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SERVICE STATION MANUAL

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DORSODURO 1200 ABS - ATC

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THE VALUE OF SERVICE

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

The reliability of the vehicle also depends on its mechanical state. Checking the vehicle before riding, its regular maintenance and using only **Original Aprilia Spare Parts** are essential!

For information about the nearest **Official Dealer and/or Service Centre**, consult the Yellow Pages or search directly from the map on our Official Website:

www.aprilia.com

Only by requesting aprilia Original Spare Parts can you be sure of purchasing products that were developed and tested together with the actual vehicle itself. All Aprilia Original Spare Parts undergo quality control procedures to guarantee reliability and durability.

The descriptions and illustrations given in this publication are not binding; While the basic characteristics as described and illustrated in this booklet remain unchanged, Aprilia reserves the right, at any time and without being required to update this publication beforehand, to make any changes to components, parts or accessories, which it considers necessary to improve the product or which are required for manufacturing or construction reasons.

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

SERVICE STATION MANUAL
DORSODURO 1200 ABS - ATC

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.

INDEX OF TOPICS

INDEX OF TOPICS

Rules

Safety rules

Carbon monoxide

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

CAUTION

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

Fuel

CAUTION

FUEL USED TO POWER INTERNAL COMBUSTION ENGINES IS HIGHLY FLAMMABLE AND CAN BECOME EXPLOSIVE UNDER SPECIFIC CONDITIONS. IT IS THEREFORE RECOMMENDED TO CARRY OUT REFUELLING AND MAINTENANCE PROCEDURES IN A VENTILATED AREA WITH THE ENGINE SWITCHED OFF. DO NOT SMOKE DURING REFUELLING AND NEAR FUEL VAPOURS, AVOID ANY CONTACT WITH NAKED FLAMES, SPARKS OR OTHER SOURCES WHICH MAY CAUSE THEM TO IGNITE OR EXPLODE.
DO NOT DISPERSE FUEL IN 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. Before handling these components, make sure that you are wearing insulating gloves or wait until the engine and the exhaust system have cooled down.

Coolant

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

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

CAUTION

TAKE CARE NOT TO SPILL COOLANT ONTO HOT ENGINE OR EXHAUST SYSTEM COMPONENTS; THE FLUID MAY IGNITE AND BURN WITH AN INVISIBLE FLAME. WHEN CARRYING OUT MAINTENANCE, IT IS ADVISABLE TO WEAR LATEX GLOVES. EVEN THOUGH IT IS TOXIC, COOLANT HAS A SWEET FLAVOUR WHICH MAKES IT VERY ATTRACTIVE TO ANIMALS. NEVER LEAVE THE COOLANT IN OPEN CONTAINERS IN AREAS ACCESSIBLE TO ANIMALS AS THEY MAY DRINK IT.

KEEP OUT OF THE REACH OF CHILDREN.
DO NOT REMOVE THE RADIATOR CAP WHEN THE ENGINE IS STILL HOT. THE COOLANT IS PRESSURISED AND MAY CAUSE SCALDING.

Used engine oil and transmission oil

CAUTION

IT IS ADVISABLE TO WEAR LATEX 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.

Brake and clutch fluid

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

Battery electrolyte and hydrogen gas

CAUTION

THE BATTERY ELECTROLYTE IS TOXIC, CORROSIVE AND, AS IT CONTAINS SULPHURIC ACID, MAY CAUSE BURNING IF IT COMES INTO CONTACT WITH THE SKIN. WHEN HANDLING BATTERY ELECTROLYTE, WEAR TIGHT-FITTING GLOVES AND PROTECTIVE APPAREL. IN THE EVENT OF SKIN CONTACT WITH THE ELECTROLYTIC FLUID, RINSE WELL WITH PLENTY OF CLEAN WATER. IT IS PARTICULARLY IMPORTANT TO PROTECT YOUR EYES BECAUSE EVEN TINY AMOUNTS OF BATTERY ACID MAY CAUSE BLINDNESS. IN THE EVENT OF CONTACT WITH THE EYES, RINSE WITH PLENTY OF WATER FOR FIFTEEN MINUTES AND CONSULT AN EYE SPECIALIST IMMEDIATELY. IF THE FLUID IS ACCIDENTALLY SWALLOWED, DRINK LARGE QUANTITIES OF WATER OR MILK, FOLLOWED BY MILK OF MAGNESIA OR VEGETABLE OIL AND SEEK MEDICAL ADVICE 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 IT OR SPILL IT, PARTICULARLY ON PLASTIC COMPONENTS. ENSURE THAT THE ELECTROLYTIC ACID IS COMPATIBLE WITH THE BATTERY BEING ACTIVATED.

Maintenance rules

GENERAL PRECAUTIONS AND INFORMATION

When repairing, disassembling and reassembling the vehicle, strictly follow the recommendations reported below.

BEFORE DISASSEMBLING COMPONENTS

- Before dismantling components, remove dirt, mud, dust and foreign bodies from the vehicle. Use the special tools designed for this bike, as required.

COMPONENTS REMOVAL

- Do not loosen and/or tighten screws and nuts using pliers or any other tools than the specific wrench.
- Mark the positions on all connection joints (pipes, cables, etc.) before separating them, and identify them with different distinctive symbols.
- Each component needs to be clearly marked to enable identification during reassembly.
- Clean and wash the dismantled components carefully using a low-flammability detergent.
- Keep mated parts together since they have "adjusted" to each other due to normal wear.
- Some components must be used together or replaced altogether.
- 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).

ELECTRIC CONNECTORS

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

Press the relative safety clips, if applicable.

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

CAUTION

DO NOT DISCONNECT CONNECTORS BY PULLING THE CABLES.

NOTE

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

TIGHTENING TORQUES

CAUTION

REMEMBER THAT THE TIGHTENING TORQUES FOR ALL FASTENING ELEMENTS ON WHEELS, BRAKES, WHEEL AXLES AND ANY OTHER SUSPENSION COMPONENTS PLAY A KEY ROLE IN ENSURING VEHICLE SAFETY AND MUST COMPLY WITH SPECIFIED VALUES. CHECK THE TIGHTENING TORQUES OF FASTENING ELEMENTS ON A REGULAR BASIS AND ALWAYS USE A TORQUE WRENCH TO REASSEMBLE THESE COMPONENTS. FAILURE TO COMPLY WITH THESE RECOMMENDATIONS MAY CAUSE ONE OF THESE COMPONENTS TO LOOSEN OR EVEN DETACH, CAUSING A WHEEL TO LOCK OR COMPROMISING VEHICLE HANDLING. THIS MAY LEAD TO FALLS, WITH THE RISK OF SERIOUS INJURY OR DEATH.

Running-in

Engine run-in is essential to ensure engine long life and correct operation. Twisty roads and gradients are ideal to run-in engine, brakes and suspensions effectively. Vary your riding speed during the running in period. In this way, you allow for the work of components to be "loaded" and then "unloaded", thus cooling engine parts.

CAUTION

ONLY AFTER THE SERVICE AT THE END OF THE RUN-IN PERIOD CAN THE BEST PERFORMANCE OF YOUR VEHICLE BE OBTAINED.

Follow the guidelines detailed below:

- Do not fully open the throttle grip abruptly at low engine speeds, either during or after the running in period.
- During the first 100 Km (62 miles) use the brakes gently, avoiding sudden or prolonged braking. That is to permit the adequate adjustment of the pad friction material to the brake discs.

AFTER THE SPECIFIED MILEAGE, TAKE YOUR VEHICLE TO AN Official aprilia Dealer FOR THE CHECKS INDICATED IN THE "AFTER-RUN-IN" TABLE IN THE SCHEDULED MAINTENANCE SECTION, TO AVOID INJURING YOURSELF, OTHERS AND/OR DAMAGING THE VEHICLE.

Vehicle identification

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

CAUTION

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

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

ZD4TVA000YSXXXXXX

KEY:

ZD4: WMI (World manufacturer identifier) code;

TV: model;

A00: version variation;

0: free digit

Y: year of manufacture

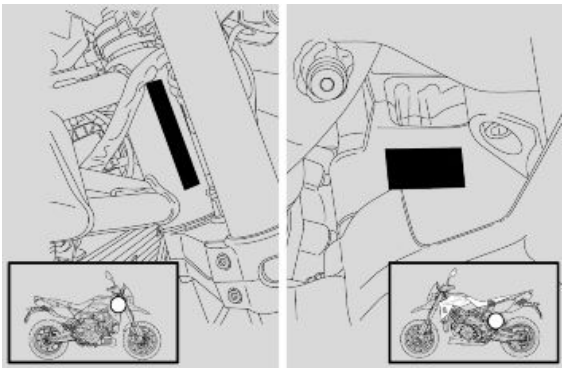
S: production plant (S= Scorzè);

XXXXXX: serial number (6 digits);

ENGINE NUMBER

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

Engine No. .....



CHASSIS NUMBER

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

Chassis No. .....

Dimensions and mass

DIMENSIONS

Specification	Desc./Quantity
Max. length	2248 mm (88.19 in)
Max. width (at hand guards)	925 mm (36.42 in)
Max. height	1205 mm (47.44 in)
Saddle height	870 mm (34.25 in)
Wheelbase	1528 mm (60.16 in)
Kerb weight	223 kg (492 lb)
Dry weight (unfuelled)	212 kg (467 lb)

Engine

ENGINE

Specification	Desc./Quantity
Model	M555M
Type	90° longitudinal V-twin, 4-stroke, 4 valves per cylinder, 2 overhead camshafts.
No. of cylinders	2
Total engine capacity	1197 cm³ (73.05 cu.in)
Bore / stroke	106 x 67.8 mm (4.17 x 2.67 in)
Valve clearance at intake	0.15 - 0.20 mm (0.0059 - 0.0079 in)
Outlet valve clearance	0.20 - 0.25 mm (0.0079 - 0.0098 in)
Compression ratio	12.0 : 1
Ignition	starter
Engine idle speed	1400 ± 100 rpm
Clutch	Multiple-disk, oil-bathed clutch with control on the left side of the handlebar
Lubrication system	Wet crankcase. Pressure system regulated by a trochoidal pump with oil radiator.
Air filter	Sponge.
Cooling	Fluid

GEARBOX

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

Transmission

GEAR RATIOS

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

Capacities

CAPACITY

Specification	Desc./Quantity
Fuel tank (reserve included)	15 l (3.30 UK gal; 3.96 USgal)
Fuel reserve	2.5 l (0.55 UK gal; 0.66 US gal)
Engine oil	3.1 l (without oil filter change) (0.68 UK gal; 0.82 USgal) 3.35 l (with oil filter change) (0.74 UKgal; 0.88 USgal)
Coolant	2.5 l (0.55 UK gal; 0.66 USgal)
Seats	2
Maximum weight limit	416 kg (917 lb)

Drive chain

DRIVE CHAIN

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

Electrical system

ELECTRICAL SYSTEM

Specification	Desc./Quantity
Battery	12 V - 12 Ah YTX 14 - BS
Main fuses	30A
Auxiliary fuses	7.5 A; 10 A; 15 A
ABS - ATC fuses (if fitted)	20 A
Alternator (permanent magnet type)	13.5 V - 450 W at 6000 rpm

SPARK PLUGS

Specification	Desc./Quantity
Standard spark plugs	NGK CR8EKB
Alternative spark plugs, for sports use or for prolonged high speed cruising fully loaded	NGK CR9EKB
Spark plug electrode gap	0.6 - 0.7 mm (0.024 - 0.028 in)
Resistance	5 kOhm

WARNING LIGHTS

Specification	Desc./Quantity
High beam light	LED
Right turn indicator	LED
Left turn indicator	LED
General warning	LED
Gear in neutral	LED
Side stand down	LED
Fuel reserve	LED
ABS	LED

BULBS

Specification	Desc./Quantity
High beam light	12 V - 60 W H4
Low beam light	12 V - 50 W H4
Front daylight running light	12V - 6W H6
Turn indicator light	12V - 10W
Rear daylight running light / stop light	LED
License plate light	12V - 5W
Rpm indicator lighting	LED
Multifunction display lighting	LED

Frame and suspensions

CHASSIS

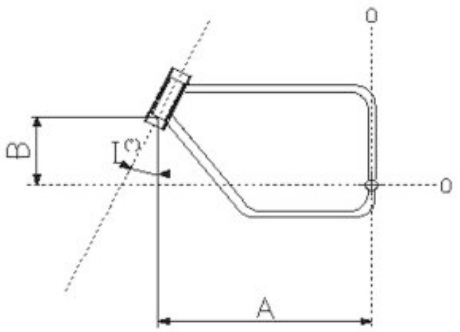
Specification	Desc./Quantity
Type	Component chassis (bolted). Die-cast aluminium plates and high-strength steel tubular chassis.
Steering inclination angle	27.3°
Trail	118 mm (4.65 in)

SUSPENSION

Specification	Desc./Quantity
Front	Sachs upside-down stanchions with adjustable hydraulic damping and 43mm (1.69 in) diameter stanchions
Travel	160 mm (6.3 in)
Rear	Oscillating swingarm with Sachs piggy-back single shock absorber and adjustable spring preloading, wheelbase and hydraulic compression and rebound damping.
Wheel travel	155 mm (6.1 in)

SIZES A AND B

Specification	Desc./Quantity
Size A	693.1 mm (27.29 in)
Size B	369.8 mm (14.56 in)



Brakes

BRAKES

Specification	Desc./Quantity
Front	Double floating disc, Ø 320 mm (12.60 in), radially-mounted calliper with four Ø 32 mm (1.26 in) pistons and two calliper pads
Rear	240 mm (9.45 in) diam. disc brake with 34 mm (1.34 in) diam. single piston calliper

Wheels and tyres

WHEEL RIMS

Specification	Desc./Quantity
Type	Light alloy rims with extractable bolt
Front	3.50 x 17"
Rear	6.00 x 17"

TYRES

Specification	Desc./Quantity
Tyre type (standard)	PIRELLI CORSA III DUNLOP SPORTMAX QUALIFIER
Front tyre	120/70 ZR17" (58W)
Front tyre pressure	rider only: 2.3 bar (230 kPa) (33.36 PSI) rider + passenger: 2.4 bar (240 kPa) (34.81 PSI)
Rear tyre	180/55 ZR17" (73W)
Rear tyre pressure	rider only: 2.5 bar (250 kPa) (36.26 PSI) rider + passenger: 2.7 bar (270 kPa) (39.16 PSI)

Supply

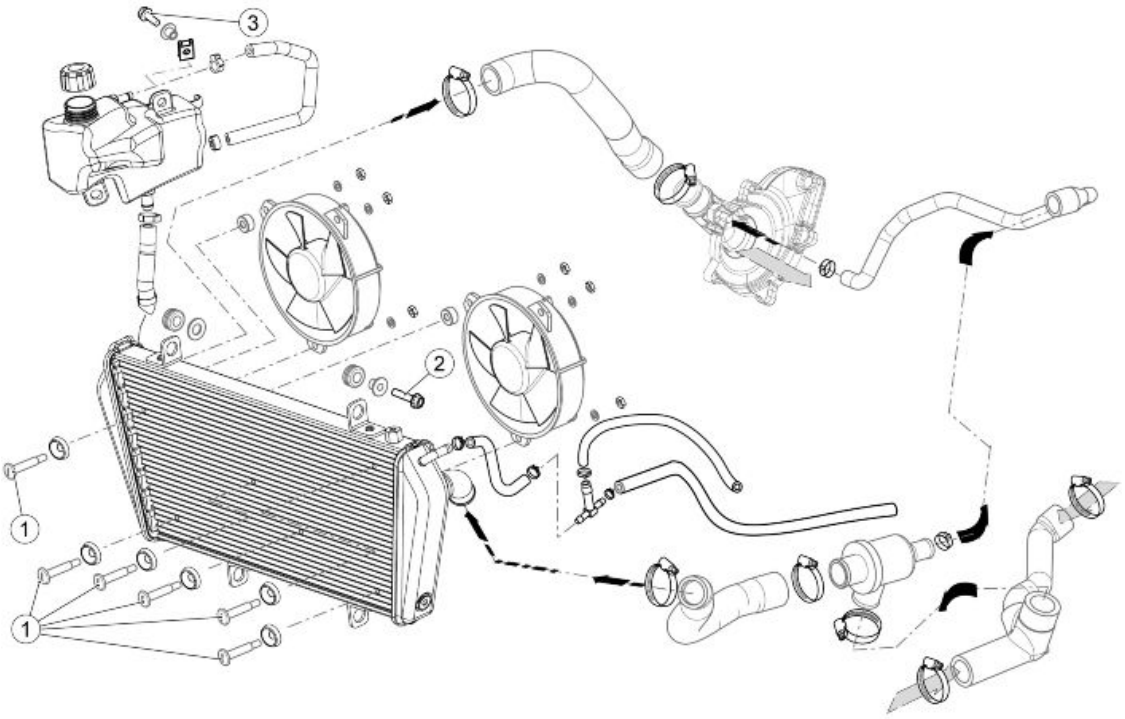
FUEL SYSTEM

Specification	Desc./Quantity
Type	Electronic injection (Multipoint)
Throttle valve diameter	Ø 57 mm (2.44 in)
Fuel	Premium unleaded petrol, minimum octane rating of 95 (NORM) and 85 (NOMM)

Tightening Torques

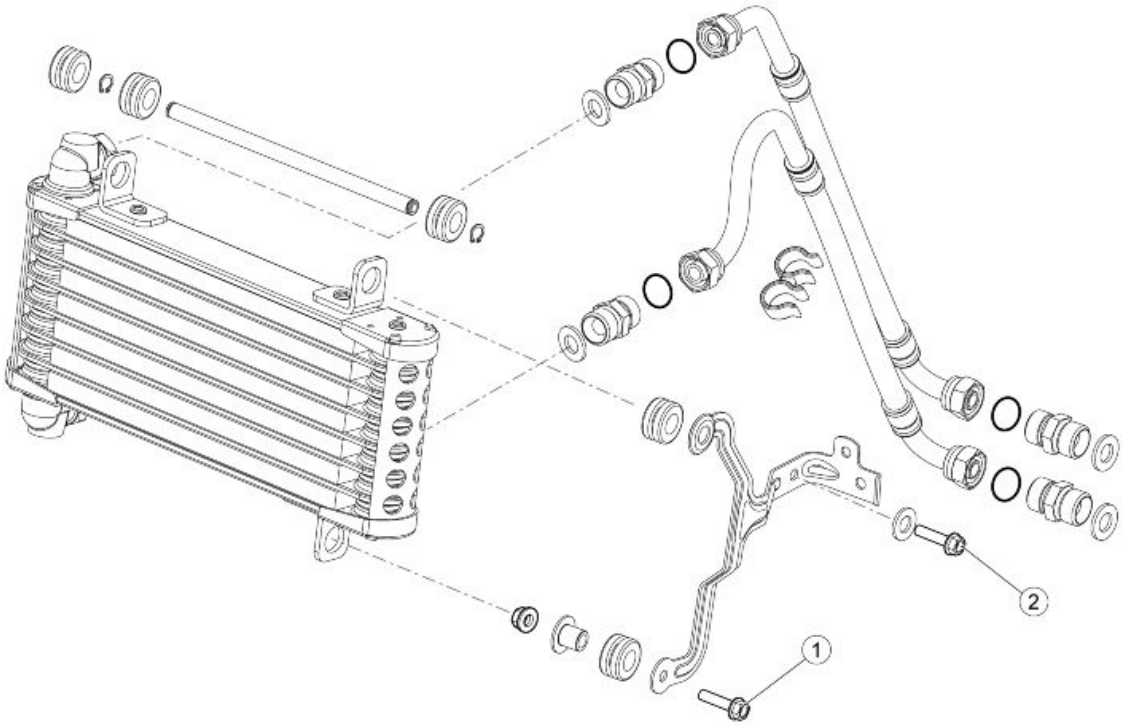
Chassis

Front side



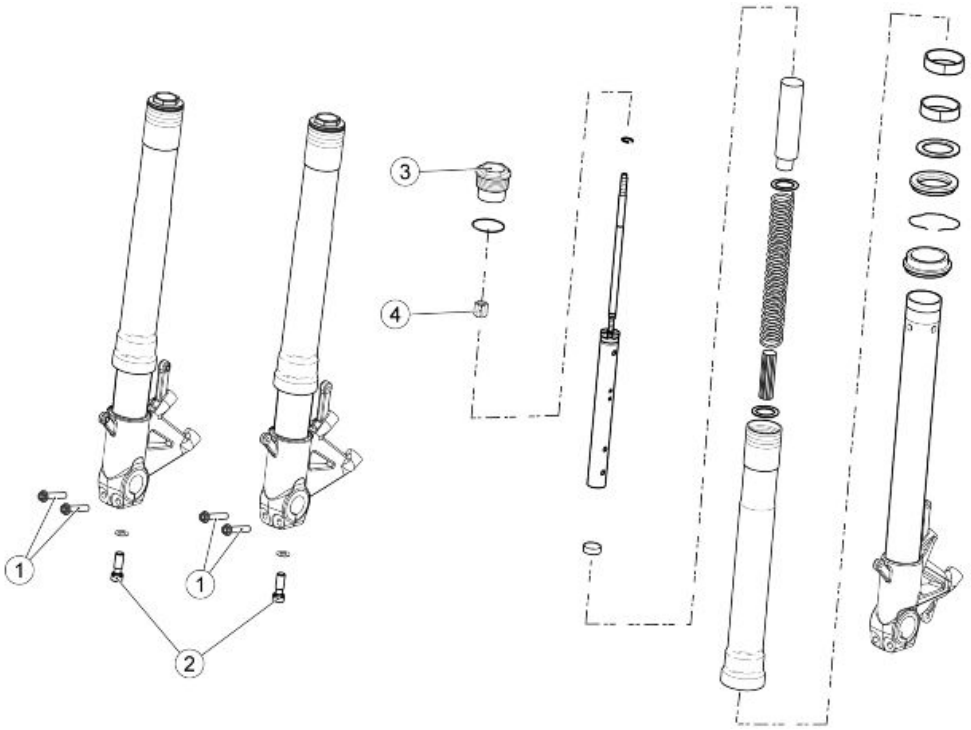
COOLING SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Electric fan fastener screw	M4x45	6	3 Nm (2.21 lbf ft)	-
2	Flanged TE screw fastening left Radiator to trellis	M6x25	1	10 Nm (7.37 lbf ft)	-
3	Flanged TE screw fastening expansion tank	M6x20	1	10 Nm (7.37 lbf ft)	-



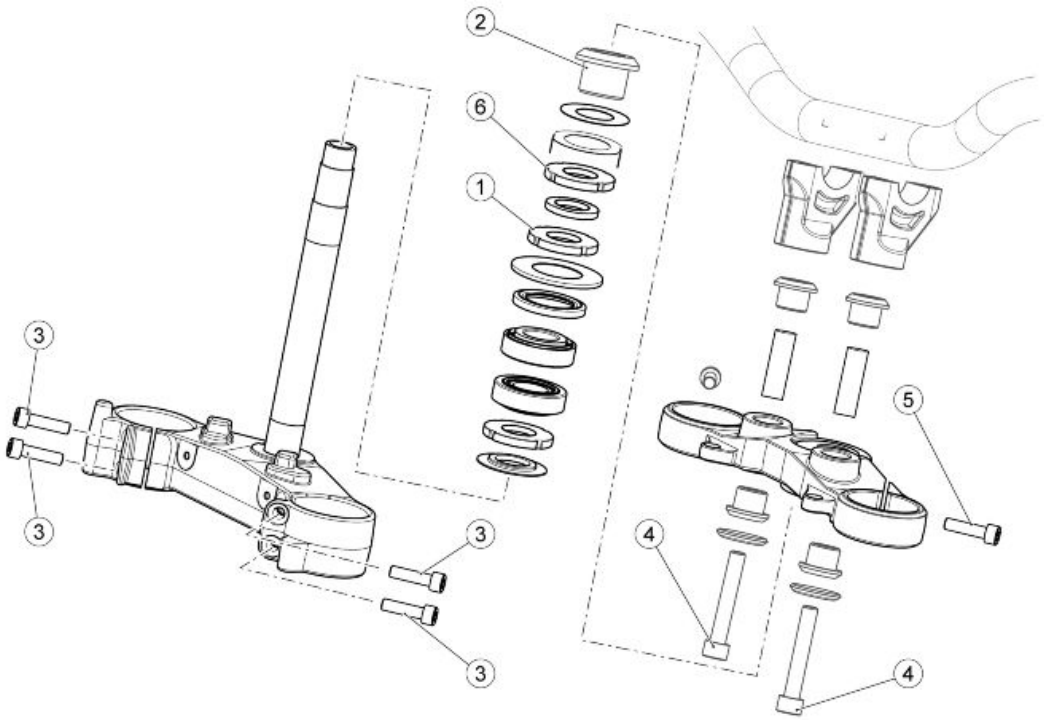
OIL COOLING RADIATOR

pos.	Description	Type	Quantity	Torque	Notes
1	TEFL screw fastening oil radiator	M6x25	1	10 Nm (7.37 lbf ft)	-
2	TEFL screw fastening oil radiator mounting	M6x12	1	10 Nm (7.37 lbf ft)	-



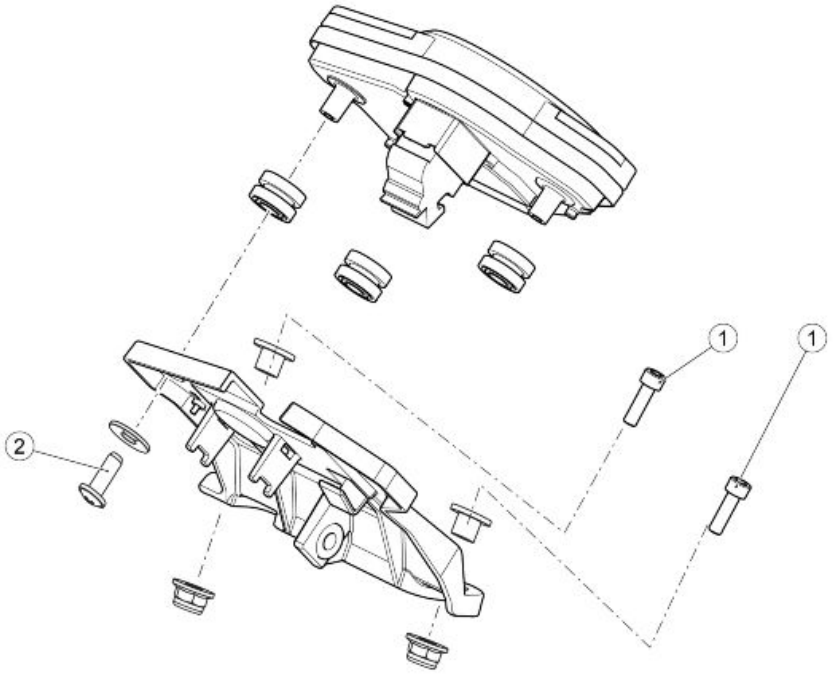
FRONT FORK

pos.	Description	Type	Quantity	Torque	Notes
1	TEFL screw (fasten onto Fork Hubs)	M6x40	4	10 Nm (7.37 lbf ft)	-
2	Screw (Pumping member pin fixing to the stem base)	-	2	30 Nm (22.13 lbf ft)	-
3	Upper cover	-	2	20 Nm (14.75 lbf ft)	-
4	Upper cover locking nut	-	2	20 Nm (14.75 lbf ft)	-



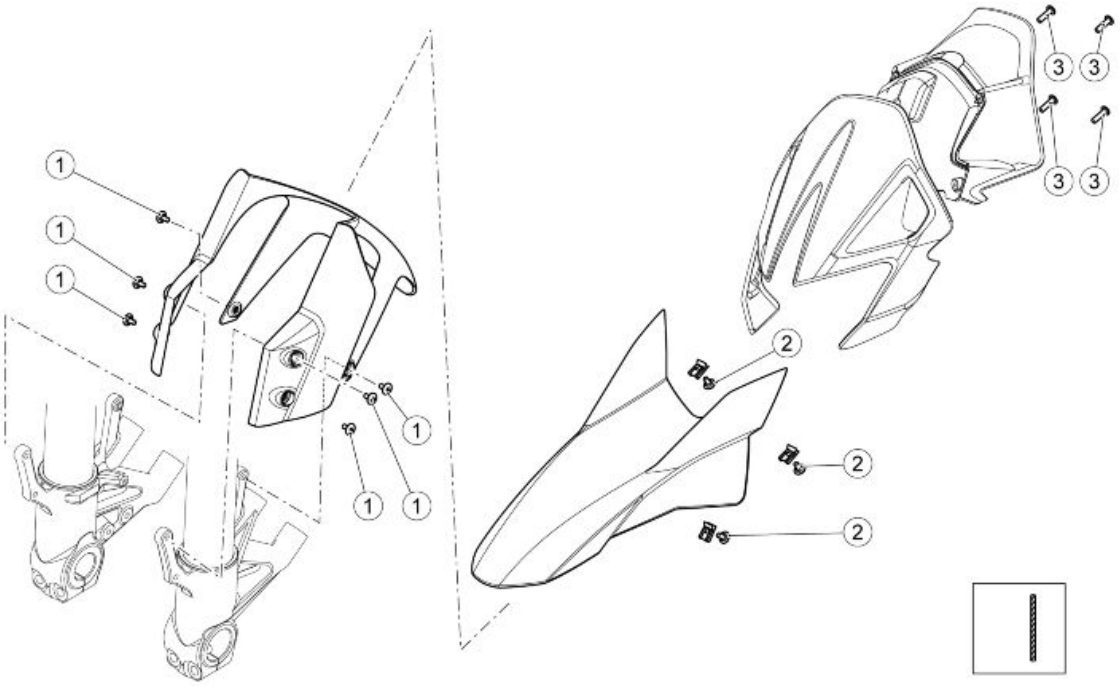
STEERING

pos.	Description	Type	Quantity	Torque	Notes
1	Headstock ring nut - pre-tightening	M25x1	1	60 Nm (44.25 lbf ft)	Unscrew after pre-tightening
1	Headstock ring nut - tightening	M25x1	1	50 Nm (36.88 lbf ft)	-
2	Headstock cap	M22x1	1	100 Nm (73.75 lbf ft)	-
3	TCEI screw fastening fork legs to bottom yoke	M8x35	4	25 Nm (18.44 lbf ft)	-
4	TCEI screw fastening U-bolt onto fork yoke	M10x60	2	50 Nm (36.88 lbf ft)	-
5	TCEI screw fastening fork legs to top yoke	M8x30	2	25 Nm (18.44 lbf ft)	-
6	Headstock counter-lock ring	M25x1	1	-	Tighten by hand



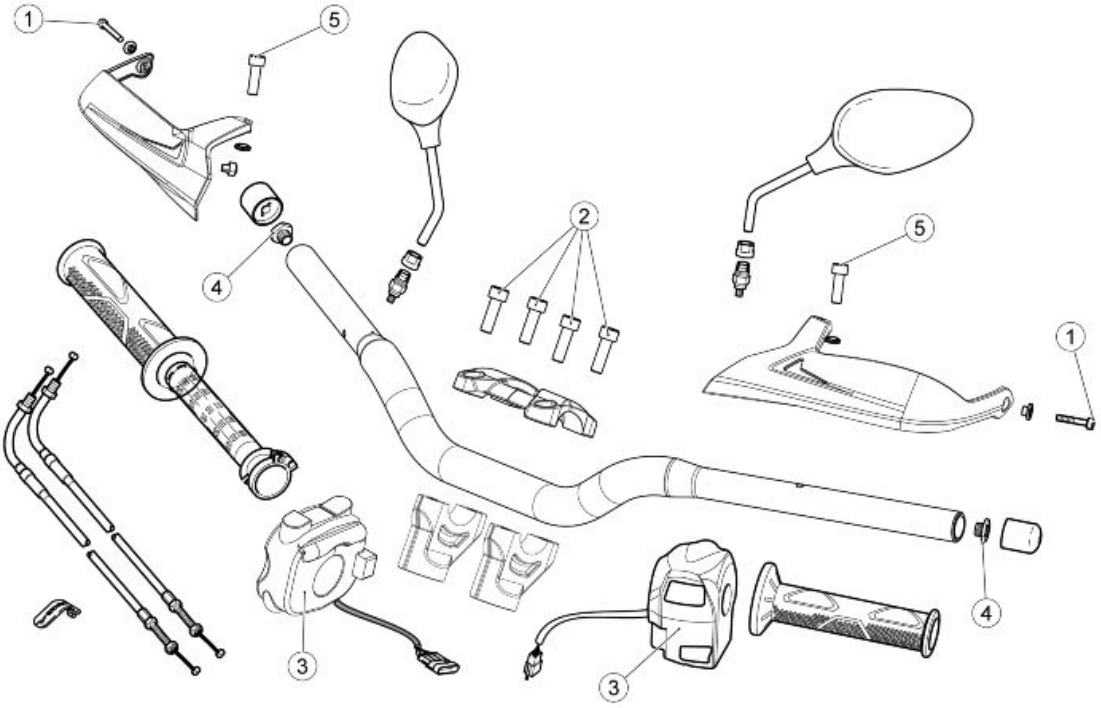
INSTRUMENT PANEL

pos.	Description	Type	Quantity	Torque	Notes
1	TCEI screw fastening instrument panel mounting to fork yoke	M6x20	2	10 Nm (7.37 lbf ft)	-
2	Screw fixing instrument panel to plate	5x14	3	2.6 Nm (1.92 lbf ft)	-



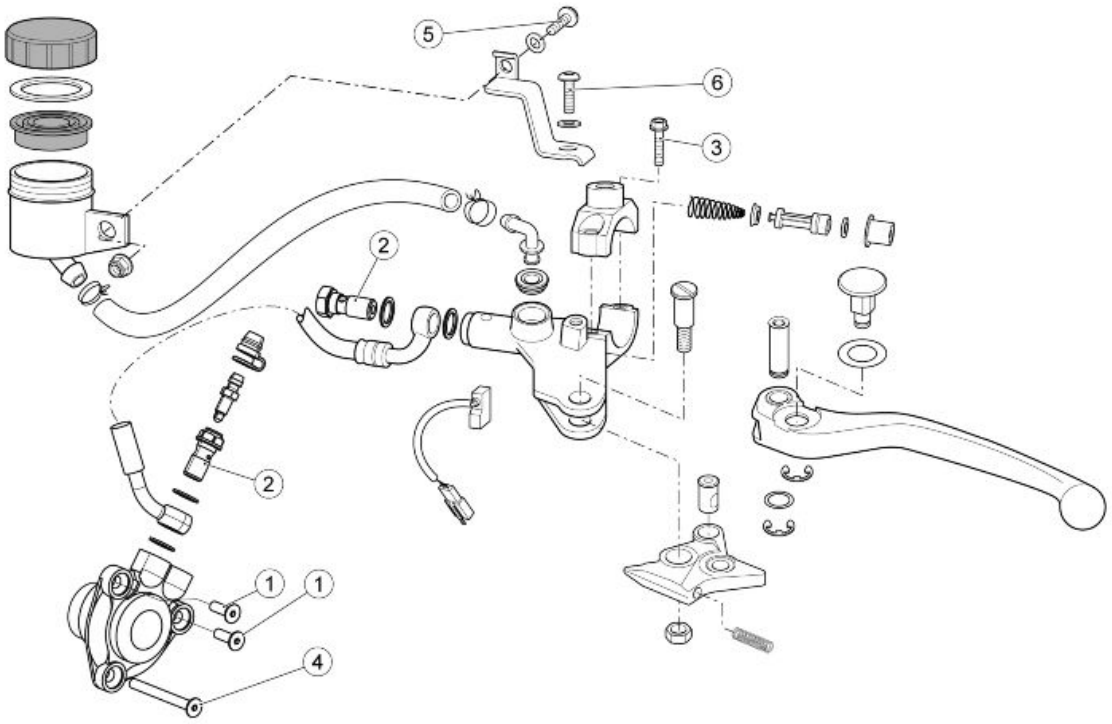
FRONT MUDGUARD

pos.	Description	Type	Quantity	Torque	Notes
1	TBEI screw fastening fork guard to calliper mounting bracket	M5x9	6	6 Nm (4.42 lbf ft)	-
2	TBEI screw fastening mudguard to stanchions	M5x12	3	6 Nm (4.42 lbf ft)	-
3	Top fairing baffle retaining self-tapping screw	-	4	1 Nm (0.74 lbf ft)	-



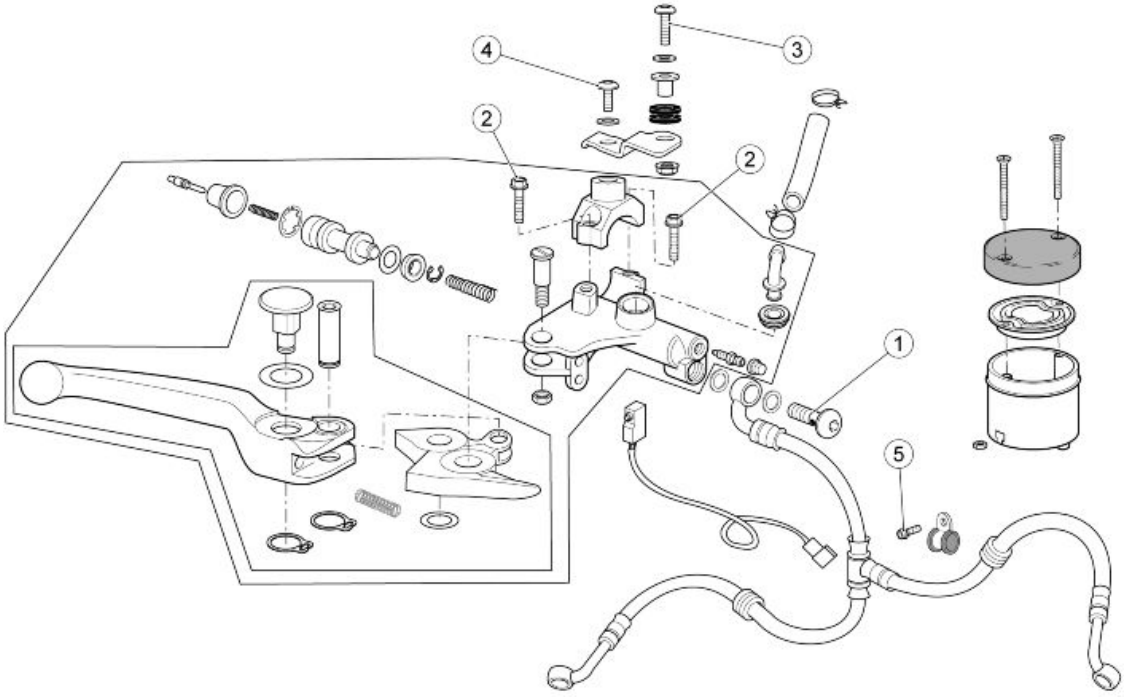
HANDLEBAR

pos.	Description	Type	Quantity	Torque	Notes
1	TCEI screw fastening counterweight to handlebar end	M6x50	2	10 Nm (7.37 lbf ft)	-
2	Stainless steel TCC screw fastening upper U-bolt to lower clamp	M8x25	4	25 Nm (18.44 lbf ft)	-
3	Screws fastening light switch assembly	-	2 + 2	1.5 Nm (1.11 lbf ft)	-



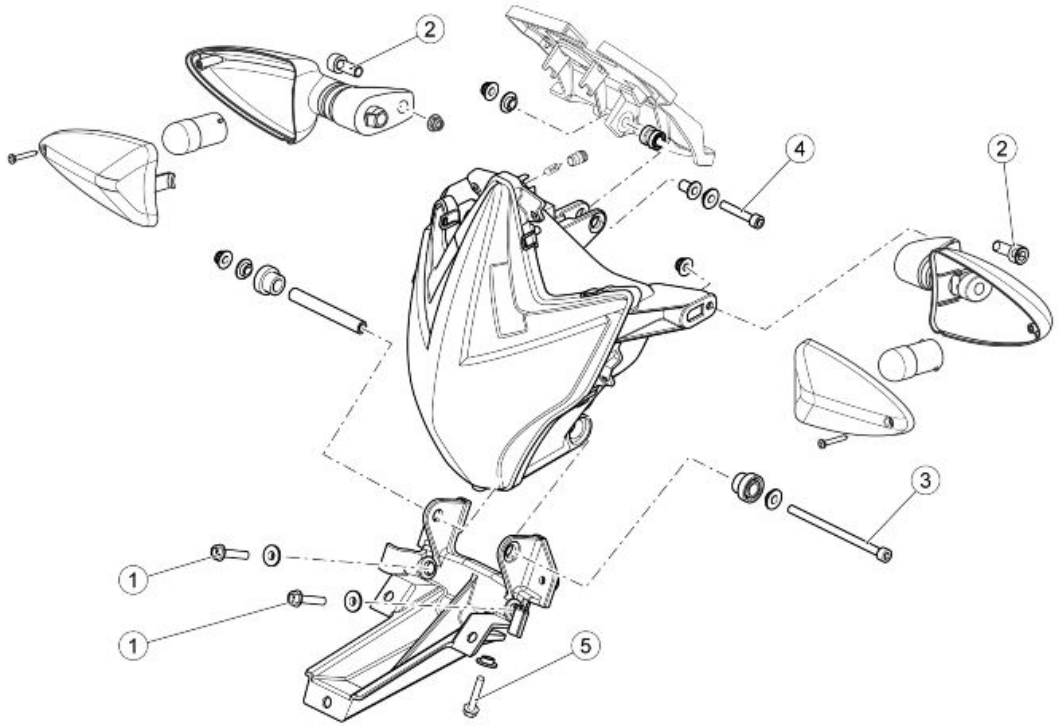
CLUTCH PUMP

pos.	Description	Type	Quantity	Torque	Notes
1	Clutch cylinder fastener	M6	2	10 Nm (7.37 lbf ft)	-
2	Union with breather and fixing pipe	M10x1	1+1	25 Nm (18.44 lbf ft)	-
3	Fastener for clutch pump on handle-bar	-	2	10 Nm (7.37 lbf ft)	-
4	Screw fastening clutch control mounting on flywheel side crankcase half	M6	1	10 Nm (7.37 lbf ft)	-
5	TBEI tank fixing screw	M5x10	1	6 Nm (4.42 lbf ft)	-
6	TBEI screw	M6x16	1	12 Nm (8.85 lbf ft)	-



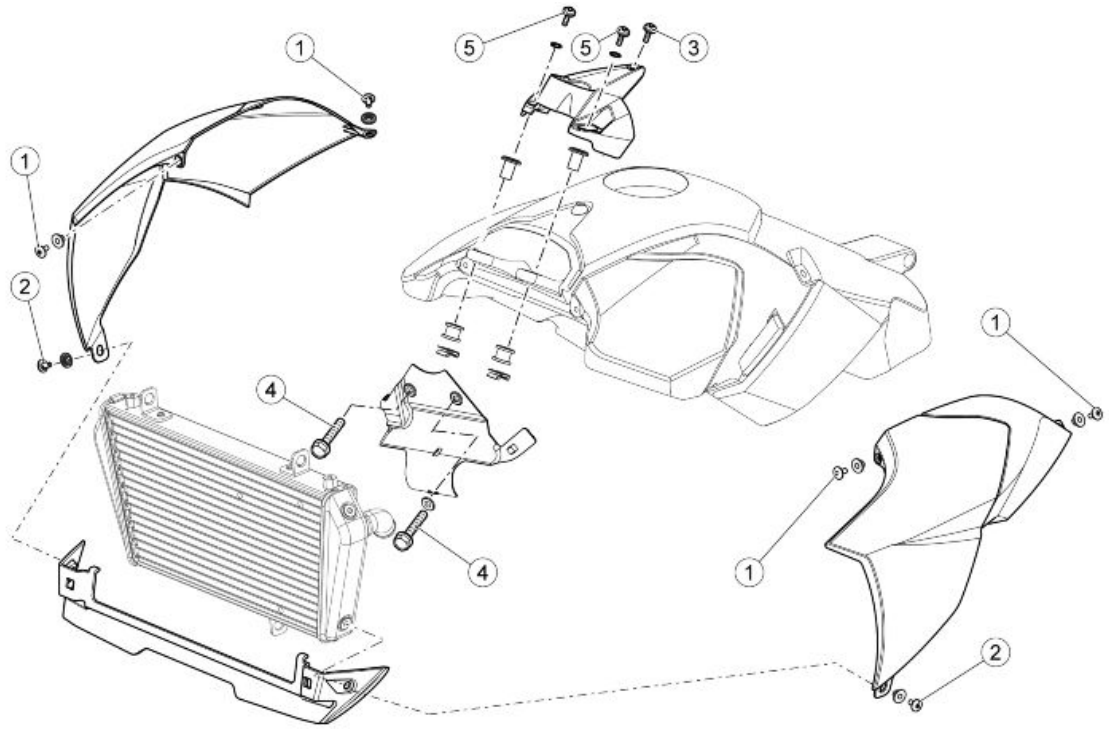
FRONT BRAKE PUMP

pos.	Description	Type	Quantity	Torque	Notes
1	Pipe union fastening brake pipe to pump	M10x1	1	25 Nm (18.44 lbf ft)	-
2	Fastener for front brake pump on handlebar	-	2	10 Nm (7.37 lbf ft)	-
3	TBEI screw fastening the brake tank to the plate	M6x20	1	10 Nm (7.37 lbf ft)	-
4	TBEI screw	M6x16	1	12 Nm (8.85 lbf ft)	-
5	Screw fastening the brake pipe to steering base	M6x25	1	10 Nm (7.37 lbf ft)	-



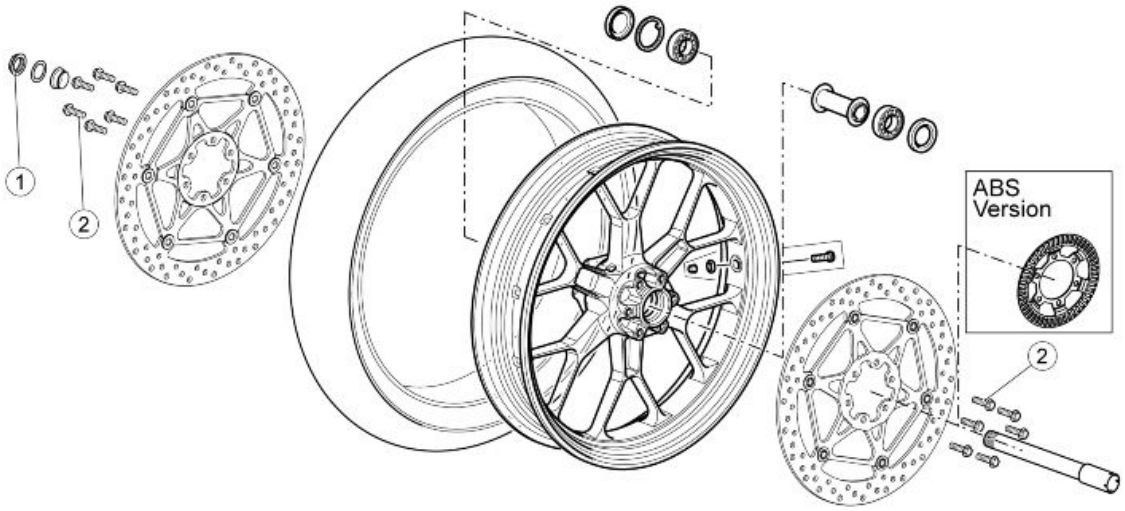
HEADLAMP

pos.	Description	Type	Quantity	Torque	Notes
1	TEFL screw fixing headlight mounting to steering base	M6x16	2	10 Nm (7.37 lbf ft)	-
2	Fastener for front turn indicators	M5x16	2	6 Nm (4.42 lbf ft)	-
3	TCEI screw fastening headlamp mounting to fork yoke	M6	1	10 Nm (7.37 lbf ft)	-
4	TCEI fixing screw of headlight to instrument panel support	M6x35	1	10 Nm (7.37 lbf ft)	-
5	TEFL screw fixing headlight mounting to steering base	M6x25	1	10 Nm (7.37 lbf ft)	-



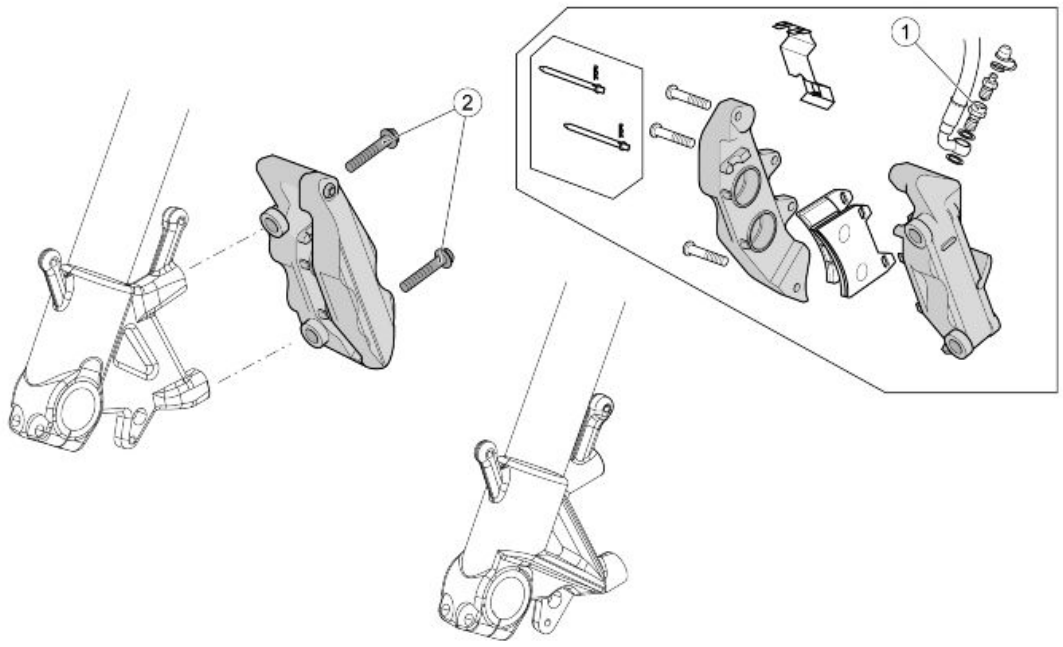
FRONT BODYWORK

pos.	Description	Type	Quantity	Torque	Notes
1	TBEI screw fastening front side panels to tank	M5x9	4	6 Nm (4.42 lbf ft)	-
2	TBEI screw fastening front side panels and duct to radiator	M6x16	2	10 Nm (7.37 lbf ft)	-
3	TBEI screw fastening ignition block cover to spacer	M5x9	1	6 Nm (4.42 lbf ft)	-
4	TEFL screw fastening tank protection	M6x12	2	10 Nm (7.37 lbf ft)	-
5	TEFL screw fastening tank to frame	M6x30	2	10 Nm (7.37 lbf ft)	-



FRONT WHEEL

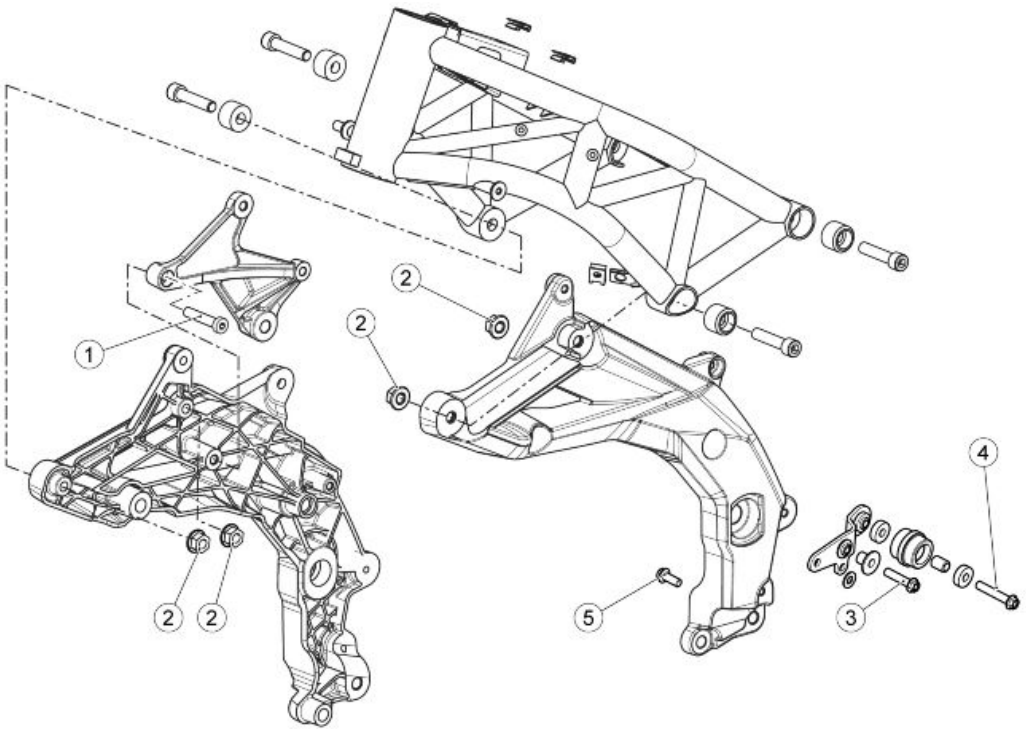
pos.	Description	Type	Quantity	Torque	Notes
1	Wheel axle nut	-	1	80 Nm (59 lbf ft)	-
2	TE flanged screw fastening front disc	M8x20	12	30 Nm (22.13 lbf ft)	Loctite 243



FRONT BRAKE

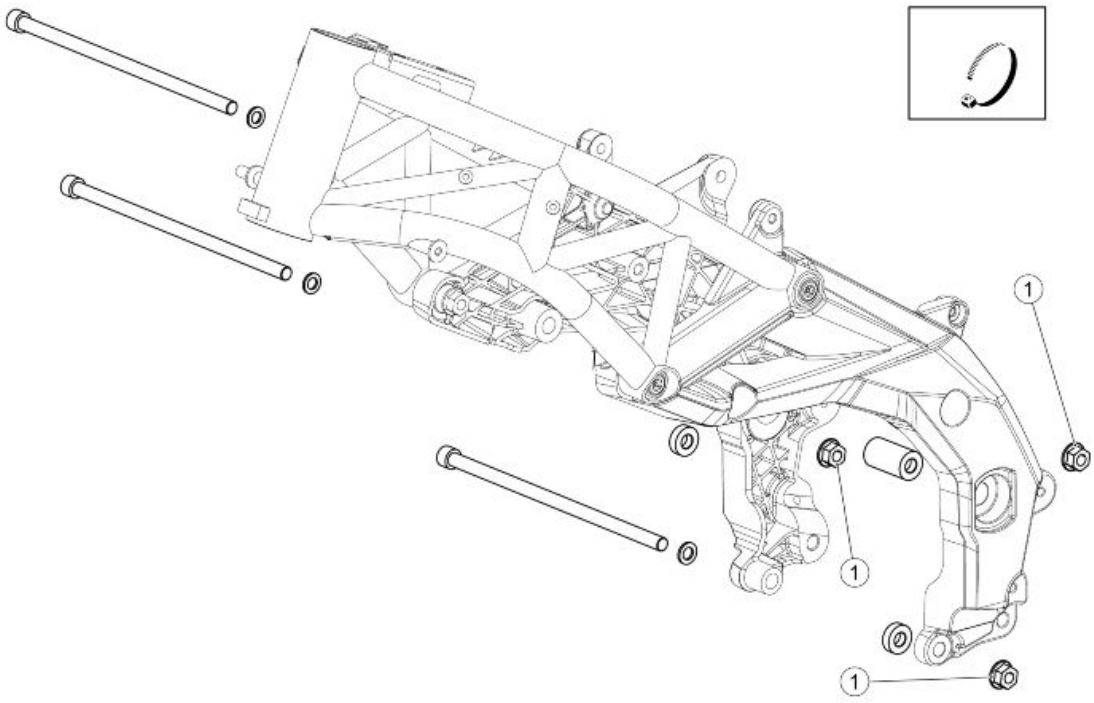
pos.	Description	Type	Quantity	Torque	Notes
1	Union with breather (fixing pipe to callipers)	M10x1	2	25 Nm (18.44 lbf ft)	-
2	TEFL screw (Fixing calliper to fork stems)	M10x1.25	4	50 Nm (36.88 lbf ft)	Loctite 270

Central part



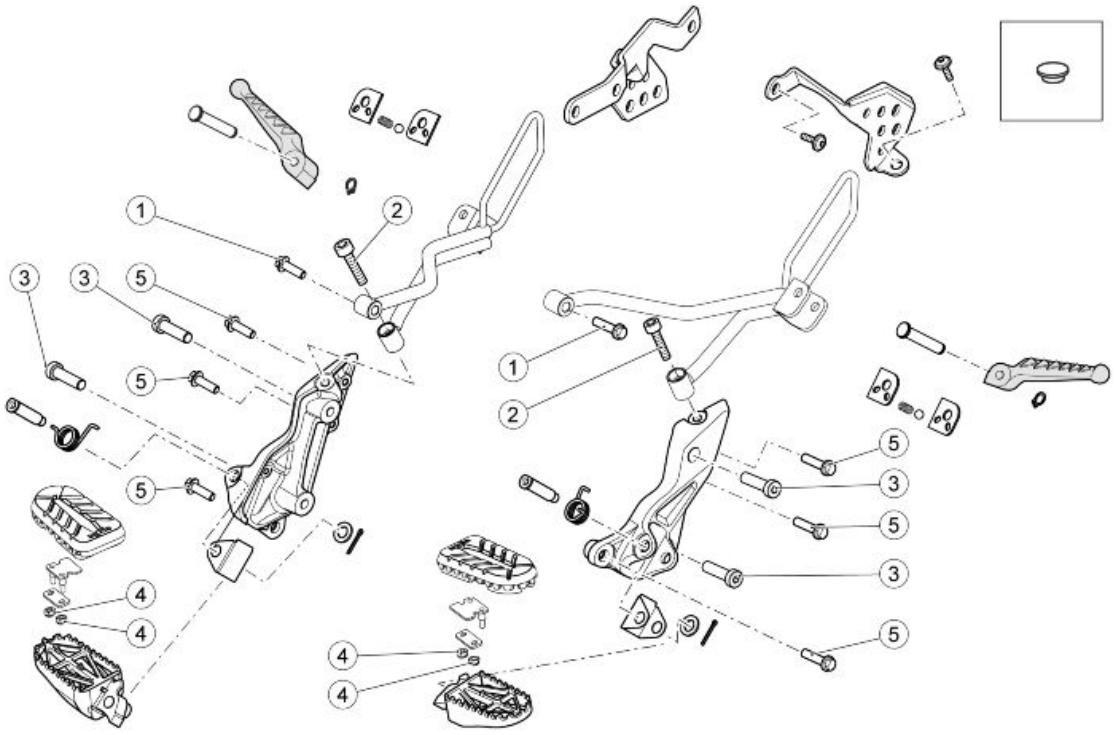
FRONT CHASSIS

pos.	Description	Type	Quantity	Torque	Notes
1	TCEI screw fastening shock absorber counterplate to RH frame bracket	M10x30	1	50 Nm (36.88 lbf ft)	-
2	Flanged nut fastening Trellis to frame side panels	M12	4	80 Nm (59 lbf ft)	-
3	Flanged TE screw fastening chain roller bracket to LH plate	M8x35	1	25 Nm (18.44 lbf ft)	Loctite 243
4	Flanged TE screw fastening chain roller to chain roller bracket	M8x45	1	25 Nm (18.44 lbf ft)	Loctite 243
5	Screw fastening chain roller bracket to LH plate	M8x20	1	25 Nm (18.44 lbf ft)	Loctite 243



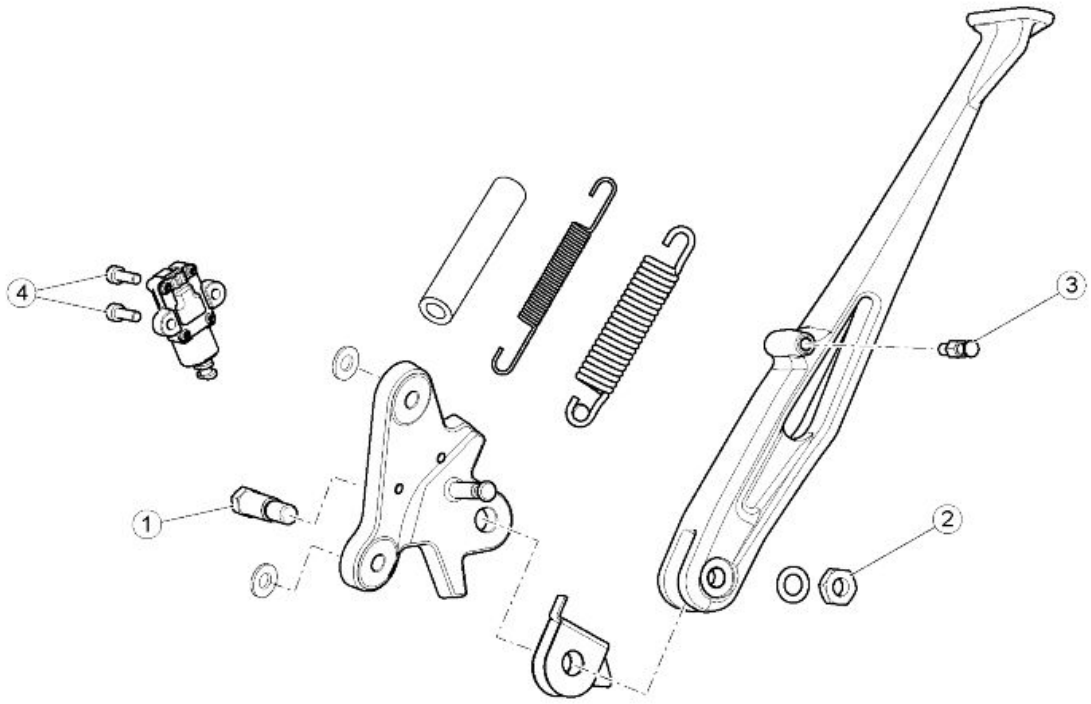
CENTRE FRAME

pos.	Description	Type	Quantity	Torque	Notes
1	Flanged nut fastening side panels to engine	M12	3	80 Nm (59 lbf ft)	-



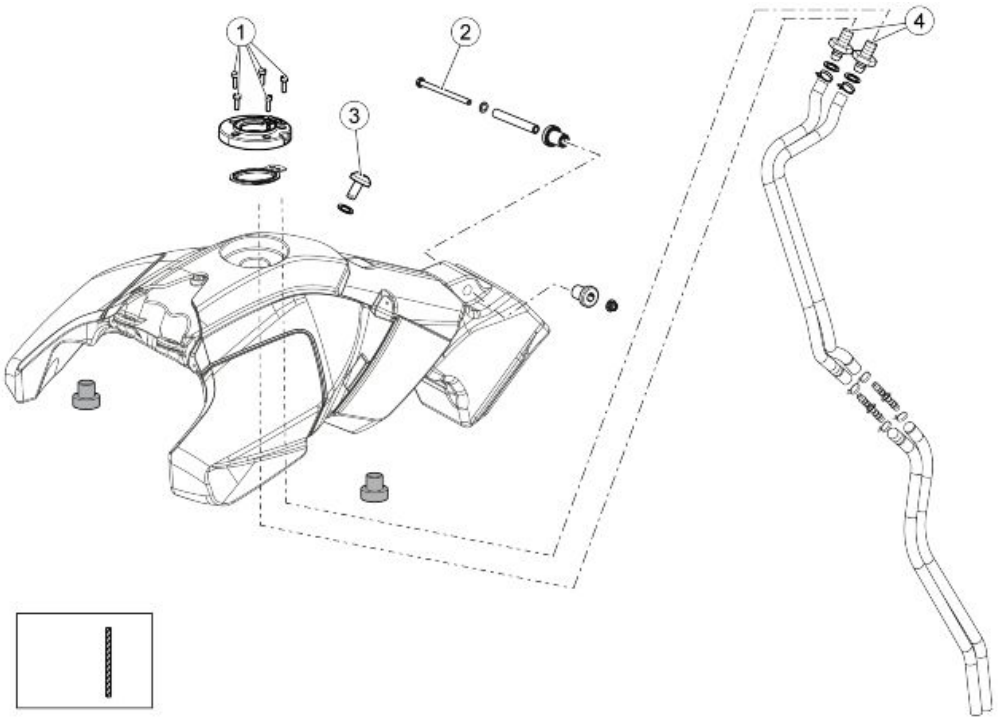
FOOTRESTS

pos.	Description	Type	Quantity	Torque	Notes
1	Upper screw fastening passenger footrests to frame side panels	M8x35	2	25 Nm (18.44 lbf ft)	Loct. 243
2	Lower TCEI screw fastening passenger footrests to rider footrest mounting	M8x35	2	25 Nm (18.44 lbf ft)	Loct. 243
3	TCEI screw fastening rider footrest mounting to frame	M8x35	4	30 Nm (22.12 lbf ft)	Loct. 243
4	Footrest rubber fastener narrow nut	M5	4	6 Nm (4.42 lbf ft)	-
5	TCEI screw fastening rider footrest mounting	M6x16	6	10 Nm (7.37 lbf ft)	-



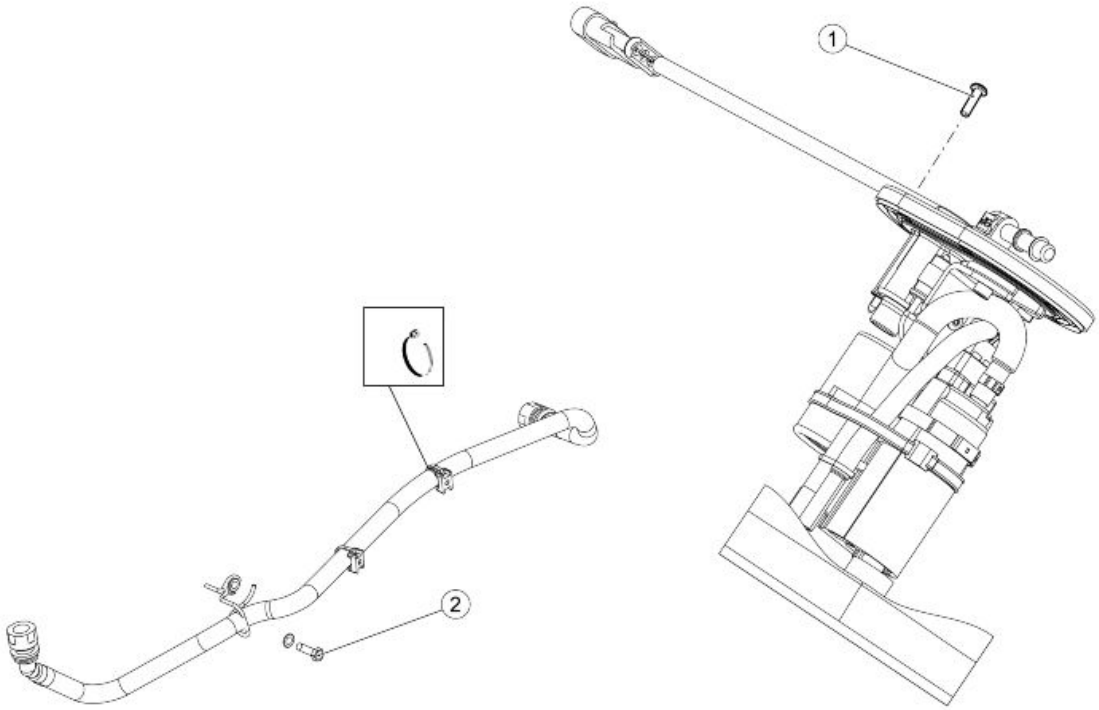
STAND ASSEMBLY

pos.	Description	Type	Quantity	Torque	Notes
1	Stand bolt	M10x1.25	1	10 Nm (7.37 lbf ft)	-
2	Thin nut	M10x1.25	1	25 Nm (18.44 lbf ft)	Loctite 243
3	Spring fixing pin	-	1	7.5 Nm (5.53 lbf ft)	-
4	TCEI screw fastening stand switch	M5x16	2	6 Nm (4.42 lbf ft)	Loctite 243



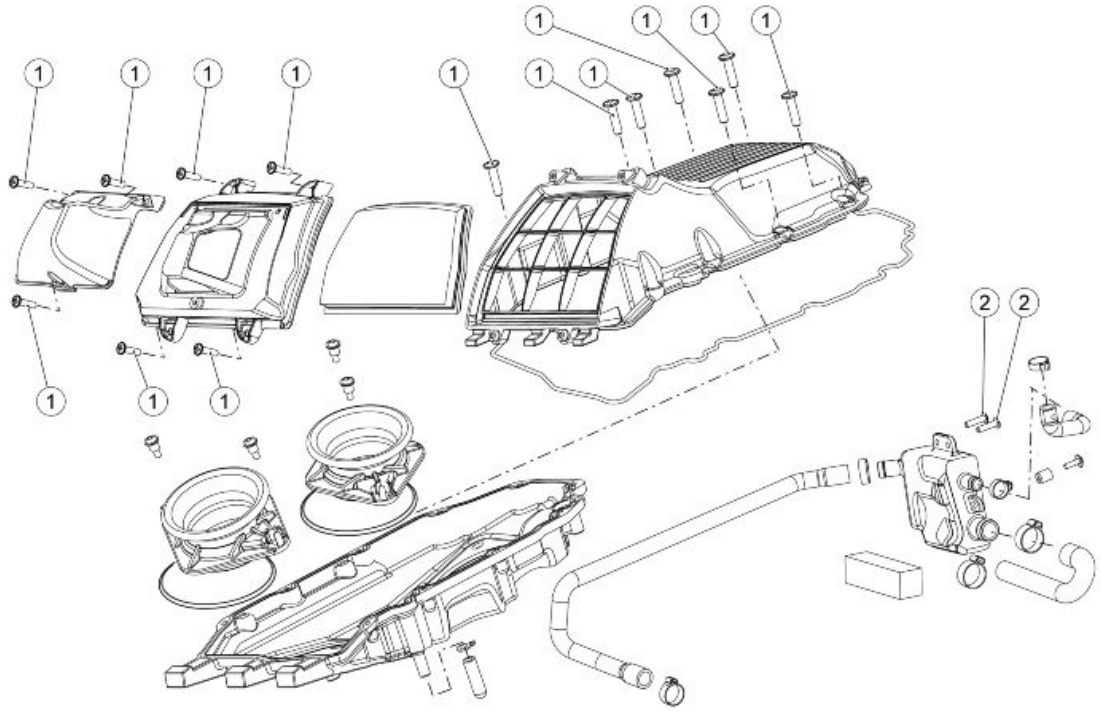
FUEL TANK

pos.	Description	Type	Quantity	Torque	Notes
1	TCEI screw fastening filler cap flange	M5x12	5	6 Nm (4.42 lbf ft)	-
2	Rear TE screw fastening tank	M6x90	1	10 Nm (7.37 lbf ft)	-
3	Saddle front retaining pin	-	1	3 Nm (2.21 lbf ft)	-
4	Hose tail fitting	-	2	6 Nm (4.42 lbf ft)	Loctite 518



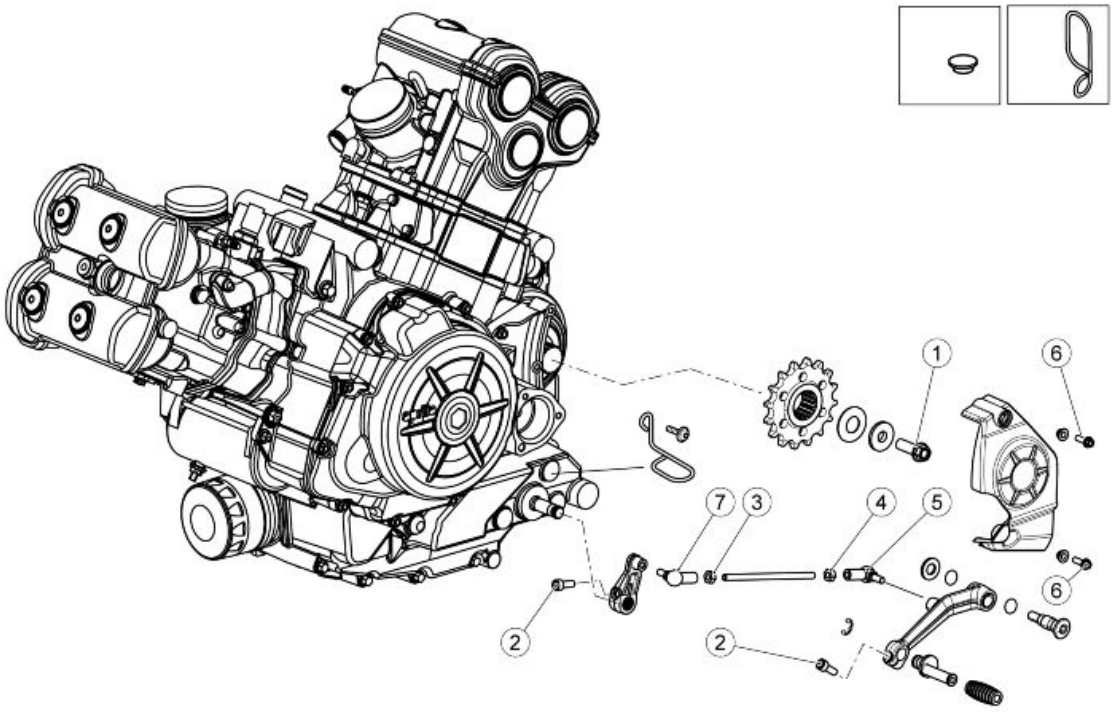
FUEL PUMP

pos.	Description	Type	Quantity	Torque	Notes
1	TEFL screw fastening fuel pump	M5x16	6	3 Nm (2.21 lbf ft)	Loctite 518
2	TEFL screw fastening fuel pipe	M6x16	1	10 Nm (7.37 lbf ft)	-



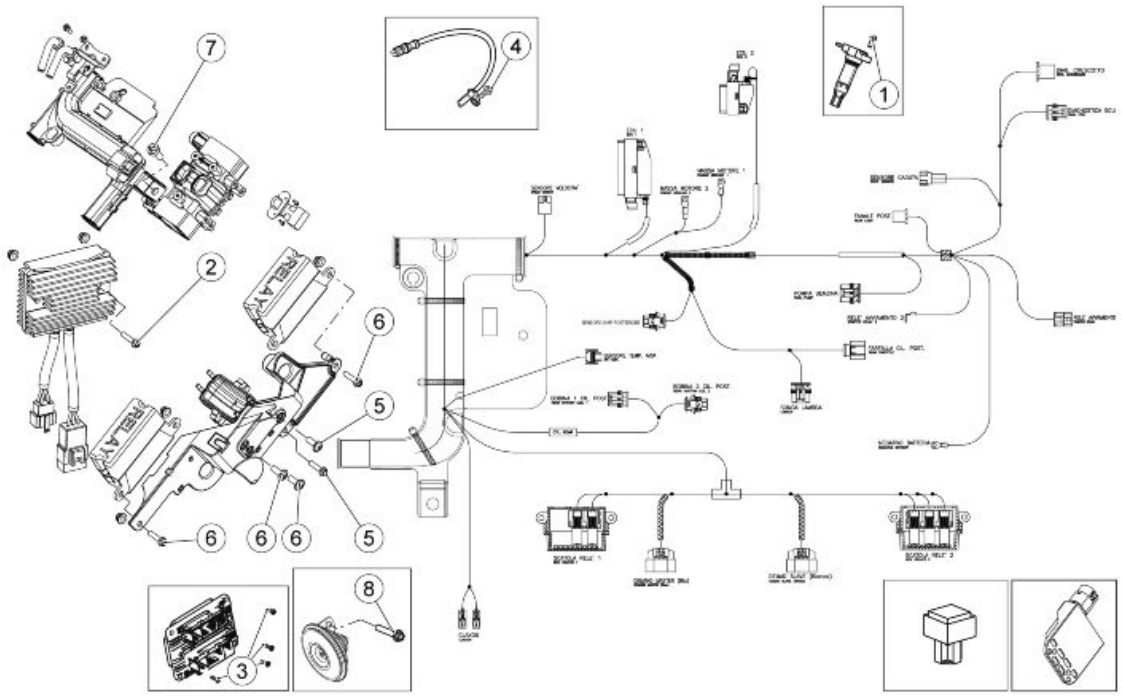
AIR FILTER BOX

pos.	Description	Type	Quantity	Torque	Notes
1	Cross head self-tapping screw fastening covers / filter box	M5x20	10	3 Nm (2.21 lbf ft)	-
2	Cross head self-tapping screw fastening blow-by tank	M5x20	2	3 Nm (2.21 lbf ft)	-



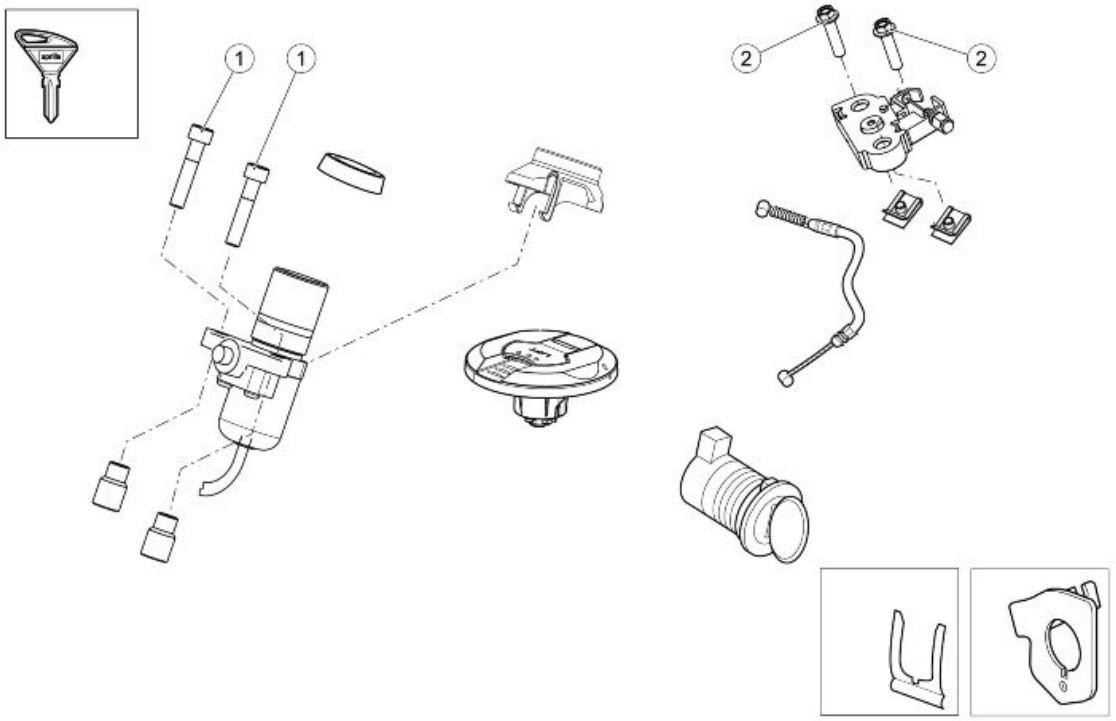
ENGINE

pos.	Description	Type	Quantity	Torque	Notes
1	Flanged TE screw fastening pinion	M10x1.25	1	50 Nm (36.88 lbf ft)	Loctite 243
2	TCEI screw fastening Pin to gearbox lever and Gearbox Lever to knurled shaft	M6x16	2	12 Nm (8.85 lbf ft)	-
3	LH lock nut for ball joint	M6	1	10 Nm (7.37 lbf ft)	-
4	RH lock nut for ball joint	M6	1	10 Nm (7.37 lbf ft)	-
5	RH ball joint on gearbox control lever	M6	1	10 Nm (7.37 lbf ft)	-
6	Pinion protector fixing screw	M6x12	2	10 Nm (7.37 lbf ft)	-
7	LH ball joint on gearbox control lever	M6	1	10 Nm (7.37 lbf ft)	-
-	Fastener for positive cable on engine	-	1	10 Nm (7.37 lbf ft)	-
-	TE screw fastening negative cable to engine	M6x12	1	10 Nm (7.37 lbf ft)	-



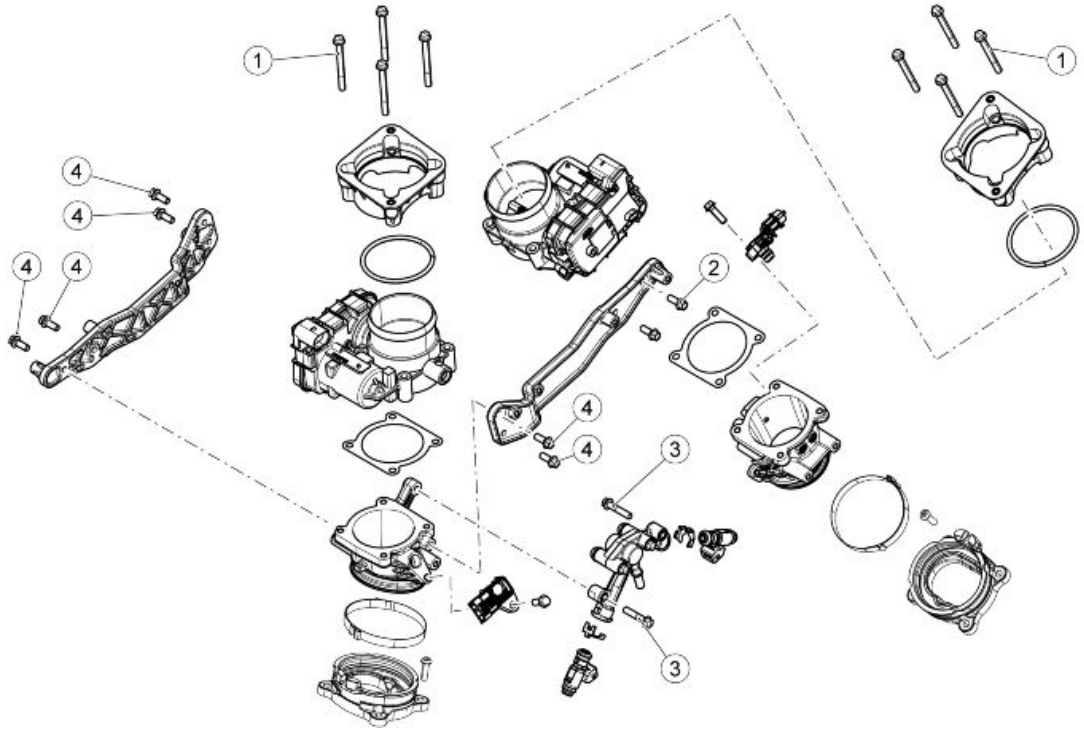
ELECTRICAL SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Coil fixing screw	M6	2	5.50 Nm (4.06 lbf ft)	-
2	TE screw fastening regulator to frame	M6x30	2	10 Nm (7.37 lbf ft)	-
3	Screw fastening ECU to filter box base	-	4	3 Nm (2.21 lbf ft)	-
4	Speed sensor TBEI fixing screw	M5x16	1	6 Nm (4.42 lbf ft)	-
5	Self-tapping screw fastening de-mand sensor mounting to demand sensor	5x14	3	4 Nm (2.35 lbf ft)	-
6	TBEI screw fastening relay support to demand sensor mounting	M6x16	4	10 Nm (7.37 lbf ft)	-
7	TEFL screw fastening cableway to demand sensor mounting	M6x12	1	10 Nm (7.37 lbf ft)	-
8	TEFL horn fixing screw	M6x12	1	10 Nm (7.37 lbf ft)	-
-	TBEI starter relay fixing screw	M6x10	2	10 Nm (7.37 lbf ft)	-



LOCKS

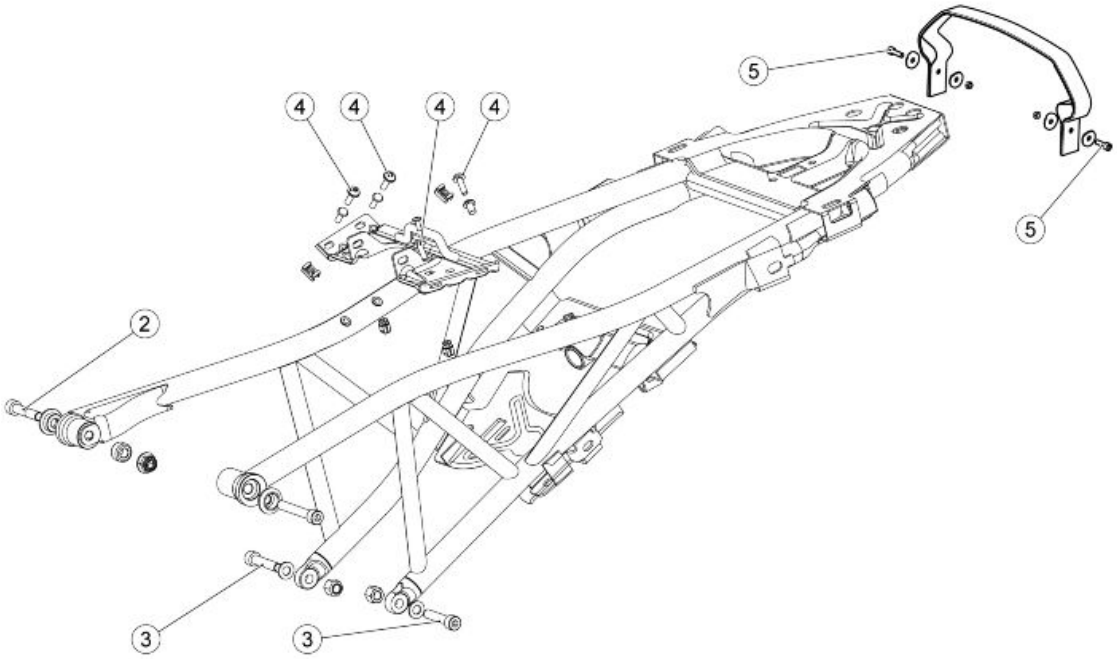
pos.	Description	Type	Quantity	Torque	Notes
1	Switch fastener	shear head screw	1	Manual	-
2	TE screw fastening saddle lock / battery compartment to saddle mounting	M6x25	2	10 Nm (7.37 lbf ft)	To reuse: Loctite 243



THROTTLE BODY

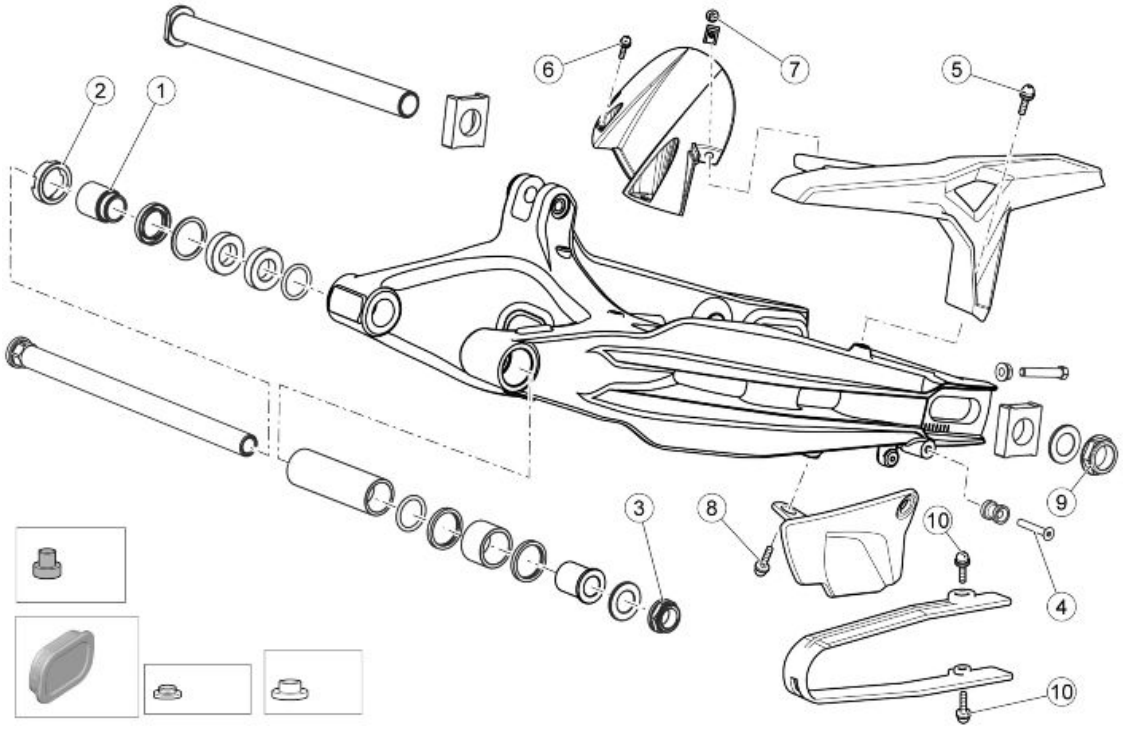
pos.	Description	Type	Quantity	Torque	Notes
1	Intake union fastener screw	M6	8	12 Nm (8.85 lbf ft)	Loctite 242
2	Map sensor fixing screw	M6	2	5.5 Nm (4.05 lbf ft)	-
3	Injector fastener screw	M6	2	12 Nm (8.85 lbf ft)	Loctite 242
4	Injection Throttle Body fastener screw	M6	8	12 Nm (8.85 lbf ft)	Loctite 242

Back side



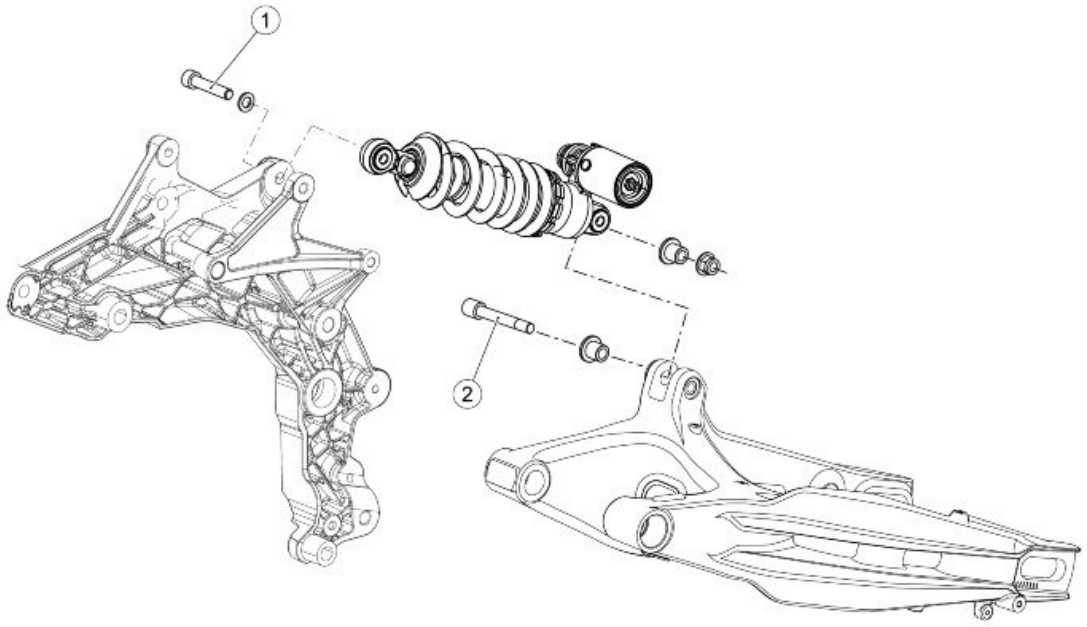
SADDLE MOUNTING

pos.	Description	Type	Quantity	Torque	Notes
1	Upper LH TCEI screw fastening saddle mounting to frame	M8x55	1	25 Nm (18.44 lbf ft)	-
2	Upper RH TCEI screw fastening saddle mounting to frame	M8x60	1	25 Nm (18.44 lbf ft)	-
3	Lower TCEI screw fastening Saddle mounting to frame	M8x40	2	25 Nm (18.44 lbf ft)	Loctite 243
4	TCEI tank cross member fixing screw	M5x16	4	6 Nm (4.42 lbf ft)	-
5	TBEI screw fastening saddle strap	M6x20	2	10 Nm (7.37 lbf ft)	-



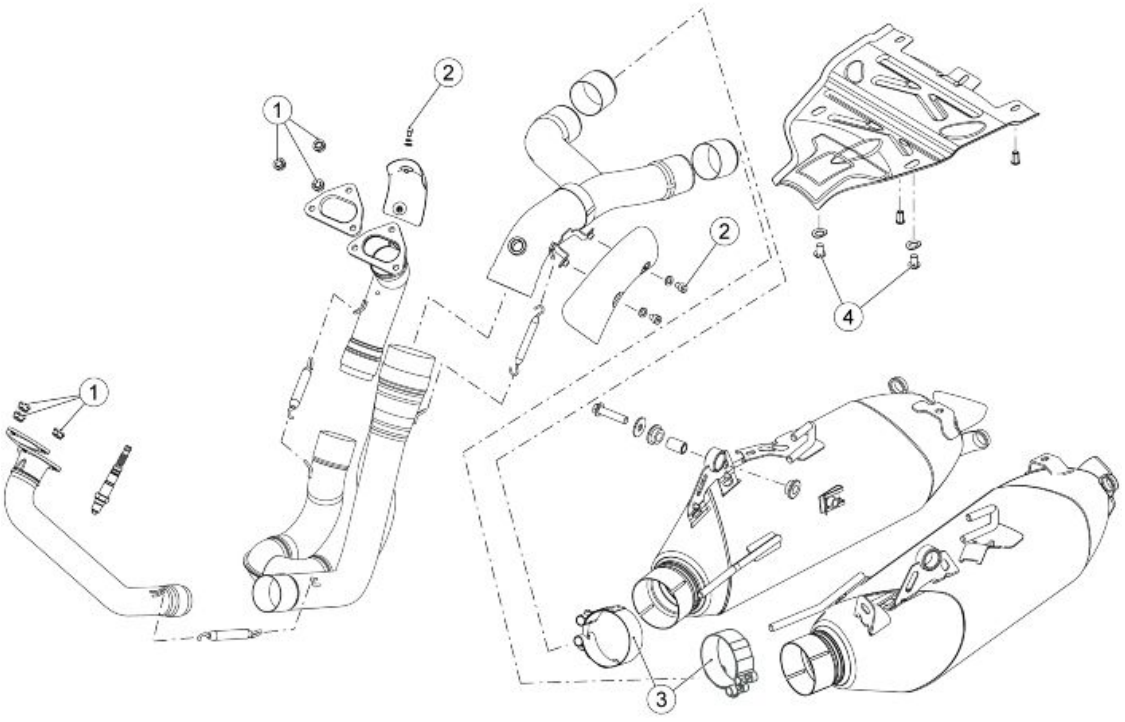
SWINGARM

pos.	Description	Type	Quantity	Torque	Notes
1	Swingarm Pin adjustment bushing	-	1	12 Nm (8.85 lbf ft)	-
2	Swingarm pin ring nut	-	1	60 Nm (44.25 lbf ft)	-
3	Swingarm pin nut	-	1	90 Nm (66.38 lbf ft)	-
4	TPSI screw fastening rear stand bushing	M6x40	2	10 Nm (7.37 lbf ft)	-
5	TBEI screw fastening chain guard to swingarm	M5x9	1	6 Nm (4.42 lbf ft)	Loctite 243
6	TBEI screw fastening rear mudguard to swingarm	M5x9	2	6 Nm (4.42 lbf ft)	Loctite 243
7	TBEI screw fastening chain guard to rear mudguard	M5x9	1	4 Nm (2.95 lbf ft)	-
8	TBEI screw fastening chain guide to swingarm	M5x9	2	6 Nm (4.42 lbf ft)	Loctite 243
9	Wheel axle nut	M25x1.5	1	120 Nm (88.5 lbf ft)	-
10	Flanged TBEI screw fastening chain slider	M5x9	2	6 Nm (4.42 lbf ft)	-



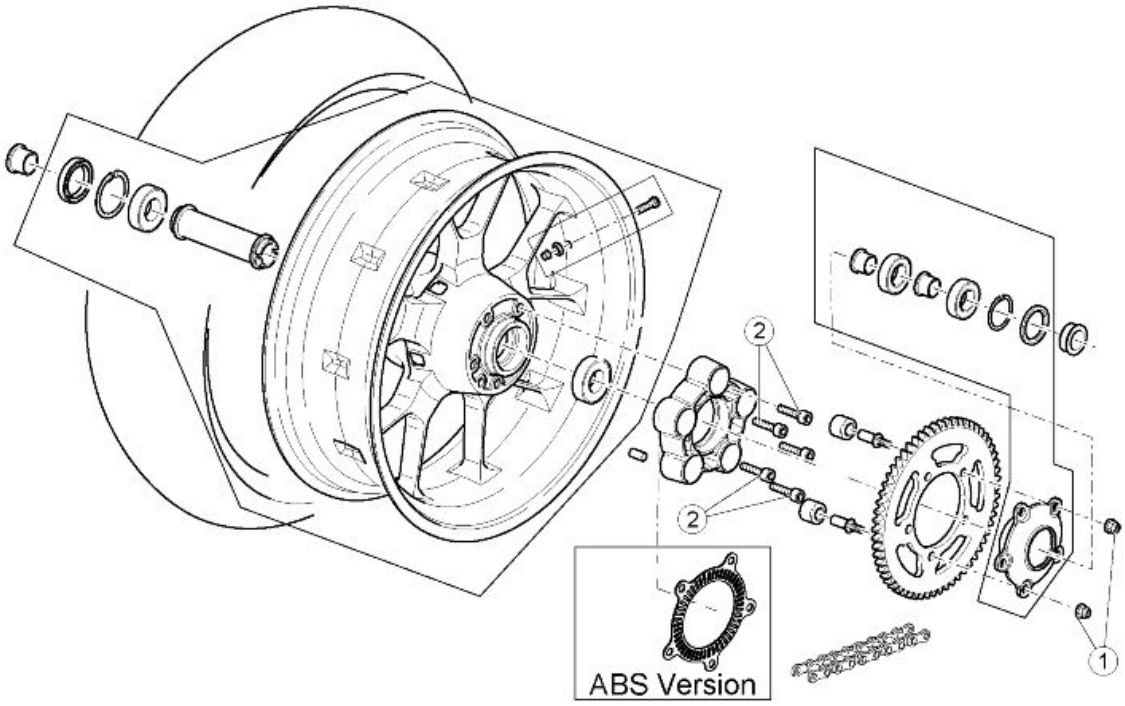
REAR SUSPENSION

pos.	Description	Type	Quantity	Torque	Notes
1	Upper TCEI mounting screw	M10x50	1	50 Nm (36.88 lbf ft)	-
2	Lower TCEI mounting screw	M10x80	1	50 Nm (36.88 lbf ft)	-



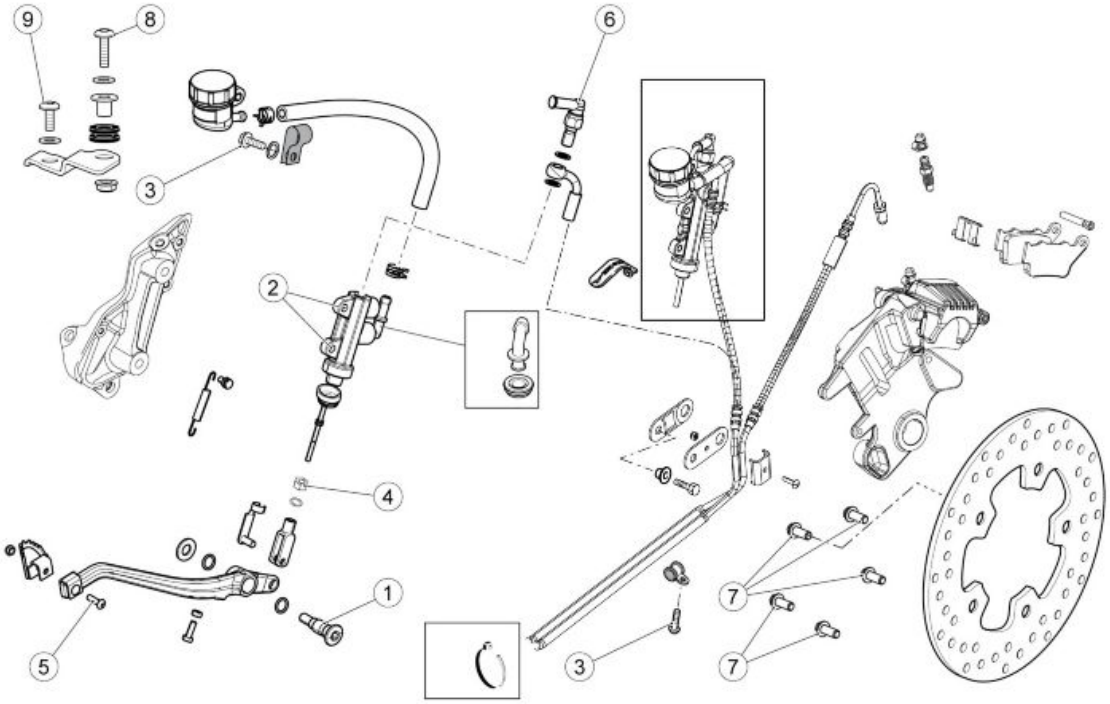
EXHAUST SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	SERPRESS self-locking nut fastening flange on head	M8	4	25 Nm (18.44 lbf ft)	-
2	Screw fastening exhaust manifold protection	M4x6	4	3-4 Nm (2.21-2.95 lbf ft)	-
3	Silencer Clamp (between central manifold and silencer)	M6	2	7 Nm (5.16 lbf ft)	-
4	Screw fastening saddle compartment protection	M8x12	2	22 Nm (16.23 lbf ft)	-
5	Flanged TE screw fastening silencer	M8x35	2	25 Nm (18.44 lbf ft)	-



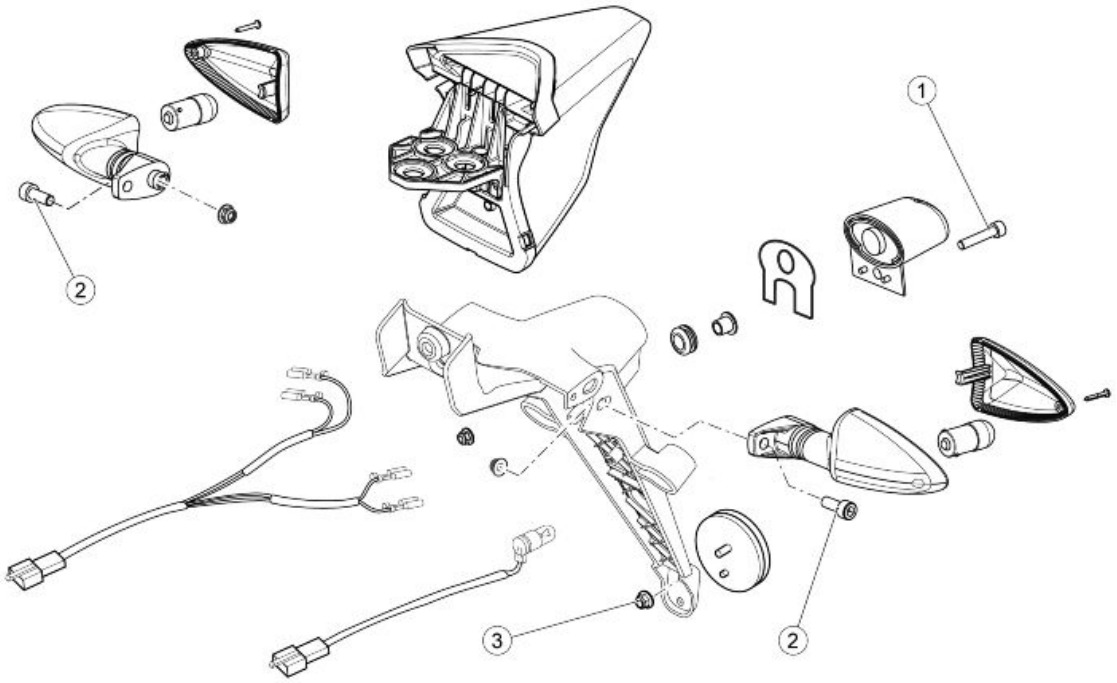
REAR WHEEL

pos.	Description	Type	Quantity	Torque	Notes
1	Lower self-locking nut fastening sprocket to sprocket carrier	M10	5	50 Nm (36.88 lbf ft)	-
2	TCEI screw fastening flexible coupling mounting on wheel	M10x30	5	50 Nm (36.88 lbf ft)	Loctite 270



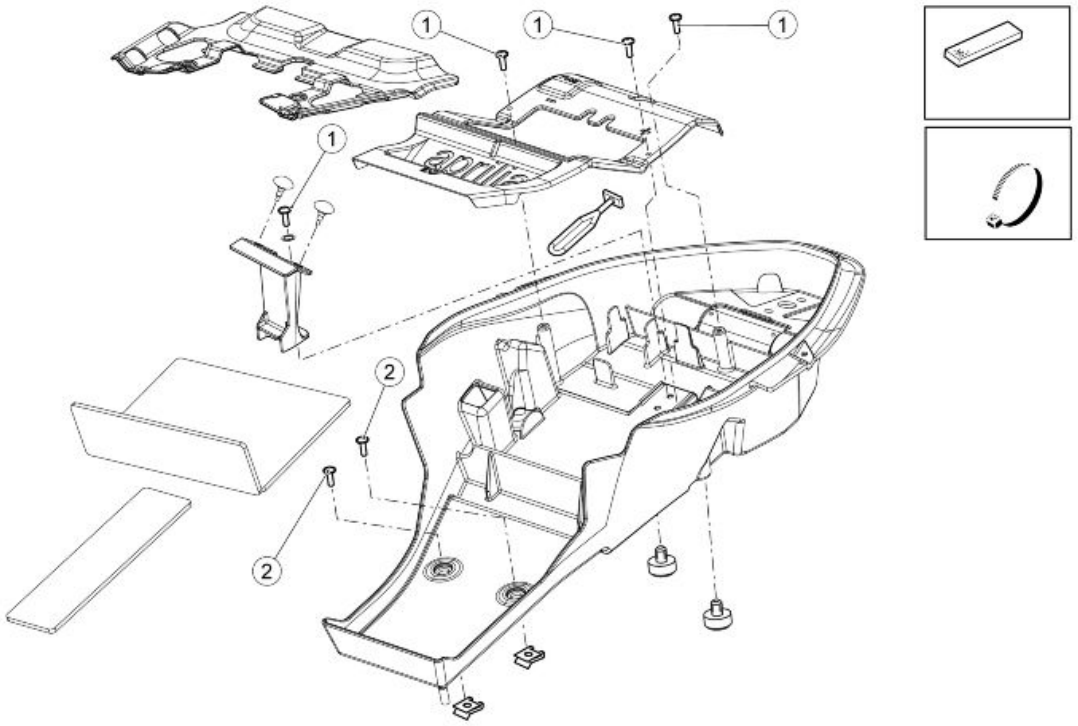
REAR BRAKE

pos.	Description	Type	Quantity	Torque	Notes
1	Rear brake lever pin	-	1	10 Nm (7.37 lbf ft)	Loctite 243
2	Flanged TE screw fastening pump to footrest mounting	M6x16	2	10 Nm (7.37 lbf ft)	-
3	TBEI screw fastening oil pipe to swingarm	M5x12	4	8 Nm (5.90 lbf ft)	-
4	Flanged self-locking nut	M6	1	10 Nm (7.37 lbf ft)	-
5	Screw + nut fastening pedal to brake lever	M6	1	10 Nm (7.37 lbf ft)	-
6	Brake pipe union	M10x1	2	25 Nm (18.44 lbf ft)	-
7	Flanged TE screw fastening rear disc	M8x18	5	25 Nm (18.44 lbf ft)	Loctite 243
8	TCEI screw	M6x16	2	12 Nm (8.85 lbf ft)	-
-	Flanged TE screw	M6x16	1	10 Nm (7.37 lbf ft)	-



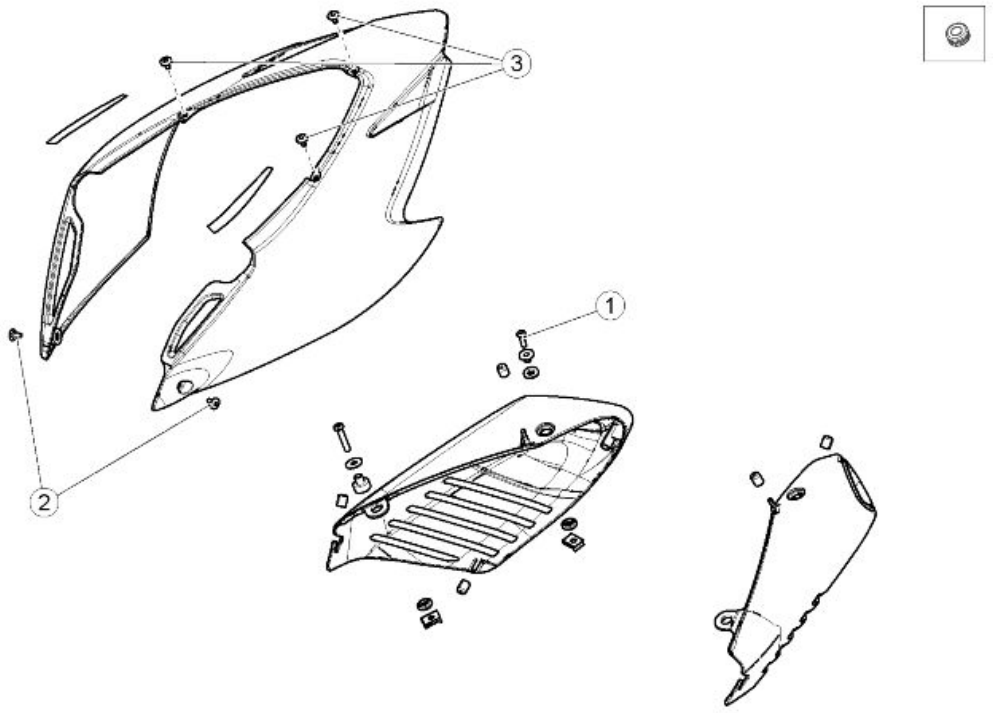
TAILLIGHT

pos.	Description	Type	Quantity	Torque	Notes
1	TCEI license plate light fixing screw	M5x25	1	6 Nm (4.42 lbf ft)	-
2	TCEI rear turn indicator fixing screw	M6	2	3 Nm (2.21 lbf ft)	-
3	Reflector fastener	M5	1	6 Nm (4.42 lbf ft)	-



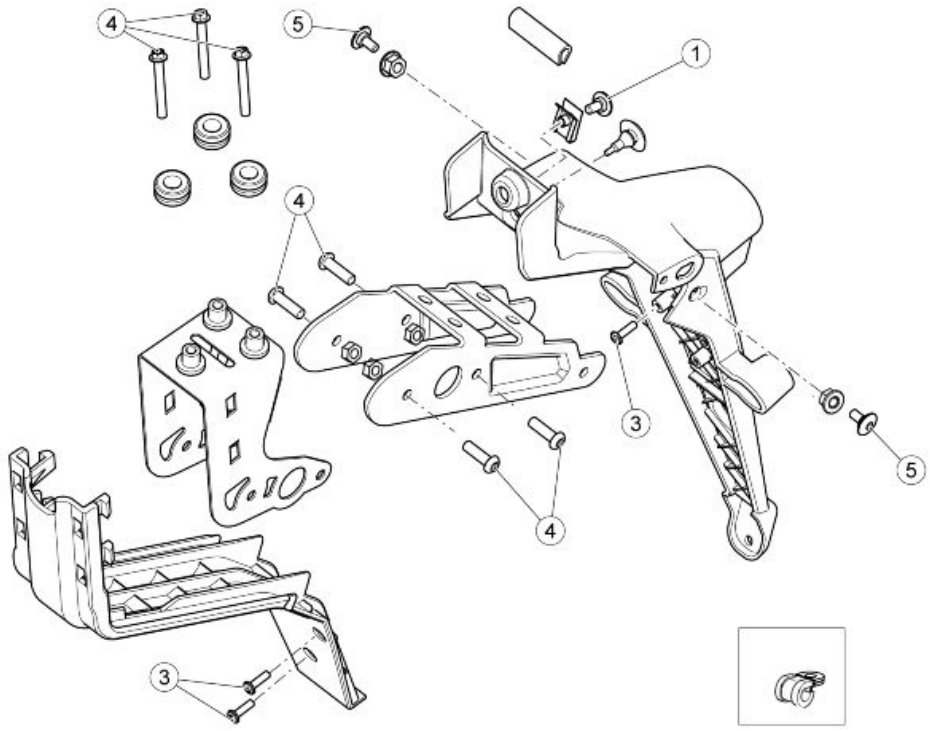
REAR BODYWORK 1

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fastening battery cover to compartment	5x14	3	2.6 Nm (1.92 lbf ft)	-
2	TBEI screw fastening battery compartment to saddle mounting	M5x9	2	6 Nm (4.42 lbf ft)	-



REAR BODYWORK 2

pos.	Description	Type	Quantity	Torque	Notes
1	TBEI screw fastening LH - RH covers to silencer	M6x20	4	10 Nm (7.37 lbf ft)	-
2	TBEI screw fastening tail fairing to saddle mounting	M5x9	2	6 Nm (4.42 lbf ft)	-
3	Screw fastening tail fairing to battery compartment	5x14	3	2.6 Nm (1.92 lbf ft)	-



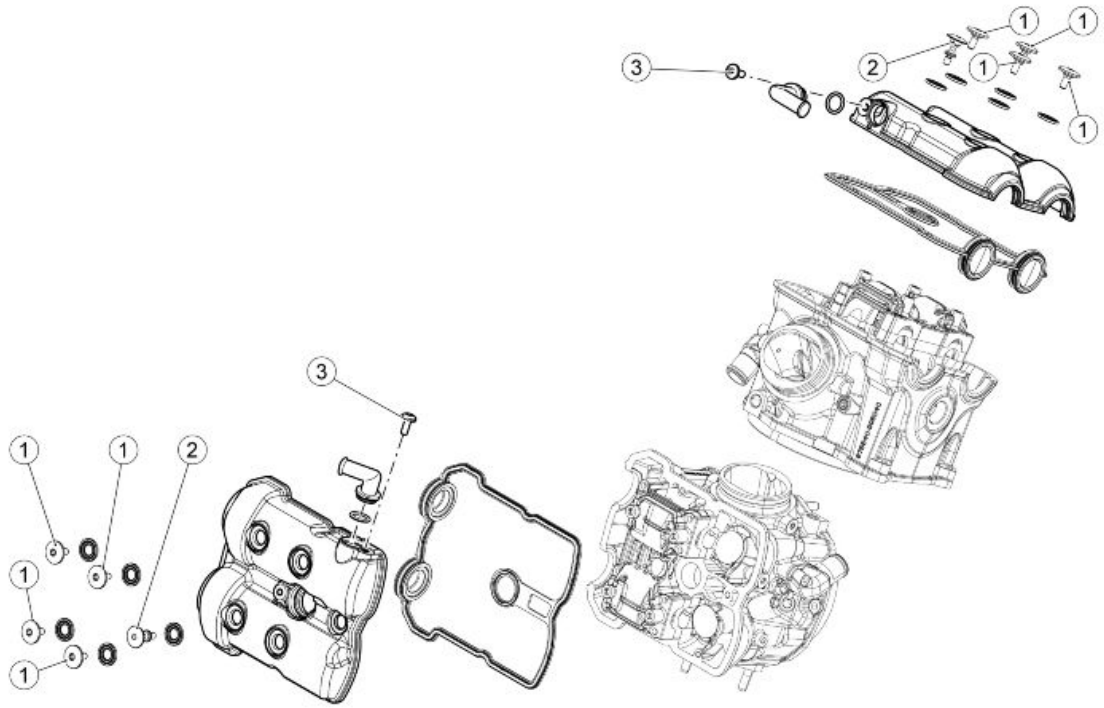
REAR BODYWORK 3

pos.	Description	Type	Quantity	Torque	Notes
1	TBEI screw fastening license plate mounting to mounting	M5x12	1	6 Nm (4.42 lbf ft)	-
2	Fastener for license plate mounting frame assembly to gusset plate - saddle lock	M6x12	4	10 Nm (7.37 lbf ft)	-
3	Screw fastening license plate mounting cover to license plate mounting	3.9x14	3	0.8 Nm (0.59 lbf ft)	-
4	TEFL screw fastening taillight to license plate mounting support	M6x45	3	10 Nm (7.37 lbf ft)	-
5	Flanged TBEI screw fastening license plate bracket to mounting	M5x12	2	6 Nm (4.42 lbf ft)	-

ABS SYSTEM

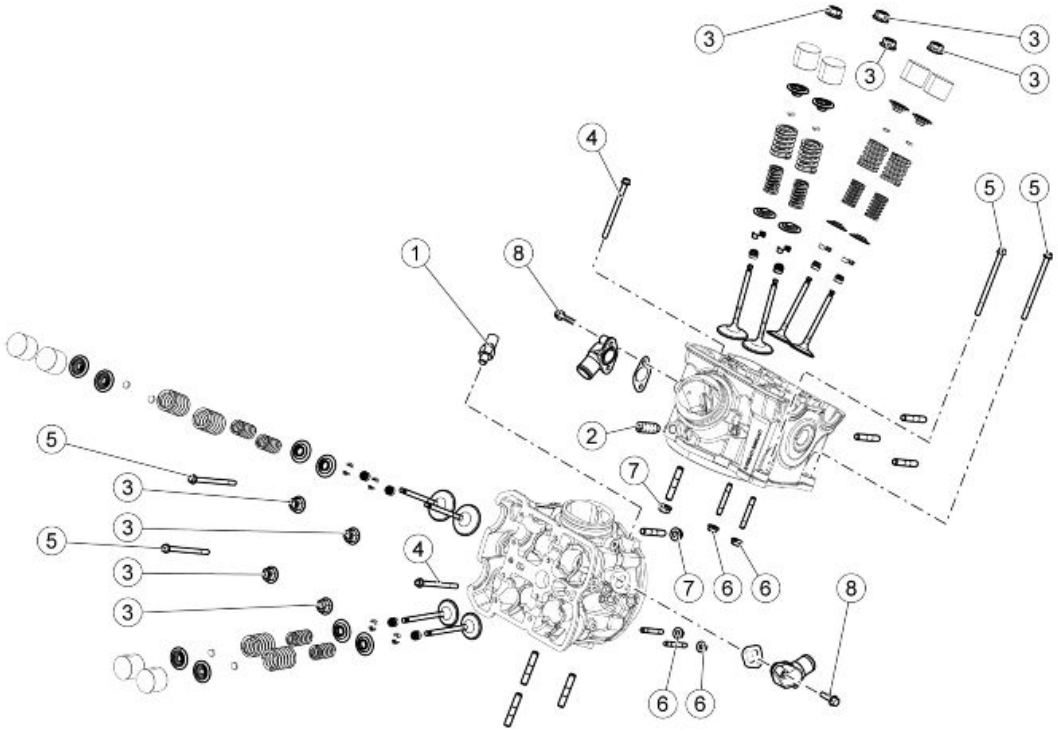
pos.	Description	Type	Quantity	Torque	Notes
-	ABS ECU fastener screw	M6x25	1	10 Nm (7.37 lbf ft)	Loctite 243
-	ABS ECU fastener nut	M6	2	10 Nm (7.37 lbf ft)	-

Engine



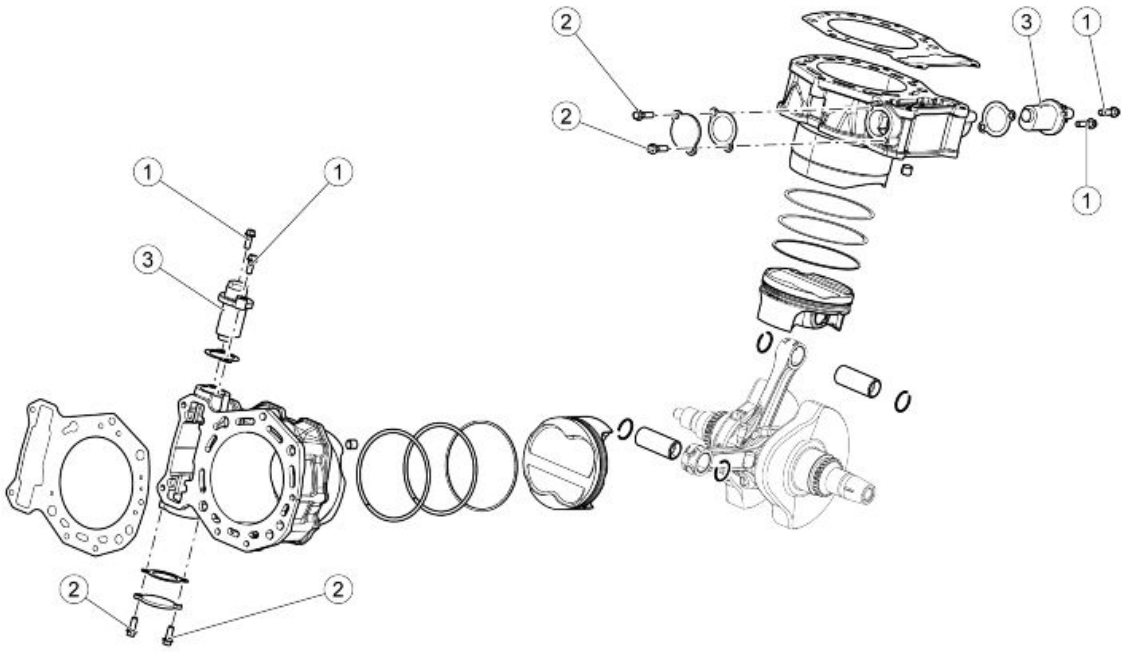
HEAD COVER

pos.	Description	Type	Quantity	Torque	Notes
1	Special screw for fastening head cover	M6	8	9 Nm (6.64 lbf ft)	-
2	Special screw for fastening head cover	M6	2	9 Nm (6.64 lbf ft)	-
3	Oil breather fastener screw	M6	2	5.50 Nm (4.06 lbf ft)	-
-	Spark plugs	-	2	10-12 Nm (7.38-8.85 lbf ft)	-



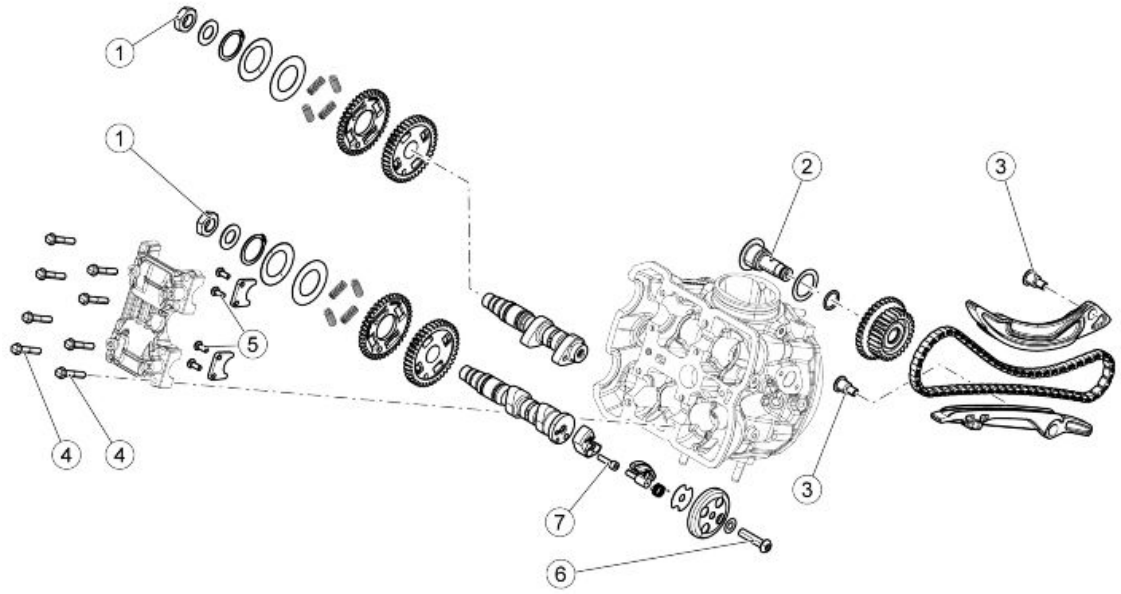
HEAD

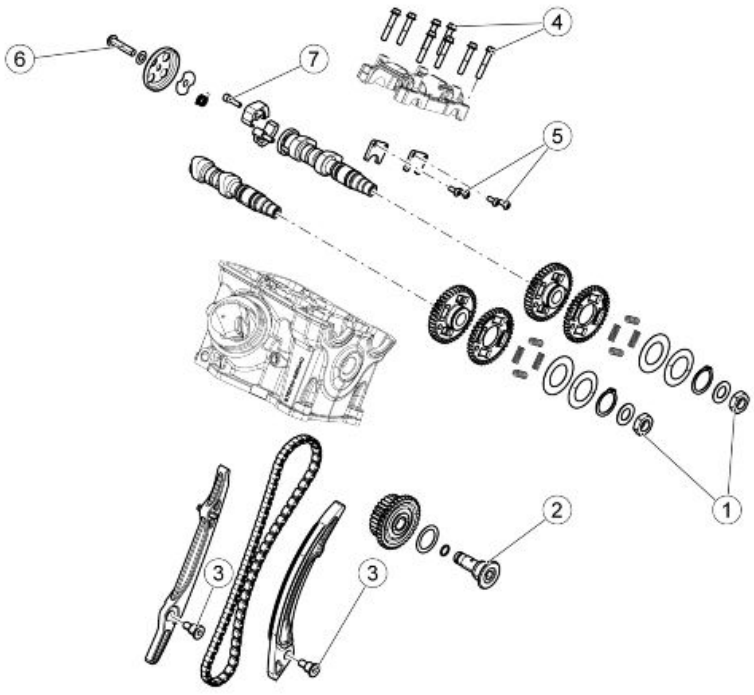
pos.	Description	Type	Quantity	Torque	Notes
1	Water Temperature Sensor	M12x1.5	1	22 Nm (16.22 lbf ft)	-
2	Threaded plug for water sensor seat	M12x1.5	1	10 Nm (7.38 lbf ft)	Loctite Drise AL 506
3	Head stud bolt fastener nut - pre-tightening	M10x1.25	8	10 Nm (7.38 lbf ft)	Lubricate the threads before tightening
3	Head stud bolt fastener nut - tightening	M10x1.25	8	13 Nm (9.59 lbf ft) + 90° + 90°	Lubricate the threads before tightening
4	Fastener for Head / Cylinder / Outer side crankcase	M6	2	12 Nm (8.85 lbf ft)	-
5	Fastener for Head / Cylinder / Inner side crankcase	M6	4	12 Nm (8.85 lbf ft)	-
6	Nut fastening Stud Bolts / Head	M6	4	12 Nm (8.85 lbf ft)	-
7	Nut fastening Stud Bolts / Head	M8	2	26 Nm (19.18 lbf ft)	-
8	Bleed union fastener screw	M5	4	5.50 Nm (4.06 lbf ft)	Loctite dry loc 2040



CYLINDER

pos.	Description	Type	Quantity	Torque	Notes
1	Chain tensioner fastener screw	M6	4	13 Nm (9.59 lbf ft)	-
2	Cylinder plate fastener screw	M6	4	13 Nm (9.59 lbf ft)	-
3	Chain tensioner adjustment screw	M6	2	5.50 Nm (4.06 lbf ft)	-

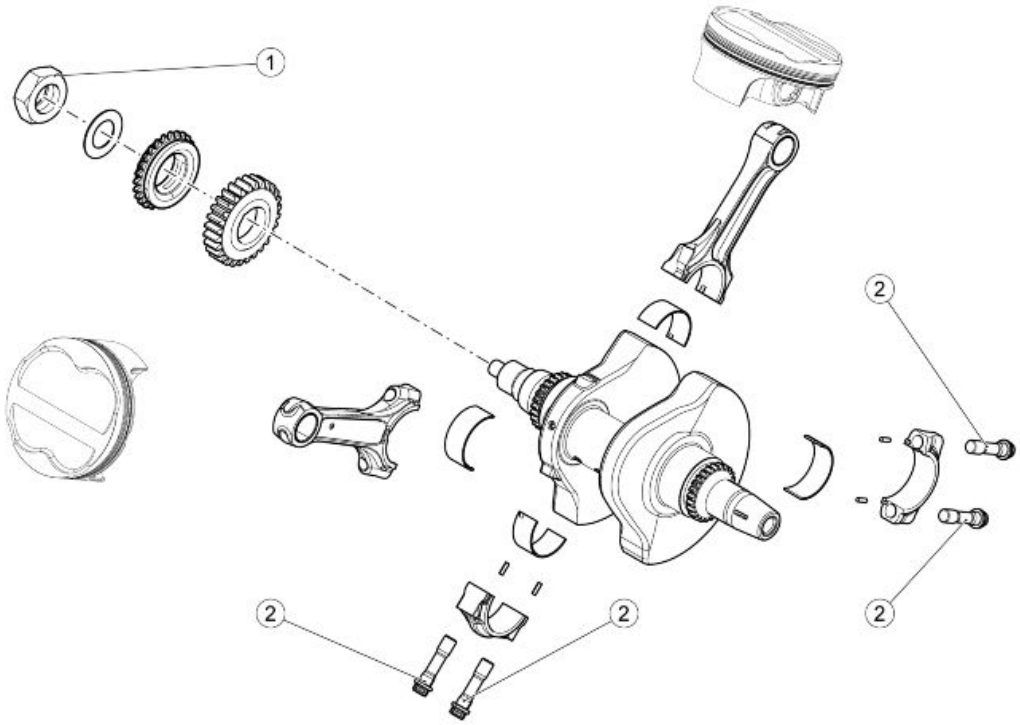




TIMING SYSTEM

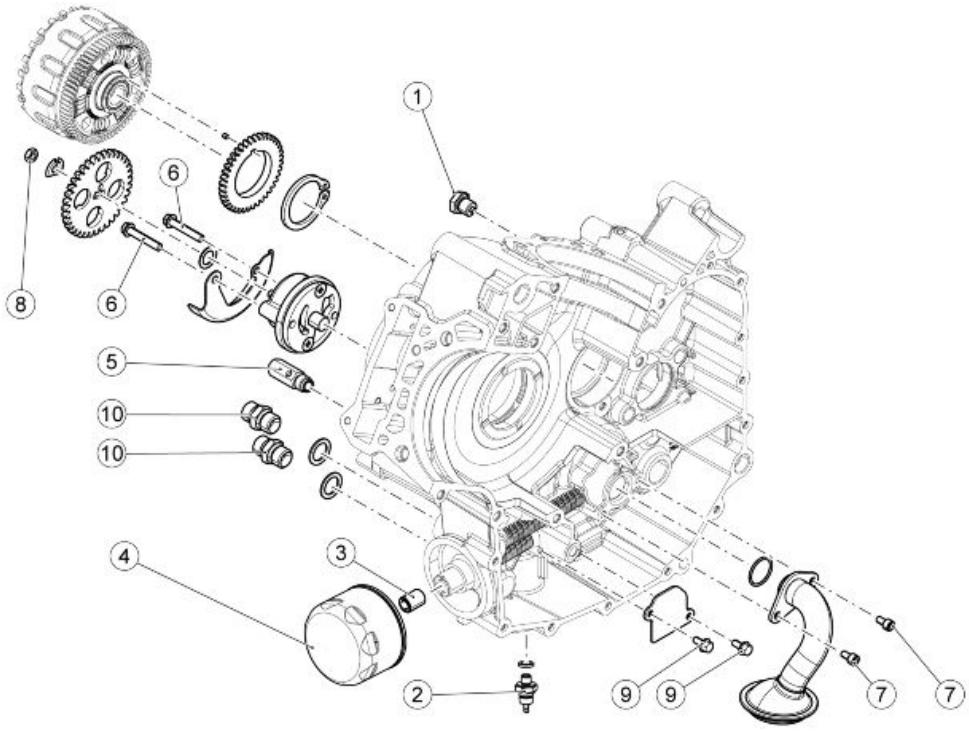
pos.	Description	Type	Quantity	Torque	Notes
1	Camshaft gear fastener nut	M15x1	4	90 Nm (66.38 lbf ft)	-
2	Timing drive gear fastener screw	M24x1.5	2	40 Nm (29.50 lbf ft)	3M SCOTCH GRIP 2353
3	Special screw for fastening mobile / fixed shoes	M8	4	19 Nm (14.01 lbf ft)	3M SCOTCH GRIP 2353
4	Cam tower / head fastener screws	M6	16	12 Nm (8.85 lbf ft)	-
5	Camshaft retainer plate fastener screw	torx M5	8	8.5 Nm (6.26 lbf ft)	3M SCOTCH GRIP 2353

pos.	Description	Type	Quantity	Torque	Notes
6	Decompression device fixing screw	torx M8	2	28.5 Nm (21.02 lbf ft)	3M SCOTCH GRIP 2353
7	Fastener screw	M5	2	5.50 Nm (4.06 lbf ft)	3M SCOTCH GRIP 2353



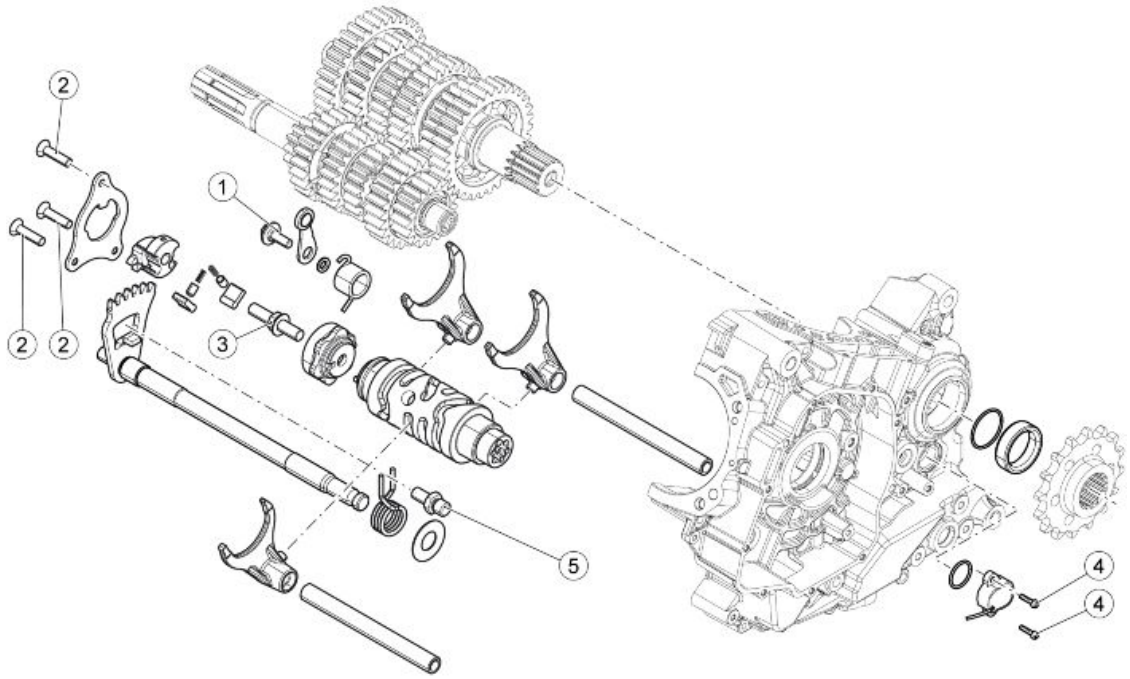
CRANKSHAFT

pos.	Description	Type	Quantity	Torque	Notes
1	Crankshaft primary gear fastener nut	M24x1.5	1	300 Nm (221.27 lbf ft)	Anticlockwise nut
2	Connecting rod screw	M10	4	15 + 30 Nm (11.06 + 22.13 lbf ft) + 50° ± 2°, final control torque 65 - 78 Nm (47.94 - 57.53 lbf ft)	Lubricate the threads before tightening



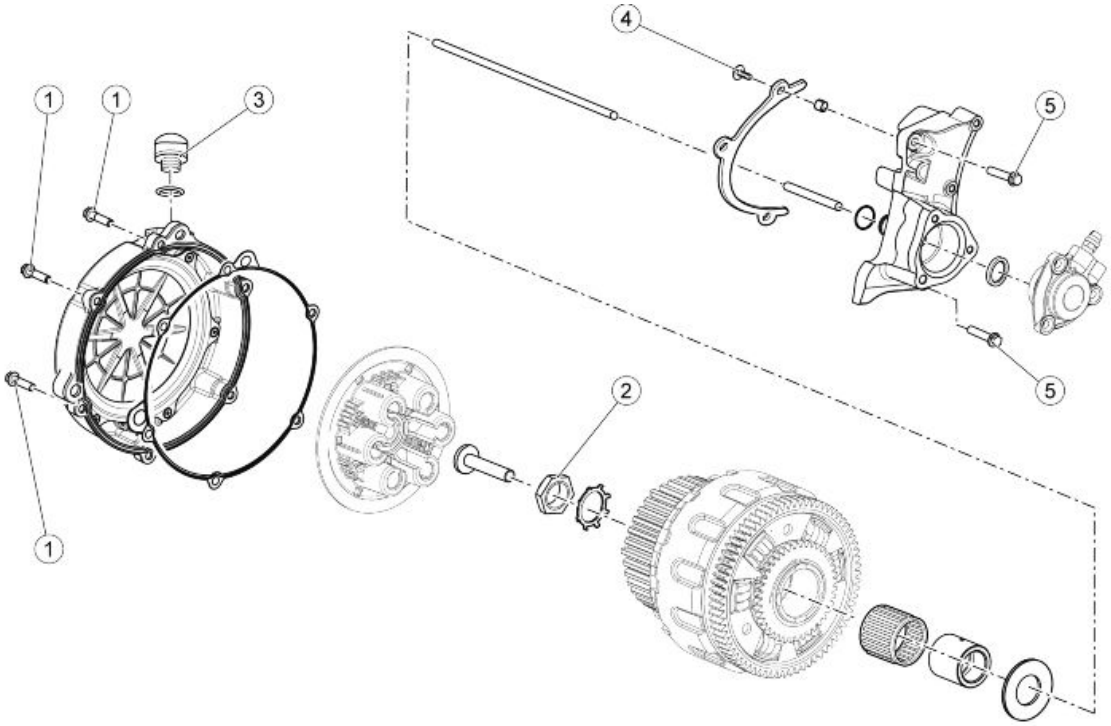
OIL PUMP

pos.	Description	Type	Quantity	Torque	Notes
1	Oil drainage plug	M16x1.5	1	19 Nm (14.01 lbf ft)	-
2	Fastening oil sensor on clutch side crankcase half	-	1	13 Nm (9.59 lbf ft)	-
3	Fastening oil filter union on clutch side crankcase half	-	1	20 Nm (14.75 lbf ft)	-
4	Oil filter	-	1	14 Nm (10.33 lbf ft)	-
5	Oil pressure regulator valve	M18x1.5	1	42 Nm (30.98 lbf ft)	-
6	Oil pump fastener screw	M6	2	12 Nm (8.85 lbf ft)	3M SCOTCH GRIP 2353
7	Rose pipe fastener screw	M6	2	12 Nm (8.85 lbf ft)	-
8	Oil pump driven gear fastener nut	M6	1	11 Nm (8.11 lbf ft)	-
9	By-Pass plate fastener screw	M5	2	5.50 Nm (4.06 lbf ft)	Loctite 242
10	Oil cooling radiator nipple	M16x1.5	2	42.5 Nm (31.35 lbf ft)	-



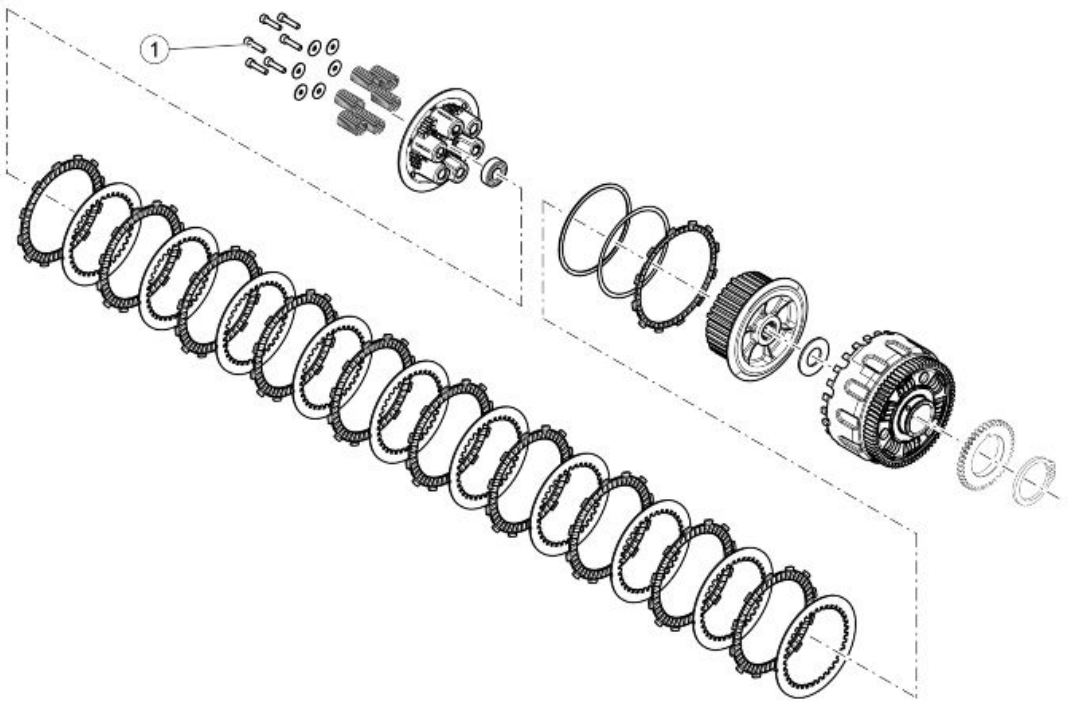
GEAR SELECTOR

pos.	Description	Type	Quantity	Torque	Notes
1	Gear retainer pawl fastener screw	M6	1	12 Nm (8.85 lbf ft)	Loctite dry loc 2040
2	Selector plate fastener screw	M5	3	5.50 Nm (4.06 lbf ft)	3M SCOTCH GRIP 2353
3	Screw fastening Desmodromic selector drum / Selector sprocket	M8	1	20 Nm (14.75 lbf ft)	3M SCOTCH GRIP 2353
4	Gear sensor fastener screw	M5	2	5.50 Nm (4.06 lbf ft)	Loctite 270
5	Selector pin fastener onto clutch side crankcase half	M10x1.5	1	16 Nm (11.80 lbf ft)	Loctite 242



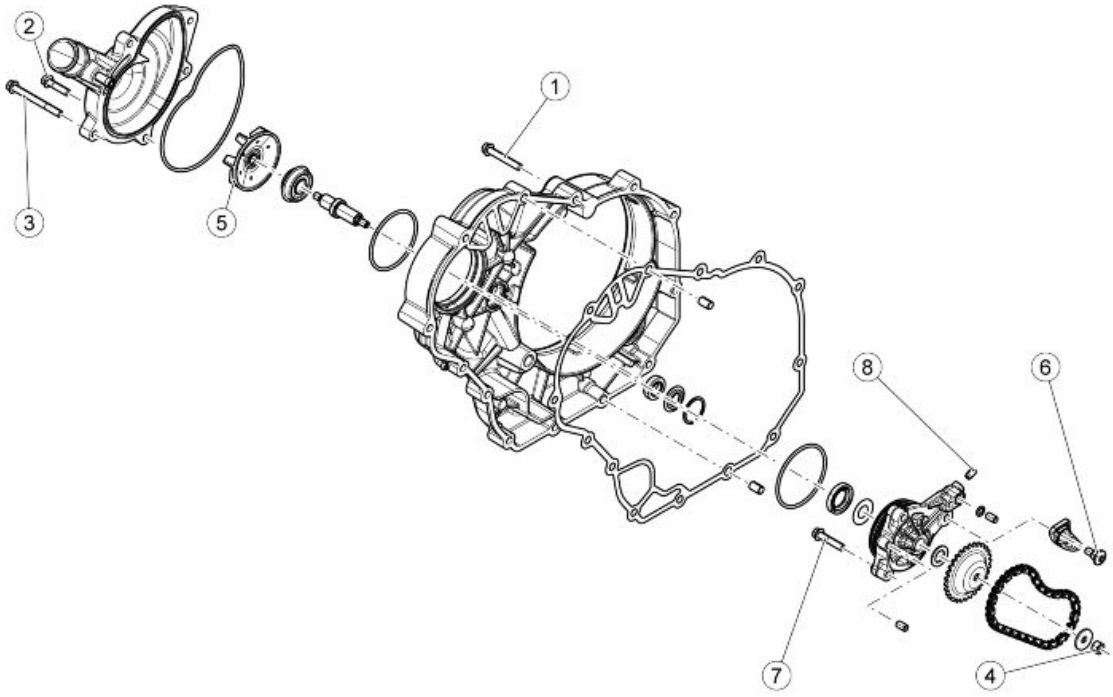
CLUTCH COVER

pos.	Description	Type	Quantity	Torque	Notes
1	Screw fastening Clutch Cover / intermediate Clutch side cover	M6	6	13 Nm (9.59 lbf ft)	-
2	Clutch fastener nut	M24x1	1	170 Nm (125.38 lbf ft)	Chamfer
3	Fastening oil filler plug on Clutch cover	-	1	2 Nm (1.48 lbf ft)	-
4	Screw fastening fixing Plate / Clutch control Mounting	M5	3	5.50 Nm (4.06 lbf ft)	Loctite 242
5	Screw fastening clutch control mounting on flywheel side crankcase half	M6	2	13 Nm (9.59 lbf ft)	-



CLUTCH

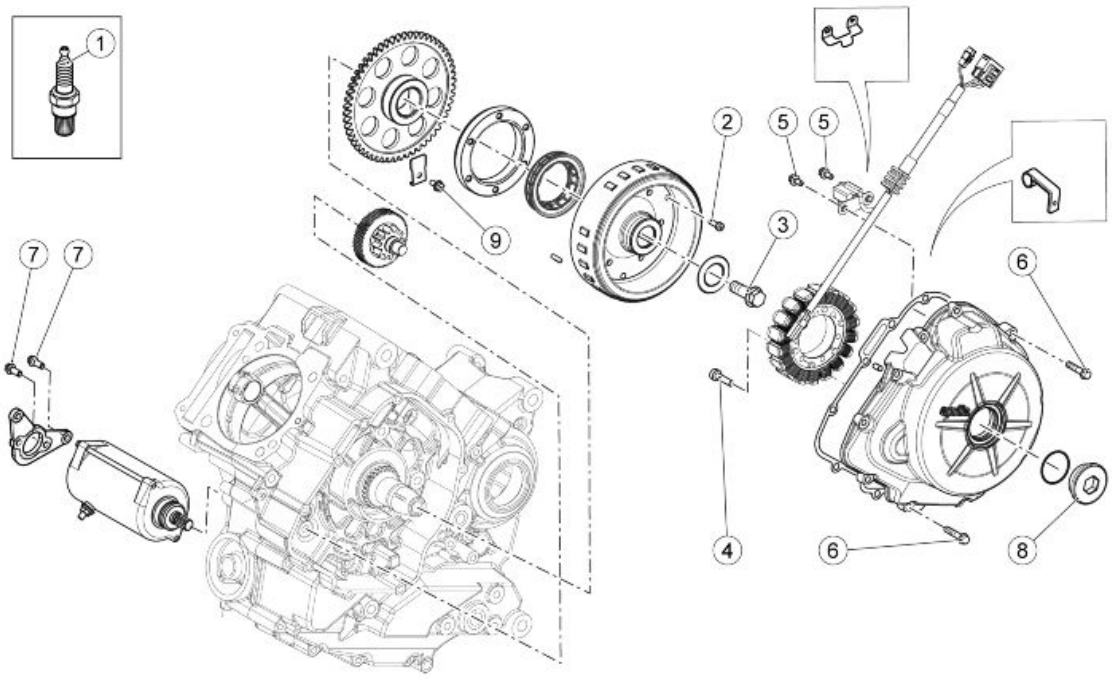
pos.	Description	Type	Quantity	Torque	Notes
1	Clutch spring fastener screw	M6	6	11 Nm (8.11 lbf ft)	-



WATER PUMP

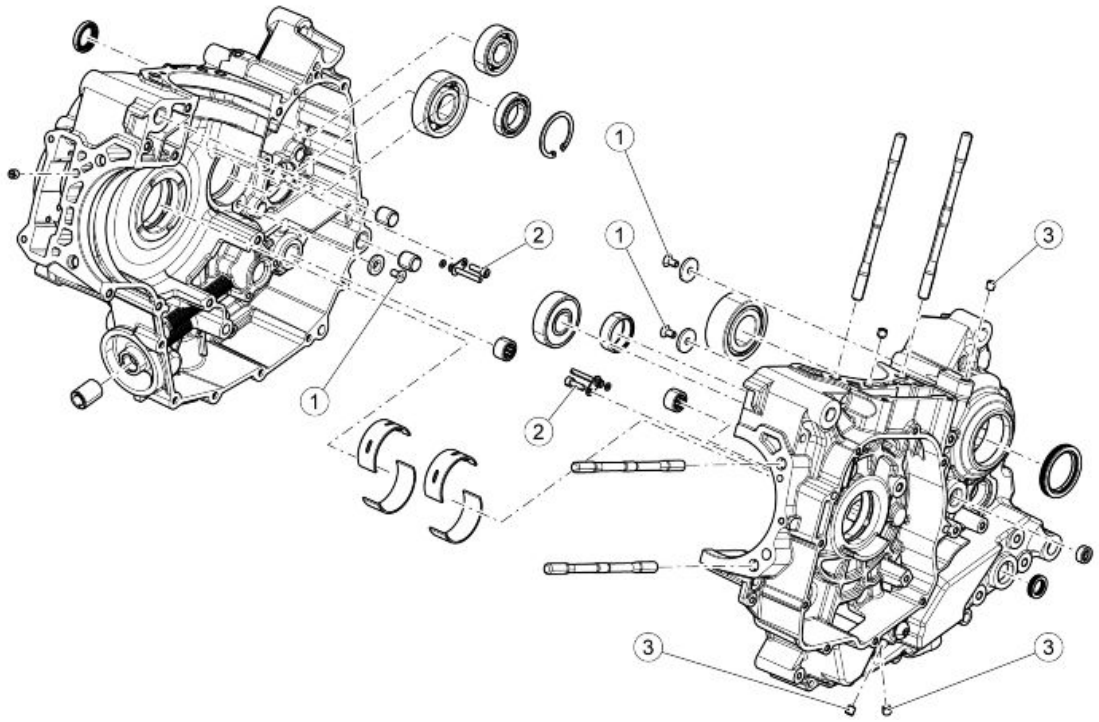
pos.	Description	Type	Quantity	Torque	Notes
1	Clutch side cover fastener screw	M6	11	13 Nm (9.59 lbf ft)	-

pos.	Description	Type	Quantity	Torque	Notes
2	Fastener screw for Pump Cover / Clutch side cover	M6	3	13 Nm (9.59 lbf ft)	-
3	Screw fastening Pump Cover / Clutch Cover / clutch side crankcase half	M6	2	13 Nm (9.59 lbf ft)	-
4	Nut fastening water pump drive gear sprocket	M6	1	12 Nm (8.85 lbf ft)	-
5	Water pump rotor	-	1	4.50 Nm (3.32 lbf ft)	-
6	Screw fastening chain tensioner slider to water pump	M6	1	6 Nm (4.42 lbf ft)	-
7	Water pump support fixing screw	M6	3	12 Nm (8.85 lbf ft)	-
8	Water pump support plug	M6x10	1	6.5 Nm (4.79 lbf ft)	3M SCOTCH GRIP 2353



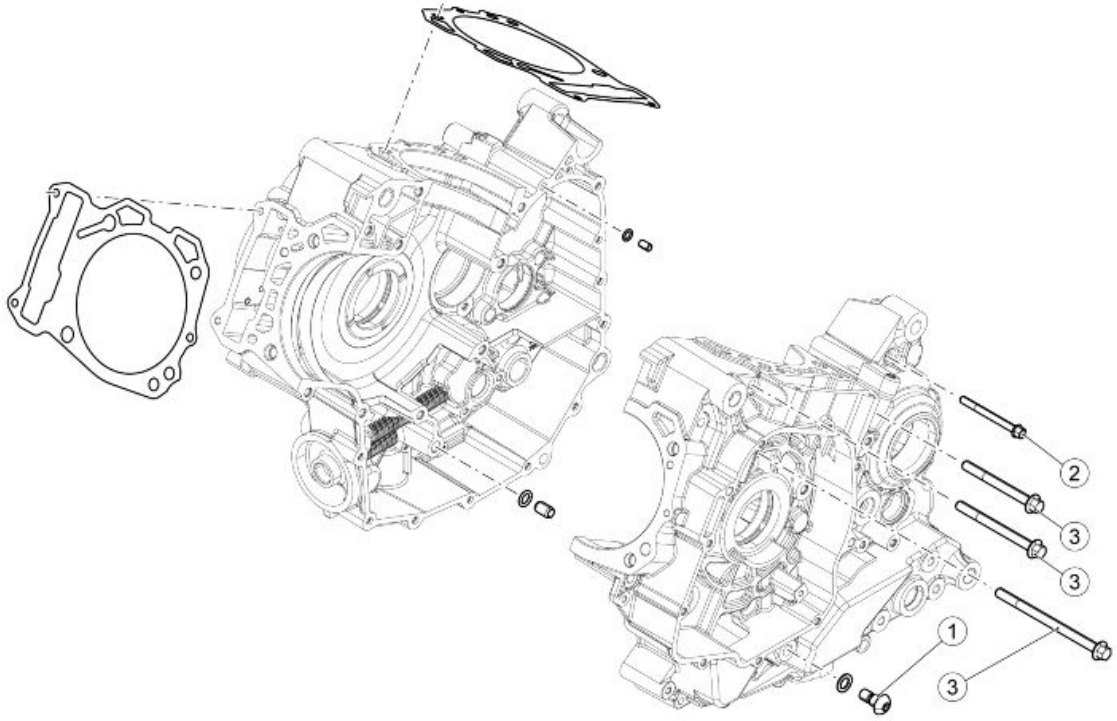
IGNITION

pos.	Description	Type	Quantity	Torque	Notes
1	Spark plug	-	4	11 Nm (8.11 lbf ft)	-
2	Freewheel Ring fastener screw	M6	6	14 Nm (10.33 lbf ft)	3M SCOTCH GRIP 2353
3	Screw fastening Rotor - Crankshaft	M12x1.25	1	130 Nm (95.88 lbf ft)	-
4	Screw fastening Stator / Flywheel Cover	M6	3	9 Nm (6.64 lbf ft)	-
5	Screw fastening pick-up / Flywheel cover	M5	2	3.50 Nm (2.58 lbf ft)	Loctite 270
6	Flywheel cover fastener screw	M6	10	13 Nm (9.59 lbf ft)	-
7	Screw fastening starter motor bracket to motor and crankcase	M6	4	13 Nm (9.59 lbf ft)	-
8	Crankshaft access cap	-	1	4 Nm (2.95 lbf ft)	-
9	Retainer plate fastener screw	M6	1	8 Nm (5.90 lbf ft)	3M SCOTCH GRIP 2353



CRANKCASE 1

pos.	Description	Type	Quantity	Torque	Notes
1	Bearing retainer fastener screw	M6	3	10 Nm (7.38 lbf ft)	Loctite 270
2	Piston oil jet fastener screw	M5	2	5.50 Nm (4.06 lbf ft)	Loctite 270
3	Tapered plug for crankshaft main bearing lubrication	M8x1	4	15 Nm (11.06 lbf ft)	-



CRANKCASE 2

pos.	Description	Type	Quantity	Torque	Notes
1	Special calibrated screw for gearbox lubrication	M9x1	1	18 Nm (13.28 lbf ft)	-
2	Screw fastening flywheel side / clutch side crankcase halves	M6	11	13 Nm (9.59 lbf ft)	-
3	Screw fastening flywheel side / clutch side crankcase halves	M8	9	29 Nm (21.39 lbf ft)	-

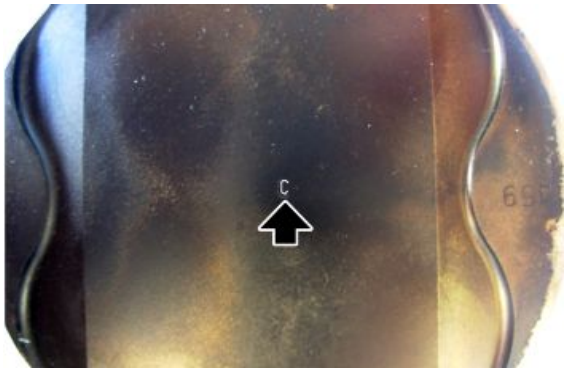
Overhaul data

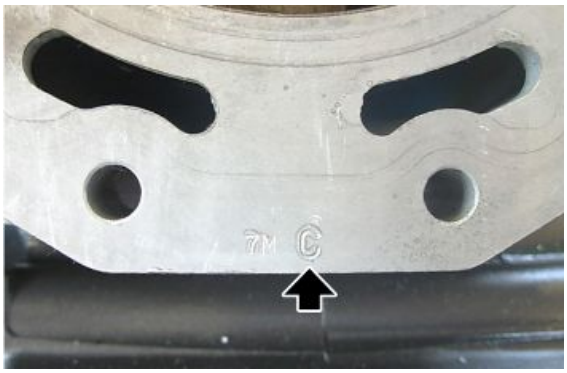
Assembly clearances

Cylinder - piston assy.

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

Only one type of piston ring is available.





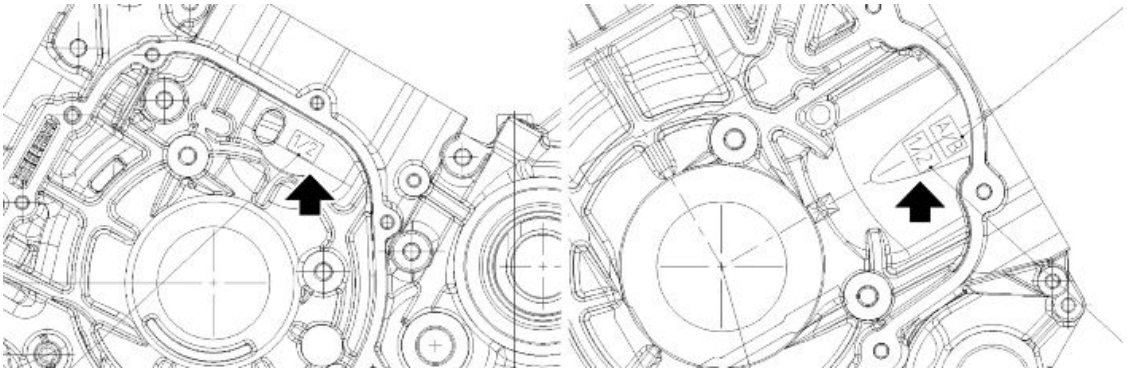
CYLINDER-PISTON COUPLING

Name	Initials	Cylinder	Piston	Play on fitting
Cylinder-piston clearance A - A	Type A - A	105.990 - 105.997 mm (4.1728 - 4.1731 in)	105.928 - 105.935 mm (4.1704 - 4.1707 in)	0.055 - 0.069 mm (0.0022 - 0.0027 in)
Cylinder-piston clearance B - B	Type B - B	105.997 - 106.004 mm (4.1731 - 4.1734 in)	105.935 - 105.942 mm (4.1707 - 4.1709 in)	0.055 - 0.069 mm (0.0022 - 0.0027 in)
Cylinder-piston clearance C - C	Type C -C	106.004 - 106.011 mm (4.1734 - 4.1736 in)	105.942 - 105.949 mm (4.1709 - 4.1712 in)	0.055 - 0.069 mm (0.0022 - 0.0027 in)
Cylinder-piston clearance D - D	Type D - D	106.011 - 106.018 mm (4.1736 - 4.1739 in)	105.949 - 105.956 mm (4.1712 - 4.1715 in)	0.055 - 0.069 mm (0.0022 - 0.0027 in)

Crankcase - crankshaft - connecting rod

INTERNAL MARKING ON FIRST GENERATION CRANKCASES

Crankcases are classified in two classes (1 or 2) depending on the diameter of the main bearing seat. The class is indicated on both crankcase halves, specifically, in the rear cylinder area on flywheel side crankcase halves and in the front cylinder area on clutch side crankcase halves.

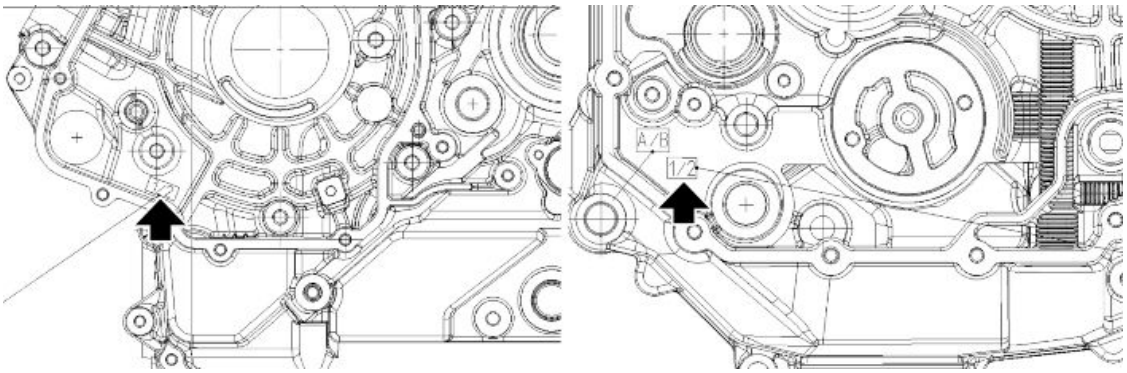


CRANKCASE CLASSES

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

INTERNAL MARKING ON SECOND GENERATION CRANKCASES

Crankcases are classified in two classes (1 or 2) depending on the diameter of the main bearing seat. The class is indicated on both crankcase halves, specifically, in the starter gear area on flywheel side crankcase halves and in the gearbox control mechanism area on clutch side crankcase halves.



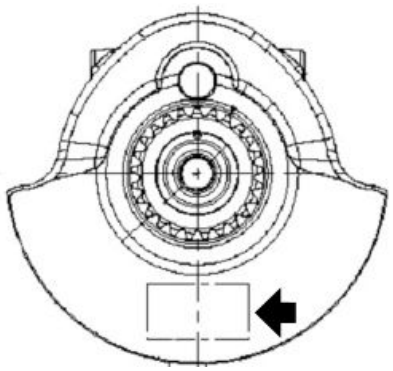
See also

Removing the flywheel cover

There are three crankshaft classes selectable for each bearing:

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

The class is stamped on the outer face of the crankshaft counterweight.



NOTE

TWO DIFFERENT CRANKSHAFT CLASSES MAY BE POSSIBLE ON THE TWO BEARINGS.

CRANKSHAFT CLASSES

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

Once the categories below are checked:

- crankcase
- flywheel side main journal
- clutch side main journal

choose the bushings used for assembly from the following table

See also

Removing the flywheel cover

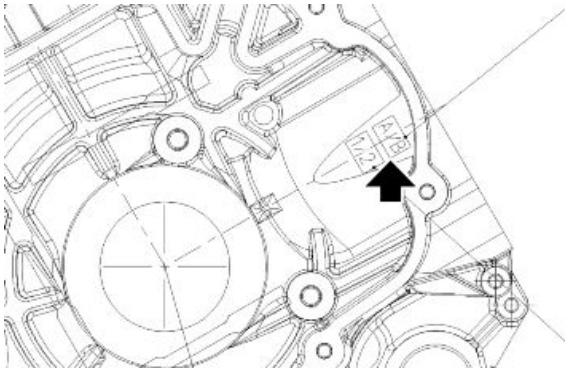
MAIN BUSHINGS

Main journal	Crankcase class 1	Crankcase class 2
Class 4 main journal (l.v.)	Semi-bushing type A (red)	Semi-bushing type B (blue)
Class 5 main journal (l.v.)	Semi-bushing type B (blue)	Semi-bushing type C (yellow)
Class 6 main journal (l.v.)	Semi-bushing type E (green)	Semi-bushing type A (red)
Class 7 main journal (l.f.)	Semi-bushing type A (red)	Semi-bushing type B (blue)
Class 8 main journal (l.f.)	Semi-bushing type B (blue)	Semi-bushing type C (yellow)
Class 9 main journal (l.f.)	Semi-bushing type E (green)	Semi-bushing type A (red)

Crankcase class (internal marking on first generation crankcases)

Two different crankcase classes (A or B) are available, selected in relation to the centre-to-centre distance between the primary reduction gears.

The class is indicated on the clutch side crankcase half near the front cylinder area.



NOTE

IN THE EVENT OF CRANKCASE REPLACEMENT, THE PRIMARY REDUCTION GEAR IS SUPPLIED READY MESHED.

CRANKCASE CLASSES 01

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

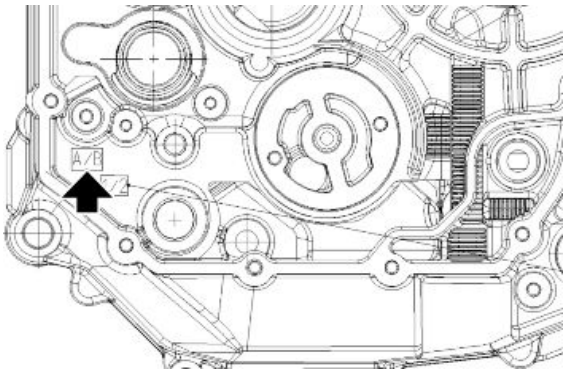
See also

Removing the flywheel cover

Crankcase class (internal marking on second generation crankcases)

Two different crankcase classes (A or B) are available, selected in relation to the centre-to-centre distance between the primary reduction gears.

The class is indicated on the clutch side crankcase half, in the gearbox control mechanism area.



NOTE

IN THE EVENT OF CRANKCASE REPLACEMENT, THE PRIMARY REDUCTION GEAR IS SUPPLIED READY MESHED.

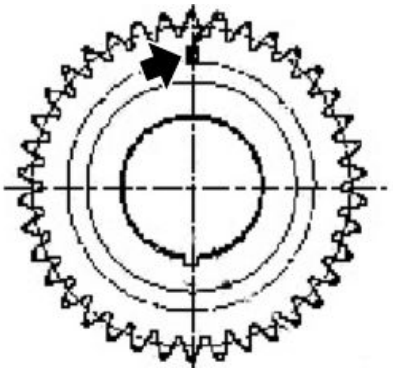
CRANKCASE CLASSES 02

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

Class one

Two different pinion classes (A or B) are available, selected in relation to the centre-to-centre distance between the primary reduction gears.

On class B pinions only, the class is indicated on the pinion itself.



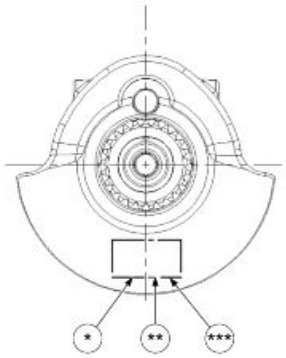
See also

Removing the flywheel cover

Crankshaft class (crank pin)

There are four different classes of crankshaft available (0, 1, 2, 3), selected in relation to crank pin diameter.

There are four different classes of crankshaft available (E1, E2, ...) selectable in relation to connecting rod weight.



Key:

* Class according to connecting rod weight.

** Class according to crank pin diameter.

*** Serial number for traceability and indicating date.

SHAFT CATEGORY

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

See also

Removing the flywheel cover

Selecting bushings

There is only one dimension class for the connecting rod. As a result, the bushings used must be selected in accordance with the dimension class of the crank pin.

BUSHINGS

Crank pin diameter	Connecting rod class 1
Crankshaft class 0	Semi-bushing type E (green)
Crankshaft class 1	Semi-bushing type A (red)
Crankshaft class 2	Semi-bushing type B (blue)
Crankshaft class 3	Semi-bushing type C (yellow)

Selecting connecting rods

Not all weight classes are available as spare parts. Only the two most significant weight classes are available - refer to the following table for selection:

CONNECTING RODS

Class according to crankshaft weight	Original connecting rod class
E1	Brown connecting rod
E2	Blue connecting rod
E3	Yellow connecting rod
E4	Green connecting rod
E5	Pink connecting rod
E6	Black connecting rod
E7	White connecting rod

CAUTION

THE CONNECTING RODS INSTALLED ON THE SAME ENGINE MUST BE OF THE SAME COLOUR AND MUST USE THE SAME TYPE OF ASSEMBLY WITH THE CRANKSHAFT.

WHEN REFITTING, ALSO ENSURE THAT THE SEMI-BUSHINGS ARE ALL OF THE SAME CLASS.

See also

Removing the flywheel cover

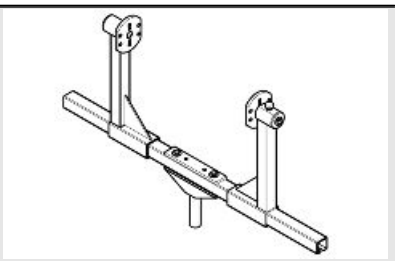
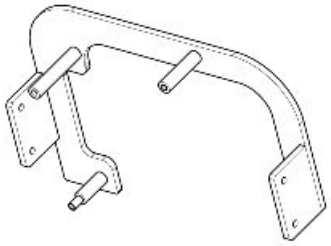
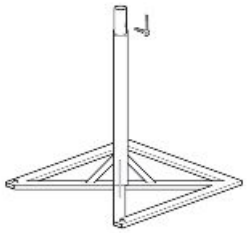
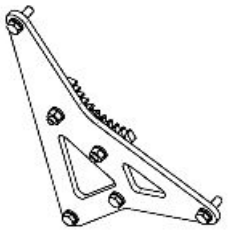
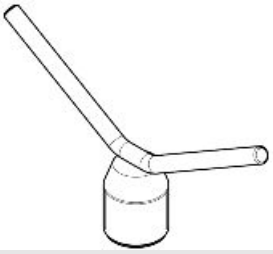
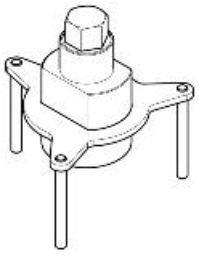
Recommended products chart

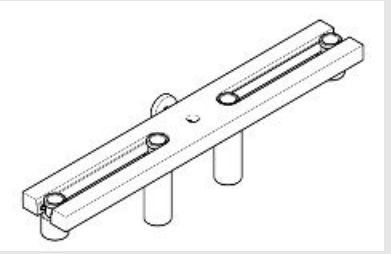
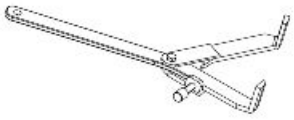
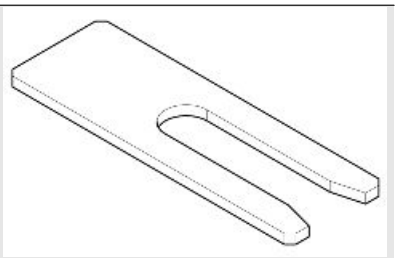
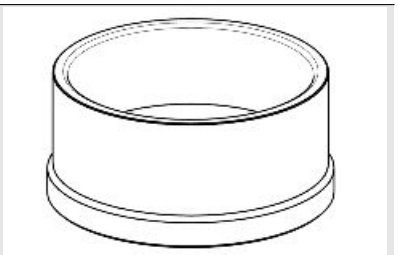
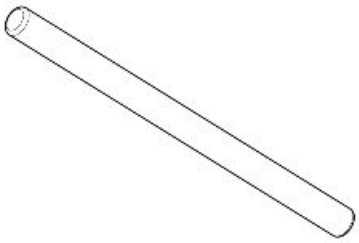
RECOMMENDED PRODUCTS TABLE

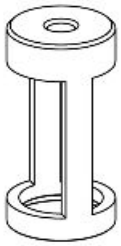
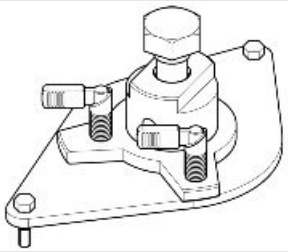
Product	Description	Specifications
AGIP TEC 4T, SAE 15W-50	Engine oil	Use top-brand oils that meet or exceed the requirements of API SJ/CCMC G4/ ACEA A3-04/ JASO MA specifications.
FUCHS TITAN SAF 1091	Fork oil	-
AGIP MP GREASE	Grease for bearings, joints, couplings and linkages	As an alternative to the recommended product, use top brand grease for roller bearings with an operating temperature range of -30°C to +140°C (-22°F to +284° F), a drop point between 150°C and 230° C (302°F and 446°F), high corrosion protection qualities and good water and rust resistance.
AGIP CHAIN GREASE SPRAY	Recommended CHAIN oil	Grease
AGIP BRAKE 4 / BRAKE 5.1	Recommended BRAKE FLUID	-
AGIP BRAKE 4 / BRAKE 5.1	Recommended CLUTCH FLUID	-
AGIP PERMANENT SPEZIAL	Recommended ENGINE COOLANT	Ready mixed biodegradable coolant with "long life" technology and characteristics (red). Freezing protection up to -40° (-40° F). Compliant with CUNA 956-16 standard.

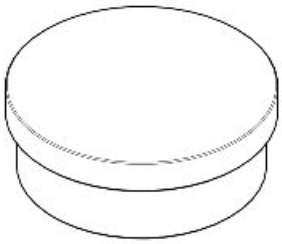
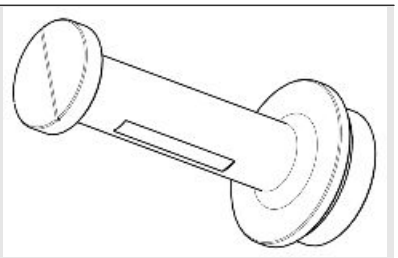
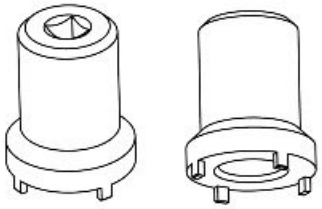
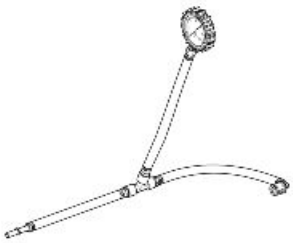
INDEX OF TOPICS

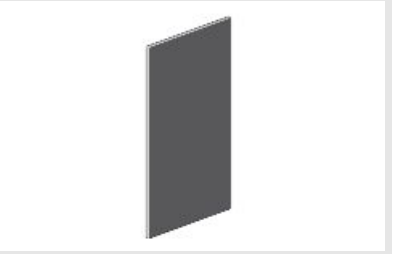
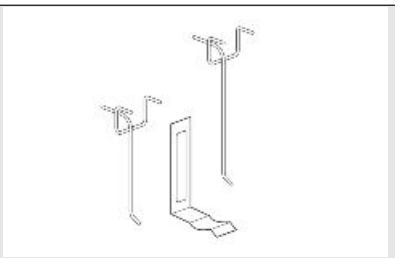
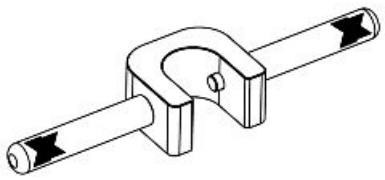
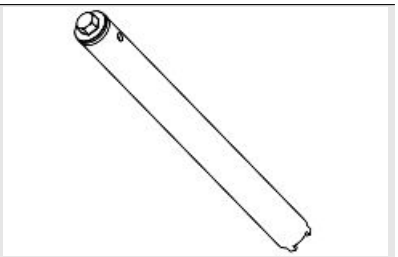
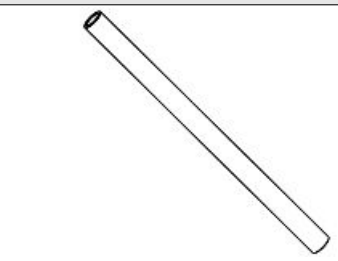
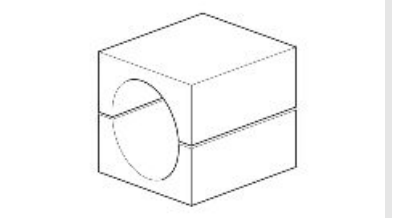
SPECIAL TOOLS

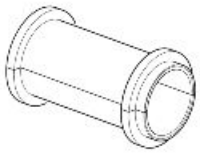
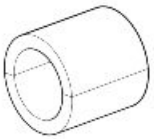
Stores code	Description	
020709Y	Engine support	
020710Y	Engine plate	
AP8140187	Engine support stand	
020850Y	Primary gear lock	
020712Y	Handle for Flywheel cover removal	
020713Y	Flywheel extractor	

Stores code	Description	
020714Y	Dial gauge mounting	
9100896	Clutch housing locking tool	
020716Y	Connecting rod locking	
020894Y	Pin snap ring fitting tool	
020895Y	Piston installation ring	
020719Y	Timing pin	

Stores code	Description	
020382Y	Valve cotters removal tool	
020896Y	Bushing for valve removal	
020720Y	Timing tool	
020376Y	Adapter handle	
020891Y	Adapter 25 mm (0.98 in)	
020362Y	12 mm guide	

Stores code	Description	
020724Y	Gear control rod roller cage punch	
020726Y	Extractor for bushings	
020727Y	Punch for bushings	
020884Y	46 mm wrench for steering ring nut	
020193Y	Gauge for oil pressure check	
AP8140612	Fuel pressure gauge	

Stores code	Description	
AP8140199	Tool panel	
020898Y	Dorsoduro 1200 graphics for tool support panels	
8140426	Hooks for panel	
020888Y	Pliers for pre-fill pipe	
020889Y	Pumping member ring nut locking spanner	
020890Y	Pumping member stanchion support rod	
AP8140149	Protection for fitting operations	

Stores code	Description	
AP8140189	Oil seal fitting tool for Ø 43 mm (1.69 in) orifices	
AP8140146	Weight	

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Maintenance chart

Adequate maintenance is fundamental to ensure long-lasting, optimum operation and performance of your vehicle.

To this end, Aprilia offers a set of checks and maintenance services (at the owner's expense), that are summarised in the table shown on the following page. Any minor faults must be reported without delay to an **Authorised Aprilia Dealer or Sub-Dealer** without waiting until the next scheduled service to solve it.

All scheduled maintenance services must be carried out at the specified intervals and mileage, as soon as the predetermined mileage is reached. Carrying out scheduled services on time is essential for your warranty validity. For further information regarding Warranty procedures and ''Scheduled Maintenance'', please refer to the ''Warranty Booklet''.

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.

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

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

(1) Check and clean, adjust or replace if necessary every 1,000 km

(2) Replace every 2 years

(3) Replace every 4 years

(4) At each engine start

(5) Check every month

(6) Check each time the rear tyre is replaced

(7) Lubricate if you are riding in the rain, on wet roads or after the vehicle has been washed

ROUTINE MAINTENANCE TABLE

km x 1,000	1	5	10	15	20	25	30	35	40
Rear shock absorber					I				I
Spark plug					R				R
Drive chain (7)	I	I	I	I	I	I	I	I	I
Transmission cables and controls	I				I				I
Steering bearings and steering clearance	I				I				I
Wheel bearings					I				I
Control unit diagnosis	I				I				I
Brake discs	I				I				I
Air filter			I		R		I		R
Engine oil filter	R				R				R
Fork					I				I
General vehicle operation	I				I				I
Valve clearance	I				A				A
Cooling system					I				I
Braking systems	I				I				I
Light circuit	I				I				I
Safety switches					I				I
Clutch control fluid (2)	I				I				I
Brake fluid (2)	I				I				I
Coolant (2)	I				I				I

km x 1,000	1	5	10	15	20	25	30	35	40
Fork oil (2)									
Engine oil	R				R				R
Light aiming					I				I
Fork oil seals					I				I
Flexible coupling (6)					I				I
Clutch lever pin (7)	L	L	L	L	L	L	L	L	L
Tyres - pressure/wear (5)	I	I	I	I	I	I	I	I	I
Wheels	I				I				I
Bolts and nuts tightening	I				I				I
Stand joint	L	L	L	L	L	L	L	L	L
Suspensions and setting	I				I				I
Fault warning light on instrument panel (4)									
Fuel lines (3)					I				I
Clutch wear					I				I
Break pad wear	I	I	I	I	I	I	I	I	I

Spark plug

At regular intervals, remove the spark plug and clean off any carbon deposits or replace as required.

CAUTION

ALWAYS REPLACE ALL SPARK PLUGS, EVEN IF ONLY ONE NEEDS REPLACING.

- Remove the saddle.
- Remove the side fairings.

In order to reach the spark plugs:

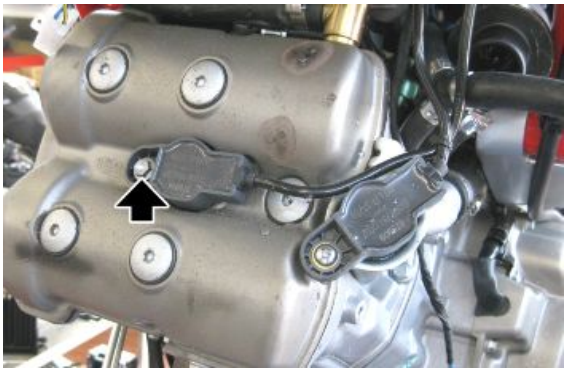
CAUTION

BEFORE CARRYING OUT THE FOLLOWING OPERATIONS AND IN ORDER TO AVOID BURNS, LEAVE ENGINE AND SILENCER TO COOL OFF TO AMBIENT TEMPERATURE.

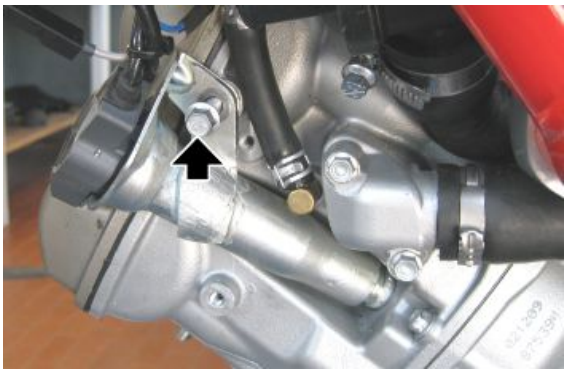
FRONT SPARK PLUGS

- Working on the left side of the vehicle, unscrew and remove the screw.

- Turn the radiator forwards to act on the coils.
- Unscrew and remove the two screws fixing coils to head cover.

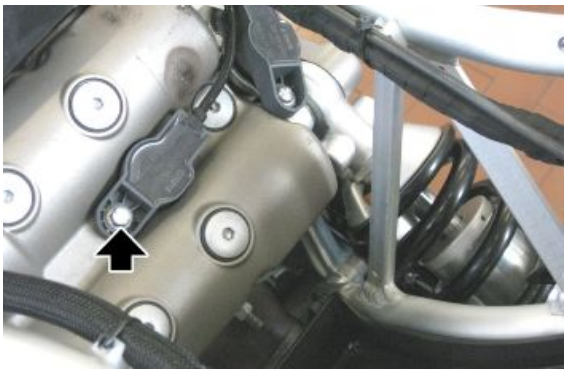


- Slide out the front coils.
- Unscrew and remove the front spark plugs.



REAR SPARK PLUGS

- Lift the tank.
- Unscrew and remove the rear coil fixing screws.
- Slide out the rear coils.
- Unscrew and remove the rear spark plugs.



See also

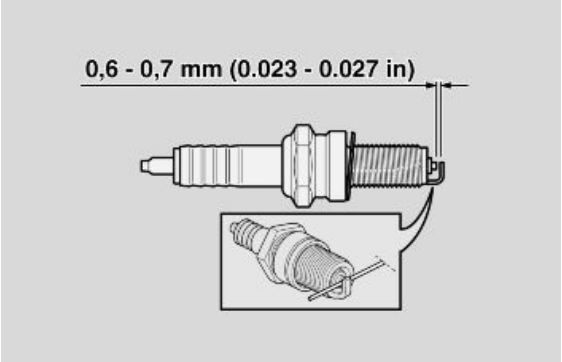
Fuel tank

- Check the gap between the electrodes with a feeler gauge.

CAUTION

DO NOT ATTEMPT TO READJUST THE ELECTRODE GAP.

The gap between the electrodes should be 0.6 - 0.7 mm (0.023 - 0.027 in) Wear limit is achieved when the gap for one of the two electrodes reaches 1.0 mm (0.039 in)



- Make sure the washer is in good conditions.

Installation:

- Once the washer is fitted, screw the spark plug carefully to avoid damaging the thread.
- Screw the spark plug to the prescribed torque.

CAUTION

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

See also

Engine

Engine oil

Check

Check the engine oil level frequently.

NOTE

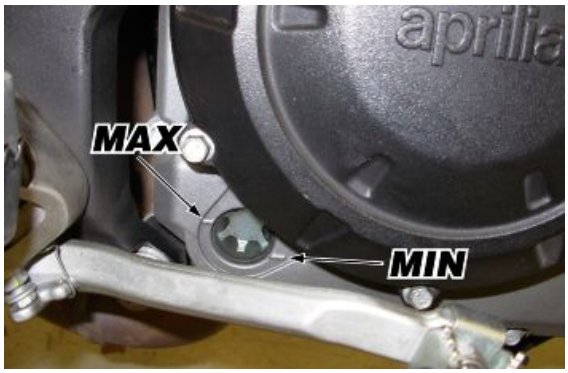
CARRY OUT MAINTENANCE OPERATIONS AT HALF THE INTERVALS SPECIFIED IF THE VEHICLE IS USED IN PARTICULAR RAINY OR DUSTY CONDITIONS, OFF ROAD OR FOR TRACK USE.

ENGINE OIL LEVEL MUST BE CHECKED WHEN THE ENGINE IS WARM.
IF YOU CHECK LEVEL WHEN THE ENGINE IS COLD, OIL LEVEL COULD TEMPORARILY DROP BELOW THE "MIN" MARK.
THIS SHOULD NOT BE CONSIDERED A PROBLEM PROVIDED THAT THE ALARM WARNING LIGHT AND THE ENGINE OIL PRESSURE ICON ON THE DISPLAY DO NOT TURN ON SIMULTANEOUSLY.

CAUTION

DO NOT LET THE ENGINE IDLE WITH THE VEHICLE AT STANDSTILL TO WARM UP THE ENGINE AND OBTAIN THE OPERATING TEMPERATURE OF ENGINE OIL.
OIL IS BEST CHECKED AFTER A TRIP OR AFTER TRAVELLING APPROXIMATELY 15 km (10 mi), OUT OF TOWN (ENOUGH TO WARM UP ENGINE OIL TO OPERATING TEMPERATURE).

- Switch off the engine and wait at least five minutes to allow the lubricant to drain back into the sump.
- Keep the vehicle upright on a level surface and with both wheels on the ground.
- Check the oil level from the sight glass on the clutch case.



MAX = maximum level.

MIN = minimum level

The difference between the "**MAX**" and "**MIN**" marks is approx. 460 cm³ (28.07 cu.in).

CAUTION

DO NOT EXCEED THE MAXIMUM LEVEL

CAUTION

THE VEHICLE MUST BE UNLOADED.

Replacement

Check the engine oil level frequently.

To change the oil:

CAUTION

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

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

- Use a cloth to wipe off any mud deposit on the area next to the filler plug (1).
- Place a container with + 4000 cm³ (244 cu.in) capacity under the drainage plug (2).
- Unscrew and remove the drainage plug (2).
- Unscrew and remove the filler plug (1).

- Drain the oil into the container; allow several minutes for oil to drain out completely.
- Replace the sealing washer of the drainage plug (2).
- Remove any metal scrap attached to the drainage plug (2) magnet.
- Screw and tighten the drainage plug (2).
- Replace the oil filter.
- Fill up to the right engine oil level by adding recommended engine oil.

See also

Engine
oil filter
Check

Engine oil filter

- Remove the fairing lug.
- Working from both sides, unscrew and remove the two ABS control unit mounting screws.

- Move the frame complete with ABS control unit.
- Drain the engine oil.
- Unscrew and remove the filter.
- Fit a new engine oil filter.
- Add engine oil up to the correct level.

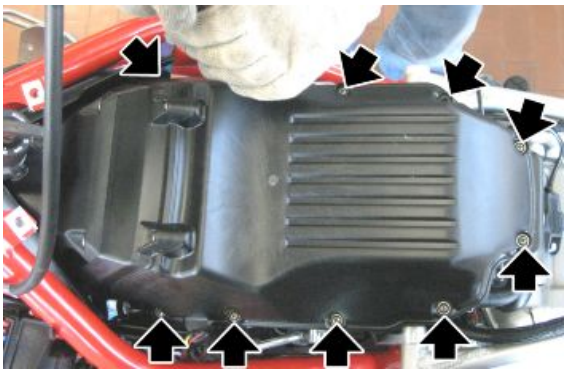
NOTE
NEVER REUSE AN OLD FILTER.

See also

Replacement

Air filter

- Remove the fuel tank.
- Unscrew and remove the ten screws.



- Remove the filter box cover.

COVER THE INTAKE DUCTS WITH A CLEAN CLOTH SO THAT FOREIGN BODIES DO NOT GET INTO THE INLET DUCTS. UPON REFITTING AND BEFORE PLACING THE FILTER BOX COVER, MAKE SURE NEITHER THE CLOTH NOR ANY OTHER OBJECT HAS BEEN LEFT INSIDE THE FILTER BOX. MAKE SURE THE FILTERING ELEMENT IS CORRECTLY PLACED SO THAT UNFILTERED AIR DOES NOT FLOW IN. DO NOT FORGET THAT EARLY WEAR OF THE PISTON RINGS AND THE CYLINDER CAN BE CAUSED BY A MALFUNCTIONING OR MISPLACED FILTERING ELEMENT.

- Unscrew and remove the four screws.
- Remove the air-box cover.
- Remove the filtering element.

Checking the valve clearance

The following operation can be carried out also with the engine fitted on the vehicle.

- Remove both head covers.

CAUTION

WHENEVER THE HEAD COVER IS REMOVED, ALL FOUR RUBBER RINGS AND THE GASKET SHOULD BE REPLACED.

- Using the pins, synchronise the cylinder being checked.
- Using a feeler gauge, measure the distance between the cam of the camshaft and the valve bucket tappet
- Take note of the measurement.

If valve clearance is not within the tolerance range, adjust as follows:

- Take the engine to the TDC.
- Lock the camshafts by using the corresponding timing pins.

Specific tooling

020719Y Timing pin

Characteristic

Valve clearance at intake

0.15 - 0.20 mm (0.0059 - 0.0079 in)

Outlet valve clearance

0.20 - 0.25 mm (0.0079 - 0.0098 in)

- Remove one camshaft at a time
- Leave the other camshaft assembled and blocked by means of the timing pin.

CAUTION

IF BOTH CAMSHAFTS ARE REMOVED, THE ENGINE SPINS MAKING TIMING NECESSARY.

See also

Removing the head cover

- Remove the bowl tappets and the adjustment shims using a magnet.

NOTE

GREASE THE BOWL TAPPETS AND THE ADJUSTMENT SHIMS PROPERLY EACH TIME THEY ARE REMOVED.

- Replace calibrated pads with a pad thick enough to correct the valve clearance previously detected.
- List of calibrated break pads:

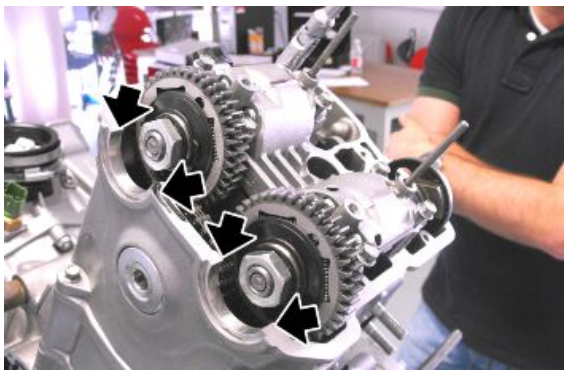
1. Calibrated pad 2.60
2. Calibrated pad 2.65
3. Calibrated pad 2.70
4. Calibrated pad 2.75
5. Calibrated pad 2.80
6. Calibrated pad 2.85
7. Calibrated pad 2.90
8. Calibrated pad 2.95
9. Calibrated pad 3.00
10. Calibrated pad 3.05
11. Calibrated pad 3.10
12. Calibrated pad 3.15
13. Calibrated pad 3.20
14. Calibrated pad 3.25
15. Calibrated pad 3.30
16. Calibrated pad 3.35
17. Calibrated pad 3.40
18. Calibrated pad 2.55
19. Calibrated pad 2.50
20. Calibrated pad 2.45
21. Calibrated pad 2.40

CAUTION

BEFORE REFITTING HEAD COVERS, CLEAN HEAD AND COVER SURFACES CAREFULLY.

- Apply THREEBOND on the head cover perimeter along the gasket housing.

- Apply THREEBOND on the head in the areas indicated in the figure.



INDEX OF TOPICS

TROUBLESHOOTING PROCEDURE IF THE EFI WARNING LIGHT ON THE INSTRUMENT PANEL TURNS ON OR IF THERE IS ABNORMAL ENGINE PERFORMANCE

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 THE DIAGNOSIS INSTRUMENT TO THE CONTROL UNIT SELECTING "APRILIA, DORSODURO 1200, FUEL INJECTION"
- 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 "ELECTRICAL SYSTEM/CHECKS AND CONTROLS/AIR TEMPERATURE SENSOR" CHAPTER.

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

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

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

See also

Checks and inspections

Engine

The engine does not start

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

CAUTION

THE DIAGNOSIS INSTRUMENT MUST OPERATE CORRECTLY AND PGDS MUST BE UPDATED AT LEAST TO VERSION 9.0.0.

CAUTION

BEFORE ANY TROUBLESHOOTING, MAKE SURE THAT:
1) BATTERY VOLTAGE IS ABOVE 12V;
2) THE MAIN 30A FUSE IS NOT DAMAGED AND IS ADEQUATELY FITTED;
3) AUXILIARY FUSES ARE NOT DAMAGED AND ARE ADEQUATELY FITTED.

NOTE

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

- 1- WITH THE KEY TURNED TO "ON", THE INSTRUMENT PANEL LIGHTS UP BUT NO FAULT INDICATION IS SHOWN WITH INDICATION "SERVICE" OR "URGENT SERVICE" BUT THE WORD ECU IS READ BELOW and THE PLUG SOCKET DISCONNECTED?

YES, go to CONTROL UNIT SUPPLY CHECK; NO, go to 2

- 2. IS THE FUEL PUMP ACTIVATED?

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

- 3. THE DIAGNOSIS INSTRUMENT COMMUNICATES WITH THE CONTROL UNIT? THAT IS, AFTER SELECTING FUEL INJECTION, AND FOLLOWING THE INSTRUCTION, WITH KEY SET TO "ON", THE PARAMETERS, STATUSES, ETC ARE READ?

YES, go to 4; NO, go to DIAGNOSIS INSTRUMENT CONNECTION CHECK

- 4. WITH DIAGNOSIS INSTRUMENT ("DEVICES ACTIVATION" SCREEN PAGE, INJECTOR ICON) CARRY OUT ACTIVATION OF AN INJECTOR (IT IS ADVISED TO DISCONNECT THE BLACK FUEL PUMP 4-PIN CONNECTOR, ON THE RIGHT): IS THE INJECTOR ACTIVATED?

YES, go to 5, NO, go to INJECTION RELAY 31 CHECK

5. DOES THE MOTOR TURN WHEN THE STARTER SWITCH IS PRESSED?

YES, SEE CHAPTER "ELECTRICAL SYSTEM/CHECK AND CONTROLS/ENGINE SPEED SENSOR and if engine speed sensor works correctly, go to 16; NO, go to 6

- 6. WHAT DOES THE "START-UP ENABLING SWITCH" STATUS IN THE DIAGNOSIS INSTRUMENT, DEVICES STATUS SCREEN PAGE, ICON 0/1 MEAN?

YES, go to STARTER SWITCH CHECK; NO, go to 7

- 7. WHAT DOES THE "FALL SENSOR" STATUS IN THE DIAGNOSIS INSTRUMENT, DEVICES STATUS SCREEN PAGE, ICON 0/1 MEAN?

If NORMAL is shown, go to 8; if TIP OVER is shown, go to 12

- 8. WITH THE SWITCH SET TO "RUN", WHAT DOES THE "RUN-STOP SWITCH" STATUS ON THE DIAGNOSIS INSTRUMENT, DEVICES STATUS SCREEN PAGE, ICON 0/1 MEAN?

If "RUN" is shown, go to 9; if "STOP" is shown, go to 15

- 9. CHECK THROUGH THE DIAGNOSIS INSTRUMENT THE CORRECT OPERATION OF THE SIDE STAND, THE NEUTRAL SENSOR, THE CLUTCH SENSOR: OPERATE ANY DEVICE AND CHECK THE SUITABLE INDICATION ON THE DEVICE STATUS, ICON 0/1 SCREEN PAGE.

If there is a fault, go to 10; if everything works correctly, go to 11

- 10. ACCORDING TO THE FAULT, SEE CHAPTER "ELECTRICAL SYSTEM/CHECK AND CONTROLS/NEUTRAL GEAR SENSOR" or "ELECTRICAL SYSTEM/CHECK AND CONTROLS/GEAR SENSOR" or "ELECTRICAL SYSTEM/CHECK AND CONTROLS/SIDE STAND SENSOR" - END
- 11. REPLACE THE CONTROL UNIT - END
- 12. IS THE "FALL SENSOR" IN VERTICAL POSITION?

YES, go to 13; NO, go to 14

- 13. REFER TO THE CHAPTER "ELECTRICAL SYSTEM/CHECKS AND CONTROLS/FALL SENSOR"; INDICATION ON DIAGNOSIS INSTRUMENT ALWAYS "TIP OVER" - END
- 14. SET THE SENSOR TO THE CORRECT POSITION - END
- 15. REFER TO THE CHAPTER "ELECTRICAL SYSTEM/CHECKS AND CONTROLS/RUN - STOP SWITCH"; INDICATION ON DIAGNOSIS INSTRUMENT ALWAYS "STOP" - END
- 16. CHECK OPERATION OF FUEL CIRCUIT PRESSURE AND ENGINE MECHANICAL OPERATION - END

See also

Engine rpm sensor
Neutral sensor

Side stand sensor

RUN/STOP switch

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 (ground point is on the engine, right side, on the clutch casing) 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 OF THE GREY-BLUE CABLE UP TO THE SECONDARY FUSE (4) AND RED/WHITE CABLE FROM THE SECONDARY FUSE TO THE 30 A MAIN FUSE - END
- 6. CHECK CONTINUITY OF RED/BROWN CABLE FROM THE PIN 40 TO THE MAIN INJECTION RELAY 17

If there is continuity, go to MAIN INJECTION RELAY 17 CHECK; if there is not continuity, restore cable harness - END

See also

Electrical system installation

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: THERE SHOULD BE A RESISTANCE OF 0.5 - 1 ohm between PIN 1 and PIN 2 - END
- 4. CHECK CONTINUITY OF ORANGE/GREEN CABLE FROM PUMP CONNECTOR TO AUXILIARY INJECTION RELAY 31 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, restore the cable harness

- 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

AUXILIARY INJECTION RELAY 31 CHECK

- 1. CHECK CONTINUITY OF THE ORANGE/GREEN CABLE FROM THE INJECTOR AT PIN 3 OF THE RELAY, ALSO CHECKING THE AUXILIARY INJECTION RELAY CONNECTOR

If there is continuity, go to 2; otherwise, restore cable harness - END

- 2. WITH KEY SET TO "ON", IS THERE VOLTAGE ON RED/BROWN CABLE OF THE 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 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 RELAY TO THE MAIN INJECTION RELAY 17

If there is continuity, go to MAIN INJECTION RELAY 17 CHECK; otherwise, restore cable harness - END

- 7. CHECK CONTINUITY OF THE CABLE FROM THE AUXILIARY INJECTION RELAY 31 TO THE MAIN INJECTION RELAY 17: ORANGE (BETWEEN RELAY 31 AND FUSE 5) and RED/WHITE (BETWEEN RELAY 31 AND RELAY 17)

If there is continuity, go to MAIN INJECTION RELAY 17 CHECK; if there is not continuity, restore cable harness - END

MAIN INJECTION RELAY 17 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: PROVIDE VOLTAGE ON THE PIN CORRESPONDING TO THE GREEN/BLACK CABLE; AND GROUND ON THE PIN CORRESPONDING 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/BLACK 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 BLACK AND REPLACE THE KEY SWITCH- END

STARTER BUTTON CHECK

- 1. WITH KEY SET TO "ON" DISCONNECT THE SWITCH CONNECTOR (6 ways, black, at the centre, between filter box and water radiator) AND CHECK IF THERE IS VOLTAGE + 5V ON PIN 4 ON THE CABLE HARNESS SIDE

YES, go to 2; NO, go to 5

- 2. WITH CONNECTOR DISCONNECTED (6 ways, black, at the centre, between filter box and water radiator) CHECK IF THERE IS GROUND CONNECTION ON PIN 5 ON THE CABLE HARNESS SIDE

YES, go to 3; NO, go to 6

- 3. CHECK WITH CONNECTOR DISCONNECTED (6-ways black, inside the bow) ON THE SWITCH SIDE, PUSHING THE SWITCH, IF THERE IS CONTINUITY BETWEEN PIN 4 AND PIN 5

YES, go to 4; NO, go to 7

- 4. REPLACE THE CONTROL UNIT - END
- 5. CHECK CONTINUITY OF PINK/BROWN CABLE BETWEEN SWITCH CONNECTOR AND PIN 58 OF THE CONTROL UNIT

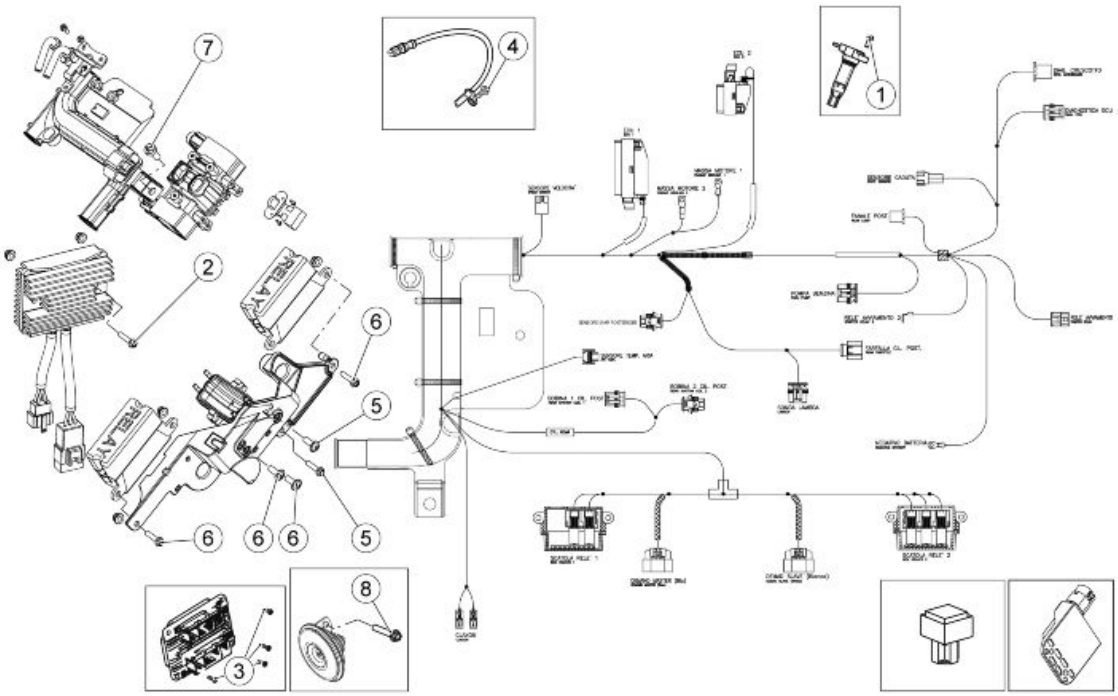
YES, go to 4; NO, restore the cable harness - END

- 6. CHECK CONTINUITY OF PINK/BLACK CABLE BETWEEN SWITCH CONNECTOR AND PIN 4 OF THE CONTROL UNIT

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

- 7. REPLACE THE STARTER BUTTON COMPONENT - END

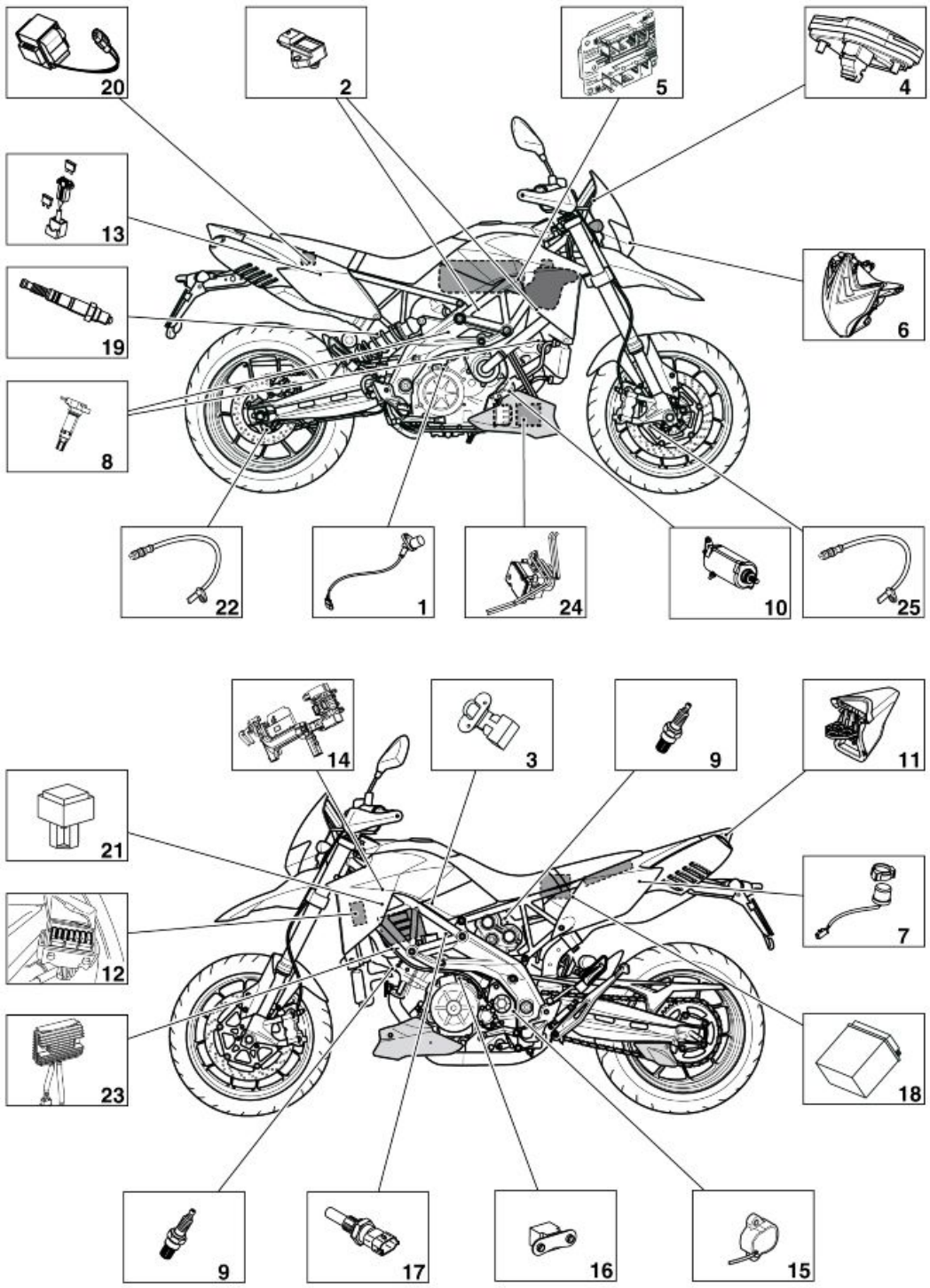
INDEX OF TOPICS



ELECTRICAL SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Coil fixing screw	M6	2	5.50 Nm (4.06 lbf ft)	-
2	TE screw fastening regulator to frame	M6x30	2	10 Nm (7.37 lbf ft)	-
3	Screw fastening ECU to filter box base	-	4	3 Nm (2.21 lbf ft)	-
4	Speed sensor TBEI fixing screw	M5x16	1	6 Nm (4.42 lbf ft)	-
5	Self-tapping screw fastening demand sensor mounting to demand sensor	5x14	3	4 Nm (2.35 lbf ft)	-
6	TBEI screw fastening relay support to demand sensor mounting	M6x16	4	10 Nm (7.37 lbf ft)	-
7	TEFL screw fastening cableway to demand sensor mounting	M6x12	1	10 Nm (7.37 lbf ft)	-
8	TEFL horn fixing screw	M6x12	1	10 Nm (7.37 lbf ft)	-
-	TBEI starter relay fixing screw	M6x10	2	10 Nm (7.37 lbf ft)	-

Components arrangement



Key

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

5. Engine control unit
6. Headlamp
7. Start-up relay
8. Coils
9. Spark plugs
10. Starter motor
11. Taillight
12. Auxiliary fuses
13. Main fuses and ABS fuses
14. Throttle grip position sensor
15. Neutral / gear sensor
16. Engine speed sensor - pick up
17. Engine temperature sensor
18. Battery
19. Lambda probe
20. fall sensor
21. Main injection relay
22. Rear speed / ABS sensor
23. Voltage regulator
24. ABS control unit / Modulator
25. Front speed / ABS sensor

CAUTION

A RELAY CANNOT BE IDENTIFIED BASED ONLY ON THE FOLLOWING INDICATIONS: THIS SHOULD BE DONE ALSO IDENTIFYING THE COLOUR OF THE RELAY CABLES.

RELAY LAYOUT ON THE WIRING DIAGRAM AND ON THE VEHICLE

LIGHT LOGIC RELAY

- Location on the wiring diagram: 8
- Location on the vehicle: under the fuel tank, left side, rear relay box, second relay starting from the front.

START-UP RELAY

- Location on the wiring diagram: 31
- Location on the vehicle: under the saddle, right side, next to main fuses.

MAIN INJECTION RELAY

- Location on the wiring diagram: 17
- Location on the vehicle: under the left fairing, left side, next to auxiliary fuses.

AUXILIARY INJECTION RELAY

- Location on the wiring diagram: 35

- Location on the vehicle: under the fuel tank, left side, front relay box, second relay starting from the front.

FAN CONTROL RELAY

- Location on the wiring diagram: 38
- Location on the vehicle: under the fuel tank, left side, rear relay box, third relay starting from the front.

HIGH BEAM LIGHTS RELAY

- Location on the wiring diagram: 7
- Location on the vehicle: under the fuel tank, left side, rear relay box, first relay starting from the front.

RECOVERY LOGIC RELAY (URGENT SERVICE)

- Location on the wiring diagram: 23
- Location on the vehicle: under the fuel tank, left side, front relay box, third relay starting from the front.

Electrical system installation

INTRODUCTION

Scope and applicability

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

Materials used and corresponding quantities

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

- 1 Main Cable Harness
- 1 Taillight Cable harness
- 1 License Plate Light Cable Harness
- 1 Injection Main Relay
- 1 Relay Mounting Rubber Block
- 1 Start-up Relay
- 2 Small black clamps 2.5x98 mm (0.01x3.86 in)
- 13 Small black clamps 2.5x160 mm (0.01x6.30 in)
- 3 Medium black clamps 4.5x180 mm (0.18x7.08 in)
- 13 Medium black clamps 4.5x290 mm (0.18x11.42 in)
- 2 Mountings for the AMP Connector
- 1 Mounting for the Bosch Connector
- 1 Cable Harness Protection
- 2 Cable Harness Supports

- 2 Rivets
- 1 Black cable guide
- 2 Littelfuse 30 A Fuses (ATO Series)
- 12 Cable grommets (4 different types)
- 2 Frame seals
- 2 Cable guides (2 different types)
- 2 Rubber clamps
- 1 Pipe clamp
- 1 M4x6 TCB screw
- 1 Pipe clamp
- 1 Screw

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

Carry out the checks described below once the electrical system is refitted, connectors reconnected and clamps and retainers restored.

- Check the connector block for connections and correct tightening in the following connectors.

1. Secondary Lock Connector.
2. Instrument panel connector: FRONT SECTION, TABLE B1.
3. Throttle grip position sensor connectors, CENTRAL SECTION, TABLE A2.
4. Pick-up connector
5. Side Stand Switch Connector: CENTRAL SECTION, TABLES V1, V2, V3.
6. Regulator Connector: CENTRAL SECTION, TABLE N.
7. Front cylinder coil and rear cylinder coil connectors: CENTRAL SECTION, TABLES I1, I2 (assembly diagrams under table D).
8. Control Unit Connectors: CENTRAL SECTION, TABLES A6, A7.
9. Fuel pump connector: CENTRAL SECTION, TABLES M1, M2, M3.
10. Connectors inside the housing, behind the radiator: - Key Connector - Right Light Switch Connectors - Left Light Switch Connectors
11. ABS connector.

12.Speed sensor connectors: CENTRAL SECTION, TABLE D.

13.Auxiliary Fuses (rubber housing correct positioning and closing): FRONT SECTION, TABLE A.

- THE CONNECTORS LISTED ARE CONSIDERED CRITICAL IN COMPARISON WITH ANY OTHER BECAUSE THE VEHICLE WILL STOP IF THEY ARE ACCIDENTALLY DISCONNECTED.
- All FILTER BOX CABLE HARNESS CONNECTORS must be subjected to inspection, even if they are not highlighted.
- Undoubtedly the connection of the rest of connectors is also important and essential for the correct operation of the vehicle.

Front side

CAUTION

ONCE THE ELECTRICAL SYSTEM IS REFITTED, THE CONNECTORS RECONNECTED AND CLAMPS AND RETAINERS RESTORED, CARRY OUT THE CHECKS INDICATED UNDER "SPECIAL CHECKS FOR THE CORRECT CONNECTION AND LAYING OF CABLES" IN THE "ELECTRICAL SYSTEM INSTALLATION" SECTION.

TABLE A - AUXILIARY FUSES VIEW, WHEN BIKE IS FINISHED

TABLE A1 - Secondary fuses

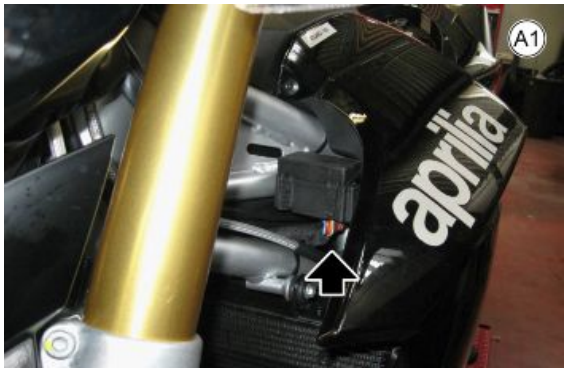


TABLE A2 - Lug, when bike is finished

TABLES B: FRONT CABLE HARNESS ARRANGEMENT TABLE B1

- Main cable harness must be routed under throttle cables and brake pipes.
- 4.5x290 mm (0.18x11.42 in) Clamps

TABLE B2

TABLE B3

TABLES C: FRONT PIPE ARRANGEMENT TABLE C1

- Rubber clamps.

TABLE C2

- Rubber clamp.

TABLE C3

- Rubber clamp.

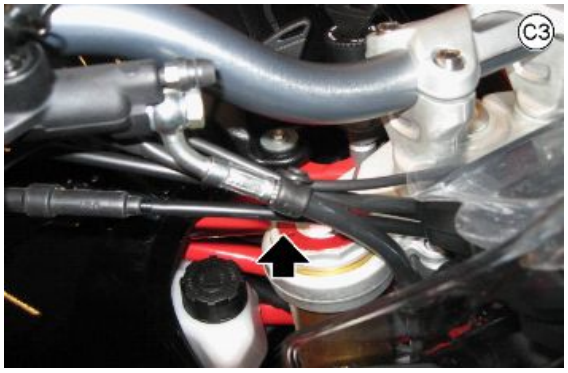


TABLE D

- 4.5x290 mm (0.18x11.42 in) Clamps

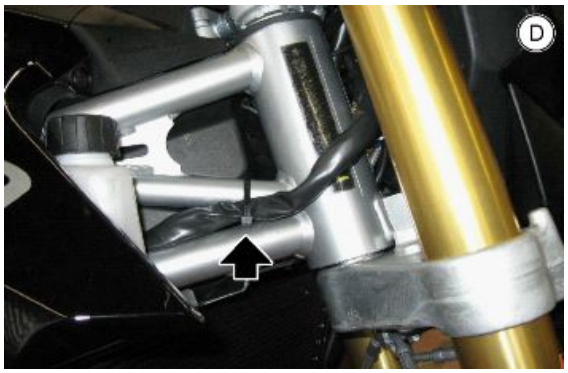


TABLE E - Front speed / ABS sensor cable

- 2.5x160 mm (0.01x6.30 in) Clamps

TABLE F - Front speed / ABS sensor cable

1. Hose clamps
2. 2.5x160 mm (0.01x6.30 in) Clamps
3. M4x6 TCB screw

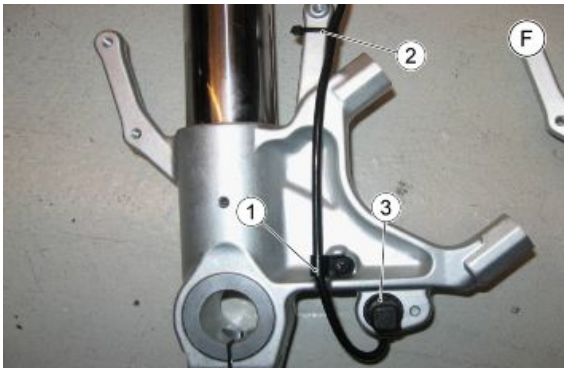


TABLE G - Front speed / ABS sensor cable

4. Cable grommet

TABLE H - Front speed / ABS sensor cable

5. 2.5x160 mm (0.01x6.30 in) Clamps

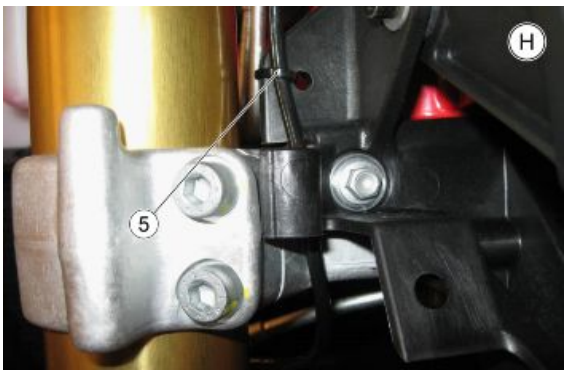


TABLE I - ABS pipes

6. 2.5x160 mm (0.01x6.30 in) Clamps

TABLE J

7. 2.5x160 mm (0.01x6.30 in) Clamps

Central part

CAUTION

ONCE THE ELECTRICAL SYSTEM IS REFITTED, THE CONNECTORS RECONNECTED AND CLAMPS AND RETAINERS RESTORED, CARRY OUT THE CHECKS INDICATED UNDER "SPECIAL CHECKS FOR THE CORRECT CONNECTION AND LAYING OF CABLES" IN THE "ELECTRICAL SYSTEM INSTALLATION" SECTION.

TABLES A: NOTES FOR INSTALLING THE

MAIN CABLE HARNESS

TABLE A1

Complete main cable harness.

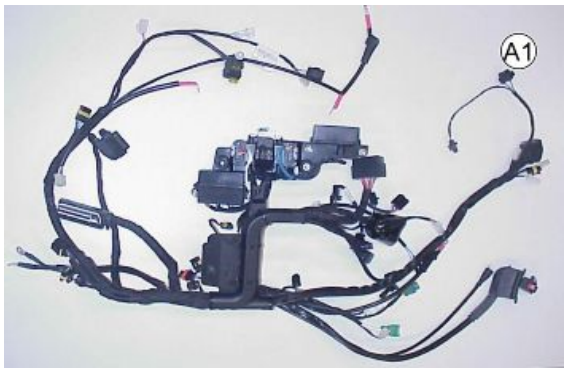


TABLE A2

4.5x290 mm (0.18x11.42 in) Clamps

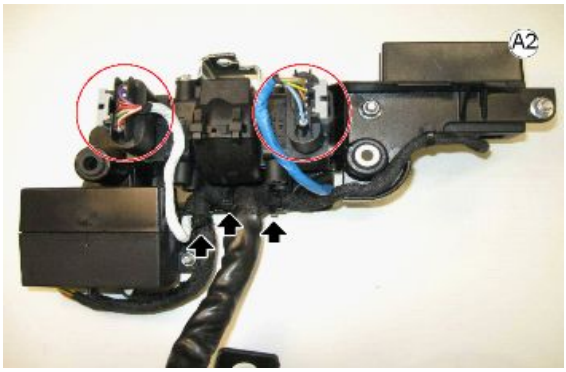


TABLE A3

1. Rubber blocks
2. Nuts
3. Bushes
4. 4.5x290 mm (0.18x11.42 in) Clamps (must be removed after reassembly to engine)

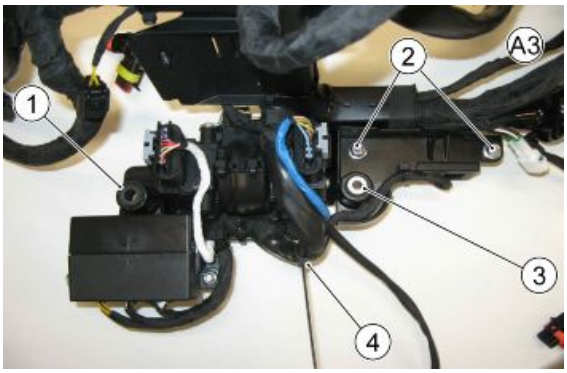


TABLE A4

5. Screw
6. M5 Clip
7. Short screws
8. Screws

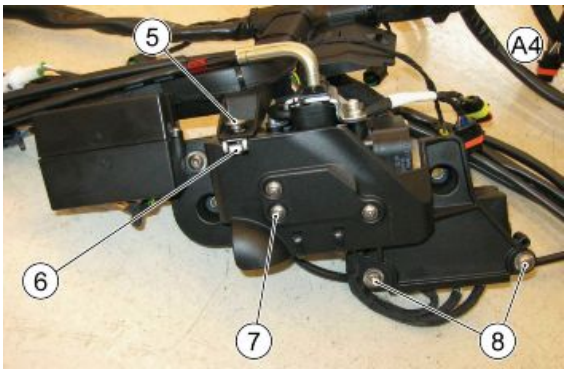


TABLE A5

Mounting for the AMP SuperSeal connector.

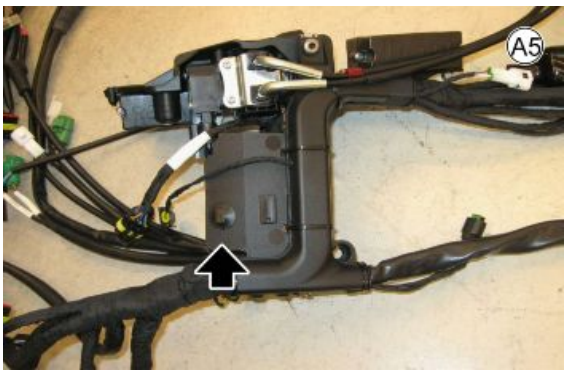


TABLE A6

9. Buffer
10. Bushes
11. Rubber blocks

TABLE A7

12. 4.5x290 mm (0.18x11.42 in) Clamps
13. No. 3 short screws

TABLE A8

View of the engine left side with cable harness assembled.

TABLE A9

View of the engine right side with cable harness assembled.

TABLE A10

Ensure that the cable harness is correctly routed, as shown.

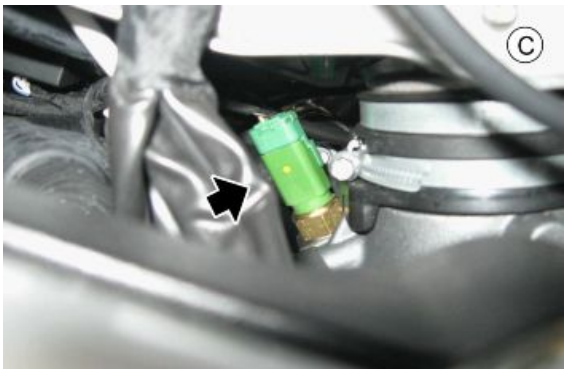
TABLE B - INJECTORS

14. GREEN connector for front cylinder injector

15. BLACK connector for rear cylinder injector

TABLE C: WATER TEMPERATURE BULB

Water temperature bulb and connection (at the base and inside the front cylinder).



TABLES D - OVERVIEW OF THE VARIOUS COMPONENTS POSITION

TABLE D1 - Rear cylinder coil connectors position and fastening

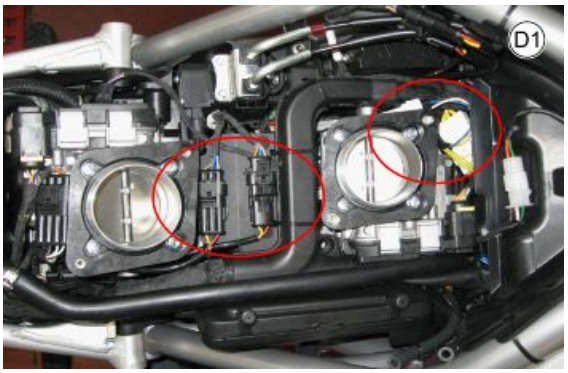


TABLE D2

4.5x290 mm (0.18x11.42 in) Clamps

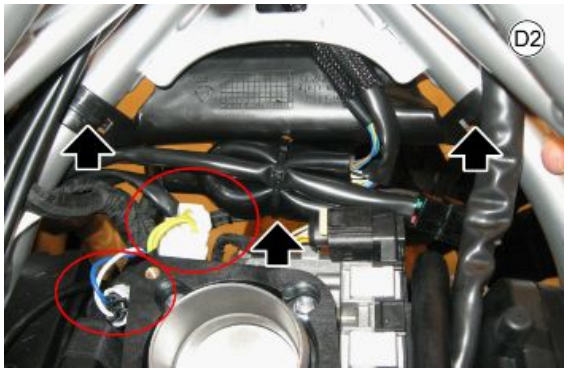


TABLE E

16. Cable harness protection
17. 4.5x180 mm (0.18x7.08 in) Clamps

TABLE F

18. Screws
19. Bushes

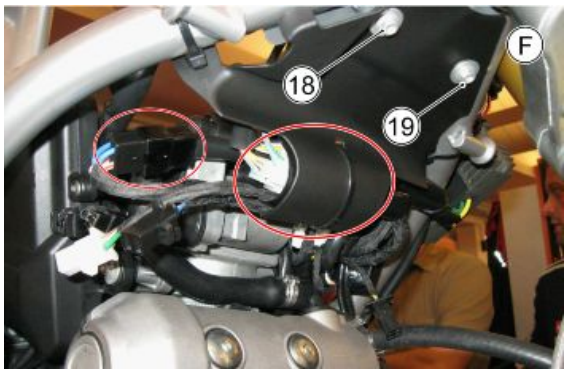


TABLE G

2.5x160 mm (0.01x6.30 in) Clamps

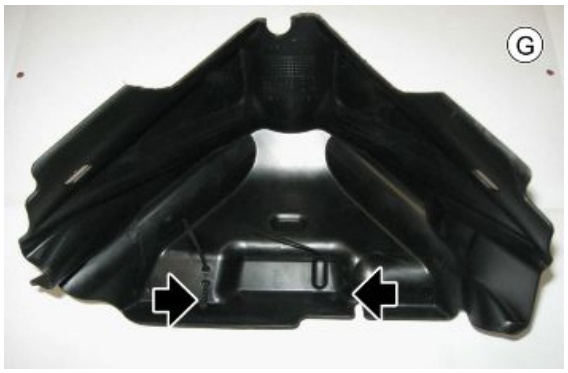
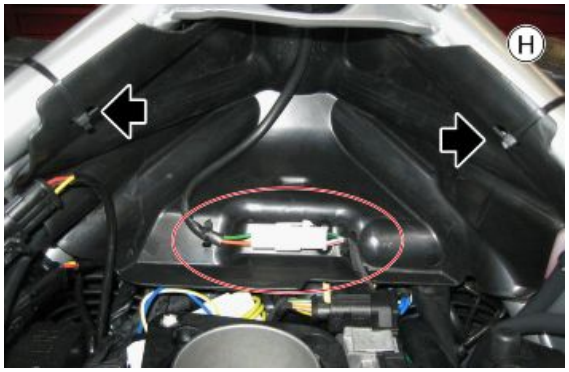


TABLE H

4.5x290 mm (0.18x11.42 in) Clamps



TABLES I: FRONT CYLINDER COIL CONNECTORS POSITION AND FASTENING

TABLE I1

20. Mounting for the AMP SuperSeal connector

21. MTA mounting for the Bosch connector

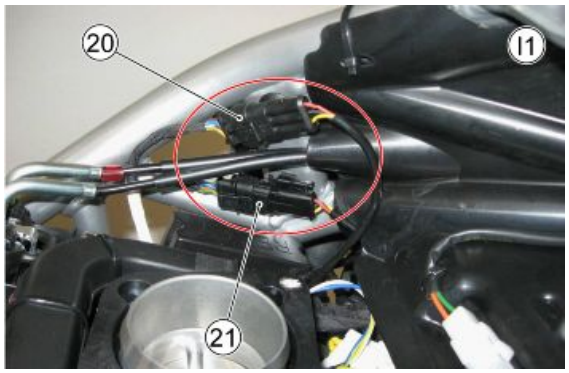


TABLE I2

TABLE I3

TABLES J: LAMBDA CONNECTOR POSITION

TABLE J1

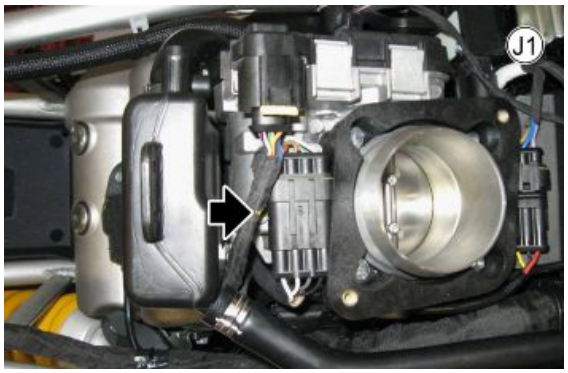


TABLE J2

TABLES K

TABLE K1: OVERVIEW WITH FILTER BOX BASE INSTALLED

TABLE K2

22. Gasket
23. Screws
24. Air temperature sensor

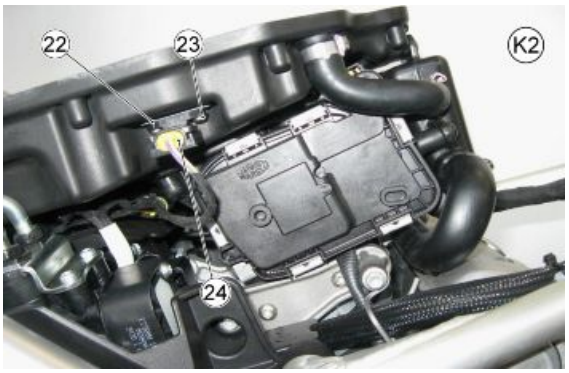


TABLE L

25. Cable harness supports

26. 2.5x160 mm (0.01x6.30 in) Clamps

TABLES M: FUEL PUMP CONNECTION POSITION

TABLE M1

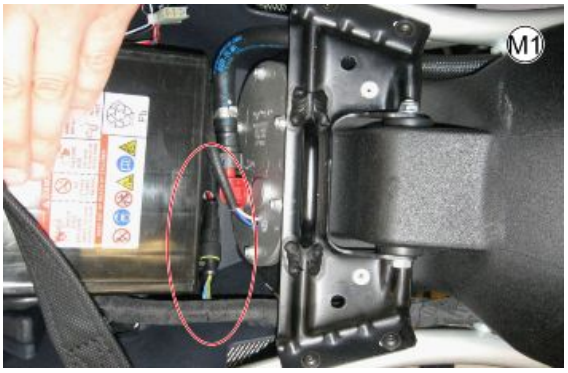


TABLE M2

TABLE M3

TABLE N

4.5x290 mm (0.18x11.42 in) Clamps

TABLE O

27. Polarised relay

28. Cap

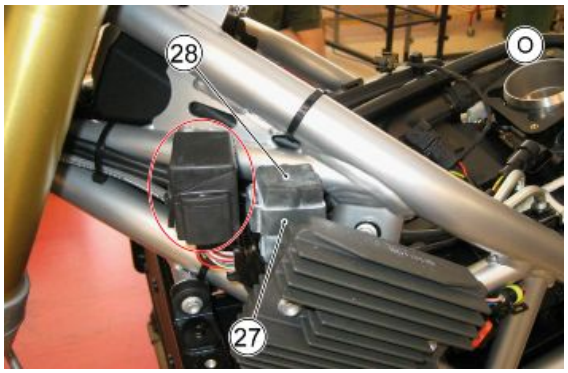


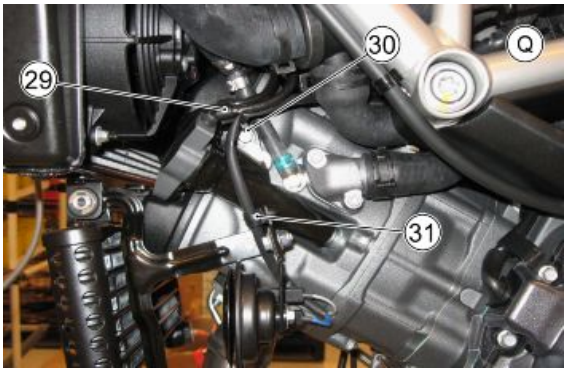
TABLE P: OVERVIEW OF THE LEFT SIDE

TABLE P1

TABLE P2

TABLE Q

29. Cable grommets
30. 2.5x98 mm (0.01x3.86 in) Clamps
31. Cable grommet



TABLES R

TABLE R1

- Starter cable and ABS branch are routed outside the metal cable grommet.

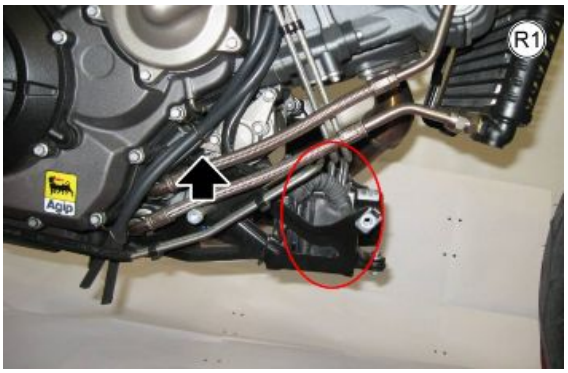


TABLE R2

4.5x290 mm (0.18x11.42 in) Clamps

TABLE R3

- The ABS branch must act as a trap to help keep water out of the gaiter.
- Frame seal and 4.5x180mm (0.18x7.08 in) clamps

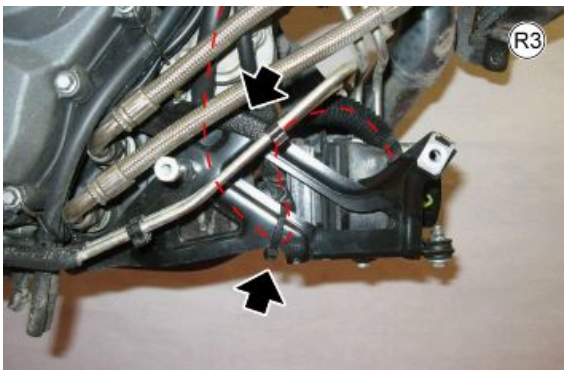


TABLE S - Starter motor connector

The starter motor connector cap is pierced.

Grease connector with waterproof grease.

32. Chassis seal.

TABLE T

4.5x290 mm (0.18x11.42 in) Clamps

TABLES U

TABLE U1

Cable guide.

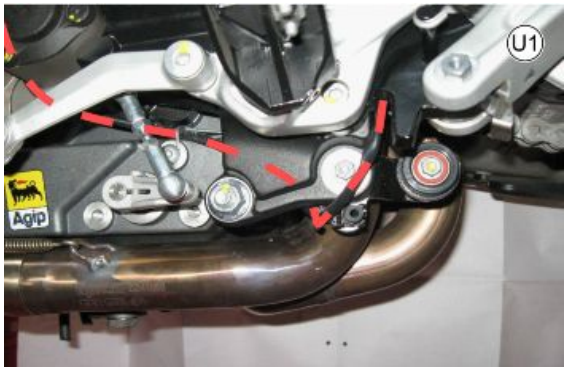


TABLE U2

33. Cable guide

34. Screw

TABLES V

TABLE V1

35. Stand switch cable: it must be routed under the clutch control support

36. 2.5x160 mm (0.01x6.30 in) Clamps

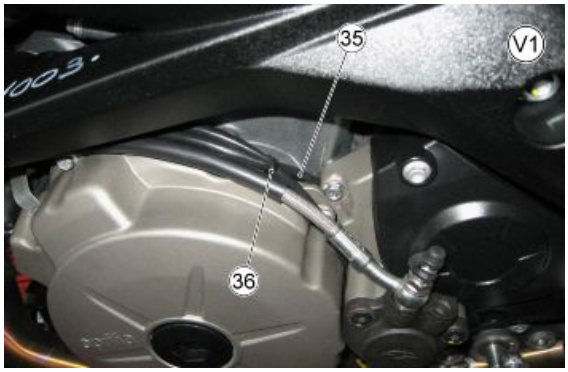


TABLE V2

4.5x290 mm (0.18x11.42 in) Clamps

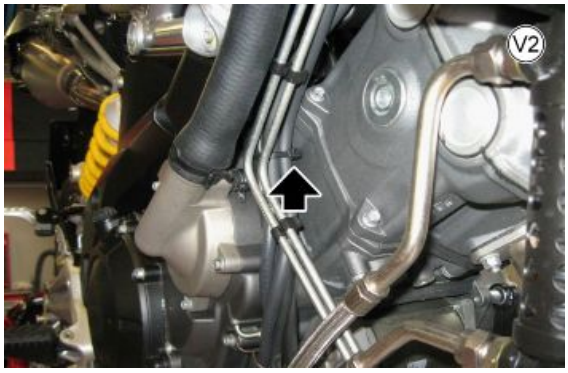


TABLE V3

2.5x98 mm (0.02x3.86 in) Clamps

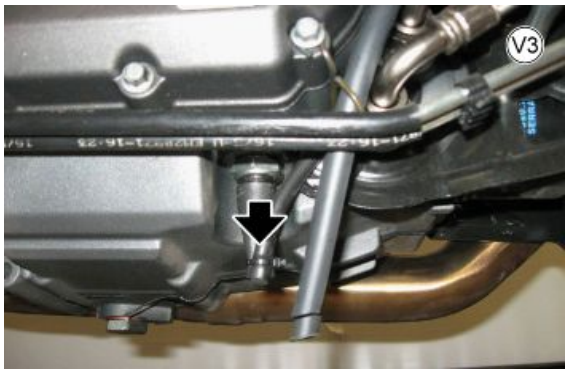


TABLE W: GROUND POINT

The ground point is on the engine, right side, and holds together only the two eyelets already present on main cable harness, through the flanged screw.

TABLE X

Cable grommet.

TABLE Y

Rear stop switch cable arrangement.

TABLE Z: OVERVIEW, LEFT SIDE

TABLES AA

TABLE AA1

Cable grommet.

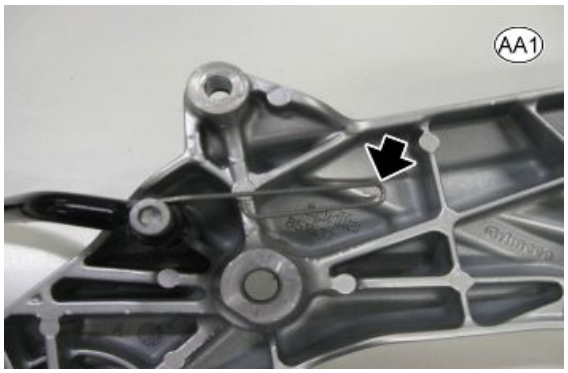


TABLE AA2

2.5x160 mm (0.01x6.30 in) Clamps

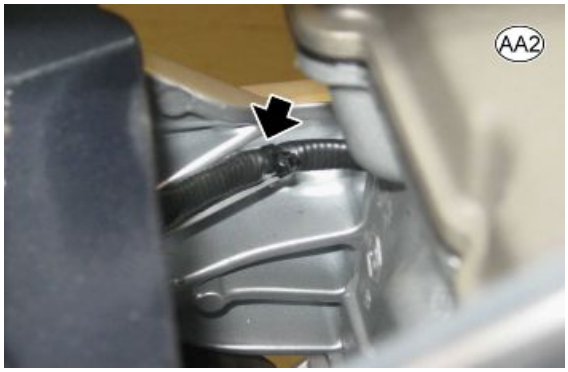


TABLE AA3

Lambda probe correct installation.

TABLE AA4

35. Screw

36. Cable grommet

TABLE AA5

Lambda probe cable arrangement.

TABLE AA6

Lambda probe cable arrangement.

Back side

CAUTION

ONCE THE ELECTRICAL SYSTEM IS REFITTED, THE CONNECTORS RECONNECTED AND CLAMPS AND RETAINERS RESTORED, CARRY OUT THE CHECKS INDICATED UNDER "SPECIAL CHECKS FOR THE CORRECT CONNECTION AND LAYING OF CABLES" IN THE "ELECTRICAL SYSTEM INSTALLATION" SECTION.

TABLES A

TABLE A1

1. Start-up relay
2. 30A fuses
3. Black cable guide

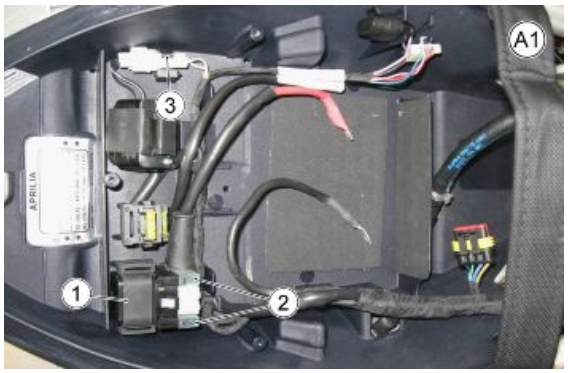


TABLE A2

BATTERY

TABLES B - FRONT AND REAR WHEEL SPEED / ABS SENSOR FITTING

TABLE B1

2.5x160 mm (0.01x6.30 in) Clamps

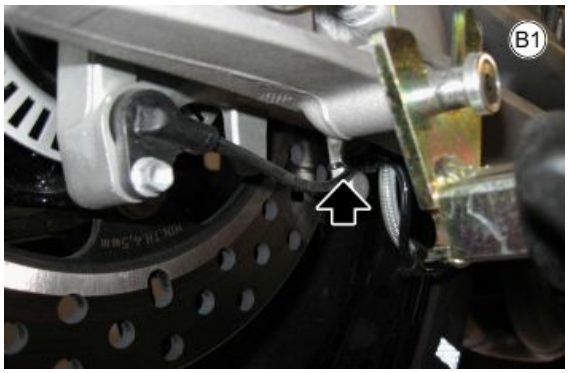


TABLE B2

4. 2.5x160 mm (0.01x6.30 in) Clamps

5. Cable grommet

4.5x180 mm (0.18x7.08 in) Clamps

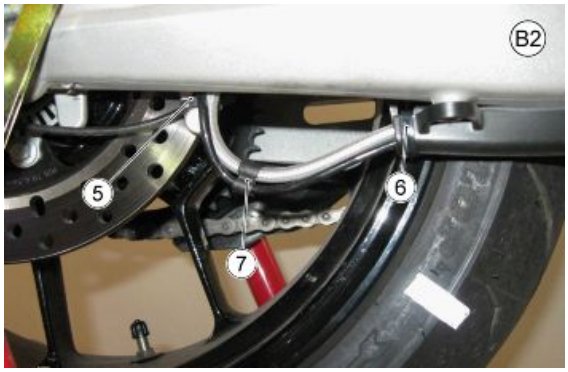


TABLE B3

Cable guide

TABLE B4

5. Cable grommet

TABLES C - NOTES ABOUT THE ROUTING OF THE TAILLIGHT CABLE HARNESS

TABLE C1

7. 4.5x290 mm (0.18x11.42 in) Clamp
8. Chassis seal
9. License Plate Light Cable Harness

TABLE C2

4. 2.5x160 mm (0.01x6.30 in) Clamp

10. Taillight Cable harness

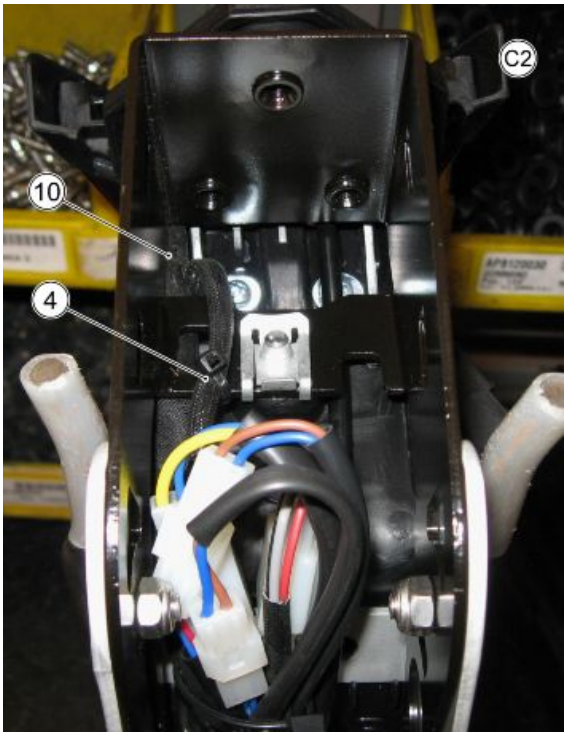


TABLE C3

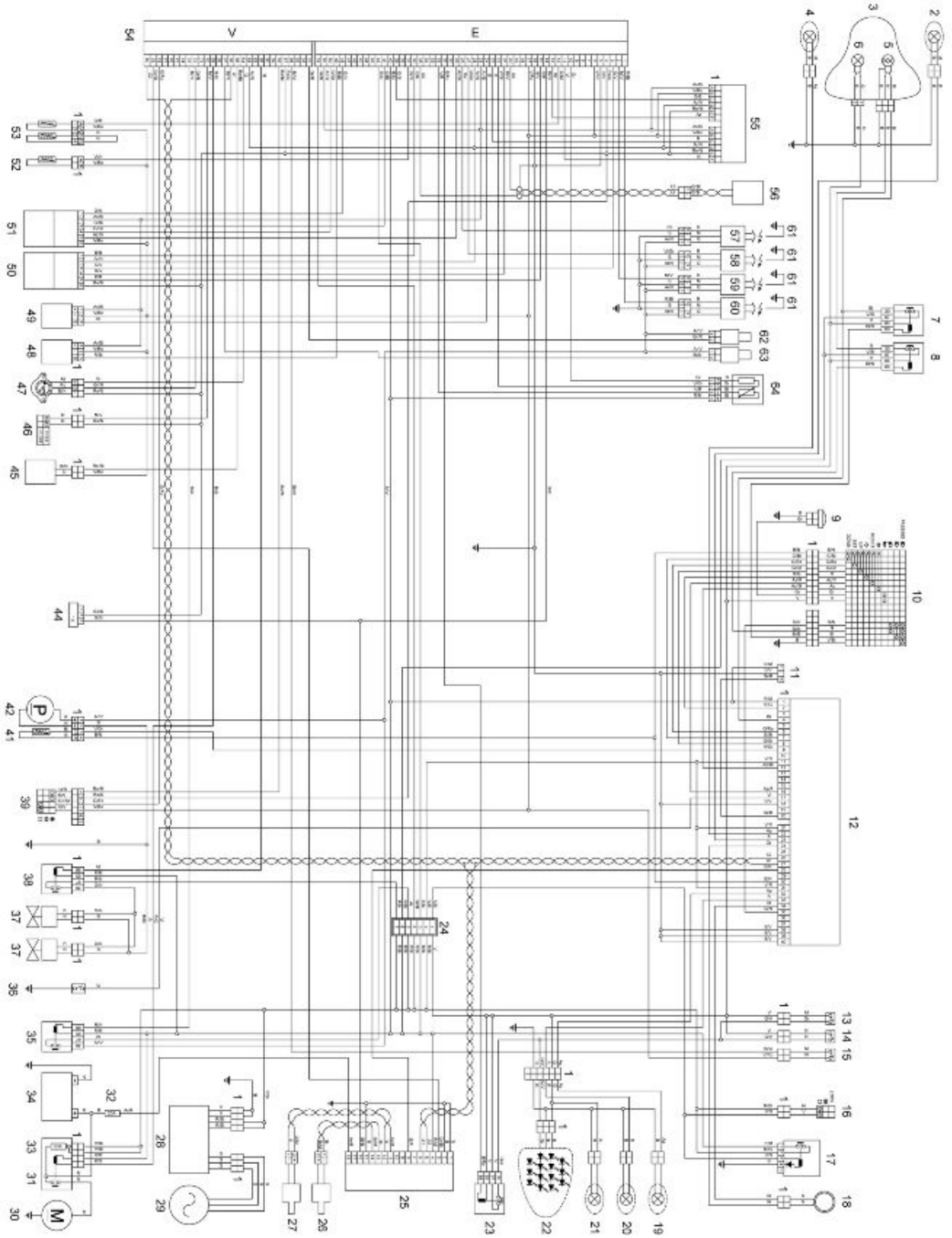
4. 2.5x160 mm (0.01x6.30 in) Clamp

11. Pipe clamp

TABLE C4

2.5x160 mm (0.01x6.30 in) Clamp

General wiring diagram



Key:

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

5. HIGH - LOW BEAM BULB
6. TAIL LIGHT BULB
7. HIGH BEAM LIGHT RELAY
8. LIGHT LOGIC RELAY
9. HORN
10. Left light switch
11. INSTRUMENT PANEL DIAGNOSIS
12. INSTRUMENT PANEL
13. FRONT STOP SWITCH
14. REAR STOP SWITCH
15. CLUTCH SWITCH
16. IGNITION SWITCH
17. MAIN INJECTION RELAY
18. IMMOBILIZER AERIAL
19. REAR LEFT TURN INDICATOR
20. Rear right turn indicator
21. LICENSE PLATE LIGHT BULB
22. TAILLIGHT ASSEMBLY
23. RECOVERY LOGIC RELAY
24. Secondary fuses
25. ABS CONTROL UNIT
26. FRONT ABS SENSOR
27. REAR ABS SENSOR
28. Voltage regulator
29. ALTERNATOR
30. STARTER MOTOR
31. START-UP RELAY
32. ABS CONTROL UNIT FUSE
33. MAIN FUSE
34. BATTERY
35. AUXILIARY INJECTION RELAY
36. OIL PRESSURE SENSOR
37. FAN
38. FAN CONTROL RELAY
39. Right light switch
40. -
41. FUEL RESERVE SENSOR (PIC)
42. FUEL PUMP

43.-
44.ECU DIAGNOSIS
45.FALL SENSOR
46.SIDE STAND SWITCH
47.GEAR SENSOR
48.REAR CYLINDER PRESSURE SENSOR
49.FRONT CYLINDER PRESSURE SENSOR
50.REAR CYLINDER THROTTLE
51.FRONT CYLINDER THROTTLE
52.INTAKE AIR TEMPERATURE SENSOR
53.Water Temperature Sensor
54.ECU
55.HAND GRIP POSITION SENSOR
56.ENGINE SPEED SENSOR
57.FRONT CYLINDER COIL
58.REAR CYLINDER COIL
59.FRONT CYLINDER COIL
60.REAR CYLINDER COIL
61.SPARK PLUG
62.FRONT CYLINDER INJECTOR
63.REAR CYLINDER INJECTOR
64.LAMBDA PROBE

Colour key:

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

Conceptual diagrams

Checks and inspections

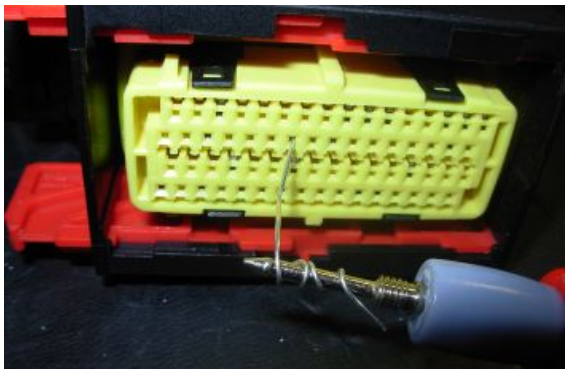
GENERAL CONCEPTS OF ELECTRICAL TROUBLESHOOTING

THE CONNECTION DIAGRAMS ARE IN THE ELECTRICAL SYSTEM SECTIONS; PAY ATTENTION TO THESE DIAGRAMS AS THEY SHOW THE CONNECTOR/COMPONENT AS VIEWED FROM THE CABLE HARNESS SIDE, THAT IS LOOKING AT THE CABLES WHEN GOING OUT OF THE "MAIN" CABLE HARNESS AND INTO THE CONNECTOR/COMPONENT.

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING PROCEDURE 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 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 CASE OF TEMPORAL MALFUNCTIONING, CARRY OUT ALL DUE CHECKS LOOKING FOR FAULT BY MOVING SLIGHTLY THE CABLE HARNESS BEING INSPECTED.

3. Pulling the cables slightly from the back of the connector in order to check the correct position of the terminals on the connector and of the cable on the terminal.

CONTINUITY check

Check goal: this control is to check that there are not any circuit interruptions nor excessive resistance, for instance caused by rust, on the two terminals being inspected.

Tester: set the tester on the "continuity" symbol and place the tester probes on the two circuit ends: the tester emits a sound signal only if there is continuity; the tester can also be set to the Ohm symbol to check that the circuit resistance is null or a few tenths of an Ohm.

CAUTION: THE CIRCUIT SHOULD NOT BE ENERGISED, OTHERWISE THE TEST IS IRRELEVANT.

GROUND CONNECTION check

Check goal: this control is to check if a cable or a circuit is in contact with the vehicle ground (-) connection.

Tester: set the tester on the "continuity" symbol and place one tester probe on the vehicle ground connection (or on the battery - terminal) and the other probe on the cable being inspected: the tester sends out a sound signal only if there is continuity. The tester can also be set to the Ohm symbol to check that the circuit resistance is null or a few tenths of an Ohm.

CAUTION! IF THERE IS A GROUND CONNECTION COMING FROM THE CONTROL UNIT, MAKE SURE THAT DURING THE TEST THE CONTROL UNIT IS GROUND CONNECTED TO THE CIRCUIT.

VOLTAGE check

Check goal: this control is to check if a cable is energised, i.e. if it receives power supply from the battery or the control unit.

Tester: set the tester on the direct current symbol and place the tester red probe on the cable being inspected and the black probe on the vehicle ground connection (or on the battery - terminal).

CAUTION

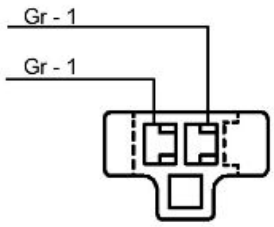
IN CASE OF TEMPORAL MALFUNCTIONING, CARRY OUT ALL DUE CHECKS LOOKING FOR FAULT BY MOVING SLIGHTLY THE CABLE HARNESS BEING INSPECTED.

Immobiliser

System components

Function

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



Level in electrical circuit diagram:

Immobilizer

Location:

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

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 failure: 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 diagnosis instrument and activate the engine revs indication choosing the function "Rpm indicator" from the "Devices Activation" screen page (injector icon)

Installing a 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:

98789

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:

98789

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

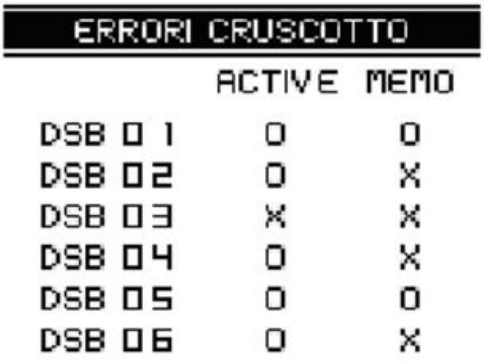
- INCORRECT CODE

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 Navigator 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

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-up signal

Location:

- on the vehicle: right light switch.
- connector: between filter box and water radiator, at the centre.

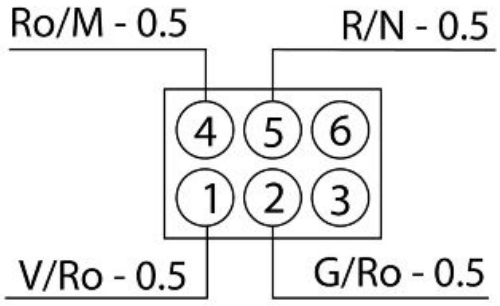
Electrical characteristics:

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

Pin out:

4: voltage + 5V

5: 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.

DIAGNOSIS INSTRUMENT: 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.

DIAGNOSIS INSTRUMENT: LOGIC ERRORS

Starter switch P0169

- signal not valid.

Error cause

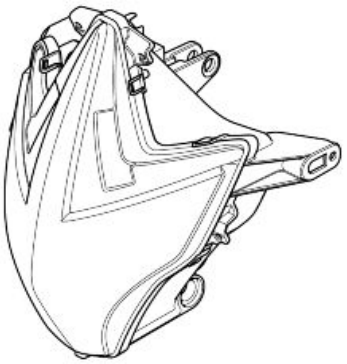
- Fault in the switch (lock) of the engine start-up. The instrument panel does not indicate the presence of this error even in the ATT status.

Troubleshooting

- Check the locking cause and restore.

Lights list

Front headlamp



Characteristic

Front daylight running light

12V - 6W H6

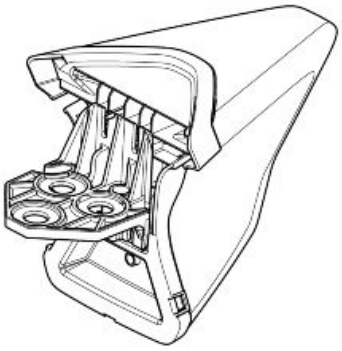
Low beam light

12 V - 50 W H4

High beam light

12 V - 60 W H4

Rear light



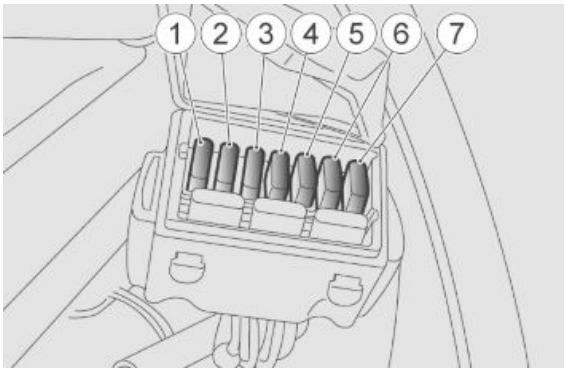
Characteristic

Rear daylight running light / stop light

LED

Fuses

SECONDARY FUSES (front left, above the water radiator)



1 - Light logic relay, Recovery logic relay, Stop, Horn, Daylight running lights, License plate light (10 A).

2 - Permanent instrument panel positive (7.5 A).

3 - Live positive leads to the ECU (15 A).

4 - Permanent positive leads to the ECU (7.5 A).

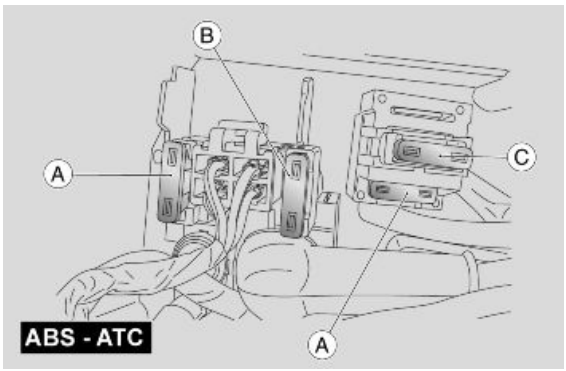
5 - Coils, Petrol pump, Injectors (15 A).

6 - Low beam/high beam light logic (15 A).

7 - Fans (15 A).

Spare fuses (7.5 - 10 - 15 A)

MAIN FUSES - ABS - ATC version (under the saddle, remove the battery protection)



A - Spare fuses (30 A - 20 A)

B - Battery recharge, fan relay, live positive, lambda probe, ABS - ATC live positive (30 A)

C - Permanent ABS - ATC positive (20 A)

Control unit

- Remove the fuel tank.
- Unscrew and remove the two screws.

- Shift the ECU and the protection.
- Remove the ECU protection.
- Disconnect the connector and remove the control unit.

NOTE

WHEN REFITTING THE CONNECTORS, THE SLIDES MUST MOVE FREELY TO THE END OF STROKE, WHICH HELPS WITH THE INSERTION OF THE CONNECTOR: YOU MUST HEAR THE RELEASE OF THE RETAINING TANG AT THE END OF STROKE.

See also

Fuel tank
Air box

CONTROL UNIT - Diagnosis

Function

it controls 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

Location:

- on the vehicle: right side, next to the filter box
- connector: on connector control unit of ENGINE PIN 52 (figure A), connector of ENGINE PIN 28 (figure B)

Pin out: See the CONNECTORS section

DIAGNOSIS INSTRUMENT: PARAMETERS ISO

Screen page

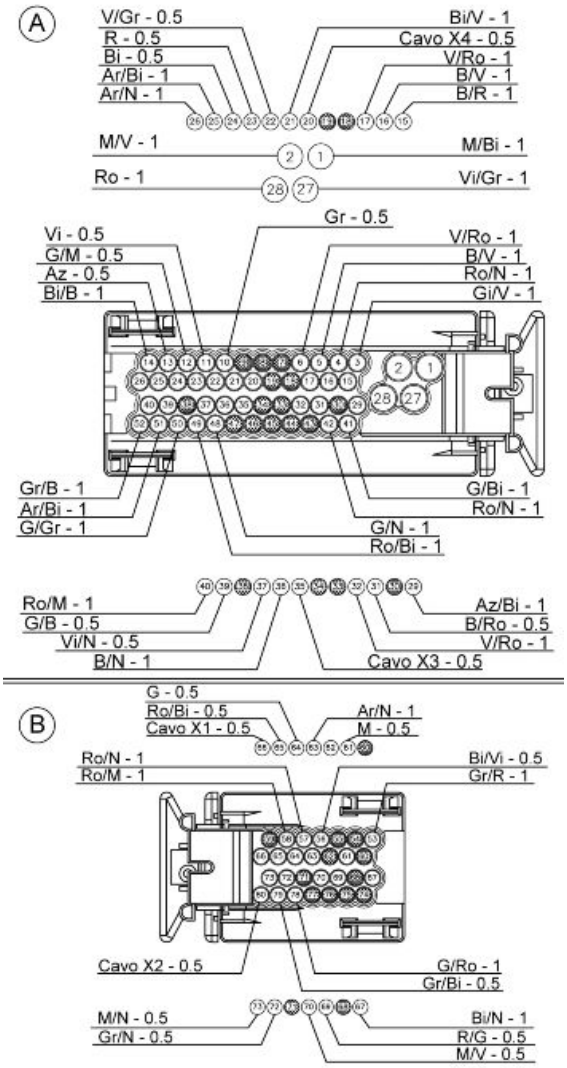
(screen/example value with key set to ON)

- Drawing number / -
- Marelli spare part code / IAW7SMHW430
- Hardware number / 00
- Mapping / -
- Software version number / 0000
- Type-approval Code / -
- ISO Code / -
- Marelli software code / -
- Control unit series number (NIP) / 7SMPRA119 - Identifies the single control unit
- Person in charge for last programming / - Indicates the series number of the diagnosis instrument that has carried out the last control unit remapping

DIAGNOSIS INSTRUMENT: PARAMETERS

Nominal idle speed

- Example value with key ON: 1600 rpm



Adjustable fuel supply

Adjustable fuel correction

CAUTION

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DIAGNOSIS INSTRUMENT: STATUSES

Engine status

- Indefinite_Key ON_Running engine_Stopped_Power latch_Power latch 2_Power latch finished

Engine mode

- Indefinite_Start-up_Stable_Idle_Acceleration_Deceleration_Enters Cut Off_Cut Off_Exits Cut Off

Immobilizer signal

- yes/no
- Indicates whether the control unit has received the consent by the instrument panel regarding the immobilizer: coded key or user code entered manually. Potential errors will be shown on the Instrument Panel Errors screen page, on the DIAGNOSIS section of the instrument panel

Start-up enabling

- yes/no
- Indicates whether the control unit will enable start-up when requested: in case the safety measures are not respected (side stand, neutral sensor and clutch in correct position) or the fall sensor is inverted or if the immobilizer does not send the start-up consent to the control unit, the status is NO

DIAGNOSIS INSTRUMENT: ACTIVATION

Stop light

- The safety relay is energised (No. 23 in the wiring diagram; location: under the passenger saddle; also CHECK relay identification with the colour of the cables)

Error clearing

Ambient parameter reading

- Front throttle valve position target angle
- Rear throttle valve position target angle
- Front throttle position
- Rear throttle position
- Engine Temp. before Recovery

- Front cylinder average intake pressure (1)
- Rear cylinder average intake pressure (2)
- Engine rpm
- Indicated average torque
- Engine status - Indefinite_Key ON_Running engine_Stopped_Power latch_Power latch 2_Power latch finished
- Odometer
- Mapping selection - Indefinite/Rain/Touring/Sport

DIAGNOSIS INSTRUMENT: ELECTRICAL ERRORS

EEPROM Error P0601

- circuit not operational

Error cause

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

RAM Error P0604

- circuit not operational

Error cause

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

ROM Error P0605

- circuit not operational

Error cause

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

A/D converter P0607

- circuit not operational

Error cause

- Replace injection ECU

Safety relay error P0610

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 31. If shorted to negative: no voltage has been detected. If the circuit is open: an interruption has been detected

Troubleshooting

- If shorted to positive: check the relay electrical specifications are correct by disconnecting it from the cable harness. If they are not correct, replace the relay; if OK, restore the cable harness (Blue/Pink cable)
- If shorted to negative: check the relay electrical specifications are correct by disconnecting it from the cable harness. If they are not correct, replace the relay; if OK, restore the cable harness (Blue/Pink cable)
- If the circuit is open: check the relay electrical characteristics are correct by disconnecting it from the cable harness; if not OK, replace the relay, if OK, check relay connector and ENGINE connector of the Marelli control unit: if not OK, restore; if OK, check continuity of cable harness (Blue/Pink cable)

DIAGNOSIS INSTRUMENT: LOGIC ERRORS

Level 2 safety reset P0608

Error cause

- As the level 2 safety system (comparison between requested torque and calculated torque) has detected a fault, the control unit has reset engine (C gravity). The instrument panel does not indicate the presence of this error even in the ATT status.

Troubleshooting

- Continue fault search for the other errors detected

Safety Engine Stop P0609

Error cause

- Since the safety system has detected a serious fault, the control unit has shut off the engine

Troubleshooting

- Continue fault search for the other errors detected.

Saved data file (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

- Continue fault search for the other errors detected.

See also

Cylinders synchronisation

Saved data file download

Error cause

- The BUFRSVXX.BIN file is saved in the diagnosis instrument memory card or in your PC hard disk, if you are using Piaggio Group Diagnostic Software combined to the diagnosis instrument: data regarding the control unit serial number and the serial number of the diagnosis instrument that has carried out the download is also included in the file

Saved data file deletion

Error cause

- Deletion enabled only if the file is downloaded after setting KEY ON

NEW CONTROL UNIT ACTIVATION PROCEDURE and 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 this time the control unit carries out throttle position acquisition. Connect to diagnosis instrument and check that the statuses "Front throttle automatic self-acquisition" and "Rear throttle automatic self-learning" are "Carried out" and "Handle self-acquisition" is "Not carried out" (this last status entails Urgent service being displayed on the instrument panel). If front and rear throttle automatic self-acquisition indicate "Not carried out" go to phase 1, if indicate "Carried out" go to phase 2. Phase 1: current errors have probably been detected by the control unit: solve these malfunctions and check the two statuses. Throttle Self-learning can also be checked from the Parameter adjustment (screwdriver and hammer) screen page. Stage 2: Carry out the Handle Self-learning from the Parameter adjustment (screwdriver and hammer) screen page and check that Handle Self-learning status is Carried out. If not OK the voltage detected on the throttle is out of scale (check with diagnosis instrument) or current errors have been probably detected by the control unit: solve these malfunctions and repeat the procedure

Battery

Function

Battery YTX 14-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: 12 Ah

Pin out:

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

DIAGNOSIS 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

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DIAGNOSIS INSTRUMENT: LOGIC ERRORS

Battery voltage P0560

- too high/too low

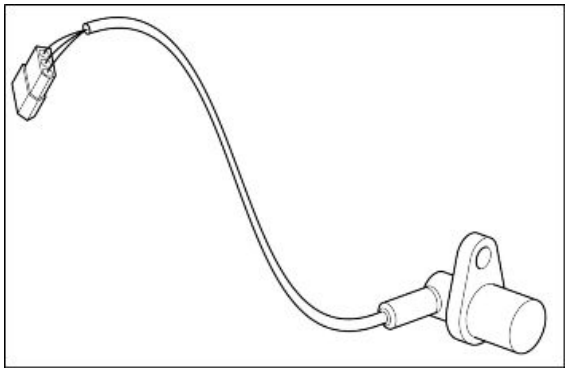
Error cause

- 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 indicate the vehicle speed by reading the front wheel turning speed.

OPERATION / OPERATING PRINCIPLE: Magnetoresistive sensor: a square-wave pulse is generated with voltage approx. between 11.55 V and 11.25 V

WIRING DIAGRAM Level in wiring diagram: ABS.

REMOVAL

LOCATION ON THE VEHICLE:on the fork, right stem, next to the brake calliper support.

CONNECTOR LOCATION (if available): under the helmet compartment.

PINS

- PIN 1- Ground connection (white)
- PIN 2 - Power supply voltage/Output signal (white/brown)

NAVIGATOR

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

ELECTRICAL ERRORS

Speed sensor

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

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

LOGIC ERRORS

Speed sensor

5D91 the signal works irregularly: faulty sensor or signal interference.

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

5D92 the signal decreases periodically: Possible tone wheel fault due to deformations or dirt; possible alterations on the wheel bearing surface. In very rare cases, abnormal tone wheel vibrations.

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

5D93 missing signal or speed measured too low in relation to the rear wheel: faulty sensor or missing sensor/tone wheel. Or excessive distance between the sensor and the tone wheel or tone wheel with wrong number of teeth.

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

5D94 no acceleration after pressure reduction: Faulty sensor or missing sensor/tone wheel or excessive distance between the sensor and the tone wheel.

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

5D95 excessive speed measured: Faulty sensor or tone wheel, or tone wheel with wrong number of teeth or wrong tyre size.

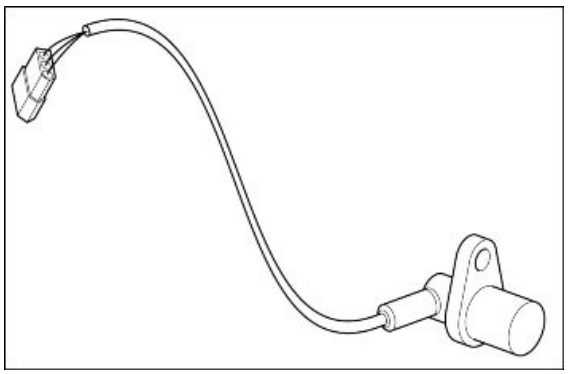
Troubleshooting: Check that the speed sensor and the tone wheel are installed. If they are not, install them. If they are, check the speed sensor retainer. If it is not OK, restore it. If it is, check if the tone wheel has the correct number of teeth or if it is dirty, deformed or wrongly fixed. If it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

VEHICLE REAR SPEED SENSOR

FUNCTION: To indicate the vehicle speed by reading the rear wheel turning speed.

OPERATION / OPERATING PRINCIPLE: Magnetoresistive sensor: a square-wave pulse is generated with voltage approx. between 11.55 V and 11.25 V

WIRING DIAGRAM Level in wiring diagram: ABS.



REMOVAL

LOCATION ON THE VEHICLE:on the swingarm, right side, under the chain tension screw.

CONNECTOR LOCATION (if available): under the saddle, right side.

PINS

- PIN 1- Ground connection (yellow)
- PIN 2 - Power supply voltage/Output signal (yellow/brown)

NAVIGATOR

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

ELECTRICAL ERRORS

Speed sensor

5DA0 electric malfunction: Electrical fault in sensor or cable harness.

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

LOGIC ERRORS

Speed sensor

5DA1 the signal works irregularly:faulty sensor or signal interference.

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

5DA2 the signal decreases periodically: Possible tone wheel fault due to deformations or dirt; possible alterations on the wheel bearing surface. In very rare cases, abnormal tone wheel vibrations.

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

5DA3 no signal or speed measured too low in relation to the front wheel: Faulty sensor or missing sensor/tone wheel. Or excessive distance between the sensor and the tone wheel or tone wheel with wrong number of teeth.

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

5DA4 missing acceleration after pressure reduction: Faulty sensor or missing sensor/tone wheel or excessive distance between the sensor and the tone wheel.

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

5DA5 excessive measured speed: Faulty sensor or tone wheel, or tone wheel with wrong number of teeth or wrong tyre size.

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

Engine rpm sensor

ENGINE SPEED SENSOR

Function

It informs crankshaft position and speed to the Marelli control unit.

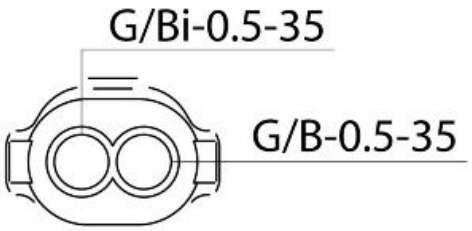
Operation / Operating principle

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

Location:

- on the vehicle: inside the flywheel cover
- connector (if available): near the Marelli control unit



Electrical characteristics:

- Resistance at ambient temperature:
  130 +/- 20 Ohm

Pin-out:

1. Negative signal
2. Positive signal

CAUTION

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DIAGNOSIS INSTRUMENT: STATUSES

Synchronised panel

- No_under analysis_standby_Yes

DIAGNOSIS INSTRUMENT: ELECTRICAL ERRORS

CAUTION

IF THE ELECTRIC CIRCUIT IS INTERRUPTED OR SHORT-CIRCUITED, NO ERROR IS DISPLAYED. CHECK THE ENGINE SPEED SENSOR CONNECTOR AND THE MARELLI CONTROL UNIT CONNECTOR: IF NOT OK, RESTORE; IF OK, CHECK THE CORRECT ELECTRIC CHARACTERISTICS OF THE SENSOR: IF NOT OK, REPLACE THE SENSOR. IF OK, CHECK THAT THERE IS CONTINUITY ON BOTH CABLES, SUPPLY INSULATION AND GROUND INSULATION. CARRY OUT THE TESTS FROM THE SENSOR CONNECTOR TO THE SENSOR. IF NOT OK, RESTORE THE CABLE HARNESS/REPLACE THE SENSOR. IF OK, PERFORM THE TEST FROM PIN 20 AND 35 OF THE MARELLI CONTROL UNIT ENGINE CONNECTOR.

DIAGNOSIS INSTRUMENT: LOGIC ERRORS

Engine speed sensor P0336

- signal not valid

Error cause

- Probable bad contact in the electric circuit detected at PIN 20 - 35 of the ENGINE connector

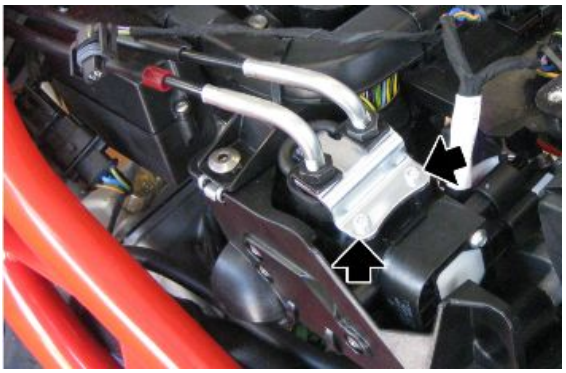
Troubleshooting

- Check the electric circuit is in good conditions and the flywheel teeth cleaning and correct positioning of the sensor in its own housing: if it is not, replace it. If it is OK, replace the sensor

Twistgrip position sensor

Removal

- Remove the filter box.
- Loosen the throttle cable nuts.
- Unscrew and remove the two fixing screws.



- Disconnect the two connections and remove the throttle grip position sensor.
- Remove the throttle cables.

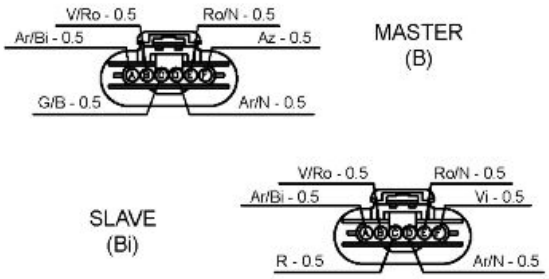
See also

Air box

THROTTLE GRIP POSITION SENSOR

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 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 electrical circuit diagram: Throttle grip position sensor.

Location:

- on the vehicle: left side, under the filter box
- connector: on the sensor

Electrical characteristics:

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

MASTER connector (blue)

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

SLAVE connector (white)

- 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 front connector throttle grip position sensor - track A

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

Voltage value of the front potentiometer - track A

Blue front 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 front potentiometer track B

White rear connector throttle grip position sensor - track C

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

Voltage value of the rear potentiometer track C

White rear 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 rear 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

Handle self-learning

- carried out/not carried out

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

Blue front 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 ENGINE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 39 of the ENGINE connector.

Troubleshooting

- shorted to positive: check the value shown by the parameter of the BLUE front 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 front 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 ENGINE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 13 of the ENGINE connector

Troubleshooting

- short circuit to positive: check the value shown by the parameter of the BLUE front 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 rear 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 rear 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: with open circuit, short it 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 rear 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 rear connector Throttle Grip Position Sensor - track D: 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: LOGIC ERRORS

Blue front 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 front 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 rear 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 rear 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 front side sensor (tracks A-B) does not coincide with the value of the rear sensor (tracks C-D)

Troubleshooting

- Replace the throttle grip sensor

DIAGNOSIS INSTRUMENT: ADJUSTABLE PARAMETERS

Handle self-learning: -

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 self-learning procedure with the diagnosis instrument: once the check is completed, make sure that the Handle self-learning status indicates: carried out

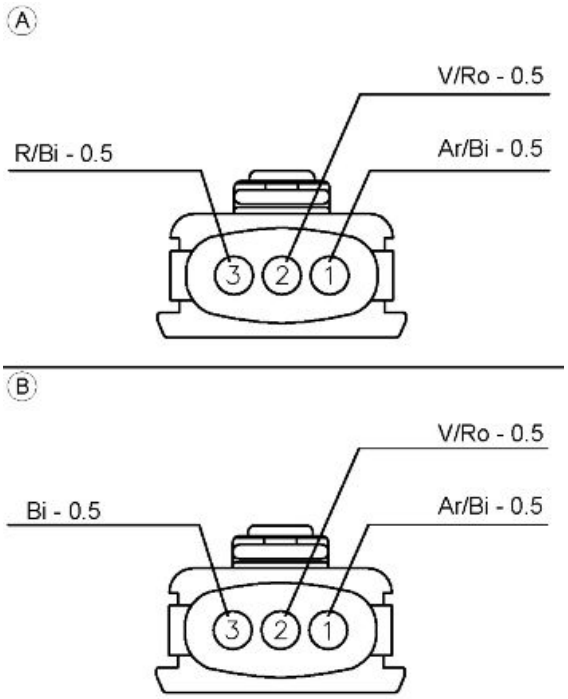
CAUTION

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 CONNECTOR AND THE BLUE BAND SHOULD BE PLACED AT THE FRONT. THE CONNECTOR AND THE WHITE BAND SHOULD BE PLACED AT THE BACK.

Intake pressure sensor

Figure key

- A - Rear
- B - Front



Function

The pressure sensors (one at the front, one at the rear) 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 electrical circuit diagram:

Intake air pressure sensor

Location:

- on the vehicle: rear cylinder sensor on rear throttle body right side, front cylinder sensor on front throttle body left side.
- 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

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

Rear Cylinder Intake Pressure

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

Front Cylinder estimated Intake Pressure

- 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

Rear Cylinder estimated Intake Pressure

- 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

CAUTION

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DIAGNOSIS INSTRUMENT: ELECTRICAL ERRORS

front 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: verify that the parameter of the front cylinder air Pressure Sensor on the diagnosis instrument is 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.

rear 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: verify that the parameter of the rear cylinder air Pressure Sensor on the diagnosis instrument is approx. 1200 mbar; disconnect the sensor connector: if the value does not 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

front 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 ENGINE 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 activa-

ted. 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 ENGINE 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 front 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 (intake manifold conditions).

Troubleshooting

- Check the conditions of the intake manifold and cleanliness of the hole for pressure reading.

Error for unexpected air intake in the rear 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 (intake manifold conditions).

Troubleshooting

- Check the conditions of the intake manifold and cleanliness of the hole for pressure reading.

Estimation error for front 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 hole for pressure reading is clogged or sensor screw is loose).

Troubleshooting

- Check the conditions of the intake manifold and cleanliness of the hole for reading the pressure: there is an evident defect in the intake and pressure reading systems.

Estimation error for rear 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 hole for pressure reading is clogged or sensor screw is loose).

Troubleshooting

- Check the conditions of the intake manifold and cleanliness of the hole for reading the pressure: there is an evident defect in the intake and pressure reading systems.

Pressure too low at front 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 conditions of the intake manifold and cleanliness of the hole for pressure reading.

Pressure too low at rear 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).

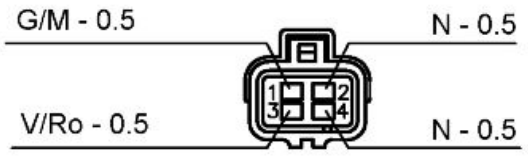
Troubleshooting

- Check the conditions of the intake manifold and cleanliness of the hole for pressure reading.

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

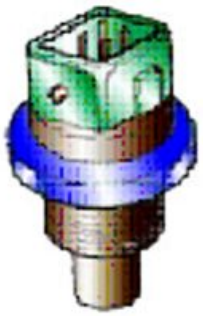
NTC type sensor (resistance sensor, inversely variable with temperature).

Level in electrical circuit diagram:

Temperature sensors

Location:

- on the vehicle: on the front cylinder, inside the "V"
- 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. Yellow/Brown: 0-5 V signal
2. Green/Pink: 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 90°.

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.

DIAGNOSIS INSTRUMENT: 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

DIAGNOSIS INSTRUMENT: LOGIC ERRORS

engine temperature sensor P0116

- signal not valid.

Error cause

- An excessive temperature variation has been detected: for example, the cause may be a contact resistance between the terminals. 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.

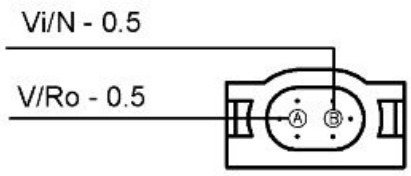
NOTES

No error is detected if the sensor does not work correctly or the control unit connector or sensor terminals are rusty: then check through Navigator 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

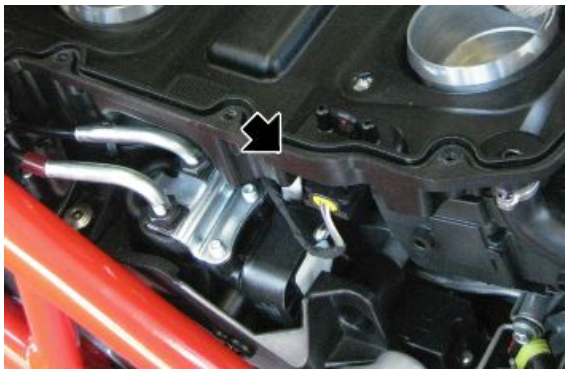


Operation / Operating principle

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

Level in wiring diagram:

Temperature sensors



Location:

- sensor: on filter box left side, next to rear throttle body
- 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: 45 °C (113 °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 Purple/Black cable has ground connection: restore the cable harness

Lambda sensor

Function

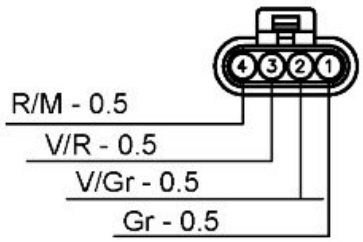
In charge of telling the control unit whether the mixture is lean or rich

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



Location:

- on the vehicle: exhaust end behind the rear head
- connector: on the right side, at the back of the filter box

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)

DIAGNOSIS INSTRUMENT: PARAMETERS

Lambda probe

- Example value with key ON: 0 mV
- Example value with engine on: 100--900 mV

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

Lambda correction

- Example value with key ON: 1.00 mV
- Example value with engine on: 0.90 - 1.10mV

In closed loop, the value must be close to 1.00 (values not within the 0.90 - 1.10 interval indicate a fault): for example, value 0.75 corresponds to +25% with respect to the reference injection time; 1.25 corresponds to -25%. In an open circuit, the lambda probe signal is too low. Therefore, the control unit takes it as a lean combustion condition and will try to enrich it. The value read will be 0.75: once this correction has been tried, the value shifts to 1.00 fixed and the Lambda probe error is signalled

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

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.

DIAGNOSIS INSTRUMENT: ACTIVATION

Lambda probe heating

- The auxiliary injection relay (No. 35 in the wiring diagram, placed in the front relay box, left side; 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

DIAGNOSIS INSTRUMENT: 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/Red 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 Pink/Brown cable continuity between the probe connector and the auxiliary injection relay (No. 35 in the wiring diagram, placed in the front relay box, left side; 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 Green/Red cable ground insulation (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 auxiliary injection relay (No. 35 in the wiring diagram, placed in the front relay box, left side; 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 Green/Red cable ground insulation (PIN 3): if not OK, restore the cable harness. If it is OK, check the continuity of the Green/Red 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.

DIAGNOSIS INSTRUMENT: LOGIC ERRORS

Lambda probe P0134 - voltage without variation.

Error cause

- An abnormal behaviour of the voltage at PIN 10 of the ENGINE connector has been detected: the voltage, that should vary over time, keeps a constant value instead.

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.

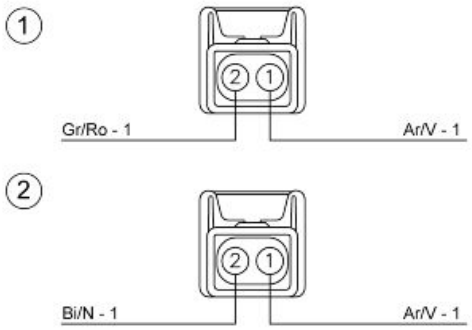
CAUTION

IN CASE THE Lambda sensor correction PARAMETER, WITH ENGINE AT IDLE AND H2O T >90 °C, WHICH IS NOT WITHIN THE 0.9 - 1.1 RANGE, WITHOUT ERRORS, CHECK:
- IF < 0.9, THE PROBE READS LEAN COMBUSTION CONDITIONS AND THE CONTROL UNIT INCREASES INJECTION TIME; CAUSES: CHECK FOR INCORRECT AIR INTAKE, LITTLE PETROL, RUSTY TERMINAL CONTACTS, DEFECTIVE PROBE.
- IF > 1.1, THE PROBE READS RICH COMBUSTION CONDITIONS AND THE CONTROL UNIT REDUCES INJECTION TIME; CAUSES: LITTLE AIR, EXCESSIVE PETROL, DEFECTIVE PROBE.

Injector

Injectors key:

1. Front injector
2. Rear injector



INJECTOR

Function

To supply the correct amount of petrol at the right timing.

Operation / Operating principle

Injector coil is excited for the petrol passage to open

Level in electrical circuit diagram:

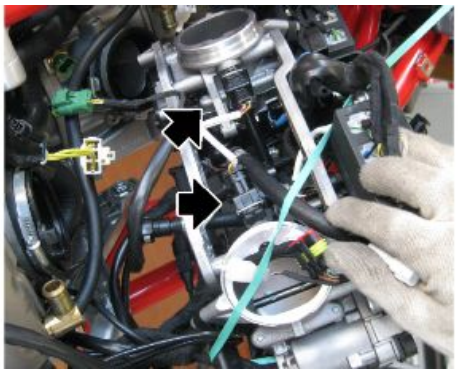
Coils and injectors

Location:

- on the vehicle: intake manifold
- connector: on injectors

Electrical characteristics:

14.8Ω ± 5% (at ambient temp)



Pin out:

- "+": supply
- " ": ground

DIAGNOSIS INSTRUMENT: PARAMETERS

Front cylinder injection time

- Example value with engine on: 1.9 ms

Rear cylinder injection time

- 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.

DIAGNOSIS INSTRUMENT: ACTIVATION

Front cylinder injector

- The auxiliary injection relay (No. 35 in the wiring diagram, placed in the front relay box, left 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. The continuity of the wiring is necessary for correct activation: no error indications are displayed in case of lack of activation

Rear cylinder injector

- The auxiliary injection relay (No. 35 in the wiring diagram, placed in the front relay box, left 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. 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

Front cylinder injector: P0201

- 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 diagnosis instrument and check the voltage on the Grey/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 Grey/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 2 and restore the cable harness

Rear cylinder injector P0202

- 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 diagnosis instrument and check the voltage on the White/Black 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/Black 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 67 and component PIN 2 and restore the cable harness

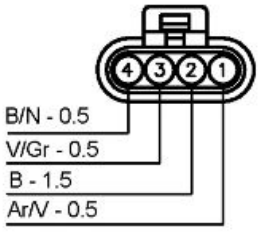
Fuel pump

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: near the fuel pump (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

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: ACTIVATION

Fuel pump

NOTE: The auxiliary injection relay (No. 35 in the wiring diagram, positioned in the front relay box, left side, 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

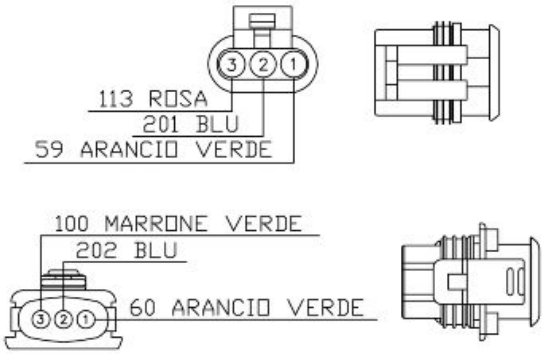
Inductive discharge system

Level in electrical circuit diagram:

coils and injectors

Location:

- on the vehicle: on the head covers.
- connector:



- FRONT CENTRAL COIL with long cable, left side, on the frame near filter box cover, above the front side coil connector.
- FRONT SIDE COIL with short cable and retaining tongue, left side, on the frame near filter box cover, below the front central coil connector.
- REAR CENTRAL COIL with long cable, at the centre, under the filter box, at the back compared to connector.
- REAR SIDE COIL with short cable and retaining tongue, at the centre, under the filter box, at the front compared to the rear central coil connector.

Electrical characteristics:

0.7 - 0.9 Ω at ambient temperature

Pin out:

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

DIAGNOSIS 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

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: ACTIVATION

Front Central Coil:

The auxiliary injection relay (No. 35 in the wiring diagram, placed in the front relay box, left side; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the coil Pink/Yellow cable 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.

Rear Central Coil:

The auxiliary relay (No. 35 in the wiring diagram, placed in the front relay box, left side; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the coil Purple/Grey cable 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.

Front Side Coil:

The auxiliary injection relay (No. 35 in the wiring diagram, placed in the front relay box, left side; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the coil Brown/Green cable 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.

Rear Side Coil:

The auxiliary injection relay (No. 35 in the wiring diagram, placed in the front relay box, left side; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the coil Brown/White cable 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.

DIAGNOSIS INSTRUMENT: LOGIC ERRORS

Front cylinder central coil 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 diagnosis 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.

Rear cylinder central coil 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 diagnosis 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.

Front cylinder side coil 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 diagnosis 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.

Rear cylinder side coil 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 diagnosis 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

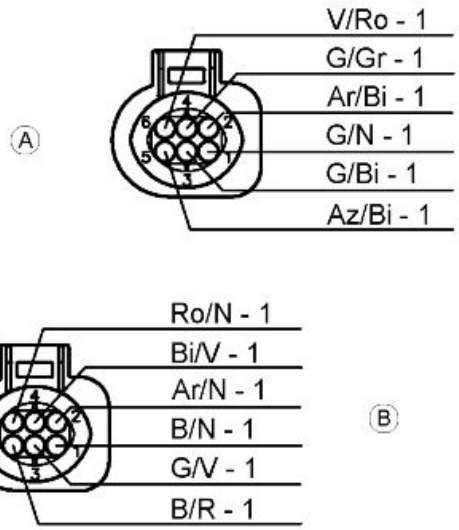
All the unit internal components (potentiometer and electric motor) are contactless; therefore, no electrical diagnosis is possible for the throttle body, but for the circuits connected to it only.

Level in electrical circuit diagram:

Throttle check and throttle grip sensor (Demand)

Location:

- on the vehicle: inside the filter box
- connector: 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 at idle: -0.5°

The system, reading the intake pressure, tries to balance the intake pressures between the front cylinder and the rear one working on the throttle position: an acceptable value should be between -0.8º and +0.8º.

Rear cylinder throttle correction

- Example value with key ON: 0.0°
- Example value with engine on: -0.3°

The system, reading the intake pressure, tries to balance the intake pressures between the front cylinder and the rear one working on the throttle position: an acceptable value should be between -0.8º and +0.8º.

Front throttle Potentiometer 1 (degrees)

- Example value with key ON: 5.5°
- Example value with engine at idle: 2.1°

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: 5.2°
- Example value with engine on: 2.2°

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: 761 mV
- Example value with engine on: 610 mV

Rear throttle Potentiometer 1 (voltage)

- Example value with key ON: 746 mV
- Example value with engine on: 605 mV

Front throttle Potentiometer 2 (degrees)

- Example value with key ON: 5.5°
- Example value with engine on: 2.5°

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: 5.2°
- Example value with engine on: 2.5°

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 2 (voltage)

- Example value with key ON: 4245 mV
- Example value with engine on: 4377 mV

Rear throttle Potentiometer 2 (voltage)

- Example value with key ON: 4226 mV
- Example value with engine on: 4372 mV

Key to throttle connectors figure:

- A - Front cylinder throttle connector
- B - Rear cylinder throttle connector

Front cylinder throttle Limp Home position

- Example value with key ON: 878 mV

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

Rear cylinder throttle 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

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

Front throttle automatic self-acquisition

- ice/ interrupted/carried out/limp home/closed throttle stop/springs check/limp home self-acquisition/initialise

Indicates if self-acquisition carried out by control unit has/has not been carried out: it is essential to know if the last self-acquisition with key ON has been successful

Rear throttle automatic self-acquisition

- ice/ interrupted/carried out/limp home/closed throttle stop/springs check/limp home self-acquisition/initialise

Indicates if self-acquisition carried out by control unit has/has not been carried out: it is essential to know if the last self-acquisition with key ON has been successful

Throttle self-learning with diagnostics instrument

- carried out/not carried out

Indicates whether the self-acquisition process through the diagnosis instrument has/has not been carried out: if it has been carried out once, will always be carried out unless EEPROM control unit zero setting is carried out

DIAGNOSIS INSTRUMENT: 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, front 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 front throttle Potentiometer 1 (voltage): 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; 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 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 by the diagnosis 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, rear 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 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 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 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 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 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

Front 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

Rear 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, front 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, front 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

front 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, rear 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, rear 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

rear 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.

Front 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

Front 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

Front 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 front 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

Front throttle power supply voltage during self-acquisition P0164

- low power 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 P0167

- misalignment between control and activation

Error cause

- The throttle mechanical control may be damaged

Troubleshooting

- Replace the throttle body

Rear 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

Rear 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

Rear 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 rear 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

Rear throttle supply voltage during self-acquisition P0184

- low power 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 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-learning process: according to the throttle body replaced check that the status "Front throttle automatic self-acquisition" or "Rear throttle automatic self-acquisition" 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-acquisition" or "Rear throttle automatic self-acquisition" indicate: "carried out"

Engine oil pressure sensor

ENGINE OIL PRESSURE SENSOR

Function: it indicates to the instrument panel if there is enough oil pressure (0.5 + / - 0.2 bar (7.25 + / - 2.9 PSI)) in the engine.

Operation / Operating principle: normally closed switch. With oil pressure above 0.5 + / -0.2 bar (7.25 + / - 2.9 PSI), open circuit.

Location on the vehicle: right side of the vehicle, under the oil sump

Pin-out: Voltage 5V

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.

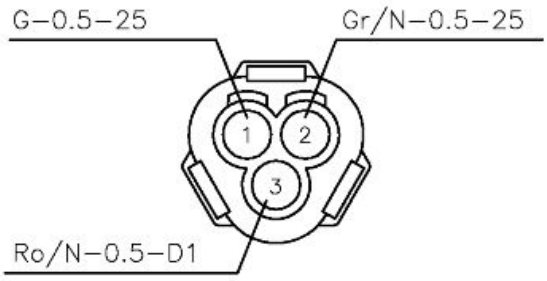
Troubleshooting

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

Neutral sensor

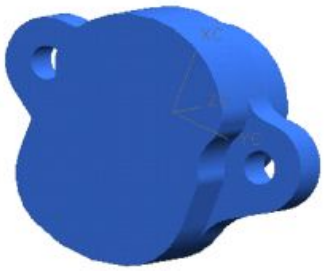
Function

It tells the gear position to the control unit, from the 1st gear to the 6th gear, and if the gear is neutral or riding.



Operation / Operating principle

The sensor has 2 circuits: one to indicate the engaged gear, whose resistance varies according to the gear engaged: in this way, the injection ECU, according to detected electric voltage, identifies the engaged gear and sends the information via CAN to the instrument panel; the other indicates neutral gear, whose voltage is taken to zero if in neutral position.



Level in electrical circuit diagram:

Start-up enabling switches

Location:

- on the vehicle: under chain pinion, behind the pinion cover.
- connector: left side, on flywheel cover

Electrical characteristics:

PIN 64: gear indication: closed circuit (continuity); gear engaged: open circuit (infinite resistance).
Gear engaged 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 (gear), Pink: + 5V from ECU (gears).

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

Gear in neutral

- Yes/No

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

DIAGNOSIS INSTRUMENT: ELECTRICAL ERRORS

Gear sensor P0461

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

Error cause

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

Troubleshooting

- If the circuit is open, shorted to positive: the error is detected with gear engaged only. 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 they are OK, with key set to ON and control unit connector disconnected, check from the control unit side if the cable is in voltage: if it is in voltage, disconnect the sensor connector and check if the cable is in voltage: if it is in voltage, restore the cable harness; if it is not in voltage, replace the sensor (there is an interruption or shorted to positive of the pink cable in the section from the sensor connector to the sensor or inside the sensor).
- If shorted to negative: disconnect the sensor connector and with key set to ON, check grey/black cable voltage: if equal to zero, restore the cable harness; if equal to approx. 5 V, replace the sensor (there is short circuit to ground of the pink cable in the section from the sensor connector to the sensor or inside the sensor).

Clutch lever sensor

Function

It tells the clutch lever position to the control unit.

Operation / Operating principle

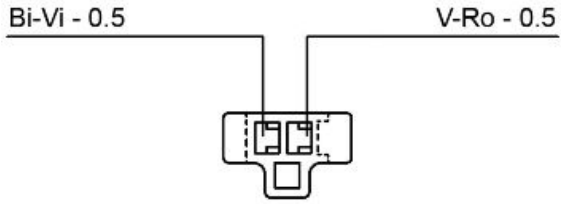
If there is gear engaged but the clutch is pulled, i.e. circuit closed to ground, vehicle start-up is not enabled.

Level in electrical circuit diagram:

Start-up enabling switches

Location:

- on the vehicle: under the clutch lever.
- connector: behind the instrument panel.



Electrical characteristics:

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

Pin out:

1. voltage 5V
2. ground connection

CAUTION

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DIAGNOSIS INSTRUMENT: STATUSES

Clutch

- Indefinite_Released_Pulled

WARNING The statuses regularly viewed are Released and Pulled.

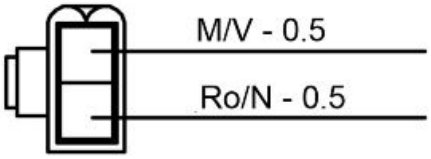
- Indication on Navigator always released: check the sensor connector and the control unit connector (special attention to PIN56): if not OK, restore cable harness; if OK, disconnect both terminals from the sensor and check, with key set to ON, continuity to ground of PIN 2 (Green/Pink cable): if there is no continuity, restore the cable harness; if there is, replace the sensor.
- Indication on Navigator 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

the sensor. If the circuit is open, it means that the White/Purple cable from PIN 1 to PIN 56 of VEHICLE connector is shorted to ground: 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: on the alternator cover (2-way White/Blue connector)

Pin out:

1. Ground connection
2. Voltage 12V

Electrical characteristics:

- Side Stand Up: closed circuit (continuity)
- Side Stand Down: open circuit (infinite resistance)

CAUTION

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DIAGNOSIS INSTRUMENT: STATUSES

Side stand sensor: up/down

- Indication on Navigator 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 Navigator 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

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: under the saddle, behind the battery.
- connector: next to the sensor (2-way White/Grey connector).

Electrical characteristics:

- 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.

DIAGNOSIS INSTRUMENT: STATUSES

Fall sensor: Normal / Tip over

- Indication on Navigator 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. If OK, check continuity to ground of PIN 1 (Green/Pink cable): if there is no continuity, restore the cable harness; otherwise, with key set to ON, check if

there is 5V voltage at PIN 2 (Pink/White cable). If there is not, check the Marelli control unit connector (PIN 65).

- Indication on Navigator 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.

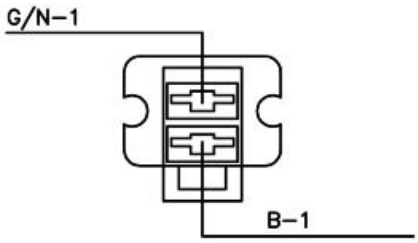
Electric fan circuit

Function

Radiator fan and coolant - Operation

Operation / Operating principle

When the control unit detects a temperature of approx. 102 °C, it closes the fan control relay pickup circuit to ground

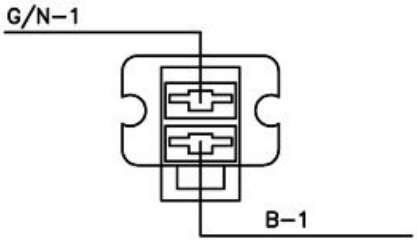


Level in electrical circuit diagram:

electric fan

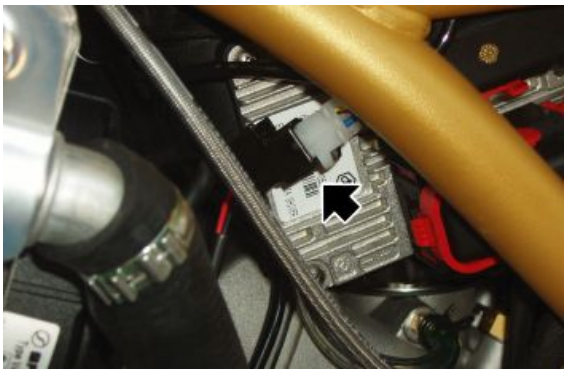
Location:

- sensor: relay located inside the rear relay box, the one toward motorcycle rear end (also CHECK relay identification with the colour of the cables)
- connector: on the relay



Electrical characteristics:

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



DIAGNOSIS INSTRUMENT: STATUSES

Fan relay

- on/off

DIAGNOSIS INSTRUMENT: ACTIVATIONS

Fan

- The fan relay (No. 38 in the wiring diagram) is energised for 10 seconds. The continuity of the wiring is necessary for

correct activation: no error indications are displayed in case of lack of activation

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 not OK, replace the relay, if OK, check relay connector and VEHICLE connector of the Marelli control unit: if not OK, restore; if OK, check continuity of cable harness (Brown cable)

RUN/STOP switch

Function

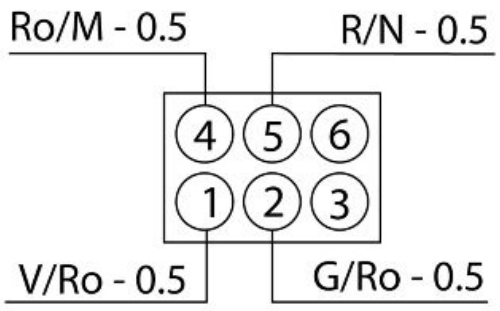
It tells the control unit if the rider wishes to enable engine start-up or to keep the engine running.

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 light switch.
- connector: at the centre between air filter box and water radiator.

Electrical characteristics:

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

Pin out:

1 blue/green cable: ground connection

2 yellow/red cable: 5 V

CAUTION

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DIAGNOSIS INSTRUMENT: STATUSES

RUN / STOP switch

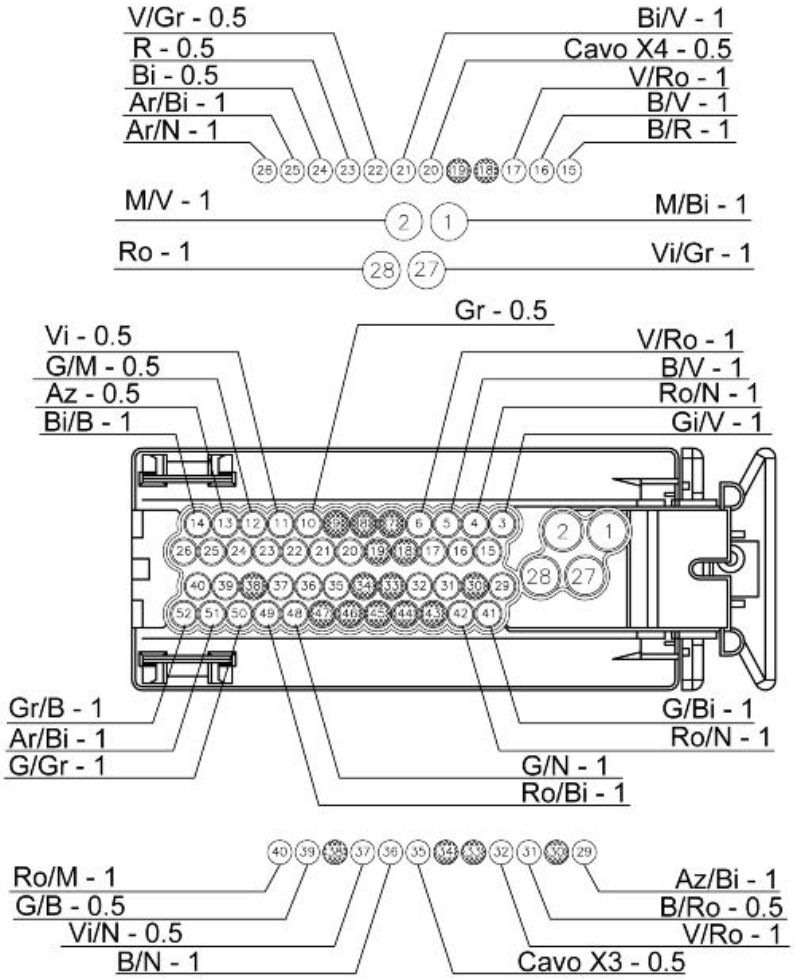
- Run/Stop

NOTES

- Indication on Navigator 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 it is not OK, restore; if it is OK, check the continuity of the Yellow/Red cable between the switch connector and VEHICLE connector PIN 78: if not OK, restore the cable harness; if OK, replace the Marelli control unit.
- Indication on Navigator 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; otherwise, it means that, with key set to ON, the Yellow/Red cable (between switch and the PIN 78 of the control unit connector) is shorted to positive: restore the cable harness.

Connectors

ECU



Engine pinout key:

Rear cylinder side spark plug coil control output **PIN 1**

Front cylinder side spark plug coil control output **PIN 2**

Rear throttle motor output (+) **PIN 3**

Analogue ground connection 2 **PIN 4**

Power ground connection 1 **PIN 5**

Analogue ground connection 1 **PIN 6/17**

Lambda sensor input (+) **PIN 10**

Track D throttle grip input **PIN 11**

Water temp. sensor input **PIN 12**

Track B throttle grip input **PIN 13**

Serial line K for diagnosis **PIN 14**

Rear throttle motor output (-) **PIN 15**

Power ground connection 2 **PIN 16**

Engine speed sensor input (-) **PIN 20**

Input for rear throttle potentiometer 2 signal **PIN 21**

Lambda sensor input (-) **PIN 22**

Track C throttle grip input **PIN 23**

Front cylinder intake pressure sensor input **PIN 24**

Reference voltage output + 5 V: tracks A-C, front throttle and pressure sensor **PIN 25/51**

Reference voltage output + 5V: tracks B-D and rear throttle **PIN 26**

Rear cylinder central spark plug coil control output **PIN 27**

Front cylinder central spark plug coil control output **PIN 28**

Front throttle motor output (-) **PIN 29**

SAFETY relay control output **PIN 31**

Lambda heating control output **PIN 32**

Engine speed sensor input (+) **PIN 35**

Input for rear throttle potentiometer 1 signal **PIN 36**

Air temperature sensor input **PIN 37**

Track A throttle grip input **PIN 39**

Key input **PIN 40/42**

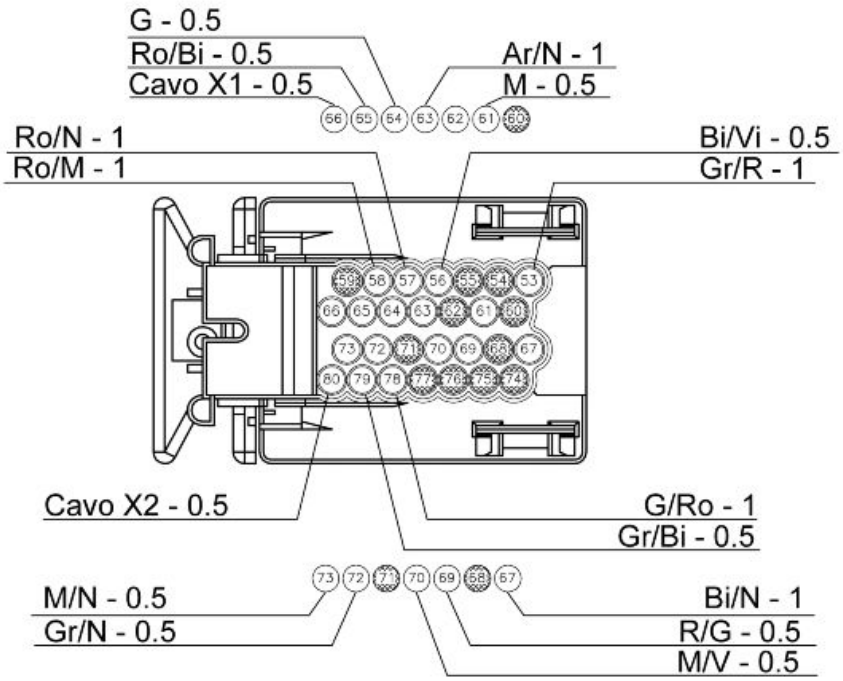
Front throttle motor output (+) **PIN 41**

Input for front throttle potentiometer 1 signal **PIN 48**

Rear cylinder intake pressure sensor input **PIN 49**

Input for front throttle potentiometer 2 signal **PIN 50**

Direct power supply to control unit **PIN 52**



Vehicle pinout key:

Front cylinder 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**

Reference voltage output + 5V: tracks B-D and rear throttle **PIN 63**

Neutral input **PIN 64**

Fall sensor input **PIN 65**

CAN L line (high speed) **PIN 66**

Rear cylinder injector control output **PIN 67**

Start-up control output **PIN 69**

Side stand input **PIN 70**

Gear input **PIN 72**

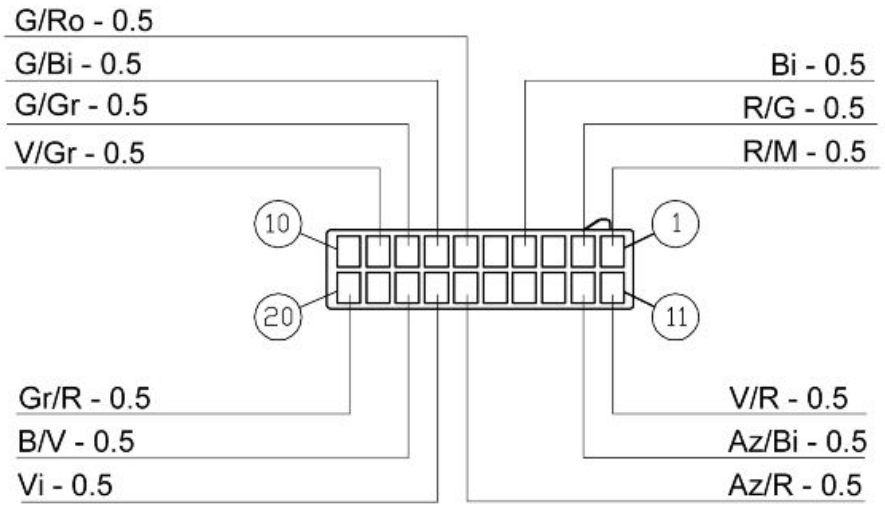
Auxiliary injection relay control output **PIN 73**

"engine stop" input **PIN 78**

Vehicle speed input **PIN 79**

CAN H line (high speed) **PIN 80**

Dashboard



Grey-bodied instrument panel pinout key:

1 +Key

2 Right turn indicator control

3 Not used

4 High beam lights input

5 Not used

6 Select 3 (Set)

7 Select 2 (Down)

8 Select 1 (Up)

9 Low fuel sensor

10 Not used

11+ Battery

12 Left turn indicator control

13 Not used

14 Not used

15 Not used

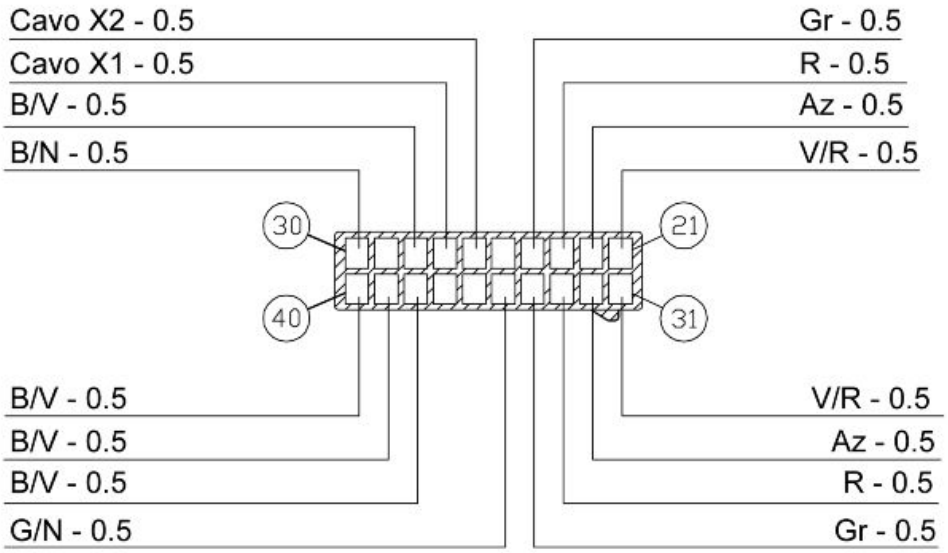
16 Indicator reset

17 Oil sensor input

18 Dorsoduro 750 / Dorsoduro 1200 selection

19 Not used

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 Not used

26 CAN H

27 CAN L

28 ABS warning light input (if present)

29 Not used

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 Not used

37 Not used

38 Ground connection

39 Ground connection

40 Ground connection

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 characteristics:

- between PIN 66 and 80 of the control unit: approximately 130 Ohm

- between PIN 26 and 27 of the instrument panel: approximately 120 Ohm

Pin out:

- Line L: Orange cable between Marelli control unit PIN 66 and the black-bodied connector PIN 27 of the instrument panel.
- Line H: White/Black 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 and the ABS control unit (if any): 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: 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 2 connectors (Marelli control unit 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.

NAVIGATOR: ELECTRICAL ERRORS

CAN line towards instrument panel U1702 - Intermittent signal or communication error

Error cause

- Probable bad contact in the CAN line.

Troubleshooting

- Check the pins 66 and 80 and the Vehicle connector of the Marelli control unit. 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 towards ABS control unit U1712 - Intermittent signal or communication error

Error cause

- Probable bad contact in the CAN line

Troubleshooting

- Check the pins 66 and 80 and the Vehicle connector of the Marelli control unit. If not OK, restore. If OK, check pins 5 and 6 and the ABS control unit connector. If not OK, restore. If OK, check overall operation of the Marelli control unit and ABS control unit: replace the affected component if you find any fault.

NAVIGATOR: LOGIC ERRORS

CAN line towards ABS control unit U1711 - No signal/Configuration error

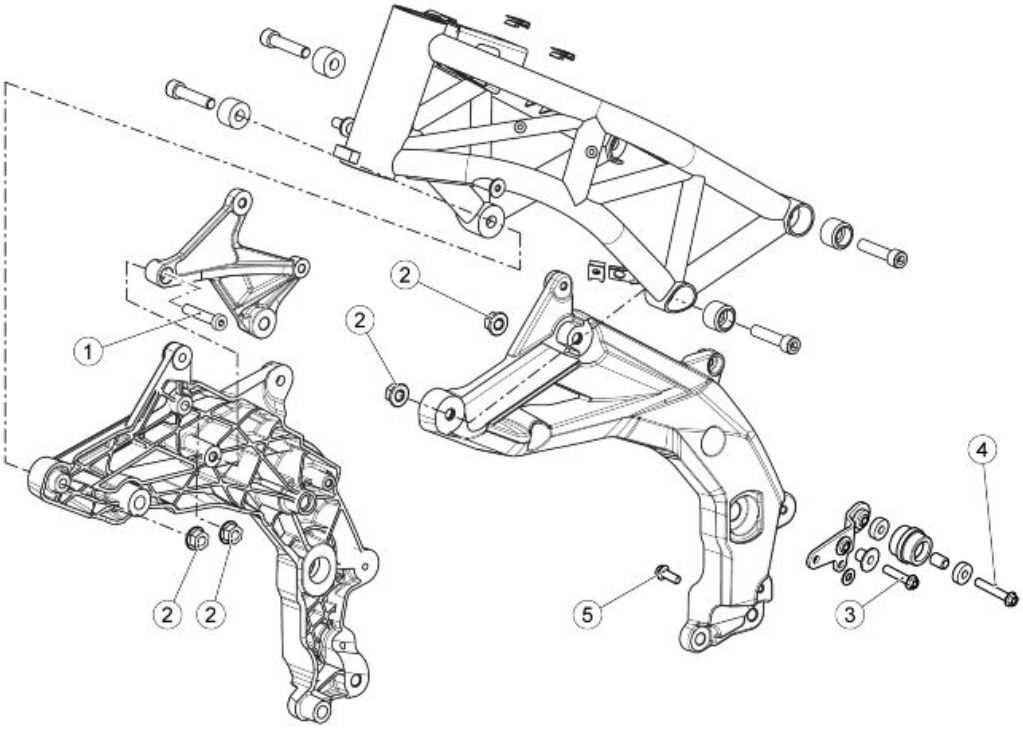
Error cause

- 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

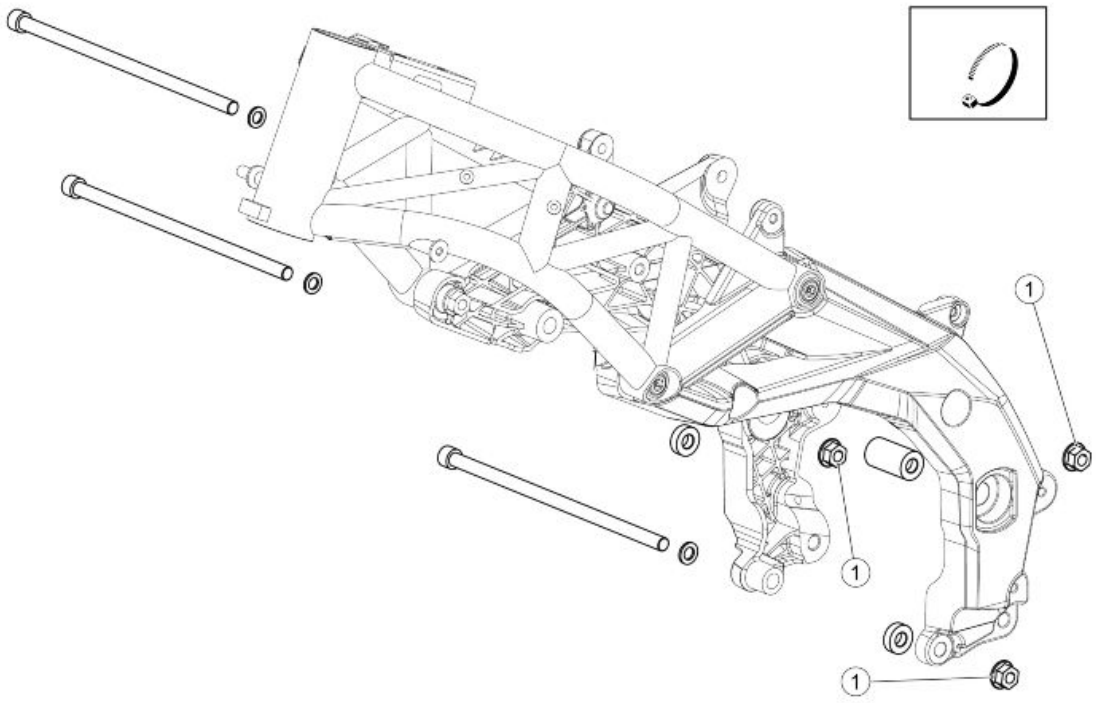
- Open the Navigator devices status page to check if the control unit setting is actually consistent with the motorcycle setting. Example: if the bike is equipped with ABS, the correct status we should find on the Navigator devices status page will be: Aprilia Traction Control present. While on a bike equipped with ABS and Navigator indication: Aprilia Traction Control not present, update the control unit.

INDEX OF TOPICS



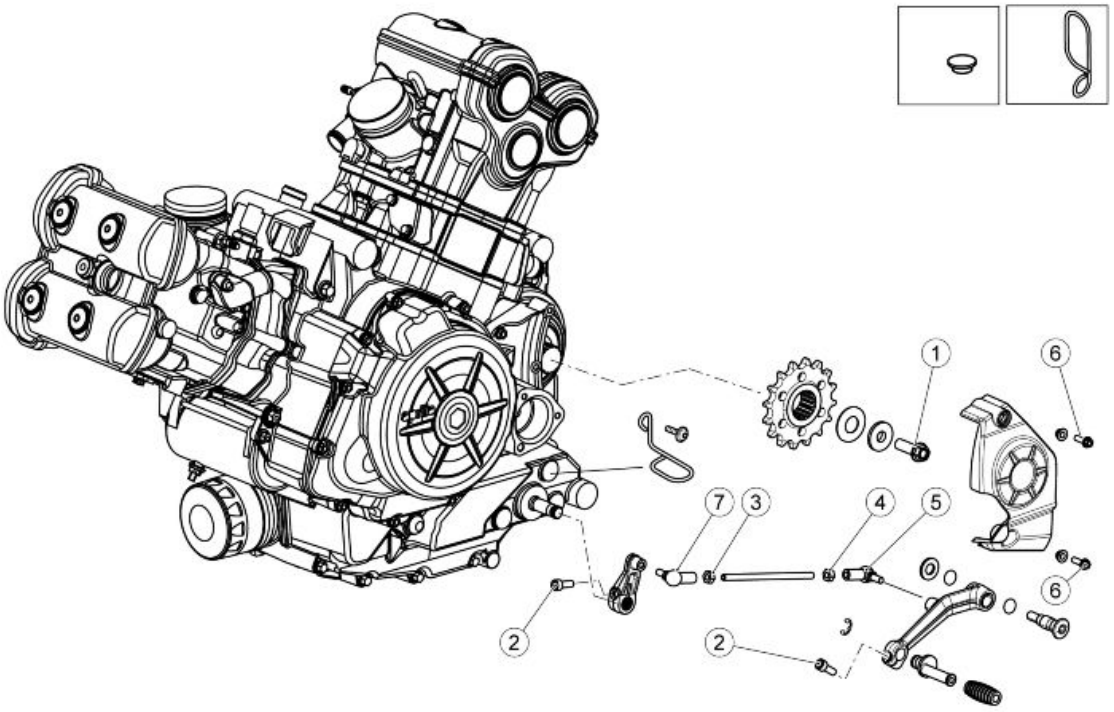
FRONT CHASSIS

pos.	Description	Type	Quantity	Torque	Notes
1	TCEI screw fastening shock absorber counterplate to RH frame bracket	M10x30	1	50 Nm (36.88 lbf ft)	-
2	Flanged nut fastening Trellis to frame side panels	M12	4	80 Nm (59 lbf ft)	-
3	Flanged TE screw fastening chain roller bracket to LH plate	M8x35	1	25 Nm (18.44 lbf ft)	Loctite 243
4	Flanged TE screw fastening chain roller to chain roller bracket	M8x45	1	25 Nm (18.44 lbf ft)	Loctite 243
5	Screw fastening chain roller bracket to LH plate	M8x20	1	25 Nm (18.44 lbf ft)	Loctite 243



CENTRE FRAME

pos.	Description	Type	Quantity	Torque	Notes
1	Flanged nut fastening side panels to engine	M12	3	80 Nm (59 lbf ft)	-



ENGINE

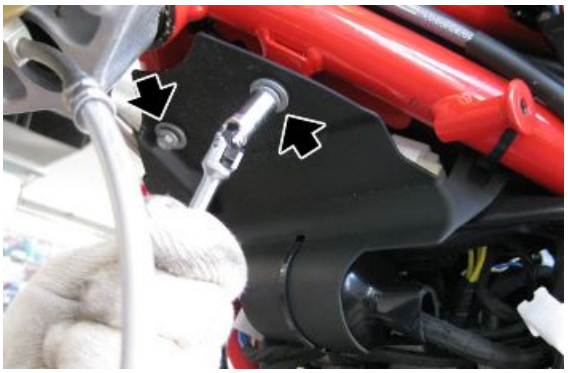
pos.	Description	Type	Quantity	Torque	Notes
1	Flanged TE screw fastening pinion	M10x1.25	1	50 Nm (36.88 lbf ft)	Loctite 243

pos.	Description	Type	Quantity	Torque	Notes
2	TCEI screw fastening Pin to gearbox lever and Gearbox Lever to knurled shaft	M6x16	2	12 Nm (8.85 lbf ft)	-
3	LH lock nut for ball joint	M6	1	10 Nm (7.37 lbf ft)	-
4	RH lock nut for ball joint	M6	1	10 Nm (7.37 lbf ft)	-
5	RH ball joint on gearbox control lever	M6	1	10 Nm (7.37 lbf ft)	-
6	Pinion protector fixing screw	M6x12	2	10 Nm (7.37 lbf ft)	-
7	LH ball joint on gearbox control lever	M6	1	10 Nm (7.37 lbf ft)	-
-	Fastener for positive cable on engine	-	1	10 Nm (7.37 lbf ft)	-
-	TE screw fastening negative cable to engine	M6x12	1	10 Nm (7.37 lbf ft)	-

Vehicle preparation

- Remove the battery.
- Remove the fuel tank.
- Remove the water radiator and oil radiator.
- Remove the air filter box.

- Unscrew and remove the two screws.



- Cut the clamps and remove the chassis cover.

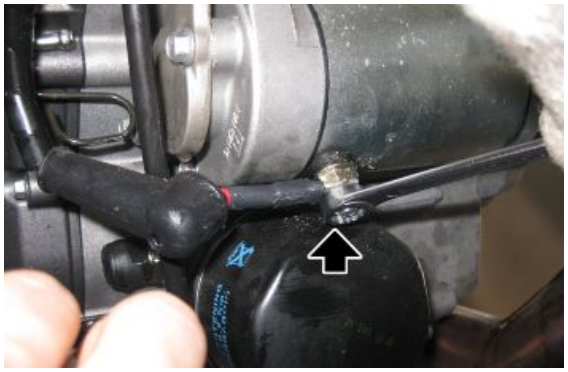
See also

Fuel tank
Removing the radiator

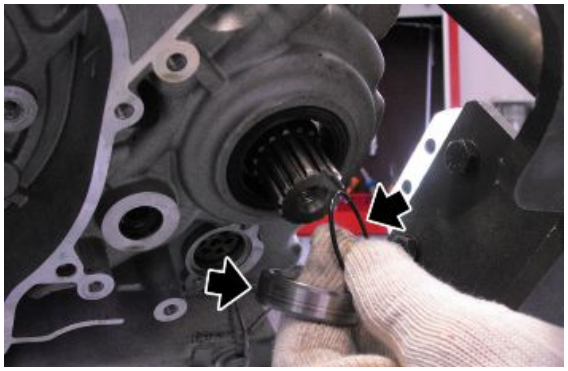
Engine oil cooler
Air box

- Disconnect the engine oil pressure sensor connector.

- Disconnect the starter motor power supply cable.
- For ABS version: Move the ABS control unit and disconnect control unit connector.

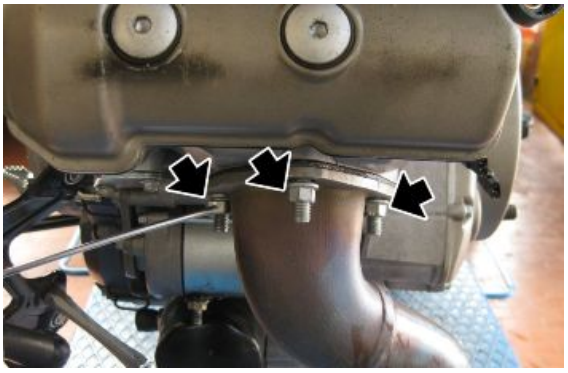


- Slide out bushing and O-ring from gearbox secondary shaft.

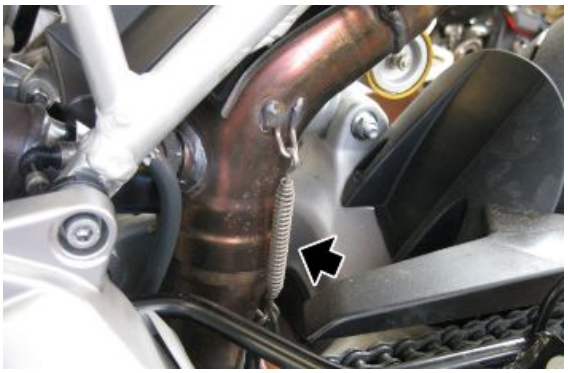


- Disengage the spring.

- Unscrew and remove the three nuts from the front exhaust manifold



- Disengage the spring joining central exhaust manifold to exhaust end.



- Disengage the spring joining the central exhaust manifold to the rear exhaust manifold.

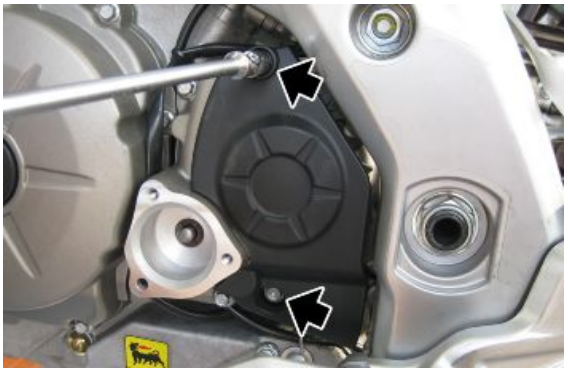
- Remove the front exhaust manifold, moving the central exhaust manifold.

- Remove the central exhaust manifold.

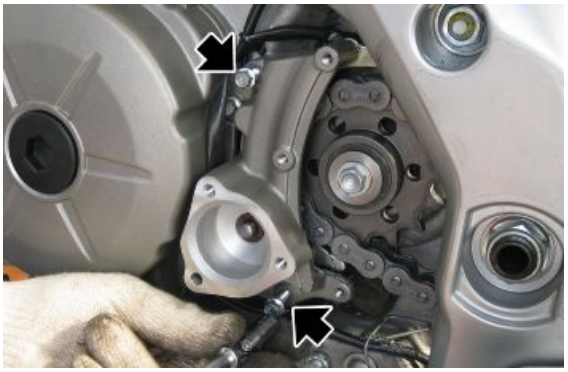
- Unscrew and remove the three nuts from the rear exhaust manifold.
- Remove the exhaust manifold.

- Unscrew and remove the three screws.
- Remove the clutch control cylinder.
- Lock the plunger using a clamp.

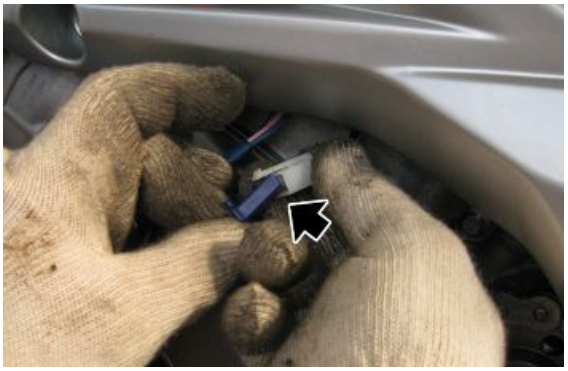
- Undo and remove the two screws and remove the pinion protection case.



- Unscrew and remove the two clutch support screws.

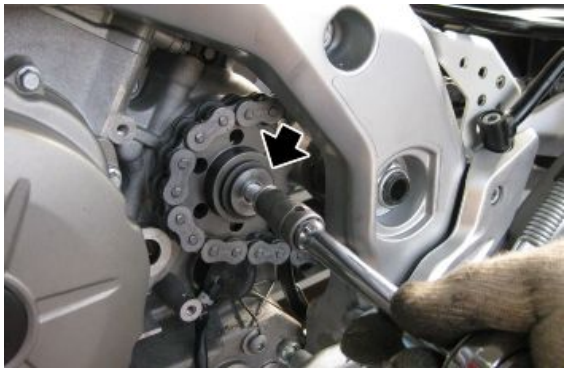


- Disconnect the side stand sensor connector.



- Disconnect the gear in neutral sensor connector.

- Slacken the gearing chain tension.
- Unscrew and remove the screw; collect the washer and the spacer.
- Slide off the pinion from the chain and remove.



- Loosen the screw and slide off the gear transmission connecting rod keeping it linked to the gear shift lever through the rod.

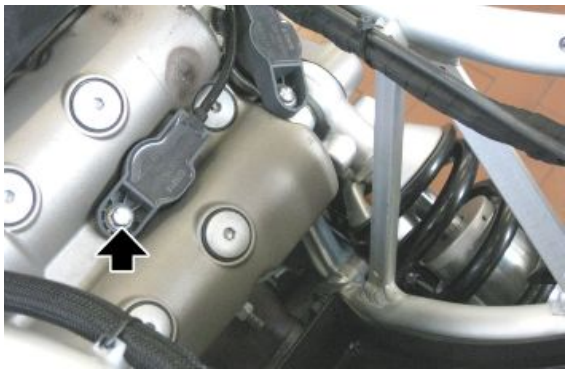
Removing the engine from the vehicle

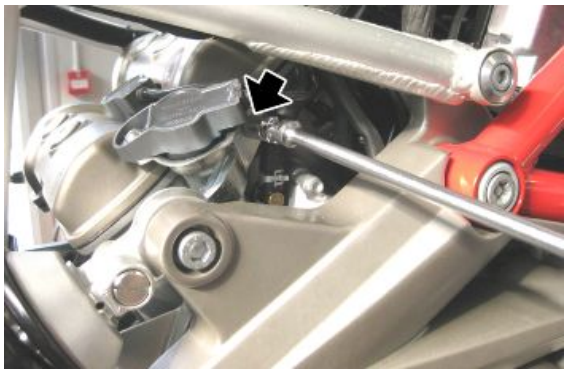
- Carry out the operations described under Vehicle preparation.
- Support the engine by means of belt and hoist.
- Working on the left side, unscrew and remove the three nuts.

See also

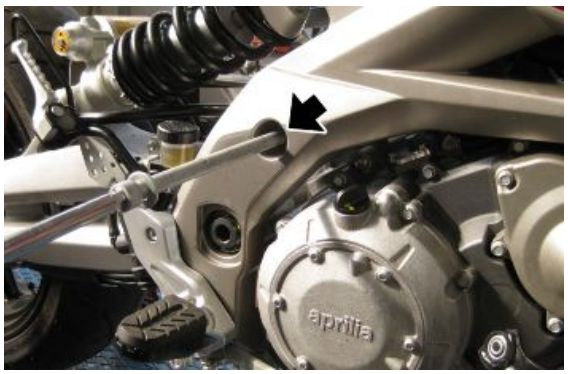
Vehicle preparation

- Unscrew and remove the rear coil fixing screws.
- Slide out the rear coils.

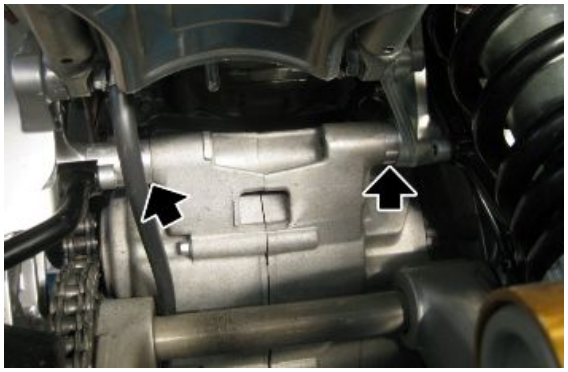




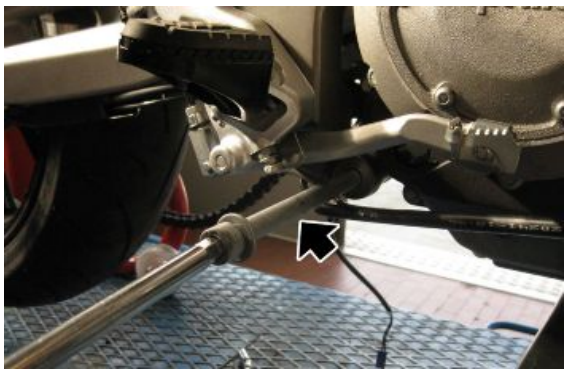
- Slide off the rear top pin and collect the washer.



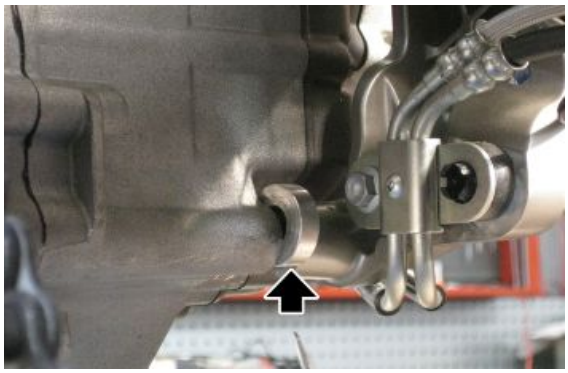
- Remove the two spacers. The thinner spacer is on the right.



- Slide off the rear bottom pin and collect the washer.



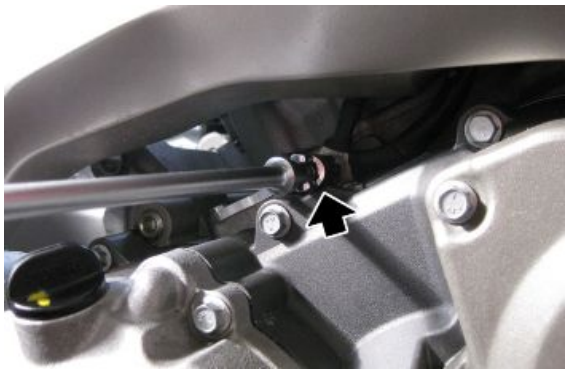
- Remove the bottom spacer on the right side.



- Slide off the front pin and collect the washer.

- Remove the bottom spacer on the right side.

- Unscrew and remove the screw.
- Release the ground points.



- Unscrew and remove the two screws of the ECU.

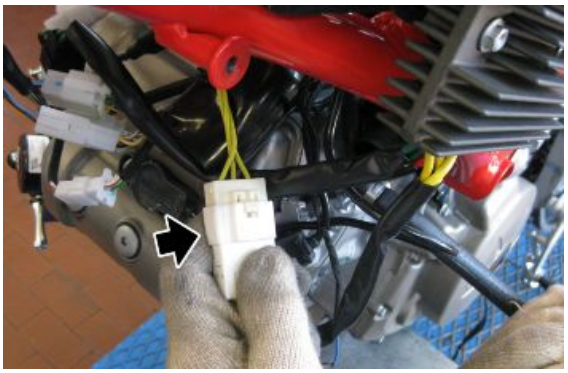
- Move the ECU aside but keep it connected to the wiring harness.

- Loosen the two clamps.

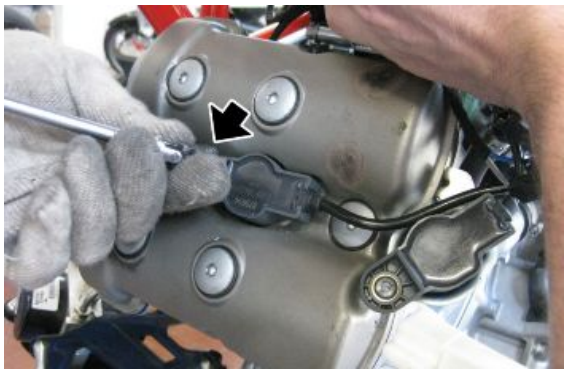
- Lift the throttle body but keep it connected to the wiring harness.

- Disconnect the engine temperature sensor from the front cylinder.

- Disconnect the alternator connectors.



- Disconnect the throttle body and fasten it using an elastic band.
- Unscrew and remove the screws, sliding out the front coils.



- Lower the engine and take it out of the chassis.

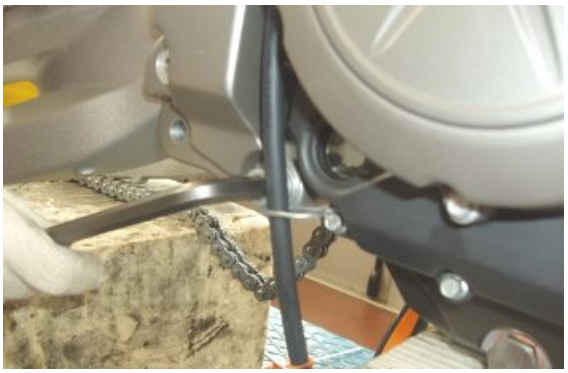
Installing the engine to the vehicle

- Place the engine on a suitable lower stand.
- Lift the engine.
- Place the engine so that the rear attachments on the chassis are aligned.

- Working on the right side, insert the three bolts with their washers.
- Working on the right side, place the spacers on the three bolts between the engine block and the chassis.

CAUTION

THE SPACERS HAVE DIFFERENT SIZES. REFIT THEM IN THE SAME WAY THEY WERE BEFORE BEING REMOVED.



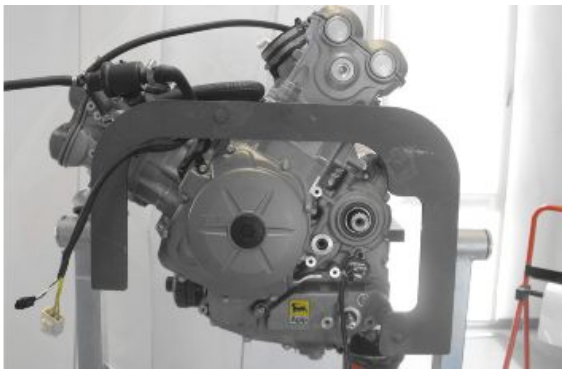
- Working from the left side, tighten the three nuts.
- Release the engine from the belt and the hoist.
- Refit the pinion and restore the gearing chain clearance.
- Reconnect the electric connections and clamp the cable harnesses.
- Carry out the vehicle preparation operations but in reverse order, restore the correct level of all fluids and carry out the adjustments that may be required.

See also

Vehicle preparation
Adjusting

INDEX OF TOPICS

- Use the special plate to duly support the engine during the servicing operations.



CAUTION

TAKE PARTICULAR CARE TO ENSURE THAT THE ENGINE AND ENGINE MOUNTING ARE STABLE AND ENSURE THAT THE ENGINE IS SECURELY FASTENED TO THE MOUNTING PLATE.

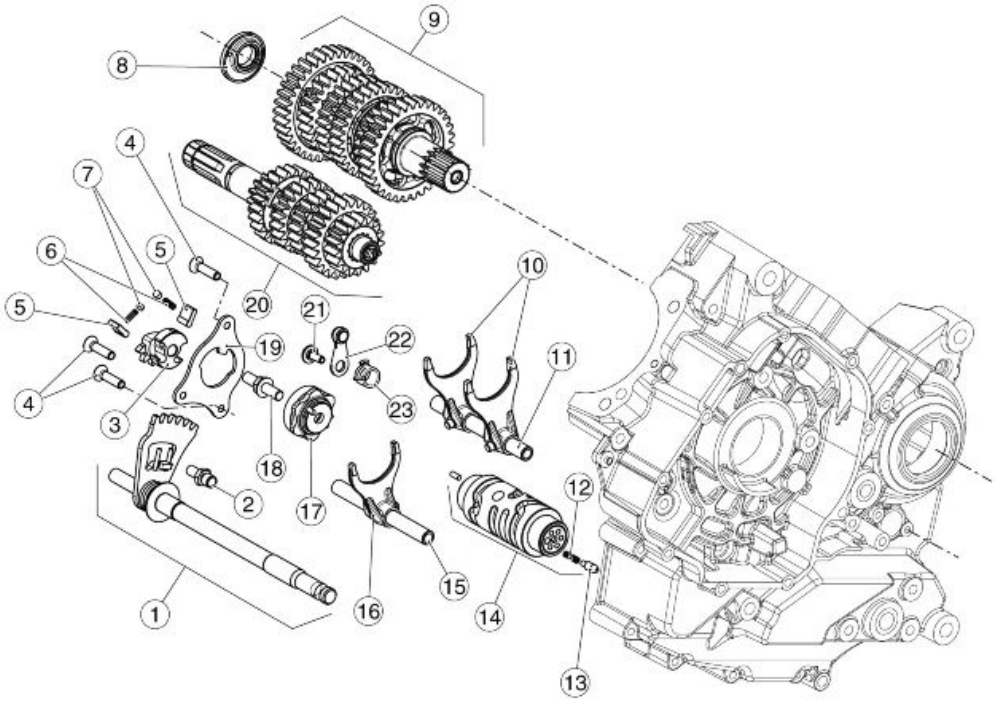
Specific tooling

020710Y Engine plate

AP8140187 Engine support stand

Gearbox

Diagram



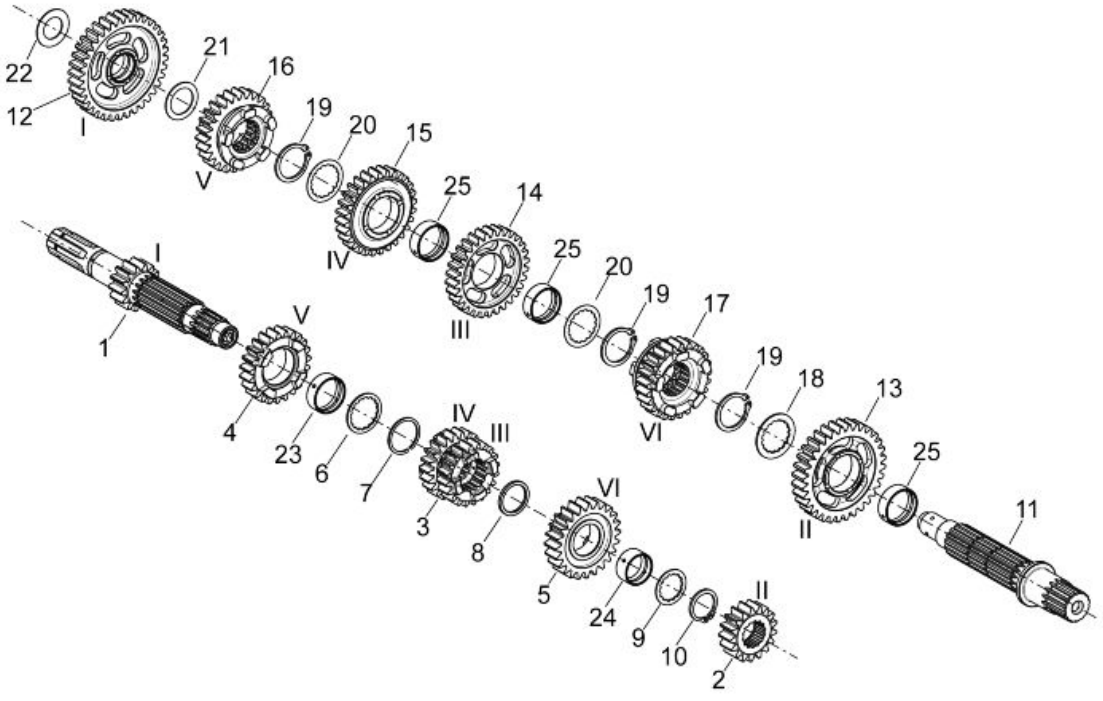
Key

1. Complete gear shaft and spring
2. Selector lock
3. Selector sprocket wheel
4. M5x16 Screw
5. Sprocket wheel pawl
6. Spring
7. Pin for spring

8. Tone wheel
9. Complete transmission gear shaft
10. Forks
11. Fork shaft
12. Spring
13. Pin for spring
14. Gear selector
15. Fork shaft
16. Fork
17. Gear selector drum
18. M8x1.25 threaded pin
19. Selector locking plate
20. Complete main gear shaft
21. TE flanged screw, M6x15
22. Complete index lever
23. Spring

Gearbox shafts

Gearbox shafts diagram

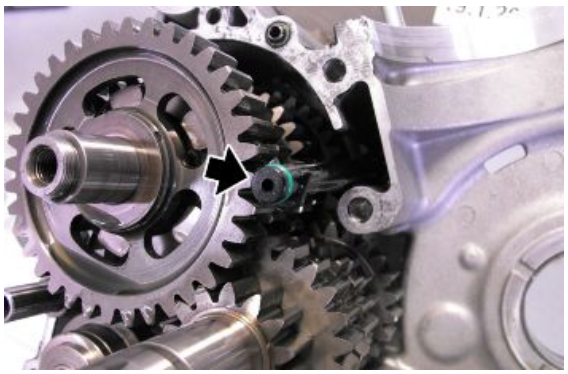


key:

1. Main gear shaft Z=14
2. 2nd gear on primary Z=17
3. 3rd - 4th gear on secondary Z=20/22
4. 5th gear on primary Z=23
5. 6th gear on primary Z=24
6. Thrust washer
7. Circlip
8. Thrust washer
9. Thrust washer
10. Circlip
11. Transmission shaft
12. 1st gear on primary Z=36
13. 2nd gear on secondary Z=32
14. 3rd gear on secondary Z=30
15. 4th gear on secondary Z=28
16. 5th gear on secondary Z=26
17. 6th gear on secondary Z=25
18. Thrust washer
19. Circlip
20. Thrust washer
21. Thrust washer
22. Thrust washer
23. Floating bushing
24. Floating bushing
25. Floating bushing

Disassembling the gearbox

- Open the crankcase halves.
- Slide off the gearbox lubrication diffuser pipe.
- Remove the two bolts of the forks.



See also

Splitting the
crankcase halves

- Slide off the desmodromic drum control.

- Remove the three gear selection forks.

CAUTION

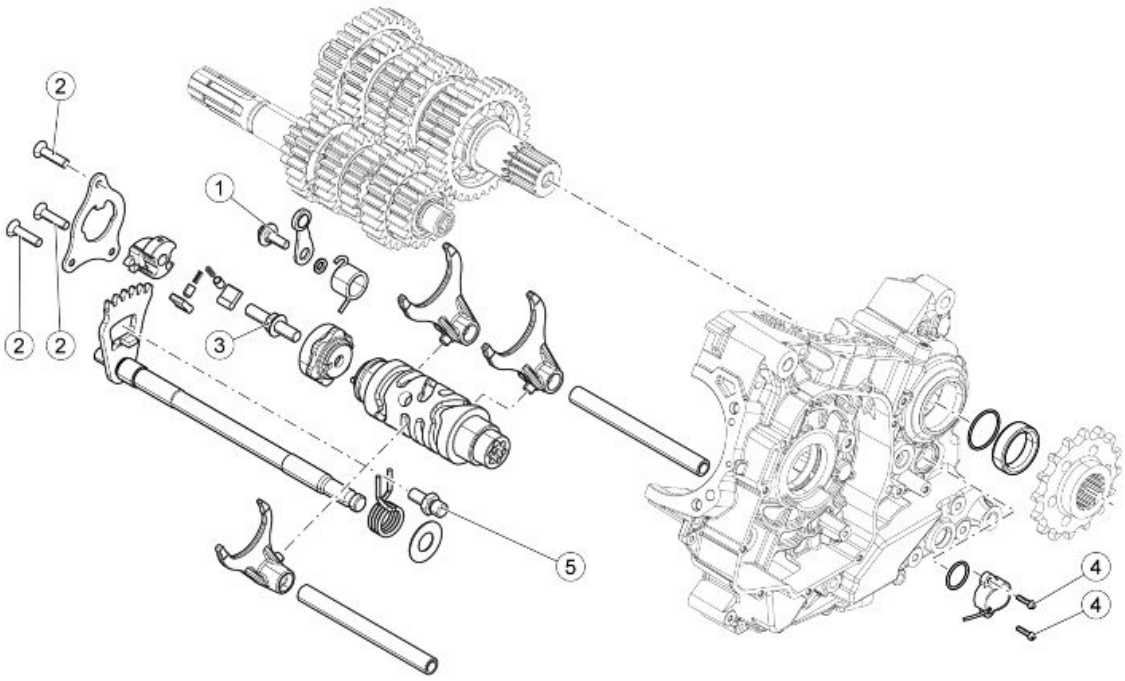
THE MAIN SHAFT FORK IS SMALLER THAN THOSE OF THE SECONDARY SHAFT.
ALL THE SECONDARY SHAFT FORKS ARE THE SAME SIZE.

- Carefully rotate the engine support.

- Carefully slide off the whole gear unit.

- Repeat the removal operations but in reverse order.

Gear selector



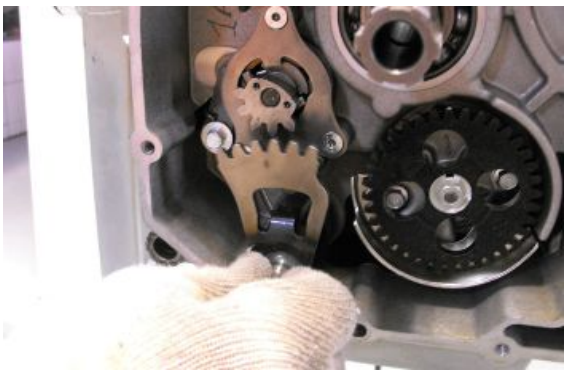
GEAR SELECTOR

pos.	Description	Type	Quantity	Torque	Notes
1	Gear retainer pawl fastener screw	M6	1	12 Nm (8.85 lbf ft)	Loctite dry loc 2040
2	Selector plate fastener screw	M5	3	5.50 Nm (4.06 lbf ft)	3M SCOTCH GRIP 2353
3	Screw fastening Desmodromic selector drum / Selector sprocket	M8	1	20 Nm (14.75 lbf ft)	3M SCOTCH GRIP 2353
4	Gear sensor fastener screw	M5	2	5.50 Nm (4.06 lbf ft)	Loctite 270
5	Selector pin fastener onto clutch side crankcase half	M10x1.5	1	16 Nm (11.80 lbf ft)	Loctite 242

Removing the gear selector

Remove the clutch.

Remove the selector shaft.



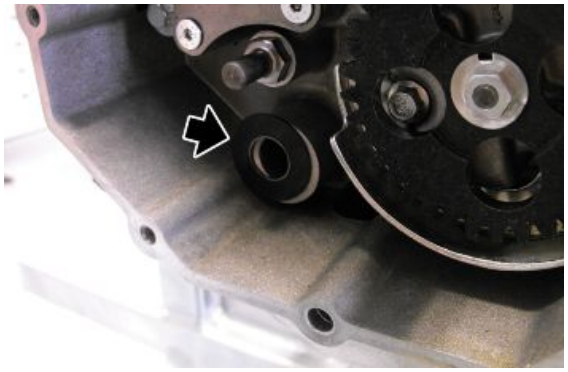
See also

Disassembling the clutch

Collect the washer.

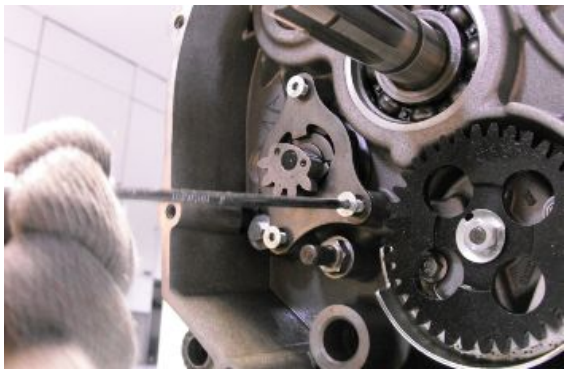
NOTE

REPLACE THE WASHER ON EVERY SERVICING

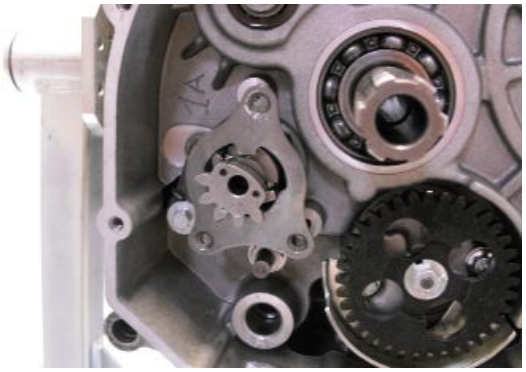


- Heat the screws of the gearbox selector mounting plate.

- Unscrew and remove the three screws fastening the gearbox selector mounting plate.



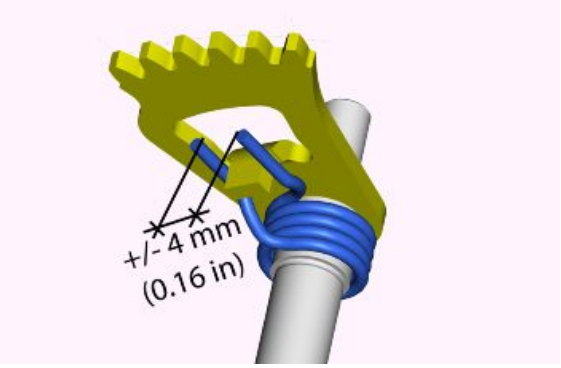
- Remove the plate complete with selector



Checking the gear selector

Selector spring

In the position shown, ensure that the gap between spring ends is +/- 0.4 mm (0.016 in), compared to the same gap measured at the corresponding teeth.



Pawl

Make sure that both pawl tips run free, without jamming

Reassembling the gear selector

CAUTION

ON REASSEMBLY, ENSURE THAT THE REFERENCE MARKS ON GEARBOX SHAFT AND SELECTOR SPROCKET ARE ALIGNED

Gearbox Selector Shaft

Removal

- Place the left hand crankcase in a press and extract the roller cage with the specific tool.

NOTE

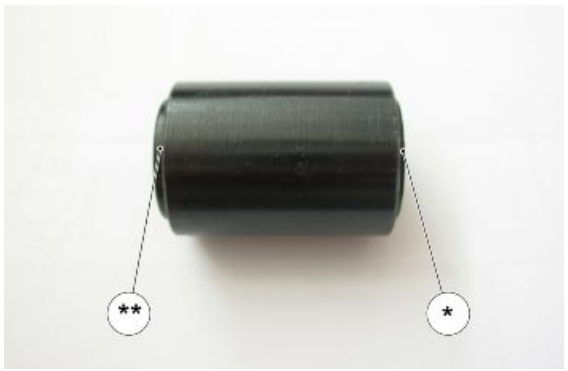
REPEAT THE SAME OPERATION FOR THE RIGHT HAND CRANKCASE HALF.

Specific tooling

020724Y Gear control rod roller cage punch

INSTALLATION

- Place the left hand crankcase in a press and install the roller cage with the specific tool.



CAUTION

TO INSTALL THE ROLLER CAGE IN THE RIGHT HAND CRANKCASE HALF, WORK WITH THE CYLINDER ON THE SIDE OF THE 1 mm (*) STEP ON THE TOOL TURNED TOWARD THE ROLLER CAGE, WHEREAS TO INSTALL THE CAGE IN THE LEFT HAND CRANKCASE HALF, USE THE CYLINDER ON THE SIDE OF THE 2 mm (**) STEP ON THE TOOL.

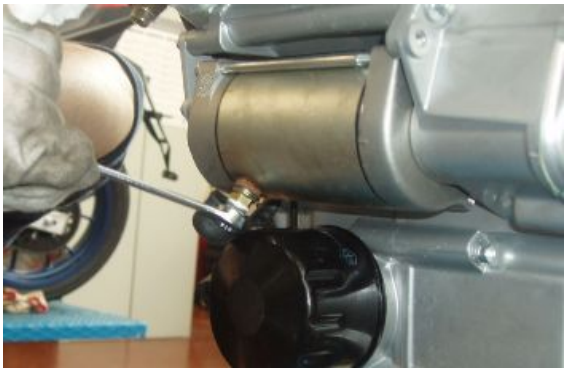
Specific tooling

020724Y Gear control rod roller cage punch

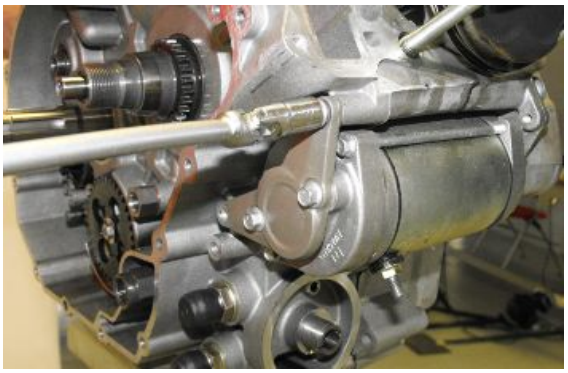
Starter motor

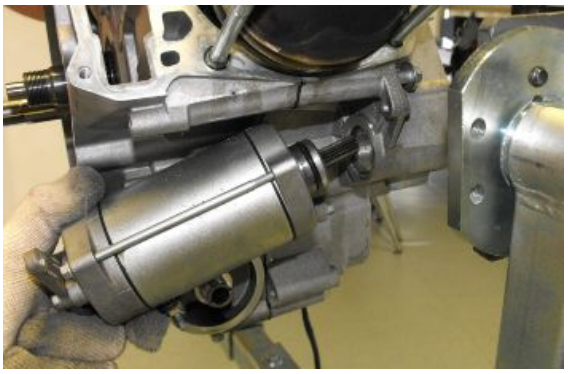
Removing the starter motor

- Disconnect the starter motor power supply cable.

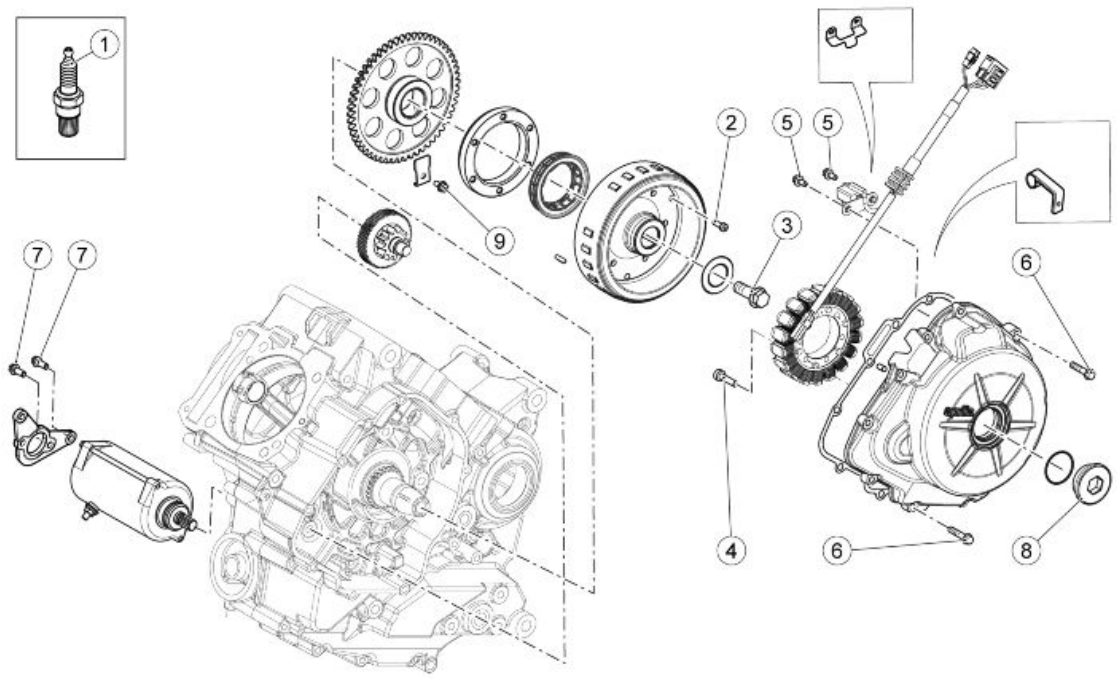


- Unscrew and remove the two screws and remove the starter motor.





Generator side



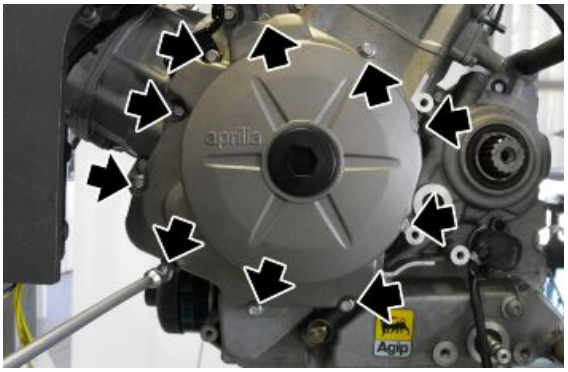
IGNITION

pos.	Description	Type	Quantity	Torque	Notes
1	Spark plug	-	4	11 Nm (8.11 lbf ft)	-
2	Freewheel Ring fastener screw	M6	6	14 Nm (10.33 lbf ft)	3M SCOTCH GRIP 2353
3	Screw fastening Rotor - Crankshaft	M12x1.25	1	130 Nm (95.88 lbf ft)	-
4	Screw fastening Stator / Flywheel Cover	M6	3	9 Nm (6.64 lbf ft)	-
5	Screw fastening pick-up / Flywheel cover	M5	2	3.50 Nm (2.58 lbf ft)	Loctite 270
6	Flywheel cover fastener screw	M6	10	13 Nm (9.59 lbf ft)	-
7	Screw fastening starter motor bracket to motor and crankcase	M6	4	13 Nm (9.59 lbf ft)	-
8	Crankshaft access cap	-	1	4 Nm (2.95 lbf ft)	-
9	Retainer plate fastener screw	M6	1	8 Nm (5.90 lbf ft)	3M SCOTCH GRIP 2353

Removing the flywheel cover

- Remove the flywheel cover inspection cap.

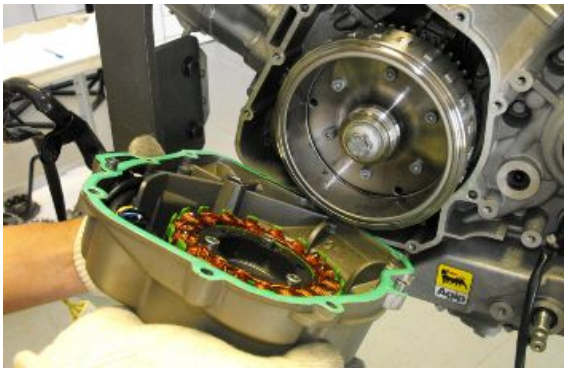
- Unscrew and remove the ten screws.



- Remove the flywheel cover using the specific tool.

Specific tooling

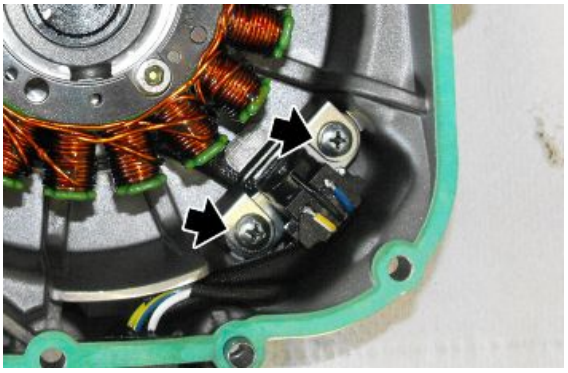
020712Y Handle for Flywheel cover removal



- Collect the gasket and the two dowel pins.

Removing the flywheel cover components

- Remove the two pick-up fixing screws.



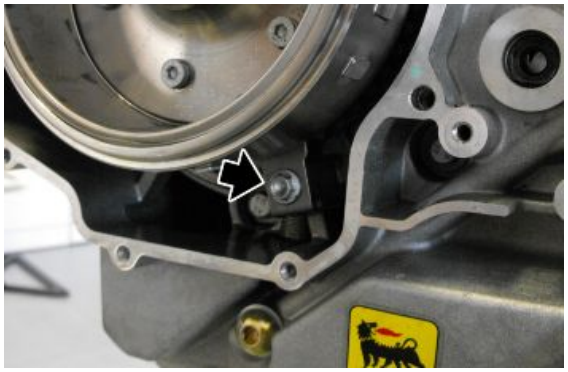
- Remove the three stator fixing screws.

CAUTION

THE PICK-UP AND STATOR SHALL BE REMOVED SIMULTANEOUSLY AS THEY ARE PART OF THE SAME ELECTRICAL BRANCH.

Magneto flywheel removal

- Remove the flywheel cover.
- Unscrew and remove the screw and remove the retention plate.



- Heat the magneto flywheel with the specific heater.
- Lock the flywheel using the specific tool and loosen the screw.

Specific tooling

020713Y Flywheel extractor

- Screw the anticlockwise bolt of the special tool on the external body.
- Keeping the external body blocked and gripping the key, screw the anticlockwise bolt so as to remove the flywheel from the crankshaft.

Specific tooling

020713Y Flywheel extractor

- Unscrew and remove the anticlockwise bolt of the special tool from the external body.
- Unscrew the screw from the crankshaft.

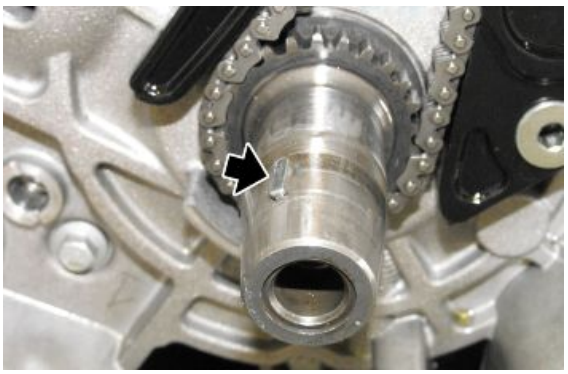
Specific tooling

020713Y Flywheel extractor

- Remove the flywheel together with the freewheel.

- Remove the start-up transmission gear.
- Check dimensions of the supports of transmission gear on crankcase and cover: the limit is 12.005 mm (0.4726 in) for both supports
- In case of malfunction, the start-up transmission gear cannot be over-hauled. Therefore, the complete trans-mission gear should be replaced.

- Collect the crankshaft woodruff key.



Freewheel removal

- Remove the flywheel.
- Remove the freewheel gear.

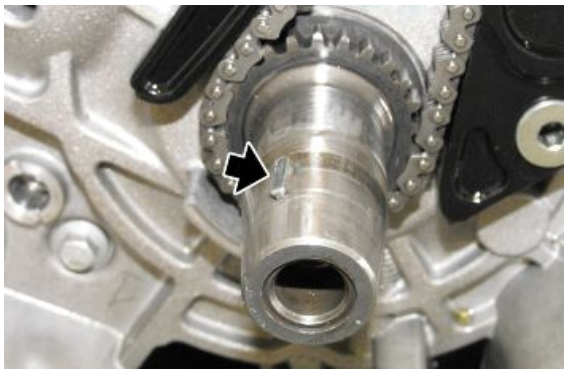
- Heat the magneto flywheel with the specific heater.
- Unscrew and remove the six screws.
- Remove the bearing retainer and bearing from the magneto flywheel.

See also

Magneto flywheel removal

Installing the flywheel

- Insert the woodruff key on the crankshaft.



- Insert the start-up transmission gear after applying a layer of grease.

- Insert the flywheel on the crankshaft.
- Screw the screw together with the washer but without tightening.

- Place the appropriate tool for locking the flywheel.
- Locking the flywheel in position, using the specific tool, tighten the screw on the crankshaft.
- Remove the special tool.

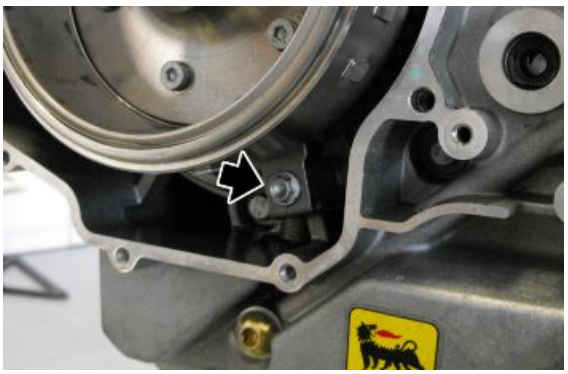
Specific tooling

020713Y Flywheel extractor

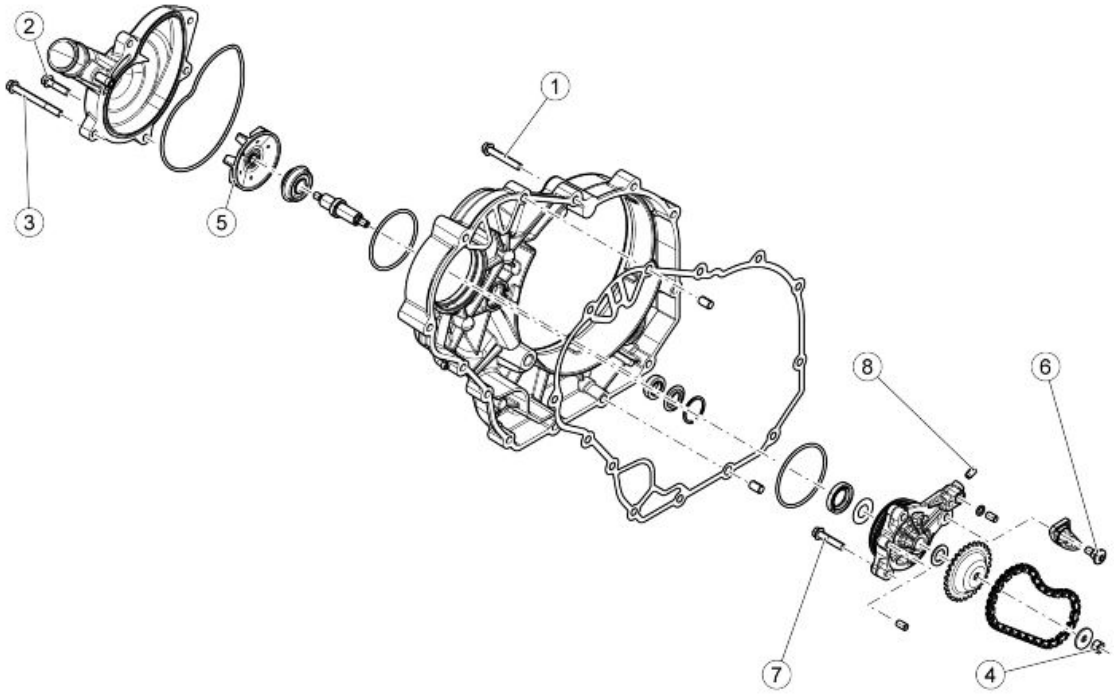
Locking torques (N*m)

Screw fixing Rotor - Crankshaft - M12x1.25 (1)
130 Nm (95.88 lbf ft)

- Place the retention plate.
- Tighten the screw.



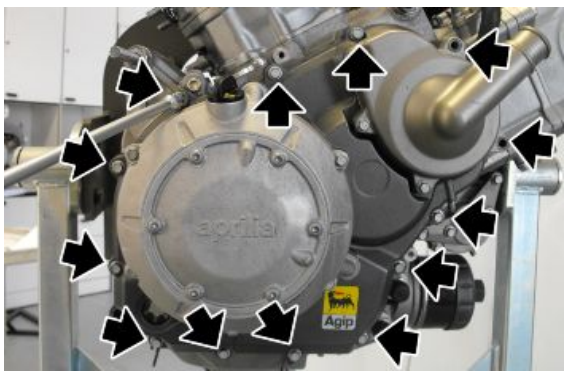
Clutch side



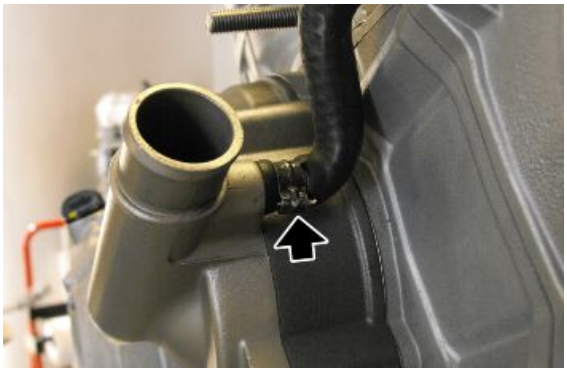
WATER PUMP

pos.	Description	Type	Quantity	Torque	Notes
1	Clutch side cover fastener screw	M6	11	13 Nm (9.59 lbf ft)	-
2	Fastener screw for Pump Cover / Clutch side cover	M6	3	13 Nm (9.59 lbf ft)	-
3	Screw fastening Pump Cover / Clutch Cover / clutch side crankcase half	M6	2	13 Nm (9.59 lbf ft)	-
4	Nut fastening water pump drive gear sprocket	M6	1	12 Nm (8.85 lbf ft)	-
5	Water pump rotor	-	1	4.50 Nm (3.32 lbf ft)	-
6	Screw fastening chain tensioner slider to water pump	M6	1	6 Nm (4.42 lbf ft)	-
7	Water pump support fixing screw	M6	3	12 Nm (8.85 lbf ft)	-
8	Water pump support plug	M6x10	1	6.5 Nm (4.79 lbf ft)	3M SCOTCH GRIP 2353

- Unscrew and remove the thirteen screws in a cross pattern (the two screws also retaining the water pump cover are longer than the other eleven ones).

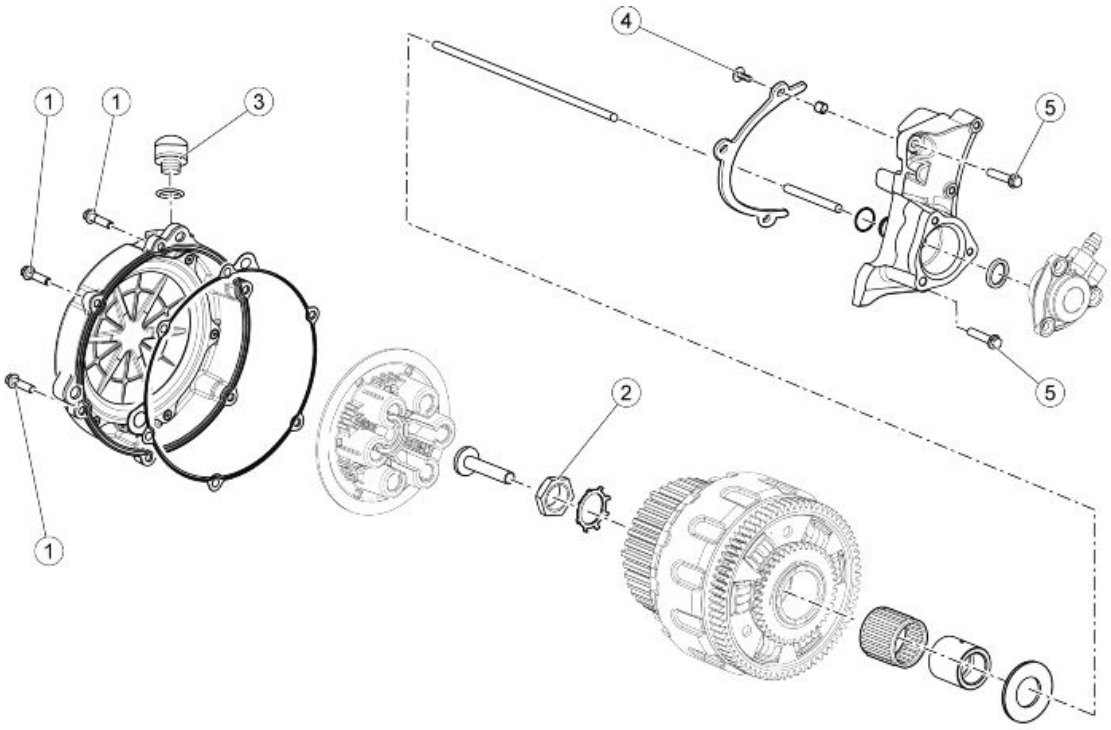


- Drain the engine oil.
- Detach clamp retaining water pump pipe.



- Collect the gasket.

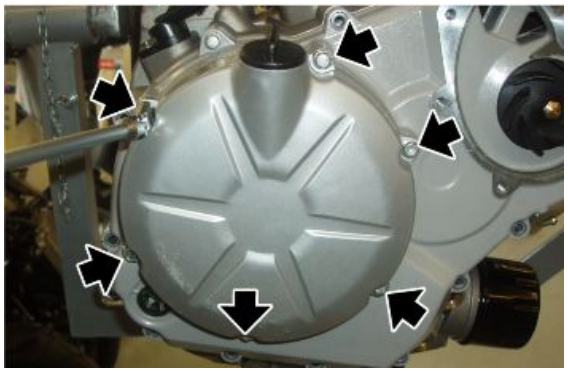
Removing the clutch cover



CLUTCH COVER

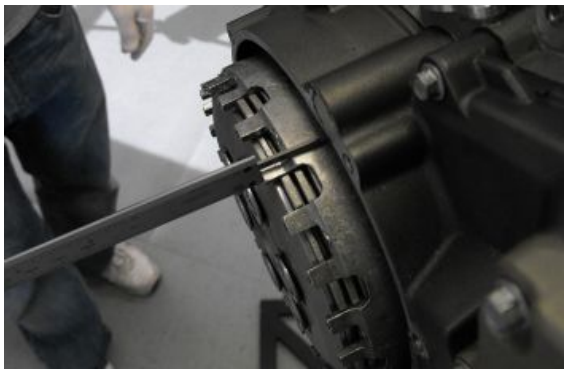
pos.	Description	Type	Quantity	Torque	Notes
1	Screw fastening Clutch Cover / intermediate Clutch side cover	M6	6	13 Nm (9.59 lbf ft)	-
2	Clutch fastener nut	M24x1	1	170 Nm (125.38 lbf ft)	Chamfer
3	Fastening oil filler plug on Clutch cover	-	1	2 Nm (1.48 lbf ft)	-
4	Screw fastening fixing Plate / Clutch control Mounting	M5	3	5.50 Nm (4.06 lbf ft)	Loctite 242
5	Screw fastening clutch control mounting on flywheel side crankcase half	M6	2	13 Nm (9.59 lbf ft)	-

- Unscrew and remove the six perimeter fastener screws.
- Remove the clutch cover.
- Remove the gasket

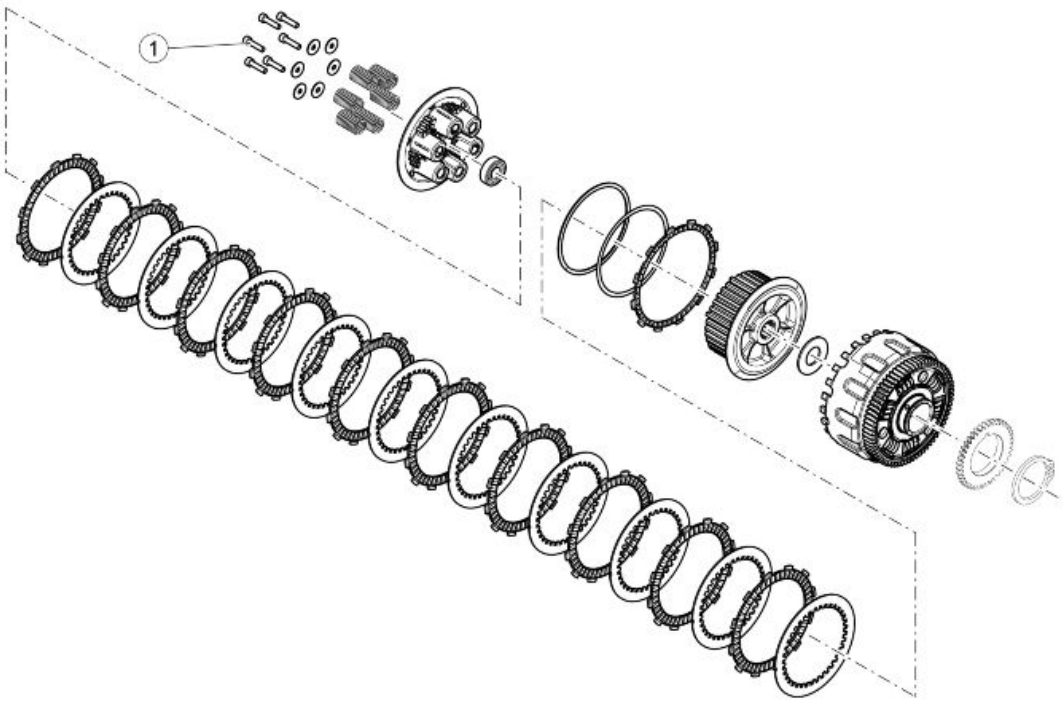


Removing the clutch cover alone is only recommended when replacing the clutch plates. When removing the entire clutch assembly, removing the clutch side cover is recommended.
However, removing the entire clutch assembly is possible by removing the clutch cover alone. In this case, proceed as follows:

- measure the projection of the clutch housing from the crankcase before disassembling;
- when refitting, check that the projection has not changed before tightening the clutch nut. If the projection has changed, rotate the crankshaft to correctly engage the engine oil pump drive gear on the clutch housing with the oil pump driven gear.



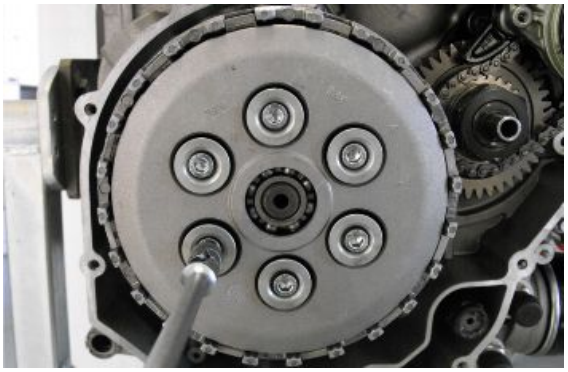
Disassembling the clutch



CLUTCH

pos.	Description	Type	Quantity	Torque	Notes
1	Clutch spring fastener screw	M6	6	11 Nm (8.11 lbf ft)	-

- Remove the clutch-side 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, the plates and belleville washer.

- Remove the mushroom head clutch control rod.

- Working on the flywheel side, push the clutch control rod so that it comes out on the other side.

- Remove the clutch control rod.

- Fasten the clutch housing using the specific tool.

Specific tooling

9100896 Clutch housing locking tool

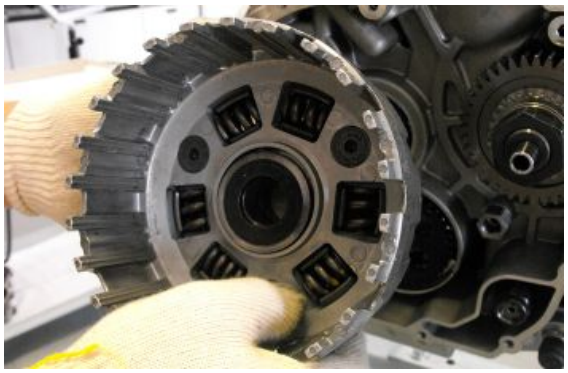
- Unscrew and remove the clutch hub nut.

- Remove the washer to be chamfered.

- Remove the clutch hub.

- Collect the washer between the clutch hub and the housing.

- Collect the clutch housing.

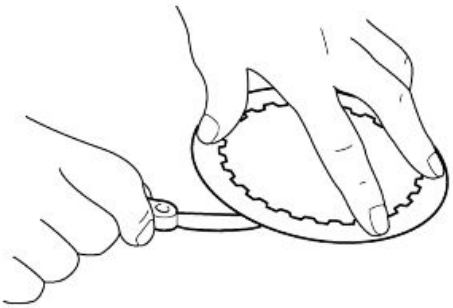


- Collect the spacer and the needle bearings.

- Collect the special shim featuring two thicknesses.

Checking the clutch plates

- Lay the friction discs and steel discs on a level surface and check them for cracks and potential distortions.



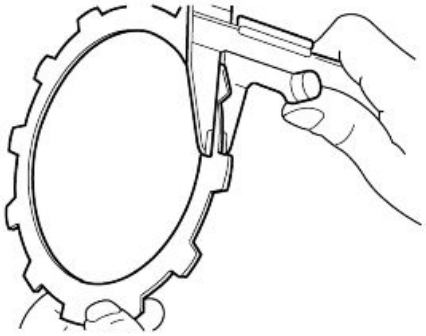
Maximum distortion allowed: 0.20 mm (0.0079 in)

- Measure the driving plate thickness at four positions, replace them all if not complying with specifications.

CAUTION

THE STEEL DISCS MUST SHOW NO SCORES OR TEMPERING COLOUR.

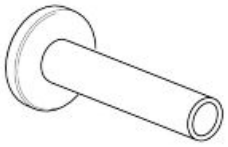
- Measure the thickness of the clutch plates at four positions, replace them if not complying with specifications.



Minimum thickness of the eleven driving plates (individually): 2.75 mm (0.11 in).
Minimum thickness of the ten driven plates (individually): 1.95 mm (0.077 in).

MUSHROOM VALVE CHECK

- Check if the valve slides freely, without jamming.
- Blow compressed air into the valve and check that the lubricating oil passage holes open.



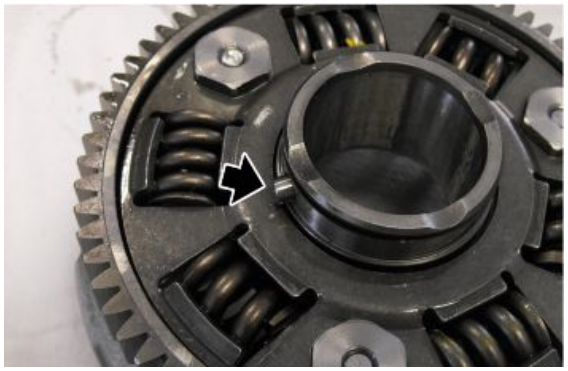
Checking the clutch housing

- Remove the clutch bell.
- Remove the seeger ring.

- Remove the oil pump control gear.

UPON REFITTING, THE GEAR COLLAR MUST ALWAYS BE FACING THE CLUTCH BELL.

- Remove the rotation locking pin from the oil pump control gear.



Check the clutch bell for damage and wear that may result in clutch irregular operation. Deburr the teeth or replace the bell.

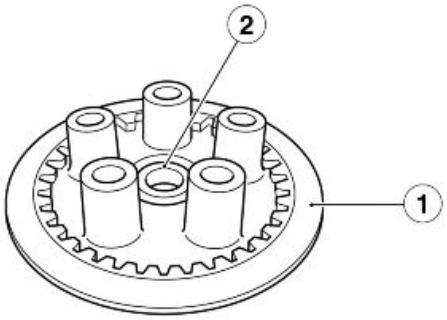
MAIN DRIVEN GEAR CHECK

Check the main driven gear for damage and wear and, if necessary, replace the main transmission driving gear and the clutch bell all together.

Make sure there is not excessive noise during operation; if necessary, replace the main transmission driving gear and the clutch bell all together.

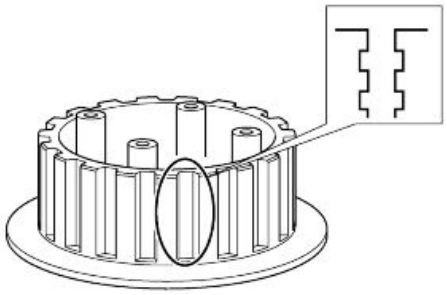
Checking the pusher plate

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



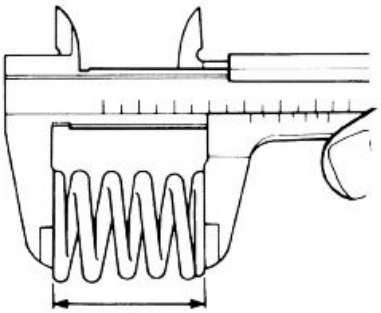
Checking the clutch hub

Check the clutch hub for damage and wear that may result in clutch irregular operation. If necessary, replace the bell.



Checking the springs

- Check the springs for damage and, if necessary, replace the them all together.
- Measure the clutch spring length when unloaded; if necessary, replace the springs all together.



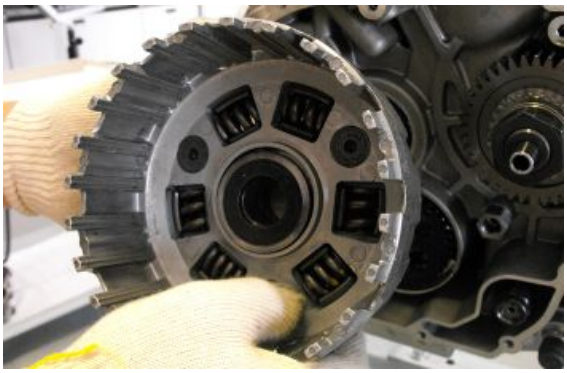
Clutch spring length when unloaded: 69.2 +/- 5 mm (2.72 +/- 0.2 in)

Assembling the clutch

- Fit the shim washer.

- Fit the needle bearing and the spacer.

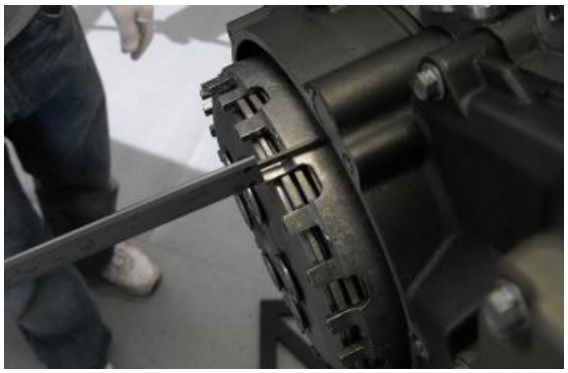
- Fit the clutch housing.
- Make sure that the oil pump control drive gear of the clutch housing engages correctly with the oil pump driven gear.



- Place the washer correctly between the clutch housing and the hub.

- Position the clutch hub.

- Fit the clutch-side cover.
- Check that the measurement has not changed compared with the one carried out upon removal; tighten the clutch nut afterwards. If the projection has changed, rotate the crankshaft to correctly engage the engine oil pump drive gear on the clutch housing with the oil pump driven gear.



- Fit the washer and a new clutch hub nut.
- Tighten the clutch hub nut using the specific tool.

Specific tooling

9100896 Clutch housing locking tool

- Tighten the nut and proceed to caulk.

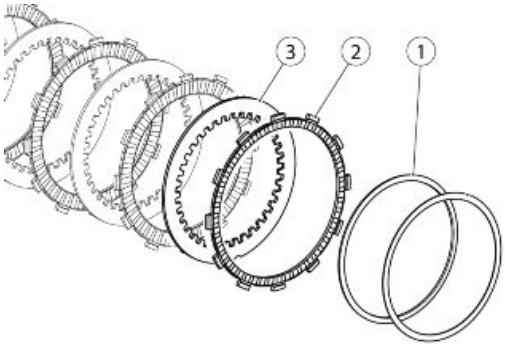
CAUTION

BE CAREFUL WITH THE CUPPED RING FITTING SIDE; THE RING CONE SHALL BE DIRECTED TOWARDS THE ENGINE.

- Insert the cupped ring (1).

CAUTION

BE CAREFUL WITH THE CUPPED RING FITTING SIDE; THE RING CONE SHALL BE DIRECTED TOWARDS THE ENGINE.



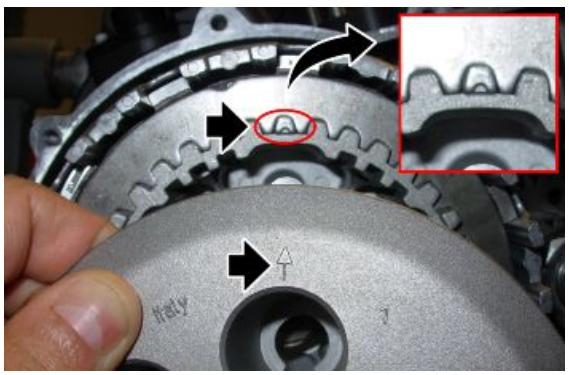
- Fit the lathed driven disc (2).
- Fit the nitrided steel disc (3).

- Fit the clutch plates. Start with the friction material discs and alternate with steel discs.
- Position all friction material discs with their teeth aligned in one of the long slots of the clutch housing.
- Place the control rod.

- Place the thrust plate.

CAUTION

ENSURE TO ALIGN THE ARROW ON THRUST PLATE WITH THE MACHINED REFERENCE ON HUB.



- Fit the clutch springs.
- Fit the screw washers.
- Tighten the six screws operating in stages and diagonally.

- On reassembly, replace the gasket under clutch cover.

Installing the clutch cover

CLUTCH-SIDE COVER OIL SEAL INSTALLATION

- For controlled driving of the oil seal, take a 0.5 mm (0.020 in) thick washer, having an inside diameter of 12 mm (0.47 in) and outside diameter of 20 mm (0.79 in).
- Prepare the following tools:

Specific tooling

020376Y Adapter handle

020362Y 12 mm guide

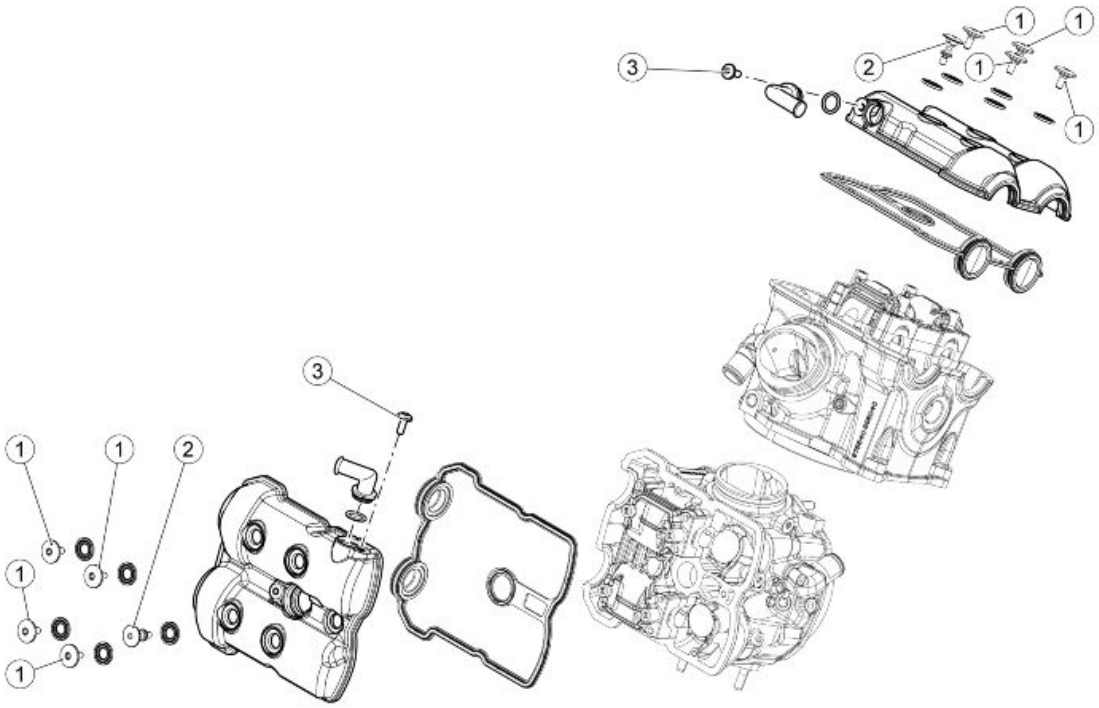
020891Y Adapter 25 mm (0.98 in)

- Assemble the tool using the washer for controlled driving then, paying attention to the assembly direction, set the oil seal in its seat, with marking facing the operator.

- Place the oil seal retainer with its flat side resting against the oil seal.

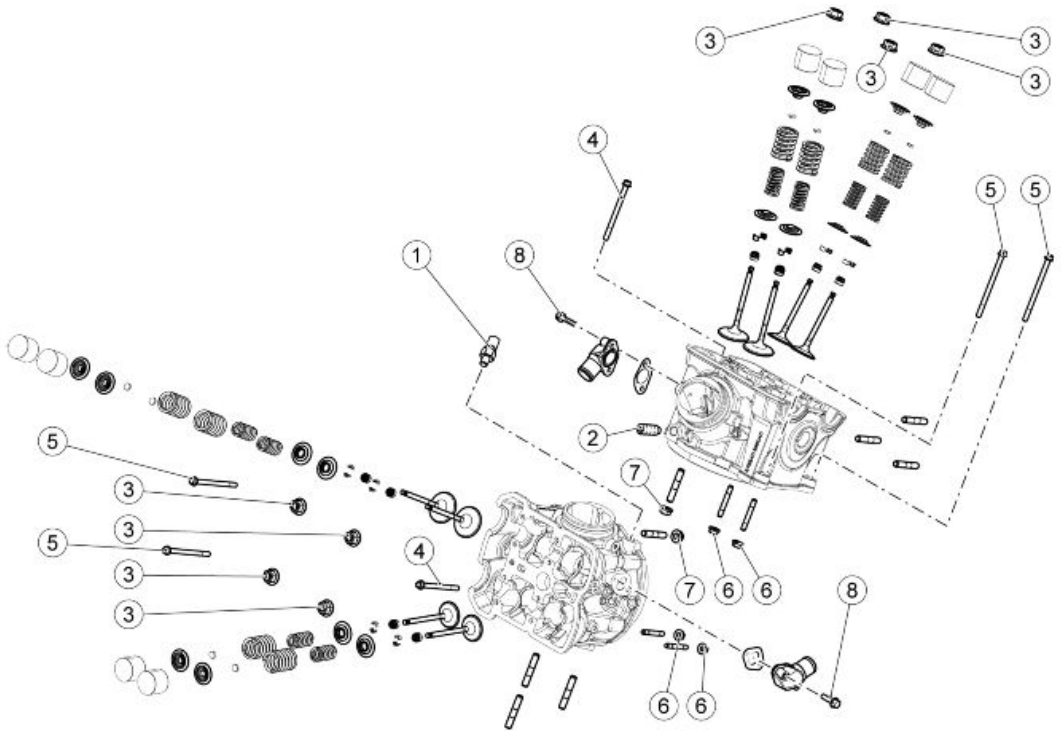
- Position the retainer ring.

Heads



HEAD COVER

pos.	Description	Type	Quantity	Torque	Notes
1	Special screw for fastening head cover	M6	8	9 Nm (6.64 lbf ft)	-
2	Special screw for fastening head cover	M6	2	9 Nm (6.64 lbf ft)	-
3	Oil breather fastener screw	M6	2	5.50 Nm (4.06 lbf ft)	-
-	Spark plugs	-	2	10-12 Nm (7.38-8.85 lbf ft)	-



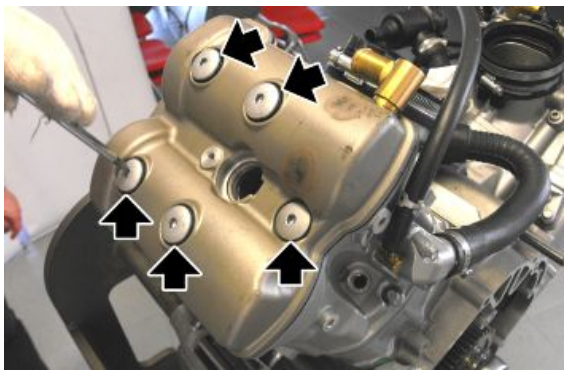
HEAD

pos.	Description	Type	Quantity	Torque	Notes
1	Water Temperature Sensor	M12x1.5	1	22 Nm (16.22 lbf ft)	-
2	Threaded plug for water sensor seat	M12x1.5	1	10 Nm (7.38 lbf ft)	Loctite Drise AL 506
3	Head stud bolt fastener nut - pre-tightening	M10x1.25	8	10 Nm (7.38 lbf ft)	Lubricate the threads before tightening
3	Head stud bolt fastener nut - tightening	M10x1.25	8	13 Nm (9.59 lbf ft) + 90° + 90°	Lubricate the threads before tightening
4	Fastener for Head / Cylinder / Outer side crankcase	M6	2	12 Nm (8.85 lbf ft)	-
5	Fastener for Head / Cylinder / Inner side crankcase	M6	4	12 Nm (8.85 lbf ft)	-
6	Nut fastening Stud Bolts / Head	M6	4	12 Nm (8.85 lbf ft)	-
7	Nut fastening Stud Bolts / Head	M8	2	26 Nm (19.18 lbf ft)	-
8	Bleed union fastener screw	M5	4	5.50 Nm (4.06 lbf ft)	Loctite dry loc 2040

Head cover removal

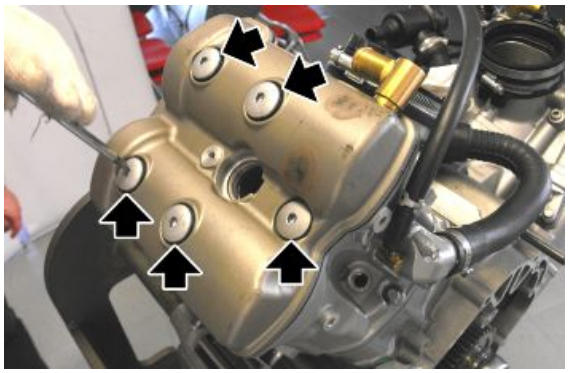
The operations described below are valid for both heads.

- Unscrew and remove the five screws and collect the rubber rings.
- Remove the head cover.



HEAD COVER FITTING

- Installation operations apply to both head covers.
- Ensure gasket is in good conditions. If required, change it and use a gasket having the same features.
- Fit the cover.
- Fit the rubber blocks in their seats.
- Start and tighten the five screws to the prescribed torque working diagonally and in stages.

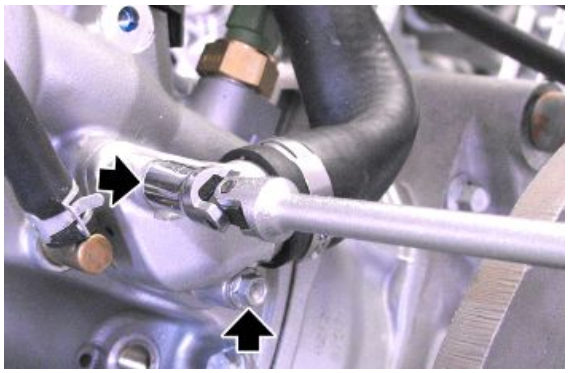


Front head

Removing camshafts

- Remove the head cover.

- Unscrew and remove the two screws.
- Remove the coolant fitting.

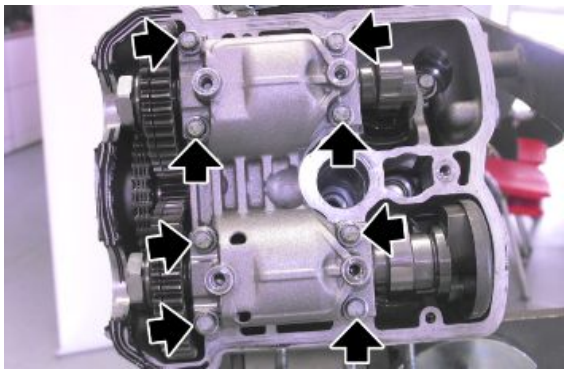


- Disconnect the coolant breather pipe.

See also

Head cover removal

- Remove the cap from flywheel cover.
- Turn the crankshaft until the front cylinder piston reaches the TDC (combustion).
- Unscrew and remove the eight cam tower screws working in a diagonal sequence and in stages.



- Remove the cam tower.

- Remove the camshafts with the gears.

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.

- Remove the exhaust camshaft.
- Position the camshaft on a vice featuring protective shoes.
- Unscrew and remove the screw and collect the washer.

- Remove the decompression device housing.

- Remove the counterweight and decompression device with the relevant spring.

- To refit, engage spring on decompression device and preload it by one turn.
- Install the counterweight and engage the preloaded device to it.
- Tighten the counterweight fixing screw.

Installing camshafts

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

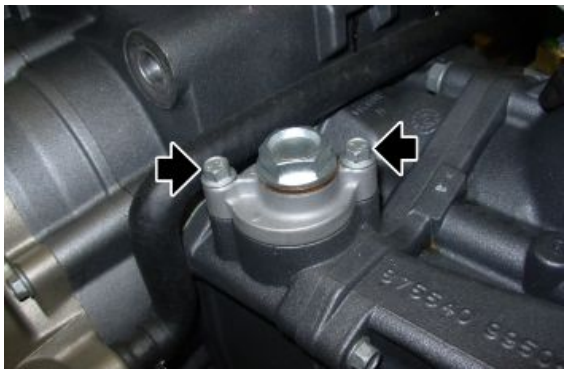
See also

Timing

Front head removal

- Remove the clutch assembly.
- Unscrew and remove the screw and collect the washer and the internal spring.

- Unscrew and remove the two screws.
- Remove the chain tensioner and collect the gasket.

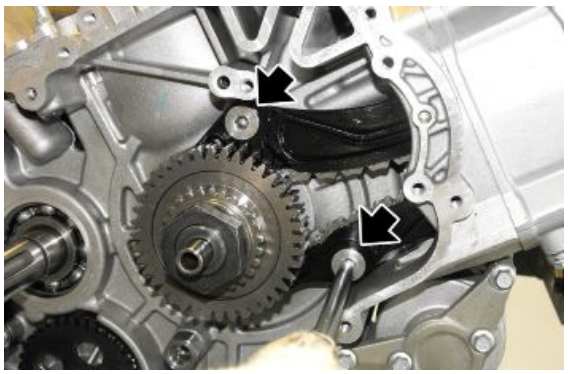


- Remove the camshafts with the gears.

See also

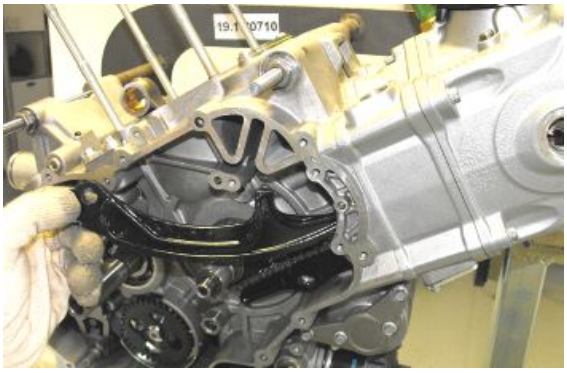
Removing camshafts
Disassembling the clutch

- Unscrew and remove the two chain slider screws.



- Unscrew and remove the chain intermediate gear pin.
- Pay attention to avoid damaging the O-ring.

- Remove the primary gear following the explanation given on crankcase opening.
- Remove the mobile chain slider.



- Remove the primary gear following the explanation given on crankcase opening.
- Remove the intermediate gear with chain.

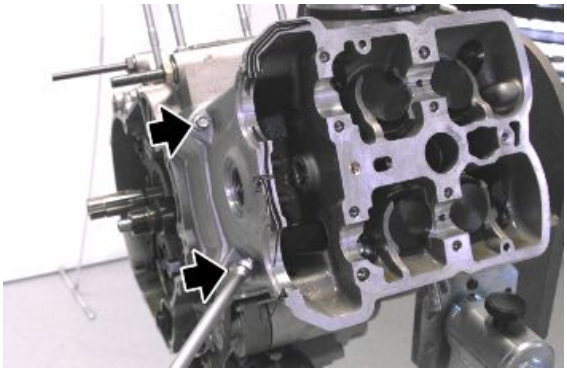
NOTE

IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE INITIAL DIRECTION OF ROTATION IS MAINTAINED.

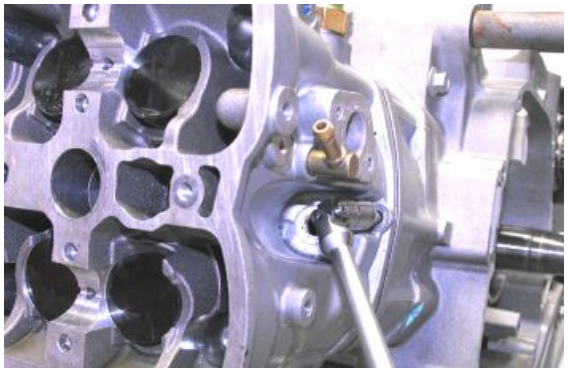
See also

Splitting the
crankcase halves

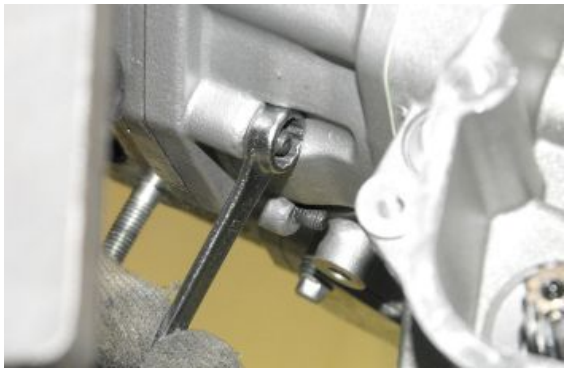
- Unscrew and remove the two external head fixing screws.



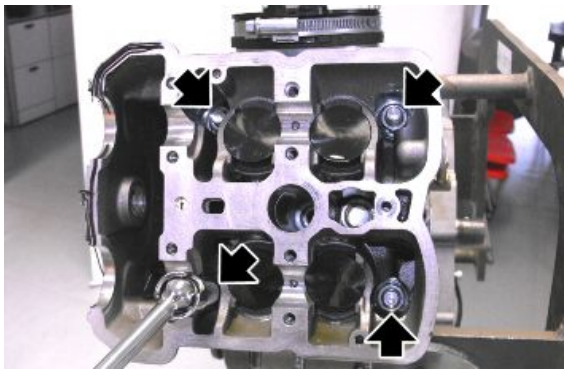
- Unscrew and remove the external screw on the flywheel side.



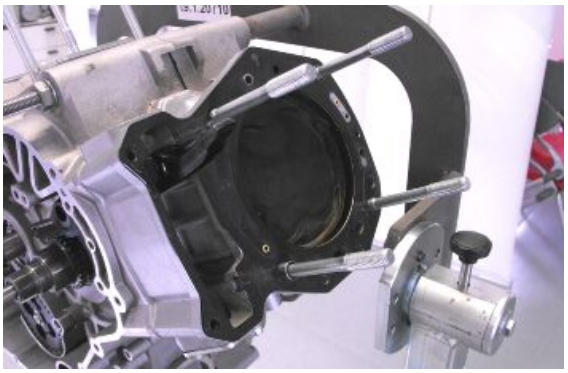
- Unscrew and remove the three bottom head fixing nuts.



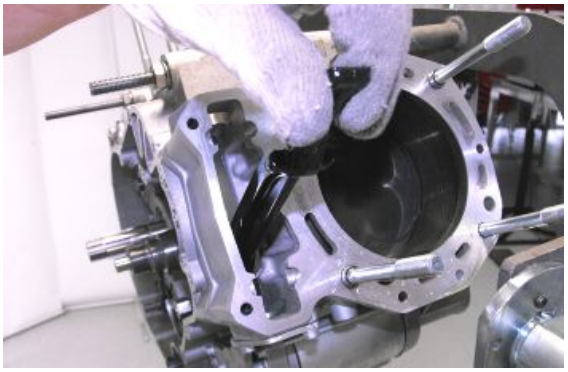
- Unscrew and remove the four nuts, proceeding in stages and in a diagonal pattern.



- Slide head off the stud bolts.
- Remove the gasket between the head and the cylinder.



- Rimuovere il pattino catena fisso.



Front head check

- Using a round scraper, clean off any carbon deposits in the combustion chamber.

CAUTION

DO NOT USE A POINTED INSTRUMENT TO AVOID DAMAGING OR SCRATCHING THE SPARK PLUG THREADS OR THE VALVE SEATS.

- Check that cylinder head is not damaged or scratched; replace it if necessary.
- Check that there are no mineral deposits or rust in the cylinder head water cooled jacket; remove them if necessary.
- Check that the tappet covers and the camshaft toothed wheel cover are not damaged or worn; replace the defective part(s).

Rear head

Removing camshafts

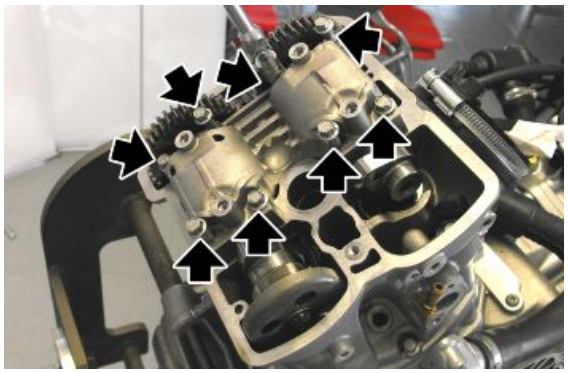
- Remove the head cover.

- Unscrew and remove the two screws.
- Remove the coolant fitting.

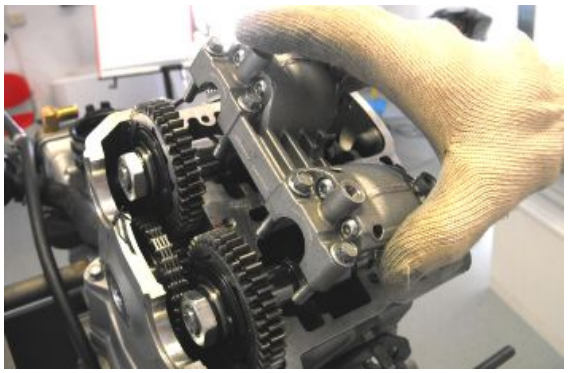
See also

Head cover removal

- Remove the cap from flywheel cover.
- Rotate the crankshaft until the rear cylinder piston reaches the TDC.
- Unscrew and remove the eight cam tower screws working in a diagonal sequence and in stages.



- Remove the cam tower.



- Remove the camshafts with the gears.

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.

- Remove the exhaust camshaft.
- Position the camshaft on a vice featuring protective shoes.
- Unscrew and remove the screw and collect the washer.

- Remove the decompression device housing.

- Remove the counterweight and decompression device with the relevant spring.

- To refit, engage spring on decompression device and preload it by one turn.
- Install the counterweight and engage the preloaded device to it.
- Tighten the counterweight fixing screw.

Installing camshafts

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

See also

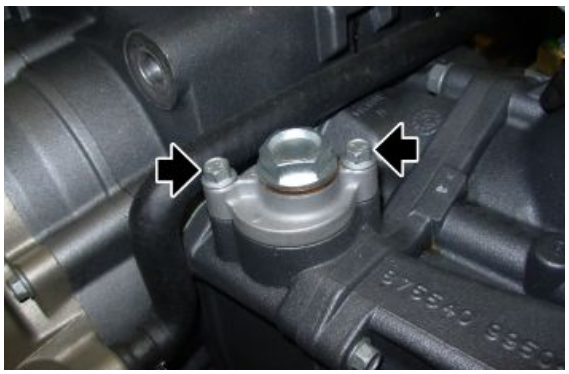
Timing

Rear head removal

- Remove the magneto flywheel.

- Unscrew and remove the screw and collect the washer and the internal spring.

- Unscrew and remove the two screws.
- Remove the chain tensioner and collect the gasket.



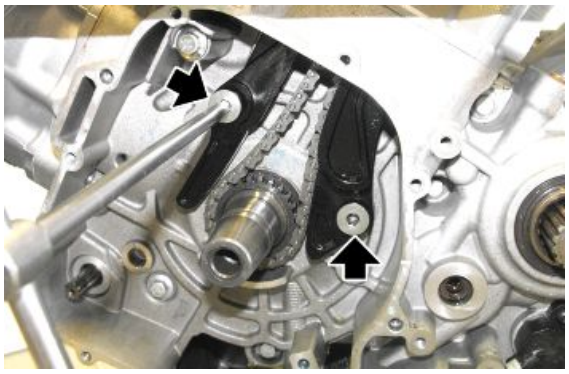
- Remove the camshafts with the gears.

See also

Removing camshafts

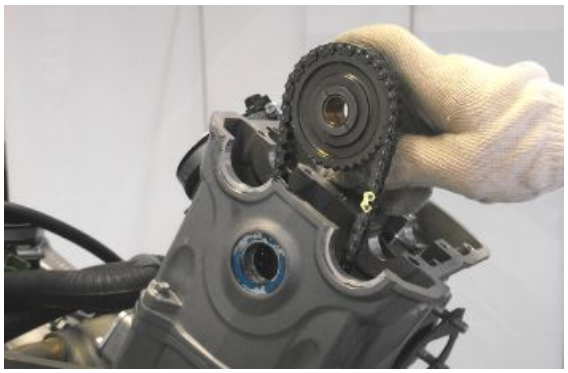
Magneto flywheel removal

- Unscrew and remove the two chain slider screws.



- Unscrew and remove the chain intermediate gear pin.
- Pay attention to avoid damaging the O-ring.

- Remove the primary gear following the explanation given on crankcase opening.
- Remove the intermediate gear with chain.



NOTE

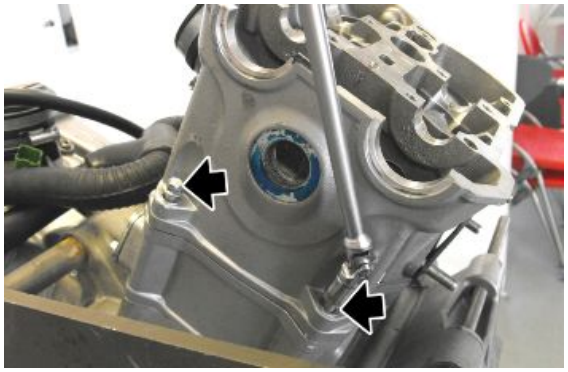
IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE INITIAL DIRECTION OF ROTATION IS MAINTAINED.

- Remove the mobile chain slider.

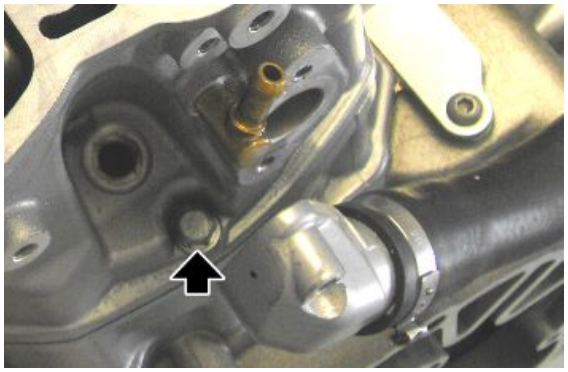
See also

Splitting the crankcase halves

- Unscrew and remove the two external head fixing screws.

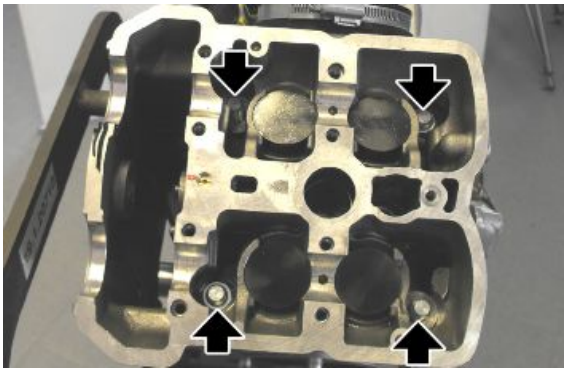


- Unscrew and remove the external screw on the flywheel side.

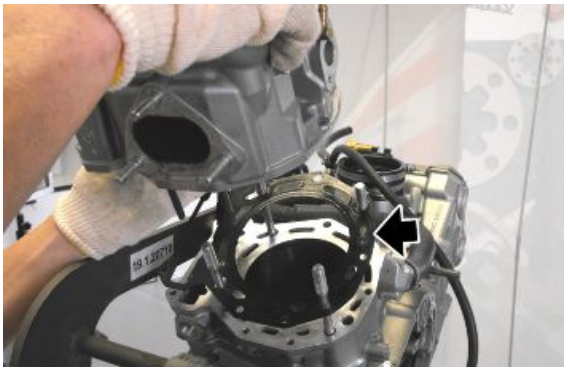


- Unscrew and remove the three bottom head fixing nuts.

- Unscrew and remove the four nuts, proceeding in stages and in a diagonal pattern.



- Slide head off the stud bolts.
- Remove the gasket between the head and the cylinder.



- Remove the fixed chain slider.

NOTE

ON REASSEMBLY, PERFECTLY CLEAN THE MATING SURFACE OF THE SPECIAL SCREW RETAINING THE IDLE GEAR AND THE THREE TIMING GEARS AND REPLACE THE ALUMINIUM WASHER.

Rear head check

- Using a round scraper, clean off any carbon deposits in the combustion chamber.

CAUTION

DO NOT USE A POINTED INSTRUMENT TO AVOID DAMAGING OR SCRATCHING THE SPARK PLUG THREADS OR THE VALVE SEATS.

- Check that cylinder head is not damaged or scratched; replace it if necessary.
- Check that there are no mineral deposits or rust in the cylinder head water cooled jacket; remove them if necessary.
- Check that the tappet covers and the camshaft toothed wheel cover are not damaged or worn; replace the defective part(s).

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.

- Remove the bucket tappets and the adjustment shims using a magnet.

- Compress the valve springs with the specific wrench and with the spring compressing tool.

Specific tooling

020382Y Tool for removing valve cotters fitted with part 012

020896Y Bushing for valve removal

- Remove the cotters using a magnet.

- Release the valve springs.
- Remove the valve spring fittings and the springs.

- Remove the valves.

Valve check

CAUTION

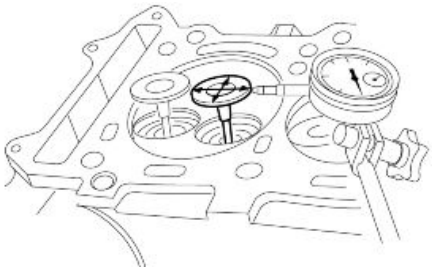
REPLACE THE VALVES ONE AT A TIME. DO NOT MIX THE COMPONENTS. EACH VALVE MUST BE INSERTED INTO ITS SEAT, WHICH IS MARKED PRIOR TO REMOVAL.

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.

If the measured deviation exceeds the specified limit, determine if the valve or the guide must be replaced.



Characteristic

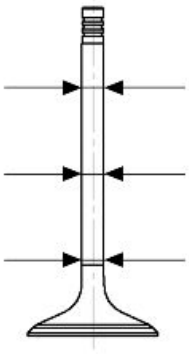
Valve stem distortion

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.

If the valve stem lies within the specific limit, replace the valve guide.

Recheck the clearance after replacing the valve or the guide.



Characteristic

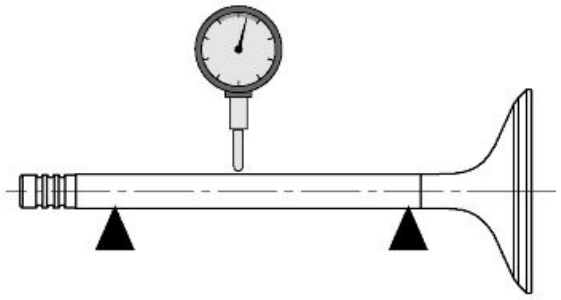
Intake valve stem diameter

5.987 - 5.973 mm (0.2357 - 0.2352 in)

Exhaust valve stem diameter

5.975 - 5.960 mm (0.2352 - 0.2346 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.

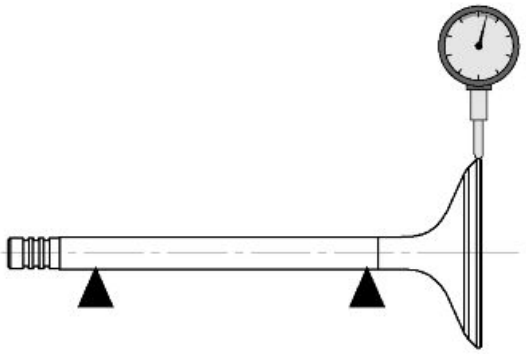


Characteristic

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.



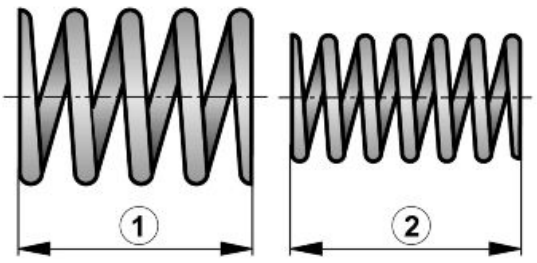
Characteristic

Valve head eccentricity

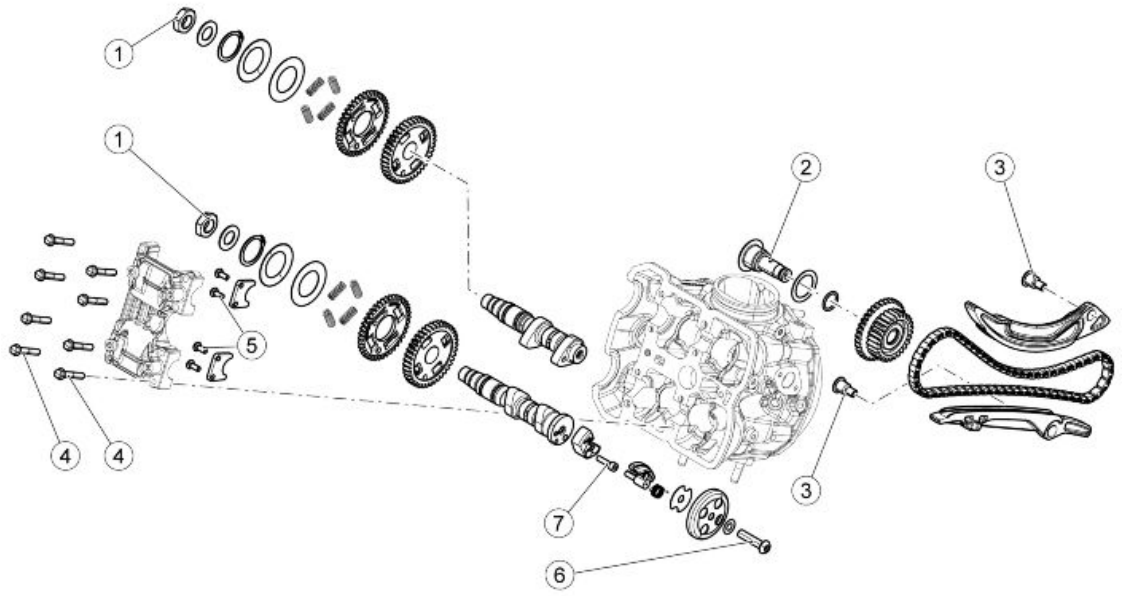
0.03 mm (0.0012 in)

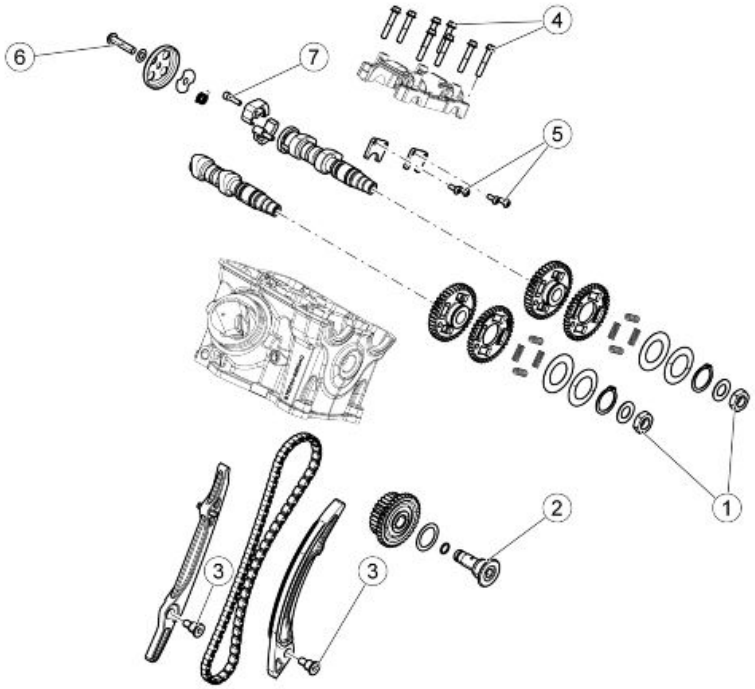
Spring check

Carry out a measurement and a visual inspection of the valve springs for damage, distortion or loss of tension.
Measure the spring length at release position.
Valve springs: minimum wear limit (1) **43.8 mm (1.724 in).**
minimum wear limit (2) **36.7 mm (1.445 in).**



Timing





TIMING SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Camshaft gear fastener nut	M15x1	4	90 Nm (66.38 lbf ft)	-
2	Timing drive gear fastener screw	M24x1.5	2	40 Nm (29.50 lbf ft)	3M SCOTCH GRIP 2353
3	Special screw for fastening mobile / fixed shoes	M8	4	19 Nm (14.01 lbf ft)	3M SCOTCH GRIP 2353
4	Cam tower / head fastener screws	M6	16	12 Nm (8.85 lbf ft)	-

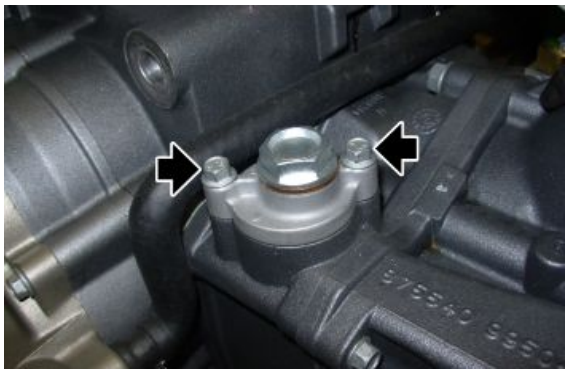
pos.	Description	Type	Quantity	Torque	Notes
5	Camshaft retainer plate fastener screw	torx M5	8	8.5 Nm (6.26 lbf ft)	3M SCOTCH GRIP 2353
6	Decompression device fixing screw	torx M8	2	28.5 Nm (21.02 lbf ft)	3M SCOTCH GRIP 2353
7	Fastener screw	M5	2	5.50 Nm (4.06 lbf ft)	3M SCOTCH GRIP 2353

Installing the chain tensioner

Refit the removed timing system chain tensioner on the cylinder - head:

- Fit the timing chain on the crankshaft and on the intermediate gear.
- Remove the screw and collect the washer and the spring.

- Fit the chain tensioner body on the cylinder and insert a new paper gasket.
- Tighten the two screws to the prescribed torque.

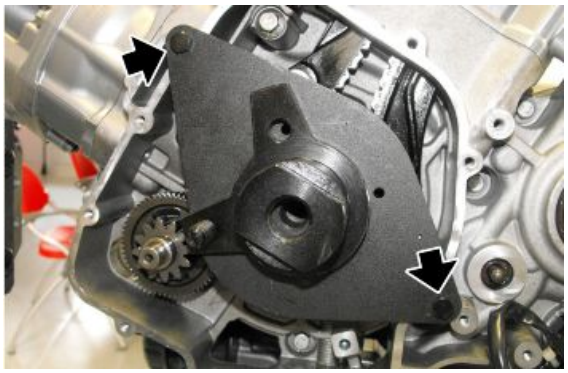


- Insert the spring and tighten the screw together with the washer.

Cam timing

Timing

- Remove the flywheel.
- Install the timing chains on the intermediate gears.
- Install special tool flange on flywheel side crankcase and fasten it using the two screws supplied.

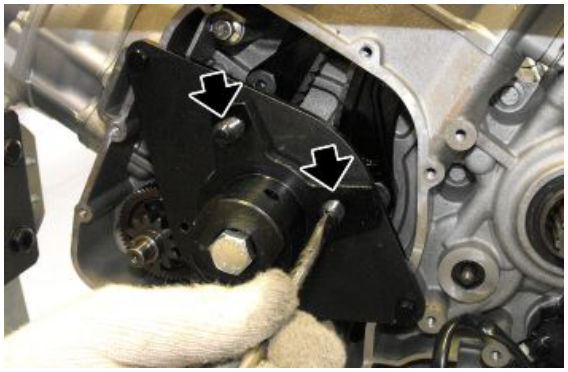


Specific tooling

020720Y Timing tool

- Fit tool on crankshaft matching the fly-wheel key.
- Tighten the screw on the crankshaft.
- Turn crankshaft until the tool "V" is positioned at the front cylinder.

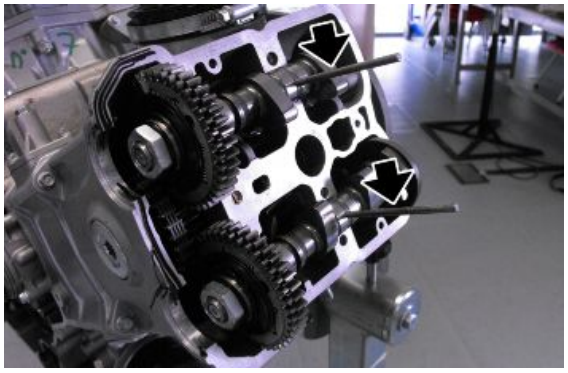
- Tighten the two pins of the tool.



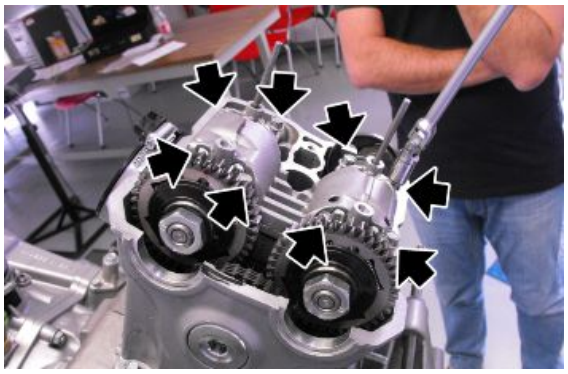
- Screw without tighten the nuts on cam-shaft gears.
- Install the camshafts on front head, aligning them using the suitable pins.

Specific tooling

020719Y Timing pin



- Fit cam tower and tighten the eight screws working in a diagonal sequence and in stages.



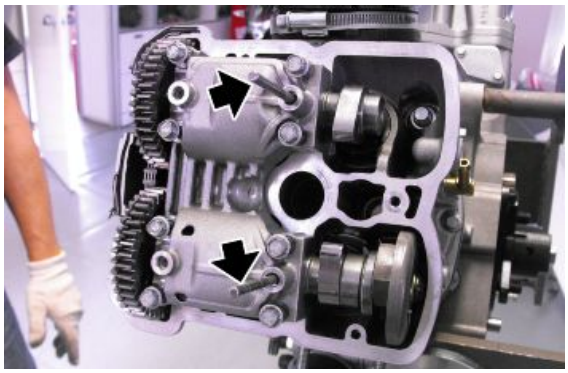
- Pre-tighten the gear nut on the camshaft.

REFIT THE NUT WITH THE MACHINED SURFACE FACING THE GEAR (THE MATERIAL ACRONYM SHOULD BE VISIBLE).

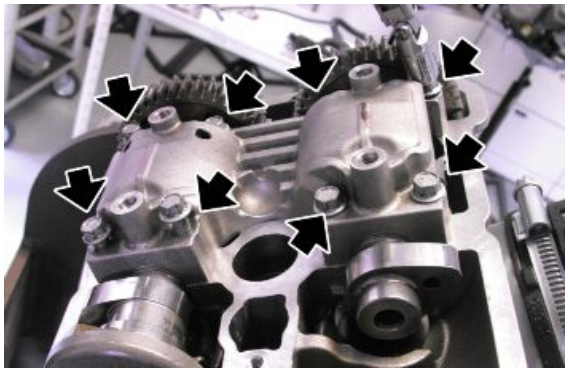
Locking torques (N*m)

Nut fixing camshaft gears (pre-tightening) - M15x1 (4) 30 Nm (22.13 lbf ft)

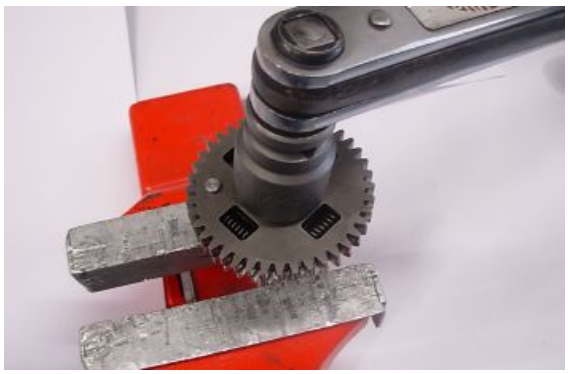
- Remove the two pins.



- Unscrew and remove the eight fixing screws and remove the cam tower.



- Remove both camshafts, lock them on a vice with aluminium jaws, then tighten the gear retaining nut to the prescribed torque.



DO NOT TIGHTEN THE CAMSHAFT GEAR NUT TO THE ULTIMATE TIGHTENING TORQUE WITH THE SHAFT MOUNTED ON THE HEAD.
THIS OPERATION WOULD IRRETRIEVABLY DAMAGE THE HEAD.

Locking torques (N*m)

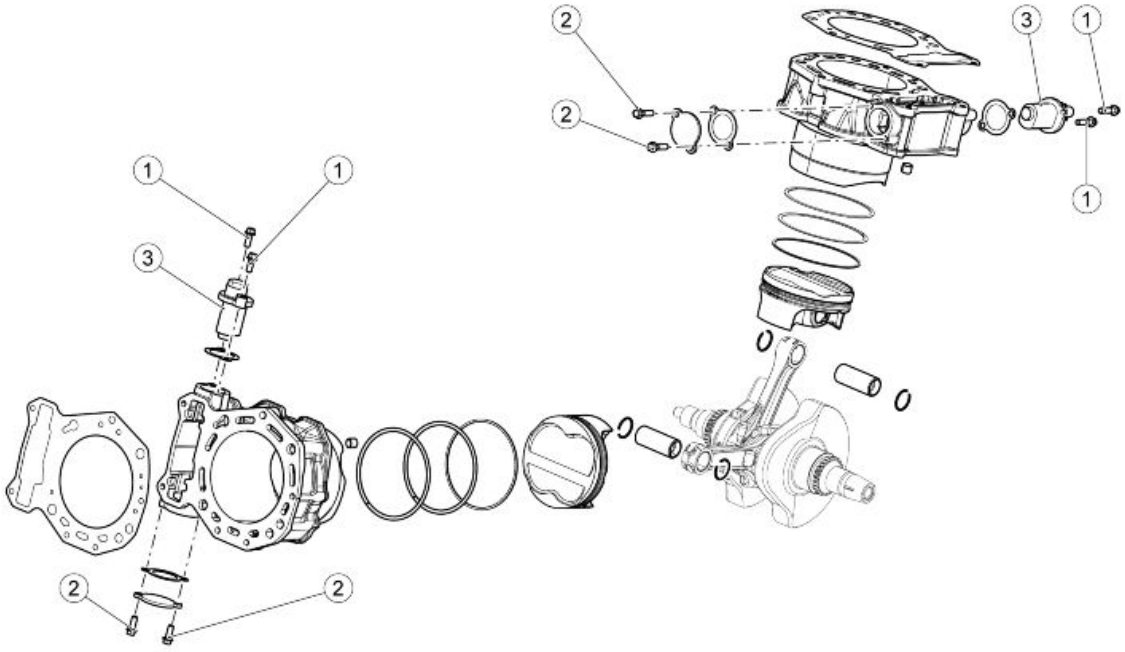
Nut fixing camshaft gears - M15x1 (4) 90 Nm (66.38 lbf ft)

- Repeat the fastening operations of the camshafts to the front head.
- Release the crankshaft from the specific special tool.
- Rotate the crankshaft in the riding direction until the rear cylinder piston reaches the top dead centre (270°).
- Lock the crankshaft with the specific special tool.
- Carry out the timing operations performed on the front cylinder; please remember that rear camshaft gear nuts are anticlockwise and cam position is divergent.

Specific tooling

020720Y Timing tool

Cylinder-piston assembly

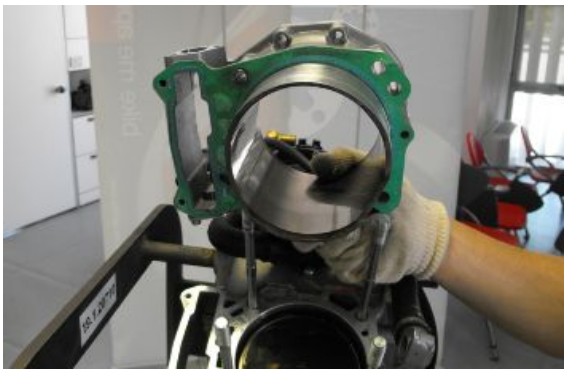


CYLINDER

pos.	Description	Type	Quantity	Torque	Notes
1	Chain tensioner fastener screw	M6	4	13 Nm (9.59 lbf ft)	-
2	Cylinder plate fastener screw	M6	4	13 Nm (9.59 lbf ft)	-
3	Chain tensioner adjustment screw	M6	2	5.50 Nm (4.06 lbf ft)	-

Removing the cylinder

- Remove the head
- Slide cylinder out of stud bolts collecting the base gasket.



See also

Front head removal

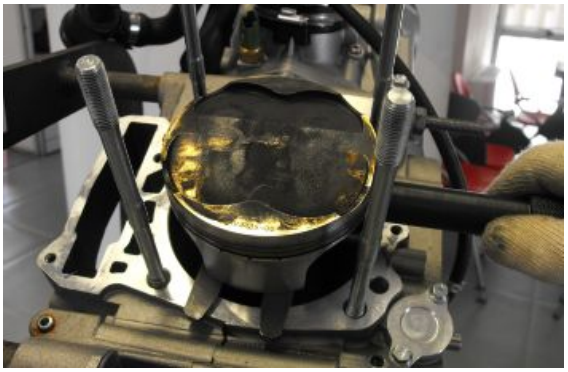
Rear head removal

Disassembling the piston

- Remove the cylinder.

- Take out the pin locking ring.

- Lock the connecting rod using the specific tool.
- Slide out the pin, using the assembly tool pin, and remove the piston.

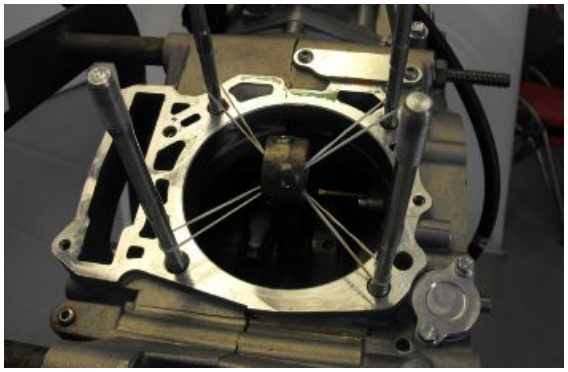


Specific tooling

020716Y Connecting rod locking

020894Y Pin snap ring fitting tool

- Lock the connecting rod using circlips.

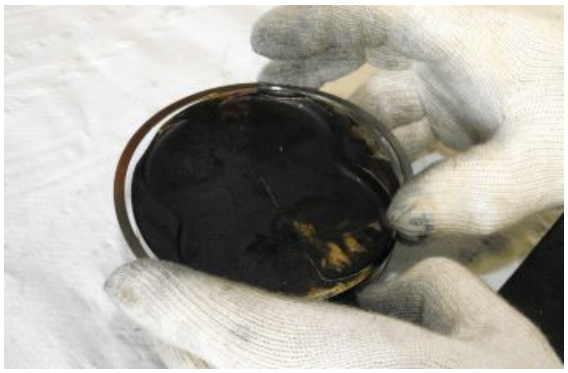


FOR SAFETY REASONS COVER THE CRANKCASE WITH A CLEAN CLOTH SO THAT THE PARTS DO NOT FALL IN-TO THE CRANKCASE.

See also

Removing the cylinder head
Removing the cylinder

- Remove the top ring, the intermediate ring and the three oil scraper rings.



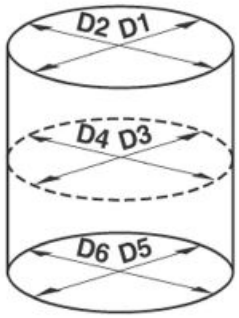
Checking the cylinder

- All seal surfaces must be clean and flat.
- Make sure all threads are in proper conditions.
- Check cylinder sliding surface for signs of friction and scratches. Also check the seal surfaces for damages.

CAUTION

IF THE GROOVES ON THE CYLINDER LINER ARE EVIDENT, REPLACE THE CYLINDER AND THE PISTON.

- Clean off lime scales on the cylinder cooling slots.
- Measure the cylinder bore at a distance of 10 - 43 - 90 mm (0.39 - 1.69 - 3.54 in) from the head coupling surface; the highest value should be considered to estimate wear limits.

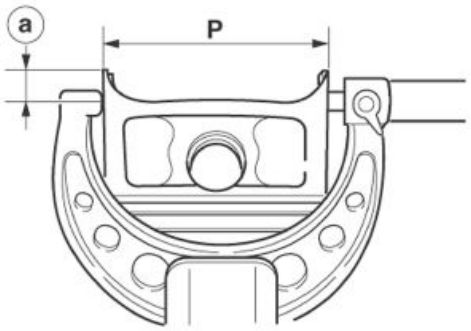


Cylinder bore (C): 106.000 mm (4.1732 in) C= D1 or D2 max

Replace the cylinder, the piston and the piston ring all together if not complying with specifications.

Checking the piston

- Measure the piston skirt diameter "P" with a micrometer (a=10 mm (0.39 in) from the piston lower border).
- Calculate the clearance between piston and cylinder as follows:



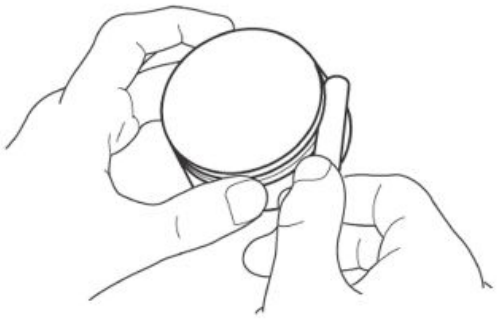
Piston diameter (P): 106.000 mm (4.1732 in)

Piston - cylinder clearance C = C - P

Piston - cylinder clearance: 0.085 mm (0.00335 in)

- Replace the cylinder, the piston and the piston ring all together if not complying with specifications.

PISTON RINGS

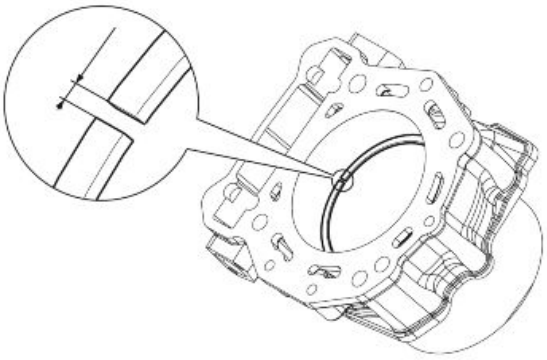


- Clean off any carbon deposits from the grooves in the piston rings and from the rings themselves.
- Measure the piston ring side clearance and replace the piston and the piston rings all together if not complying with specifications.

Piston ring side clearance:
Top ring (1st slot): with new engine 0.030 - 0.065 mm (0.0012 - 0.0026 in). Wear limit: 0.075 mm (0.0029 in)
Intermediate ring (2nd slot): with new engine 0.020 - 0.055 mm (0.0008 - 0.0022 in). Wear limit 0.065 mm (0.0026 in)
Oil scraper ring (3rd slot): with new engine 0.010 - 0.045 mm (0.0004 - 0.0018 in). Wear limit 0.055 mm (0.0022 in)

- Fit the piston ring to the cylinder.
- Level the installed piston ring with the piston crown.
- Measure piston ring port and replace it if not complying with specifications.

Piston ring end gap:
Top ring: with new engine 0.25 - 0.45 mm (0.0079 - 0.0177 in). Wear limit: 0.65 mm (0.026 in)
Intermediate ring: with new engine 0.35 - 0.60 mm (0.0138 - 0.0236 in). Wear limit: 0.80 mm (0.032 in)
Oil scraper ring: with new engine 0.20 - 0.70 mm (0.0079 - 0.0276 in). Wear limit: 0.90 mm (0.035 in)



PIN

- Clean off combustion residues from the piston crown and from the area above the top ring.

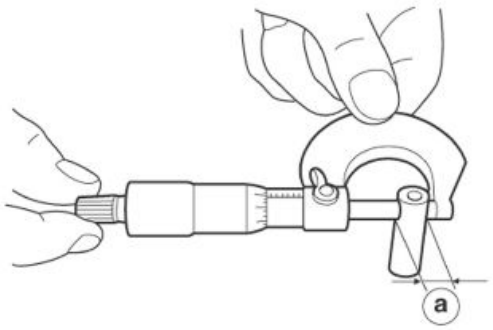
- Check for cracks on the piston and for compression on the piston sliding surface (seizing); Replace the piston if required.

CAUTION

SMALL STRIATIONS ON THE PISTON LINER ARE ADMISSIBLE.

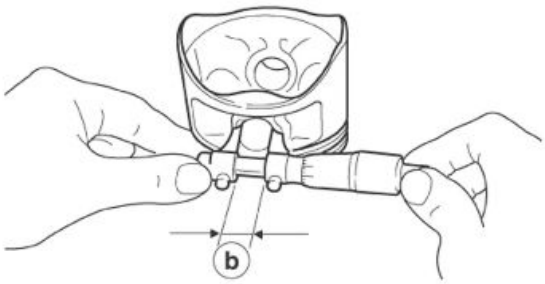
- Measure the pin outside diameter (a) and if not complying with specifications, replace the pin.

Pin outside diameter: 22.00 - 21.97 mm (0.8661 - 0.8650 in) Limit: 21.96 mm (0.8646 in)



- Measure the pin housing diameter (b) and replace the piston if not complying with specifications.

Pin housing diameter (b): 22.010 - 22.015 mm (0.8665 - 0.8667 in)



- Calculate the clearance between pin and pin hole and, if not complying with specifications, replace both pin and piston.

Pin - piston clearance: C = b - a

0.010 - 0.045 mm (0.0004 - 0.0018 in)

Limit: 0.060 mm (0.0024 in)

CYLINDER-PISTON COUPLING

Name	Initials	Cylinder	Piston	Play on fitting
Cylinder-piston clearance A - A	Type A - A	105.990 - 105.997 mm (4.1728 - 4.1731 in)	105.928 - 105.935 mm (4.1704 - 4.1707 in)	0.055 - 0.069 mm (0.0022 - 0.0027 in)
Cylinder-piston clearance B - B	Type B - B	105.997 - 106.004 mm (4.1731 - 4.1734 in)	105.935 - 105.942 mm (4.1707 - 4.1709 in)	0.055 - 0.069 mm (0.0022 - 0.0027 in)
Cylinder-piston clearance C - C	Type C -C	106.004 - 106.011 mm (4.1734 - 4.1736 in)	105.942 - 105.949 mm (4.1709 - 4.1712 in)	0.055 - 0.069 mm (0.0022 - 0.0027 in)
Cylinder-piston clearance D - D	Type D - D	106.011 - 106.018 mm (4.1736 - 4.1739 in)	105.949 - 105.956 mm (4.1712 - 4.1715 in)	0.055 - 0.069 mm (0.0022 - 0.0027 in)

NOTE

MAXIMUM CLEARANCE AT WEAR LIMIT 0.085 mm (0.0033 in)

Installing the cylinder

- Fit the stud bolts, if previously removed.

CAUTION

THE STUD BOLTS SHOULD BE FITTED SO THAT THEY PROTRUDE.

DISTRIBUTE Loctite 270 (high-strength) ON THE THREAD AND SCREW THE STUD BOLT ON THE CRANKCASE UNTIL THEY PROTRUDE BY 137 mm (5.39 in), THEN MAKE SURE THE Loctite HAS SET.

- The piston rings are different and must be installed with the marking at the top.
- Fit the lower oil scraper ring on the piston with the gap turned towards the exhaust side.
- Install the remaining piston rings on the piston, offsetting the gaps in the rings by 90° relative to each other.
- Fit a new retainer ring on the piston.
- Insert piston in the cylinder using the tool.

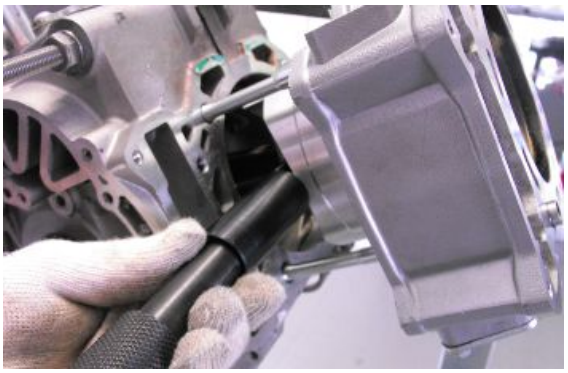
Specific tooling

020895Y Piston installation ring

- Install the second pin retainer ring on the tool guide, as shown in the figure.
- Insert tool shaft and push retainer ring inside the guide until reaching the height shown in the figure.
- Fit a new base gasket.
- Fit the piston-cylinder assembly previously assembled on the stud bolts, aligning pin with connecting rod big end.
- Fit the tool in the pin and push shaft to position the retainer ring in its seat.

Specific tooling

020894Y Pin snap ring fitting tool



See also

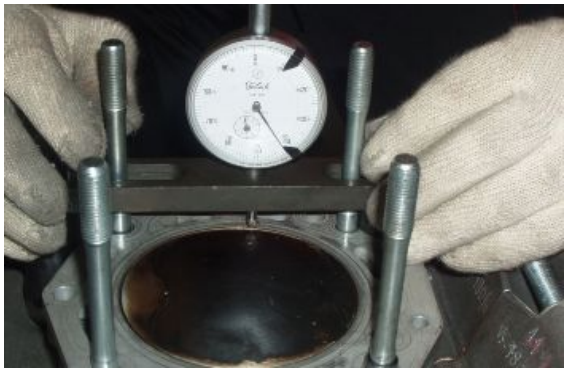
Selecting the base gasket

- Remove the tool and fully push cylinder on the stud bolts.

Selecting the base gasket

- Temporarily, fit the piston to the cylinder, without base or head gasket.

- Fit a dial gauge on the specific tool.
- Set the dial gauge to zero on a reference surface with a medium preload, e.g. 5 mm (0.2 in). Keeping the zero setting, fit the tool on the cylinder and lock it with two nuts (10 Nm - 7.38 lb ft) as shown in the figure.



Specific tooling

020714Y Dial gauge mounting

- Rotate the crankshaft up to the TDC (the reversal point of the dial gauge rotation).
- Lock the crankshaft at TDC using the specific tool.
- Calculate the difference between the two measurements: using the chart below, identify the thickness of the cylinder base gasket to be used upon refitting. By correctly identifying the cylinder base gasket thickness, an adequate compression ratio can be maintained
- Remove the specific tool and the cylinder.

Specific tooling

020720Y Timing tool

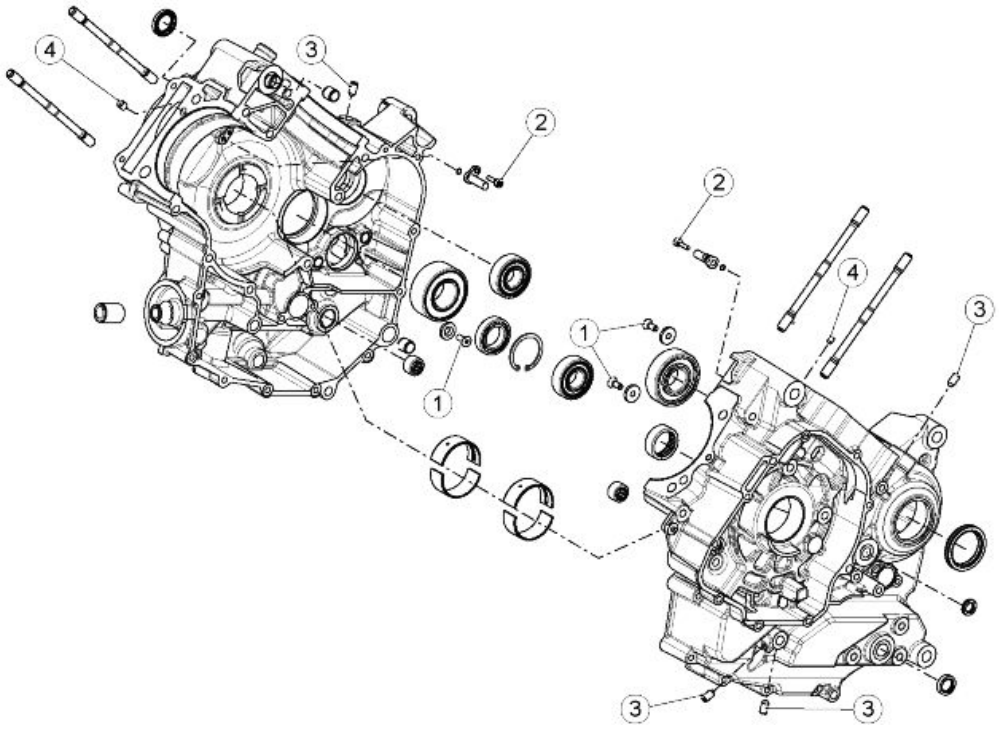
BASE GASKET

Specification	Desc./Quantity
Measured protrusion -0.10 / + 0.0 mm (- 0.0039 / 0.0000 in)	Gasket 0.4 mm (0.0157 in)
Measured protrusion 0.05 / 0.10 mm (0.0020 / 0.0039 in)	Gasket 0.5 mm (0.0197 in)
Measured protrusion 0.15 / 0.30 mm (0.0059 / 0.0118 in)	Gasket 0.6 mm (0.0236 in)

See also

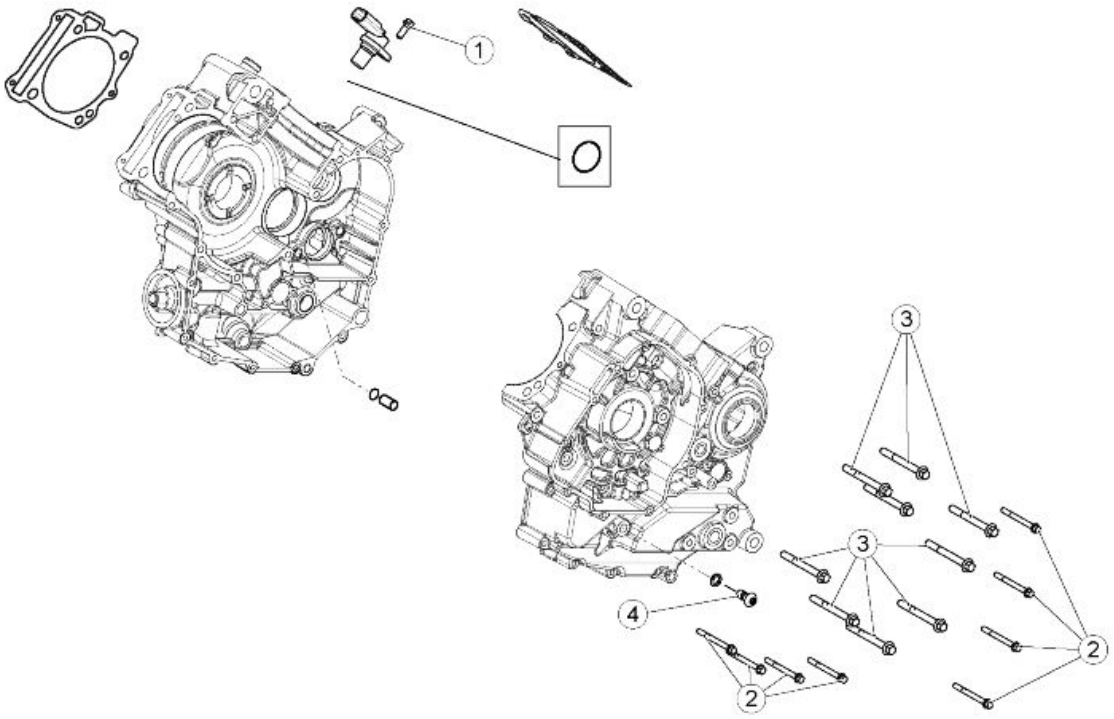
Installing the cylinder

Crankcase - crankshaft



CRANKCASE 1

pos.	Description	Type	Quantity	Torque	Notes
1	Bearing retainer fastener screw	M6	3	10 Nm (7.38 lbf ft)	Loctite 270
2	Piston oil jet fastener screw	M5	2	5.50 Nm (4.06 lbf ft)	Loctite 242
3	Tapered plug for crankshaft main bearing lubrication	M8x1	4	15 Nm (11.06 lbf ft)	-
4	Calibrated Brass dowel fixed to complete crankcase	M8	2	5.50 Nm (4.06 lbf ft)	-

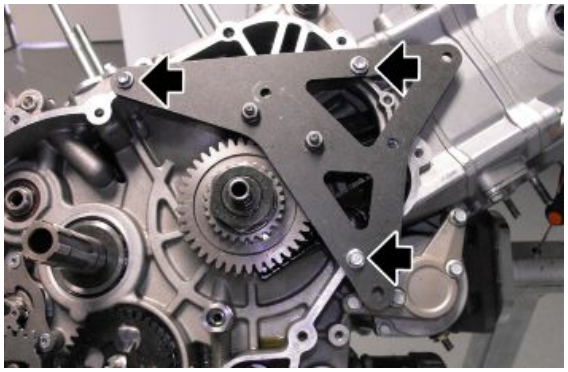


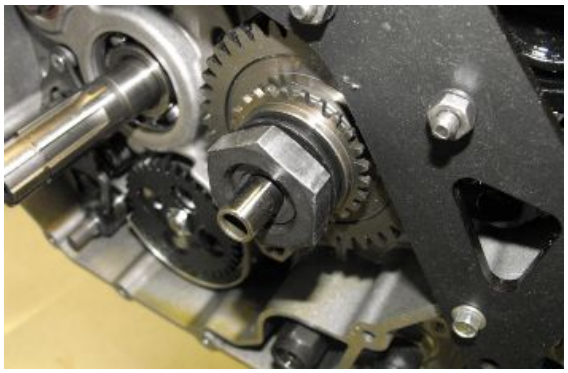
CRANKCASE 2

pos.	Description	Type	Quantity	Torque	Notes
1	Engine speed sensor fixing screw	M6	1	13 Nm (9.59 lbf ft)	Loctite 243
2	Screw fastening flywheel side / clutch side crankcase halves	M6	8	13 Nm (9.59 lbf ft)	-
3	Screw fastening flywheel side / clutch side crankcase halves	M8	9	29 Nm (21.39 lbf ft)	-
4	Special calibrated screw for gearbox lubrication	-	1	18 Nm (13.28 lbf ft)	-

Splitting the crankcase halves

- Fit the special tool, tightly fastening the three screws securing the tool onto the crankcase.
- Unscrew and remove the crankshaft fastener nut anticlockwise using the special tool, retrieving the washer and the water pump drive gear.





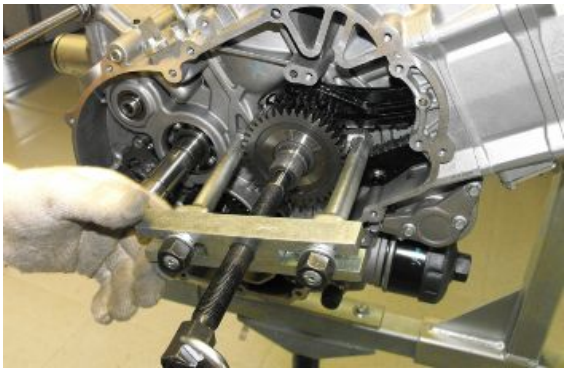
Specific tooling

020850Y Primary gear lock

- Remove the clutch.
- Remove the complete flywheel.
- Remove the selector.
- Remove the starter motor.

- Remove the oil filter.

- Using a heating gun, heat the area shown in the figure then remove the crankshaft gear with a commercially available extractor.



See also

Disassembling the clutch

Magneto flywheel removal

- Remove the head-cylinder assemblies.
- Remove the gear sensor loosening the two fixing screws.

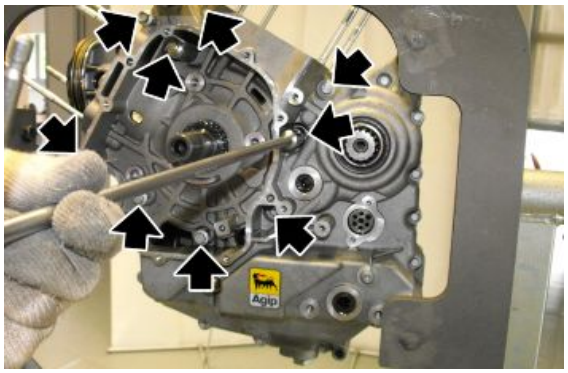
- Collect the O-ring.

See also

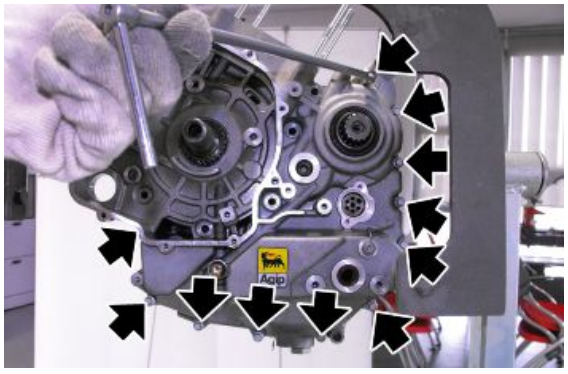
Removing the cylinder

- Unscrew and remove the selector drum fastener screw.

- Unscrew and remove the nine flywheel side M8 screws.

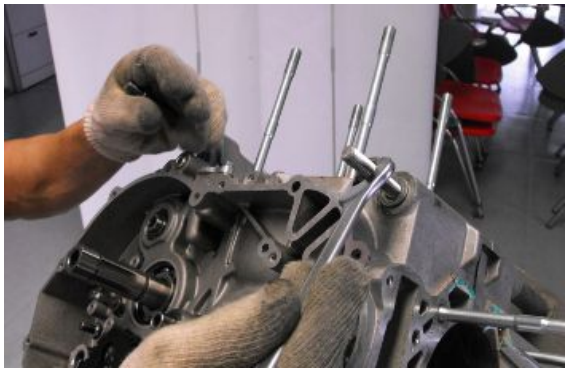


- Unscrew and remove the eleven fly-wheel side M6 screws.



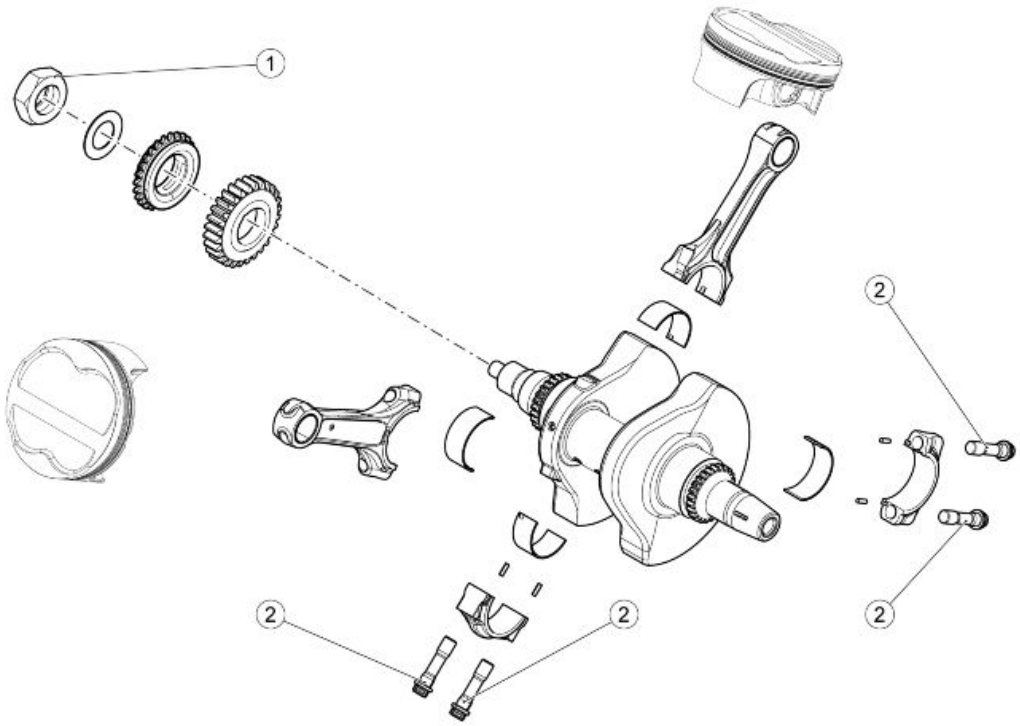
- Turn the engine into horizontal position.

- Unscrew and remove the two engine support nuts.



- Open the crankcase halves.

Removing the crankshaft



CRANKSHAFT

pos.	Description	Type	Quantity	Torque	Notes
1	Crankshaft primary gear fastener nut	M24x1.5	1	300 Nm (221.27 lbf ft)	Anticlockwise nut

pos.	Description	Type	Quantity	Torque	Notes
2	Connecting rod screw	M10	4	15 + 30 Nm (11.06 + 22.13 lbf ft) + 50° ± 2°, final control torque 65 - 78 Nm (47.94 - 57.53 lbf ft)	Lubricate the threads before tightening

- Open the crankcase halves.
- Remove the crankshaft.

See also

Splitting the crankcase halves

Inspecting the crankcase halves

BEARINGS AND OIL SEAL CHECK

Thoroughly clean the two sections of the crankcase, the ball bearings, the threads of the crankcase fixing screws and the bearing seats with a non-aggressive solvent. Clean the seal surfaces and check that they are not damaged.

CAUTION

TO AVOID DAMAGING BOTH CRANKCASE HALVES PLACE THEM ON A FLAT SURFACE.

Check that both crankcase halves are not cracked or damaged.

Check that all threads are in proper conditions.

Check that all oil seals remaining in their position are not worn or damaged.

Check all ball bearings for clearance, smoothness and potential distortions.

CAUTION

LUBRICATE BALL BEARINGS WITH ENGINE OIL BEFORE FURTHER CHECKING.

If the internal ring does not rotate smoothly and silently or if there is some noise while it turns, it means that the bearing is faulty and must be replaced.

OIL FILTER AND OIL DELIVERY PIPE CHECK

Check the oil filter for damage. If necessary, replace the part.

Clean the oil net with petrol and inspect the net links for potential damage.

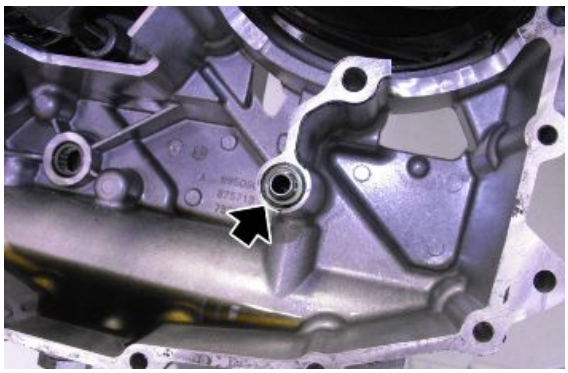
CHECK THE ENGINE OIL FILTER O-RING.

LUBRICATION CHECK

- Working on both crankcase halves, remove and thoroughly clean the nozzle that lubricates the piston crown.

REPLACE THE SPRAY NOZZLE O-RING IF NECESSARY.

- Replace the O-Rings on oil ducts.



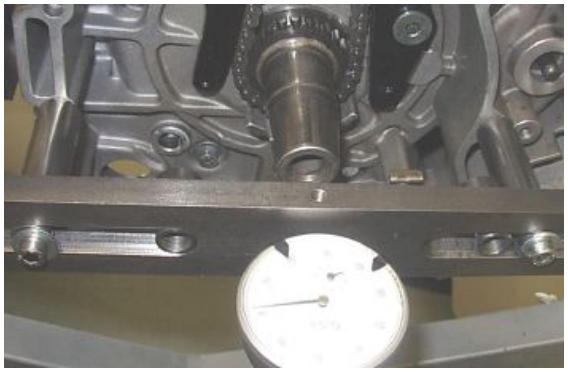
Before refitting

UPON REFITTING THE CRANKSHAFT, GREASE THE SHAFT BUSHING-CONNECTING ROD COUPLING.

Inspecting the crankshaft components

Crankshaft axial clearance check

- The shaft axial clearance on the crankcase should be checked with a dial gauge mounted on the specific dial gauge support.
- The clearance should be between 0.1 - 0.26 mm (0.0039 - 0.0102 in).
- If the clearance is beyond tolerance, check the reference surfaces.



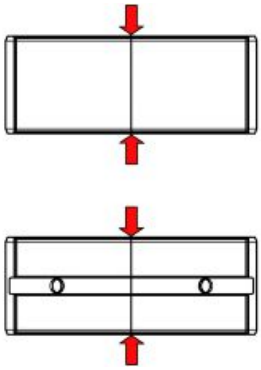
Specific tooling

020714Y Dial gauge mounting

Removal

- Mark the position of the original semi-bushings on the crankcase.

- To reduce the installation force necessary, score an incision approximately 0.5 mm (0.02 in) deep (without cutting into the steel shell) in each semi-bushing in the area indicated in the figure.



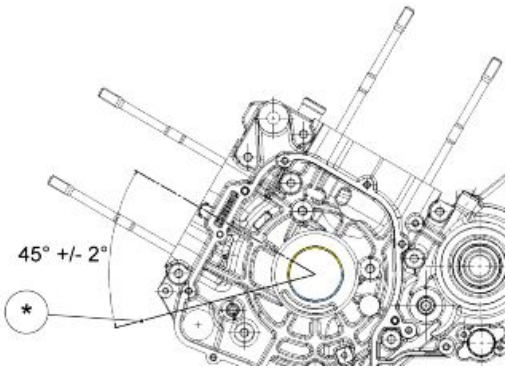
- Remove the bushings with the crankcase cold, using a press and the specific tool and pushing inward from the outside of the crankcase.

Specific tooling

020726Y Extractor for bushings

Installing

- The orientation of the semi-bushings must match the specifications indicated in the drawing as closely as possible.



NOTE

WHEN REPLACING THE SEMI-BUSHINGS ALONE, THE NEW COMPONENTS MUST BE THE SAME COLOUR AS THE REMOVED COMPONENTS. IF THE COLOUR OF THE OLD COMPONENTS IS NO LONGER VISIBLE, USE THE TABLE TO IDENTIFY THE CORRECT COMPONENTS, REFERRING TO THE CRANKCASE AND CRANKSHAFT CLASSES.

Key:

* Semi-bushing joint line.

- Fit the new bushings with the crankcase cold, using a press and the specific tool and pushing outward from the inside of the crankcase, until the punch comes into contact with the crankcase surface.

Specific tooling

020727Y Punch for bushings

Assembling the connecting rod

CAUTION

TO FIT THE CONNECTING RODS, CHECK THE COUPLING TYPES INDICATED IN THE "CRANKCASE- CRANKSHAFT CONNECTING ROD" SECTION, IN THE "CHARACTERISTICS" CHAPTER OF THE WORKSHOP MANUAL.

Installing the crankshaft

- Place the left side crankcase half on the engine support adequately.
- Place the crankshaft on the seat of the crankcase half with caution.

Refitting the crankcase halves

- Fit the strum box, if previously removed.
- Tighten the two strum box fixing screws.

- Turn the engine support into horizontal position.
- Place the left crankcase half on the engine support, fitting it on the engine support plate pins.

CAUTION

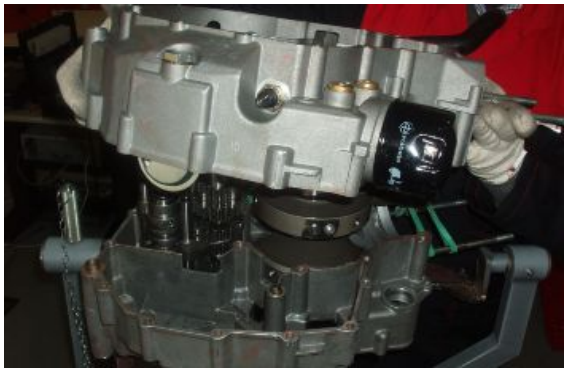
TAKE PARTICULAR CARE TO ENSURE THAT THE ENGINE AND ENGINE MOUNTING ARE STABLE AND ENSURE THAT THE ENGINE IS SECURELY FASTENED TO THE MOUNTING PLATE.

- Install the complete gearbox assembly and the gearbox lubrication diffuser pipe, checking O-ring conditions.

- Apply black sealing paste (Threebond) on the left crankcase half.

CAUTION

BE CAREFUL NOT TO APPLY THREEBOND IN EXCESS AS IT MAY BLOCK OIL DUCTS THROUGH THE CRANKCASE HALVES.

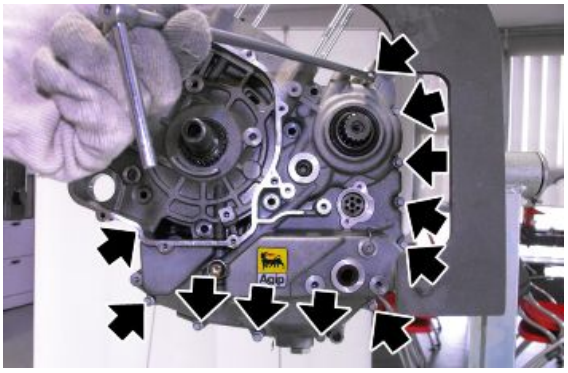


- Place the right crankcase half with the aid of a rubber hammer.

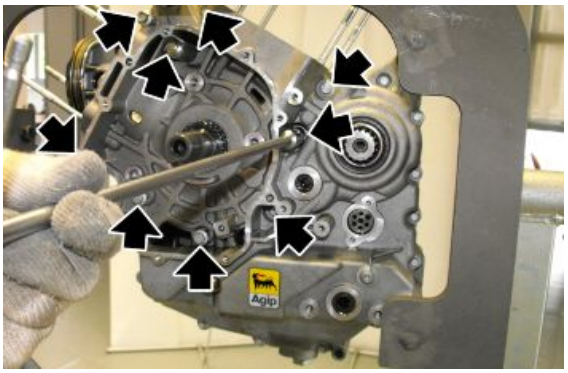
- Tighten the two fixing pins.

- Rotate the engine and the engine support into vertical position.

- Working on the left side, place the eleven M6 screws fixing the crankcase.



- Working on the left side, place the nine M8 screws fixing the crankcase.
- Tighten all the crankcase fixing screws, both M6 and M8 type.



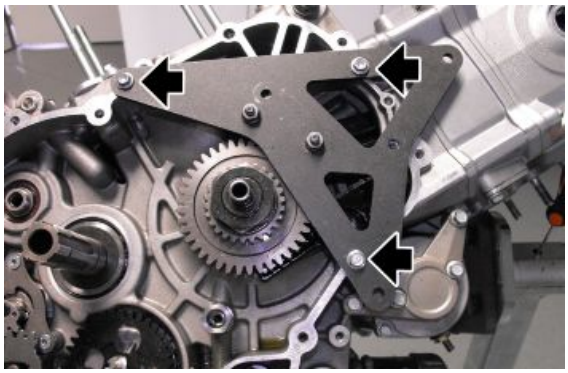
- Tighten the two screws fixing the selector drum.

- Fit a new O-ring in the seat.

- Position the gear sensor and screw the two fixing screws.

- Refit both head-cylinder assemblies.
- Position the crankshaft gear.

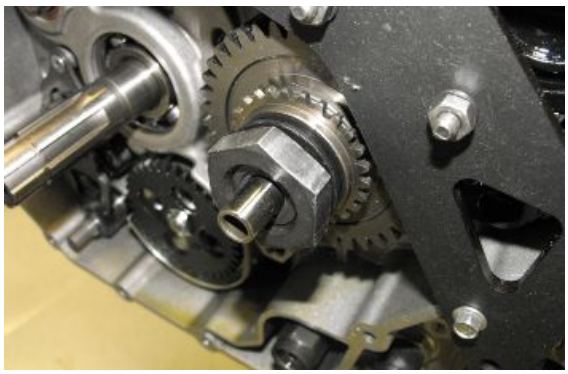
- Fit the special tool, tightly fastening the three screws securing the tool onto the crankcase.



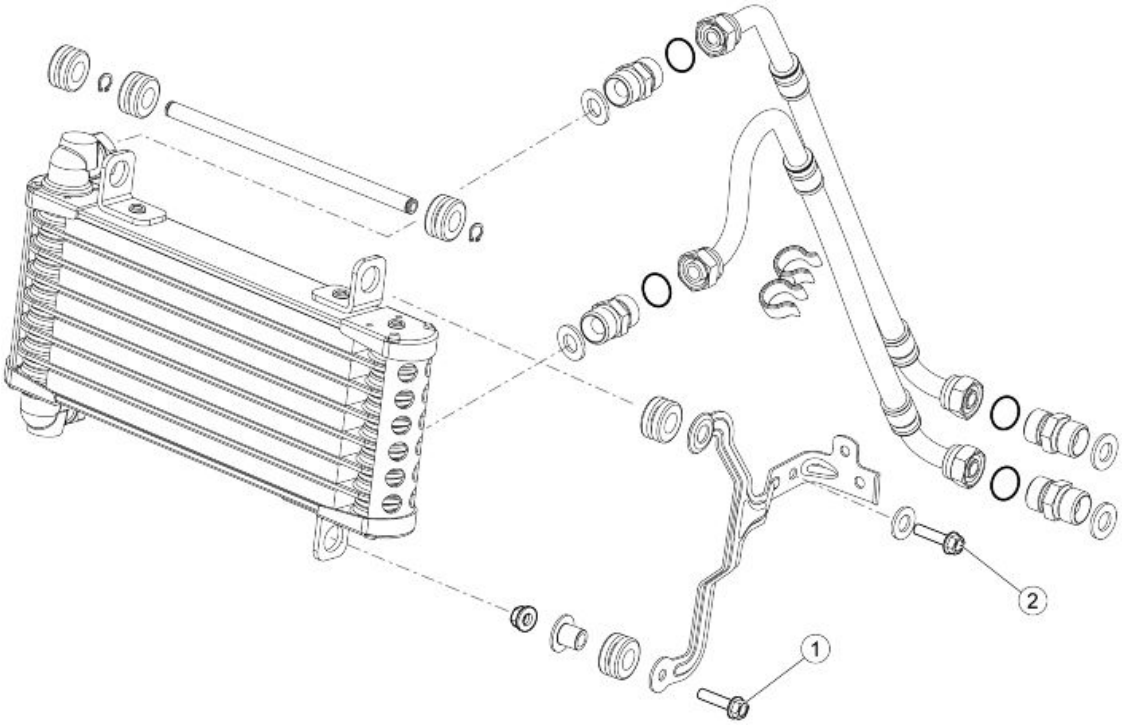
Specific tooling

020850Y Primary gear lock

- Position the water pump drive gear, the washer and crankshaft fastener nut and tighten it to the specified torque.



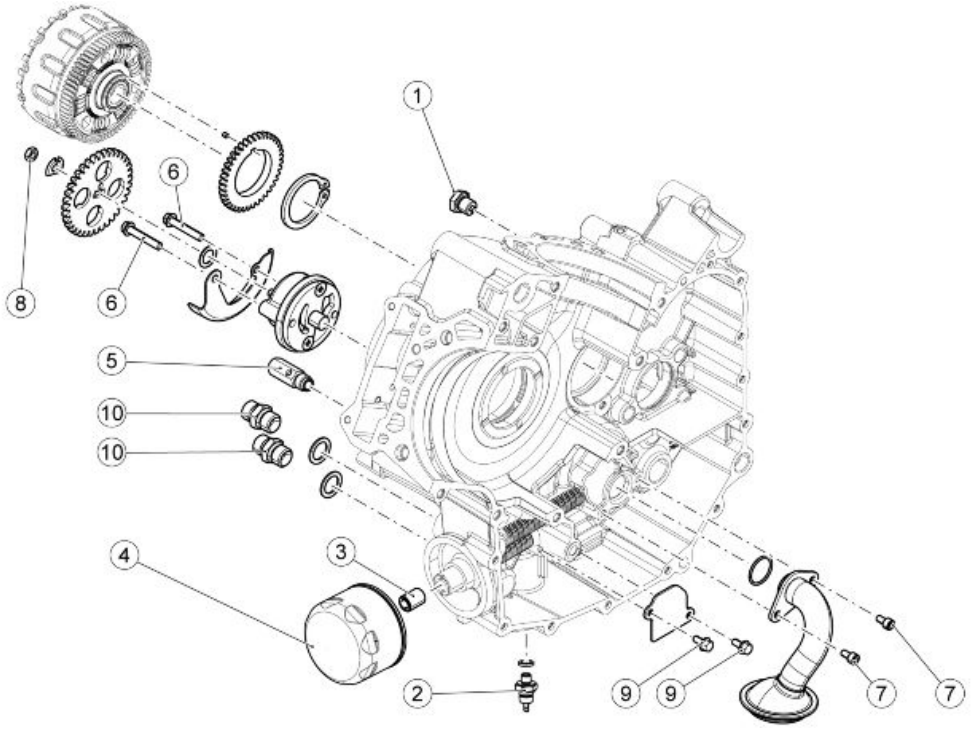
Lubrication



OIL COOLING RADIATOR

pos.	Description	Type	Quantity	Torque	Notes
1	TEFL screw fastening oil radiator	M6x25	1	10 Nm (7.37 lbf ft)	-
2	TEFL screw fastening oil radiator mounting	M6x12	1	10 Nm (7.37 lbf ft)	-

Oil pump

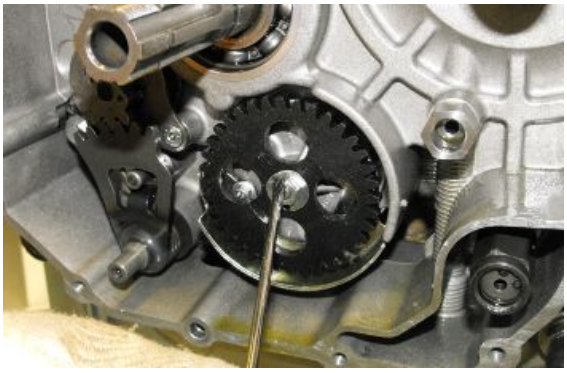


OIL PUMP

pos.	Description	Type	Quantity	Torque	Notes
1	Oil drainage plug	M16x1.5	1	19 Nm (14.01 lbf ft)	-
2	Fastening oil sensor on clutch side crankcase half	-	1	13 Nm (9.59 lbf ft)	-
3	Fastening oil filter union on clutch side crankcase half	-	1	20 Nm (14.75 lbf ft)	-
4	Oil filter	-	1	14 Nm (10.33 lbf ft)	-
5	Oil pressure regulator valve	M18x1.5	1	42 Nm (30.98 lbf ft)	-
6	Oil pump fastener screw	M6	2	12 Nm (8.85 lbf ft)	3M SCOTCH GRIP 2353
7	Rose pipe fastener screw	M6	2	12 Nm (8.85 lbf ft)	-
8	Oil pump driven gear fastener nut	M6	1	11 Nm (8.11 lbf ft)	-
9	By-Pass plate fastener screw	M5	2	5.50 Nm (4.06 lbf ft)	Loctite 242
10	Oil cooling radiator nipple	M16x1.5	2	42.5 Nm (31.35 lbf ft)	-

Removing

- Remove the clutch.
- Bend the chamfering tongue.



- By means of a calliper spanner lock out gear rotation and loosen the nut to remove it.

See also

Disassembling the clutch

- Collect the washer.

- Collect the gear.

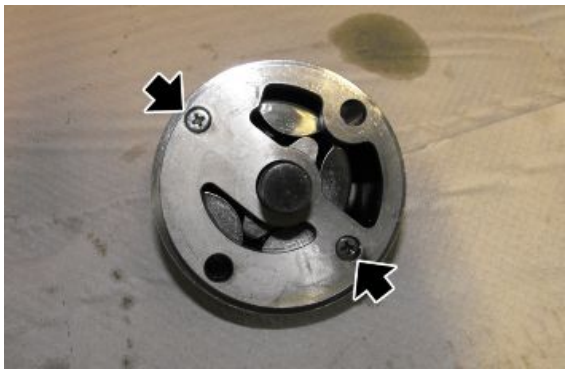
- Collect the spacer.

- Unscrew and remove the two nuts fixing the protection.
- Collect the protection.

- Remove the oil pump.

Inspection

- Undo and remove the two fixing screws.



- Using a thickness gauge check clearance between rotor and stator and replace the rotor / stator unit if necessary.

clearance between rotor and stator: 0.04 ± 0.10 mm (0.0016 in - 0.0039 in).

- Slide off the shaft with the cover.

- Collect the lock pin from the shaft.

- Remove the oil pump rotor.

- Remove the oil pump stator.

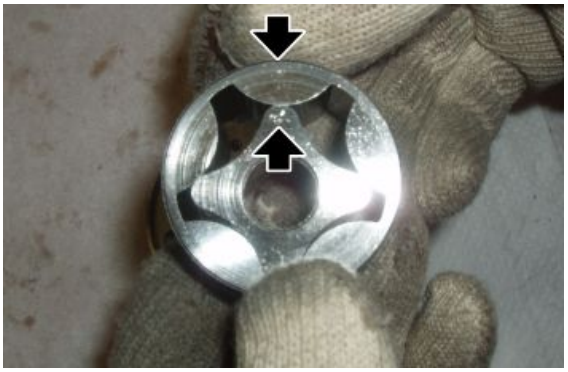
CAUTION

CHECK THAT THE ROTOR AND STATOR ARE NOT DAMAGED (NO EVIDENT ABRASIONS, SCORES OR ANY OTHER MARKS).

Installing

NOTE

PAY ATTENTION TO ALIGN THE REFERENCES ON STATOR AND ROTOR DURING INSTALLATION AND CHECK CLEARANCE WITH A FEELER GAUGE.
IF REQUIRED, REPLACE THE STATOR / ROTOR UNIT.



- Fit the oil pump.

- Fit the protection and tighten the two retaining screws.

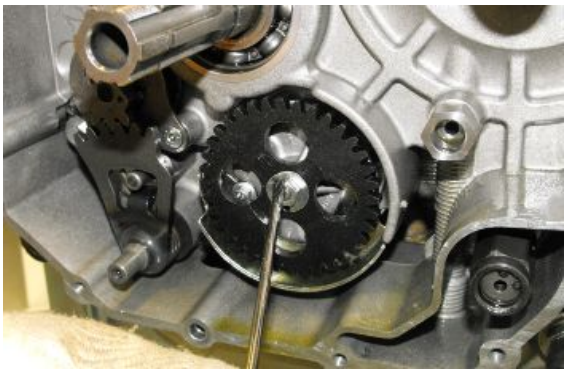
- Fit the spacer.

- Fit the gear.

- Place the washer.

- By means of a calliper spanner lock out gear rotation and tighten the retaining nut.

- Bend the chamfering tongue.
- Refit the clutch.

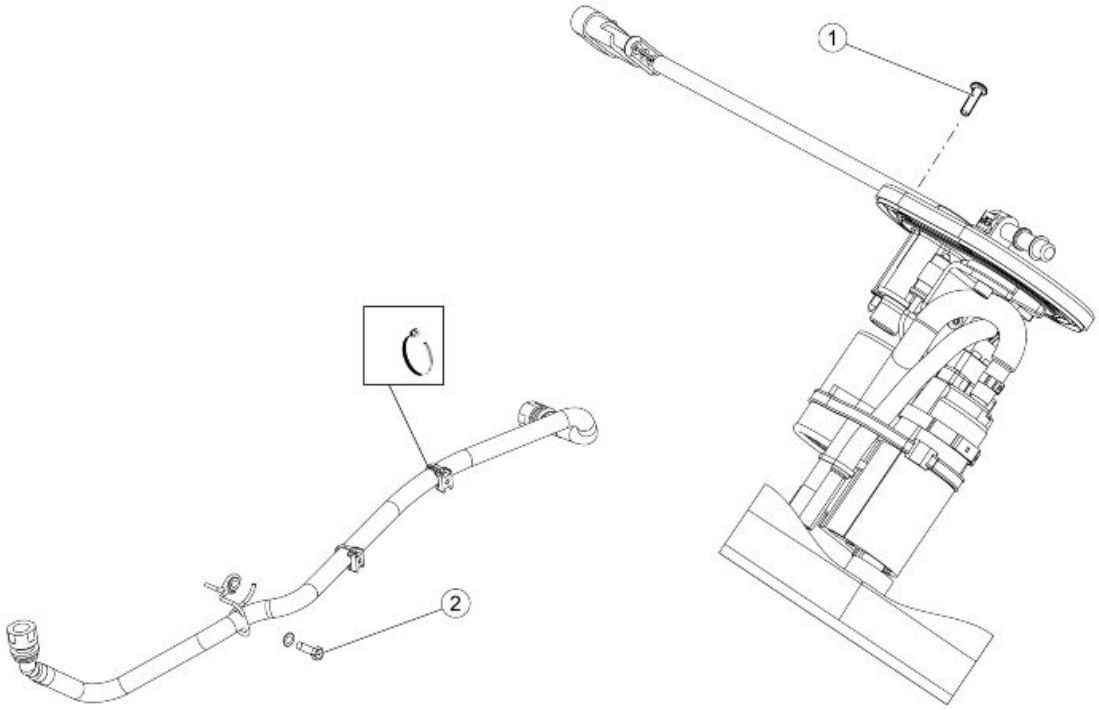


See also

Assembling the clutch

INDEX OF TOPICS

Fuel pump



FUEL PUMP

pos.	Description	Type	Quantity	Torque	Notes
1	TEFL screw fastening fuel pump	M5x16	6	3 Nm (2.21 lbf ft)	Loctite 518
2	TEFL screw fastening fuel pipe	M6x16	1	10 Nm (7.37 lbf ft)	-

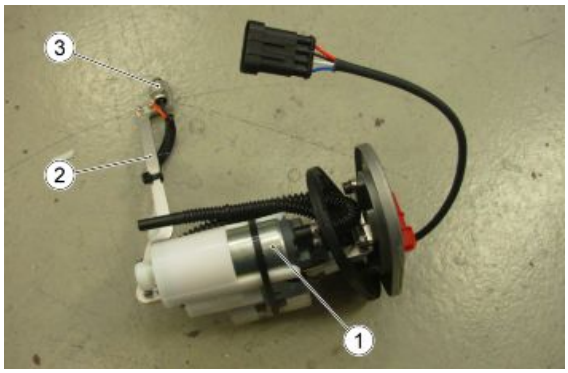
Removing

CAUTION

PAY ATTENTION DURING THE REMOVAL AND INSTALLATION PHASES OF THE FUEL PUMP SINCE TI COULD GET DAMAGED.

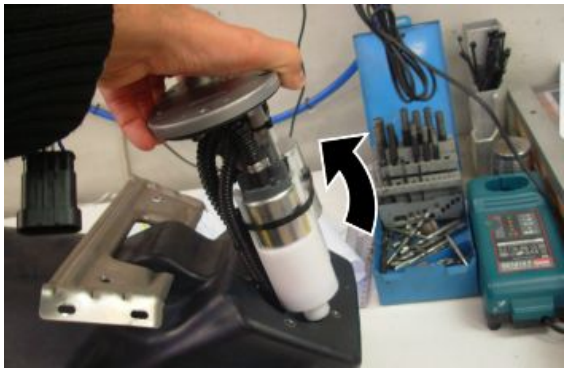
The fuel pump includes:

1. Fuel pump.
2. Fuel level probe bracket.
3. Fuel level probe.

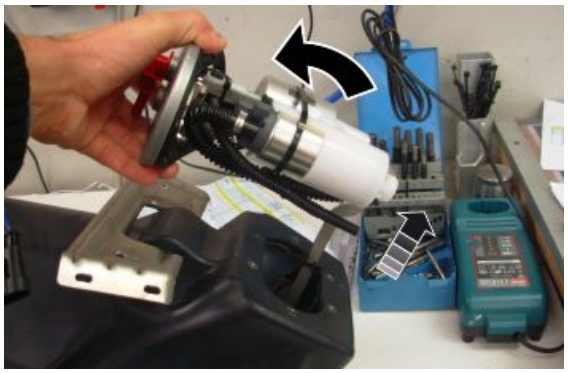


- Remove and empty the fuel tank, then remove the fuel pump fastening screws.
- Partially slide out the fuel pump as shown.

- Progressively turn the fuel pump while sliding it out to avoid damaging it.

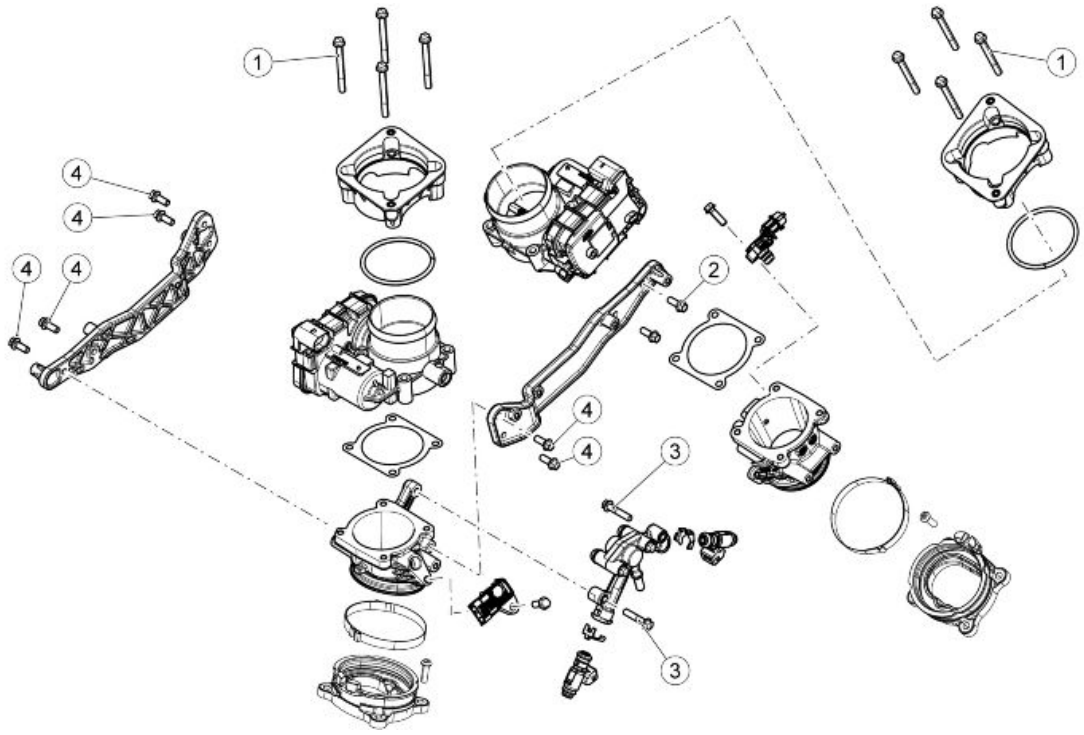


- Turn and fully take out the fuel pump.



Injection

Diagram



THROTTLE BODY

pos.	Description	Type	Quantity	Torque	Notes
1	Intake union fastener screw	M6	8	12 Nm (8.85 lbf ft)	Loctite 242
2	Map sensor fixing screw	M6	2	5.5 Nm (4.05 lbf ft)	-
3	Injector fastener screw	M6	2	12 Nm (8.85 lbf ft)	Loctite 242
4	Injection Throttle Body fastener screw	M6	8	12 Nm (8.85 lbf ft)	Loctite 242

Ride by Wire

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. Therefore, there is a "Throttle map" to which the control unit refers in order to decide the position at which the throttle valves should be and at what speed they should reach the pre-set position. The main parameters which influence the throttle map are:

- Throttle position and opening/closing speed
- Engine rpm
- Intake pressure read at each intake manifold
- Rear and front throttle valve position
- Air temperature

The functions required from the Marelli control unit therefore are:

1. Ride by Wire system control (throttle map)
2. Injection/ignition control
3. System safety checks

1 - Ride by Wire system control

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

Marelli 7SM electronic control unit Besides the regular control functions of the injection system, it supervises the throttle bodies: Through the throttle grip position sensor, it reads the torque demand and, through the THROTTLE MAP, it decides the throttle opening. It checks the correct operation of each component (Self-diagnosis), of the system (Safety), and carries out the emergency procedure (Recovery).

Throttle Body The two throttle bodies are made up of:

- Throttle valve with 2 return springs for the controlled minimum opening position.
- DC electrical motor
- Tinned double throttle position sensors with magnetic control (contactless)

The throttle bodies do not require any maintenance and cannot be overhauled. In case of electric or mechanic malfunction, replace the whole unit.

Pressure sensors The pressure sensors (one per cylinder) are fundamental not only for the injection map at low and stabilised speeds but also for checking the Ride by Wire system: their signal is connected to a TORQUE CHAIN for checking the correct opening of the throttle valves.

Intake air temperature sensor The signal coming from the sensor is used to calculate the estimated torque since the oxygen in the air also depends on its density which varies according to temperature.

2 - Injection/ignition control

Map for injection type (alpha-D)/rpm where:

- alpha is the throttle position
- D is the pressure measured at intake ducts
- At idle and for slow and stabilised speeds D/n
- For medium-high throttle openings alpha/n
- For temporary speed (speed change) alpha/n
- The main parameters that correct the injection map are:
- Engine temperature
- Atmospheric pressure (calculated)
- Lambda probe signal

- Air temperature

3 - System safety checks

The checks are structured in several levels:

- Level 1 - sensor correct operation
- Level 2 - comparison between requested torque and estimated torque generated by the engine
- Level 3 - a microprocessor controls the correct operation of the regular microprocessor

The consequent maintenance operations may be of different gravity according to the level and the defective component:

A the malfunction does not affect riding in safety, the warning light turns on, the word Service is displayed, the signal recovery value considered not reliable is used and the engine works regularly.

B the malfunction may affect riding in safety, the warning light turns on, the message Urgent Service is displayed, the torque demands are not fully activated (reduced torque).

C the malfunction may affect riding in safety, the warning light turns on, the message Urgent Service is displayed, the engine operates in Limp Home function (accelerated idle), the throttles which are at the position exclusively depending on the springs are not moved. The engine may shut off during the operation if it is running at idle speed and the gear is in neutral.

D the malfunction may affect riding in safety, the warning light turns on, the message Urgent Service is displayed, the engine stops running.

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:

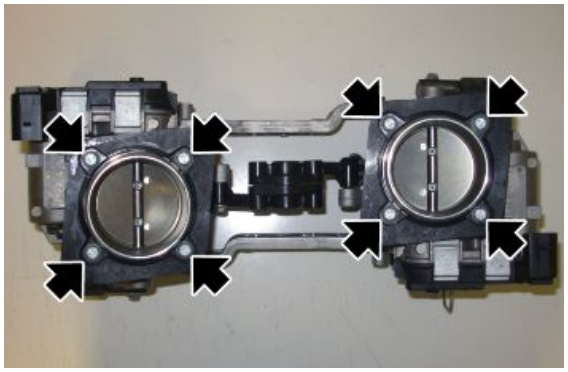
- Handle aperture
- Engine rpm
- Handle aperture rate

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 throttle body

- To reach the throttle body you must remove the filter box.
- Working on both bodies, unscrew and remove the four screws and unscrew the filter support.



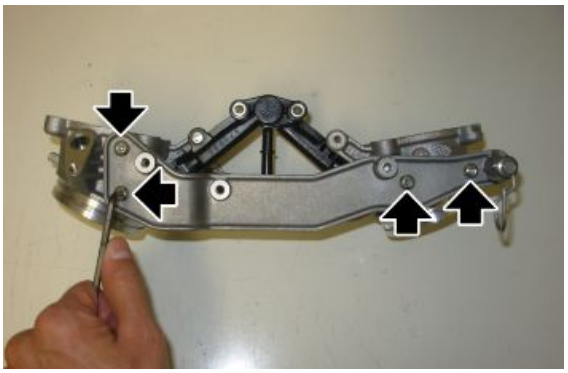
- Remove both bodies.

UPON REFITTING, REPLACE THE THROTTLE BODY GASKET WITH A NEW ONE OF THE SAME TYPE.

- Remove the air pressure sensors retaining screw

- Remove the air pressure sensors.

- Working on both sides, remove the screws retaining the side brackets to intake fittings.



- Remove the plates.
- Working on both bodies, unscrew and remove the screws releasing the intake fittings

See also

Removing the engine from the vehicle

- Working on the body in question, remove the injector, slide off the clip and the injector itself.

CAUTION

NEVER UNDO THE SCREWS IN THE FIGURE

See also

Removing the engine from the vehicle

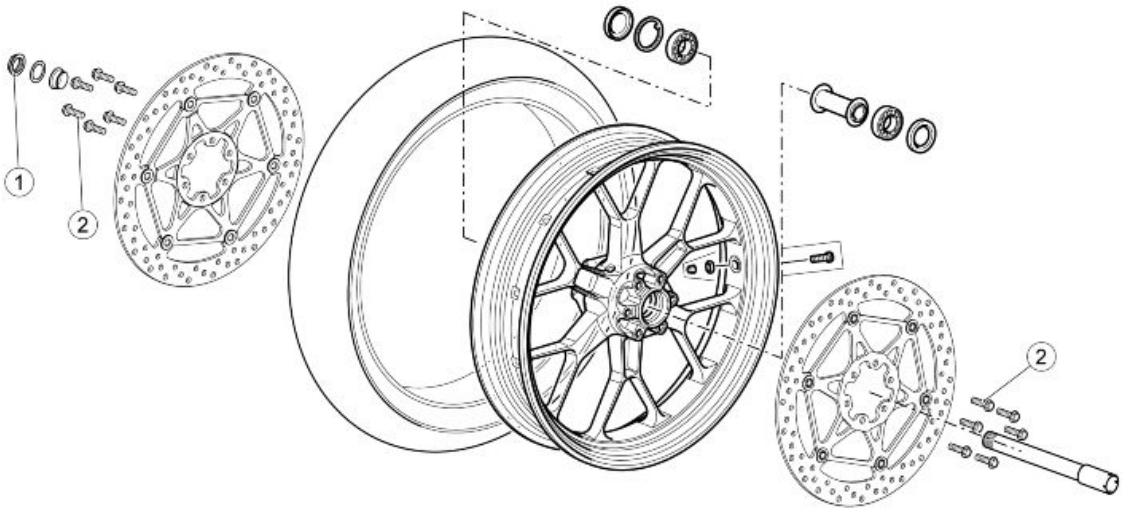
Using Navigator for injection system

The complete list of all the parameters, status, errors, etc. is available at the home page of the website **www.serviceaprilia.com** in the search section: Parameters Navigator.

The same parameters, status, errors,... etc…divided according to components they refer to, are available in the **Electrical system** chapter: **Checks and controls**

INDEX OF TOPICS

Front



FRONT WHEEL

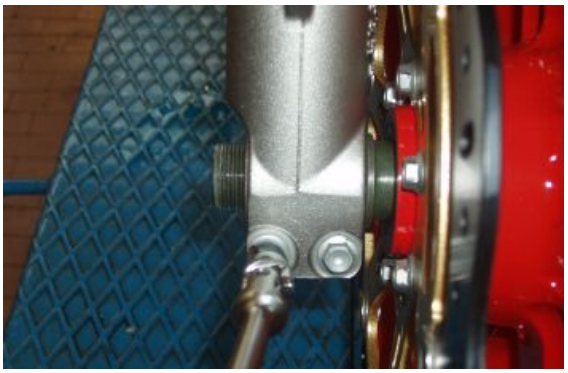
pos.	Description	Type	Quantity	Torque	Notes
1	Wheel axle nut	-	1	80 Nm (59 lbf ft)	-
2	TE flanged screw fastening front disc	M8x20	12	30 Nm (22.13 lbf ft)	Loctite 243

Removing the front wheel

- Hold the vehicle front part.
- Unscrew the screws fixing the front pliers and slide them off the disc.

- Remove the wheel axle fixing 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.

- During extraction, support the wheel and then remove it.

- Collect the spacer from the front wheel right side.

Checking the front wheel

FRONT WHEEL BEARINGS

Carry out the check with the bearings fitted on the wheel.

CHECK THAT ALL PARTS ARE IN GOOD CONDITION, ESPECIALLY THOSE LISTED AS FOLLOWS.

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 wheel 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 wheel bearings.

ALWAYS REPLACE BOTH BEARINGS.
ALWAYS REPLACE THE BEARINGS WITH OTHERS OF THE SAME TYPE.

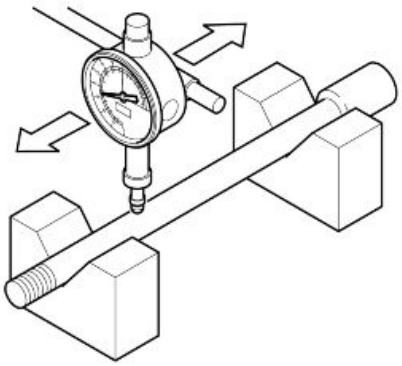
GASKETS

- Check that the gaskets are in good conditions; replace them if they show signs of damage or excessive wear.

ALWAYS REPLACE BOTH GASKETS.
ALWAYS REPLACE THE GASKETS WITH OTHERS OF THE SAME TYPE.

WHEEL AXLE

- Use a dial gauge to check the wheel axle eccentricity. Replace the wheel axle if the eccentricity exceeds the limit value.

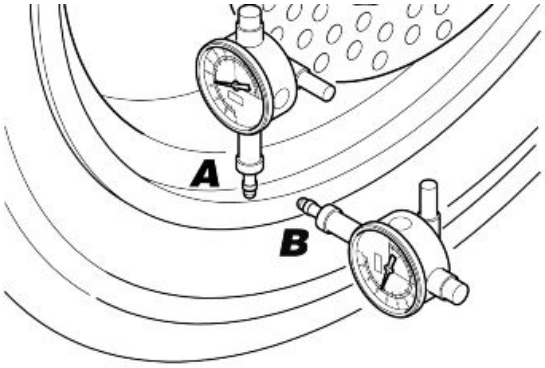


Characteristic

Maximum eccentricity:

0.25 mm (0.0098 in)

- Using a dial gauge, check that the radial (A) and the axial (B) eccentricities of the rim do not exceed the limit value. An excessive eccentricity is usually caused by worn or damaged bearings. Replace the rim if, after replacing the bearings, the value is not within the specified limit.

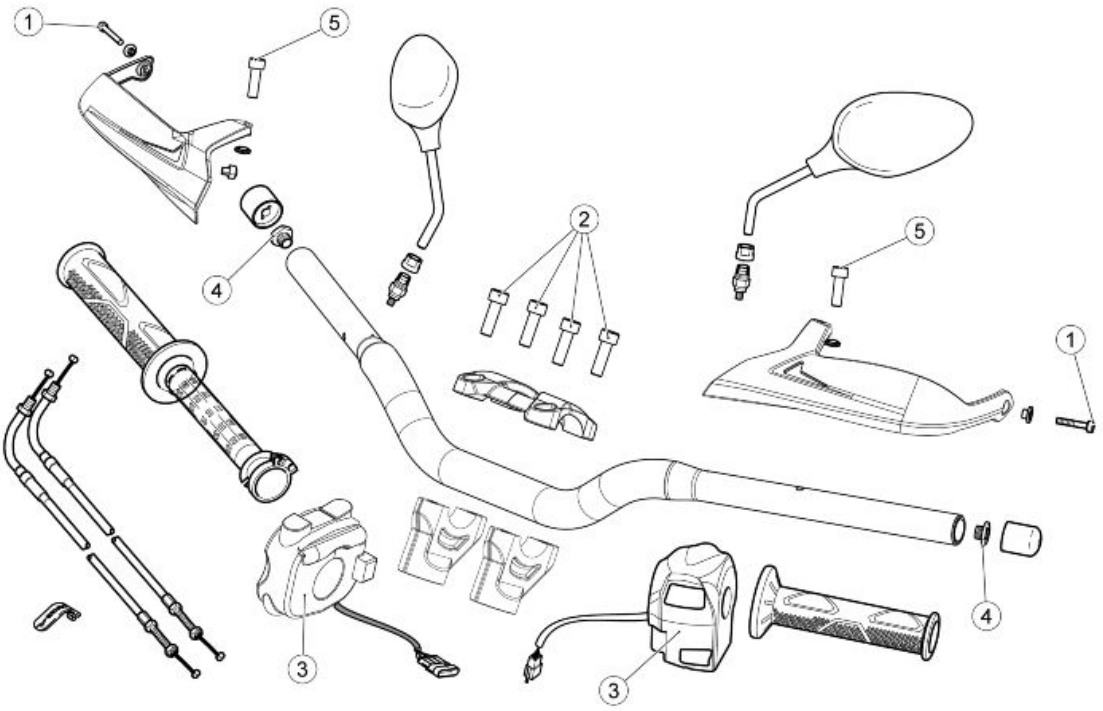


Characteristic

Maximum radial and axial eccentricity:

2 mm (0.0079 in)

Handlebar

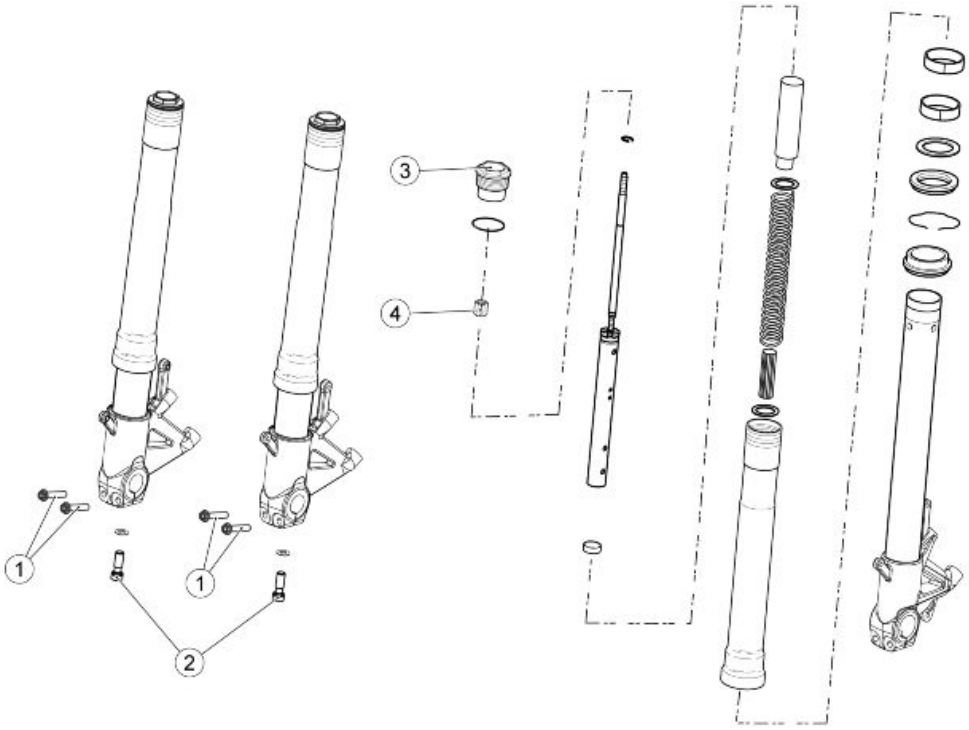


HANDLEBAR

pos.	Description	Type	Quantity	Torque	Notes
1	TCEI screw fastening counterweight to handlebar end	M6x50	2	10 Nm (7.37 lbf ft)	-
2	Stainless steel TCC screw fastening upper U-bolt to lower clamp	M8x25	4	25 Nm (18.44 lbf ft)	-
3	Screws fastening light switch assembly	-	2 + 2	1.5 Nm (1.11 lbf ft)	-
4	Anti-vibration weight terminal	M18	2	20 Nm (14.75 lbf ft)	-
5	TBEI screw	M6x16	2	12 Nm (8.85 lbf ft)	-

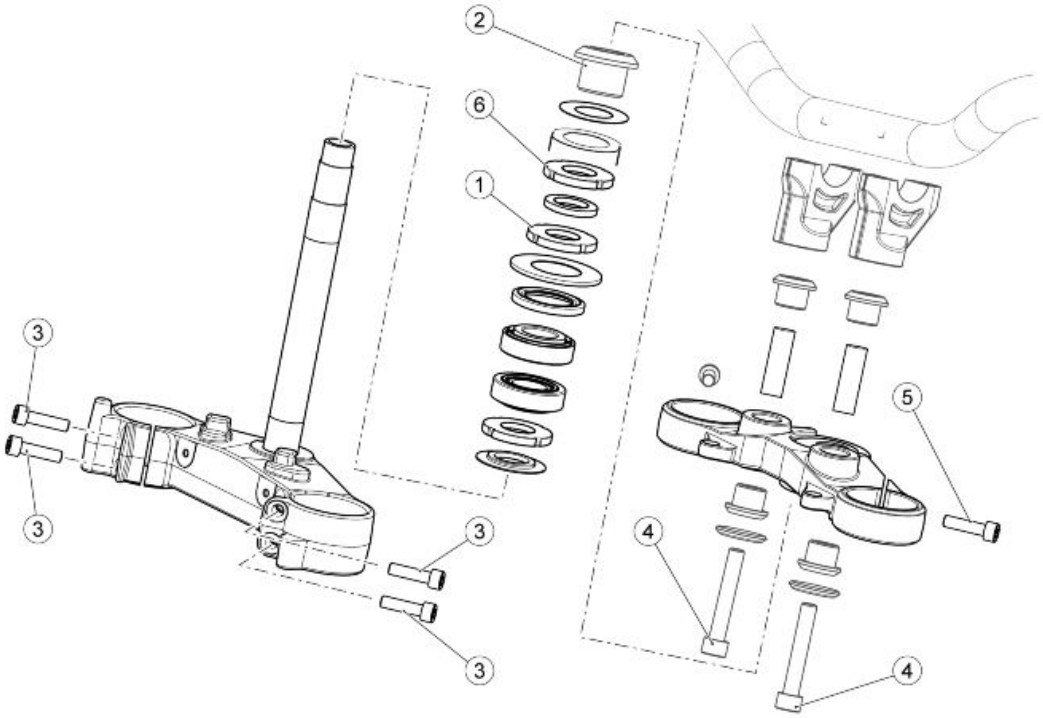
Front fork

Diagram



FRONT FORK

pos.	Description	Type	Quantity	Torque	Notes
1	TEFL screw (fasten onto Fork Hubs)	M6x40	4	10 Nm (7.37 lbf ft)	-
2	Screw (Pumping member pin fixing to the stem base)	-	2	30 Nm (22.13 lbf ft)	-
3	Upper cover	-	2	20 Nm (14.75 lbf ft)	-
4	Upper cover locking nut	-	2	20 Nm (14.75 lbf ft)	-

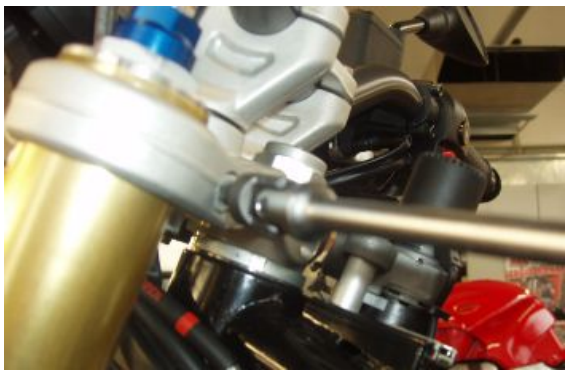


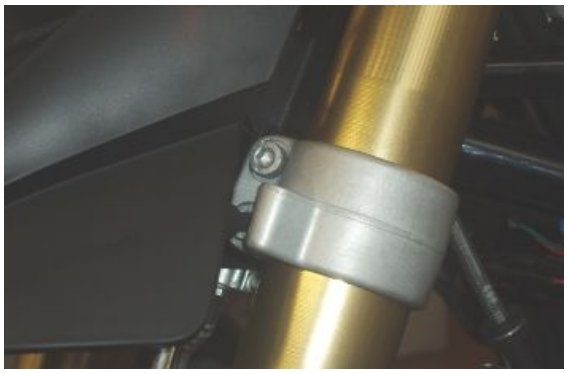
STEERING

pos.	Description	Type	Quantity	Torque	Notes
1	Headstock ring nut - pre-tightening	M25x1	1	60 Nm (44.25 lbf ft)	Unscrew after pre-tightening
1	Headstock ring nut - tightening	M25x1	1	50 Nm (36.88 lbf ft)	-
2	Headstock cap	M22x1	1	100 Nm (73.75 lbf ft)	-
3	TCEI screw fastening fork legs to bottom yoke	M8x35	4	25 Nm (18.44 lbf ft)	-
4	TCEI screw fastening U-bolt onto fork yoke	M10x60	2	50 Nm (36.88 lbf ft)	-
5	TCEI screw fastening fork legs to top yoke	M8x30	2	25 Nm (18.44 lbf ft)	-
6	Headstock counter-lock ring	M25x1	1	-	Tighten by hand

Removing the fork legs

- Remove the front wheel.
- Support the stanchion and loosen the screws on the upper and then the lower plate.
- Remove the stanchion.





Disassembling the fork

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 fitting operations

- Operating on the upper screw, unload the spring.

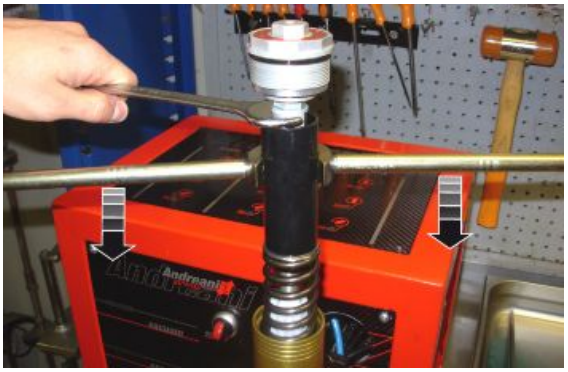
- Loosen the cover without unscrewing it completely.

- Place the fork vertically locking it in a vice by the specific tool.
- Completely unscrew the plug.

Specific tooling

AP8140149 Protection for fitting 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 Pliers for pre-fill 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.

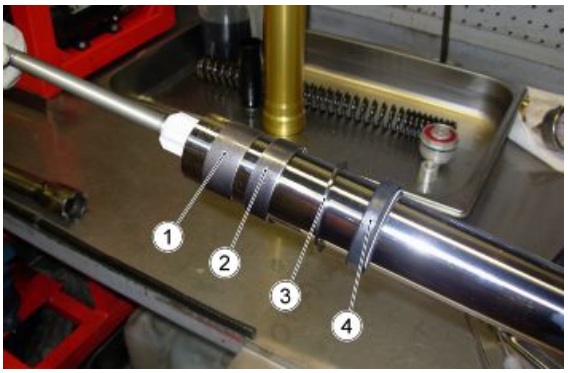
- Discharge the fork, remove the internal dipstick of the pumping member pin (1) and the washer (2).
- Operate repeatedly on the pumping member pin (3) so as to drain completely the oil from inside.

- 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.

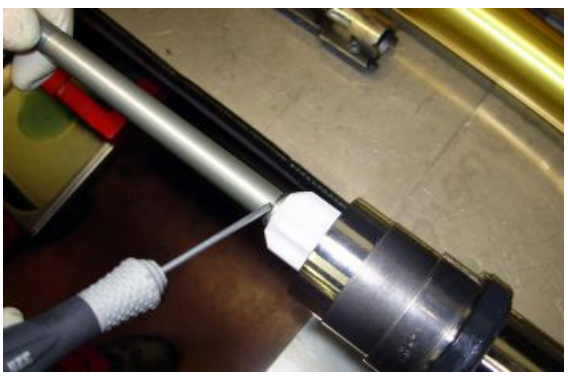
- Remove the retainer ring.

- 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 Pumping member ring nut locking spanner

- Remove the pumping member pin.

Checking the components

Stem

Check the sliding surface for scorings and/or scratches.

These scorings can be eliminated by rubbing them with wet sandpaper (grain 1).

If the scorings are deep, replace the stem.

Use a dial gauge to check that the stem bending is below the limit value.

If over the value, replace the stem.

CAUTION

A BENT STEM SHOULD NEVER BE STRAIGHTENED BECAUSE ITS STRUCTURE WOULD BE WEAKENED AND USING THE VEHICLE MAY BECOME DANGEROUS.

Characteristic

Bending limit:

0.2 mm (0.00787 in)

Sleeve

Check that there are no damages and/or cracks; otherwise, replace it.

Spring

Check the spring is in good conditions.

Check that the following components are in good conditions:

- upper bushing;

- lower bushing;

- piston.

If there are signs of excessive wear or damage, replace the affected component.

CAUTION

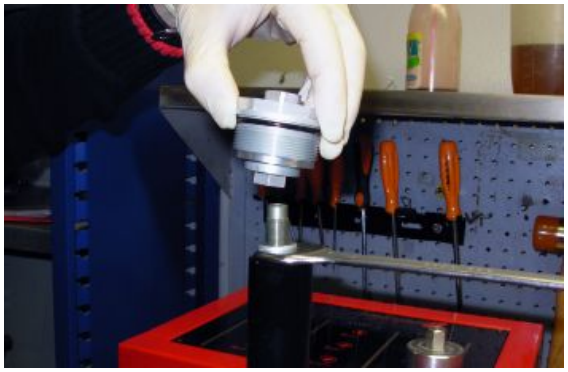
REMOVE ANY IMPURITY IN THE BUSHINGS, TAKING CARE NOT TO SCRATCH THEIR SURFACE.

Replace the following components with new ones:

- seal ring;

- dust gaiter;

- O-Ring on the cap.



Reassembling the fork

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 Oil seal fitting tool for Ø 43 mm (1.69 in) orifices

AP8140146 Weight

- Insert the retainer ring in its position.

- Fit the dust gaiter with the specific tool.

Specific tooling

AP8140189 Oil seal fitting tool for Ø 43 mm (1.69 in) orifices

AP8140146 Weight

- Insert the pumping member pin in the stem.

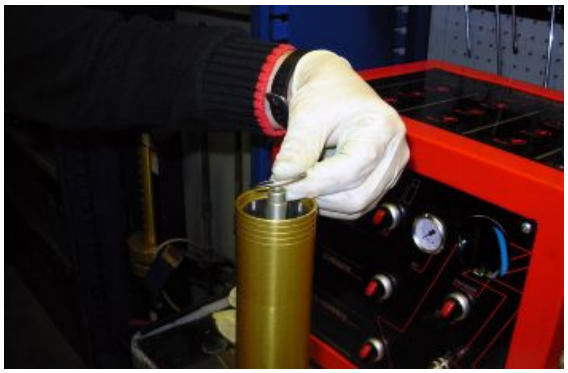
- Using a hook spanner lock the pumping member pin and tighten the fixing screw on the fork end to the prescribed torque.

Specific tooling

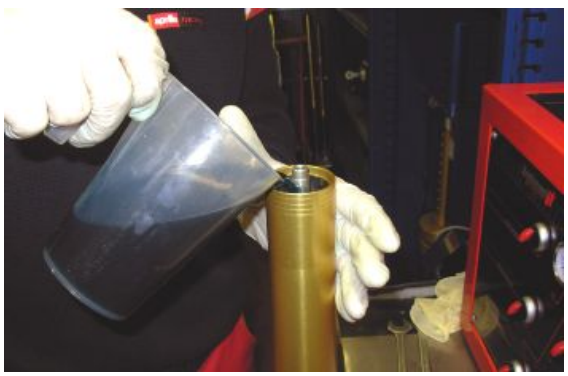
020889Y Pumping member ring nut locking spanner

- Insert the spring guide and lock it by the appropriate seeger.

- Place the fork vertically.
- Insert the washer.



- Refill the fork with oil according to the prescribed quantity.



- Fit the spring.

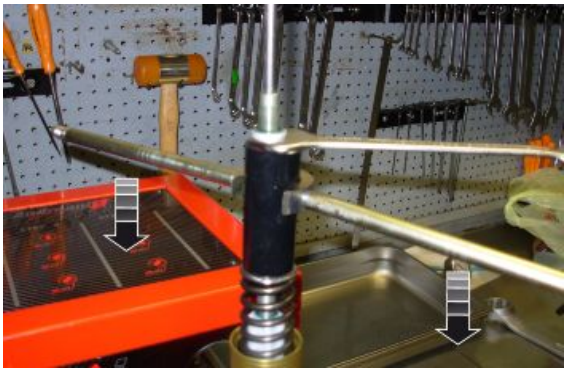
CAUTION

BE CAREFUL WHEN INSERTING THE SPRING SINCE THE COMPRESSED SPIRAL PART MUST BE PLACED DOWN-WARDS.

See also

Filling oil

- 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.



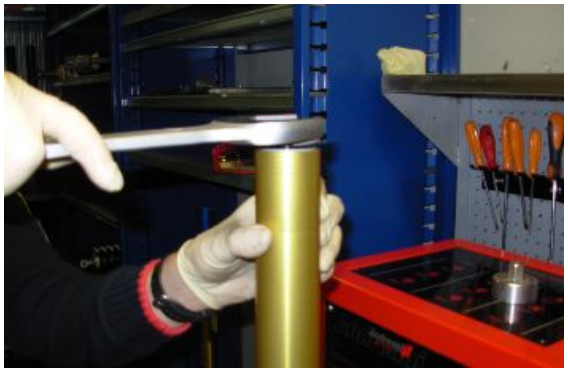
Specific tooling

020890Y Pumping member stanchion support rod

AP8140147 Spacer tool

- 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

- 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 STEMS.

Specific tooling

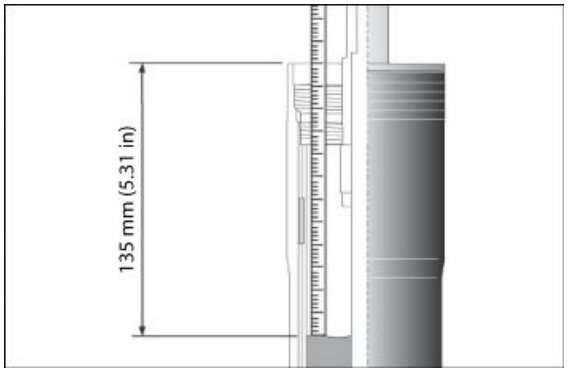
AP8140149 Protection for fitting operations

Oil level: 135 mm (5.31 in) (from the sleeve edge, without a spring and with preload pipe).

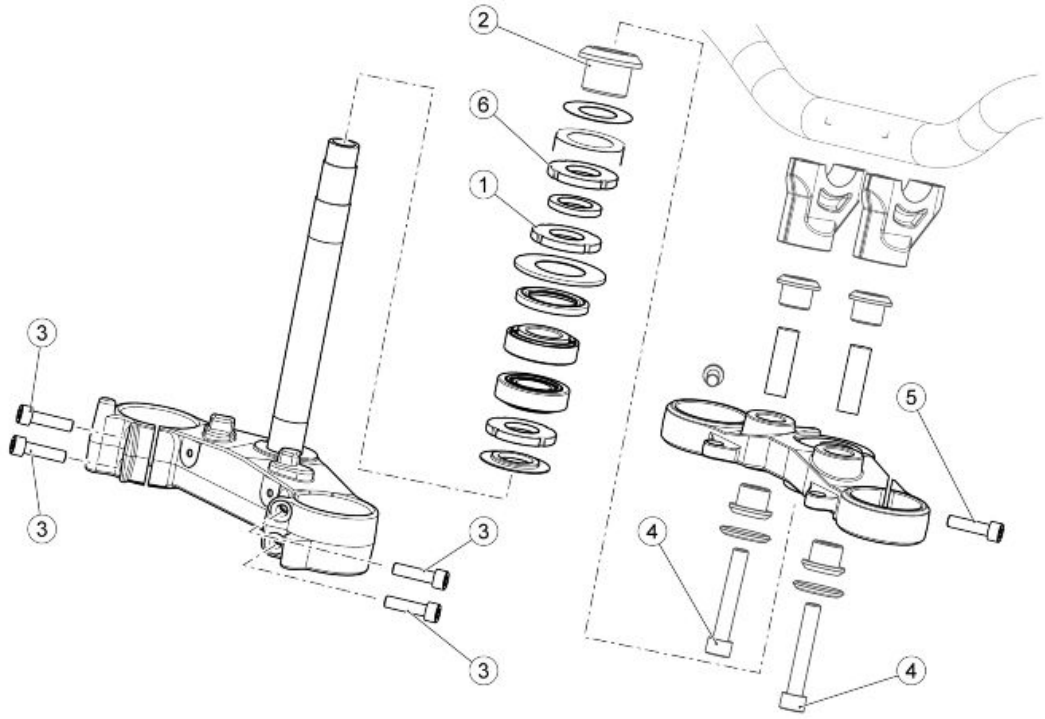
Characteristic

Fork oil (check also the correct air level in the stem)

441 cm³ (26.91 cu.in) (for each stanchion)



Steering bearing



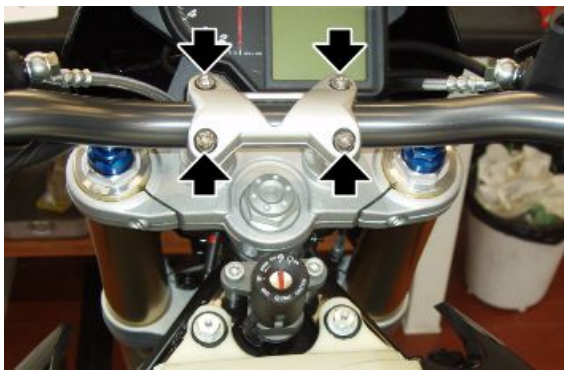
STEERING

pos.	Description	Type	Quantity	Torque	Notes
1	Headstock ring nut - pre-tightening	M25x1	1	60 Nm (44.25 lbf ft)	Unscrew after pre-tightening
1	Headstock ring nut - tightening	M25x1	1	50 Nm (36.88 lbf ft)	-
2	Headstock cap	M22x1	1	100 Nm (73.75 lbf ft)	-
3	TCEI screw fastening fork legs to bottom yoke	M8x35	4	25 Nm (18.44 lbf ft)	-
4	TCEI screw fastening U-bolt onto fork yoke	M10x60	2	50 Nm (36.88 lbf ft)	-
5	TCEI screw fastening fork legs to top yoke	M8x30	2	25 Nm (18.44 lbf ft)	-
6	Headstock counter-lock ring	M25x1	1	-	Tighten by hand

Adjusting play

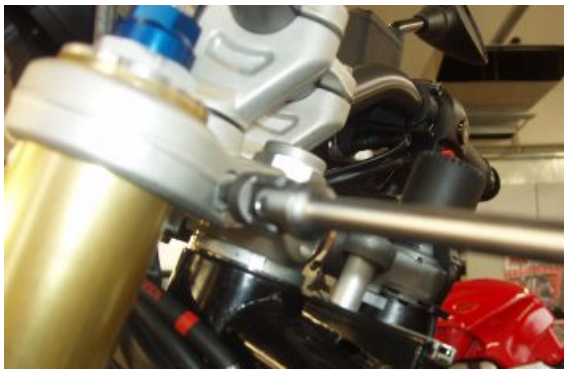
- Place the vehicle so that the front wheel is off the ground.
- Carry out a handlebar rotation test, using a dynamometer at the hand grip external end.
- The handlebar resistance to rotation must be of 400 ± 150 g (0.88 ± 0.33 lb) in both directions.
- Adjust if clearance is detected.

- Unscrew and remove the U-bolt four fixing screws.
- Remove the U-bolt.
- Remove the handlebar and place it paying attention that oil in the clutch and front brake tanks does not spill out.



- Unscrew and remove the upper plug from steering yoke pin and collect the washer.

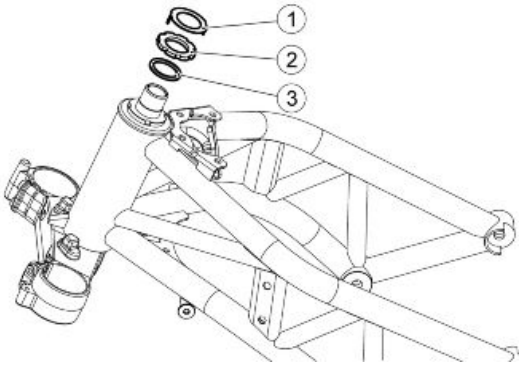
- Operating from both sides, loosen the screws fixing the stanchions to the upper plate.



- Undo and remove the two screws fixing the instrument panel support to the fork upper plate.

- Slide off the fork upper plate by moving it towards the instrument panel.

- Straighten the safety plate (1) on the counter-lock ring (2) and remove it from steering yoke pin.
- Take the suitable tool for working on the steering ring nuts.
- Loosen the counter-lock ring (2) and remove it together with the rubber spacer (3) from the steering yoke pin.



Specific tooling

020884Y 46 mm wrench for steering ring nut

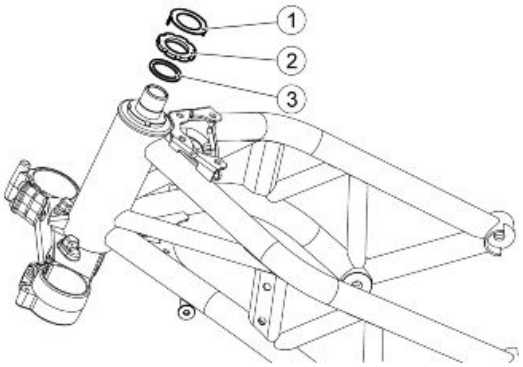
Carry out the following operations:
- carry out a first tightening of the ring nut to the indicated tightening torque for the settlement of the steering package.
- turn the steering completely from both sides, for several times.

Loosen the ring nut completely.
- carry out the final tightening of the ring nut to the indicated tightening torque.

STEERING RING NUT

pos.	Description	Type	Quantity	Torque	Notes
1	Headstock ring nut - pre-tightening	M25x1	1	60 Nm (44.25 lbf ft)	Unscrew after pre-tightening
1	Headstock ring nut - tightening	M25x1	1	50 Nm (36.88 lbf ft)	-

- Install the rubber spacer (3).
- Hand screw counter-lock ring (2) until against spacer (3).
- Install a new safety plate (1) and bend it on the ring nuts.

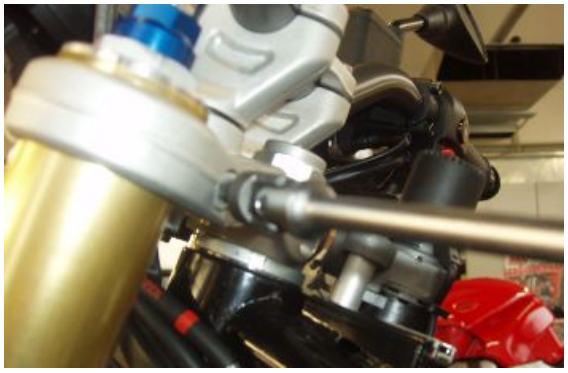


- Fit the entire fork upper plate, adjusting with short taps with a rubber hammer
- Fit the washer and tighten the upper plug to the specified tightening torque.

STEERING UPPER PLATE

pos.	Description	Type	Quantity	Torque	Notes
2	Headstock cap	M22x1	1	100 Nm (73.75 lbf ft)	-
3	TCEI screw fastening fork legs to bottom yoke	M8x35	4	25 Nm (18.44 lbf ft)	-
4	TCEI screw fastening U-bolt onto fork yoke	M10x60	2	50 Nm (36.88 lbf ft)	-
5	TCEI screw fastening fork legs to top yoke	M8x30	2	25 Nm (18.44 lbf ft)	-
6	Headstock counter-lock ring	M25x1	1	-	Tighten by hand

- Tighten the fixing screws of the upper plate to the prescribed tightening torque.



When refitting the U-bolt, position the two references facing the front part of the vehicle.

Assembling

- Grease the lower and upper bearing rollers
- Prefit the shim, dust gaiter and lower bearing on the steering yoke as shown in the figure.

Recommended products

AGIP MP GREASE Grease for bearings, joints, couplings and linkages

As an alternative to the recommended product, use top brand grease for roller bearings with an operating temperature range of -22°F to +284°F (-30°C to +140°C), drop point between 302ºF to 446°F (150°C to 230°C), high corrosion protection qualities and good water and rust resistance.

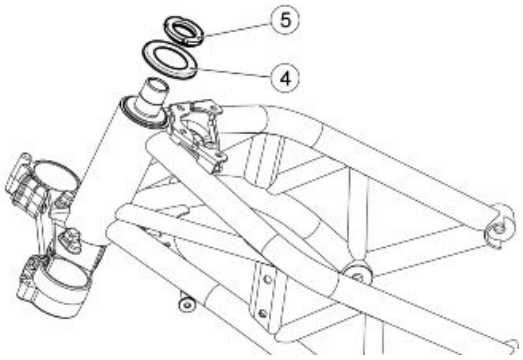
- Install the upper bearing on the steering yoke pin as shown in the figure, with the conical part facing downward.

- After inserting, the bearing must slide freely on the steering pin till matching with the steering bearing conic in the frame.
- Ensure the bearing mating in its seat, using a teflon buffer from a suitable diameter.

- Fit the specific upper seal ring with the lip placed upwards and the surface with the words downwards.
- Fit it on the pin and place it on the upper rim of the headstock.
- Finish inserting, until the stop, with the teflon buffer and rubber hammer.

- Pass with a brush on the seal ring to lay down potential grease storage.

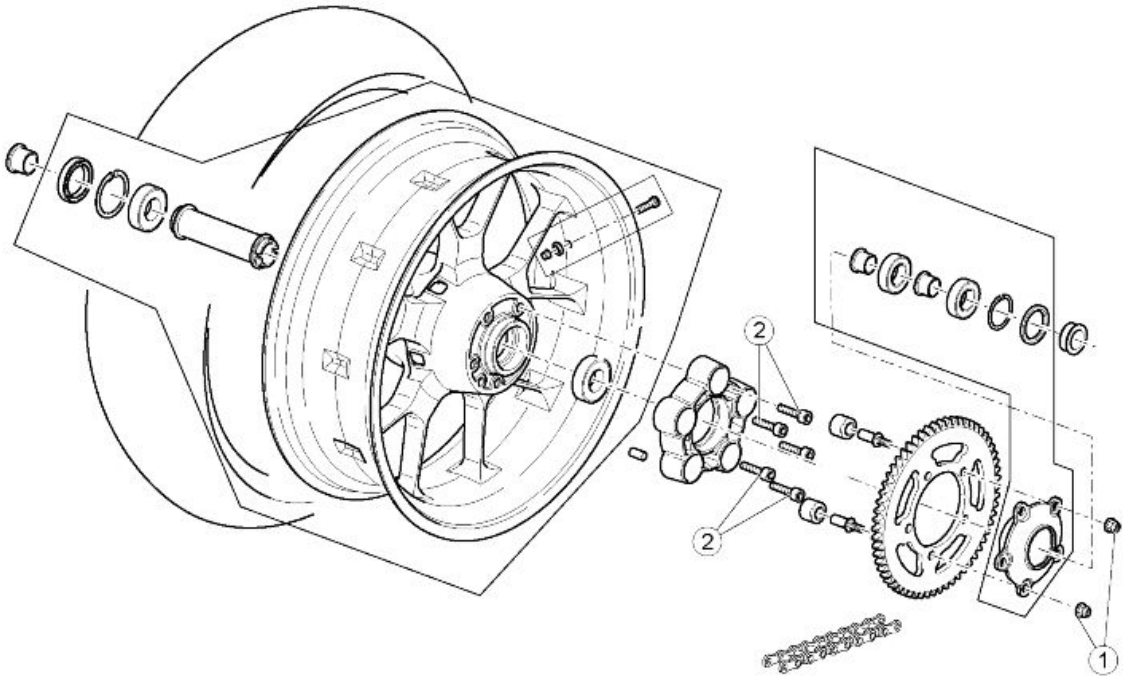
- Install dust gaiter (4) on frame headstock.
- Place the tightening ring nut (5) with the indicated rim placed downwards.
- Carry out the steering bearings clearance adjustment.



See also

Assembling

Rear

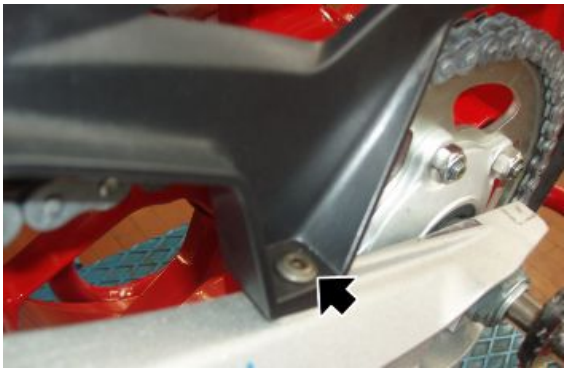


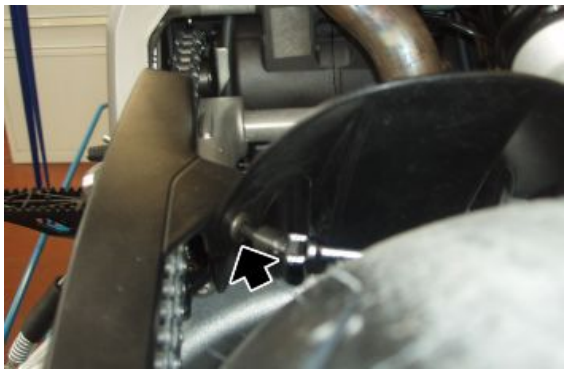
REAR WHEEL

pos.	Description	Type	Quantity	Torque	Notes
1	Lower self-locking nut fastening sprocket to sprocket carrier	M10	5	50 Nm (36.88 lbf ft)	Loctite 270
2	TCEI screw fastening flexible coupling mounting on wheel	M10x30	5	50 Nm (36.88 lbf ft)	Loctite 270

Removing the rear wheel

- Place the vehicle on its rear service stand.
- Fasten the vehicle handlebar to the bench using belts.
- To facilitate operations, it is advisable to remove the chain protection by unscrewing the two screws.

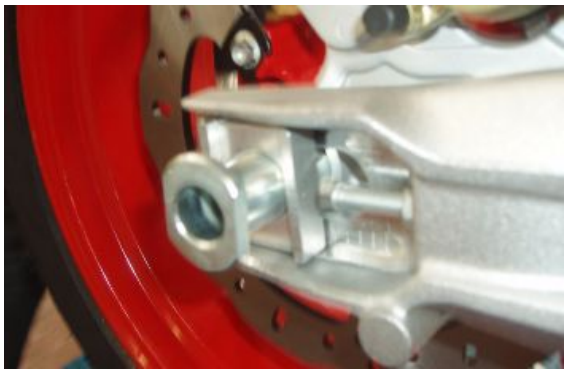




- Fully slacken the gearing chain tension.
- Make the wheel move forward and release the gearing chain from the sprocket.

- Unscrew and remove the nut on the wheel axle.
- Collect the thrust washer and the right chain tensioner slider.

- Working on the right side, hit the wheel axle lightly so as to take out the head from its housing.
- Working on the left side, slide off the wheel axle together with the chain guide slider.
- Remove the wheel by freeing the disc from the brake calliper.



- Collect the spacer from the rear wheel right side.

- Working from the left side, unscrew and remove the five nuts and remove the sprocket and the bolts.

- Unscrew and remove the five screws and remove the anti-vibration buffer holder.
- Check the flexible couplings according to the routine maintenance table.

See also

Adjusting

Checking the rear wheel

CHECK THAT ALL PARTS ARE IN GOOD CONDITION, ESPECIALLY THOSE LISTED AS FOLLOWS.

REAR WHEEL BEARINGS

Carry out the check with the bearings fitted on the wheel.

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 wheel bearings.

ALWAYS REPLACE BOTH BEARINGS.
ALWAYS REPLACE THE BEARINGS WITH OTHERS OF THE SAME TYPE.

- 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 wheel bearings.

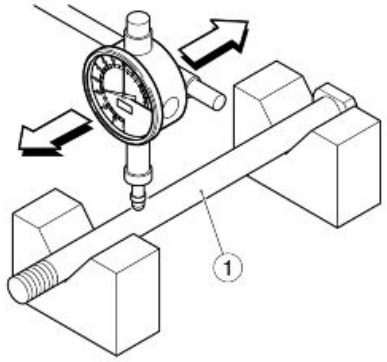
REAR WHEEL GASKETS

- Check that the gaskets are in good conditions; replace them if they show signs of damage or excessive wear.

ALWAYS REPLACE BOTH GASKETS.
ALWAYS REPLACE THE GASKETS WITH OTHERS OF THE SAME TYPE.

REAR wheel axle

- Use a dial gauge to check the wheel axle eccentricity (1). Replace the wheel axle if the eccentricity exceeds the limit value (1).



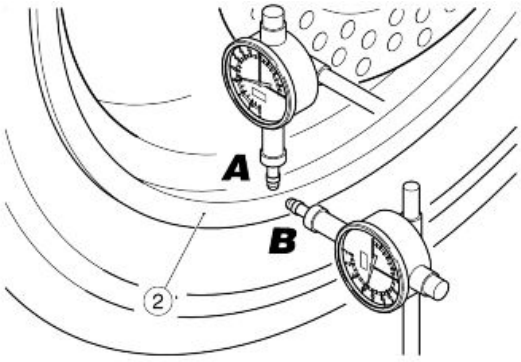
Characteristic

Maximum eccentricity:

0.25 mm (0.0098 in)

REAR WHEEL RIM

- Using a dial gauge, check that the radial (A) and the axial eccentricity (B) of the rim (2) do not exceed the limit value.



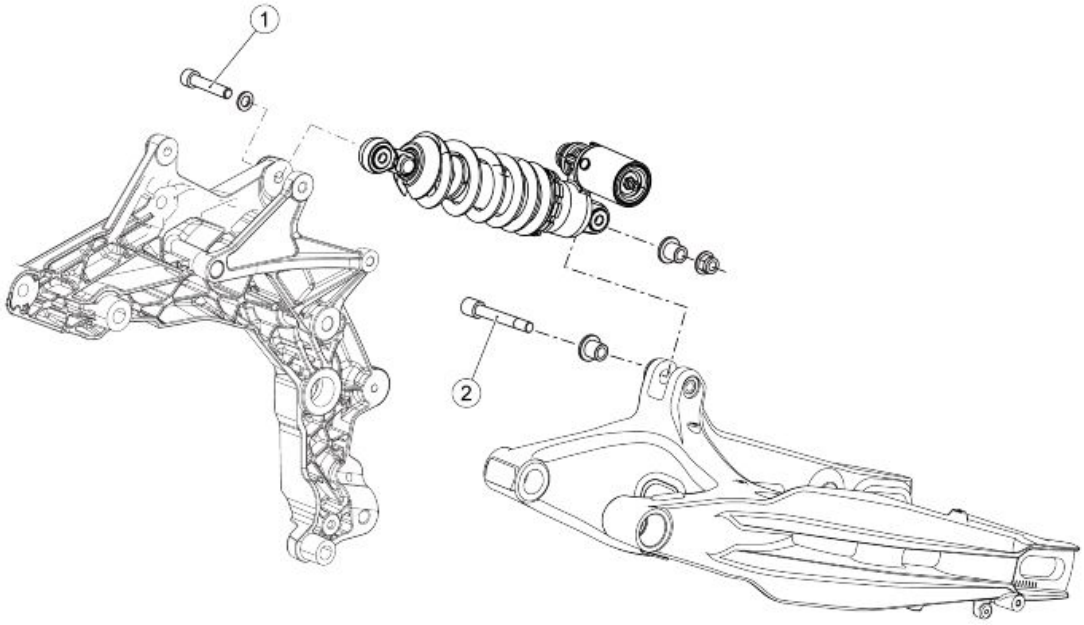
An excessive eccentricity is usually caused by worn or damaged bearings. Replace the rim (2) if after replacing the bearings, the value is not within the specified limit.

Characteristic

Maximum radial and axial eccentricity:

2 mm (0.0079 in)

Shock absorbers



REAR SUSPENSION

pos.	Description	Type	Quantity	Torque	Notes
1	Upper TCEI mounting screw	M10x50	1	50 Nm (36.88 lbf ft)	-
2	Lower TCEI mounting screw	M10x80	1	50 Nm (36.88 lbf ft)	-

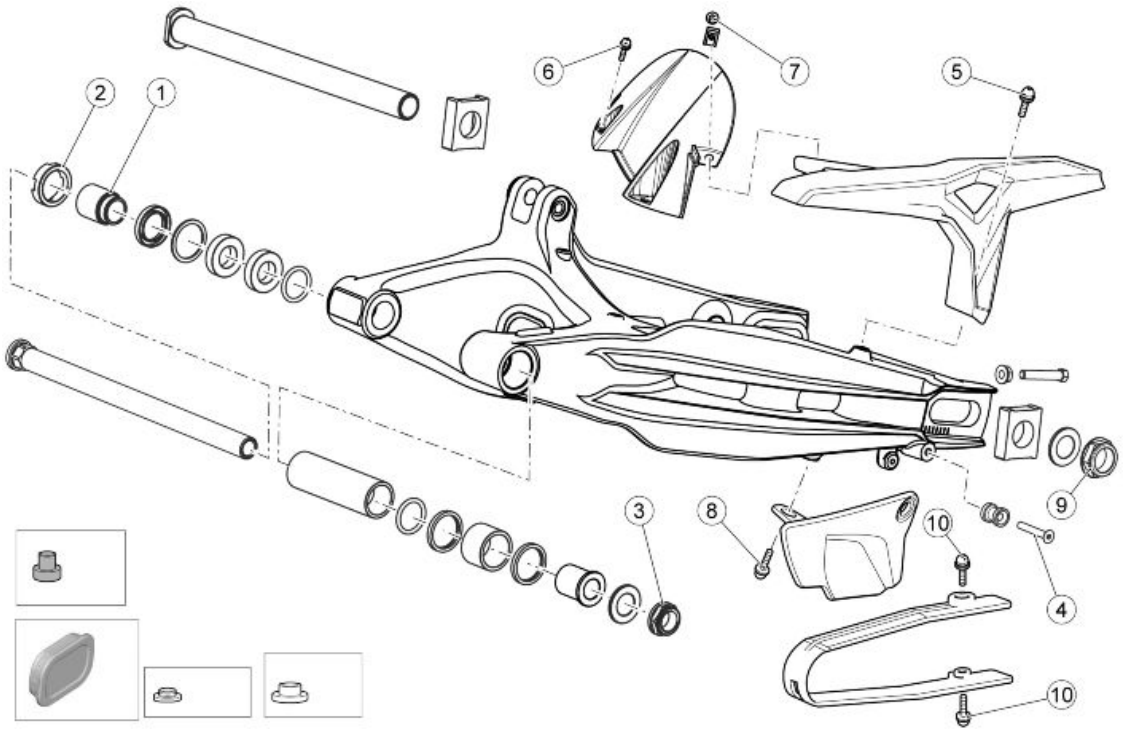
Removing

- Place the optional under-sump and rear wheel service stands.
- Unscrew and remove the upper screw and collect the washer.

- Loosen the under-sump optional service stand to lower the engine.
- Unscrew and remove the lower screw and retrieve the nut.
- Remove the shock absorber.

INDEX OF TOPICS

Swinging arm



SWINGARM

pos.	Description	Type	Quantity	Torque	Notes
1	Swingarm Pin adjustment bushing	-	1	12 Nm (8.85 lbf ft)	-
2	Swingarm pin ring nut	-	1	60 Nm (44.25 lbf ft)	-
3	Swingarm pin nut	-	1	90 Nm (66.38 lbf ft)	-
4	TPSI screw fastening rear stand bushing	M6x40	2	10 Nm (7.37 lbf ft)	-
5	TBEI screw fastening chain guard to swingarm	M5x9	1	6 Nm (4.42 lbf ft)	Loctite 243
6	TBEI screw fastening rear mudguard to swingarm	M5x9	2	6 Nm (4.42 lbf ft)	Loctite 243
7	TBEI screw fastening chain guard to rear mudguard	M5x9	1	4 Nm (2.95 lbf ft)	-
8	TBEI screw fastening chain guide to swingarm	M5x9	2	6 Nm (4.42 lbf ft)	Loctite 243
9	Wheel axle nut	M25x1.5	1	120 Nm (88.5 lbf ft)	-
10	Flanged TBEI screw fastening chain slider	M5x9	2	6 Nm (4.42 lbf ft)	-

Removing

- Remove the exhaust system.
- Support the vehicle by means of the engine service stand and a hoist with belts fastened to the rear section of the frame.
- Remove the rear wheel.

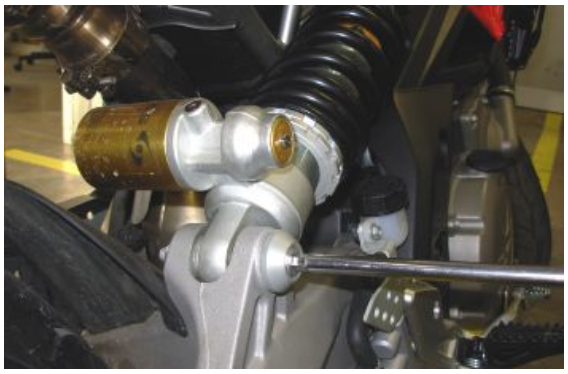
- Slide off the rear calliper holding plate, keeping it linked to the brake pipe.

CAUTION

DO NOT ACTUATE ON THE REAR BRAKE LEVER AFTER REMOVING THE WHEEL. OTHERWISE, THE CALLIPER PLUNGERS COULD GO OUT OF THEIR SEAT, RESULTING IN BRAKE FLUID LEAKAGE.

- Unscrew and remove the two lower swingarm screws.
- Remove the cable guide.

- Unscrew and remove the shock absorber lower screw and collect the nut.
- Fasten the shock absorber to the chassis.



- With the specific box-spanner, unscrew and remove the locking ring nut.

- Working from the left side, unscrew and remove the nut and collect the washer.

REMOVAL SHOULD BE CARRIED OUT WITH UTMOST CAUTION.
SUPPORT THE SWINGARM FROM THE FRONT TO AVOID ACCIDENTAL FALLS.
PLACE A WOODEN SUPPORT UNDER THE FRONT PART OF THE REAR SWINGARM TO PREVENT IT FROM LOWERING AND TO KEEP IT UPRIGHT.

- Working on the right side, unscrew and remove the swingarm bolt.

UPON REMOVING THE REAR SWINGARM PAY ATTENTION NOT TO JAM THE GEARING CHAIN.

See also

Removing the rear wheel

Drive chain

Adjusting

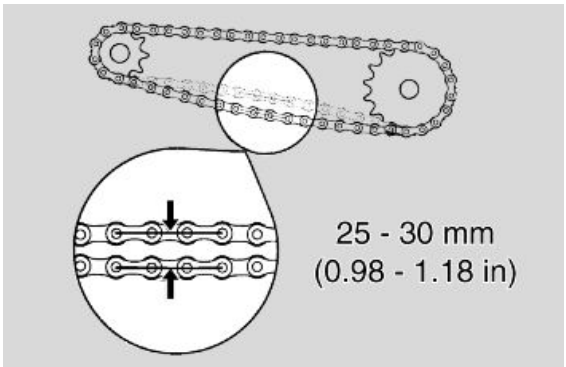
The vehicle is fitted with an endless chain, without master link.

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.

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 approx. 25 - 30 mm (0.98 - 1.18 in).



- Move the vehicle forward so as to check vertical oscillation of the chain in other positions too. clearance should remain constant at all wheel rotation phases.
- If clearance is uniform but over 30 mm (1.18 in) or below 25 mm (0.98 in), adjustment is necessary.

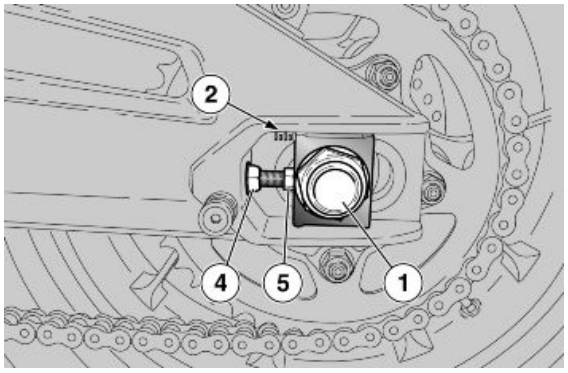
ADJUSTMENT

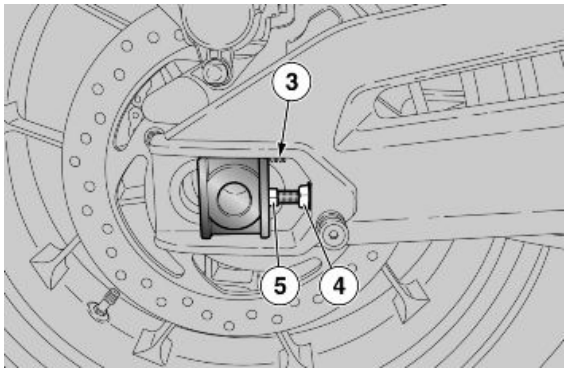
CAUTION

GET A SPECIFIC REAR SERVICE STAND (OPT) 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

TO ENSURE THAT THE WHEEL IS CORRECTLY CENTRED, THERE ARE FIXED REFERENCE MARKINGS (2-3) INSIDE THE CHAIN TENSIONER SLIDER SEATS ON THE SWINGARMS, IN FRONT OF THE WHEEL AXLE.

CHECKING THE CHAIN, THE PINION AND THE SPROCKET FOR WEAR

Furthermore, check the following parts and make sure 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 MISSING OR DAMAGED, THE WHOLE CHAIN UNIT (PINION, SPROCKET AND CHAIN) SHOULD BE REPLACED.
LUBRICATE THE CHAIN ON A REGULAR BASIS, PARTICULARLY IF YOU DETECT DRY OR RUSTY PARTS.
FLATTENED OR JAMMED CHAIN LINKS SHOULD BE LUBRICATED AND GOOD OPERATING CONDITIONS RESTORED.

THE GEARING CHAIN HAS SEALING RINGS AMONG THE LINKS THAT KEEP THE GREASE INSIDE.
ADJUST, LUBRICATE, WASH AND REPLACE THE CHAIN WITH UTMOST CAUTION.

CLEANING AND LUBRICATION

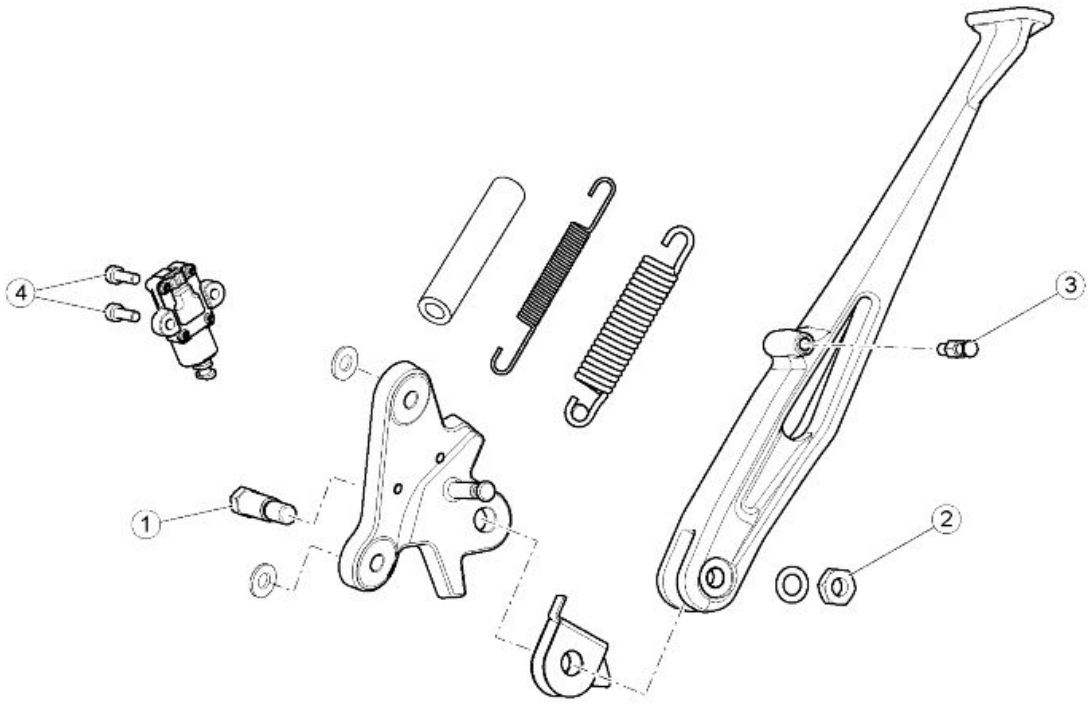
Do not wash the chain with water jets, steam jets, high-pressure water jets and highly flammable solvents.

- Wash the chain with fuel oil or kerosene. Maintenance operations should be more frequent if there are signs of quick rust.

Lubricate the chain at the intervals specified on the routine maintenance table and whenever necessary.

- Wash the chain, allow to dry and lubricate with spray grease for sealed chains.

Stand

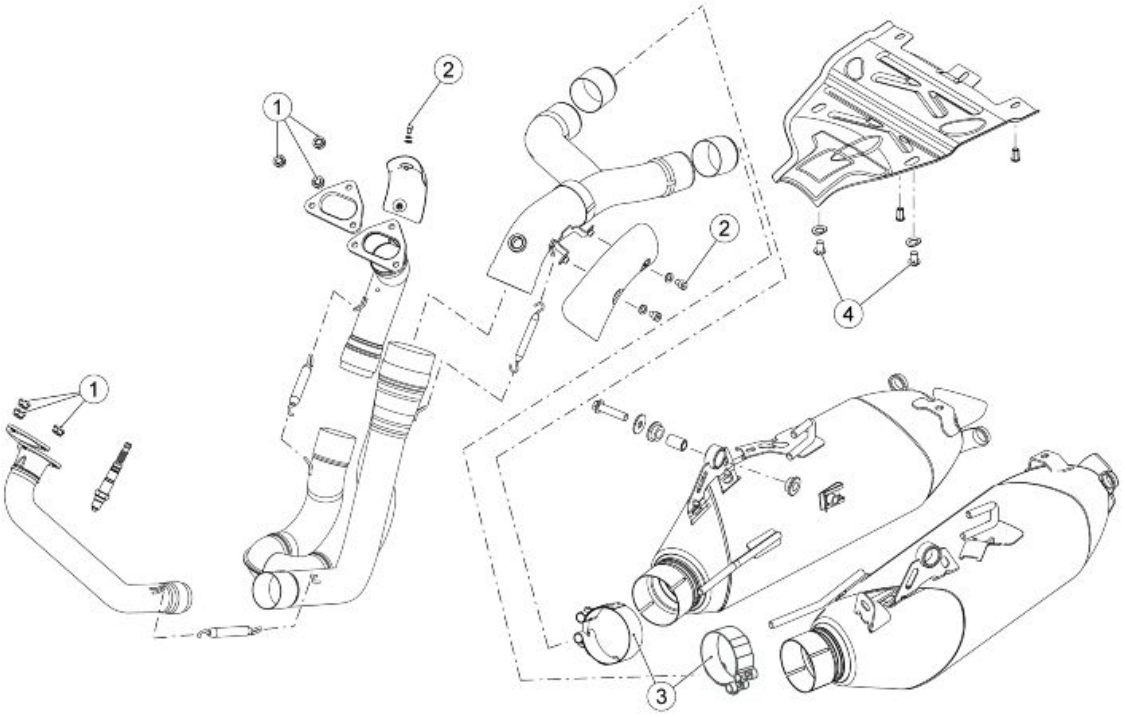


STAND ASSEMBLY

pos.	Description	Type	Quantity	Torque	Notes
1	Stand bolt	M10x1.25	1	10 Nm (7.37 lbf ft)	-
2	Thin nut	M10x1.25	1	25 Nm (18.44 lbf ft)	Loctite 243
3	Spring fixing pin	-	1	7.5 Nm (5.53 lbf ft)	-

pos.	Description	Type	Quantity	Torque	Notes
4	TCEI screw fastening stand switch	M5x16	2	6 Nm (4.42 lbf ft)	Loctite 243

Exhaust



EXHAUST SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	SERPRESS self-locking nut fastening flange on head	M8	4	25 Nm (18.44 lbf ft)	-
2	Screw fastening exhaust manifold protection	M4x6	4	3-4 Nm (2.21-2.95 lbf ft)	-
3	Silencer Clamp (between central manifold and silencer)	M6	2	7 Nm (5.16 lbf ft)	-
4	Screw fastening saddle compartment protection	M8x12	2	22 Nm (16.23 lbf ft)	-
5	Flanged TE screw fastening silencer	M8x35	2	25 Nm (18.44 lbf ft)	-

Removing the tail pipe

- Remove the tail fairing.
- Remove the central manifold.
- Remove the clamp.

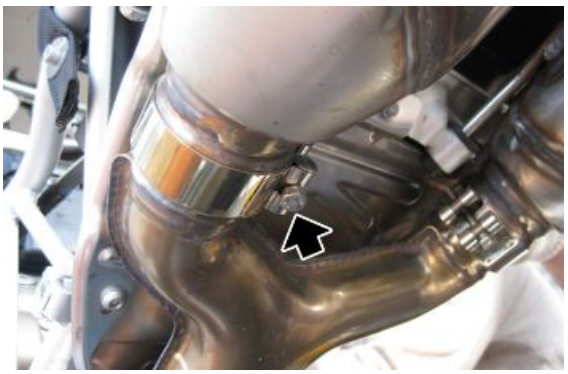
- Disconnect the lambda probe.

See also

Tail guard
Removing the
exhaust manifold

- Unscrew and remove the exhaust end fixing screw.

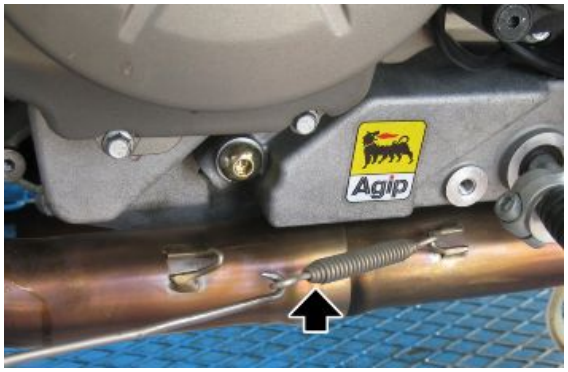
- Loosen the clip and remove one exhaust end.



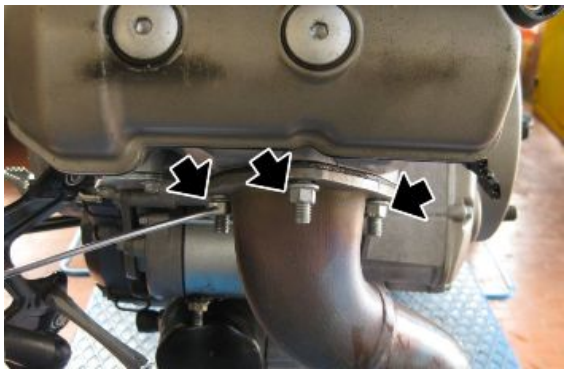
- Remove the other exhaust end together with manifold, sliding it out of the rubber blocks.

Removing the exhaust manifold

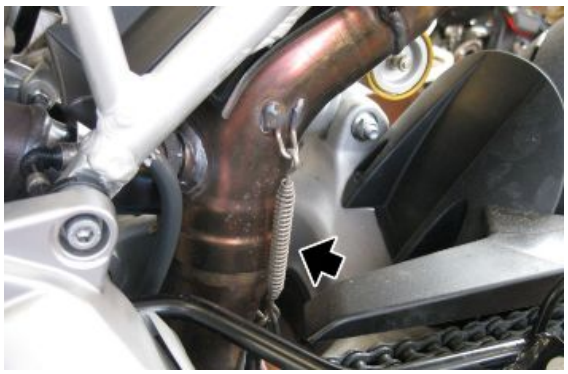
- Remove the engine oil radiator.
- Disengage the spring.



- Unscrew and remove the three nuts from the front exhaust manifold



- Disengage the spring joining central exhaust manifold to exhaust end.



See also

Engine oil cooler

- Disengage the spring joining the central exhaust manifold to the rear exhaust manifold.

- Remove the front exhaust manifold, moving the central exhaust manifold.

- Remove the central exhaust manifold.

- Unscrew and remove the three nuts from the rear exhaust manifold.
- Remove the exhaust manifold.

Removing the lambda sensor

- To remove the lambda probe refer to exhaust end removal.

See also

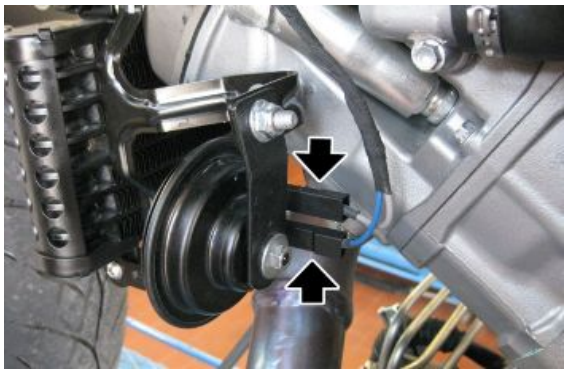
Removing the tail pipe

Engine oil cooler

- Remove the fairing lug.

- Drain the engine oil.
- Remove both side fairings.
- Working on the right side, unscrew the two oil pipes.

- Disconnect the horn connectors.



See also

Side body panels

- Working on the left side, unscrew and remove the screw from the front cylinder.

- Remove the seeger ring and slide off the pin.

- Remove the oil radiator together with support and horn.

INDEX OF TOPICS

Interventions rules

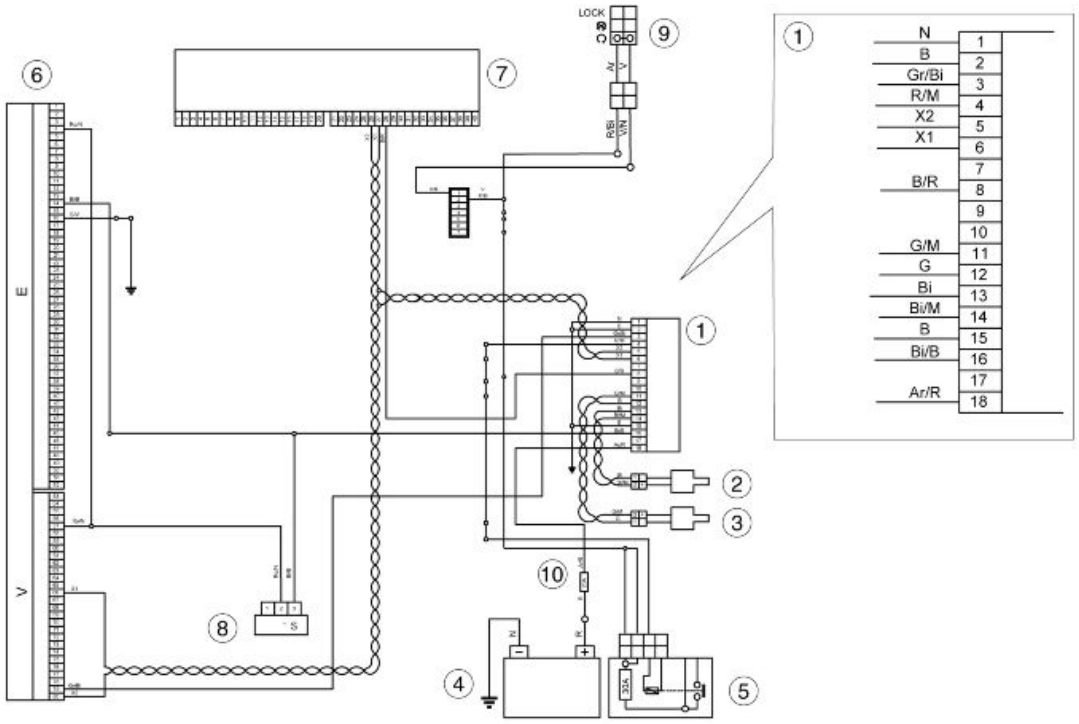
CAUTION

THE FRONT BRAKE DISC SHAPE DOES NOT CHANGE THE OPERATING AND MAINTENANCE SPECIFICATIONS OF THE SYSTEM.

ABS

ABS SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
-	ABS ECU fastener screw	M6x25	1	10 Nm (7.37 lbf ft)	Loctite 243
-	ABS ECU fastener nut	M6	2	10 Nm (7.37 lbf ft)	-



Key:

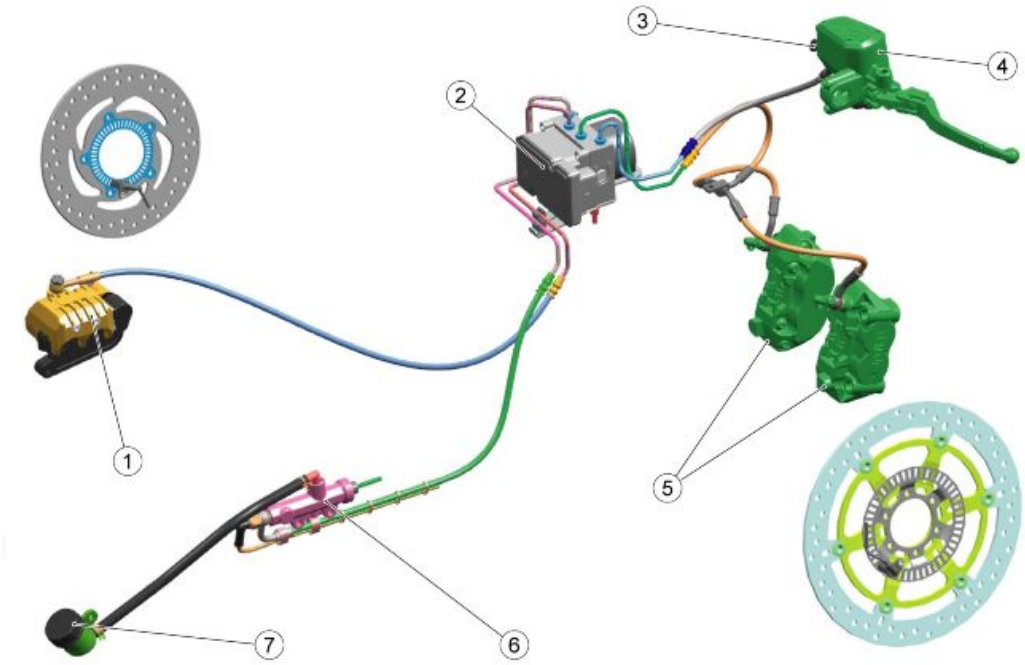
1. ABS ECU control unit
2. Front ABS sensor
3. Rear ABS sensor
4. Battery
5. Main fuse
6. ECU
7. Instrument panel
8. K line (diagnosis)
9. Key
10. ABS control unit fuse

ABS ECU control unit pin configuration

- PIN 1 - GND - Ground
- PIN 2 - PCC1 - Vehicle identification ground connection
- PIN 3 - Speed signal to ECU
- PIN 4 - IGN - Injection
- PIN 5 - CAN H line
- PIN 6 - CAN L line
- PIN 8 - WL - Alarm warning light
- PIN 11 - R_SIGN - Rear ABS sensor signal
- PIN 12 - R_GND - Rear ABS sensor ground connection

- PIN 13 - F_GND - Front ABS sensor ground connection
- PIN 14 - F_SIG - Front ABS sensor signal
- PIN 15 - PCC2 - Vehicle identification ground connection
- PIN 16 - ISO_K - K line (diagnosis)
- PIN 18 - KL30 - Power supply

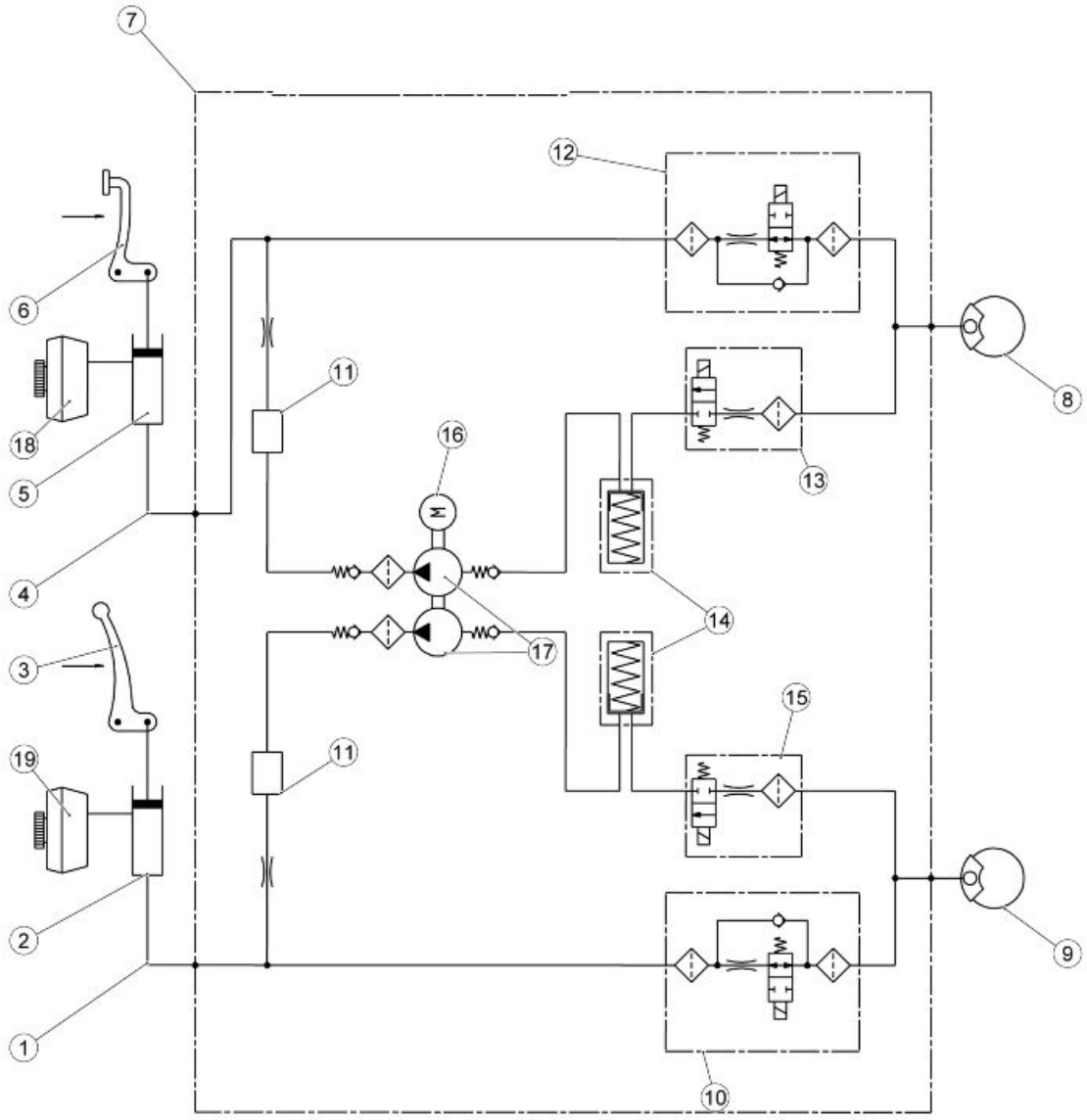
Foreword



key:

1. Rear brake calliper
2. Modulator
3. Front bleed valve
4. Front brake reservoir
5. Front brake callipers
6. Rear brake pump
7. Rear brake reservoir

Operating diagram



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. Humidifier
12. Rear brake circuit intake solenoid valve (normally open)
13. Rear brake exhaust circuit solenoid valve (normally closed)
14. Rear/front brake circuit low pressure accumulator
15. Front brake exhaust circuit solenoid valve (normally closed)
16. DC electric motor
17. Double circuit hydraulic pump (ABS)
18. Rear brake reservoir
19. Front brake reservoir

ABS OPERATION

General specifications:

The front circuit is similar to the rear circuit.

- The ABS inlet valve (10 - 12) is normally open and it is closed only when the system intervenes to avoid wheel locking.
- The outlet valve (13 - 15) is normally closed and it is opened only when the system intervenes to avoid wheel locking.
- When the system is in standby, the ABS processor never stops monitoring the speed of the wheels in order to assess potential wheel slippage.
- 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: it coincides with danger recognition (wheel slippage above threshold): the system closes the inlet valve (10-12) and opens the outlet valve (13-15) temporarily.

At this stage the rider cannot increase the pressure on the callipers (8-9) and the system reduces the pressure on the callipers partially. The excess fluid temporarily fills the front reservoir (18-19) until the ABS pump (17) self-activates and delivers the fluid back to the brake pump (2-5).

C - 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 (10-12).

D - Pressure restored: by opening the inlet valve (10-12) momentarily, the pressure of the callipers (8-9) is increased until maximum deceleration is reached. Then, the system gives the control over the braking back to the rider.

E - If the wheel does not reach complete grip, the system continues operating as before until complete grip is obtained or until the vehicle stops. An error 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.

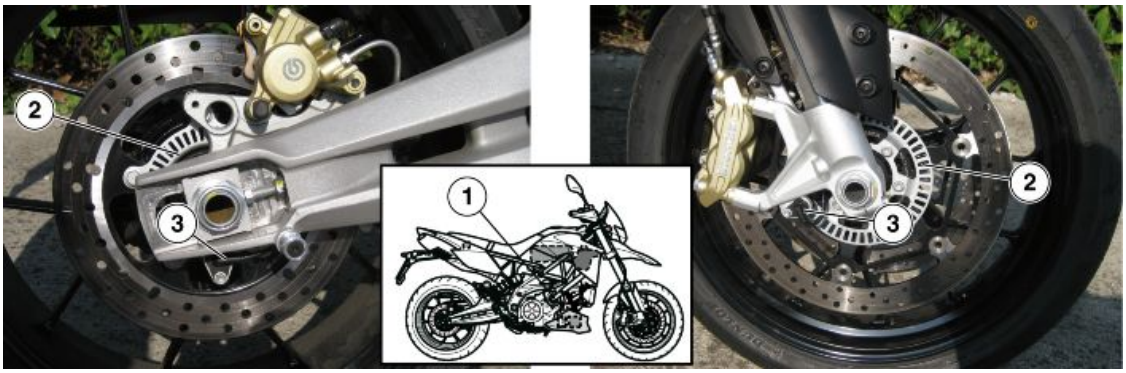
A position sensor (3) on the tone wheel (2), forming an integral unit with the vehicle wheel, "reads" the status of the vehicle wheel spotting any possible lock.

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.



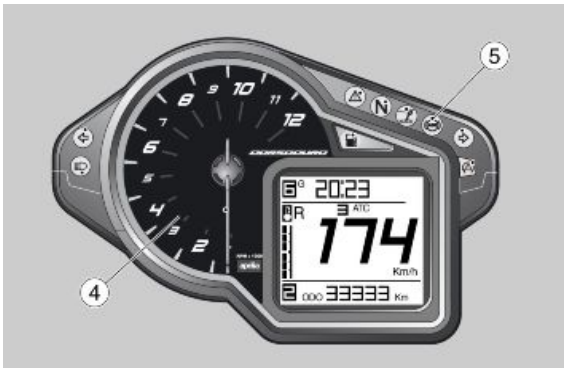
When sensors (3) detect a significant speed difference between the rear and the front wheels (for example, when rearing up on the back wheel), the ABS system could take this as a dangerous situation. In this case, 2 things may occur:

- 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.

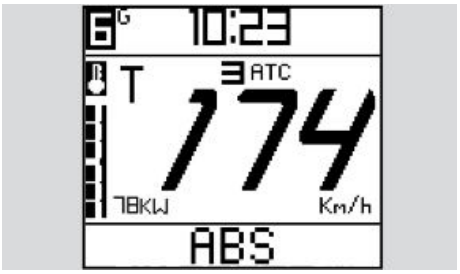


IN CASE OF FAILURE OR WITH ABS DISCONNECTED, THE VEHICLE OPERATES AS IF IT DID NOT HAVE THIS SYSTEM.

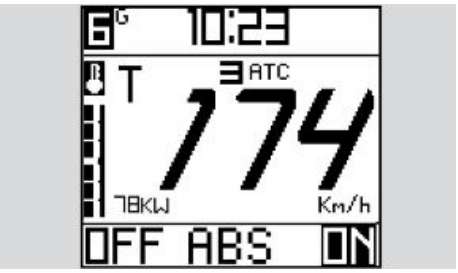
ABS enable/disable

Push the MODE control briefly to the left or right to scroll through the TRIP1 or TRIP2 trip journal and view the ABS option.

Press the centre of the MODE control to access the ABS function.



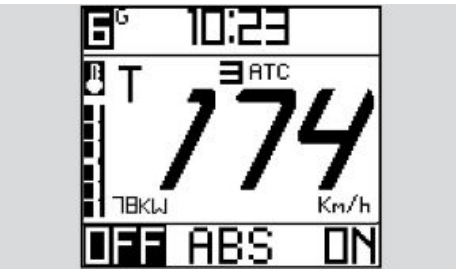
By moving the selector to the right - pressing it briefly - the ABS system turns on and the warning light starts blinking.



By moving the selector to the left - pressing it briefly - the ABS system turns off and the warning light remains on with a steady light.

Once the ABS system is enabled or disabled, the digital display automatically returns to the ABS function.

When the bike is in motion, the instrument panel automatically exits the ABS function.



NOTE

AT KEY ON, IF THE SYSTEM IS FUNCTIONING CORRECTLY, THE ABS INDICATOR LIGHT WILL FLASH, AND ONCE A VEHICLE SPEED OF 5 Km/h - 3.1 mph IS EXCEEDED, THE SYSTEM WILL BE ACTIVE.

NOTE

WHEN THE BIKE'S PANEL IS OFF AND WHEN TURNING IT ON THE NEXT TIME THE ABS SYSTEM IS STILL ACTIVE, REGARDLESS OF WHAT WAS SET PREVIOUSLY.

Riding with a deactivated ABS system

The warning light (5) turns on permanently, the system was deactivated.

Riding with a deactivated ABS system

The warning light (5) turns on permanently, the system was deactivated.

20 A fuse (ABS Main fuse) (6)

Protects: ABS Control unit.

Guide to diagnosis

Each time the key is ON, if at least one current or stored* error of the ABS system is not detected:

- the EFI warning light flashes and the word ABS is shown on the display (NA 850 Mana ABS).

- the ABS warning light flashes (SL 750 Shiver ABS / Dorsoduro 750 ABS / Dorsoduro 1200 ABS)

When the 5 km/h (3.11 mph) are exceeded:

- if errors are not detected

- the EFI warning light turns off and the word ABS on the display disappears (NA 850 Mana ABS).
- the ABS warning light turns off (SL 750 Shiver ABS / Dorsoduro 750 ABS / Dorsoduro 1200 ABS)

- if at least one malfunction is detected

- the EFI warning light turns on permanently and the word ABS appears on the display (NA 850 Mana ABS)
- the ABS warning light turns on permanently (SL 750 Shiver ABS / Dorsoduro 750 ABS / Dorsoduro 1200 ABS)

The ABS system is deactivated!

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 is still inactive.

Example:

- error code 5D93 requires some minutes before it is diagnosed during the given time:

- A - The EFI warning light keeps flashing with the word ABS on the display (NA 850 Mana ABS)
- B - The ABS warning light keeps flashing (SL 750 Shiver ABS / Dorsoduro 750 ABS / Dorsoduro 1200 ABS)

ABS FAULTS - GUIDE TO THE DIAGNOSIS

1a. **NA 850 Mana** - ABS WARNING LIGHT + ICON 1b. **Dorsoduro 750 - SL 750 Shiver - Dorsoduro 1200** - ABS WARNING LIGHT LIT

2- CONNECT NAVIGATOR

DOES NAVIGATOR COMMUNICATE? (NO, go to 3; YES, go to 4)

3.PERFORM THESE CHECKS:

- A. Ground connection PIN 1
- B. +12V at PIN 18

- C. +12V at PIN 4 with key ON

4. **ARE THERE ANY ERRORS? (YES, go to 5; NO, go to 6)**

5. CONSULT THE TABLE ERROR DISPLAY

6. ABS WARNING LIGHT ACTIVATION

ACTIVE?(YES, go to 7; NO, go to 8)

7. CONTACT TECHNICAL SERVICE

8. CHECK:

- A. Cable continuity between PIN 8 of the ABS control unit connector and PIN 28 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

NOTE: to check the wheel speed sensor using the NAVIGATOR, follow the instructions given in chapter "ELECTRICAL SYSTEM/CHECKS AND TESTS/SPEED SENSOR".

Using Navigator for the abs

Abs screen pages

ECU INFO screen page

This screen page shows general data regarding the control unit, for example software type, mapping, control unit programming date

INFO ECU SCREEN PAGE

Characteristic	Value/example	Unit of measurement	Notes
Vehicle manufacturing date			
Chassis number			
Software version			
Vehicle code	Dorsoduro 1200		The vehicle code stored in the control unit is read.
Vehicle identification according to state of Pins 2 and 15	Norge / Stelvio / Identification provided by ECU		A different type of vehicle is associated with each configuration of PIN 2 and PIN 15 connections.

Characteristic	Value/example	Unit of measurement	Notes
			Possible indications are as follows: Norge / Stelvio / ID by ECU.
			Configuration with PIN 2 and PIN 15 connected to ground, as is the case with Dorsoduro 1200, provides the following indication: "Identification provided by ECU";
			the ECU also requires a CAN message from the injection ECU in order to determine vehicle ID.

NOTE: the "X" in the table identifies the connector pin is grounded.

*** - DORSODURO 1200 and all motorcycles equipped with ABS control units connected via CAN line**

aprilia		PIN2	PIN15
	*	X	X

PARAMETERS screen page

This screen page 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

Characteristic	Value/example	Unit of measurement	Notes
Front wheel speed	0	km/h	With stopped wheel, 0 Km/h is displayed
Rear wheel speed	0	km/h	With stopped wheel, 0 Km/h is displayed
Battery voltage	11.9	V	

ACTIVATION screen page

This screen page is used to delete errors in the control unit memory and to activate some systems controlled by the control unit.

ACTIVATION

Characteristic	Value/example	Unit of measurement	Notes
Front brake bleeding procedure			Useful in case of lever sponginess although the bleeding has been done as in a regular braking system
Rear brake bleeding procedure			Useful in case of lever sponginess although the bleeding has been done as in a regular braking system
ABS warning light			For Shiver, Shiver GT and Dorsoduro models, the ABS warning light is caused to flash. For the Mana model, both the EFI warning light and the ABS word flash on the display.
Ambient parameter error reading (1)			The ambient parameters are 4: Number of error detections, Operation cycles from the last detection, Battery voltage, Speed.
Ambient parameter error reading (2)			Number of error detections: number of times the error has been detected by the control unit;
Ambient parameter error reading (3)			for example, if it indicates 2, it means that the error has been detected (ATT), then it has not been detected for a while (sent to the MEM) and then it has been detected again.
Ambient parameter error reading (4)			Operation cycles from the last reading: a cycle is counted if the following occurs: key ON and speed over 20 km/h.
Ambient parameter error reading (5)			If for example 5 is shown, it means that the last time the error has been measured was 5 cycles ago.
Error clearing (1)			Press "enter" to transfer errors from the memory (MEM) to the historical record (STO).
Error clearing (2)			In the next connection between Navigator and the control unit, the historical errors (STO) are no longer shown.

ERRORS screen page

This screen page shows potential errors detected in the vehicle (ATT) or stored in the control unit (MEM) and it allows to check error clearing (STO).

ERRORI

Caratteristica	Valore/esempio	Unità di misura	Note
Front speed sensor: 5D90 electric malfunction			Electrical fault in sensor or cable harness
Front speed sensor: 5D91 the signal works irregularly			Faulty sensor or signal interference
Front speed sensor: 5D92 the signal decreases periodically			Possible tone wheel fault due to deformations or dirt; possible alterations on the wheel bearing surface. In very rare cases, abnormal tone wheel vibrations
Front speed sensor: no signal or speed measured too low in relation to the rear wheel 5D93			Faulty sensor or missing sensor/tone wheel or excessive distance between the sensor and the tone wheel or tone wheel with wrong number of teeth
Front speed sensor: 5D94 no acceleration after pressure reduction			Faulty sensor or missing sensor/tone wheel or excessive distance between the sensor and the tone wheel
Front speed sensor: 5D95 excessive measured speed			Faulty sensor/tone wheel, or tone wheel with wrong number of teeth or wrong tyre size
Rear speed sensor: 5DA0 electric malfunction			Electrical fault in sensor or cable harness
Rear speed sensor: 5DA1 the signal works irregularly			Faulty sensor or signal interference
Rear speed sensor: 5DA2 the signal decreases periodically			Possible tone wheel fault due to deformations or dirt; possible alterations on the wheel bearing surface. In very rare cases, abnormal tone wheel vibrations
Rear speed sensor: 5DA3 no signal or speed measured too low in relation to the front wheel			Faulty sensor or missing sensor/tone wheel or excessive distance between the sensor and the tone wheel or tone wheel with wrong number of teeth
Rear speed sensor: 5DA4 no acceleration after pressure reduction			Faulty sensor or missing sensor/tone wheel or excessive distance between the sensor and the tone wheel
Rear speed sensor: excessive measured speed 5DA5			Faulty sensor or tone wheel with wrong number of teeth or wrong tyre size
Control unit: missing valve calibration 5DD2			Possible control unit fault
Control unit 5DD3			Possible control unit fault
Recirculation pump 5DF0			Possible control unit fault
Recirculation pump 5DF1			Possible control unit fault
Control unit 5DF2			Possible control unit fault
Low electric voltage - long period measurement 5DF3			Voltage too low measured for 30 seconds at PIN 18 of the ABS control unit:
Control unit 5DF5			Possible control unit fault
High electric voltage 5DF7			Excessive voltage measured at PIN 18 of the ABS control unit
Codifica veicolo 5E59			Appare questo errore se la centralina rileva un'incoerenza tra la sua codifica, presente in memoria

Caratteristica	Valore/esempio	Unità di misura	Note
			(leggibile nella schermata ISO sulla riga Codice veicolo) e quanto rilevato dai PIN di identificazione del cablaggio
			(leggibile nella schermata ISO sulla riga Identificazione veicolo in base allo stato dei Pin 2 e 15) e, per Dorsoduro 1200, dal segnale CAN ricevuto dalla centralina iniezione
Control unit F000			Possible control unit fault

SETTINGS screen page

This screen page is used to adjust some control unit parameters.

ADJUSTMENTS

Characteristic	Value/example	Unit of measurement	Notes
Coding (1)			Used for re-coding the control unit or coding a new one.
Coding (2)			Vehicle identification is done according to the connection of PINS 2 and 15 of the ABS control unit connector and is stored in the control unit memory.
Coding (3)			The identification can be read in the INFO ECU screen page in the line: Vehicle code.

NOTE: the "X" in the table identifies the connector pin is grounded.

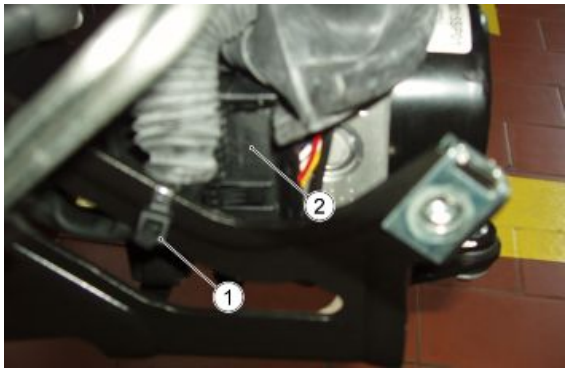
*** - DORSODURO 1200 and all motorcycles equipped with ABS control units connected via CAN line**

aprilia		PIN2	PIN15
	*	X	X

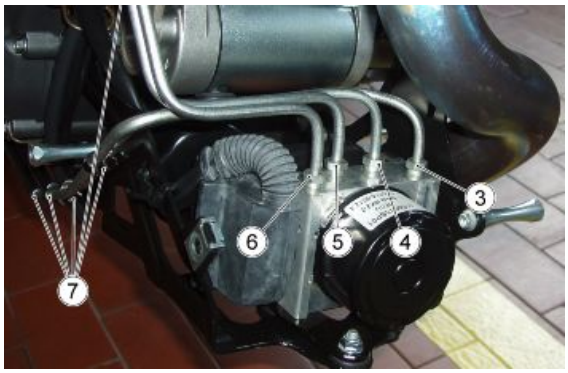
Modulator

MODULATOR REMOVAL

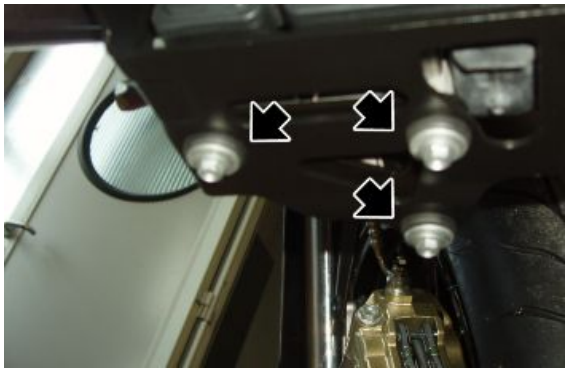
- Remove the fairing lug.
- Release clamp (1) and disconnect connector (2).



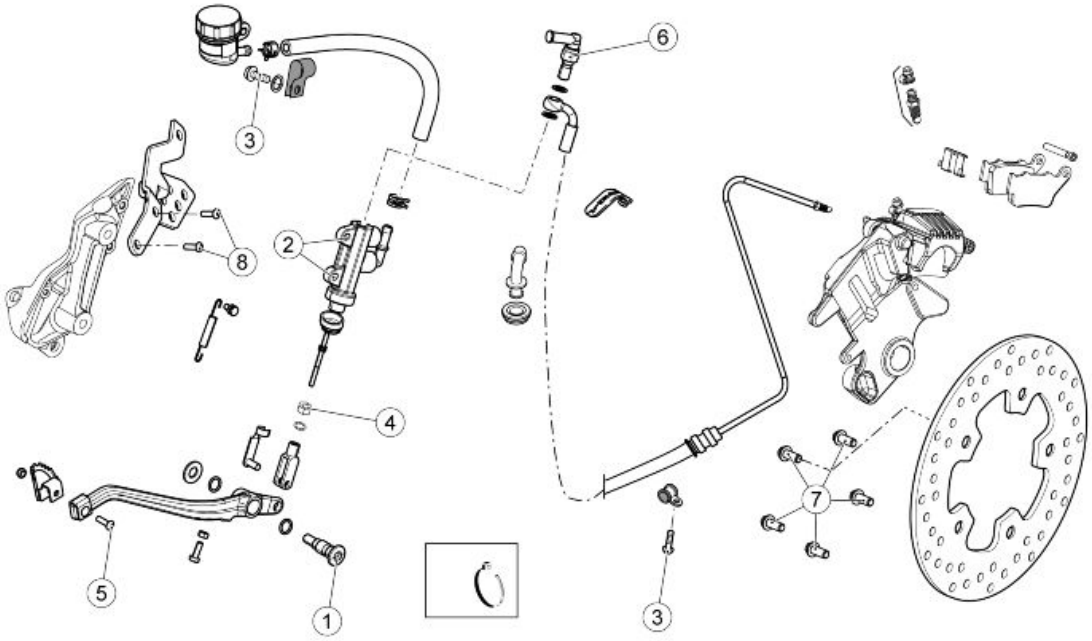
- By unscrewing the nuts, remove and plug the brake oil pipes following this sequence: (3) - (4) - (6) - (5).



- Slide off the rear system pipes from the hooks (7).
- Undo and remove the three screws, collect the washers and remove the ABS modulator.



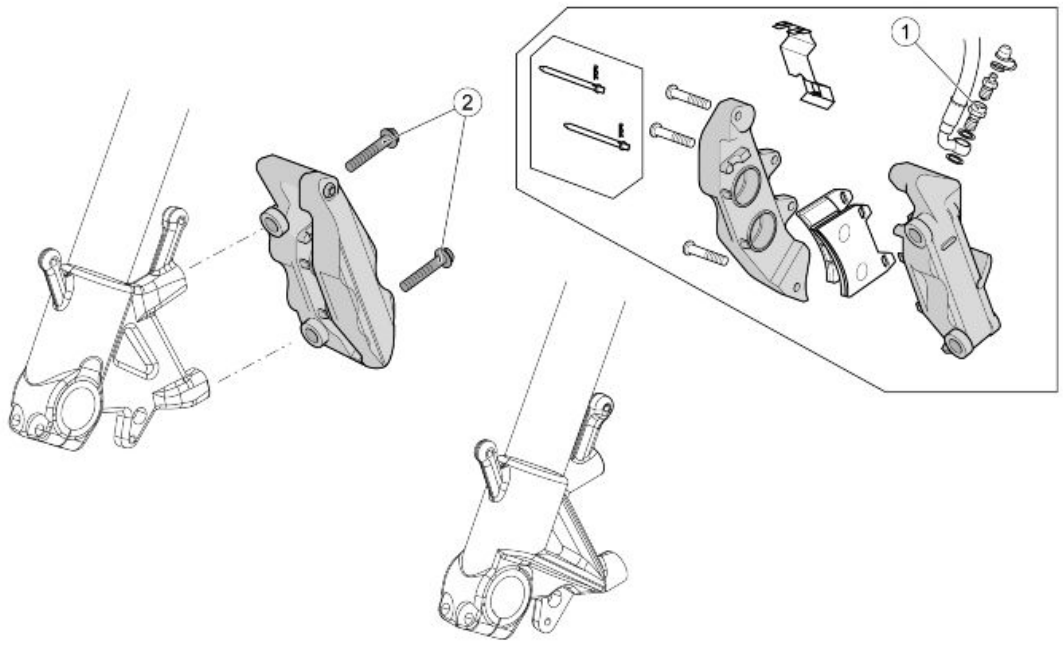
Rear brake calliper



REAR BRAKE

pos.	Description	Type	Quantity	Torque	Notes
1	Rear brake lever pin	-	1	10 Nm (7.37 lbf ft)	Loctite 243
2	Flanged TE screw fastening pump to footrest mounting	M6x16	2	10 Nm (7.37 lbf ft)	-
3	TBEI screw fastening oil pipe to swingarm	M5x12	4	8 Nm (5.90 lbf ft)	-
4	Flanged self-locking nut	M6	1	10 Nm (7.37 lbf ft)	-
5	Screw + nut fastening pedal to brake lever	M6	1	10 Nm (7.37 lbf ft)	-
6	Brake pipe union	M10x1	2	25 Nm (18.44 lbf ft)	-
7	Flanged TE screw fastening rear disc	M8x18	5	25 Nm (18.44 lbf ft)	Loctite 243
8	TCEI screw	M6x16	2	12 Nm (8.85 lbf ft)	-
-	Flanged TE screw	M6x16	1	10 Nm (7.37 lbf ft)	-

Front brake calliper



FRONT BRAKE

pos.	Description	Type	Quantity	Torque	Notes
1	Union with breather (fixing pipe to callipers)	M10x1	2	25 Nm (18.44 lbf ft)	-
2	TEFL screw (Fixing calliper to fork stems)	M10x1.25	4	50 Nm (36.88 lbf ft)	Loctite 270

Front brake pads

Removal

- Turn the pins and remove both split pins.

- Remove both pins.
- Collect the anti-vibration springs.
- Extract one pad at a time.

CAUTION

AFTER REMOVING THE PADS, DO NOT OPERATE THE BRAKE LEVER OR THE CALLIPER PLUNGERS COULD GO OUT OF THEIR SEATS RESULTING IN BRAKE FLUID LEAKS.

Rear brake pads

Removal

- Remove the cotter pin.

- Remove the pin by sliding it backwards.

- Extract one pad at a time.

CAUTION

AFTER REMOVING THE PADS, DO NOT OPERATE THE BRAKE LEVER OR THE CALLIPER PLUNGERS COULD GO OUT OF THEIR SEATS RESULTING IN BRAKE FLUID LEAKS.

Bleeding the braking system

VEHICLE PREPARATION

- It is important to check that there is always enough brake fluid in the reservoir.
- Using a bleed device facilitates these operations while, in the meantime, the "Brake fluid replacement" operations are performed.

- In this case, the bleed process must be accompanied by further pedal strokes and with the bleed device connected (about 5 for each wheel circuit).

BLEED SYSTEM AFTER BRAKE PUMP RE-PLACEMENT

PRELIMINARY OPERATIONS

- Install the new brake pump.
- Connect the reservoir to the brake pump.
- Connect the brake pipe to the pump line coupling.
- Fill the reservoir with new DOT4 brake fluid.

REGULAR BLEEDING SYSTEM

- Connect the bleed bottle to the bleed screw of the front brake calliper.
- Operate the brake lever.
- Open the bleed screw until all the pressure has been release and then close it.
- Release the brake lever.
- After releasing the lever, wait two seconds so that the brake fluid flows into the cylinder.
- Repeat this procedure until the brake fluid is clear and has no air bubbles. (about 10 to 20 times).

NOTE: CHECK BRAKE FLUID LEVEL IN THE RESERVOIR AND, IF NECESSARY, TOP UP (CHECKING BRAKE PAD WEAR).

- Then perform the same procedure for the rear brake calliper, acting only on the valve installed on that calliper.
- Fill the reservoir until it reaches the reference "MAX" and refit the cap (check pad wear).
- Detach the bleed hoses and close the bleed screws again to the correct tightening torque.
- Check the stroke and the sensitivity of both the lever and the brake pedal.

NOTE: IF AFTER BLEEDING, THE STROKE OF THE PEDAL OR THE LEVER IS TOO LONG, CHECK THAT THERE ARE NO LEAKS IN THE BRAKING SYSTEM AND IF EVERYTHING IS OK, CONTINUE BLEEDING OPERATIONS USING NAVIGATOR.

BRAKE BLEEDING AFTER ABS CONTROL UNIT REPLACEMENT

VEHICLE PREPARATION

- Connect the bleed bottle to the bleed screws of the front and rear callipers and open it.
- Fully press down the lever and the brake pedal and fix them into position with the respective locking devices.
- Close the bleed screws of the front and rear callipers and remove the bleed bottle.
- Remove the damaged ABS control unit.

Note: First of all, detach the brake pipes that go from the ABS control unit to the brake pump (1-4) and immediately seal the opened unions of the ABS control unit with protective caps. Afterwards, remove pipes (2-3) that go from the ABS control unit to the brakes and also seal these unions with protective caps.

- Install the new ABS control unit, previously filled up.
- So that the brake fluid remains in the ABS control unit, first remove the protective caps of the braking circuit unions and connect the respective pipes.

Once all the braking circuits have been connected, remove the protective caps from the braking pump unions and connect the braking pump pipes to the ABS control unit.

- Unlock the lever and the brake pedal.
- Remove the cap of the reservoir and fill it with the new DOT 4 brake fluid up to the reference "MAX".
- Refit the cap.

CAUTION

PERFORM THE REGULAR BRAKING SYSTEM BLEED, AS DESCRIBED AT THE BEGINNING OF THE CHAPTER.

- Check the stroke and the sensitivity of both the lever and the brake pedal.
- If, after bleeding, the pedal or the lever stroke is too long, check that there are no leaks in the braking system and if everything is ok, continue bleeding operations using Navigator as described.
- Detach the bleed hoses and close the bleed screws again to the correct tightening torque.

BRAKE BLEEDING AFTER CALLIPER RE-PLACEMENT

VEHICLE PREPARATION - The operations are described for the front system, but they are also valid for both braking systems.

- Connect the bleed bottles to the bleed screw of the front calliper and open it.
- Fully press down the brake lever and fasten it into position with a locking device so as to avoid fluid flowing out from the open system.
- Close the bleed screws of the front calliper and remove the bleed bottle.
- Replace the damaged calliper with a new one.
- Unlock the brake lever.
- Remove the cap of the reservoir and fill it with the new DOT 4 brake fluid up to the reference "MAX".
- Refit the cap.

BRAKING SYSTEM BLEEDING (only the new calliper)

CAUTION

PERFORM THE REGULAR BRAKING SYSTEM BLEED, AS DESCRIBED AT THE BEGINNING OF THE CHAPTER.

- Check the stroke and the sensitivity of both the lever and the brake pedal.
- If, after bleeding, the pedal or the lever stroke is too long, check that there are no leaks in the braking system and if everything is ok, continue bleeding operations using Navigator as described.
- Detach the bleed hoses and close the bleed screws again to the correct tightening torque.

BLEEDING SYSTEM WITH NAVIGATOR

This type of bleeding has to be carried out if after all the checks the brake lever and the pedal are still spongy.
The operations described here are valid for both systems even though the description refers to the front system.
FRONT

- With Navigator properly connected, select the function "FRONT BRAKE BLEEDING PROCEDURE".
- The pump starts rotating.
- While the pump is performing a rotation cycle, operate and release the front brake lever until the message Navigator cycle completion is received.
- This procedure allows the air to turn and to accumulate.
- Once the procedure with Navigator is finished, perform the REGULAR BLEEDING to remove the air from the system completely.

CAUTION

PERFORM THE REGULAR BRAKING SYSTEM BLEED, AS DESCRIBED AT THE BEGINNING OF THE CHAPTER.

Changing the brake fluid

BRAKE FLUID REPLACEMENT

VEHICLE PREPARATION

- Connect the bleeding unit to the reservoir of the braking system.

Max. filling pressure to be applied to the system= 3 bar (300 kPa - 43.51 PSI).

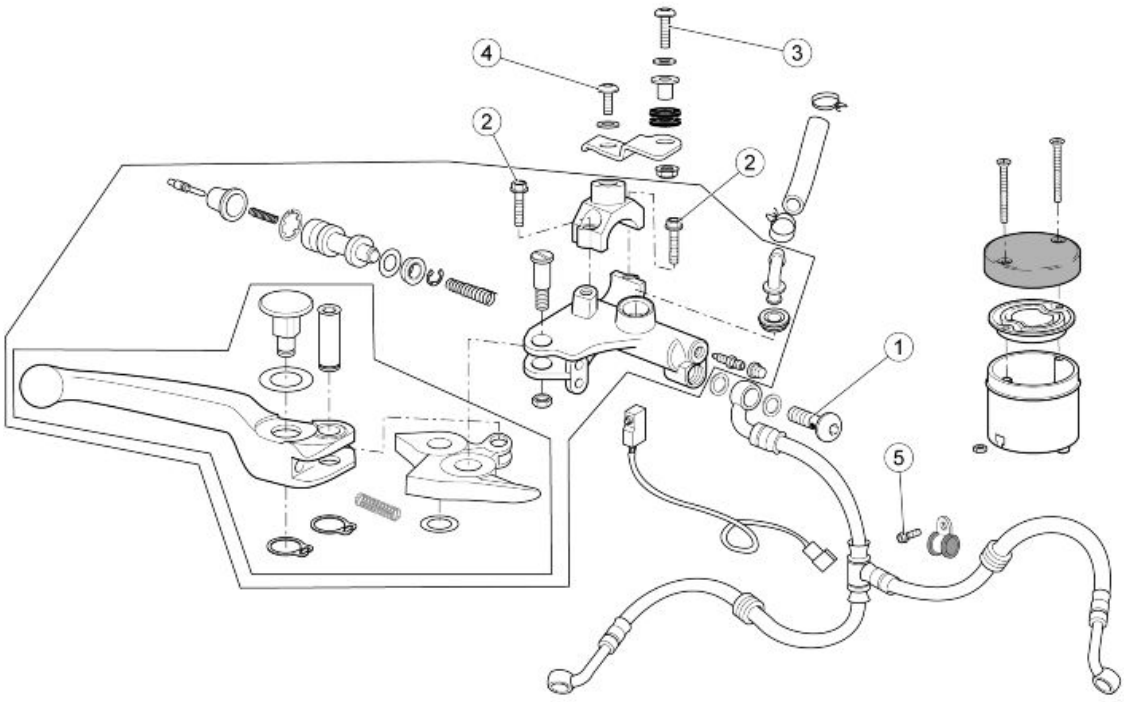
PURGING PROCESS TO CHANGE THE BRAKING SYSTEM FLUID

Connect the bleed bottle to the bleed screw of the front calliper and open it.

- Operate the bleeding unit and while the system is being purged, top up the reservoir with the new DOT 4 brake fluid; keep doing this until clean oil begins to flow out through the bleed tube.
- Leave the screw open until the fluid in the tube is clear and free of air bubbles.
- Close the bleed screw.

- Repeat this procedure on the remaining bleed valves of the system and close them all to the prescribed tightening torque.
- Remove the bleeding unit.
- Always fill the reservoir up to the reference "MAX" and refit the cap.
- Check the stroke and the sensitivity of both the lever and the brake pedal.
- If, after bleeding, the pedal or the lever stroke is too long, check that there are no leaks in the braking system and if everything is ok, continue bleeding operations using Navigator as described.
- Detach the bleed hoses and close the bleed screws again to the correct tightening torque.

Front brake pump



FRONT BRAKE PUMP

pos.	Description	Type	Quantity	Torque	Notes
1	Pipe union fastening brake pipe to pump	M10x1	1	25 Nm (18.44 lbf ft)	-
2	Fastener for front brake pump on handlebar	-	2	10 Nm (7.37 lbf ft)	-
3	TBEI screw fastening the brake tank to the plate	M6x20	1	10 Nm (7.37 lbf ft)	-
4	TBEI screw	M6x16	1	12 Nm (8.85 lbf ft)	-
5	Screw fastening the brake pipe to steering base	M6x25	1	10 Nm (7.37 lbf ft)	-

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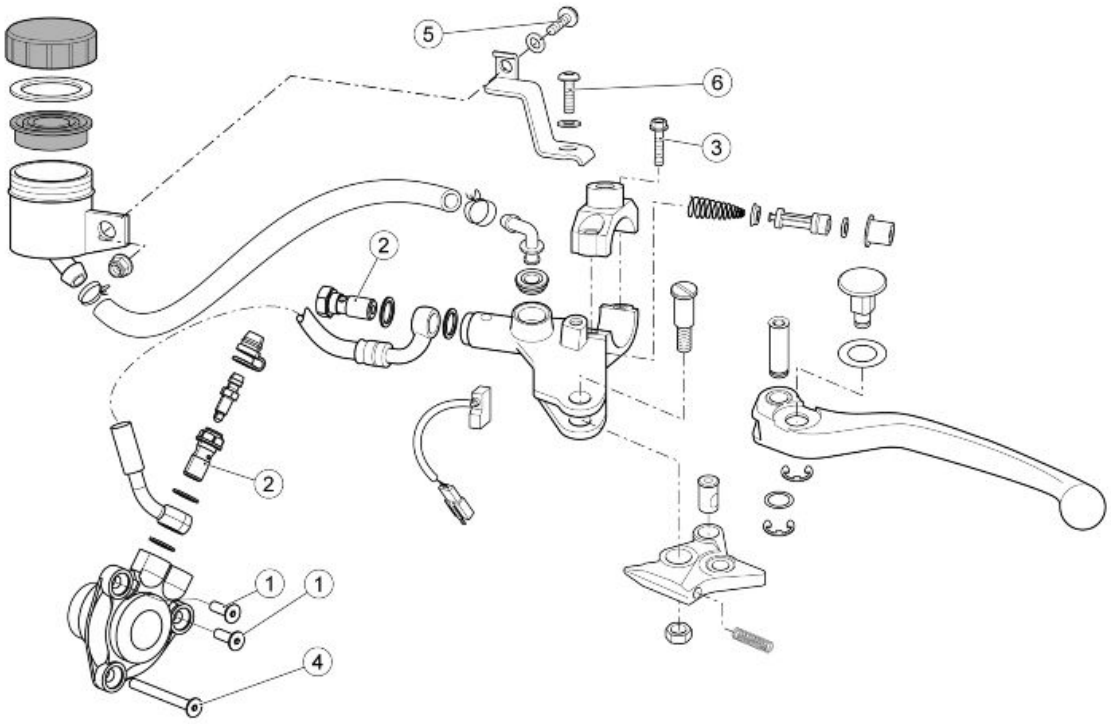

CLUTCH PUMP

pos.	Description	Type	Quantity	Torque	Notes
1	Clutch cylinder fastener	M6	2	10 Nm (7.37 lbf ft)	-
2	Union with breather and fixing pipe	M10x1	1+1	25 Nm (18.44 lbf ft)	-
3	Fastener for clutch pump on handle-bar	-	2	10 Nm (7.37 lbf ft)	-
4	Screw fastening clutch control mounting on flywheel side crankcase half	M6	1	10 Nm (7.37 lbf ft)	-
5	TBEI tank fixing screw	M5x10	1	6 Nm (4.42 lbf ft)	-
6	TBEI screw	M6x16	1	12 Nm (8.85 lbf ft)	-

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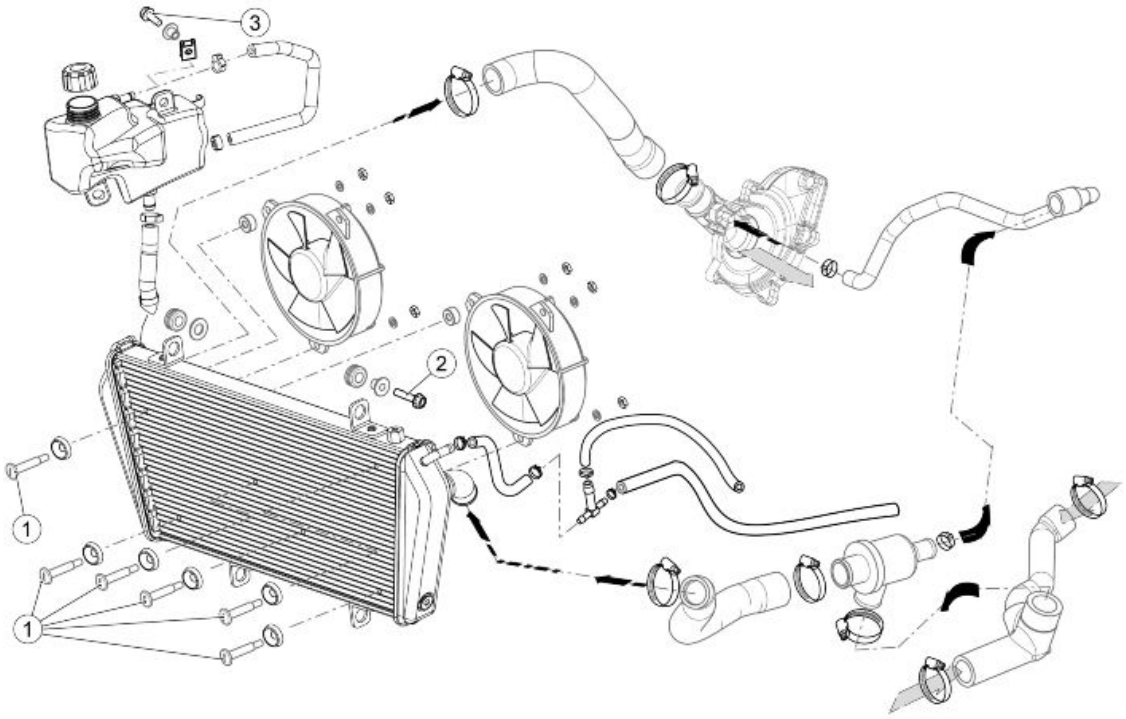
Circuit diagram

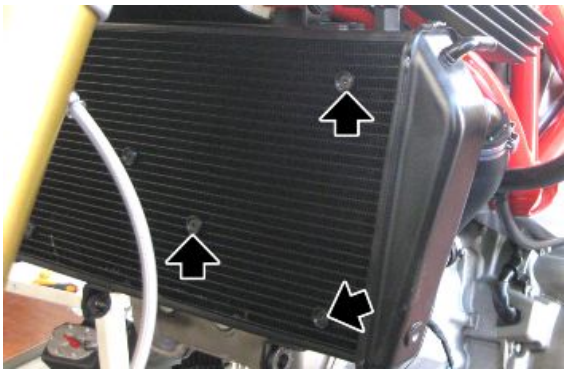


COOLING SYSTEM

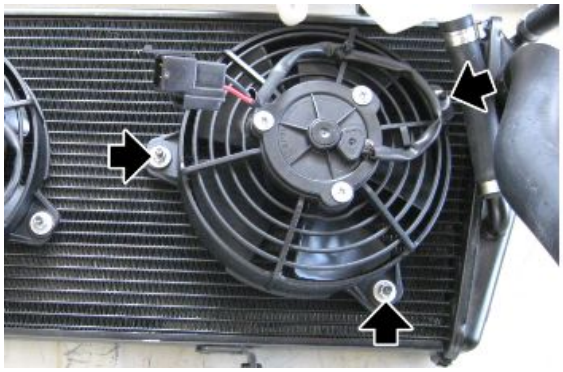
pos.	Description	Type	Quantity	Torque	Notes
1	Electric fan fastener screw	M4x45	6	3 Nm (2.21 lbf ft)	-
2	Flanged TE screw fastening left Radiator to trellis	M6x25	1	10 Nm (7.37 lbf ft)	-
3	Flanged TE screw fastening expansion tank	M6x20	1	10 Nm (7.37 lbf ft)	-

Electric fan

- Remove the radiator
- Tighten the three screws on radiator front side.



- Unscrew and remove the three nuts on the opposite side, collecting the washers.
- Remove the electric fan collecting the spacers.
- From the front side, collect the screws and dished washers.



See also

Removing the radiator

Coolant replacement

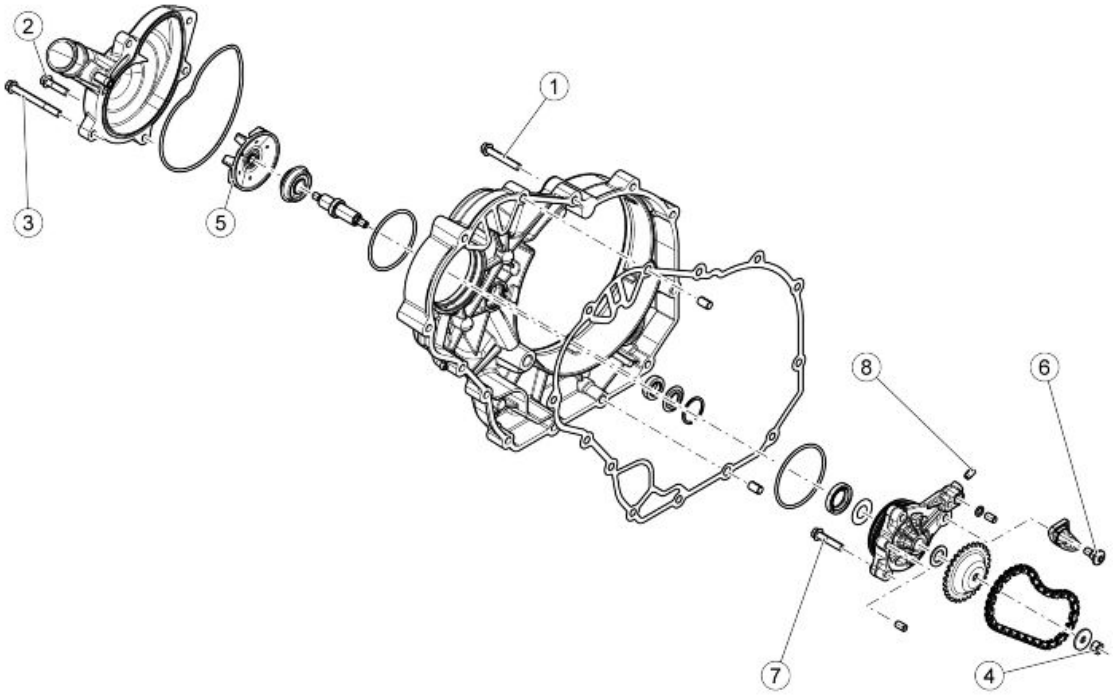
- Remove the right side fairing.

- Place a container of suitable capacity.
- Loosen the screw, move the clamp and slide off the sleeve.

- Remove the cap.

- Slide off the sleeve and empty the system completely.

Water pump



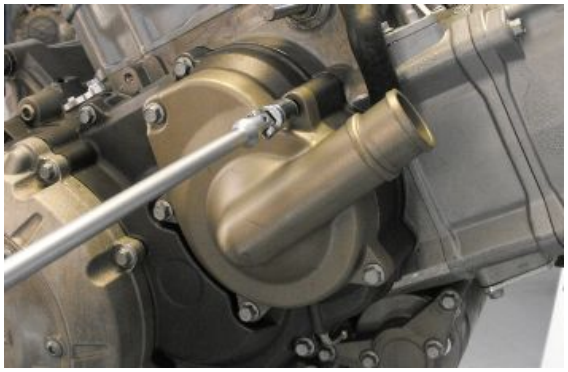
WATER PUMP

pos.	Description	Type	Quantity	Torque	Notes
1	Clutch side cover fastener screw	M6	11	13 Nm (9.59 lbf ft)	-
2	Fastener screw for Pump Cover / Clutch side cover	M6	3	13 Nm (9.59 lbf ft)	-
3	Screw fastening Pump Cover / Clutch Cover / clutch side crankcase half	M6	2	13 Nm (9.59 lbf ft)	-
4	Nut fastening water pump drive gear sprocket	M6	1	12 Nm (8.85 lbf ft)	-
5	Water pump rotor	-	1	4.50 Nm (3.32 lbf ft)	-
6	Screw fastening chain tensioner slider to water pump	M6	1	6 Nm (4.42 lbf ft)	-
7	Water pump support fixing screw	M6	3	12 Nm (8.85 lbf ft)	-
8	Water pump support plug	M6x10	1	6.5 Nm (4.79 lbf ft)	3M SCOTCH GRIP 2353

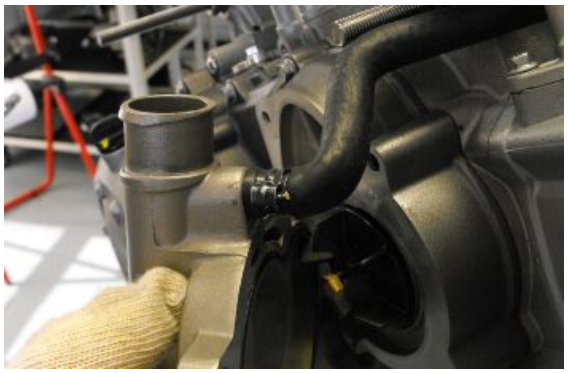
Removal

COVER REMOVAL

- Drain off the cooling circuit completely.
- Unscrew and remove the five water pump cover fixing screws.



- Release the clamp.



See also

Coolant replacement

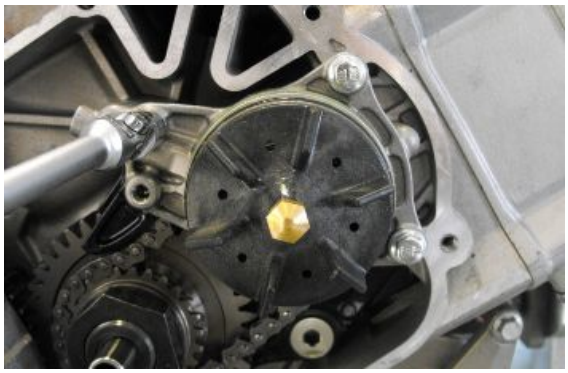
- Remove the water pump cover.

PUMP ROTOR REMOVAL

- Remove the water pump cover H20.
- Unscrew and remove the (anticlock-wise) screw
- Remove the rotor.

COMPLETE H2O PUMP REMOVAL

- Remove the clutch cover.
- Unscrew and remove the three H2O pump fixing screws.



- Remove the H2O pump and slide off the drive chain.

NOTE

REPLACE THE O-RINGS ON REASSEMBLY

Removing the radiator

- Remove the fuel tank.
- Slide out the connection pin with oil radiator.

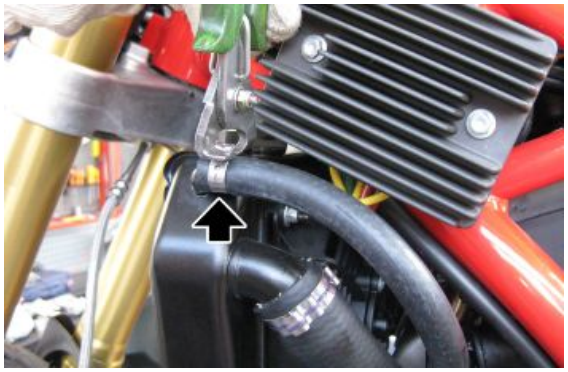
- Drain the fluid from the system.
- Slacken the clamp on the left side.
- Slide off the pipe from the thermostatic valve.

See also

Fuel tank

Coolant replacement

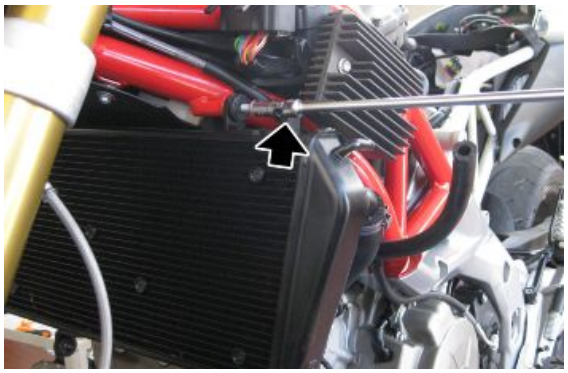
- Release the clamp retaining the breather pipe to radiator.



NOTE

UPON REFITTING, ALWAYS REPLACE WITH A NEW CLAMP.

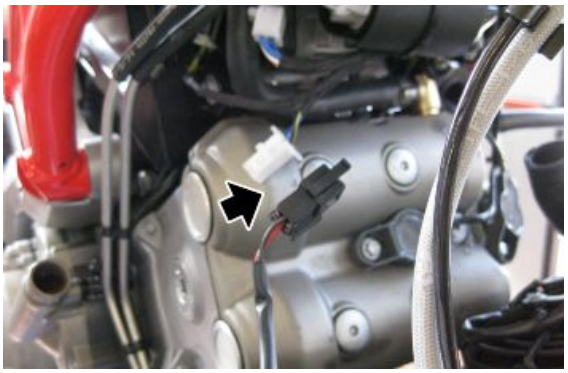
- Operating from the right side, unscrew and remove the radiator upper screw.



- Disconnect the left electric fan.

- Unscrew and remove the screw of the expansion tank.

- Lower radiator and disconnect the right electric fan.



- Remove the radiator with the expansion tank.

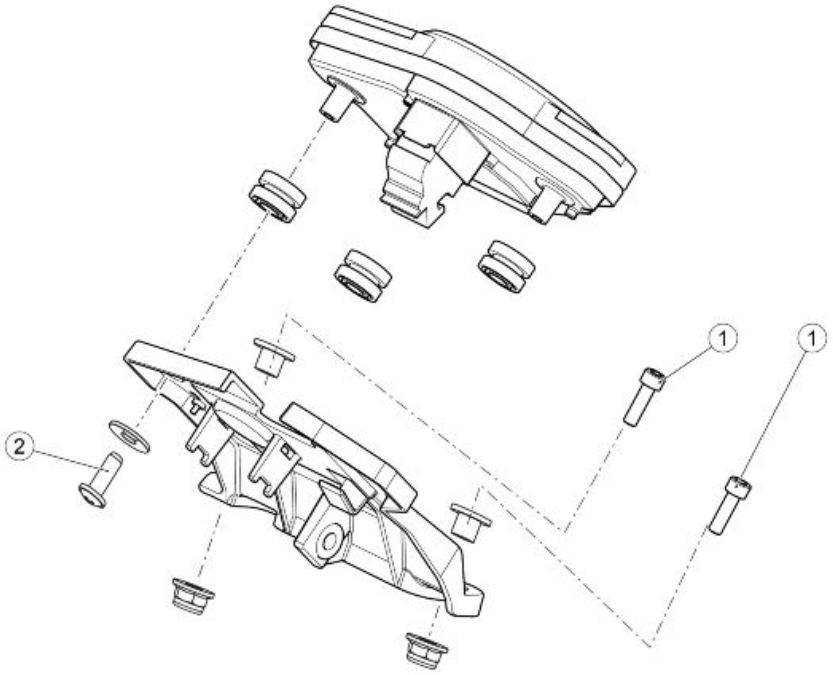
- To install the radiator, follow the operations explained above but in reverse order, and replace all the clamps removed.
- Restore the correct coolant level.

Thermostatic valve

Traditional circuit, three-way thermostatic valve:

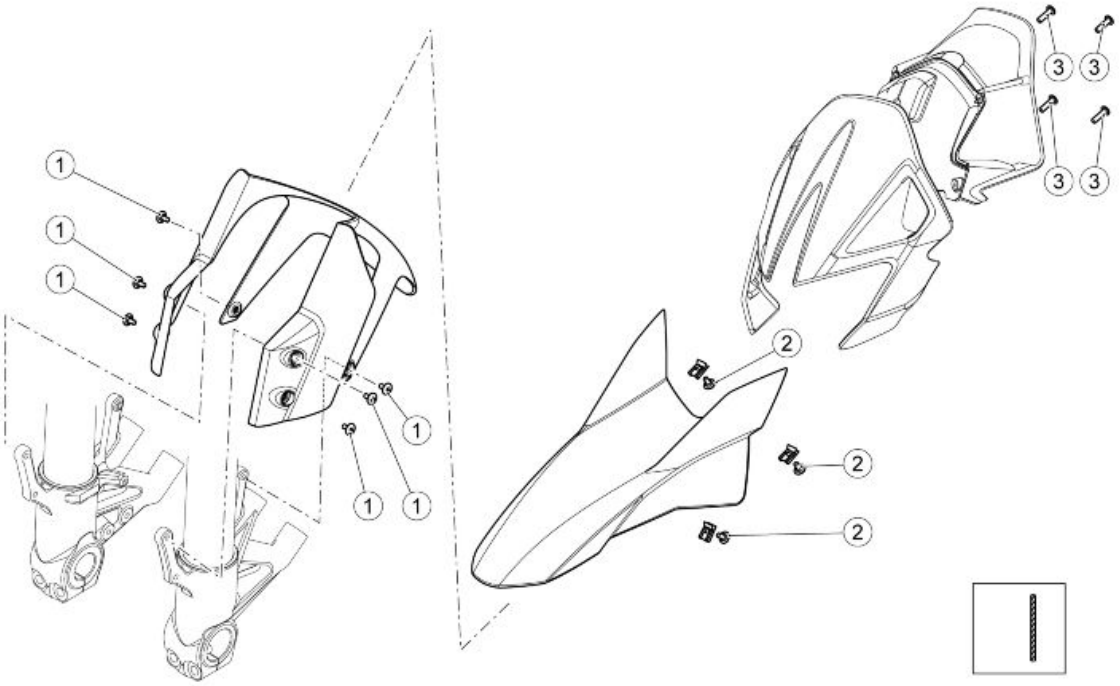
1. Hot water inlet from the heads.
2. Outlet towards the short circuit (direct to the pump).
3. Outlet towards the radiator

INDEX OF TOPICS



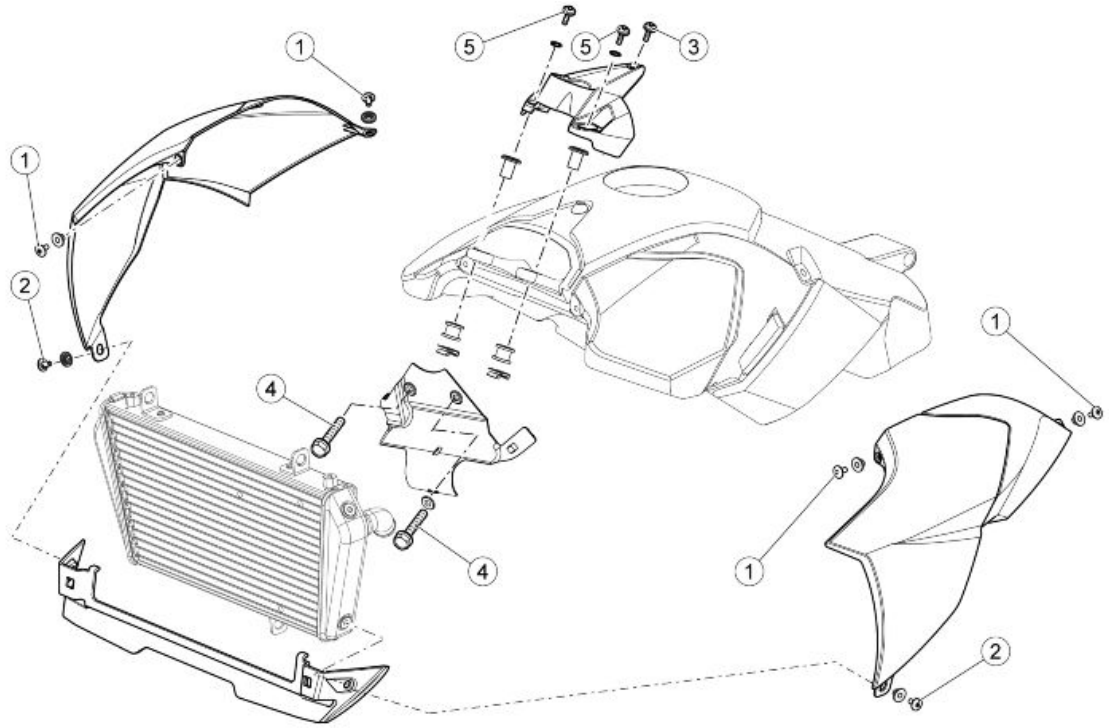
INSTRUMENT PANEL

pos.	Description	Type	Quantity	Torque	Notes
1	TCEI screw fastening instrument panel mounting to fork yoke	M6x20	2	10 Nm (7.37 lbf ft)	-
2	Screw fixing instrument panel to plate	5x14	3	2.6 Nm (1.92 lbf ft)	-



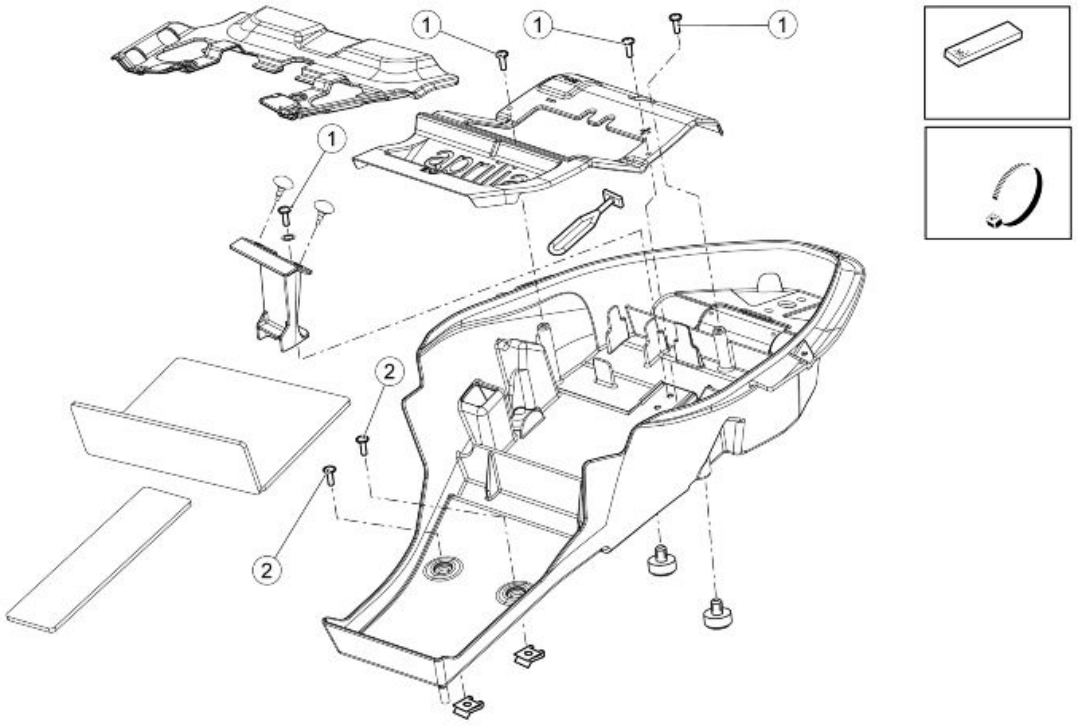
FRONT MUDGUARD

pos.	Description	Type	Quantity	Torque	Notes
1	TBEI screw fastening fork guard to calliper mounting bracket	M5x9	6	6 Nm (4.42 lbf ft)	-
2	TBEI screw fastening mudguard to stanchions	M5x12	3	6 Nm (4.42 lbf ft)	-
3	Top fairing baffle retaining self-tapping screw	-	4	1 Nm (0.74 lbf ft)	-



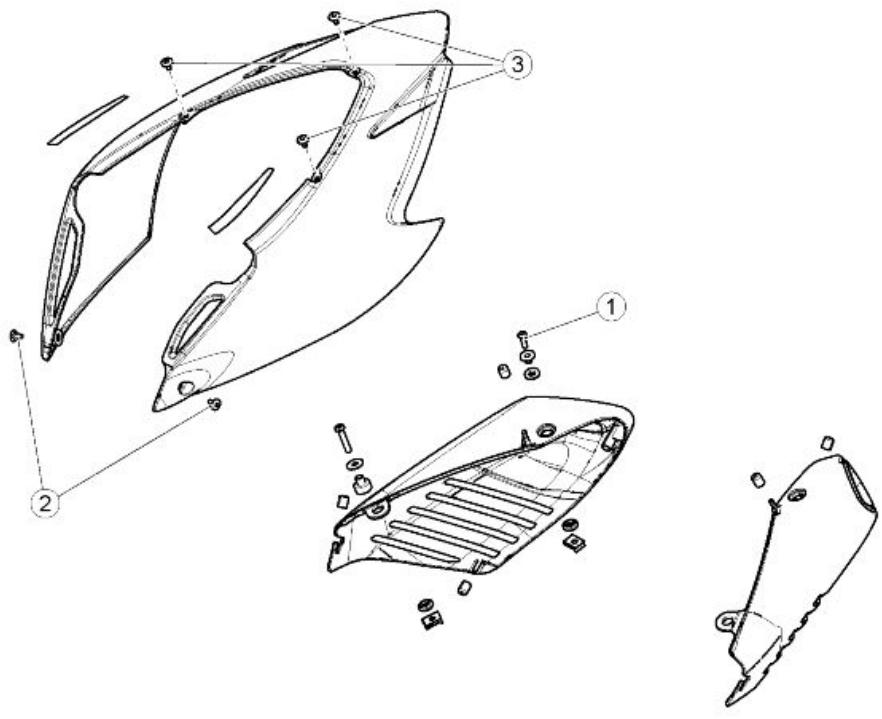
FRONT BODYWORK

pos.	Description	Type	Quantity	Torque	Notes
1	TBEI screw fastening front side panels to tank	M5x9	4	6 Nm (4.42 lbf ft)	-
2	TBEI screw fastening front side panels and duct to radiator	M6x16	2	10 Nm (7.37 lbf ft)	-
3	TBEI screw fastening ignition block cover to spacer	M5x9	1	6 Nm (4.42 lbf ft)	-
4	TEFL screw fastening tank protection	M6x12	2	10 Nm (7.37 lbf ft)	-
5	TEFL screw fastening tank to frame	M6x30	2	10 Nm (7.37 lbf ft)	-



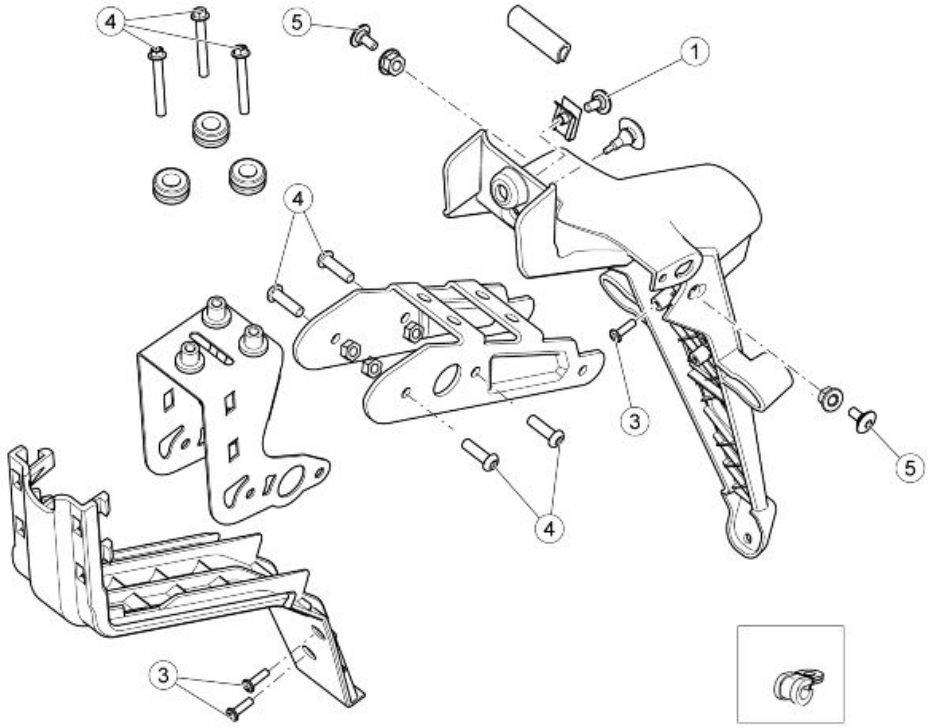
REAR BODYWORK 1

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fastening battery cover to compartment	5x14	3	2.6 Nm (1.92 lbf ft)	-
2	TBEI screw fastening battery compartment to saddle mounting	M5x9	2	6 Nm (4.42 lbf ft)	-



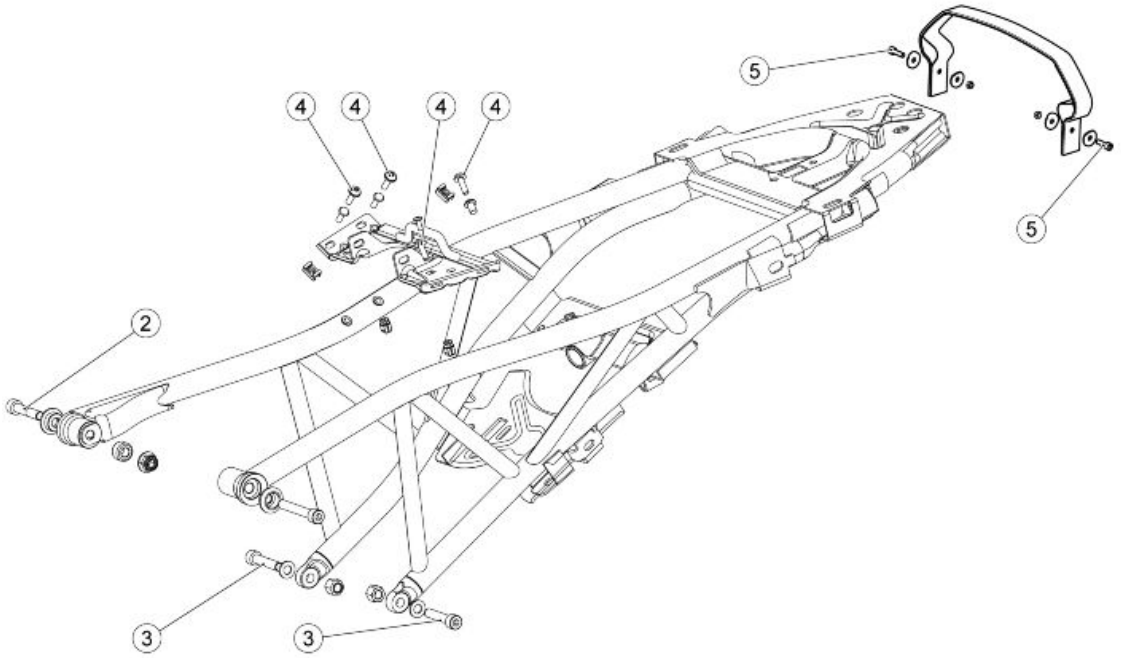
REAR BODYWORK 2

pos.	Description	Type	Quantity	Torque	Notes
1	TBEI screw fastening LH - RH covers to silencer	M6x20	4	10 Nm (7.37 lbf ft)	-
2	TBEI screw fastening tail fairing to saddle mounting	M5x9	2	6 Nm (4.42 lbf ft)	-
3	Screw fastening tail fairing to battery compartment	5x14	3	2.6 Nm (1.92 lbf ft)	-



REAR BODYWORK 3

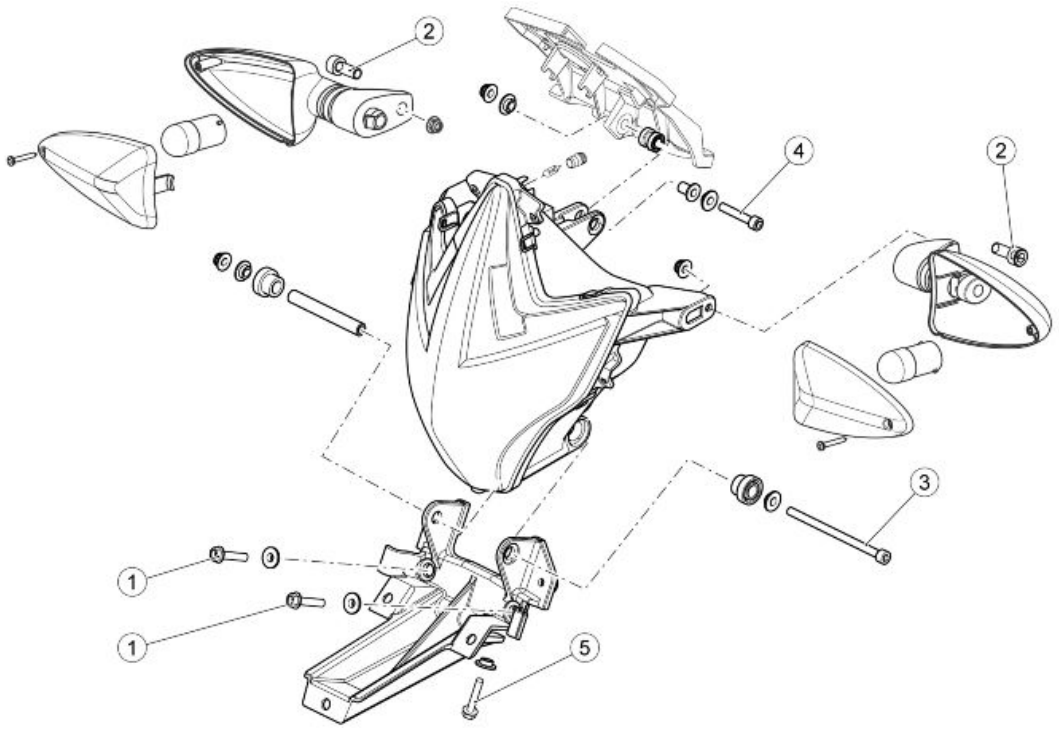
pos.	Description	Type	Quantity	Torque	Notes
1	TBEI screw fastening license plate mounting to mounting	M5x12	1	6 Nm (4.42 lbf ft)	-
2	Fastener for license plate mounting frame assembly to gusset plate - saddle lock	M6x12	4	10 Nm (7.37 lbf ft)	-
3	Screw fastening license plate mounting cover to license plate mounting	3.9x14	3	0.8 Nm (0.59 lbf ft)	-
4	TEFL screw fastening taillight to license plate mounting support	M6x45	3	10 Nm (7.37 lbf ft)	-
5	Flanged TBEI screw fastening license plate bracket to mounting	M5x12	2	6 Nm (4.42 lbf ft)	-



SADDLE MOUNTING

pos.	Description	Type	Quantity	Torque	Notes
1	Upper LH TCEI screw fastening saddle mounting to frame	M8x55	1	25 Nm (18.44 lbf ft)	-
2	Upper RH TCEI screw fastening saddle mounting to frame	M8x60	1	25 Nm (18.44 lbf ft)	-
3	Lower TCEI screw fastening Saddle mounting to frame	M8x40	2	25 Nm (18.44 lbf ft)	Loctite 243
4	TCEI tank cross member fixing screw	M5x16	4	6 Nm (4.42 lbf ft)	-
5	TBEI screw fastening saddle strap	M6x20	2	10 Nm (7.37 lbf ft)	-

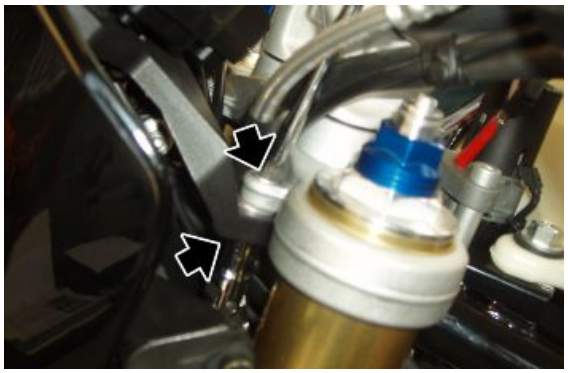
Headlight assy.



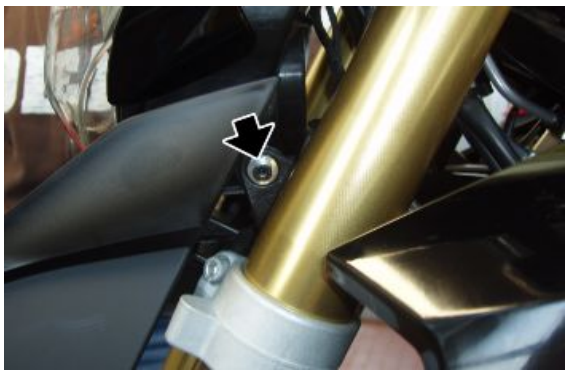
HEADLAMP

pos.	Description	Type	Quantity	Torque	Notes
1	TEFL screw fixing headlight mounting to steering base	M6x16	2	10 Nm (7.37 lbf ft)	-
2	Fastener for front turn indicators	M5x16	2	6 Nm (4.42 lbf ft)	-
3	TCEI screw fastening headlamp mounting to fork yoke	M6	1	10 Nm (7.37 lbf ft)	-
4	TCEI fixing screw of headlight to instrument panel support	M6x35	1	10 Nm (7.37 lbf ft)	-
5	TEFL screw fixing headlight mounting to steering base	M6x25	1	10 Nm (7.37 lbf ft)	-

- Operating from both sides, unscrew and remove the front frame fixing screw and collect the nut.

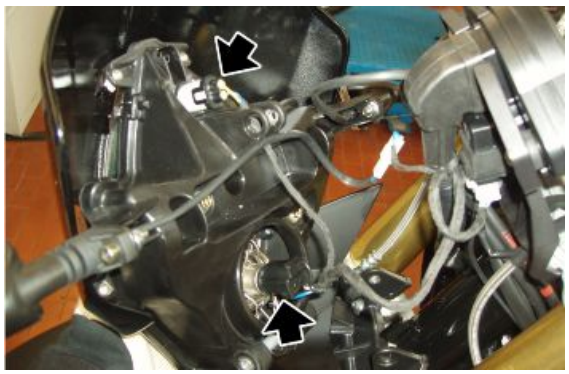


- Remove the instrument panel.
- Working from the vehicle left side, unscrew and remove the pin, and collect the nut and the washer from the right side.



- Disconnect the front turn indicator cable harness.

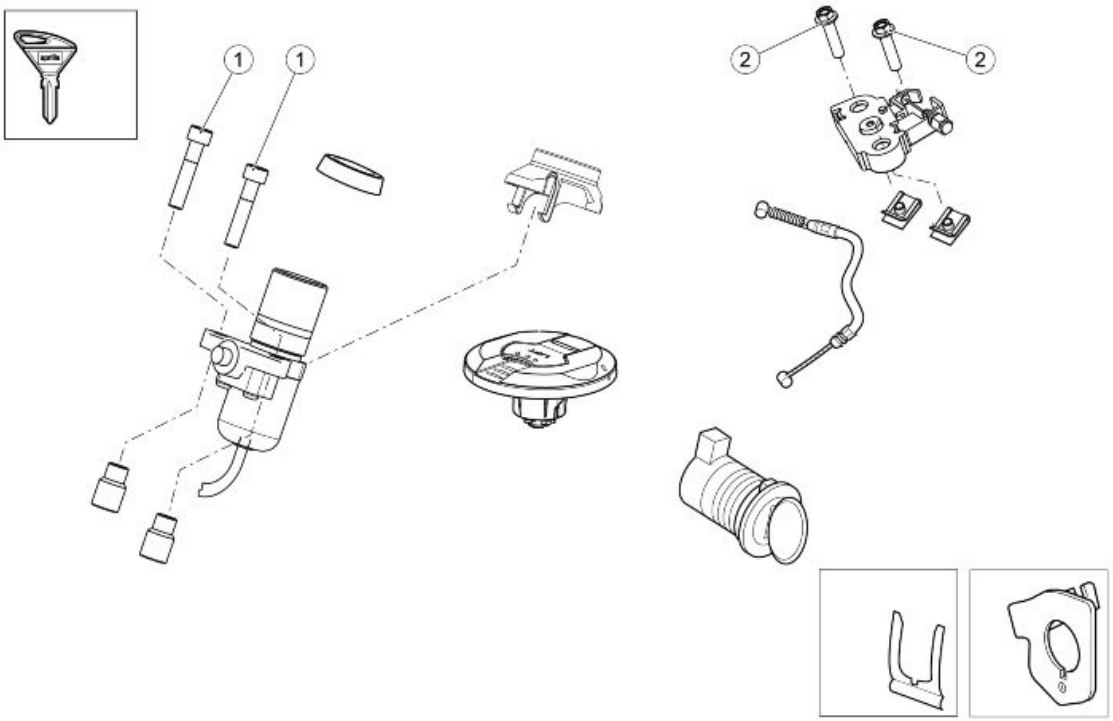
- Disconnect the headlamp connector and remove the headlamp assembly.



See also

Instrument cluster support

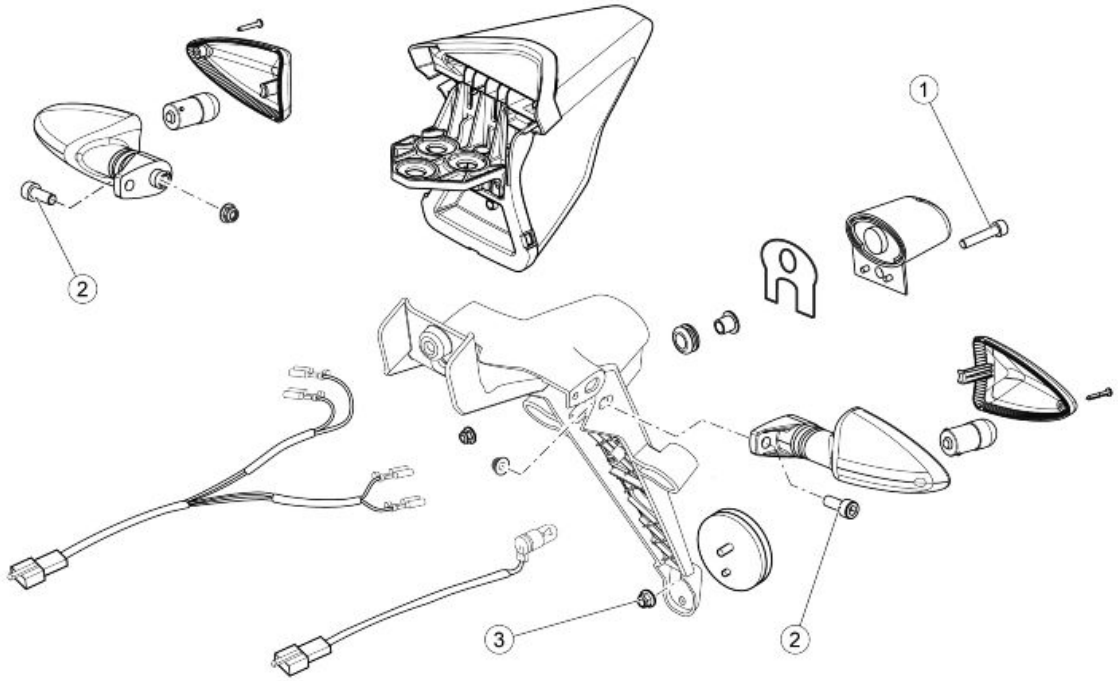
Disassembling the lock



LOCKS

pos.	Description	Type	Quantity	Torque	Notes
1	Switch fastener	shear head screw	1	Manual	-
2	TE screw fastening saddle lock / battery compartment to saddle mounting	M6x25	2	10 Nm (7.37 lbf ft)	To reuse: Loctite 243

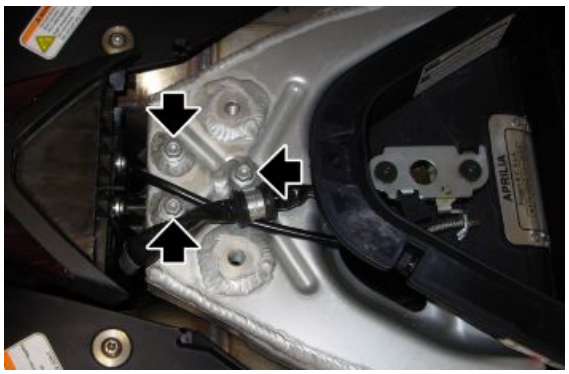
Taillight assy.



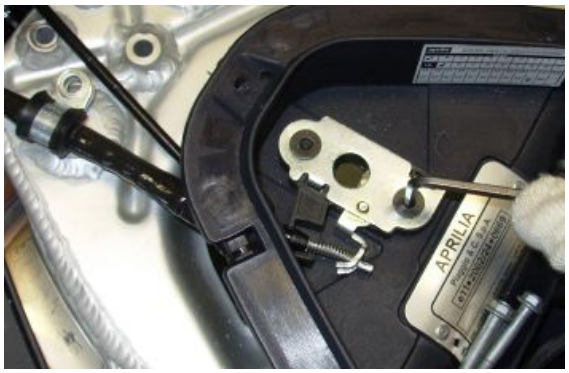
TAILLIGHT

pos.	Description	Type	Quantity	Torque	Notes
1	TCEI license plate light fixing screw	M5x25	1	6 Nm (4.42 lbf ft)	-
2	TCEI rear turn indicator fixing screw	M6	2	3 Nm (2.21 lbf ft)	-
3	Reflector fastener	M5	1	6 Nm (4.42 lbf ft)	-

- Remove the screws fastening the license plate support/taillight.



- Unscrew the saddle release block fastener screws.



See also

Tail guard

- Disconnect the saddle opening cable and slide it out of the cable grommet.

- Open the rear end of the license plate holder to be able to disconnect the tail-light connector.

See also

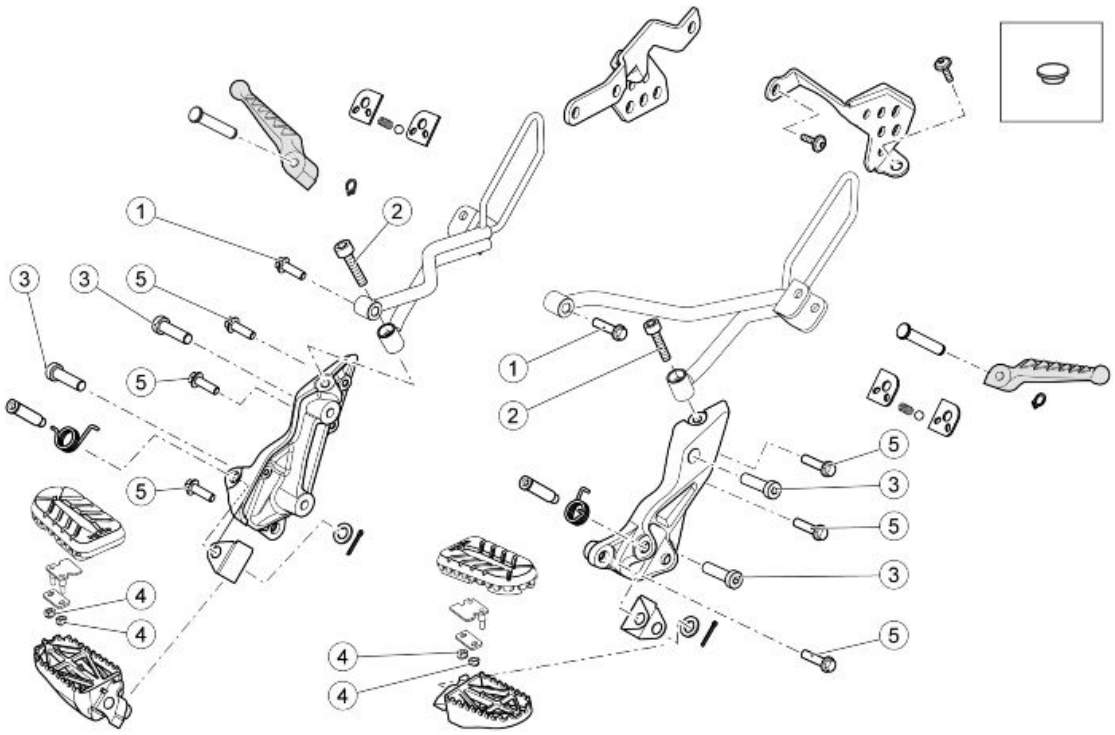
Tail guard

- Slide out the saddle opening cable from the taillight.
- Remove the taillight.

See also

Tail guard

Footrest

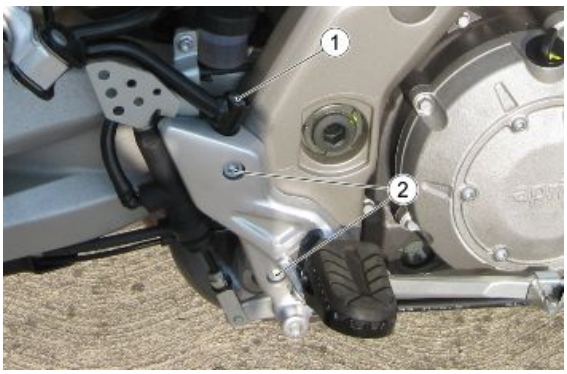


FOOTRESTS

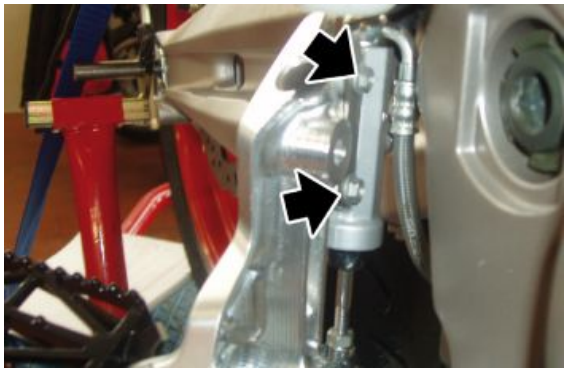
pos.	Description	Type	Quantity	Torque	Notes
1	Upper screw fastening passenger footrests to frame side panels	M8x35	2	25 Nm (18.44 lbf ft)	Loct. 243
2	Lower TCEI screw fastening passenger footrests to rider footrest mounting	M8x35	2	25 Nm (18.44 lbf ft)	Loct. 243
3	TCEI screw fastening rider footrest mounting to frame	M8x35	4	30 Nm (22.12 lbf ft)	Loct. 243
4	Footrest rubber fastener narrow nut	M5	4	6 Nm (4.42 lbf ft)	-
5	TCEI screw fastening rider footrest mounting	M6x16	6	10 Nm (7.37 lbf ft)	-

RIGHT FOOTREST

- Unscrew and remove the upper screw (1).
- Unscrew and remove the two outer screws (2).



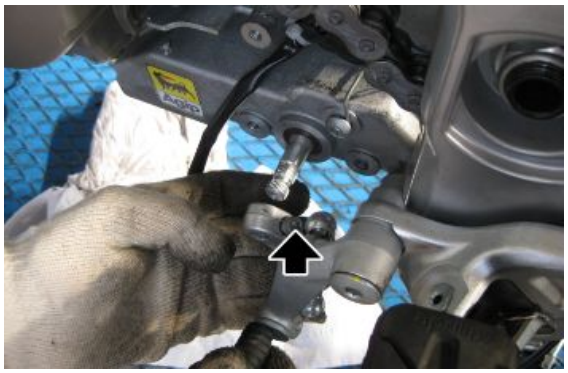
- Remove the right footrest
- Unscrew and remove both rear brake pump internal fixing screws.



LEFT FOOTREST

- Unscrew and remove the two external screws.

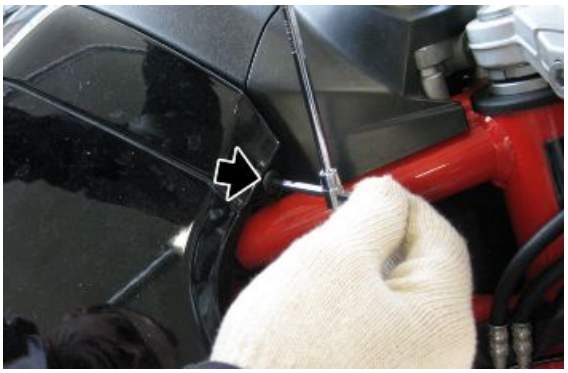
- Loosen the gear shift lever rod screw.
- Slide off the gear shift lever rod.
- Remove the left footrest.



Side body panels

- Remove the saddle.
- Unscrew and remove the rear screw.

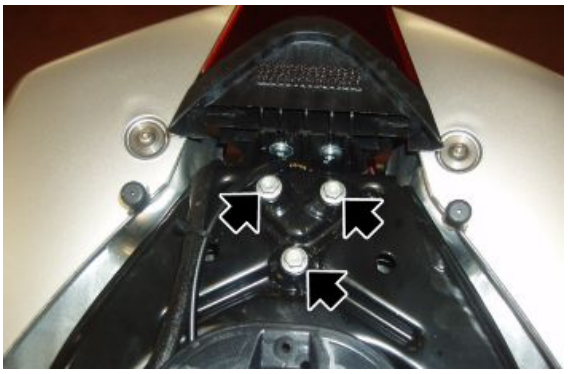
- Unscrew and remove the front screw.



- Unscrew and remove the water radiator screw.

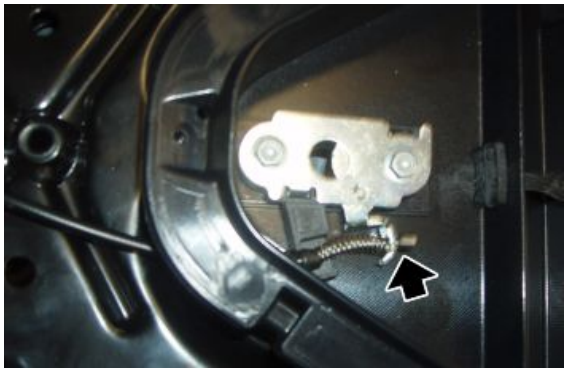
License plate holder

- Remove the saddle.
- Remove the tail fairing.
- Unscrew and remove the three screws.



- Disconnect the taillight connector.
- Release the taillight cable harness from the clamps.

- Disconnect the saddle unlocking cable.

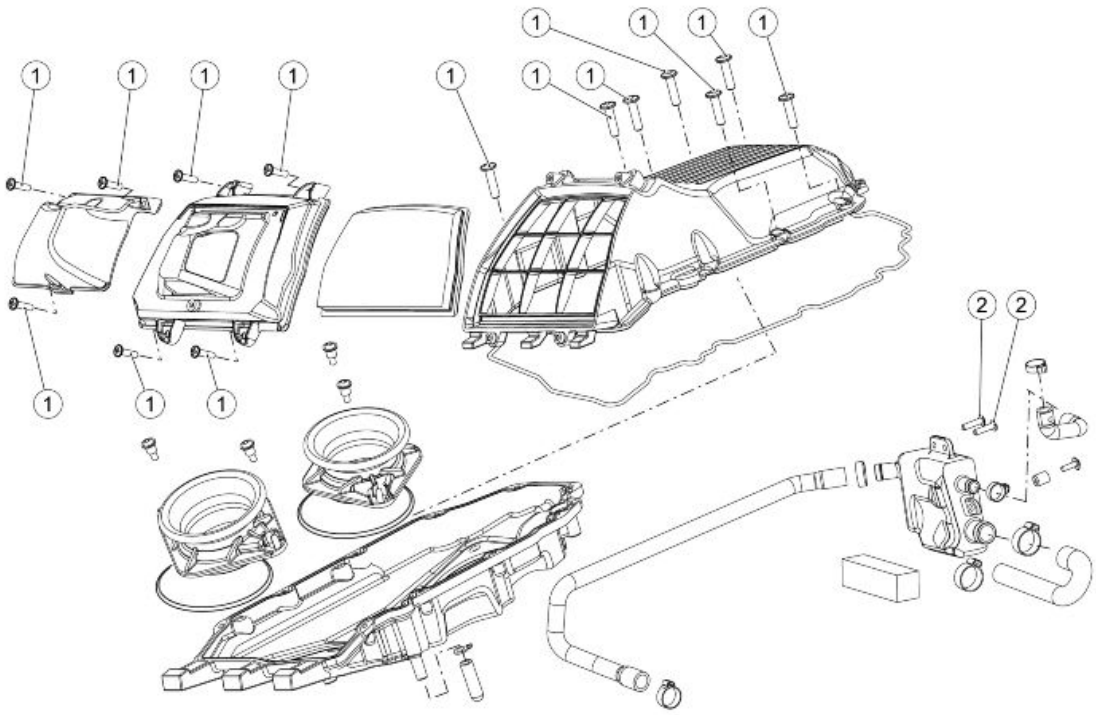


- Slide off the license plate holder towards the back.

See also

Seat
Tail guard

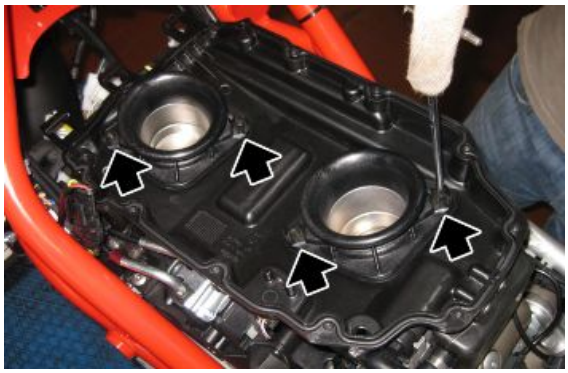
Air box



AIR FILTER BOX

pos.	Description	Type	Quantity	Torque	Notes
1	Cross head self-tapping screw fastening covers / filter box	M5x20	10	3 Nm (2.21 lbf ft)	-
2	Cross head self-tapping screw fastening blow-by tank	M5x20	2	3 Nm (2.21 lbf ft)	-

- Remove the air filter box cover.
- Remove the four screws.

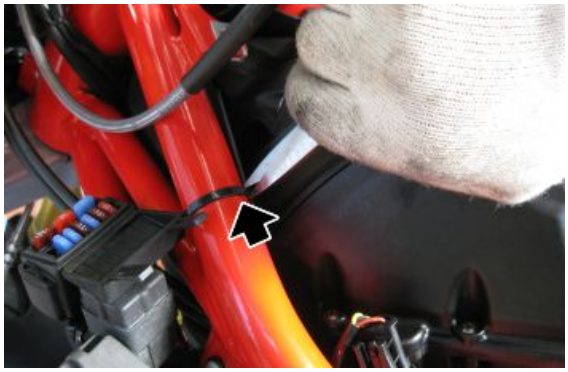


- Remove the two intake ducts.

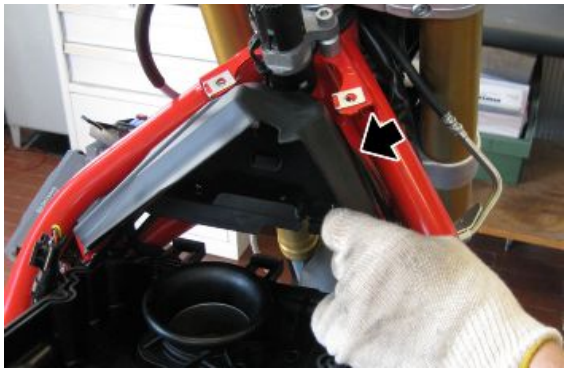
See also

Air filter

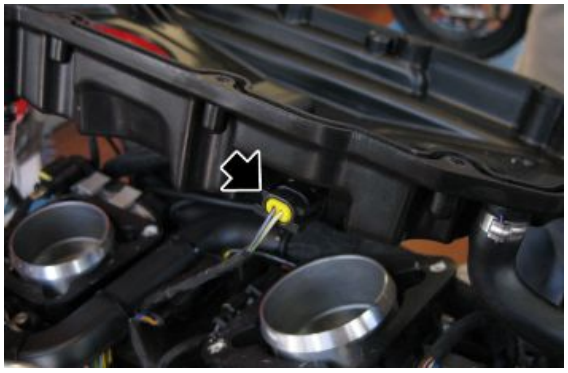
- Cut the ties.



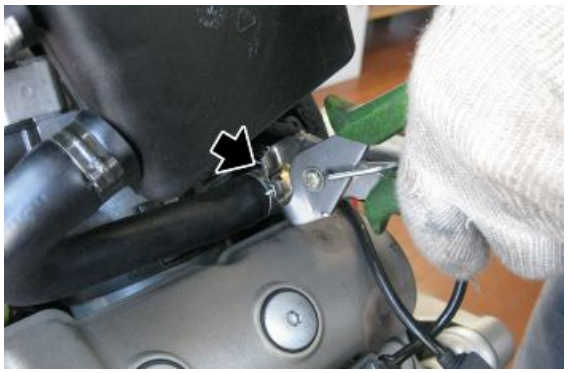
- Remove the headstock protection.



- Disconnect the air temperature sensor.

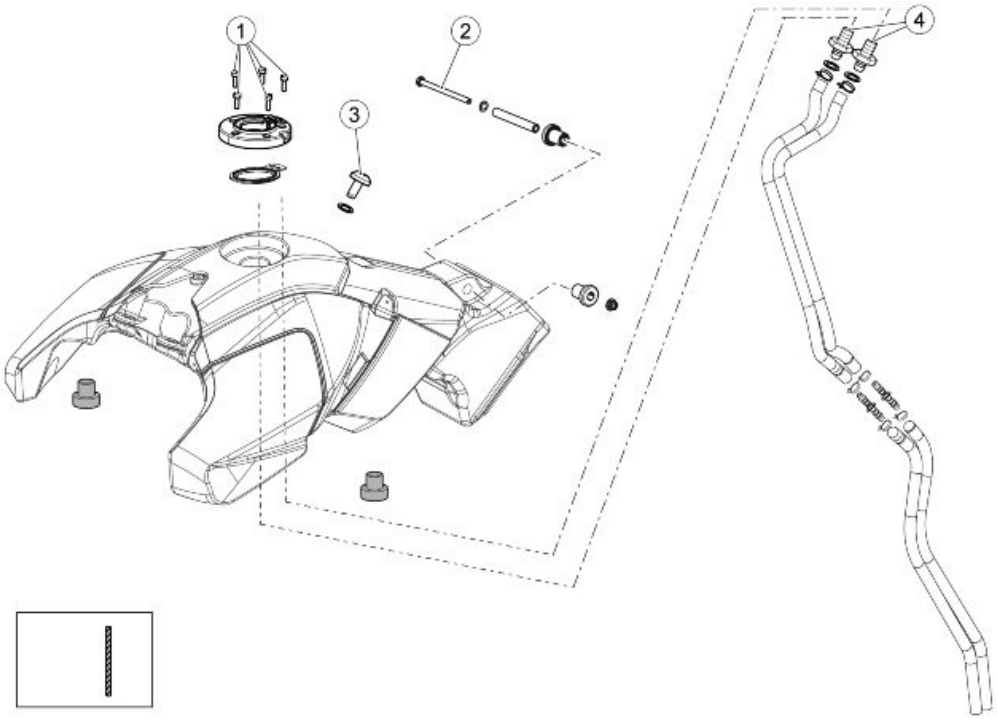


- Remove the two clamps from the blow-by system.



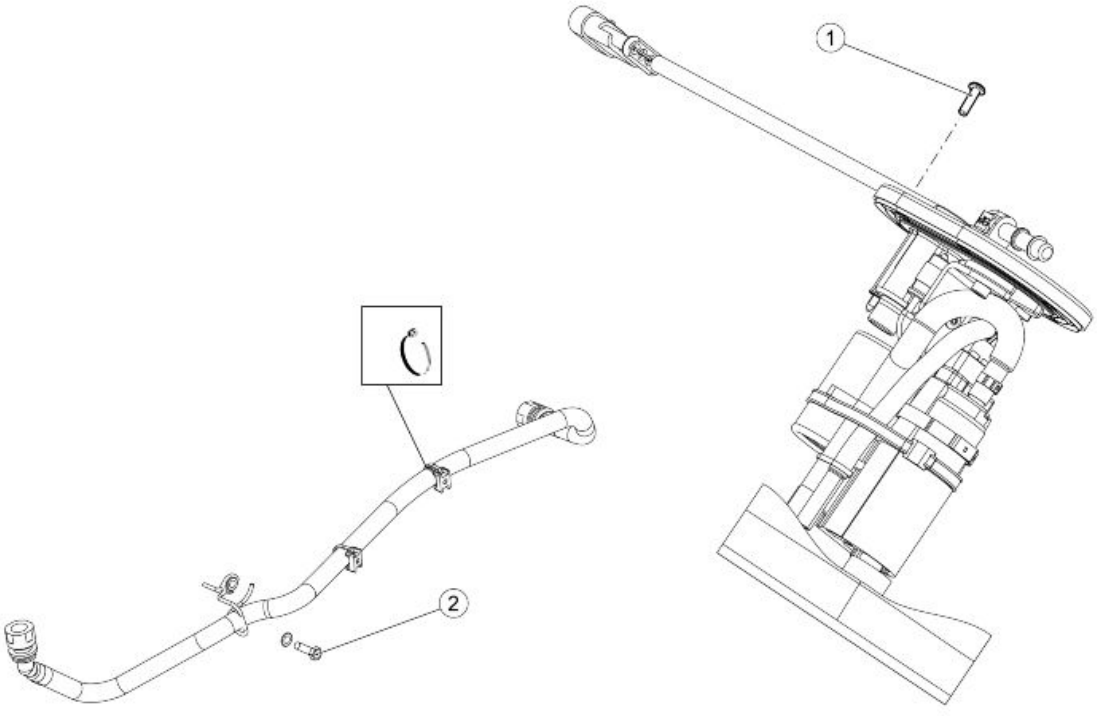
- Remove the air filter box.

Fuel tank



FUEL TANK

pos.	Description	Type	Quantity	Torque	Notes
1	TCEI screw fastening filler cap flange	M5x12	5	6 Nm (4.42 lbf ft)	-
2	Rear TE screw fastening tank	M6x90	1	10 Nm (7.37 lbf ft)	-
3	Saddle front retaining pin	-	1	3 Nm (2.21 lbf ft)	-
4	Hose tail fitting	-	2	6 Nm (4.42 lbf ft)	Loctite 518



FUEL PUMP

pos.	Description	Type	Quantity	Torque	Notes
1	TEFL screw fastening fuel pump	M5x16	6	3 Nm (2.21 lbf ft)	Loctite 518
2	TEFL screw fastening fuel pipe	M6x16	1	10 Nm (7.37 lbf ft)	-

- Remove both side fairings.
- Remove the rubber ring on the ignition switch assembly.

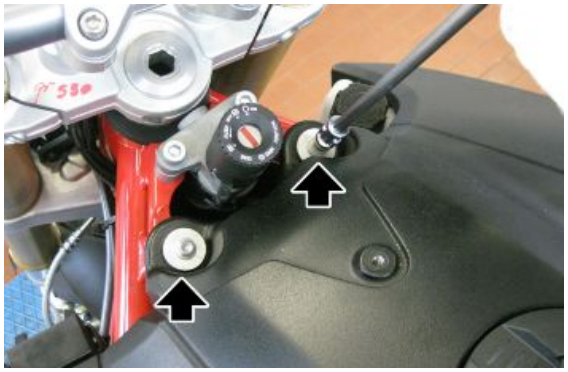
- Unscrew and remove the screw.

- Remove the cover of the ignition switch assembly.

See also

Side body panels

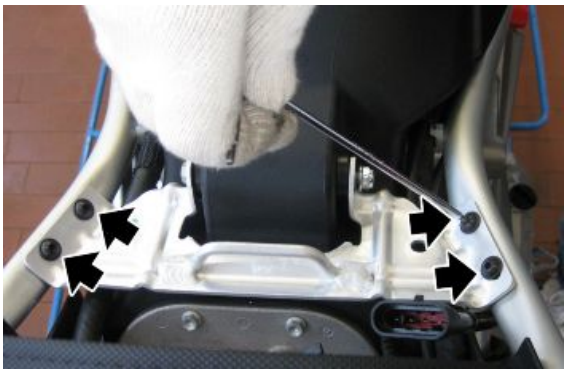
- Unscrew and remove the two front screws retaining the fuel tank, collecting the corresponding bushings.



- Disconnect the fuel pump connector.

- Disconnect the fuel pipe.

- Unscrew and remove the four lower support screws.



CAUTION

DURING FUEL TANK LIFTING AND REPOSITIONING, BE CAREFUL SO AS NOT TO CRUSH/ BEND OR SLIDE OFF TANK BREATHERS FROM THE CORRESPONDING TUBE-GUIDES

- Lift the fuel tank.

- Disconnect the two breather tubes on the right side.

- Remove the tank.

Instrument cluster support

- Working on both sides, loosen the nuts and screws and remove everything.

- Disconnect the connectors of arrow indicators, headlamps, ignition switch assembly and relay.

- Remove the three screws that fix the instrument panel.

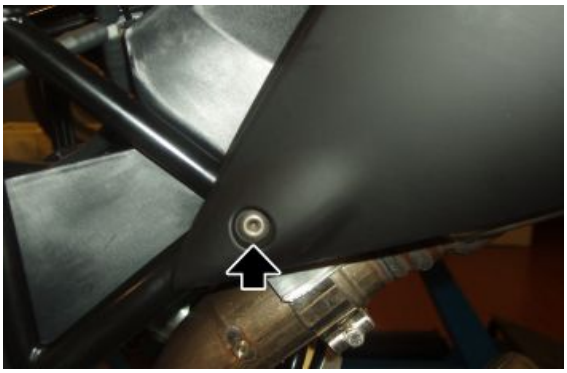
- Slide off the instrument panel from its support.

- Disconnect the instrument panel connector.

- Remove the instrument panel.

Tail guard

- Remove the saddle.
- Remove the rear passenger grab handle (if present).
- Working from both sides, unscrew and remove the external screw.



- Unscrew and remove the three screws.
- Slide off the tail fairing backwards.

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 BATTERY LIFE.

CAUTION

UPON INSTALLING THE BATTERY, ATTACH THE POSITIVE LEAD FIRST AND THEN THE NEGATIVE ONE, AND PERFORM THE REVERSE OPERATION UPON 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.
IN CASE OF CONTACT WITH YOUR EYES OR SKIN, WASH WITH ABUNDANT WATER FOR APPROX. 15 MIN. AND SEEK MEDICAL ATTENTION IMMEDIATELY.
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 THE RECOMMENDED CAPACITY. USING A FUSE OF UNSUITABLE RATING MAY SERIOUSLY DAMAGE THE 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

HAND GUARDS

- Remove the TCEI M6 X 50 screw which fastens the antivibration weight.

- Fit the rubber ring in the hand guards.

- Position and fasten the top screw ensuring to insert the bushing between the hand guard and the handlebar fastening point.

- Place the hand guards fastening them on the sides using TCEI M6 X 50 screw being careful when inserting the bushing.

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