SERVICE STATION MANUAL

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RSV4 RR/RF

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THE VALUE OF SERVICE

As a result of continuous updates and specific technical training programmes for 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, its regular maintenance and the use of **original Aprilia spare parts** only are essential factors!

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

www.aprilia.com

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

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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
RSV4 RR/RF

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, aprilia 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

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CHARACTERISTICS	CHAR

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

THE FUEL USED TO POWER INTERNAL COMBUSTION ENGINES IS HIGHLY FLAMMABLE AND MAY BE EXPLOSIVE UNDER CERTAIN 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 components

The engine and the exhaust system components become very hot and remain hot for some time after the engine has been switched off. When handling these components, wear 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

IT IS ADVISABLE TO WEAR PROTECTIVE IMPERMEABLE GLOVES WHEN SERVICING THE VEHICLE.
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.

THE BRAKE FLUID MAY DAMAGE PAINTED, PVC OR RUBBER SURFACES. WHEN SERVICING THE BRAKING SYSTEM, PROTECT THESE COMPONENTS WITH A CLEAN CLOTH. ALWAYS WEAR PROTECTIVE GOGGLES WHEN SERVICING THE BRAKING SYSTEM. THE BRAKE FLUID IS EXTREMELY DANGEROUS TO THE 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 TORQUE

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 the guidelines detailed below:

- Do not twist the throttle grip abruptly and completely when the engine is working at a low revs, either during or after run-in.
- During the first 100 Km (62 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, during the first 1000 km (621 mi), not to exceed 7500 rpm and 9500 rpm up 2000 km (1243 mi).

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

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

Vehicle identification

SERIAL NUMBER LOCATION

These numbers are necessary for vehicle registration.

NOTE

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

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

ZD4RKL000YSXXXXXX

KEY:

ZD4: WMI (World manufacturer identifier) code;

RK: model;

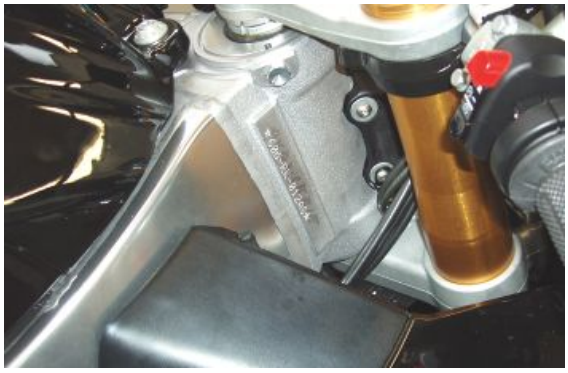
L00: Race Pack/RF or RR

0: free digit

Y year of manufacture

S: production plant (S= Scorzè);

XXXXXX: serial number (6 digits);



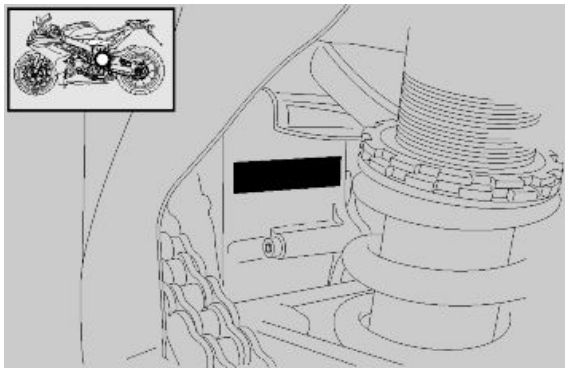
CHASSIS NUMBER

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

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	2,055 mm (80.90 in)
Max. width (at handlebar)	735 mm (28.94 in)
Max. height (to windshield)	1,150 mm (45.27 in)
Saddle height	847 mm (33.35 in)
Wheelbase	1,435 mm (56.50 in)
Minimum ground clearance	130 mm (5.12 in)

Specification	Desc./Quantity
Kerb weight	190 kg (419 lb)
Kerb weight	201 kg (443 lb)
Full loaded weight (rider only)	276 kg (608 lb)

Engine

ENGINE

Specification	Desc./Quantity
Model	V4
Type	65° longitudinal V-4, 4-stroke, 4 valves per cylinder, double overhead camshafts.
Engine capacity	999 cc (60.96 cu in)
Bore / stroke	78 mm / 52.26 mm (3.07 in / 2.06 in)
Compression ratio	13.5 +/- 0.5: 1
Engine idle speed	1500 +/- 100 rpm
Engine revs at maximum speed	13900 +/- 100 rpm
Clutch	Multi plate wet clutch with mechanical control lever on left side of the handlebar. Anti-juddering and slipper clutch systems
Start-up	Electric
Timing system	Morse chain on intake camshaft, cam to cam gear, bucket tappets and valve clearance adjustments with calibrated pads
Lubrication	Wet sump with oil radiator
Oil pump	Dual trochoidal pump (lubrication + cooling)
Oil filter	With external cartridge filter
Liquid	Liquid
Cooling system	3-way thermostatic valve, cooling radiator with electric fan and expansion tank
Coolant pump	Centrifugal bearingless aspirating pump with integrated ceramic gasket
Air filter	In cotton

Transmission

GEAR RATIOS

Specification	Desc./Quantity
Primary drive ratio	44 / 73 (with gears)
Drive ratio, 1st gear	15 / 39 (secondary)
Drive ratio, 2nd gear	16 / 33 (secondary)
Drive ratio, 3rd gear	20 / 34 (secondary)
Drive ratio, 4th gear	21 / 31 (secondary)
Drive ratio, 5th gear	23 / 31 (secondary)
Drive ratio, 6th gear	27 / 34 (secondary)
Final drive ratio	16 / 41

TRACTION CONTROL

Specification	Desc./Quantity
a-PRC system	(Aprilia Performance Ride Control), which includes traction control, wheelie control, launch control and clutchless gear shift functions both going up and down the gears.

Capacities

CAPACITY

Specification	Desc./Quantity
Fuel tank (reserve included)	18.5 l (4.07 UKgal; 4.88 US gal)
Fuel tank reserve	4 l (0.88 UK gal; 1.06 US gal)
Engine oil	oil and filter change 4.1 l (0.90 UK gal)

Specification	Desc./Quantity
Coolant	2.7 l (0.59 UK gal)
Seats	2
Maximum weight capacity	201 kg (443 lb)

Drive chain

DRIVE CHAIN

Specification	Desc./Quantity
Type	525 With sealed master link
Model	Regina 110 links

Electrical system

ELECTRICAL SYSTEM

Specification	Desc./Quantity
Spark plugs	NGK-R CR9EKB Alternatively: NGK-R CR9EB NGK-R CR10E (for competition use)
Electrode gap	0.7 - 0.8 mm (0.027 - 0.031 in)
Battery	YUASA YT12A-BS, 12 V 9.5 Ah or YUASA YTZ10S, 12 V 8.6 Ah
Coils	Stick coil
Recharging system	Flywheel with rare earth magnets
Alternator	450 W
Main fuses	30 A
Secondary fuses	5A - 7.5A - 15A
ABS fuses	15 A - 30 A

BULBS

Specification	Desc./Quantity
High beam/low beam light	12 V - 55 W H7
Front daylight running lights	LED
Turn indicator light	LED
Rear daylight running light /stop light	LED
Licence plate light	12 V - 5 W

WARNING LIGHTS

Specification	Desc./Quantity
High beam light	LED
Turn indicators	LED
General warning	LED
Gear in neutral	LED
a-PRC	LED
Fuel reserve	LED
MI	LED
ABS	LED
Overrevving	LED

Frame and suspensions

CHASSIS

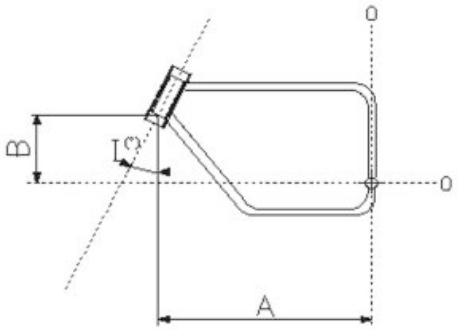
Specification	Desc./Quantity
Type	Adjustable aluminium, dual beam chassis with pressed and cast sheet elements.
Steering rake	26.5° (measurements with reference to bare chassis)

SUSPENSION

Specification	Desc./Quantity
Front fork - RSV4 1000 RR Race Pack/RF	Öhlins upside down units with adjustable hydraulic damping and 43 mm (1.69 in) diam. stanchions with Tin surface coating)
Front fork - RSV4 1000 RR	Sachs upside-down stanchions with adjustable hydraulic damping and 43mm (1.69 in) diameter stanchions.
Front wheel stroke - RSV4 1000 RR Race Pack/RF	120 mm (4.72 in)
Front wheel stroke - RSV4 1000 RR	121 mm (4.76 in)
Rear shock absorber - RSV4 1000 RR Race Pack/RF	With progressive linkage with APS system. Öhlins shock absorber with adjustable spring preload piggy-back, wheelbase,compression damping and rebound damping.
Rear shock absorber - RSV4 1000 RR	With progressive linkage with APS system. Sachs shock absorber with adjustable spring preload piggy-back, wheelbase,compression damping and rebound damping.
Rear wheel stroke - RSV4 1000 RR Race Pack/RF	137 mm (5.39 in)
Rear wheel stroke - RSV4 1000 RR	138.5 mm (5.45 in)

SIZES A AND B

Specification	Desc./Quantity
Size "A"	639.5 mm (25.18 in) (measurements refer to the bare chassis)
Size "B"	329.5 mm (12.97 in) (measurements refer to the bare chassis)



Brakes

BRAKES

Specification	Desc./Quantity
Front	Dual 320 mm (12.59 inches) diam. floating disc, forged radial-mounted single block calipers and four pistons 30 mm diam. (1.18 inches) and 2 pads - radial pump and brake pipe in metal braid.
Rear	disc brake -220 mm diam. (8.66 inches), 2-piston callipers - 32 mm diam. (1.25 inches) - pump with built-in tank and metal braid pipe.

Wheels and tyres

WHEEL RIMS

Specification	Desc./Quantity
Front wheel rim	3.50 x 17" RSV4 1000 RR - forging for the version RSV4 1000 RR Race Pack/RF
Rear wheel rim	6.00 x 17" RSV4 1000 RR - forging for the version RSV4 1000 RR Race Pack/RF

TYRES

Specification	Desc./Quantity
Tyre model	Pirelli DIABLO Supercorsa SP V2 Pirelli DIABLO Supercorsa SP
Front tyre	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 tyre	200/55 ZR17 (78W) (*) 190/55 ZR17 (75W) **(*) With these dimensions use only Pirelli Diablo Supercorsa SP and Diablo Supercorsa SP V2 tyres.**
Inflation pressure	1 passenger: 2.5 bar (250 KPa) (36.26 PSI) 2 passengers: 2.8 bar (280 KPa) (40.61 PSI)

Supply

FUEL SYSTEM

Specification	Desc./Quantity
Fuel	Unleaded petrol max E10 (95 RON)

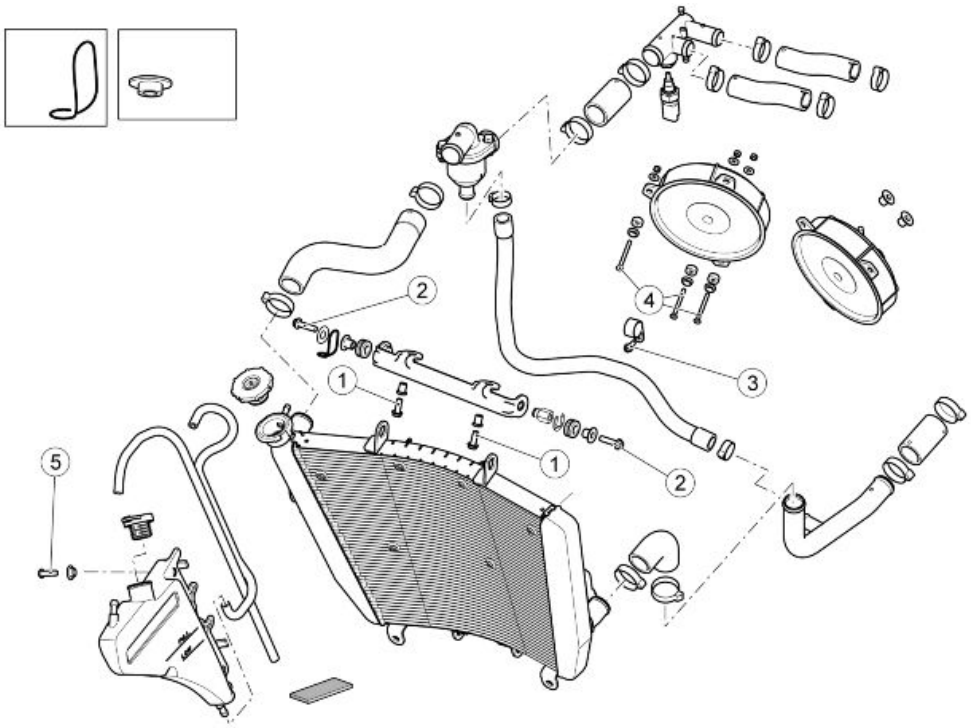
FUEL SYSTEM

Specification	Desc./Quantity
Throttle body diameter	48 mm (1.89 in)
Type	Electronic injection with 2 injectors per cylinder, 4 throttle bodies motorised (Ride by wire). Intake ducts at variable height. 2 dynamic air intakes. Selectable multimap.

Tightening Torques

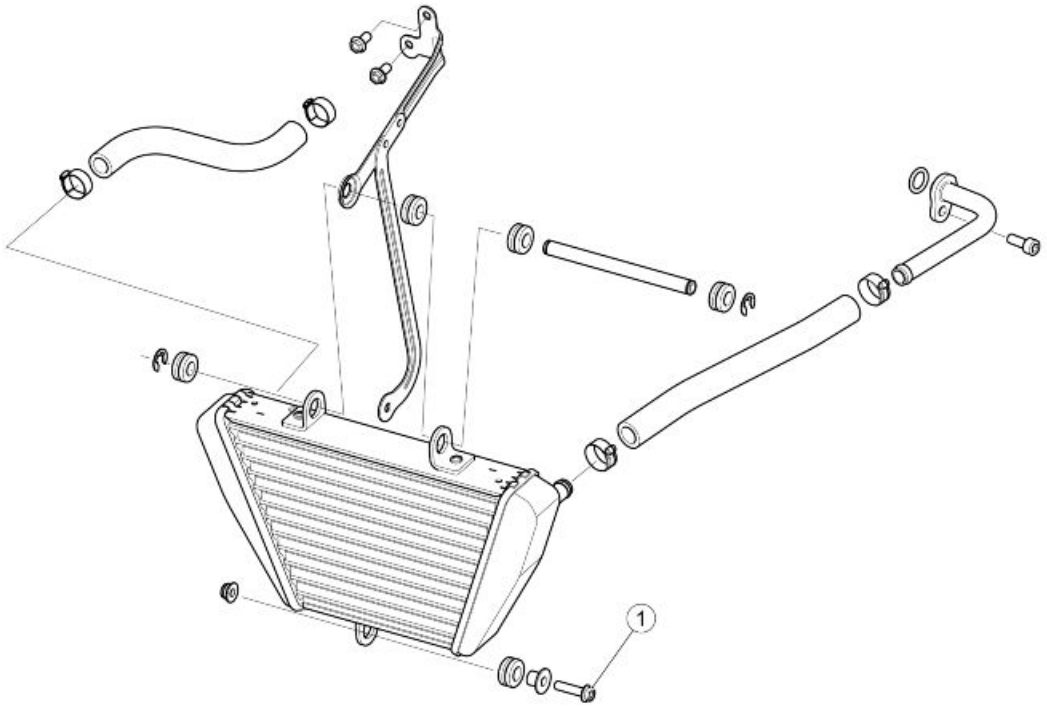
Chassis

Front side



COOLING

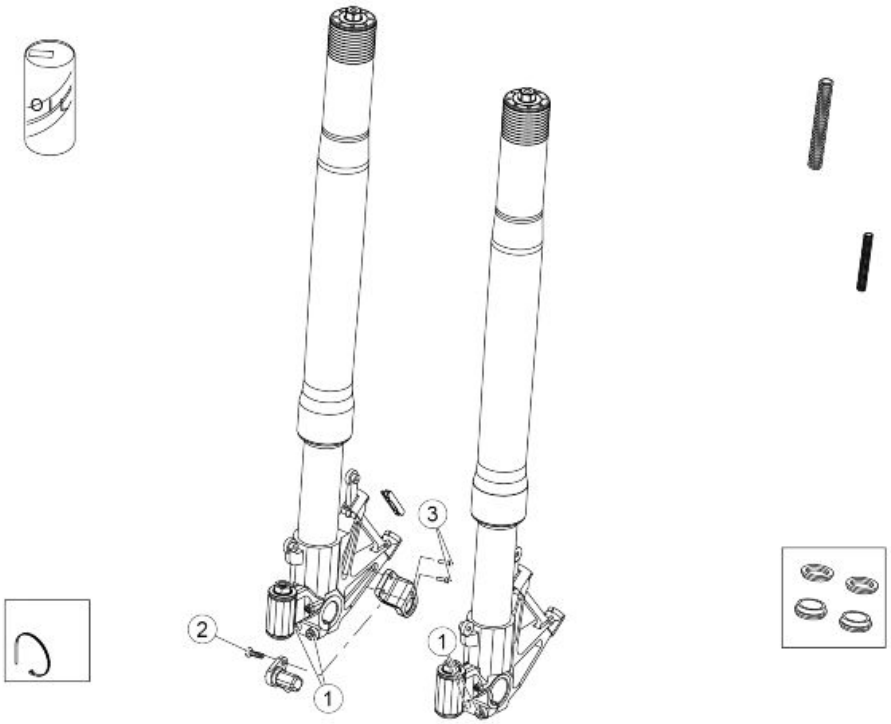
pos.	Description	Type	Quantity	Torque	Notes
1	Flanged hex. head screws for fastening the water radiator support bracket to the frame	M6x20	2	10 Nm (7.38 lb ft)	-
2	Flanged hex. head screws for fastening the water radiator to the support bracket	M6x20	2	7 Nm (5.16 lb ft)	-
3	Screws for fastening the water by-pass pipe tube gland	M5	1	6 Nm (4.43 lb ft)	-
4	Screws fastening electric fan to water radiator	M4	6	2 Nm (1.48 lb ft)	-
5	Expansion tank support fixing screw	M6	1	5 Nm (3.69 lb ft)	-



OIL RADIATOR

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fastening oil radiator to mounting bracket	M6	1	7 Nm (5.16 lb ft)	-

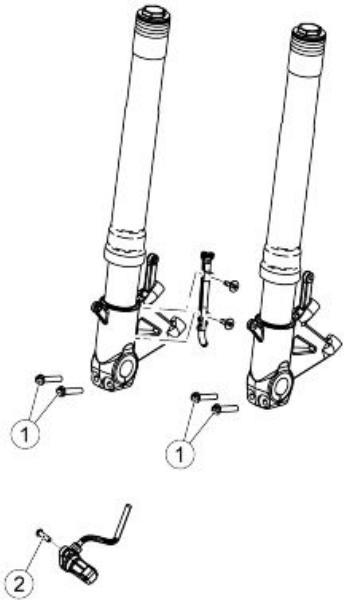
(OHLINS FORKS)

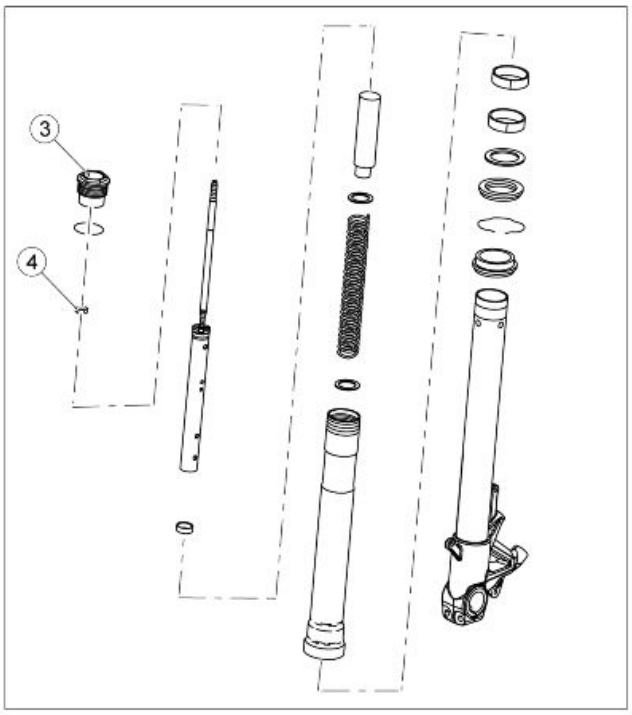


FRONT FORK - OHLINS

pos.	Description	Type	Quantity	Torque	Notes
1	Fork feet hub fastening screws (Ohlins)	M6	2 + 2	12 Nm (8.85 lb ft)	-
2	Speed sensor fastening screw	M5	1	6 Nm (4.43 lb ft)	-
3	Speed sensor bracket screws	M5	2	8 Nm (5.90 lb ft)	-

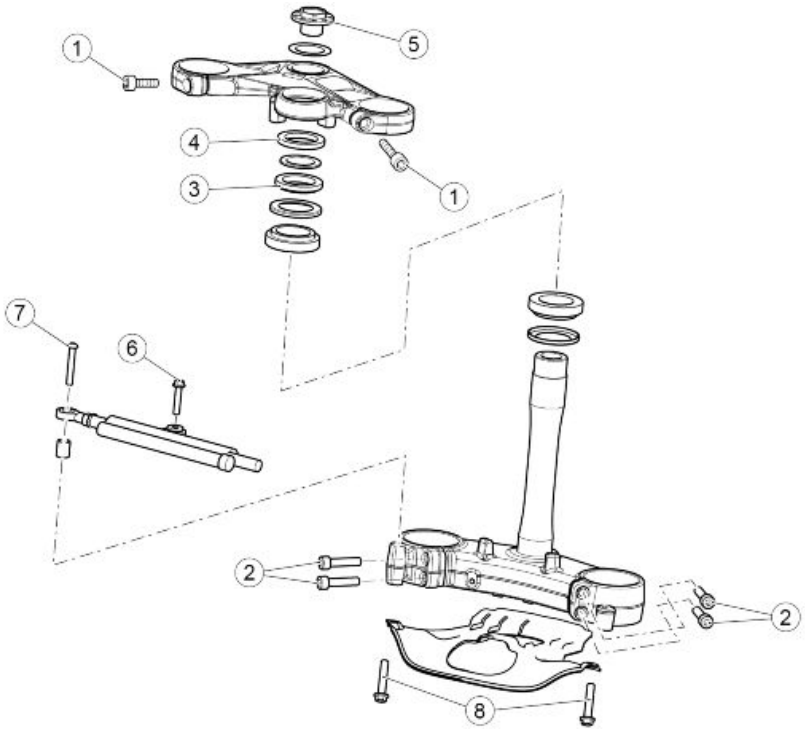
(SACHS FORKS)





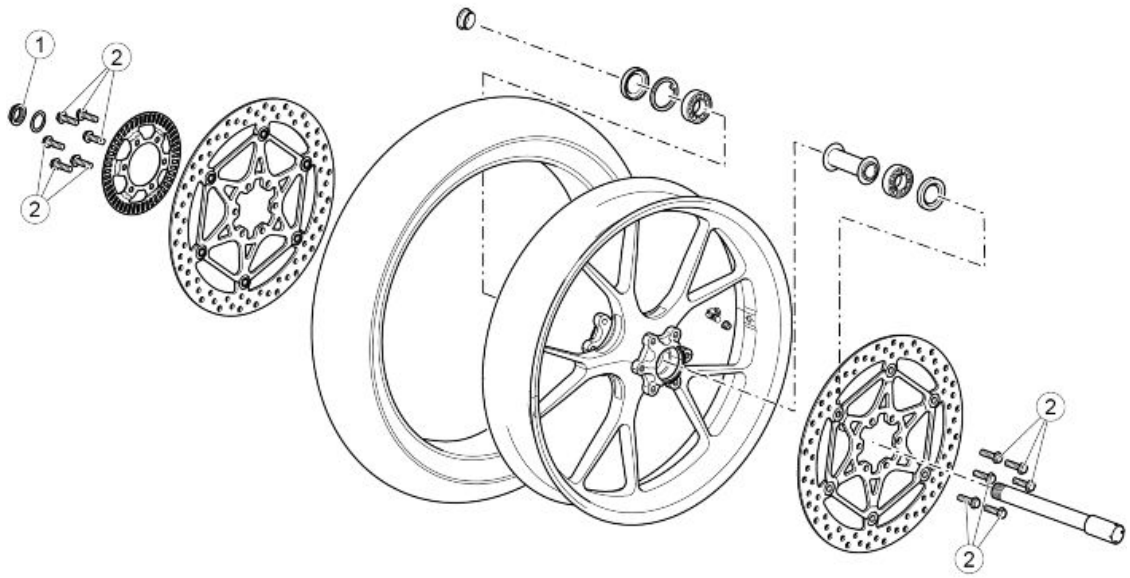
FRONT FORKS - SACHS

Pos.	Description	Type	Quantity	Torque	Notes
1	Calliper bracket fixing screws (Sachs)	M6	4	12 Nm (8.85 lb ft)	-
2	Speed sensor fastening screw	M5	1	6 Nm (4.43 lb ft)	-
3	Upper cap	-	2	20 Nm (14.75 lb ft)	-
4	Upper cap locking nut	-	2	20 Nm (14.75 lb ft)	-



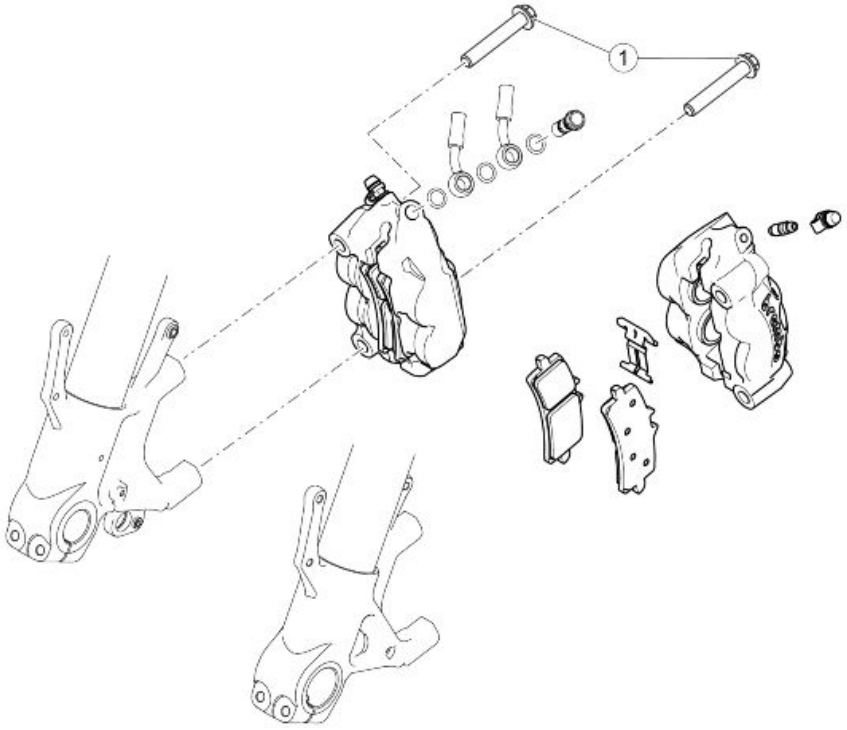
STEERING

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fastening upper yoke to stanchions	M8	2	25 Nm (18.44 lb ft)	-
2	Screws fastening lower yoke to stanchions	M8	4	25 Nm (18.44 lb ft)	-
3	Headstock ring nut - pre-tightening	M35x1	1	70 Nm (51.63 lb ft)	Unscrew after pre-tightening
3	Headstock ring nut - tightening	M35x1	1	60 +/- 9 Nm (44.25 +/- 6.64 lb ft)	-
4	Headstock counter-lock ring	M35x1	1	Manual +35° or -10°	Bend the tabs into the notches in the lock ring
5	Upper yoke fixing cap	M29x1	1	100 Nm (73.76 lb ft)	-
6	Screw fastening shock absorber to frame	M6	1	10 Nm (7.38 lb ft)	Loctite 243
7	Screw fastening shock absorber to lower yoke	M6	1	10 Nm (7.38 lb ft)	Loctite 243
8	Lower cover fixing screws	M6	2	8 Nm (5.90 lb ft)	-



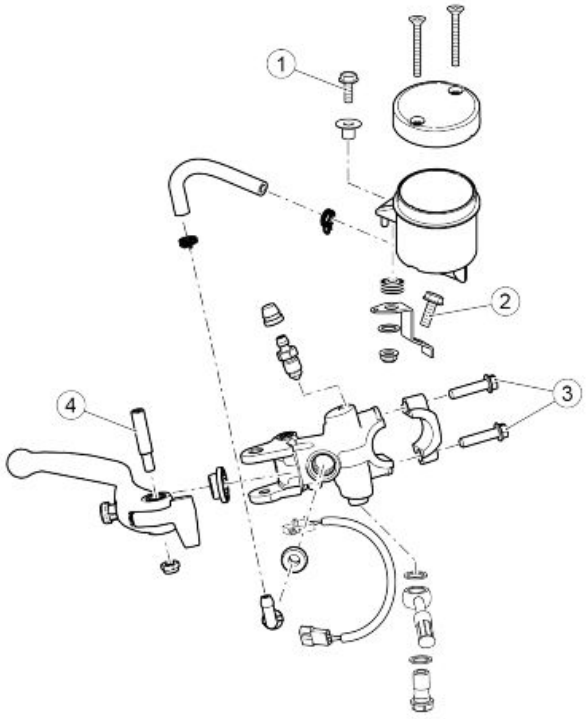
FRONT WHEEL

Pos.	Description	Type	Quantity	Torque	Notes
1	Front wheel pin nut	M25x1.5	1	80 Nm (59.00 lb ft)	-
2	Front brake disk fastening screws	M8	6 + 6	30 Nm (22.13 lb ft)	Loct. 243



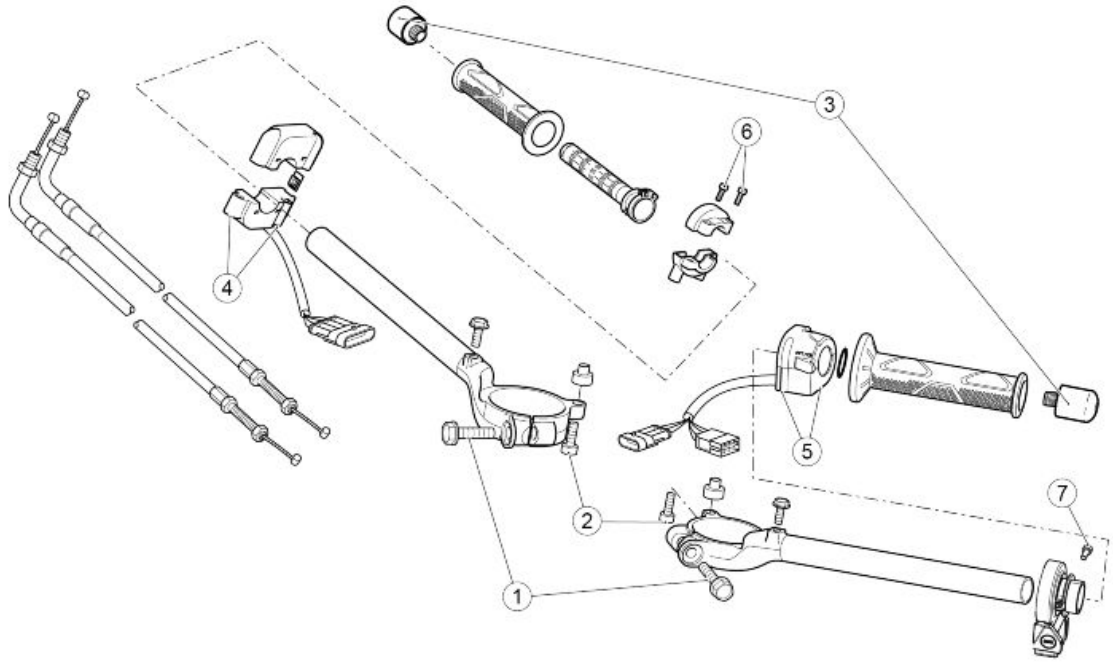
FRONT BRAKE CALLIPER

Pos.	Description	Type	Quantity	Torque	Notes
1	Front brake calliper fastening screws	M10x1.25	2 + 2	50 Nm (36.88 lb ft)	-



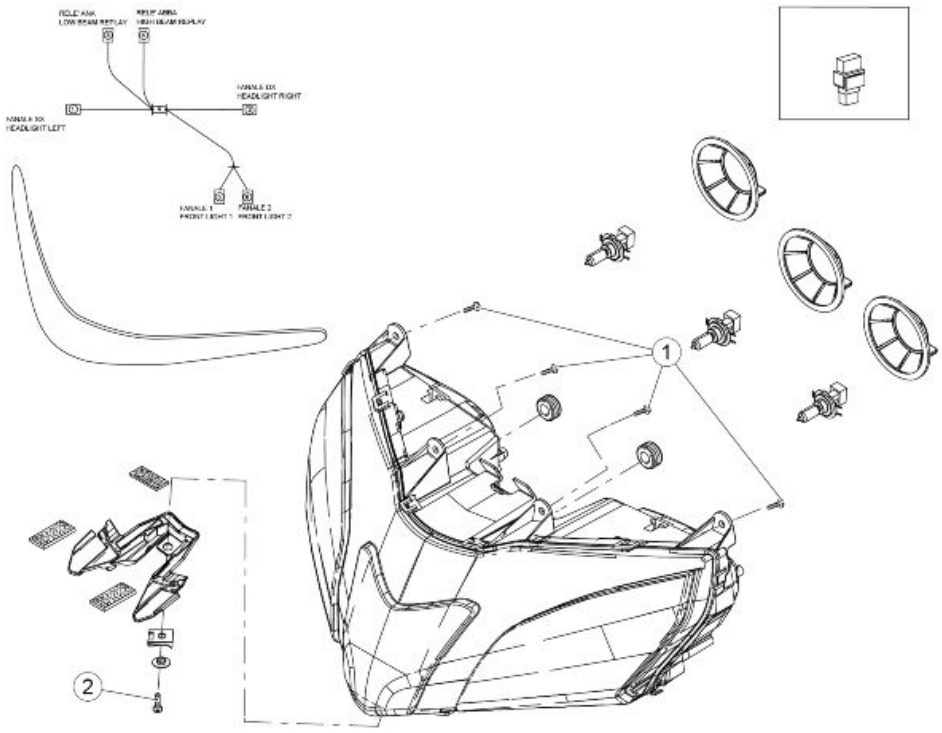
FRONT BRAKE PUMP

pos.	Description	Type	Quantity	Torque	Notes
1	Screw fastening front brake fluid reservoir to bracket	M6	1	7 Nm (5.16 lb ft)	-
2	Screw fastening brake fluid reservoir mounting bracket to handlebar	M6	1	7 Nm (5.16 lb ft)	-
3	Front brake pump U bolt clamp	M6	2	10 Nm (7.38 lb ft)	-
4	Front brake lever pin fixing screw	M6	1	10 Nm (7.38 lb ft)	-
-	Screw fastening brake pipe grommet to the lower yoke	M5	1	8 Nm (5.90 lb ft)	-



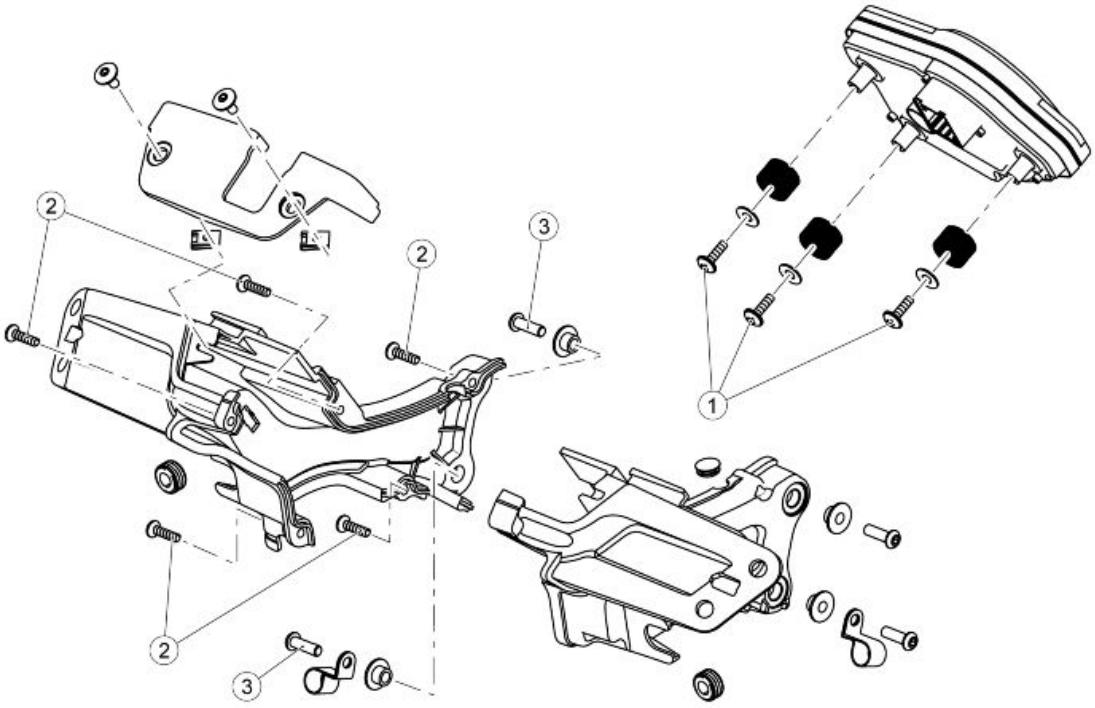
HANDLEBAR AND CONTROLS

pos.	Description	Type	Quantity	Torque	Notes
1	Screws for fastening the handlebar collar to the forks sleeves	M8	1 + 1	25 Nm (18.44 lb ft)	-
2	Handlebar safety screw	M6	1+1	10 Nm (7.38 lb ft)	-
3	Anti-vibration counterweight fastener	M18x1.5	1+1	20 Nm (14.75 lb ft)	-
4	Right hand light switch	M4	2	1.5 Nm (1.11 lb ft)	-
5	Left light switch	M5	2	1.5 Nm (1.11 lb ft)	-
6	Throttle control fixing screws	M5	2	2 Nm (1.48 lb ft)	-
7	Traction control unit fixing screw	M4	1	2.5 Nm (1.84 lb ft)	-



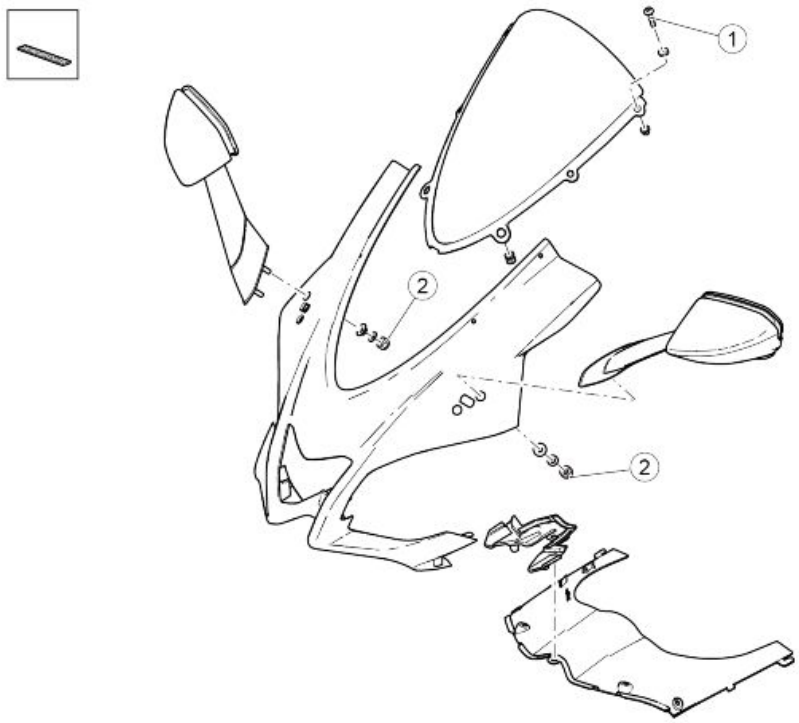
HEADLAMP

Pos.	Description	Type	Quantity	Torque	Notes
1	Screw for fastening the front headlight to the front mudguard	SWP 4.9	4	2 Nm (1.48 lb ft)	-
2	Headlamp fastener screw	M5 x 12	1	2 Nm (1.48 lb ft)	-



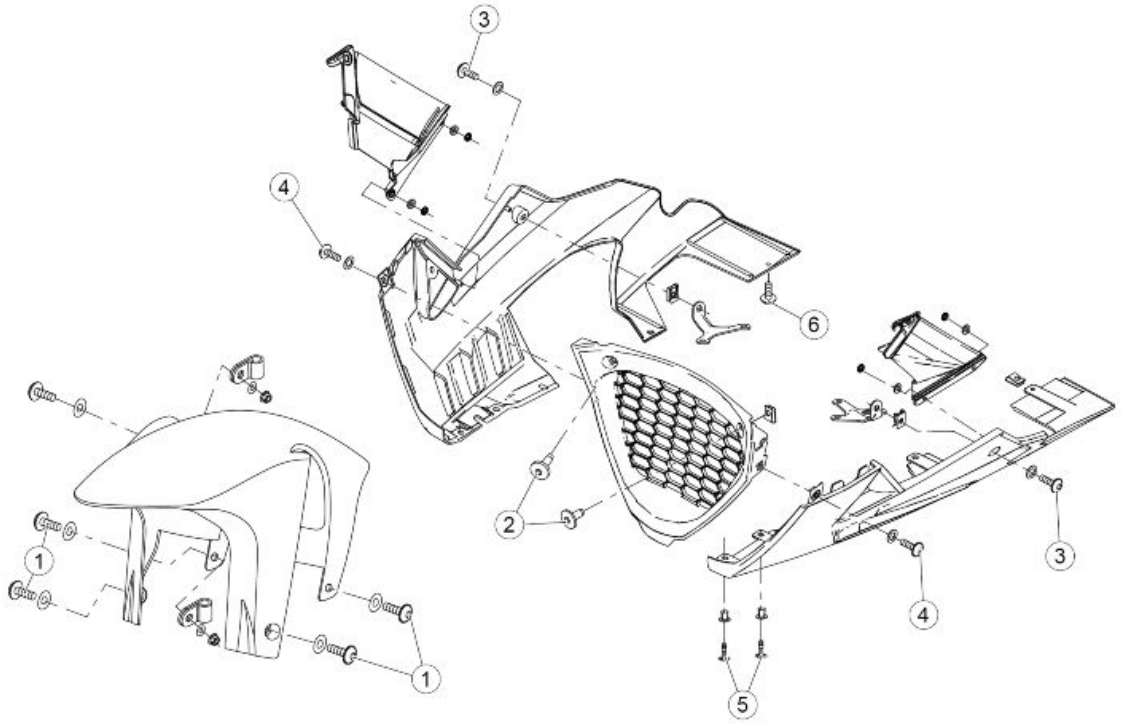
INSTRUMENT PANEL

Pos.	Description	Type	Quantity	Torque	Notes
1	Screws used to fasten the rubber blocks to the instrument panel	SWP 4.9	3	3 Nm (2.21 lb ft)	-
2	Instrument panel support shell fastening screws	SWP 4.9	5	2 Nm (1.48 lb ft)	-
3	Screws used to fasten the instrument panel support to the chassis	M6	4	8 Nm (5.90 lb ft)	-



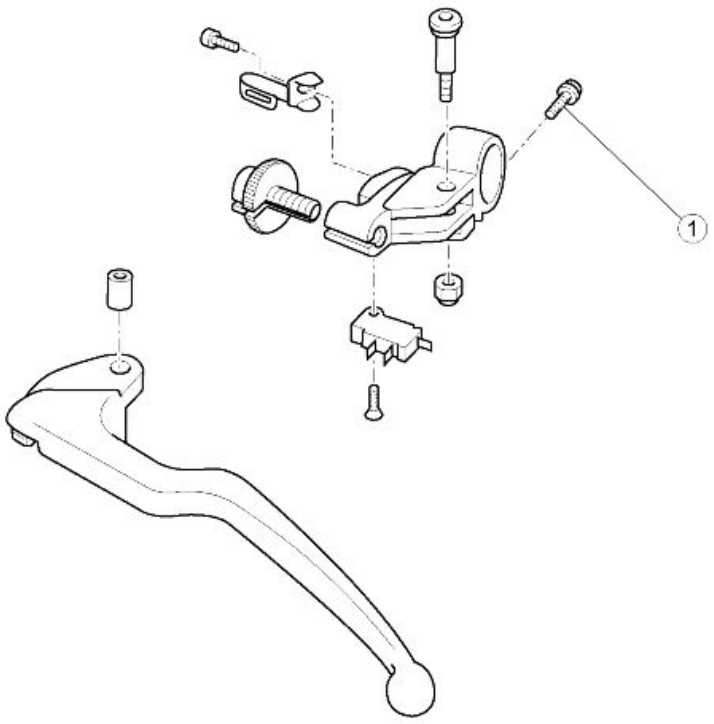
TOP FAIRING

pos.	Description	Type	Quantity	Torque	Notes
1	Windshield fixing screws	M4	4	0.5 Nm (0.37 lb ft)	-
2	Rear-view mirror fixing nuts	M6	2 + 2	10 Nm (7.38 lb ft)	-



FRONT MUDGUARD

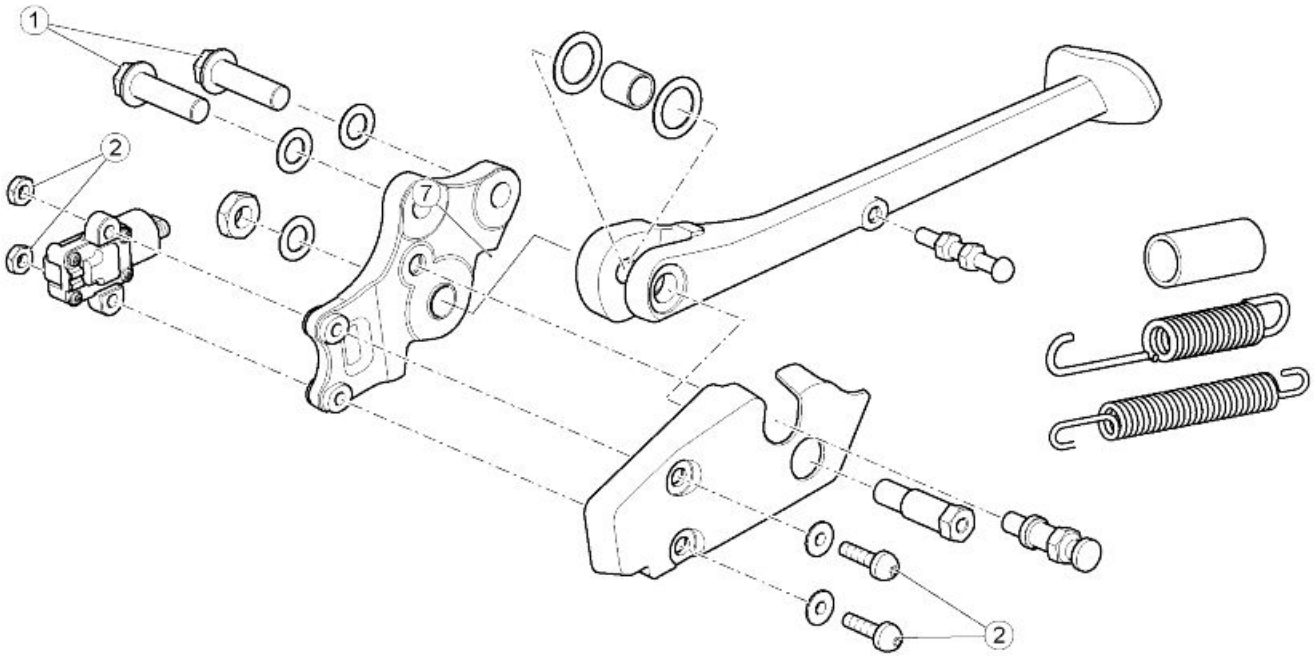
pos.	Description	Type	Quantity	Torque	Notes
1	Front mudguard fixing screws	M5	4	3 Nm (2.21 lb ft)	-
2	Lug fixing screws	M5	2	4 Nm (2.95 lb ft)	-
3	Screws fixing the side fairings to the side spacers	M5	2	1.5 Nm (1.11 lb ft)	-
4	Screws fastening the lower fairing to the lug	M5	2	2 Nm (1.48 lb ft)	-
5	Lower fairing lower fastening screws	M5	2	2 Nm (1.48 lb ft)	-
6	Centre screws fastening lower fairing	M6	2	10 Nm (7.38 lb ft)	-



CLUTCH LEVER

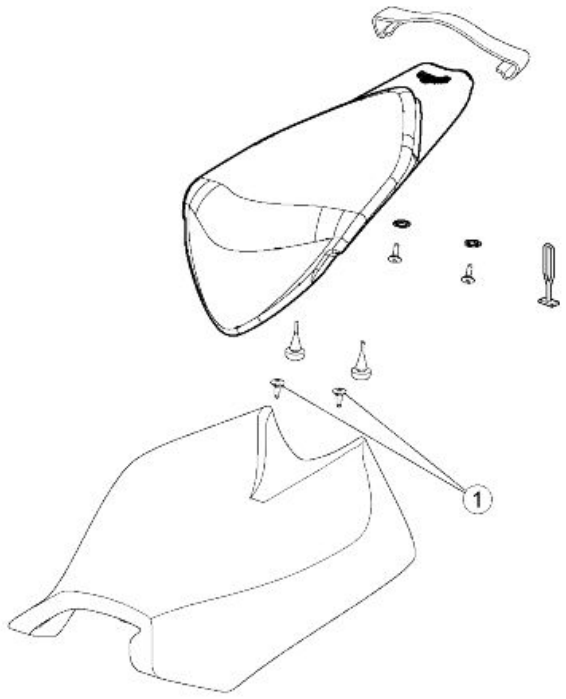
Pos.	Description	Type	Quantity	Torque	Notes
1	Clutch lever collar fastening screws	M6	1	10 Nm (7.38 lb ft)	-

Central part



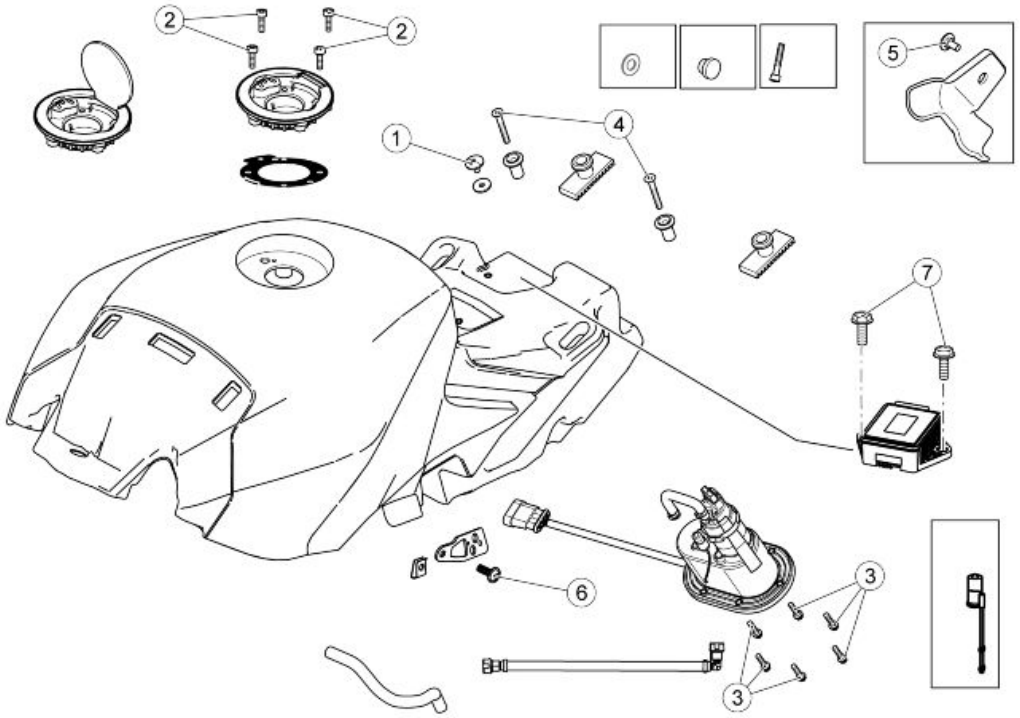
SIDE STAND

pos.	Description	Type	Quantity	Torque	Notes
1	Screws for fastening the stand to the frame	M10	2	45 Nm (33.19 lb ft)	Loct. 243
2	Linear switch retaining screws and nuts	M5	2	4 Nm (2.95 lb ft)	-
-	Rear stand bushing retaining screw	M6	2	7 Nm (5.16 lb ft)	-



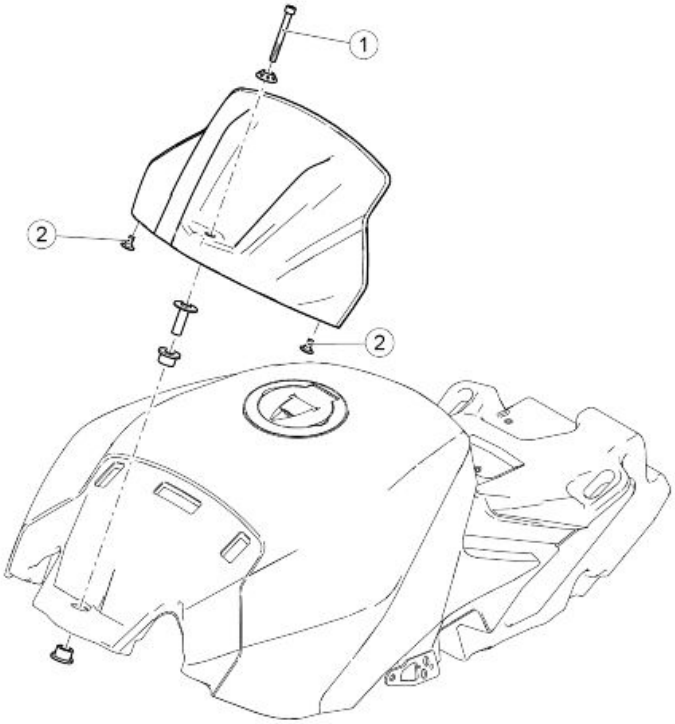
SADDLE

pos.	Description	Type	Quantity	Torque	Notes
1	Rider's saddle retaining screw	M5	2	6 Nm (4.43 lb ft)	-
-	Special screw saddle fastening	M6	1	4 Nm (2.95 lb ft)	-



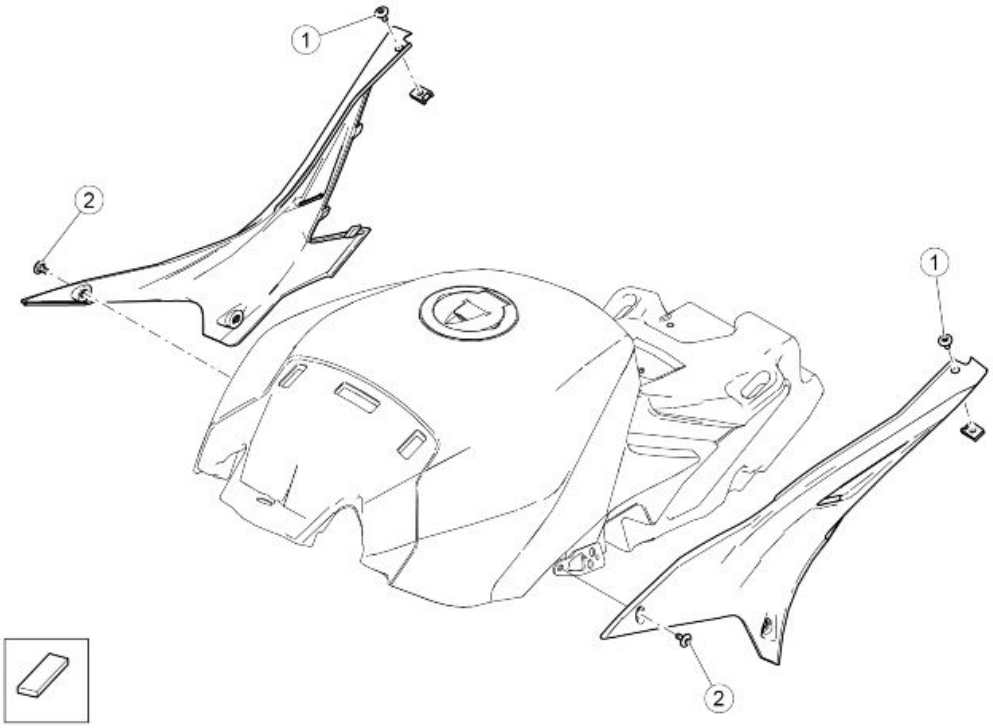
FUEL TANK

pos.	Description	Type	Quantity	Torque	Notes
1	Special screw for fastening the rider's saddle to the fuel tank	M6	1	4 Nm (2.95 lb ft)	-
2	Filler to tank retaining screws	M5	4	4 Nm (2.95 lb ft)	-
3	Screws fastening fuel pump flange to fuel tank	M5	8	5 Nm (3.69 lb ft)	-
4	Screws fastening the rear fuel tank to the rear frame	M6	2	7 Nm (5.16 lb ft)	-
5	Plastic petrol hose support retaining screws	M5	1	2.5 Nm (1.84 lb ft)	-
6	LH fairing support bracket retaining screws	M5	1	3 Nm (2.21 lb ft)	-
7	Fastening screws tilting sensor	M6x16 stainless steel	2	6 Nm (4.43 lb ft)	-
-	Central fuel tank cover retaining screw	M4	1	0,5 Nm (0.37 lb ft)	-
-	Fuel tank breather couplings	M7	2	3 Nm (2.21 lb ft)	-
-	Fuel return coupling	M6	1	6 Nm (4.43 lb ft)	Loctite 243
-	Pump support to flange fastening	M5	3	4 Nm (2.95 lb ft)	-
-	Lug to flange fastening	M5	2	5 Nm (3.69 lb ft)	-
-	Petrol return closure	M6	1	10 Nm (7.38 lb ft)	Loctite 243
-	Petrol delivery pipe	M12x1.5	1	22 Nm (16.23 lb ft)	-
-	Petrol level sensor on pump support	SWP 2.9x12	2	1 Nm (0.74 lb ft)	-
-	Petrol pump on flange wiring	M6	2	10 Nm (7.34 lb ft)	-



FUEL TANK COVER

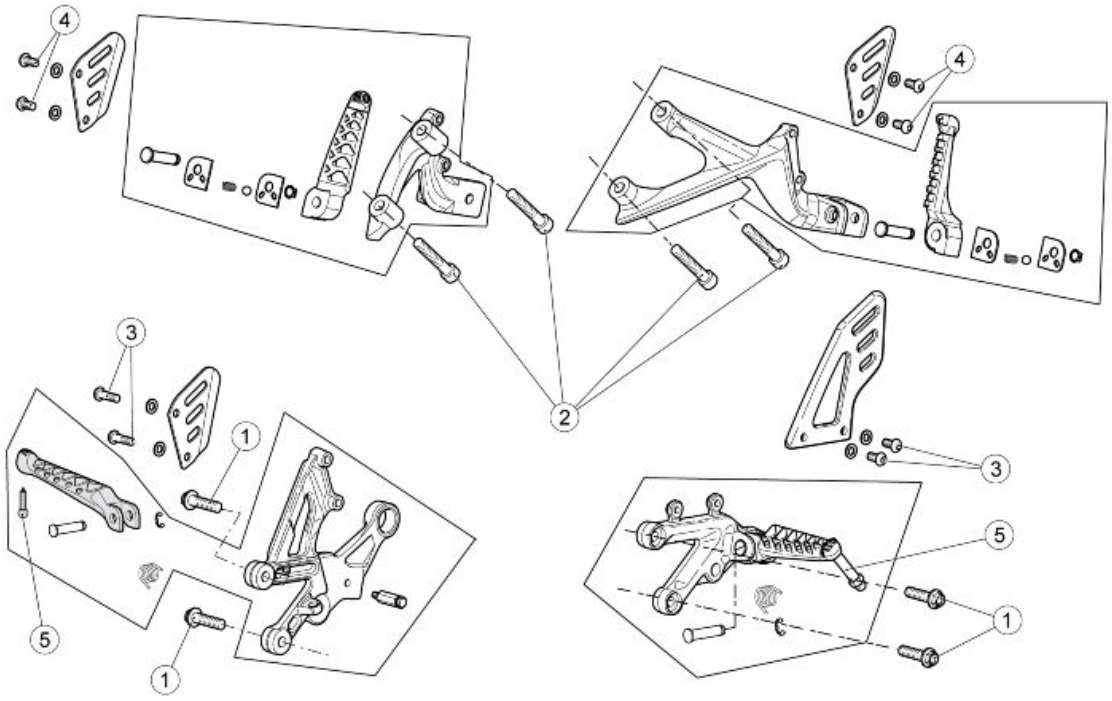
Pos.	Description	Type	Quantity	Torque	Notes
1	Screws fastening front tank to frame	M6	1	8 Nm (5.90 lb ft)	-
2	Screws fastening tank structural support to tank	M6	4	3 Nm (2.21 lb ft)	-



CENTRAL BODYWORK

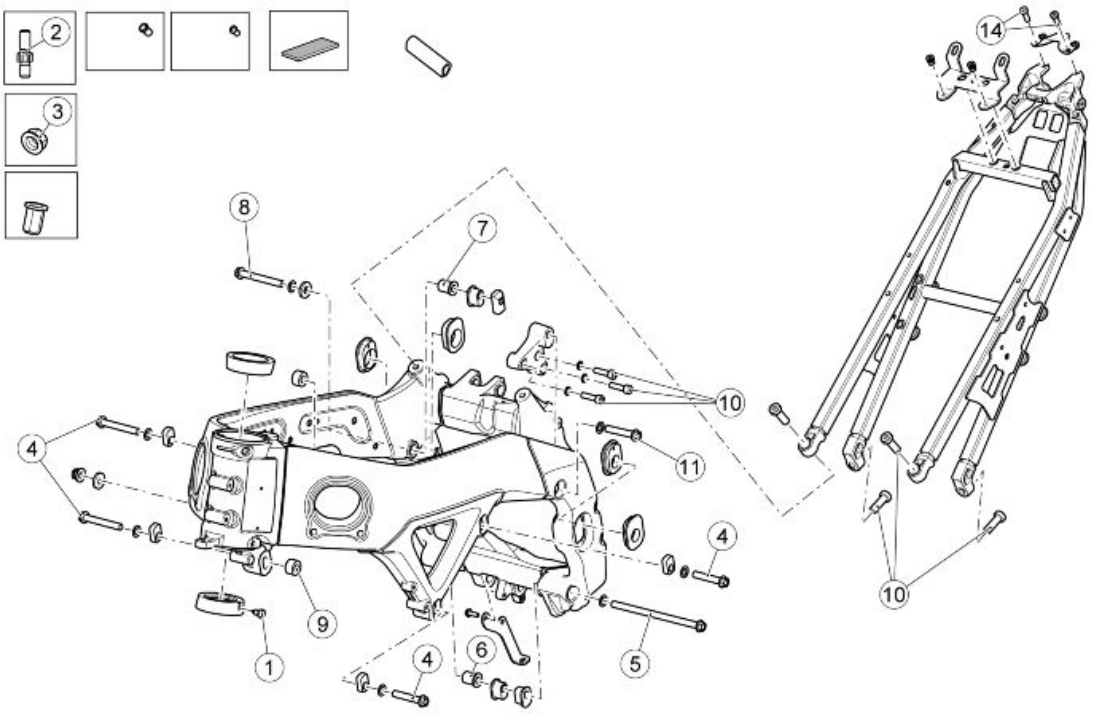
Pos.	Description	Type	Quantity	Torque	Notes
1	Screws fastening fairing to tail fairing	M5	2	1 Nm (0.74 lb ft)	-

Pos.	Description	Type	Quantity	Torque	Notes
2	Screws fastening fairing to tank	M5	2 + 2	2 Nm (1.48 lb ft)	-



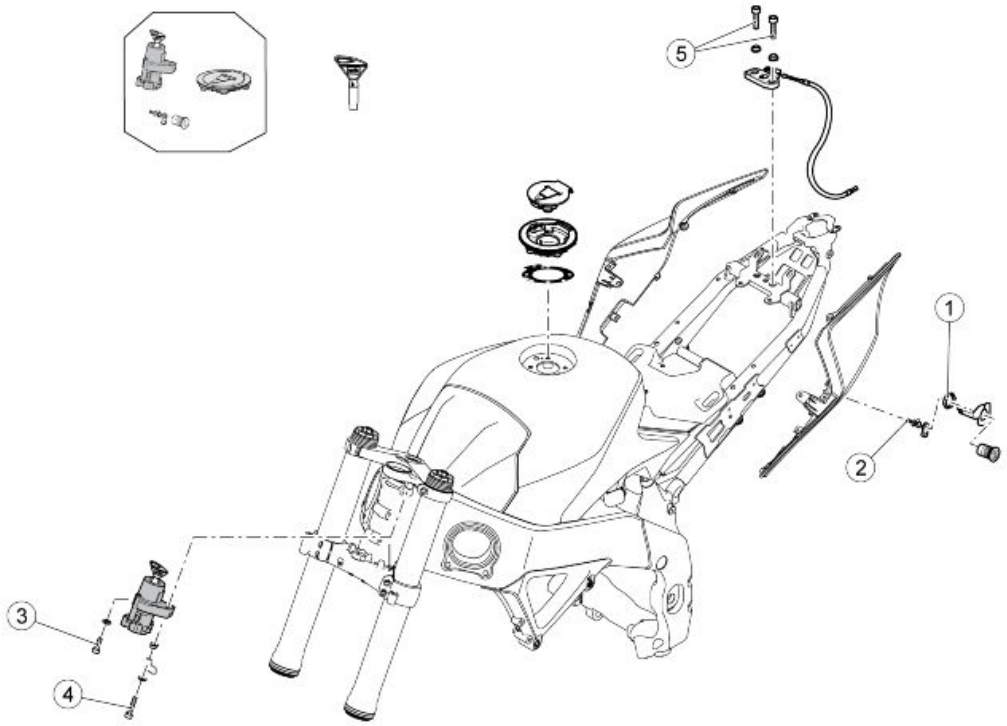
FOOTRESTS

Pos.	Description	Type	Quantity	Torque	Notes
1	Screws for fastening the rider's footrests to the frame	M8	2 + 2	25 Nm (18.44 lb ft)	Loctite 243
2	Screws for fastening the passenger's footrests to the frame	M8	2 + 2	18 Nm (13.28 lb ft)	Loctite 243 - For use in countries where it is mandatory to fit the passenger's footrests or for the two-seater configuration
3	Rider's heel guard retaining screws	M6	2 + 2	8 Nm (5.90 lb ft)	-
4	Passenger's heel guard retaining screws	M6	2 + 2	8 Nm (5.90 lb ft)	-
5	Anti-creep pin	M6	1	8 Nm (5.90 lb ft)	-



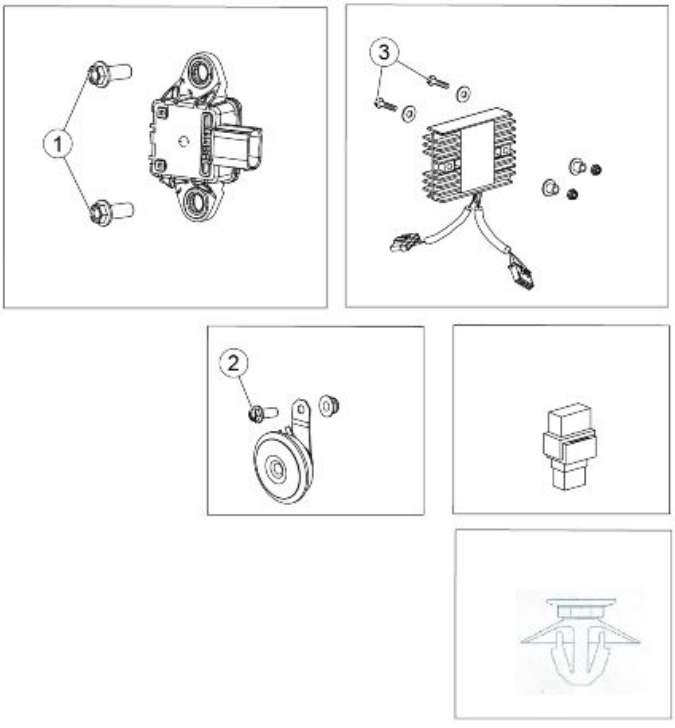
CHASSIS

pos.	Description	Type	Quantity	Torque	Notes
1	Headstock locator dowel	M8x1	2	10 Nm (7.37 lb ft)	-
2	Threaded intake duct fastener pins	M6	2 + 2	4 Nm (2.95 lb ft)	Loct. 243
3	Intake duct fixing nuts	M6	2 + 2	Manual	-
4	Front couplings	M10	2 + 2	50 Nm (36.88 lb ft)	-
5	Lower rear coupling	M10	1	50 Nm (36.88 lb ft)	-
6	RH lower rear regulator bushing	M18x1.5	1	12 Nm (8.85 lb ft)	-
7	RH upper rear regulator bushing	M18x1.5	1	12 Nm (8.85 lb ft)	-
8	RH upper rear coupling	M10	1	50 Nm (36.88 lb ft)	-
9	Right fairing spacer	M6	1	10 Nm (7.37 lb ft)	Loct. 243
10	Upper rear left hand engine mount fastener screws	M8	3	25 Nm (18.44 lb ft)	-
11	Upper rear mount	M10	1	50 Nm (36.88 lb ft)	-
12	Saddle mounting fixing screws	M10	4	50 Nm (36.88 lb ft)	-
13	Passenger saddle and saddle cover catch plate fixing screws	M6	2	8 Nm (5.9 lb ft)	-
14	Taillight mounting bracket fixing screws	M5	2	4 Nm (2.95 lb ft)	-
-	Screw fastening the ground cable to the left side chassis	M6	1	6 Nm (4.42 lb ft)	-
-	Screws fastening oil radiator mounting bracket to engine	M6	2	8 Nm (5.9 lb ft)	-



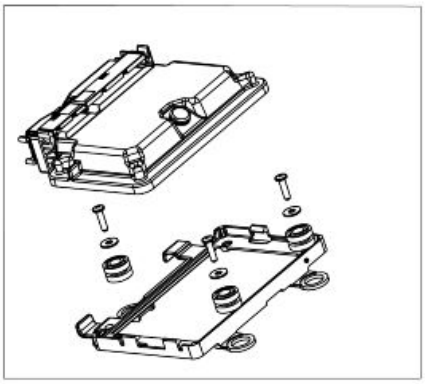
LOCKS

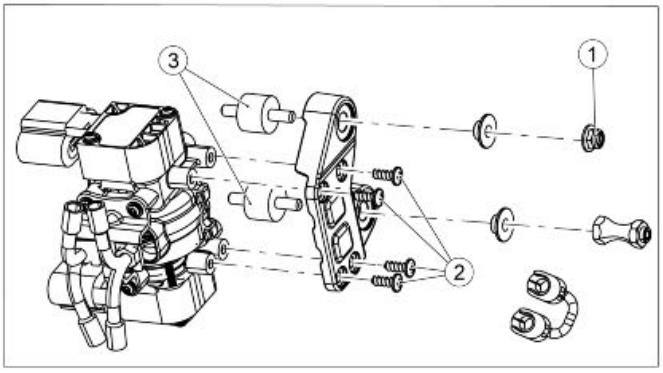
pos.	Description	Type	Quantity	Torque	Notes
1	Nut fastening saddle lock to tail fairing	M22x1.5	1	5 Nm (3.69 lb ft)	-
2	Lock lever self-tapping screw	M4	1	2 Nm (1.48 lb ft)	-
3	Shear head screw (to the left of the ignition lock)	M8	1	Manual	Tighten until the head shears off
4	Right hand ignition lock screw	M8	1	20 Nm (14.75 lb ft)	-
5	Passenger saddle fixing screws	M6	2	8 Nm (5.90 lb ft)	-

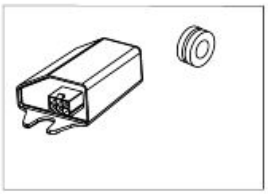


FRONT ELECTRICAL SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Fall sensor mounting fixing screws	M6x16	2	8 Nm (5.90 lb ft)	-
2	Horn fixing screw	M8	1	15 Nm (11.06 lb ft)	-
3	Screw fastening the voltage regulator to the inner fairing	M6	2	6 Nm (4.43 lb ft)	-

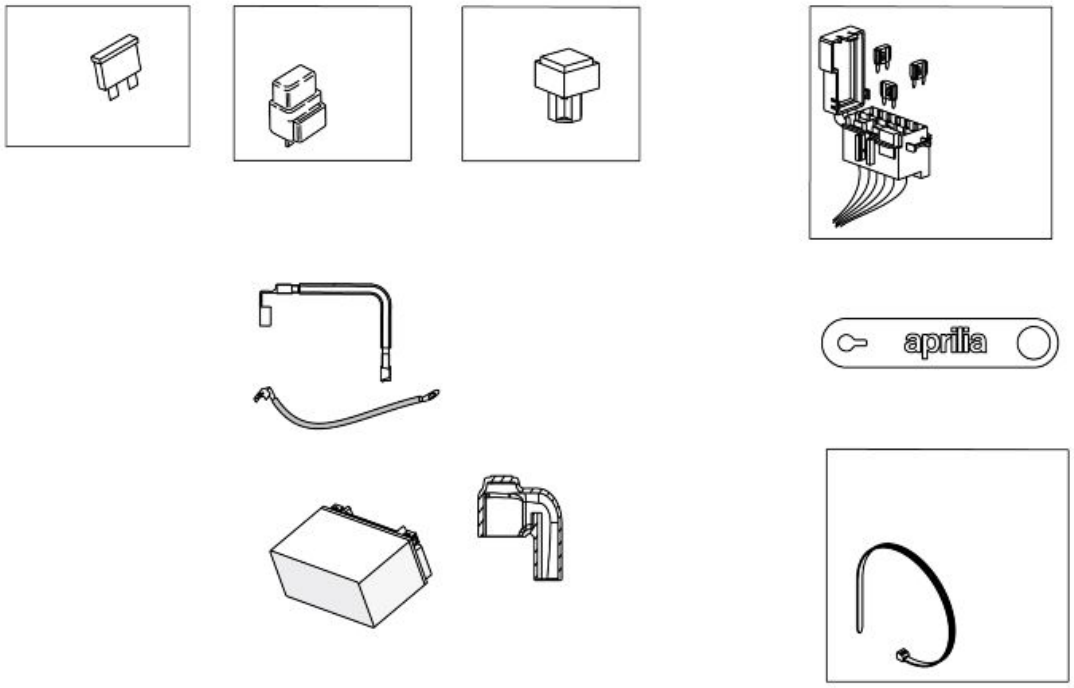






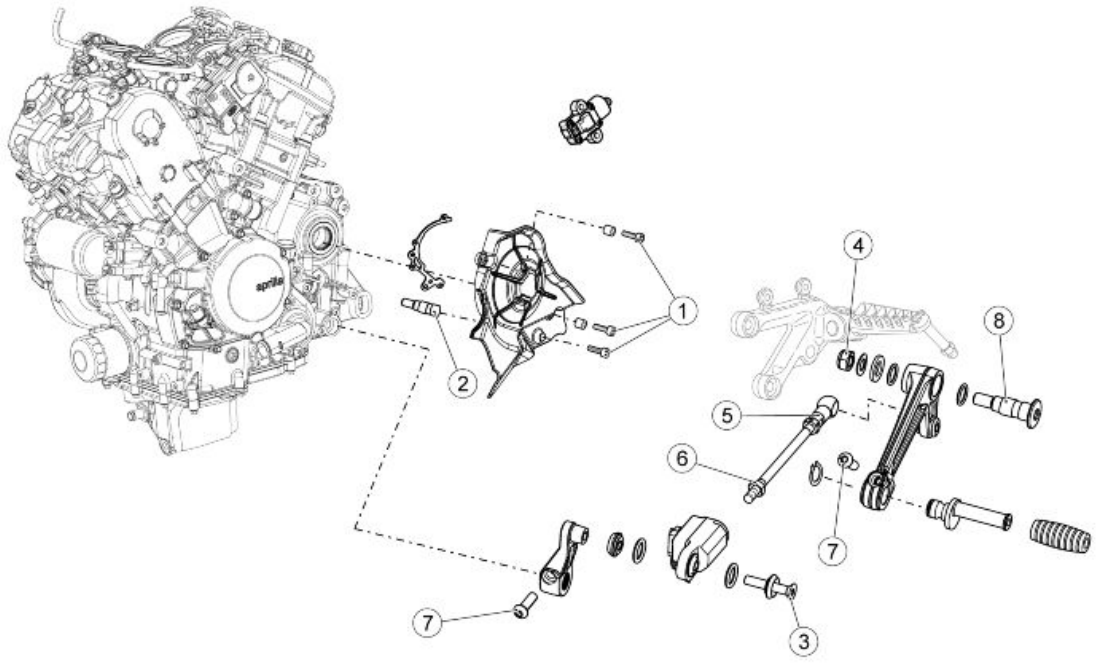
CENTRAL ELECTRICAL SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Upper Silentblock nut, demand sensor mounting bracket	M6	1	5 Nm (3.69 lb ft)	-
2	Demand sensor fixing screw to mounting plate	SWP 4.9	4	1.5 Nm (1.11 lb ft)	-
3	Silent block support bracket demand sensor	M6	2	Manual	Loctite 243 (only to chassis)



ELECTRICAL SYSTEM REAR

pos.	Description	Type	Quantity	Torque	Notes
-	Screw fixing the ground lead to chassis	M6	1	6 Nm (4.43 lb ft)	-
-	Battery bracket fixing screw	M5	2	2 Nm (1.48 lb ft)	-



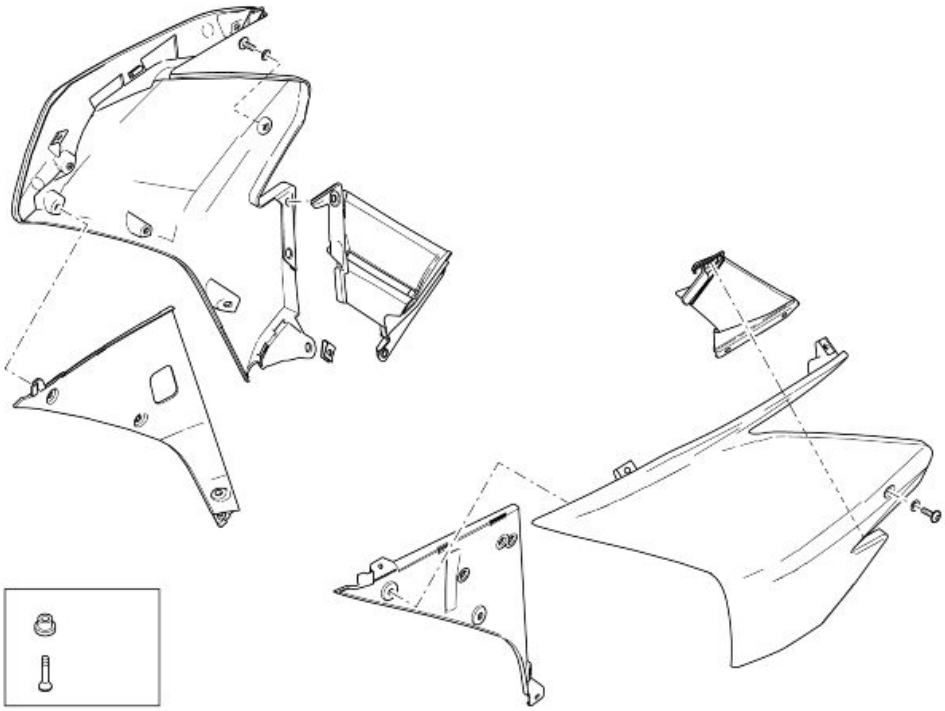
GEAR LEVER

pos.	Description	Type	Quantity	Torques	Notes
1	Pinion protector casing fixing screws	M6	3	8 Nm (5.90 lb ft)	-
2	Threaded stand-off	-	1	8 Nm (5.90 lb ft)	-
3	Countersunk, flat head, hex. socket screws	M6x35	1	10 Nm (7.38 lb ft)	Loct.
4	Self-locking nut	M8	1	25 Nm (18.44 lb ft)	-
5	Fastening between gear change tie-rod joint and gear change lever	-	1	8 Nm (5.90 lb ft)	Loct.
6	Nut used to fasten the gearbox tie-rod to the quick shift device	-	1	8 Nm (5.90 lb ft)	-
7	Gearbox lever fixing screws	M6	2	8 Nm (5.90 lb ft)	-
8	Pin for fastening the gear change lever to the footrest support	M8	1	25 Nm (18.44 lb ft)	-

- Apply water-repellent grease between the O-rings and the Quick Shift uniball

NOTE

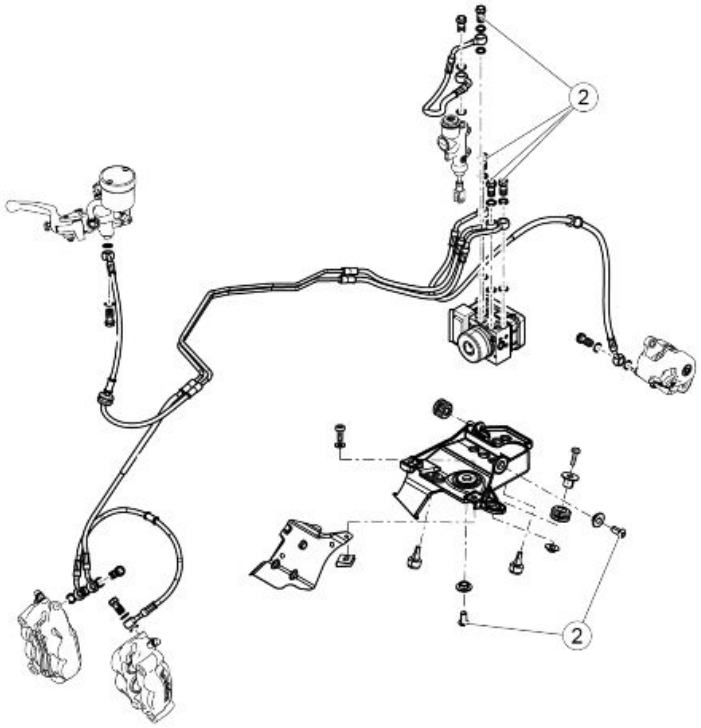
ONCE ASSEMBLE, THE DISTANCE BETWEEN THE UNIBALL AND THE JOINT MUST BE APPROXIMATELY 180mm (7.09in).



FAIRING

pos.	Description	Type	Quantity	Torque	Notes
-	Lower fairing central bracket fastening screws	M6	2	10 Nm (7.38 lb ft)	-
-	RH lower fairing support bracket	M6	2	12 Nm (8.85 lb ft)	-
-	LH lower fairing support bracket	M6	2	12 Nm (8.85 lb ft)	-
-	Screws for fastening the side fairings to the lateral spacers	M5	2	1.5 Nm (1.11 lb ft)	-
-	Screws for securing the upper fairing closure to the intake duct	M5	2	1.5 Nm (1.11 lb ft)	-
-	Screws for securing the upper fairing closure to the front mudguard	M5	2	1.5 Nm (1.11 lb ft)	-
-	Screws for securing the upper fairing closure to the intake duct	self-tapping	2	1 Nm (0.74 lb ft)	-
-	Screws for securing the upper fairing closure to the front headlight	self-tapping	2	1 Nm (0.74 lb ft)	-

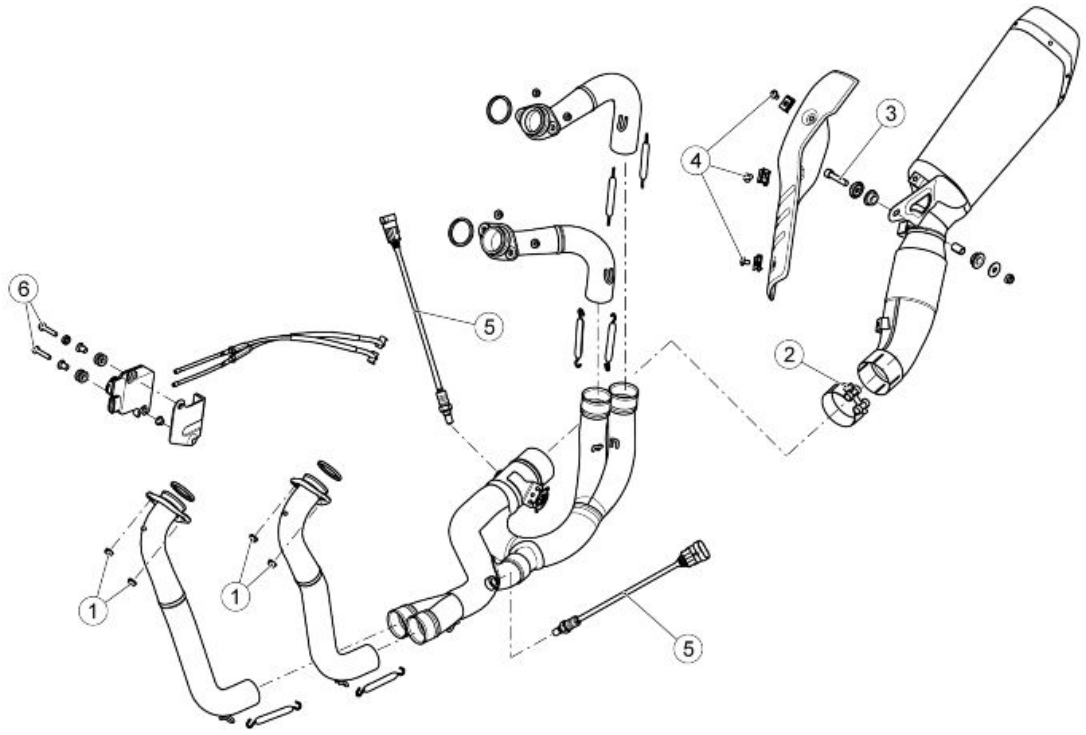
pos.	Description	Type	Quantity	Torque	Notes
-	Screws for fastening the lower fairing to the bracket	M5	2 + 2	1 Nm (0.74 lb ft)	-
-	Screws for fastening the lower fairing to the stanchion	M5	2	2 Nm (1.47 lb ft)	-
-	Lower fairing fastening screws	M5	2	2 Nm (1.47 lb ft)	-
-	Lower forks closure fastening screws	M6	2	8 Nm (5.90 lb ft)	-
-	Screws for fastening the lower frontal closure to the intake ducts	SWP 3,9	2	1 Nm (0.74 lb ft)	-
-	Internal fastening screws between the fairing and the lower frontal closure	M4	2	0,5 Nm (0.37 lb ft)	-
-	Internal fastening screws between the airing and the stanchion	M5	2	2 Nm (1.48 lb ft)	-



ABS CONTROL UNIT

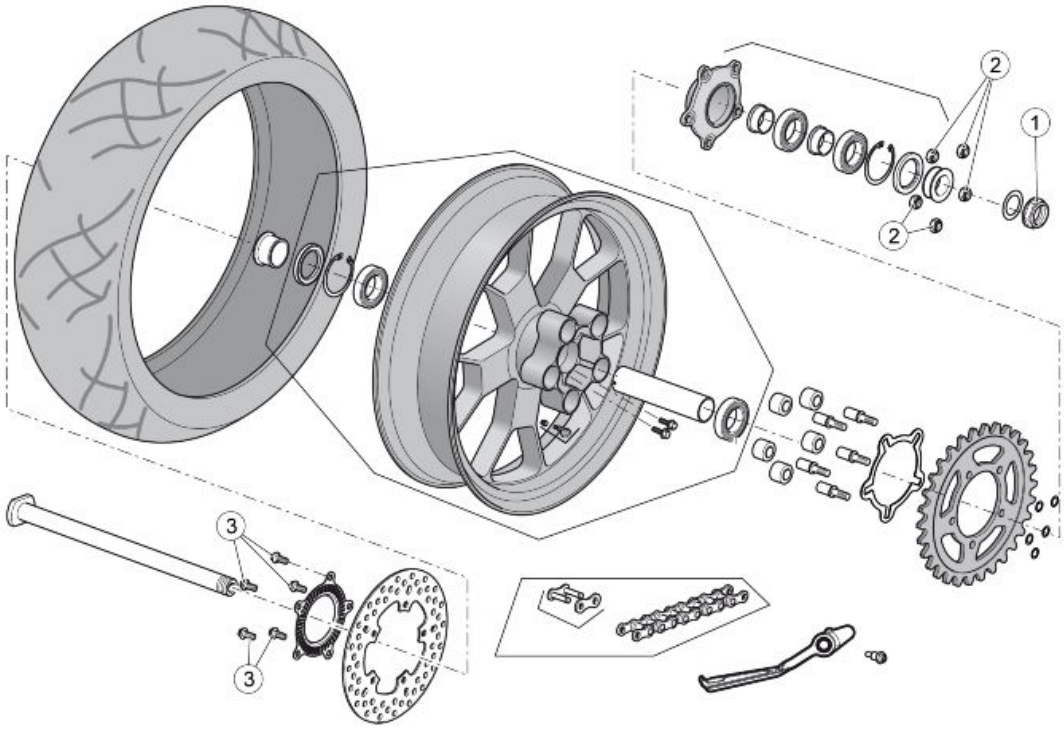
Pos.	Description	Type	Quantity	Torque	Notes
1	Oil tube screws	M10x1	4	23-26 Nm (16.96-19.18 lb ft)	-
2	Control unit support screws	M6	2	6.8+/-1 Nm (5.01 +/-0.74 lb ft)	-

Back side



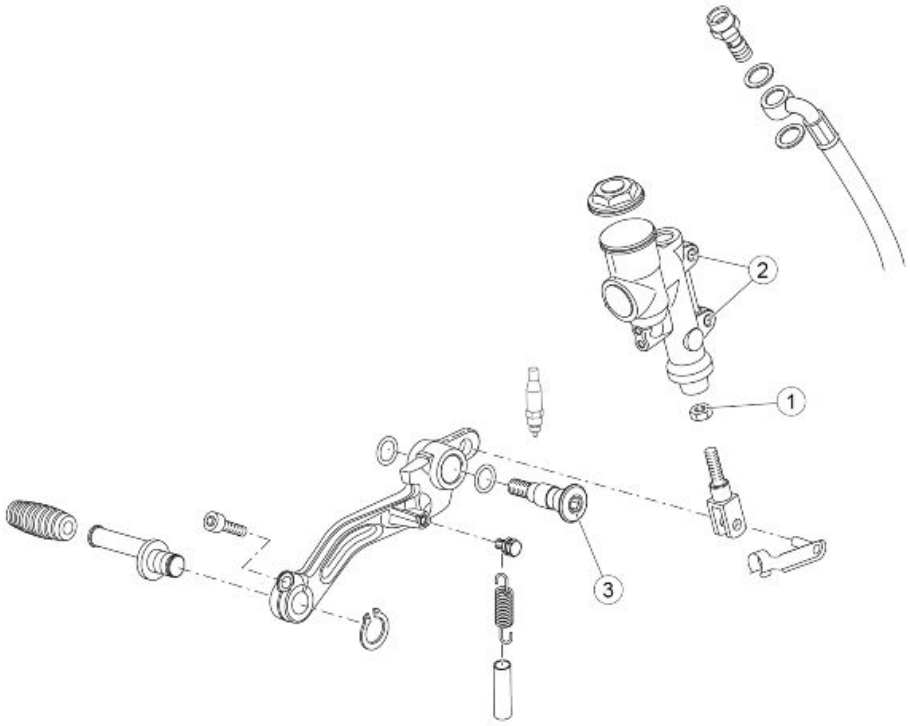
DISCHARGE

pos.	Description	Type	Quantity	Torque	Notes
1	Exhaust manifold flange fastening nuts	M7	8	13 Nm (9.59 lb ft)	-
2	Silencer clamp fixing screw - central manifold	M6	1	10 Nm (7.38 lb ft)	-
3	Screw used to secure the silencer to the RH footrest support	M8	1	25 Nm (18.44 lb ft)	-
4	Cosmetic silencer shield fixing screw	M5	3	5 Nm (3.69 lb ft)	-
5	Lambda probe fastener	M18x1.5	2	38 Nm (28.03 lb ft)	-
6	Exhaust valve actuator fixing screws	M6	2	10 Nm (7.38 lb ft)	-
-	Exhaust valve opening/closure fixing nuts	M6	2	5 Nm (3.69 lb ft)	-



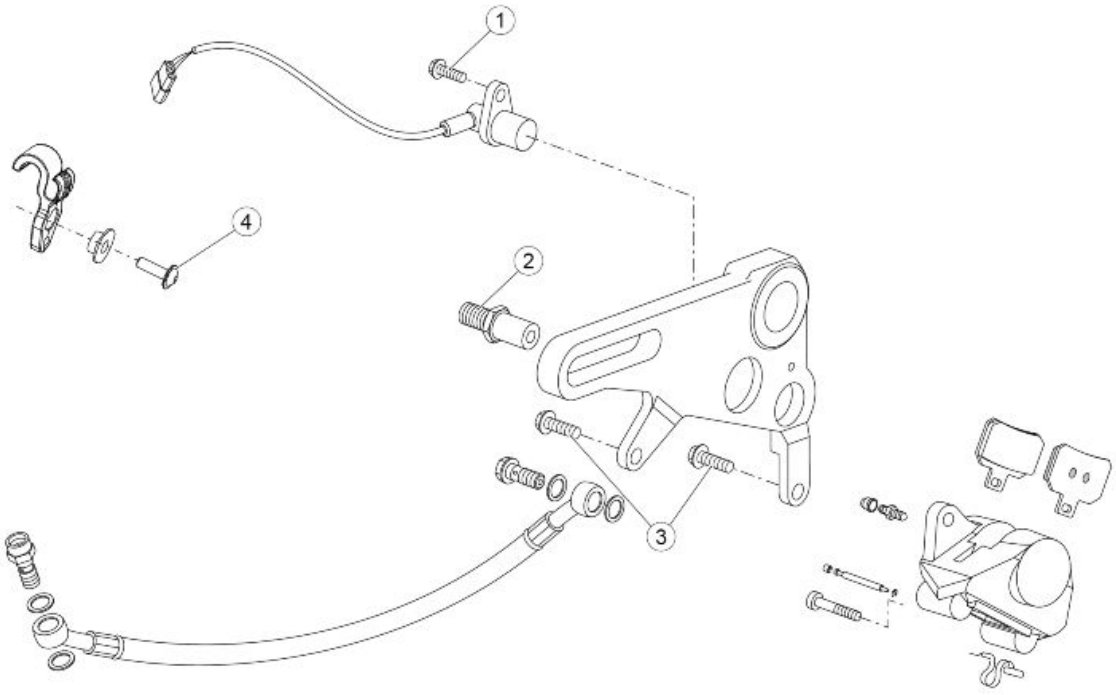
REAR WHEEL

pos.	Description	Type	Quantity	Torque	Notes
1	Rear wheel axle nut	M25x1.5	1	120 Nm (88.51 lb ft)	-
2	"A" Nuts fastening sprocket on sprocket mount	M10	5	50 Nm (36.88 lb ft)	-
2	"B" Nuts fastening sprocket on sprocket mount	M10	5	55 Nm (40.57 lb ft)	-
2	"C" Nuts fastening sprocket on sprocket mount	M10	5	50 Nm (36.88 lb ft)	-
3	Rear brake disc fastening screws	M8	5	30 Nm (22.13 lb ft)	Loct. 243



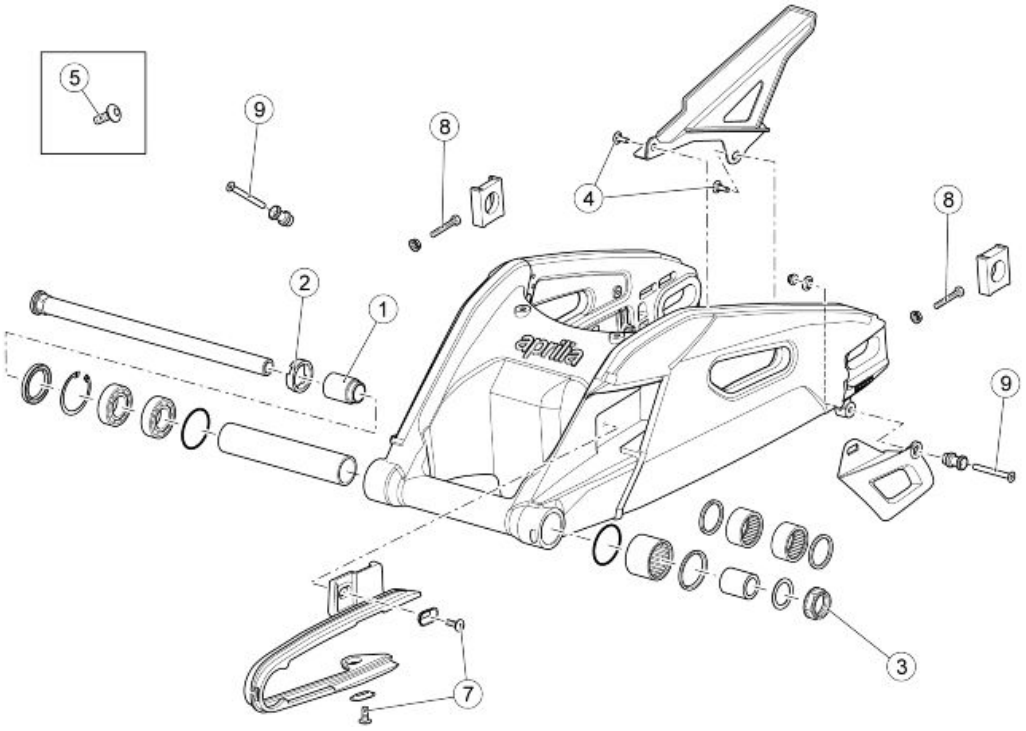
REAR BRAKE PUMP

pos.	Description	Type	Quantity	Torque	Notes
1	Rear brake rod lock nut	M6	1	12 Nm (8.85 lb ft)	-
2	Rear brake pump retaining screws	M6	2	8 Nm (5.90 lb ft)	Loctite 243
3	Rear brake lever fixing pin	M8	1	25 Nm (18.44 lb ft)	Loctite 243
-	Brake lever push rod fixing screw	M6	1	8 Nm (5.90 lb ft)	-



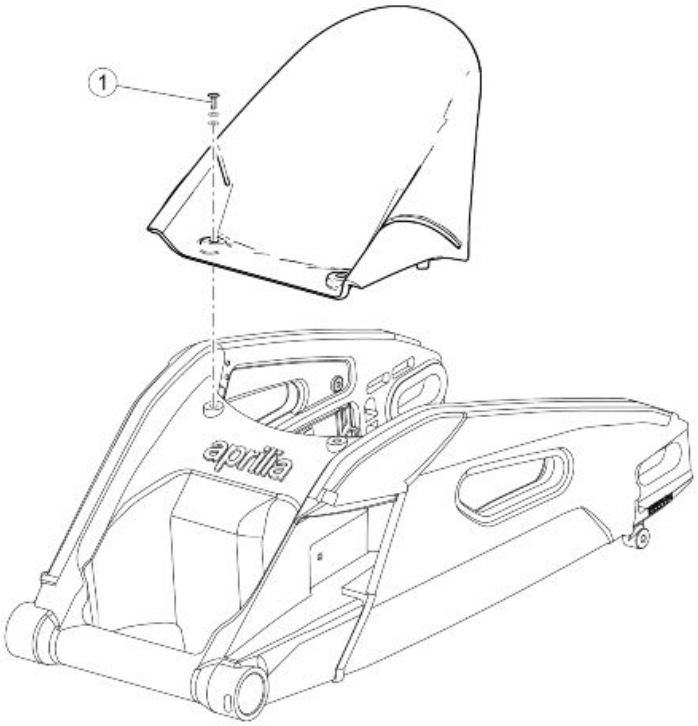
REAR BRAKE CALLIPER

pos.	Description	Type	Quantity	Torque	Notes
1	Odometer sensor fixing screw	M6	1	10 Nm (7.38 lb ft)	-
2	Rear brake calliper support plate retaining pin	M12	1	50 Nm (36.88 lb ft)	Loct. 243
3	Rear brake calliper fastening screw	M5	2	25 Nm (18.44 lb ft)	-
4	Brake pipe bracket fastening screw	M5	1	4 Nm (2.95 lb ft)	-
-	Screw fastening brake pipe clamp	M5	2	4 Nm (2.95 lb ft)	-
-	Screw fastening odometer sensor onto brake calliper mounting	M6	1	12 Nm (8.85 lb ft)	-



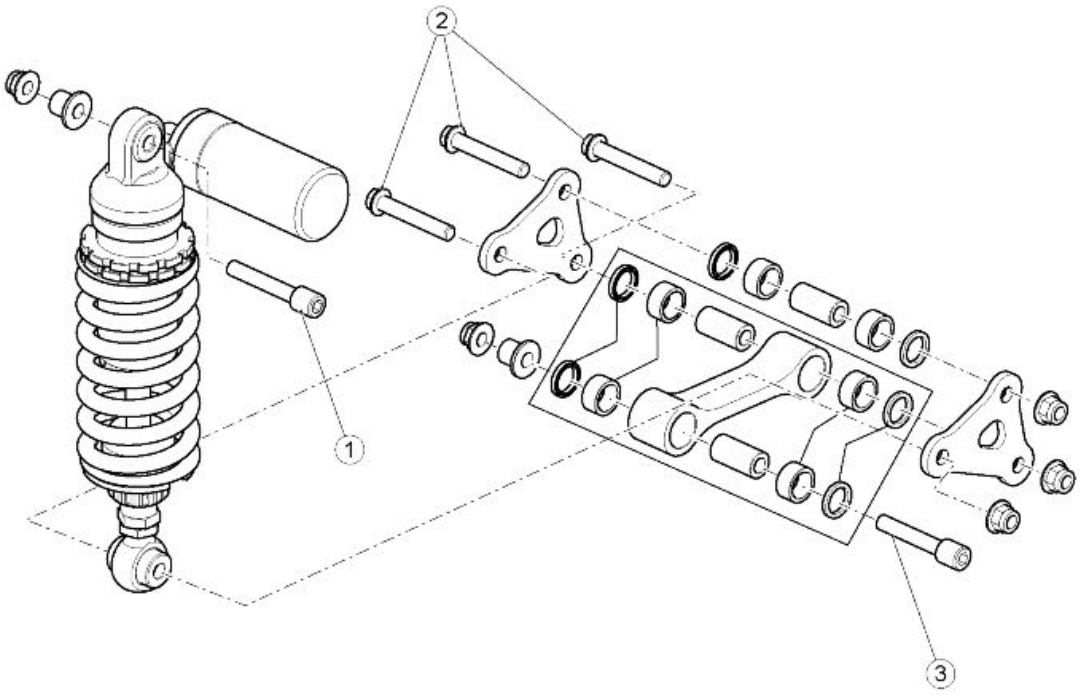
REAR SWINGARM

pos.	Description	Type	Quantity	Torque	Notes
1	Swingarm regulator bushing	M30x1.5	1	12 Nm (8.85 lb ft)	-
2	Swingarm ferrule	M30x1.5	1	60 Nm (44.25 lb ft)	-
3	Fork pin nut	M20x1.5	1	65 Nm (47.94 lb ft)	AGIP GREASE SM2
4	Chain guard fastening screws	M5	2	4 Nm (2.95 lb ft)	-
5	Front chain guide fixing screw	M5	1	4 Nm (2.95 lb ft)	-
6	Chain guide rear fastening nut	M6	1	7 Nm (5.16 lb ft)	-
7	Chain feeder shoe fastening screws	M5	2	2 Nm (1.48 lb ft)	-
8	Chain tensioner fastener screw	M8	2	Manual	-
9	Rear stand bushing fastening screws	M6	2	7 Nm (5.16 lb ft)	-
-	Lower chain shoe fastening screws	M6	2	10 Nm (7.38 lb ft)	-



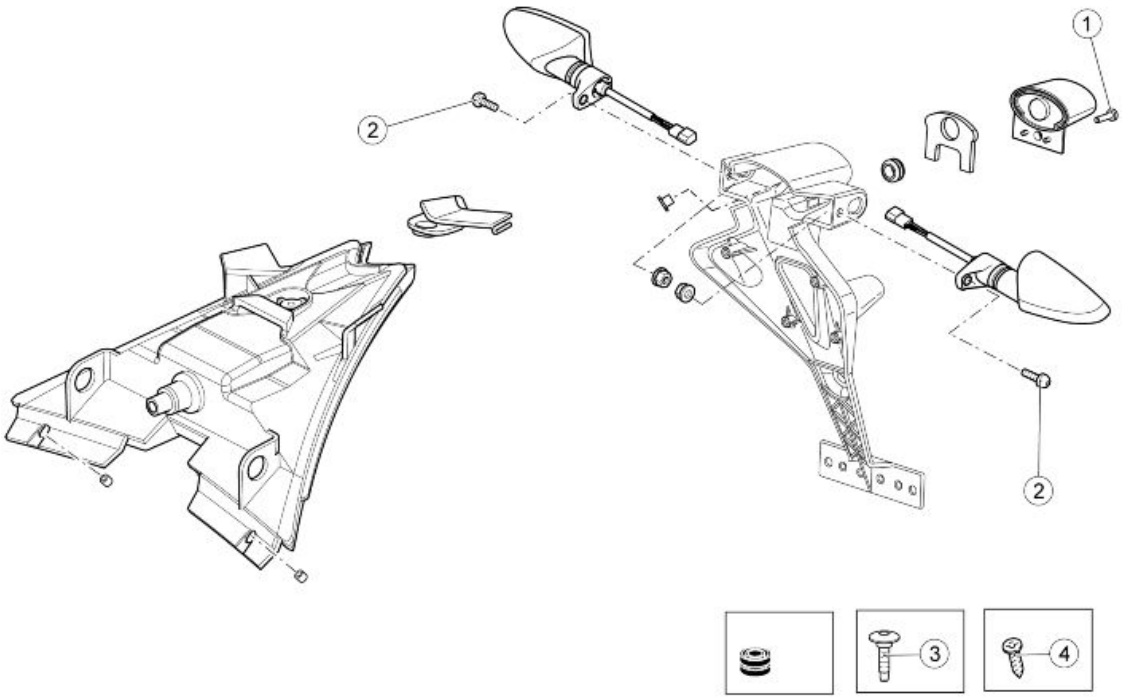
REAR MUDGUARD

pos.	Description	Type	Quantity	Torque	Notes
1	Rear mudguard fixing screws	M6	2	5 Nm (3.69 lb ft)	For plastic mud-guard
1	Rear mudguard fixing screws	M6	2	3 Nm (2.21 lb ft)	For carbon mud-guard



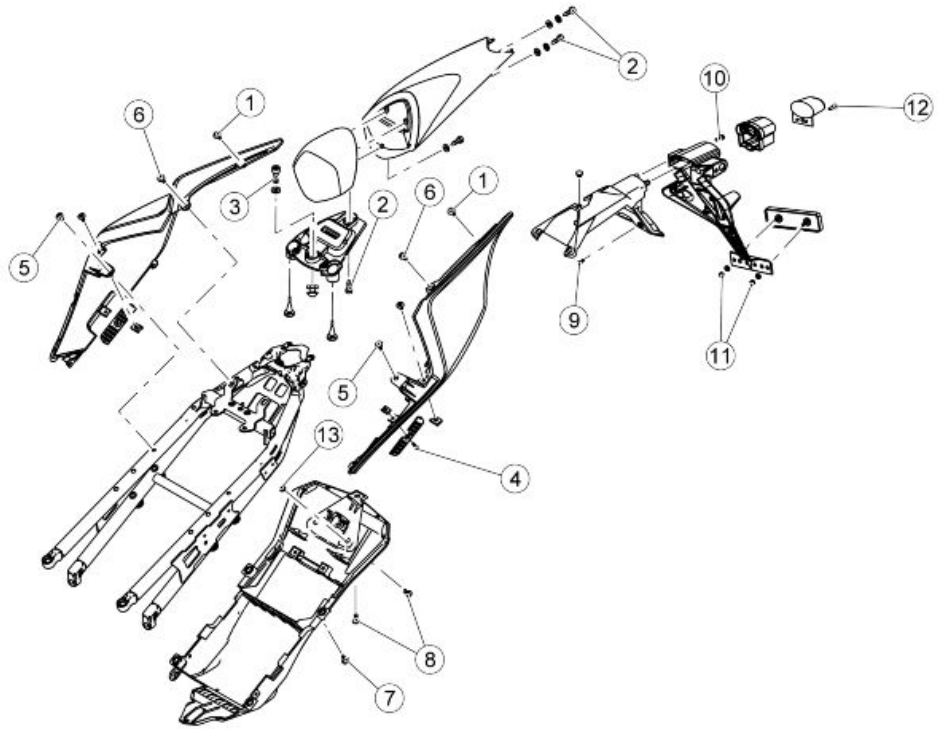
REAR SHOCK ABSORBER

pos.	Description	Type	Quantity	Torque	Notes
1	Upper shock absorber fixing screw	M10	1	50 Nm (36.88 lb ft)	-
2	Dual connecting rod fixing screw	M10	3	50 Nm (36.88 lb ft)	-
3	Screw fastening single connecting rod to chassis	M10	1	50 Nm (36.88 lb ft)	-



LICENSE PLATE HOLDER

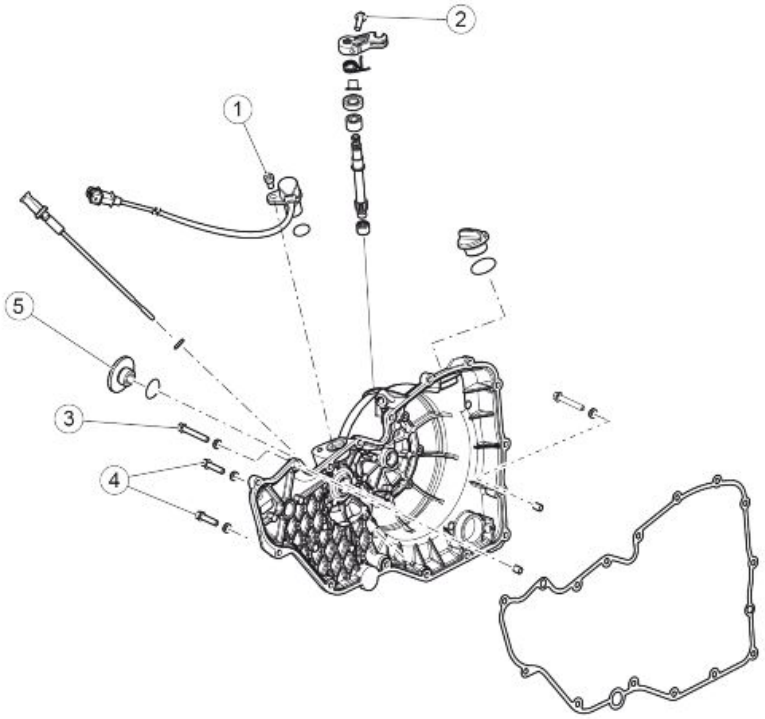
pos.	Description	Type	Quantity	Torque	Notes
1	License plate light fixing screws	M4	1	1 Nm (0.74 lb ft)	-
2	Rear turn indicator fixing screws	M6	2	2.5 Nm (1.84 lb ft)	-
3	Taillight fixing screws	M5	2	3 Nm (2.21 lb ft)	-
4	Taillight cover self-tapping fixing screw	SWP 3.9	1	0.5 Nm (0.37 lb ft)	-
-	Screws fastening license plate mounting to saddle mounting casting	M6	3	4 Nm (2.95 lb ft)	-



REAR BODYWORK

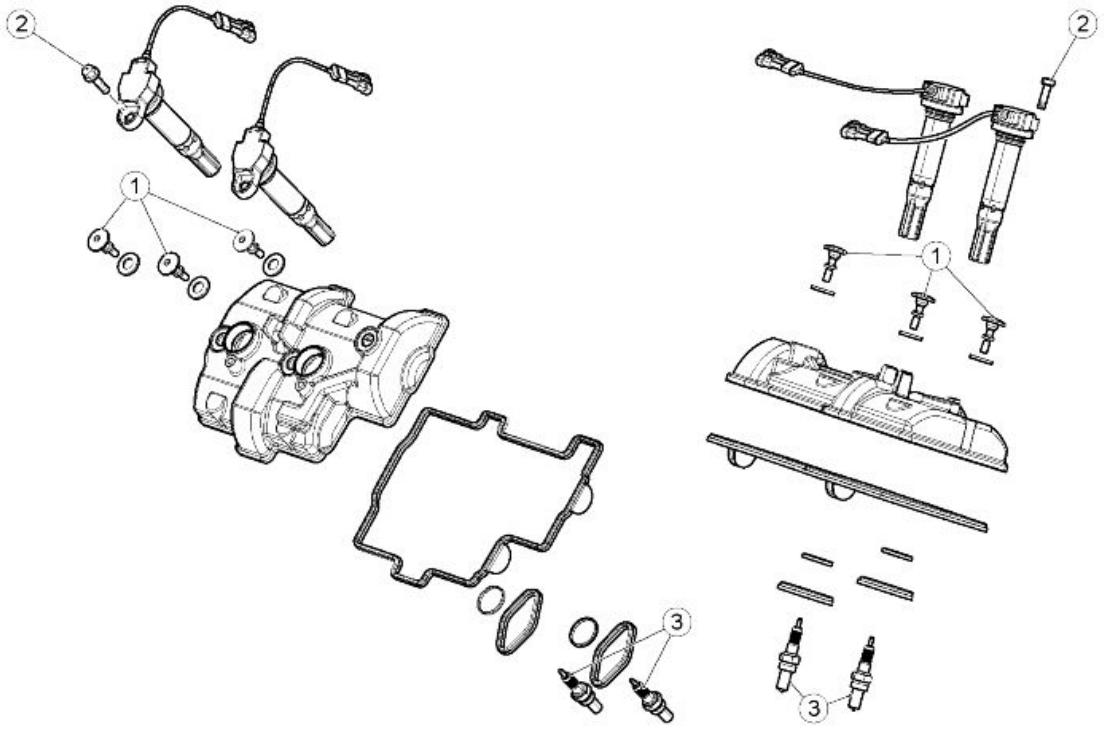
pos.	Description	Type	Quantity	Torque	Notes
1	Rear screws used to fasten the tail fairing to the rear headlight bracket	M5	2	3 Nm (2.21 lb ft)	-
2	Screws used to fasten the saddle cover base to the saddle cover	SWP 2.9	3	1 Nm (0.74 lb ft)	-
3	Saddle cover stud fastening screws	M4	1	1.5 Nm (1.11 lb ft)	-
4	Screws used to fasten the grilles to the tail fairing	M5	2	0.5 Nm (0.37 lb ft)	-
5	Screws for fastening the grilles to the saddle mounting	M5	2	3 Nm (2.21 lb ft)	-
6	Screws fastening tail fairing to saddle mounting bracket	M5	4	2 Nm (1.48 lb ft)	-
7	Lower saddle mounting fastener fixing screws	M5	5	3 Nm (2.21 lb ft)	-
8	Screws for fastening license plate holder to saddle mounting plate	M6	3	4 Nm (2.95 lb ft)	-
9	Screws for fastening the rear number plate holder to the front number plate holder	SWP 3,9	4	1 Nm (0.74 lb ft)	-
10	Self-tapping screws for fastening the rear number plate holder to the front number plate holder	SWP 4.9	2	2 Nm (1.48 lb ft)	-
11	Reflector retaining nuts	M4	2	1 Nm (0.74 lb ft)	-
12	License plate light fixing screw	M4	1	1 Nm (0.74 lb ft)	-
13	Nuts for fastening the number plate holder to the saddle mounting	M6	2	4 Nm (2.95 lb ft)	-
-	Screw for fastening the tail fairing to the taillight bracket	M5	2	3 Nm (2.21 lb ft)	-

Engine



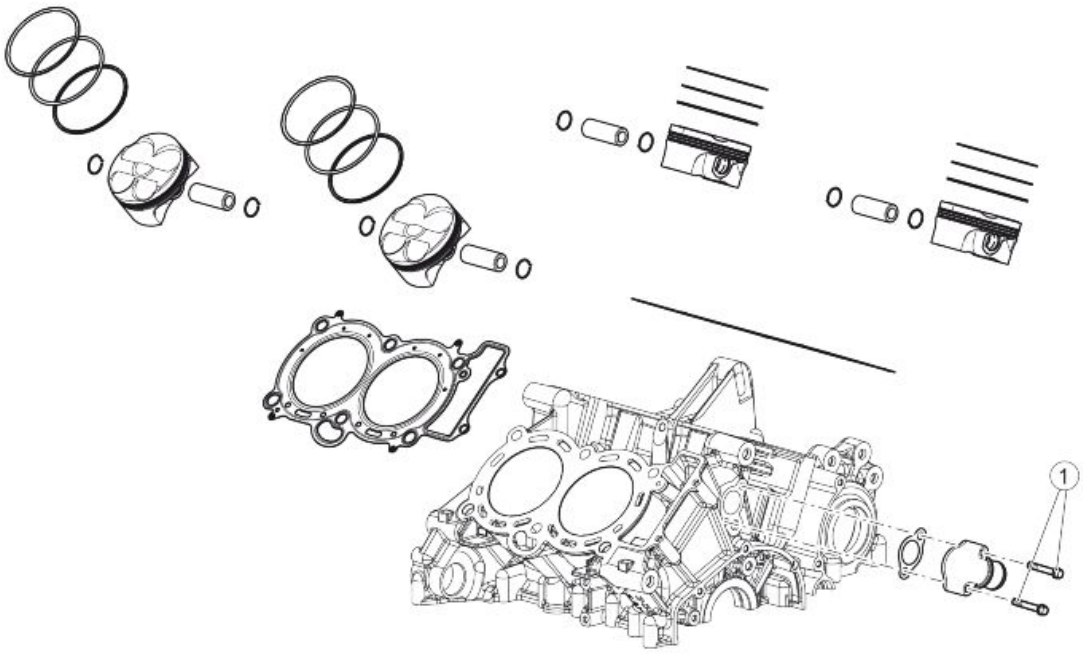
CLUTCH COVER

pos.	Description	Type	Quantity	Torque	Notes
1	Rpm sensor fixing screw	-	1	8 Nm (5.90 lb ft)	-
2	TE Flanged screw	M6x20	1	10 Nm (7.38 lb ft)	-
3	TE Flanged screw	M6x35	2	12 Nm (8.85 lb ft)	Tighten to torque, unscrew and re-tighten to torque.
4	TE Flanged screw	M6x22	14	12 Nm (8.85 lb ft)	Tighten to torque, unscrew and re-tighten to torque.
5	Engine timing inspection cap	-	1	20 Nm (14.75 lb ft)	-



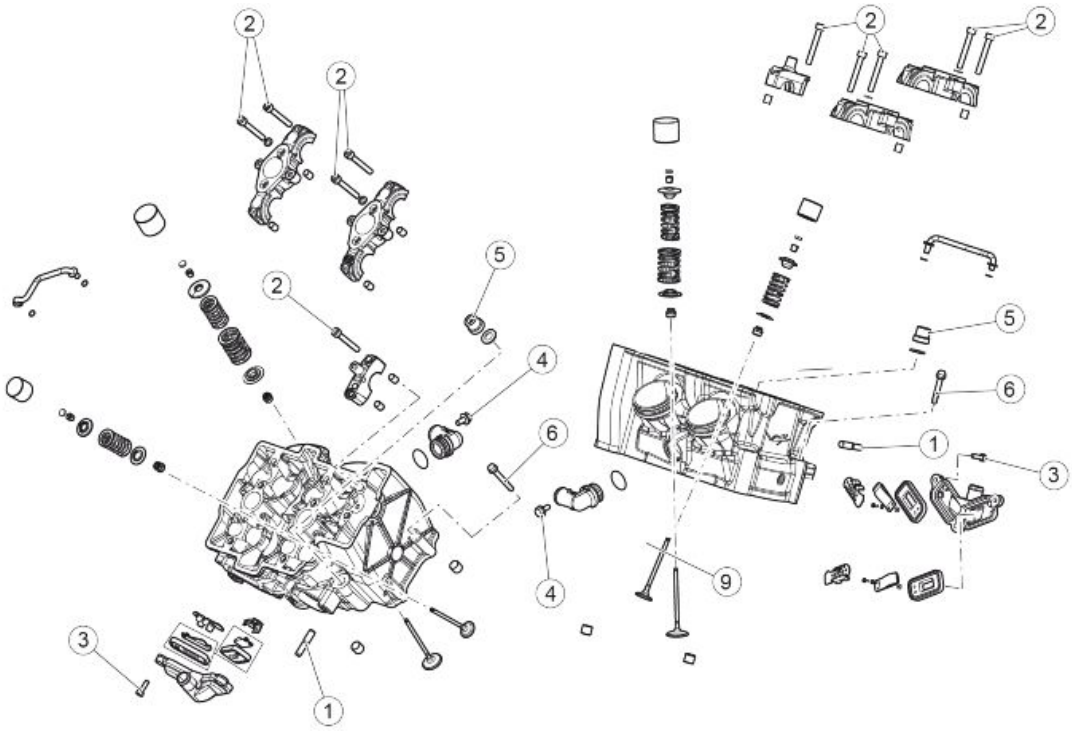
VALVES COVER

Pos.	Description	Type	Quantity	Torque	Notes
1	Head cover fixing screws	-	6	10 Nm (7.38 lb ft)	-
2	Coil fastening screws	-	4	8 Nm (5.90 lb ft)	Loct. 243
3	Spark plugs	-	4	12 Nm (8.85 lb ft)	-



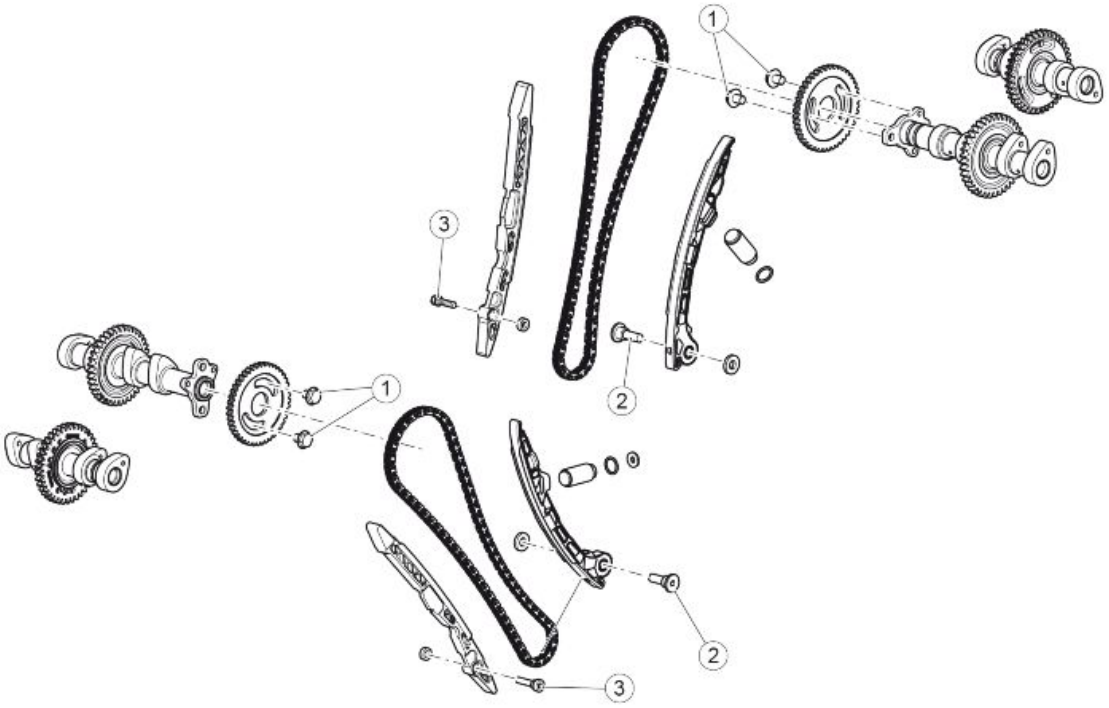
CYLINDERS - PISTON

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fastening water union onto crankcase	M6x40	2	10 Nm (7.38 lb ft)	-



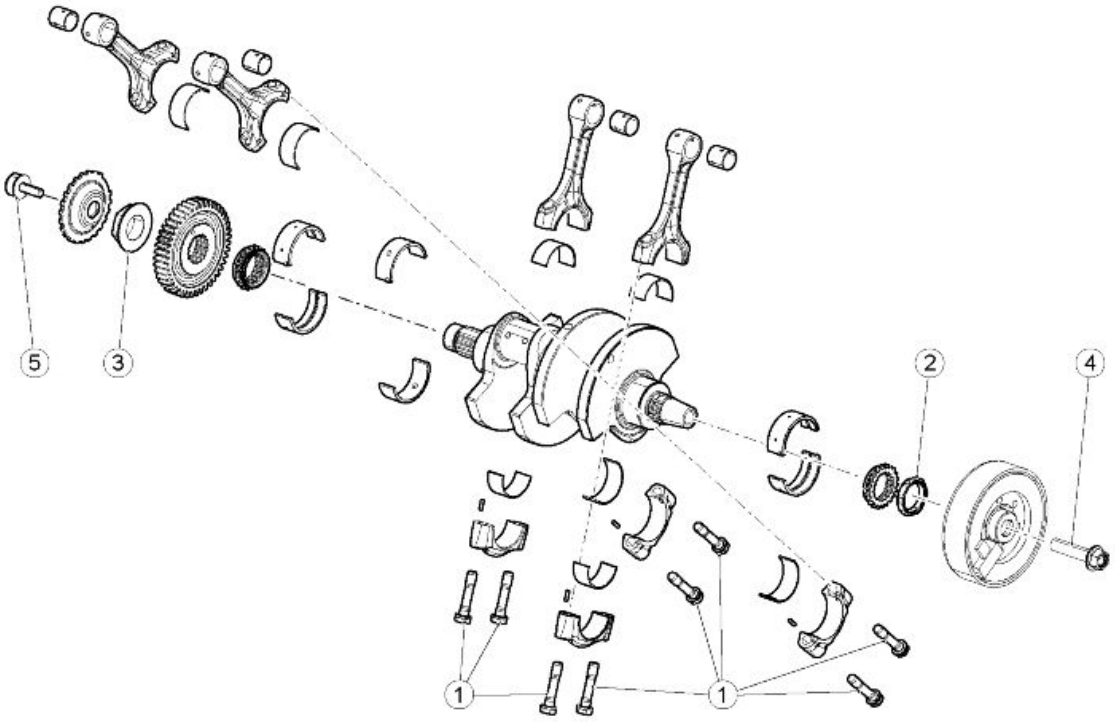
HEADS

Pos.	Description	Type	Quantity	Torque	Notes
1	Exhaust stud bolts	-	8	10 Nm (7.38 lb ft)	-
2	Cam shaft cam tower fixing screws	M6x45	20	11 Nm (8.11 lb ft)	-
3	Reed valve covers fixing screws	-	6	6 Nm (4.43 lb ft)	-
4	Water outlet coupling fixing screw	-	2	10 Nm (7.38 lb ft)	Pre-impregnated or else Loct. 270 or Loct. 648
5	Flanged head nut	-	12	30 + 55 Nm (22.13 + 40.57 lb ft)	Lubricate the head and under the head.
6	Head tightening screw, chain side	M6x55	4	12 Nm (8.85 lb ft)	Lubricate the head and under the head.



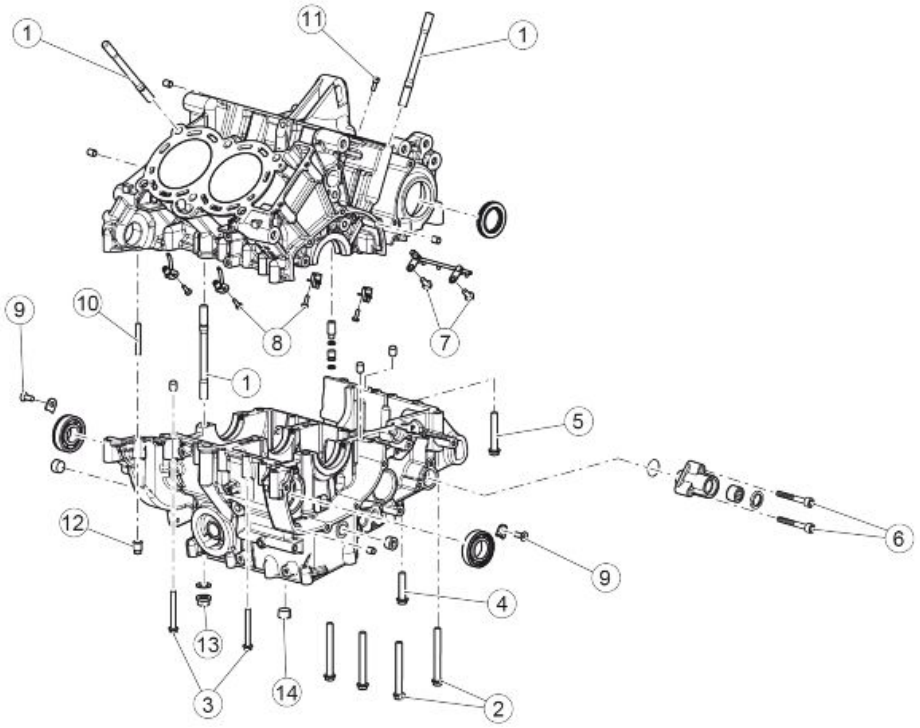
TIMING SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Screw fastening the timing system gear on the intake shaft	M8	4	30 Nm (22.13 lb ft)	Loct. 243
2	Shoe fastening screws	M8	2	20 Nm (14.75 lb ft)	Loct. 243
3	Skid fastener screws	M6x18	2	10 Nm (7.38 lb ft)	Loct. 243



CRANKSHAFT

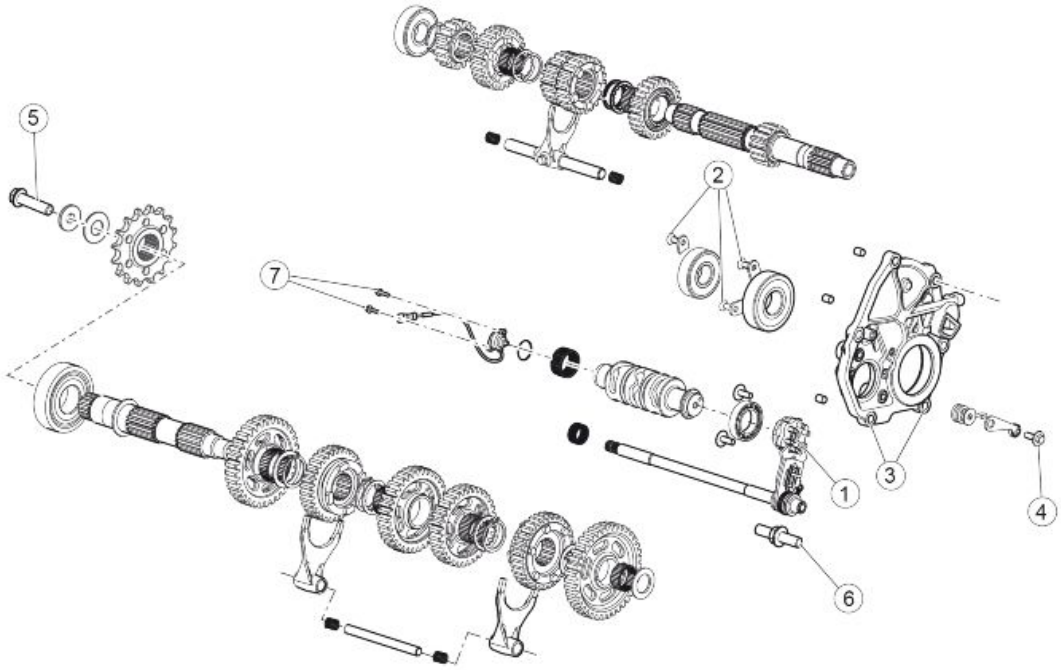
pos.	Description	Type	Quantity	Torque	Notes
1	Connecting rod screws	-	8	15 + 20 Nm (11.06 + 14.75 lb ft) + 130°	Lubricate the head and under head with con PANKL Lubricant 01 (PLB01)
2	Fastener ring nut for alternator side timing sprocket	-	1	100 Nm (73.76 lb ft)	Loct. 243
3	Primary fixing ring nut	-	1	200 Nm (147.51 lb ft)	Loct. 243
4	Generator fixing screw	M12x1.25	1	120 Nm (88.51 lb ft)	-
5	Tone wheel fixing screw	M8x1.25	1	50 Nm (36.88 lb ft)	Loct. 3M or 270



CRANKCASES

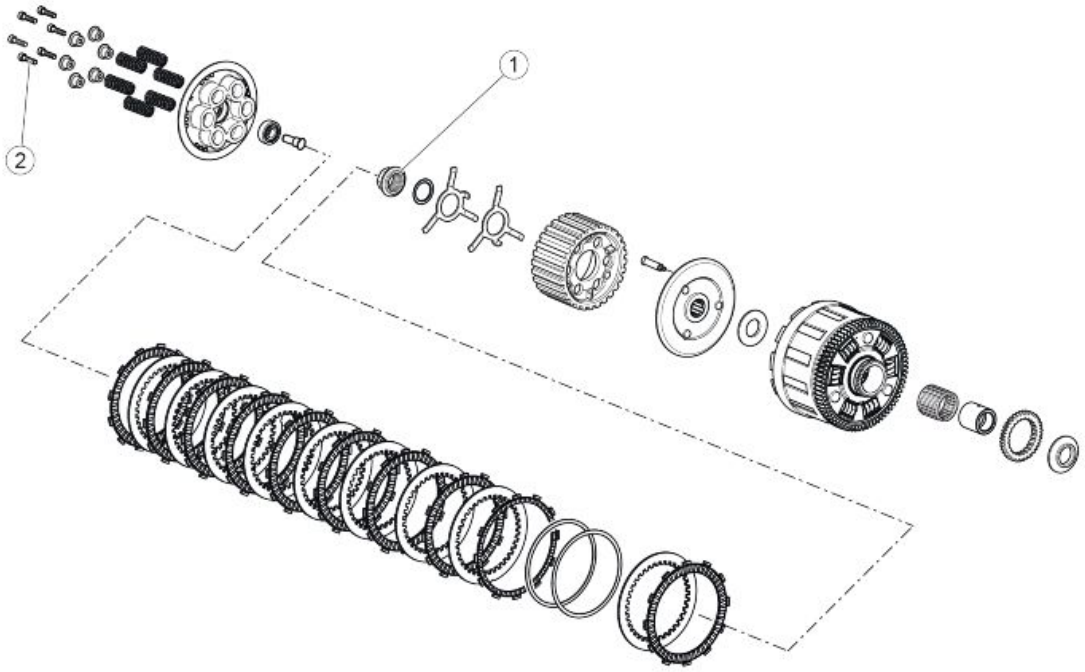
pos.	Description	Type	Quantity	Torque	Notes
1	Stud bolt	-	18	20 Nm (14.75 lb ft)	Loctite 648 or 270
2	TE Flanged screw	-	4	25 Nm (18.44 lb ft)	Lubricate the thread and under the head.
3	TE Flanged screw	-	8	10 Nm (7.38 lb ft)	Lubricate the thread and under the head.
4	TE Flanged screw	-	1	10 Nm (7.38 lb ft)	Lubricate the thread and under the head.
5	TE Flanged screw	-	3	25 Nm (18.44 lb ft)	Lubricate the thread and under the head.
6	SHC screw	-	2	10 Nm (7.38 lb ft)	Lubricate the thread and under the head.
7	TE Flanged screw	-	2	10 Nm (7.38 lb ft)	Lubricate the thread and under the head.
8	TB TORX screw	-	4	3.5 Nm (2.58 lb ft)	Loctite 2045.
9	Screw	-	2	6 Nm (4.43 lb ft)	
10	Stud bolt	-	1	*	* Move to 33mm from table.
11	SHC screw	-	1	10 Nm (7.38 lb ft)	Lubricate the thread and under the head.
12	Special nut	-	1	10 Nm (7.38 lb ft)	-

pos.	Description	Type	Quantity	Torque	Notes
13	Flanged nut	-	6	30 ± 55 Nm (22.13 ± 40.57 lb ft)	Molykote - Lubricate the thread and under the head.
14	Conical cap	-	3	**	* Move to 1mm under the table.



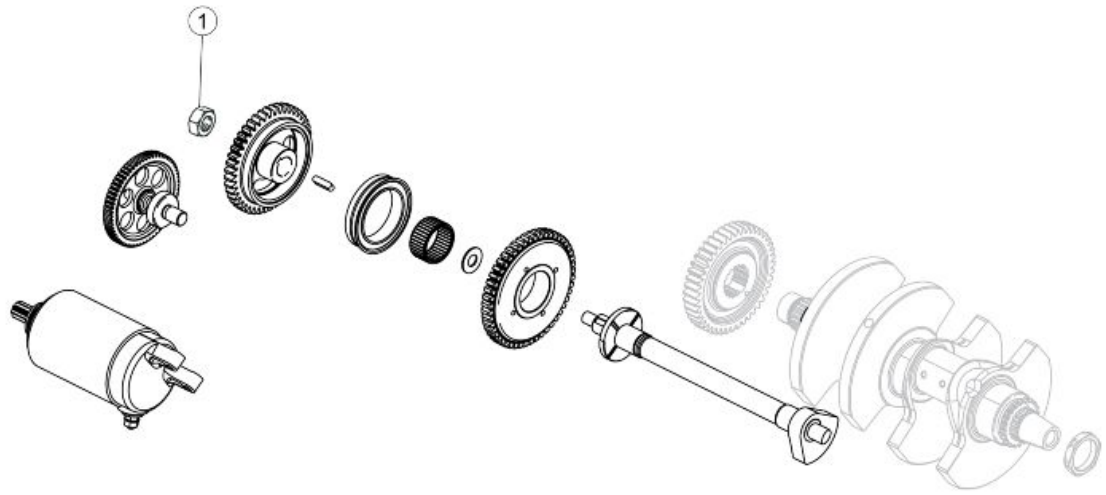
GEARBOX

pos.	Description	Type	Quantity	Torque	Notes
1	Star fastening screw	M6x20	1	10 Nm (7.38 lb ft)	Loct. 243
2	Bearing retaining plate fastening screw	M6x16	3	10 Nm (7.38 lb ft)	Loct. 243
3	Flange fastening screws	M8x25	6	25 Nm (18.44 lb ft)	-
4	Index lever fixing screw	M6	1	10 Nm (7.38 lb ft)	Loct. 243
5	Pinion fastening	-	1	50 Nm (36.88 lb ft)	Loct. 243
6	Screw retaining pre-selector on crankcase	-	1	25 Nm (18.44 lb ft)	Loct. 270
7	Gear selector fastening screw	M5x15	2	6 Nm (4.43 lb ft)	-



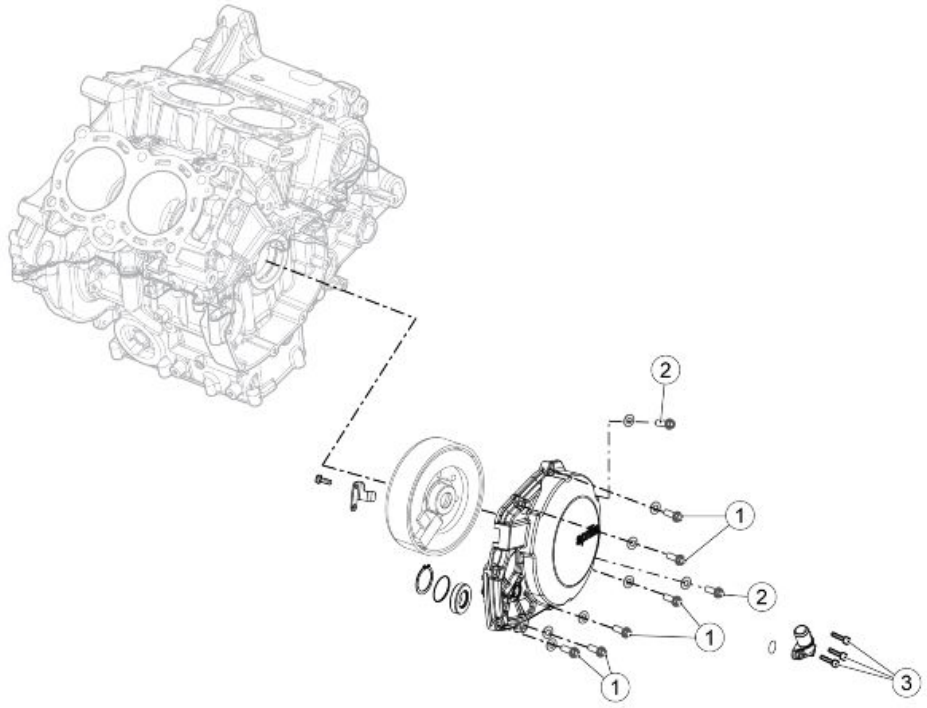
CLUTCH

pos.	Description	Type	Quantity	Torque	Notes
1	Flanged nut fixing clutch	M20x1	1	150 Nm (110.63 lb ft)	Loct. 243
2	Clutch springs SHC fixing screw	M6x25	6	10 Nm (7.38 lb ft)	-



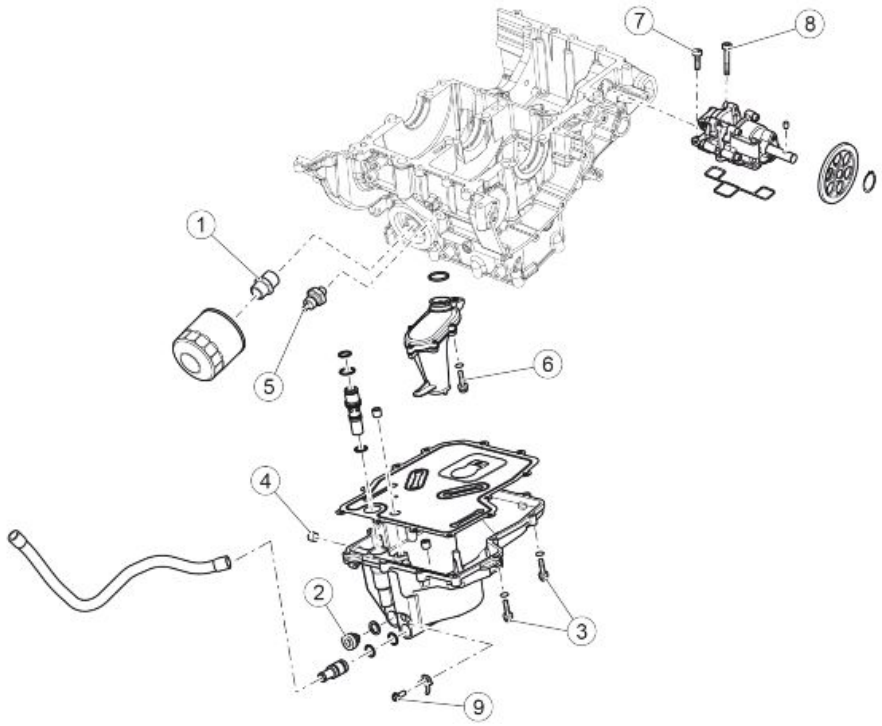
IGNITION UNIT

pos.	Description	Type	Quantity	Torque	Notes
1	Hex headed nut cl.10 type 2 iso 8674	M10x1	1	50 Nm (36.88 lb ft)	Loct. 243



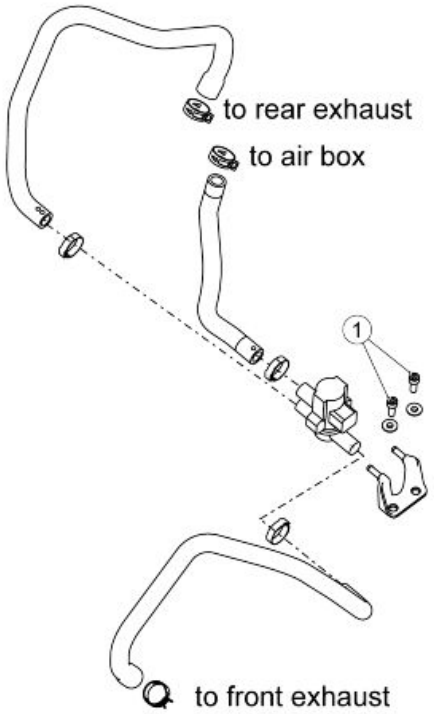
ALTERNATOR COVER

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fastening cover onto centre pins	M6x25	6	12 Nm (8.85 lb ft)	Move to the torque, unscrew, bring back to torque.
2	Cover fastening screws generator side	M6x40	2	12 Nm (8.85 lb ft)	Tighten to torque, unscrew and re-tighten to torque.
3	Blow-by union fastener screws	M5x16	3	7 Nm (5.16 lb ft)	-
-	Stator fixing screw UNI 5931 CL8.8	M6x25	3	10 Nm (7.38 lb ft)	Loct. 2045
-	Flanged screw	M5x12	1	6 Nm (4.43 lb ft)	Loct. 2045



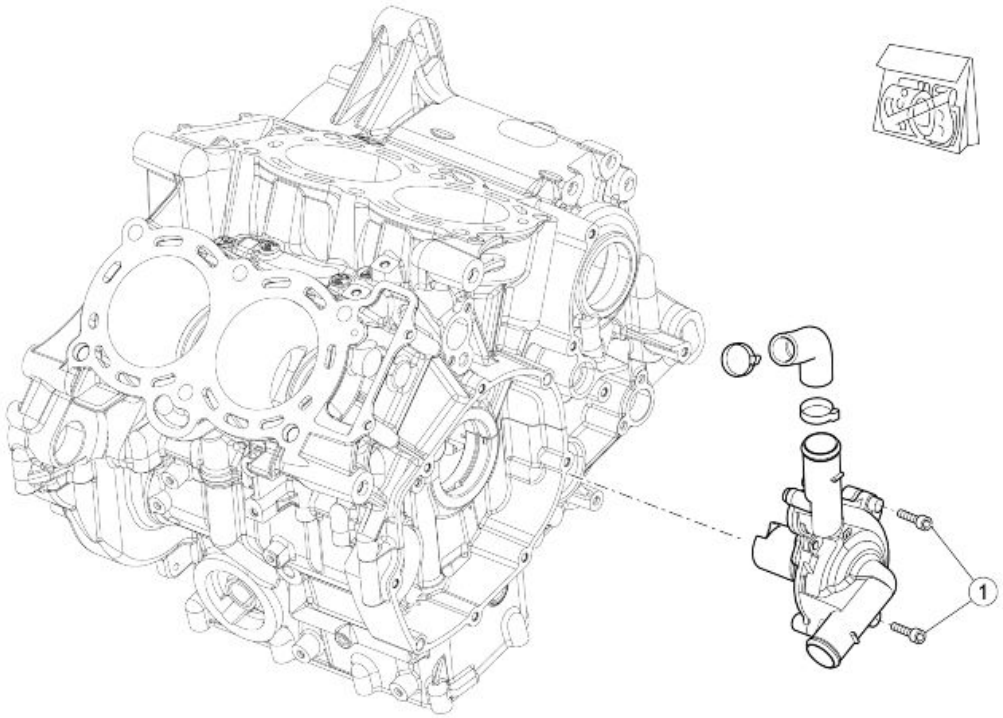
LUBRICATION

pos.	Description	Type	Quantity	Torque	Notes
1	Oil filter coupling fastening screw	-	1	30 Nm (22.13 lb ft)	-
2	Oil drainage plug	-	1	30 Nm (22.13 lb ft)	-
3	Oil sump fixing screws	M6x30	12	12 Nm (8.85 lb ft)	Tighten to torque, unscrew and re-tighten to torque.
4	Ergal conical cap	-	3	*	* Move to 1mm under the table.
5	Oil pressure sensor	-	1	15 Nm (11.06 lb ft)	-
6	TE Flanged screw	-	1	10 Nm (7.38 lb ft)	Loct. 243
7	SHC screw	-	5	10 Nm (7.38 lb ft)	-
8	SHC screw	-	1	10 Nm (7.38 lb ft)	-
9	TE Flanged screw	-	1	6 Nm (4.43 lb ft)	-



SECONDARY AIR SYSTEM

Pos.	Description	Type	Quantity	Torque	Notes
1	Secondary air solenoid screws	-	2	10 Nm (7.38 lb ft)	-

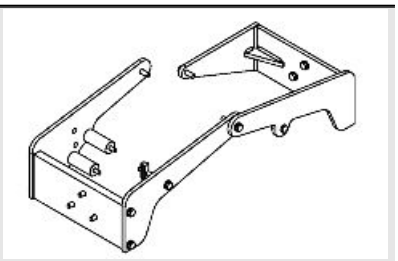
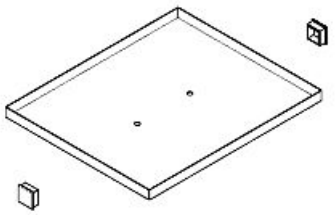
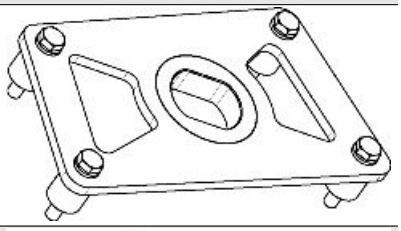
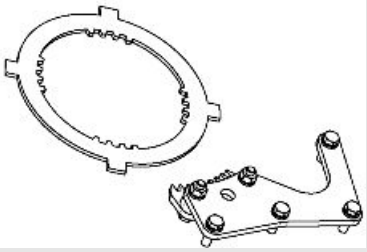
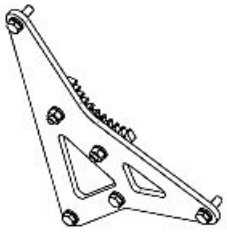


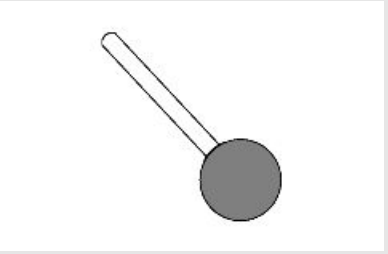
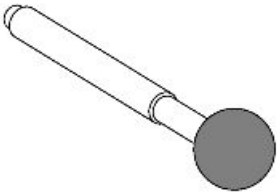
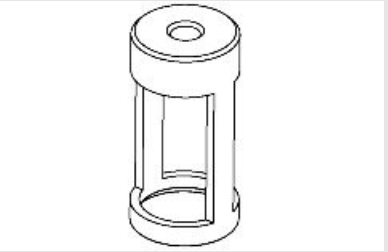
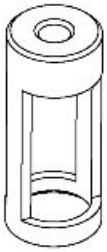
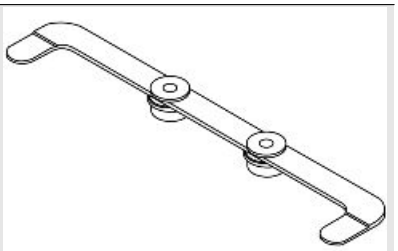
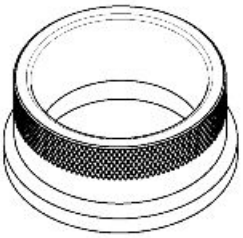
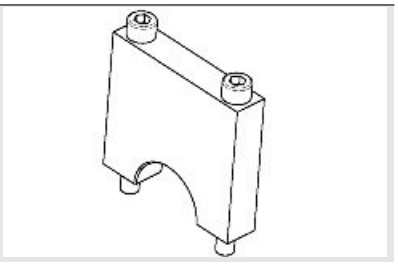
WATER PUMP

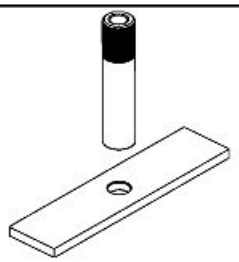
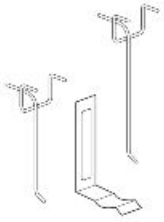
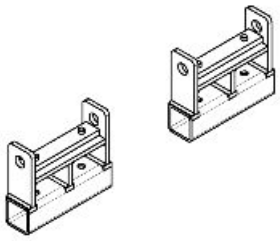
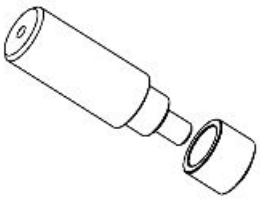
pos.	Description	Type	Quantity	Torque	Notes
1	Screws used to fasten the pump to the crankcase	M6x25	2	10 Nm (7.38 lb ft)	-

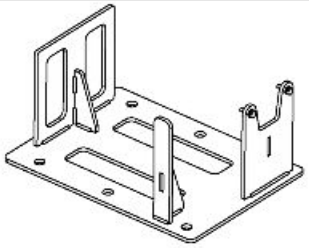
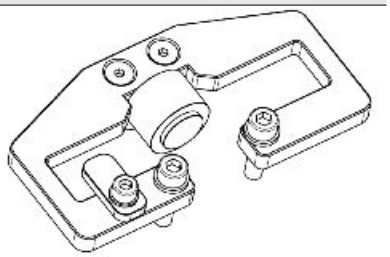
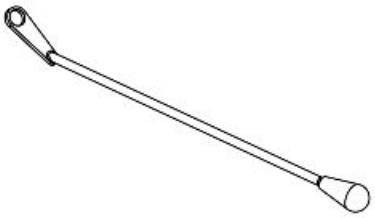
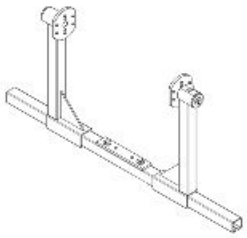
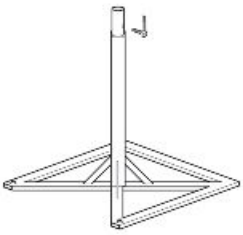
INDEX OF TOPICS

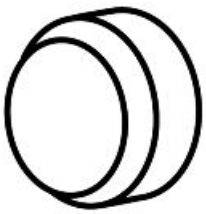
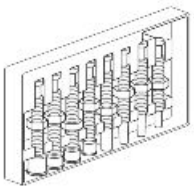
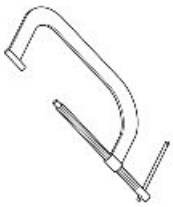
SPECIFIC TOOLS

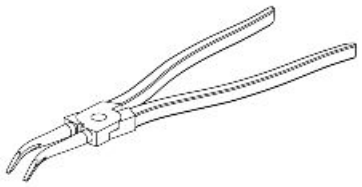
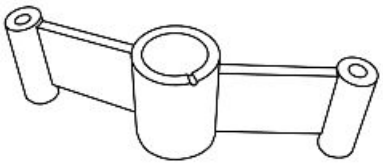
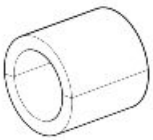
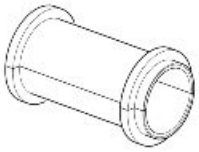
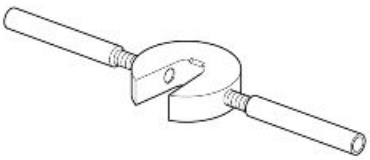
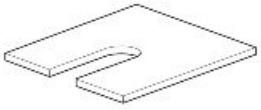
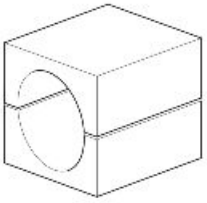
Stores code	Description	
020845Y	Engine support	
020846Y	Containment tray + plastic plugs	
020847Y	Flywheel extractor	
020914Y	Flywheel retainer	
020849Y	Clutch lock	
020850Y	Primary gear lock	

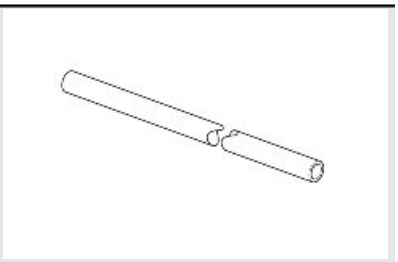
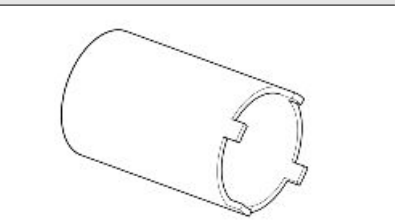
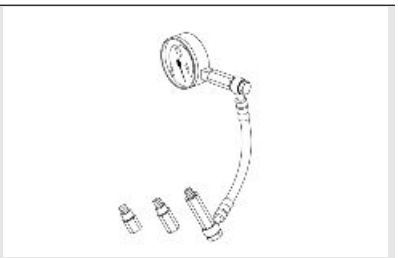
Stores code	Description	
020851Y	Camshaft timing pin	
020852Y	Crankshaft timing pin	
020853Y	Compresses intake valve springs	
020854Y	Compresses exhaust valve springs	
020981Y	Lever for disarming the hydraulic tensioner of the timing chain	
020856Y	Piston assembly ring	
020857Y	Crankshaft support U-bolt	

Stores code	Description	
020858Y	Maintenance of the pistons in the cylinders	
AP8140199	Tool storage panel	
020859Y	Graphics for panels	
8140426	Hooks for panel	
020860Y	Motor support extension	
020862Y	Punch assembly cage with rollers gearbox control rod.....	
020863Y	Punch assembly cage with rollers desmodromic drum.....	

Stores code	Description	
020864Y	Engine mounting plate	
020956Y	Support for camshaft gear on head	
020883Y	Fitting/removing timing chain tensioner tool	
020709Y	Engine support	
AP8140187	U-bolt for motor support	
020376Y	Adaptor handle	
020363Y	20mm oil seal guide	

Stores code	Description	
020364Y	25-mm guide	
020359Y	42 x 47 mm punch	
020431Y	Valve oil seal extractor	
AP8140180	Bearing extractor	
AP8140179	Valve springs compressor	
0277308	Guide bushing for gearbox secondary shaft	

Stores code	Description	
020877Y	Calliper for clamps	
020926Y	Tool for fitting clutch bushing	
AP8140146	Weight	
AP8140189	Tool for fitting oil seal for 43 mm (1.69 in) diameter hole	
AP8140147	Spacer retaining device	
AP8140148	Plunger-spacer separator plate	
AP8140149	Protection for assembly operations	

Stores code	Description	
AP8140150	Bored shaft for bleeding plunger air	
AP8140190	Tool for steering tightening	
AP8140181	Tool for checking fuel pressure	
020922Y	Diagnostic tool	

INDEX OF TOPICS

MAINTENANCE	MAIN

Scheduled maintenance table

Correct maintenance is fundamental for ensuring the longevity of your vehicle and maintaining optimum function and performance.

For this purpose, Aprilia has formulated a series of checks and scheduled services (at the owner's expense), are summarised in the table given in the following page. It is generally advisable to have any minor malfunctions rectified immediately by an **Authorised Aprilia Dealer** without waiting until the next service.

It is necessary to have your vehicle serviced to the prescribed intervals of time, even if you have not reached the predicted mileage. Services must be performed punctually at the correct intervals to maintain the validity of the warranty. See the "Warranty Booklet" for all other information concerning the applicability of the Warranty and on performing "Scheduled Maintenance" correctly.

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 at each engine start

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

(3) Check and clean and adjust or replace, if necessary, every 1,000 Km (621.37 mi)

(4) Replace every 2 years

(5) Replace every 4 years

(6) Every 5,000 Km (3,106.86 mi) if the vehicle is used for racing

(7) Every 10,000 Km (6,213.71 mi) if the vehicle is used for racing

(8) Your RSV4 is equipped with a sophisticated system, based on exchangeable conical bushes that allow the modification of the steering angle for track use. In case of prolonged road use in conditions with uneven ground (e.g. use on pave, holes, speed bumps) can bring small adjustments that, in extreme cases, can cause a slight clearance to the handlebar. Therefore it is recommended to perform the check and adjustment operations at an Authorised Aprilia-Piaggio Workshop every 5,000 km (3,106.86 mi).

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

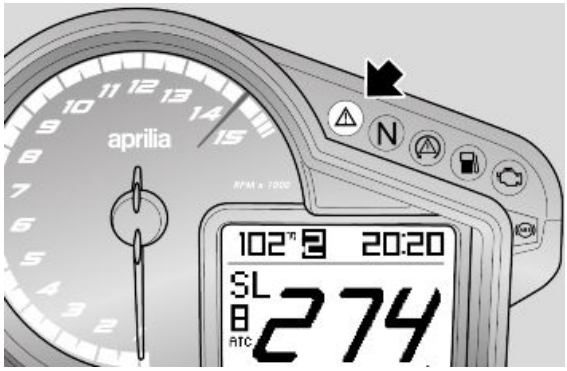
SCHEDULED MAINTENANCE TABLE

km x 1,000 (mi x 1,000)	1 (0.6)	10 (6.2)	20 (12.4)	30 (18.6)	40 (24.9)
Rear shock absorber (6)			I		I
Set up (6)	I	I	I	I	I
Spark plug			R		R
Drive chain (3)	I - L	I - L	I - L	I - L	I - L

km x 1,000 (mi x 1,000)	1 (0.6)	10 (6.2)	20 (12.4)	30 (18.6)	40 (24.9)
Clutch cable	L	L	L	L	L
Control cables and controls (6)	I	I	I	I	I
Crown wheel - sprocket (6)		I	I	I	I
Rear suspension bearings - linkages			I		I
Steering bearings and steering play (8)	I	I	I	I	I
Wheel bearings (6)		I	I	I	I
Diagnosis by tool	I	I	I	I	I
Brake discs (6)	I	I	I	I	I
Air filter (6)		I	R	I	R
Engine oil filter (6)	R	R	R	R	R
Fork			I		I
General vehicle operation (6)	I	I	I	I	I
Valve clearance (7)			A		A
Cooling system (6)		I	I	I	I
Brake systems (6)	I	I	I	I	I
Light circuit	I	I	I	I	I
Stand switch		I	I	I	I
Safety switches	I	I	I	I	I
Stop switches		I	I	I	I
Brake fluid (4)	I	I	I	I	I
Coolant (4)	I	I	I	I	I
Fork oil (7) (9)					R
Engine oil (6)	R	R	R	R	R
Headlight aiming		I	I	I	I
Fork oil seals (6)		I		I	
Slipper mechanism			I		I
Tyres - pressure / wear (2)	I	I	I	I	I
Wheels (6)	I	I	I	I	I
Nut/bolt tightness (6)	I	I	I	I	I
Slipper mechanism pin nut tightness	I	I	I	I	I
Clutch cover, flywheel and sump screw tightness	I	I	I	I	I
Fault indicator light on instrument cluster (1)					
Fuel lines (5)		I	I	I	I
Clutch wear (7)			I		I
Brake pads wear (2)	I	I	I	I	I
Labour times (minutes) - Race Pack/RF - My2015	120	160	410	160	500
Labour time (minutes) - RR - My2015	150	190	440	190	530
Labour time (minutes) - RF/RR - My2016	120	160	410	160	500

The scheduled maintenance table refers to road use. In case of using the new RSV4 RR - RF on a competitive level, as for sport events and use on the track, in order to correctly monitor the effective degree of technological stress of the mechanical components, an electric device intervenes that registers the engine performance and allows to plan eventual maintenance.

Therefore, when the general warning light (see figure) steadily lights up for 2 seconds, each 120 seconds, it is necessary to contact an Authorised Service Centre to plan the specific maintenance intervention, which is recommended by the manufacturer.



To carry out the correct verification **"Flexible coupling pin nuts tightening"** indicated in the scheduled maintenance table, refer to the corresponding procedure in chapter **"Maintenance / Verification Flexible coupling"**

SCHEDULED MAINTENANCE TABLE ONLY FOR THE ASIA/PACIFIC MARKET

ROUTINE MAINTENANCE TABLE

km x 1,000 or (months) maximum	1 (1)	10 (10)	20 (20)	30 (30)	40 (40)
Rear shock absorber (6)			I		I
Set up (6)	I	I	I	I	I
Spark plug			R		R
Drive chain (3)	I - L	I - L	I - L	I - L	I - L
Clutch cable	L	L	L	L	L
Control cables and controls (6)	I	I	I	I	I
Crown wheel - sprocket (6)		I	I	I	I
Rear suspension bearings - linkages			I		I
Steering bearings and steering play (8)	I	I	I	I	I
Wheel bearings (6)		I	I	I	I
Diagnosis by tool	I	I	I	I	I
Brake discs (6)	I	I	I	I	I
Air filter (6)		I	R	I	R
Engine oil filter (6)	R	R	R	R	R
Fork			I		I
General vehicle operation (6)	I	I	I	I	I
Valve clearance (7)			A		A
Cooling system (6)		I	I	I	I
Brake systems (6)	I	I	I	I	I
Light circuit	I	I	I	I	I
Stand switch		I	I	I	I
Safety switches	I	I	I	I	I
Stop switches		I	I	I	I
Brake fluid (4)	I	I	I	I	I
Coolant (4)	I	I	I	I	I
Fork oil (7) (9)					R
Engine oil (6)	R	R	R	R	R
Headlight aiming		I	I	I	I
Fork oil seals (6)		I		I	
Slipper mechanism			I		I
Tyres - pressure / wear (2)	I	I	I	I	I
Wheels (6)	I	I	I	I	I
Nut/bolt tightness (6)	I	I	I	I	I
Slipper mechanism pin nut tightness	I	I	I	I	I
Clutch cover, flywheel and sump screw tightness	I	I	I	I	I
Fault indicator light on instrument cluster (1)					
Fuel lines (5)		I	I	I	I
Clutch wear (7)			I		I
Brake pads wear (2)	I	I	I	I	I
Labour times (minutes) - Race Pack/RF - My2015	120	160	410	160	500
Labour time (minutes) - RR - My2015	150	190	440	190	530
Labour time (minutes) - RF/RR - My2016	120	160	410	160	500

NOTE

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

CAUTION

AFTER THE PROVIDED MAINTENANCE PROGRAM IS INDICATED TO PROCEED WITH THE MAINTENANCE OF THE VEHICLE STARTING FROM THE SERVICE OF 10,000 Km OR 10 MONTHS

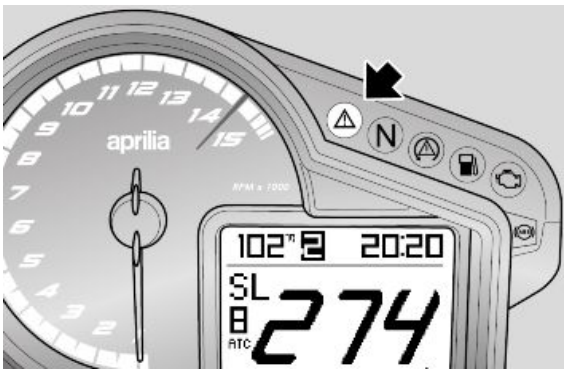
Maintenance table for track use

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

R: REPLACE

TABLE OF EQUIVALENT KILOMETRES

Km x 1000	6	12	18	24	30	36
Intake valve spring	R	R	R	R	R	R
Exhaust valve prong	R	R	R	R	R	R
Intake caps			R			R
Exhaust caps			R			R
Intake valves			R			R
Exhaust valves			R			R
Intake cam			I			I
Exhaust cam			I			I
Valve seats			I			I
Chains	I	I	R	I	I	R
Chain pads	I	I	R	I	I	R
Complete connecting rod			R			R
Big-end bearing			R			R
Main bearings			R			R
Countershaft bearing transm. side (up to registration number 1319)	R	R	R	R	R	R
Countershaft bearing transm. side (from registration number 1320)		R		R		R
Countershaft bearing flywheel side (up to registration number 1319)	R	R	R	R	R	R
Countershaft bearing flywheel side (from registration number 1320)		R		R		R
Pistons			R			R
Gear selector fork	R	R	R	R	R	R
Oil intake rose pipe			R			R
Spark plugs	R	R	R	R	R	R
Engine oil filter	R	R	R	R	R	R
Air filter	R	R	R	R	R	R
Valve clearance	I	I	I	I	I	I
Engine oil	R	R	R	R	R	R
Tightening nuts and bolts	I	I	I	I	I	I
Clutch wear	I	R	I	R	I	R
Labour in hours (up to serial No. 1319)	14.5	14.5	18	14.5	14.5	18
Labour in hours (up to serial No. 1320)	14	14.5	17.5	14.5	14	17.5

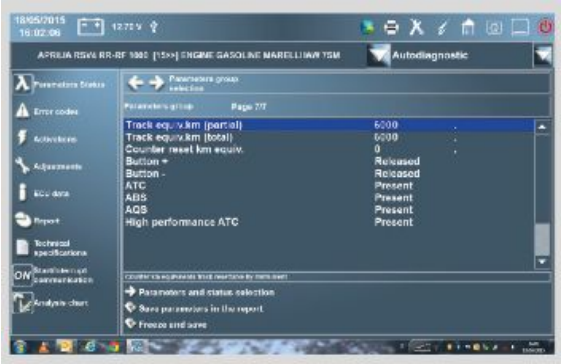


By using the P.A.D.S. diagnostic tool (which must be updated to the latest available version), the new, dedicated engine calibration designed specifically for the version in question may be used **to monitor the effective technological stress level of the mechanical components for use on the racetrack**.

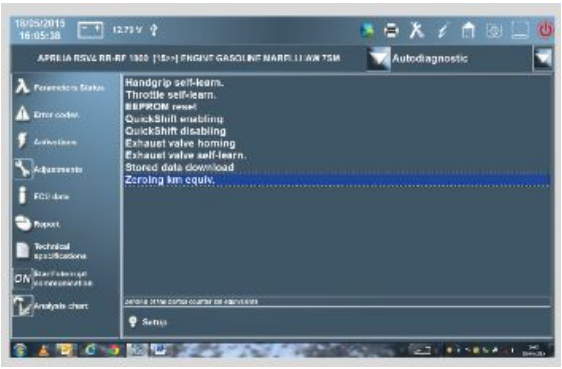
For this reason,**when the general warning lamp** (see figure) **remains on in the steady state for more than 2 seconds**, every 120 seconds, users should contact their local Authorised Aprilia Service Centre in order to arrange for the specific

maintenance procedure to be carried out, as indicated in the table.

Connect the diagnostic tool, select parameters and states, and check that the equivalent track kilometres correspond to 6,000 km, or a multiple thereof



Upon completing the specific track maintenance procedure, access the "adjustments" section of the diagnostic tool **and reset the equivalent kilometres, so that it is possible to extinguish the "warning lamp" and carry out the calculation for the next service.**
The "Equivalent KM reset counter" will be increased by one.



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.

RECOMMENDED PRODUCTS TABLE

Product	Description	Specifications
Engine oil 5W -40	Synthetic-based lubricant for four-stroke engines.	SAE 5W-40; JASO MA, MA2; API SL; ACEA A3
Lithium-based grease	Lithium-calcium soap based grease	colour - black, contains EP (Extreme Pressure) additives, excellent water-repellent properties
Anti-freeze liquid, ready to use, colour red	Ethylene glycol antifreeze liquid with organic inhibition additives. Red, ready to use.	ASTM D 3306 - ASTM D 4656 - ASTM D 4985 - CUNA NC 956-16
Brake fluid DOT 4	Synthetic brake fluid.	SAE J 1703; FMVSS 116; ISO 4925; CUNA NC 956 DOT4
OHLINS 5W	Ohlins fork oil.	Application - RSV4 1000 RR Race Pack/ RF forks; SAE 5W
Hydraulic fluid HVI 32	Fork oil	Application - Sachs RSV4 1000 RR forks; ISO-L-HV

Spark plug

FRONT SPARK PLUGS

- Remove the base of the air filter box.

- Undo and remove the screw.

- Slide off the front coil.

- Unscrew and remove the front spark plug.

REAR SPARK PLUGS

- Remove the fuel tank.
- Unscrew and remove the rear coil fastener screw.

- Slide off the rear coil.
- Unscrew and slide off the rear spark plug.

Engine oil

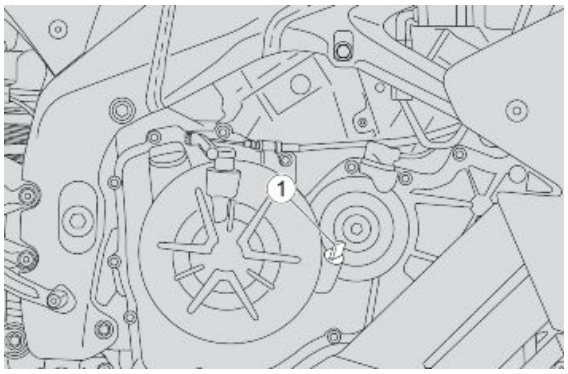
Check

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

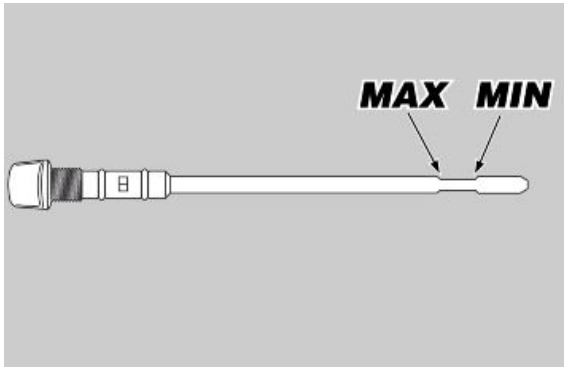
CAUTION

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 EXTRAURBAN CONDITIONS (ENOUGH TO WARM UP THE ENGINE OIL TO OPERATING TEMPERATURE).

- Shut off the engine and wait for a few seconds
- Keep the vehicle upright with both wheels on the ground
- Ensure that the vehicle is on a level surface
- Undo the oil level dipstick (1)



- Clean the oil dipstick (1) and insert it again without tighten it
- Pull it out again and check the oil level
- The oil level is correct when it is close to the "MAX" mark. Otherwise, top-up with engine oil



CAUTION

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

Replacement

NOTE

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

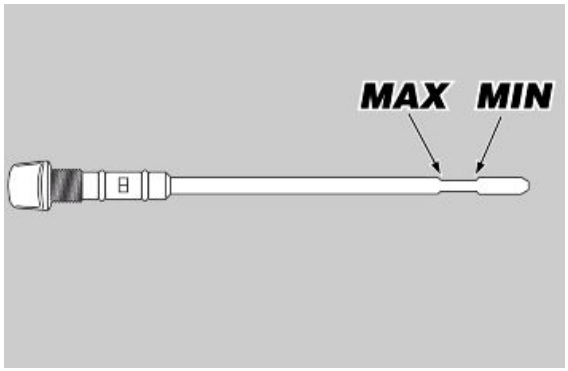
- Place a container with suitable capacity under the drainage plug.
- Unscrew and remove the drainage plug.

- Unscrew and remove the filler cap.
- Drain the oil into the container; allow several minutes for oil to drain out completely.
- Check and, if necessary, replace the drainage plug sealing washers.
- Screw and tighten the drainage plug.
- Add 4 l (0.88 UK gal) of new engine oil of the specified type.
- Screw on the filler cap.

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

CAUTION

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



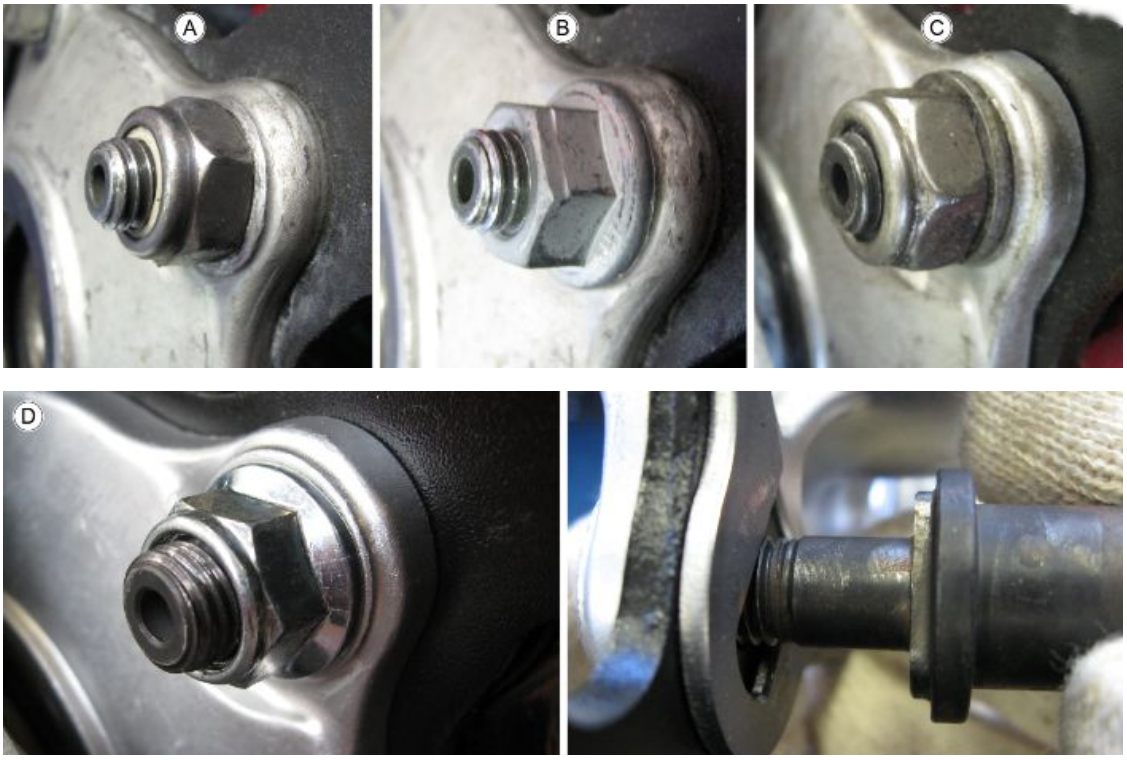
Verifica parastrappi

The verification and tightening of the flexible coupling nuts differs according to the model.

Based on the type indicated in the table, apply the correct tightening torque

FLEXIBLE COUPLINGS FIXING

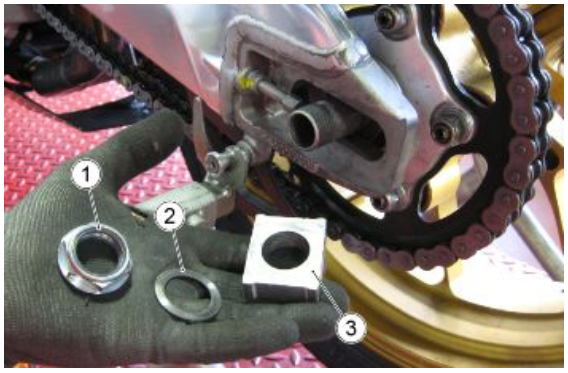
Type	Nut	Washer	Tightening torque	Year
Type "A"	Stainless steel self-locking nut	No	50 Nm (36.88 lb ft)	My2015
Type "B"	Flanged	No	55 Nm (40.57 lb ft)	My2015
Type "C"	Stainless steel self-locking nut	Yes	50 Nm (36.88 lb ft)	My2015
Type "D"	DAX	Rear flange	50 Nm (36.88 lb ft)	My2016



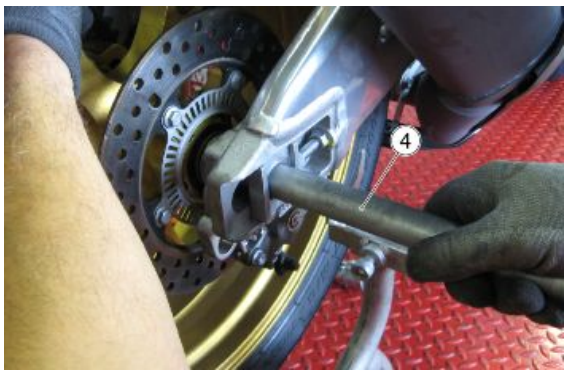
My2015

RSV4 1000 RR

- Remove the fixing nut (1) of the rear wheel pin, recovering the washer (2) and the guide (3)



- Remove the rear wheel pin (4), pulling it from the right side of the motorcycle



- Make the wheel move forward and release the gearing chain from the sprocket

- Slide off the final transmission unit by pulling it parallel to the wheel axis

OPERATE WITH CAUTION. IF THE FINAL TRANSMISSION UNIT IS INSTALLED ON THE FLEXIBLE COUPLING SUPPORT, DO NOT TURN OVER OR ROTATE THE REAR WHEEL SPROCKET SIDE HORIZONTALLY, OR THE FINAL TRANSMISSION UNIT COULD SLIDE OUT AND FALL, AND THE SPROCKET MAY GET DAMAGED.

CAUTION

DO NOT UNSCREW THE FIVE NUTS. THE FINAL TRANSMISSION UNIT CAN BE SLID OFF COMPLETELY FROM THE FLEXIBLE COUPLING SUPPORT.

- Place the final transmission unit in a vice, locking it on the crown gear
- Locking the pin rotation, check and if necessary tighten the nut to the prescribed torque indicated in the table using a torque wrench

TO PROTECT THE CROWN GEAR, INSTALL (WOODEN OR ALUMINIUM) PROTECTIONS ON THE VICE JAWS. LOCK THE CROWN GEAR ONLY IN A VICE. DO NOT LOCK ANY OTHER COMPONENT OF THE FINAL TRANSMISSION UNIT.

RSV4 1000 RR Race Pack/RF

- Operating from the right side of the motorcycle, lock the crown fixing pins

- Using a torque wrench, check and if necessary tighten the nuts fixing the crown to the support to the prescribed torque

My2016

RSV4 1000 RF/RR

- Operating from the left side of the motorcycle, using a torque wrench, check and if necessary tighten the nuts fixing the crown to the support to the prescribed torque

Engine oil filter

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

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

NOTE

NEVER REUSE AN OLD FILTER.

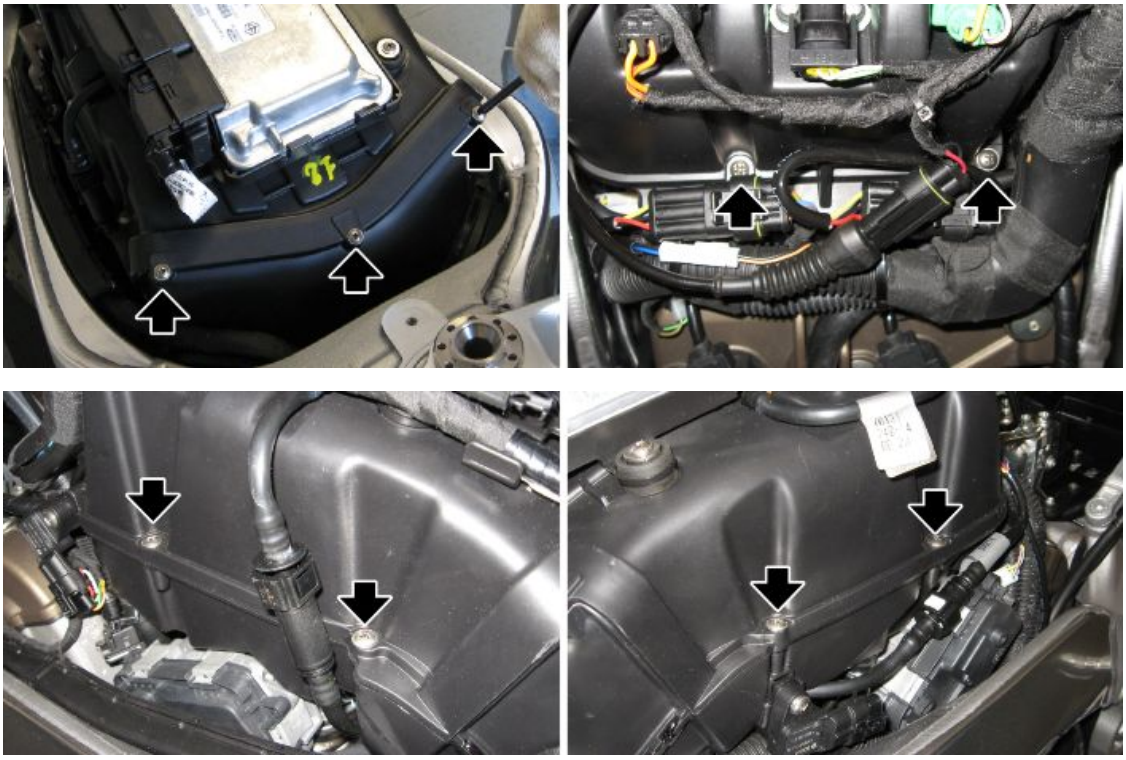
- Spread a thin layer of oil on the sealing ring of the new engine oil filter.
- Insert and screw the new engine oil filter in the seat, filling the filter to 1/3 of its capacity with engine oil before fitting.

See also

Replacement

Air filter

- Remove the fuel tank.
- Unscrew and remove the eight air filter box cover screws.



- Disconnect the upper injector fuel delivery union.

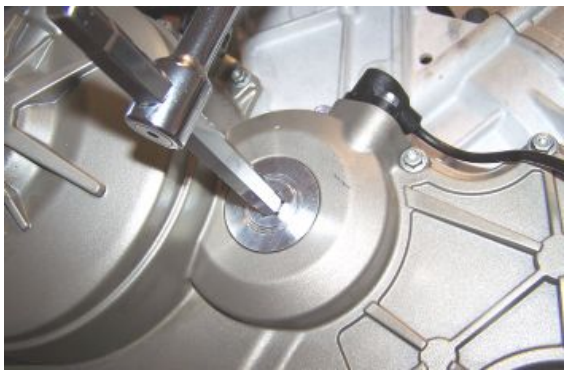
- Lift the filter box cover on which the control unit is installed.
- Do not rotate the cover excessively to avoid straining the pipes and cables.

- Remove the air filter.

Checking the valve clearance

FRONT HEAD

- Remove both throttle bodies and the coils.
- Remove the front head cover and the spark plugs.
- Remove the cap on the clutch cover in order to turn the crankshaft, taking care not to lose the O-ring.



See also

Removing the throttle body

Spark plug

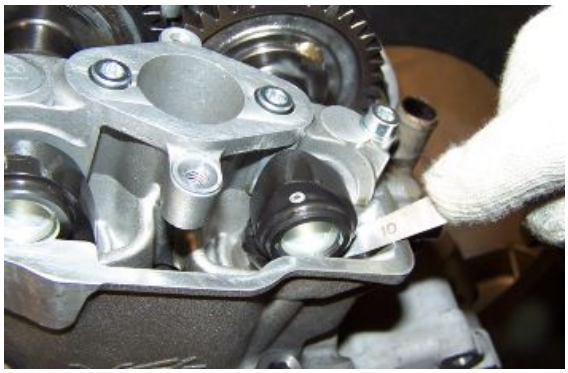
Head cover removal

- Use a feeler gauge to check the clearance between the cam of the shaft and the relative tappet for both front head shafts.

Characteristic

Acceptable values with control clearance between cam and valve

intake: 0.10 - 0.15 mm (0.0039 - 0.0059 in) exhaust: 0.20 - 0.25 mm (0.0079 - 0.0098 in)



REAR CYLINDER HEAD

- Remove both throttle bodies and the spark plugs.
- Remove the rear head cover.

See also

Removing the throttle body

Spark plug

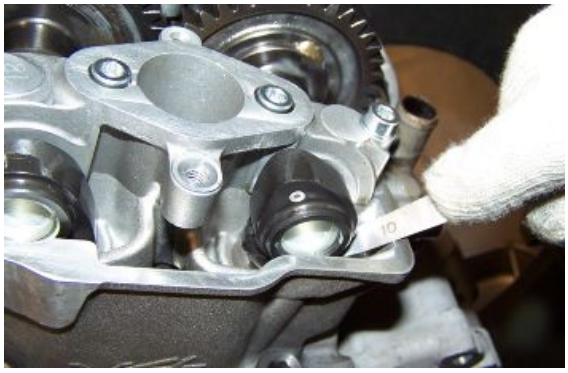
Head cover removal

- Use a feeler gauge to check the clearance between the cam on the shaft and the relative tappet for both rear head shafts.

Characteristic

Acceptable values with control clearance between cam and valve

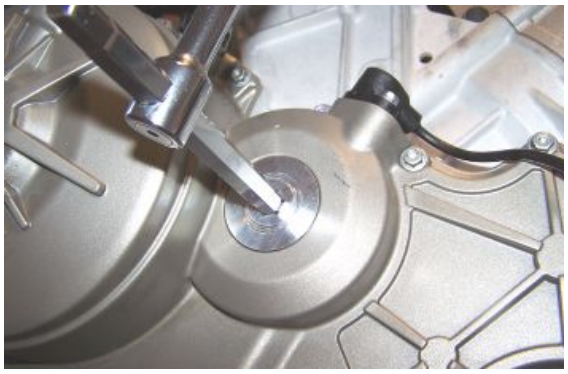
intake: 0.10 - 0.15 mm (0.0039 - 0.0059 in) exhaust: 0.20 - 0.25 mm (0.0079 - 0.0098 in)



Front cylinder head valves

- Check the play on the front head valves and, if it is necessary to restore the correct play values, proceed as follows.

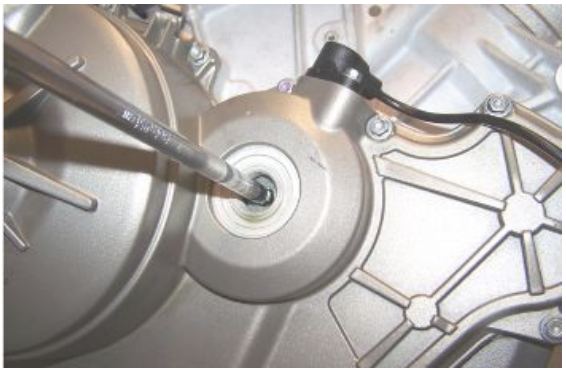
- Remove both head covers, the alternator side cover and remove the cap on the clutch cover in order to rotate the crankshaft.
- Remove the O ring.



See also

Head cover removal
Removing the flywheel cover

- Rotate the crankshaft via the opening on the clutch cover.
- Position cylinder 1 piston (LH, rear piston) so that it is at the point where it crosses TDC.
- rotate the crankshaft 150° in the engine rotation direction (direction of travel).



- insert the respective pin, from the flywheel side, into the groove on the crankshaft.

NOTE

THE SPECIAL TOOL SHOWN HERE MUST ONLY BE USED FOR IDENTIFYING THE CORRECT POSITION OF THE CRANKSHAFT.
DO NOT USE IT FOR TIGHTENING COMPONENTS.

Specific tooling

020852Y Crankshaft timing pin

- Fit the pin for aligning the intake camshaft with the hole on U-bolt.
- If it was not possible before adjusting the valve clearance, check the engine timing.

Specific tooling

020851Y Camshaft timing pin

- Remove the two crankshaft and camshaft reference pins.
- Turn the crankshaft until the gear screw covered by the head when the hole on the camshaft gear is aligned with the hole on the U bolt, is visible.
- Block crankshaft rotation using one of the specific tools.
- Unscrew and remove the camshaft gear screw.
- Remove the crankshaft locking tool.

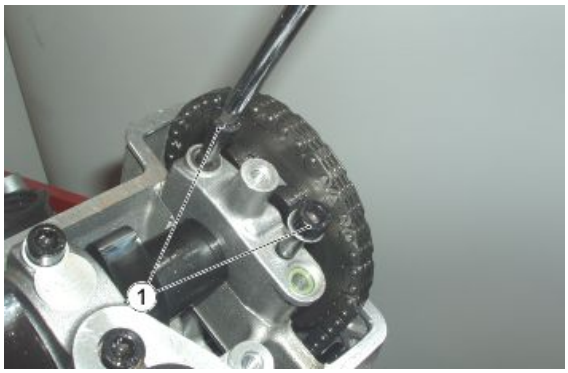
Specific tooling

020850Y Primary gear lock

020914Y Flywheel retainer

Repeat the following operations:

- move cylinder piston 1 (left rear piston) to TDC;
- turn the crankshaft 150° in the direction of engine rotation (direction of travel) in order to align the hole on the intake camshaft with the specific hole on the U bolt; this ensures that all the front cylinder bank valve springs are decompressed.
- Refit the camshaft timing setting pin in the hole in the U bolt on the front head, and refit the crankshaft timing pin from the flywheel side, to check that the tim-



ing setting was not altered while the engine was turned with only one camshaft drive gear fastener screw in place.

- Remove the camshaft timing pin.
- Unscrew and remove the two U bolt screws (1).
- Remove the U bolt and the oil pipe.

Specific tooling

020851Y Camshaft timing pin

020852Y Crankshaft timing pin

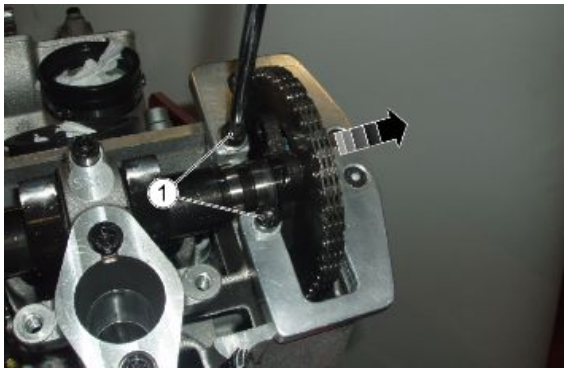
- Block crankshaft rotation using one of the specific tools.
- Unscrew and remove the second intake camshaft gear screw.
- Leave the gear on the camshaft.

Specific tooling

020850Y Primary gear lock

020914Y Flywheel retainer

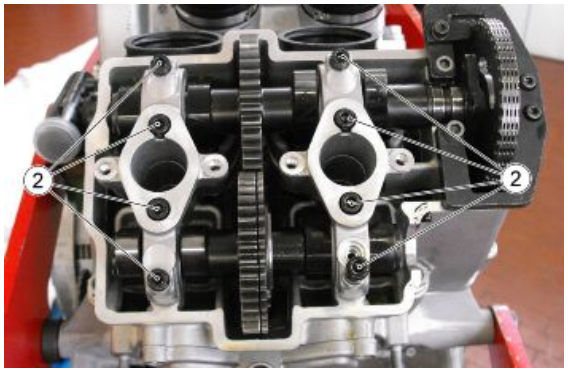
- Install the specific camshaft gear support tool.
- Fix it to the head using the two screws (1).
- Move the gear from the camshaft to the tool.



Specific tooling

020956Y Support for camshaft gear on head

- Unscrew and remove the eight screws (2), proceeding in stages and diagonally.
- Retrieve the washers from the screws near the spark plug holes.
- Remove the U bolts with the O rings and locator pins.



- Remove the intake and exhaust camshafts.

If the two camshafts are timed correctly, the exhaust camshaft gear tooth (indicated with a dot) is meshed with the trough of the intake camshaft gear (indicated with two dots).

- Use a magnet to remove the tappet.

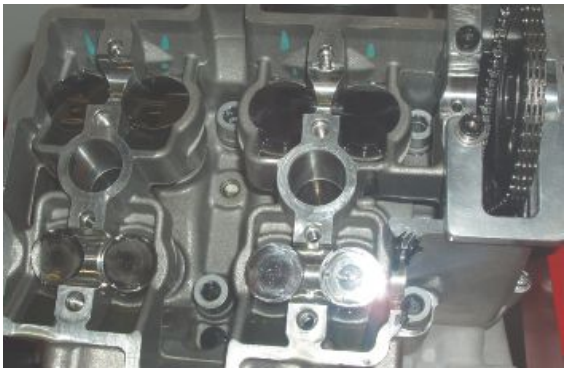
CAUTION

REMOVE THE TAPPET CAREFULLY AS THE PAD MAY FALL INTO THE ENGINE.

- Retrieve the pad and replace with a suitable component to achieve the correct valve clearance.

Refer to the table: "Calibrated pad thicknesses" to identify the suitable thickness.

- Fit the tappet.



See also

Calibrated pad thickness

NOTE

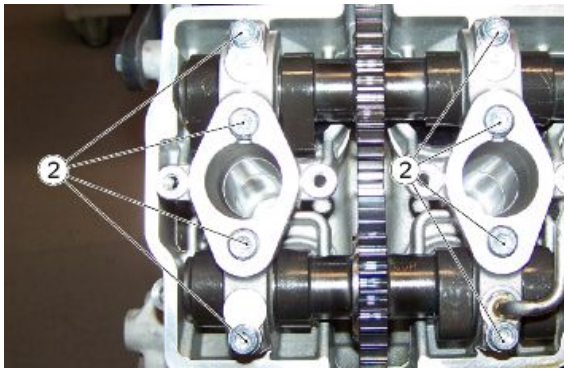
THIS ENGINE HAS CAMSHAFTS OF THE EXHAUST VALVES WITH CLEARANCE RECOVERY.

- Install the intake and exhaust camshafts on the front head, bearing in mind that:

the exhaust camshaft gear tooth (indicated with a dot) is meshed with the trough of the intake camshaft gear (indicated with two dots).

CLEAN THOROUGHLY THE SEATS OF THE GEAR RETAINER SCREWS, ON THE INTAKE CAMSHAFT.

- Fit the U bolts with the nine O rings and locator pins.
- Fit the new washers under the screws (2) near the spark plug holes only.
- Tighten the seven screws (2) operating in stages and diagonally.
- Do not fit the eighth screw (2 - fastening the oil pipe) yet.

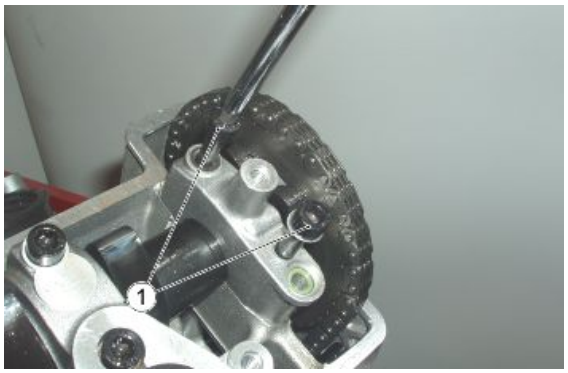


- Move the gear from the mounting tool to the camshaft.
- Unscrew and remove the two screws (1).
- Remove the tool.

Specific tooling

020956Y Support for camshaft gear on head

- Fit the U bolt and the oil pipe.
- Tighten the two U bolt screws (1) and the screw (2) that was not fitted previously.



- Align the intake camshaft with the specific hole on the U bolt.
- Insert the specified pin.

Specific tooling

020851Y Camshaft timing pin

- Apply Loctite 243 thread lock on the thread of the timing gear fastener screw. This screw must be replaced at each reassembly.
- Apply and loosely tighten the gear fixing screw on the camshaft.

- Block crankshaft rotation using one of the specific tools.
- Tighten the gear fixing screw on the camshaft to exactly the torque specified.
- Remove the crankshaft locking tool.

Specific tooling

020850Y Primary gear lock

020914Y Flywheel retainer

- Remove the two crankshaft and camshaft reference pins.
- Turn the crankshaft until the gear screw covered by the head when the hole on the camshaft gear is aligned with the hole on the U bolt, is visible.
- Block crankshaft rotation using one of the specific tools.
- Apply Loctite 243 thread lock on the thread of the second gear fastener screw. This screw must be replaced at each reassembly.
- Tighten the second camshaft gear fixing screw to exactly the torque specified.
- Remove the crankshaft locking tool.

- Turn the crankshaft back to the previous position in which the camshaft and U bolt holes were aligned; insert the reference pin while checking with the crankshaft reference pin, that the flywheel side hole and the hole on the crankshaft are perfectly aligned.
- If this is not the case, repeat the timing operations.

Specific tooling

020851Y Camshaft timing pin

020852Y Crankshaft timing pin

- Check if the clearance between the cam on the shaft and the tappet is correct.
- If not, repeat the valve clearance adjustment procedure.

Rear cylinder head valves

- Check the rear valve head clearance and restore the correct clearance values if necessary, proceeding as described below.
- Remove the rear head cover and the clutch cover.
- Move cylinder piston 1 (left rear piston) to the TDC;
- Turn the crankshaft 450° (one complete turn + 90°) in the direction of motor rotation (direction of travel).

- Insert the pin from the clutch side into the hole in the crankshaft.

NOTE

THE SPECIAL TOOL SHOWN HERE MUST ONLY BE USED FOR IDENTIFYING THE CORRECT POSITION OF THE CRANKSHAFT.
DO NOT USE IT FOR TIGHTENING COMPONENTS.

Specific tooling

020852Y Crankshaft timing pin

See also

Head cover removal
Removing the clutch cover

- Fit the pin for aligning the intake camshaft with the hole on U-bolt.
- If it was not possible before adjusting the valve clearance, check the engine timing.

Specific tooling

020851Y Camshaft timing pin

- Remove the two crankshaft and camshaft reference pins.
- Turn the crankshaft until the gear screw covered by the head when the hole on the camshaft gear is aligned with the hole on the U bolt, is visible.
- Block crankshaft rotation using one of the specific tools.
- Unscrew and remove the camshaft gear screw.
- Remove the crankshaft locking tool.

Specific tooling

020850Y Primary gear lock

020914Y Flywheel retainer

Repeat the following operations:

- move cylinder piston 1 (left rear piston) to TDC;
- turn the crankshaft by 450° (one complete turn + 90°) in the direction of engine rotation (direction of travel) to align the hole on the intake camshaft with the specific hole on the U bolt This ensures that all the rear cylinder bank valve springs are decompressed.
- Refit the camshaft timing setting pin in the hole in the U bolt on the rear head, and refit the crankshaft timing pin from the clutch side, to check that the timing setting was not altered while the engine was turned with only one camshaft drive gear fastener screw in place.
- Remove the camshaft timing pin.
- Unscrew and remove the two U bolt screws (1).
- Remove the U bolt and the oil pipe.

Specific tooling

020851Y Camshaft timing pin

020852Y Crankshaft timing pin

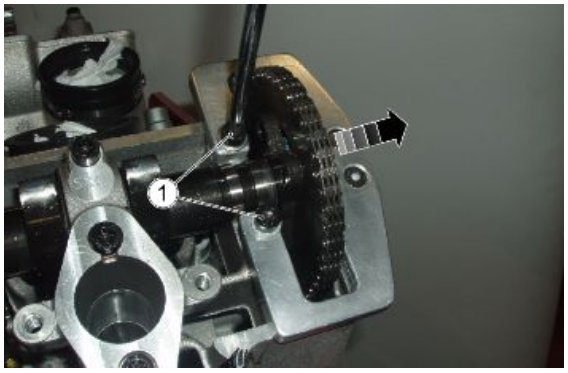
- Block crankshaft rotation using one of the specific tools.
- Unscrew and remove the second intake camshaft gear screw.
- Leave the gear on the camshaft.

Specific tooling

020850Y Primary gear lock

020914Y Flywheel retainer

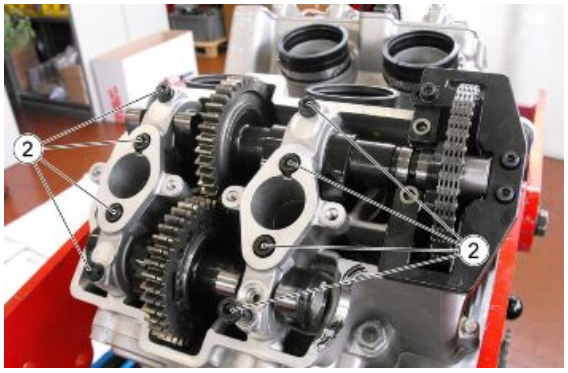
- Install the specific camshaft gear support tool.
- Fix it to the head using the two screws (1).
- Move the gear from the camshaft to the tool.



Specific tooling

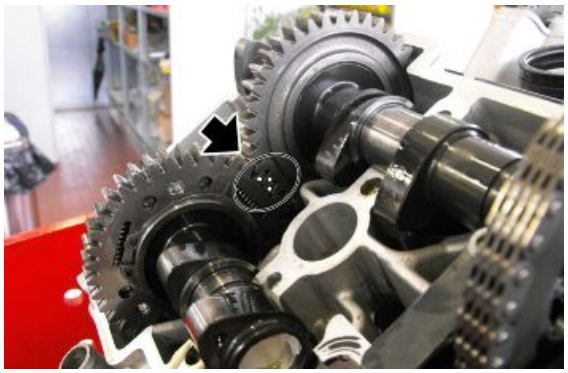
020956Y Support for camshaft gear on head

- Unscrew and remove the eight screws (2), proceeding in stages and diagonally.
- Retrieve the washers from the screws near the spark plug holes.
- Remove the U bolts with the O rings and locator pins.



- Remove the intake and exhaust camshafts.

If the two camshafts are timed correctly, the intake camshaft gear tooth (indicated with one dot) is meshed with the trough of the exhaust camshaft gear (indicated with two dots).



- Use a magnet to remove the tappet.

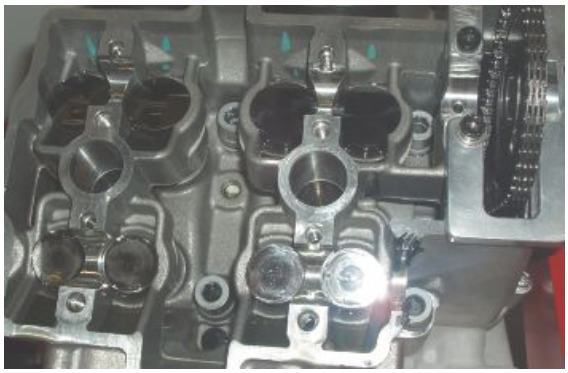
CAUTION

REMOVE THE TAPPET CAREFULLY AS THE PAD MAY FALL INTO THE ENGINE.

- Retrieve the pad and replace with a suitable component to achieve the correct valve clearance.

Refer to the table: "Calibrated pad thicknesses" to identify the suitable thickness.

- Fit the tappet.



See also

Calibrated pad thickness

NOTE

THIS ENGINE HAS CAMSHAFTS OF THE EXHAUST VALVES WITH CLEARANCE RECOVERY.

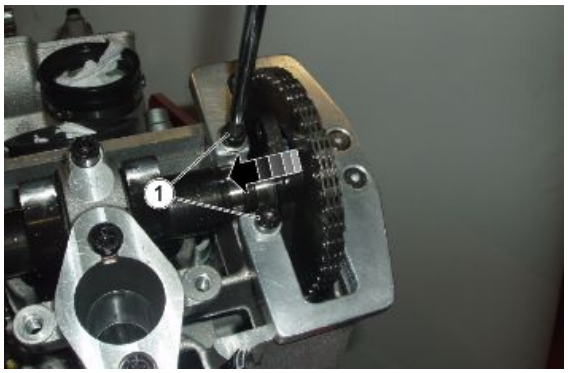
- Install the intake and exhaust camshafts on the rear head, remembering that:

the intake camshaft gear tooth (indicated with a dot) is inserted in the groove of the exhaust camshaft gear (indicated with two dots).

CLEAN THOROUGHLY THE SEATS OF THE GEAR RETAINER SCREWS, ON THE INTAKE CAMSHAFT.

- Fit the U bolts with the nine O rings and locator pins.
- Fit the new washers under the screws (2) near the spark plug holes only.
- Tighten the seven screws (2) operating in stages and diagonally.
- Do not fit the eighth screw (2 - fastening the oil pipe) yet.

- Move the gear from the mounting tool to the camshaft.
- Unscrew and remove the two screws (1).
- Remove the tool.



Specific tooling

020956Y Support for camshaft gear on head

- Fit the U bolt and the oil pipe.
- Tighten the two U bolt screws (1) and the screw (2) that was not fitted previously.

- Align the intake camshaft with the specific hole on the U bolt.
- Insert the specified pin.

Specific tooling

020851Y Camshaft timing pin

- Apply Loctite 243 thread lock on the thread of the timing gear fastener screw. This screw must be replaced at each reassembly.
- Apply and loosely tighten the gear fixing screw on the camshaft.

- Block crankshaft rotation using one of the specific tools.
- Tighten the gear fixing screw on the camshaft to exactly the torque specified.
- Remove the crankshaft locking tool.

Specific tooling

020850Y Primary gear lock

020914Y Flywheel retainer

- Remove the two crankshaft and camshaft reference pins.
- Turn the crankshaft until the gear screw covered by the head when the hole on the camshaft gear is aligned with the hole on the U bolt, is visible.
- Block crankshaft rotation using one of the specific tools.
- Apply Loctite 243 thread lock on the thread of the second gear fastener screw. This screw must be replaced at each reassembly.
- Tighten the second camshaft gear fixing screw to exactly the torque specified.
- Remove the crankshaft locking tool.

- Turn the crankshaft back to the previous position in which the camshaft and U bolt holes were aligned; Refit the reference pin while checking, using the crankshaft reference pin, that the clutch side hole and the hole in the crankshaft are perfectly aligned.
- If this is not the case, repeat the timing operations.

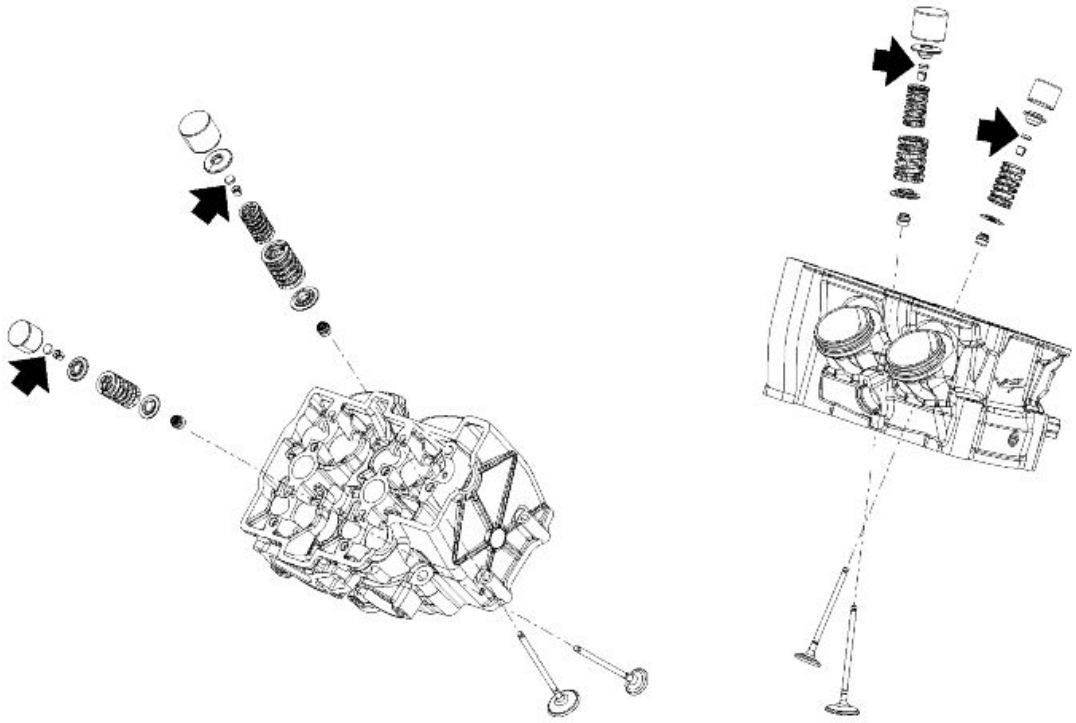
Specific tooling

020851Y Camshaft timing pin

020852Y Crankshaft timing pin

- Check if the clearance between the cam on the shaft and the tappet is correct.
- If not, repeat the valve clearance adjustment procedure.

Calibrated pad thickness



Pad thicknesses for adjusting valve clearance correctly:

1.75 mm (0.0689 in)

1.77 mm (0.0697 in)

1.80 mm (0.0709 in)

1.82 mm (0.0716 in)

1.85 mm (0.0728 in)

1.87 mm (0.0736 in)

1.90 mm (0.0748 in)

1.92 mm (0.0756 in)

1.95 mm (0.0768 in)

1.97 mm (0.0775 in)

2 mm (0.0787 in)

2.02 mm (0.0795 in)

2.05 mm (0.0807 in)

2.07 mm (0.0815 in)

2.1 mm (0.0827 in)

2.12 mm (0.0835 in)

2.15 mm (0.0846 in)

2.17 mm (0.0854 in)

2.2 mm (0.0866 in)

2.22 mm (0.0874 in)

2.25 mm (0.0886 in)
2.27 mm (0.0894 in)
2.3 mm (0.0905 in)
2.32 mm (0.0913 in)
2.35 mm (0.0925 in)
2.37 mm (0.0933 in)
2.4 mm (0.0945 in)
2.42 mm (0.0953 in)
2.45 mm (0.0964 in)
2.47 mm (0.0972 in)
2.50 mm (0.0984 in)
2.52 mm (0.0992 in)
2.55 mm (0.1004 in)
2.57 mm (0.1012 in)
2.6 mm (0.1024 in)
2.62 mm (0.1031 in)
2.65 mm (0.1043 in)
2.67 mm (0.1051 in)
2.7 mm (0.1063 in)
2.72 mm (0.1071 in)
2.75 mm (0.1083 in)
2.77 mm (0.1090 in)
2.8 mm (0.1102 in)
2.82 mm (0.1110 in)
2.85 mm (0.1122 in)
2.87 mm (0.1129 in)
2.9 mm (0.1142 in)
2.92 mm (0.1150 in)
2.95 mm (0.1161 in)
2.97 mm (0.1169 in)
3 mm (0.1181 in)
3.02 mm (0.1189 in)
3.05 mm (0.1201 in)
3.07 mm (0.1209 in)
3.10 mm (0.1220 in)
3.12 mm (0.1228 in)
3.15 mm (0.1240 in)

INDEX OF TOPICS

TROUBLESHOOTING	TROUBL

TROUBLESHOOTING PROCEDURE IN THE EVENT THAT THE EFI INDICATOR LIGHT SHOULD APPEAR ON THE INSTRUMENT PANEL OR IN THE CASE OF ABNORMAL ENGINE BEHAVIOUR

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.

- 1 - THE "EFI" WARNING LIGHT IS ON AND THE WORD "SERVICE" IS SHOWN or THE "EFI" WARNING LIGHT IS FLASHING AND THE WORDS "URGENT SERVICE" ARE SHOWN or ONE OF THE TWO SITUATIONS TAKES PLACE AND IS SUDDENLY OUT or THERE IS ABNORMAL ENGINE PERFORMANCE
- 2 - CONNECT TO THE DIAGNOSIS INSTRUMENT THROUGH CONTROL UNIT BY SELECTING "SELF-ACQUISITION, APRILIA, RSV4"
- 3 - ARE CURRENT- "ATT"- or STORED- "MEM"- ERRORS SHOWN IN THE "ERRORS DISPLAY" SCREEN PAGE?

YES, go to 4; NO, go to 11.

- 4 - IF THE ERROR IN THE CENTRAL WINDOW IS SELECTED AND "?" IS DISPLAYED, PRESS THE KEY "?" TO OBTAIN FURTHER INFORMATION ABOUT THE ERROR. THEN GO TO THE "ELECTRICAL SYSTEM/CHECKS AND CONTROLS" CHAPTER AND READ THE INFORMATION CONCERNING THE DEFECTIVE COMPONENT
- 5 - ACCORDING TO WHAT IS INDICATED ABOUT THE ERROR/S, PROCEED AS SUGGESTED AND SOLVE THE PROBLEM
- 6 - WAS THE PROBLEM SOLVED BY REPLACING THE MARELLI CONTROL UNIT?

YES, go to 7; NO, go to 8.

- 7 - READ THE ACTIVATION PROCEDURE FOR A NEW CONTROL UNIT ON THE "ELECTRICAL SYSTEM/CHECKS AND CONTROLS/ECU/MARELLI CONTROL UNIT" CHAPTER - END
- 8 - SELECT "ERROR CLEARING" FROM THE "DEVICES ACTIVATION (INJECTOR ICON)" SCREEN PAGE
- 9 - WAS THE PROBLEM SOLVED BY REPLACING THE THROTTLE GRIP SENSOR (DEMAND) OR THE THROTTLE BODY?

NO, END; YES, go to 10

- 10 - READ THE RESET PROCEDURE ON THE "ELECTRICAL SYSTEM/CHECKS AND CONTROLS/THROTTLE GRIP POSITION SENSOR OR THROTTLE BODY" CHAPTER - END
- 11 - CHECK IF THERE ARE CURRENT OR STORED ERRORS DETECTED BY THE INSTRUMENT PANEL REFERRING TO THE "DIAGNOSIS" CHAPTER, "INSTRUMENT

PANEL ERRORS" SECTION. IF THERE ARE ERRORS PRESENT, SOLVE THE FAULT AND SELECT "CLEAR ERRORS"; IF THERE ARE NO ERRORS PRESENT, go to 12

- 12 - IN THE "ENGINE PARAMETER READING" SCREEN PAGE, DOES THE "AIR TEMPERATURE" PARAMETER INDICATE A VALUE EQUIVALENT TO ROOM TEMPERATURE?

YES, go to 13; NO, note A

- 13 - IN THE "ENGINE PARAMETER READING" SCREEN PAGE, DOES THE ENGINE TEMPERATURE PARAMETER WITH COLD ENGINE INDICATE A VALUE SIMILAR TO THAT OF THE AIR TEMPERATURE PARAMETER? AFTER STARTING THE ENGINE, DOES THE PARAMETER INCREASE GRADUALLY INDICATING A CORRECT VALUE?

YES, go to 14; NO, note B

- 14 - IN THE "ENGINE PARAMETER READING" AND THE "LAMBDA CORRECTION" SCREEN PAGES, WITH ENGINE AT IDLE AND ENGINE TEMPERATURE AT > 65°C, DOES THE VALUE VARY WITHIN THE 0.85 - 1.15 RANGE?

YES, go to 15; NO, note C

- 15 - IN THE "ENGINE PARAMETER READING" WITH ENGINE AT IDLE AND ENGINE TEMPERATURE >65°c, "FRONT THROTTLE CORRECTION" OR "REAR THROTTLE CORRECTION", WITH ENGINE AT IDLE, ARE THE PARAMETERS INCLUDED WITHIN (-0.8° - +0.8°) INTERVAL? AND IN THE SAME SCREEN PAGE, ARE THE "FRONT THROT., POT. 1 (DEGREES)" AND " "REAR THROT., POT. 1 (DEGREES)", WITH ENGINE AT IDLE, > OR = A 0.5°? CAUTION: THE DIFFERENCE OF THE THROTTLE CORRECTION VALUES BETWEEN THE REAR AND FRONT CYLINDER MUST NOT BE >1°

YES, go to 16; NO, note D

- 16 - CHECK: ENGINE SPEED SENSOR, FUEL PRESSURE, INJECTORS (MECHANICAL OPERATION), COILS (SPARK), ENGINE MECHANICS - END

Note A: SEE THE CHAPTER TITLED " ELECTRICAL SYSTEM/CHECKS AND INSPECTIONS/AIR TEMPERATURE SENSOR".

Note B: SEE THE CHAPTER TITLED " ELECTRICAL SYSTEM/CHECKS AND INSPECTIONS/ENGINE TEMPERATURE SENSOR".

Note C: SEE THE CHAPTER TITLED " ELECTRICAL SYSTEM/CHECKS AND INSPECTIONS/ LAMBDA PROBE".

Note D: SEE THE CHAPTER TITLED " ELECTRICAL SYSTEM/CHECKS AND INSPECTIONS/ THROTTLE BODY".

See also

Checks and inspections

The engine does not start

THE ENGINE DOES NOT START, THE INSTRUMENT PANEL TURNS ON.

CAUTION

AXONE SHOULD BE WORKING PROPERLY AND UPGRADED AT LEAST TO THE 7.0.0 VERSION OR THE PGDS UPDATED AT LEAST TO THE 3.0.0 VERSION

CAUTION

BEFORE STARTING THE TROUBLESHOOTING PROCEDURE, MAKE SURE THAT:
1) THE BATTERY VOLTAGE IS GREATER THAN 12V;
2) THE MAIN, 30 A FUSE IS INTACT AND INSERTED CORRECTLY;
3) THE SECONDARY FUSES ARE INTACT AND INSERTED CORRECTLY.

NOTE

THE NUMBER OF THE INDICATED RELAY REFERS TO THE ELECTRICAL CIRCUIT DIAGRAM. THE POSITION OF THE RELAY ON THE VEHICLE IS INDICATED IN THE CHAPTER "ELECTRICAL SYSTEM/COMPONENT LAYOUT/RELAY LAYOUT".

- 1- WHEN THE IGNITION KEY IS TURNED TO THE "ON" POSITION, THE INSTRUMENT CLUSTER SWITCHES ON AND, WHILE NO "SERVICE" OR "URGENT SERVICE" MALFUNCTION INDICATIONS ARE PRESENT, THE MESSAGE ECU and CURRENT SOCKET DISCONNECTED APPEAR AT THE BOTTOM OF THE PANEL?

  If YES, go to the CONTROL UNIT POWER SUPPLY CHECK; NO, go to point 2

- 2. IS THE FUEL PUMP RUNNING?

  YES, go to point 3; NO, go to the FUEL PUMP CHECK

- 3. DOES THE DIAGNOSTIC TOOL COMMUNICATE WITH THE CONTROL UNIT? IN OTHER WORDS: AFTER SELECTING FUEL IN INJECTION AND PERFORMING THE SUBSEQUENT INSTRUCTIONS, ARE THE PARAMETERS, STATES ETC. DISPLAYED WHEN THE IGNITION KEY IS TURNED TO THE "ON" POSITION?

  YES, go to point 4; NO, go to the DIAGNOSTIC TOOL CONNECTION CHECK

- 4. USING THE DIAGNOSTIC TOOL ("DEVICE ACTIVATION" PAGE, INJECTOR ICON) ACTIVATE ONE OF THE LOWER INJECTORS (WE RECOMMEND DISCONNECTING THE 4 PIN BLACK FUEL PUMP CONNECTOR ON THE LEFT HAND SIDE): IS THE INJECTOR ACTIVATED?

  YES, go to point 5, NO, go to the INJECTION RELAY CHECK 33

5. DOES THE STARTER MOTOR STAR RUNNING WHEN THE STARTER BUTTON IS PRESSED?

YES, SEE THE CHAPTER "ELECTRICAL SYSTEM/CHECKS AND CONTROLS/ENGINE RPM SENSOR" and, if the sensors function correctly, go to point 16; NO, go to point 6

- 6. WHAT DOES THE "START ENABLE" STATE ICON ON THE DIAGNOSTIC TOOL DEVICE STATES PAGE INDICATE, ICON 0/1?

  SI', go to the STARTER BUTTON CHECK; NO, go to point 7

- 7. WHAT DOES THE "TIP-OVER SENSOR" STATE ICON ON THE DIAGNOSTIC TOOL DEVICE STATES PAGE INDICATE, ICON 0/1?

If it indicates the NORMAL state, go to point 8, if it indicates TIP OVER, go to point 12

- 8. WHEN THE PUSH-BUTTON IS IN THE "RUN" POSITION, WHAT DOES THE "RUN-STOP SWITCH" STATE ICON ON THE DIAGNOSTIC TOOL DEVICE STATES PAGE INDICATE, ICON 0/1?

If it indicates the "RUN" state, go to point 9, if it indicates "STOP", go to point 15

- 9. USING THE DIAGNOSTIC TOOL, CHECK THAT THE SIDE STAND, NEUTRAL SENSOR, CLUTCH SENSOR FUNCTION CORRECTLY: OPERATE EACH DEVICE AND CHECK THAT ICON 0/1 ON THE DEVICE STATES PAGE INDICATES THE CORRECT STATE.

In the event of a fault condition, go to point 10, if everything functions correctly, go to point 11

- 10. DEPENDING ON THE SPECIFIC FAULT, SEE CHAPTER "ELECTRICAL SYSTEM, CHECKS AND CONTROLS/NEUTRAL SENSOR" or "ELECTRICAL SYSTEM, CHECKS AND CONTROLS/GEAR SENSOR" or "ELECTRICAL SYSTEM, CHECKS AND CONTROLS/SIDE STAND" - END
- 11. REPLACE THE CONTROL UNIT - END
- 12. IS THE SENSOR IN THE FRONT, INTERNAL RECESS ON THE FRAME POSITIONED VERTICALLY?

YES, go to point 13; NO, go to point 14

- 13. SEE CHAPTER "ELECTRICAL SYSTEM/CHECKS AND CONTROLS/TIP OVER SENSOR, INDICATION ON DIAGNOSTIC TOOL PERMANENTLY "TIP OVER" - END
- 14. POSITION THE SENSOR CORRECTLY-FINE
- 15. SEE CHAPTER "ELECTRICAL SYSTEM/CHECKS AND CONTROLS/RUN-STOP SWITCH, INDICATION ON DIAGNOSTIC TOOL PERMANENTLY "TIP OVER" - END
- 16. CHECK THE FUEL SUPPLY CIRCUIT PRESSURE AND THE MECHANICAL OPERATION OF THE ENGINE - END

See also

Engine rpm sensor
Neutral sensor

THE ENGINE DOES NOT START, THE INSTRUMENT CLUSTER IS ILLUMINATED.

CAUTION

MAKE SURE THAT THE DIAGNOSTIC TOOL FUNCTIONS CORRECTLY AND HAS UPDATED TO AT LEAST VERSION 7.0.0 OR THAT THE PGDS HAS BEEN UPDATED TO AT LEAST VERSION 3.0.0

CAUTION

BEFORE STARTING THE TROUBLESHOOTING PROCEDURE, MAKE SURE THAT:
1) THE BATTERY VOLTAGE IS GREATER THAN 12V;
2) THE MAIN, 30 A FUSE IS INTACT AND INSERTED CORRECTLY;
3) THE SECONDARY FUSES ARE INTACT AND INSERTED CORRECTLY.

NOTE

THE NUMBER OF THE INDICATED RELAY REFERS TO THE ELECTRICAL CIRCUIT DIAGRAM. THE POSITION OF THE RELAY ON THE VEHICLE IS INDICATED IN THE CHAPTER "ELECTRICAL SYSTEM/COMPONENT LAYOUT/RELAY LAYOUT".

- 1- WHEN THE IGNITION KEY IS TURNED TO THE "ON" POSITION, THE INSTRUMENT CLUSTER SWITCHES ON AND, WHILE NO "SERVICE" OR "URGENT SERVICE" MALFUNCTION INDICATIONS ARE PRESENT, THE MESSAGE ECU and CURRENT SOCKET DISCONNECTED APPEAR AT THE BOTTOM OF THE PANEL?

If YES, go to the CONTROL UNIT POWER SUPPLY CHECK; NO, go to point 2

- 2. IS THE FUEL PUMP RUNNING?

YES, go to point 3; NO, go to the FUEL PUMP CHECK

- 3. DOES THE DIAGNOSTIC TOOL COMMUNICATE WITH THE CONTROL UNIT? IN OTHER WORDS: AFTER SELECTING FUEL IN INJECTION AND PERFORMING THE SUBSEQUENT INSTRUCTIONS, ARE THE PARAMETERS, STATES ETC. DISPLAYED WHEN THE IGNITION KEY IS TURNED TO THE "ON" POSITION?

YES, go to point 4; NO, go to the DIAGNOSTIC TOOL CONNECTION CHECK

- 4. USING THE DIAGNOSTIC TOOL ("DEVICE ACTIVATION" PAGE, INJECTOR ICON) ACTIVATE ONE OF THE LOWER INJECTORS (WE RECOMMEND DISCONNECTING THE 4 PIN BLACK FUEL PUMP CONNECTOR ON THE LEFT HAND SIDE): IS THE INJECTOR ACTIVATED?

YES, go to point 5, NO, go to the INJECTION RELAY CHECK 33

5. DOES THE STARTER MOTOR STAR RUNNING WHEN THE STARTER BUTTON IS PRESSED?

YES, SEE THE CHAPTER "ELECTRICAL SYSTEM/CHECKS AND CONTROLS/ENGINE RPM SENSOR" and, if the sensors function correctly, go to point 16; NO, go to point 6

- 6. WHAT DOES THE "START ENABLE" STATE ICON ON THE DIAGNOSTIC TOOL DEVICE STATES PAGE INDICATE, ICON 0/1?

SI', go to the STARTER BUTTON CHECK; NO, go to point 7

- 7. WHAT DOES THE "TIP-OVER SENSOR" STATE ICON ON THE DIAGNOSTIC TOOL DEVICE STATES PAGE INDICATE, ICON 0/1?

If it indicates the NORMAL state, go to point 8, if it indicates TIP OVER, go to point 12

- 8. WHEN THE PUSH-BUTTON IS IN THE "RUN" POSITION, WHAT DOES THE "RUN-STOP SWITCH" STATE ICON ON THE DIAGNOSTIC TOOL DEVICE STATES PAGE INDICATE, ICON 0/1?

If it indicates the "RUN" state, go to point 9, if it indicates "STOP", go to point 15

- 9. USING THE DIAGNOSTIC TOOL, CHECK THAT THE SIDE STAND, NEUTRAL SENSOR, CLUTCH SENSOR FUNCTION CORRECTLY: OPERATE EACH DEVICE AND

CHECK THAT ICON 0/1 ON THE DEVICE STATES PAGE INDICATES THE CORRECT STATE.

In the event of a fault condition, go to point 10, if everything functions correctly, go to point 11

- 10. DEPENDING ON THE SPECIFIC FAULT, SEE CHAPTER "ELECTRICAL SYSTEM, CHECKS AND CONTROLS/NEUTRAL SENSOR" or "ELECTRICAL SYSTEM, CHECKS AND CONTROLS/GEAR SENSOR" or "ELECTRICAL SYSTEM, CHECKS AND CONTROLS/SIDE STAND" - END
- 11. REPLACE THE CONTROL UNIT - END
- 12. IS THE SENSOR IN THE FRONT, INTERNAL RECESS ON THE FRAME POSITIONED VERTICALLY?

YES, go to point 13; NO, go to point 14

- 13. SEE CHAPTER "ELECTRICAL SYSTEM/CHECKS AND CONTROLS/TIP OVER SENSOR, INDICATION ON DIAGNOSTIC TOOL PERMANENTLY "TIP OVER" - END
- 14. POSITION THE SENSOR CORRECTLY-FINE
- 15. SEE CHAPTER "ELECTRICAL SYSTEM/CHECKS AND CONTROLS/RUN-STOP SWITCH, INDICATION ON DIAGNOSTIC TOOL PERMANENTLY "TIP OVER" - END
- 16. CHECK THE FUEL SUPPLY CIRCUIT PRESSURE AND THE MECHANICAL OPERATION OF THE ENGINE - END

See also

Engine rpm sensor
Neutral sensor

CHECK CONTROL UNIT POWER SUPPLY

- 1. WITH THE KEY TURNED TO "OFF" CHECK IF THERE IS BATTERY VOLTAGE AT PIN 52 OF THE CONTROL UNIT, CABLE HARNESS SIDE

YES, go to 2; NO, go to 5

- 2. WITH THE KEY TURNED TO "ON" THERE IS BATTERY VOLTAGE AT PIN 40 OF THE CONTROL UNIT, CABLE HARNESS SIDE (IN CASE OF LACK OF POWER SUPPLY ON PIN 42, "URGENT SERVICE" TURNS ON IN THE INSTRUMENT PANEL AND THE CONTROL UNIT INDICATES ERRORS RELATED TO THE FRONT AND REAR THROTTLE BODY)

YES, go to 3; NO, go to 6

- 3. CHECK CONTINUITY WITH GROUND CONNECTION AT PIN 5 and 16

If there is continuity, go to 4; if there is not continuity, restore ground connection on the engine front part or restore cable harness

- 4. REPLACE CONTROL UNIT, SEE "ELECTRICAL SYSTEM/CHECK AND CONTROLS/ CONTROL UNIT " THE PART RELATED TO NEW CONTROL UNIT ACTIVATION PROCEDURE - END
- 5. CHECK CONTINUITY red/blue CABLE up to secondary fuse D and red/white cable from secondary fuse to 30 A main fuse CHECKING ALSO THE ENGINE - VEHICLE CABLE HARNESS CONNECTOR - END
- 6. CHECK CONTINUITY OF RED/BROWN CABLE FROM PIN 40 TO PROTECTION RELAY 19 CHECKING ENGINE - VEHICLE ELECTRICAL SYSTEM CONNECTOR

If there is continuity, go to PROTECTION RELAY 19 CHECK; if there is not continuity, restore cable harness - END

See also

Control unit

CHECK FUEL PUMP

- 1. WITH KEY SET TO "ON", DISCONNECT THE CONNECTOR AND CHECK THAT THERE IS BATTERY VOLTAGE ON PIN 1

YES, go to 2; NO, go to 4

- 2. CHECK FUEL PUMP CONNECTOR AND CHECK THAT AT PIN 2 THERE IS GROUND CONTINUITY

YES, go to 3; NO, go to 5

- 3. CHECK ON CONNECTOR ON THE PUMP SIDE, THE ELECTRICAL CHARACTERISTICS: between PIN 1 and PIN 2 there should be a resistance of 0.5 - 1 ohm - END
- 4. CHECK CONTINUITY OF ORANGE/GREEN CABLE FROM PUMP CONNECTOR TO INJECTION RELAY 33 AND RESTORE CABLE HARNESS - END
- 5. RESTORE GROUND CONNECTION - END

DIAGNOSIS INSTRUMENT CONNECTION CHECK

- 1. CHECK CONTINUITY OF WHITE/BLUE CABLE FROM PIN 14 OF THE CONTROL UNIT ON CABLE HARNESS SIDE TO PIN 3 OF THE BLACK CONNECTOR OF THE DIAGNOSIS

YES, go to 2; NO, go to 4

- 2. CHECK THE CONTROL UNIT CONNECTOR AS WELL AS THE DIAGNOSIS BLACK CONNECTOR

YES, go to 3; NO, restore faulty connector - END

- 3. CHECK CORRECT OPERATION OF THE DIAGNOSIS INSTRUMENT CONNECTION CABLE AND THE CORRECT INSTALLATION OF THE PLIERS ON THE BATTERY - END

- 4. CHECK ENGINE CABLE HARNESS - VEHICLE CABLE HARNESS CONNECTOR - END

INJECTION RELAY 33 CHECK

- 1. CHECK CONTINUITY OF THE ORANGE/GREEN CABLE FROM THE LOWER INJECTOR AT PIN 3 OF THE INJECTION RELAY 33, ALSO CHECKING THE ENGINE CABLE HARNESS - VEHICLE CABLE HARNESS CONNECTOR AND THE INJECTION RELAY CONNECTOR

If there is continuity, go to 2; if there is not continuity, restore cable harness - END

- 2. WITH KEY SET TO "ON" IS THERE VOLTAGE ON RED/BROWN CABLE OF THE INJECTION RELAY CONNECTOR, ON THE CABLE HARNESS SIDE?

YES, go to 3; NO, go to 6

- 3. WITH KEY SET TO "ON" IS THERE VOLTAGE ON ORANGE CABLE OF THE INJECTION RELAY CONNECTOR, ON THE CABLE HARNESS SIDE?

YES, go to 4; NO, go to 7

- 4. CHECK CORRECT OPERATION OF THE RELAY, THAT IS, PROVIDING VOLTAGE ON THE CORRESPONDING PIN TO THE RED/BROWN CABLE AND GROUND ON SPECIFIC PIN TO THE BROWN/BLACK CABLE IS THERE CONTINUITY BETWEEN THE OTHER TWO RELAY PINS?

YES, go to 5; NO, replace the relay - END

- 5. REPLACE THE CONTROL UNIT - END
- 6. CHECK CONTINUITY OF RED/BROWN CABLE FROM THE INJECTION RELAY 33 TO THE PROTECTION RELAY 19

If there is continuity, go to PROTECTION RELAY 19 CHECK; if there is not continuity, restore cable harness - END

- 7. CHECK CONTINUITY OF THE CABLE FROM THE INJECTION RELAY 33 TO THE PROTECTION RELAY 19: ORANGE (BETWEEN RELAY 33 AND FUSE F) and RED/BROWN (BETWEEN FUSE RELAY F AND RELAY 19)

If there is continuity, go to PROTECTION RELAY 19 CHECK; if there is not continuity, restore cable harness - END

PROTECTION RELAY 19 CHECK

- 1. WITH KEY SET TO OFF, DISCONNECT THE RELAY CONNECTOR AND CHECK CONTINUITY OF BLUE CABLE WITH GROUND

If there is continuity, go to 2; if there is not continuity, restore cable harness - END

- 2. WITH KEY SET TO OFF, DISCONNECT THE RELAY CONNECTOR AND CHECK IF THERE IS VOLTAGE ON RED/WHITE CABLE

YES, go to 3; NO, restore the cable harness - END

- 3. CHECK CORRECT OPERATION OF THE RELAY, THAT IS, PROVIDING VOLTAGE ON CORRESPONDING PIN TO THE GREEN/BLUE CABLE AND GROUND ON SPECIFIC PIN TO THE BLUE CABLE IS THERE CONTINUITY BETWEEN THE OTHER TWO RELAY PINS?

YES, go to 4; NO, replace the relay - END

- 4. CHECK CONTINUITY OF THE GREEN/BLUE CABLE FROM THE KEY CONNECTOR AT PIN 3 OF THE RELAY CHECKING ALSO THE KEY SWITCH CONNECTOR AND RELAY CONNECTOR

If there is continuity, go to 5; if there is not continuity, restore cable harness - END

- 5. WITH KEY SET TO OFF, CHECK IF THERE IS VOLTAGE ON RED/WHITE CABLE ON THE KEY SWITCH CONNECTOR

YES, go to 6; NO, restore the cable harness - END

- 6. WITH KEY SET TO ON AND CONNECTOR DISCONNECTED, CHECK ON THE SWITCH SIDE IF THERE IS LACK OF CONTINUITY BETWEEN THE TWO PINS CORRESPONDING TO THE RED/WHITE CABLE AND GREEN BLUE AND REPLACE THE KEY SWITCH- END

STARTER BUTTON CHECK

- 1. WITH KEY SET TO "ON" DISCONNECT THE SWITCH CONNECTOR (4-ways black, inside the bow) AND CHECK IF THERE IS VOLTAGE + 5V ON PIN 2 ON THE CABLE HARNESS SIDE

YES, go to 2; NO, go to 5

- 2. WITH CONNECTOR DISCONNECTED (4-ways black, inside the bow) CHECK IF THERE IS GROUND CONNECTION ON PIN 3, ON THE CABLE HARNESS SIDE

YES, go to 3; NO, go to 6

- 3. CHECK WITH CONNECTOR DISCONNECTED (4-ways black, inside the bow) ON THE SWITCH SIDE, PUSHING THE SWITCH, IF THERE IS CONTINUITY BETWEEN PIN 2 AND PIN 3

YES, go to 4; NO, go to 7

- 4. REPLACE THE CONTROL UNIT - END

- 5. CHECK CONTINUITY OF PINK CABLE BETWEEN SWITCH CONNECTOR AND PIN 58 OF THE CONTROL UNIT, CHECKING ALSO THE ENGINE - VEHICLE CABLE HARNESS CONNECTOR

  YES, go to 4; NO, restore the cable harness - END

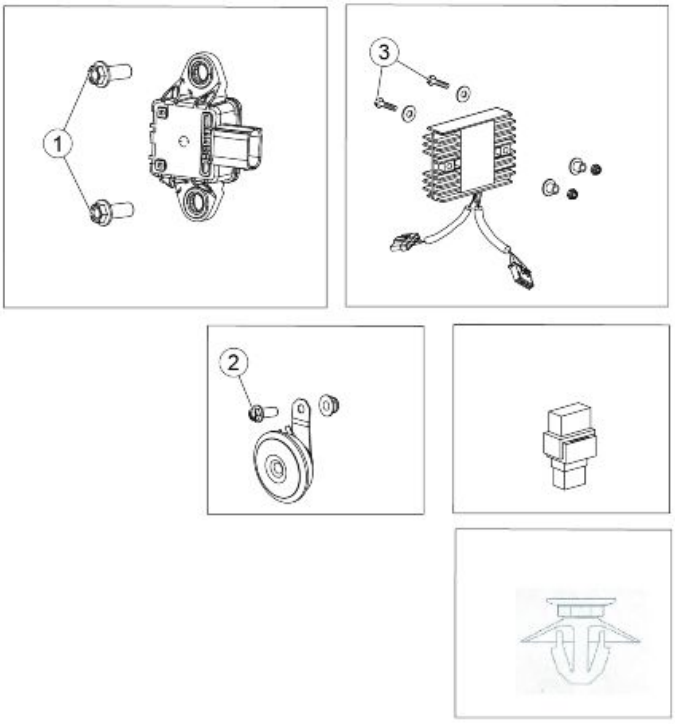
- 6. CHECK CONTINUITY OF PINK/BLACK CABLE BETWEEN SWITCH CONNECTOR AND PIN 4 OF THE CONTROL UNIT, CHECKING ALSO THE ENGINE - VEHICLE CABLE HARNESS CONNECTOR

  YES, go to 4; NO, restore the cable harness - END

- 7. REPLACE THE STARTER BUTTON COMPONENT - END

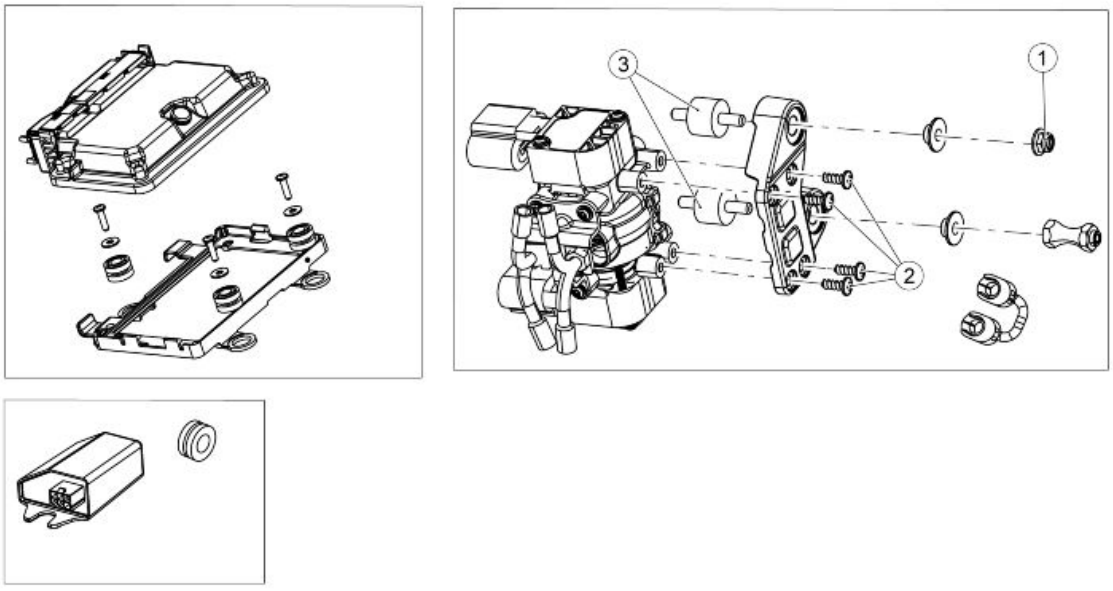
INDEX OF TOPICS

ELECTRICAL SYSTEM	ELE SYS



FRONT ELECTRICAL SYSTEM

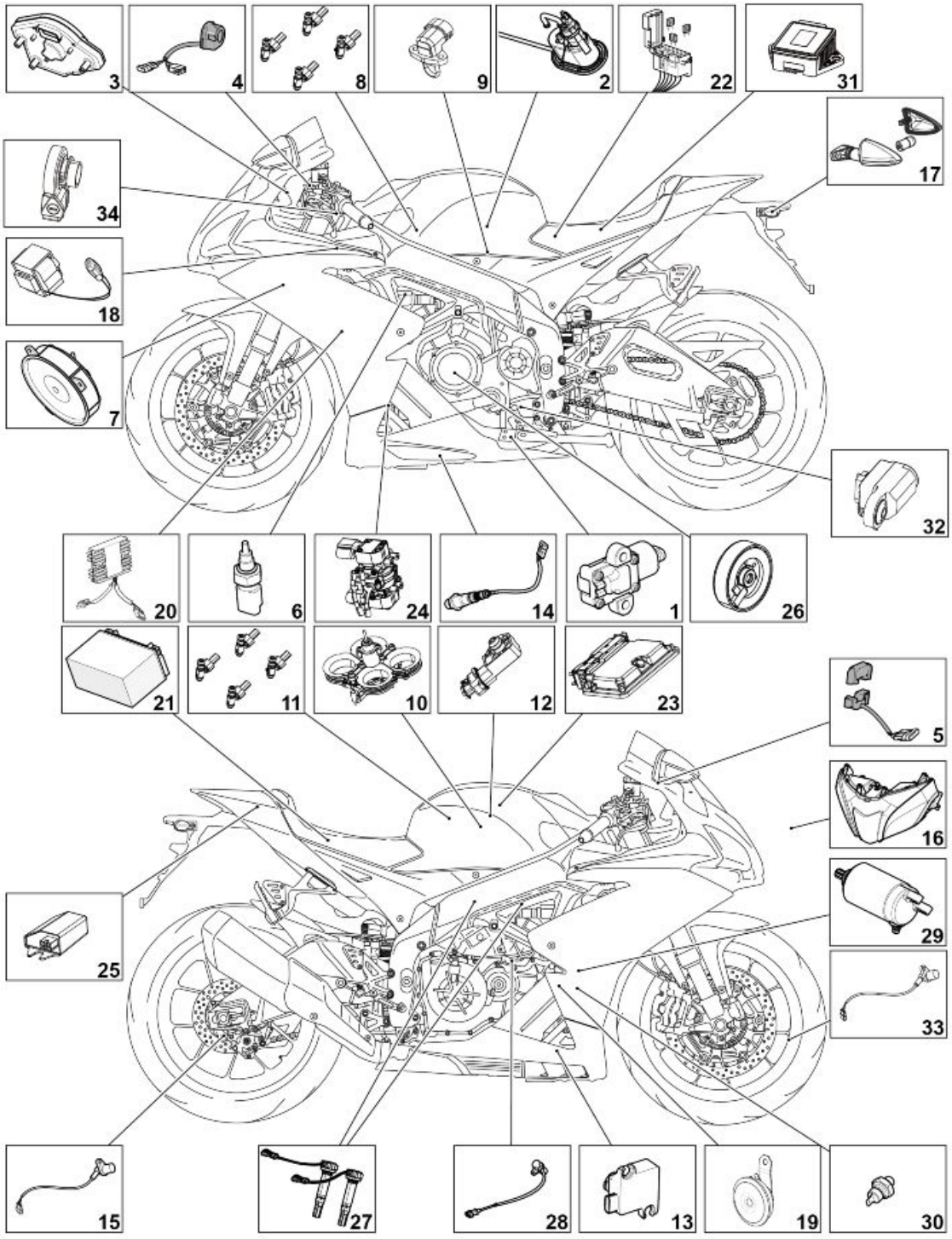
pos.	Description	Type	Quantity	Torque	Notes
1	Fall sensor mounting fixing screws	M6x16	2	8 Nm (5.90 lb ft)	-
2	Horn fixing screw	M8	1	15 Nm (11.06 lb ft)	-
3	Screw fastening the voltage regulator to the inner fairing	M6	2	6 Nm (4.43 lb ft)	-



CENTRAL ELECTRICAL SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Upper Silentblock nut, demand sensor mounting bracket	M6	1	5 Nm (3.69 lb ft)	-
2	Demand sensor fixing screw to mounting plate	SWP 4.9	4	1.5 Nm (1.11 lb ft)	-
3	Silent block support bracket demand sensor	M6	2	Manual	Loctite 243 (only to chassis)

Components arrangement



key:

1. Side stand sensor
2. Fuel pump
3. Instrument panel
4. Left hand switch
5. Right hand switch
6. Water temperature sensor
7. Cooling fans
8. Upper injectors
9. Air temperature sensor
10. Intake ducts
11. Lower injectors
12. Air pressure sensor
13. Exhaust valve
14. Lambda probe
15. Speed sensor
16. Headlamp
17. Rear turn indicators
18. Fall sensor
19. Horn
20. Voltage regulator
21. Battery
22. Auxiliary fuses
23. Control unit
24. Throttle grip position sensor
25. Intake ducts connector control unit
26. Alternator
27. Coils
28. Timing sensor
29. Starter motor
30. Oil pressure sensor
31. Inertia sensor platform
32. Quick Shift
33. Front tone wheel sensor
34. a-PRC controls
35. ABS 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

Component position in the electrical circuit diagram	Component name	Location on the vehicle
10	Low beam lights relay	Front part of the top fairing
9	High beam lights relay	Front part of the top fairing
31	Start-up relay	Under rear tail fairing
19	Protection relay	Under the saddle next to the battery, left side
33	Injection relay	Under the saddle near the battery, right side
36	Fan control relay	In the headstock niche, on the left
25	Recovery logic relay (urgent service)	In the headstock niche, on the right

Electrical system installation

Scope and applicability

This document aims at defining the cable harness routing in order to achieve the vehicle reliability targets.

Materials used and corresponding quantities

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

- 1 Vehicle cable harness
- 1 Headlamp cable harness
- 1 License Plate Cable Harness
- 1 Positive battery cable
- 1 Battery - engine ground cable
- 1 Ignition switch
- 2 ABS speed sensor
- 1 Start-up relay
- 5 Relay
- 1 Protection relay
- 1 Horn
- 1 Headlamp
- 1 Taillight
- 1 Instrument panel
- 1 RH rear-view mirror with turn indicator.
- 1 LH rear-view mirror with turn indicator.
- 1 Rear right turn indicator (LED)
- 1 Rear left turn indicator (LED)
- 1 Fuel pump unit
- 1 Stand switch
- 1 Exhaust valve actuator

- 2 Lambda probe
- 2 Fan
- 1 Regulator
- 1 Demand sensor
- 1 YT12A-BS battery
- 1 SensorBox
- 1 QuickShift

Small parts and mountings

- 10 290x4 Large black clamps
- 12 160x2.5 Small black clamps
- 5 Rubber clamps
- 2 TBEI M6x30 screw
- 1 flanged TE 6x16 screw
- 1 M6x15 flanged screw
- 2 M5x8 screw
- 1 TE M6x30 screw
- 1 M6 nut
- 2 Flanged self-locking M6 nuts
- 7 Cable grommets
- 4 W Cable grommets
- 3 Cable guide
- 5 Relay socket rubber ring
- 4 Rubber ring
- 1 AMP Superseal connector mounting
- 1 Relay/fall sensor mounting
- 1 Battery mounting bracket (YT12A-BS)
- 4 T-shaped bushings
- 2 6.6x18x1.6 Washer
- 2 Washer
- 2 Spacer
- 1 Heat-protecting cover
- 1 Clamp
- 2 Clamp for edges

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

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

- Instrument panel connector (is engaged and the boot well inserted
- Demand sensor connectors
- Start-up relay connector
- Front speed sensor connector
- Rear speed sensor connector
- Check correct closure of ABS control unit connector
- Safety relay connector
- Protection relay connector
- Injection relay connector
- Taillight connector
- Fuel pump connector
- Exhaust valve actuator connector
- Engine-vehicle interface connector
- Flywheel connector
- Regulator connector
- Fan connectors
- Starter motor eyelet
- Stand switch connector
- Right handlebar control connector
- Left handlebar control connector
- Clutch connector
- Relay connectors
- Ignition switch connector
- Immobilizer aerial connector
- Front lambda probe and read lambda probe connector
- ECU connectors (7sm)

- Check that the front turn indicator connectors are well inserted on the instrument holder support
- SensorBox connector
- Check the ground fixing on the engine and chassis
- Check correct securing (torque) of the screws on the starter relay positive cables and the correct routing of the Battery-Starter Relay cable
- Check securing of positive cable on starter motor. Check if the cap is well inserted
- Check the correct passage and fixing of the ABS fuse
- Check the correct fixing of the ABS fuses connector and check if the ends came out
- Check if the cable grommet of the rear lambda probe is placed as in the picture and check if the cable of the lambda probe is inside the cable grommet
- Check that it is the clamp that is keeping the quick shift cable blocked

Front side

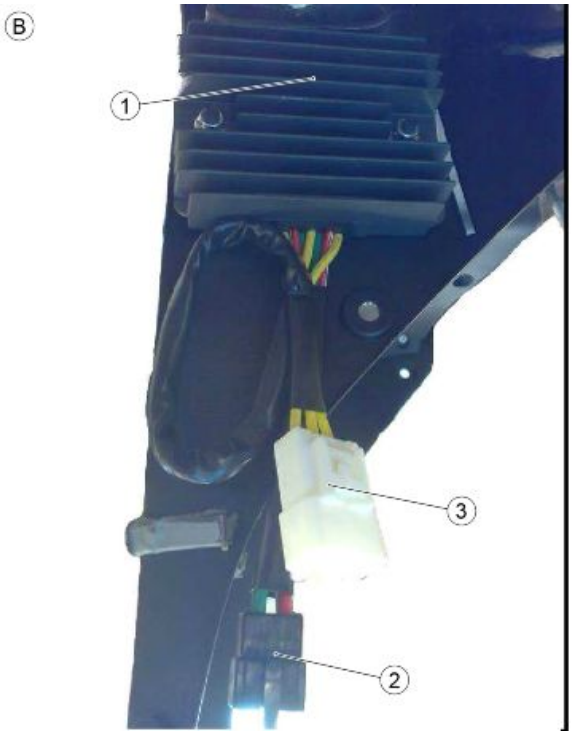
TABLE A - RELAY SENSOR MOUNTING PRE-FITTING

Check that the fall sensor has been positioned correctly, with the arrow above the indication UP-PER facing upward.

1. Relay
2. Relay rubber
3. Mounting

WIRING TABLE B - REGULATOR PRE-ASSEMBLY

1. Regulator
2. Regulator connector
3. Flywheel connector
4. Self-locking nut (x2)
5. T-shaped bushing (x2)
6. M6x30 button head hex socket screws (x2)
7. Washer (x2)



WIRING TABLE C - FRONT HEADLIGHT PRE-ASSEMBLY

The front headlight wiring must be pre-assembled on the headlight by means of a clamp

1. Headlamp wiring harness
2. Small black clamp

WIRING TABLE C1 - FRONT HEADLIGHT PRE-ASSEMBLY

1. Headlamp
2. Relay
3. Cable grommet
4. Small black clamp

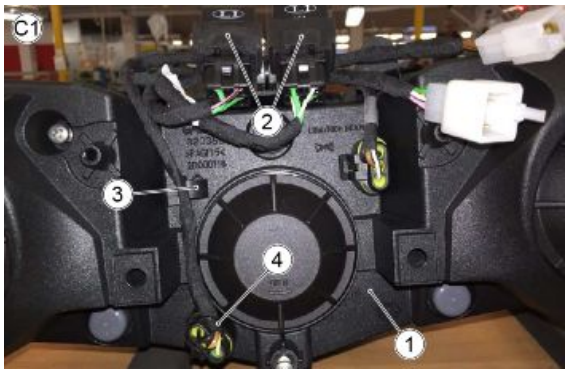
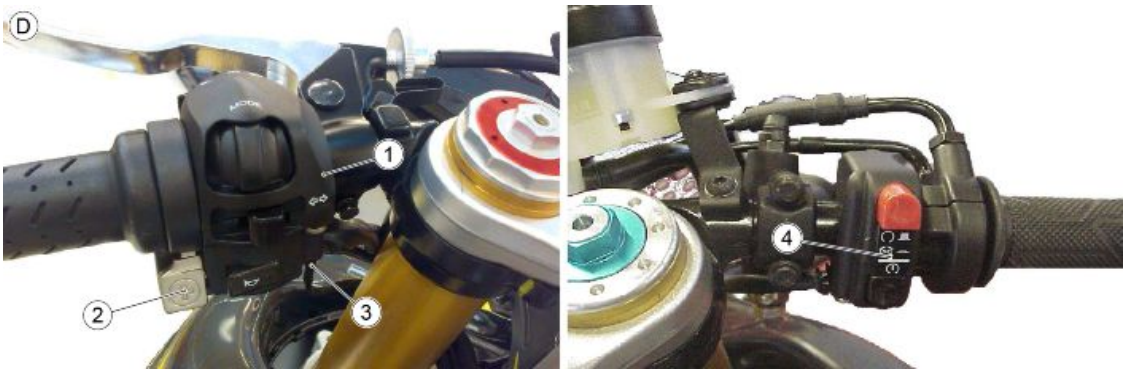


TABLE D - HANDLEBAR CONTROLS

Check that the clutch connector is well hooked

1. Left light switch
2. Quick Shift control on handlebar
3. Clutch connector

4. Right hand light switch



WIRING TABLE E - INSTRUMENT SUPPORT ARCH AND FRONT PART

Position the two clamps as indicated

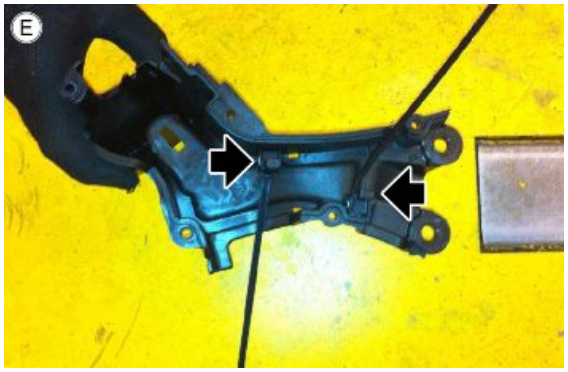


TABLE E1 - INSTRUMENT HOLDER SUPPORT AND FRONT PART

With the first clamp for edges, take and block the two cables first adjusting their length keeping in mind the handlebar movement

1. Front stop switch connector
2. Right handlebar control connector

WIRING TABLE E2 - INSTRUMENT SUPPORT ARCH AND FRONT PART

Position the main wiring harness and secure it to the right hand instrument holder support using a grey reference clamp

WIRING TABLE E3 - INSTRUMENT SUPPORT ARCH AND FRONT PART

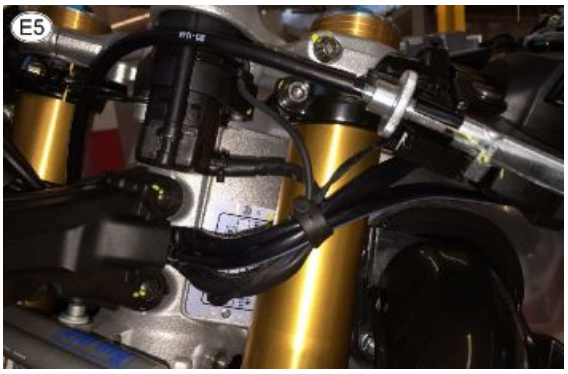
Using the second pre-installed clamp on the instrument support arch, group together all the cables from the left hand side of the handlebar, and fasten them together, making a note of their respective lengths first

TABLE E4 - INSTRUMENT HOLDER SUPPORT AND FRONT PART

Instrument holder right side cables output

TABLE E5 - INSTRUMENT HOLDER SUPPORT AND FRONT PART

Instrument holder left side cables output



WIRING TABLE E6 - INSTRUMENT SUPPORT ARCH AND FRONT PART

Insert the connectors in their housings on the arch

1. Left turn indicator connector
2. Right hand turn signal connector

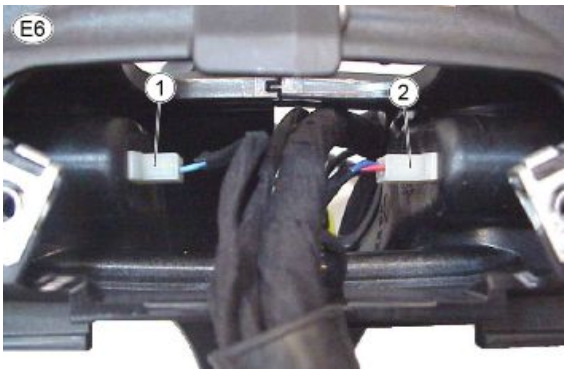
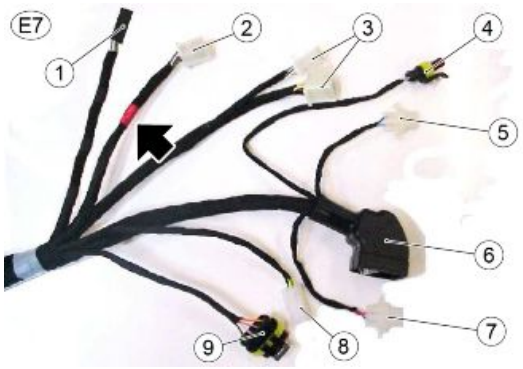


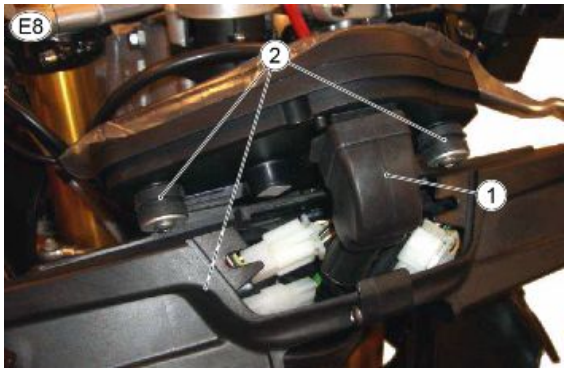
TABLE E7 - INSTRUMENT HOLDER SUPPORT AND FRONT PART



Make the connections for all connectors: The cable harness side ignition switch connector is distinguished with red taping on its branch

1. Quick Shift control connector
2. Ignition switch connector (cable harness with red taping)
3. Left handlebar control connectors
4. Antenna connector
5. Left turn indicator connector (cable colours: light blue/blue
6. Instrument panel connector
7. Right turn indicator connector (cable colours: red/blue)
8. Front stop switch connector
9. Right handlebar control connector

TABLE E8 - INSTRUMENT HOLDER SUPPORT AND FRONT PART



The instrument panel connector must be engaged and the boot must be well inserted.

1. Instrument panel connector
2. Insert the instrument panel rubber rings in their seats on the support.

TABLE F - FRONT WHEEL ABS SENSOR PASSAGE

(OHLINS FORK)

Pass the wiring harness of the speed sensor forward to the brake pipe in the indicated point

1. ABS sensor
2. Cable grommets
3. Clamp

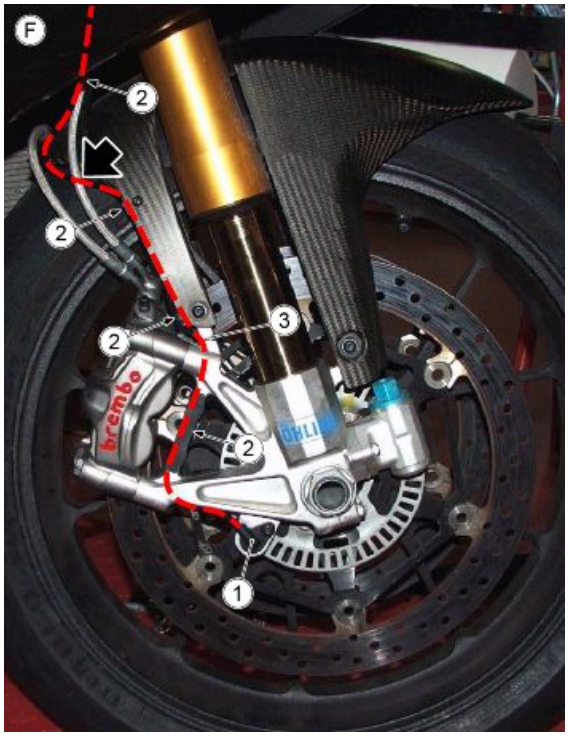


TABLE F1 - FRONT WHEEL ABS SENSOR PASSAGE

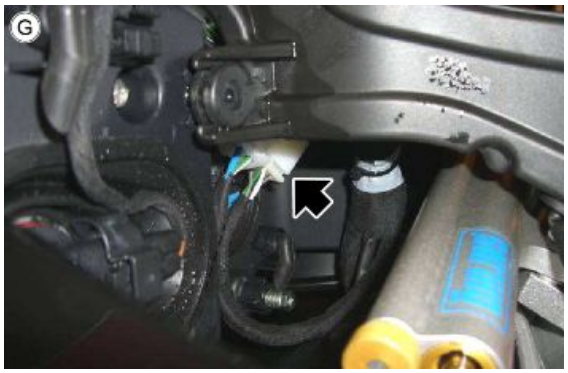
(SACHS FORK)

Pass the wiring harness of the speed sensor forward to the brake pipe in the indicated point

1. ABS sensor
2. Cable guide
3. Cable grommets
4. Clamp

WIRING TABLE G - COMPLETING THE FRONT MUDGUARD ASSEMBLY

Position the front headlight connectors under the instrument support arch



WIRING TABLE G - COMPLETING THE FRONT MUDGUARD ASSEMBLY

Check that the indicator connectors are inserted correctly and that they do not protrude into the instrument holder arch

1. Right hand turn signal connector
2. Left turn indicator connector

Central part

TABLE A - IGNITION RELAY PRE-ASSEMBLY

The positive battery cable must be connected to the hole identified by the letter B (Battery) using M5x8 screw

1. Start-up relay
2. Battery positive cable pole (identified by the letter "B")
3. Vehicle wiring starter motor cable pole (identified by the letter "M")

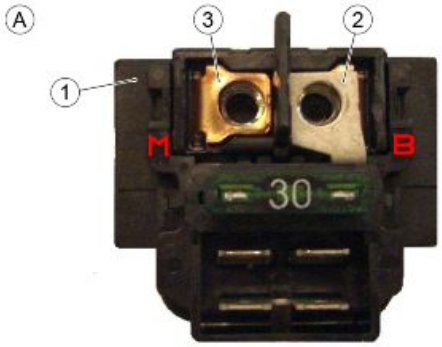


TABLE A1 - IGNITION RELAY PRE-ASSEMBLY

If the battery positive cable is not connected to the ignition relay correctly it may result in fires and incorrect vehicle operation.

1. Ignition relay
2. Battery positive cable

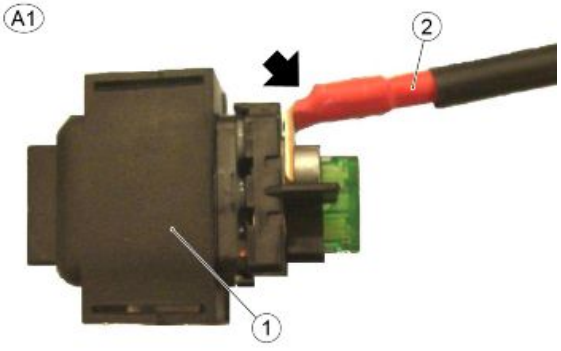


TABLE B - VEHICLE CABLE HARNESS

Place the main wiring harness inside the conduits and close them using two clamps

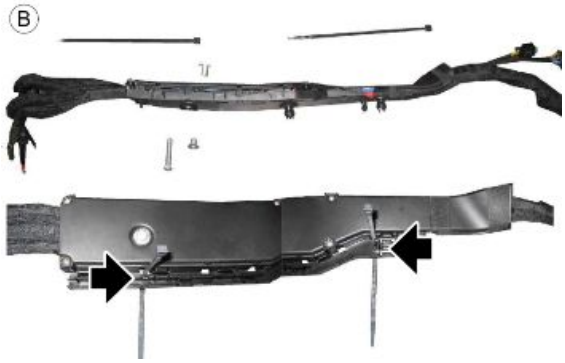


TABLE B1 - VEHICLE CABLE HARNESS

Block the conduit to the chassis in the four indicated points and fix it using the central screw (1)

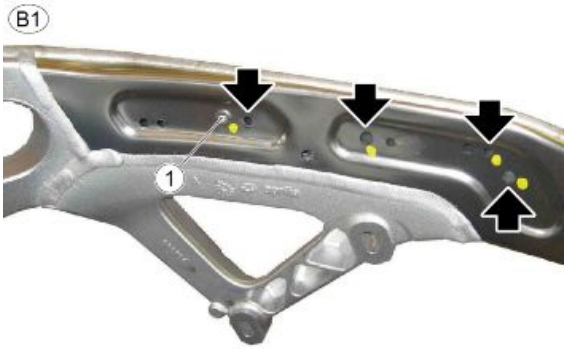


TABLE B2 - VEHICLE CABLE HARNESS

Place the relay unit behind the steering column and fix it by passing the main wiring harness through the cable grommet

TABLE C - RELAY UNIT

Check the correct insertion of the connectors on the relevant relays

1. Safety relay connector
2. Injection relay connector
3. Fan relay connector

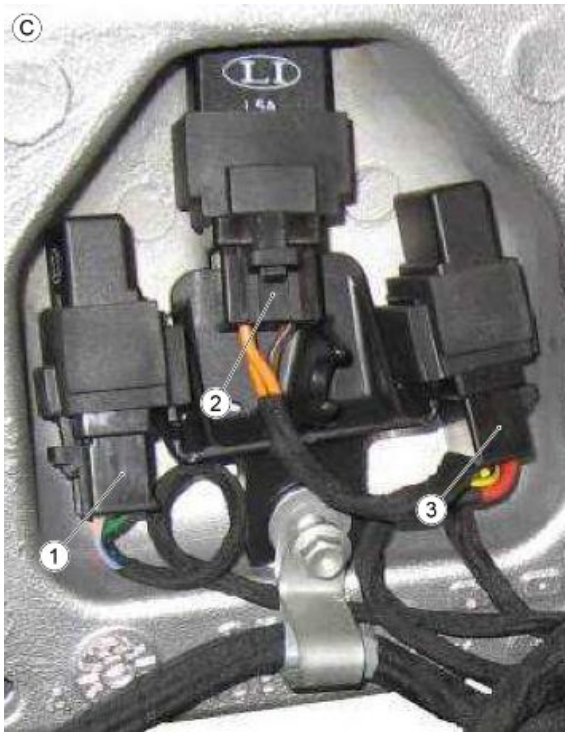


TABLE D - RADIATOR AREA

right side:

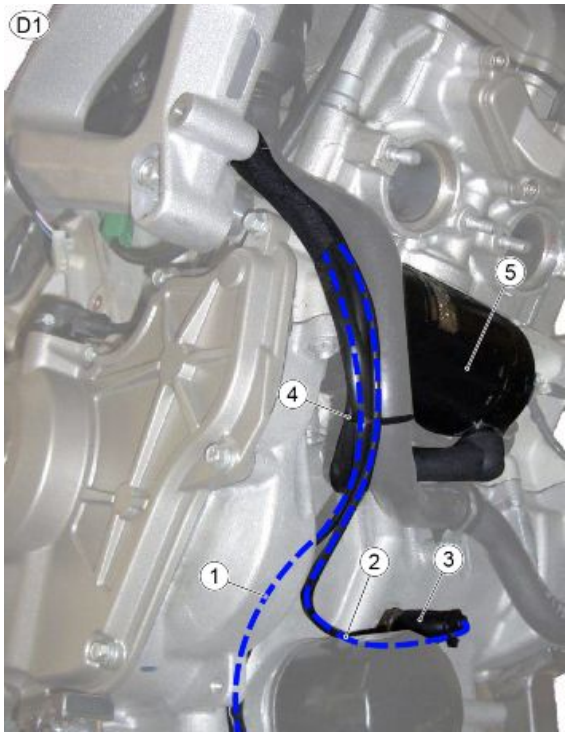
1. Vehicle cable harness
2. Cable grommet

TABLE D1 - RADIATOR AREA

The female faston of oil pressure sensor features a retaining tang.

When disconnecting it, pay attention as it could be damaged.

1. Exhaust valve actuator cable harness routing
2. Oil pressure sensor cable harness routing
3. Oil pressure sensor
4. Starter motor

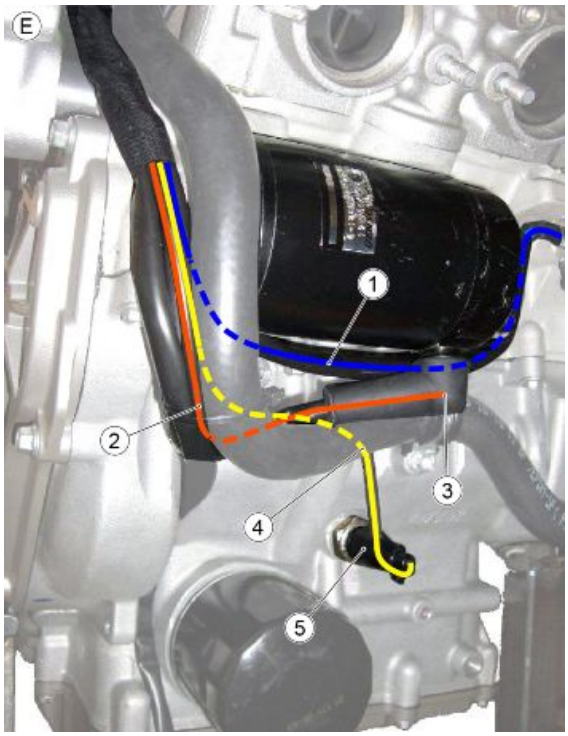


WIRING TABLE E - STARTER MOTOR AND OIL BULB ZONE

1. Earth wiring routing (behind the water pipe and starter motor)
2. Starter motor wiring harness routing (behind the water pipe)
3. Starter motor lug

COVER THE STARTER MOTOR NUT AND THE SQUARE TERMINAL WITH DI-ELECTRIC, WATER-REPELLENT GREASE

4. Oil pressure sensor wiring harness routing (behind the water pipe)
5. Oil pressure sensor



WIRING TABLE E1 - STARTER MOTOR AND OIL BULB ZONE

IF THE RELAY-STARTER MOTOR CABLE IS NOT ROUTED AND/OR SECURED CORRECTLY IT MAY CAUSE THE VEHICLE TO CATCH FIRE. CHECK THAT THE CABLE ON THE STARTER MOTOR IS POSITIONED AS INDICATED IN THE FIGURE

WIRING TABLE F - INTERCONNECTION BETWEEN ENGINE WIRING HARNESS AND MAIN WIRING HARNESS

Check that the connectors have been connected correctly and that the purple slide is in the end stop position

1. Vehicle connector
2. Engine connector

WIRING TABLE G - VEHICLE EARTH CABLE

Battery-engine earth cable routing

The battery-engine earth cable must not be visible in the zone indicated by the red triangle symbol

1. Large clamp (clamp the battery-engine earth wiring to the demand sensor wiring as high up as possible)
2. Engine-battery earth cable

TABLE H - ENGINE GROUND CABLE

INCORRECT SECURING OF THE SCREW THAT LOCKS THE GROUND CABLE MAY CAUSE THE VEHICLE TO CATCH FIRE.

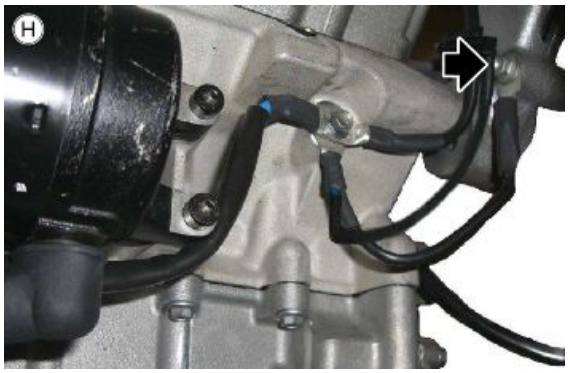
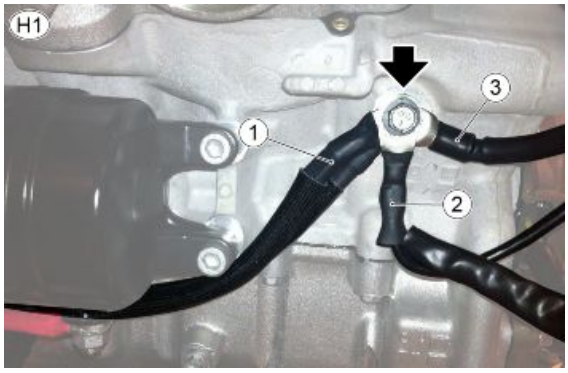


TABLE H1 - ENGINE GROUND CABLE

INCORRECT SECURING OF THE SCREW THAT LOCKS THE GROUND CABLES MAY CAUSE THE VEHICLE TO CATCH FIRE.



1. ENGINE GND eyelet from the vehicle wiring harness
2. ENGINE GND eyelet from the engine wiring harness
3. Battery-engine ground cable ENGINE GND eyelet **PAY ATTENTION NOT TO INVERT THE "FRAME GDN EYELET FROM THE ENGINE WIRING HARNESS" WITH THE "BATTERY-ENGINE GROUND CABLE ENGINE GND EYELET"**

TABLE H2 - ENGINE GROUND CABLE

1. Check that the connector with BLUE tape is correctly hooked on demand with the BLUE label. Ensure the grey security lock is closed
2. Check that the connector with WHITE tape is correctly hooked on demand without the label. Ensure the grey security lock is closed

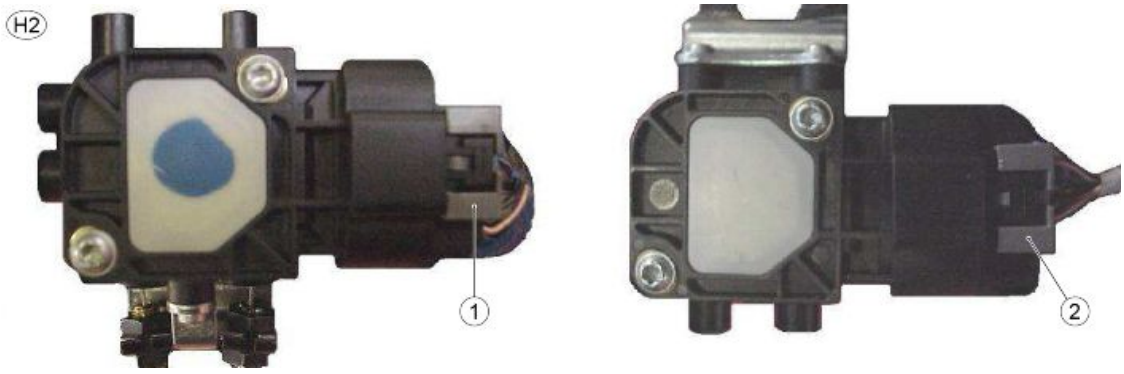


TABLE H3 - ENGINE GROUND CABLE

1. Routing of the Demand Slave wiring harness
2. Routing of the Demand Master wiring harness

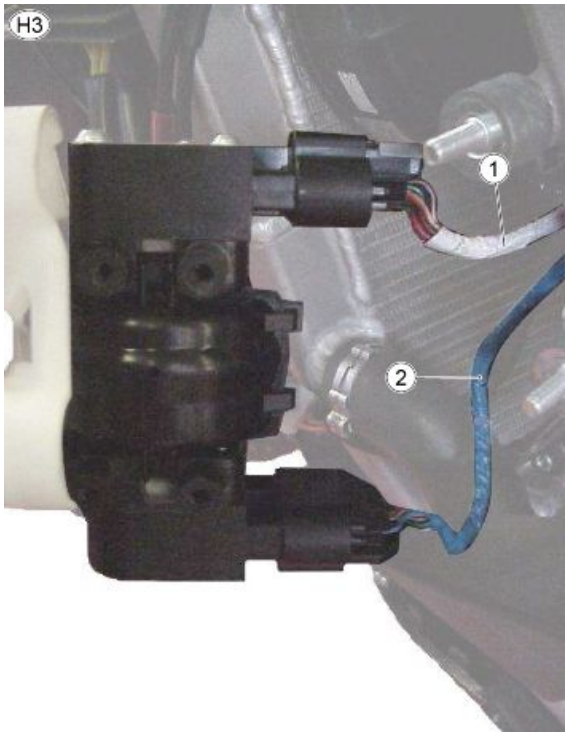


TABLE H4

1. Big clamp
2. Fan connector
3. Regulator wiring harness routing

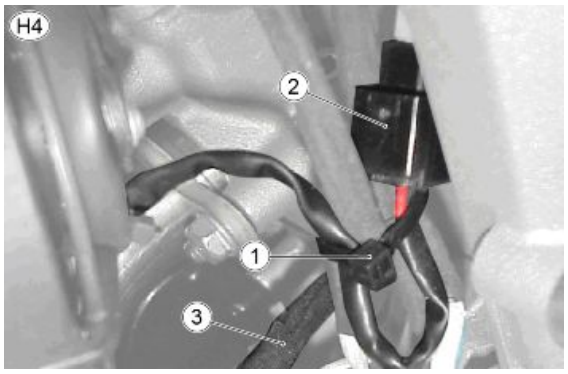


TABLE H5

Check that the regulator wiring harness is secured well

1. Regulator connector
2. Regulator connector on the vehicle wiring harness
3. Big clamp
4. Flywheel wiring harness routing
5. Regulator wiring harness routing

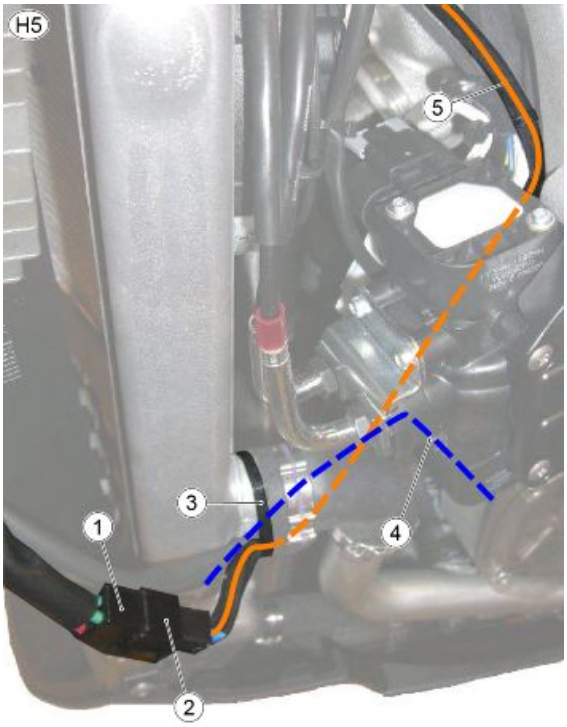


TABLE H6

Make sure the flywheel wiring harness is positioned so that it does not go near the discharge and the white connector is properly connected.

1. Big clamp
2. Flywheel wiring harness routing

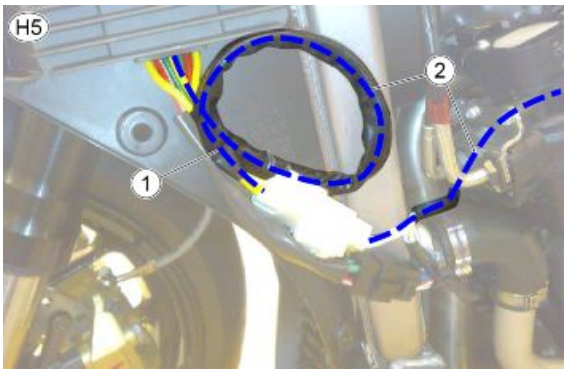


TABLE I - EXHAUST VALVE ACTUATOR: POSITIONING AND CALIBRATION

CHECK THAT THE CONNECTOR OF THE EXHAUST VALVE ACTUATOR IS WELL CONNECTED

1. Exhaust valve actuator
2. Exhaust valve actuator connector
3. Exhaust valve actuator wiring harness routing
4. Clamp

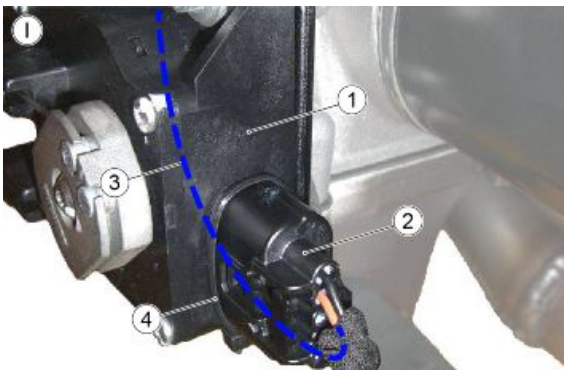


TABLE L - PINION CASING AREA

CHECK THAT THE REAR LAMBDA PROBE CONNECTOR IS CONNECTED CORRECTLY

1. Quick Shift wiring harness routing
2. Gear sensor wiring harness routing
3. Rear lambda probe cable routing
4. Stand switch wiring harness routing
5. Oxygen sensor connector on the vehicle wiring harness
6. Oxygen sensor connector
7. Gear sensor
8. Small clamp
9. Quick Shift

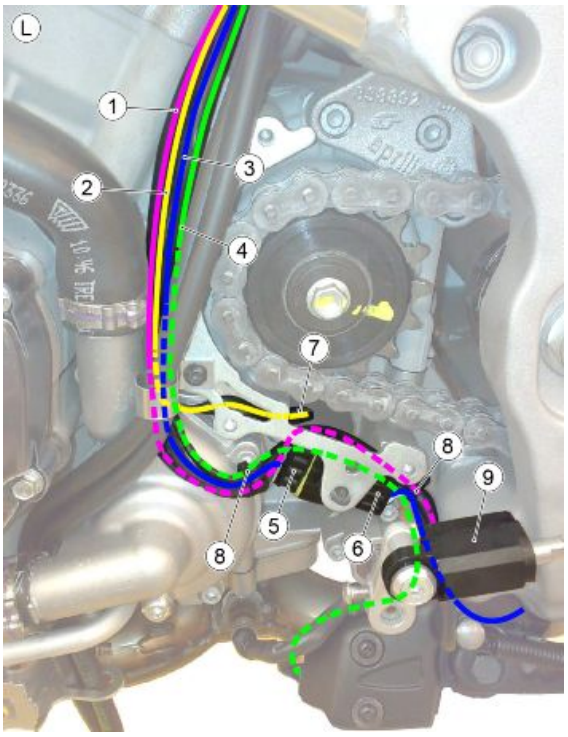


TABLE L1 - PINION CASING AREA

1. Stand switch
2. Cable grommet
3. Stand switch wiring harness

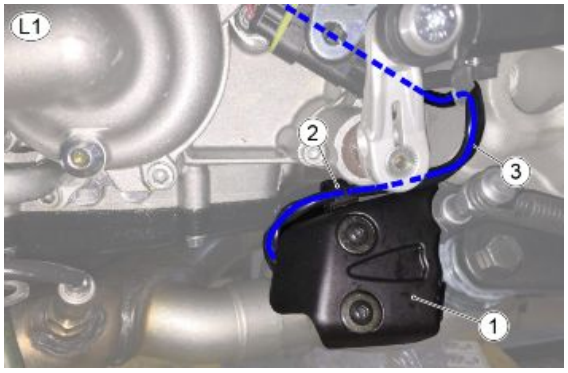


TABLE L2 - PINION CASING AREA

PASS THE WIRING HARNESS BEHIND THE CABLE GROMMET THAT CLOSES THE TWO FUEL BREATHER PIPES

1. Quick Shift wiring harness
2. Rear lambda probe wiring harness routing
3. Gear sensor wiring harness routing
4. Stand switch wiring harness routing

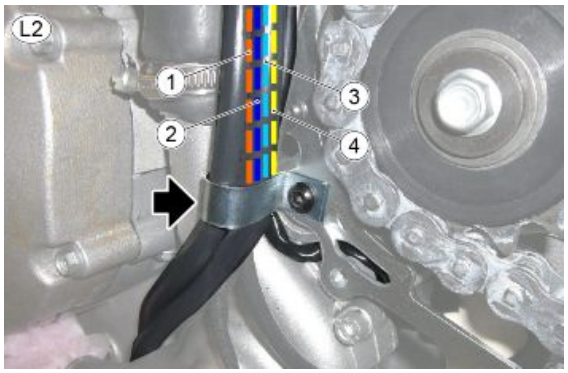


TABLE M - REAR LAMBDA

1. Rear lambda probe wiring harness routing

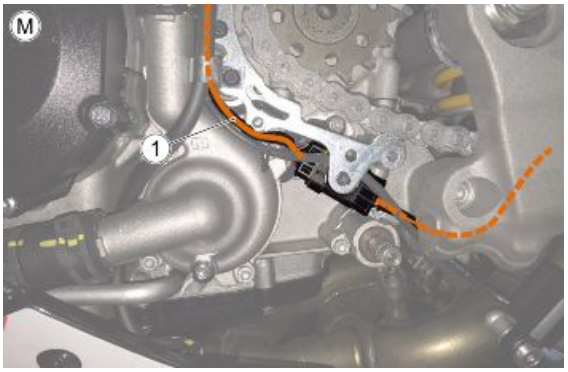


TABLE M1 - REAR LAMBDA

THE CABLE GROMMET MUST BE POSITIONED UPWARD AND THE LAMBDA PROBE CABLE SHOULD PASS INSIDE

TABLE M2 - REAR LAMBDA

CHECK THE CORRECT CONNECTION OF THE FRONT LAMBDA PROBE CONNECTOR

1. Front lambda probe wiring harness routing

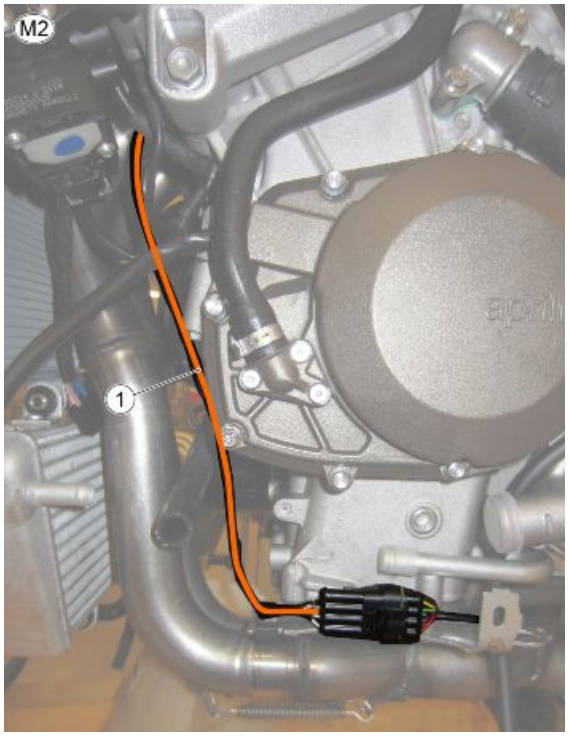


TABLE M3 - REAR LAMBDA

1. Front lambda probe cable of the main wiring harness
2. Front lambda probe cable to probe

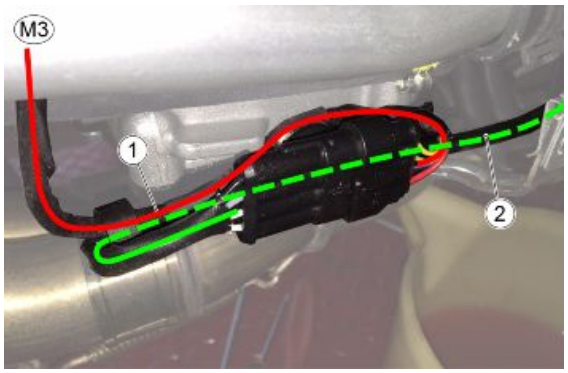


TABLE M4 - REAR LAMBDA

1. Lambda probe cable in front of vent pipes

TABLE N

Set the connectors for stand switch, Quick Shift and gear sensor under the two corrugated pipes

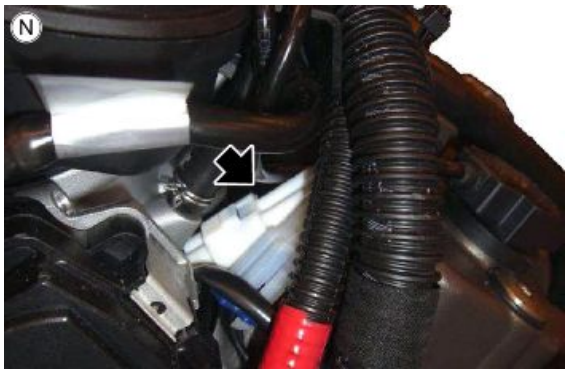


TABLE N1

Check that the clamp holds all cables and especially the Quick Shift cable. The cable must be locked so that it does not slide and comes into contact with the exhaust.

1. Quick Shift wiring harness
2. Clamp

Back side

TABLE A - LICENSE PLATE FRAME PRE-FITTING

The right arrow is identified with the RED taping and must be inserted on the license plate holder as indicated in the picture. The arrow with the red tape must be connected with the wiring harness branch that includes the grey tape

1. Left LED indicator
2. Right LED indicator
3. Grey tape
4. Red tape

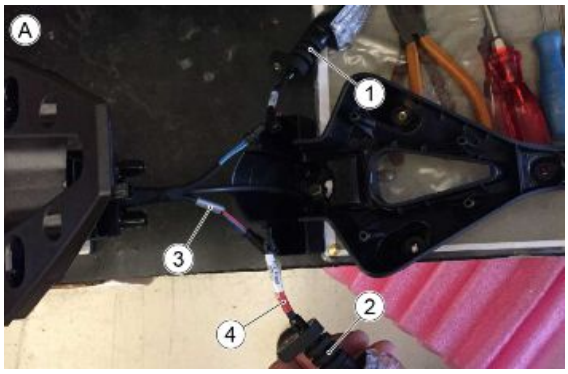


TABLE A1 - LICENSE PLATE HOLDER PRE-FITTING

Bring all cables, including connectors in the hole of the plate holder as in the picture and close all paying attention not to pinch the cables

TABLE B - REAR ABS SPEED SENSOR PRE-FITTING

1. ABS speed sensor

TABLE B1 - REAR ABS SPEED SENSOR PRE-FITTING

1. ABS speed sensor wiring harness
2. Cable grommets

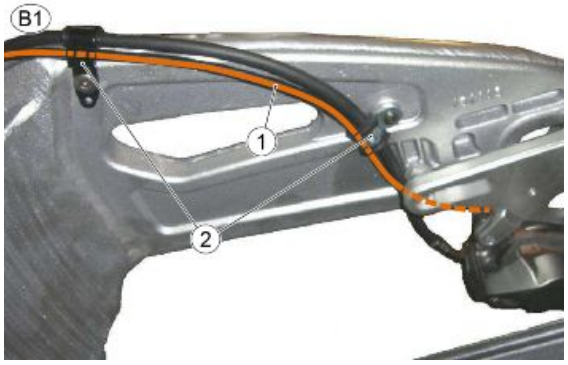


TABLE C - PROCEDURE FOR CORRECT ABS CONTROL UNIT CONNECTOR INSERTION

The initial position of the connector fastener lever must be as shown in the figure

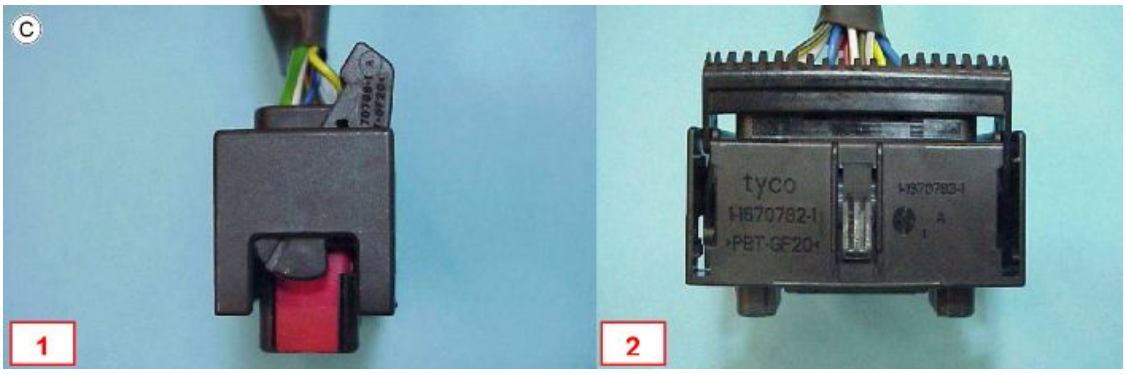


TABLE C1 - PROCEDURE FOR CORRECT ABS CONTROL UNIT CONNECTOR INSERTION

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

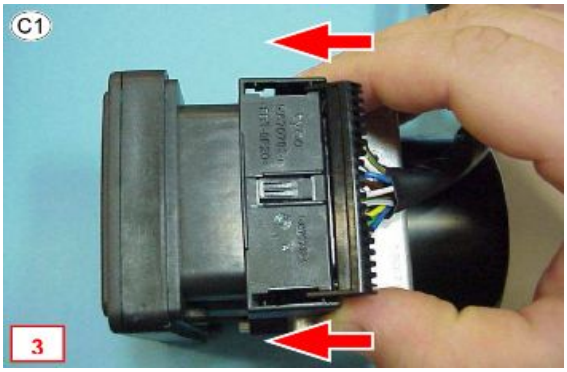


TABLE C2 - PROCEDURE FOR CORRECT ABS CONTROL UNIT CONNECTOR INSERTION

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

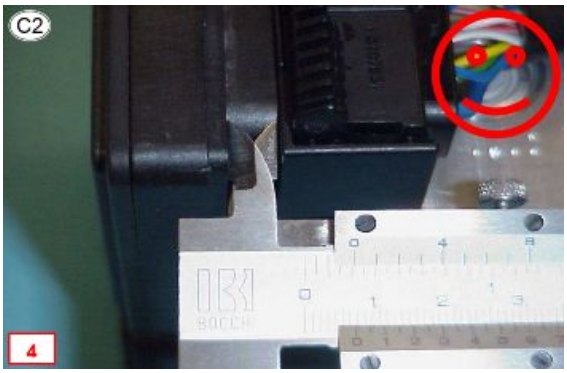
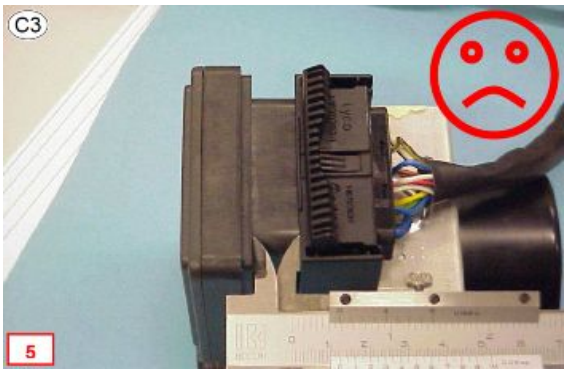


TABLE C3 - PROCEDURE FOR CORRECT ABS CONTROL UNIT CONNECTOR INSERTION

If the initial position of the connector and the pulling level is not as the one shown in "TABLE C", the connector will not hook correctly and the measured distance will be higher (around 12 mm).

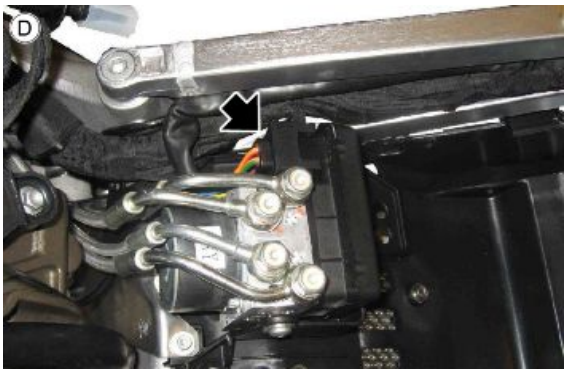
In this case repeat the operation as described in "TABLE C1/C2"

It is advisable to create a jig in order to check the correct connector insertion.

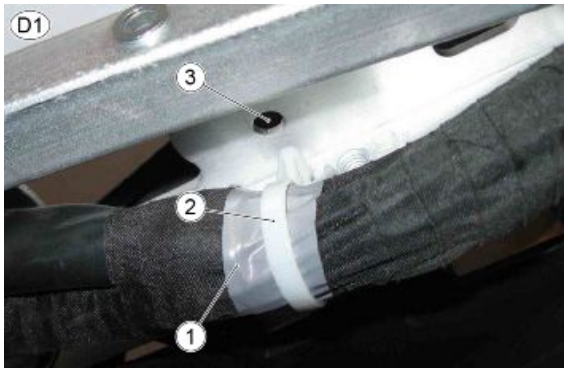


WIRING TABLE D - ABS ON SADDLE MOUNTING

Check that the connector has been inserted correctly, as described in the preceding TABLES



WIRING TABLE D1 - ABS ON SADDLE MOUNTING



The reference taping is purely indicative, position the clamp so that it is aligned with the hole on the saddle mounting. (the clamp may not be positioned above the taping)

Position the clamp without tightening it but allowing it rotate of its own accord.

Insert the tip of the clamp into the hole on the saddle mounting and push it until it locks into place.

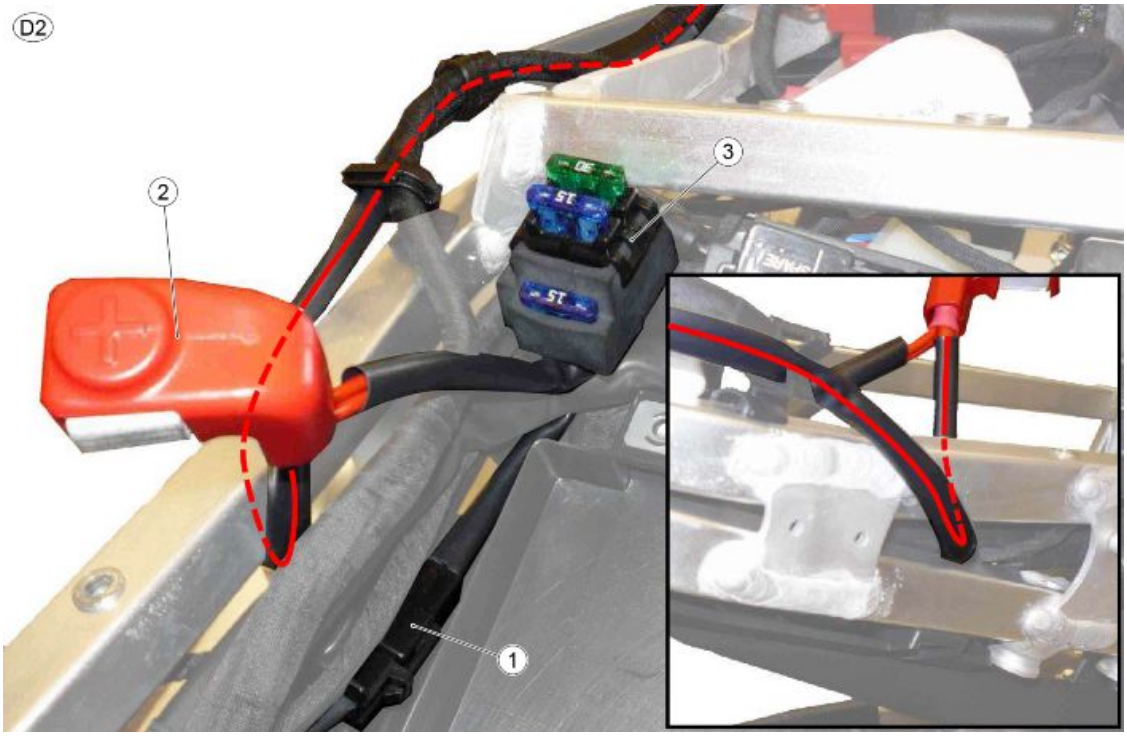
1. Grey taping
2. Clamp
3. Saddle mounting hole

WIRING TABLE D2 - ABS ON SADDLE MOUNTING

IF THIS WIRING ABS FUSES-BATTERY) IS NOT SECURED CORRECTLY IT MAY CAUSE THE VEHICLE TO CATCH FIRE

Check that the connected is securely attached and that all the terminals are in place. Position it as indicated

1. ABS speed sensor connector
2. ABS positive wiring
3. ABS fuses



WIRING TABLE E - REAR SADDLE MOUNTING ZONE

Preparing the battery support bracket with fuses

1. Battery support bracket
2. Vehicle wiring harness

E

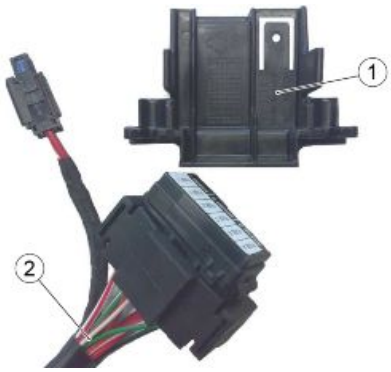


TABLE E1 - REAR SEAT POST AREA

Fit the (individual) fan fuse on battery mounting bracket tongue

E1

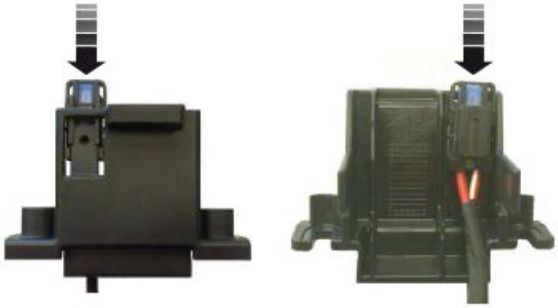


TABLE E2 - REAR SEAT POST AREA

Fuse-box positioning on battery mounting bracket

Insert the fuse-box in the two tongues on the battery mounting bracket

E2

TABLE E3 - REAR SEAT POST AREA

Check that the connector is correctly connected with the protection relay

E3

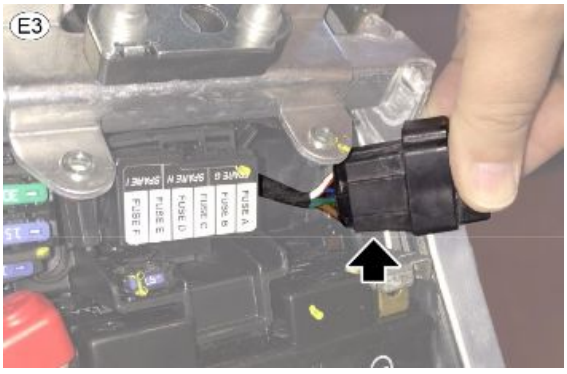
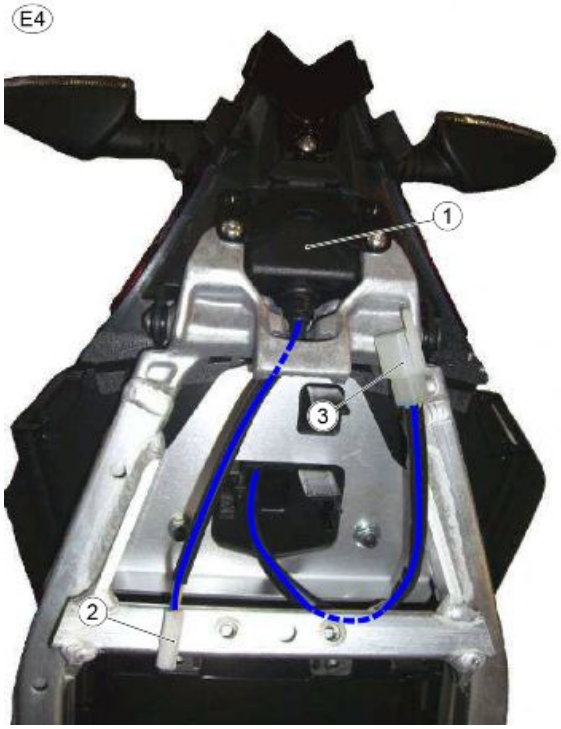


TABLE E4 - REAR SEAT POST AREA

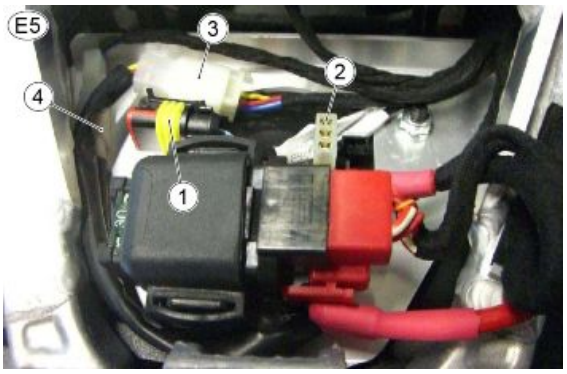
1. Taillight
2. Taillight connector
3. License plate frame wiring harness connector



WIRING TABLE E5 - REAR SADDLE MOUNTING ZONE

Insert the ECU diagnostic and the instrument cluster diagnostic connectors in their respective housings

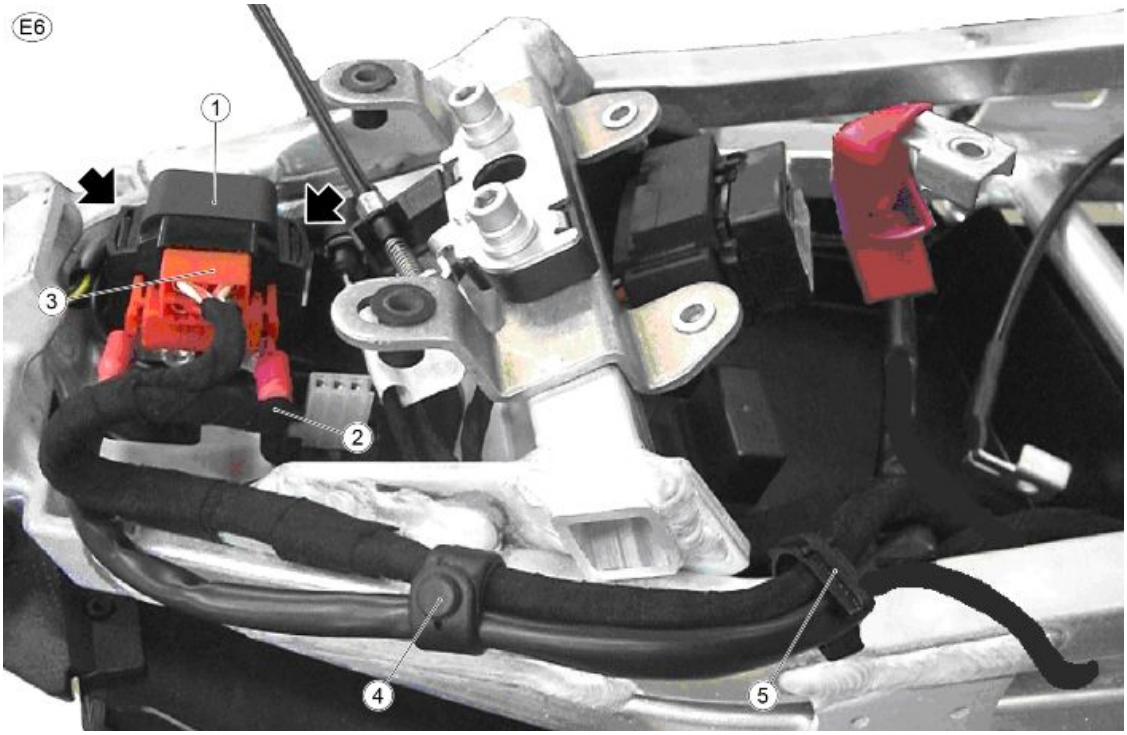
1. ECU diagnostic connector
2. Diagnostic connector
3. Number plate holder wiring connector
4. Taillight connector



WIRING TABLE E6 - REAR SADDLE MOUNTING ZONE

Insert the starter relay between the two plastic flaps

1. Start-up relay
2. Starter motor cable on vehicle wiring harness
3. Starter relay connector
4. Rubber clamp
5. Cable grommet



WIRING TABLE F - ENGINE BATTERY EARTH CABLE

1. Engine-battery earth cable
2. Cable grommet

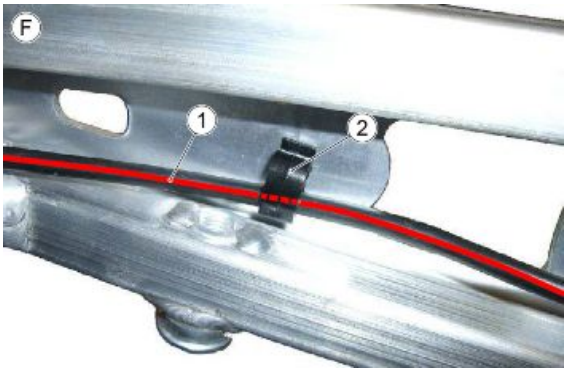


TABLE F1 - ENGINE BATTERY GROUND CABLE

1. Battery - engine ground lead
2. Big clamp

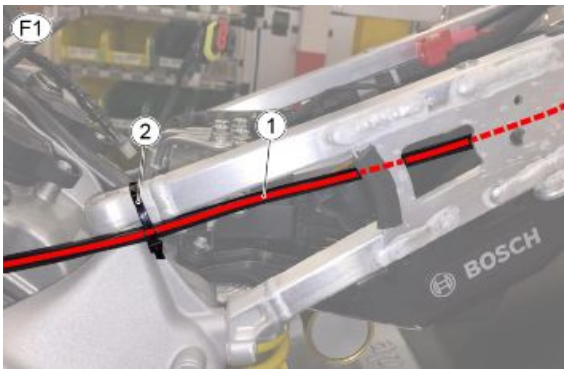


TABLE G - VARIABLE INTAKE DUCT CONTROL UNIT

1. Variable intake duct control unit
2. Variable intake duct control unit connector
3. Rubber blocks

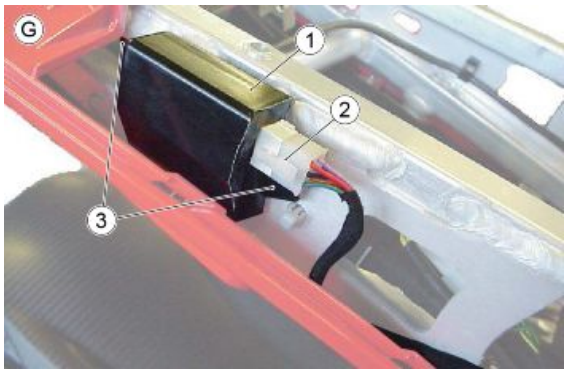
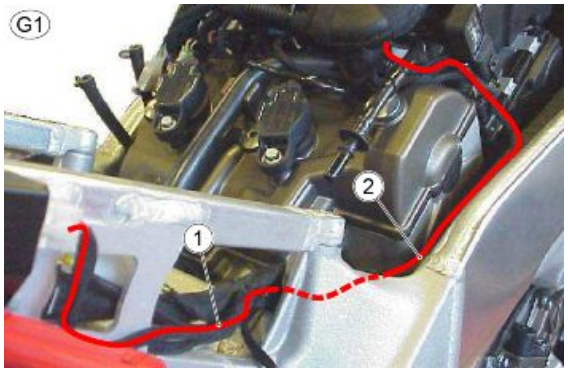


TABLE G1 - VARIABLE INTAKE DUCT CONTROL UNIT

1. Intake duct control unit wiring harness routing
2. Small clamp

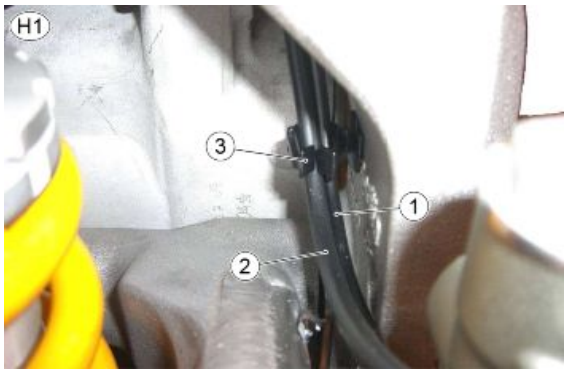


WIRING TABLE H - SWINGARM ZONE

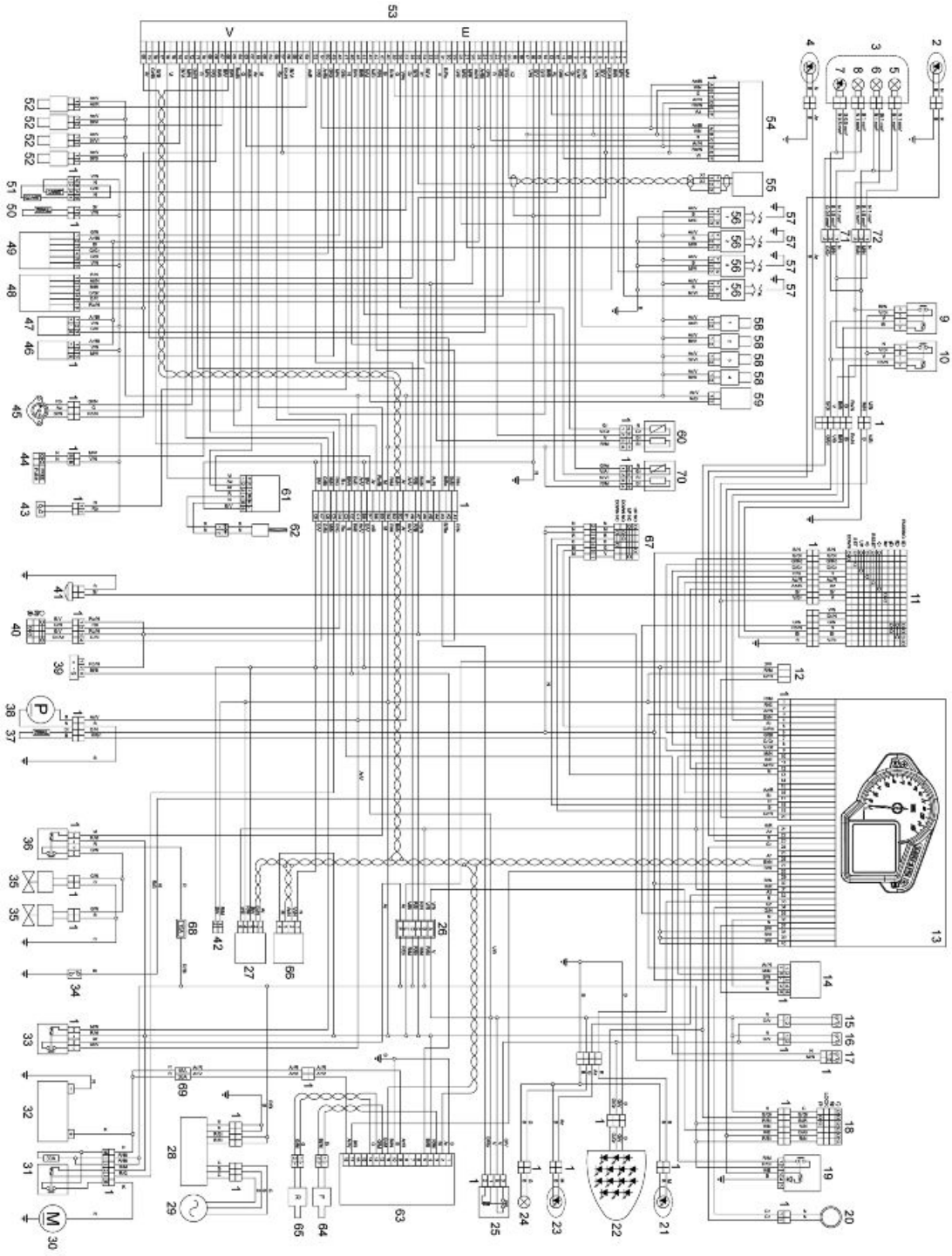
1. Rear brake switch wiring
2. Speed sensor wiring
3. Cable fasteners

WIRING TABLE H1 - SWINGARM ZONE

1. Rear brake switch wiring
2. Speed sensor wiring
3. Cable grommet



General wiring diagram



key:

1. Multiple connectors
2. Front right turn indicator (LED)
3. Complete headlamp
4. Front left turn indicator (LED)

5. Right low beam light bulb
6. High beam bulb
7. Tail light bulb (LED)
8. Left low beam light bulb
9. High beam light relay
10. Low beam light relay
11. Left light switch 1
12. Instrument panel diagnosis
13. Instrument panel matrix II
14. Exhaust valve motor
15. Front stop switch
16. Rear stop switch
17. Clutch switch
18. Ignition switch
19. Protection relay
20. Immobilizer antenna
21. Rear right turn indicator (LED)
22. Complete taillight (LED)
23. Rear left turn indicator (LED)
24. License plate light bulb
25. Recovery logic relay
26. Auxiliary fuses
27. BLUEDASH pre-installation
28. Voltage regulator
29. Alternator
30. Starter motor
31. Start-up relay
32. Battery
33. Main injection relay
34. Oil pressure sensor
35. Fan
36. Fan control relay
37. Fuel reserve sensor
38. Fuel pump
39. ECU Diagnosis.
40. Right hand light switch
41. Horn
42. USB pre-installation

43.Electronic transmission
44.Side stand switch
45.Gear sensor
46.Front cylinder pressure sensor
47.Rear cylinder pressure sensor
48.Front cylinder throttles
49.Rear cylinder throttles
50.Air temperature sensor
51.Water temperature sensor
52.Upper injectors
53.7SM control unit
54.Throttle grip position sensor
55.Engine speed sensor
56.Coil
57.Spark plug
58.Lower injectors
59.Secondary air system
60.Lambda probe 1
61.Variable geometry control unit
62.Variable geometry engine
63.ABS control unit
64.Front wheel speed sensor
65.Rear wheel speed sensor
66.SensorBox
67.Left light switch 2
68.Fan fuse
69.ABS fuses
70.Lambda probe 2
71.Left headlamp connector
72.Right headlamp connector

Checks and inspections

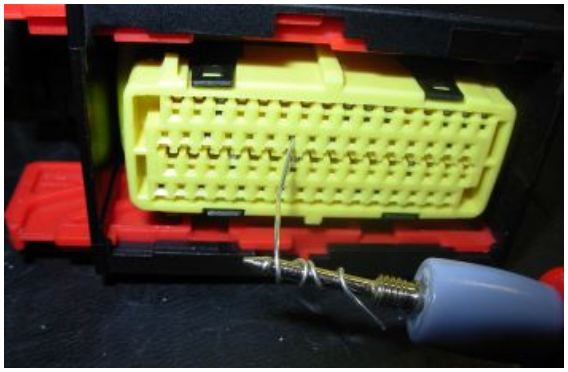
GENERAL NOTIONS FOR TROUBLESHOOTING ELECTRICAL FAULTS

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. Nor-

mally, 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

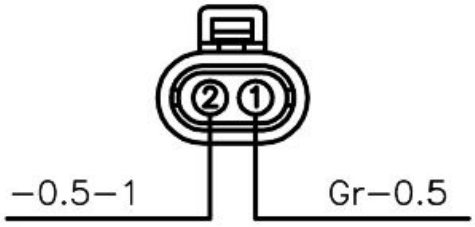
detects the transponder code in the key and sends it to the instrument panel

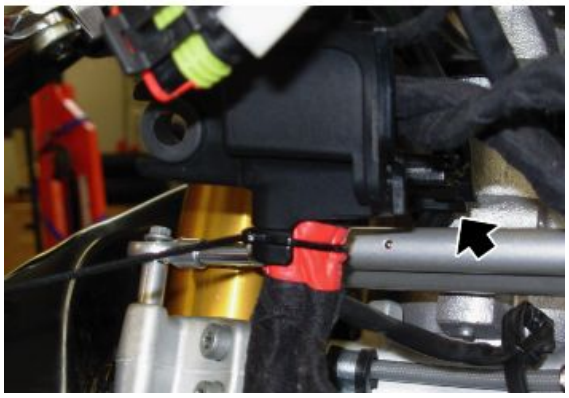
Level in electrical circuit diagram:

Immobilizer

Position:

- on the vehicle: in the ignition switch assembly
- connector: two-way, black, inside the bow





Electrical specifications

- 14 Ohm

Pin out

not significant

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

DSB 01 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

DSB 02 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

DSB 03 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 24 and 34: 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

DSB 04 Internal controller fault

Error cause

- There is a fault in the instrument panel

Troubleshooting

- Replace the instrument panel

Dashboard

In case of doubts in operation of the engine revs indication, it is possible to connect the vehicle to the diagnostics instrument and activate the engine revs indication choosing the function "Rpm indicator" from the "Devices Activation" screen page (injector icon)

Installation of new instrument panel

In case the instrument panel is replaced by a new one, follow the procedure shown below so that the immobilizer system (key storage) and the exhaust butterfly valve (controlled by the ECU through the instrument panel) operate correctly.

1. Request all the keys of the vehicle in the customer possession.

Once the instrument panel is electrically connected to the vehicle and a key is set to ON, the key is stored and the instrument panel waits for 20 seconds for a possible second key. If there is a second key, remove the first key and wait for the storage of the second key. When the second key storage is complete, the instrument panel waits for another key up to a maximum of 4 total keys or the procedure will be interrupted after 20 seconds.

At this stage, the instrument panel turns on as usual.

2. Deleting the errors stored by the instrument panel: select Menu and then Diagnosis. An access code is required to enter this menu:

12412

Then, select the option: "Delete errors"

NOTE

DELETE THE ERROR CAUSED BY THE LACK OF MEMORY OF KEY CODES.

3. Connect to the vehicle with the diagnosis tool and select the adjustable Parameters in the screen page:

"Exhaust butterfly valve self-acquisition"

NOTE

SEARCH FOR MINIMUM AND MAXIMUM MECHANICAL STOPS STORED IN THE INSTRUMENT PANEL.

In case of a correct self-acquisition, the procedure is finished.

If the self-acquisition is not performed correctly, follow the procedure "Exhaust butterfly valve calibration" as shown in the section: Electrical system, Checks and controls, Exhaust butterfly valve.

See also

Butterfly valve in exhaust

Diagnosis

An access code is required to enter this menu which controls the diagnosis function:

- ENTER SERVICE CODE

This is a 5-digit code, fixed for each vehicle. For these vehicles, the code is:

12412

If the code is incorrect, the following message is displayed:

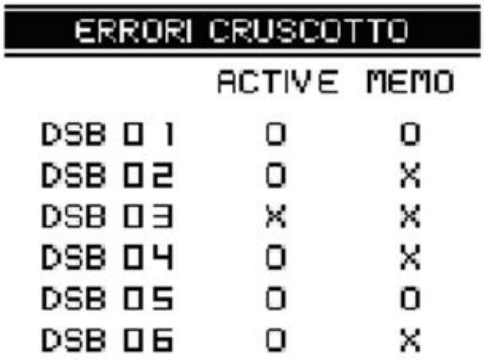
- INCORRECT CODE

and the instrument panel goes back to the main menu. Otherwise, the following menu is displayed:

- Exit
- INSTRUMENT PANEL ERRORS
- Error Clearing
- VEHICLE SERVICING RESET
- Update
- CHANGE KEYS
- KM / MILES

INSTRUMENT PANEL ERRORS

In this mode, a chart is displayed showing potential errors in the immobilizer and the sensors connected to it.



Instrument panel errors

In this mode, a chart is displayed showing potential errors in the immobilizer and the sensors connected to it.

DSB 01 - Immobilizer fault: key code read but not recognised.

DSB 02 - Immobilizer fault: key code not read (key not present or transponder not working)

DSB 03 - Immobilizer fault: aerial not working (open or short-circuited)

DSB 04 - Internal controller fault

DSB 05 - -

DSB 06 - -

Error cause

- An oil sensor fault is signalled when it is detected that the sensor circuit is open or shorted to positive.

DSB 07 - Oil pressure sensor

Error cause

An oil sensor fault is signalled when, with engine off, it is detected that the sensor circuit is open.

Troubleshooting

The test is performed only once when the key is set to ON. This error is signalled by the bulb icon, and the general warning light turns on as well.

DSB 08 - Oil pressure sensor

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

This error is signalled by the bulb icon, and the general warning light turns on as well.

The instrument panel must keep all previous errors stored in its memory.

DELETE ERRORS

This option deletes all instrument panel errors; a further confirmation is requested. Use the diagnosis instrument to reset ECU errors.

VEHICLE SERVICING RESET

This function is used to reset vehicle servicing. Using this function, the odometer can be reset only once within the first 200 km (124 mi) of the vehicle, provided this has not been done by the Quality Check.

UPDATE

This function is used to program the instrument panel again. This screen page shows the software version currently loaded; the LCD reads:

- INSTRUMENT PANEL DISCONNECTED. NOW CONNECT THE DIAGNOSIS INSTRUMENT.

The instrument panel will restart to work normally after the key is inserted-extracted.

MODIFY KEYS

With this function the instrument panel can update the keys. Up to 4 keys can be stored.
The user code is first requested to be entered:

- ENTER THE CODE

After entering the correct code, the following message should be shown on the display:

- INSERT THE X KEY
- INSERT THE X+1 KEY

At least one key must be programmed for the next start-ups. If no other key is inserted within 20 seconds or if there is no power or after the fourth key is programmed, the procedure finishes and all the functions of the vehicle and the instrument panel must be enabled (even if only one key has been programmed).

KM / MILES

This menu selects the unit of measurement, either for the speed or the total or partial odometers.

- KM
- MILES

LANGUAGES

Select the user interface language from this menu.

- ITALIANO
- ENGLISH
- FRANCAIS
- DEUTSCH

- ESPAÑOL

Service warning light reset

VEHICLE SERVICING RESET

This function is used to reset vehicle servicing. Using this function, the odometer can be reset only once within the first 200 km (124 mi) of the vehicle, provided this has not been done by the Quality Check. In order to activate this function follow the instructions in the DIAGNOSIS section.

See also

Diagnosis

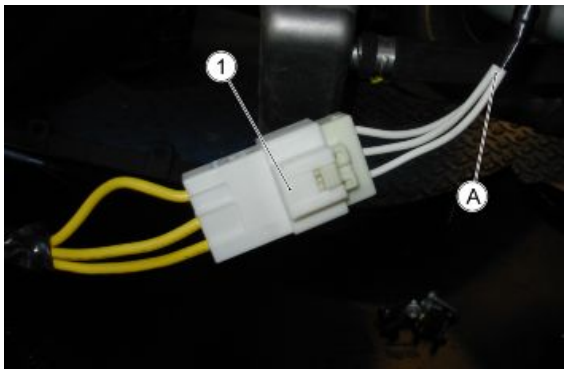
Battery recharge circuit

RECHARGING SYSTEM

- Remove the left side fairing;
- Disconnect the three-way connector (1) (white).

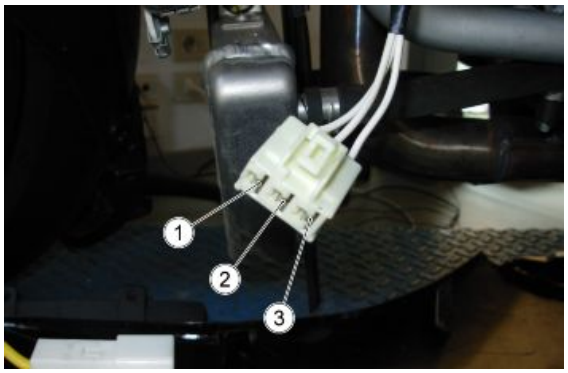
NOTE

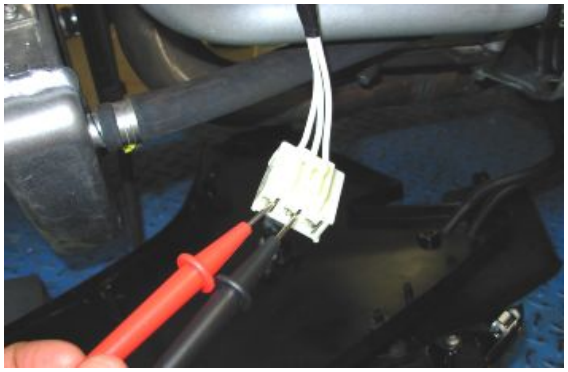
THE ENGINE SIDE IS IDENTIFIED WITH THE LETTER "A"



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 = 0.62 Ohm

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

- Effective resistance stage 1 = 0.62-0.47 = 0.15 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 MEASURE

Winding stage	Ambient temperature (ohm)	Afterwards heat stabilisation (ohm)
Stage 1	0.15 - 0.20	0.25 - 0.30
Stage 2	0.15 - 0.20	0.25 - 0.30
Stage 3	0.15 - 0.20	0.25 - 0.30

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.

ZERO LOAD VOLTAGE

rpm	2000	4000	6000	8000
Vm line-to-line voltage Reference values (V rms)	22 - 27	46 - 51	69 - 74	92 - 97

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)	22 - 27	22 - 27	22 - 27	22 - 27

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.

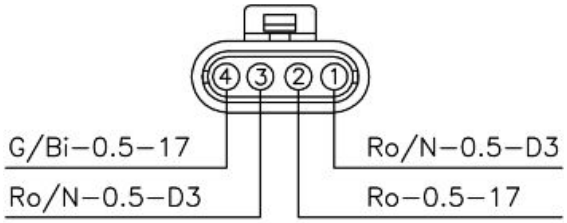
Start-up system check

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: inside the support (4-ways black).

Electrical specifications:

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

Pin out:

2: voltage + 5V

3. ground

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

Starter switch P0170

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 58; if the circuit is open, shorted to negative: voltage equal to zero has been detected.

DIAGNOSTIC TOOL: LOGIC ERRORS

Starter switch P0169

- signal not valid.

Error cause

- Fault in the switch (lock) of the engine start-up. The instrument panel does not indicate the presence of this error even in the ATT status.

Troubleshooting

- Check the locking cause and restore.

level indicators

See also

Fuel pump

Fuses

AUXILIARY FUSES DISTRIBUTION

Specification	Desc./Quantity
A) 5A fuse	Lights relay, stop light, daylight running lights, variable geometry intake ducts (factory)
B) 5A fuse	Instrument panel, turn indicators, Bluedash and USB (predisposition)
C) 15A fuse	ECU
D) 7.5A fuse	ECU (2)
E) 15A fuse	High beam/low beam, horn.
F) 15A fuse	Coils, injectors, fuel pump, secondary air, injection relay
G) 15A fuse	Fans.

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

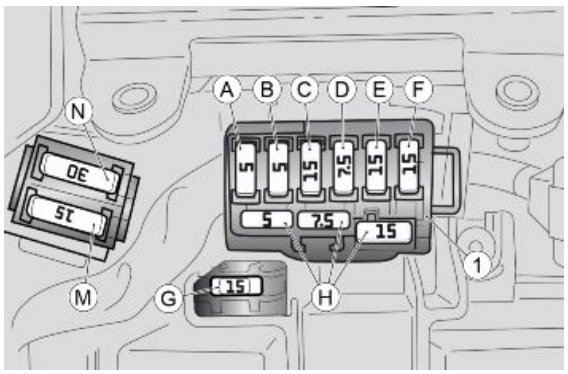
ABS FUSE LAYOUT

Specification	Desc./Quantity
M) fuse of 15A	ABS solenoid valves.
N) fuse of 30A	ABS pump motor.

WHERE CONTEMPLATED

CAUTION

THREE OF THE FUSES ARE SPARES (H).



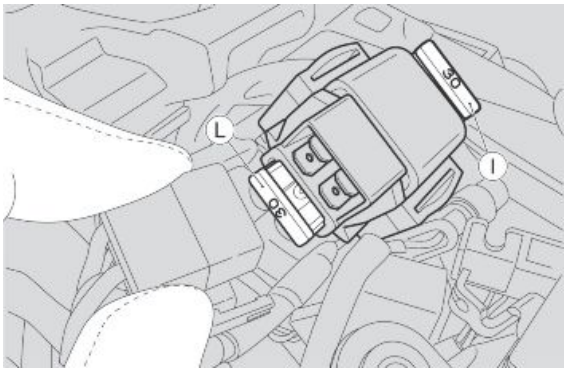
MAIN FUSES DISTRIBUTION

Specification	Desc./Quantity
L) 30A fuse	Battery recharge, positive switched live, permanent positive under instrument panel, sensor box positive switched live, fan relay

Main fuses are placed in the rear part of the motorcycle, under the passenger seat.

CAUTION

THERE IS ONE SPARE FUSE (I).



Control unit

Removal

- Remove the fuel tank.
- Disconnect both control unit connectors

- Unscrew and remove the three screws.
- Remove the control unit.

NOTE

WHEN REASSEMBLING THE CONNECTORS, THE SLIDES MUST SLIDE FREELY UP TO THE LIMIT STOP, THUS FACILITATING THE CONNECTOR'S INSERTION. THE CATCH SHOULD SNAP INTO PLACE ONCE THE LIMIT STOP IS REACHED.

CONTROL UNIT - Diagnosis

Function

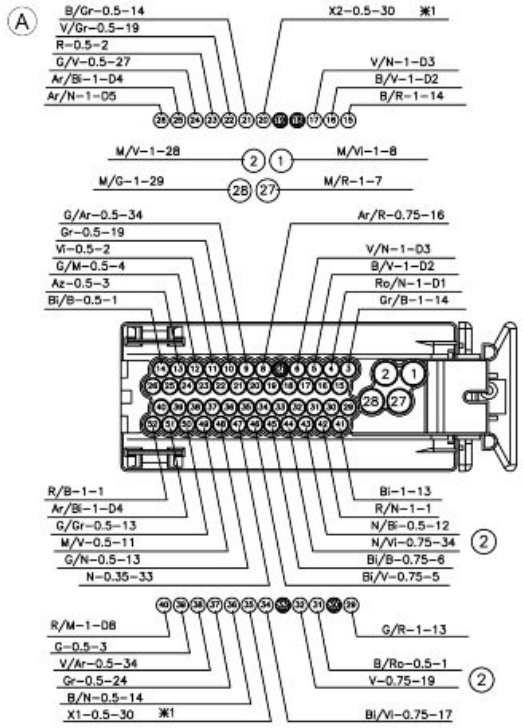
It manages the Ride by wire system, the injection/ ignition, the system safety checks and the self-diagnosis function

Level in electrical circuit diagram:

Each level in which the main component involves the control unit

Position:

- on the vehicle: above the filter box
- connector: on connector control unit of ENGINE PIN 52 (figure A), connector of VEHICLE PIN 28 (figure B)



Pin out: See CONNECTORS paragraph

DIAGNOSTIC TOOL:PARAMETERS ISO screen page

(screen page/example values with key ON)

- Drawing number / -
- Marelli spare part number / IAW7SMHW430
- Hardware number / 00
- Mapping / -
- Software version number / 0000
- Type approval number / -
- ISO code / -
- Marelli software code / -
- Control unit serial number (NIP) / 7SMPRA119 - Identifies the individual control unit
- Author of the last programming / - Indicates the serial number of the diagnostic tool that performed the last mapping of the control unit

DIAGNOSTIC TOOL: PARAMETERS

Nominal idle speed

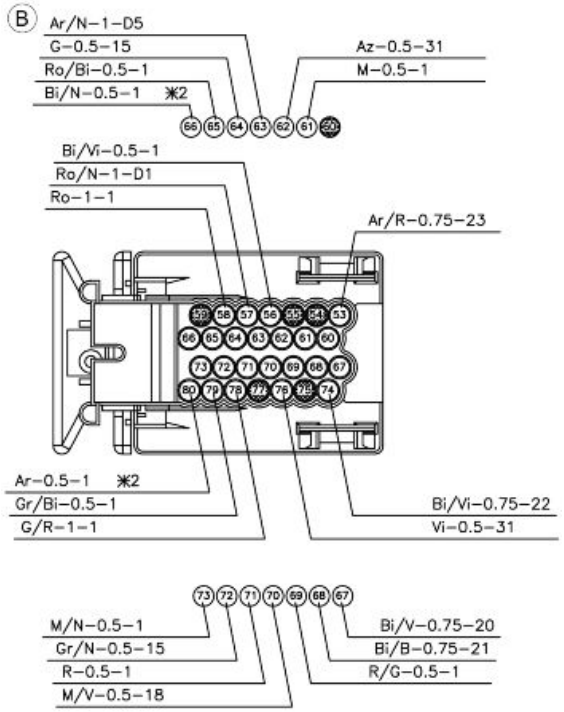
- Example value with key ON: 1600 rpm

Fuel additive capacity

Fuel additive correction

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

'Engine state

- Intermediate_Key ON_Engine running_Stopped_Power latch_Power latch 2_Power latch terminated

Engine mode

- Undetermined_Start-up_Stable_Minimum_Acceleration_Deceleration_Input in Cut Off_Cut Off_Output from Cut Off

Immobilizer consent

- 'yes/no
- Indicates if the control unit received the consent from the instrument panel regarding the immobilizer: coded key or user code entered manually. Any errors can be read on the instrument panel error screen page in the DIAGNOSTICS section of the instrument panel

Start up enabling

- 'yes/no
- indicates if the control unit will make start up possible if requested: if the safeties were not respected (correct side stand position, neutral and clutch sensor) or with the fall sensor overturned or if the immobilizer does not send the start enable to the control unit, the status is NO

DIAGNOSTIC TOOL: ACTIVATIONS

Stop light

- The stop light logic relay (no. 25 in the electrical circuit diagram, in the front niche of the frame, right side, CHECK anyway the identification of the relay with the colour of the cables) is energised

'Error cancellation

Ambient parameter reading

- Rear throttle valve target position angle
- Front throttle valve target position angle
- Rear throttle valve position
- Front throttle valve position
- Engine temperature prior to recovery mode
- Rear cylinders average intake pressure (1 and 3)
- Front cylinders average intake pressure (2 and 4)
- Engine rpm
- Average indicated torque
- Engine state-Intermediate_Key ON_Engine running_Stopped_Power latch_Power latch 2_Power latch terminated
- Trip counter
- Mapping selection - Intermediate/Track/Sport/Road

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

'Error EEPROM P0601

- Circuit not functioning

Error cause

- Replace the injection control unit. The instrument panel does not indicate the presence of this error even in the ATT status

'Error RAM P0604

- Circuit not functioning

Error cause

- Replace the injection control unit. The instrument panel does not indicate the presence of this error even in the ATT status

'Error ROM P0605

- Circuit not functioning

Error cause

- Replace the injection control unit. The instrument panel does not indicate the presence of this error even in the ATT status

'A/D converter P0607

- Circuit not functioning

Error cause

- Replace the injection control unit

'Stop lights relay error P0610

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

Error cause

- Short-circuit to positive: excessive voltage has been detected on PIN 31. If short circuit to negative: no voltage has been detected. If open circuit: an interruption has been detected

Troubleshooting

- Short-circuit to positive: check the correct electrical characteristics of the relay by disconnecting it from the wiring harness, if not ok replace the relay, if ok restore the wiring harness (blue/pink cable)
- If short circuit to negative: check the correct electrical characteristics of the relay by disconnecting it from the wiring harness, if not ok replace the relay, if ok restore the wiring harness (blue/pink cable)
- If open circuit: check the correct electrical characteristics of the relay by disconnecting it from the wiring harness, if not ok replace the relay, if ok perform the check procedure for the relay connector, the engine-vehicle wiring harness connector and the ENGINE connector for the Marelli control unit: if not ok restore, if ok check the continuity of the wiring harness (blue/pink cable)

DIAGNOSTIC TOOL: LOGIC ERRORS

Level 2 safety reset P0608

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

Engine safety Stop P0609

Error cause

- Due to the fact that the safety system detected a serious fault, the control unit shut off the engine

Troubleshooting

- Perform the troubleshooting for the other detected errors.

'Data file saved (for safety) P0611

- 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.

a-PRC (Aprilia Performance Ride Control) operating error P0700

- Incorrect a-PRC scheduling / Incorrect CheckSum of the software on Flash / Control unit voltage too low for a-PRC controls

Error cause

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

Troubleshooting

- Contact technical service.

DIAGNOSTIC TOOL: ADJUSTABLE PARAMETERS

Cylinders pressure balancing

- Allows cylinders 1-3 to be balanced and then cylinders 2-4 using the by-pass screws

EEPROM control unit zero setting

CAUTION

AFTER CANCELLING ALL THE DATA STORED DURING THE VEHICLE PRODUCTION PHASE (INCLUDING THE SELF-ADAPTIVE PARAMETERS), THE FOLLOWING MUST BE SELECTED: HANDLE SELF-LEARNING AND CHECK THE TWO "AUTOMATIC SELF-LEARNING OF THE FRONT THROTTLE VALVES" AND "AUTOMATIC SELF-LEARNING OF THE REAR THROTTLE VALVES" STATUSES ARE "CARRIED OUT".

See also

Cylinders synchronisation

Download of stored data file

Error cause

- The file BUFRSVXX.BIN is saved in the memory card of the diagnostic tool or on the hard disk of your PC if you are using Piaggio software: it also includes data regarding the control unit serial number and the serial number of the diagnostic tool that performed the download

Deletion of stored data file

Error cause

- Deletion can be performed only if the is downloaded after KEY ON

PROCEDURE FOR ACTIVATION OF A NEW CONTROL UNIT OR REPROGRAMMING

After installing the control unit for the first time, or after REPROGRAMMING the control unit with a different or more updated mapping, turn the key to ON and wait 3 seconds, during which the control

unit will acquire the throttle valve position. Connect with the diagnostic tool and check that the states of "Automatic throttle valve self-learning is "performed" and "Handle self-learning" is "Not performed" (the latter involved the display of the message Urgent service on the instrument panel). If the automatic throttle valve self-learning indicates "Not performed" go to step 1, if "Performed" is indicated, go to step 2. Step 1: current errors were probably detected by the control unit: resolve the malfunction and recheck the two states. Throttle self-learning can also be performed from the Parameter adjustment screen page (screw driver and hammer). Step 2: perform handle self-learning from the Parameter adjustment screen page (screw driver and hammer) and check that the Handle self-learning state is Performed. If not ok, either the voltage detected on the handle is out of scale (check using the diagnostic tool) or current errors were detected by the control unit: resolve the malfunctions and repeat the procedure

Battery

Function

Electrically supply the vehicle: battery YTZ 10 S MF is already activated, loaded and sealed; or, alternatively, battery YT 12A - BS, which must be activated and loaded.

Level in electrical circuit diagram:

Battery recharge

Location:

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

Electrical specifications:8.6 Ah

Pin out:

1. Positive pole (red): approx. 12.6 V
2. negative pole (black): ground connection

DIAGNOSTICS INSTRUMENT: PARAMETERS

Battery voltage

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

In case of recovery, this value is set by the control unit

Battery voltage pre Recovery

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

Value drawn from the signal read without taking into account any recovery

CAUTION

PAY ATTENTION TO THE POSITIVE BATTERY CABLE, WHICH MUST PASS BELOW THE UPPER PART OF THE FRAME.

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.

DIAGNOSIS INSTRUMENT: LOGIC ERRORS

Battery voltage P0560

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

Troubleshooting

- If too high: check correct operation of the voltage regulator.
- If too low: check voltage regulator connectors, engine - vehicle cable harness connector and the control unit connector (paying special attention to possible oxidation): if not OK, restore; if OK, check that red/white cable resistance from the voltage regulator connector to the control unit connector is a few tenths of Ohm: if not OK, restore cable harness; if OK, check correct operation of the electrical alternator: if not OK, restore; if OK, check operation of the voltage regulator

Speed sensor

VEHICLE FRONT SPEED SENSOR

Function:

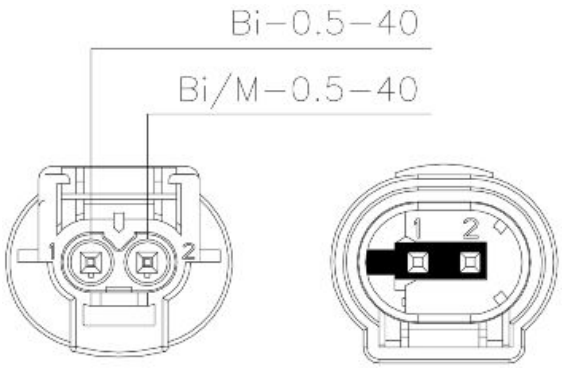
To generate a signal that the ABS control unit converts into wheel speed.

Operation / Operating principle:

Magnetoresistive sensor: a square-wave pulse is generated with width of approximately 1V across PIN3 and PIN6.

Electrical circuit diagram - Level in wiring diagram:

Traction control.



Location on the vehicle:

On the fork, right stanchion, next to the brake caliper support.

Connector location (if available):

Under the right dynamic air intake.

Pin-out:

- PIN 1 - Power negative/Signal negative (white)
- PIN 2 - Power positive/Signal positive (white/brown)

DIAGNOSTIC TOOL

Parameters:

Speed (km/h) - Front wheel speed.

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

C1002 Front speed sensor: short circuit.

It activates when the two wires are shorted one with the other or if the negative wire is shorted to positive (e.g. 12V)

Troubleshooting:

Check insulation of white cable and white/brown cable: if NOT OK, restore cable harness; if OK, check positive insulation (12V) of the white cable. If NOT OK, restore; if OK, check with sensor disconnected and key ON that power voltage is slightly below battery voltage. If OK, change the sensor; if NOT OK, change the ABS control unit

C1003 Front speed sensor: electric malfunction.

Missing sensor or interrupted wire or short circuit to negative of one of the two wires.

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 cable harness side and PIN 3 if NOT OK restore cable harness, if OK check continuity of the white cable between PIN 1 of the sensor on the cable harness side and PIN 6 of the ABS control unit connector. If NOT OK, restore cable harness; if OK, check the white/brown cable ground insulation. If NOT OK restore cable harness; if OK, check the white cable ground insulation. If NOT OK restore cable harness; if OK, check with sensor disconnected and key ON that power voltage is slightly below battery voltage. If OK, replace the sensor; if NOT OK, replace the ABS control unit

C1008 Front speed sensor: electric malfunction.

It activates when the positive wire is shorted to ground.

Troubleshooting:

Check continuity of white/brown cable across wiring-side sensor PIN 2 and ABS connector PIN 3: if NOT OK, restore cable harness; if OK, check ground insulation of the white/brown cable. If NOT OK, restore cable harness; if OK, check with sensor disconnected and key ON that power voltage is slightly below battery voltage. If OK, replace the sensor; if NOT OK, replace the ABS control unit.

P0501 Front wheel speed signal/sensor.

Connect to the ABS control unit diagnostics

DIAGNOSTIC TOOL: LOGIC ERRORS

C1100 Front speed sensor: missing signal or speed measured too low in relation to the rear wheel.

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

C1102 Front speed sensor: missing signal or speed measured too low in relation to the rear wheel.

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

C1104 Front speed sensor: missing signal or different speed measured at the two wheels.

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

C1106 Front speed sensor: missing signal or different speed measured at the two wheels.

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

C1108 Front speed sensor: the signal works irregularly.

Faulty sensor or signal interference

C1110 Front speed sensor: the signal decreases 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.

VEHICLE REAR SPEED SENSOR

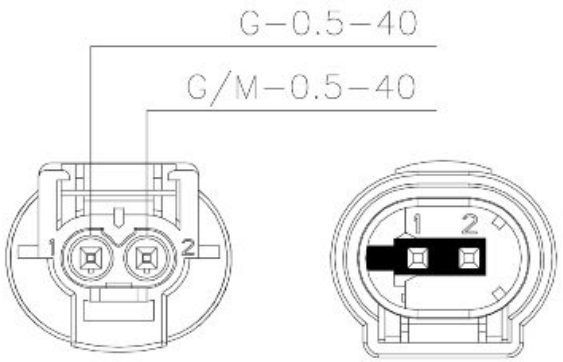
Function:

To generate a signal that the ABS control unit converts into wheel speed.

Operation / Operating principle:

Magnetoresistive sensor: a square-wave pulse is generated with width of approximately 1V across PIN4 and PIN5.

Electrical circuit diagram - Level in wiring diagram:



Traction control.

Location on the vehicle:

Swingarm, right side, on the brake calliper support plate.

Connector location (if available):

Under the right side fairing.

Pin-out:

- PIN 1 - Power negative/Signal negative (yellow)
- PIN 2 - Power positive/Signal positive (yellow/brown)

DIAGNOSTIC TOOL

Parameters:

Speed (km/h) - Rear wheel speed

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

C1004 Rear speed sensor: short circuit.

It activates when the two wires are shorted one with the other or if the negative wire is shorted to positive (e.g. 12V).

Troubleshooting:

Check insulation of yellow cable and yellow/brown cable: if NOT OK, restore cable harness; if OK, check positive insulation (12V) of the yellow cable. If NOT OK, restore; if OK, check with sensor disconnected and key ON that power voltage is slightly below battery voltage. If OK, replace the sensor; if NOT OK, replace the ABS control unit.

C1005 Rear speed sensor: electric malfunction.

Missing sensor or interrupted wire or short circuit to negative of one of the two wires.

Troubleshooting:

Check the sensor connector and the ABS control unit connector. If it is not OK, restore the connectors; if it is OK, check continuity of the yellow/brown cable across wiring-side sensor PIN 2 and PIN 4. If NOT OK, restore cable harness; if OK, check the continuity of the yellow cable across wiring-side sensor PIN 1 and ABS control unit connector PIN 5. If NOT OK, restore cable harness; if OK, check the yellow/brown cable ground insulation. If NOT OK restore cable harness; if OK, check the yellow cable ground insulation. If NOT OK restore cable harness; if OK, check with sensor disconnected and key ON that power voltage is slightly below battery voltage. If OK, replace the sensor; if NOT OK, replace the control unit

ABS C1009 Rear speed sensor: electric malfunction.

It activates when the positive wire is shorted to ground.

Troubleshooting:

Check continuity of yellow/brown cable across wiring-side sensor PIN 2 and ABS connector PIN 3: if NOT OK, restore cable harness; if OK, check ground insulation of the yellow/brown cable. If NOT OK, restore cable harness; if OK, check with sensor disconnected and key ON that power voltage is slightly below battery voltage. If OK, replace the sensor; if NOT OK, replace the ABS control unit

DIAGNOSTIC TOOL: LOGIC ERRORS

C1101 Rear speed sensor: missing signal or speed measured too low in relation to the front wheel.

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

C1103 Rear speed sensor: missing signal or speed measured too low in relation to the front wheel.

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

C1105 Rear speed sensor: missing signal or different speed measured at the two wheels.

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

C1107 Rear speed sensor: missing signal or different speed measured at the two wheels.

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

C1109 Rear speed sensor: the signal works irregularly.

Faulty sensor or signal interference.

C1111 Rear speed sensor: the signal decreases periodically.

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

Variable geometry intake

Function

Extend or shorten the engine intake ducts to increase the intake air quantity according to the engine revs.

Operation / Operating principle

The system consists of:

- two intake ducts for each manifold, which may be joined (long ducts) or separated (short ducts);
- a motor that, by means of an endless screw, activates the upper part of the intake ducts;
- a variable geometry control unit for managing the system, interfaced with the engine injection control unit.

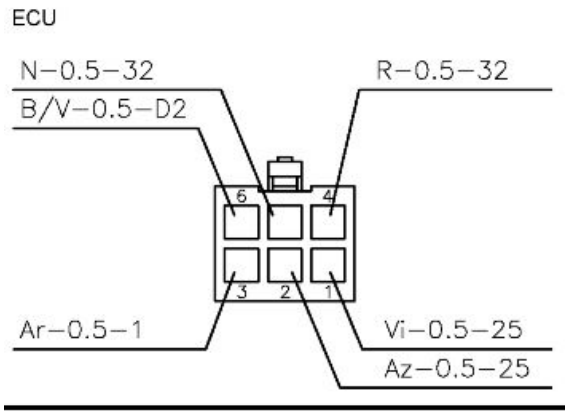
At key-ON, the variable geometry control unit lowers the ducts (if still in the raised position). Subsequently, depending on the control voltage on PIN 2 from the injection ECU (0V down, 5V up), the ECU drives the electric motor with the relative polarity for raising or lowering the ducts. The drive voltage delivered to the motor is determined in relation to battery voltage and the motor is stopped once a given current limit is reached or if the time-out period of 500 ms has elapsed.

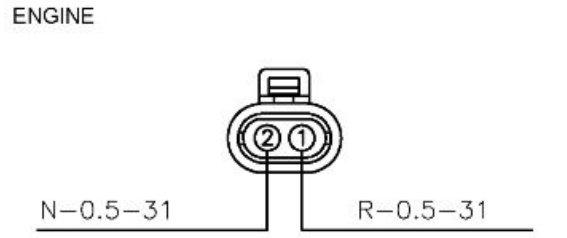
Level in electrical circuit diagram:

Variable geometry

Location:

- on the vehicle: ducts and motor inside the filter box, variable geometry control unit on rear frame under the saddle, right side.
- variable geometry control unit connector: on the control unit.
- connector of the electrical motor cable to the engine cable harness: outside





the filter box next to the rear upper injectors.

Electrical specifications:

Electrical motor resistance. 4.5 +/- 0.5 Ω; PIN 1: 0V normal, Vbatt fault PIN 2: 0V ducts control down, 5V ducts control up.

Pin out:

1. Control unit fault
2. Control from the injection ECU
3. Key ON (Vbatt)
4. Engine +
5. Engine -
6. Ground connection

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

Variable geometry intake

- not active/active

NOTE: It indicates whether the control unit has sent the command to the variable geometry control unit to lift the ducts.

DIAGNOSTIC TOOL: ACTIVATION

Variable geometry intake control

NOTE: The injection ECU sends the command to the variable geometry control unit to lift the ducts. In PADS, the command only works once, then put the key to OFF and wait for the loss of communication with the control unit.

DIAGNOSIS INSTRUMENT: ERRORS

Variable geometry intake P0447

- shorted to positive / shorted to negative / open circuit / signal not valid.

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 62. If shorted to negative: no voltage has been detected. If the circuit is open: an interruption has been detected. If signal is not valid: PIN 76 detects a battery voltage set by the variable geometry control unit to indicate error detection. The instrument panel does not indicate the presence of this error even in the ATT status.

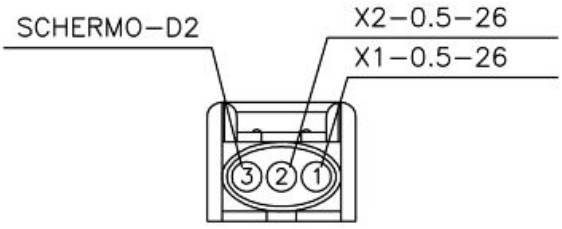
Troubleshooting

- If shorted to positive: if a voltage higher than 5V is detected, disconnect the variable geometry control unit connector and check with key ON the voltage to PIN 2: if it is higher than 5 V, restore cable harness; if equal to zero, replace the variable geometry control unit.
- If shorted to negative: disconnect the variable geometry control unit connector and the injection ECU connector and check continuity to ground of the light blue cable: if there is continuity with the ground, restore cable harness; if insulated from ground, replace the variable geometry control unit.
- If the circuit is open: check the connector of the variable geometry control unit and the injection control unit: if they are not OK, restore; if they are OK, check continuity on the light blue cable: if not OK, restore; if OK, replace the variable geometry control unit.
- If signal is not valid: check the connector of the variable geometry control unit, the motor cable connector and the motor connector (check the PINS of the connector, installed directly on the motor): if not OK, restore; if OK, check electrical characteristics of the motor: if not OK, replace; if OK, check, with connector of the variable geometry control unit and connector of the motor disconnected and intermediate connector connected, if the red and black cables are in continuity, insulated from ground and without voltage and insulated one from the other: if not OK, restore; if OK, check if the electrical motor pin is correctly inserted in the cavity of the endless screw (however it must turn a bit): if not OK, place it correctly; if OK, replace the variable geometry control unit.

Engine rpm sensor

Function

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

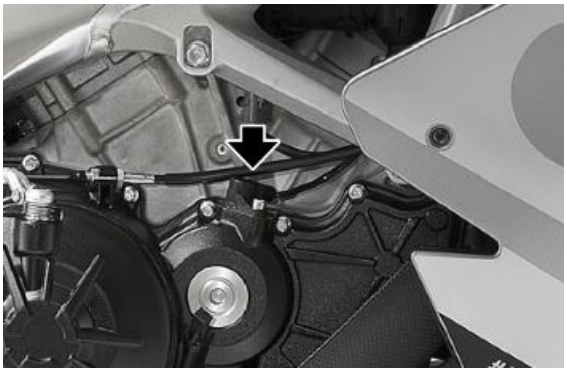


Operation / Operating principle

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 clutch cover
- connector: under fuel tank on RH side (3 pin black connector)

Electrical specifications:

0.79 kohm at ambient temperature

Pin out:

1. negative signal
2. positive signal
3. shielding with earth connection

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 speed sensor

- Signal not plausible

Causes of error

- Possible false contact in the electric circuit detected at PIN 20 and - 35 of the ENGINE connector

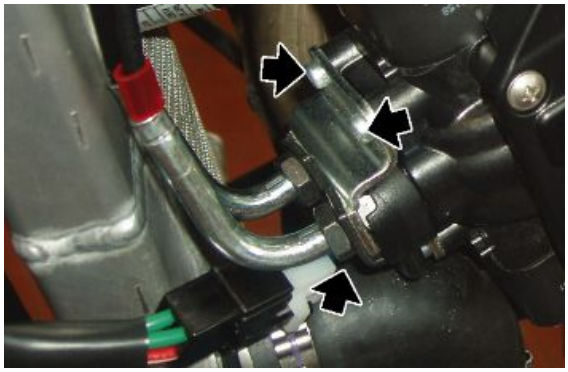
Troubleshooting

- Check the electric circuit is in good condition, that the flywheel teeth are clean and that the sensor is positioned correctly in its housing; if it is not, replace it. If it is OK, replace the sensor

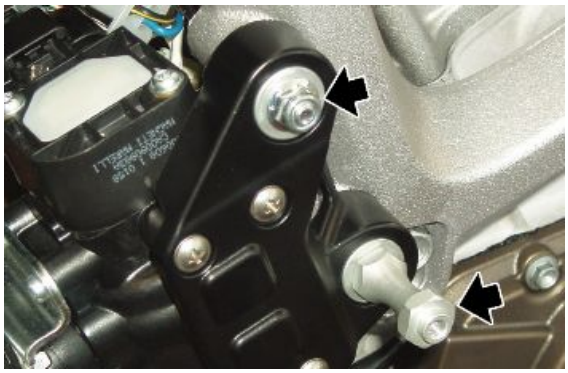
Twistgrip position sensor

REMOVAL

- Remove the left fairing.
- Loosen the two throttle cable nuts.
- Unscrew and remove the three plate fixing screws.
- Remove the throttle cables.



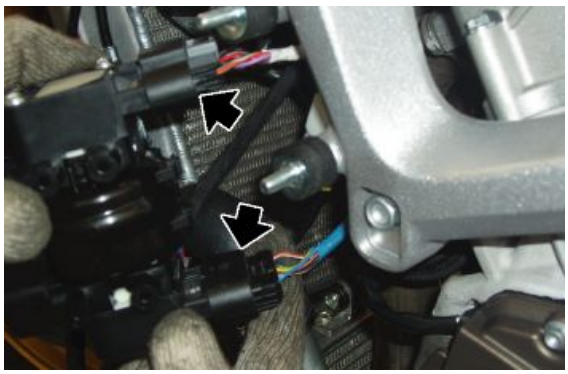
- Unscrew and remove the nut and the stud bolt.
- Retrieve the washers.



- Move the hand grip position sensor, disconnect the two connectors.
- Remove the hand grip position sensor.

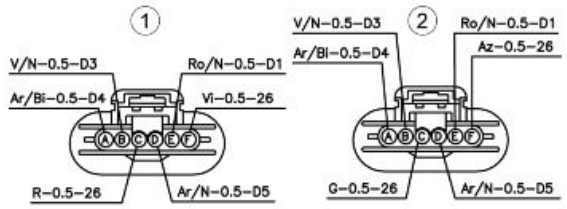
NOTE

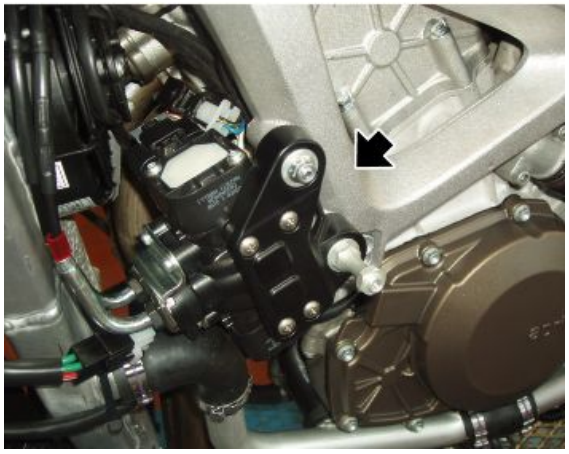
WHEN REFITTING, REMEMBER NOT TO INVERT THE CONNECTORS.
THE LIGHT BLUE CONNECTOR HAS THE BLUE CABLE AND THE WHITE CONNECTOR HAS THE WHITE CABLE.



Function

The throttle grip is the part to which the throttle control cables arrive; its task is to translate the rider's power request (Demand) into an electrical signal to be sent to the electronic control unit.





Operation / operating principle

The two throttle cables (opening and closing) actuate on a scroll mounted on a shaft and which is sent back to its home position by a return spring. On the shaft covers there are 2 double track potentiometers (4 control tracks) by means of which the torque demand is read (and checked). The 4 potentiometers are tinned and magnetically controlled (contactless); they cannot be overhauled nor replaced

Level in wiring diagram:

Hand grip position sensor

Location:

- on the vehicle: front left part, next to the cooling liquid radiator
- connector: on the sensor

Electrical specifications

- Not detected by a multimeter as they are contactless: read the voltage of the 4 tracks by the diagnosis instrument

Pin out:

BLUE connector

- A: Track A supply
- B: Track A ground
- C: Track A signal
- D: Track B supply
- E: Track B ground
- F: Track B signal

WHITE connector

- A: Track C supply
- B: Track C ground

- C: Track C signal
- D: Track D supply
- E: Track D ground
- F: Track D signal

DIAGNOSIS INSTRUMENT: PARAMETERS

Blue lower connector throttle grip position sensor - track A

- Example value with key ON: 1107 mV
- Example value with engine on: -

Voltage value of the lower potentiometer - track A

Blue lower connector throttle grip position sensor - track B

- Example value with key ON: 1070 mV
- Example value with engine on: -

Voltage value times 2 of the lower potentiometer track B

White upper connector throttle grip position sensor - track C

- Example value with key ON: 3560 mV
- Example value with engine on: -

Voltage value of the upper potentiometer track C

White upper connector throttle grip position sensor - track D

- Example value with key ON: 3555 mV
- Example value with engine on: -

Voltage value times 2 of the upper potentiometer track D

Throttle grip position sensor

- Example value with key ON: 1107 mV
- Example value with engine on: -

Voltage corresponding to the potentiometer track A

Throttle grip opening percentage

- Example value with key ON: 0 mV
- Example value with engine on: -

With a released throttle grip, the value read should be 0%, whereas 100 % should be read with throttle grip fully twisted.

DIAGNOSIS INSTRUMENT: STATUSES

Throttle grip

- Slightly twisted_choked_fully twisted

Throttle grip self-acquisition

- carried out/not carried out

CAUTION

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DIAGNOSIS INSTRUMENT: ELECTRICAL ERRORS

Blue lower connector throttle grip position sensor - track A P0150

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 39 of the VEHICLE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 39 of the VEHICLE connector

Troubleshooting

- shorted to positive: check the value shown by the parameter of the BLUE lower connector Throttle Grip Position Sensor - track A: disconnect the connector and read the value indicated by the diagnosis instrument: if the voltage does not vary, there is a short circuit in the cable wiring; replace the throttle grip sensor if the voltage drops to zero.
- if the circuit is open, shorted to negative: check the throttle grip sensor connector and the Marelli control unit connector. If not OK, restore. If OK, check circuit continuity between the two cable terminals. If not OK, restore; if OK, check the cable ground insulation (from the throttle grip sensor connector or the control unit connector): if the cable is not ground insulated, restore the wiring. If it is ground insulated, and with the key set to ON, check that there is power supply for the potentiometer PIN A and that PIN C is connected to ground. If both are correct, replace the throttle grip sensor; if not, check the continuity of the cable that is not functioning properly: if there is continuity, replace the control unit; if not, restore the wiring

Blue lower connector throttle grip position sensor - track B P0151

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 13 of the VEHICLE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 13 of the VEHICLE connector

Troubleshooting

- short circuit to positive: check the value shown by the parameter of the BLUE lower connector Throttle Grip position Sensor track B: disconnect the connector and read the value indicated by the diagnosis instrument: if the voltage does not vary, there is a short circuit in the cable wiring; replace the throttle grip sensor if the voltage drops to zero.
- if the circuit is open, shorted to negative: check the throttle grip sensor connector and the Marelli control unit connector. If not OK, restore. If OK, check circuit continuity between the two cable terminals. If not OK, restore; if OK, check the cable ground insulation (from the

throttle grip sensor connector or the control unit connector): if the cable is not ground insulated, restore the wiring. If it is ground insulated, and with the switch key set to ON, check that there is power supply for the potentiometer PIN D and that PIN F is connected to ground. If both are correct, replace the throttle grip sensor; if not, check the continuity of the cable that is not functioning properly: if there is continuity, replace the control unit; if not, restore the wiring

DIAGNOSIS INSTRUMENT: ELECTRICAL ERRORS

White upper connector throttle grip position sensor - track C P0152

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 23 of the ENGINE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 23 of the ENGINE connector

Troubleshooting

- shorted to positive: check the value shown by the parameter of the white upper connector Throttle Grip Position Sensor - track C: disconnect the connector and read the value indicated by the diagnosis instrument: if the voltage does not vary, there is a short circuit in the cable wiring; replace the throttle grip sensor if the voltage drops to zero.
- if the circuit is open, shorted to negative: carry out the open circuit, shorted to negative: check the throttle grip sensor connector and the Marelli control unit connector. If not OK, restore. If OK, check circuit continuity between the two cable terminals. If not OK, restore; if OK, check the cable ground insulation (from the throttle grip sensor connector or the control unit connector): if the cable is not ground insulated, restore the wiring. If it is ground insulated, and with the key set to ON, check that there is power supply for the potentiometer PIN A and that PIN C is connected to ground. If both are correct, replace the throttle grip sensor; if not, check the continuity of the cable that is not functioning properly: if there is continuity, replace the control unit; if not, restore the wiring

White upper connector throttle grip position sensor - track D P0153

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 11 of the ENGINE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 11 of the ENGINE connector

Troubleshooting

- shorted to positive: check the value shown by the parameter of the white upper connector Throttle Grip Position Sensor - track D: disconnect the connector and read the value indi-

cated by the diagnosis instrument: if the voltage does not vary, there is a short circuit in the cable wiring; replace the throttle grip sensor if the voltage drops to zero.

- if the circuit is open, shorted to negative: check the throttle grip sensor connector and the Marelli control unit connector. If not OK, restore. If OK, check circuit continuity between the two cable terminals. If not OK, restore; if OK, check the cable ground insulation (from the throttle grip sensor connector or the control unit connector): if the cable is not ground insulated, restore the wiring. If it is ground insulated, and with the switch key set to ON, check that there is power supply for the potentiometer PIN D and that PIN F is connected to ground. If both are correct, replace the throttle grip sensor; if not, check the continuity of the cable that is not functioning properly: if there is continuity, replace the control unit; if not, restore the wiring

DIAGNOSIS INSTRUMENT: LOGIC ERRORS

Blue lower connector throttle grip position (tracks A-B) P0154

- incongruent signal

Error cause

- Two illogical voltage signals have been detected at PIN 13 and 39 of the ENGINE connector (tracks A-B)

Troubleshooting

- Check the parameters of the blue lower connector Throttle Grip Position Sensor - tracks A and B: if one of the two values clearly deviates from 600-1400 mV, it means that this potentiometer is defective. Check the throttle grip sensor connector and the control unit connector: if not OK, restore. If OK, check that cable resistance between the throttle grip sensor connector and the control unit is a few tenths of Ohm: if this is not the case, restore wiring. If the value is correct, replace the complete throttle grip sensor

White upper connector throttle grip position (tracks C-D) P0155

- incongruent signal

Error cause

- Two illogical voltage signals have been detected at PIN 23 and 11 of the ENGINE connector (tracks A-B)

Troubleshooting

- Check the parameters of the white upper connector Throttle Grip Position Sensor - tracks C and D: if one of the two values clearly deviates from 600-1400 mV, it means that this potentiometer is defective. Check the throttle grip sensor connector and the control unit connector: if not OK, restore. If OK, check that cable resistance between the throttle grip sensor connector and the control unit is a few tenths of Ohm: if this is not the case, restore wiring. If the value is correct, replace the complete throttle grip sensor

Throttle grip position P0156

- incongruent signal

Error cause

- The value of the lower side sensor (tracks A-B) does not coincide with the value of the upper side sensor (tracks C-D)

Troubleshooting

- Replace the throttle grip sensor

DIAGNOSIS INSTRUMENT: ADJUSTABLE PARAMETERS

Throttle grip self-acquisition: -

RESET PROCEDURE

- If Marelli control unit or its mapping are replaced or if you carry out control unit EEPROM zero setting or if you replace the throttle grip sensor, it is necessary to carry out the handle grip self-acquisition procedure with the diagnosis instrument: once the check is completed, make sure that the throttle grip Self-acquisition status indicates: carried out

CAUTION

THE TWO CONNECTORS WHICH GET TO THE THROTTLE GRIP SENSOR ARE ALIKE BUT THEY SHOULD NEVER BE INVERTED. MARK OR CHECK THE CONNECTOR MARKING BEFORE REMOVING THEM (BLUE STAMP + BLUE BAND). THE BLUE CONNECTOR AND COLLAR ARE PLACED DOWNWARDS AND THE WHITE CONNECTOR AND COLLAR ARE PLACED UPWARDS.

Intake pressure sensor

Function

The pressure sensors (one per bank), are fundamental for calculation of generated torque, for calculation of ambient pressure and for correct ignition timing during start-up.

Operation / operating principle

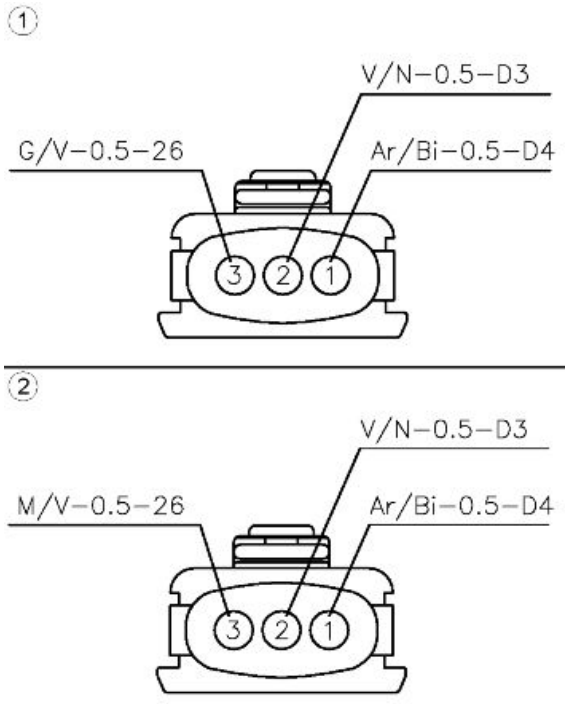
Diaphragm sensor which translates the diaphragm position into electrical voltage when in contact with the intake air.

Level in wiring diagram:

Intake air temperature sensor

Location:

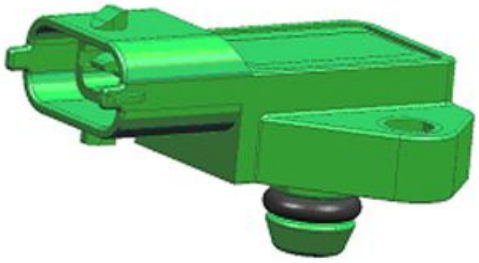
- on the vehicle: sensor for rear cylinders (1 and 3) on the right of the filter box, sensor for front cylinders (2 and 4) on the left of the filter box.
- connector: on the sensor.



Electrical specifications: -

Pin out:

1. Power supply 5V
2. Ground connection
3. Output signal



DIAGNOSIS INSTRUMENT: PARAMETERS

Front Cylinder Intake Pressure (2 and 4)

- Example value with key ON: 1003 mbar
- Example value with engine on: 720 mbar
- NOTE: pressure read by the front sensor

Rear Cylinder Intake Pressure (1 and 3)

- Example value with key ON: 1004 mbar
- Example value with engine on: 715 mbar
- NOTE: pressure read by the rear sensor

Front Cylinder estimated Intake Pressure (2 and 4)

- Example value with key ON: 1003 mbar
- Example value with engine on: 721 mbar
- NOTE: pressure estimated by the control unit according to the throttle position

Rear Cylinder estimated Intake Pressure (1 and 3)

- Example value with key ON: 1004 mbar
- Example value with engine on: 735 mbar
- NOTE: pressure estimated by the control unit according to the throttle position

CAUTION

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DIAGNOSIS INSTRUMENT: ELECTRICAL ERRORS

rear cylinder air pressure sensor P0105

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 24. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 24.

Troubleshooting

- If shorted to positive: see that the parameter of the rear cylinders air Pressure Sensor on the diagnosis instrument reads approx. 1200 mbar; disconnect the sensor connector: if the value does not vary, it means that the cable is shorted between the control unit connector and the sensor connector: restore the cable harness; Replace the sensor if the value varies.
- If the circuit is open, shorted to negative: check the Marelli control unit connector and the sensor connector; if not OK, restore. If everything is OK, with key set to OFF, check if there is continuity between the PIN 24 of the Marelli control unit and the sensor connector PIN 3: if there is no continuity, restore the cable harness. If there is continuity, check the cable ground insulation: if there is continuity to ground, restore the cable harness; if not, with key set to ON check that the voltage on sensor connector PIN 1 is approx. 5 V: if not OK, set the key to OFF and check continuity between the ENGINE connector PIN 25 and the sensor connector PIN 1: if not OK, restore the cable harness; if OK, replace the control unit; if there is 5V voltage at PIN 1, and with key set to ON, check the continuity to ground of the sensor connector PIN 3: if not OK, restore the cable harness; if OK, replace the sensor.

front cylinder air pressure sensor P0106

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 49. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 49.

Troubleshooting

- If shorted to positive: see that the parameter of the front cylinders air Pressure Sensor on the diagnosis instrument reads approx. 1200 mbar; disconnect the sensor connector: if the value does not vary, it means that the cable is shorted between the control unit connector and the sensor connector: restore the cable harness; Replace the sensor if the value varies.
- If the circuit is open, shorted to negative: check the Marelli control unit connector and the sensor connector; if not OK, restore. If everything is OK, with key set to OFF, check if there is continuity between the PIN 49 of the Marelli control unit and the sensor connector PIN 3: if there is no continuity, restore the cable harness. If there is continuity, check the cable ground insulation: if there is continuity to ground, restore the cable harness; if not, with key set to ON check that the voltage on sensor connector PIN 1 is approx. 5 V: if not OK, set the key to OFF and check continuity between the ENGINE connector PIN 25 and the sensor connector PIN 1: if not OK, restore the cable harness; if OK, replace the control unit; if there is 5V voltage at PIN 1, and with key set to ON, check the continuity to ground of the sensor connector PIN 3: if not OK, restore the cable harness; if OK, replace the sensor.

DIAGNOSIS INSTRUMENT: LOGIC ERRORS

rear cylinder air pressure sensor P0107

- signal not valid.

Error cause

- According to the engine operation data (rpm, throttle, etc.) an average value for the intake pressure is estimated: if the value read deviates by a given percentage, this error is activated. The most frequent causes can be: abnormal resistance in the sensor circuit (for example, rusted terminals) or sensor with poor performance.

Troubleshooting

- Check the Marelli control unit connector and the sensor connector; if not OK, restore. If everything is OK, check that resistance between VEHICLE connector PIN 24 and sensor connector PIN 3 is a few tenths of an Ohm; If it is above that value, restore cable harness. Replace the sensor if it is correct.

rear cylinder air pressure sensor P0108

- signal not valid.

Error cause

- According to the engine operation data (rpm, throttle, etc.) an average value for the intake pressure is estimated: if the value read deviates by a given percentage, this error is activated. The most frequent causes can be: abnormal resistance in the sensor circuit (for example, rusted terminals) or sensor with poor performance.

Troubleshooting

- Check the filter box large connector, the Marelli control unit connector and the sensor connector; if not OK, restore. If everything is OK, check that resistance between VEHICLE connector PIN 49 and sensor connector PIN 3 is a few tenths of an Ohm; If it is above that value, restore cable harness. Replace the sensor if it is correct.

Error for unexpected air intake in the rear cylinder manifold P0210

- signal not valid.

Error cause

- A small difference between the estimated pressure and the measured pressure has been detected: 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).

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.

Error for unexpected air intake in the front cylinder manifold P0211

- signal not valid.

Error cause

- A small difference between the estimated pressure and the measured pressure has been detected: 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).

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.

Estimation error for rear cylinder intake manifold pressure P0215

- too high pressure/too low pressure.

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).

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 an evident defect in the intake and pressure reading systems.

Estimation error for front cylinder intake manifold pressure P0216

- too high pressure/too low pressure.

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).

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 an evident defect in the intake and pressure reading systems.

Pressure too low at rear cylinder manifold error P0217

- signal not valid.

Error cause

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

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.

Pressure too low at front cylinder manifold error P0218

- signal not valid.

Error cause

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

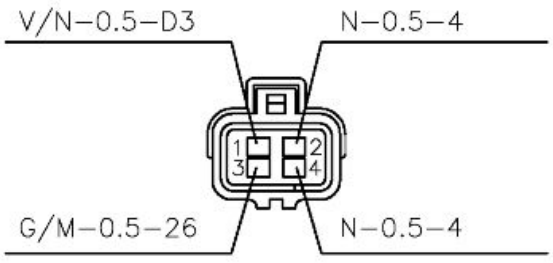
Troubleshooting

- 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

It tells the engine temperature to the control unit to improve its performance and to calculate the engine friction for a better estimation of the generated torque.

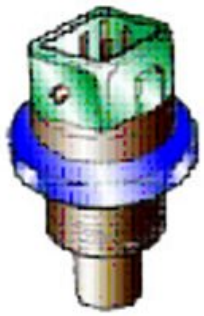


Operation / operating principle

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

Level in wiring diagram:

Temperature sensors



Location:

- on the vehicle: right side next to the two heads.
- connector: on the sensor.

Electrical characteristics:

- Resistance at 25°: 2.05 kΩ ± 100 Ω
- Resistance at 60°: 575 kΩ ± 15 Ω
- Resistance at 90°: 230 kΩ ± 5 Ω

Pin out:

1. B1 yellow/brown : 0-5 V signal

2. B2 green/black: Ground connection

DIAGNOSIS INSTRUMENT: PARAMETERS

Engine temperature:

- Example value with key ON: 25° C
- Example value with engine on: 75° C
- In case of recovery, this value is set by the control unit: if there is a malfunction after engine start-up, temperature decreases up to approximately 75°.

Engine temperature pre Recovery:

- Example value with key ON: -40° C
- Example value with engine on: -40° C
- Value drawn from the signal read without taking into account any recovery: the value in the example refers to an open circuit.

Engine temperature at start-up:

- Example value with key ON: -40° C
- Example value with engine on: 25° C
- The temperature value is stored during engine start-up. With key ON, value -40°C is read.

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

engine temperature sensor P0115

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

Error cause

- If the circuit is open, shorted to positive: excessive voltage has been detected at PIN 12 of the ENGINE connector. If shorted to negative: voltage equal to zero has been detected. The instrument panel does not indicate the presence of this error even in the ATT status.

Troubleshooting

- If the circuit is open, shorted 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 1: restore cable harness if there is not continuity; if it is OK, reconnect the control unit connector and, with key set to key ON, check the continuity between the sensor connector PIN 2 and the vehicle ground connection: if OK, it means that the error cause is that the cable is shorted to positive and it is necessary to restore the cable harness between ENGINE PIN 12 and sensor PIN 1; if there is no continuity with the ground connection, check the sensor connector and the Marelli control unit connector. If not OK, restore the cable harness. If OK, check continuity

between the ENGINE connector PIN 6 or 17 and the sensor connector PIN 2: 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 shorted to negative, check sensor correct resistance: 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

Engine temperature sensor P0116

- 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 does not indicate the presence of this error even in the ATT status.

Troubleshooting

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

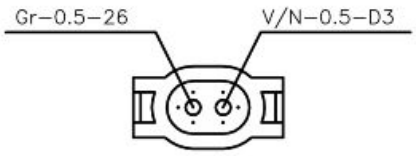
NOTES

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

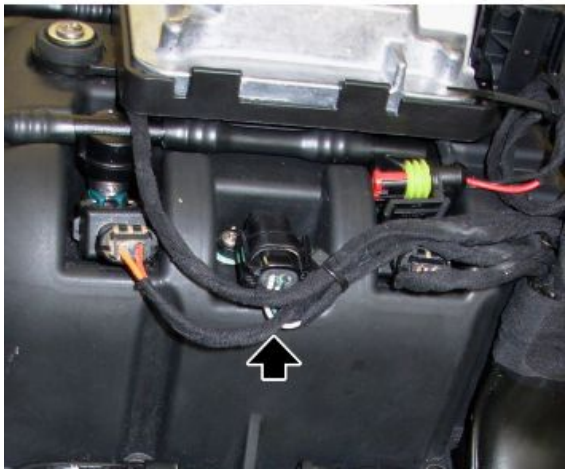
Function

it tells the control unit the intake air temperature in order to calculate oxygen presence so as to optimise the petrol quantity necessary for correct combustion



Operation / operating principle

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



Level in wiring diagram:

Temperature sensors

Location:

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

Electrical characteristics: 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 connection

DIAGNOSIS INSTRUMENT: PARAMETERS

Air temperature

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

In case of recovery, this value is set by the control unit

Air temperature pre Recovery

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

Value drawn from the signal read without taking into account any recovery: the value in the example 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.

DIAGNOSIS INSTRUMENT: ELECTRICAL ERRORS

air temperature sensor P0110

- open circuit, shorted to positive / shorted to negative

Error cause

- If the circuit is open, shorted to positive: excessive voltage has been detected at PIN 37 of the ENGINE connector. If shorted to negative: voltage equal to zero has been detected. The instrument panel does not indicate the presence of this error even in the ATT status.

Troubleshooting

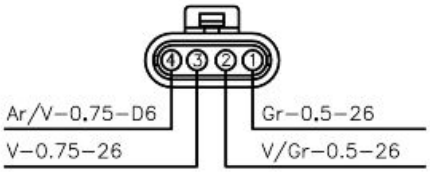
- If the circuit is open, shorted to positive: check the sensor connector and the Marelli control unit connector. If they are OK, check sensor continuity: replace the sensor if not OK; if OK, check continuity between the ENGINE connector PIN 37 and the sensor PIN 1: restore cable harness if there is not continuity; if it is OK, reconnect the control unit connector and, with key set to key ON, check the continuity between the sensor connector PIN 2 and the vehicle ground connection: if OK, it means that the error cause is that the cable is 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 continuity between the ENGINE connector PIN 6 or 17 and the sensor connector PIN 2: 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 shorted to negative, check sensor correct resistance: if resistance = 0, replace the sensor; if resistance is correct, it means that the grey cable has ground connection: restore the cable harness

Lambda sensor

(FRONT CYLINDER BANK)

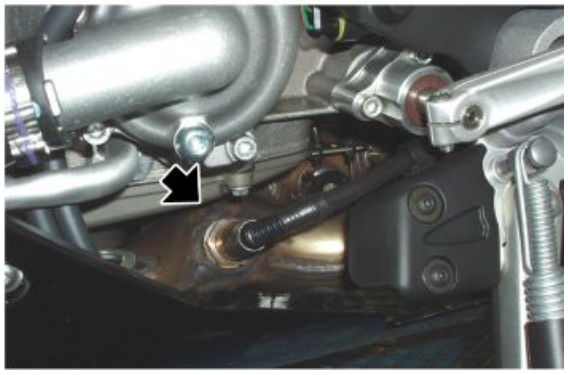
Function

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

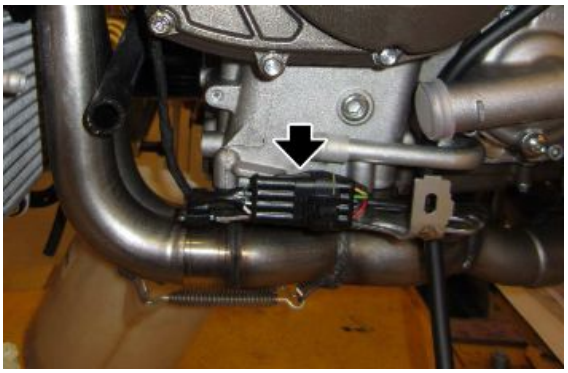


Level in electrical circuit diagram:

Lambda probe

Position:

- on manifold: left side of the vehicle
- connector: left side of the vehicle, fixed to the support bracket of the fairing lug (4-way connector black)



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 value_Fault due to lean value

- If the probe connector is removed (voltage almost equal to zero), the status is Fault due to lean value

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 as close as possible to the stoichiometric value.

DIAGNOSTIC TOOL: ACTIVATION

Lambda probe heating

- The injection relay (No. 33 in the electrical circuit diagram, placed under the saddle next to the battery positive, 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). The continuity of the wiring is necessary for correct activation: no error indications are displayed in case of lack of activation

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

Lambda probe P0136

- shorted to positive

Error cause

- Excessive voltage (battery voltage) has been detected at PIN 9 and 38 of the ENGINE connector. Caution: the 'lambda probe' parameter is not the real value that is read; a recovery value is displayed instead. The instrument panel does not indicate the presence of this error even in the ATT status.

Troubleshooting

- shorted 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 there is voltage (5 or 12 V), restore the cable harness; if there is not, replace the Lambda probe

Lambda probe heating P0141

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 44 of the ENGINE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 44 of the ENGINE connector. The instrument panel does not indicate the presence of this error even in the ATT status.

Troubleshooting

- If shorted to positive: disconnect the probe connector and check the sensor correct resistance: replace the sensor if not OK; if it is OK, restore the cable harness (black/green cable)
- If circuit is open, shorted to negative: check circuit continuity from probe connector (PIN 3 and 4) toward the probe: if it is not OK, replace the probe; if it is OK, check the sensor connector and the Marelli control unit connector: if it is not OK, restore; if it is OK, with key set to ON and sensor connector disconnected, check if there is battery voltage at PIN 4: if it is not OK, check the red/brown cable continuity between the probe connector and the injection relay (No. 33 in the electrical circuit diagram, placed under the saddle next to the battery positive, CHECK, however, the identification of the relay with the colour of the cables). If there are also coil, lower and upper injector and secondary air errors, check the relay and its excitation and power line; if there is voltage at PIN 4, check the black/purple cable ground insulation (PIN 3): if not OK, restore the cable harness. If it is OK, check the continuity of the black/purple cable (between the sensor connector PIN 3 and the ENGINE PIN 44) and restore the cable harness
- If circuit is open, shorted to negative: check circuit continuity from probe connector (PIN 3 and 4) toward the probe: if it is not OK, replace the probe; if it is OK, check the sensor connector and the Marelli control unit connector: if it is not OK, restore; if it is OK, with key set to ON and sensor connector disconnected, check if there is battery voltage at PIN 4: if it is not OK, check the red/brown cable continuity between the probe connector and the

injection relay (No. 33 in the electrical circuit diagram, placed under the saddle next to the battery positive, CHECK, however, the identification of the relay with the colour of the cables). If there are also coil, lower and upper injector and secondary air errors, check the relay and its excitation and power line; if there is voltage at PIN 4, check the black/purple cable ground insulation (PIN 3): if not OK, restore the cable harness. If it is OK, check the continuity of the black/purple cable (between the sensor connector PIN 3 and the ENGINE PIN 32) and restore the cable harness.

WARNING

The control unit does not detects the following malfunctions of the Lambda probe circuit according to the signal: interrupted circuit, shorted to ground or sensor malfunction (for example non variable voltage). In case of fault indication, carry out the following troubleshooting.

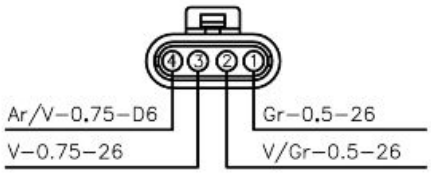
Troubleshooting

- Check circuit continuity from probe connector (PIN 1 and PIN 2) toward 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 continuity between the ENGINE connector PIN 38 and PIN 9 and restore the cable harness.

(REAR CYLINDER BANK)

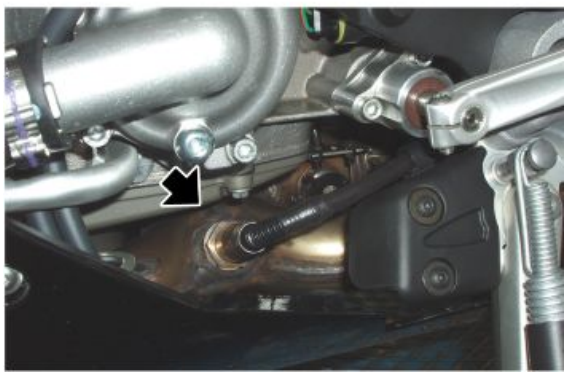
Function

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:

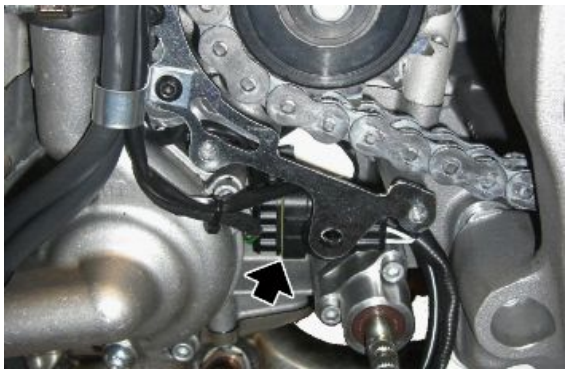
- on manifold: on the rear part of the vehicle in correspondence with the shock absorber
- connector: on the right of the pinion cover (4-ways black connector)

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 value_Fault due to lean value

- If the probe connector is removed (voltage almost equal to zero), the status is Fault due to lean value

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 as close as possible to the stoichiometric value.

DIAGNOSTIC TOOL: ACTIVATION

Lambda probe heating

- The injection relay (No. 33 in the electrical circuit diagram, placed under the saddle next to the battery positive, 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). The continuity of the wiring is necessary for correct activation: no error indications are displayed in case of lack of activation

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

Lambda probe P0130

- shorted to positive

Error cause

- Excessive voltage (battery voltage) has been detected at PIN 10 and 22 of the ENGINE connector. Caution: the 'Lambda probe' parameter is not the real value that is read; a recovery value is displayed instead. The instrument panel does not indicate the presence of this error even in the ATT status.

Troubleshooting

- shorted to positive: with key set to ON, disconnect the sensor connector and measure PIN 1 voltage on the cable harness side (grey cable): if there is voltage (5 or 12 V), restore the cable harness; if there is not, replace the Lambda probe

Lambda probe heating P0135

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 32 of the ENGINE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 32 of the ENGINE connector. The instrument panel does not indicate the presence of this error even in the ATT status.

Troubleshooting

- If shorted to positive: disconnect the probe connector and check the sensor correct resistance: replace the sensor if not OK; if it is OK, restore the cable harness (green cable)

- If circuit is open, shorted to negative: check circuit continuity from probe connector (PIN 3 and 4) toward the probe: if it is not OK, replace the probe; if it is OK, check the sensor connector and the Marelli control unit connector: if it is not OK, restore; if it is OK, with key set to ON and sensor connector disconnected, check if there is battery voltage at PIN 4: if it is not OK, check the red/brown cable continuity between the probe connector and the injection relay (No. 33 in the electrical circuit diagram, placed under the saddle next to the battery positive, CHECK, however, the identification of the relay with the colour of the cables). If there are also coil, lower and upper injector and secondary air errors, check the relay and its excitation and power line; if there is voltage at PIN 4, check ground insulation of the green cable (PIN 3): if not OK, restore the cable harness. If it is OK, check the continuity of the Green cable (between the sensor connector PIN 3 and the ENGINE PIN 32) and restore the cable harness
- If circuit is open, shorted to negative: check circuit continuity from probe connector (PIN 3 and 4) toward the probe: if it is not OK, replace the probe; if it is OK, check the sensor connector and the Marelli control unit connector: if it is not OK, restore; if it is OK, with key set to ON and sensor connector disconnected, check if there is battery voltage at PIN 4: if it is not OK, check the red/brown cable continuity between the probe connector and the injection relay (No. 33 in the electrical circuit diagram, placed under the saddle next to the battery positive, CHECK, however, the identification of the relay with the colour of the cables). If there are also coil, lower and upper injector and secondary air errors, check the relay and its excitation and power line; if there is voltage at PIN 4, check ground insulation of the green cable (PIN 3): if not OK, restore the cable harness. If it is OK, check the continuity of the green cable (between the sensor connector PIN 3 and the ENGINE PIN 32) and restore the cable harness.

WARNING

The control unit does not detects the following malfunctions of the Lambda probe circuit according to the signal: interrupted circuit, shorted to ground or sensor malfunction (for example non variable voltage). In case of fault indication, carry out the following troubleshooting.

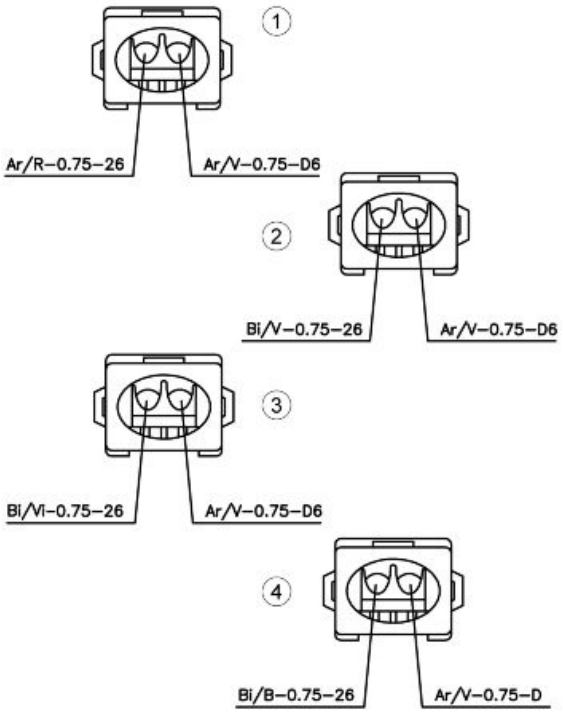
Troubleshooting

- Check circuit continuity from probe connector (PIN 1 and PIN 2) toward 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 continuity between the ENGINE connector PIN 22 and PIN 10 and restore the cable harness.

Injector

Lower injectors key:

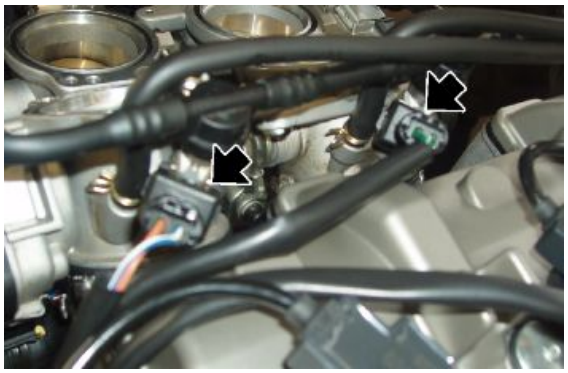
- 1. Lower Injector 1
- 2. Lower Injector 3
- 3. Lower Injector 2
- 4. Lower Injector 4



LOWER INJECTOR

Function

Provide the correct amount of fuel at the correct time. The lower injectors work in the field of low engine revs, the upper injectors in the field of high engine revs.



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:

14.8 Ω ± 5% (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

Cylinder injection time 3

- Example value with engine on: 1.9 ms

Cylinder injection time 4

- Example value with engine on: 1.9 ms

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: ACTIVATIONS

Lower injector cylinder 1

- The injection relay (No. 33 in the electrical circuit diagram, placed under saddle, right side; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the injector cable connected to control unit is closed to ground for 4 ms per second. 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

Lower injector cylinder 2

- The injection relay (No. 33 in the electrical circuit diagram, placed under saddle, right side; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the injector cable connected to control unit is closed to ground for 4 ms per second. 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

Lower injector cylinder 3

- The injection relay (No. 33 in the electrical circuit diagram, placed under saddle, right side; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the injector cable connected to control unit is closed to ground for 4 ms per second. 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

Lower injector cylinder 4

- The injection relay (No. 33 in the electrical circuit diagram, placed under saddle, right side; CHECK, however, the identification of the relay with the colour of the cables) is energised

for 5 seconds and the injector cable connected to control unit is closed to ground for 4 ms per second. 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

Lower injector cylinder 1 P0201

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 8. If shorted to negative: no voltage has been detected. If the circuit is open: an interruption has been detected

Troubleshooting

- If shorted to positive: disconnect the injector connector, set key to ON, activate the component with the diagnostic tool and check the voltage on the orange/red cable on the injector connector (if there is voltage): if there is voltage, restore the filter box cable harness. If there is no voltage, replace the sensor
- If shorted to negative: disconnect the injector connector, set the key to ON and check if there is a ground connection on the orange/red cable: if there connection, restore the cable harness. If there is no connection, replace the injector
- If the circuit is open: 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 cable continuity between the ENGINE PIN 8 and component PIN - and restore the cable harness

Lower injector cylinder 2 P0202

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 46. If shorted to negative: no voltage has been detected. If the circuit is open: an interruption has been detected

Troubleshooting

- If shorted to positive: disconnect the injector connector, set key to ON, activate the component with the diagnostic tool and check the voltage on the white/green cable on the injector connector: if there is voltage, restore the filter box cable harness. If there is no voltage, replace the sensor
- If shorted to negative: disconnect the injector connector, set the key to ON and check if there is a ground connection on the white/green cable: if there connection, restore the cable harness. If there is no connection, replace the injector
- If the circuit is open: 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 cable continuity between the ENGINE PIN 46 and component PIN - and restore the cable harness

Lower injector cylinder 3 P0203

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 34. If shorted to negative: no voltage has been detected. If the circuit is open: an interruption has been detected

Troubleshooting

- If shorted to positive: disconnect the injector connector, set key to ON, activate the component with the diagnostic tool and check the voltage on the white/purple cable on the injector connector (if there is voltage): if there is voltage, restore the filter box cable harness. If there is no voltage, replace the sensor
- If shorted to negative: disconnect the injector connector, set the key to ON and check if there is a ground connection on the white/purple cable: if there connection, restore the cable harness. If there is no connection, replace the injector
- If the circuit is open: 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 cable continuity between the ENGINE PIN 34 and component PIN - and restore the cable harness

Lower injector cylinder 4 P0204

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

Error cause

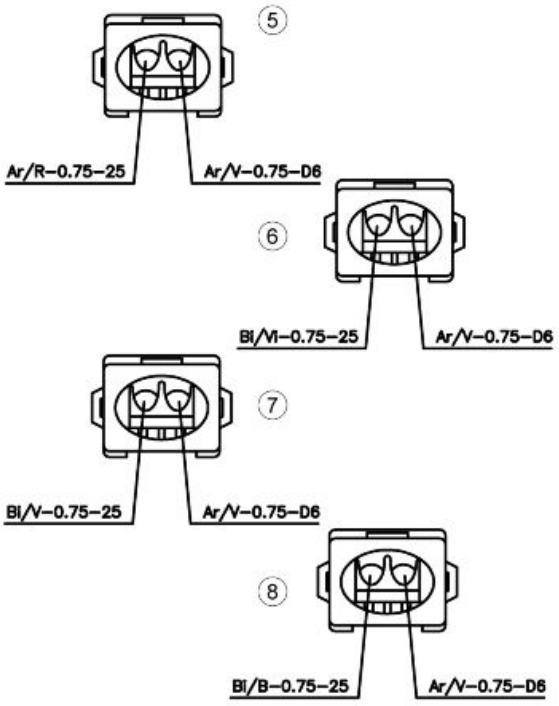
- If shorted to positive: excessive voltage has been detected at PIN 45. If shorted to negative: no voltage has been detected. If the circuit is open: an interruption has been detected

Troubleshooting

- If shorted to positive: disconnect the injector connector, set key to ON, activate the component with the diagnostic tool and check the voltage on the white/blue cable on the injector connector (if there is voltage): if there is voltage, restore the filter box cable harness. If there is no voltage, replace the sensor
- If shorted to negative: disconnect the injector connector, set the key to ON and check if there is a ground connection on the white/blue cable: if there connection, restore the cable harness. If there is no connection, replace the injector
- If the circuit is open: 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 cable continuity between the ENGINE PIN 45 and component PIN - and restore the cable harness

Upper injectors key:

- 5. Upper Injector 1
- 6. Upper Injector 3
- 7. Upper Injector 2
- 8. Upper Injector 4



UPPER INJECTOR Function

Provide the correct amount of fuel at the correct time. The lower injectors work in the field of low engine revs, the upper injectors in the field of high engine revs.

Operation / Operating principle

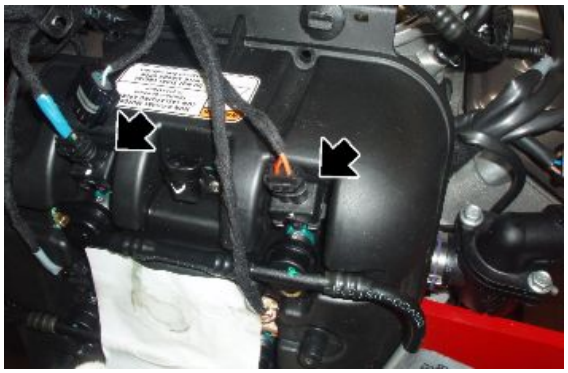
Injector coil is energised for the petrol passage to open

Level in electrical circuit diagram:

Coils and injectors

Position:

- on the vehicle: on filter box cover
- connector: on injectors



Electrical specifications:

12 +/- 0.6Ω ± 5% (at ambient temp)

Pin out:

- "+": supply
- " ": ground

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: ACTIVATIONS

Lower injector cylinder 1

- The injection relay (No. 33 in the electrical circuit diagram, placed under saddle, right side; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the injector cable connected to control unit is closed to ground for 4 ms per second. 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

Upper injector cylinder 2

- The injection relay (No. 33 in the electrical circuit diagram, placed under saddle, right side; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the injector cable connected to control unit is closed to ground for 4 ms per second. 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

Upper injector cylinder 3

- The injection relay (No. 33 in the electrical circuit diagram, placed under saddle, right side; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the injector cable connected to control unit is closed to ground for 4 ms per second. 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

Upper injector cylinder 4

- The injection relay (No. 33 in the electrical circuit diagram, placed under saddle, right side; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the injector cable connected to control unit is closed to ground for 4 ms per second. 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

Upper injector cylinder 1 P0205

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 53. If shorted to negative: no voltage has been detected. If the circuit is open: an interruption has been detected

Troubleshooting

- If shorted to positive: disconnect the injector connector, set key to ON, activate the component with the diagnostic tool and check the voltage on the orange/red cable on the injector connector (if there is voltage): if there is voltage, restore the filter box cable harness. If there is no voltage, replace the sensor
- If shorted to negative: disconnect the injector connector, set the key to ON and check if there is a ground connection on the orange/red cable: if there connection, restore the cable harness. If there is no connection, replace the injector
- If the circuit is open: 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 cable continuity between PIN 53 and component PIN - and restore the cable harness

Upper injector cylinder 2 P0206

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 67. If shorted to negative: no voltage has been detected. If the circuit is open: an interruption has been detected

Troubleshooting

- If shorted to positive: disconnect the injector connector, set key to ON, activate the component with the diagnostic tool and check the voltage on the white/green cable on the injector connector: if there is voltage, restore the filter box cable harness. If there is no voltage, replace the sensor
- If shorted to negative: disconnect the injector connector, set the key to ON and check if there is a ground connection on the white/green cable: if there connection, restore the cable harness. If there is no connection, replace the injector
- If the circuit is open: 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 cable continuity between PIN 67 and component PIN - and restore the cable harness

Upper injector cylinder 3 P0207

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 74. If shorted to negative: no voltage has been detected. If the circuit is open: an interruption has been detected

Troubleshooting

- If shorted to positive: disconnect the injector connector, set key to ON, activate the component with the diagnostic tool and check the voltage on the white/purple cable on the injector

connector (if there is voltage): if there is voltage, restore the filter box cable harness. If there is no voltage, replace the sensor

- If shorted to negative: disconnect the injector connector, set the key to ON and check if there is a ground connection on the white/purple cable: if there connection, restore the cable harness. If there is no connection, replace the injector
- If the circuit is open: 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 cable continuity between PIN 74 and component PIN - and restore the cable harness

Upper injector cylinder 4 P0208

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 68. If shorted to negative: no voltage has been detected. If the circuit is open: an interruption has been detected

Troubleshooting

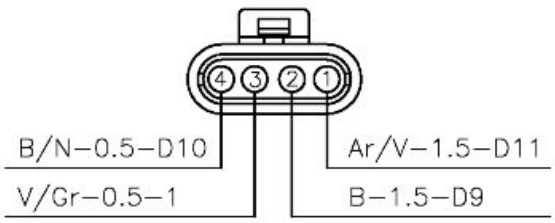
- If shorted to positive: disconnect the injector connector, set key to ON, activate the component with the diagnostic tool and check the voltage on the white/blue cable on the injector connector (if there is voltage): if there is voltage, restore the filter box cable harness. If there is no voltage, replace the sensor
- If shorted to negative: disconnect the injector connector, set the key to ON and check if there is a ground connection on the white/blue cable: if there connection, restore the cable harness. If there is no connection, replace the injector
- If the circuit is open: 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 cable continuity between PIN 68 and component PIN - and restore the cable 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 load relay

Location:

- on the vehicle: on the tank.
- connector: on right rear frame (4-ways black).

Electrical characteristics:

PIN 1-2: 0.5 - 1 ohm; PIN 3-4: you do not need to measure the component electrical resistance since it works correctly with suitable supply from the instrument panel only. Check correct operation as follows: connect in series a bulb of approximately 2 W: it should turn on if the tank is in reserve, otherwise, it remains off.

Pin out:

1. + 12 V
2. ground connection
3. ground connection
4. + 12 V (signal)

CAUTION

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DIAGNOSIS INSTRUMENT: ACTIVATION

Fuel pump

NOTE: The injection relay (No 33 in the wiring diagram, position under the saddle, next to the battery positive, CHECK, however, the identification of the relay with the colour of the cables) is energised for 30 seconds. The continuity of the wiring is necessary for correct activation: no error indications are displayed in case of lack of activation

DIAGNOSIS INSTRUMENT: ELECTRICAL ERRORS

fuel pump relay control P0230

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 73 of the VEHICLE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 73 of the VEHICLE connector.

Troubleshooting

- If shorted to positive: check whether the relay electrical specifications are correct by disconnecting it from the cable harness. If are not OK, replace the relay; if OK, restore the cable harness (Brown/Black cable).
- If the circuit is open, shorted 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

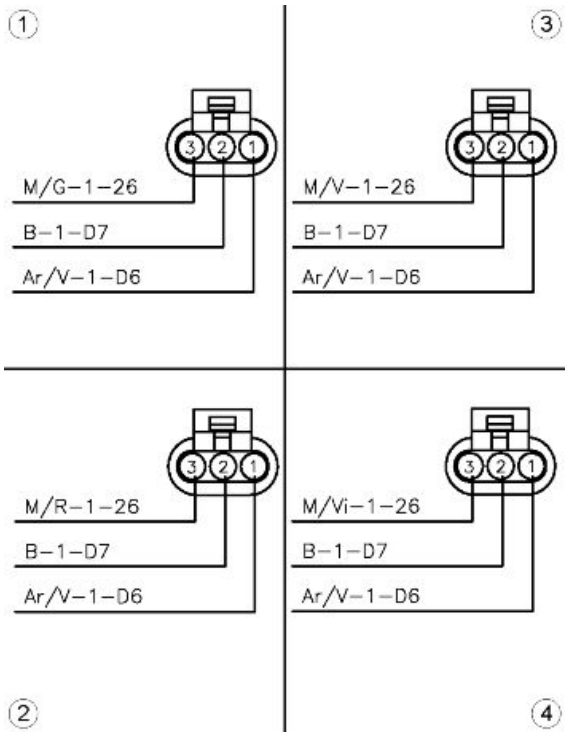
Inductive discharge system

Level in electrical circuit diagram:

coils and injectors

Location:

- on the vehicle: on the head covers.
- connector: For each 3-ways black coil connector. Coil 1 with short cable: on the left on the filter box, rear side; coil 2 with long cable: on the left of the front side of the filter box (connector with red strap on engine cable harness), coil 3 with long cable: on the left on the rear side of the filter box (connector with red strap on engine cable harness); coil 4 with short cable: on the right of the front side of the filter box.



Electrical specifications:

0.7 - 0.9 Ω at ambient temperature

Pin out:

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

DIAGNOSTICS INSTRUMENT: PARAMETERS

Example value with key ON: Current ignition advance

Example value with engine on: Indicates the cylinder advance where combustion will take place.

CAUTION

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DIAGNOSTICS INSTRUMENT: ACTIVATION

Coil 1:

The injection relay (No. 33 in the wiring diagram, placed under the saddle, next to the battery positive CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the brown/yellow cable of the coil is closed to ground for 2 ms per second. Disconnect the 4-way connector of the fuel pump to be able to hear the relay and injector activation. The continuity of the wiring is necessary for correct activation: no error indications are displayed in case of lack of activation.

Coil 2:

The injection relay (No. 33 in the wiring diagram, placed under the saddle, next to the battery positive CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the brown/red cable of the coil is closed to ground for 2 ms per second. Disconnect the 4-way connector of the fuel pump to be able to hear the relay and injector activation. The continuity of the wiring is necessary for correct activation: no error indications are displayed in case of lack of activation.

Coil 3:

The injection relay (No. 33 in the wiring diagram, placed under the saddle, next to the battery positive CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the brown/green cable of the coil is closed to ground for 2 ms per second. Disconnect the 4-way connector of the fuel pump to be able to hear the relay and injector activation. The continuity of the wiring is necessary for correct activation: no error indications are displayed in case of lack of activation.

Coil 4:

The injection relay (No. 33 in the wiring diagram, placed under the saddle, next to the battery positive CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the brown/purple cable of the coil is closed to ground for 2 ms per second. Disconnect the 4-way connector of the fuel pump to be able to hear the relay and injector activation. The continuity of the wiring is necessary for correct activation: no error indications are displayed in case of lack of activation.

DIAGNOSTICS INSTRUMENT: LOGIC ERRORS

Coil 1 P0351

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 28 of the ENGINE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 28 of the ENGINE connector.

Troubleshooting

- If shorted to positive: disconnect the coil connector, set the key to ON, activate the coil with the diagnostics instrument and check voltage at connector PIN 28: if there is voltage, restore the cable harness; if voltage = 0, replace the coil.
- If the circuit is open, shorted to negative: check electric characteristics of the coil: if not OK, replace the coil, if OK check the coil connector and the Marelli control unit connector; if not OK, restore, if OK, check cable continuity between the two cable terminals: if there is not continuity, restore the cable harness; if there is cable continuity, with key set to ON, check the ground insulation of the cable (from coil connector or control unit connector), if not OK, restore cable harness.

Coil 2 P0352

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 27 of the ENGINE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 27 of the ENGINE connector

Troubleshooting

- If shorted to positive: disconnect the coil connector, set the key to ON, activate the coil with the diagnostics instrument and check voltage at connector PIN 27: if there is voltage, restore the cable harness; if voltage = 0, replace the coil.
- If the circuit is open, shorted to negative: check electric characteristics of the coil: if not OK, replace the coil, if OK check the coil connector and the Marelli control unit connector; if not OK, restore, if OK, check cable continuity between the two cable terminals: if there is not continuity, restore the cable harness; if there is cable continuity, with key set to ON, check the ground insulation of the cable (from coil connector or control unit connector), if not OK, restore cable harness.

Coil 3 P0353

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 2 of the ENGINE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 2 of the ENGINE connector.

Troubleshooting

- If shorted to positive: disconnect the coil connector, set the key to ON, activate the coil with the diagnostics instrument and check voltage at connector PIN 2: if there is voltage, restore the cable harness; if voltage = 0, replace the coil.
- If the circuit is open, shorted to negative: check electric characteristics of the coil: if not OK, replace the coil, if OK check the coil connector and the Marelli control unit connector; if not OK, restore, if OK, check cable continuity between the two cable terminals: if there is not continuity, restore the cable harness; if there is cable continuity, with key set to ON, check the ground insulation of the cable (from coil connector or control unit connector), if not OK, restore cable harness.

Coil 4 P0354

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 1 of the ENGINE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 1 of the ENGINE connector.

Troubleshooting

- If shorted to positive: disconnect the coil connector, set the key to ON, activate the coil with the diagnostics instrument and check voltage at connector PIN 1: if there is voltage, restore the cable harness; if voltage = 0, replace the coil.
- If the circuit is open, shorted to negative: check electric characteristics of the coil: if not OK, replace the coil, if OK check the coil connector and the Marelli control unit connector; if not OK, restore, if OK, check cable continuity between the two cable terminals: if there is not continuity, restore the cable harness; if there is cable continuity, with key set to ON, check the cable ground insulation (from coil connector or control unit connector), if not OK, restore cable 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)

Location:

- 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 (+)
4. potentiometer signal 2
5. throttle valve control (+)
6. ground connection

DIAGNOSIS INSTRUMENT: PARAMETERS

Front cylinder throttle correction

- Example value with key ON: 0.0°
- Example value with engine on: 0.4°

The system, reading the intake pressure, tries to balance the intake pressures between the cylinders of the rear bank (1-3) and of the front bank (2-4) working on the throttle position: an acceptable value should be between -0.5 and + 0.5

Rear cylinder throttle correction

- Example value with key ON: 0.0°
- Example value with engine on: -0.2°

The system, reading the intake pressure, tries to balance the intake pressures between the cylinders of the rear bank (1-3) and of the front bank (2-4) working on the throttle position: an acceptable value should be between -0.5 and + 0.5

Front throttle Potentiometer 1 (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 approx. 6000 rpm, throttles open very little because the requested torque is too low (around 5-7°)

Rear throttle Potentiometer 1 (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 approx. 6000 rpm, throttles open very little because the requested torque is too low (around 5-7°)

Front throttle Potentiometer 1 (voltage)

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

Rear throttle Potentiometer 1 (voltage)

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

Front throttle Potentiometer 2 (voltage)

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

Rear throttle Potentiometer 2 (voltage)

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

Front throttle Potentiometer 2 (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 approx. 6000 rpm, throttles open very little because the requested torque is too low (around 5-7°)

Rear throttle Potentiometer 2 (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 approx. 6000 rpm, throttles open very little because the requested torque is too low (around 5-7°)

Front cylinders throttle Limp Home position

- Example value with key ON: 878 mV

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

Rear cylinders throttle Limp Home position

- Example value with key ON: 888 mV

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

Front throttle lower position

- Example value with key ON: 502 mV

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

Rear throttle lower position

- Example value with key ON: 492 mV

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

CAUTION

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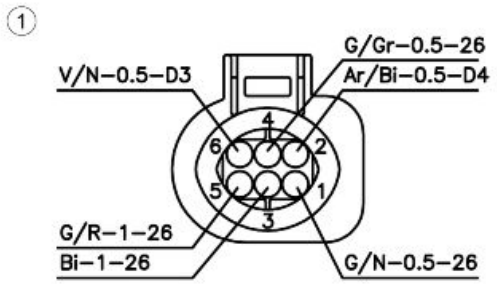
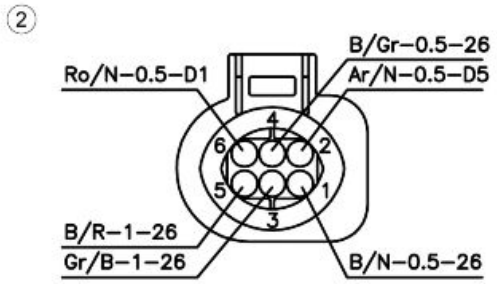
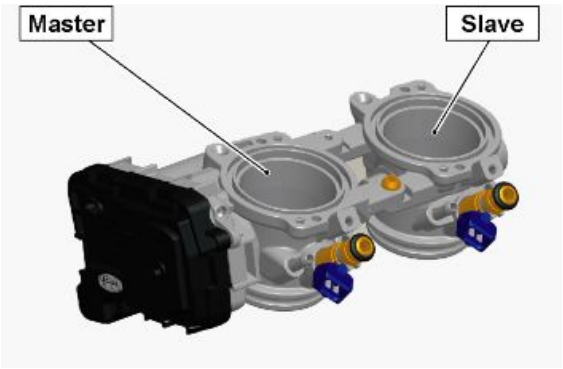






DIAGNOSTIC TOOL: STATUSES

Front throttle 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 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.

potentiometer 1 sensor, rear throttle position P0120

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 48. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 48

Troubleshooting

- If shorted to positive: check the value shown by the parameter of the Rear throttle Potentiometer 1 (voltage): disconnect the connector and read the value indicated in the diagnostics instrument: if the voltage does not vary, there is a short circuit in the cable; replace the throttle body if the voltage drops to zero
- If the circuit is open, shorted to negative: check the throttle body connector and the control unit connector. If not OK, restore; if everything is OK, check circuit continuity between the two terminals. If not OK, restore the cable harness; if OK, check the circuit ground insulation (from throttle sensor connector or control unit connector). If it is ground insulated, check that there is power (+5 V) at the throttle body connector PIN 2, and that PIN 6 is connected to ground. If both are correct, replace the throttle body

potentiometer 2 sensor, rear throttle position P0122

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 50. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 50

Troubleshooting

- If shorted to positive: check the value shown by the parameter of the Front throttle Potentiometer 2 (voltage): disconnect the connector and read the value indicated in the diagnostics instrument: if the voltage does not vary, there is a short circuit in the cable; replace the throttle body if the voltage drops to zero
- If the circuit is open, shorted to negative: check the throttle body connector and the control unit connector. If not OK, restore; if everything is OK, check circuit continuity between the two terminals. If not OK, restore the cable harness; if OK, check the circuit ground insulation (from throttle sensor connector or control unit connector). If it is ground insulated, check that

there is power (+5 V) at the throttle body connector PIN 2, and that PIN 6 is connected to ground. If both are correct, replace the throttle body

potentiometer 1 sensor, front throttle position P0125

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 36. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 36

Troubleshooting

- If shorted to positive: check the value shown by the parameter of the Rear throttle Potentiometer 1 (voltage): disconnect the left side connector and read the value indicated in the diagnostics instrument: 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 the circuit is open, shorted to negative: check the throttle body connector and the control unit connector. If not OK, restore; if everything is OK, check circuit continuity between the two terminals. If not OK, restore the cable harness; if OK, check the circuit ground insulation (from throttle sensor connector or control unit connector). If it is ground insulated, check that there is power (+5 V) at the throttle body connector PIN 2, and that PIN 6 is connected to ground. If both are correct, replace the throttle body

potentiometer 2 sensor, front throttle position P0127

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 21. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 21

Troubleshooting

- If shorted to positive: check the value shown by the parameter of the rear Throttle Potentiometer 2 (voltage): disconnect the left side connector and read the value indicated in the diagnostics instrument: 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 the circuit is open, shorted to negative: check the throttle body connector and the control unit connector. If not OK, restore; if everything is OK, check circuit continuity between the two terminals. If not OK, restore the cable harness; if OK, check the circuit ground insulation (from throttle sensor connector or control unit connector). If it is ground insulated, check that there is power (+5 V) at the throttle body connector PIN 2, and that PIN 6 is connected to ground. If both are correct, replace the throttle body

Rear throttle control circuit P0166

- short circuit to positive / short circuit to negative / open circuit, overvoltage, excessive internal temperature

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 29 - 41. If shorted to negative: no voltage has been detected. If the circuit is open: an interruption or excessive ampere input or control unit overheating has been detected

Troubleshooting

- If shorted to positive: disconnect the throttle body connector, set key to ON and check voltage at PIN 3: if the voltage read is higher or equal to 5V, there is a short circuit on the cable harness; replace the throttle body if the voltage is null
- If shorted to negative: disconnect the throttle body connector, set the key to ON and check if PIN 3 is in continuity with the vehicle ground connection: if there is continuity, restore the cable harness; if there is not continuity, replace the throttle body
- If the circuit is open, there is overvoltage or excessive internal temperature: check the throttle body connector and the control unit connector: if not OK, restore; if OK, disconnect the throttle body connector and control unit connector and check if there is cables 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 it is not, replace the throttle body; if it is, check that the throttle body is not mechanically blocked: if blocked, solve the problem and replace the body; if it is not, replace the control unit

Front throttle control circuit P0186

- short circuit to positive / short circuit to negative / open circuit, overvoltage, excessive internal temperature circuit open

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 3 - 15. If shorted to negative: no voltage has been detected. If the circuit is open: an interruption or excessive ampere input or control unit overheating has been detected

Troubleshooting

- If shorted to positive: disconnect the throttle body connector, set key to ON and check voltage at PIN 3: if the voltage read is higher or equal to 5V, there is a short circuit on the cable harness; replace the throttle body if the voltage is null
- If shorted to negative: disconnect the throttle body connector, set the key to ON and check if PIN 3 is in continuity with the vehicle ground connection: if there is continuity, restore the cable harness; if there is not continuity, replace the throttle body
- If the circuit is open, there is overvoltage or excessive internal temperature: check the throttle body connector and the control unit connector: if not OK, restore; if OK, disconnect the

throttle body connector and control unit connector and check if there is cables 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 3 and 15 is within 1 and 2.5 Ohm; if it is not, replace the throttle body; if it is, check that the throttle body is not mechanically blocked: if blocked, solve the problem and replace the body; if it is not, replace the control unit

DIAGNOSIS INSTRUMENT: LOGIC ERRORS

potentiometer 1 sensor, rear throttle position P0121

- signal not valid

Error cause

- Signal not within the expected value drawn according to the values of the intake pressure

Troubleshooting

- Check the parameter of the Potentiometer 1 front Throttle (voltage) to get which signal the control unit receives and to compare it to the Potentiometer 1 rear Throttle (voltage). Check the throttle body connector as well as 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. If this is not the case, restore the cable harness. If the value is correct, replace the complete throttle body

potentiometer 2 sensor, rear throttle position P0123

- signal not valid

Error cause

- Signal not within the expected value drawn according to the values of the intake pressure

Troubleshooting

- Check the parameter of the Potentiometer 2 front Throttle (voltage) to get which signal the control unit receives and to compare it to the Potentiometer 2 rear Throttle (voltage). Check the throttle body connector as well as the control unit connector. Check that cable resistance between the throttle body connector (PIN 4) and the control unit (PIN 50) is a few tenths of an Ohm. If this is not the case, restore the cable harness. If the value is correct, replace the complete throttle body

rear throttle position potentiometer P0124

- incongruent signal

Error cause

- Potentiometer 1 and potentiometer 2 do not show a logical value: the sum of the two voltages should be constant. The cause may be a malfunction in one of the two sensors or an abnormal resistance in one of the two circuits

Troubleshooting

- Check the throttle body connector as well as the control unit connector. Check that cable resistance between the throttle body connector (PIN 1) and the control unit (PIN 48) is a few tenths of an Ohm. Check that cable resistance between the throttle body connector (PIN 4) and the control unit (PIN 50) is a few tenths of an Ohm. If one of the two is different, restore the cable harness. If correct, replace the complete throttle body.

potentiometer 1 sensor, front throttle position P0126

- signal not valid

Error cause

- Signal not within the expected value drawn according to the values of the intake pressure

Troubleshooting

- Check the parameter of the Potentiometer 1 rear throttle (voltage) to get which signal the control unit receives and to compare it to the Potentiometer 1 front throttle (voltage). Check the throttle body connector as well as the control unit connector. Check that cable resistance between the throttle body connector (PIN 1) and the control unit (PIN 36) is a few tenths of an Ohm. If this is not the case, restore the cable harness. If the value is correct, replace the complete throttle body

potentiometer 2 sensor, front throttle position P0128

- signal not valid

Error cause

- Signal not within the expected value drawn according to the values of the intake pressure

Troubleshooting

- Check the parameter of the Potentiometer 2 rear throttle (voltage) to get which signal the control unit receives and to compare it to the Potentiometer 2 front throttle (voltage). Check the throttle body connector as well as 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. If this is not the case, restore the cable harness. If the value is correct, replace the complete throttle body

front throttle position potentiometer P0129

- incongruent signal

Error cause

- Potentiometer 1 and potentiometer 2 do not show a logical value: the sum of the two voltages should be constant. The cause may be a malfunction in one of the two sensors or an abnormal resistance in one of the two circuits

Troubleshooting

- Check the throttle body connector as well as the control unit connector. Check that cable resistance between the throttle body connector (PIN 1) and the control unit (PIN 36) is a few tenths of an Ohm. 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. If one of the two is different, restore the cable harness. If correct, replace the complete throttle body.

Rear throttle Limp Home self-acquisition P0160

- failed test

Error cause

- Throttle position, kept by the springs, not within the expected range (at each key ON). The instrument panel does not indicate the presence of this error even in the ATT status

Troubleshooting

- Check if the throttle body and the intake duct are clean. If OK, replace the throttle body

Rear throttle mechanical springs self-acquisition P0161

- failed test

Error cause

- Return time of the throttle, kept in position by the springs, not within the expected limits: the causes can be a deterioration of the performance of the springs or excessive throttle friction (at each key ON)

Troubleshooting

- Check if the throttle body and the intake duct are clean. If OK, replace the throttle body

Rear throttle minimum mechanical position self-acquisition P0162

- failed test

Error cause

- Position of the throttle stop not within the expected field (at each key ON)

Troubleshooting

- Check if the throttle body and the intake duct are clean. If OK, replace the throttle body

Detection of the rear throttle Recovery conditions (air temp., water temp.) P0163

- possible presence of ice

Error cause

- A correct throttle rotation cannot be detected given low ambient and engine temperatures: some ice may have formed in the duct (at each key ON). The instrument panel does not indicate the presence of this error even in the ATT status

Troubleshooting

- Check that the throttle body is clean and that there is no ice or condensation in the intake duct. If OK, replace the throttle body

Rear throttle power supply voltage during self-learning P0164

- low supply voltage

Error cause

- The throttle power supply voltage is too low to carry out the self-acquisition test correctly (at each key ON). The instrument panel does not indicate the presence of this error even in the ATT status

Troubleshooting

- Delete errors hindering throttle self-learning.

Rear throttle position error P0167

- misalignment between control and activation

Error cause

- The throttle mechanical control may be damaged

Troubleshooting

- Replace the throttle body

Front throttle Limp Home self-acquisition P0180

- failed test

Error cause

- Throttle position, kept by the springs, not within the expected range (at each key ON). The instrument panel does not indicate the presence of this error even in the ATT status

Troubleshooting

- Check if the throttle body and the intake duct are clean. If OK, replace the throttle body

Front throttle mechanical springs self-acquisition P0181

- failed test

Error cause

- Return time of the throttle, kept in position by the springs, not within the expected limits: the causes can be a deterioration of the performance of the springs or excessive throttle friction (at each key ON)

Troubleshooting

- Check if the throttle body and the intake duct are clean. If OK, replace the throttle body

Front throttle minimum mechanical position self-acquisition P0182

- failed test

Error cause

- Position of the throttle stop not within the expected field (at each key ON)

Troubleshooting

- Check if the throttle body and the intake duct are clean. If OK, replace the throttle body

Detection of the front throttle Recovery conditions (air temp., water temp.) P0183

- possible presence of ice

Error cause

- A correct throttle rotation cannot be detected given low ambient and engine temperatures: some ice may have formed in the duct (at each key ON). The instrument panel does not indicate the presence of this error even in the ATT status

Troubleshooting

- Check that the throttle body is clean and that there is no ice or condensation in the intake duct. If OK, replace the throttle body

Front throttle power supply voltage during self-learning P0184

- low supply voltage

Error cause

- The throttle power supply voltage is too low to carry out the self-acquisition test correctly (at each key ON). The instrument panel does not indicate the presence of this error even in the ATT status

Troubleshooting

- Delete errors hindering throttle self-learning.

Front throttle position error P0187

- misalignment between control and activation

Error cause

- The throttle mechanical control may be damaged

Troubleshooting

- Replace the throttle body

DIAGNOSIS INSTRUMENT: ADJUSTABLE PARAMETERS

Throttle Self-learning

NOTE

THROTTLE BODY ACTIVATION TAKES PLACE EVERY TIME THE KEY IS SET TO ON: CORRECT ACTIVATION IS INDICATED WHEN THE STOP LIGHTS TURN ON: IF DURING ACTIVATION, THE

ENGINE IS STARTED, THE ACTIVATION IS NOT COMPLETED AND THE STOP LIGHTS DO NOT TURN ON. EVERY 150 KEY-ONs, HOWEVER, THE THROTTLE VALVES ARE FORCED TO ACTIVATION. IF START-UP IS ATTEMPTED DURING THIS ACTIVATION (WHICH REQUIRES 3 SECONDS), THE ENGINE WILL NOT START.

FITTING: MECHANICAL/ELECTRICAL REFIT

RESET PROCEDURE

If a throttle body is replaced, after key is set to ON, do not start the engine within the 3 seconds; during this time the control unit carries out the throttle self-acquisition process: according to the throttle body replaced check that the status "Front throttle automatic self-learning" or "Rear throttle automatic self-learning" indicates: "carried out". If indication is not "Carried out", delete possible errors on the vehicle and then, with key set to ON, check that the statuses are "Carried out". If necessary, carry out "Throttle self-learning" process on the adjustable parameters screen page (screwdriver and hammer), and check again that the "Throttle self-learning with diagnostics instrument" status indicates: "Carried out" and that the "Front throttle automatic self-learning" or "Rear throttle automatic self-learning" indicate: "carried out"

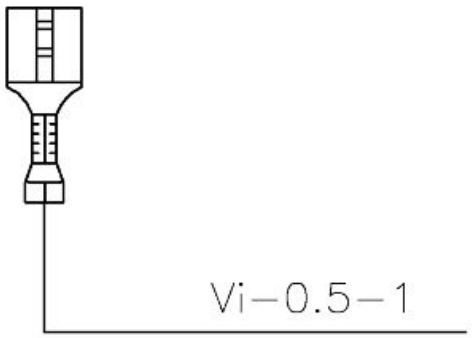
Engine oil pressure sensor

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.

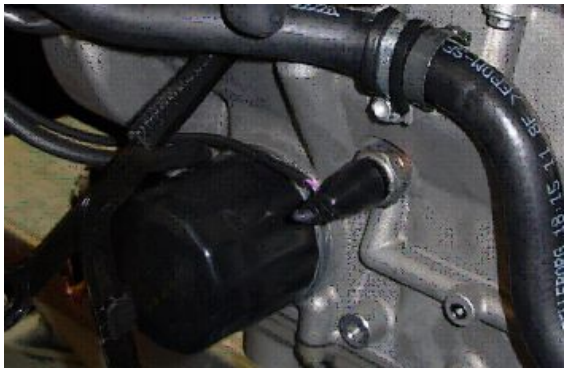


Level in electrical circuit diagram:

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.

INSTRUMENT PANEL

DSB 07: Oil pressure sensor

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 17): if they are not OK, restore. If OK, check continuity of the purple cable between the sensor connector and the instrument panel connector PIN 17: if not OK, restore the cable harness; if OK, replace the sensor.

DSB 08: Oil pressure

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.

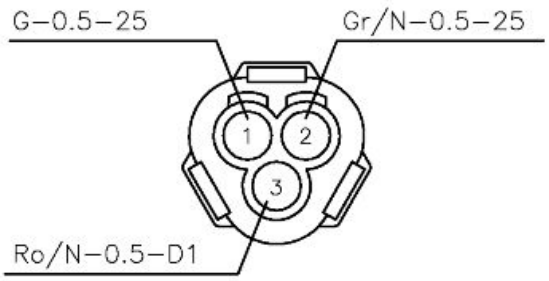
Troubleshooting

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

Neutral sensor

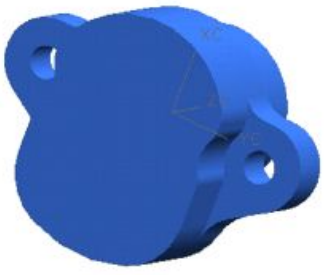
Function

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: between the head cover and the left side of the filter casing (3 pin 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:

White/black: ground from ECU, light blue: + 12V from ECU (neutral), pink: + 5V from ECU (drive).

CAUTION

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DIAGNOSTIC TOOL: STATUSES

Gearbox in neutral

- Yes/No

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

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

Gear sensor P0461

- 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 they are OK, check the continuity of the grey/black cable between the two connectors: if not ok, restore if ok with key ON and 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: if it is energised, restore the wiring harness, if it is not energised, replace the sensor (there is an interruption or a short circuit to positive of the pink/black cable in the section between the sensor connector and the sensor or inside the sensor itself).
- If short circuit to negative: disconnect the sensor connector and with key ON, check the voltage of the Grey/Black cable: if it is equal to zero, restore the wiring harness, if it is equal

to approx. 5V, replace the sensor (there is a short circuit to ground of the pink/black cable in the section between the sensor connector and the sensor or inside the sensor itself).

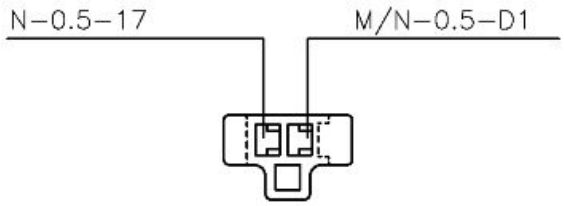
Clutch lever sensor

Function

It tells the clutch lever position to the control unit.

Operation / Operating principle

If there is gear engaged but the clutch is pulled, i.e. circuit closed to ground, vehicle start-up is not enabled.



Level in electrical circuit diagram:

Start-up enabling switches

Location:

- 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 connection

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.

DIAGNOSTICS INSTRUMENT: STATUSES

Clutch

- Indefinite_Released_Pulled

WARNING The statuses regularly viewed are Released and Pulled.

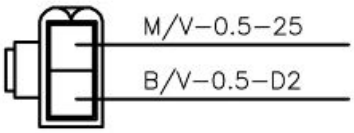
- indication on the diagnostics instrument always Released: check the sensor connector, the engine-vehicle cable harness connector (special attention to PIN C3) and the control unit connector (special attention to PIN56): if not OK, restore cable harness; if OK, disconnect both terminals from the sensor and check, with key set to ON, continuity to ground of PIN 2: if there is no continuity, restore the cable harness; if there is, replace the sensor.

- indication on the diagnostics instrument always Pulled: disconnect the terminals from the sensor and check if there is continuity between the two PINS, with clutch released: if there is continuity, replace sensor; if the circuit is open, it means that there is short circuit to ground of black cable from sensor PIN 1 to engine-vehicle cable harness connector PIN C3 or of the white/purple cable from PIN C3 to VEHICLE connector PIN 56: restore the cable harness.

Side stand sensor

Function

it tells the side stand position to the control unit



Operation / Operating principle

If the gear is engaged and the side stand is unfolded, and therefore the circuit is open, the control unit does not enable vehicle start-up or shuts off the engine if it is rotating

Level in electrical circuit diagram:

Start-up enabling switches

Location:

- on the vehicle: on the stand
- connector: between head cover and filter box on left side (2-ways white connector)

Pin out:

1. Ground connection
2. Voltage 12V

Electrical specifications:

- Side Stand Up: closed circuit (continuity)
- Side Stand Down: open circuit (infinite resistance)

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.

DIAGNOSTICS INSTRUMENT: STATUSES

Side stand sensor: up/down

- indication on the diagnostics instrument always down: check the connector: if not OK, restore; if it is OK, disconnect the two terminals from the sensor and check continuity to ground of PIN 1: if there is no continuity, restore the cable harness; if there is, replace the sensor
- indication on the diagnostics instrument always up: disconnect the terminals from the sensor and check if there is continuity between the two PINS, with stand down: if there is continuity, replace the sensor; if the circuit is open, it means that the brown/green cable from sensor PIN 2 to VEHICLE connector PIN 70 is short circuit to ground: restore the cable harness

Bank angle sensor

(if applicable)

Function

It tells the vehicle position to the control unit

Operation / Operating principle

When the sensor is inverted, the circuit is closed to ground: When the Marelli control unit detects this ground connection, it does not enable start-up or shuts off the engine.

Level in electrical circuit diagram:

Start-up enabling switches

Location:

- on the vehicle: sensor placed in the frame front niche.
- connector: next to the sensor (2-ways grey connector).

Electrical specifications:

- Sensor in vertical position: open circuit (resistance: 62 kOhm)
- Sensor inverted: closed circuit (continuity)

Pin out:

1. Ground connection
2. Voltage 5V

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.

DIAGNOSTICS INSTRUMENT: STATUSES

Fall sensor: Normal / Tip over

- Indication on diagnostics instrument always Normal, even when the sensor is inverted: disconnect the connector and, with sensor inverted, check if there is continuity between the two PINS of the sensor: If there is not continuity, replace the sensor; if there is continuity, check the connector: if not OK, restore cable harness; if OK, check the ground continuity of PIN 1: if there is not continuity, restore cable harness; if there is continuity, check, with key ON, if there is voltage of 5 V at PIN 2; if there is not voltage, check Marelli control unit connector (with special attention to PIN 65) and check the vehicle-engine cable harness connector (with special attention to PIN B6).
- Indication on the diagnostics instrument always Tip over: disconnect the connector and check if there is continuity between the two PINS when the sensor is in vertical position: if there is continuity, replace the sensor; if there is not, it means that, with key set to ON, there is no 5V voltage at PIN 2: restore the cable harness whose pink/white cable will be shorted to ground

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.

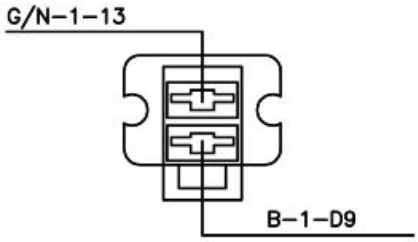
Electric fan circuit

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

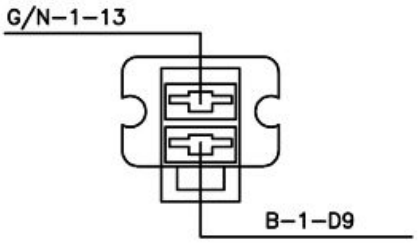


Level in electrical circuit diagram:

electric fan

Position:

- sensor: relay installed in front frame recess on left hand side
- connector: on relay



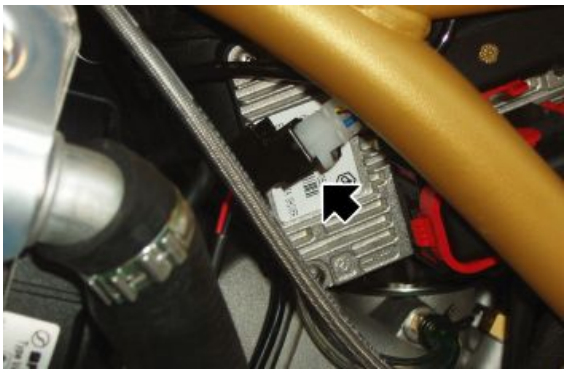
Electrical specifications:

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

DIAGNOSTIC TOOL:STATUSES

Fan relay

- on/off



DIAGNOSTIC TOOL:ACTIVATIONS

Fan

- The fan relay (No. 36 in the electrical circuit diagram, placed in the headstock niche, left side; CHECK, however, the identification of the relay with the colour of the cables) is energised for 10 seconds. 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.

DIAGNOSIS INSTRUMENT: ELECTRICAL ERRORS

Cooling fan relay P0480

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

Error cause

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

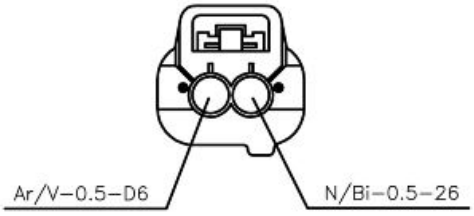
Troubleshooting

- If shorted 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 shorted 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 the circuit is open: 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)

SAS valve actuator

Function

Quickly warms up the catalytic converter and keeps the combustion rich in some critical conditions



Operation / Operating principle

The valve coil is excited to open the air passage of the filter box to the exhaust manifold

Level in electrical circuit diagram:

Secondary air valve and lambda probe

Location:

- on the vehicle: under throttle bodies, in the V between the two front and rear cylinders banks
- connector: on the valve

Electrical characteristics:

Resistance at ambient temperature: 21 +3/- 1 Ω

Pin out:

1. Power supply V batt
2. Ground connection

DIAGNOSIS INSTRUMENT: PARAMETERS

Secondary air valve duty cycle

- Example value with key ON: 0 %
- Example value with engine on: %

Used only at 0 or 100%

CAUTION

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DIAGNOSIS INSTRUMENT: LOGIC ERRORS

Secondary air valve control P0446

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 43. If shorted to negative/ open circuit: no voltage has been detected. The instrument panel does not indicate the presence of this error even in the ATT status.

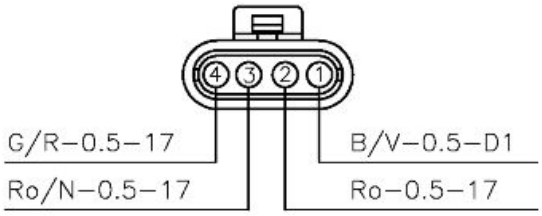
Troubleshooting

- If shorted to positive: disconnect the component, set the key to ON, start the vehicle and check if the error symptom is still "shorted to positive": it means that short circuit is between black/white cable and a cable in voltage, therefore restore cable harness; if the error symptom is short circuit to ground, it means that short circuit is inside the valve and therefore, you must replace the component.
- If shorted to negative or open circuit: check the component connector and control unit connector: if not OK, restore; if OK, check the continuity of the black/white cable between the two connectors: if not OK, restore cable harness; if OK, with key ON, check if there is voltage at PIN 1: if there is not voltage, check orange/green cable; if there is voltage, check component electrical characteristics and replace the component

RUN/STOP switch

Function

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



Operation / Operating principle

If the rider wants to shut off the engine or to disable engine start-up, the switch should be open, i.e. VEHICLE connector PIN 78 of the Marelli control unit must not be connected to ground.

Level in electrical circuit diagram:

Start-up enabling switches

Location:

- on the vehicle: Right hand light switch.
- connector: inside the support (4-ways black).

Electrical specifications:

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

Pin out:

1 blue/green cable: ground connection

4 yellow/red cable: 5 V

CAUTION

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DIAGNOSTICS INSTRUMENT: STATUSES

RUN / STOP switch

- Run/Stop

NOTES

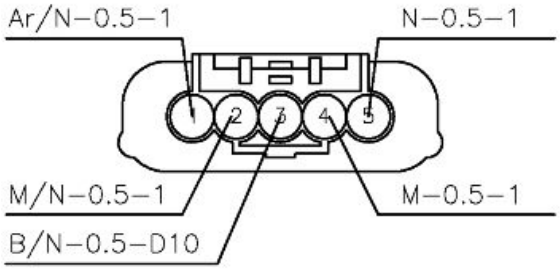
- indication on the diagnostics instrument always STOP: disconnect the connector and, with the switch set to RUN, check if there is continuity towards the two cables switch - Blue/Green and Yellow/Red: If there is not continuity, replace the sensor; if there is continuity, check the connector: if not OK, restore the cable harness; if OK, check, with key set to ON, if there is voltage on Yellow/Red cable: if there is no voltage, restore the cable harness; if there is, check the Yellow/Red cable ground insulation: If there is continuity with ground connection, restore the cable harness; if OK, set the key to OFF and check the VEHICLE connector and the engine-vehicle cable harness connector: if not OK, restore; if OK, check continuity of the Pink cable between switch connector and PIN C7 of the engine-vehicle cable harness connector and between the PIN C7 and the VEHICLE connector PIN 78: if not OK, restore the cable harness; if OK, replace the Marelli control unit.
- indication on the diagnostics instrument always RUN: disconnect the connector and, with the switch set to STOP, check if there is continuity between the two cables of the switch: if there is continuity, replace the switch; if there is not continuity, it means that, with key set to ON, the Pink cable (between switch and the PIN C7 of the engine-vehicle cable harness connector or from the latter to the PIN 78 of the control unit connector) is shorted to positive: restore the cable harness.

Butterfly valve in exhaust

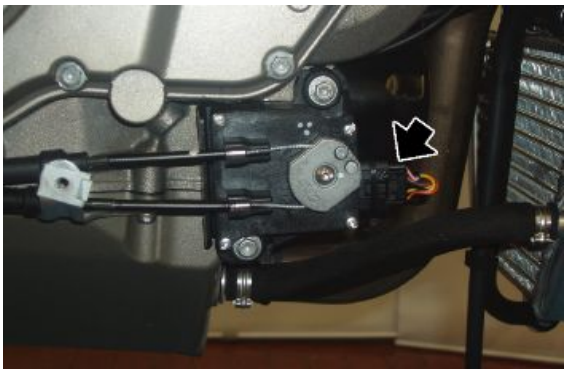
Function

It is used to reduce exhaust noise. The exhaust butterfly valve is managed as follows:

- With engine off: open by 75%
- With engine running: regardless of the gear engaged, below 5,500 rpm and below 14° of throttle opening it is fully closed; over 6,500 rpm or 16° of throttle opening it is fully open; under any other condition it is in an intermediate position. With bike stopped and in neutral the valve stays closed, regardless of rpm.



Operation / Operating principle



The system consists of a throttle valve with a return spring placed on the exhaust pipe. The valve is closed via two cables actuated by an electric motor, which, in turn, is connected electrically to the instrument panel. The operating logic and motor control are, however, resident in the Marelli injection control unit, which dialogues with the instrument panel via the CAN.

Level in electrical circuit diagram:

Exhaust butterfly valve

Location:

- on the vehicle: The motor is placed in the front lower part of the engine. The valve in the exhaust duct.
- connector: on the motor.

Electrical characteristics:

- Electrical motor resistance (PIN 4-5): 2--4 Ohm
- Potentiometer resistance (PIN 1-3): 10.1 kOhm +/- 10%

Pin out:

1. Power supply voltage 5V
2. Output signal (0- 5V)
3. Ground connection
4. Motor A supply
5. Motor B supply

DIAGNOSIS INSTRUMENT: PARAMETERS

Exhaust butterfly valve target position: 7 - 93 %

NOTE: Value that control unit sends to the instrument panel to activate the valve: 7% (closed valve), 93 % (open valve).

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.

DIAGNOSIS INSTRUMENT: STATUSES

Exhaust butterfly valve

- Indefinite/in research/activation with key ON/ in operation/stopped for detected malfunction/ research of zero position.

NOTE: If there is no problem, it appears: in operation

DIAGNOSIS INSTRUMENT: ELECTRICAL ERRORS

Exhaust butterfly valve stop research P0191

- potentiometer signal above maximum threshold/potentiometer signal below minimum threshold/excessive time/research not carried out or wrong stroke.

Error cause

- If potentiometer signal is above maximum threshold: voltage of the maximum end of stroke position (open valve) outside the foreseen field has been detected. If potentiometer signal is below maximum threshold: voltage of the minimum end of stroke position (closed valve) outside the foreseen field has been detected. If time is excessive: excessive time for stop search has been detected (possible mechanical problem of the valve, of the motor or cables not connected). If research has not been carried out or wrong stroke: this symptom may be caused when a new instrument panel is installed and the stop self-acquisition procedure is not carried out or if the stop between minimum and maximum is too short or too long.

Troubleshooting

- If potentiometer signal is above maximum threshold: during adjustment "Exhaust butterfly valve self-acquisition", voltage of maximum opening end of stroke outside the foreseen field is detected. Check correct tensioning of the two valve cables.
- If potentiometer signal is below maximum threshold: during adjustment "Exhaust butterfly valve self-acquisition", voltage of minimum opening end of stroke outside the foreseen field is detected. Check correct tensioning of the two valve cables.
- If time is excessive: check that the valve cables are in voltage: if they are not in voltage, fix them; if they are OK, check that mechanical rotation of the exhaust butterfly valve is without friction or deceleration: if they are not OK, restore normal valve rotation; if they are OK, check motor electrical characteristics: if they are not OK, replace the motor; if they are OK, check valve connector and instrument panel connector (with special attention to possible oxidation): if they are not OK, restore; if they are OK, replace the electrical motor. Or also free cables.
- If research has not been carried out or wrong stroke: adjust "Exhaust butterfly valve self-acquisition" if the stop self-acquisition procedure has not been carried out after installation of new instrument panel. If the instrument panel is not new, check correct calibration of the cables and if correct, check that there is not an obstacle for correct rotation of the valve.

Exhaust valve engine P0192

- open circuit, thermal overload protection, shorted to negative, shorted to positive or short circuit between both cables.

Error cause

- If the circuit is open: too low current has been detected at PIN 36 - 37 of the instrument panel connector. If thermal overload protection: instrument panel fault. If shorted to negative: voltage equal to zero has been detected. If shorted to positive or short circuit between both cables: excessive voltage has been detected.

Troubleshooting

- If the circuit is open: may occur due to loosen cables, therefore, make sure that cables are tight: if not tight, fix them; if cables are OK, check valve connector and instrument panel connector: if not OK, restore; if OK, check continuity of brown and black cables: if not OK, restore cable harness; if OK, check motor electrical characteristics and replace it.
- If thermal overload protection: replace the instrument panel.
- If shorted to negative: disconnect the valve connector and check, with key set to ON, if there is continuity with ground at PIN 4 of the connector: if there is ground connection, disconnect also the instrument panels connector and if it is still present, restore the brown cable; if there is not ground connection, replace the instrument panel; if there is not ground connection, check, with key set to ON, if there is continuity with ground connection at PIN 5 of the connector: if there is ground connection, disconnect also the instrument panel connector and if it is still present, restore the black cable; if there is not ground connection, replace the instrument panel; if there is not ground connection, check if PIN 4 or PIN 5 on the motor are in continuity with ground connection: if it is in continuity, replace the motor.
- If shorted to positive or short circuit between both cables: disconnect the instrument panel connector and check, with key set to ON if there is voltage on PIN 4 and PIN 5 of the connector: if there is, restore cable harness; if there is not, check, with key set to OFF and disconnecting also the valve connector, if both cables are insulated between them: if they are not insulated, restore cable harness; if insulated between them, it is possible that there is a shorted to positive inside the motor or instrument panel: it is necessary to replace one of the two components to identify which of them is faulty.

Exhaust valve potentiometer P0193

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 10 of the instrument panel. If shorted to negative, the circuit is open: low voltage has been detected.

Troubleshooting

- If shorted to positive: disconnect the valve connector and check, with key set to ON, if there is voltage at PIN 2 of the connector: if there is voltage, disconnect also the instrument panel

connector and if there is voltage, restore cable harness; if there is not voltage, replace instrument panel, if there is not voltage, replace motor.

- If shorted to negative, the circuit is open: check the valve connector and instrument panel connector: if not OK, restore; if OK, check continuity on the brown/black cable: if not OK, restore; if OK, always with two connectors disconnected, check ground insulation: if there is ground continuity, disconnect also the instrument panel and if it is still present, restore the cable harness; if there is not ground continuity, replace the instrument panel; if there is not ground continuity, replace the motor.

DIAGNOSTICS INSTRUMENT: LOGIC ERRORS

Exhaust butterfly valve position P0190

- position error.

Error cause

- Position indicated by potentiometer does not correspond with position set by control unit.

Troubleshooting

- Mechanically check the valve, its normal rotation (with cables disconnected from motor, manually activate the cables and see movement regularity and check valve complete stroke with correct operation of the return spring) and absence of foreign bodies which do not allow its rotation: if not OK, restore; if OK, check valve and instrument panel connectors (special attention to oxidation) and check cables resistance: if not OK, restore; if OK, always with cables disconnected and key set to ON, check normal rotation of the electric motor and replace motor (potentiometer does not work correctly).

DIAGNOSTICS INSTRUMENT: ADJUSTABLE PARAMETERS

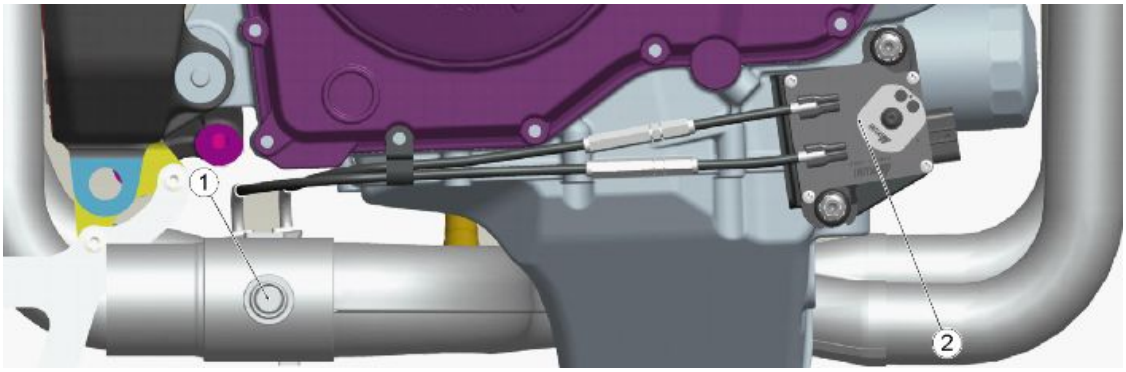
- Acquire exhaust butterfly valve zero position.

NOTE: Motor is placed in a reference position to correctly search mechanical stop later.

- Exhaust butterfly valve self-acquisition

NOTE: Search minimum and maximum mechanical stop.

The system consists of a throttle valve (1) with a return spring placed in the exhaust pipe. The valve is closed via two cables actuated by an electric motor (2) which, in turn, is connected electrically to the instrument panel. The operating logic and motor control are, however, resident in the Marelli injection control unit, which dialogues with the instrument panel via the CAN.
The motor unit (2) consists of a potentiometer for position detection and a DC electric motor (2).
At key-ON, a valve (1) self-cleaning cycle is performed.
In the event of malfunction (electric or mechanical), the valve (1) may remain stuck in the closed position.
In the event of a CAN line malfunction, the valve (1) is returned to the open position.
In the event of removal or replacement of one or more system components (cables, valve or motor), a calibration procedure is required.



CAUTION

BEFORE CARRYING OUT THIS OPERATION, CHECK THAT THE BATTERY VOLTAGE IS HIGHER THAN 12.5 V

CAUTION

WORK ON THE MOTOR OF THE EXHAUST THROTTLE VALVE ONLY WITH THE KEY SET TO "OFF" OR ONLY AFTER DISCONNECTING THE NEGATIVE POLE OF THE BATTERY.

CAUTION

NEVER REMOVE THE PULLEY FROM THE MOTOR

CAUTION

LOOSEN THE ADJUSTER SCREWS OF THE CONTROL CABLES BEFORE REMOVING THEM, TO PREVENT FORCING THEM.

CAUTION

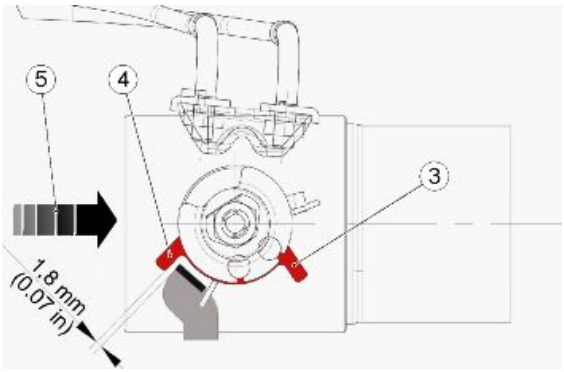
BEFORE REMOVING THE CONTROL CABLES CHECK THAT THE MOTOR PULLEY IS IN THE "ZERO" POSITION. NEVER WORK ON THE CONTROL CABLES IF THE MOTOR PULLEY IS NOT IN THE "ZERO" POSITION

EXHAUST THROTTLE VALVE CALIBRATION

- From the Adjustable parameters screen page, use the diagnostic instrument to select: Acquire exhaust valve zero position
- After having pressed the enter button for the zero position search, shut off the vehicle and leave the keys in OFF, even in the event that the instruments indicate the opposite.
- Slacken the exhaust throttle valve cable tension.

NOTE

IF IT IS NECESSARY TO REPLACE THE MOTOR, FROM POSITION ZERO LOOSEN THE CABLES COMPLETELY TO REMOVE THEM, THEN, AFTER DISCONNECTING THE CONNECTOR, REMOVE THE MOTOR ITSELF.



- After having pressed the enter button for the zero position search, shut off the vehicle and leave the keys in OFF, even in the event that the instruments indicate the opposite.
- With the appropriate adjuster screw, tension the upper cable to leave approximately 1.8 mm (0.07 in) between the lock and opening travel limit (4) of the valve (1), with the appropriate adjuster screw, tension the lower cable so that the tensioning is as close as possible to that of the upper cable (otherwise the failure of the following regulation carried out with the instrument).
- Tightening the lower cable will probably have caused the travel limit to shift: repeat the procedure until the correct position is obtained.
- Turn the key to ON.

CAUTION

THE "ZERO SEARCH OF THE DISCHARGE VALVE MOTOR" PROCEDURE ENTAILS RESETTING THE EXISTING MECHANICAL STOPS. AN ERROR FOR STOP SEARCH NOT CARRIED OUT IS THEN INDICATED, WHICH REMAINS UNTIL THE "SELF-TEACHING OF THE DISCHARGE VALVE" PROCEDURE IS PERFORMED. DO NOT CARRY OUT THIS OPERATION WHEN USING A NON-ORIGINAL EXHAUST SYSTEM WHERE ANY CABLES CONSIDERED NOT NECESSARY HAVE BEEN DISCONNECTED.

- Using the diagnostic tool, from the Adjustable parameters screen page, select:

Exhaust valve self-acquisition, which acquires the opening travel limit (4) (valve open) and the closing travel limit (3) (valve closed).

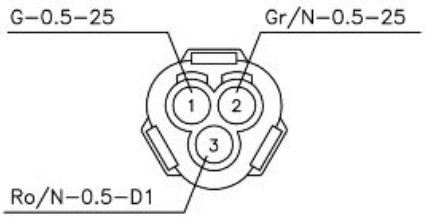
During both normal operation and the self-cleaning cycle, the valve will only move within this range and without reaching the mechanical end stops, to prevent strain to the electric motor.

5 - exhaust fumes flow direction.

Quick shift

Function:

To signal to the control unit the request for power-assisted gear shifting.



Operation / Operating principle:

Normally open switch that is closed to ground when the gearbox lever is activated (only when shifting up).

Electrical circuit diagram - Level in electrical circuit diagram:

Electronic transmission.

Location on the vehicle:

On the gearbox lever transmission.

Connector location (if available):

Under the fuel tank, left side, next to the rear head.

Electrical specifications:

Normally open.

Pin-out:

- PIN1 - Signal
- PIN2 - Ground

DIAGNOSTIC TOOL: STATUSES

Quick shift (electronic transmission) control status:

Activated released.

Aprilia Quick Shift:

Present/Not present

DIAGNOSTICS INSTRUMENT: ELECTRICAL ERRORS

Quick Shift sensor (electronic transmission) P0462.

- Shorted to negative (upon key-ON)/Signal not valid.

Error cause:

If shorted to negative: on key-ON a voltage equal to zero has been detected at PIN 47. If signal is not valid it means that the control unit has detected activation of the lever but not its release within the set time limit.

Troubleshooting:

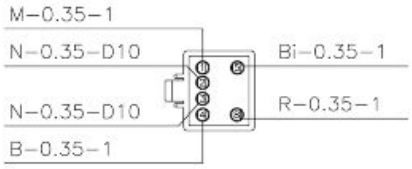
indication on the diagnostics instrument always ACTIVATED: disconnect the sensor connector and, with the switch RELEASED, check if there is continuity between the two cables (PIN 1) and (PIN 2) (sensor side): if present, replace the sensor; if not present, replace the cable harness. Disconnect the Engine connector from the Marelli control unit and check the ground insulation of the black cable (sensor

PIN 1 - Marelli ECU PIN 47): if OK, check pink cable and black cable insulation; if NOT OK, restore cable harness; if pink/black cable insulation is OK, replace the Marelli control unit; if NOT OK, restore cable harness.
NOTE: The control unit can not detect faults due to failed cable continuity.

a-PRC setting buttons

Function:

To signal to the control unit the request for modification of the a-PRC system settings.



Operation / Operating principle:

Either control (+) or (-) is made up of a deviator with both outputs electrically connected to the instrument panel: at the same time, the instrument panel sends the requested command to the Marelli ECU, via CAN line.

Electrical circuit diagram - Level in electrical circuit diagram:

Traction control.

Position on vehicle:

On the left side semi-handlebar.

Position of connector (if applicable):

Inside the top fairing and instrument panel mounting support.

Electrical specifications:

+ button: - 0 Ohm across PIN 2 and PIN 1 - Infinite resistance across PIN 2 and PIN 5; - button: 0 Ohm across PIN 3 and PIN 8 - infinite resistance across PIN 3 and PIN 4.

Pin-out:

- PIN 1: + 12 V power supply (green-brown)
- PIN 2: ground (black-black)
- PIN 3: ground (brown-black)
- PIN 4: + 12 V power supply (blue-blue)
- PIN 5: + 12 V power supply (yellow-white)
- PIN 8: + 12 V power supply (red-red)

DIAGNOSTIC TOOL: STATUSES

"+" button:

Pressed/Released/Invalid data due to open circuit error/Invalid data due to short circuit error.

"-" button:

Pressed/Released/Invalid data due to open circuit error/Invalid data due to short circuit error

DIAGNOSTICS INSTRUMENT: ELECTRICAL ERRORS

"+" button sensor P0720:

- Open contacts/Closed contacts.

Error cause:

With open contacts, a voltage over zero is detected at the same time at PIN 5 and PIN 13 of the instrument panel. With closed contacts, zero voltage is detected at the same time at PIN 5 and PIN 13 of the instrument panel.

Troubleshooting:

The instrument panel expects to find, at either of the two PINs, a voltage over approx. 1 V and at the same time a voltage below 1 V at the other PIN; if this does not occur, the instrument panel outputs the information to the control unit that shows this error. Indication on diagnostics instrument "Invalid data due to short circuit error"; CASE 1): if this status is displayed with control not activated only, it means that a voltage below 1V, instead of battery, is detected at PIN 5 of the instrument panel; disconnect the "+" button connector and read voltage at PIN 5 of the instrument panel: if voltage is below 1 V, it means that on the white cable there is a short circuit to ground; if voltage is above 1 V (approximately battery voltage), replace the "+" button sensor. CASE 2): if this status is displayed only with control activated, it means that at that moment a voltage below 1V, instead of battery, is being detected at PIN 13 of the instrument panel; disconnect the gearshift control connector and read voltage at PIN 13 of the instrument panel: if voltage is below 1 V, it means that on the brown cable there is a short circuit to ground; if voltage is above 1 V (approximately battery voltage), replace the "+" button sensor. Indication on diagnostics instrument "Invalid data due to open circuit error"; CASE 1): if this status is displayed only with control not activated, it means that circuit from PIN 13 to PIN 30 of the instrument panel is interrupted or that PIN 30 is not grounded: check the instrument panel connector and the "+" button connector: if they are not OK, restore; if they are OK, check continuity on the brown cable: if it is not OK, restore; if it is OK, check continuity on the black cable from the "+" button connector to PIN 30 of the instrument panel: if it is not OK, restore; if it is OK, check continuity of the "+" button from the "+" button connector (between black cable and green cable): if it is not OK, change the control; if it is OK, check, with key to ON, that the black cable is not grounded and then change the instrument panel. CASE 2): if this status is displayed with control activated only, it means that circuit from PIN 5 to PIN 30 of the instrument panel is interrupted: check the instrument panel connector and the "+" button connector: if they are not OK, restore; if they are OK, check continuity on the white cable: if it is not OK, restore; if it is OK, check, with control activated, that there is not continuity of the "+" button from the "+" button connector (between black cable and yellow cable) and then replace the control.

"-" button sensor P0721

- Open contacts/Closed contacts

Error cause:

With open contacts, a voltage over zero is detected at the same time at PIN 18 and PIN 19 of the instrument panel. With closed contacts, zero voltage is detected at the same time at PIN 18 and PIN 19 of the instrument panel.

Troubleshooting:

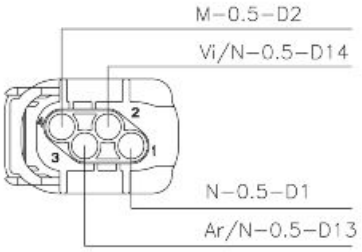
The instrument panel expects to find, at either of the two PINs, a voltage over approx. 1 V and at the same time a voltage below 1 V at the other PIN; if this does not occur, the instrument panel outputs the information to the control unit that shows this error. Indication on diagnostics instrument "Invalid data due to short circuit error"; CASE 1): if this status is displayed with control not activated only, it means that a voltage below 1V, instead of battery, is detected at PIN 18 of the instrument panel; disconnect the "-" button connector and read voltage at PIN 18 of the instrument panel: if voltage is below 1 V, it means that on the red cable there is a short circuit to ground; if voltage is above 1 V (approximately battery voltage), replace the "-" button sensor. CASE 2): if this status is displayed only with control activated, it means that at that moment a voltage below 1V, instead of battery, is being detected at PIN 19 of the instrument panel; disconnect the gearshift control connector and read voltage at PIN 19 of the instrument panel: if voltage is below 1 V, it means that on the blue cable there is a short circuit to ground; if voltage is above 1 V (approximately battery voltage), replace the "-" button sensor. Indication on diagnostics instrument "Invalid data due to open circuit error"; CASE 1): if this status is displayed only with control not activated, it means that circuit from PIN 19 to PIN 30 of the instrument panel is interrupted or that PIN 30 is not grounded: check the instrument panel connector and the "-" button connector: if they are not OK, restore; if they are OK, check continuity on the blue cable: if it is not OK, restore; if it is OK, check continuity on the black cable from the "-" button connector to PIN 30 of the instrument panel: if it is not OK, restore; if it is OK, check continuity of the "-" button from the "-" button connector (between brown cable and blue cable): if it is not OK, change the control; if it is OK, check, with key to ON, that the black cable is not grounded and then change the instrument panel. CASE 2): if this status is displayed only with control activated, it means that circuit from PIN 18 to PIN 30 of the instrument panel is interrupted: check the instrument panel connector and the "-" button connector: if they are not OK, restore; if they are OK, check continuity on the red cable: if it is not OK, restore; if it is OK, check, with control activated, that there is not continuity of the "-" button from the "-" button connector (between brown cable and red cable) and then replace the control.

NOTE: The control unit can not detect faults due to failed cable continuity

Inertial sensor platform (sensor box)

Function:

To transmit information about the motorcycle dynamics to the Marelli control unit (e.g.: yaw rate).



Electrical circuit diagram - Level in electrical circuit diagram:

Traction control.

Position on vehicle:

Fastened to the fuel tank, under the seat.

Position of connector (if applicable):

-

Pin-out:

- Pin 1: ground lead (black)
- Pin 2: CAN "L" Line (purple/black)
- Pin 3: CAN "H" Line (orange/black)
- Pin 4: supply (brown)

DIAGNOSIS INSTRUMENT: ELECTRICAL ERRORS

-

DIAGNOSIS INSTRUMENT: LOGIC ERRORS

Sensor box error (inertia sensor platform) P0710

- Faulty sensor/Signal not valid

Troubleshooting:

With faulty sensor, the component inside the control unit is damaged and replacement of the control unit is recommended. With signal not valid, the sensor has generated a signal out of range that is still sent to the injection control unit together with the relevant error.

Sensor box error (inertia sensor platform) P0711

- Faulty sensor/Signal not valid

Troubleshooting:

With faulty sensor, the component inside the control unit is damaged and replacement of the control unit is recommended. With signal not valid, the sensor has generated a signal out of range that is still sent to the injection control unit together with the relevant error.

Sensor box error (inertia sensor platform) P0712

- Faulty sensor/Signal not valid

Troubleshooting:

With faulty sensor, the component inside the control unit is damaged and replacement of the control unit is recommended. With signal not valid, the sensor has generated a signal out of range that is still sent to the injection control unit together with the relevant error.

Sensor box error (inertia sensor platform) P0713

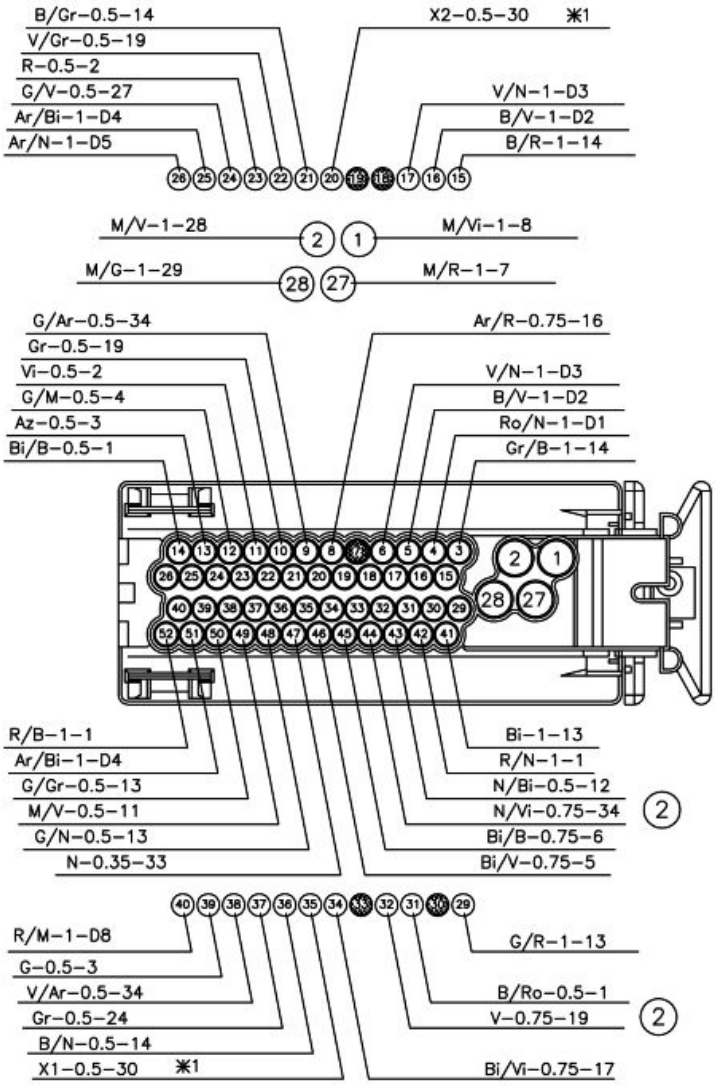
- Faulty sensor/Signal not valid

Troubleshooting:

With faulty sensor, the component inside the control unit is damaged and replacement of the control unit is recommended. With signal not valid, the sensor has generated a signal out of range that is still sent to the injection control unit together with the relevant error.

Connectors

ECU



Engine pinout key:

Cylinder 4 coil control output **PIN 1**

Cylinder 3 coil control output **PIN 2**

Front throttle motor output (+) **PIN 3**

Analogue ground connection 2 **PIN 4**

Power ground connection 1 **PIN 5**

Analogue ground connection 1 **PIN 6/17**

Lower cylinder 1 injector control output **PIN 8**

Front cylinder bank lambda sensor input 2 (+) **PIN9**

Rear cylinder bank lambda sensor input 1 (+) **PIN 10**

Track D hand grip input **PIN 11**

Water temp. sensor input **PIN 12**

Track B hand grip input **PIN 13**

Serial line K for diagnosis **PIN 14**

Front throttle motor output (-) **PIN 15**

Power ground connection 2 **PIN 16**

Engine speed sensor input (-) **PIN 20**

Input for front throttle potentiometer 2 signal **PIN 21**

Rear cylinder bank lambda sensor input 1 (-) **PIN 22**

Track C hand grip input **PIN 23**

Rear cylinder intake pressure sensor input **PIN 24**

Reference voltage output + 5 V: tracks A-C, rear throttle and pressure sensor **PIN 25/51**

Reference voltage output + 5V: tracks B-D and front throttle **PIN 26**

Cylinder 2 coil control output **PIN 27**

Cylinder 1 coil control output **PIN 28**

Rear cylinder bank throttle motor output (-) **PIN 29**

STOP lights relay control output **PIN 31**

Rear cylinder bank lambda heating control output 1 **PIN 32**

Lower cylinder 3 injector control output **PIN 34**

Engine speed sensor input (+) **PIN 35**

Input for front throttle potentiometer 1 signal **PIN 36**

Air temperature sensor input **PIN 37**

Rear cylinder bank lambda sensor input 2 (-) **PIN 38**

Track A hand grip input **PIN 39**

Key input **PIN 40/42**

Rear throttle motor output (+) **PIN 41**

Secondary air valve control output **PIN 43**

Front cylinder bank lambda heating control output 2 **PIN 44**

Lower cylinder 4 injector control output **PIN 45**

Lower cylinder 2 injector control output **PIN 46**

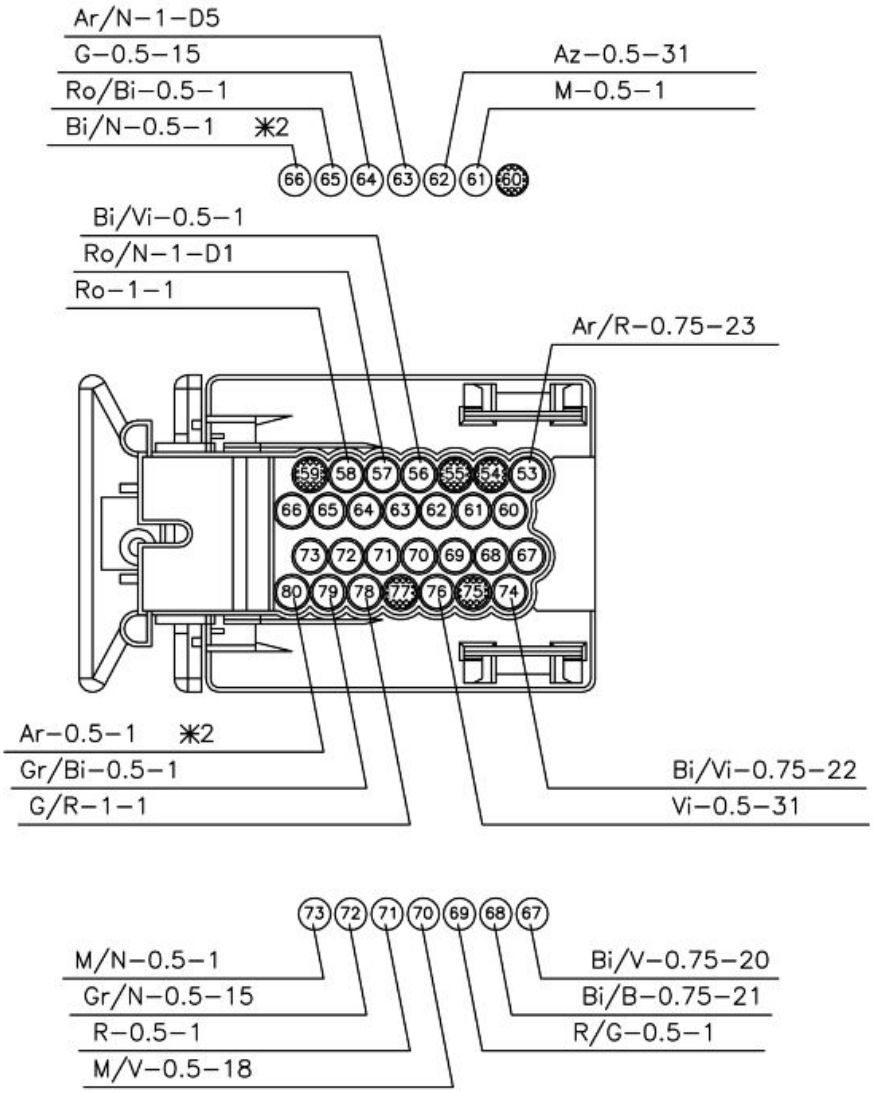
Quick shift input **PIN 47**

Input for rear throttle potentiometer 1 signal **PIN 48**

Front cylinder intake pressure sensor input **PIN 49**

Input for rear throttle potentiometer 2 signal **PIN 50**

Direct power supply to control unit **PIN 52**



Vehicle pinout key:

Upper cylinder 1 injector control output **PIN 53**

Clutch sensor input **PIN 56**

Analogue ground connection 2 **PIN 57**

"Start engine" switch input **PIN 58**

Electric fan relay control output **PIN 61**

Variable geometry control unit control output **PIN 62**

Reference voltage output + 5V: tracks B-D and front throttle **PIN 63**

Neutral input **PIN 64**

Fall sensor input **PIN 65**

CAN L line (high speed) **PIN 66**

Upper cylinder 2 injector control output **PIN 67**

Upper cylinder 4 injector control output **PIN 68**

Start-up control output **PIN 69**

Side stand input **PIN 70**

Gear input **PIN 72**

Injection relay control output **PIN 73**

Upper cylinder 3 injector control output **PIN 74**

Variable geometry control unit fault input **PIN 76**

"engine stop" input **PIN 78**

Vehicle speed input **PIN 79**

CAN H line (high speed) **PIN 80**

Engine - vehicle connector pinout key:

Key **PIN 1A**

Vehicle speed **PIN 2A**

STOP lights relay control output **PIN 3A**

- **PIN 4A**

- **PIN 5A**

- **PIN 6A**

Analogue ground connection 2 **PIN 7A**

Direct power supply to control unit **PIN 8A**

Injection supply **PIN 1B**

CAN H **PIN 2B**

CAN L **PIN 3B**

Key **PIN 4A**

Electric fan relay control **PIN 5B**

Fall sensor **PIN 6B**

Variable geometry power supply **PIN 7B**

Power ground connection 2 **PIN 8B**

Injection power supply **PIN 1C**

Serial line K for diagnosis **PIN 2C**

Clutch sensor **PIN 3C**

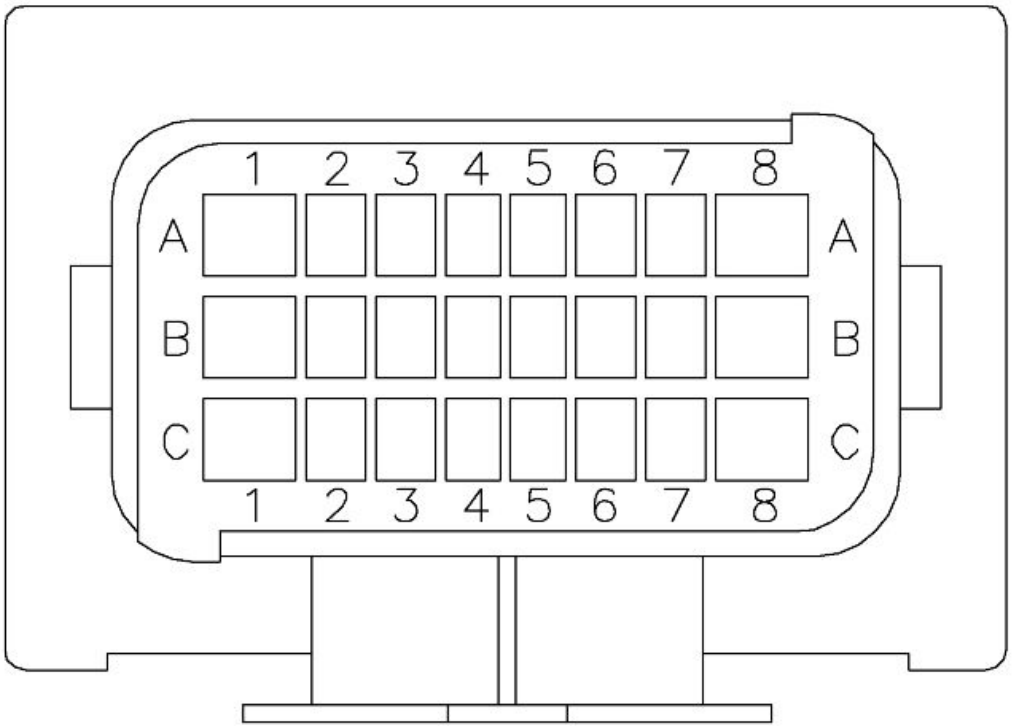
"Start engine" switch **PIN 4C**

Start-up control **PIN 5C**

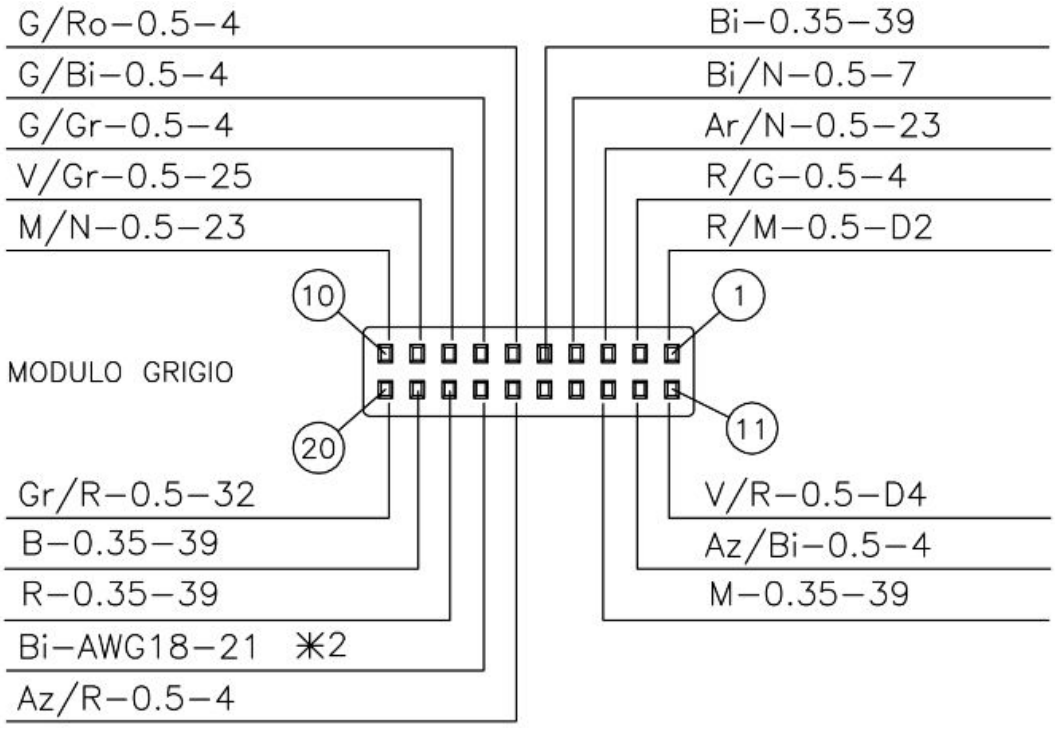
Injection relay **PIN 6C**

Engine stop **PIN 7C**

Power ground connection 2 **PIN 8C**



Dashboard



Grey-bodied instrument panel pinout key:

1 +Key

2 Right turn indicator control

3 Exhaust valve potentiometer power supply

4 High beam lights input

5 Normally open button "1"

6 Select 3 (Set)

7 Select 2 (Down)

8 Select 1 (Up)

9 Low fuel sensor

10 Exhaust valve potentiometer signal input

11+ Battery

12 Left turn indicator control

13 Normally closed button "+"

14 *

15 *

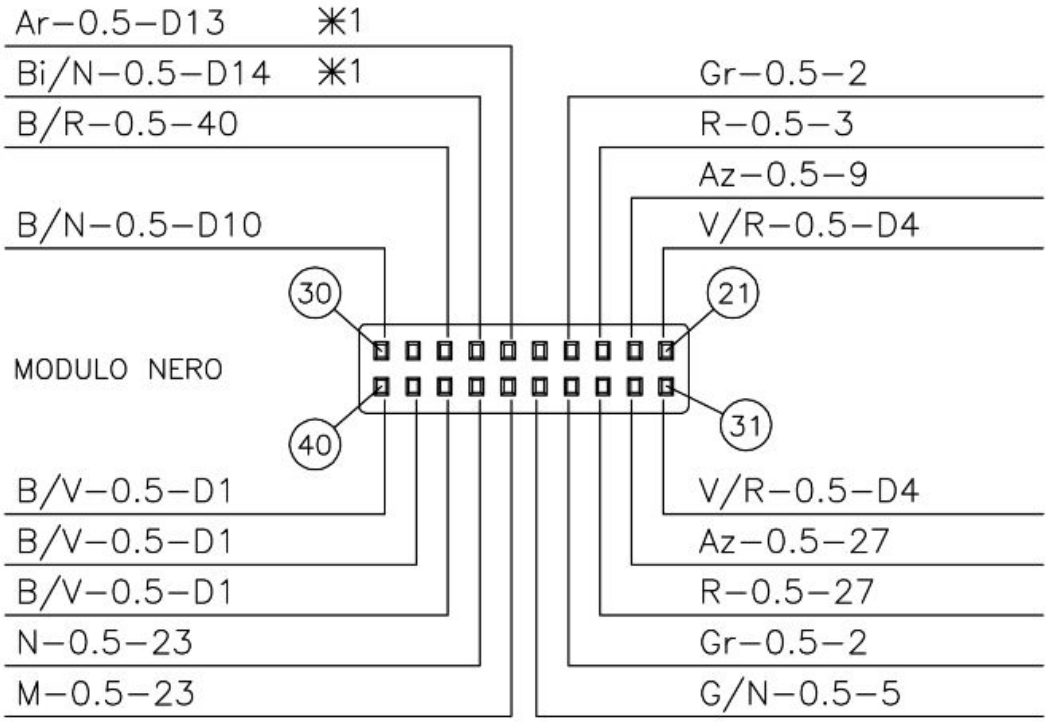
16 Indicator reset

17 Oil sensor input

18 Normally open button "-"

19 Normally closed button "-"

20 K line



Black-bodied instrument panel pinout key:

21 +Battery

22 Front left turn indicator activation

23 Front right turn indicator activation

24 Aerial 2

25 *

26 CAN H

27 CAN L

28 ABS warning light input (if present)

29 *

30 Sensors ground connection

31 +Battery

32 Rear left turn indicator activation

33 Rear right turn indicator activation

34 Aerial 1

35 Low beam light relay activation

36 Exhaust valve A control output

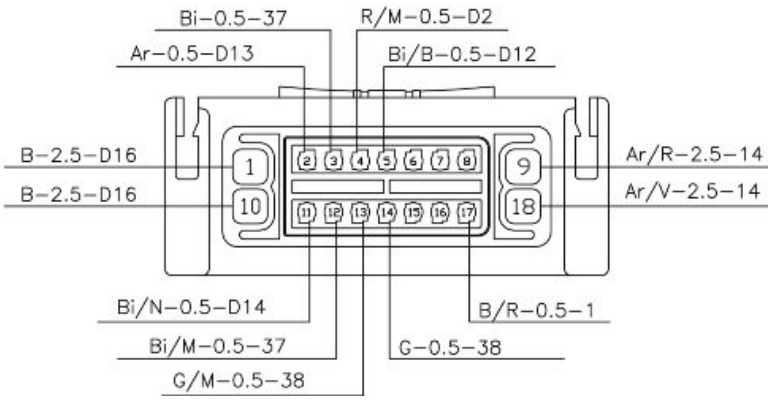
37 Exhaust valve B control output

38 Ground connection

39 Ground connection

40 Ground connection

ABS Modulator



ABS control unit pin out key:

Valve ground and ECU **PIN 1**

CAN H line (high speed) **PIN 2**

Front speed sensor input **PIN 3**

Key positive (ECU) **PIN 4**

Serial line K for diagnosis **PIN 5**

Battery for valve positive **PIN 9**

Pump engine ground **PIN 10**

CAN L line (high speed) **PIN 11**

Front speed sensor positive **PIN 12**

Rear speed sensor positive **PIN 13**

Rear speed sensor input **PIN 14**

ABS warning light **PIN 17**

Battery for pump engine positive **PIN 18**

Can line

Function

It allows communication between the Marelli injection ECU and the instrument panel.

Operation / operating principle

CAN SYSTEM ADVANTAGES

A CAN (controller Area network) line is a connection among the vehicle several electronic devices, organised as a computer network (Internet). The CAN network has greatly simplified the electrical system layout and consequently, its complexity. With this communication line, needless duplication of several sensors present on the motorbike has been obviated. The sensor signals are shared by the two electronic elaboration units (instrument panel and control unit).

- 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: messages travel at a speed of 250 kbps (data arrive at nodes every 20 ms, i.e. 50 times/second).

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. 130 Ohm
- between PIN 26 and 27 of the instrument panel: approx. 120 Ohm

Pin out:

- Line L: white/black cable between Marelli control unit PIN 66 and the black-bodied connector PIN 27 of the instrument panel.
- Line H: orange cable between Marelli control unit PIN 80 and the black-bodied connector PIN 26 of the instrument panel.

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.

DIAGNOSIS INSTRUMENT: ELECTRICAL ERRORS

CAN line "Mute Node" U1601

- Mute Node.

Error cause

- The injection ECU cannot send CAN signals; it receives signals from the instrument panel: the control unit may need replacing.

Troubleshooting

- Replace the Marelli control unit.

CAN line without signals U1602

- Bus Off.

Error cause

- No communication on CAN line (PIN 66 and/or PIN 80): problem on the whole network (for example, battery cut-off or short circuited or shorted to ground).

Troubleshooting

- check the Marelli control unit VEHICLE connector and the engine-vehicle cable harness connector: if not OK, restore; if OK, check the ground insulation of the two CAN lines from PIN 66 and PIN 80 of the VEHICLE connector: if not OK, restore cable harness; if OK, check the continuity of the two CAN lines from Marelli control unit VEHICLE connector to the instrument panel connector: if not OK, restore the cable harness; if OK, check that the two lines are not shorted to positive testing each of the 3 connectors (Marelli control unit, engine-vehicle cable harness connector and instrument panel connector) with 1 connector disconnected at a time and by setting the key to ON: If not OK, restore; if OK, replace the Marelli control unit.

CAN line towards instrument panel U1701

- no signal.

Error cause

- No signal is received from the instrument panel.

Troubleshooting

- Check the connector of the instrument panel: if not OK, restore; if OK, check the continuity of the two lines from the instrument panel connector to the VEHICLE connector of the Marelli control unit: if not OK, restore the cable harness; if OK, replace the instrument panel.

CAN line towards instrument panel U1702.

- Intermittent signal or communication error.

Error cause

- Probable bad contact in the CAN line.

Troubleshooting

- Check the Vehicle connector pins 66 and 80 and the vehicle-engine cable harness pins B2 and B3. If not OK, restore. If OK, check pins 26 and 27 and the instrument panel connector. If not OK, restore. If OK, check overall operation of the Marelli control unit and instrument panel: replace the affected component if you find any fault

CAN line toward Sensor Box U1722

- Intermittent signal or communication error

Error cause

- Probable bad contact in the CAN line.

Troubleshooting

- Check the Vehicle connector pins 66 and 80 and the vehicle-engine cable harness pins B2 and B3. If not OK, restore. If OK, check pins 2 and 3 and the inertia sensor platform (Sensor box) connector. If not OK, restore. If OK, check overall operation of the Marelli control unit and inertia sensor platform (Sensor box): replace the affected component if any fault is detected.

Failed CAN reception from instrument panel C1301

Error cause

- No signal is received from the instrument panel.

Troubleshooting

- Check the pins 26 and 27 of the instrument panel connector, and ABS control unit connector pins 2 and 11. If NOT OK, restore. If OK, with key OFF disconnect the following: a) ABS control unit connector, b) instrument panel connector and check the continuity across instrument panel connector pin 26 and ABS control unit connector pin 2. If NOT OK, replace

the vehicle cable harness; if OK, check the continuity across instrument panel pin 27 and ABS control unit connector pin 11. If NOT OK, replace the cable harness; if OK, check for the correct power supply (12V) at pins 1 and 11 and ground at pins 38,39, 40 of the instrument panel connector. If NOT OK, restore the cable harness; if OK, replace the instrument panel.

CAN line mute mode C1302

Error cause

- No signal is received from the CAN line, possible line break.

Troubleshooting

- Check the pins 2 and 3 of the inertia sensor platform (Sensor box) connector, and ABS control unit connector pins 2 and 11. If NOT OK, restore. If OK, with key OFF disconnect the following: a) ABS control unit connector, b) inertia sensor platform (Sensor box) connector and check the continuity across inertia sensor platform (Sensor box) connector pin 2 and ABS control unit connector pin 11. If NOT OK, replace the vehicle cable harness; if OK, check the continuity across inertia sensor platform (Sensor box) connector pin 3 and ABS control unit connector pin 2. If NOT OK, change the cable harness; if OK, check for the correct power supply (12V) at pins 1 and 2 and ground at pin 4 of the ABS control unit connector. If NOT OK, restore the cable harness; if OK, change the instrument panel.

DIAGNOSTIC TOOL: LOGIC ERRORS

CAN line to ABS control unit U1711

- No signal/Configuration error

Error cause

- If there is no signal, no signal is received from the ABS control unit. In case of configuration error, some devices are present (e.g. ABS) that were not foreseen in the vehicle configuration stored in the control unit.

Troubleshooting

- Signal absent - Carry out the check procedure on pins 5 and 6 of the ABS control unit, pins 66 and 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 cabling, if OK check correct power supply pin 18 (12V) and ground at pin 1 of the ABS control unit, if NOT OK restore cabling, if OK replace the ABS control unit
- Configuration error - Open the diagnostic tool devices status page to check if the control unit setting is actually consistent with the motorcycle setting. Example: if the bike has an ABS control unit the correct state that should be found in the diagnostic tool device status screen will be: MGTC (traction control) PRESENT. In the event of a bike with ABS control unit

present and indication of the diagnostic tool of: MGTC (traction control) NOT PRESENT, update the control unit.

CAN line to ABS control unit U1712

- Intermittent signal or communication error.

Error cause

- Probable bad contact in the CAN line.

Troubleshooting

- Carry out the Vehicle connector check on pins 66 and 80, if NOT OK restore, if OK carry out the check procedure on pins 5 and 6 and the ABS control unit connector, if NOT OK restore, if OK check general operation of the Marelli control unit and the ABS control unit, in case of faults replace the component in question.

CAN line toward Sensor box U1721

- No signal/Configuration error

Error cause

- If there is no signal, no signal is received from the inertia sensor platform (Sensor Box control unit). In case of configuration error, some devices are present (e.g. Sensor Box) that were not foreseen in the vehicle configuration stored in the control unit.

Troubleshooting

- No signal - Check the pins 2 and 3 of the inertia sensor platform (Sensor Box) connector, vehicle-engine connector pins B2 and B3 and Marelli control unit vehicle connector pins 66 and 80. If NOT OK, restore. If OK, with key OFF disconnect the following: a) ABS control unit connector, b) inertia sensor platform (Sensor box) connector and check the continuity across inertia sensor platform (Sensor box) pin 3 and ABS control unit pin 11. If NOT OK, change the vehicle cable harness; if OK, check the continuity across inertia sensor platform (Sensor box) pin 2 and ABS control unit pin 2. If NOT OK, change the cable harness; if OK, check for the correct power supply (12V) at pin 4 and ground at pin 1 of the ABS control unit. If NOT OK, restore the cable harness; if OK, change the inertia sensor platform (sensor box)
- Configuration error - Open the diagnostics instrument devices status page to check if the control unit setting is actually consistent with the motorcycle setting. Example: if the vehicle is equipped with inertia sensor platform (Sensor box), the correct status we should find on the diagnostics instrument devices status page will be: Aprilia Traction Control Performance (in a bend) PRESENT. While on a vehicle equipped with inertia sensor platform (Sensor box) and diagnostics instrument indication: Aprilia Traction Control Performance (in a bend) NOT PRESENT update the control unit

Rear wheel radius acquisition P0510

- CAN error during acquisition/Invalid value.

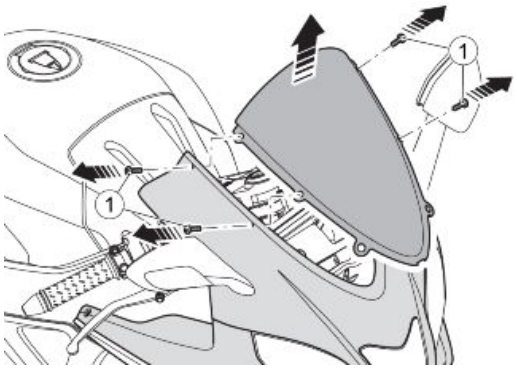
Error cause

- 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. In case of invalid value, it means that on key-ON an error of transcription occurred - from the non-volatile memory (EEPROM) to the volatile one (RAM) - of the value concerning the rear wheel radius. In this case the default value is used.

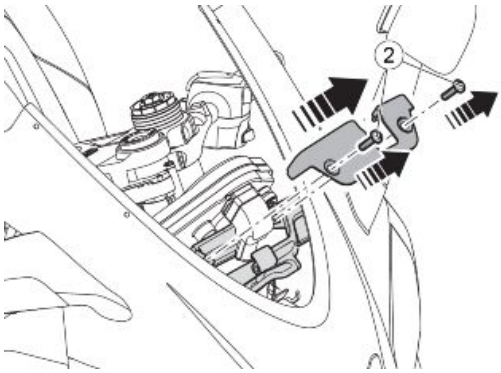
Presa USB

Rimozione

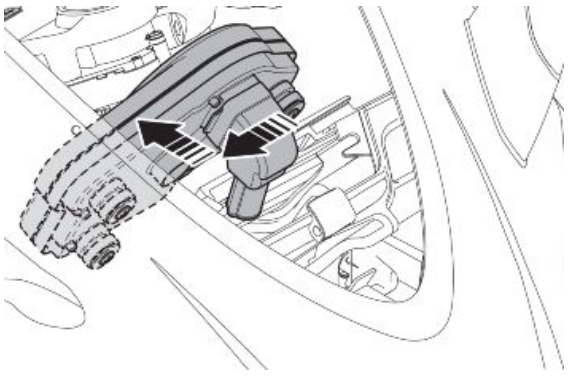
- Unscrew and remove the screws (1) Remove the top fairing glass from the seats of the motorcycle



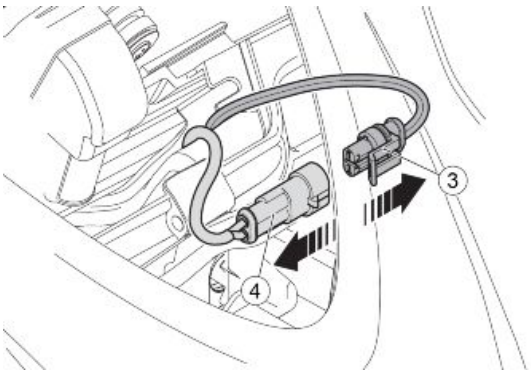
- Unscrew and remove the two screws (2); Remove the instrumentation lid



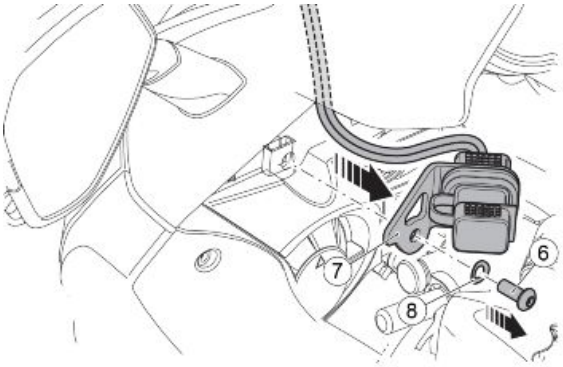
- Move the instrument panel to the right, so as to remove it from its seat.
- Once released, move the instrument panel without disconnecting the connectors from it, so as to be able to easy access the USB port connector.



- Disconnect the USB wiring connector (3) from the connector of the wiring harness on the vehicle (4)

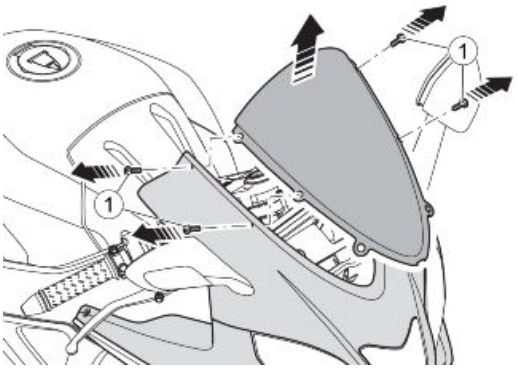


- Remove the fixing screw (6) of the support bracket (7) paying attention to recover the elastic washer (8)
- Remove the USB port

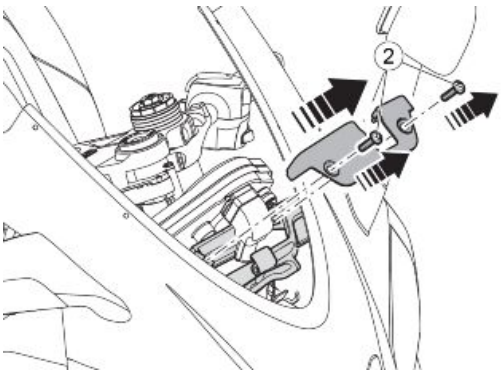


Installazione

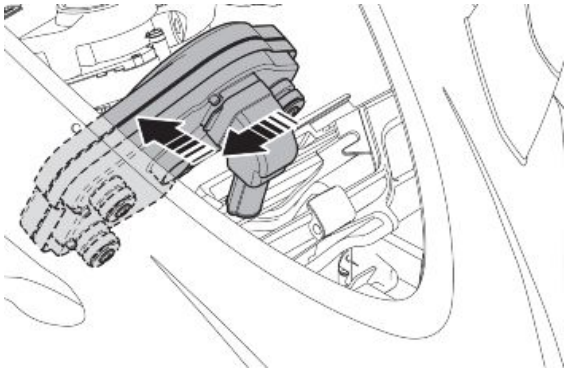
- Unscrew and remove the screws (1) Remove the top fairing glass from the seats of the motorcycle



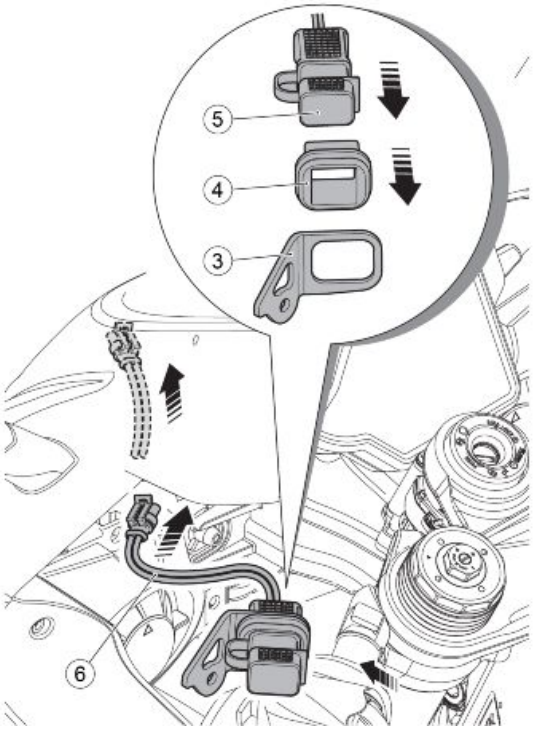
- Unscrew and remove the two screws (2); Remove the instrumentation lid



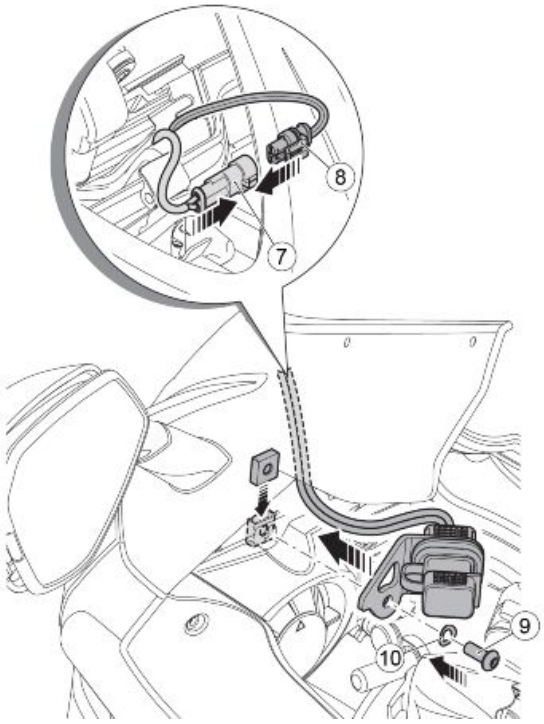
- Move the instrument panel to the right, so as to remove it from its seat.
- Once released, move the instrument panel without disconnecting the connectors from it, so as to be able to easy access the wiring harness connector on the vehicle.



- Insert the rubber gasket housing the USB port (4) into the support bracket (3).
- Then insert the USB port (5) in the rubber gasket (4).
- Operating from the left vehicle side, insert the nut in the corresponding housing on the headlamp.
- Place the wiring harness of the USB cable (6) on the vehicle, making it pass through the headlamp and the instrumentation support and recover the connector (7) so as it is inside the instrumentation support compartment.



- Connect the vehicle wiring harness connector (7) to the USB wiring harness connector (8) and place it carefully inside the instrumentation support compartment



- Fix the USB supporting clamp (3) to the headlamp with the screw (9) provided with the washer (10)

Locking torques (N*m)

USB port support bracket fixing 6 Nm (4.43 lb ft)

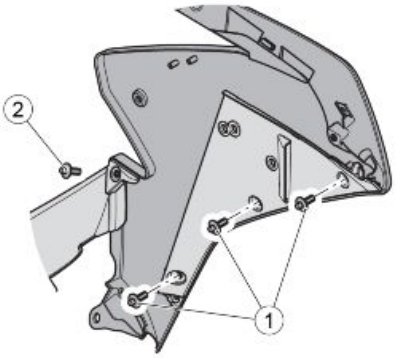
Aprilia V4-MP Tecnology

Rimozione

CAUTION

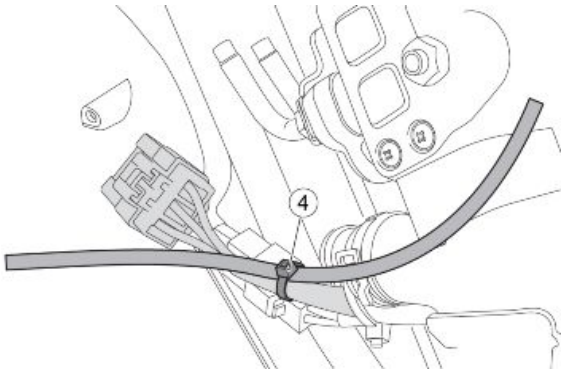
MAKE SURE THE ENGINE AND THERMAL PARTS OF THE MOTORCYCLE HAVE COOLED BEFORE PERFORMING THE REMOVAL

- Operating on the vehicle LHS, remove the three expansion caps (1) located on the inside of the side fairing.
- Remove the expansion cap (2) fixing the side fairing to the lower fairing.

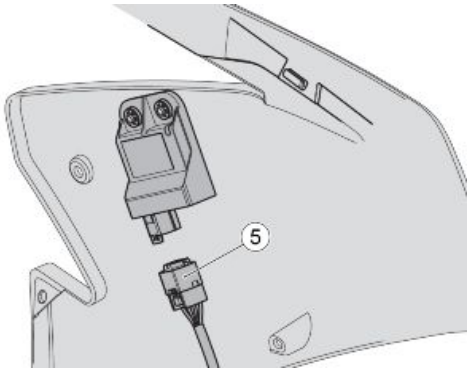


- Undo and remove the fixing screws (3) and remove side fairing from the vehicle

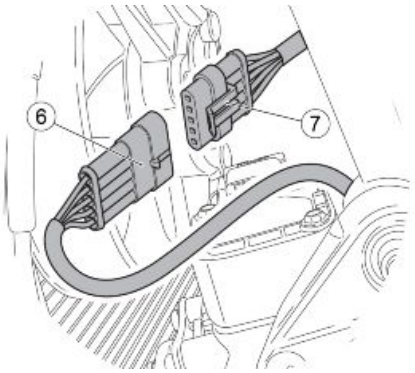
- Remove the nylon clamp (4) blocking the wiring harness of the control unit to the vehicle wiring harness



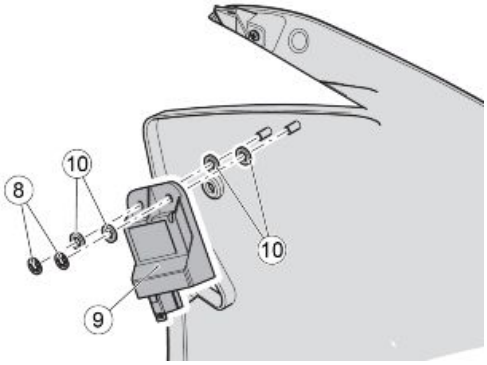
- Repeat the test using the resistance multimeter (5)



- Disconnect the engine control unit wiring connector (6) from the connector (7) of the wiring harness on the vehicle



- Remove the two elastic washers (8) and remove the control unit (9) paying attention to recover the four rubber washers (10)

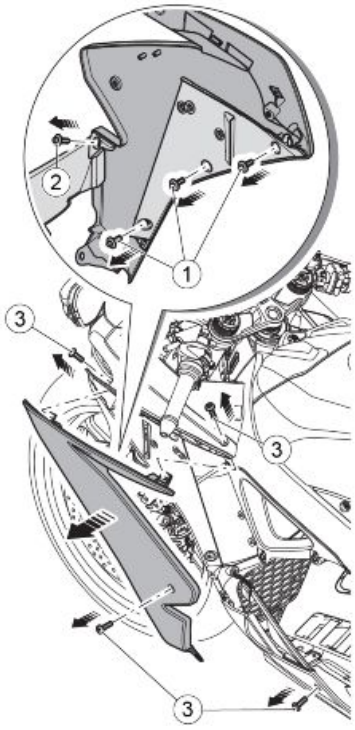


Installazione

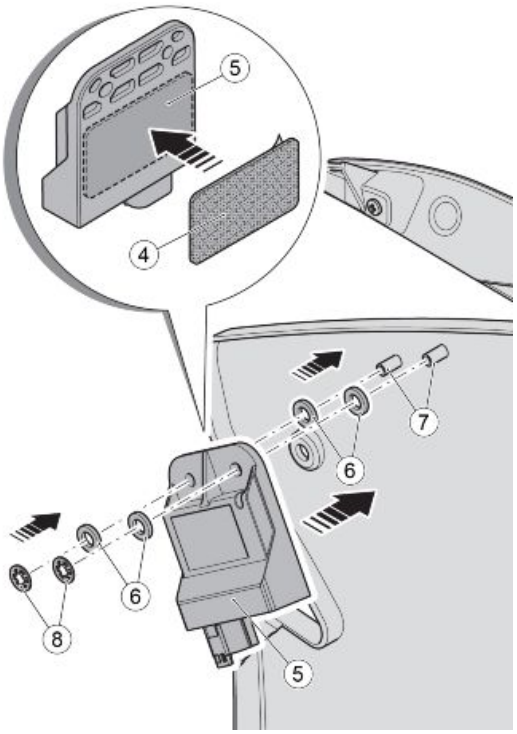
CAUTION

MAKE SURE THE ENGINE AND THERMAL PARTS OF THE MOTORCYCLE HAVE COOLED BEFORE PERFORMING THE REMOVAL

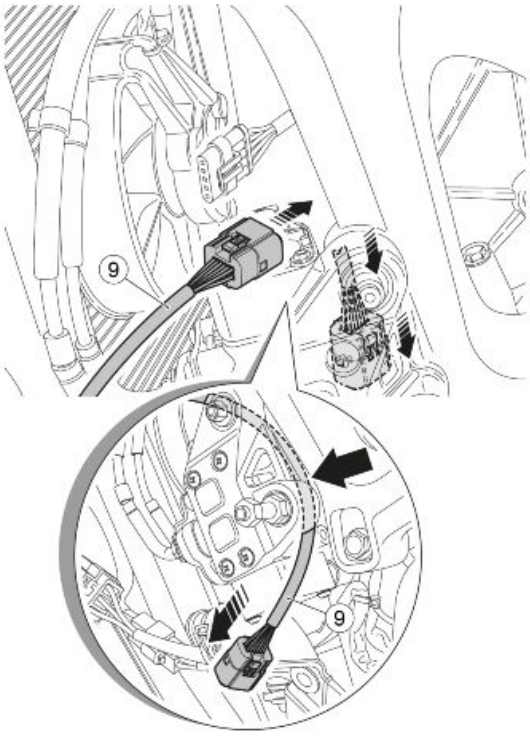
- Operating on the vehicle LHS, remove the three expansion caps (1) located on the inside of the side fairing.
- Remove the expansion cap (2) fixing the side fairing to the lower fairing
- Undo and remove the fixing screws (3) and remove side fairing from the vehicle



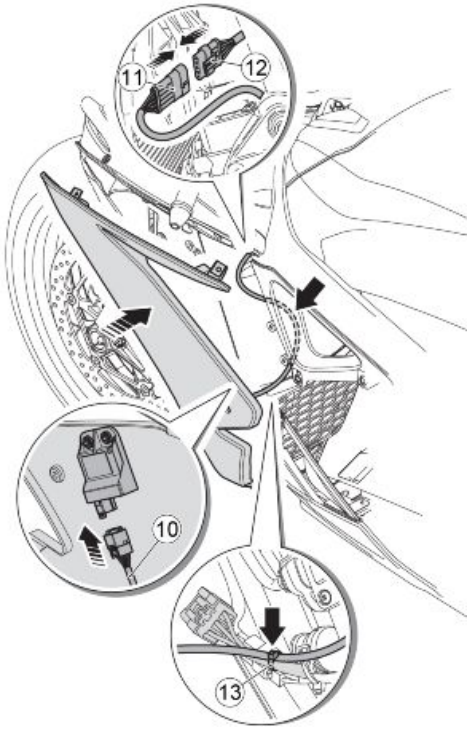
- Apply the foam adhesive rubber (4) on the lower part of the control unit V4-MP (5)
- Place two flat rubber washers (6), supplied in the kit, on the control unit fixing pins (7) located on the inside of the side fairing.
- Place the control unit V4-MP (5) on the fixing pins (7), insert the remaining two flat rubber washers (6) on the fixing pins (7) and fix the control unit V4-MP to the side fairing using the two elastic washers (8)



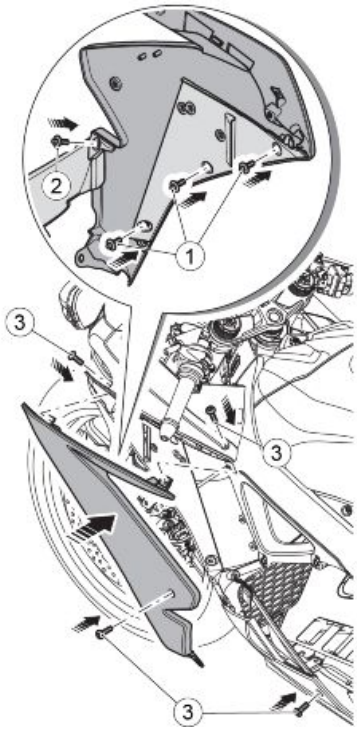
- Place the control unit wiring harness (9) paying attention to let it pass through the chassis and the accelerator position sensor.



- Connect the engine control unit wiring connector (11) to the connector (12) of the wiring harness on the vehicle.
- Approach the side fairing complete with the control unit to the vehicle, connect the wiring harness (10) to the control unit V4-MP using the connector.
- Fix the wiring harness of the control unit to the wiring harness of the vehicle using the nylon clamp (13)



- Place the left side fairing on the vehicle, first fix it to the top fairing and then fix it with the relative fixing screws (3)
- Fix the expansion cap fixing the side fairing (2) to the lower fairing
- Fix the three expansion caps (1) on the inside of the side fairing



Sincronizzazione

To use the system V4-MP the synchronisation that differs depending on the operating system must be performed:

iOS OPERATING SYSTEM

- Turn the ignition switch of the motorcycle ON with the PMP ECU correctly connected.
- Open the App settings clicking on the icon

- In the page settings click on the "BlueTooth" menu

- Inside the "BlueTooth" page if BlueTooth is not active, to activate it press the button shown
- BlueTooth active = Green button

- Once BlueTooth is enabled, the smartphone automatically searches devices. When the PMP ECU has been recognized, it appears in the "MY DEVICES" list as PMP. Click on "PMP" and wait for the smartphone to connect. When connected, the PMP shows "Connected". Now the PMP is connected to the phone and in the V4-MP App you should note the motorcycle data transmission

After the first connection the system connects automatically to the instrument panel (key ON).

ANDROID OPERATING SYSTEM

- Turn the ignition switch of the motorcycle ON with the PMP ECU correctly connected.
- Open the App's "settings" by clicking on the icon.

NOTE

THE ICON CAN VARY FROM ONE TO ANOTHER ANDROID VERSION

- In the page settings click on the "BlueTooth" menu.

- Inside the "BlueTooth" page if BlueTooth is not active, proceed to activate it by pressing the button indicated by the arrow BlueTooth active -> green button. Wait for the smartphone to recognize the PMP ECU until you see PMP in "Available devices" list.

- When the PMP is found, click on the «PMP» line and make sure the smartphone is connected. Once connected, the PMP is added to the «Paired devices» list and in the menu PMP appears the message "Paired". Now the PMP is connected to the phone and in the V4-MP App you should note the motorcycle data transmission.

After the first connection the system connects automatically to the instrument panel (key ON).

Once the connection is established you can start the application by selecting the corresponding icon

By turning off the instrument panel (key OFF) the application automatically closes

CAUTION

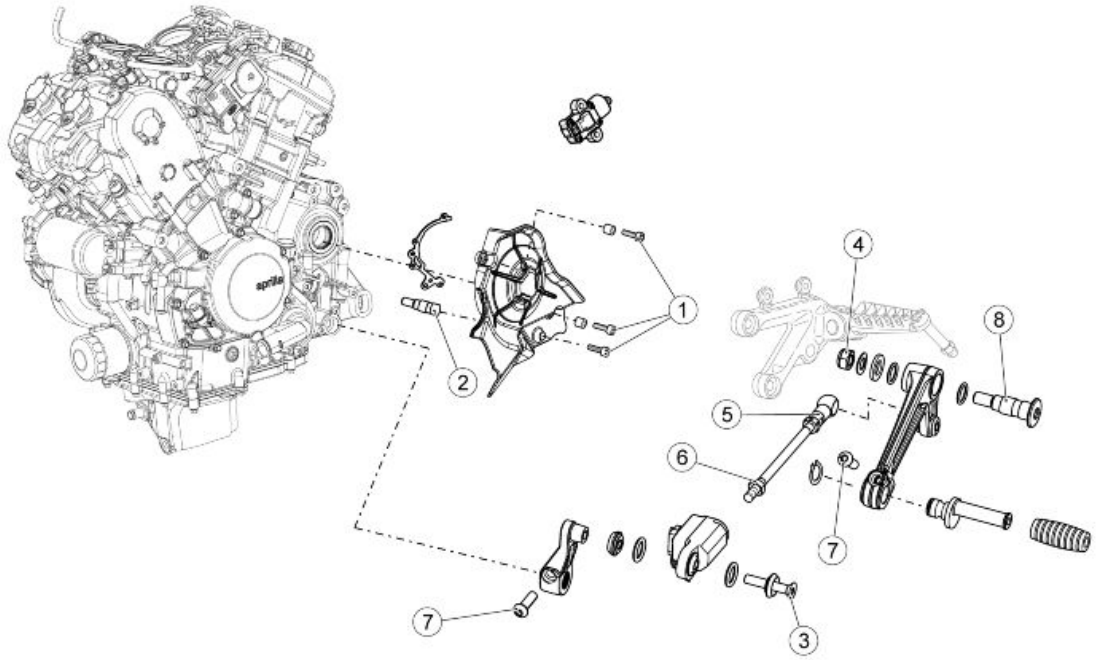
TO MAINTAIN A SUCCESSFUL CONNECTION IT IS ESSENTIAL THAT THE KEY SWITCH IS IN THE "ON" POSITION BEFORE THE APP IS LAUNCHED

CAUTION

AFTER THE KEY IS OFF IT WILL BE NECESSARY TO WAIT FOR ABOUT 20 SECONDS TO ENSURE THAT THE WIRELESS CONNECTION IS CLOSED.
IN CASE OF CONNECTION FAILURE JUST EXIT THE APPLICATION USING THE APPROPRIATE BUTTON, CLOSE IT FROM THE BACKGROUND MENU AND MANUALLY RESTART IT.
IF THE PREVIOUS DEVICE IS NOT IN THE AREA, AFTER 20 SECONDS THE SYSTEM WILL BE AVAILABLE TO CONNECT WITH A NEW SMARTPHONE.

INDEX OF TOPICS

ENGINE FROM VEHICLE	ENG VE



GEAR LEVER

pos.	Description	Type	Quantity	Torques	Notes
1	Pinion protector casing fixing screws	M6	3	8 Nm (5.90 lb ft)	-
2	Threaded stand-off	-	1	8 Nm (5.90 lb ft)	-
3	Countersunk, flat head, hex. socket screws	M6x35	1	10 Nm (7.38 lb ft)	Loct.
4	Self-locking nut	M8	1	25 Nm (18.44 lb ft)	-
5	Fastening between gear change tie-rod joint and gear change lever	-	1	8 Nm (5.90 lb ft)	Loct.
6	Nut used to fasten the gearbox tie-rod to the quick shift device	-	1	8 Nm (5.90 lb ft)	-
7	Gearbox lever fixing screws	M6	2	8 Nm (5.90 lb ft)	-
8	Pin for fastening the gear change lever to the footrest support	M8	1	25 Nm (18.44 lb ft)	-

- Apply water-repellent grease between the O-rings and the Quick Shift uniball

NOTE

ONCE ASSEMBLE, THE DISTANCE BETWEEN THE UNIBALL AND THE JOINT MUST BE APPROXIMATELY 180mm (7.09in).

Vehicle preparation

To remove the engine from the chassis, previously perform the following operations:

- Remove the fuel tank and the battery.
- Remove the fairing, the side fairings, the air deflectors and the fairing lug

Position the vehicle as described:

- Fasten an appropriately sized belt for the weight of the vehicle to the semi-handlebars and to a hoist.
- Place the rear stand.

Removing the engine from the vehicle

- Remove the spacer (1) and the nut (2) fixing the ride by wire support

- Disconnect the ride by wire connectors (3)

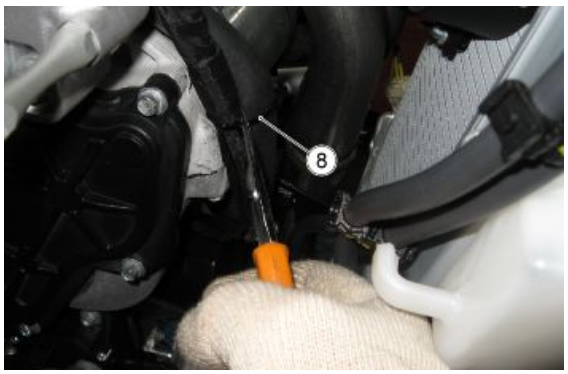
- Move the clamps (4) and disconnect the water pipe with the connector from the engine in order to empty the system

- Move the clamp (5) and disconnect the water pipe from the radiator fluid tank

- Disconnect the connectors (6) of the electric fans

- Use a container of suitable capacity, remove the clamp (7) and disconnect the oil connection pipe

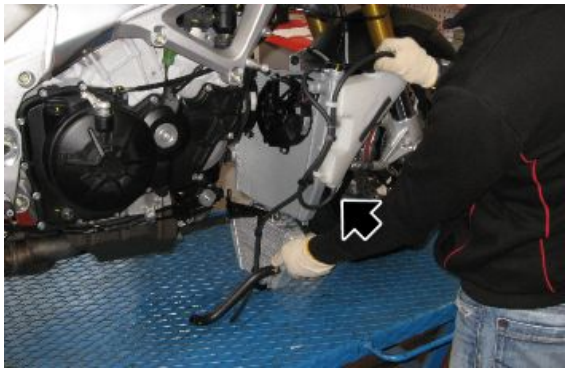
- Remove the clamp (8) fixing the oil pressure bulb wiring and exhaust valve to the water pipe



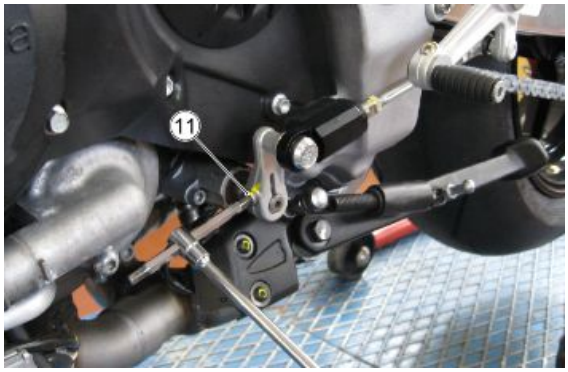
- Remove the fixing screws (9) of the radiators support bracket

- Operating from both sides of the motorcycle, remove the screws (10) fixing the radiator to the support bracket

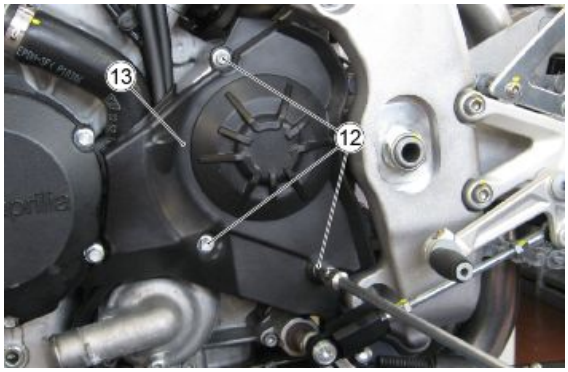
- Remove the radiators by sliding them off from the right side of the motorcycle



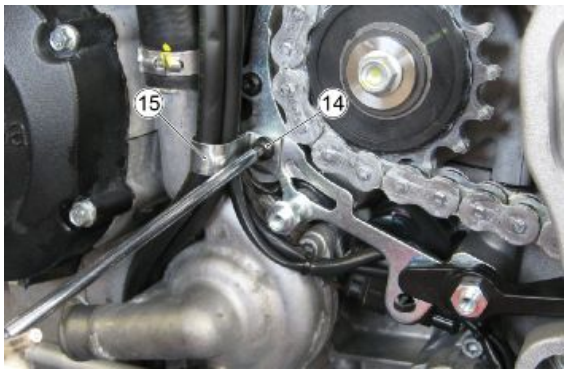
- Loosen the screw (11) and ease off the gear lever



- Remove the three fixing screws (12) of the pinion cover (13)

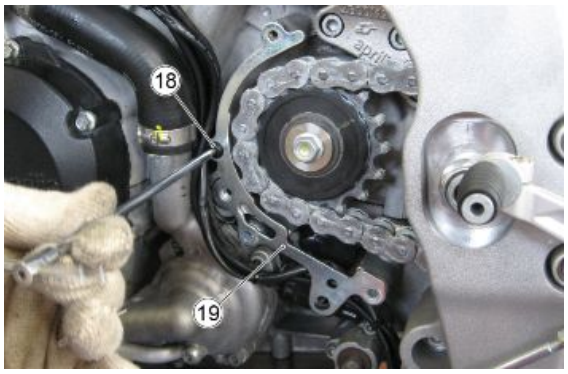


- Remove the fixing screw (14) of the cable grommet (15)

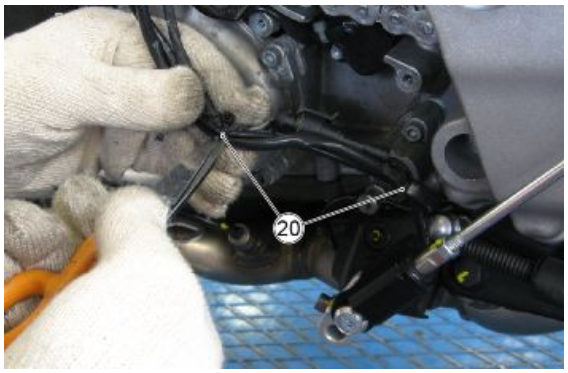


- Remove the fixing screw (16) and slide off the chain slider (17)

- Remove the fixing screw (18) of the chain guide plate (19)

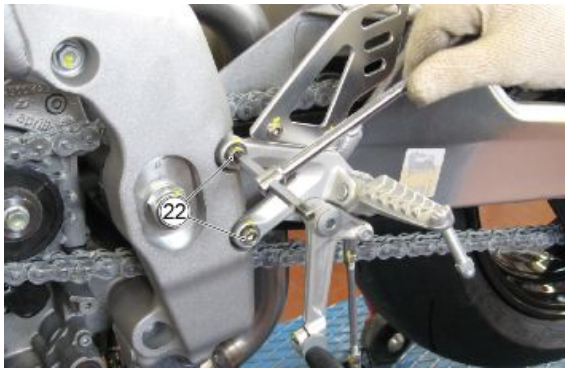


- Cut the two clamps (20) that connect the wiring of the quick-shift to the wiring of the side stand and of the lambda probe



- Disconnect the connector (21) of the quick-shift and release the wiring

- Remove the two fixing screws (22) of the footrest complete with leverage



- Disconnect the connector (23) of the side stand sensor and release the wiring

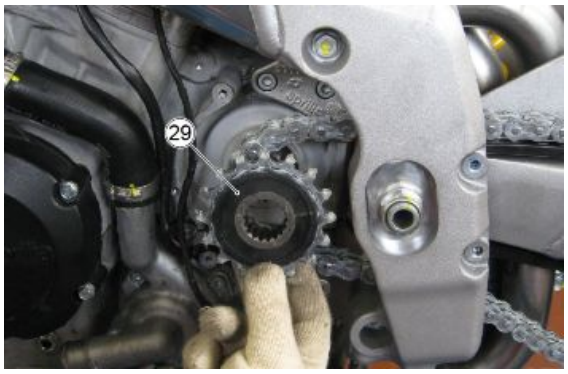
- Undo the two fixing screws and remove side stand (24)

- Disconnect the connectors of the lambda probes (25)

- Loosen the nut (26) of the rear wheel pin

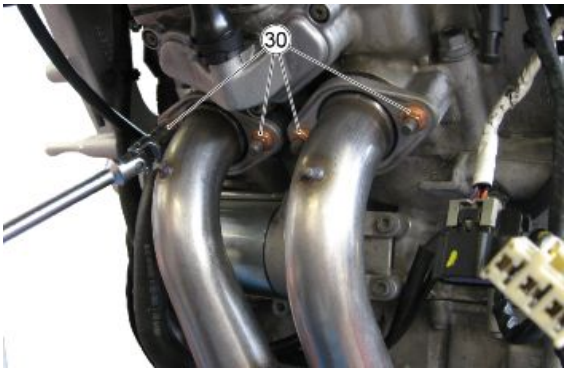
- Working from both sides of the motorcycle, loosen the locknuts (27) and act on the register screws (28) to loose the chain tension

- Loose the clamp (32) that blocks the silencer at the central manifold



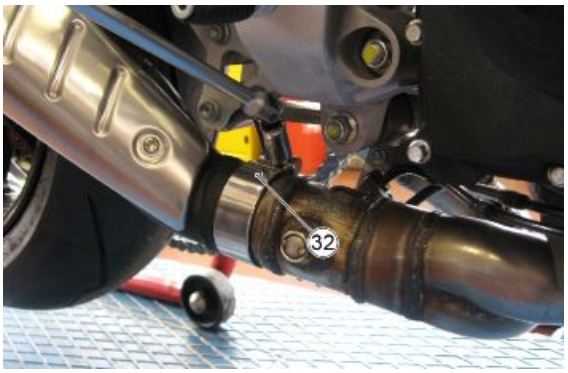
- Detach and remove the springs (29) fixing the front exhaust manifolds

- Remove the four screws (30) fixing the manifolds to the front heads

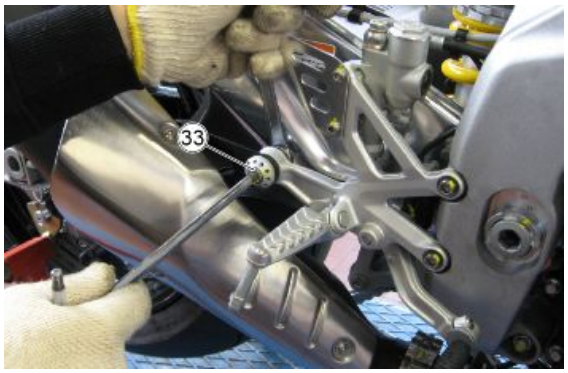


- Remove the two front manifolds (31)

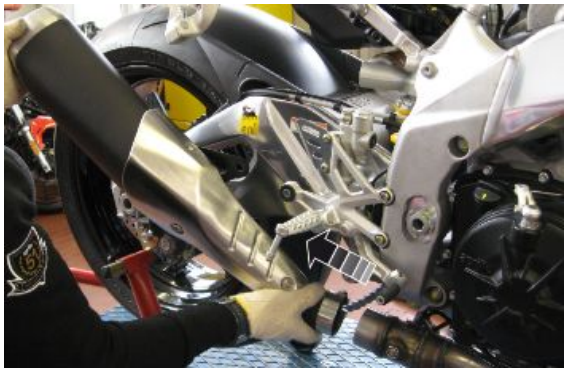
- Loose the clamp (32) that blocks the silencer at the central manifold



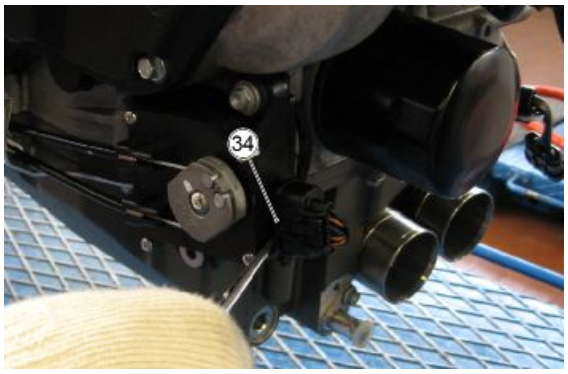
- Remove the screw (33) and the nut locking the silencer at the rider footrest



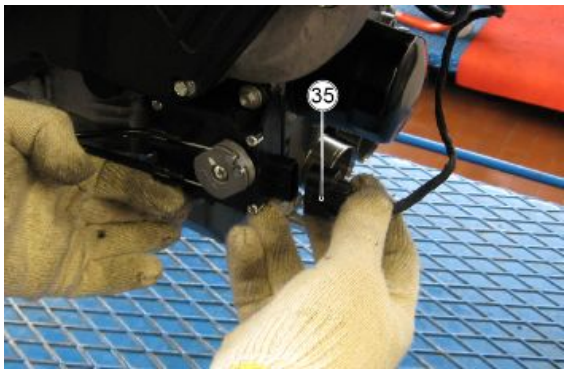
- Slide off the central manifold and remove the silencer



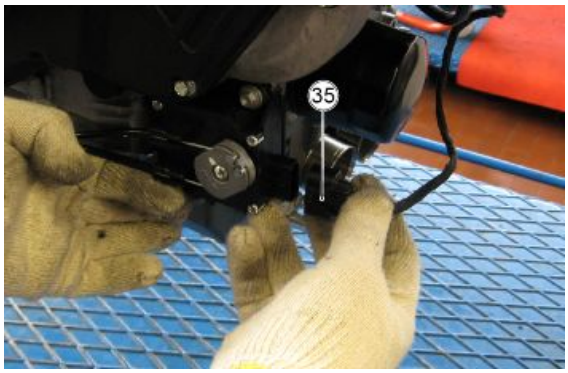
- Remove the fixing clamp (34) of the exhaust valve wiring



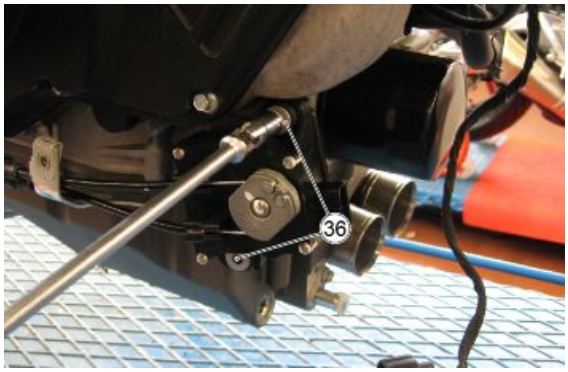
- Disconnect the connector (35) of the exhaust valve



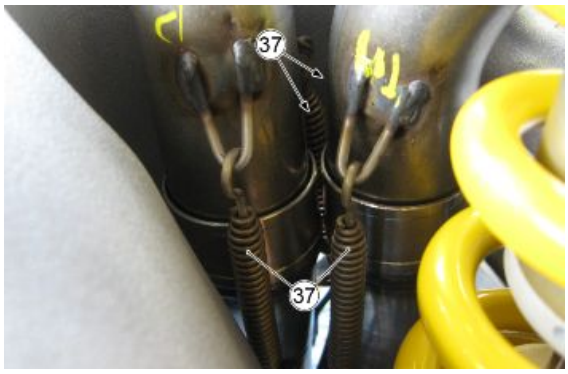
- Disconnect the connector (35) of the exhaust valve



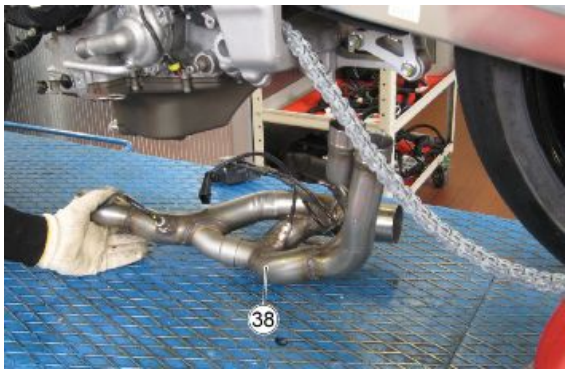
- Remove the fixing screws (36) of the exhaust valve



- Detach and remove the springs (37) fixing the rear exhaust manifolds



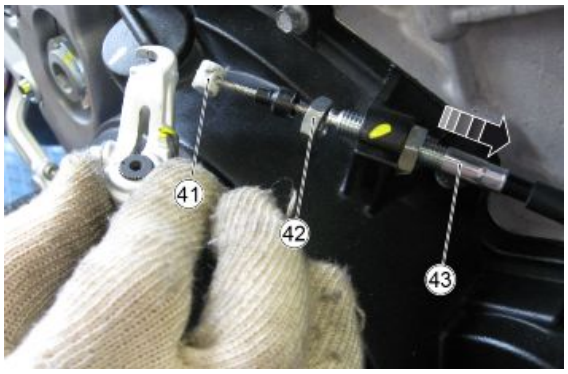
- Remove the central exhaust manifold (38)



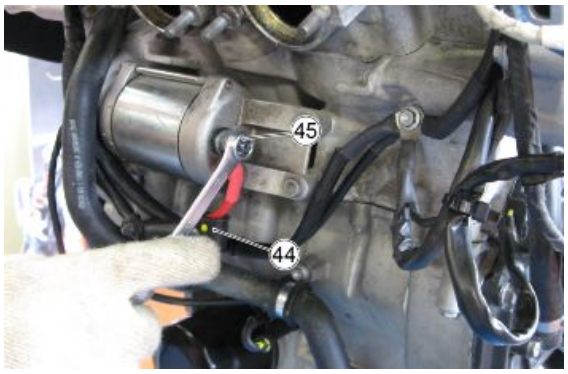
- Remove the four fixing screws (39) of the rear exhaust manifolds

- Remove the rear exhaust manifolds (40)

- Detach the clutch cable (41), remove the nut (42) and take the cable complete with sheath (43) off from the guide in the housing



- Remove the rubber cap (44)
- Unscrew and remove the nut (45) and collect the washer
- Remove the power supply cable from the starter motor.



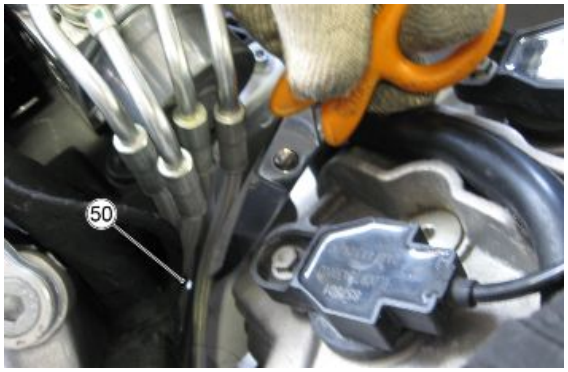
- Remove the engine oil pressure sensor (46)

- Undo and remove the screw (47) and release the ground cables

- Detach the ground cable and unscrew and remove the nut (48)

- Disconnect the engine wiring connector (49)

- Remove the clamp (50) that locks the main wiring at the ABS system pipes



- Remove the screws (51) to remove the ABS protection plate

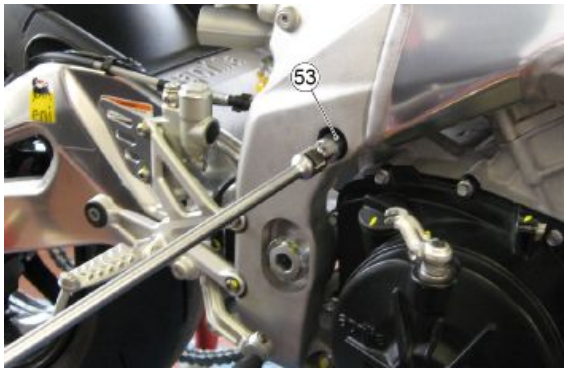
- Remove the protection plate (52) of the ABS system

- Install the engine support and place a winch under it

Specific tooling

020864Y Engine mounting plate

- Operating from the right side of the motorcycle, remove the upper screw (53) fixing the engine to the chassis



- Completely unscrew the internal upper bush (54)

- Remove the lower screw (55) fixing the engine to the chassis

- Completely unscrew the internal lower bush (56)

Installing the engine to the vehicle

- Before aligning the engine retainers, place on the frame the internal and external right and left inserts, with the precautions described below.

Adjustment of engine height relative to the chassis is determined by properly inserts placed on the chassis (front position) and on the engine, matching the fixing points of the engine to the chassis.
The hole position relative to the centreline of the insert is e=-5 mm (e= -0.197 in), therefore, the engine is fixed at minimum height possible.

CAUTION

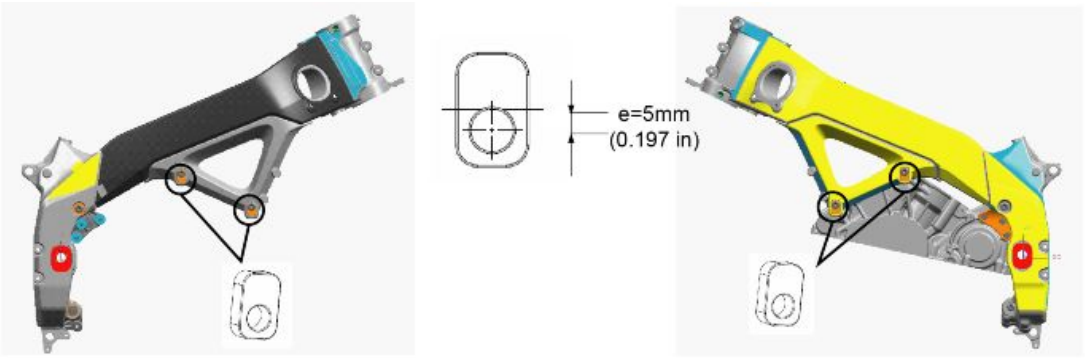
THE LEFT AND RIGHT FRONT INSERTS ARE EQUAL AND MUST NOT BE PLACED IN THE INVERTED POSITION.

Adjustment of engine height relative to the chassis is assured by properly inserts placed on the chassis (front position) and on the engine, matching the fixing points of the engine to the chassis.

The hole position relative to the centreline of the insert is e=-5 mm (e= -0.197 in), therefore, the engine is fixed at minimum height possible.

CAUTION

THE LEFT AND RIGHT FRONT INSERTS ARE EQUAL AND MUST NOT BE PLACED IN THE INVERTED POSITION.



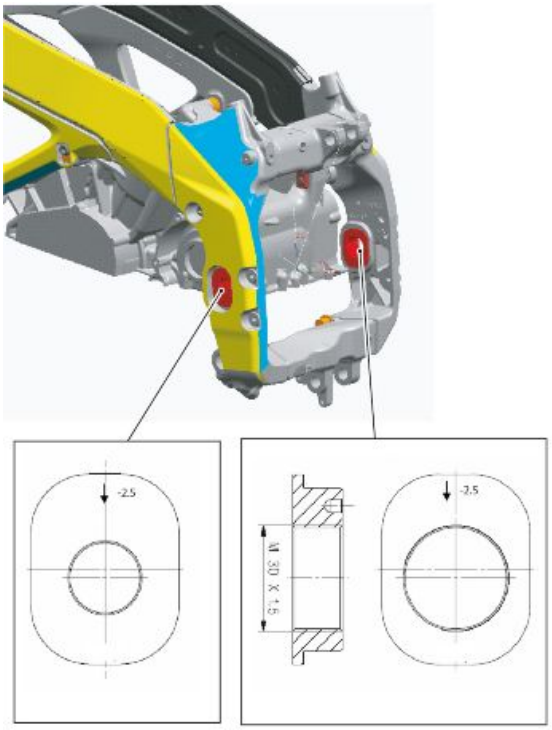
The height of the swingarm pin relative to the chassis is adjusted with special inserts installed in the respective seats in the chassis. The hole is offset by -2.5 mm (- 0.098 in) relative to the centreline of the insert, as a result the swingarm is in the low position.

There are 4 inserts, subdivided as follows:

- Inner/outer
- Right/Left

The two right side swingarm pin inserts are different.

The two left side swingarm pin inserts are the same.

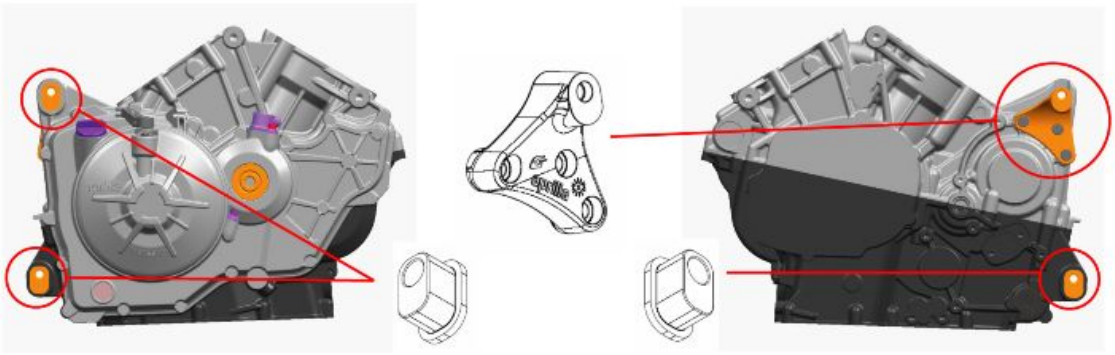


CAUTION

THE FOUR INSERTS MUST BE FITTED WITH THE ARROW FACING DOWNWARDS, OTHERWISE THE VEHICLE WILL BE DAMAGED!

CAUTION

THE RIGHT REAR INSERTS (-5mm (-0.19 in)) AND THE LOWER LEFT REAR INSERT (-5mm (-0.19 in)), ARE EQUAL.



- Working from the vehicle left side, install the left upper engine attachment, tightening the three screws.

- With the help of a second operator, secure the vehicle chassis with a hoist and onto a front and rear stand and lift the engine to place it in position.

Specific tooling

020864Y Engine mounting plate

Centring the engine on the chassis

CAUTION

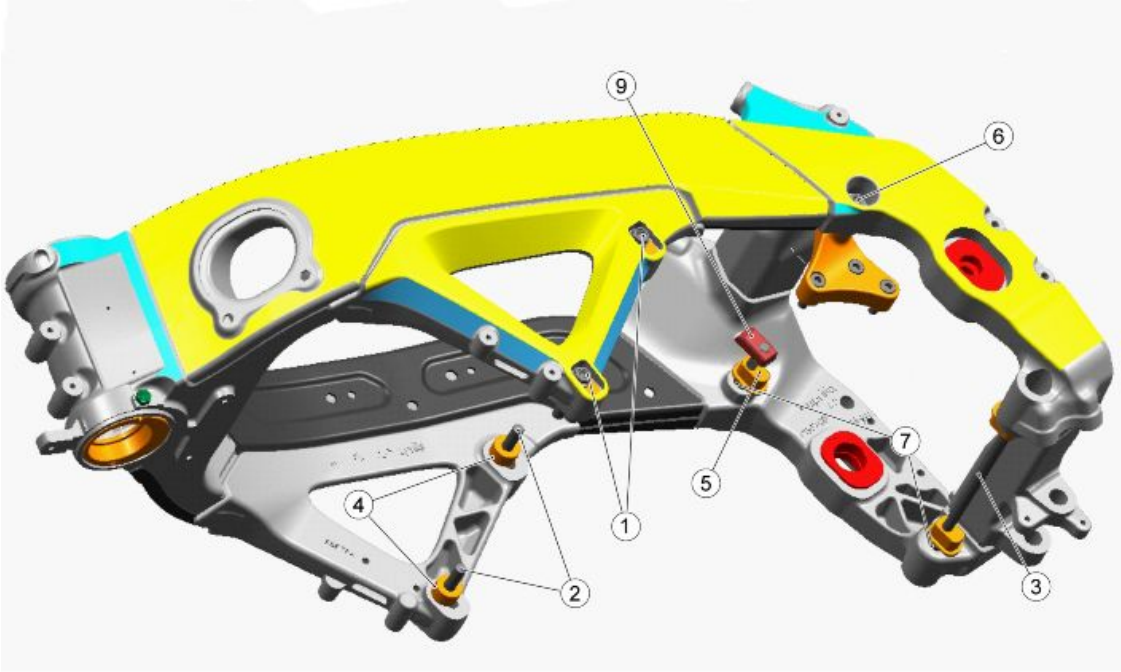
PAY SPECIAL ATTENTION DURING CENTRING PHASE OF THE ENGINE ON THE CHASSIS. OPERATE WITH CAUTION SO AS NOT TO DAMAGE THE SCREWS AND THE CHASSIS INTERNAL AND EXTERNAL SPACERS.

Working on the left side, place and screw without tighten:

- the two front fixing screws (1);
- the engine attachment upper fixing screw (6);
- the lower rear fixing pin (3), so as to centre the engine position.

Working on the right side, place and screw without tighten:

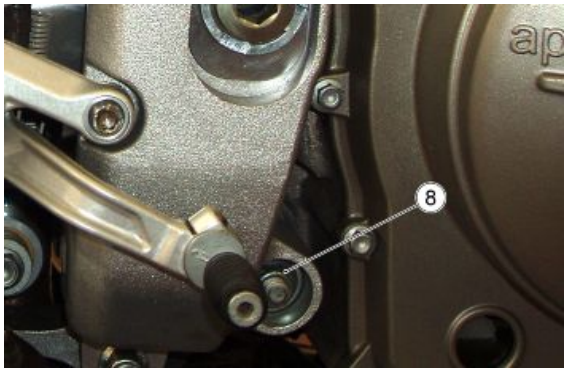
- the two front fixing screws (2) and, from the chassis internal side, the specific spacers (4);
- the upper rear fixing screws (5).



Engine retainer

CAUTION

AFTER ENGINE ALIGNMENT AND CENTRING ON THE CHASSIS, ASSURE THE CORRECT POSITION BEFORE TIGHTENING TO THE PRESCRIBED TORQUE ALL THE SCREWS IN THE ABOVE MENTIONED ORDER.



Working on the left side:

- tighten the two front screws (1) to the prescribed torque.
- Tighten the engine attachment upper fixing screw (6) to the prescribed torque, after placing the corresponding washer.
- Slide the lower rear fixing pin (3);

Working on the right side:

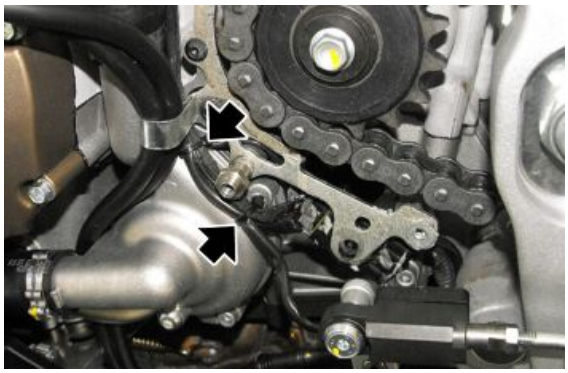
- slide the upper rear fixing screw (5).
- Place and tighten internally the two set pack bushings (7) to the prescribed torque.
- Place again on the left side, the lower rear fixing pin (3).
- Tighten the rear pin fastening nut (8).
- Place again the upper rear fixing screw (5) and tighten the lock nut (9) on the internal side of the chassis to the prescribed torque.
- Tighten the two engine screws (2) to the prescribed torque.

- Refit the clamps on the saddle mounting.

- Place the radiator frame, the washer and tighten the screw, fastening the frame to the engine.

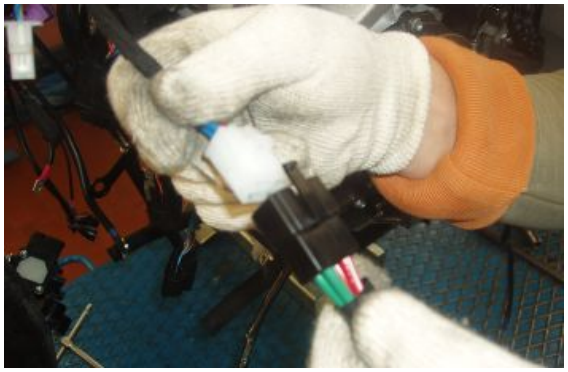
- Place the gear lever and tighten the screw.

- Position the quick-shift cable harness and fasten using ties.



- Connect the quick-shift connector.

- Connect the alternator connector.



- Connect the voltage regulator connector.

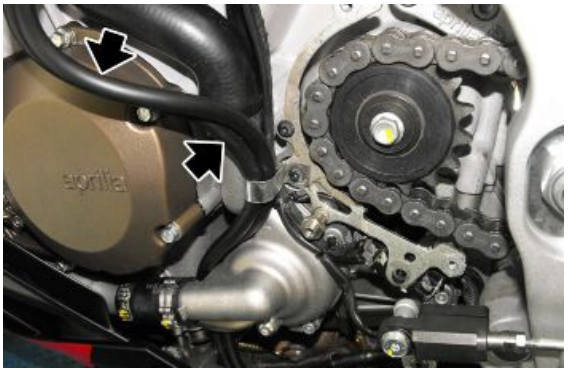
- Position and fix the hand grip position sensor to the chassis.

WARNING

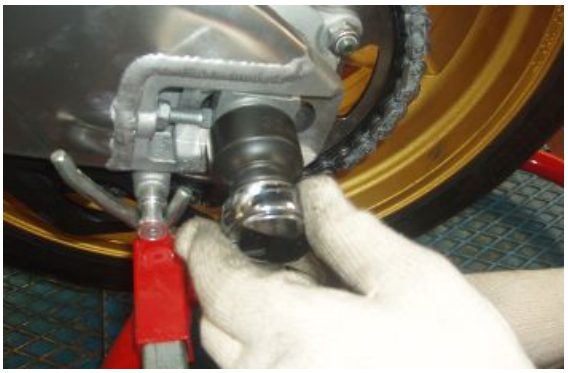
BEFORE POSITIONING THE DEMAND SENSOR APPLY SOME LOCTITE 243 ON THE SILENT BLOCKS.

- Connect the neutral sensor.

- Place the two fuel breather pipes.
- Install the side stand.



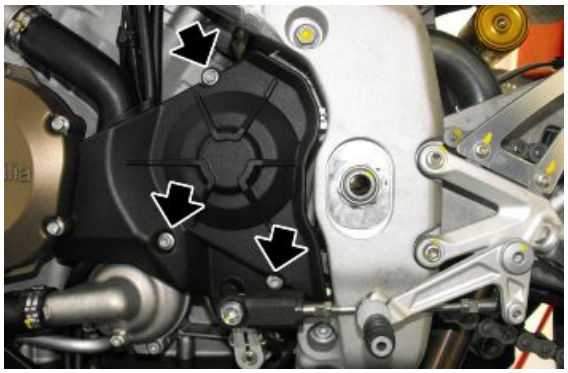
- Place the pinion and insert the transmission chain in the seat.
- Tighten the rear wheel fixing nut.



- Adjust the drive chain adjuster screws.

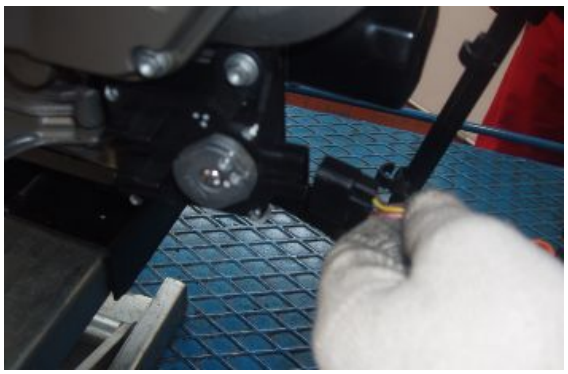
- Place the two washers and tighten the pinion fixing screw.

- Place the pinion cover and tighten the three screws.



- Connect the vehicle cable harness / engine cable harness connector.

- Working on the right side of the vehicle, connect the exhaust valve control unit connector.



- Place the ground on the frame.
- Fit the washer and tighten the nut.

- Place the cable grommet and the three cable leads as shown.
- Tighten the cable grommet fixing screw.

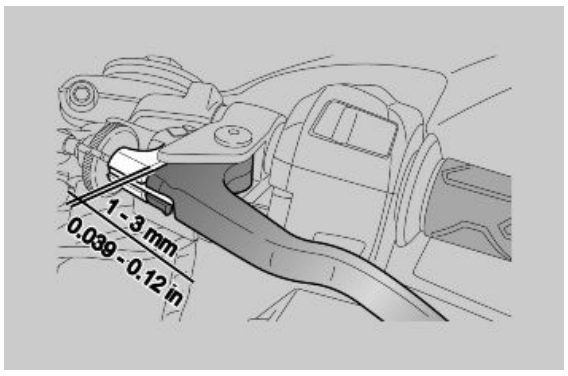
- Connect the starter motor, place the washer and tighten the nut.
- Place the rubber cap.

- Tighten the engine oil pressure sensor.

- Connect the timing sensor.

- Connect the clutch cable.

- Check and adjust the clutch lever clearance with the adjuster screw.
- The clutch lever clearance should be between 1-3 mm (0.039 - 0.12 in).



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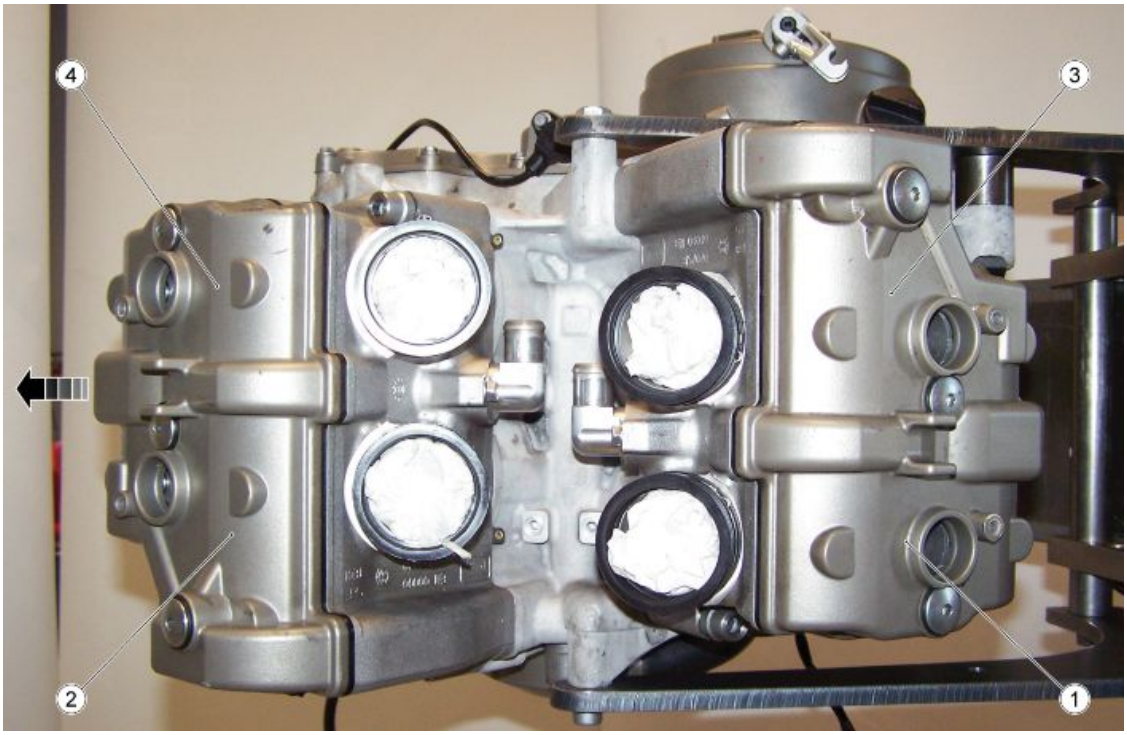
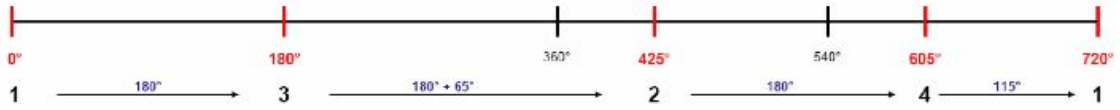
ENGINE	ENG



key:

1. rear left cylinder;
2. front left cylinder;
3. rear right cylinder;
4. front right cylinder.



Combustion sequence:

1 - 3 - 2 - 4

Combustion angle:

cyl 1: 0°

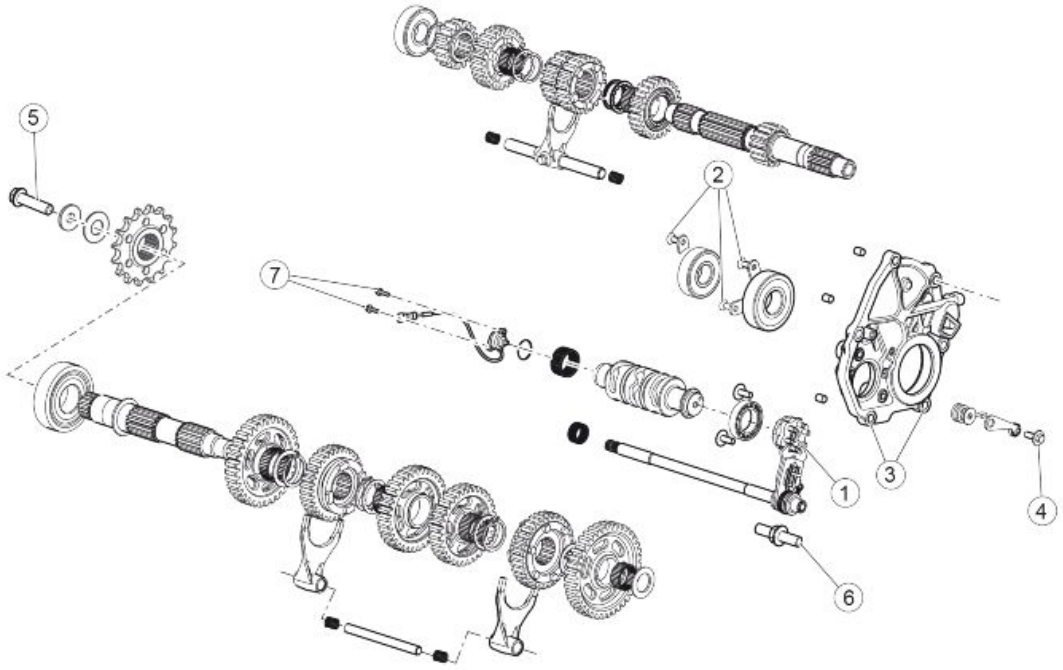
cyl 2: 180°

cyl 3: 425°

cyl 4: 605°

Gearbox

Diagram



GEARBOX

pos.	Description	Type	Quantity	Torque	Notes
1	Star fastening screw	M6x20	1	10 Nm (7.38 lb ft)	Loct. 243
2	Bearing retaining plate fastening screw	M6x16	3	10 Nm (7.38 lb ft)	Loct. 243
3	Flange fastening screws	M8x25	6	25 Nm (18.44 lb ft)	-
4	Index lever fixing screw	M6	1	10 Nm (7.38 lb ft)	Loct. 243
5	Pinion fastening	-	1	50 Nm (36.88 lb ft)	Loct. 243
6	Screw retaining pre-selector on crankcase	-	1	25 Nm (18.44 lb ft)	Loct. 270
7	Gear selector fastening screw	M5x15	2	6 Nm (4.43 lb ft)	-

Removing the gearbox

- Remove the gearbox selector.
- Remove the clutch housing.
- Remove the gear sensor from the flywheel side.

- Remove the Seeger ring.
- Remove the water/oil pump control gear.

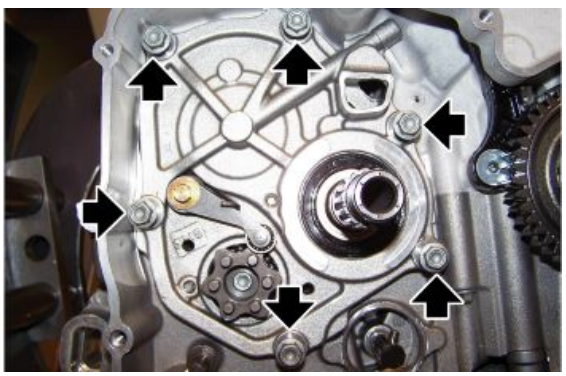
See also

Removing the gear selector
Disassembling the clutch

- Remove the water/oil pump control gear driving pin

- Loosen the screw.

- Unscrew and remove the six screws.



- Screw a M10x120 screw in the secondary shaft hole, from the alternator side, to make it easier to extract the gearbox unit.

- Use a rubber mallet to tap on the secondary shaft from the alternator side to detach the gearbox cover from the crankcase.
- Remove the complete gearbox unit.

Gearbox shafts

Disassembling the gearbox

Based on the design development of the engine, some gear components can have superficial treatments of different types.
Some components of the gear can have a superficial cover in **WC/C**.
This coating consists of a layer composed of tungsten carbide lamellae alternating with amorphous carbon lamellae. The coating **WC/C** has an elevated hardness and a good resistance to wear. The main reason for using this coating is its extremely low friction coefficient, making this an ideal treatment for preventing adhesion phenomena such as seizing and cold welding. The treatment has a characteristic colouring, darker than at a traditional operation.

OPTION 01

- The components listed in the following are coated in WC/C

1. Primary shaft
2. the gear of 3a-4a of the primary shaft;
3. Transmission shaft;
4. The gears of the 5a and 6a of the transmission shaft;
5. All forks

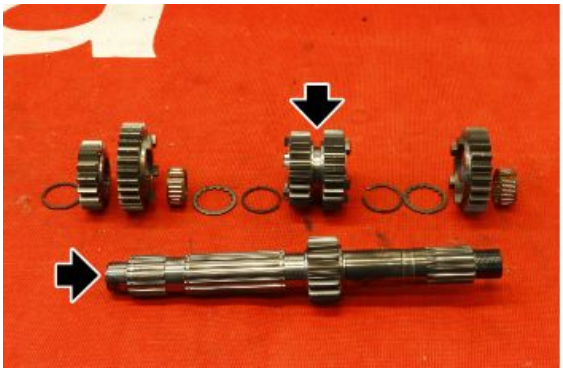
TO THIS SOLUTION CAN BE ASSOCIATED THE LUBRICATION DEVICE WITH 3 OR 5 JETS.

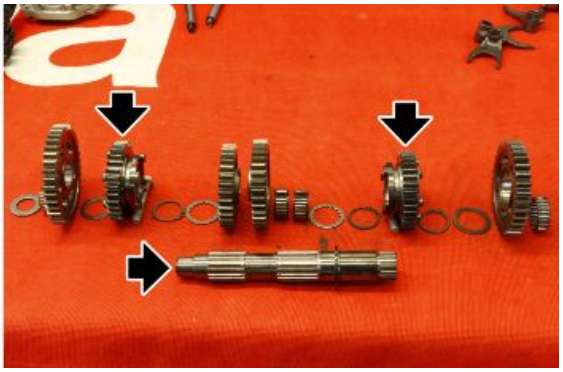
OPTION 02

- Only some components have the coating WC/C, among them:

1. Primary shaft
2. the gear of 3a-4a of the primary shaft;
3. All forks

TO THIS SOLUTION SHALL ONLY BE ASSOCIATED THE LUBRICATION DEVICE WITH 5 JETS





GEAR REMOVAL

- Position the gear in neutral, checking that when the primary shaft rotates the secondary shaft does not move.
- Remove the gearbox unit.
- Slide off the gearbox primary shaft control rod (1)

- Remove the fork (2) of the gearbox primary shaft

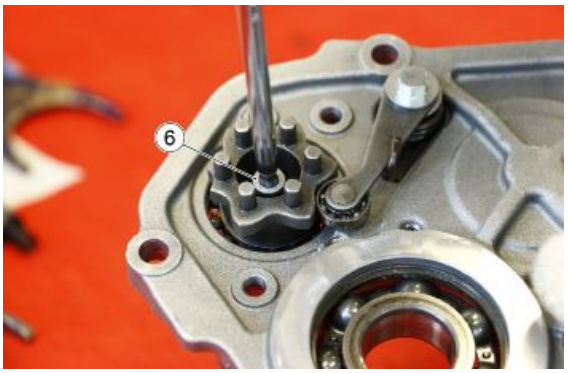
- Slide off the gearbox secondary shaft control rod (3)

- Remove the forks (4) of the gearbox secondary shaft

- Remove both gearbox shafts from the cover

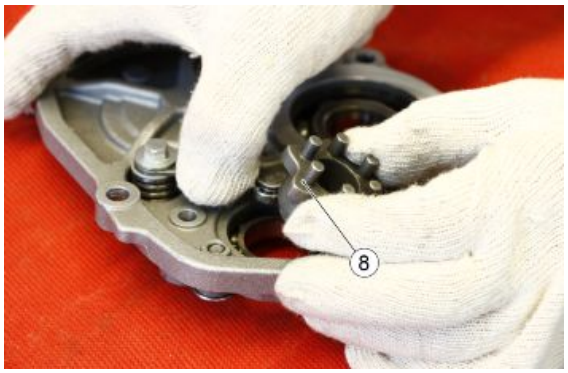
- Remove the shim washer (5) that is located on the secondary shaft between the shaft and the cover

- Loosen and remove the screw (6)



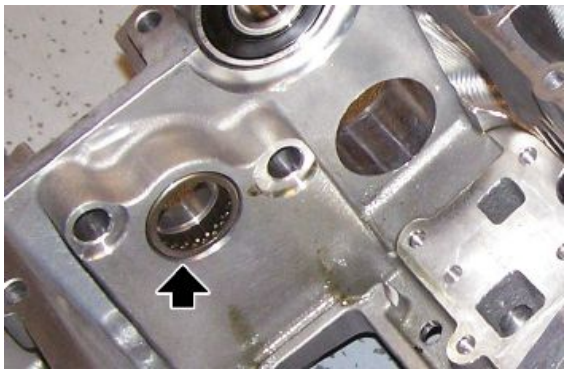
- Remove the desmodromic shaft (7)

- Remove the selector drum (8)



DESMODROMIC GEARBOX CONTROL ROD DRUM ROLLER CAGE, ALTERNATOR SIDE

- Remove the lower crankcase.
- A suitable extractor must be used to remove the desmodromic gearbox control rod drum roller cage from the alternator side.



- A specific punch is required to install the desmodromic gearbox control rod drum roller cage.
- Lubricate the seat and insert the new roller cage.

Specific tooling

020863Y Punch assembly cage with rollers desmodromic drum.....

Checking the primary shaft

Characteristic

Maximum wear limit for the selection gear grooves

5.3 mm (0.21 in)

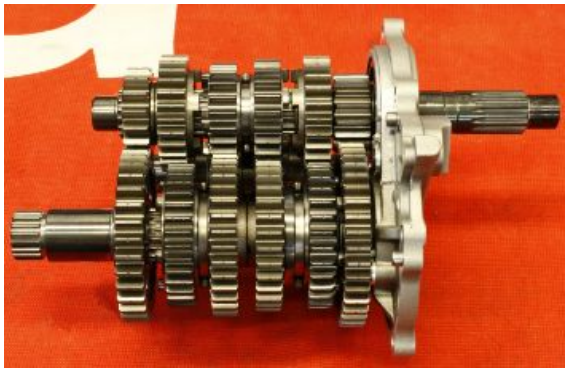
Minimum wear limit of the pinion side primary shaft seat

24.97 mm (0.98 in)

Minimum wear limit of the clutch side primary and secondary shaft seat

19.97 mm (0.79 in)

Checking the secondary shaft



Characteristic

Maximum wear limit for the selection gear grooves

5.3 mm (0.21 in)

Minimum wear limit of the pinion side secondary shaft seat

29.97 mm (1.18 in)

Minimum wear limit of the clutch side primary and secondary shaft seat

19.97 mm (0.79 in)

Checking the desmodromic drum

Check gear drum for damage, scratches and wear and replace the desmodromic if necessary.

Check the desmodromic segment (1) for damage and wear and replace it if necessary.

Check the desmodromic bearing (2) for damage and pitting and replace it if necessary.

Characteristic

Maximum selector shaft eccentricity

0.2 mm (0.0079 in)

Checking the forks

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

Characteristic

Maximum selection fork axial clearance

0.05 mm (0.0020 in)

Minimum wear limit of the selection fork guide pins

6.8 mm (0.27 in)

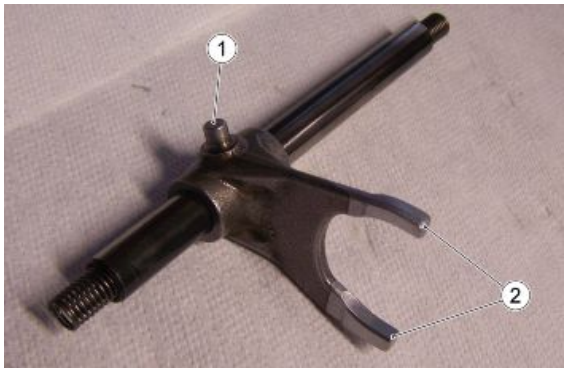
Maximum eccentricity of the two fork guide shafts

0.05 mm (0.0020 in)

NOTE

THE FOLLOWING PROCEDURE IS VALID FOR ALL GEARBOX FORKS.

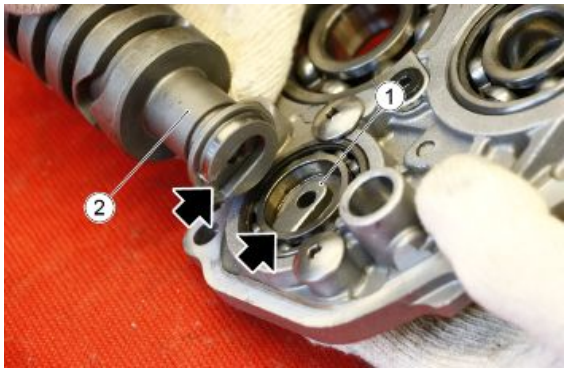
- Check the transmission fork cam roller «1» and the transmission fork tooth «2» for damage, deformation and wear.
- Replace the transmission fork if necessary.



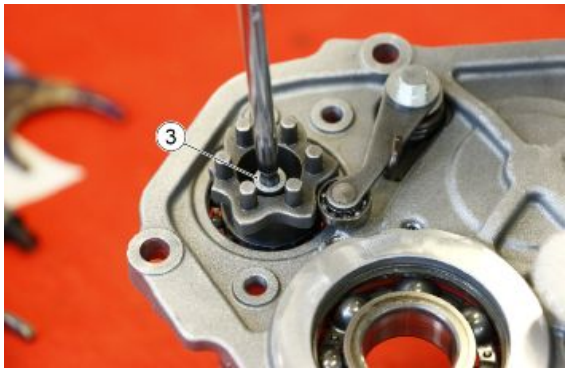
- Check the transmission fork movement and if it is not regular, replace the transmission forks.

Assembling the gearbox

- Place the drum (1) of the gear selector on the support and insert the desmodromic shaft (2), paying attention to correspond the operations on both components



- Position and tighten the screw (3) fixing the drum to the desmodromic shaft

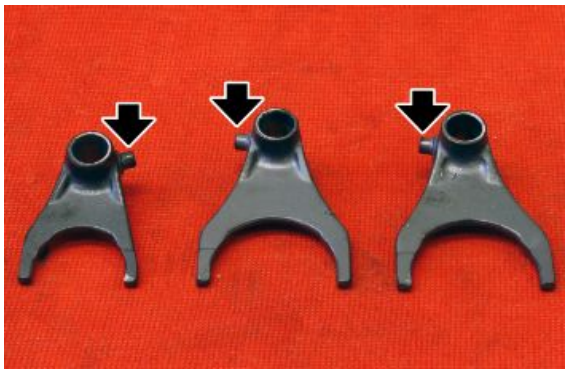


CAUTION

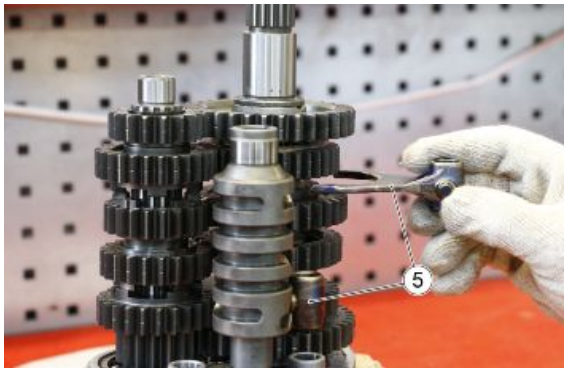
SECURE THE SHIM WASHER (4) TO THE SECONDARY SHAFT WITH GREASE

- Move the gearbox shafts together and fit them into the support

- Grease the sliding bushes of the forks



- Insert the forks (5) in the specific seats of the gearbox secondary shaft



- Insert the gearbox secondary shaft control rod (6) checking the presence of the springs

- Insert the fork (7) in the specific seat of the gearbox primary shaft

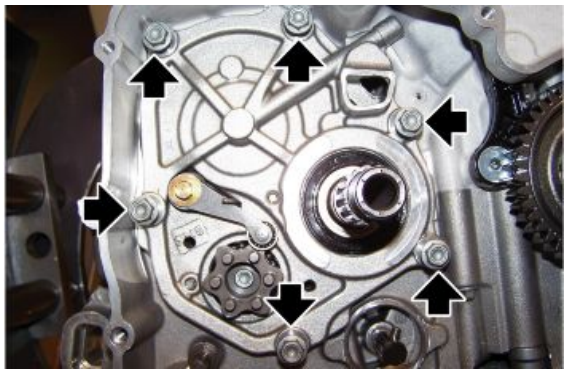
- Insert the gearbox primary shaft control rod (8)

- Position the special tool from the alternator side in order to not ruin the edges of the oil seal.
- Insert the gearbox unit in the crankcase.

Specific tooling

0277308 Guide bushing for gearbox secondary shaft

- Remove the special tool from the alternator side.
- Tighten the six screws that fasten the gearbox unit to the crankcase.



Specific tooling

0277308 Guide bushing for gearbox secondary shaft

- Insert the driving pin on the oil pump shaft.
- Install the water/oil pump control gear.
- Insert the Seeger ring.
- Install the gear sensor, making the pin coincide with the slot on the desmodromic control rod.

Gear selector

Removing the gear selector

- Drain the engine oil.
- Remove the clutch cover.
- Working from the clutch side, remove the selector control shaft.

- Remove the gear locking pawl and retrieve the washer and the spring.

GEARBOX CONTROL ROD ROLLER CAGE, CLUTCH SIDE

- Remove the lower crankcase.
- The specific tool without an adaptor must be used to remove the gearbox control rod roller cage from the clutch side.

Specific tooling

020862Y Punch assembly cage with rollers gearbox control rod.....

- Fit the adaptor on the specific tool to insert the roller cage at the controlled depth.
- Lubricate the seat and insert the new roller cage from the clutch side.

Specific tooling

020862Y Punch assembly cage with rollers gearbox control rod.....

GEARBOX CONTROL ROD OIL SEAL AND ROLLER CAGE, SPACER

- Remove the gearbox control rod spacer.
- Remove the oil seal and the roller cage.
- Install a new gearbox control rod roller cage on the spacer, using the specific tool without an adaptor.

Specific tooling

020862Y Punch assembly cage with rollers gearbox control rod.....

- Position a new oil seal on the spacer with the writing on the edge of the oil seal facing outward.
- Install the oil seal on the spacer using the specific tool without an adaptor.

Specific tooling

020862Y Punch assembly cage with rollers gearbox control rod.....

Checking the gear selector

Check the stop lever for damage and wear and make sure the ball rotates freely.
If necessary, replace the parts.
Check the gear selector spring for damage and wear.
If necessary, replace the part.

Check the selector shaft and its teeth for damage and wear.
If necessary, replace the part.
Check the lever spring for damage and wear.
If necessary, replace the part.

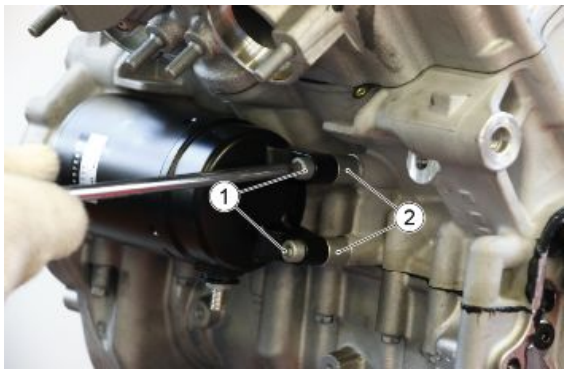
Reassembling the gear selector

- To refit, lubricate and carry out the removal operations but in reverse order.

Starter motor

Removing the starter motor

- Undo the fixing screws (1) of the starter motor, collecting the spacers (2)



- Remove the starter motor (3) from its housing.

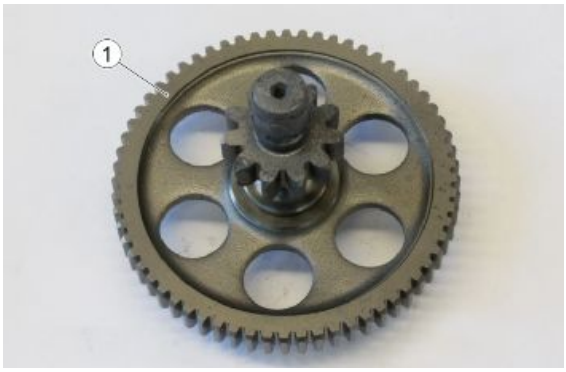
Removing the idle gear

- Remove the clutch cover.
- Remove the intermediate gear.

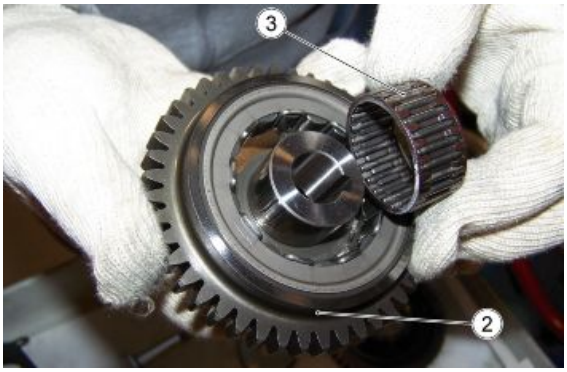
Start-up system check

IF THE DUAL STARTER GEAR TOOTHING IS DEFORMED AFTER STARTING, THE STARTER MOTOR TOOTHING MUST BE CHECKED AS WELL.

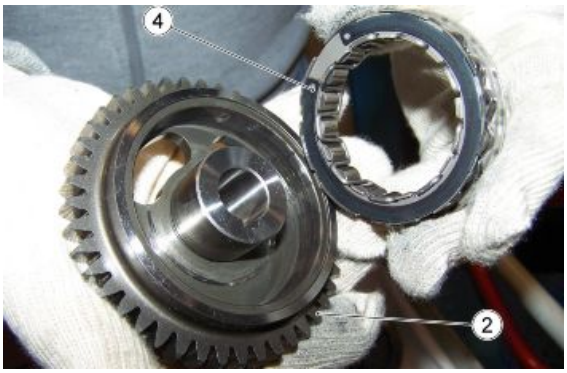
Check the dual starter gear toothing (1) and the freewheel gear (2) to see if the material is damaged or deformed.



If deformations or broken material are found on the sliding surface, replace the freewheel gear (2).
Check the freewheel sliding surface (2) for wear.
Make sure that the woodruff key slot is in perfect condition.



Remove the needle cage (3) and the roller cage (4) from their housings on the freewheel (2) and check the rollers/needles for wear.
Check for wear on the freewheel sliding surface (2).



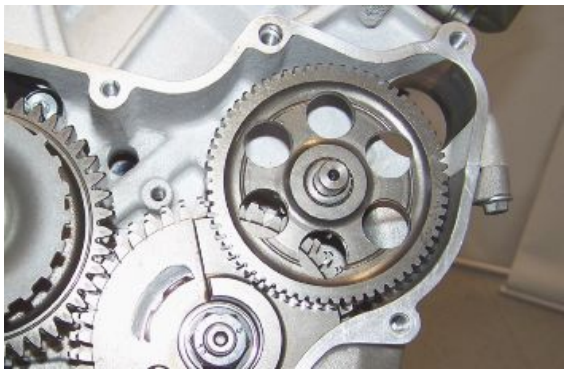
Fitting the idle gear

The ratios between the gears of the starter system are:

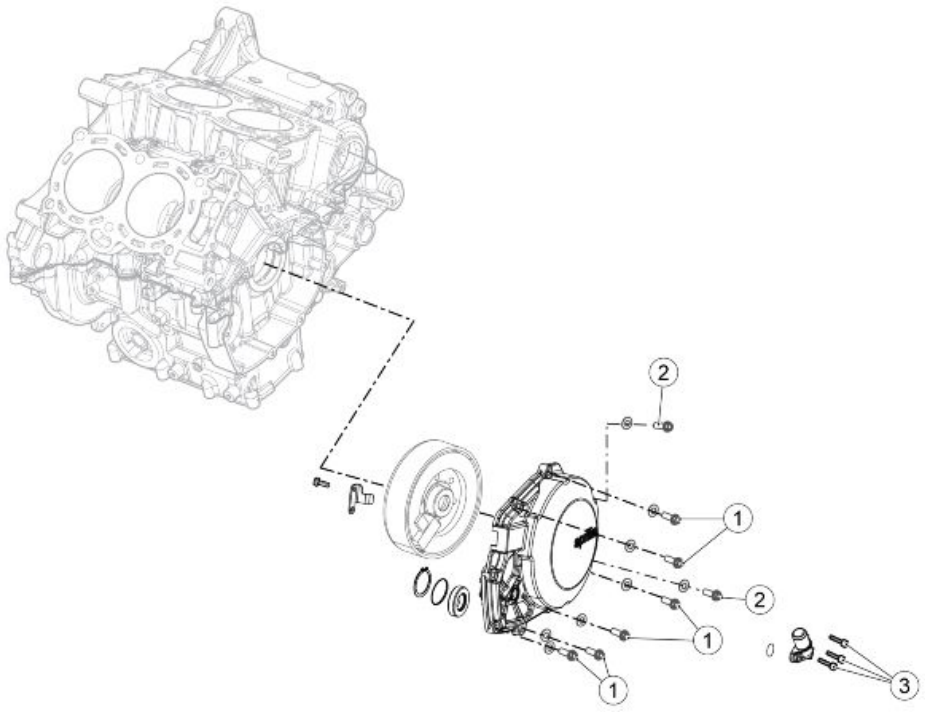
1. Starter motor 9 teeth;

2. External transmission gear 64 teeth;
3. Internal transmission gear 12 teeth;
4. Freewheel 49 teeth.

- Fit the intermediate gear.
- Fit the clutch cover.



Generator side

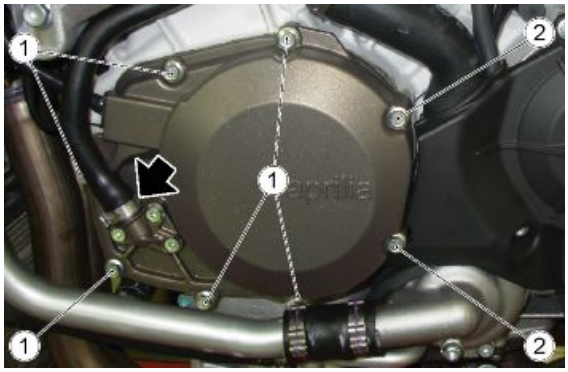


ALTERNATOR COVER

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fastening cover onto centre pins	M6x25	6	12 Nm (8.85 lb ft)	Move to the torque, unscrew, bring back to torque.
2	Cover fastening screws generator side	M6x40	2	12 Nm (8.85 lb ft)	Tighten to torque, unscrew and re-tighten to torque.
3	Blow-by union fastener screws	M5x16	3	7 Nm (5.16 lb ft)	-
-	Stator fixing screw UNI 5931 CL8.8	M6x25	3	10 Nm (7.38 lb ft)	Loct. 2045
-	Flanged screw	M5x12	1	6 Nm (4.43 lb ft)	Loct. 2045

Removing the flywheel cover

- Release the clamp and detach the Blow-by pipe.
- Unscrew and remove the five screws (1).
- Unscrew and remove the two screws (2).
- Mark the screws (1 - 2) that have different lengths.
- Remove the cover together with the stator and retrieve the two centring dowels.



Magneto flywheel removal

- Remove the flywheel cover.
- Block flywheel rotation using the specific tool.
- Unscrew and remove the screw.

Specific tooling

020914Y Flywheel retainer

- Remove the tool for blocking flywheel rotation.
- Insert a SHC M10x20 screw into the crankshaft hole, which will act as a mounting base for flywheel extraction.
- Remove the flywheel using the specific extractor.
- Collect the SHC M10x20 screw.

Specific tooling

020913Y Flywheel extractor

See also

Removing the flywheel cover

Inspecting the cover components

- Unscrew and remove the three Blow-by system fitting screws.
- Remove the Blow-by system fitting.
- Replace the O-ring with a new one of the same type

- Remove the flywheel cover.
- Remove the Seeger ring.

- Remove the shim washer.

- Remove the oil seal.

CAUTION

DURING REFITTING REPLACE THE OIL SEAL WITH A NEW ONE OF THE SAME TYPE.
SET THE NEW OIL SEAL WITH THE MARKING ON THE EDGE FACING OUTWARD.

Installing the flywheel

- Position the flywheel on the crankshaft.
- Block flywheel rotation using the specific tool.
- Tighten the screw.

Specific tooling

020914Y Flywheel retainer

Flywheel cover installation

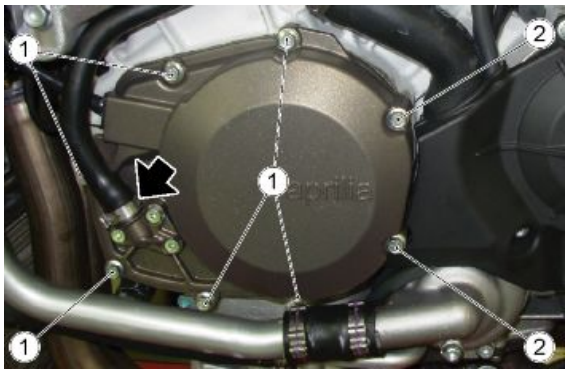
- Insert the centring dowels in the cover.
- Apply a layer of sealing paste along the external edge of the cover.
- Insert the cover together with the stator.

Recommended products

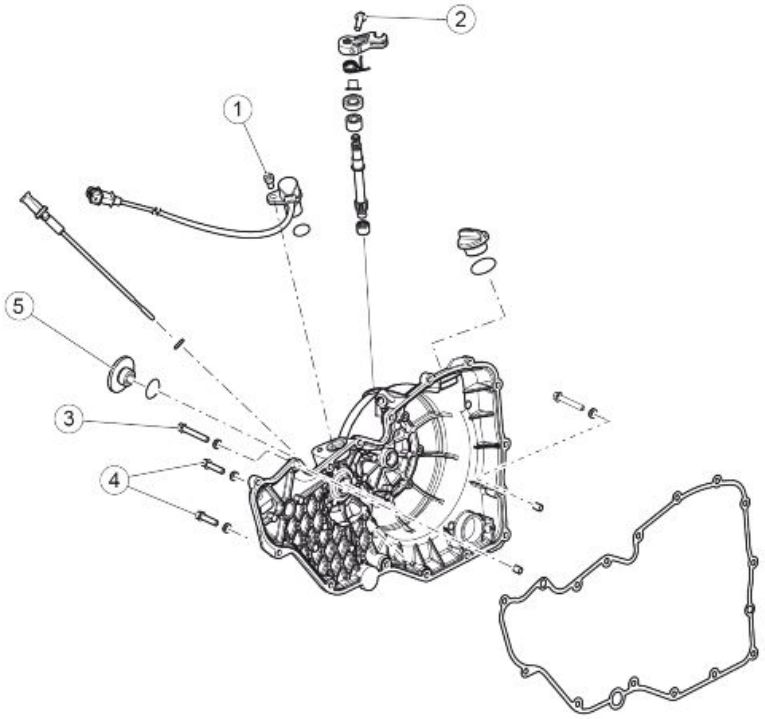
Three bond Sealing paste

-

- Turn the five screws (1) and the two screws (2).
- Tighten the screws working in stages and diagonally.
- Insert the Blow-by system pipe and fasten it with a new clamp.



Clutch side



CLUTCH COVER

pos.	Description	Type	Quantity	Torque	Notes
1	Rpm sensor fixing screw	-	1	8 Nm (5.90 lb ft)	-
2	TE Flanged screw	M6x20	1	10 Nm (7.38 lb ft)	-
3	TE Flanged screw	M6x35	2	12 Nm (8.85 lb ft)	Tighten to torque, unscrew and re-tighten to torque.
4	TE Flanged screw	M6x22	14	12 Nm (8.85 lb ft)	Tighten to torque, unscrew and re-tighten to torque.
5	Engine timing inspection cap	-	1	20 Nm (14.75 lb ft)	-

Removing the clutch cover

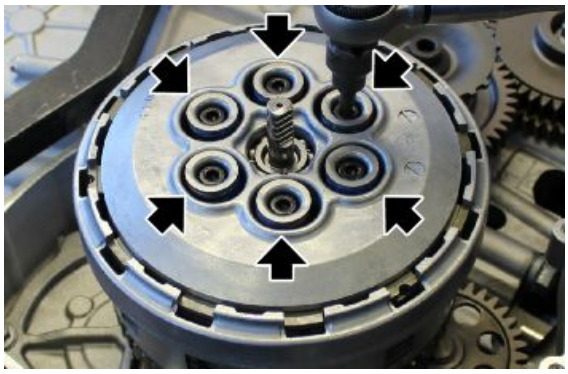
- Drain the engine oil.
- Unscrew and remove the sixteen peri-metric fixing screws and retrieve the washers.

- Remove the clutch casing, retrieving the gasket, the two locator pins and the starter motor transmission gear.

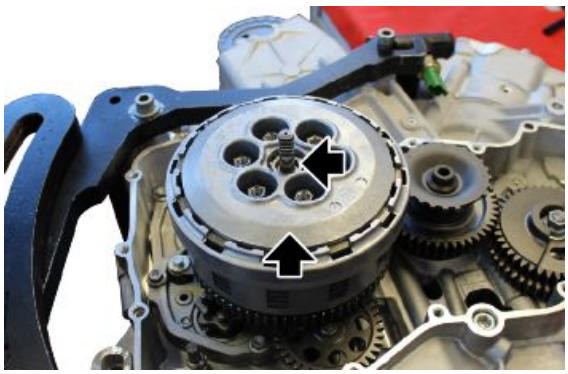
Disassembling the clutch

- Unscrew and remove the tone wheel fixing screw.
- Remove the tone wheel.

- Remove the clutch cover.
- Unscrew and remove the six screws by loosening them 1/4 of a turn at a time; operate in stages and diagonally, and retrieve the washers and the clutch springs.



- Remove the thrust plate and the complete control rod.

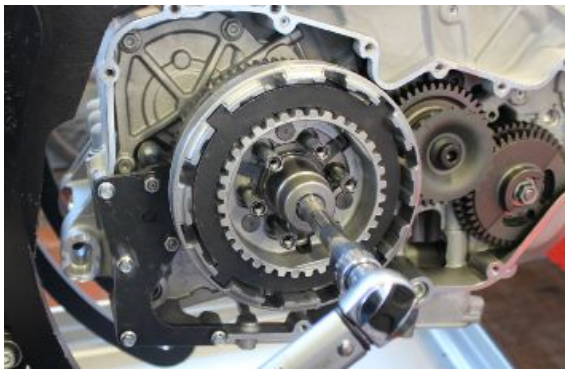


- Remove the discs.

- Block clutch bell rotation using the specific tools.
- Unscrew and remove the clutch bell fixing nut.

Specific tooling

020849Y Clutch lock



- Remove the slipper unit.

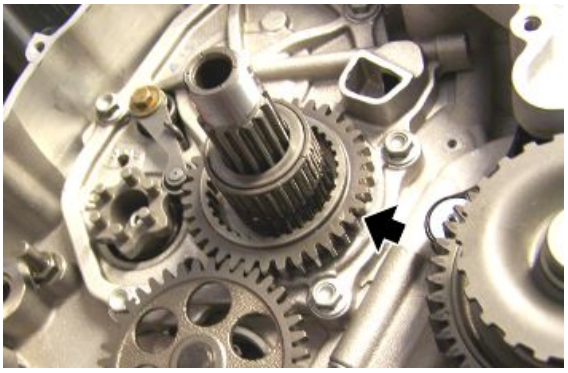
- Remove the clutch hub.

- Remove the clutch hub cam tower.

- Retrieve the shim.

- Collect the clutch housing.

- Remove the clutch gear that controls the oil/water pumps



- Remove the needle cage.

- Remove the spacer.

- Remove the thrust bearing.

Checking the clutch plates

Characteristic

Maximum clutch plate deformation (in comparison to a flat surface)

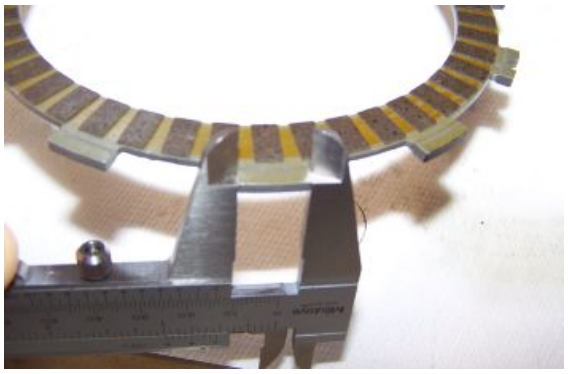
0.15 mm (0.0059 in)

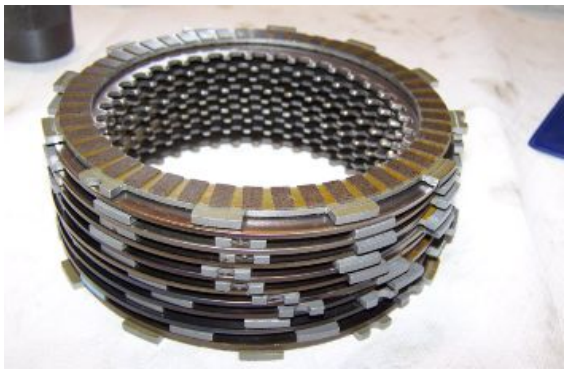
Minimum wear limit of the clutch plate sliding teeth

13.5 mm (0.53 in)

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

47.6 mm (1.87 in)





Checking the clutch housing

Check the clutch bell for damage and wear that may result in clutch irregular operation. If necessary, replace the bell.

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

Check the primary driven gear for damage and wear and, if necessary, replace the primary driven gear and the clutch bell all together.
Make sure there is not excessive noise during operation; if necessary, replace the primary drive gear and the clutch bell all together.

Checking the pusher plate

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

Characteristic

Maximum deformation permitted on the thrust plate compression surface

0.15 mm (0.0059 in)

Maximum depth of the thrust plate

27.3 mm (1.07 in)

Checking the clutch hub

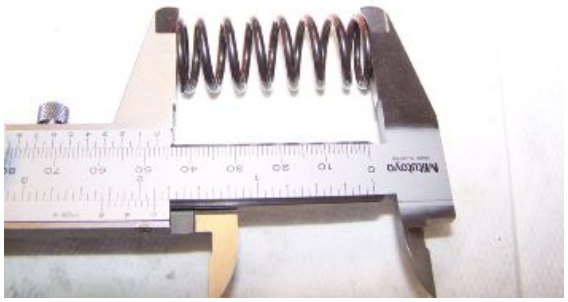
Check the clutch hub for damage and wear that may result in clutch irregular operation. If necessary, replace the hub.

Checking the springs

NOTE

THE FOLLOWING PROCEDURE IS VALID FOR ALL CLUTCH SPRINGS.

- Check the springs for damage and, if necessary, replace the them all together.
- Measure the clutch spring length when unloaded; if necessary, replace the springs all together.



Characteristic

Minimum wear limit in the release position of the individual clutch springs

46.8 mm (1.84 in)

Assembling the clutch

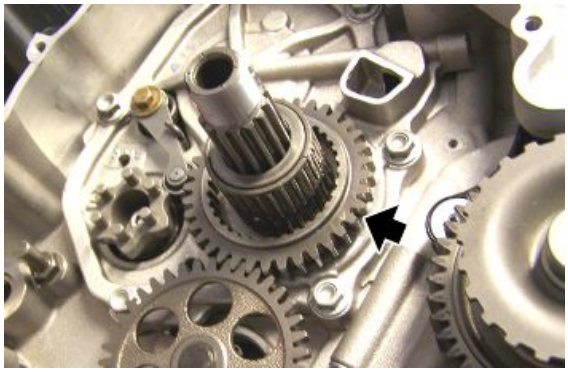
- Insert the thrust bearing with the collar facing the gearbox

- Insert the spacer.

- Fit the needle cage.

- Install the clutch gear, making it mesh with the oil/water pump control gear

TURN THE CLUTCH GEAR COLLAR TOWARD THE CLUTCH BELL.



- Insert the clutch bell, making it engage with the engine pinion

- Fit the shim washer.

- Install the clutch hub cam tower.

- Position the clutch hub.

HOUSE THE THREE CLUTCH HUB CAMS IN THE SPECIFIC CLUTCH HUB CAM TOWER INCLINES.

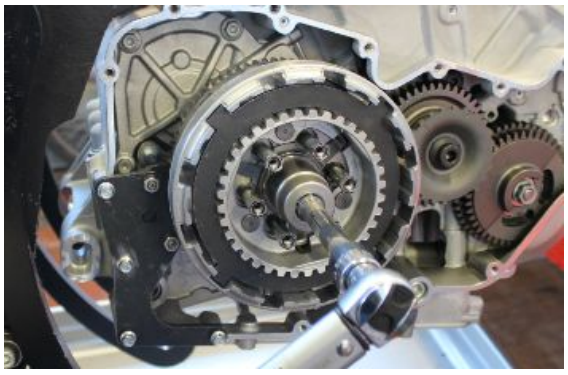
- Fit the three slipper unit clips, offsetting them between each other;
- Install the slipper unit correctly.

- Insert the washer

- Block clutch housing rotation using the specific tool.
- Tighten the clutch housing fixing nut.

Specific tooling

020849Y Clutch lock



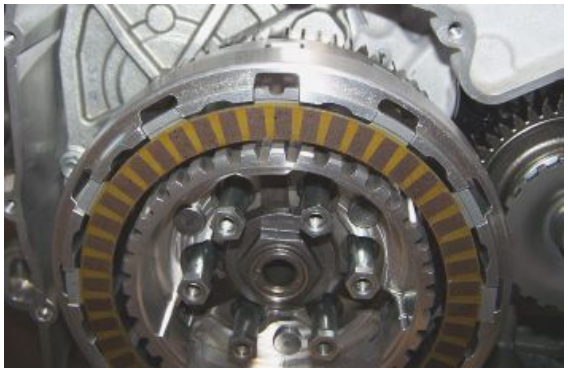
- Insert the disc with friction material and the black tooth into the bell.

- Insert one of the metal discs into the bell.

- Insert the flat washer.
- Insert the belleville spring with the concave side facing outward.

- Insert the disc covered with the friction material into the bell.

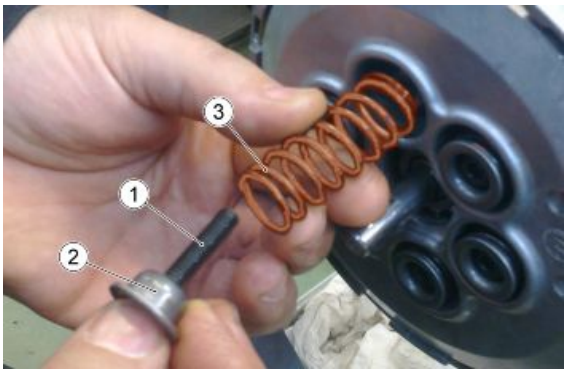
- Continue inserting, alternating a metal disc with one with friction material, finishing with a friction material disc with a black tooth.



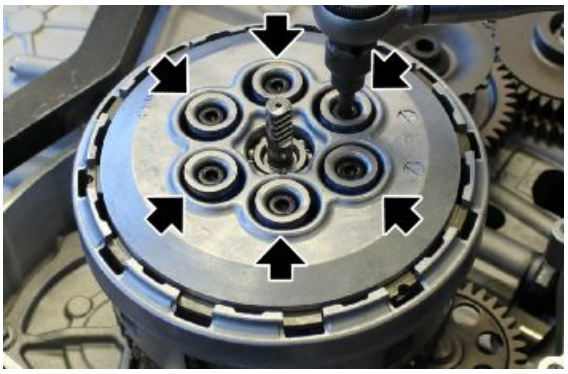
- Place the control rod together with the thrust bearing and the shim washer.

- Place the thrust plate.

- Fit the clutch springs (3).
- Insert the spring holder cap (2) onto the screws (1).



- Tighten the six screws operating in stages and diagonally.



Installing the clutch cover

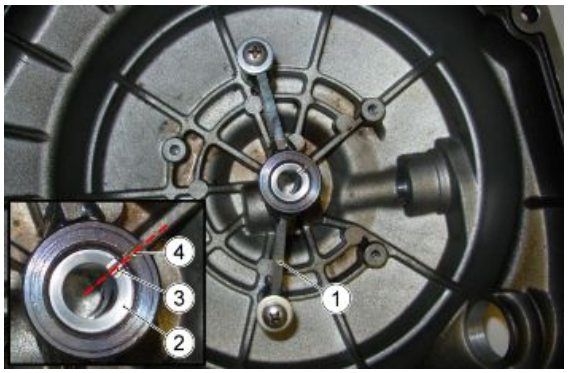
REMOVING THE CLUTCH CONTROL PIN BUSHING

- Before carrying out the removal of the bushing, it is necessary to thread the inside to allow the extractor to tighten sufficiently.

- Warm up the cover.
- Using a generic extractor, it is then possible to remove the bushing from the cover.

INSTALLING THE CLUTCH CONTROL PIN BUSHING

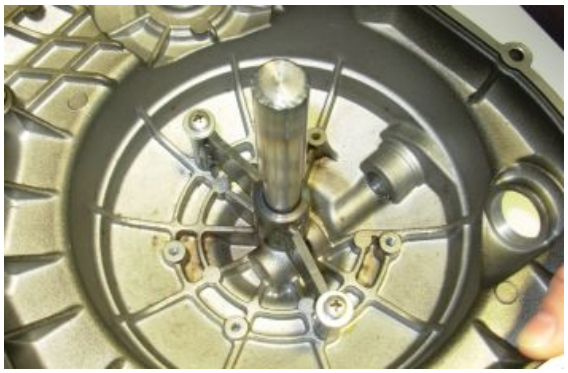
- Before carrying out the installation of the bushing, it is necessary to warm up the cover.
- Position the guide (1) to insert the bushing (2) as indicated in the figure.
- Insert the bushing so that the processing notch (3) is aligned with the notch on the guide (4).



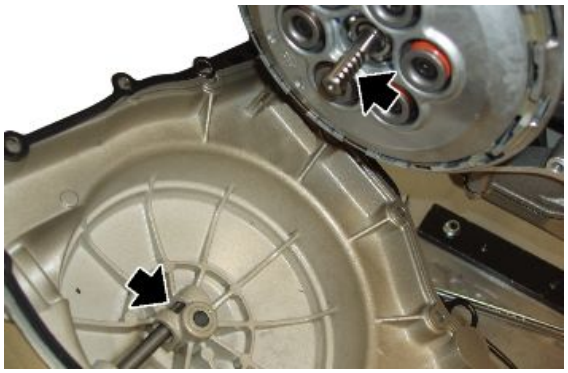
Specific tooling

020926Y Tool for fitting clutch bushing

- Then insert the tool to push the bushing into the seat until it stops.

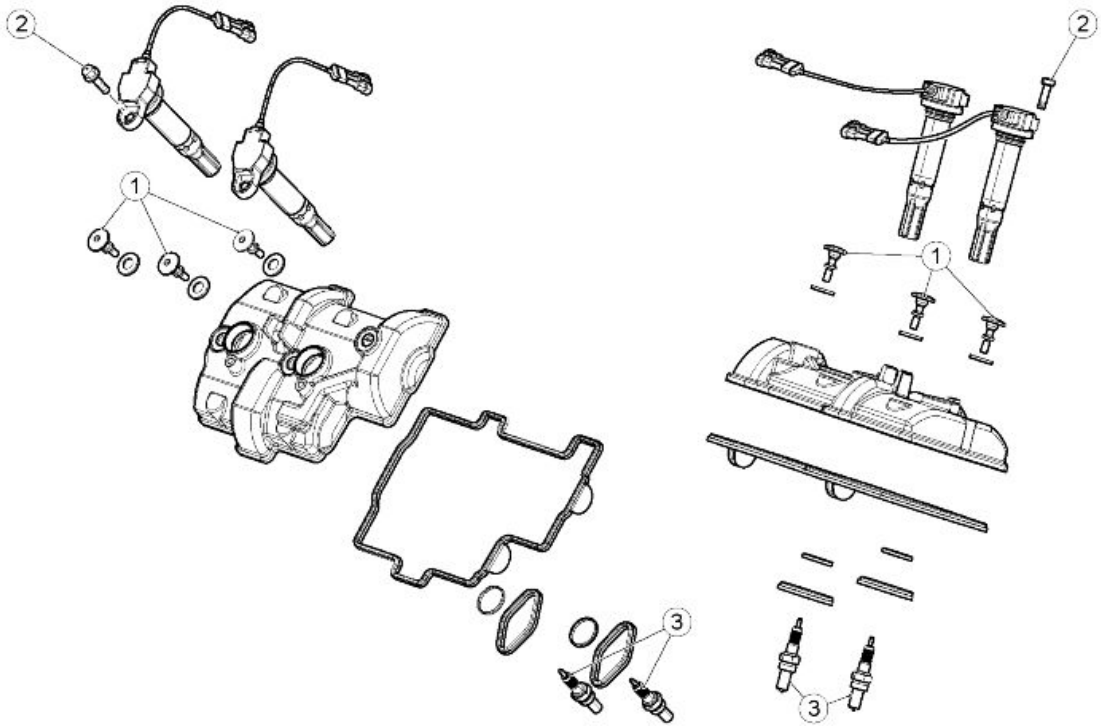


- Position the starting transmission gear on the crankcase.
- Position the gasket and the two dowel pins in the clutch cover.
- Insert the clutch cover, making sure to have correctly engaged the clutch control lever and the rack shaft.



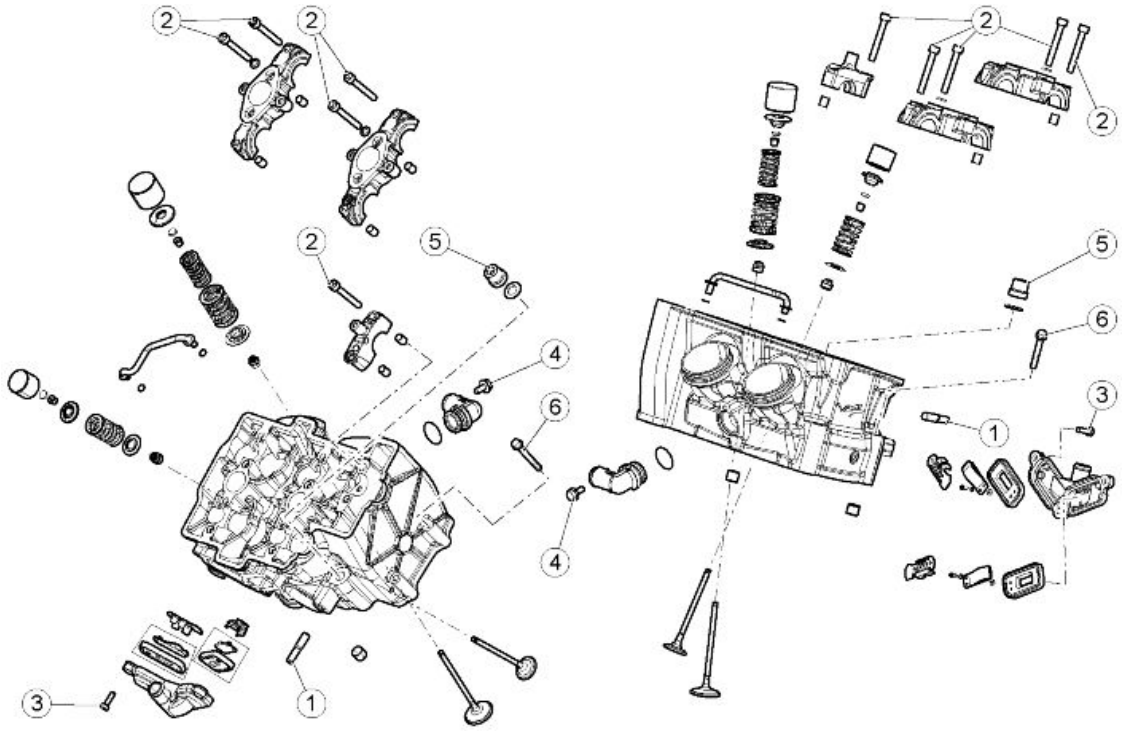
- Screw the sixteen perimetric fixing screws with the washers.
- Tighten the screws working in stages and diagonally.
- Add engine oil up to the correct level.

Heads



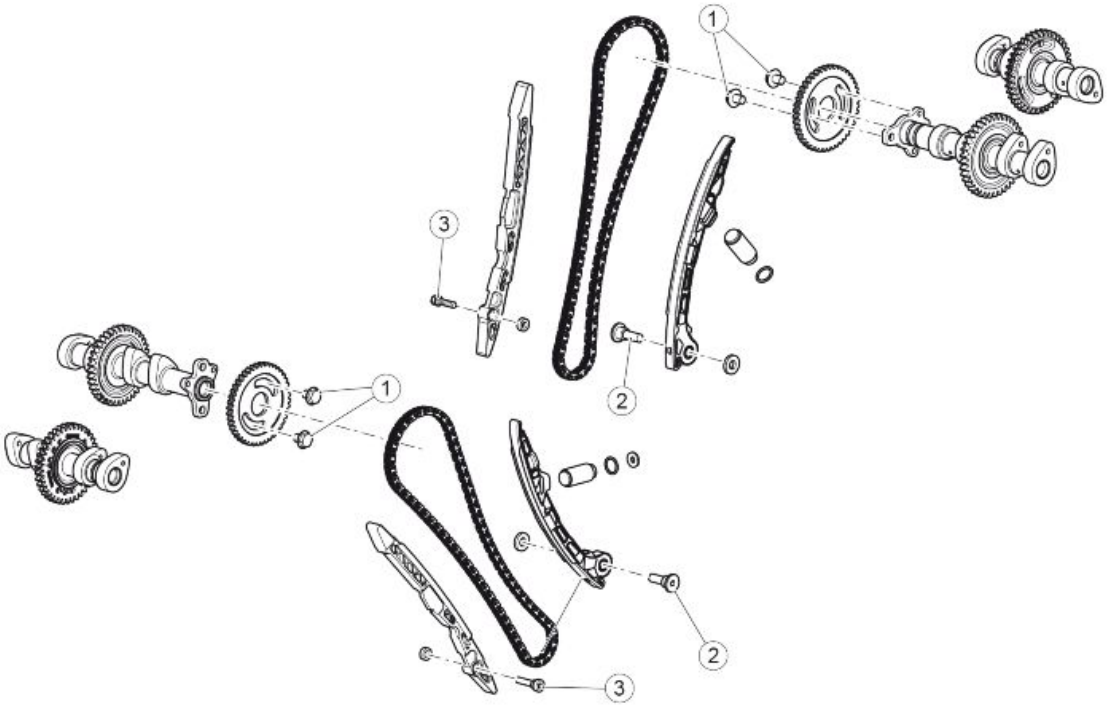
VALVES COVER

Pos.	Description	Type	Quantity	Torque	Notes
1	Head cover fixing screws	-	6	10 Nm (7.38 lb ft)	-
2	Coil fastening screws	-	4	8 Nm (5.90 lb ft)	Loct. 243
3	Spark plugs	-	4	12 Nm (8.85 lb ft)	-



HEADS

Pos.	Description	Type	Quantity	Torque	Notes
1	Exhaust stud bolts	-	8	10 Nm (7.38 lb ft)	-
2	Cam shaft cam tower fixing screws	M6x45	20	11 Nm (8.11 lb ft)	-
3	Reed valve covers fixing screws	-	6	6 Nm (4.43 lb ft)	-
4	Water outlet coupling fixing screw	-	2	10 Nm (7.38 lb ft)	Pre-impregnated or else Loct. 270 or Loct. 648
5	Flanged head nut	-	12	30 + 55 Nm (22.13 + 40.57 lb ft)	Lubricate the head and under the head.
6	Head tightening screw, chain side	M6x55	4	12 Nm (8.85 lb ft)	Lubricate the head and under the head.

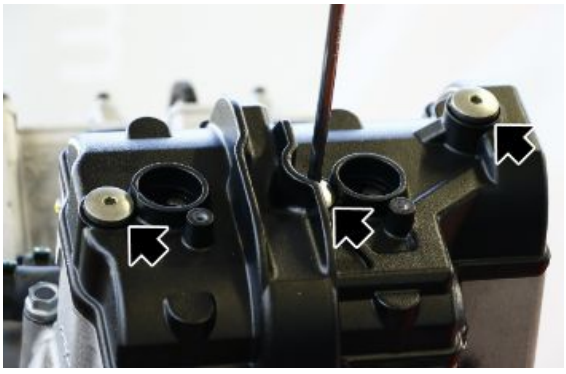


TIMING SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Screw fastening the timing system gear on the intake shaft	M8	4	30 Nm (22.13 lb ft)	Loct. 243
2	Shoe fastening screws	M8	2	20 Nm (14.75 lb ft)	Loct. 243
3	Skid fastener screws	M6x18	2	10 Nm (7.38 lb ft)	Loct. 243

Head cover removal

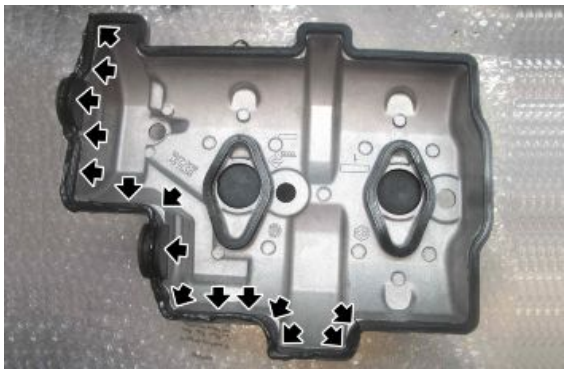
- Unscrew and remove the three screws with rubber washers



- Remove the head cover together with the sealing gasket

INSTALLATION

- Install a new gasket in the head cover.
- Smear the gasket with suitable sealant, in the area indicated in the figure.

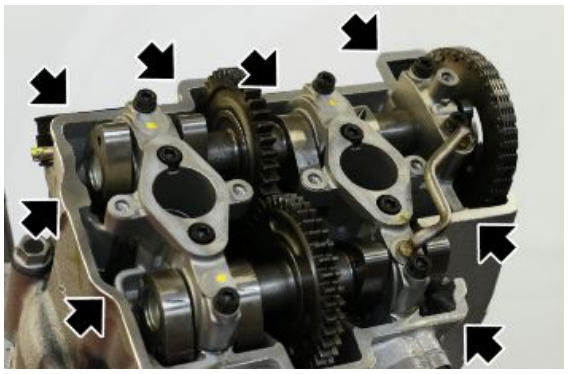


Recommended products

Three bond Sealing paste

-

- Smear the head surface with suitable sealant, in the area indicated in the figure.



Recommended products

Three bond Sealing paste

-

- Fit the head cover.
- Tighten the three screws with rubber washers to the prescribed tightening torque.

Front head

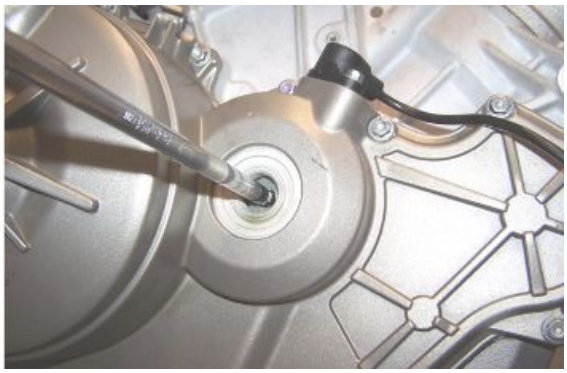
Removing camshafts

- Remove both head covers, the alternator side cover and remove the cap on the clutch cover in order to rotate the crankshaft.
- Remove the O ring.

See also

Head cover removal
Removing the flywheel cover

- Rotate the crankshaft via the opening on the clutch cover.
- Position cylinder 1 piston (LH, rear piston) so that it is at the point where it crosses TDC.
- rotate the crankshaft 150° in the engine rotation direction (direction of travel).



- insert the respective pin, from the flywheel side, into the groove on the crankshaft.

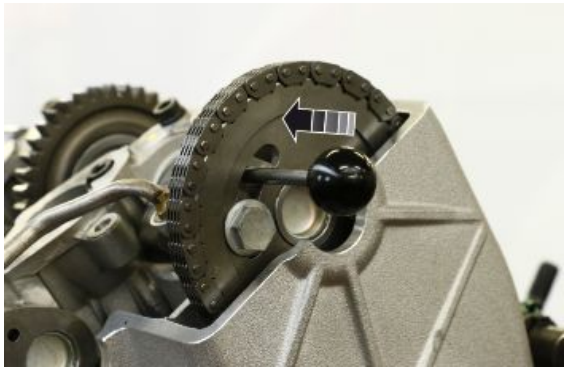
NOTE

THE SPECIAL TOOL SHOWN HERE MUST ONLY BE USED FOR IDENTIFYING THE CORRECT POSITION OF THE CRANKSHAFT.
DO NOT USE IT FOR TIGHTENING COMPONENTS.

Specific tooling

020852Y Crankshaft timing pin

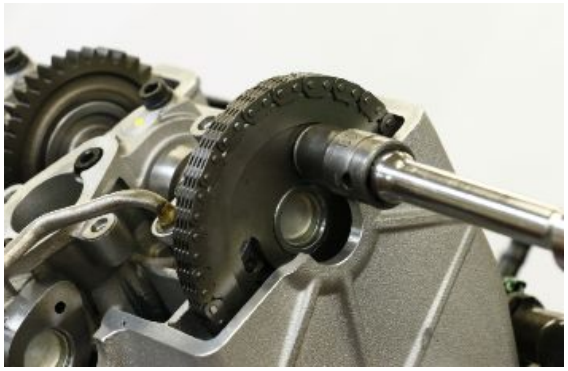
- Fit the pin for aligning the intake camshaft with the hole on U-bolt.
- If it was not possible before adjusting the valve clearance, check the engine timing.



Specific tooling

020851Y Camshaft timing pin

- Remove the two crankshaft and camshaft reference pins.
- Turn the crankshaft until the gear screw covered by the head when the hole on the camshaft gear is aligned with the hole on the U bolt, is visible.
- Block crankshaft rotation using one of the specific tools.
- Unscrew and remove the camshaft gear screw.
- Remove the crankshaft locking tool.



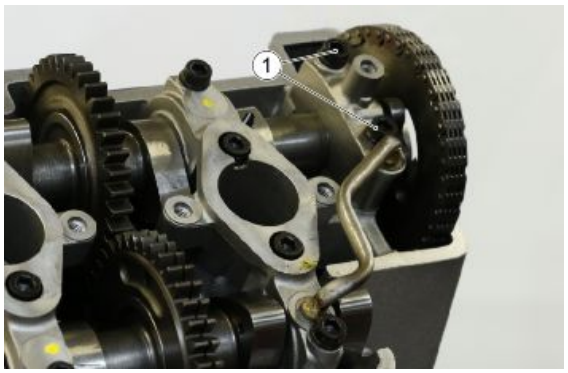
Specific tooling

020850Y Primary gear lock

020914Y Flywheel retainer

Repeat the following operations:

- move cylinder piston 1 (left rear piston) to TDC;
- turn the crankshaft 150° in the direction of engine rotation (direction of travel) in order to align the hole on the intake camshaft with the specific hole on the U bolt; this ensures that all the front cylinder bank valve springs are decompressed.
- Refit the camshaft timing setting pin in the hole in the U bolt on the front head, and refit the crankshaft timing pin from the flywheel side, to check that the tim-



ing setting was not altered while the engine was turned with only one camshaft drive gear fastener screw in place.

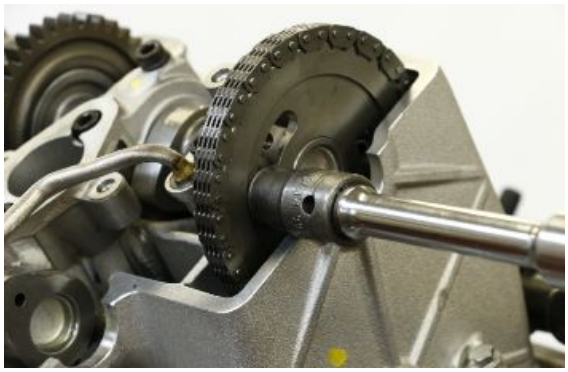
- Remove the camshaft timing pin.
- Unscrew and remove the two U bolt screws (1).
- Remove the U bolt and the oil pipe.

Specific tooling

020851Y Camshaft timing pin

020852Y Crankshaft timing pin

- Block crankshaft rotation using one of the specific tools.
- Unscrew and remove the second intake camshaft gear screw.
- Leave the gear on the camshaft.

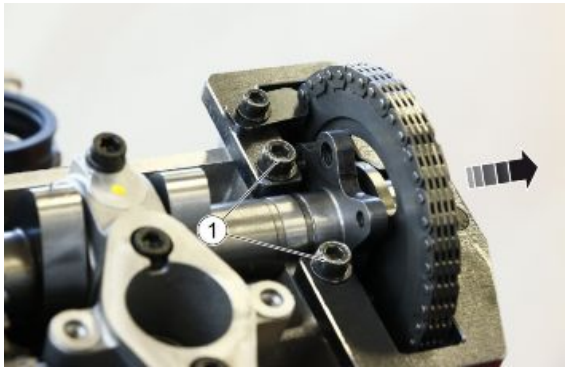


Specific tooling

020850Y Primary gear lock

020914Y Flywheel retainer

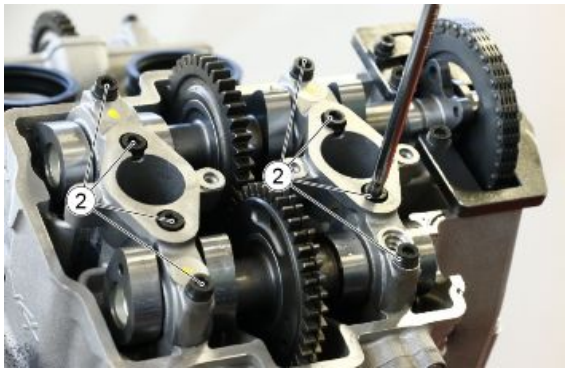
- Install the specific camshaft gear support tool.
- Fix it to the head using the two screws (1).
- Move the gear from the camshaft to the tool.



Specific tooling

020956Y Support for camshaft gear on head

- Unscrew and remove the eight screws (2), proceeding in stages and diagonally.
- Retrieve the washers from the screws near the spark plug holes.
- Remove the U bolts with the O rings and locator pins.



- Remove the intake and exhaust camshafts.

If the two camshafts are timed correctly, the exhaust camshaft gear tooth (indicated with a dot) is meshed with the trough of the intake camshaft gear (indicated with two dots).

Inspecting camshafts

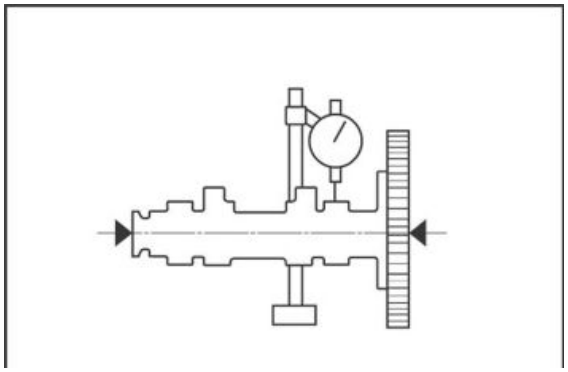
CAMSHAFT TOOTHED WHEEL CHECK

- Check that the camshaft gear works properly: if it is damaged or does not move smoothly, replace the timing chain and the camshaft gear.

CAMSHAFT LOBES

- Check that they do not show blue colouring, cracks or scratches; otherwise, replace the camshaft, gear and chain.

- 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 part.



Characteristic

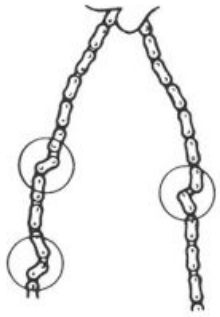
Maximum camshaft axial clearance (intake/exhaust)

0.4 mm (0.0016 in)

WARNING

THE EXHAUST CAMSHAFTS OF THE FRONT AND REAR CYLINDER BANKS MUST BOTH BE OF THE SAME TYPE - EITHER WITH A CONVENTIONAL GEAR OR WITH A SELF-ADJUSTING CAMSHAFT GEAR. THE TWO TYPES OF CAMSHAFT ARE INTERCHANGEABLE ON ALL ENGINES IRRESPECTIVE OF THE CAMSHAFT TYPE ORIGINALLY INSTALLED.

Check the timing chain for damage or stiffness while moving.
If necessary, replace the timing chain together with the camshaft gears.
Check the timing chain guide sliders for damage.
If necessary, replace the parts.



Installing camshafts

NOTE

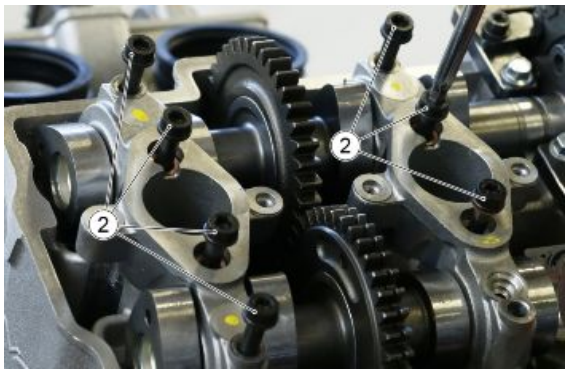
THIS ENGINE HAS CAMSHAFTS OF THE EXHAUST VALVES WITH CLEARANCE RECOVERY.

- Install the intake and exhaust camshafts on the front head, bearing in mind that:

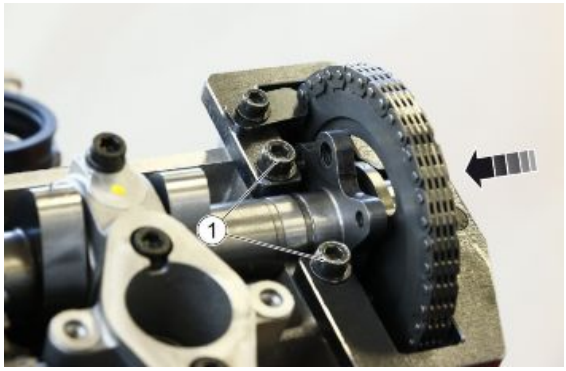
the exhaust camshaft gear tooth (indicated with a dot) is meshed with the trough of the intake camshaft gear (indicated with two dots).

CLEAN THOROUGHLY THE SEATS OF THE GEAR RETAINER SCREWS, ON THE INTAKE CAMSHAFT.

- Fit the U bolts with the nine O rings and locator pins.
- Fit the new washers under the screws (2) near the spark plug holes only.
- Tighten the seven screws (2) operating in stages and diagonally.
- Do not fit the eighth screw (2 - fastening the oil pipe) yet.



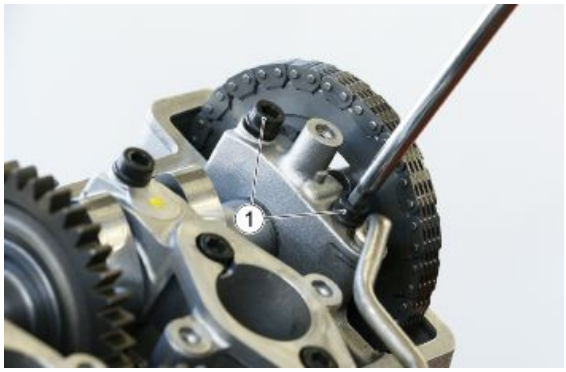
- Move the gear from the mounting tool to the camshaft.
- Unscrew and remove the two screws (1).
- Remove the tool.



Specific tooling

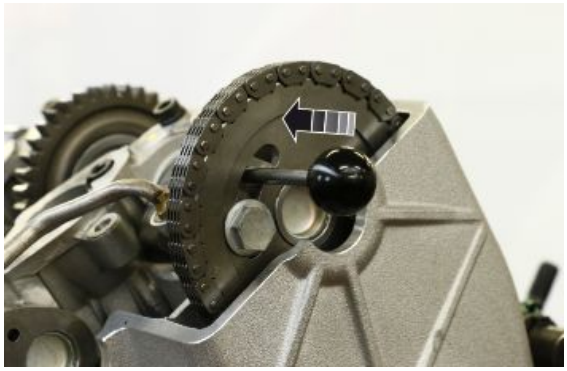
020956Y Support for camshaft gear on head

- Fit the U bolt and the oil pipe
- Tighten the two screws (1) of the U bolt



- Place and tighten the screw (2) not previously inserted

- Align the intake camshaft with the specific hole on the U bolt.
- Insert the specified pin.

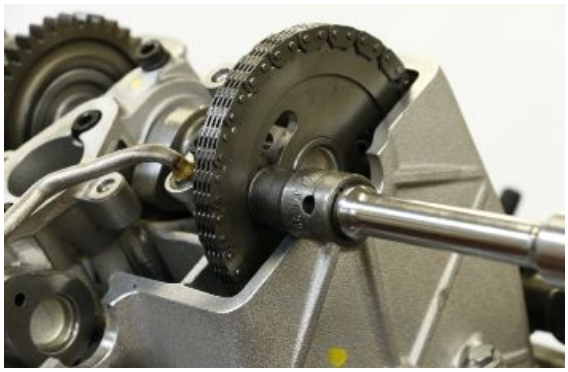


Specific tooling

020851Y Camshaft timing pin

- Apply Loctite 243 thread lock on the thread of the timing gear fastener screw. This screw must be replaced at each reassembly.
- Apply and loosely tighten the gear fixing screw on the camshaft.

- Block crankshaft rotation using one of the specific tools.
- Tighten the gear fixing screw on the camshaft to exactly the torque specified.
- Remove the crankshaft locking tool.

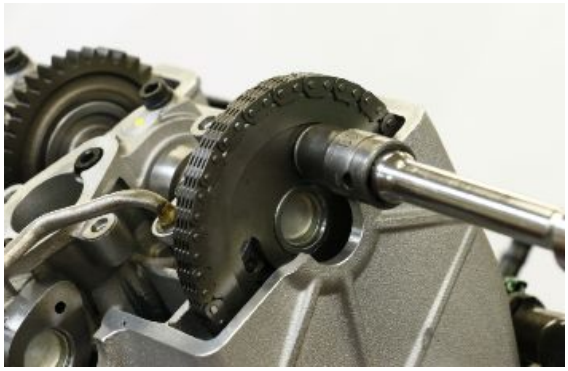


Specific tooling

020850Y Primary gear lock

020914Y Flywheel retainer

- Remove the two crankshaft and camshaft reference pins.
- Turn the crankshaft until the gear screw covered by the head when the hole on the camshaft gear is aligned with the hole on the U bolt, is visible.
- Block crankshaft rotation using one of the specific tools.
- Apply Loctite 243 thread lock on the thread of the second gear fastener screw. This screw must be replaced at each reassembly.
- Tighten the second camshaft gear fixing screw to exactly the torque specified.
- Remove the crankshaft locking tool.



- Turn the crankshaft back to the previous position in which the camshaft and U bolt holes were aligned; insert the reference pin while checking with the crankshaft reference pin, that the flywheel side hole and the hole on the crankshaft are perfectly aligned.

- If this is not the case, repeat the timing operations.

Specific tooling

020851Y Camshaft timing pin

020852Y Crankshaft timing pin

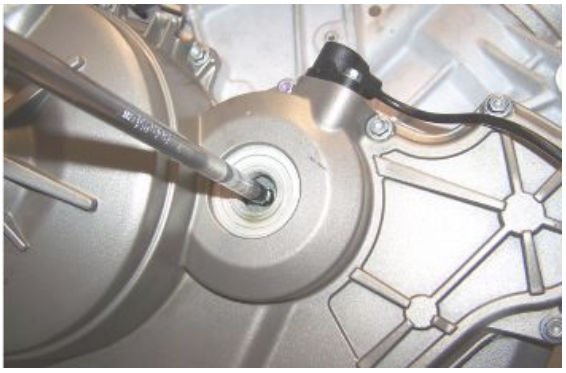
Front head removal

- Remove both head covers, the alternator side cover and remove the cap on the clutch cover in order to rotate the crankshaft.
- Remove the O ring.

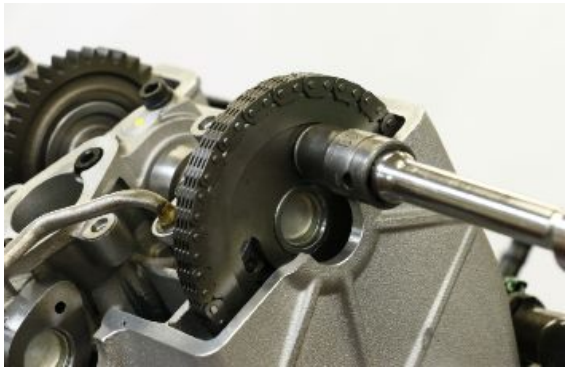
See also

Head cover removal
Removing the flywheel cover

- Turn the crankshaft from the hole on the clutch cover.
- Move cylinder piston 1 (left rear piston) to the overlap TDC;
- Turn the crankshaft 150° in the engine rotation direction (direction of travel), in order to align the hole on the intake camshaft with the specific hole on the U bolt; this ensures that all the front cylinder bank valve springs are decompressed.



- Turn the crankshaft until the gear screw covered by the head when the hole on the camshaft gear is aligned with the hole on the U bolt, is visible.
- Block crankshaft rotation using one of the specific tools.
- Unscrew and remove the camshaft gear screw.
- Remove the crankshaft locking tool.



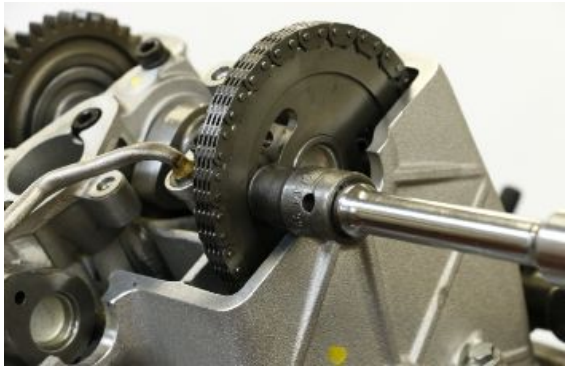
Specific tooling

020850Y Primary gear lock

020914Y Flywheel retainer

Repeat the following operations:

- move cylinder piston 1 (left rear piston) to TDC;
- turn the crankshaft 150° in the engine rotation direction (direction of travel), in order to align the hole on the intake camshaft with the specific hole on the U bolt; this ensures that all the front cylinder bank valve springs are decompressed.
- Block crankshaft rotation using one of the specific tools.
- Unscrew and remove the second intake camshaft gear screw.
- Remove the crankshaft locking tool.



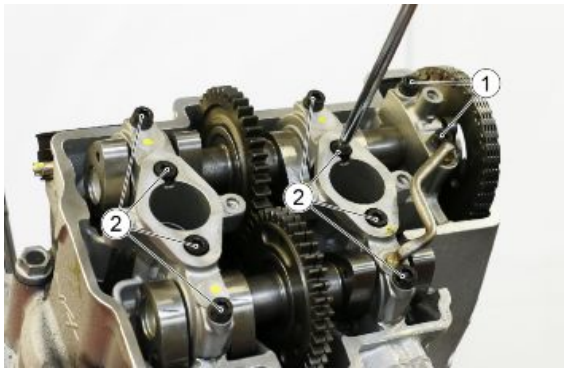
Specific tooling

020850Y Primary gear lock

020914Y Flywheel retainer

- Slide and remove the gear from the intake camshaft

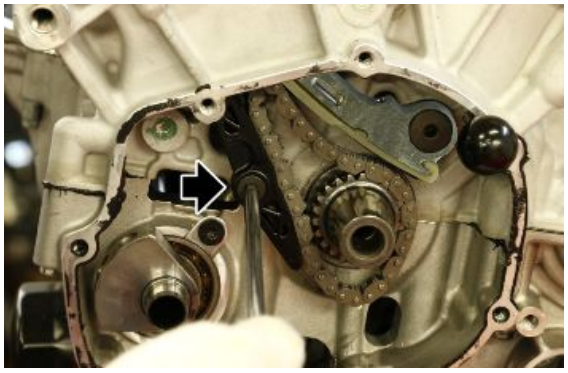
- Unscrew and remove the ten screws (1-2), proceeding in stages and in a crossed pattern.
- Retrieve the washers from the screws (2) near the spark plug holes.
- Remove the U bolts with the O rings and locator pins.



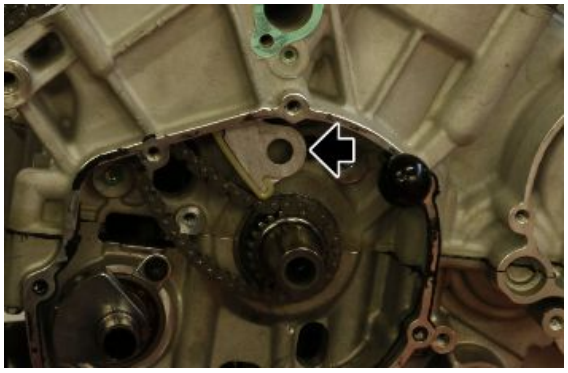
NOTE

MARK THE COMPONENTS TO PREVENT INCORRECT REFITTING.

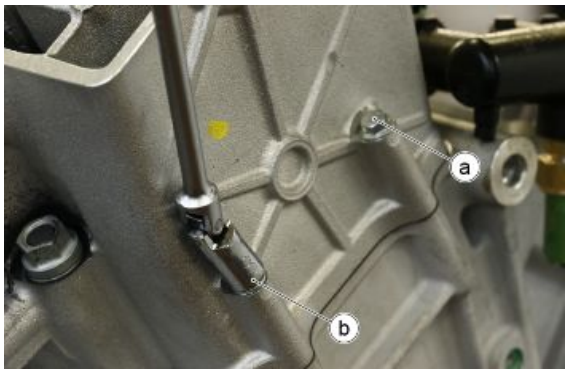
- Remove the intake and exhaust camshafts from the front head.
- Unscrew and remove the fixed chain slider screw.
- Remove the fixed chain slider.



- Unscrew and remove the mobile chain slider screw.
- Remove the mobile chain slider.



- Unscrew and remove the two head fixing screws (a - b) from the flywheel side.



- Loosen the six nuts on the stud bolts, proceeding in the following order 6 - 5 - 4 - 3 - 2 - 1.
- After loosening all nuts, remove them in order indicated above.

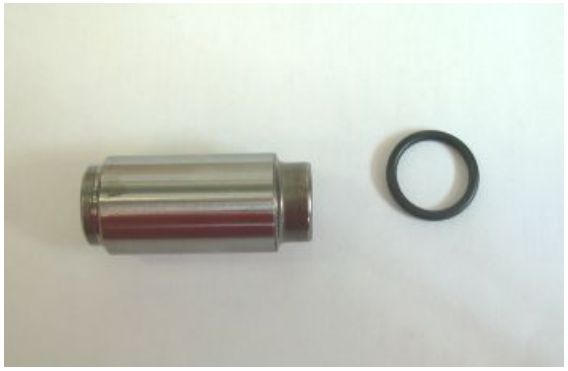
- Remove the front head, slipping it off the stud bolts.
- Collect the gasket and the two dowel pins.

- Remove the chain tensioner complete with O-ring using the specific tool.
- If the O-ring is not on the chain tensioner, make sure it was not left in the crankcase seat.

REPLACE THE O RING UPON EACH REMOVAL.

Specific tooling

020883Y Fitting/removing timing chain tensioner tool



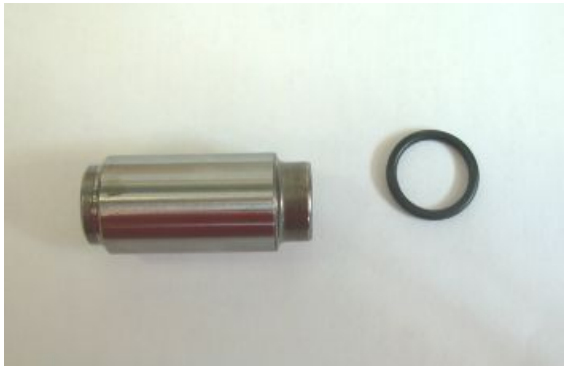
Front head check

Check that:

- The contact surfaces with the cover and the crankcase are not scored or damaged so they jeopardise a perfect seal.
- Check the status of the valve seats.
- Check that the routing of the oil pipes is free and if required, clean them by blowing a jet of compressed air.

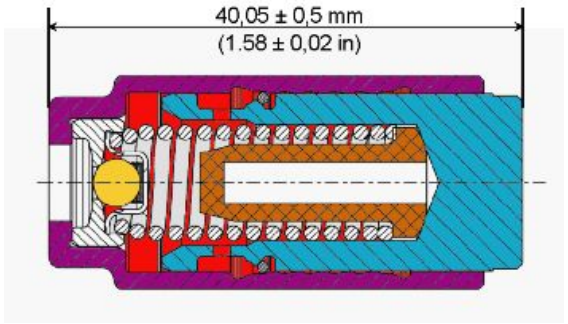
Front head fitting

- Install a new O ring on the chain tensioner



REPLACE THE O RING UPON EACH REMOVAL.

- Compress the chain tensioner completely, making sure that the total length is 40.05 ± 0.5 mm (1.58 ± 0.02 in).



- Insert the chain tensioner into the crankcase, being careful to position it correctly.

THE WASHER SHALL ONLY BE INSTALLED ON THE FRONT CHAIN TENSIONER

WASHER

- We recommend installing a washer between the front crankcase and the chain tensioner to optimise the functionality of the timing system.
- This washer is available as a spare part.

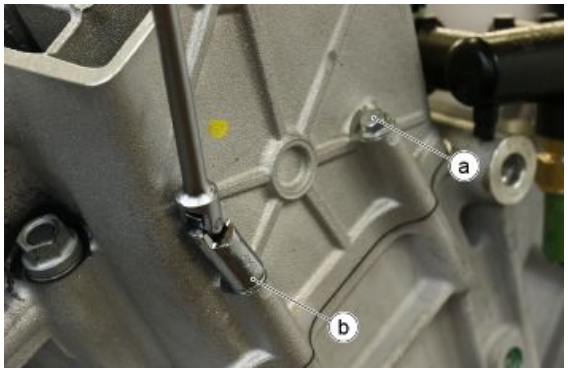
- Fit the washer onto the front chain tensioner then install the chain tensioner in the relative seat in the crankcase. Take particular care to ensure that the washer seats correctly, as the functionality of the timing system may be compromised if the washer is bent or incorrectly positioned.

- Place a new gasket between the crankcase and the head.
- Place the two dowel pins.

- Install the head.

- Pretighten the six nuts on the stud bolts proceeding in the following order: 1 - 2 - 3 - 4 - 5 - 6.
- Then tighten them fully following the same order.

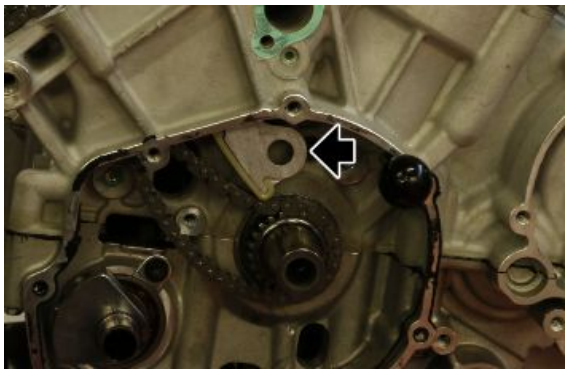
- Tighten the two screws according to the sequence (a - b).

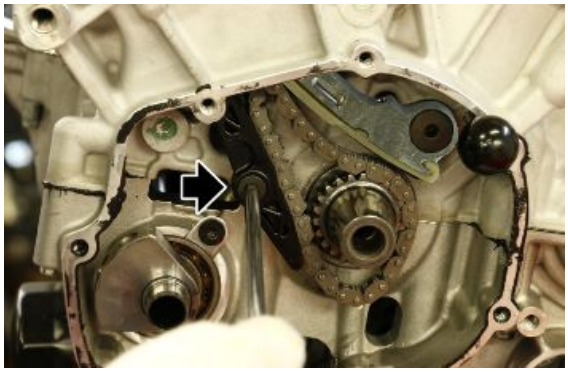


- Fit the camshaft gear
- Keep the gear in position with the chain tightened

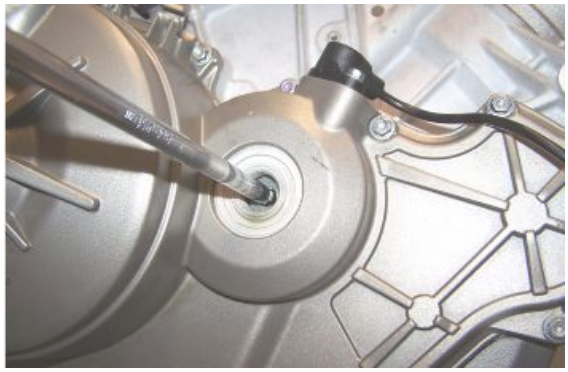
THE SIDE WITH THE BEVELLED HOLE IN THE TIMING SYSTEM GEAR MUST ALWAYS FACE THE EXTERIOR OF THE HEAD.

- Install both chain sliders and fasten them with the specific screws.





- Rotate the crankshaft via the opening on the clutch cover.
- Position cylinder 1 piston (LH, rear piston) so that it is at the point where it crosses TDC.
- rotate the crankshaft 150° in the engine rotation direction (direction of travel).



- insert the respective pin, from the flywheel side, into the groove on the crankshaft.

NOTE

THE SPECIAL TOOL SHOWN HERE MUST ONLY BE USED FOR IDENTIFYING THE CORRECT POSITION OF THE CRANKSHAFT.
DO NOT USE IT FOR TIGHTENING COMPONENTS.

Specific tooling

020852Y Crankshaft timing pin

NOTE

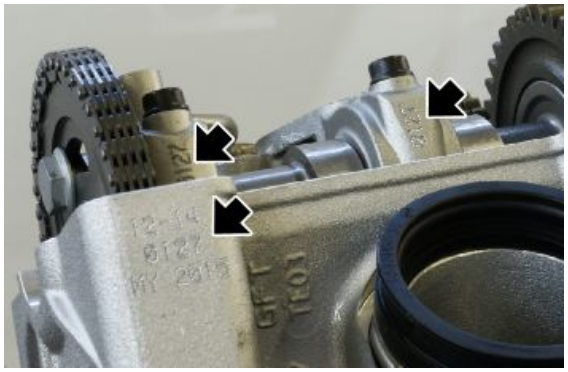
THIS ENGINE HAS CAMSHAFTS OF THE EXHAUST VALVES WITH CLEARANCE RECOVERY.

- Install the intake and exhaust camshafts on the front head, bearing in mind that:

the exhaust camshaft gear tooth (indicated with a dot) is meshed with the trough of the intake camshaft gear (indicated with two dots).

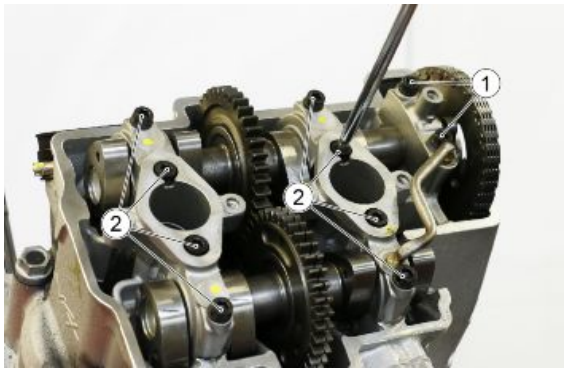
CLEAN THOROUGHLY THE SEATS OF THE GEAR RETAINER SCREWS, ON THE INTAKE CAMSHAFT.

- Check the number engraved on the U bolts, which must correspond with the one engraved on the head.
- If the U bolts between the two heads are inverted, camshaft seizure may occur



IT IS NOT POSSIBLE TO REPLACE ONLY ONE U BOLT, IF NECESSARY: REPLACE THE ENTIRE HEAD.

- Fit the U bolts with the nine O rings and locator pins.
- Install the oil pipe.
- Fit the new washers under the screws (2) near the spark plug holes only.
- Tighten the ten screws (1 - 2) working in stages and diagonally.



- Cut the clamp that binds the chain to the gear.
- Position the gear on the camshaft so that the timing hole and the gear fixing screw hole are centred with the gear slot.
- Insert the specific timing pin.

Specific tooling

020851Y Camshaft timing pin

- Apply Loctite 243 thread lock on the thread of the timing gear fastener screw. This screw must be replaced at each reassembly.
- Apply and loosely tighten the gear fixing screw on the camshaft.

- Protect the edge of the head with rubber.
- Load the chain tensioner with special tool.

Specific tooling

020981Y Lever for disarming the hydraulic tensioner of the timing chain

- Block crankshaft rotation using one of the specific tools.
- Tighten the gear fixing screw on the camshaft to exactly the torque specified.
- Remove the crankshaft locking tool.

Specific tooling

020850Y Primary gear lock

020914Y Flywheel retainer

- Remove the two crankshaft and camshaft reference pins.
- Turn the crankshaft until the gear screw covered by the head when the hole on the camshaft gear is aligned with the hole on the U bolt, is visible.
- Block crankshaft rotation using one of the specific tools.
- Apply Loctite 243 thread lock on the thread of the second gear fastener screw. This screw must be replaced at each reassembly.
- Tighten the second camshaft gear fixing screw to exactly the torque specified.
- Remove the crankshaft locking tool.

- Turn the crankshaft back to the previous position in which the camshaft and U bolt holes were aligned; insert the reference pin while checking with the crankshaft reference pin, that the flywheel side hole and the hole on the crankshaft are perfectly aligned.
- If this is not the case, repeat the timing operations.

Specific tooling

020851Y Camshaft timing pin

020852Y Crankshaft timing pin

Rear head

Removing camshafts

- Remove the rear head cover and the clutch cover.
- Move cylinder piston 1 (left rear piston) to the TDC;
- Turn the crankshaft 450° (one complete turn + 90°) in the direction of motor rotation (direction of travel).

- Insert the pin from the clutch side into the hole in the crankshaft.

NOTE

THE SPECIAL TOOL SHOWN HERE MUST ONLY BE USED FOR IDENTIFYING THE CORRECT POSITION OF THE CRANKSHAFT.
DO NOT USE IT FOR TIGHTENING COMPONENTS.

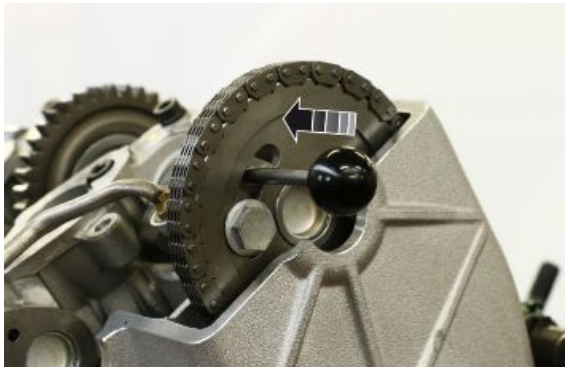
Specific tooling

020852Y Crankshaft timing pin

See also

Head cover removal
Removing the clutch cover

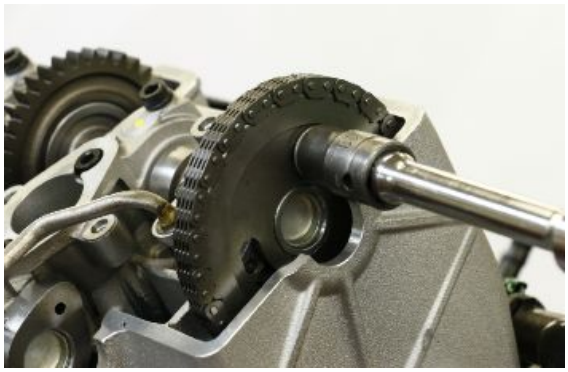
- Fit the pin for aligning the intake camshaft with the hole on U-bolt.
- If it was not possible before adjusting the valve clearance, check the engine timing.



Specific tooling

020851Y Camshaft timing pin

- Remove the two crankshaft and camshaft reference pins.
- Turn the crankshaft until the gear screw covered by the head when the hole on the camshaft gear is aligned with the hole on the U bolt, is visible.
- Block crankshaft rotation using one of the specific tools.
- Unscrew and remove the camshaft gear screw.



- Remove the crankshaft locking tool.

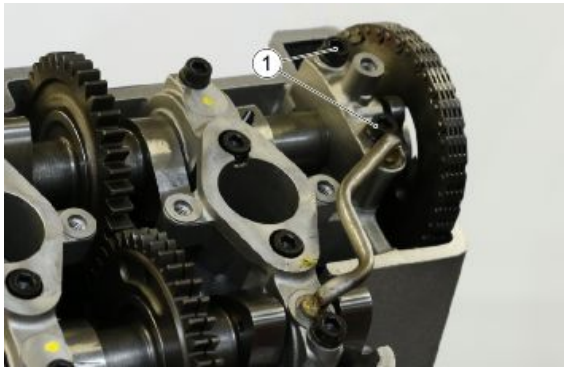
Specific tooling

020850Y Primary gear lock

020914Y Flywheel retainer

Repeat the following operations:

- move cylinder piston 1 (left rear piston) to TDC;
- turn the crankshaft by 450° (one complete turn + 90°) in the direction of engine rotation (direction of travel) to align the hole on the intake camshaft with the specific hole on the U bolt This ensures that all the rear cylinder bank valve springs are decompressed.
- Refit the camshaft timing setting pin in the hole in the U bolt on the rear head, and refit the crankshaft timing pin from the clutch side, to check that the timing setting was not altered while the engine was turned with only one camshaft drive gear fastener screw in place.
- Remove the camshaft timing pin.
- Unscrew and remove the two U bolt screws (1).
- Remove the U bolt and the oil pipe.

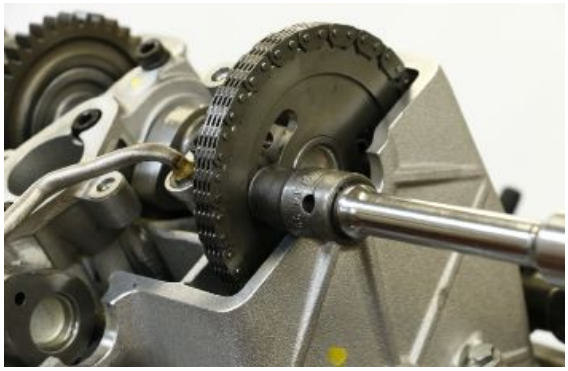


Specific tooling

020851Y Camshaft timing pin

020852Y Crankshaft timing pin

- Block crankshaft rotation using one of the specific tools.
- Unscrew and remove the second intake camshaft gear screw.
- Leave the gear on the camshaft.

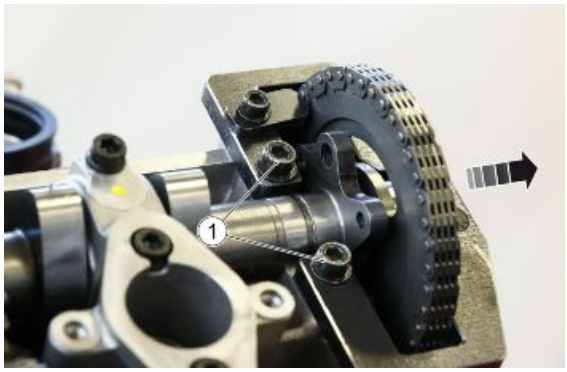


Specific tooling

020850Y Primary gear lock

020914Y Flywheel retainer

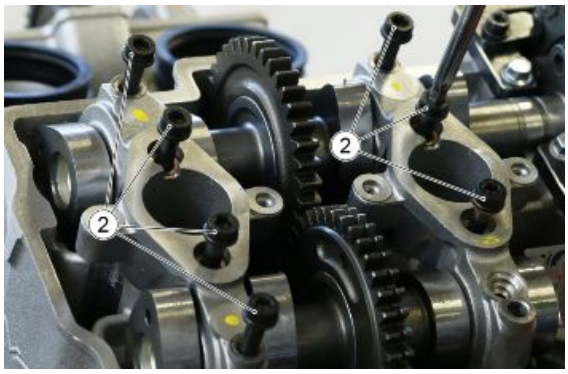
- Install the specific camshaft gear support tool.
- Fix it to the head using the two screws (1).
- Move the gear from the camshaft to the tool.



Specific tooling

020956Y Support for camshaft gear on head

- Unscrew and remove the seven screws (2), proceeding in stages and diagonally.
- Retrieve the washers from the screws near the spark plug holes.
- Remove the U bolts with the O rings and locator pins.



- Remove the intake and exhaust camshafts.

If the two camshafts are timed correctly, the intake camshaft gear tooth (indicated with one dot) is meshed with the trough of the exhaust camshaft gear (indicated with two dots).

Inspecting camshafts

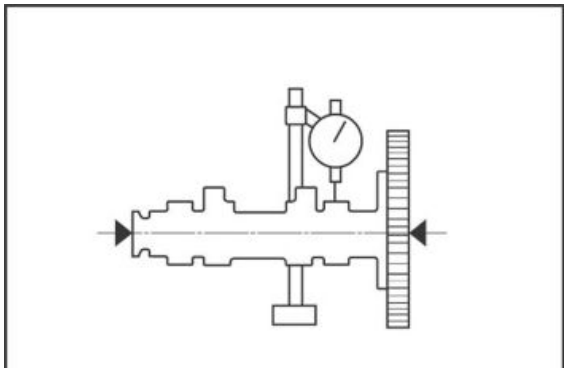
CAMSHAFT TOOTHED WHEEL CHECK

- Check that the camshaft gear works properly: if it is damaged or does not move smoothly, replace the timing chain and the camshaft gear.

CAMSHAFT LOBES

- Check that they do not show blue colouring, cracks or scratches; otherwise, replace the camshaft, gear and chain.

- 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 part.



Characteristic

Maximum camshaft axial clearance (intake/exhaust)

0.4 mm (0.0016 in)

WARNING

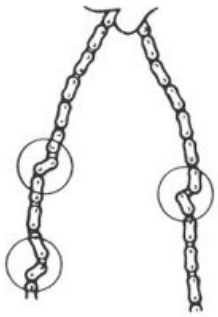
THE EXHAUST CAMSHAFTS OF THE FRONT AND REAR CYLINDER BANKS MUST BOTH BE OF THE SAME TYPE - EITHER WITH A CONVENTIONAL GEAR OR WITH A SELF-ADJUSTING CAMSHAFT GEAR. THE TWO TYPES OF CAMSHAFT ARE INTERCHANGEABLE ON ALL ENGINES IRRESPECTIVE OF THE CAMSHAFT TYPE ORIGINALLY INSTALLED.

Check the timing chain for damage or stiffness while moving.

If necessary, replace the timing chain together with the camshaft gears.

Check the timing chain guide sliders for damage.

If necessary, replace the parts.



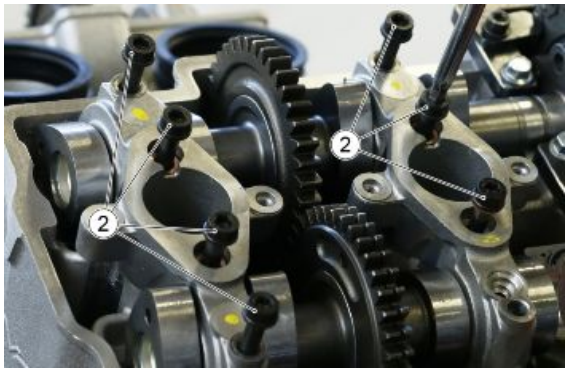
Installing camshafts

- Install the intake and exhaust camshafts on the rear head, remembering that:

the intake camshaft gear tooth (indicated with a dot) is inserted in the groove of the exhaust camshaft gear (indicated with two dots).

CLEAN THOROUGHLY THE SEATS OF THE GEAR RETAINER SCREWS, ON THE INTAKE CAMSHAFT.

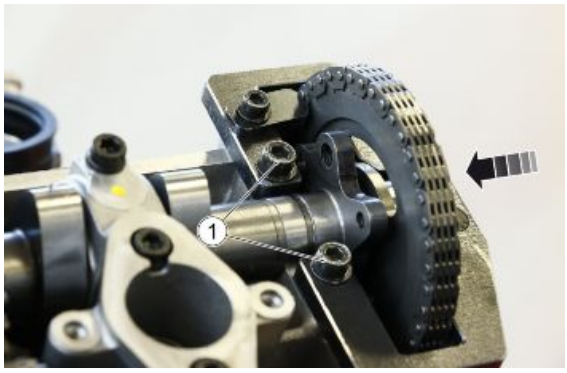
- Fit the U bolts with the nine O rings and locator pins.
- Fit the new washers under the screws (2) near the spark plug holes only.
- Tighten the seven screws (2) operating in stages and diagonally.
- Do not fit the eighth screw (2 - fastening the oil pipe) yet.



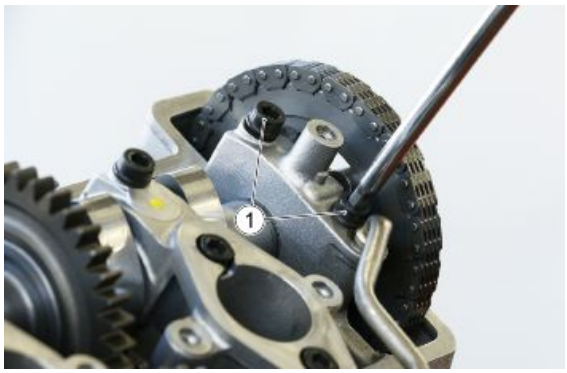
- Move the gear from the mounting tool to the camshaft.
- Unscrew and remove the two screws (1).
- Remove the tool.

Specific tooling

020956Y Support for camshaft gear on head



- Fit the U bolt and the oil pipe.
- Tighten the two U bolt screws (1) and the screw (2) that was not fitted previously.



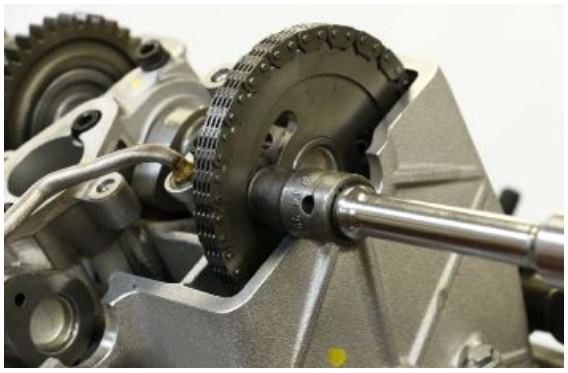
- Align the intake camshaft with the specific hole on the U bolt.
- Insert the specified pin.

Specific tooling

020851Y Camshaft timing pin

- Apply Loctite 243 thread lock on the thread of the timing gear fastener screw. This screw must be replaced at each reassembly.
- Apply and loosely tighten the gear fixing screw on the camshaft.

- Block crankshaft rotation using one of the specific tools.
- Tighten the gear fixing screw on the camshaft to exactly the torque specified.
- Remove the crankshaft locking tool.

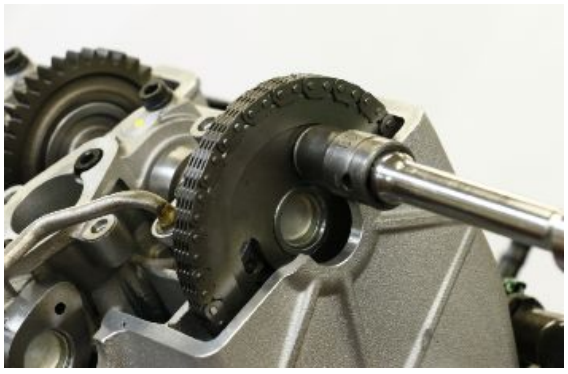


Specific tooling

020850Y Primary gear lock

020914Y Flywheel retainer

- Remove the two crankshaft and camshaft reference pins.
- Turn the crankshaft until the gear screw covered by the head when the hole on the camshaft gear is aligned with the hole on the U bolt, is visible.
- Block crankshaft rotation using one of the specific tools.
- Apply Loctite 243 thread lock on the thread of the second gear fastener



screw. This screw must be replaced at each reassembly.

- Tighten the second camshaft gear fixing screw to exactly the torque specified.
- Remove the crankshaft locking tool.

Specific tooling

020850Y Primary gear lock

020851Y Camshaft timing pin

020852Y Crankshaft timing pin

020914Y Flywheel retainer

- Turn the crankshaft back to the previous position in which the camshaft and U bolt holes were aligned; Refit the reference pin while checking, using the crankshaft reference pin, that the clutch side hole and the hole in the crankshaft are perfectly aligned.
- If this is not the case, repeat the timing operations.

Specific tooling

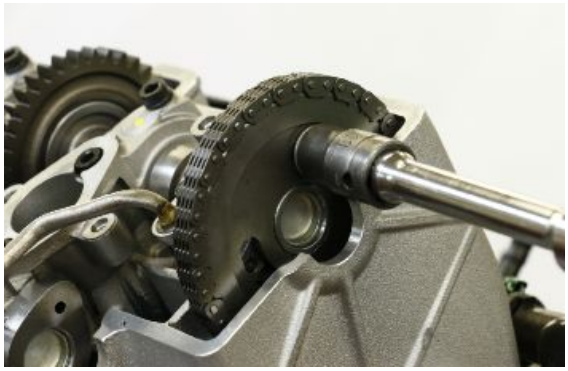
020851Y Camshaft timing pin

020852Y Crankshaft timing pin

Rear head removal

- Remove the rear head cover and the clutch cover.
- Move cylinder piston 1 (left rear piston) to the TDC;
- Turn the crankshaft 450° (one complete turn + 90°) in the direction of motor rotation (direction of travel) in order to align the hole on the intake camshaft gear with the hole on the U-bolt. This ensures that all the rear cylinder bank valve springs are decompressed.

- Turn the crankshaft until the gear screw covered by the head when the hole on the camshaft gear is aligned with the hole on the U bolt, is visible.
- Block crankshaft rotation using one of the specific tools.
- Unscrew and remove the camshaft gear screw.
- Remove the crankshaft locking tool.



Specific tooling

020850Y Primary gear lock

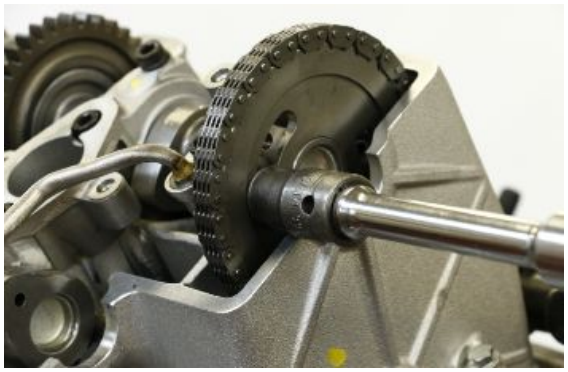
020914Y Flywheel retainer

See also

Head cover removal
Removing the
clutch cover

Repeat the following operations:

- move cylinder piston 1 (left rear piston) to TDC;
- turn the crankshaft by 450° (one complete turn + 90°) in the direction of engine rotation (direction of travel) to align the hole on the intake camshaft with the specific hole on the U bolt This ensures that all the rear cylinder bank valve springs are decompressed.
- Block crankshaft rotation using one of the specific tools.
- Unscrew and remove the second intake camshaft gear screw.
- Remove the crankshaft locking tool.



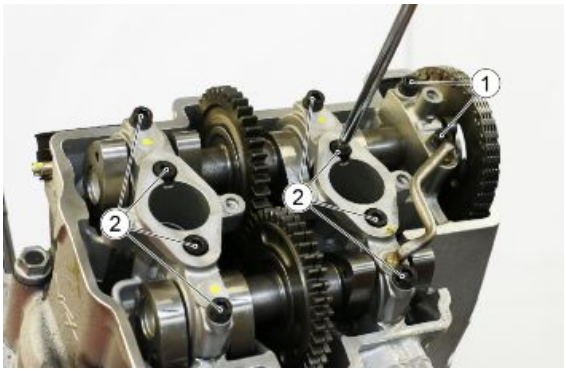
Specific tooling

020850Y Primary gear lock

020914Y Flywheel retainer Kokusan

- Slide and remove the gear from the intake camshaft

- Unscrew and remove the ten screws (1-2), proceeding in stages and in a crossed pattern.
- Retrieve the washers from the screws (2) near the spark plug holes.
- Remove the U bolts with the O rings and locator pins.

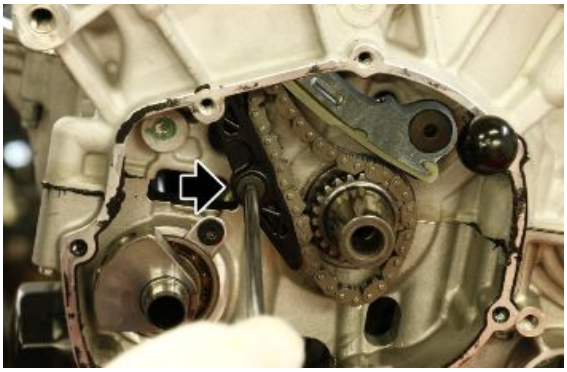


NOTE

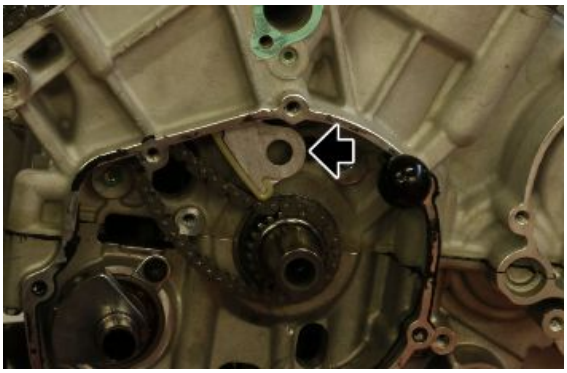
MARK THE COMPONENTS TO PREVENT INCORRECT RE-FITTING.

- Remove the intake and exhaust camshafts from the rear head.

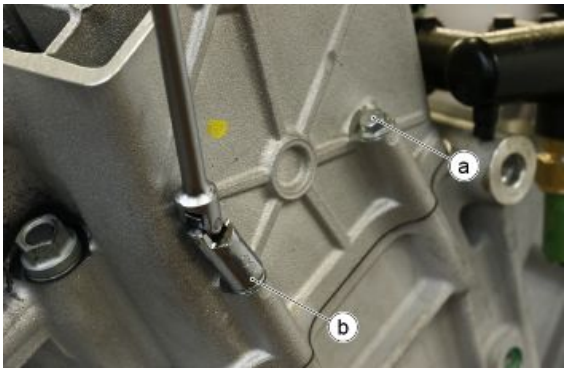
- Unscrew and remove the mobile chain slider screw.
- Remove the mobile chain slider.



- Unscrew and remove the fixed chain slider screw.
- Remove the fixed chain slider.



- Unscrew and remove the two head fastener screws (a - b) from the clutch side.



- Loosen the six nuts on the stud bolts, proceeding in the following order 6 - 5 - 4 - 3 - 2 - 1.
- After loosening all nuts, remove them in order indicated above.

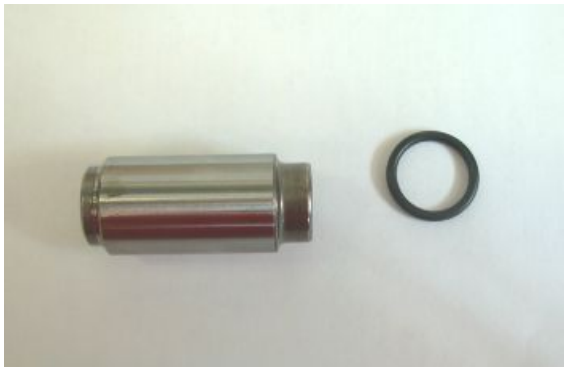
- Remove the rear head, slipping it off the stud bolts.
- Collect the gasket and the two dowel pins.

- Remove the chain tensioner complete with O-ring using the specific tool.
- If the O-ring is not on the chain tensioner, make sure it was not left in the crankcase seat.

REPLACE THE O RING UPON EACH REMOVAL.

Specific tooling

020883Y Fitting/removing timing chain tensioner tool



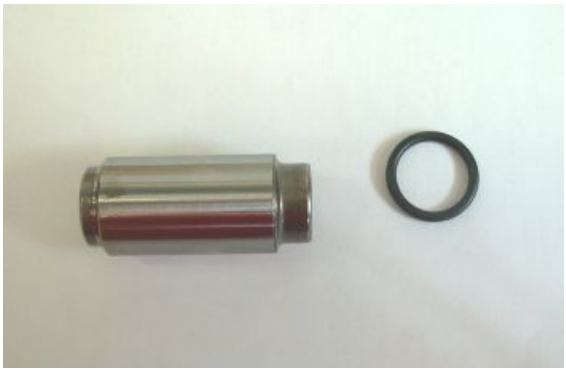
Rear head check

Check that:

- The contact surfaces with the cover and the crankcase are not scored or damaged so they jeopardise a perfect seal.
- Check the status of the valve seats.
- Check that the routing of the oil pipes is free and if required, clean them by blowing a jet of compressed air.

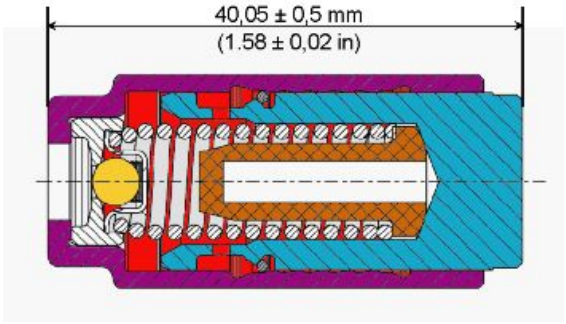
Rear head fitting

- Install a new O ring on the chain tensioner



REPLACE THE O RING UPON EACH REMOVAL.

- Compress the chain tensioner completely, making sure that the total length is 40.05 ± 0.5 mm (1.58 ± 0.02 in).



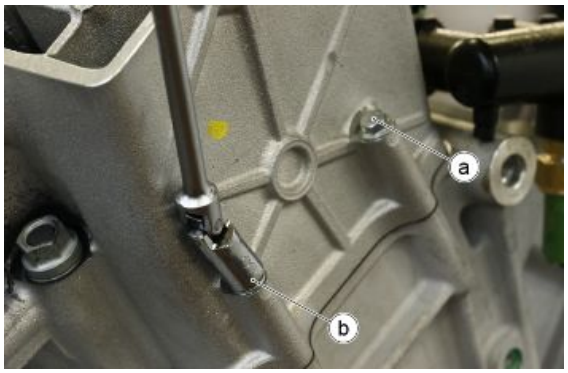
- Insert the chain tensioner into the crankcase, being careful to position it correctly.

- Place a new gasket between the crank-case and the head.
- Place the two dowel pins.

- Install the head.

- Pretighten the six nuts on the stud bolts proceeding in the following order: 1 - 2 - 3 - 4 - 5 - 6.
- Then tighten them fully following the same order.

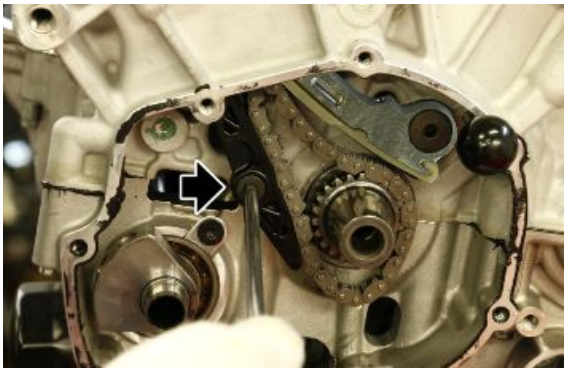
- Tighten the two screws according to the sequence (a - b).

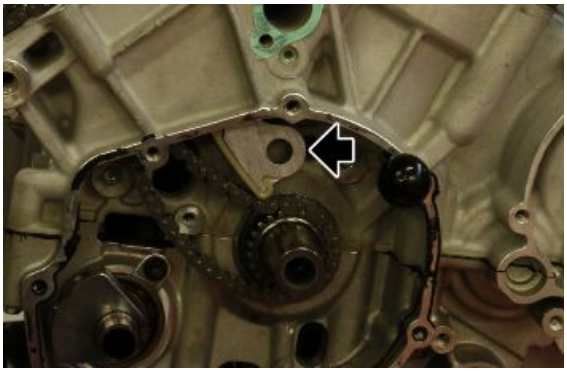


- Fit the camshaft gear
- Keep the gear in position with the chain tightened

THE SIDE WITH THE BEVELLED HOLE IN THE TIMING SYSTEM GEAR MUST ALWAYS FACE THE EXTERIOR OF THE HEAD.

- Install both chain sliders and fasten them with the specific screws.





NOTE

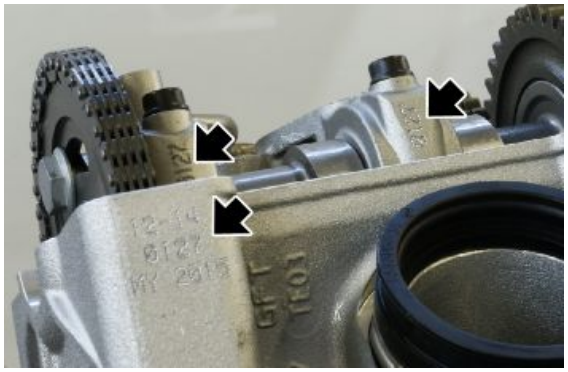
THIS ENGINE HAS CAMSHAFTS OF THE EXHAUST VALVES WITH CLEARANCE RECOVERY.

- Install the intake and exhaust camshafts on the rear head, remembering that:

the intake camshaft gear tooth (indicated with a dot) is inserted in the groove of the exhaust camshaft gear (indicated with two dots).

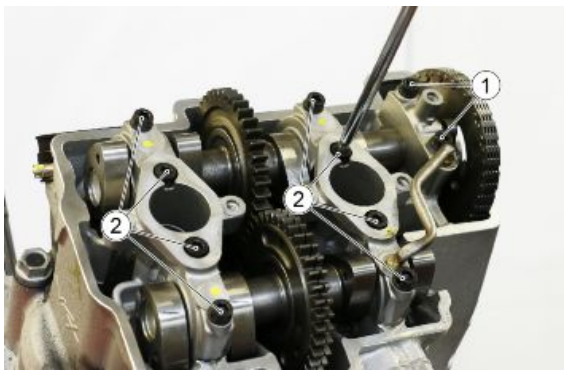
CLEAN THOROUGHLY THE SEATS OF THE GEAR RETAINER SCREWS, ON THE INTAKE CAMSHAFT.

- Check the number engraved on the U bolts, which must correspond with the one engraved on the head.
- If the U bolts between the two heads are inverted, camshaft seizure may occur



IT IS NOT POSSIBLE TO REPLACE ONLY ONE U BOLT, IF NECESSARY: REPLACE THE ENTIRE HEAD.

- Fit the U bolts with the nine O rings and locator pins.
- Install the oil pipe.
- Fit the new washers under the screws (2) near the spark plug holes only.
- Tighten the ten screws (1 - 2) working in stages and diagonally.



- Cut the clamp that binds the chain to the gear.
- Position the gear on the camshaft so that the timing hole and the gear fixing screw hole are centred with the gear slot.
- Insert the specific timing pin.

Specific tooling

020851Y Camshaft timing pin

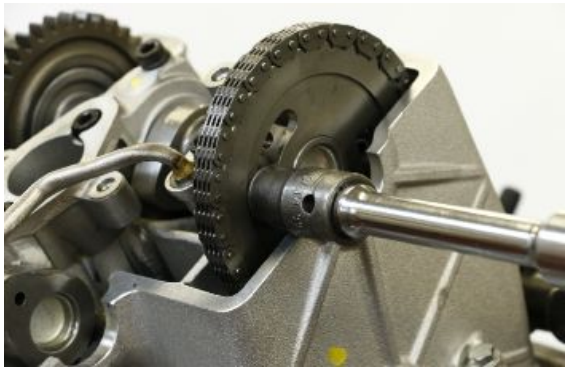
- Apply Loctite 243 thread lock on the thread of the timing gear fastener screw. This screw must be replaced at each reassembly.
- Apply and loosely tighten the gear fixing screw on the camshaft.

- Protect the edge of the head with rubber.
- Load the chain tensioner with special tool.

Specific tooling

020981Y Lever for disarming the hydraulic tensioner of the timing chain

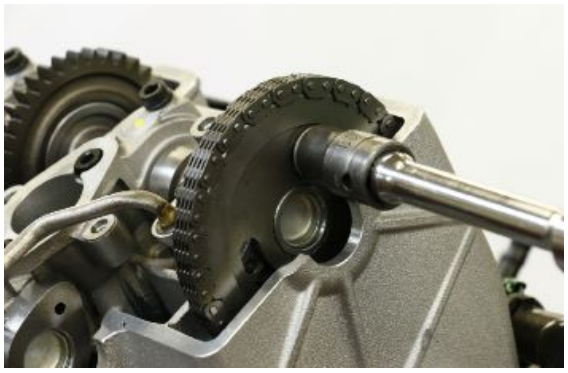
- Block crankshaft rotation using one of the specific tools.
- Tighten the gear fixing screw on the camshaft to exactly the torque specified.
- Remove the crankshaft locking tool.



Specific tooling

020850Y Primary gear lock

020914Y Flywheel retainer



- Remove the two crankshaft and camshaft reference pins.
- Turn the crankshaft until the gear screw covered by the head when the hole on the camshaft gear is aligned with the hole on the U bolt, is visible.
- Block crankshaft rotation using one of the specific tools.
- Apply Loctite 243 thread lock on the thread of the second gear fastener screw. This screw must be replaced at each reassembly.
- Tighten the second camshaft gear fixing screw to exactly the torque specified.
- Remove the crankshaft locking tool.

Specific tooling

020850Y Primary gear lock

020851Y Camshaft timing pin

020852Y Crankshaft timing pin

020914Y Flywheel retainer

- Turn the crankshaft back to the previous position in which the camshaft and U bolt holes were aligned; Refit the reference pin while checking, using the crankshaft reference pin, that the clutch side hole and the hole in the crankshaft are perfectly aligned.
- If this is not the case, repeat the timing operations.

Specific tooling

020851Y Camshaft timing pin

020852Y Crankshaft timing pin

Valves

Valve removal

- Remove the head.
- Place the head on supporting surface.
- Number the valves and their bucket tappets in order to position them correctly upon refitting.

- Extract the bucket tappets

- Extract the adjusting shims

- Compress the valve springs with the specific wrench and with the spring compressing tool.

Specific tooling

AP8140179 Valve springs compressor

020853Y Compresses intake valve springs

020854Y Compresses exhaust valve springs

See also

Front head removal

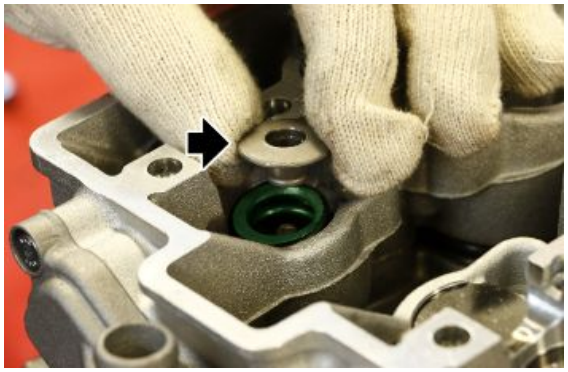
Rear head removal

- Remove the cotters using a magnet.

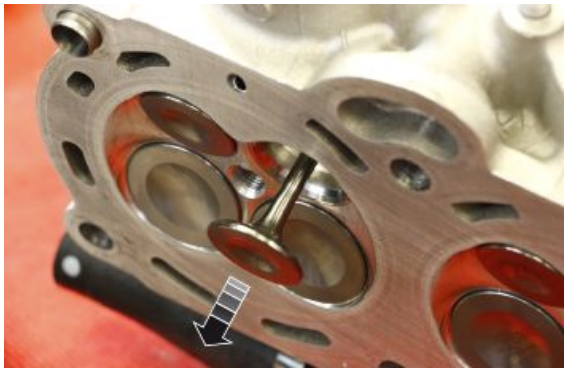
- Release the valve springs.
- Remove the upper cap and the springs.

CAUTION

THE INTAKE VALVES HAVE A DOUBLE SPRING WHEREAS THE EXHAUST VALVES HAVE A SINGLE SPRING.



- Remove the valves.



Valve check

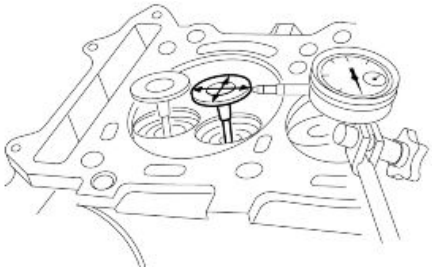
CAUTION

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.

VALVE STEM DEVIATION

Lift up the valve approx. 10 mm (0.39 in) from its seat.

Measure the valve stem deviation in two perpendicular directions and position the dial gauge as shown in the figure.

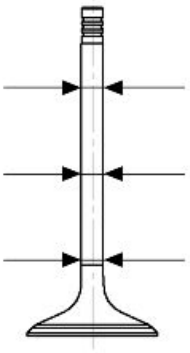


Characteristic

Valve stem distortion

0.25 mm (0.0098 in)

If the valve stem, when measured with a micrometer, is worn to its limit and the clearance exceeds the specified limit, replace the valve.
Recheck the clearance after replacing the valve.



Characteristic

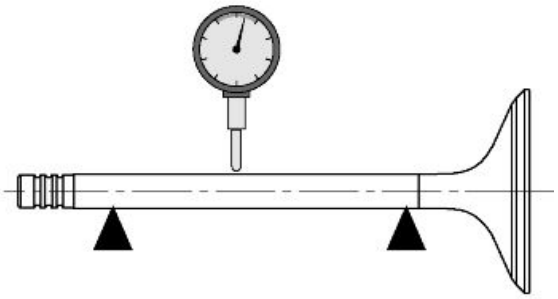
Intake valve stem diameter

4.985 - 4.965 mm (0.1963 - 0.1954 in)

Exhaust valve stem diameter

4.975 - 4.955 mm (0.1959 - 0.1951 in)

Support the valve with two "V" blocks as shown and check the run-out with a dial gauge.
If the run-out exceeds the specified limit, replace the valve.

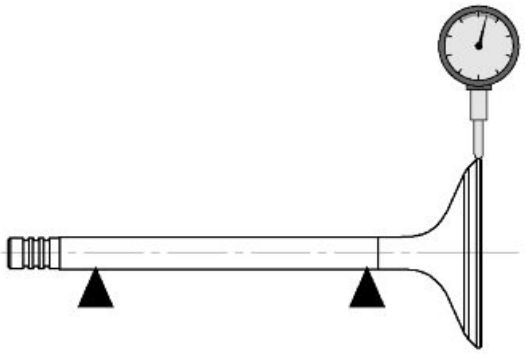


Characteristic

Valve stem run-out

0.05 mm (0.0020 in)

Position the dial gauge at a right angle to the valve head face and measure the eccentricity.
If the eccentricity exceeds the specified limit, replace the valve.

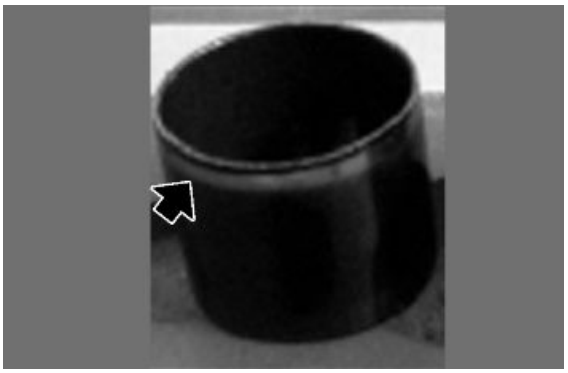


Characteristic

Valve head eccentricity

0.03 mm (0.0012 in)

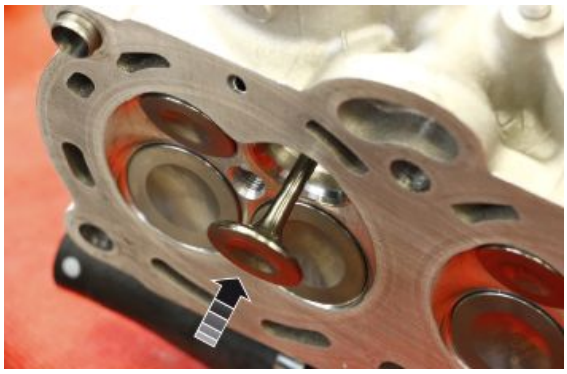
Coating may get slightly damaged in the indicated area.



Valve installation

The intake valves mount a double spring, while the exhaut valves have only one spring.
The old intake valve springs are marked blue and the old exhaust springs are marked green.

- Lubricate the valve stem and insert the valves on the valve guide.



- Position the springs with the closest turns facing the head of the valve

CAUTION

THE INTAKE VALVES HAVE A DOUBLE SPRING WHEREAS THE EXHAUST VALVES HAVE A SINGLE SPRING.

- Fit the caps.

- Compress the valve springs with the specific wrench and with the spring compressing tool.
- Insert the cotters into the seat

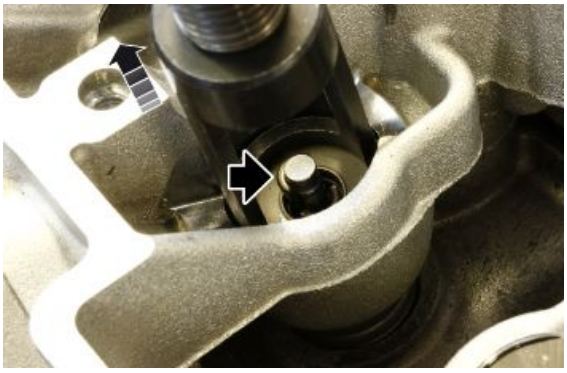
Specific tooling

AP8140179 Valve springs compressor

020853Y Compresses intake valve springs

020854Y Compresses exhaust valve springs

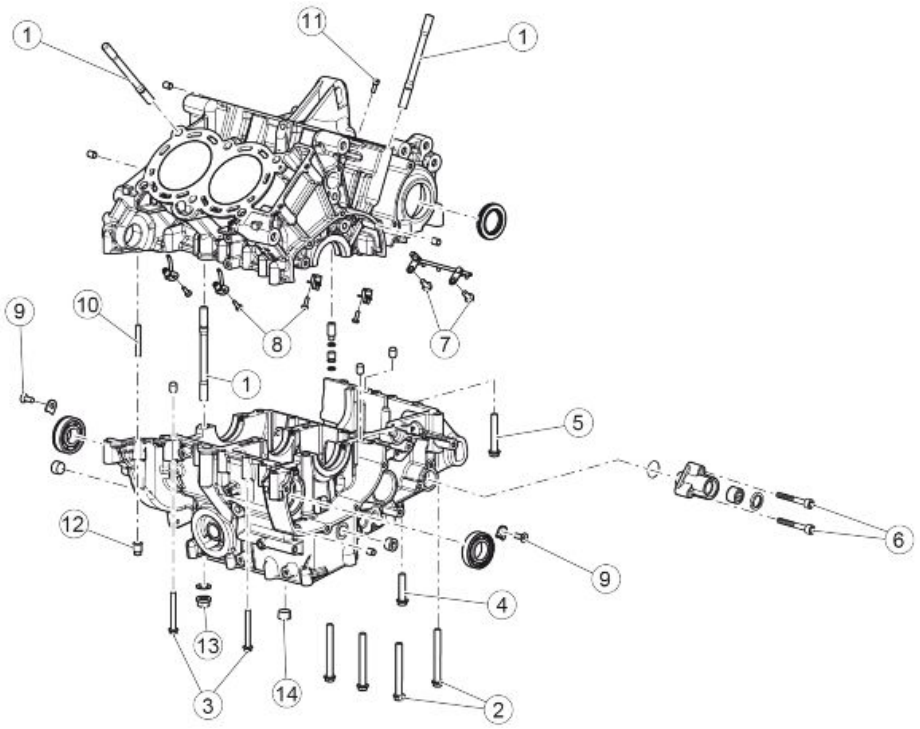
- Release the wrench, checking that the cotters are positioned correctly in the valve grooves.



- Position the adjusting shims

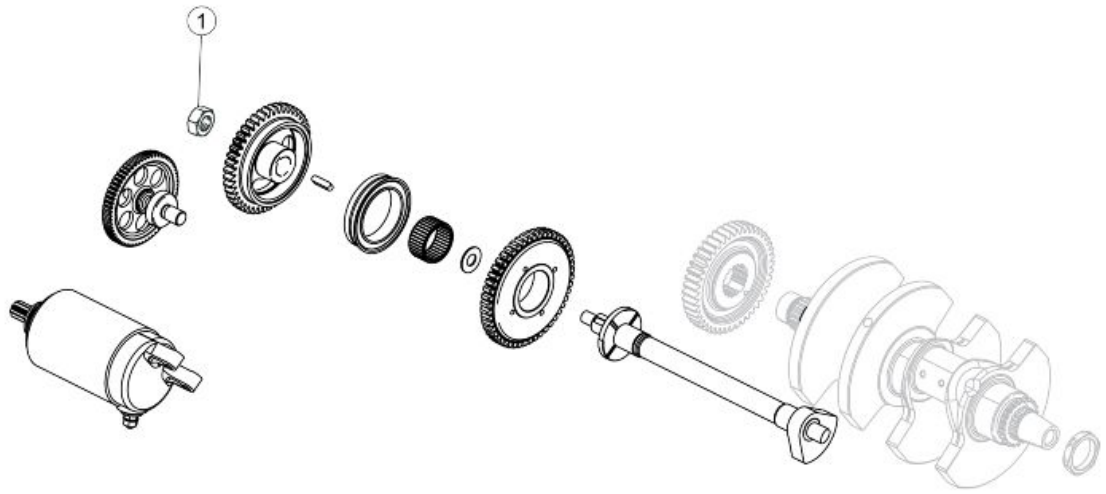
- Position the bucket tappets.

Crankcase



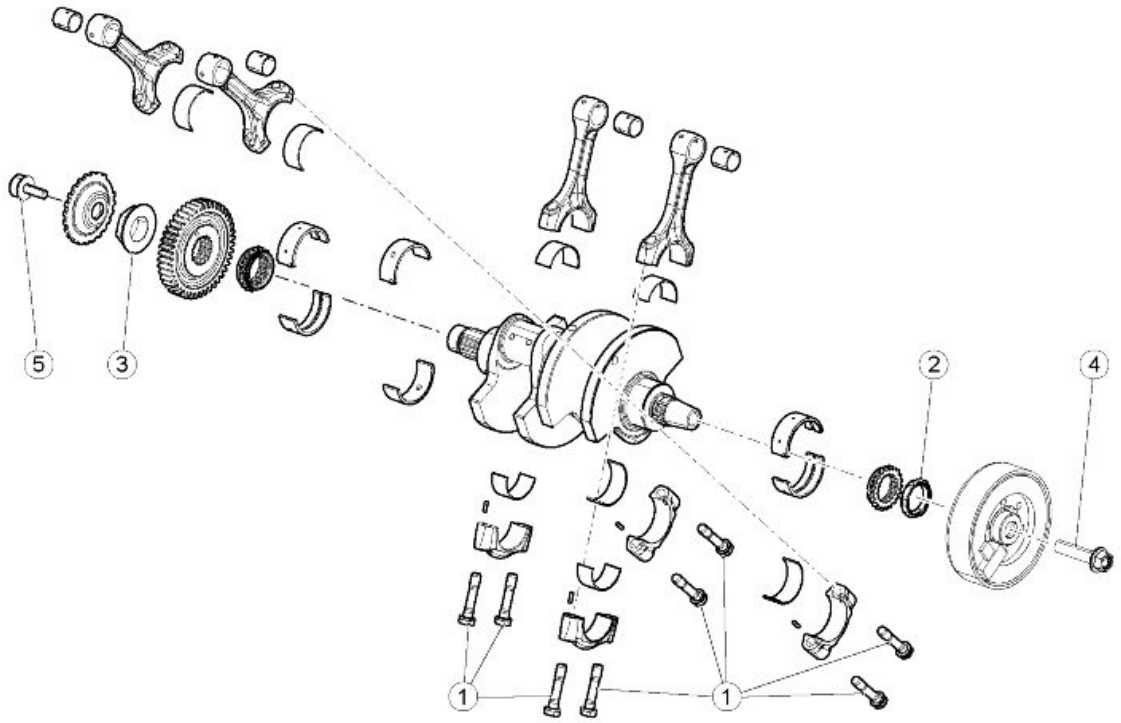
CRANKCASES

pos.	Description	Type	Quantity	Torque	Notes
1	Stud bolt	-	18	20 Nm (14.75 lb ft)	Loctite 648 or 270
2	TE Flanged screw	-	4	25 Nm (18.44 lb ft)	Lubricate the thread and under the head.
3	TE Flanged screw	-	8	10 Nm (7.38 lb ft)	Lubricate the thread and under the head.
4	TE Flanged screw	-	1	10 Nm (7.38 lb ft)	Lubricate the thread and under the head.
5	TE Flanged screw	-	3	25 Nm (18.44 lb ft)	Lubricate the thread and under the head.
6	SHC screw	-	2	10 Nm (7.38 lb ft)	Lubricate the thread and under the head.
7	TE Flanged screw	-	2	10 Nm (7.38 lb ft)	Lubricate the thread and under the head.
8	TB TORX screw	-	4	3.5 Nm (2.58 lb ft)	Loctite 2045.
9	Screw	-	2	6 Nm (4.43 lb ft)	
10	Stud bolt	-	1	*	* Move to 33mm from table.
11	SHC screw	-	1	10 Nm (7.38 lb ft)	Lubricate the thread and under the head.
12	Special nut	-	1	10 Nm (7.38 lb ft)	-
13	Flanged nut	-	6	30 ± 55 Nm (22.13 ± 40.57 lb ft)	Molykote - Lubricate the thread and under the head.
14	Conical cap	-	3	**	* Move to 1mm under the table.



IGNITION UNIT

pos.	Description	Type	Quantity	Torque	Notes
1	Hex headed nut cl.10 type 2 iso 8674	M10x1	1	50 Nm (36.88 lb ft)	Loct. 243



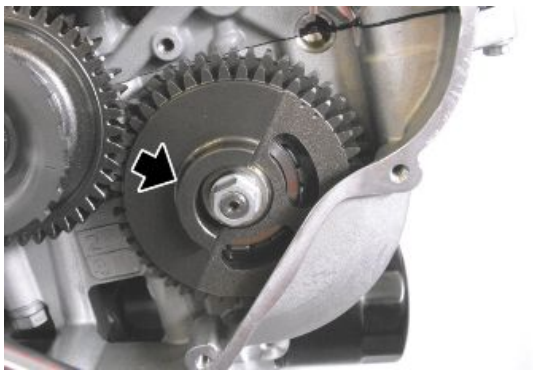
CRANKSHAFT

pos.	Description	Type	Quantity	Torque	Notes
1	Connecting rod screws	-	8	15 + 20 Nm (11.06 + 14.75 lb ft) + 130°	Lubricate the head and under head with

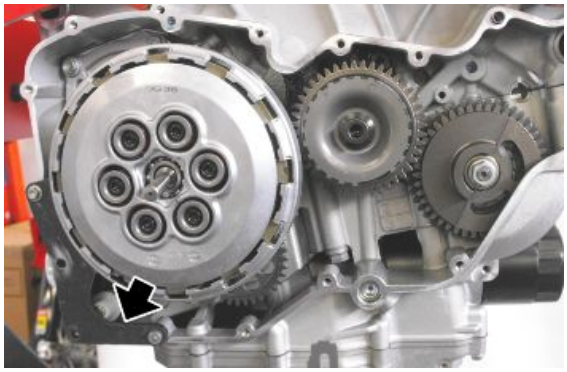
pos.	Description	Type	Quantity	Torque	Notes
					con PANKL Lubricant 01 (PLB01)
2	Fastener ring nut for alternator side timing sprocket	-	1	100 Nm (73.76 lb ft)	Loct. 243
3	Primary fixing ring nut	-	1	200 Nm (147.51 lb ft)	Loct. 243
4	Generator fixing screw	M12x1.25	1	120 Nm (88.51 lb ft)	-
5	Tone wheel fixing screw	M8x1.25	1	50 Nm (36.88 lb ft)	Loct. 3M or 270

Balancing countershaft removal

- To extract the balancing countershaft, first remove: the clutch cover and the alternator cover.
- Turn the crankshaft so as to position the thicker side of countershaft gear on the side opposite to crankcase bulkhead.



- Block crankshaft rotation using the specific tool.



Specific tooling

020850Y Primary gear lock

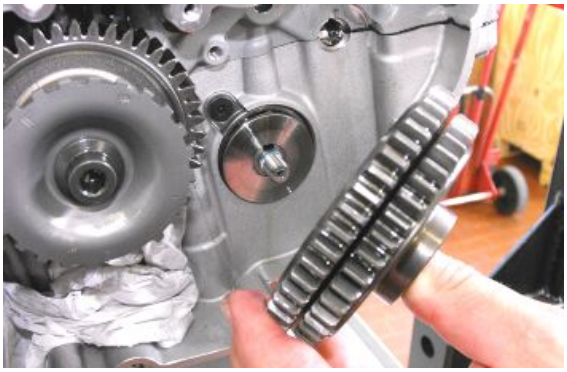
See also

Removing the clutch cover
Removing the flywheel cover

- Unscrew and remove the nut and collect the washer

- Remove the countershaft from the alternator side.

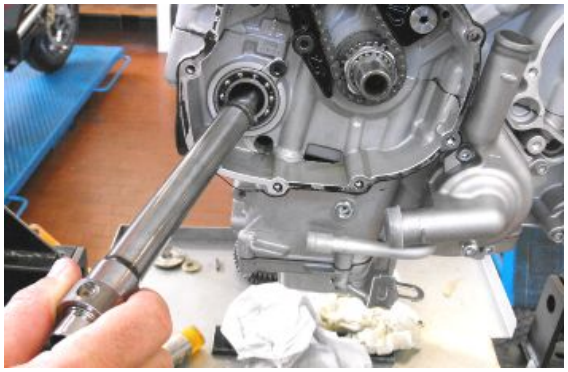
- Remove the countershaft gear.



- Remove the key on countershaft

- Remove the spacer.

- Remove the countershaft on the opposite side.



Balancing countershaft fitting

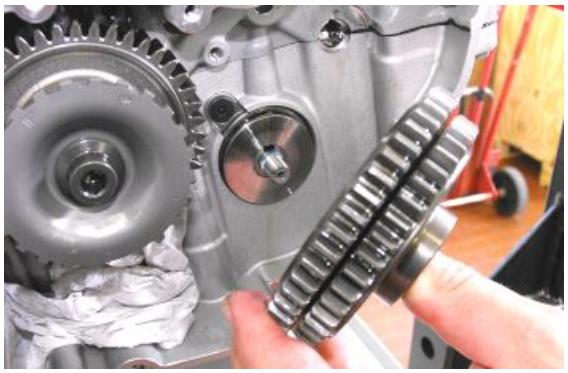
- Install the spacer.

THE SPACER CHAMFERED SIDE MUST BE FACING THE CRANKCASE.

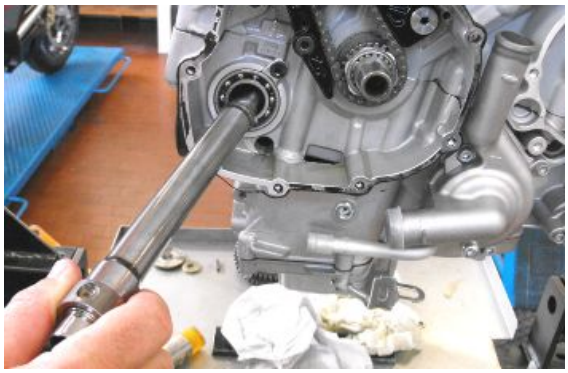
- Install the countershaft gear aligning the references on the countershaft gear and the primary shaft gear.

NOTE

THE BURIN ON THE PRIMARY SHAFT GEAR TOOTH MUST BE INSERTED INTO THE SLOT IDENTIFIED WITH TWO BURINS ON THE COUNTERSHAFT GEAR.



- Insert the countershaft from the alternator side.
- Turn the countershaft until aligning the key seat on the countershaft and on the gear.
- Insert the drive key.

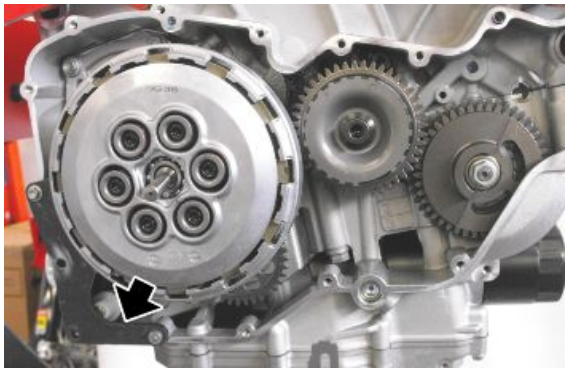


- Place the washer.

- Turn the nut on the countershaft.
- Block crankshaft rotation using the specific tool.
- Tighten the nut on the countershaft.

Specific tooling

020849Y Clutch lock

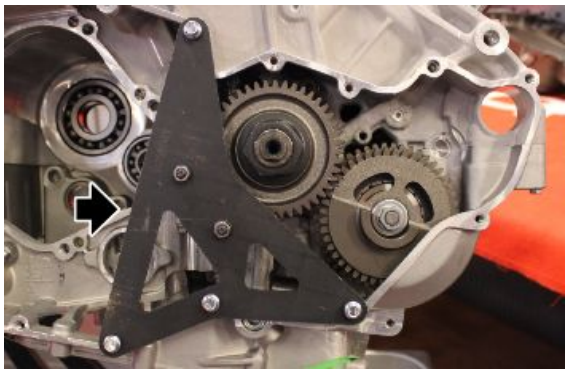


Main transmission gear removal

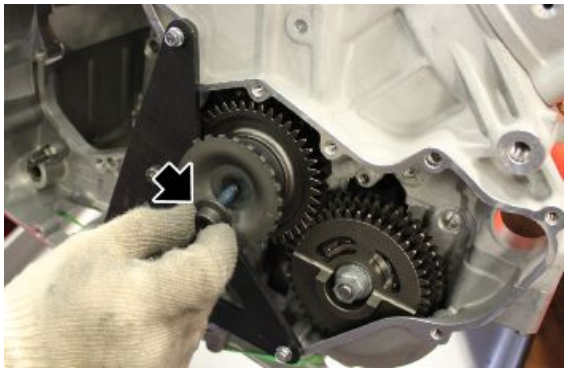
- Remove the clutch.
- Turn the crankshaft and align the references on the countershaft gear and the primary shaft gear.
- Block crankshaft rotation using the specific tool.

Specific tooling

020850Y Primary gear lock



- Unscrew and remove the tone wheel fixing screw.
- Remove the tone wheel.



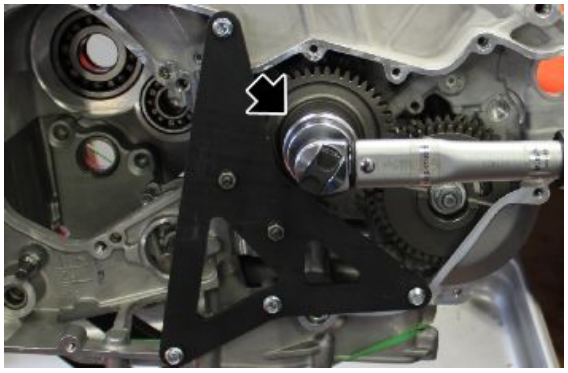
See also

Disassembling the clutch

- Unscrew and remove the primary shaft fixing nut.
- Remove the crankshaft blocking tool.

Specific tooling

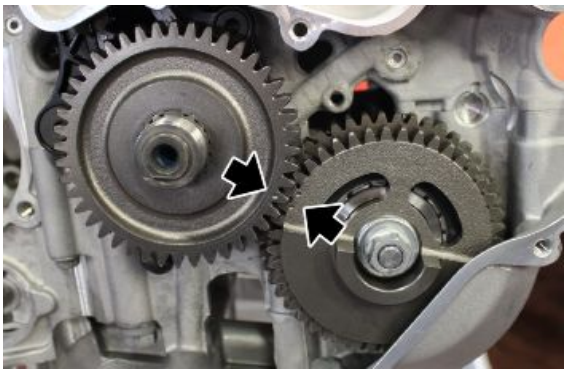
020850Y Primary gear lock



- Remove the primary shaft gear.

Installing the primary drive gear

- Install the primary shaft gear correctly in its seat on the crankshaft from the clutch side.
- Make the references on the gears of the primary shaft and the countershaft coincide.



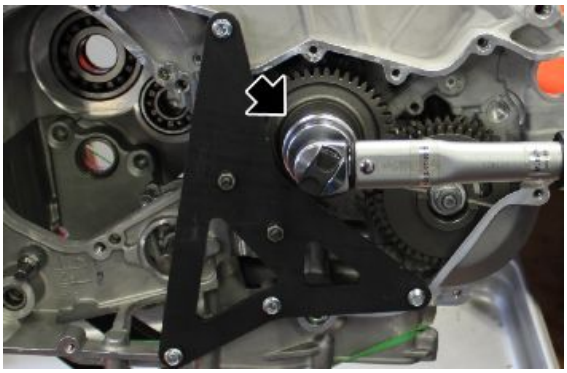
NOTE

THE BURIN ON THE PRIMARY SHAFT GEAR TOOTH MUST BE INSERTED INTO THE SLOT IDENTIFIED WITH TWO BURINS ON THE COUNTERSHAFT GEAR.

- Install the crankshaft blocking tool.
- Tighten the primary shaft fixing nut.

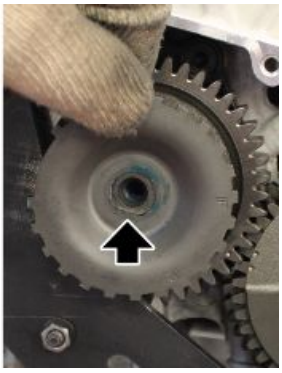
Specific tooling

020850Y Primary gear lock



- Insert the tone wheel on the crankshaft.

The crankshaft and the tone wheel have a bevel that identifies the fitting direction.



- Tighten the tone wheel fixing screw.
- Remove the special tool.

Specific tooling

020850Y Primary gear lock

Preparation

To open the crankcase, first remove the following components:

- alternator;
- water pump;
- gearbox unit;
- primary drive shaft gear
- both timing chains;
- the chain sliders;
- oil sump;
- the gear selector pin spacer;
- starter motor and intermediate gear;
- countershaft.

See also

Magneto flywheel removal

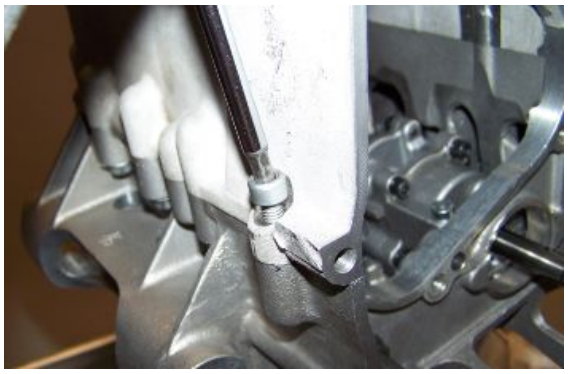
Water pump
Disassembling the gearbox
Main
transmission gear removal

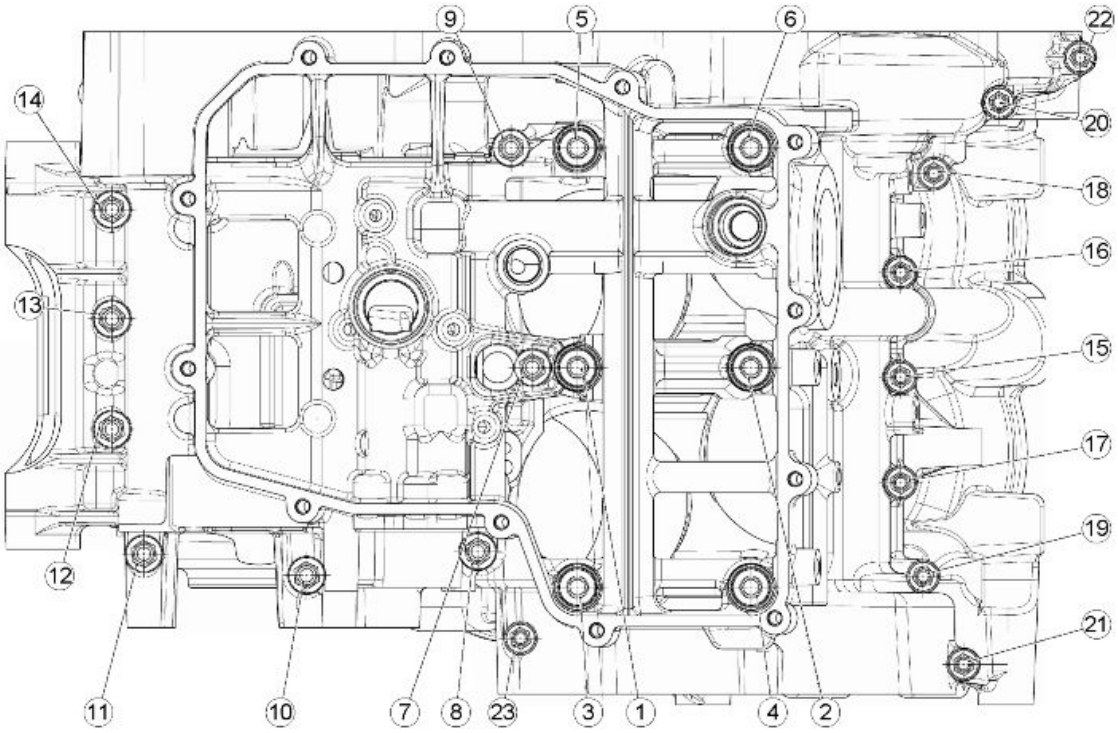
Front head removal

Rear head removal
Removing the
oil sump
Balancing
countershaft removal

Crankcase opening

- Position the engine with the heads facing upward, unscrew and remove the screw (24).



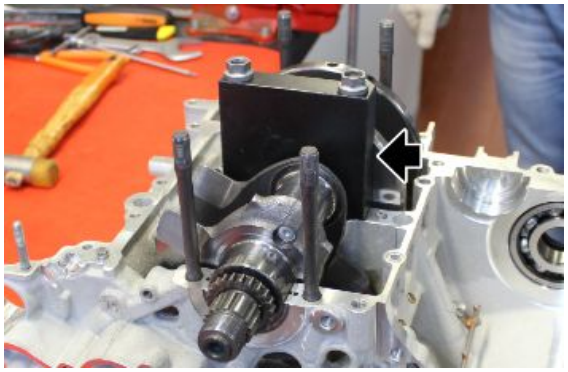


- Turn the engine with the heads facing downward and loosen the screws in the following order: 23 - 22 - 21 - 20 - 19 - 18 - 17 - 16 - 15 - 14 - 13 - 12 - 11 - 10 - 9 - 8 - 7.
- After loosening all screws, remove them in order indicated above.
- Loosen the six nuts on the stud bolts, proceeding in the following order 6 - 5 - 4 - 3 - 2 - 1.
- After loosening all nuts, remove them in order indicated above.

- Separate the crankcases, removing the lower part
- Collect the three dowel pins.
- The crankshaft, the pistons and the connecting rods remain in the upper crankcase.

Removing connecting rods - pistons

- Remove both heads.
- Open the crankcases.
- Install the tool that keeps the crankshaft in position.



Specific tooling

020857Y Crankshaft support U-bolt

See also

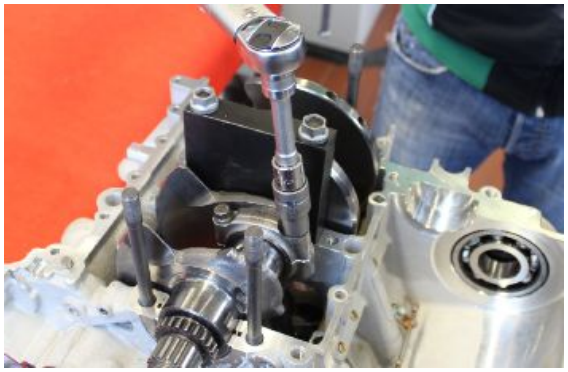
Front head removal

Rear head removal

- Unscrew and remove the two connecting rod screws.
- Remove the connecting rod cap.

NOTE

MARK THE COMPONENTS TO PREVENT INCORRECT REFITTING.



- Remove the piston connected to the connecting rod from the cylinder side.
- Take out the Seeger ring

- Slide off the pin

- Mark the piston crown on the exhaust side so as to remember the refitting position.
- Remove the piston.

Crankshaft removal

- Separate the crankcases, removing the lower part
- If the heads were removed, position the specific special tool to keep the pistons from coming out.

Specific tooling

020858Y Maintenance of the pistons in the cylinders

- Unscrew and remove the eight connecting rod screws.
- Remove the four connecting rod caps.

NOTE

MARK THE COMPONENTS TO PREVENT INCORRECT REFITTING.

- Take out the crankshaft.

Bearing removal

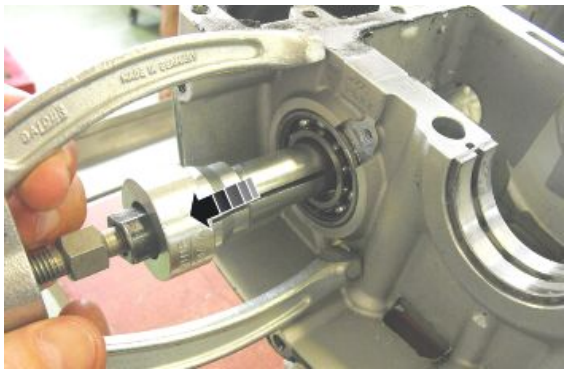
BALANCING COUNTERSHAFT BEARING REMOVAL

- Remove the lower crankcase.
- Remove the countershaft.

FLYWHEEL-SIDE

- Unscrew and remove the bearing retainer screw.
- Remove the lock.

- Heat up the crankcase to 150°C (302° F).
- Position the general tool to pull out bearings.
- Remove the bearing.



See also

Crankcase opening

CLUTCH-SIDE

- Unscrew and remove the bearing retainer screw.
- Remove the lock.

- Heat up the crankcase to 150°C (302° F).
- Position the general tool to pull out bearings.
- Remove the bearing.

Crankshaft check

Characteristic

Maximum crankshaft axial clearance after closing the crankcase

0.5 mm (0.0197 in)

Maximum radial play between main bushings and crankpins

0.07 mm (0.00275 in)

Balancing countershaft check

Characteristic

Maximum countershaft axial clearance after closing the crankcase

0.1 mm (0.0039 in)

Connecting rod check

Characteristic

Maximum wear limit of the connecting rod small end

17.03 mm (0.6705 in)

Maximum connecting rod small end radial clearance

0.045 mm (0.0018 in)

Maximum radial play between connecting rod and crankpin

0.55 mm (0.022 in)

Maximum radial play of crankpin

0.08 mm (0.0031 in)

Inspecting pistons

WITHOUT CLASS SELECTION

Characteristic

Minimum piston diameter

77,934 mm (3.0683 in)

Maximum clearance between the cylinder and piston

0.08 mm (0.0031 in)

Maximum wear limit of the clearance between pin and pin hole on the piston

0.040 mm (0.0016 in)

Maximum allowed clearance between the first piston ring and respective slot on the piston

0.1 mm (0.0039 in)

Maximum allowed clearance between the second piston ring and respective slot on the piston

0.1 mm (0.0039 in)

Maximum opening of the piston ring fit on the pin First piston ring

0.5 mm (0.0197 in)

Second piston ring

0.7 mm (0.0275 in)

WITH CLASS SELECTION

CAUTION

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

Characteristic

Piston diameter

Class A: 77.961-77.971 mm (3.0693-3.0697 in).

Class B: 77.971-77.981 mm (3.0697-3.0701 in)

Maximum clearance between the cylinder and piston

0.1 mm (0.0039 in)

Maximum wear limit of the clearance between pin and pin hole on the piston

0.040 mm (0.0016 in)

Maximum allowed clearance between the first piston ring and respective slot on the piston

0.1 mm (0.0039 in)

Maximum allowed clearance between the second piston ring and respective slot on the piston

0.1 mm (0.0039 in)

Maximum opening of the piston ring fit on the pin First piston ring

0.5 mm (0.0197 in)

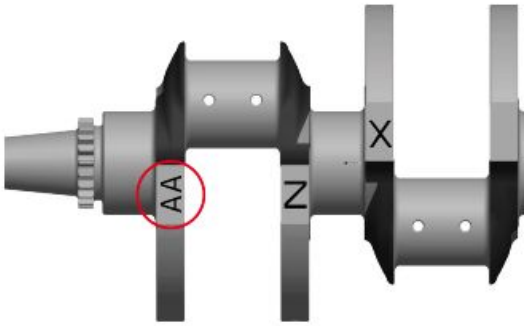
Second piston ring

0.7 mm (0.0275 in)

Selecting connecting rods

SELECTING CRANKSHAFTS AND CONNECTING RODS ACCORDING TO BALANCING CLASS

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



CAUTION

IT IS NOT POSSIBLE TO ORDER CERTAIN CONNECTING ROD AND CRANKSHAFTS CLASSES, THEREFORE, IF NECESSARY, REPLACE THE CONNECTING RODS OR CRANKSHAFTS, FOLLOW THE TABLE BELOW.

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

CRANKSHAFT-CONNECTING ROD ORIGINAL BALANCING CLASSES

Crankshaft balancing classes	Balancing class combinations for alternator side connecting rod pair	Balancing class combinations for primary drive side connecting rod pair
HH	AA+AA	AA+AA
LL	BB+BB / **AA+CC**	BB+BB / **AA+CC**
MM	CC+CC / **BB+DD**	CC+CC / **BB+DD**
NN	DD+DD / **CC+EE**	DD+DD / **CC+EE**
OO	EE+EE	EE+EE

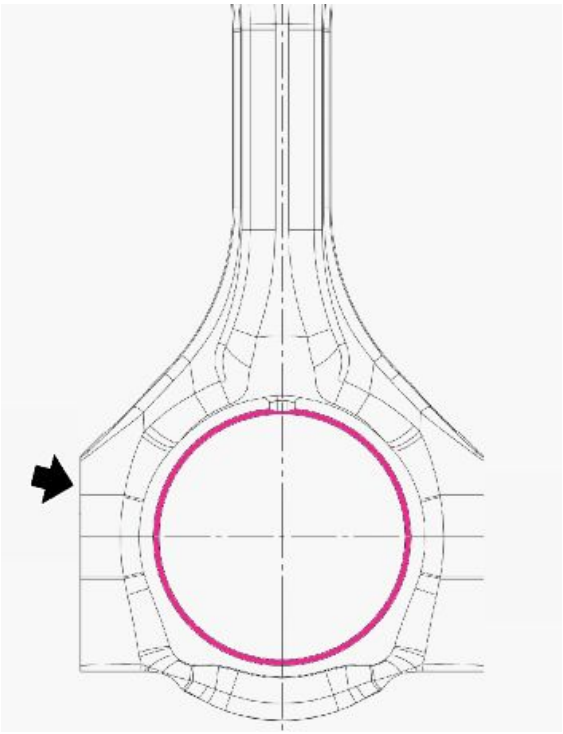
CRANKSHAFT-CONNECTING ASSISTANCE ROD BALANCING CLASSES

Crankshaft balancing classes	Balancing class combinations for alternator side connecting rod pair	Balancing class combinations for primary drive side connecting rod pair
HH	BB+BB	BB+BB
LL	BB+BB	BB+BB
MM	CC+CC	CC+CC
NN	DD+DD	DD+DD
OO	DD+DD	DD+DD

* if necessary replace a crankshaft of a class not available as spare part by keeping the connecting rods in the engine:

- for HH shaft - order LL SHAFT

The connecting rod class is stamped on its left side, viewed from the front, from the side with the bevelling on the big end hole.



Bushing selection

CRANKSHAFT BUSHINGS

CRANKCASE CATEGORY

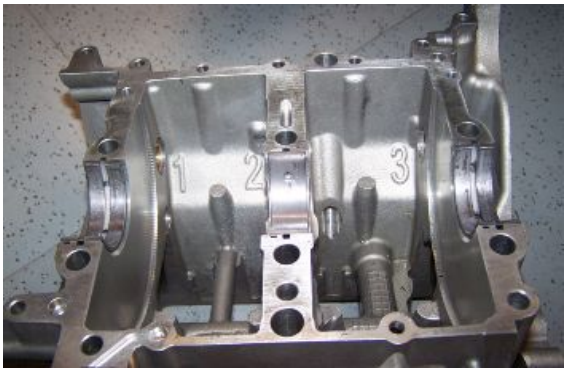
Three crankcase classes are available (A - B- C) which differentiate in the diameter of the hole in the bearings.

The category is marked on the crankcase, on the right side, in the area below the gearbox.

Different classes of bearings can be used (e.g.: A - B - C or B - B - C or A - B - A ....).

A number that indicates the position of the main journal is stamped on the crankcase:

1. flywheel side;
2. central;
3. clutch side.



CRANKCASE CATEGORY

Specification	Desc./Quantity
Class A	Bushing seat diameter 52.023 - 52.018 mm (2.0481 - 2.0479 in)
Class B	Bushing seat diameter 52.018 - 52.013 mm (2.0479 - 2.0477 in)
Class C	Bushing seat diameter 52.013 - 52.008 mm (2.0477 - 2.0475 in)

SHAFT CATEGORY

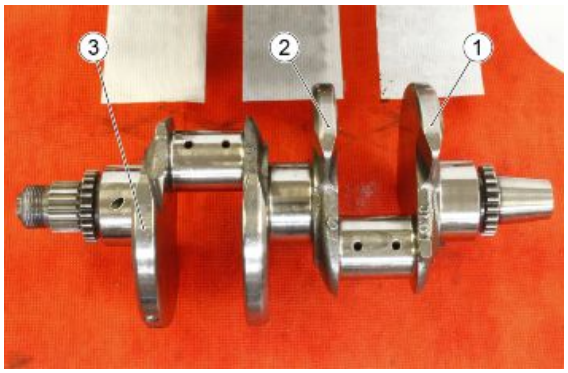
The three crankshaft main journals:

1. flywheel side;
2. central;
3. clutch side.

they are each selectable in two pairs of classes, A-B (up to engine No. 3990) or C-D-E (from Engine No. 3991).

The class is stamped on the flat face of the counterweight, as shown in the image.

The three main journals may have different classes to each other according to the type of coupling (e.g: A - B - A or B - B - A etc.) o (e.g.: C - D - E or D - C - C etc.)



CRANKSHAFT CATEGORIES

Specification	Desc./Quantity
Class C	Main journals - diameter: 46.028 - 46.023 mm (1.8121 - 1.8119 in)
Class D	Main journals - diameter: 46.023 - 46.018 mm (1.8119 - 1.8117 in)
Class E	Main journals - diameter: 46.018 - 46.013 mm (1.8117 - 1.8115 in)

Once the categories below are checked:

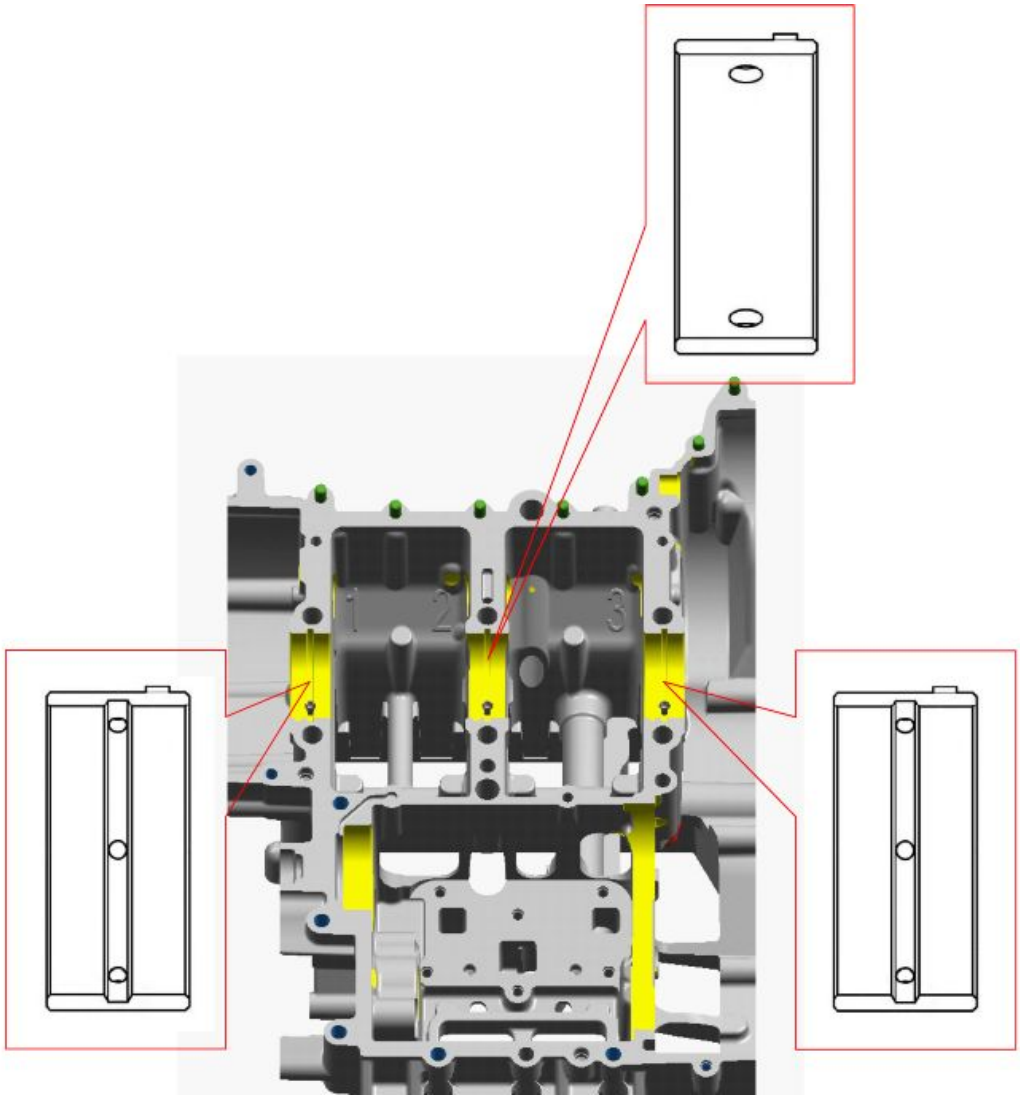
1. crankcase;
2. flywheel side main journal;
3. centre main journal;
4. clutch side main journal.

Choose the bushings used for assembly from the following table

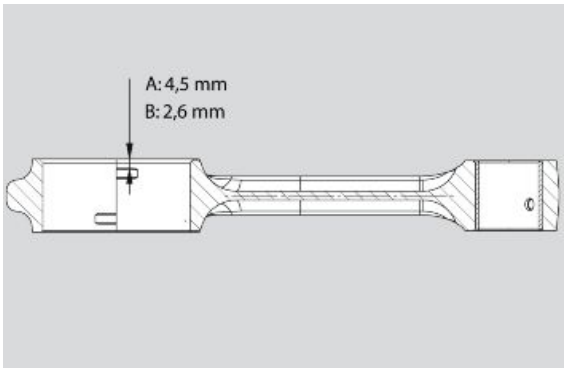
CRANKSHAFT BUSHINGS

Crankshaft main journal	Class A crankcase	Class B crankcase	Class C crankcase
Class C main journal	Bushing (green)	Bushing (green)	Bushing (yellow)
Class D main journal	Bushing (black)	Bushing (green)	Bushing (green)
Class E main journal	Bushing (black)	Bushing (black)	Bushing (green)

The flywheel side and clutch side main bearings are different from the central ones and therefore, so are the respective replacement part numbers.



CRANKSHAFT BUSHINGS - CONNECTING RODS



Three types of semi-bushing are available for the connecting rods:

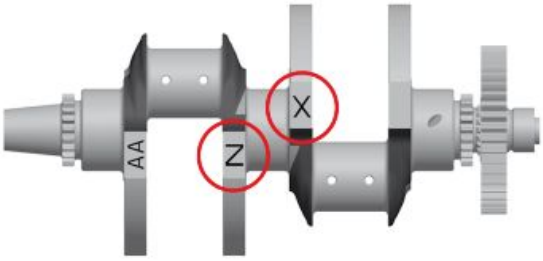
- Blue
- Yellow

- Green

For the coupling of the connecting rod with the crankshaft, according to the engraving on the counter-weights, observe the following table:

BUSHINGS THICKNESS

Bushing colours	Thickness
BLUE	1.547 - 1.552 mm
YELLOW	1.552 - 1.557 mm
GREEN	1.557 - 1.562 mm



CONNECTING RODS COUPLING - CRANKSHAFT

Selection connecting rod pin dimension	Connecting rod pin dimension	Bushing colours	Provided clearance
X	35.885 - 35.880 mm	Blue + Yellow (1)	0.055 - 0.026
Y	35.880 - 35.874 mm	Yellow + Yellow	0.056 - 0.026
Z	35.874 - 35.869 mm	Yellow + Green (1)	0.056 - 0.027

Key:

(1) If using bushing of different thickness, install the thickest on the side of the connecting rod shank

BIG END BUSHING REPLACEMENT PROCEDURE

When replacing the big end bushings, make sure that the tang of the semi-bushing is correctly housed in the corresponding notch in the connecting rod stem or cap.

Bearing fitting

BALANCING COUNTERSHAFT BEARING INSTALLATION

FLYWHEEL-SIDE

- Heat up the crankcase to 150°C (302°F).
- Prepare the following tools:

Specific tooling

020364Y 25 mm adapter

020359Y 42 x 47 mm punch

020376Y Adaptor handle

- Position the new bearing with its groove on the outside diameter facing outward with respect to the crankcase. In this way it will be possible to install the bearing retainer in the groove.

- Using the suitable tools, fit the bearing in the crankcase until tool stops

- Fit the retainer in the bearing groove.
- Tighten the bearing retainer screw.

CLUTCH-SIDE

- Heat up the crankcase to 150°C (302°F).
- Prepare the following tools:

Specific tooling

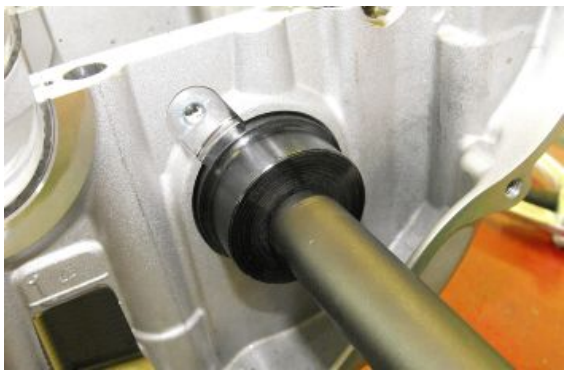
020363Y 20 mm diam. punch for crankshaft oil seal

020359Y 42 x 47 mm punch

020376Y Adaptor handle

- Position the new bearings with their groove on the outside diameter facing outward with respect to the crankcase. In this way it will be possible to install the bearing retainer in the groove.

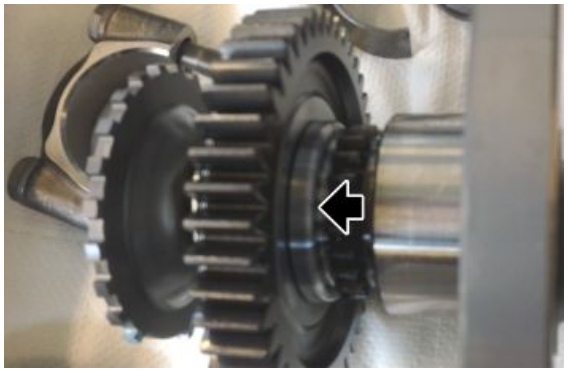
- Using the suitable tools, fit the bearing in the crankcase until tool stops.



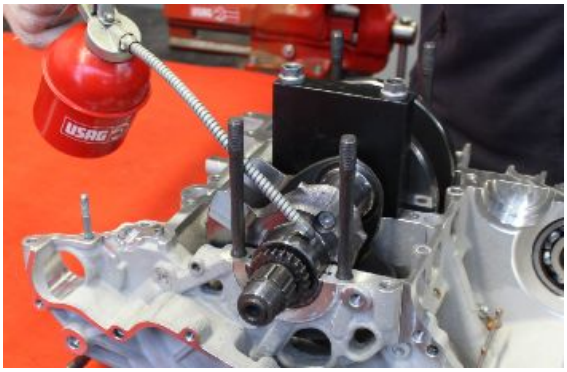
- Fit the retainer in the bearing groove.
- Tighten the bearing retainer screw.
- Install the balancing countershaft.

Crankshaft fitting

When refitting the primary gear, remember to first place the lining as shown in the figure. The greater diameter side is facing outwards the engine.



- Lubricate the crankshaft pins and insert them into their positions.



- Install the connecting rod shank piston assembly in the relative cylinders.
- Join the crankcases.
- If the special tool was used, remove it to keep the pistons from coming out.

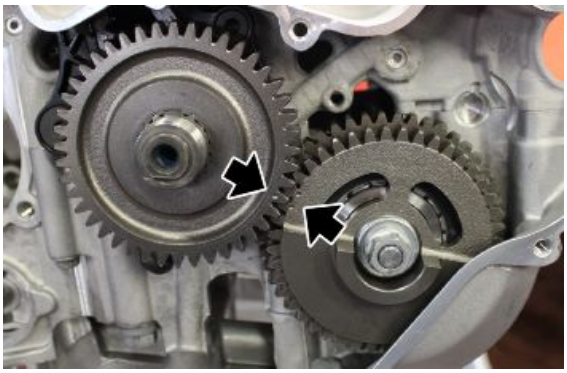
Specific tooling

020858Y Maintenance of the pistons in the cylinders

- Install the primary shaft gear correctly in its seat on the crankshaft from the clutch side.
- Make the references on the gears of the primary shaft and the countershaft coincide.

NOTE

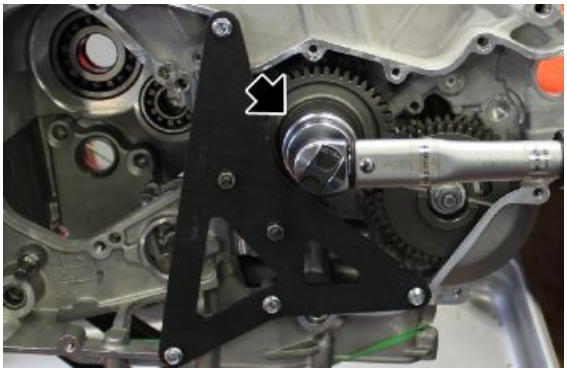
THE BURIN ON THE PRIMARY SHAFT GEAR TOOTH MUST BE INSERTED INTO THE SLOT IDENTIFIED WITH TWO BURINS ON THE COUNTERSHAFT GEAR.



- Install the crankshaft blocking tool.
- Tighten the primary shaft fixing nut.

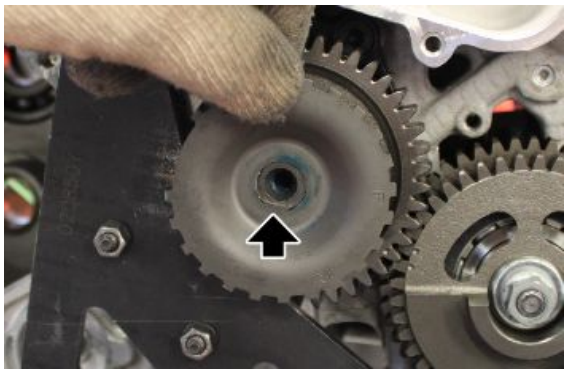
Specific tooling

020850Y Primary gear lock



- Insert the tone wheel on the crankshaft.

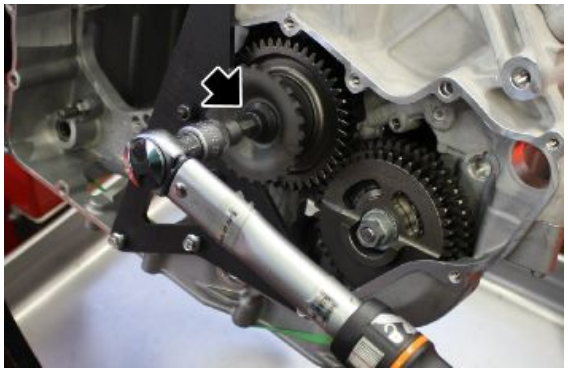
The crankshaft and the tone wheel have a bevel that identifies the fitting direction.



- Tighten the tone wheel fixing screw.
- Remove the special tool.

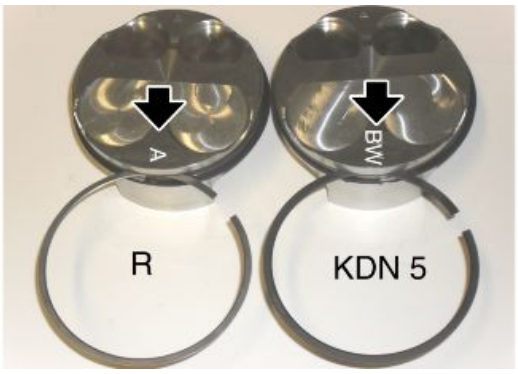
Specific tooling

020850Y Primary gear lock



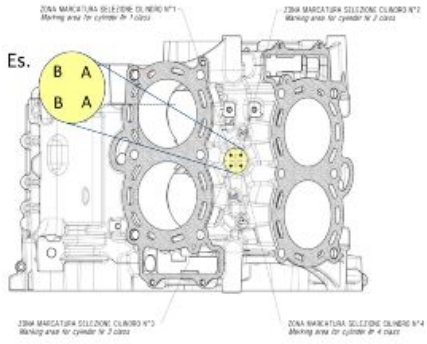
Installing connecting rods - pistons

The piston rings are different and must be fitted with the markings "N" or "KDN5" (for the upper one) and "RN" (for the lower one) facing upward.



The five ring gaps (two piston rings, two oil scraper rings, one oil scraper spring) are fitted displaced 90º to each other, starting from the exhaust-side stud bolt opposite the chain and continuing clockwise.

The fitted pistons have two selections A and B. Therefore they are coupled with the cylinder according to the selection of the latter, which is marked on the upper crankcase halves.



Pre-assemble the pistons on the workbench with the connecting rod shank and the relative semi-bushing.

The pre-assembly procedure is identical for all four pistons and must be done as follows:

- with the piston crown parallel to the workbench and the arrow (1) positioned from the side opposite of the operator, fit the connecting rod shank with the bevelling (2), on the hole of the rod head, on the right side.

- Position the special tool on the crankcase.
- Partially insert the connecting rod shank - piston assembly in the corresponding cylinder with the arrow (on the piston) twisted 45°towards the exhaust.
- When the connecting rod head is low, and has exceed its lubricating jet, rotate the connecting rod shank - piston assembly with the arrow on the piston crown towards the exhaust; the bevel-

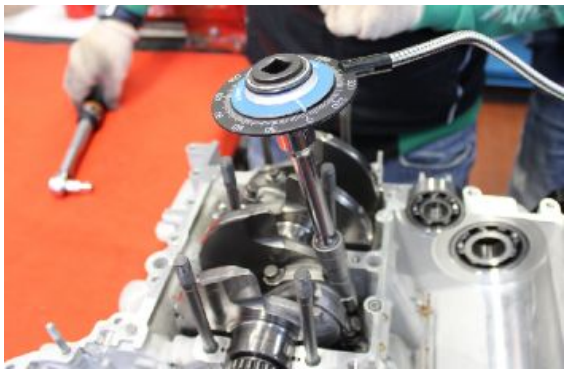
ling on the connecting rod head must face outward of its crank pin.

Specific tooling

020856Y Piston assembly ring

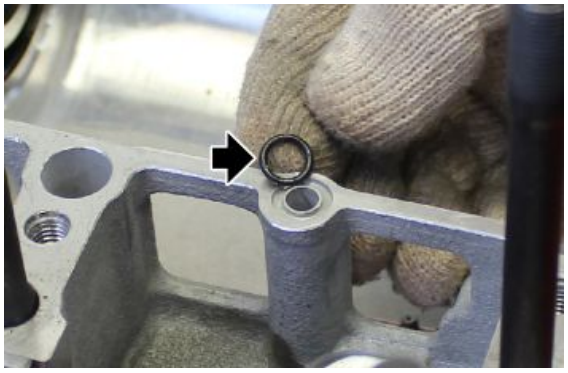
- Remember to couple the connecting rod shank and cap correctly, combining the respective numerical references.
- Use new connecting rod screws, lubricating the thread and under the head..

- Proceed with tightening according to the procedure described in the tightening torque table using the torque wrench and angular tightening with a goniometer.



Crankcase closing

- Insert the crankshaft together with connecting rods and pistons in the upper crankcase.
- Position the three centring dowels in the crankcase.
- Insert a new oil seal O ring in the specific seat.



- Insert the maximum pressure valve in the crankcase, composed of two separate parts

- Apply a layer of sealing paste along the external edge of the crankcase.
- Join the two crankcases.

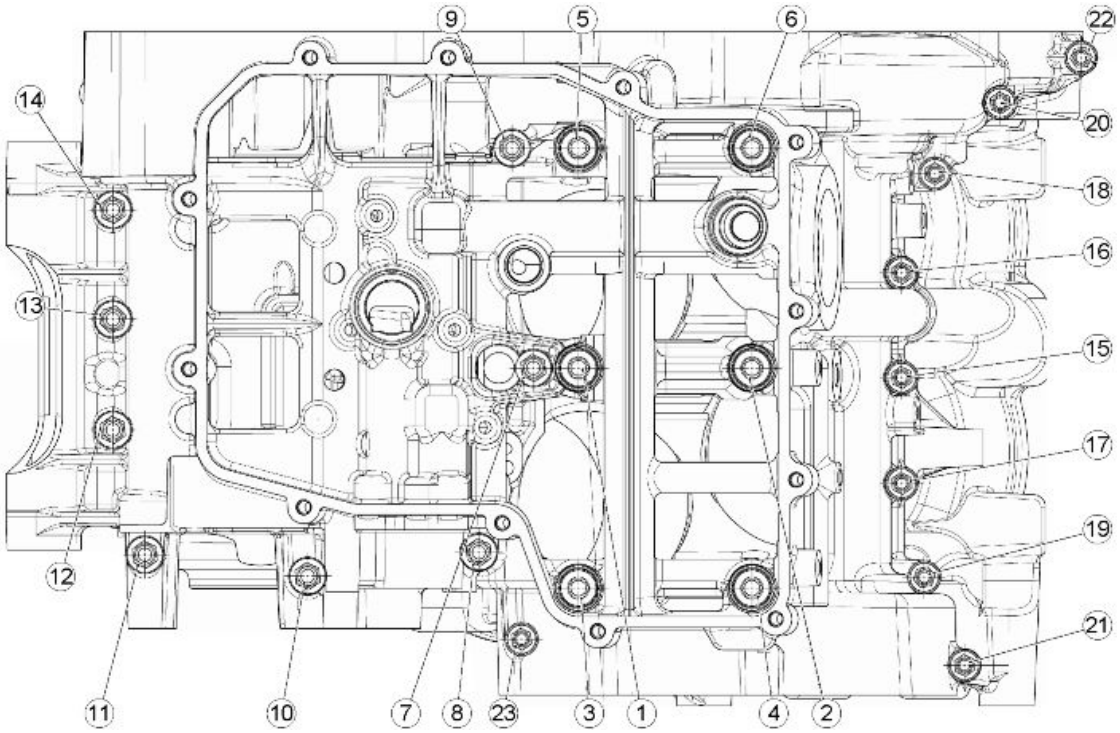
Recommended products

Three bond Sealing paste

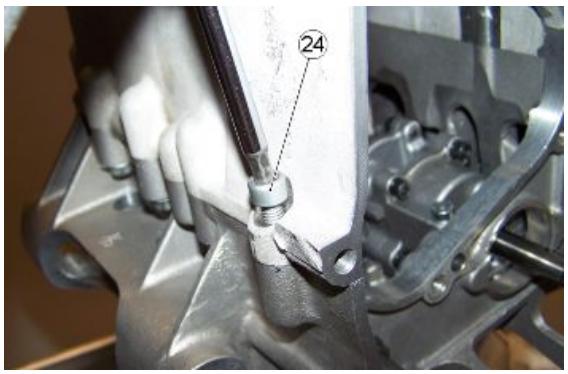
-

- Pretighten the six nuts on the stud bolts proceeding in the following order: 1 - 2 - 3 - 4 - 5 - 6.
- Then tighten them fully following the same order.

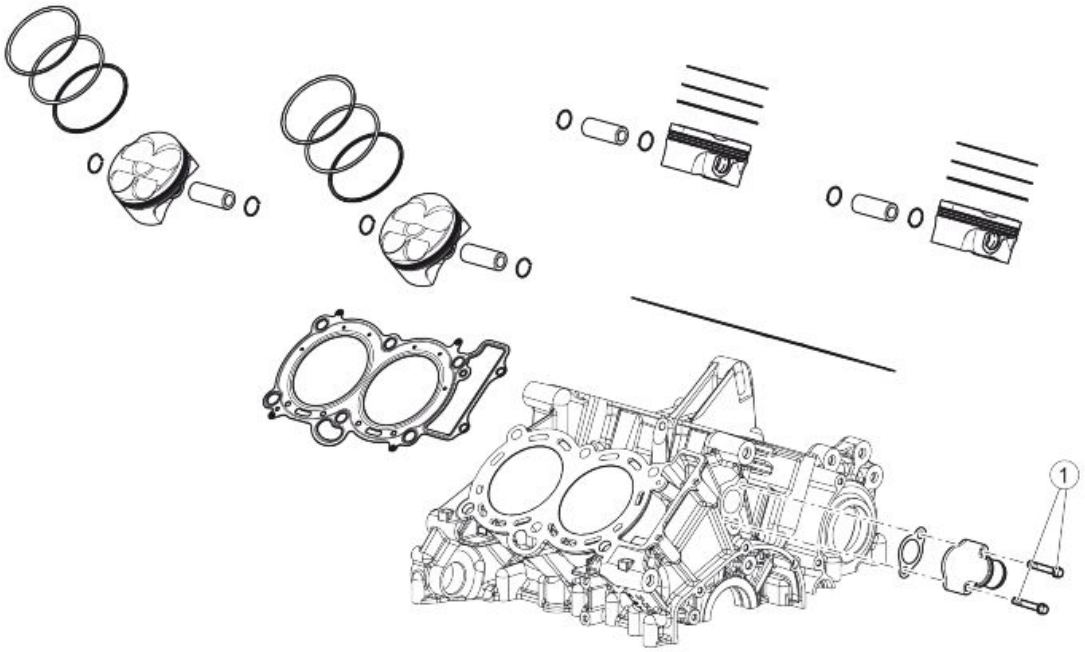
- Pre-tighten the screws in the following order: 7 - 8 - 9 - 10 - 11 - 12 - 13 - 14 - 15 - 16 - 17 - 18 - 19 - 20 - 21 - 22 - 23.
- Then tighten them fully following the same order.



- Turn the engine with the heads facing upward.
- Tighten the screw (24).



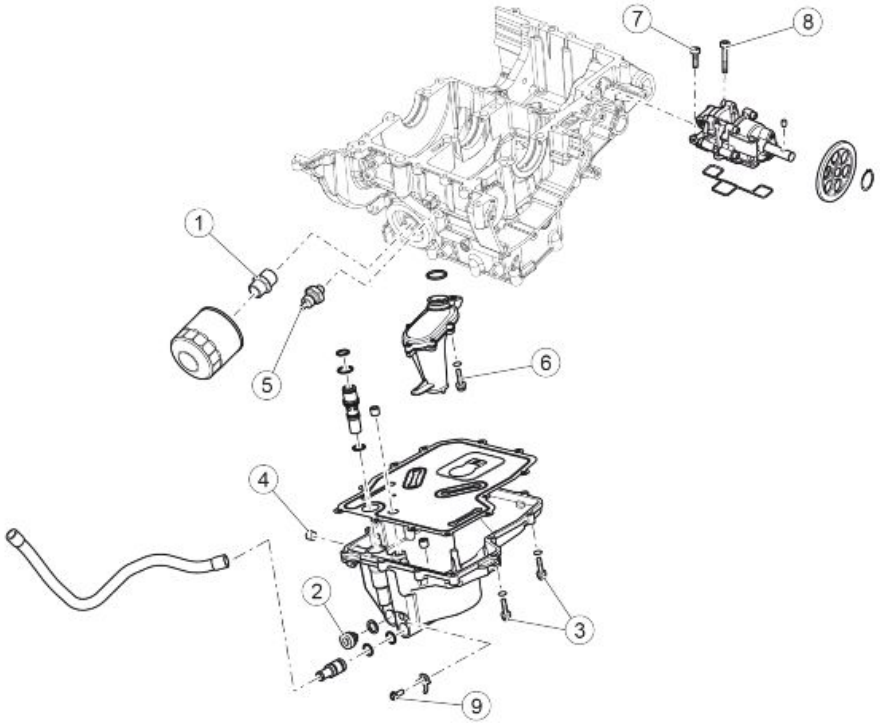
Thermal group



CYLINDERS - PISTON

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fastening water union onto crankcase	M6x40	2	10 Nm (7.38 lb ft)	-

Lubrication



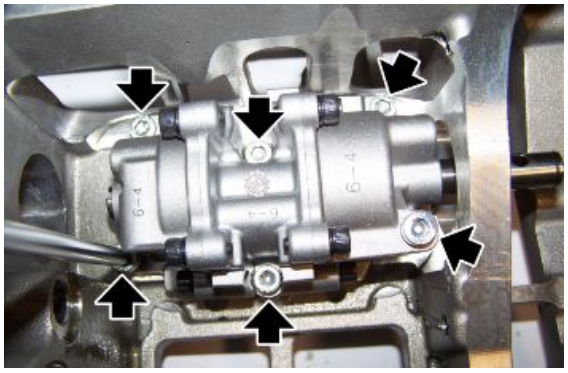
LUBRICATION

pos.	Description	Type	Quantity	Torque	Notes
1	Oil filter coupling fastening screw	-	1	30 Nm (22.13 lb ft)	-
2	Oil drainage plug	-	1	30 Nm (22.13 lb ft)	-
3	Oil sump fixing screws	M6x30	12	12 Nm (8.85 lb ft)	Tighten to torque, unscrew and re-tighten to torque.
4	Ergal conical cap	-	3	*	* Move to 1mm under the table.
5	Oil pressure sensor	-	1	15 Nm (11.06 lb ft)	-
6	TE Flanged screw	-	1	10 Nm (7.38 lb ft)	Loct. 243
7	SHC screw	-	5	10 Nm (7.38 lb ft)	-
8	SHC screw	-	1	10 Nm (7.38 lb ft)	-
9	TE Flanged screw	-	1	6 Nm (4.43 lb ft)	-

Oil pump

Removing

- Remove the gearbox.
- Remove the water pump.
- Unscrew and remove the six screws fastening the oil pump to the crankcase.
- Remove the oil pumps.



OIL PUMP REMOVAL

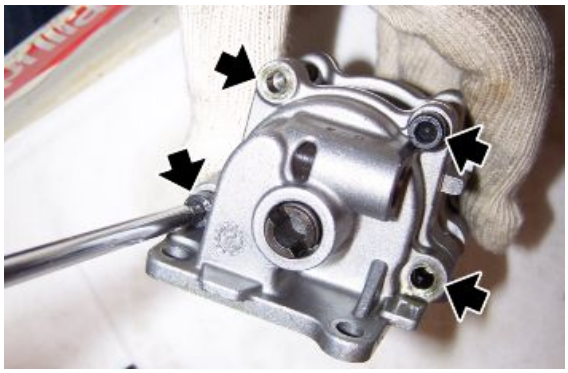
- Place the oil pumps on a work table.
- Remove the gasket.

See also

Removing the gearbox

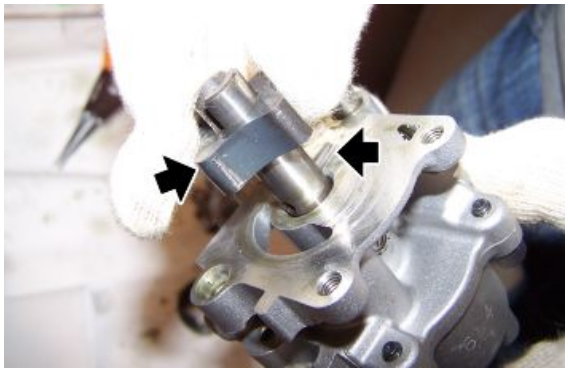
Water pump

- Unscrew and remove the four cooling oil pump cover screws

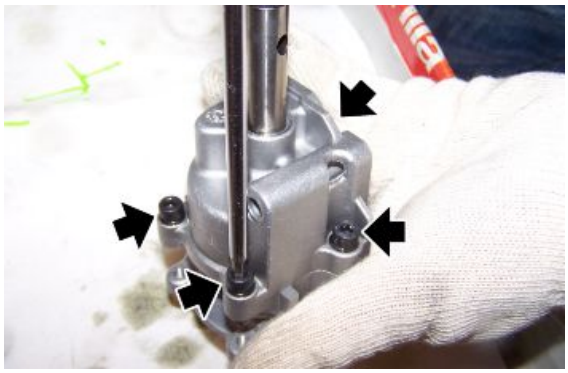


- Remove the cooling oil pump cover.
- Collect the two dowel pins.
- Remove the external rotor from the cover.

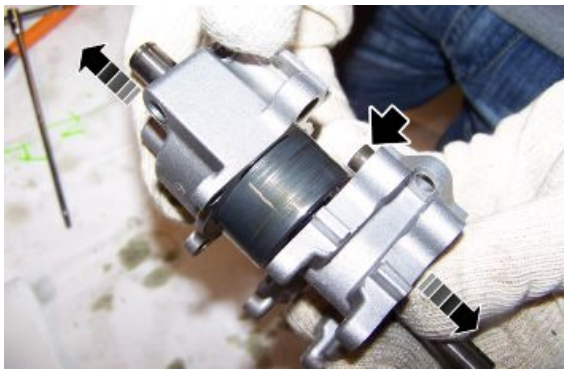
- Remove the internal oil cooling rotor.
- Collect the hitch pin.



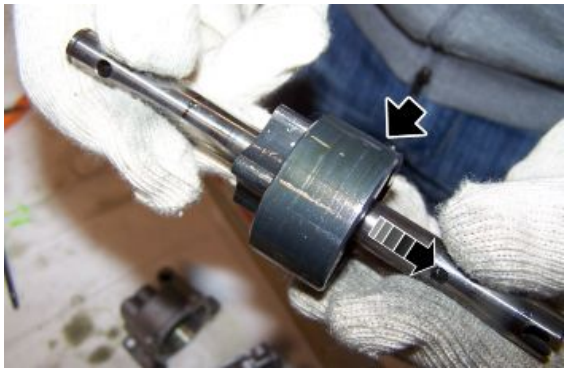
- Unscrew and remove the four lubrication oil pump cover screws.



- Remove the lubrication oil pump cover and the intermediate pump casing from the shaft.
- Collect the two dowel pins.



- Remove the external lubrication rotor.



- Remove the internal oil lubrication rotor
- Collect the drive spindle.

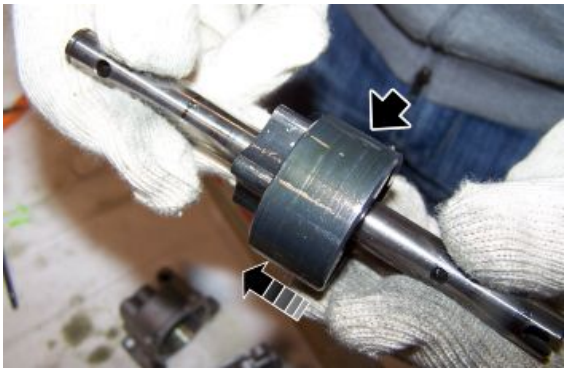
Installing

- Position the lubrication pump internal rotor on the oil pump control shaft

The lubrication pump components are larger than the cooling pump components.
The lubrication pump must be fit onto the shaft from the side with the Seeger ring seat for fastening the gear.

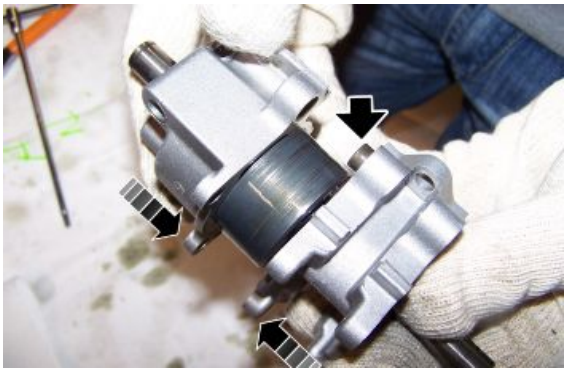
- Install the drive spindle on the shaft.

- Position the external rotor on the lubrication pump's internal rotor.

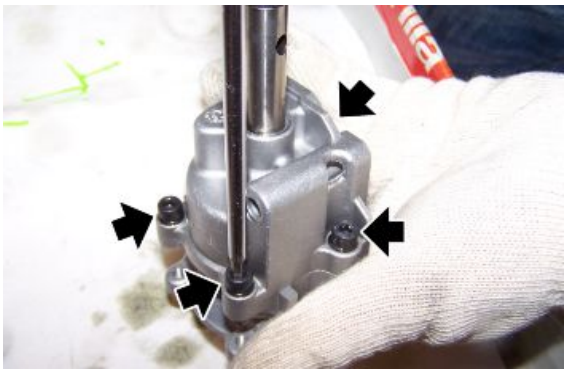


- Position the dowel pins.
- Position the pump cover and the intermediate pump casing on the lubrication pump's external rotor.

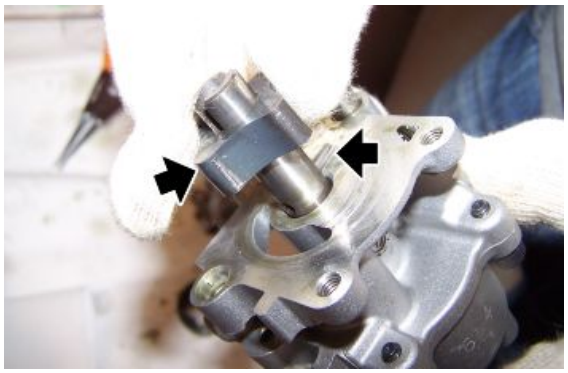
To check that the intermediate casing is oriented correctly, check the gasket seat.



- Tighten the four lubrication oil pump cover screws.

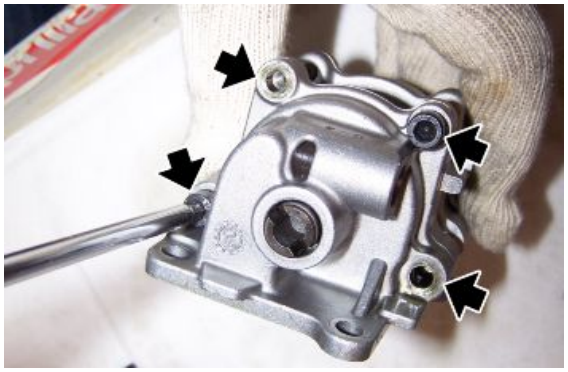


- Position the hitch pin on the oil pump control shaft.
- Position the oil cooling pump's internal rotor.



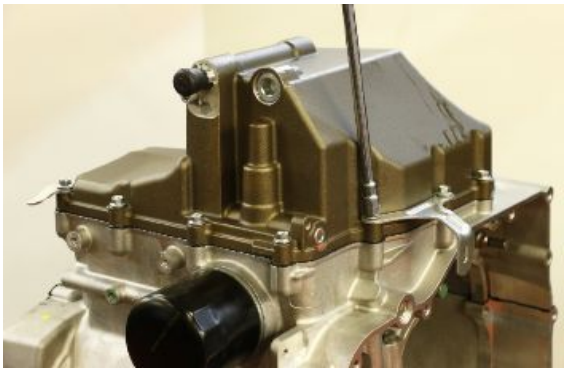
- Position the dowel pins and the external rotor on the cooling oil pump cover.
- Fit the pump cover on the internal rotor.

- Tighten the four cooling oil pump cover screws.
- Fit a new gasket.



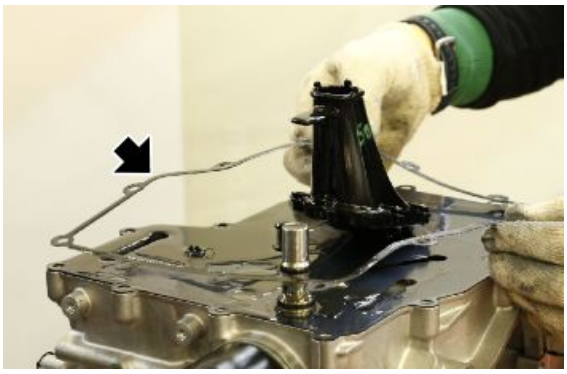
Removing the oil sump

- Drain the engine oil.
- Unscrew and remove the twelve oil sump screws.



- Remove the oil sump

- Remove the upper gasket

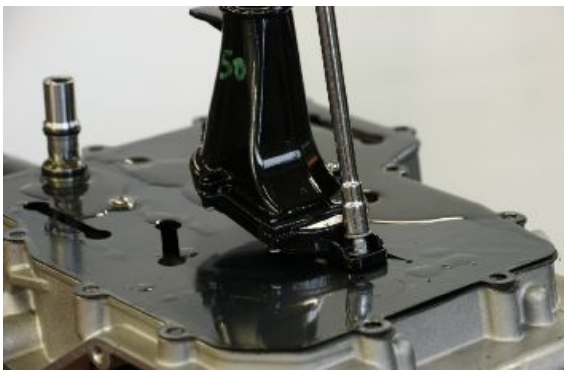


- Remove the rose pipe together with the gasket

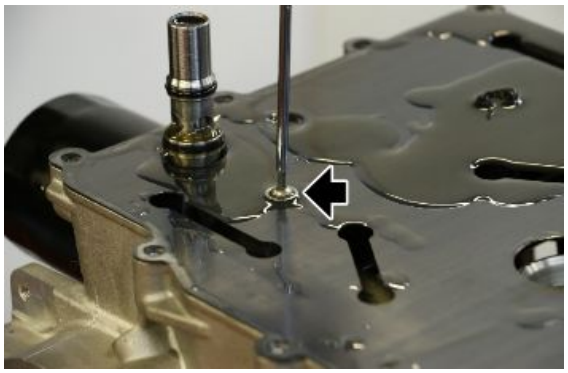
CAUTION

THE ROSE PIPE MUST BE CAREFULLY CLEANED IN THE EVENT THAT THE ENGINE IS COMPLETELY OVER-HAULED OR IN CASE OF PROBLEM WHICH MAY HAVE GENERATED SUSPENDED DEBRIS IN THE OIL.

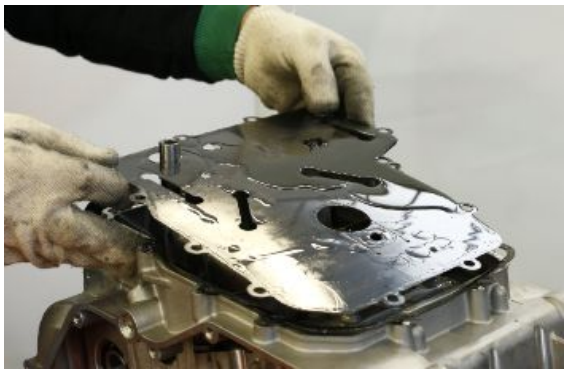
DURING REFITTING REPLACE THE GASKET WITH A NEW ONE OF THE SAME TYPE.



- Remove the metal gasket central fixing screw



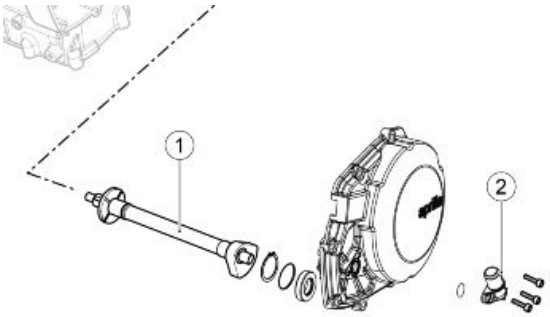
- Remove the metal gasket



- Remove the lower gasket

- Remove the overpressure valve together with gasket

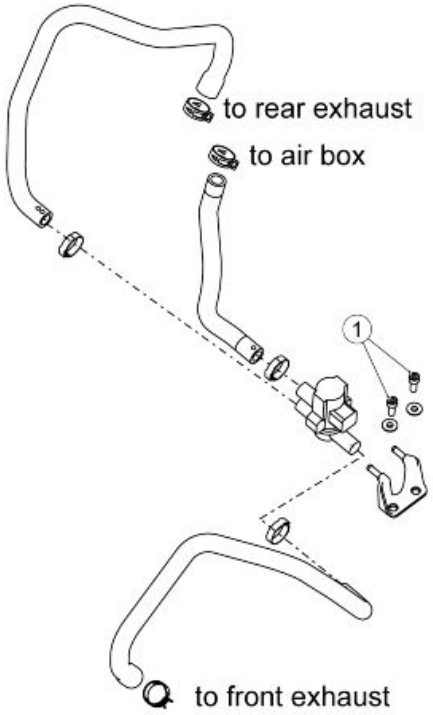
Blow-by



The Blow-by system uses the rotation of the countershaft (1) to separate the engine oil into oil vapour and liquid.

The oil vapours exit from the fitting (2) on the alternator cover and enter the air filter box whereas the liquid returns to the oil sump.

SAS valve



SECONDARY AIR SYSTEM

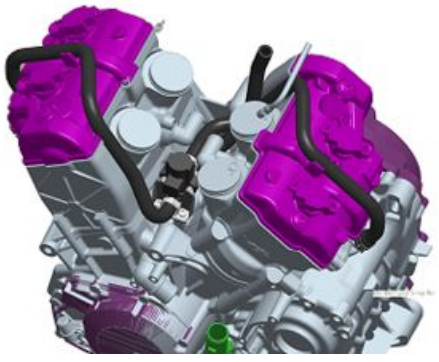
Pos.	Description	Type	Quantity	Torque	Notes
1	Secondary air solenoid screws	-	2	10 Nm (7.38 lb ft)	-

Diagram

Valve controlled by control unit which delivers aspirated air from the filter box to the exhaust manifolds.

The advantages of this function are twofold:

- the catalytic converter reaches the operating temperature more quickly;
- it permits the use of richer mixtures in some critical conditions (e.g. at idle or low engine speeds).



Inspecting the one-way valve

- Unscrew and remove the three screws.

- Remove the cover together with the two secondary air system valves.

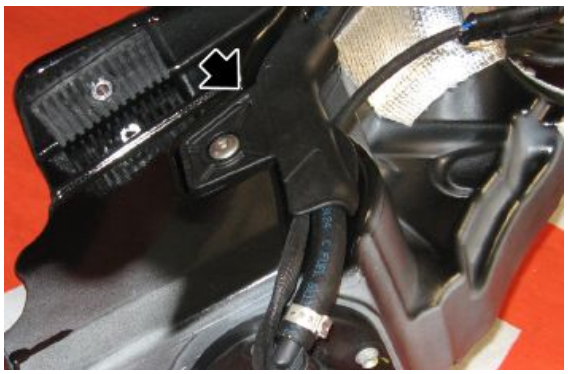
INDEX OF TOPICS

POWER SUPPLY	P SUPP

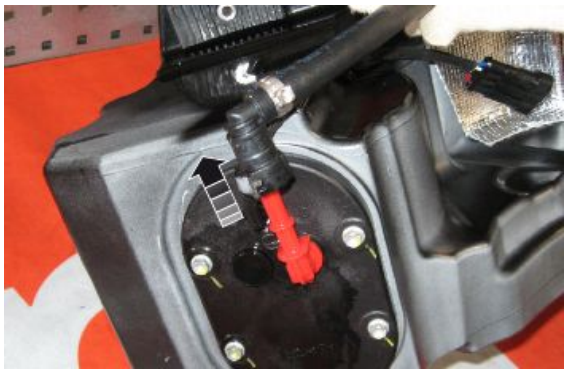
Fuel pump

Removing

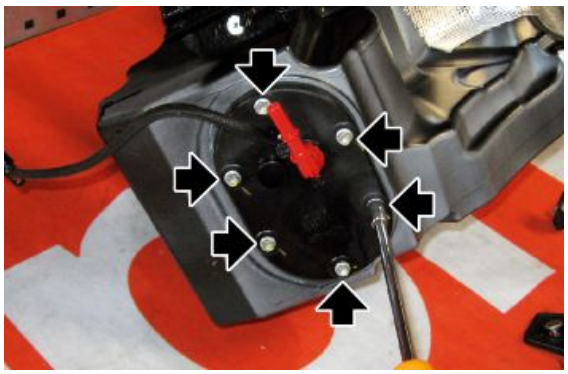
- Remove and empty the fuel tank.
- Remove the pipe grommet.



- Disconnect the fuel pipe from the fuel pump



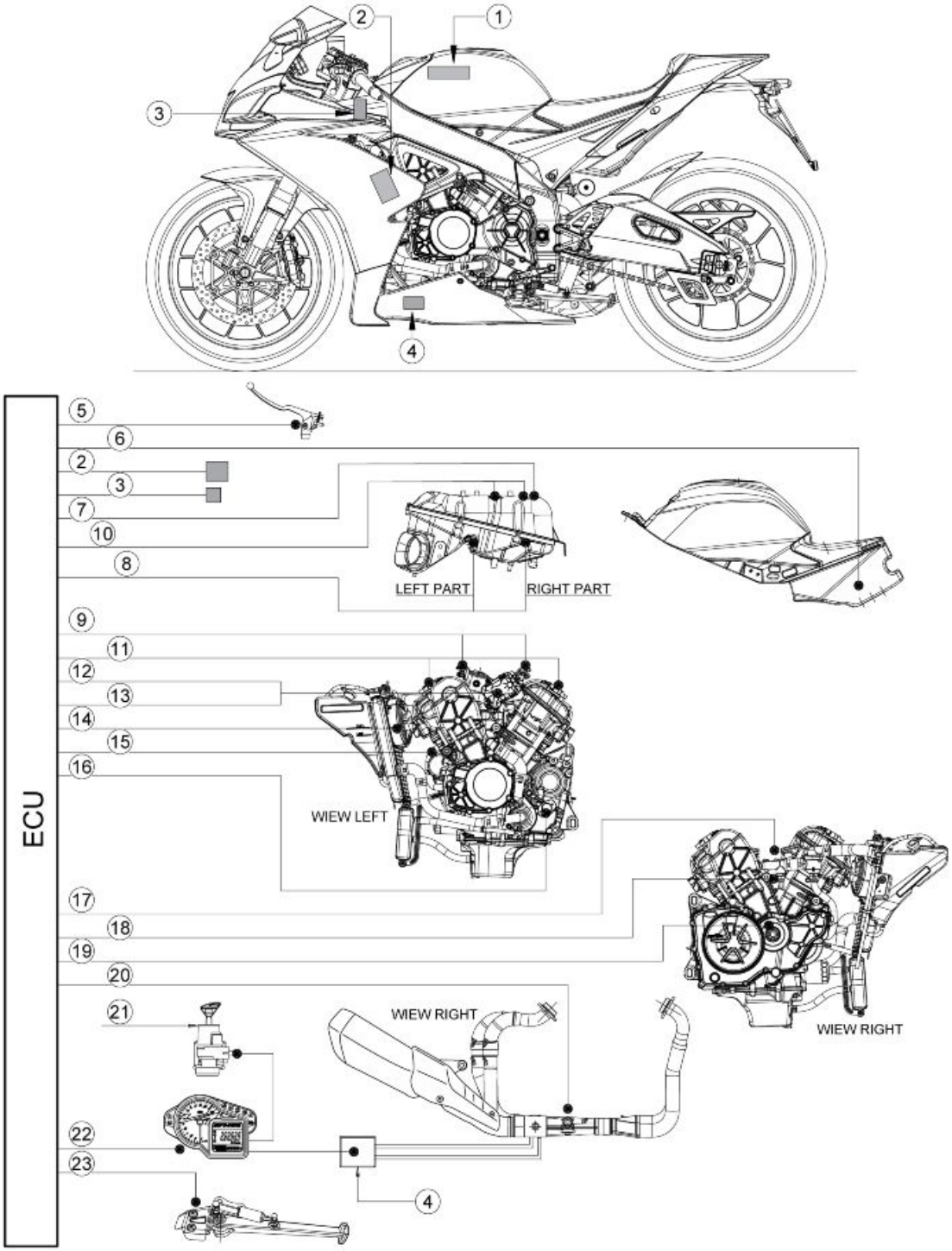
- Unscrew and remove the six fixing screws of the fuel pump



- Remove the fuel pump

Injection

Diagram



key:

1. Control unit position
2. Throttle grip position sensor

3. Fall sensor
4. Exhaust valve
5. Clutch position sensor
6. Fuel pump (inside the tank)
7. Air temperature sensor
8. Air pressure sensor (MAP)
9. Lower injectors
10. Upper injectors
11. Coils (spark plug cover)
12. Engine throttle valves
13. Throttle valve position sensor
14. Electric fan
15. Starter motor
16. Gear position sensor
17. Secondary air injection valve
18. Coolant temperature sensor
19. Crankshaft position sensor
20. Lambda probe
21. Ignition switch
22. Instrument panel
23. Side stand sensor

Ride by Wire

Operating logic

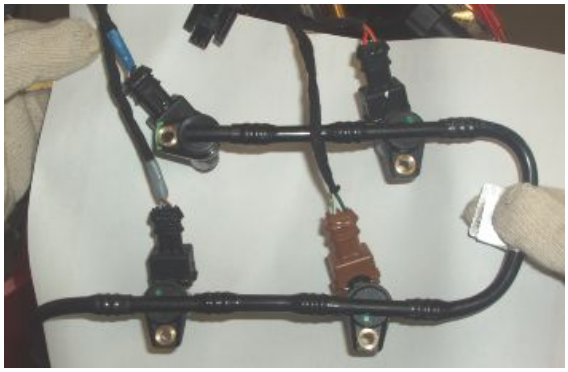
Those riding motorbikes do not require a specific throttle valve opening from their engines but actually a specific torque. The Ride by Wire system has been so designed that the throttles of the throttle bodies are mechanically isolated from the throttle control; their actuation depends exclusively on 2 electrical motors controlled by the control unit. The control unit refers to specific handle maps to determine by how much and how quickly the throttle valves are opened. The parameters influencing the handle map are as follows:

- Handle aperture
- Engine rpm
- Handle aperture rate

The Marelli control unit performs the following functions:

1. Implements the necessary strategies for calculating torque demand
2. Operates the sensors and actuators necessary for system function
3. Safety checks for the Ride by Wire system

Removing the injector

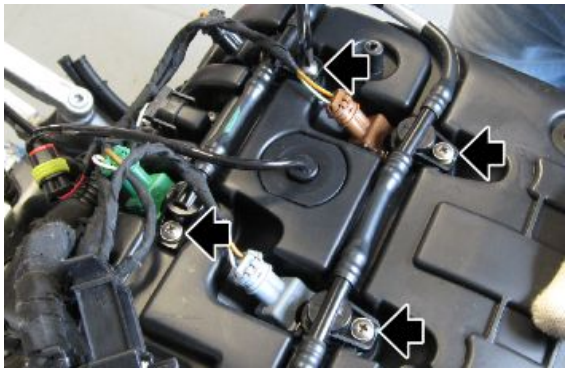


To optimise engine performance, there are four lower injectors on the throttle bodies and four upper injectors on the filter box. Except during transition stages, only the lower or the upper injectors are working at any given time.

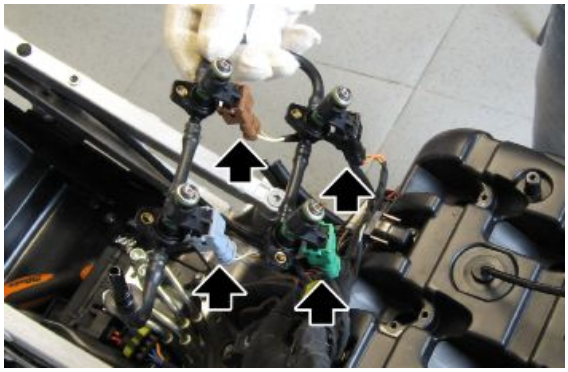
- The lower injectors optimise tractability and reduce emissions and fuel consumption
- The upper injectors are designed for maximum power output and, as a result, have a high fuel flow rate

The electrical connectors are colour coded as follows to prevent accidentally swapping the injector connectors:

- Cylinder 1: Black
- Cylinder 2: Brown
- Cylinder 3: Green
- Cylinder 4: Grey



- To remove the complete injectors unit, disconnect and remove the engine control unit complete with support
- Undo the four screws fixing the injectors unit to the filter box



- Remove the complete injectors unit from the filter box, disconnect the four connectors of the injectors and remove the complete injectors unit.

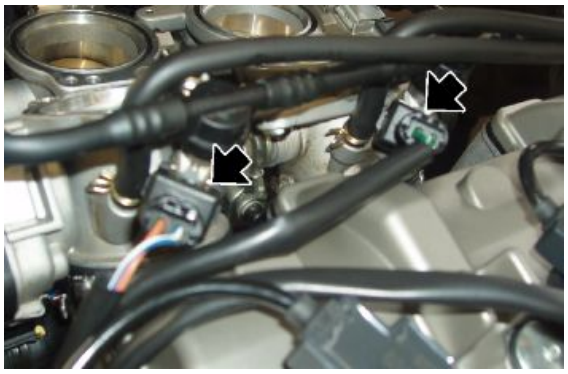
Removing the throttle body

- Completely remove the air filter box.
- Disconnect the injector fuel pipe.
- Release the snap fit clamp on the collars from the engine.

NOTE

DO NOT RELEASE THE CLAMPS COMPLETELY. LEAVE IN AN INTERMEDIATE POSITION TO FACILITATE REFITTING.

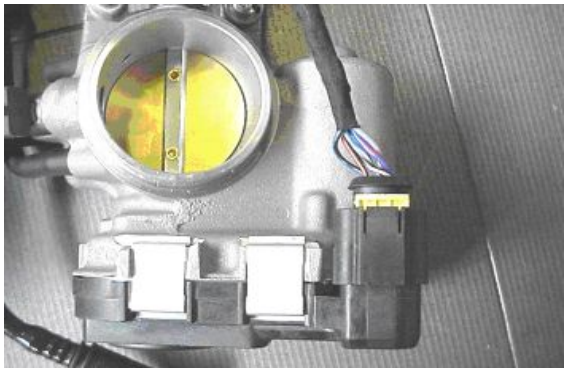
- Disconnect the lower injector connectors.



See also

Air box

- Disconnect the connector.
- Remove the complete throttle body.

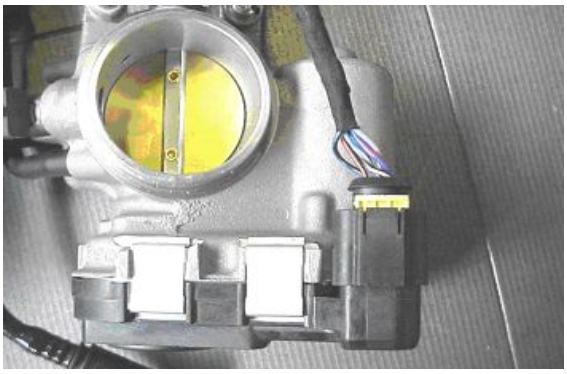


Checking the throttle body

The throttle bodies are maintenance free and are not serviceable. Replace the entire assembly in the event of malfunction.
As all the internal components of the throttle body assembly (potentiometers and electrical motor) are contactless, no electrical diagnosis is possible.
Functional tests are performed on the throttle body assembly by the control unit during vehicle operation, with the results visible on the diagnostic instrument.
The only action possible before replacing the component is checking the connectors and cable harnesses.

Installing the throttle body

- When installing the throttle body, refer to the electrical system section for the correct cable routing.
- Ensure that the injector connectors are correctly fastened.
- Connect the control unit connector, ensuring that the security lock is in the locked position.



Stepper motor

The control unit regulates the idle speed by controlling the throttle body motors directly. As a result, idle speed adjustment and maintenance of the components involved in idle speed regulation (stepper motors, thermoactuators, etc.) are not necessary.

Variable geometry intake

To access the variable geometry intake system, remove the air filter box cover.

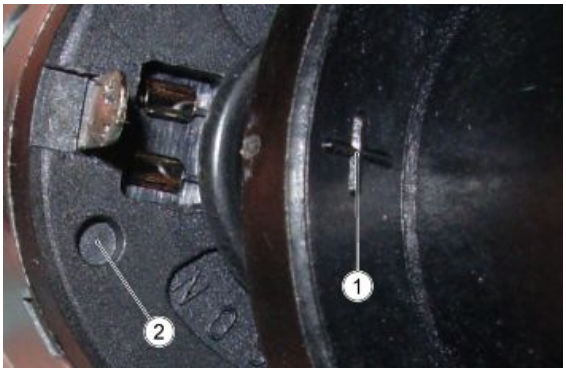
The system consists of: two intake ducts for each manifold, which may be joined (short ducts) or separated (long ducts)

Electric motor

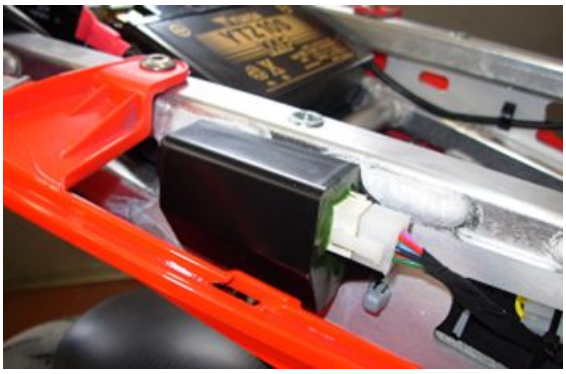
This is a DC motor actuating the upper portion of the intake ducts through an endless circuit.

CAUTION

TAKE PARTICULAR CARE DURING REASSEMBLY. THE POSITIVE SIDE (1) OF THE CONNECTOR MUST MATCH WITH THE SIDE WHERE A NOTCH (2) IS INDICATED.



a variable geometry control unit for managing the system, interfaced with the engine injection control unit



Operation

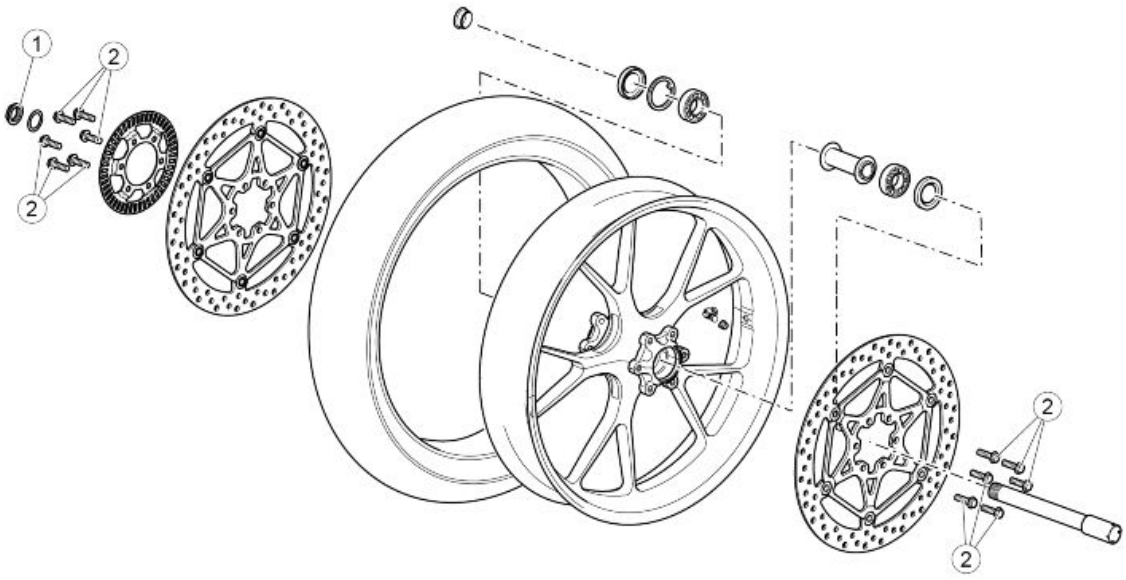
At key-ON, the variable geometry control unit lowers the ducts (if still in the raised position). Subsequently, depending on the control voltage on PIN 2 from the injection ECU (0V down, 5V up), the ECU drives the electric motor with the relative polarity for raising or lowering the ducts.

The drive voltage delivered to the motor is determined in relation to battery voltage and the motor is stopped once a given current limit is reached or if the time-out period of 500 ms has elapsed.
There is no feedback relative to duct position! If in doubt, use the diagnostic instrument to actuate the ducts.
In the case of a defect in the variable geometry control unit, an error message is sent immediately to the engine injection ECU.
The variable geometry control unit does store errors

INDEX OF TOPICS

SUSPENSIONS	SUSP

Front



FRONT WHEEL

Pos.	Description	Type	Quantity	Torque	Notes
1	Front wheel pin nut	M25x1.5	1	80 Nm (59.00 lb ft)	-
2	Front brake disk fastening screws	M8	6 + 6	30 Nm (22.13 lb ft)	Loct. 243

Removing the front wheel

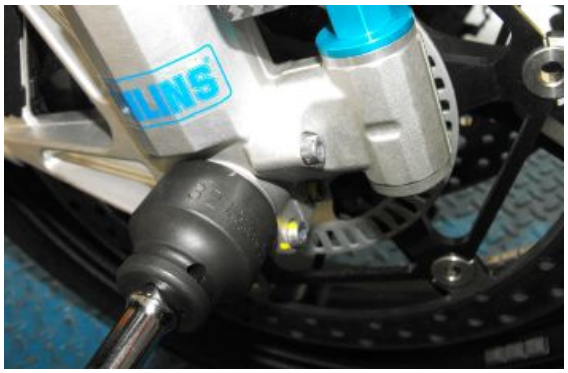
- Support the front part of the motorcycle.
- Remove the front mudguard.

- Unscrew the screws fixing the front pliers and slide them off the disc.

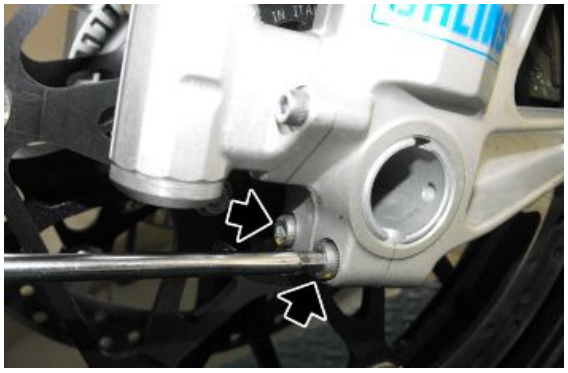
See also

Front mudguard

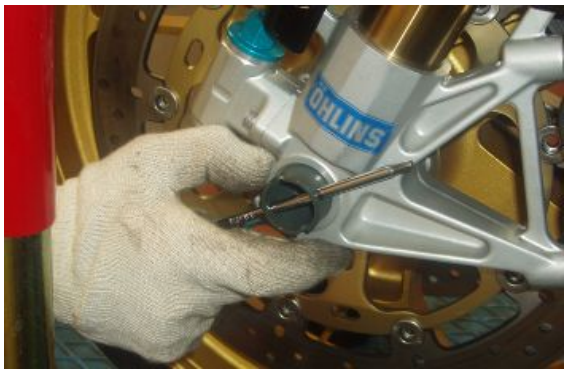
- Remove the wheel hub fastening nut.
- Retrieve the sealing washer.



- Loosen the screws on the wheel axle clamps.



- Tap the wheel axle slightly with a rubber mallet so that the hole on the opposite side is exposed.
- Remove the wheel axle by inserting a screwdriver in the holes on the pin.



- Support the wheel while extracting the pin, and then remove it.

Checking the front wheel

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.

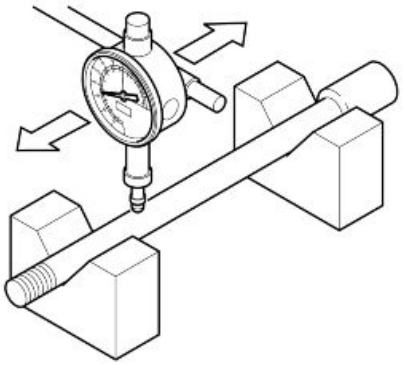
SEALS

- 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.

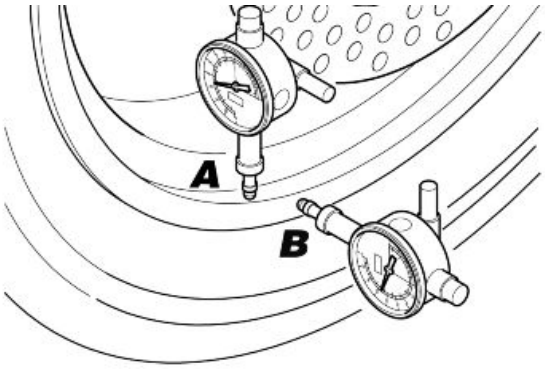


Characteristic

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.

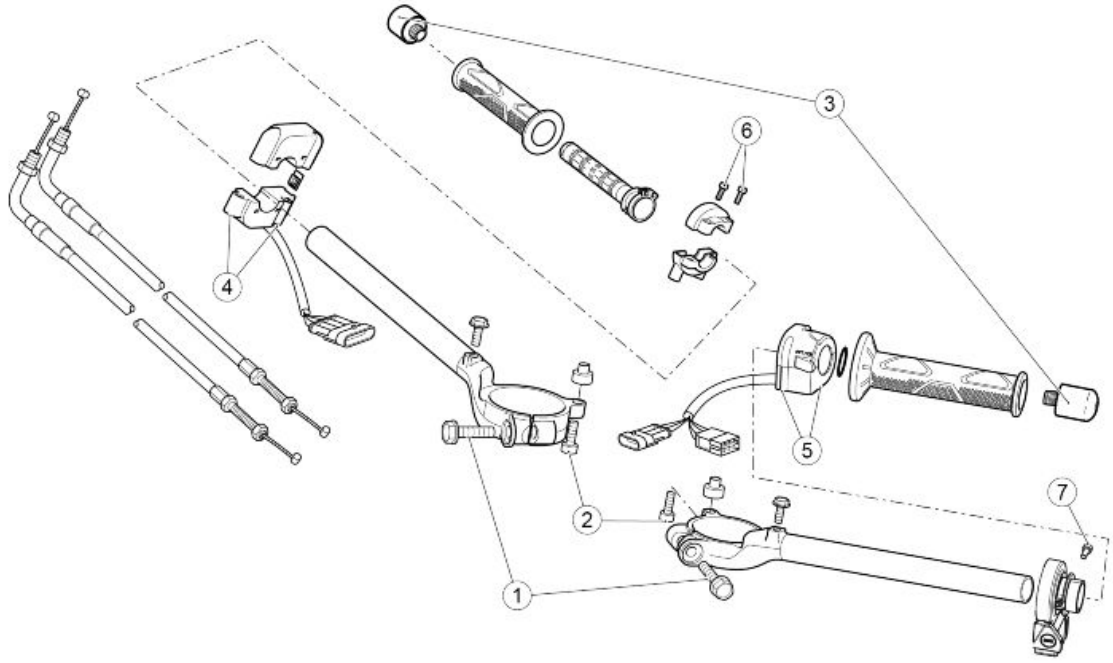


Characteristic

Maximum radial and axial eccentricity:

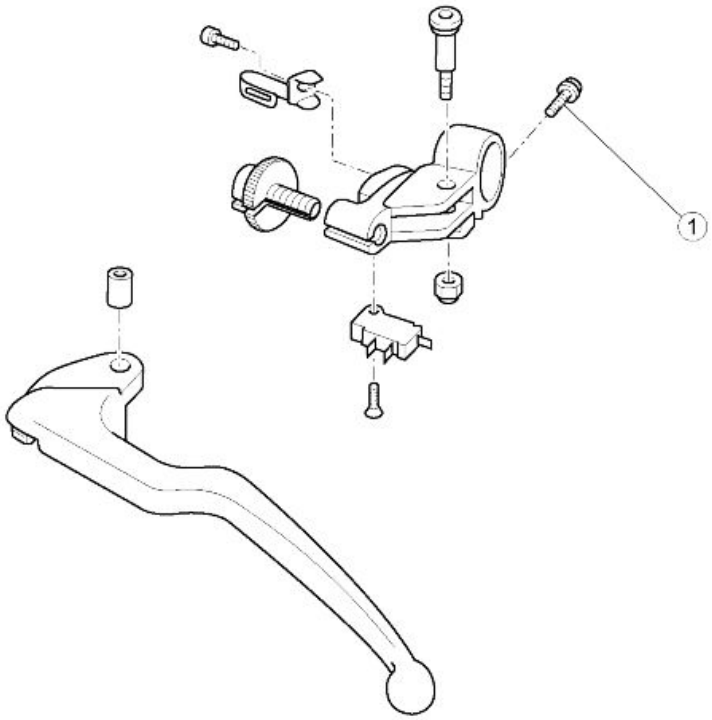
0.8 mm (0.031 in)

Handlebar



HANDLEBAR AND CONTROLS

pos.	Description	Type	Quantity	Torque	Notes
1	Screws for fastening the handlebar collar to the forks sleeves	M8	1 + 1	25 Nm (18.44 lb ft)	-
2	Handlebar safety screw	M6	1+1	10 Nm (7.38 lb ft)	-
3	Anti-vibration counterweight fastener	M18x1.5	1+1	20 Nm (14.75 lb ft)	-
4	Right hand light switch	M4	2	1.5 Nm (1.11 lb ft)	-
5	Left light switch	M5	2	1.5 Nm (1.11 lb ft)	-
6	Throttle control fixing screws	M5	2	2 Nm (1.48 lb ft)	-
7	Traction control unit fixing screw	M4	1	2.5 Nm (1.84 lb ft)	-

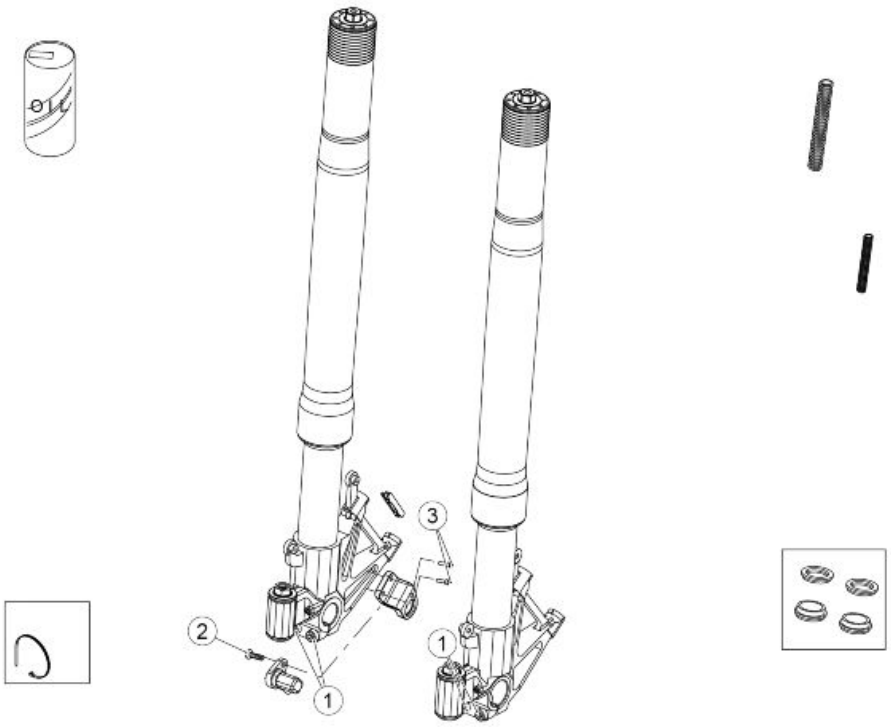


CLUTCH LEVER

Pos.	Description	Type	Quantity	Torque	Notes
1	Clutch lever collar fastening screws	M6	1	10 Nm (7.38 lb ft)	-

Front fork

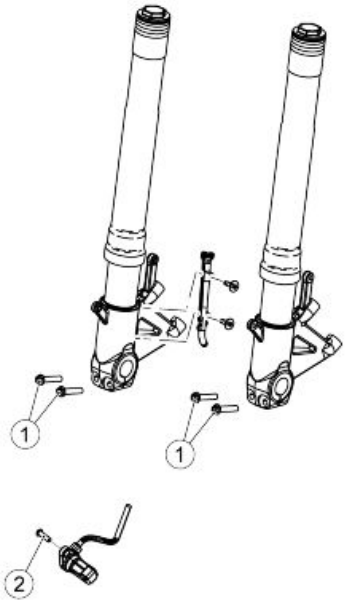
(OHLINS FORKS)

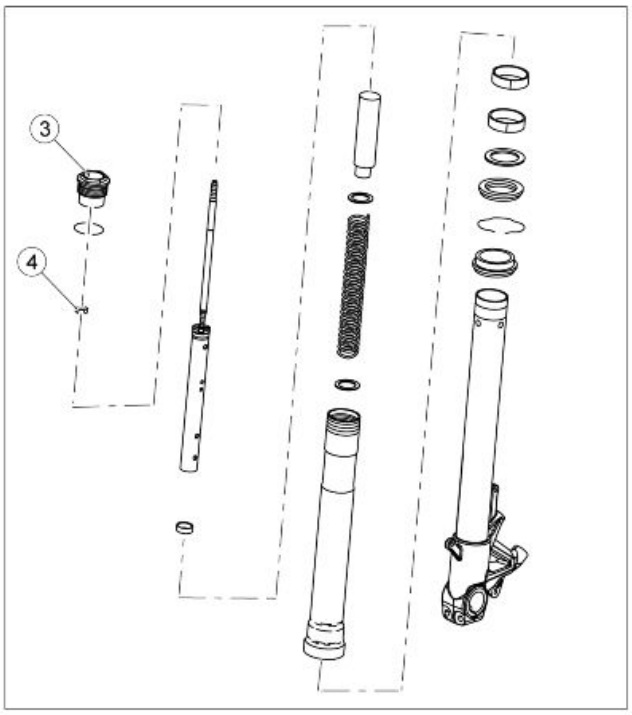


FRONT FORK - OHLINS

pos.	Description	Type	Quantity	Torque	Notes
1	Fork feet hub fastening screws (Ohlins)	M6	2 + 2	12 Nm (8.85 lb ft)	-
2	Speed sensor fastening screw	M5	1	6 Nm (4.43 lb ft)	-
3	Speed sensor bracket screws	M5	2	8 Nm (5.90 lb ft)	-

(SACHS FORKS)



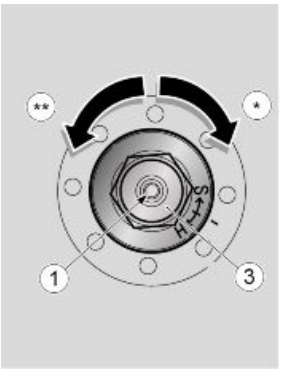


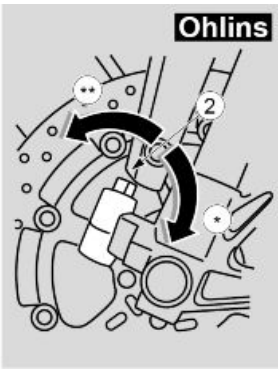
FRONT FORKS - SACHS

Pos.	Description	Type	Quantity	Torque	Notes
1	Calliper bracket fixing screws (Sachs)	M6	4	12 Nm (8.85 lb ft)	-
2	Speed sensor fastening screw	M5	1	6 Nm (4.43 lb ft)	-
3	Upper cap	-	2	20 Nm (14.75 lb ft)	-
4	Upper cap locking nut	-	2	20 Nm (14.75 lb ft)	-

Adjustment

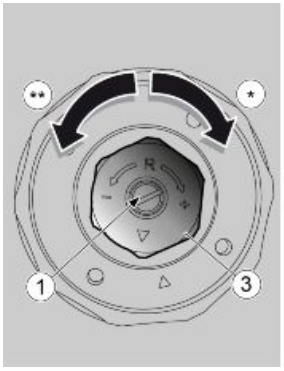
Standard front fork setting is adjusted to suit most high and low speed riding conditions, whether the vehicle is partially or fully loaded.
However, the setting can be modified for specific needs according to vehicle use.

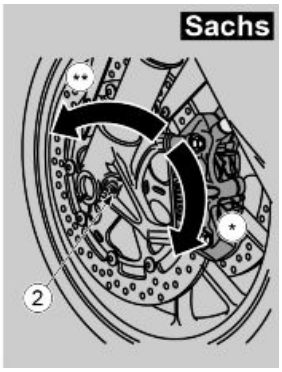




RACING TRACK SETTINGS MUST BE DONE ONLY FOR OFFICIAL COMPETITIONS OR SPORTS EVENTS WHICH ARE, IN ALL CASES, AWAY FROM NORMAL ROAD TRAF-

FIC AND WITH THE AUTHORISATION OF THE RELEVANT AUTHORITIES.
IT IS STRICTLY FORBIDDEN TO RIDE A VEHICLE SET FOR RACING ON ROADS AND MOTORWAYS.

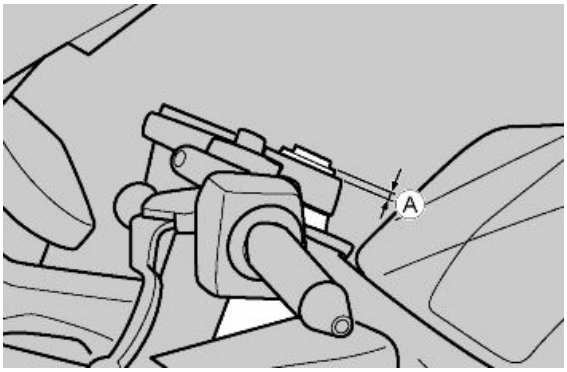




TO COUNT THE NUMBER OF RELEASES AND/OR REVOLUTIONS OF ADJUSTMENT SETTINGS (1 - 2) ALWAYS START FROM THE MOST RIGID SETTING (WHOLE CLOCKWISE ROTATION OF THE SETTING). WHEN COUNTING THE NUMBER OF CLICKS AND/OR TURNS OF ADJUSTMENT SCREW (3), ALWAYS START FROM THE SOFTEST SETTING (ADJUSTER SCREW TURNED FULLY ANTICLOCKWISE).

CAUTION

TO COUNT THE NUMBER OF RELEASES AND/OR REVOLUTIONS OF ADJUSTMENT SETTINGS ALWAYS START FROM THE MOST RIGID SETTING (WHOLE CLOCKWISE ROTATION OF THE SETTING). IN ORDER TO AVOID DAMAGES DO NOT FORCE THE SET SCREWS TO TURN BEYOND THE END OF THE STROKE ON BOTH SIDES.



FRONT FORK - RSV4 1000 RF - STANDARD ADJUSTMENT (OHLINS) (FOR ROAD USE ONLY)

Specification	Desc./Quantity
Rebound damping adjustment, screw (1)	Unscrew (**) 12 clicks from fully closed (*)
Compression damping adjustment, screw (2)	Unscrew (**) 12 clicks from fully closed (*)
Spring preloading, nut (3)	screw (*) 8 turns from fully open (**)
Stems (A) (***) protrusion from top plate (excluding cover)	3 notches/ 12 mm (3 notches/0.47 in)

FRONT FORK - RSV4 1000 RF - RACING ADJUSTMENT RANGE (OHLINS) (TRACK USE ONLY)

Specification	Desc./Quantity
Rebound damping adjustment, screw (1)	Unscrew (**) 6 clicks from fully closed (*)
Compression damping adjustment, screw (2)	Unscrew (**) 4 clicks from fully closed (*)
Spring preloading, nut (3)	screw (*) 10 turns from fully open (**)
Stems (A) (***) protrusion from top plate (excluding cover)	3 notches/ 12 mm (3 notches/0.47 in)

FRONT FORK - RSV4 1000 RR - STANDARD SETTING (SACHS - FOR ROAD USE ONLY)

Specification	Desc./Quantity
Rebound damping adjustment, screw (1)	Unscrew (**) 10 clicks from fully closed (*)
Compression damping adjustment, screw (2)	Unscrew (**) 6 clicks from fully closed (*)
Spring pre-loading, nut (3)	screw (*) 5 turns from fully open (**)
Stems (A) (***) protrusion from top plate (excluding cover)	2 notches/ 8 mm (2 notches/0.31 in)

FRONT FORK - RSV4 1000 RR - RACING ADJUSTMENT RANGE (SACHS - TRACK USE ONLY)

Specification	Desc./Quantity
Rebound damping adjustment, screw (1)	Unscrew (**) 8 clicks from fully closed (*)
Compression damping adjustment, screw (2)	Unscrew (**) 4 clicks from fully closed (*)
Spring pre-loading, nut (3)	screw (*) 6 turns from fully open (**)
Stems (A) (***) protrusion from top plate (excluding cover)	2 notches/ 8 mm (2 notches/0.31 in)

(*)= Clockwise (**)= Anticlockwise (***)= This type of adjustment must only be carried out by an Official aprilia Dealer

CAUTION

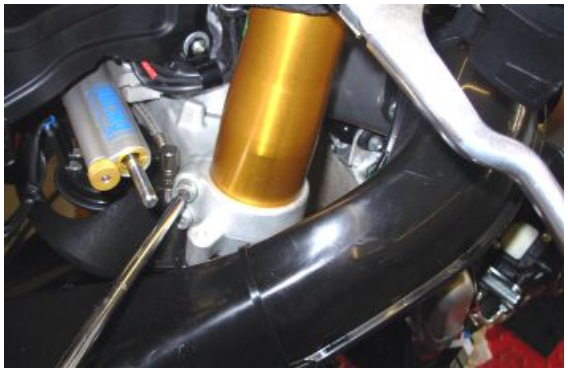
TO COUNT THE NUMBER OF CLICKS AND/OR TURNS FOR ADJUSTER SCREWS (1 -2) ALWAYS START FROM THE STIFFEST SETTING (ADJUSTER SCREW TURNED FULLY CLOCKWISE).

Removing the fork legs

- Remove the front wheel.
- Support the fork shaft and loosen the screws on the upper plate.

- Loosen the screws on the semi-handlebars.

- Loosen the screws on the lower plate.
- Slide out the fork stanchion.



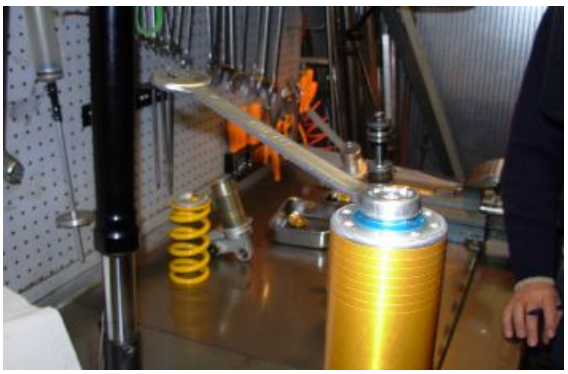
See also

Removing the front wheel

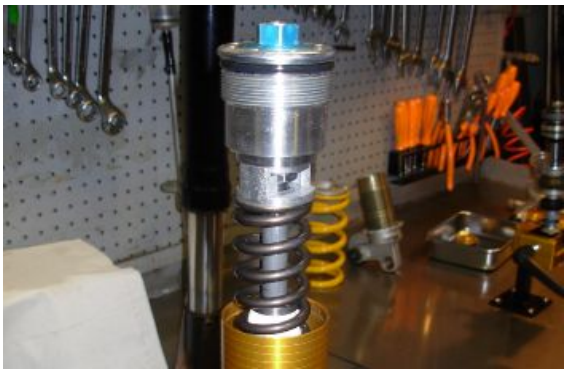
Draining oil

(PROCEDURE FOR OHLINS FORKS)

- Fix the fork in a vice, taking care not to damage the fork.
- Set the minimum spring preloading.



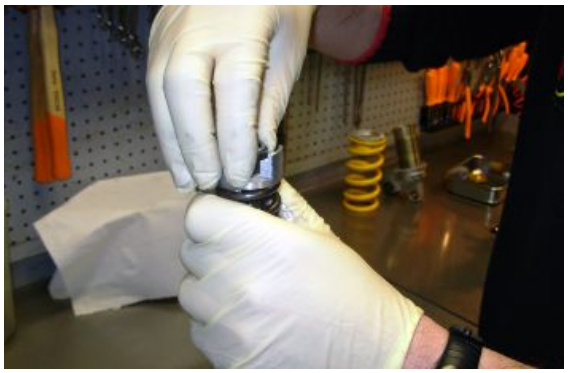
- Unscrew the upper cap from the sleeve using a specific Öhlins tool.



- Loosen the cap using a wrench in order to release the upper nut on the spring retaining ring.
- Unscrew the upper adjustment cap.

- Remove the complete cap.

- Unscrew the nut and remove it, exerting slight pressure on the pre-loading spring.



- Remove the pre-loading spring retaining ring.

- Remove the pre-loading spring.

- Drain the fork oil into a specific container, taking care not to allow the preload pipe and the hydraulic rebound damping brake adjustment pipe to escape.

(PROCEDURE FOR SACHS FORKS)

NOTE

THE OPERATIONS DESCRIBED BELOW ARE VALID FOR BOTH STEMS.

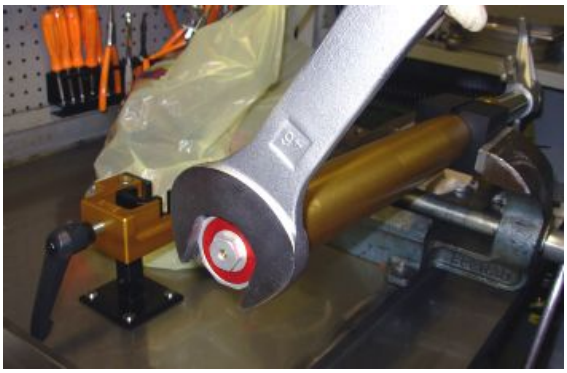
- Using the appropriate tool fasten the fork in the vice.

Specific tooling

AP8140149 Protection for assembly operations

- Operating on the upper screw, unload the spring.

- Loosen the cover without unscrewing it completely.



- Place the fork vertically locking it in a vice by the specific tool.
- Completely unscrew the plug.

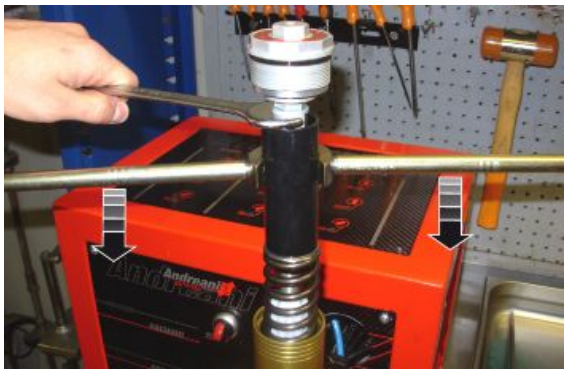
Specific tooling

AP8140149 Protection for assembly operations

- Using the specific tool, fixed to the pre-loading pipe, compress the spring.
- Insert a spanner in the lock nut of the cover.

Specific tooling

020888Y Clamp for pre-load pipe



- Unscrew the cap and remove it.

- Remove the spring preload pipe.

- Remove the lock nut and the washer.

- Remove the spring paying attention to drain the oil correctly.

- Drain the oil into a container of suitable capacity to collect fluids.

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.

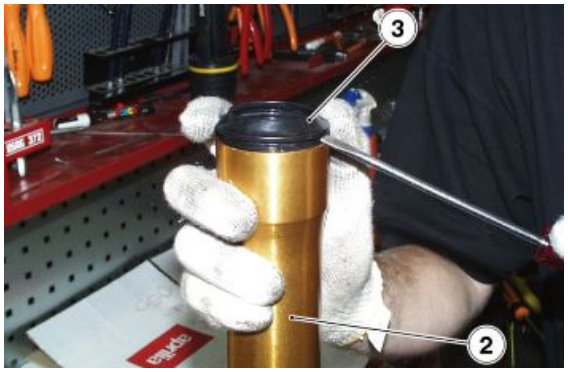
Disassembling the fork

(PROCEDURE FOR OHLINS FORKS)

- Fix the fork again in a vice, taking care not to damage the fork.
- Remove the preload pipe.

- Remove the wheel holder shaft (1) and the sleeve (2).

- Use a plain slot screwdriver to lift up the dust gaiter (3) in multiple points and remove from the sleeve (2).

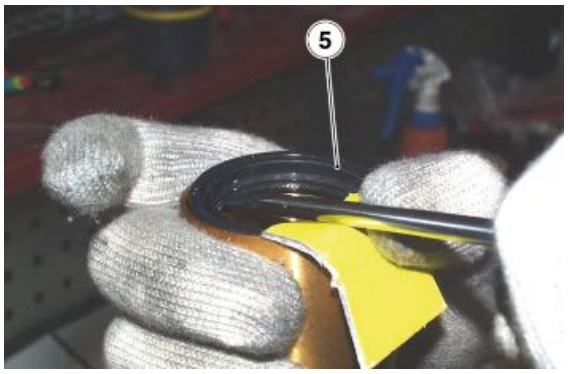


- Use a plain slot screwdriver to remove the snap ring (4).

- Use a plain slot screwdriver to remove the oil seal (5).

CAUTION

PLACE A STRIP OF RUBBER ON THE EDGE OF THE SLEEVE TO PROTECT IT FROM DAMAGE WHEN REMOVING THE OIL SEAL (5).



Replace the following components with new ones:

- shaft seal (5)

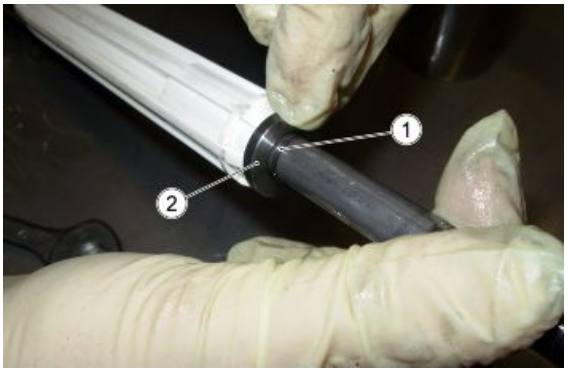
- anti-dust seal (3)

CAUTION

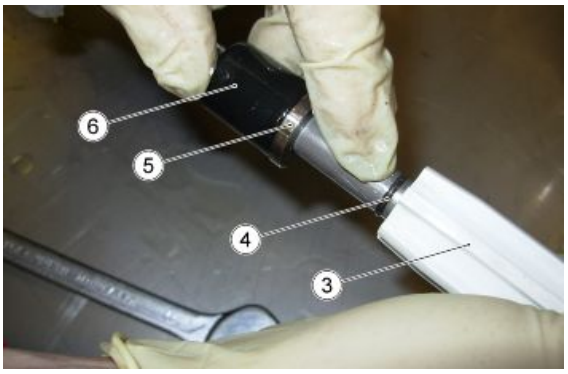
PROCEED WITH EXTREME CAUTION IN ORDER TO PREVENT FOREIGN BODIES FROM ENTERING THE SLEEVE OR THE WHEEL HOLDER SHAFT. DO NOT REUSE THE OIL THAT WAS DRAINED EARLIER

- Use the Öhlins tool to unscrew the pumping member pin fixing ring nut.
- Remove the pumping member pin unit.

- Remove the spring guide snap ring (1)
- Remove the spring guide support ring (2)



- Remove the spring guide (3), noting its direction of installation to ensure correct reassembly.
- Remove the other spring guide snap ring (4).
- Remove the ring (5) and extract the rubber buffer (6)



- Remove the ring nut, on which the threaded pipe is attached, from the pumping member pin.

- Remove the rubber O ring.

- Remove the guide bushing and the counterspring.

(PROCEDURE FOR SACHS FORKS)

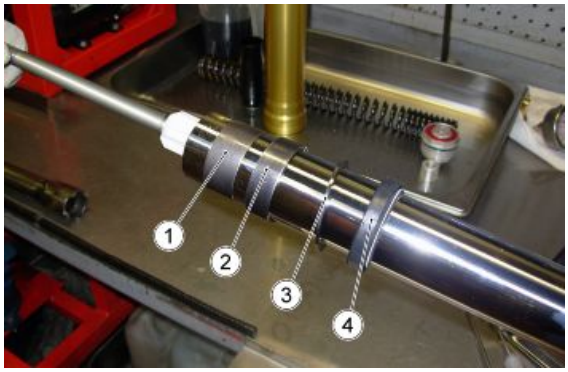
- Discharge the fork, remove the internal dipstick of the pumping member pin (1) and the washer (2).
- Operate repeatedly on the pumping member pin (3) so as to drain completely the oil from inside.

- Slide off the dust scraper from the sleeve using a screwdriver as a lever.
- During this operation, pay attention not to damage the sleeve rim.

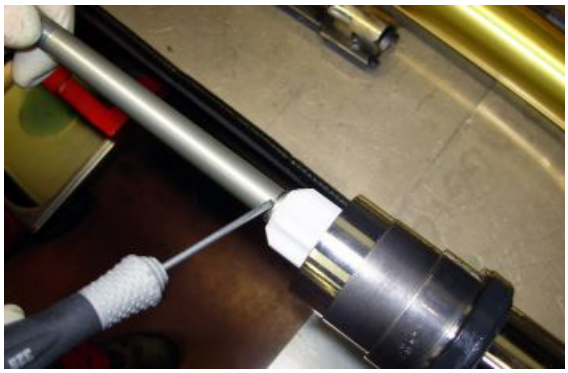
- Remove the retainer ring.

- Take out the sleeve from the stem using the stem as a hammer puller.

- Remove the fixed bushing (1), the movable bushing (2), the ring (3) and the oil seal (4) from the stem.



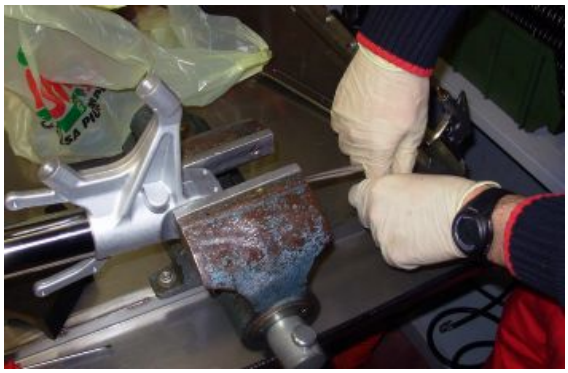
- Remove the lock seeger ring of the spring guide.
- Remove the spring guide.



- Using a hook spanner lock the pumping member pin.
- Remove the stem bottom screw.

Specific tooling

020889Y Wrench for locking pumping unit ring nut



- Remove the pumping member pin.

Checking the components

(PROCEDURE FOR OHLINS FORKS)

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 that there are no damages and/or cracks; otherwise, replace it.

Springs

Check that the springs are in good condition. Check that the length of the springs is within the specified tolerance range.

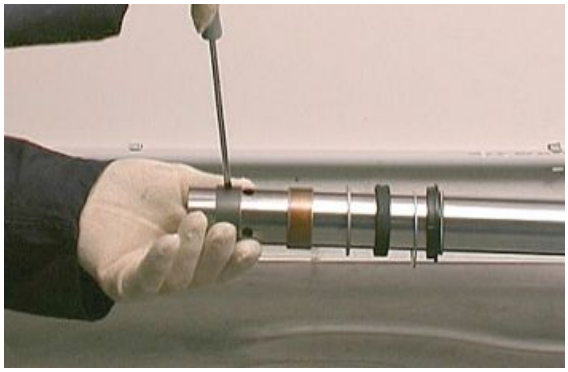
Replace the springs if the length is not within the specified tolerance range.

SPRING MINIMUM LENGTH WHEN UNLOADED: 254 mm (9.99 in)

MINIMUM COUNTERSPRING LENGTH 35 mm (1.38 in)

Check the condition of the following components:

- slider bushing;
- guide bushing;



- plunger.

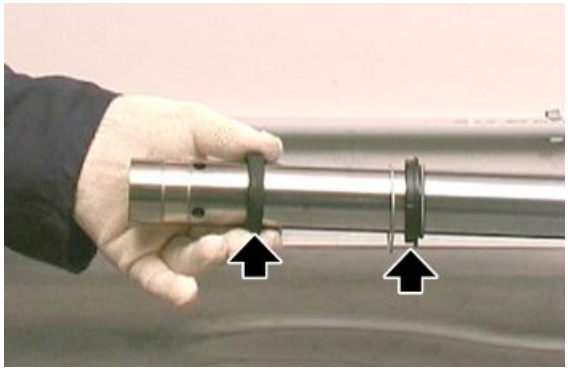
If there is evidence of excessive wear or damage, replace the component concerned.

CAUTION

REMOVE ANY IMPURITIES FROM THE BUSHINGS, BEING CAREFUL NOT TO SCRATCH THEIR SURFACES.

Replace the following components with new ones:

- seal;
- dust gaiter
- the two OR on the regulator.



(PROCEDURE FOR SACHS FORKS)

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 that there are no damages and/or cracks; otherwise, replace it.

Spring

Check that the spring is in good conditions. Check that the spring length is within the limit value.

Replace the spring if its length does not fall within the limit values.

SPRING MINIMUM LENGTH WHEN UNLOADED: 265 mm (10.4 in)

Check that the following components are in good conditions:

- upper bushing;

- lower bushing;

- plunger.

If there is evidence of excessive wear or damage, replace the component concerned.

CAUTION

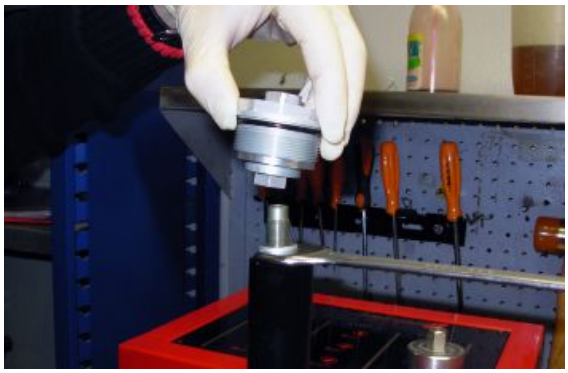
REMOVE ANY IMPURITIES FROM THE BUSHINGS, BEING CAREFUL NOT TO SCRATCH THEIR SURFACES.

Replace the following components with new ones:

- seal ring;

- dust gaiter;

- O-Ring on the cap.



Reassembling the fork

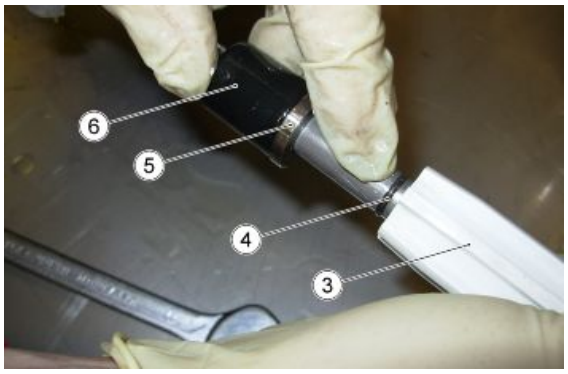
(PROCEDURE FOR OHLINS FORKS)

- Insert the guide bushing and the counterspring.

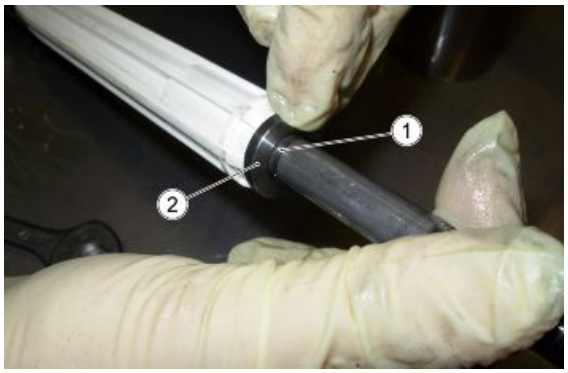
- Insert the rubber O ring.

- Insert the ring nut, on which the threaded pipe is attached, on the pumping member pin.

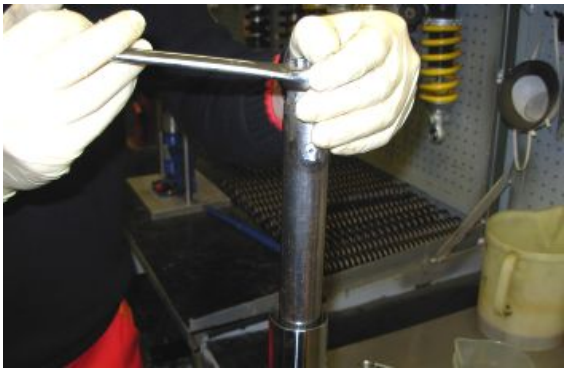
- Insert the rubber buffer (6).
- Insert the spring guide support ring (5), noting the internal milling allowing the spring guide retainer ring to be installed against the support ring.
- Insert the spring guide retainer ring (4).
- Insert the spring guide (3).



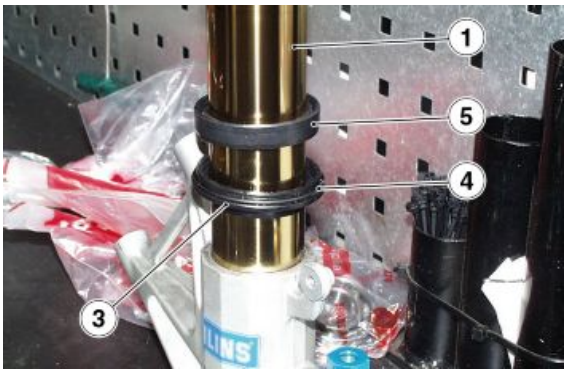
- Insert the spring guide retainer ring (1)
- Insert the spring guide support ring (2), noting the internal milling allowing the spring guide retainer ring to be installed against the support ring.



- Insert the pumping member pin unit.
- Use the Öhlins tool to tighten the pumping member pin fixing ring nut to 40 Nm (29.50 lbf ft).



- Install the following components on the wheel holder stanchion (1) in the order given: dust gaiter (3), retainer ring (4) and oil seal (5).



- Fix the sleeve in a vice, taking care not to damage the sleeve.
- Insert the stanchion (1) into the sleeve (2).

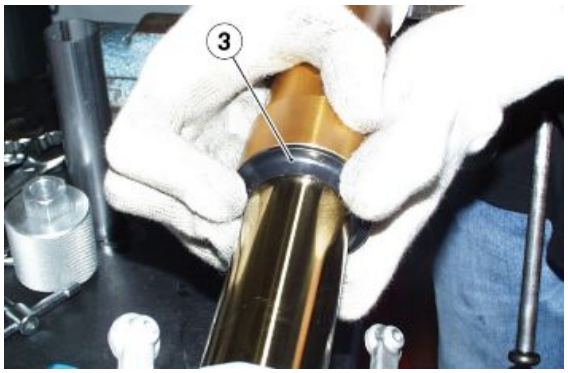
- Fit the two half-shells of the special tool on the wheel holder stanchion (1), behind the oil seal (5).
- Grip the special tool and push the oil seal (5) into its seat on the sleeve (2).
- Remove the tool.

- Insert the retaining ring (4) into its housing on the sleeve (2).

- Push the dust gaiter (3) into its seat on the sleeve (2), ensuring that it is located correctly.
- Grip the stanchion and move it repeatedly and slowly in opposite directions.

CAUTION

THE SHAFT MUST SLIDE FREELY WITHIN THE SLEEVE, WITHOUT OBSTRUCTIONS.



- Insert the pumping member pin unit.

CAUTION

THE SHAFT MUST SLIDE FREELY WITHIN THE SLEEVE, WITHOUT OBSTRUCTIONS.

(PROCEDURE FOR SACHS FORKS)

NOTE

THE OPERATIONS DESCRIBED BELOW ARE VALID FOR BOTH STEMS.

- Lock the stem in a vice without damaging the surface.
- Protect the bearing tube end with adhesive tape.
- Lubricate the sliding edges with fork oil or sealing grease.
- Fit the dust gaiter, the retainer ring and the dust scraper on the stem.

- Fit the ring, the movable bushing and, after removing the tape, fit the fixed bushing.

- Fit the sleeve on the stem and set the oil seal into position with the aid of the specific tool.

Specific tooling

AP8140189 Tool for fitting oil seal for 43 mm (1.69 in) diameter hole

AP8140146 Weight

- Insert the retainer ring in its position.

- Fit the dust gaiter with the specific tool.

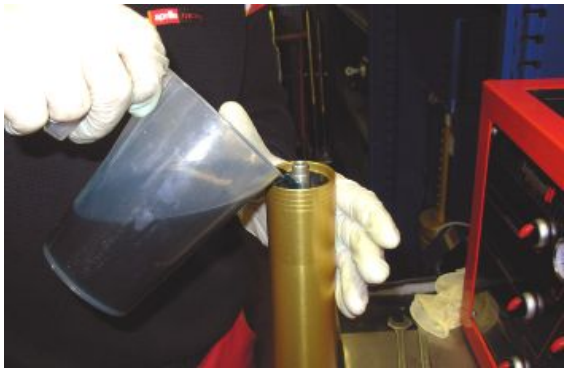
Specific tooling

AP8140189 Tool for fitting oil seal for 43 mm (1.69 in) diameter hole

AP8140146 Weight

- Insert the pumping member pin in the stem.

- Fill the forks with oil, according to the indicated quantities.



- Insert the spring.

CAUTION

PROCEED WITH CAUTION WHEN INSERTING THE SPRING AND ENSURE THAT THE PART WHERE THE SPIRAL IS MORE COMPRESSED IS FACING DOWNWARDS.

See also

Filling oil

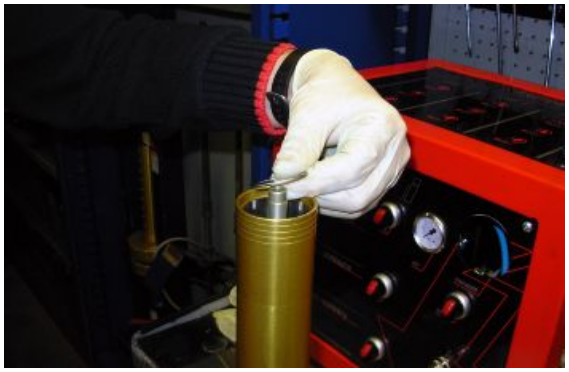
- Using a hook spanner lock the pumping member pin and tighten the fixing screw on the fork end to the prescribed torque.

Specific tooling

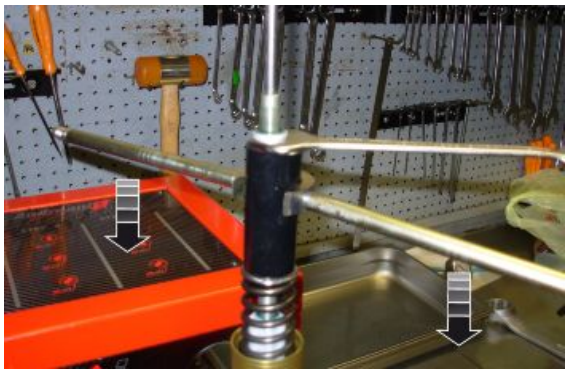
020889Y Wrench for locking pumping unit ring nut

- Insert the spring guide and lock it in place using the respective snap ring.

- Position the forks vertically.
- Insert the base washer.



- Insert the washer that will be supported on the spring
- Insert and hand tighten the nut on the pumping member pin
- Place the preload pipe.
- Tighten the appropriate tool on the pumping member pin rod and keep it raised to allow, inserting a wrench in the nut by compressing the spring.



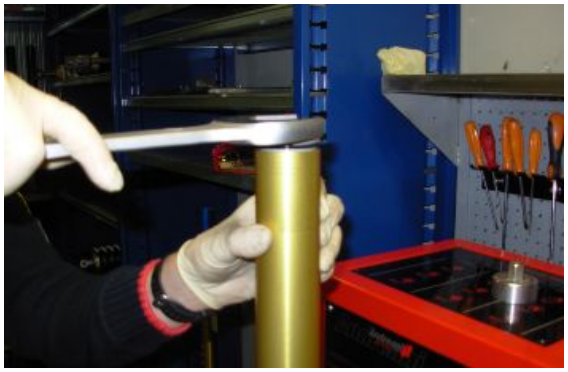
Specific tooling

020890Y Support rod of pumping unit stanchion

AP8140147 Spacer retaining device

- Tighten the nut as much as possible.
- Insert the cover and tighten until it stops.

- Remove the specific tools.
- Screw the cover in the sleeve to the prescribed torque.

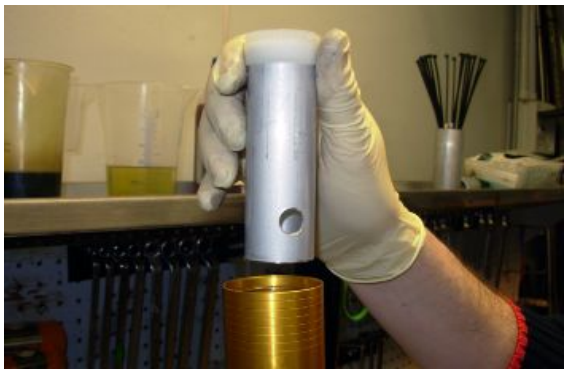


Filling oil

(PROCEDURE FOR OHLINS FORKS)

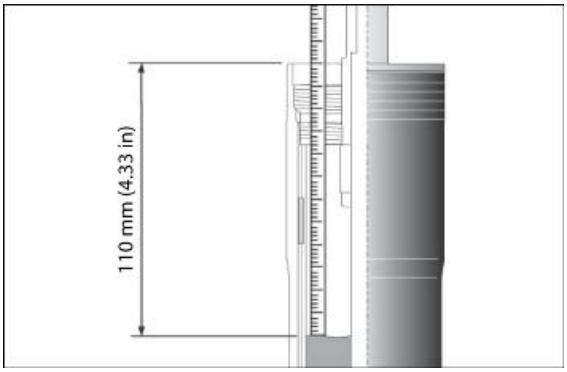
- Place the sleeve in a vertical position.
- Insert the pumping member pin unit and tighten to the specified torque with the Öhlins tool.

- Insert the preload pipe.



- Fill the forks with oil until the air bubbles trapped inside are forced out.

Oil level: 110 mm (4.33 in) (from the sleeve edge, without a spring and with preload pipe).



THE SLEEVE MUST BE PERFECTLY UPRIGHT IN ORDER TO MEASURE THE CORRECT OIL LEVEL. THE OIL LEVEL MUST BE THE SAME IN BOTH STANCHIONS.

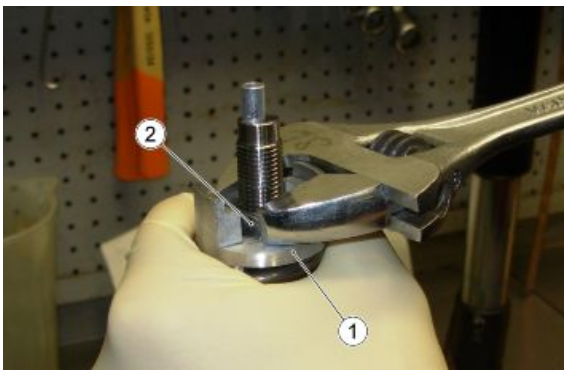
Characteristic

Fork oil

530 cc (0.12 Uk gal) (for each stanchion)

- Insert the pre-loading spring while maintaining the pin in the raised position.

- Insert the pre-loading spring retaining ring (1).
- Insert the nut (2).
- While maintaining the spring compressed, tighten the nut as far as it will go.



- Screw the complete cap into place on the plunger pin.

- Tighten the cap using a wrench to block the lower spring ring nut.
- Tighten the upper adjustment cap to bring it into contact with the lower nut on the cap.

- Use the specific Öhlins tool to tighten the upper cap on the sleeve to 20 Nm (14.75 lbf ft).

(PROCEDURE FOR SACHS FORKS)

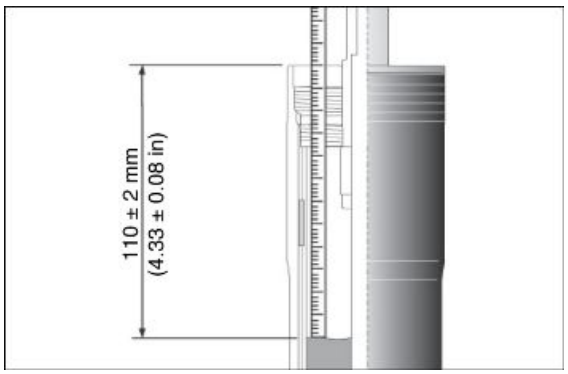
- Place the sleeve upright in a vice fitted with protection shoes.
- Compress the sleeve in the stem. Place a support under the stem in order to leave it compressed.
- Pour part of the fork oil into the sleeve.
- Wait some minutes until the oil fills all the ducts.
- Pour the remaining oil.
- Pump out oil a few times.
- Measure the air gap between the oil level and the rim.

THE SLEEVE MUST BE PERFECTLY UPRIGHT IN ORDER TO MEASURE THE CORRECT OIL LEVEL. THE OIL LEVEL MUST BE THE SAME IN BOTH STANCHIONS.

Specific tooling

AP8140149 Protection for assembly operations

Oil level: 110 +/- 2 mm (4.33 +/- 0.08 in) (from edge of sleeve, without spring and with pre-loading tube).



THE SLEEVE MUST BE PERFECTLY UPRIGHT IN ORDER TO MEASURE THE CORRECT OIL LEVEL. THE OIL LEVEL MUST BE THE SAME IN BOTH STANCHIONS.

Characteristic

Oil for forks

427 +/- 5 cc (26.06 +/- 0.30 cu in) (for each shaft)

Steering damper

Adjusting

The steering damper may be adjusted by turning the knob (1).

- Turn the knob (1) clockwise to stiffen the steering.
- Turn the knob anticlockwise to loosen the steering.

SPORT SETTINGS MAY BE USED ONLY FOR OFFICIAL COMPETITIONS TO BE CARRIED OUT ON TRACKS, AWAY FROM NORMAL ROAD TRAFFIC AND WITH THE AUTHORISATION OF THE RELEVANT AUTHORITIES.

ADJUST ONLY WHEN THE VEHICLE IS STANDING STILL. AFTER HAVING CHANGED THE SETTINGS, ALWAYS CHECK THAT THE STEERING IS FREE IN BOTH DIRECTIONS.

STEERING DAMPER - STANDARD SETTING (FOR ROAD USE)

Specification	Desc./Quantity
Hydraulic setting	From all open (**) tighten (*) 5 - 8 clicks

STEERING DAMPER- RACING SETTING RANGE (FOR TRACK ONLY)

Specification	Desc./Quantity
Hydraulic setting	From all open (**) tighten (*) 10 - 13 clicks

(*) = clockwise

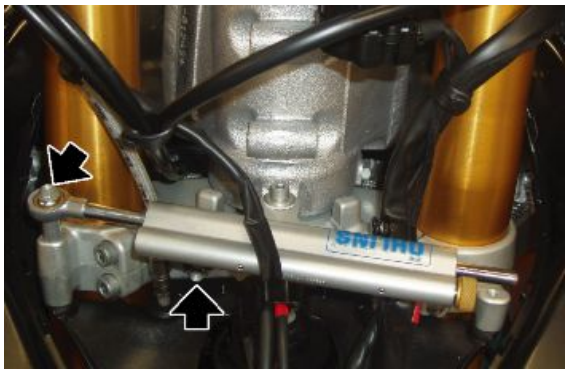
(**) = anticlockwise

Removing

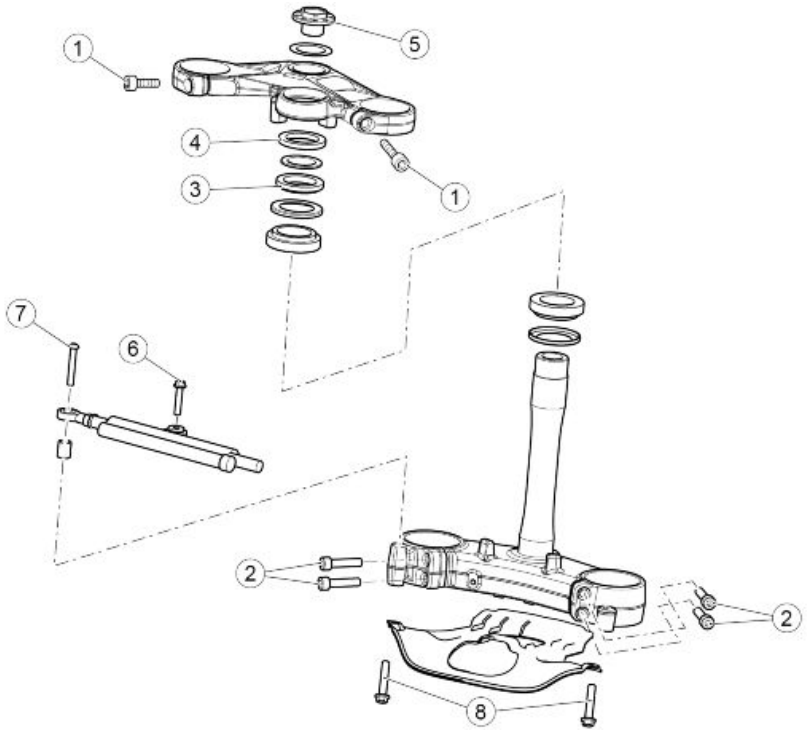
The steering damper steering more precise and stable, improving motorcycle handling in all conditions The damper is fastened at the front of the motorcycle between the bottom yoke and the frame

Removal:

- Unscrew the chassis fixing screw.
- Unscrew the fixing screw at the bottom yoke.
- Remove the steering damper.



Steering bearing



STEERING

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fastening upper yoke to stanchions	M8	2	25 Nm (18.44 lb ft)	-
2	Screws fastening lower yoke to stanchions	M8	4	25 Nm (18.44 lb ft)	-
3	Headstock ring nut - pre-tightening	M35x1	1	70 Nm (51.63 lb ft)	Unscrew after pre-tightening
3	Headstock ring nut - tightening	M35x1	1	60 +/- 9 Nm (44.25 +/- 6.64 lb ft)	-
4	Headstock counter-lock ring	M35x1	1	Manual +35° or -10°	Bend the tabs into the notches in the lock ring
5	Upper yoke fixing cap	M29x1	1	100 Nm (73.76 lb ft)	-
6	Screw fastening shock absorber to frame	M6	1	10 Nm (7.38 lb ft)	Loctite 243
7	Screw fastening shock absorber to lower yoke	M6	1	10 Nm (7.38 lb ft)	Loctite 243
8	Lower cover fixing screws	M6	2	8 Nm (5.90 lb ft)	-

Adjusting play

- Place the vehicle so that the front wheel is off the ground.
- Carry out a handlebar rotation test, using a dynamometer at the hand grip external end.
- The handlebar resistance to rotation must be of 450 (+250 / -100 g) (0.88 +0.55 / -0.22 lb) in both directions.
- Adjust if clearance is detected.

NOTE

THE STEERING COLUMN RESISTANCE TO ROTATION MUST BE PERFORMED IN THE TWO OPPOSITE ROTATION DIRECTIONS.
THE STEERING DAMPER MUST BE DISCONNECTED DURING MEASUREMENT.

- Unscrew and remove the top bolt on the headstock and retrieve the washer.

- Loosen the screws fixing the fork stanchions to the upper yoke.

- Working from both sides, unscrew and remove the semi-handlebar screws.

- Remove the upper yoke

- Rivet the safety washer on the head-stock.

- Undo the counter-lock ring, remove the safety washer then unscrew the lower lock ring in order to adjust the steering free play correctly.

- Tighten the lower lock ring to a torque of 70 Nm (51.63 lb ft).
- Steer repeatedly completely left and completely right to allow the bearings to settle.
- Loosen the ring nut.
- Retighten the lock ring to the prescribed torque of 60 Nm +/- 9 Nm (44.25 lb ft +/- 6.64 lb ft).
- Steer completely left and completely right and check that the steering ro-

tates smoothly and without excessive resistance.

- If any problems are noted, repeat the procedures described above.

NOTE

DISCONNECT THE STEERING DAMPER WHEN ADJUSTING THE STEERING FREE PLAY.

Specific tooling

AP8140190 Tool for steering tightening

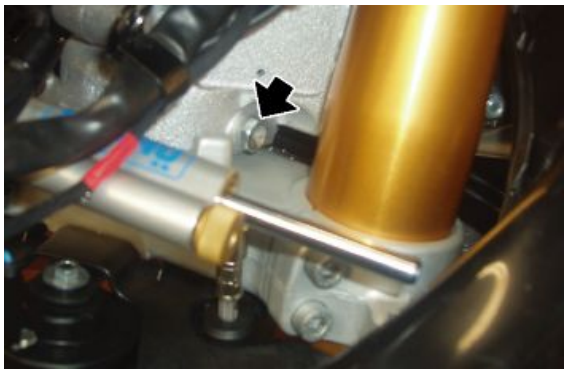
- Fit the safety washer and bend the two opposing tabs into the notches on the lock ring.

- Fit the counter-lock ring, hand tightening only.
- To allow the tabs to be bent into the notches of the counter-lock ring in order to lock the ring, the counter-lock ring may be tightened further by up to 35° or loosened by up to 10°.
- When tightening the counter-lock ring, hold the lock ring still with an appropriate hook spanner.
- Lock the counter-lock ring by bending the tabs of the retainer washer into the notches in the counter-lock ring itself.
- Reconnect the steering damper.

- Fit the upper fork plate.

Disassembling

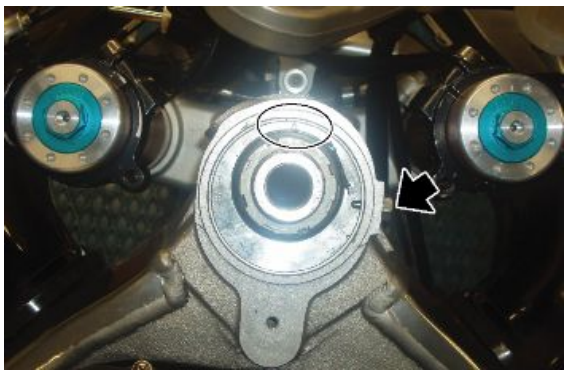
- Remove the steering assembly completely.
- Unscrew and remove the lower dowel fastening the collar.
- Remove the lower collar.



- Unscrew and remove the upper dowel fastening the collar.
- Remove the upper collar.

CAUTION

ALWAYS CHANGE BOTH COLLARS (UPPER AND LOWER).



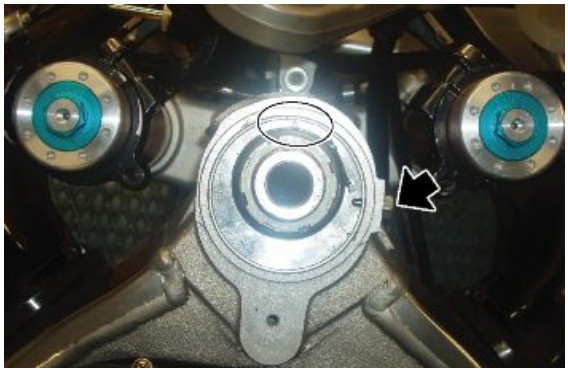
Upper and lower collars are not interchangeable.

To identify them, check the number printed on them:

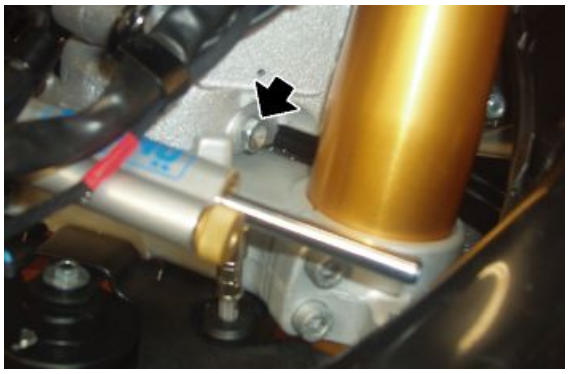
- lower collar 0.49 mm + 3 mm (0.30 in / + 1.86 in)
- upper collar 0.49 mm + 1.5 mm (0.30 in / + 0.93 in)

Assembling

- Fit the upper collar.
- Partially tighten the dowel in the relative threaded hole, so that it protrudes by no more than 2 or 3 mm into the conical surface.
- Fit the bushing in its seat, ensuring that the seal (in the groove in the bushing) remains in place.
- Press the bushing into place with a rubber mallet.
- Tighten the dowel to the specified torque.
- Repeat the procedure for the lower bushing.



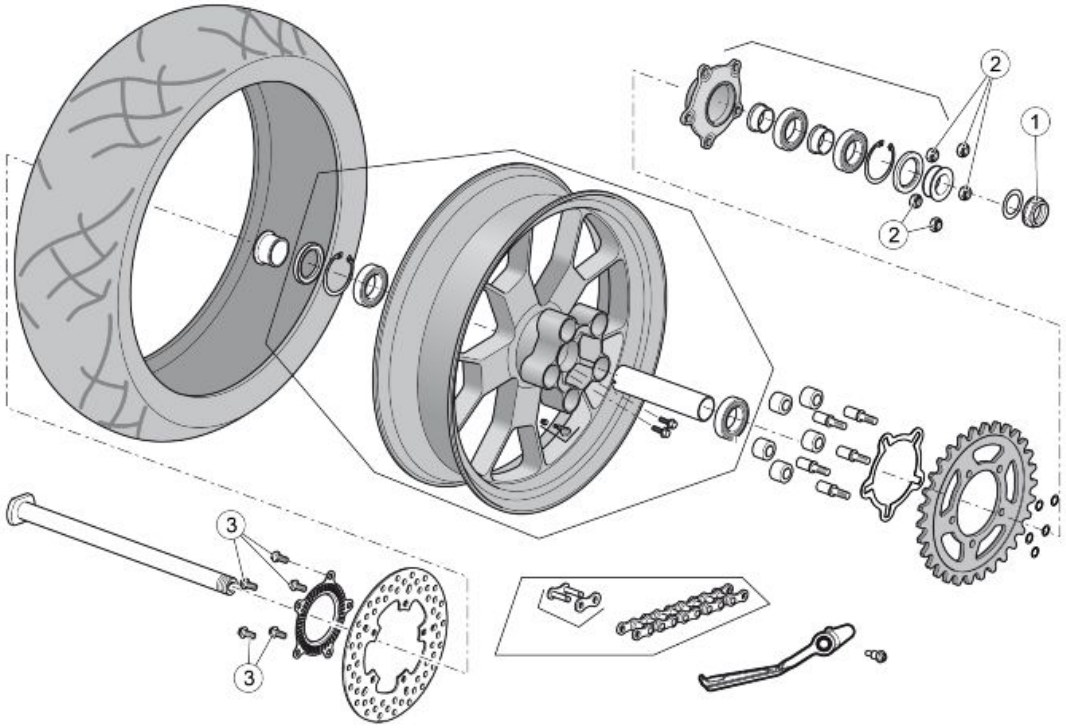
- Fit the steering assembly and restore the correct steering bearing free play.



See also

Adjusting play

Rear



REAR WHEEL

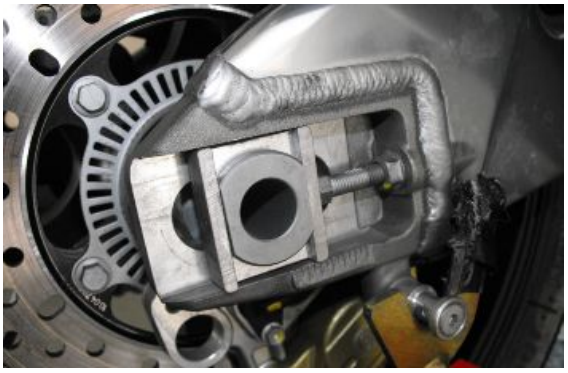
pos.	Description	Type	Quantity	Torque	Notes
1	Rear wheel axle nut	M25x1.5	1	120 Nm (88.51 lb ft)	-
2	"A" Nuts fastening sprocket on sprocket mount	M10	5	50 Nm (36.88 lb ft)	-
2	"B" Nuts fastening sprocket on sprocket mount	M10	5	55 Nm (40.57 lb ft)	-
2	"C" Nuts fastening sprocket on sprocket mount	M10	5	50 Nm (36.88 lb ft)	-
3	Rear brake disc fastening screws	M8	5	30 Nm (22.13 lb ft)	Loct. 243

Removing the rear wheel

- Place the vehicle on its rear service stand.
- Loosen and remove the nut on the wheel axle.
- Retrieve the thrust washer and the left hand chain tensioner slider.

- Tap the wheel axle slightly to extract the head from its seat.
- Make the wheel move forward and release the gearing chain from the sprocket.

- Remove the wheel spindle together with the right hand chain tensioner skid.
- Remove the wheel by freeing the disc from the brake calliper.



Parastrappi

REMOVAL

- Remove the final transmission unit

NOTE

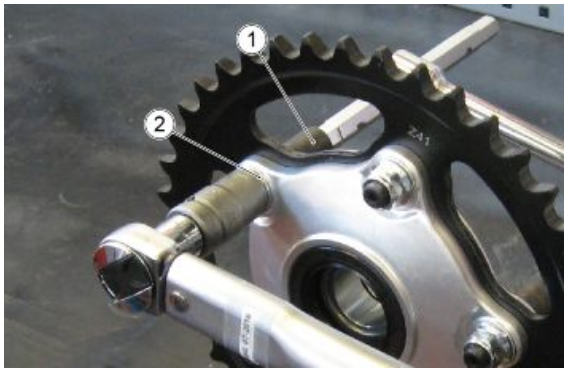
THE FLEXIBLE COUPLINGS REMAIN FITTED ON THEIR WHEEL

REMOVAL

- Place the final transmission unit on a vice

TO PROTECT THE CROWN GEAR, INSTALL (WOODEN OR ALUMINIUM) PROTECTIONS ON THE VICE JAWS. LOCK THE CROWN GEAR ONLY IN A VICE. DO NOT LOCK ANY OTHER COMPONENT OF THE FINAL TRANSMISSION UNIT.

- Block the rotation with a hex wrench on the threaded pin (1); Unscrew and remove the DAX nut (2)
- Repeat the operation to remove all nuts and corresponding pins.



- Remove the sprocket (3) and the flange (4)

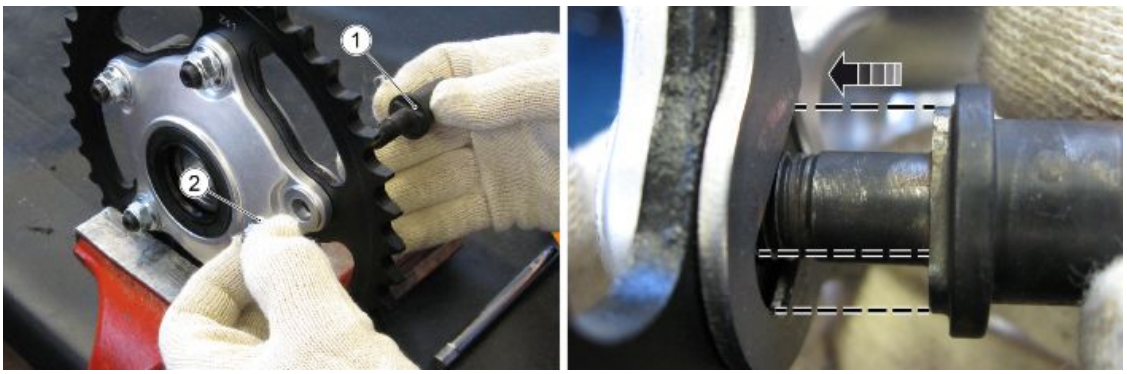
FITTING

- Fit the sprocket (3) and the flange (4) on the crown gear

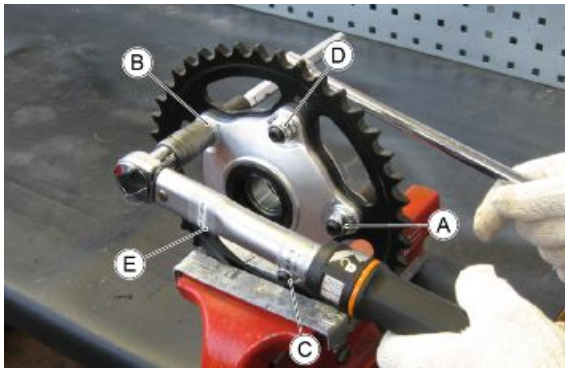
- Place the pins (1) with the corresponding DAX nuts (2) paying attention so the pins are directed towards the inside the machining on the flange

CAUTION

WITH EVERY REMOVAL, REPLACE THE PINS AND NUTS WITH THE NEW COMPONENTS



- Block the rotation of the pins with a hex wrench (1) (EVEN IF THE FLANGE ITSELF DOES NOT ALLOW THE ROTATION) and tighten to the prescribed torque, the nuts (2) diametrically opposed in the order: (A) (B) (C) (D) (E).



CAUTION

IN THIS WAY THE PRESSURE EXERTED BY THE FIXING ELEMENTS WILL BE EVENLY DISTRIBUTED ON THE COUPLING SURFACE.

Checking the rear wheel

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:

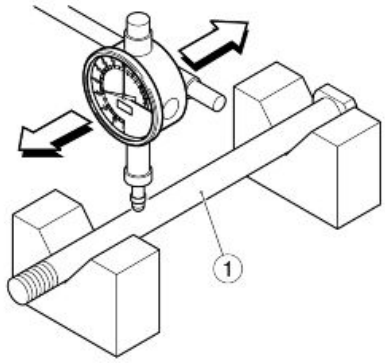
- Replace both wheel bearings.

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



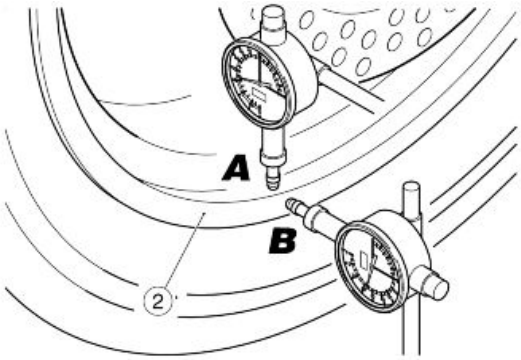
- Use a dial gauge to check the wheel axle eccentricity (1). Replace the wheel axle if the eccentricity exceeds the limit value (1).

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

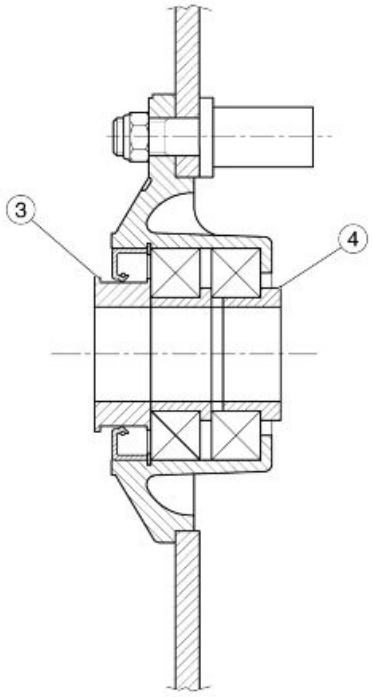
Maximum radial and axial eccentricity:

0.8 mm (0.031 in)

FINAL DRIVE UNIT BEARINGS

Carry out the check with the bearings fitted on the final drive unit.

ROTATION CHECK



- Remove the left spacer (3).
- Remove the right spacer (4).
- Manually rotate the inside ring of each bearing. Rotation must be constant, smooth and noiseless.

If one or both bearings do not fall within the control parameters:

- Replace both bearings of the final drive unit.

RADIAL AND AXIAL CLEARANCE CHECK

- Check the radial and axial clearance. Axial clearance: a minimum axial clearance is allowed. Radial clearance: none.

If one or both bearings do not fall within the control parameters:

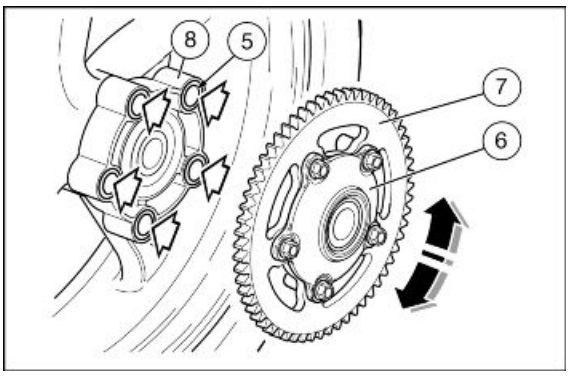
- Replace both bearings of the final drive unit.

FLEXIBLE COUPLING

Check that the flexible couplings (5) are not damaged or excessively worn.

To check:

- Fit the entire final drive unit (6) to the wheel.
- Manually rotate the sprocket (7) to right and left, and check the clearance between the flexible couplings (5) and their holder (8).



If there is excessive clearance:

- Replace all the flexible couplings (5).

ALWAYS REPLACE ALL THE FLEXIBLE COUPLINGS WITH OTHERS OF THE SAME TYPE.

SPROCKET

- Check the sprocket (7) toothing for proper conditions.

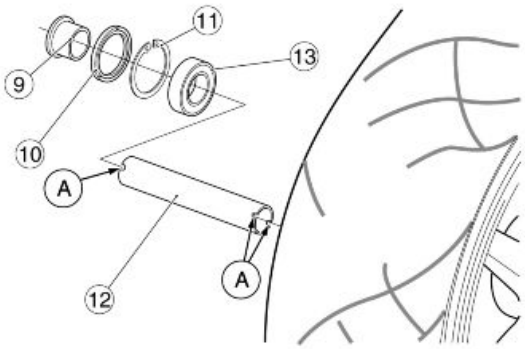
If there is excessive wear:

- Replace the sprocket.

TO PREVENT NEW COMPONENTS FROM WEARING PREMATURELY, THE REAR SPROCKET, FRONT SPROCKET AND DRIVE CHAIN MUST ALWAYS BE REPLACED TOGETHER AS A SET.

REAR WHEEL BEARINGS

- Remove the rear wheel.
- Clean both sides of the hub with a cloth.



On the right hand side of the wheel:

- Remove the right hand spacer (9).
- Remove the seal (10).
- Remove the circlip (11)

CAUTION

THE CIRCLIP (11) IS ONLY INSTALLED ON THE RIGHT HAND SIDE OF THE WHEEL.

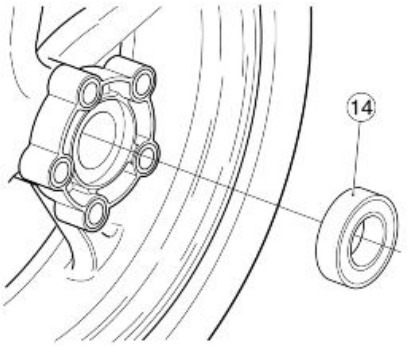
There are notches (A) for engaging with the teeth of the extractor tool at the ends of the spacer (12).

- Use the extractor tool to remove the right hand bearing (13).

Specific tooling

AP8140180 Bearing extractor

- Retrieve the inner spacer (12).



On the left hand side of the wheel:

- Use the extractor tool to remove the left hand bearing (16).

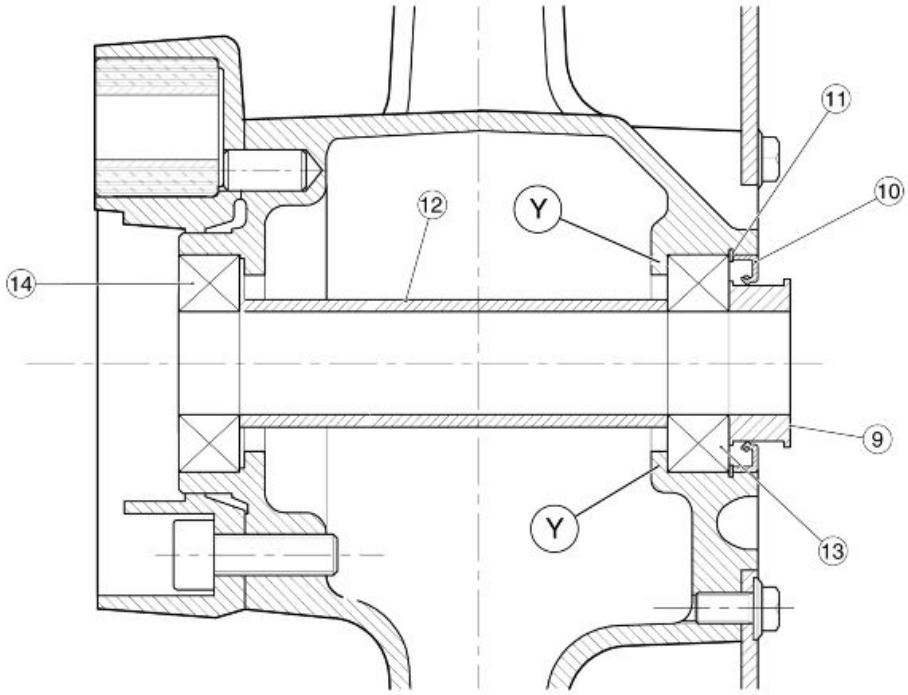
Specific tooling

AP8140180 Bearing extractor

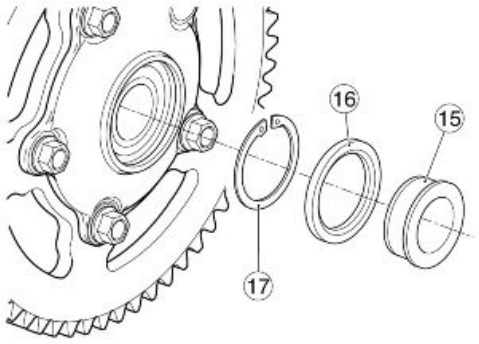
- Clean the interior of the hub thoroughly.

CAUTION

WASH ALL COMPONENTS WITH CLEAN DETERGENT SOLUTION.



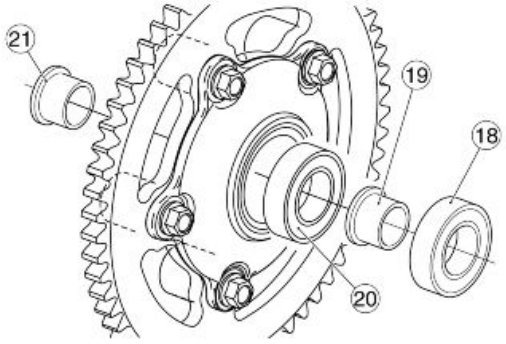
FINAL DRIVE UNIT - BEARING REMOVAL



- Remove the final drive unit.
- Clean the two sides of the hub with a cloth.
- Remove the left spacer (15).
- Remove the sealing gasket (16).
- Remove the circlip (17).

CAUTION

THE CIRCLIP (17) IS FITTED ONLY ON THE FINAL DRIVE UNIT, LEFT SIDE.



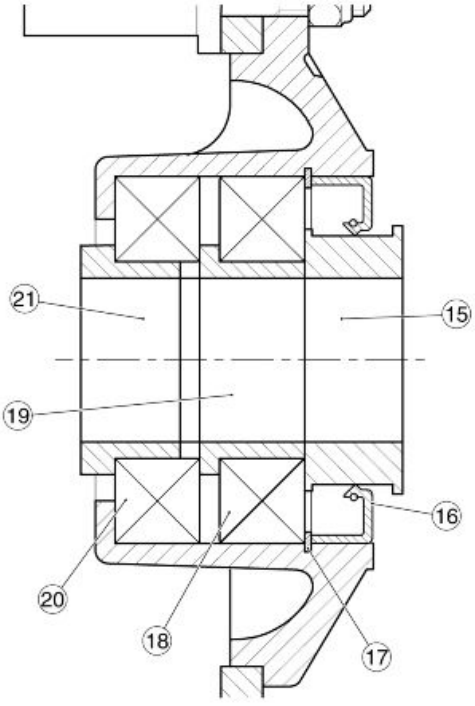
- Remove the left bearing (18) with the specific extractor.
- Collect the inside spacer (19).
- Remove the right bearing (20) with the specific extractor.
- Retrieve the right hand spacer (21).
- Clean the inside of the hub thoroughly.

CAUTION

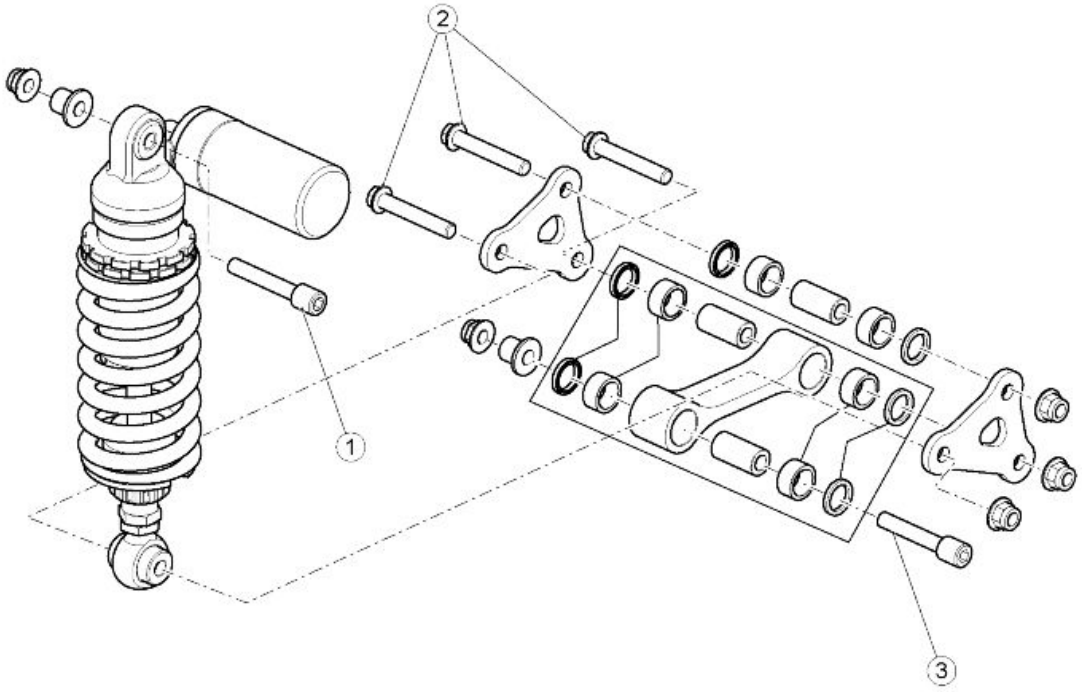
WASH ALL COMPONENTS WITH CLEAN DETERGENT SOLUTION.

Specific tooling

AP8140180 Bearing extractor



Shock absorbers



REAR SHOCK ABSORBER

pos.	Description	Type	Quantity	Torque	Notes
1	Upper shock absorber fixing screw	M10	1	50 Nm (36.88 lb ft)	-
2	Dual connecting rod fixing screw	M10	3	50 Nm (36.88 lb ft)	-
3	Screw fastening single connecting rod to chassis	M10	1	50 Nm (36.88 lb ft)	-

The rear suspension consists of a spring-shock absorber unit linked to the frame via uniball joints and to the swingarm via a linkage system.

To adjust the rear shock absorbers, the following adjustments can be performed: Rebound damping, adjusting with the knurled hand grip (1); compression damping by adjusting the thumbscrew with the knob (2); Spring preload by adjusting the ring nut (3) blocked in its seat by the lock ring nut (4).

NOTE

THE VEHICLE HAS A HEIGHT ADJUSTABLE SUSPENSION. FOR USE ON THE TRACK PLEASE OBSERVE THE VALUES RECOMMENDED FOR USE ON THE ROAD.
TO CHANGE THE HEIGHT, YOU MUST CONTACT AN Official Aprilia Dealer.

TO COUNT THE NUMBER OF RELEASES AND/OR REVOLUTIONS OF ADJUSTMENT SETTINGS ALWAYS START FROM THE MOST RIGID SETTING (WHOLE CLOCKWISE ROTATION OF THE SETTING).
IN ORDER TO AVOID DAMAGES DO NOT FORCE THE SET SCREWS TO TURN BEYOND THE END OF THE STROKE ON BOTH SIDES.

- Using the specific spanner, unscrew the locking ring nut (4).
- Operate on the adjusting ring nut (3) to adjust the spring preloading (B).

- Once the adjustment is done, screw the ring nut (4).
- Turn the (1) screw to adjust the shock absorber hydraulic rebound damping.
- Turn the knob (2) to adjust the shock absorber hydraulic compression damping.

To change the vehicle setting:

- Loosen the lock nut (5) slightly.
- Turn the adjuster screw (6) to adjust the shock absorber centre-to-centre distance (A).
- After adjusting, tighten the lock nut (5).

ONLY FOR VERSION RSV4 1000 RR Race Pack/RF:
TO AVOID COMPROMISING SHOCK ABSORBER OPERATION, DO NOT LOOSEN THE SCREW (7) AND DO NOT TAMPER WITH THE SEAL UNDERNEATH, AS NITROGEN MAY COME OUT RESULTING IN RISK OF ACCIDENTS.

SET SPRING PRE-LOADING AND SHOCK ABSORBER REBOUND DAMPING ACCORDING TO THE VEHICLE USE CONDITIONS.
IF THE SPRING PRE-LOADING IS INCREASED, IT IS NECESSARY TO INCREASE THE REBOUND DAMPING ACCORDINGLY TO AVOID SUDDEN JERKS WHEN RIDING.

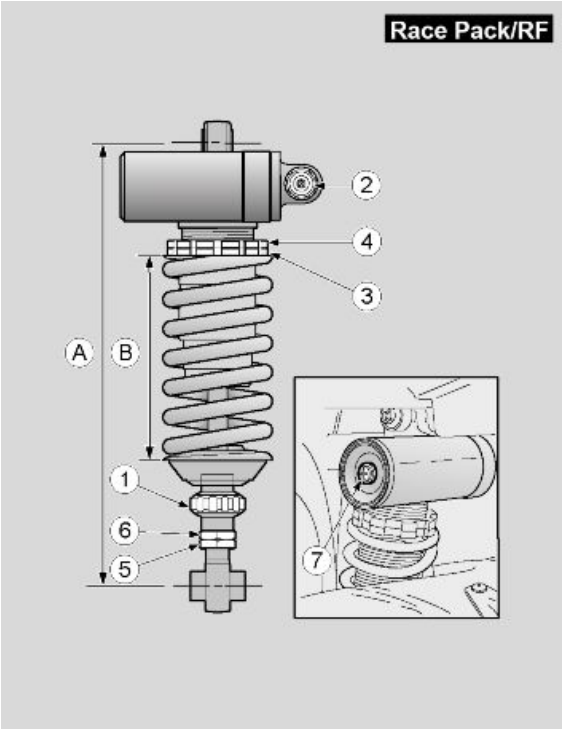
CAUTION

ALWAYS OBSERVE THE RECOMMENDED ADJUSTMENT RANGE.

Adjusting

(PROCEDURE FOR OHLINS FORKS)

SPORT SETTINGS MAY BE USED ONLY FOR OFFICIAL COMPETITIONS TO BE CARRIED OUT ON TRACKS, AWAY FROM NORMAL ROAD TRAFFIC AND WITH THE AUTHORISATION OF THE RELEVANT AUTHORITIES.



My2015

REAR SHOCK ABSORBER - RSV4 1000 RR RACE PACK/RF - STANDARD ADJUSTMENT (FOR ROAD USE ONLY)

Specification	Desc./Quantity
Shock absorber centre-to-centre distance (A)	312 mm (12.28 in)
(preloaded) Spring (B) length	148.5 mm (5.85 in)
Rebound adjustment, ring nut (1)	open (**) 18 clicks from fully closed (*)
Compression adjustment, knob (2)	open (**) 15 clicks from fully closed (*)

REAR SHOCK ABSORBER - RSV4 1000 RR RACE PACK/RF - RACING ADJUSTMENT RANGE (TRACK USE ONLY)

Specification	Desc./Quantity
Shock absorber centre-to-centre distance (A)	313 mm (12.32 in)
(preloaded) Spring (B) length	145 mm (5.71 in)
Rebound adjustment, ring nut (1)	open (**) 12 clicks from fully closed (*)
Compression adjustment, knob (2)	open (**) 10 clicks from fully closed (*)

My2016

REAR SHOCK ABSORBER - RSV4 1000 RF - STANDARD ADJUSTMENT (OHLINS) (FOR ROAD USE ONLY)

Specification	Desc./Quantity
Shock absorber centre-to-centre distance (A)	312 mm (12.28 in)
(preloaded) Spring (B) length	149 mm (5.87 in)
Rebound adjustment, ring nut (1)	open (**) 20 clicks from fully closed (*)
Compression adjustment, knob (2)	open (**) 20 clicks from fully closed (*)

REAR SHOCK ABSORBER - RSV4 1000 RF - RACING ADJUSTMENT RANGE (OHLINS) (TRACK USE ONLY)

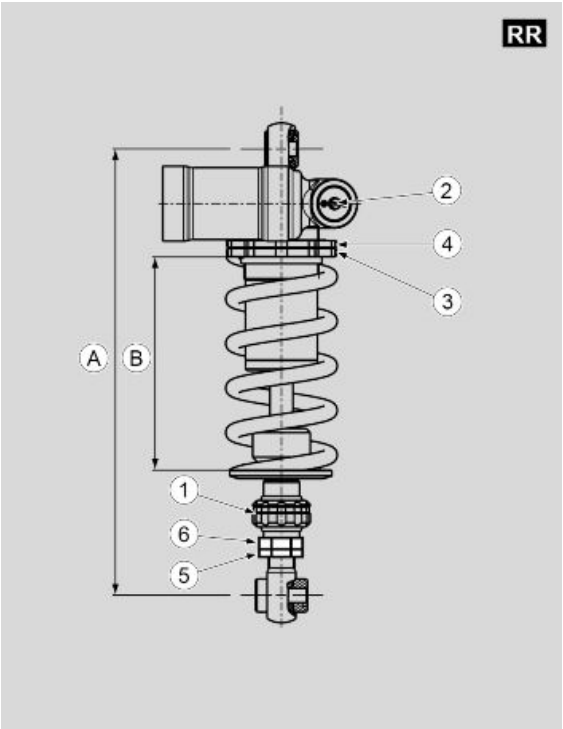
Specification	Desc./Quantity
Shock absorber centre-to-centre distance (A)	314 mm (12.36 in)
(preloaded) Spring (B) length	147 mm (5.79 in)
Rebound adjustment, ring nut (1)	open (**) 8 clicks from fully closed (*)
Compression adjustment, knob (2)	open (**) 4 clicks from fully closed (*)

(*) = clockwise

(**) = anticlockwise

(PROCEDURE FOR SACHS FORKS)

SPORT SETTINGS MAY BE USED ONLY FOR OFFICIAL COMPETITIONS TO BE CARRIED OUT ON TRACKS, AWAY FROM NORMAL ROAD TRAFFIC AND WITH THE AUTHORISATION OF THE RELEVANT AUTHORITIES.



REAR SHOCK ABSORBER - RSV4 1000 RR - STANDARD ADJUSTMENT (FOR ROAD USE ONLY)

Specification	Desc./Quantity
Shock absorber centre-to-centre distance (A)	312 mm (12.28 in)
(preloaded) Spring (B) length	148 mm (5.83 in)
Rebound adjustment, ring nut (1)	open (**) 20 clicks from fully closed (*)
Compression adjustment, knob (2)	open (**) 2 click from fully closed (*)

REAR SHOCK ABSORBER - RSV4 1000 RR - RACING ADJUSTMENT RANGE (TRACK USE ONLY)

Specification	Desc./Quantity
Shock absorber centre-to-centre distance (A)	314 mm (12.36 in)
(preloaded) Spring (B) length	144 mm (5.67 in)
Rebound adjustment, ring nut (1)	open (**) 8 clicks from fully closed (*)
Compression adjustment, knob (2)	from completely closed (*) open (**) 1 - 2 turns

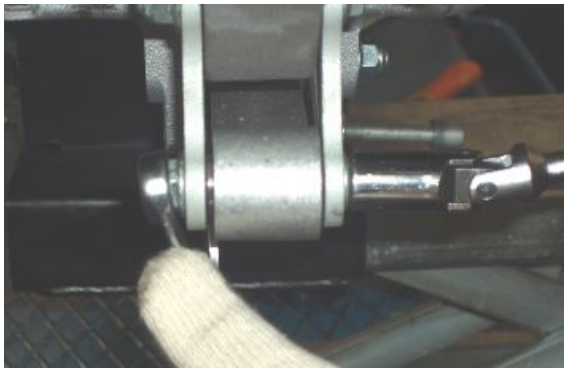
(*) = clockwise

(**) = anticlockwise

Removing

- Secure the vehicle using a belt and hoist.
- Remove the silencer and the right hand rider footpeg.
- Unscrew and remove the lower screw and retrieve the nut.

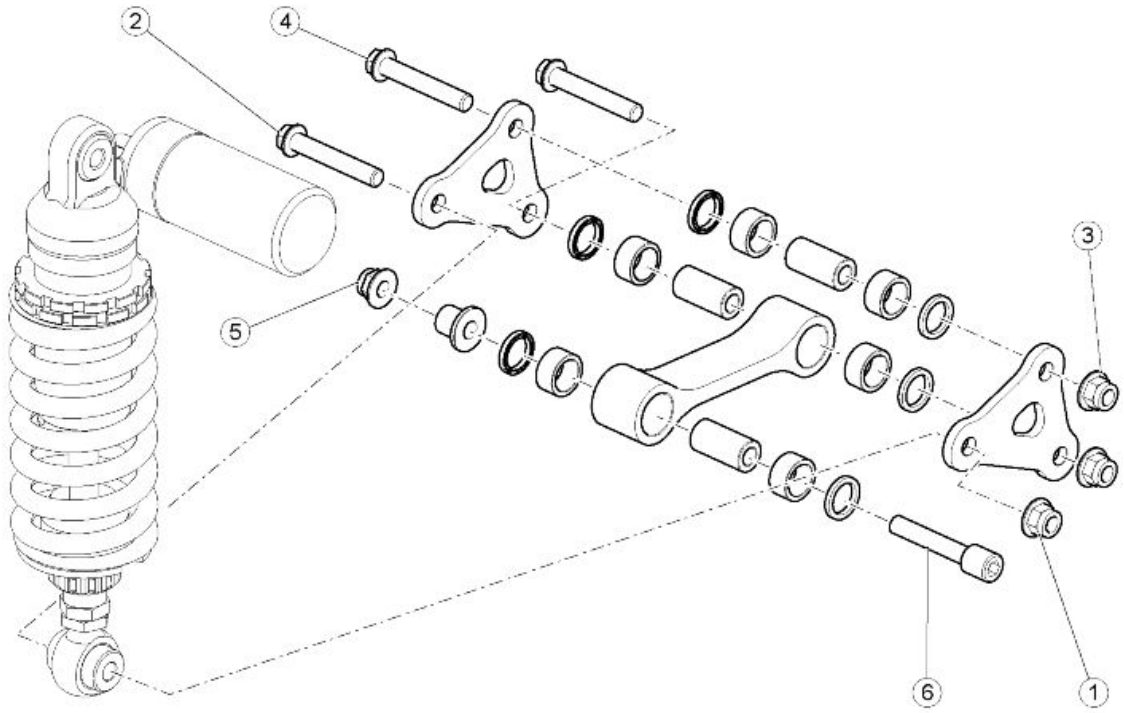
- Unscrew and remove the screw fixing the dual linkage rod to the single linkage.
- Retrieve the nut.



- Unscrew and remove the upper screw and retrieve the nut.
- Remove the shock absorber from the right side.

Linkages

Removing



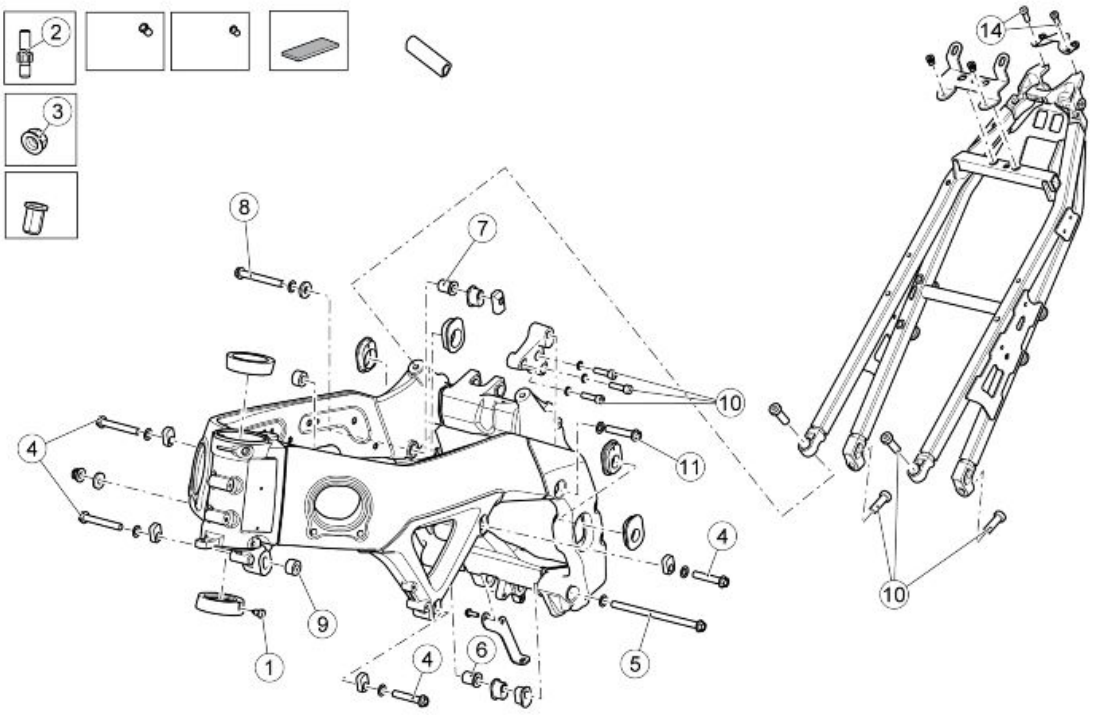
- Working from the left side of the vehicle, loosen and remove the nut (1).
- Slide off the screw (2) from the opposite side.
- Loosen and remove the nut (3).
- Slide off the screw (4) from the opposite side.
- Loosen and remove the nut (5).
- Slide off the screw (6) from the opposite side.
- Remove the complete suspension connecting rod assembly unit.

CAUTION

UPON REFITTING, GREASE THE FULCRUM POINTS ON THE CONNECTING ROD ASSEMBLY. PAY SPECIAL ATTENTION TO THE CORRECT POSITIONING OF THE PARTS AND CHECK SEVERAL TIMES THAT JOINTS MOVE SMOOTHLY.

INDEX OF TOPICS

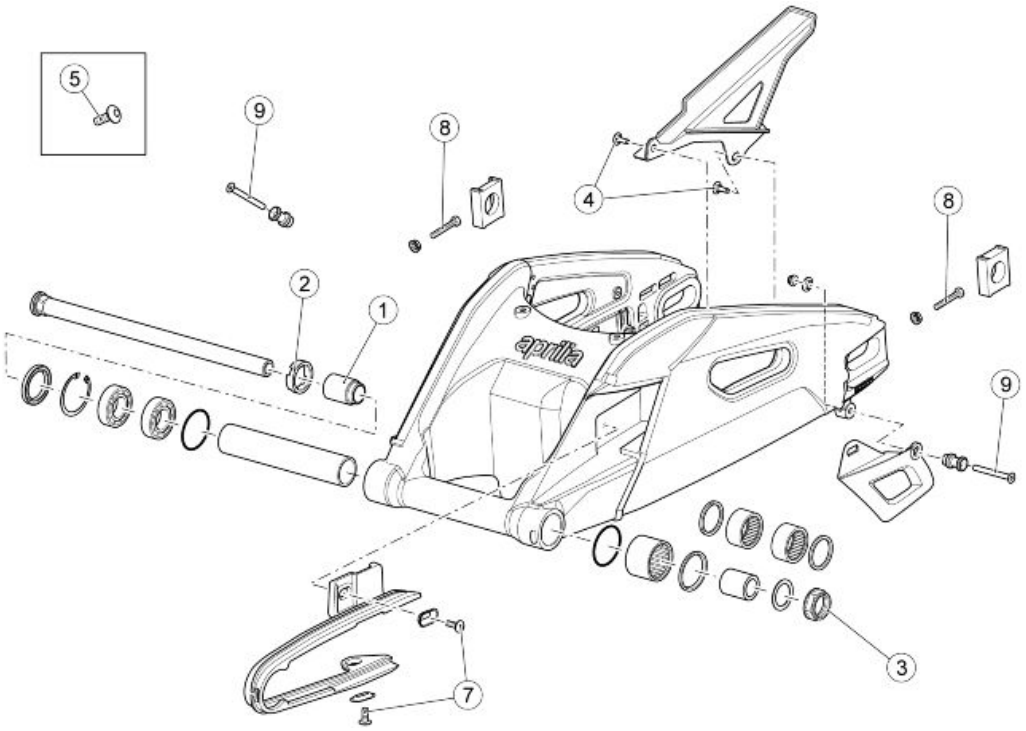
CHASSIS	CHAS



CHASSIS

pos.	Description	Type	Quantity	Torque	Notes
1	Headstock locator dowel	M8x1	2	10 Nm (7.37 lb ft)	-
2	Threaded intake duct fastener pins	M6	2 + 2	4 Nm (2.95 lb ft)	Loct. 243
3	Intake duct fixing nuts	M6	2 + 2	Manual	-
4	Front couplings	M10	2 + 2	50 Nm (36.88 lb ft)	-
5	Lower rear coupling	M10	1	50 Nm (36.88 lb ft)	-
6	RH lower rear regulator bushing	M18x1.5	1	12 Nm (8.85 lb ft)	-
7	RH upper rear regulator bushing	M18x1.5	1	12 Nm (8.85 lb ft)	-
8	RH upper rear coupling	M10	1	50 Nm (36.88 lb ft)	-
9	Right fairing spacer	M6	1	10 Nm (7.37 lb ft)	Loct. 243
10	Upper rear left hand engine mount fastener screws	M8	3	25 Nm (18.44 lb ft)	-
11	Upper rear mount	M10	1	50 Nm (36.88 lb ft)	-
12	Saddle mounting fixing screws	M10	4	50 Nm (36.88 lb ft)	-
13	Passenger saddle and saddle cover catch plate fixing screws	M6	2	8 Nm (5.9 lb ft)	-
14	Taillight mounting bracket fixing screws	M5	2	4 Nm (2.95 lb ft)	-
-	Screw fastening the ground cable to the left side chassis	M6	1	6 Nm (4.42 lb ft)	-
-	Screws fastening oil radiator mounting bracket to engine	M6	2	8 Nm (5.9 lb ft)	-

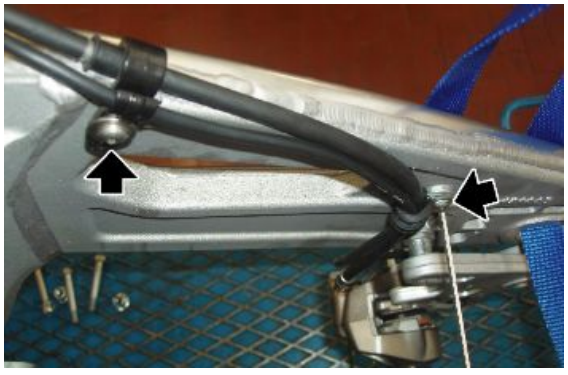
Swinging arm



REAR SWINGARM

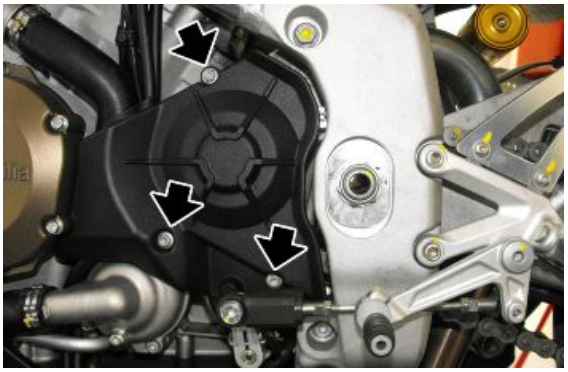
pos.	Description	Type	Quantity	Torque	Notes
1	Swingarm regulator bushing	M30x1.5	1	12 Nm (8.85 lb ft)	-
2	Swingarm ferrule	M30x1.5	1	60 Nm (44.25 lb ft)	-
3	Fork pin nut	M20x1.5	1	65 Nm (47.94 lb ft)	AGIP GREASE SM2
4	Chain guard fastening screws	M5	2	4 Nm (2.95 lb ft)	-
5	Front chain guide fixing screw	M5	1	4 Nm (2.95 lb ft)	-
6	Chain guide rear fastening nut	M6	1	7 Nm (5.16 lb ft)	-
7	Chain feeder shoe fastening screws	M5	2	2 Nm (1.48 lb ft)	-
8	Chain tensioner fastener screw	M8	2	Manual	-
9	Rear stand bushing fastening screws	M6	2	7 Nm (5.16 lb ft)	-
-	Lower chain shoe fastening screws	M6	2	10 Nm (7.38 lb ft)	-

Removing



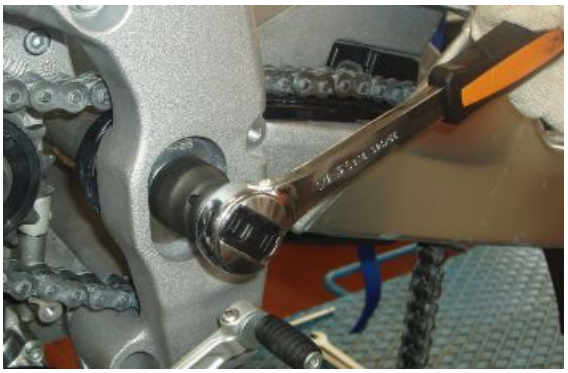
- Remove the exhaust system.
- Remove the rear mudguard.
- Remove the rear shock absorber.
- Remove the rear wheel.
- Secure the rear part of the vehicle with a belt and a hoist.
- Unscrew and remove the two pipe grommet screws.
- Remove the rear brake calliper off the swingarm.

- Unscrew and remove the three screws and remove the pinion cover.

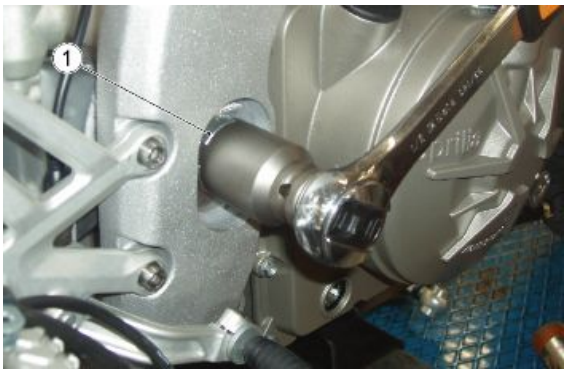


- Unscrew and remove the screw and retrieve the washer.
- Slide off the pinion from the chain and remove.

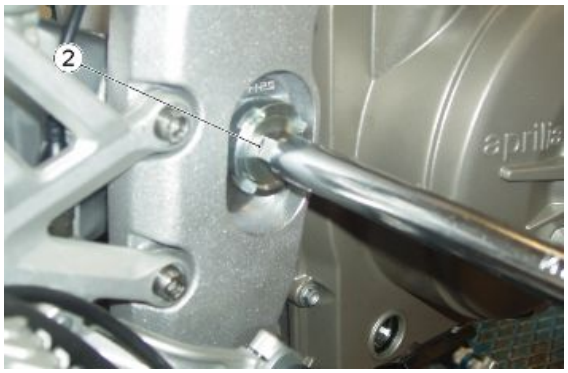
- Unscrew and remove the nut and retrieve the washer.



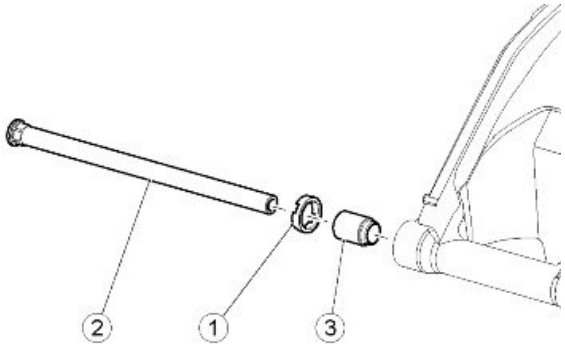
- Working from the right side, loosen and remove the locking ring nut.



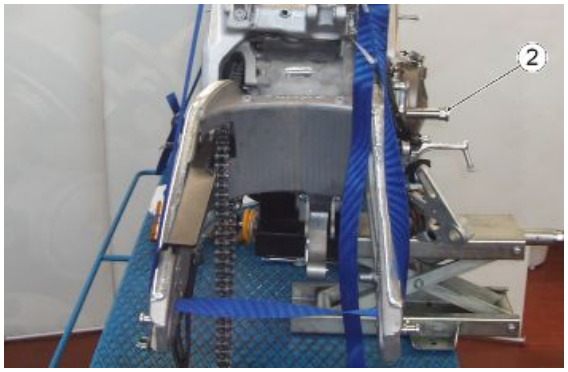
- Turn the swingarm pin (2) anticlockwise, which turns and loosens the adjustment bushing (3) completely.



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.



- Place a mounting under the front part of the swingarm.
- Support the swingarm from the front.
- Remove the swingarm pin (2) from the right hand side.
- Support the front part of the swingarm and be ready to accompany it.
- Using the rear mounting stand, remove the swingarm completely from the vehicle from the rear.
- Remove the adjustment bushing from the swingarm pin (2).

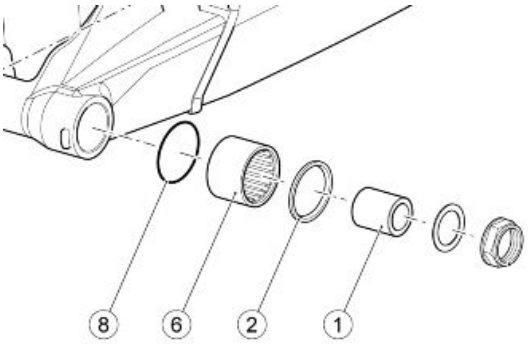


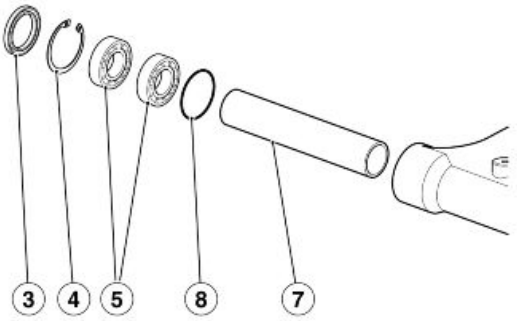
UPON REMOVING THE REAR SWINGARM PAY ATTENTION NOT TO JAM THE GEARING CHAIN.

- If necessary, use a specific tool to remove a pin from the drive chain.
- Open and remove the chain.

Checking

- Remove the swingarm.
- Clean the two sides of the bearing seats with a cloth.
- Slide off the bushing (1).
- Remove the sealing gasket (2).
- Remove the sealing gasket (3).
- Remove the circlip (4).
- Use the specific special tool to extract the two bearings (5) and the roller bearing (6).





CHECK AND, IF REQUIRED, REPLACE THE BEARINGS AFTER EVERY BEARING REMOVAL.

Specific tooling

AP8140180 Bearing extractor

- Remove the inner spacer (7) and collect the two OR seals (8).
- Carefully clean inside the bearing seat.

CAUTION

WASH ALL COMPONENTS WITH CLEAN DETERGENT SOLUTION.

UPON REFITTING, USE A BUFFER WITH A DIAMETER EQUAL TO THE EXTERNAL RING OF THE BEARINGS TO INSERT THE BEARINGS.
DO NOT HIT THE BALLS AND/OR THE INTERNAL RING.

CHECK THE CONDITION OF ALL COMPONENTS AND OF THE COMPONENTS INDICATED AS FOLLOWS IN PARTICULAR.

SWINGARM BEARINGS

Carry out the check with the bearings fitted on the swingarm.

ROTATION CHECK

- Manually rotate the inside ring of each bearing. Rotation must be constant, smooth and noiseless.

If one or both bearings do not fall within the control parameters:

- Replace both swingarm bearings.

RADIAL AND AXIAL CLEARANCE CHECK

- Check the radial and axial clearance.

Axial clearance: a minimum axial clearance is allowed.

Radial clearance: none.

If one or both bearings do not fall within the control parameters:

- Replace both swingarm bearings.

ALWAYS REPLACE BOTH BEARINGS.
ALWAYS REPLACE THE BEARINGS WITH COMPONENTS OF THE SAME TYPE.

SWINGARM SEALS

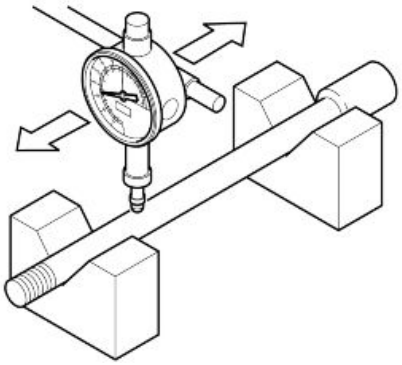
- Check that the gaskets are in good conditions; replace them if they show signs of damage or excessive wear.

ALWAYS REPLACE BOTH SEALS TOGETHER.
ALWAYS REPLACE THE SEALS WITH COMPONENTS OF THE SAME TYPE.

SWINGARM PIN

- Use a dial gauge to check the swing-arm pin eccentricity. If the eccentricity exceeds the limit value, replace the swingarm pin.

Maximum eccentricity: 0.3 mm (0.012 in)



Installing

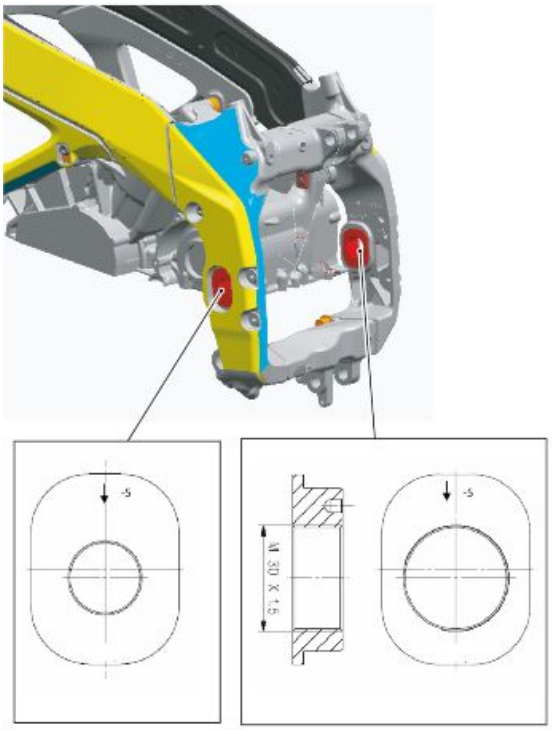
NOTE

ADJUSTMENT OF THE SWINGARM HEIGHT ON THE FRAME IS ONLY POSSIBLE FOR THE FACTORY MODEL.

The height of the swingarm pin relative to the chassis is adjusted with special inserts installed in the respective seats in the chassis. The hole is offset by -5 mm (-0.197 in) relative to the centreline of the insert, as a result the swingarm is in the low position.

There are four inserts, subdivided as follows:

- Inner/outer
- Right/left



THE TWO LEFT SIDE SWINGARM PIN INSERTS ARE THE SAME.
THE TWO RIGHT SIDE SWINGARM PIN INSERTS ARE DIFFERENT.

- Refit the swingarm height adjustment inserts if removed, bearing in mind that the arrow must face downward.

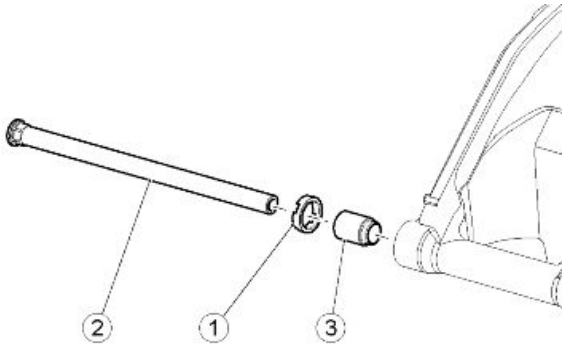
WARNING

PAY PARTICULAR ATTENTION TO THE DIRECTION OF THE INSERTS WHEN REFITTING. INCORRECT ASSEMBLY MAY CAUSE SEVERE DAMAGE TO THE VEHICLE. THE ARROW MUST FACE DOWNWARD.

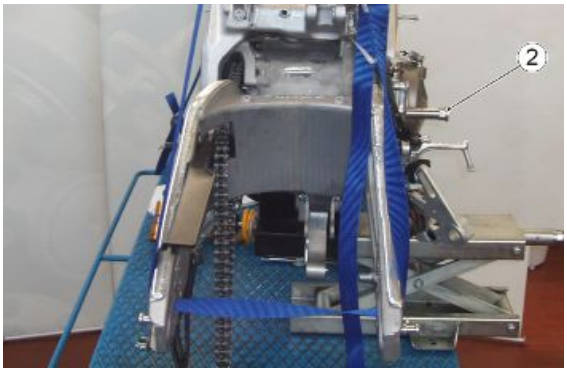
- Spread a thin layer of lubricating grease all along the swingarm pin.
- Fit the adjustment bushing (3) to its seat and tighten it manually.

CAUTION

THE ADJUSTMENT BUSHING (3) MUST NOT PROTRUDE BEYOND THE CHASSIS INTERNAL EDGE.



- Place a wooden support under the front of the swingarm to prevent it from dropping and hold in position.
- Support the swingarm from the front; move it into position so that the holes are aligned and simultaneously insert the pin (2) fully.

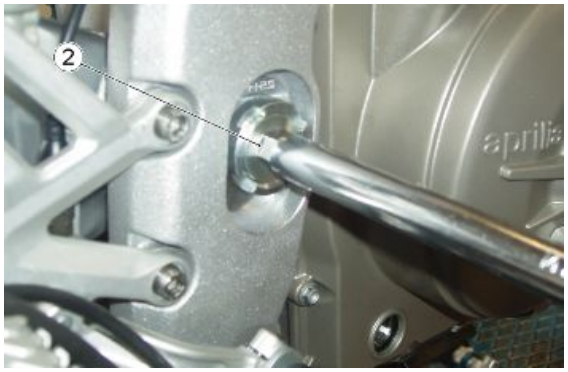


- Ensure that the hexagonal area on the pin head (2) is inserted correctly in the hexagonal seat inside the adjustment bushing (3).
- Fit and hand-tighten the counter-lock ring nut by a few turns (1).

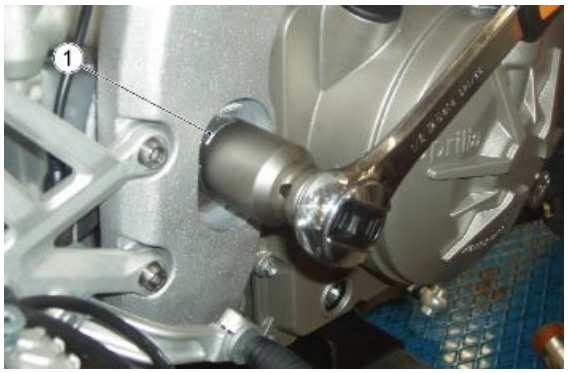
- Put some grease on the swingarm pin nut as indicated

- Fit and the washer and the swingarm pin fixing nut on the pin and hand-tighten the nut.

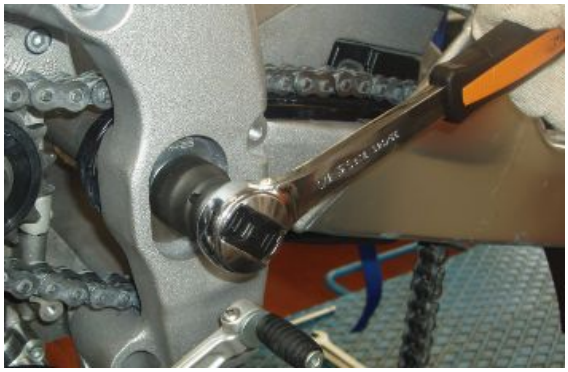
- Working from the right hand side of the vehicle, turn the swingarm pin (2) clockwise. This turns the adjustment bushing (3), driving the swingarm in until fully seated.



- Tighten the locking ring nut (1).



- Screw the nut.



- Refit the chain on the drive pinion

CAUTION

APPLY LOCTITE ANTI-SEIZE ON THE INTERNAL TOOTHING OF THE TRANSMISSION PINION.

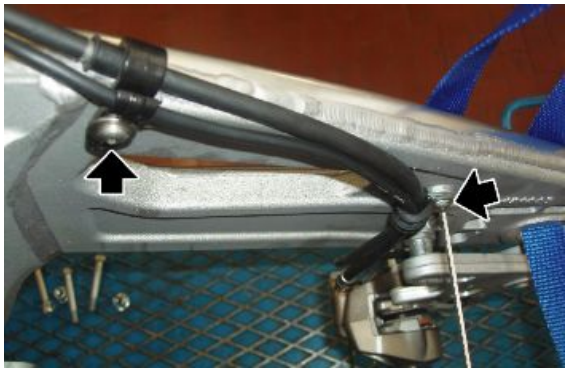
- Fit the pinion and the chain on the shaft.

CAUTION

APPLY LOCTITE 243 ON THE SCREW THREAD.

- Fit the washer on the screw
- Tighten the screw.

- Install the rear shock absorber and the linkages.
- Fit the rear brake calliper plate.
- Fasten the two pipe grommets on the swingarm



- Install the rear wheel and the exhaust system.
- Fit the pinion casing.
- Adjust the chain tension

Drive chain

inspection

To check the wear of the drive chain, use the chain checking instrument, P/N: **Ognibene - 529510001**.

The different chain pitches which may be checked with the instrument are indicated on the instrument itself. There are three reference markings for each chain pitch indicated on the instrument. These indicate (from right to left) the correct measurements for:

1. New chain with length near nominal value;
2. Chain with chain stretch of 1.5%;
3. Chain with chain stretch of 3%, which must therefore be replaced in accordance with applicable legislation.

Perform the procedure described as follows to check chain wear:

- Tauten the chain.
- Place the jaws of the tool on the rollers at the opposite ends of a STRAIGHT length of chain consisting of 8 chain links.
- Check that the notch on the sliding jaw matches the correct marking on the instrument.

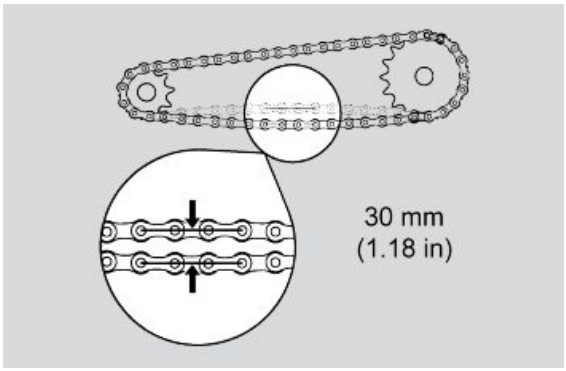
Adjusting

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.

CLEARANCE CHECK



To check clearance:

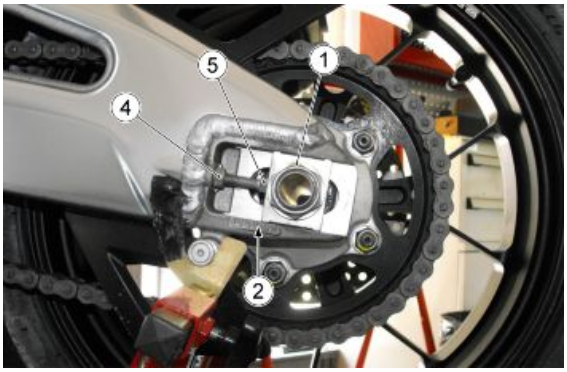
- Shut off the engine.
- Rest the vehicle on its stand.
- Engage neutral gear.
- Check that the vertical oscillation at a point between the pinion and the sprocket on the lower branch of the chain is around 30 mm (1,18 in).
- Move the vehicle forward so as to check vertical oscillation in other positions too. clearance should remain constant at all wheel rotation phases.

ADJUSTMENT

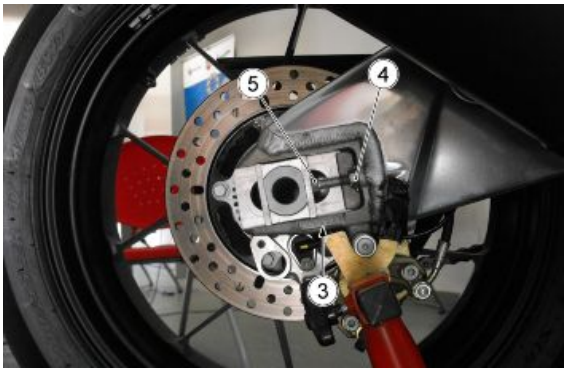
CAUTION

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.

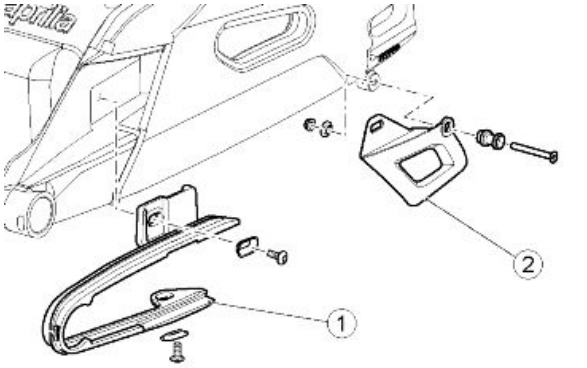
- Wash the chain with naphtha or kerosene. If it tends to rust quickly, carry out the maintenance operations more frequently.

Lubricate the chain at the intervals shown in the routine maintenance table and whenever necessary.

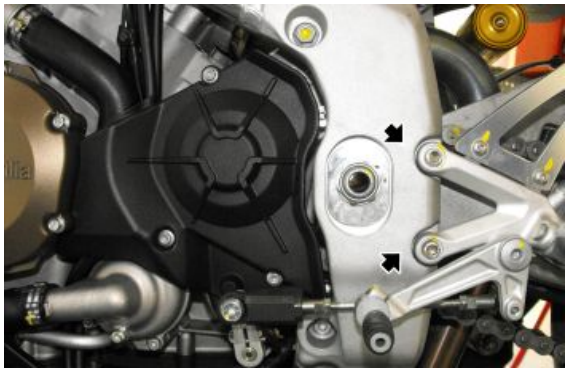
- After washing and drying the chain, lubricate it with spray grease for sealed chains.

Chain sliders

- Place the vehicle on its OPTIONAL rear service stand.
- Check that the pad (1) is not worn or damaged. Replace it with a new one if it is.
- Check the chain guide (2) for wear.



- Unscrew and remove the two screws from the left rider footpeg protection.



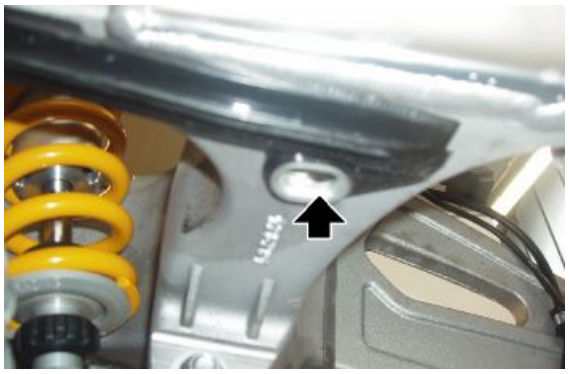
- Remove the rear wheel.

- Unscrew and remove the upper screw fixing the chain slider and retrieve the washer.

See also

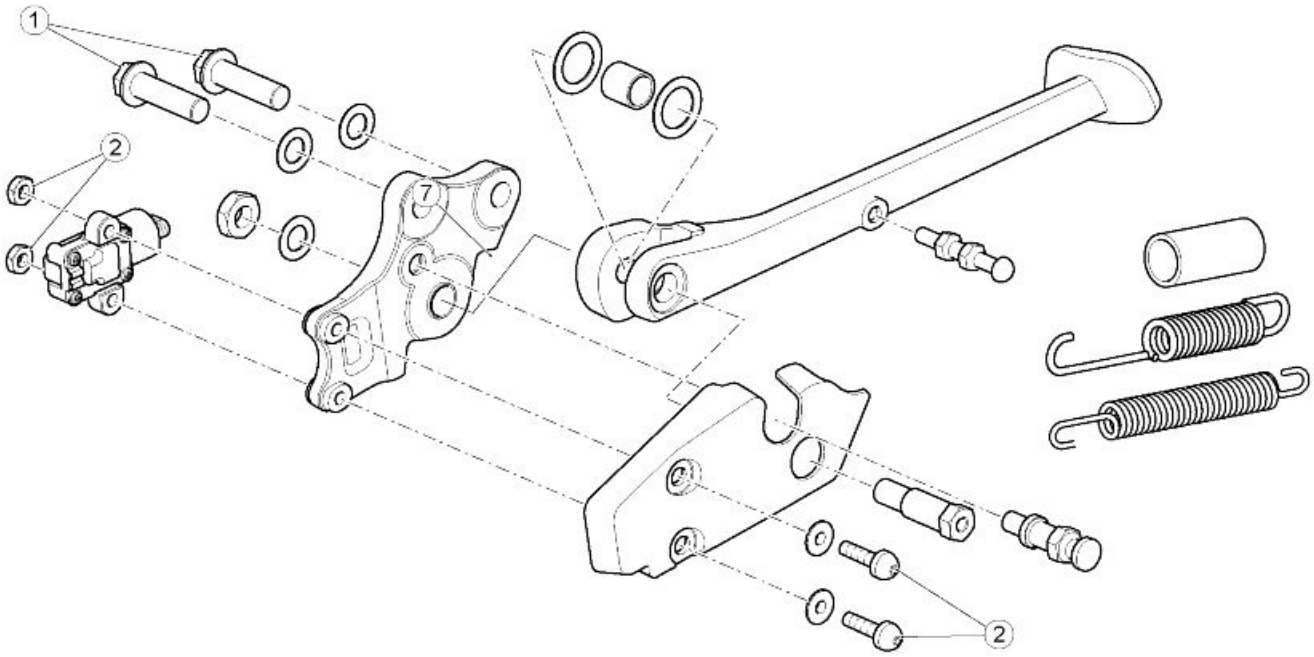
Removing the rear wheel

- Unscrew and remove the lower screw fixing the chain pad and retrieve the washers.



- Remove the chain skid (1).

Stand

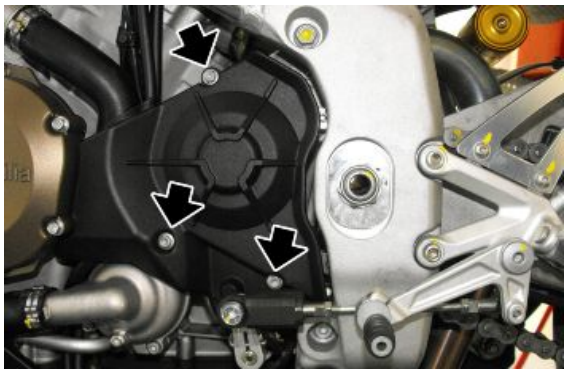


SIDE STAND

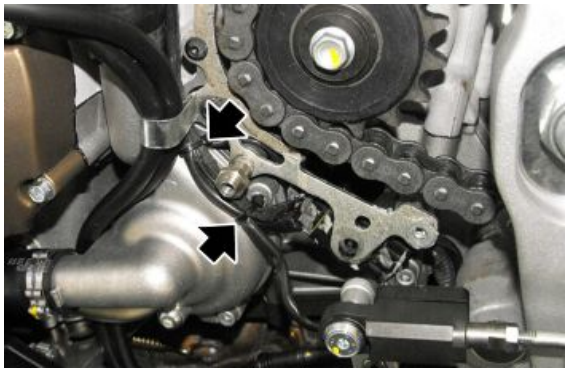
pos.	Description	Type	Quantity	Torque	Notes
1	Screws for fastening the stand to the frame	M10	2	45 Nm (33.19 lb ft)	Loct. 243
2	Linear switch retainer	M5	2	4 Nm (2.95 lb ft)	-
-	Rear stand bushing retaining screw	M6	2	7 Nm (5.16 lb ft)	-

Side stand

- Remove the fuel tank.
- Remove the pinion cover.

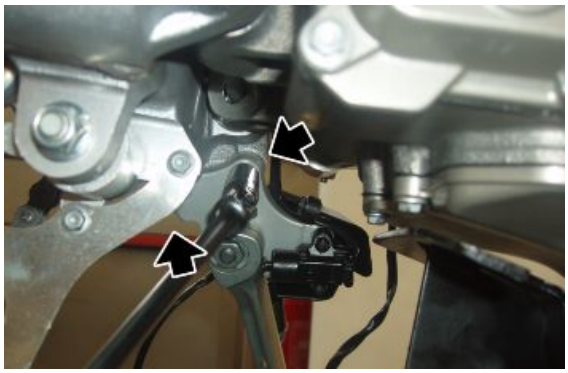


- Remove the clamps.



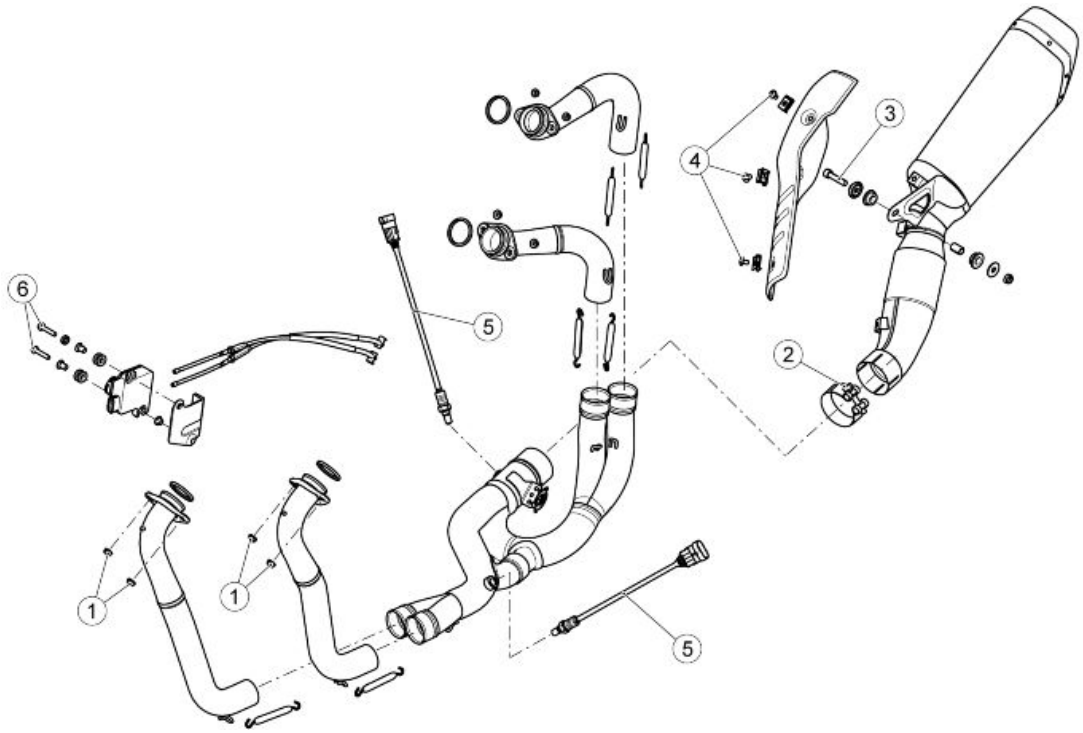
- Disconnect the stand connector.

- Unscrew and remove the two screws.



- Remove the side stand.

Exhaust

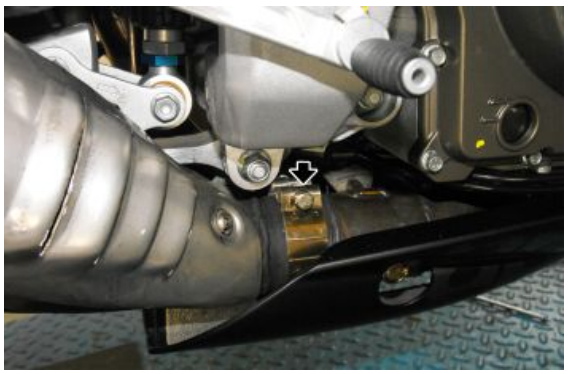


DISCHARGE

pos.	Description	Type	Quantity	Torque	Notes
1	Exhaust manifold flange fastening nuts	M7	8	13 Nm (9.59 lb ft)	-
2	Silencer clamp fixing screw - central manifold	M6	1	10 Nm (7.38 lb ft)	-
3	Screw used to secure the silencer to the RH footrest support	M8	1	25 Nm (18.44 lb ft)	-
4	Cosmetic silencer shield fixing screw	M5	3	5 Nm (3.69 lb ft)	-
5	Lambda probe fastener	M18x1.5	2	38 Nm (28.03 lb ft)	-
6	Exhaust valve actuator fixing screws	M6	2	10 Nm (7.38 lb ft)	-
-	Exhaust valve opening/closure fixing nuts	M6	2	5 Nm (3.69 lb ft)	-

Removing the tail pipe

- Loosen the sealing clamp between the exhaust and the central manifold.



- Unscrew and remove the front screw fastening the exhaust to the chassis.

- Unscrew and remove the upper attachment screw fixing the exhaust pipe to the chassis; retrieve the collar, the washer and the nut.

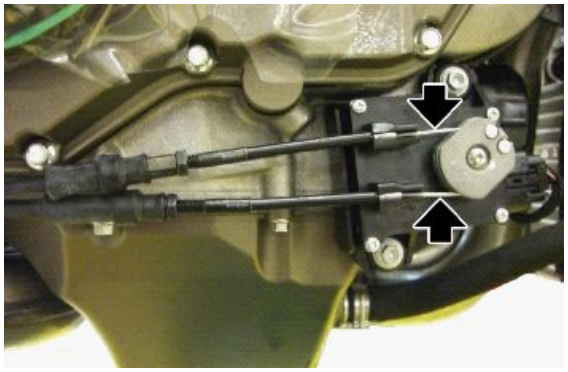
DURING THIS OPERATION SUPPORT THE EXHAUST PIPE SO THAT IT DOES NOT FALL.

- Remove the exhaust end.

Removing the catalytic converter

- Remove the exhaust end.
- Remove the front exhaust manifold.
- Remove the pinion crankcase
- Disconnect the lambda sensor connector.
- Release the oxygen sensor cable harness from the clamps.

- Disconnect the two exhaust butterfly valve control cables



- Unscrew and remove the screw from the cable grommet for the two exhaust butterfly valve control cables.

CAUTION

ON REASSEMBLY, POSITION AND TIGHTEN THE SCREW BUT NOT THE CABLE GROMMET.

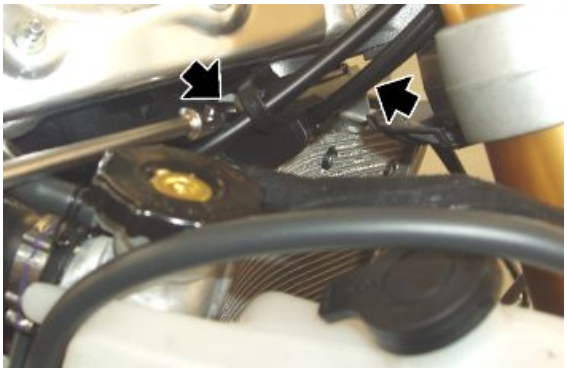
- Release the springs between the rear exhaust manifolds and the catalytic converter
- Remove the catalytic converter.

Removing the exhaust manifold

2 IN 1 FRONT EXHAUST MANIFOLD

- Remove the front underfairings.
- Remove the hand grip position sensor control unit.

- Unscrew and remove both radiator upper fixing screws.



See also

Fairing mounting panels
Twistgrip position sensor

- Release the springs between the front exhaust manifolds and the catalytic converter

- Move the radiator forward.
- Unscrew and remove the four nuts fastening the front exhaust manifold and retrieve the washers.

- Remove the front exhaust manifold.

REAR EXHAUST MANIFOLDS

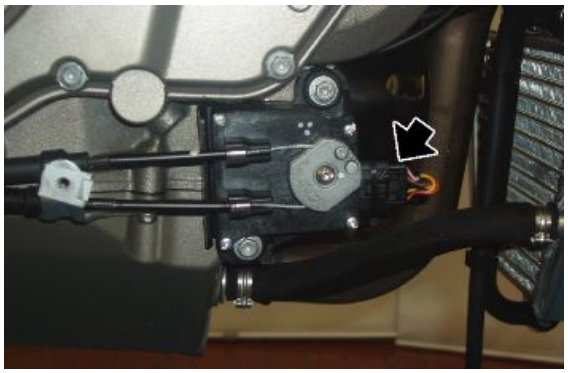
- Remove the catalytic converter.
- Remove the left rider footpeg.
- Unscrew and remove the four nuts fastening the rear exhaust manifolds and retrieve the washers.
- Remove both rear exhaust manifolds.

Butterfly valve in exhaust

To check correct operation and calibration of the exhaust valve, see electrical system section.

REMOVING THE EXHAUST THROTTLE VALVE

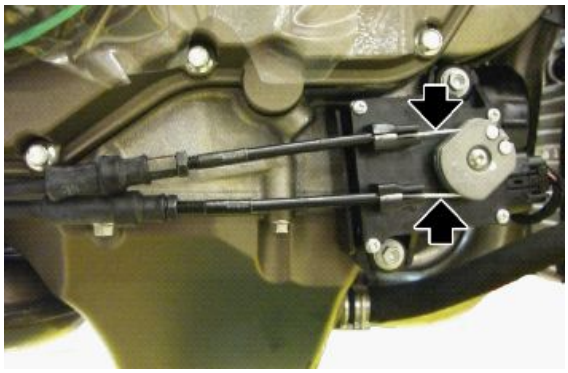
- Remove the fairing lug.
- Disconnect the connector from the valve actuator motor.



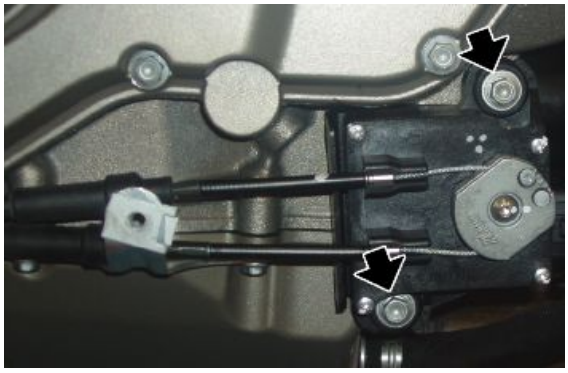
See also

Lower cowl

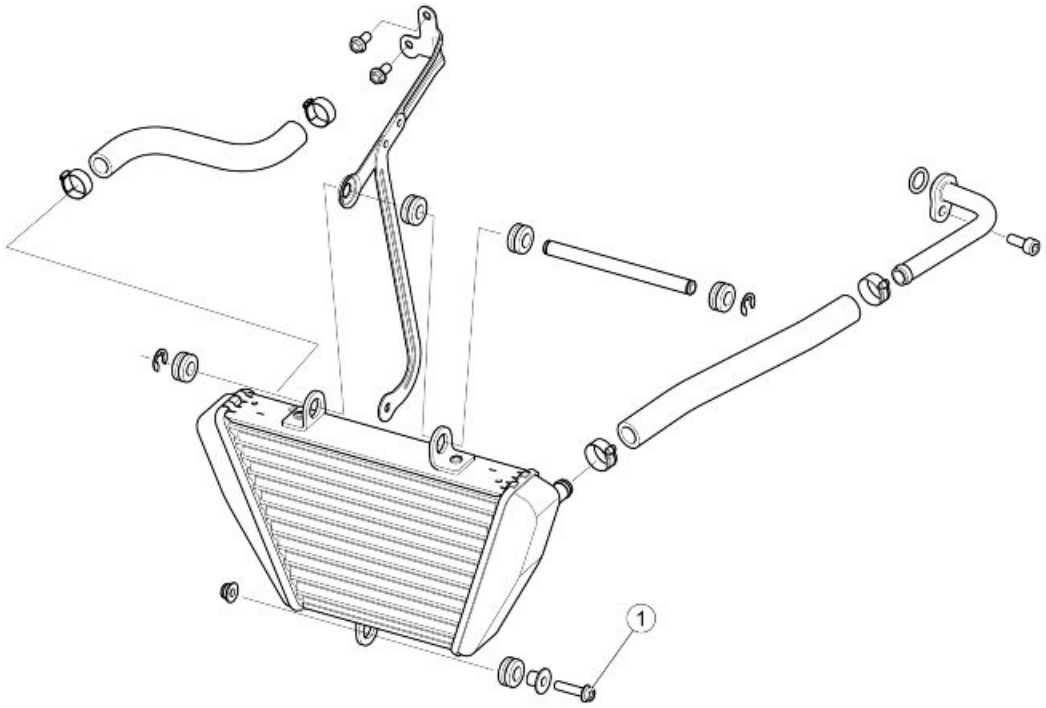
- Disconnect the two exhaust butterfly valve control cables



- Unscrew and remove the two valve actuator motor screws
- Remove the valve actuator motor together with the heat shield.



Engine oil cooler



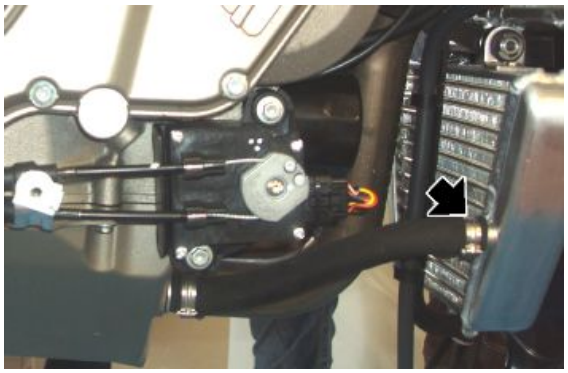
RADIATORE OLIO

Pos.	Descrizione	Tipo	Quantità	Coppia	Note
1	Screws fastening oil radiator to mounting bracket	M6	1	7 Nm (5.16 lb ft)	-

Pos.	Descrizione	Tipo	Quantità	Coppia	Note
2	Viti TE fl. per fissaggio staffa a telaio	M6x20	2	10 Nm (7.38 lbf ft)	-

Removing

- Drain the engine oil.
- Remove both fairings and the radiator cowl.
- Release the clamp and disconnect the right hand radiator pipe.



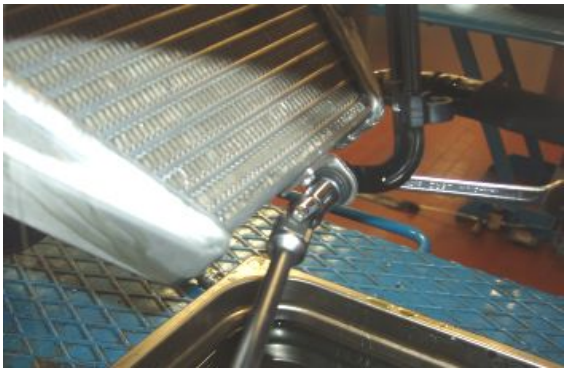
- Release the clamp and disconnect the left hand radiator pipe.

See also

Replacement

- Remove the split pin.
- From the opposite site, remove the coolant radiator-oil radiator connector pin.

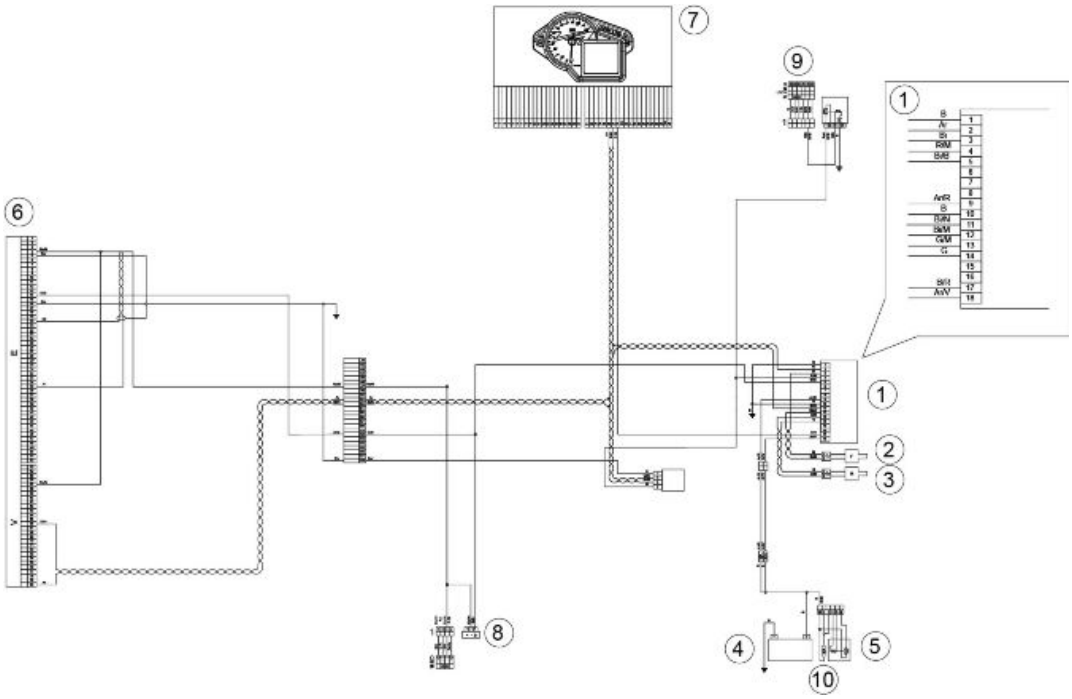
- Unscrew and remove the lower radiator retainer.
- Remove the radiator, draining completely of oil.



INDEX OF TOPICS

BRAKING SYSTEM	BRAK SYS

ABS



Key:

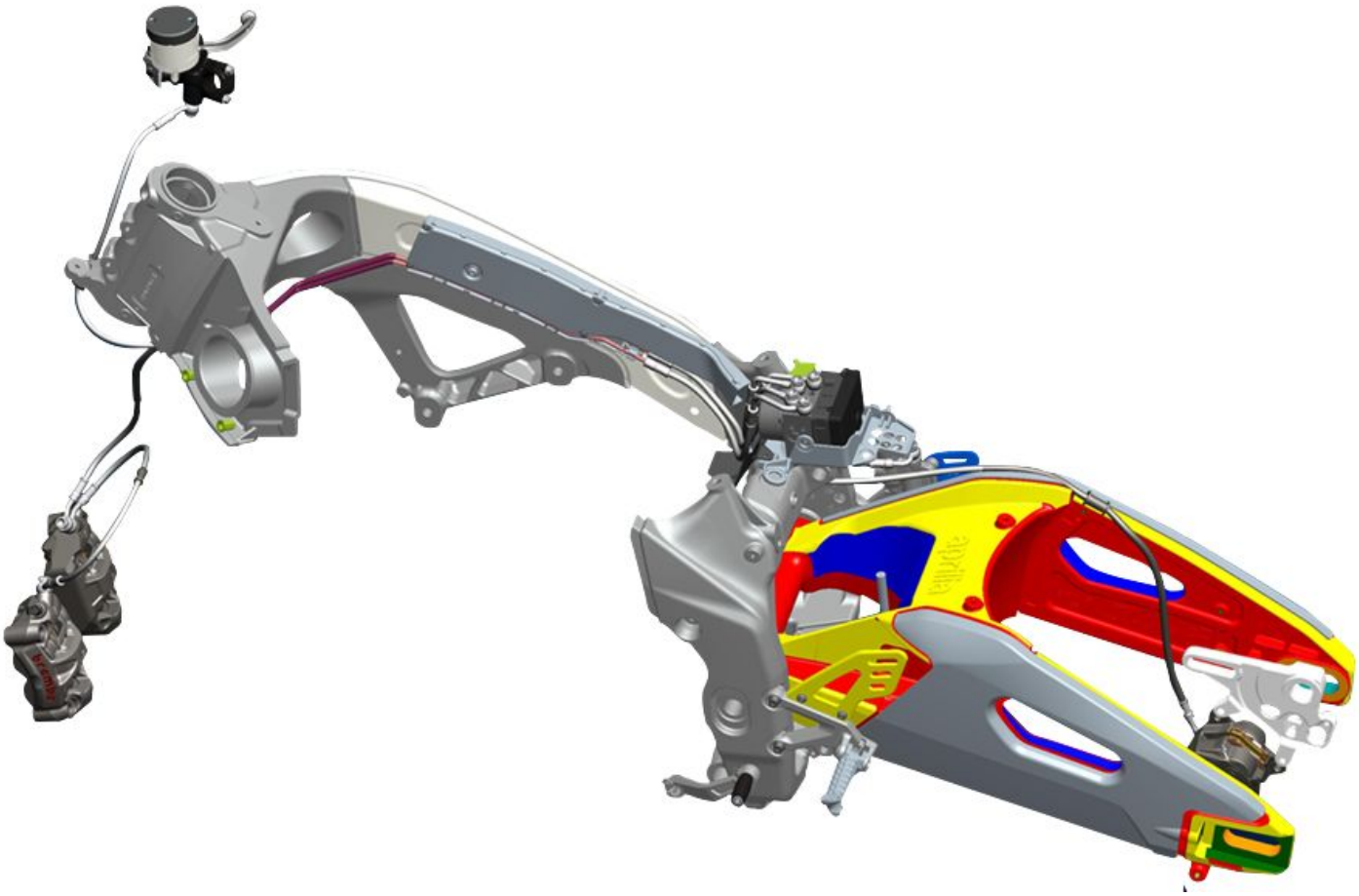
1. ABS control unit
2. Front ABS sensor
3. Rear ABS sensor
4. Battery
5. Main fuse
6. Injection ECU
7. Instrument panel
8. K line (diagnosis)
9. Key
10. ABS control unit fuse

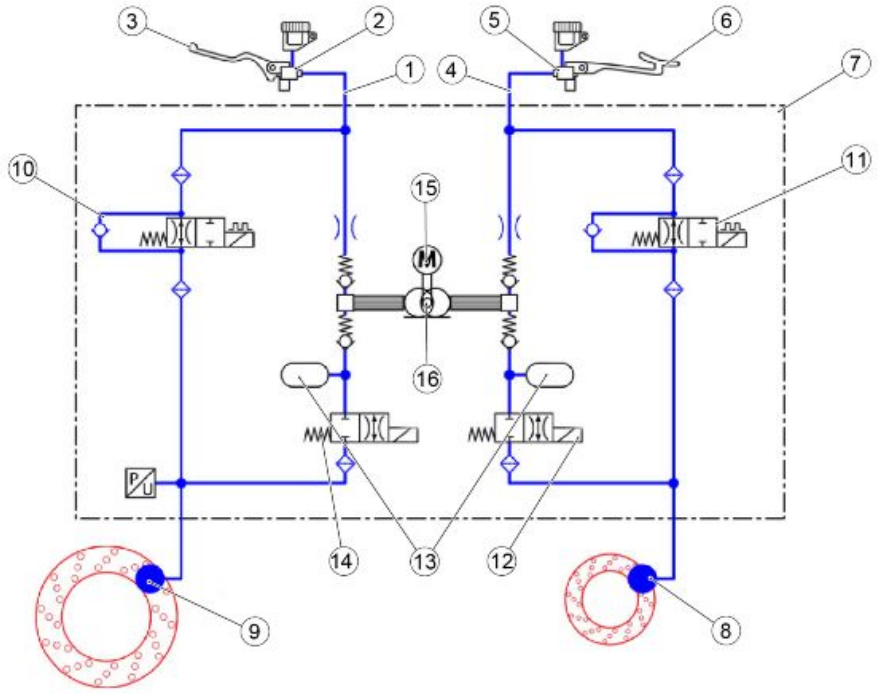
ABS control unit pinout

- PIN 1 (Blue) - Valve ground and ECU
- PIN 2 (Orange) - CAN H line (high speed)
- PIN 3 (White) - Front speed sensor input
- PIN 4 (Red/Brown) - Control unit positive live
- PIN 5 (White/Blue) - K serial line for Diagnosis
- PIN 9 (Orange/Red) - Battery for valve positive
- PIN 10 (Blue) - Pump engine ground
- PIN 11 (White/Black) - CAN L line (low speed)

- PIN 12 (White/Brown) - Front speed sensor positive
- PIN 13 (Yellow/Brown) - Rear speed sensor positive
- PIN 14 (Yellow) - Rear speed sensor input
- PIN 17 (Blue/Red) - ABS warning light
- PIN 18 (Orange/Green) - Battery for ABS pump engine positive

Operating diagram



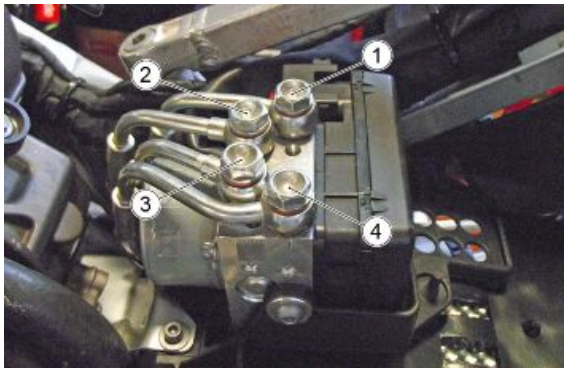


ABS functional diagram key

1. Front system circuit
2. Front brake pump
3. Front brake lever
4. Rear system circuit
5. Rear brake pump
6. Rear brake pedal control
7. ABS control unit
8. Rear brake calliper
9. Front calliper (2 callipers)
10. Front brake circuit intake solenoid valve (normally open)
11. Rear brake circuit intake solenoid valve (normally open)
12. Rear brake exhaust circuit solenoid valve (normally closed)
13. Rear/front brake circuit low pressure accumulator
14. Front brake exhaust circuit solenoid valve (normally closed)
15. DC electric motor
16. Double circuit hydraulic pump (ABS)

Intakes and supplies

1. Supply to the rear brake calliper.
2. Intake from the rear brake pump.
3. Intake from the front brake pump.
4. Supply to the front brake calliper.



ABS OPERATION

General specifications:

The front circuit is similar to the rear circuit.

- The ABS inlet valve (10 - 11) is normally open and it is closed only when the system intervenes to avoid wheel locking.
- The exhaust valve (12 - 14) is normally closed and is only opened when the system intervenes to prevent 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.

Stages in ABS cycle (the following operations refer to the front circuit but are also applicable to the rear one):

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 (10-11) and opens the outlet valve (12-13) 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. Excess fluid temporarily fills the "reservoir" located inside the ABS modulator until the ABS pump (16) automatically activates to direct the fluid to the brake master (2 -5).

C - Pressure maintained: 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 (10-11).

D - Pressure restoration: by opening the inlet valve (10-11) 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 can be detected if the duration of the pressure reduction phase exceeds the pre-set 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.

ABS enable/disable

Only at a motorcycle standstill, with a long press of the mode button, it is possible to access the menu **a-PRC Settings**.

When ABS is selected (shown in negative), in addition to varying its level by short pressing, it can be deactivated. To do this, position it to level one and press with a long pressure the button "**-**".

To reactivate it, press with a short pressure the button "**+**".

CAUTION

THE DISABLING OF THE ABS REMAINS EVEN AFTER A "KEY OFF".

NOTE

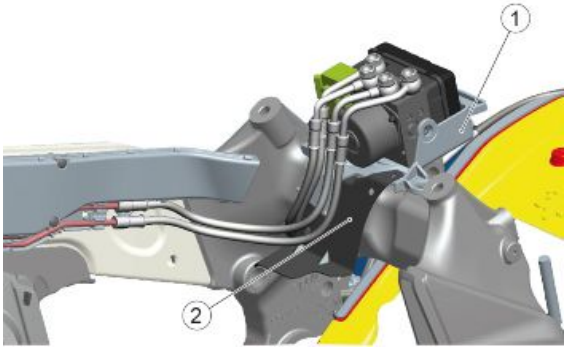
WHEN THE IGNITION KEY IS TURNED, IF THE SYSTEM IS FUNCTIONING CORRECTLY, THE ABS INDICATOR LAMP WILL FLASH (THE SYSTEM IS ACTIVATED AS SOON AS THE VEHICLE SPEED EXCEEDS 5 km/h - 3.1 mph)

Riding with the ABS system inactive

The warning light (5) comes on stead, the system has been deactivated.

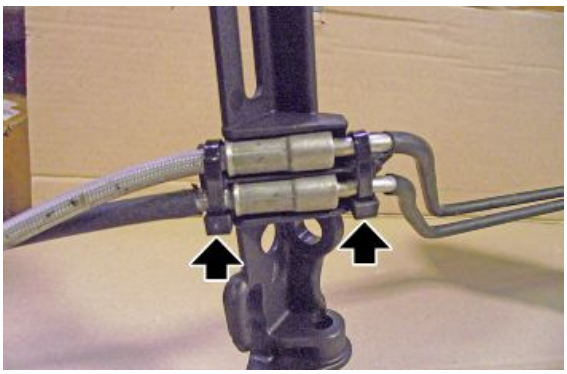
REPLACING THE ABS CONTROL UNIT

- Before replacing the ABS control unit, mark the hoses so that they can be refit correctly on the new control unit.
- Remove the ABS support (1), the heat shield plate (2) and finally the ABS control unit.

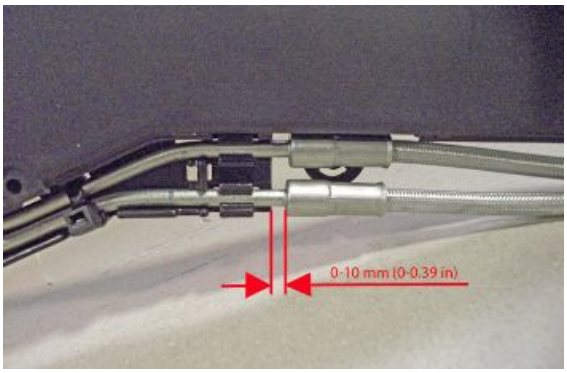


- In case of replacement or refitting of the front brake lines, take care that the steel ends are correctly lodged in the respective seats on the radiator support.

- Use clamps to secure any axial movements of the hoses.



- Reposition the front brake steel pipes in the conduit, secure the pipes using clamps and observing the tolerances indicated in the figure.



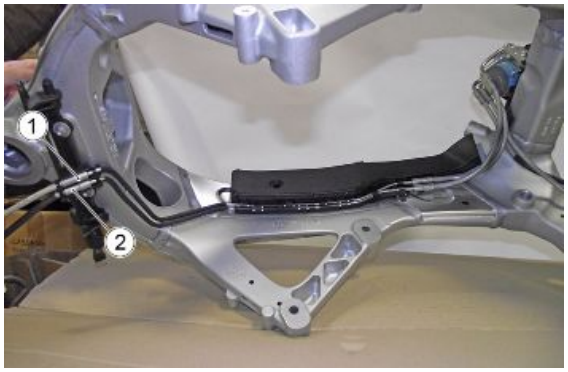
Characteristic

Pipe axial clearance

0 - 0.10 mm (0 - 0.39 in)

- Take care of hose position on the support.

1. Goes to the pump.
2. Goes to the caliper.



- After replacing hoses or the control unit the entire ABS system must be bled.

To bleed the ABS system optimally, it is advisable to use devices such as vacuum pumps or similar.

CAUTION

MORE OIL IS REQUIRED TO BLEED THE ABS SYSTEM THAN A CONVENTIONAL SYSTEM. FOR THIS REASON, CAREFULLY CHECK THE OIL LEVEL IN THE BRAKE TANK.

If there is a lever or brake pedal "sponginess" although the bleeding has been done, bleed the secondary circuit in the ABS control unit. To do this, carry out a road test by repeatedly activating the ABS positioning its threshold to level 3

After the bleeding has been done, delete any errors with the diagnostics instrument on the ABS control unit and on the 7SM one.

Before returning the vehicle, carry out a functional road test.

REPLACING/ACTIVATING NEW ABS CONTROL UNIT

In case of replacement of the ABS control unit, ensure that the new one has caps on all four hydraulic connections and then proceed as follows:

- Before disconnecting the electrical connections, switch the key "OFF".
- After hydraulic and electrical connection of the new ABS control unit, activation/recognition must be carried out.
- Switch the key "ON".
- Verify that the ABS indicator light flashes rapidly.
- Turn the key to "OFF" and then back to "ON".
- If activation is successful, the warning light should light up with a slow flash.
- In case of faults, the indicator light should be steady with the diagnostics instrument disconnected.
- Connect the diagnostics instrument and check if there are errors.

ABS PIPES ROUTING

TABLE A - ABS PIPES ROUTING

1. Small clamps

TABLE B - ABS PIPES ROUTING

1. Rear speed sensor cable.
2. Cable guide.
3. Cable grommet.
4. Cable grommet.

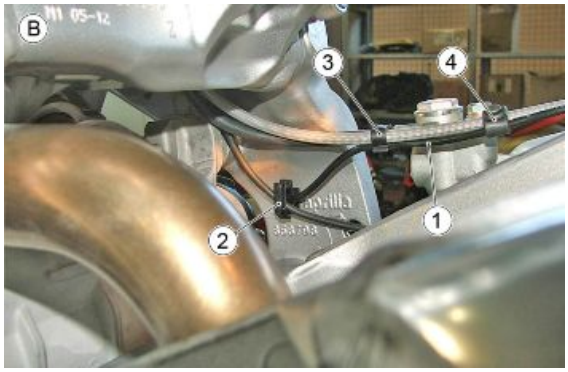


TABLE C - ABS PIPES ROUTING

The hydraulic pipes must necessarily pass as shown in the figure.

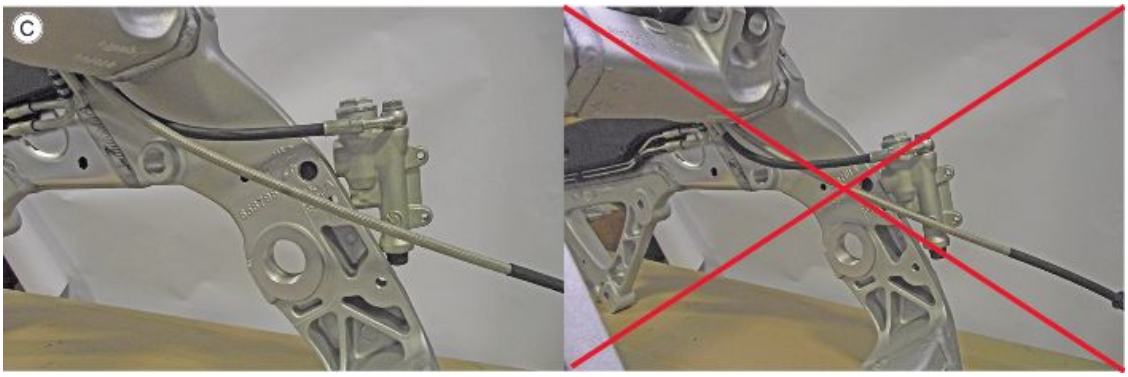
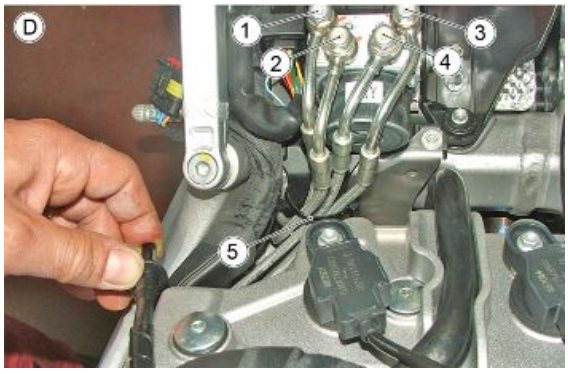


TABLE D - ABS PIPES ROUTING

1. Delivery rear calliper.
2. Input from the rear pump.
3. Delivery front calliper.
4. Input from the front pump.
5. Medium clamp.



Guide to diagnosis

PREMISE

Each time the key is ON, if, at least one current or stored* error is detected, the ABS warning light turns on permanently.

The ABS system is deactivated automatically

The system operates perfectly just as any other braking system without ABS

*** The diagnosis requires exceeding the 5 km/h (3.1 mph).**

Each time the key is ON, if at least one current or stored* error of the ABS system is not detected:

- the abs warning light flashes.

When the 5 km/h (3.1 mph) are exceeded:

- 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 disabled!

The system operates perfectly just 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.

ABS FAULTS - GUIDE TO THE DIAGNOSIS

1. ABS WARNING LIGHT ON
2. CONNECT DIAGNOSTICS INSTRUMENT

DOES THE DIAGNOSTICS INSTRUMENT COMMUNICATE? (NO, point 3; YES, point 4)

3.PERFORM THESE CHECKS:

- A. Ground connection PIN 1
- B. +12V at PIN 18
- C. +12V live at PIN 4

4. **ARE THERE ERRORS? (YES, point 5; NO, point 6)**

5. CONSULT THE ERRORS TABLE
6. ABS WARNING LIGHT ACTIVATION

IS IT ACTIVATED? (YES, point 7; NO, point 8)

7. CONTACT TECHNICAL SERVICE

8. CHECK:

- A. Cable continuity between PIN17 of the ABS control unit connector and PIN28 of the instrument panel.
- B. Check connectors - refer to the operations described in the chapter

If the previous checks are OK, the causes might be:

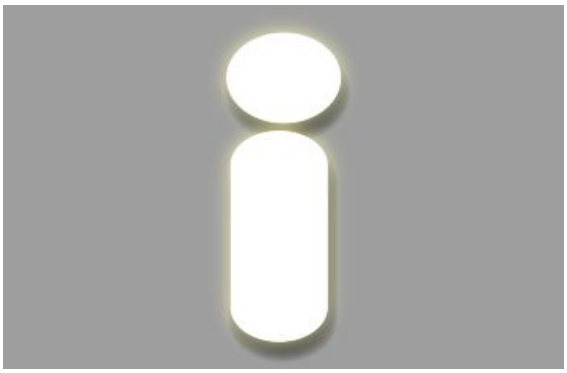
- C. ABS control unit malfunction
- D. Instrument panel malfunction

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



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

P.A.D.S. characteristic	Value/example	Unit of measurement	Notes
Speed of the front wheel	-	km/h	-
Speed of the rear wheel	-	km/h	-
Battery voltage	-	D	-

P.A.D.S. characteristic	Value/example	Unit of measurement	Notes
Front brake circuit pressure	-	bar	-

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 page, you can delete the errors from the memory of the controller and you can enable some systems controlled by the control unit.

ACTIVATION

P.A.D.S. characteristic	Value/example	Unit of measurement	Notes
ABS Warning Light			
Delete errors			
Freezes and saves the parameter and states values			

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

P.A.D.S. characteristic.	Value/example	Units of measurement	Notes
Comparison of front and rear wheel	C1024		Excessive difference
Rear wheel speed sensor electrical diagnosis	C1031		Short circuit or open circuit to negative or short circuit to positive
Rear wheel speed sensor functional diagnosis	C1032		Signal not plausible
Front wheel speed sensor electrical diagnosis	C1033		Short circuit or open circuit to negative or short circuit to positive

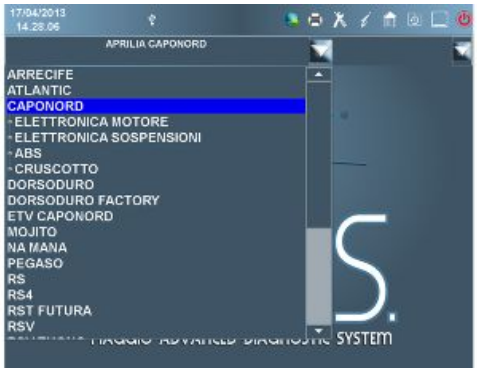
P.A.D.S. characteristic.	Value/example	Units of measurement	Notes
Front wheel speed sensor functional diagnosis	C1034		Signal not plausible
Inside error	C1014		Solenoid valve relay failure
Inside error	C1015		Recirculation pump failure
Inside error	C1021		Control unit failure
Inside error	C1048		Rear circuit output solenoid valve failure
Inside error	C1049		Rear circuit output solenoid valve failure
Inside error	C1052		Rear circuit input solenoid valve failure
Inside error	C1054		Front circuit inlet solenoid valve failure
Low power supply voltage	C1058		
High power supply voltage	C1059		
Configuration error	C1089		
CAN error	U2921		Controller error
CAN error	U2922		Line failure (busoff)
CAN error	U2924		Failed reception from instrument panel
CAN error	U2925		Failed reception from injection ECU
+ button	U2926		Connect to the injection control unit diagnostics
- button	U2927		Connect to the injection control unit diagnostics
Inside error	C1331		Pressure sensor failure
Inside error	C1332		Pressure sensor failure (Offset)
Inside error	C1333		Pressure sensor failure (Power supply)

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.

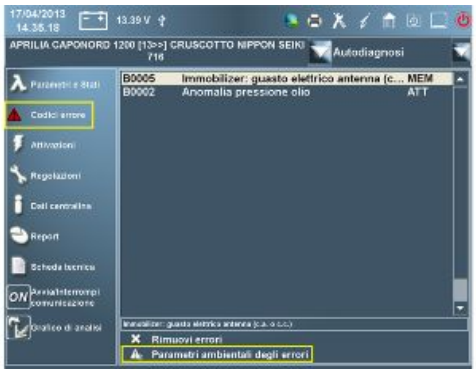
- Select the vehicle and the component.



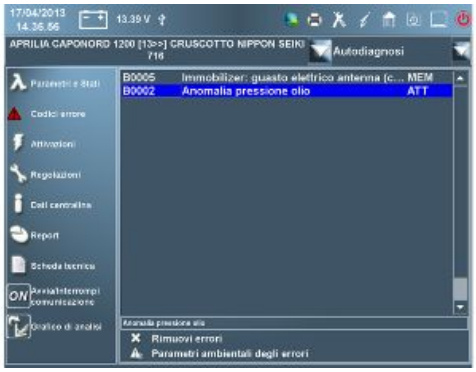
- Select Self-diagnosis.

- Go to the page Error codes.

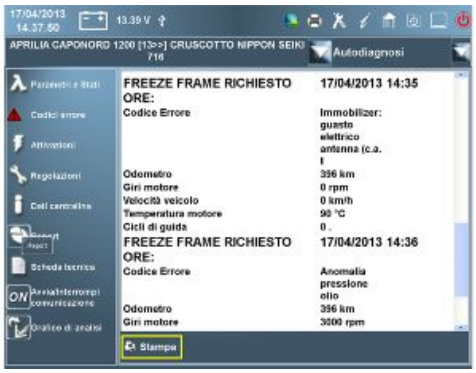
- Select an error and show the Ambient parameter error(where provided).

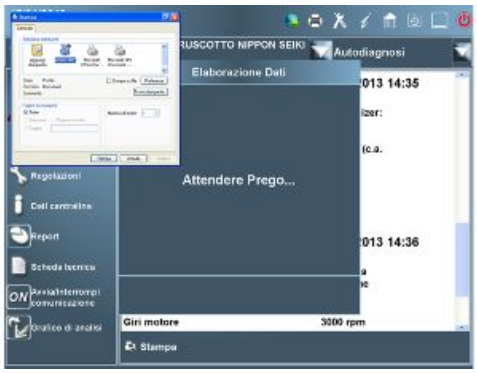


- Repeat the operation by selecting each error and showing the corresponding Ambient parameter error (where provided).

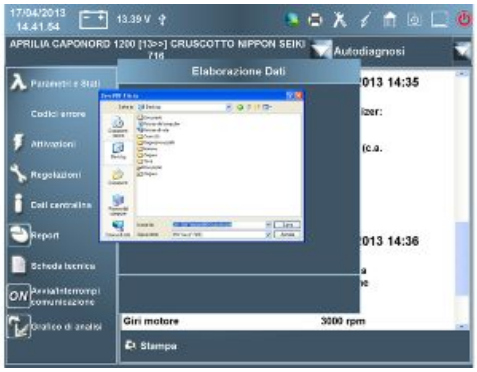


- Go to the page Report and then on Print and select the virtual PDF printer.





- 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./Navigator characteristic	Value/example	Unit of measurement	Notes
Coding			Reset the vehicle code and it performs the self-learning from CAN line to the key ON

Diagnosis

SPEED SENSOR ERRORS

C1024 Comparison of front and rear wheel- Excessive difference.

Error cause

Wrong wheel or tone wheel sizes.

Troubleshooting

- Check the type and sizes of the fitted tyres.
- Check the type and sizes of the fitted tone wheels.

C1031 Rear wheel speed sensor electrical diagnosis - open circuit, shorted to negative or shorted to positive.

Error cause

Open circuit: an interruption of the circuit has been detected.

Shorted to negative: no voltage has been detected at ABS control unit PIN 14.

Shorted to positive: an excessive voltage has been detected at ABS control unit PIN 14.

Troubleshooting

The circuit is open:

- Perform the check of the connectors on the components and the ABS control unit.
- Check the good condition and the wiring continuity:
    - between ABS control unit PIN 14 and sensor PIN 1 (Yellow cable)
    - between ABS control unit PIN 13 and sensor PIN 2 (Yellow/Brown cable)

Shorted to negative:

- Disconnect the sensor connector.
- Check the ground insulation of the two PIN.
- If there is no insulation, restore the cable harness, otherwise replace the sensor.

Shorted to positive:

- Disconnect the sensor connector.
- Check the battery supply insulation of the two PIN.
- If there is no insulation, restore the cable harness, otherwise replace the sensor.

C1032 Rear wheel speed sensor functional diagnosis - signal not valid.

Error cause

Possible tone wheel fault due to deformations or dirt.

Troubleshooting

- Check the tone wheel is in good condition and that it is clean.
- Check that the number of teeth on the tone wheel is correct.
- Check the correct positioning of the tone wheel and the sensor.
- Check the correct size of the tyre.
- If all the above tested have a positive result, replace the sensor.

C1033 Front wheel speed sensor electrical diagnosis - open circuit, shorted to negative or shorted to positive.

Error cause

Open circuit: an interruption of the circuit has been detected.

Shorted to negative: no voltage has been detected at ABS control unit PIN 3.

Shorted to positive: an excessive voltage has been detected at ABS control unit PIN 3.

Troubleshooting

The circuit is open:

- Perform the check of the connectors on the components and the ABS control unit.
- Check the good condition and the wiring continuity:
  - between ABS control unit PIN 3 and sensor PIN 1 (White cable)
  - between ABS control unit PIN 12 and sensor PIN 2 (White/Brown cable)

Shorted to negative:

- Disconnect the sensor connector.
- Check the ground insulation of the two PIN.
- If there is no insulation, restore the cable harness, otherwise replace the sensor.

Shorted to positive:

- Disconnect the sensor connector.
- Check the battery supply insulation of the two PIN.
- If there is no insulation, restore the cable harness, otherwise replace the sensor.

C1034 Front wheel speed sensor functional diagnosis - signal not valid.

Error cause

Possible tone wheel fault due to deformations or dirt.

Troubleshooting

- Check the tone wheel is in good condition and that it is clean.
- Check that the number of teeth on the tone wheel is correct.
- Check the correct positioning of the tone wheel and the sensor.
- Check the correct size of the tyre.
- If all the above tested have a positive result, replace the sensor.

VOLTAGE ERRORS

C1058 Low power supply voltage

C1059 High power supply voltage

Cause of error

Power supply voltage below minimum threshold or above maximum threshold detected on PIN 4 or on PIN 18 of the ABS control unit.

Troubleshooting

- Check that the voltage regulator is working correctly.
- Check the battery.

CONFIGURATION ERRORS

C1089 Configuration error

Cause of error

The configuration stored in the ABS control unit does not correspond to the configuration in the vehicle it is installed on.

Troubleshooting

Check the control unit mapping and reset the vehicle configuration.

CAN LINE ERRORS

U2921 Controller error

U2922 Line failure (busoff)

Error cause

Communication problem on the CAN line: probable contact.

Troubleshooting

Check the good condition and the wiring continuity:

- between ABS control unit PIN 2, instrument panel PIN 26 and injection control unit PIN 80 (Orange cable)
- between ABS control unit PIN 11, instrument panel PIN 27 and injection control unit PIN 66 (White/Black cable)

U2924 Failed reception from instrument panel

Error cause

Communication problem with the instrument panel: probable CAN line contact.

Troubleshooting

Check wiring continuity:

- between ABS control unit PIN 2 and instrument panel PIN 26 (Orange cable)
- between ABS control unit PIN 11 and instrument panel PIN 27 (White/Black cable)

U2925 Failed reception from injection ECU

Error cause

Communication problem with the injection ECU: probable CAN line contact.

Troubleshooting

Check wiring continuity:

- between ABS control unit PIN 2 and injection ECU PIN 80 (Orange cable)
- between ABS control unit PIN 11 and injection ECU PIN 66 (White/Black cable)

+/- BUTTON ERRORS

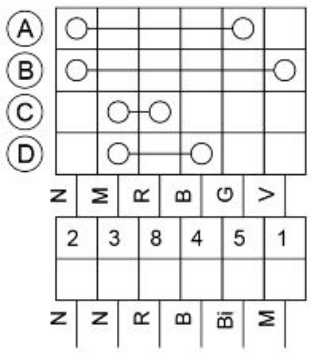
key:

A. Button "+" opened

B. Button "+" closed

C. Button "-" opened

D. Button "-" closed



U2926 + button

U2927 - button

Error cause

Malfunction of the switch.

Troubleshooting

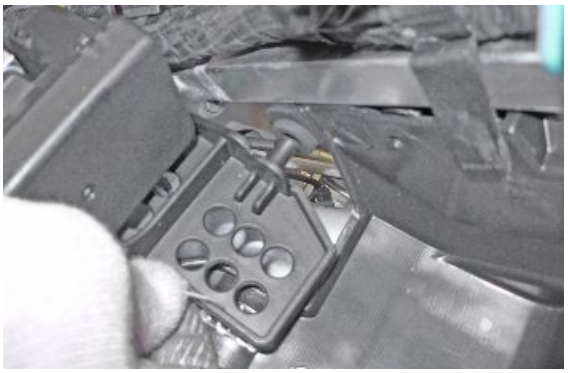
- Connect to the injection control unit diagnostics.
- Check as shown in the figure if there is or not continuity between the switch contacts in the different opening/closing conditions:
  - with "+" button open, the "-" button must be closed
  - with "+" button closed, the "-" button must be opened

Modulator

- Disconnect the ABS connector.

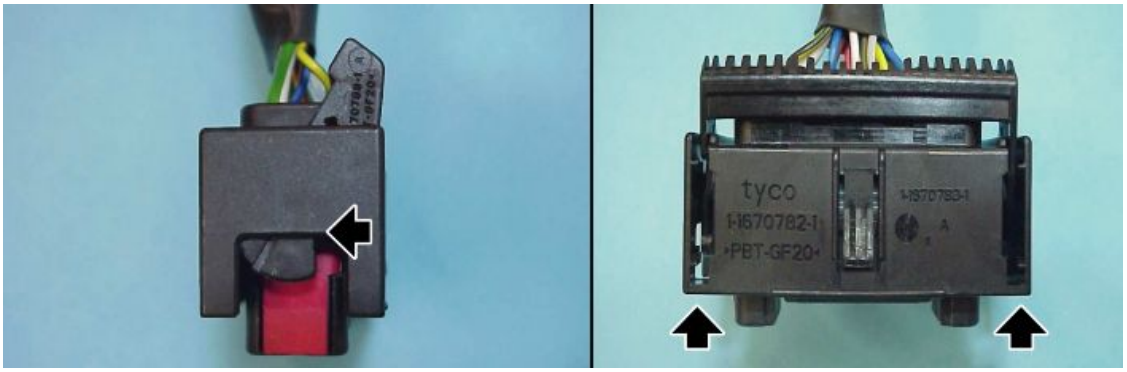
- Disconnect and remove the brake pipes inserts from the ABS control unit.
- Undo the fixing screw of the ABS control unit

- Disconnect the ABS control unit from its rear inserts.
- Remove the ABS control unit

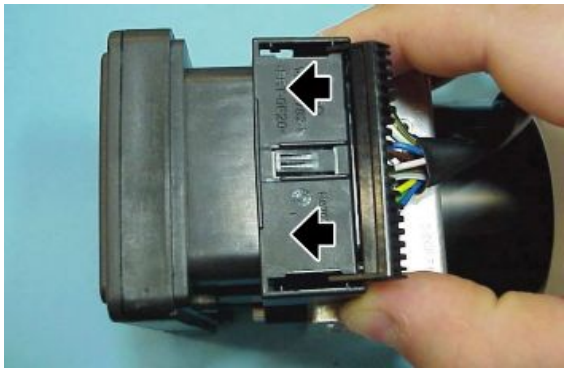


INSERTION PROCEDURE OF ABS CONTROL UNIT CONNECTOR

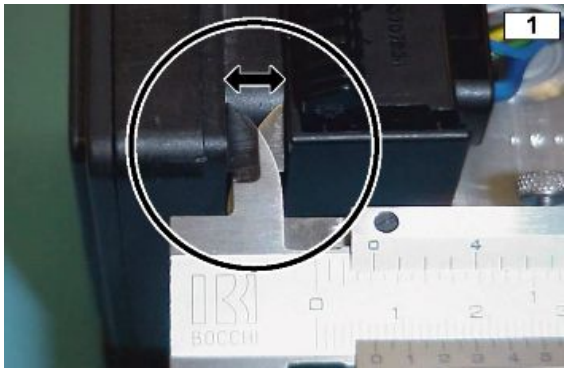
- Check the initial position of the lever that couples the connector.



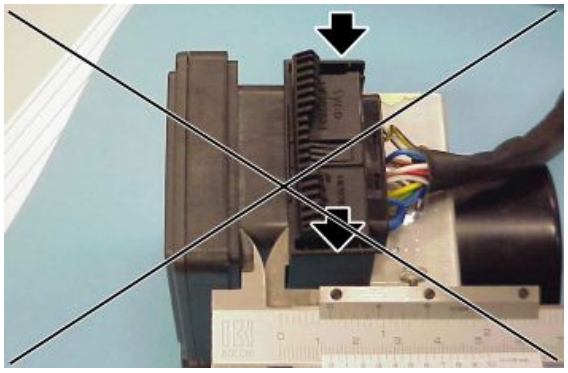
- When the connector is fully inserted, the distance between the connector and the ABS control unit must be 7.5 mm (0.29 in).



- If the initial position of the connector and the driving lever is not that shown in fig. 1, the connector will not be properly coupled and the distance measured will be greater (12 mm approx. (0.47 in)). In this case repeat the operation as described in the two previous points.



IT IS ADVISABLE TO CREATE A TEMPLATE TO CHECK THE CORRECT CONNECTOR INSERTION.



- Fit the protection casing.

Component maintenance

The vehicle is fitted with a two-channel ABS system, i.e. it works on both the front and the rear wheel.

Check periodically and each time the wheels are refitted, the tone wheel (2) or the sensor (1) replaced, that the wheel distance is constant at each 360°. Use a thickness gauge to check the distance between sensor (1) and tone wheel (2) at three points at a 120° span. The values should be between:

0.3 - 2.00 mm (0.012 - 0.079 in) for the front one;

0.3 - 2.00 mm (0.012 - 0.079 in) for the rear one;

CAUTION

IF A VALUE BEYOND THE TOLERANCE RANGE IS MEASURED, REPLACE THE SENSOR (1) AND/OR THE TONE WHEEL (2) AND REPEAT THE CHECKS; MAKE SURE THAT THE VALUES ARE WITHIN THE TOLERANCE LIMITS.

TONE WHEELS (2) CLEANING

It is important to check that all the tone wheels (2) are always clean. Otherwise,: gently remove any possible dirt deposits with a cloth or metal brush. Avoid using solvents, abrasives and air or water jets directly on the tone wheel (2).

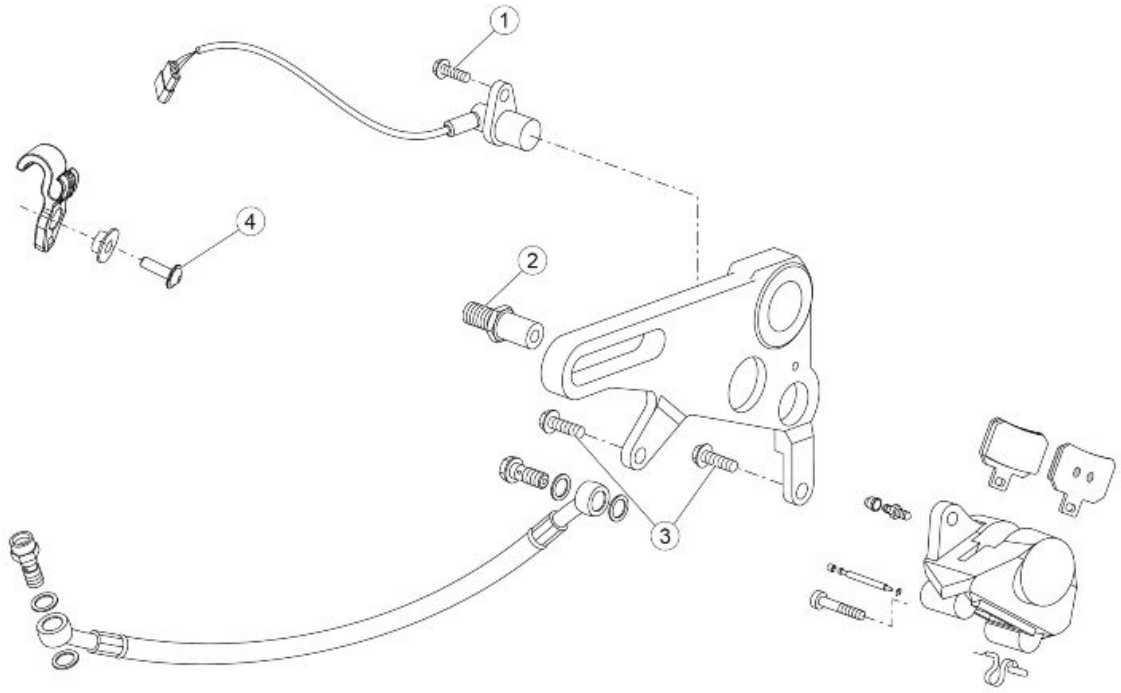
TONE WHEEL SENSOR REPLACEMENT

Disconnect the tone wheel sensor connector (1) from the main wire. Unscrew and remove the screw and remove the tone wheel sensor (1).

CAUTION

BEFORE REFITTING, MAKE SURE THAT THE FAYING SURFACES BETWEEN THE SENSOR (1) AND THE SEAT ITSELF DO NOT SHOW SIGNS OF DAMAGE AND ARE COMPLETELY CLEAN. ALWAYS CHECK THE DISTANCE BETWEEN THE SENSOR (1) AND THE TONE WHEEL (2).

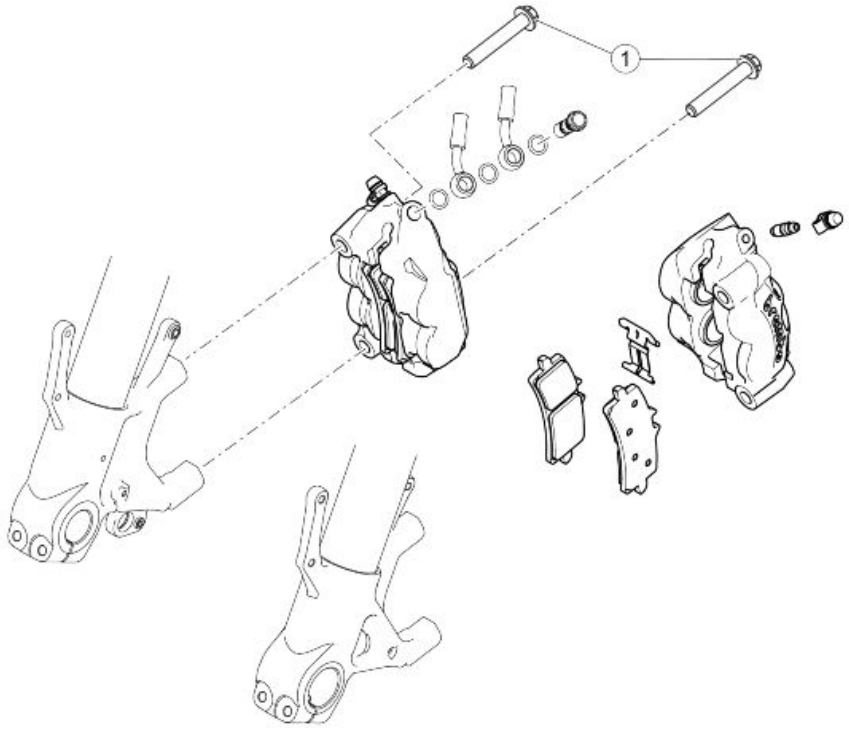
Rear brake calliper



REAR BRAKE CALLIPER

pos.	Description	Type	Quantity	Torque	Notes
1	Odometer sensor fixing screw	M6	1	10 Nm (7.38 lb ft)	-
2	Rear brake calliper support plate retaining pin	M12	1	50 Nm (36.88 lb ft)	Loct. 243
3	Rear brake calliper fastening screw	M5	2	25 Nm (18.44 lb ft)	-
4	Brake pipe bracket fastening screw	M5	1	4 Nm (2.95 lb ft)	-
-	Screw fastening brake pipe clamp	M5	2	4 Nm (2.95 lb ft)	-
-	Screw fastening odometer sensor onto brake calliper mounting	M6	1	12 Nm (8.85 lb ft)	-

Front brake calliper



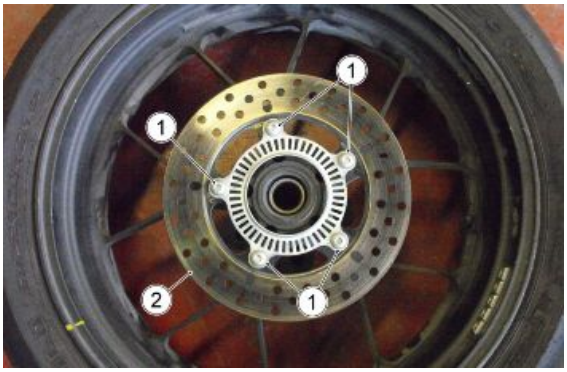
FRONT BRAKE CALLIPER

Pos.	Description	Type	Quantity	Torque	Notes
1	Front brake calliper fastening screws	M10x1.25	2 + 2	50 Nm (36.88 lb ft)	-

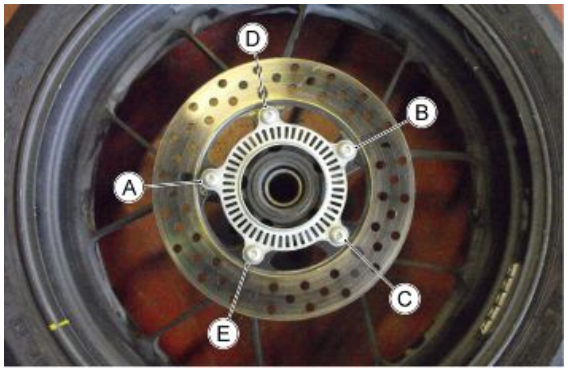
Rear brake disc

Removal

- Remove the rear wheel.



- Unscrew and remove the five brake disc screws (1).
- Remove the brake disc (2).



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.

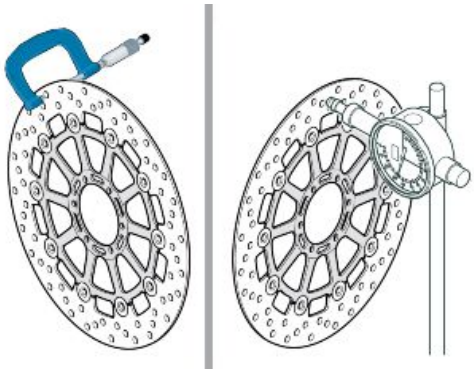
See also

Removing the rear wheel

Disc Inspection

The operations must be carried out with the 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)

- Using a dial gauge, check that the maximum oscillation of the disc does not exceed the tolerance; otherwise, replace it.

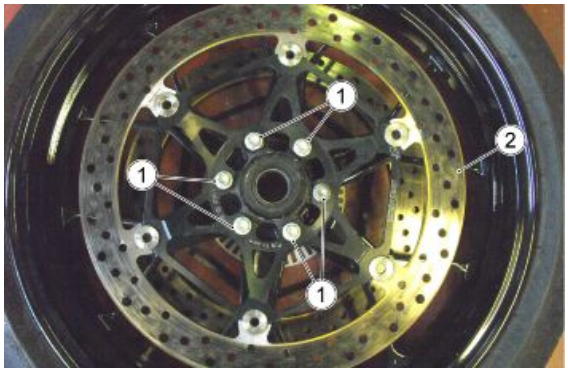
Disc oscillation tolerance: 0.1 mm (0.0039 in)

Front brake disc

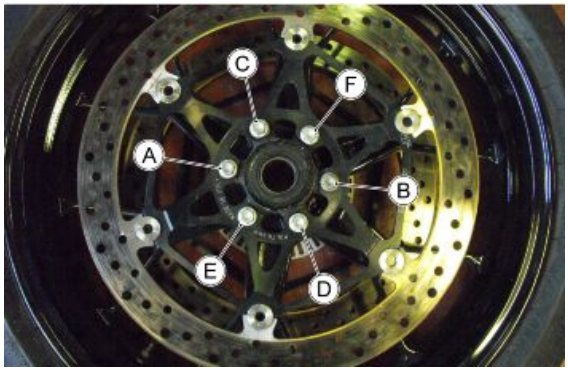
Removal

- Remove the front wheel

The following operations refers to a single disc but apply to both.



- Unscrew and remove the six brake disc screws (1).
- Remove the brake disc (2).



UPON REFITTING, APPLY LOCTITE 243 ON THE THREAD OF THE BRAKE DISC SCREWS (1).

CAUTION

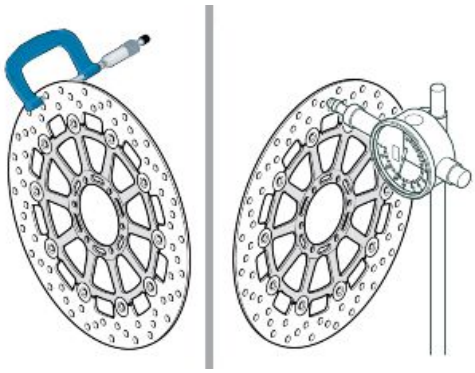
UPON REFITTING, SCREW ALL THE SCREWS (1) MANUALLY AND TIGHTEN THEM OPERATING DIAGONALLY FOLLOWING THIS SEQUENCE: A-B-C-D-E-F.

See also

Removing the front wheel

Disc Inspection

- The following operations must be carried out with the brake discs fitted on the wheel; they refer to a single disc, but are valid for both.
- Check the disc for wear by measuring the minimum thickness with a micrometer in different points. If the minimum thickness, even in a single point of the disc, is less than the minimum value, replace the disc.



Disc thickness minimum value: 4 mm (0.16 in)

- Using a dial gauge, check that the maximum oscillation of the disc does not

exceed the tolerance; otherwise, replace it.

Disc oscillation tolerance: 0.15 mm (0.0059 in)

Front brake pads

Removal

THIS VEHICLE IS FITTED WITH A DOUBLE DISC FRONT BRAKING SYSTEM (RIGHT AND LEFT SIDE).
ALWAYS REPLACE ALL THE PADS FROM BOTH FRONT BRAKE CALLIPERS.
REPLACING THE PADS OF ONLY ONE FRONT CALLIPER MAY JEOPARDISE THE VEHICLE STABILITY AND SAFETY, POSING SERIOUS DANGER FOR PEOPLE, OBJECTS AND THE VEHICLE ITSELF.

CAUTION

THE FOLLOWING OPERATIONS REFER TO A SINGLE CALLIPER, BUT APPLY TO BOTH.

- Unscrew and remove the two screws (1).
- Slide off the disc from the front brake calliper.

- Separate the brake calliper pistons.
- Remove the pads from the brake calliper.
- Retrieve the clip.

AFTER REMOVING THE PADS, DO NOT OPERATE THE BRAKE CONTROL LEVER OR THE CALLIPER PLUNGERS COULD GO OUT OF THEIR SEATS RESULTING IN BRAKE FLUID LEAKAGE.

Installing

- An arrow is stamped on the brake calliper and on the clip, which must always point in the direction of rotation of the front wheel.
- Fit the clip in the brake calliper.

- Fit the two new pads in the correct position.

ALWAYS REPLACE THE FOUR PADS AND MAKE SURE THEY ARE CORRECTLY POSITIONED INSIDE THE CALLIPER.

- Fit the front brake calliper on the disc.
- Hand-tighten the two screws (1) fully.
- Pull the front brake lever to seat the brake calliper correctly.
- Tighten the two screws (1).
- Check the front brake fluid level.

Rear brake pads

Removal

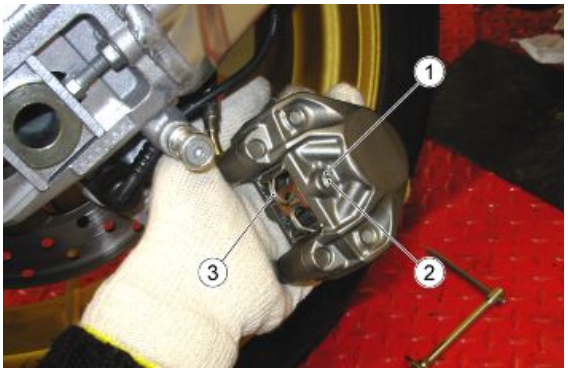
- Rest the vehicle on its stand.
- Remove the rear brake calliper.

CAUTION

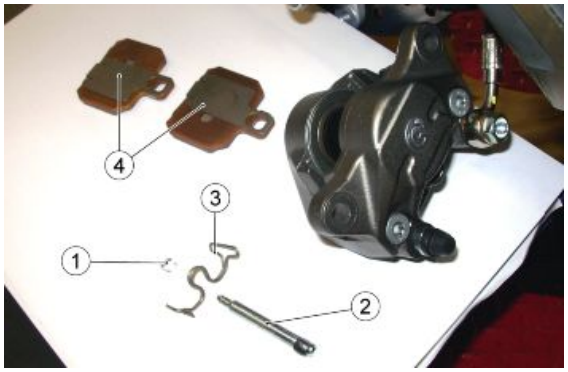
DO NOT ACTUATE ON THE REAR BRAKE LEVER AFTER REMOVING THE WHEEL, OTHERWISE THE CALLIPER PLUNGER COULD GO OUT OF ITS SEAT, RESULTING IN BRAKE FLUID LEAKAGE.

- Remove the snap ring (1).

BEFORE REMOVING THE PIN (2), CHECK THAT THE SAFETY SPRING (3) IS CORRECTLY POSITIONED; WHEN REFITTED, IT MUST POSITIONED IN THE SAME WAY.



- Remove the pin (2) and retrieve the safety spring (3).
- Extract the two pads (4) and retrieve the noise damping plates.
- If worn, replace the vibration damping plates.



AFTER REMOVING THE PADS, DO NOT OPERATE THE BRAKE CONTROL LEVER OR THE CALLIPER PLUNGERS COULD GO OUT OF THEIR SEATS RESULTING IN BRAKE FLUID LEAKAGE.

Installing

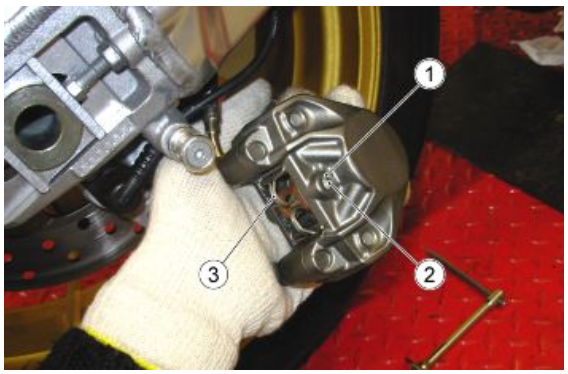
- Insert two new pads and the vibration-damping plates, placing them so that the holes are aligned with the calliper holes.

UPON REFITTING, MAKE SURE THE ARROWS ON THE VIBRATION-DAMPING PLATES FACE THE DIRECTION OF ROTATION OF THE WHEEL.

CAUTION

ALWAYS REPLACE BOTH PADS AND MAKE SURE THEY ARE CORRECTLY POSITIONED INSIDE THE CALLIPER.

- Place the safety spring (3).
- Hold the centre of the safety spring (3) depressed and insert the pin (2) so it passes above the spring.
- Fit the retainer ring (1).
- Check the brake fluid.



Bleeding the braking system

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

CONSIDERING THE DANGER FOR VEHICLE AND RIDER, IT IS STRICTLY NECESSARY, AFTER REFITTING BRAKES AND RESTORING THE BRAKING SYSTEM TO THE REGULAR USE CONDITIONS, THAT THE HYDRAULIC CIRCUIT BE AIR PURGED.

NOTE

THE FOLLOWING OPERATIONS REFER TO ONE FRONT BRAKE CALLIPER ONLY, BUT ARE VALID FOR BOTH. THE VEHICLE MUST BE ON LEVEL GROUND TO BE PURGED. WHILE PURGING THE HYDRAULIC SYSTEM, FILL THE RESERVOIR WITH THE NECESSARY QUANTITY OF BRAKE FLUID. CHECK THAT, DURING THE OPERATION, THERE IS ALWAYS BRAKE FLUID IN THE RESERVOIR.

La procedura di spurgo può essere eseguita in modo tradizionale o con l'uso di attrezzi specifici quali pompe a vuoto o simili. E' importante però procedere spurgando l'impianto nell'ordine che segue:

- Pompa freno.
- Pinza destra.
- Pinza sinistra.
- Pompa freno ("rifinitura").

Sotto è riportata la procedura di spurgo "tradizionale".

CAUTION

IN CASO DI SOSTITUZIONE DEL LIQUIDO FRENI, PROCEDERE COME PER UN IMPIANTO TRADIZIONALE SENZA ABS. RICORDARSI PERO' CHE UN COMPLETO RICAMBIO DEL LIQUIDO FRENI RICHIEDE UNA QUANTITA' MAGGIORE RISPETTO AD UN IMPIANTO TRADIZIONALE. PER LA POMPA FRENO ANTERIORE SIAMO NELL'ORDINE DI CIRCA TRE SERBATOI MENTRE, PER IL POSTERIORE SIAMO NELL'ORDINE DI CIRCA DUE SERBATOI.

- 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

CONSIDERING THE DANGER FOR VEHICLE AND RIDER, IT IS STRICTLY NECESSARY, AFTER REFITTING BRAKES AND RESTORING THE BRAKING SYSTEM TO THE REGULAR USE CONDITIONS, THAT THE HYDRAULIC CIRCUIT BE AIR PURGED.

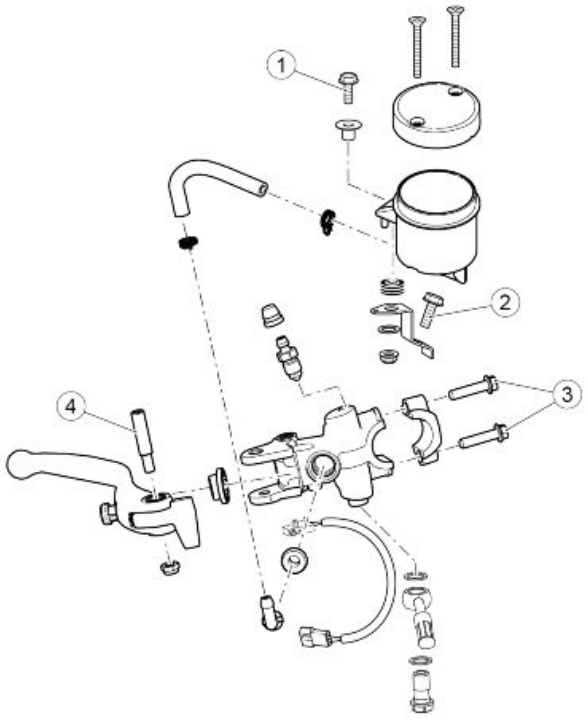
NOTE

THE VEHICLE MUST BE ON LEVEL GROUND TO BE PURGED. WHILE PURGING THE HYDRAULIC SYSTEM, FILL THE RESERVOIR WITH THE NECESSARY QUANTITY OF BRAKE FLUID. CHECK THAT, DURING THE OPERATION, THERE IS ALWAYS BRAKE FLUID IN THE RESERVOIR.

- Remove the rubber protection cover 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.

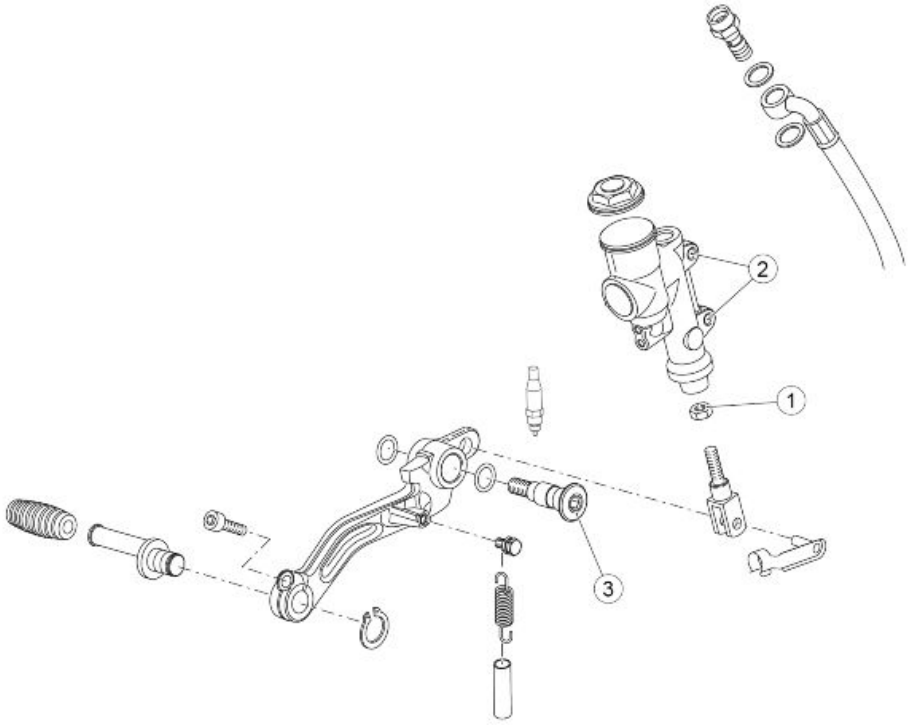
Front brake pump



FRONT BRAKE PUMP

pos.	Description	Type	Quantity	Torque	Notes
1	Screw fastening front brake fluid reservoir to bracket	M6	1	7 Nm (5.16 lb ft)	-
2	Screw fastening brake fluid reservoir mounting bracket to handlebar	M6	1	7 Nm (5.16 lb ft)	-
3	Front brake pump U bolt clamp	M6	2	10 Nm (7.38 lb ft)	-
4	Front brake lever pin fixing screw	M6	1	10 Nm (7.38 lb ft)	-
-	Screw fastening brake pipe grommet to the lower yoke	M5	1	8 Nm (5.90 lb ft)	-

Rear brake pump



REAR BRAKE PUMP

pos.	Description	Type	Quantity	Torque	Notes
1	Rear brake rod lock nut	M6	1	12 Nm (8.85 lb ft)	-
2	Rear brake pump retaining screws	M6	2	8 Nm (5.90 lb ft)	Loctite 243
3	Rear brake lever fixing pin	M8	1	25 Nm (18.44 lb ft)	Loctite 243
-	Brake lever push rod fixing screw	M6	1	8 Nm (5.90 lb ft)	-

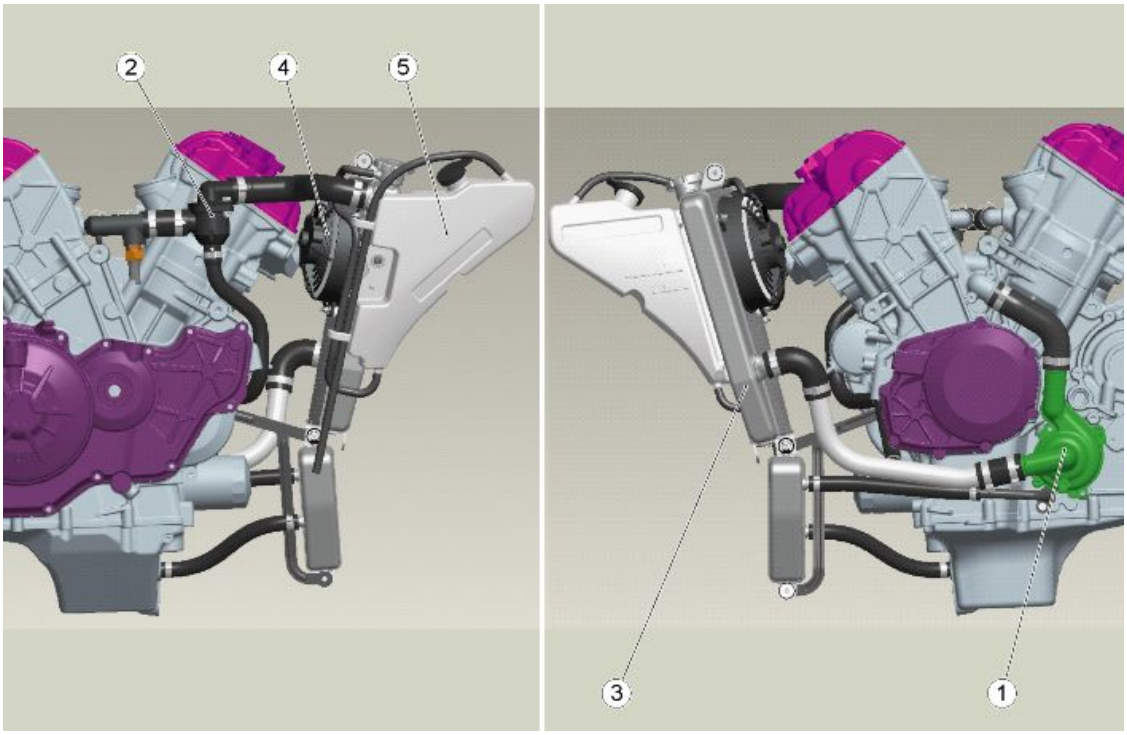
INDEX OF TOPICS

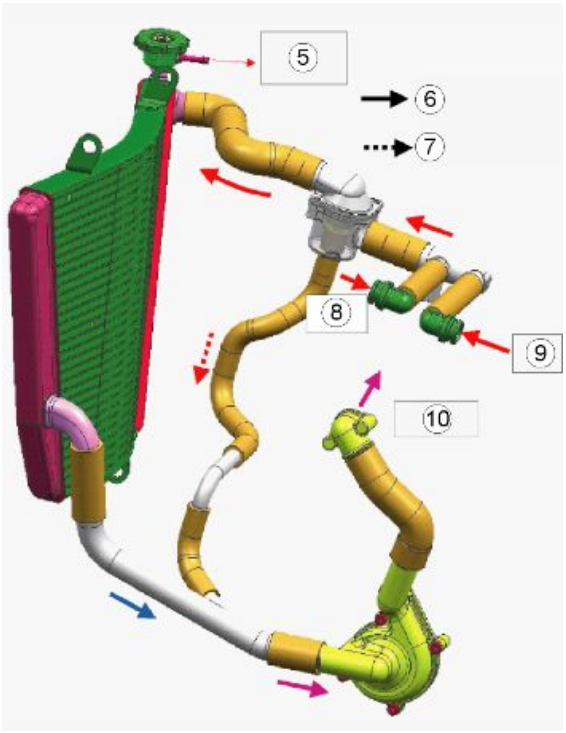
COOLING SYSTEM	COOL SYS

Circuit diagram

SYSTEM TYPE

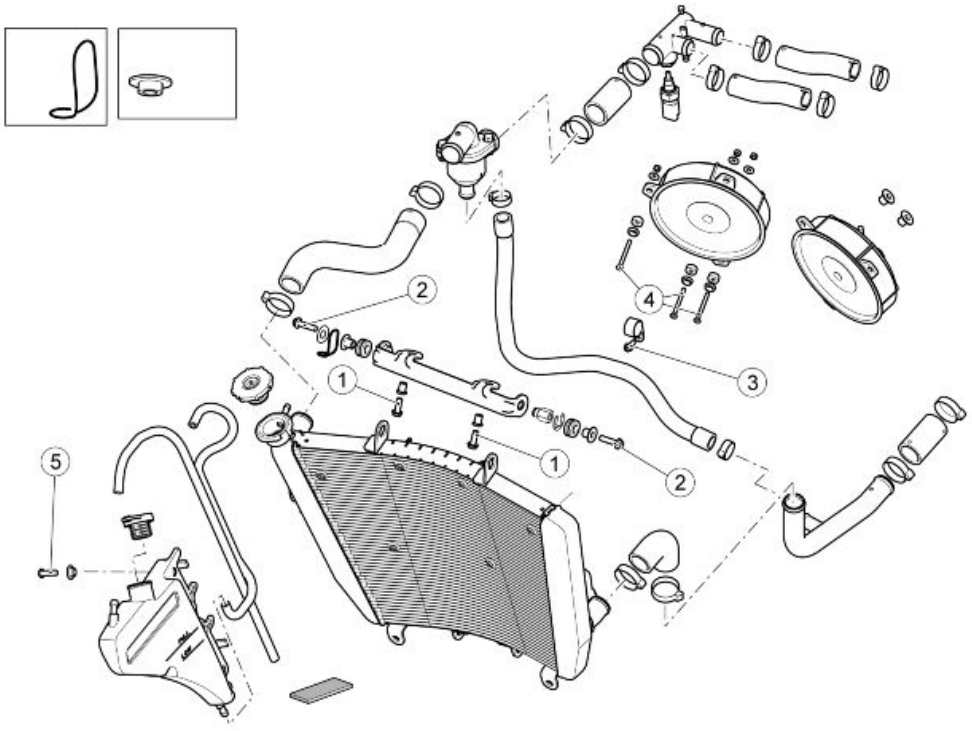
Self bleeding cooling circuit with aspirating centrifugal pump (1), three-way thermostat valve (2), cooling radiator (3) with electric fans (4) and expansion tank (5).





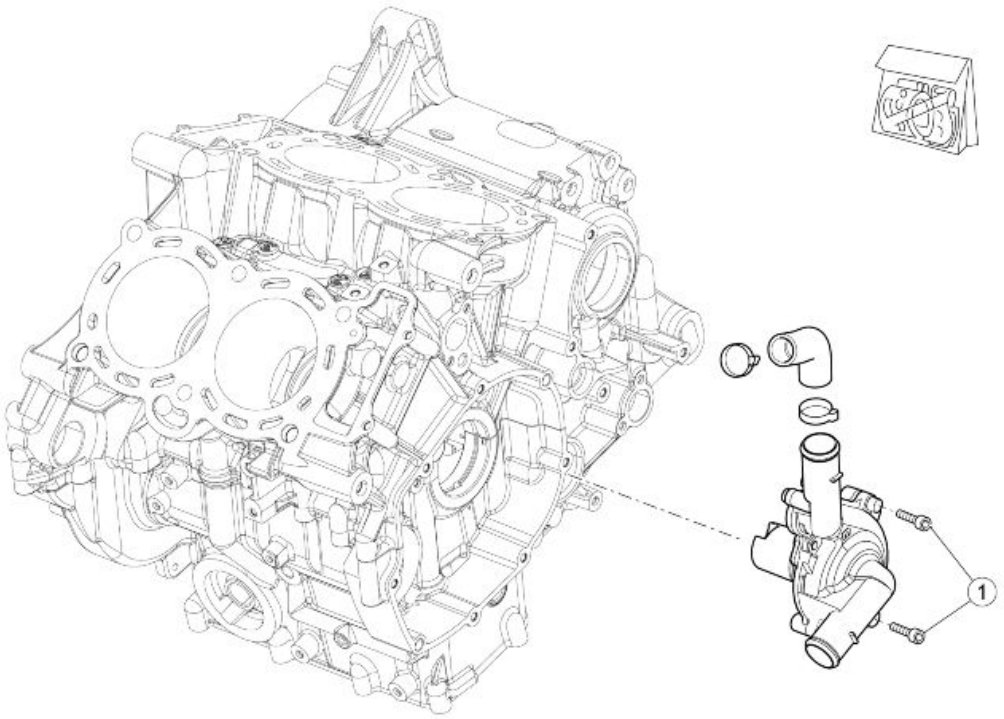
key:

1. Centrifugal pump
2. Thermostatic valve
3. Radiator
4. Electric fans
5. Expansion tank
6. With the thermostat open
7. With the thermostat closed
8. From front head
9. From rear head
10. To upper crankcase



COOLING

pos.	Description	Type	Quantity	Torque	Notes
1	Flanged hex. head screws for fastening the water radiator support bracket to the frame	M6x20	2	10 Nm (7.38 lb ft)	-
2	Flanged hex. head screws for fastening the water radiator to the support bracket	M6x20	2	7 Nm (5.16 lb ft)	-
3	Screws for fastening the water by-pass pipe tube gland	M5	1	6 Nm (4.43 lb ft)	-
4	Screws fastening electric fan to water radiator	M4	6	2 Nm (1.48 lb ft)	-
5	Expansion tank support fixing screw	M6	1	5 Nm (3.69 lb ft)	-

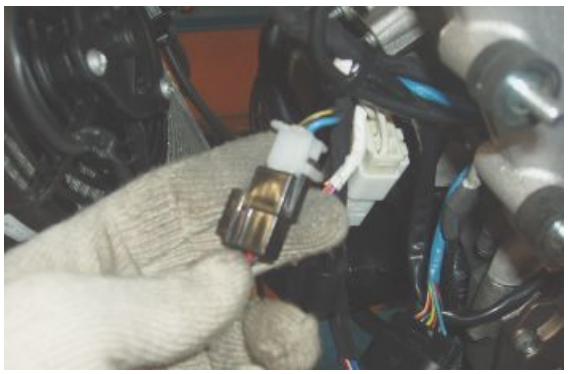


WATER PUMP

pos.	Description	Type	Quantity	Torque	Notes
1	Screws used to fasten the pump to the crankcase	M6x25	2	10 Nm (7.38 lb ft)	-

Electric fan

- Remove the front underfairings and the hand grip position sensor
- Disconnect the cooling fan connector to be replaced.

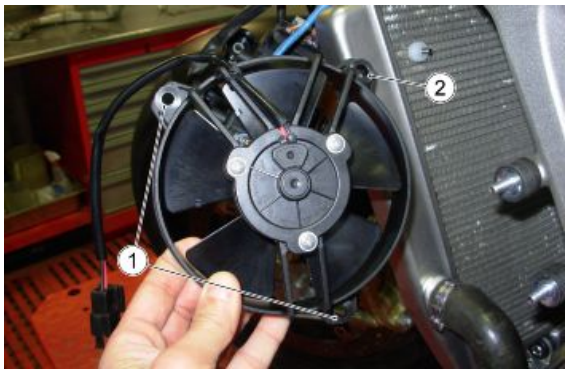


- Internally blocking the nuts, unscrew the fixing screw from the internal part.
- Make sure that the nuts and washers are retrieved.

See also

Fairing mounting panels
Twistgrip position sensor

- The retainer points of the electric fan are not the same as the hole (2), compared to the holes (1), has a different thickness and is therefore fixed from the internal side using a threaded "T" bushing.

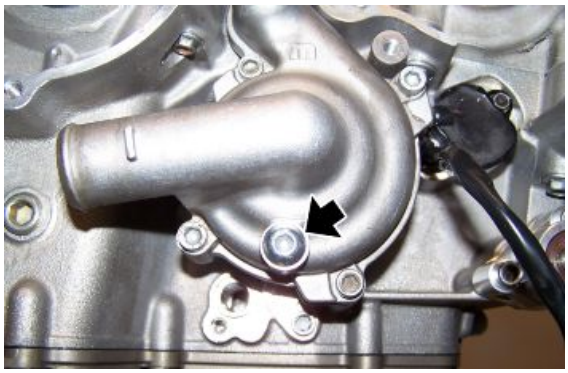


- Now it is possible to remove the electric fan.

Coolant replacement

- Remove both fairings.
- Place a container with a suitable capacity under the coolant pump.
- Remove the radiator cap/valve to help the fluid drain out.

- Unscrew and remove the system drain screw and retrieve the sealing washer.
- Wait for the entire circuit to drain (engine+pipes+radiator)
- Refit the system drain screw complete with a new washer.



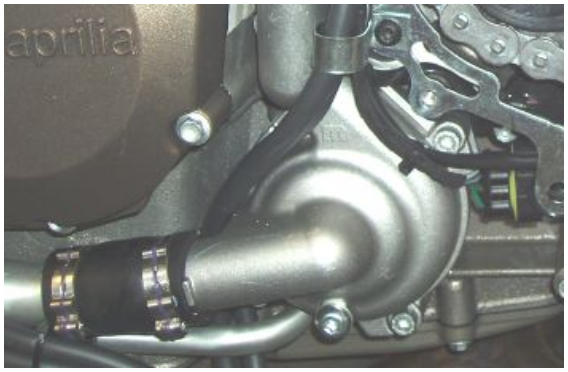
FILLING

- Via the filler orifice on the radiator, fill with the quantity of coolant (approx. 2.2 l - 0.48 UK gal) necessary to reach the edge.
- Fit the cap / valve.

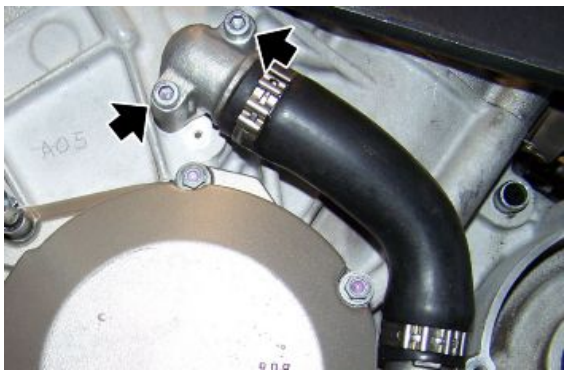
- Via the filler orifice on the expansion tank, fill with the quantity of coolant necessary to reach the FULL marking, then refit the cap.
- Start the engine, run at idle speed and wait for the electric fans to activate (approx. 101 °C - 213 °F) then turn off the engine and wait for it to cool.
- With the vehicle standing vertically, check the liquid level both in the radiator and in the expansion tank and top up if necessary.

Water pump

- Drain the coolant.
- Remove the pipe from the radiator.



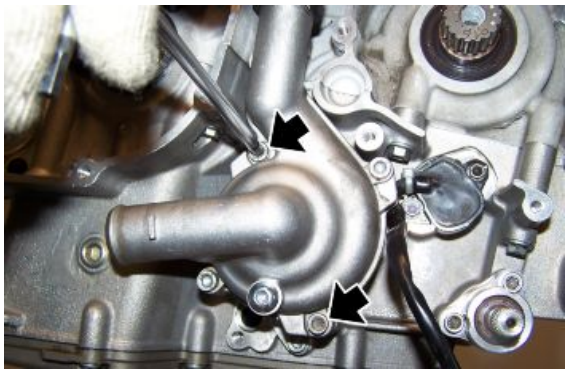
- Unscrew and remove the two screws fastening the pipe to the engine.
- Retrieve the gasket and replace with a new component when refitting.



See also

Coolant replacement

- Unscrew and remove the two screws fastening the pump to the engine.
- Remove the coolant pump.

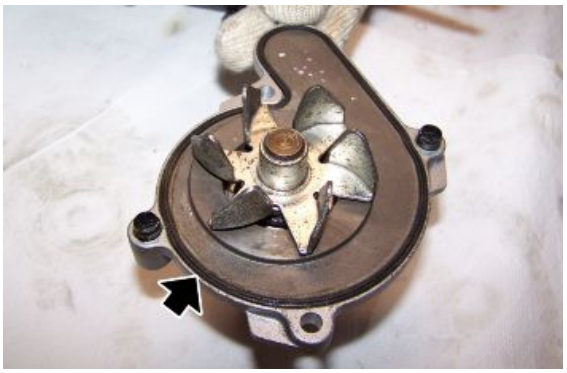


- Unscrew and remove the two external pump cover fixing screws.

- Unscrew and remove the inner screw.
- Remove the pump cover.

TO PREVENT IRREPARABLE DAMAGE TO THE PUMP, UNSCREW AND REMOVE THE INNER SCREW BEFORE REMOVING THE COVER.

- At each removal, replace the inner gasket between the pump casing and the cover and the O ring on the pump casing.



ENSURE THAT THE LIQUID PASSAGE ORIFICES ARE NOT OBSTRUCTED.

Removing the radiator

RADIATOR BRACKET REMOVAL

- Operating from the right side of the motorcycle, move the main cable harness and remove the screw fixing the radiator to the retainer bracket.

- Remove the two chassis bracket fixing screws.
- Then remove the radiator retainer bracket.

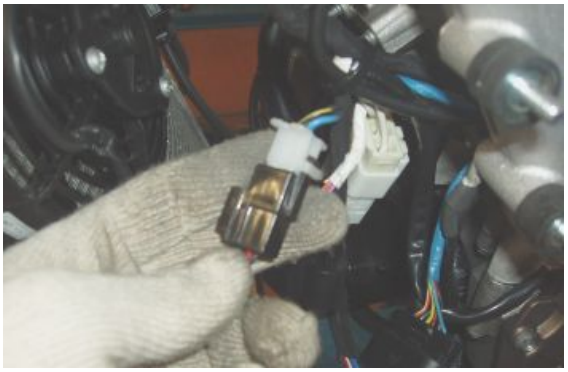
- Moving the bracket outwards, it is then possible to remove it by sliding it out.

CAUTION

DURING THE REFIT PHASE, MAKE SURE THAT THE MAIN CABLE HARNESS IS CORRECTLY POSITIONED ON THE CAVITY OF THE RADIATOR RETAINER BRACKET, IN ORDER TO PREVENT THE CABLE HARNESS FROM COMING INTO CONTACT WITH THE RADIATOR AT HIGH TEMPERATURE AND DAMAGING ITSELF.

RADIATOR REMOVAL

- Drain off the cooling system.
- Remove the front underfairings and the hand grip position sensor
- Disconnect both cooling fan connectors.

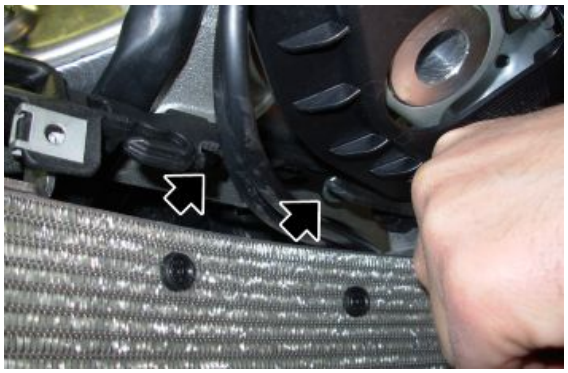


- Disconnect the expansion tank breather pipe from the pipe grommet.

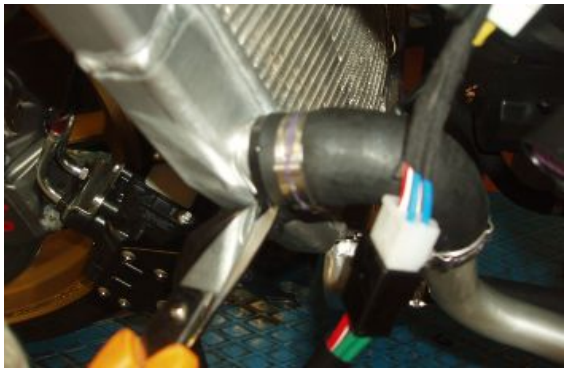
See also

Coolant replacement
Fairing mounting panels
Twistgrip position sensor

- Remove the two fixing screws of the radiator bracket.

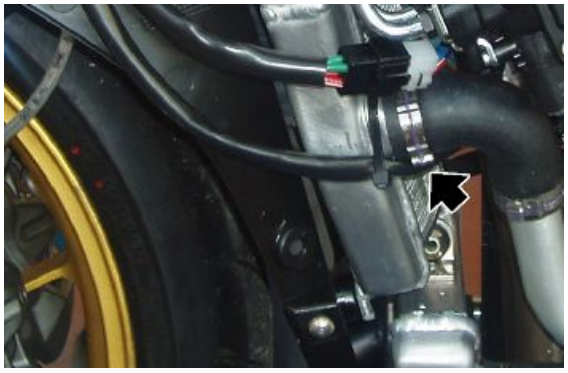


- Cut the clamp fastening the cable harness to the radiator return pipe on the left hand side.



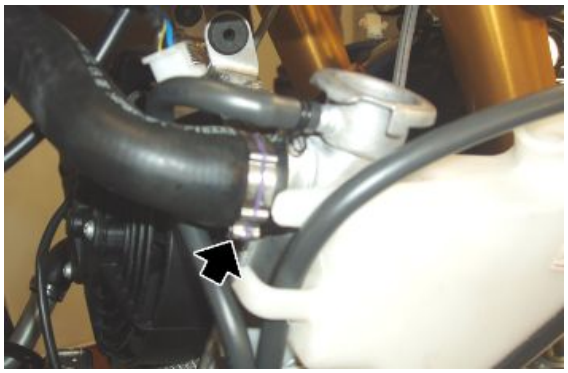
- Release the clamp fastening the return pipe to the radiator pipe

UPON REFITTING, REPLACE CLIC CLAMP REMOVED WITH A NEW ONE OF EQUAL SIZE.
DO NOT REFIT THE CLIP-ON CLAMP REMOVED PREVIOUSLY AS IT IS NO LONGER USABLE.
DO NOT REPLACE THE CLIP-ON CLAMP REMOVED PREVIOUSLY WITH A SCREW CLAMP OR ANY OTHER TYPE OF CLAMP.



- Release the clamp fastening the delivery pipe to the radiator pipe

UPON REFITTING, REPLACE CLIC CLAMP REMOVED WITH A NEW ONE OF EQUAL SIZE.
DO NOT REFIT THE CLIP-ON CLAMP REMOVED PREVIOUSLY AS IT IS NO LONGER USABLE.
DO NOT REPLACE THE CLIP-ON CLAMP REMOVED PREVIOUSLY WITH A SCREW CLAMP OR ANY OTHER TYPE OF CLAMP.

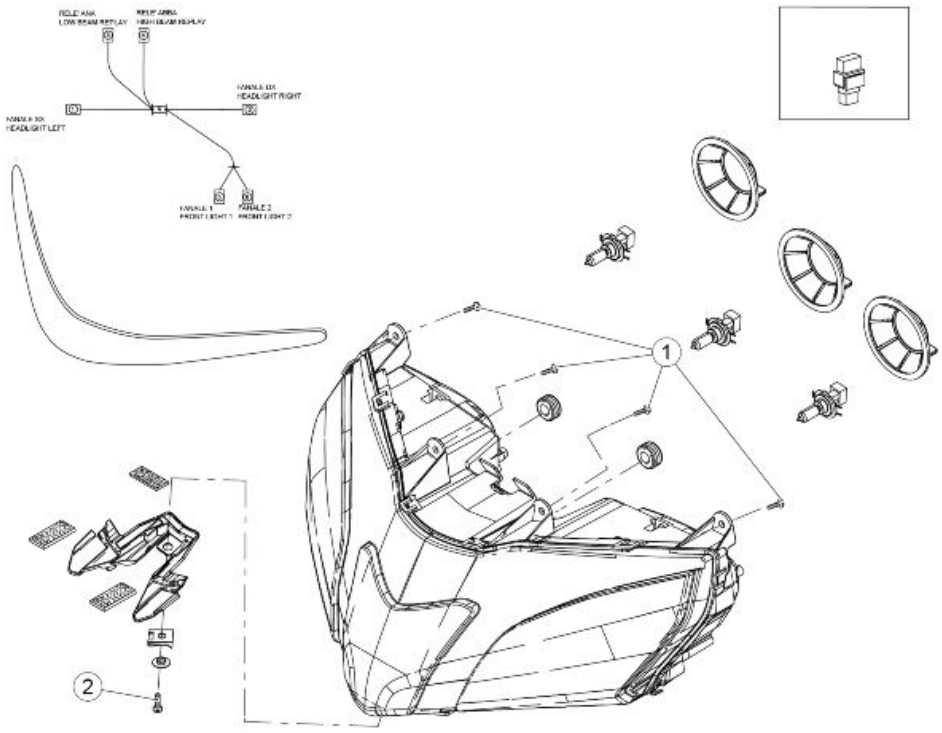


- Remove the split pin.
- From the opposite site, remove the coolant radiator-oil radiator connector pin.

- Remove the radiator.

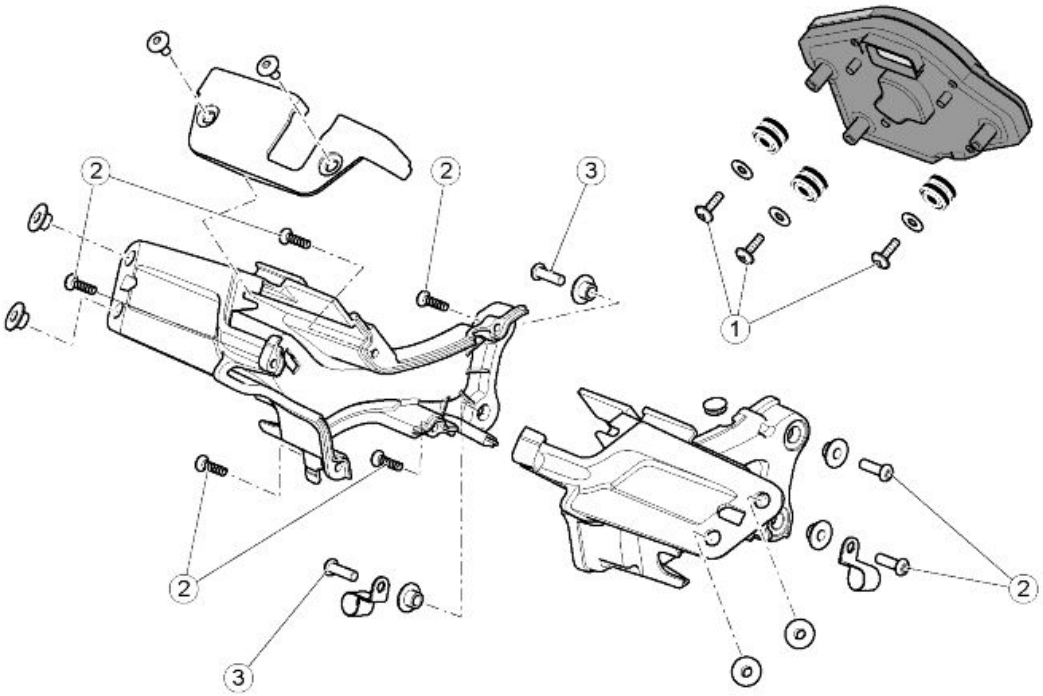
INDEX OF TOPICS

BODYWORK	BODYW



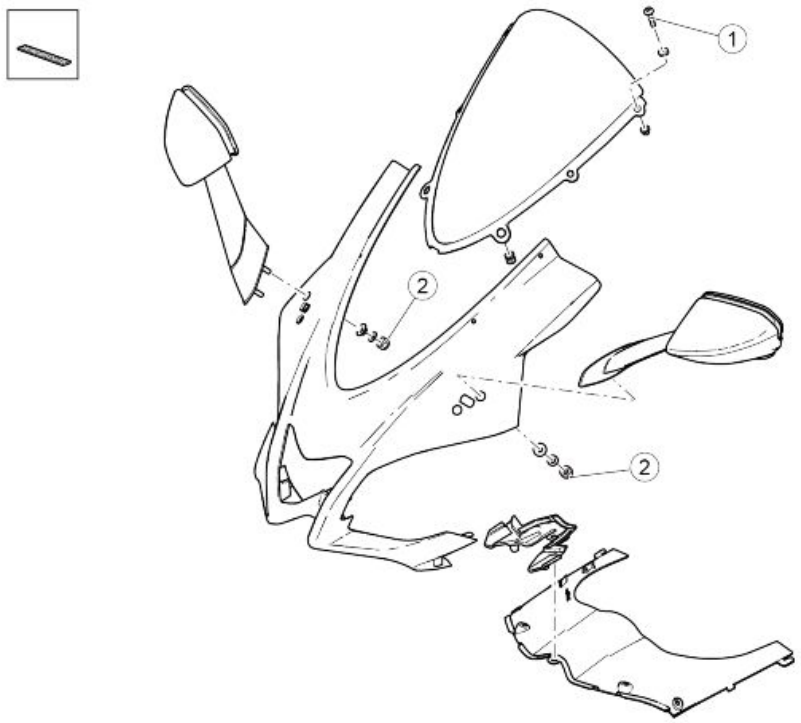
HEADLAMP

Pos.	Description	Type	Quantity	Torque	Notes
1	Screw for fastening the front headlight to the front mudguard	SWP 4.9	4	2 Nm (1.48 lb ft)	-
2	Headlamp fastener screw	M5 x 12	1	2 Nm (1.48 lb ft)	-



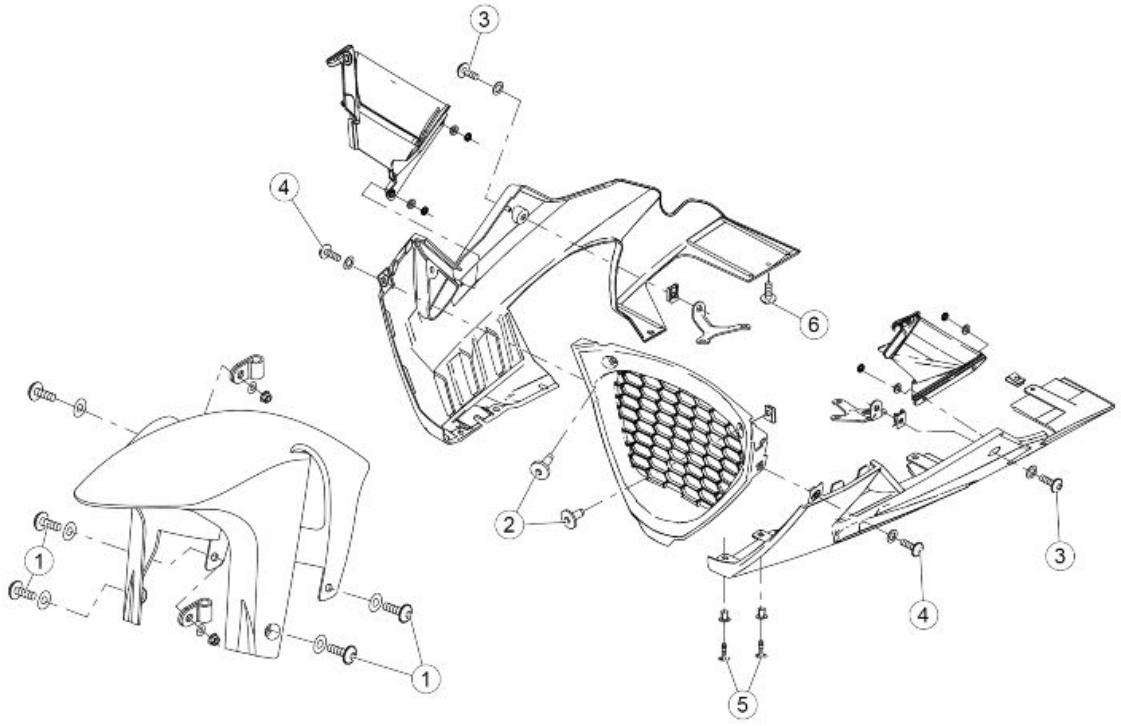
INSTRUMENT PANEL

Pos.	Description	Type	Quantity	Torque	Notes
1	Screws used to fasten the rubber blocks to the instrument panel	SWP 4.9	3	3 Nm (2.21 lb ft)	-
2	Instrument panel support shell fastening screws	SWP 4.9	5	2 Nm (1.48 lb ft)	-
3	Screws used to fasten the instrument panel support to the chassis	M6	4	8 Nm (5.90 lb ft)	-



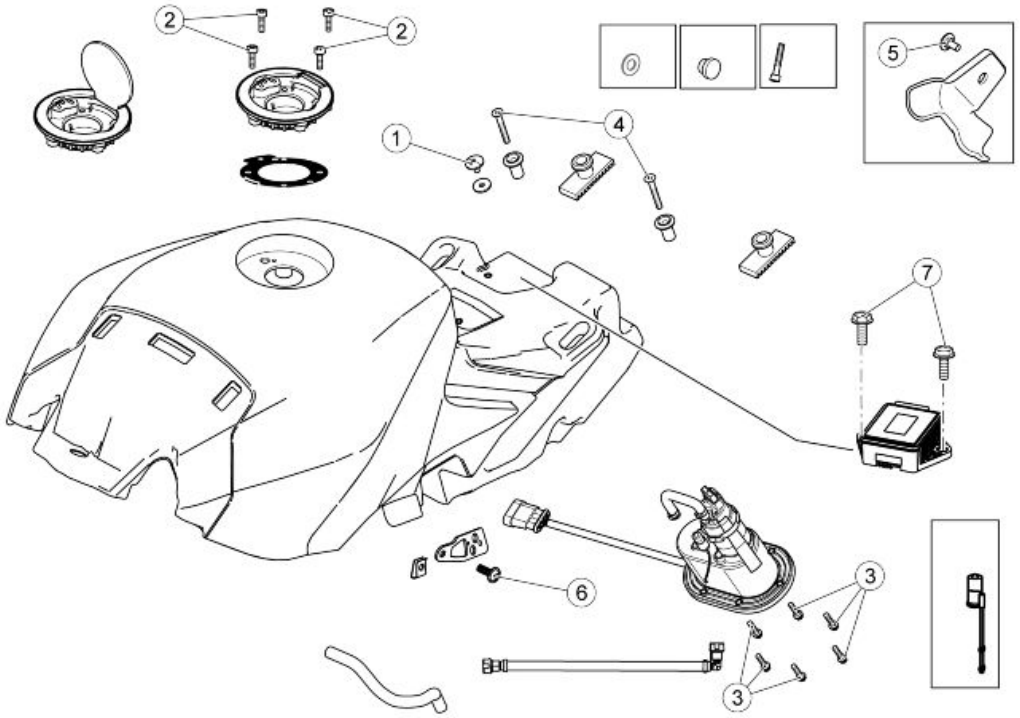
TOP FAIRING

pos.	Description	Type	Quantity	Torque	Notes
1	Windshield fixing screws	M4	4	0.5 Nm (0.37 lb ft)	-
2	Rear-view mirror fixing nuts	M6	2 + 2	10 Nm (7.38 lb ft)	-



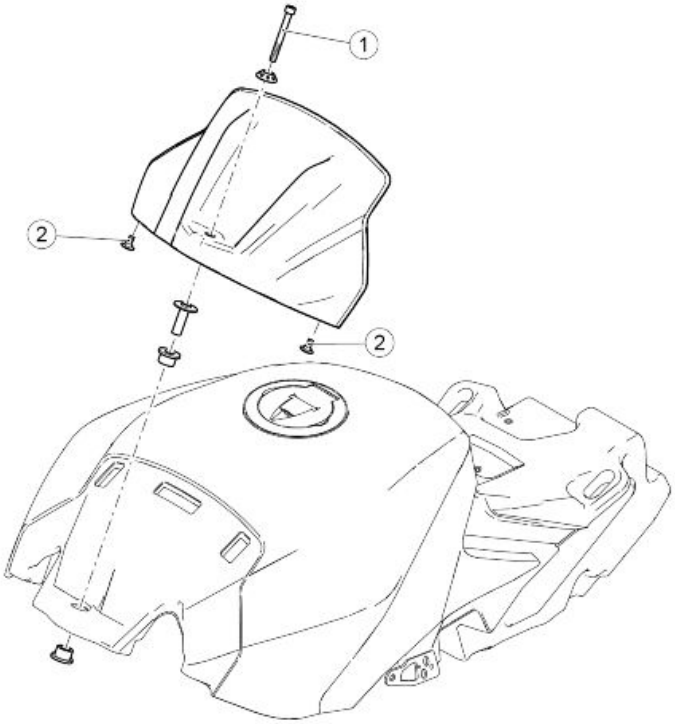
FRONT MUDGUARD

pos.	Description	Type	Quantity	Torque	Notes
1	Front mudguard fixing screws	M5	4	3 Nm (2.21 lb ft)	-
2	Lug fixing screws	M5	2	4 Nm (2.95 lb ft)	-
3	Screws fixing the side fairings to the side spacers	M5	2	1.5 Nm (1.11 lb ft)	-
4	Screws fastening the lower fairing to the lug	M5	2	2 Nm (1.48 lb ft)	-
5	Lower fairing lower fastening screws	M5	2	2 Nm (1.48 lb ft)	-
6	Centre screws fastening lower fairing	M6	2	10 Nm (7.38 lb ft)	-



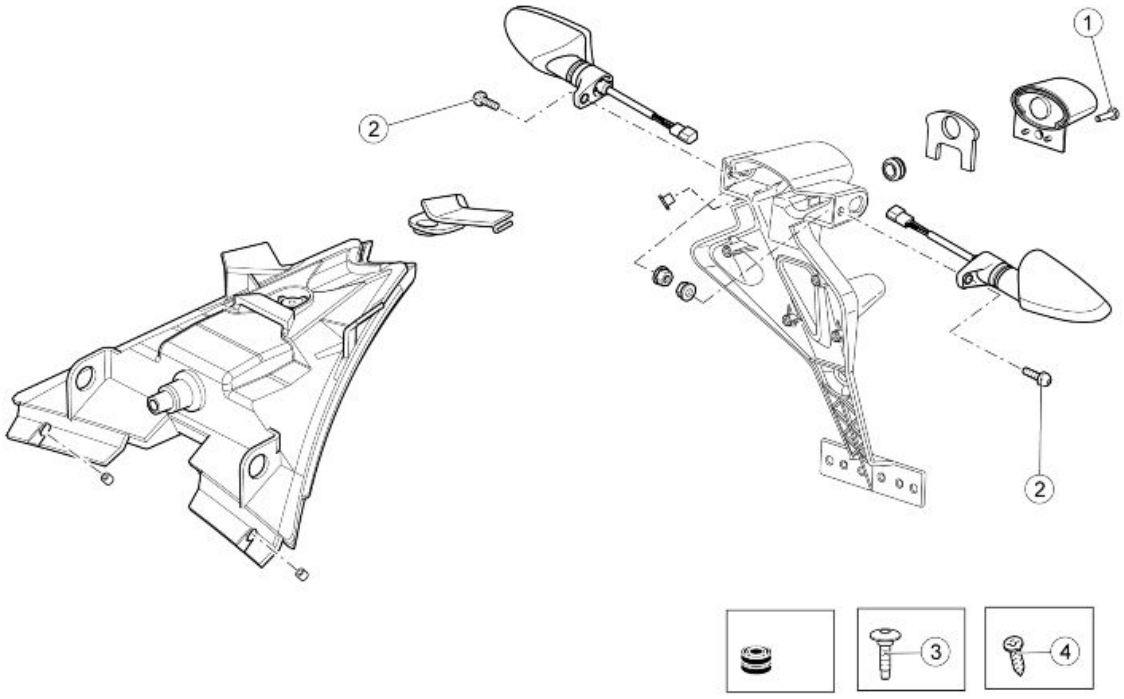
FUEL TANK

pos.	Description	Type	Quantity	Torque	Notes
1	Special screw for fastening the rider's saddle to the fuel tank	M6	1	4 Nm (2.95 lb ft)	-
2	Filler to tank retaining screws	M5	4	4 Nm (2.95 lb ft)	-
3	Screws fastening fuel pump flange to fuel tank	M5	8	5 Nm (3.69 lb ft)	-
4	Screws fastening the rear fuel tank to the rear frame	M6	2	7 Nm (5.16 lb ft)	-
5	Plastic petrol hose support retaining screws	M5	1	2.5 Nm (1.84 lb ft)	-
6	LH fairing support bracket retaining screws	M5	1	3 Nm (2.21 lb ft)	-
7	Fastening screws tilting sensor	M6x16 stainless steel	2	6 Nm (4.43 lb ft)	-
-	Central fuel tank cover retaining screw	M4	1	0,5 Nm (0.37 lb ft)	-
-	Fuel tank breather couplings	M7	2	3 Nm (2.21 lb ft)	-
-	Fuel return coupling	M6	1	6 Nm (4.43 lb ft)	Loctite 243
-	Pump support to flange fastening	M5	3	4 Nm (2.95 lb ft)	-
-	Lug to flange fastening	M5	2	5 Nm (3.69 lb ft)	-
-	Petrol return closure	M6	1	10 Nm (7.38 lb ft)	Loctite 243
-	Petrol delivery pipe	M12x1.5	1	22 Nm (16.23 lb ft)	-
-	Petrol level sensor on pump support	SWP 2.9x12	2	1 Nm (0.74 lb ft)	-
-	Petrol pump on flange wiring	M6	2	10 Nm (7.34 lb ft)	-



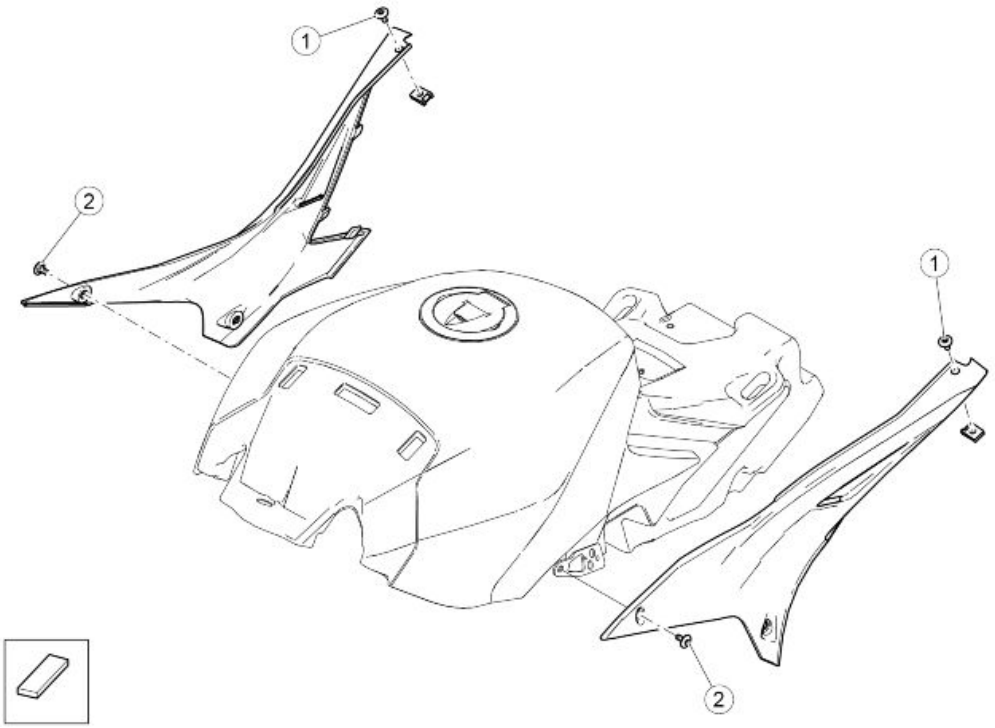
FUEL TANK COVER

Pos.	Description	Type	Quantity	Torque	Notes
1	Screws fastening front tank to frame	M6	1	8 Nm (5.90 lb ft)	-
2	Screws fastening tank structural support to tank	M6	4	3 Nm (2.21 lb ft)	-



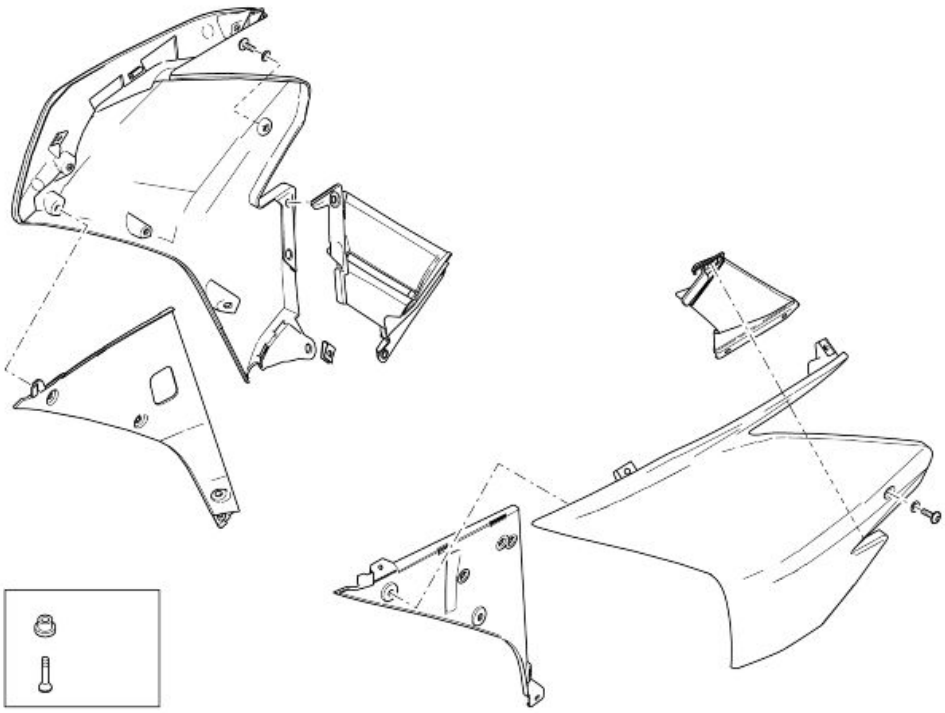
LICENSE PLATE HOLDER

pos.	Description	Type	Quantity	Torque	Notes
1	License plate light fixing screws	M4	1	1 Nm (0.74 lb ft)	-
2	Rear turn indicator fixing screws	M6	2	2.5 Nm (1.84 lb ft)	-
3	Taillight fixing screws	M5	2	3 Nm (2.21 lb ft)	-
4	Taillight cover self-tapping fixing screw	SWP 3.9	1	0.5 Nm (0.37 lb ft)	-
-	Screws fastening license plate mounting to saddle mounting casting	M6	3	4 Nm (2.95 lb ft)	-



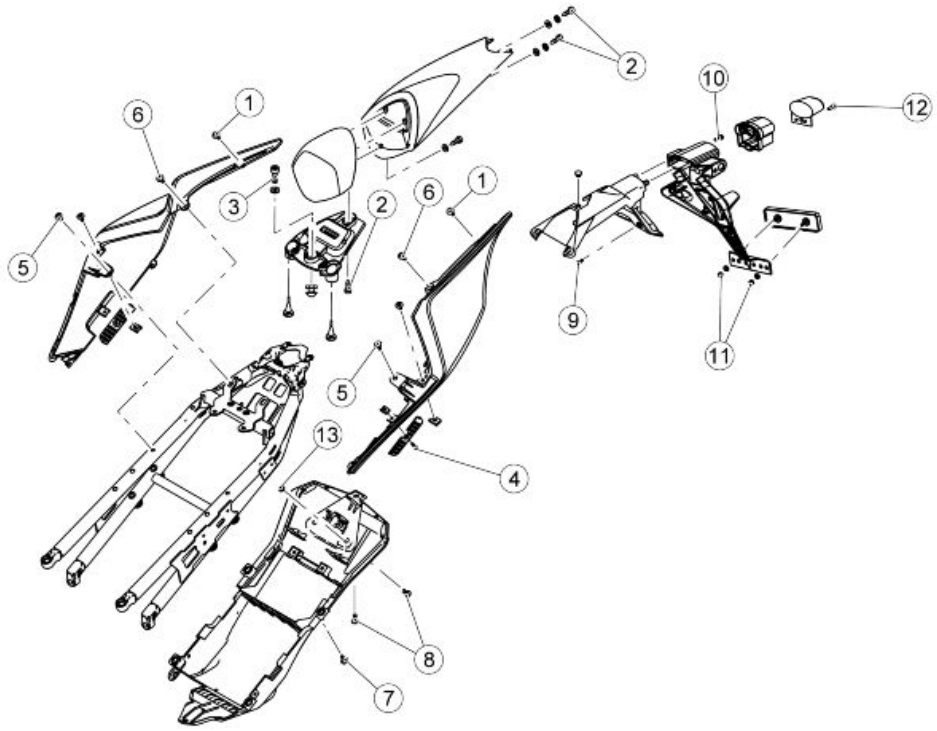
CENTRAL BODYWORK

Pos.	Description	Type	Quantity	Torque	Notes
1	Screws fastening fairing to tail fairing	M5	2	1 Nm (0.74 lb ft)	-
2	Screws fastening fairing to tank	M5	2 + 2	2 Nm (1.48 lb ft)	-



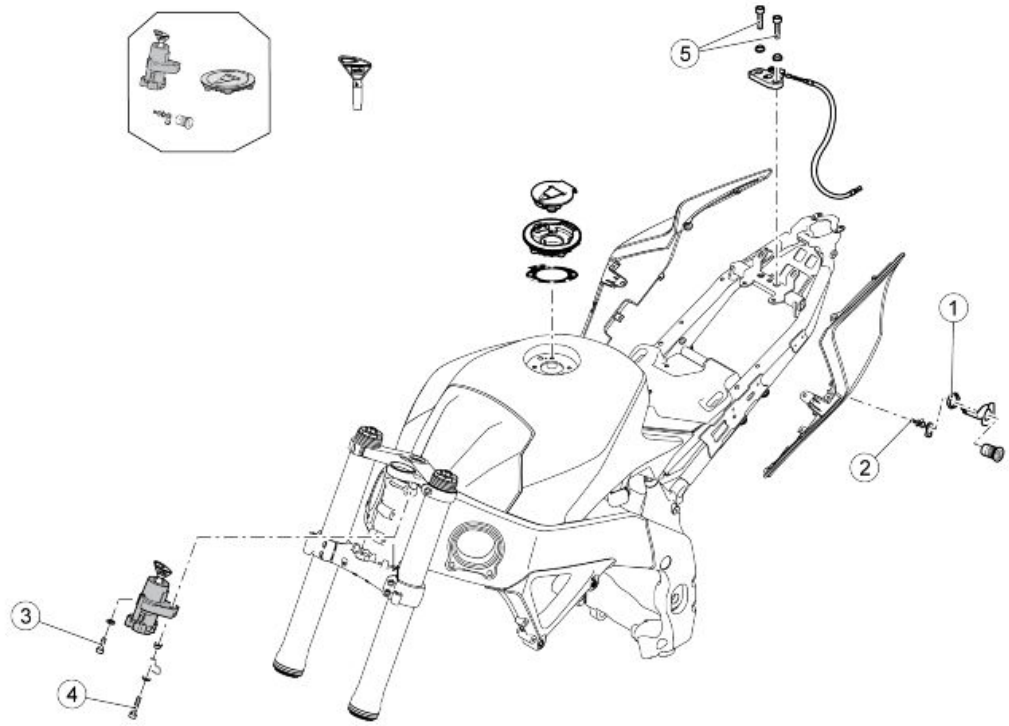
FAIRING

pos.	Description	Type	Quantity	Torque	Notes
-	Lower fairing central bracket fastening screws	M6	2	10 Nm (7.38 lb ft)	-
-	RH lower fairing support bracket	M6	2	12 Nm (8.85 lb ft)	-
-	LH lower fairing support bracket	M6	2	12 Nm (8.85 lb ft)	-
-	Screws for fastening the side fairings to the lateral spacers	M5	2	1.5 Nm (1.11 lb ft)	-
-	Screws for securing the upper fairing closure to the intake duct	M5	2	1.5 Nm (1.11 lb ft)	-
-	Screws for securing the upper fairing closure to the front mudguard	M5	2	1.5 Nm (1.11 lb ft)	-
-	Screws for securing the upper fairing closure to the intake duct	self-tapping	2	1 Nm (0.74 lb ft)	-
-	Screws for securing the upper fairing closure to the front headlight	self-tapping	2	1 Nm (0.74 lb ft)	-
-	Screws for fastening the lower fairing to the bracket	M5	2 + 2	1 Nm (0.74 lb ft)	-
-	Screws for fastening the lower fairing to the stanchion	M5	2	2 Nm (1.47 lb ft)	-
-	Lower fairing fastening screws	M5	2	2 Nm (1.47 lb ft)	-
-	Lower forks closure fastening screws	M6	2	8 Nm (5.90 lb ft)	-
-	Screws for fastening the lower frontal closure to the intake ducts	SWP 3,9	2	1 Nm (0.74 lb ft)	-
-	Internal fastening screws between the fairing and the lower frontal closure	M4	2	0,5 Nm (0.37 lb ft)	-
-	Internal fastening screws between the airing and the stanchion	M5	2	2 Nm (1.48 lb ft)	-



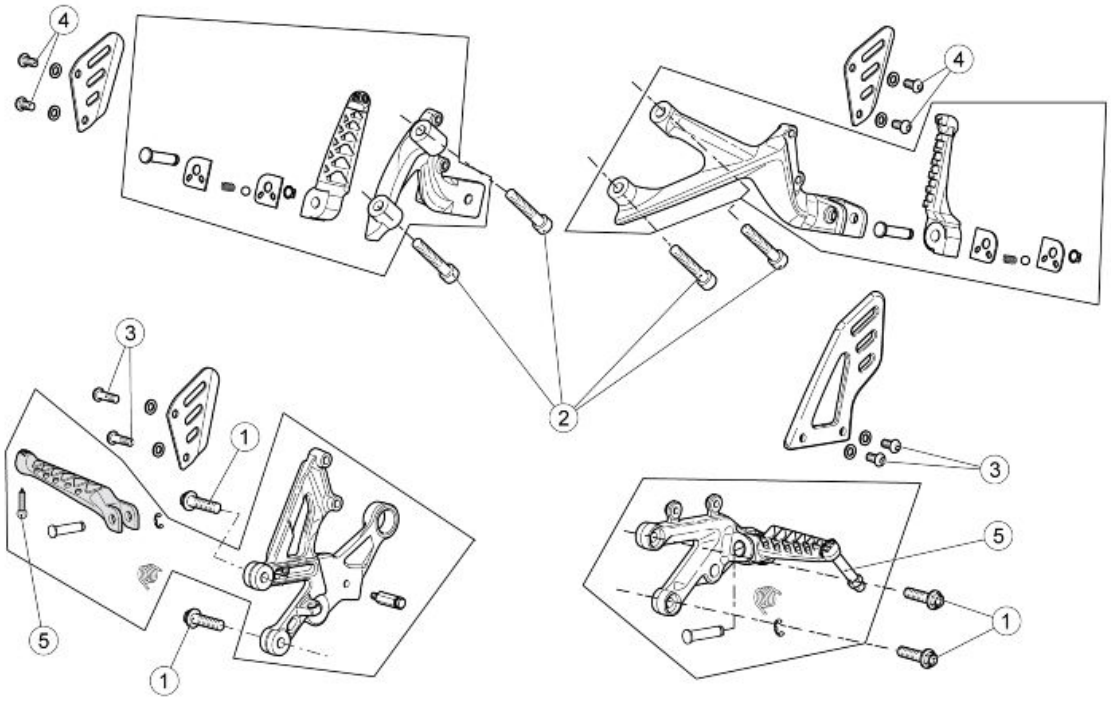
REAR BODYWORK

pos.	Description	Type	Quantity	Torque	Notes
1	Rear screws used to fasten the tail fairing to the rear headlight bracket	M5	2	3 Nm (2.21 lb ft)	-
2	Screws used to fasten the saddle cover base to the saddle cover	SWP 2.9	3	1 Nm (0.74 lb ft)	-
3	Saddle cover stud fastening screws	M4	1	1.5 Nm (1.11 lb ft)	-
4	Screws used to fasten the grilles to the tail fairing	M5	2	0.5 Nm (0.37 lb ft)	-
5	Screws for fastening the grilles to the saddle mounting	M5	2	3 Nm (2.21 lb ft)	-
6	Screws fastening tail fairing to saddle mounting bracket	M5	4	2 Nm (1.48 lb ft)	-
7	Lower saddle mounting fastener fixing screws	M5	5	3 Nm (2.21 lb ft)	-
8	Screws for fastening license plate holder to saddle mounting plate	M6	3	4 Nm (2.95 lb ft)	-
9	Screws for fastening the rear number plate holder to the front number plate holder	SWP 3,9	4	1 Nm (0.74 lb ft)	-
10	Self-tapping screws for fastening the rear number plate holder to the front number plate holder	SWP 4.9	2	2 Nm (1.48 lb ft)	-
11	Reflector retaining nuts	M4	2	1 Nm (0.74 lb ft)	-
12	License plate light fixing screw	M4	1	1 Nm (0.74 lb ft)	-
13	Nuts for fastening the number plate holder to the saddle mounting	M6	2	4 Nm (2.95 lb ft)	-
-	Screw for fastening the tail fairing to the taillight bracket	M5	2	3 Nm (2.21 lb ft)	-



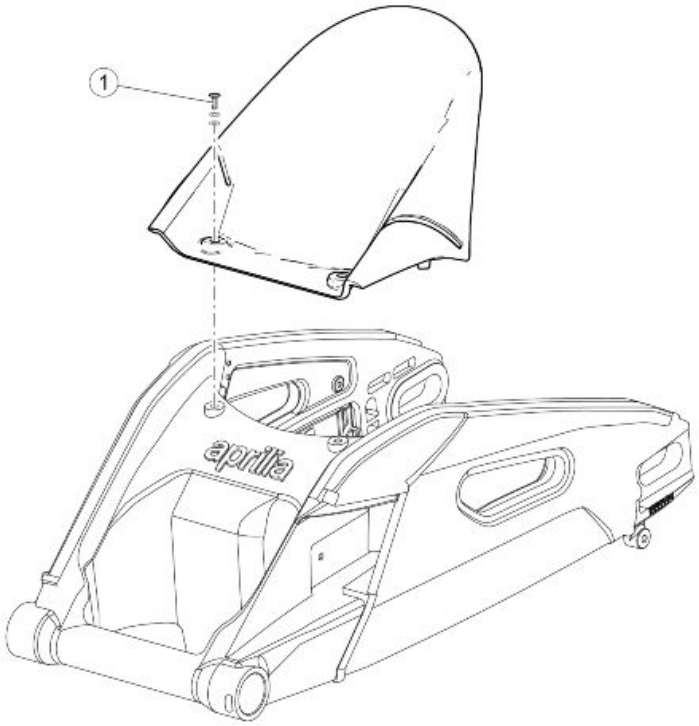
LOCKS

pos.	Description	Type	Quantity	Torque	Notes
1	Nut fastening saddle lock to tail fairing	M22x1.5	1	5 Nm (3.69 lb ft)	-
2	Lock lever self-tapping screw	M4	1	2 Nm (1.48 lb ft)	-
3	Shear head screw (to the left of the ignition lock)	M8	1	Manual	Tighten until the head shears off
4	Right hand ignition lock screw	M8	1	20 Nm (14.75 lb ft)	-
5	Passenger saddle fixing screws	M6	2	8 Nm (5.90 lb ft)	-



FOOTRESTS

Pos.	Description	Type	Quantity	Torque	Notes
1	Screws for fastening the rider's footrests to the frame	M8	2 + 2	25 Nm (18.44 lb ft)	Loctite 243
2	Screws for fastening the passenger's footrests to the frame	M8	2 + 2	18 Nm (13.28 lb ft)	Loctite 243 - For use in countries where it is mandatory to fit the passenger's footrests or for the two-seater configuration
3	Rider's heel guard retaining screws	M6	2 + 2	8 Nm (5.90 lb ft)	-
4	Passenger's heel guard retaining screws	M6	2 + 2	8 Nm (5.90 lb ft)	-
5	Anti-creep pin	M6	1	8 Nm (5.90 lb ft)	-



REAR MUDGUARD

pos.	Description	Type	Quantity	Torque	Notes
1	Rear mudguard fixing screws	M6	2	5 Nm (3.69 lb ft)	For plastic mudguard
1	Rear mudguard fixing screws	M6	2	3 Nm (2.21 lb ft)	For carbon mudguard

Seat

- Remove the saddle cover/ passenger saddle
- Remove the two rear fastening screws

- Lift the rear saddle and slide it off the pin on the tank

Driving mirrors

- The following procedure is for a single rear view mirror, but is applicable to both mirrors.
- Disconnect the turn indicator connector from the relative fixed connector on the instrument panel

- Unscrew and remove the two nuts, supporting the rear view mirror.

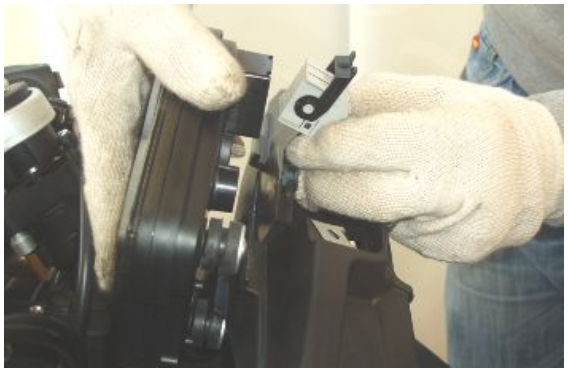
- Guiding the turn indicator cable through the relative hole on the top fairing, remove the rear view mirror.

Instrument panel

- Remove the windshield.
- Unscrew and remove the two screws.

- Remove the instrument panel mounting cover.
- Move the instrument panel, removing the rubber rings from the seats on the support.

- Rotate the instrument panel connector retainer lever.
- Remove the connector.
- Remove the instrument panel.

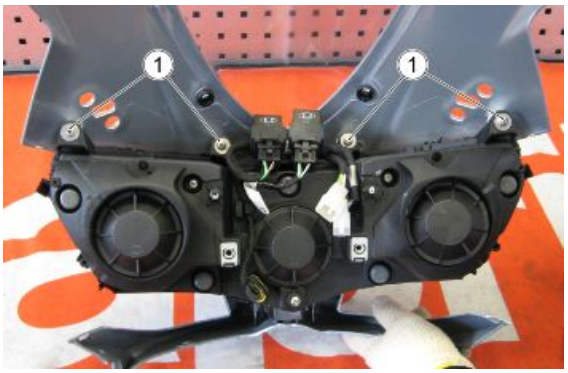


NOTE

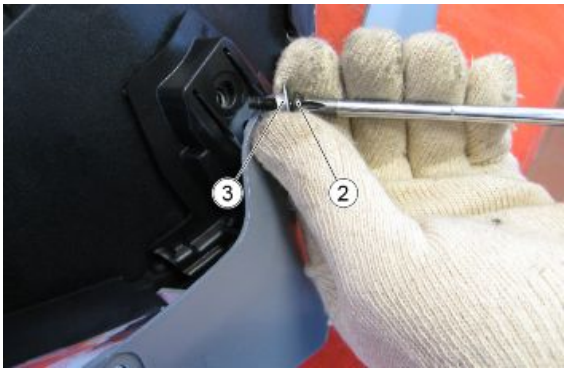
WHEN REASSEMBLING THE CONNECTORS, THE SLIDES MUST SLIDE FREELY UP TO THE LIMIT STOP, THUS FACILITATING THE CONNECTOR'S INSERTION. THE CATCH SHOULD SNAP INTO PLACE ONCE THE LIMIT STOP IS REACHED.

Headlight assy.

- Remove the top fairing complete
- Remove the side air deflectors from the top fairing
- Remove the four fixing screws (1)



- Remove the lower fixing screw (2) paying attention to collect the bush (3)



- Remove the headlight assembly complete (4)

- Slide off the support (5) of the headlight from the top fairing

Headlight fairing

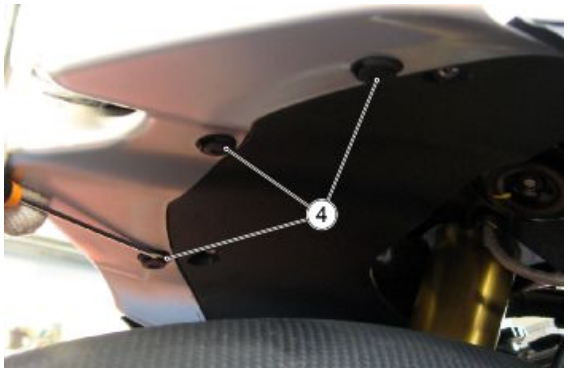
- Previously remove the side fairings
- Operating from the left side of the motorcycle, remove the rear screw (1) fixing the top fairing to the air deflector

- Remove the upper screw (2) fixing the top fairing to the air deflector

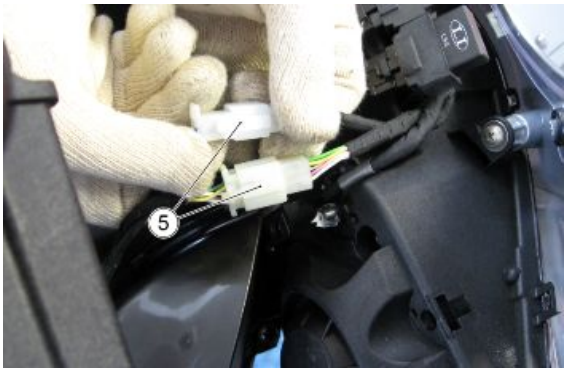
- Remove the central screw (3) fixing the top fairing to the support frame

- Remove the previously described screws also for the right side of the motorcycle

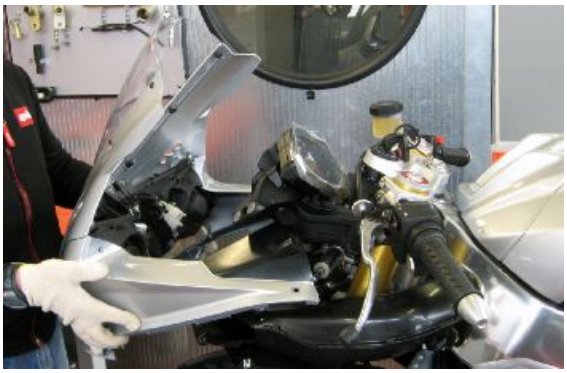
- Remove the three clips (4) under the top fairing, which are fixing it to the central underfairing



- Move the top fairing forward to the minimum space necessary to work on the front bulb connectors
- Disconnect the front headlamp connectors (5)



- Remove the top fairing complete



SIDE AIR DEFLECTOR COVERS

- To disassemble the side air deflector covers connected to the top fairing, the lower screw (1) must be removed

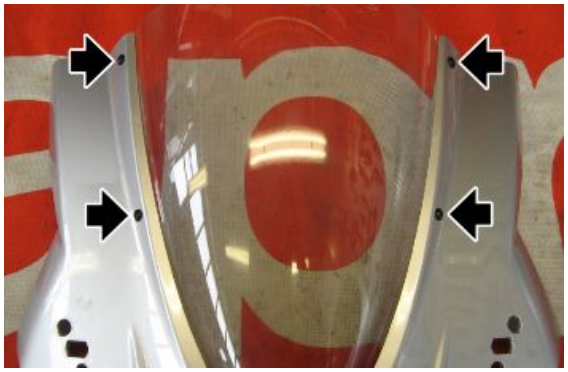
- Remove the inner screw (2)

- Detach and remove the side air deflector covers from the top fairing

- Remove the previously described screws also for the right side of the top fairing to remove the side air deflector covers

PLEXIGLAS

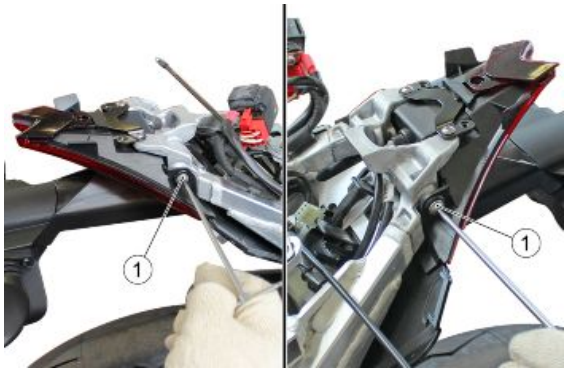
- Remove the four fixing screws paying attention to collect the Teflon washers



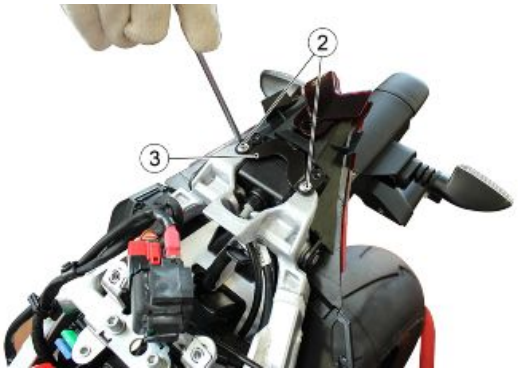
- Slide the plexiglas from the lower pins and remove it

Taillight assy.

- Carry out the tail fairing removal procedure.
- Unscrew and remove the two screws (1).



- Unscrew and remove the two screws (2).
- Remove the bracket (3).

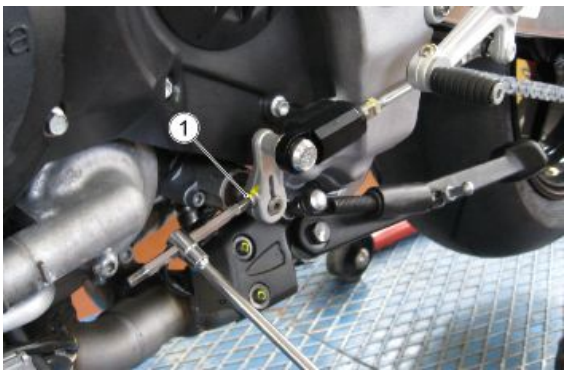


- Disconnect the connector (4).
- Remove the taillight (5).

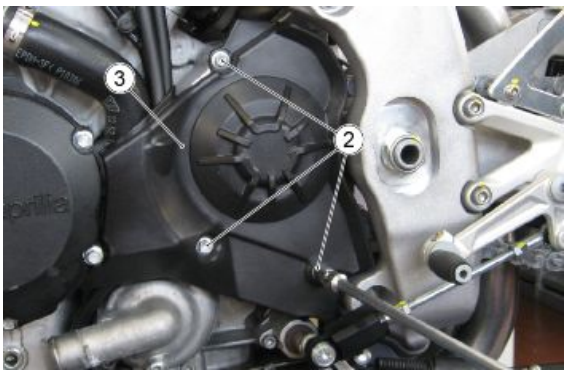
Rider footrest plate

LEFT RIDER FOOTREST REMOVAL - GEAR-BOX LEVER

- Remove the fuel tank
- Loosen the screw (1) and ease off the gear lever

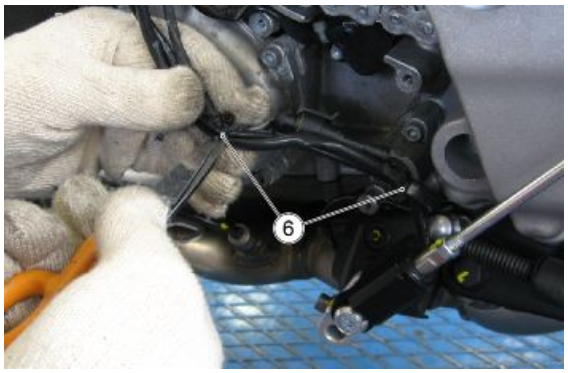


- Remove the three fixing screws (2) of the pinion cover (3)



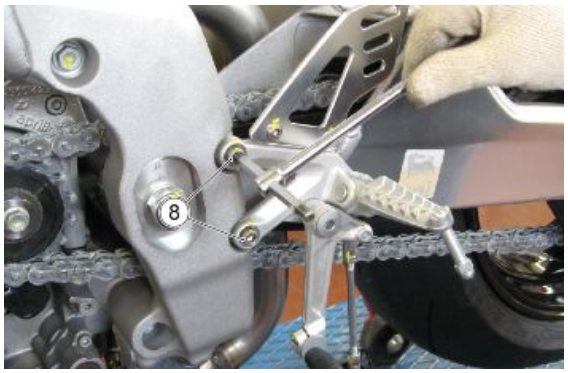
- Remove the fixing screw (4) of the cable grommet (5)

- Cut the two clamps (6) that connect the wiring of the quick-shift to the wiring of the side stand and of the lambda probe



- Disconnect the connector (7) of the quick-shift and release the wiring

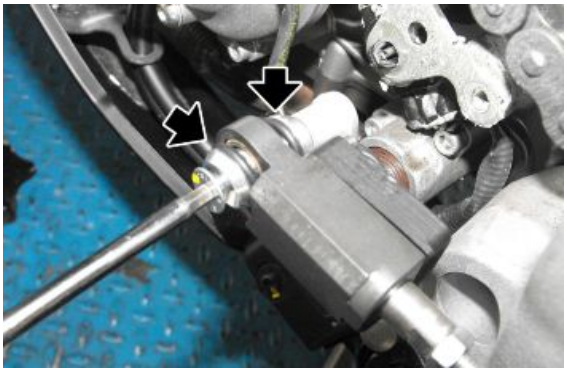
- Remove the two fixing screws (8) of the footrest complete with leverage



- If necessary, you can loosen and remove the quick-shift fixing screw to change the O-rings.

NOTE

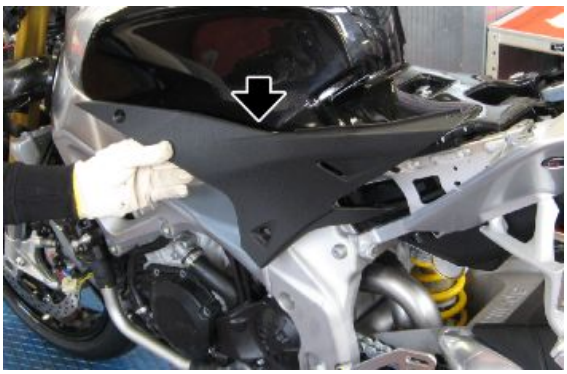
NOTE THE WIRING HARNESS DOES NOT NEED TO BE DISCONNECTED FOR THIS OPERATION



Side body panels

- Remove the rider saddle
- Working from the left side of the motorcycle, remove the three fixing screws of the side fairing

- Remove the side fairing



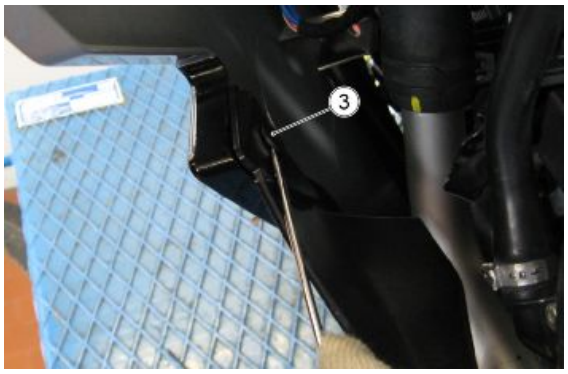
- To remove the right side fairing, perform the previously described operations

Side fairings

- Operating from the left side of the motorcycle, detaching the three clips (1) placed on the inner fairing.

- Remove the four screws (2)

- Detach the inner fixing clip (3) with the air deflector



- Slide the side fairing paying attention to the fittings with the lug

AIR DEFLECTORS

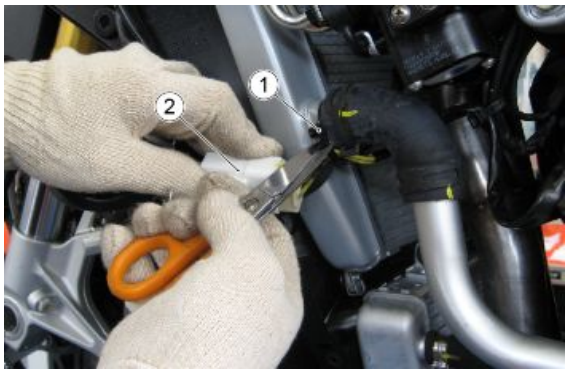
- The following operations are valid for both air deflectors
- Remove the screw (1) fixing the deflector to the lower fairing
- Remove the deflector (2)

Fairing mounting panels

- Previously remove the side fairings

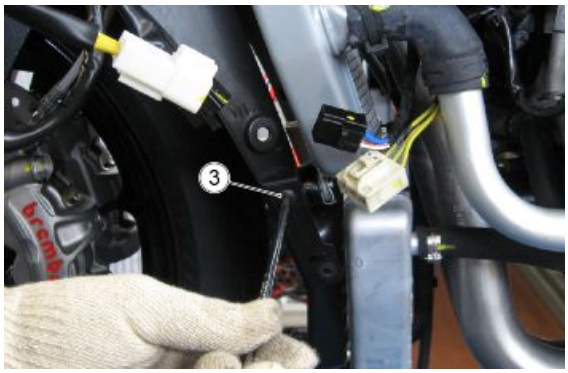
LATERAL UNDERFAIRINGS

- Working from the left side of the motorcycle, remove the clamp (1) locking the wiring of the connectors (2) of the alternator to the radiator.



- Disconnect the connectors (2) of the alternator to the radiator

- Remove the lower fixing screw (3) of the left inner fairing

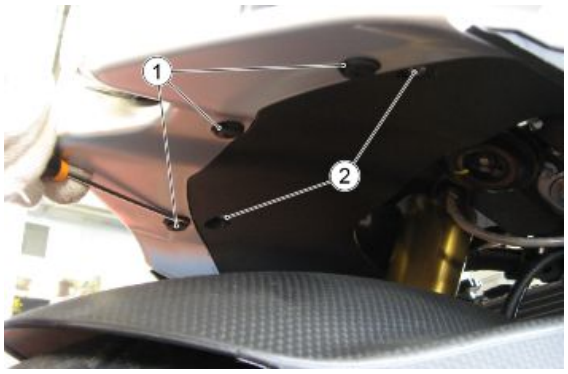


- Remove the upper fixing screw (4) of the left inner fairing

- Detach the internal left fairing (5) from the central underfairing and remove it

CENTRAL UNDERFAIRING

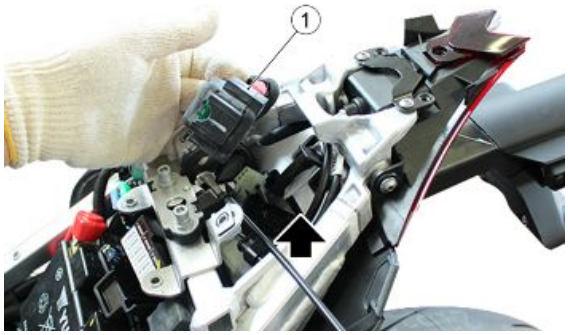
- Remove the three clips (1) and the two screws (2) fixing the central underfairing to the top fairing.



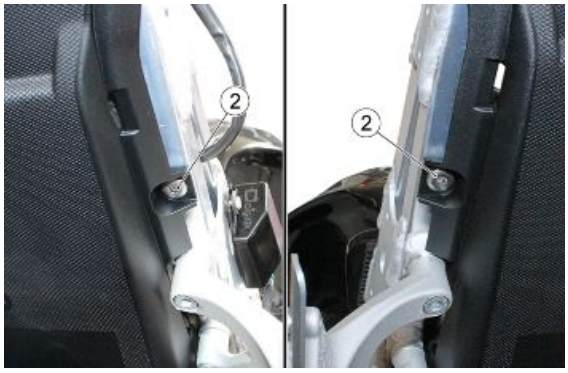
- In case the side underfairing are not removed, remove the internal screws (3) from both sides.
- Ease off the central underfairing, taking care not to damage the fittings with the lateral underfairings and the top fairing

REAR UNDERFAIRING

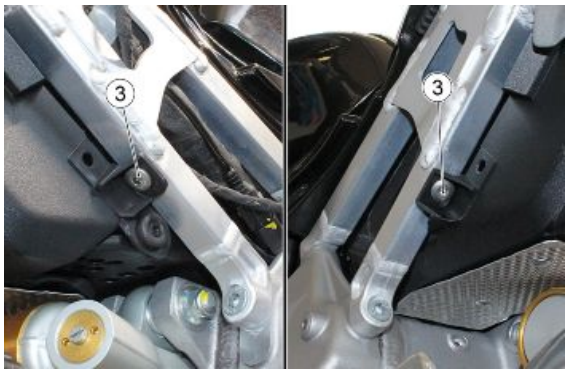
- Carry out the tail fairing removal procedure.
- Remove the starter relay box (1) from the point indicated in the figure.



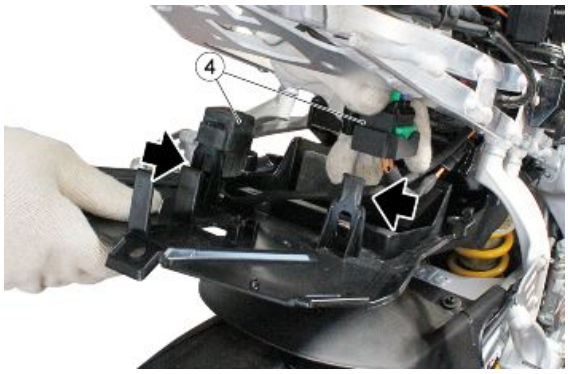
- Remove the rear light unit.
- Carry out the licence plate support removal procedure.
- Remove the tank.
- Remove the battery.
- Working from both sides of the motorcycle, undo and remove the two screws (2).



- Working from both sides of the motorcycle, undo and remove the two screws (3).

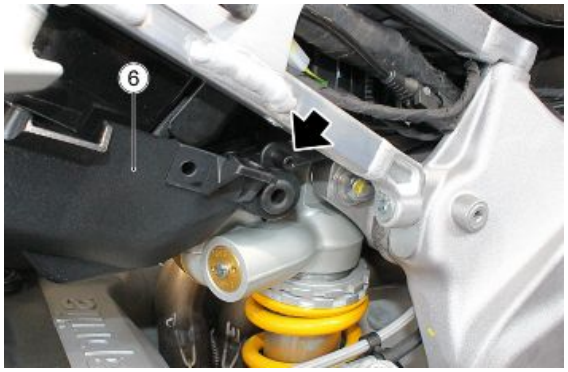


- Remove the two auxiliary fuse boxes (4) from the corresponding supports indicated in the figure.



- Unscrew and remove the screw (5).

- Unhook the underfairing (6) from the point indicated in the figure.

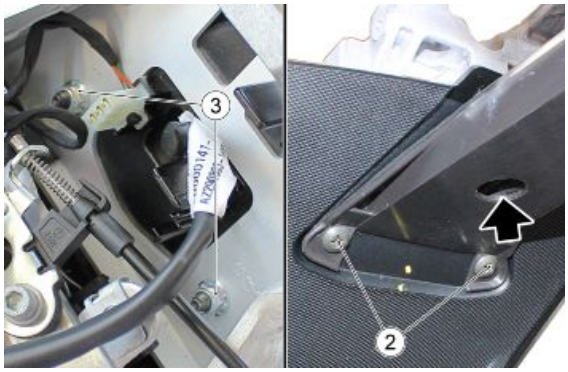


- Remove the underfairing (6).

License plate holder

- Remove the plastic cover (1).

- Undo and remove the screw inside of the point indicated in the figure.
- Unscrew the fixing screws (2) together with the nuts (3).

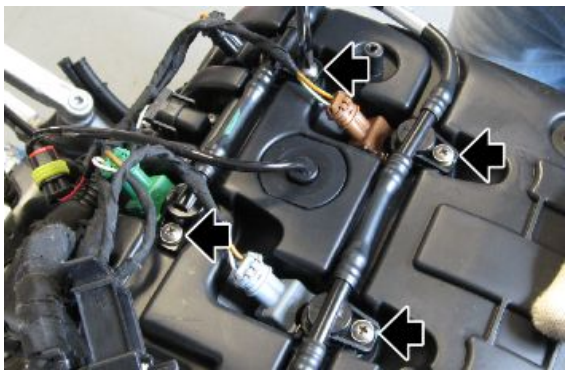


- Disconnect the connector (4).
- Remove the support (5).

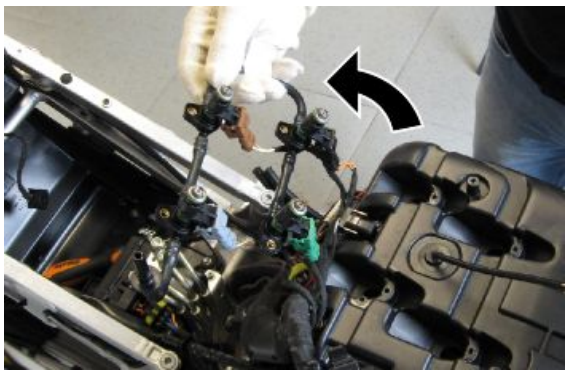
Air box

FILTER BOX COVER REMOVAL

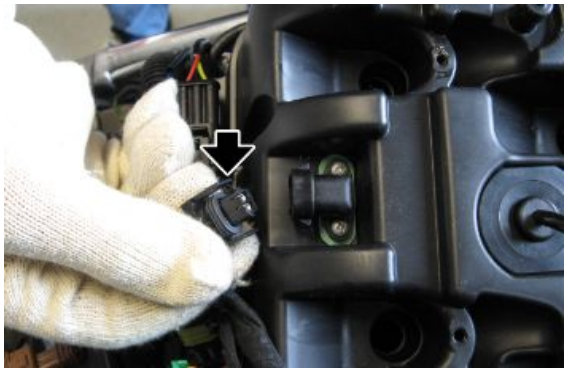
- Remove the control unit complete with support.
- Undo the four screws fixing the injectors unit to the filter box



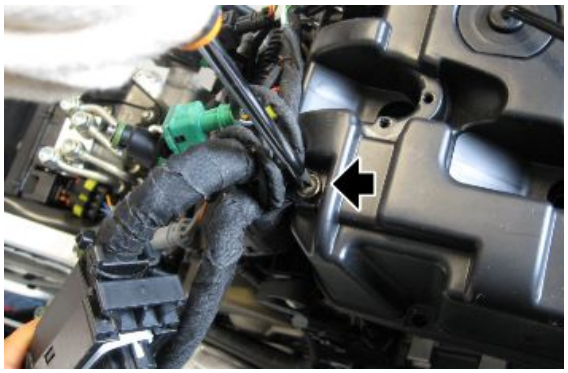
- Remove the injectors from the filter box



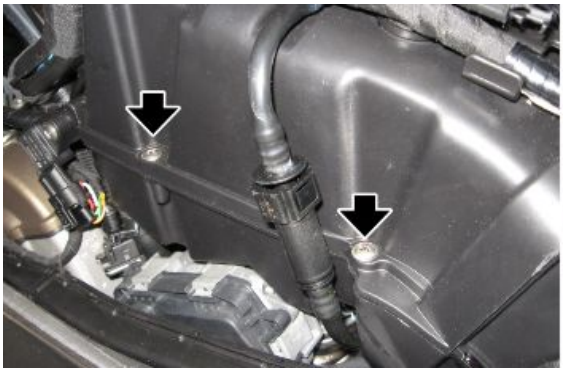
- Disconnect the air temperature sensor connector

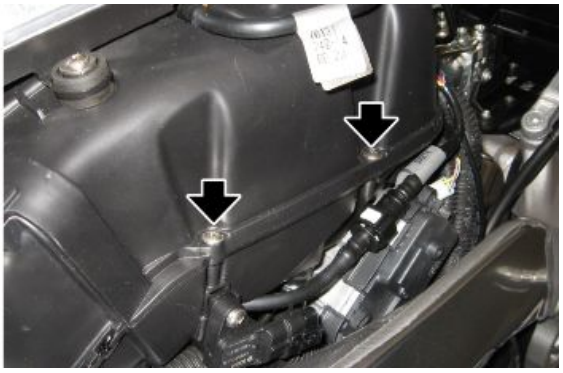


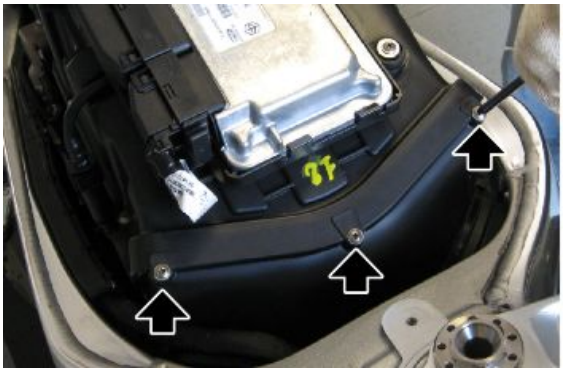
- Remove the screw fixing the wiring harness to the filter box and move it away



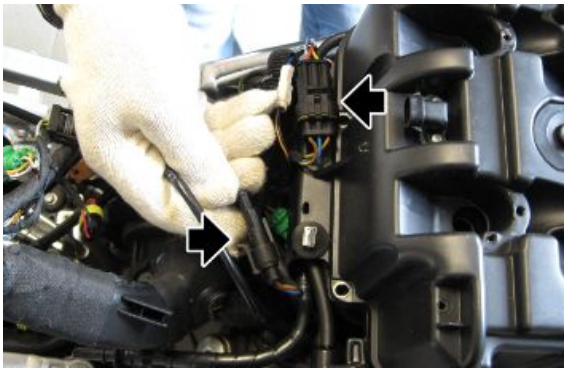
- Unscrew and remove the eight air filter box cover screws



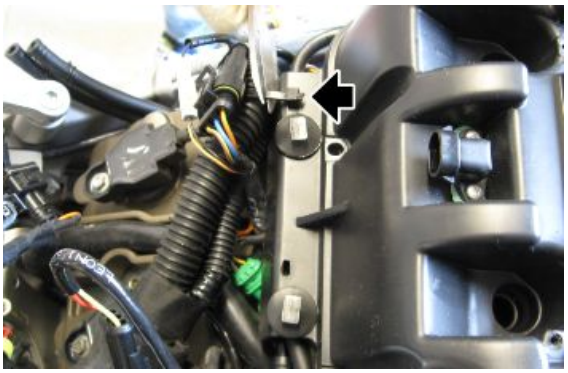




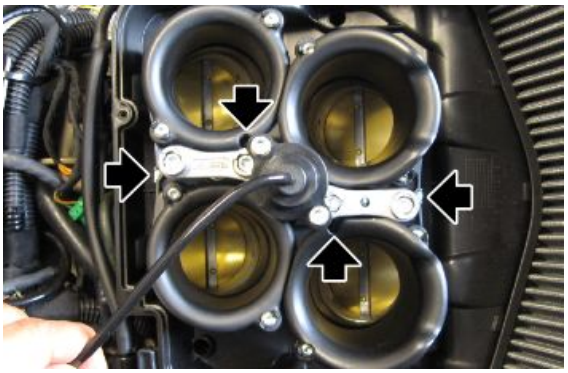
- Move the two rear coil connectors.



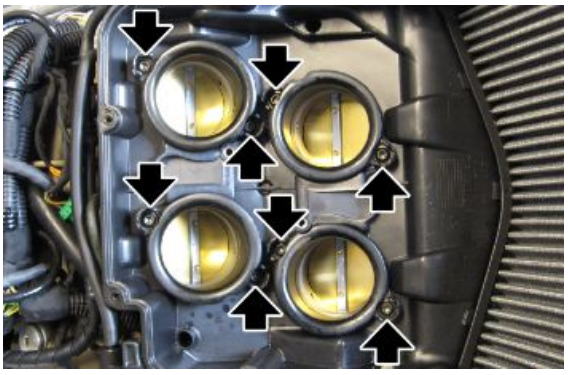
- Remove the two clamps blocking the wiring harness to the filter box cover



- Remove the four screws fixing the variable geometry intake system and remove it



- Remove the fixing screws of the intake duct/supports



- Remove the intake ducts complete with support

- Operating from both sides, unscrew and remove the air pressure sensors fixing screws

- Operating from both sides, unscrew and remove the air pressure sensors fixing screws

- Operating from the left side of the motorcycle, remove the clamp blocking the main wiring harness to the filter box

- Disconnect the engine wiring connector, previously placed on the filter box

- Release the cable harness from the cable grommet on the filter box

- Remove the filter box

Rear mudguard

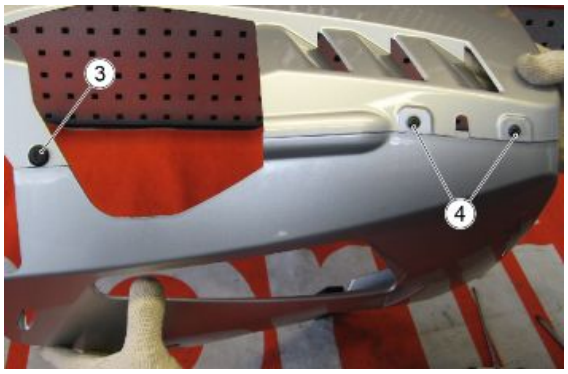
- Unscrew and remove the two screws.
- Remove the rear mudguard.

Lower cowl

- Remove the side fairings
- Operating from both sides, remove the front fixing screws (1)

- Remove the lower fixing screw (2) holding the lug

- Remove the clip (3) and the two screws (4) to divide the lug



Fuel tank

- Unscrew and remove the front screw fixing the tank.

- Remove the rider saddle.
- Unscrew and remove the two rear screws.

- Release the clamps.
- Remove the two tank breather pipes.

- Disconnect the fuel pipe.

- Disconnect the fuel pump connector.
- Remove the tank.

Front mudguard

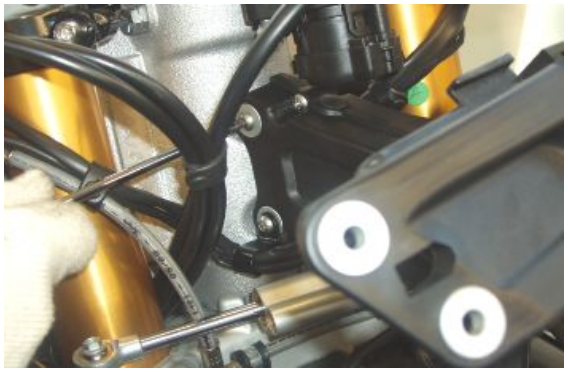
- Working on both sides of the vehicle, undo and remove the two screws.

- Release the brake pipe eliminating the clamp.
- Remove the front mudguard.

Instrument cluster support

REMOVAL

- Remove the instrument panel.
- Working on both sides, unscrew and remove the two screws fastening the arch brace to the headstock.
- Retrieve the cable grommet.

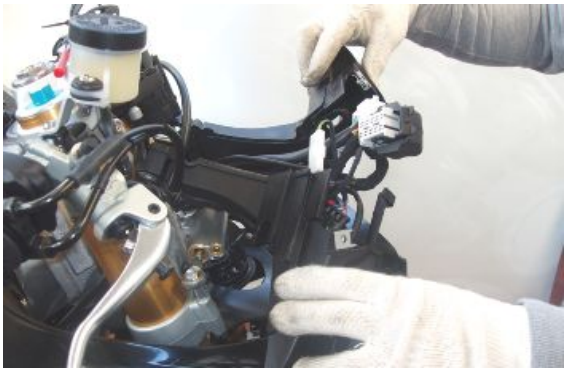


- Unscrew and remove the five semi-arch brace fixing screws.

See also

Instrument panel

- Separate and remove the two semi-arch braces

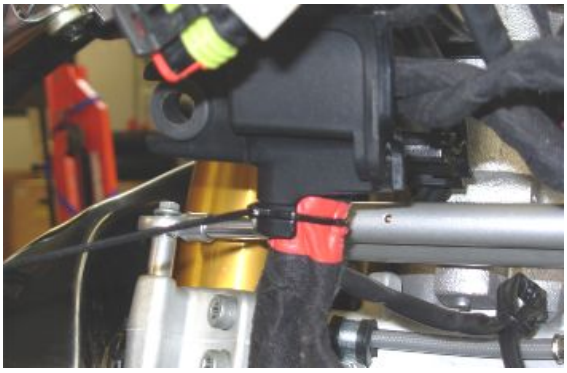


FITTING

- Fit the right semi-arch brace, fixing it to the headstock with two screws.

- Connect the Immobilizer aerial cables.

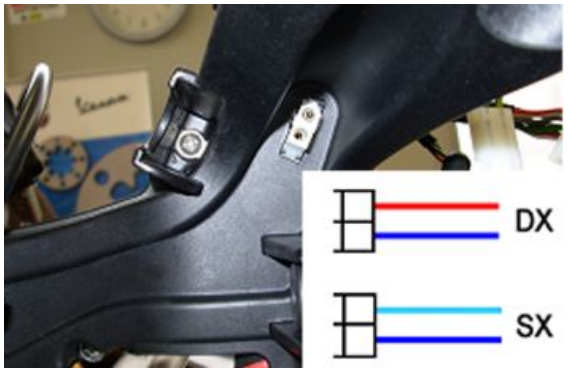
- Fasten the main cable harness to the semi-arch brace with a clamp.



- Gather the cables on the right semi-arch brace and fasten them provisionally with a clamp.
- Fit the left semi-arch brace, applying the five coupling screws. Do not strain the connection between the two semi-arch braces, as this would prevent the removal of the clamp.

- Cut and remove the provisional clamp.
- Fit the cable grommet from the left hand side of the arch brace, tighten the two screws on the headstock.
- Tighten the five coupling screws.

- Fit the turn indicator connectors in the relative housings, noting the colours of the wires identifying the correct side.



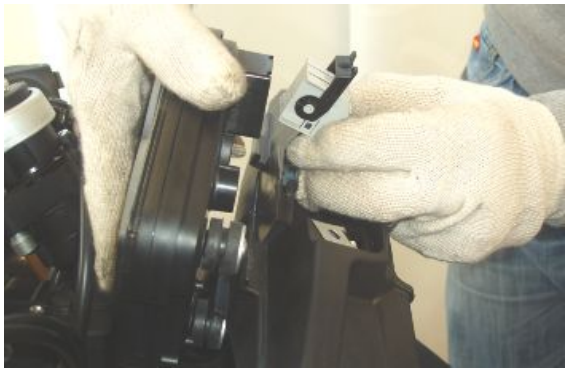
- Join the remaining connectors and arrange the cable carefully in the space available within the arch brace. Note that there are two pairs of connectors which may be connected incorrectly.

The male connector on the cable with the red strip must be connected to the female connector on the longer cable.

- Reconnect the instrument panel connector

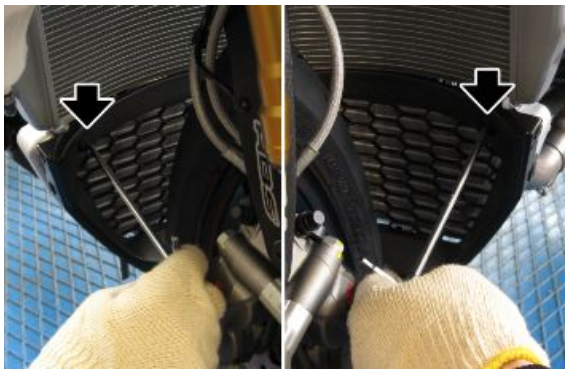
NOTE

WHEN REASSEMBLING THE CONNECTORS, THE SLIDES MUST SLIDE FREELY UP TO THE LIMIT STOP, THUS FACILITATING THE CONNECTOR'S INSERTION. THE CATCH SHOULD SNAP INTO PLACE ONCE THE LIMIT STOP IS REACHED.



Radiator cover

- Remove the side fairings.
- Remove the fairing lug.
- Operating from both sides, unscrew and remove the fixing screws.



- Remove the radiator cover

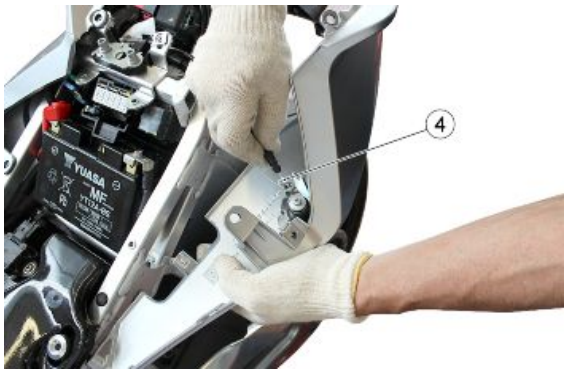
Tail guard

- Carry out the saddle removal procedure.
- Carry out the side fairing removal procedure.
- Undo and remove the six fixing screws (1).

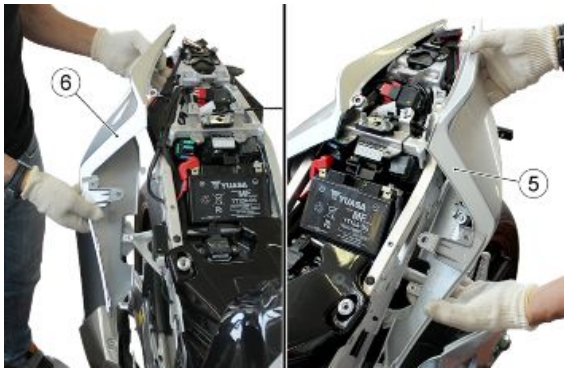
- Remove the two plastic inserts (2) from both sides of the motorcycle.

- Unscrew and remove the screw (3).

- Unhook the saddle opening cable (4) from its seat.



- Remove the left (5) and right (6) tail fairing.



Side air deflectors

The following procedure is for a single lateral duct but is applicable to both.

- Remove the windshield.
- Unscrew and remove the two fixing nuts.

- Remove the duct from its seat on the frame.

CAUTION

DURING REASSEMBLY, THE DUCT MUST BE SEATED CORRECTLY ON THE FRAME TO ENSURE THAT IT IS FLUSH WITH THE ADJACENT PARTS.

See also

Headlight fairing

INDEX OF TOPICS

PRE-DELIVERY	PRE DE

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 AS TYRES MAY BURST.

CAUTION

CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.

Specific operations for the vehicle

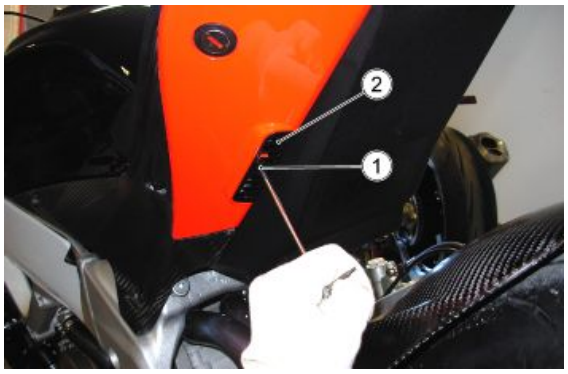
LICENSE PLATE HOLDER

- Set three washers of suitable diameter between license plate and its holder to avoid damaging the license plate.

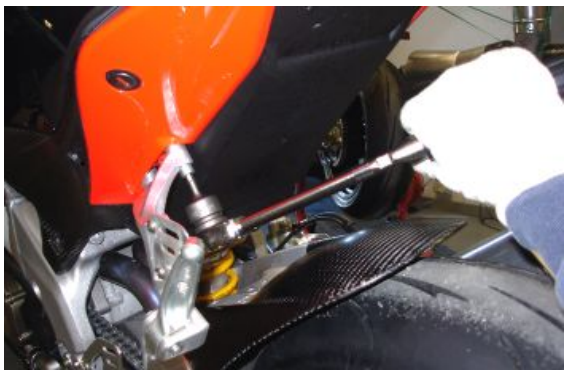
WARNING

OPERATIONS REQUIRED TO RENDER VEHICLE COMPLIANT WITH TWO SEATER TYPE APPROVAL.

- Remove the screw (2).
- Remove the plastic cover (1).



- Fit the rear pedal in its seat.
- Fit the two TCEI M8X45 screws and tighten with a torque wrench to a torque of 18 Nm (13.27 lbf ft)



NOTE

REPEAT THE STEPS TO FIT THE PASSENGER FOOTPEG ON THE OPPOSITE SIDE.

Saddle replacement

- Insert the key in the lock and turn it clockwise.
- Remove the tail fairing.

- Fit the two-seater saddle.

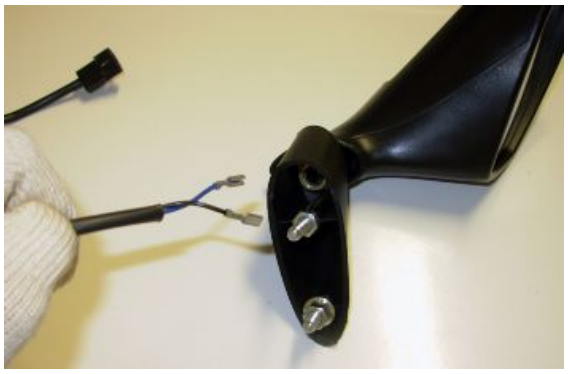
Adjusting the rear-view window joint

- With the mirror closed (base turned 90° in relation to the mirror) check that the nut is closed properly, as indicated by the arrow, (you should be able to see about 0.5 mm - 1 mm (0.02 in - 0.04 in) of the threaded pin projecting from the nut and the Loctite 270).

If the nut is not closed correctly, proceed as follows:

- Close the mirror (base turned 90° in relation to the mirror).
- Remove the glass from the indicator light.

- Cut the wiring harness clamp (if there is one), disconnect the wiring harness connector and pull the wiring harness away from the mirror.



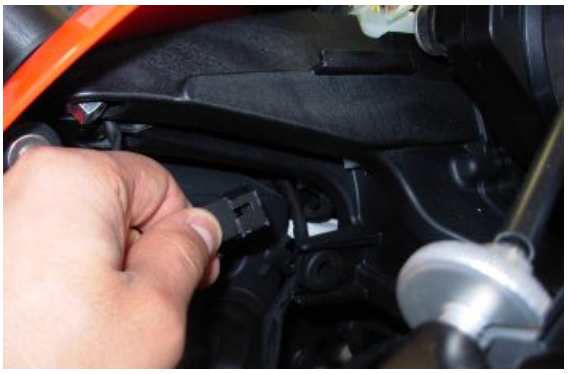
- Loosen the nut so its upper surface is about 0.5 mm (0.02 in) above the end of the threaded pin.
- Put some Loctite 270 inside the nut.

- Screw the nut back down until its upper surface is about 0.5 mm - 1 mm (0.02 in - 0.04 in) away from the end of the pin.
- Wait 24 hours for the Loctite to dry well before moving the mirror.

- Assemble the rear-view mirror.
- Pass the wiring harness through the specific hole and place the rear-view mirror in its seat.

- Tighten the two fixing nuts of the rear-view mirror.

- Connect the connector.



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