.

NOTE

THE PRESENCE OF THIS ERROR DETERMINE THE DEACTIVATION OF THE TRACTION CONTROL AND THE CRUISE CONTROL.

P1800 Rear wheel radius learning diagnosis

Functional diagnosis:

- CAN error while learning / Signal not plausible.

Error cause:

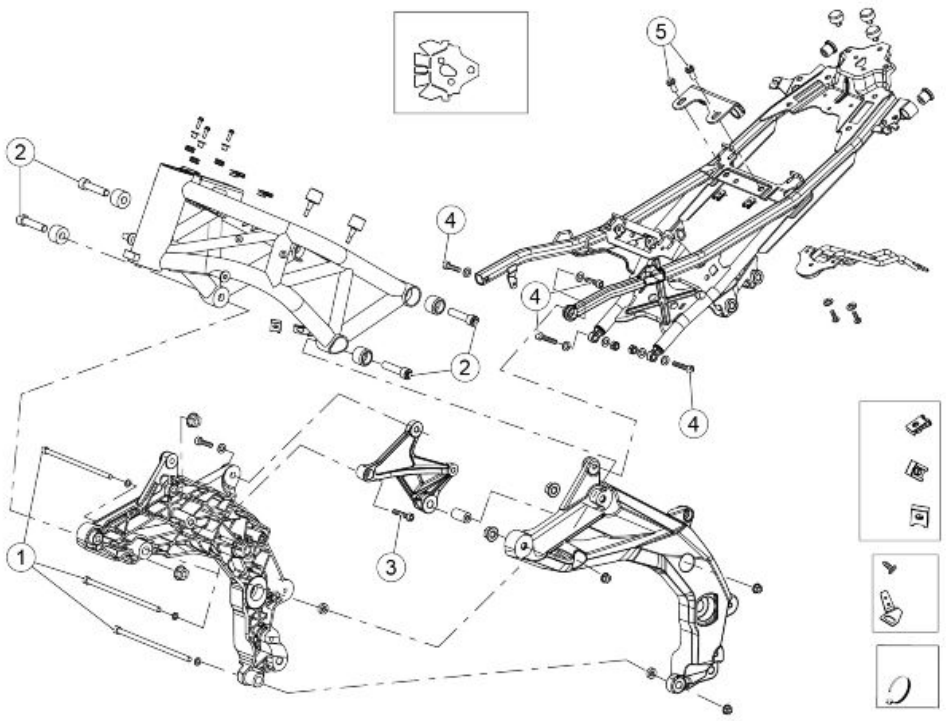
- In case of CAN error during acquisition, system warns that the procedure can not be completed due to a communication problem on the CAN line.
- If the signal is not plausible, there was a transcription error of the value of the rear wheel radius from the non volatile memory (EEPROM) to the volatile memory (RAM) at key ON. In this case the default value is used.

This error is indicated by lighting up in a fixed manner the MI warning light

NOTE

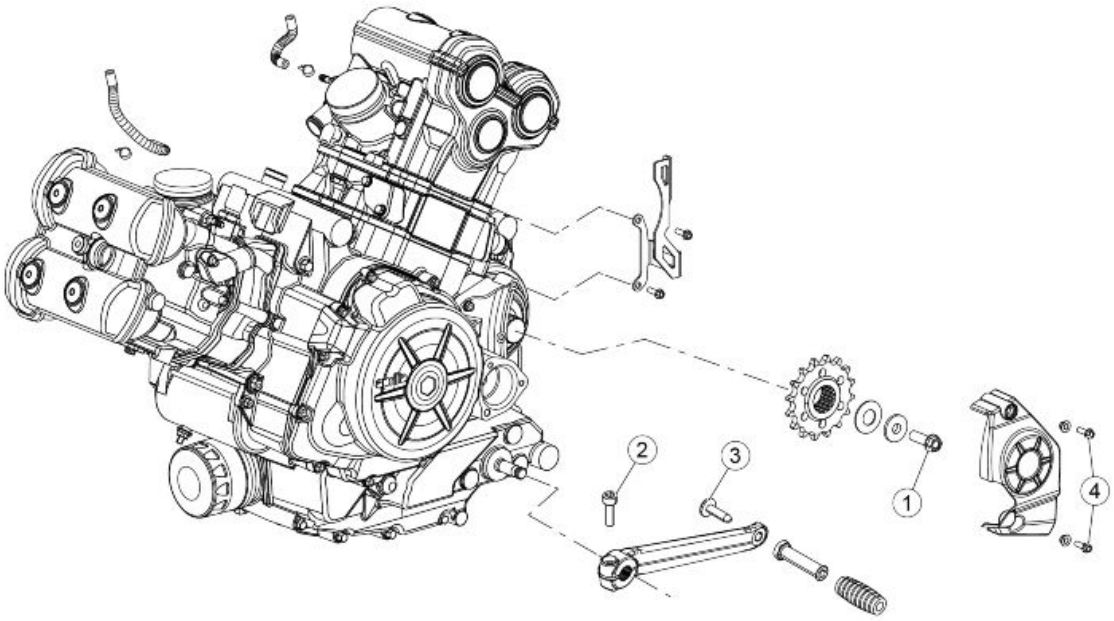
THIS ERROR DISABLES THE TRACTION CONTROL.

INDEX OF TOPICS



CHASSIS

Pos.	Description	Type	Quantity	Torque	Notes
1	Cyl. head, hex. socket screws used for fastening the side fairings to the engine	M12x282	3	80 Nm (59.00 lb ft)	-
2	TORX cyl. head screws used for fastening the trellis to the frame side fairings	M12x53	4	80 Nm (59.00 lb ft)	-
3	Cyl. head, hex. socket screw used for fastening the shock absorber counter-plate to the right hand frame side fairing	M10x30	1	50 Nm (36.88 lb ft)	Pre-impregnated screw
4	Cyl. head, hex. socket screws used for fastening the saddle support to the frame	M8x35	4	35 Nm (25.81 lb ft)	Pre-impregnated screws
5	Flanged, hex. head screws used for fastening the silencer support bracket to the saddle support	M8x20	2	25 Nm (18.44 lb ft)	-



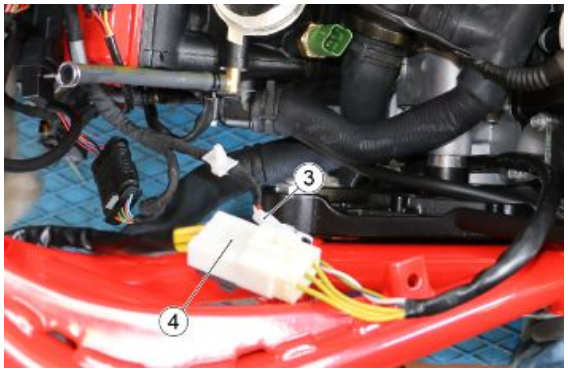
ENGINE - ACCESSORIES - LEVER MECHANISMS

Pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head screw used for fastening the pinion	M10x1.25x26	1	50 Nm (36.88 lb ft)	Pre-impregnated screw
2	Cyl. head, hex. socket screw used for fastening the gear lever to the gear-box output shaft	M6x20	1	10 Nm (7.38 lb ft)	-
3	TORX screw used for fastening the gear lever pedal	M6x22	1	8 Nm (5.90 lb ft)	Loct. 270
4	Flanged, hex. head screws used for fastening the pinion cover guard	M6x12	2	10 Nm (7.38 lb ft)	-

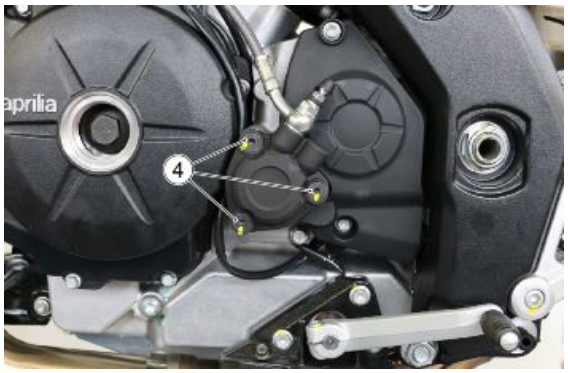
Vehicle preparation

- Disconnect the battery and remove the fuel tank, the coolant radiator and the exhaust system.
- Remove the filter box and disconnect the water temperature sensor connector (1).

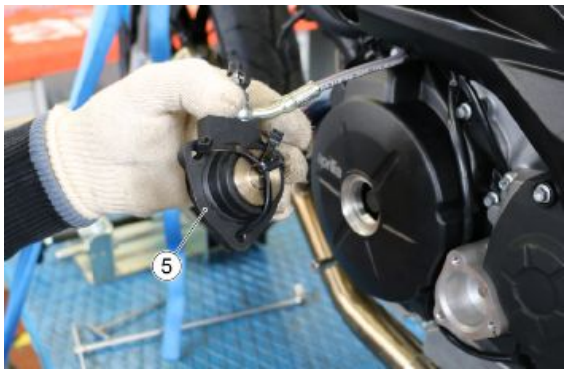
- Disconnect the timing sensor (3) and the voltage regulator connectors (4).



- Remove the three clutch pump fastening screws (4).



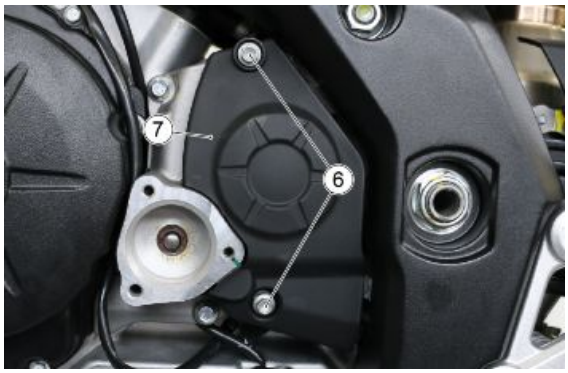
- Remove the clutch pump (5) and use the clamps to secure the pump so that the piston cannot fall out.



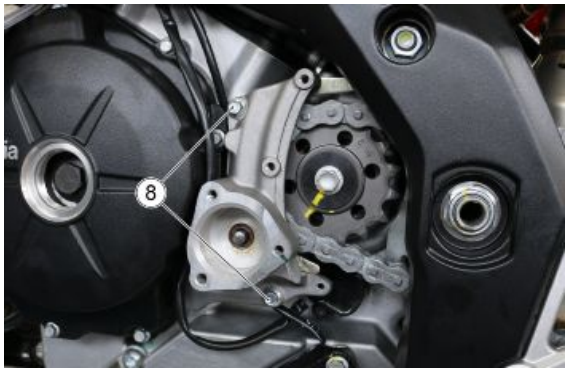
See also

Fuel tank
Removing the radiator
Removing the tail pipe
Removing the exhaust manifold

- Remove the two screws (6) used to fasten the pinion cover (7), taking care to retrieve the respective bushings.
- Remove the cover (7).

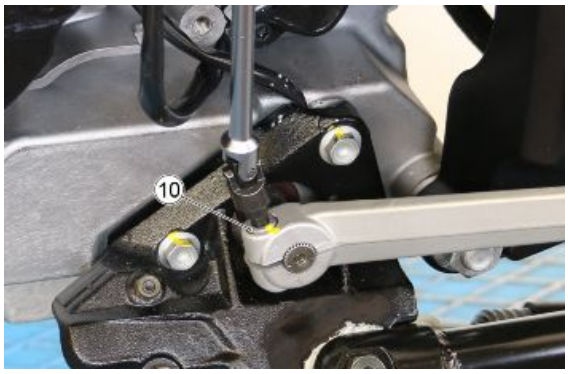


- Remove the two clutch pump support fastening screws (8).



- Remove the clutch pump support (9).

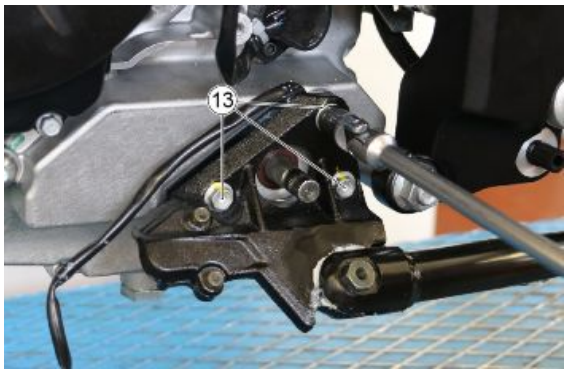
- Loosen the screws (10) used to fasten the gear lever.



- Remove the gear lever (11)

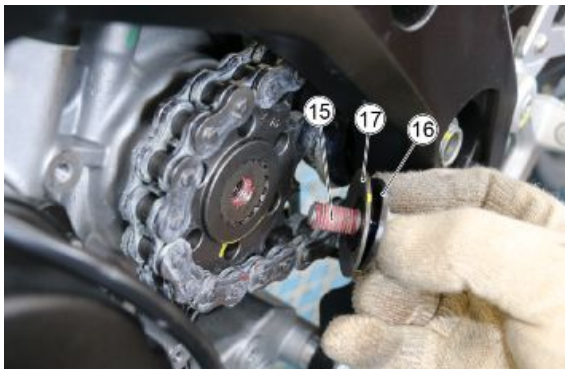
- Disconnect the vehicle stand switch connector (12).

- Remove the three screws (13) used to fasten the stand support.



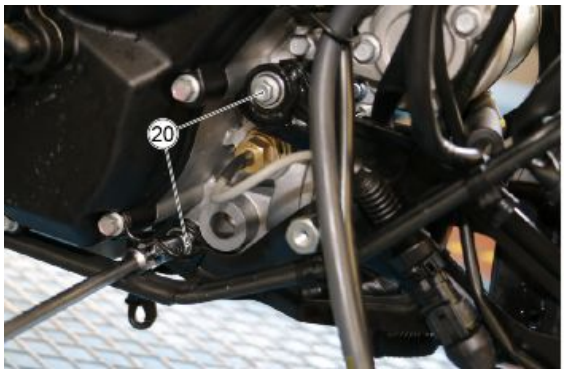
- Remove the stand support (14).

- Remove the screw (15) used to fasten the pinion, retrieving the washer (16) and the spring washer (17) and taking care to reposition them correctly during reassembly.

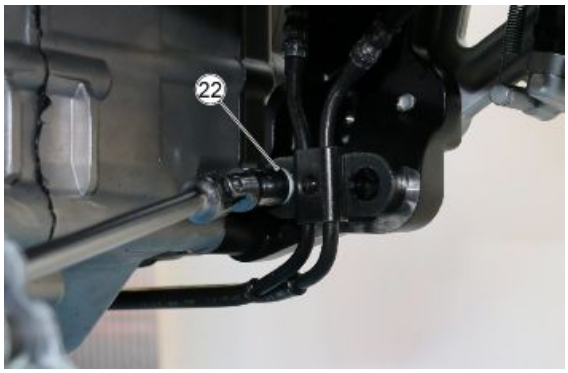


- Remove the pinion (18) and detach the drive chain (19).

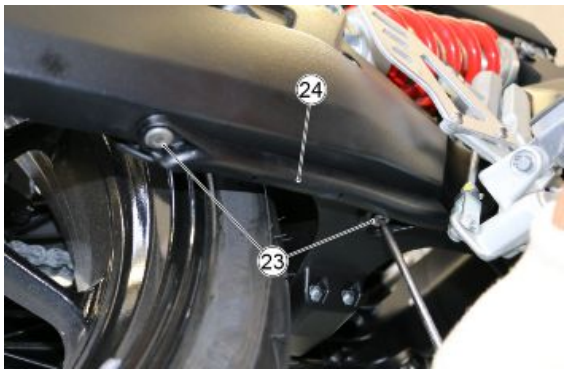
- Working on both sides of the vehicle, remove the screws (20) used to fasten the ABS support, taking care to retrieve the spacer (21).



- Access the left hand side of the motorcycle and remove the screw (22) used to fasten the cable clamp positioned inside the frame, on the left hand side.



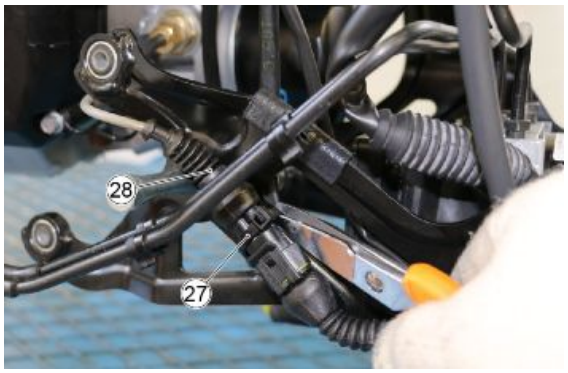
- Remove the two screws (23) used to secure the cable clamp (24) positioned under the swingarm, and remove it.



- Remove the two screws (25) used to fasten the right hand rider's footrest.

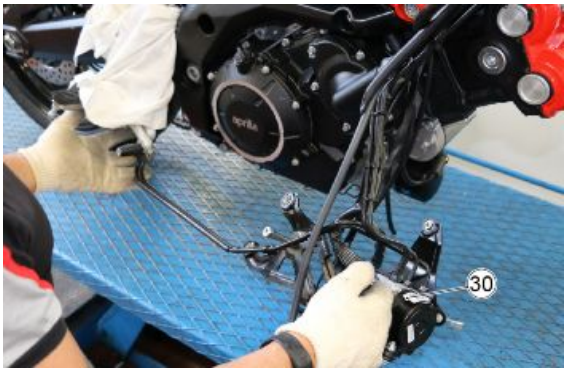
- Disconnect the engine oil pressure sensor connector (26).

- Remove the clamp (27), disconnect the connector (28) from the sensor ... and free the wiring harness.



- Remove the two screws (29) used to fasten the plate positioned under the steering headstock.

- Move the complete ABS system (30) towards the outside so that it is easier to remove the engine.



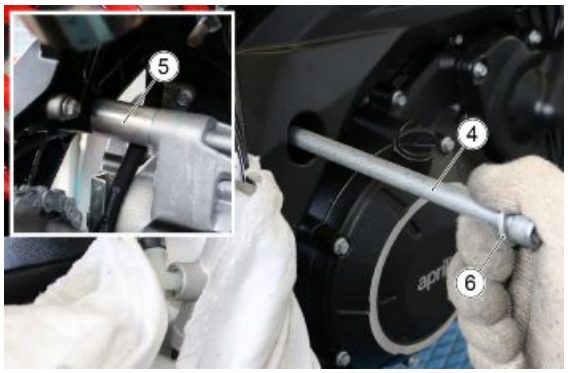
Removing the engine from the vehicle

- Carry out the operations described in the vehicle preparation procedure.
- Access the left hand side of the motorcycle, unscrew the upper central nut (1) and remove it.

- Access the left hand side of the motorcycle, unscrew the lower nut (2) and remove it.

- Access the left hand side of the motorcycle, unscrew the front nut (3) and remove it.

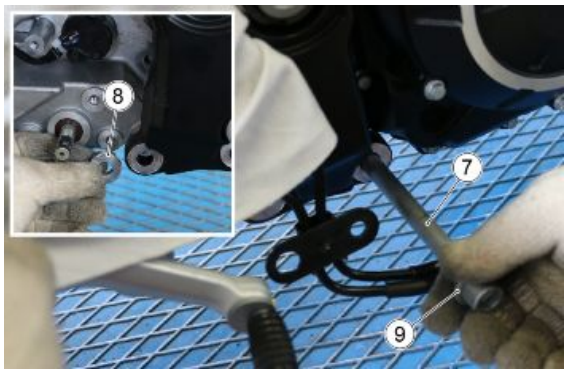
- Access the right hand side of the motorcycle, partially extract the central pin (4) and remove the spacer (5) position on the internal, left hand side of the frame.
- Remove the pin (4), complete with washer (6).



See also

Vehicle preparation

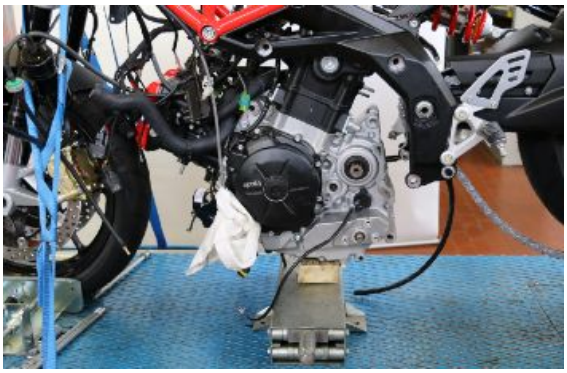
- Access the right hand side of the motorcycle, partially extract the lower pin (7) and remove the spacer (8) positioned inside the frame, on the left hand side.
- Remove the pin (7), complete with washer (9).



- Access the right hand side of the motorcycle, partially extract the front pin (10) and remove the spacer (11) positioned inside the frame, on the left hand side.
- Remove the pin (10), complete with washer (12).

- Position a central stand in order to support the engine and a trestle under the rear of the motorcycle in order to raise it.
- Lower the engine partially, unscrew the screws (13) used to fasten the earth cables to the engine, and remove them.

- Lower the engine completely, and raise the rear of the motorcycle so that it is possible to remove the engine completely.



Installing the engine to the vehicle

NOTE

IN ORDER TO INSTALL THE ENGINE ON THE VEHICLE, REPEAT THE "REMOVING THE ENGINE FROM THE VEHICLE" PROCEDURE IN REVERSE ORDER, AND CARRY OUT THE "PREPARING THE VEHICLE" PROCEDURE.

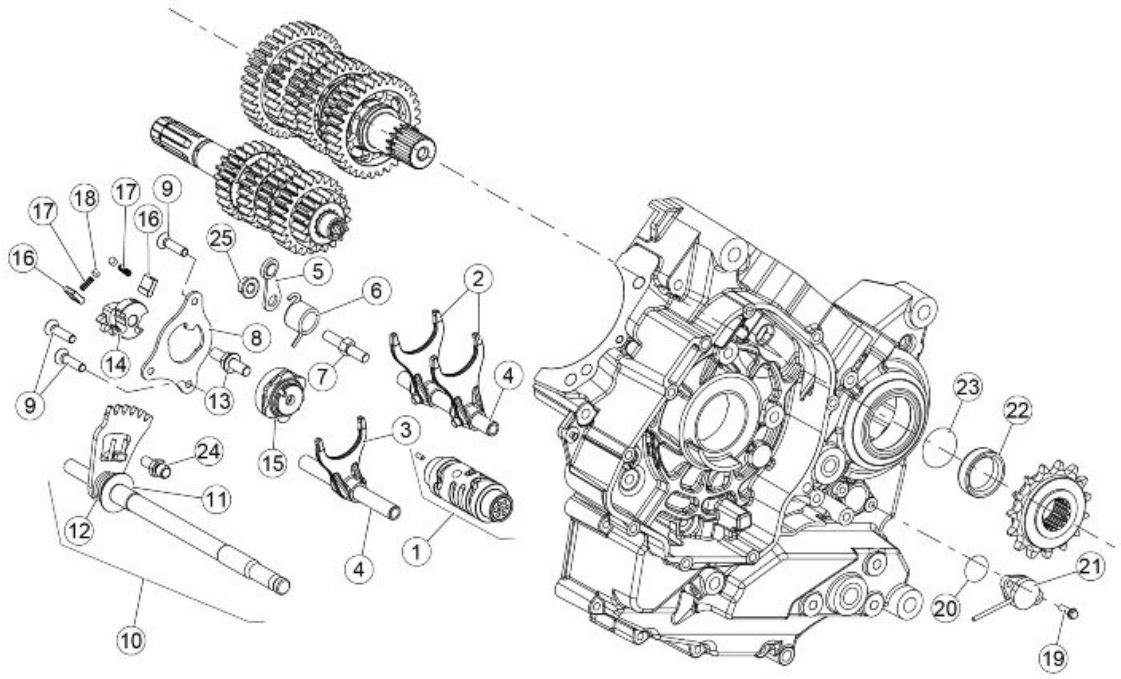
See also

Removing the engine from the vehicle
Vehicle preparation

INDEX OF TOPICS

Gearbox

Diagram



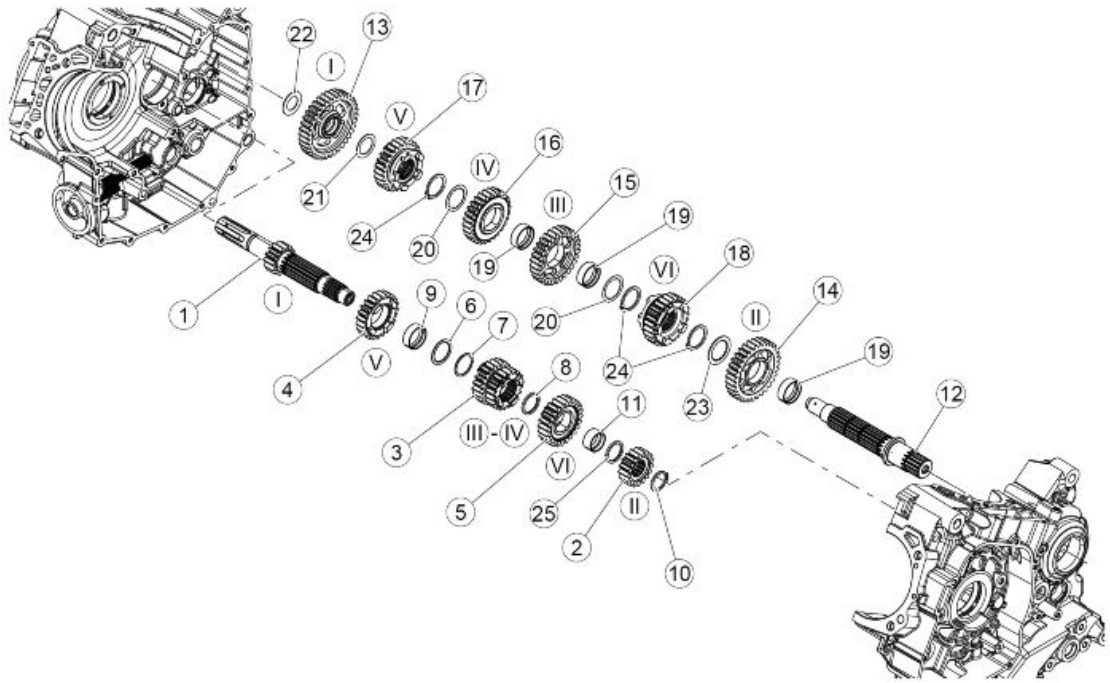
Key

1. Complete desmodromic
2. Fork
3. Primary fork
4. Fork shaft
5. complete index lever
6. Gear stopper lever spring
7. Threaded rod
8. Selector stopper plate
9. Screw
10. Selector shaft
11. Flat washer 14x30x1
12. Selector spring
13. Threaded rod M8x1.25
14. Selector sprocket
15. Gear selector drum
16. Sprocket ratchet

17.Spring
18.Tip for spring
19.Domed head torx screw
20.O-Ring
21.Gear sensor
22.Spacer
23.O-Ring
24.Selector stopper
25.Self-locking nut

Gearbox shafts

Gearbox shafts diagram



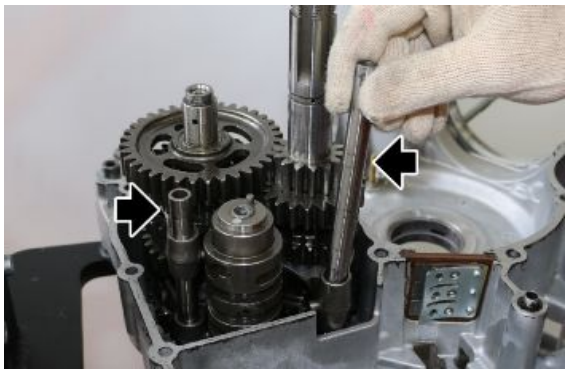
Key:

1. Primary transmission shaft Z=14
2. 2nd gear on primary Z=17
3. 3rd - 4th gear on primary Z=20/22
4. 5th gear on primary Z=23
5. 6th gear on primary Z=24
6. Shoulder washer
7. Snap ring

8. Shoulder washer
9. Shoulder washer
10. Snap ring
11. Floating bushing
12. Secondary transmission shaft
13. 1st gear on secondary Z=36
14. 2nd gear on secondary Z=32
15. 3rd gear on secondary Z=30
16. 4th gear on secondary Z=28
17. 5th gear on secondary Z=26
18. 6th gear on secondary Z=25
19. Floating bushing
20. Shoulder washer
21. Shoulder washer
22. Shoulder washer
23. Shoulder washer
24. Snap ring
25. Shoulder washer
26. Floating bushing

Disassembling the gearbox

- Remove the gear shift selector as described in the Crankcase Opening section.
- Remove the two fork pins.



- Extract the desmodromic control.

- Remove the three gear selection forks.

CAUTION

THE FORK FOR THE PRIMARY SHAFT IS SMALLER THAN THAT OF THE SECONDARY SHAFT.
THE FORKS FOR THE SECONDARY SHAFT ARE THE SAME.

- Remove the shim.

- Carefully turn the engine support.
- Carefully extract the entire gearbox assembly.

FITTING

- Repeat the removal operations in the opposite order, taking care to check that the shim is present on the secondary shaft.

VERIFICATION OF PINION FASTENING ON SECONDARY SHAFT

Perform the following procedure in order to check the hole for fastening the pinion onto the gearbox's secondary shaft.

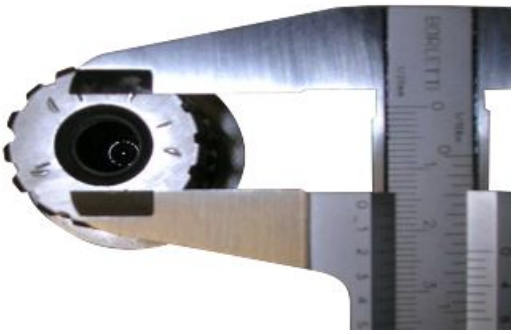
- Measure the external diameter of the countersink on the hole for fastening the pinion onto the secondary shaft.
- In order to reduce the measurement error, lock the bore gauge after having set it to 15.5 mm, then check whether the two ferrules are inside or outside the countersink.

CAUTION

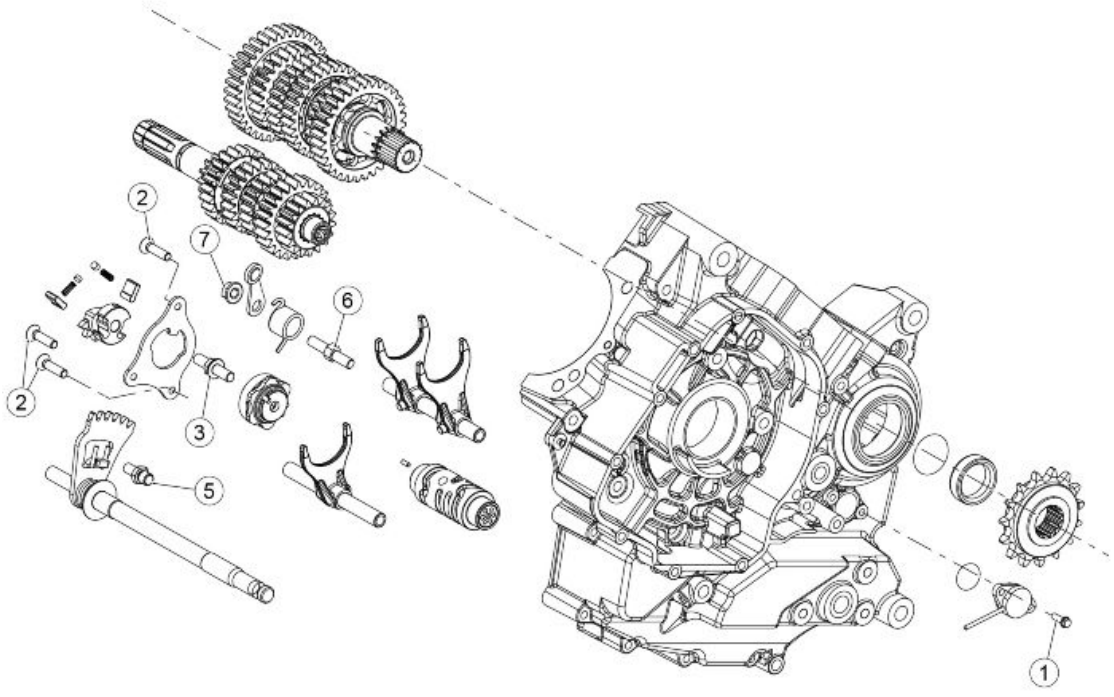
THE RELIABILITY OF THE MEASURED VALUE IS FUNDAMENTAL.

- If the external diameter of the countersink is equal to or less than 15.50 mm, rework the threading with a male M10 x 1.25. Use a manual male finisher or a low input machine series male.
- Blow with compressed air.
- Wash with degreasing spray.
- Blow with compressed air.
- Replace the pinion's fastening elements with upgraded fastening elements, as indicated in the Spare Parts Catalogue.

- If the external diameter of the countersink is greater than 15.50 mm, replace the secondary shaft and the pinion's fastening elements with upgraded components, as indicated in the Spare Parts Catalogue.



Gear selector

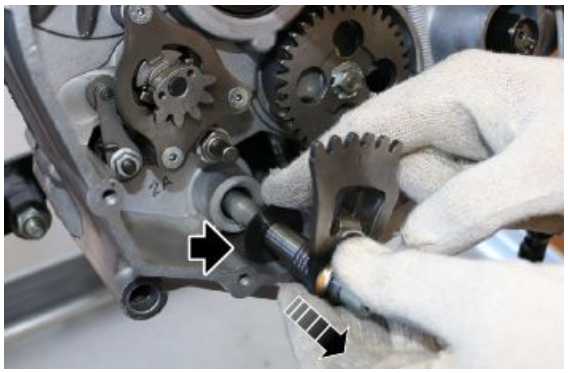


GEAR SELECTOR

Pos.	Description	Type	Quantity	Torque	Notes
1	Gear sensor fastening screw	M5	2	6 Nm (4.43 lb ft)	Loct. 270
2	Selector plate fastening screw	M5x12	3	5 Nm (3.69 lb ft)	3M SCOTCH GRIP 2353
3	Desmodromic drum/sprocket fastening screw	M8x1.25x17	1	15 Nm (11.06 lb ft)	3M SCOTCH GRIP 2353
4	Selector pin fastening screw	M10x1.5	1	16 Nm (11.80 lb ft)	Loct. 242
5	Ratchet pin fastening screw	M6	1	12 Nm (8.85 lb ft)	Loct. dry loc 2040

Removing the gear selector

- After having removed the clutch side cover and the complete clutch, the gear shift selector shaft can be extracted, taking care to retrieve the flat washer.

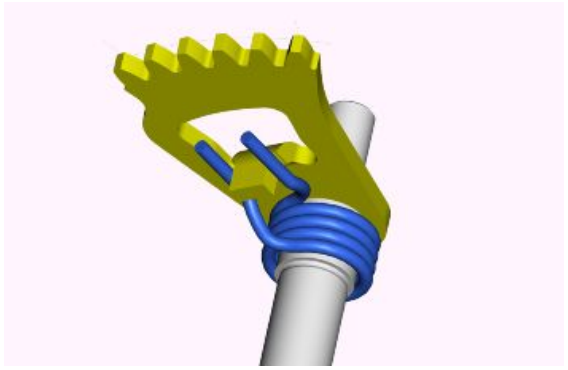


Checking the gear selector

Selector spring

Make sure that the spring ends on the two shifting positions (forward = downshifting and backward = up-shifting) are always in contact with the selector plate

Make sure that the clearance between the end of the spring on the selector plate and the stop pin is almost null, when in home position (see diagrams)

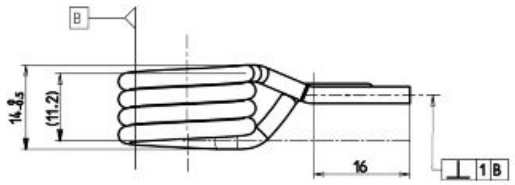


Pawl

Make sure that both pawl tips run free, without jamming

Selector plate spring

With a thickness gauge, check that the spring is not deformed by over-stretching.



Gearbox Selector Shaft

Removal

- Place the left hand crankcase in a press and extract the roller cage with the specific tool.

NOTE

REPEAT THE SAME OPERATION FOR THE RIGHT HAND CRANKCASE HALF.

Specific tooling

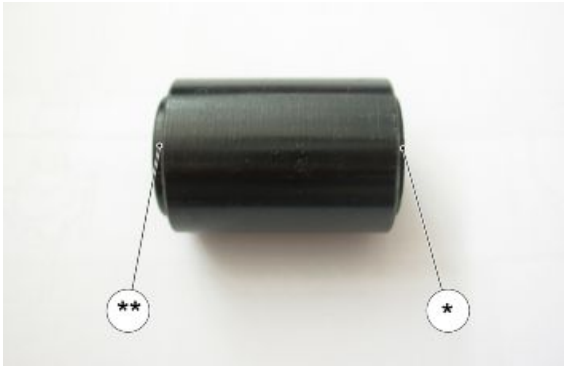
020724Y Punch cage with rollers gearbox control stem

INSTALLATION

- Place the left hand crankcase in a press and install the roller cage with the specific tool.

CAUTION

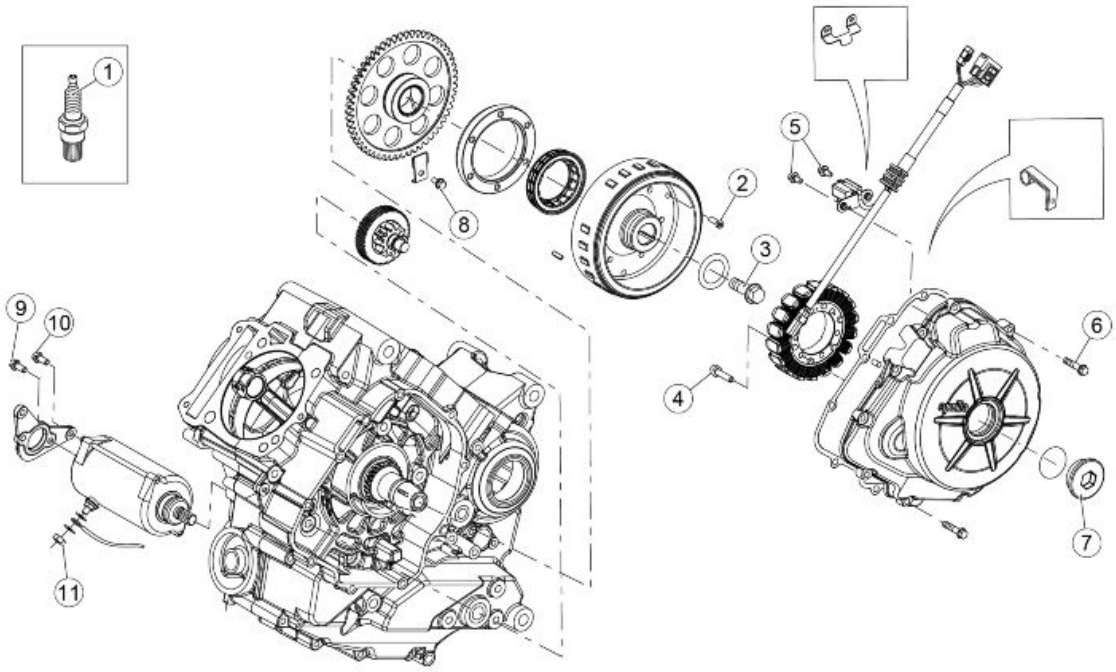
TO INSTALL THE ROLLER CAGE IN THE RIGHT HAND CRANKCASE HALF, WORK WITH THE CYLINDER ON THE SIDE OF THE 1 mm (*) STEP ON THE TOOL TURNED TOWARD THE ROLLER CAGE, WHEREAS TO INSTALL THE CAGE IN THE LEFT HAND CRANKCASE HALF, USE THE CYLINDER ON THE SIDE OF THE 2 mm (**) STEP ON THE TOOL.



Specific tooling

020724Y Punch cage with rollers gearbox control stem

Starter motor

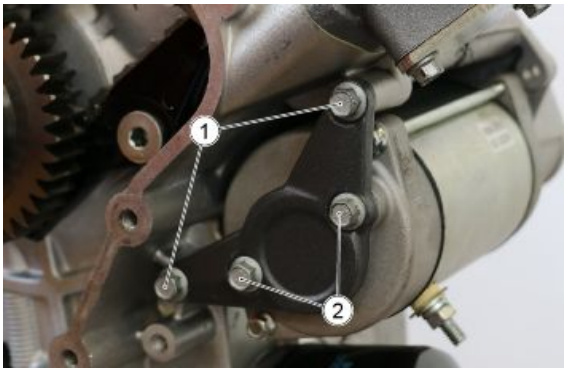


IGNITION

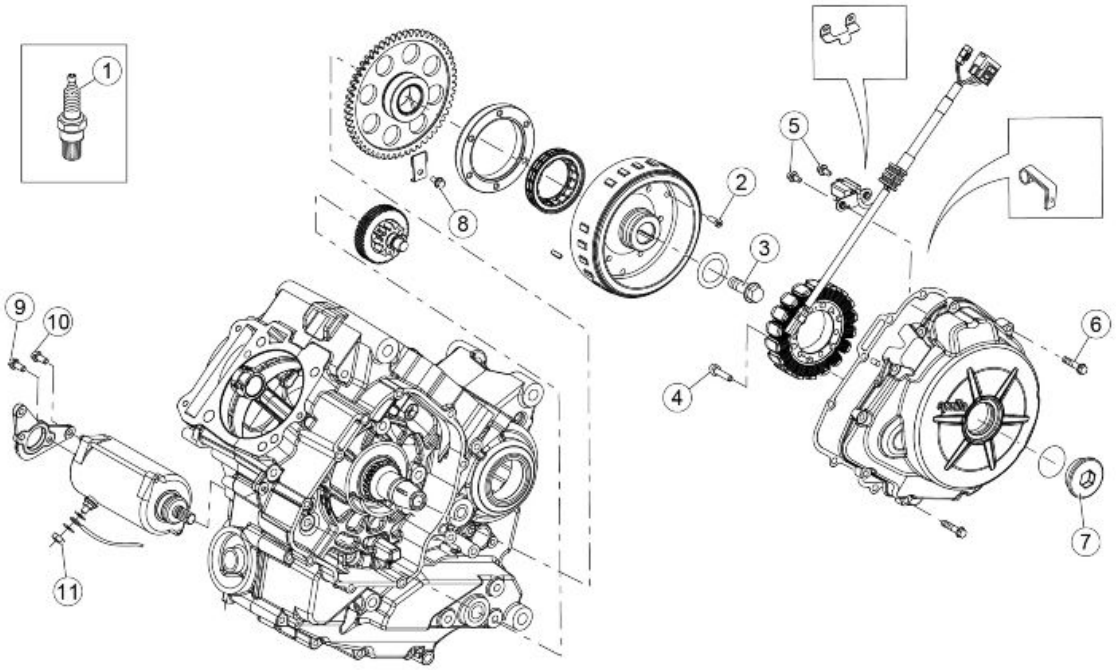
Pos.	Description	Type	Quantity	Torque	Notes
1	Spark plug	-	2	13 Nm (9.59 lb ft)	-
2	Free wheel ring fastening screw	M6x18	6	14 Nm (10.33 lb ft)	3M SCOTCH GRIP 2353
3	Rotor fastening screw - Crankshaft	M14x1.5	1	191 Nm (140.87 lb ft)	Thoroughly de-grease both of the coupling surfaces
4	Stator fastening screw / Flywheel cover	M6x30	3	9 Nm (6.64 lb ft)	-
5	Pick-up fastening screw / Flywheel cover	M5x14	2	3 Nm (2.21 lb ft)	Loct. 270
6	Flywheel cover fastening screw	M6x30	10	13 Nm (9.59 lb ft)	-
7	Crankshaft access plug	-	1	4 Nm (2.95 lb ft)	-
8	Crown containment plate fastening screw	M6x12	1	8 Nm (5.90 lb ft)	-
9	Bracket to starter motor fastening screw	M6x14	2	7 Nm (5.16 lb ft)	Loct. 242
10	Starter motor bracket to crankcase fastening screw	M6x16	2	13 Nm (9.59 lb ft)	-

Removing the starter motor

- In order to remove the starter motor complete with the support bracket, it is necessary to remove the two screws (1).
- If the bracket needs to be removed from the starter motor, first remove the two screws (2) and then the other screws (1).



Generator side



IGNITION

Pos.	Description	Type	Quantity	Torque	Notes
1	Spark plug	-	2	13 Nm (9.59 lb ft)	-
2	Free wheel ring fastening screw	M6x18	6	14 Nm (10.33 lb ft)	3M SCOTCH GRIP 2353
3	Rotor fastening screw - Crankshaft	M14x1.5	1	191 Nm (140.87 lb ft)	Thoroughly de-grease both of the coupling surfaces
4	Stator fastening screw / Flywheel cover	M6x30	3	9 Nm (6.64 lb ft)	-
5	Pick-up fastening screw / Flywheel cover	M5x14	2	3 Nm (2.21 lb ft)	Loct. 270
6	Flywheel cover fastening screw	M6x30	10	13 Nm (9.59 lb ft)	-
7	Crankshaft access plug	-	1	4 Nm (2.95 lb ft)	-
8	Crown containment plate fastening screw	M6x12	1	8 Nm (5.90 lb ft)	-

Pos.	Description	Type	Quantity	Torque	Notes
9	Bracket to starter motor fastening screw	M6x14	2	7 Nm (5.16 lb ft)	Loct. 242
10	Starter motor bracket to crankcase fastening screw	M6x16	2	13 Nm (9.59 lb ft)	-

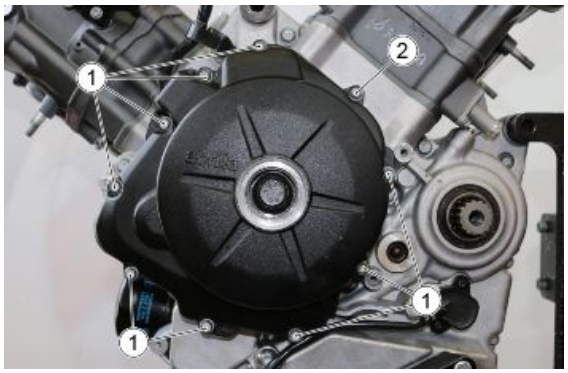
Removing the flywheel cover

- Remove the flywheel cover inspection cap.

- Unscrew and remove the ten screws (1 - 2).

NOTE

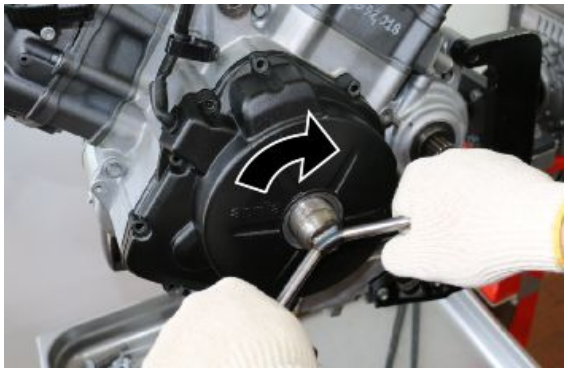
THE SCREW (2) FOR THE FLYWHEEL COVER IS SHORTER THAN THE OTHER SCREWS (1).



- Position the appropriate tool in screw it in a clockwise direction until the flywheel cover has been partially extracted.

Specific tooling

020712Y Handle for removing the flywheel cover



- Remove the flywheel cover.

Specific tooling

020712Y Handle for removing the flywheel cover

Removing the flywheel cover components

- Remove the two pick-up fixing screws.

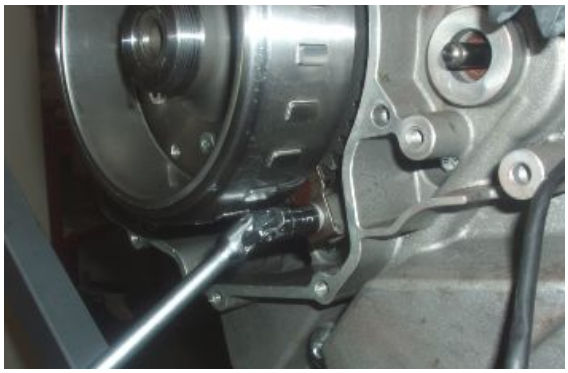
- Remove the three stator fixing screws.

CAUTION

THE PICK-UP AND STATOR SHALL BE REMOVED SIMULTANEOUSLY AS THEY ARE PART OF THE SAME ELECTRICAL BRANCH.

Magneto flywheel removal

- Remove the flywheel cover.
- Unscrew and remove the screw and remove the retention plate.



- Use a heater to heat the flywheel magnet.
- Use the appropriate tool to block the flywheel and loosen the screw.

Specific tooling

020713Y Flywheel extractor

- Remove the tool from the rotor and remove the screw complete with the washer.

- Screw the special tool's left-handed pin onto the outer body.
- Keeping the outer body blocked, screw in the pin in such a way as to extract the flywheel from the crankshaft.

Specific tooling

020713Y Flywheel extractor

- Unscrew and remove the special tool's left-handed pin from the outer body.
- Unscrew the screw from the crankshaft.

Specific tooling

020713Y Flywheel extractor

- Remove the flywheel complete with the free wheel

- Retrieve the wrench from the crankshaft.

- Remove the starter's transmission gear bearing.
- In the event of a malfunction, the starter's transmission gear bearing cannot be overhauled and must be completely replaced.

Freewheel removal

- Heat the magneto flywheel with the specific heater.
- Undo and remove the six screws.
- Remove the freewheel from the magneto flywheel.

Installing the flywheel

- Insert the starter's transmission gear, after having coated it with a layer of grease.

- Apply the wrench to the crankshaft.

- Apply the flywheel to the crankshaft.

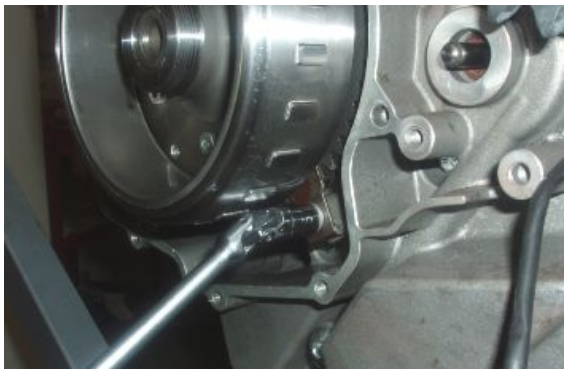
- Apply the screw and the washer without tightening.

- Position the appropriate tool to lock the flywheel in place.
- Holding the flywheel still using the appropriate tool, tighten the screw on the crankshaft.
- Remove the special tool.

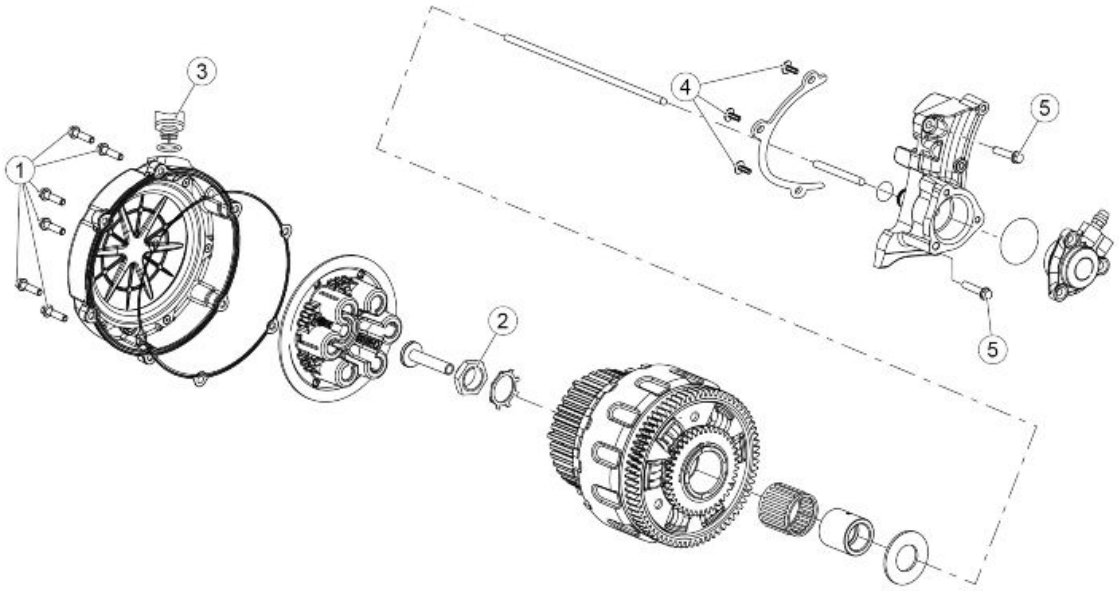
Specific tooling

020713Y Flywheel extractor

- Position the retention plate.
- Tighten the screw.

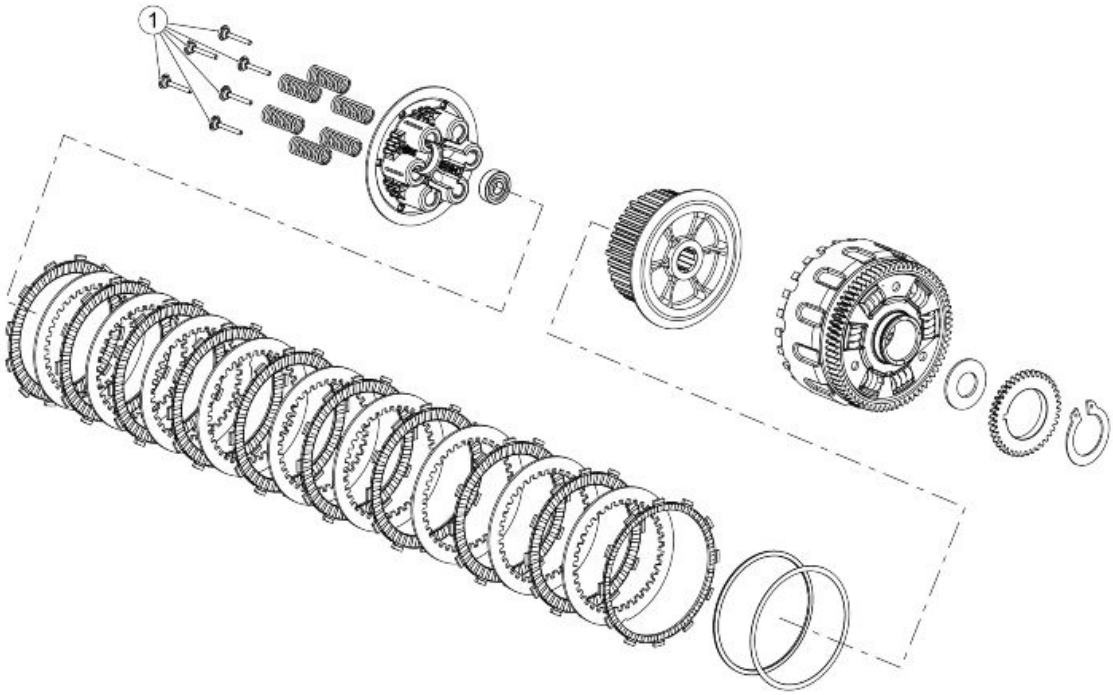


Clutch side



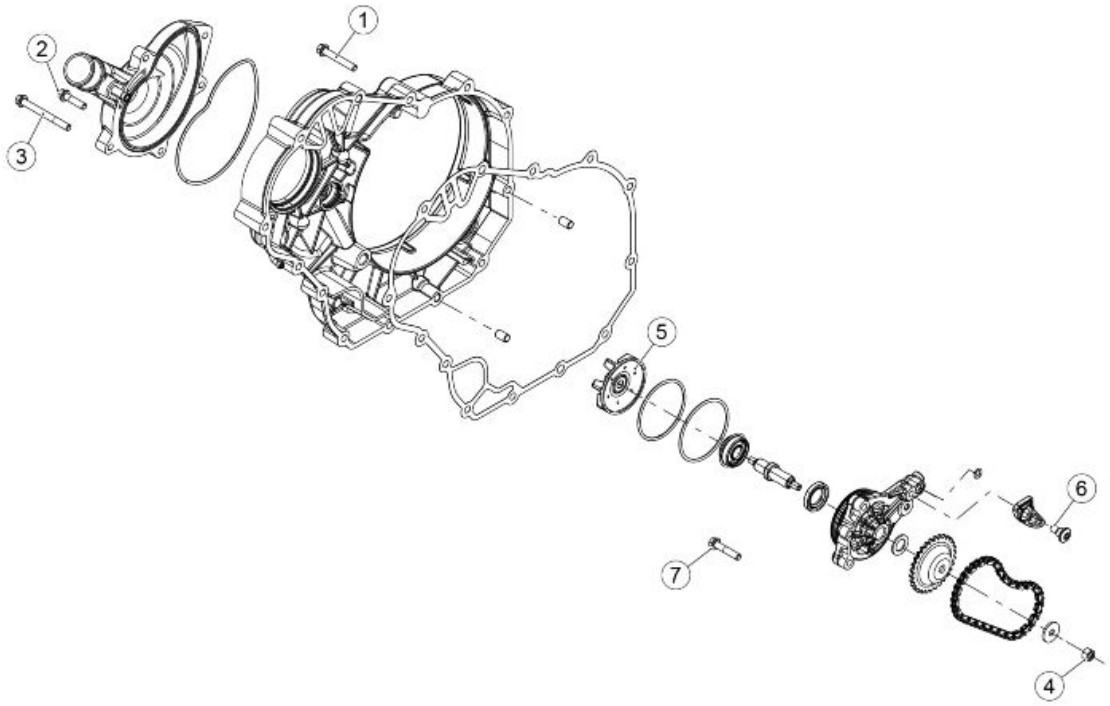
CLUTCH COVER

Pos.	Description	Type	Quantity	Torque	Notes
1	Clutch cover / Clutch side cover fastening screw	M6	6	13 Nm (9.59 lb ft)	-
2	Clutch fastening nut	M24x1.5	1	177 Nm (130.55 lb ft)	Chamfer
3	Oil filler cap on clutch cover	M25x1.25	1	2 Nm (1.48 lb ft)	-
4	Clutch Control Plate / Support countersunk hex head fastening screw	M5x12	3	5 Nm (3.69 lb ft)	3M SCOTCH GRIP 2353
5	Flywheel side clutch control support / half-crankcase fastening screw	M6	2	13 Nm (9.59 lb ft)	-



CLUTCH

Pos.	Description	Type	Quantity	Torque	Notes
1	Clutch spring fastening screw	M6	6	12 Nm (8.85 lb ft)	-

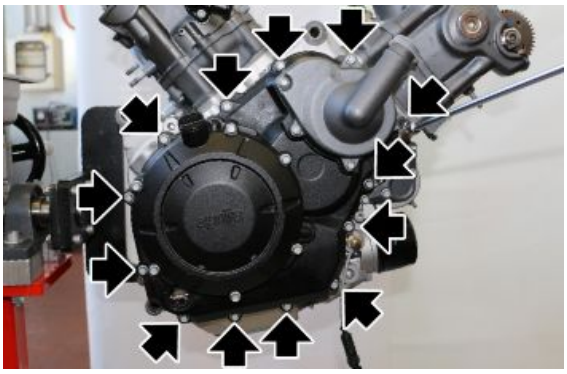


WATER PUMP

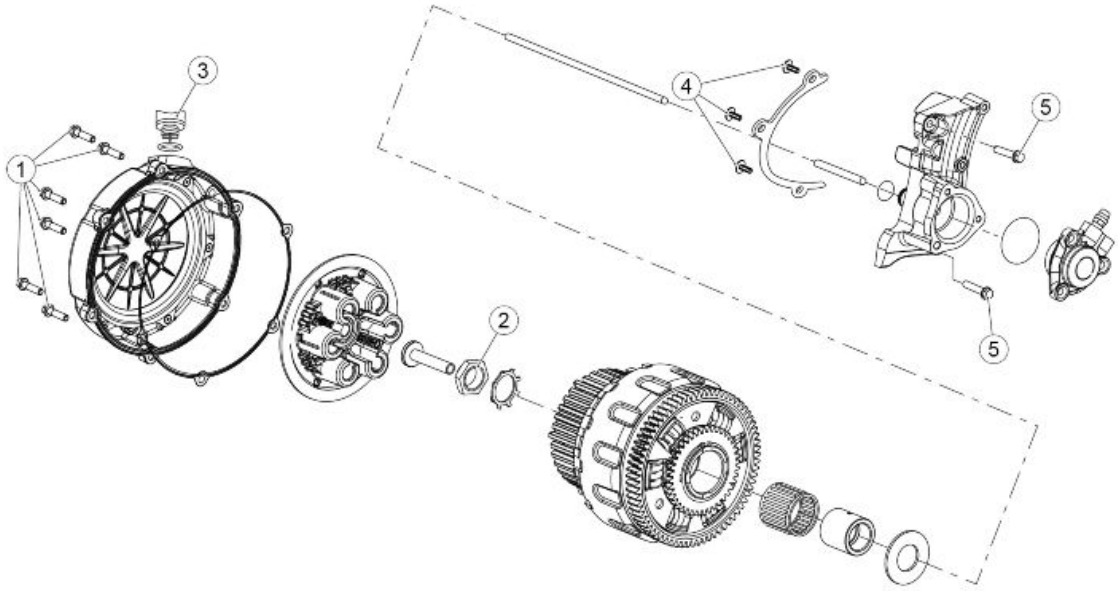
Pos.	Description	Type	Quantity	Torque	Notes
1	Clutch side cover fixing screw	M6x40	13	13 Nm (9.59 lb ft)	-
2	Pump cover / Clutch side cover fastening screw	M6x25	3	13 Nm (9.59 lb ft)	-

Pos.	Description	Type	Quantity	Torque	Notes
3	Pump cover / Clutch cover / clutch side half-crankcase fastening screw	M6x60	2	13 Nm (9.59 lb ft)	-
4	Water pump control crown fastening nut	M6	1	12 Nm (8.85 lb ft)	Loct. 244
5	Water pump impeller (brass insert)	M6	1	4 Nm (2.95 lb ft)	-
6	Flanged hex head screw for fastening the chain tensioner slider	M6x12	1	9 Nm (6.64 lb ft)	Loct. 242
7	Pump support fastening screw	M6x30	3	12 Nm (8.85 lb ft)	-

- Remove the water pump cover.
- Undo and remove the eleven screws working in a diagonal sequence.
- Collect the gasket.



Removing the clutch cover



CLUTCH COVER

Pos.	Description	Type	Quantity	Torque	Notes
1	Clutch cover / Clutch side cover fastening screw	M6	6	13 Nm (9.59 lb ft)	-
2	Clutch fastening nut	M24x1.5	1	177 Nm (130.55 lb ft)	Chamfer
3	Oil filler cap on clutch cover	M25x1.25	1	2 Nm (1.48 lb ft)	-
4	Clutch Control Plate / Support countersunk hex head fastening screw	M5x12	3	5 Nm (3.69 lb ft)	3M SCOTCH GRIP 2353

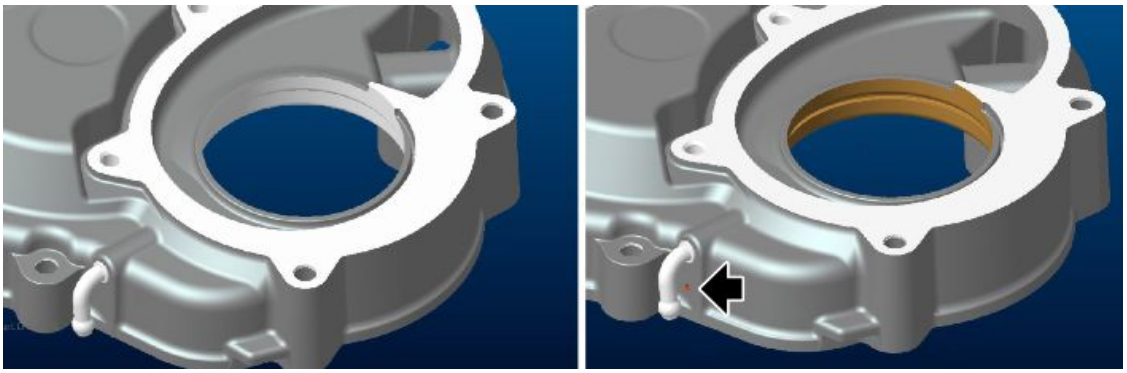
Pos.	Description	Type	Quantity	Torque	Notes
5	Flywheel side clutch control support / half-crankcase fastening screw	M6	2	13 Nm (9.59 lb ft)	-

Based on the engine design development, there are two types of clutch crankcases, associated to the specific water pumps.

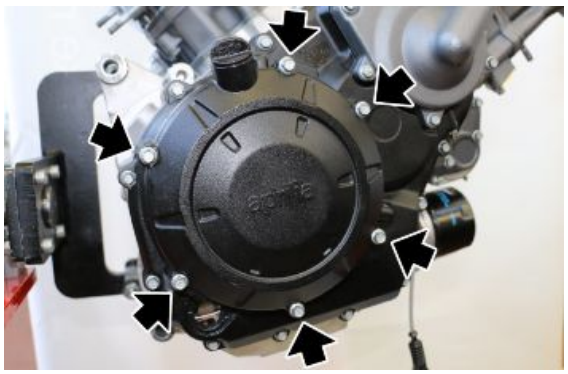
The second generation cover is distinguished through punch marks, as indicated in the image.

CAUTION

THE CLUTCH CRANKCASES MUST BE COUPLED TO THE CORRESPONDING WATER PUMPS. THE COMPONENTS ARE NOT INTERCHANGEABLE.
THE CRANKCASE WITH THE PUNCH MARKS MUST BE COUPLED TO THE WATER PUMP WITH PUNCH MARKS.
INCORRECT COUPLING MAY CAUSE SERIOUS DAMAGE TO THE ENGINE.

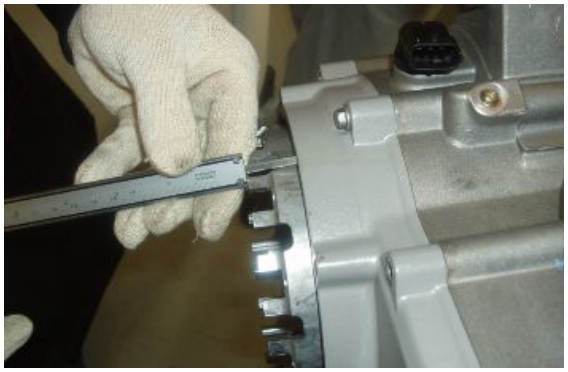


- Unscrew and remove the retaining screws.
- Remove the clutch cover.



The removal of the clutch cover is recommended for the replacement of the clutch discs. If the entire clutch unit is removed, it is recommended to remove the clutch side crankcase.
However, the entire clutch unit can be removed, by removing only the clutch cover. In this case, perform the following operations:

- measure the overhang of he clutch housing from the crankcase, before removal;

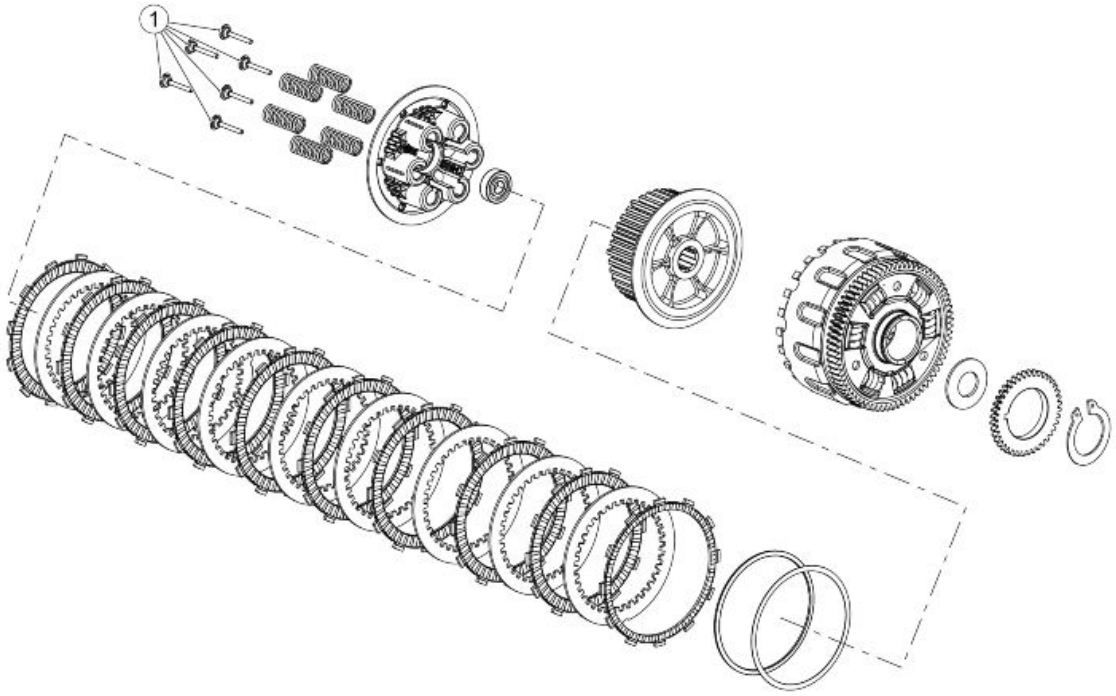


- upon refitting, before tightening the clutch nut, check that the measure has not changed. If it is different, turn the crank shaft in such a way as to properly align the engine's oil pump control gear on the clutch bell with the oil pump's driven gear.

See also

Removal

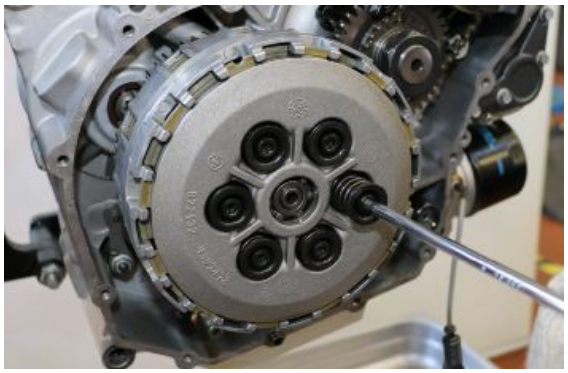
Disassembling the clutch



CLUTCH

Pos.	Description	Type	Quantity	Torque	Notes
1	Clutch spring fastening screw	M6	6	12 Nm (8.85 lb ft)	-

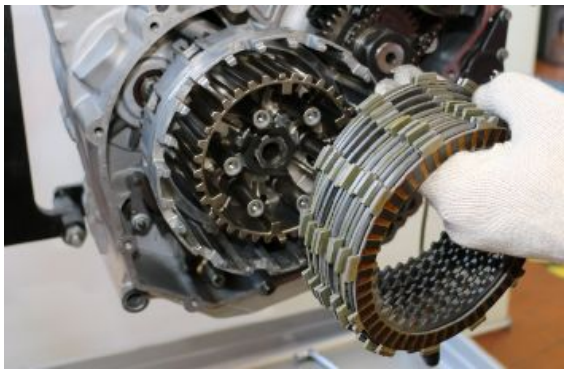
- Remove the clutch crankcase.
- Unscrew and remove the six screws, loosening them by a quarter of a turn at a time, by stages, and working in a diagonal fashion, while recovering the washers and the clutch springs.



- Remove the thrust plate.

- Remove the mushroom-head clutch control rod

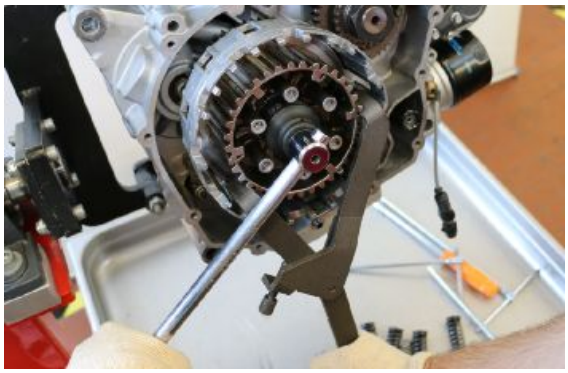
- Remove the discs.



- Block the clutch bell using the appropriate tool and unscrew the nut on the hub.

Specific tooling

9100896 Clutch bell stopper



- Remove the disc spring.

- Remove the clutch hub.

- Remove the special washer between the clutch hub and the clutch bell.

- Remove the clutch bell.

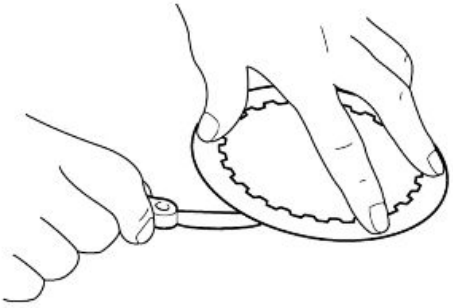
- Retrieve the spacer and the roller bearings.

- Retrieve the shim.

Checking the clutch plates

- Lay the friction discs and steel discs on a level surface and check them for cracks and potential distortions.

Maximum distortion allowed: 0.20 mm (0.0079 in)



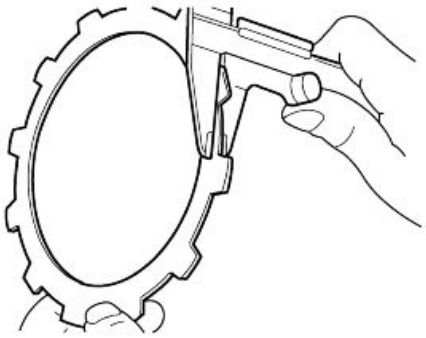
- Measure the driving plate thickness at four positions, replace them all if not complying with specifications.

CAUTION

THE STEEL DISCS MUST SHOW NO SCORES OR TEMPERING COLOUR.

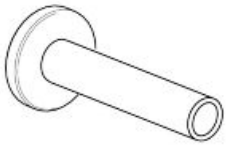
- Measure the thickness of the clutch discs at four positions, replace them if not complying with specifications.

Thickness of nine drive discs: 2.5 mm (0.10 in).
Driven disc thickness: 2,75 - 2,85 mm (0.108 ÷ 0.112 in).



MUSHROOM VALVE CHECK

- Check if the valve slides freely, without jamming.
- Blow compressed air into the valve and check that the lubricating oil passage holes open.



Checking the clutch housing

- Remove the clutch bell.
- Remove the seeger ring.

- Remove the oil pump's drive gear.

DURING REASSEMBLY, THE COLLAR OF THE GEAR MUST ALWAYS BE FACING THE CLUTCH BELL.

- Remove the pin that blocks the rotation of the oil pump control gear.

Check for any damage or signs of wear on the clutch bell that could lead to irregular clutch functionality. Grind down the teeth or replace the bell if necessary.

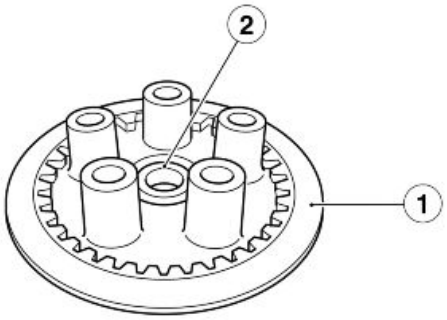
PRIMARY DRIVEN GEAR CONTROL

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 bell, if necessary.

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

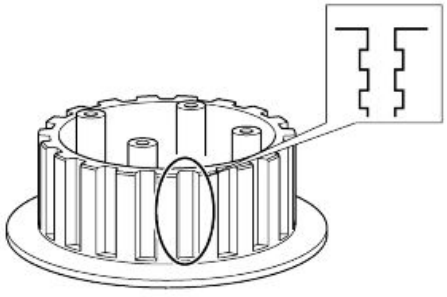
Checking the pusher plate

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



Checking the clutch hub

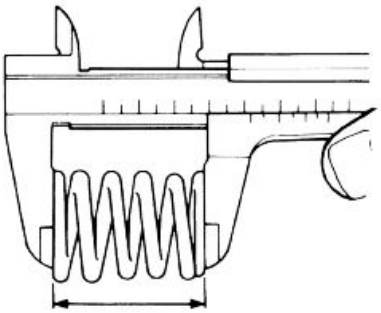
Check the clutch hub for damage and wear that may result in clutch irregular operation. If necessary, replace the bell.



Checking the 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.

Free length of the clutch spring: 66.5 mm (2.62 in)



Assembling the clutch

- Fit the shim washer.

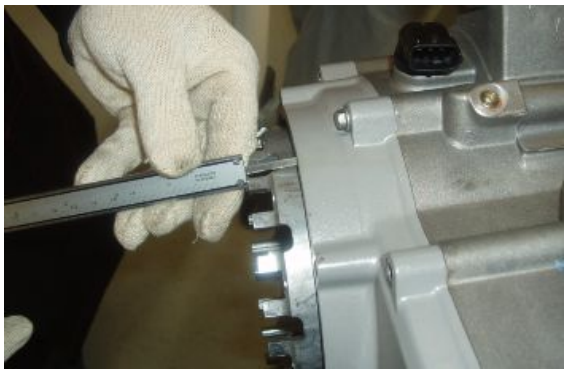
- Fit the needle bearing and the spacer.

- Fit the clutch housing.
- Make sure that the oil pump control drive gear of the clutch housing engages correctly with the oil pump driven gear.

- Place the washer correctly between the clutch housing and the hub.

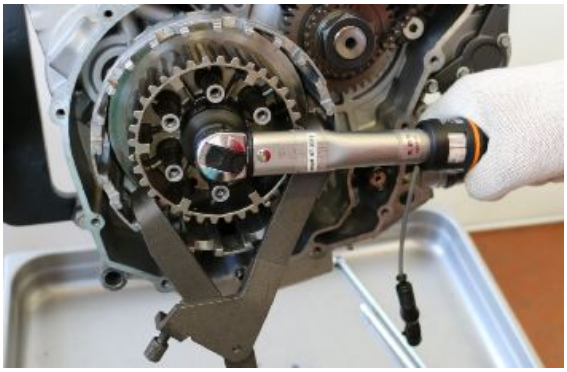
- Position the clutch hub.

- Install the clutch cover.
- Before tightening the clutch nut, check to make sure that the measurement has not changed with respect to that which was measured during the disassembly phase. If it is different, turn the crank shaft in such a way as to properly align the engine's oil pump control gear on the clutch bell with the oil pump's driven gear.



- Insert the safety washer.

- Position the clutch hub nut and tighten it using the appropriate tool.



Specific tooling

9100896 Clutch bell stopper

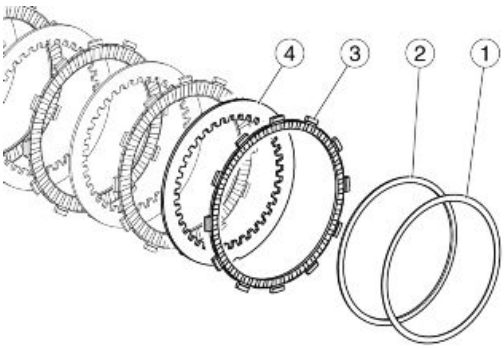
- After having tightened the nut, proceed with the chamfering.

- Insert the flat ring (1).
- Insert the disc ring (2).

CAUTION

MAKE SURE THE DISC RING IS INSERTED FACING THE RIGHT DIRECTION; THE RING'S CONE MUST BE FACING THE ENGINE.

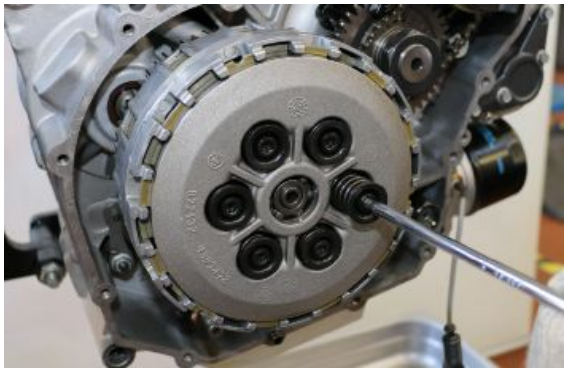
- Insert the turned drive disc (3).
- Insert the nitride steel disc (4).



- Insert the clutch discs starting with the discs with friction material, and alternating them with steel discs.
- Position the control rod.

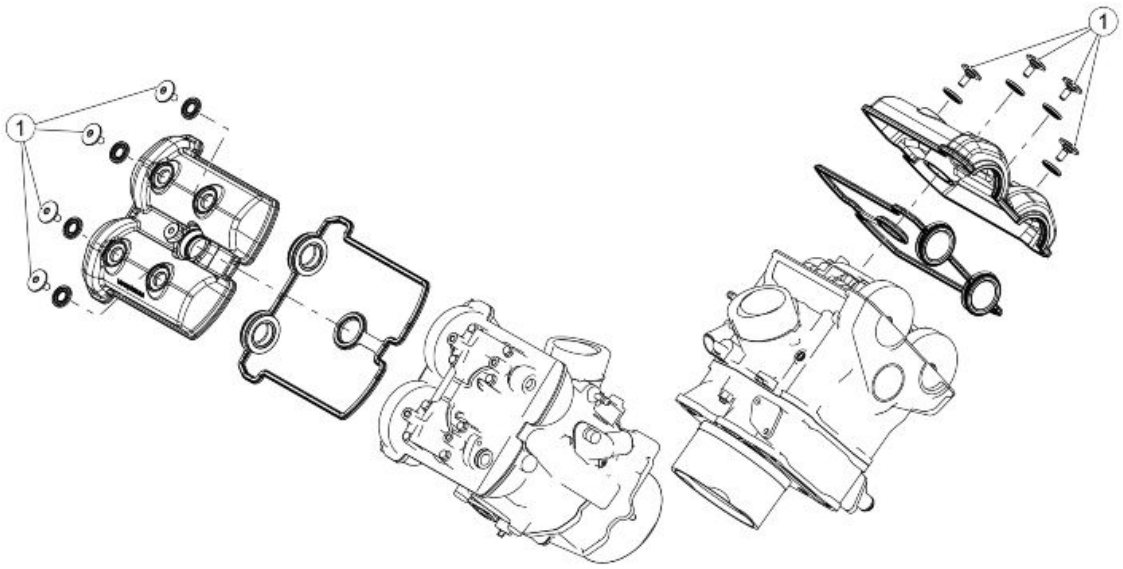
- Position the thrust plate.

- Fit the clutch springs.
- Fit the screw washers.
- Tighten the six screws operating in stages and diagonally.



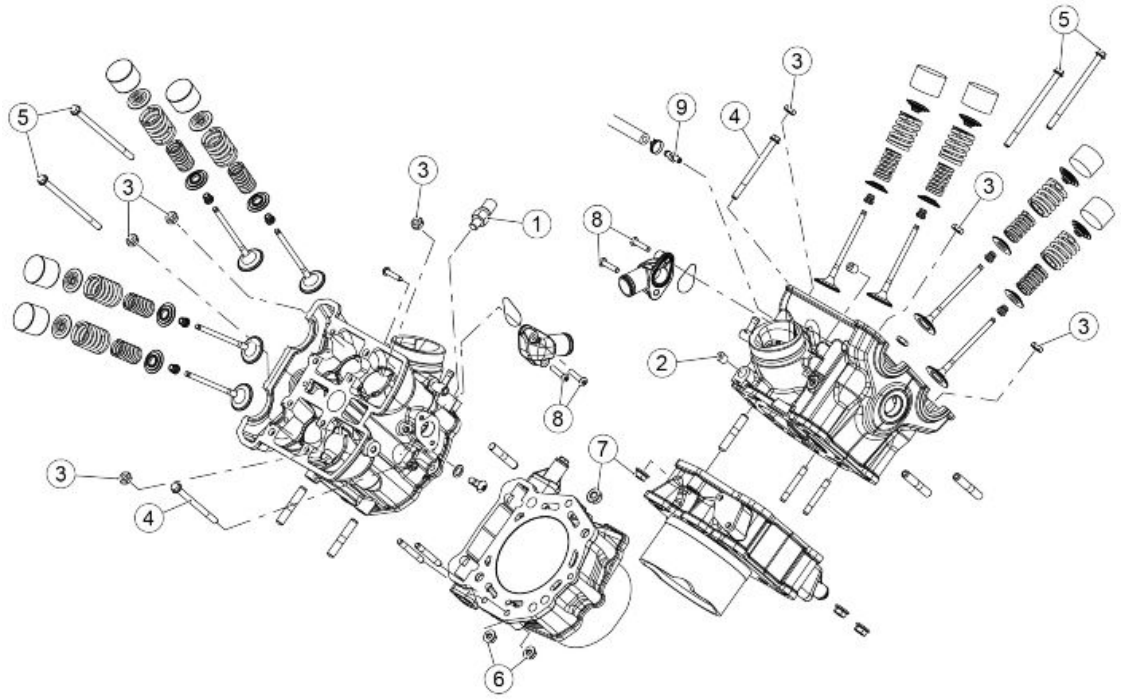
- Replace the gasket upon refitting.

Head and timing



HEAD COVER

Pos.	Description	Type	Quantity	Torque	Notes
1	Special head cover fastening screw	M6	8	9 Nm (6.64 lb ft)	-



HEAD

Pos.	Description	Type	Quantity	Torque	Notes
1	Water Temperature Sensor	M12x1.5	1	20 Nm (14.75 lb ft)	-
2	Threaded plug	M12x1.5	1	10 Nm (7.38 lb ft)	Loct. drise AL 506
3	Nut for fastening the stud bolts to the head - Pre-tightening	M10x1.25	8	13 Nm (9.59 lb ft)	Lubricate the threads before tightening
3	Nut for fastening the stud bolts to the head - Tightening	M10x1.25	8	135° + 135°	-
4	Head / Cylinder / Crankcase fastening outside	M6x75	2	13 Nm (9.59 lb ft)	-
5	Head / Cylinder / Crankcase fastening inside	M6x125	4	13 Nm (9.59 lb ft)	-
6	Nut for fastening the Stud bolts to the Head	M6	4	12 Nm (8.85 lb ft)	-
7	Nut for fastening the Stud bolts to the Head	M8x1.25	2	25 Nm (18.44 lb ft)	-
8	Screw for fastening the connector to the discharge	M5	4	6 Nm (4.43 lb ft)	Loct. dry loc 2040
9	Water vent connector	M6	1	3 Nm (2.21 lb ft)	Loct. 262

Removing the head cover

The following operations are valid for both of the heads.

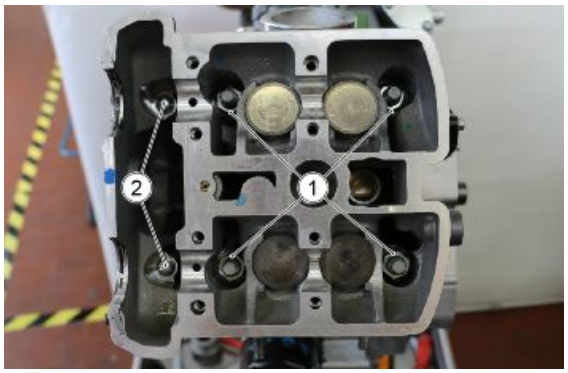
- Unscrew and remove the four screws, and retrieve the rubber blocks.
- Remove the head cover.

Removing the cylinder head

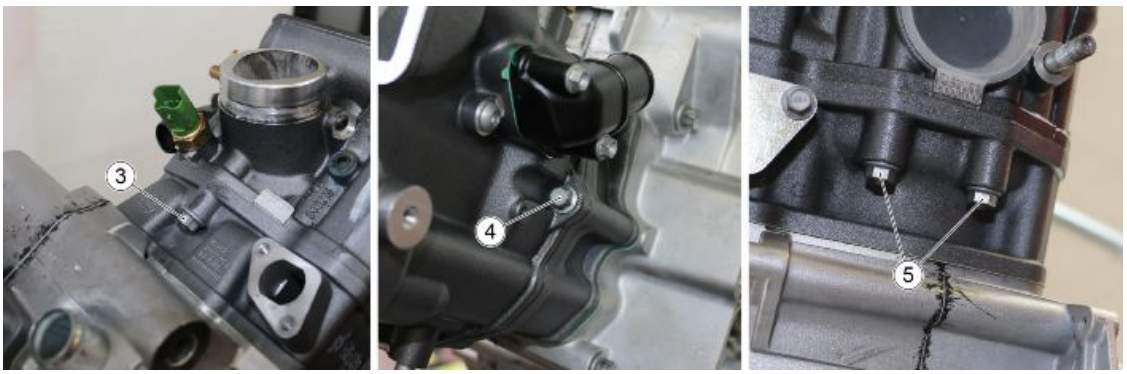
NOTE

THE OPERATIONS DESCRIBED BELOW REFER TO THE REMOVAL OF ONE HEAD ONLY, BUT ARE VALID FOR BOTH.

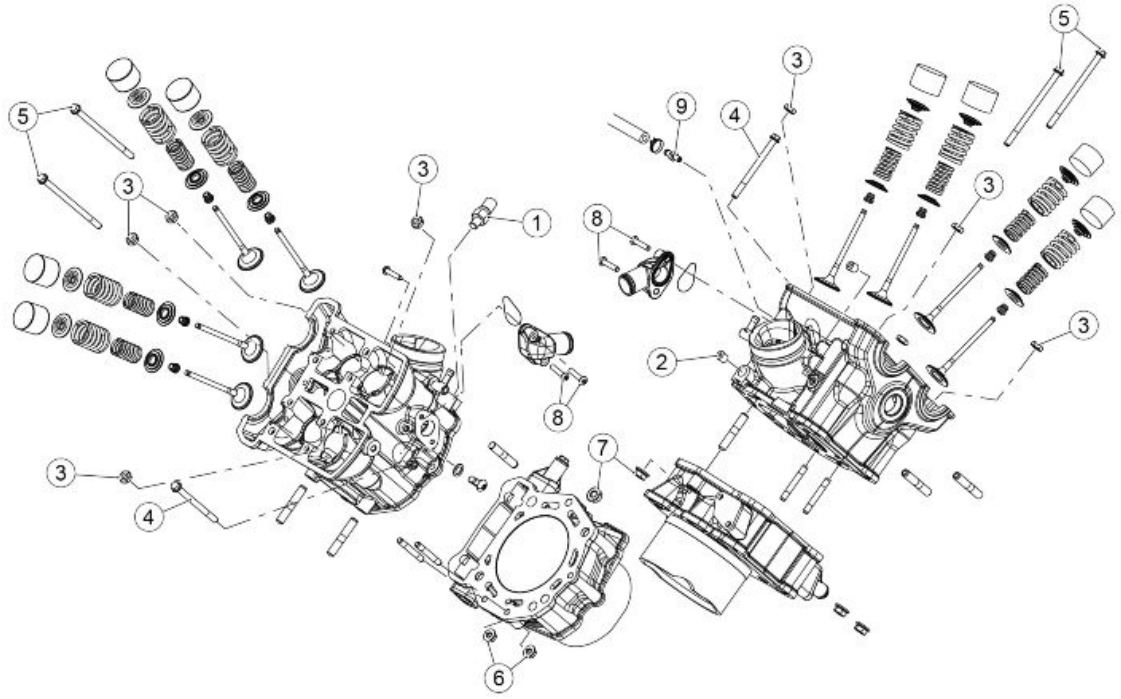
- Pre-emptively remove the camshafts, the chain tensioners, and the timing system.
- Remove the four nuts (1) on the stud bolts and the two screws (2).



- Remove the four external screws (3, 4, 5).



Cylinder head



HEAD

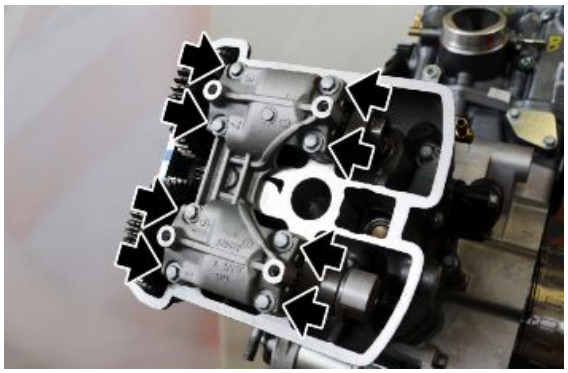
Pos.	Description	Type	Quantity	Torque	Notes
1	Water Temperature Sensor	M12x1.5	1	20 Nm (14.75 lb ft)	-
2	Threaded plug	M12x1.5	1	10 Nm (7.38 lb ft)	Loct. drise AL 506
3	Nut for fastening the stud bolts to the head - Pre-tightening	M10x1.25	8	13 Nm (9.59 lb ft)	Lubricate the threads before tightening
3	Nut for fastening the stud bolts to the head - Tightening	M10x1.25	8	135° + 135°	-
4	Head / Cylinder / Crankcase fastening outside	M6x75	2	13 Nm (9.59 lb ft)	-
5	Head / Cylinder / Crankcase fastening inside	M6x125	4	13 Nm (9.59 lb ft)	-
6	Nut for fastening the Stud bolts to the Head	M6	4	12 Nm (8.85 lb ft)	-
7	Nut for fastening the Stud bolts to the Head	M8x1.25	2	25 Nm (18.44 lb ft)	-
8	Screw for fastening the connector to the discharge	M5	4	6 Nm (4.43 lb ft)	Loct. dry loc 2040
9	Water vent connector	M6	1	3 Nm (2.21 lb ft)	Loct. 262

Removing the overhead camshaft

- Remove the clutch side crankcase.
- Turn the crankshaft of the head for which the camshafts need to be removed to TDC.

In order to remove the head camshafts, it is necessary to remove the head covers.
Mark the camshafts, le relative cogwheels, and the cam towers in order to avoid mixing them up during the reassembly phase.

- Unscrew and remove the cam tower's eight screws, proceeding in a diagonal fashion and by stages.
- Carefully remove the cam tower in order to avoid damaging the calibrated grub screws' lodgings.



- Remove the camshafts complete with the gears.

Removing the valves

- When removing the valve, mark the components according to the position and the cylinder they belong to, in order to refit the components to their correct positions.

- Remove the bucket tappets and the adjustment shims using a magnet.

- Compress the valve springs with the specific wrench and with the spring compressing tool.

Specific tooling

AP8140179 Valve springs compressor

020721Y Valve removal adaptor

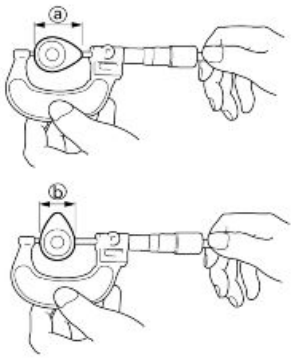
- Remove the cotters using a magnet.

- Release the valve springs.
- Remove the valve spring fittings and the springs.

- Remove the valves.

Checking the overhead camshaft

Check that the camshaft toothed wheel works properly: if it is damaged or does not move smoothly, replace both the timing chain and the camshaft toothed wheel.



CAMSHAFT LOBES

- Check that they do not show blue colouring, pitting or scratches; otherwise, replace the camshaft and the relevant toothed wheel.
- Use a micrometer to check the sizes (a) and (b) of the camshaft lobes.

Camshaft lobes sizes:

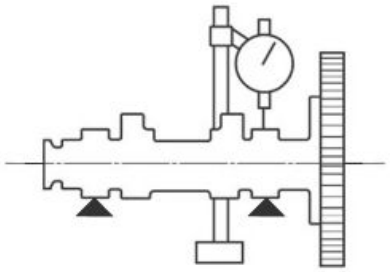
Inlet

- a: 36.28 / 36.32 mm (1.4283 / 1.4299 in); Limit: 36.15 mm (1.4232 in);
- b: 28 mm (1.1023 in);

Outlet

- a: 35.13 / 35.17 mm (1.3831 / 1.3846 in); Limit: 35.00 mm (1.3779 in);
- b: 28 mm (1.1023 in);

- Fasten the camshaft in horizontal position, as shown in the figure, and make it spin to check the eccentricity with a dial gauge; if necessary, replace the component.



Camshaft eccentricity maximum limit 0.040 mm (0.0016 in)

Valve check

CAUTION

REPLACE THE VALVES ONE AT A TIME. DO NOT MIX THE COMPONENTS. EACH VALVE MUST BE INSERTED INTO ITS SEAT, WHICH IS MARKED PRIOR TO REMOVAL.

CAUTION

THE SEAT (1) ON THE VALVE HEAD CANNOT BE REGROUND. IF REQUIRED, REPLACE THE VALVE.
GRINDING WITH ABRASIVE PASTE IS ALLOWED; VALVE STEM END REGRINDING IS NOT ALLOWED.

Clean off any combustion residues from the valves.

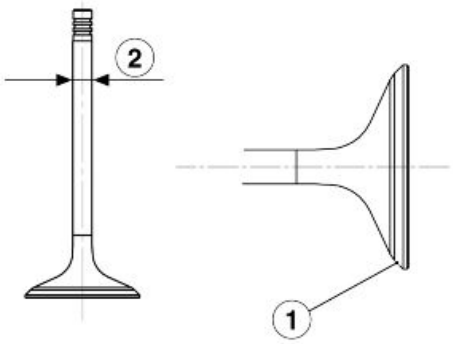
Check the seat (1) on the valve head with a ruler flush.

The surface of the seat must not be concave; replace the valve if necessary.

Check the clearance between the stem and the valve guide:

inlet: **0.013 - 0.040 mm (0.00051 - 0.00157 in); limit: 0.080 mm (0.00315 in)**

outlet: **0.025 - 0.052 mm (0.00098 - 0.00205 in); limit: 0.100 mm (0.00394 in)**

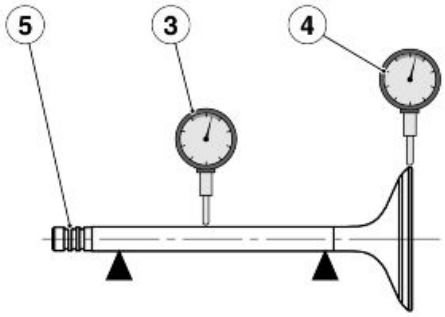


Check the valve eccentricity:

valve stem (3) maximum eccentricity allowed: 0.05 mm (0.00197 in)

valve head (4) maximum eccentricity allowed: 0.05 mm (0.00197 in)

Check that the fixing grooves (5) of the valve cotters are in proper conditions.



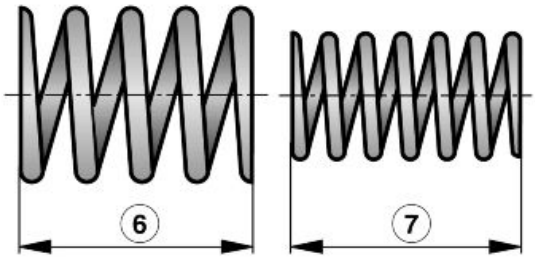
VALVE SPRINGS

Carry out a measurement and a visual inspection of the valve springs for damage, distortion or loss of tension.

Measure the spring length at release position.

Valve springs: **minimum wear limit (6) 42.5 mm (1.673 in).**

Valve springs: **minimum wear limit (7) 38 mm (1.496 in).**



Checking the cylinder head

- Using a round scraper, clean off any carbon deposits in the combustion chamber.

CAUTION

DO NOT USE A POINTED INSTRUMENT TO AVOID DAMAGING OR SCRATCHING THE SPARK PLUG THREADS OR THE VALVE SEATS.

- Check the head for damage or scratches and replace it if necessary.
- Check there are no mineral deposits or rust in the head water cooled jacket; clean off if required.
- Use a checking ruler and a thickness gauge positioned diagonally to the ruler to measure the cylinder head distortion.

Maximum cylinder head distortion: 0.03 mm (0.0012 in)

- Check that the tappet covers and the camshaft toothed wheel cover are not damaged or worn; replace the defective part(s).

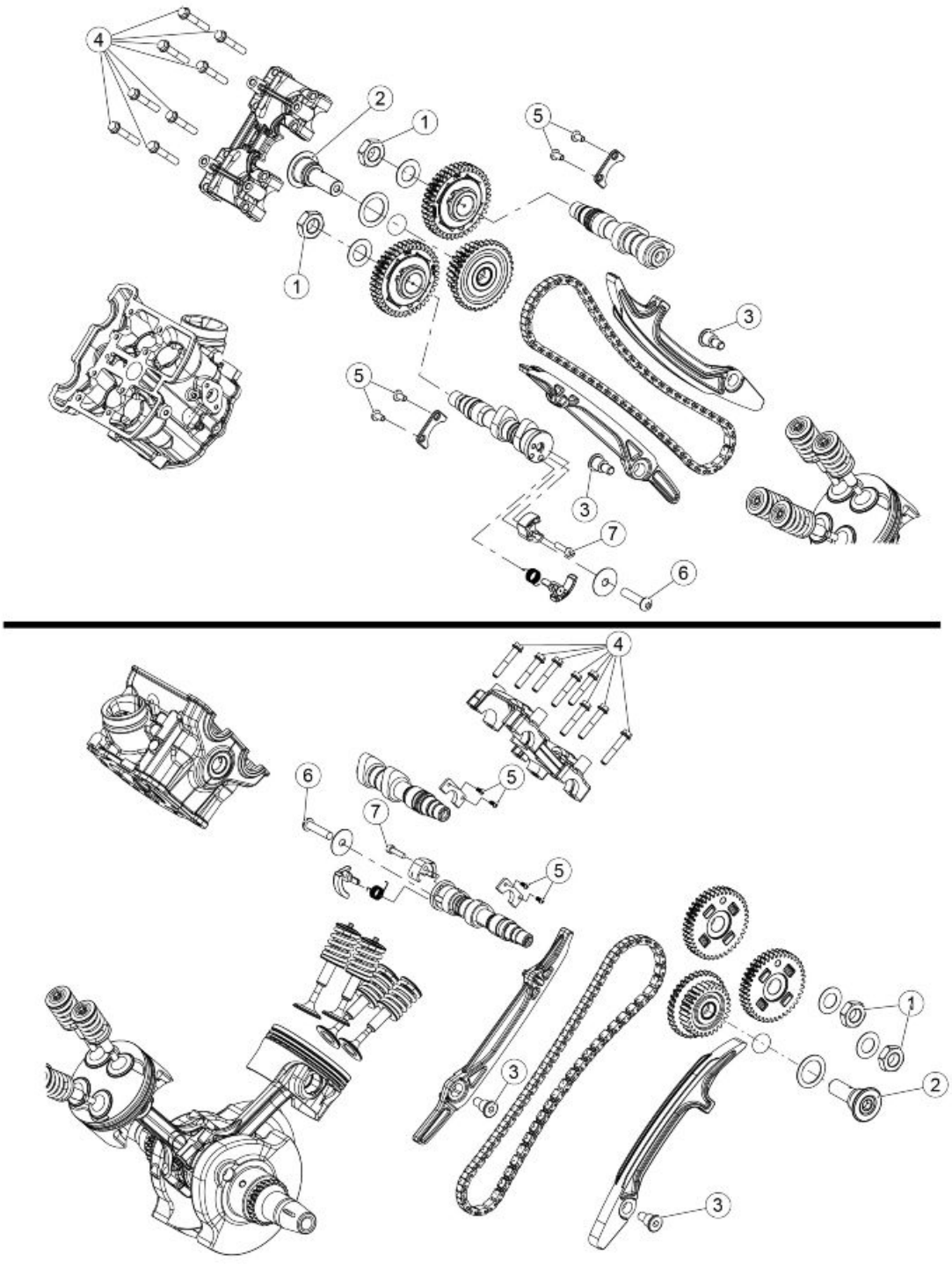
Installing the overhead camshaft

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

See also

Timing

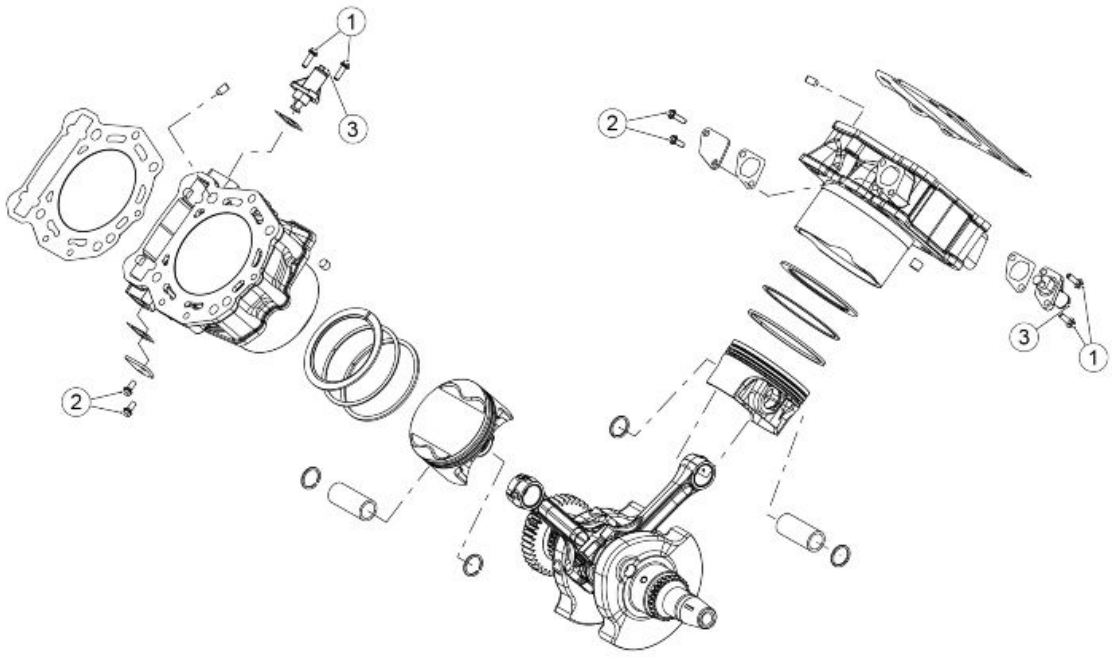
Timing



TIMING SYSTEM

Pos.	Description	Type	Quantity	Torque	Notes
1	Cam shaft gear fastening nut	M15x1	4	88 Nm (64.91 lb ft)	Thoroughly de-grease both of the coupling surfaces (axle cone and gear cone)
2	Timing lay shaft fastening screw	M24x1.5	2	88 Nm (64.91 lb ft)	3M SCOTCH GRIP 2353

Pos.	Description	Type	Quantity	Torque	Notes
3	Special mobile / fixed slider fastening screw	M8	4	18 Nm (13.28 lb ft)	3M SCOTCH GRIP 2353
4	Cam tower / head fastening screws	M6x37	16	13 Nm (9.59 lb ft)	Follow the numbering sequence stamped on the cam towers
5	Cam tower / plate fastening screws	M4x10	8	3 Nm (2.21 lb ft)	3M SCOTCH GRIP 2353
6	Decompressor fastening screws	M8	2	28 Nm (20.65 lb ft)	3M SCOTCH GRIP 2353 or Loct. DRI-LOC 2045 BLUE
7	Decompressor fastening screw	M5x12.9	2	5 Nm (3.69 lb ft)	3M SCOTCH GRIP 2353 or Loct. DRI-LOC 2045 BLUE



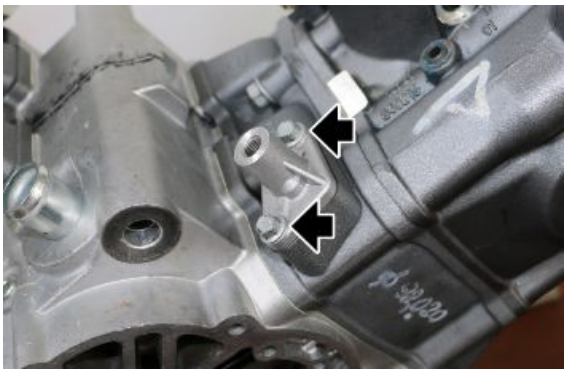
CYLINDER

Pos.	Description	Type	Quantity	Torque	Notes
1	Chain tensioner fastener screw	M6x30	4	13 Nm (9.59 lb ft)	-
2	Cylinder plate fastening screw	M6x16	4	9 Nm (6.64 lb ft)	-
3	Chain tensioner adjustment screw	M6	2	5 Nm (3.69 lb ft)	-

Removing the chain tensioner

- Unscrew and remove the screw, and retrieve the washer and the internal spring.

- Unscrew and remove the two screws.
- Remove the chain tensioner and retrieve the gasket.



Chain removal

- Remove the chain tensioner.
- Remove the mobile chain slider and free the fixed chain slider from the fastener.
- Heat the pin for the intermediate gear and loosen it.

- Hold the intermediate gear still and remove the pin.

- Extract the timing chain from the crankshaft.

NOTE

IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE INITIAL DIRECTION OF ROTATION IS MAINTAINED.

- Remove the timing chain complete with the gear.

See also

Removing the chain sliders
Removing the chain tensioner

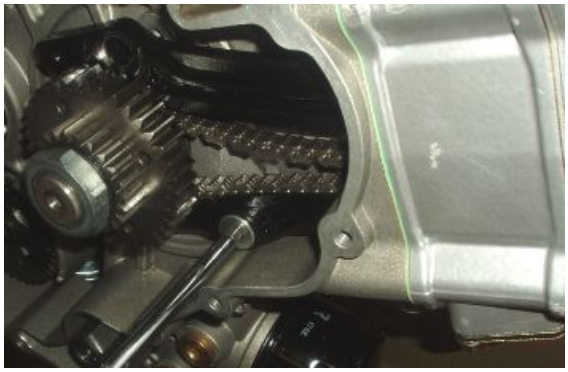
Removing the chain sliders

- Remove the chain tensioner and the camshafts for the head in question.

FRONT HEAD

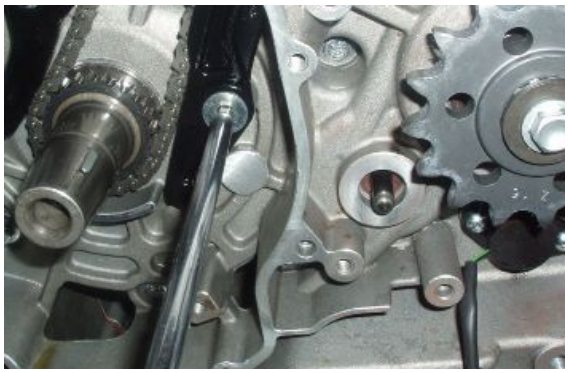
- In order to remove the front head's chain sliders, it is necessary to remove the clutch cover.
- Unscrew and remove the mobile chain tensioner slider's screw.
- Remove it by extracting it from the head.

- Unscrew and remove the fixed chain tensioner slider's screw.
- The head must be removed in order to remove it.

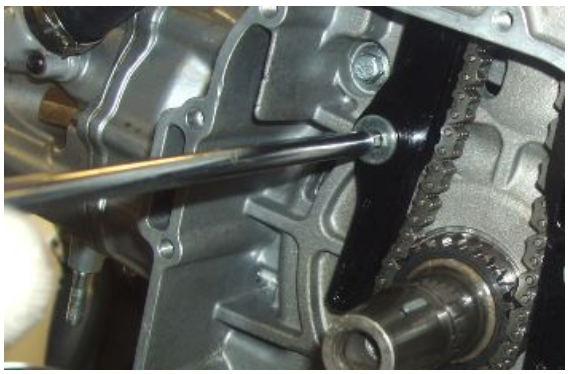


REAR CYLINDER HEAD

- In order to remove the rear head's chain sliders, it is necessary to remove the flywheel.
- Unscrew and remove the mobile chain tensioner slider's screw.
- Remove it by extracting it from the head.



- Unscrew and remove the fixed chain tensioner slider's screw.
- The head must be removed in order to remove it.



See also

Removing the chain tensioner
Removing the head cover

Magneto flywheel removal

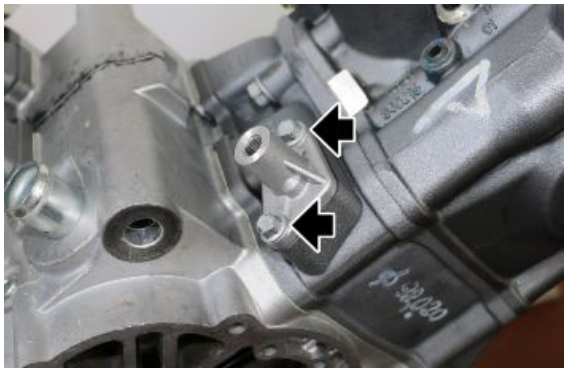
Checking the chain

Check the timing chain for damage or stiffness while moving. If required, replace both the timing chain and the camshaft sprocket wheels.

Check the timing chain guide for damage. If necessary, replace the parts.

Installing the chain tensioner

- Fit the chain tensioner body on the cylinder and insert a new paper gasket.
- Tighten the two screws to the prescribed torque.

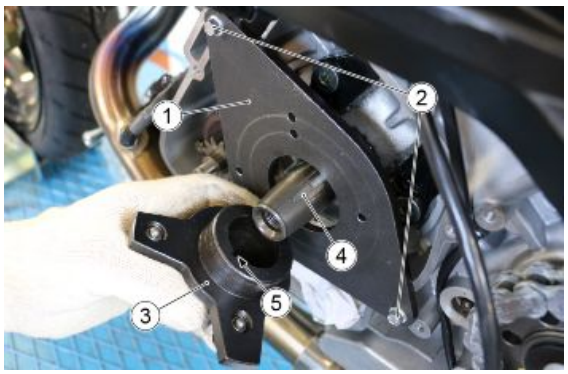


- Insert the spring and tighten the screw together with the washer.

Cam timing

Timing

- Position the plate (1) of the specific timing tool and lock it in place using the two screws (2) on the cover.
- Insert the tool (3) on the crankshaft, making sure that the pin (4) mounted on the crankshaft is inserted into the seat on the tool (5).



Specific tooling

020720Y Timing tool

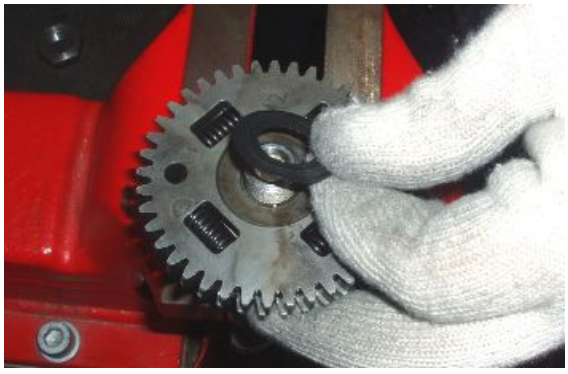
- Rotate the crankshaft anticlockwise until the front cylinder piston is positioned at top dead centre, while checking that there is sufficient play on the camshafts.
- The front cylinder top dead centre position must correspond to position (A).

If necessary, remove the distribution gearwheels from the cam shafts:

- Position the cam shaft, complete with distribution gearwheel, in a vice, ensuring that the shaft is adequately protected.
- Unscrew the nut and remove it.

BOTH REAR CYLINDER SHAFTS ARE FITTED WITH LEFT-HANDED THREAD NUTS, WHICH HAVE BEEN STAMPED WITH A ANTICLOCKWISE ARROW.

- Retrieve the washer.
- Remove the distribution gearwheel from the cam shaft.



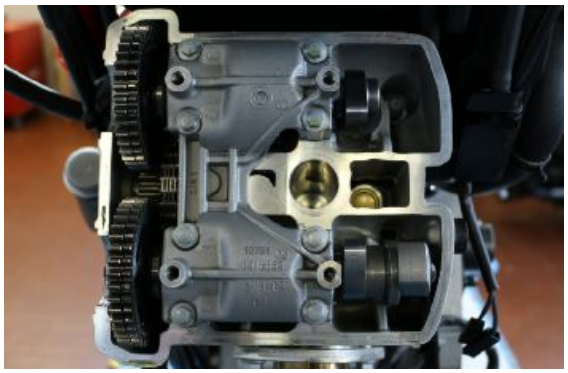
- Clean the surfaces of the gearwheels (camshaft cone and gearwheel cone).
- Pre-assemble the gearwheel on the camshaft so that it is free to rotate.
- Position the two camshafts in the housings in the front big end, aligning the two bores on the camshaft with the corresponding holes on the big end. The camshaft cams must be convergent.

- Align the play compensation gear-wheel with the main distribution gear-wheel using the dedicated tool.

Specific tooling

020718Y Camshaft gearwheel alignment pin

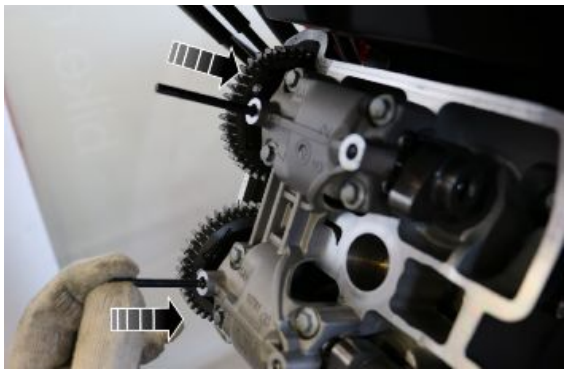
- Position the cam tower.
- Tighten the screws provisionally.



- Time the camshafts, using the appro-priate pins.

Specific tooling

020719Y Timing pin



- Pre-tighten the nuts on the camshaft gearwheels.

FIT THE NUTS SO THAT THE MACHINED SURFACE IS FACING THE GEARWHEEL (MATERIAL CODE VISIBLE).

- Remove the cam tower and the cam-shafts, place them in a vice using a pair of aluminium jaws, then tighten the nuts, applying the pre-defined torque.

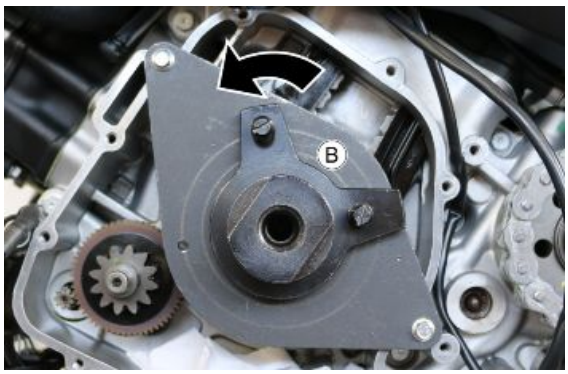
NEVER APPLY THE DEFINITIVE TIGHTENING TORQUE TO THE CAMSHAFT NUTS WHILE THE SHAFT IS MOUNTED ON THE CYLINDER.
THIS WOULD DAMAGE THE HEAD IRREVERSIBLY.

- Remove the gearwheel alignment tool.

Specific tooling

020718Y Camshaft gearwheel alignment pin

- Reposition the cam tower and the camshafts, applying the pre-defined tightening torque.
- Rotate the camshaft anticlockwise until the rear cylinder piston is at TDC (B).
- Repeat the timing procedure for the front cylinder.



Specific tooling

020720Y Timing tool

CAUTION

AT TDC THE REAR BIG END CAMS MUST BE DIVERGENT.

Cylinder-piston assembly

Removing the cylinder

- After having removed the head complete with the timing system, extract the cylinder from the stud bolts.

- Remove the gasket on the cylinder base.

See also

Chain removal
Removing the cylinder head

Disassembling the piston

- Remove the big end and the cylinder.
- Extract the pin locking ring.

- Lock the connecting rod using the specific tool.
- Slide the pin and remove the piston.

Specific tooling

020716Y Connecting stem lock

- Lock the connecting stem with elastic straps

FOR SAFETY REASONS, COVER THE CRANKCASE WITH A CLEAN MATERIAL TO AVOID THE FALL OF THE SAFETY RINGS IN THE CRANKCASE.

- Remove the upper ring, the second ring and the oil ring.

See also

Removing the cylinder head
Removing the cylinder

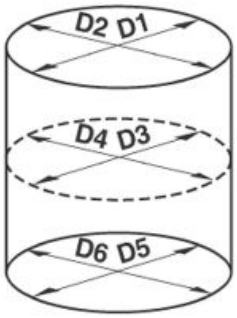
Checking the cylinder

- All seal surfaces must be clean and flat.
- Make sure all threads are in proper conditions.
- Check cylinder sliding surface for signs of friction and scratches. Also check the seal surfaces for damages.

CAUTION

IF THE GROOVES ON THE CYLINDER LINER ARE EVIDENT, REPLACE THE CYLINDER AND THE PISTON.

- Clean off lime scales on the cylinder cooling slots.
- Measure the cylinder bore at a distance of 10 - 40 - 98.5 mm (0.39 - 1.57 - 3.88 in) from the head coupling surface; the highest value should be considered to estimate wear limits.



Cylinder bore "C": 92,000 mm (3.6220 in)

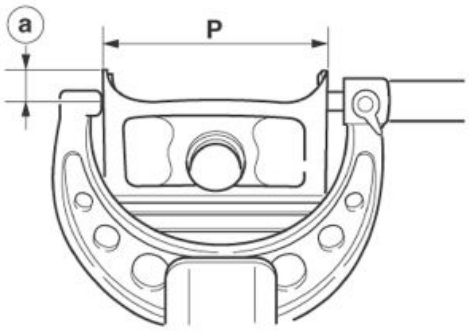
(Key: C = max D1 or D2)

Cylindricity limit: 0.028 mm (0.0011 in)

Replace the cylinder, the piston and the piston ring all together if not complying with specifications.

Checking the piston

- Measure the piston skirt diameter "P" with a micrometer (a=10 mm (0.39 in) from the piston lower border).
- Calculate the clearance between piston and cylinder as follows:

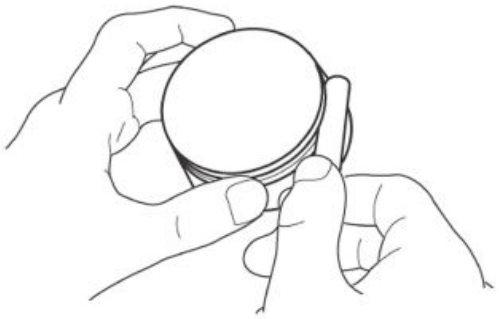


Piston - cylinder clearance C = C - P

Piston - cylinder clearance: 0.050 - 0.064 mm (0.00197 - 0.00252 in) Limit: 0.100 mm (0.00039 in)

- Replace the cylinder, the piston and the piston ring all together if not complying with specifications.

PISTON RINGS



- Clean off any carbon deposits from the grooves in the piston rings and from the rings themselves.
- Measure the piston ring side clearance and replace the piston and the piston rings all together if not complying with specifications.

Piston ring side clearance:

Top ring (1st slot): 0.030 - 0.065 mm (0.0012 - 0.0026 in)

Intermediate ring (2nd slot): 0.020 - 0.055 mm (0.0008 - 0.0022 in)

Oil scraper ring (3rd slot): 0.010 - 0.045 mm (0.0004 - 0.0018 in)

- Fit the piston ring to the cylinder.
- Level the installed piston ring with the piston crown.
- Measure piston ring port and replace it if not complying with specifications.

CAUTION

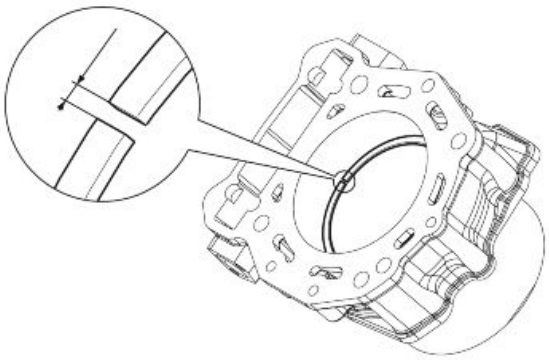
IT IS NOT POSSIBLE TO MEASURE THE CLEARANCE OF THE END OF THE OIL SCRAPER RING: IF THERE IS EXCESSIVE PLAY, REPLACE THE THREE ELASTIC RINGS.

Piston ring end gap:

Top ring: 0.15 - 0.35 mm (0.0059 - 0.0138 in)

The second ring: 0.20 - 0.40 mm (0.0079 - 0.0157 in)

Oil scraper ring: 0.20 - 0.70 mm (0.0079 - 0.0276 in)



PISTON PIN

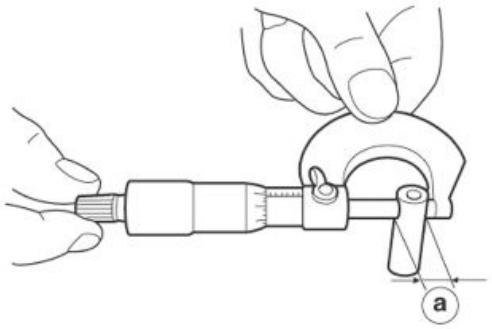
- Clean off combustion residues from the piston crown and from the area above the top ring.
- Check for cracks on the piston and for compression on the piston sliding surface (seizing); Replace the piston if required.

CAUTION

SMALL STRIATIONS ON THE PISTON LINER ARE ADMISSIBLE.

- Measure the pin outside diameter (a) and if not complying with specifications, replace the pin.

Pin outside diameter: 22.00 - 21.97 mm (0.8661 - 0.8650 in) Limit: 21.96 mm (0.8646 in)



- Measure the pin housing diameter (b) and replace the piston if not complying with specifications.

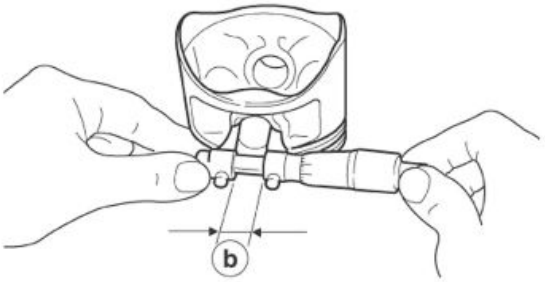
Pin housing diameter (b): 22.010 - 22.015 mm (0.8665 - 0.8667 in)

- Calculate the clearance between pin and pin hole and, if not complying with specifications, replace both pin and piston.

Pin - piston clearance: C = b - a

0.010 - 0.045 mm (0.0004 - 0.0018 in)

Limit: 0.060 mm (0.0024 in)



CAUTION

TO ANY CYLINDER TYPE THE SPECIFIC PISTON MUST BE COUPLED.

PISTON - CYLINDER COUPLING

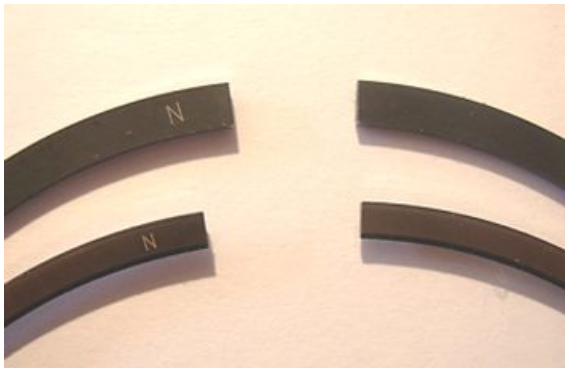
Specification	Desc./Quantity
Cylinder-piston class A coupling	Cylinder: 91.990 - 91.997 mm (3.6216 - 3.6219 in) Piston: 91.933 - 91.940 mm (3.6217 - 3.6197 in)
Cylinder-piston class B coupling	Cylinder: 91.997 - 92.004 mm (3.6219 - 3.6222 in) Piston: 91.940 - 91.947 mm (3.6197 - 3.6199 in)
Cylinder-piston class C coupling	Cylinder: 92.004 - 92.011 mm (3.6222 - 3.6225 in) Piston: 91.947 - 91.954 mm (3.6199 - 3.6202 in)
Cylinder-piston class D coupling	Cylinder: 92.011 - 92.018 mm (3.6225 - 3.6227 in) Piston: 91.954 - 91.961 mm (3.6202 - 3.6205 in)
Fitting clearance	0.050 - 0.064 mm (0.00197 - 0.00252 in)

Fitting the piston

The top of the piston is stamped with an arrow that indicates the direction of installation, towards the cylinder's output.

- In order to reinstall the seal rings on the piston, position that arrow stamped on outside of the pinion so that it is facing the operator.

- The elastic bands are different from one another, and must be mounted with the "N" marking facing upwards.



- Apply the lower oil scraper ring to the piston with the opening facing the output side.

- Apply the remaining seal rings to the piston so that they are offset in relation to one another by 90°.

- Apply the lock ring to the appropriate tool.
- To facilitate its insertion onto the piston, move the ring near to the edge of the tool.

Specific tooling

020470Y Pin snap ring fitting tool

- Insert the lock ring positioned on the appropriate tool onto the piston.

Specific tooling

020470Y Pin snap ring fitting tool

- Position the piston on the connecting rod and insert the pin using the appropriate tool.

Specific tooling

020470Y Pin snap ring fitting tool

- Insert the piston's missing stopper ring using the appropriate tool, as described above, to lock the pin in place.

Specific tooling

020470Y Pin snap ring fitting tool

Installing the cylinder

- If previously removed, install the stud bolts.

CAUTION

THE STUD BOLTS MUST BE MOUNTED SO THAT THEY PROTRUDE.
THE PRE-IMPREGNATED PART MUST BE SCREWED ONTO THE CRANKCASES.
SCREW THE STUD BOLT ONTO THE CRANK CASE UNTIL A PROTRUSION OF 138 MM (5.43 IN) IS OBTAINED, THEN WAIT FOR THE SEALANT TO DRY.

- Insert a new cylinder base gasket of the same thickness as that which was previously removed: 0.50 - 0.60 - 0.70 mm (0.0197 - 0.0236 - 0.0275 in).
- The silicon side must be facing the crankcase.

CAUTION

IF THE THICKNESS OF THE ORIGINAL GASKET CANNOT BE VERIFIED, OR IN THE CASE OF A CYLINDER REPLACEMENT, REFER TO THE SECTION TITLED "BASE GASKET SELECTION".

- Using the band tightener, compress the piston's bands and insert the cylinder onto the stud bolts.

NOTE

BEFORE FITTING THE CYLINDER, CAREFULLY BLOW OUT THE LUBRICATION DUCT AND OIL THE CYLINDER BARREL.

See also

Selecting the base gasket

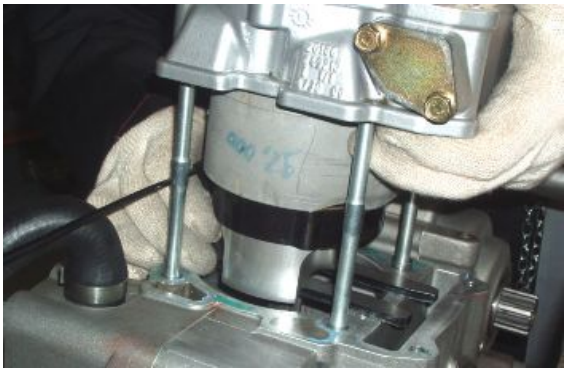
Selecting the base gasket

- Once the seal rings have been applied to the piston and it has been mounted on the connecting rod, position the special tool on the piston itself.
- Use a clamp to lock the special tool in place.

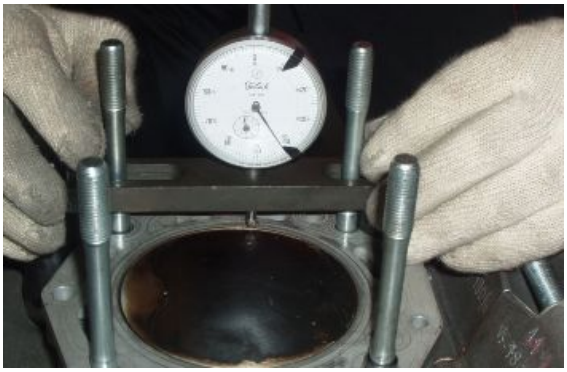
Specific tooling

AP8140302 tool for installing seal rings

- Provisionally mount the piston on the cylinder, without the base and head gasket.
- Remove the clamp from the seal ring locking tool.
- Remove the special connecting rod locking tool.



- Fit a dial gauge on the specific tool.
- Zero the dial gauge on a reference surface with an average preload of 5 mm (0.2 in), for example. Maintaining the zero position, mount the tool on the cylinder and secure it with two nuts (10 Nm - 7.38 lb ft), as shown in the figure.



Specific tooling

020714Y Dial gauge mount

- Turn the crankshaft to TDC (the reversal point of the dial gauge's rotation).
- Lock the crankshaft at TDC using the appropriate tool.
- Calculate the difference between the two measurements: use the chart below to identify the thickness of the cylinder base gasket to be used for refitting. Correctly identify the cylinder base gasket thickness to keep the correct compression ratio.
- Remove the special tool and the cylinder.

Specific tooling

020720Y Timing tool

BASE GASKET

Specification	Desc./Quantity
Protrusion detected from 0.6 to 0.75 mm (0.0236 / 0.0295 in)	Gasket 0.5 mm (0.0197 in)
Protrusion detected from 0.75 to 0.85 mm (0.0295 / 0.0335 in)	Gasket 0.6 mm (0.0236 in)
Protrusion detected from 0.85 to 1 mm (0.0335 / 0.0394 in)	Gasket 0.7 mm (0.0275 in)

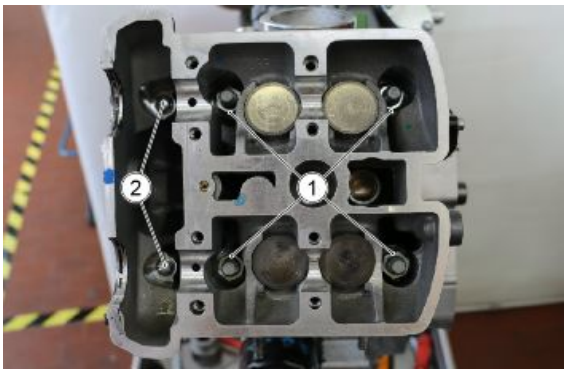
Installing the cylinder head

- Position the chain guide slider in the appropriate lodging on the cylinder.

- Position the gasket on the cylinder base.

- Insert the head onto the stud bolts.

- Apply the nuts (1) to the stud bolts and tighten them to the required torque value, proceeding in a crossover fashion.
- Insert and tighten the internal screws (2).



- Insert and tighten the external screws (3, 4, 5).

Installing the head cover

CAUTION

BEFORE REMOVING THE BIG END COVERS, CAREFULLY CLEAN THE SURFACES OF THE BIG END AND THE COVER.

CAUTION

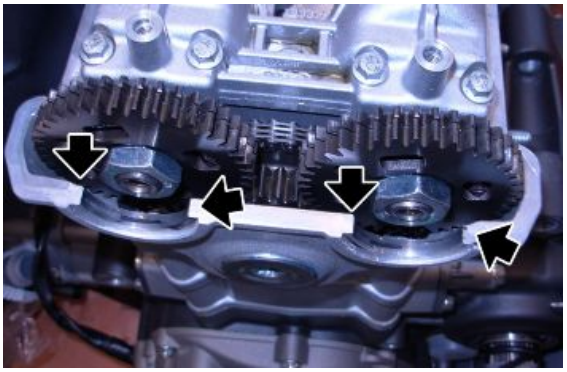
REPLACE THE FOUR RUBBER INSERTS AND THE GASKET EACH TIME THE BIG END COVER IS REMOVED.

CAUTION

BEFORE REMOVING THE BIG END COVERS, CAREFULLY CLEAN THE SURFACES OF THE BIG END AND THE COVER.

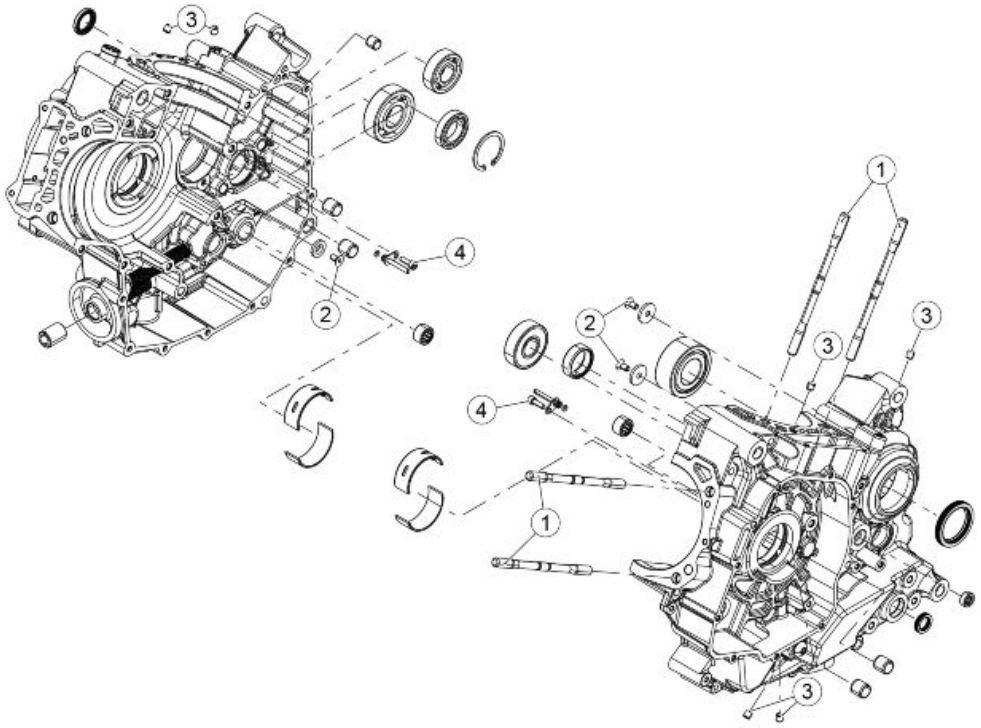
- Apply THREEBOND around the perimeter of the big end cover along the gasket housings.

- Apply THREEBOND to the head at the points indicated in figure.



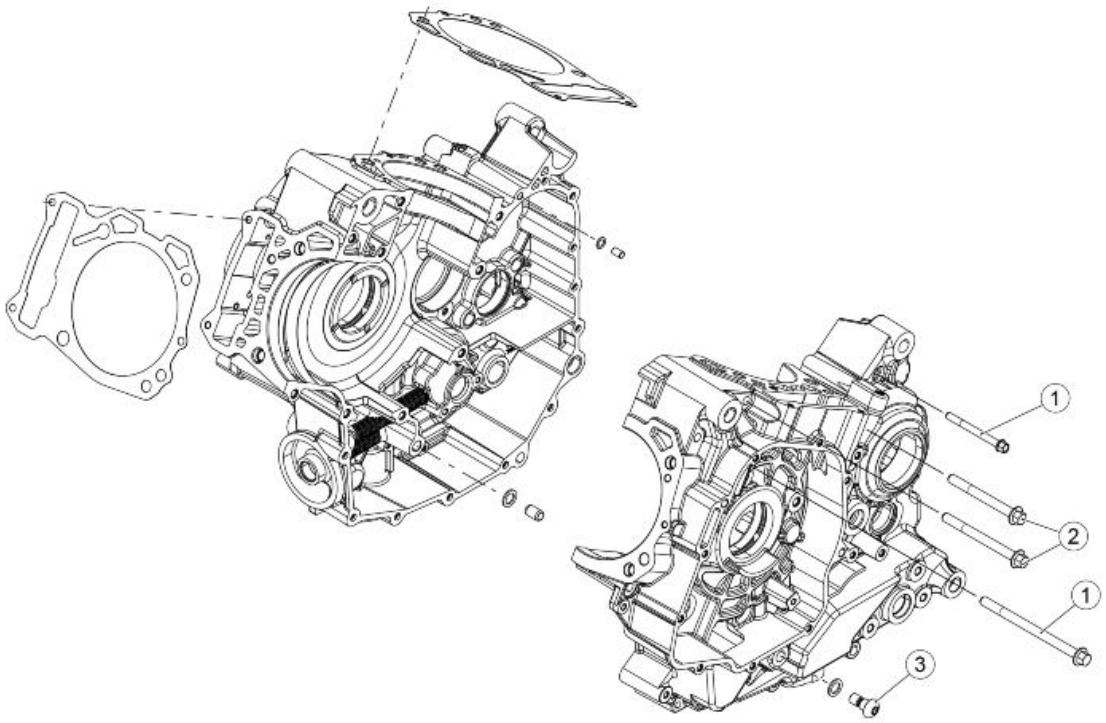
- In order to complete the remaining operations, repeat the removal procedure in reverse order.

Crankcase - crankshaft



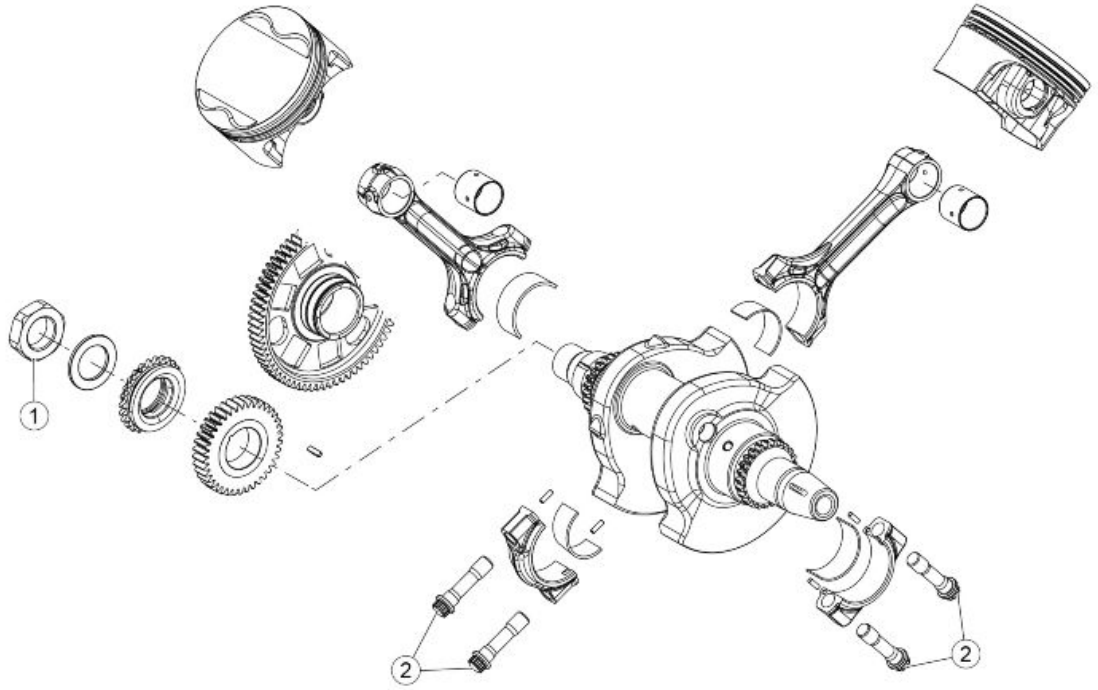
CRANKCASE I

Pos.	Description	Type	Quantity	Torque	Notes
1	Crankcase-cylinder-head fastening stud bolts	M10x1.25x166	8	Distance-based tightening	SCOTCH GRIP 2510 GREEN
2	Bearing retainer fastening screws	M6x12	3	10 Nm (7.38 lb ft)	3M SCOTCH GRIP 2353 or Loct. DRI-LOC 2045 BLUE
3	Threaded plug	M8x1	5	15 Nm (11.06 lb ft)	3M SCOTCH GRIP 2353
4	Piston oil jet fastening screw	M5x16	2	5 Nm (3.69 lb ft)	3M SCOTCH GRIP 2353 or Loct. DRI-LOC 2045 BLUE



CRANKCASE II

Pos.	Description	Type	Quantity	Torque	Notes
1	Half-crankcase coupling screw	M8x80	9	28 Nm (20.65 lb ft)	-
2	Half-crankcase coupling screw	M6x65	8	13 Nm (9.59 lb ft)	-
3	Special oil calibration screw	M10x1	1	14 Nm (10.33 lb ft)	-



CRANKSHAFT

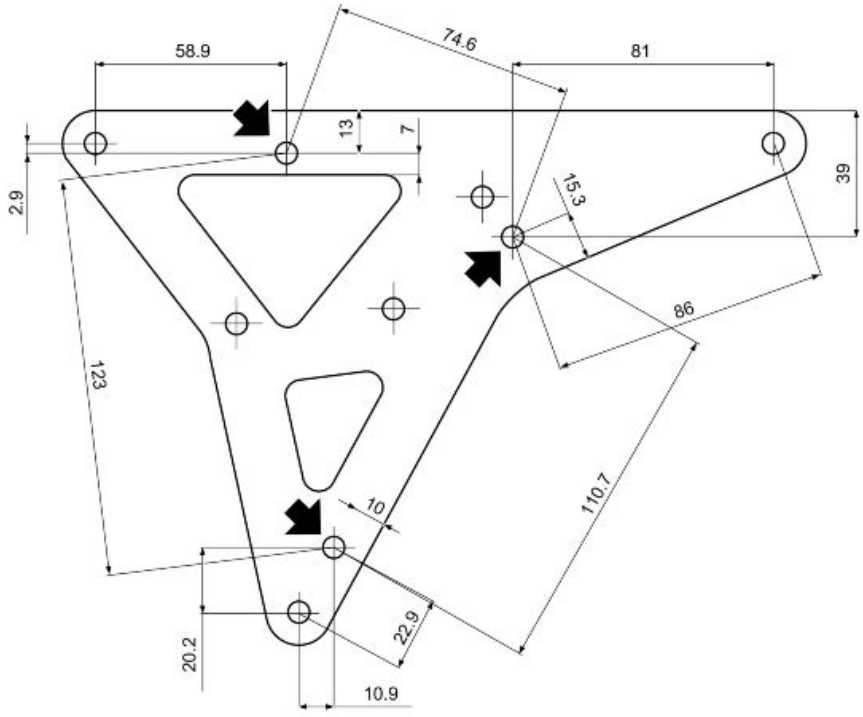
Pos.	Description	Type	Quantity	Torque	Notes
1	Primary crankshaft fastening net	M24x1.5	1	294 Nm (216.84 lb ft)	Thoroughly de-grease both of the coupling surfaces (shaft cone and gear cone)
2	Connecting rod fastening screws - Pre-torque	M10x1x40	4	15 Nm (11.06 lb ft)	Lubricate the threads before tight-ening
2	Connecting rod fastening screws - Torque	M10x1x40	4	30 Nm (22.13 lb ft) + 50° +/- 2°	-
2	Connecting rod fastening screws - Control	M10x1x40	4	70 Nm (51.63 lb ft)	-

Splitting the crankcase halves

- Remove the water pump, the oil pump, the clutch, the flywheel, the intermediate gearwheel and the head-engine block-piston assembly complete with distribution.

CAUTION

BEFORE USING THE "PRIMARY GEARWHEEL LOCK TOOL - 020850Y", IT IS NECESSARY TO MAKE THREE HOLES SO THAT IT MAY BE POSITIONED CORRECTLY ON THE ENGINE GUARD. THE HOLES ARE ILLUSTRATED IN THE FOLLOWING IMAGE.



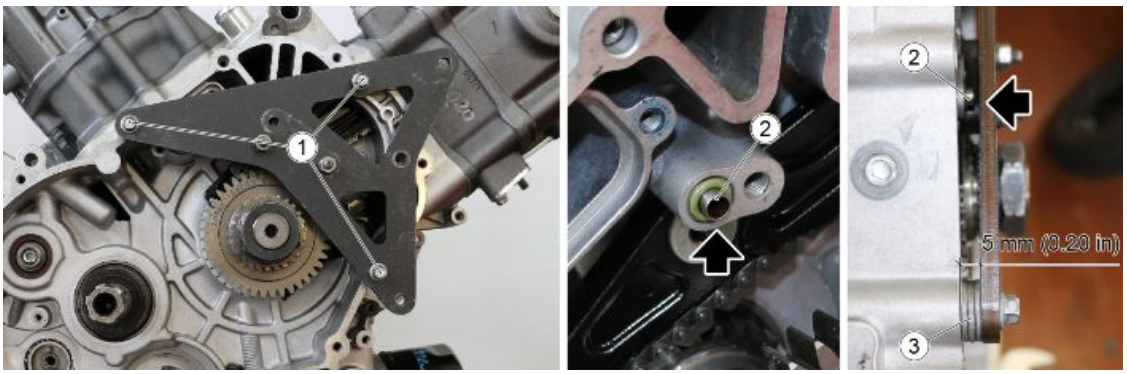
- Mount the tool used to block the pinion, securing the three screws (1) on the guard.

CAUTION

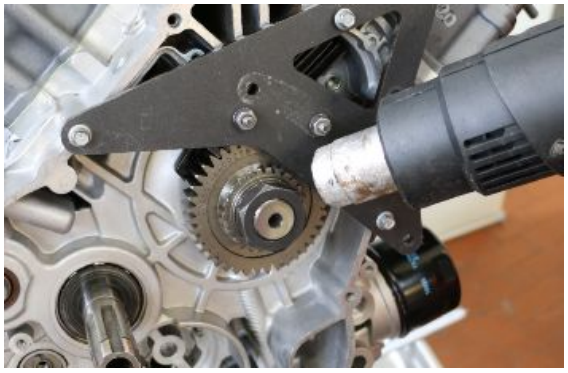
TO AVOID DAMAGING THE OIL FEEDER COUPLING (2) POSITIONED ON THE GUARD, INSERT SPACER WASHERS (3) BETWEEN THE TOOL AND THE GUARD, SO AS TO ENSURE A MINIMUM DISTANCE OF 5mm (0.20 in)

Specific tooling

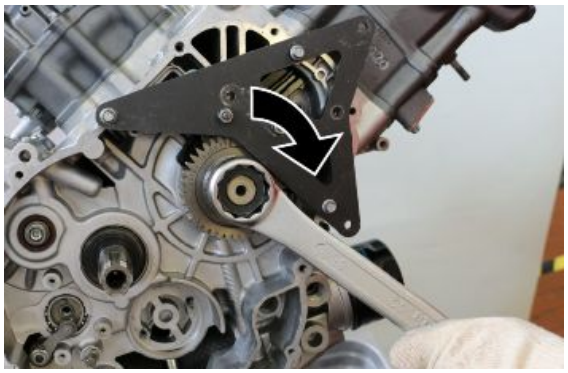
020850Y Primary gear lock



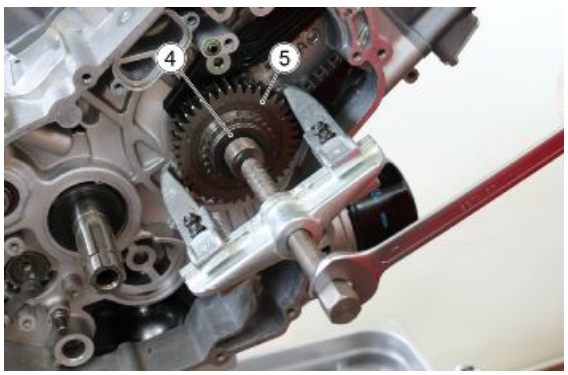
- Heat up the crankshaft gearwheel retaining nut using a suitable heater



- Remove the nut and the flat washer.



- Remove the motor pinion locking tool.
- Using a generic extractor tool, remove the water pump gearwheel (4) and the primary drive gearwheel (5) simultaneously.

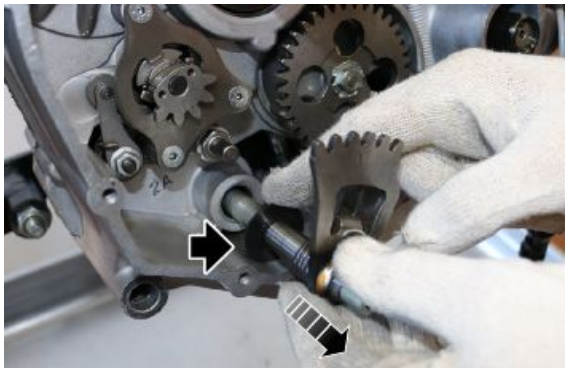


See also

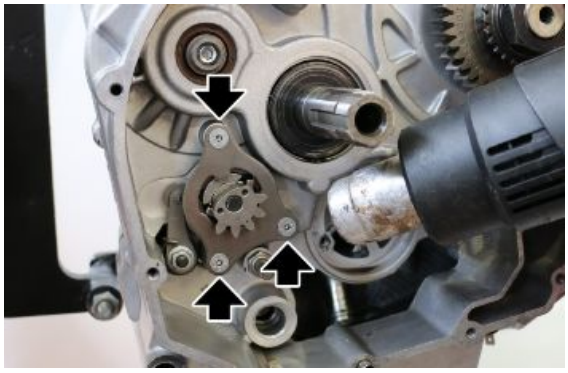
Removing the cylinder

Magneto flywheel removal

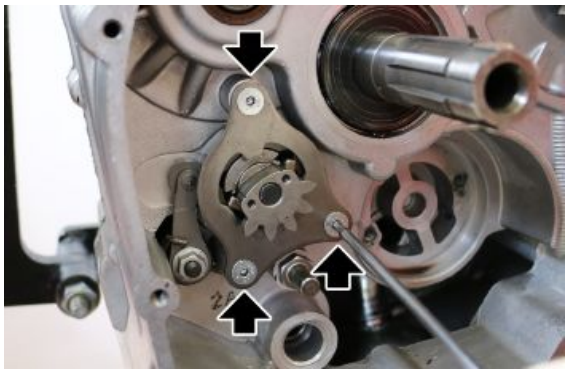
- Remove the gearbox control rod, taking care to retrieve the washer.



- Heat up the gearbox selector support plate screws.



- Unscrew the three gearbox selector plate fastening screws and remove them..



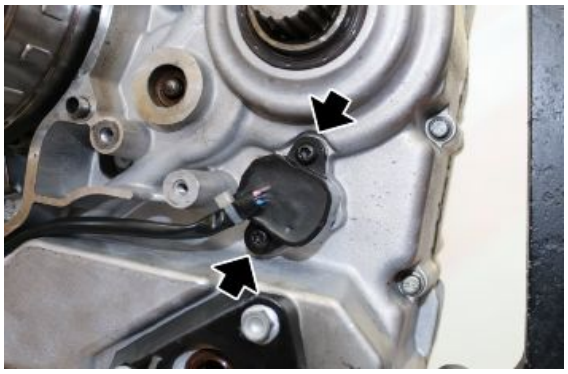
- Remove the plate.

- Press the springs on the selector sprocket simultaneously in order to remove it.

- Unscrew the threaded pin used to fasten the selector drum and remove it.

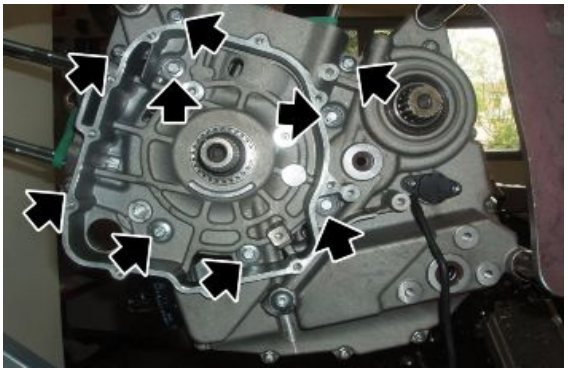
- Move the index lever to one side so that it is possible to remove the selector drum.

- Remove the idle sensor fastening screws, then remove the sensor.

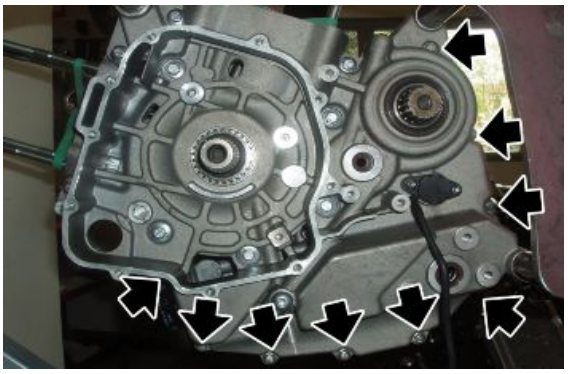


- Remove the clutch control rod.

- Working on the left hand side, unscrew and remove the nine M8 crankcase fastener screws.



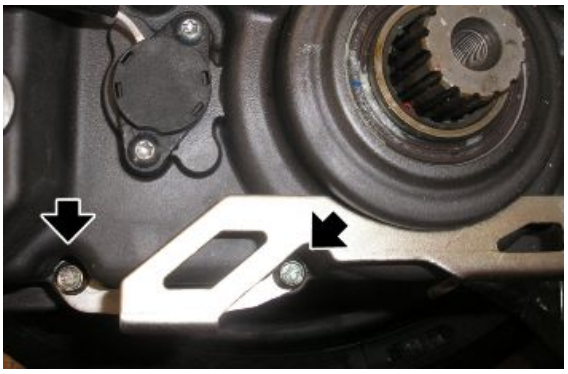
- Working on the left hand side, unscrew and remove the nine M6 crankcase fastener screws.



- Remove the fuel vapour breather pipe mounting plate.

CAUTION

DURING REASSEMBLY, REMEMBER TO FIT THE FUEL VAPOUR BREATHER PIPE MOUNTING PLATE NEAR THE PINION.



- Rotate the engine and the engine support to the horizontal position.
- Using a rubber mallet, strike the guards gently in order to separate them.

- Open the guards.

- If necessary, unscrew the two pick-up tube fastening screws and remove them.
- Remove the pick-up tube.

Removing the crankshaft

- Remove the crankshaft.

See also

Splitting the crankcase halves

Inspecting the crankcase halves

BEARINGS AND OIL SEAL CHECK

Thoroughly clean the two sections of the crankcase, the ball bearings, the threads of the crankcase fixing screws and the bearing seats with a non-aggressive solvent. Clean the seal surfaces and check that they are not damaged.

CAUTION

TO AVOID DAMAGING BOTH CRANKCASE HALVES PLACE THEM ON A FLAT SURFACE.

Check that both crankcase halves are not cracked or damaged.

Check that all threads are in proper conditions.

Check that all oil seals remaining in their position are not worn or damaged.

Check all ball bearings for clearance, smoothness and potential distortions.

CAUTION

LUBRICATE BALL BEARINGS WITH ENGINE OIL BEFORE FURTHER CHECKING.

If the internal ring does not rotate smoothly and silently or if there is some noise while it turns, it means that the bearing is faulty and must be replaced.

OIL FILTER AND OIL DELIVERY PIPE CHECK

Check the oil filter for damage. If necessary, replace the part.

Clean the oil net with petrol and inspect the net links for potential damage.

CHECK THE ENGINE OIL FILTER O-RING.

LUBRICATION CHECK

- Working on both crankcase halves, remove and thoroughly clean the nozzle that lubricates the piston crown.

REPLACE THE SPRAY NOZZLE O-RING IF NECESSARY.

- Replace the O-ring on the oil passage duct.

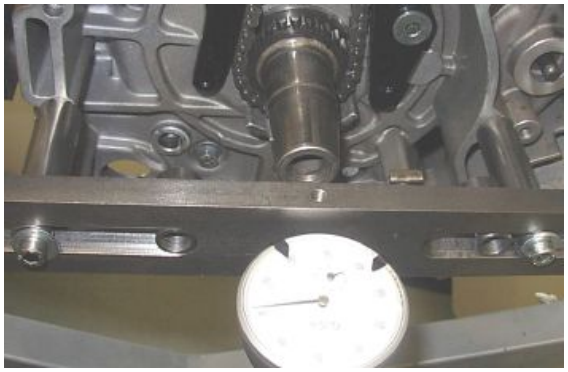
Before refitting

UPON REFITTING THE CRANKSHAFT, GREASE THE SHAFT BUSHING-CONNECTING ROD COUPLING.

Inspecting the crankshaft components

Checking crankshaft endfloat

- The shaft axial clearance on the crankcase should be checked with a dial gauge mounted on the specific dial gauge support.
- The clearance should be between 0.10 and 0.26 mm (0.0039 - 0.0102 in).
- If the clearance is beyond tolerance, check the reference surfaces.



Specific tooling

020714Y Dial gauge mount

Main bearing journal

Removal

- Mark the position of the original semi-bushings on the crankcase.

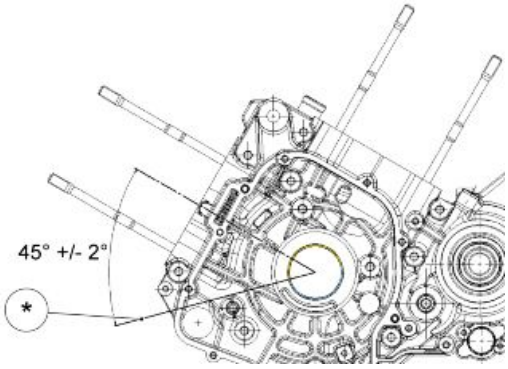
- Remove the bushings with the crankcase cold, using a press and the specific tool and pushing inward from the outside of the crankcase.

Specific tooling

020726Y Bushing extractor

Installing

- The orientation of the semi-bushings must match the specifications indicated in the drawing as closely as possible.



NOTE

WHEN REPLACING THE SEMI-BUSHINGS ALONE, THE NEW COMPONENTS MUST BE THE SAME COLOUR AS THE REMOVED COMPONENTS. IF THE COLOUR OF THE OLD COMPONENTS IS NO LONGER VISIBLE, USE THE TABLE TO IDENTIFY THE CORRECT COMPONENTS, REFERRING TO THE CRANKCASE AND CRANKSHAFT CLASSES.

Key:

* Semi-bushing joint line.

- Fit the new bushings with the crankcase cold, using a press and the specific tool and pushing outward from the inside of the crankcase, until the punch comes into contact with the crankcase surface.

Specific tooling

020727Y Bushing punch

Assembling the connecting rod

CAUTION

TO FIT THE CONNECTING RODS, CHECK THE COUPLING TYPES INDICATED IN THE "CRANKCASE- CRANKSHAFT CONNECTING ROD" SECTION, IN THE "CHARACTERISTICS" CHAPTER OF THE WORKSHOP MANUAL.

Installing the crankshaft

- Place the left side crankcase half on the engine support adequately.
- Place the crankshaft on the seat of the crankcase half with caution.

Refitting the crankcase halves

- In order to reposition the guards, repeat the procedure described in the section "OPENING THE GUARDS" in reverse order.

CAUTION

TAKE CARE NOT TO MAKE EXCESSIVE USE OF THREEBOND AS THIS COULD PREVENT THE OIL FROM PASSING BETWEEN THE GUARDS.

CAUTION

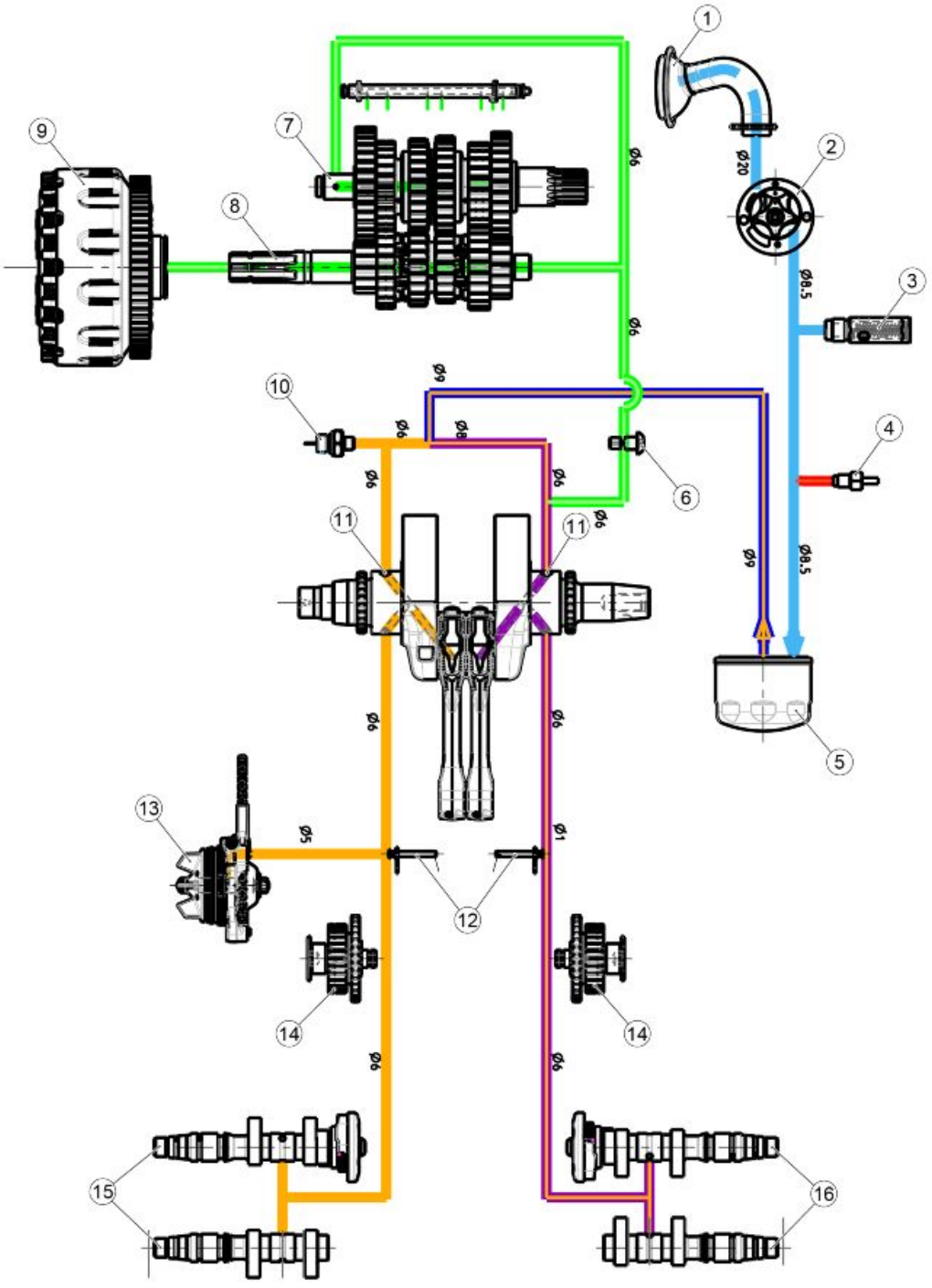
ENSURE THAT THE AL GUARDS ARE POSITIONED AS PERPENDICULARLY AS POSSIBLE, IN ORDER TO AVOID DAMAGING THE MAIN HALF BEARINGS.

See also

Splitting the crankcase halves

Lubrication

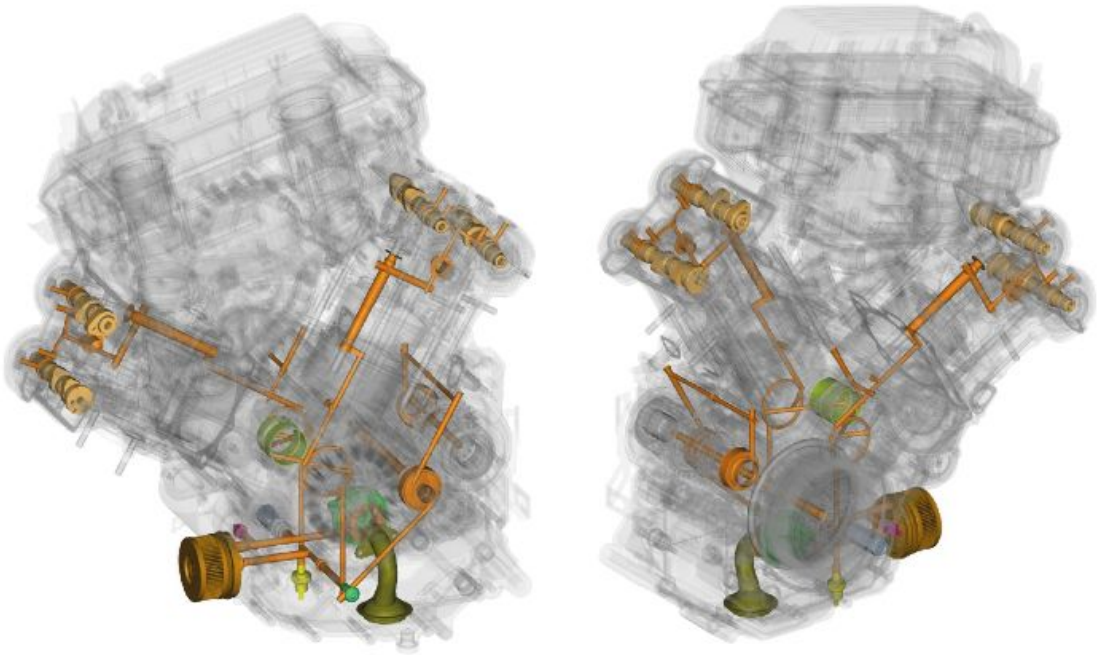
Conceptual diagrams

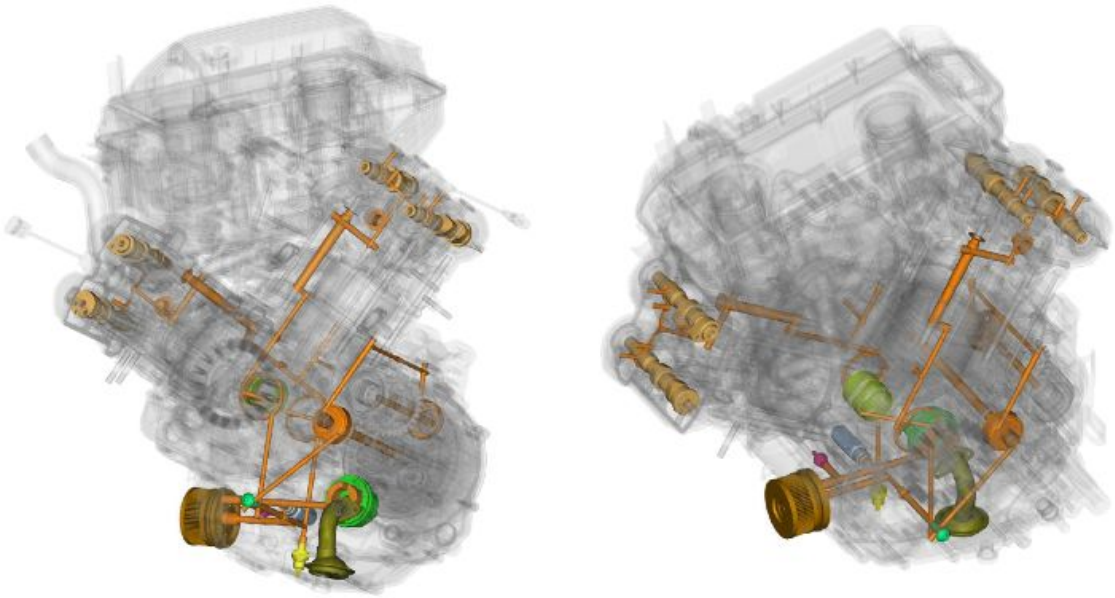


Key:

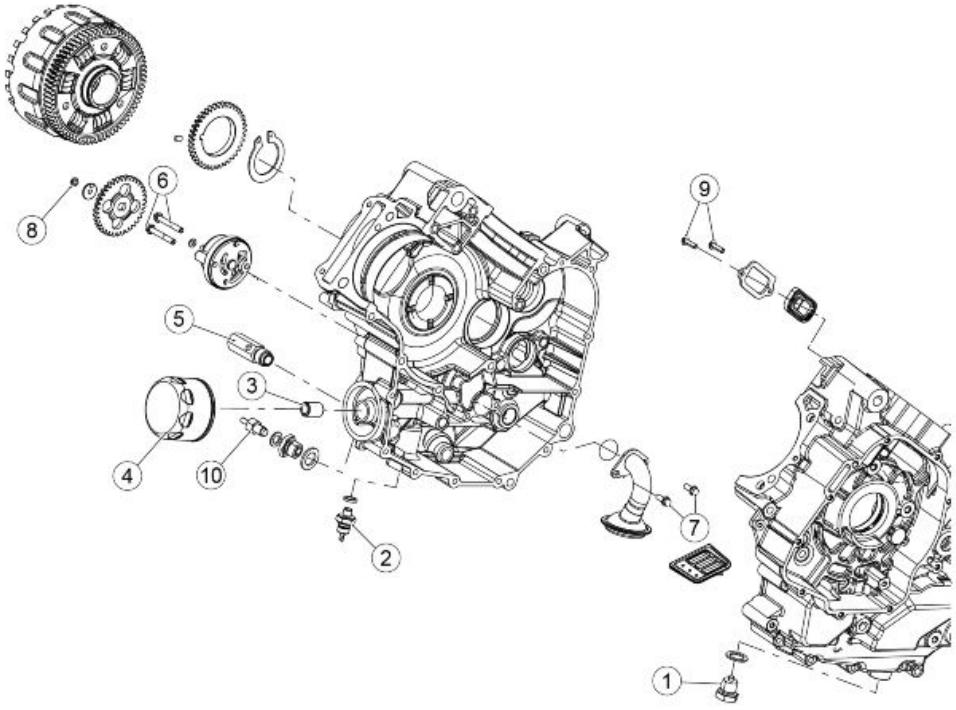
1. Filter head support.
2. Oil pump.
3. Oil pressure regulator valve.
4. Oil pressure sensor.

5. Oil filter.
6. Oil pressure regulator screw.
7. Secondary transmission shaft lubrication.
8. Primary transmission shaft lubrication.
9. Clutch discs lubrication.
10. Oil pressure sensor.
11. Main bushing lubrication.
12. Piston oil jets.
13. Water pump shaft lubrication.
14. Distribution command gearwheels.
15. Front big end cam axis.
16. Rear big end cam axis.





Oil pump



LUBRICATION

Pos.	Description	Type	Quantity	Torque	Notes
1	Oil drainage plug	M16x1.5	1	17 Nm (12.54 lb ft) +/- 15%	-
2	Oil pressure sensor	M10x1	1	13 Nm (9.59 lb ft)	-
3	Fitting fixing of the oil filter	-	1	20 Nm (14.75 lb ft)	-

Pos.	Description	Type	Quantity	Torque	Notes
4	Oil filter	-	1	14 Nm (10.33 lb ft)	-
5	Oil pressure regulation valve	M16x1.5	1	41 Nm (30.24 lb ft)	-
6	Oil pump / bulkhead fastening screws	M6x45	2	5 Nm (3.69 lb ft)	3M SCOTCH GRIP 2353
7	Strainer fastening screws	-	2	12 Nm (8.85 lb ft)	-
8	Oil pump gear fastener nut	M6	1	11 Nm (8.11 lb ft)	-
9	Gear sensor fastening screws	M5x16	2	5 Nm (3.69 lb ft)	3M SCOTCH GRIP 2353
10	Oil temperature sensor	M10x1	1	13 Nm (9.59 lb ft)	-

Removing

- Press the raised side of the safety washer back into place

- Block the pump gearwheel using a commercial hook spanner and unscrew the nut, taking care to retrieve the safety washer.

- Remove the water pump gearwheel

- Retrieve the shim.

- Undo and remove the two screws fixing the oil pump.

- Remove the entire pump.

Inspection

- Undo and remove the two fixing screws.

- Using a thickness gauge check clearance between rotor and stator and replace the rotor / stator unit if necessary.

clearance between rotor and stator: 0.04 ± 0.10 mm (0.0016 in - 0.0039 in).

- Slide off the shaft with the cover.

- Collect the lock pin from the shaft.

- Remove the oil pump rotor.

- Remove the oil pump stator.

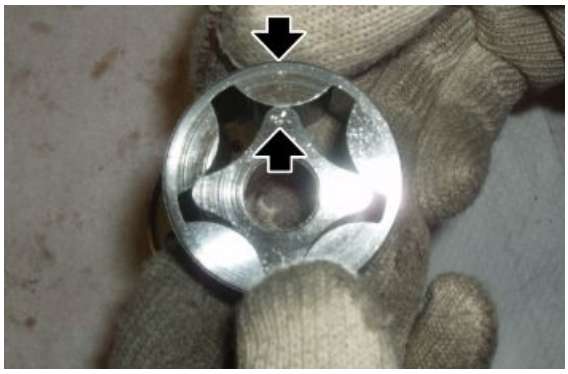
CAUTION

CHECK THAT THE ROTOR AND STATOR ARE NOT DAMAGED (NO EVIDENT ABRASIONS, SCORES OR ANY OTHER MARKS).

Installing

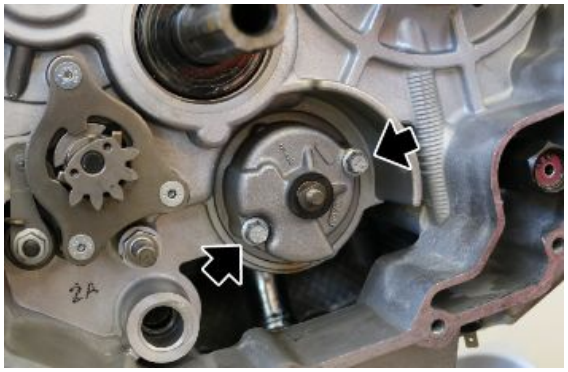
NOTE

PAY ATTENTION TO ALIGN THE REFERENCES ON STATOR AND ROTOR DURING INSTALLATION AND CHECK CLEARANCE WITH A FEELER GAUGE.
IF REQUIRED, REPLACE THE STATOR / ROTOR UNIT.



- Fit the oil pump in its seat.

- Tighten both oil pump fixing screws.



- Fit the shim washer.

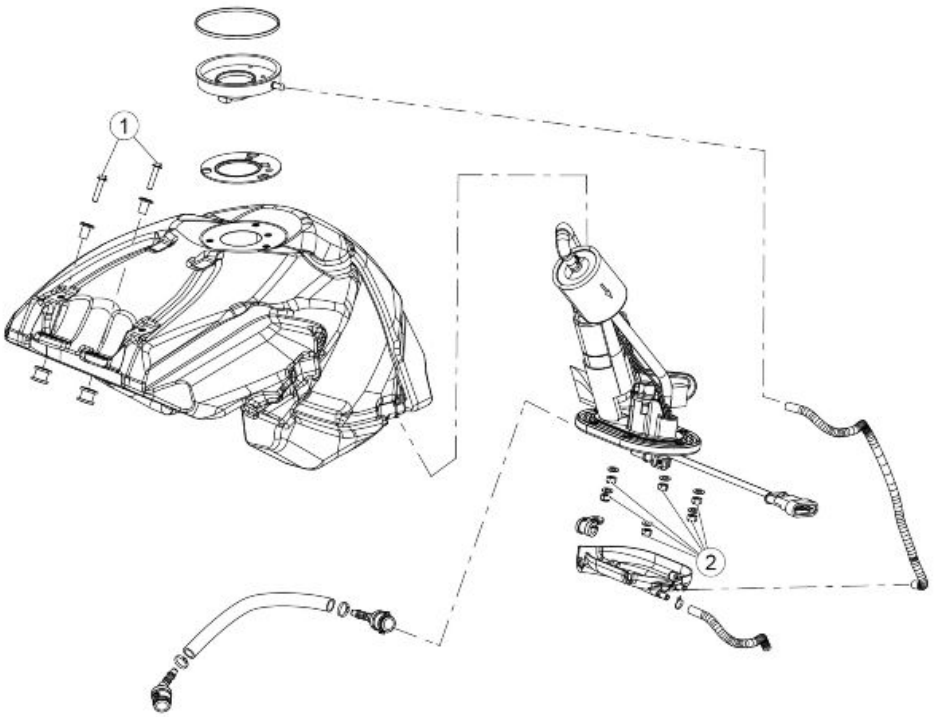
- Insert the oil pump gearwheel, making sure that the machined groove coincides with the pin on the pump.

- Insert the safety washer.
- Using a commercial hook spanner, lock the pump in position and tighten the nut, applying the predefined torque.

- Using a screwdriver, raise and bend the safety washer on the side opposite the slot until it is touching the nut.

INDEX OF TOPICS

Fuel pump

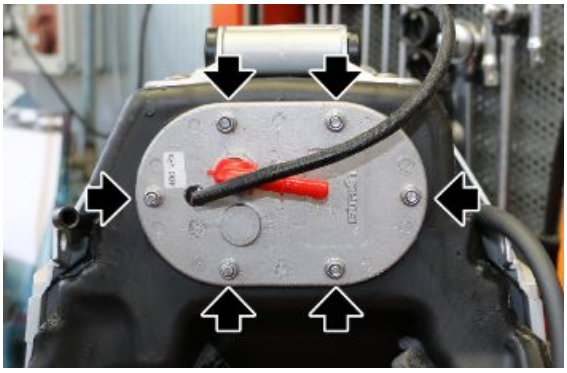


TANK

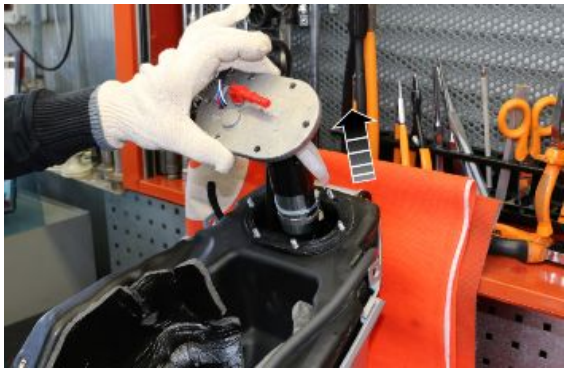
pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head front fuel tank fastening screws	M6x30	2	6 Nm (4.43 lb ft)	-
2	Fuel pump fastening nuts	M5	6	6 Nm (4.43 lb ft)	-

Removing

- Remove the fuel tank.
- Remove the six nuts fixing the fuel pump.

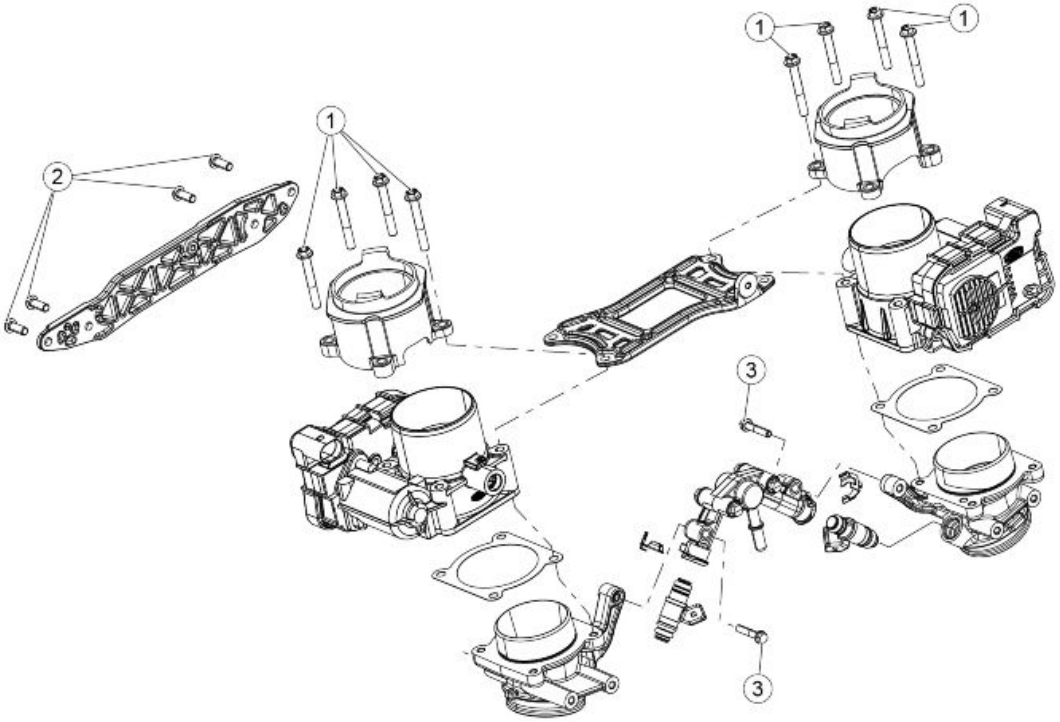


- Remove the fuel pump.



Injection

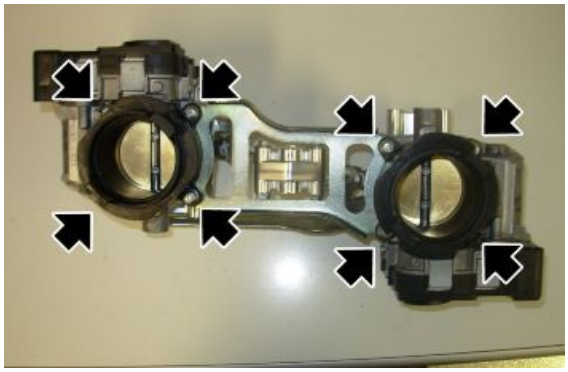
Removing the throttle body



THROTTLE BODY

Pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head screws used for fastening the inlet coupling	M6x60	8	12 Nm (8.85 lb ft)	Loct. 242
2	Button head, hex. socket screws used for fastening the throttle body to the bracket	M6	8	12 Nm (8.85 lb ft)	Loct. 242
3	Flanged, hex. head screws used for fastening the Injectors	M6	2	12 Nm (8.85 lb ft)	Loct. 242

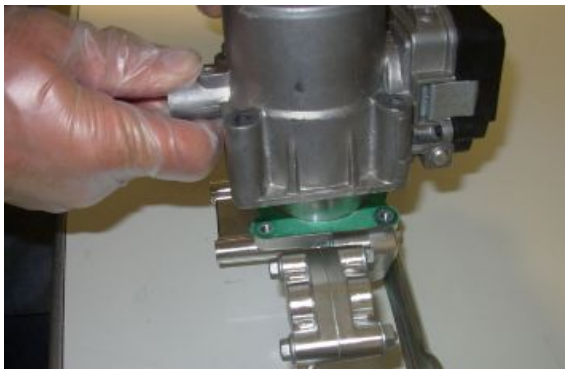
- Remove the filter casing.
- Working on both bodies, undo and remove the four screws and slide off the filter support.



- Remove the upper plate.

- Remove both bodies.

UPON REFITTING, REPLACE THE THROTTLE BODY GASKET WITH A NEW ONE OF THE SAME TYPE.



- Working on both bodies, undo and remove the two plate screws.

- Remove the plate.
- Working on both bodies, undo and remove the screw and detach the body.

- Working on the body in question, remove the injector, slide off the clip and the injector itself.

CAUTION

NEVER UNDO THE SCREWS IN THE FIGURE

Use of diagnostics instrument for injection system

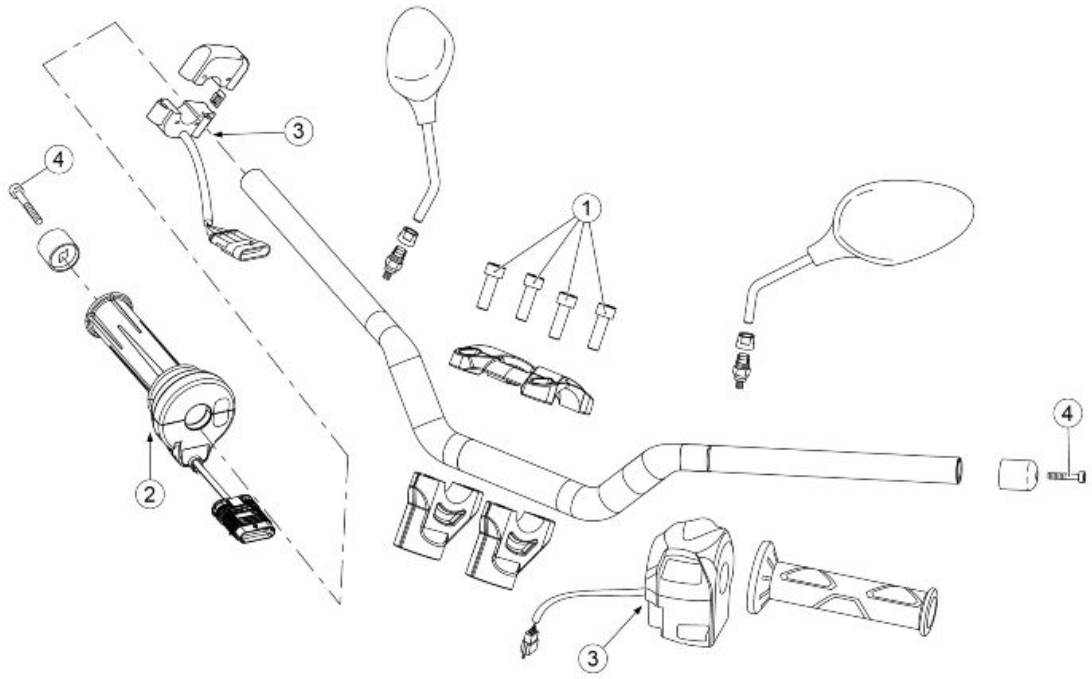
L'elenco completo di tutti i parametri, stati, errori,…ecc è disponibile nella home page del sito **www.serviceaprilia.com** nella sezione ricerca: Parametri PADS.

Gli stessi parametri, stati, errori,.. ecc…suddivisi per componente a cui si riferiscono sono presenti all'interno della sezione **Impianto elettrico,** capitolo: **Verifiche e controlli**

INDEX OF TOPICS

Front

Handlebar



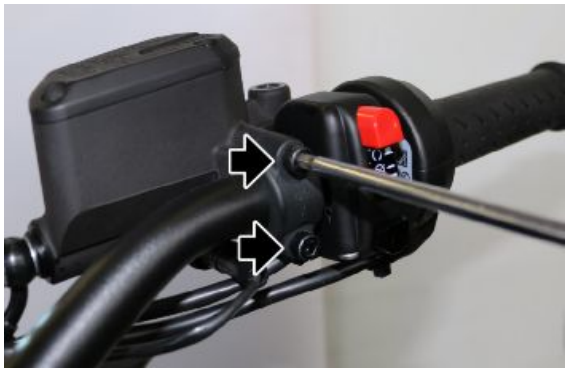
HANDLEBAR-CONTROLS

Pos.	Description	Type	Quantity	Torque	Notes
1	Stainless steel, cyl. head Pozidriv screws used for fastening the upper U-bolt to the lower U-bolt	M8x25	4	25 Nm (18.44 lb ft)	-
2	Electronic accelerator control fastening screws	-	1	4 Nm (2.95 lb ft)	-
3	Light switch fastening screws	-	2	1.5 Nm (1.11 lb ft)	-
4	Cyl. head, hex. socket anti-vibration counterweight fastener screws	M6x45	2	10 Nm (7.38 lb ft)	-

Removing

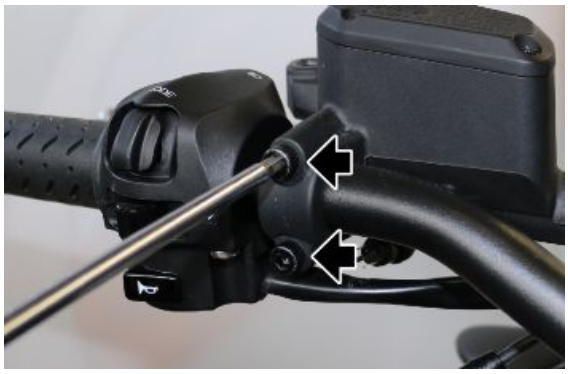
- Remove the rearview mirrors and remove the rubber clamps used for fastening the column switch and ride-by wire control wiring to the brake and clutch pipe.

- Remove the two screws used for fastening the front brake pump U-bolt.



- Move the front brake pump to one side.

- Remove the two screws used for fastening the clutch pump U-bolt.



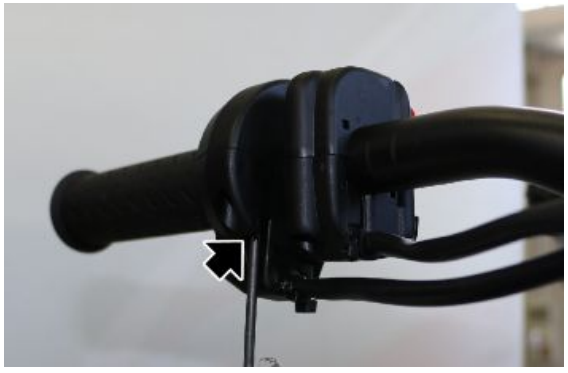
- Move the clutch pump to one side.

- Remove the anti-vibration weights.

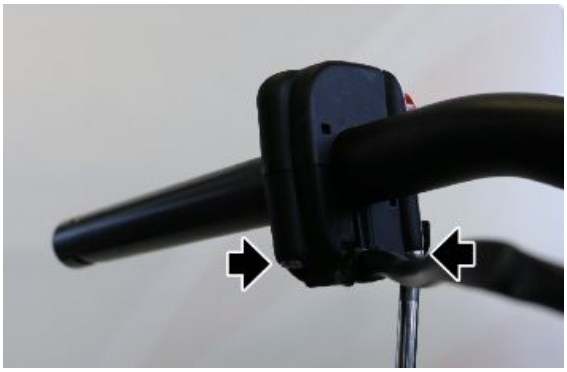
- Remove the left hand knob with the assistance of compressed air.

- Remove the two screws used for fastening the left hand column switch and disconnect it from the handlebars

- Remove the screw used for fastening the Ride By Wire gas control and slide it off the handlebars



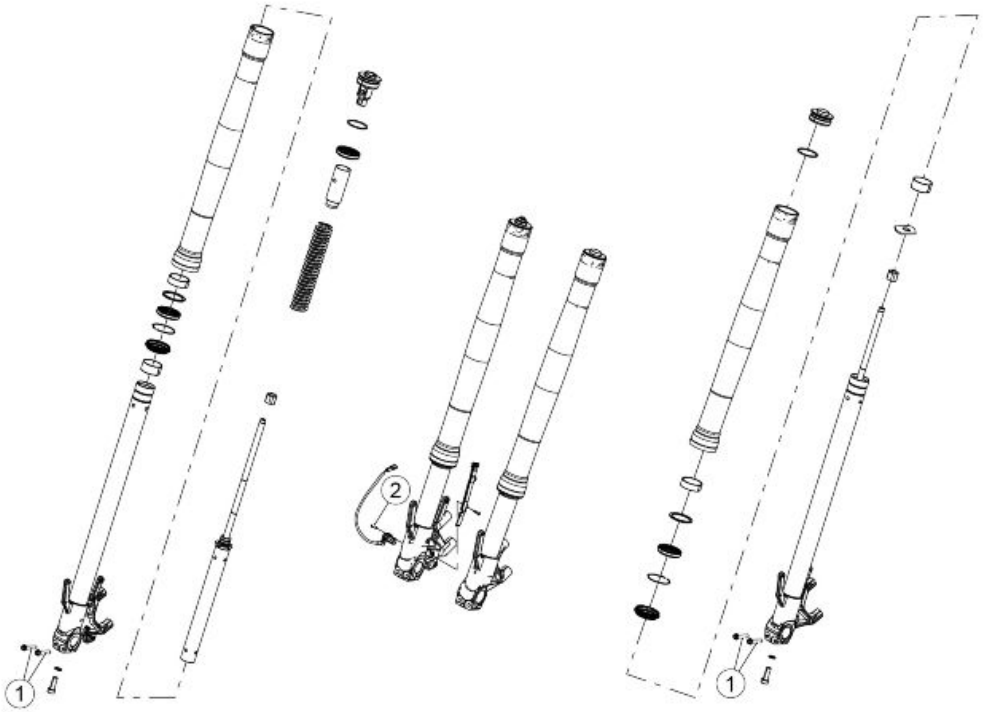
- Remove the two screws used for fastening the left hand column switch.



- Remove the four screws and the U-bolt.

- Remove the handlebars

Front fork



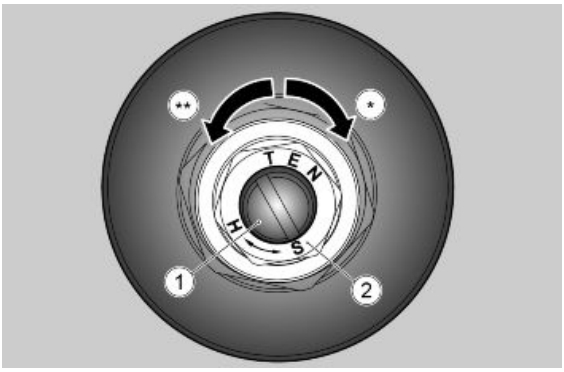
FRONT FORK

Pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head screws used for closing the fork feet	M6x40	4	10 Nm (7.38 lb ft)	-
2	Button head, hex. socket screws used for fastening the sensor to the right hand fork foot	M5x16	1	6 Nm (4.43 lb ft)	-

Adjustment

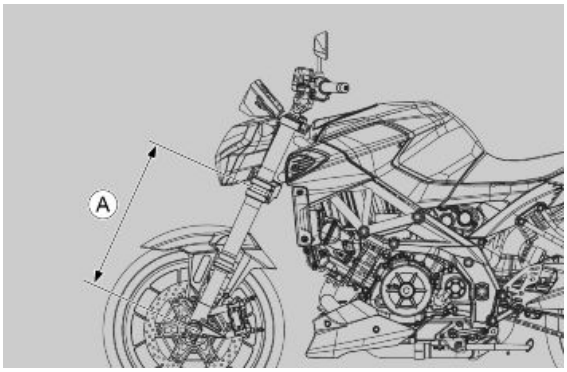
The front suspension consists of a hydraulic fork connected to the headstock by means of two plates.

The right stem of the fork has an upper nut (2) for adjusting the spring pre-load and an upper adjustment screw (1) for adjusting the hydraulic braking in rebound.



DO NOT FORCE THE ROTATION OF THE ADJUSTMENT SCREW BEYOND THE LIMIT STOP IN BOTH DIRECTIONS, IN ORDER TO PREVENT ANY DAMAGE.
WHEN SPRING PRE-LOAD IS INCREASED, REBOUND DAMPING MUST ALSO BE INCREASED TO PREVENT EXCESSIVE SUSPENSION KICKBACK WHEN RIDING.

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.



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).

FRONT FORK - ADJUSTING

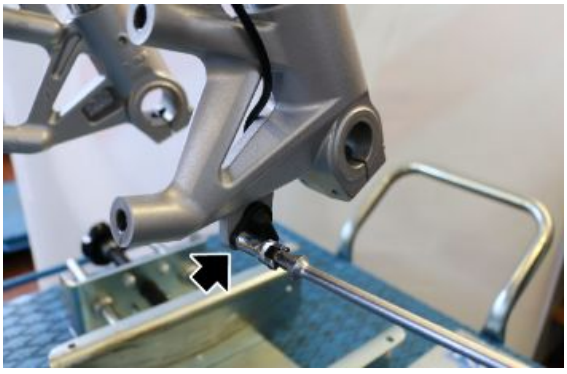
Description	Pilot	Pilot + Passenger + Baggage
Rebound damping adjustment, screw (1)	from completely closed (*) unscrew (**) 6 / 7 clicks	from completely closed (*) unscrew (**) 6 / 7 clicks
Spring preload (2)	2 notches (4 total)	2 notches (4 total)
Extracting the fork (A) (from below the lower plate to the centre of the wheel)	480 mm (18.90 in)	480 mm (18.90 in)

(*) = clockwise

(**) = anticlockwise

Removing the fork legs

- Position a central stand in order to support the motorcycle and remove the front wheel and mudguard.
- Remove the ABS sensor fastening screw.



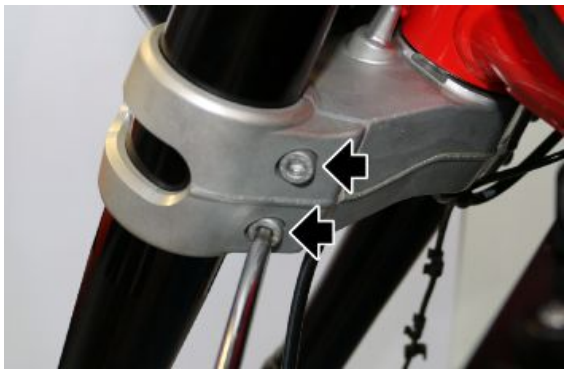
- Remove the cable clamp fastening screw positioned inside the fork foot in order to free the ABS sensor wiring hardness.

NOTE

THE OPERATIONS DESCRIBED BELOW REFER TO ONE ROD ONLY, BUT APPLY EQUALLY TO BOTH RODS.

- Unscrew the screw that fastens the rod to the upper steering plate.

- Unscrew the screws that fasten the rod to the lower steering plate.



- Slide the rod of the steering plates and remove it.

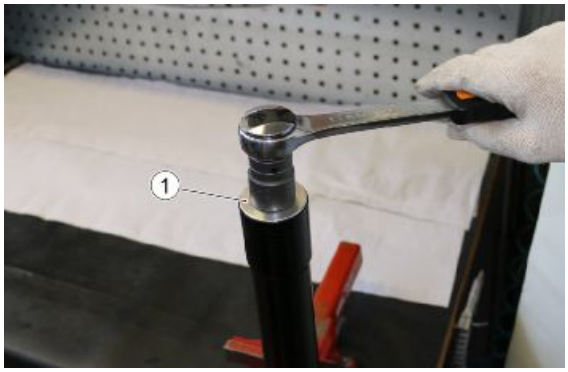
Disassembling the fork

NOTE

THE STEMS ARE NOT THE SAME, THEREFORE THEY REQUIRE SEPARATE REMOVAL PROCEDURES.

THE FOLLOWING OPERATIONS APPLY WHEN REMOVING THE RIGHT HAND STEM

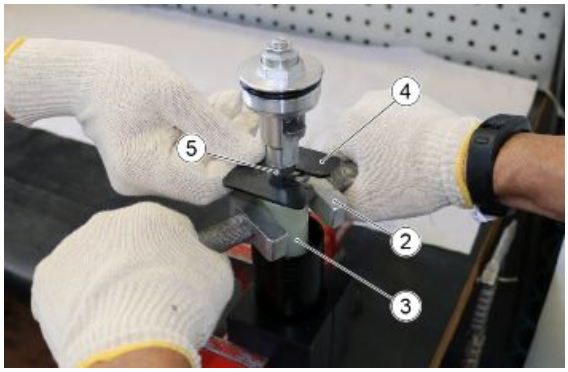
- Taking care not to damage it, secure the fork vertically in a vice, using the appropriate protection devices.
- Unscrew the upper cap (1).



Specific tooling

AP8140149 Guard for assembly operations

- Using the special tool (2), fastened to the pre-loading pipe (3), compress the spring and, with the assistance of a second operator, insert the separator plate (4) under the cap retaining nut (5).

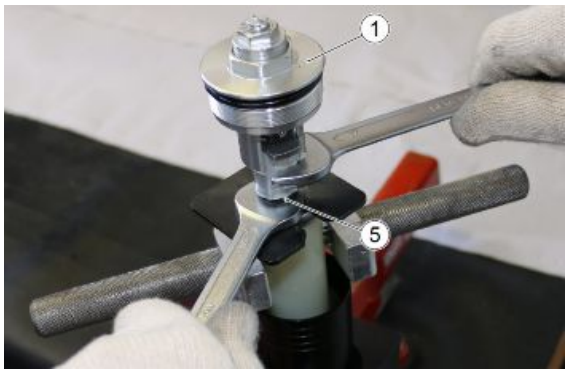


Specific tooling

020888Y Preload tube clamp

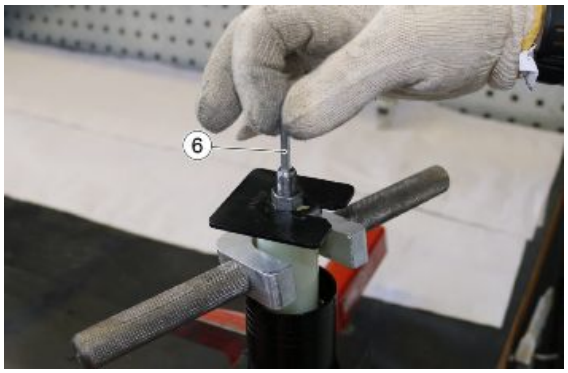
AP8140148 Plunger-spacer separator plate

- Ensure that the cap (1) cannot rotate, and then loosen the nut (5).

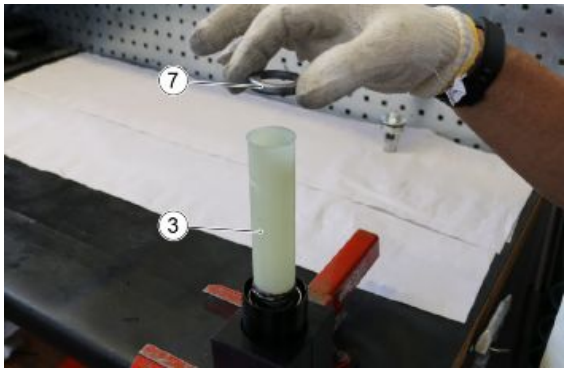


- Unscrew and remove the cap (1).

- Extract the shaft (6) and remove it.



- After removing the locking plate and the device used to compress the spring, remove the upper plate (7) and the pre-loading pipe (3).



- Remove the spring (8) allowing the oil inside the stem to drip out.

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

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

- Taking care not to damage it, secure the sleeve horizontally in a vice, using the appropriate protection devices.
- Extract the dust guard (9).

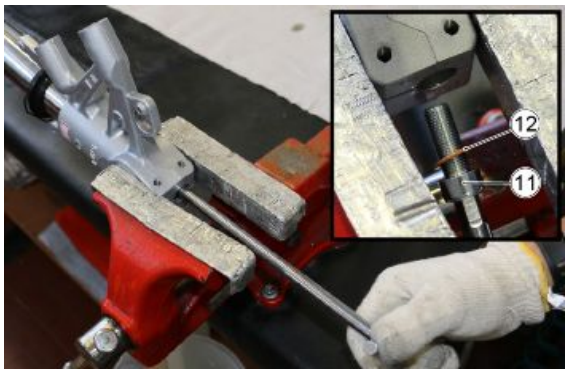
Specific tooling

AP8140149 Guard for assembly operations

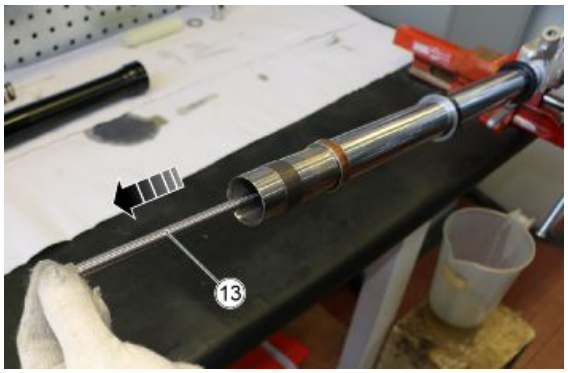
- Remove the seeger ring (10) from inside the sleeve.

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

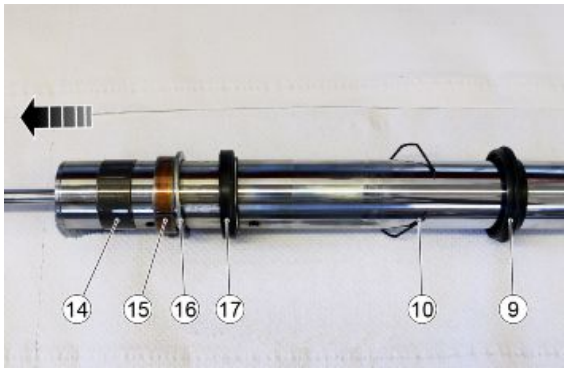
- Secure the stem in a vice and remove the plunger fastening screw (11), taking care not to lose the copper washer (12).



- Remove the complete plunger (13).

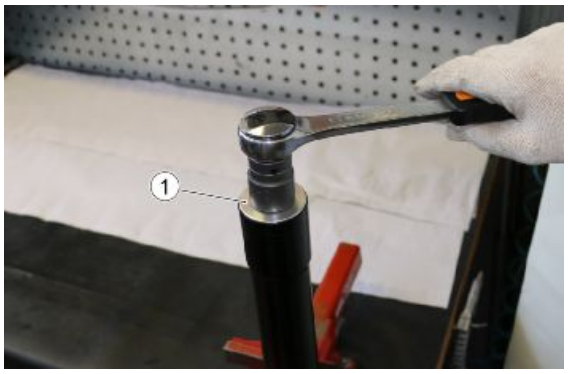


- Observing the indicated sequence, extract and remove the slider bushing (14), the guide bushing (15), the ring (16), the oil seal (17), the seeger ring (10) and the dust guard (9).



THE FOLLOWING OPERATIONS APPLY WHEN REMOVING THE RIGHT HAND STEM

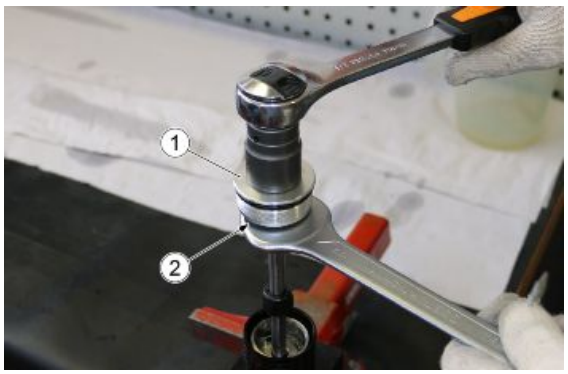
- Taking care not to damage it, secure the fork vertically in a vice, using the appropriate protection devices.
- Unscrew the upper cap (1).



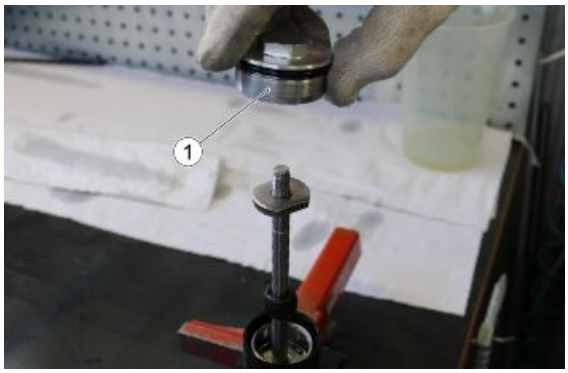
Specific tooling

AP8140149 Guard for assembly operations

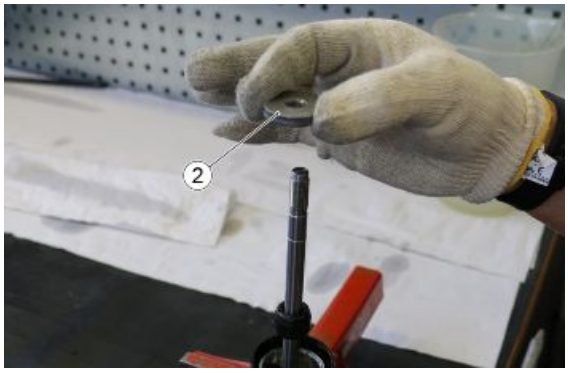
- Ensure that the cap (1) cannot rotate, and then loosen the special nut (2).



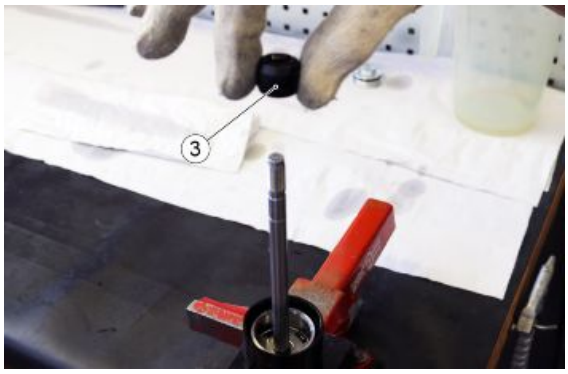
- Unscrew and remove the cap (1).



- Unscrew the special nut (2) and remove it.



- Remove the buffer (3).



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

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

- Taking care not to damage it, secure the sleeve horizontally in a vice, using the appropriate protection devices.
- Extract the dust guard (4).

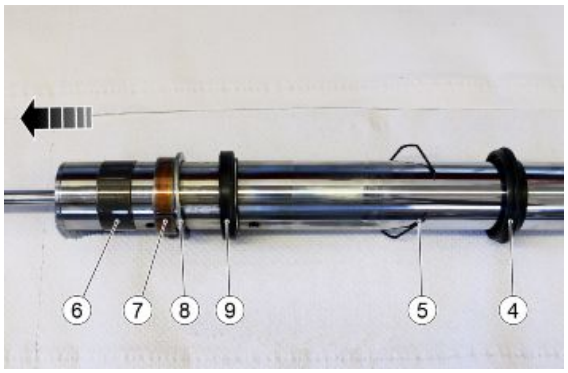
Specific tooling

AP8140149 Guard for assembly operations

- Remove the seeger ring (5) from inside the sleeve.

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

- Observing the indicated sequence, extract and remove the slider bushing (6), the guide bushing (7), the ring (8), the oil seal (9), the seeger ring (5) and the dust guard (4).



Checking the components

Stem

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 stem.

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

If it is over the limit, replace the stem.

CAUTION

A BENT STEM 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.

Spring

Check the condition of the spring, making sure that the length is within the acceptable limits.

If not, replace the spring.

MINIMUM LENGTH OF FREE SPRING: ... mm (... in)

Check the condition of the following components:

- slider bushing;
- guide bushing;
- plunger.

If there is evidence of excessive wear or damage, replace the component concerned.

CAUTION

REMOVE ANY IMPURITIES FROM THE BUSHINGS, BEING CAREFUL NOT TO SCRATCH THEIR SURFACES.

Replace the following components with new ones:

- Oil seal.
- Dust guard.
- - O-ring on the cap.

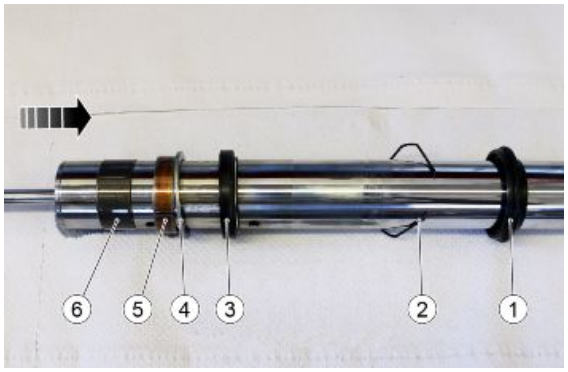
Reassembling the fork

CAUTION

THE STEMS ARE NOT THE SAME, THEREFORE THEY REQUIRE SEPARATE MOUNTING PROCEDURES.

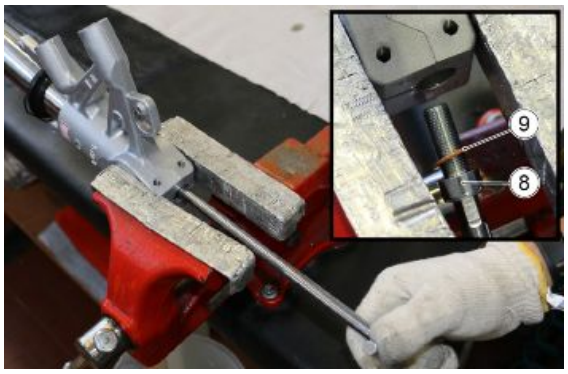
THE FOLLOWING OPERATIONS APPLY WHEN MOUNTING THE RIGHT HAND STEM

- Observing the indicated sequence, extract and remove the dust guard (1), the seeger ring (2), the oil seal (3), the ring (4), the guide bushing (5) and the slider bushing (6).



- Insert the complete plunger (7).

- Secure the stem in a vice and, after inserting the screw (8) used to fasten the plunger, complete with the copper washer (9), apply the pre-defined tightening torque.



- - Insert the stem in the sleeve.

- Using a suitable tool, complete with striking hammer, insert oil seal into its housing (3).

Specific tooling

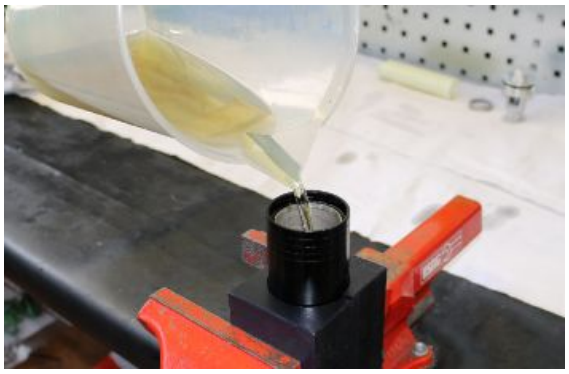
AP8140189 Tool for fitting oil seal for 43 mm (1.69 in) diameter hole

AP8140146 Weight

- Position the seeger ring (2) inside the sleeve.

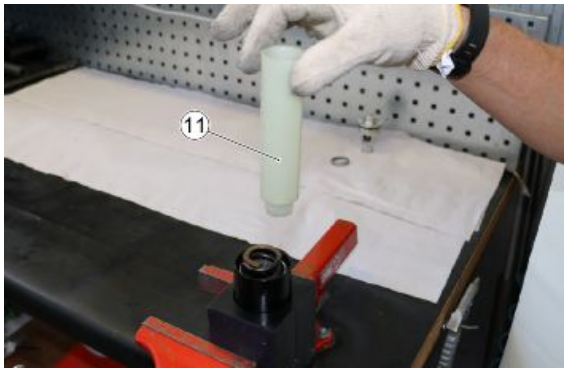
- Insert the dust guard (1) into its housing correctly.

- Place the fork stem vertically on a work surface.
- Fill the stem with the quantity of oil indicated in the "Refilling oil" section.

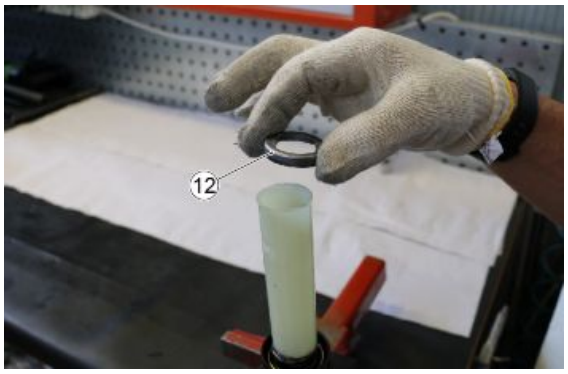


- Insert the spring (10).

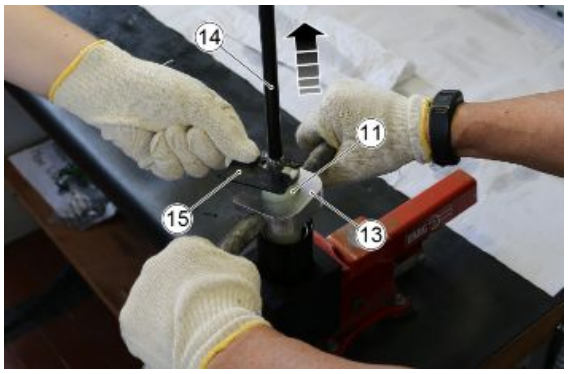
- Insert the pre-load tube (11), making sure that it is aligned correctly. The narrower part must be inserted into the spring.



- Insert the upper plate (12) on the pre-load pipe



- After positioning the device (13) on the pre-load pipe (11) and the plunger support shaft (14), with the assistance of a second operator, raise the plunger so that it is possible to insert the plate (15) under the cap locking nut.



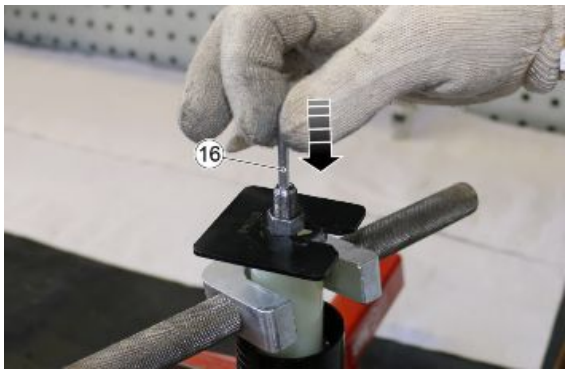
Specific tooling

020888Y Pre-load pipe clamp

AP8140150 Bored shaft for bleeding plunger air

AP8140148 Plunger-spacer separator plate

- Insert the shaft (16) into the plunger.



- 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).

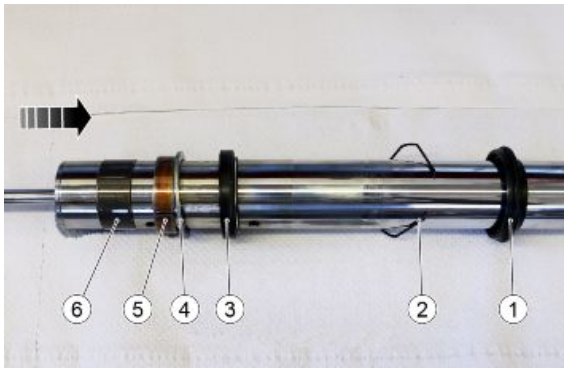
- Screw the cap (17) onto the plunger as far as it will go.

- Ensure that the cap cannot rotate, and then tighten the nut.

- Tighten the cap on the sleeve, applying the pre-defined torque.

THE FOLLOWING OPERATIONS APPLY WHEN MOUNTING THE LEFT HAND STEM

- Observing the indicated sequence, extract and remove the dust guard (1), the seeger ring (2), the oil seal (3), the ring (4), the guide bushing (5) and the slider bushing (6).



- - Insert the stem in the sleeve.

- Using a suitable tool, complete with striking hammer, insert oil seal into its housing (3).

Specific tooling

AP8140189 Tool for fitting oil seal for 43 mm (1.69 in) diameter hole

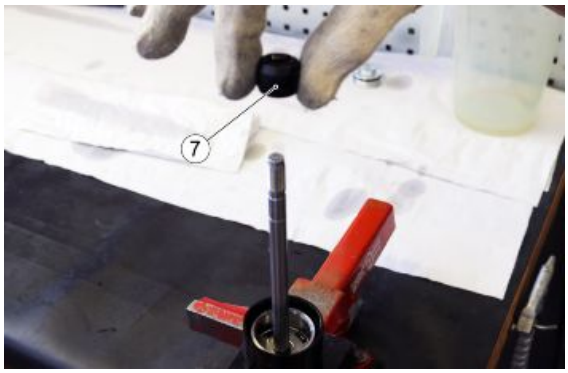
AP8140146 Weight

- Position the seeger ring (2) inside the sleeve.

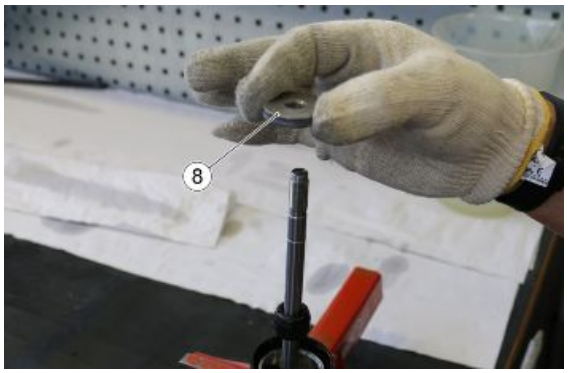
- Insert the dust guard (1) into its housing correctly.

- Place the fork stem vertically on a work surface.
- Fill the stem with the quantity of oil indicated in the "Refilling oil" section.

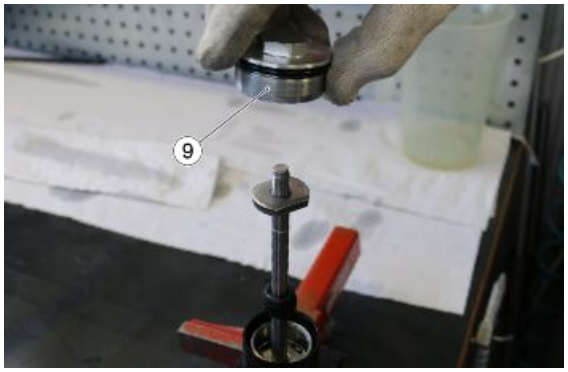
- Insert the buffer (7).



- Insert the special nut (8) and tighten it as far as it will go.



- Insert the cap (9) and tighten it as far as it will go.



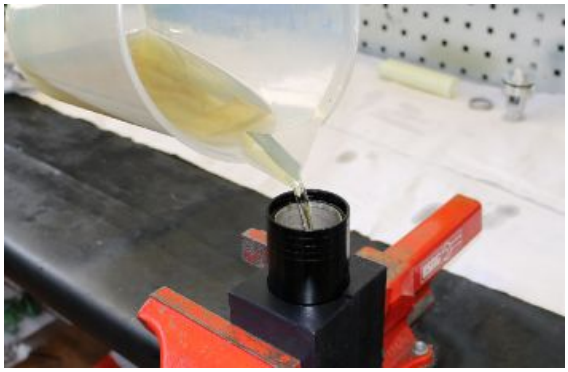
- Ensure that the cap cannot rotate, and then tighten the nut.

- Tighten the cap on the sleeve, applying the pre-defined torque.

Filling oil

THE FOLLOWING OPERATIONS APPLY WHEN MOUNTING THE RIGHT HAND STEM

- Place the fork stem vertically on a work surface.
- Fill the STEM with the indicated quantity of oil.



WARNING

OPERATE THE PLUNGER MULTIPLE TIMES UNTIL AIR BUBBLES MAY BE SEEN ON THE SURFACE OF THE OIL.

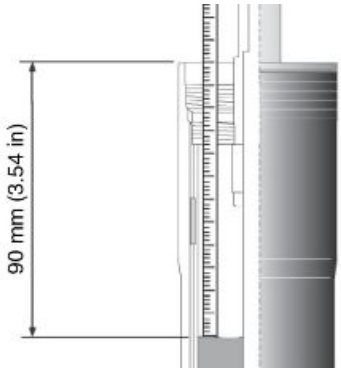
THE FORK MUST BE PERFECTLY UPRIGHT IN ORDER TO MEASURE THE CORRECT OIL LEVEL.

Characteristic

Quantity of oil for RH STEM

522 cm³ (31.85 cu in)

- Check the oil level from the rim of the sleeve.



Characteristic

Oil level (from sleeve rim, without the spring and with the pump all the way lowered)

90 mm (3.54 in)

THE FOLLOWING OPERATIONS APPLY WHEN MOUNTING THE LEFT HAND STEM

- Place the fork stem vertically on a work surface.
- Fill the STEM with the indicated quantity of oil.

WARNING

OPERATE THE PLUNGER MULTIPLE TIMES UNTIL AIR BUBBLES MAY BE SEEN ON THE SURFACE OF THE OIL.

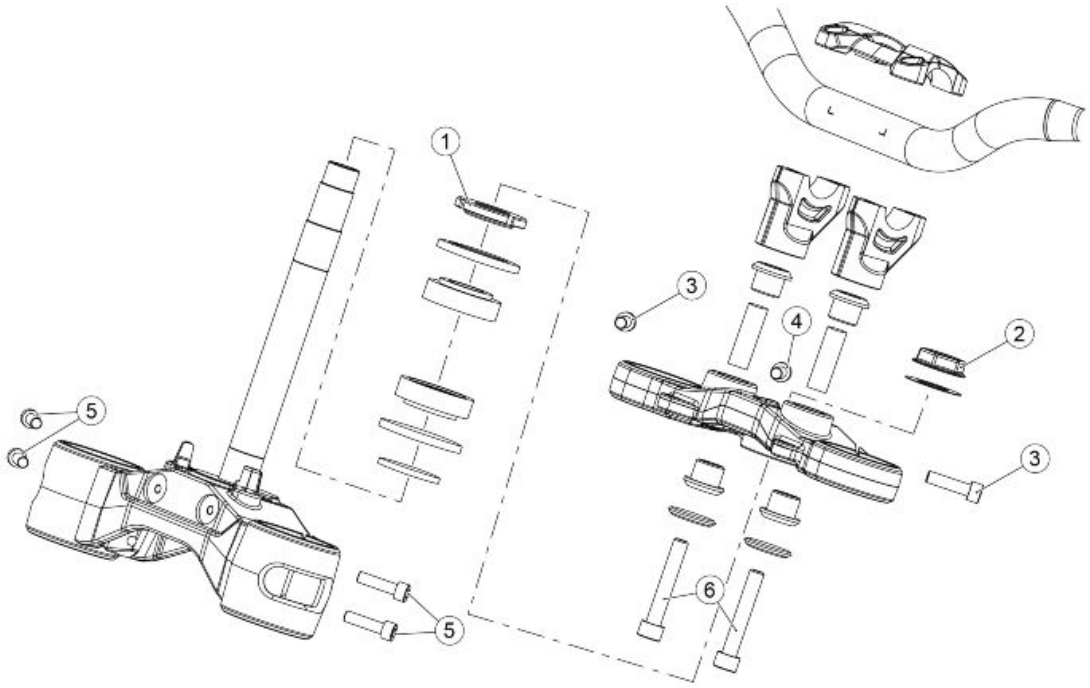
THE FORK MUST BE PERFECTLY UPRIGHT IN ORDER TO MEASURE THE CORRECT OIL LEVEL.

Characteristic

Quantity of oil for LH stem

401 cm³ (24.47 cu in)

Steering bearing

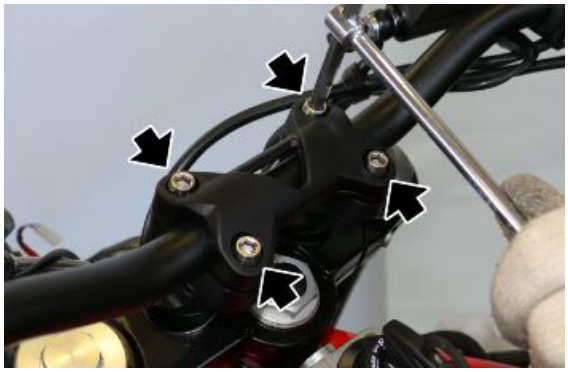


STEERING

Pos.	Description	Type	Quantity	Torque	Notes
1	Headstock ferrule (pre-tightening)	M25	1	50 Nm (36.88 lb ft)	Steering assembly settling
1	Headstock ferrule (tightening)	M25	1	15 Nm (11.06 lb ft)	-
2	Flanged upper steering plate fastening nut (stop)	M22	1	25 Nm (18.44 lb ft)	-
2	Flanged upper steering plate fastening nut (pre-tightening)	M22	1	25 Nm (18.44 lb ft)	Loct. 243
2	Flanged upper steering plate fastening nut (tightening)	M22	1	25 Nm (18.44 lb ft)	-
3	Cyl. head, hex. socket screws used for fastening the fork stanchions to the upper plate	M8x30	2	25 Nm (18.44 lb ft)	-
4	Low profile, cyl. head, hex. socket screw used for fastening the steering headstock to the upper plate	M8x30	1	25 Nm (18.44 lb ft)	-
5	Cyl. head, hex. socket screws used for fastening the fork stanchions to the lower plate	M8x35	4	25 Nm (18.44 lb ft)	-
6	Cyl. head, hex. socket screws for fastening the lower U-bolt to the upper steering plate	M10x60	2	50 Nm (36.88 lb ft)	Loct. 243

Adjusting play

- Secure the rear of the motorcycle using suitable belts and position a central stand under the engine in order to maintain the front wheel in a raised position.
- After removing the instrument panel support and the front light assembly, maintain the fuel tank in raised position and remove the four handlebar U-bolt retaining screws.



- Move the handlebar to one side.

- Remove the upper steering plate fastening nut.

- Remove the washer.

See also

Instrument cluster support

Headlight assy.

- Unscrew the three screws used for fastening the upper steering plate.

- Remove the upper steering plate.

- Apply the pre-tightening torque to the ferrule using the dedicated tool.
- Execute two complete rotations to the left, and two to the right.
- Loosen the ferrule by executing a 90° rotation, and then apply the definitive tightening torque.

Specific tooling

020884Y 46 mm wrench for steering ferrule

- Reposition the upper steering plate and settle it into place by striking it gently with a rubber mallet.

- Tighten the sleeving blocking screws, applying the pre-defined torque.

- Loosen the nut used for fastening the upper steering plate again.
- Tighten the upper steering plate central closure screw, applying the predefined torque.

- Tighten the upper steering plate nut again, applying the predefined torque.

- After refitting the handlebars, apply a dynamometer to the ends of the grips and check the rotation resistance.

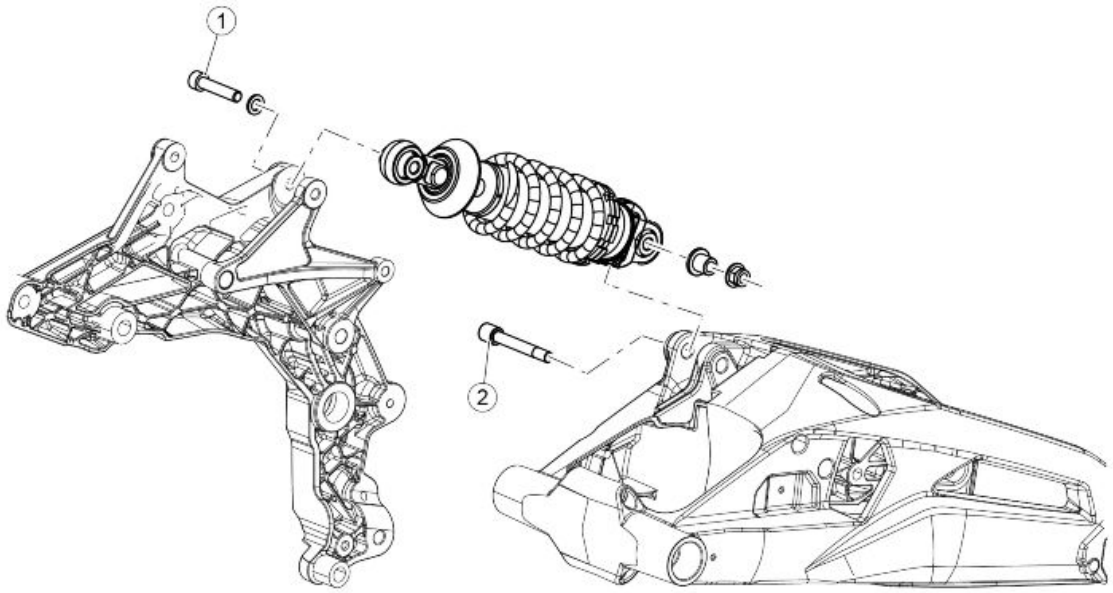
Characteristic

Rotation resistance

500 +100/-300 g (1.10 +0.22/-0.66 lb)

Rear

Shock absorbers



SHOCK ABSORBER

Pos.	Description	Type	Quantity	Torque	Notes
1	Cyl head, hex. socket upper shock absorber fastening screw	M10x50	1	50 Nm (36.88 lb ft)	Pre-impregnated screw
2	Cyl head, hex. socket lower shock absorber fastening screw	M10x59	1	50 Nm (36.88 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 preload (2) and a locking ring nut (3).

CAUTION

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.

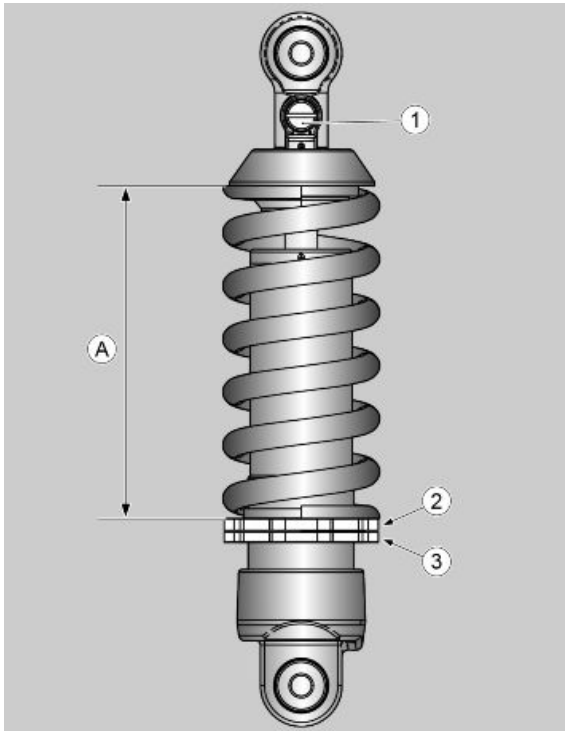
TO COUNT THE NUMBER OF CLICKS OF THE ADJUSTER (1) ALWAYS START FROM THE MOST RIGID SETTING (COMPLETE CLOCKWISE ROTATION).
TO PREVENT DAMAGE TO THE ADJUSTER SCREWS (1), NEVER FORCE THEM BEYOND THE END OF TRAVEL IN EITHER DIRECTION.

- Using the specific spanner, unscrew the locking ring nut (3).
- Use the adjuster ring nut (2) to adjust the preload 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 PRELOADING 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.

REAR SHOCK ABSORBER - ADJUSTMENT

Description	Pilot	Pilot + Passenger + Baggage
Spring length (preloaded)	168 mm (6.61 in)	160 mm (6.30 in)
Rebound adjustment	12	6 / 7



(*) = clockwise

(**) = anticlockwise

Removing

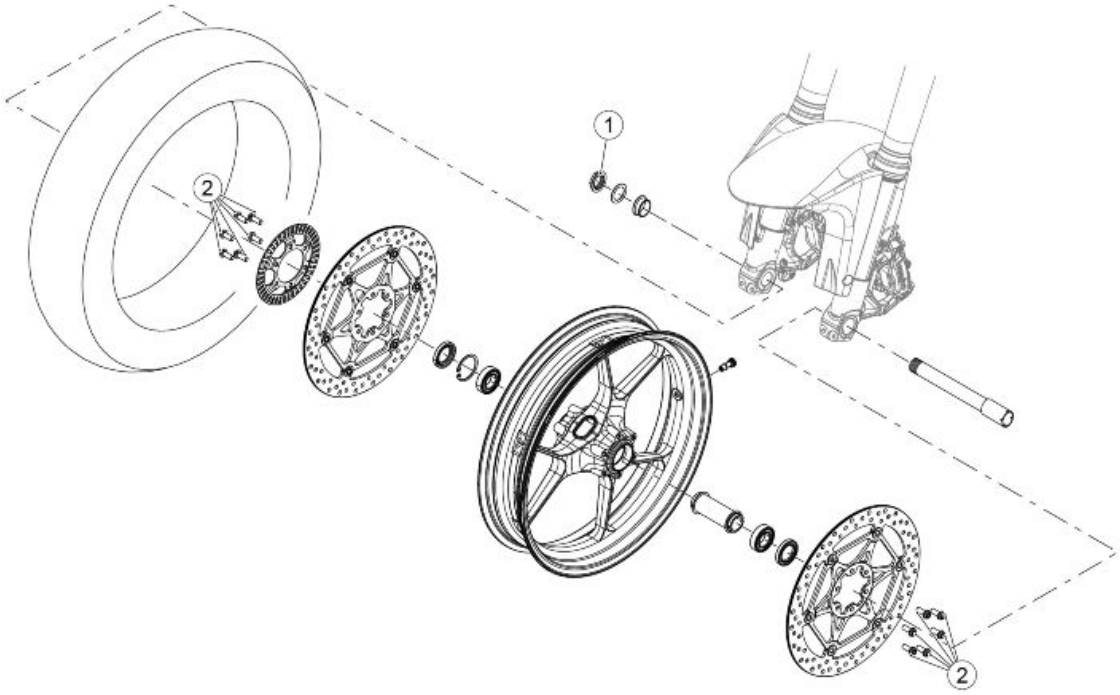
- Place the optional under-sump and rear wheel service stands.
- Unscrew and remove the upper screw and collect the washer.

- Loosen the under-sump optional service stand to lower the engine.
- Unscrew and remove the lower screw and retrieve the nut.
- Remove the shock absorber.

INDEX OF TOPICS

Wheels

Front wheel



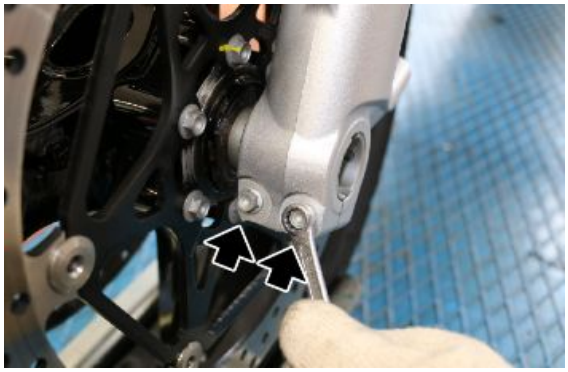
FRONT WHEEL

Pos.	Description	Type	Quantity	Torque	Notes
1	Wheel axle nut	-	1	80 Nm (59.00 lb ft)	-
2	Flanged, hex. head phonic wheel and brake discs fixing screws	M8x20	12	30 Nm (22.13 lb ft)	Pre-impregnated screws

Removal

- Position the motorcycle on the central and rear stand so that the front wheel is slightly raised.
- Remove the front brake callipers, the mudguard, the nut and the washer.

- Working on both sides, loosen the screws on the fork feet



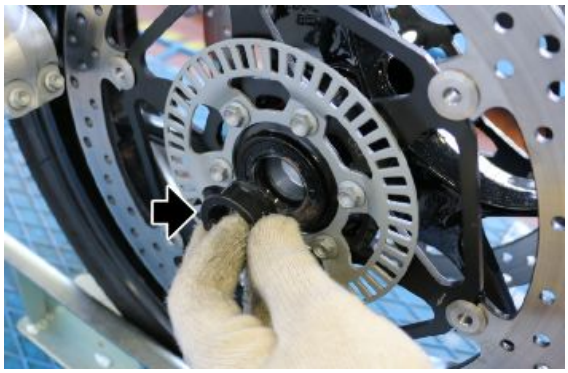
- Slide out the pin from the left hand side of the motorcycle.

- Remove the wheel.

See also

Front mudguard

- Retrieve the spacer present on the left hand side.



Checking

FRONT WHEEL BEARINGS

Check the bearings installed on the wheel.

CHECK THE CONDITION OF ALL COMPONENTS AND OF THE COMPONENTS INDICATED AS FOLLOWS IN PARTICULAR.

CHECKING ROTATION

- Manually rotate the inner race of each bearing. The race must turn smoothly without impediment or noise.

If one or both bearings are not conformant:

- Replace both wheel bearings.

CHECKING RADIAL AND AXIAL PLAY

- Check the radial and axial play.

Axial play: minimal axial play is permitted.

Radial: none.

If one or both bearings are not conformant:

- Replace both wheel bearings.

ALWAYS REPLACE BOTH BEARINGS.
ALWAYS REPLACE THE BEARINGS WITH COMPONENTS OF THE SAME TYPE.

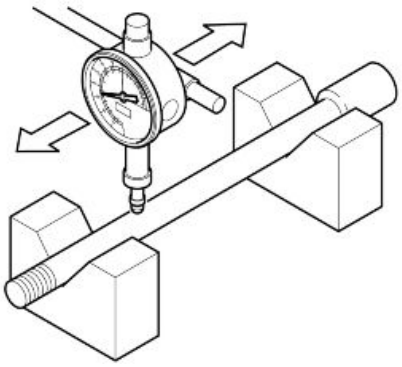
SEALS

- Check the condition of the seals; replace if damaged or excessively worn.

ALWAYS REPLACE BOTH SEALS TOGETHER.
ALWAYS REPLACE THE SEALS WITH COMPONENTS OF THE SAME TYPE.

WHEEL AXLE

- Use a dial gauge to check the wheel axle eccentricity. Replace the wheel axle if the eccentricity exceeds the limit value.

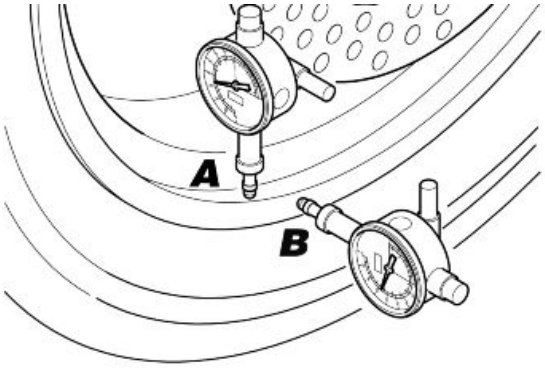


Characteristic

Maximum eccentricity:

0.25 mm (0.0098 in)

- Using a dial gauge, check that the radial (A) and the axial (B) eccentricities of the rim do not exceed the limit value. An excessive eccentricity is usually caused by worn or damaged bearings. Replace the rim if, after replacing the bearings, the value is not within the specified limit.

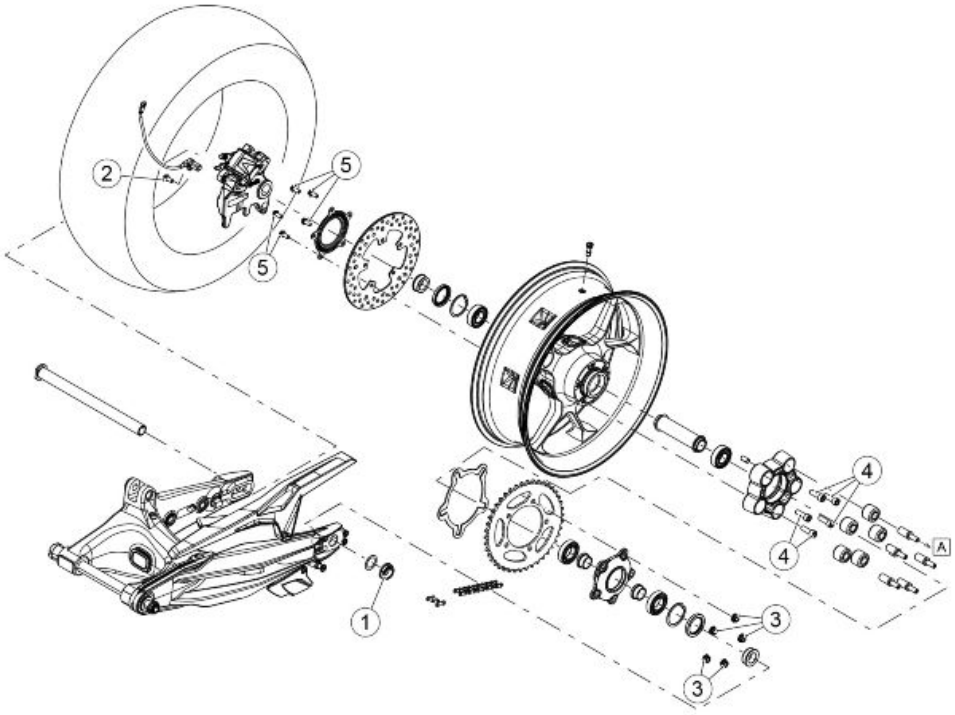


Characteristic

Maximum radial and axial eccentricity:

2 mm (0.0079 in)

Rear wheel



REAR WHEEL

Pos.	Description	Type	Quantity	Torque	Notes
1	Wheel axle nut	M25x1.5	1	120 Nm (88.51 lb ft)	-
2	Button head, hex. socket screw used for fastening the sensor to the brake calliper support	M5x16	1	6 Nm (4.43 lb ft)	-
3	DAX nut for fastening the crown gear on the hub	M10x1.25	5	50 Nm (36.88 lb ft)	-
4	Cyl. head, hex. socket screws used for fastening the cush to the wheel	M10x30	5	50 Nm (36.88 lb ft)	Pre-impregnated screws
5	Flanged, hex. head screws used for fastening the brake disc to the wheel	M8x18	5	30 Nm (22.13 lb ft)	Pre-impregnated screws

Rimozione

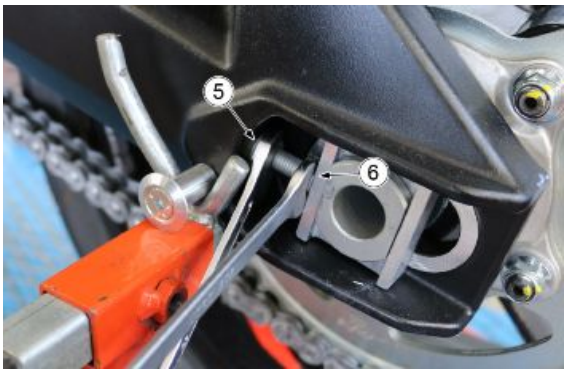
- Place the vehicle on a suitable rear support stand.
- To make it easier to carry out these operations, we recommend removing the chain guard.
- Remove the external screw (1).

- Access the left hand side of the motorcycle and loosen the internal screw (2).

- Detach the chain guard (3) from the internal screw and remove it.

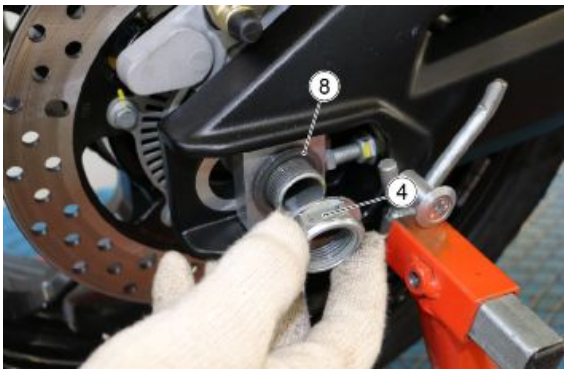
- Loosen the nut (4) without removing it.

- Working on both sides of the vehicle, loosen the locknuts (5) and adjust the regulator screws (6) in order to release the tension on the drive chain.



- Rotate the wheel forwards and disengage the drive chain (7) from the sprocket.

- Remove then nut (4) and the spacer washer (8).



- Partially extract the wheel shaft and remove the guide (9) on the right hand side.

- Remove the wheel shaft (10), complete with guide (11).

- Remove the rear wheel (12).

- Remove the spacers from both sides (13).

- Remove the complete sprocket assembly (14).

- Remove the internal spacer (15)

Checking

CHECK THE CONDITION OF ALL COMPONENTS AND OF THE COMPONENTS INDICATED AS FOLLOWS IN PARTICULAR.

REAR WHEEL BEARINGS

Check the bearings installed on the wheel.

CHECKING ROTATION

- Manually rotate the inner race of each bearing. The race must turn smoothly without impediment or noise.

If one or both bearings do not fall within the control parameters:

- Replace both wheel bearings.

ALWAYS REPLACE BOTH BEARINGS.
ALWAYS REPLACE THE BEARINGS WITH COMPONENTS OF THE SAME TYPE.

- Check the radial and axial play.

Axial play: minimal axial play is permitted.

Radial: none.

If one or both bearings do not fall within the control parameters:

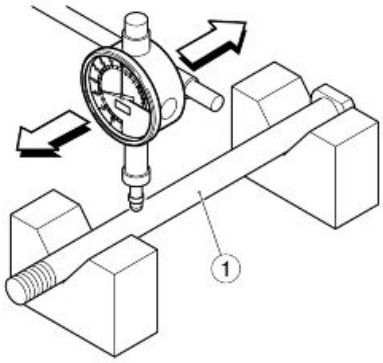
- Replace both wheel bearings.

REAR WHEEL GASKETS

- Check that the gaskets are in good conditions; replace them if they show signs of damage or excessive wear.

ALWAYS REPLACE BOTH SEALS TOGETHER.
ALWAYS REPLACE THE SEALS WITH COMPONENTS OF THE SAME TYPE.

REAR WHEEL AXLE



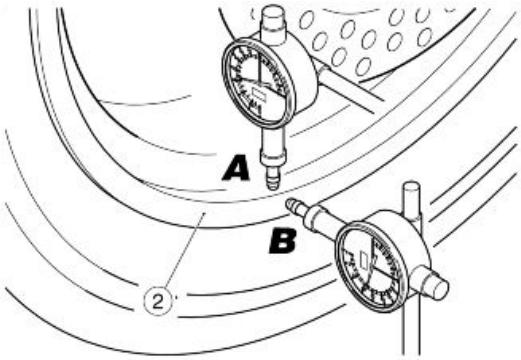
- Use a dial gauge to check the wheel axle eccentricity (1). Replace the wheel axle if the eccentricity exceeds the limit value (1).

Characteristic

Maximum eccentricity:

0.25 mm (0.0098 in)

REAR WHEEL RIM



- Using a dial gauge, check that the radial (A) and the axial eccentricity (B) of the rim (2) do not exceed the limit value.

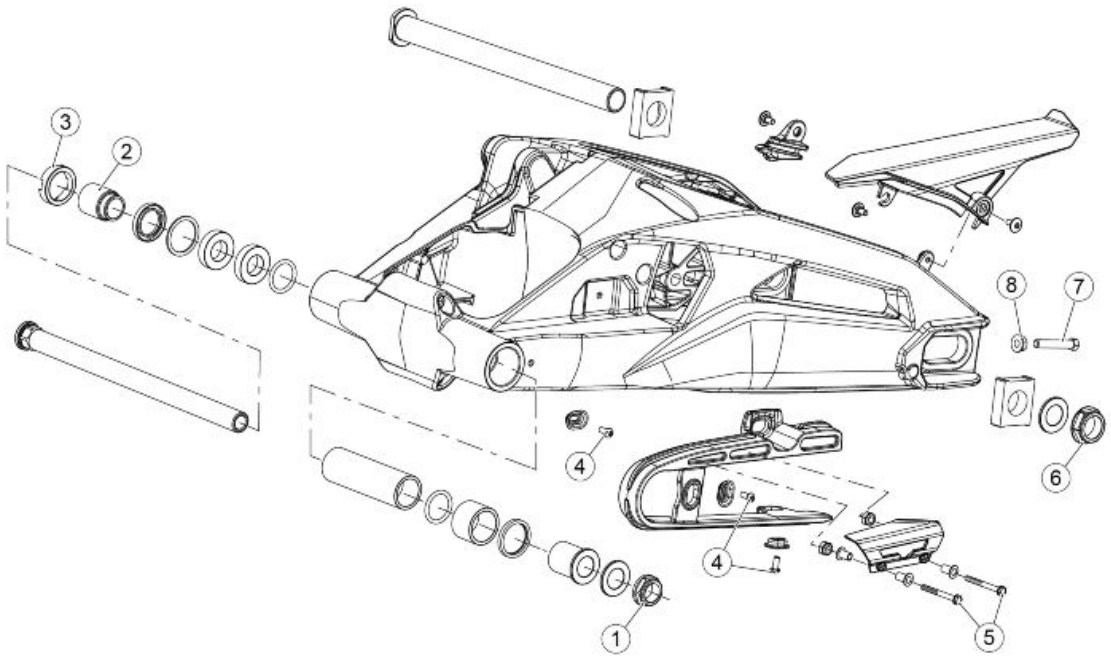
An excessive eccentricity is usually caused by worn or damaged bearings. Replace the rim (2) if after replacing the bearings, the value is not within the specified limit.

Characteristic

Maximum radial and axial eccentricity:

2 mm (0.0079 in)

Swinging arm



SWINGARM

Pos.	Description	Type	Quantity	Torque	Notes
1	Swingarm pivot bolt fastening nut	-	1	90 Nm (66.38 lb ft)	-
2	Swingarm pivot bolt fastening nut swingarm bolt regulator bushing	-	1	12 Nm (8.85 lb ft)	-
3	Swingarm pivot bolt fastening swing-arm bolt ferrule	-	1	60 Nm (44.25 lb ft)	-
4	Button head, hex. socket shoe cap fastening screws	M5x12	3	6 Nm (4.43 lb ft)	-
5	Button head, hex. socket screws used for fastening the chain guard on the chain guide shoe	M6x35	2	10 Nm (7.38 lb ft)	-
6	Wheel axle nut	M25x1.5	1	120 Nm (88.51 lb ft)	-
7	Chain tensioner adjustment screws	-	2	Manual	-
8	Flanged, self-locking nut on the chain tensioner shoe regulator screw	M8	2	Manual	-

Removing

- Remove the ABS sensor.

- Remove the rear wheel.
- Support the vehicle by means of the engine service stand and a hoist with belts fastened to the rear section of the frame.
- Remove the rear service stand.
- Undo and remove the two lower swing-arm screws.
- Remove the cable guide.

- Slide off the rear calliper holding plate, keeping it linked to the brake pipe.

CAUTION

DO NOT ACTUATE ON THE REAR BRAKE LEVER AFTER REMOVING THE WHEEL. OTHERWISE, THE CALLIPER PLUNGERS COULD GO OUT OF THEIR SEAT, RESULTING IN BRAKE FLUID LEAKAGE.

See also

Removing the rear wheel

- With the specific box-spanner, unscrew and remove the locking ring nut.

- Working from the left side, unscrew and remove the nut and collect the washer.

REMOVAL SHOULD BE CARRIED OUT WITH UTMOST CAUTION.
SUPPORT THE SWINGARM FROM THE FRONT TO AVOID ACCIDENTAL FALLS.
PLACE A WOODEN SUPPORT UNDER THE FRONT PART OF THE REAR SWINGARM TO PREVENT IT FROM LOWERING AND TO KEEP IT UPRIGHT.

See also

Removing the
rear wheel

- Working on the right side, unscrew and remove the swingarm bolt.

UPON REMOVING THE REAR SWINGARM PAY ATTENTION NOT TO JAM THE GEARING CHAIN.

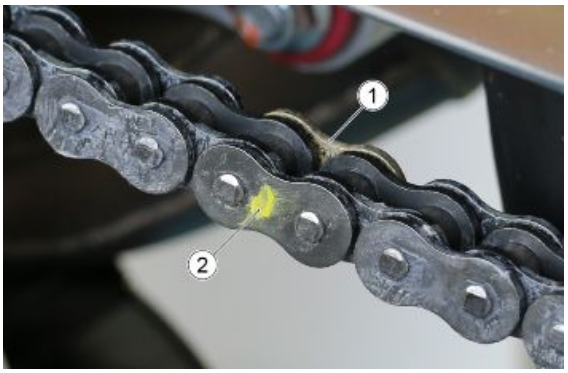
See also

Removing the
rear wheel

Drive chain

Removing

The transmission chain, although "closed", has a different coloured hammerlock (where provided), which should be used to perform opening / disassembling procedures.

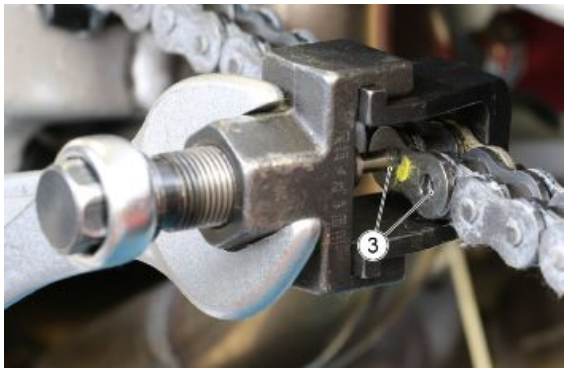


NOTE

WHERE PRESENT, THE HAMMERLOCK (1) MAY ALSO BE IDENTIFIED BY A SIGN (2) APPLIED IN THE MOUNTING LINES DURING MANUFACTURING.

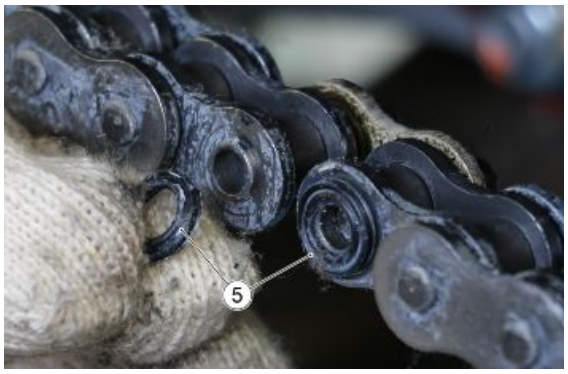
To dismantle and remove the chain, proceed as follows:

- Partially remove the pins (3) using a generic chain breaker.

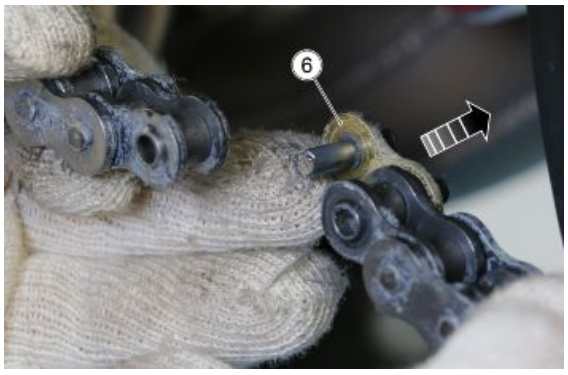


- Remove the outer plate (4).

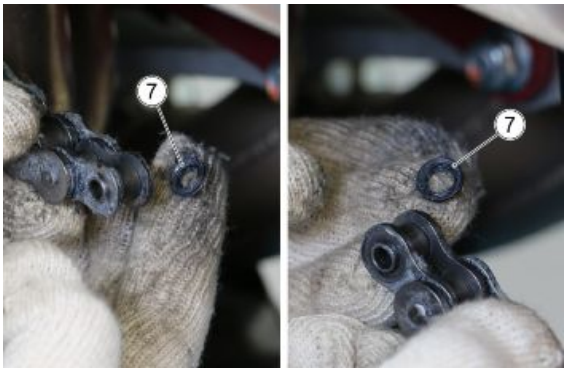
- Remove the outer O-ring rings (5).



- Remove the inner plate (6).

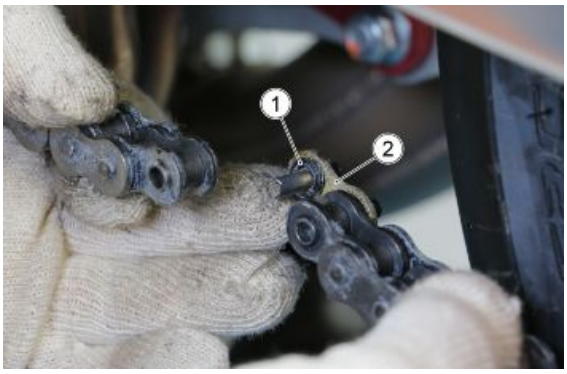


- Collect the inner O-ring rings (7) and completely remove the transmission chain.



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.

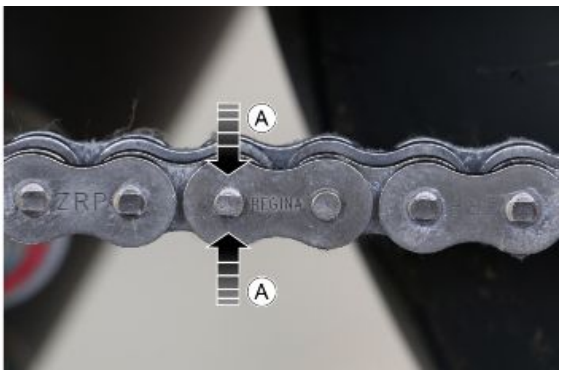
- Compress the outer plate (4) using the appropriate generic tool.

CAUTION

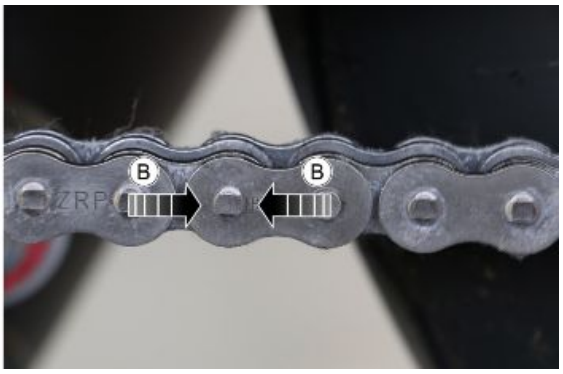
BE CAREFUL NOT TO COMPRESS TOO THE OUTER PLATE TOO MUCH AS THIS COULD SEIZE THE CHAIN.

- 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

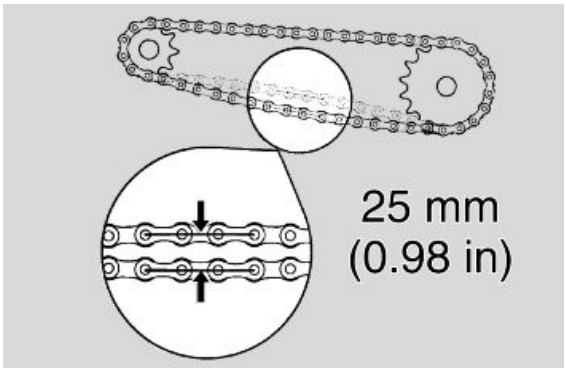
The vehicle has an endless chain, without master link.

NOTE

CARRY OUT MAINTENANCE OPERATIONS AT HALF THE INTERVALS SPECIFIED IF THE VEHICLE IS USED IN PARTICULAR RAINY OR DUSTY CONDITIONS, OFF ROAD OR FOR TRACK USE.

BACKSLASH CHECK

To check clearance:



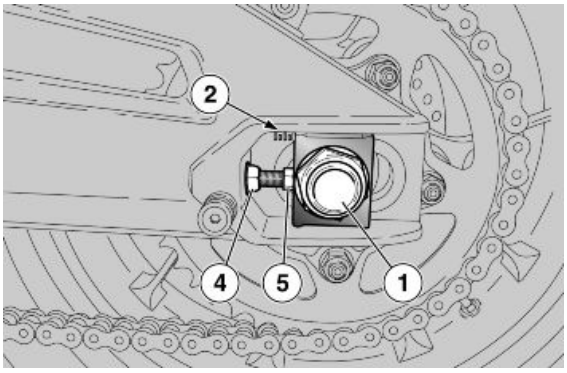
- Shut off the engine.
- Rest the vehicle on its stand.
- Engage neutral gear.
- Check that the vertical oscillation at a point between the pinion and the sprocket on the lower branch of the chain is around 25 mm (0,98 in).
- Move the vehicle forward so as to check vertical oscillation of the chain in other positions too. clearance should remain constant at all wheel rotation phases.

ADJUSTMENT

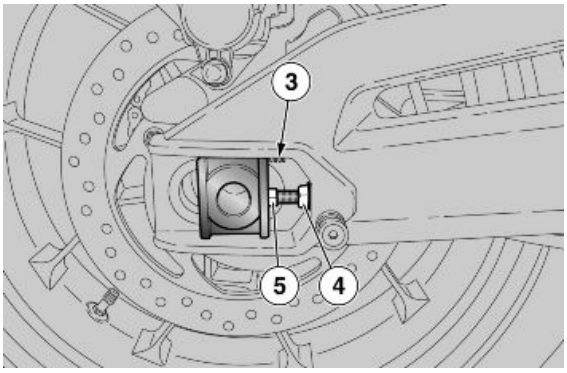
CAUTION

THE SPECIFIC OPTIONAL REAR SUPPORT STAND IS NECESSARY TO ADJUST THE CHAIN.

If you need to adjust chain tension after the check:



- Place the vehicle on its rear service stand (OPT).
- Loosen the nut (1) completely.
- Loosen both lock nuts (4).
- Actuate on the adjuster screws (5) and adjust the chain clearance checking that the references (2-3) match on both sides of the vehicle.
- Tighten both lock nuts (4).
- Tighten the nut (1).
- Check chain clearance.



CAUTION

WHEEL CENTRING IS CARRIED OUT USING THE IDENTIFIABLE FIXED REFERENCES (2-3) INSIDE THE CHAIN TENSIONER PAD MOUNTS ON THE SWINGARMS, IN FRONT OF THE WHEEL AXLE.

CHECKING WEAR OF CHAIN, PINION AND SPROCKET

Also regularly check the following parts and make sure that the chain, the pinion and the sprocket do not show:

- damaged rollers;

- loosened pins;
- dry, rusty, flattened or jammed chain links;
- excessive wear;
- missing sealing rings;
- excessively worn or damaged pinion or sprocket teeth;

IF THE CHAIN ROLLERS ARE DAMAGED, THE PINS ARE LOOSE AND/OR THE SEAL RINGS ARE DAMAGED OR MISSING, THE ENTIRE CHAIN UNIT (PINION, SPROCKET AND CHAIN) NEEDS TO BE REPLACED.
LUBRICATE THE CHAIN REGULARLY, ESPECIALLY IF THERE ARE DRY OR RUSTY PARTS. CRUSHED OR SEIZED LINKS MUST BE LUBRICATED AND RESTORED TO PROPER WORKING ORDER.

THE DRIVE CHAIN HAS SEAL RINGS BETWEEN THE LINKS, WHICH KEEP THE GREASE INSIDE. BE EXTREMELY CAREFUL WHEN ADJUSTING, LUBRICATING, WASHING AND REPLACING THE CHAIN.

CLEANING AND LUBRICATION

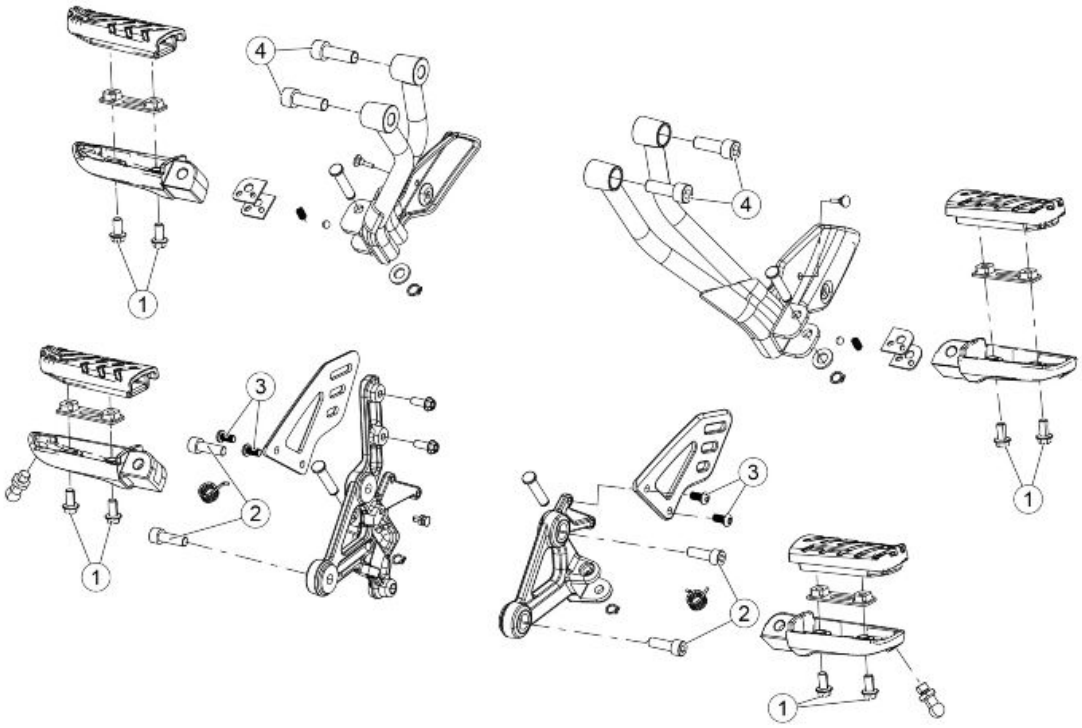
Do not wash the chain with water jets, vapour jets, high-pressure water jets and highly flammable solvents.

- Wash the chain with naphtha or kerosene. If it tends to rust quickly, carry out the maintenance operations more frequently.

Lubricate the chain at the intervals shown in the routine maintenance table and whenever necessary.

- After washing and drying the chain, lubricate it with spray grease for sealed chains.

Pedaline



FOOTRESTS

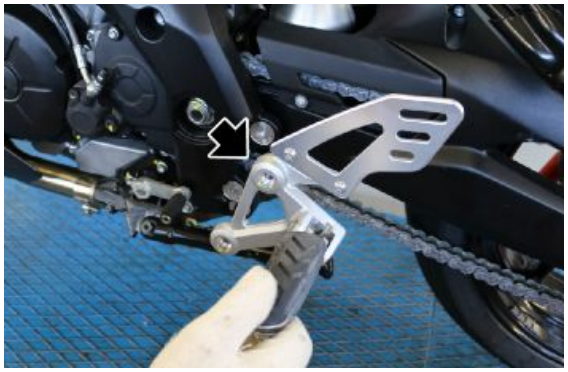
Pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head screws used for fastening the rider/passenger rubber footrests	M6x12	8	10 Nm (7.38 lb ft)	-
2	Cyl. head, hex. socket screws used for fastening the rider's footrest support to the frame plates	M8x25	4	18 Nm (13.28 lb ft)	Loct. 243
3	Button head, hex. socket screws used for fastening the luggage rack to the rider's footrest support	M6x12	4	8 Nm (5.90 lb ft)	-
4	Cyl. head, hex. socket screws used for fastening the passenger footrest supports to the saddle support	M10x30	4	50 Nm (36.88 lb ft)	Loct. 243

Rimozione

LEFT RIDER FOOTREST

- Remove the two fastening screws (1).

- Remove the complete footrest.

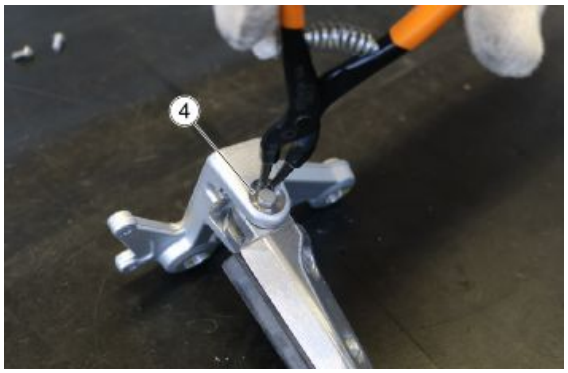


To dismantle the footrest, proceed as follows:

- Remove the two screws (2) used to fasten the heel guard plate.

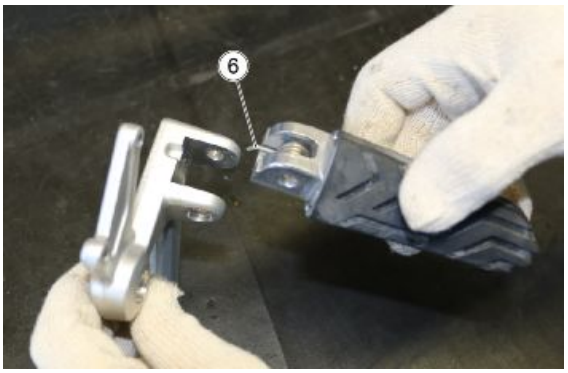
- Remove the heel guard plate (3).

- Remove the seeger ring (4)



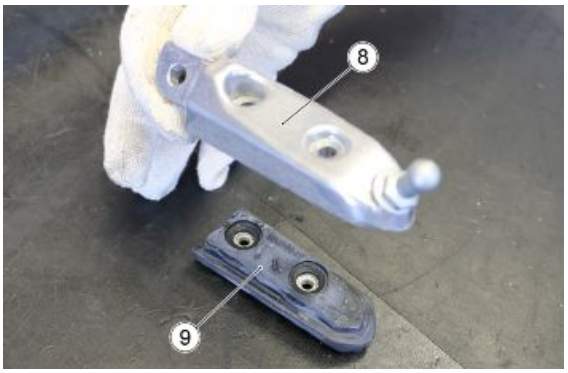
- Extract the pin (5) and remove it.

- Remove the pedal, complete with spring (6).



- Remove the two screws (7) used to fasten the rubber pad.

- Separate the pedal (8) from the rubber pad (9).



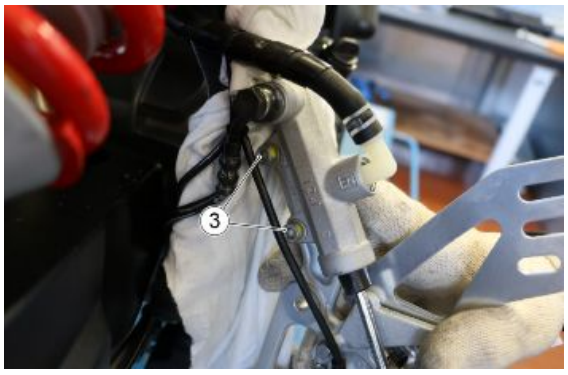
- Remove the pin (10).

RH RIDER FOOTREST

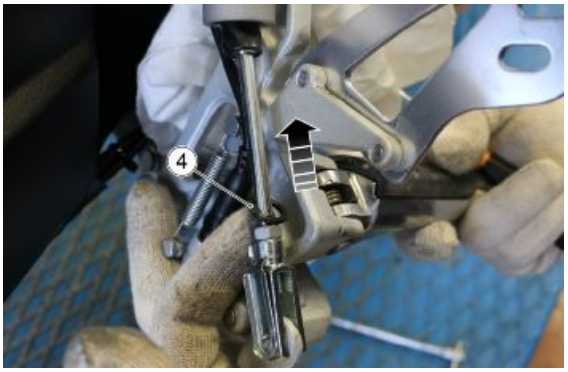
- Remove the fastening screw (1) from the brake pipe retaining plate in order simplify the mounting operations.

- Remove the two fastening screws (2).

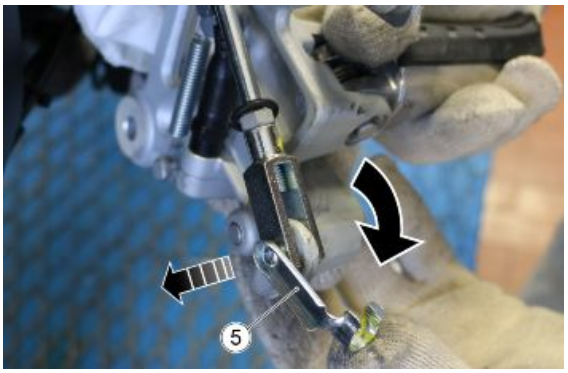
- Position the cloth in order to protect the frame from scratches and remove the two rear brake pump fastening screws (3).



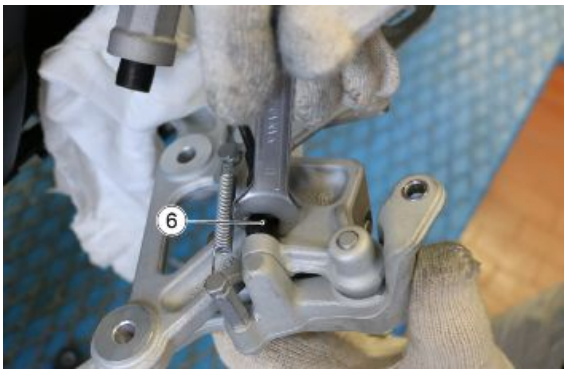
- Remove the safety O-ring (4) from the pin that blocks the brake pump control rod.



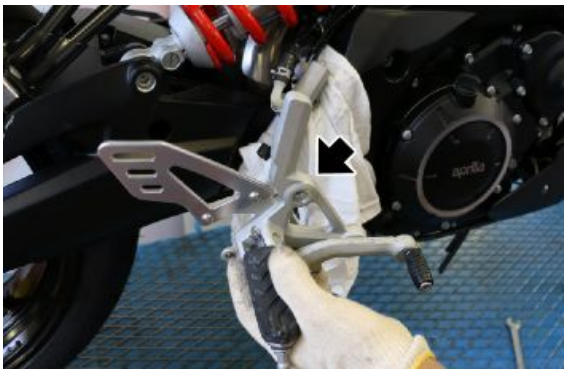
- Rotate the pin (5) to release the brake pump control rod and slide it out in order to remove it.



- Remove the brake switch (6).



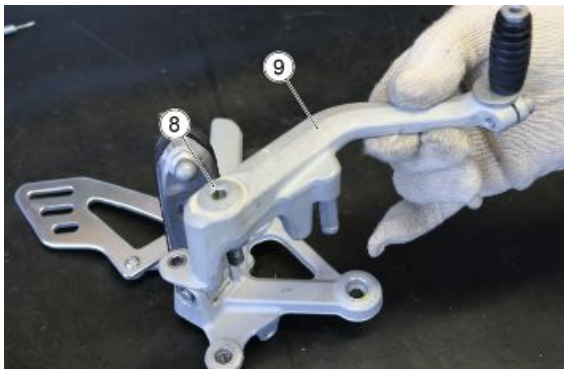
- Remove the complete footrest.



To dismantle the footrest, proceed as follows:

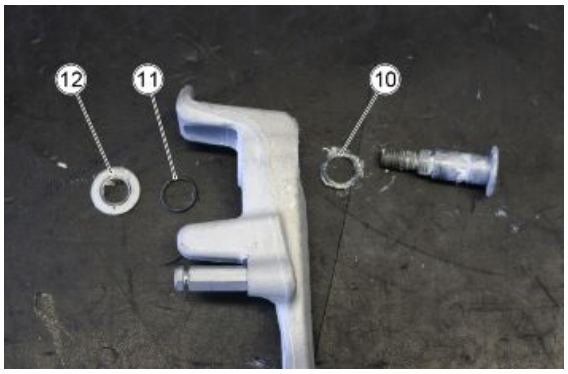
- Disconnect the brake lever return spring (7) and remove it.

- After unscrewing the pin (8) it is possible to remove the complete brake lever (9).



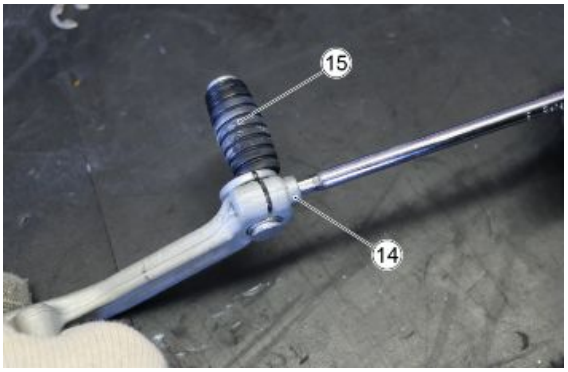
The pin (8) consists of the following elements:

- An external washer (10)
- An O-ring (11)
- An internal washer (12)

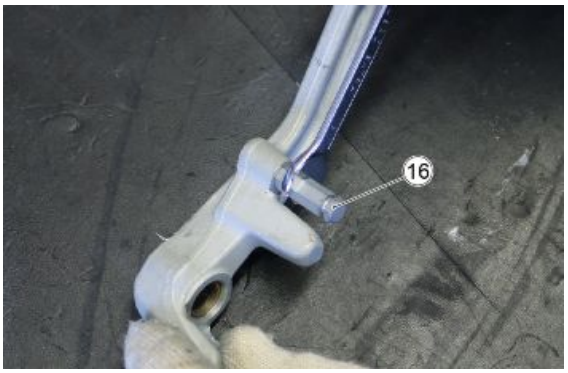


- Remove the seeger ring (13)

- Undo the screw (14) in order to remove the peg (15) from the lever, complete with rubber protection pad.

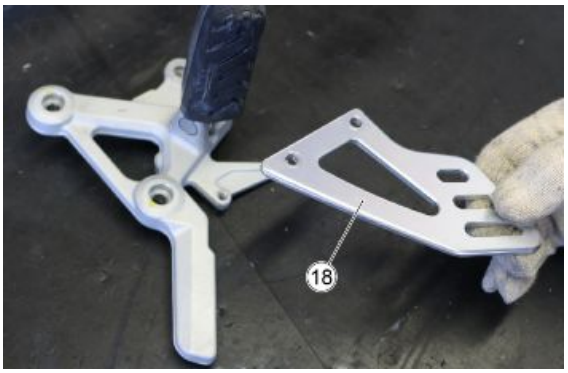


- Unscrew the brake lever spring coupling pin (16) and remove it.

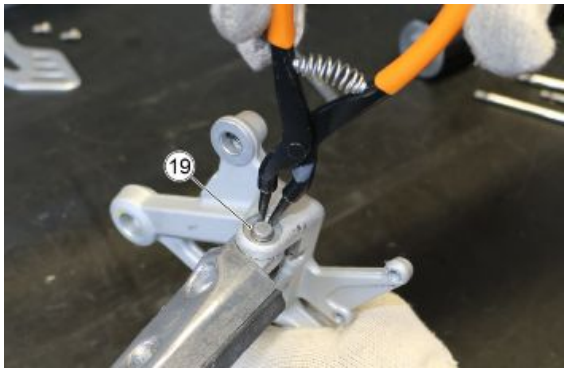


- Remove the two screws (17) used to fasten the heel guard plate.

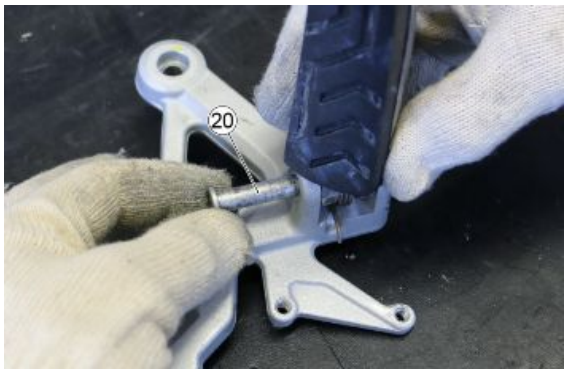
- Remove the heel guard plate (18).



- Remove the seeger ring (19)



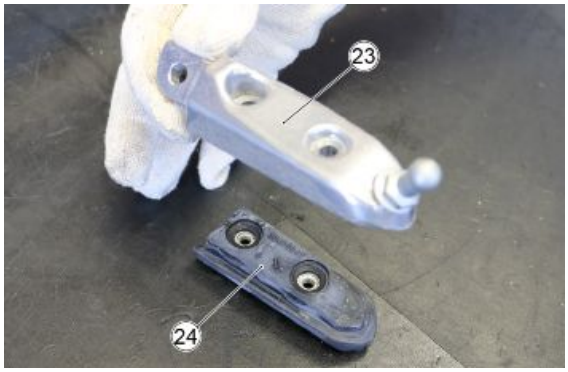
- Extract the pin (20) and remove it.



- Remove the pedal, complete with spring (21).

- Remove the two screws (22) used to fasten the rubber pad.

- Separate the pedal (23) from the rubber pad (24).



- Remove the pin (25).

PASSENGER FOOTRESTS

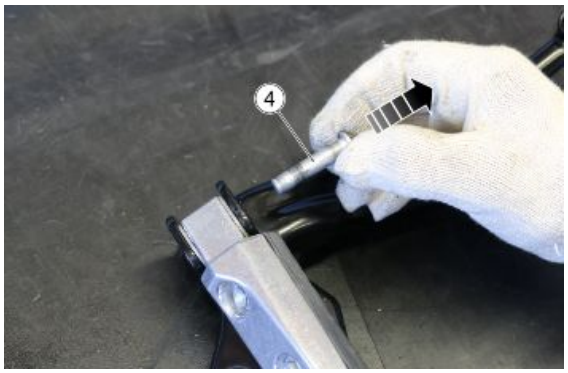
THE FOLLOWING OPERATIONS ARE VALID FOR BOTH FOOTRESTS

- Remove the two screws (1) used to fasten the support bracket.

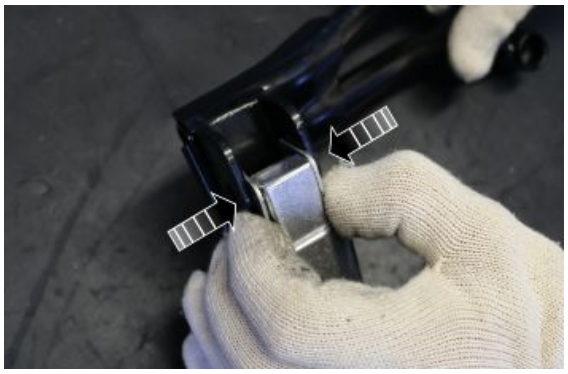
- Remove the support bracket (2) complete with pedal.

- Remove the seeger ring (3)

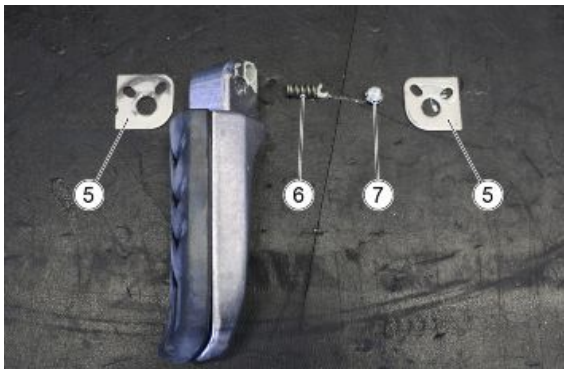
- Extract the pin (4).



- While pressing the side plates, remove the complete pedal.

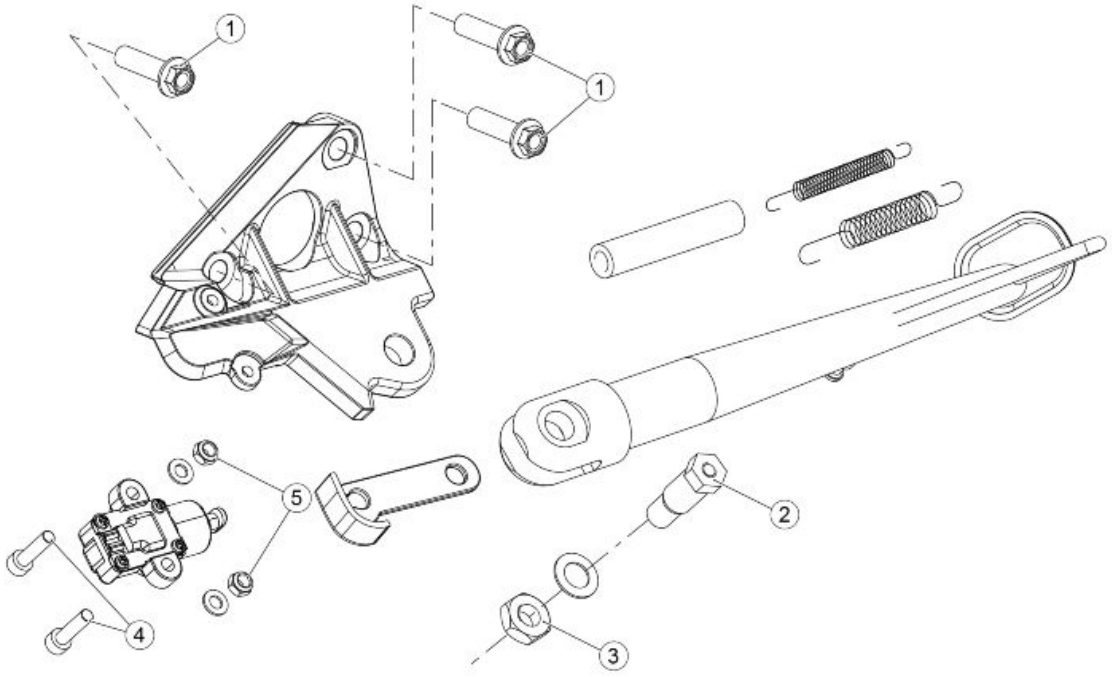


Check that the plates (5) are aligned correctly before dismantling the pedal, taking care not to lose the spring (6) and the ball (7).



- Remove the two screws (8) used to fasten the rubber pad.
- Separate the pedal (9) from the rubber pad (10).

Stand

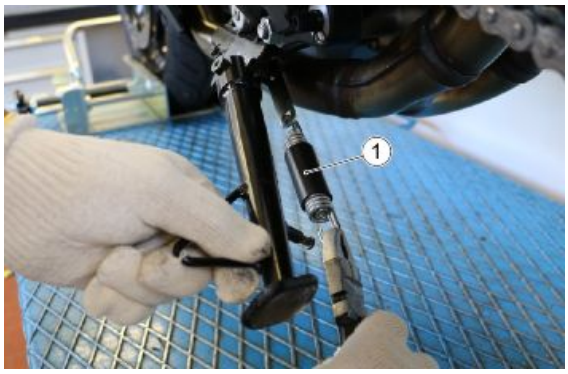


STAND

Pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head screws used for fastening the stand plate to the engine	M8x30	3	25 Nm (18.44 lb ft)	-
2	Screw for fastening the stand to the plate	M10x1.25	1	10 Nm (7.38 lb ft)	-
3	Low profile nut used for fastening the stand to the plate	M10x1.25	1	30 Nm (22.13 lb ft)	-
4	Cyl. head, hex. socket screws used for fastening the stand switch	M5x16	2	7 Nm (5.16 lb ft)	-
5	Self-locking, low profile nut used for fastening the stand switch	M5x16	2	7 Nm (5.16 lb ft)	-

Side stand

- Release the two side stand support springs (1) and remove them.



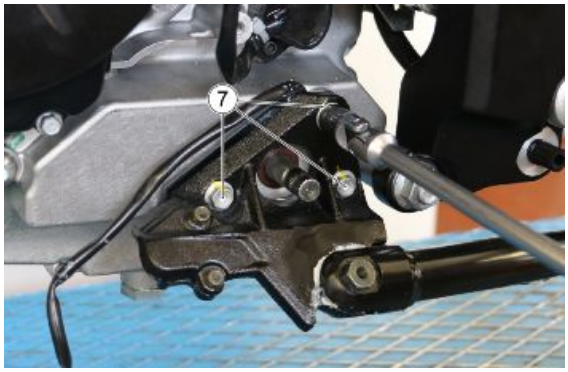
- Release the spring coupling plate (2) and remove it.

- Unscrew the nut (3) and remove it, complete with washer (4).

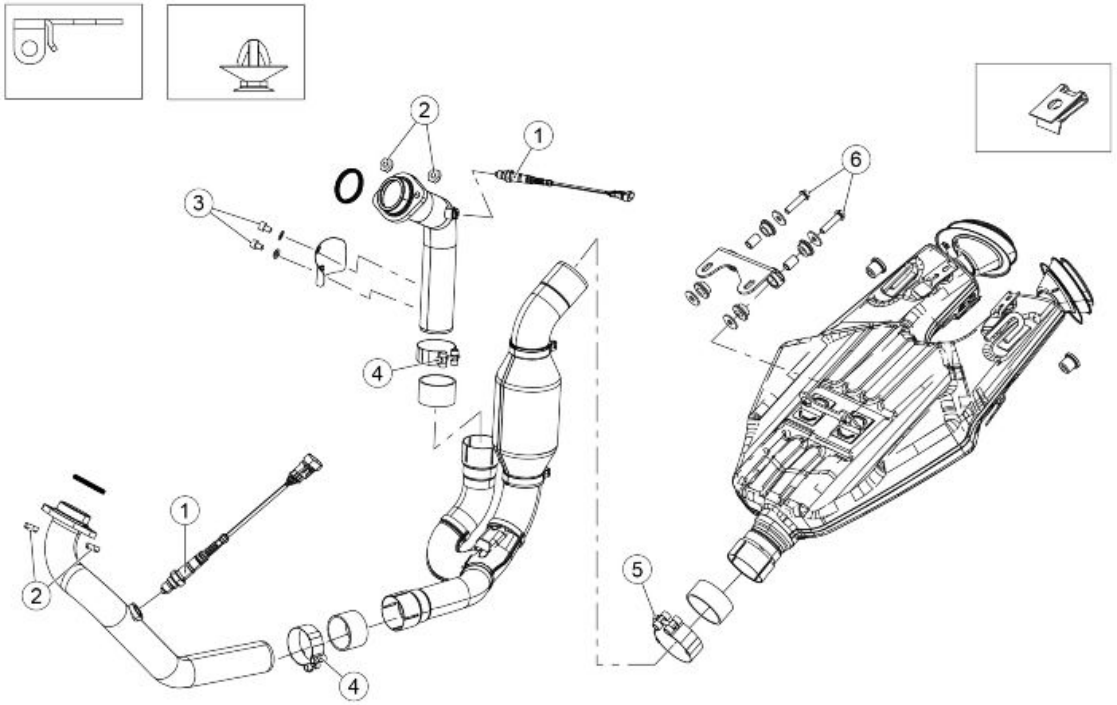
- Unscrew the pin (5) and remove it.

- Remove the stand (6).

- To remove the stand, complete with support plate, disconnect the side stand switch connector and remove the three screws (7) that fasten the plate to the engine.



Exhaust



SILENCER

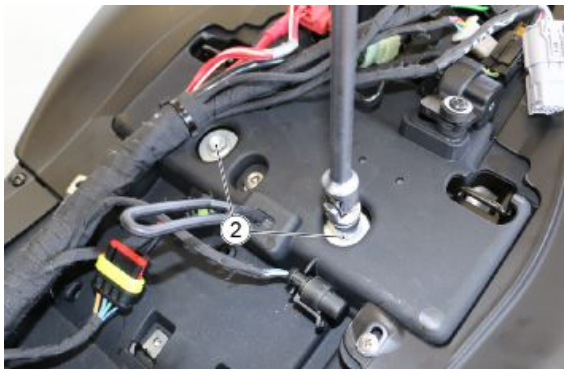
Pos.	Description	Type	Quantity	Torque	Notes
1	Lambda probes	-	2	40 Nm (29.50 lb ft)	-
2	Flanged, self-locking used for fastening the exhaust flanges to the big ends	M8	4	12.5 Nm (9.22 lb ft)	-
3	Cyl. head, hex. socket screws used for fastening the shock absorber protection	M4x6	2	3 Nm (2.21 lb ft)	-
4	Manifold fastening clamps	M6	2	7 Nm (5.16 lb ft)	-
5	Terminal fastening clamp	M6	1	7 Nm (5.16 lb ft)	-
6	Flanged, hex. head screws used for fastening the terminal front coupling to the support bracket	M8x35	2	18 Nm (13.28 lb ft)	-

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.

Removing the tail pipe

- Remove the saddle, the rear grab-bar, the rear light assembly and the number plate support.
- Loosen the clamp between the exhaust end and the manifold.

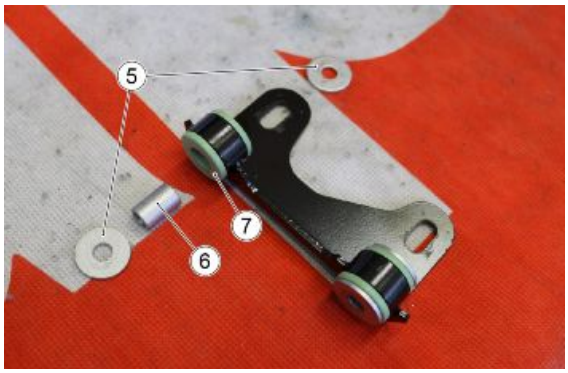
- Remove the two support bracket fastening screws (2) and retrieve the spacer washers.



- Slide the exhaust terminal (3) off from the rear.

- Remove the exhaust terminal support bracket fastening screws (4)

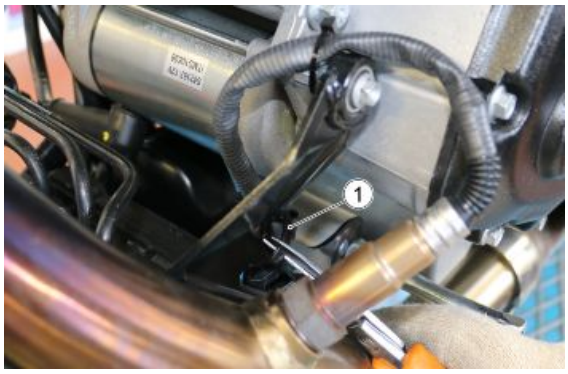
- Retrieve the washers (5), the spacers (6) and the rubber grommets (7), and replace them if necessary.



Removing the exhaust manifold

FRONT MANIFOLD

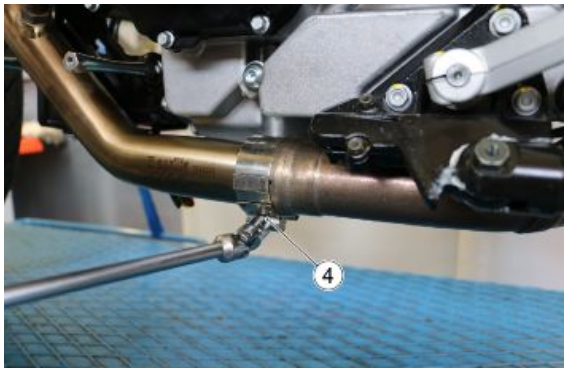
- Remove the lower fairing and cut the upper clamp (1) that fastens the front lambda probe wiring harness to the ABS pump support frame.



- Remove the lower clamp (2).

- Disconnect the front lambda probe connector (3) and free the wiring harness.

- Loosen the clamp (4) that unites the front manifold with the central manifold

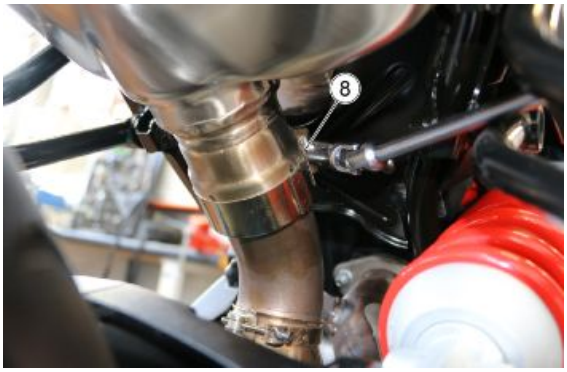


- Remove the two nuts (5) used to fasten the front manifold to the head.

- Remove the front manifold (6).

- Loosen the lower clamp (7) that connects the rear manifold to the central manifold.

- Loosen the upper clamp (8) that connects the terminal to the central manifold.



- Remove the central manifold (9).

REAR MANIFOLD

- Remove the clamp (10) that fastens the rear lambda probe wiring harness to the rear frame.

- Remove the clamp (11) that fastens the rear lambda probe wiring harness to the metallic cable clamp and disconnect the connector.

- Remove the two nuts (12) used to fasten the rear manifold to the head.

- Remove the rear manifold (13), sliding out from underneath the motorcycle.

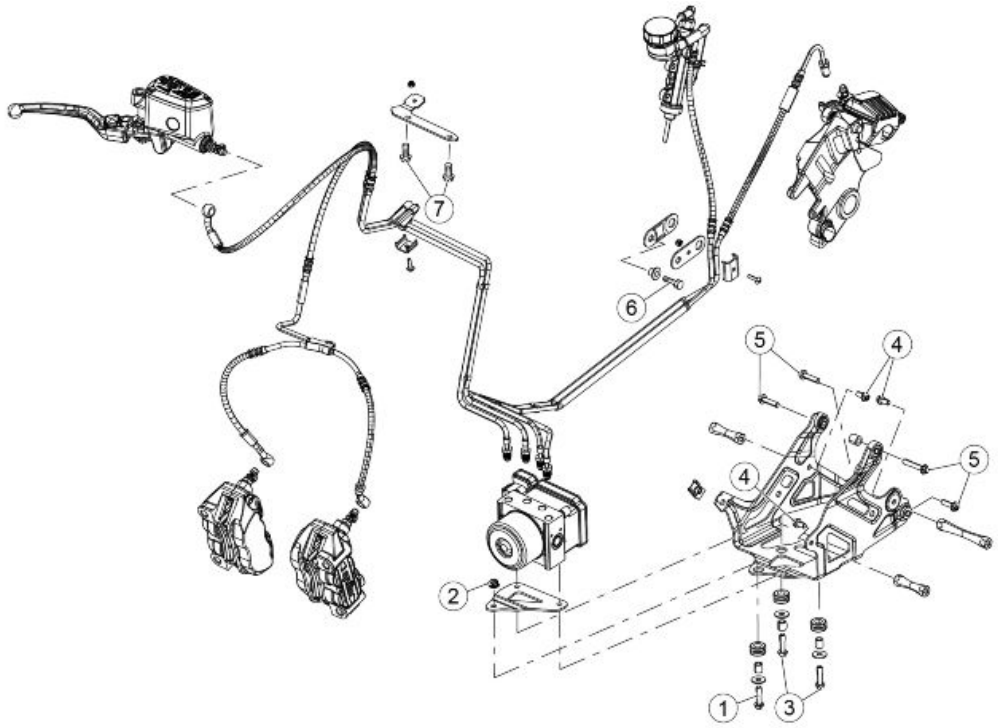
INDEX OF TOPICS

Interventions rules

CAUTION

THE FRONT BRAKE DISC SHAPE DOES NOT CHANGE THE OPERATING AND MAINTENANCE SPECIFICATIONS OF THE SYSTEM.

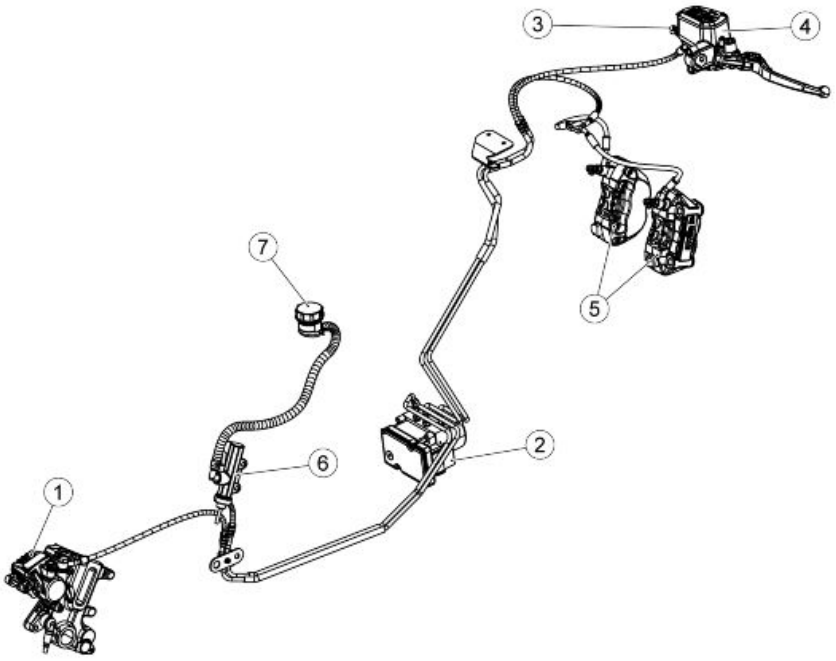
ABS



ABS BRAKING SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head screw used for fastening the ABS control unit on the support	M6x25	1	10 Nm (7.38 lb ft)	-
2	Front fastening, flanged self-locking nut	M6	1	10 Nm (7.38 lb ft)	-
3	Flanged, hex. head screw used for fastening the ABS control unit on the support	M6x25	2	10 Nm (7.38 lb ft)	Loct. 270
4	Flanged, hex. head screws used for fastening the spacers on the ABS support	M6x12	3	10 Nm (7.38 lb ft)	-
5	Flanged, hex. head screws used for fastening the ABS support on the engine	M6x25	3	10 Nm (7.38 lb ft)	-
6	Flanged, hex. head screws for fastening the spacer plate on the frame plate	M8x25	1	25 Nm (18.44 lb ft)	Loct. 243
7	Cyl. head, hex. socket screws used for fastening the pipes under the steering headstock	M6x16	2	10 Nm (7.38 lb ft)	-

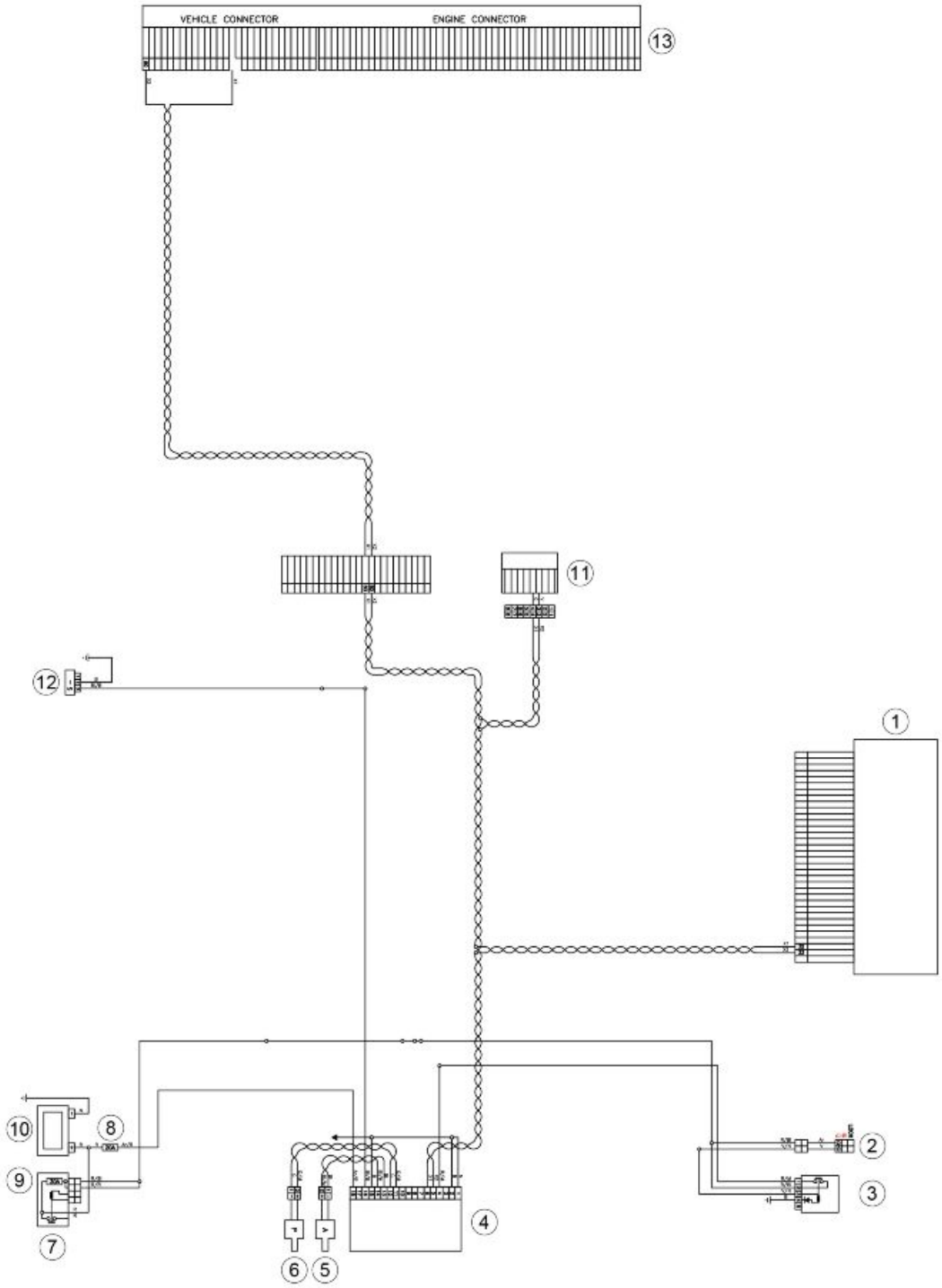
Foreword



Key:

1. Rear brake calliper
2. Modulator
3. Front bleed valve
4. Front brake reservoir
5. Front brake callipers
6. Rear brake pump
7. Rear brake reservoir

Operating diagram



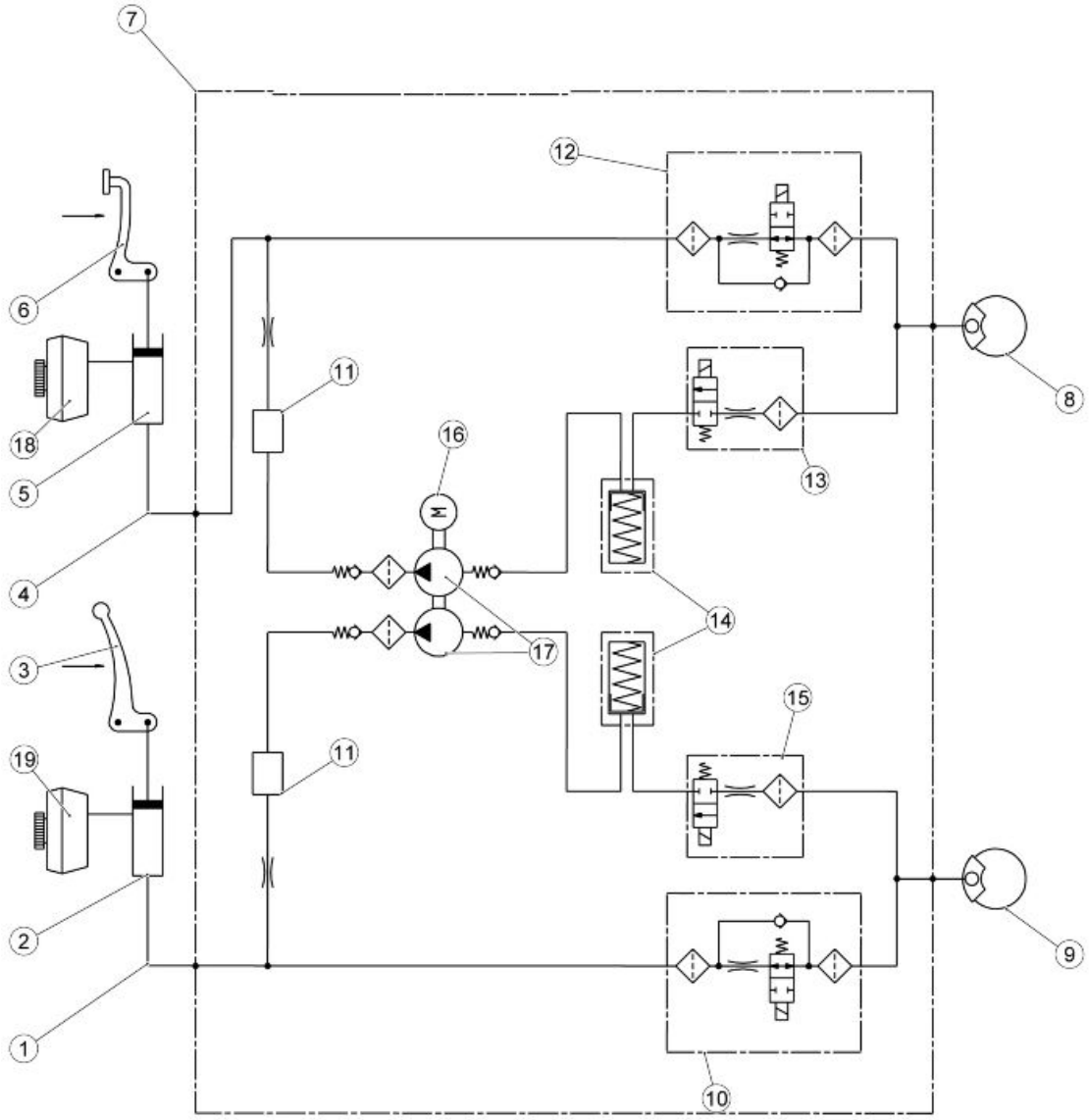
Key:

1. Instrument panel
2. Ignition switch
3. Main injection relay
4. ABS control unit

5. Front ABS sensor
6. Rear ABS sensor
7. Start-up relay
8. ABS control unit fuse
9. Main fuse
10. Battery
11. BLUEDASCH set-up (optional)
12. Diagnostics socket
13. 7SM engine control unit

ABS Electronic Control Unit pin-out

- PIN1 - Power ground 1
- PIN2 - Power ground 2
- PIN3 -
- PIN4 - Ignition switched live
- PIN5 - CAN H line
- PIN6 - CAN L line
- PIN7 -
- PIN8 -
- PIN9 -
- PIN10 -
- PIN11 - Rear ABS sensor positive
- PIN12 - Rear ABS sensor negative
- PIN13 - Front ABS sensor negative
- PIN14 - Front ABS sensor positive
- PIN15 - Power ground 3
- PIN16 - Serial line
- PIN17 -
- PIN18 - Battery power supply



ABS OPERATION

General specifications:

The front circuit is the same as the rear one.

- The ABS inlet valve (10 - 12) is normally open and it is closed only when the system intervenes to avoid wheel locking.
- The exhaust valve (13 - 15) 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 (10-12) and opens the exhaust valve (13-15) temporarily.

At this stage the rider cannot increase the pressure on the callipers (8-9) and the system reduces the pressure on the callipers partially. The excess fluid temporarily fills the front reservoir (18-19) until the ABS pump (17) self-activates and delivers the fluid back to the brake pump (2-5).

C - Maintaining pressure: the pressure in the callipers (8-9) remains low until total recovery of speed / wheel grip.

The system restores the fluid taken from the calliper (8-9) in the section of the system between the brake pump (2-5) and the ABS inlet valve (10-12).

D - Pressure restoration: by opening the inlet valve (10-12) momentarily, the pressure of the callipers (8-9) 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 shown in the event that the duration of the pressure reduction phase exceeds a predetermined time limit.

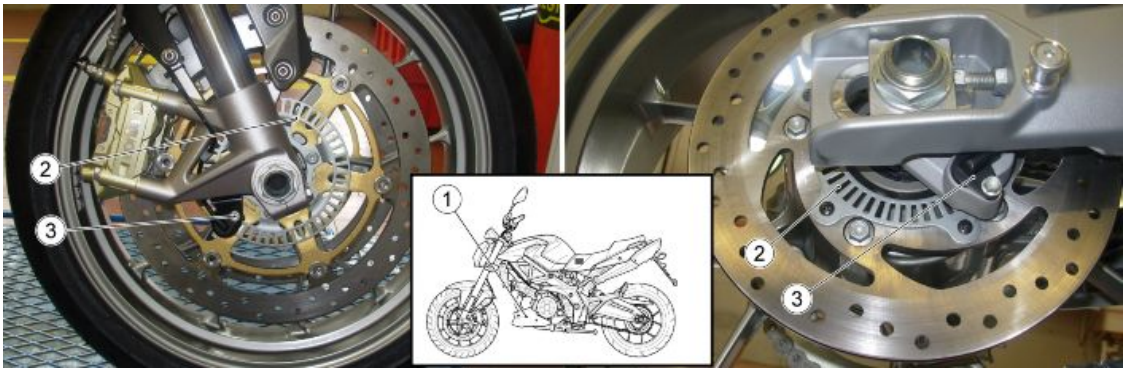
ABS SYSTEM DESCRIPTION

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 enhances control over the vehicle, taking into consideration never to exceed the physical limits of vehicle grip on the road. 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.

CAUTION

WHEN THE ABS STARTS WORKING, A PULSING IS FELT ON THE BRAKE LEVER.

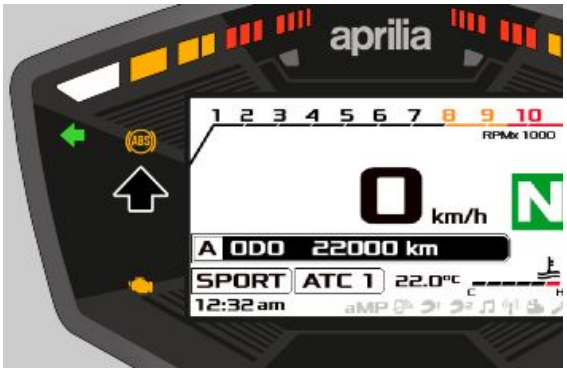
THE WHEEL ANTILOCK BRAKING SYSTEM DOES NOT PREVENT FALLS WHILE ON A BEND. AN EMERGENCY BRAKING WITH THE VEHICLE INCLINED, HANDLE BAR TURNED, ON UNEVEN OR SLIPPERY ROADS, OR WITH POOR GRIP CREATES LACK OF STABILITY DIFFICULT TO HANDLE. THEREFORE, RIDE CAREFULLY AND SENSIBLY AND ALWAYS BRAKE GRADUALLY. BRAKING WHILE TURNING A CORNER IS SUBJECT TO LAWS OF PHYSICS WHICH NOT EVEN ABS CAN ELIMINATE.

When sensors (3) detect a significant speed difference between the rear and the front wheels (for example, when rearing up on the back wheel), the ABS system could take this as a dangerous situation. In this case, 2 things may occur:

- the ABS system intervenes by releasing pressure from the calliper until the wheel turns again at the same speed of the other wheel; it is not possible to brake for an instant.
- if the speed difference lasts long, the system may detect an error and deactivates the ABS system. As a consequence, the system works as any regular braking system.

Riding with an active ABS system

- During the vehicle start-up, after the instrument panel initial check, the ABS warning light stops flashing when the speed is under 5 km/h (3.1 mph).



If the ABS warning light remains on when the vehicle is running, it means that a fault has been detected and the ABS system has been automatically deactivated.

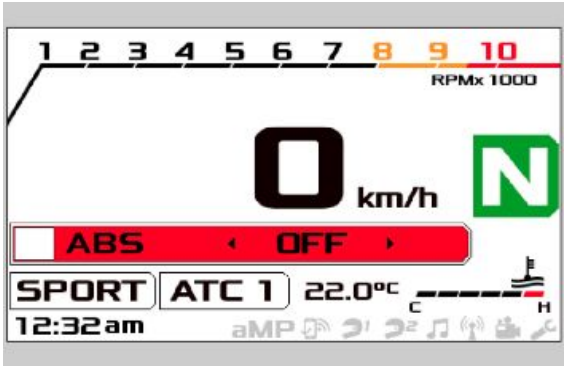
IN CASE OF FAILURE OR WITH ABS DISCONNECTED, THE VEHICLE OPERATES AS IF IT DID NOT HAVE THIS SYSTEM.

Attivazione/Disattivazione dispositivo ABS

Soltanto a moto ferma è possibile modificare lo stato di attivazione/disattivazione del sistema ABS ed è possibile farlo in due modi distinti:

1) Dalla schermata principale, mediante uno spostamento breve verso sinistra o verso destra è possibile disattivare o riattivare il sistema ABS

Per tornare al menù "ABS" premere centralmente in modo breev il selettore MODE.



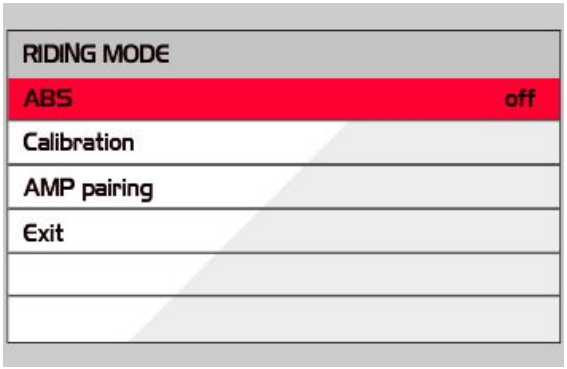
CAUTION

IT IS DISABLED ONLY TEMPORARILY, WHEN THE KEY IS INSERTED THE SYSTEM IS ALWAYS ACTIVE.

2) Entering the MENU, in the "RIDING MODE" section and then in the "ABS" item Through a brief central pressing on the central part of the MODE selector, the "ABS" function is highlighted in red. Briefly moving to left or right deactivates the function "Off".

This function allows you to disable the ABS system that is normally active "On".

To return to the main "MENU", select the "EXIT" menu item and briefly press on the central part of the MODE selector.



CAUTION

IT IS DISABLED ONLY TEMPORARILY, WHEN THE KEY IS INSERTED THE SYSTEM IS ALWAYS ACTIVE.

Guide to diagnosis

FOREWORD

Each time the key is set to ON, if at least one current or stored error is detected*, the ABS warning light turns on permanently.

The ABS system is automatically deactivated

The system operates perfectly just as any other braking system without ABS

*** Diagnosis is possible when exceeding 5 km/h (3.1 mph).**

Each time the key is set to ON, if at least one current or stored error is not detected immediately in the system:

- the ABS warning light flashes.

Once the vehicle speed exceeds 5 km/h (3.1 mph):

- if errors are not detected: the ABS warning light turns off

- if at least one malfunction is detected: the ABS warning light turns on permanently.

The ABS system is deactivated!

However, the system is perfectly operative as any other braking system without ABS.

The detection of malfunctions may require more or less time according to the type of failure.

Error detection logic foresees that for the errors to be diagnosed one or more conditions must persist within a given time.

If during this given time one of the conditions is missing but then it comes back, the timer is reset and the system is no longer able to diagnose the error.

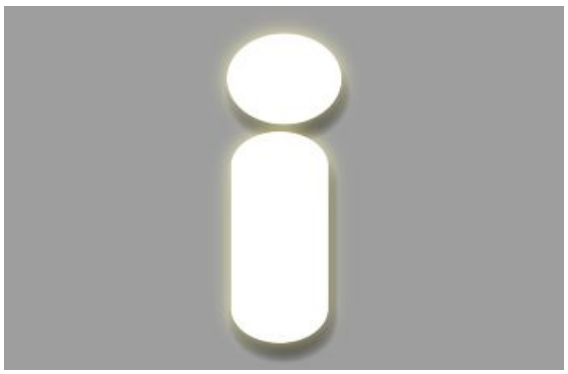
The ABS system continues to be inactive.

Use of diagnostics instrument for ABS system

Abs screen pages

ECU INFO screen page

This screen shows general data regarding the control unit, for example software type, mapping, control unit programming date



CONTROL UNIT DATA

P.A.D.S. characteristic.	Value/example	Units of measurement	Notes
Frame number	-	-	-
SW version	-	-	-
Vehicle code	-	-	-
Vehicle manuf. or encoding	-	-	-
Vehicle ID from PIN 2 and 15	-	-	-

PARAMETERS screen page

This screen shows the parameters measured by the several sensors (engine revs, engine temperature, etc.) or values set by the control unit (injection time, ignition advance, etc.)

PARAMETERS AND STATUSES

P.A.D.S. characteristic.	Value/example	Units of measurement	Notes
Speed of the front wheel	-	km/h	-
Speed of the rear wheel	-	km/h	-

Quality test of the sensors

When turning the wheel or acting on the brake, a variation of parameters must be detected.

ACTIVATION screen page

On this screen, you can delete the errors from the memory of the controller and you can enable some systems controlled by the control unit.

ACTIVATIONS

P.A.D.S. characteristic.	Value/example	Units of measurement	Notes
ABS Warning Light			

ERRORS screen page

This display shows potential errors detected in the vehicle (ATT) or stored in the control unit (MEM) and it allows to check error clearing (STO).

ERRORS

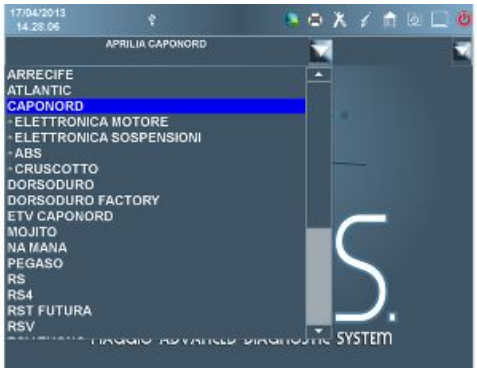
Description	Code	Symptom
Front wheel speed sensor	5D90	Electrical fault
Front speed sensor - Functional fault	5D91	the signal changes in irregular manner
Front speed sensor - Functional fault	5D92	the signal becomes weak periodically
Front speed sensor - Functional fault	5D93	missing signal or wheel speed comparison
Front speed sensor - Functional fault	5D94	excessive duration for pressure reduction stage
Front speed sensor - Functional fault	5D95	too high wheel speed - too low wheel speed
Rear wheel speed sensor	5DA0	electrical fault
Rear speed sensor - Functional fault	5DA1	the signal changes in irregular manner
Rear speed sensor - Functional fault	5DA2	the signal becomes weak periodically
Rear wheel speed sensor	5DA3	-
Rear wheel speed sensor	5DA4	signal plausibility
Rear wheel speed sensor	5DA5	dauble frequency check
Control unit software error	5DD3	-
Recirculation pump	5DF0	-
Recirculation pump	5DF1	-
Control unit hardware error	5DF2	-
Control unit hardware error	5DF5	-
Low voltage	5DF3	Long period detection
Low voltage	5DF4	-
High voltage	5DF7	-
Incorrect control unit encoding	5E59	-
CAN Line	5E11	Bus off
CAN Line	5E16	missing vehicle code message
CAN Line	5E1F	incorrect vehicle code
CAN Line	5E15	missing ABS switch status
ABS switch fault	5E5A	-
CAN Line	D347	Transmission time out

PADS report mode

In the following are described the procedure to be performed through the diagnostic tool in order to generate an errors report:

- When started the program, select the brand.

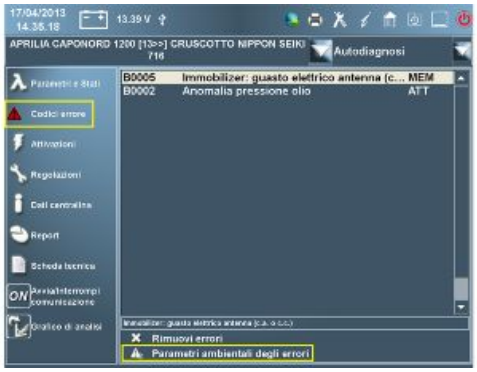
- Select the vehicle and the component.



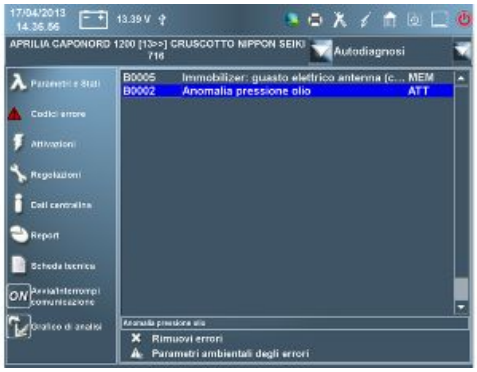
- Select Self-diagnosis.

- Go to the page Error codes.

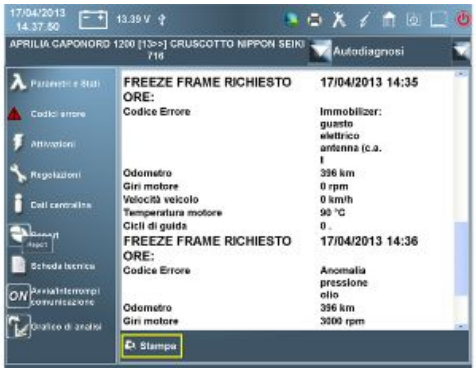
- Select an error and show the Ambient parameter error(where provided).

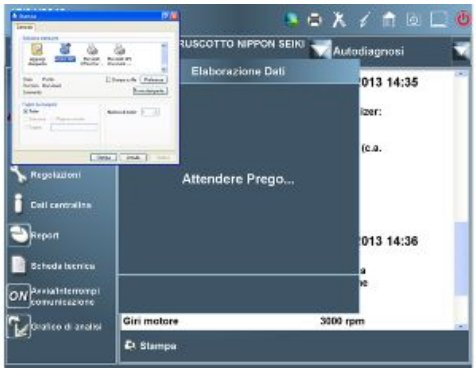


- Repeat the operation by selecting each error and showing the corresponding Ambient parameter error (where provided).

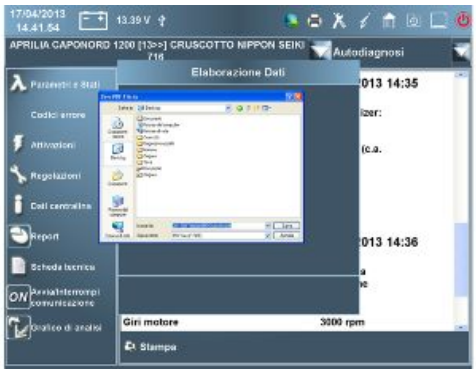


- Go to the page Report and then on Print and select the virtual PDF printer.





- If there is no PDF printer, there are several free programs, ask the information systems to install it.
- Name the file with a name that contains the main information of the vehicle and the analysed component e.g. CN1200-Chassis0465-Instrument panel.



SETTINGS screen page

This screen is used to adjust some control unit parameters.

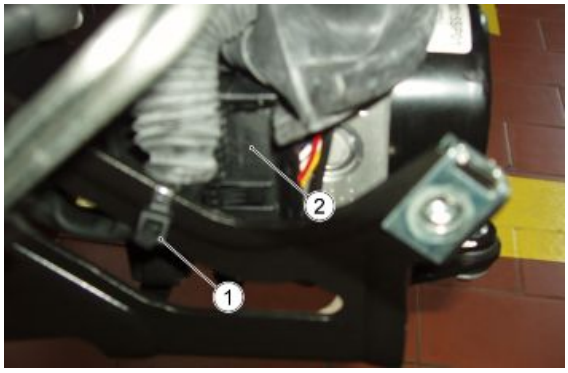
ADJUSTMENTS

P.A.D.S. characteristic.	Value/example	Units of measurement	Notes
Front bleed	-	-	-
Rear bleed	-	-	-
Encoding			Resets the vehicle code and obtains it automatically from the CAN line at the next key ON

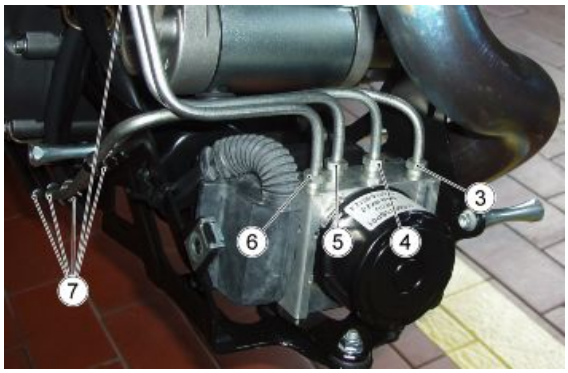
Modulator

MODULATOR REMOVAL

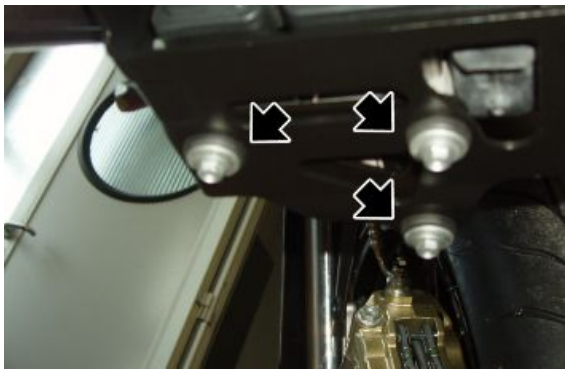
- Remove the fairing lug.
- Release clamp (1) and disconnect connector (2).



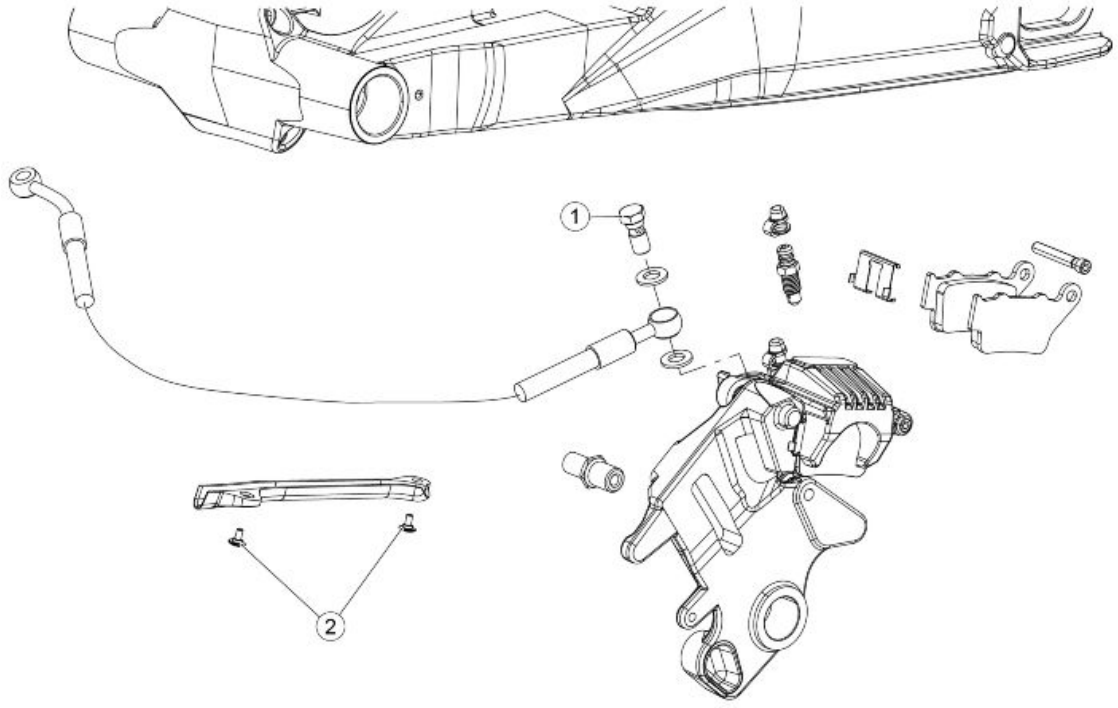
- By unscrewing the nuts, remove and plug the brake oil pipes following this sequence: (3) - (4) - (6) - (5).



- Slide off the rear system pipes from the hooks (7).
- Undo and remove the three screws, collect the washers and remove the ABS modulator.



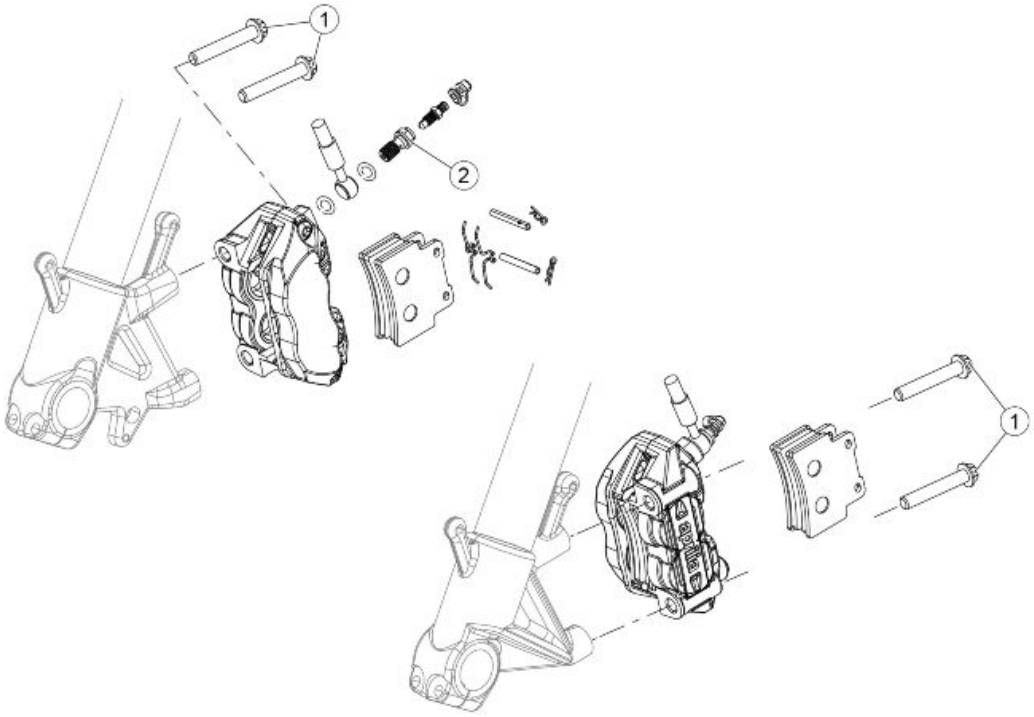
Rear brake calliper



REAR BRAKE CALLIPER

Pos.	Description	Type	Quantity	Torque	Notes
1	Special brake pipe coupling fastening screw	M10x1	1	10 Nm (7.38 lb ft)	-
2	Button head, hex. socket screws used for fastening the brake pipe protection	M5x9	1	4 Nm (2.95 lb ft)	-

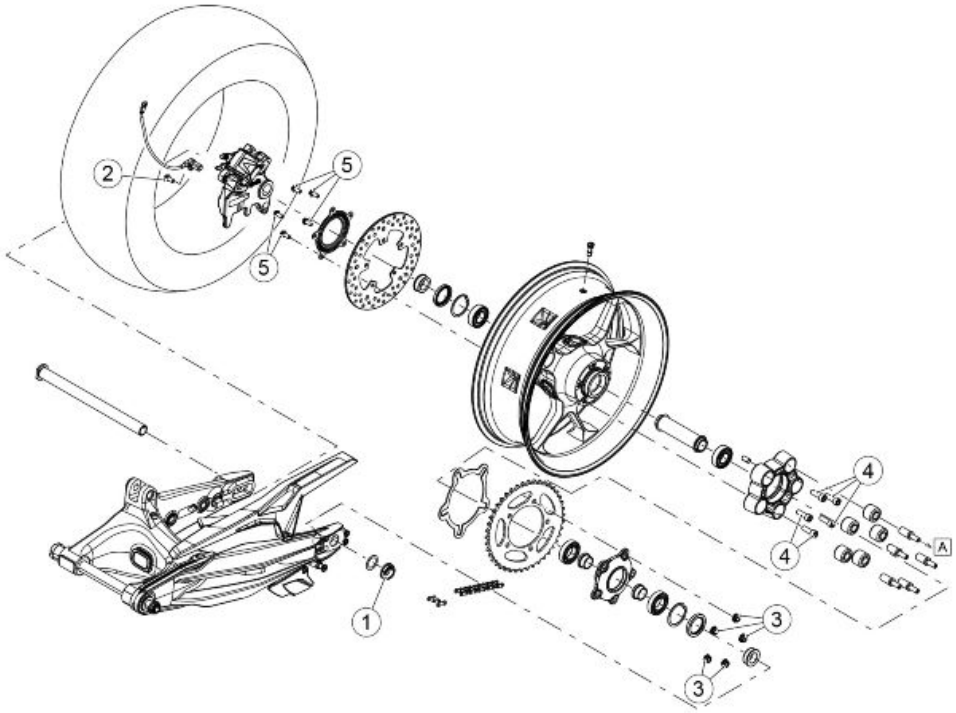
Front brake calliper



FRONT BRAKE CALLIPERS

Pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head screws for fastening the brake callipers to the fork stanchions	M10x1.25	4	50 Nm (36.88 lb ft)	-
2	Special screws for fastening the brake pipe to the callipers	M10	2	25 Nm (18.44 lb ft)	-

Rear brake disc

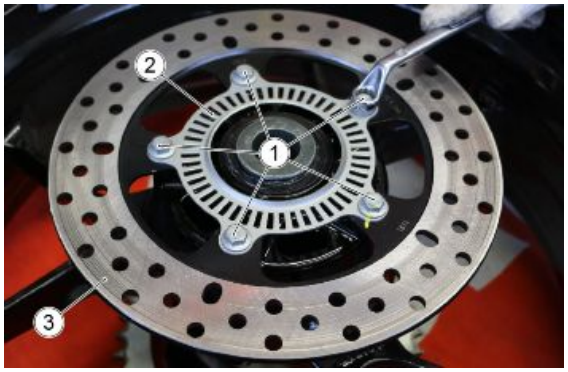


REAR WHEEL

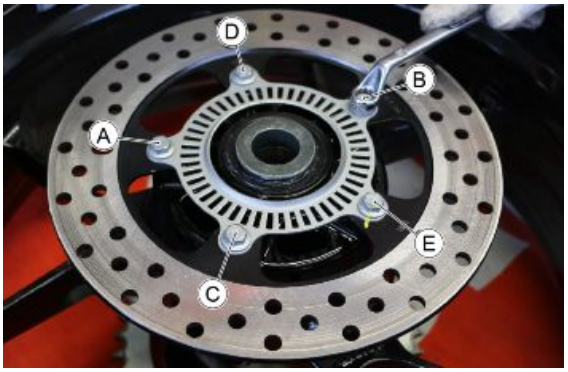
Pos.	Description	Type	Quantity	Torque	Notes
1	Wheel axle nut	M25x1.5	1	120 Nm (88.51 lb ft)	-
2	Button head, hex. socket screw used for fastening the sensor to the brake calliper support	M5x16	1	6 Nm (4.43 lb ft)	-
3	DAX nut for fastening the crown gear on the hub	M10x1.25	5	50 Nm (36.88 lb ft)	-
4	Cyl. head, hex. socket screws used for fastening the cush to the wheel	M10x30	5	50 Nm (36.88 lb ft)	Pre-impregnated screws
5	Flanged, hex. head screws used for fastening the brake disc to the wheel	M8x18	5	30 Nm (22.13 lb ft)	Pre-impregnated screws

Removal

- Remove the rear wheel.



- Unscrew the five screws (1) used to fasten the brake disc and remove them.
- Remove the phonic wheel (2) and the brake disc (3).



DURING REFITTING, APPLY LOCTITE 243 ON THE THREAD OF THE BRAKE DISC SCREWS (1).

CAUTION

DURING REFITTING, SCREW ALL THE SCREWS (1) MANUALLY AND TIGHTEN THEM OPERATING DIAGONALLY FOLLOWING THIS SEQUENCE: A-B-C-D-E.

See also

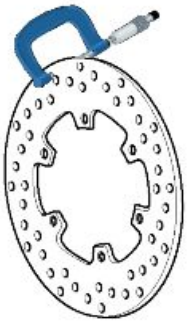
Rimozione

Disc Inspection

CAUTION

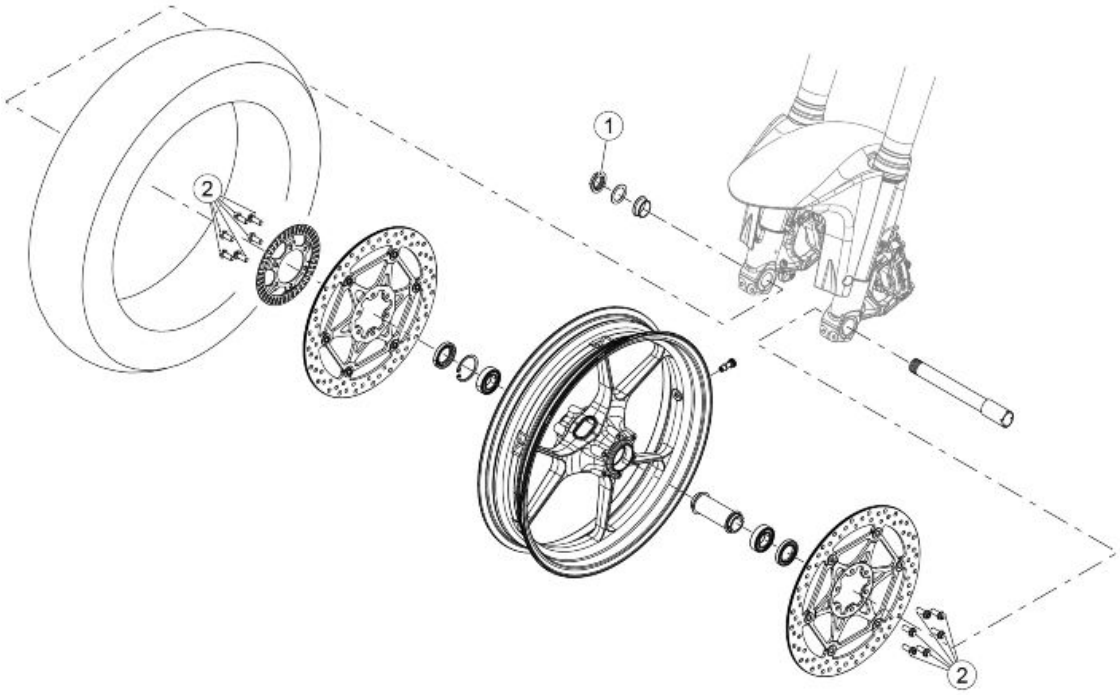
THE BRAKE DISC SHAPE DOES NOT CHANGE THE OPERATING AND MAINTENANCE SPECIFICATIONS OF THE SYSTEM.

- The following operations are to be carried out with brake disc fitted 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)

Front brake disc



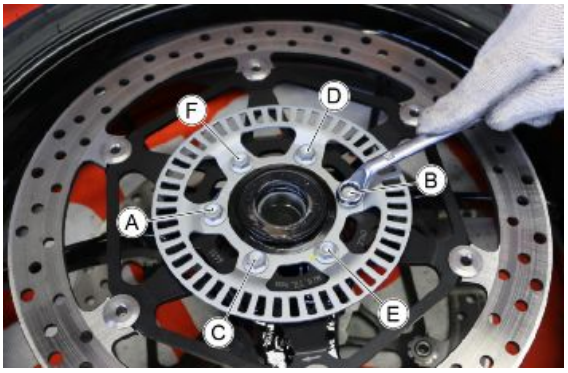
FRONT WHEEL

Pos.	Description	Type	Quantity	Torque	Notes
1	Wheel axle nut	-	1	80 Nm (59.00 lb ft)	-
2	Flanged, hex. head phonic wheel and brake discs fixing screws	M8x20	12	30 Nm (22.13 lb ft)	Pre-impregnated screws

Removal

- Remove the front wheel

- Unscrew the six screws (1) used to fasten the brake disc and remove them.
- Remove the phonic wheel (2) and the brake disc (3).



DURING REFITTING, APPLY LOCTITE 243 ON THE THREAD OF THE BRAKE DISC SCREWS (1).

CAUTION

DURING REFITTING, SCREW ALL THE SCREWS (1) MANUALLY AND TIGHTEN THEM OPERATING DIAGONALLY FOLLOWING THIS SEQUENCE: A-B-C-D-E-F.

See also

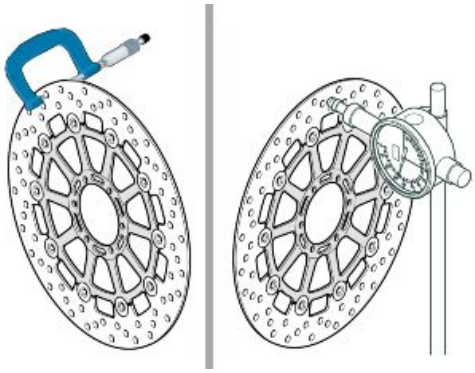
Removal

Disc Inspection

CAUTION

THE FRONT BRAKE DISC SHAPE DOES NOT CHANGE THE OPERATING AND MAINTENANCE SPECIFICATIONS OF THE SYSTEM.

- 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)

Front brake pads

Removal

- Turn the pins and remove both cotter pins.

- Remove both pins.

- Collect the anti-vibration springs.
- Extract one pad at a time.

CAUTION

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

- Insert two new pads, placing them so that the holes are aligned with the calliper holes.

CAUTION

ALWAYS REPLACE BOTH PADS AND MAKE SURE THEY ARE CORRECTLY POSITIONED INSIDE THE CALLIPER.

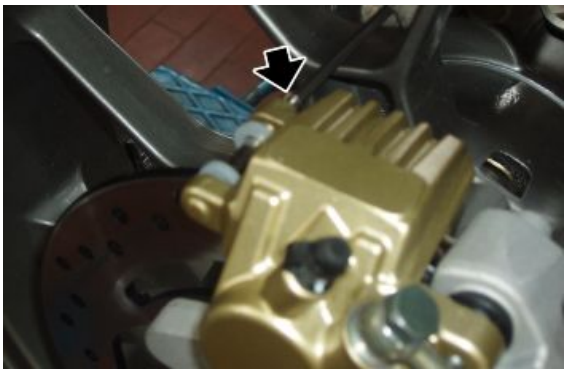
- Position the anti-vibration plate.
- Insert both pins.
- Position both split pins.
- Abut the plungers against the pads, acting on the brake pump lever several times.
- Check the brake fluid level in the reservoir.

Rear brake pads

Removal

- Remove the safety circlip.

- Unscrew and remove the pin.



- Extract one pad at a time.

CAUTION

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.

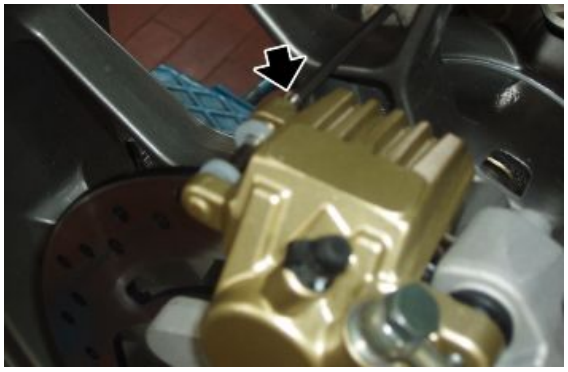
Installing

- Insert two new pads, placing them so that the holes are aligned with the caliper holes.

CAUTION

ALWAYS REPLACE BOTH PADS AND MAKE SURE THEY ARE CORRECTLY POSITIONED INSIDE THE CALLIPER.

- Screw the pin.



- Install the safety circlip.

Bleeding the braking system

PREPARING 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).

REPLACING THE BRAKE PUMP

PRELIMINARY OPERATIONS

- Replace the damaged brake pump with a new one.
- Connect the brake pipe to the new brake pump.
- Fill the tank with fresh brake fluid.

CAUTION

PERFORM THE STANDARD BRAKING SYSTEM BLEEDING PROCEDURE, AS DESCRIBED AT THE END OF THE CHAPTER.

- Fill the tank up to the "MAX" level mark and replace the plug.
- Check the stroke and sensitivity of the brake pedal and lever.
- If the brake pedal or lever stroke is too long after carrying out the bleeding procedure, check the braking system for leaks and, if none are found, bleed the system using PADS, as described.
- Disconnect the flexible bleeder pipes and re-tighten the bleeder screws, applying the correct torque.

See also

Front
Rear

REPLACING THE ABS CONTROL UNIT

PREPARING THE VEHICLE

- Connect the bleeder bottles to the front and rear calliper bleeder screws and open them.
- Press the brake pedal and lever as far as they will go and block them in position using the clamping devices.
- Close the front and rear calliper bleeder screws and remove the bleeder bottles.
- Remove the damaged ABS control unit.

Note: First of all, disconnect the brake pipes between the ABS control unit and the brake pump (1-4) and seal the open couplings on the ABS control unit immediately using protective plugs.

Next, remove the pipes between the ABS control unit and the brakes (2-3) and seal these couplings using protective plugs too.

- Install the fully pre-filled, new control unit.
- In order to ensure that the brake fluid remains inside the ABS control unit, first remove the protective plugs from the braking circuit couplings and connect the corresponding pipes.

Once all the braking circuit pipes have been connected, remove the protective plugs from the brake pump couplings and connect the brake pump pipes to the ABS control unit.

- Remove the clamping device from the brake pedal and lever.
- Remove the plug from the tank and fill it up to the "MAX" level mark with fresh brake fluid.

CAUTION

PERFORM THE STANDARD BRAKING SYSTEM BLEEDING PROCEDURE, AS DESCRIBED AT THE END OF THE CHAPTER.

- Fill the tank up to the "MAX" level mark and replace the plug.
- Check the stroke and sensitivity of the brake pedal and lever.
- If the brake pedal or lever stroke is too long after carrying out the bleeding procedure, check the braking system for leaks and, if none are found, bleed the system using PADS, as described.
- Disconnect the flexible bleeder pipes and re-tighten the bleeder screws, applying the correct torque.

See also

Front
Rear

REPLACING THE CALLIPERS

PREPARING THE VEHICLE - The operations are described for the front system, but they are identical for both braking systems.

- Connect the bleeder bottle to the front calliper bleeder screw and open it.
- Press the lever down as far as it will go and block it in position using a clamp-

ing device in order to prevent the liquid from escaping from the system when it is open.

- Close the front calliper bleeder screw and remove the bleeder bottle.
- Replace the damaged calliper with a new one.
- Remove the clamp from the brake lever.
- Remove the plug from the tank and fill it up to the "MAX" level mark with fresh brake fluid.

CAUTION

PERFORM THE STANDARD BRAKING SYSTEM BLEEDING PROCEDURE, AS DESCRIBED AT THE END OF THE CHAPTER.

- Fill the tank up to the "MAX" level mark and replace the plug.
- Check the stroke and sensitivity of the brake pedal and lever.
- If the brake pedal or lever stroke is too long after carrying out the bleeding procedure, check the braking system for leaks and, if none are found, bleed the system using PADS, as described.
- Disconnect the flexible bleeder pipes and re-tighten the bleeder screws, applying the correct torque.

See also

Front
Rear

BLEEDING SYSTEM WITH PADS

If the brake pedal and lever still feel "spongy" after completing these checks, it is necessary to bleed the brakes using this type of procedure.

The operations are described for the front system, but they are identical for both systems.

FRONT

- Ensure PADS is connected correctly, then select the "FRONT BRAKE BLEEDING PROCEDURE" function.
- The pump starts running.
- While the pump is executing a rotation cycle, activate and release the front brake lever until the cycle complete message is received on PADS.
- This procedure allows the air to circulate and accumulate.

- Once the procedure with PADS has been completed, repeat the TRADITIONAL BLEEDING procedure to remove any remaining air from the system.

CAUTION

PERFORM THE STANDARD BRAKING SYSTEM BLEEDING PROCEDURE, AS DESCRIBED AT THE END OF THE CHAPTER.

See also

Front
Rear

Front

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 control and by poor braking efficiency.

CAUTION

IN VIEW OF THE DANGER THIS POSES FOR VEHICLE AND RIDER, THE HYDRAULIC CIRCUIT MUST BE BLED AFTER REFITTING THE BRAKES AND RESTORING THE BRAKING SYSTEM TO ITS NORMAL OPERATING CONDITIONS.

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 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.

CONVENTIONAL AIR PURGING SYSTEM

- Remove the rubber protection cover from 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.
- Operate the brake lever and then open the bleed valve on the calliper 1/4 of a turn to let the air out.
- Close the bleed again before reaching the lever end of the stroke and repeat the operation until there is no air.
- Repeat the procedure for both callipers.
- 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.

Rear

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 control and by poor braking efficiency.

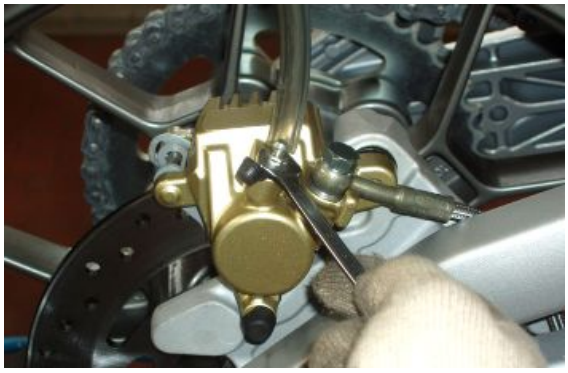
CAUTION

IN VIEW OF THE DANGER THIS POSES FOR VEHICLE AND RIDER, THE HYDRAULIC CIRCUIT MUST BE BLED AFTER REFITTING THE BRAKES AND RESTORING THE BRAKING SYSTEM TO ITS NORMAL OPERATING CONDITIONS.

NOTE

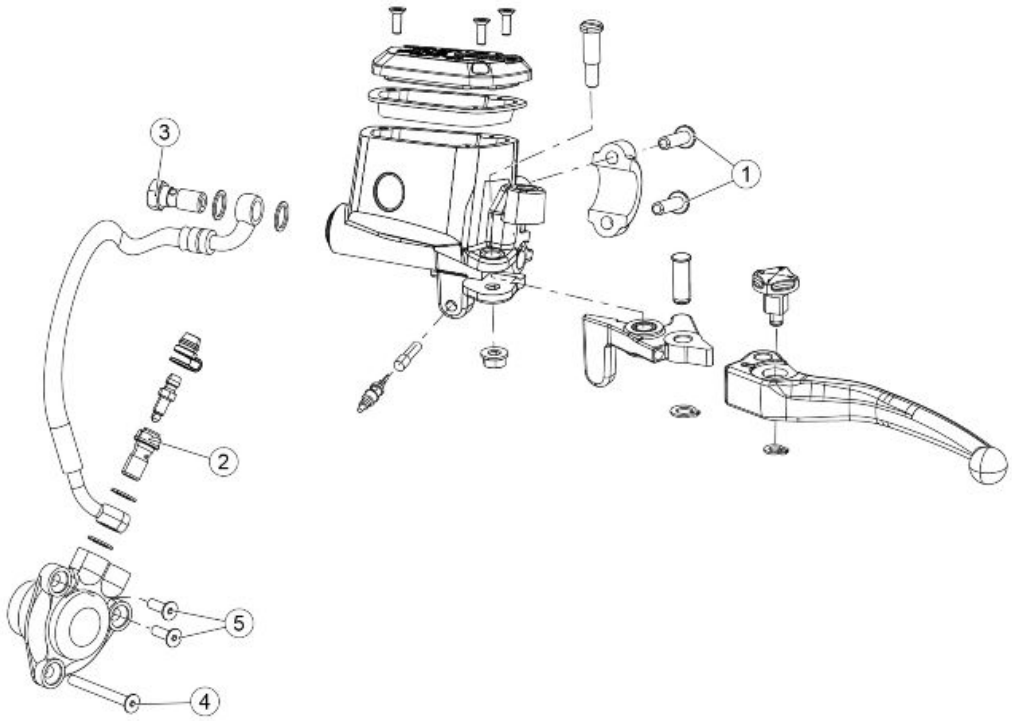
THE VEHICLE MUST BE ON LEVEL GROUND TO BE BLED. WHILE BLEEDING THE HYDRAULIC SYSTEM, FILL THE RESERVOIR WITH THE NECESSARY QUANTITY OF BRAKE FLUID. CHECK THAT, DURING THE OPERATION, THERE IS ALWAYS BRAKE FLUID IN THE RESERVOIR.

CONVENTIONAL AIR PURGING SYSTEM



- Remove the rubber protection cover from 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.
- Operate the brake lever and then open the bleed valve on the calliper 1/4 of a turn to let the air out.
- Close the bleed again before reaching the lever end of the stroke and repeat the operation until there is no air.
- Screw the bleeding valve and remove the pipe.
- Top-up the reservoir until the correct brake fluid level is obtained.
- Refit and lock the rear brake oil reservoir cap.
- Refit the rubber protection cover.

INDEX OF TOPICS



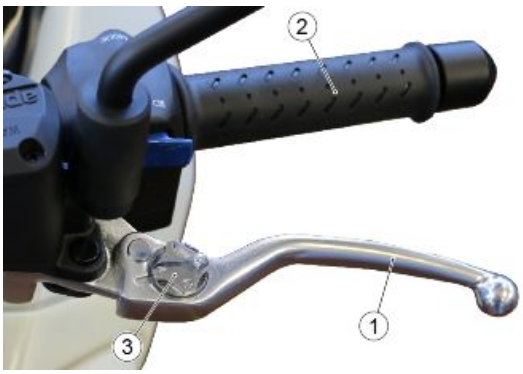
CLUTCH CONTROL

Pos.	Description	Type	Quantity	Torque	Notes
1	Clutch pump U-bolt fastening screws	-	2	10 Nm (7.38 lb ft)	-
2	Special screw for fastening the pipe to the clutch cylinder	M10	1	25 Nm (18.44 lb ft)	-
3	Special screw for fastening the pipe to the clutch pump	M10	1	25 Nm (18.44 lb ft)	-
4	Countersunk, hex. socket screws used for fastening the clutch actuator cylinder	M6x75	1	8 Nm (5.90 lb ft)	Perform two tightening cycles
5	Countersunk, hex. socket screws used for fastening the clutch actuator cylinder	M6x20	2	8 Nm (5.90 lb ft)	Perform two tightening cycles

Adjustment

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).



Removing the clutch master cylinder

- Remove the rear-view mirror, drain the oil from the clutch system and, after removing the rubber clamp (1), remove the pump pipe retaining screws (2).

- Disconnect the clutch switch connectors (3).

- Unscrew and remove the two clutch pump U-bolt (5) fastening screws (4).

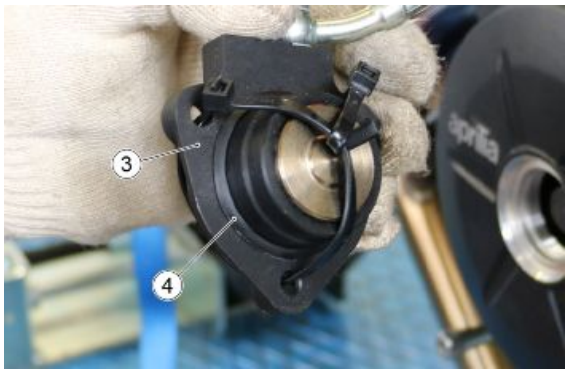
- Remove the complete friction pump.

Removing the clutch slave cylinder

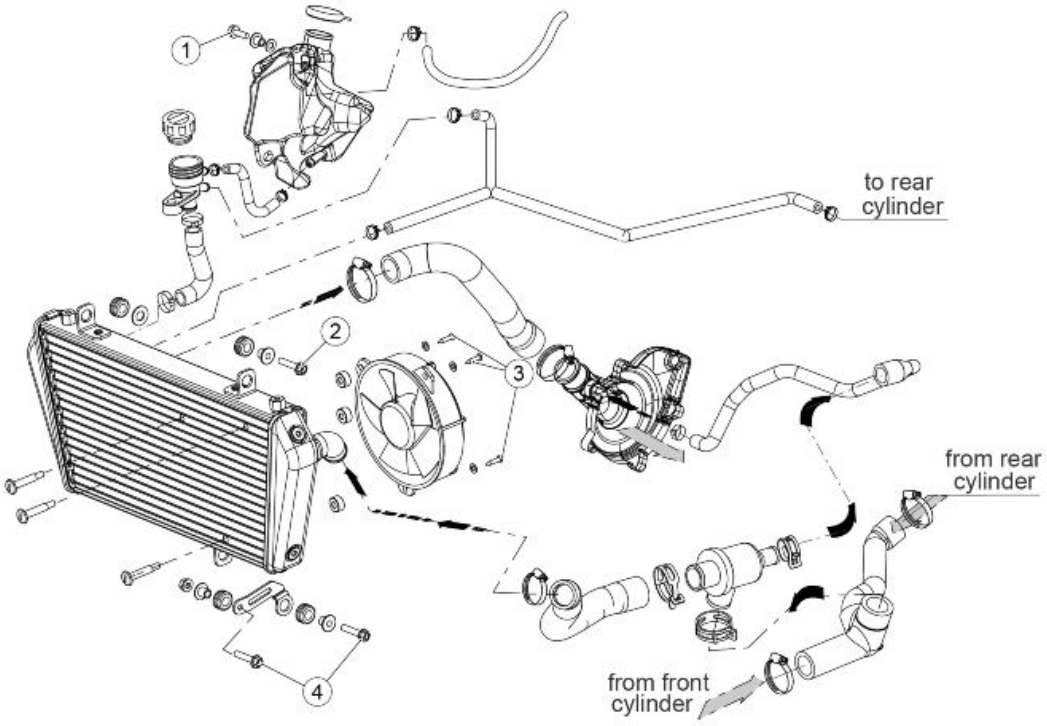
- Drain the oil from the clutch system and remove the retaining screw (1) from the control cylinder pipe.

- Undo and remove the three control cylinder fastening screws (2)

- Remove the complete cylinder (3) and replace the rubber o-ring (4) if necessary.



INDEX OF TOPICS

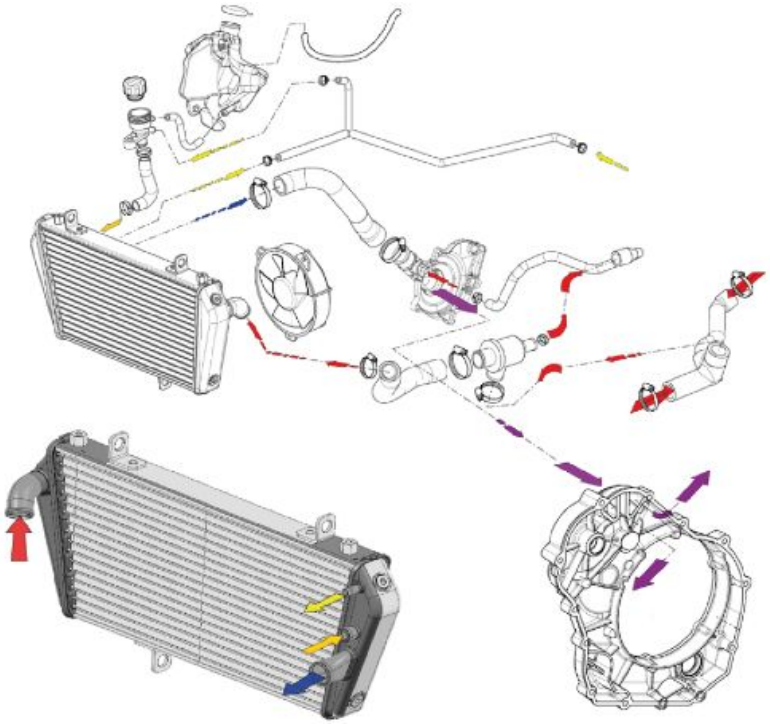


COOLING SYSTEM

Pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head used for fastening the trellis expansion tank	M6x20	1	10 Nm (7.38 lb ft)	-
2	Flanged, hex. head screw used for fastening the trellis radiator	M6x25	1	10 Nm (7.38 lb ft)	-
3	Button cyl. head screw used for fastening the electric fan to the radiator	4.2x20	3	3 Nm (2.21 lb ft)	-
4	Flanged, hex. head screws used for fastening the radiator bracket	M6x25	2	10 Nm (7.38 lb ft)	-

Circuit diagram

- The cooling circuit diagram is shown below



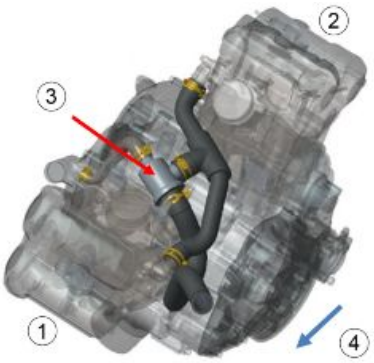
Key:

Yellow = Air purge

Orange = Refilling

Red = From engine

Blue = To the pump

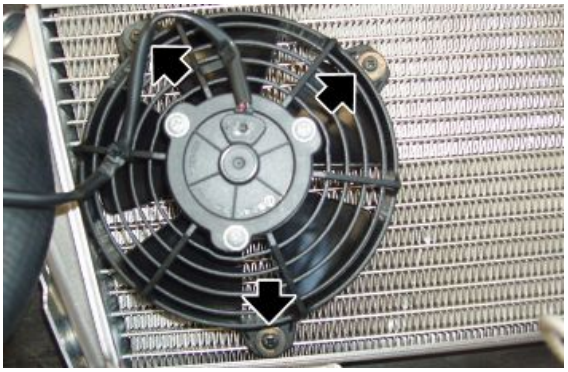


Key:

1. Front cylinder.
2. Rear cylinder.
3. Thermostat.
4. Direction of travel of vehicle.

Electric fan

- Remove the radiator
- Undo and remove the three screws and collect the washers; remove the electric fan.



See also

Removing the radiator

Coolant replacement

- Remove the right side fairing.
- Unscrew and remove the screw and remove the protection.

- Place a container of suitable capacity.
- Loosen the screw, move the clamp and slide off the sleeve.

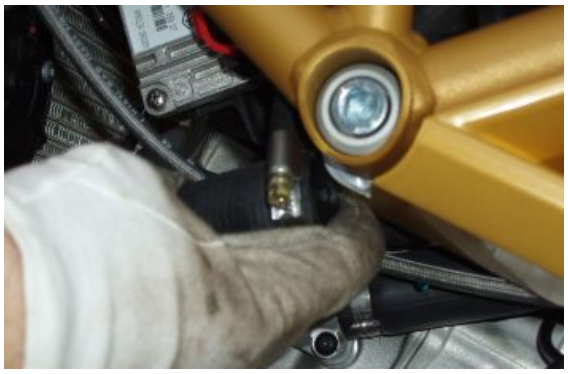
- Remove the cap.

- Empty the system into the specific container.
- Loosen the screw and move the clamp.

- Slide off the sleeve and empty the system completely.

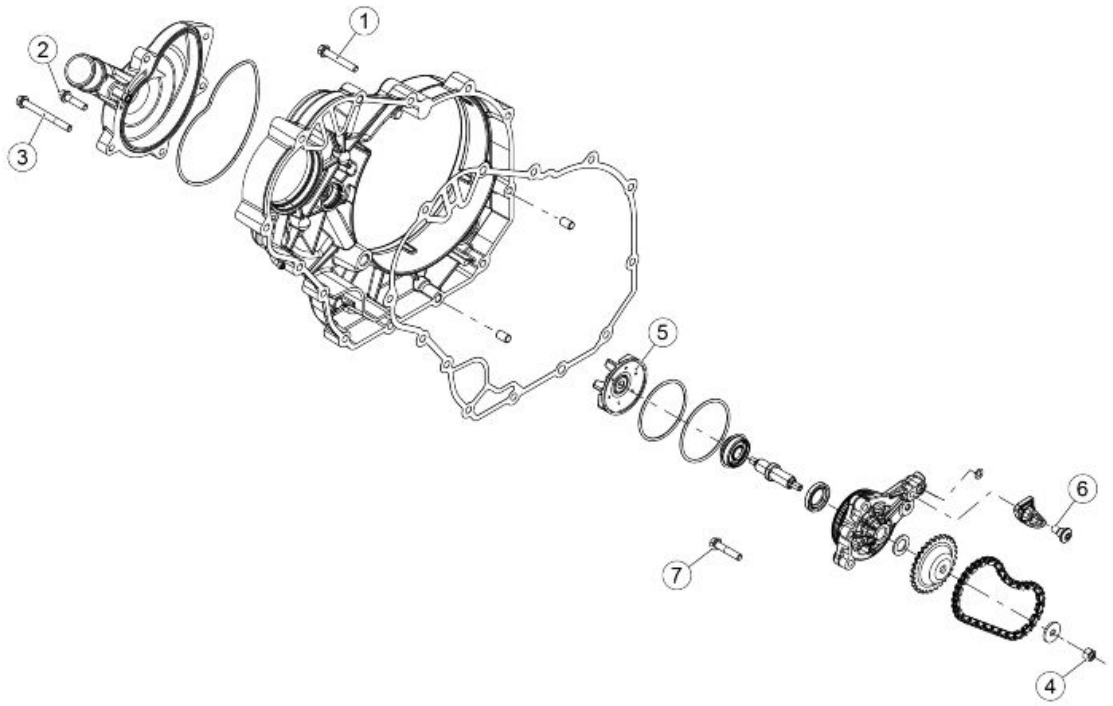
CAUTION

SHOULD GREASE BE NOTED IN THE WATER THIS IS TO BE CONSIDERED NORMAL BECAUSE DURING THE ASSEMBLY PHASE OF THE WATER PUMP SIGNIFICANT LUBRICATION OF THE SAME IS REQUIRED IN ORDER TO PREVENT DAMAGE.



- Refit both sleeves, place the corresponding clamps and tighten their screws.
- Fill the expansion tank up to the marked level.
- After bleeding the air from the tank, fit the expansion tank cap.
- Refit the front protection and tighten the screw.
- Fit the right side fairing.

Water pump



WATER PUMP

Pos.	Description	Type	Quantity	Torque	Notes
1	Clutch side cover fixing screw	M6x40	13	13 Nm (9.59 lb ft)	-
2	Pump cover / Clutch side cover fastening screw	M6x25	3	13 Nm (9.59 lb ft)	-
3	Pump cover / Clutch cover / clutch side half-crankcase fastening screw	M6x60	2	13 Nm (9.59 lb ft)	-
4	Water pump control crown fastening nut	M6	1	12 Nm (8.85 lb ft)	Loct. 244
5	Water pump impeller (brass insert)	M6	1	4 Nm (2.95 lb ft)	-
6	Flanged hex head screw for fastening the chain tensioner slider	M6x12	1	9 Nm (6.64 lb ft)	Loct. 242
7	Pump support fastening screw	M6x30	3	12 Nm (8.85 lb ft)	-

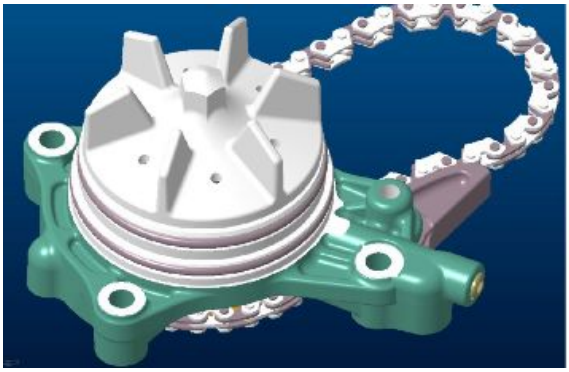
Removal

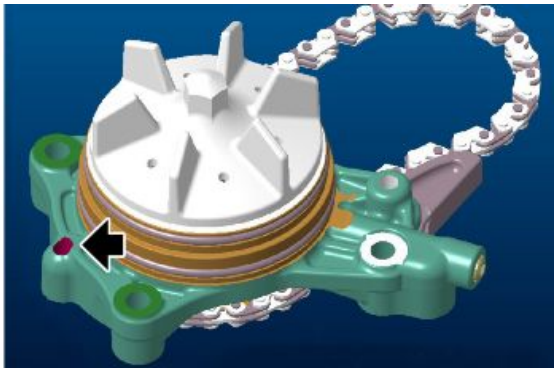
Based on the engine design development, there are two types of water pumps, associated to the specific clutch crankcases.

The second generation water pumps are distinguished through the punch marks, as indicated in the image.

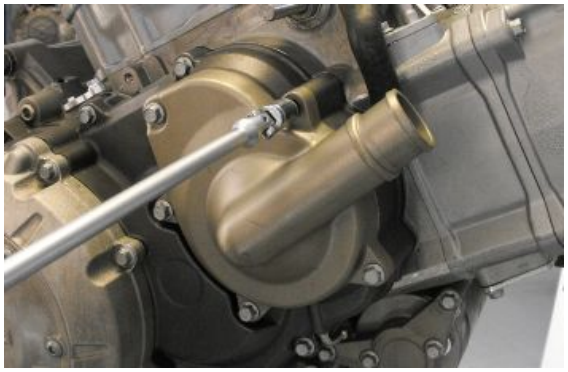
CAUTION

THE WATER PUMPS MUST BE COUPLED TO THE CORRESPONDING CLUTCH CRANKCASES. THE COMPONENTS ARE NOT INTERCHANGEABLE.
THE WATER PUMP WITH THE PUNCH MARKS MUST BE COUPLED TO THE CRANKCASE WITH PUNCH MARKS.
INCORRECT COUPLING MAY CAUSE SERIOUS DAMAGE TO THE ENGINE.

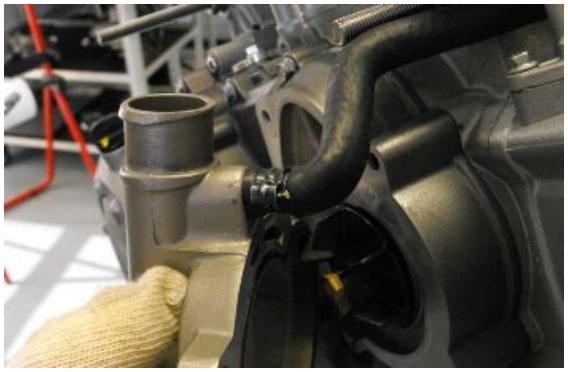




- Drain the cooling circuit completely.
- - Unscrew the and remove the five water pomp cover fastening screws.



- - Loosen the clip and remove the cover.

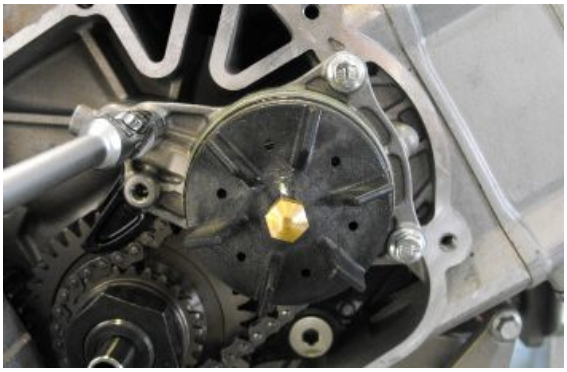


REMOVING THE PUMP ROTOR

- Remove the H2O pump cover.
- Unscrew the rotor and remove it, noting the left hand thread on the pin.

REMOVING THE COMPLETE H2O PUMP

- Remove the clutch cover.
- Unscrew and remove the three H2O pump retaining screws.



- Remove the H2O pump and extract the control chain.

NOTE

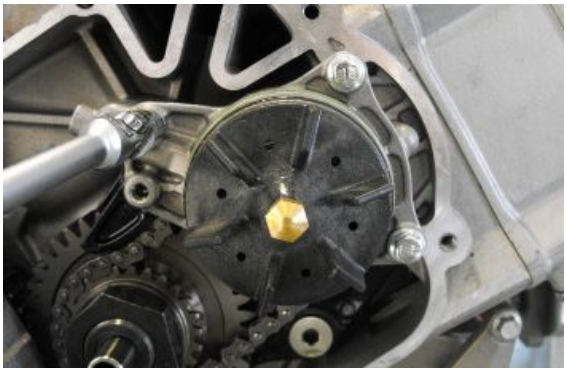
WHEN REMOUNTING THE PUMP, REPLACE THE "O-RINGS"

Installing

MOUNTING THE COMPLETE H2O PUMP

- - Insert the control chain and position the H2O pump in its housing.

- Insert the three H2O pump retaining screws, applying the pre-defined tightening torque.



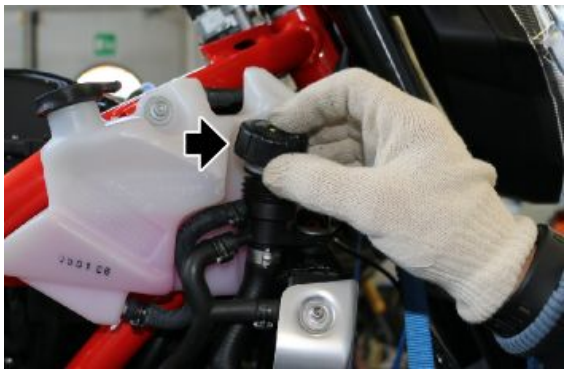
- Apply a large quantity of grease to the sides of the H2O pump so that it is easier to insert the cover.

CAUTION

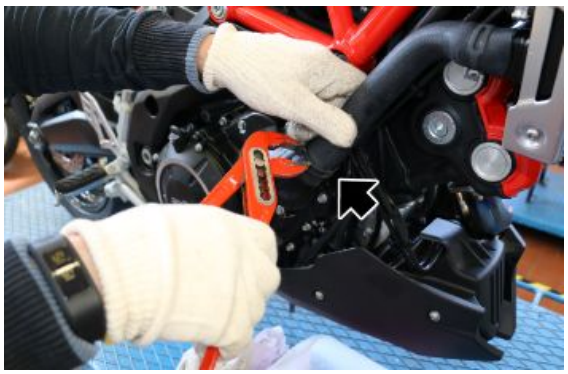
WHEN MOUNTING THE COVER, MAKE SURE THAT IT IS INSERTED PERPENDICULARLY TO THE GUARD, APPLYING EVEN PRESSURE OVER THE ENTIRE SURFACE IN ORDER TO AVOID DAMAGING THE O-RINGS.

Removing the radiator

- Remove the fuel tank.
- Locate a suitable recipient for collecting the coolant.
- Remove the filler cap.



- Access the left hand side of the motorcycle, loosen the clamp and move it to one side so that it is possible to disconnect the tube and drain the coolant.

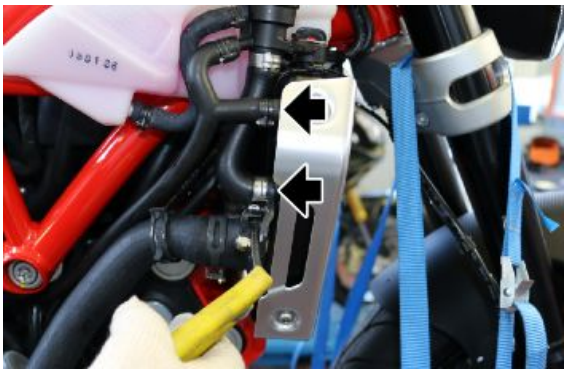


- Loosen the clamp and remove it, then disconnect the tube from the radiator, collecting the coolant in the recipient.

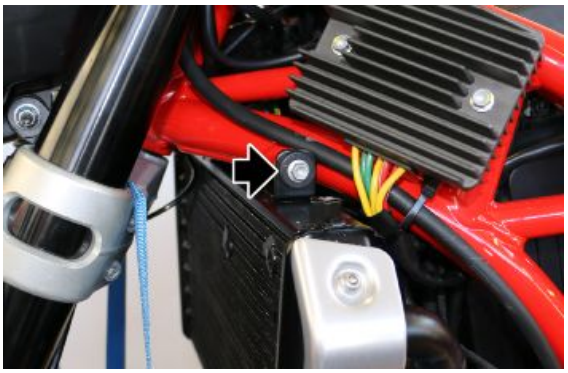
- Remove the screw that fastens the horn support bracket to the engine
- Disconnect the horn from its connectors and remove it.

- Disconnect the electric fan connector.

- Release the clamps of the pipes that connect the radiator to the expansion tank and disconnect them from the radiator.



- Remove the radiator fixing screw.

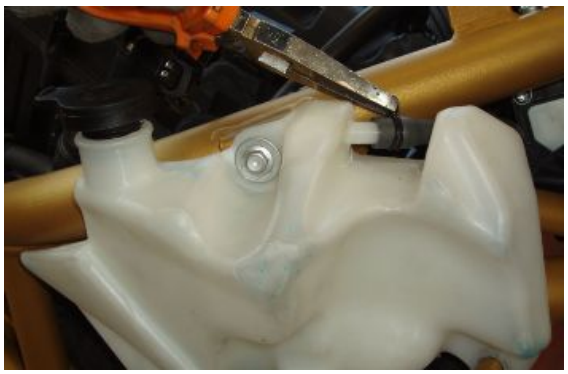


- Operating from the right side of the motorcycle, release and remove the radiator from the chassis.

Removing the expansion tank

- Remove the right side fairing.
- Unscrew and remove the screw and remove the protection.

- Loosen and move the clamp.
- Slide off the pipe.

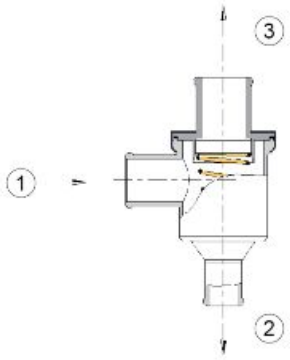


- Undo and remove the screw and collect the washer.
- Slide off the expansion tank.

Thermostatic valve

Traditional circuit, three-way thermostatic valve:

1. Hot water inlet from big ends.
2. Outlet to short circuit (direct to the pump).
3. Outlet to radiator



Thermostat specifications:

Characteristic

Temperature at start of stroke

85° +/- 2°

Valve stroke at 100°

>=7mm

Valve tightness pressure

2 bar

Working pressure

1.2 bar

Maximum working temperature

125°

INDEX OF TOPICS

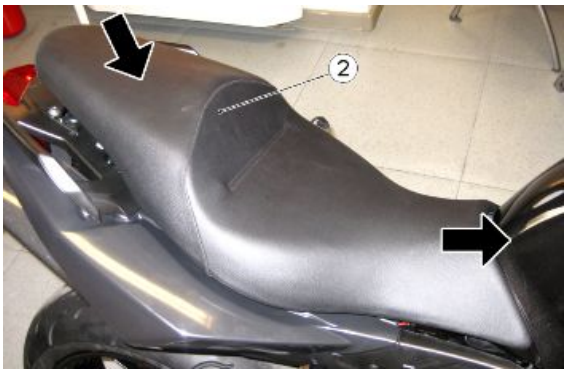
Seat

- Rest the vehicle on its stand.
- Insert the key (1) in the lock.
- Turn the key (1) anticlockwise, pull out and lift the saddle (2).

There is a handy document/tool kit compartment in the vehicle tail fairing. Remove the saddle (2) to reach it.

To lock the saddle (2):

- Move the saddle (2) so that the front retainers fasten correctly.
- Press on the middle of the saddle (2), at the rear fasteners, to insert them correctly.
- Press down and push the saddle (2) forwards, engaging the lock.

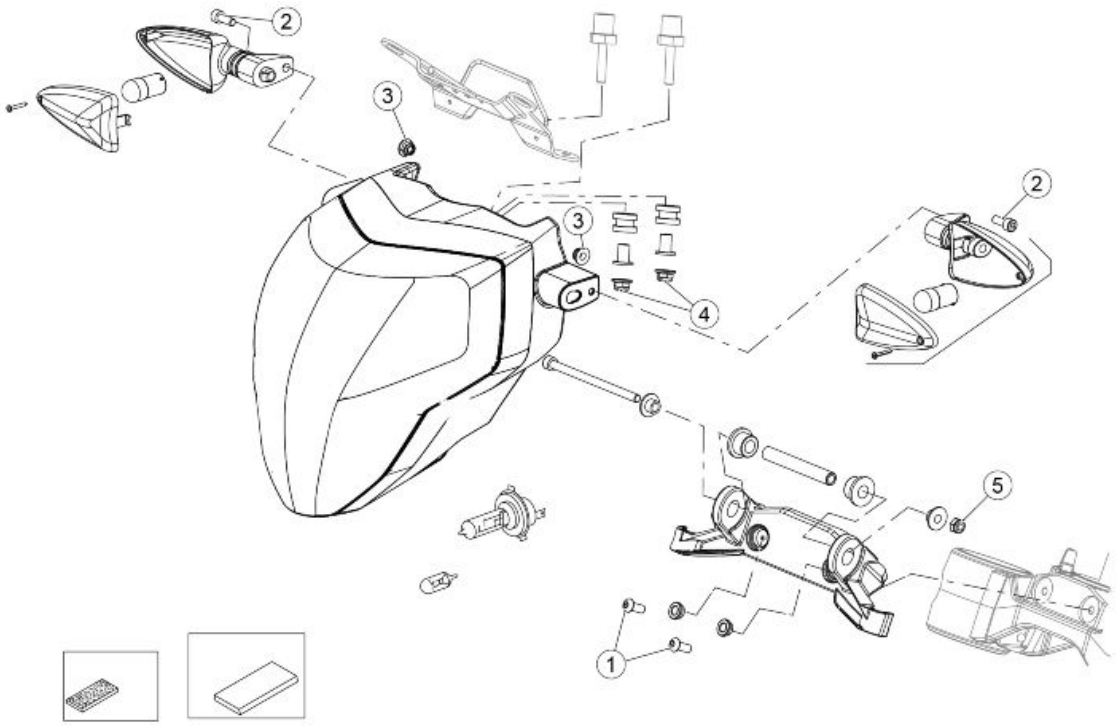


CAUTION

BEFORE LOWERING AND LOCKING THE SADDLE, CHECK THAT THE KEY HAS NOT BEEN LEFT IN THE GLOVEBOX / TOOL KIT COMPARTMENT.

BEFORE SETTING OFF, MAKE SURE THAT THE SADDLE IS CORRECTLY LOCKED INTO POSITION.

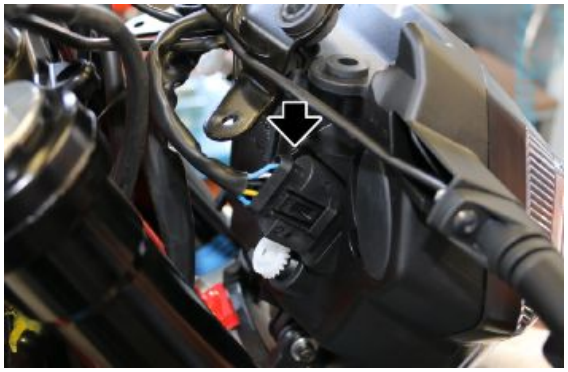
Headlight assy.



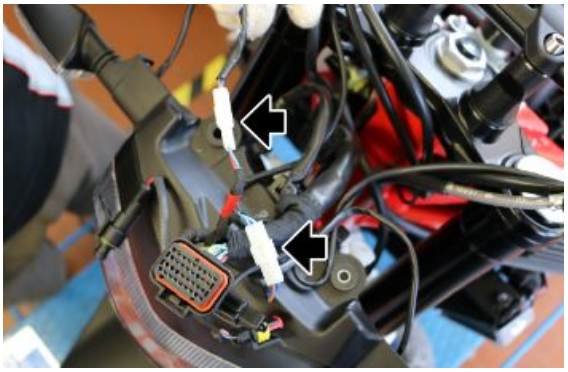
HEADLAMP

Pos.	Description	Type	Quantity	Torque	Notes
1	Button head, hex. socket screws used to fasten the headlight bracket to the bottom yoke	M6x15	2	10 Nm (7.38 lb ft)	-
2	Button head, hex. socket screws used to fasten the direction indicators	M5x16	2	3 Nm (2.21 lb ft)	-
3	Self-locking, flanged direction indicator fastening nuts	M5	2	2 Nm (1.48 lb ft)	-
4	Flanged, self-locking upper headlight fastening nuts	M6	2	10 Nm (7.38 lb ft)	-
5	Flanged, self-locking lower headlight fastening nut	M6	1	10 Nm (7.38 lb ft)	-

- After removing the instrument panel support, disconnect the main wiring harness connector from the headlight.



- Disconnect the direction indicator connectors.



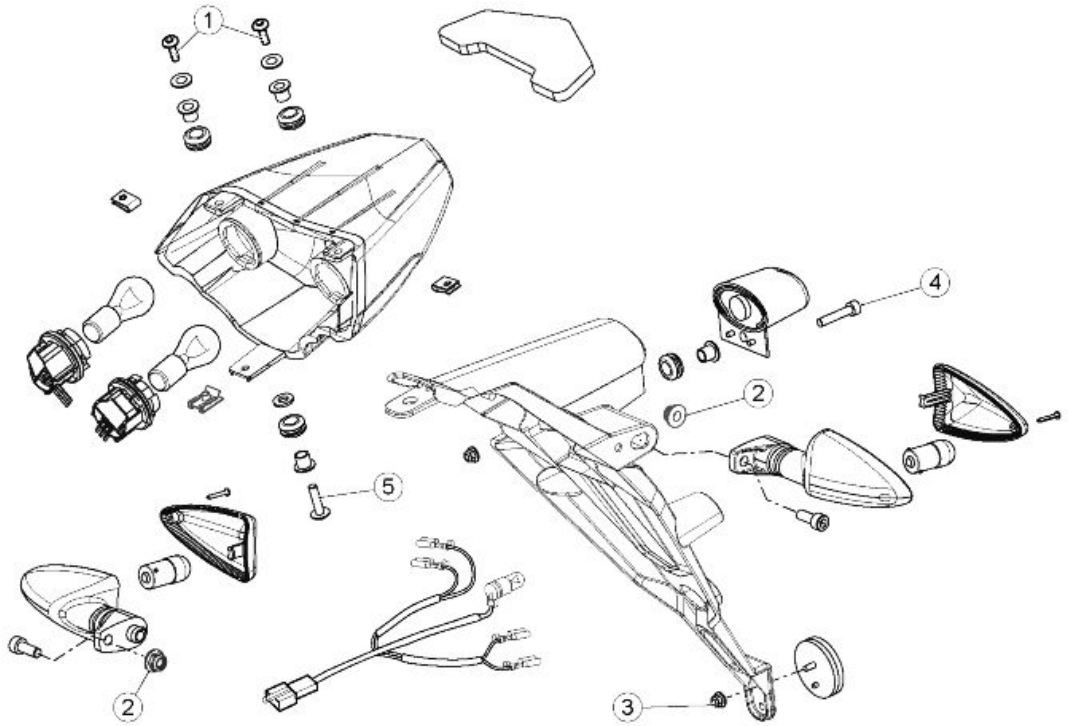
- After removing the lower front light assembly fastening nut, remove the pin, taking care to retrieve the "T" bushings from both sides.

See also

Instrument cluster support

- Remove the complete front light assembly.

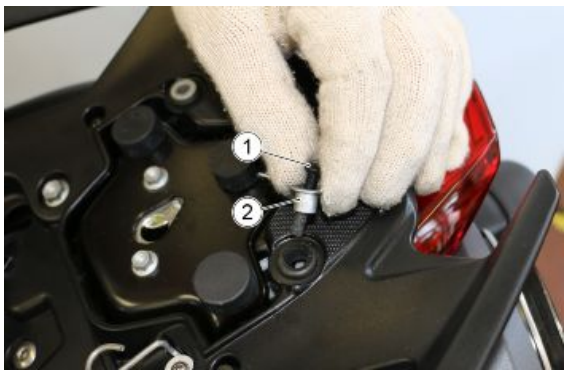
Taillight assy.



TAILLIGHT

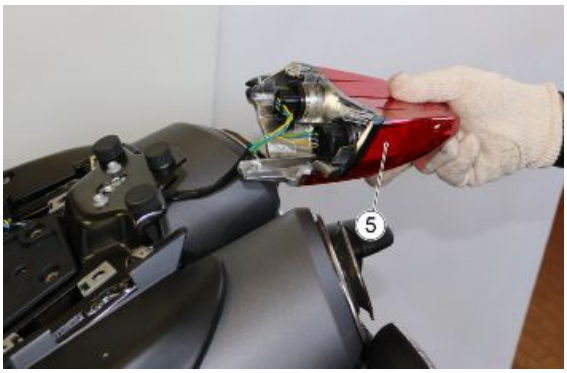
Pos.	Description	Type	Quantity	Torque	Notes
1	Button head hex. socket upper tail-light fastening screw	M5x16	2	4 Nm (2.95 lb ft)	-
2	Rear indicators fastening	M6	2	3 Nm (2.21 lb ft)	-
3	Reflector fastening	M5	2	2 Nm (1.47 lb ft)	-
4	License plate light fastening	M5	1	5 Nm (3.69 lb ft)	-
5	Button head hex. socket lower tail-light fastening screw	M5x25	1	4 Nm (2.95 lb ft)	-

- Remove the saddle and the rear wiring harnesses protection cover in order to cut the clamps and free the rear light assembly wiring harness.
- Undo and remove the two upper rear light assembly fastening screws (1) and retrieve the two bushings (2).



- Access the vehicle from underneath the exhaust terminal and unscrew the lower rear light assembly fastening screw (3) and retrieve the "T" bushing (4).

- Remove the rear light assembly (5).



License plate holder

- Remove the saddle and the rear light assembly.
- Unscrew the three upper screws (1) and remove them.

- Remove the two screws (3) that fasten the number plate support to the exhaust terminal, taking care to retrieve the washers.

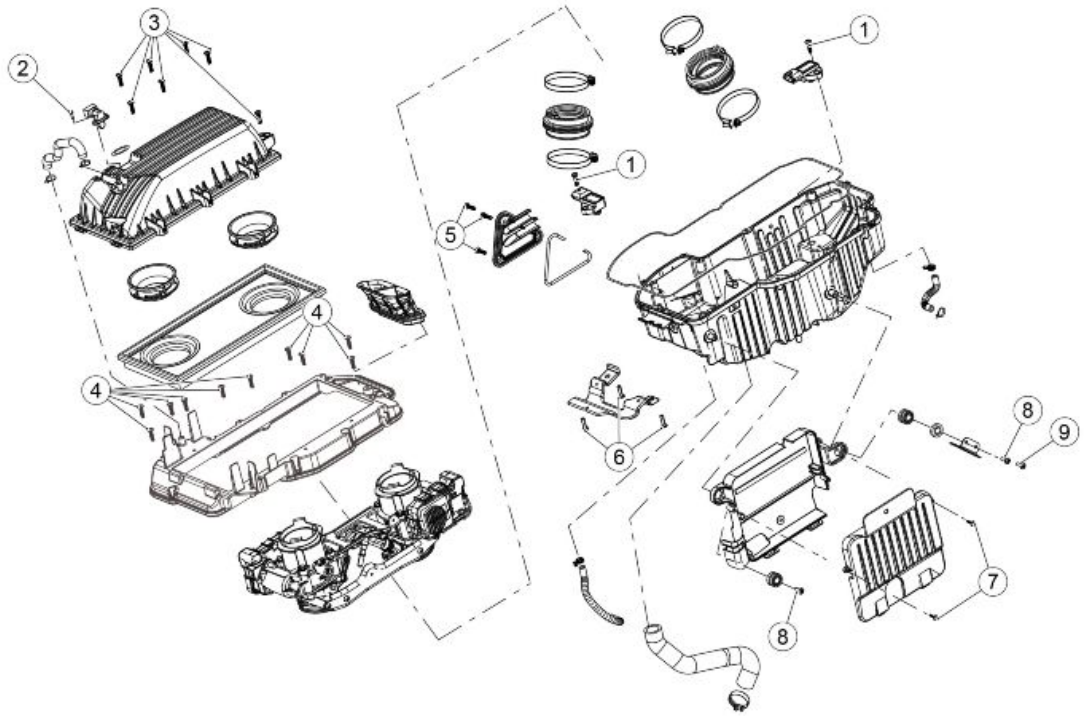
- To make it easier to route the direction indicators/license plate light wiring harness, we recommend removing the rear light assembly in order to remove the clamp (2) used to fasten the wiring harness to the number plate support frame.

- Remove the license plate holder (4).

See also

Seat

Air box



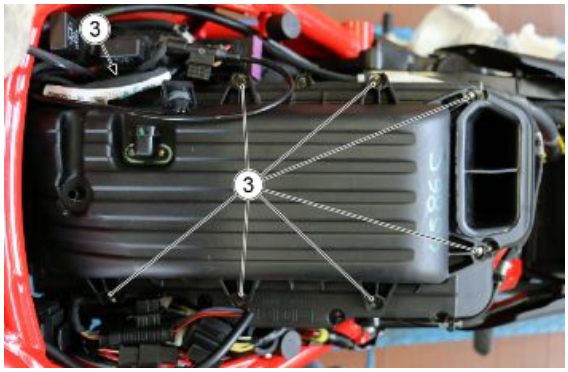
AIR FILTER CASING

Pos.	Description	Type	Quantity	Torque	Notes
1	Self-tapping, SWP air pressure sensor fastening screws	5x20	2	2 Nm (1.48 lb ft)	-
2	Self-tapping air temperature sensor fastening screws	2.9x12	2	2 Nm (1.48 lb ft)	-
3	SWP filter box lid fastening screws	5x20	8	2 Nm (1.48 lb ft)	-
4	SWP screws used to fasten the upper part of the filter box	5x20	10	2 Nm (1.48 lb ft)	-
5	SWP screws used to fasten the filter box side cover	5x20	3	2 Nm (1.48 lb ft)	-
6	SWP wiring harness support bracket fastening screws	5x20	3	2 Nm (1.48 lb ft)	-
7	SWP control unit cover fastening screws	3.9x14	2	2 Nm (1.48 lb ft)	-
8	SWP control unit support fastening screws	5x14	2	2 Nm (1.48 lb ft)	-

- Remove the saddle, the fuel tank complete with lateral ducts and the radiator
- Disconnect the air temperature sensor connector (1)

- Disconnect the blow-by breather tube (2) and remove it.

- Remove the eight filter box lid fastening screws (3)



- Unscrew the intake ducts (4) anticlockwise and remove them.

- Remove the air filter (5).

- Remove the starter relay (6) from the support present on the base of the filter box.

- Detach the Ride by Wire control connector (7) from the support present on the vase of the filter box

- Remove the fan control relay (8) from the support present on the base of the filter box.

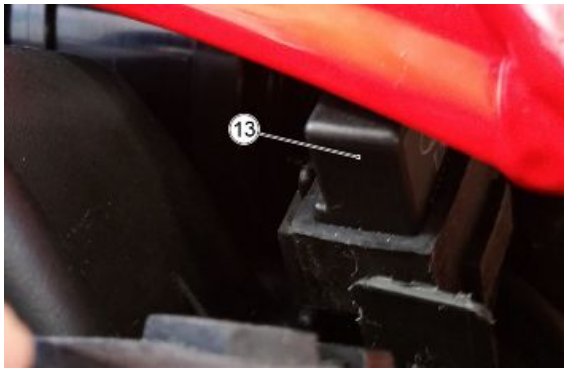
- Remove the main injection relay (9) from the support present on the base of the filter box.

- Detach the front ABS speed sensor connector (10) from the support present on the base of the filter box.

- Remove the secondary injection relay (11) from the support present on the base of the filter box.

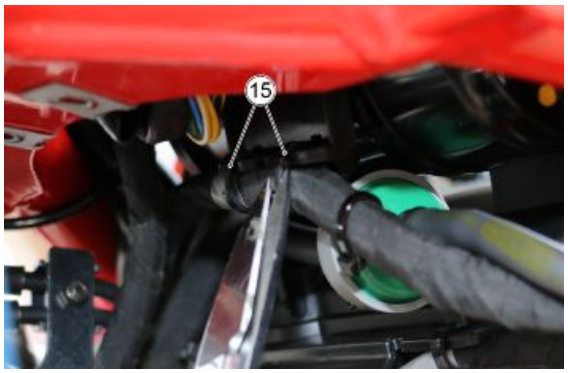
- Remove the lights relay (12) from the support present on the base of the filter box.

- Remove the highbeam lights relay (13) from the support present on the base of the filter box.

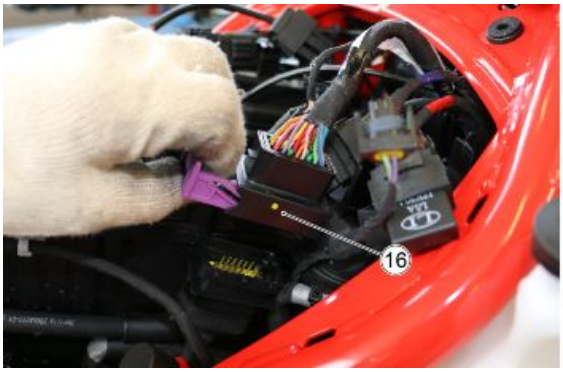


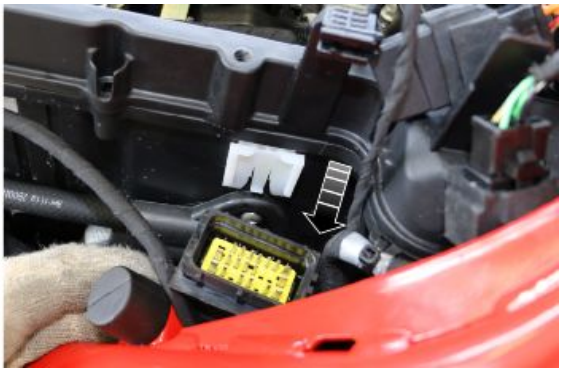
- Remove the two instrument cannister support fastening screws (14).

- Remove the two clamps (15) used to fasten the main wiring harness to the cannister support.

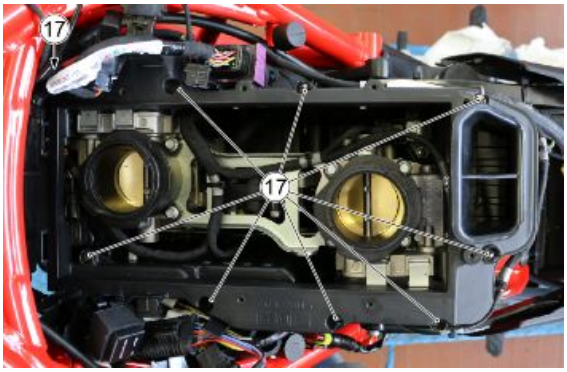


- Disconnect the main wiring harness connector (16) and detach it from its support on the base of the filter box.



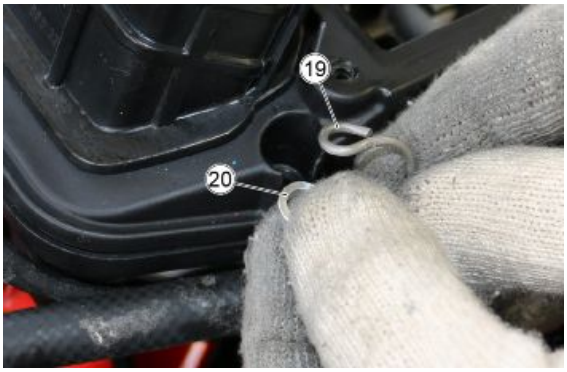


- Remove the nine screws used to fasten the cover (17).



- Remove the tenth screw used to fasten the cover (18) positioned in correspondence with steering headstock.

- Remove the metallic cable clamp (19), taking care to retrieve the washer (20).



- Remove the upper part (21) of the filter box.

- Remove the two screws (22) used to fasten the air pressure sensors.
- Disconnect the connectors and remove the sensors.

- Remove the two clamps (23) used to fasten the wiring harness to the throttle body.

NOTE

DURING REASSEMBLY, REPLACE THE CLAMPS IN THE POSITIONS IDENTIFIED BY THE GREY TAPE.

- Disconnect the two connectors (24) from the throttle body.

- Access the right hand side of the motorcycle and remove the three screws (25) used to fasten the side panel mounted on the filter box in order permit the passage of the wiring harness.

NOTE

DURING REASSEMBLY, REPLACE THE CLAMPS IN THE POSITIONS IDENTIFIED BY THE GREY TAPE.

- Remove the side panel (26).
- Insert a suitable screwdriver through the hole in the side panel and loosen the two clamps used fasten the throttle body to the manifolds.

NOTE

DURING REASSEMBLY, MAKE SURE THAT THE METALLIC CLAMPS ARE POSITIONED CORRECTLY SO AS TO GUARANTEE THEY ARE TIGHTENED PROPERLY WHEN REPOSITIONING THE THROTTLE BODY.

- Disconnect the throttle body and remove the injector connectors (27).

CAUTION

THE FRONT INJECTOR CONNECTOR IS COLOURED GREEN IN ORDER TO DISTINGUISH IT FROM THE REAR CONNECTOR.
TAKE CARE NOT TO INVERT THE TWO CONNECTORS AS THIS WOULD RESULT IN THE MOTORCYCLE NOT FUNCTIONING CORRECTLY, AS WELL AS GENERATING ELECTRICAL ERRORS.

- Remove the complete throttle body (28).
- Extract the internal wiring harness through the side of the filter box.

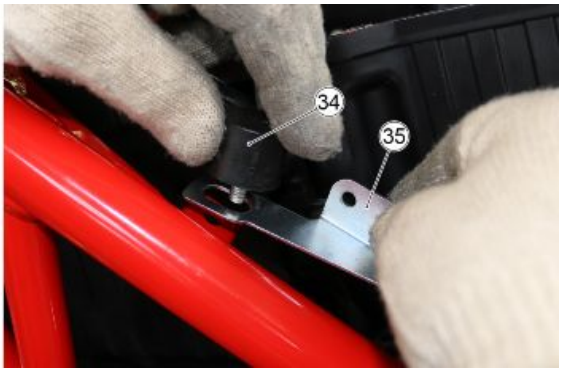
- Unclip the coil connectors (29) from their support on the base of the filter box, and disconnect them.

- Disconnect the cable clamp (30) from the base of the filter box.

- Remove the clamps (31) in order to detach the wiring harness from the base of the filter box.

- Remove the two screws (32) that fasten the plate used to connect the filter box to the frame.

- Unscrew the nut (33) in order to remove the rubber spacer (34) and the plate (35).



- Remove the two screws (35) used to fasten the control unit cover.

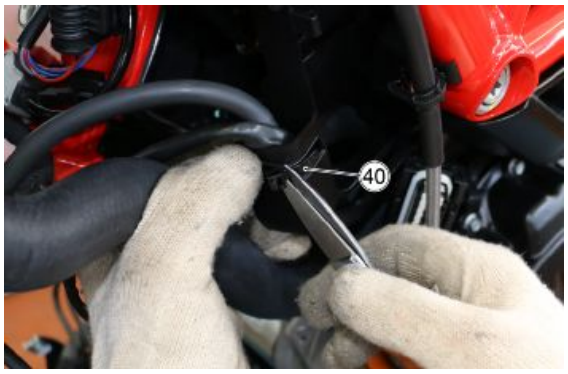
- Slide the control unit cover (36) off vertically.

- Disconnect the two connectors (37) from the control unit.

- Slide the control unit (38) out vertically.

- Remove the screw (39) used to fasten the control unit support to the base of the filter box.

- Remove the clamp (40) from the control unit support and release the wiring harnesses.



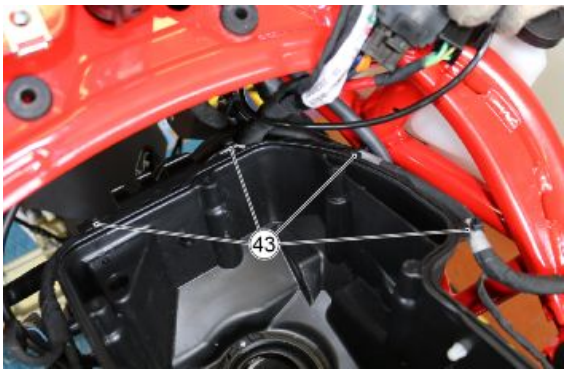
- Detach the support (41) from the pin present on the base of the filter box and slide it out from the front.

- Detach the cable clamp (42) from the base of the filter box.

- Remove the four clamps positioned on the front part of the filter box (43) and release the wiring harness.

NOTE

DURING REASSEMBLY, REPLACE THE CLAMPS IN THE POSITIONS IDENTIFIED BY THE GREY TAPE.



- Working on both sides, loosen the metallic clamps (44) that fasten the filter box rubber manifolds to the aluminium manifolds on the heads.

NOTE

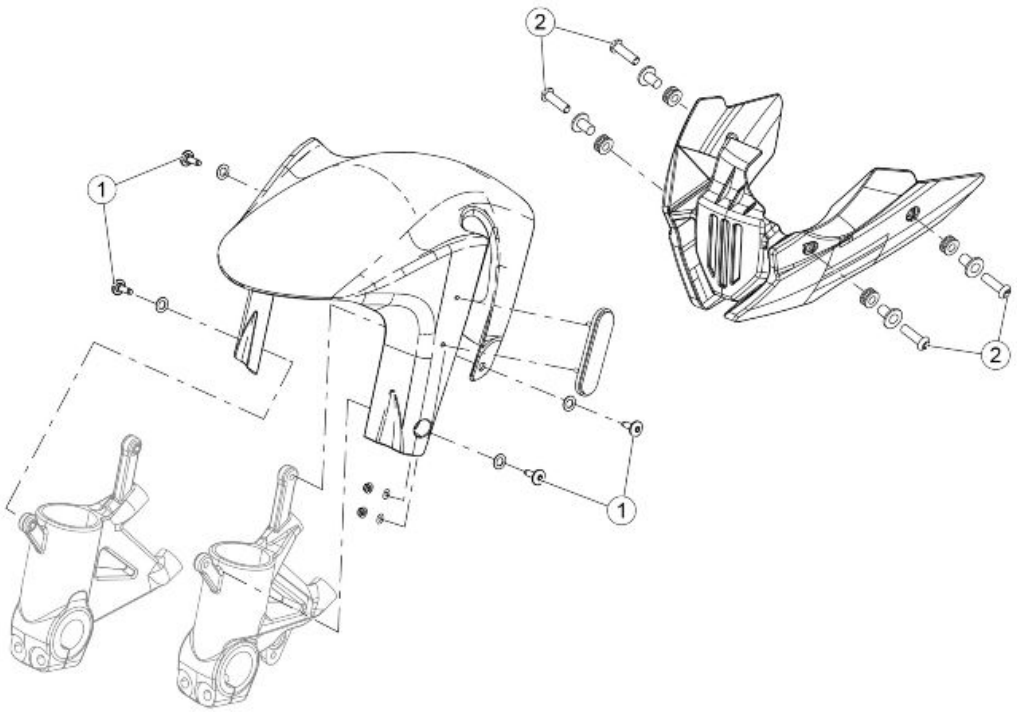
DURING REASSEMBLY, MAKE SURE THAT THE METALLIC CLAMPS ARE POSITIONED CORRECTLY SO AS TO GUARANTEE THEY ARE TIGHTENED PROPERLY WHEN REPOSITIONING THE FILTER BOX.

- Raise the filter box slightly and disconnect the gear sensor connector (45) and the engine oil temperature sensor (46) from their supports.
- Disconnect the two front/rear breather tubes (47) from the filter box.

- Remove the three screws (48) that fasten the cable guide (49) and free the wiring harness.

- Remove the base from the filter box (50).

Lower cowl

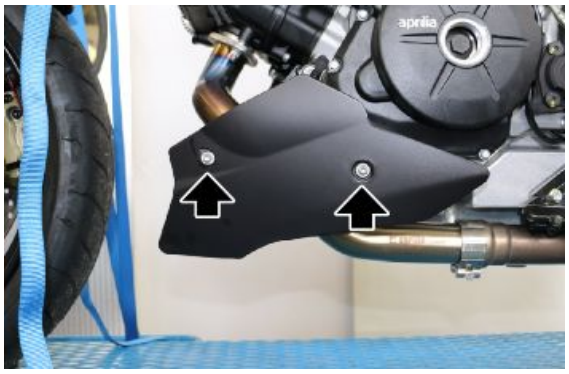


FRONT MUDGUARD - ENGINE FAIRING

Pos.	Description	Type	Quantity	Torque	Notes
1	Button head hex. socket screws used to fasten the mudguard to the calliper mounting bracket	M5x9	4	4 Nm (2.95 lb ft)	Loct. 243

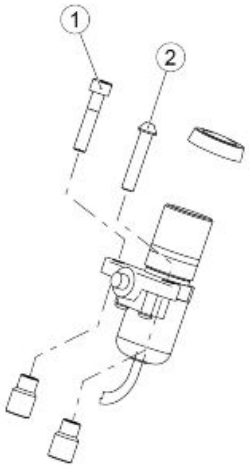
Pos.	Description	Type	Quantity	Torque	Notes
2	Button head hex. socket screws for fastening the engine fairing to the support	M6x20	4	10 Nm (7.38 lb ft)	-

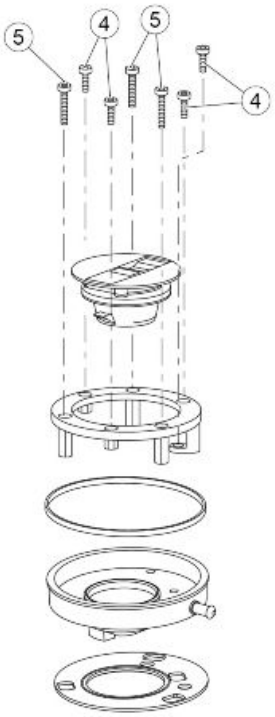
- After positioning the vehicle on the side stand, unscrew and remove the lower fairing fastening screws, working on both sides of the vehicle.

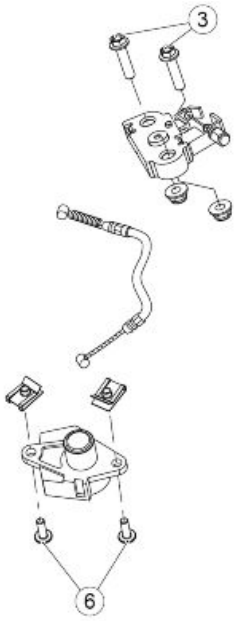


- Remove the lower fairing, taking care to retrieve the "T" bushings.

Fuel tank

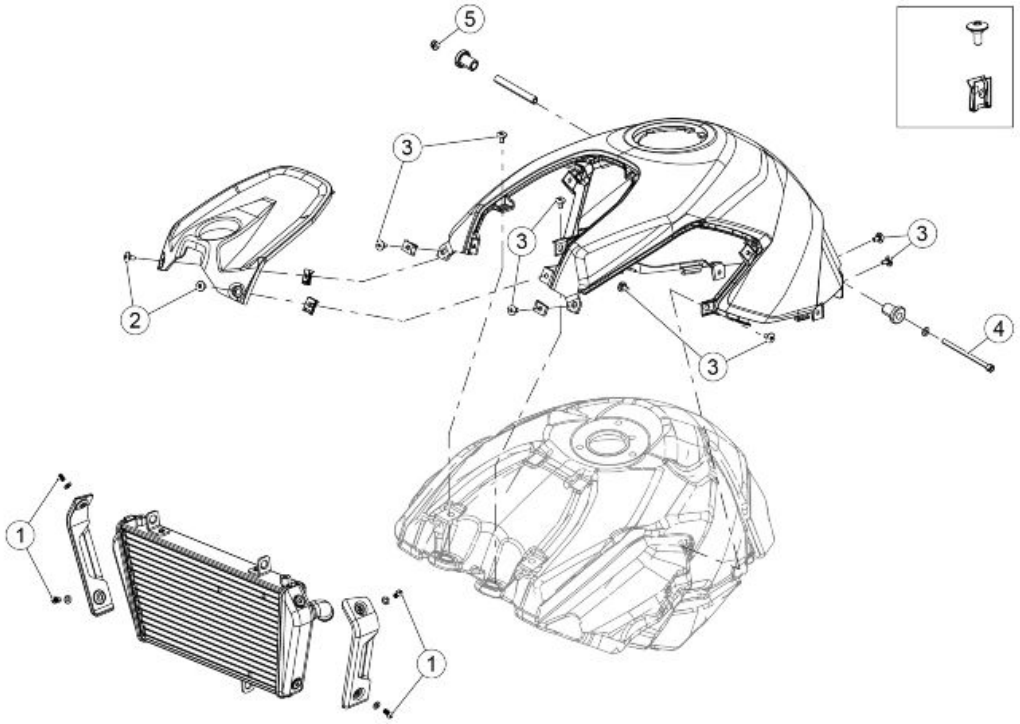






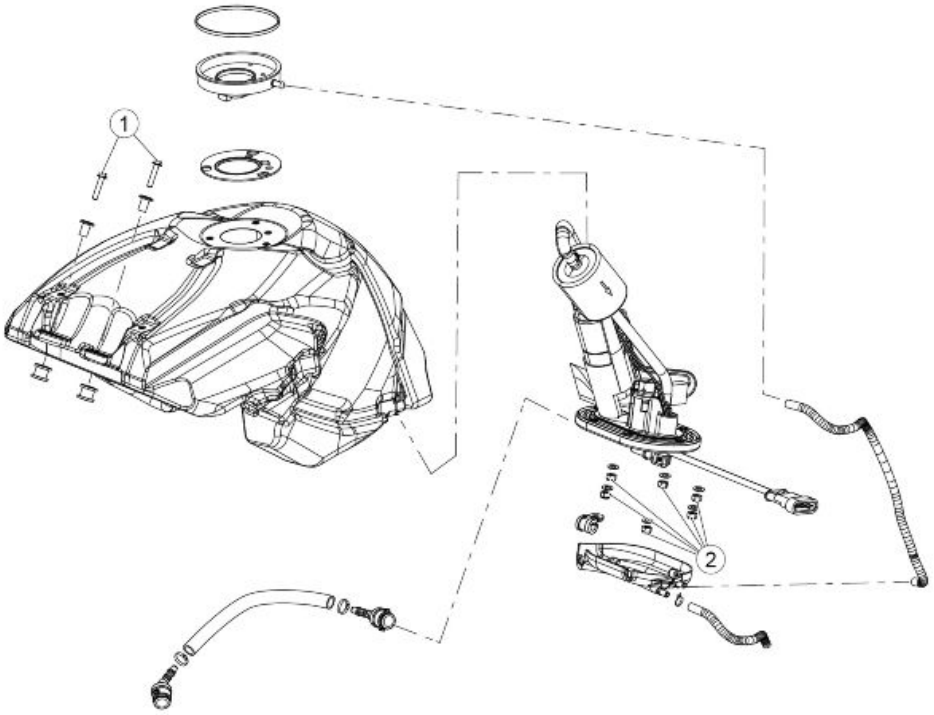
LOCKS

Pos.	Description	Type	Quantity	Torque	Notes
1	Button head, hex. socket ignition lock fastening screw	M8x40	1	25 Nm (18.44 lb ft)	-
2	Ignition lock fastening shear head screw	-	1	Manual	-
3	Flanged, hex. head screws used to fasten the saddle lock to the saddle	M6x25	2	10 Nm (7.38 lb ft)	-
4	Cyl. head, hex. socket screws used to fasten the filler cap to the fuel tank	M5x16	4	5 Nm (3.69 lb ft)	-
5	Cyl. head, hex. socket screws used to fasten the filler cap to the fuel tank	M5x30	4	5 Nm (3.69 lb ft)	-
6	Cyl. head, hex. socket for fastening the saddle to the tail fairing	M5x16	4	4 Nm (2.95 lb ft)	-



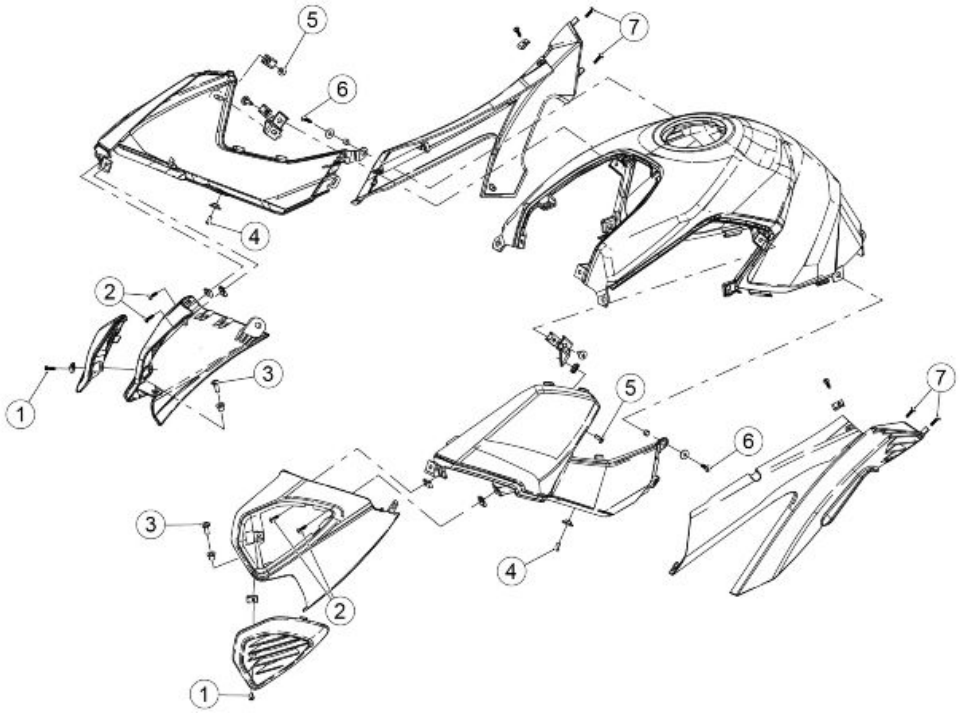
FUEL TANK COVER

Pos.	Description	Type	Quantity	Torque	Notes
1	Button head, hex. socket screws used to fasten the radiator guard to the radiator	M6x12	4	10 Nm (7.38 lb ft)	-
2	Button head, hex. socket block lid/ fuel tank cover fastening screws	M5x9	2	10 Nm (7.38 lb ft)	-
3	Button head, hex. socket fuel tank cover fastening screws	M5x9	8	4 Nm (2.95 lb ft)	-
4	Cyl. head, hex. socket rear fuel tank cover fastening screw	M6x90	1	12 Nm (8.85 lb ft)	-
5	Self-locking rear fuel tank cover fastening nut	M6	1	12 Nm (8.85 lb ft)	-



TANK

pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head front fuel tank fastening screws	M6x30	2	6 Nm (4.43 lb ft)	-
2	Fuel pump fastening nuts	M5	6	6 Nm (4.43 lb ft)	-



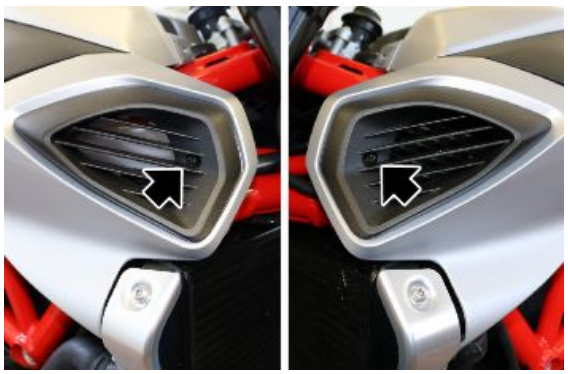
SIDE FAIRINGS

Pos.	Description	Type	Quantity	Torque	Notes
1	Self-tapping, cyl. head slot drive screws used for fastening the grilles to the duct covers	4.2x16	2	3 Nm (2.21 lb ft)	-
2	Self-tapping, cyl. head slot drive screws used for fastening the duct covers to the ducts	4.2x16	4	3 Nm (2.21 lb ft)	-
3	Button head, hex. socket screws used to fasten the duct covers to the radiator	M6x16	2	7 Nm (5.16 lb ft)	-
4	Button head, hex. socket screws for fastening the conveyors to the tank	M5x10	2	4 Nm (2.95 lb ft)	-
5	Button head, hex. socket screws for fastening the conveyors to the bracket	M5x12	2	4 Nm (2.95 lb ft)	-
6	Self-tapping screws used for fastening the tank/fuel tank cover/ducts	2.9x20	2	2 Nm (1.48 lb ft)	-
7	Self-tapping, cyl. head, slot drive screws used for fastening the side/tail fairings	2.9x20	4	2 Nm (1.48 lb ft)	-

- Remove the saddle.
- Remove from both sides the fixing screws of the ignition switch assembly dashboard.

- Lift the front of the ignition switch assembly dashboard and remove the rear from the tank cover.

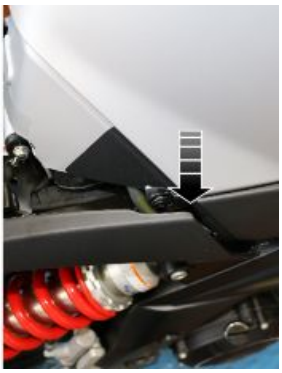
- Operating from both sides of the motorcycle, remove the fixing screws of the duct covers.



- Remove the side panel fixing screws before the radiator.


- Remove the four screws fixing the side panels to the tank covers.

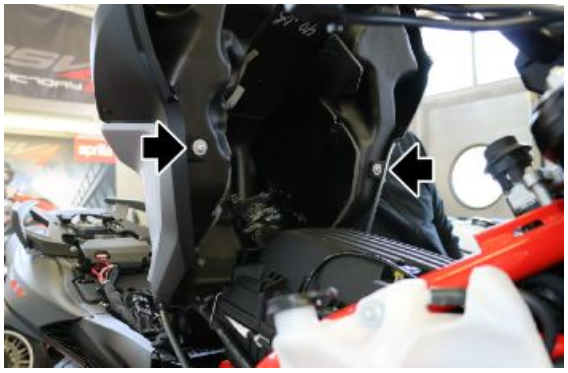

- Release the side panels from the ducts.

- Remove the duct front screws.


- Remove the duct rear screws.

- Raise the tank partially and remove the duct central fixing screws.
- Remove the ducts.



- Disconnect the vent pipes from the fuel collection tank and remove it.

- Operating from the right side of the motorcycle, disconnect the vent pipe.

- Disconnect the fuel pump connector.

- Remove the fuel pump connector below the chassis crosspiece so that the tank can be removed later.

- Remove the nut and remove the central fixing screw of the tank.

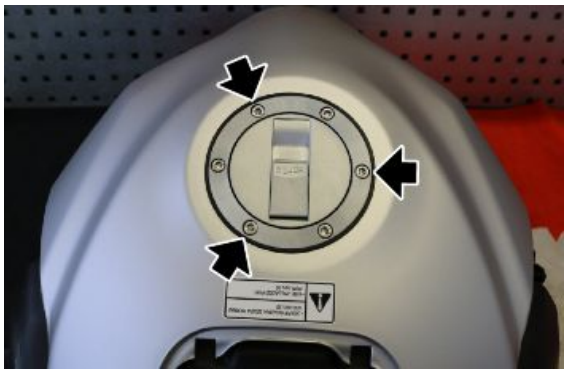
- Remove the tank.

- Remove the front screws of the tank cover.

- Remove the rear screws of the tank cover.

- Remove the central screws of the tank cover.

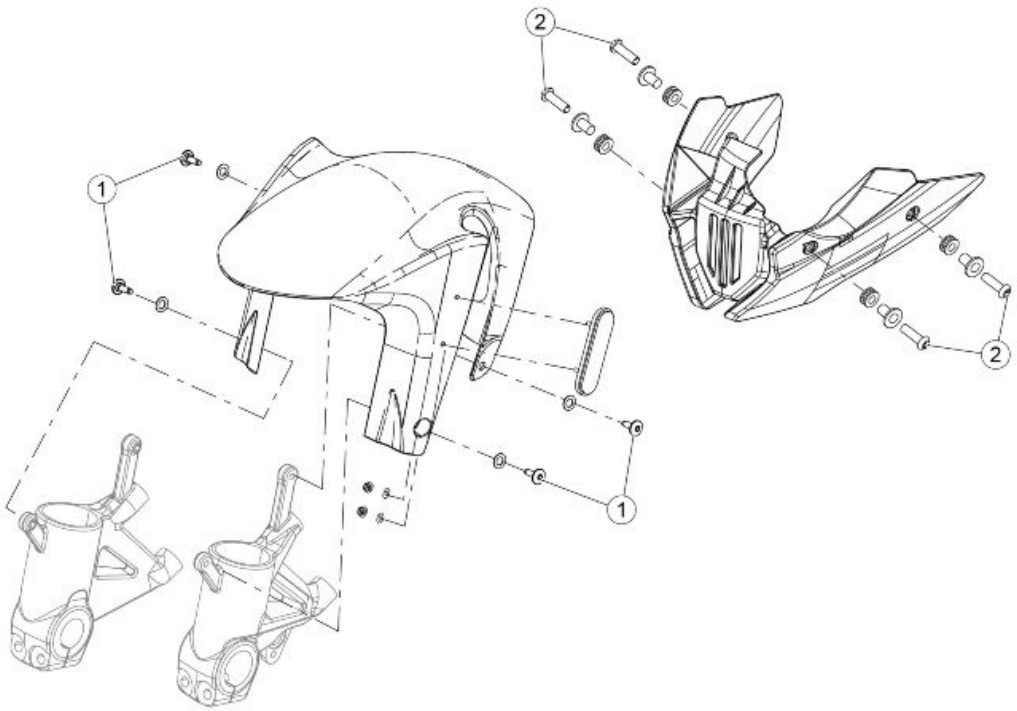
- Remove the three outer screws indicated on the tank cap.



- Carefully remove the inner screw of the tank cap so that it does not fall into the tank.
- Remove the complete cap.

- Remove the tank cover.

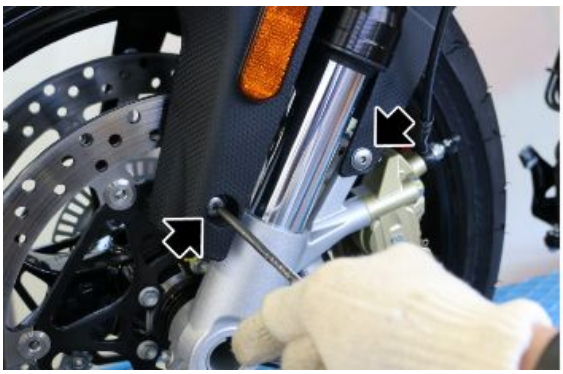
Front mudguard

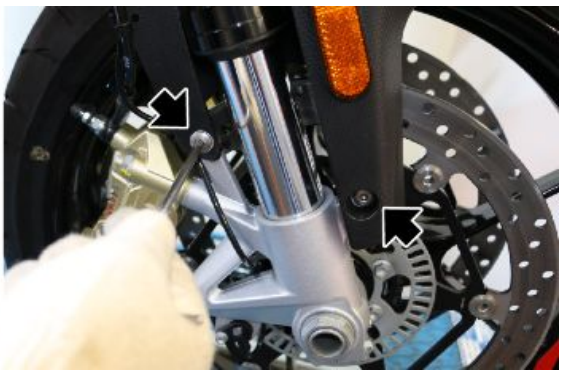


FRONT MUDGUARD - ENGINE FAIRING

Pos.	Description	Type	Quantity	Torque	Notes
1	Button head hex. socket screws used to fasten the mudguard to the calliper mounting bracket	M5x9	4	4 Nm (2.95 lb ft)	Loct. 243
2	Button head hex. socket screws for fastening the engine fairing to the support	M6x20	4	10 Nm (7.38 lb ft)	-

- Working on both sides of the vehicle, undo and remove the four screws that secure the mudguard.

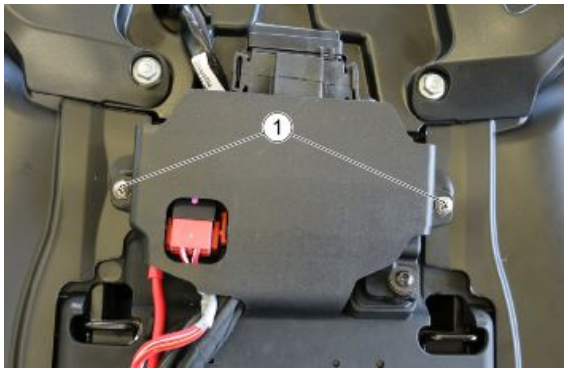




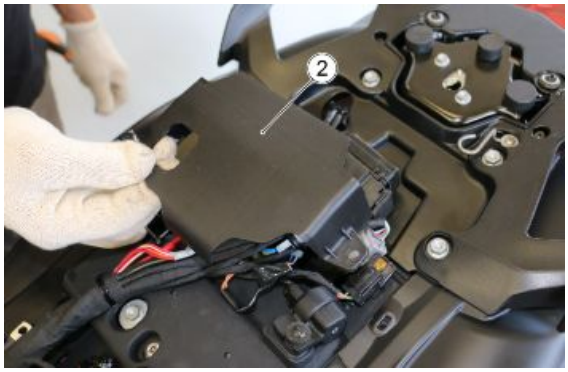
- Remove the mudguard

Rear grab rail

- Unscrew and remove the screws (1) used for fastening the rear wiring harness protection cover.



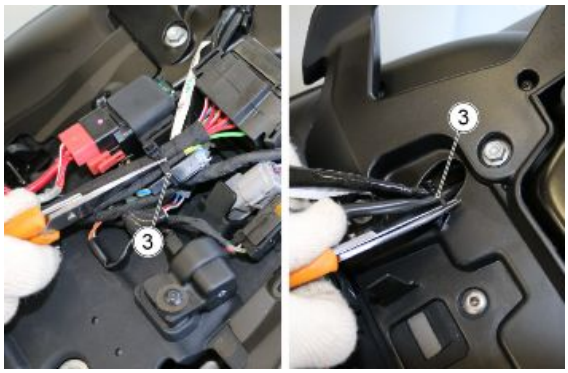
- Remove the protection cover (2).



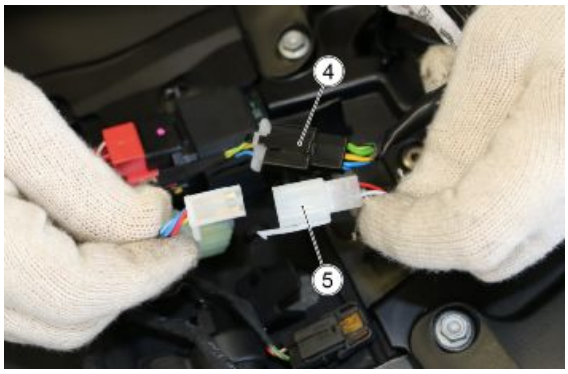
- Remove the clamps (3).

NOTE

DURING REASSEMBLY, ENSURE THAT ALL THE CLAMPS AND THE WIRING HARNESS ARE IN THE CORRECT POSITION.



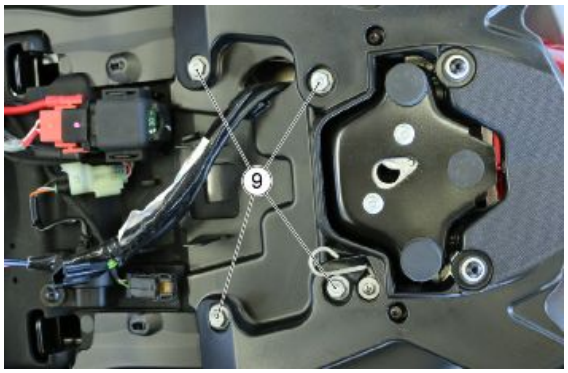
- Disconnect the license plate light (4) and rear light assembly (5) connector.



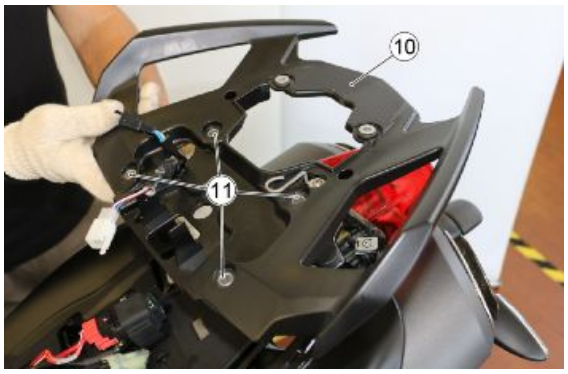
- Remove the two self-tapping screws (6).

- Remove the two screws (7), complete with "T" bushings (8).

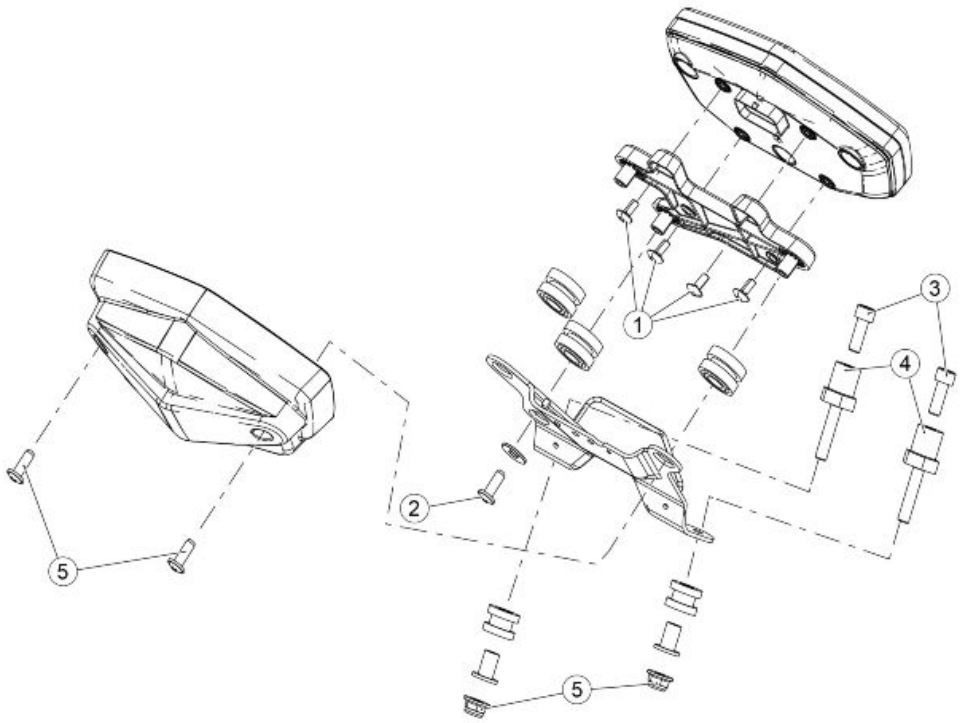
- Remove the four front screws (9)



- Remove the grab bar (10), taking care to retrieve the "T" bushings (11).



Instrument cluster support



INSTRUMENTS

Pos.	Description	Type	Quantity	Torque	Notes
1	Button head, hex. socket instrument panel adapter fastening screws	M5x12	4	3 Nm (2.21 lb ft)	-
2	Self-tapping, SWP screws used to fasten the instrument cluster and cover to the support plate	5x14	3	3 Nm (2.21 lb ft)	-
3	Button head, hex. socket screws for fastening the steering plate to the instrument panel plate	M6x16	2	10 Nm (7.38 lb ft)	-
4	Special screws for fastening the steering plate to the instrument panel support plate	M6	2	10 Nm (7.38 lb ft)	-
5	Flanged, self-locking upper headlight fastening nuts	M6	2	10 Nm (7.38 lb ft)	-

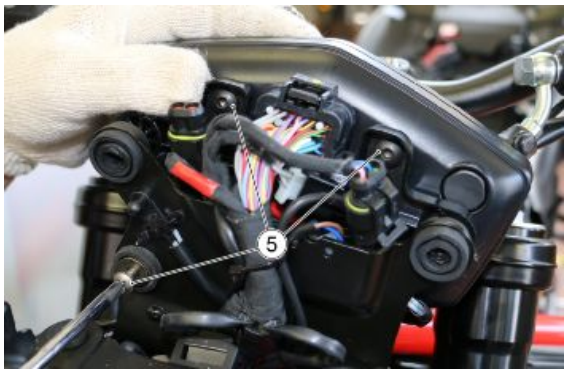
- Remove the two instrument panel cover (2) fastening screws (1).

- Remove the instrument panel cover (2).

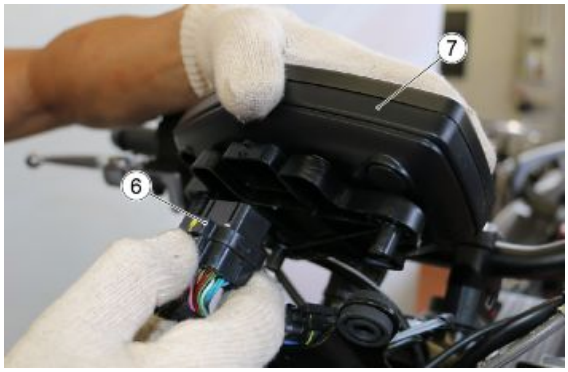
- Remove the two instrument panel support fastening screws (3).

- Loosen the nuts used for fastening the special screws (4) so that it is possible to remove them.

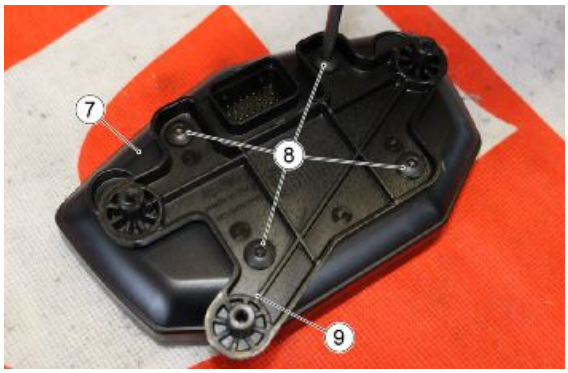
- Raise the instrument panel in order to remove the three screws (5) used for fastening metal instrument panel support to the instrument panel.



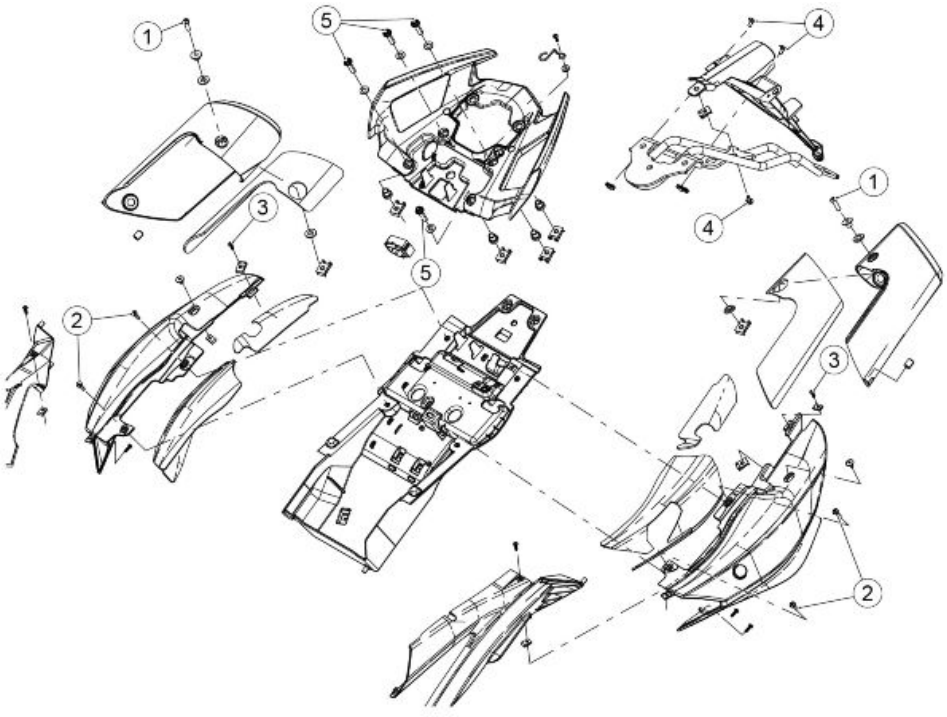
- Disconnect the connector (6) and remove the instrument panel (7).



- Remove the four screws (8) in order to separate the instrument panel (7) from the plastic support (9)



Tail guard

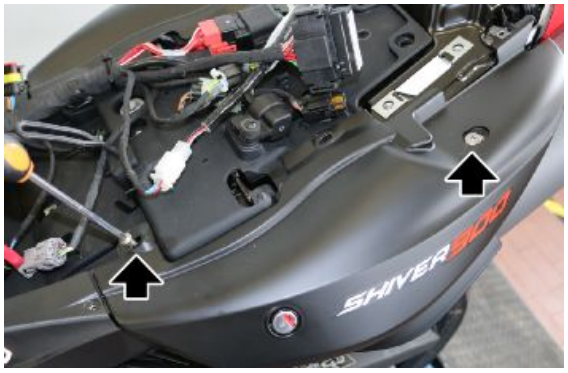


REAR BODYWORK

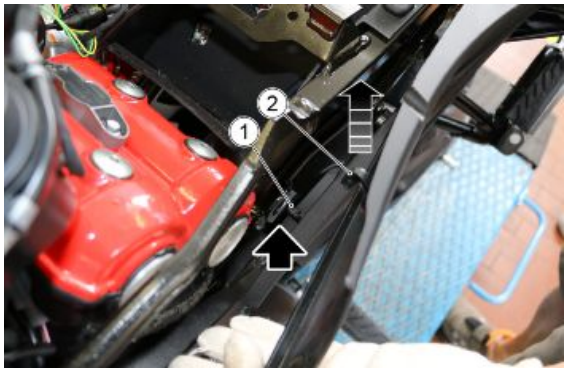
Pos.	Description	Type	Quantity	Torque	Notes
1	Button head, hex. socket screws used for fastening the covers to the terminal	M6x20	6	10 Nm (7.38 lb ft)	-

Pos.	Description	Type	Quantity	Torque	Notes
2	Self-tapping screws used for fastening the tail fairings to the battery compartment	M5x19	4	4 Nm (2.95 lb ft)	-
3	Self-tapping, cyl. head Pozidriv screws used for fastening the grab-bar to the tail fairings	4.2x16	2	3 Nm (2.21 lb ft)	-
4	Button head, hex. socket screws used for fastening the number plate holder to the number plate holder support	M5x9	3	4 Nm (2.95 lb ft)	-
5	Flanged, hex. head screws used for fastening the grab-bar support to the grab bar and the saddle support	M8x30	4	22 Nm (16.23 lb ft)	-

- Remove the rear grab bar and the two upper screws used for fastening the tail fairing



- Extract the pin (1) from the side fairing, and raise the fairing so as to unhook it at point (2).



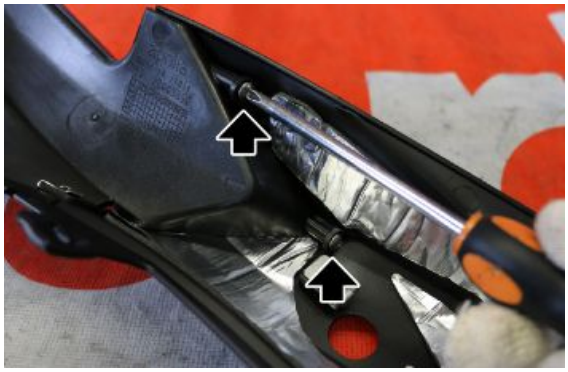
- Remove the two ignition switch assembly fastening screws, remembering to retrieve the metallic cable clamp

See also

Rear grab rail

- Remove the external screw used for fastening the tail fairing to the side fairing.

- Remove the two internal screws used fro fastening tail fairing to the side fairing and separate them.



- If necessary, in order to remove the ignition switch assembly, disconnect the saddle opening cable and remove it.

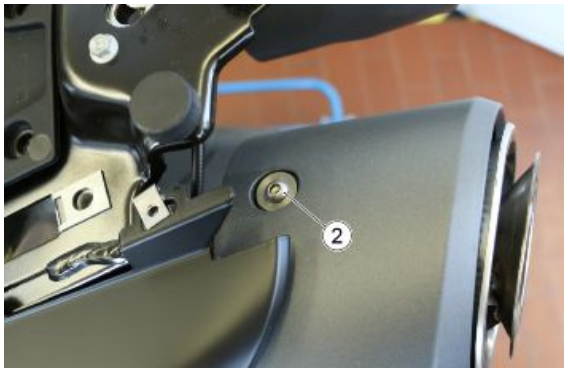
Copertura terminale

- Remove the saddle, the rear grab-bar, the rear light assembly and the number plate support in order to remove the terminal covers.

The following operations refer to a single cover, but are valid for both:

- Remove the lower fastening screw (1) and retrieve the "T" bushing with the rubber grommet.

- Remove the upper fastening screw (2) and retrieve the "T" bushing with the rubber grommet.



- If the number plate support has not been removed, remove the screw (3) and the respective washer and grommet.

- Slide the cover (4) off from the rear.

See also

Seat

License plate holder
Rear grab rail
Taillight assy.

- Unscrew and remove the protective rubber grommets (5)

INDEX OF TOPICS

Carry out the listed checks before delivering the motorcycle.

WARNING

HANDLE FUEL WITH CARE.

Aesthetic inspection

- Paintwork
- Fitting of Plastic Parts
- Scratches
- Dirt

Tightening torques inspection

- Safety fasteners:

front and rear suspension unit

front and rear brake calliper retainer unit

front and rear wheel unit

engine - chassis retainers

steering assembly

- Plastic parts fixing screws

Electrical system

- Main switch
- Headlamps: high beam lights, low beam lights, tail lights (front and rear) and their warning lights
- Headlight adjustment according to regulations in force
- Front and rear stop light switches and their bulbs
- Turn indicators and their warning lights
- Instrument panel lights
- Instrument panel: fuel and temperature indicator (if present)
- Instrument panel warning lights
- Horn
- Electric starter
- Engine stop via emergency stop switch and side stand
- Helmet compartment electrical opening switch (if present)

- Through the diagnosis 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.

CAUTION

TO ENSURE MAXIMUM PERFORMANCE, THE BATTERY MUST BE CHARGED BEFORE USE. INADEQUATE CHARGING OF THE BATTERY WITH A LOW LEVEL OF ELECTROLYTE BEFORE IT IS FIRST USED SHORTENS THE LIFE OF THE BATTERY.

CAUTION

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

WARNING

THE BATTERY ELECTROLYTE IS POISONOUS AS IT MAY CAUSE SERIOUS BURNS. IT CONTAINS SULPHURIC ACID. AVOID CONTACT WITH YOUR EYES, SKIN AND CLOTHING.
IF IT ACCIDENTALLY COMES INTO CONTACT WITH YOUR EYES OR SKIN, WASH WITH ABUNDANT WATER FOR APPROX. 15 MIN. AND SEEK IMMEDIATE MEDICAL ATTENTION.
IF ACCIDENTALLY SWALLOWED, IMMEDIATELY DRINK LARGE QUANTITIES OF WATER OR VEGETABLE OIL. SEEK IMMEDIATE MEDICAL ATTENTION.
BATTERIES PRODUCE EXPLOSIVE GASES; KEEP CLEAR OF NAKED FLAMES, SPARKS OR CIGARETTES. VENTILATE THE AREA WHEN RECHARGING INDOORS. ALWAYS WEAR EYE PROTECTION WHEN WORKING IN THE PROXIMITY OF BATTERIES.
KEEP OUT OF THE REACH OF CHILDREN

CAUTION

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.

Levels check

- Hydraulic braking system fluid level
- Clutch system fluid level (if present)
- Gearbox oil level (if present)
- Transmission oil level (if present)
- Engine coolant level (if present)
- Engine oil level
- Mixer oil level (if present)

Road test

- Cold start
- Instrument panel operation

- Response to throttle control
- Stability when accelerating and braking
- Front and rear brake efficiency
- Front and rear suspension efficiency
- Abnormal noise

Static test

Static check after test drive:

- Restarting when warmed up
- Starter operation (if present)
- Minimum holding (turning the handlebar)
- Uniform turning of the steering
- Possible leaks
- Radiator electric fan operation (if present)

Functional inspection

- Hydraulic braking system
- Stroke of brake and clutch levers (if present)
- Clutch - Check for correct operation
- Engine - Check for correct general operation and absence of abnormal noise
- Other
- Documentation check:
- Chassis and engine numbers check
- Supplied tools check
- License plate fitting
- Locks checking
- Tyre pressure check
- Installation of mirrors and any possible accessories

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

CAUTION

CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.

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