2013 - 2015 DUCATI Hypermotard SP 821 Service Manual

- HYM.01 - General
- Symbols - Abbreviations - References
  - Product specifications
- Hazardous Products - Warnings
  - General maintenance instructions
  - General safety rules

- HYM.02 - Information about the model
- Model identification data
  - Identification data

- HYM.03 - Technical data
- Technical specifications
  - Lights/instrument panel
  - Injection system
  - Fuel system
  - Injection-ignition system
  - Charging system/generator
  - Hydraulic brakes
  - Rear suspension
  - Rear wheel
  - Front suspension
  - Front wheel
  - Cooling system
  - Gearbox
  - Cylinder/Piston
  - Crankshaft
  - Timing system/valves
  - Transmission
  - Colours
  - General
- Dimensions
  - Dimensions
- Fuel, lubricants and other fluids
  - Fuel, lubricants and other fluids
- Tightening torque values
  - Engine tightening torque values
  - Frame tightening torque values
- Service tools
  - Special diagnosis equipment
  - Special tools for the frame
  - Specific tools for the engine

- HYM.04 - Maintenance operations
- Vehicle pre-delivery
  - Vehicle pre-delivery
- Scheduled maintenance chart
  - Operations to be carried out by the customer
  - Operations to be carried out by the dealer
- Maintenance operations
  - Adjusting the rear shock absorber
  - Adjusting the front fork
  - Adjusting the position of the gear change and rear brake pedals

Adjusting the clutch lever and front brake lever
- Checking the rear brake pad wear and changing the brake pads
- Checking the front brake pad wear and changing the brake pads
- Adjusting the chain tension
- Adjusting the steering head bearing play
- Adjusting the clutch control cable
- Changing the fluid in the rear brake system
- Changing the fluid in the front brake system
- Changing the coolant
- Checking the coolant level
- Changing and cleaning the air filters
- Spark plugs replacement
- Changing the timing belts
- Checking valve clearance
- Changing the engine oil and filter cartridge
- Check engine oil level

- HYM.05 - Fairings
- Rear-view mirrors
  - Refitting the rear-view mirrors
  - Removing the rear-view mirrors
- Headlight fairing
  - Refitting the headlight fairing
  - Removing the headlight fairing
- Fairings
  - Refitting the fairings
  - Removing the fairings
- Seat - side panels
  - Refitting the rear side panels
  - Removing the rear side panels
  - Refitting the seat
  - Removing the seat
- Front and rear mudguard
  - Refitting the rear mudguard
  - Removing the rear mudguard
  - Refitting the front mudguard
  - Removing the front mudguard

- HYM.06 - Electric system and engine management
- Wiring diagram
  - Table Z
  - Table Y
  - Table X
  - Table W
  - Table V
  - Table U
  - Table T
  - Table S
  - Table R
  - Table Q
  - Table P
  - Table O
  - Table N
  - Table M
  - Table L
  - Table K
  - Table J
  - Table I

    - Table H
    - Table G
    - Table F
    - Table E
    - Table D
    - Table C
    - Table B
    - Table A
    - Routing of wiring on frame
    - Key to fuse box
    - Wiring diagram colour codes
    - Key to wiring diagram
- Battery charging system
    - Rectifier-regulator
    - Generator
    - Battery
    - Topping up the electrolyte
    - Recharging the battery
    - Checking the battery charging system
- Electric starting
    - Solenoid starter
    - Starter motor
    - Electric starting system
- Lights
    - Headlight aim
    - Changing bulbs
- Instruments
    - Other functions
    - Setting the Unit of Measurement (UNITS)
    - Light control
    - Operation
    - PIN CODE entering function for overriding purposes
    - Keys
    - Immobilizer code (PIN CODE)
    - Engine rpm digital indication (RPM)
    - Battery voltage function (BATTERY)
    - Clock setting function (CLOCK)
    - Lap time function (LAP): stored LAP display
    - LAP time function: LAP recording
    - LAP time function: LAP enabling/disabling
    - Instrument panel backlighting regulation function (B.LIGHT)
    - ALL DEFAULT (Restoring the default parameters of all Riding Modes)
    - ENGINE set-up
    - ABS set-up
    - DTC set-up
    - Riding Mode customisation (R.MODE)
    - Error displaying (ERRORS)
    - Riding Mode SET-UP function (riding mode change)
    - Enabled / disabled LAP function indication
    - Active / not active ERRORS indication
    - SERVICE function - Maintenance interventions
    - SET UP - Riding Style set indication
    - Menu 2 functions: Clock
    - Menu 2 functions: Air temperature (AIR)
    - Menu 2 functions: Coolant temperature
    - Menu 2 functions
    - Menu 1 functions: Trip time indicator (TIME TRIP)
    - Menu 1 functions: Average speed indicator (SPEED AVG)

    - Menu 1 functions: Instantaneous fuel consumption indicator (CONS.)
    - Menu 1 functions: Average fuel consumption indicator (CONS. AVG)
    - Menu 1 functions: Partial fuel reserve counter (TRIP FUEL)
    - Menu 1 functions: Trip meter (TRIP 2)
    - Menu 1 functions: Trip meter (TRIP 1)
    - Menu 1 functions: Odometer (TOT)
    - Menu 1 functions
    - Engine rpm indicator (RPM)
    - Vehicle speed indicator
    - LCD - How to set/display parameters
    - LCD unit functions
    - Function push-buttons
    - Technological Dictionary
    - Display settings and functions

- HYM.07 - Chassis
- Front wheel
    - Refitting the front wheel
    - Overhauling the front wheel
    - Removing the front wheel
- Rear wheel
    - Refitting the rear wheel
    - Overhauling the rear wheel
    - Removing the rear wheel
- Front brake control
    - Refitting the front brake system
    - Refitting the brake discs
    - Overhauling the front brake components
    - Removing the brake discs
    - Removing the front brake system
    - Maintenance operations
    - Refitting the front brake master cylinder
    - Removing the front brake master cylinder
- Rear brake
    - Refitting the rear brake calliper
    - Removing the rear brake disc
    - Removing the rear brake calliper
    - Refitting the rear brake control
    - Disassembling the rear brake control
    - Removing the rear brake control
- ABS information
    - Disabling the ABS
    - ABS operating information
    - Operating principle
- ABS components
    - Wiring/hose routing
    - Refitting the ABS control unit
    - Removing the ABS control unit
    - Changing the rear phonic wheel sensor
    - Changing the front phonic wheel sensor
- ABS component maintenance
    - Bleeding the ABS hydraulic system
    - Adjusting the phonic wheel sensor AIR-GAP
- Handlebar unit: hand guard - throttle control
    - Refitting the throttle twistgrip
    - Removing the throttle twistgrip
    - Refitting the handlebar
    - Removing the handlebar

    - Refitting the hand guards
    - Removing the hand guards
- Handlebar unit: clutch control
    - Refitting the clutch unit
    - Disassembling the clutch unit
- Handlebar unit: ignition switch
    - Refitting the ignition switch
    - Removing the ignition switch
- Gearchange mechanism
    - Refitting the gearchange mechanism
    - Disassembling the gearchange control
    - Removing the gearchange mechanism
- Fork - steering head: front fork
    - Refitting the front forks
    - Overhauling the front forks
    - Removal of the front forks
- Fork - steering head: steering
    - Refitting the steering tube components
    - Removing the steering head components
    - Steering angle adjustment
    - Adjusting the steering head bearing clearance
- Rear shock absorber unit
    - Refitting the rear suspension
    - Overhauling the rear shock absorber
    - Removing the rear shock absorber
    - Rear suspension system
- Swinging arm
    - Refitting the rear swinging arm
    - Overhauling the rear swinging arm
    - Inspecting the swinging arm shaft
    - Removing the swinging arm
    - Refitting the rear wheel eccentric hub and rear wheel shaft
    - Removing the rear wheel eccentric hub and the rear wheel shaft
- Final drive
    - Lubricating the chain
    - Washing the chain
    - Refitting the rear sprocket
    - Replacing the rear sprocket
    - Refitting the front sprocket
    - Removing the front sprocket
    - Inspecting the final drive
- Footpeg brackets
    - Refitting the footpegs
    - Removing the footpegs
- Stands
    - Refitting the side stand
    - Removing the side stand
- Frame inspection
    - Refitting the rear frame
    - Reassembling structural components and frame
    - Checking the frame
    - Removing the rear frame
    - Disassembling structural components and frame
- Tail light - number plate holder
    - Refitting the tail light
    - Removing the tail light
    - Refitting the number plate holder
    - Removing the number plate holder

- Electrical component tray
  - Refitting the electrical component tray
  - Removing the electrical component tray

- HYM.08 - Fuel system / Exhaust system
- Fuel tank
  - Refitting the fuel tank
  - Refitting the fuel tank flange
  - Removing the tank flange
  - Removing the fuel tank
- Airbox - Throttle Body
  - Refitting the throttle body
  - Removing the throttle body
  - Refitting the airbox
  - Removing the airbox
- Air intake
  - Refitting the secondary air system
  - Removing the secondary air system
  - Refitting the air filters
  - Removing the air filters
- Exhaust system
  - Refitting the silencer
  - Refitting the exhaust system
  - Removing the exhaust system
  - Removing the silencer
- Canister filter
  - Refitting the Canister filter
  - Removing the Canister filter
  - Canister filter system

- HYM.09 - Engine
- Removing-refitting the engine assembly
  - Refitting the engine
  - Removing the engine
- Lubrication system: oil pump
  - Refitting the oil pump
  - Reassembling the oil pump
  - Disassembling the oil pump
  - Removing the oil pump
- Cooling system: water tank
  - Refitting the water tank
  - Removing the water tank
- Cooling system: water radiator
  - Refitting the cooling system hoses and unions
  - Removing the cooling system hoses and unions
  - Refitting the water radiator
  - Replacing the cooling fan
  - Removing the water radiator
- Cooling system: water pump
  - Refitting the water pump
  - Removing the water pump
- Cylinder head assembly: checks and adjustments
  - Checking the engine timing
  - Checking valve lift
  - Checking and adjusting the valve clearance
- Cylinder head assembly: timing system
  - Refitting the timing layshaft pulley
  - Removing the timing layshaft pulleys

    - Reassembling the timing pulleys
    - Disassembling the camshaft pulleys
    - Refitting the idler and tensioner pulley mounting pins
    - Removing the tensioner pins
    - Refitting the cylinder heads pulleys/idler pulleys
    - Removing the cylinder head pulley/idler pulley
    - Refitting the timing belts
    - Removing the tensioner pulley/timing belt
    - Refitting the timing outer covers
    - Removing the timing belt covers
- Cylinder head assembly: camshafts
    - Refitting the intake manifold and water union
    - Removing the intake manifold and water union
    - Refitting the camshafts
    - Checking the camshafts and supports
    - Removing the camshafts
- Cylinder head assemblies: valves - rocker arms
    - Refitting the cylinder head assemblies
    - Reassembling the cylinder head
    - Overhauling the cylinder head components
    - Removing the valve rocker arms
    - Removing the valves
    - Removing the cylinder heads
- Cylinder/piston assembly
    - Refitting the cylinder/piston assembly
    - Overhauling the cylinder/piston components
    - Removing the cylinder/piston assembly
- Clutch assembly: clutch
    - Reassembling the clutch
    - Checking and overhauling the components
    - Removing the clutch
    - Description of the clutch assembly
- Clutch assembly: clutch cover
    - Reassembling the clutch cover
    - Disassembling the clutch cover
    - Refitting the clutch cover
    - Removing the clutch cover
- Clutch assembly: primary drive gears
    - Refitting the primary drive gears and checking backlash
    - Removing the primary drive gears
- Gearbox assembly: gearchange mechanism
    - Refitting the gear interlock plunger and ratchet
    - Disassembling gear interlock plunger and ratchet
    - Refitting the gearchange mechanism
    - Removing the gearchange mechanism
- Gearbox assembly: gearbox shafts
    - Reassembling the gearbox assembly
    - Reassembling the gearbox shafts
    - Inspecting the fork selector drum
    - Inspecting the gear selector forks
    - Overhauling the gearbox
    - Disassembling the gearbox shafts
    - Removing the gearbox assembly
- Flywheel - generator
    - Overhauling the flywheel-generator assembly
    - Refitting the flywheel-generator assembly
    - Removing the flywheel - generator assembly
    - Refitting the generator cover

    - Disassembling the generator cover
    - Removing the generator cover
- Crankcase assembly: outer components
    - Refitting the starter motor
    - Removing the starter motor
    - Refitting the starter motor gear
    - Removing the starter motor idler gear
    - Refitting the timing gears
    - Removing the timing gears
    - Refitting the external components
    - Removing outer components
- Crankcase assembly: crankcase halves
    - Closing the crankcase halves
    - Shimming the shafts
    - Reassembling the crankcase halves
    - Main bearing shells
    - Overhauling the crankcase halves
    - Separating the crankcase halves
- Crankcase assembly: connecting rods
    - Refitting the connecting rod assembly
    - Reassembling the connecting rod assembly
    - Overhauling the connecting rods
    - Disassembling the connecting rod assembly
    - Removing the connecting rod assembly

Symbols - Abbreviations - References

To allow quick and easy consultation, this manual uses graphic symbols to highlight situations in which maximum care is required, as well as practical advice or information. Pay attention to the meaning of the symbols since they serve to avoid repeating technical concepts or safety warnings throughout the text. The symbols should therefore be seen as real "reminders". Please refer to this page whenever in doubt as to their meaning.

The terms right-hand and left-hand refer to the motorcycle viewed from the riding position.

Warning
Failure to comply with these instructions may put you at risk, and could lead to severe injury or even death.

Important
Failure to follow the instructions in text marked with this symbol can lead to serious damage to the motorcycle and its components.

Note
This symbol indicates additional useful information for the current operation.

Product specifications

Symbols in the diagram show the type of threadlocker, sealant or lubricant to be used at the points indicated. The table below shows the symbols used and the specifications of the various products.

Symbol		Specifications	Recommended product
		Engine oil (for characteristics see Fuel, lubricants and other fluids).	SHELL Advance 4T Ultra
		DOT 4 special hydraulic brake fluid.	SHELL Advance Brake DOT 4
		SAE 80-90 gear oil or special products for chains with O rings.	SHELL Advance Chain or Advance Teflon Chain
		Anti-freeze (nitride, amine and phosphate free) 30 to 40% + water.	SHELL Advance coolant or Glycoshell
	GREASE A	Multipurpose, medium fibre, lithium grease.	SHELL Alvania R3
	GREASE B	Molybdenum disulphide grease, high mechanical stress and high temperature resistant.	SHELL Retinax HDX2
	GREASE C	Bearing/joint grease for parts subject to prolonged mechanical stress. Temperature range: -10 to 110 °C.	SHELL Retinax LX2

	GREASE D	Protective grease, with anti-corrosive and waterproofing properties.	SHELL Retinax HD2
	GREASE E	Grease	PANKL - PLB 05
	GREASE F	Grease	OPTIMOL - PASTE WHITE T
	GREASE G	Grease	PANKL - PLB07
	GREASE H	Grease	KLÜBER STABURAGS NBU 30 PTM
	GREASE I	Copper grease	CUPRUM 320
	LOCK 1	Low-strength threadlocker.	Loctite 222
	LOCK 2	Medium-strength threadlocker, compatible with oil.	Loctite 243
	LOCK 3	High-strength threadlocker for threaded parts.	Loctite 270
	LOCK 4	Surface sealant resistant to high mechanical stress and solvents. Resists high temperatures (up to 200 °C) and pressures up to 350 bar; fills gaps up to 0.4 mm.	Loctite 510
	LOCK 5	Permanent adhesive for freely sliding cylindrical couplings or threaded couplings on mechanical parts. High resistance to mechanical stress and solvents. Temperature range: 55 to 175 °C.	Loctite 128455
	LOCK 6	Pipe sealant for pipes and medium to large fittings. For water and gases (except oxygen). Maximum filling capacity: 0.40 mm (diameter clearance).	Loctite 577
	LOCK 7	Instant adhesive for rubber and plastics with elastomer charged ethylic base.	Loctite 480
	LOCK 8	High-strength retaining compound for threaded parts, bearings, bushes, splines and keys. Operating temperature range: 55 to 150 °C.	Loctite 601

			
	LOCK 9	Medium-strength threadlocker.	Loctite 406
	LOCK 10	Product for metal parts to seal and lock freely sliding cylindrical couplings or threaded couplings. Resistant to high mechanical stress and high temperature, excellent resistance to solvents and chemical attack.	Loctite 128443
	LOCK 11	Medium-strength threadlocker.	Loctite 401
	LOCK 12	Instant adhesive gel offering tensile/shear strength.	Loctite 454 gel
		DUCATI sealing compound.	Three bond 1215 - Sealing compound
		Exhaust pipe sealing paste. Self-sealing paste hardens when heated and resists temperatures exceeding 1000 °C.	Holts Firegum
		Spray used to protect electric systems. Eliminates moisture and condensation and provides excellent corrosion resistance. Water repellent.	SHELL Advance Contact Cleaner
		Dry lubricant, polymerising on contact with air.	Molykote M55 Plus
		Emulsion for lubrication of rubber.	P 80
		Protection lubricant emulsion.	KLUBERPLUS S 06/100
		Lubricant for mechanical elements	Castor oil
		Degreasing agent	Deta Blu

General maintenance instructions

Useful tips

Ducati recommends you to follow the instructions below in order to prevent problems and obtain the best result:

- when diagnosing faults, primary consideration should always be given to what the customer reports about motorcycle operation since this information can highlight faults; your questions to the customer concerning symptoms of the fault should be aimed at clarifying the problem;
- diagnose the problem systematically and accurately before proceeding further. This manual provides the theoretical background for troubleshooting; this basis must be combined with personal experience and attendance at periodic training courses held by Ducati;
- repair work should be planned carefully in advance to prevent any unnecessary downtime, for example obtaining the required spare parts or preparing the necessary tools, etc.;
- limit the number of operations needed to access the part to be repaired. Note that the disassembly procedures in this manual describe the most efficient way to reach the part to be repaired.

General advice on repair work

- Always use top quality tools. When lifting the motorcycle, only use devices that fully comply with the relevant European directives.
- When working on the motorcycle, always keep the tools within reach, ideally in the order required, and never put them on the motorcycle or in hard-to-reach or inaccessible places.
- The workplace must be kept clean and tidy at all times.
- Always replace gaskets, sealing rings and split pins with new parts.
- When loosening or tightening nuts or screws, always start with the largest or start from the centre; tighten nuts and screws to the specified torque working in a cross pattern.
- Always mark any parts and positions which might easily be confused upon reassembly.
- Use exclusively Ducati original spare parts and the recommended brands of lubricants.
- Use special tools where specified.
- Ducati Technical Bulletins often contain updated versions of the service procedures described in this manual. Check the latest Bulletins for details.

General safety rules

Carbon monoxide

When a maintenance operation must be performed with the engine running, make sure that the working area is well-ventilated. Never run the engine indoors.

Warning
Exhaust gases contain carbon monoxide, which is a poisonous gas that can cause unconsciousness or even death if inhaled.

Run the engine outdoors or, if working indoors, use an exhaust gas extraction system.

Fuel

Always make sure the working area is well ventilated. Keep any sources of ignition, such as cigarettes, open flames or sparks, well away from working area and fuel storage area.

Warning
Fuel is highly flammable and can explode under certain conditions. Keep away from children.

Hot parts

Warning
The engine and exhaust parts become hot when the motorcycle engine is running and will stay hot for some time after the engine has been stopped. Wear heat-resistant gloves before handling these components or allow the engine and exhaust system to cool down before proceeding.

Warning
The exhaust system might be hot, even after engine is switched OFF; pay particular attention not to touch exhaust system with any body part and do not park the motorcycle next to inflammable material (wood, leaves etc.).

Used engine oil

Warning
Prolonged or repeated contact with used engine oil may cause skin cancer. If working with engine oil on a daily basis, we recommend washing your hands thoroughly with soap immediately afterwards. Keep away from children.

Brake dust

Never clean the brake assembly using compressed air or a dry brush.

Warning
Inhalation of asbestos fibres is a proven cause of respiratory illness and cancer.

Brake fluid

Warning
Spilling brake fluid onto plastic, rubber or painted parts of the motorcycle may cause damages. Protect these parts with a clean shop cloth before proceeding to service the system. Keep away from children.

Coolant

Engine coolant contains ethylene glycol, which may ignite under particular conditions, producing invisible flames. Although the flames from burning ethylene glycol are not visible, they are still capable of causing severe burns.

Warning

Take care not to spill engine coolant on the exhaust system or engine parts. These parts may be hot and ignite the coolant, which will subsequently burn with invisible flames. Coolant (ethylene glycol) is irritant and poisonous when ingested. Keep away from children. Never remove the radiator cap when the engine is hot. The coolant is under pressure and will cause severe burns.

The cooling fan operates automatically: keep hands well clear and make sure your clothing does not snag on the fan.

Battery

 Warning

The battery gives off explosive gases; never cause sparks or allow naked flames and cigarettes near the battery. When charging the battery, ensure that the working area is properly ventilated.

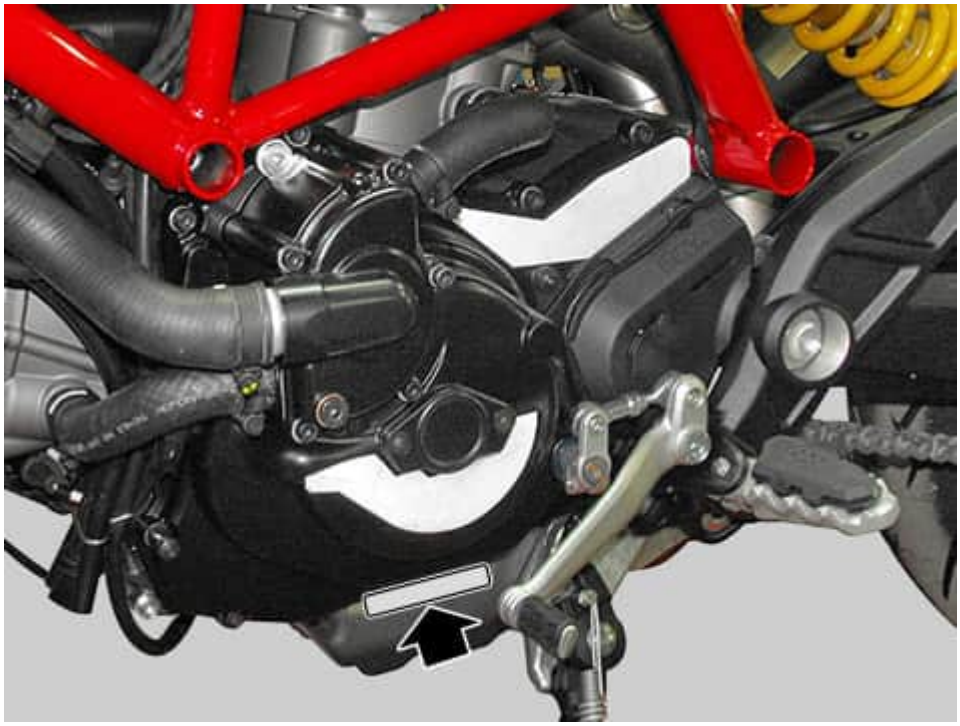
Identification data

Each Ducati motorcycle has two identification numbers - the frame number and the engine number- and an EC nameplate (A) (not present on the US version).

Note

Please quote these numbers, which identify the motorcycle model, when ordering spare parts.



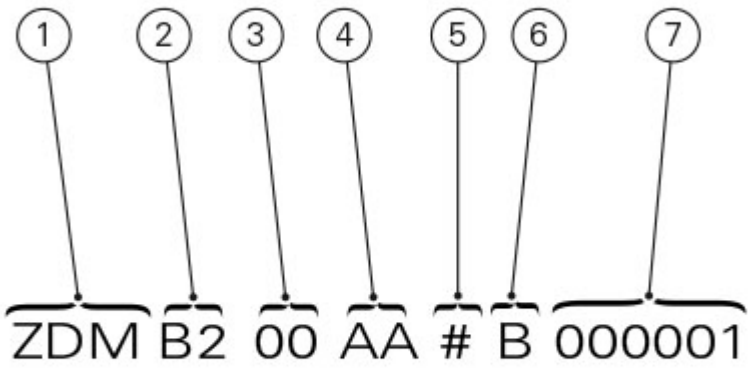




DATA STAMPED ON THE FRAME

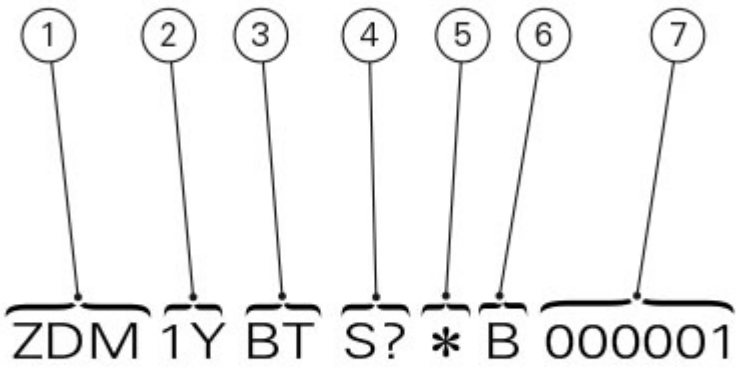
Europe/france/japan/australia version

1 Manufacturer: Ducati Motor Holding
2 type:
B2 = hypermotard / hypermotard sp / hyperstrada (77kw): Europe, France, Japan, Australia
B3 = hypermotard / hypermotard sp / hyperstrada (70kw): France
B3 = hypermotard / hypermotard sp / hyperstrada (35kw): Europe, France
B3 = hypermotard / hypermotard sp / hyperstrada (25kw): Europe, France
3 variant:
00 = hypermotard / hypermotard sp / hyperstrada (77kw): Europe, France, Australia
00 = hypermotard / hypermotard sp / hyperstrada (70kw): France
01 = hypermotard / hypermotard sp / hyperstrada (77kw): Japan
01 = hypermotard / hypermotard sp / hyperstrada (35 kw): Europe, France
02 = hypermotard / hypermotard sp / hyperstrada (25 kw): Europe, France
4 version:
AA = hypermotard / hypermotard sp / hyperstrada (77kw): Europe, France, Australia
AA = hypermotard / hypermotard sp / hyperstrada (35 kw): Europe, France
aa = hypermotard / hypermotard sp / hyperstrada (25 kw): Europe, France
FA = hypermotard / hypermotard sp / hyperstrada (70kw): France
JA = hypermotard / hypermotard sp / hyperstrada (77kw): Japan
5 year of production:
= year of production
6 manufacturing facility
B = for all models
7 progressive serial no. from "000001"
identical for all models



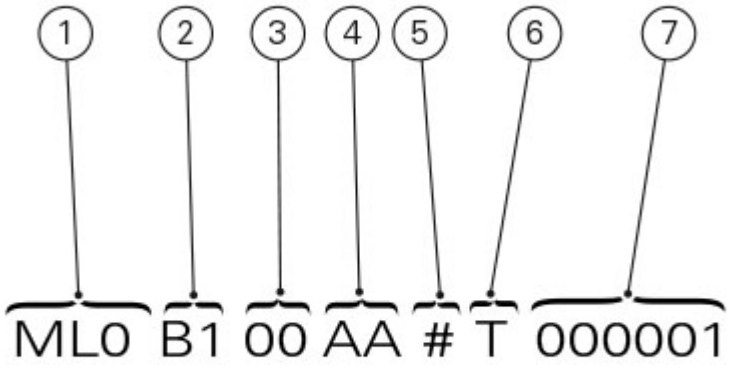
Usa/california/canada/brasil version

1 Manufacturer: Ducati Motor Holding
2 type:
1Y = hypermotard / hypermotard sp / hyperstrada (77kw): Usa, California, Canada
B2 = hypermotard / hypermotard sp / hyperstrada (77kw): Brasil
B3 = hypermotard / hypermotard sp / hyperstrada (35 kw): Brasil
B3 = hypermotard / hypermotard sp / hyperstrada (25 kw): Brasil
3 variant:
Bt = hypermotard / hypermotard sp / hyperstrada (77kw): Usa, California, Canada
00 = hypermotard / hypermotard sp / hyperstrada (77kw): Brasil
01 = hypermotard / hypermotard sp / hyperstrada (35 kw): Brasil
02 = hypermotard / hypermotard sp / hyperstrada (77 kw): Brasil
02 = hypermotard / hypermotard sp / hyperstrada (25 kw): Brasil
4 version:
S? = hypermotard / hypermotard sp / hyperstrada (77kw): USA, California, Canada
AA = hypermotard / hypermotard sp / hyperstrada (77 kw): Brasil
AA = hypermotard / hypermotard sp / hyperstrada (35 kw): Brasil
AA = hypermotard / hypermotard sp / hyperstrada (25 kw): Brasil
5 year of production:
D = model year 2013: hypermotard / hypermotard sp / hyperstrada (77kw): Usa, California, Canada, Brasil
* = year of production: hypermotard / hypermotard sp / hyperstrada (77 kw): Brasil
* = year of production: hypermotard / hypermotard sp / hyperstrada (35 kw): Brasil
* = year of production: hypermotard / hypermotard sp / hyperstrada (25 kw): Brasil
E = model year 2014: hypermotard / hypermotard sp / hyperstrada (77 kw): Brasil
6 manufacturing facility
B = for all models
7 progressive serial no. from "000001"
identical for all models



Thailand version

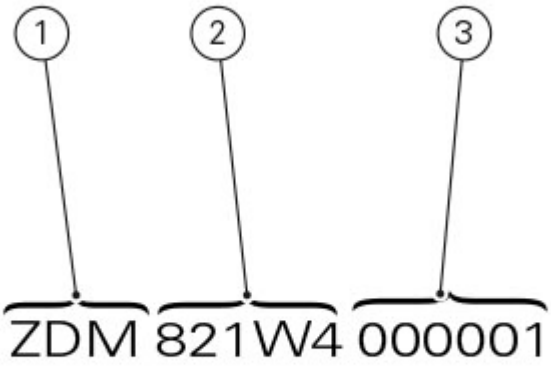
1 Manufacturer: Ducati Motor Holding
2 type:
B1 = hypermotard / hypermotard sp / hyperstrada
3 variant:
00 = hypermotard / hypermotard sp / hyperstrada
4 version:
aa = hypermotard / hypermotard sp / hyperstrada
5 year of production:
D = 2013: year of production
6 manufacturing facility
T = hypermotard / hypermotard sp / hyperstrada (77 kw)
7 progressive serial no. from "000001"
identical for all models



DATA STAMPED ON ENGINE

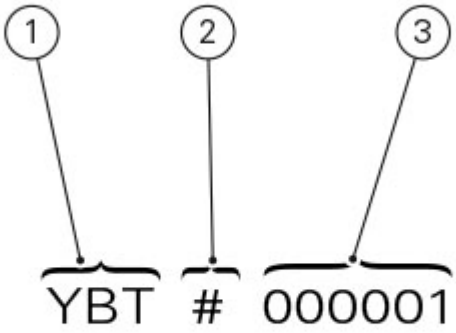
Europe/france/japan/australia version

1 Manufacturer: Ducati Motor Holding
2 Engine type, Model Year
3 Production progressive serial no. from 000001



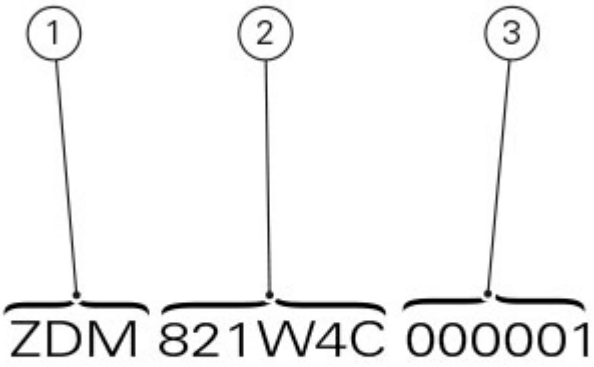
Usa/california/canada/brasil version

1 Engine type
2 Model year (D = 2013)
3 Progressive serial No.



Thailand version

1 Manufacturer: Ducati Motor Holding
2 Engine type, Model Year
3 Progressive serial No.


1
2
3
ZDM 821W4C 000001

Lights/Instruments

	Reference	Technical specifications
Headlight	Low / High beam	H4 blue vision bulb (12V – 60/55W)
	parking light	No. 8 LEDs
Tail light	parking light	No. 6 LEDs (0.27W-13.5V)
	stop light	No. 6 LEDs (2.43W-13.5V)
	number plate light	C5W (12-5W)
Front turn indicators	Light type	GE 2641A 12VRY 10W
Rear turn indicators	Light type	GE 2641A 12VRY 10W
Fuses		
Front fuse box key	Lights	10 A
	Instrument panel	10 A
	Key-1	15 A
	Key-2	10 A
	Key-7SM	15 A
	Injection	20 A
Rear fuse box key	Key-sense	7.5 A
	Diagnosis	7.5 A
	Black-Box System (BBS)	10 A
	ABS 1	30 A
	ABS 2	25 A
	Alarm	10A
	ECU	7.5 A

Injection system

	Make	Type
Control unit	MARELLI	7SM Marelli

Fuel system

Important

Do not use any additives in fuel or lubricants. Using them could result in severe damage of the engine and motorcycle components.

Warning

The motorcycle is only compatible with fuel having a maximum content of ethanol of 10% (E10). Using fuel with ethanol content over 10% is forbidden. Using it could result in severe damage to the engine and motorcycle components. Using fuel with ethanol content over 10% will make the warranty null and void.

Make	Type
Unleaded fuel Fuel for the US market	95-98 RON Unleaded fuel with a minimum octane rating of 90 (RON+MON)/2
Throttle body	with full Ride-by-wire system, round section Ø 52 mm
Injectors per cylinder	1
Firing points per injector	4

Injection-ignition system

	Reference	Technical specifications
Ignition	Type	Inductive electric discharge I.A.W. type
Starting	Type	12 V - 0.7 kW starter motor
Spark plugs	Make and type	NGK MAR9A-J
	Electrode gap	0.8±0.1 mm

Generator/charging system

	Reference	Technical specifications
Battery	Voltage	12 V
	Charge	10 Ah
	Type	dry, sealed, maintenance-free
Generator	Capacity	460W - 14V - 33A

Hydraulic brakes

Brake anti-blocking system with separate action, controlled by hall-effect sensors reading phonic wheels fitted on both wheels: possibility to disable the ABS.

	Reference	Standard value	Limit value
FRONT			
Brake disc	Type	Semi-floating drilled twin-disc	
	Thickness	4 mm	4 mm
	Braking material	steel	
	Disc diameter	320 mm	
Brake calliper	Make	Brembo	
	Type	M4.3 pistons	
	Calliper cylinder diameter	32	
	Pad friction material	TT2182 FF	
Brake master cylinder	Type	PS 18/18	
	Master cylinder diameter	18 mm	
REAR			
Brake disc	Type	Drilled twin-disc	
	Thickness	5 mm	4.5 mm (min.)
	Diameter	245 mm	
Brake calliper	Make	Brembo	
	Type	P34e	
	Calliper cylinder diameter	34 mm	
	Pad friction material	Ferit I/D 450 FF	
Brake master cylinder	Type	PS11	
	Master cylinder diameter	11 mm	

Rear suspension

	Reference	Technical specifications
Type		OHLINS: Progressive. The shock absorber is adjustable for rebound and spring preload. At the bottom pivot point it is connected to a die-cast aluminium single-sided swingarm.
Shock absorber	Stroke	61.5 mm
	Spring preload	7 mm from Min. (all unpreloaded)
	Wheel travel	175 mm

Rear wheel

	Reference	Standard value	Limit value
Minimum tread depth	At the point where tread is most worn down		2 mm
Tyre pressure	Cold	2.1 bar (rider only) 2.9 bar (carrying full load)	
Swingarm shaft runout	On 100 mm		0.2 mm
Wheel rim runout	Radial	0,8 mm	2 mm
	Axial	0.5 mm	2 mm
Drive chain	Make	DID	
	Type	252 VAZ	
	Dimensions	5/8" x 1/16"	
	Number of links	108	

Front suspension

	Reference	Technical specifications
Type	MARZOCCHI	Pressurised upside-down fork in aluminium alloy with hard oxide coating, fully adjustable
	Travel	185 mm
Fork	Spring preload	+ 5 turns from Min. (all unpreloaded)
	Oil quantity per leg	230 cc (right leg)

(*) The value refers to the air column between the free surface of the oil and the end of the sleeve, with the latter fully lowered and without the preload pipe and spring inside the fork leg.

Front wheel

	Reference	Standard value	Limit value
Minimum tread depth	At the point where tread is most worn down		2 mm
Tyre pressure	Cold	2.3 bar (rider only) 2.5 bar (carrying full load)	
Wheel shaft runout	On 100 mm		0.2 mm
Wheel rim runout	Radial	0,8 mm	2 mm
	Axial	0.5 mm	2 mm

Cooling system

	Reference	Technical specifications
Type	Liquid-cooled; closed circuit radiator with fan and thermostat	
Coolant capacity		2.3±0.5 litres
Thermostat	Starts opening at	65 °C ±2 °C
	Electric fan enabling	103 °C
	Electric fan disabling	102 °C

Gearbox

	Reference	Standard value	Limit value
Gearbox shafts	End float		0.05 to 0.20 mm
Gearbox drum	End float		0.10 to 0.40 mm
Gear selector fork	Fork shoe thickness	3.90 to 4.00 mm	
	Fork and gear clearance	0.070 to 0.285 mm	0,4 mm

Cylinder/Piston

	Reference	Standard value	Limit value
	Cylinder nominal diameter	88 mm	
	Max. ovality		0,005
	Max. taper		0,015 Inspection: Section A: 10 mm from the top edge Section B: 50 mm from the top edge Section C: 100 mm from the top edge
Diameter	Section A Section B Section C	88.000 mm ÷ 88.010 mm 88.010 mm ÷ 88.020 mm 88.020 mm ÷ 88.030 mm	
Piston-cylinder coupling clearance		0.025 ÷ 0.045 mm	
Piston	Nominal diameter	88 mm	
Diameter	Section A Section B Section C	87.965 mm ÷ 87.975 mm 87.975 mm ÷ 87.985 mm 87.985 mm ÷ 87.995 mm	
Con-rod	Con-rod big end diameter	43.67 (0 ÷ 0.013) mm	
	Crankshaft class	Con-rod class	Bearing colour
Con-rod big end bearing pairing	A B A B	A A B B	Blue + Yellow Yellow + Yellow Blue + Blue Blue + Yellow
Con-rod big end bearing-crankshaft journal coupling clearance	Pin selection	A: Ø40.025 (+0.016; +0) mm B: Ø40.025 (+0; -0.016) mm	
Piston and gudgeon pin clearance		0.015 ÷ 0.024 mm	
	Nominal diameter	Ø 18 mm	
	Piston	Ø 18 (+0.020;+0.015) mm	

	Gudgeon pin	Ø 18 mm (+0; -0.004) mm	
Con-rod and gudgeon pin clearance		0.035 ÷ 0.049 mm	
Cylinder compression measured with DDS2		11÷12 bar	10 bar (MIN.), difference between cylinders: 2 bar (MAX.)

Crankshaft

	Reference	Standard value	Limit value
Crankshaft	Ovality		0,005 mm
	Taper		0,005 mm
	Main bearing journal alignment		0.01 mm on diameter

Timing system/valves

	Reference	Assembly value	Inspection value, every 24,000 km
Timing diagram	With 1 mm valve clearance		
	Intake	Opens at 4° B.T.D.C. Closes at 52° A.B.D.C.	
	Exhaust	Opens at 58° B.B.D.C. Closes at 7° A.T.D.C.	
	Intake valve diameter	35.5 mm	
	Exhaust valve diameter	28.8 mm	
Valve lift	With 0 mm valve clearance	Intake Exhaust 11.2 mm	11.3 mm 9.6 mm
Valve clearances			
	Opening rocker arm - intake	0.13 to 0.18 mm	0.10 to 0.25 mm
	Opening rocker arm - exhaust	0.13 to 0.18 mm	0.10 to 0.25 mm
	Closing rocker arm - intake	0.05 to 0.10 mm	0.05 to 0.15 mm
	Closing rocker arm - exhaust	0.05 to 0.10 mm	0.05 to 0.15 mm

Transmission

	Reference	Technical specifications
	Clutch	Multiplate, wet type
	Clutch control	By cable
	Gearbox	Six speed
	Primary drive	33/61
	Drive ratio	1,85
	Gearbox type	With constant mesh spur gears, operated by a lever on the left side of the motorcycle
Transmission	Gear ratios	
	1st	37/15
	2nd	30/17
	3rd	28/20
	4th	26/22
	5th	24/23
	6th	23/24

Colours

Primer (Black 2K Primer)	873.A002 (PALINAL)
Base (Black Stealth - Black 94)	929.R223 (PALINAL)
Base (Tricolore White)	929.D398 (PALINAL)
Clear coat	923M1598 (PALINAL)
Mercury Grey subframe (Powder mercury grey)	79086 (INVER)
Red frame (Ducati Red)	81784 (INVER)
Black rims	

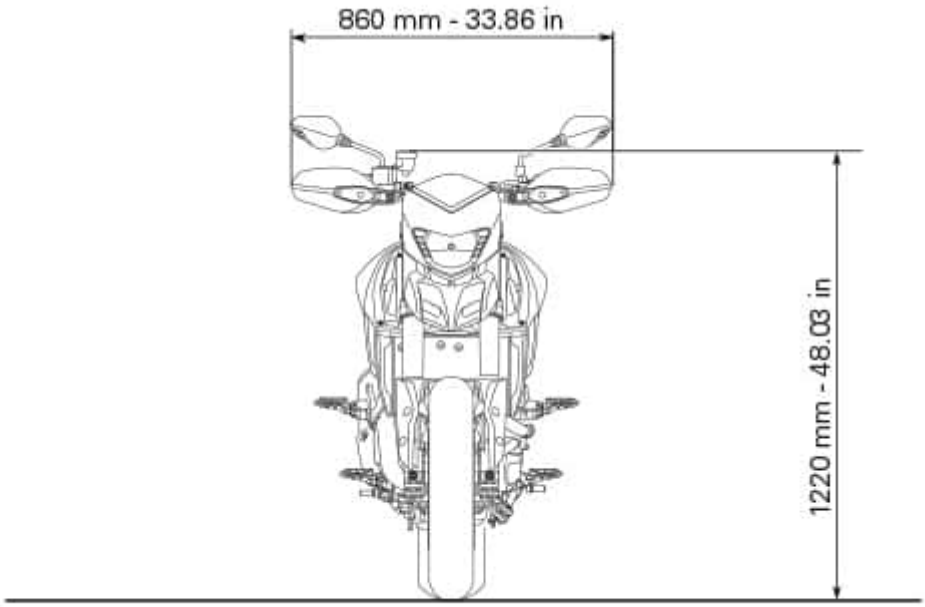
General

	Reference	Technical specifications
Motorcycle dimensions	Total length	2110 ± 20 mm
	Total width	860 ± 20 mm
	Total height (without mirrors)	1150 ± 20 mm
	Seat height	870 mm
	Minimum ground clearance	198 mm
	Wheelbase	1505 ± 20 mm
Frame	Type	Steel tube trellis frame
Subframe	Type	Die-cast aluminium
	Steering head angle	25.5°
	Steering angle	70°
	Trail	104 mm
	Front suspension	Hydraulic upside-down fork Fork leg diameter: 50 mm
	Front wheel travel	185 mm
	Rear suspension	OHLINS: Progressive. The shock absorber is adjustable for rebound and spring preload. At the bottom pivot point it is connected to a die-cast aluminium single-sided swingarm. Wheel travel: 175 mm.
	Front rim	Light alloy rim with three spokes
	Front rim size	MT 3.50x17”
	Front tyre size	120/70 - ZR 17
	Rear rim	light alloy with three spokes
	Rear rim size	MT 5.50x17”
	Rear tyre size	180/55 - ZR 17
	Type of tyres	Radial, tubeless
	Front brake	Semi-floating drilled twin-disc. Standard ABS.
	Rear brake	Drilled fixed steel disc. Standard ABS.

Engine	Type	Testastretta 11°, 90º L twin cylinder
	Bore	88 mm
	Stroke	67,5 mm
	Displacement	821 cu cc
	Compression ratio	12,.8:1
	Timing system	With toothed belt, with two overhead camshafts
	Lubrication system	Forced lubrication by pump without oil cooler
	Type of oil pump	Gear pump with by-pass valve
	Cooling system	Liquid-cooled, with thermostat
	Air filter	One cylindrical filtering element
	Crankshaft type	One-piece

Overall dimensions





Fuel, lubricants and other fluids

Warning
Failure to observe weight limits could result in poor handling and impair the performance of your motorcycle, and you may lose control of the motorcycle.

Fuel, lubricants and other fluids	Type	cu. dm(litres)
Fuel tank, including a reserve of 4 cu. dm(litres)	Unleaded fuel with 95 RON fuel octane rating (at least). For the US market, unleaded fuel with 90 (RON+MON)/2 fuel octane rating (at least).	16
Lubrication circuit	Ducati recommends you use Shell Advance 4T Ultra 15W-50 oil. As an alternative it is possible to use a motorcycle engine oil having the same degree SAE 15W-50 and meeting the following specifications JASO: MA2 and API: SM.	3.4
Front/rear brake and clutch circuits	SHELL – Advance Brake DOT 4	
Protectant for electric contacts	SHELL – Advance Contact Cleaner	
Front fork	SHELL - Advance Fork 7.5 or Donax TA	230 cc.
Cooling circuit		2.3

Important
Do not use any additives in fuel or lubricants. Using them could result in severe damage of the engine and motorcycle components.

Warning
The motorcycle is only compatible with fuel having a maximum content of ethanol of 10% (E10). Using fuel with ethanol content over 10% is forbidden. Using it could result in severe damage to the engine and motorcycle components. Using fuel with ethanol content over 10% will make the warranty null and void.

Engine oil
A good quality engine oil has special properties. Use only a highly detergent engine oil with certified SE, SF or SG or higher service ratings as marked on the container.

Recommendations concerning oil
It is recommended to use oil complying with the following specifications:

- viscosity grade SAE 15W-50;
- standard API: SM;
- standard JASO: MA2.

SAE 15W-50 is an alphanumerical code identifying oil class based on viscosity: two figures with a W ("winter") in-between; the first figure indicates oil viscosity at low temperature; the second figure indicates its viscosity at high temperature. API (American standard) and JASO (Japanese standard) standards specify oil characteristics.

Engine tightening torques

Application description	Thread length	Threading	Torque (Nm)			Note
			Nom.	Min.	Max.	
Head						
Idler pulley pin		M20x1	45	40	50	Pre-applied product
FIXED and MOBILE tensioner pin		M20x1	50	45	55	LOCK 2 or TB 1324
Camshaft pulley ring nut		M17x1	71	64	78	GREASE A
Rocker arm shaft blanking cap		M12x1.25	14	12	16	Pre-applied product
Water union temperature sensor		M12x1.5	23	20	26	LOCK 4: Lock insert when tightening
Cylinder/head stud bolt nut (snug torque)		M10x1.5	20			Apply GREASE C on nut underside and on stud bolt thread
Cylinder/head stud bolt nut (preload)		M10x1.5	40	38	42	
Cylinder/head stud bolt nut (tightening)		M10x1.5	60	57	63	
Cam cap retaining screw (preload)	32	M8x1.25	10	9	11	Apply oil SHELL ADVANCE ULTRA 4
Cam cap retaining screw (tightening)	32	M8x1.25	22,5	21	25	
Coil screw	18	M6x1	10	9	11	
Pulley flange retaining screw	12	M6x1	10	9	11	
Head cover retaining nut		M6x1	10	9	11	
Coil retaining nut		M6x1	10	9	11	
Intake manifold retaining nut		M6x1	10	9	11	
Head cover retaining screw		M6x1	10	9	11	
Secondary air cover retaining screw		M6x1	10	9	11	
Stud bolt for exhaust manifold	16	M6x1	10	9	11	LOCK 5
Screw for securing vacuum gauge to cylinder head	8	M6x1	5	4	6	LOCK 2 (or TB 1324) (Europe versions)
Union on head for canister		M6x1	5	4	6	LOCK 2 (or TB 1324) (California versions)
Horizontal head air breather union		M6x1	2,5	2	3	LOCK 2
Vertical head air breather blanking dowel	8	M6x1	10	9	11	LOCK 6

Intake manifold retaining screw	16	M6x1	10	9	11	
Water temperature sensor		M8x1.25	6	5	7	
Head unions on head retaining screw	16	M5x1	6	5	7	Pre-applied product
Crankcase						
Oil cartridge		M16x1.5	11	10	12	Oil SHELL ADVANCE ULTRA 4 on seal
Nipple for oil cartridge		M16x1.5	42	38	46	LOCK 2 (or TB 1324)
Oil intake duct cap		M16x1.5	24	21	27	LOCK 5
Oil cooler nipple		M14x1.5	32	29	35	LOCK 5
Oil drain plug with magnet		M12x1.5	20	18	22	TB1215
Clutch-side crankcase oil channel blanking cap	16	M10x1.5	15	13	17	LOCK 5
Taper cap		M10x1	20	18	22	LOCK 5
Neutral sensor		M10x1.25	10	9	11	
Oil pump screw adapter bush		M10x1				LOCK 5
Dowel for oil channel inside clutch-side crankcase	18	M10x1.5	15	13	17	LOCK 5
Roller bearing flange hole taper blanking plug	8	M10x1.5	22	20	24	LOCK 2 (or TB 1324)
Cylinder/head stud bolt		M10x1.5	30	28	32	LOCK 2 (or TB 1324)
Crankcase jointing screw at cylinder area (preload)	90	M8x1.25	19	17	21	GREASE B on thread
Crankcase jointing screw at cylinder area (tightening)	90	M8x1.25	25	22	28	
Central crankcase screw + swinging arm pivot (preload)	75	M8x1.25	19	17	21	GREASE B on thread
Central crankcase screw + swinging arm pivot (tightening)	75	M8x1.25	25	22	28	
Gear stopper retaining screw	21,5	M8x1.25	18	16	20	LOCK 2 (or TB 1324)
Special grub screw for roller bearing flange	14	M8x1.25	16	15	17	LOCK 2 (or TB 1324)
Blow-by valve retaining screw	16	M6x1	10	9	11	
Chain side secondary bearing retaining screw	12	M6x1	10	9	11	LOCK 2 (or TB 1324)
Clutch side primary bearing retaining screw	16	M6x1	10	9	11	LOCK 2 (or TB 1324)
Crankcase jointing screw at idle gear pin area	75	M6x1	10	9	11	

External crankcase jointing screw	35	M6x1	10	9	11	
Mesh filter cover screws TSPEI - TEF	16	M6x1	10	9	11	TB 1215
Radial pick-up retaining screw	18	M6x1	10	9	11	
Screw retaining upper shell of blow-by valve		M3	1,2	1	1,4	LOCK 5
Piston oil squirter screw	10	M5x0.8	8	7	9	LOCK 2 (or TB 1324)
Electric starter						
Inner starter motor retaining screw TCEI - TCEIF	18	M6x1	10	9	11	Pre-applied product
External starter motor retaining screw	25	M6x1	10	9	11	Pre-applied product
Rear starter motor retaining screw	30	M6x1	10	9	11	Pre-applied product
Idle gear pin retaining screw	70	M6x1	10	9	11	LOCK 2 (or TB 1324)
Connecting rods						
Flywheel nut		M24x1	330	313	346	LOCK 5
Steel/aluminium crankshaft plug		M20x1	15	13,5	16,5	LOCK 5
Balancing plug		M12x1.25	28	26	30	LOCK 5
Con-rod screw (Class 12.9)	4	M10x1				
1) Apply specified grease on the thread						GREASE B on thread
2) Tightening at 50 rpm				35		
3) Pause 2 seconds and undo by 360° at 30 rpm						
4) Pre-tighten at 30 rpm				20		
5) Pre-tighten at 10 rpm				35		
6) Tightening by 65º +/-1º at 14 rpm						
7) Torque check				70 ÷ 103		
Con-rod screw (Class 14.9)	4	M10x1				
1) Apply specified grease on the thread						GREASE B on thread
2) Tightening at 50 rpm				35		
3) Pause 2 seconds and undo by 360° at 30 rpm						
4) Pre-tighten at 30 rpm				20		
5) Pre-tighten at 10 rpm				35		
6) Tightening by 65º +/-1º at 14 rpm						

7) Torque check				70 ÷ 113		
Crankshaft grub screw	8	M8x1.25	13	11	15	LOCK 5
Crankshaft drilled grub screw	8	M8x1.25	13	11	15	LOCK 5
Gearchange mechanism						
Gearbox drum positioning screw		M16x1.5	30	27	33	
Gearbox pawl screw	25	M8x1.25	36	34	38	LOCK 2 (or TB 1324)
Pawl positioning nut		M6x1	10	9	11	
Gearbox pawl screw	20	M6x1	16	15	17	LOCK 2 (or TB 1324)
Timing system						
Timing transmission pulley ring nut		M15x1	71	64	78	GREASE A
Timing idle gear nut		M14x1	55	50	60	GREASE A
FIXED tensioner bearing stopper screw		M14x2	50	45	55	GREASE A
MOBILE tensioner retaining nut		M8x1.25	25	22	28	GREASE A
Carbon cover screw	18	M6x1	6	5,5	6,5	Pre-applied product
Plastic cover screw	18	M6x1	10	9	11	Pre-applied product
Carbon cover filter support screw	8	M4x0.7	1,75	1,5	2	
Self-tapping screw for cover filter	12	AF3.5	1,75	1,5	2	
Covers						
Water inlet union		M30x1.5	25	23	27	LOCK 5
Water delivery union		M22x1.5	25	23	27	LOCK 5
Wet clutch fluid filler cap		M20x1.5	5	4,5	5,5	
Pick-up inspection screw		M12x1	15	13	17	LOCK 2 (or TB 1324)
Water pump cover plug		M10x1	15	13,5	16,5	LOCK 5
Oil duct blanking cap		M10x1	15	13,5	16,5	LOCK 5
Water pump bearing stopper screw	16	M6x1	10	9	11	LOCK 2 (or TB 1324)
Timing inspection cover screw TSPEI	14	M6x1	5	4,5	5,5	
Water pump cover screw (through hole) TCEI	18	M6x1	10	9	11	LOCK 6
Water pump cover screw TCEI	18-25	M6x1	10	9	11	
Generator cover screw TCEIF	30-35	M6x1	13,5	12,5	14,5	
Generator stator retaining screw	30-40	M6x1	10	9	11	LOCK 2 (or TB 1324)
Clutch cover screw	30-80-90	M6x1	13,5	12,5	14,5	

Screw securing special clutch cover to stud bolt	30	M6x1	13,5	12,5	14,5	
Clutch cover cable grommet retaining screw	12	M6x1	10	9	11	
Generator cover to clutch rod plug retaining screw	12	M6x1	10	9	11	
Gearbox and clutch						
Wet clutch drum nut.		M25x1.5	190	180	200	GREASE B
Wet clutch spring screw	20	M5x0.8				
Ignition						
Spark plug		M10x1	12	11	13	
Rotor to flywheel retaining screw	25-35	M6x1	13	11	15	Pre-applied product
Oil pump						
By-pass pump cap		M15x1	17	15	19	LOCK 5
Oil pump screw	40	M8x1.25	26	23	29	
Oil pump assembly screw	25	M6x1	10	9	11	
Oil pump screw	25	M6x1	10	9	11	
Cylinders						
Water delivery union		M22x1.5	25	23	27	LOCK 5
Cooling circuit						
Water circuit clamps			2,5	2	3	

Frame tightening torques

Application description	Threading	Nm Tolerance ±10%	Note
Accessories			
Left rear-view mirror fastener	M10x1.25	40	
Right rear-view mirror fastener	M10x1.25-LH	40	
LH heated grip fastener	M4x0.7	2,8	
Fastener retaining RBW heated twistgrip to handlebar	M5x0.8	4,5±0,5	Sequence 1-(UP)-2-1
Fastener securing short retaining element to lower support (right+left) (HYPERSTRADA, HYPERSTRADA WITH LOW SEAT)	M6x1	10	
Fastener securing long retaining element to grab handle (right+left) (HYPERSTRADA, HYPERSTRADA WITH LOW SEAT)	M6x1	10	
Fastener retaining pannier support to compartment (front) (HYPERSTRADA, HYPERSTRADA WITH LOW SEAT)	M8x1.25	22	
Fastener retaining pannier support to compartment (rear) (HYPERSTRADA, HYPERSTRADA WITH LOW SEAT)	M8x1.25	22	
Side stand			
Side stand rotation pivot lock nut tightening	M10x1.25	24	
Side stand plate to crankcase fastener	M10x1.5	36	Preapplied threadlocker
Side stand sensor fastener	M6x1	5	Preapplied threadlocker
Side stand rotation pivot fastener	M10x1.25	35	GREASE A
Centre stand rotation pivot fastener (HYPERSTRADA, HYPERSTRADA WITH LOW SEAT)	M18x1.5	70	
Centre stand spring rotation pivot fastener (HYPERSTRADA, HYPERSTRADA WITH LOW SEAT)	M6x1	10	LOCK 2
Chain and sprocket			
Sprocket fastener	25x1.5	186*	GREASE B
Sprocket cover fastener	M6x1	6	
Lights and reflectors			
Fastener retaining headlight to headlight fairing frame	AF5	3	
Fastener retaining tail light to compartment	AF5	4	
Handlebar end hand guard fastener (right+left)	M6x1	10	
Fastener retaining hand guard clamp to handlebar (right+left)	M5x0.8	3	Sequence 2-(DOWN)-1-2

Fastener retaining hand guard to support (right+left)	M6x1	5	
Instruments			
Fastener retaining instrument panel to headlight fairing frame	M5x0.8	3	
Front fork			
Steering bearing fastener	M35x1	30*	GREASE B
Fastener retaining brake hose cable ring to bottom yoke fastener	M6x1	10	
Steering limit check nut fastener		18	LOCK 2 (to nut thread only)
Fastener retaining steering head to steering shaft		18*	GREASE B
Fastener retaining steering head to fork (right+left)	M6x1	10*	GREASE B (Sequence 1-2-1)
Fastener retaining bottom yoke to fork (right+left)		16*	GREASE B (Sequence 1-2-1)
MARZOCCHI fork bottom end fastener (right+left) (SP)	M6x1	10*	Sequence 1-2-1
Fastener retaining KAYABA fork bottom end (right+left) (HYPERMOTARD, HYPERSTRADA, HYPERSTRADA WITH LOW SEAT)	M6x1	10*	GREASE B (Sequence 1-2-1)
Fastener retaining handlebar lower U-bolt to steering head		45*	
Fastener retaining headlight fairing support to steering head	M6x1	10	LOCK 2
Fastener retaining headlight fairing support to bottom yoke	M6x1	10	LOCK 2
Fastener retaining ABS sensor cable ring to fork bottom end	M6x1	10	
Electrical and electronic system			
Fastener retaining switches to handlebar (right+left)	M4x0.7	1,3	
Fastener retaining battery cable to terminal	M6x1	10	
Fastener retaining solenoid starter cable to starter motor	M6x1	5	GREASE D
Fastener retaining solenoid starter cable to solenoid starter	M6x1	5	
Fastener retaining earth cable to engine	M6x1	10	
Fastener retaining ABS sensor on wheels (front+rear)	M6x1	7	Preapplied threadlocker
Fastener retaining fuse support to solenoid starter and compartment	AF5	4	
Fastener retaining horn to headlight fairing	M6x1	8	
Fastener retaining voltage regulator to small support	M6x1	5	
Fastener retaining bracket to vertical head manifold.	M6x1	10	
Fastener retaining power outlet to frame (HYPERSTRADA WITH LOW SEAT)	M18x1	3,5	
Fastener retaining power outlet to piggyback support (HYPERSTRADA WITH LOW SEAT)	M18x1	3,5	

Braking system: ABS			
Fastener retaining brake hose unions (rear master cylinder + rear calliper)	M10x1	23	
Fastener retaining unions on ABS control unit	M10x1	23	
Fastener retaining brake hose union (front master cylinder)	M10x1	23	
Fastener retaining double eyelet union (front right master cylinder)	M10x1	23	
Fastener retaining single eyelet union (front left master cylinder)	M10x1	23	
Bleeder fastener (front right+left calliper)	M6x1	4	
Fastener retaining ABS control unit on bracket	M6x1	6,8±1	LOCK 2
Fastener retaining ABS control unit on bracket	M6x1	6,8±1	LOCK 2
Fastener retaining ABS control unit bracket to frame	M6x1	10	Preapplied threadlocker
Braking system: front brake			
Fastener retaining front brake master cylinder to handlebar	M6x1	10	Sequence 1-(UP)-2-1
Front brake calliper fastener (right+left)	M10x1.25	45*	GREASE B
Front brake calliper pre-tightening for setting (right+left)	M10x1.25	2	GREASE B
Braking system: rear brake			
Rear brake calliper fastener	M8x1.25	25*	GREASE B
Fastener retaining rear brake master cylinder to footpeg holder plate	M6x1	10	
Fastener retaining rear brake master cylinder to footpeg holder plate	M6x1	10	
Fastener retaining rear brake fluid reservoir to cable ring	M5x0.8	2	
Fastener retaining ABS hose cable ring to frame	M5x0.8	2	
Rear swinging arm			
Swinging arm shaft fastener	M8x1.25	18*	GREASE B
Calliper holder plate pin fastener	M12x1.25	33*	Preapplied threadlocker
Fastener retaining eccentric to swinging arm	M12x1.25	31*	GREASE B. Sequence 1-2-1
Fastener retaining speed sensor cable ring	M4x0.7	1	LOCK 2
Upper chain sliding fastener	M5x0.8	5	Preapplied threadlocker
Fastener retaining chain sliding shoe/lower hose clamp	M5x0.8	5	Preapplied threadlocker
Fastener retaining lower hose clamp protection to swinging arm	M5x0.8	5	Preapplied threadlocker
Fastener retaining Australia chain guard to chain sliding shoe (AUSTRALIA VERSION)	5	1,2	

Number plate holder			
Fastener retaining front number plate holder to compartment	M8x1.25	20	
Rear fastener retaining number plate holder to compartment	M8x1.25	20	
Fastener retaining rear turn indicators to rear guard	M5x0.8	3	LOCK 2
Fastener retaining upper to lower guard	M5x0.8	3,5	
Fastener retaining upper to lower guard	AF5	5	
Fastener retaining number plate holder to guard	M6x1	5	
Reflector fastener	M4x0.7	2	
Number plate light fastener (reed support)	AF4	2	
Fastener retaining rear number plate holder to compartment (AUSTRALIA VERSION)	M8x1.25	20	
Fastener retaining gravel guard to number plate holder (AUSTRALIA VERSION)	M6x1	3	
Fastener retaining number plate holder to rear guard (AUSTRALIA VERSION)	M6x1	5	
Handlebar - clutch control			
Fastener retaining handlebar upper U-bolt	M8x1.25	25*	GREASE B (sequence 1-2-3-4-3)
Fastener retaining RBW twistgrip to handlebar	M5x0.8	4,5±0,5	Sequence 1-(UP)-2-1
Fastener retaining clutch lever to handlebar	M6x1	8-9	
Fastener retaining clutch lever to lever body	M6x1	10-15	
Rear suspension			
Fastener retaining shock absorber to swinging arm and frame	M10x1.25	42*	GREASE B
Fastener retaining shock absorber preload adjuster (press) to frame (HYPERSTRADA, HYPERSTRADA WITH LOW SEAT)	M6x1	10	
Fastener retaining piggyback support and side body panel to compartment (HYPERSTRADA, HYPERSTRADA WITH LOW SEAT)	M5x0.8	5	
Piggyback support closure and fastener (HYPERSTRADA, HYPERSTRADA WITH LOW SEAT)	M5x0.8	3	
Front mudguard			
Fastener retaining front mudguard (right + left)	M6x1	8	Preapplied threadlocker
Rear suspension			
Fastener retaining front mudguard (right + left)	M6x1	8	Preapplied threadlocker
Fastener retaining front mudguard (right + left) (SP)	M6x1	8	
Fastener retaining front mudguard (right + left) (HYPERSTRADA, HYPERSTRADA WITH LOW SEAT)	M6x1	8	

Water radiator			
Fastener retaining radiator to frame	M6x1	10	
Fastener retaining radiator to engine	M5x0.8	5	
Fastener retaining threaded pin on horizontal head.	M6x1	10	
Fastener retaining fan to radiator (right+left)	M3x0.5	1,5	
Fastener retaining expansion reservoir supp. bracket to manifold	M6x1	10	
Fastener retaining expansion reservoir to bracket	M6x1	10	
Fastener retaining bushing to reservoir	M6x1	8	
Fastener retaining water hose clamps on engine and radiator		2,5	
Fastener retaining fairing supp. bracket to radiator (right+left)	M5x0.8	5	
Fastener retaining water hose clamp to engine horizontal head union		0,6	
Water hose tie fastener on thermostat		2	
Footpegs and levers: brake side			
Fastener retaining brake lever pin on right footpeg holder plate	M8x1.25	24	Preapplied threadlocker
Screw retaining switch on rear brake lever	M6x1	5	
Fastener retaining brake master cylinder control rod	M6x1	7,5	
Fastener retaining right footpeg holder plate to engine	M10X1.25	36	
Upper fastener retaining right footpeg support to swinging arm shaft	M12x1.25	55*	GRASE B
Stop light switch fastener	M8x1	5	
Fastener retaining rear brake rod spacer for spring contrast	M6x1	10	LOCK 2
Footpegs and levers: gearbox side			
Gearbox rod nut fastener	M6x1	8	LOCK 2
Fastener retaining left footpeg holder plate to engine	M10x1.5	36	
Fastener retaining left footpeg holder plate to engine	M10x1.25	36	
Upper fastener retaining left footpeg support to swinging arm shaft	M12X1.25	55*	GRASE B
Fastener retaining linkage and gearchange control lever rod junction	M6x1	10	
Fastener retaining gearchange lever to selector pawl	M6x1	10	LOCK 1
Fastener retaining gearbox lever pin on left footpeg holder plate	M8x1.25	24	Preapplied threadlocker
Rear mudguard			
Rear mudguard fastener (HYPERMOTARD, SP)	M5x0.8		Preapplied threadlocker
Rear mudguard fastener (HYPERSTRADA, HYPERSTRADA WITH			

LOW SEAT)	M5x0.8		Preapplied threadlocker
Front wheel			
Fastener retaining brake discs (right + left)	M8x1.25	30*	Preapplied threadlocker (for spare parts, LOCK 2)
Front wheel nut fastener	M25x1.25	63*	GREASE B
Valve fastener	M8x1.25	10	
Rear wheel			
Rear sprocket fastener	M10x1.25	48	GREASE B
Fastener retaining wheel shaft on rear sprocket side (left)	M33x1.5	156*	GREASE B
Fastener retaining wheel shaft on rim side (right)	M38x1.5	176*	GREASE B
Driving pin fastener	M6x1	11	LOCK 2
Brake disc screw	M8x1.5	25*	Preapplied threadlocker (for spare parts, LOCK 2)
Phonic wheel fastener	M5x0.8	5	Preapplied threadlocker
Valve tightening	M8x1.5	10	
Fuel tank			
GAC flange to fuel tank fastener	M5x0.8	5	
Fastener for plug union to tank	M5x0.8	5	
Fastener retaining GAC flange to tank with double thread screw	M5x0.8	5	
GAC flange cover fastener	M5x0.8	3	
Fastener retaining seat to tank	M5x0.8	2	
Fastener retaining tank to compartment	M8x1.25	10	Preapplied threadlocker; Hold on tank
Fastener retaining tank pads to frame (right+left)	M6x1	8	
Fastener retaining tank pads to frame (right)	M6x1	10	
Fastener retaining fuel hose grommet to tank	M5x0.8	5	
Exhaust			
Fastener retaining exhaust pipe flange to head (horizontal + vertical)	M6x1	10	
Fastener retaining CO2 plugs on exhaust pipes (horizontal + vertical)	G1/8" A	25	
Lambda sensor fastener (horizontal + vertical)	M12x1.25	18±1,5	
Fastener retaining exhaust valve pulley	M6x1	10	

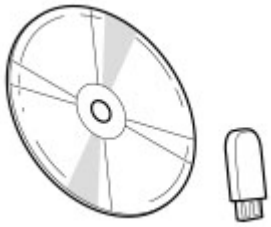
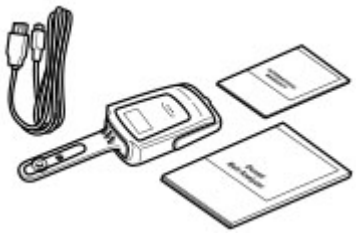
Fastener retaining heat guard to horizontal exhaust	M6x1	8	Preapplied threadlocker
Fastener retaining heat guard on silencer	M6x1	8	
Fastener retaining bracket to silencer	M8x1.25	22	
Fastener retaining silencer to right footpeg holder plate	M8x1.25	22	
Fastener retaining central body / exhaust supporting bracket	M6x1	5	
Fastener retaining silencer clamp on exhaust valve	M10x1.5	25	Speed 300 rpm
Frame			
Fastener retaining frame to engine	M12x1.25	60*	GREASE B) on thread and underside)
Fastener retaining front subframe to subframe	M8x1.25	24*	
Fastener retaining rear subframe to frame	M8x1.25	24*	
Ignition switch cover blind retaining nuts	M6x1	7	
Fastener retaining ignition switch to frame	M6x1	>12	Preapplied threadlocker; Tighten down the screw head until it fails
Fastener retaining lock latch to compartment	M6x1	5	
Supp. tie on frame fastener	M4x0.7	2	LOCK 2
Fastener retaining rear cross bar and compartment to subframes	M8x1.25	18	
Fastener retaining subframe front cross bar	M8x1.25	18	
Fastener retaining upper cross bar to frame	M8x1.25	24	Preapplied threadlocker
Fastener retaining BBS supp. bracket to rear cross bar	M4x0.7	2	
Exhaust valve actuator fastener	M6x1	8	
Exhaust valve actuator fastener	M6x1	fully home	
Lubrication			
Fastener retaining pressure switch to remote oil hose	M10x1	24	GREASE B) on thread and underside)
Fastener retaining oil hose pressure switch to engine	M14x1.5	32	
Fastener retaining pressure switch support to engine (HYPERMOTARD, SP)	M6x1	10	
Fastener retaining pressure switch to engine with sump guard (HYPERSTRADA, HYPERSTRADA WITH LOW SEAT)	M6x1	10	LOCK 2
Air intake - oil breather			
Fastener retaining filter cover to filter box	AF5	2	
Air filter ring nut	M6x1	6	

Fastener retaining blow-by hose tie on valve and filter box		1,5	
Fastener retaining filter box drain hose ring on engine	M5x0.8	5	
Fastener retaining regulator rubber blocks to airbox	AF4	3	
Fastener retaining MAP Sensor support to filter box	M5x0.8	5	
Fuel system			
Fastener retaining throttle bodies to manifolds (FRONT+REAR)	M6x1	10*	
Fastener retaining injector caps to plastic manifold	M5x0.8	5	LOCK 2
Filter box ties		2,5	
Fastener retaining canister to bracket (USA/CAL)	M6x1	8	
Fastener retaining canister bracket to engine (USA/CAL)	M6x1	10	
Fairings			
Fastener retaining tail guard central cover to subframe (right+left) (HYPERMOTARD, SP)	M8x1.25	22	
Fastener retaining painted tail guard to subframe (right+left) (HYPERMOTARD, SP)	M5x0.8	5	
Fastener retaining painted tail guard to subframe (right+left) (HYPERMOTARD, SP)	AF5	3	
Fastener retaining fairing to bracket on radiator (right+left)	M5x0.8	5	
Fastener retaining central cover to tank plug	M5x0.8	3	
Fastener retaining central cover to tank (right+left)	M5x0.8	3	
Fastener retaining central and lateral cover to tank (right+left)	M5x0.8	4	
Fastener retaining radiator cover (right+left)	M5x0.8	3	
Fastener retaining instrument panel to headlight fairing frame (HYPERMOTARD, SP)	M5x0.8	5	
Fastener retaining silent block to headlight fairing frame	M6x1	5	
Fastener retaining headlight fairing support to silent blocks	M6x1	7	
Fastener retaining painted headlight trim to headlight fairing frame	M5x0.8	2	
Fastener retaining tank internal front panel (right + left)	M5x0.8	2	
Underseat side body panel fastener (HYPERMOTARD, SP)	M5x0.8	5	Preapplied threadlocker
Fastener retaining seat lock to right side body panel	M22x1.5	4	
Fastener retaining front side body panel to frame and subframe (right+left)	M5x0.8	5	Preapplied threadlocker
Fastener retaining clip to headlight fairing frame	AF4	2	
Fastener retaining instrument panel to headlight fairing frame (HYPERSTRADA and HYPERMOTARD WITH LOW SEAT)	M5x0.8	5	

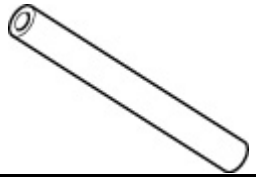
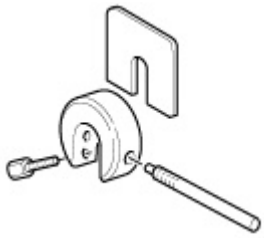
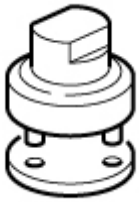
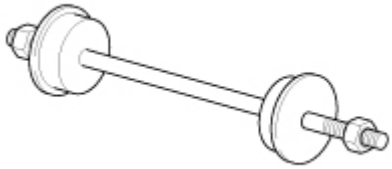
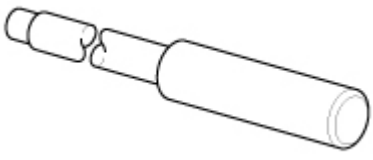
Fastener retaining windscreen to headlight fairing frame (HYPERSTRADA and HYPERMOTARD WITH LOW SEAT)	M5x0.8	3	
Underseat side body panel fastener (HYPERSTRADA, HYPERSTRADA WITH LOW SEAT)	M5x0.8	5	Preapplied threadlocker
Hand grab central fastener (HYPERSTRADA, HYPERSTRADA WITH LOW SEAT)	M6x1	5	
Fastener retaining tail guard to subframe (right + left) (HYPERSTRADA, HYPERSTRADA WITH LOW SEAT)	M5x0.8	5	
Fastener retaining tail guard to subframe (right + left) (HYPERSTRADA, HYPERSTRADA WITH LOW SEAT)	M8x1.25	20	
Fastener retaining sump guard to plate (right + left) (HYPERSTRADA, HYPERSTRADA WITH LOW SEAT)	M5x0.8	5	
Fastener retaining sump guard to central plate (HYPERSTRADA, HYPERSTRADA WITH LOW SEAT)	M6x1	5	
Fastener retaining sump guard supporting plate to engine (right + left) (HYPERSTRADA, HYPERSTRADA WITH LOW SEAT)	M5x0.8	5	
Fastener retaining hand grab to central cover (HYPERSTRADA, HYPERSTRADA WITH LOW SEAT)	M6x1	10	

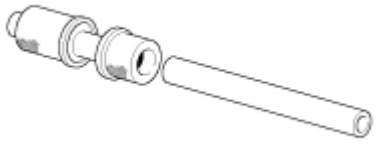
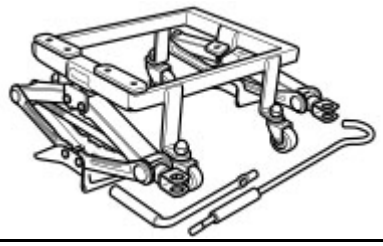
* critical point for dynamic safety. Tightening torque tolerance must be ±5%.

Diagnosis special tools

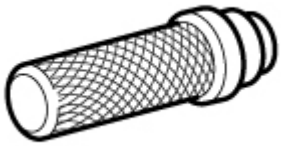
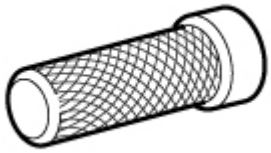
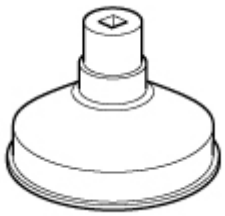
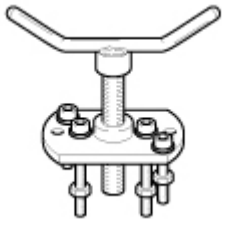
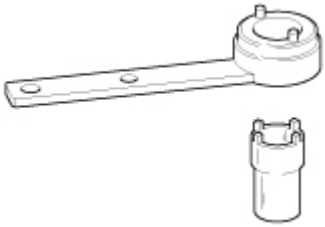
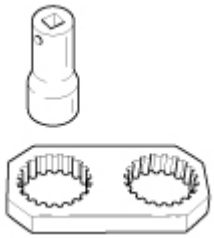
PART NO.	DESCRIPTION	IMAGE
28620441A	"PC HASP DDS2.0" wrench	
979000252	DDS 2 (Ducati Diagnosis System 2.0)	
979000253	Belt tensioning	
979000254	Diagnosis and power supply cable	
979000255	Diagnosis and power supply cable (CAN)	
979000256	Power supply cable from DDS battery	

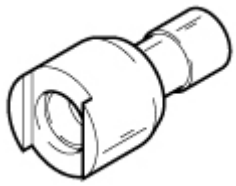
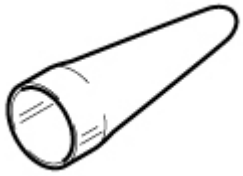
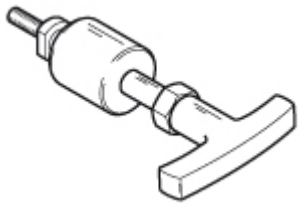
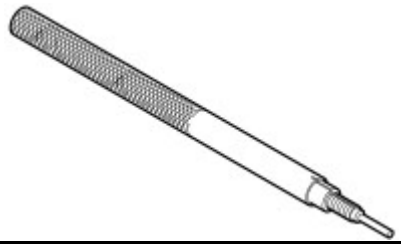
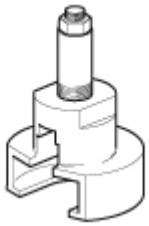
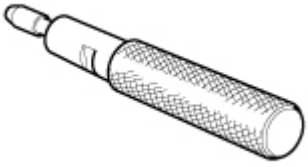
Frame special tools

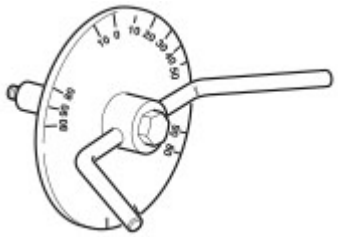
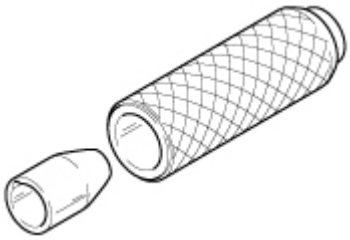
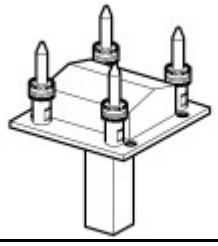
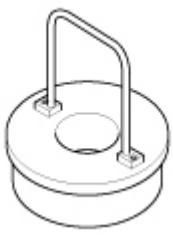
PART NO.	DESCRIPTION	IMAGE
80007.0139	Front wheel shaft wrench	
88713.0950	Traction bar for Kayaba fork overhaul	
88713.0957	Preload tube retaining tool for Kayaba fork	
88713.1058	Wrench to fit steering tube plug	
88713.1062	Steering tube bearing installation tool	
88713.1074	Swingarm shaft removal tool	
88713.1096	Driving tool for Kayaba fork oil seal	

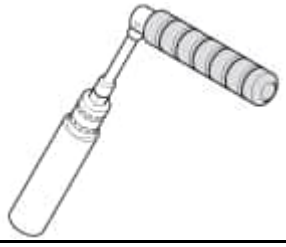
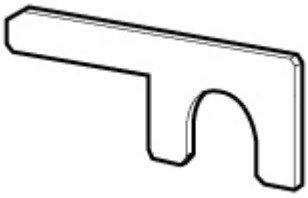
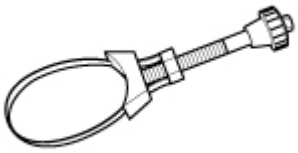
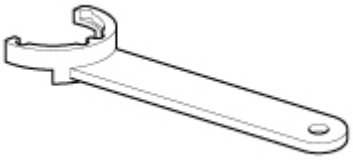
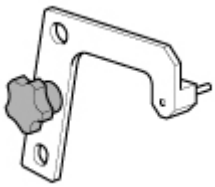
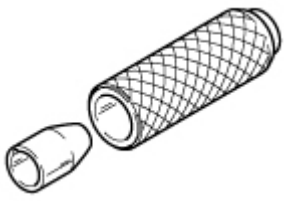
88713.2409	Ball bearing installation tool	
88713.3220	Engine repair work bench	
88713.4513	Frame/engine support	

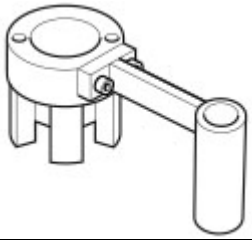
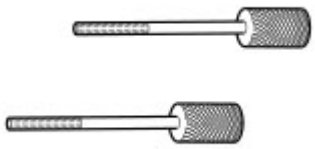
Engine special tools

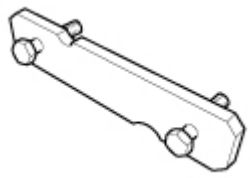
PART NO.	DESCRIPTION	IMAGE
88713.0137	Primary drive sprocket retainer key	
88713.0869	Water pump front seal installation tool	
88713.0870	Water pump front seal counter-washer installation tool	
88713.0944	Oil cartridge wrench	
88713.1749	Puller for driving pulley and cover	
88713.1805	Driving pulley tightening tool	
88713.1806	Camshaft pulley (Z=20) tightening tool	

88713.1821	Tensioner pin wrench	
88713.1920	Tool to install O-rings on engine block stud bolts	
88713.1994	Rocker arm shaft puller	
88713.2011	Tool to block crankshaft at Top Dead Centre (TDC)	
88713.2906	Gauge to check Top Dead Centre (TDC)	
88713.2092	Primary drive gear puller	
88713.2442	Tool to install seal ring on valve guide	
88713.2556	Clutch housing reaction tool	

		
88713.2571	Timing check tool	
88713.2676	Cylinder head nut tightening tool	
88713.2834	Snap ring installation tool	
88713.2861	Camshaft seal ring installation tool	
88713.2863	Bearing surface for head installation	
88713.2870	Con-rod guiding tool	
88713.2877	Spark plug wrench	

		
88713.2878	Spacer and fork feeler gauge 0.2/0.3 mm	
88713.2906	Oil cartridge wrench	
88713.3219	Reaction tool for pulley tightening	
88713.3334	Selector fork positioning plate	
88713.3367	Flywheel wrench	
88713.3394	Tool to install the snap ring on the camshaft	
88713.3497	Wrench to tension the belt mobile tensioner	

		
88713.4198	vertical cylinder exhaust manifold upper nut disassembly tool	
88713.4284	Clutch pack assembly reaction tool	
88713.4285	Clutch pack locking screws	
88713.4286	Clutch pack assembly/disassembly support	
88765.1000 88765.1005 88765.1006	Fork feeler gauges	
88765.1298	Valve lower shim check spacer	
88765.1623	Timing pulley positioning tool	

Vehicle pre-delivery

Pre-delivery check list

1 Transport packaging integrity check (if required).
2 Removal from the transport packaging (if required).
3 Motorbike integrity visual check.
4 Check that the standard supplied kit is complete (use checklist in the kit).
5 Hand guard assembly (if required).
6 Rear-view mirror assembly.
7 Prepare the battery (charging the battery, electrolyte top-up) and install it on the motorcycle.
8 Check the drive chain tension.
9 Check tyre pressure (BASE - front and rear: 2.5 bar) (SP - front 2.3 bar; rear 2.1 bar).
10 Check coolant, brake and clutch fluid level (and top up if necessary).
11 Engine oil level check (top-up if necessary).
12 Lights, turn indicators, horn and controls check. Headlight beam height adjustment check. Check handlebar freedom of movement and for any interference.
13 Check key operation and steering lock on the right and left sides.
14 Check of the front and rear wheel shaft tightening (Front: 63 Nm ±5% - Rear: 176 Nm ±5%).
15 Check the brake calliper retaining screws tightening (Front: 45 Nm ±5% - Rear: 25 Nm ±5%).
16 Top-up with fuel until reserve light switching off (approx. 5 litres).
17 Check the operation of engine stop switch, side stand switch and clutch lever switch.
18 Check the presence of any technical updates and recall campaigns on the DCS.
19 Install any Ducati Performance accessories requested by the Customer and check their operation.
20 Final test and road test of the motorcycle (testing the safety devices, and electric fan).
21 Reading of the error memory with DDS 2.0 and check of Software version update on control units (use the Global Scan function).
22 Vehicle cleaning.
23 Activate the motorcycle warranty and fill out the on-board documentation (general warranty terms and conditions);
24 Explain motorcycle operation to the Customer and deliver all standard documents, literature and the Service Manual (duly filled-in).

Scheduled maintenance operations check list

1 Reading of the error memory with DDS and check of Software version update on control units.
2 Check the presence of any technical updates and recall campaigns.
3 Change engine oil and filter.
4 Clean engine oil filter at intake.
5 Check and/or adjust valve clearance.
6 Replace the timing belts.
7 Change spark plugs.
8 Change the air filter.
9 Check brake fluid level.
10 Change brake fluid.
11 Check pad wear and brake discs. Change, if necessary.
12 Check tightening of the safety components (brake disc flange screws, brake calliper screws, front/rear wheel nuts, sprocket and final drive sprocket nuts).
13 Check and lubricate the rear wheel shaft.
14 Check the drive chain tension and lubrication.
15 Check final drive wear (chain, front and rear sprockets) and chain sliding shoes.
16 Visual check of front fork and rear shock absorber seals.
17 Change the front fork fluid.
18 Check the freedom of movement and tightening of side and central stand (if installed).
19 Check rubbing points, clearance, freedom of movement and positioning of hoses and electric wiring in view.
20 Check coolant level.
21 Change coolant.
22 Check electric fan operation.
23 Check tyre pressure and wear.
24 Check the battery charge level.
25 Check idling.
26 Check the operation of the electric safety devices (side stand sensor, front and rear brake switches, engine kill switch, gear/neutral sensor).
27 Check the indicators and lighting.

28 Reset Service indication through DDS.
29 Road test of the motorcycle, testing the safety devices (ex. ABS and DTC).
30 Softly clean the motorcycle.
31 Fill out that the service was performed in on-board documentation (Service Booklet).

Check of the supplied kit

Check that the supplied kit (1), located under the seat, is complete.



All motorcycles are supplied with two keys (2).



Hand guard assembly

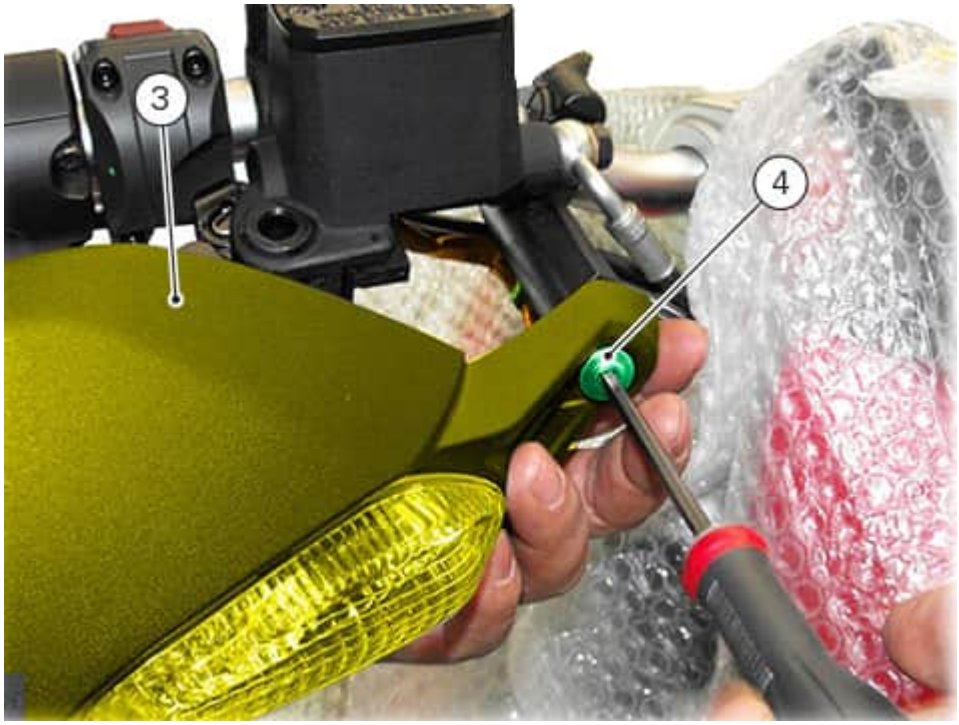
Note

The instructions below show how to assemble the hand guard; follow the same procedure for the left one.

Fitted hand guards

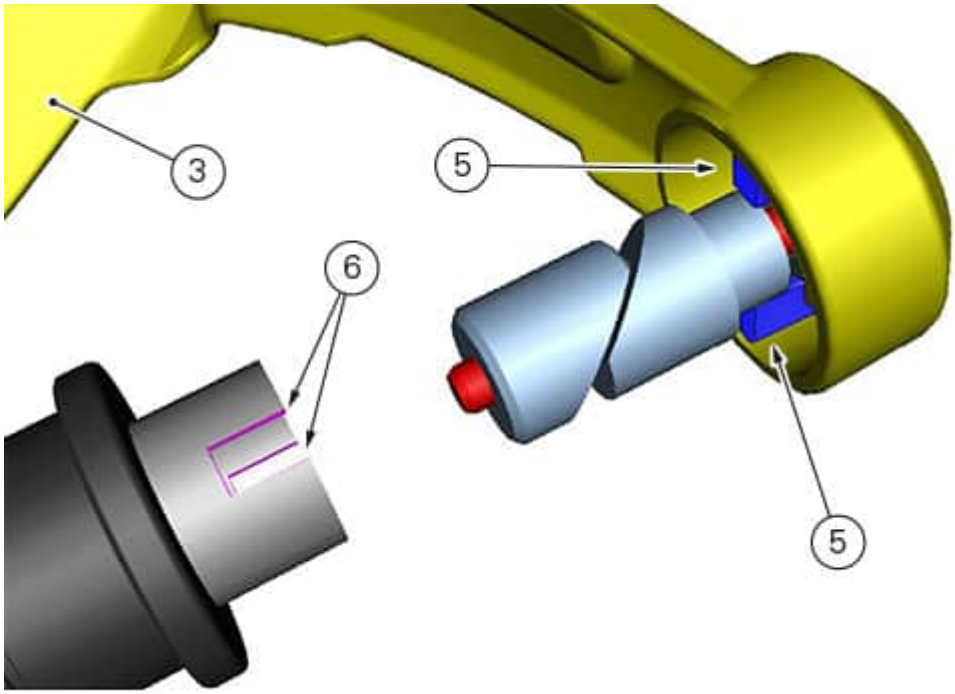
In case hand guards (3) are already fitted on the bike, it is necessary to replace the two grey service screws with the two black screws (5), with pre-applied threadlocker, supplied with kit (1).

Tighten screws (4) to a torque of 5 Nm ± 10%.

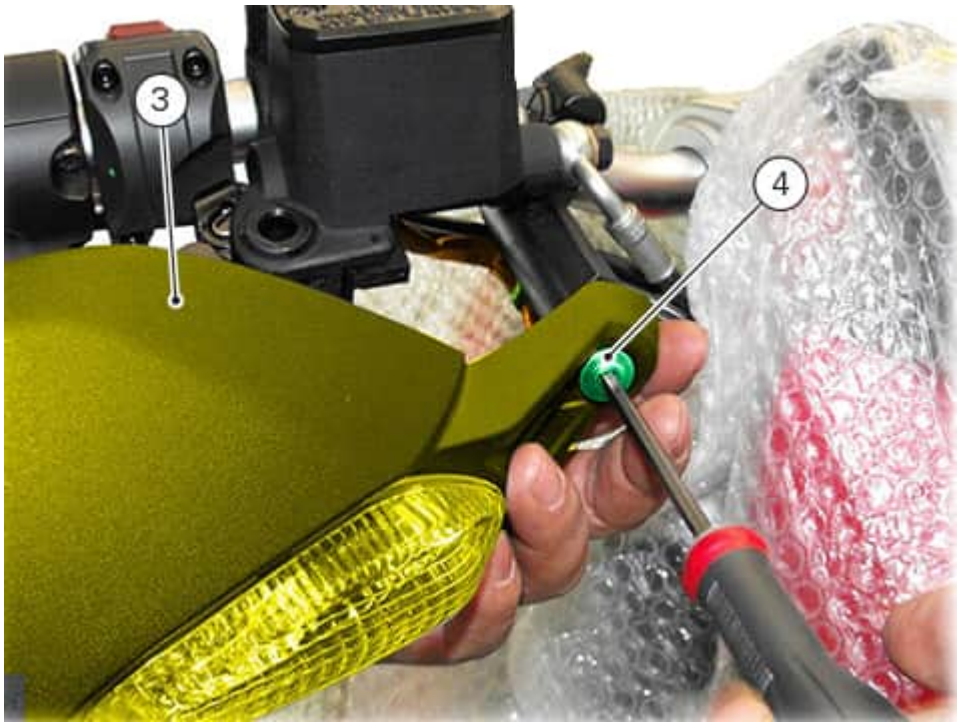


Hand guards not fitted

If hand guard (3) is not fitted on the vehicle yet, proceed as follows.
Remove the hand guard unit (3) from the protection package and position it on the handlebar, by engaging reference tab (5) in handlebar groove (6).



Take the black screw (4) with pre-applied threadlocker from the supplied kit (1), start and tighten it to 5 Nm ± 10%.

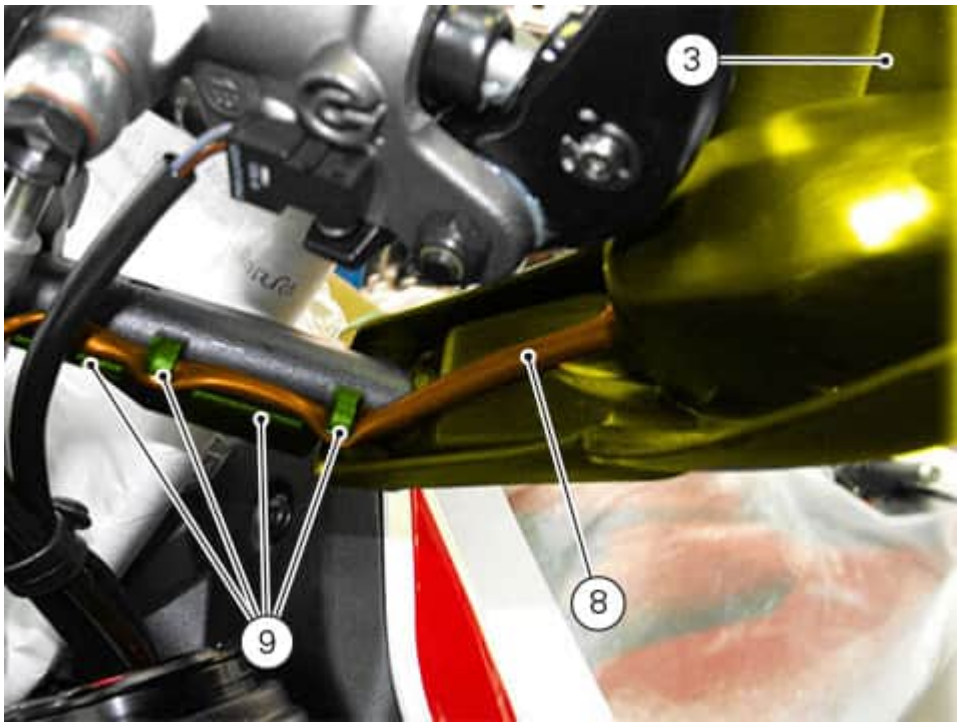


Tighten the counter-weight screw (7) in the following sequence:

- keep hand guard (3) end turned down;
- keep the counter-weight screw (7) pressed towards the handlebar internal side;
- tighten counter-weight screw (7) to a torque of 10 Nm ± 10%.



Insert wiring (8) of hand guard unit (3) in cable rings (9).



Rear-view mirror assembly

Fix the rear-view mirrors by tightening the retaining nuts (10) to 40 Nm ± 10%.





Battery start-up and fitting on the vehicle

Warning

Before carrying out any operations on the battery, keep in mind the safety standards. When under charge, batteries produce explosive gases. Keep batteries away from heat sources, sparks or open flames.

After electrolyte top-up let the battery rest for at least thirty minutes.
Always charge the battery correctly before the first operation and after long storage periods – such as before selling the vehicle.
Leaving the battery discharged for more than one month could damage it. Use only constant-voltage battery chargers.
Check that battery terminals are properly connected to the battery charger. To charge the battery, follow the instructions found on the battery itself; for further information, see the table above.

Type of charging	Volt (V)	Ampere (A)	Time (Hours)
Normal	12	1,2	5 ÷ 10

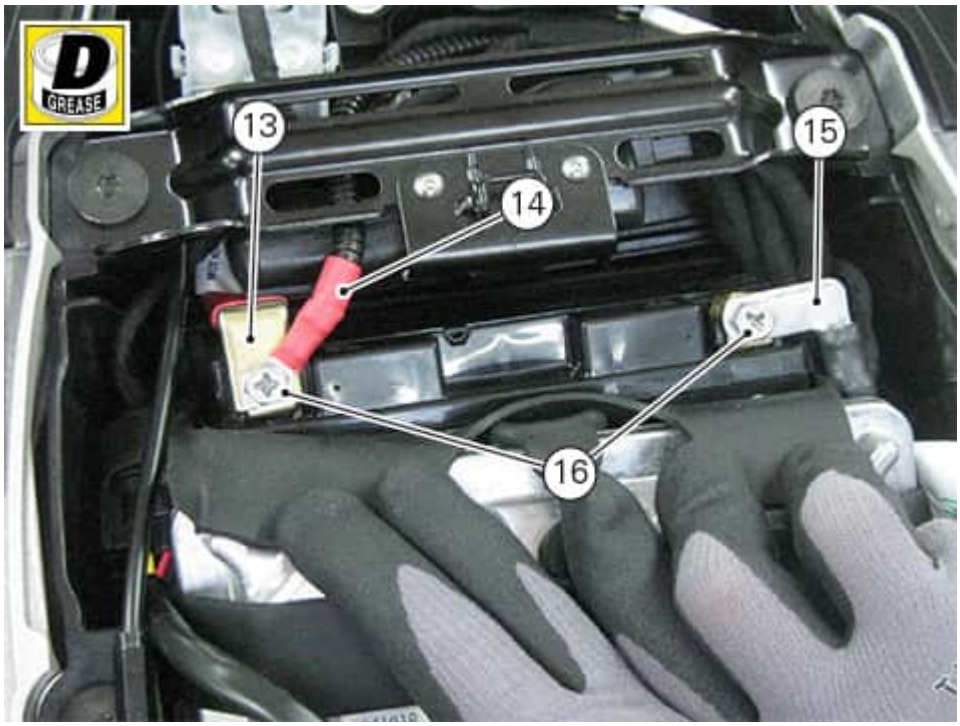
Remove the seat (Removing the seat).
Release the retaining metallic ring (11) and the retaining element (12).



Lift the battery support unit without disconnecting its electric components and place the battery in its seat. We recommend lubricating the battery lateral sides with some soapy water to better slide it on rubber.



Reposition the battery support unit in its seat.
Connect the battery to the motorcycle's terminals.
Strictly follow the routing of cables (13), (14) and (15) as shown in the figure.



Connect the positive red cable (13) and the positive cable of the ABS system (14) to the battery positive terminal and the negative black cable (15) to the battery negative terminal.
Start the two screws (16) on the terminals starting with the positive cables, then tighten the screws.
Apply specified grease onto the battery terminals to prevent oxidation.
Engage the retaining element (12) end side and the retaining metallic ring (11) in this sequence.



Refit the seat (Refitting the seat).

Scheduled maintenance chart: operations to be carried out by the customer

List of operations and type of intervention [set mileage (km/mi) or time interval *]	km. x1000	1
	mi. x1000	0,6
	Months	6
Checking the engine oil level		•
Check brake fluid level		•
Check tyre pressure and wear		•
Check the drive chain tension and lubrication		•
Check brake pads		•

* Service operation to be carried out in accordance with the specified distance or time intervals (km, miles or months), whichever occurs first.

Scheduled maintenance chart: operations to be carried out by the dealer

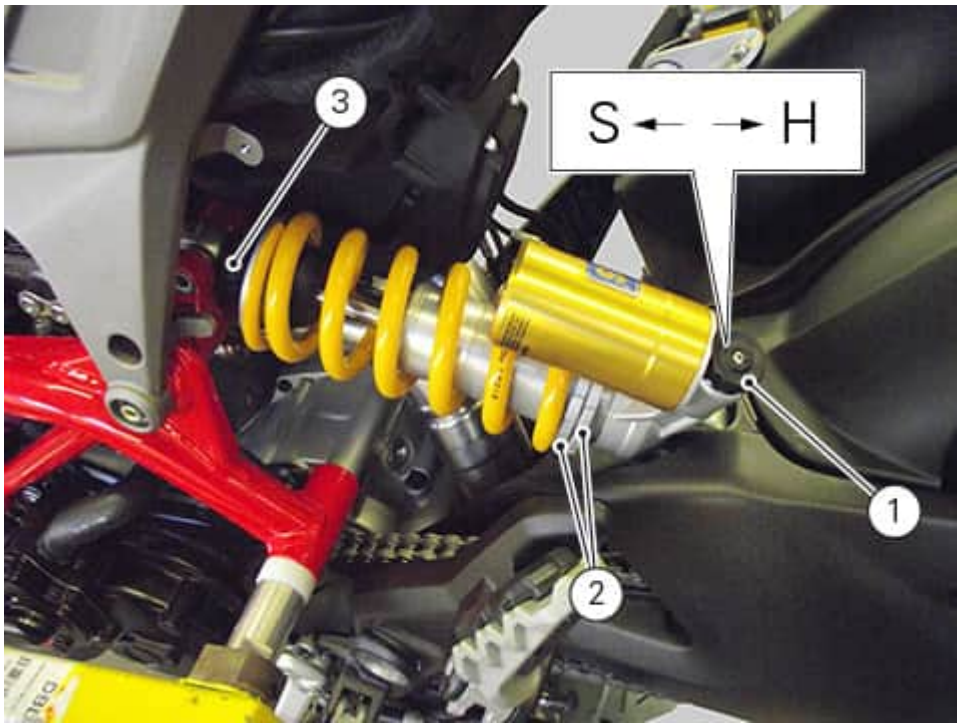
List of operations and type of intervention	km. x 1000	1	15	30	45	60	Time Months
	mi. x 1000	0,6	9	18	27	36	
Read the error memory with the DDS and check for Software version update on control units.		•	•	•	•	•	12
Check the presence of any technical updates and recall campaigns		•	•	•	•	•	12
Lubricate the clutch lever cable pawl		•	•	•	•	•	12
Change engine oil and filter		•	•	•	•	•	12
Lubricate the clutch lever cable pawl		•	•	•	•	•	12
Clean engine oil filter at intake		•					-
Check and/or adjust valve clearance				•		•	-
Replace the timing belts				•		•	-
Change spark plugs			•	•	•	•	60
Change the air filter				•		•	-
Check brake fluid level		•	•	•	•	•	12
Change brake fluid							36
Check pad wear and brake discs (replace if necessary).		•	•	•	•	•	12
Check tightening of the safety components (brake disc carrier screws, brake calliper screws, front/rear wheel nuts, sprocket and final drive sprocket nuts)		•	•	•	•	•	12
Check and lubricate the rear wheel shaft				•		•	-
Check the drive chain tension and lubrication		•	•	•	•	•	12
Check final drive wear (chain, front and rear sprockets) and chain sliding shoes			•	•	•	•	12
Visual check of front fork and rear shock absorber seals		•	•	•	•	•	12
Change the front fork fluid					•		-
Check the freedom of movement and tightening of side and central stand (only Hyperstrada version)		•	•	•	•	•	12
Check rubbing points, clearance, freedom of movement and positioning of hoses and electric wiring in view		•	•	•	•	•	12
Check coolant level		•	•	•	•	•	12
Change coolant					•		48
Check electric fan operation		•	•	•	•	•	12
Check tyre pressure and wear		•	•	•	•	•	12
Check the battery charge level		•	•	•	•	•	12

Check idling	•	•	•	•	•	12
Check the operation of the electric safety devices (side stand sensor, front and rear brake switches, engine kill switch, gear/neutral sensor)	•	•	•	•	•	12
Check the indicators and lighting	•	•	•	•	•	12
Reset Service indication through DDS	•	•	•	•	•	-
Road test of the motorcycle, testing the safety devices (ex. ABS and DTC)	•	•	•	•	•	12
Softly clean the motorcycle	•	•	•	•	•	12
Fill out that the service was performed in on-board documentation (Service Booklet)	•	•	•	•	•	12

Adjusting the rear shock absorber

The rear shock absorber has commands that enable you to adjust the setting to suit the load on the motorcycle.
The knob (1) on the expansion reservoir controls compression damping.
The knob (3), located on the upper point at which the shock absorber is fixed to the swingarm, controls rebound damping. Turn the knobs (1) and (3) clockwise to stiffen the damping or anticlockwise to soften it.
Two ring nuts (2) located on the lower section of the shock absorber are used to adjust the outer spring preload.
To adjust spring preload, loosen the upper locking ring nut. TIGHTEN or LOOSEN the lower ring nut to INCREASE or DECREASE spring preload.
STANDARD setting from the fully closed position (clockwise):

- rebound: unscrew the adjuster (1) by 16 clicks from Max (fully closed);
- compression: unscrew adjuster (3) by 10 clicks from Max (fully closed);
- spring preload: 7 mm from Min. (all unpreloaded).



Warning

To turn the preload adjuster ring nut use a pin wrench. Pay attention to avoid hand injuries by hitting motorcycle parts in case the wrench tooth suddenly slips on the ring nut groove while moving it.

Warning

The shock absorber is filled with gas under pressure and may cause severe damage if taken apart by someone who is unskilled.

Once the desired spring preload has been set, tighten upper locking ring nut.
When carrying a passenger and luggage, set the rear shock absorber spring to proper preload to improve motorcycle handling and keep safe clearance from the ground. It may also be necessary to adjust the rebound damping accordingly.
The shock absorber is adjusted by electric impulses sent by the instrument panel to the adjusters inside the shock absorber body.

Adjusting the front fork

The front fork can be adjusted for rebound, leg compression and spring preload.
The settings are adjusted by way of external adjuster screws:

1 to adjust rebound damping (right leg);
2 to adjust internal spring preload (both legs);
3 to adjust compression damping (left leg).

Park the motorcycle in a stable position on its side stand.
Use a flat screwdriver to turn adjuster (1) on the right leg to modify the rebound damping.
Use a flat screwdriver to turn adjuster (3) on the left leg to modify the compression damping.
To change the spring preload inside each fork leg, turn the hex. adjuster (2) with a 22 mm hexagon wrench. As you turn adjusters (1) and (3) you will hear them click. Each click corresponds to a different damping setting.
The stiffest damping setting is obtained with the adjuster turned fully clockwise to the "0" position.

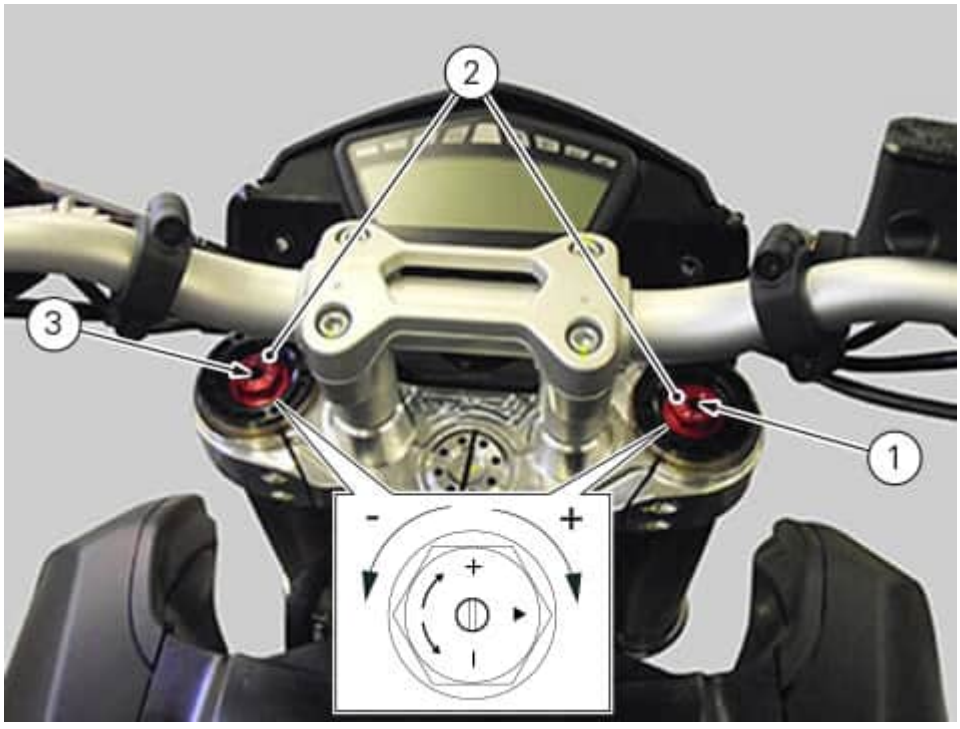
Start with this position and turn anticlockwise. Count the clicks, which correspond to positions "1", "2", and so forth.
The STANDARD factory settings are as follows:

- compression: 14 clicks (from fully closed position);
- rebound: 14 turns (from fully closed position);
- spring preload: + 5 mm from Min. (all unpreloaded).

A full turn corresponds to 1 mm of spring preload (10 mm as a total).

Warning

Regulate the adjusters on both legs to the same positions.

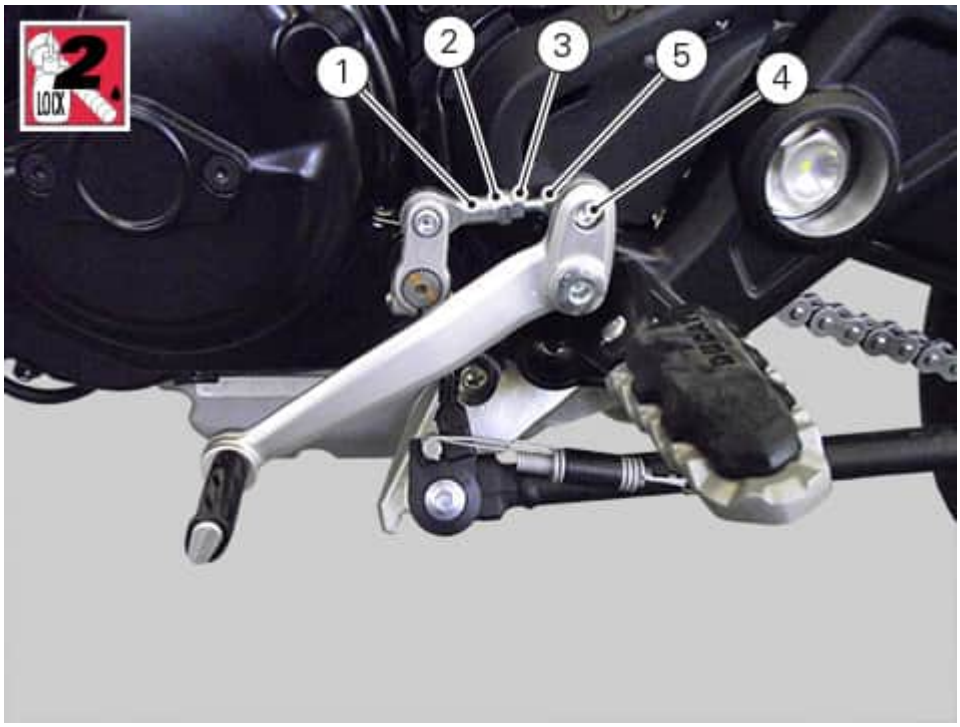


Adjusting the position of the gear change and rear brake pedals

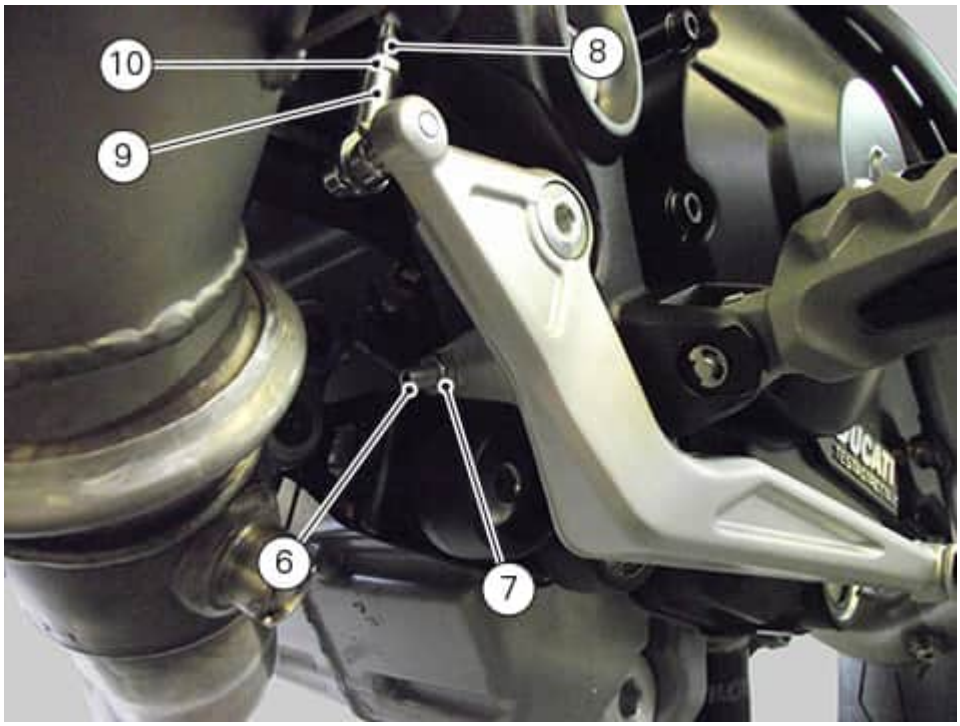
The position of the gear change and rear brake pedals in relation to the footpegs can be adjusted to suit the preferred riding position.

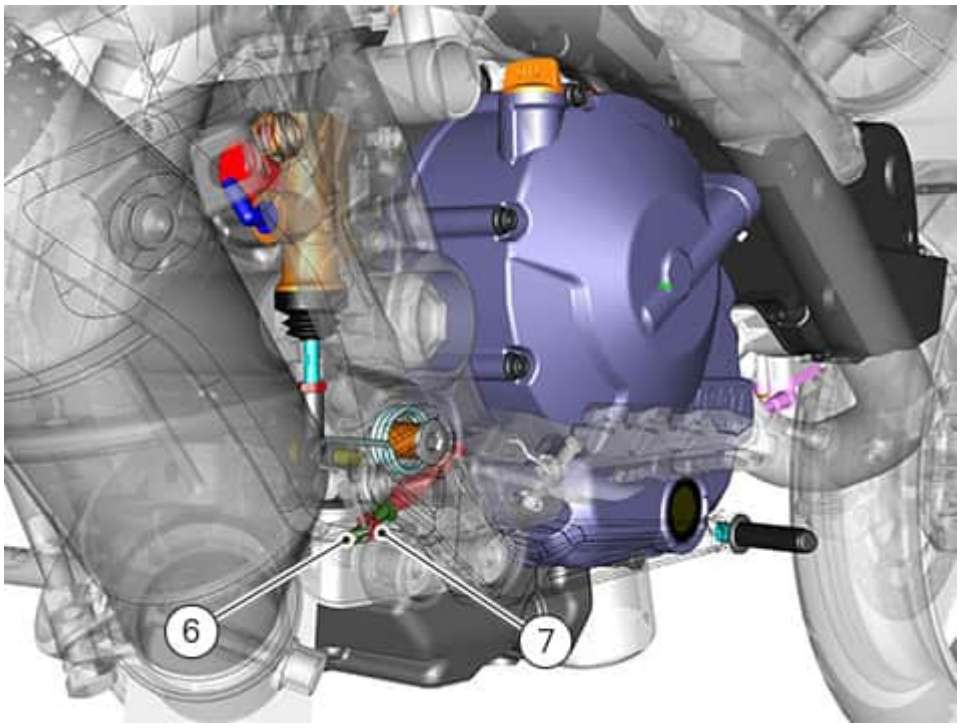
Gear change pedal

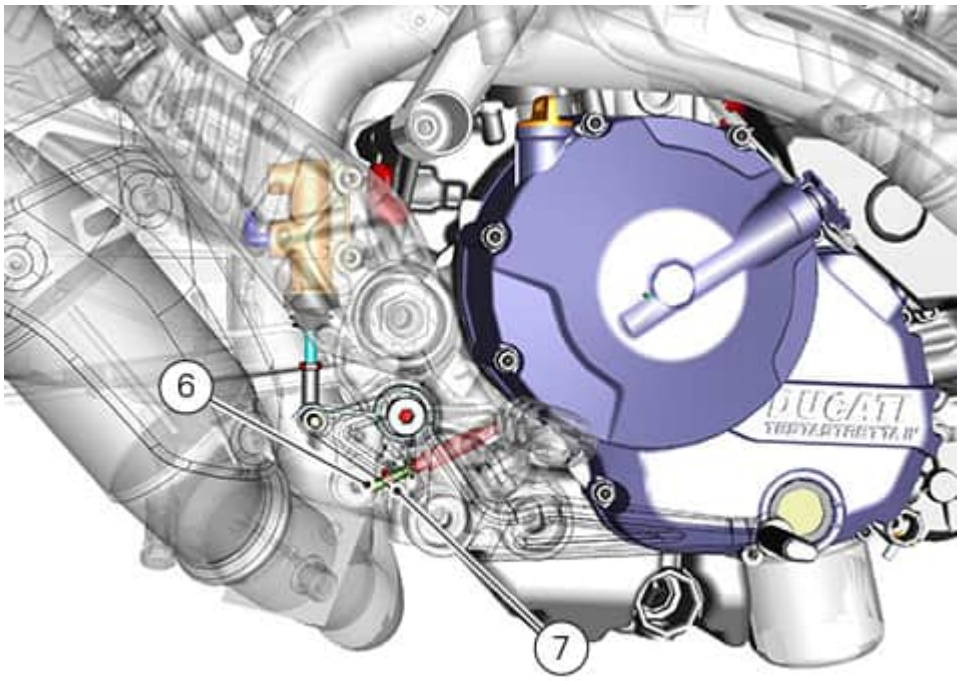
Use an open ended spanner to hold the spherical end on the rod (1) on the flat (2) and loosen the counter nut (3).
Turn the screw (4) to detach the rod completely from the gear change lever.
Turn the rod (5), until the gear change pedal is set to the desired position.
Fix the gearbox lever to the rod (5) by tightening screw (4) to 8 Nm ± 10% after having applied the specified threadlocker.
Tighten lock nut (3) onto the spherical end (1).



To adjust the position of the rear brake pedal, proceed as follows.
Loosen check nut (7).
Turn pedal travel adjusting screw (6) until pedal is in the desired position.
Tighten lock nut (7) to 5 Nm ±10%.
Verify, by acting manually on the pedal, that there is a play of about 1.5 ÷2 mm before starting the braking operation.
If not, modify the length of the cylinder push-rod in the following mode.
Slacken off the check nut (10) on the cylinder pushrod.
Screw pushrod (8) into fork (9) to increase the free play, or screw it out to reduce it.
Tighten the lock nut (10) to 2.5 Nm ±10% and check play again.


10
8
9
6
7

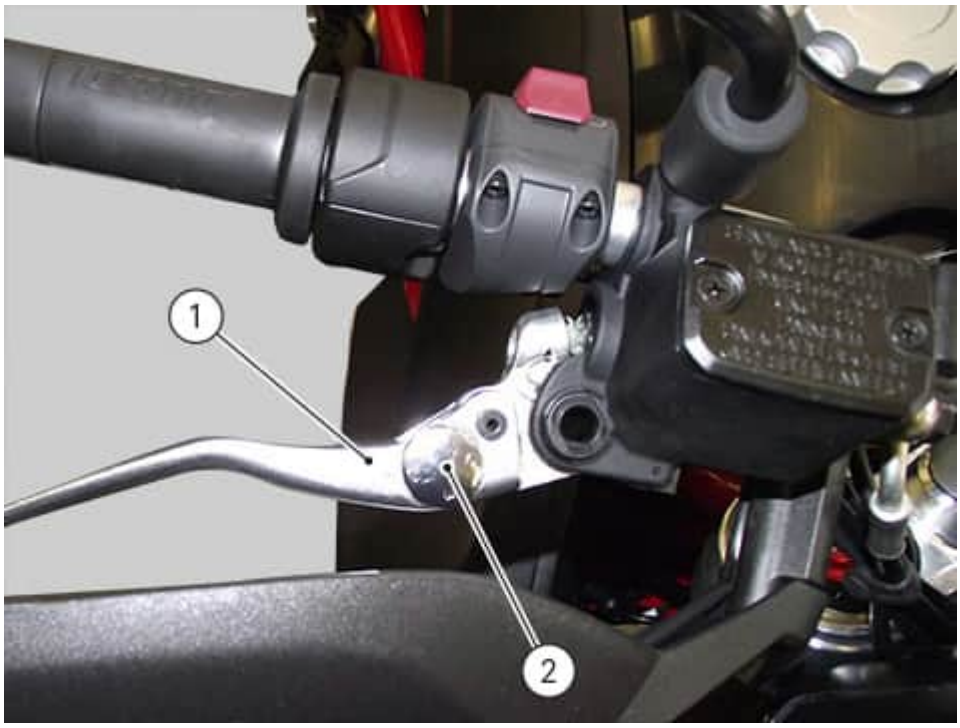

6
7


6
7

Front brake lever adjustment

Pull in the lever (1) towards the twistgrip to operate the front brake. The system is hydraulically operated and you just need to pull the lever gently.
The brake lever has a wheel (2) for adjusting the distance between lever and twistgrip on the handlebar. To adjust it, keep lever (4) fully extended and turn knob (5) in one of the four positions.
Position no. 1 corresponds to the max. distance between lever and knob, while position no. 4 corresponds to the min. distance.

Warning
Set front brake lever when motorcycle is stopped.



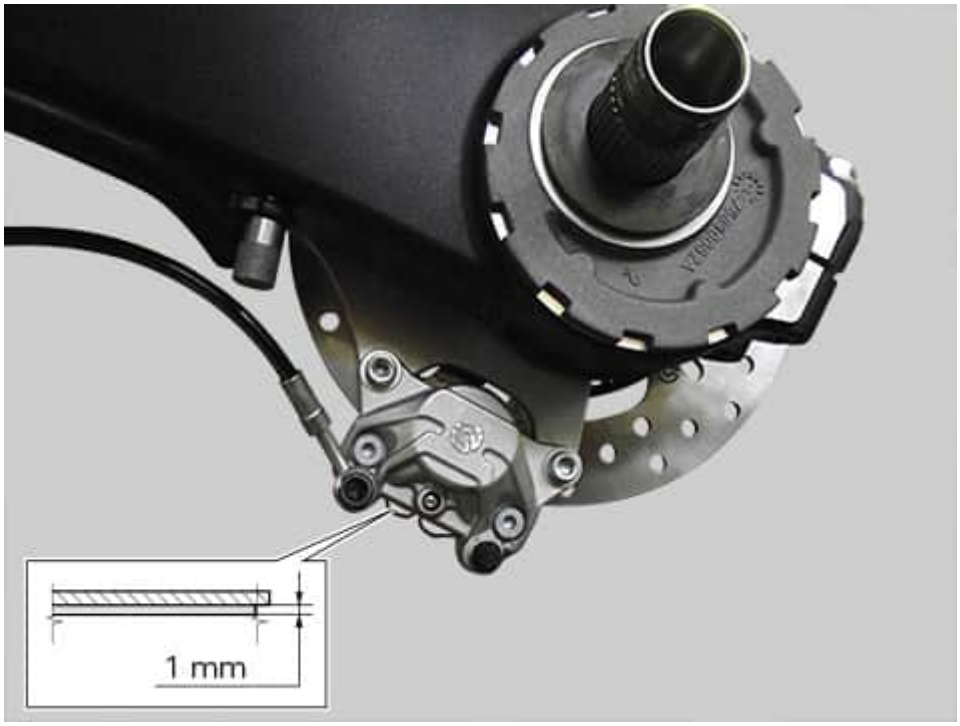
Checking brake pad wear and replacing rear brake pads

Warning
Brake fluid is corrosive and will damage paint. Avoid contact with eyes and skin. In case of accidental contact, wash thoroughly with water.

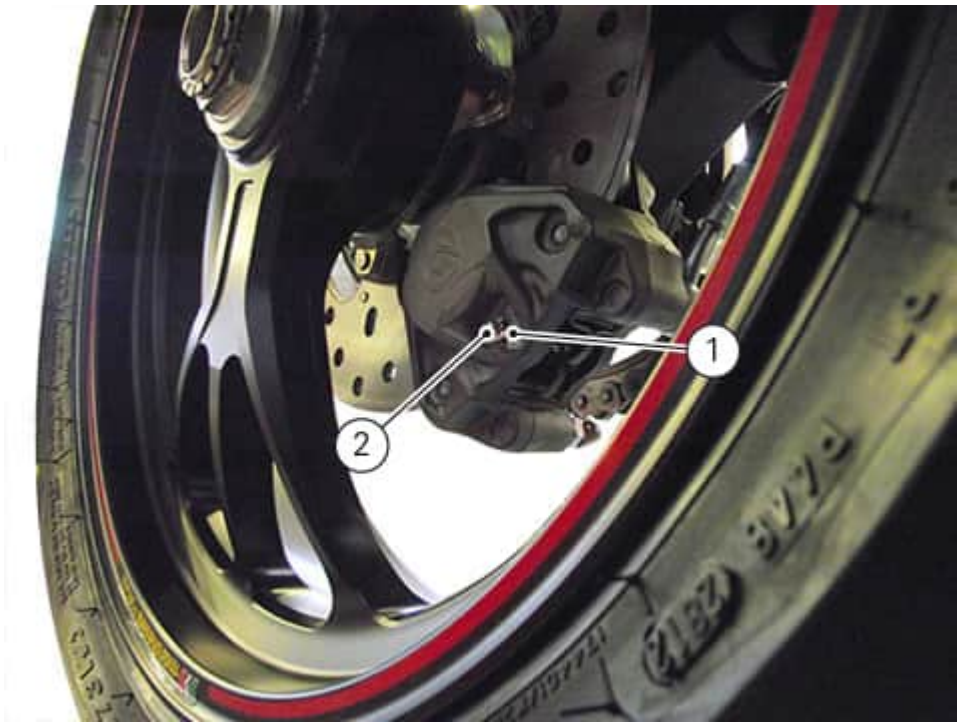
Important
On handing over the motorcycle after changing the brake pads, inform the Customer that the front brake must be used gently for the first 100 km to allow the pads to bed in completely.

Check through the slot between the two half callipers that there is at least 1 mm of friction material on the pads.

Important
Change both pads even if just one of them is worn.



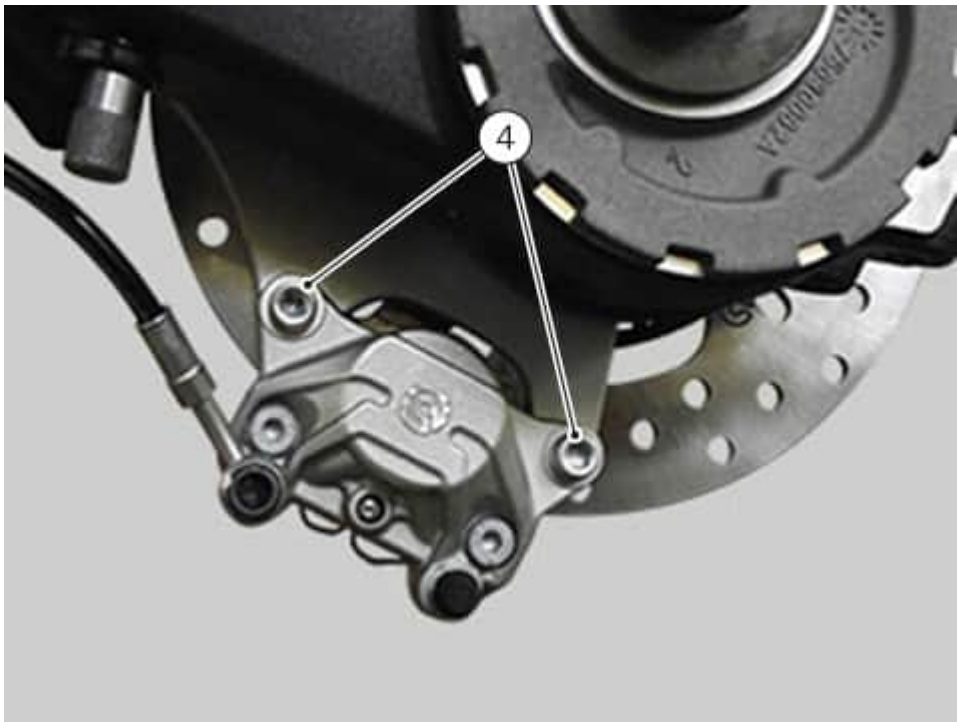
Change the brake pads as follows.
Remove the snap ring (1) from the pad retaining pin (2).



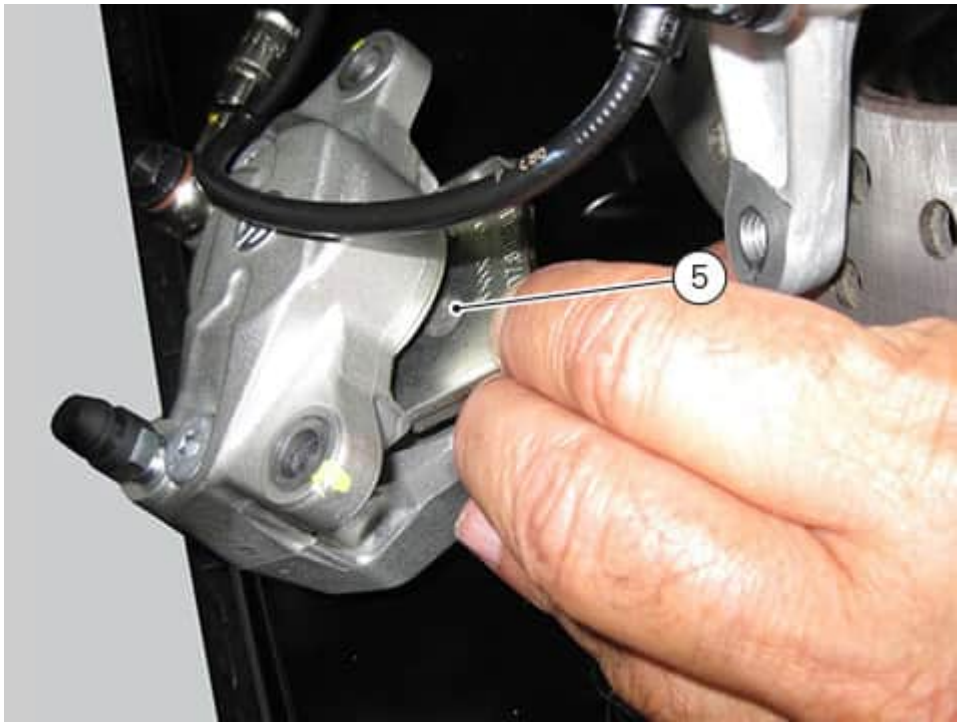
The split pin is on calliper inner side. Withdraw the brake pad retaining pin (2) and pull it out. Remove the clip (3) from between the two calliper halves.



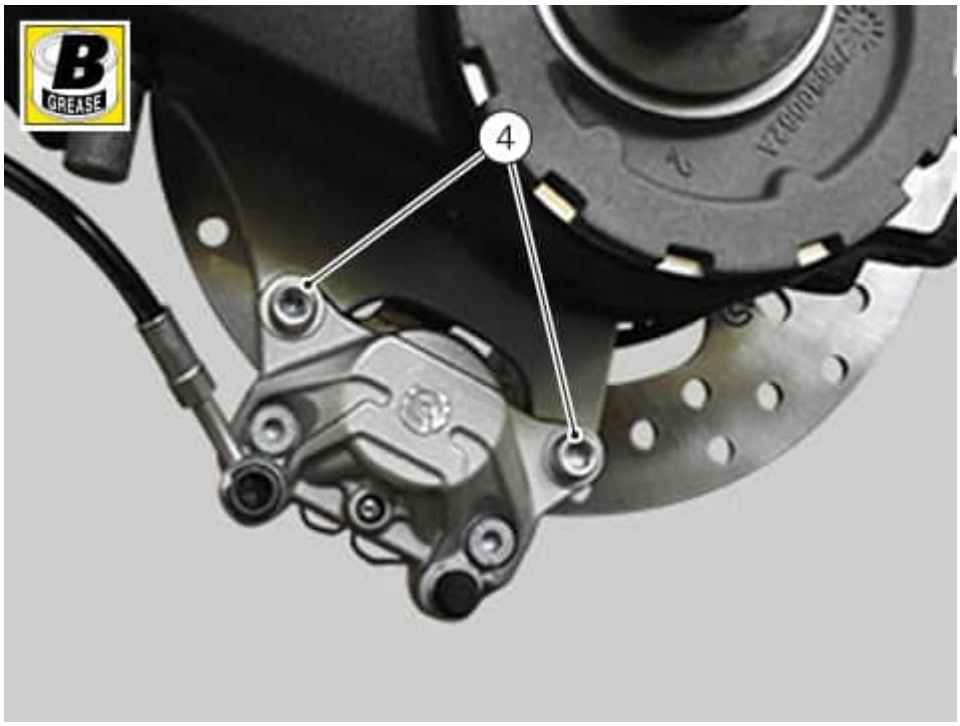
Remove the rear brake calliper by unscrewing the screws (4).



Force the brake pads apart to push the calliper pistons into their seats.
Remove the worn pads (5).

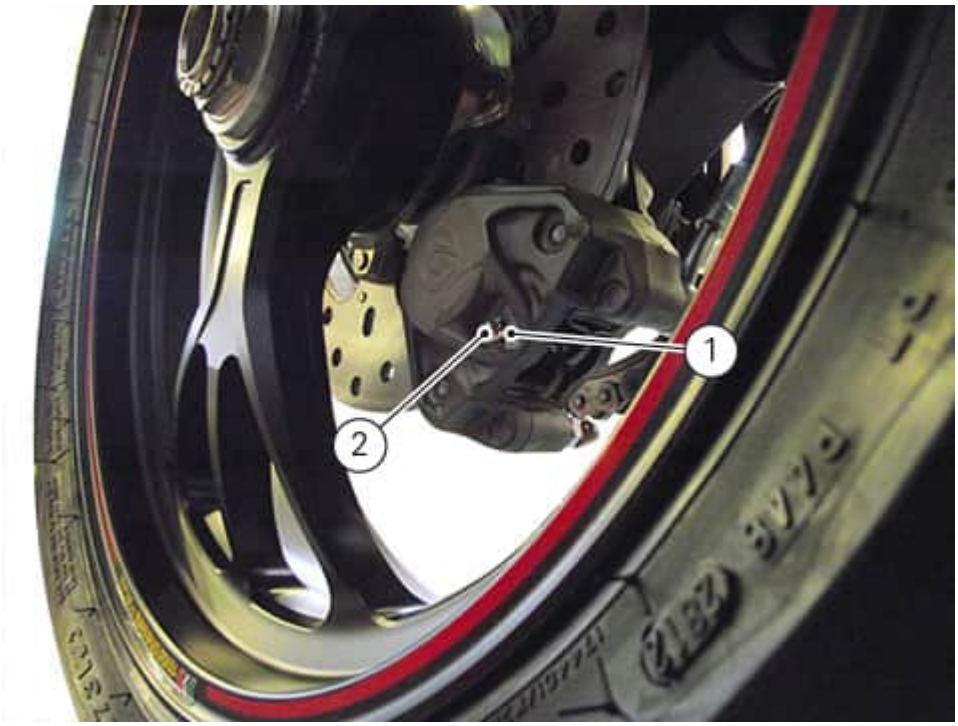


Fit the new pads.
Refit rear brake calliper stating and tightening screws (4) to 25 Nm ±5% after having applied the specified threadlocker.



Insert pad retaining spring clip (3) and centring pin (2), locking it in place with ring (1).





Operate the brake pedal repeatedly so that the pads are bedded in against the disc by the force of the brake fluid.



Check that the brake fluid level in the tank is between the MIN and MAX marks. If this is not the case, unscrew the tank cap (6) and top it up.



Being the brake callipers a safety component of the engine, follow instructions indicated in Section "Removing the rear brake control" and upon reassembly tighten the rear brake calliper retaining screws (4) to 25 Nm ±5%.

Checking brake pad wear and replacing front brake pads

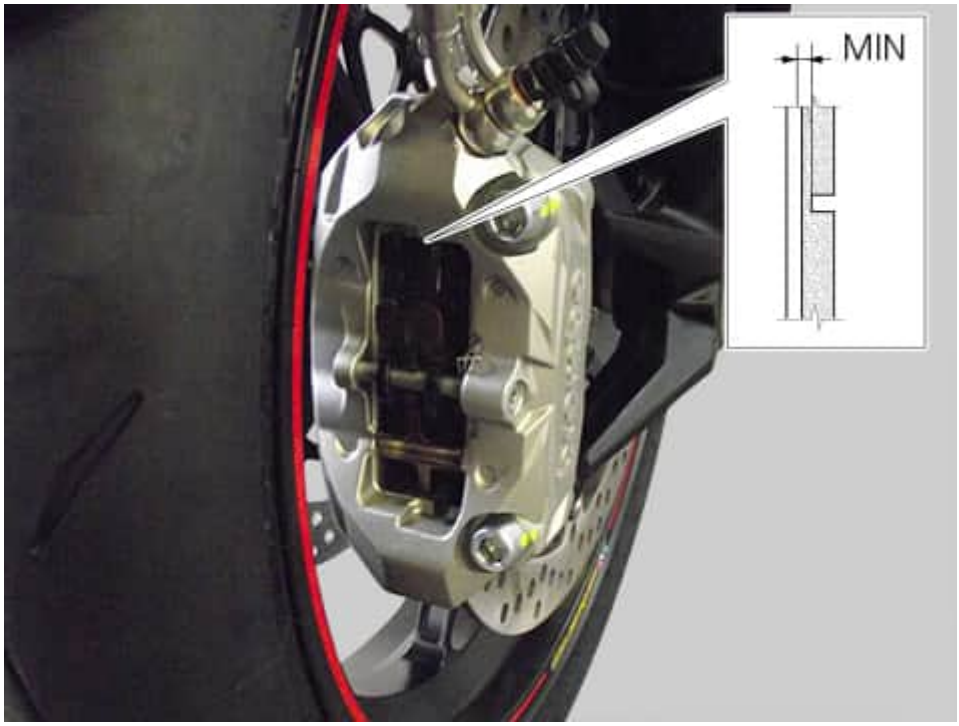
Warning
Brake fluid is corrosive and will damage paint. Avoid contact with eyes and skin. In case of accidental contact, wash thoroughly with water.

Important
On handing over the motorcycle after changing the brake pads, inform the Customer that the front brake must be used gently for the first 100 km to allow the pads to bed in completely.

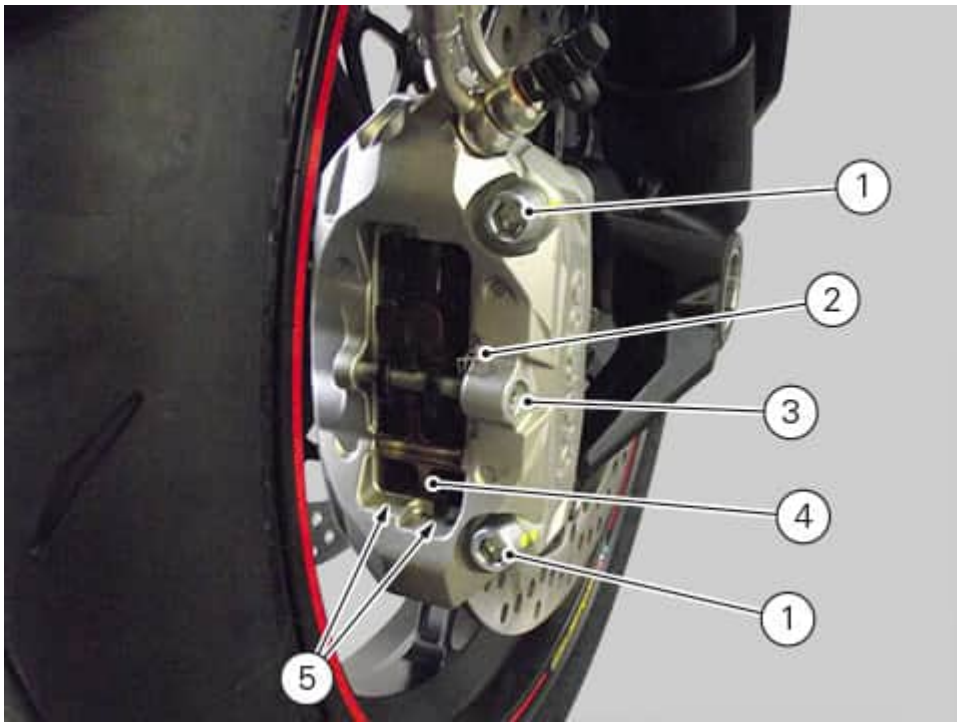
Look through the slot in the calliper to make sure the groove in the brake pad friction material (1) is still visible.

Important
Change both pads even if just one of them is worn.

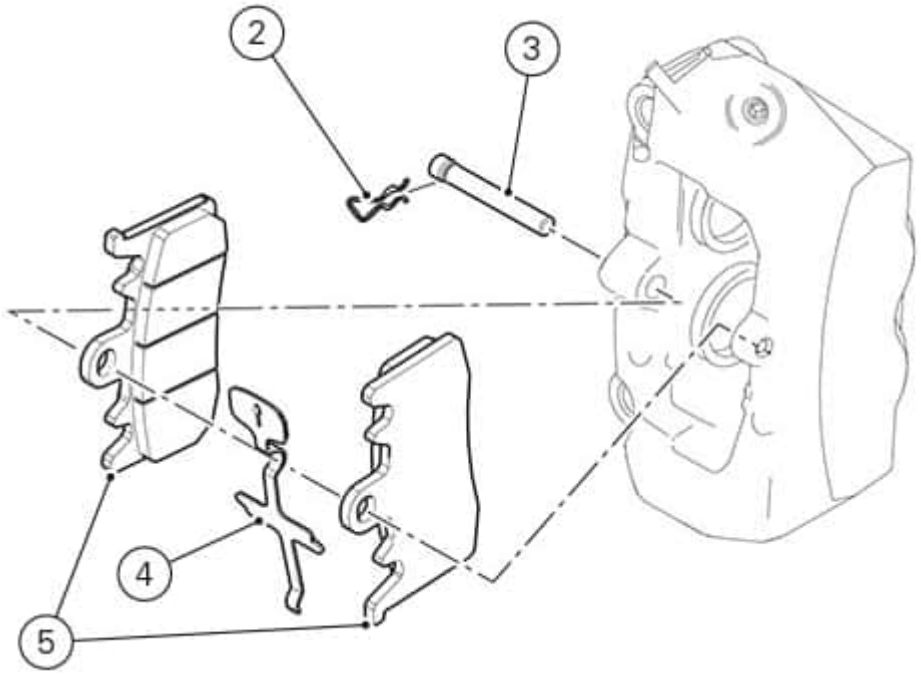
Note
Work in the same way on both front brake callipers.



Loosen the two screws (1) and remove the calliper from the disc.
Remove the safety cotter pin (2).
Turn pin (3) counter-clockwise.
Recover spring (4).

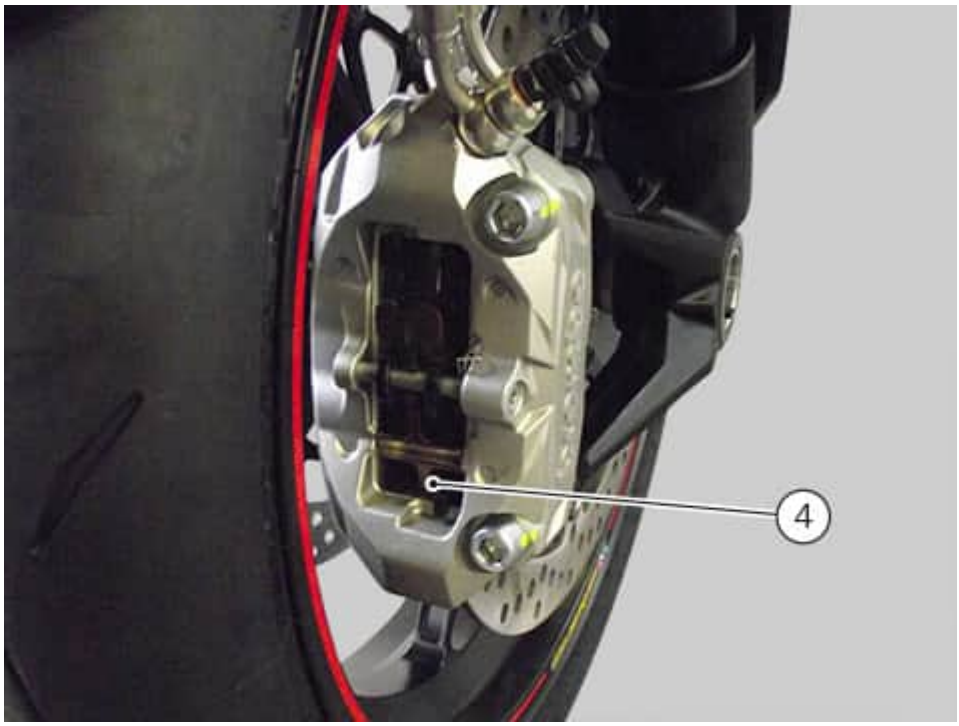


Force the calliper pistons back into their seats by forcing the old brake pads apart.
Remove the worn pads (5).

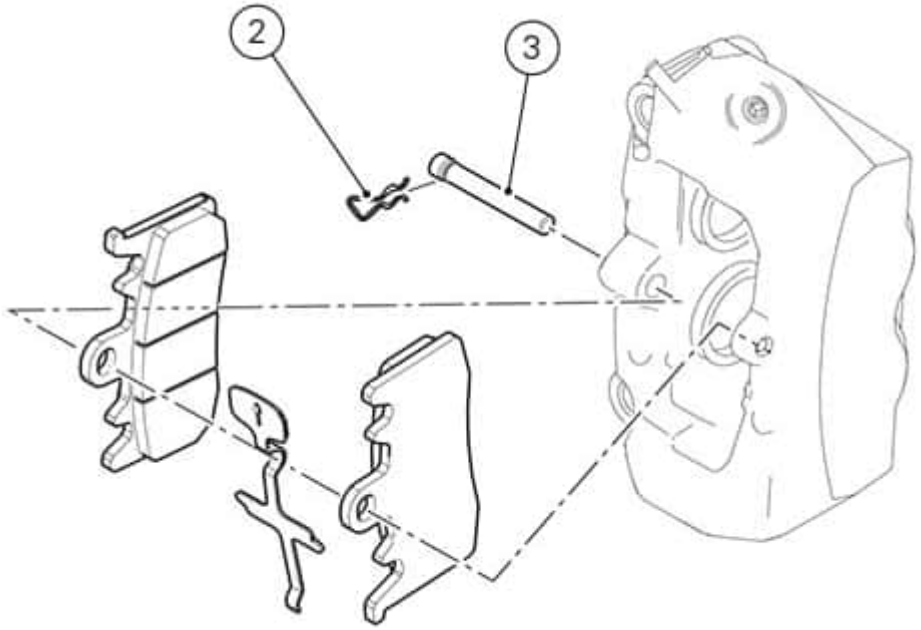


Note
Change pads that have a shiny or "vitrified" appearance.

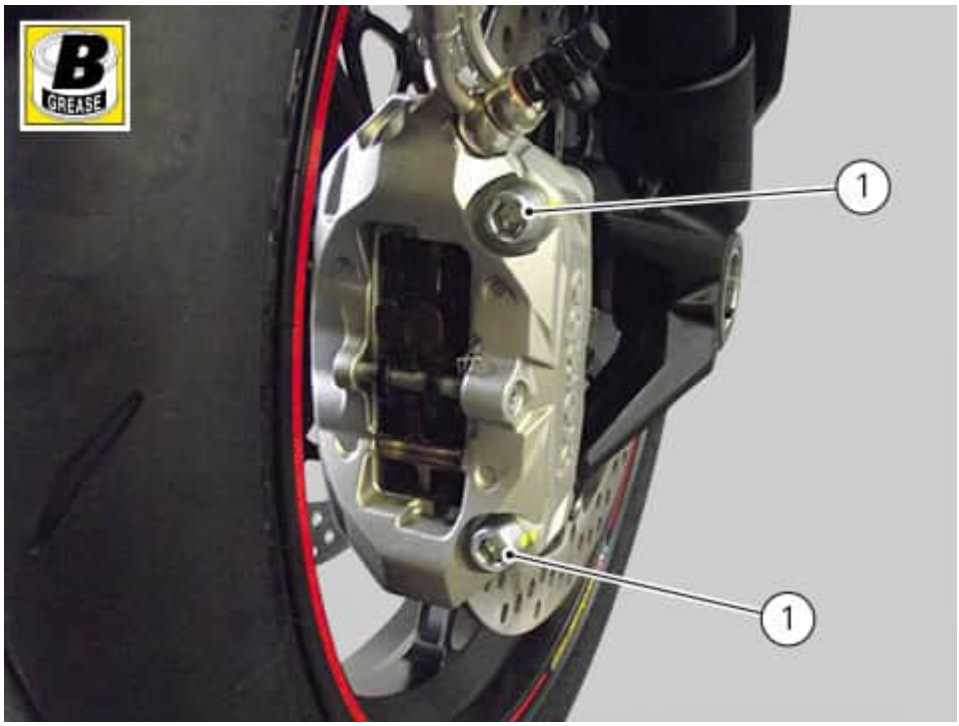
Fit the new pads and the relevant spring (4) as shown.



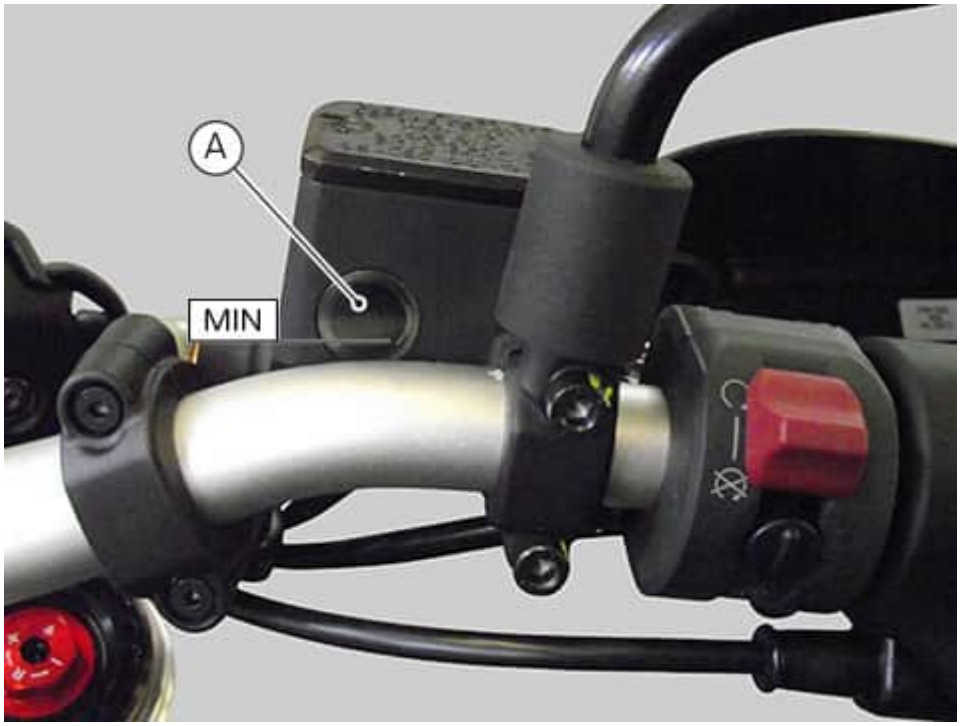
Fit pad retaining pin (3) and fix it with safety cotter pin (2).



Tighten retaining screws (1) to 25 Nm ±5%.



Turn the pad retaining pin (3) counter clockwise.
Operate the brake lever repeatedly so that the pads are firmly bedded in against the disc by the force of the brake fluid.
Check that through the sight glass (A) that the level in the master cylinder tank is not below the MIN mark.
If necessary, top up as follows.



Turn the handlebar so that the reservoir is levelled.
Remove cover (6) with membrane from the front brake fluid reservoir (7) by loosening screws (8).
Top-up with specified fluid until reaching the Max. mark.

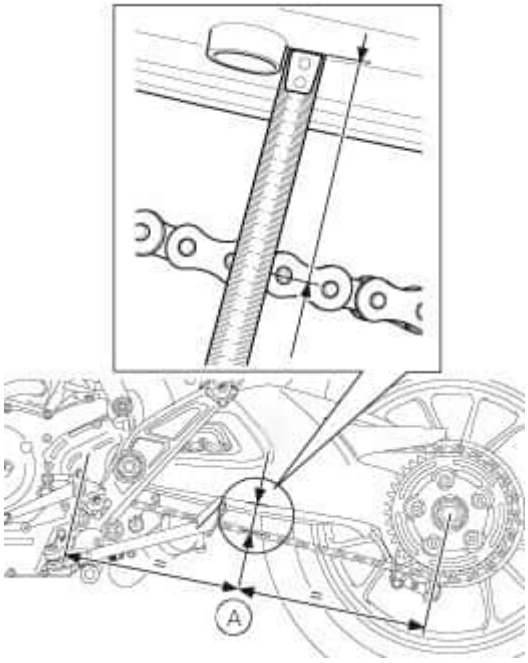


Being the brake callipers a safety component of the engine, follow instructions indicated in Section "Removing the front brake system".

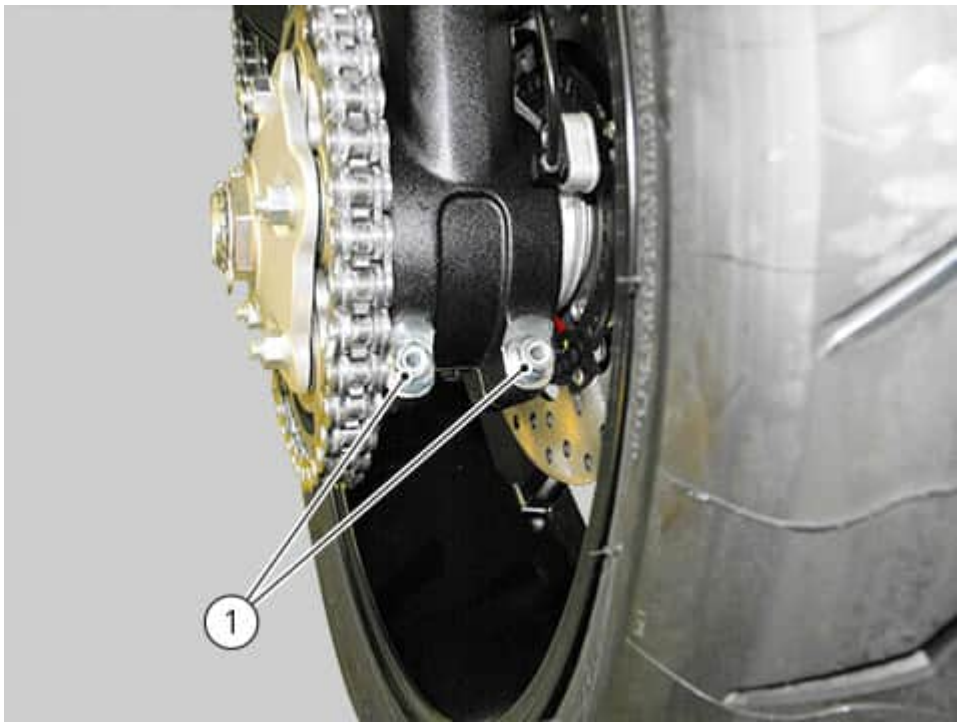
Adjusting the chain tension

Move the bike slowly so as to find the position where chain upper section is more tensioned.
Raise bike on side stand.
With the motorcycle on its side stand, measure chain tension as follows: press with a finger in the centre of the bottom run of the chain, release it and measure the distance between the centre of chain link pins and the swingarm aluminium part.
Value (A) must be:

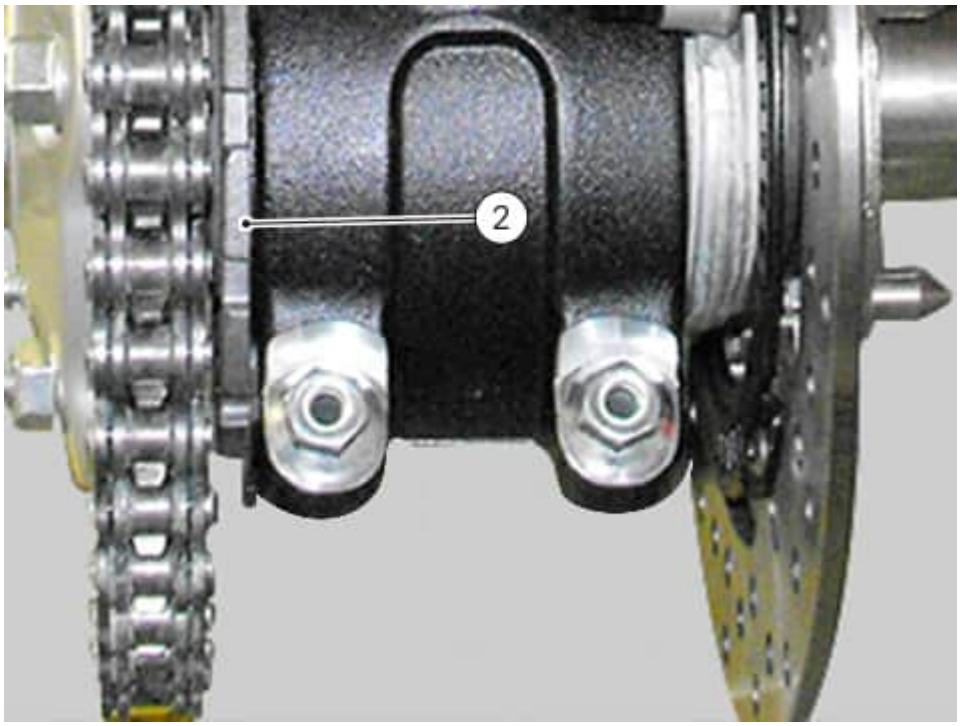
- (72 ÷ 74) mm (BASE version)
- (72 ÷ 74) mm (SP version)
- (59 ÷ 61) mm (HYPERSTRADA version)
- (57 ÷ 59) mm (HYPERSTRADA version with LOW SEAT)



Slacken off the two screws (1) that secure the rear wheel hub to the swingarm.



Fit the pin wrench (A) part no. **88713.1038** inserting its tooth in the eccentric hub (2).
Rotate the eccentric hub (2) to obtain the correct chain tension.
Turn counter clockwise to tighten the chain; clockwise to loosen (from chain side view).



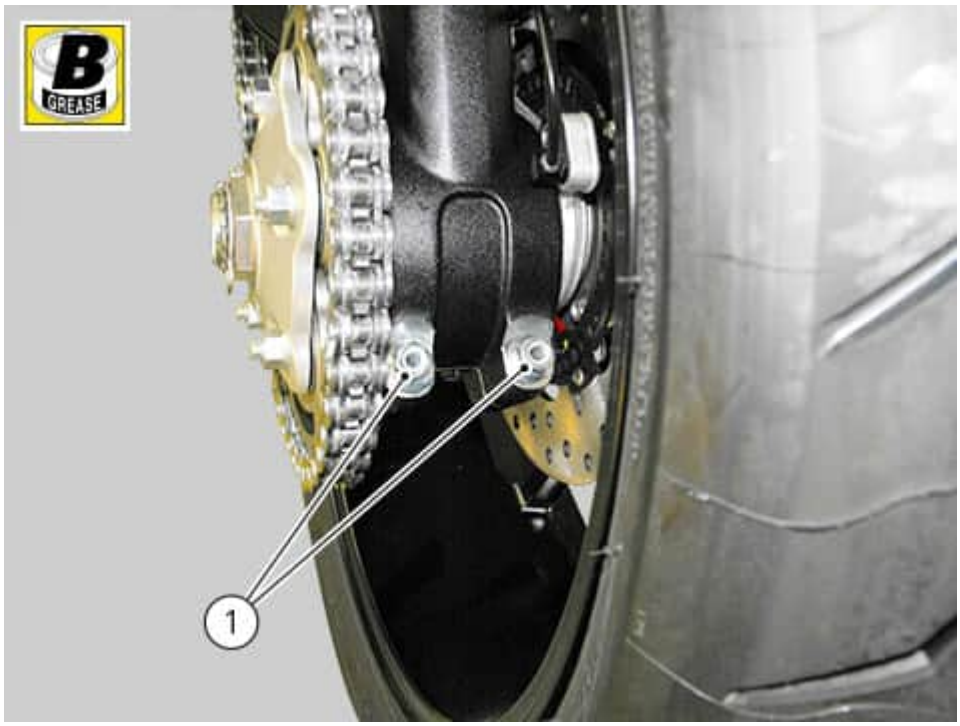
Important

An incorrectly tensioned chain will lead to early wear of the transmission components.

If screws (1) are removed, smear under head and thread with the recommended grease, then, tighten them to a torque of 31 Nm ±5%, following the sequence 1-2-1.

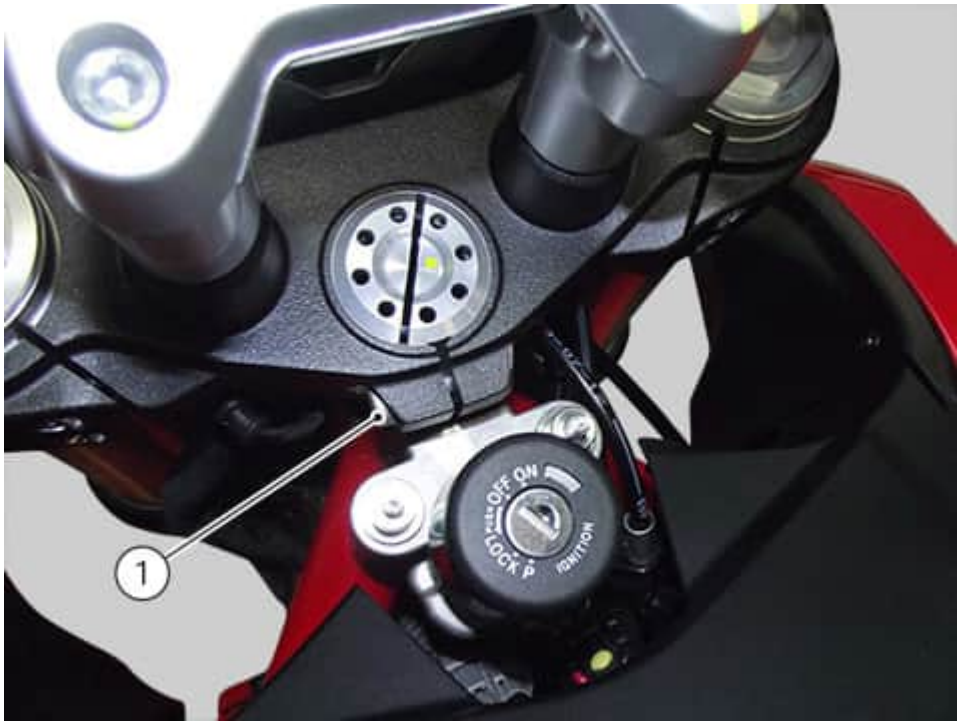
Warning

Correct tightening of swinging arm screws (1) is critical to rider and passenger safety.

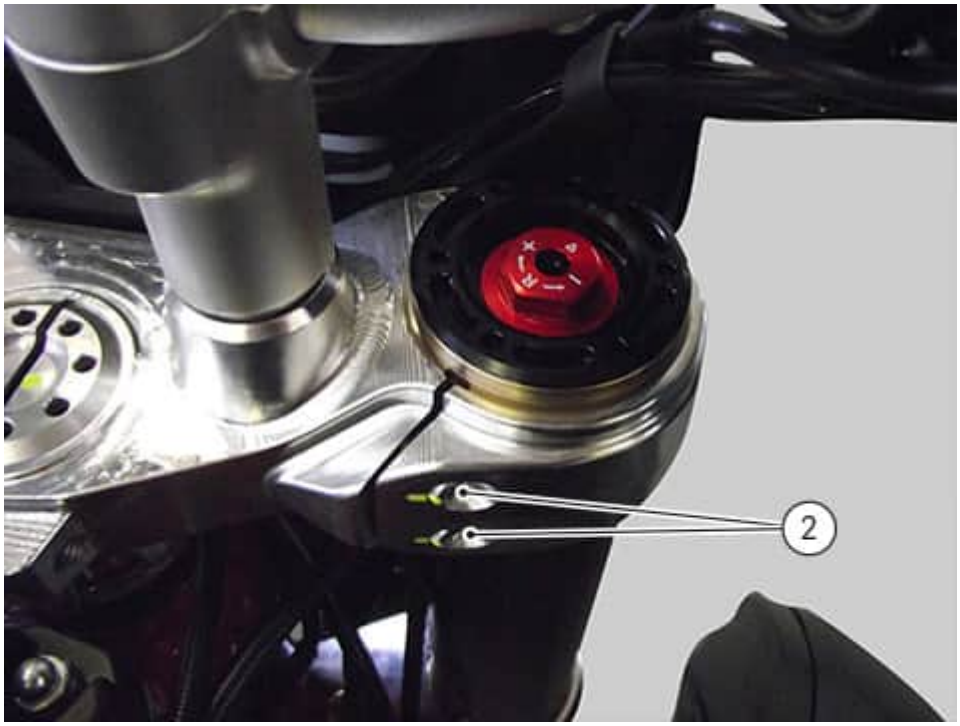


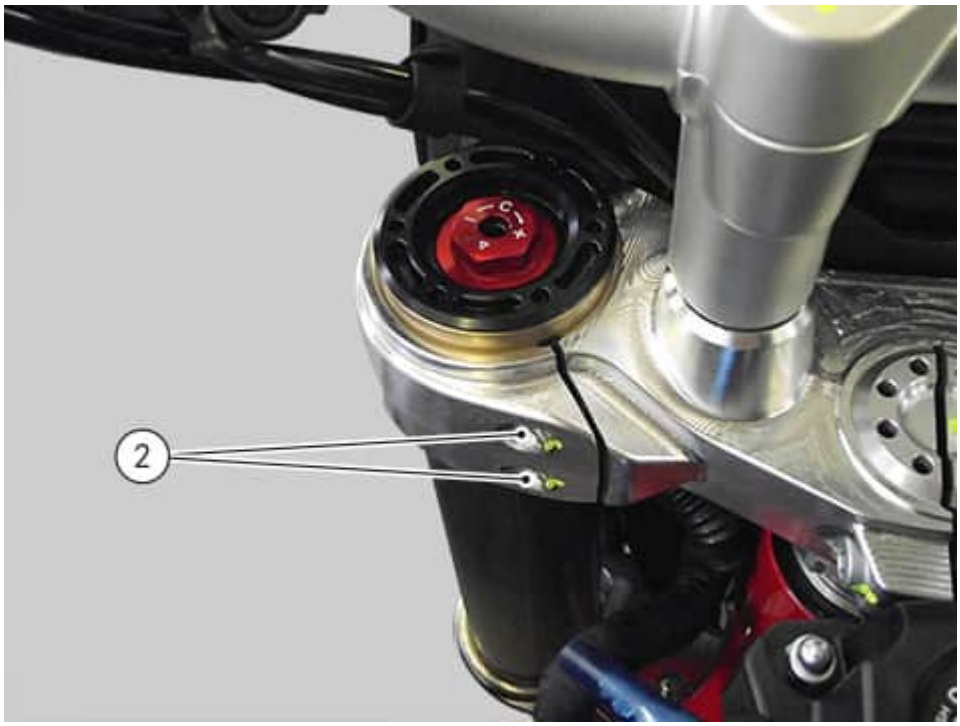
Adjusting the steering head bearing play

Excessive handlebar play or shaking forks in the steering head indicate that the play in the steering head bearings requires adjustment. Proceed as follows:
Loosen the clamp screw (1) that holds the steering tube to the steering head.

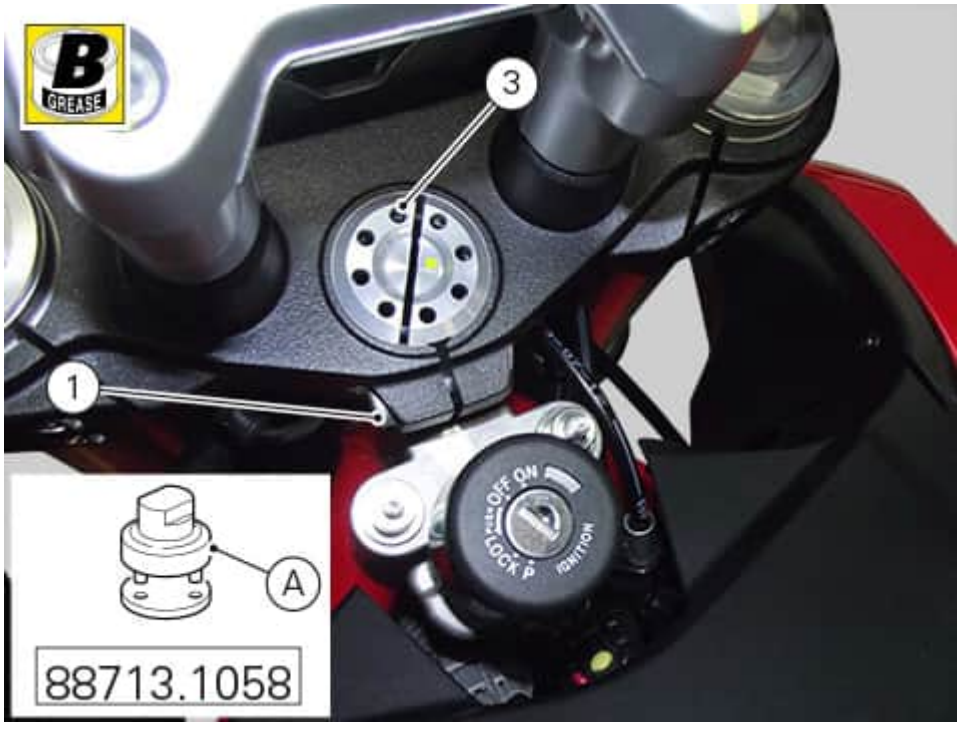


Slacken the clamp screws (2) securing the steering head to both fork legs.





Using a suitable wrench (A) part no. **88713.1058** tighten ring nut (3) to 30 Nm ±5% after having applied specified grease.
Push steering head fully against ring nut (3) and tighten screw (1) to 18 Nm ±5% and screw (2) (in the sequence (1-2-1) to 10 Nm ±5% after having applied the specified grease on all screws.



Clutch control cable adjustment

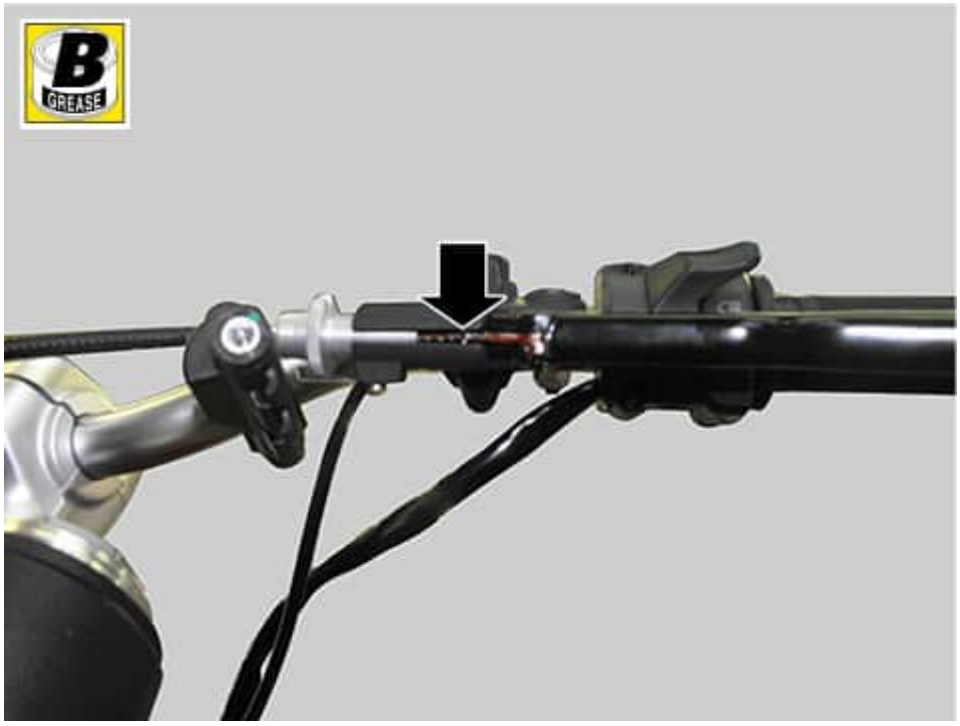
Warning
A wrong adjustment can seriously affect the clutch operation and duration.

A worn clutch makes its cable tension. Check the free play with cold engine every time before using the vehicle.

Warning
Lever free play adjustment must be carried out with cold engine and with the motorcycle on its side stand and the handlebar fully turned to the right.

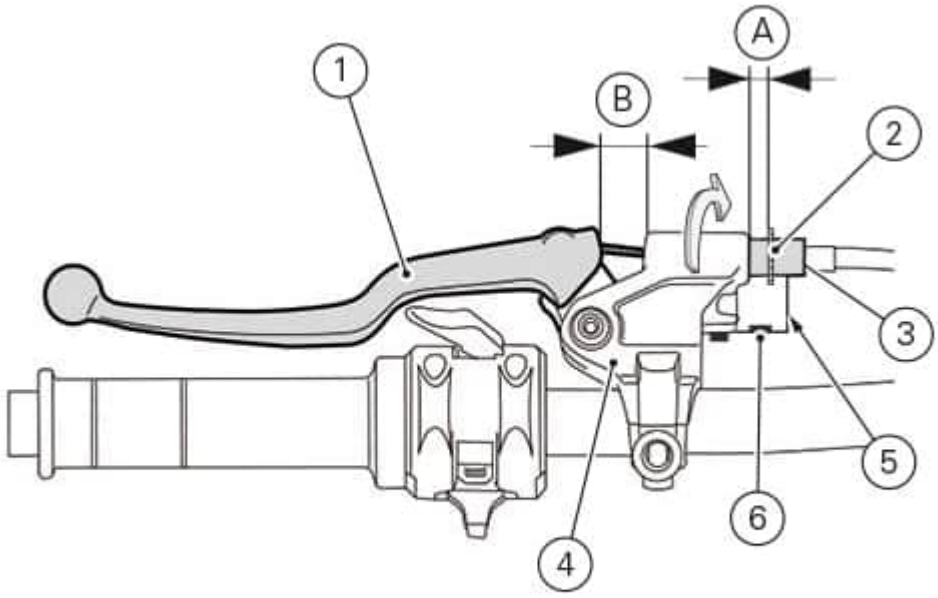
When pulling the clutch lever (1) you must clearly feel the passage from a low to a considerably higher resistance (operating force).
The resistance force in the lever free play is very low.

Before positioning the pawl in its seat, lubricate the cable with specified grease.



Check the position of ring nut (2) and adjuster (3): ting nut (2) must be at least 5 mm (A) from the lever rotation plate (4) and must not touch the edge (5) of the stop plate(6).

Move the lever for its free play and make sure distance "B" is between 2 mm and 3 mm.



Adjuster (3) located on the lever allows a maximum adjustment (C) of 11 mm, whereas the standard adjustment (the starting one) is of 5 mm.

Attention

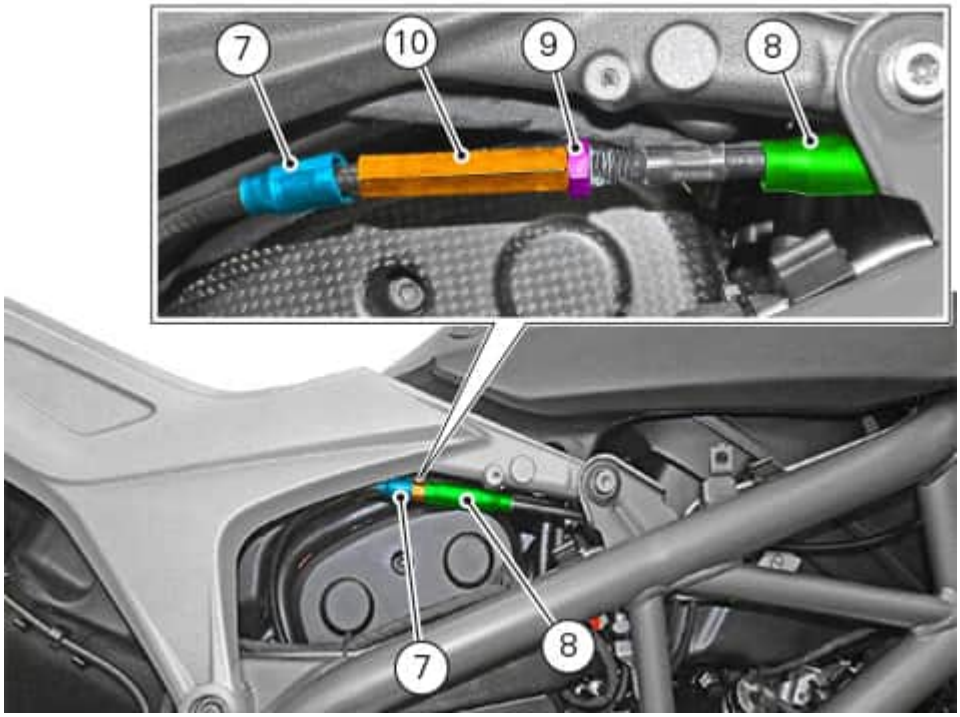
Should the clutch slip due to its wear, the adjuster on the lever MUST NOT be loosened but screwed as described above.

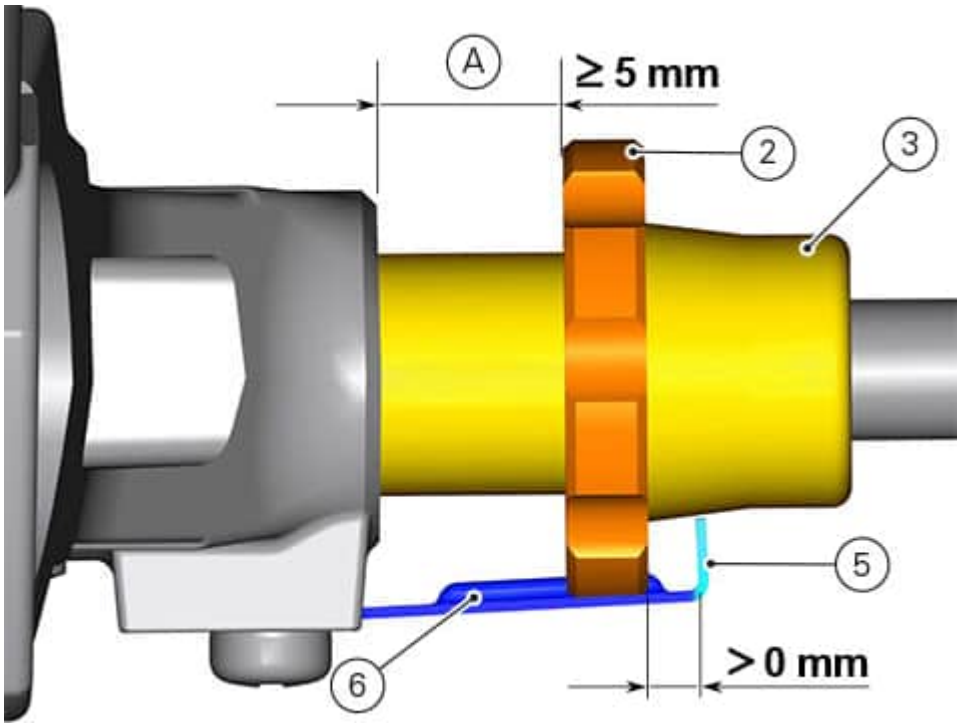


If the conditions above are not met, proceed as follows:
remove the protective caps (7) and (8) and loosen nut (9) of adjuster (10).

- To increase distance (A), first increase the free play by screwing adjuster (10) and then loosening adjuster (3).
- To decrease distance (A), first decrease the free play by loosening adjuster (10) and then screwing adjuster (3).

Tighten nut (9) to the specified torque by counter-holding adjuster (10) and then refit the protective caps (7) and (8).
Repeat all inspection procedures.


7
10
9
8
7
8

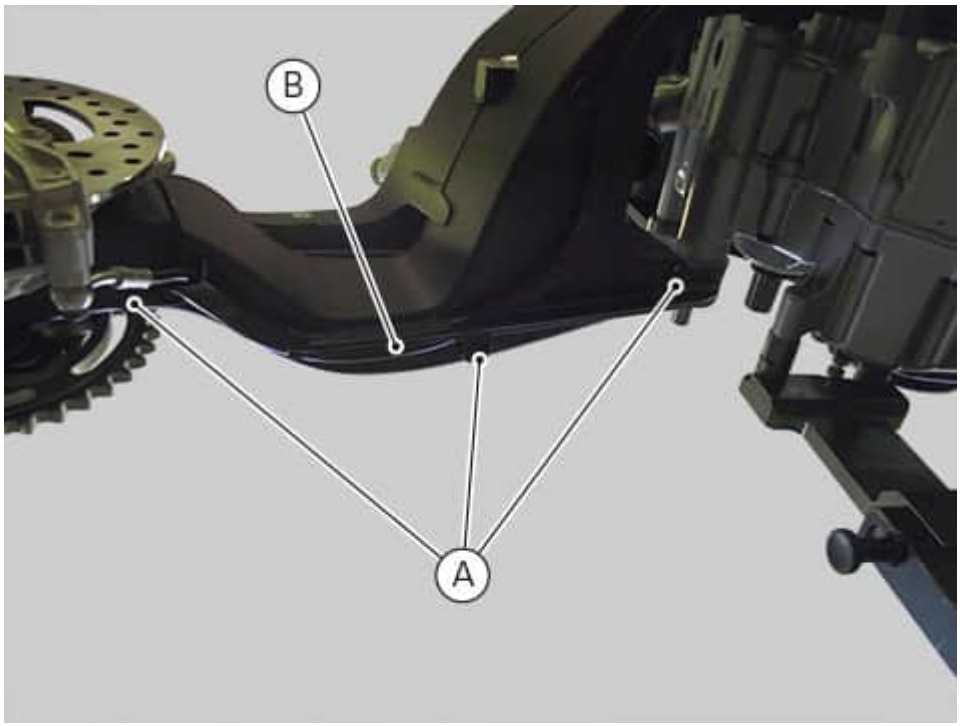

A
≥ 5 mm
2
3
5
6
> 0 mm

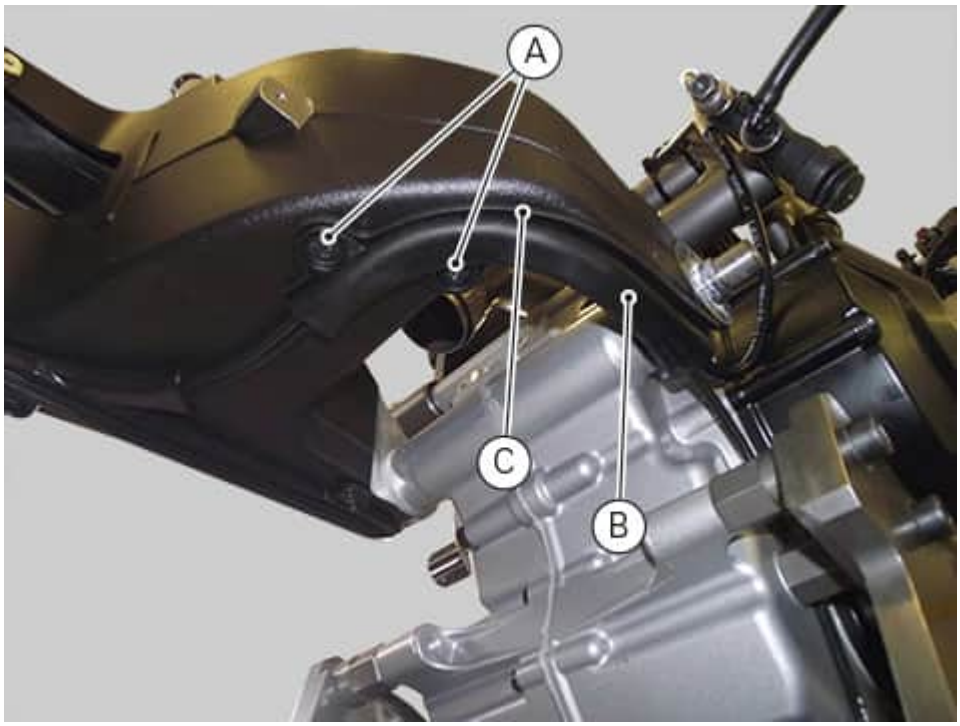
Changing the rear brake circuit fluid

Remove the rear brake calliper (1) by loosening screws (2).



Undo screws (A) and remove the two cable grommets (B) and the upper cable guide (C).





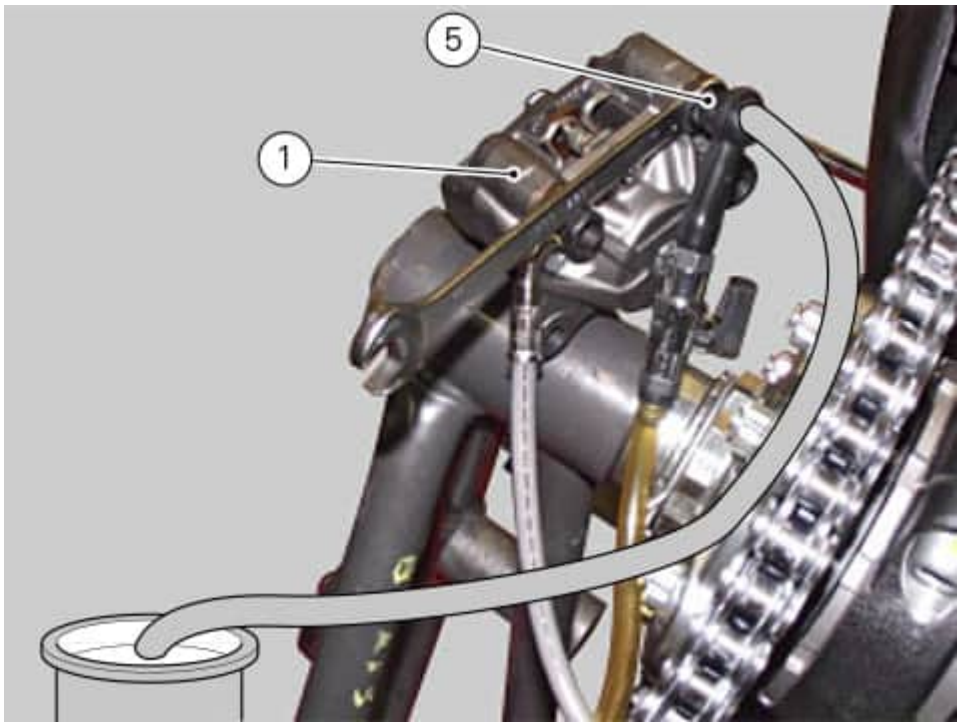
Unscrew plug (3) of the rear brake fluid reservoir (4).



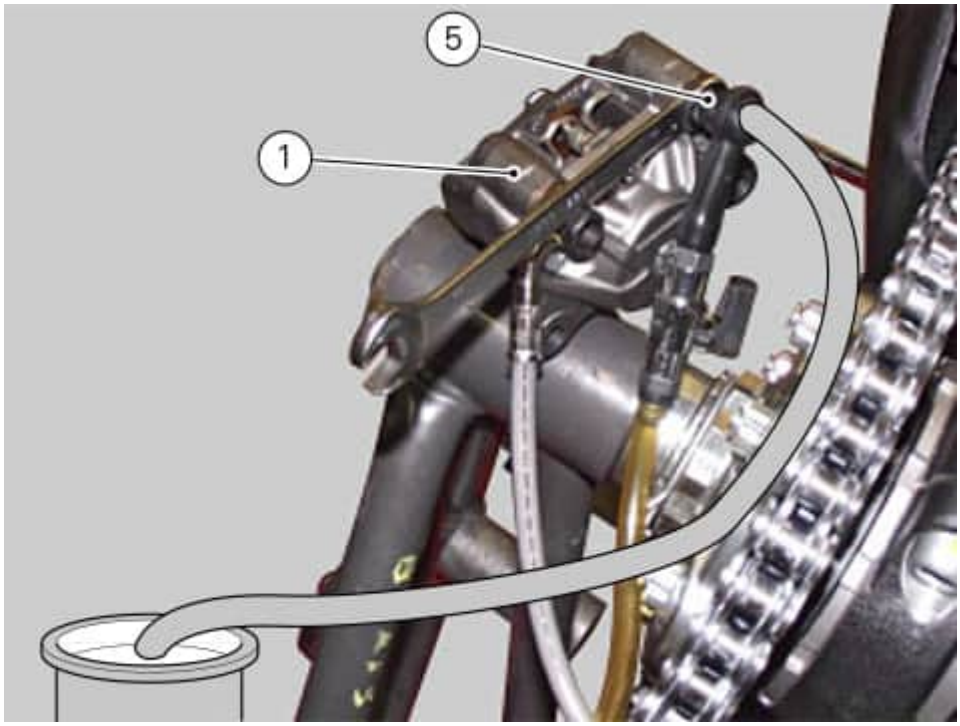
Rear brake calliper (1) shall be set as high as possible during the whole procedure (with drain plug facing upwards, as indicated in the figure).
Fit a shim of the same thickness as the disc between the rear brake calliper pads.
Connect a transparent tube to the bleed valve (5) and immerse the end in a container.

Warning
We recommend using a new container of SHELL ADVANCE BRAKE DOT4 fluid.

1 Press the brake pedal to pressurise the circuit.
2 Keep pedal depressed.
3 Loosen bleed valve (5) by 1/4 if a turn so as to allow fluid to come out and push the pedal all the way down.
4 Tighten the bleed valve again.
5 Release the brake lever and top up reservoir (4) until fluid level is between the "MIN" and "MAX" marks. During such operation always ensure that the fluid is above the minimum level in order to prevent air from entering the system from the reservoir.



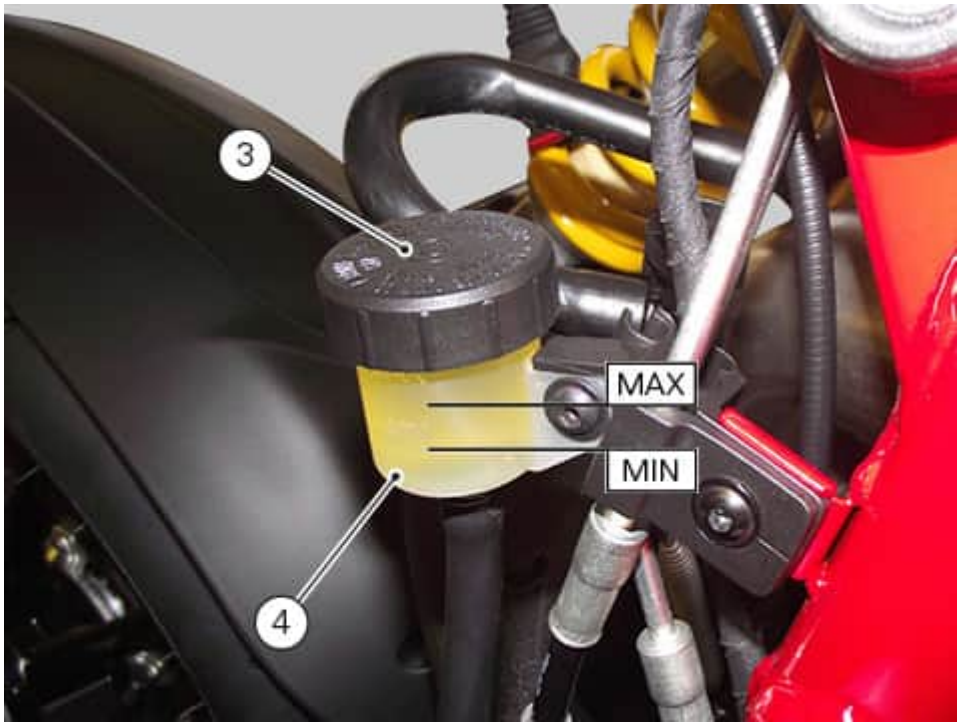
Repeat the operations from 1 to 5 until you see clean fluid with no impurities and air bobbles flowing out.
Tighten bleed valve (5) to a torque of 4 Nm ±10%.
Use absorbent paper to remove any fluid residue from the drain plug hole and after that, refit the rubber cover.
Move the calliper pistons completely back pushing onto the pads; then, top up the reservoir until the MAX fluid level is reached.
Remove the rear brake calliper shim.



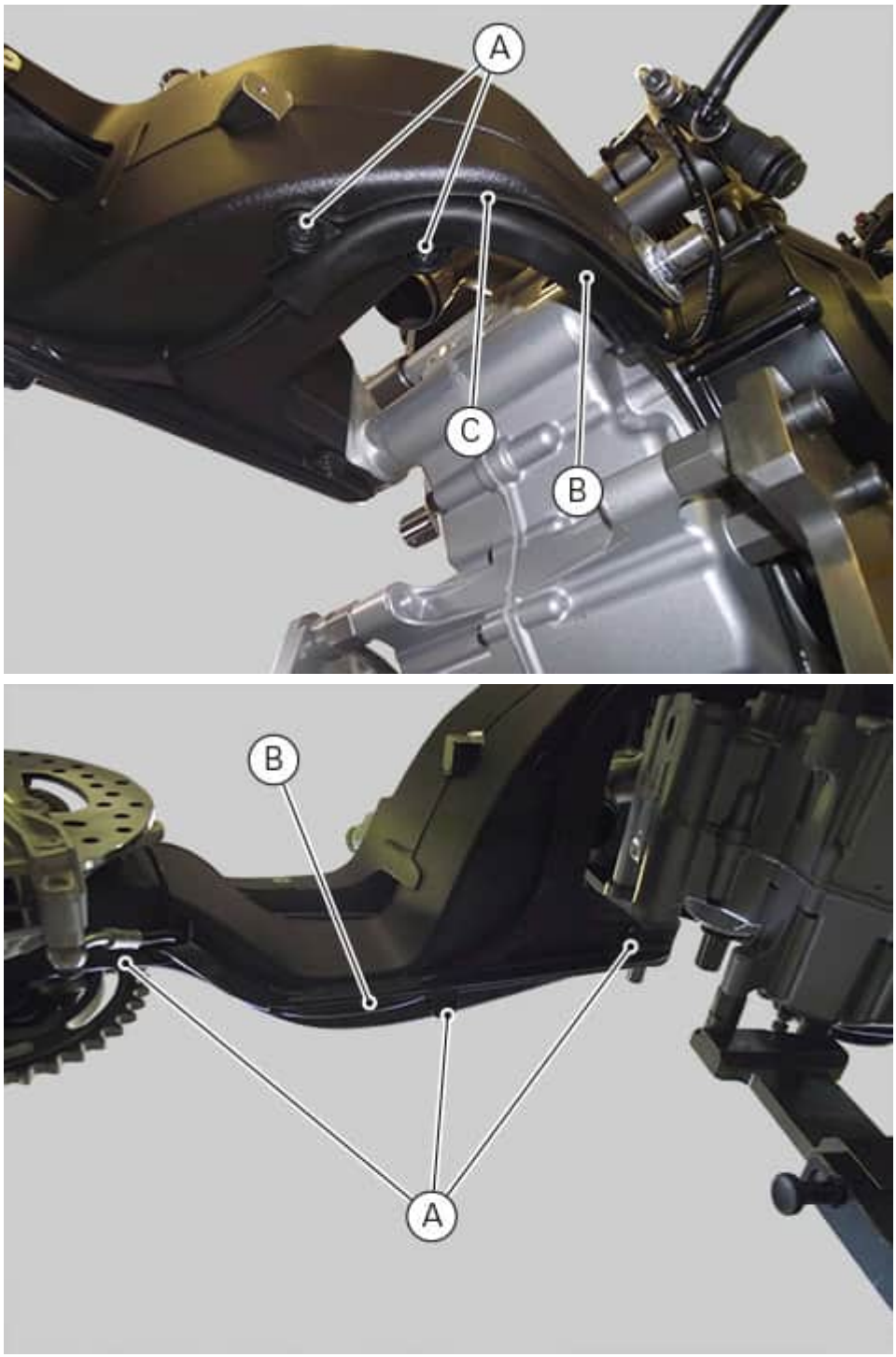
Apply the recommended threadlocker on the screws (2).
Insert the rear brake calliper on the brake disc, aligning it with the holes of the calliper holder plate. Then tighten screws (2) to 25 Nm ±5%.



Operate the brake lever repeatedly until the pads rest against the disc and make sure that the fluid level in the reservoir is between MIN and MAX marks; if not so, top up.
After removing the membrane from the plug and before fitting it again on the reservoir, clean it and dry with absorbent paper.
Tighten plug (3) of rear brake fluid reservoir (4).



Position the upper cable guide (C) and fix the two cable grommets (B) by tightening the five screws (A) with pre-applied threadlocker to a torque of 5 Nm ±10%.



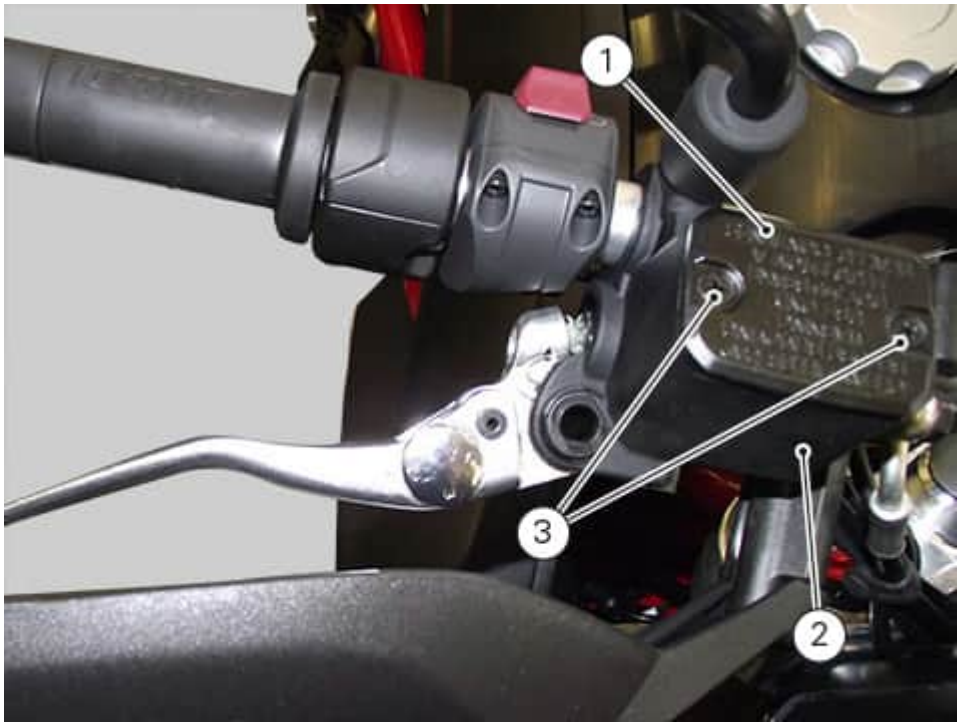
Test the motorcycle on the road at a speed of about 50 Km/h; activate the ABS 10 times at least, by operating the rear brake only.
Ensure that the rear brake lever stroke has not increased and if needed repeat the bleeding procedure.

Changing the fluid in the front brake circuit

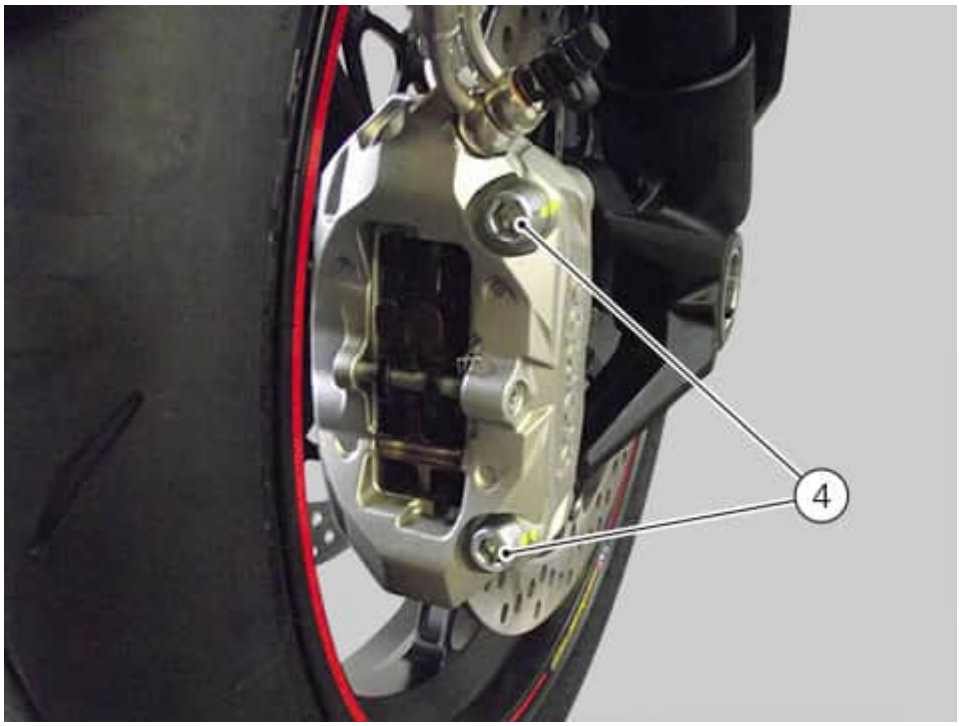
Warning

Brake fluid is corrosive and will damage paint. Avoid contact with eyes and skin. In case of accidental contact, wash thoroughly with water.

Remove cover (1) with the membrane from the front brake fluid reservoir (2) by loosening screws (3).
Siphon off the fluid from the reservoir (2).
Replace the membrane (without the plug) on the reservoir to avoid brake fluid splashes during the following operations.

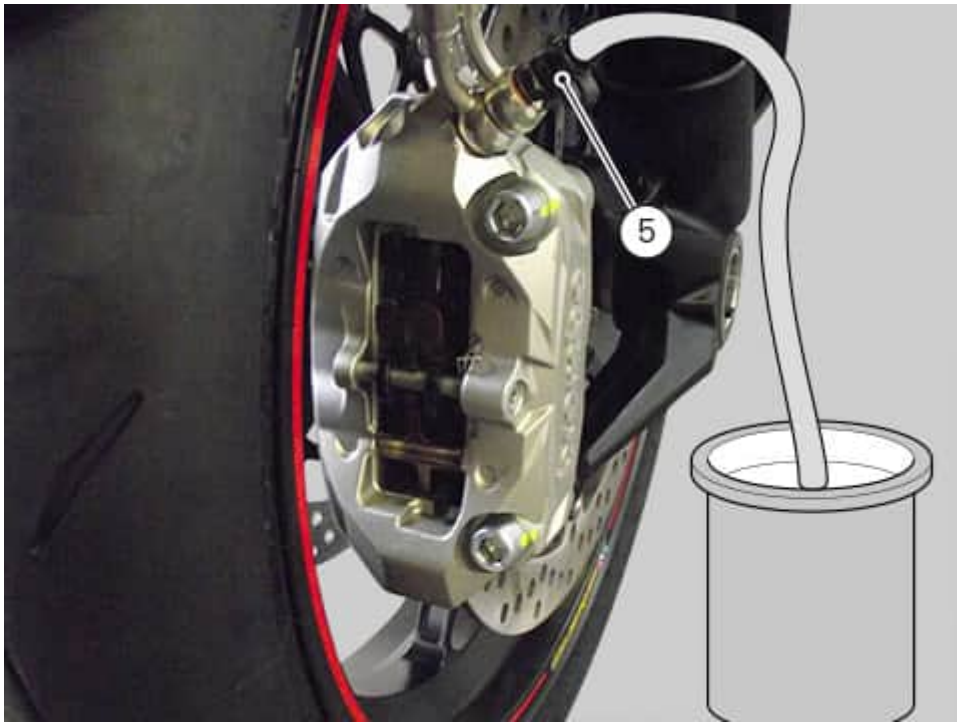


Move the brake callipers pistons back: to carry out this operation unscrew the fixing screws (4) of the callipers on the fork plates and push, by removing them from each other, both pads from every calliper; during this operation pay attention to the fluid level: fluid must always be sucked when it flows back in the reservoir.

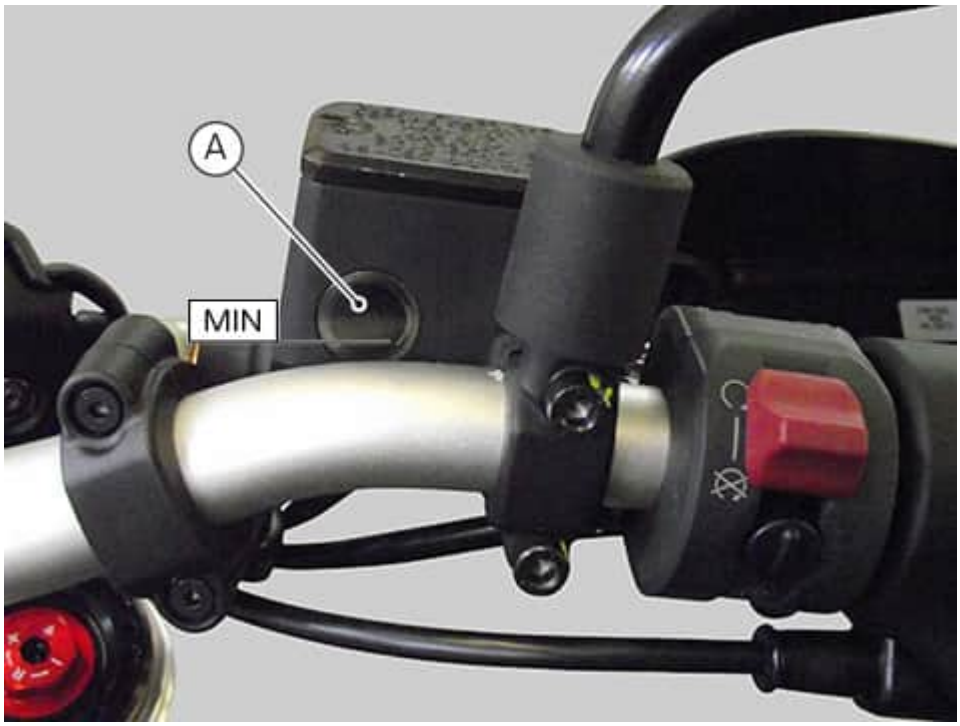




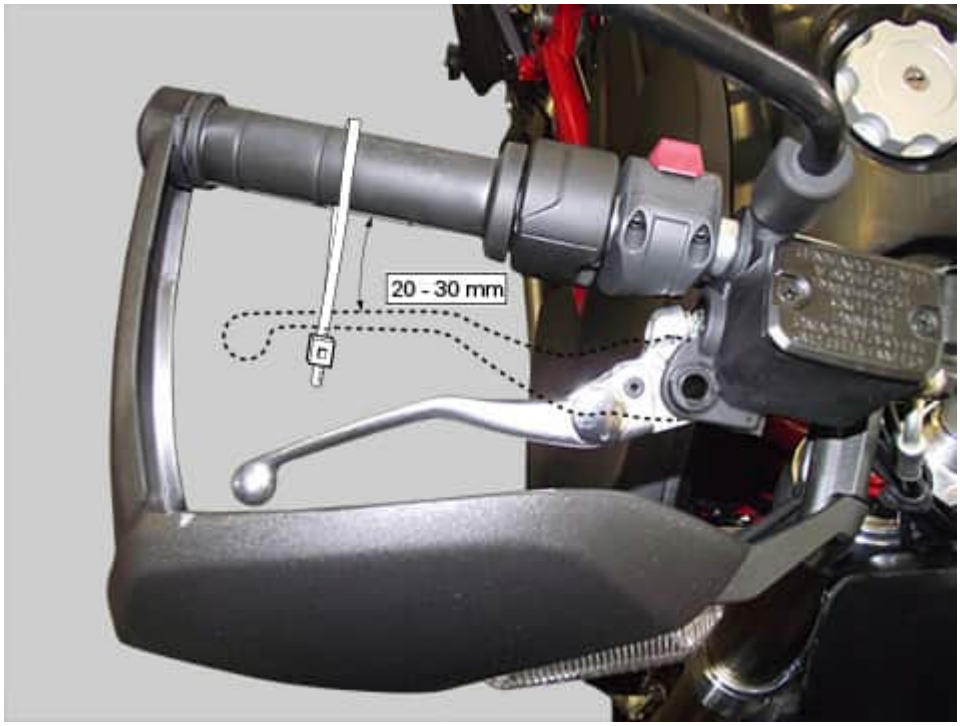
Once that all pistons of both callipers are fully moved back and that all the fluid in the tank has been aspirated, connect to the bleed valve (5) a transparent tube by immersing the end in a container placed on the floor.



Fill the reservoir (2) with new fluid until covering the sight glass (A).



Operate the lever to reach the 20 - 30 mm end of stroke and keep the lever in this position by using a non-elastic clamp.



Loosen the bleed valve of the left calliper (from the rider view) (5) and then take the lever through the whole stroke to allow fluid to flow out.
The lever is supported to the grip.

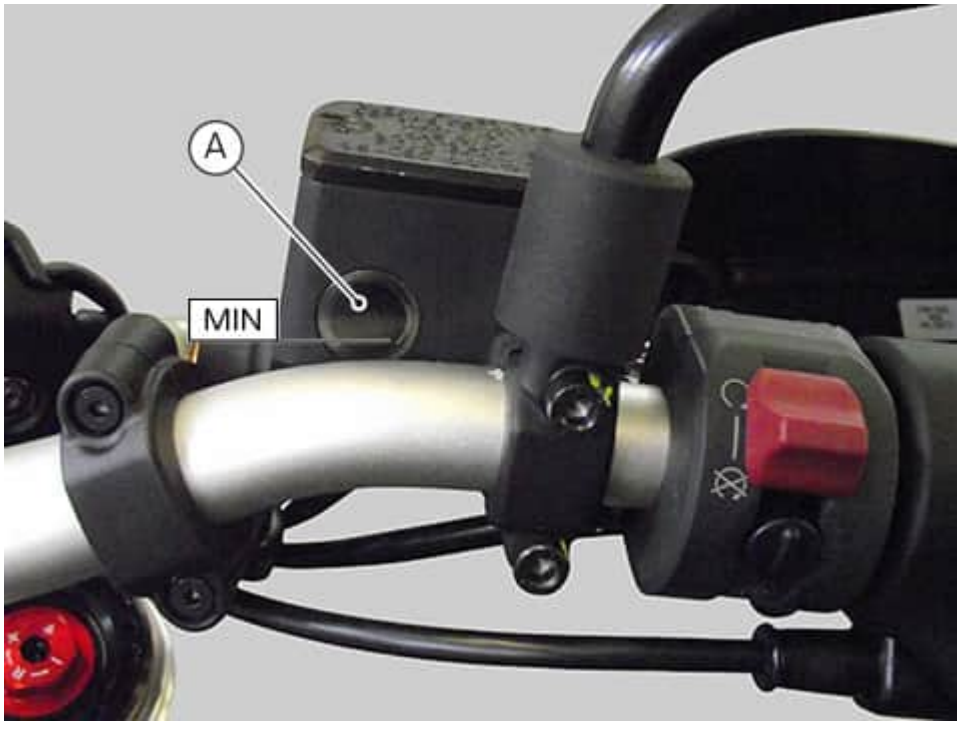


Tighten the bleed valve (5) to a torque of 10 Nm ±10% and release the lever.
Repeat the operation described above until the old fluid flows completely.
Then, with the bleed valve definitely closed to the specified torque actuate repeatedly the lever until a pressure is detected in the brake system.

Warning
After draining the old fluid from the reservoir and while filling the system, always keep the fluid level above the MIN mark to avoid any air bubbles in the circuit.

Note
With this procedure, the front brake system callipers are still filled with fluid; if callipers have to be drained as well, move back calliper pistons by keeping the bleeding tool (if available) working and connected to bleed valve.

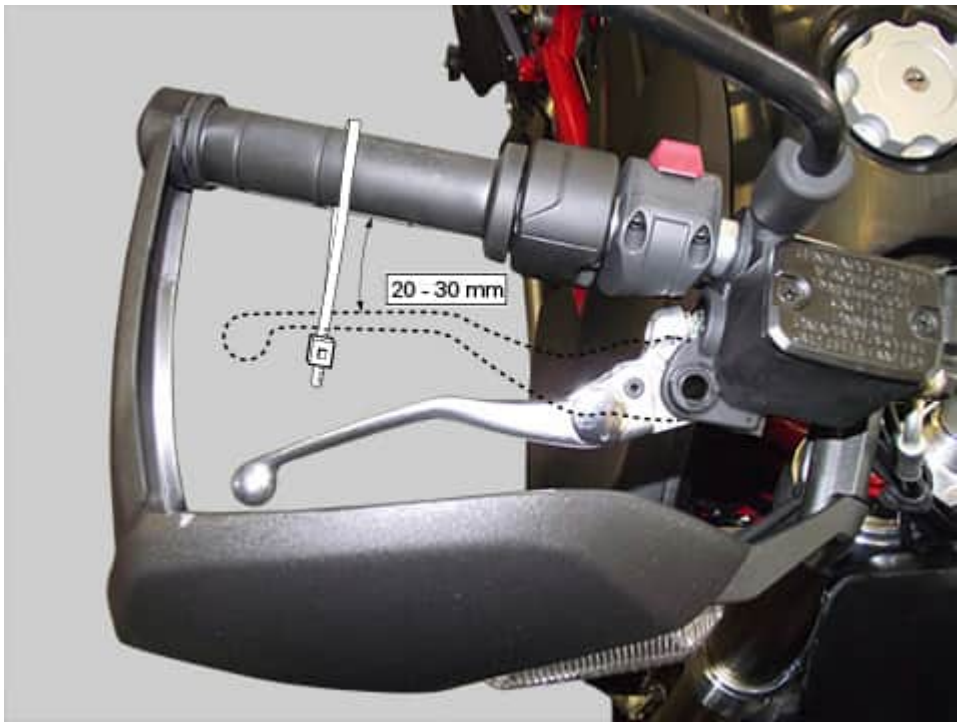
Fill tank (2) with specified oil taken from an intact container.



Important

During this operation, oil level inside reservoir must remain at a visible level from the sight glass at all times. The end of the transparent plastic hose must remain immersed in the discharged fluid at all times.

Keep the brake lever pulled during the whole filling operation.



Connect bleed valve (5) of front LH calliper.

Note
Follow the manufacturer's instructions when using a commercial brake bleeding tool.

Suck with the bleeder and open the bleed valve (5) making sure that the relevant reservoir level does not fall below the sight glass.
Carry on for the time necessary to bleed all air from the system.
Close the bleed valve (5) to a torque of 4 Nm ±10%.
If you do not have a bleeding tool available, connect a transparent plastic tubing to the bleed valve (5) as outlined in the draining procedure.



Pull the lever half way or until you feel system pressure, open bleed valve (5) and pull lever all the way; tighten bleed valve to the specified torque and release lever.

Important

Do not release the brake lever until the bleed valve has been fully tightened.

Repeat the bleeding operation until the fluid in the system is free of air bubbles. To obtain this, after filling, carry out bleeding operation working on the two bleed valves (5) of the front brake callipers.
Then make sure that, with closed bleed valves, pressure actuation by lever or pedal is correct.
Close bleed valves (5) to a torque of 4 Nm ±10% and fit the protection caps.
Level fluid and refit cover (1), tighten screws (3) on reservoir (2).



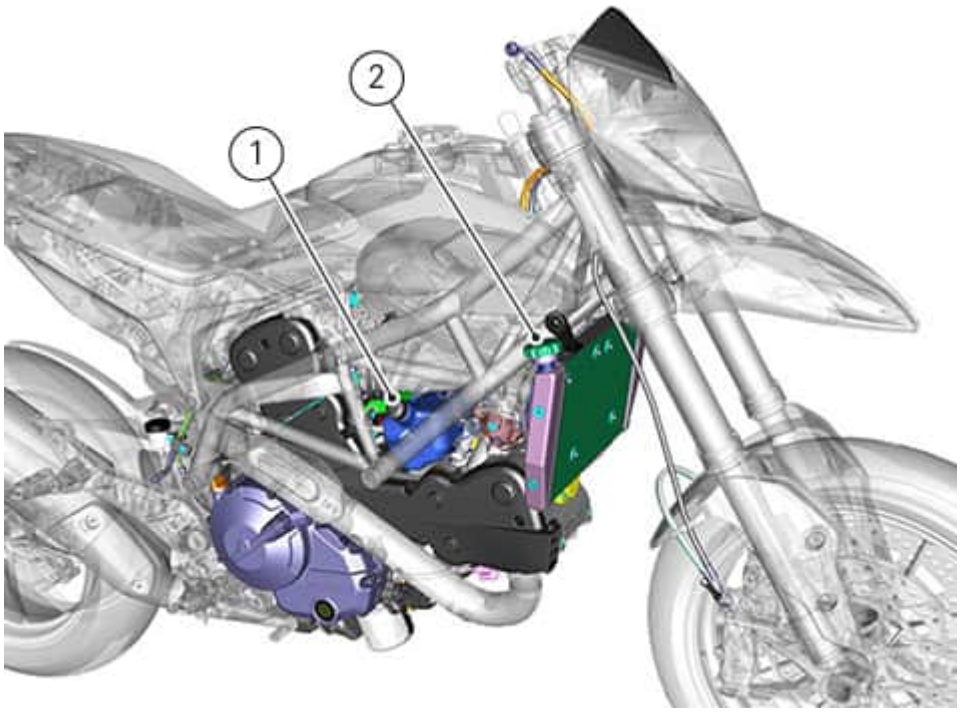
Change coolant

Warning

Make sure the engine is cold before proceeding. Attempting to change the coolant with the engine hot could lead to burns from hot coolant or scalding steam.

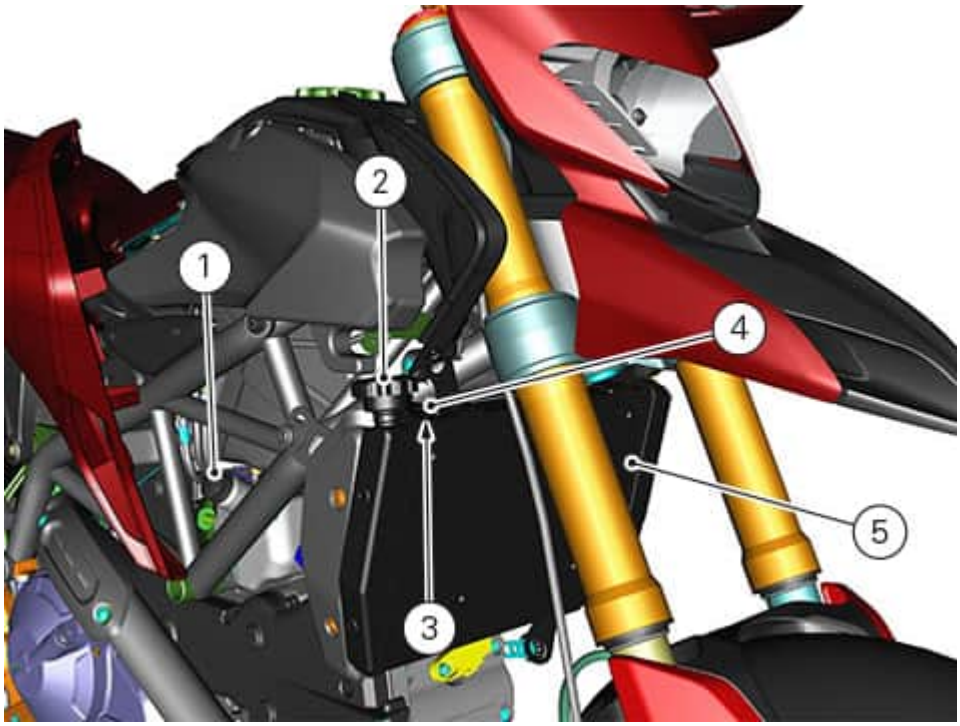
Remove the right-hand side fairing (Removal of the fairings).

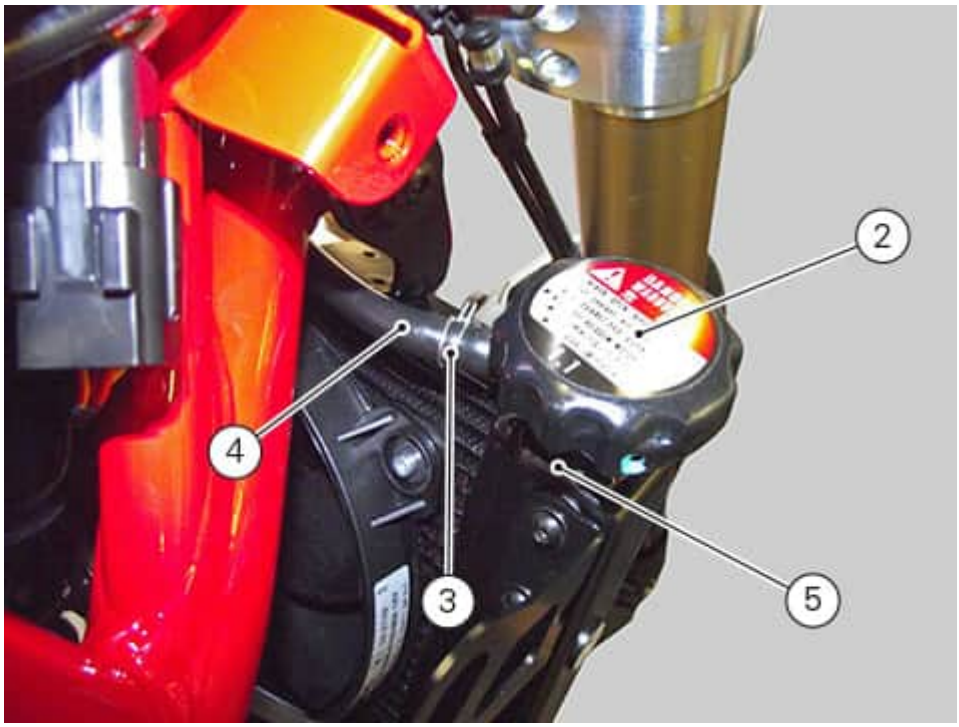
Place a vessel under the engine and place the motorcycle on its side stand.
Unscrew the radiator plug (2).
Remove the expansion reservoir filler cap (1).



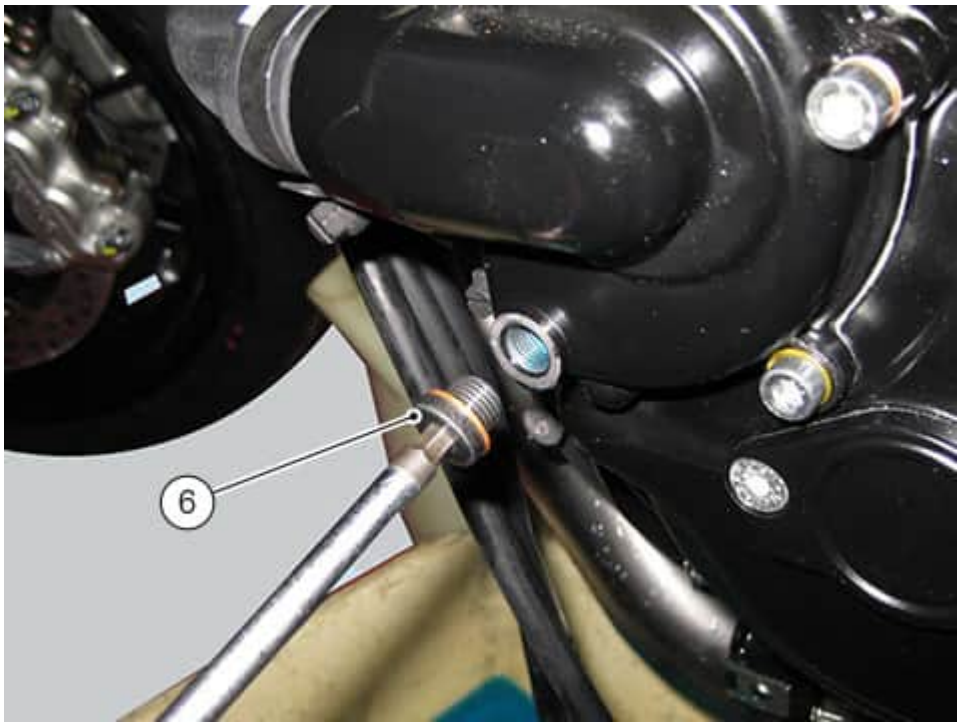


Loosen clip (3), slide out hose (4) from radiator (5) and drain the coolant inside a container.

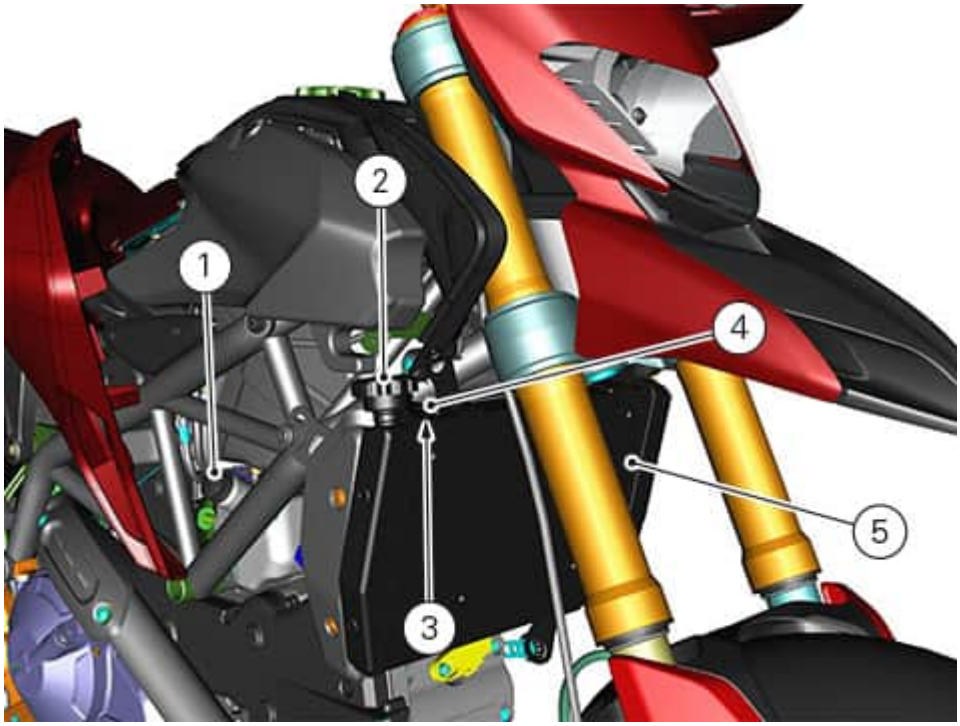


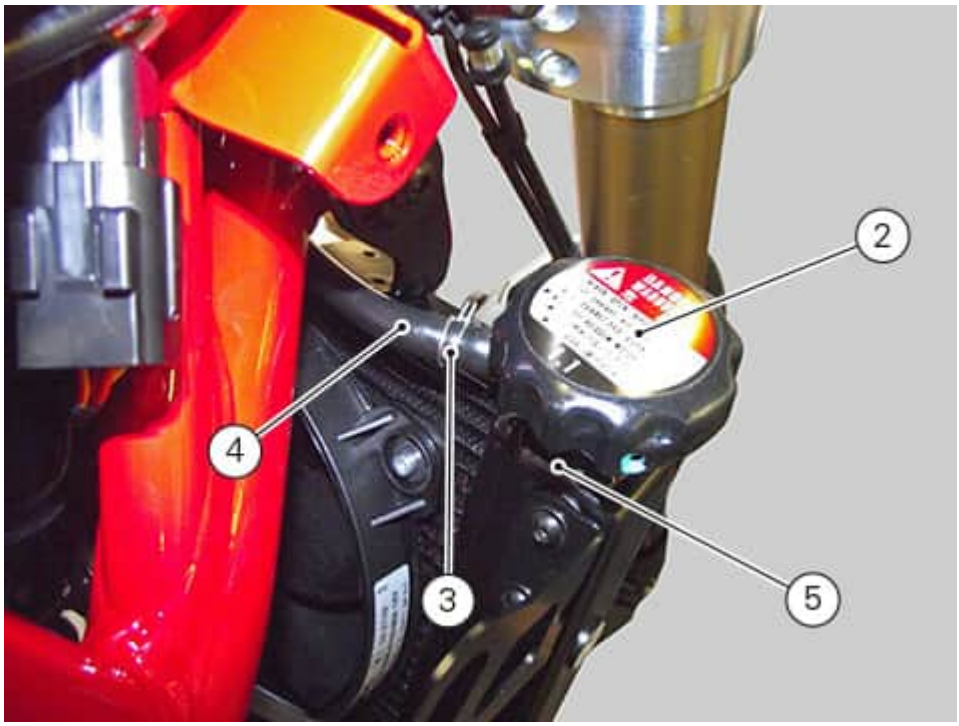


Undo plug (6) from drain hole on pump cover.
Allow the coolant to drain off completely.
Fit plug (6) with a new seal in coolant drain hole and tighten.
Tighten plug (6) to a torque of 15 Nm ±10%.
Recover the radiator plug (2) and the expansion reservoir filler cap (1).
Position the hose (4) on radiator (5) and fix it with clamp (3).

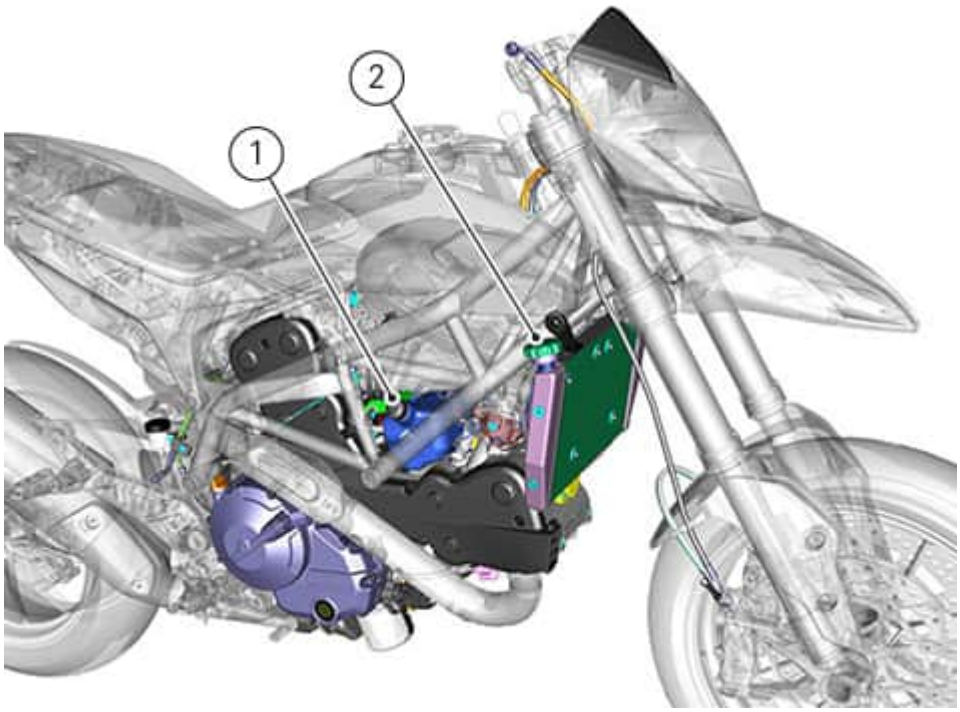


Fill the system with fresh coolant through the radiator plug (1).
Connect hose (4) to radiator (5) and fix it with clamp (3).





Wait several minutes for the coolant to fill all the internal passages.
Tighten the expansion reservoir cap (1) and the radiator plug (2).



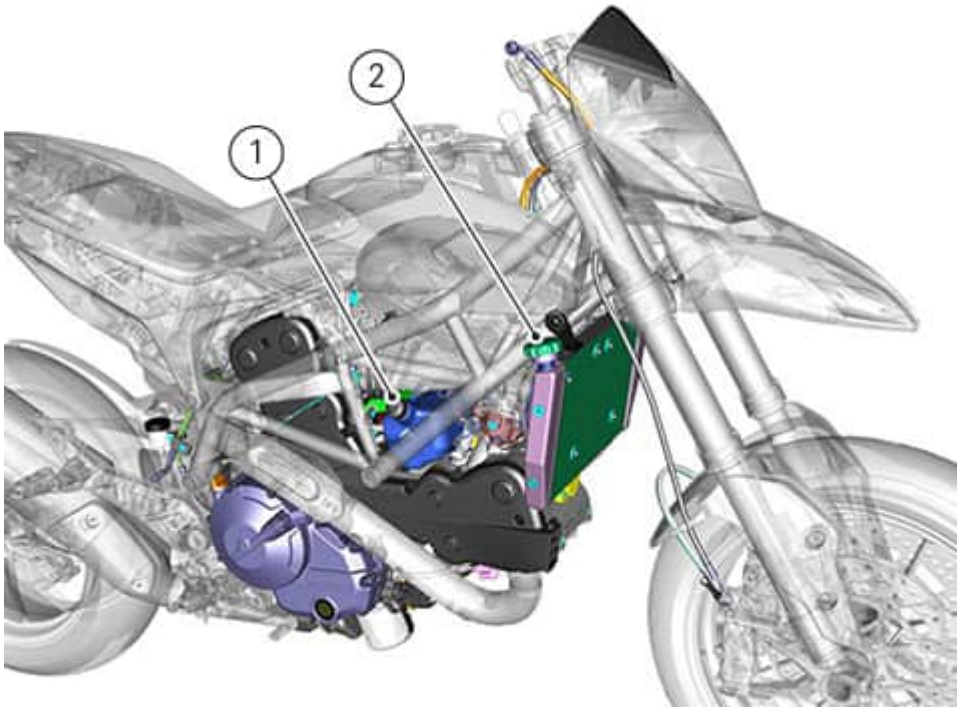
Start up the engine and wait for the coolant to reach 110 °C; run the engine for about 10 minutes.
Stop the engine and allow it to cool down completely, then open the radiator plug (2) so that all the air is expelled from the circuit.

Warning
Keep your hands, clothing and tools well clear of the radiator fan at all times; this fan starts automatically without warning and could cause serious injury or damage.

Important
Check the circuit for possible leaks.

If necessary, top up the coolant through the expansion reservoir filler to bring the level up to the MAX. mark.
Tighten the expansion reservoir cap (1) and the radiator plug (2).

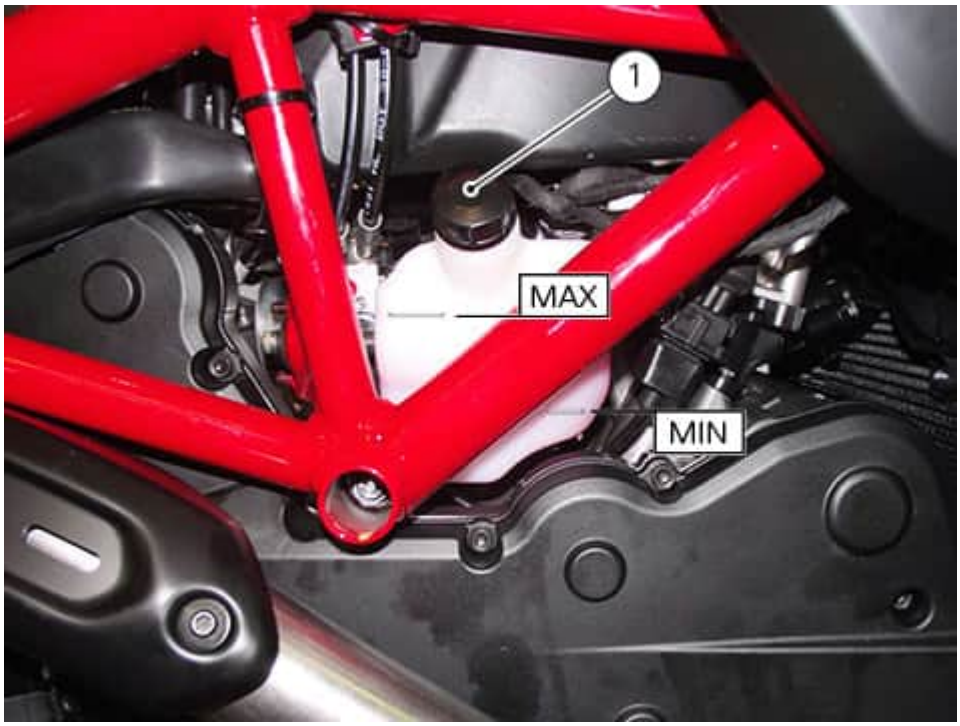




Refit the right-hand side fairing (Refitting the fairings).

Checking the coolant level

Check coolant level in the expansion tank on the right side of the vehicle at the intervals specified under "Scheduled maintenance chart".
The coolant level must be between the MAX. and MIN marks on the tank.
If the level is low, top up with the recommended coolant.
Remove the filler cap (1) and top up with new coolant to the specified level.
Refit the cap (1).



For optimal operating conditions (coolant mixture starting to freeze at 20 °C), the recommended coolant should be mixed with water in the following percentages:
ANTI-FREEZE: 35÷40% of the volume;
WATER: 65÷60% of the volume.

Important

Very hard water with a high mineral salt content can damage the engine.
Increase the amount of antifreeze to up to 55% volume in the case of very cold climates.

Important

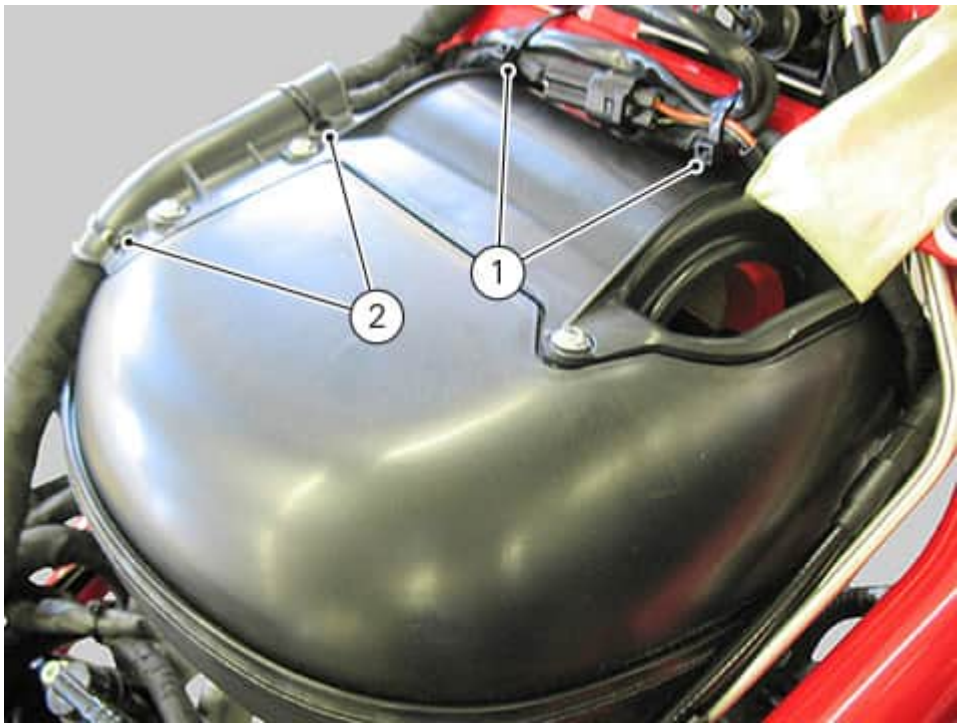
Solutions with less than **30%** of antifreeze will not provide sufficient protection against corrosion.

Changing and cleaning the air filters

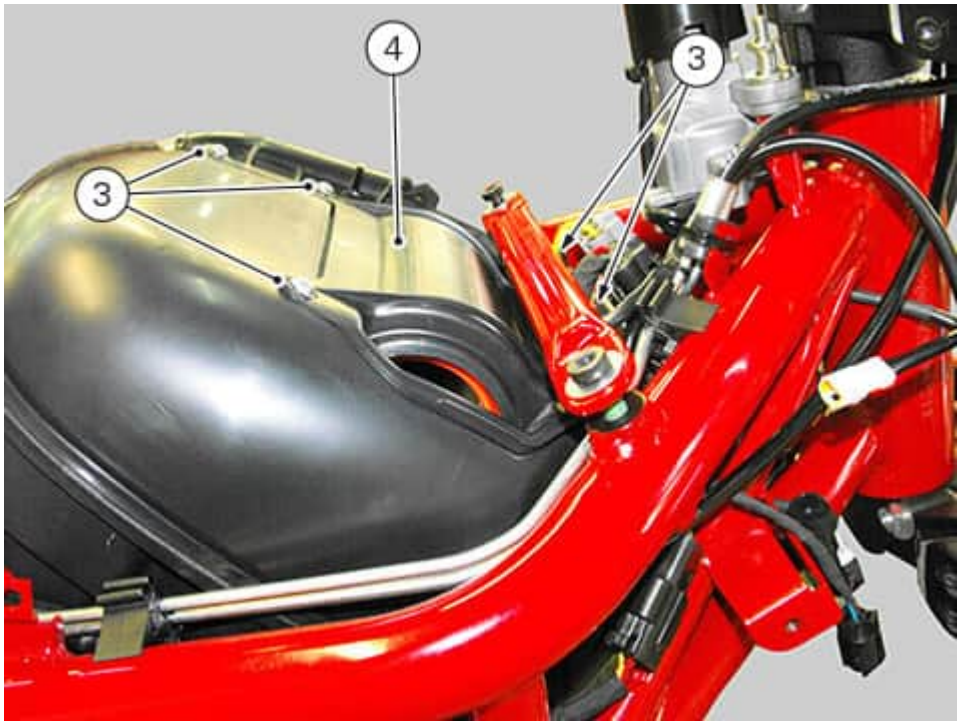
The air filter must be changed at the intervals specified under "Scheduled maintenance chart".

Remove the seat (Removing the seat).
Remove the fairings (Removal of the fairings).
Remove the fuel tank (Removing the fuel tank).

Remove ties (1) and (2) retaining the electric wiring.



Loosen the five screws (3) and remove filter cover (4).



Recover the airbox sealing gasket (5).
Loosen the air filter ring nut (6) and remove air filter (7) and support (8) from filter cover (4).



The filter cartridge (7) can be cleaned with a jet of compressed air aimed at the outside, or replaced if necessary.

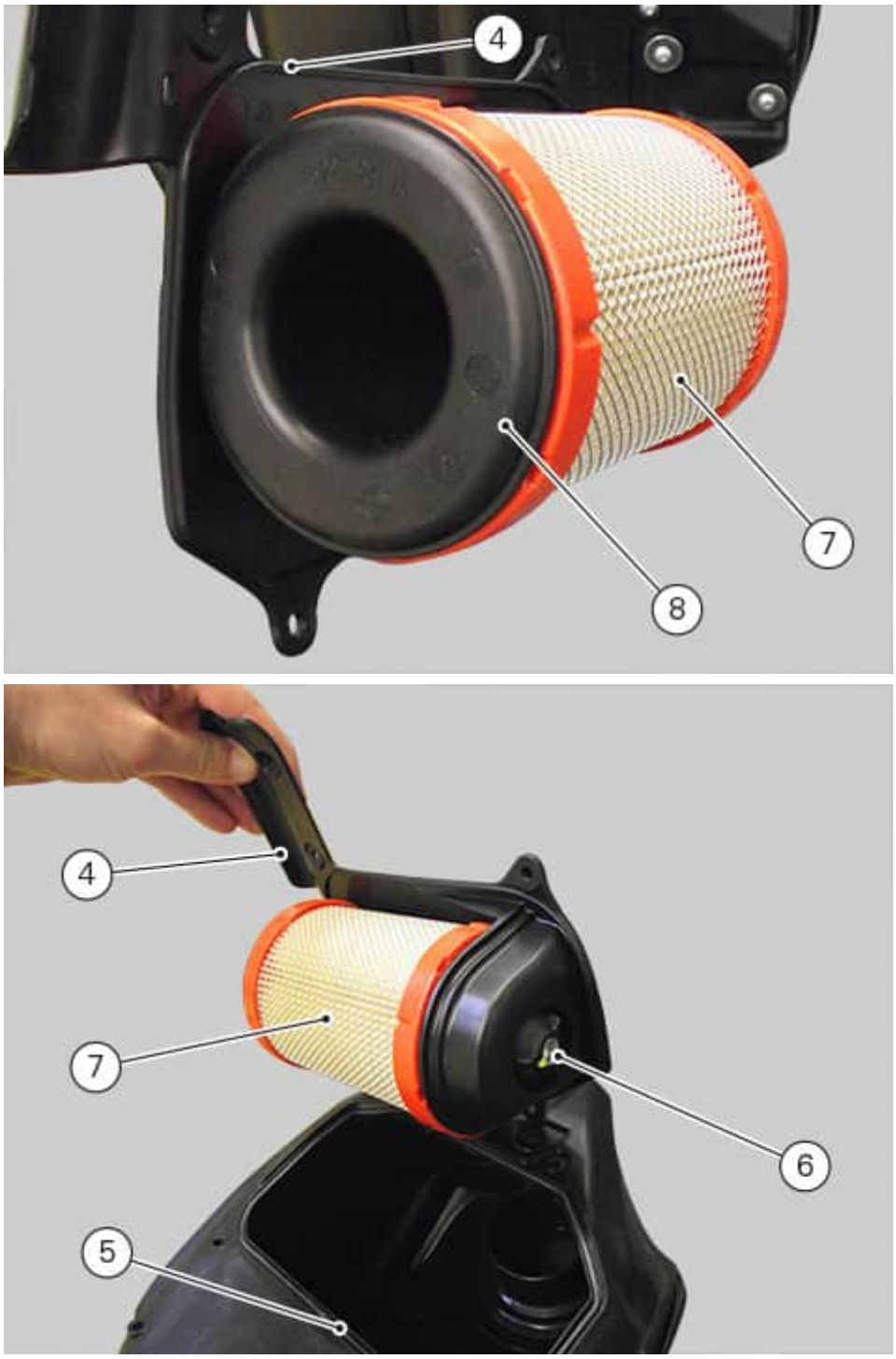
Important

A clogged air filter will reduce air intake and engine power, increase fuel consumption and cause a build up of deposits on the spark plugs. Do not use the motorcycle without a filter as impurities in the air could get into the engine and cause damage.

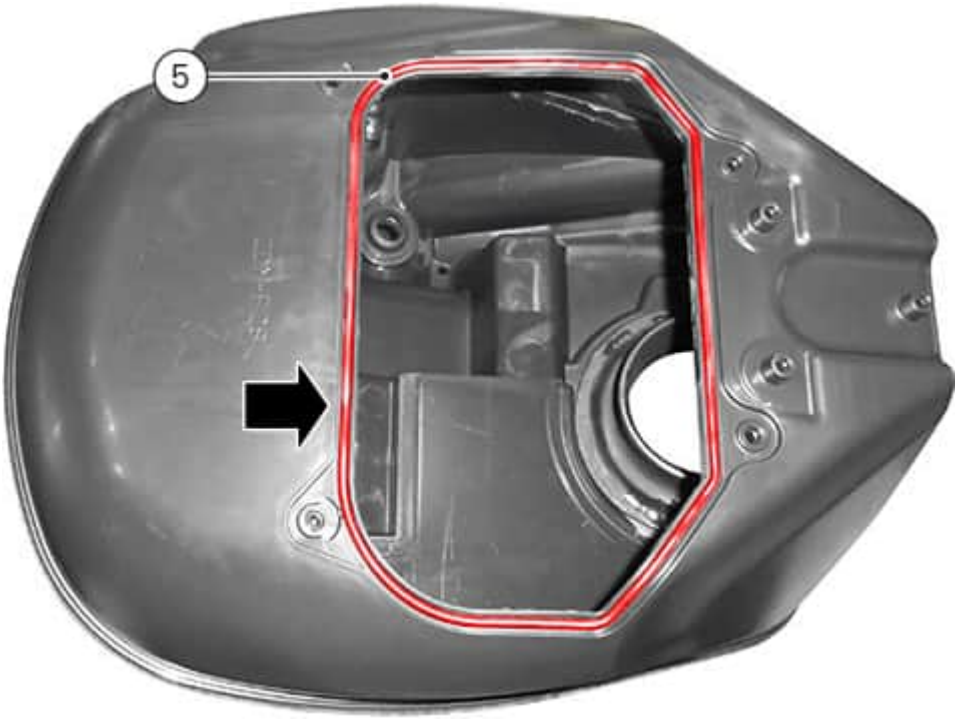
Important

If the motorcycle is used in very damp or dusty conditions, the air filter cartridge must be changed more frequently.

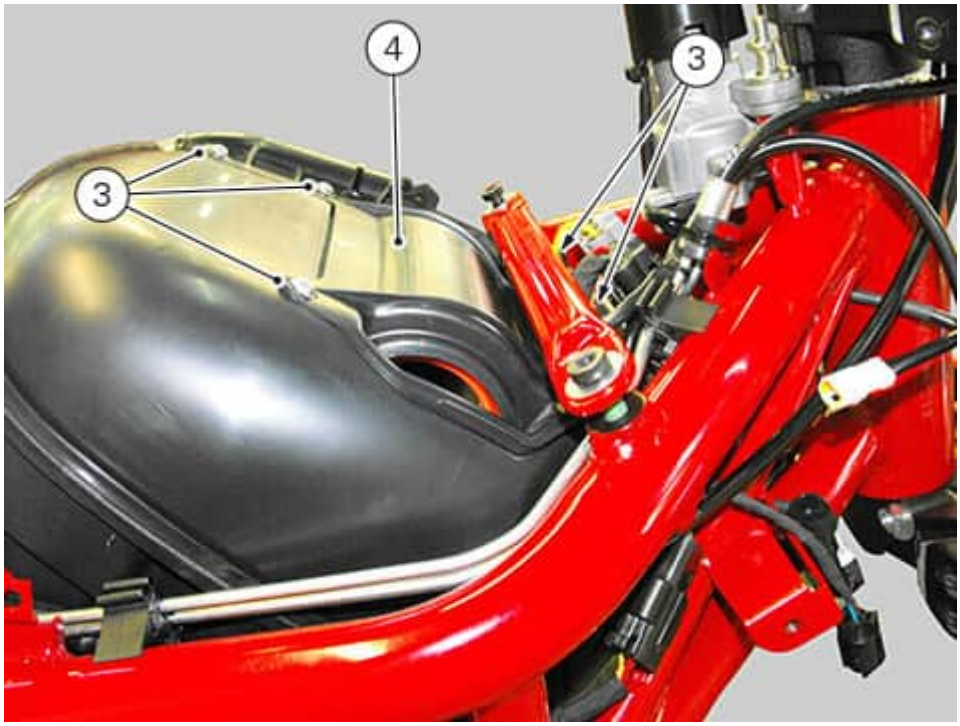
Place filter (7) on support (8), then position them on filter cover (4) and tighten the ring nut (6) to 6 Nm ± 10%.



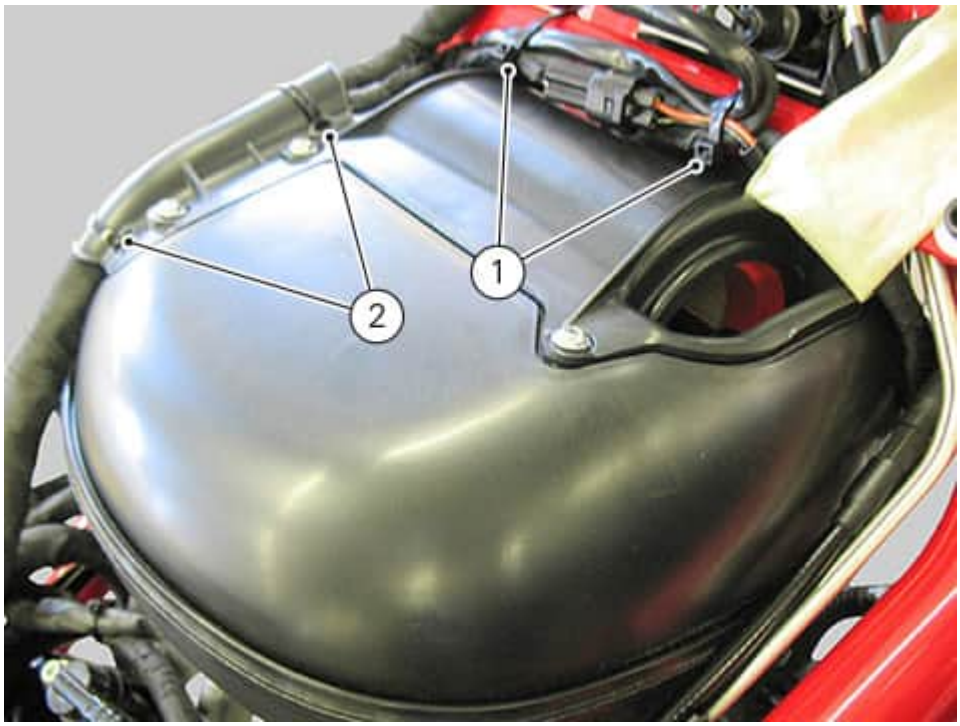
Reinstall gasket (5) in the relevant seat on the airbox.



Fit the air filter unit on the airbox.
Start and tighten the five screws (3) to a torque of 2 Nm ± 10%, in a cross pattern.



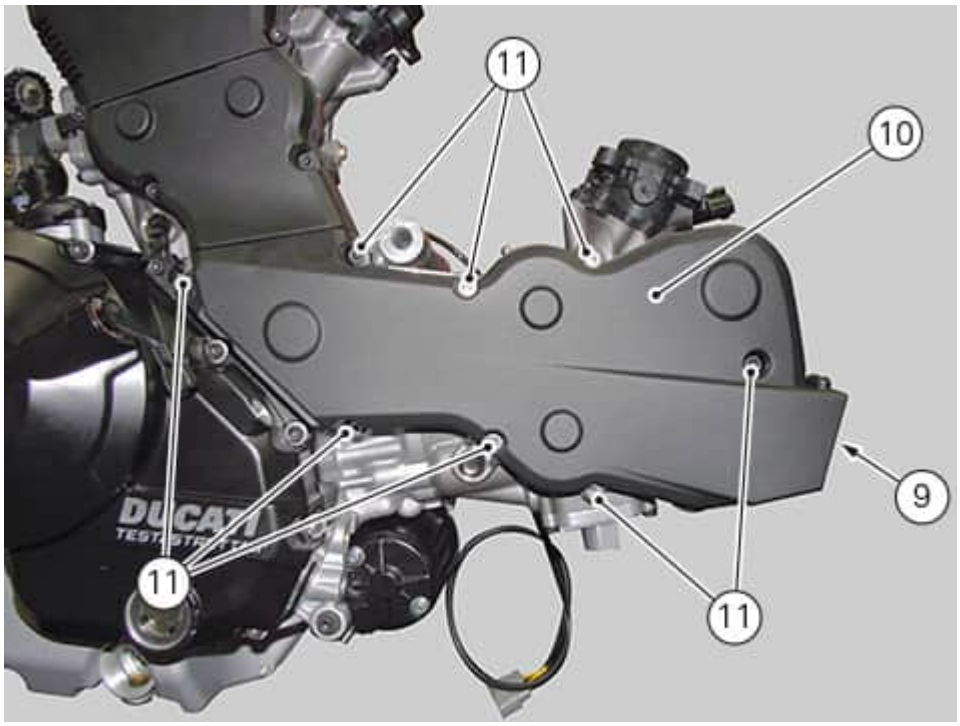
Tie the wiring as shown using the two ties (2) and (1).



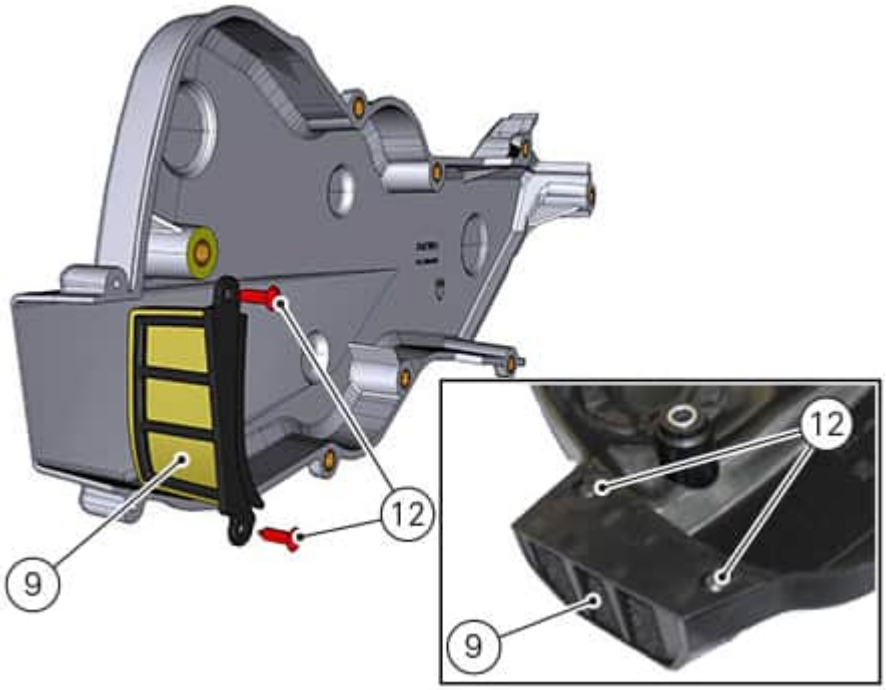
Remove the horizontal head exhaust manifold (Removing the exhaust system)
Check the air filter (9) in the horizontal timing belt cover (10).

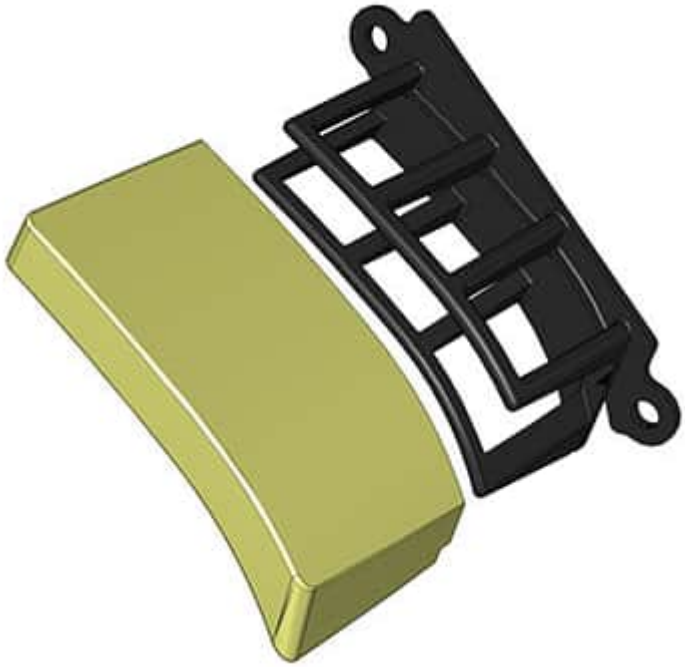
Note
The figures show an engine block removed from the frame.

Loosen the retaining screws (11) of the horizontal belt external cover (10) and remove the latter from the head by sliding downwards.

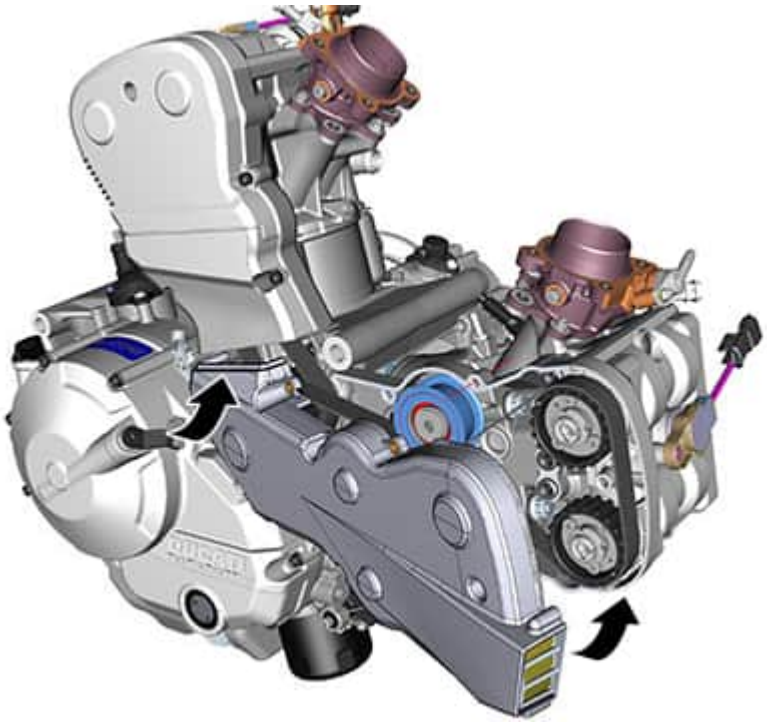


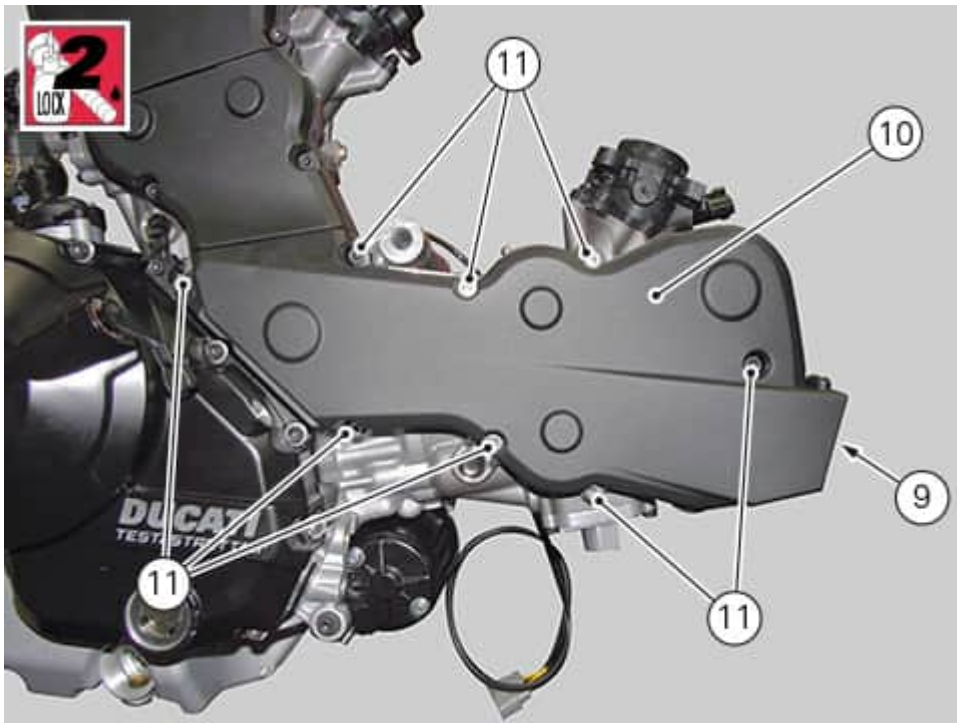
Loosen the screws (12) and remove the filter (9).
Once the check has been carried out, refit filter (9), start (without tightening) screws (12), and refit the horizontal timing belt cover (10) on the horizontal piston-cylinder assembly by tightening screws (11) to 10 Nm (Min. 9 Nm - Max. 11 Nm); for plastic guards and 6 Nm (Min. 5.5 Nm - Max. 6.5 Nm) for carbon guards.





Position the horizontal belt guard (10) on the horizontal head by sliding it upwards.
If retaining screws (11) are not new, smear them with specified threadlocker and start them.
Tighten the guard (10 retaining screws (11) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm); for plastic guards and 6 Nm (Min. 5.5 Nm - Max. 6.5 Nm) for carbon guards.





Refit the previously removed components.

Change spark plugs

Check the colour of the ceramic insulation around the central electrode: an even, light brown colour indicates the engine is in good condition and running at the right temperature.
Inspect the centre electrode for wear.



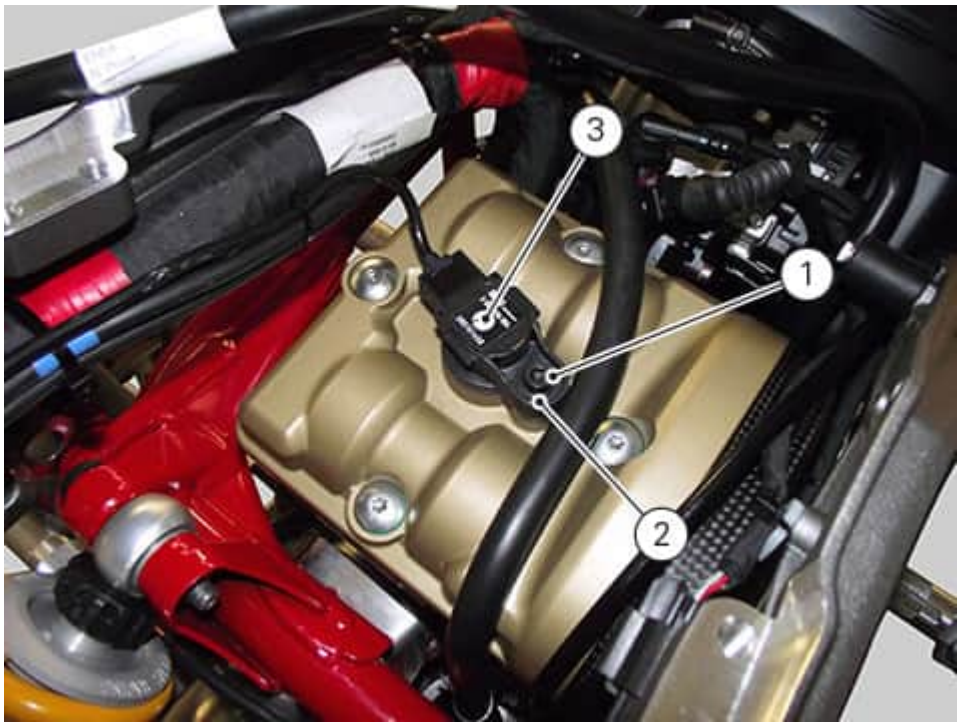
Warning

Do not use spark plugs with inadequate heat rating or incorrect thread length.
The spark plug must be securely installed.
If a spark plug is loose, it can overheat and damage the engine.

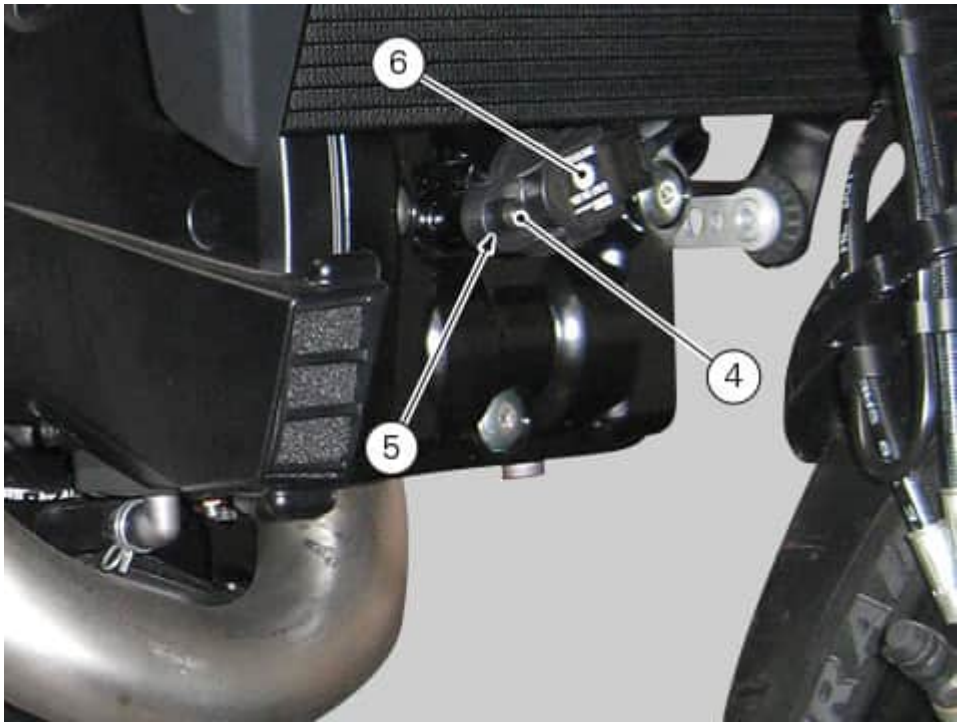
Spark plug type
Make: NGK
Type: MAR9A-J

Remove the seat (Removing the seat).
Remove the fairings (Removal of the fairings).
Remove the fuel tank (Removing the fuel tank).

Working on the vertical head, loosen screws (1), recover washer (2) and remove coil (3).
Use tool no. **88173.2877** to replace the spark plug and tighten the new one to 12 Nm (Min. 11 Nm - Max. 13 Nm).
Position coil (3), washer (2) and tighten screw (1) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).



Work in the same way on the horizontal head.
Remove the screw (4) and recover washer (5).
Loosen coil (6).
Use tool no. **88713.2877** to replace the spark plug and tighten the new one to 12 Nm (Min. 11 Nm - Max. 13 Nm).
Position coil (6), washer (5) and tighten screw (4) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).



Refit the fuel tank (Refitting the fuel tank).
Refit the fairings (Refitting the fairings).
Refit the seat (Refitting the seat).

Replace the timing belts

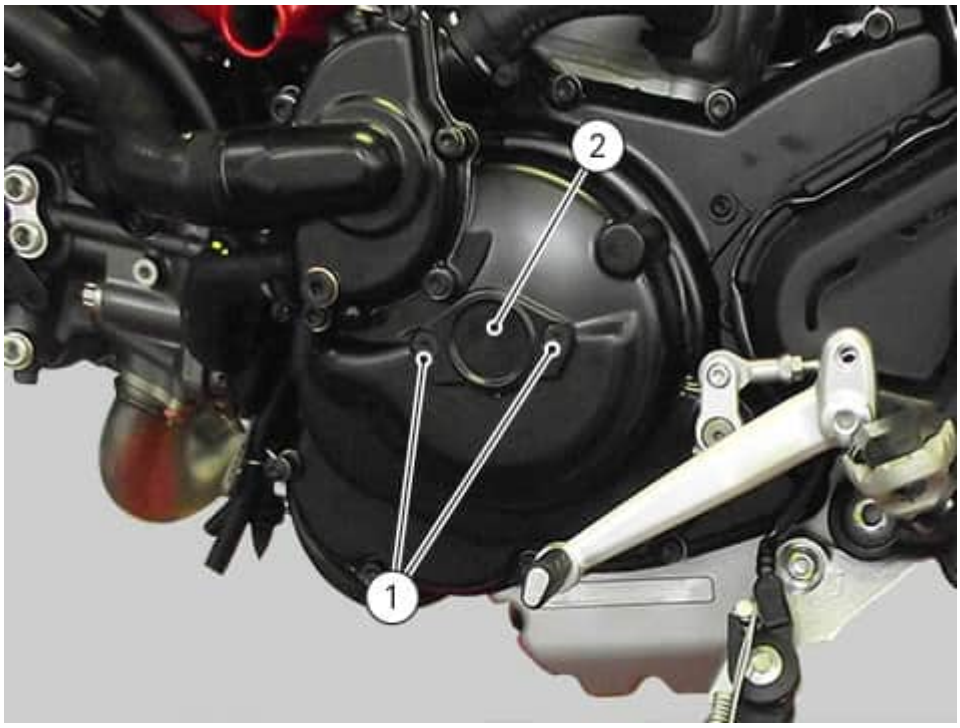
To replace the timing system belts follow the procedure described in paragraphs "Removing the tensioner pulley/timing belt and "Refitting the timing belts".

Checking valve clearances

Remove the seat (Removing the seat).
Remove the side fairings (Removal of the side fairings).
Remove the fuel tank (Removing the fuel tank).
Remove the filter box (Removing the filter box), the throttle body (Removing the throttle body), the blow-by and the oil breather hose.
Remove the fuel system and injectors from intake manifolds.
Remove the lower screw retaining water radiator to engine (Removing the water radiator).
Remove the cylinder head cover (Removing the camshafts).

Note
For clarity, the figures show the engine removed from the frame.

Undo the two retaining screws (1) of the cover (2) over the end of the crankshaft.



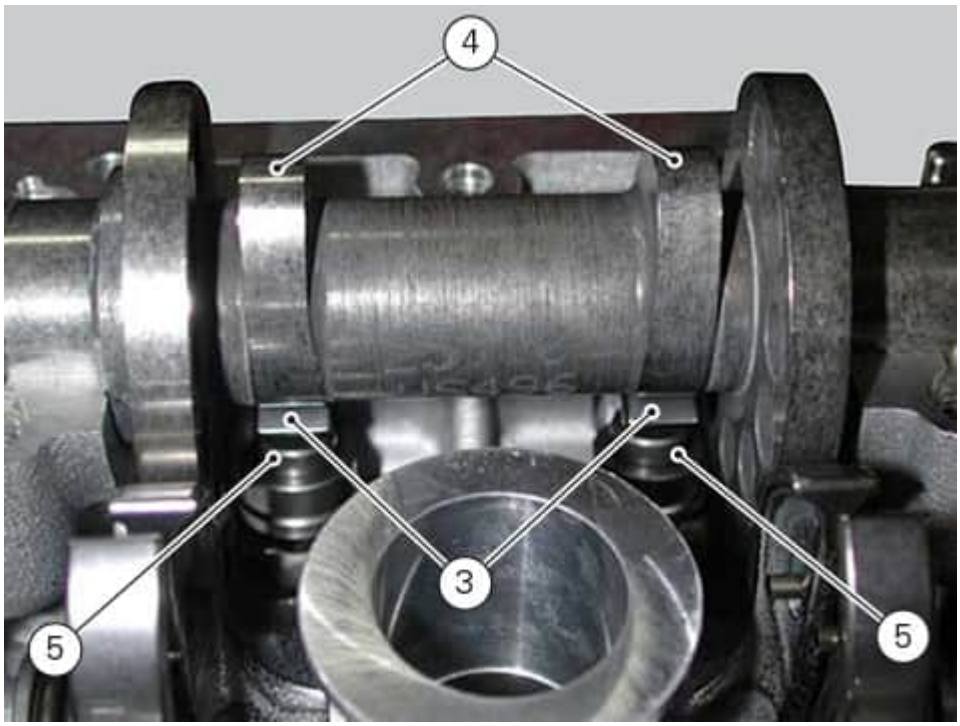
Fit the tool handgrip part no. **88765.1657** in the holes of the generator cover to be able to turn the crankshaft so that the valve on which the control is carried out is in rest position.

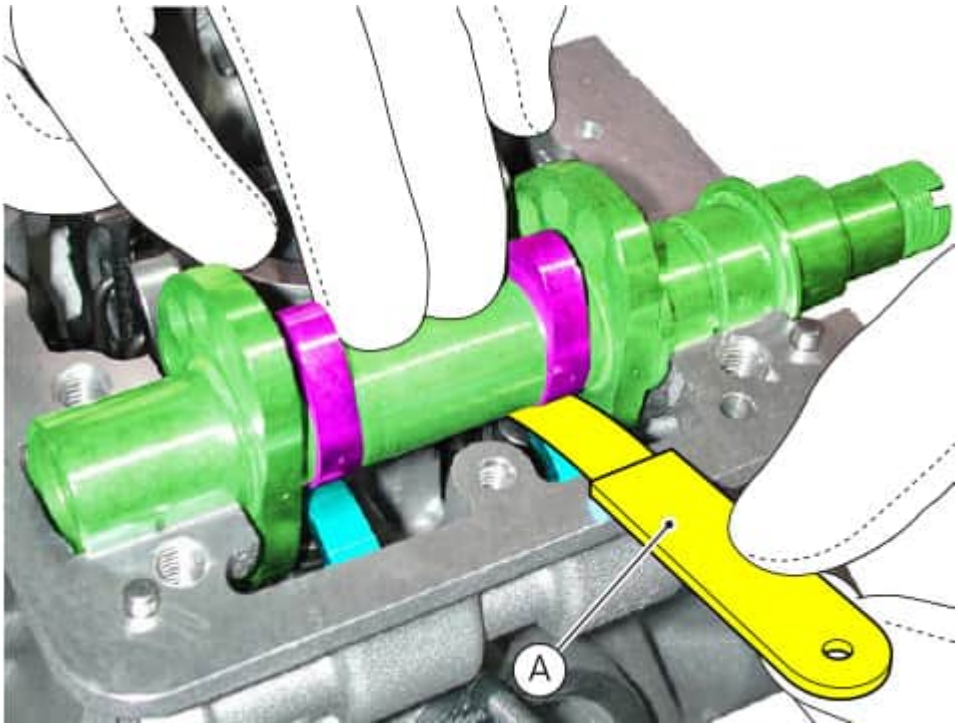
Move the piston of the cylinder being checked to TDC of the power stroke: in this condition, all valves are closed and the camshafts come in neutral position and, therefore, free to rotate; check the valve clearance on the cylinder head you are working on.

Checking the opening clearance

Using feeler gauge (A), check the clearance between the opening rocker arm (3) and the lowest point of the camshaft lobe (4), taking care not to compress the rocker arm return spring. The value must be within the prescribed ones.
If this is not the case, remove the opening shim (5) and replace it with one of a suitable size to obtain the specified clearance.

Note
Opening rocker arm shims measuring 1.80 to 3.45 are available as spare parts: the size is punched on the shim.



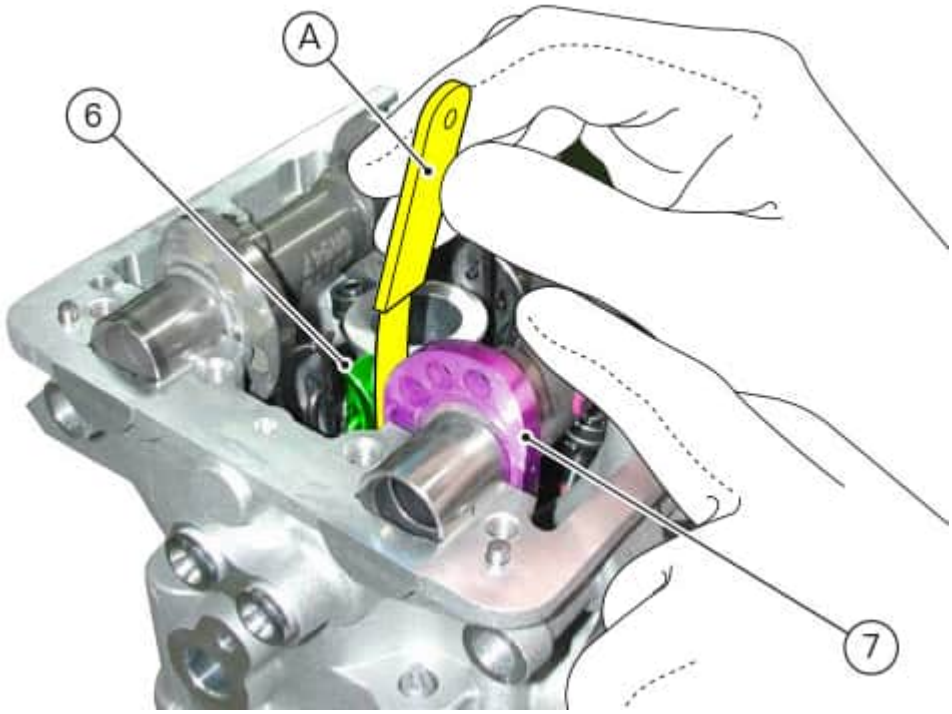


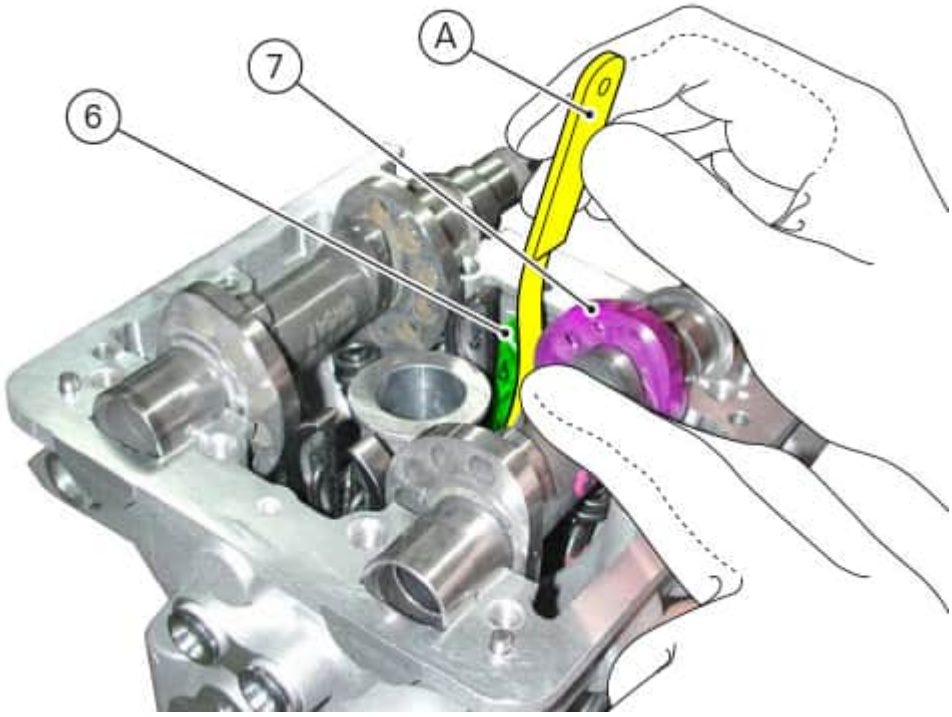
Checking the closing clearance

Using feeler gauge (A), check the clearance between the closing rocker arm slider (6) and the highest point of the camshaft lobe (7).
The value must be within the prescribed ones.
If this is not the case, remove the closing shim and replace it with one of a suitable size to obtain the specified clearance.

Note

Closing rocker arm shims measuring 2.2 to 4.5 are available as spare parts: the size is punched on the shim.





Specified values:

	Assembly value	Inspection value, every 24,000 km
Opening rocker arm - intake	0.13÷0.18 mm	0.13÷0.18 mm
Opening rocker arm - exhaust	0.13÷0.18 mm	0.13÷0.18 mm
Closing rocker arm - intake	0.05÷0.10 mm	0.05÷0.10 mm
Closing rocker arm - exhaust	0.05÷0.10 mm	0.05÷0.10 mm

Make sure that O-ring (8) is installed in cover (2).



Refit cover (2) and tighten the two retaining screws (1) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).



Refit the cylinder head covers (Refitting the camshafts).
Refit the lower screw retaining water radiator to engine (Refitting the water radiator).
Refit the fuel system and injectors on the intake manifolds.
Refit the filter box (Refitting the filter box), the throttle body (Refitting the throttle body), the blow-by and the oil breather hose.
Refit the fuel tank (Refitting the fuel tank).
Refit the side fairings (Refitting the fairings).
Refit the seat (Refitting the seat).

Changing the engine oil and filter cartridge

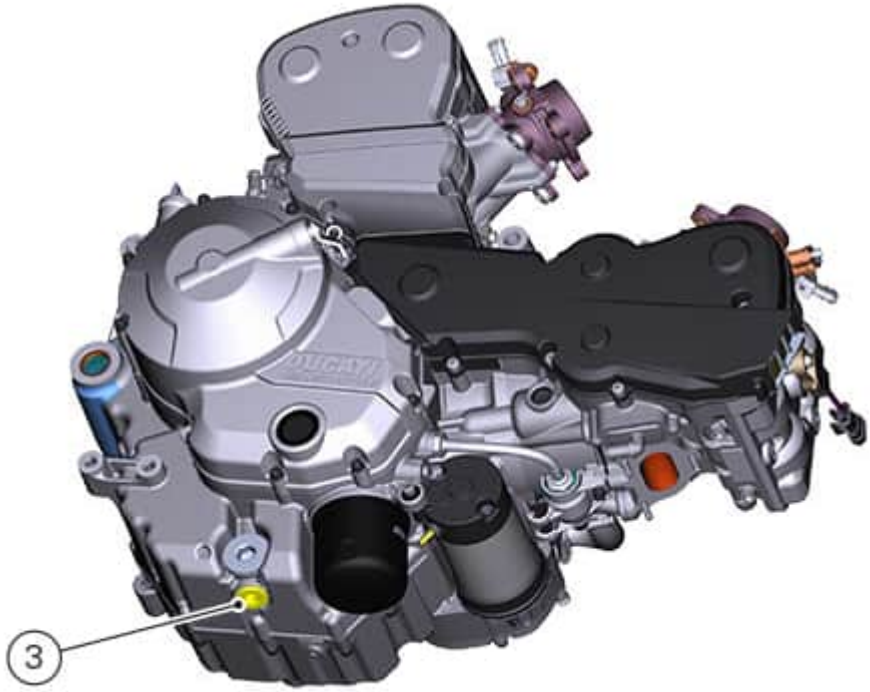
Note

This operation has to be carried out with hot engine (but turned off) because the oil in these conditions is more fluid and comes out faster and completely.

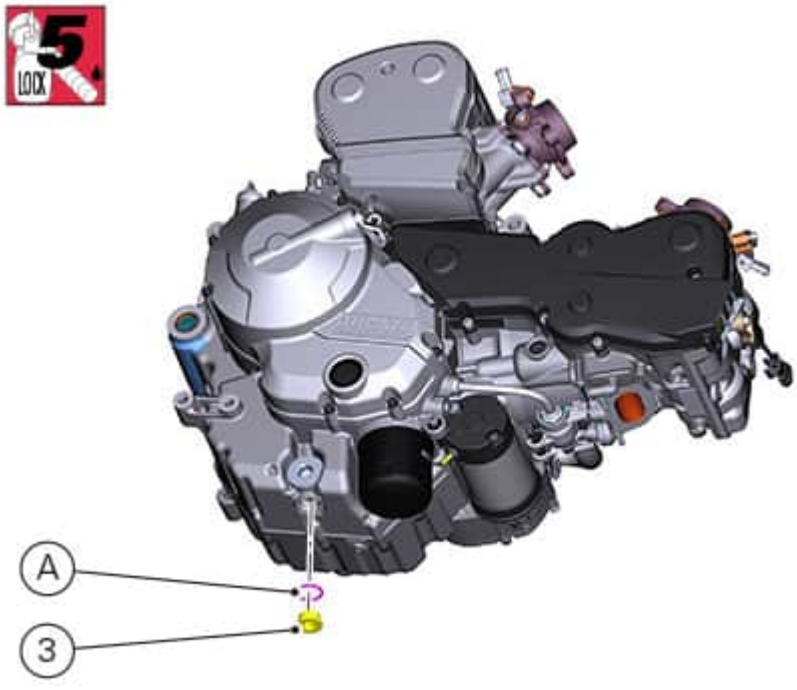
If present, remove the complete sump guard unit.
Remove the drain plug (3) with the gasket from the oil sump and allow the oil to drain off.

Warning

Dispose of oil and/or filter cartridges in compliance with environmental protection regulations.



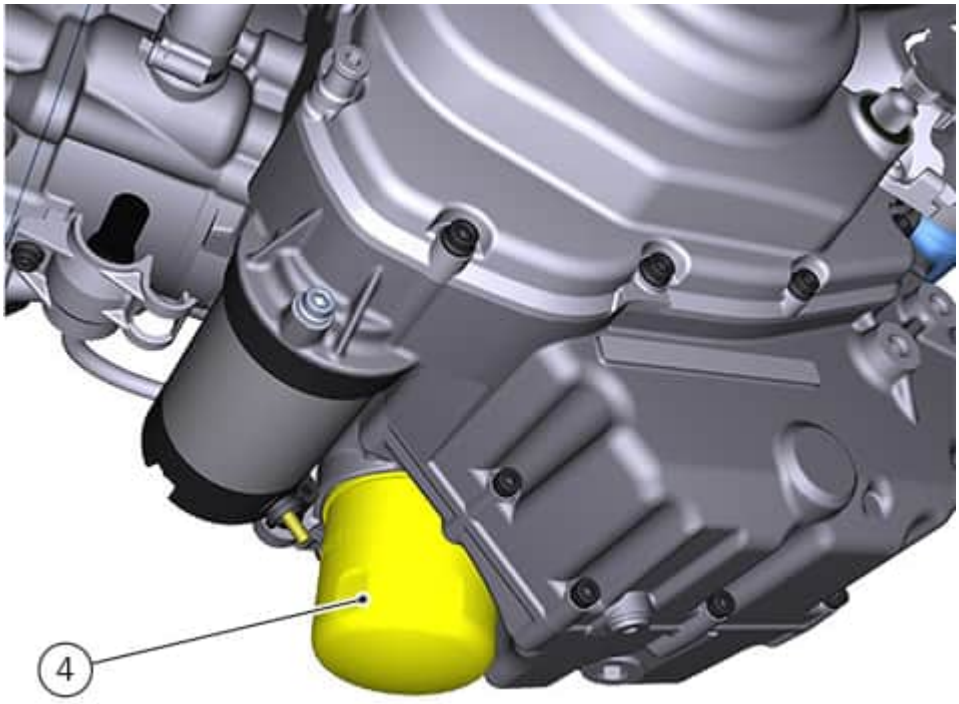
Remove any metal deposits from the end of the magnetic drain plug (3), apply specified threadlocker and refit the drain plug complete with seal (A) to the sump.



Tighten plug (3) to a torque of 42 Nm (Min. 38 Nm - Max. 46 Nm).
Remove the oil sump filter cartridge (4) using service tool no. **88713.2906**.

Important

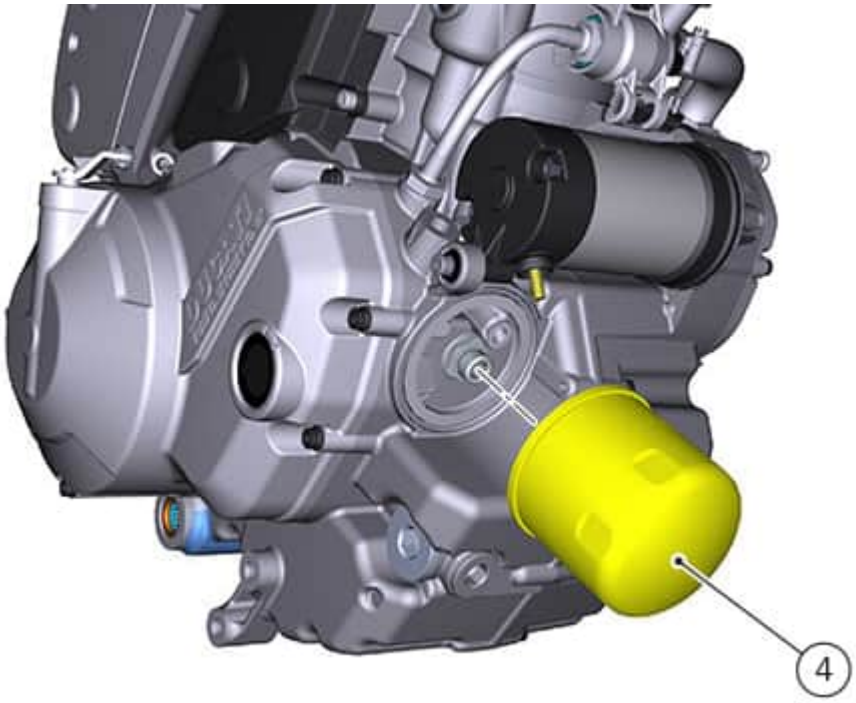
Dispose of the used filter, do not re-use it.



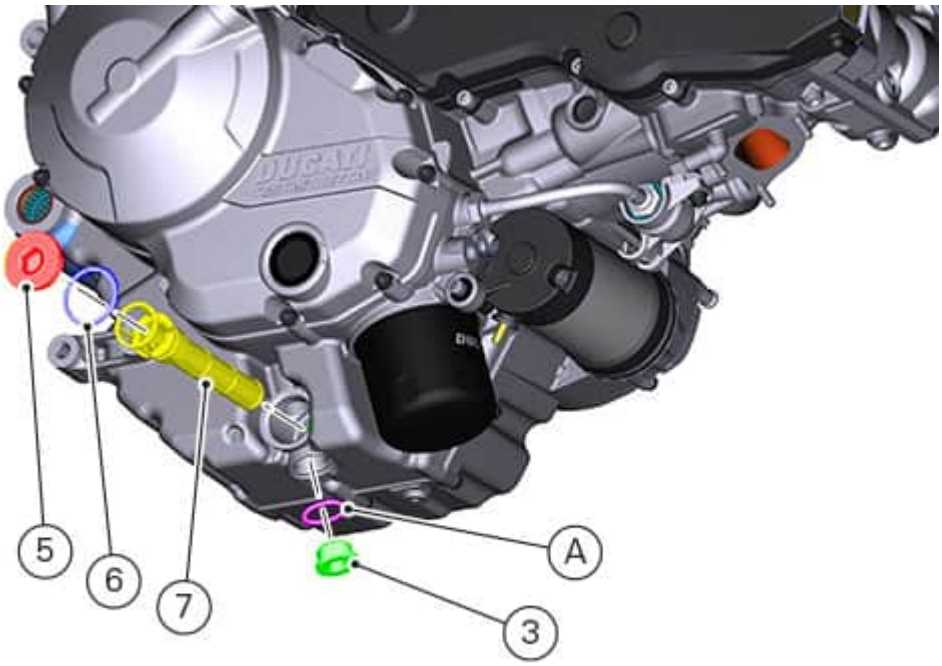
Fit a new cartridge (4) using tool no. **88713.0944** tightening it to a torque of 11 Nm (Min. 10 Nm - Max 12 Nm): lubricate seal with engine oil.

Note

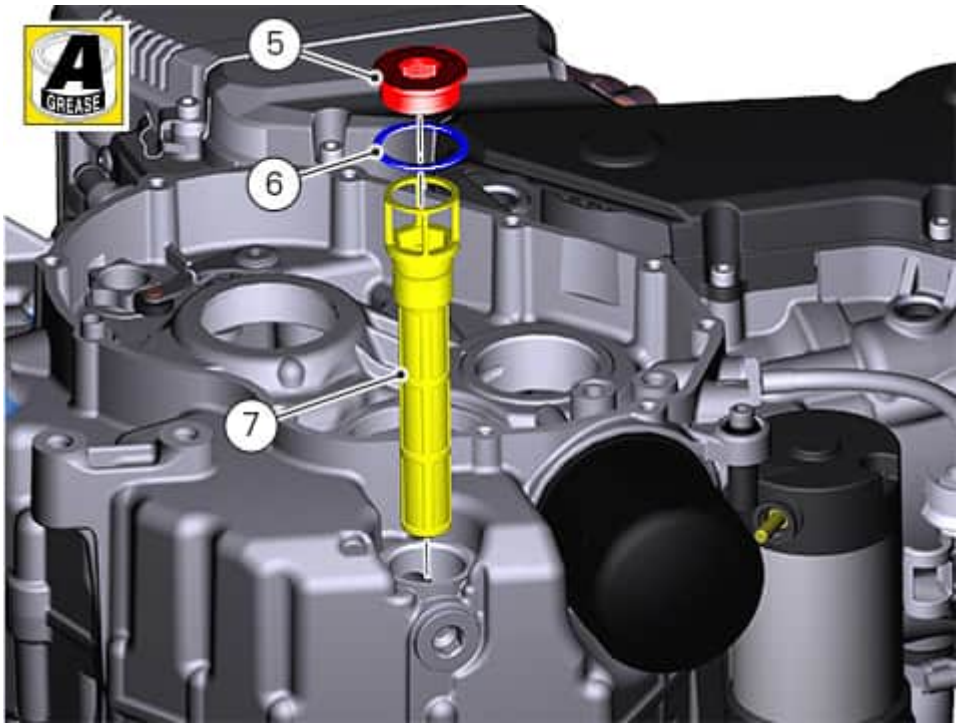
It is advisable to refill the filter cartridge with engine oil before fitting it: this enables the recommended oil level to be maintained without topping up.



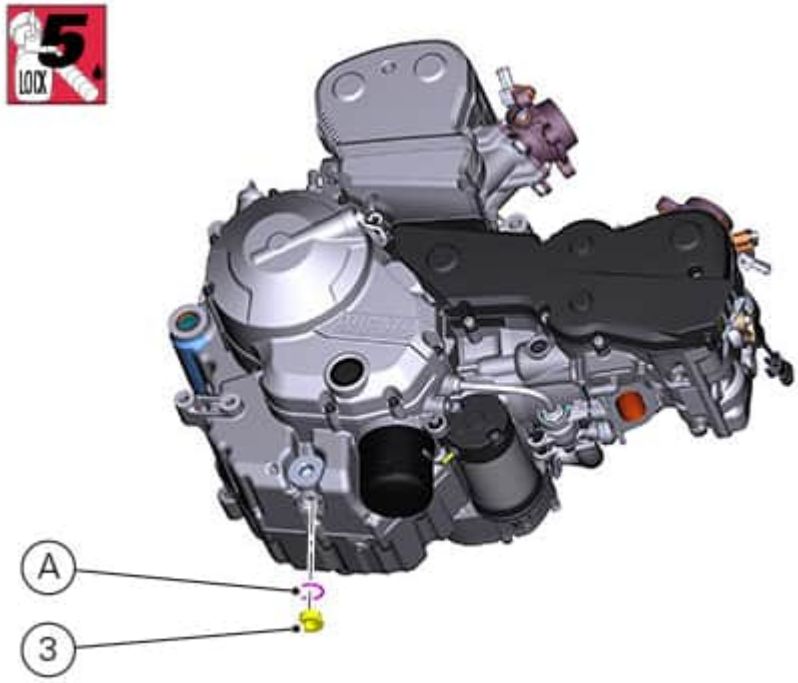
Screw it into relevant seat and tighten it to 11 Nm (Min. 10 Nm - Max. 12 Nm).
Every two oil changes, clean the oil intake mesh filter.
Loosen outer plug (5) and collect seal (6).
Loosen the filtering element (7) and slide it out.
Loosen drain plug (3) and collect seal (A).
Clean the mesh filter with fuel and compressed air. Take care not to damage the mesh.



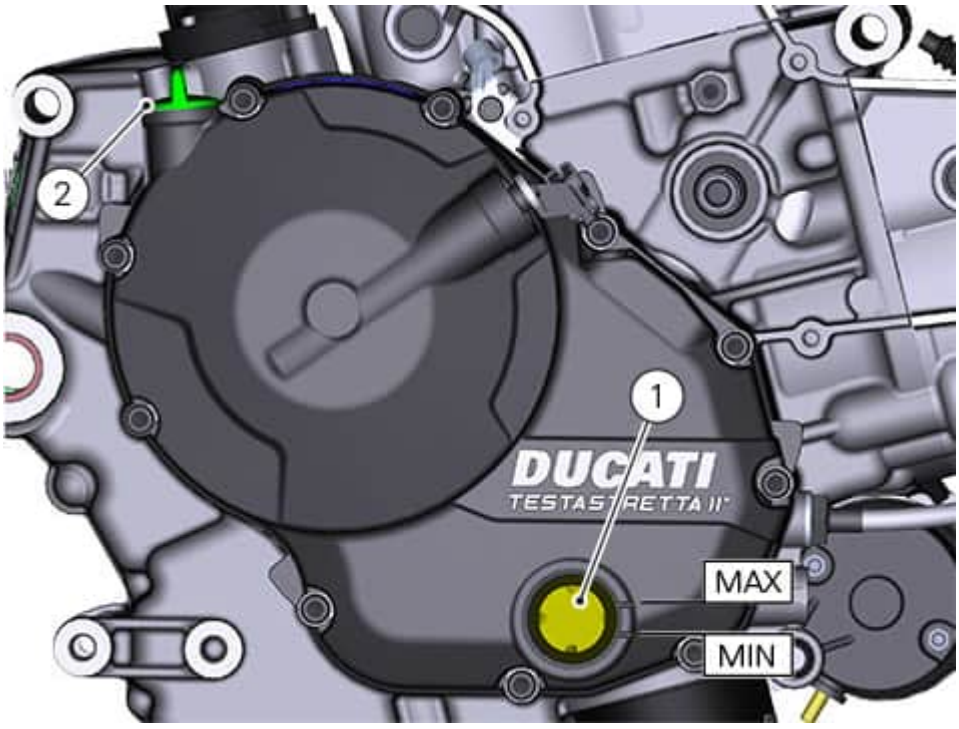
Lubricate mesh filter thread (7) with the specified grease.
Refit mesh filter (7) and tighten it to a torque of 42 Nm (Min. 38 Nm - Max. 46 Nm).
Insert seal (6) in plug (5) with the cutting edge facing the crankcase.
Tighten plug (5) to a torque of 42 Nm (Min. 38 Nm - Max. 46 Nm).



Place seal (A) on the plug, apply specified threadlocker and tighten plug (3) to a torque of 42 Nm (Min. 38 Nm - Max. 46 Nm).



Remove the filler plug (2) and carry out refilling with the specified oil type up to reaching the notch that identifies the MAX level in the sight glass.
Refit the filler plug (2). Run the engine at idle speed for a few minutes.

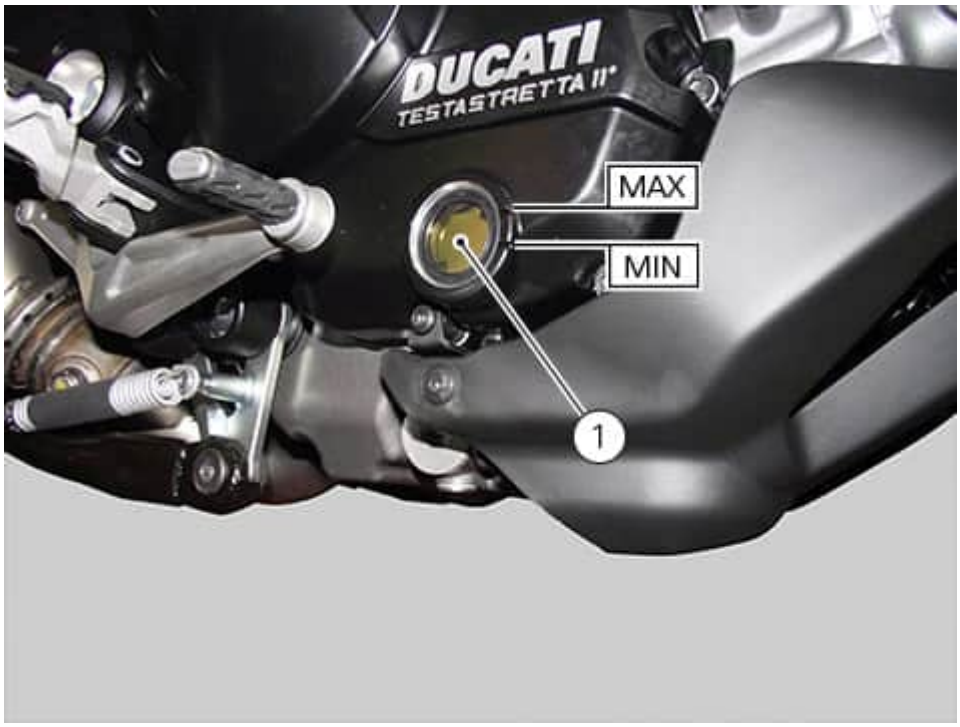


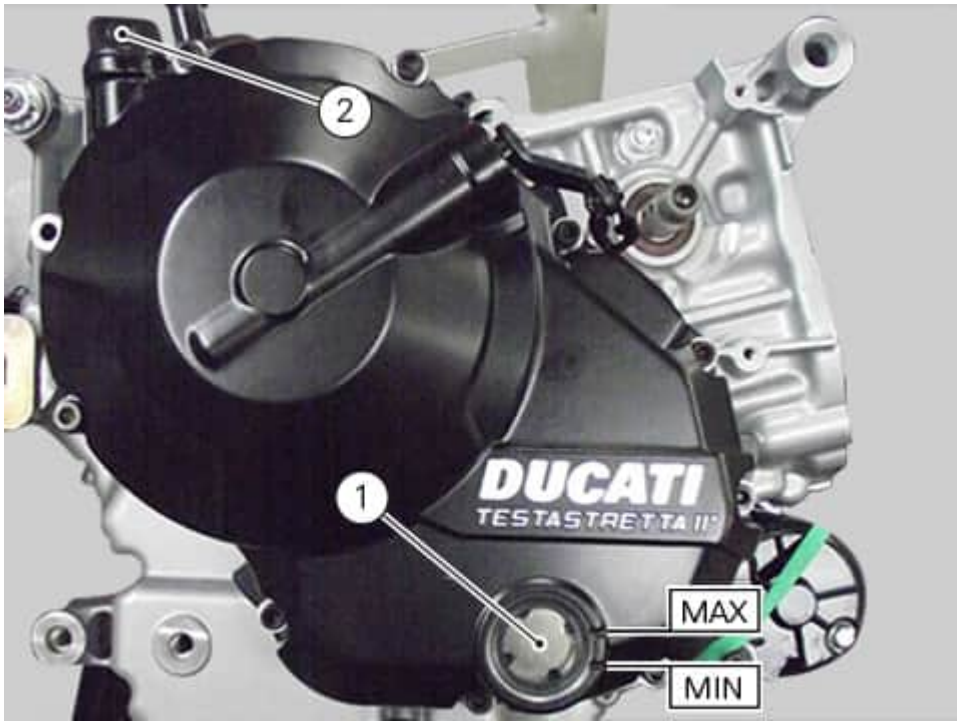
Check that there are no oil leaks and that the warning light on the instrument panel switches off a few seconds after starting up the engine. If not, stop the engine and trace the fault.
After a few minutes, check that the oil level is the specified one; if necessary, restore the MAX. level.
Refit any removed parts.
If removed, refit the complete sump guard unit.

Ducati recommends you use Shell Advance 4T Ultra 15W-50 oil. As an alternative it is possible to use a motorcycle engine oil having the same degree SAE 15W-50 and meeting the following specifications JASO: MA2 and API: SM.

Check engine oil level

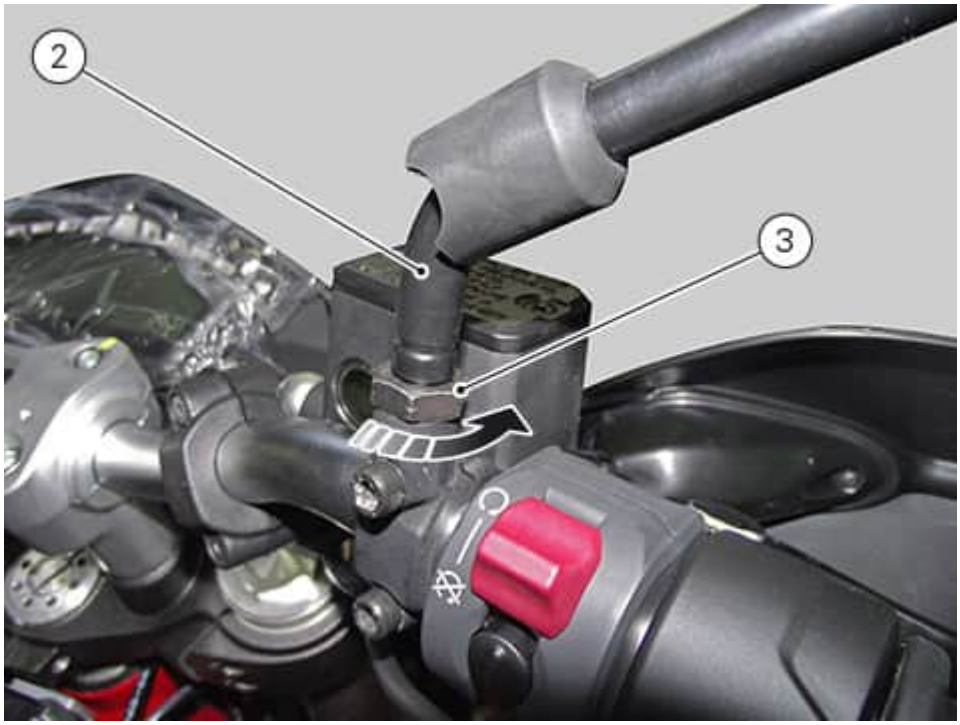
Check the engine oil level through the sight glass (1) on the right-hand side of the oil sump.
Stop the engine and allow a few minutes for the oil to settle to a steady level.
Oil level must be checked with the vehicle perfectly upright and the engine cold. Oil level must be between the MIN and MAX marks.
Top up if the level is low.
Remove the filler plug (2) and top up with the recommended oil.
Ducati recommends you use Shell Advance 4T Ultra 15W-50 oil. As an alternative it is possible to use a motorcycle engine oil having the same degree SAE 15W-50 and meeting the following specifications JASO: MA2 and API: SM.
Refit the filler plug (2).





Installation of the rear-view mirrors

Place the RH rear-view mirror (2) with nut (3) on the U-bolt.
Screw the RH rear-view mirror (2) as shown until reaching the desired position. Then keep the rear-view mirror and tighten nut (3) as shown to 40 Nm ± 10 %.

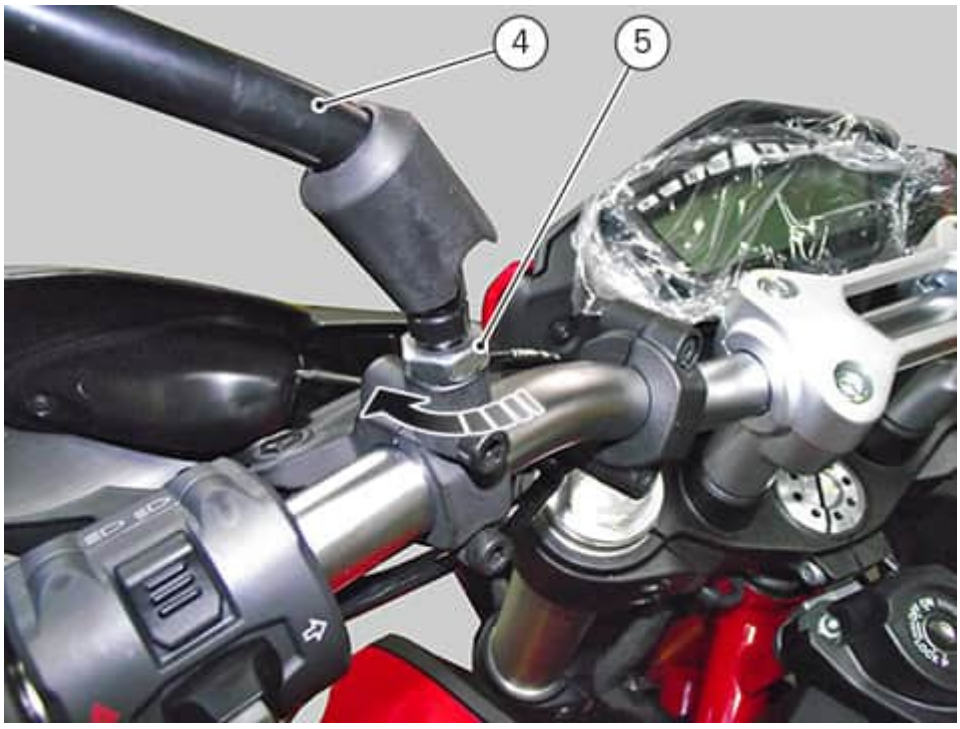


Fit rubber element (1) of RH rear-view mirror (2).

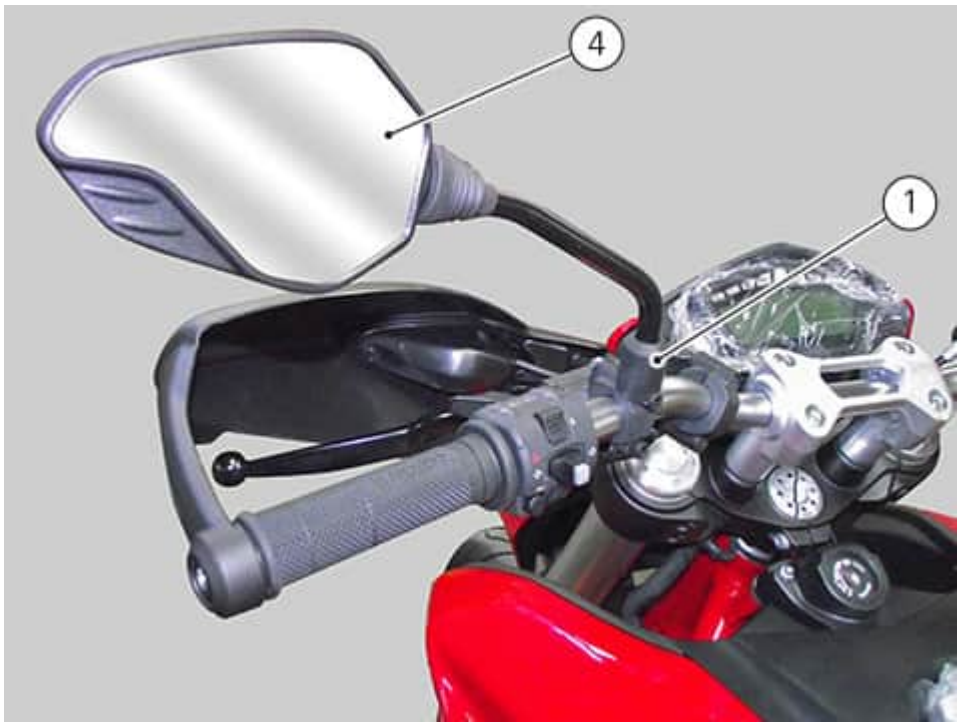




Place the LH rear-view mirror (4) with nut (5) on the U-bolt.
Screw the LH rear-view mirror (4) as shown until reaching the desired position. Then keep the rear-view mirror and tighten nut (5), as shown in the figure.



Fit rubber element (1) of LH rear-view mirror (4).


4
1

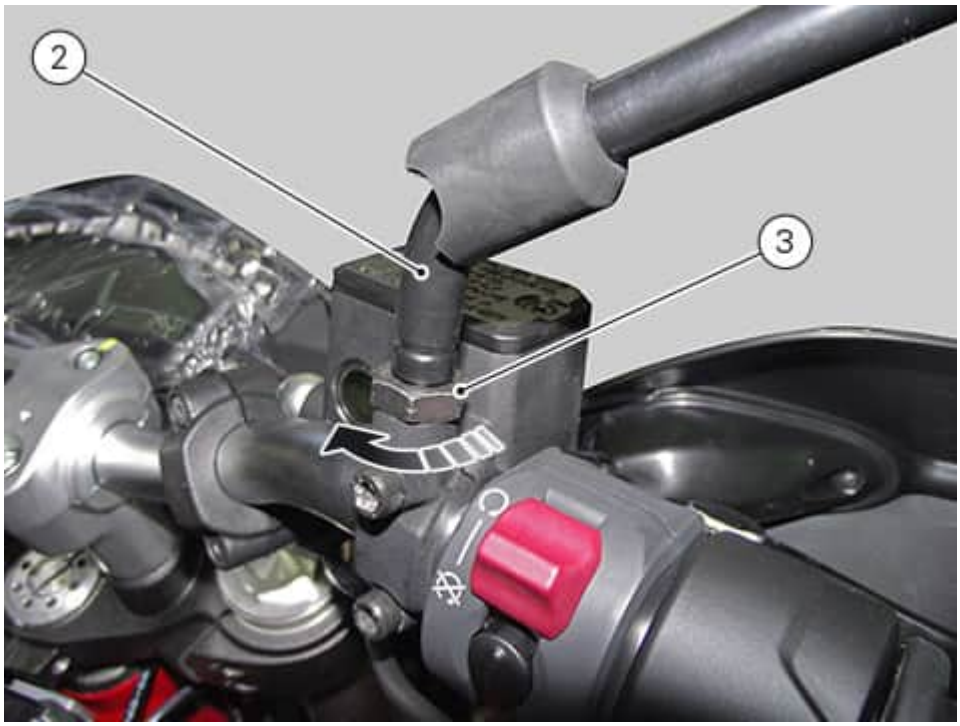
Removal of the rear-view mirrors

Lift rubber element (1) of RH rear-view mirror (2).

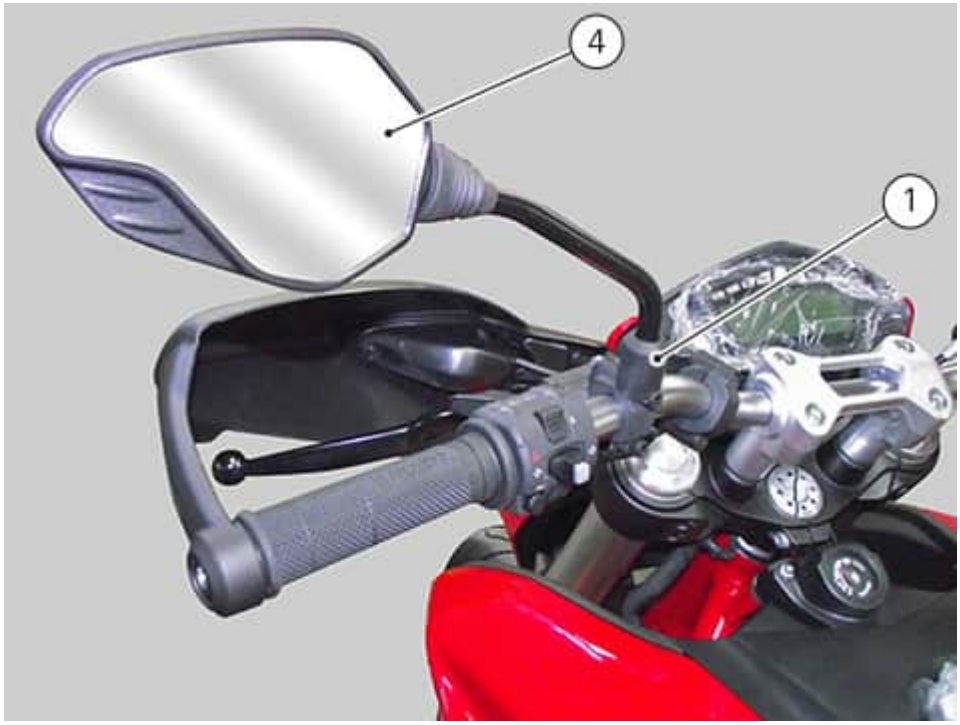




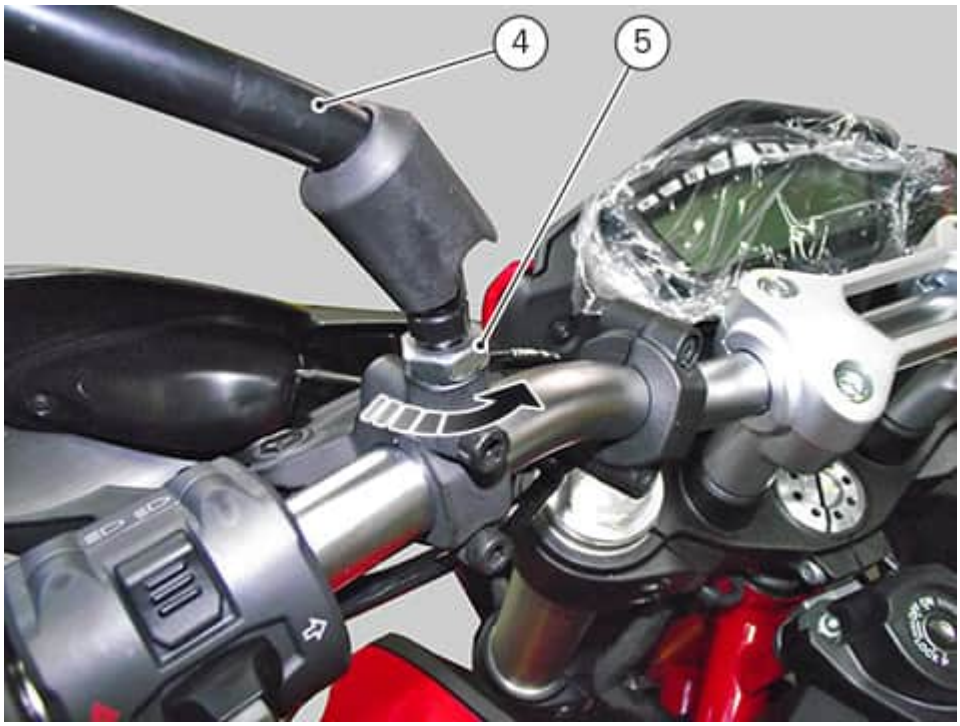
Loosen nut (3) in the shown direction and loosen RH rear-view mirror (2) to remove it.



Lift rubber element (1) of LH rear-view mirror (4).

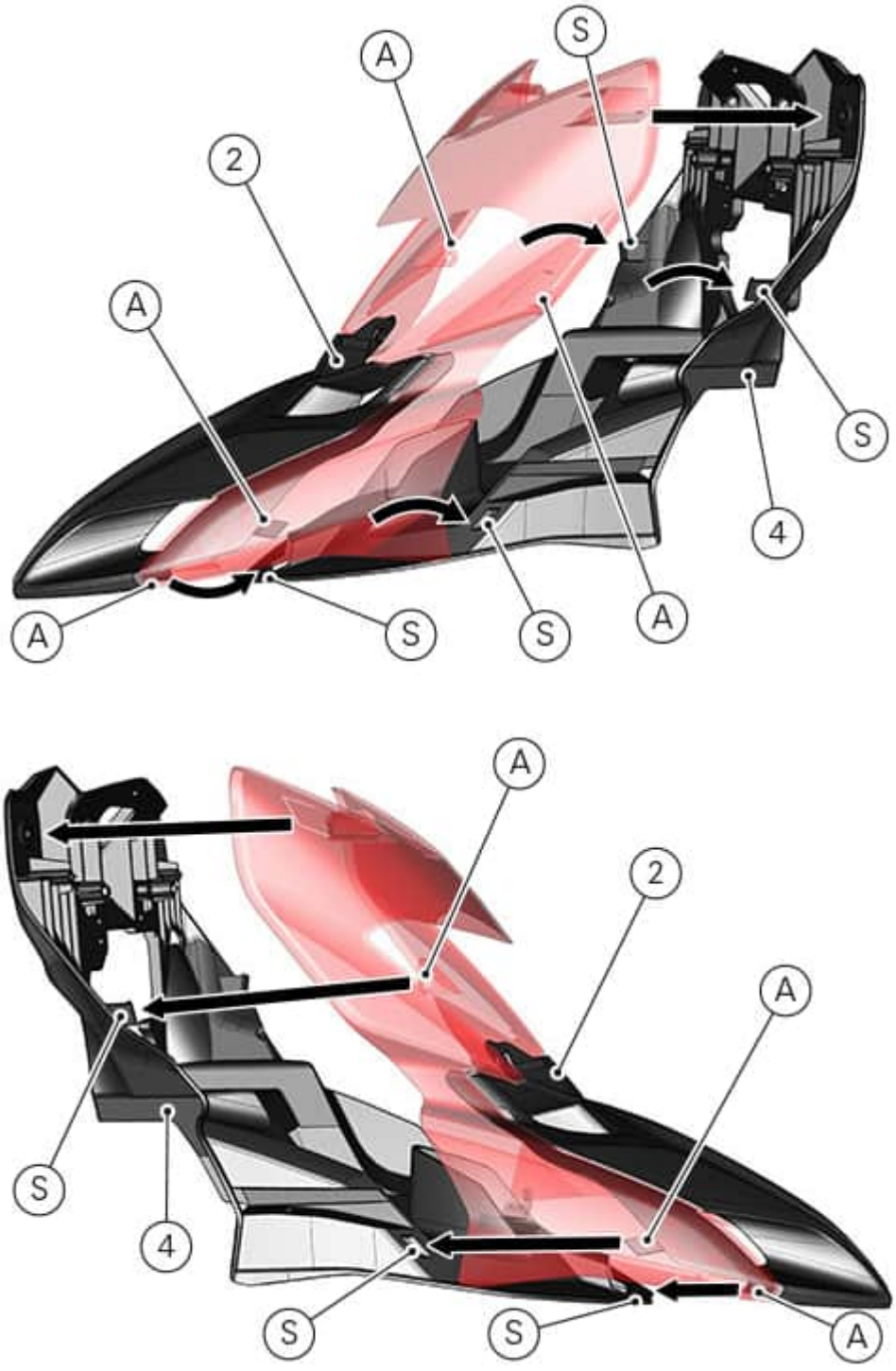


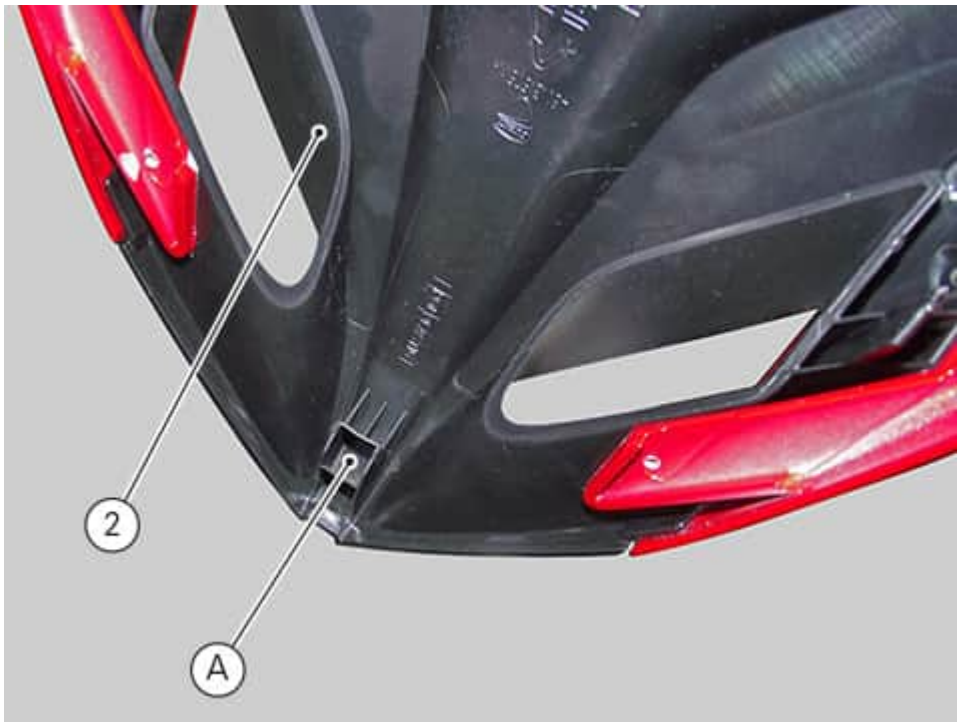
Loosen nut (5) in the shown direction and loosen LH rear-view mirror (4) to remove it.

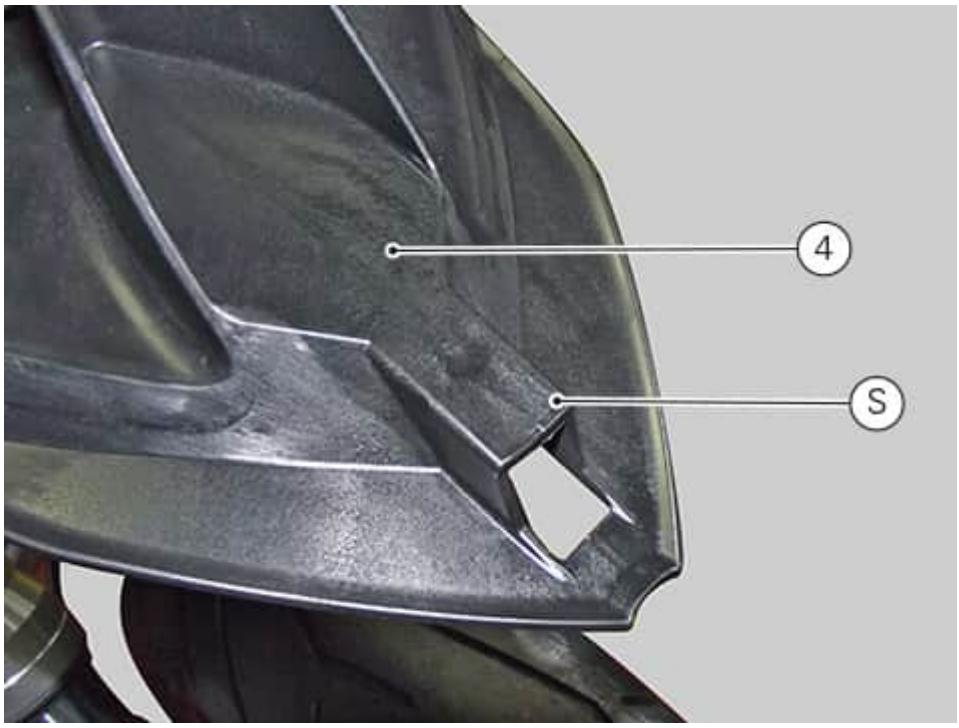

4
5

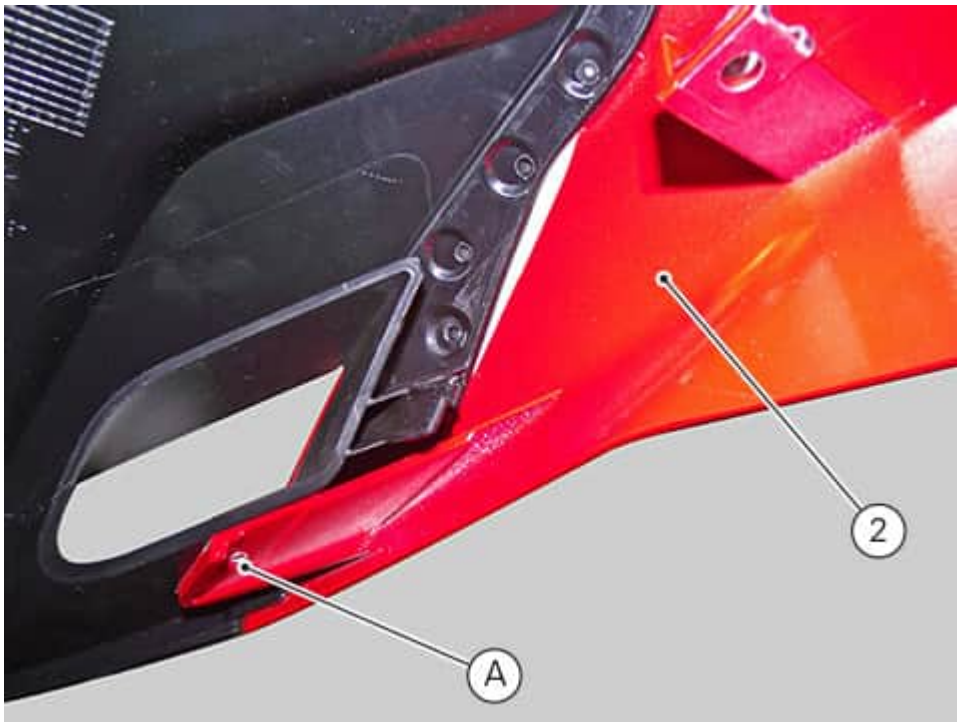
Installation of the headlight fairing

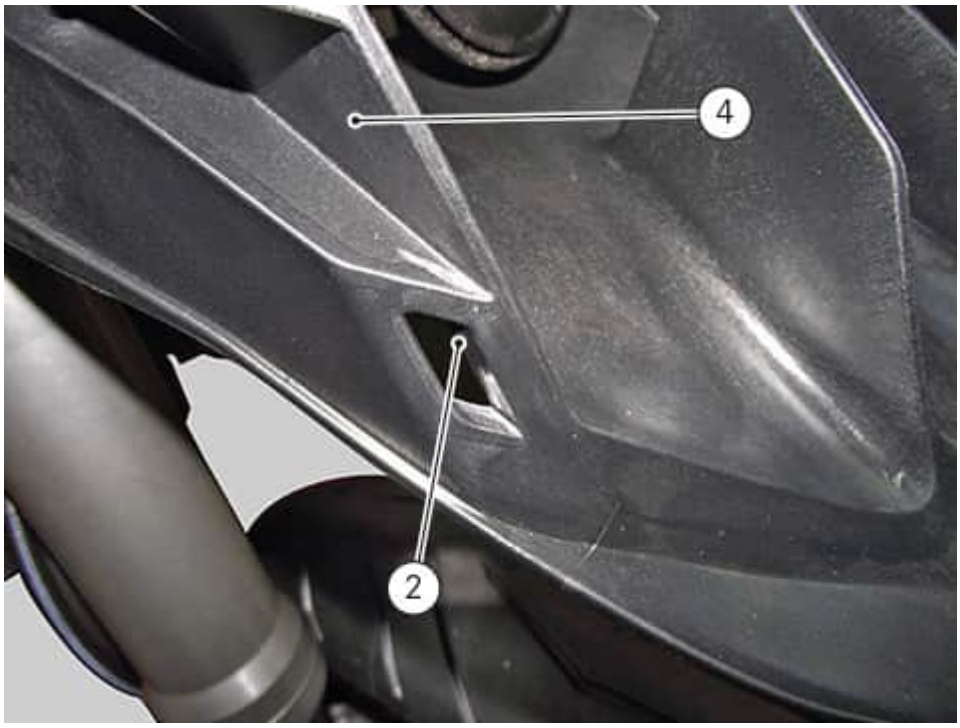
Position headlight fairing (2) on the relevant support (4) by engaging headlight tabs (A) in support seats (S).

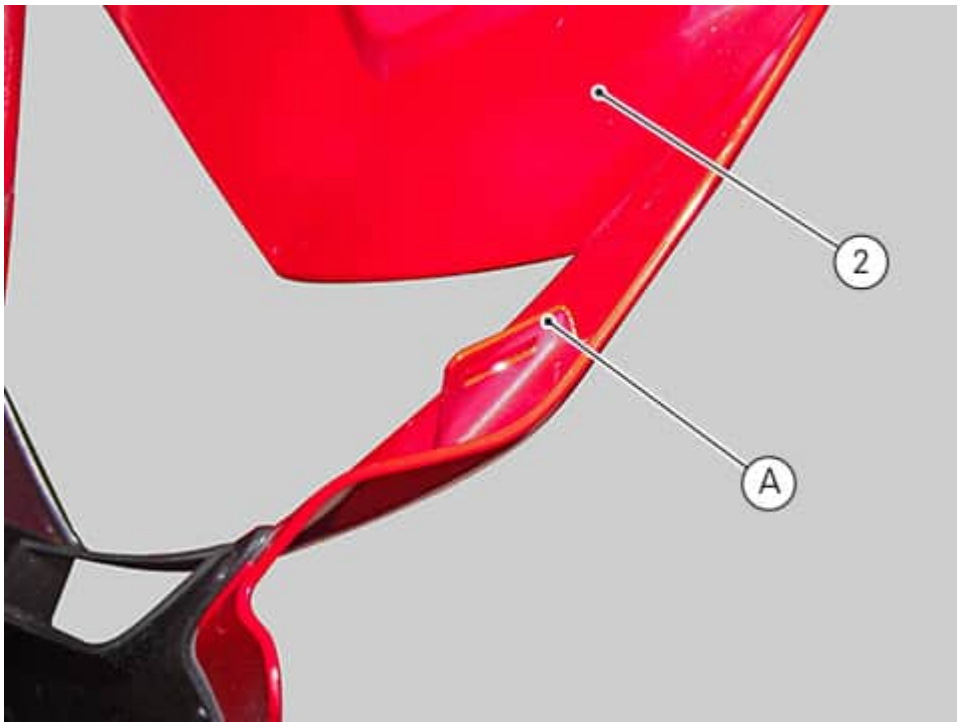



2
A

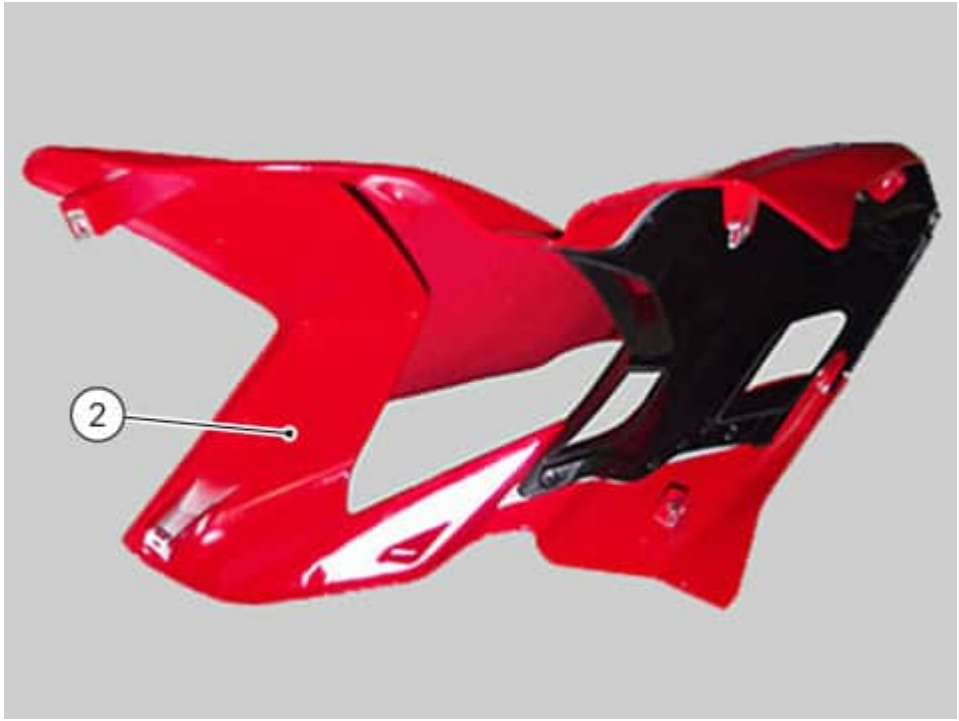

4
S

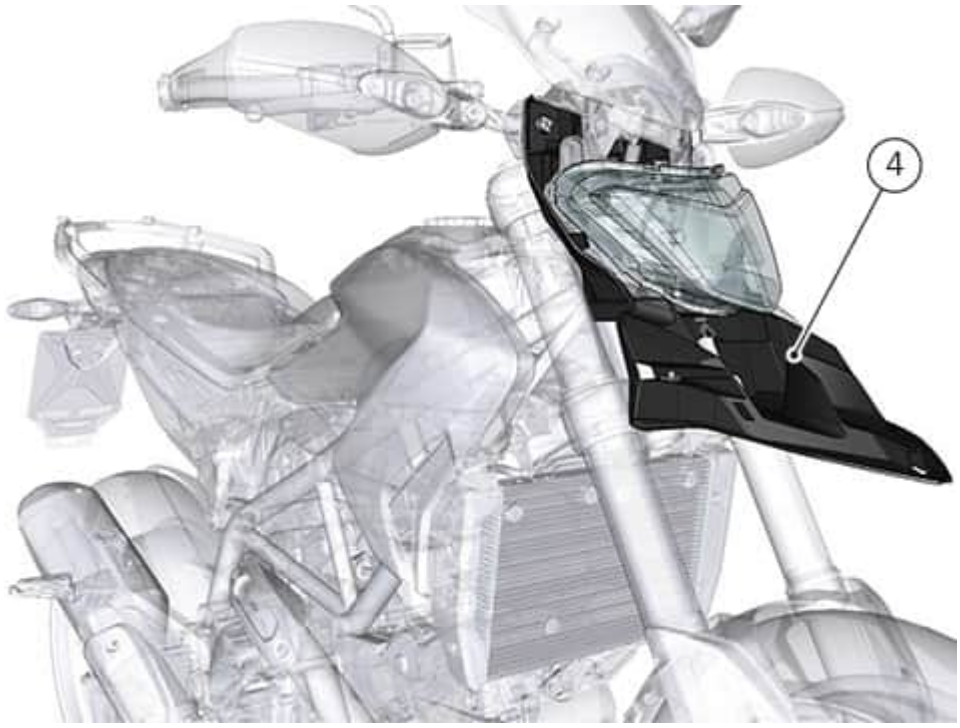

2
A


4
2


2
A

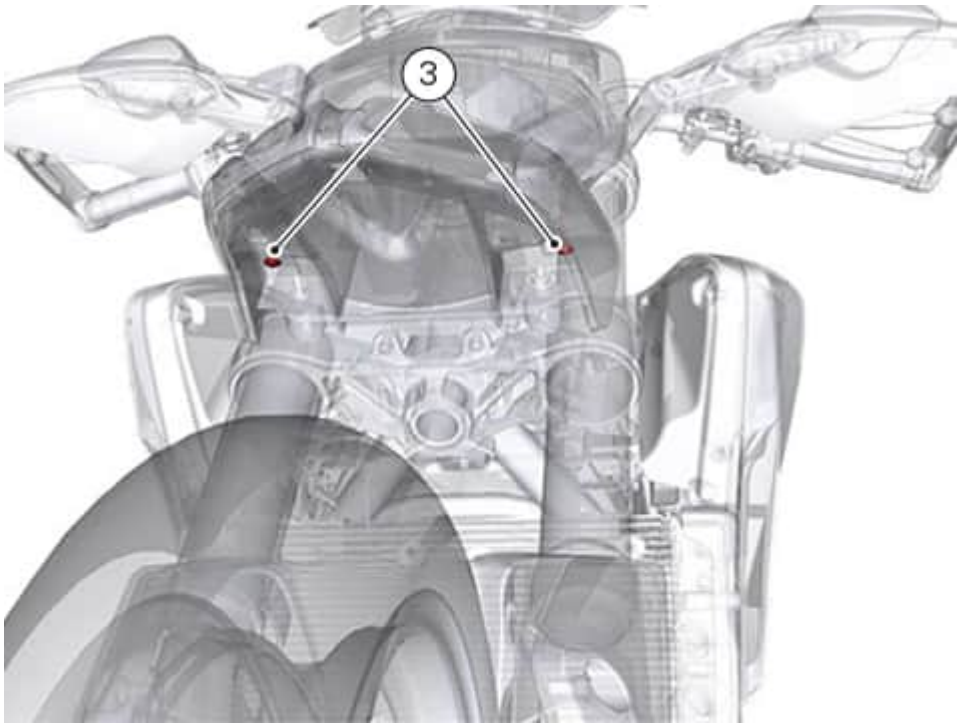

4
S



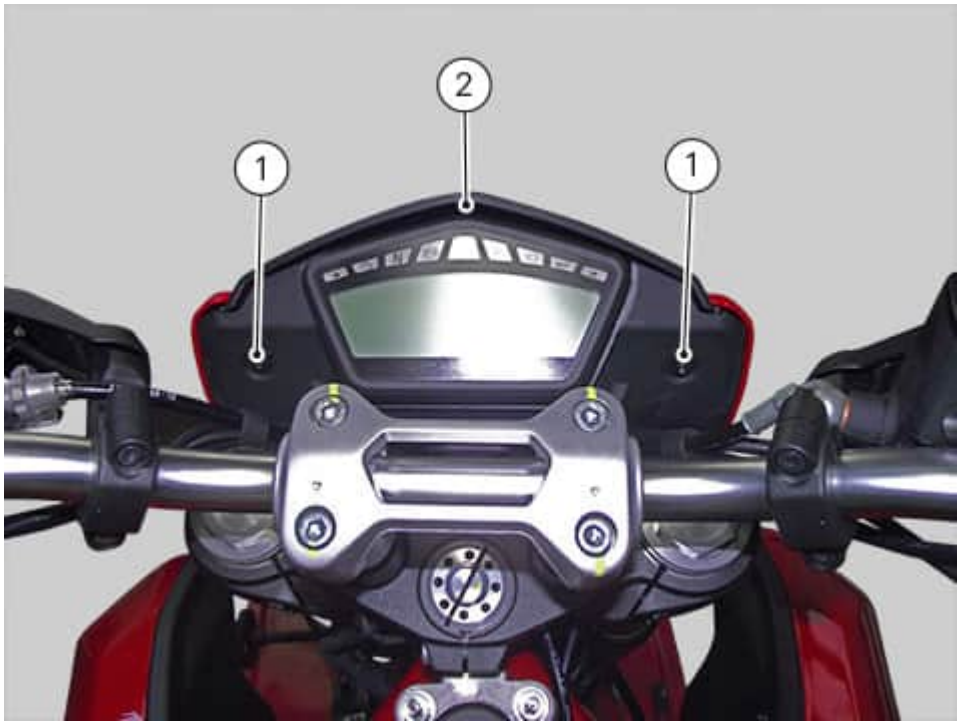


Start screws (3) securing headlight fairing (2) to the headlight lower bracket.





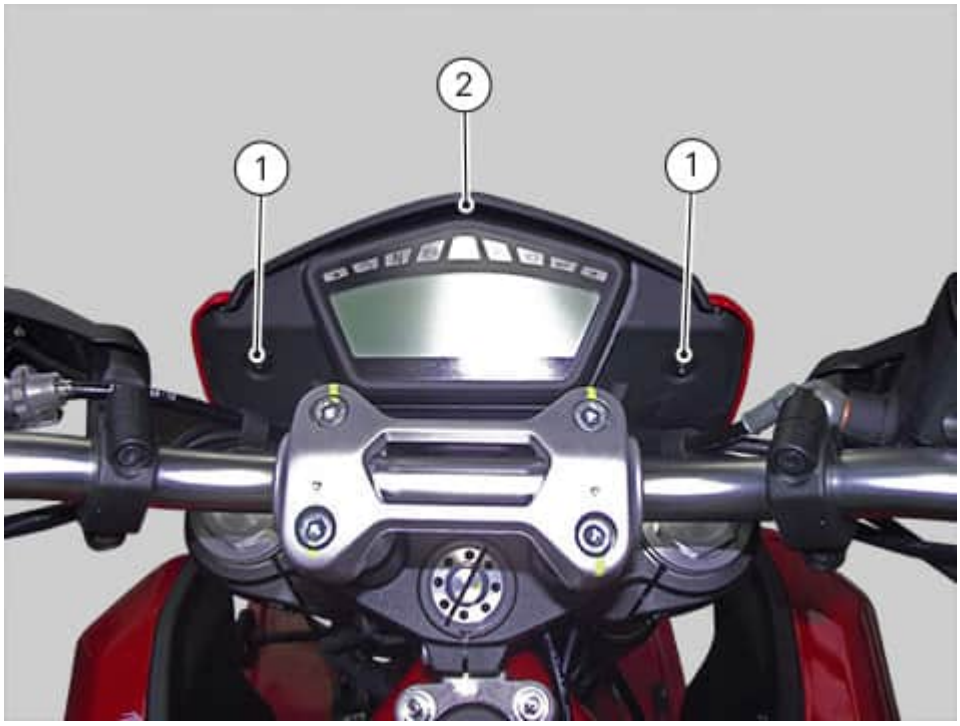
Start screws (1) securing headlight fairing (2) to the headlight support.
Tighten screws (1) and (3) to a torque of 2 Nm ± 10%.


2
1
1


3

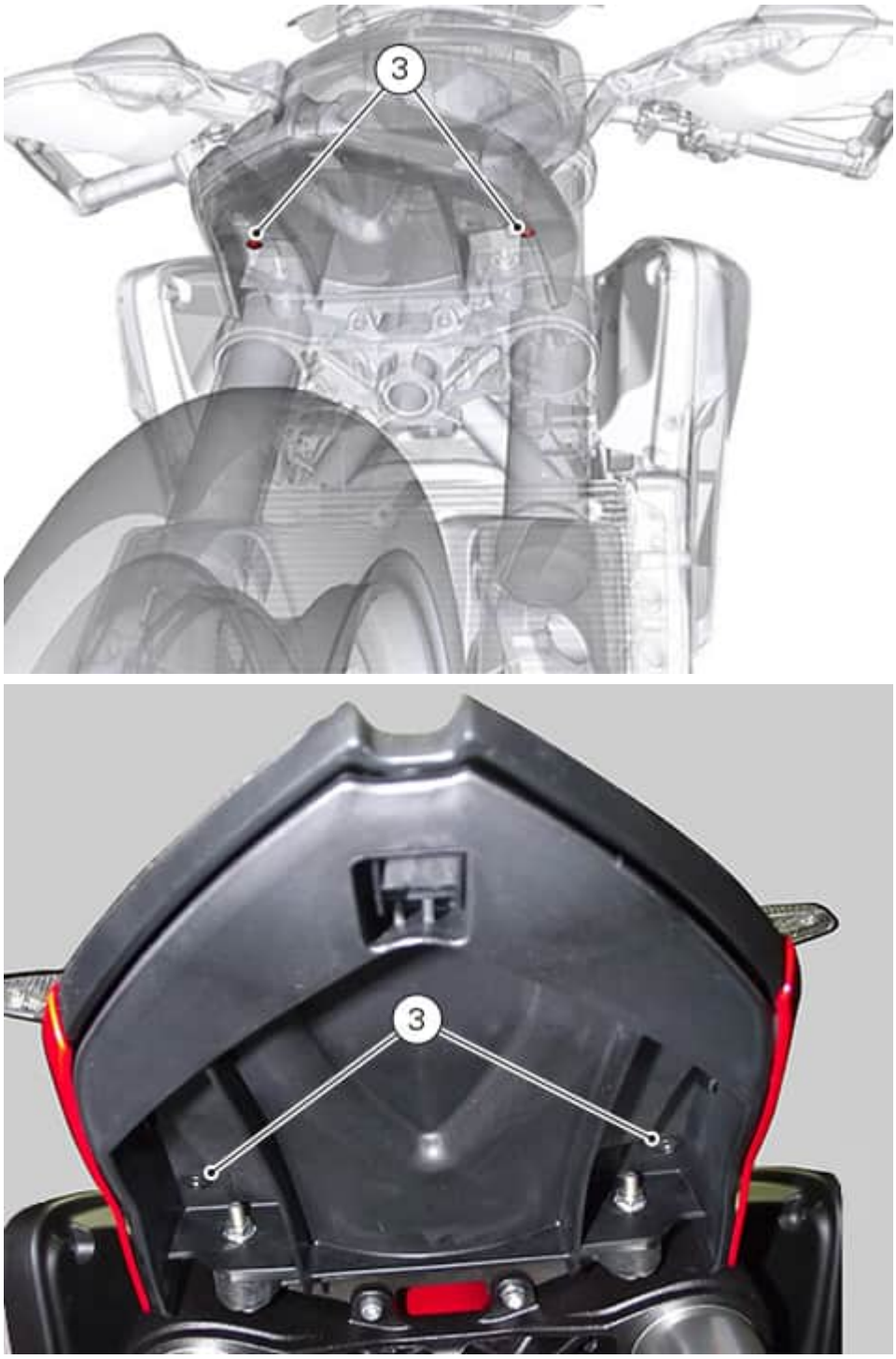
Removal of the headlight fairing

Undo and remove screws (1) securing headlight fairing (2) to the headlight support.

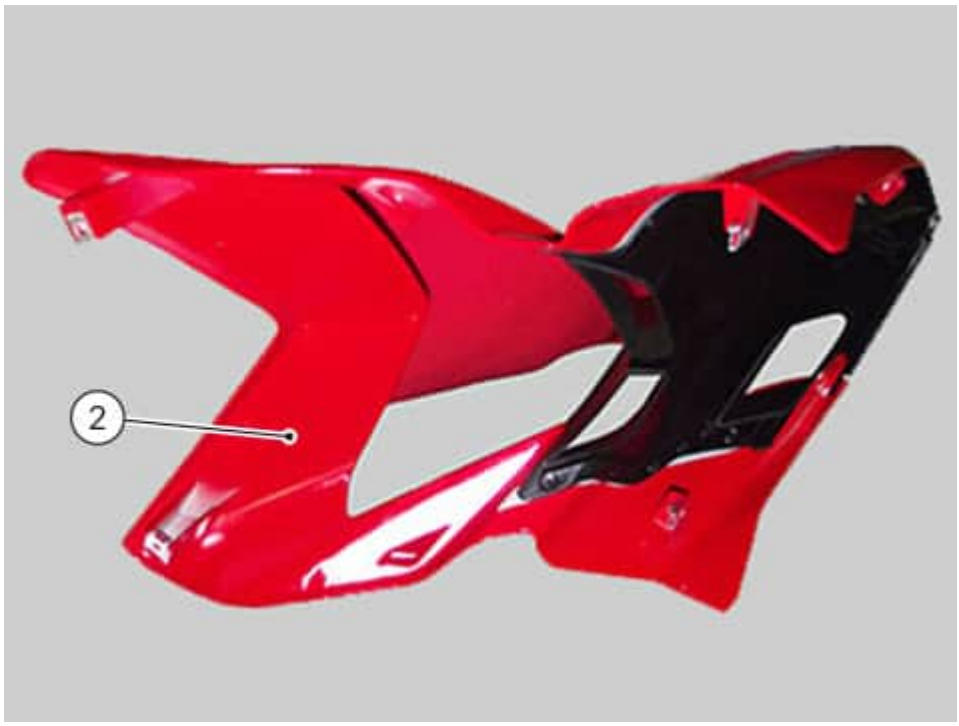


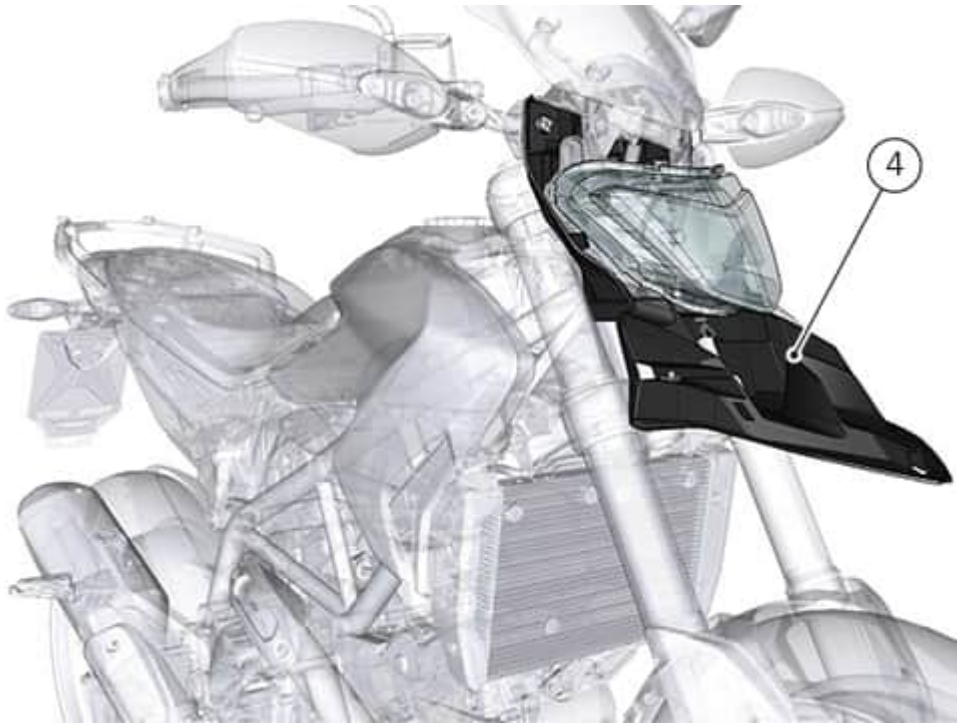


Undo and remove screws (3) securing headlight fairing (2) to the headlight lower bracket.



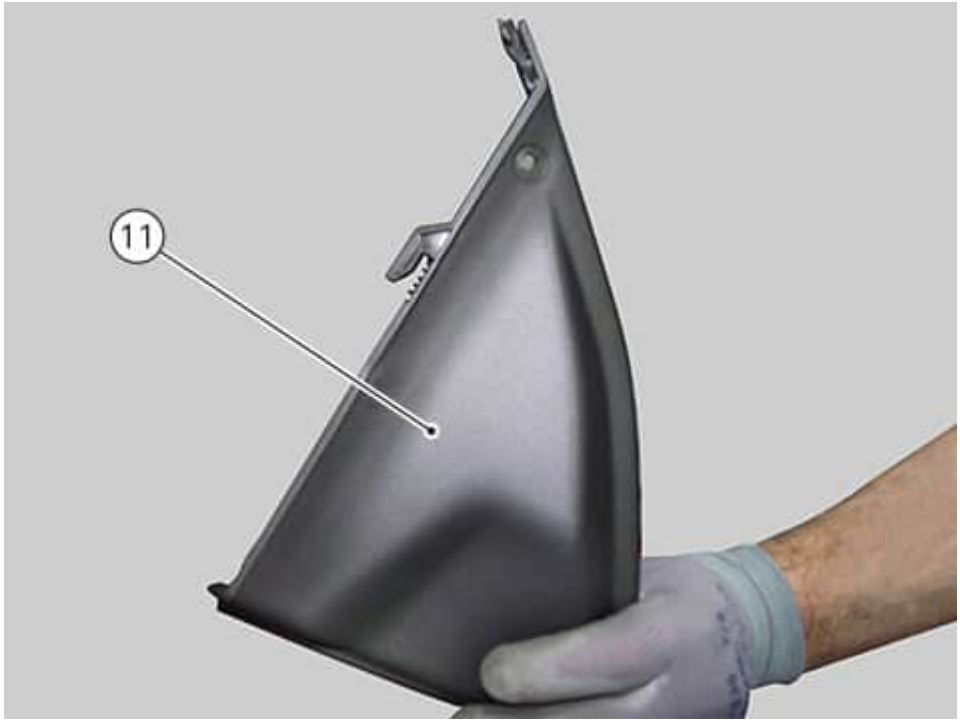
Slide out headlight fairing (2) from the relevant support (4).

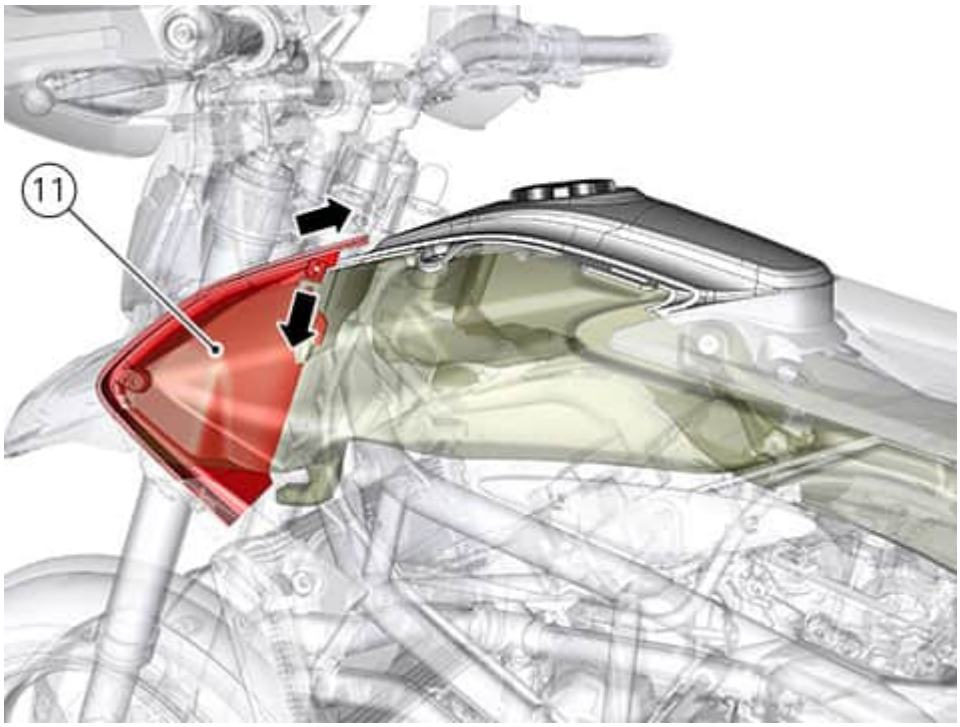

2

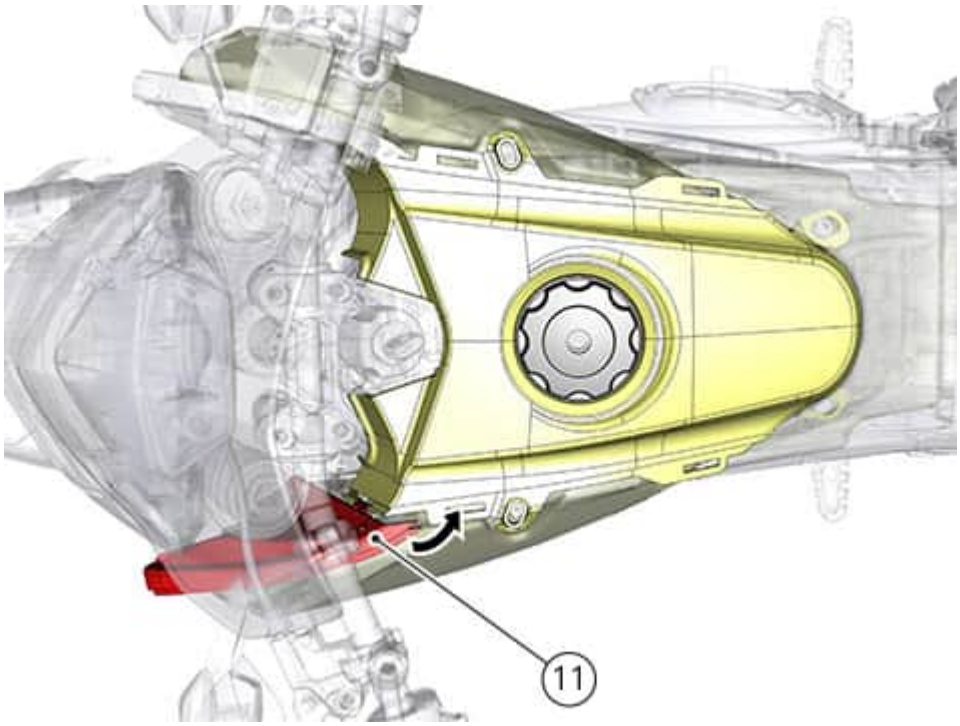

4

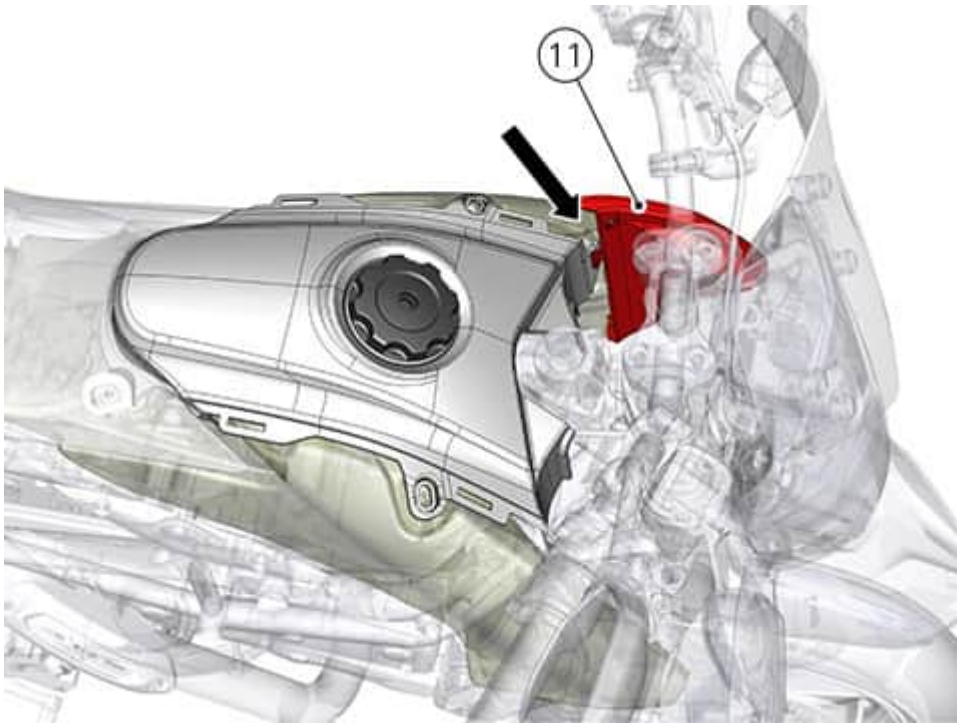
Refitting the fairings

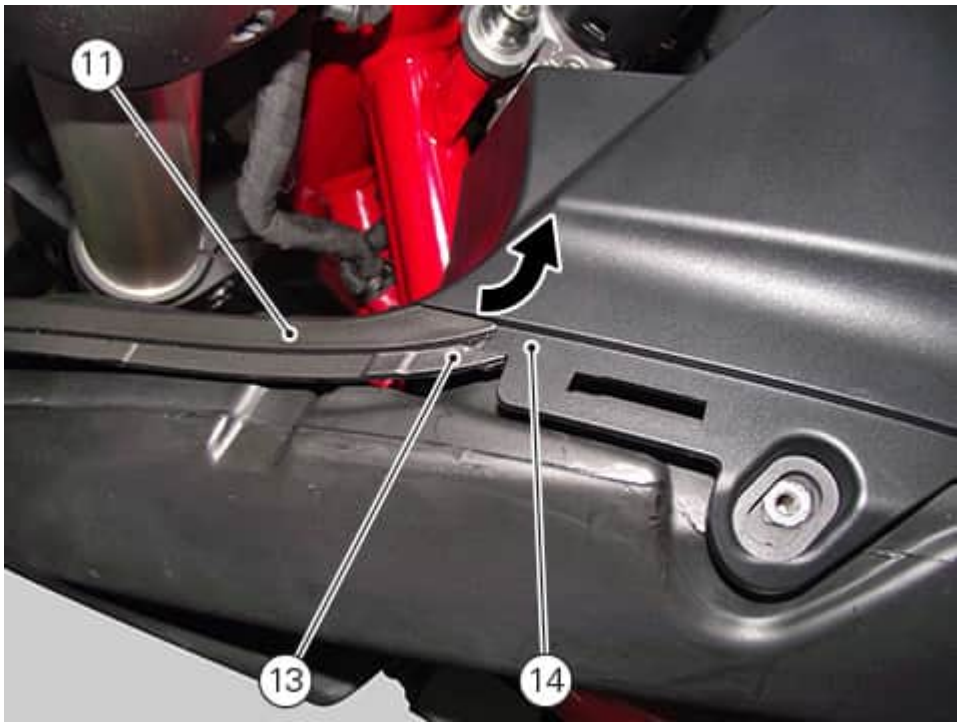
If previously removed, refit the fairing internal panels.
Place the LH panel (11) on the tank and engage tank tab (14) in groove (13).



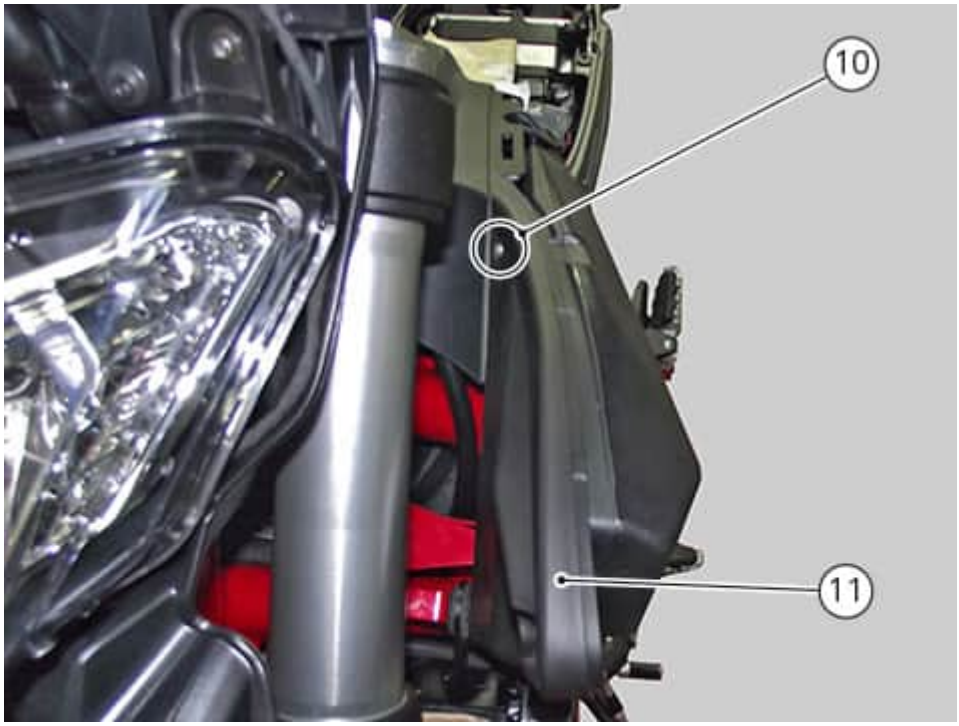



11

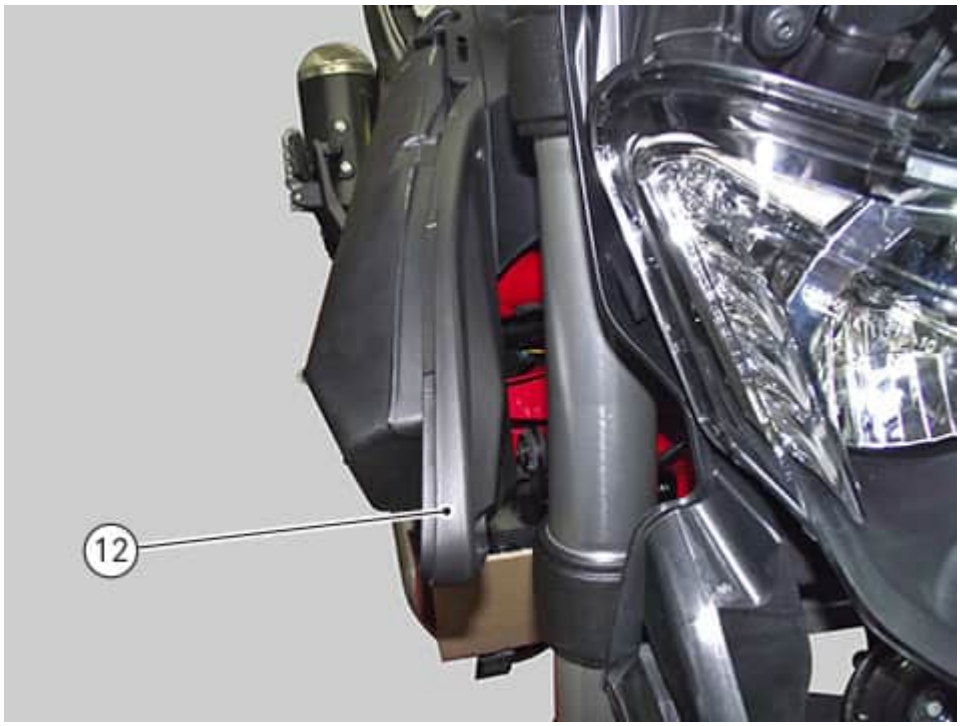

11



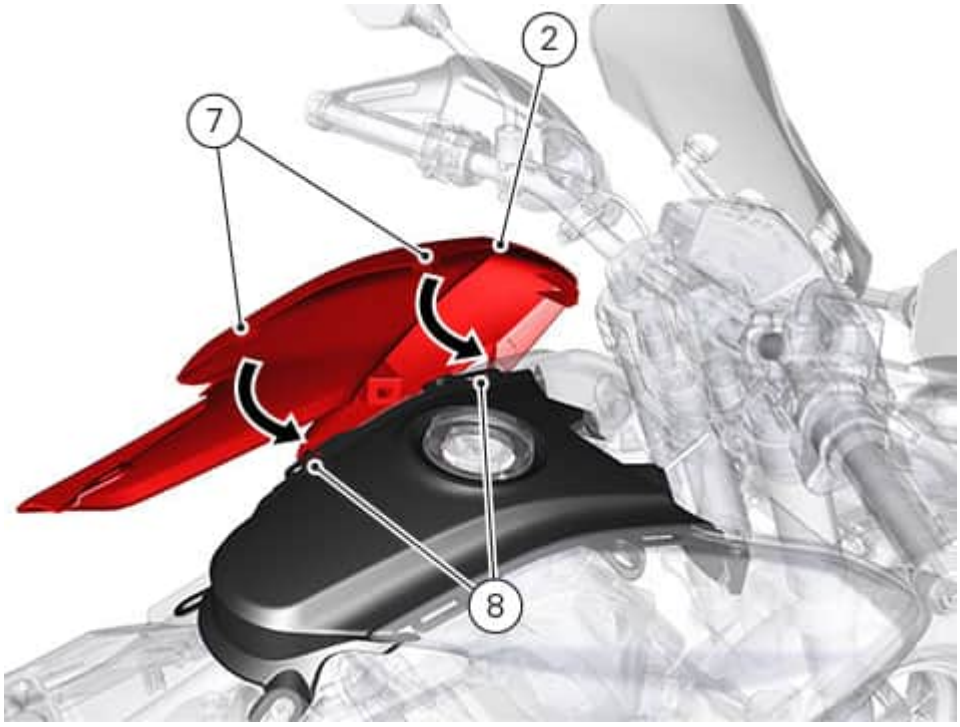
Start screw (10) securing the LH panel (11) to the tank.
Tighten screw (10) to a torque of 2 Nm ± 10%.

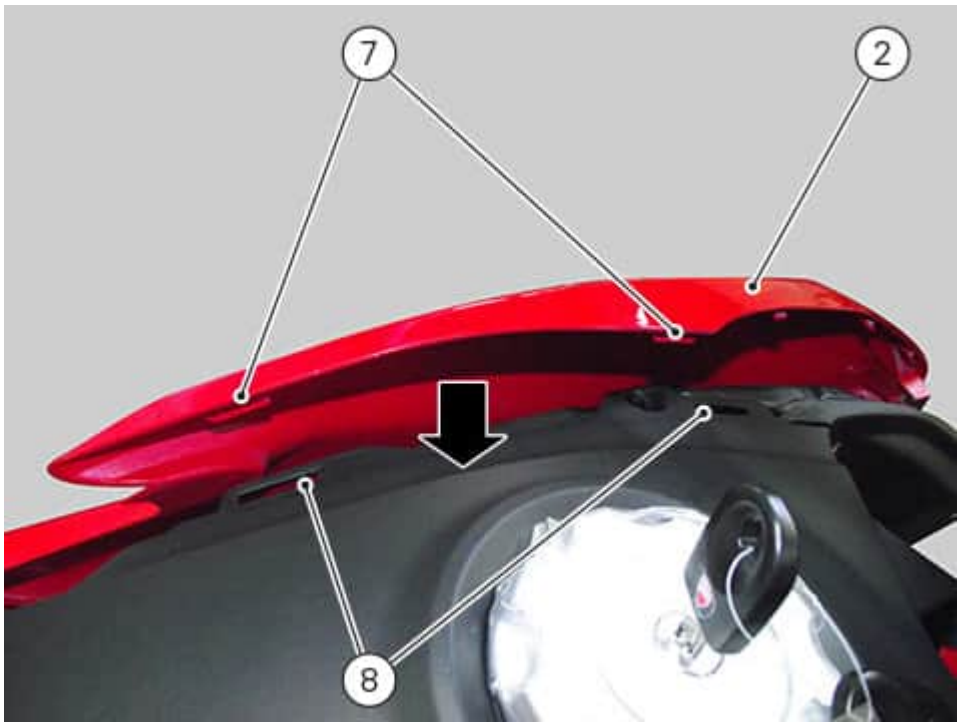


Follow the LH panel (11) fitting procedure to fit the RH panel (12).

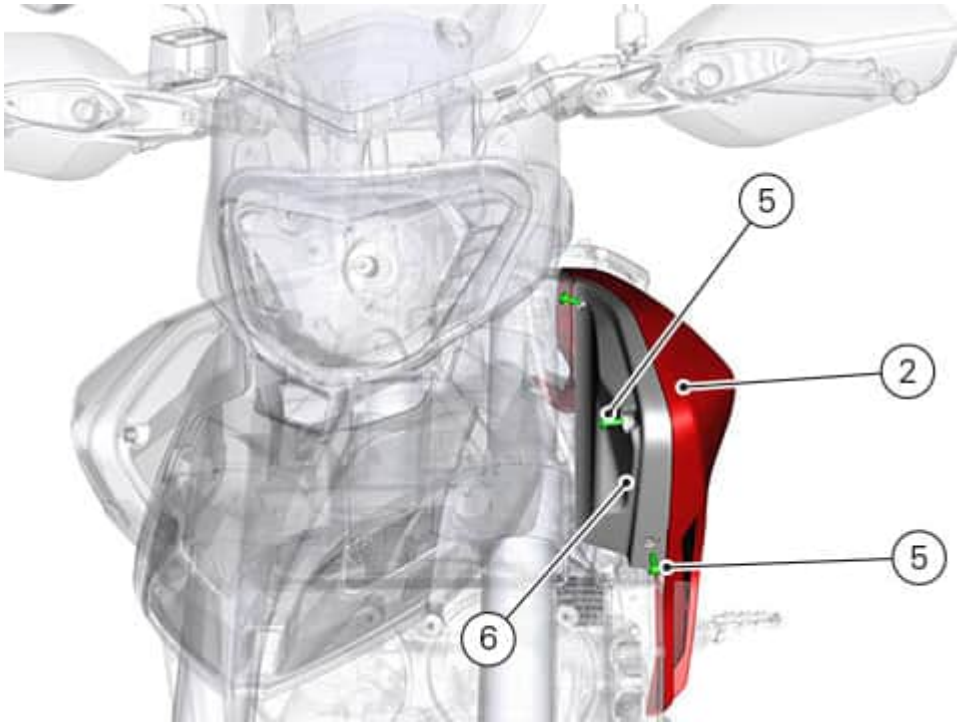


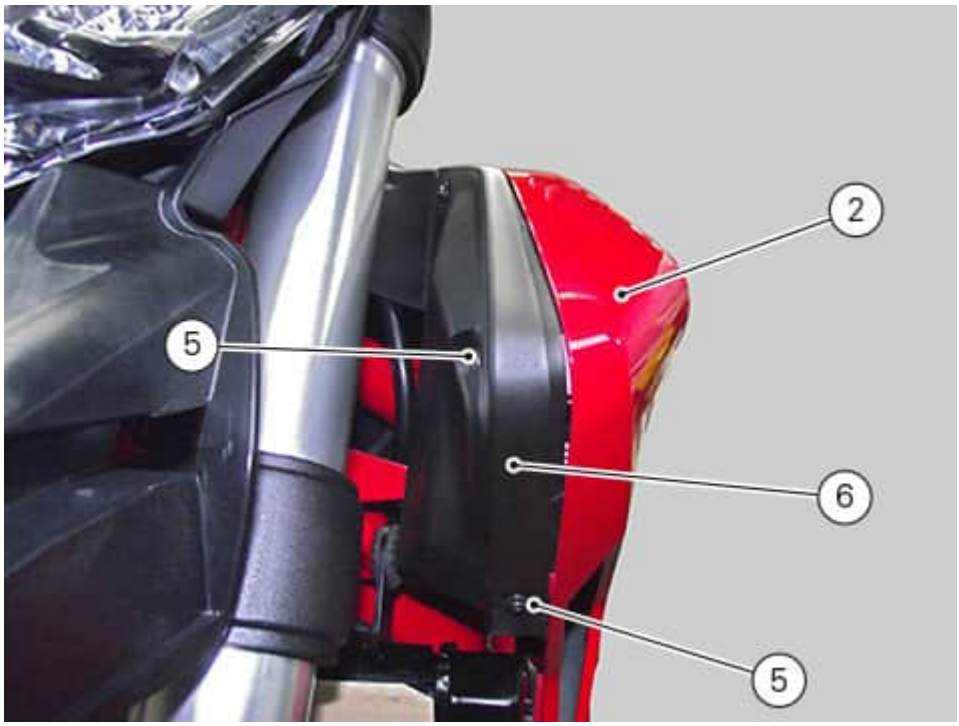
Position fairing (2) on the tank and engage fairing inserts (7) in tank slots (8).



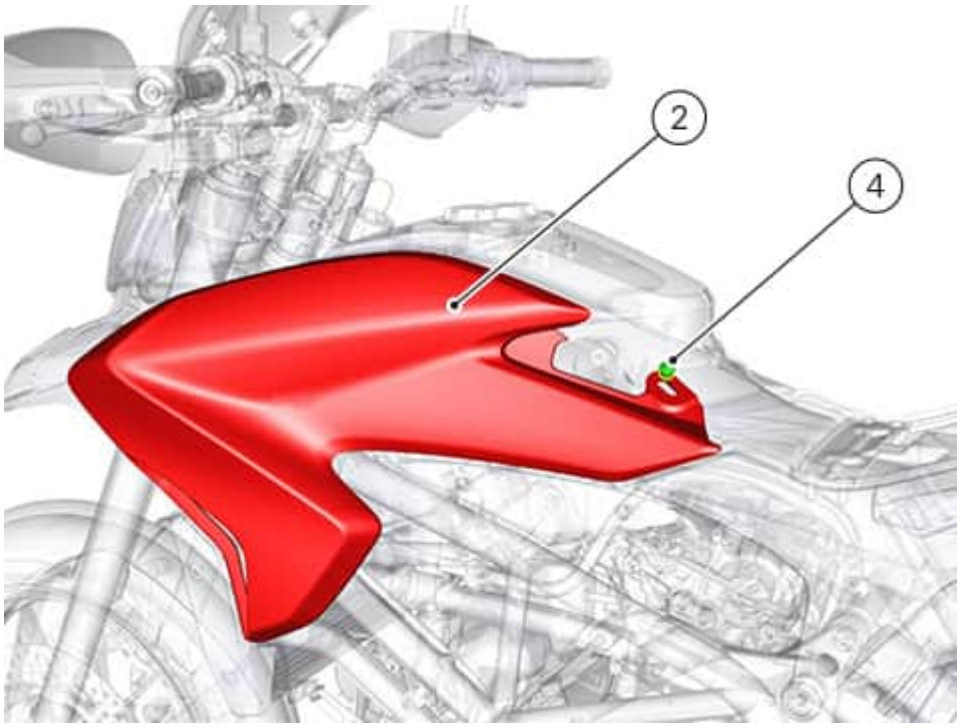


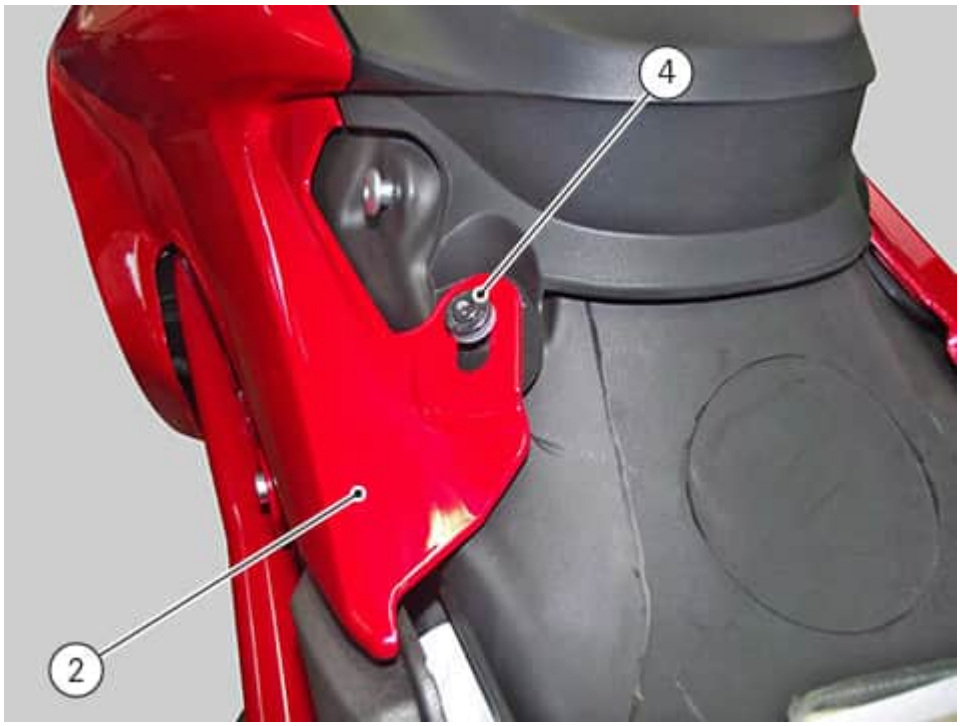
Start screws (5) securing the LH fairing (2) to the LH panel (6).





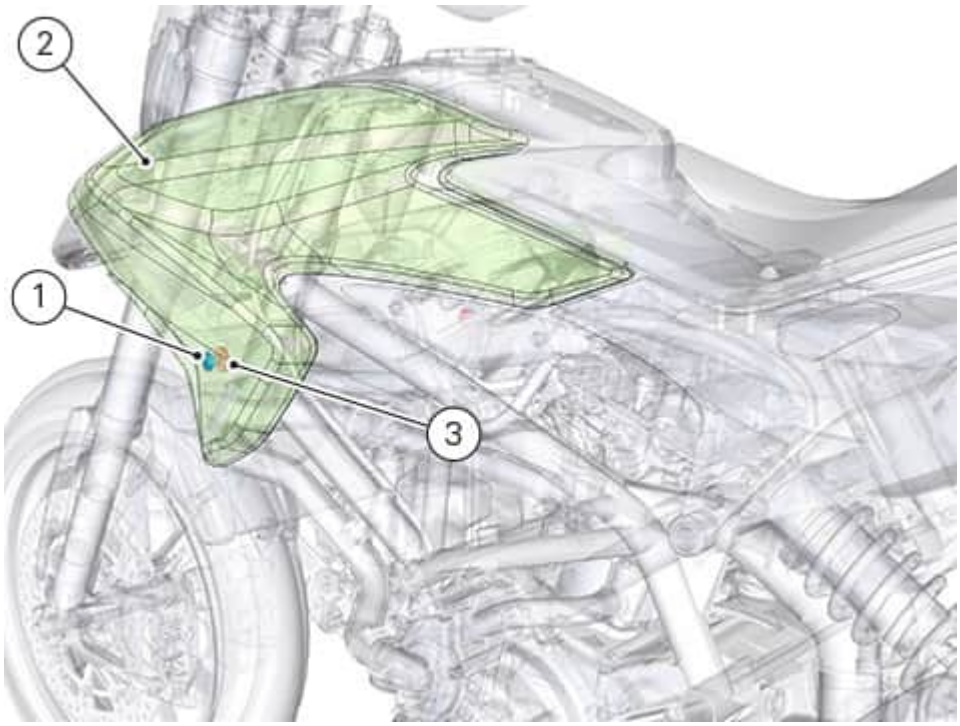
Start screw (4) securing the LH fairing (2) to the tank.



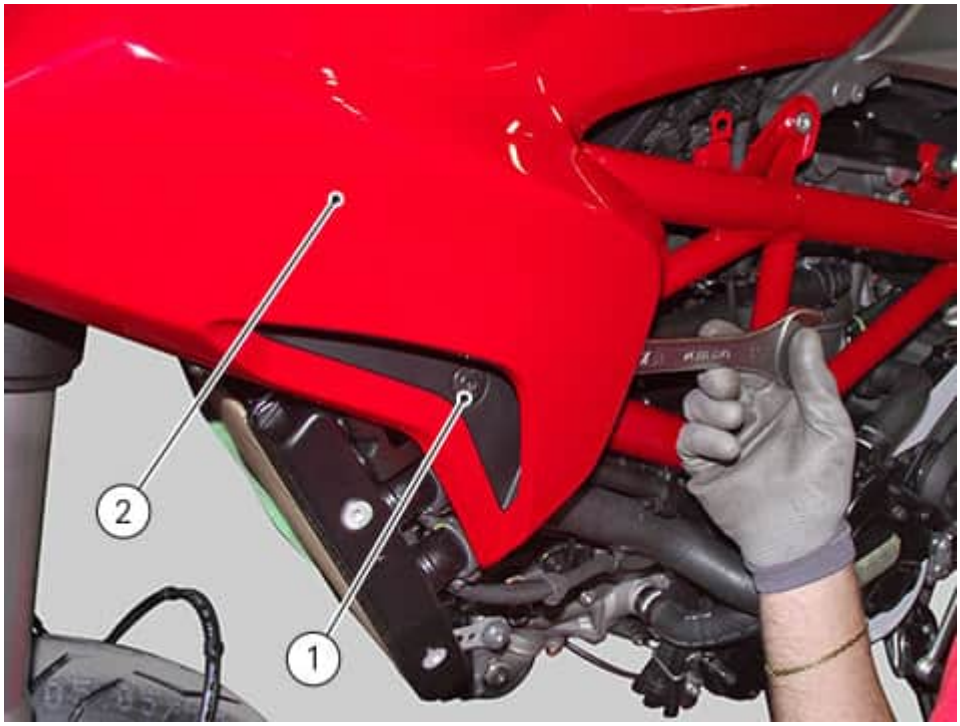


Position spacer (3) behind fairing (2).





Keep spacer (3) in position using a wrench on the internal side of the fairing, then start screw (1) securing the LH fairing (2) to the frame.



Tighten screws (1) to a torque of 5 Nm ± 10%.
Tighten screws (4) to a torque of 4 Nm ± 10%.
Tighten screws (5) to a torque of 2 Nm ± 10%.

Follow the LH fairing (2) fitting procedure to fit the RH fairing (9).



Refitting the seat.

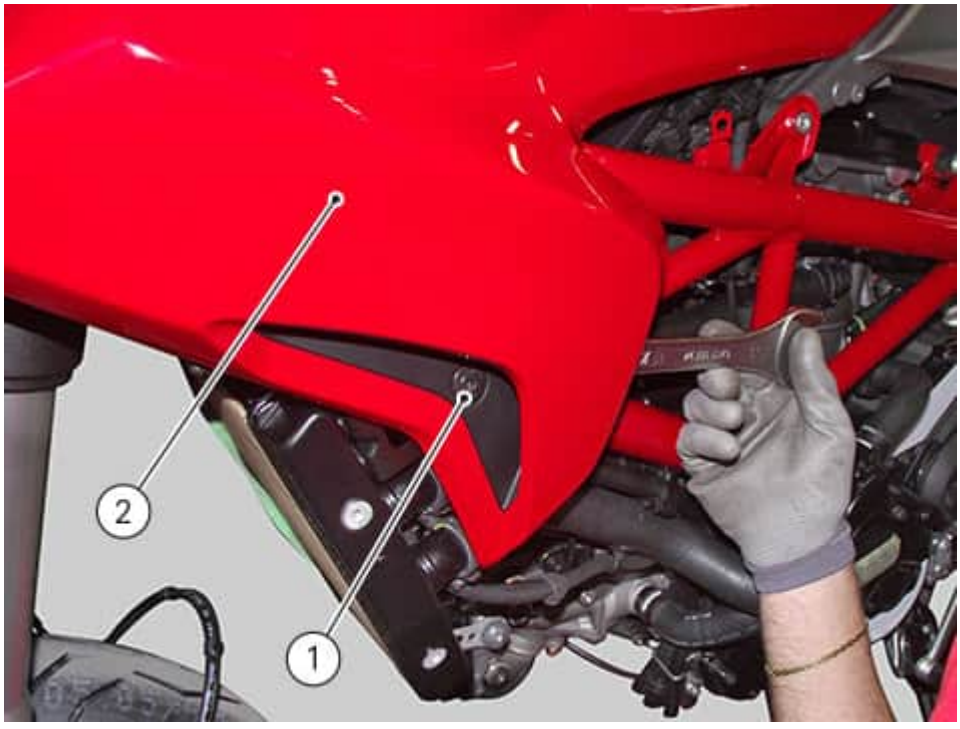


Removal of the fairings

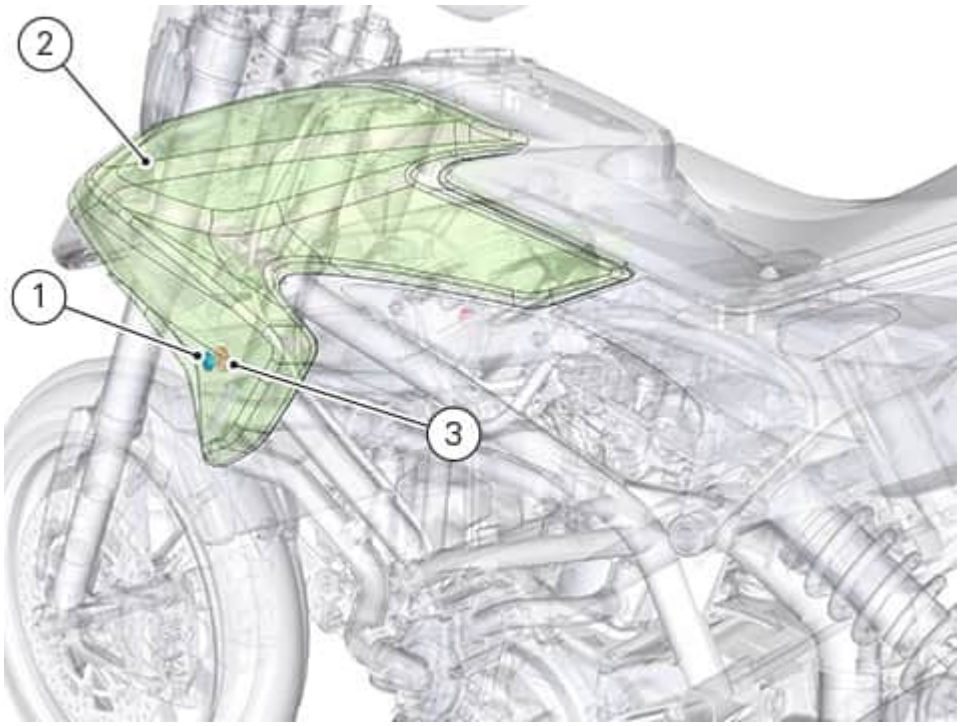
Removing the seat.



Keep a wrench on the internal side of the fairing to keep it in position, then loosen and remove screw (1) securing the LH fairing (2) to the frame.

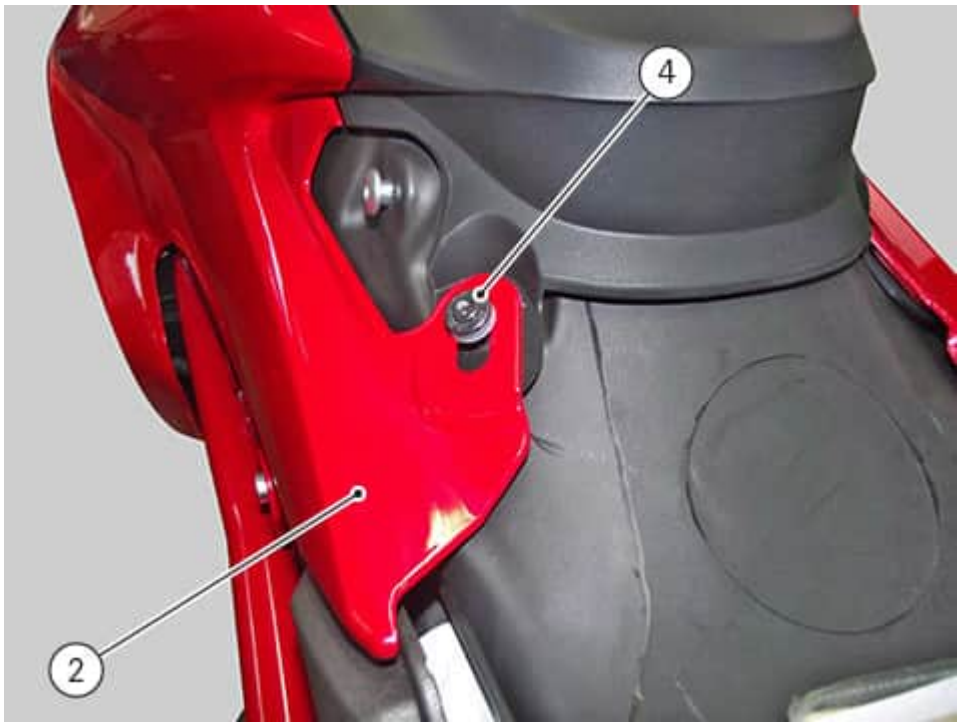


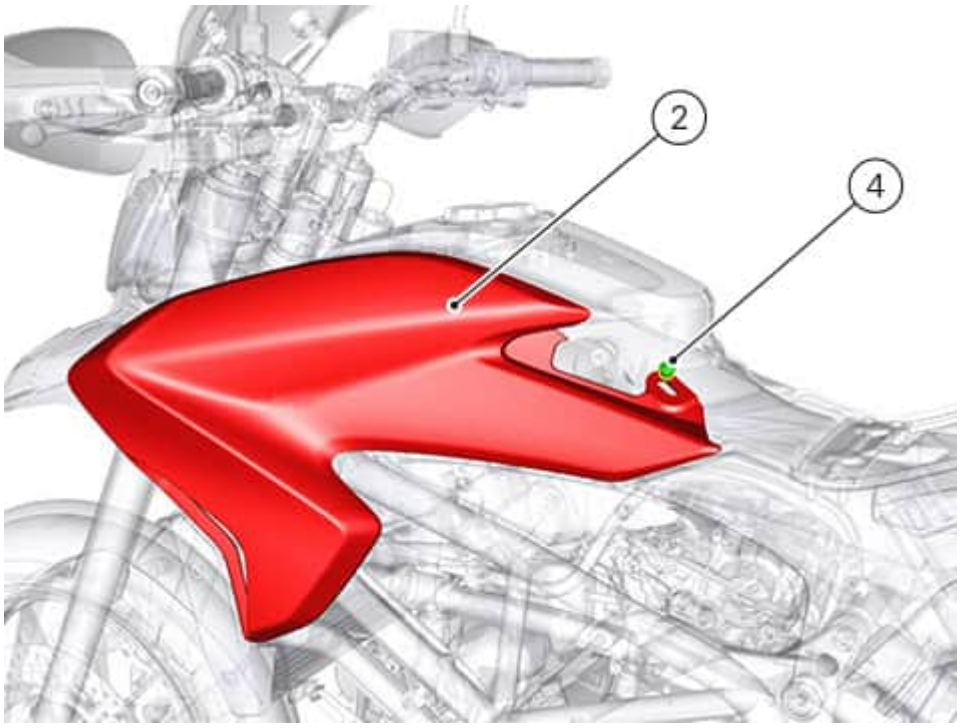
Recover threaded bush (3) behind fairing (2).



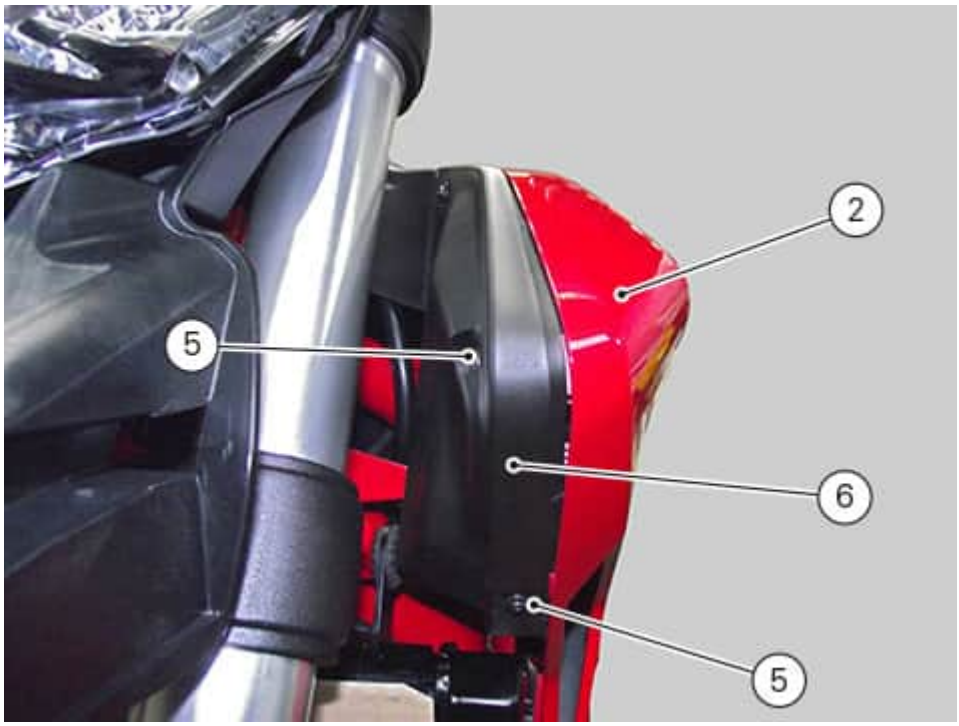


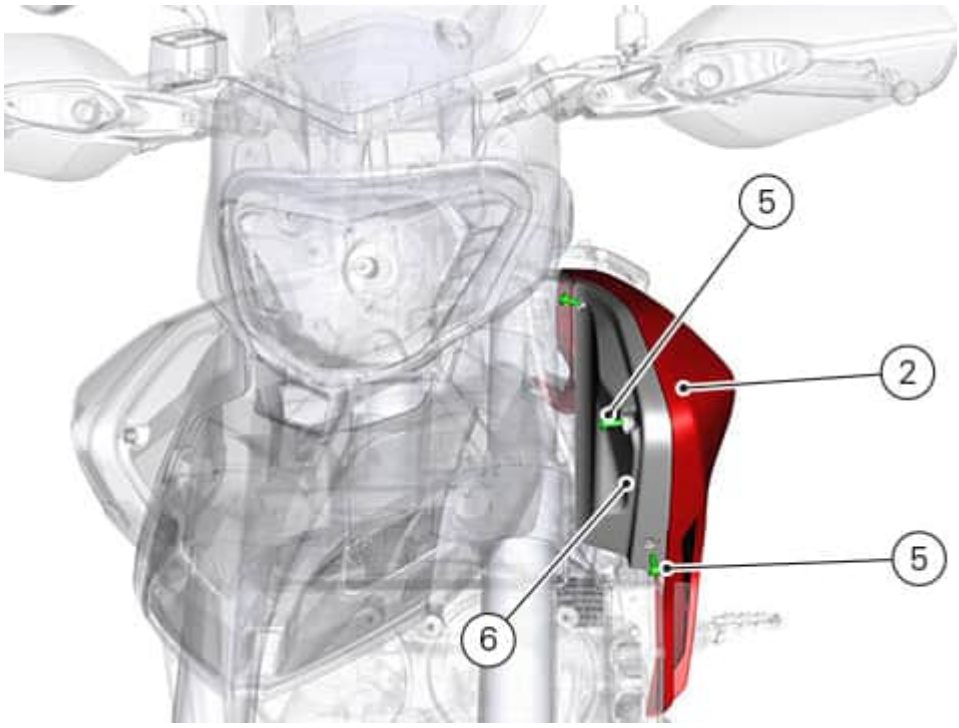
Loosen and remove screw (4) securing the LH fairing (2) to the tank.



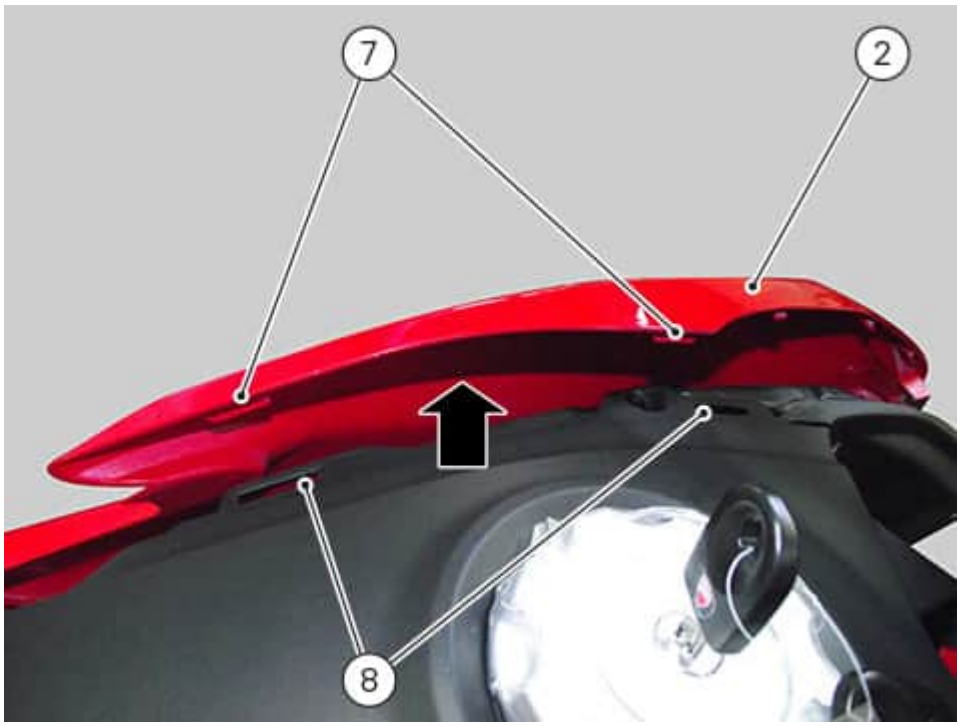


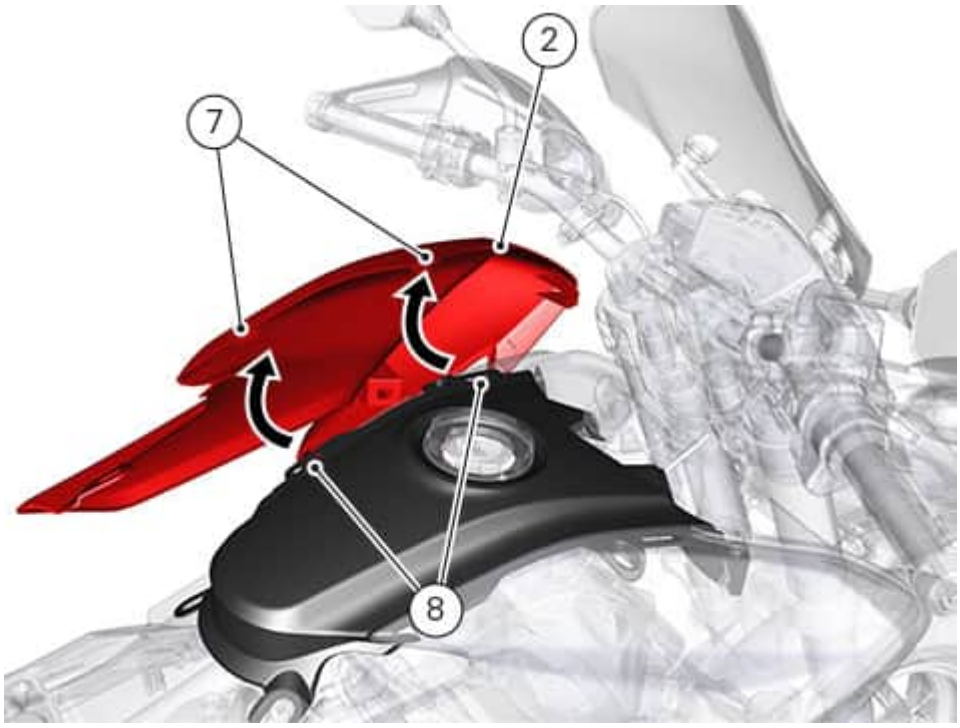
Loosen and remove screws (5) securing the LH fairing (2) to the LH panel (6).





Withdraw fairing (2) to the outside by disengaging fairing inserts (7) from tank slots (8).

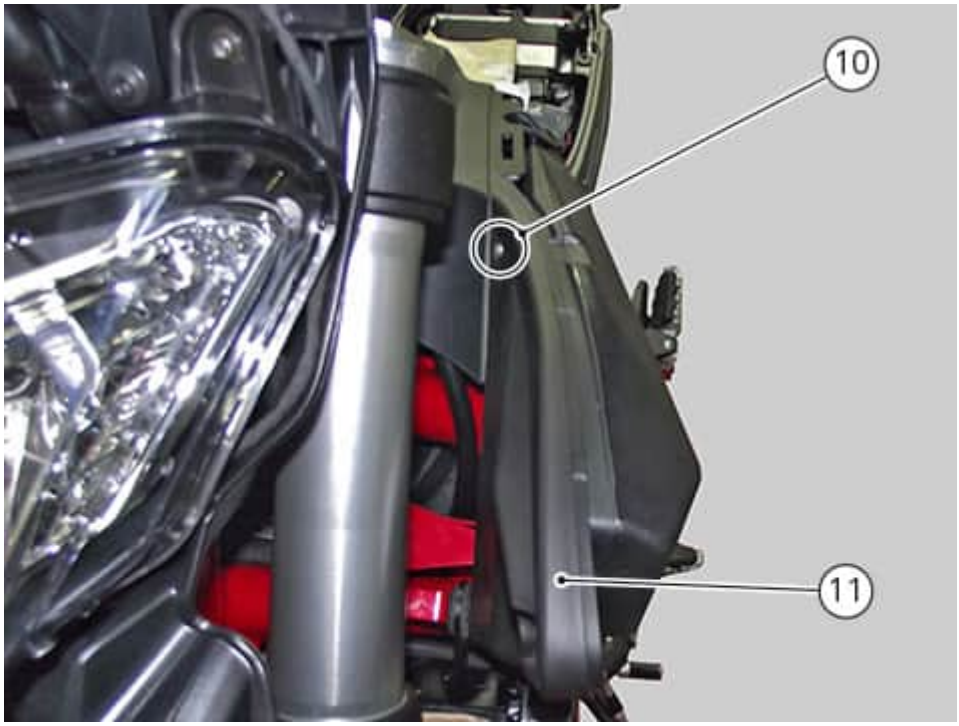




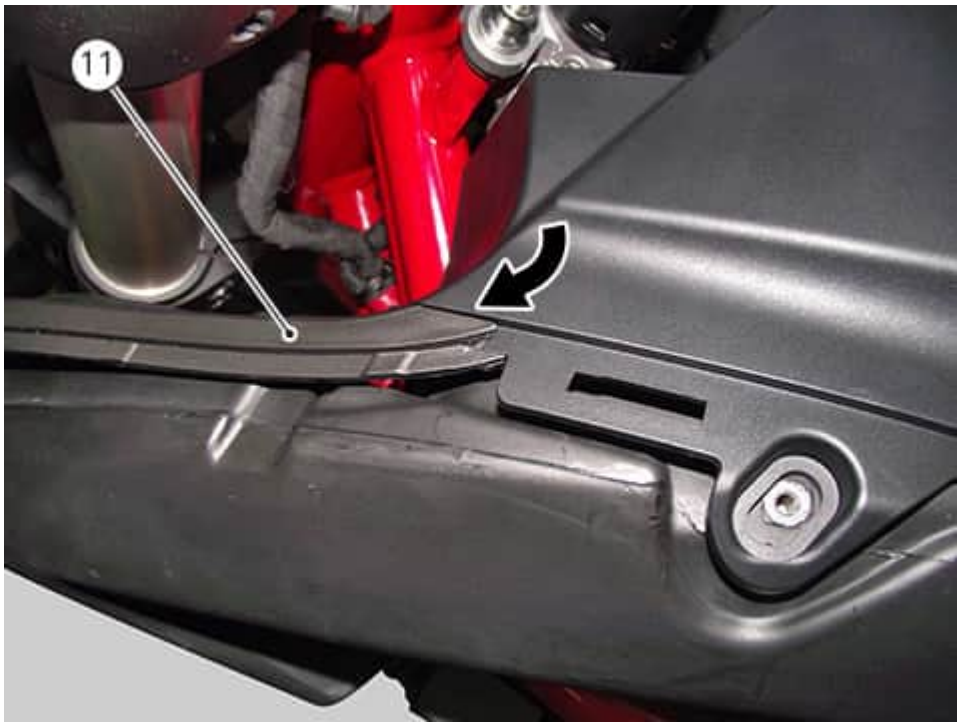
Follow the LH fairing (2) removal procedure to remove the RH fairing (9).

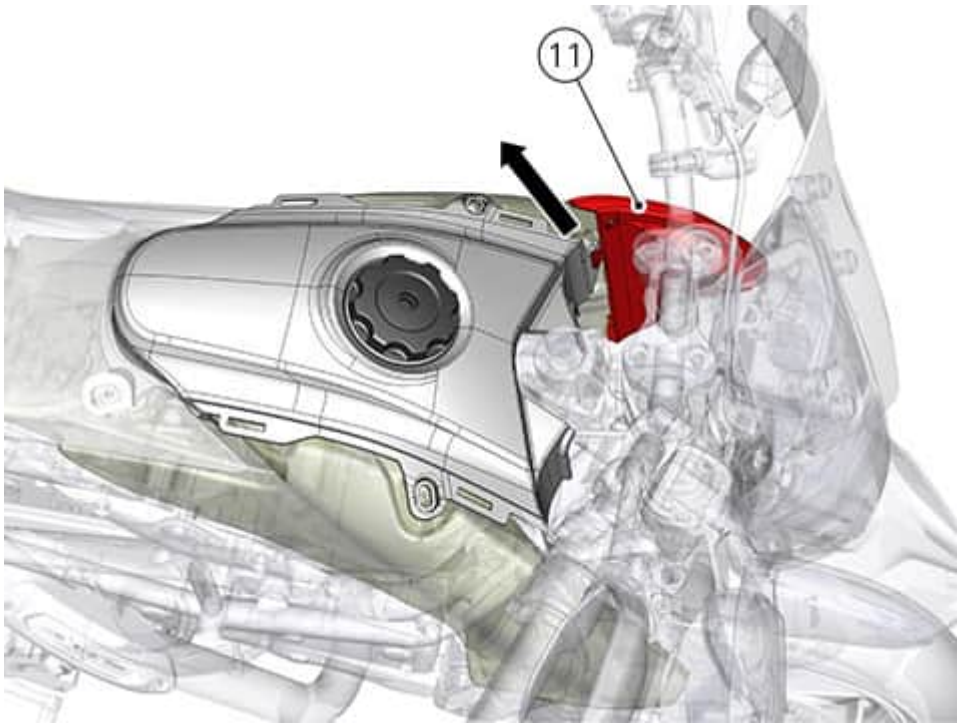


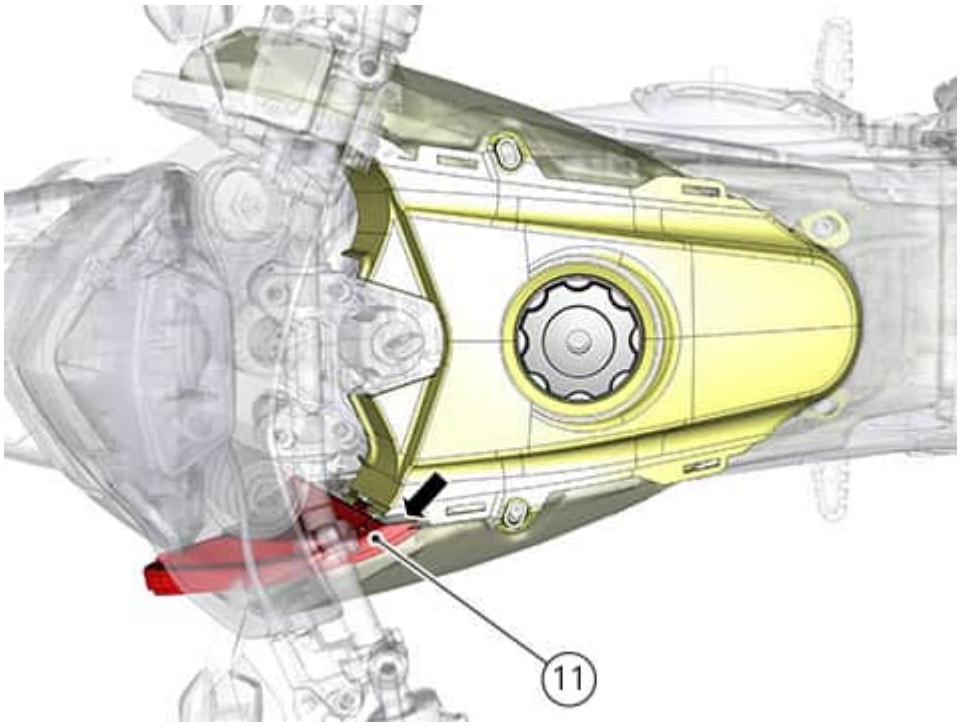
Now it is possible to remove the fairing internal panels.
Loosen and remove screw (10) securing the LH panel (11) to the tank.

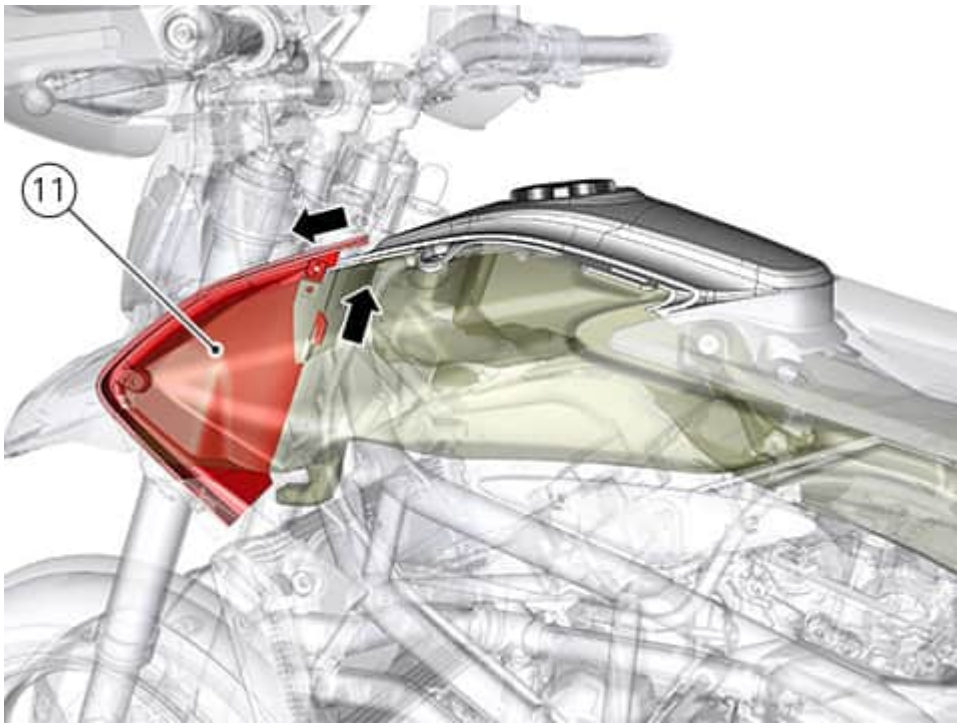


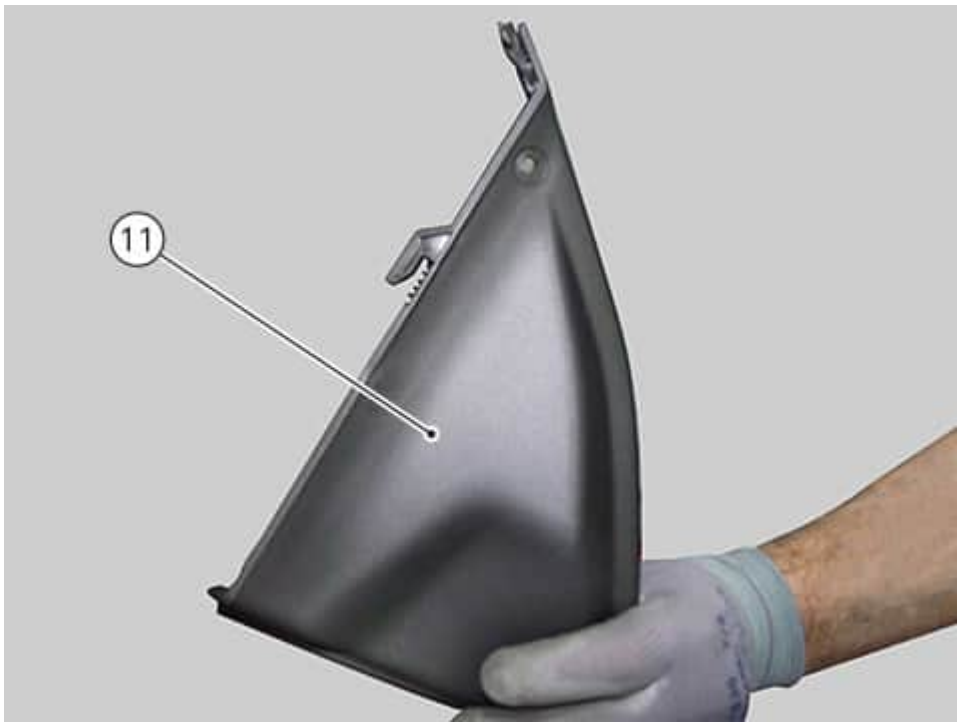
Slide the LH panel (11) to the front side of the bike and remove it.


11

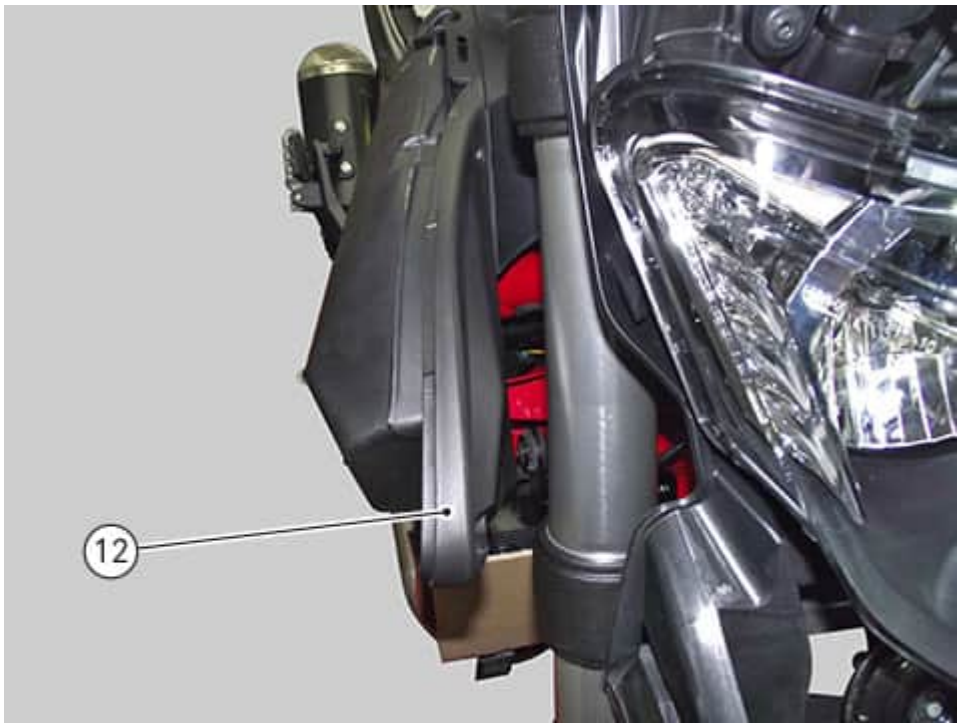

11


11


11

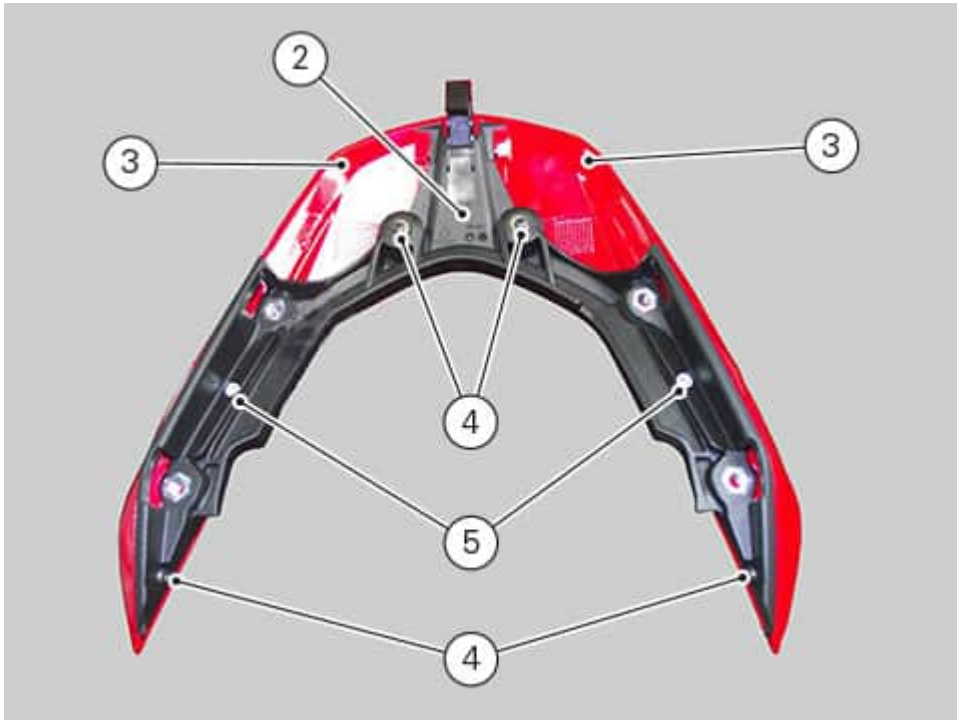


Follow the LH panel (11) removal procedure to remove the RH panel (12).

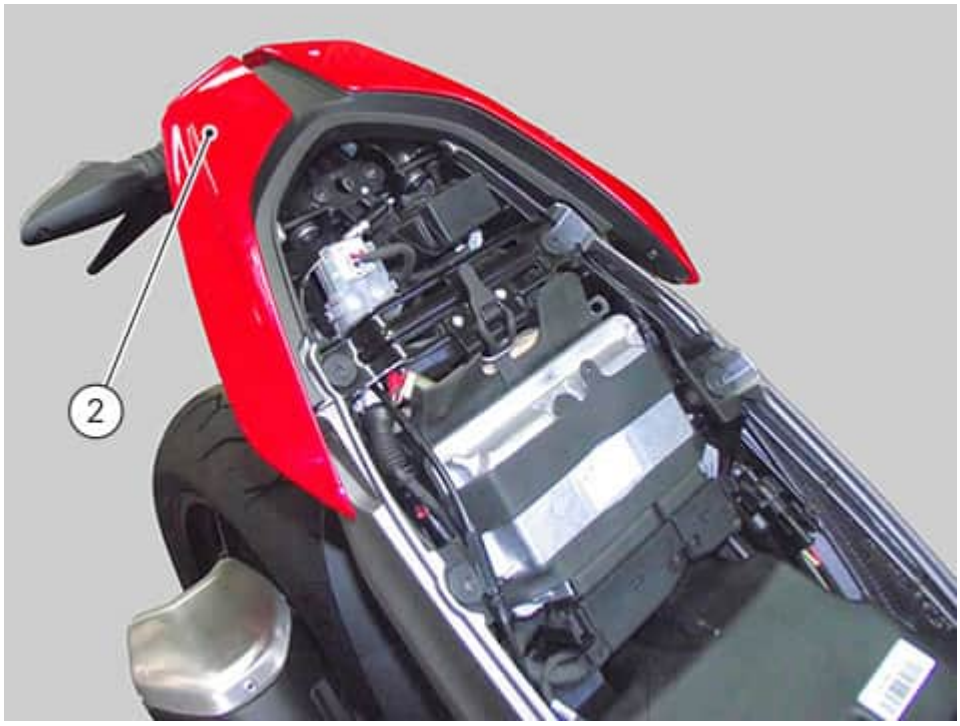


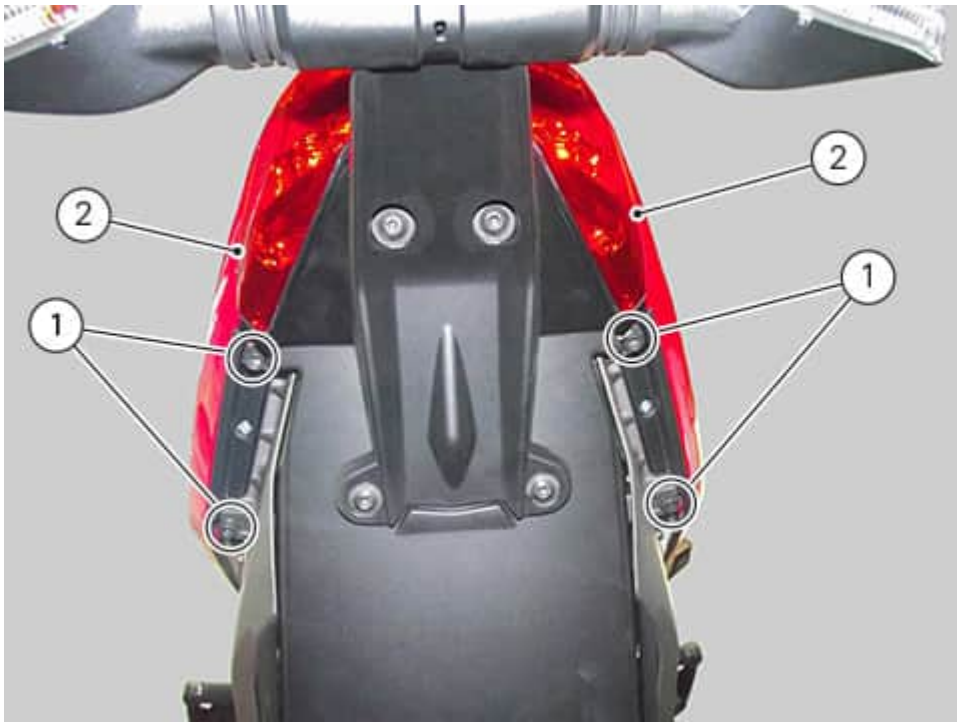
Refitting the rear side body panels

Position side body panels (3) on panel unit (2) and start screws (4) and (5).
Tighten screws (4) to a torque of 3 Nm ± 10%.
Tighten screws (5) to a torque of 5 Nm ± 10%.



Position the rear side body panel assembly (2) on the motorcycle.
Insert the screws (1).
Tighten screws (1) to a torque of 22 Nm ± 10%.

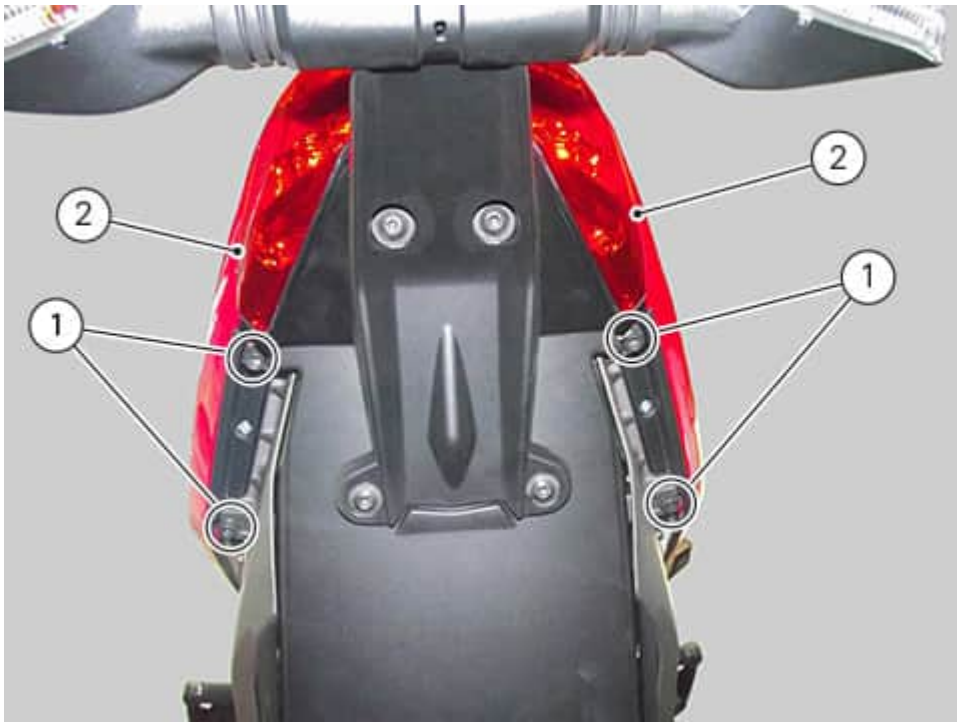


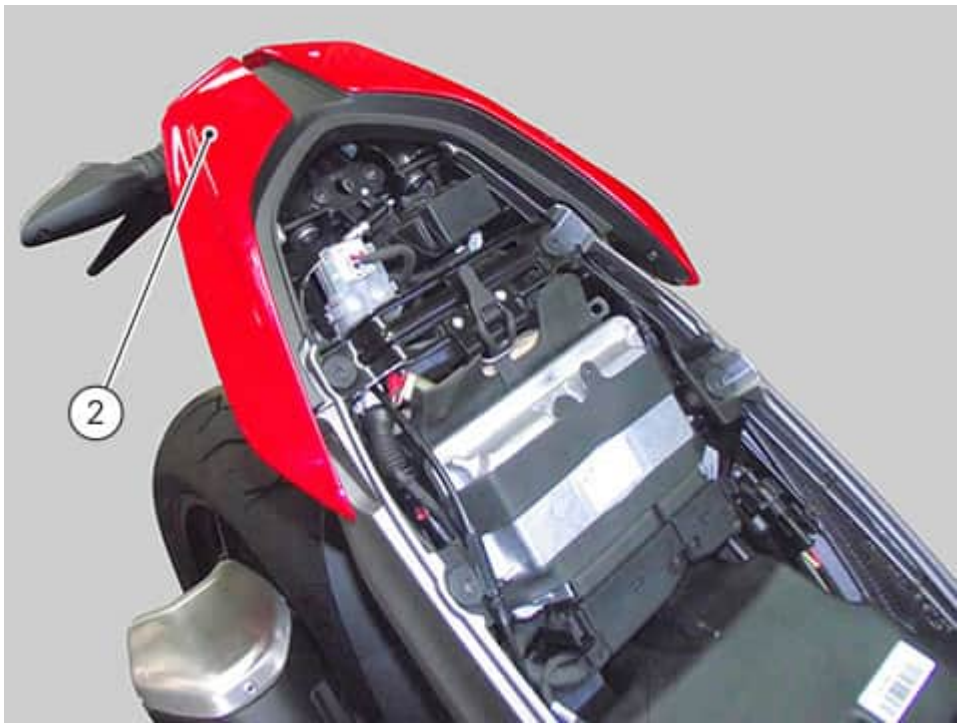


Refitting the seat.

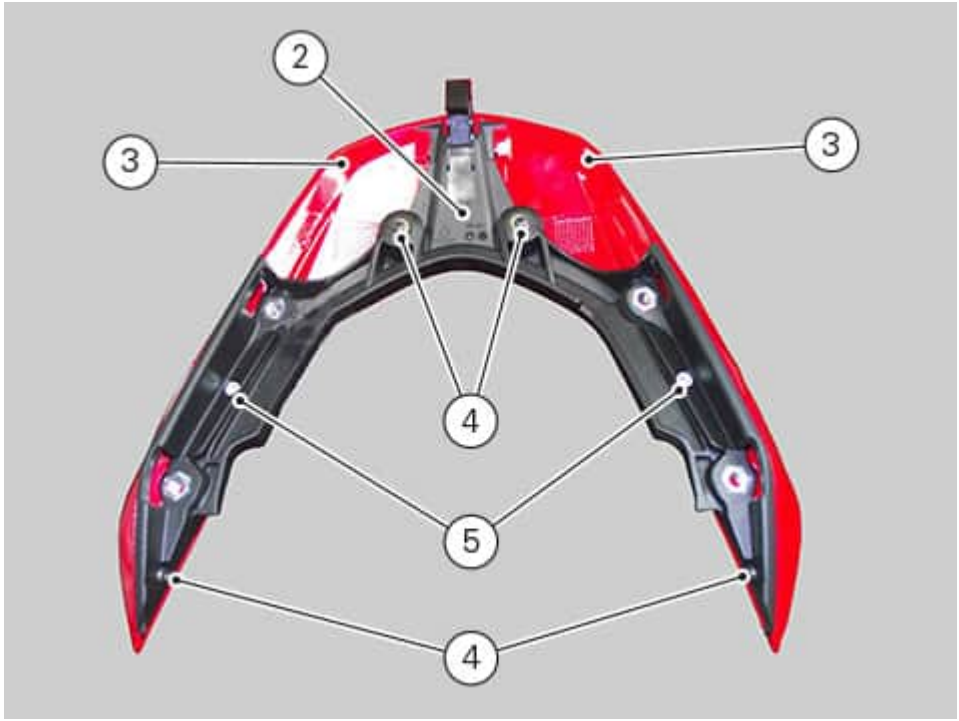
Removing the rear side body panels

Removing the seat.
Loosen screws (1) securing the rear side body panel assembly (2).



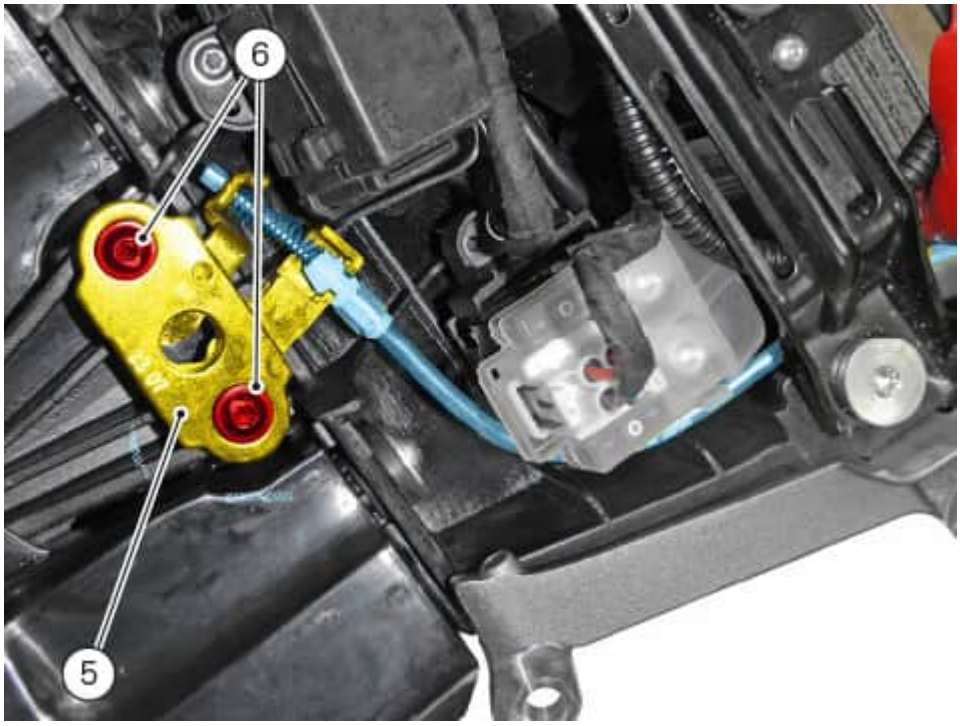


Loosen screws (4) and (5) to remove side body panels (3) from panel unit (2).

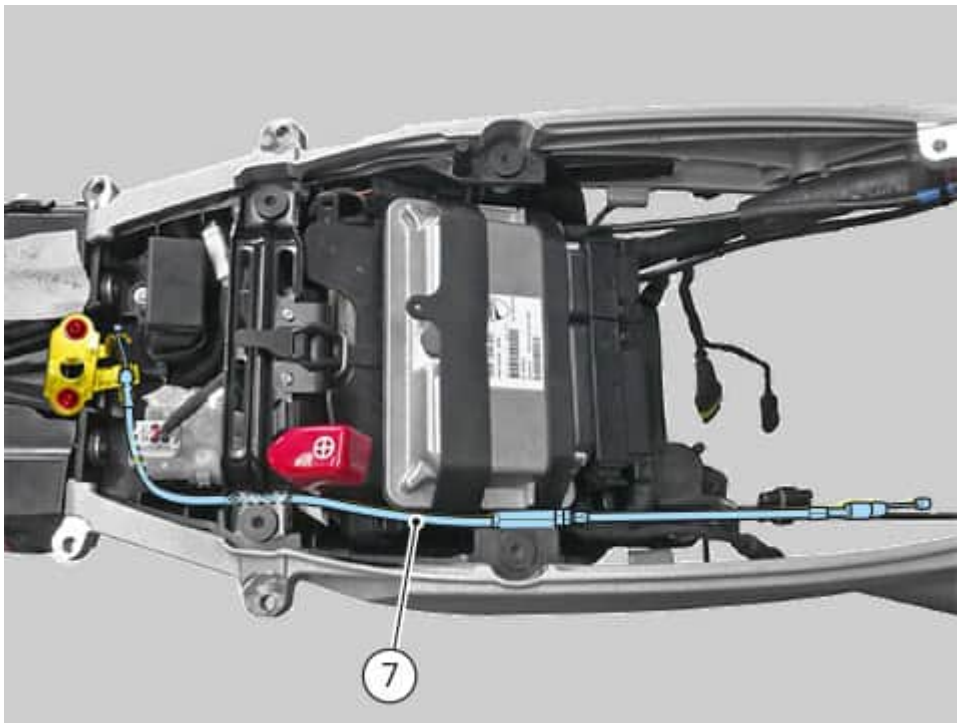

2
3
3
4
5
4

Refitting the seat

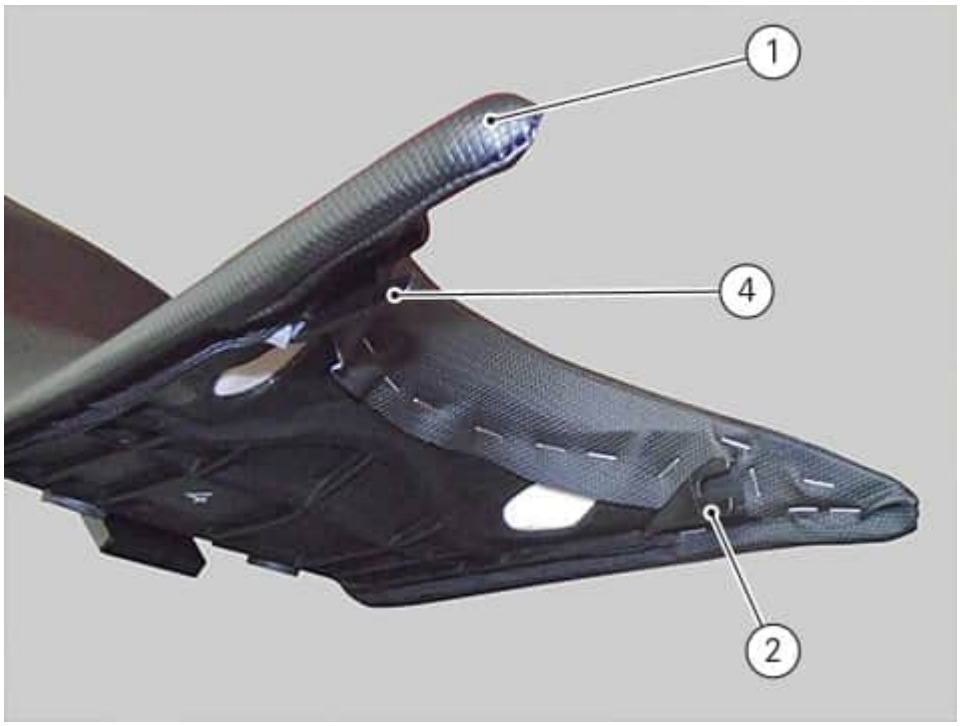
Position latch (5) and tighten screws (6) to a torque of 5 Nm ± 10.

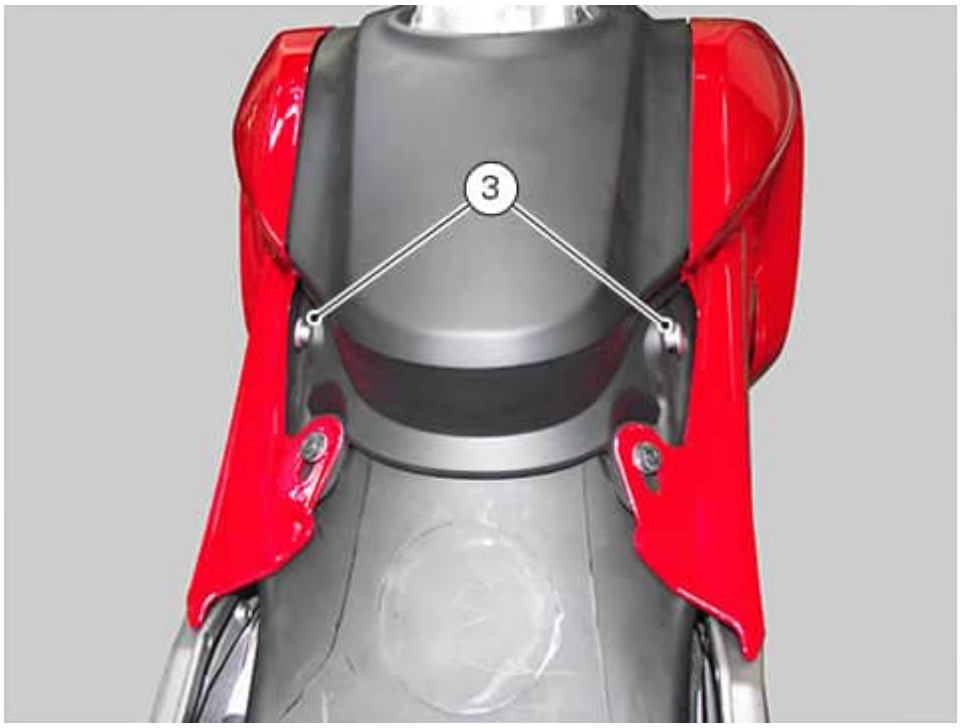


The seat lock cable (7) must be fitted inside the compartment, as shown in the figure.



Position seat (1) on the motorcycle.
The front tabs (2) of the seat must be engaged with pins (3) of the tank.





Once the front part of the seat is correctly positioned, engage the seat central tab (C) under the central supporting bracket (D).

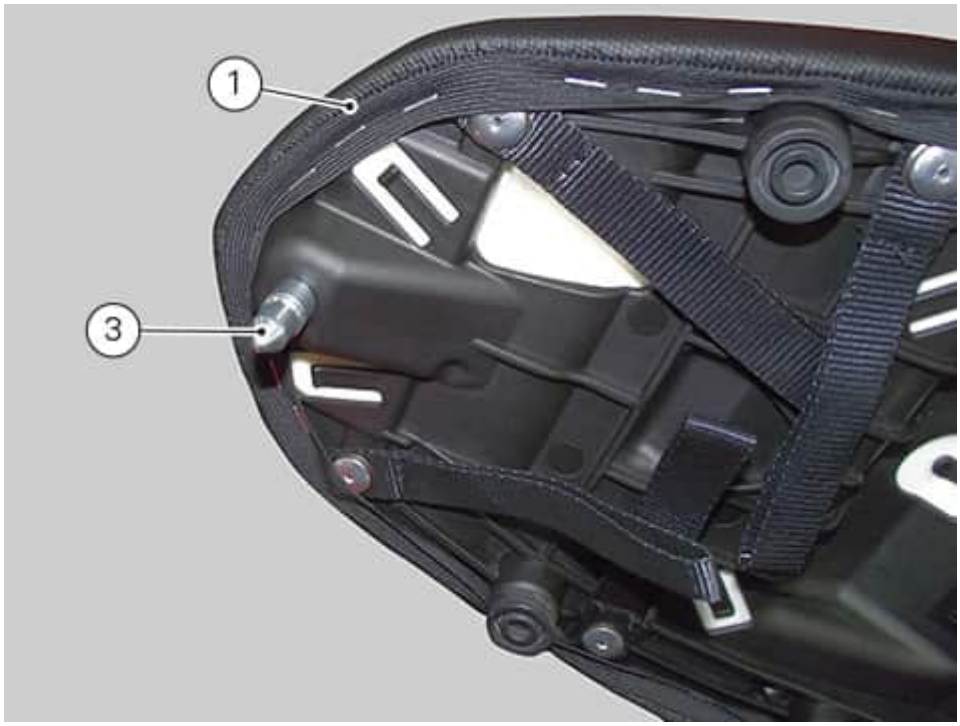


Keep the rear part lifted and push the central area of the seat.





Pin (3) in the rear part of seat (1) must be positioned so as to be aligned with seat (4) on the rear subframe. Lower seat (1) until it is properly fastened.



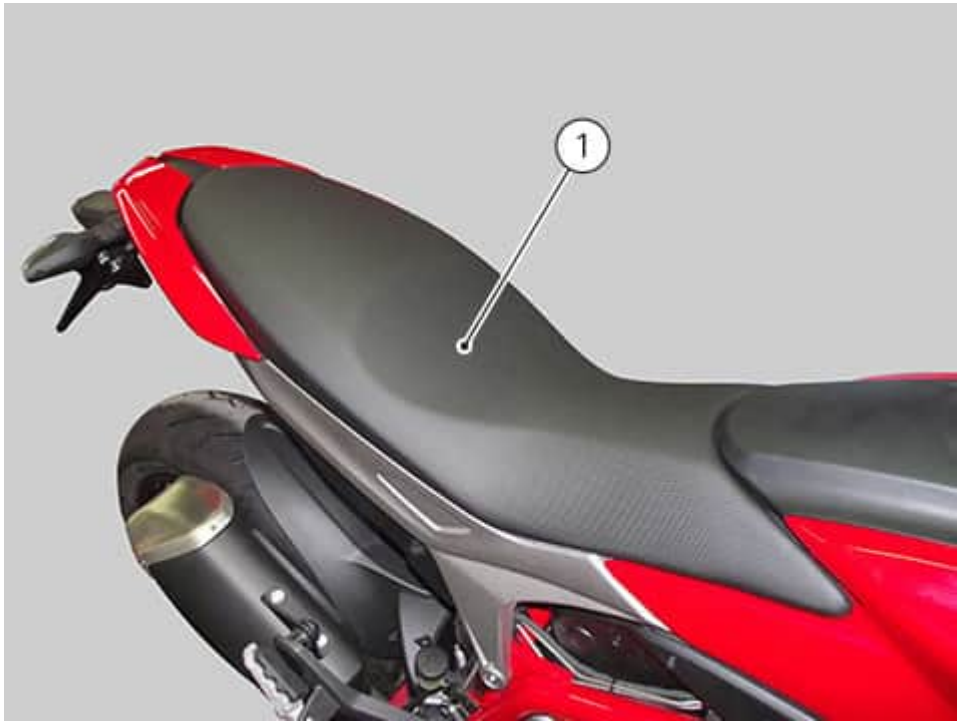

4

Removing the seat

Open the lock.

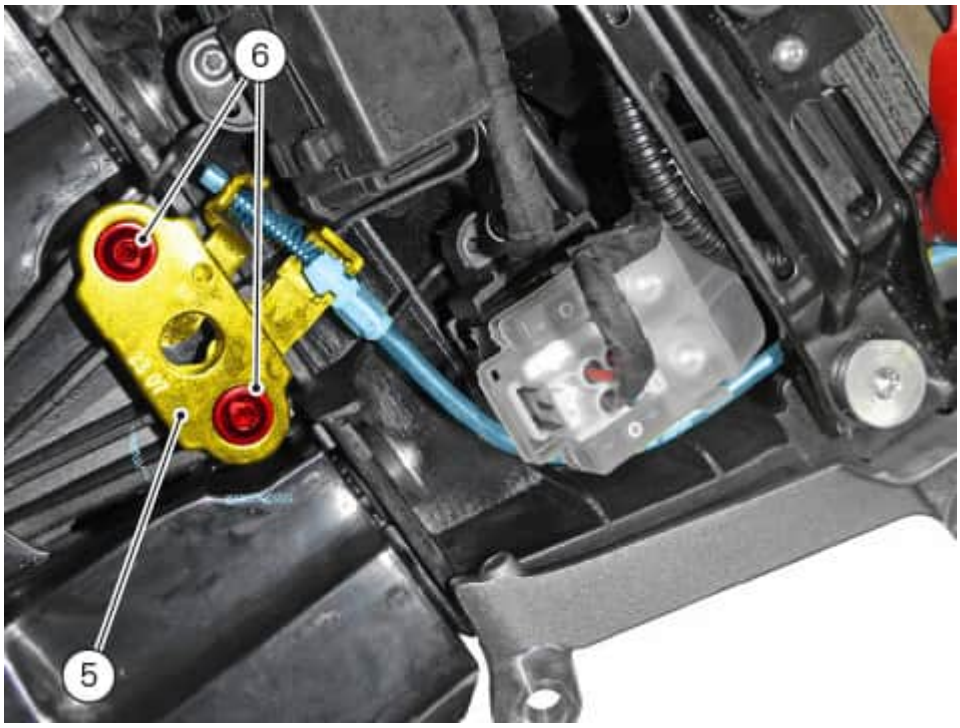


Lift up seat (1).
Remove seat (1).



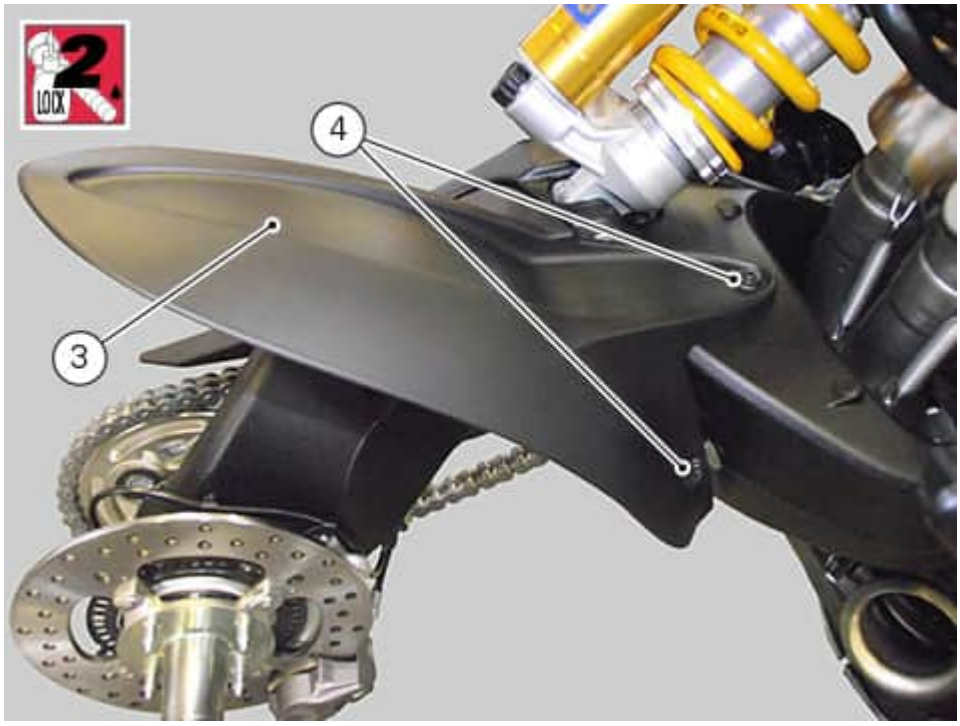


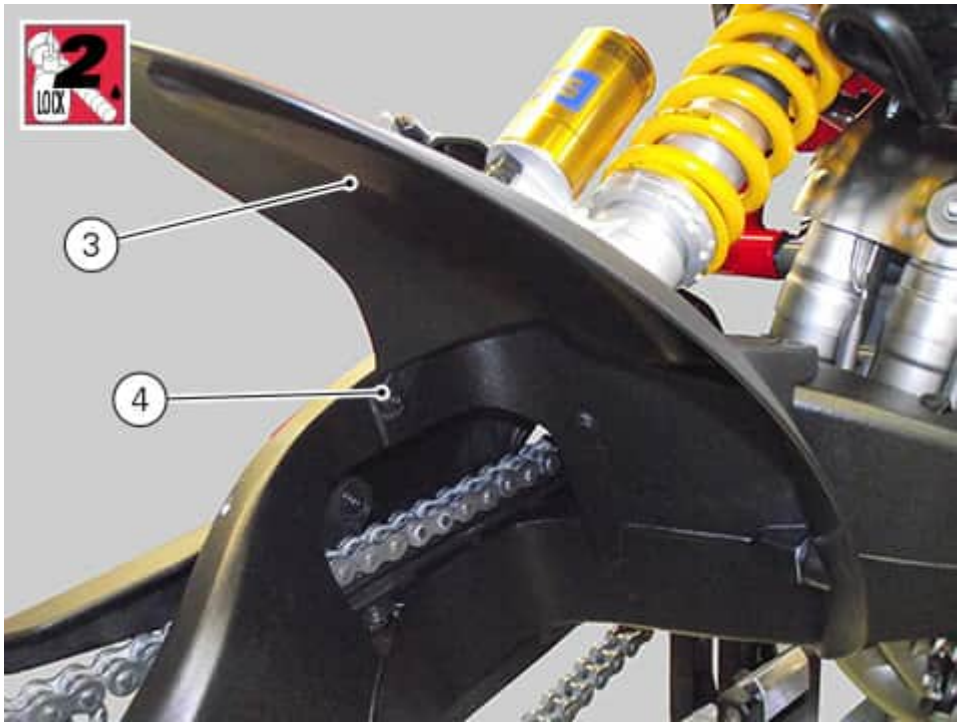
To remove latch (5), loosen screws (6).



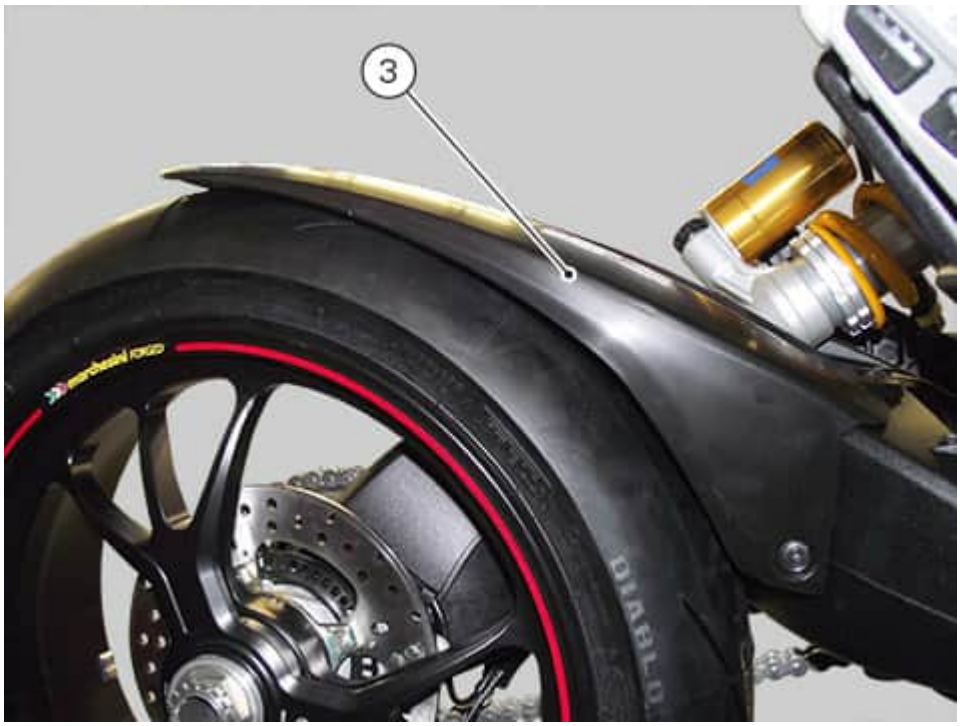
Removal of the rear mudguard

Position rear mudguard (1) on the swingarm.
If the screws (4) are not new, smear them with specified threadlocker.
Start screws (4) with the relevant washers to fix the rear mudguard.
Tighten the screws to a torque of 5 Nm ± 10%.

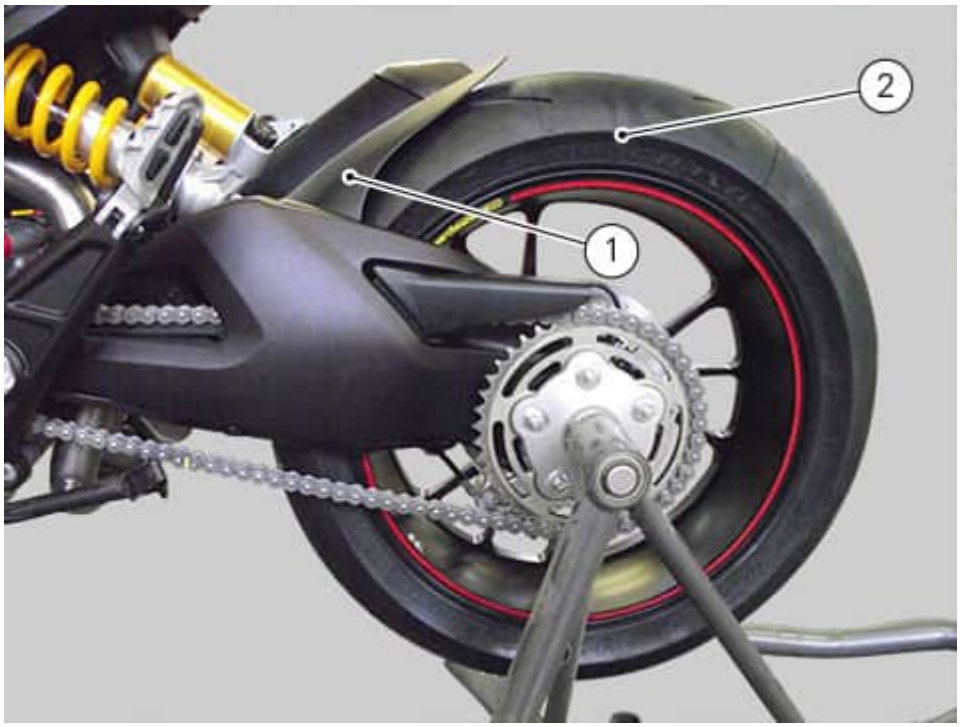




The Hyperstrada model features a rear mudguard (3) with a longer and narrower shape, but the fitting procedure is similar to that of the other models.

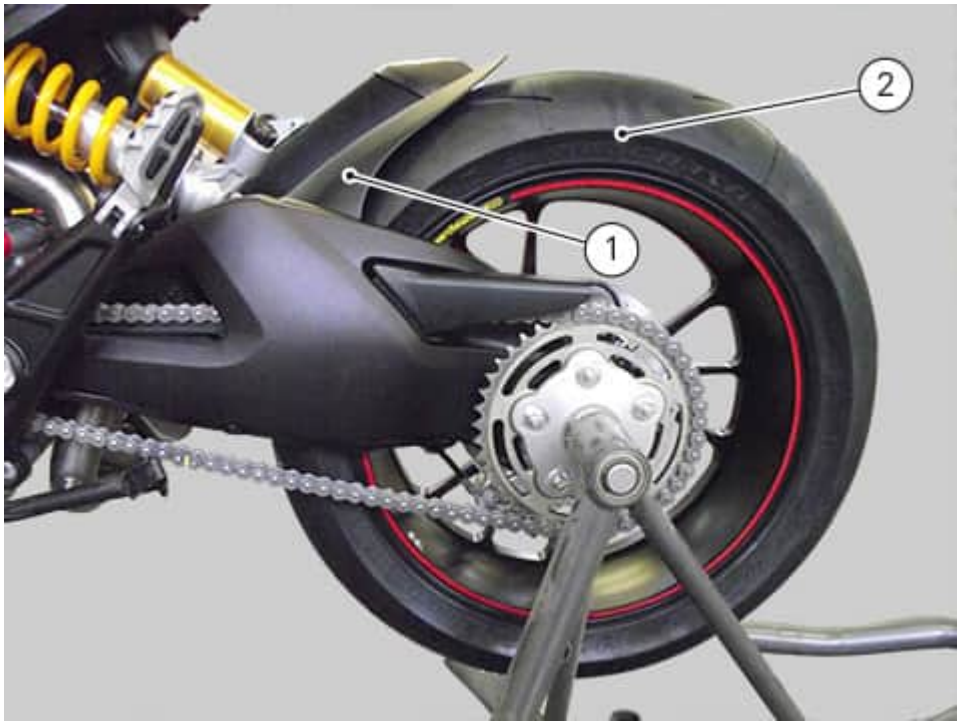


After having refitted the rear mudguard, refit the rear wheel (2).

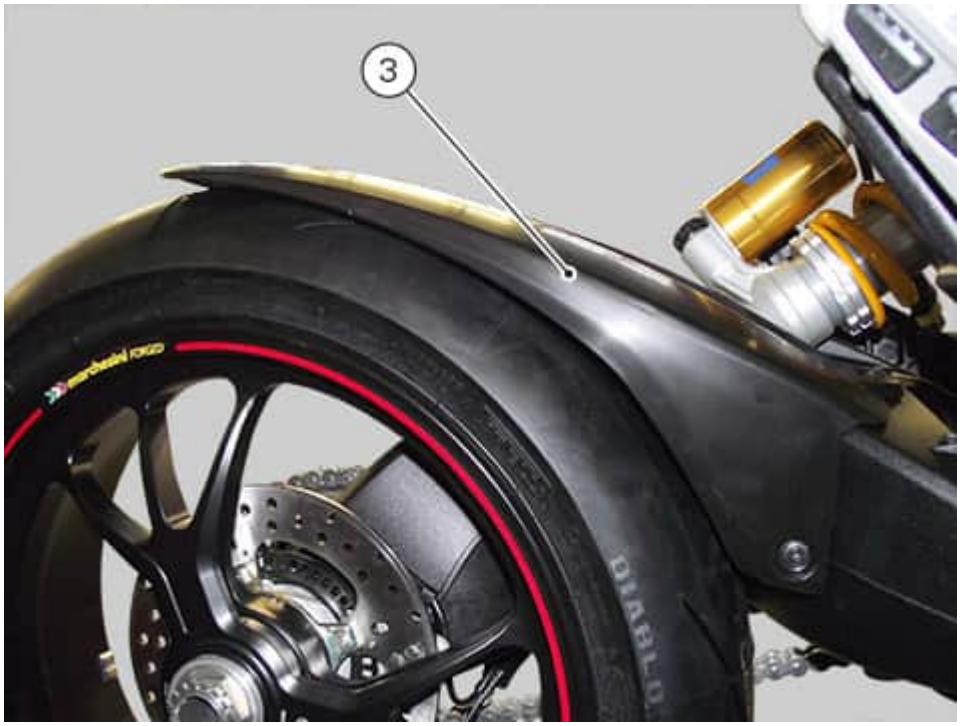


Removal of the rear mudguard

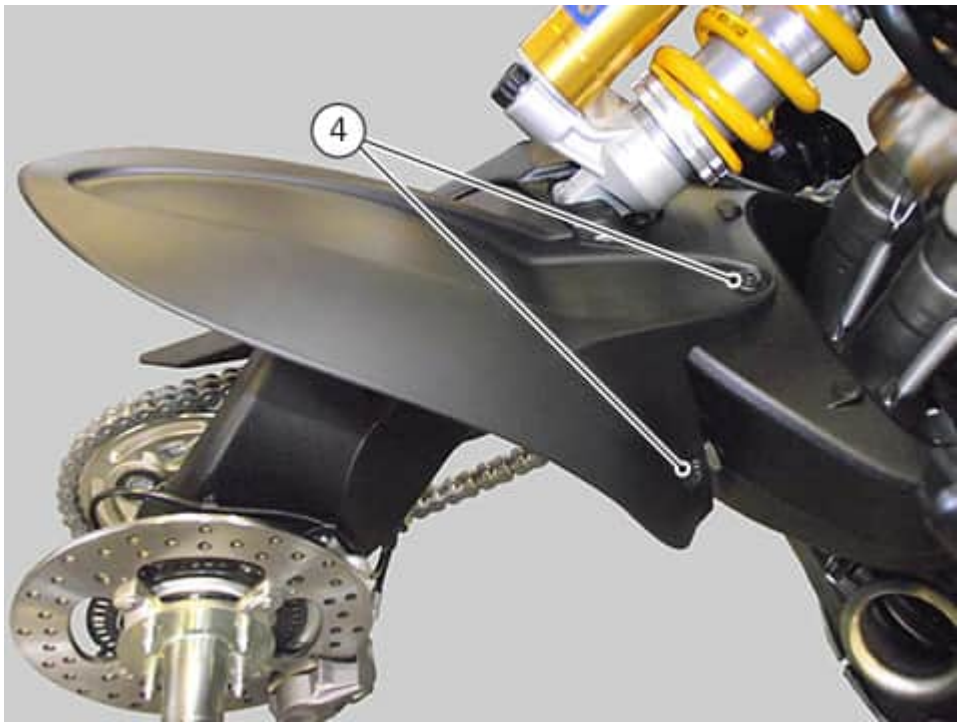
To remove the rear mudguard (1) it is necessary to remove the rear wheel (2).

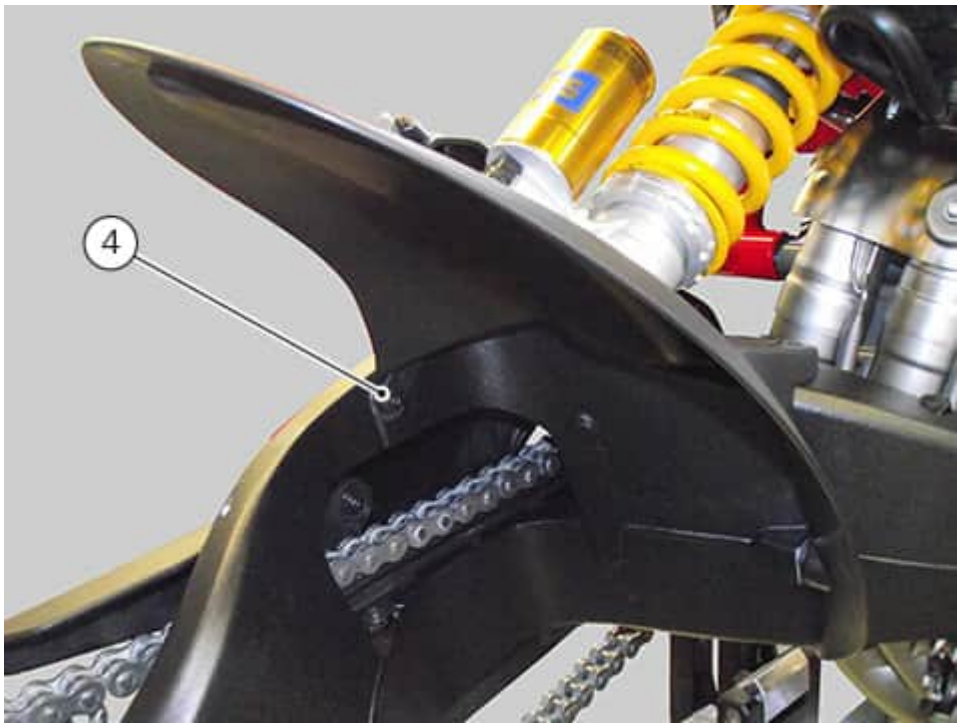


The Hyperstrada model features a rear mudguard (3) with a longer and narrower shape, but the removal procedure is similar to that of the other models.



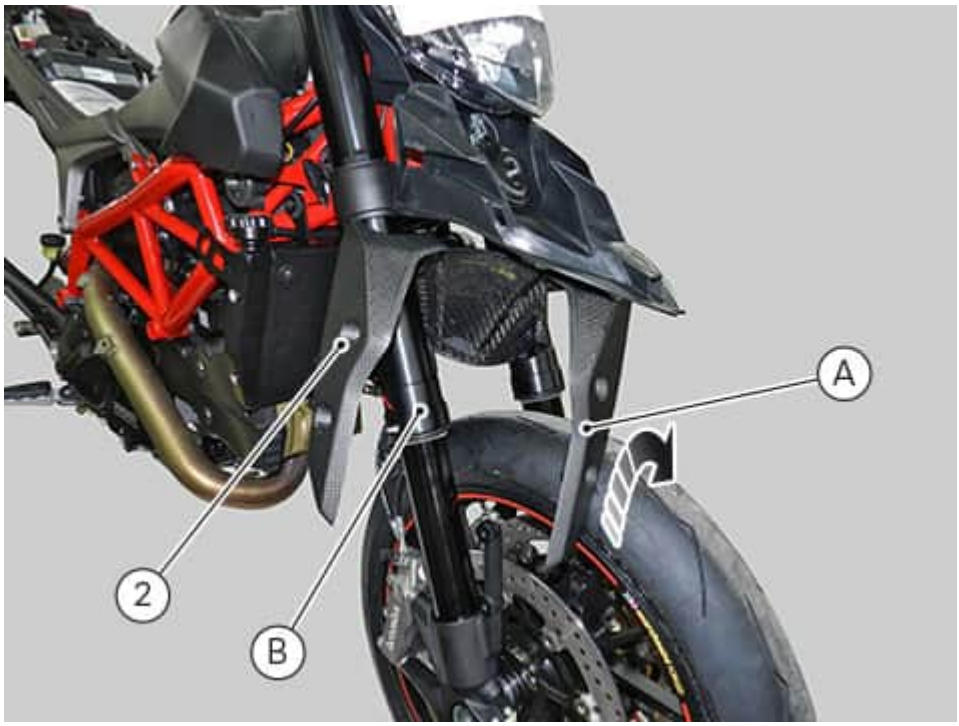
Loosen screws (4) and collect relevant washers.

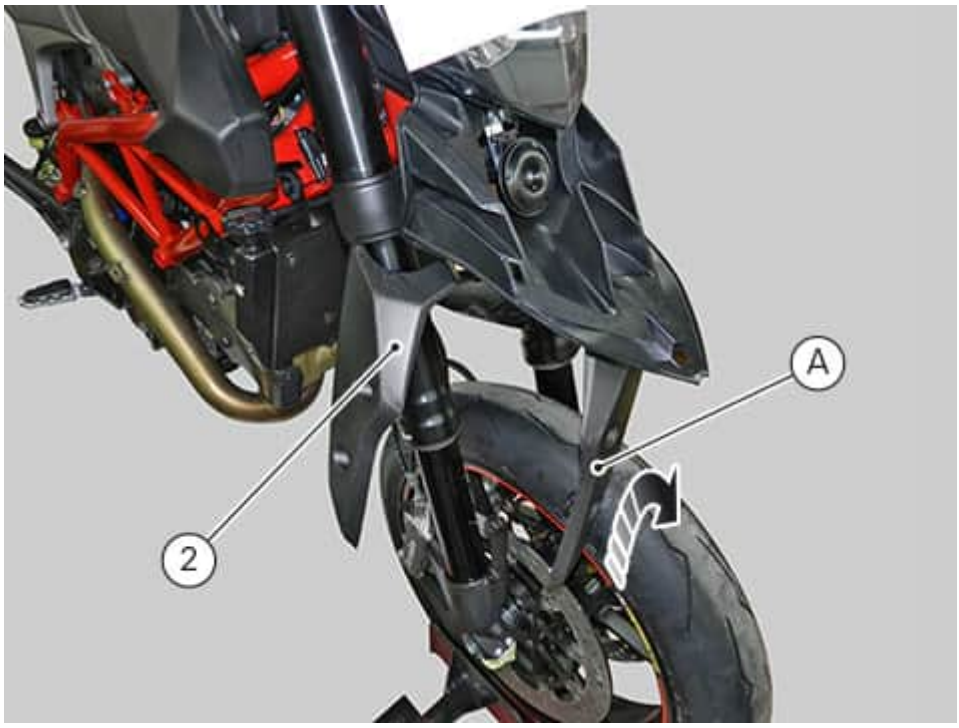

4

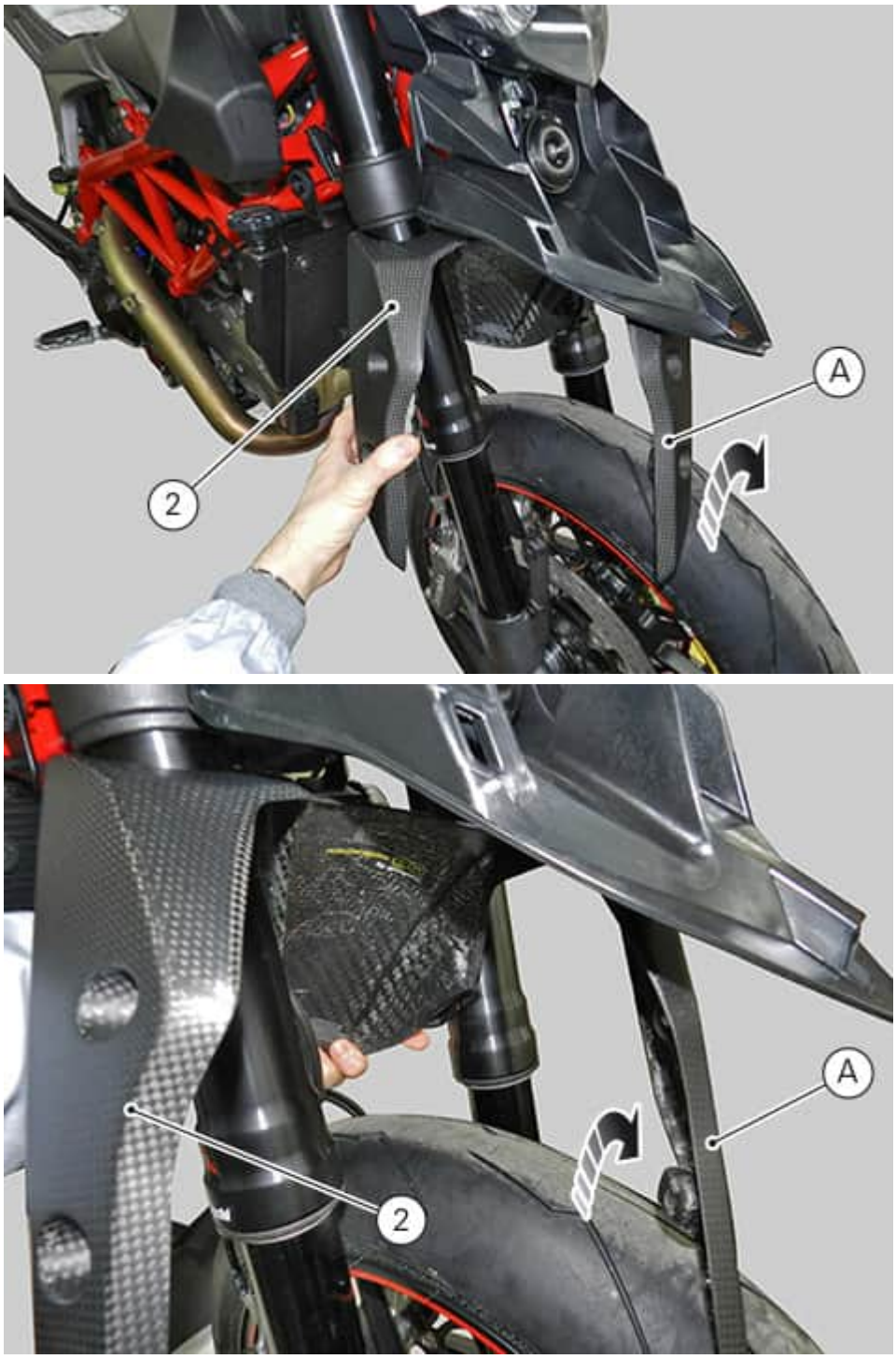

4

Refitting the front mudguard

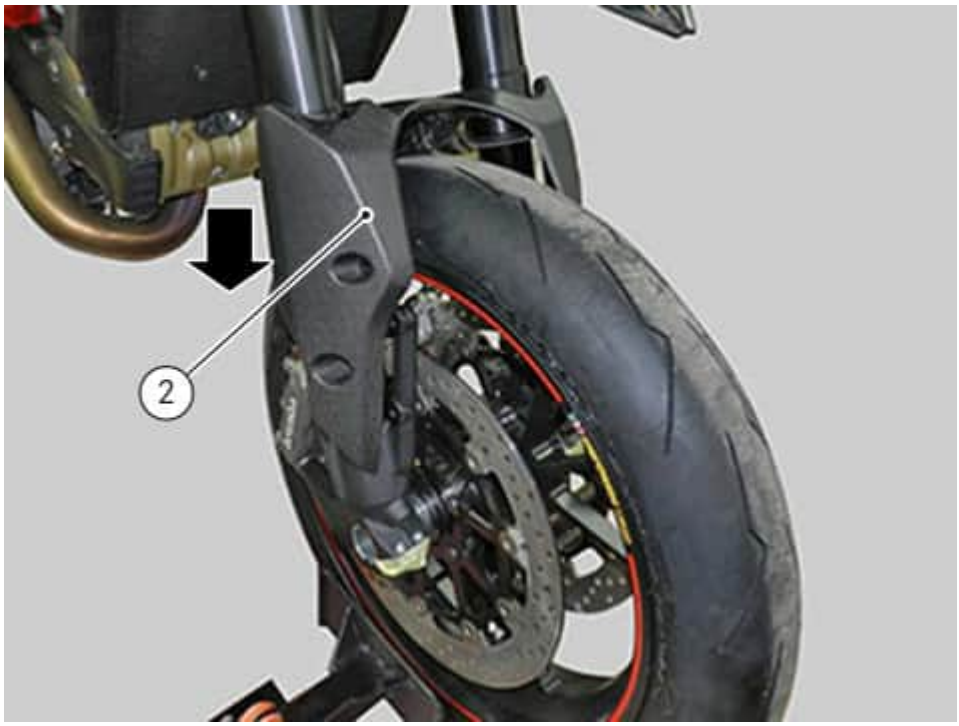
Position the right side of front mudguard (2) on the right fork sleeve (B) and slide the mudguard left side (A) until only the left side is in front of the front tyre.



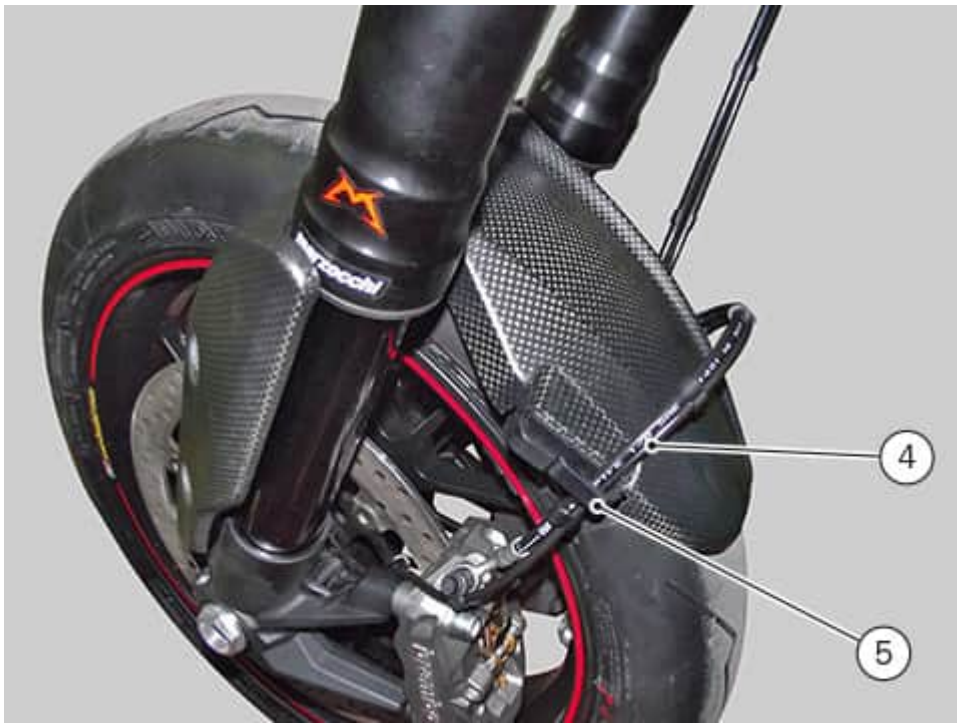




Once both parts of the front mudguard have been brought on the fork sleeves, slide the mudguard downwards up to the fork end.



Engage cables (4) of the front braking system and of the speed sensor in tabs (5) of the front mudguard (2).



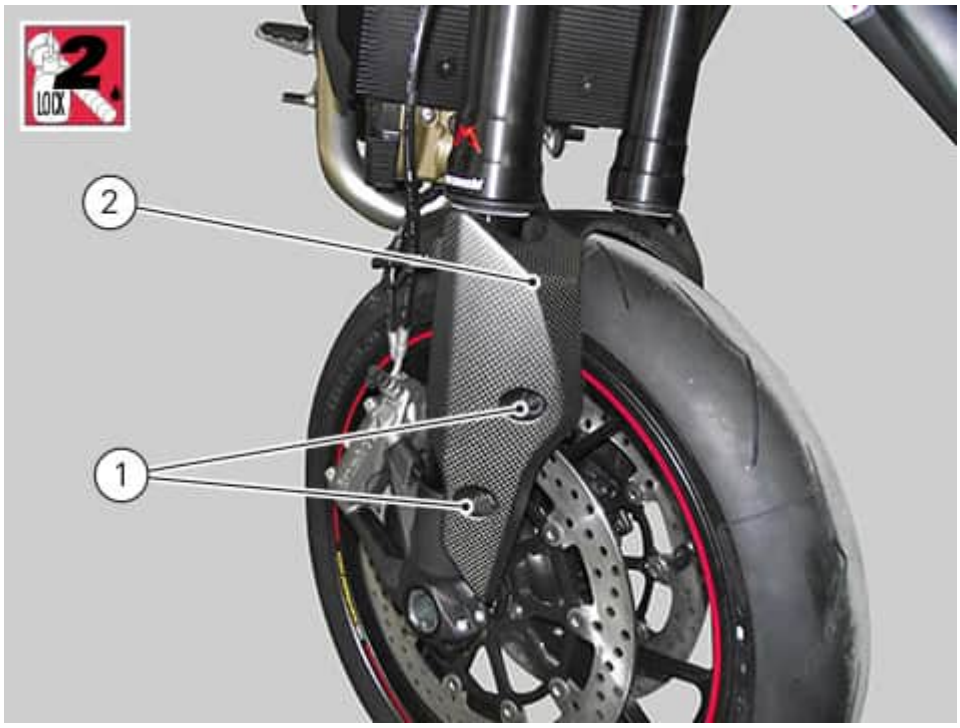


Position washers (3).



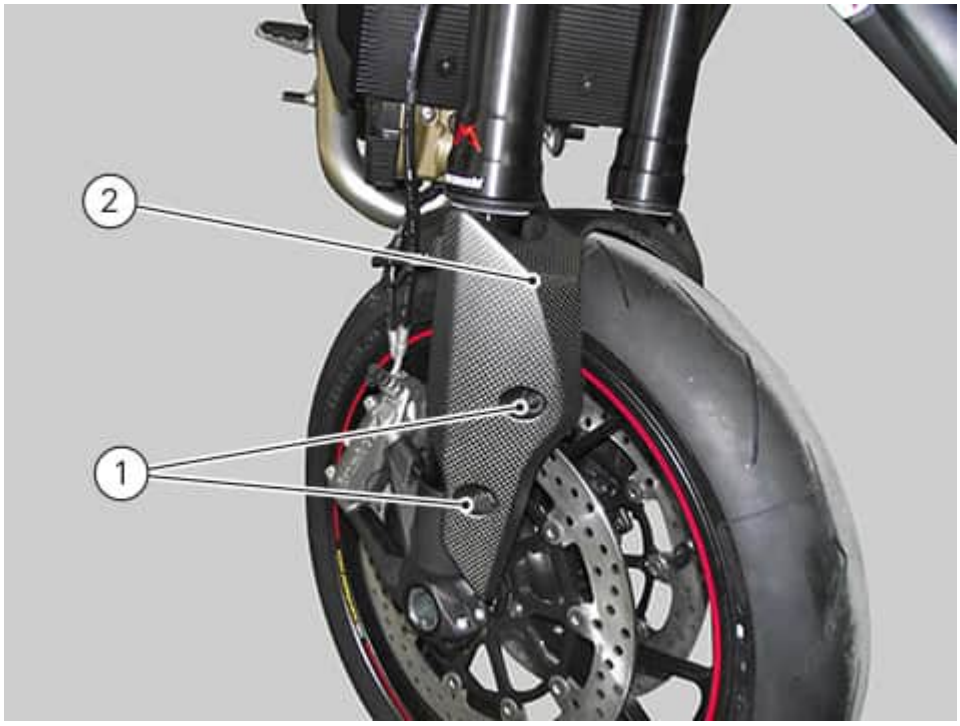
If the screws are not new, smear them with specified threadlocker.
Start screws (1) securing the front mudguard (2) to the forks.
Tighten screws (1) to a torque of 8 Nm ± 10%.


2
1


2
1

Removal of the front mudguard

Loosen screws (1) securing the front mudguard (2) to the forks.



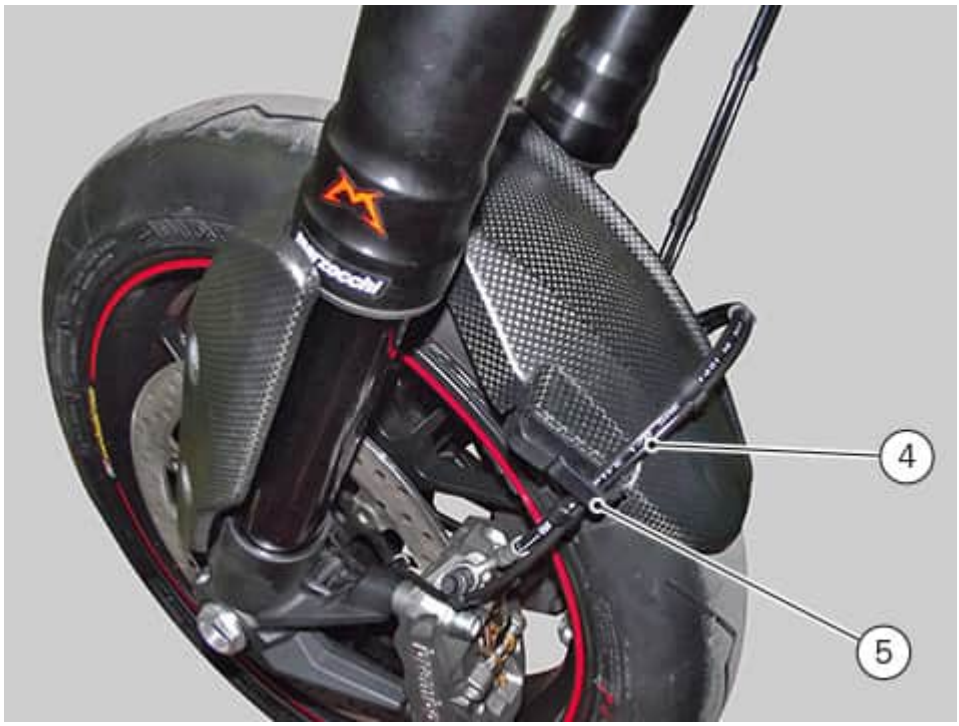


For each screw (1) recover the relevant washer (3).

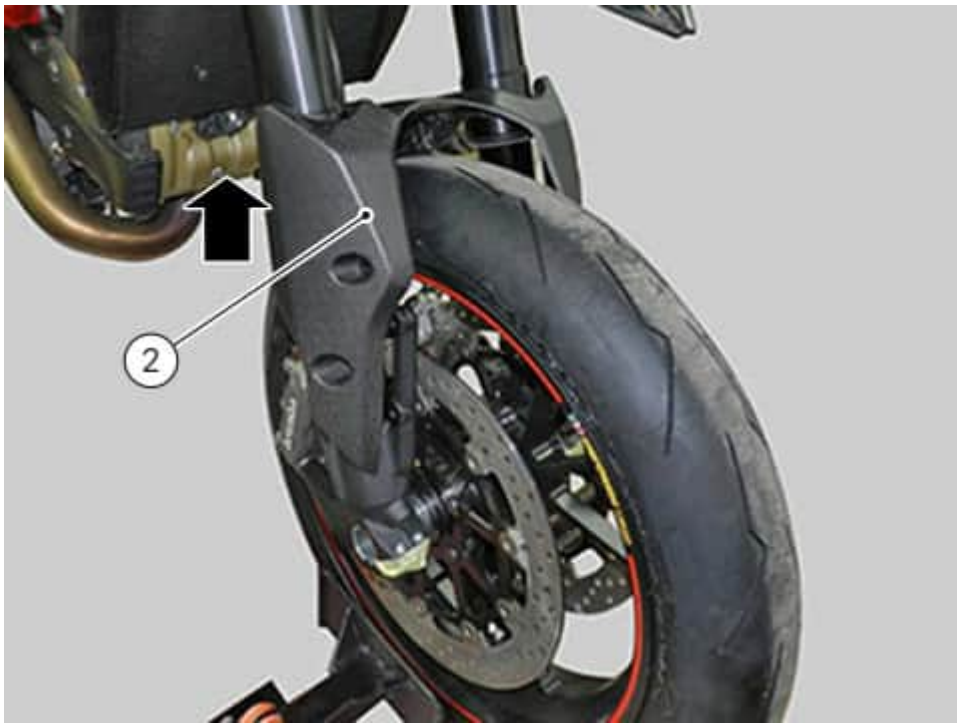


Release cables (4) of the front braking system and of the speed sensor from tabs (5) of the front mudguard (2).



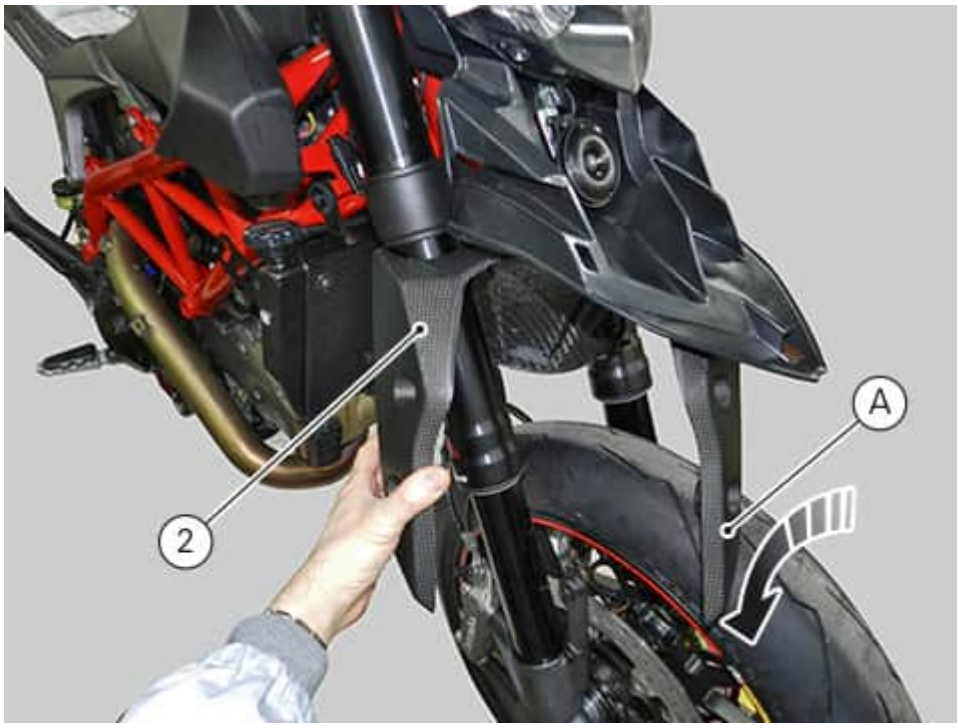


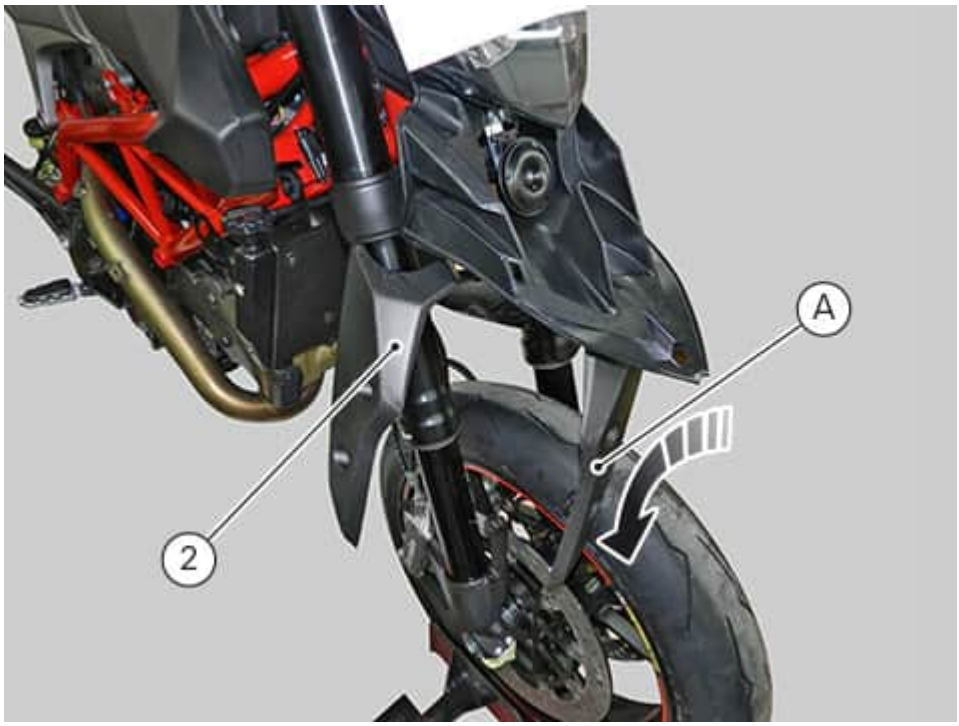
Lift up the front mudguard (2) until it is under the headlight fairing.



Slightly incline the front mudguard (2) to the right, and bring only the LH side (A) of front mudguard (2) in front of the tyre.
Slide the front mudguard in this position having care not to damage the forks and the braking system.


A
2


A
2


A
2

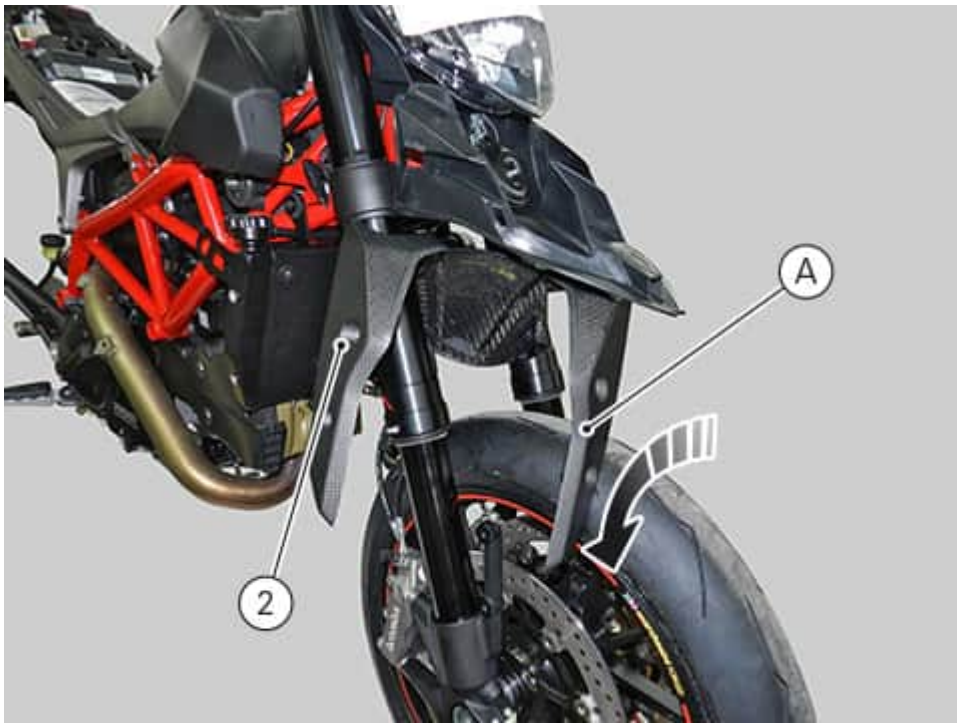
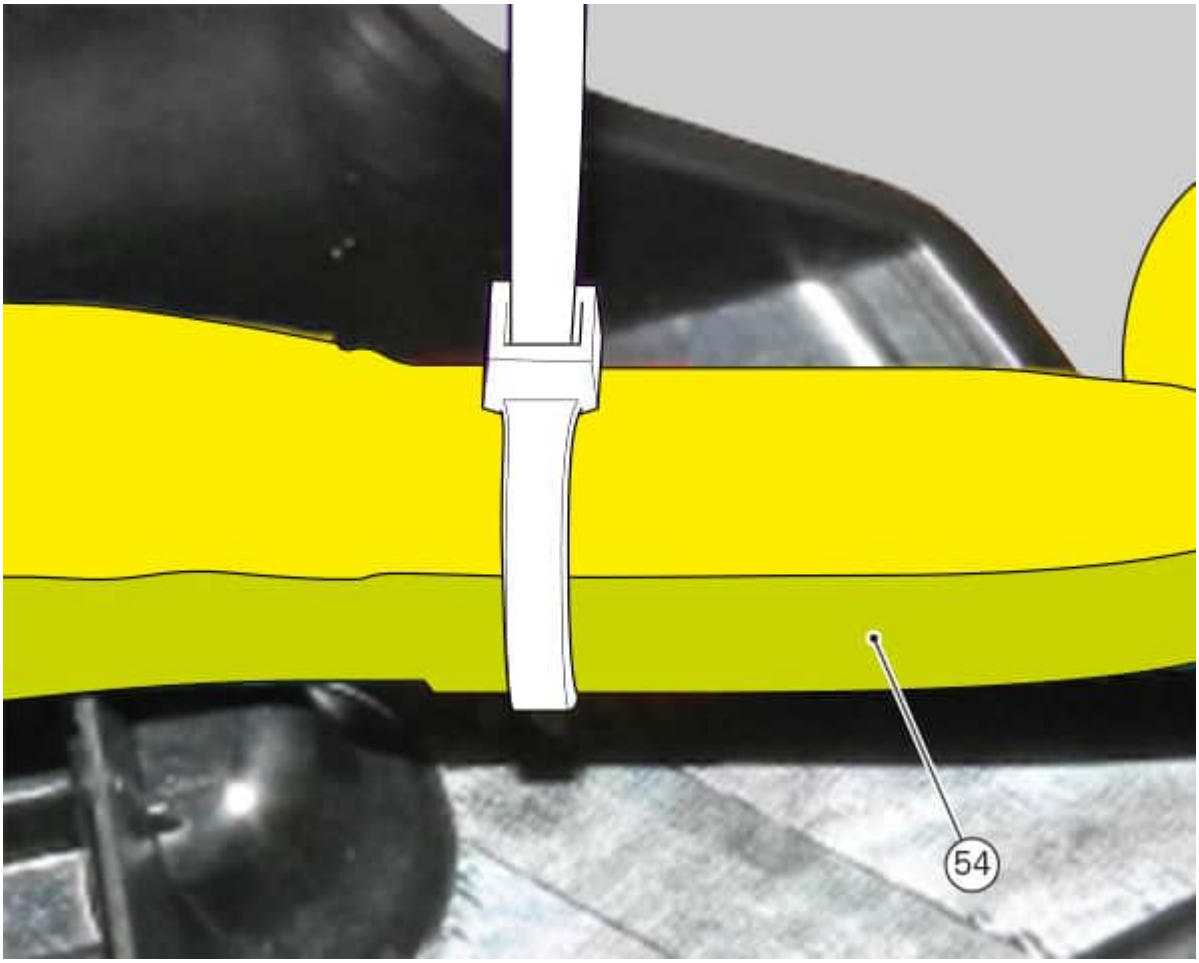
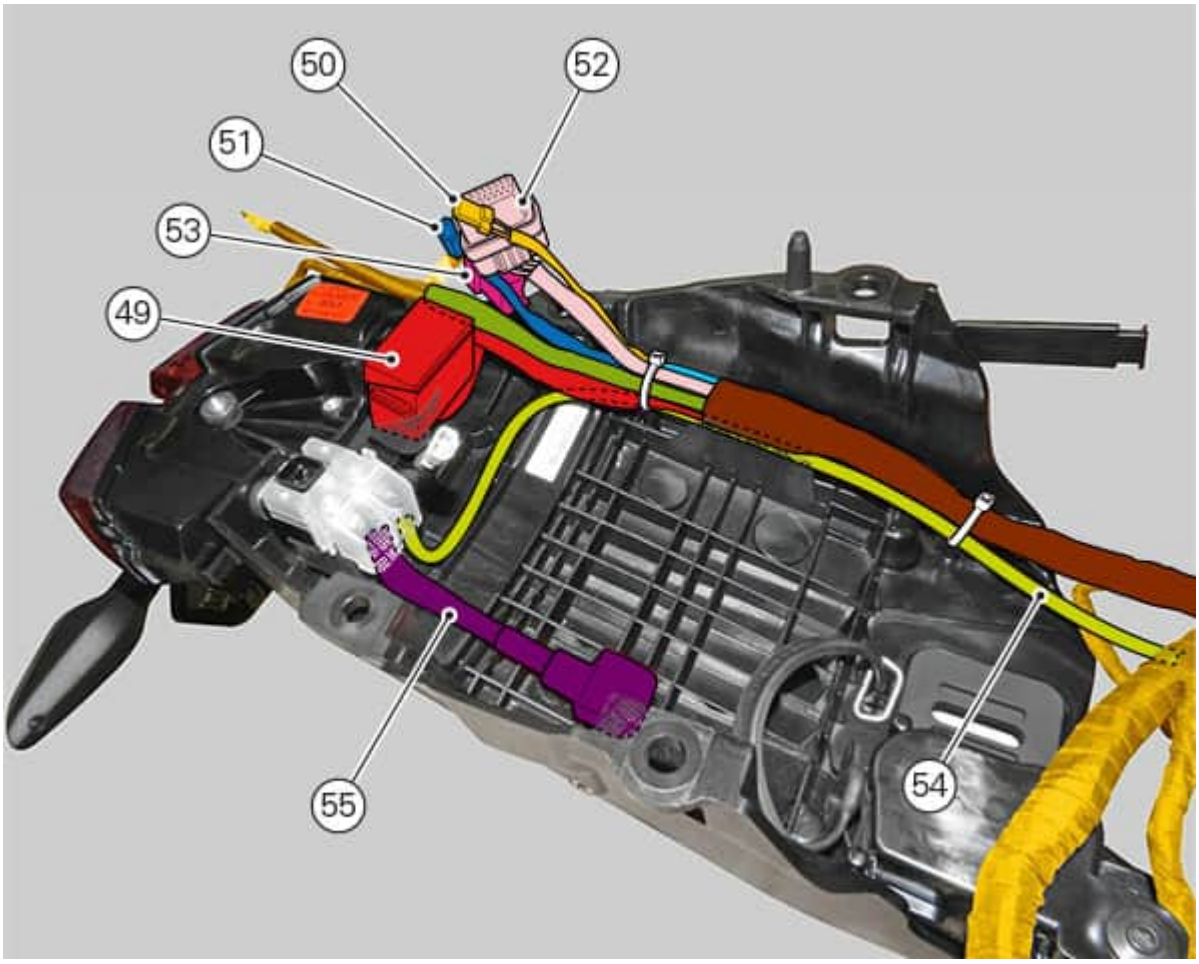
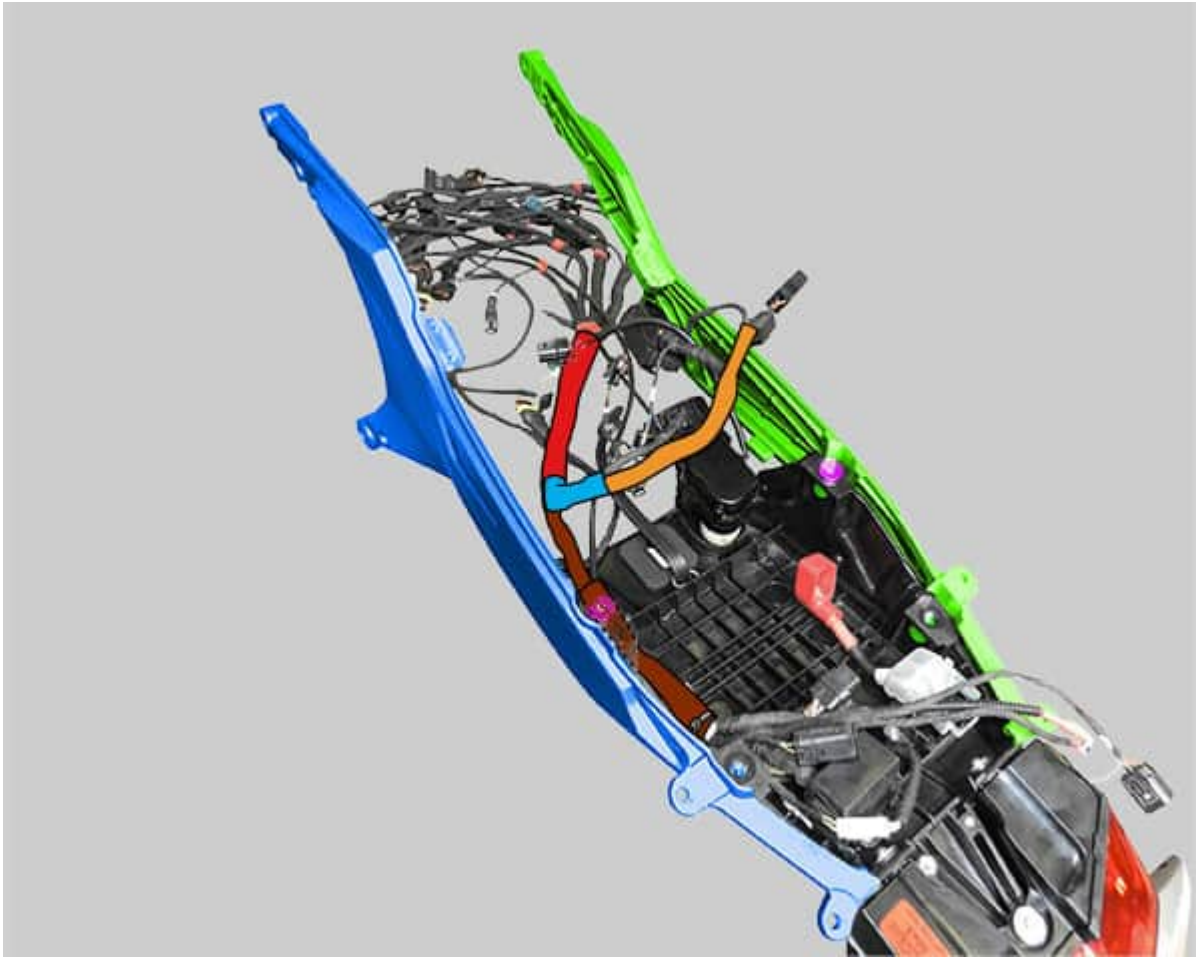
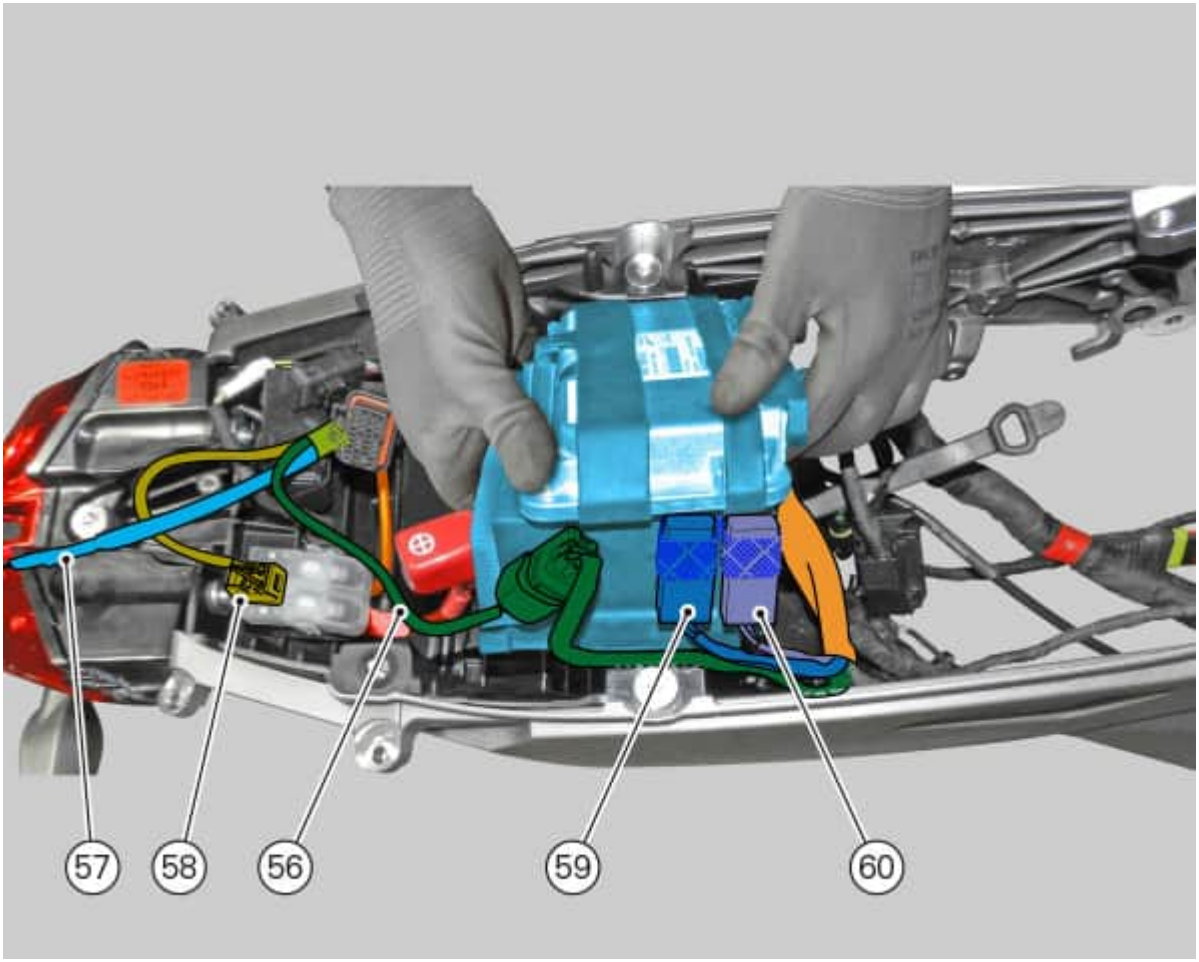

A
2

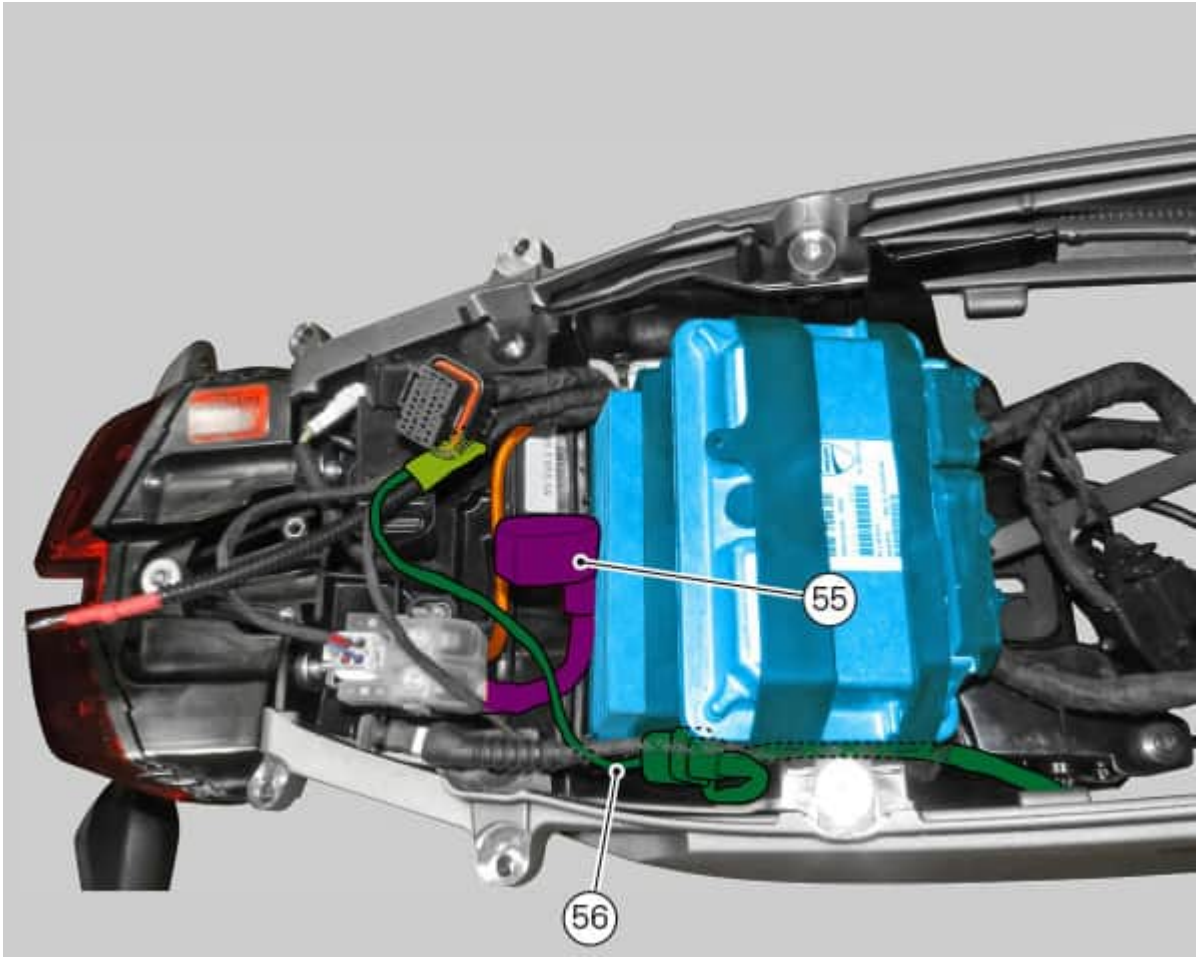
Table Z

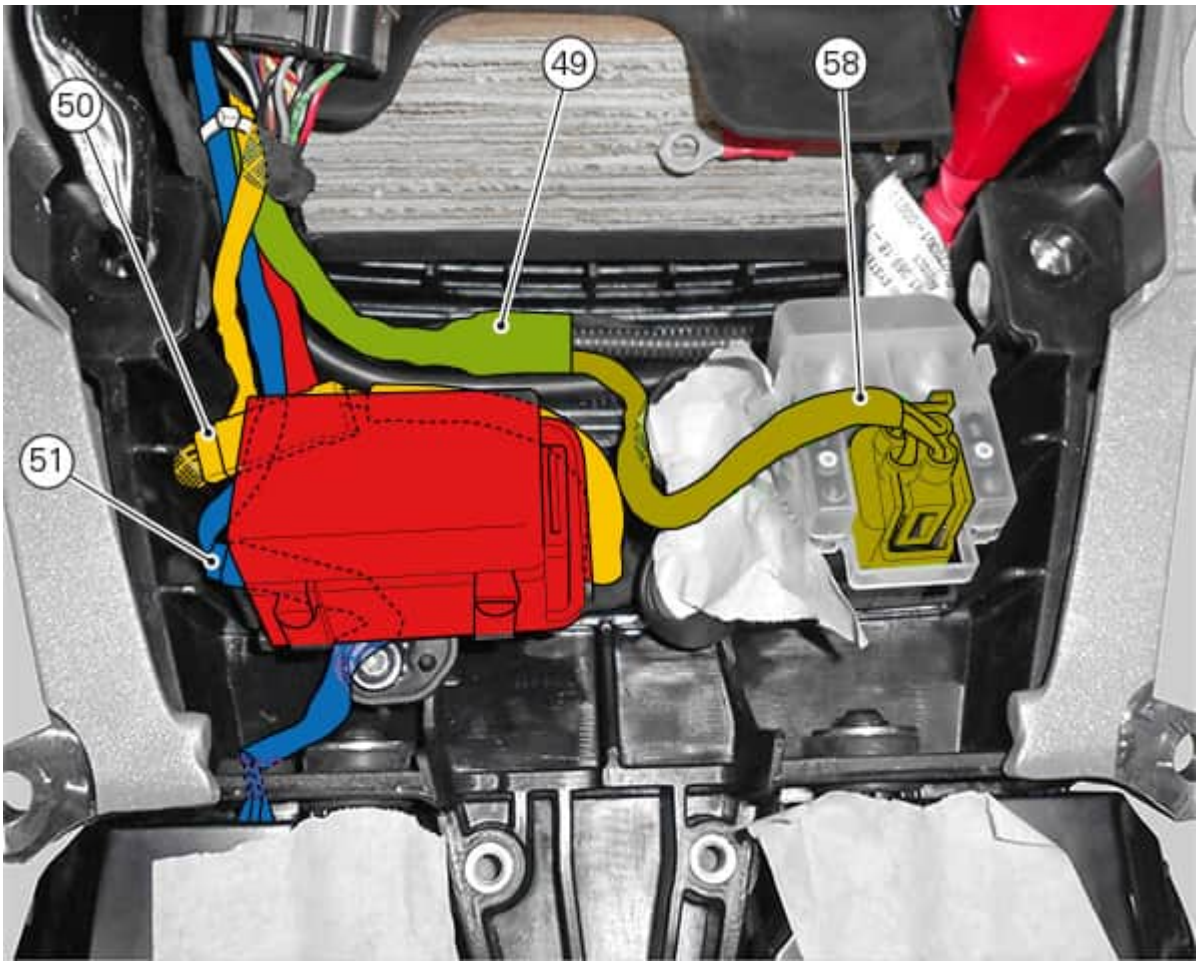


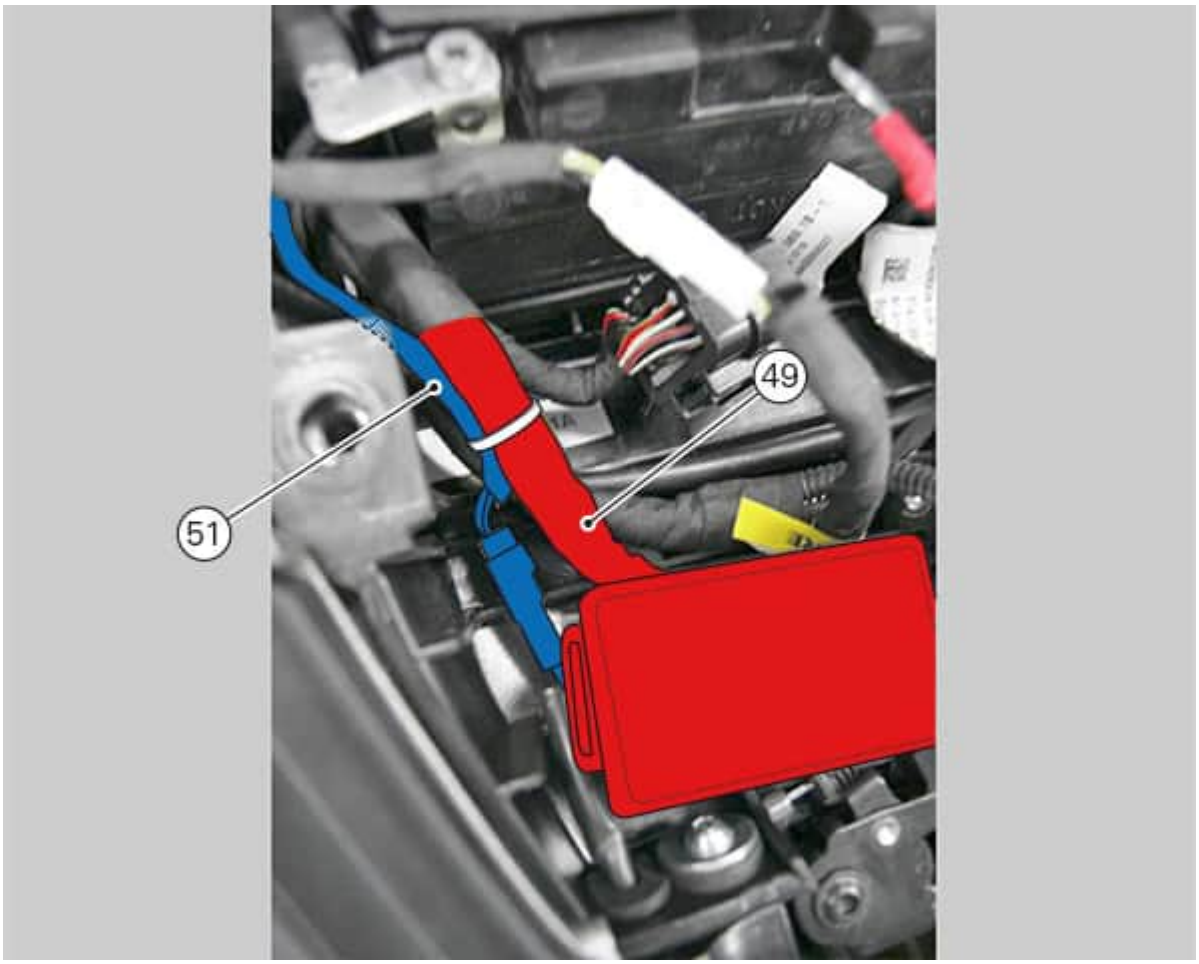


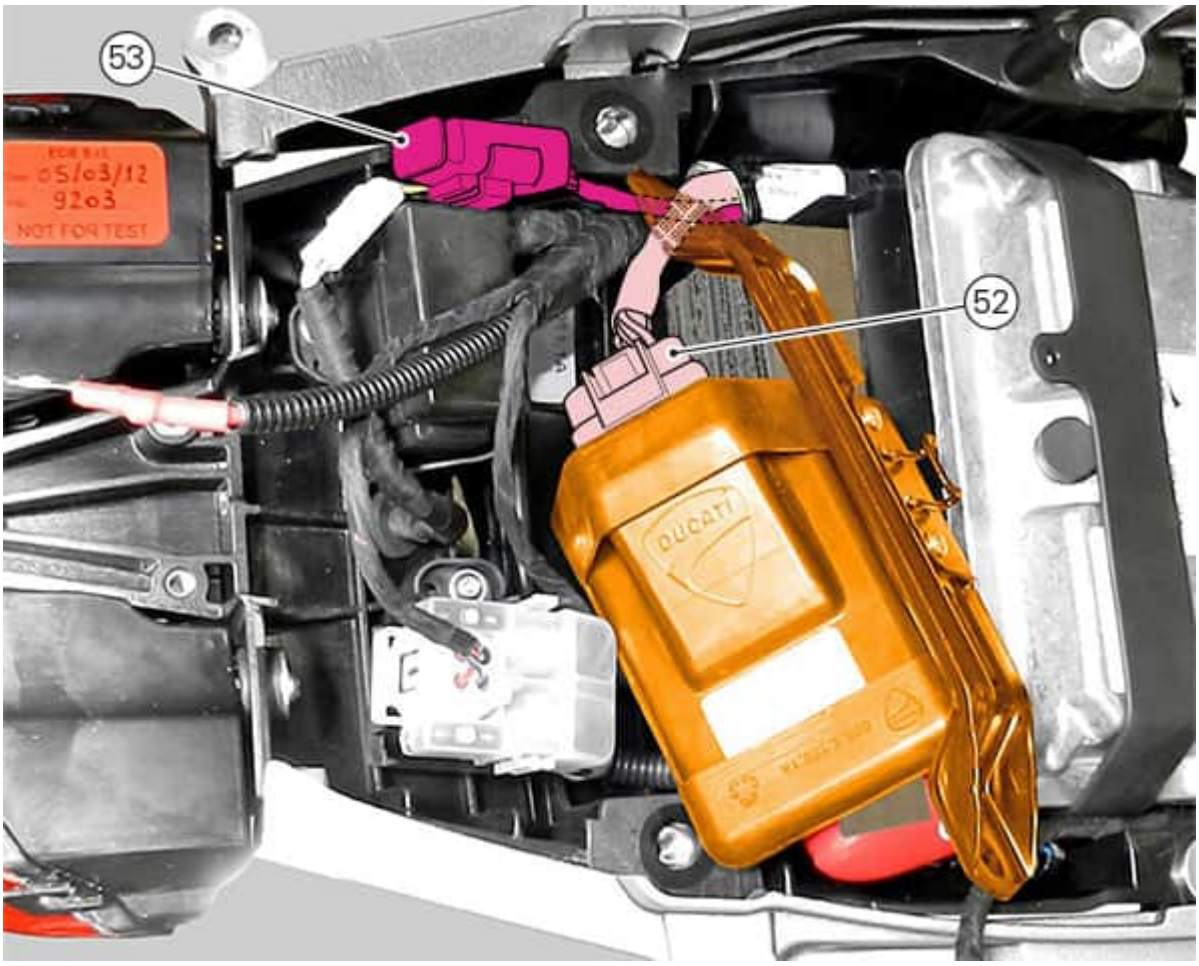


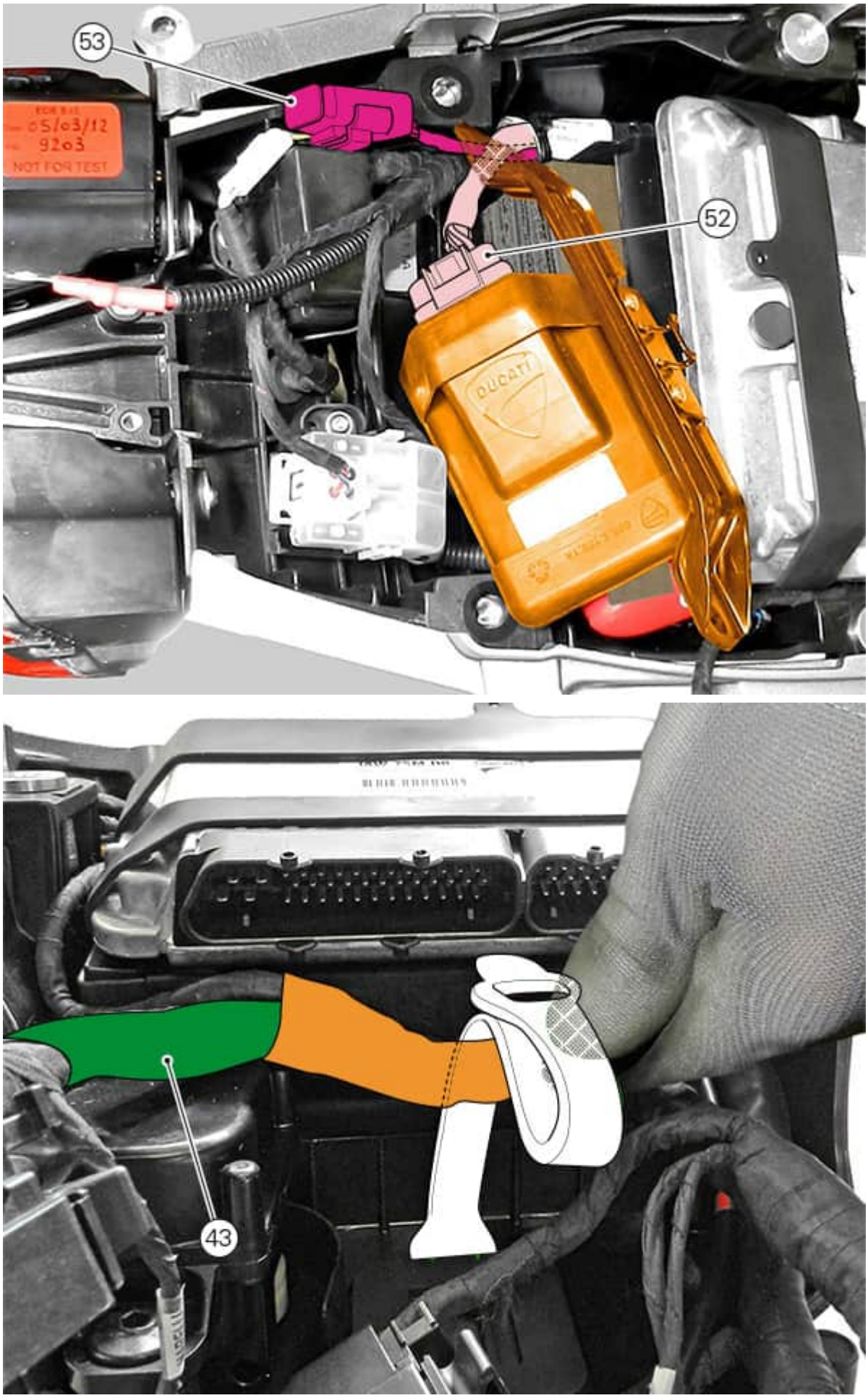

57
58
56
59
60


55
56


49
50
51
58


49
51


53
52
05/03/12
9203
NOT FOR TEST
DUCATI



Fit the seat lock cable (S) in the compartment, as shown in the figure.

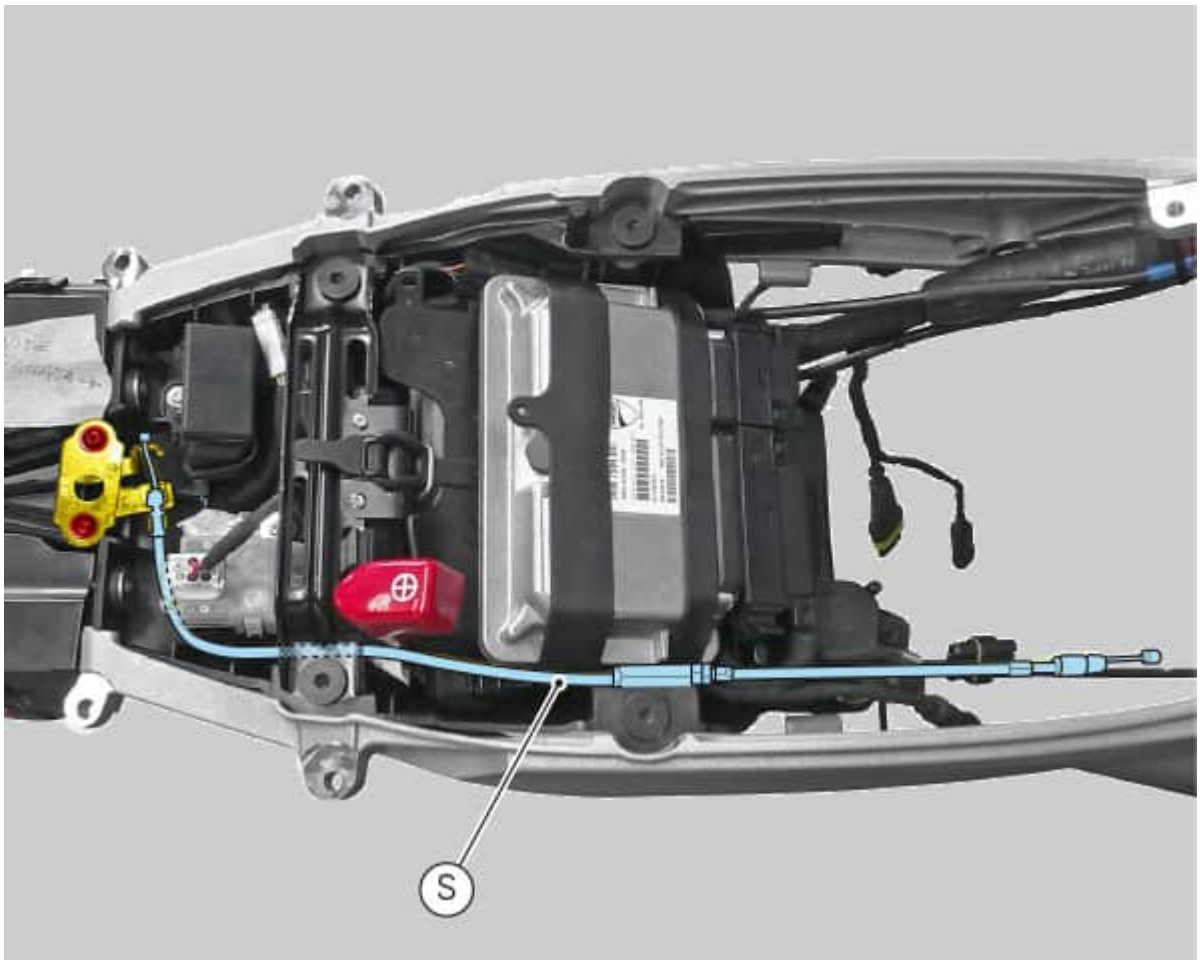

S

Table Y (only for Hyperstrada version)

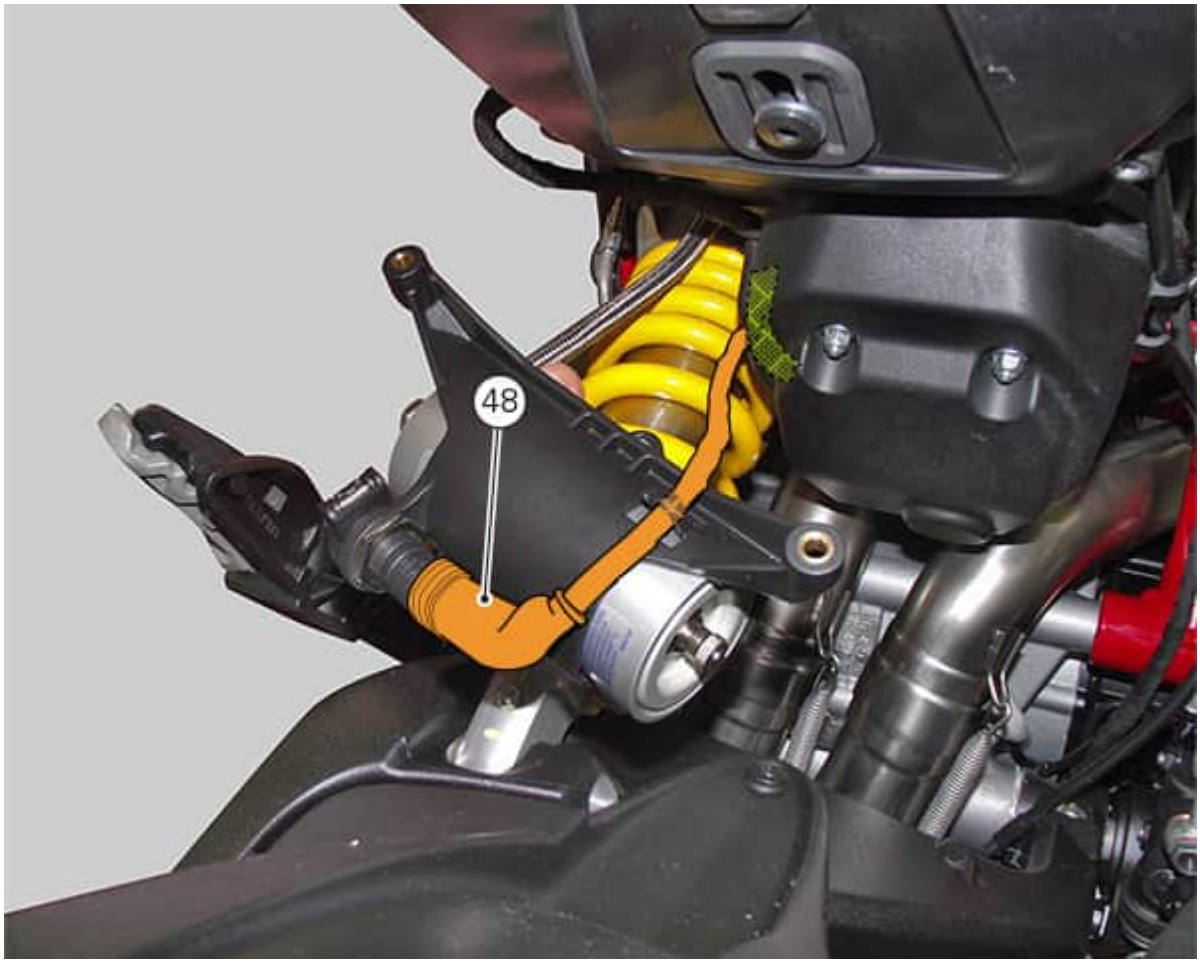
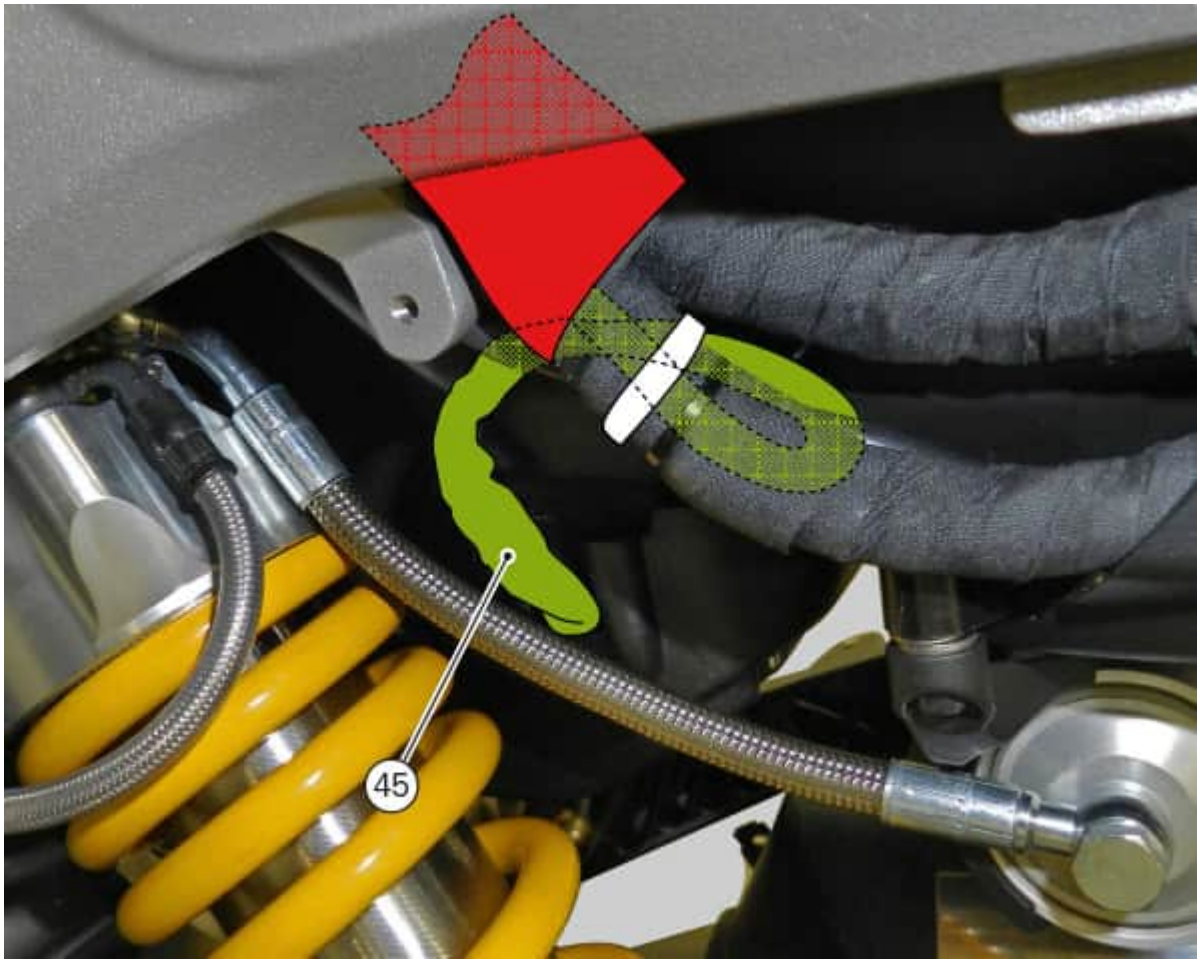
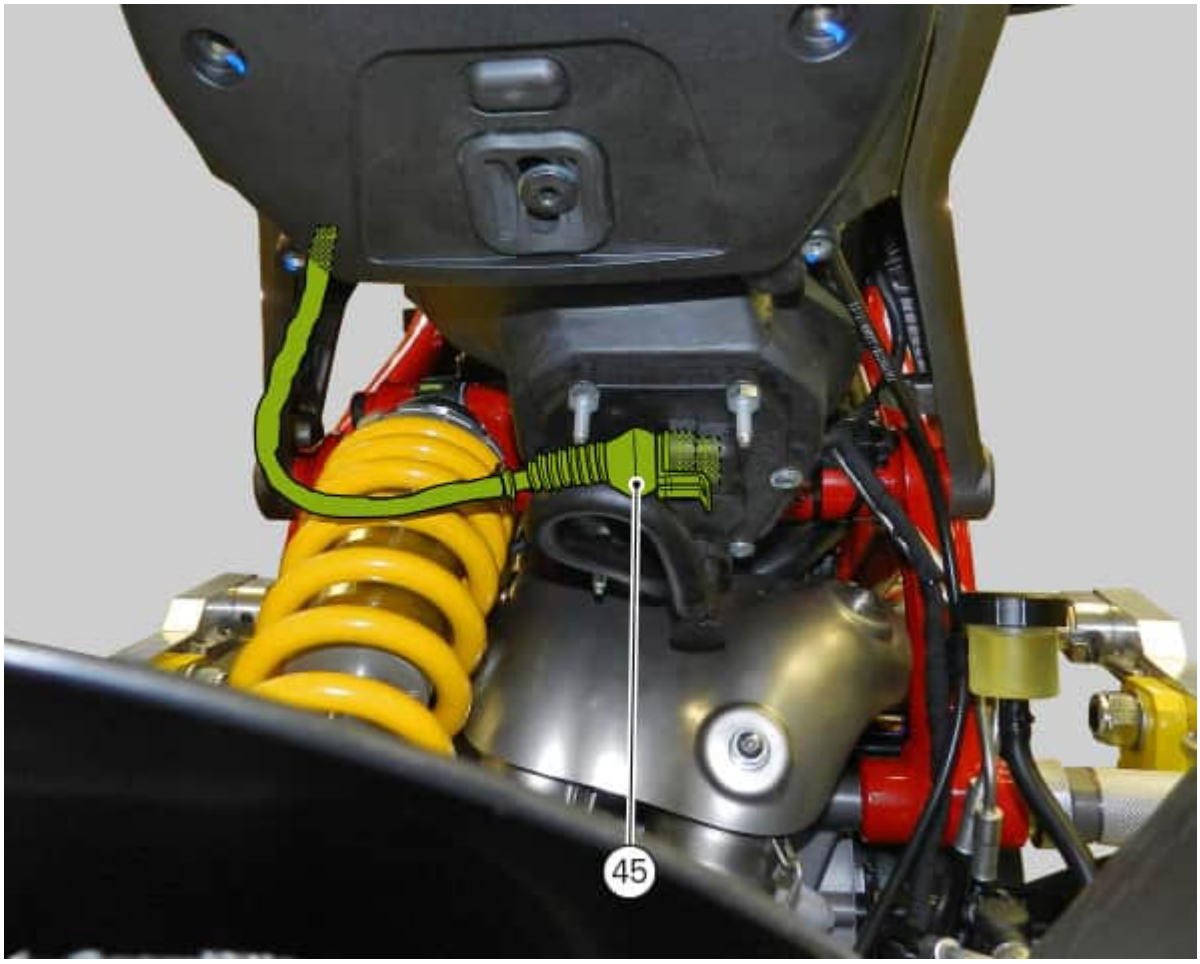
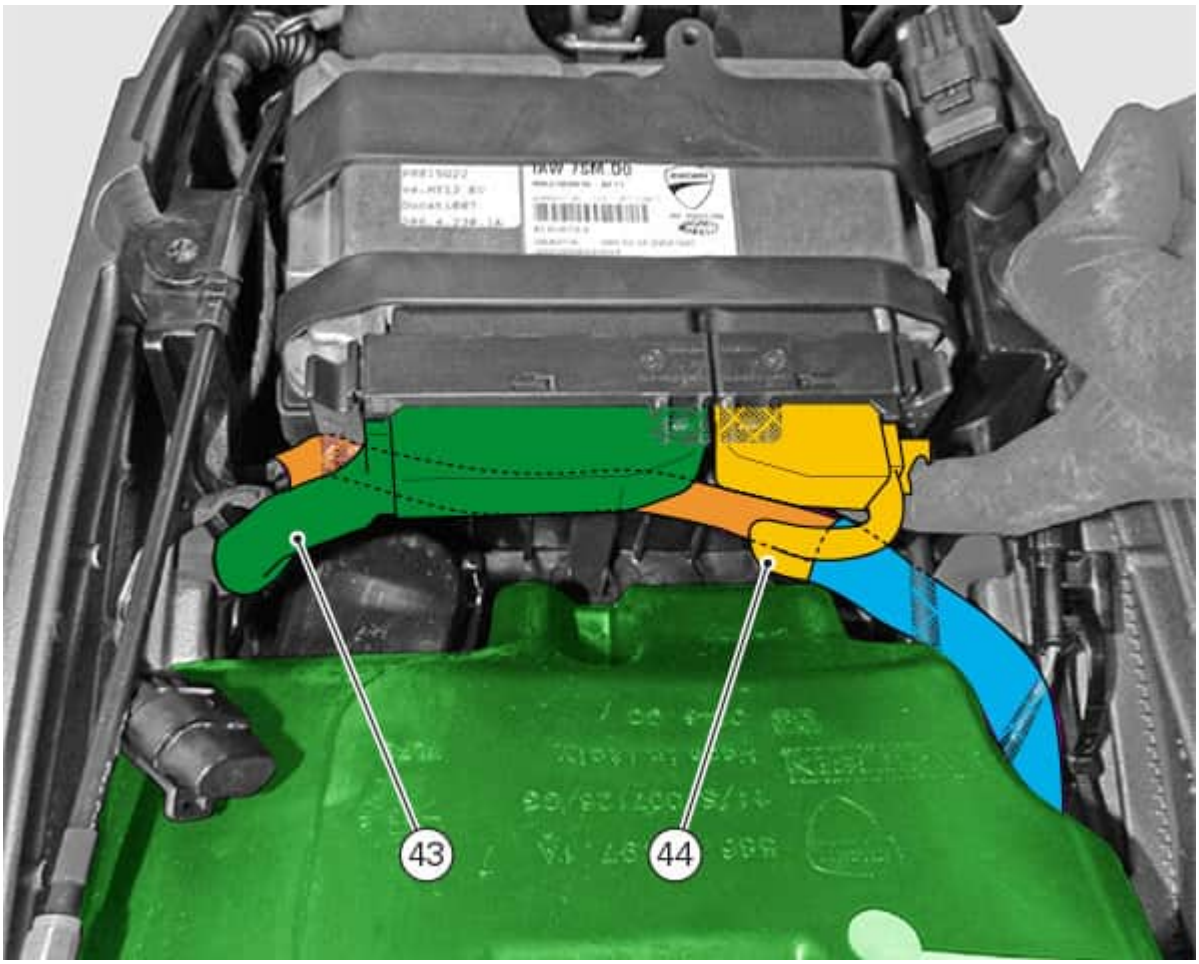




Table X






43
44

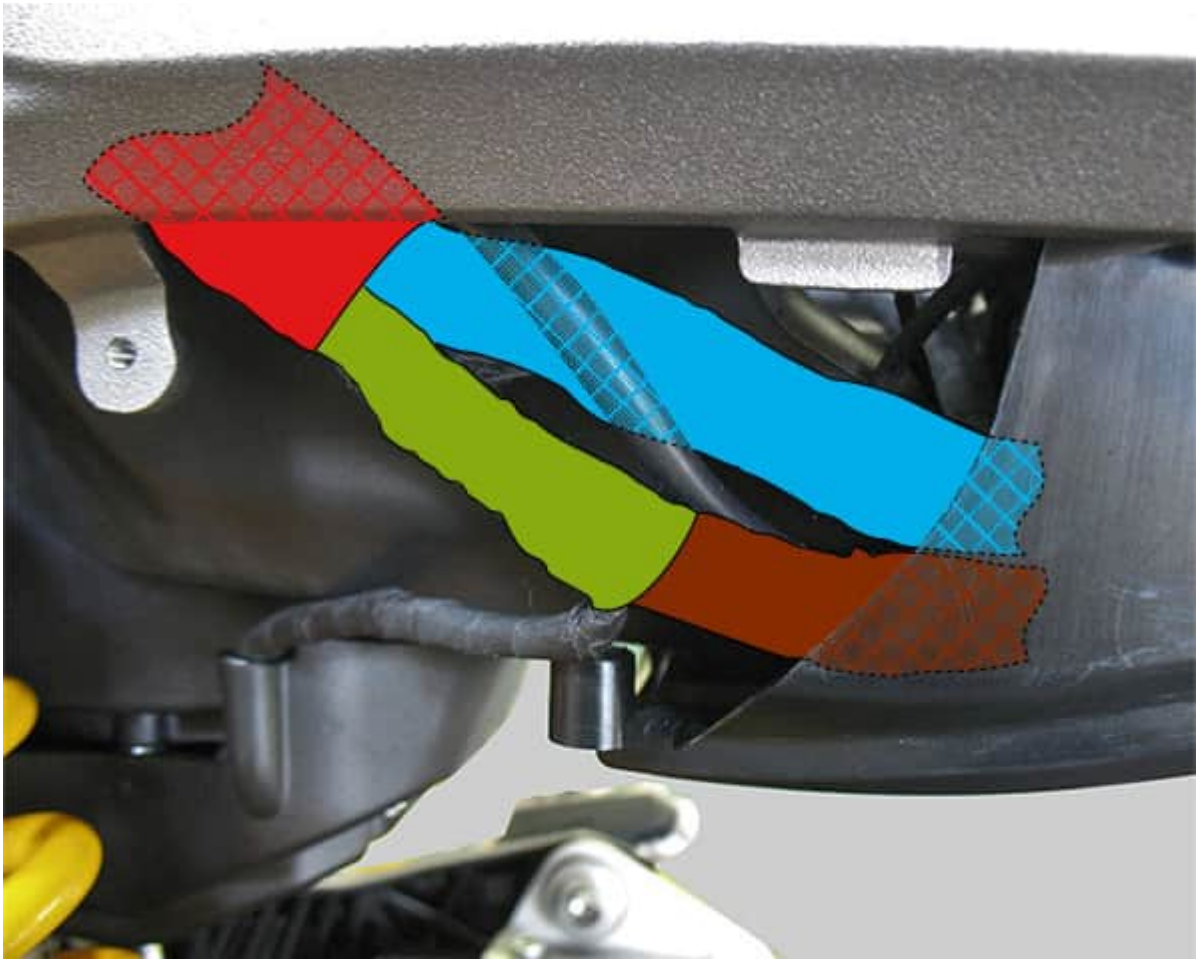


Table W

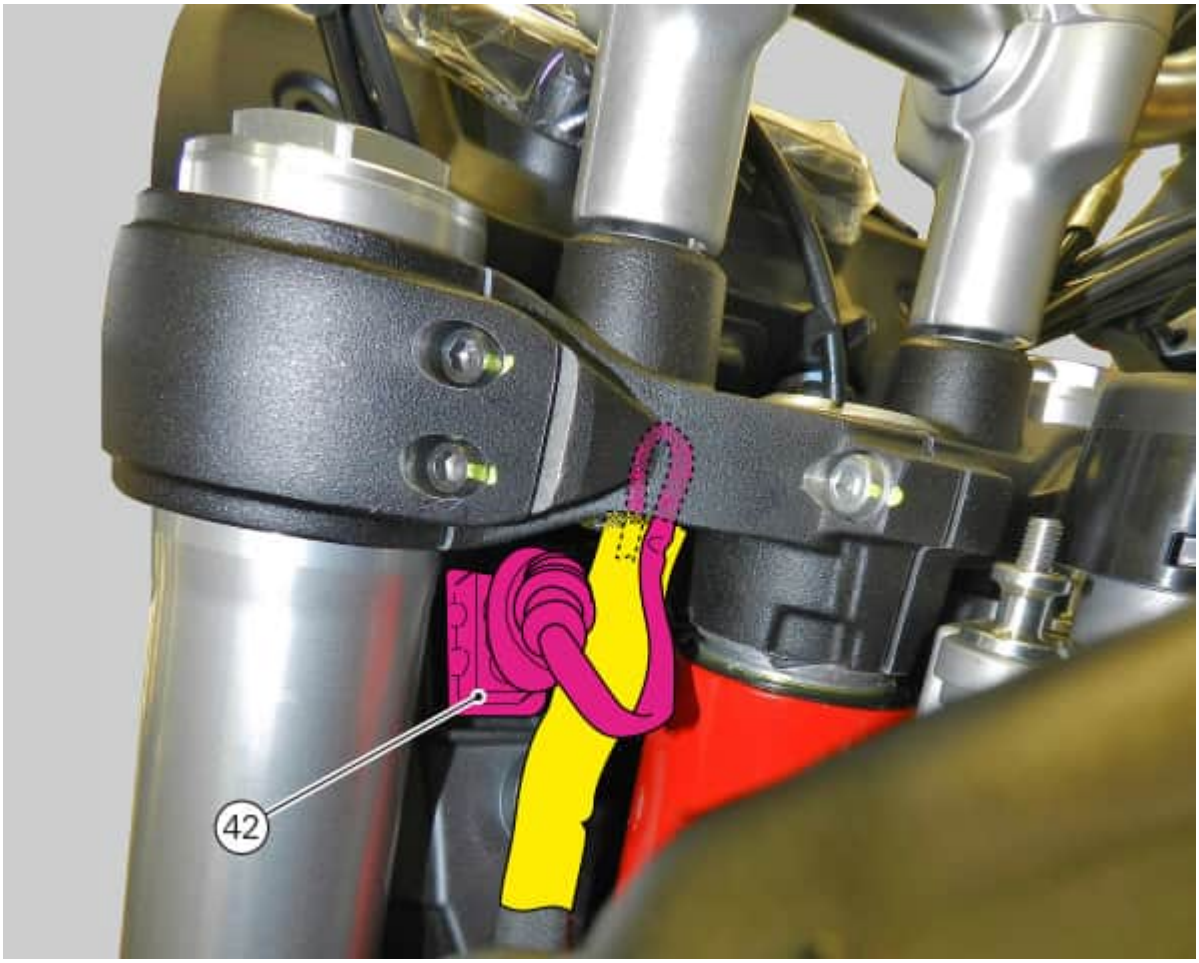
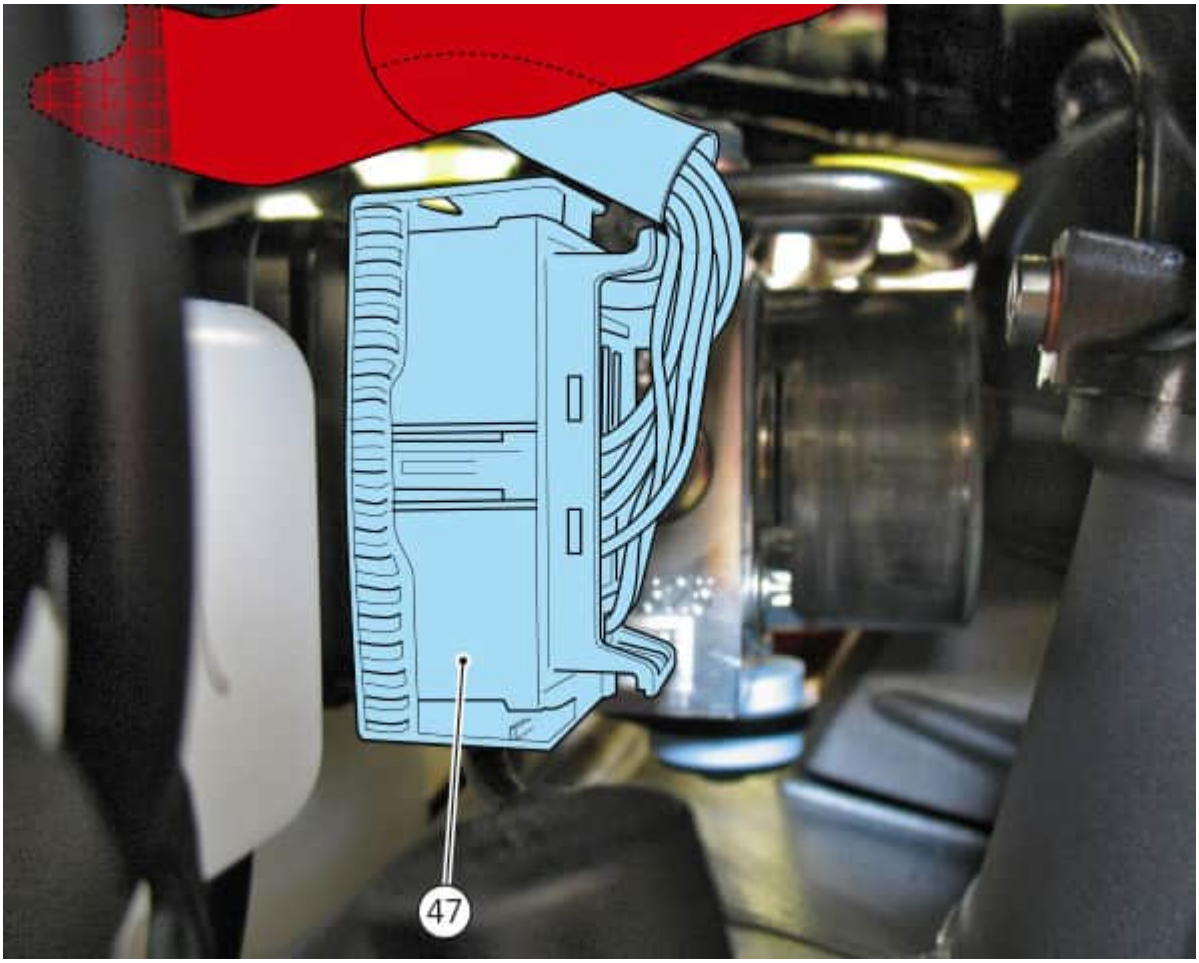


Table V

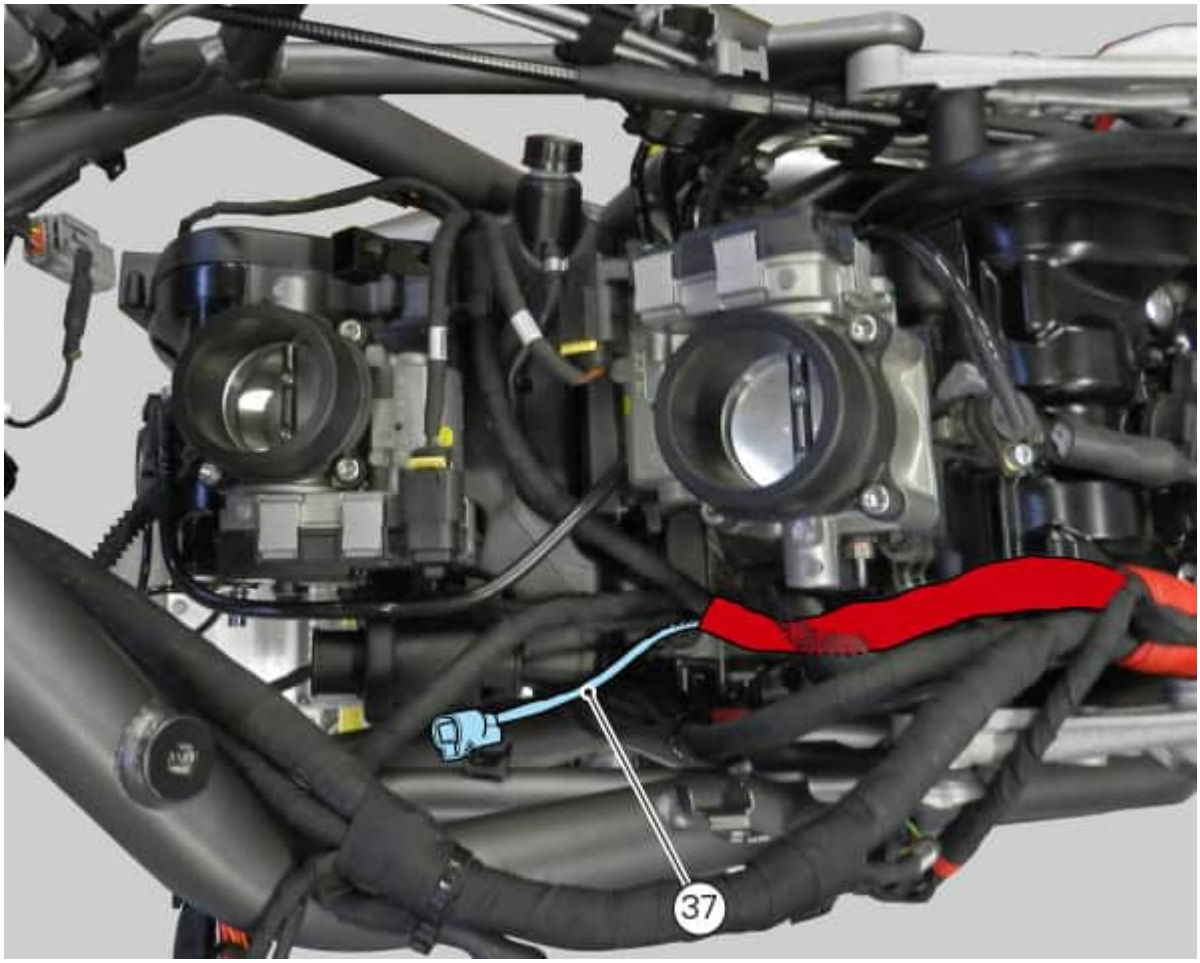


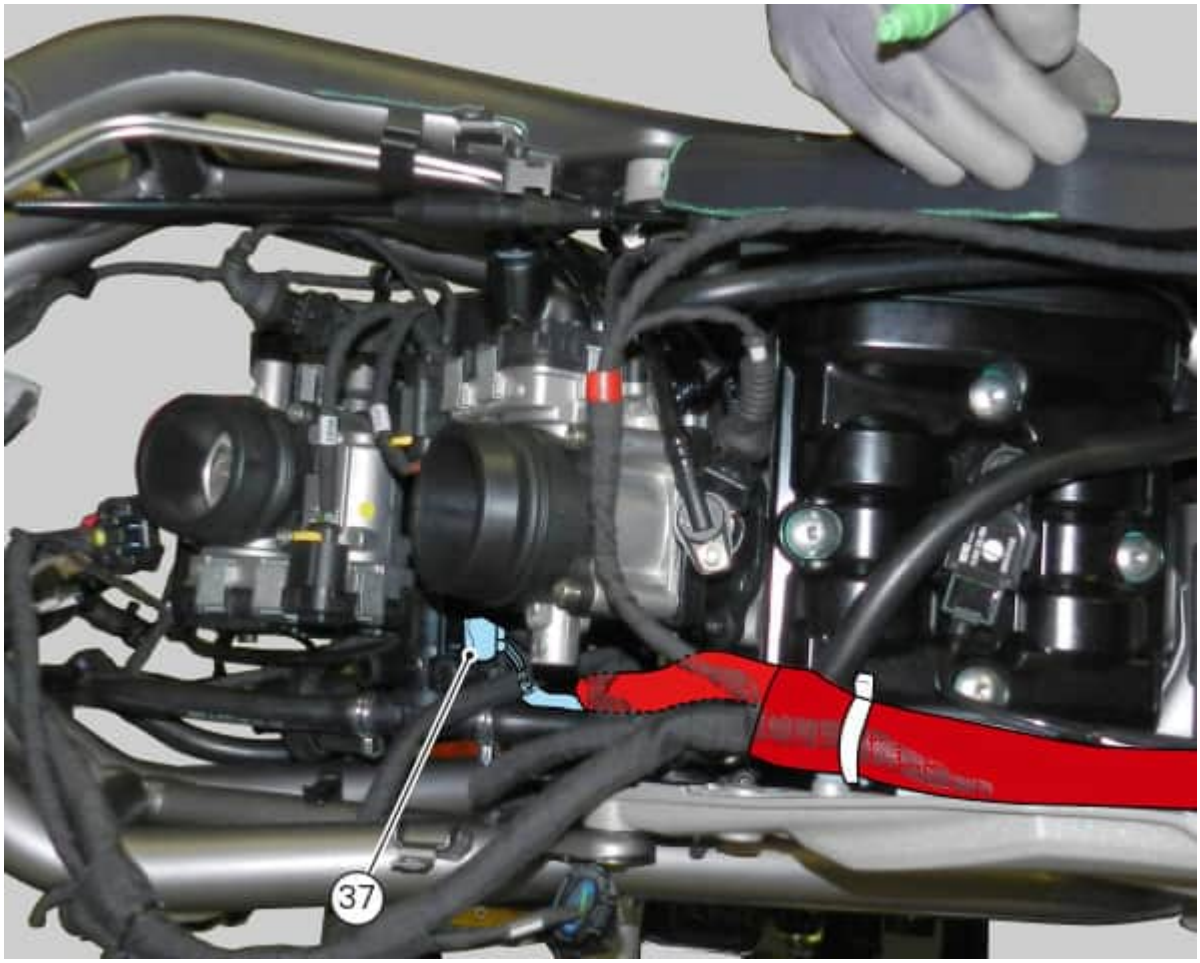


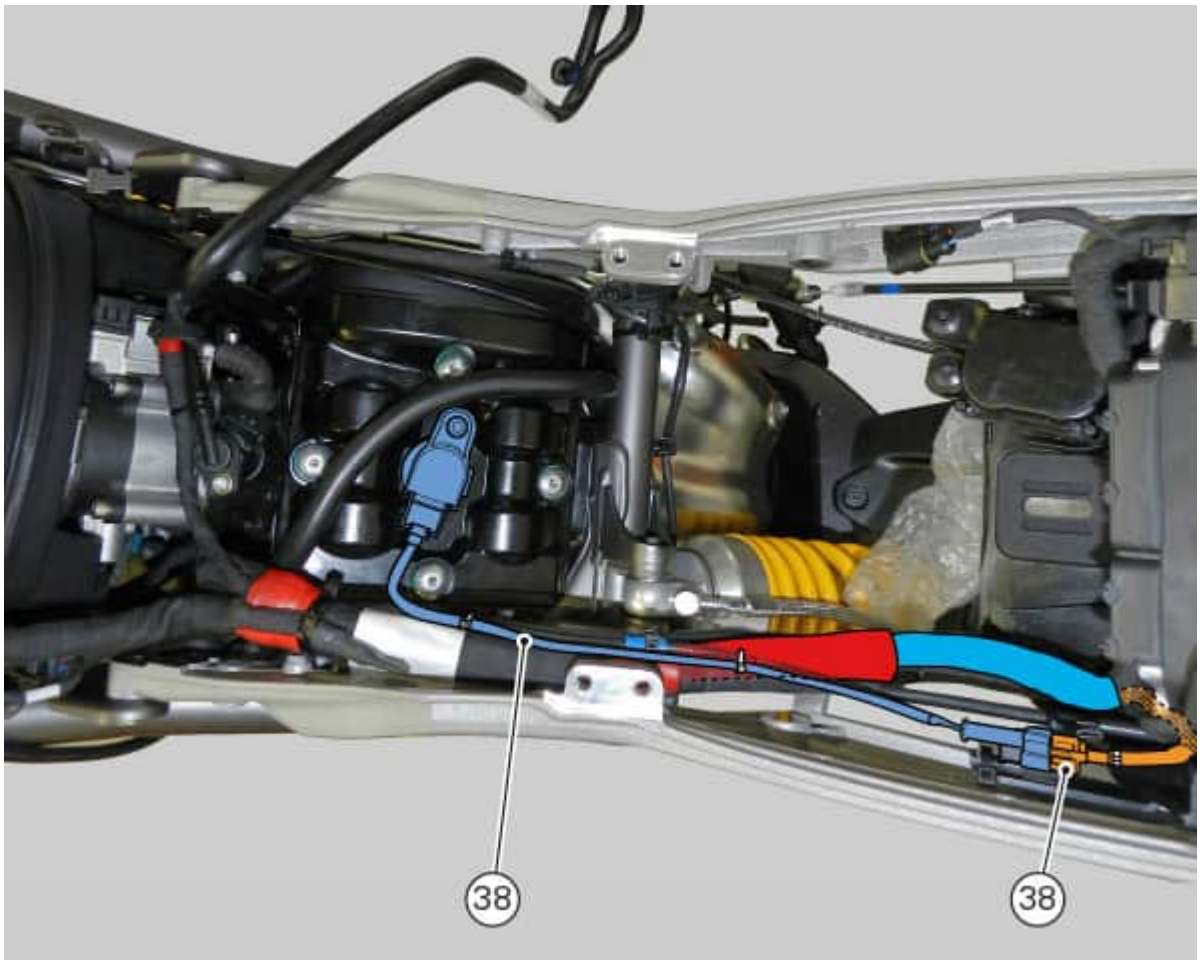

41

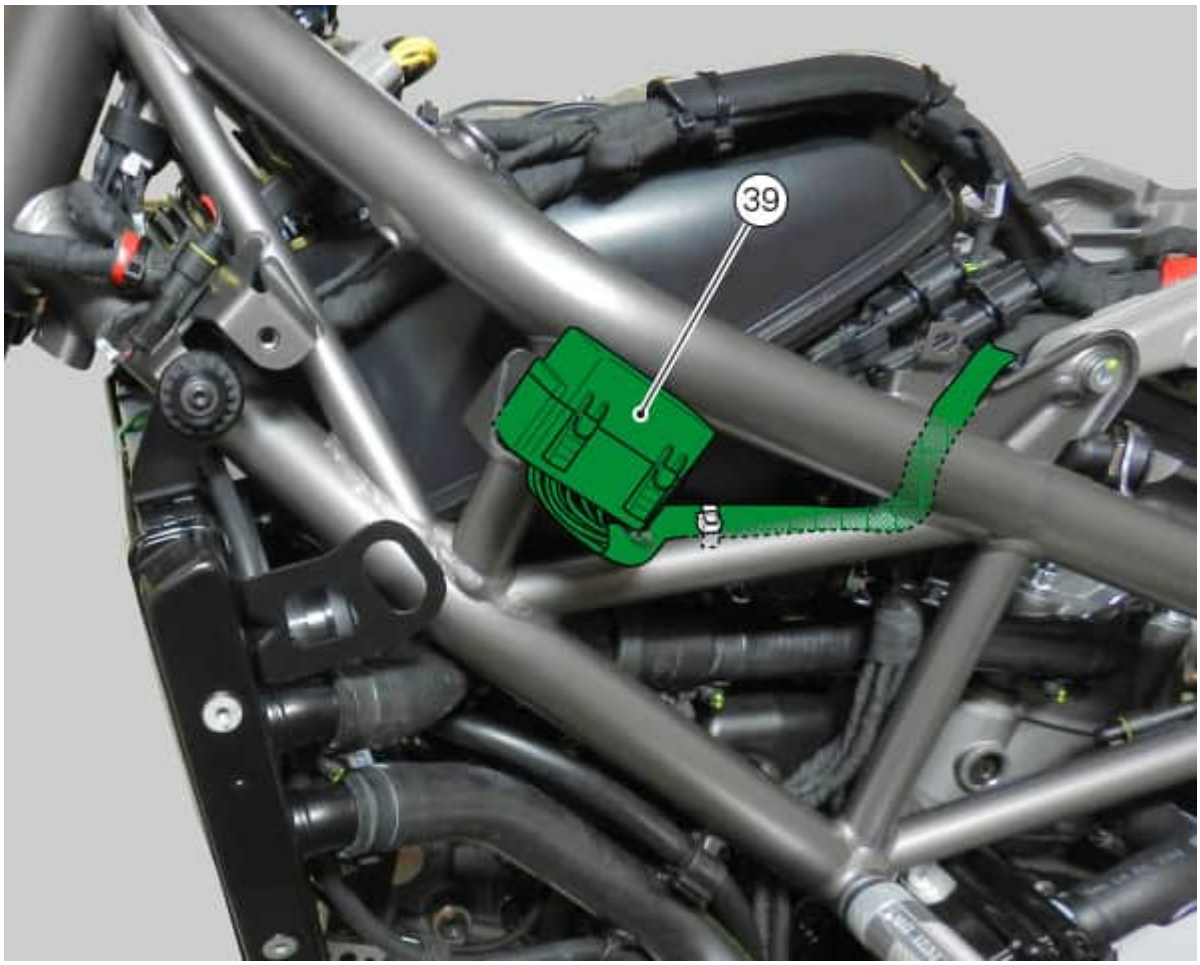

41

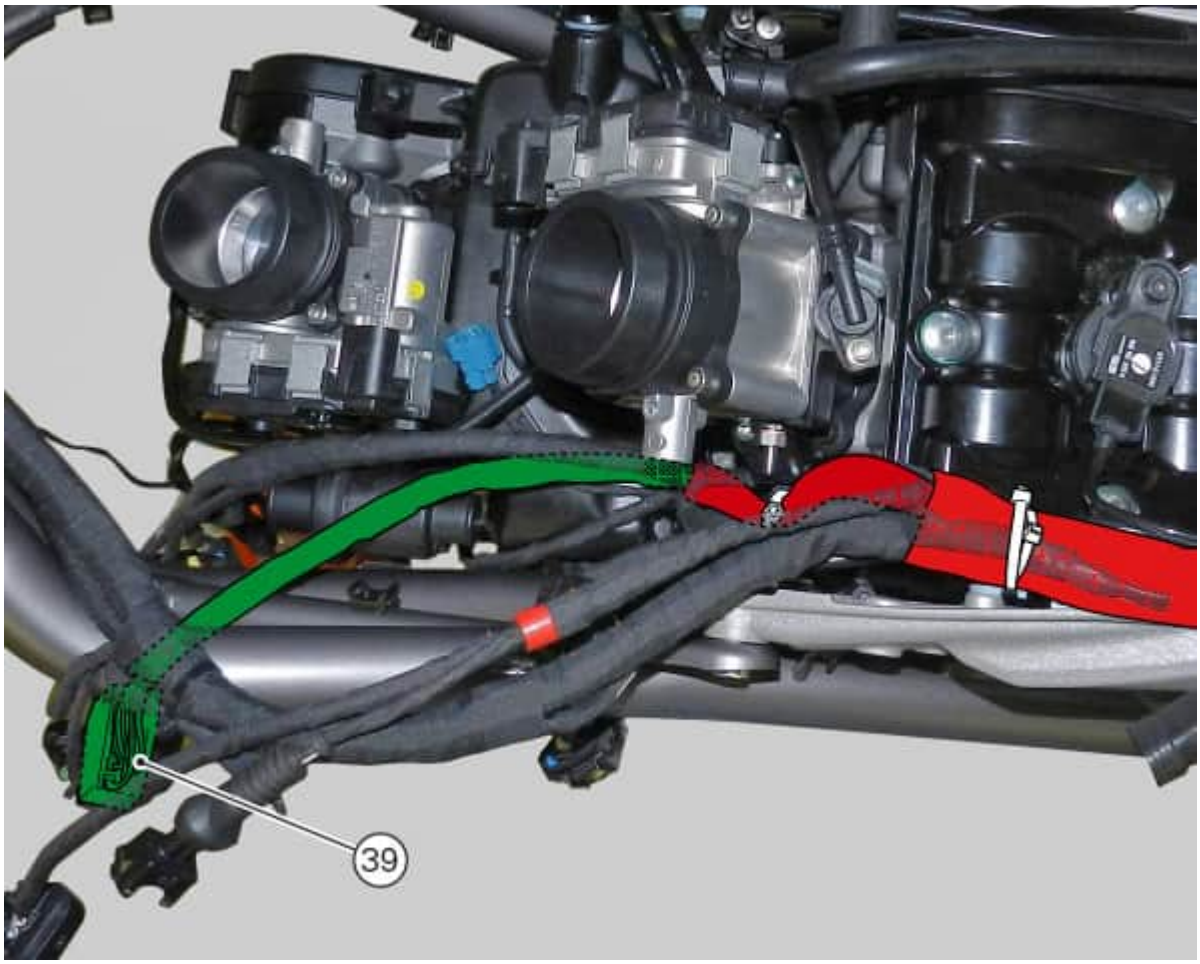
Table U






38
38


39


39

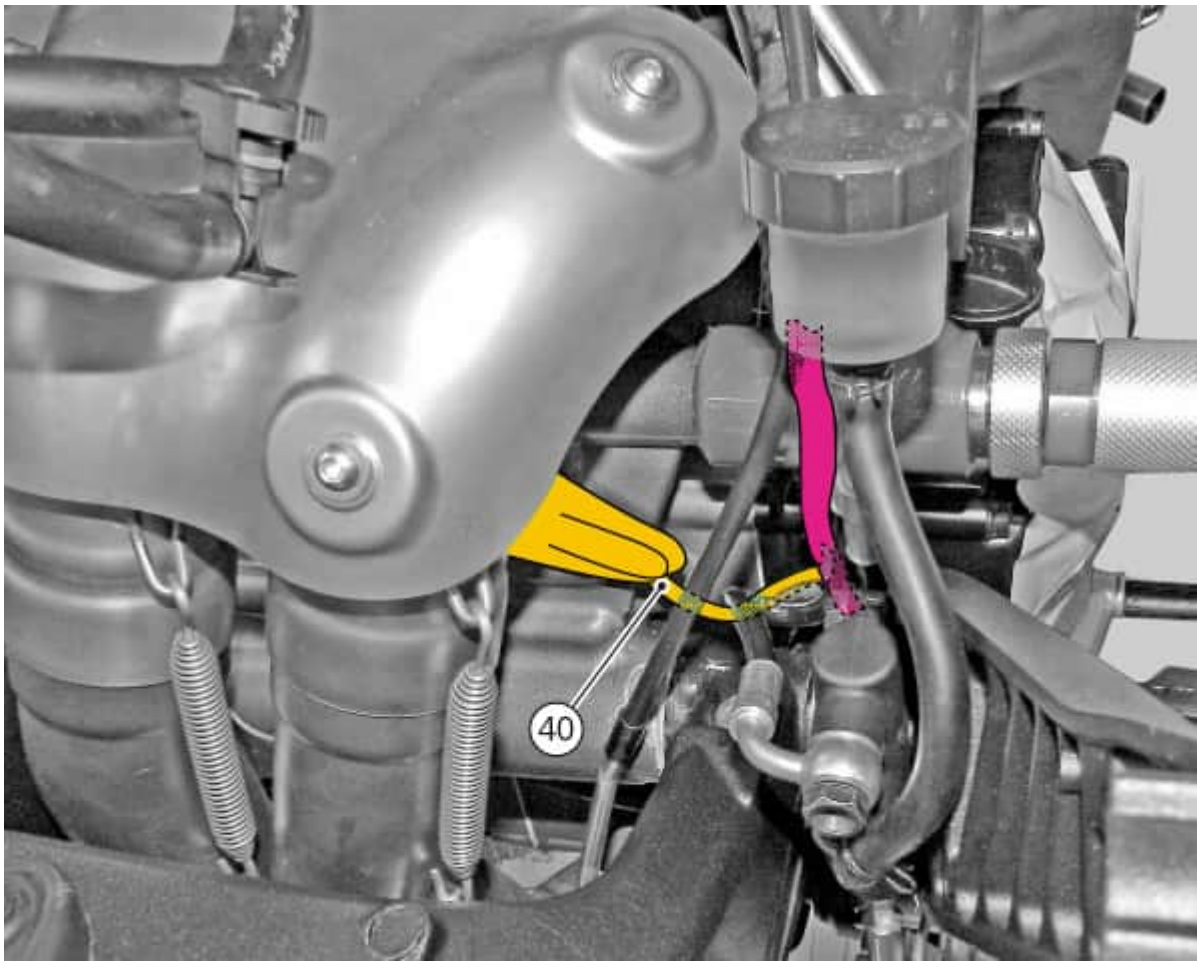
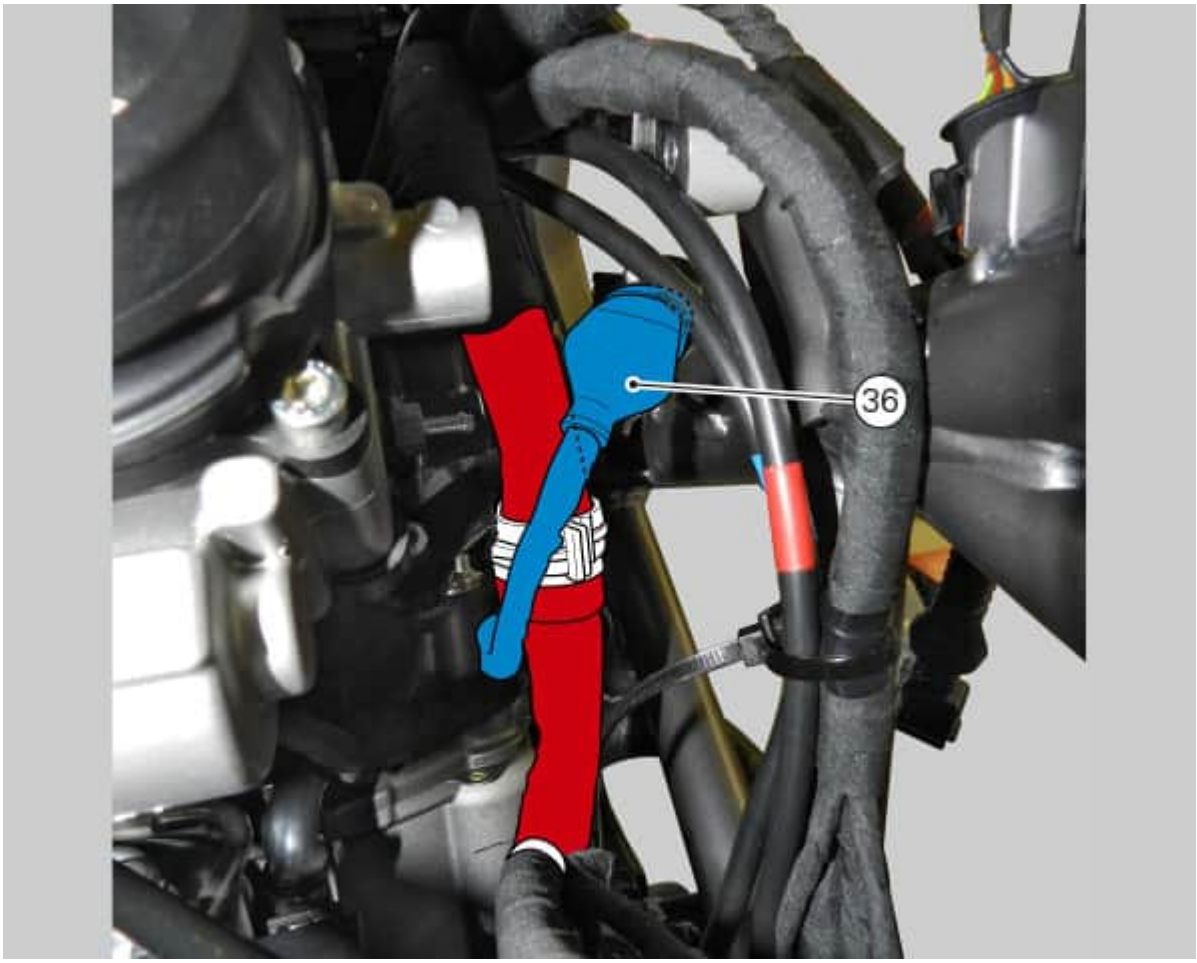

40

Table T (only for Hyperstrada version)



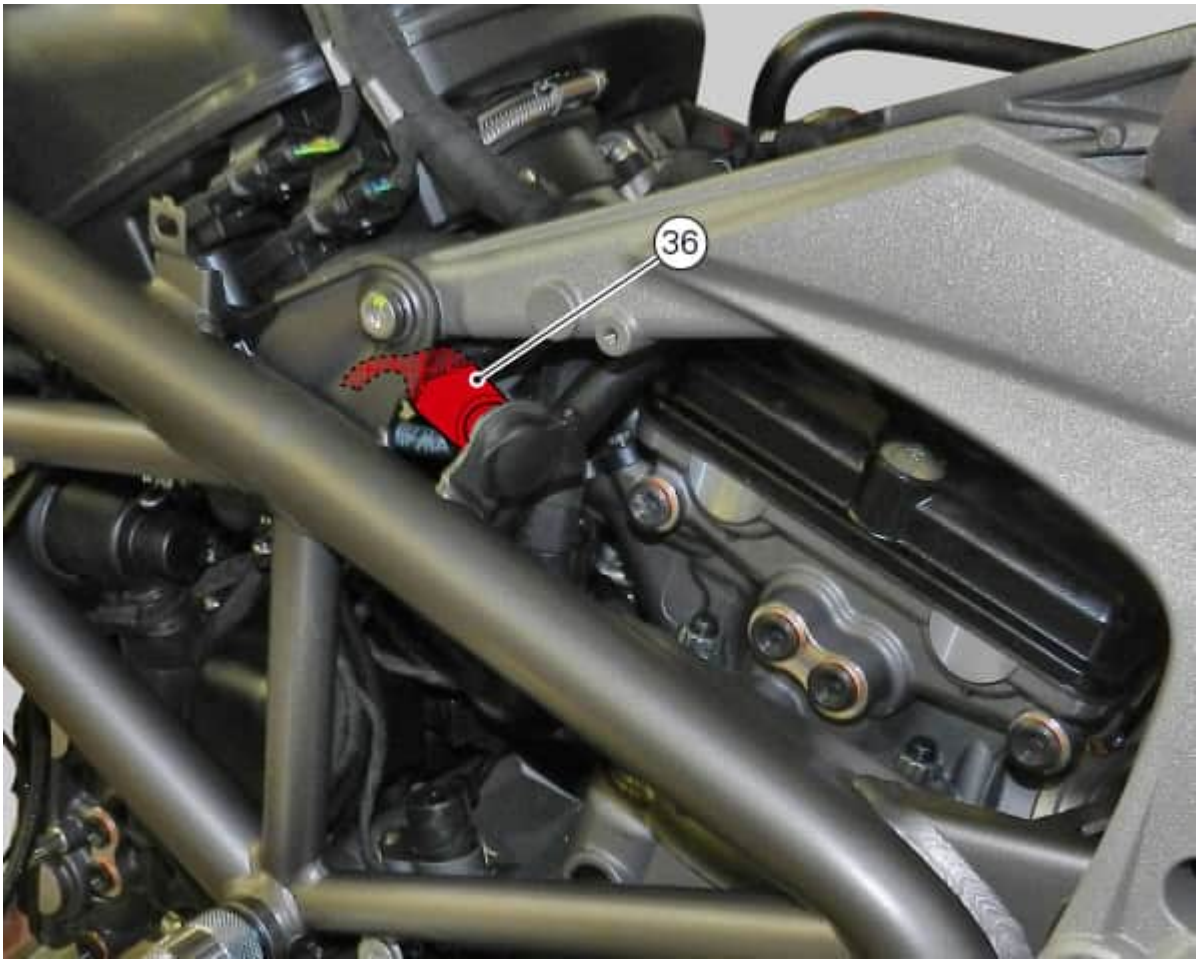
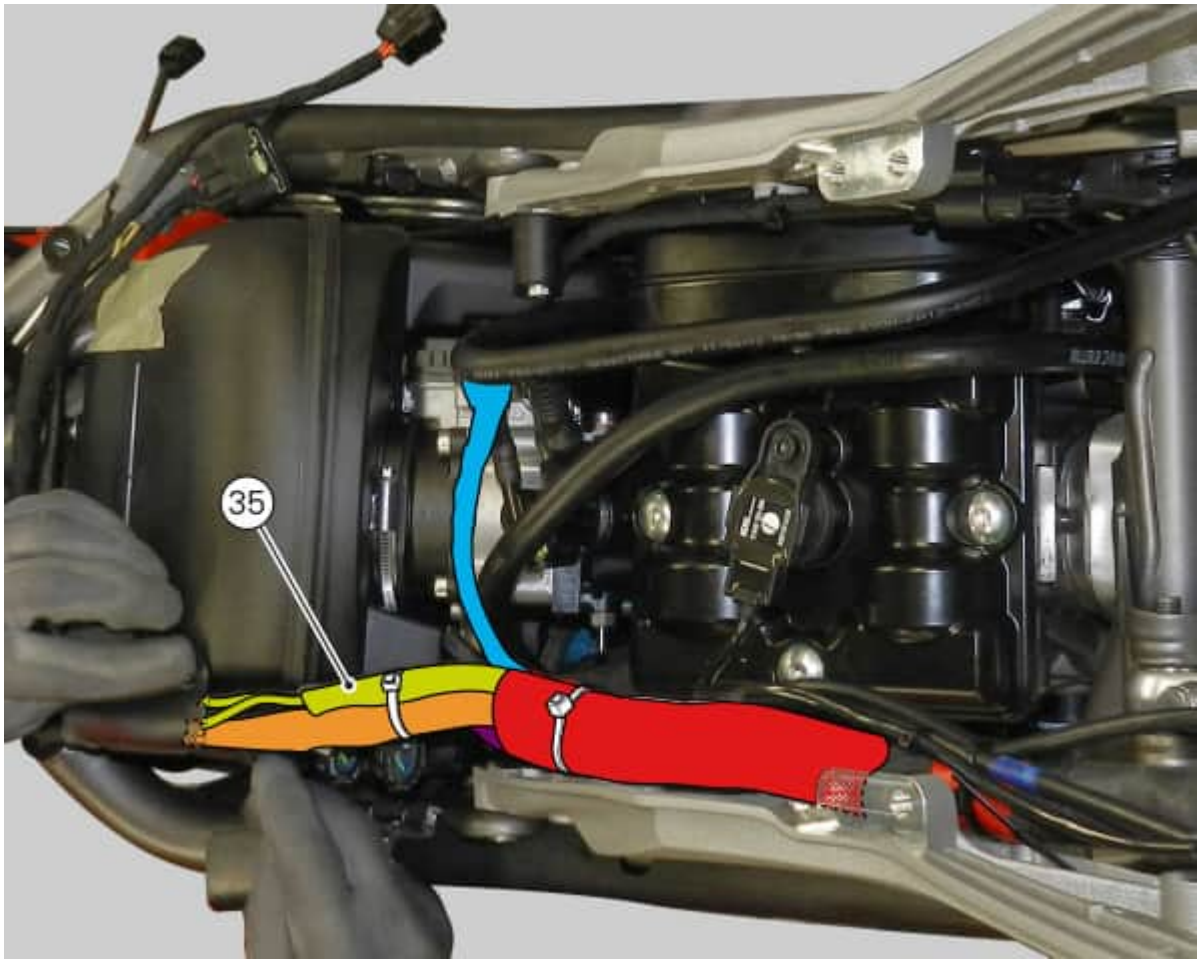


Table S



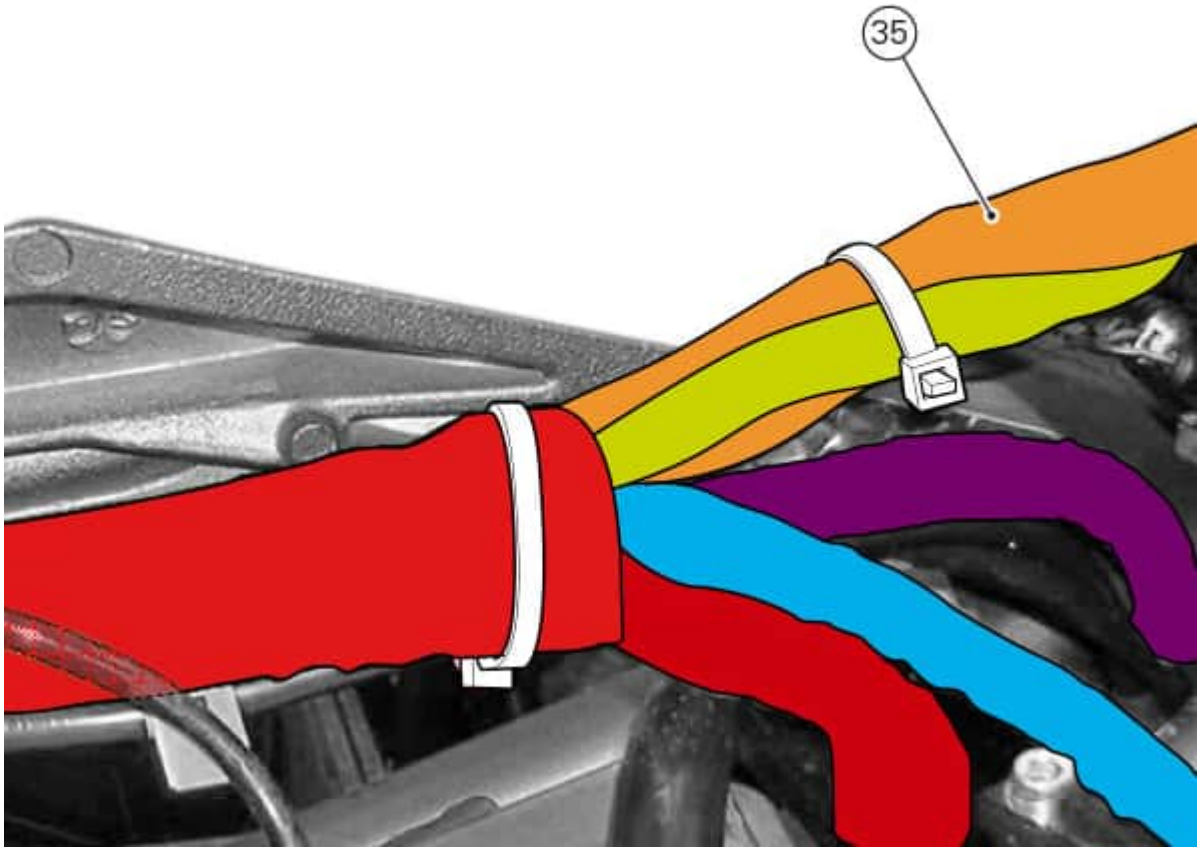
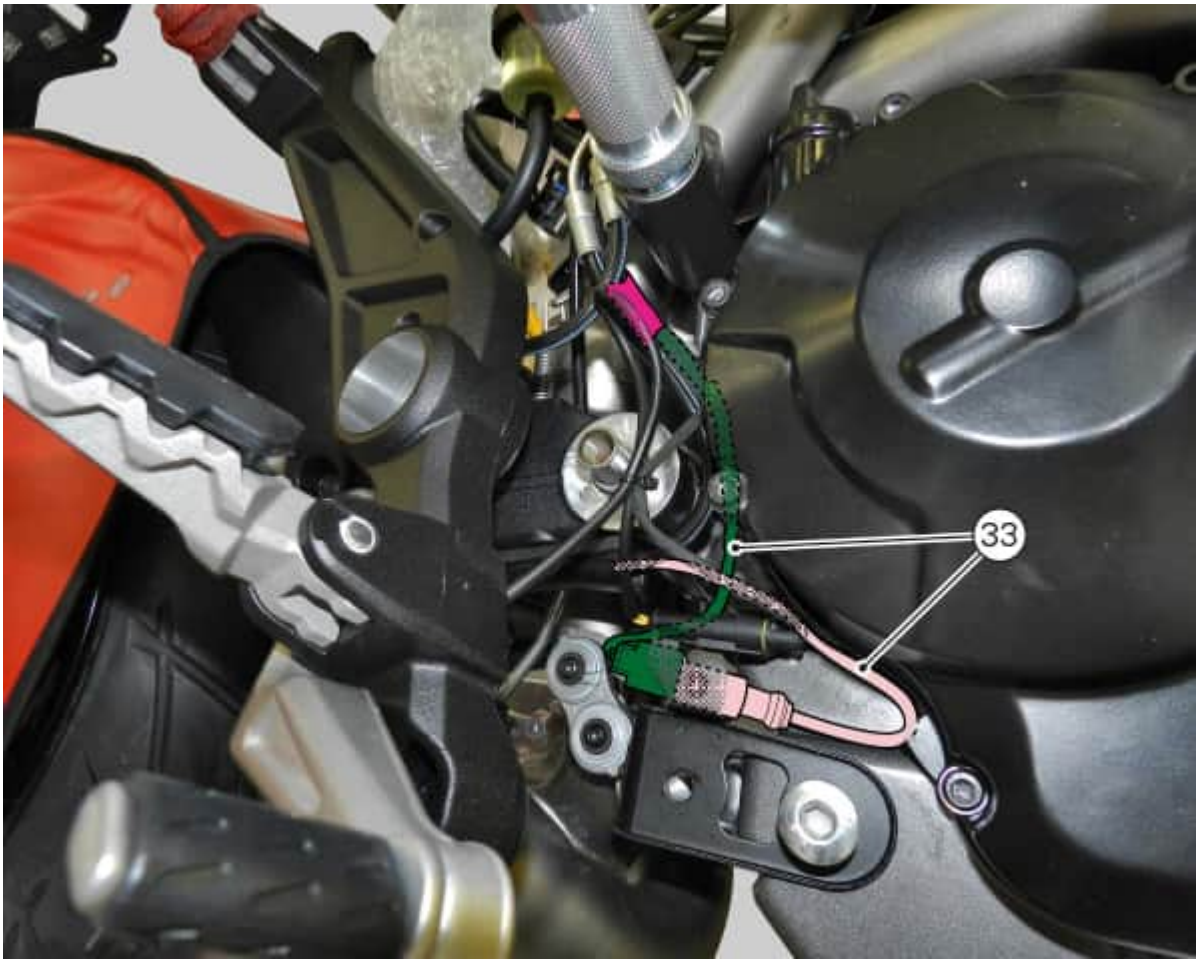


Table R



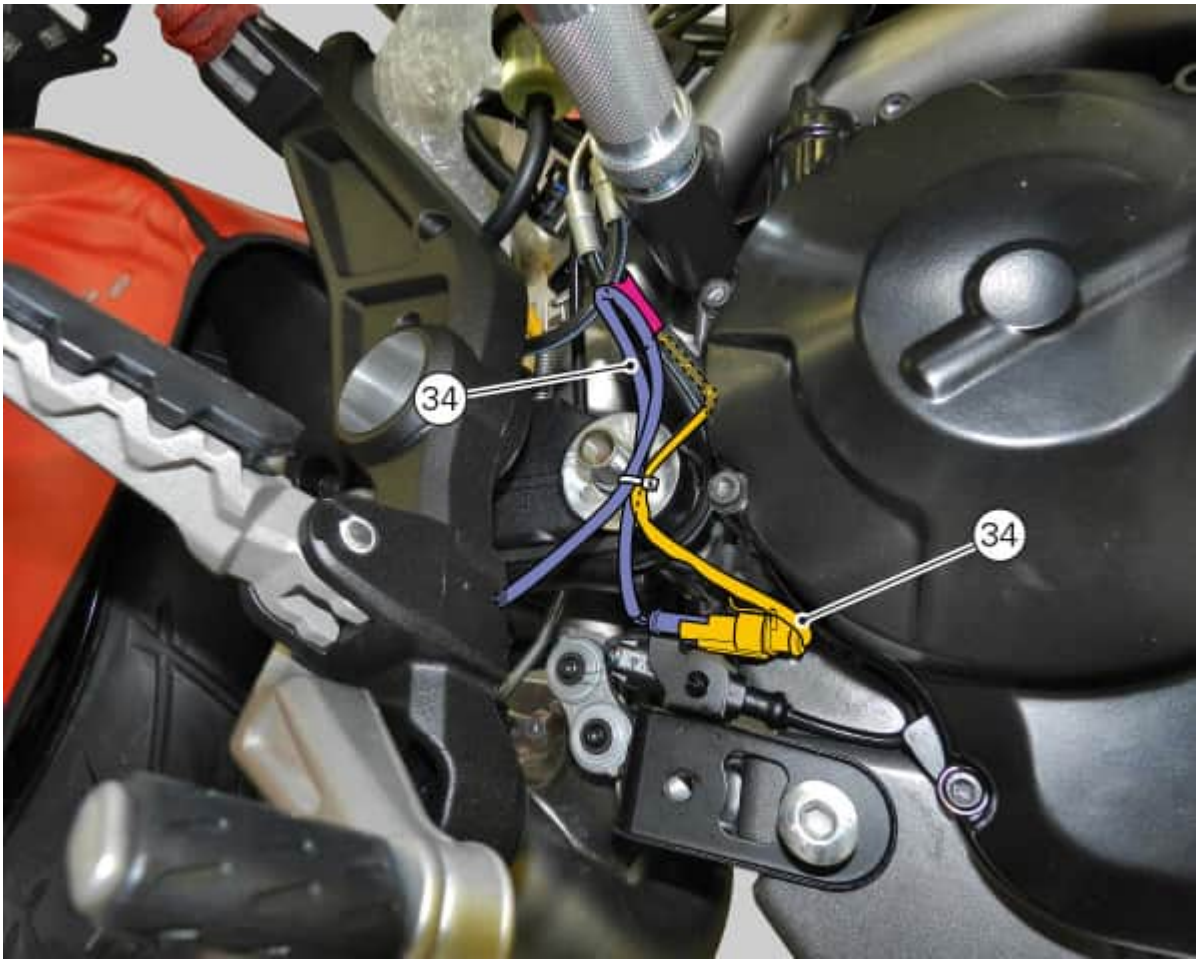
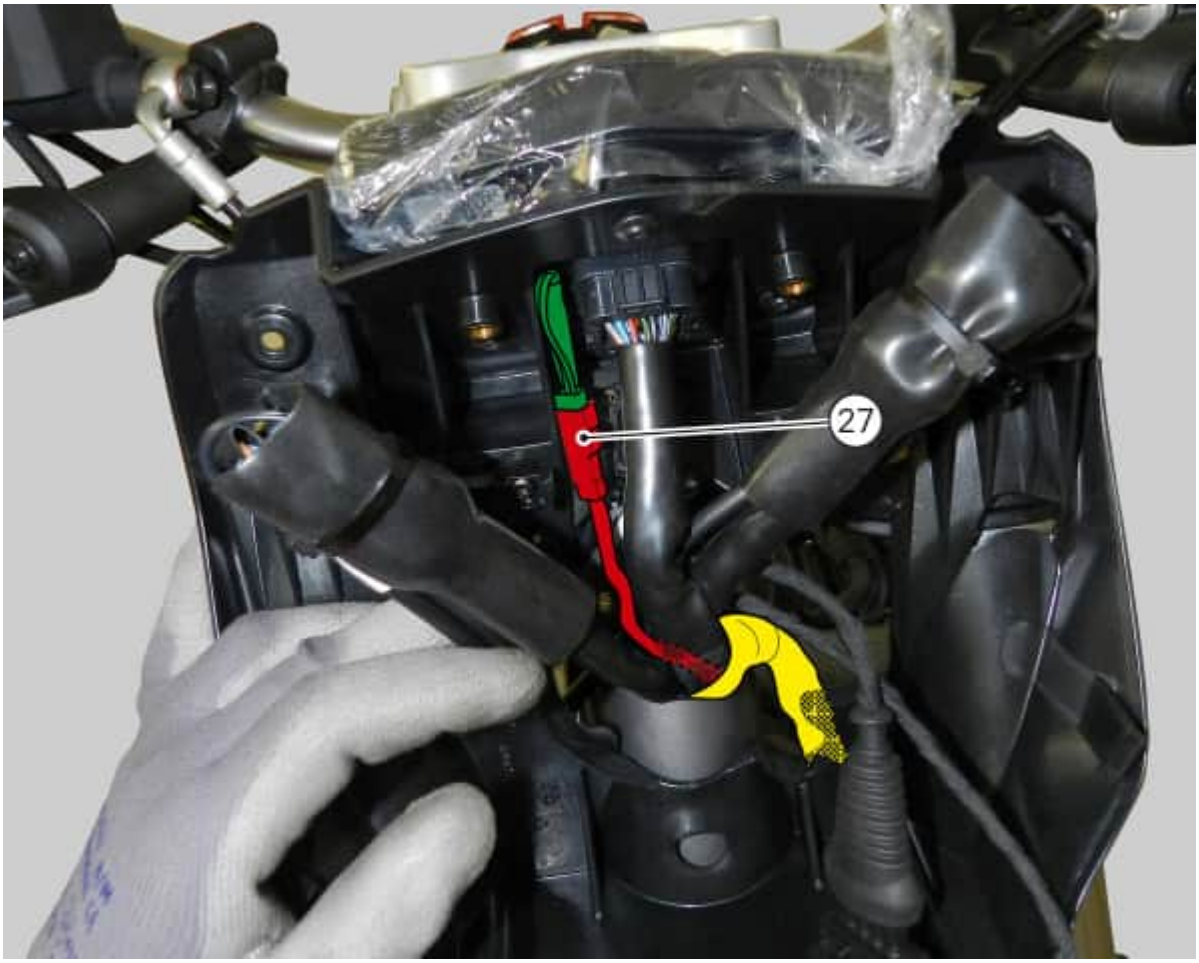


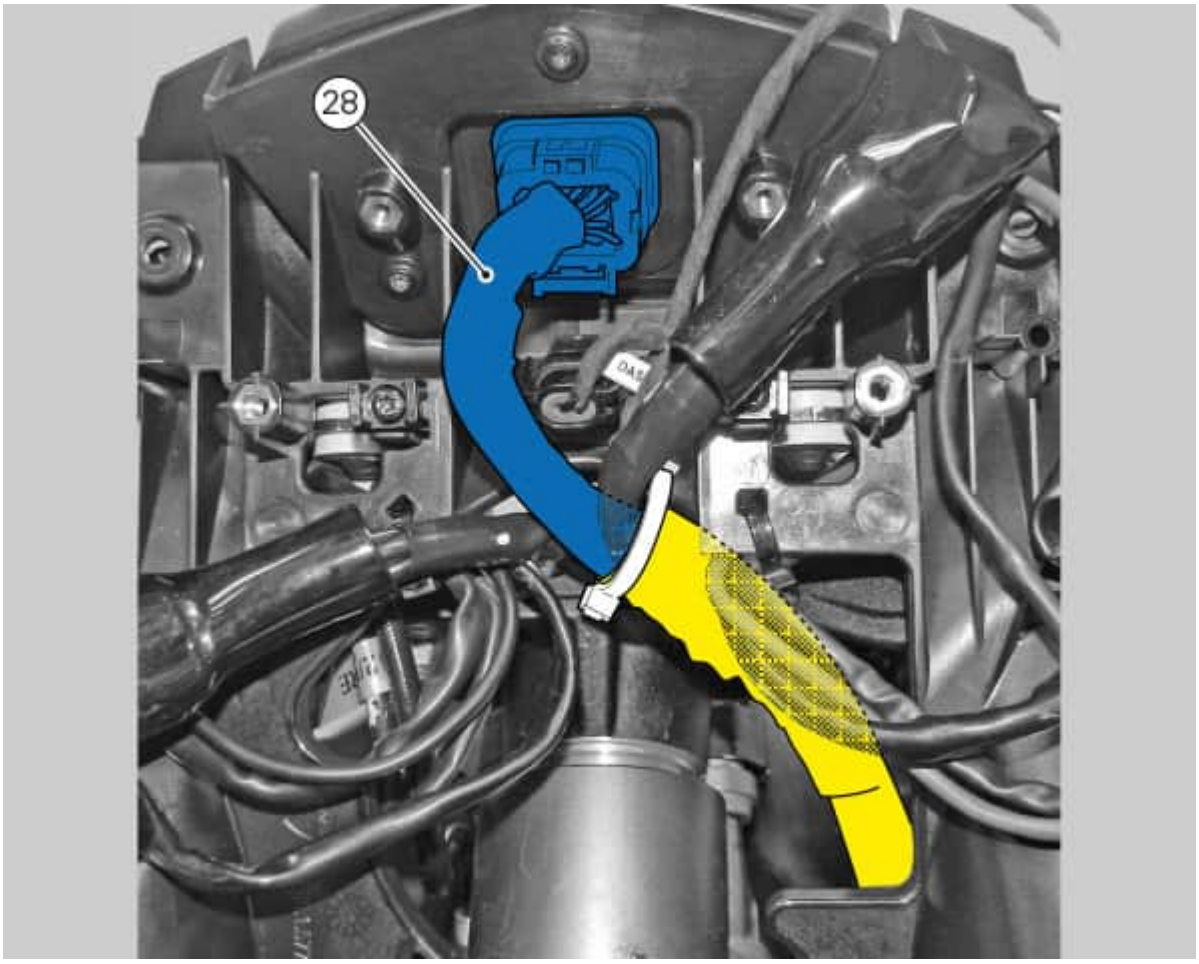
Table Q

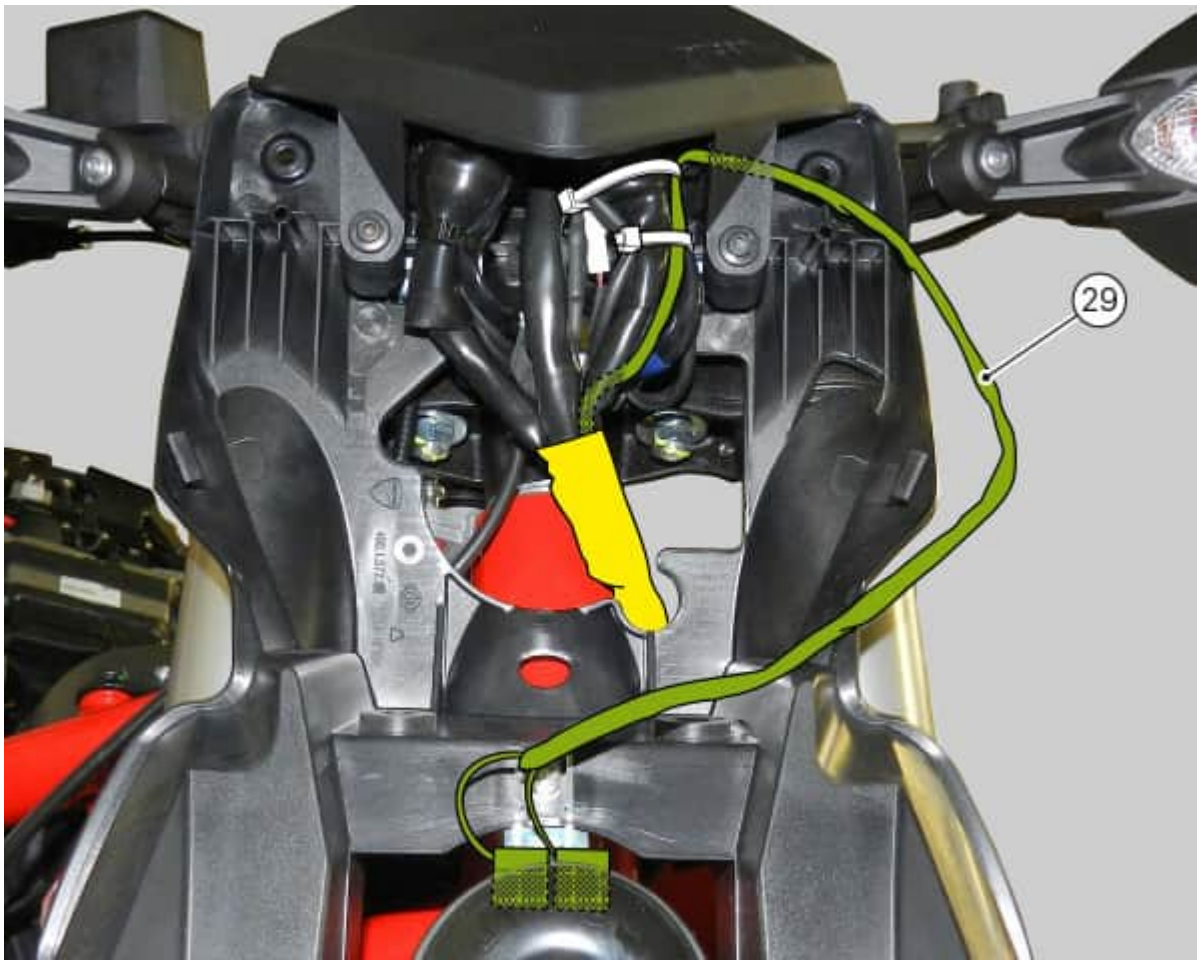


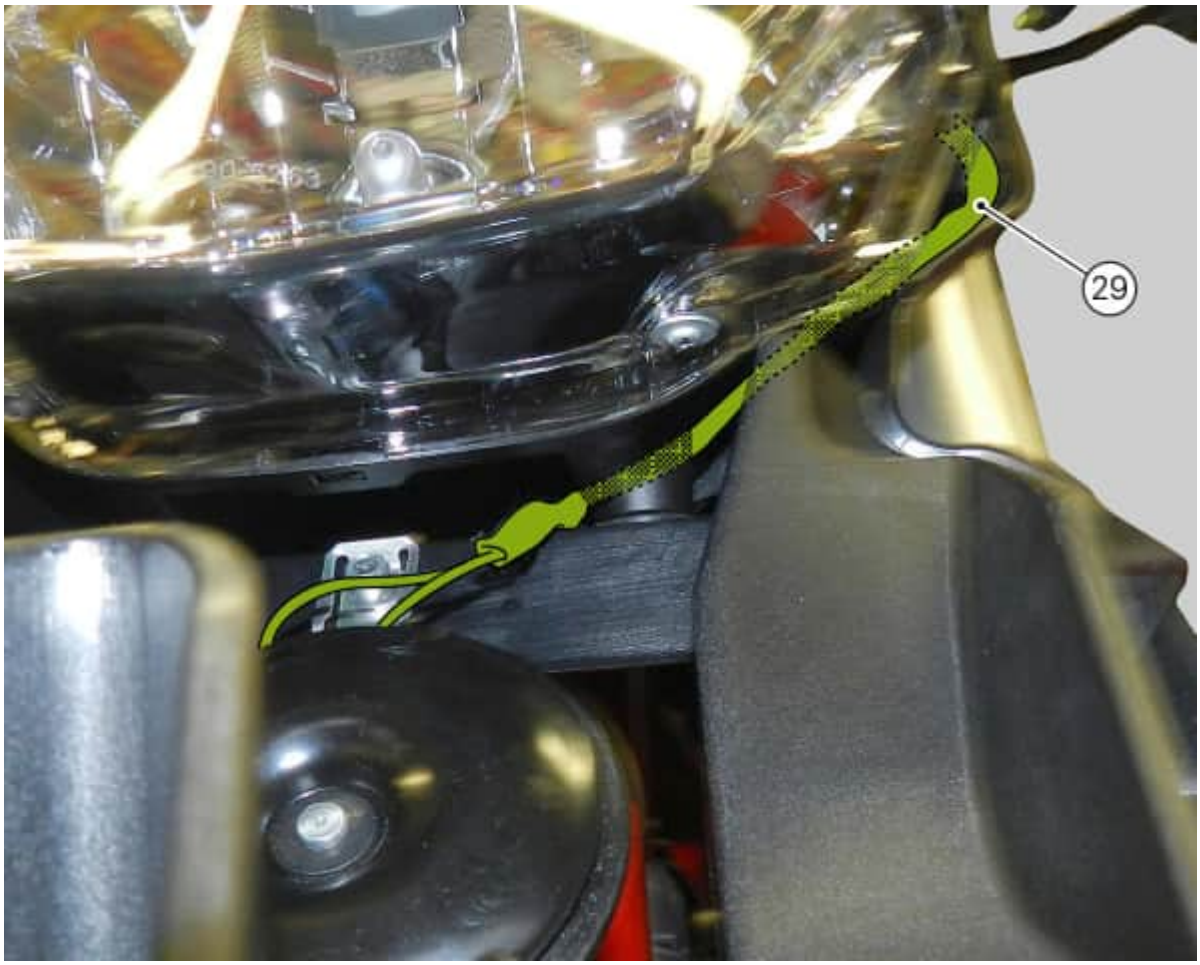


Table P






29


29


29

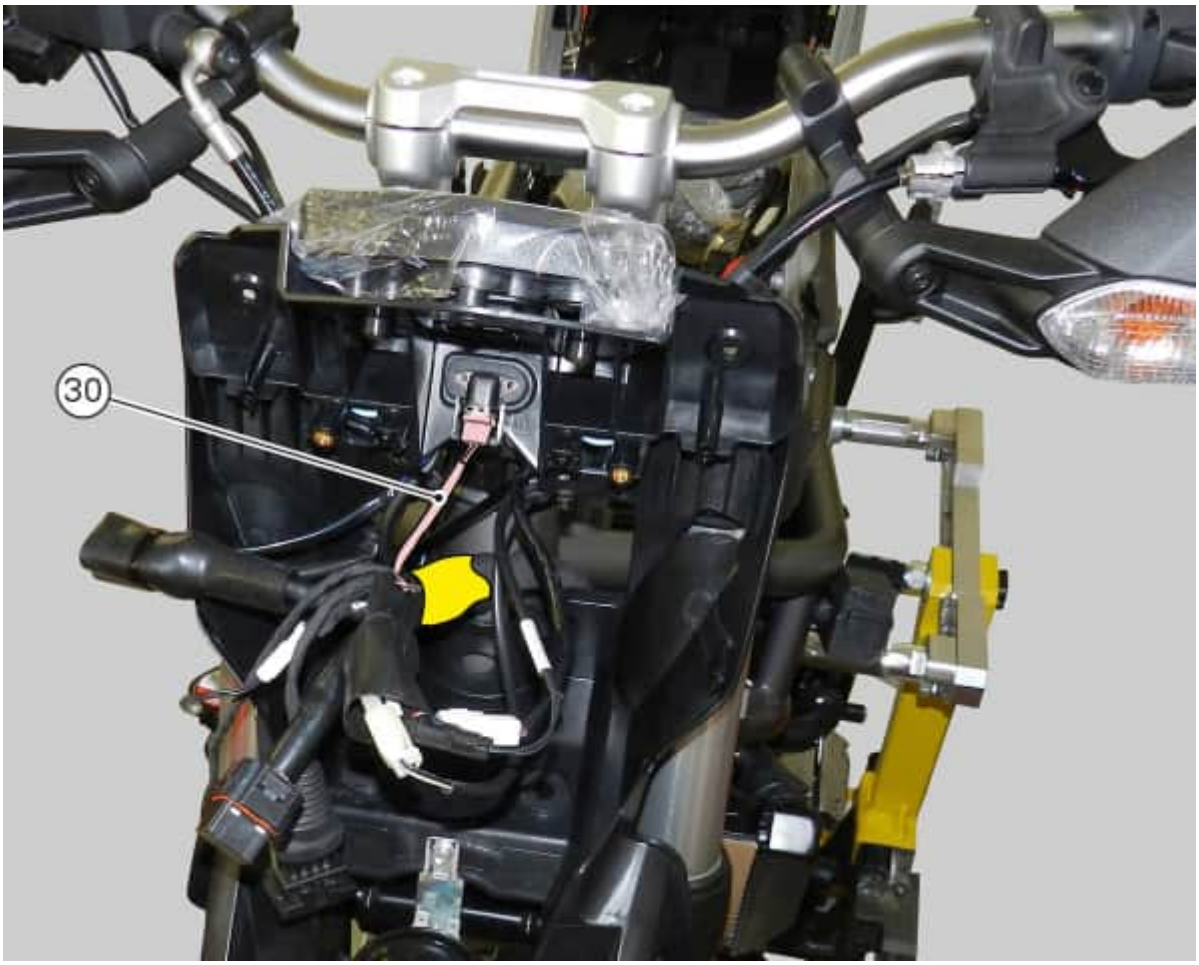
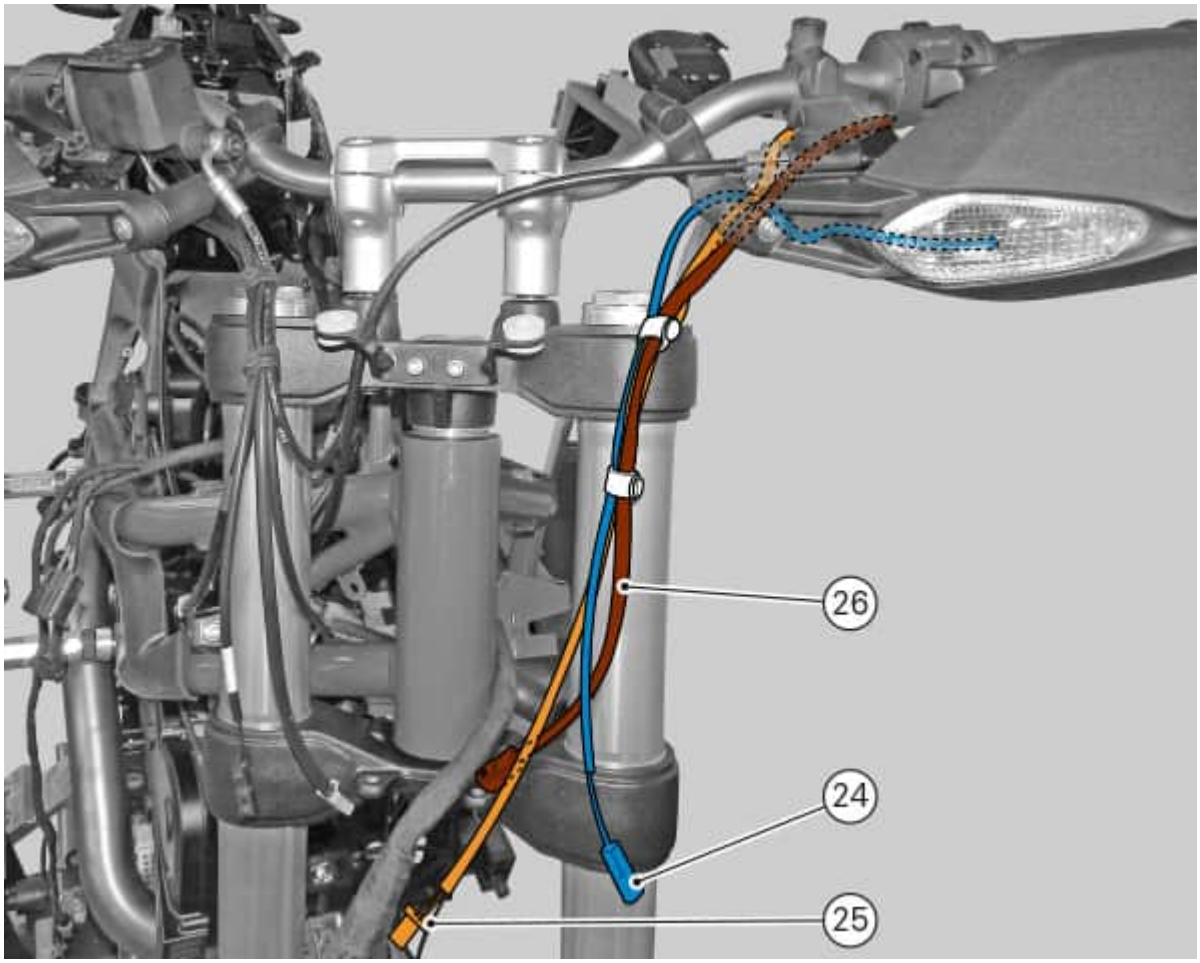
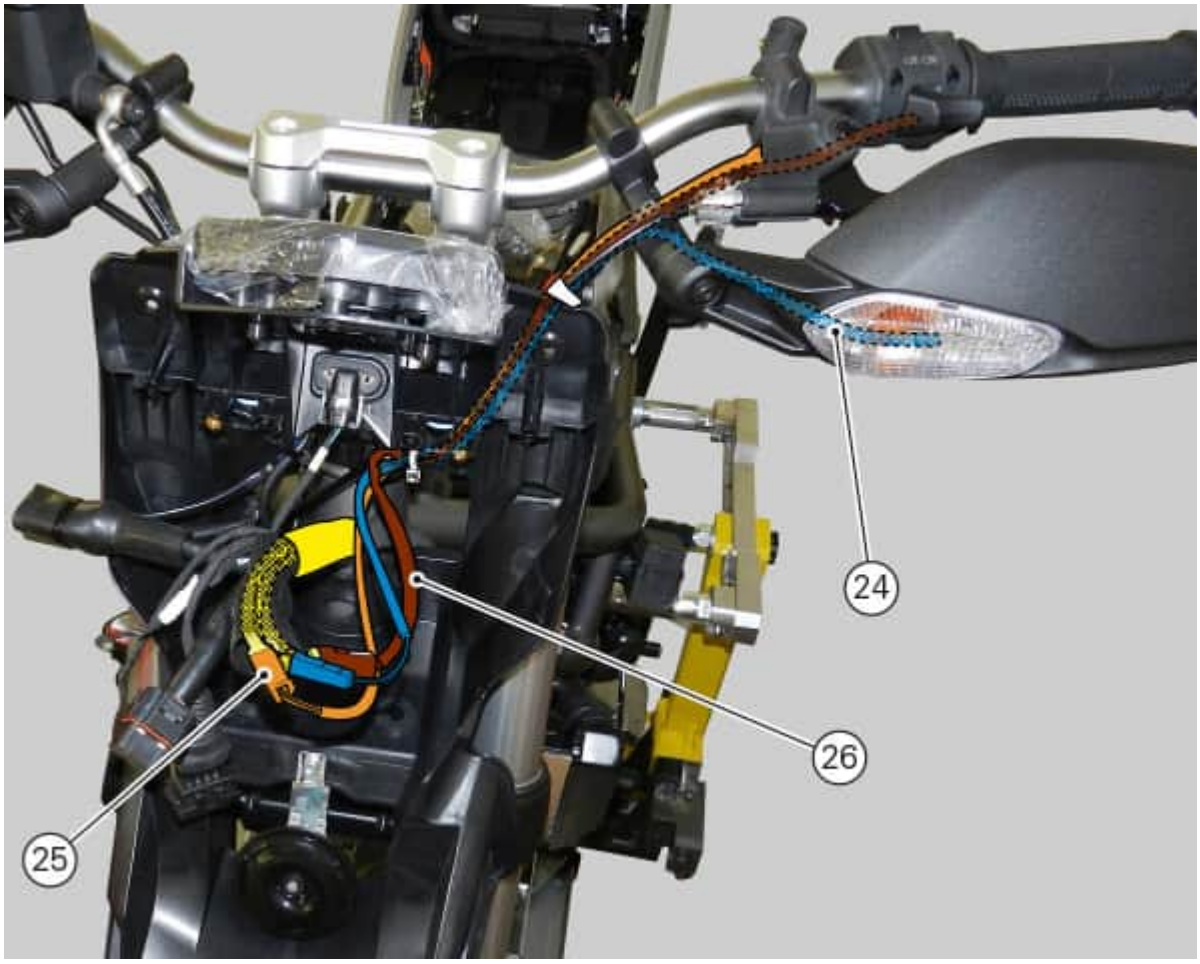
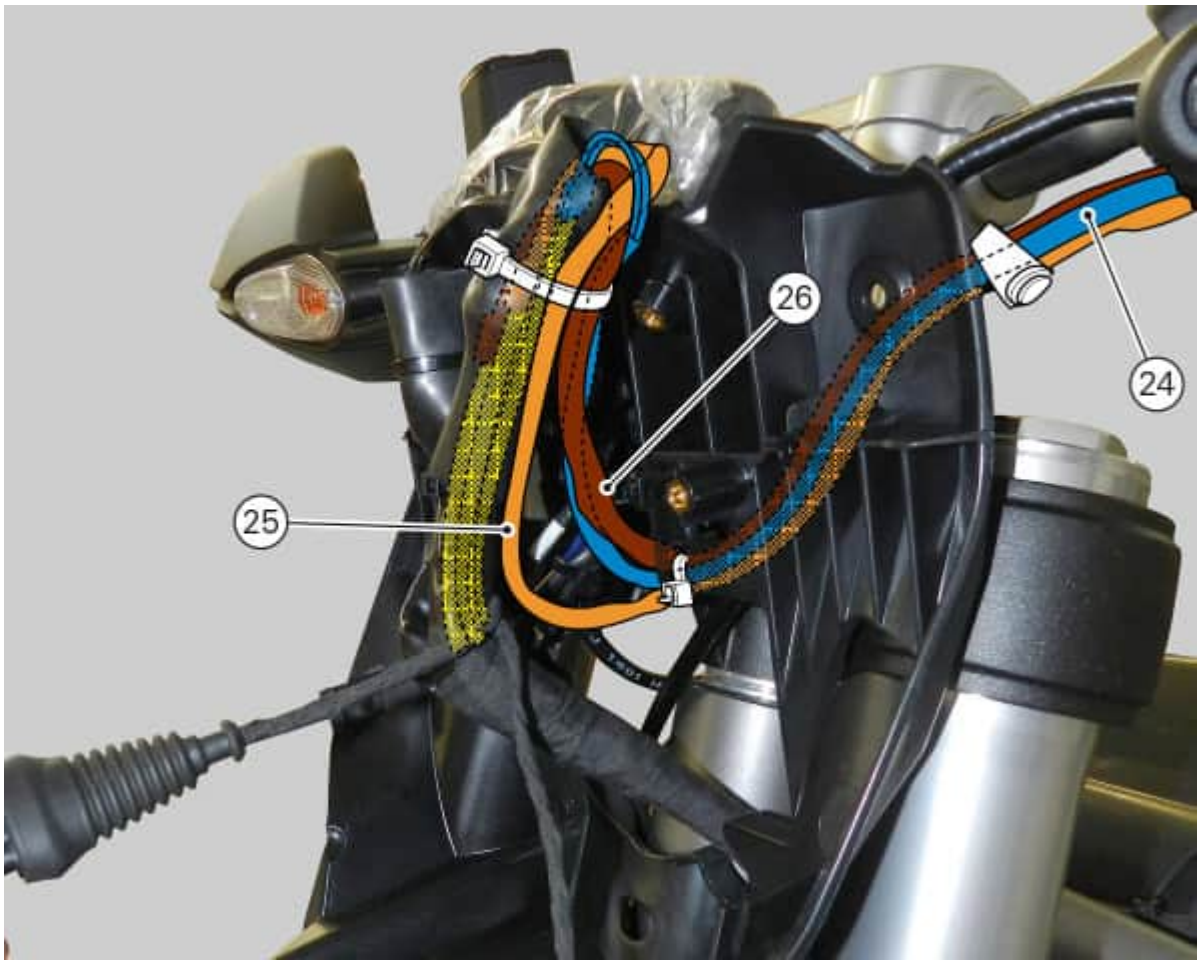

30

Table O






26
24
25

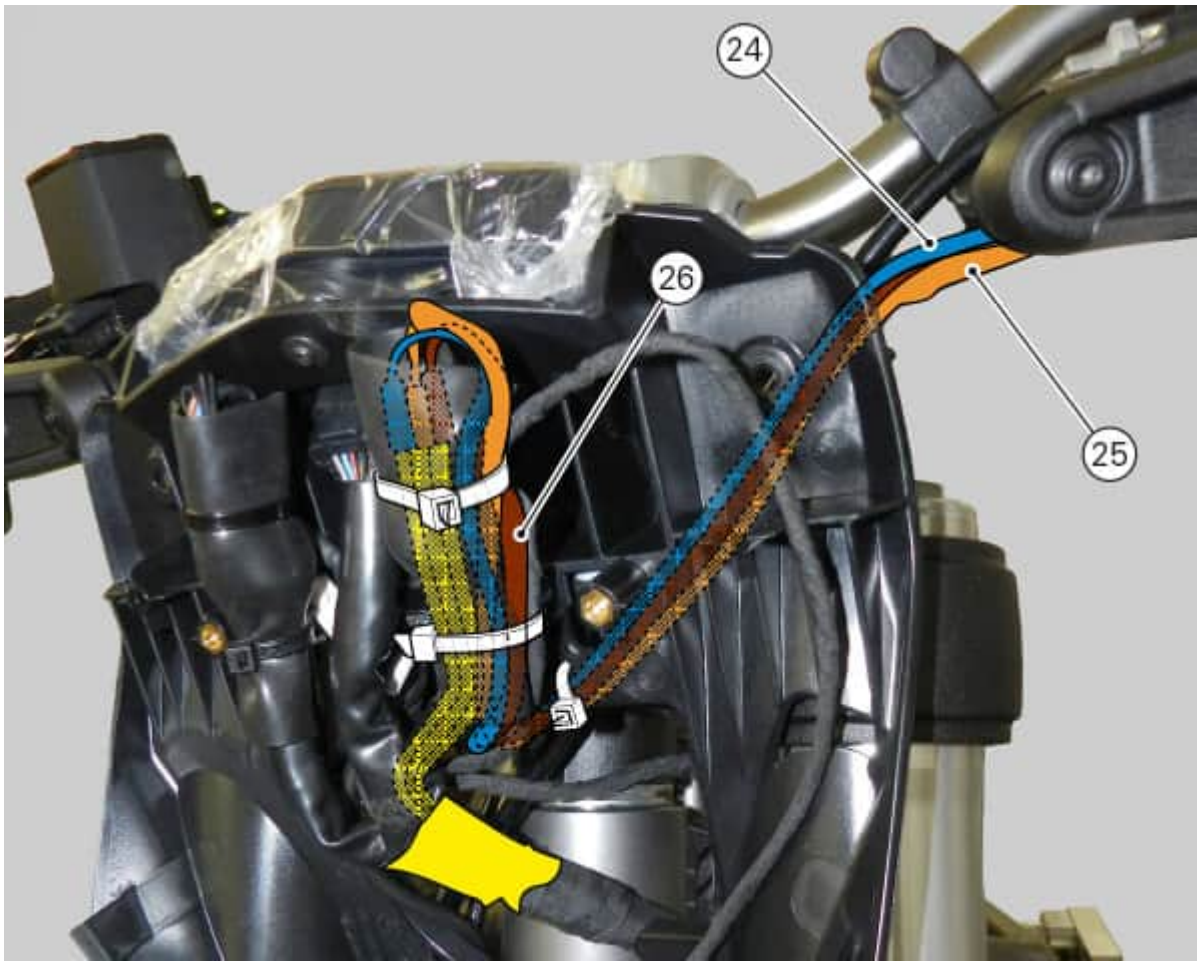
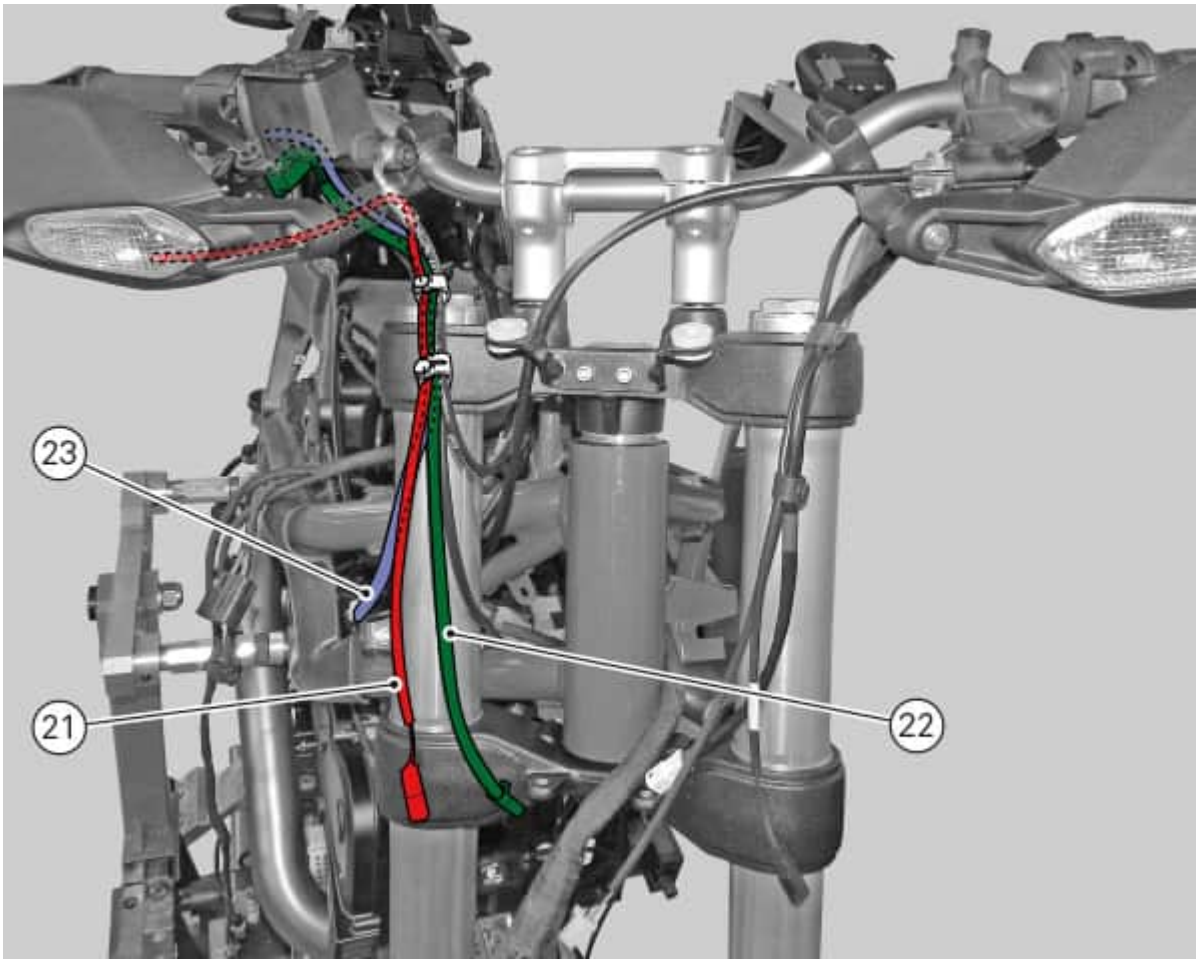
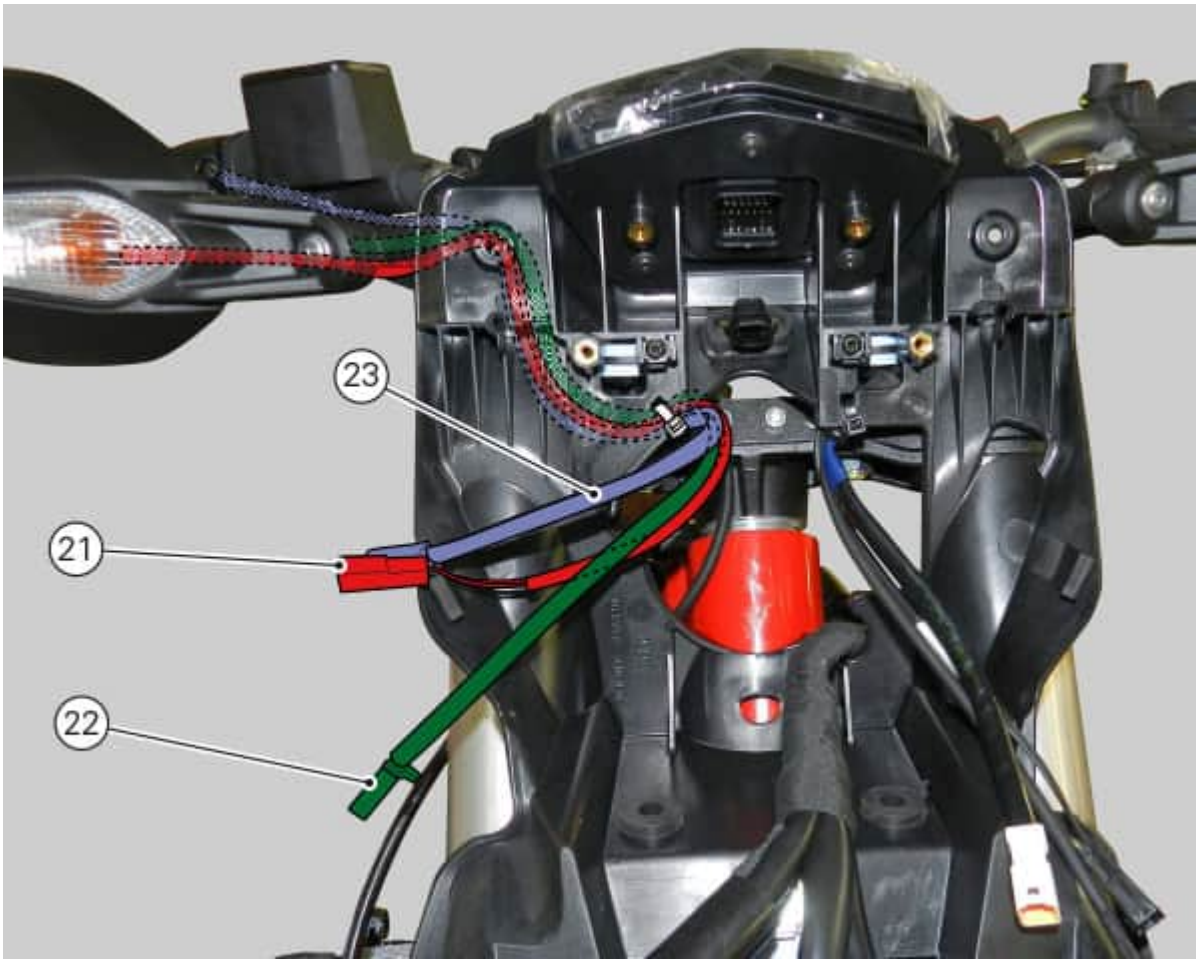
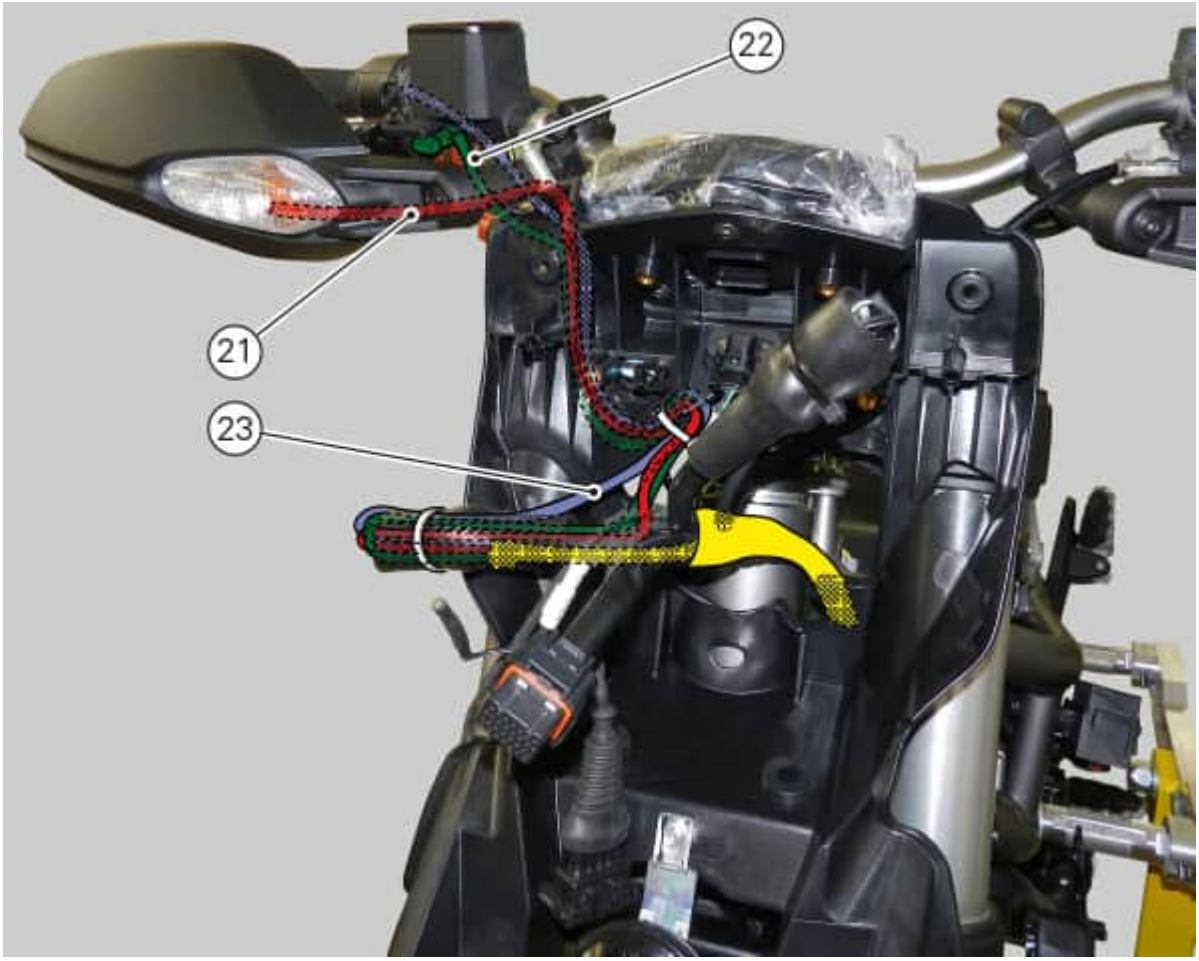

24
26
25

Table N






22
21
23

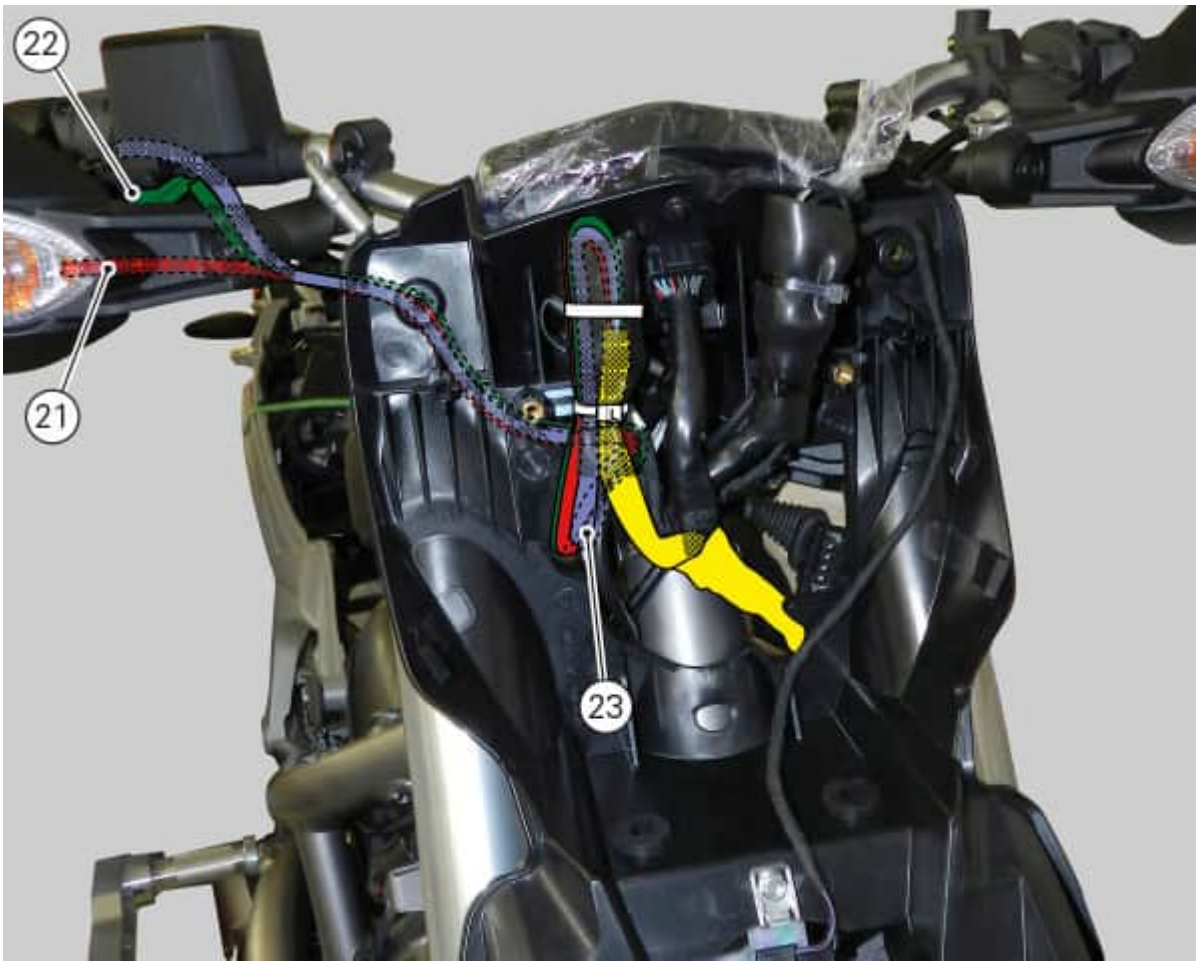
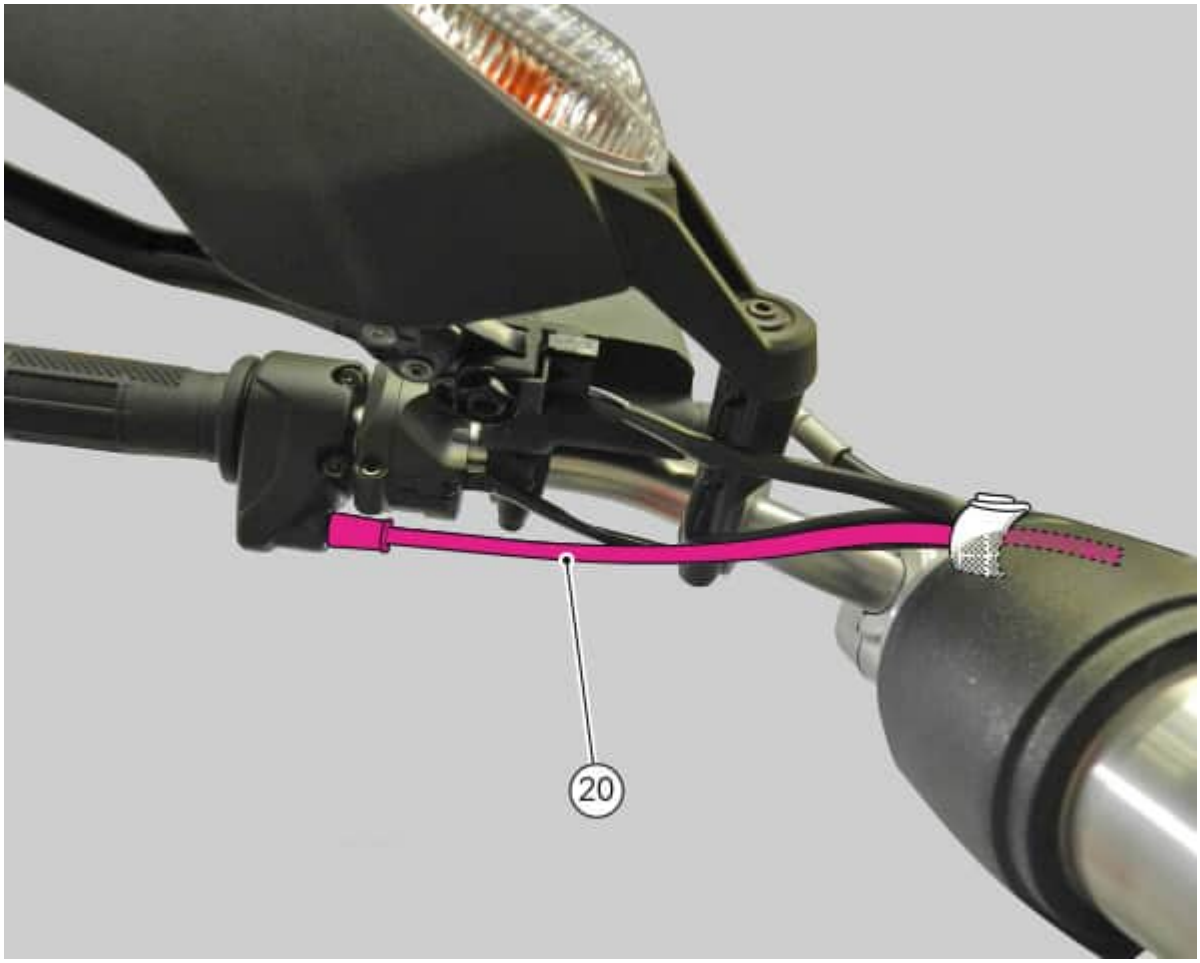
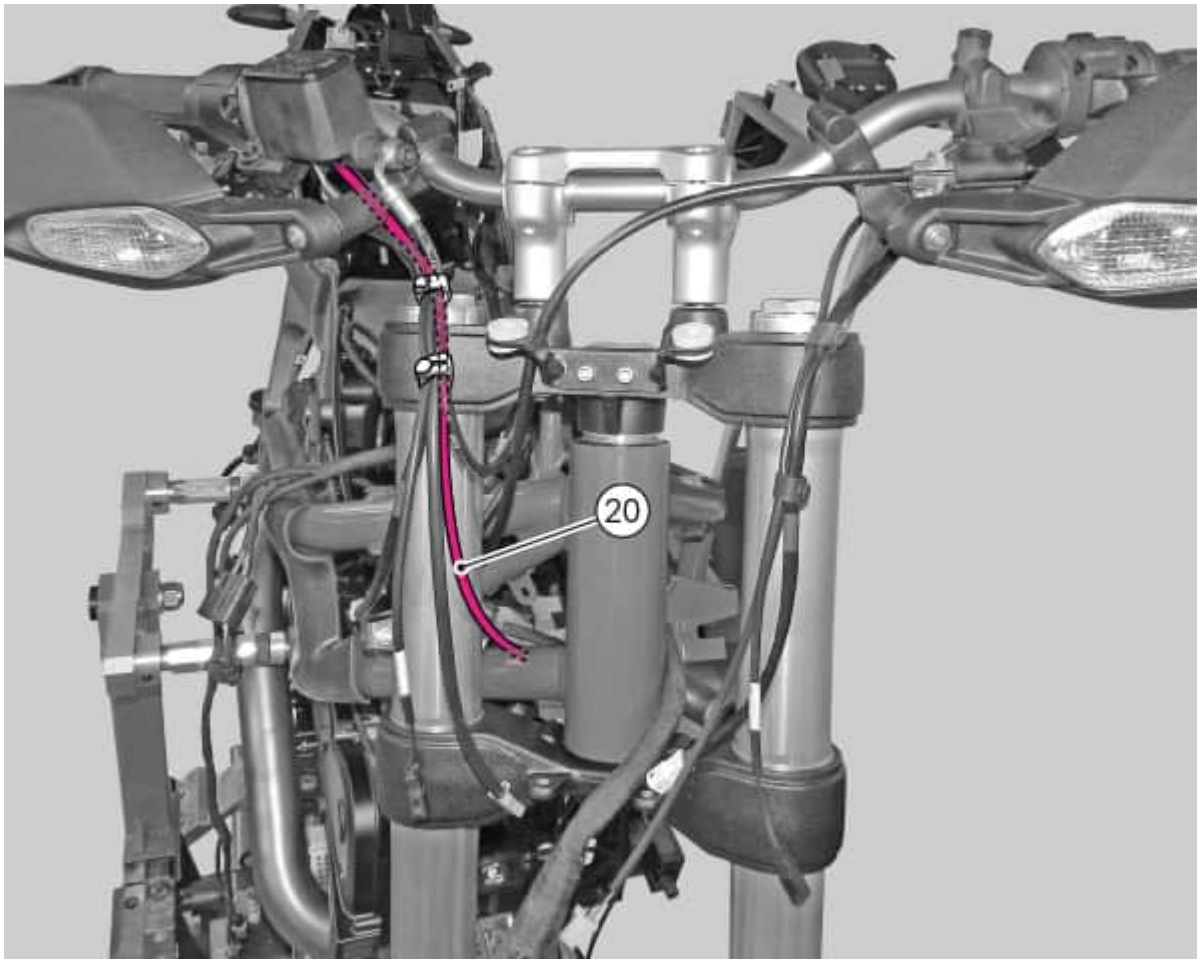
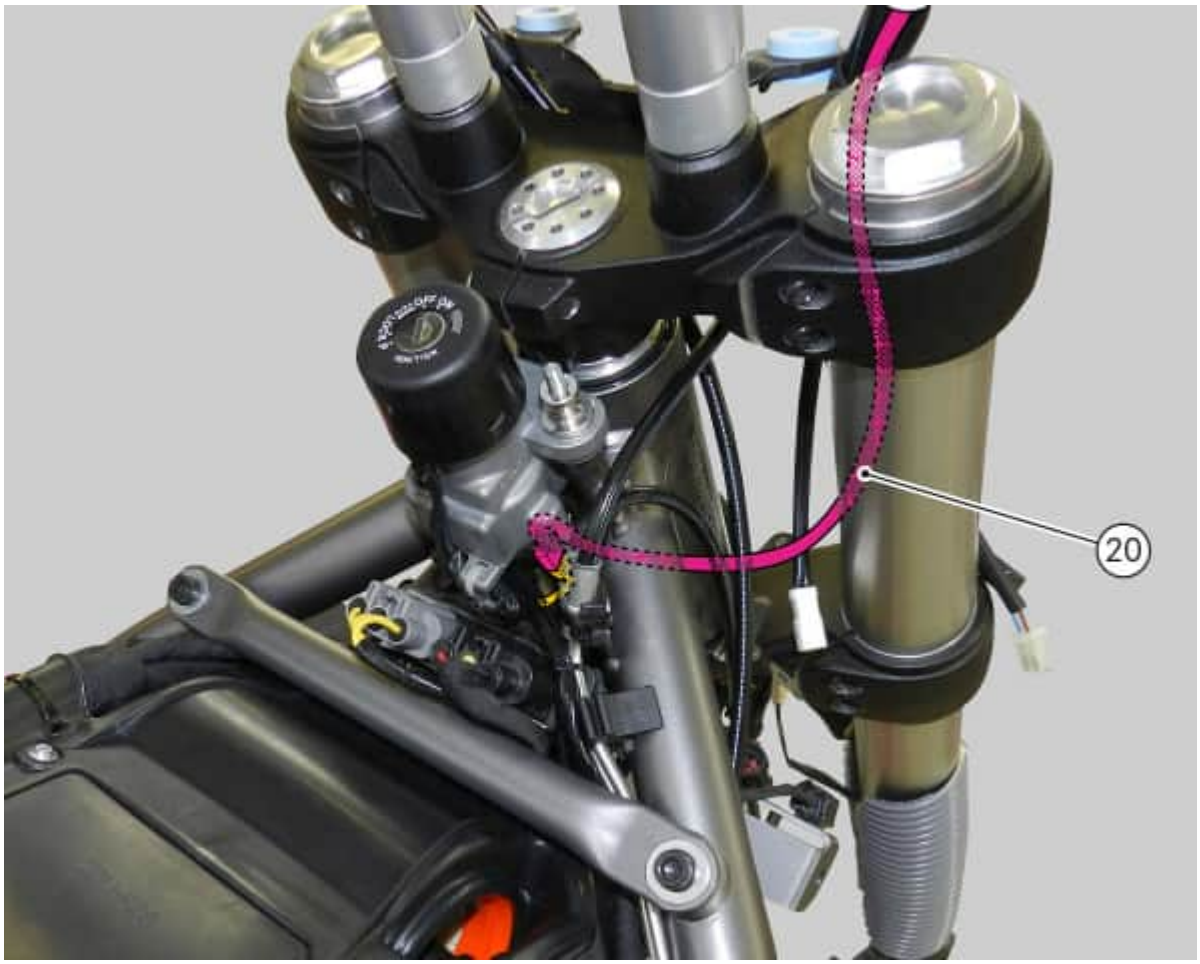
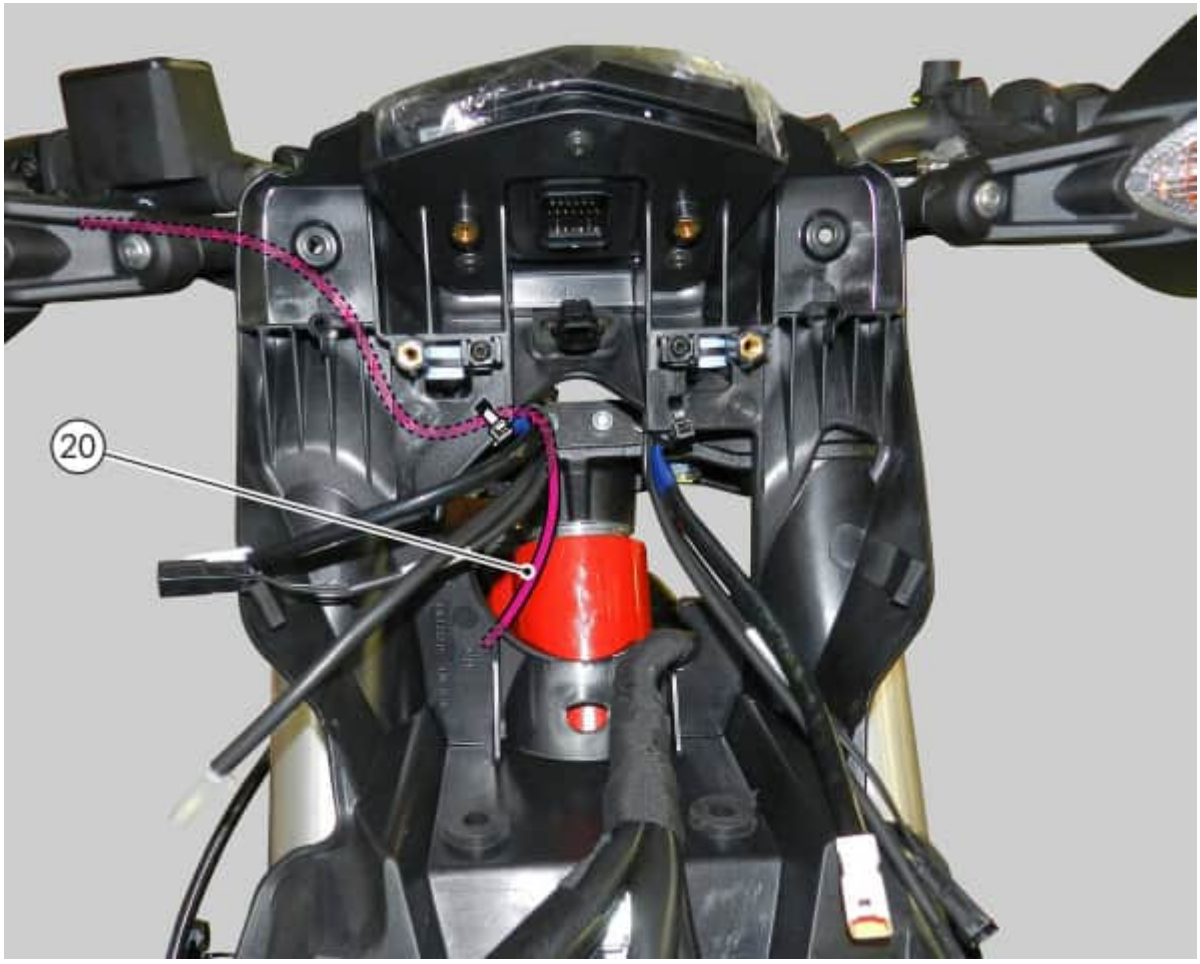

22
21
23

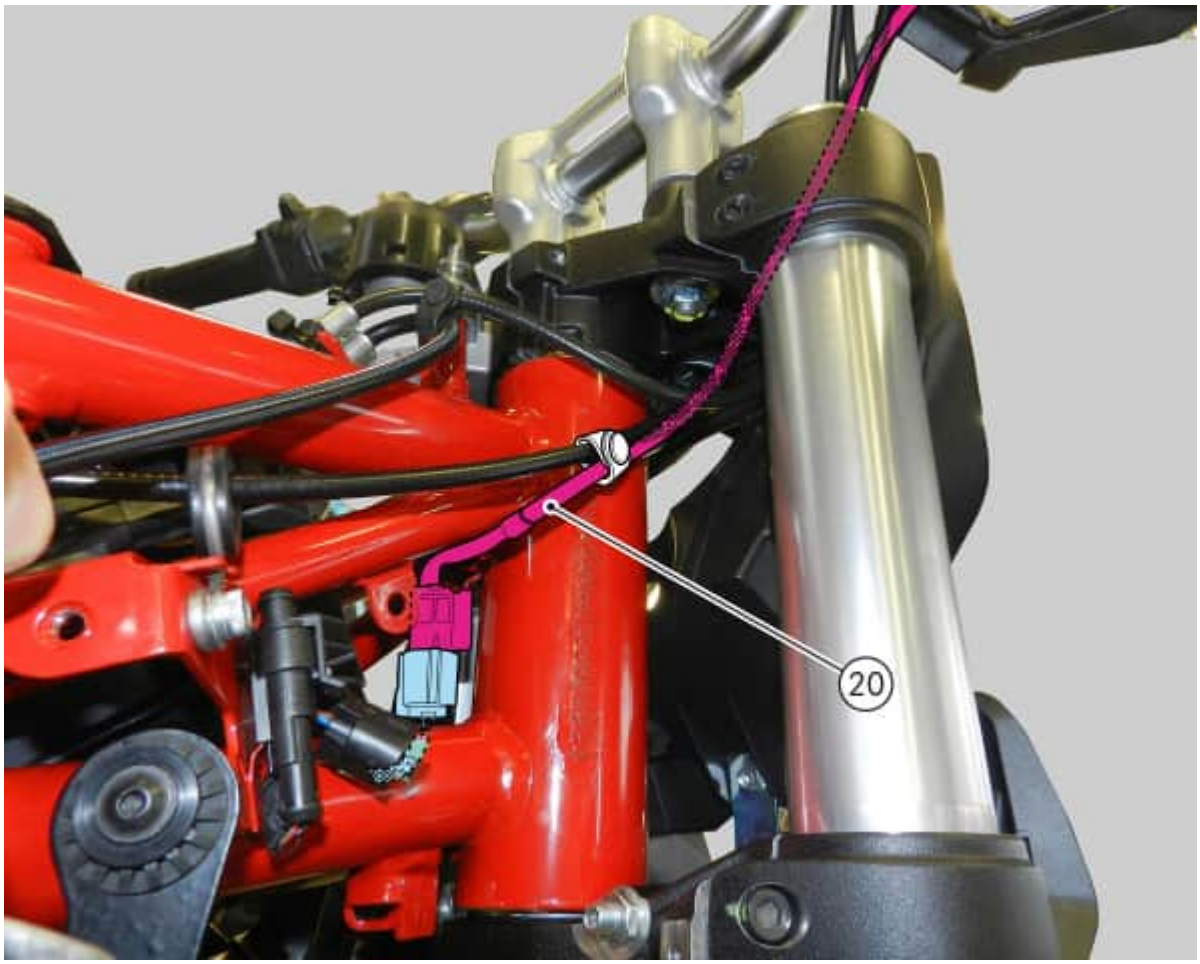
Table M

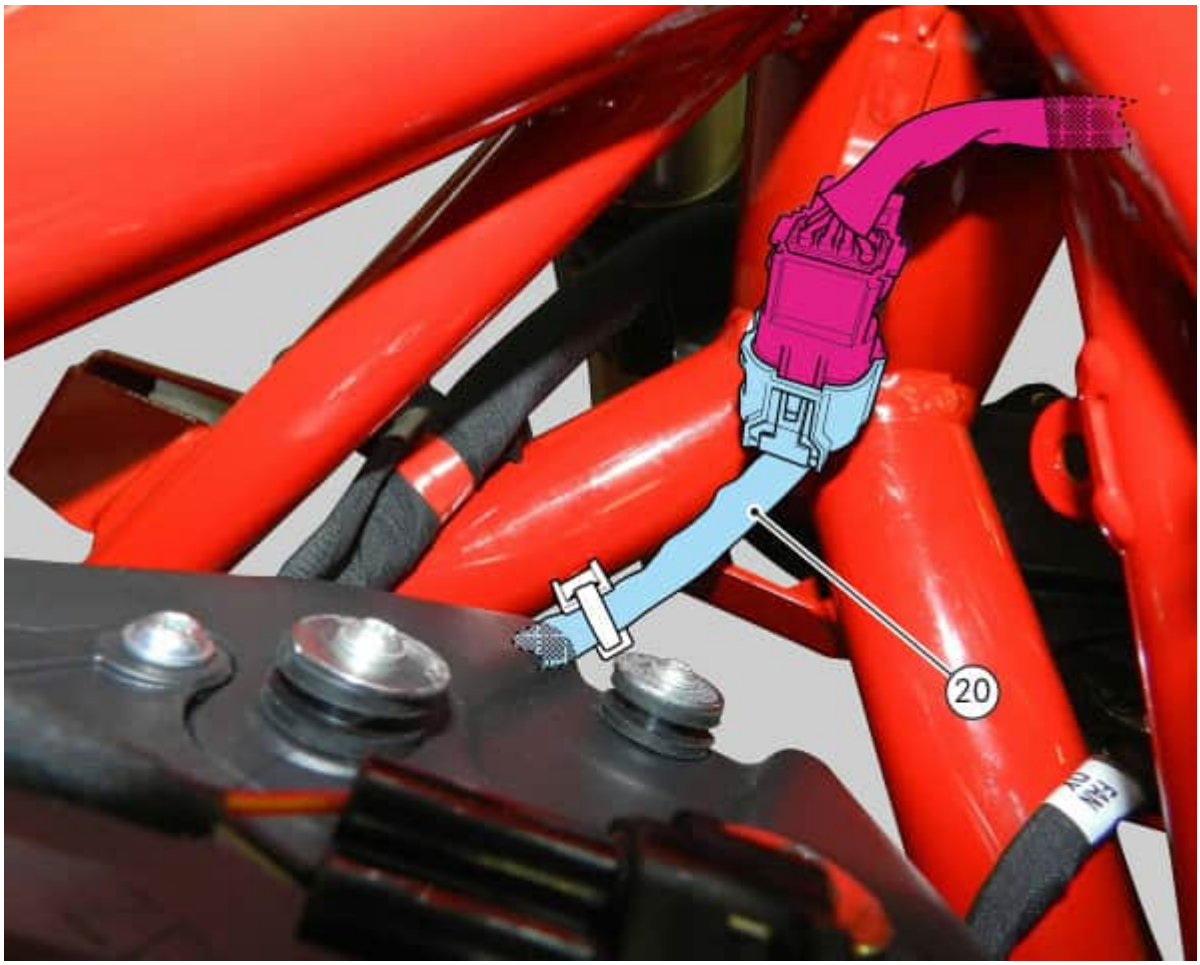





20


20


20


20

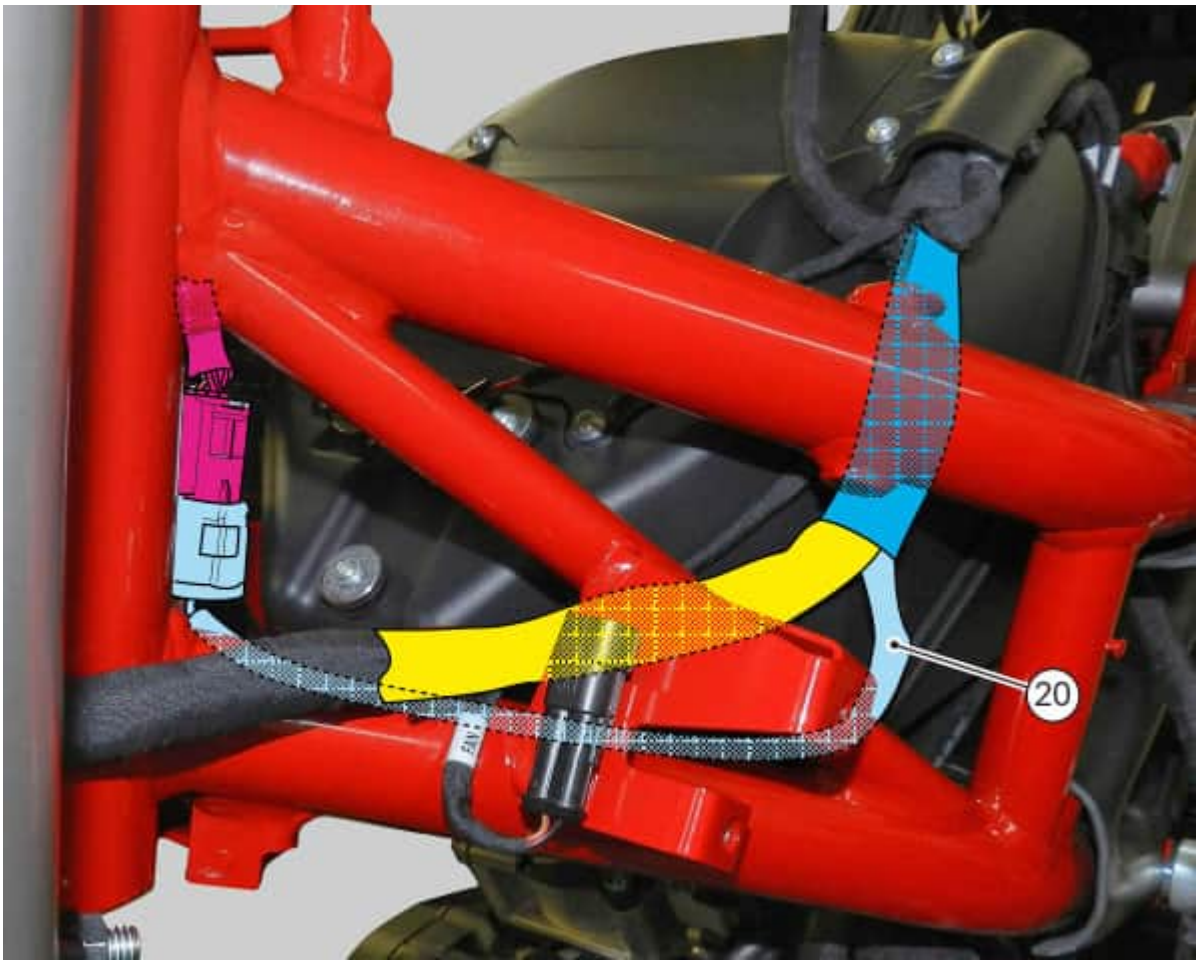

20

Table L

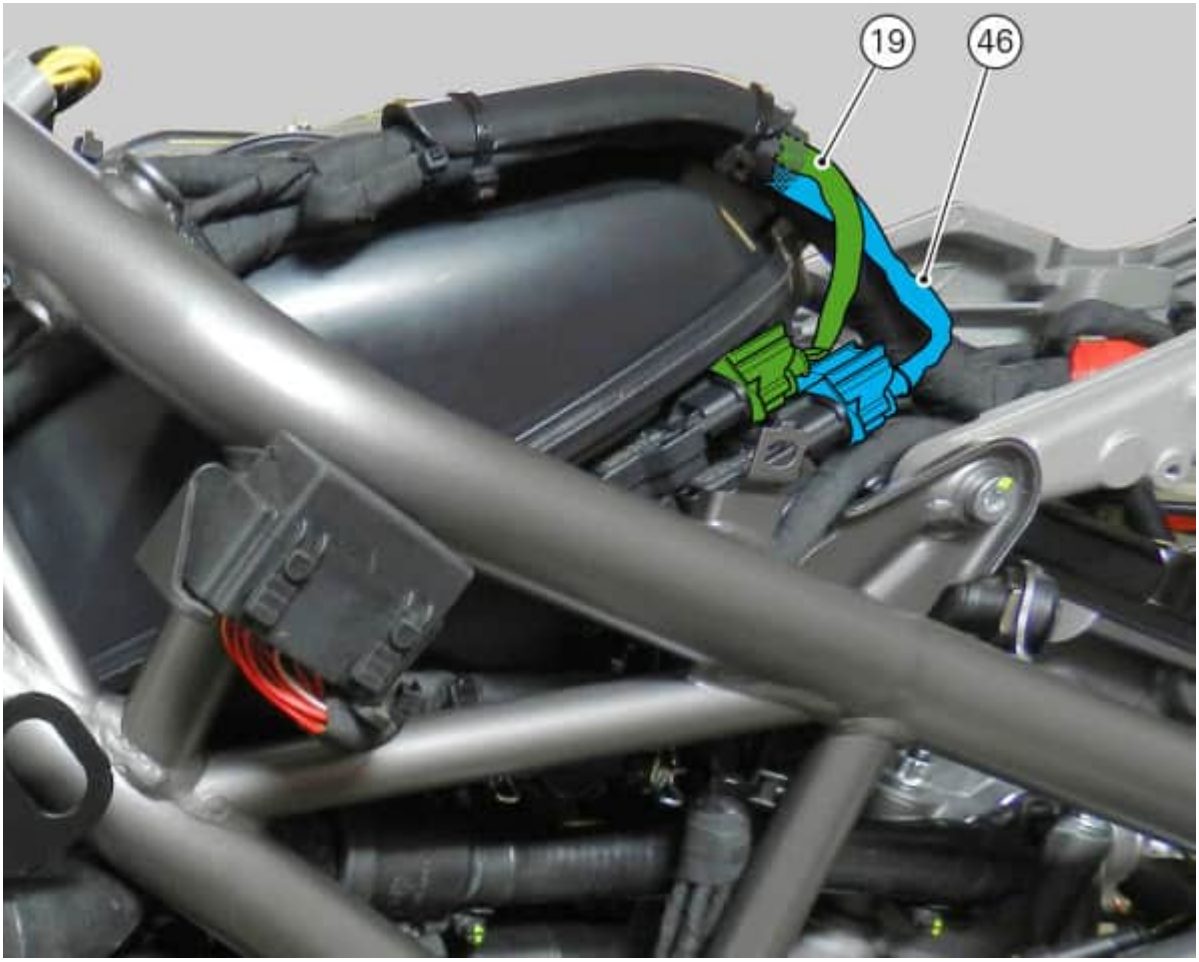
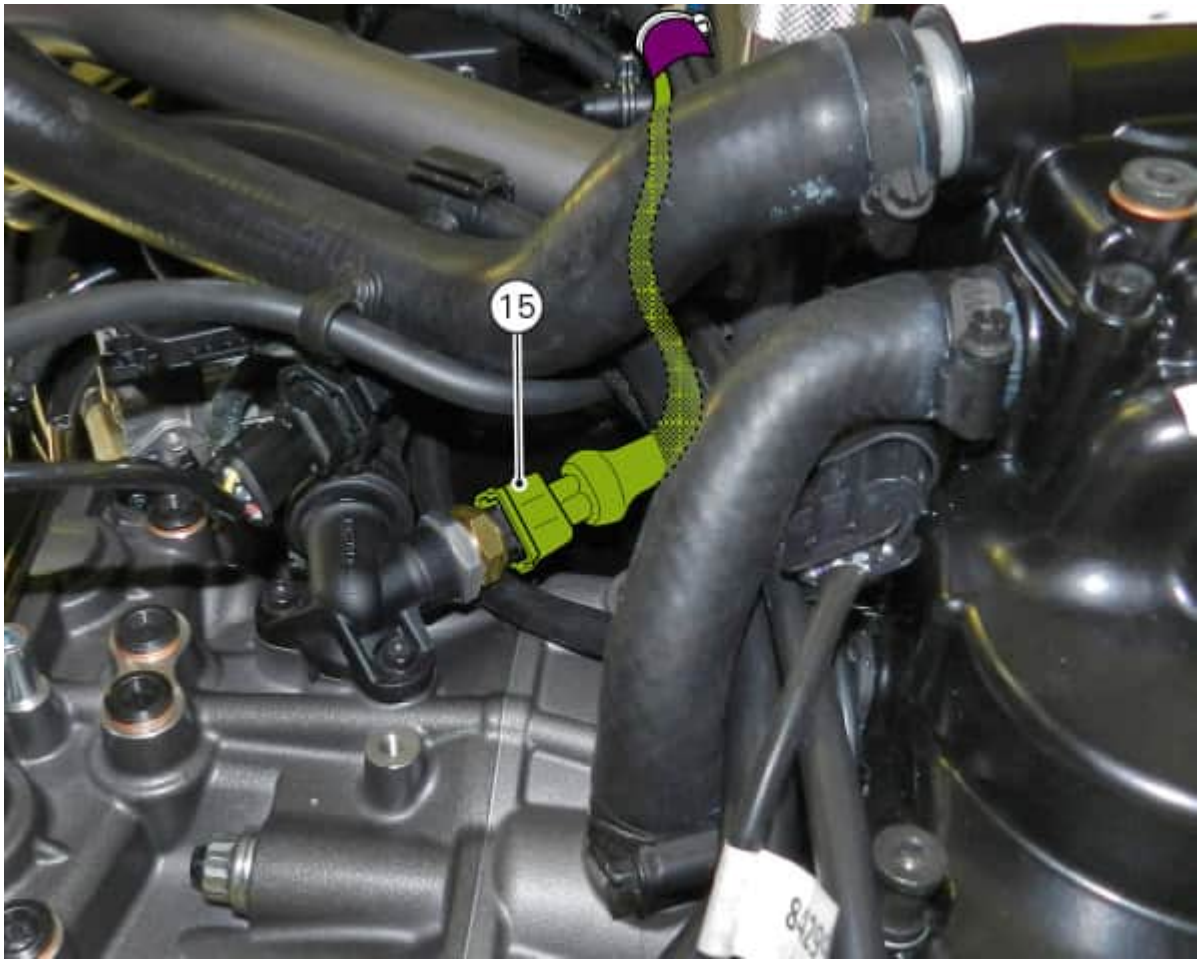
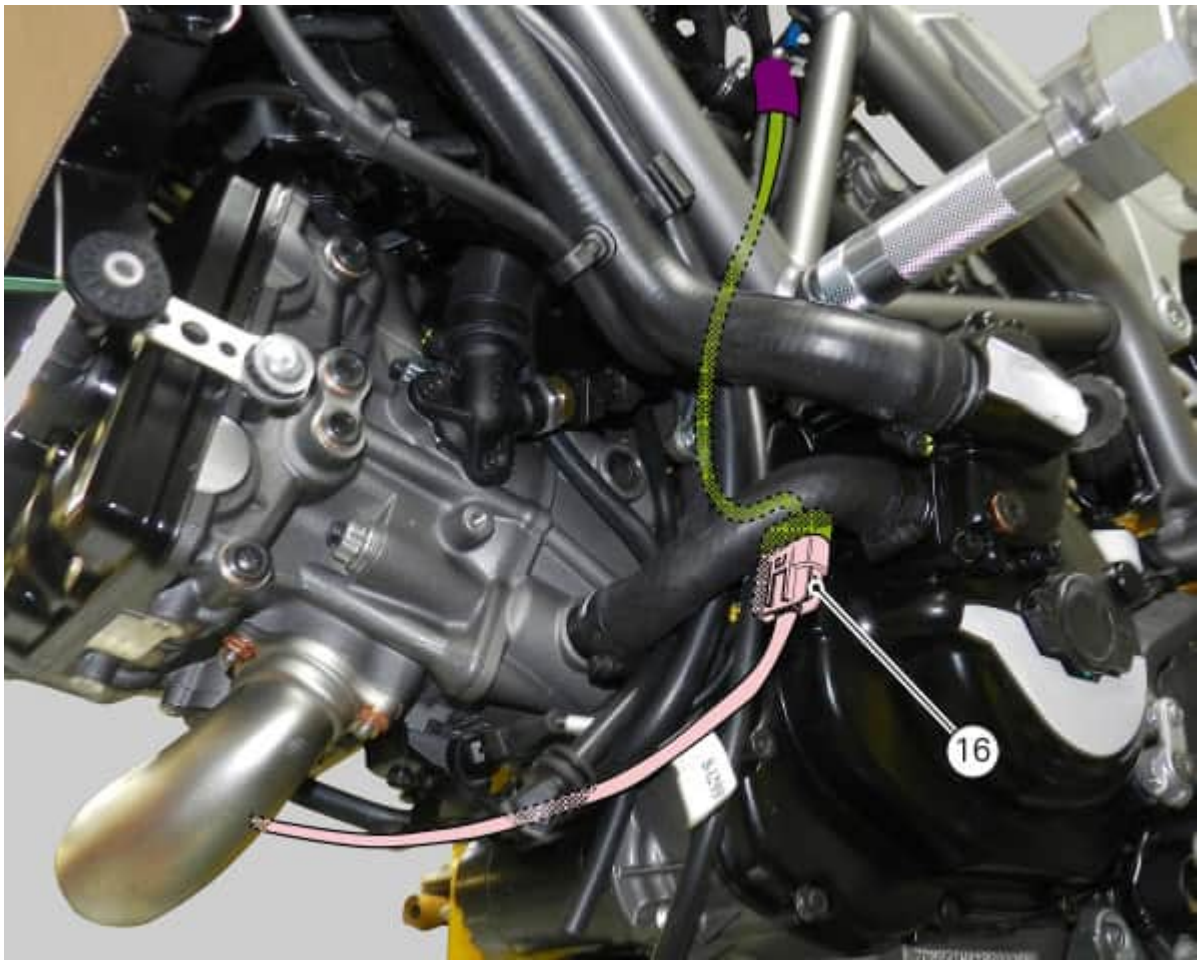
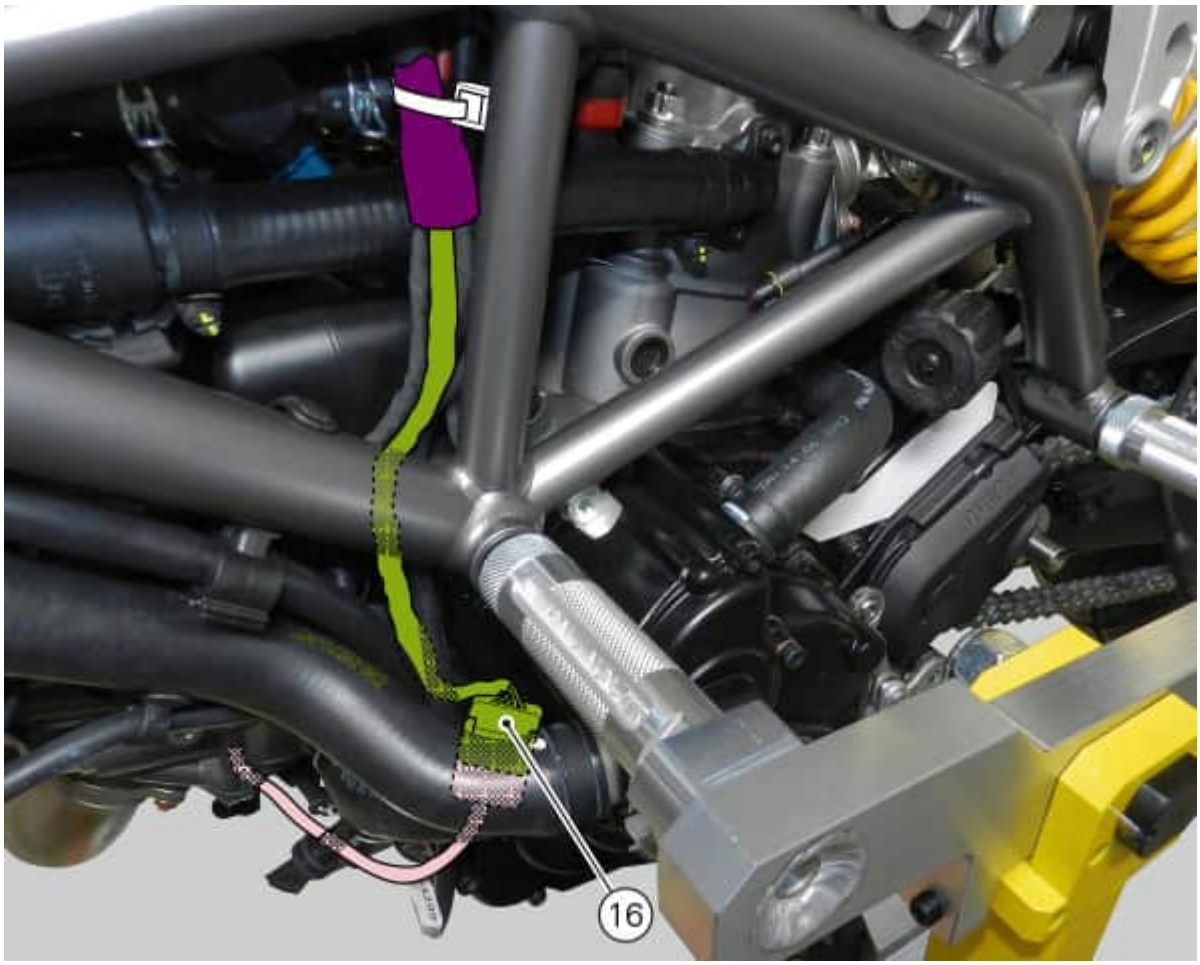


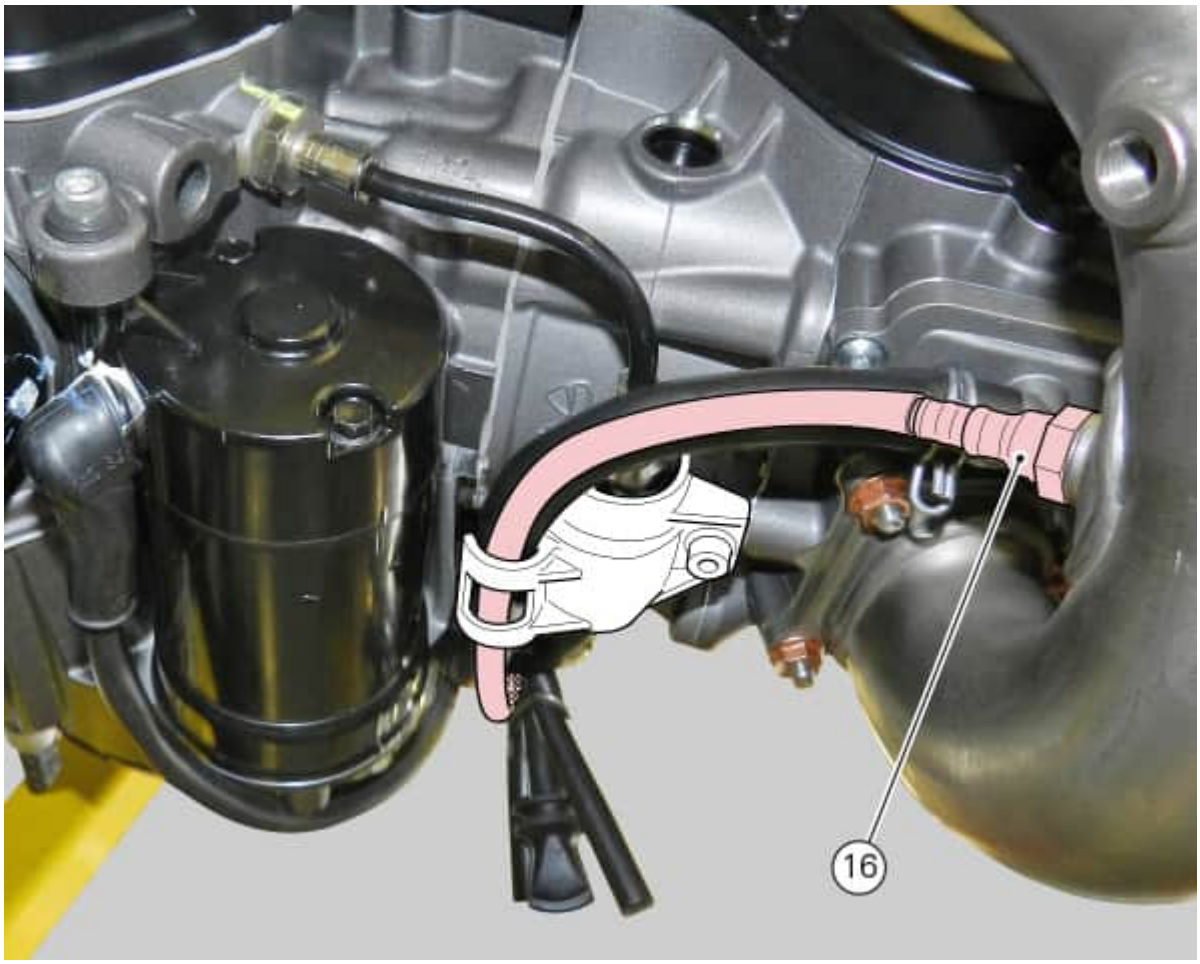
Table K

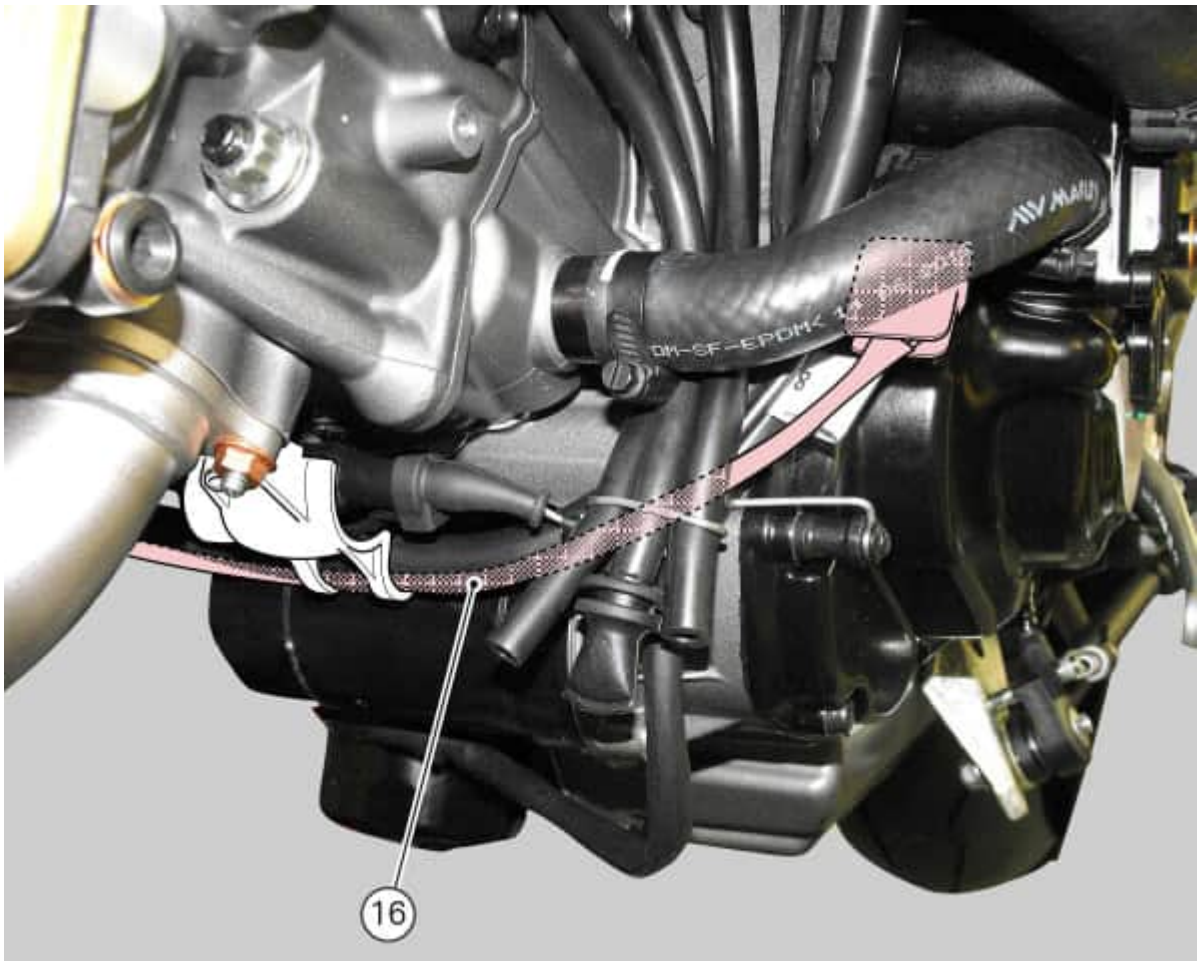




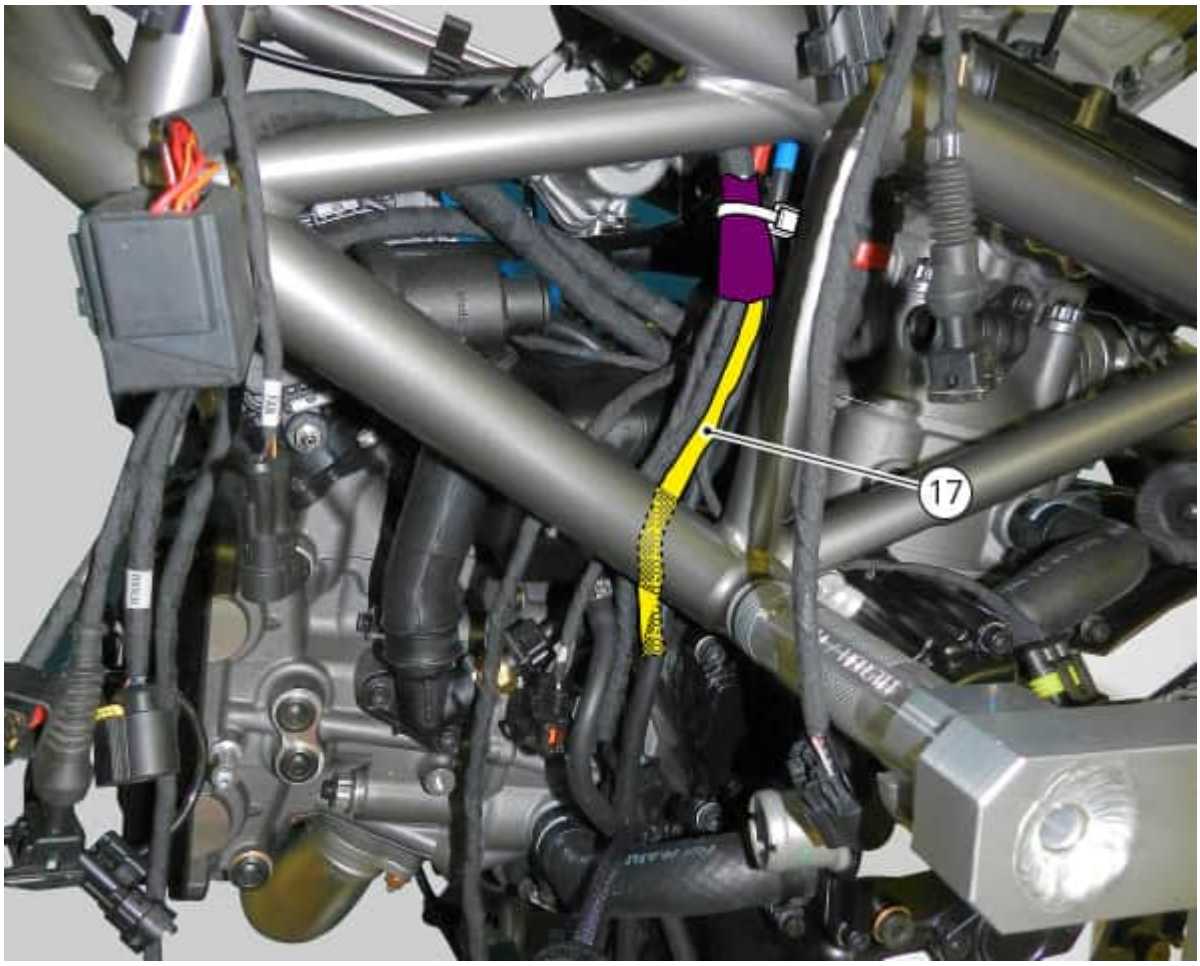

16


16


16


16


17


17

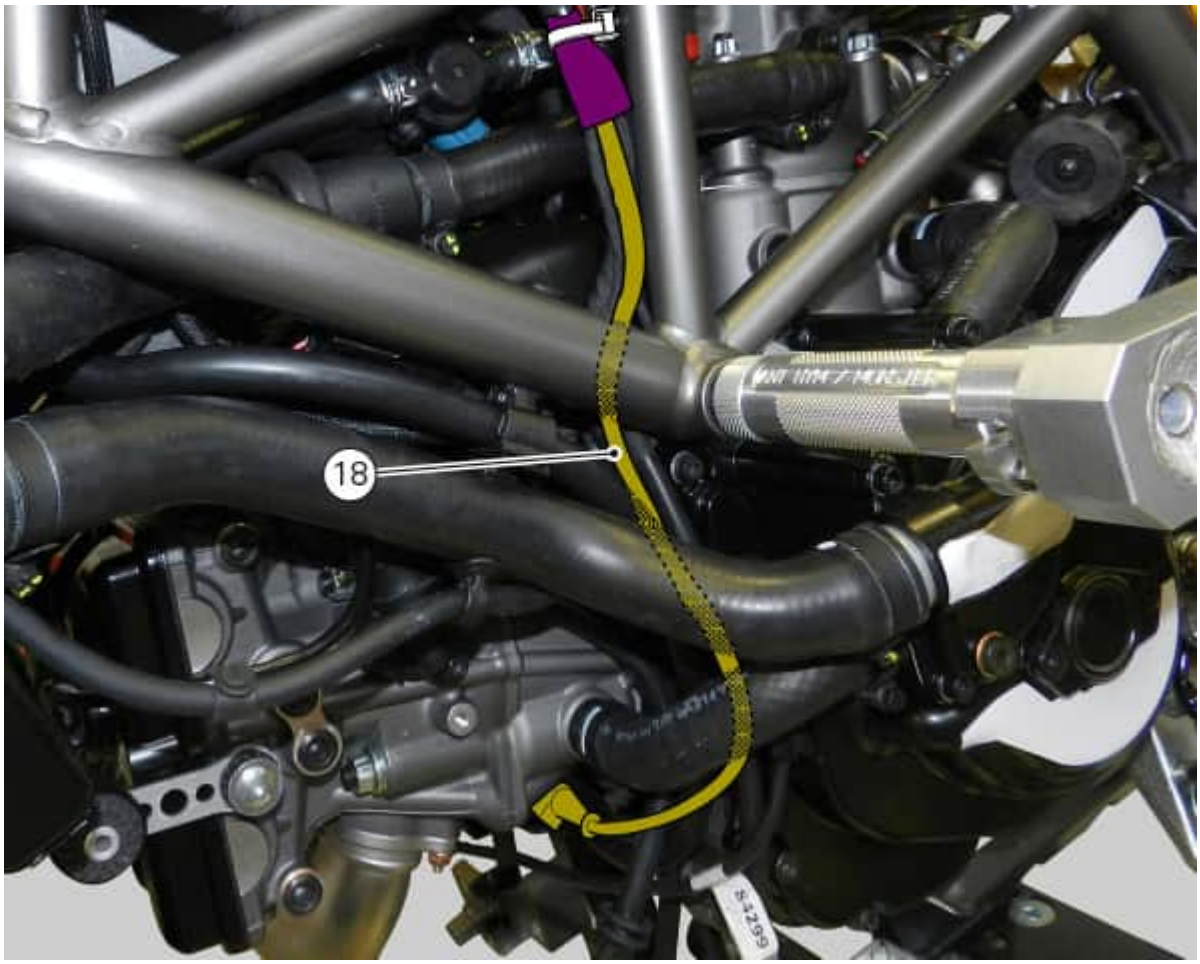
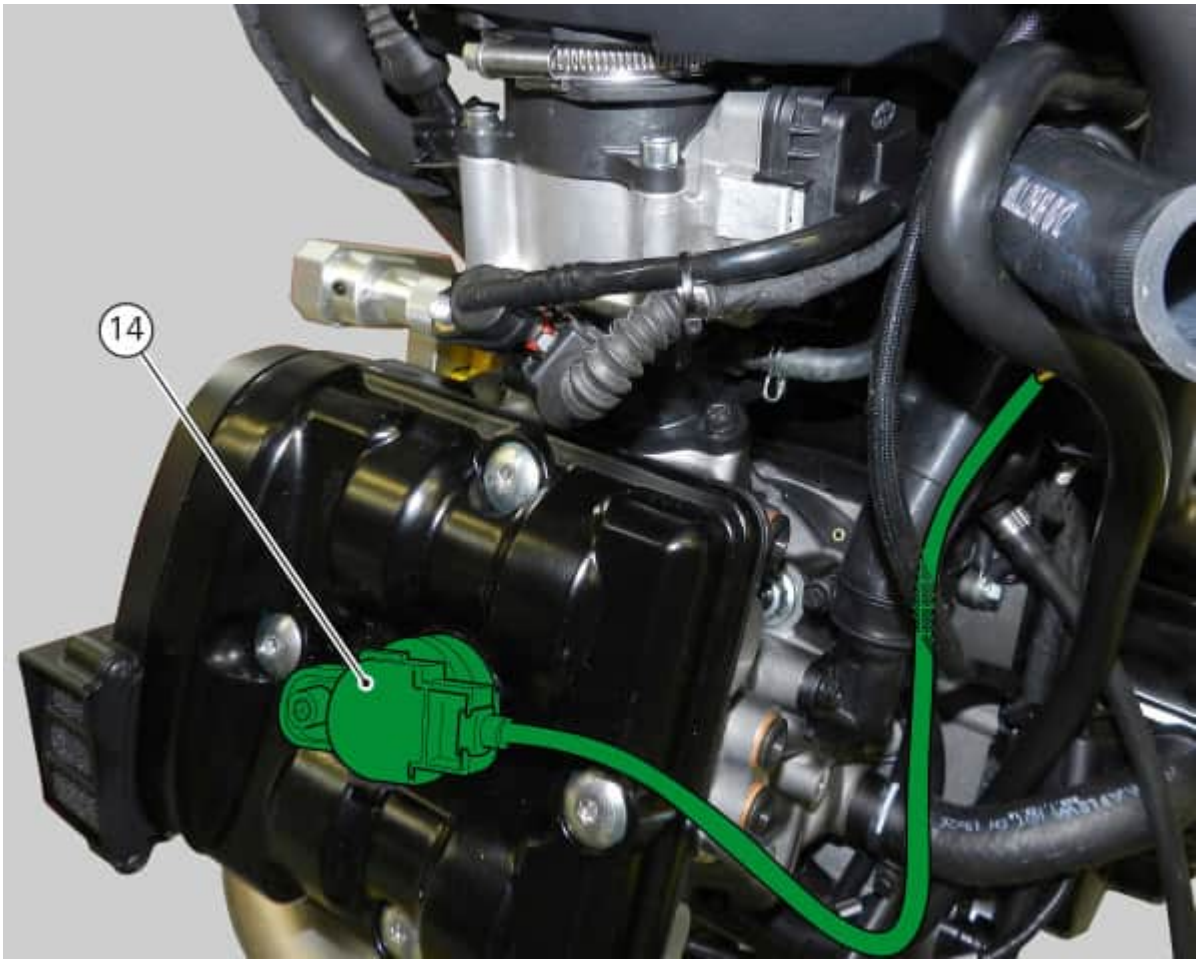

18

Table J



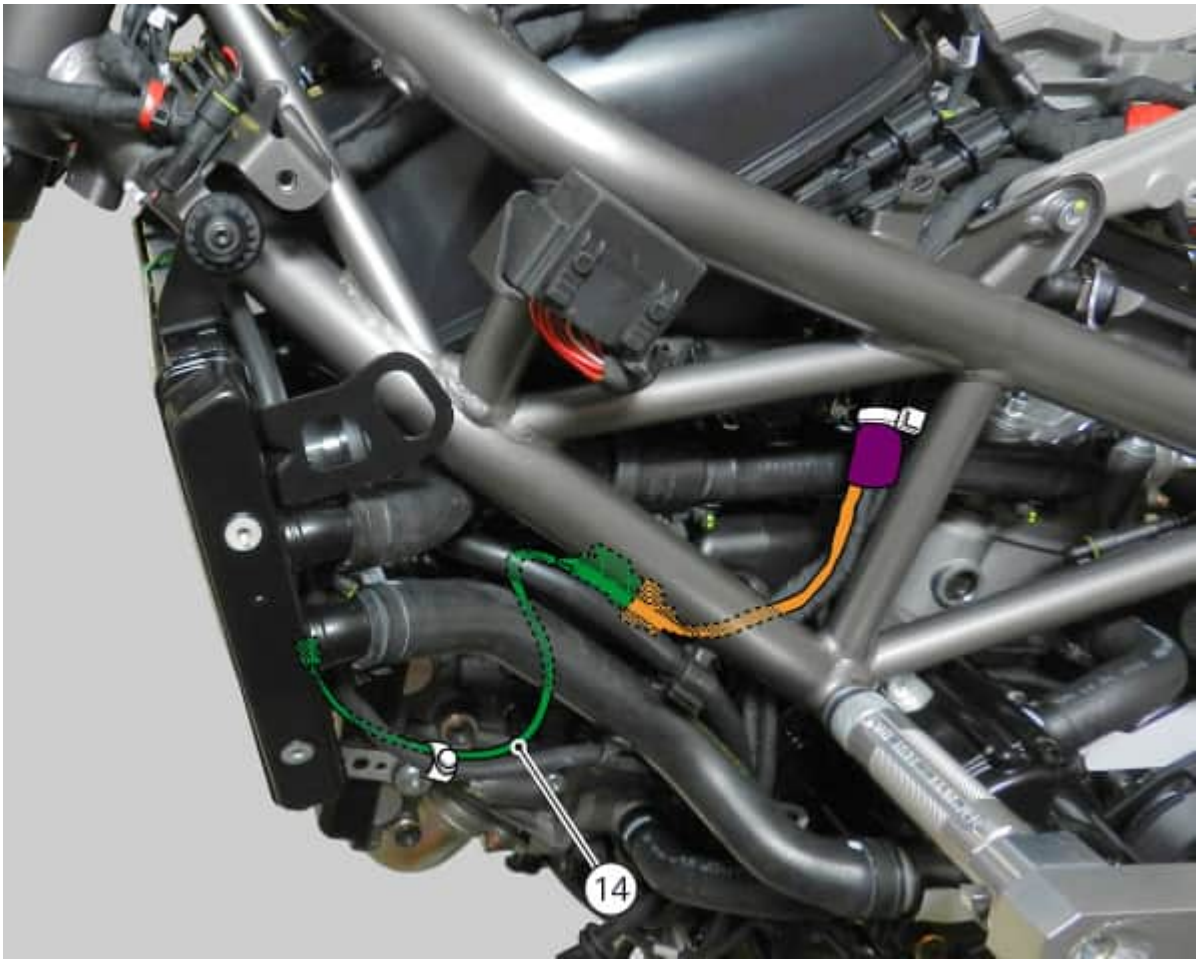
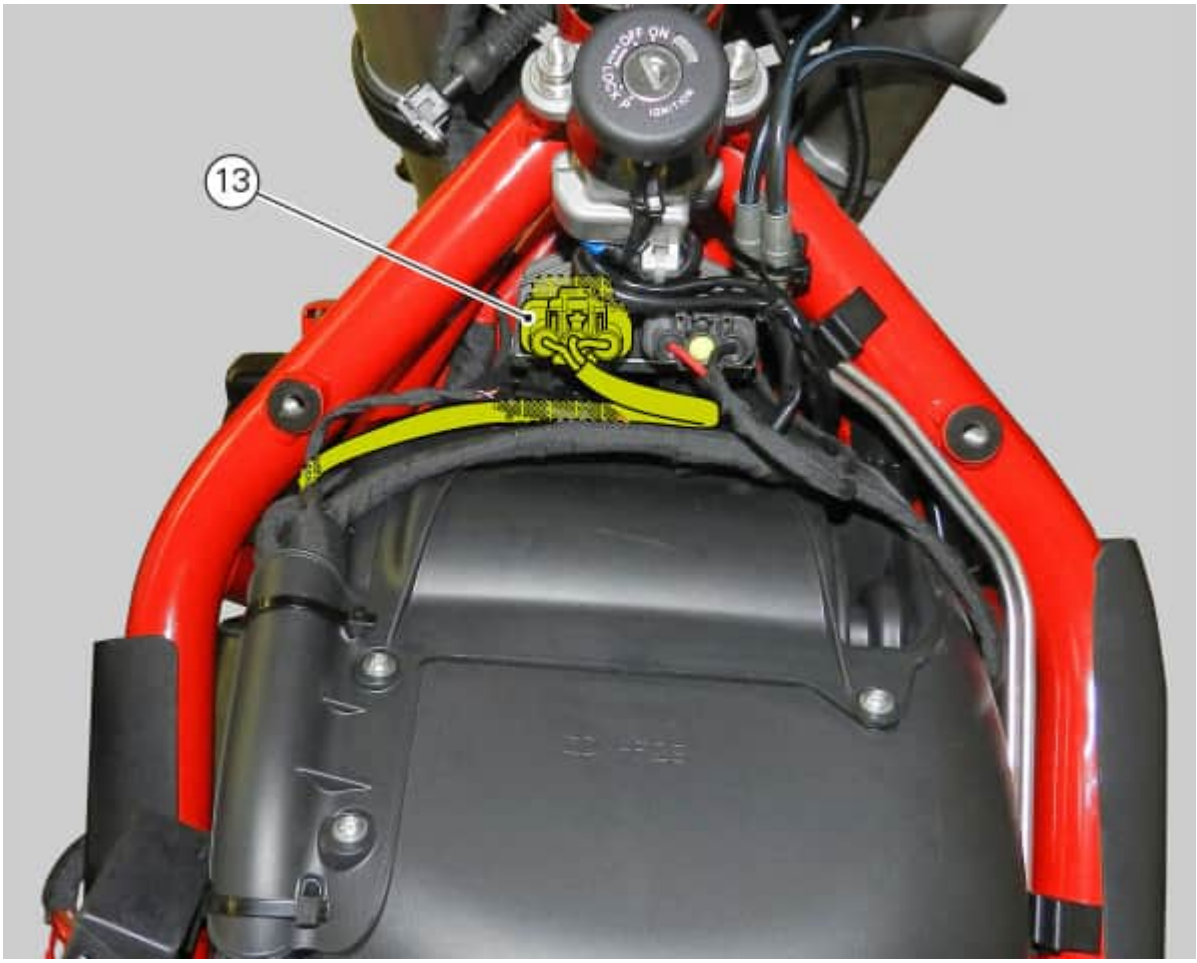
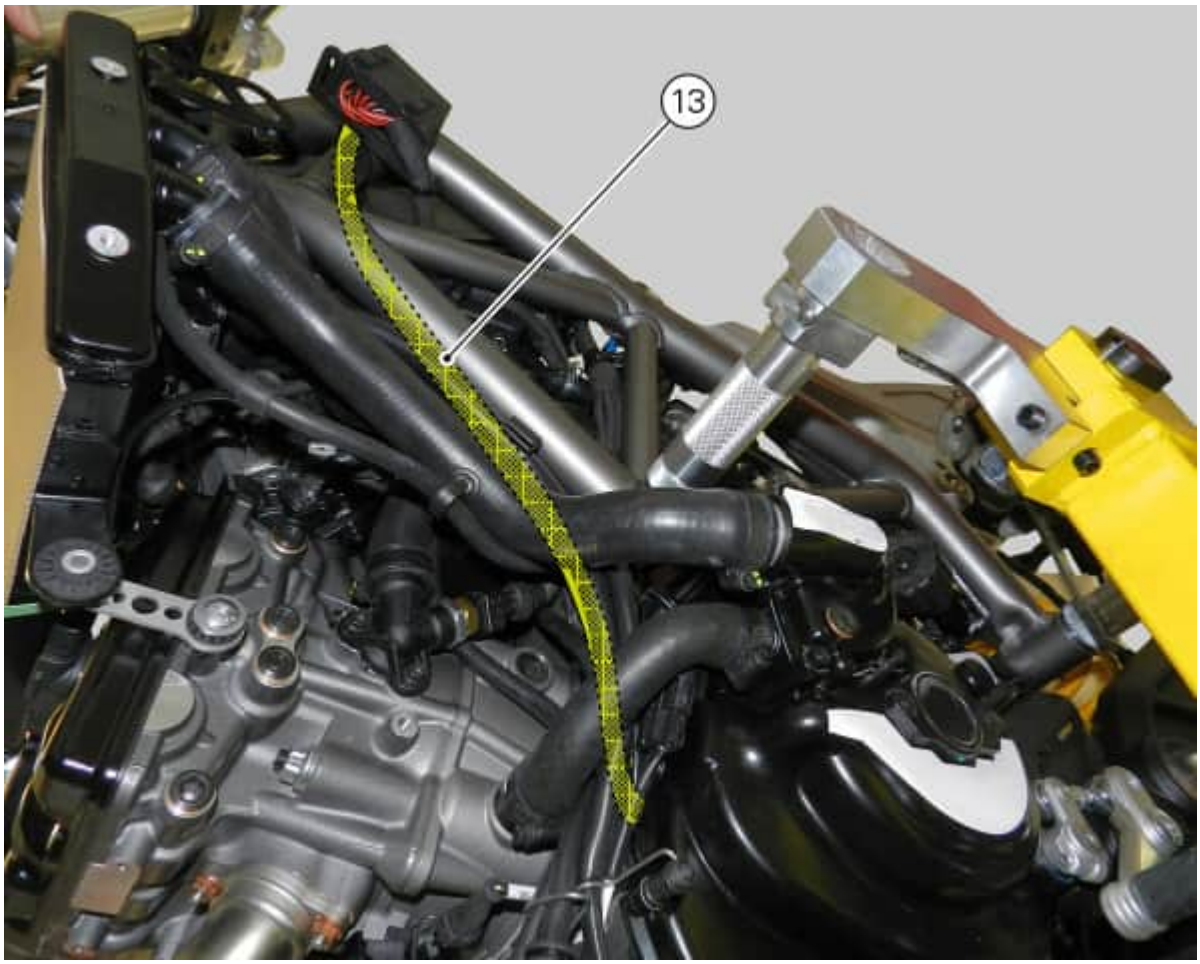
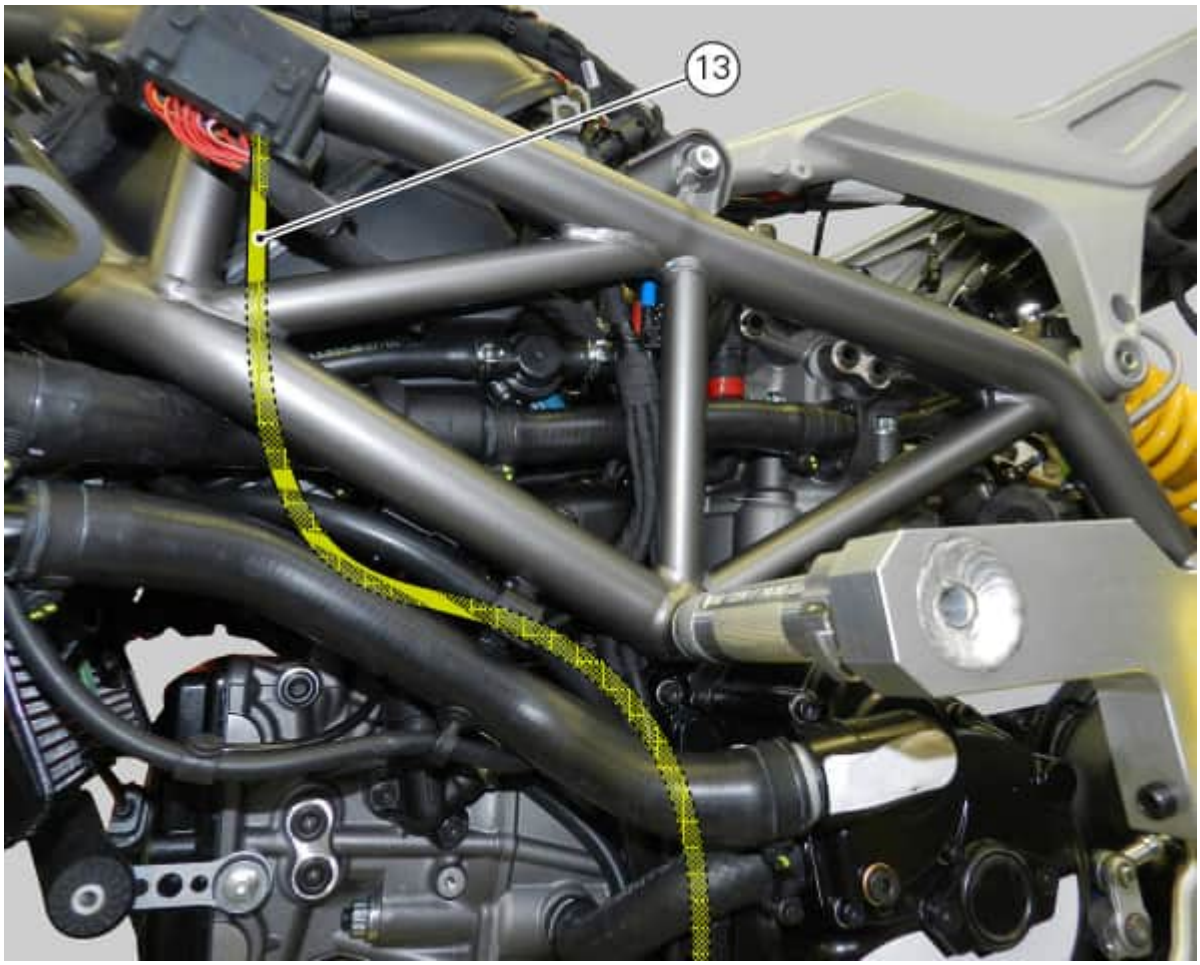


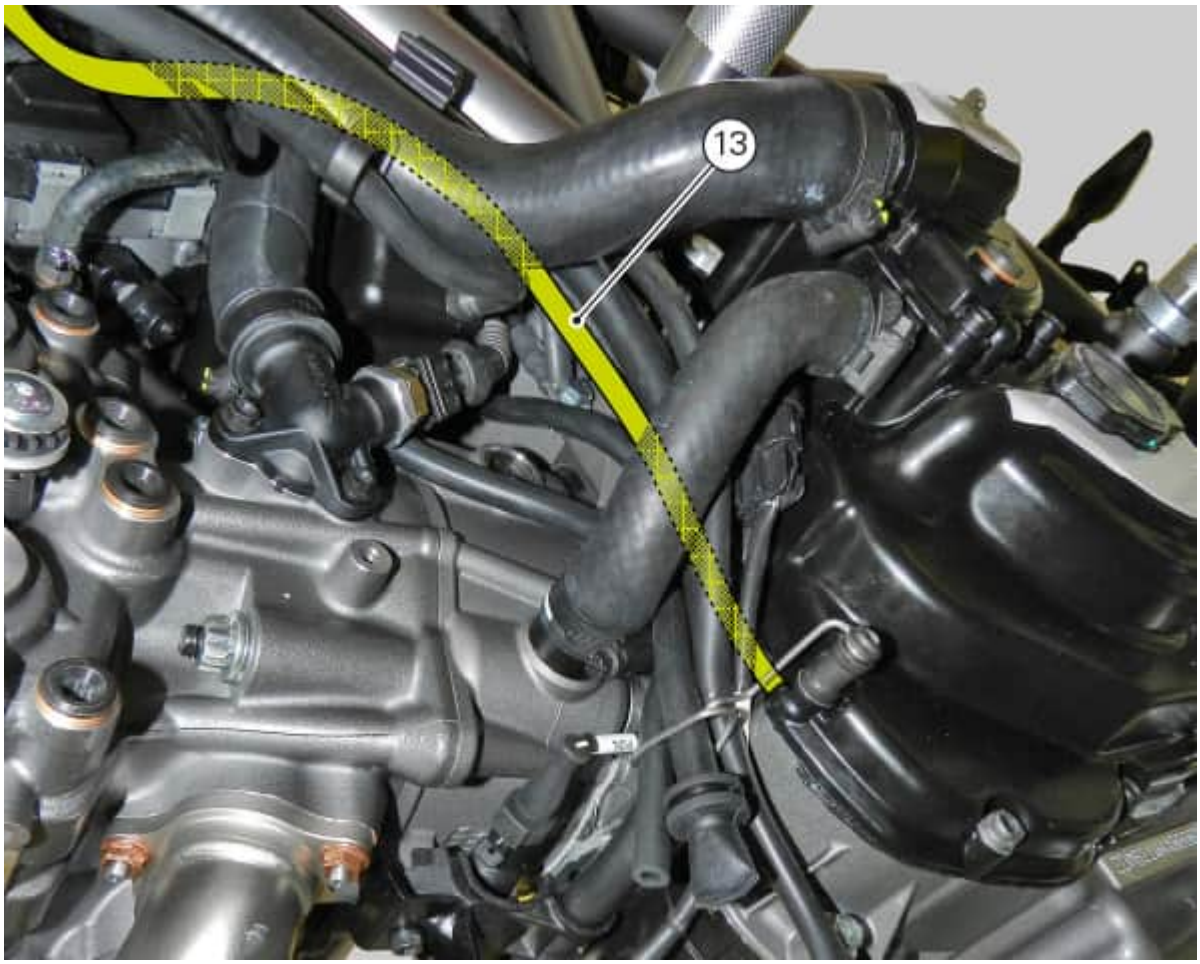
Table I






13


13


13

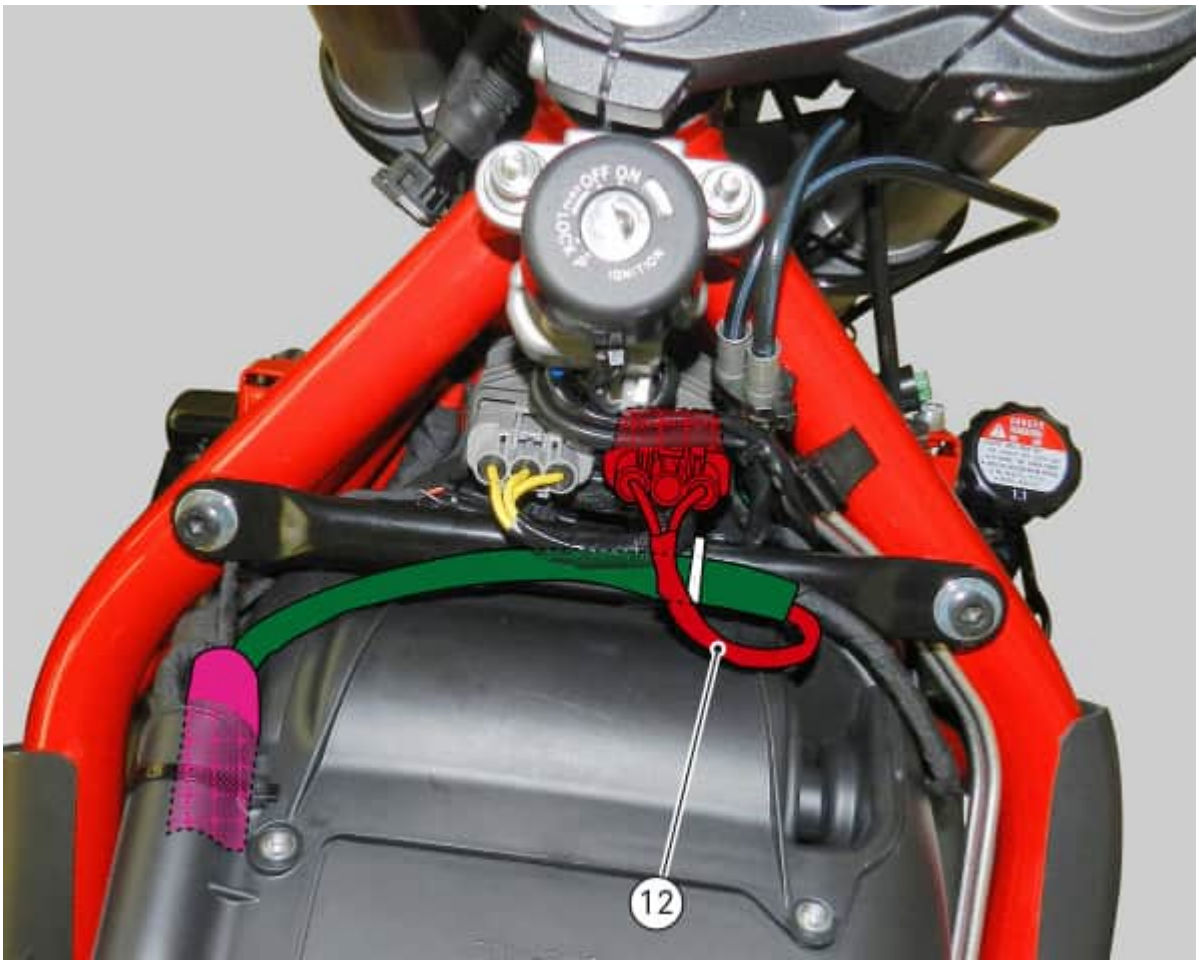
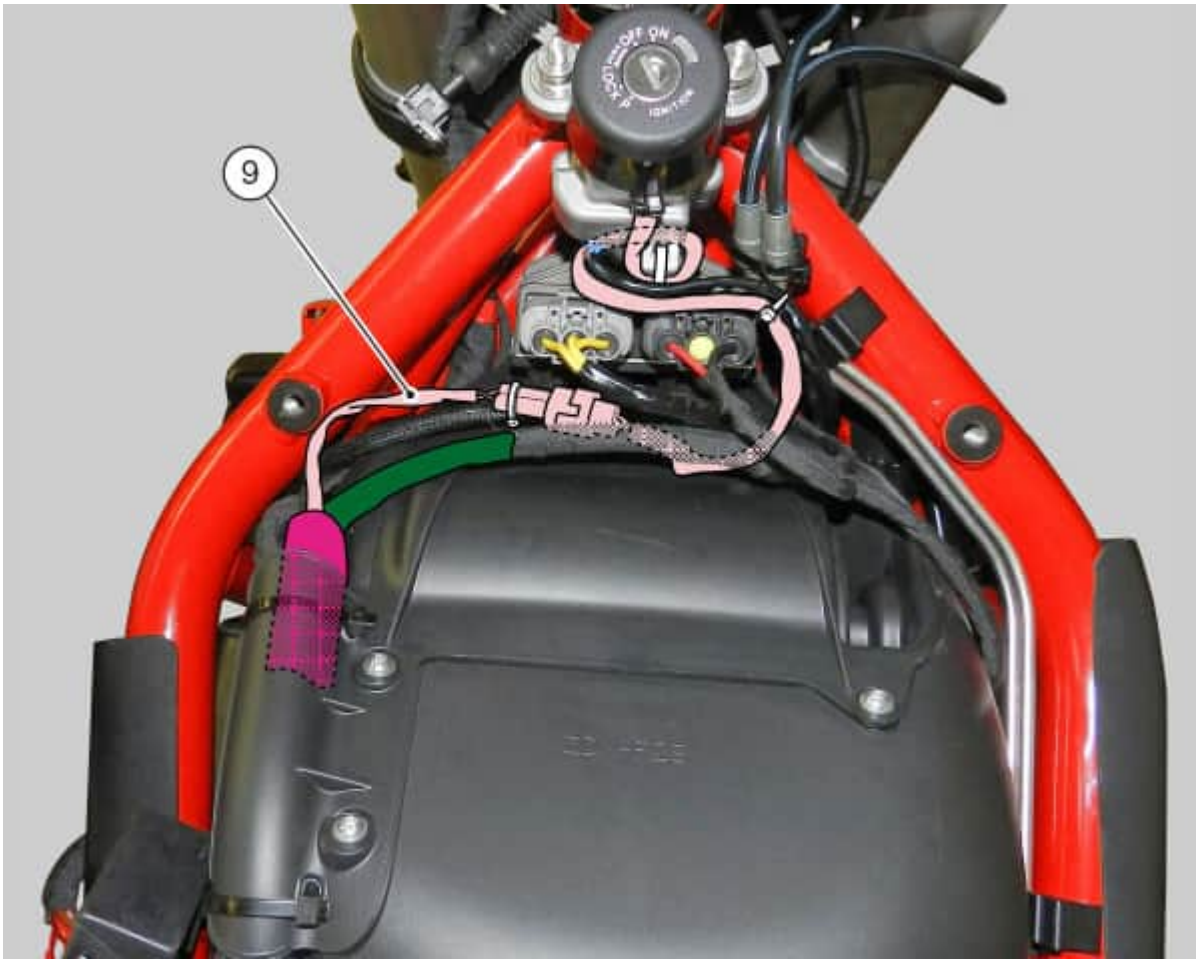
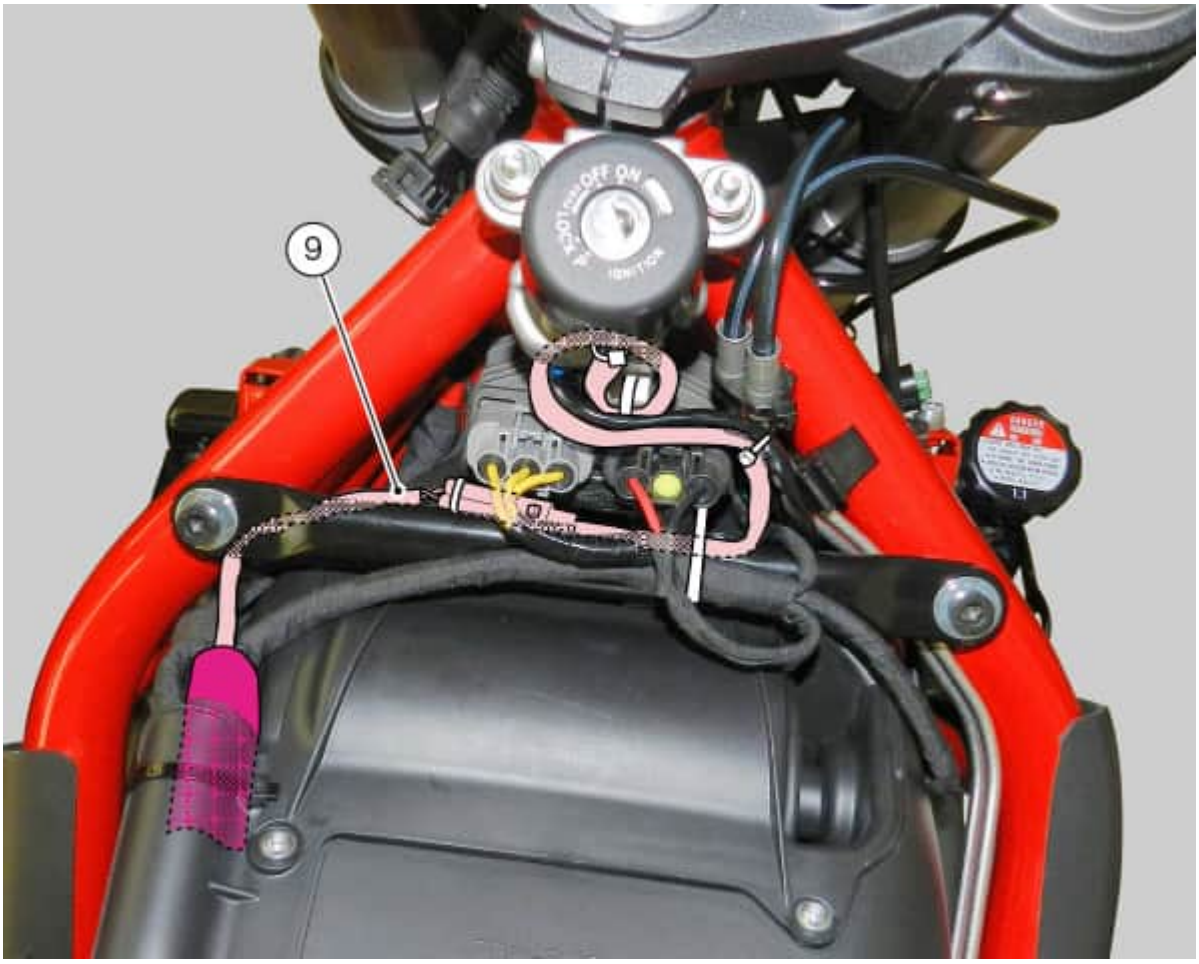
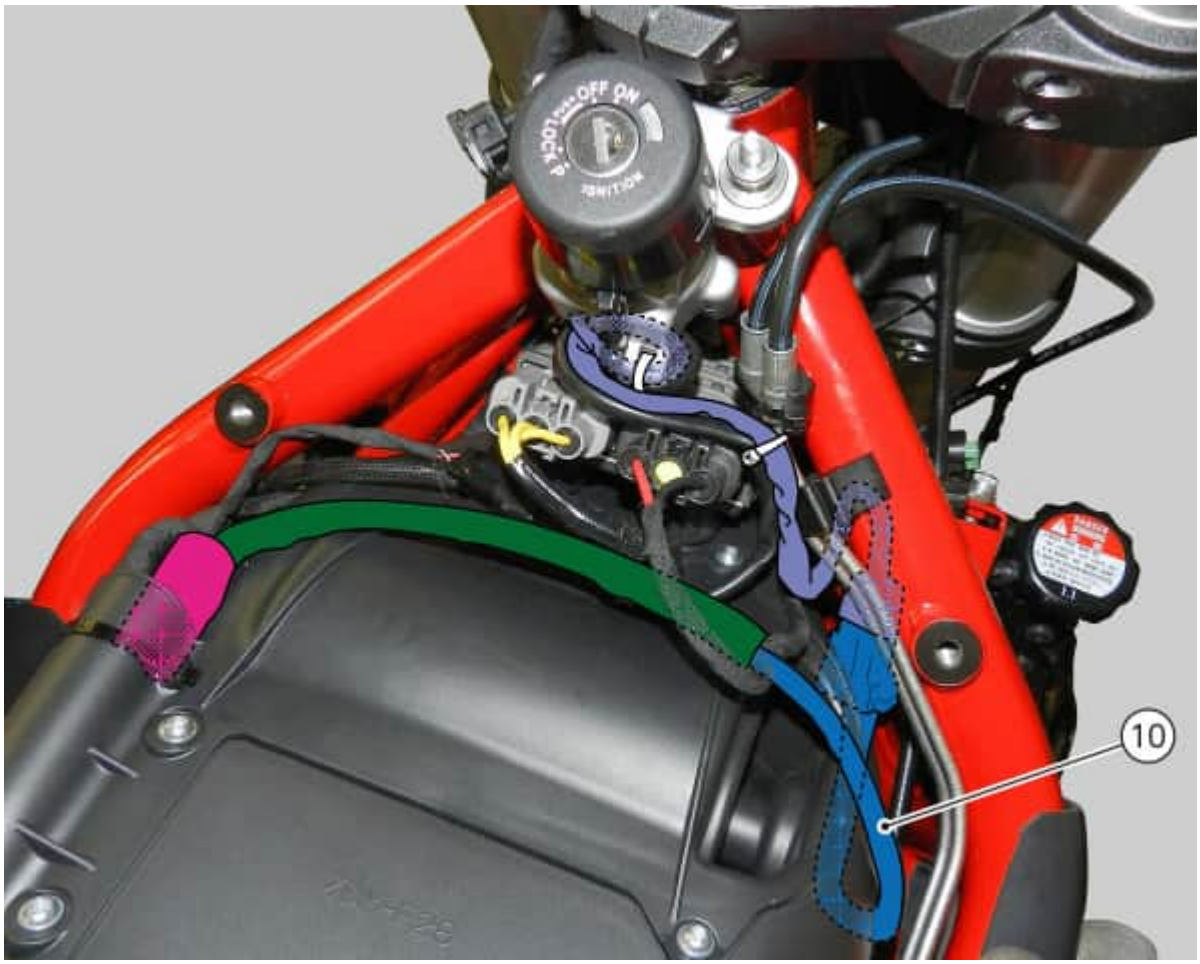
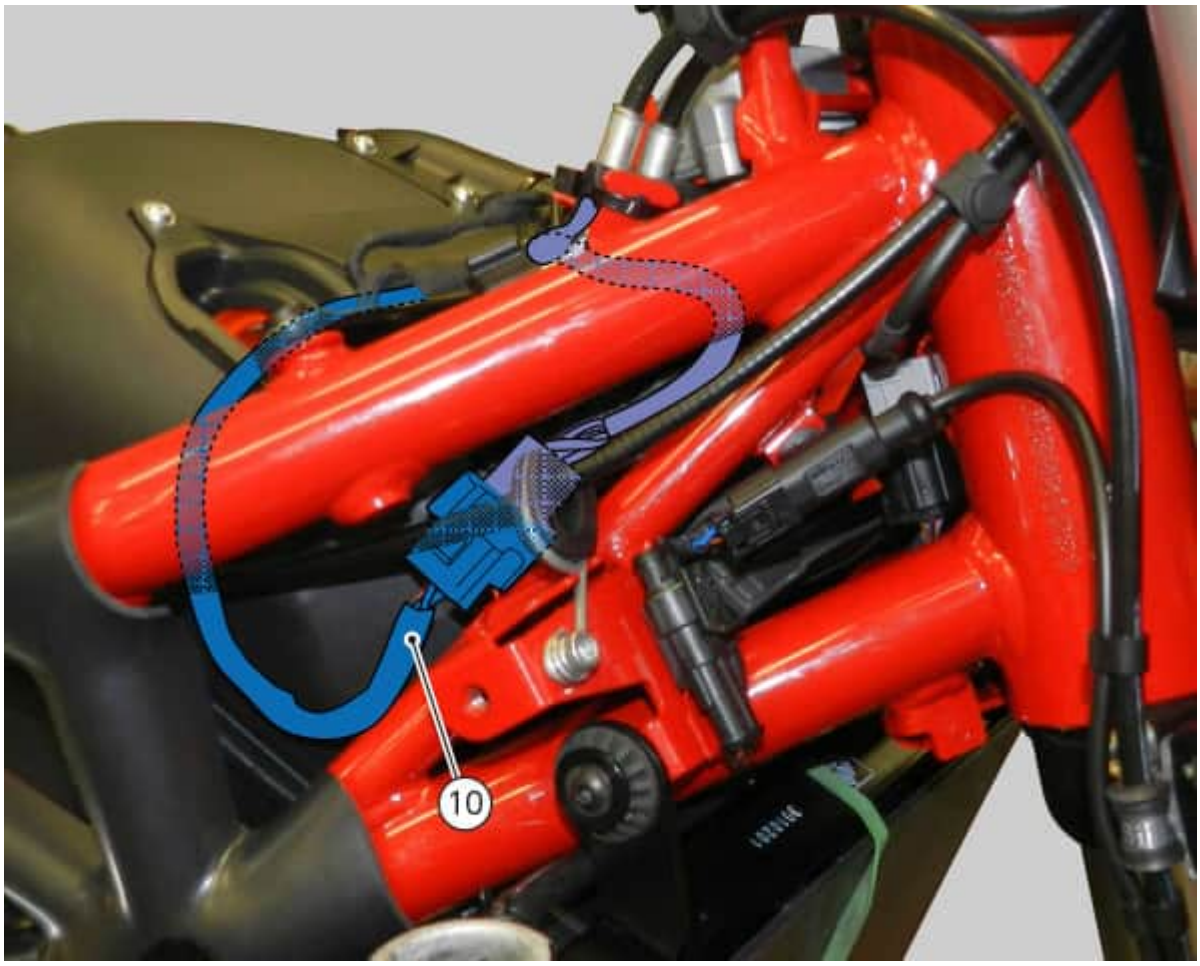

LOCK
OFF ON
IGNITION
12

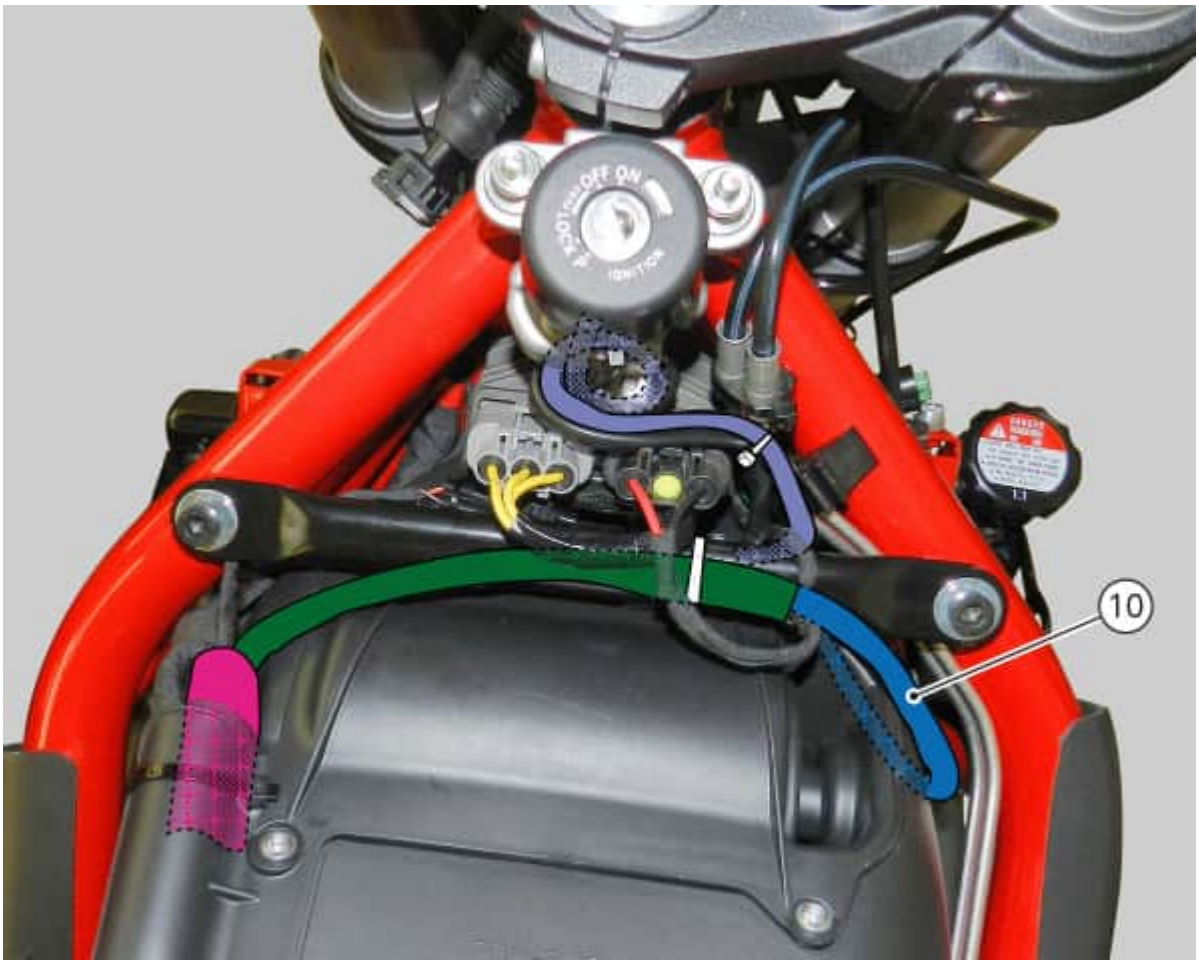
Table G

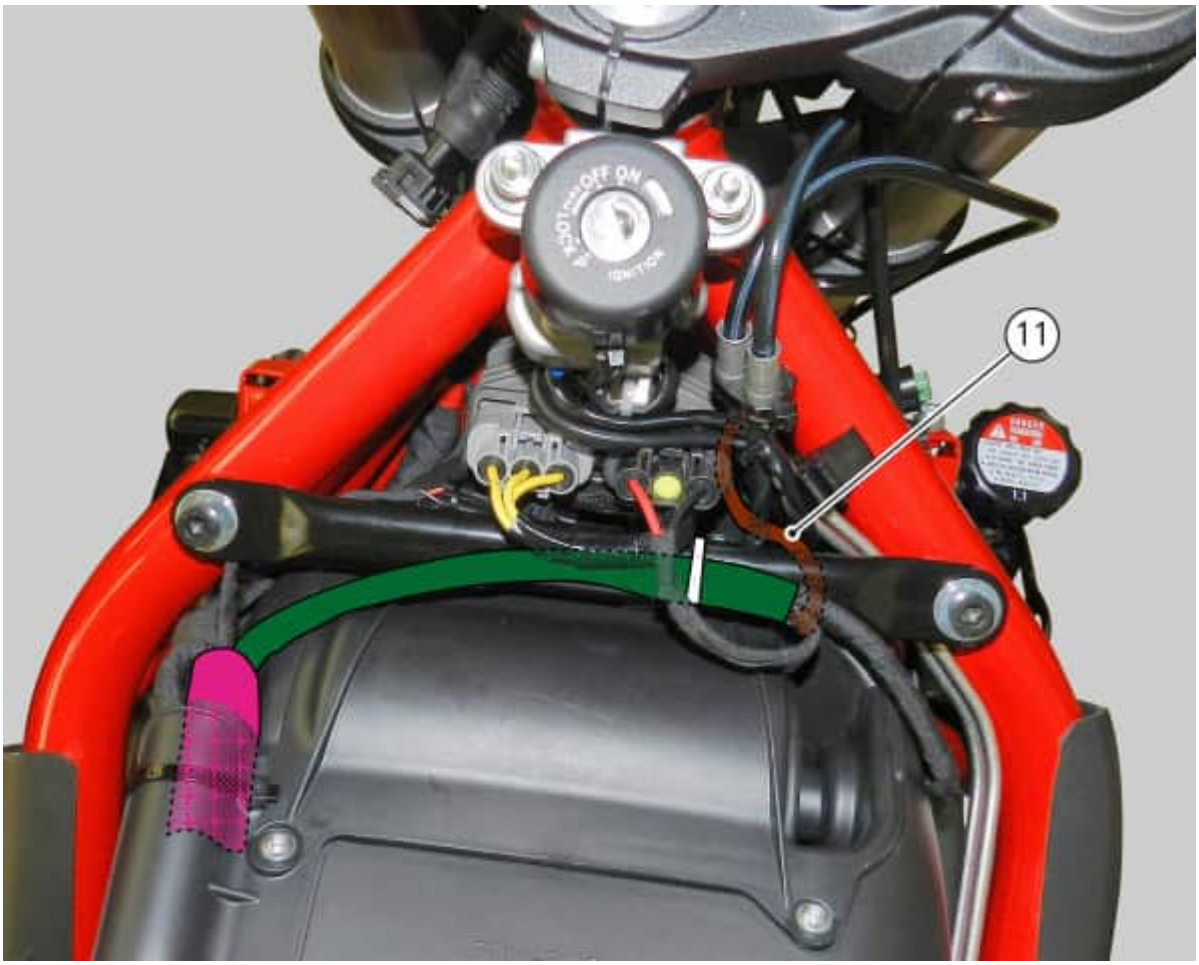


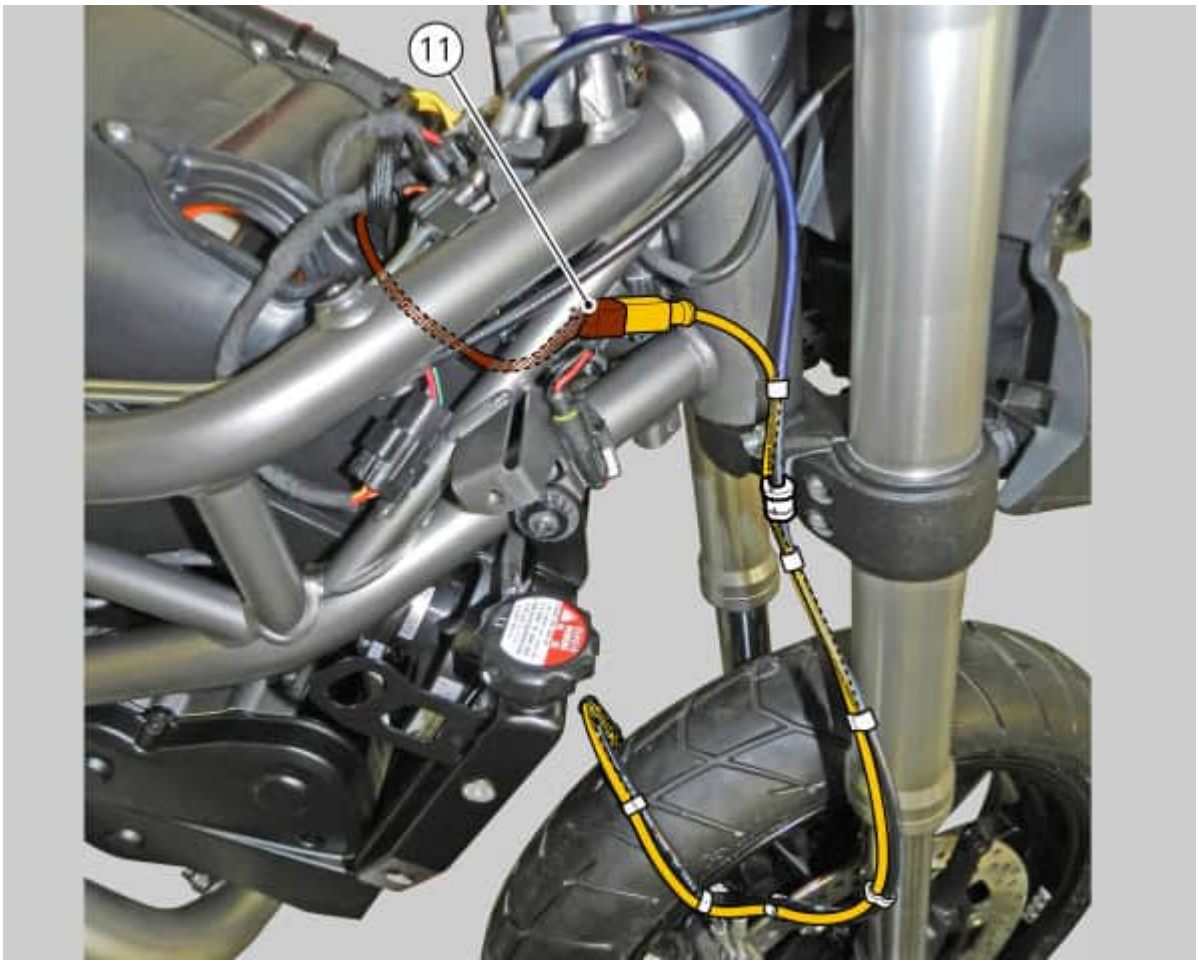


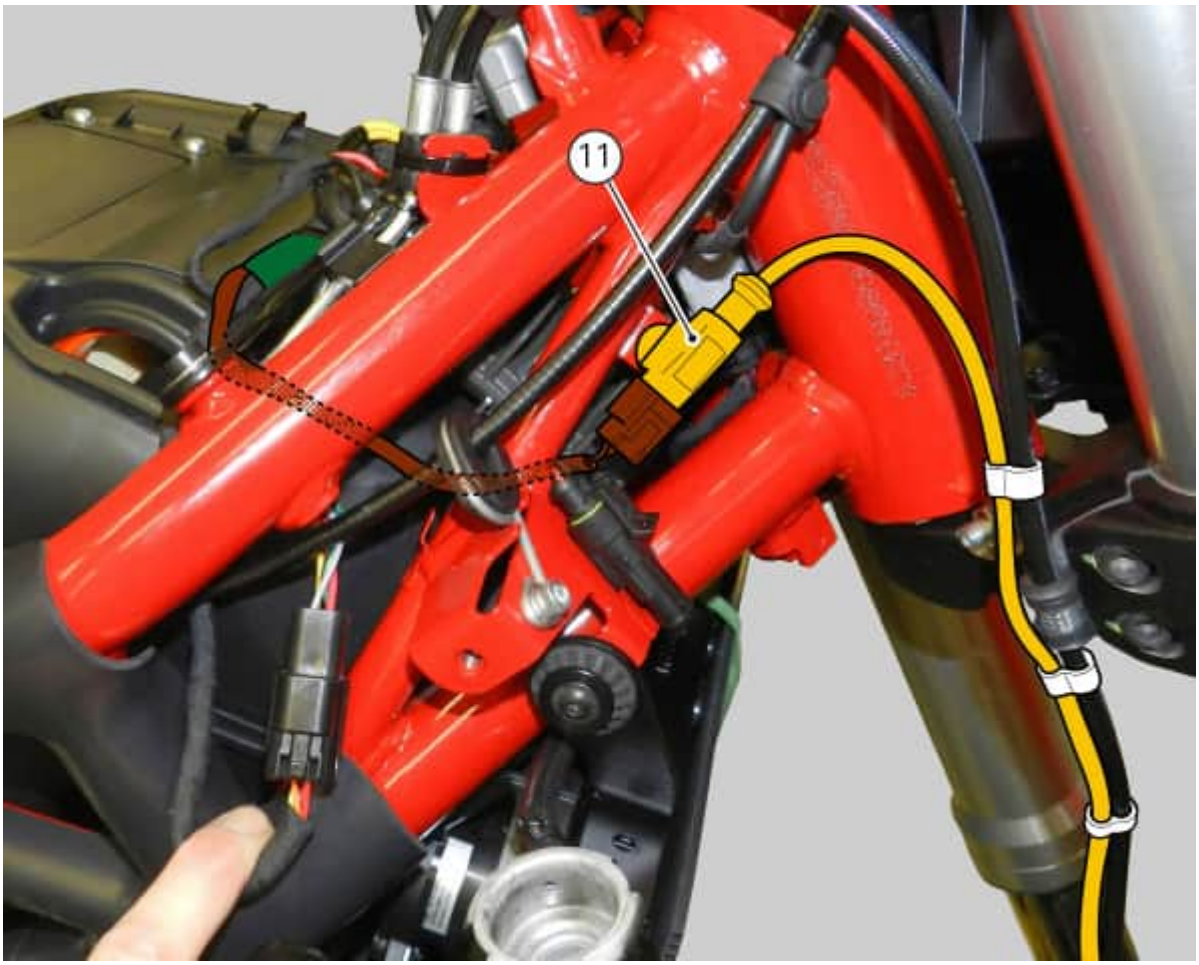

10


10


10


11


11


11

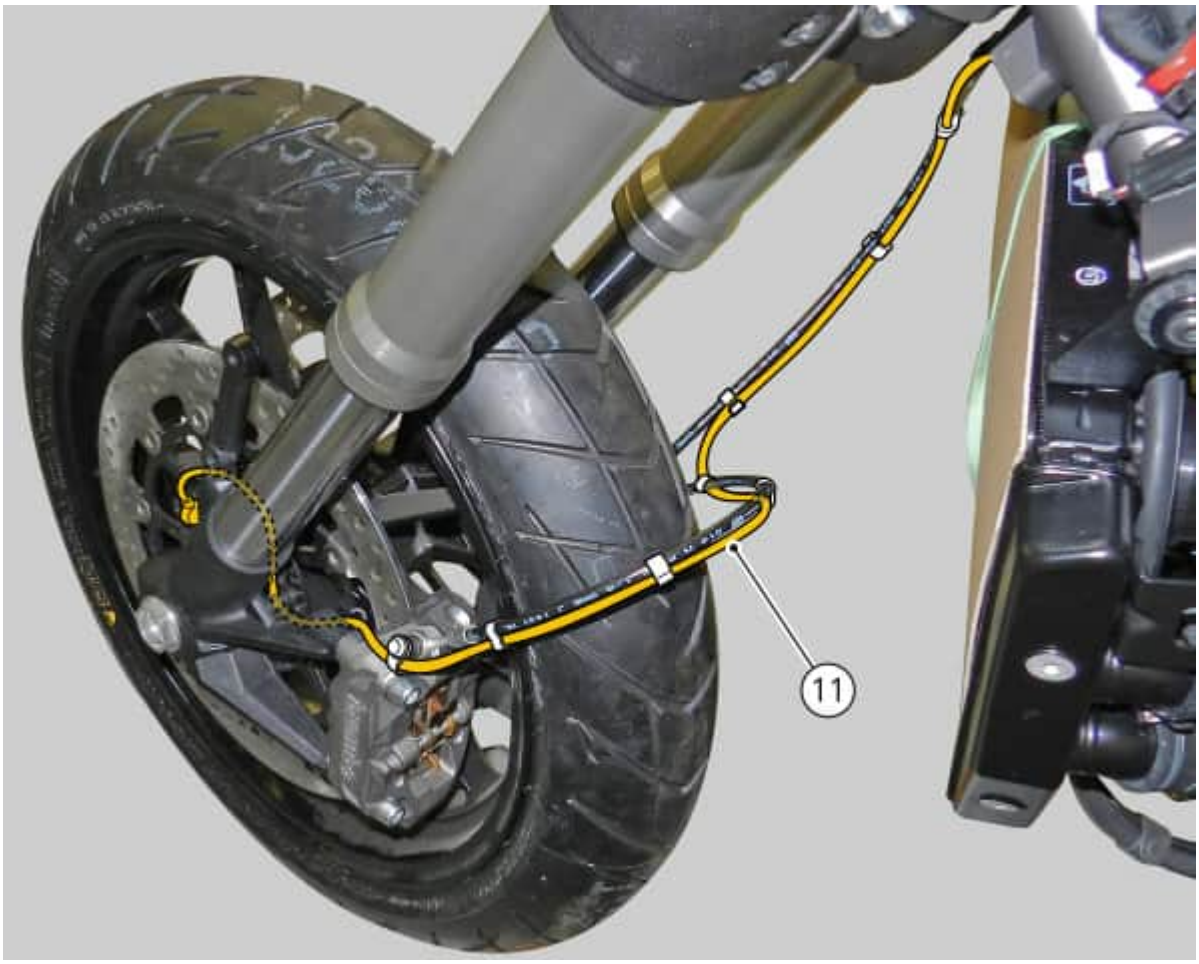
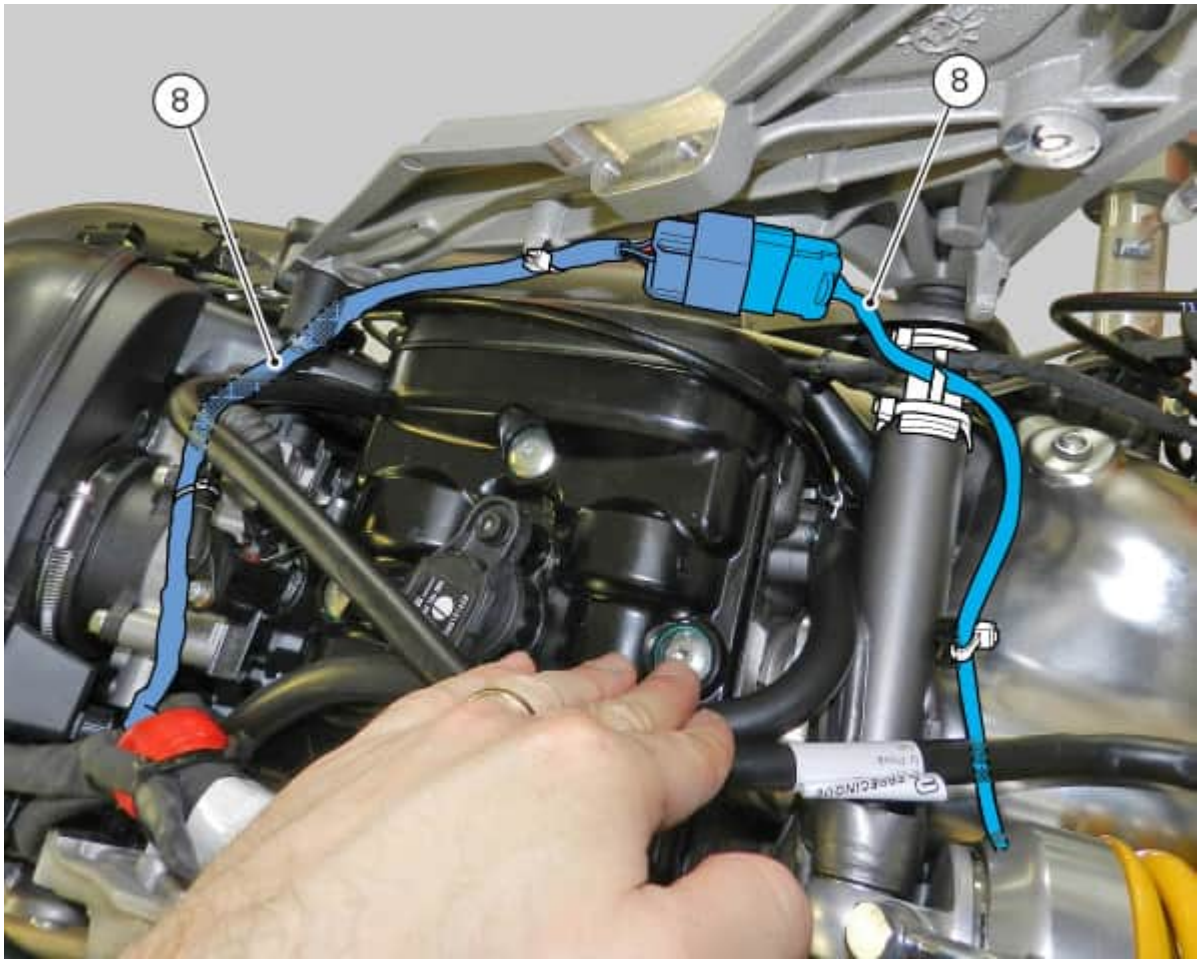
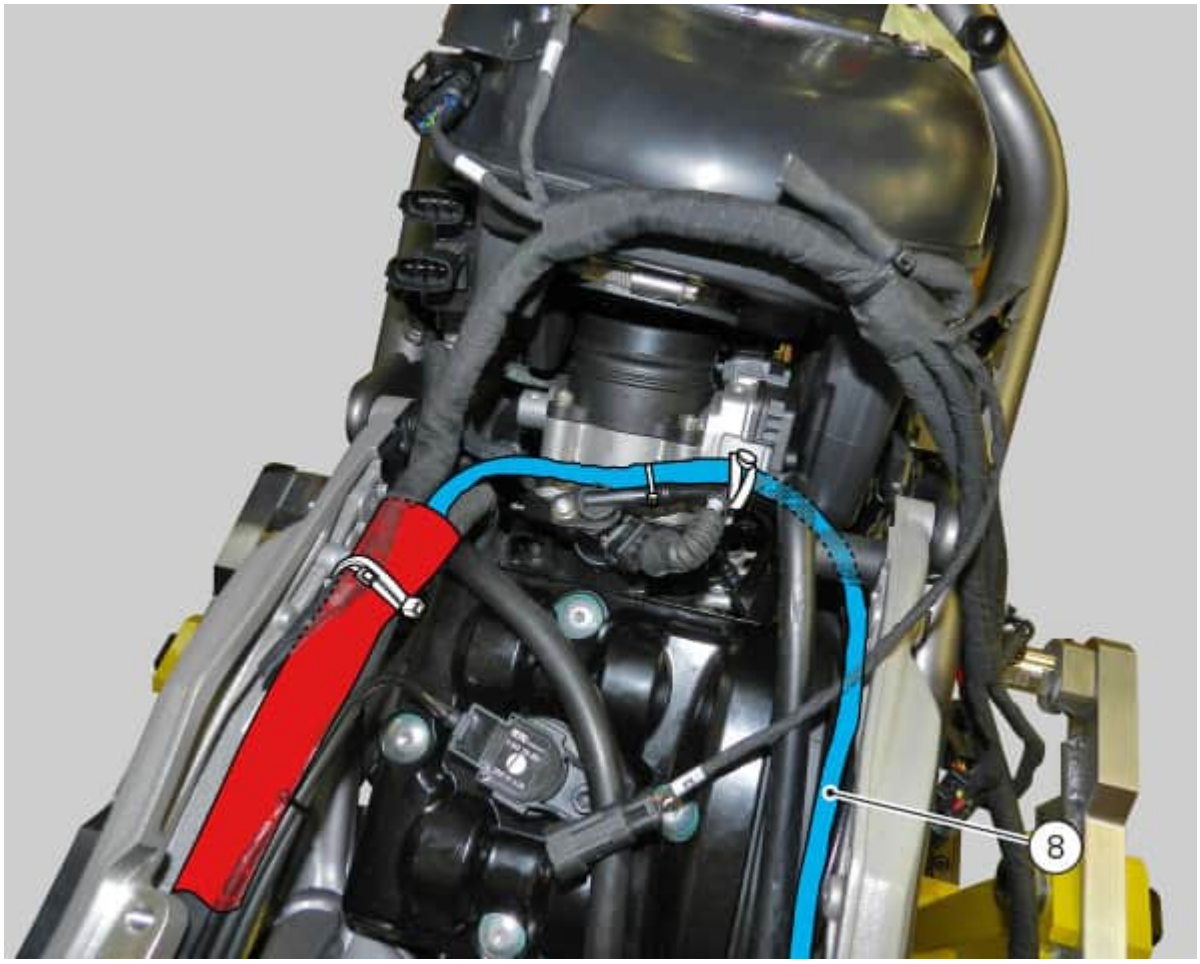

11

Table F





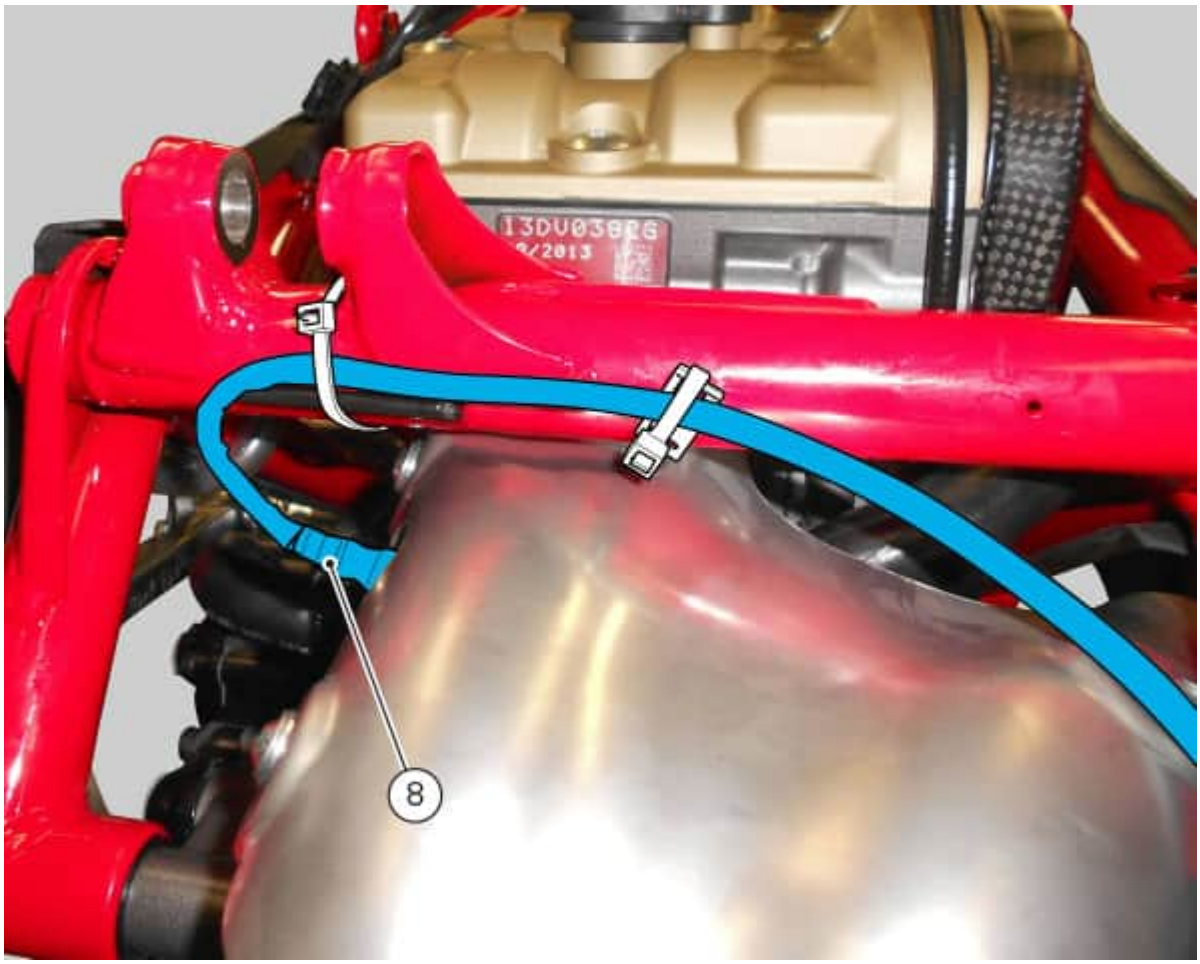

8

Table E

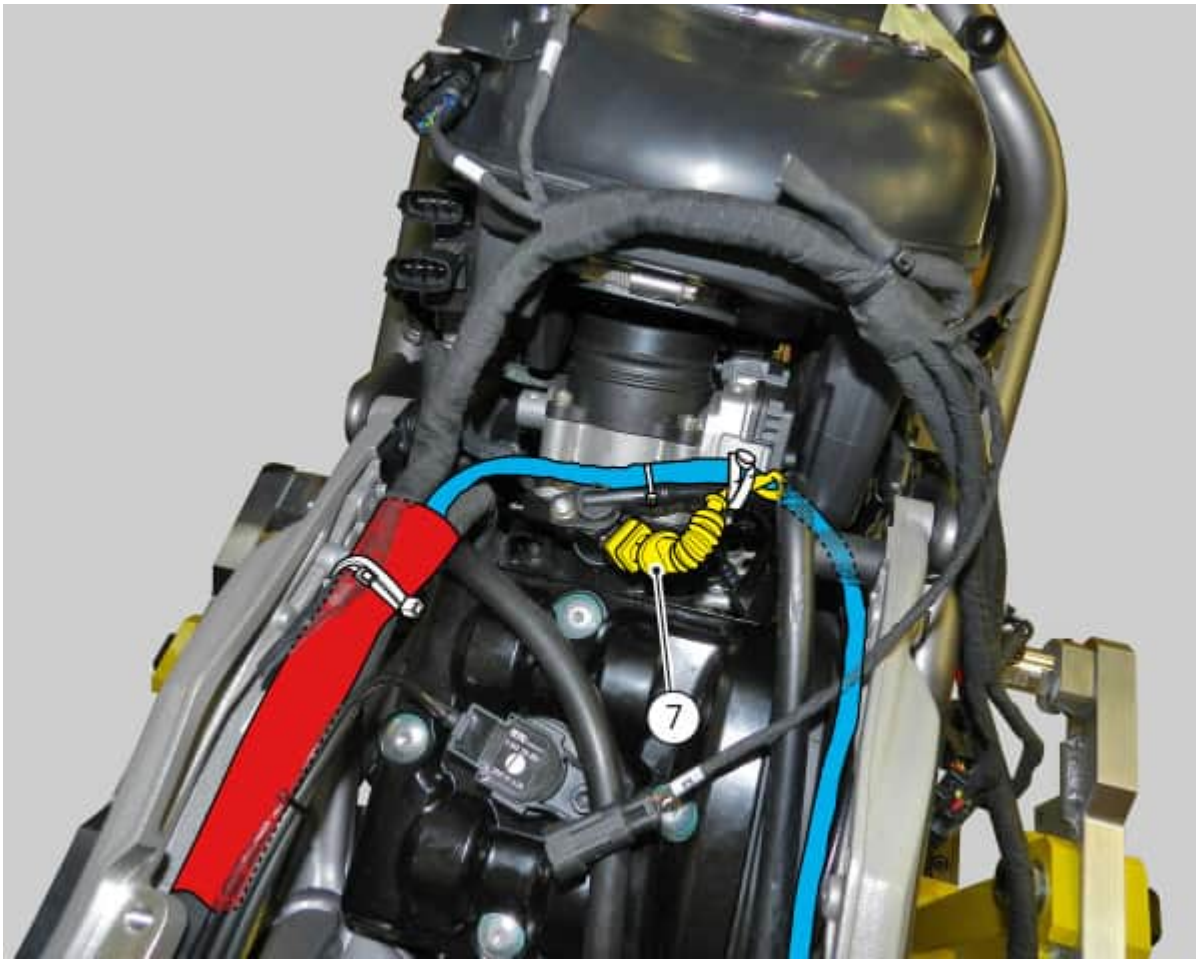
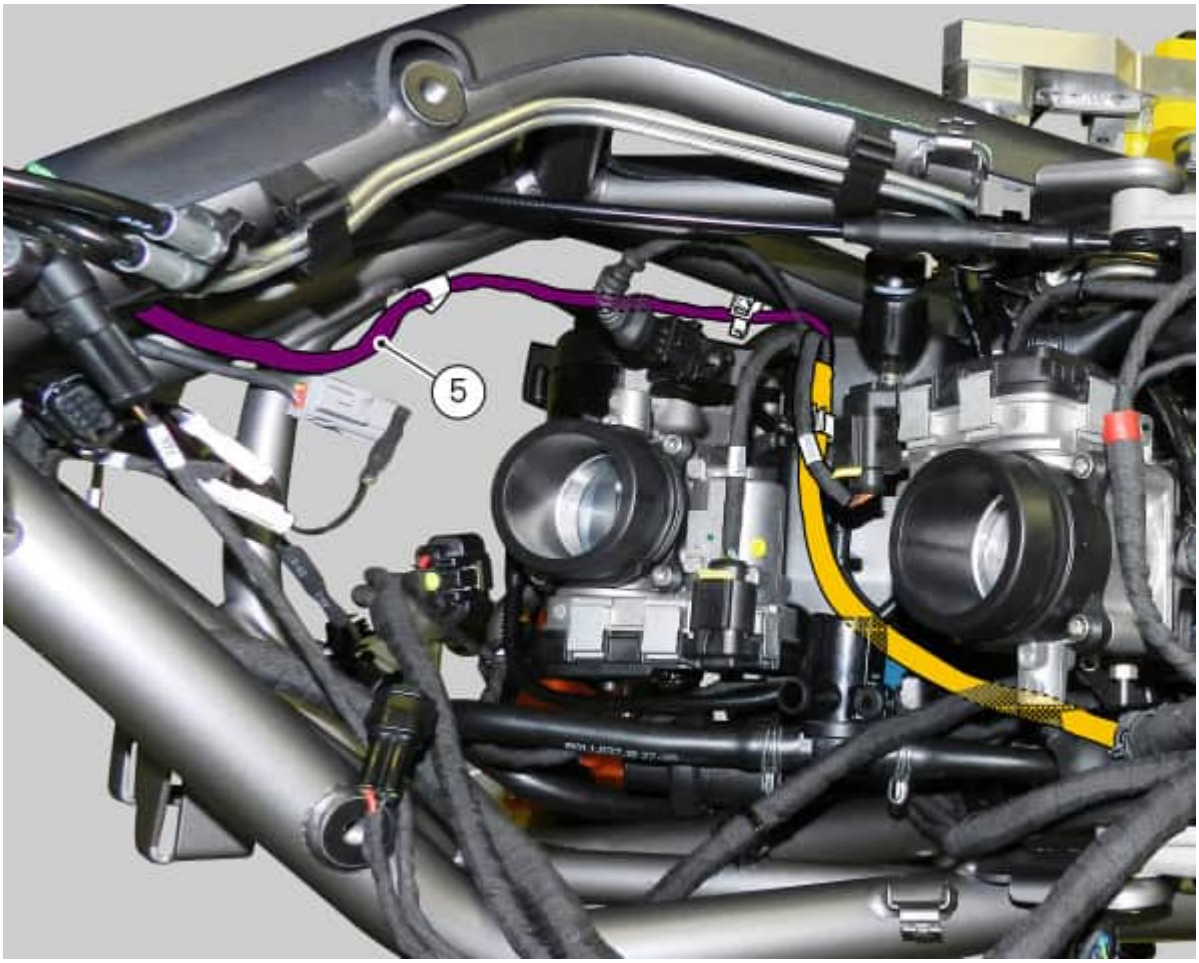
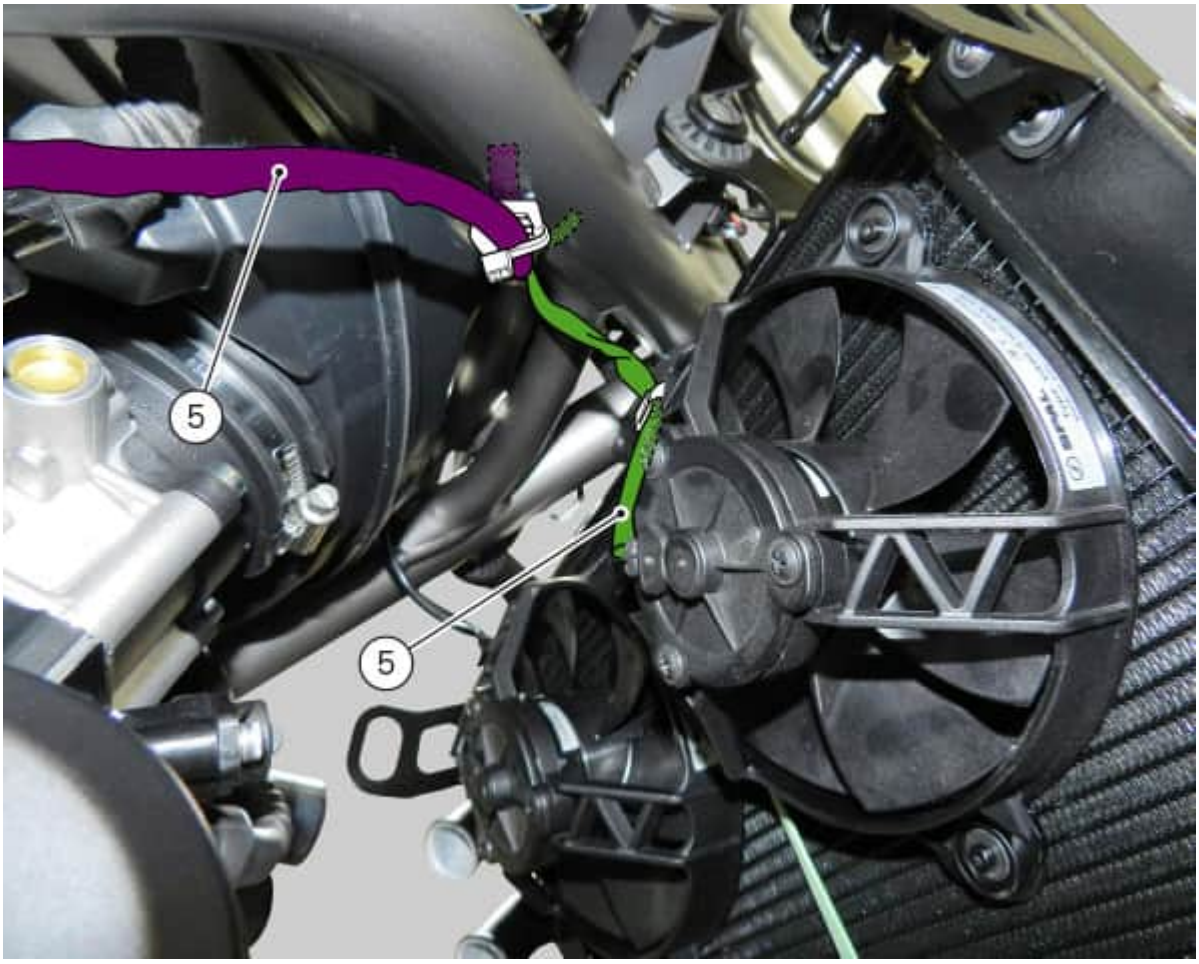
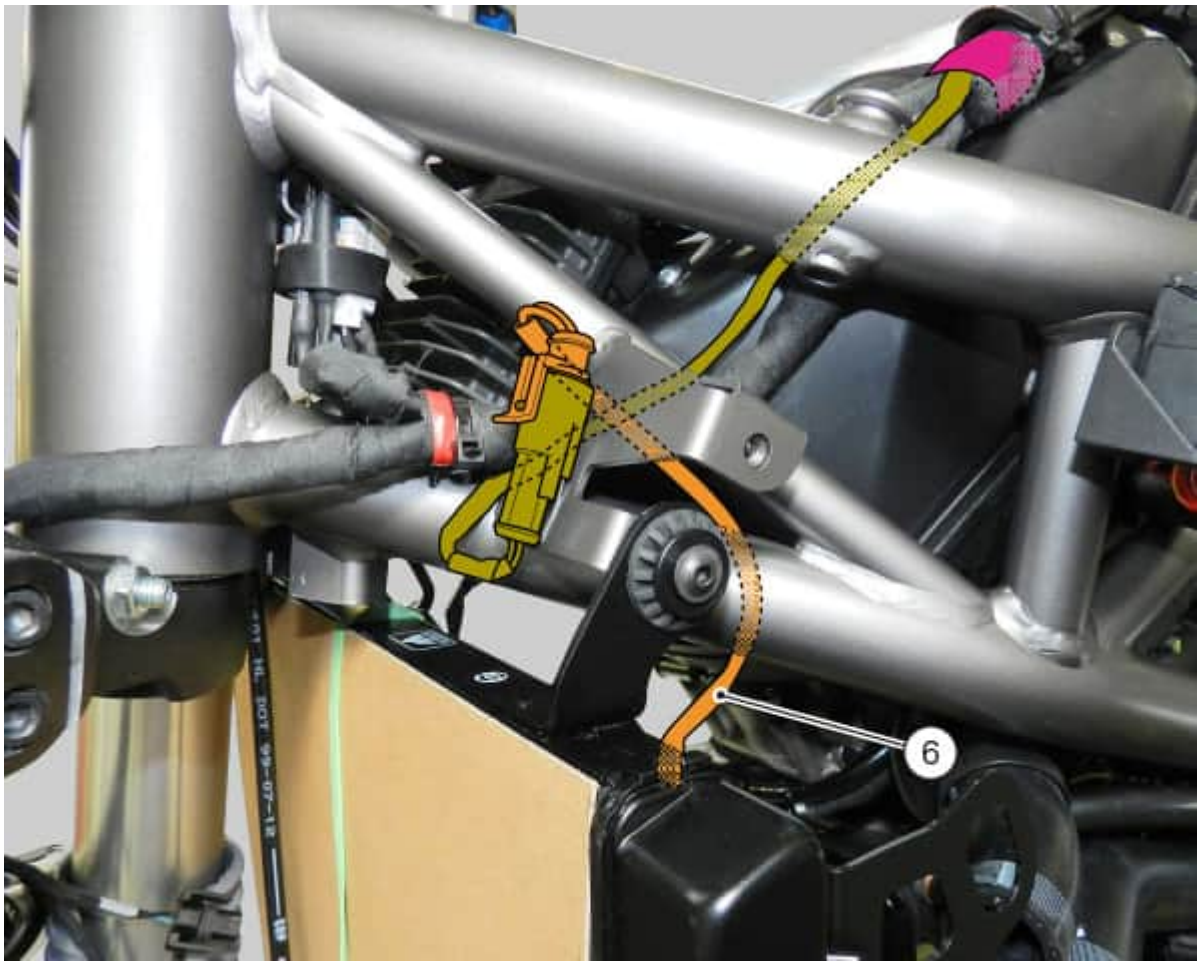


Table D



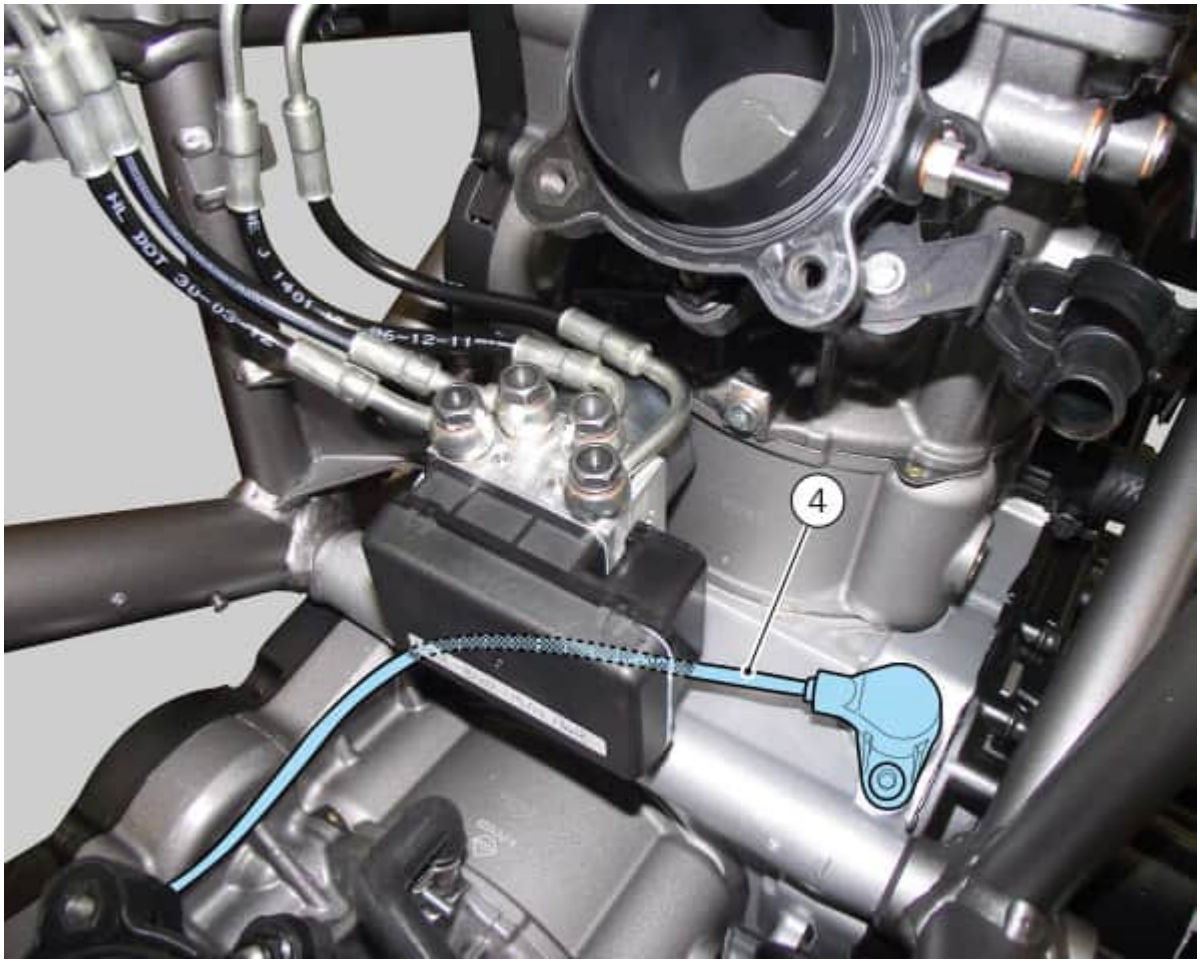



5


6


6

Table C





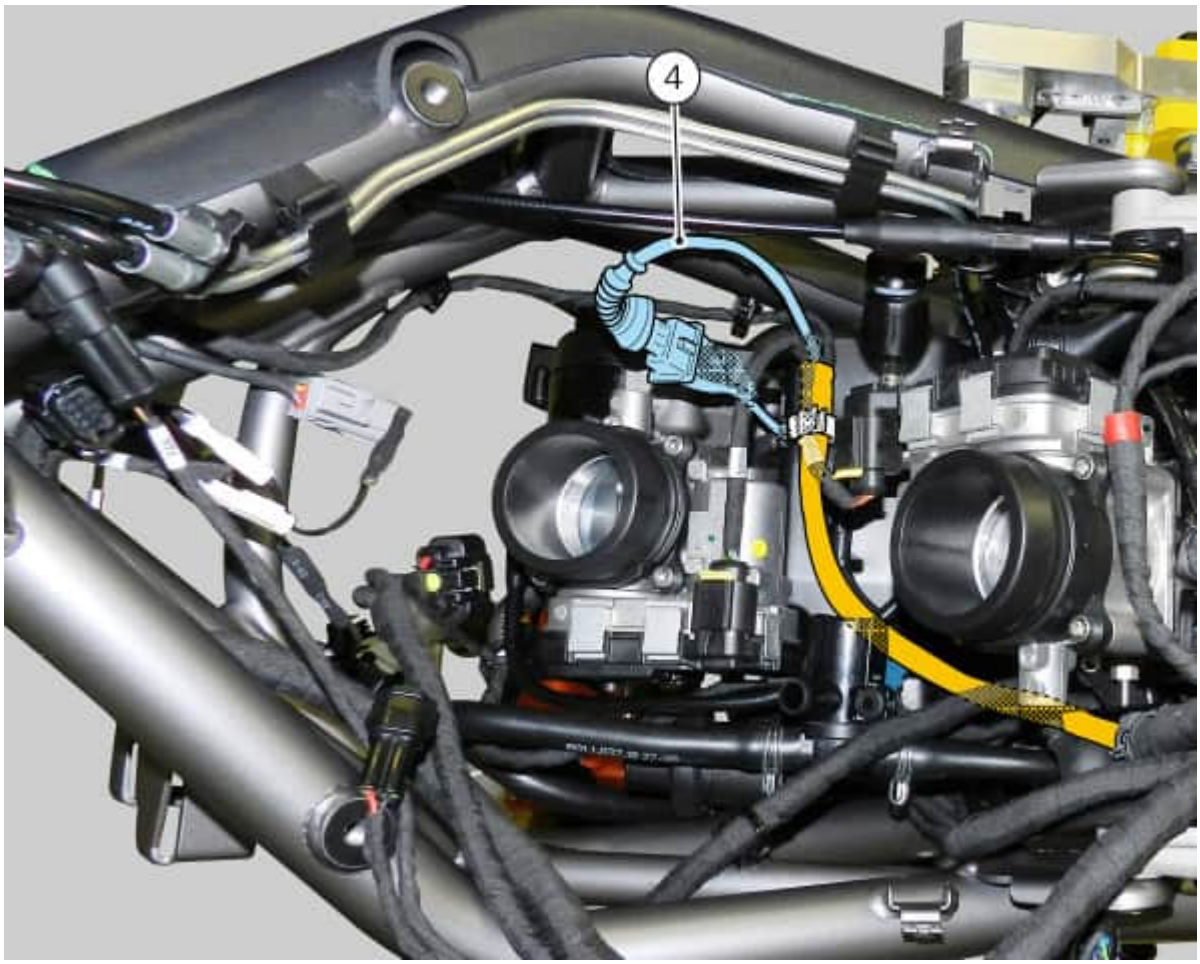
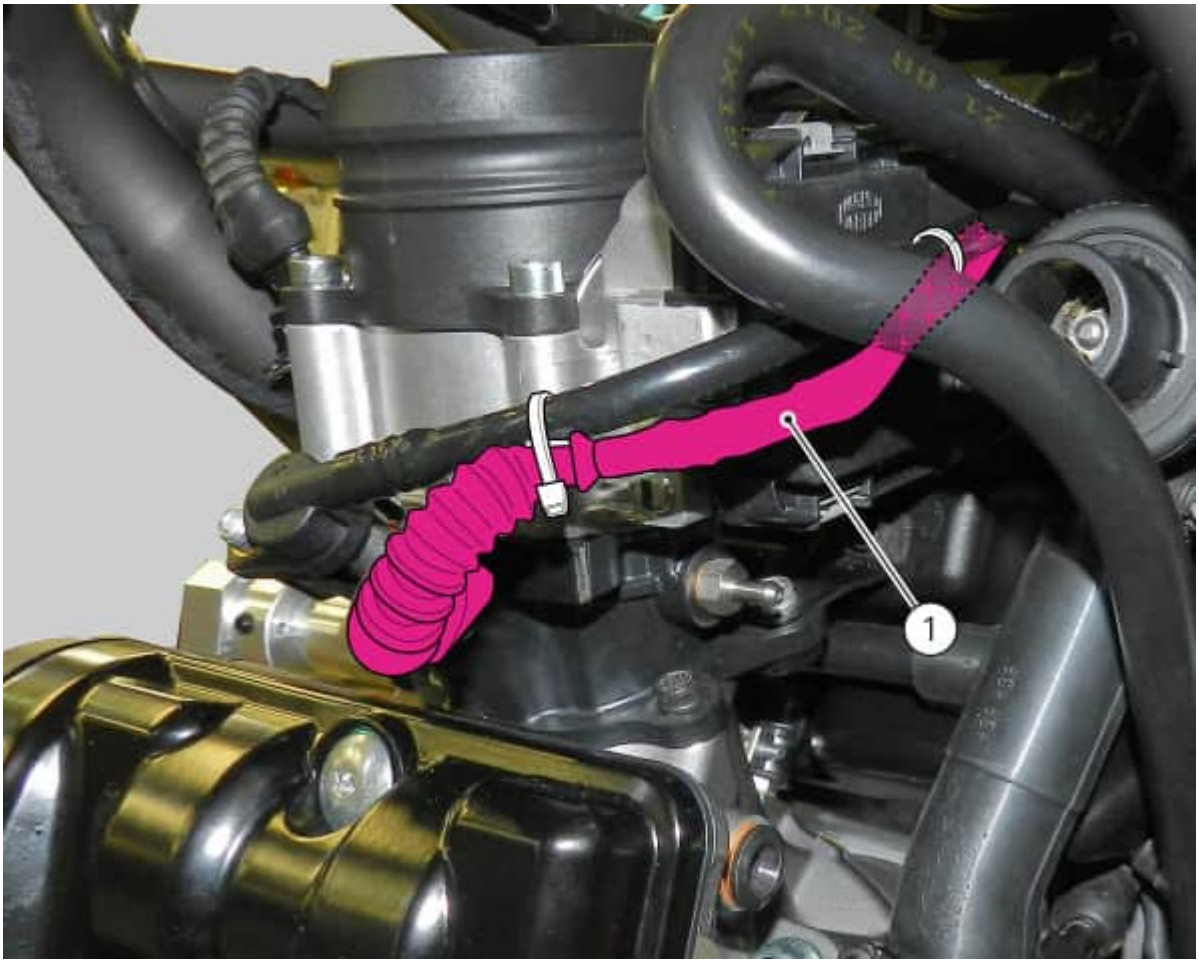
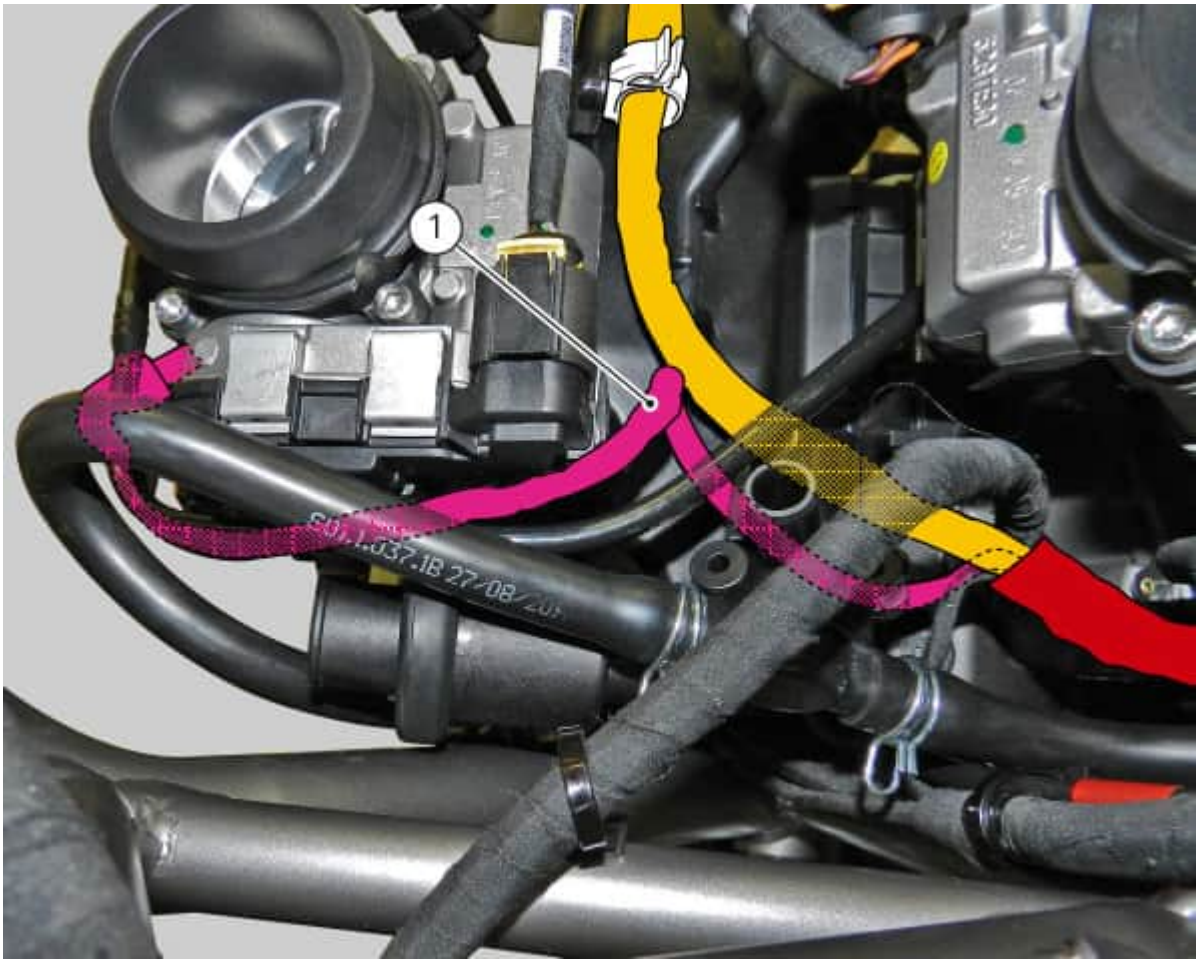

4

Table B



Table A





Routing of wiring on frame

Table	Position	Reference
Table A	1	Horizontal injector
Table B	2	Vertical TPS
Table B	3	Horizontal TPS
Table C	4	Pick-up cable
Table D	5	RH fan cable
Table D	6	LH fan cable
Table E	7	Vertical injector
Table F	8	Vertical lambda sensor cable
Table G	9	Immobilizer antenna cable
Table G	10	Ignition switch cable
Table G	11	Front speed sensor cable
Table H	12	Voltage regulator
Table I	13	Regulator/generator cable
Table J	14	Horizontal coil cable
Table K	15	Horizontal coil cable
Table K	16	Horizontal lambda sensor cable
Table K	17	Ground
Table K	18	Pressure switch
Table L	19	Horizontal MAP sensor
Table M	20	Throttle cable
Table N	21	Front right turn indicator cable
Table N	22	Front brake microswitch cable
Table N	23	RH switch cable
Table O	24	Front left turn indicator cable
Table O	25	Clutch microswitch cable
Table O	26	LH switch cable
Table P	27	GPS presetting
Table P	28	Instrument panel
Table P	29	Horn

Table P	30	Air temperature sensor
Table Q	31	Right-hand heated handgrip presetting
Table Q	32	Left-hand heated handgrip presetting
Table R	33	Rear speed sensor cable
Table R	34	Rear brake switch cable
Table S	35	Ground terminal
Table T	36	Power sockets 1 (only for Hyperstrada version)
Table U	37	Secondary air
Table U	38	Vertical coil cable
Table U	39	Front fuse box
Table U	40	Neutral sensor
Table V	41	Side stand sensor cable
Table W	42	Headlight
Table X	43	Engine control unit connector
Table X	44	Vehicle control unit connector
Table X	45	Fuel pump
Table L	46	Vertical MAP sensor
Table V	47	ABS connector
Table Y	48	Power socket 2 (only for Hyperstrada version)
Table Z	49	Rear fuse box
Table Z	50	Rear wiring connector
Table Z	51	Tail light connector
Table Z	52	BBS control unit
Table Z	53	Diagnosis
Table Z	54	Solenoid starter - starter motor
Table Z	55	Solenoid starter - battery positive cable
Table Z	56	Exhaust valve motor
Table Z	57	ABS positive
Table Z	58	Solenoid
Table Z	59	Injection relay
Table Z	60	Main relay

Table Z	S	Seat lock latch cable

Fuse box key

Front fuse box key		
Pos	El. item	Rat.
1	Lights	10 A
2	Instrument panel	10 A
3	Key-1	15 A
4	Key-2	10 A
5	Key-7SM	15 A
6	Injection	20 A
7	-	-

Rear fuse box key		
Pos	El. item	Rat.
1	Key-sense	7.5 A
2	Diagnosis	7.5 A
3	Black Box System (BBS)	10 A
4	ABS 1	30 A
5	ABS 2	25 A
6	Alarm	10 A
7	Engine control unit	7.5 A

Wiring diagram cable colour codes

B Blue
W White
V Violet
Bk Black
Y Yellow
R Red
Lb Light blue
Gr Grey
G Green
Bn Brown
O Orange
P Pink

Key to wiring diagram

1 Right-hand switch
2 Ignition system (ignition switch)
3 Main relay
4 Rectifier
5 Generator
6 GPS navigation system
7 Front fuse box
8 Starter motor
9 Fused solenoid
10 Battery
11 Wiring ground
12 Data Acquisition / Diagnosis
13 Rear fuse box
14 ABS control unit
15 ABS diagnosis
16 Front speed sensor
17 Rear speed sensor
18 RH fan
19 LH fan
20 Tail light
21 Rear right turn indicator
22 Rear wiring
23 Rear left turn indicator
24 Exhaust valve motor
25 Vehicle control unit (BBS)
26 Anti-theft system alarm
27 Oil pressure switch
28 Gear sensor
29 Side stand switch
30 Clutch switch
31 Timing/rpm sensor
32 Vertical MAP sensor
33 Horizontal MAP sensor
34 Engine temperature
35 Vertical lambda sensor
36 Horizontal lambda sensor
37 Throttle twistgrip position sensor (APS)
38 Potentiometer motor / ride-by-wire (TPS/ ETV) - horizontal
39 Potentiometer motor / ride-by-wire (TPS/ ETV) - vertical
40 Horizontal coil
41 Vertical coil
42 Main horizontal injector
43 Main vertical injector
44 Secondary air actuator
45 Fuel pump
46 Fuel pump relay
47 Control unit - frame connector
48 Control unit - engine connector
49 Left-hand switch
50 Front left turn indicator
51 Horn
52 Air temperature sensor
53 Heated handgrips
54 Instrument panel
55 Rear stop light
56 Front stop light
57 Front right turn indicator
58 Headlight
59 Serial line
60 Immobilizer

Rectifier-regulator

The regulator (1) is placed on front side of the vehicle, behind the steering tube.
The rectifier/regulator consists of an aluminium casing containing the diodes that rectify the current produced by the generator.
It also contains an electronic device that regulates the current supplied by the generator in accordance with battery voltage.
If the battery is drained, the current has the value necessary to restore optimum operating conditions of the battery itself. While, if the battery is fully charged, the current value will be lower.

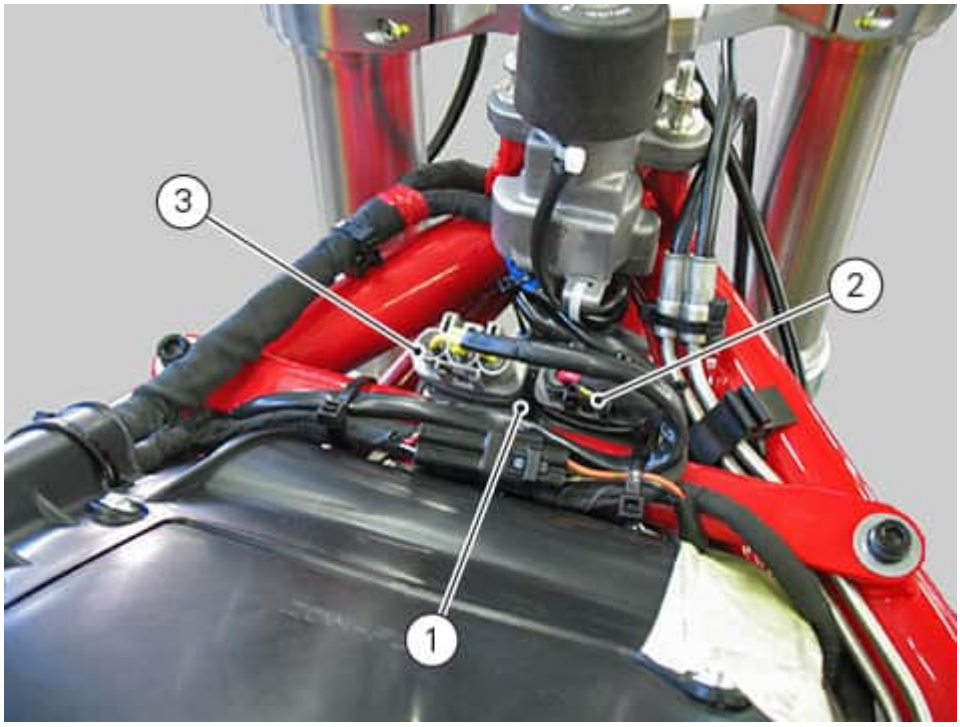
Note
Check the charging current by using the "DDS" diagnosis instrument.

Removing the regulator

Remove the seat (Removing the seat).
Remove the fuel tank (Removing the fuel tank).

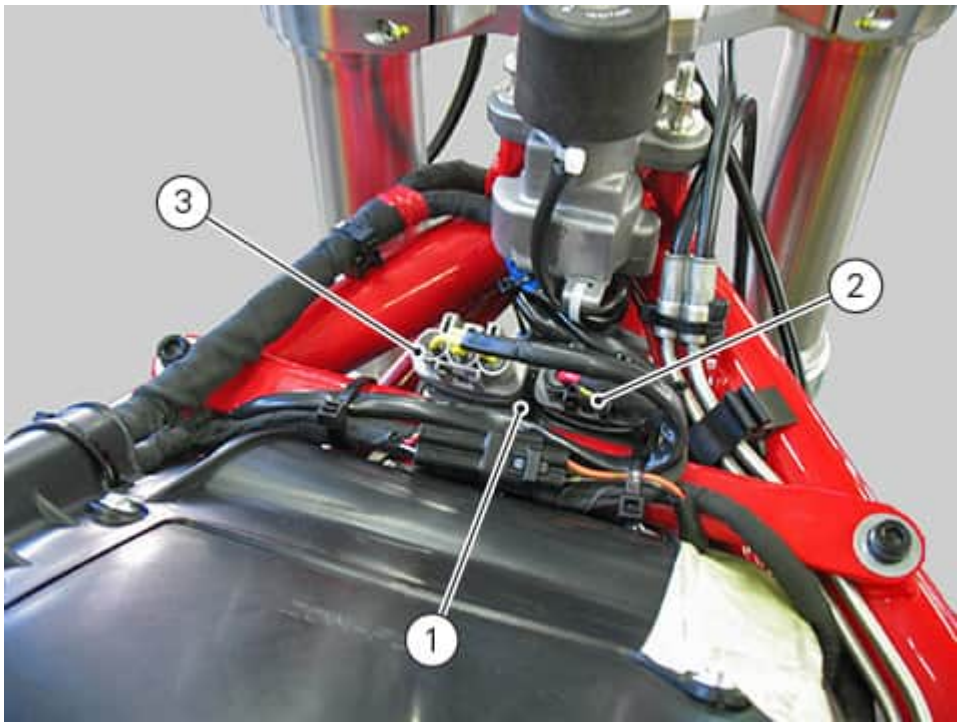
Disconnect the voltage regulator connector (2) and the generator connector (3) from regulator (1).
Loosen the two front screws on regulator (1) and remove them together with the regulator.

Important
Do not disconnect the battery cables when engine is running because this would cause irreparable damage to the regulator.



Refitting the regulator

Position the regulator (1) on the support.
Tighten screws to a torque of 10 Nm ± 10%.



Important

Do not disconnect the battery cables when engine is running because this would cause irreparable damage to the regulator.

Connect the voltage regulator connector (2) and the generator connector (3) to regulator.

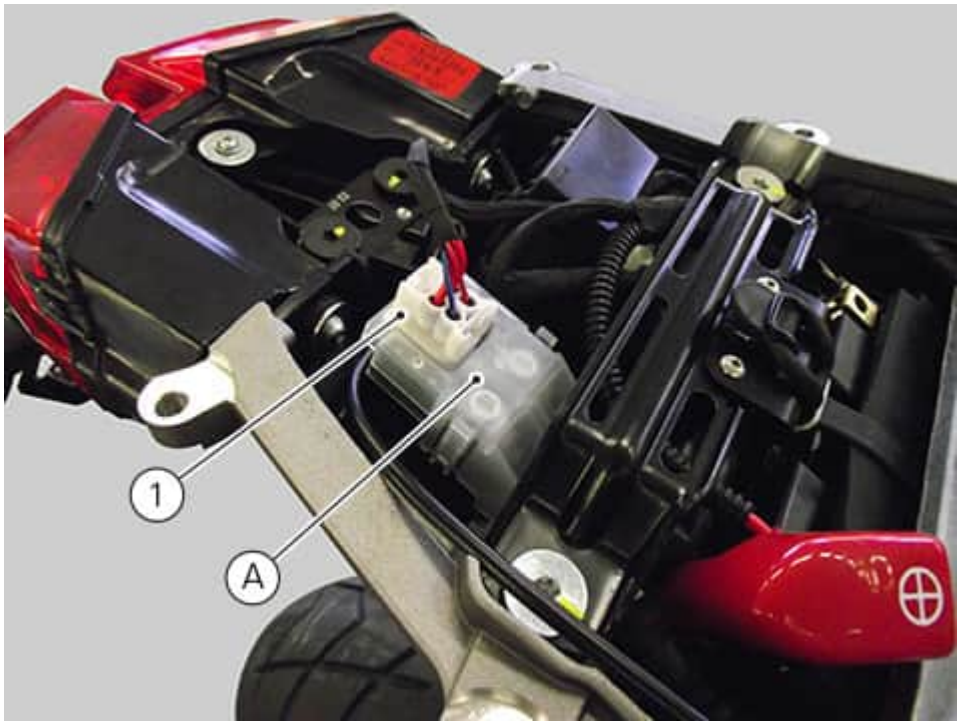
Refit the fuel tank (Refitting the fuel tank)
Refit the seat (Refitting the seat).

Regulator fuse

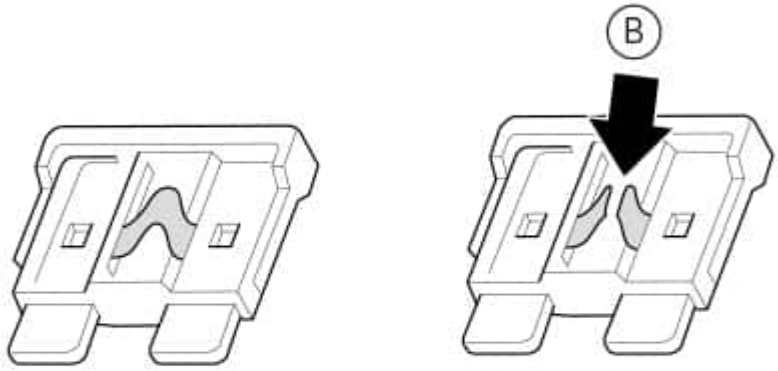
The 30 A fuse, positioned inside solenoid (1), on the rear side of the rear subframe, protects the electronic regulator.

Remove the seat (Removing the seat).

Remove the fuse cap (A) to reach it.



A blown fuse can be identified by breakage of the inner filament (B).



Important

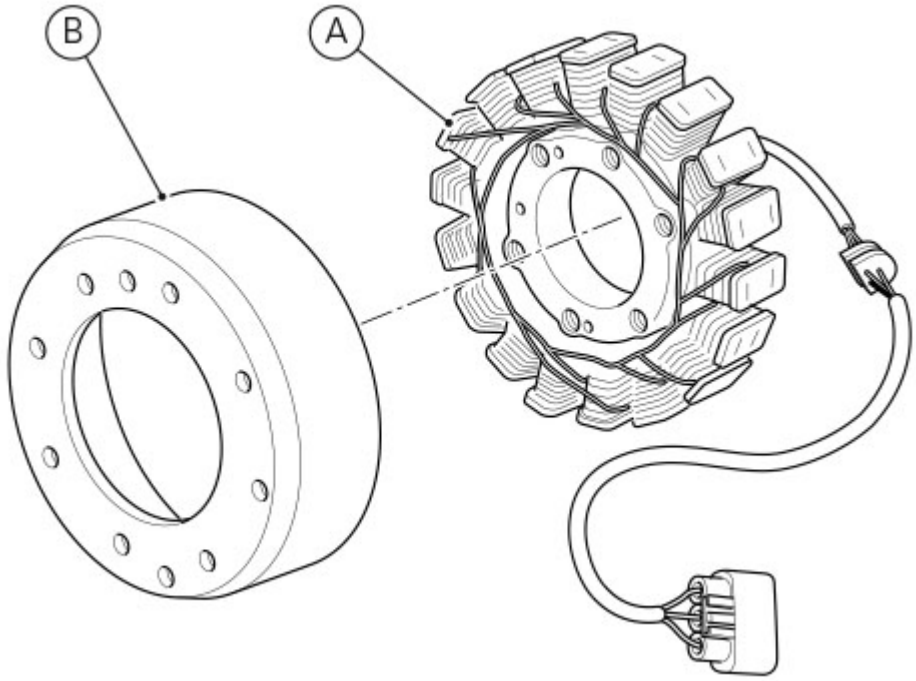
Switch the ignition key to OFF before replacing the fuse to avoid possible short-circuits.

Warning

Never use a fuse with a rating other than the specified value. Failure to observe this rule may damage the electric system or even cause fire.

Generator

It is equipped with a 12 V, 500 W generator, consisting of a fixed element (stator, A) located in the generator cover and of a movable element (rotor, B) fastened to the crankshaft.



To check the battery charging system for faults, use the "DDS" diagnosis instrument and follow the instructions given in the paragraph "Checking the battery charging system".

The absolute value of voltage measured across the terminals of two of the three yellow cables (the measured value will be the same whichever combination of cable is used) must be within the range indicated in the table below (ambient temperature: 20 °C).

Important
Before testing, disconnect the generator wiring from the electrical system when the ignition key is set to OFF.

Engine speed	2000	6000
Effective V	34±5	104±10

Values significantly lower than those indicated above can be due to:

- partially demagnetised rotor;
- short-circuited windings.

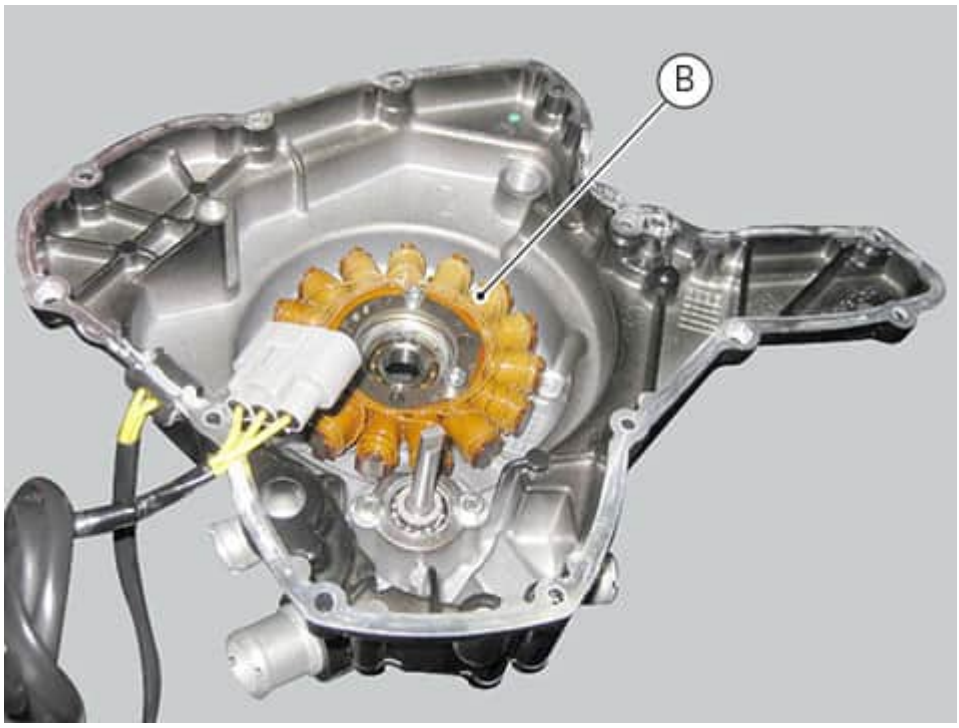
In the above cases the whole generator assembly (rotor and stator) should be replaced.
If checks have a favourable outcome, reconnect the generator to the regulator with ignition key on OFF. Make sure that no cables are damaged or disconnected.

Removing the generator

Drain the coolant (Changing the coolant).
Remove the front sprocket cover (Removing the front sprocket cover).
Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the pump-cylinder hoses (Removing the cylinder/piston assembly).
Remove the pump-water radiator hose (Removing cooling system hoses and unions).

Disconnect the cables of the generator side electric system.
Remove the generator cover, the stator (A) and the rotor (B).

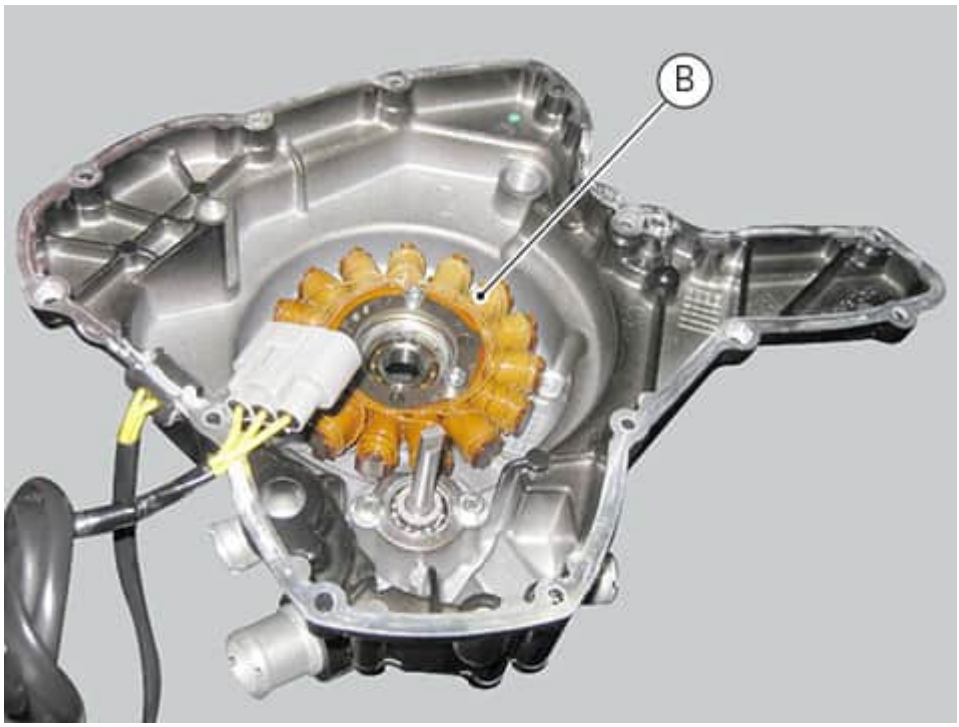




Refitting the generator

Fit the rotor (B), the stator (A) and the generator cover.
Connect the cables of the generator side electric system.





Refit the pump-water radiator hose (Refitting cooling system hoses and unions).
Refit the pump-cylinder hoses (Refitting the cylinder/piston assembly).
Refill the cooling system (Changing the coolant).
Refit the front sprocket cover (Refitting the front sprocket cover).
Refill the lubrication system with engine oil (Changing the coolant).

Battery

Battery safety rules

Warning
Before carrying out any operations on the battery, keep in mind the safety standards. When under charge, batteries produce explosive gases. Keep batteries away from heat sources, sparks or open flames.

Instructions for battery use
The battery is a sealed, maintenance-free type and therefore requires no special installation procedure.

Note
Always keep the battery clean. Apply grease around the battery terminals to prevent corrosion.

Warning
Never remove the valve cover located on top of the cover. If the block, cover or terminals are broken or if the valve cover has been tampered with, IT IS ABSOLUTELY NECESSARY TO REPLACE THE BATTERY.

Important
If the motorcycle is left unused for more than 30 days, remove the battery and store it in a safe, cool place.

Always charge the battery before the first operation and after long storage periods – such as before selling the vehicle.

Removing the battery

Remove the seat (Removing the seat).

Release metallic fastener (11) and the elastic band (12).

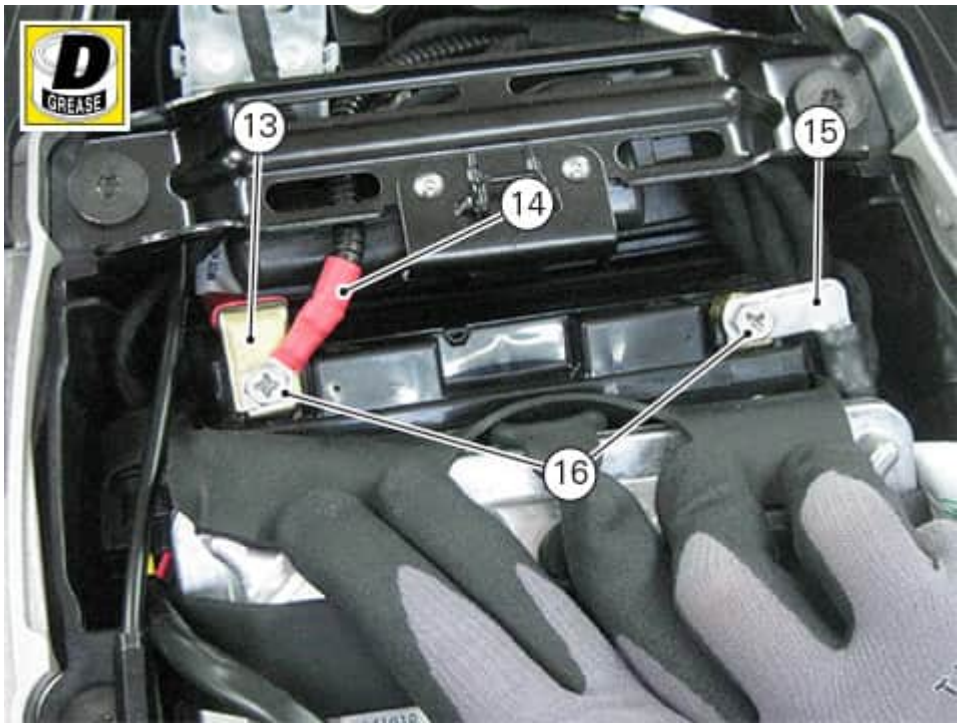


Lift the battery mount assembly without disconnecting the electrical components and fit the battery in its mount. It is recommended to lubricate the side areas of the battery with water and soap to facilitate the sliding on the rubber elements.



Refitting the battery

Refit the battery mount assembly in its seat.
Apply grease around the battery terminals to prevent oxidation.
Connect the battery to the motorcycle terminals to the torque of 10 Nm ±10%.
Duly route cables (13), (14) and (15) as shown in the figure.



Fasten the end part of the elastic band (12) and the metallic fastener (11) one after the other.



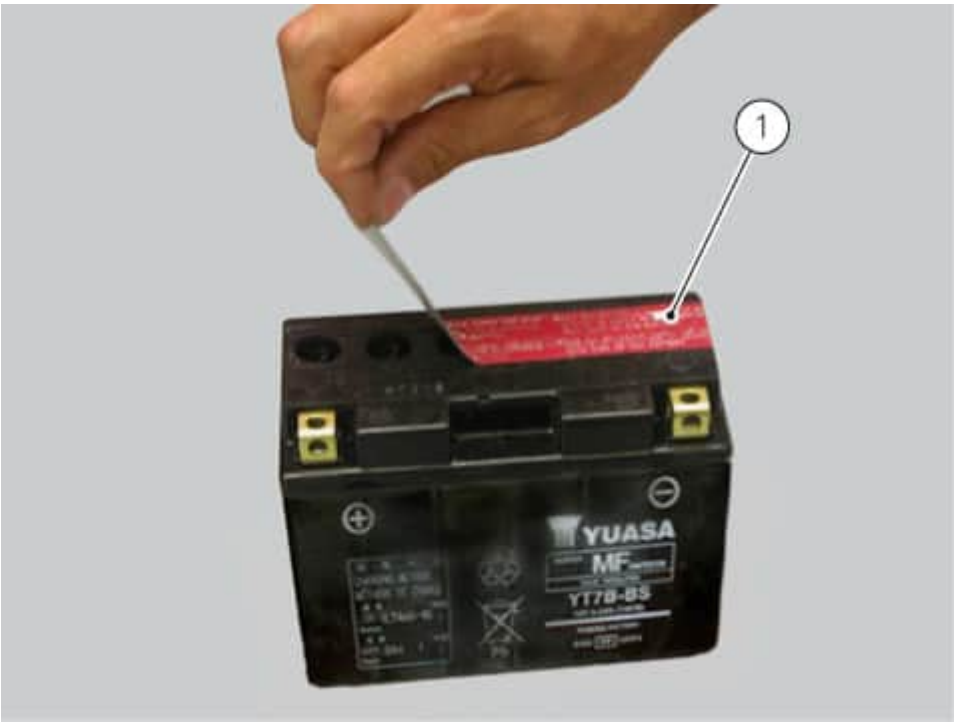
Refit the seat (Refitting the seat).

Topping up the electrolyte

Warning

Before carrying out any operations on the battery, keep in mind the safety standards (General safety rules). The electrolyte in the battery is corrosive and can cause burns if it comes into contact with the skin because it contains sulphuric acid. Wear gloves and, if necessary, protective clothing, a face-mask and goggles when adding electrolyte. If the fluid comes into contact with the skin, wash thoroughly with fresh water. If it comes into contact with the eyes, wash thoroughly with water for 15 minutes and consult an ophthalmologist. In the event of accidental ingestion, drink large quantities of water or milk, and continue with milk of magnesia, a beaten egg or vegetable oil. Do not allow sparks, flames, cigarettes or any other heat source to get near the battery, as it produces explosive gases. When recharging or using the battery indoors, make sure that the room is adequately ventilated. Do not inhale the gases produced during recharging. KEEP OUT OF REACH OF CHILDREN.

Place the battery on a flat surface. Remove the protective film (1).

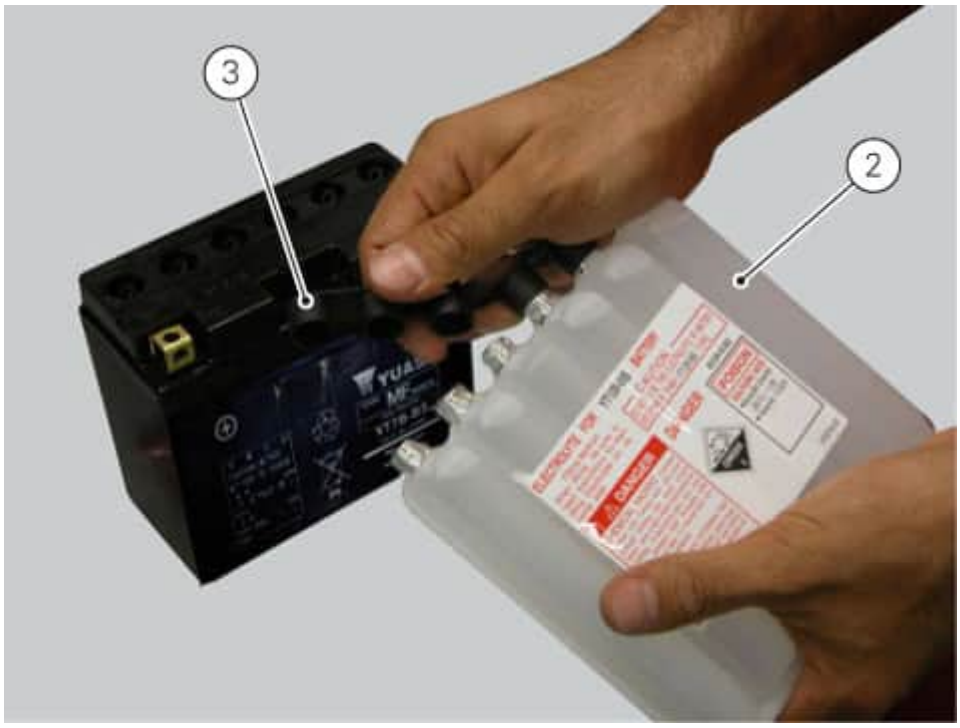


Warning

Make sure that the electrolyte is of the specific type for your battery.

Remove the container with the electrolyte from the plastic bag. Remove the cap strip (3) from the container (2).





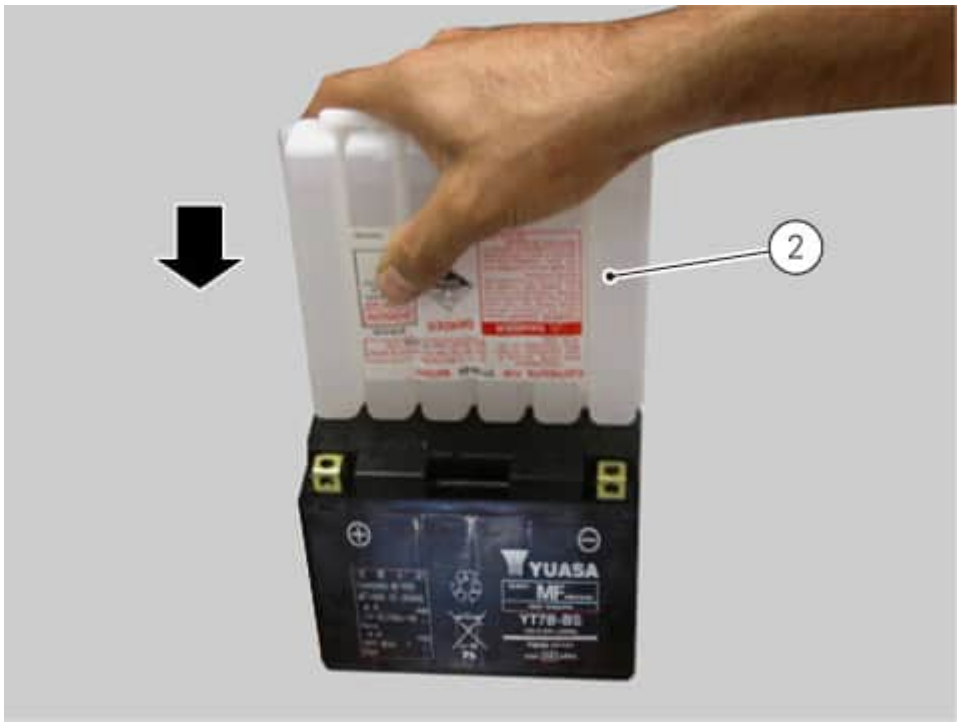
Important

Keep the cap strip (3) to hand because it will be used later to plug the battery cells.

Warning

Do not peel or perforate the sealed areas.

Place the electrolyte container (2) upside down.
Align the six sealed elements with the six filler holes on the battery.
Push the container (2) downwards with sufficient force to break the seals and allow the liquid to flow out.



Note

Do not tilt the electrolyte container as this could interrupt the flow temporarily or even permanently.

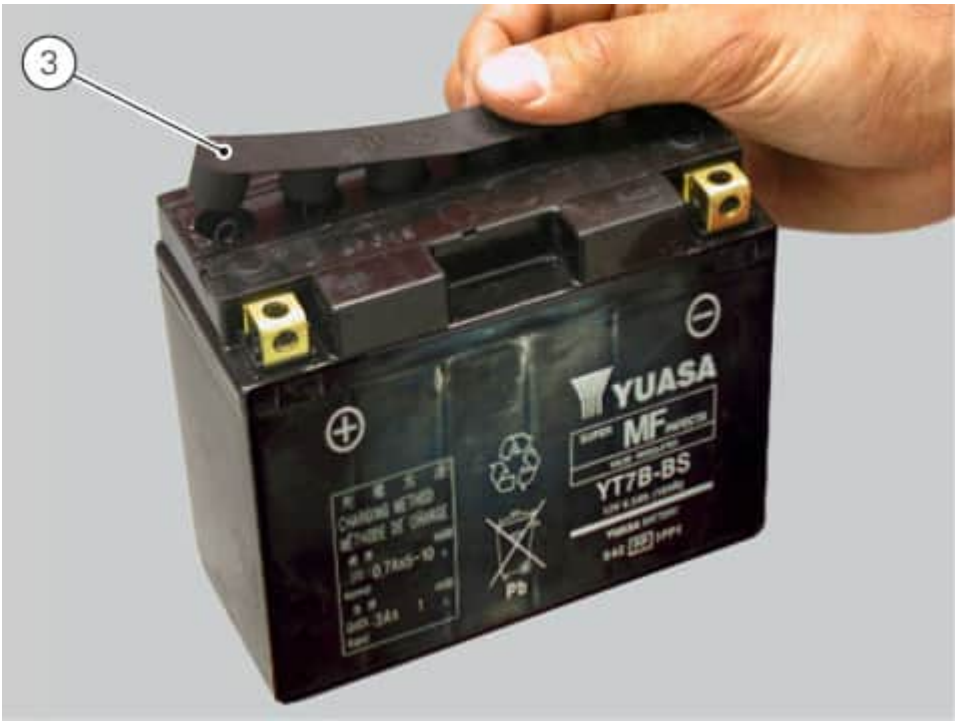
Make sure that air bubbles emerge from all six filler holes. Leave the container in this position for at least twenty minutes.
If no bubbles emerge from one of the holes, tap gently on the bottom of the respective container.



Important

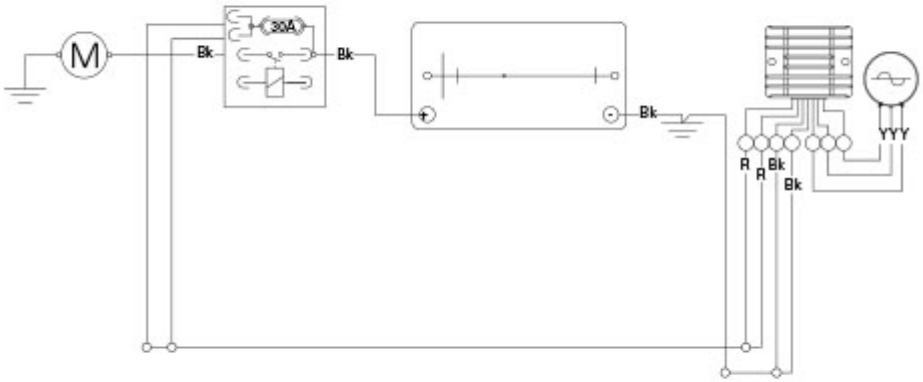
Never move the container away from the battery. Do not cut or puncture the container.

Make sure that all the electrolyte has flowed out. Carefully extract the container (2) from the battery.
Fit the cap strip (3) previously removed from the electrolyte container (2) to the battery, and ensure the caps plug off all filler holes.

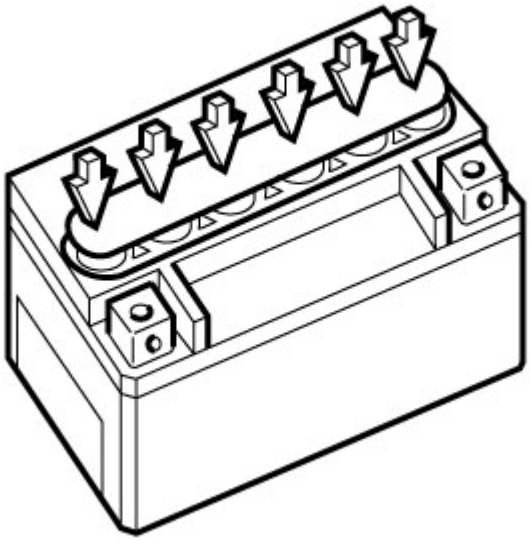


3 -12 Ah batteries: leave to stand for at least 30 min.
Over 12 Ah batteries: leave to stand for at least 1 hour.
Set the cap strip on the filler holes without securing it. Recharge the battery as described in the paragraph "Recharging the battery".

Note
When using an automatic battery charger, ensure that the charger current (ampere) is equal to or higher than the value of the standard charging system (STD) indicated on the battery itself.



Press firmly downwards with both hands until the caps are firmly in place (do not use a hammer).



Recharging the battery

Refer to the label on the battery showing the inspection intervals in order to determine when to test the voltage.



Charge the battery if the open circuit voltage is lower than 12.8 V. Leaving the battery discharged for more than one month could damage it. Check the battery charge with a voltmeter.
Always check the condition of the battery before recharging and 1 to 2 hours afterwards.

Warning

Pay careful attention to recharging times. Stop charging immediately if the battery becomes too hot to the touch. Leave to cool before resuming charging.

Use only constant-voltage battery chargers.
Check that battery terminals are properly connected to the battery charger.
To charge the battery, proceed as follows.

Type of charging	Volt	Ampere (A)	Time (Hours)
Normal	12	1.8	5-10
Fast	12	9	1

Use fast charging in emergencies only.

Storing the battery

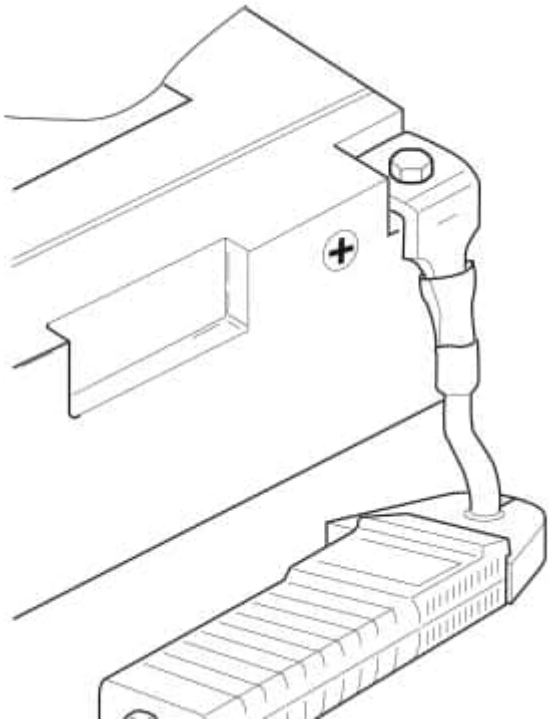
If the battery voltage is less than or equal to 11.5 V, it must be recharged.
Connect the battery charger to the battery.
Use a voltage of 16-17 V.
If the ammeter shows no change, increase the voltage to maximum 25 V.
Charge for 5 minutes.
If the ammeter shows a change, restore a voltage of 16-17 V; otherwise replace the battery.

Checking the battery charging system

To check the current flow in the charging circuit, use the “DDS" diagnosis instrument, which is equipped with clamp-type amperemeter.
With the DDS diagnosis instrument you can determine the engine rpm required for the generator to produce sufficient current to charge the battery, feed the injection/ignition system and all the electrical equipment on the motorcycle.
When applied to a cable, the clamp-type ammeter detects the magnetic field generated by the current passing through that cable.
The tester performs an automatic calibration routine using its own transducer.
If the measured current is a positive quantity, it means that generator is feeding all electric items and charging the battery at the same time. A negative value means that charging system is not powering the loads and a significant amount of current must be supplied by the battery, which is discharging at the time of the measurement.
Alternatively, a multimeter can be used, connect the multimeter probes to the battery terminals, select the DC scale on the multimeter and make sure there are 14.5 V ± 0.5 at an engine speed of 3,000 rpm.

Important

If polarity is reversed when clamping the ammeter onto the cable, the sign of the readings will also be reversed, giving rise to incorrect diagnosis.

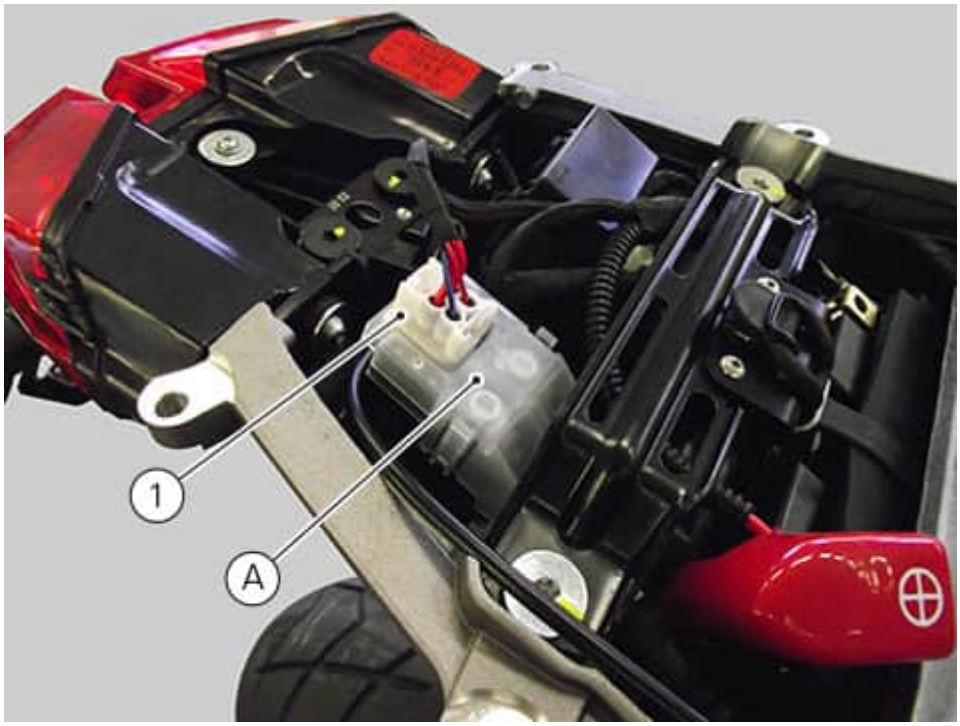


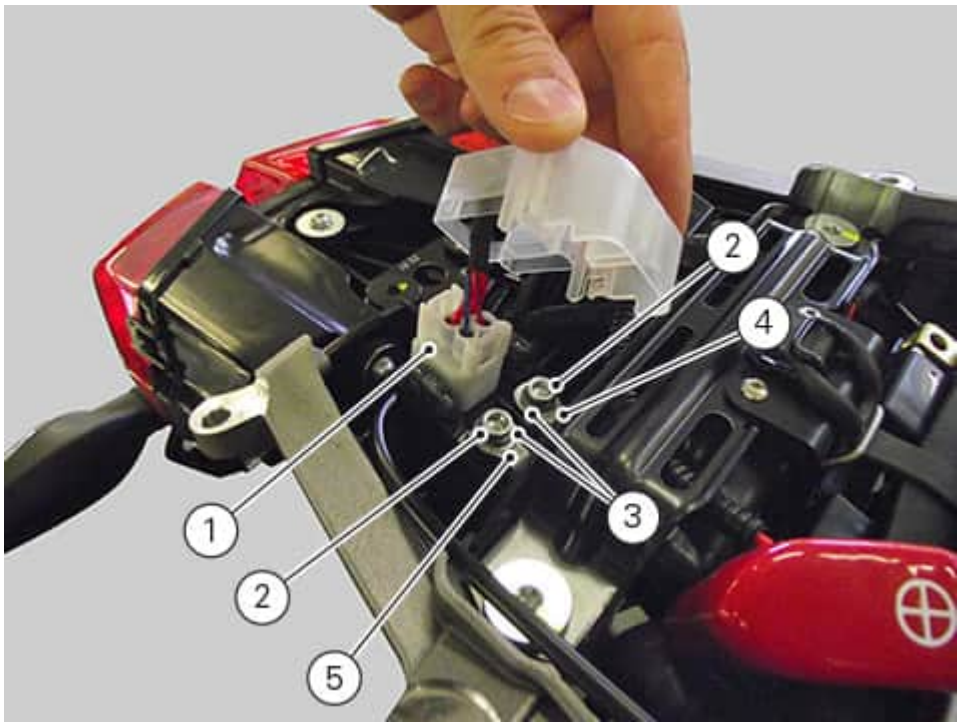
Solenoid starter

The solenoid starter (1) is mounted to the battery mount.

Remove the seat (Removing the seat).
Disconnect the battery (Battery).

Remove the protection cover (A).
Undo the screws (2), taking care to collect the spring washers (3).
Remove the starter motor-solenoid starter cable (4) and the solenoid starter-battery cable (5).
Disconnect the solenoid starter connector (6) from the wiring.



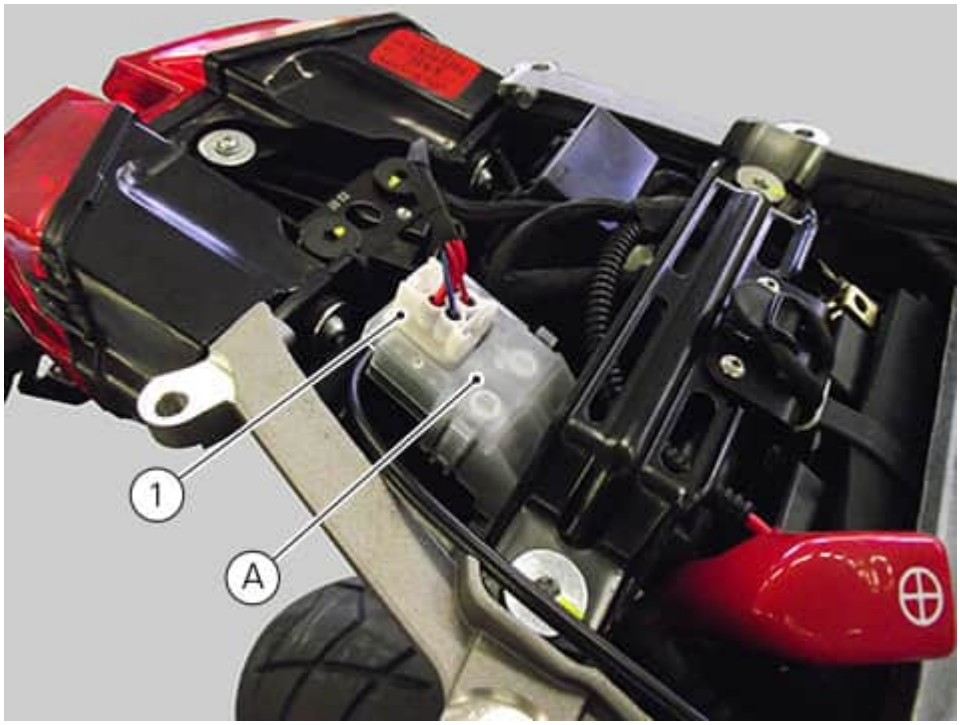


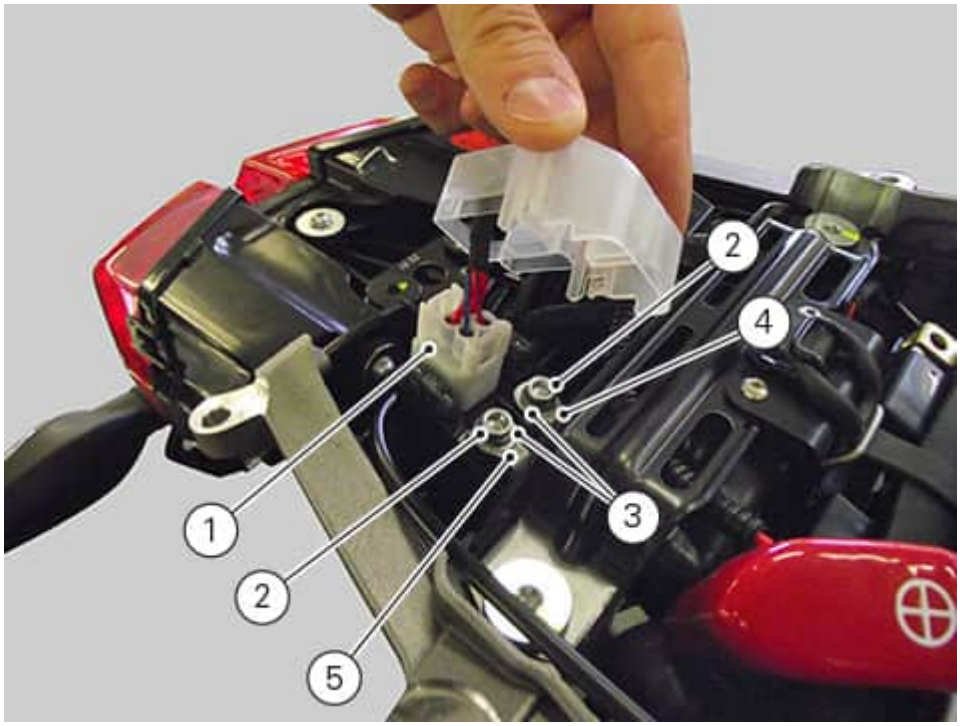
Remove solenoid starter (1) sliding it upwards.

Checking operation of the solenoid starter

To check the solenoid starter refer to section "Starter motor".

Ensure that the terminals are not oxidised and apply water repellent spray.
Position the solenoid starter-starter motor cable (4) and the solenoid starter-battery cable (5) on the solenoid starter terminals.
Start screws (2) with spring washers (3).
Tighten screws (2) to a torque of 4 Nm ± 10%.
Refit the protection cap (A).
Connect the connector (6) of the solenoid starter to the wiring harness and connect the battery (Battery).
Fasten solenoid starter (1) to battery mount by fitting it into tabs (B).

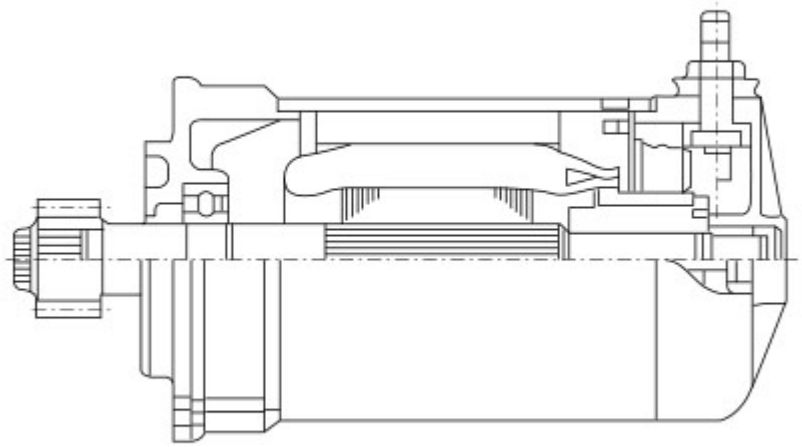




Refit the seat (Refitting the seat).

Starter motor

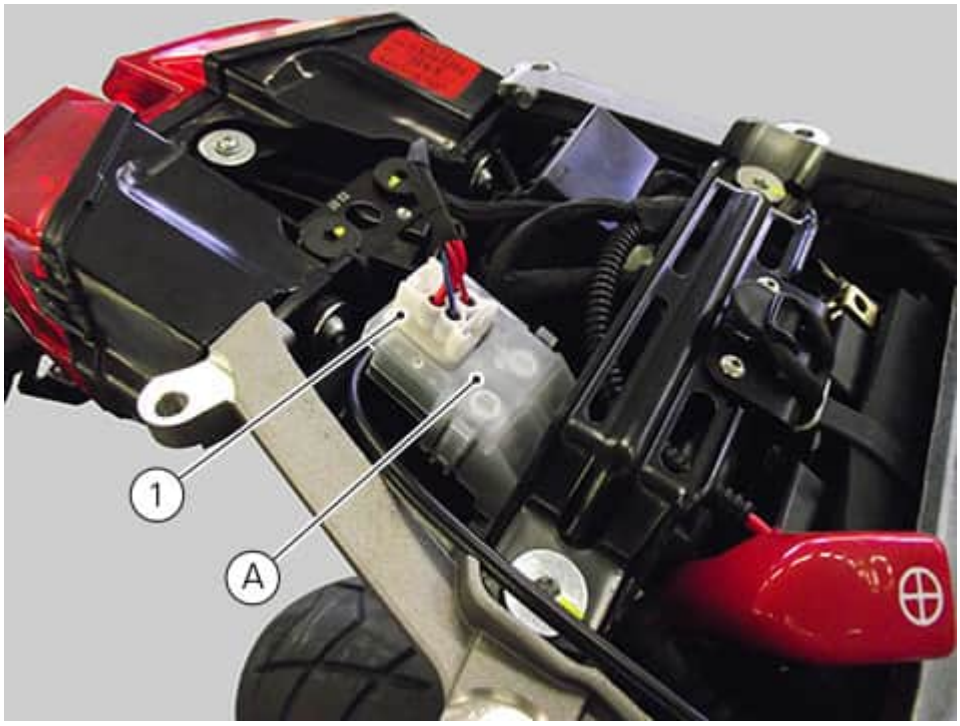
Power: 0.7 kW/12 V.
Direction of rotation:
counter clockwise viewed from power take-off side.

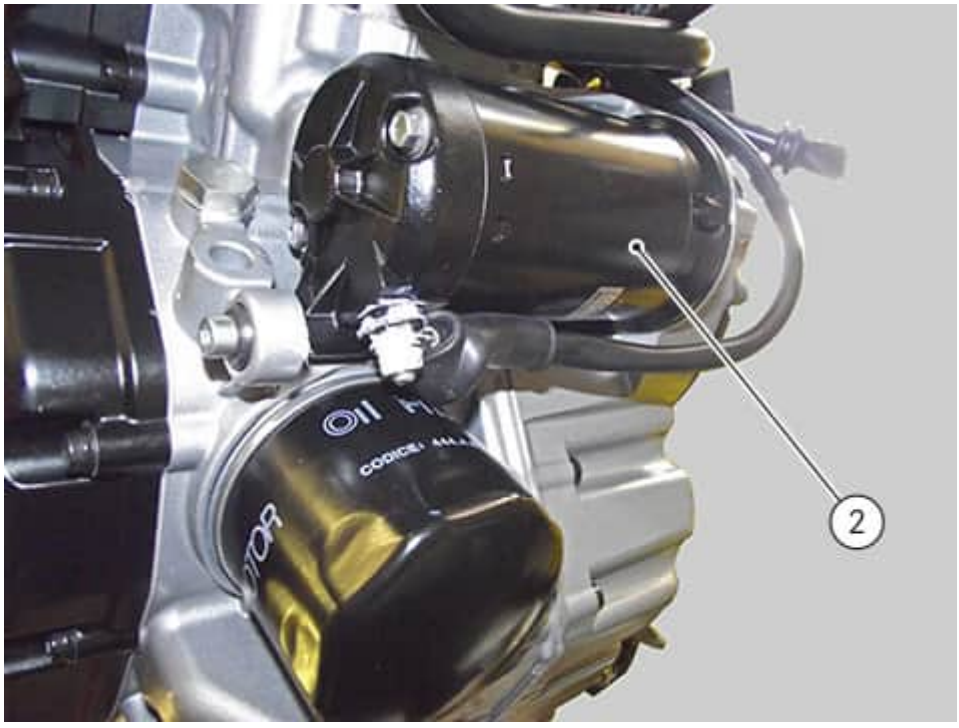


The starter motor is highly compact and reliable, therefore rarely raises any operating issue.
In case of malfunction, ensure that the starter motor wiring terminal is properly tightened under the nut and shows no sign of oxidation. If the terminal is properly tightened and free from oxidation, remove the starter motor and test it under no-load conditions (no load applied to the shaft).
Secure the starter motor to a test bench, making sure not to damage the casing.
Use a fully charged 12 V battery for the test.
Use battery-motor connection cables which are no longer than 70 cm and with the same cross-section as the cable on the motorcycle itself.
Connect the negative terminal of the battery to an unpainted area of the starter motor casing and the positive terminal to its electrical terminal. The shaft of the starter motor should rotate freely and at a high speed. Take care not to short-circuit the two cables connected to the battery.

Electric starting system

The key components of the electric starting system are a solenoid (1) and a starter motor (2) fed by the battery.





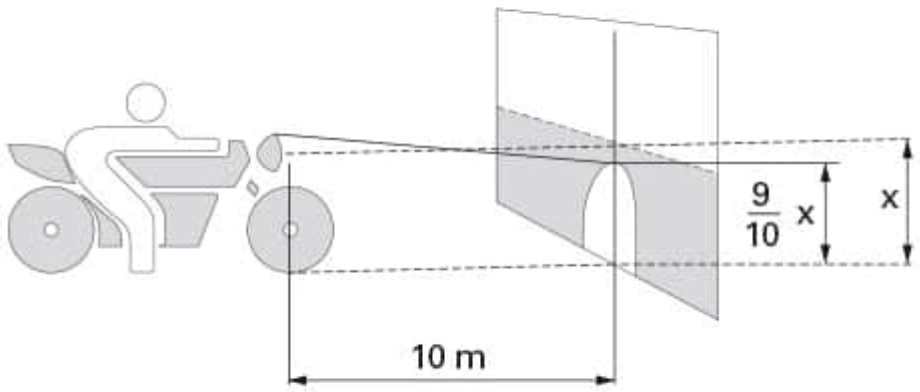
Aligning the headlight

The motorcycle must be perfectly upright with the tires inflated to the correct pressure and with a rider seated, perfectly perpendicular to the longitudinal axis.
Position the motorcycle 10 metres from a wall or a screen.
On the wall or surface, draw a horizontal line at the same height from the ground as the centre of the headlight and a vertical line aligned with the longitudinal axis of the motorcycle.

Note
If possible, perform this check in dim light.

Switch on the low beam. The height of the upper limit between the dark area and the lit area must not be more than 9/10 of the height from the ground of the headlight centre.

Note
This is the procedure specified by Italian regulations for checking the maximum height of the light beam. Please adapt said procedure to the provisions in force in your own country.



To horizontally align the headlight beam, turn the adjusting screw (1).
To vertically align the headlight beam, turn the adjusting screw (2).


1


2

Changing bulbs

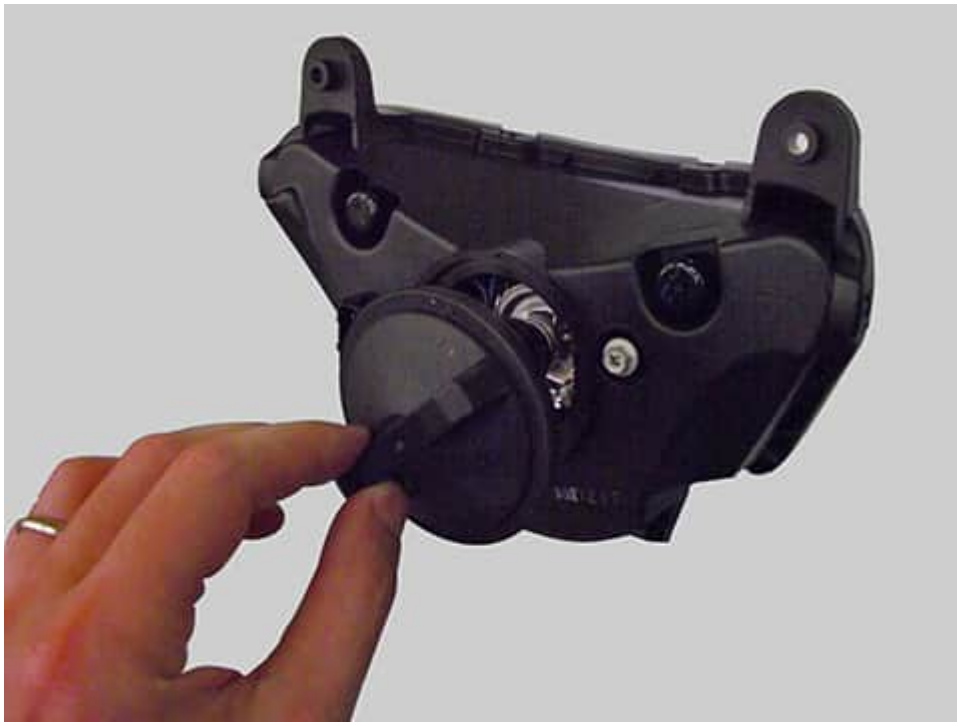
Changing the headlight bulbs

Before replacing a burnt out bulb, ensure that the replacement bulb has the same voltage and power rating as specified for the concerned lighting device (Lights/instrument panel).

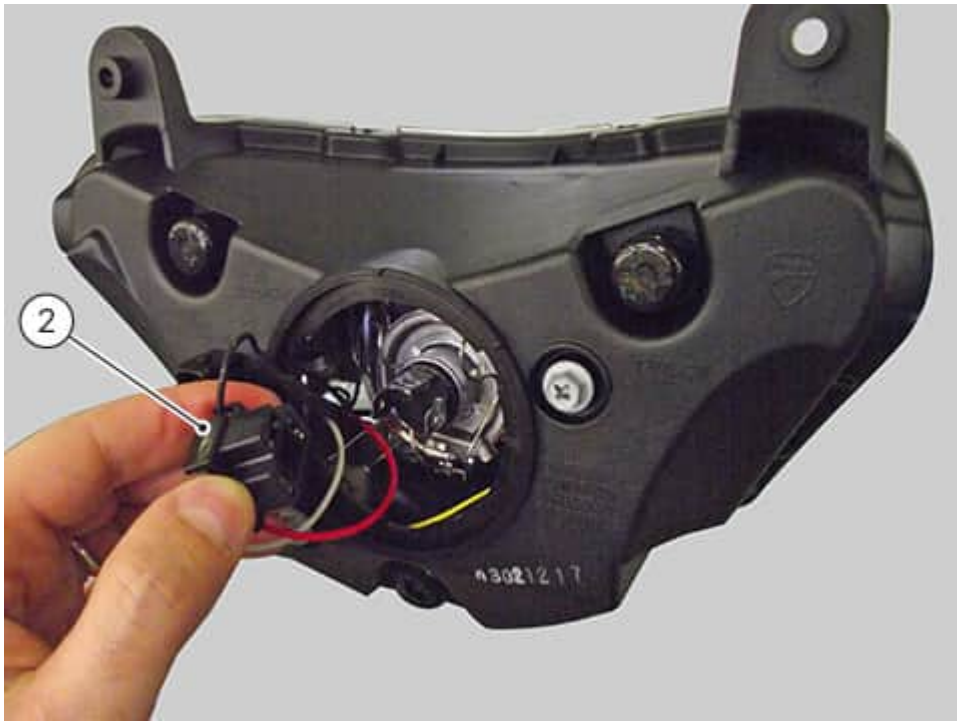
Warning
The halogen light bulbs in the headlight become hot when switched on and remain hot for some time after they are switched off. Allow bulbs to cool before replacing them.

Remove headlight fairing to reach the high and low beam bulbs remove headlight fairing (Removing the headlight fairing).

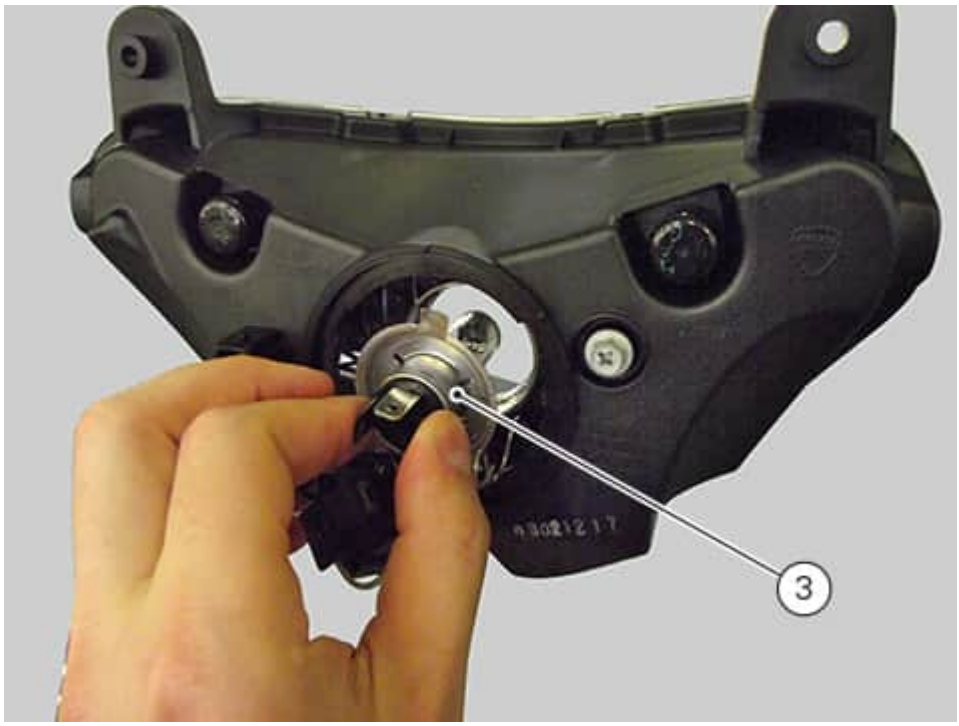
Loosen the bulb (1) cover.



Disconnect the connector (2).



Turn the high and low beam bulbs (3) anticlockwise, remove them from their seat and replace the burnt-out bulbs.



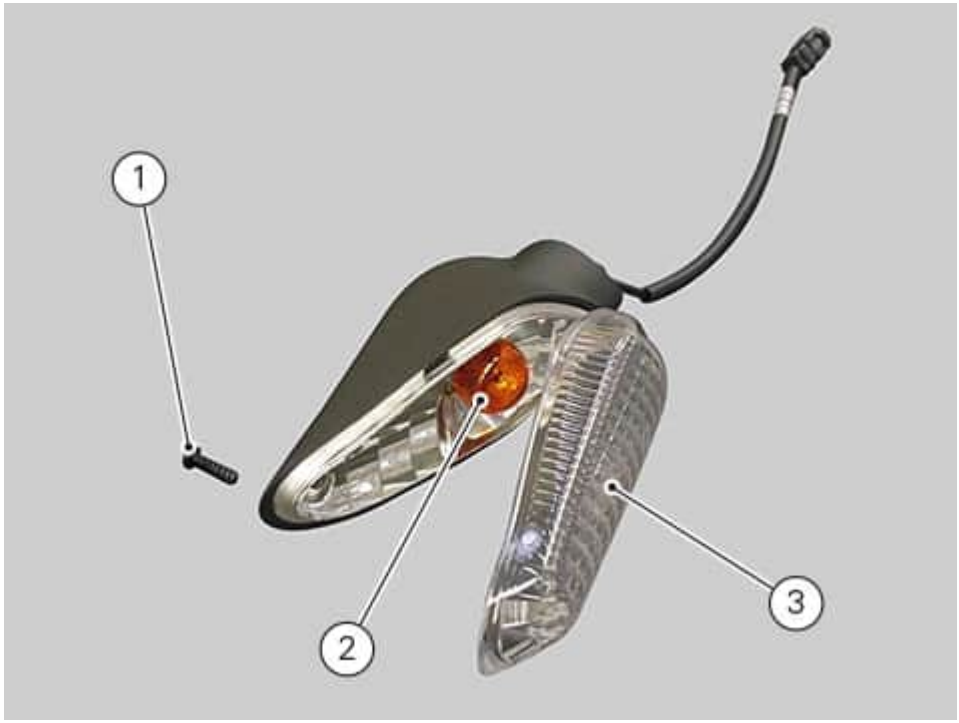
Note

Do not touch the transparent part of the new bulb with the hands. This would cause it to blacken thereby reducing bulb brilliancy.

Refit the removed components.

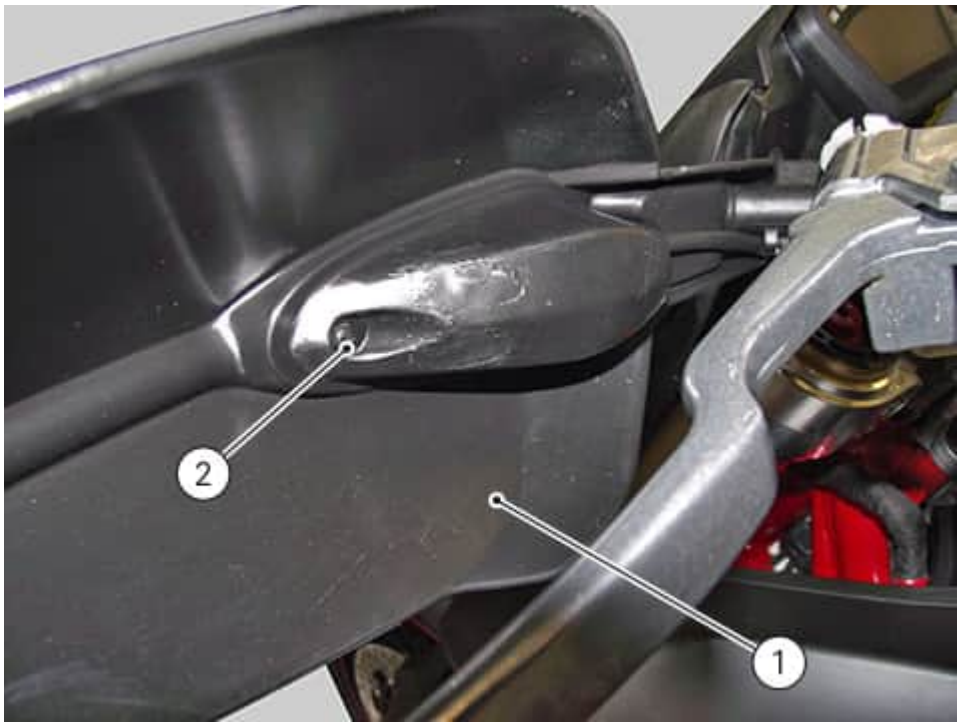
Changing the rear turn indicator light bulbs

Undo the screw (1) and detach the lens (3) from the turn indicator support.
Remove the bulb (2) by sliding it out. Then fit the new one by pressing and turning clockwise until it clicks into its seat.
Refit the lens by inserting the tab in the corresponding slot in the turn indicator support.
Tighten the screw (1).



Changing the front turn indicator light bulbs

Loosen screw (2) of hand guards (1).
Remove the bulb by sliding it out. Then fit the new one by pressing and turning clockwise until it clicks into its seat.



Changing the number plate light bulb

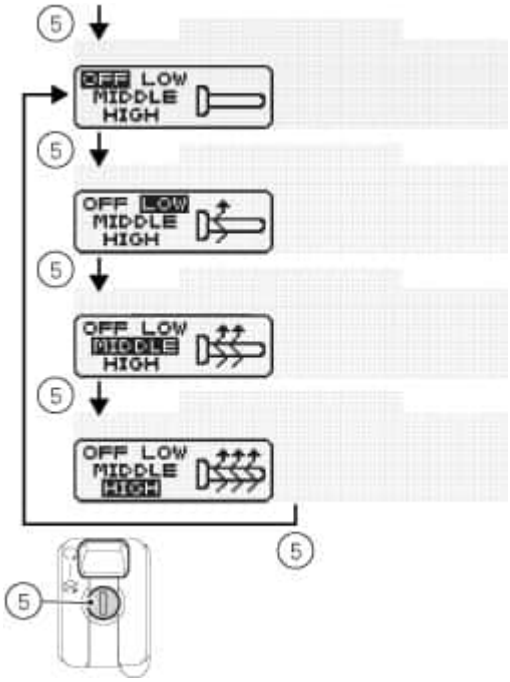
To reach the number plate light bulb (2), open the number plate light lens (1), pull the bulb out of the holder and replace it.



Other functions

Heated handgrips (Accessory) control function

This function allows enabling and adjusting the heated handgrips. To enable the "H.GRIPS" control menu for the heated handgrips, press button (5) on the RH switch. The control button (5) (Start button) controls the heated handgrips only when the engine is running. Once the menu is activated, press the same button several times to select the desired indication (OFF, LOW, MEDIUM and HIGH). If OFF is highlighted, the handgrips heating is off; select LOW to activate heating at minimum level; select MEDIUM to activate heating at intermediate level; select HIGH to activate heating at maximum level.



Select the desired setting then leave button (5) undisturbed; after 3 seconds with no controls, the instrument panel automatically quits the indication and maintains the last stored condition.

Note

The heated handgrips actually activate, i.e. produce heat, only with engine on and rpm above 2000.
If the handgrips are activated and then the engine is turned off, they will be temporarily disabled. Heating will automatically be reactivated when engine is started again.

Attention

Handgrip heating involves a high current absorption that might discharge the battery at low rpm.

If the battery is not sufficiently charged (voltage below 11.0 Volt) the handgrip heating is disabled to save the starting capacity; they reactivate automatically when the battery voltage exceeds the indicated value.

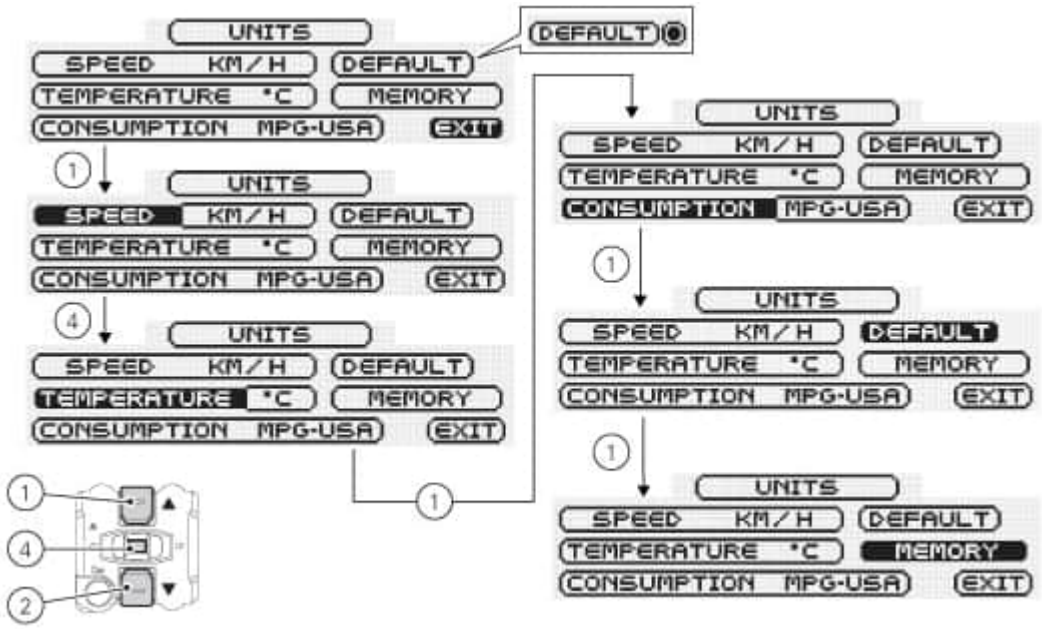
Warning

When using the heated handgrips at ambient temperature above 15° ÷ 20° C, a heat reduction is automatically enabled (according to the external temperature) to protect the handgrips from damages due to excessive heat.

Setting the Unit of Measurement (UNITS)

This function allows changing the units of measurement of the displayed values.
To display the function, enter the setting menu and access the "UNITS" page.
Instrument panel displays the values that can be changed (Speed, Temperature or Consumption); use buttons (1) and (2) to select the value you wish to change, and press button (4) again.

Note
When the current settings are the default ones, on the "DEFAULT" indication right side the display shows a symbol (a circle with a dot).



(SPEED) setting

This function allows you to change the units of measurement of the indications: Vehicle speed, Odometer, Trip 1, Trip2, Trip Fuel (when active) and Average Speed.
Once "SPEED" is selected, press button (4).
Then, the instrument panel will highlight the unit of measurement currently in use. Press button (1) or (2) to scroll among the available units of measurement (Km/h and mph). Once the units of measurements to be set have been selected, press button (4) again. The instrument panel automatically highlights the "MEMORY" item; to actually save the new unit of measurement, keep button (4) pressed for 3 seconds.
After 3 seconds, the instrument panel displays "MEMORIZED" for 2 seconds to confirm that the new setting is active.
"EXIT" will be automatically highlighted; press button (4) to quit and go back to the setting menu.

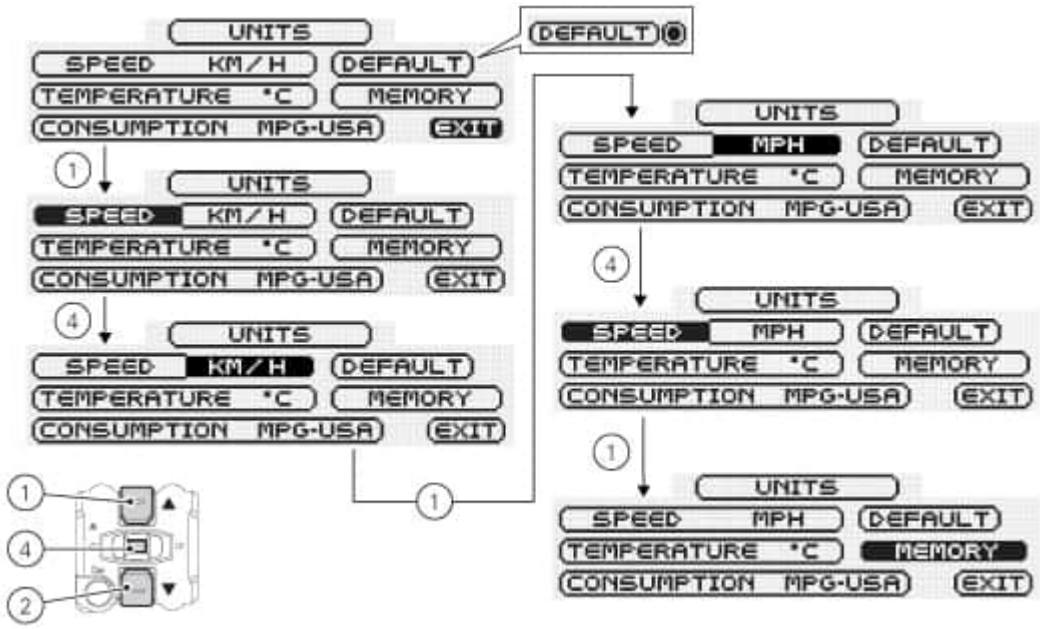
KM/H: if this unit is set, the following values will have the same units of measurement:

- TOT, TRIP1, TRIP2, TRIP FUEL: Km
- Vehicle speed and SPEED AVG: Km/h

MPH: if this unit is set, the following values will have the same units of measurement:

- TOT, TRIP1, TRIP2, TRIP FUEL: miles
- Vehicle speed and SPEED AVG: mph

Note
When the current settings are the default ones, on the "DEFAULT" indication right side the display shows a symbol (a circle with a dot).



(TEMPERATURE) setting

This function allows you to change the units of measurement of the indications: Engine coolant temperature and Air Temperature.
Once "TEMPERATURE" is selected, press button (4). Then, the instrument panel will highlight the unit of measurement currently in use.
Press button (1) or (2) to scroll among the available units of measurement (°C and °F). Once the units of measurements to be set have been selected, press button (4) again.
The instrument panel automatically highlights "MEMORY"; to actually memorise the new unit of measurement, press button (4) for 3 seconds; then the instrument panel will show "MEMORIZED" for 2 seconds to confirm the actual change.
"EXIT" will be automatically highlighted; press button (4) to quit and go back to the setting menu.

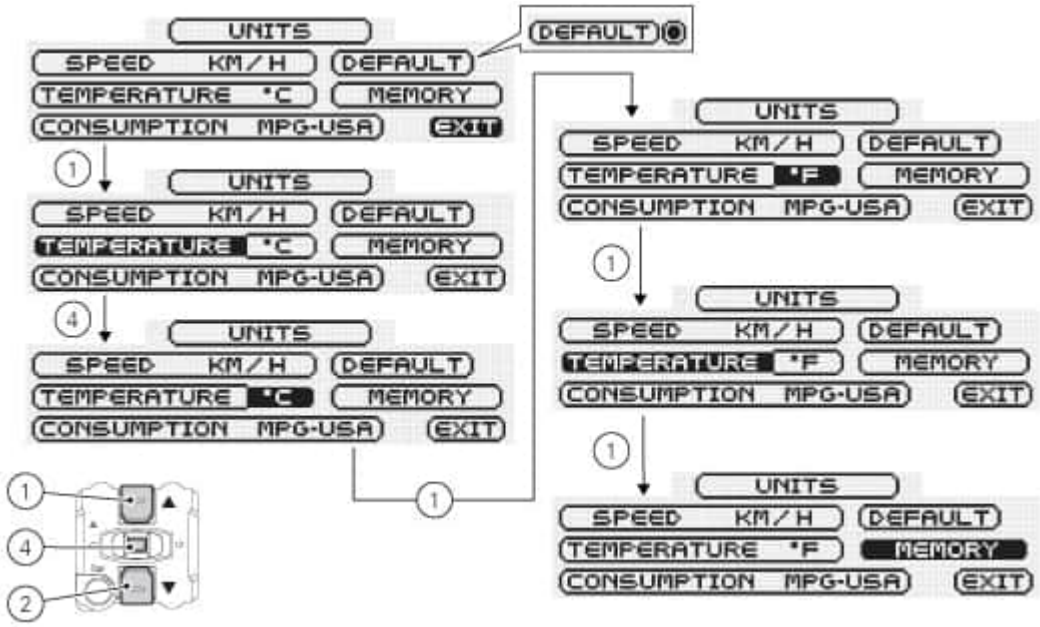
°C: if this unit is set, the following values will have the same units of measurement:

- Engine coolant temperature and T_AIR: °C

°F: if this unit is set, the following values will have the same units of measurement:

- Engine coolant temperature and T_AIR: °F

Note
When the current settings are the default ones, on the "DEFAULT" indication right side the display shows a symbol (a circle with a dot).



(CONSUMPTION) setting

This function allows you to change the units of measurement of the indications: Average fuel consumption and Instantaneous fuel consumption.
Once "CONSUMPTION" is selected, press button (4). Then, the instrument panel will highlight the unit of measurement currently in use. Press button (1) or (2) to scroll among the available units of measurement (L/100, KM/L, MPG-UK and MPG-USA).
Once the units of measurements to be set have been selected, press button (4) again. The instrument panel automatically highlights "MEMORY"; to actually memorise the new unit of measurement, press button (4) for 3 seconds; then the instrument panel will show "MEMORIZED" for 2 seconds to confirm the actual change. "EXIT" will be automatically highlighted; press button (4) to quit and go back to the setting menu.

Km/L: if this unit is set, the following values will have the same units of measurement:

- CONS. and CONS AVG: Km/l

l/100: if this unit is set, the following values will have the same units of measurement:

- CONS. and CONS AVG: l/100

UK MPG: if this unit is set, the following values will have the same units of measurement:

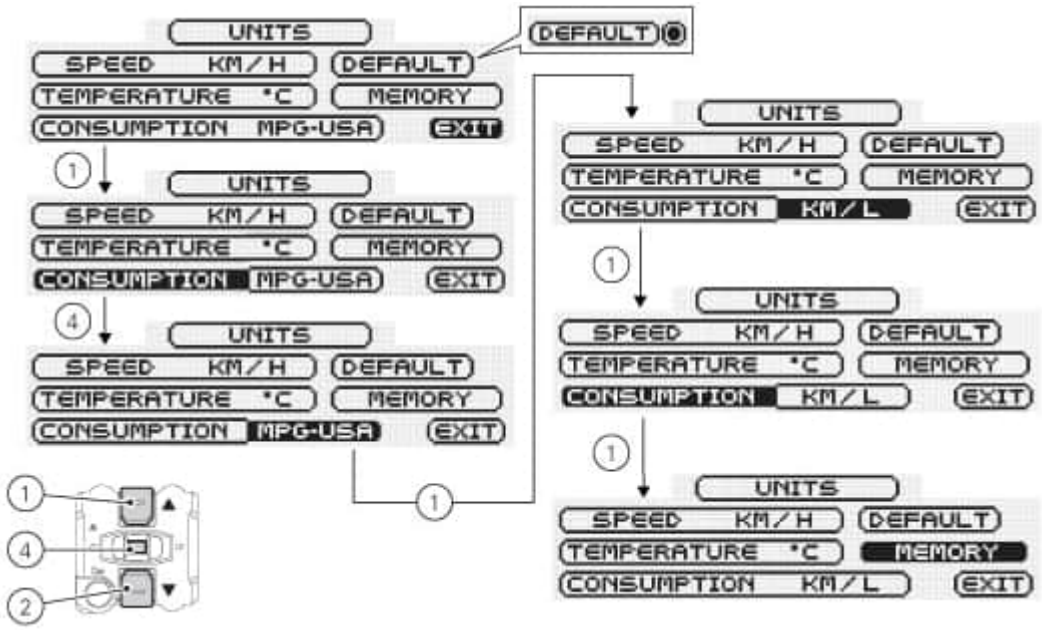
- CONS. and CONS AVG: UK mpgal

USA MPG: if this unit is set, the following values will have the same units of measurement:

- CONS. and CONS AVG: USA mpgal

Note

When the current settings are the default ones, on the "DEFAULT" indication right side the display shows a symbol (a circle with a dot).

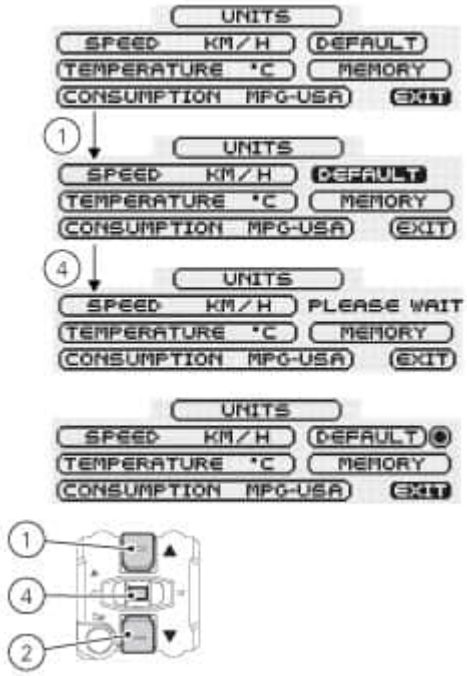


(DEFAULT) setting

This function allows setting the "DEFAULT" units of measurement according to the vehicle version. Once selected, use buttons (1) and (2) to select "DEFAULT" and keep button (4) pressed for 3 seconds. Now, instead of "DEFAULT", the indication "PLEASE WAIT" will be displayed for 3 seconds to indicate that the instrument panel is resetting the default units of measurement.
After 3 seconds all indicated units of measurement are updated and "EXIT" will be automatically highlighted; press button (4) to quit and go back to the setting menu.

Note

When the current settings are the default ones, on the "DEFAULT" indication right side the display shows a symbol (a circle with a dot).



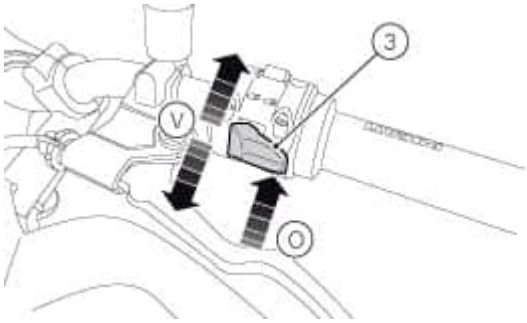
DEFAULT according to the vehicle versions

	TOT, TRIP1, TRIP2 TRIP FUEL	SPEED AVERAGE SPEED	T_ENGINE T_AIR	INSTANTANEOUS FUEL CONSUMPTION AVERAGE FUEL CONSUMPTION
Europe	Km	km/h	°C	l/100km
UK	miles	mph	°C	mpg UK
USA	miles	mph	°F	mpg USA
Canada	km	km/h	°C	l/100km
France	km	km/h	°C	l/100km
Japan	km	km/h	°C	l/100km
Brazil	km	km/h	°C	l/100km
Taiwan	km	km/h	°C	l/100km
China	km	km/h	°C	l/100km

Light control

Headlight control

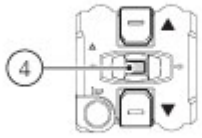
This function allows you to reduce current consumption from the battery, by automatically managing headlight switching-off.
Upon Key-On, low and high beams are Off. By starting the engine, the low beam will be automatically activated; from now on, the "standard" operation will become active, i.e. it will be possible to switch from low to high beam by pressing button (3) in position (V) or use the "FLASH" function by pressing button (3) in position (O). If engine is not started upon key-on, it is anyway possible to switch the lights on by pushing the button on the LH high/low beam switch: button (3) in position (V).
The low beam lights are turned on the first time it is pressed; from this moment, the same button can be used to switch on (and off) the high beam light: if the engine is not started within 60 seconds, the low beam and high beam that were turned on will turn off.



If the headlight was turned on before starting the engine with the procedure described above, the headlight turns off automatically when starting the vehicle and will turn ON again when the engine has been completely started.

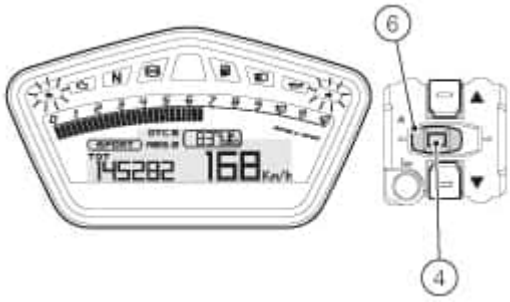
Turn indicators (Automatic Reset)

Turn indicators are automatically reset by the instrument panel.
After activating one of the two turn indicators, user can reset them using the reset button (4). If turn indicator is not manually "reset", instrument panel will automatically disable the turn indicator after having travelled 500 m (0.3 miles) since it was activated.
The counter for the distance travelled for automatic deactivation is activated at speeds below 80 Km/h (50 mph).
If the calculation of the distance for automatic deactivation is activated and then the motorcycle exceeds a speed of 80 km/h (50 mph), the calculation is interrupted and will restart when the speed returns below the indicated threshold.



Hazard

All turn indicators can be turned on together (Hazard function) as emergency indicator.
To activate the Hazard function (i.e., all 4 turn indicators) you must hold for 3 seconds the switch that normally activates the left turn indicator (button (4) in position (6)).
The Hazard function can only be activated with Key-On (not with Key-Off).
When the Hazard function is active, both warning lights (7) on the instrument panel will flash at the same time.
To disable the Hazard function, i.e. switch off the 4 turn indicators, just press once the button that normally activates the left turn indicator (button (4) in position (6)) or press the turn indicator cancel button (button (4) in central position).
The Hazard function can also be disabled with Key-Off: just press the switch that normally activates the left turn indicator once (button (4) in position (6)).

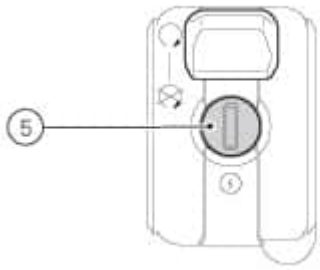


As soon as the Hazard function is activated, the 4 turn indicators will stay on even if rider turns the key-Off. They will turn off automatically after 120 minutes (2 hours), unless the rider "manually" turns them off earlier thereby stopping the automatic countdown.

Operation

Every time you turn the key from ON to OFF, the protection system activates the engine block.
When the ignition key is turned back to ON to start the engine, the following happens:

1 if the code is recognised, the immobilizer enables engine ignition. Press the START button (5), to start the engine;
2 if the code is not acknowledged, the instrument panel automatically activates the function to enter the PIN code. Refer to the PIN entering procedure for vehicle release. If also in this case you are not able to start the engine, contact an authorised Ducati service centre.



Warning

Strong impacts could damage the electronic components inside the key. During the procedure always use the same key. Using different keys may prevent the system from acknowledging the code of the inserted key.

PIN CODE entering function for overriding purposes

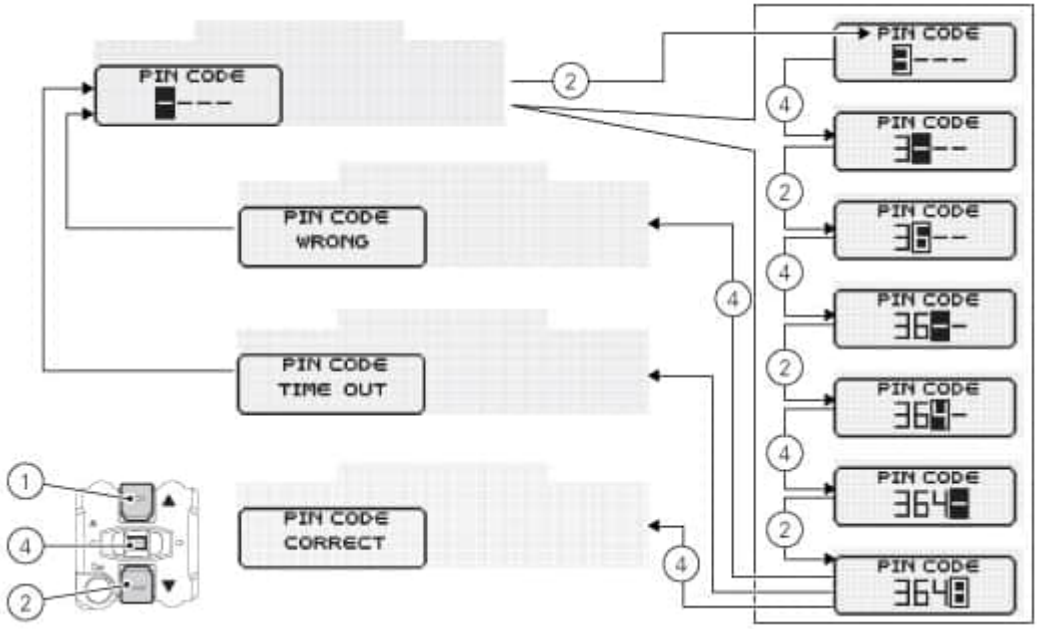
This function allows starting the vehicle temporarily in case of an engine failed operation due to a malfunction of the Immobilizer System.
If upon Key-On there is an ERROR concerning the Immobilizer, the instrument panel automatically activates the function to enter the PIN code.

Entering the code:

- Each time button (2) is pressed, the highlighted number increases from 0 to 9 and then goes back to 0; to confirm the desired number press button (4);
- Repeat the procedure until entering the fourth digit.
- Press button (4) again to confirm.

If the code is incorrect, the instrument panel will show "WRONG" for 2 seconds and return to the initial indication in order to enter the code again.
It the code is correct, the instrument panel will show "CORRECT" for 2 seconds.
After 2 seconds, the instrument panel will return to the "normal" view (with all indications active).

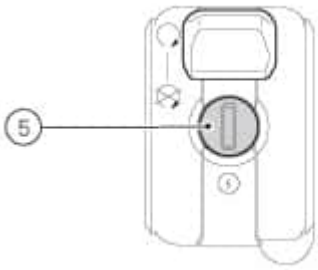
Note
There is no limit to the number of times the code can be re-entered; the instrument panel will turn off automatically 120 seconds after any attempt to enter the code by indicating "TIME OUT" for 2 seconds and then it will show the main screen.



From this moment, the vehicle can be started using button (5).

Note
The vehicle can be started until a Key-Off is performed. If the problem still persists upon the next starting attempt, repeat the procedure from the beginning in order to start the motorcycle "temporarily" again.

Important
If this procedure is necessary in order to start the vehicle, contact an Authorized Ducati Service Center as soon as possible to fix the problem.


5

Keys

The motorcycle comes with 2 (BLACK) keys.
They contain the "Immobilizer system code".

The black keys are those for the standard use, i.e. to:

- start the engine;
- open the fuel tank plug;
- open the seat lock.

Warning

Separate the keys and use only one of the two black keys to ride the bike.

Immobilizer code (PIN CODE)

This function makes it possible to temporarily turn on the motorcycle if the Immobilizer system is not working.

Note

The PIN CODE function must be activated by the user by entering your 4-digit PIN in the instrument panel, otherwise the motorcycle cannot be started temporarily in the case of a malfunction.

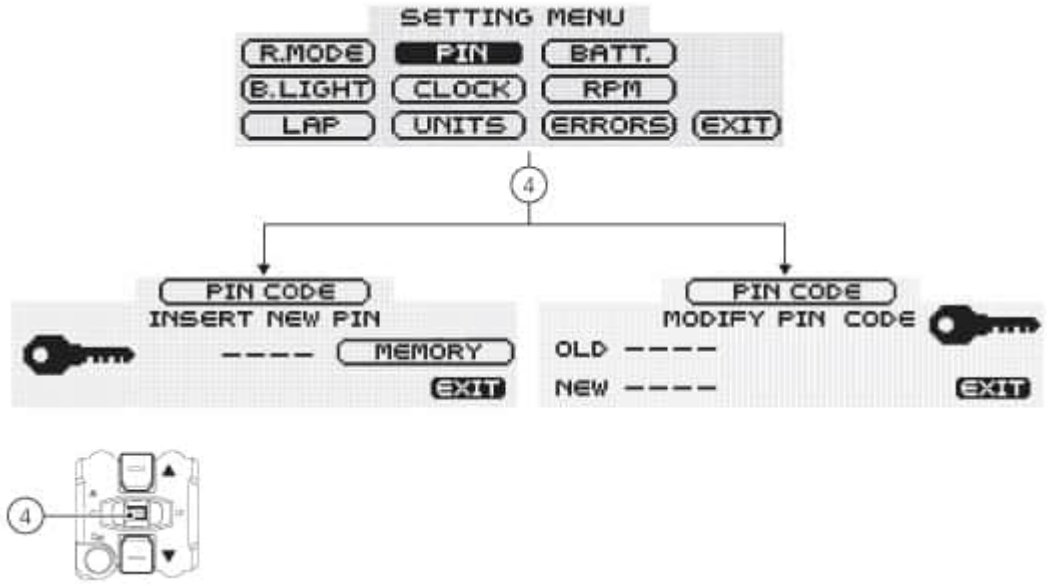
To display the function, enter the "setting" menu and access the "PIN" page by pressing button (4).

- If the PIN CODE has not yet been entered, the PIN activation function (INSERT NEW PIN) will be displayed.
- If the PIN CODE has been entered, the PIN modification function (MODIFY PIN CODE) will be displayed.

In order to temporarily start the motorcycle in case of malfunction of the Immobilizer system, please refer to the "PIN entering for vehicle release" function.

Warning

The motorcycle owner must activate (store) the PIN code; if there is already a stored PIN, contact an Authorised Ducati Dealer to have the function "reset". To perform this procedure, the Authorised Ducati Dealer may ask you to demonstrate that you are the owner of the motorcycle.



PIN activation

This function allows activating your PIN CODE to be used to start the vehicle in case of Immobilizer System malfunction.
To display the function, enter the setting menu and access the "PIN" page.

Note

If "MODIFY PIN CODE" appears when accessing this function, this means that there is already a stored PIN and therefore the function is already active.

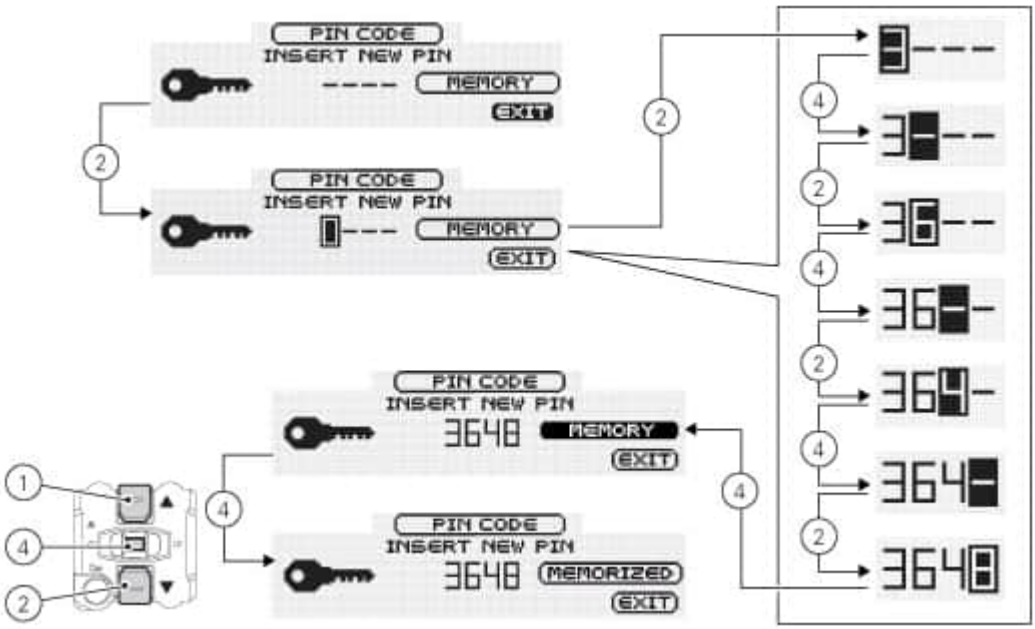
When entering the function, the display shows the message "INSERT NEW PIN" followed by four dashes "- - - -". now enter a 4 digit code.

Entering the code:

- Each time button (2) is pressed, the highlighted number increases from 0 to 9 and then goes back to 0; to confirm the desired number press button (4);
- Repeat the procedure until entering the fourth digit.
- Press button (4) again to confirm.

After entering the code, the "MEMORY" item will be highlighted automatically.

To memorize the entered PIN, keep button (4) pressed for 3 seconds.
"MEMORIZED" will be displayed to confirm that the PIN was correctly memorised.
From this moment, "MODIFY PIN CODE" will be displayed when accessing the "PIN CODE" function and the PIN can be changed again.



Changing the PIN CODE

This function allows changing your own 4-digit PIN CODE.
To display the function, enter the setting menu and access the "PIN" page.

Note

If, when accessing this function, "INSERT NEW PIN" and a string of dashes "- - -" are displayed, function is not active as PIN CODE has never been entered. Enter your PIN code with the "PIN enabling" function.

When entering the function, the display shows "MODIFY PIN CODE"; press button (1) or (2) to modify the PIN.

Note

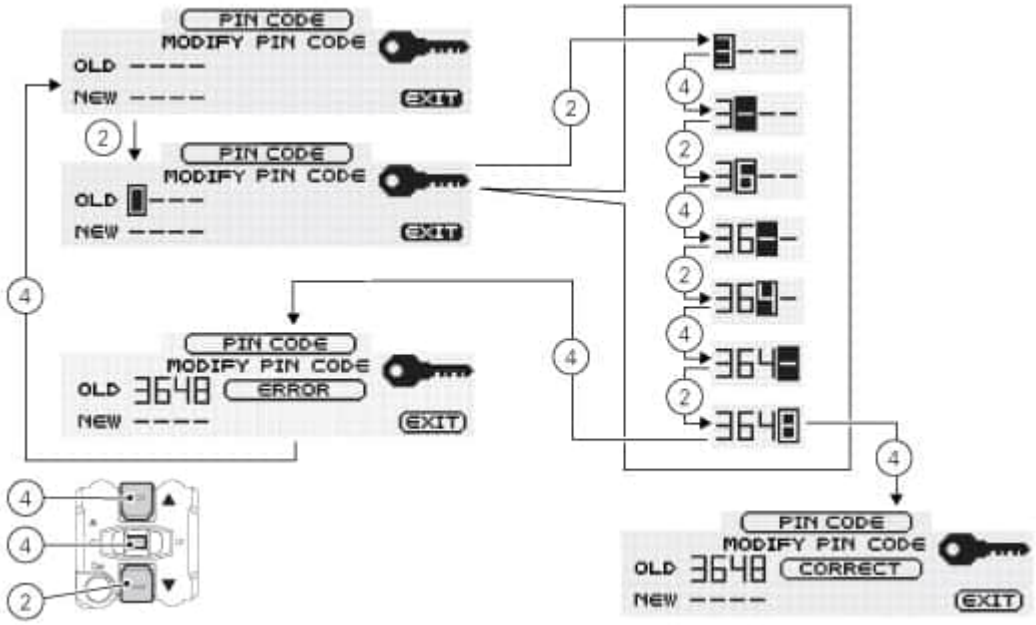
To change the PIN code, you must remember the already stored PIN.

"OLD" and four dashes "- - - -" will appear on the display; now enter the old 4-digit code previously stored.

Entering the OLD PIN:

- Each time button (2) is pressed, the highlighted number increases from 0 to 9 and then goes back to 0; to confirm the desired number press button (4);
- Repeat the procedure until entering the fourth digit.
- Press button (4) again to confirm.

If the code is not correct, "ERROR" (wrong old code) will appear for 3 seconds and then the instrument panel will display "EXIT" again.
If code has been correctly entered, "CORRECT" will appear on the display and the first dash where entering the new 4-digit code will be displayed.



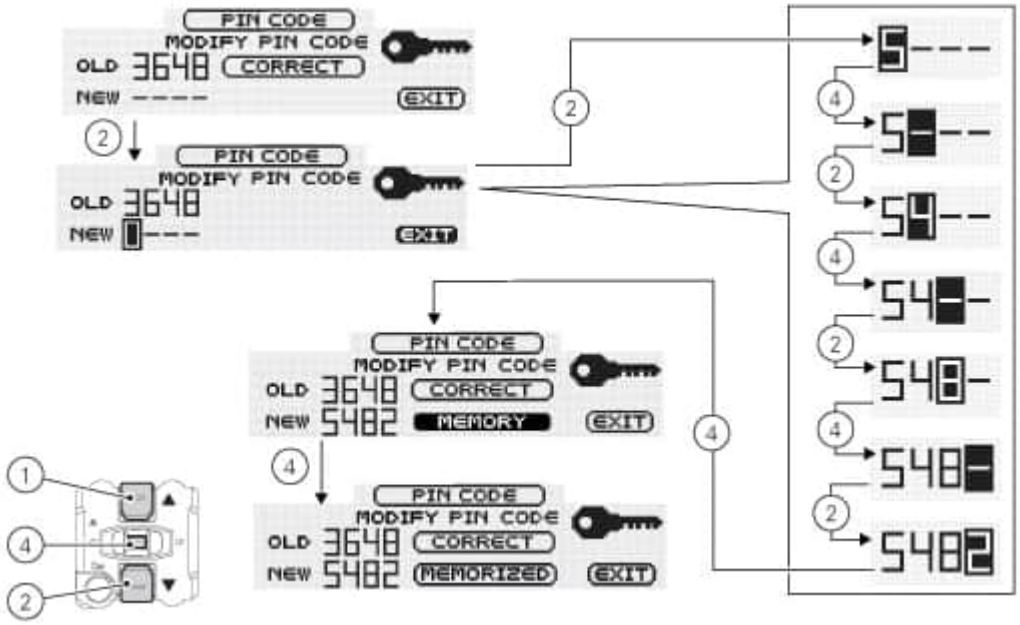
Entering the NEW PIN:

- Each time button (2) is pressed, the highlighted number increases from 0 to 9 and then goes back to 0; to confirm the desired number press button (4);
- Repeat the procedure until entering the fourth digit.
- Press button (4) again to confirm.

Once the PIN is entered, the "MEMORY" item is automatically highlighted.

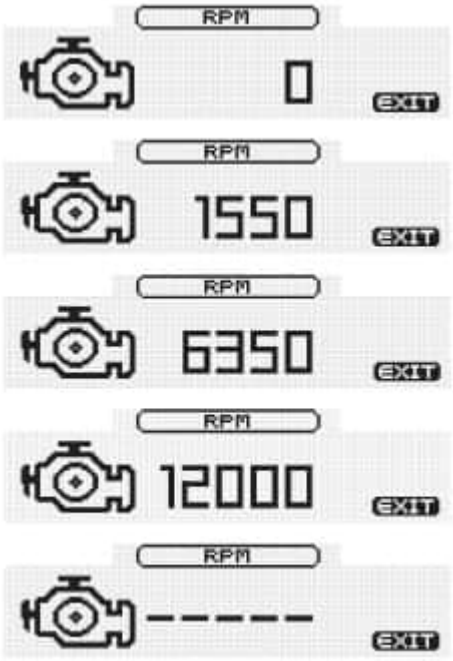
To memorize the new PIN, keep button (4) pressed for 3 seconds.
To confirm that the PIN has been memorized, the display will show "MEMORIZED" followed by "EXIT".
Press button (4) to go back to the setting menu.
The PIN CODE modification procedure is complete.

Note
You can change your PIN CODE for an unlimited number of times.



Engine rpm digital indication (RPM)

This function allows displaying engine rpm value (RPM) to have a more accurate idle speed adjustment.
To display the function, enter the "setting" menu and access the RPM page.
The display shows the numerical value of the engine rpm with a precision of 50 rpm.



Battery voltage function (BATTERY)

This function allows checking the vehicle battery status. To display the function, enter the setting menu and access the "BATT" page.
The information will be displayed as follows:

- if battery voltage is between 11.8 V and 14.9 V the reading will be displayed steady;
- if battery voltage is between 11.0 V and 11.7 V the reading will be displayed flashing;
- if battery voltage is between 15.0 V and 16.0 V the reading will be displayed flashing;
- if the battery voltage is equal to or lower than 10.9 Volt, the "LOW" message starts flashing;
- if the battery voltage is equal to or higher than 16.1 Volt, the "HIGH" message starts flashing.

 Note
If the value is not available, a string of dashes "- - -" will be displayed.



Clock setting function (CLOCK)

This function allows setting the clock. To display the function, enter the setting menu and access the "CLOCK" page. To access the setting function, keep button (4) pressed for 3 seconds. After 3 seconds, the "SETTING…." indication will be activated to indicate the access to the setting function.
On entering this mode, the message AM will flash;

- if you press button (2) the "PM" indication starts flashing;
- if you press button (2) you will return to the previous step (if it is 00:00, when switching between "AM" to "PM", 12:00 will be displayed);

press button (4) to shift to hour setting, hours will start flashing;

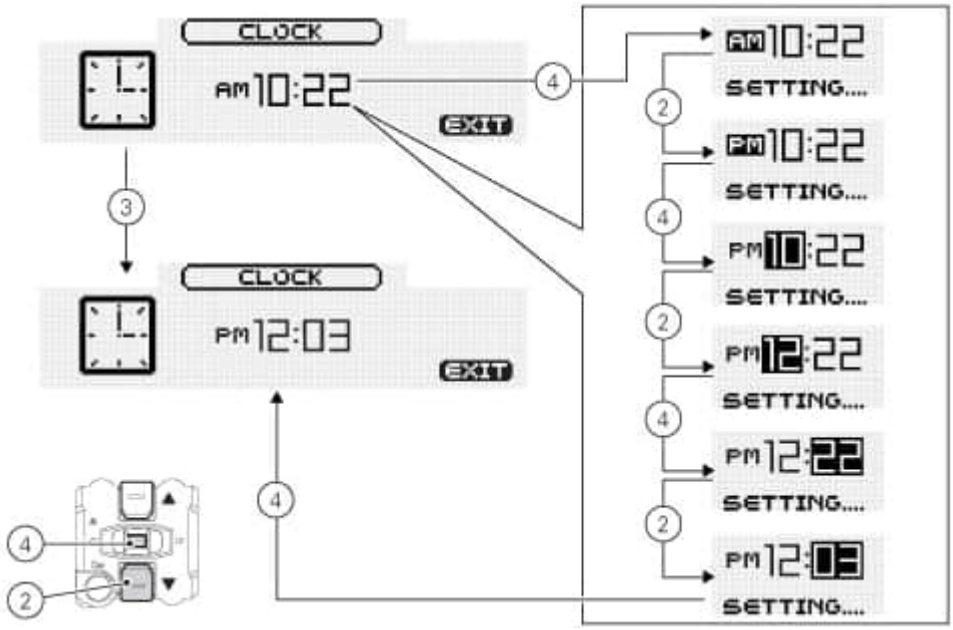
- each time button (2) is pressed, counter will increase in steps of 1 hour;
- keep button (2) pressed to make counter increase in steps of 1 hour per second (hours will not flash while button is pressed);

button (4) gives access to the minute setting mode; minutes start to flash;

- each time button (2) is pressed, counter will increase in steps of 1 minute;
- keep button (2) pressed to make counter increase in steps of 1 minute per second.
- If button (2) is kept pressed for more than 5 seconds, steps increase in steps of 1 every 100 ms (seconds will not flash while button (2) is pressed).

To confirm (store) the new set time press button (4). "EXIT" will be automatically highlighted and by pressing button (4) it will be possible to go back to the setting menu.

Note
In case of battery off, when the Voltage is restored and upon next Key-On, clock will have to be set again (it will automatically start counting from 00:00).

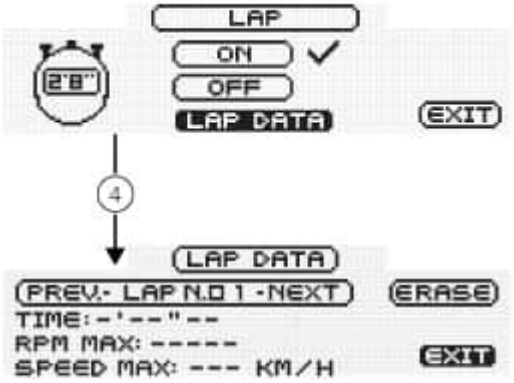


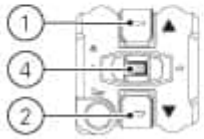
LAP time function: Stored LAPs displaying

This function allows displaying recorded LAPs. To display the function, enter the setting menu and access the LAP page. Inside the page use buttons (1) and (2) to select "LAP DATA" and press button (4).
The information will be displayed as follows:

- number of displayed lap (e.g.: no.1);
- NEXT to display the next LAP;
- ERASE to delete all the stored times;
- TIME: followed by the lap time (e.g.: 1’50’’97);
- RPM MAX: the number of maximum engine RPM reached in the recorded LAP;
- SPEED MAX: the maximum speed reached in the recorded LAP.

To quit, highlight "EXIT" and press button (4).



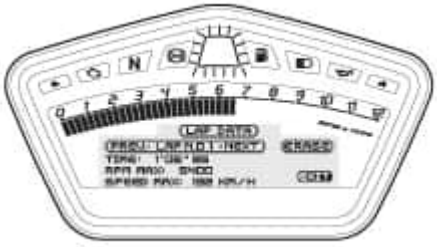


Note
The MAX stored speed is reached during lap (increased by 5%).

Note
If the MAX speed reading exceeds 299 Km/h (186 mph) while the information is stored, the speed that was reached is still displayed (example: 316 Km/h).

Note
If there is no reading in the memory, the 30 times are shown, with the display showing 0’00’’00, MAX rpm = 0 (zero) and MAX speed = 0 (zero).

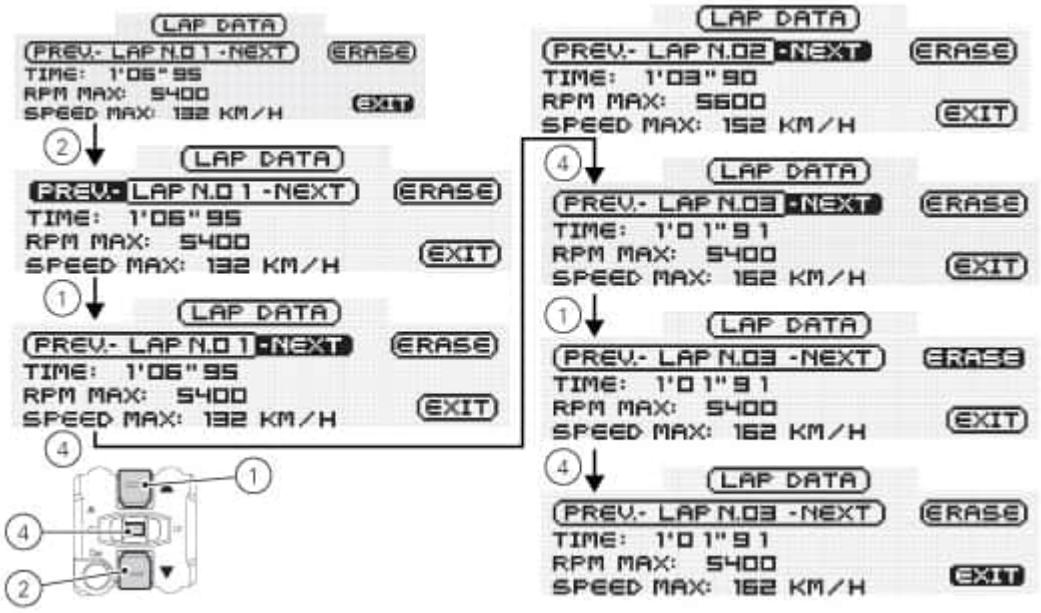
Note
If while recording the LAP the engine reaches the threshold that precedes the rev limiter or rev limiter threshold, the relevant light Over Rev will turn on when displaying the stored times.



To display the other memorised times, use buttons (1) and (2) to select NEXT (or PREV) and press button (4); every time button (4) is pressed, the display will show the following lap.
To delete all the stored times, select ERASE and press button (4) for 3 seconds.

Note

If the stored times are deleted while the LAP function is active, it will be automatically deactivated.



LAP time function: LAP recording

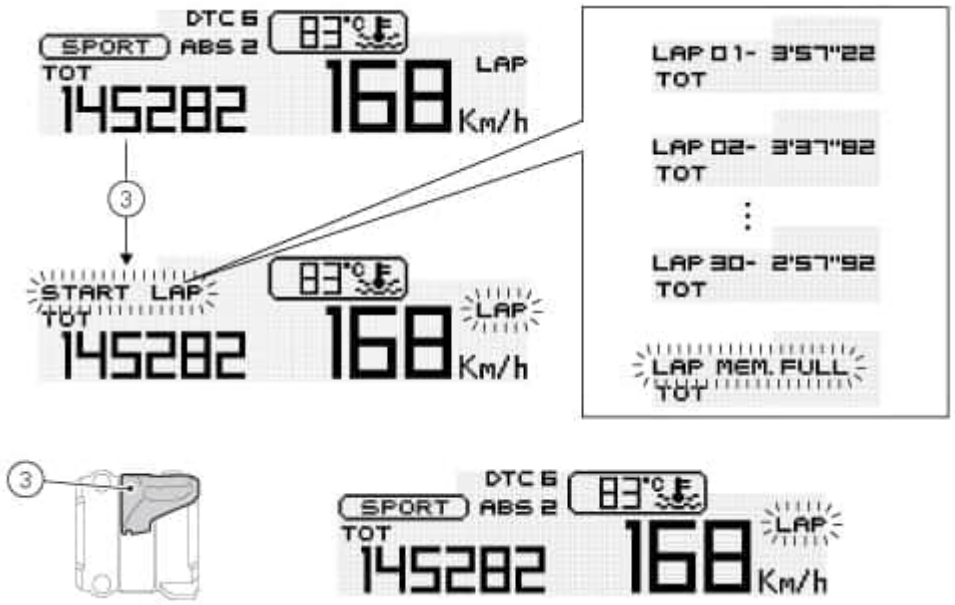
This function describes the (LAP) time recording procedure.

If this function has been enabled, lap time can be recorded as follows:

- the first time rider presses button (3), the "timer" of the first lap starts and "START LAP" will be displayed flashing on the instrument panel for 4 seconds, then the previous screen will appear again;
- from now on, every time button (3) is pressed, the instrument panel will show the lap time steady on for 10 seconds and then it will display the previous screen.

30 laps max. can be recorded. If memory is full, whenever the button (3) is pressed, the instrument panel does not record any lap time and "LAP MEM. FULL" will be displayed for 4 seconds until the times are reset.
When the LAP function is set disabled, the current lap is not stored. If the LAP function is enabled and vehicle is suddenly stopped (Key-Off), function will be automatically disabled, even if timer was active, the current lap will not be recorded.
If the time is never stopped, it will roll over upon reaching 9 minutes, 59 seconds and 99 hundredths; the lap timer starts counting from 0 (zero) and will keep running until the recording function is disabled.
If, on the contrary, the LAP function is enabled and memory was not reset, but recorded laps are less than 30 (example: 18 recorded laps) the instrument panel records any left lap until memory is full (in this case 12 further laps can be recorded).

In this function only the lap times being recorded are displayed; other data are anyway recorded (MAX speed, MAX RPM, limiter if reached), which can be later displayed in the recorded LAP displaying function.



LAP time function: LAP enabling/disabling

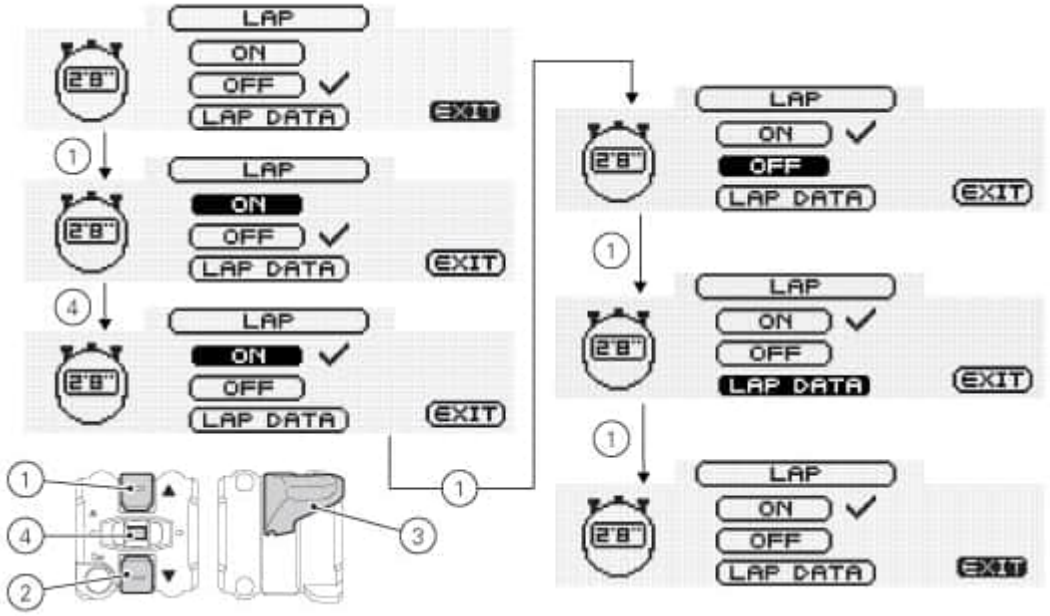
This function allows enabling/disabling LAP (lap time) function.
To display the function, enter the setting menu and access the "LAP" page.

The information will be displayed as follows:

- checkmark (V) indicates the adjustment currently in use;
- use buttons (1) and (2) to highlight the new setting;
- to store the new adjustment, press button (4); checkmark (V) will move on the stored condition.

To quit, highlight "EXIT" and press button (4). If "OFF" is saved, LAP function will be disabled.
If "ON" is saved, LAP function will be enabled.

Note
When LAP function is active, button (3) takes on the dual function of high beam Flash and LAP timer Start/Stop.



Instrument panel backlighting regulation function (B.LIGHT)

This function allows dashboard backlighting setting.
To display the function, enter the setting menu and access the "B.LIGHT" page.

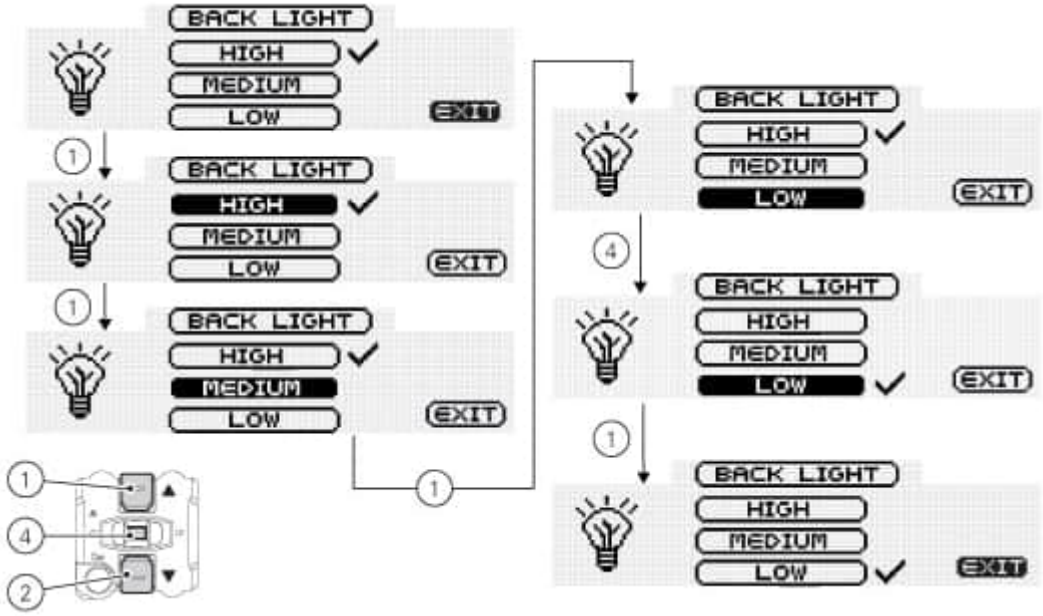
The information will be displayed as follows:

- checkmark (V) indicates the adjustment currently in use;
- use buttons (1) and (2) to highlight the new adjustment;
- to store the new adjustment, press button (4); checkmark (V) will move on the stored condition.

To quit, select "EXIT" and press button (4).

1 HIGH setting: when storing this condition, the backlighting is at maximum brightness.
2 MEDIUM setting: when storing this condition, the backlighting is reduced by approximately 30% of maximum brightness.
3 LOW setting: when storing this condition, the backlighting is reduced by approximately 70% of maximum brightness.

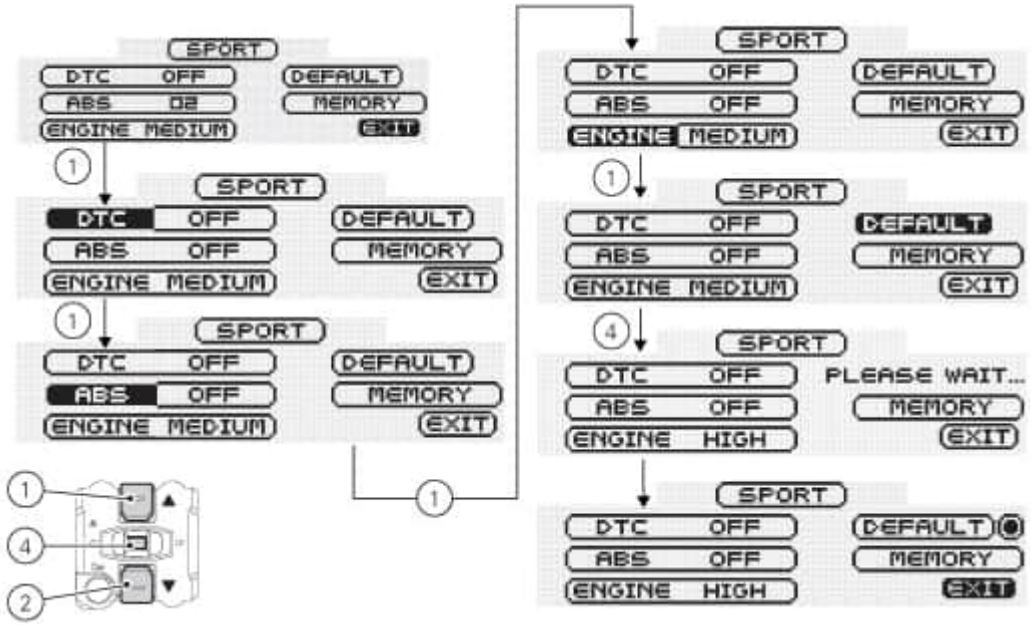
Note
In the event of an interruption of the power supply from the battery, when power is restored at the next Key-On, the backlighting will always be set by default to maximum brightness.



DEFAULT (Restoring the default parameters of a single Riding Mode)

This function allows restoring the parameters set by Ducati for each single Riding Mode.
To display the function, enter the setting menu and access the "R.MODE" page.
Then use buttons (1) and (2) to select the riding mode whose default parameters must be reset and press button (4). Use buttons (1) and (2) to select "DEFAULT" and keep button (4) pressed for 3 seconds.
Now, instead of "DEFAULT", the indication "PLEASE WAIT ..." will be displayed for 3 seconds to indicate that the instrument panel is resetting the default parameters of the selected Riding Mode.
After 3 seconds, "EXIT" will be automatically highlighted; press button (4) to quit and go back to the setting menu.

Note
When the current settings are the default ones, on the "DEFAULT" indication right side the display shows a symbol (a circle with a dot).

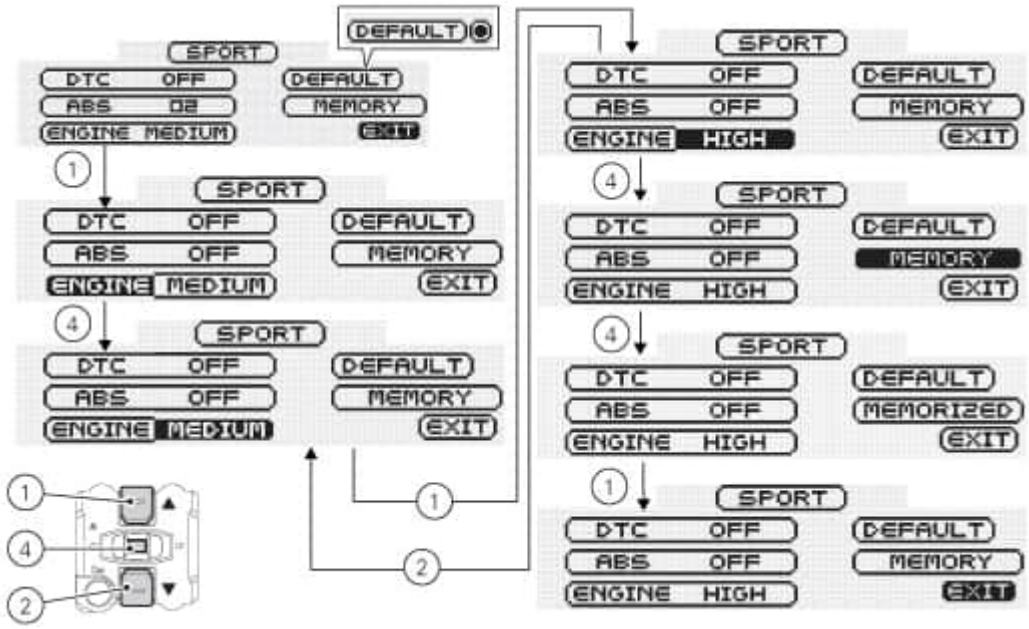


ENGINE set-up

This function allows customising ENGINE power and delivery.
To display the function, enter the setting menu and access the "R.MODE" page. Then use buttons (1) and (2) to select the riding mode to change and press button (4).
Use buttons (1) and (2) to select ENGINE and press button (4) to enter the settings.
Then, use buttons (1) and (2) to increase or decrease the ENGINE level and press button (4) to confirm the new level.
The possible settings are HIGH, MEDIUM and LOW. Once the new setting is selected, press button (4). The instrument panel automatically highlights the "MEMORY" item; to actually save the new setting, keep button (4) pressed for 3 seconds.
After 3 seconds, the instrument panel displays "MEMORIZED" for 2 seconds to confirm that the new setting is active. "EXIT" will be automatically highlighted; press button (4) to quit and go back to the setting menu.

Note

On the right side of the DEFAULT item, a symbol indicates that the active settings are the default ones, and so the parameters are those set by Ducati.



ABS set-up

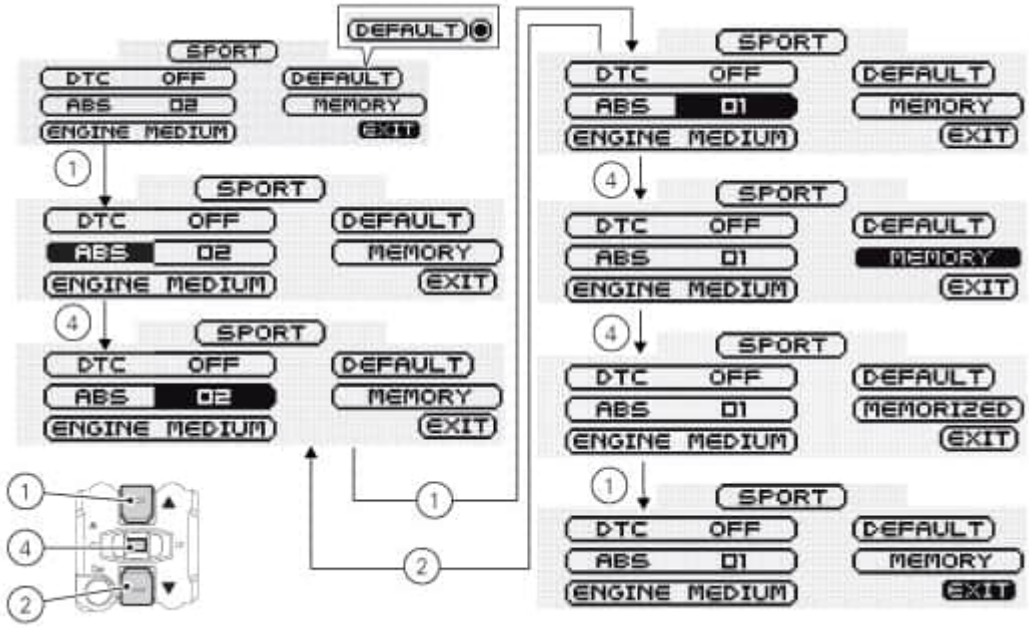
This function allows customising the ABS (Antilock Braking System) intervention level and possibly disabling it. To display the function, enter the setting Menu and access the R.MODE page.
Then use buttons (1) and (2) to select the riding mode to change and press button (4). Use buttons (1) and (2) to select ABS and press button (4) to enter the settings. Then, use buttons (1) and (2) to increase or decrease the ABS level and press button (4) to confirm the new level.
The possible settings are 01, 02, 03 and OFF.

Note
By setting OFF, the ABS will be disabled and the relevant warning light will start flashing.

Once the new setting is selected, press button (4). The instrument panel automatically highlights the "MEMORY" item; to actually save the new setting, keep button (4) pressed for 3 seconds;
After 3 seconds, the instrument panel displays "MEMORIZED" for 2 seconds to confirm that the new setting is active. "EXIT" will be automatically highlighted; press button (4) to quit and go back to the setting menu.

Note
When setting the ABS OFF, Ducati recommends paying particular attention to the riding style and the braking mode.

Note
On the right side of the DEFAULT item, a symbol indicates that the active settings are the default ones, and so the parameters are those set by Ducati.



The following table indicates the most suitable level of ABS intervention for the various riding types as well as the default settings in the "Riding Mode" that can be selected by the rider:

LEVEL	RIDING MODE	USE	DEFAULT?
OFF		The ABS is disabled.	NO
1	RACE	Exclusively for track use, for expert riders (not recommended for road use). In this function, the ABS works only on the front wheel preventing it from blocking and ensuring to performance, whereas there is no control on the rear wheel. The lift-up* control is NOT active.	It is the default level for the "RACE" Riding Mode.
2	SPORT	For road use in good grip conditions. In this mode, the ABS works on both wheels. The anti lift-up controls are active; this calibration focuses on braking power and yet keeps good stability under braking and lift-up* control.	It is the default level for the "SPORT" riding

			mode.
3	WET	For use in any grip conditions. In this mode, the ABS works on both wheels. This calibration focuses on maximum vehicle stability and lift-up* prevention, yet ensuring performance in terms of top maximum deceleration.	It is the default level for the "WET" Riding Mode.

* Rear wheel lifting up upon maximum deceleration

Tips on how to select the sensitivity level

Warning

The levels of the ABS system your motorcycle is equipped with were calibrated with original equipment tyres.
The use of tyres of different size and characteristics to the original tyres may alter the operating characteristics of the system thus making it unsafe. It is recommended not to install tyres of different size than the ones approved for your vehicle.

Motorcycle original equipment: (front 120/70ZR17 - rear 180/55ZR17).

- Pirelli Diablo Supercorsa SP;
- Pirelli Diablo Rosso II;
- Pirelli Scorpion Trail.

Selecting level 3, the ABS will intervene to ensure a very stable braking, good lift-up control and prevention, the motorcycle keeps a good alignment during the whole braking action. By passing from level 3 to level 2 the system will provide a better braking power with less action on the stability maximum control and lift-up control which are nevertheless active. Level 1 is specifically designed for the bike use on the track: no anti lift-up control is active and the rear brake is not controlled by the ABS.
The choice of the correct level mainly depends on the following parameters:

1 The tyre/road grip (type of tyre, amount of tyre wear, the road/track surface, weather conditions, etc.).
2 The rider's experience and sensitivity.

In non-perfect conditions (as indicated in point 1) and/or for less expert riders, we recommend using level 3.

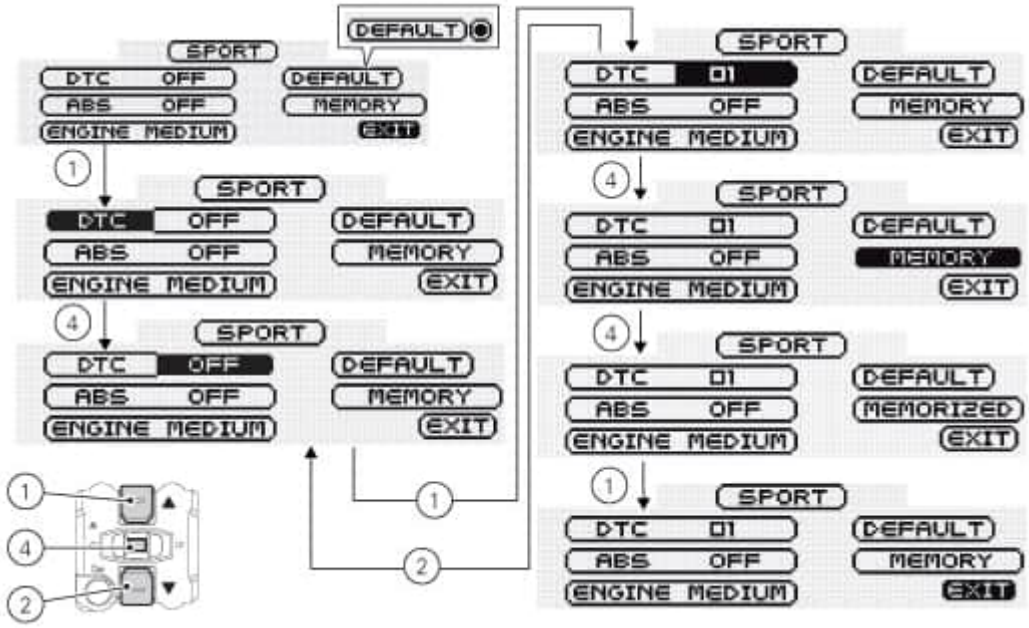
DTC set-up

This function customises the intervention level of the DTC (Ducati Traction Control) and allows disabling it.
To display the function, enter the Setting Menu and access the R.MODE page.
Then use buttons (1) and (2) to select the riding mode to change and press button (4).
Use buttons (1) and (2) to select DTC and press button (4) to enter the settings.
Then, use buttons (1) and (2) to increase or decrease the DTC level and press button (4) to confirm the new level.
The possible settings are from 01 to 08 and OFF.

Note
By setting OFF, the DTC will be disabled.

Once the new setting is selected, press button (4).
The instrument panel automatically highlights the "MEMORY" item; to actually save the new setting, keep button (4) pressed for 3 seconds. After 3 seconds, the instrument panel displays "MEMORIZED" for 2 seconds to confirm that the new setting is active.
"EXIT" will be automatically highlighted; press button (4) to quit and go back to the setting menu.

Note
On the right side of the DEFAULT item, a symbol indicates that the active settings are the default ones, and so the parameters are those set by Ducati.



The following table indicates the most suitable level of DTC intervention for the different riding modes as well as the default settings in the "Riding Modes" that can be selected by the rider:

DTC LEVEL	RIDING MODE	USE	DEFAULT?
1	TRACK Professional	Track use for very expert riders. System permits sliding sideways.	NO
2	TRACK	Track use (and road use for expert riders).	It is the default level for the "RACE" Riding Mode
3	SPORT	Sporty driving on a road or track.	It is the default level for the "SPORT" Riding Mode
4	TOURING	Extra-urban touring style.	NO
5	CRUISE	Touring style for long travels.	NO

6	URBAN	City style.	NO
7	RAIN	Wet or moist road.	It is the default level for the "WET" Riding Mode
8	HEAVY RAIN	Wet road with pouring rain or very slippery asphalt.	NO

Tips on how to select the intervention level

Warning

The 8 levels of the DTC system your motorcycle is equipped with were calibrated with original equipment tyres (make, model and size). The use of tyres of different size to the original tyres may alter the operating characteristics of the system.

Motorcycle original equipment: (front 120/70ZR17 - rear 180/55ZR17).

- Pirelli Diablo Supercorsa SP;
- Pirelli Diablo Rosso II;
- Pirelli Scorpion Trail.

In the case of minor differences, such as for example, tyres of a different make and/or model than the OE ones, but with the same size (rear = 180/55-17; front = 120/70-17), it may be sufficient to simply select the suitable level setting from those available in order to restore optimal system operation. If tyres of a different size class are used or if the tyre dimensions differ significantly from the original tyres, it may be that the system operation is affected to the point where none of the 8 available level settings will give satisfactory results. In this case it is advisable to deactivate the traction control system. If level 8 is selected, the DTC control unit will kick in at the slightest hint that the rear wheel is starting to spin. Between level 8 and level 1 there are other 8 intermediate levels. DTC intervention decreases regularly from level 8 to level 1. With levels 1 and 2, DTC control unit allows both rear tyre spinning and sliding sideways when exiting a turn; we recommend using these levels only on track and to very experienced riders.

The choice of the correct level depends on 3 main variables:

1 The grip (type of tyre, amount of tyre wear, the road/track surface, weather conditions, etc.);
2 The characteristics of the path/circuit (bends all taken at similar speeds or at very different speeds);
3 The riding mode (whether the rider has a "smooth" or a "rough" style).

Level depends on grip conditions

The choice of level setting depends greatly on the grip conditions of the track/path (see below, tips for use on the track and on the road).

Level depends on type of track/path

If the track/path features bends all taken at similar speeds, it will be easier to find a level suitable for all bends; while a track/path with a hairpin turn to be taken at very low speed compared to the other bends will require a DTC level setting that is the best compromise for all bends (on hairpin turn, DTC intervention will always be greater compared to the other bends).

Level depends on riding style

The DTC will tend to kick in more with a "smooth" riding style, where the motorcycle is leaned over further, rather than with a "rough" style, where the motorcycle is straightened up as quickly as possible when exiting a turn.

Tips for use on the track

We recommend that level 6 is used for a couple of full laps (to allow the tyres to warm up) and in order to get used to the system. Then try levels 5, 4 etc., in succession until you identify the DTC sensitivity level that suits you best (always try each level for at least two laps to allow the tyres to warm up).
Once you have found a satisfactory setting for all the corners except one or two slow ones, where the system tends to kick in and control too much, you can try to modify your riding style slightly to a more "rough" approach to cornering i.e. straighten up more rapidly on exiting the corner, instead of immediately trying a different level setting.

Tips for use on the road

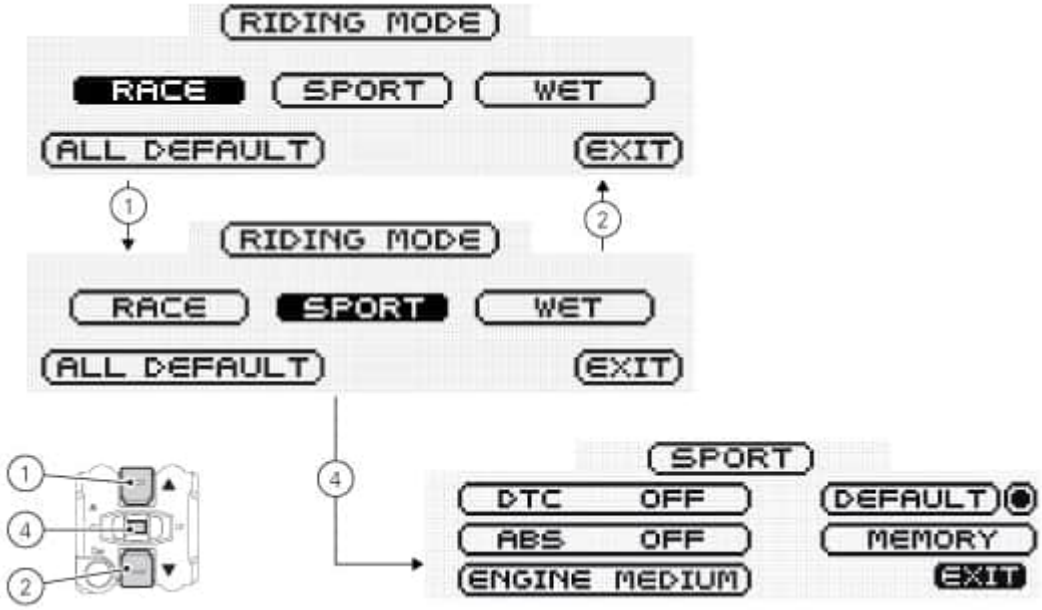
Activate the DTC, select DTC 6 and ride the motorcycle in your usual style; if the level of DTC sensitivity seems excessive, try DTC level 5; if also this RM sensitivity seems excessive try DTC level 4. If none of the level suits your riding style, you can select the level by following the indications given on the previous table until finding the intervention level you prefer.

If changes occur in the grip conditions and/or circuit characteristics and/or your riding style, and the level setting is no longer suitable, switch to the next level up or down and proceed to determine the best setting (e.g. if with level 7 the DTC intervention seems excessive, switch to level 6; alternatively, if on level 7 you cannot perceive any DTC intervention, switch to level 8).

Riding Mode customisation (R.MODE)

This function allows customising each single riding mode.
To display the function, enter the setting Menu and access the R.MODE page.
After entering the function, the display shows the three riding modes: SPORT, TOURING and URBAN.
The display also shows the ALL DEFAULT function that allows resetting the parameters set by Ducati for all riding modes.
Use buttons (1) and (2) to select the riding mode to change or the ALL DEFAULT function.

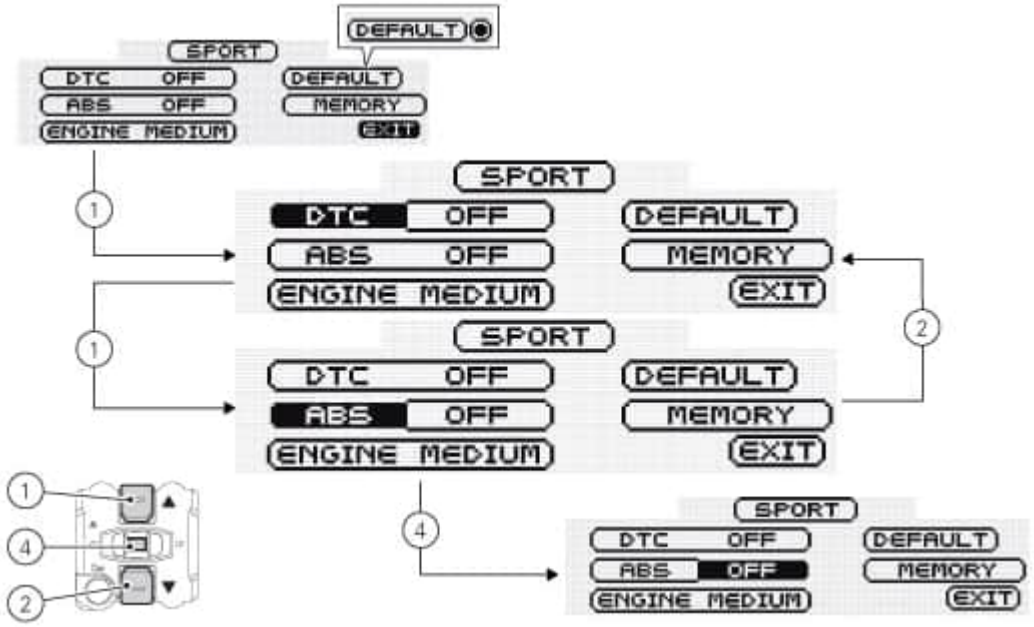
Note
On the right side of the ALL DEFAULT item, a symbol indicates that the active settings are the default ones, and so the parameters are those set by Ducati.



To customise the parameters, to select the riding mode to change and press button (4).
The parameters that can be customised are DTC (Ducati Traction Control), ABS (Antilock Braking System), ENGINE (engine power).
With buttons (1) and (2) it is possible to select the parameter to be customised.
Any parameter change (personalisation) made is saved and remains in the memory also after a Battery-Off.
It is furthermore possible to reset the parameters of a single riding mode with the DEFAULT function.

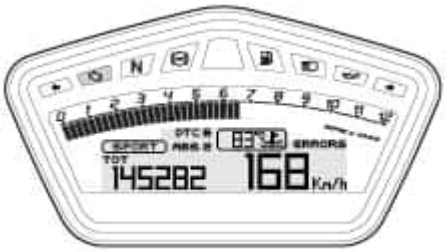
Note
On the right side of the DEFAULT item, a symbol indicates that the active settings are the default ones, and so the parameters are those set by Ducati.

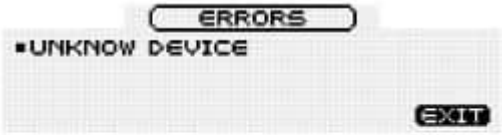
Warning
Changes should only be made to the parameters by people who are experts in motorcycle set-up; if the parameters are changed accidentally, use the "DEFAULT" function to restore factory settings.

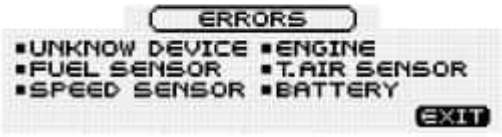

DEFAULT
SPORT
DTC OFF
ABS OFF
ENGINE MEDIUM
DEFAULT
MEMORY
EXIT
1
SPORT
DTC OFF
ABS OFF
ENGINE MEDIUM
DEFAULT
MEMORY
EXIT
2
1
SPORT
DTC OFF
ABS OFF
ENGINE MEDIUM
DEFAULT
MEMORY
EXIT
1
4
2
4
SPORT
DTC OFF
ABS OFF
ENGINE MEDIUM
DEFAULT
MEMORY
EXIT

Error displaying (ERRORS)

This function allows detecting any vehicle abnormal behaviour.
Instrument panel activates, in real time, any vehicle abnormal behaviour (ERRORS).
If one or more "errors" occur during the operation, the "ERRORS" indication will be displayed on the right side of the display.
The "EOBD" light always turns on when one or more errors are activated.
To display the list of errors, enter the Setting menu and access the "ERRORS" page that will be active only if at least one error is present.



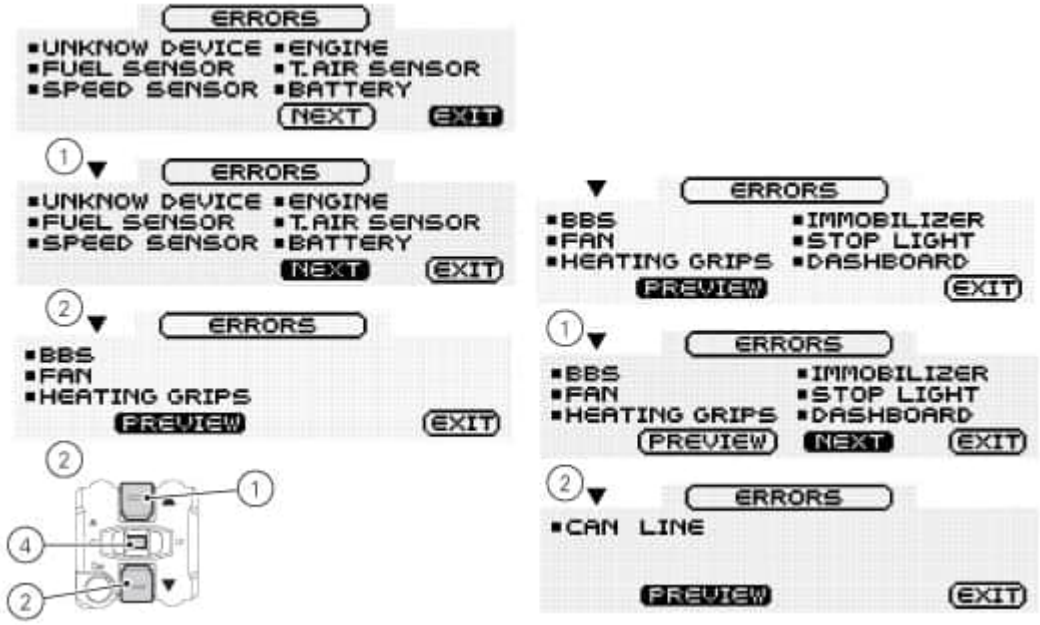




If more errors are present, the "NEXT" and "PREVIEW" indications will be activated automatically to allow changing page.
To change page, use buttons (1) and (2) to select "NEXT" and "PREVIEW" and press button (4).
It is possible to quit at any time and go back to the Setting menu by pressing button (4) with the "EXIT" item highlighted.

Warning

When one or more errors are displayed, always contact a Ducati Dealer or authorised Service Centre.



Hereinafter is the table of the possible displayed errors:

Displayed error	Description
CAN LINE	CAN line "BUS Off" (communication line of the several control units)
UNKNOWN DEVICE	Control unit not acknowledged by the system - wrong SW
ABS (Antilock Braking System)	ABS control unit faulty communication / operation
BBS (Black Box System)	BBS control unit faulty communication / operation
	BBS control unit general malfunction
	Exhaust valve motor EXVL malfunction
DASHBOARD	DSB control unit faulty communication / operation
IMMOBILIZER	Key missing
	Key not recognised
	Antenna not working
ENGINE	ECU control unit faulty communication / operation
	General malfunction of the ECU control unit
	Throttle position sensor malfunction
	Throttle motor and/or relay malfunction
	Pressure sensor malfunction
	Engine coolant temperature sensor malfunction
	Intake duct air temperature sensor malfunction
	Injection relay malfunction
	Ignition coil malfunction
	Injector malfunction
	Engine rpm sensor malfunction
	Lambda sensor or Lambda sensor heater malfunction
	Motorcycle starting relay malfunction
	Secondary air sensor malfunction
FUEL SENSOR	Reserve NTC sensor malfunction
SPEED SENSOR	Front and/or rear speed sensor malfunction
BATTERY	Battery voltage too high or too low
STOP LIGHT	Stop light not working
FAN	Electric cooling fan malfunction
T_AIR SENSOR	Ambient air temperature sensor malfunction

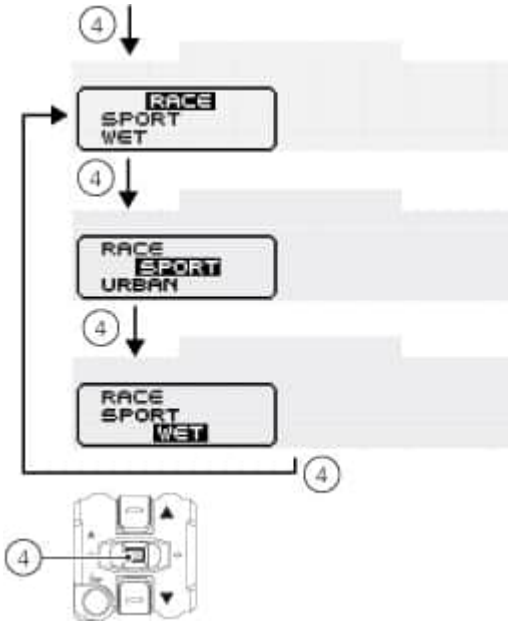
H.GRIPS	Malfunction in one or more heated handgrips

Riding Mode SET-UP function (riding mode change)

This function allows changing vehicle riding mode. A different traction control (DTC - Ducati Traction Control) intervention level, a different ABS intervention (ABS - Anti-lock Braking System) and a different engine power delivery (Engine) are associated to each riding mode. To change motorcycle riding mode, simply press button (4) once and the menu will be displayed. Upon changing the riding mode, you also change:

- the level of intervention for the "DTC" traction control (1, 2, 3, 4, 5, 6, 7, 8 and OFF);
- the "Engine" power that will in turn change the throttle operation (HIGH, MEDIUM and LOW);
- the "ABS" calibration (1, 2 and 3 OFF).

Every time button (4) is pressed, the instrument panel highlights in scroll mode the riding modes.



Once the desired riding mode is selected, by pressing button (4) for 3 seconds, the instrument panel checks the throttle position and the front and rear brake pressure:

- if throttle control is "closed" and brakes are released or vehicle is stopped, the instrument panel confirms the selected riding mode (*) and goes back to standard page displaying;
- if throttle control is "open" or if brakes are operated and vehicle is moving, the instrument panel shows "CLOSE THROTTLE AND RELEASE BRAKES" on the display and, only after all conditions are met (closed throttle control and brakes released or vehicle stopped) the instrument panel confirms the selected riding mode (*) and goes back to standard page displaying.

Note

(*) If an on/off or off/on change of the ABS system is associated to the Riding mode change, when the selected riding mode is confirmed, the instrument panel also starts the "procedure to enable/disable the ABS".

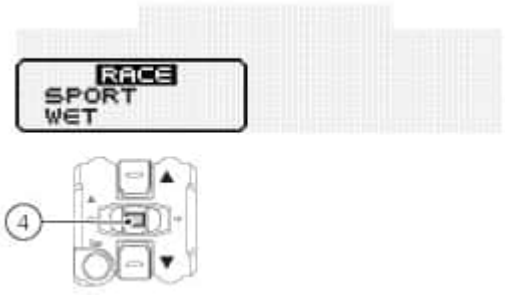


If the throttle control is not closed and brakes are not released or vehicle is not stopped within the first 5 seconds after "CLOSE THROTTLE AND RELEASE BRAKES" indication is shown, the Riding Mode selection procedure is not performed and the instrument panel goes back to standard page without changing any settings.

If the "SET UP" menu is activated and button (4) is not pressed for 10 consecutive seconds, the instrument panel automatically exits the display mode without making any change.

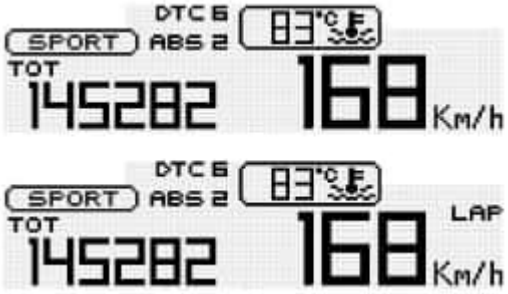
Warning

Ducati recommends changing the Riding mode when the motorcycle is stopped. If the riding mode is changed while riding, be very careful (it is recommended to change the Riding mode at a low speed).



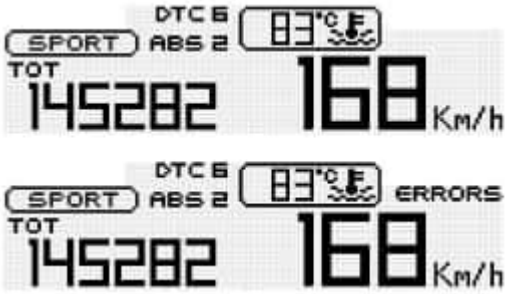
Enabled / disabled LAP function indication

This function indicates if the LAP (Lap time) function is enabled.
When "LAP" is off, function is disabled.



Active / non active ERRORS indication

This function indicates one or more active errors.
It is possible to see which and how many errors are present through the Setting menu using the ERRORS function; when the "ERRORS" indication is off, it means that there is no active error.



SERVICE function - Maintenance operations

This indication shows the user that the motorcycle is due for scheduled maintenance and must be taken to a Ducati Authorised Service Centre.
The service warning indication can be reset only by the Authorised Ducati Service Centre during servicing.

First indication: OIL SERVICE (1000 Km)

The first maintenance indication is "OIL SERVICE", enabled when the odometer counter reaches the first 1,000 km (600 miles). The "OIL SERVICE" indication is displayed flashing for 5 seconds upon each Key-On; the OIL SERVICE symbol remains displayed all the time. Both indications remain active until the Ducati authorised service centre resets them.



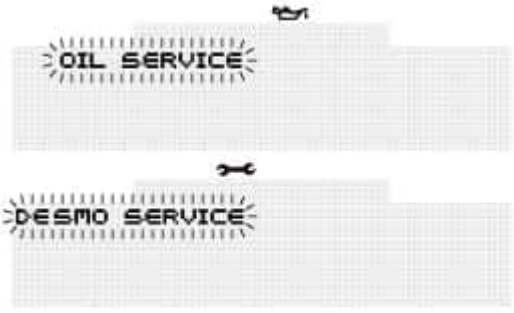
Distance left indication - OIL SERVICE or DESMO SERVICE (countdown)

After having reset the first OIL SERVICE indication (1000 km), upon each Key-On, the instrument panel will display the indication relating to the next service ("OIL SERVICE" and or "DESMO SERVICE") and the distance left.
The "OIL SERVICE" or "DESMO SERVICE" indication, the relevant symbols and the distance left are displayed "steady on" for 2 seconds upon each Key-On.
When 1000 km are left until reaching the service threshold, the indication remains displayed for 5 seconds instead of 2 upon each Key-On.
Both indications remain active until the Ducati authorised service centre resets them.



OIL SERVICE or DESMO SERVICE indication (distance reached)

When reaching the service threshold, it is necessary to perform the maintenance; upon each Key-On, the system displays the indication of the type of operation to be carried out: "OIL SERVICE" or "DESMO SERVICE".
The "OIL SERVICE" or "DESMO SERVICE" indication is displayed flashing for 5 seconds upon each Key-On; the OIL SERVICE or DESMO SERVICE symbol remains displayed all the time.
Both indications remain active until the Ducati authorised service centre resets them.



SET UP - Riding Mode set indication

This function indicates the Riding mode set on vehicle.
Each riding mode can be changed through the Riding Mode function.
The display shows the set riding mode, the Traction Control (DTC) level and the related ABS level.
It is possible to set three different riding modes: SPORT, TOURING, URBAN.

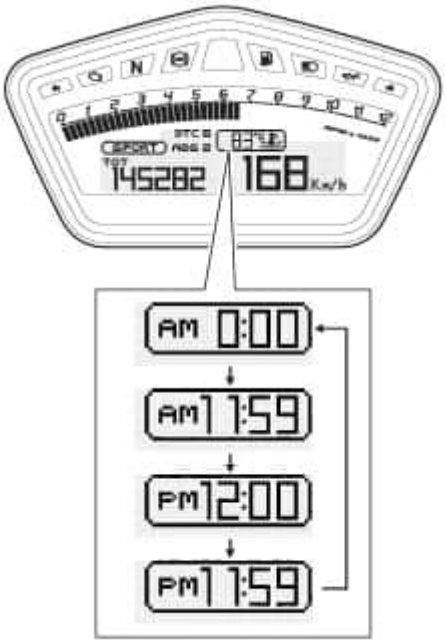


Clock

This function allows displaying time indication.
Time is always displayed according to the following sequence:

- AM 0:00 to 11:59;
- PM 12:00 to 11:59.

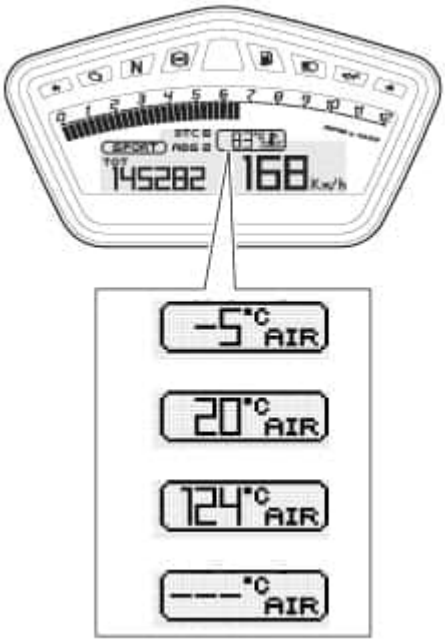
In case of battery off (Batt-OFF), when the voltage is restored and upon next Key-On, clock will be reset and will automatically start counting from "0:00".



Menu 2 functions: Ambient Air Temperature (AIR)

This function indicates the ambient air temperature.
The instrument panel received the temperature information from the sensor and displays it.

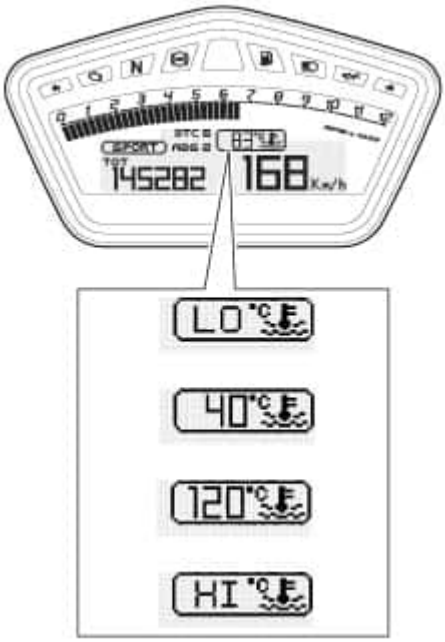
Note
When the motorcycle is stopped, the engine heat could influence the displayed temperature.



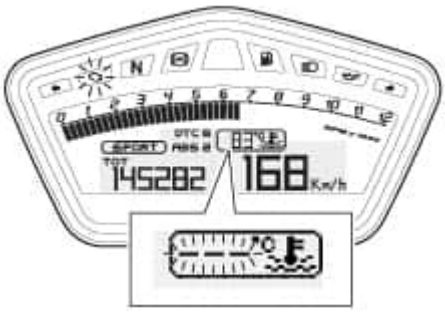
Menu 2 functions: Engine coolant temperature

This Function allows displaying the coolant temperature (°C or °F according to the specific application).
The instrument panel receives the temperature information and displays it.
Value is indicated as follows:

- if the reading is between - 39 °C and +39 °C, "LO" is shown flashing on the instrument panel (steady);
- if the reading is between +40 °C and +120 °C, it is shown on the instrument panel (steady);
- if reading is +121 °C or higher, "HI" is shown flashing on the instrument panel.



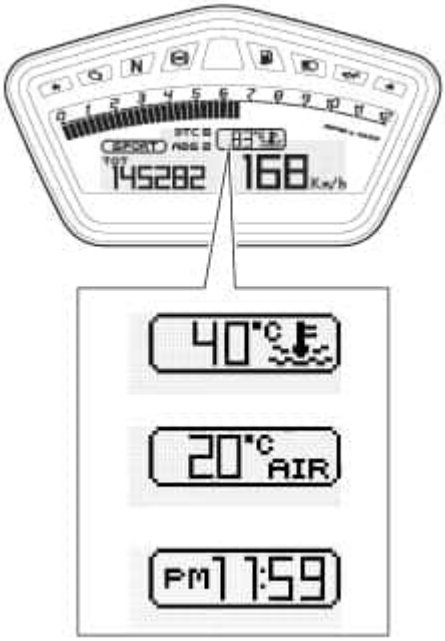
Note
If the sensor is in fault, the three flashing dashes ("- - -") will be displayed and, at the same time, the "Engine/Vehicle Diagnosis - EOBD" light will come on.



Menu 2 functions

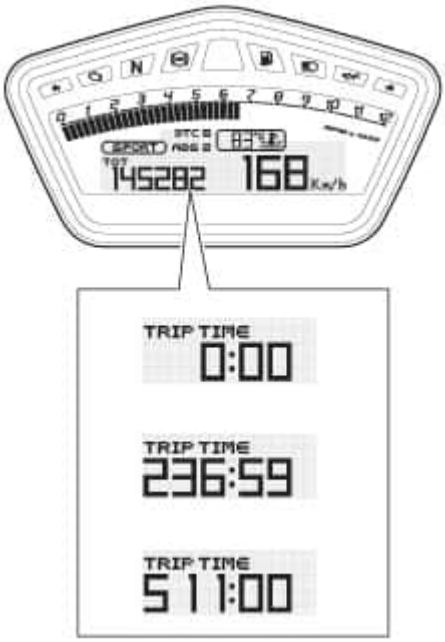
MENU 2 functions are:

- Engine coolant temperature;
- Ambient air temperature (AIR);
- Clock.



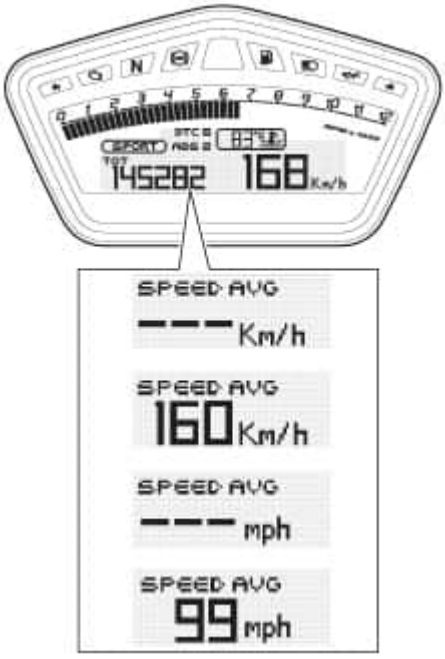
Menu 1 functions: Trip time indicator (TIME TRIP)

This function indicates vehicle trip time.
The calculation considers the time since Trip 1 was last reset. When Trip 1 is reset, this value is reset as well.
The calculation active phase occurs when the engine is running even if the motorcycle is stopped (the time is automatically stopped when the motorcycle is not moving and the engine is OFF and restarts when the counting active phase starts again).



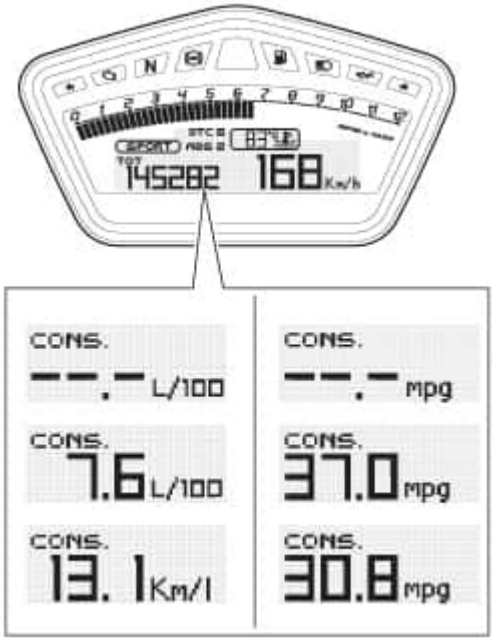
Menu 1 functions: Average speed indicator (SPEED AVG)

This function indicates vehicle average speed.
The calculation considers the distance and time since Trip 1 was last reset. When Trip 1 is reset, the value is reset and the first value available is displayed 10 seconds after the reset.
During the first 10 seconds, when the value is not yet available, the display will show a string of dashes "- -.-".
The active calculation phase occurs when the engine is running and the motorcycle is stopped (moments when the motorcycle is not moving and the engine is OFF are not considered).
The calculated value is then displayed increased by 5% to be aligned with vehicle speed indication.



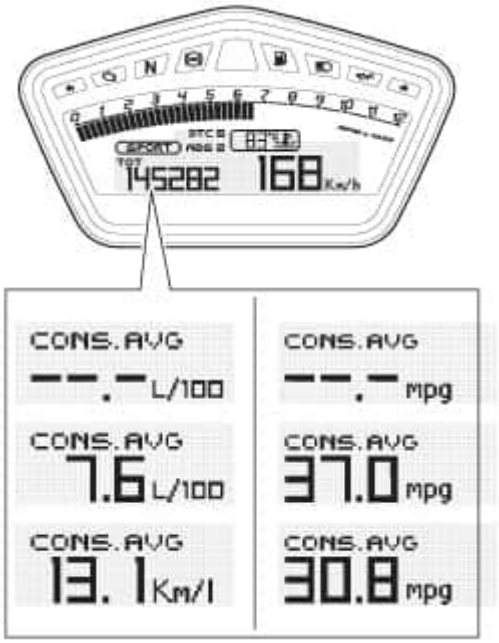
Menu 1 functions: Instant fuel consumption indicator (CONS.)

This function indicates vehicle instant fuel consumption. The calculation is made considering the quantity of fuel used and the distance travelled during the last second. For the Europe and Japan versions this information is displayed in "L / 100" (litres / 100 Km); it is though possible to set the unit of measurement "Km / L" (kilometres / litre) by means of the "Setting special" function. For the UK version this information is displayed in "mpg UK" (miles per gallon UK).
The active calculation phase only occurs when the engine is running and the motorcycle is moving (moments when the motorcycle is not moving when speed is equal to 0 and/or when the engine is OFF are not considered). When the calculation is not made, a string of dashes is displayed "- -.-".



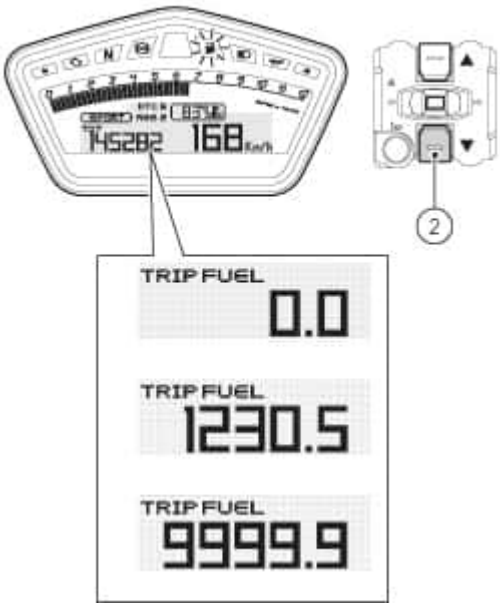
Menu 1 functions: Average fuel consumption indicator (CONS. AVG)

This function indicates vehicle average fuel consumption. The calculation is made considering the quantity of fuel used and the distance travelled since Trip 1 was last reset. When Trip 1 is reset, the value is reset and the first value available is displayed 10 seconds after the reset. During the first 10 seconds, when the value is not yet available, the display will show a string of dashes "- -.-". For the Europe and Japan versions this information is displayed in "L / 100" (litres / 100 Km); it is though possible to set the unit of measurement "Km / L" (kilometres / litre) by means of the "Setting special" function. For the UK version this information is displayed in "mpg UK" (miles per gallon UK).
The active calculation phase occurs when the engine is running and the motorcycle is stopped (moments when the motorcycle is not moving and the engine is OFF are not considered).



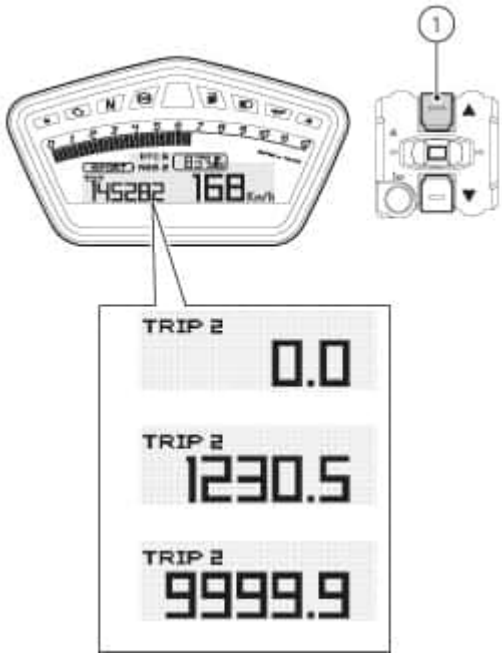
Menu 1 functions: Partial fuel reserve counter (TRIP FUEL)

This function allows displaying the indication of the distance travelled (Km or miles according to the specific application) with the motorcycle in reserve. When the low fuel light turns on, the display automatically shows the "TRIP FUEL" function, regardless of the currently displayed function. Then it is possible to scroll the other functions of MENU 1 by pressing button (2).
Trip fuel reading remains stored even after Key-Off until the motorcycle is refuelled. Count is interrupted automatically as soon as fuel is topped up to above minimum level. When the reading exceeds 9999.9, the meter is reset and automatically starts counting from 0 again.
When the TRIP FUEL function is not active, the relevant page in Menu 1 will not be available.



Menu 1 functions: Travelled distance indicator (TRIP 2)

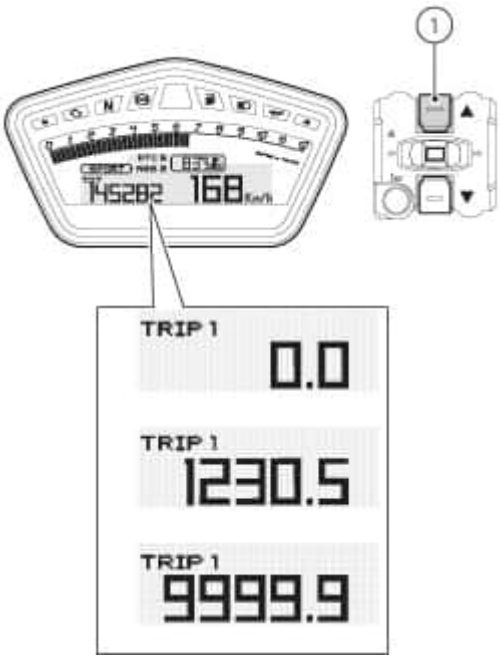
This function allows displaying the indication of the partial distance travelled (km or miles according to the specific application).
When this function is accessed and button (1) is kept pressed for 3 seconds, trip meter will be reset. When the reading exceeds 9999.9, distance travelled is reset and the meter automatically starts again. If the system measurement units are changed at any moment, or if there is an interruption in the power supply (Battery Off), the distance travelled is reset and the count starts from zero (considering the newly set unit of measurement).



Menu 1 functions: Travelled distance indicator (TRIP 1)

This function allows displaying the indication of the partial distance travelled (km or miles according to the specific application).
When this function is accessed and button (1) is kept pressed for 3 seconds, trip meter will be reset. When the reading exceeds 9999.9, distance travelled is reset and the meter automatically starts again. If the system measurement units are changed at any moment, or if there is an interruption in the power supply (Battery Off), the distance travelled is reset and the count starts from zero (considering the newly set unit of measurement).

Note
When this reading is reset, also "Average Consumption", "Average Speed" and "Trip Time" functions are reset.

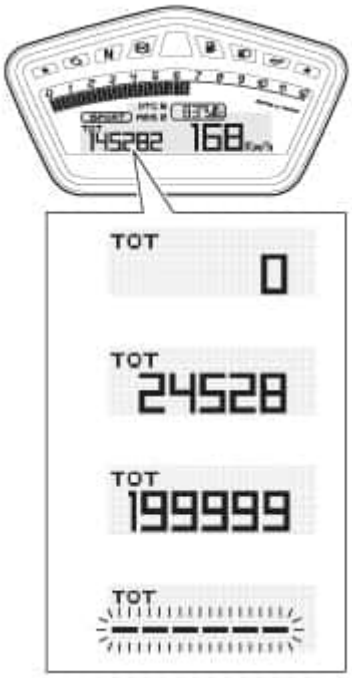


Menu 1 functions: Odometer (TOT)

This function allows displaying the indication of the total distance travelled (km or miles according to the specific application).
Upon Key-On, system will automatically access this function.
The value is saved permanently and cannot be reset.
If the value exceeds 199999 km (or 199999 miles) "199999" will be displayed permanently.

Note
The reading is not lost in case of a power OFF (Battery OFF).

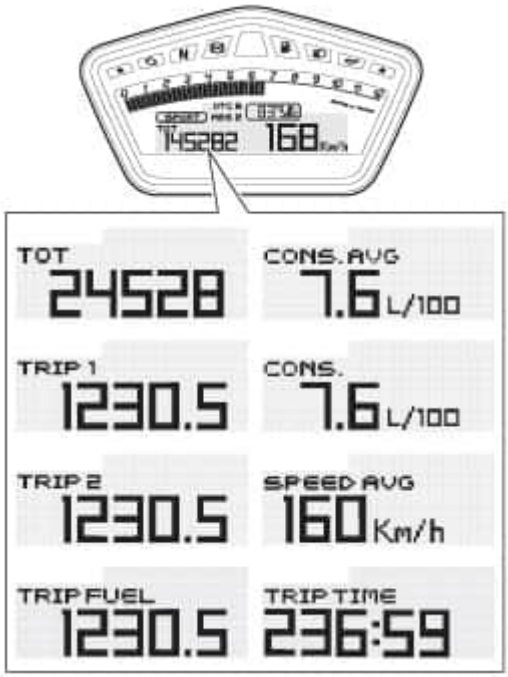
Note
If a string of flashing dashes " ----- " is displayed within odometer function, please contact a Ducati Dealer or Authorised Service Centre.



Menu 1 functions

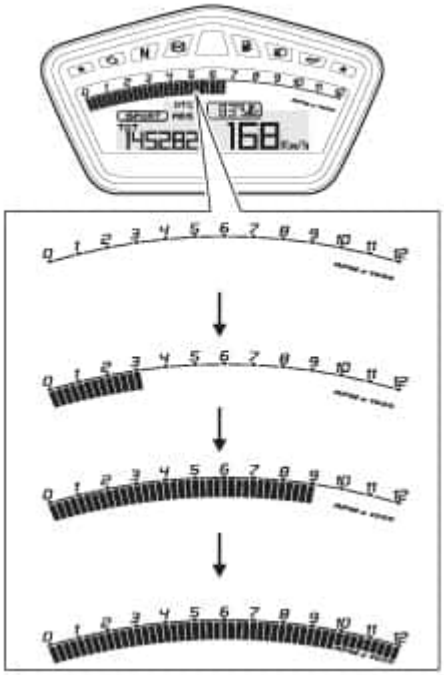
MENU 1 functions are:

- Odometer (TOT);
- Trip meter 1 (TRIP1);
- Trip meter 2 (TRIP2);
- Partial fuel reserve counter (TRIP FUEL);
- Average Fuel Consumption (CONS. AVG);
- Instant fuel consumption (CONS.);
- Average speed (SPEED AVG);
- Trip time (TRIP TIME).



Engine rpm indicator (RPM)

This function allows displaying engine rpm.
Instrument panel receives rpm value and displays it.
Value is progressively displayed from left to right identifying rpm value.



Vehicle speed indicator

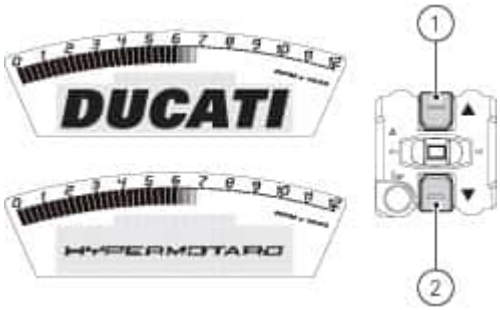
This function is used to display vehicle speed (Km/h or mph, depending on the selected unit of measurement).
The instrument panel receives information about the actual motorcycle speed (calculated in km/h) and displays the value increased by 5%.
The max. displayed speed is 299 km/h (186 mph).
When speed exceeds 299 km/h (186 mph) a string of dashes "- - -" (not flashing) will be displayed.

Note
If instrument panel does not receive any data, a string of dashes "- - -" (not flashing) will be displayed.



LCD - Parameter setting/displaying

Upon switching on, the instrument panel activates the rev counter that increases from 0 to 11000 and decreases up to 0; the Dot-Matrix shows the moving indication "DUCATI HYPERMOTARD"; warning lights turn on one after the other starting from the external side to the internal side.
After the check, the "main" information displayed on the instrument panel are Odometer (TOT), engine coolant temperature and "Riding Mode".



After the initial check the instrument panel always shows the "main" screen providing the information below:

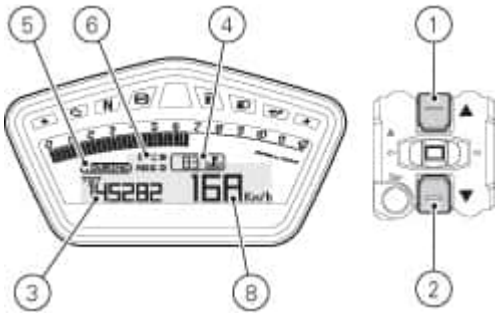
- MENU 1 (3): TOT - Odometer
- MENU 2 (4): engine coolant temperature
- SET UP - set "Riding Mode" (5) indication
- Engine rpm indication (7) (RPM)
- Vehicle speed indication (8)
- "SERVICE" indication (only if active).

With button (2) it is possible to scroll MENU 1 and reach the following functions:

- TRIP 1 - Trip meter 1
- TRIP 2 - Trip meter 2
- TRIP FUEL - Partial fuel reserve counter (only if active)
- CONS. AVG - Average consumption
- CONS. - Instant fuel consumption
- SPEED AVG - Average speed
- TRIP TIME - Trip time

With button (1) it is possible to scroll MENU 2 and reach the following Functions:

- AIR - Air temperature
- Clock.

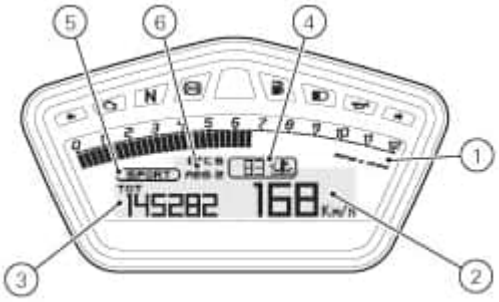


LCD - Main functions

Warning

Operate on instrument panel only when the motorcycle is stopped. Do not operate on instrument panel while you are riding the motorcycle under no circumstances.

Data displayed on the main screen are as follows:
1) Engine rpm indicator;
2) Vehicle speed indicator;
3) MENU 1 (Odometer, Trip 1, Trip 2, Trip Fuel, Average Consumption, Instant Fuel Consumption, Average Speed and Trip Time) – UP-MAP and Riding Mode Set-Up menus;
4) MENU 2 (Engine Coolant Temperature, Ambient Air Temperature and Clock);
5) Name of set Riding Mode;
6) DTC and ABS settings of the Riding Mode.

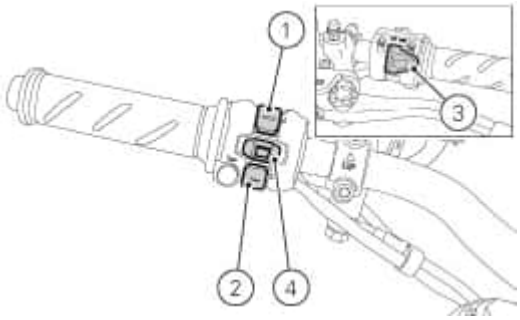


Important

Do not ride the motorcycle if temperature reaches the max. value as engine could suffer severe damage.

Function buttons

1) CONTROL BUTTON
Button used to display and set instrument panel parameters with the position "UP".
2) CONTROL BUTTON
Button used to display and set instrument panel parameters with the position "DOWN".
3) HIGH-BEAM FLASH BUTTON (FLASH)
The high-beam flash button may also be used for LAP functions.
4) TURN INDICATORS CANCEL BUTTON
The turn indicators on/off button may also be used for navigating through the MENU and for activating the "Riding Mode".
Press this button for 3 seconds to the left to activate the Hazard lights.



Technological Dictionary

Acronyms and abbreviations used in the Manual

ABS
Antilock Braking System
BBS
Black Box System
CAN
Controller Area Network
DDA
DUCATI Data Acquisition
DSB
Dashboard
DTC
DUCATI Traction Control
ECU
Engine Control Unit

Riding Mode

The rider can choose from three different preset bike configurations (Riding Modes) and pick the one that best suits his/her riding style or ground conditions. The Riding Modes allow the user to instantly change the engine power delivery (ENGINE), the ABS settings, the DTC settings.
Available Riding Modes:
Sport, Touring and Urban (for Hypermotard and Hyperstrada);
Race, Sport and Wet (for Hypermotard SP).
Within every Riding Mode, the rider can customise any settings.

Ducati Traction Control (DTC)

The Ducati Traction Control system (DTC) supervises the rear wheel slipping control and settings vary through eight different levels that are programmed to offer a different tolerance level to rear wheel slipping. Each Riding Mode features a pre-set intervention level. Level eight indicates system intervention whenever a slight slipping is detected, while level one is for very expert riders because it is less sensitive to slipping and intervention is hence softer.

Anti-lock Braking System (ABS)

The ABS system fitted on Hypermotard is a system that actuates combined braking with anti lift-up function for the rear wheel so as to guarantee not only a reduced stopping distance, but also a higher stability under braking. The ABS features different levels, one associated to each Riding Mode.

Ride by Wire (RbW)

The Ride by Wire system is the electronic device that controls throttle opening and closing. Since there is no mechanical connection between the throttle twistgrip and the throttle body, the engine control unit can adjust power delivery by directly affecting throttle opening angle.
The Ride by Wire system allows you to obtain different power level and delivery according to the selected Riding Mode (Engine), and even to control the rear wheel slipping (DTC).

Instrument panel

1) LCD Dot-Matrix.
2) REV COUNTER (rpm).
It indicates engine rpm value.
3) NEUTRAL LIGHT N (GREEN).
Comes on when in neutral position.
4) HIGH BEAM LIGHT (BLUE).
Comes on when high beams are on.
5) ENGINE OIL PRESSURE LIGHT (RED).
Comes on when engine oil pressure is too low. It must turn on at "Key-On", but must turn OFF a few seconds after the engine has started. It may shortly come on when the engine is hot, however, it should go out as the engine revs up.

Important
If the ENGINE OIL light stays ON, stop the engine or it may suffer severe damage.

6) FUEL WARNING LIGHT (AMBER YELLOW).
Comes on when fuel is low and there are about 4 litres of fuel left in the tank.
7) TURN INDICATOR LIGHTS (GREEN).
The light of the turn indicator in operation illuminates and flashes. They turn on and blink when the Hazard function (4 turn indicators on) is active.
8) "ENGINE/VEHICLE DIAGNOSIS - EOBD" LIGHT (AMBER YELLOW).
It turns on in the case of "engine" and/or "vehicle" errors and in some cases will lock the engine.
9) "OVER REV" LIMITER / "DTC" TRACTION CONTROL LIGHT (RED).

	Over rev light
No rev limitation	Off
1st threshold - no. RPM before the limiter threshold (*)	On - STEADY
Limiter (Overrev) kicks in (*)	On - Flashing

(*) each calibration of the engine control unit, depending on model, may have a different setting for the thresholds before the rev limiter kicks in and the rev limiter threshold.

	DTC intervention light
No intervention	Off
Spark advance cut	On - Steady
Injection cut	On - Steady

Note
Should both lights for Over rev Function activation and DTC intervention come on, instrument panel will give priority to Over rev Function.

10) ABS LIGHT (AMBER YELLOW).

Engine OFF / speed below 5 Km/h		
Light OFF	**Light flashing**	**Light steady on**
-	ABS disabled with the menu function (**)	ABS enabled, but not functioning yet
Engine on / speed below 5 Km/h		

Light OFF	**Light flashing**	**Light steady on**
-	ABS disabled with the menu function	ABS enabled, but not functioning yet
Engine on / speed above 5 km/h		
Light OFF	**Light flashing**	**Light steady on**
ABS enabled and functioning	ABS disabled with the menu function	ABS disabled and not functioning due to a problem

(**) the ABS can be considered as really disabled only when light continues flashing even after engine starting.



Refitting the front wheel

When all the necessary inspections have been completed, refit the wheel as follows.
Lubricate and fit the spacers (7) and (8) to the sealing rings on the sides of the wheel hub.

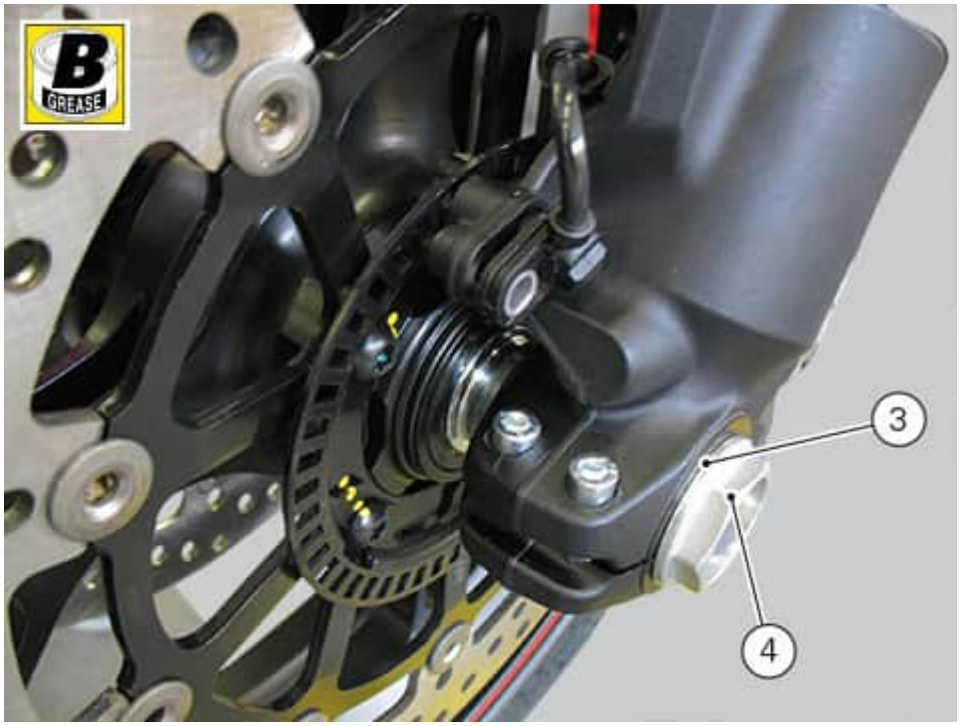




Fit the complete wheel between the fork legs.
Lubricate the shank and thread of the wheel shaft (6).
Take pin (6) fully home into the wheel hub.



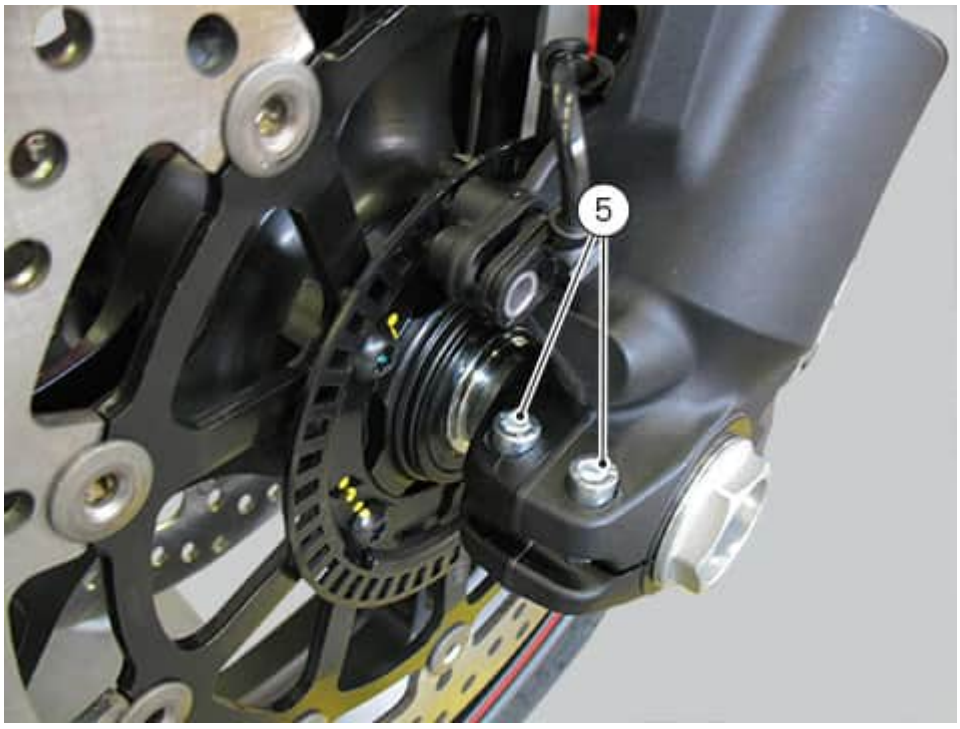
Fit the washer (3) on the end of the wheel shaft.
Grease thread and underside of the locking nut (3) and then screw it on.
Tighten nut (4) to a torque of 63 Nm ± 5%.



Apply grease to the threads and underside of the screws (2).
Tighten the two screws (2) securing brake callipers (1).
Operate the front brake lever two or three times.
Hold the lever pulled towards the handgrip and simultaneously tighten the screws (2) to a torque of 45 Nm ± 5%.



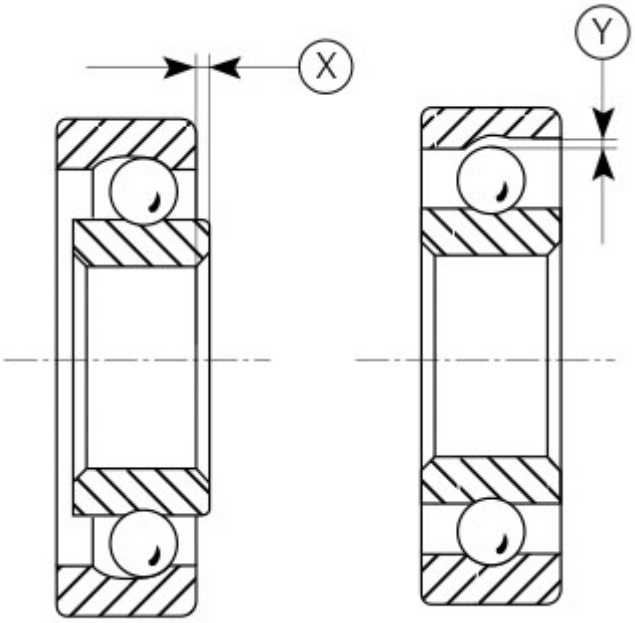
Before tightening the screws (5), lower the bike to the ground and push up and down on the handlebar to load the suspension; so the fork legs will become properly seated onto the wheel shaft.
Tighten the screws (5) to a torque of 10 Nm ± 5%, following a 1-2-1 sequence.



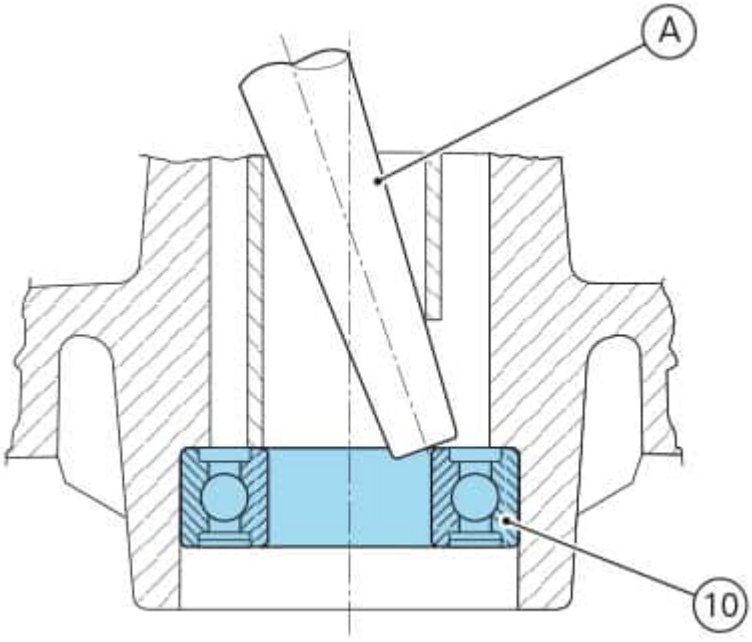
Overhauling the front wheel

Wheel bearings

Before checking the dimensions, check for wear on wheel hub bearings. Check for wear by hand after cleaning and degreasing the bearings in their seats.
Turn the inner ring.
Check the amount of radial and axial play. Excessive play will cause vibration and make the bike unstable and these parts will have to be replaced.



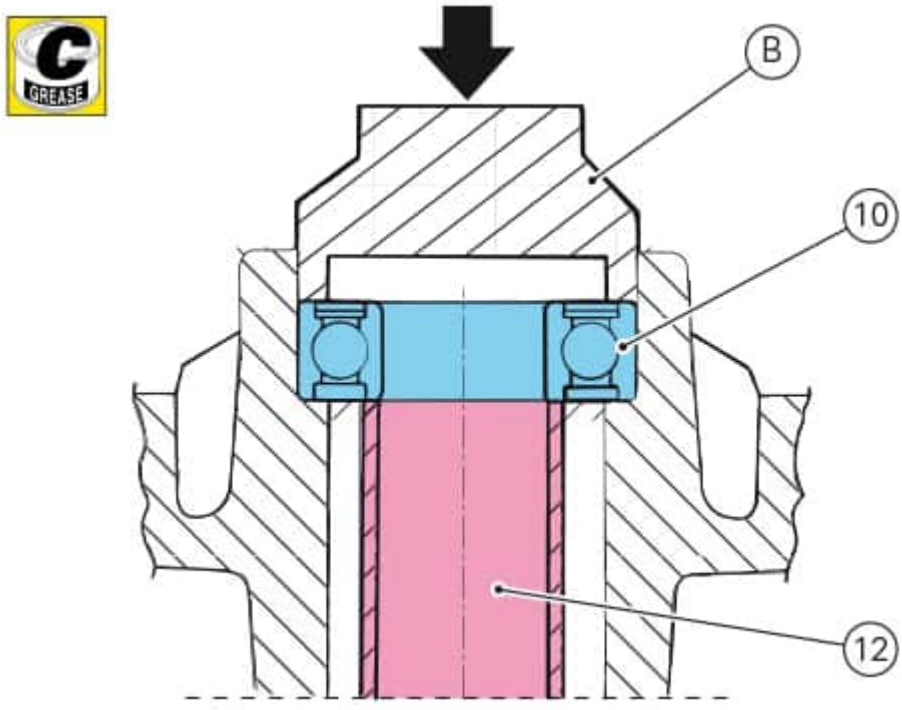
To remove the bearings (10) and the sealing rings (11) from the wheel hub follow the instructions below.
Position a drift (A) against the inner ring of the bearing (10).
Tap with a hammer until removing the bearing (10).
Apply the drift at different points to facilitate the removal.



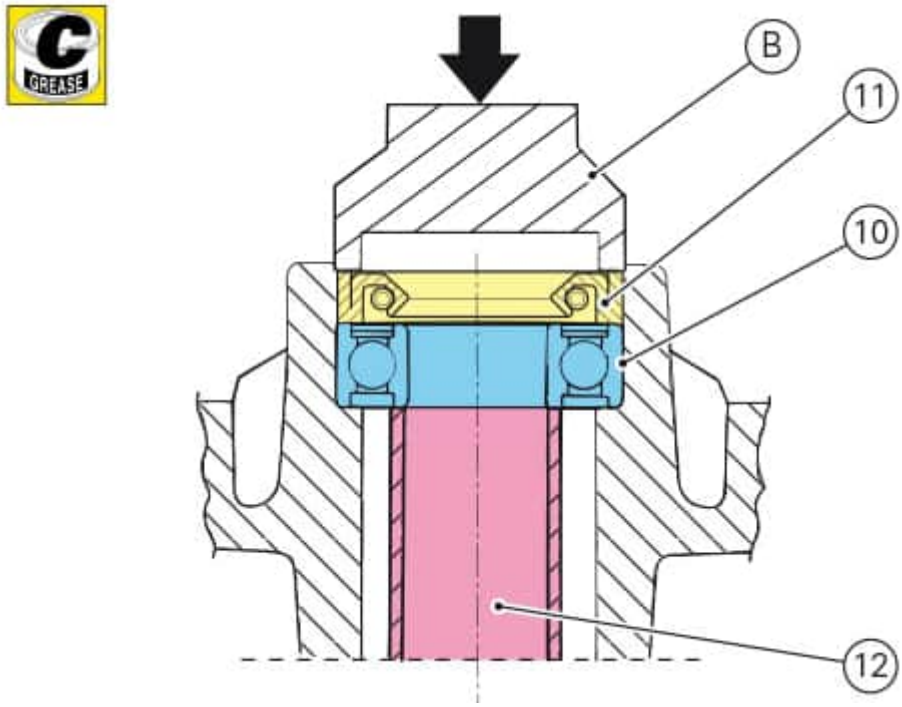
Important
Once removed, the used bearings and sealing rings must not be refitted.

Before fitting new bearings, check that the seat is clean and free from scoring and damage.

Grease the bearing seat and then push the new bearing into its seat.
Using a tubular drift (B) that only bears on the outer ring of the bearing (10) to drive the latter fully into its seat.



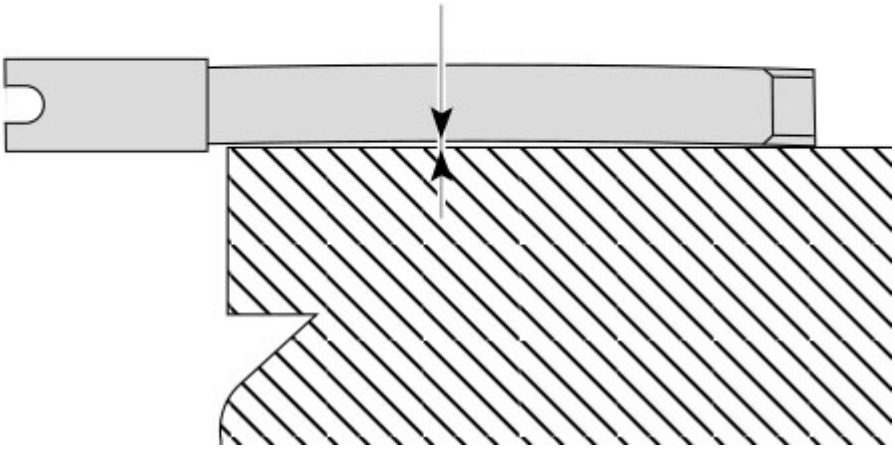
Use the same method to install the sealing rings (11).
Ensure that spacer (12) is fitted between the two wheel hub bearings.



Note
Wheels must be rebalanced after repair, maintenance and overhaul operations.

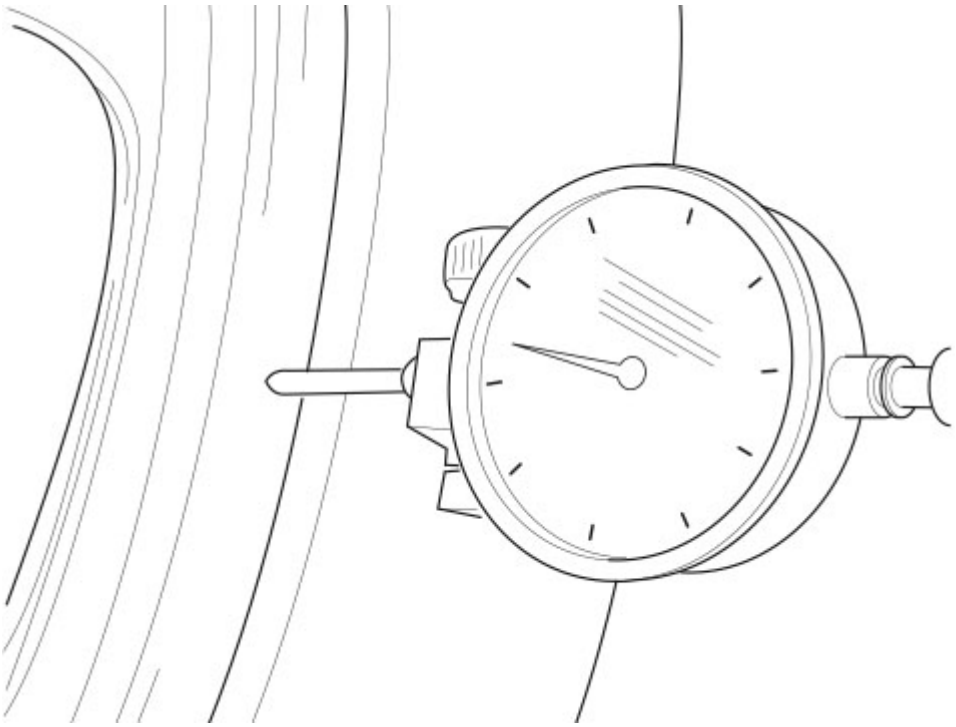
Inspecting the wheel shaft

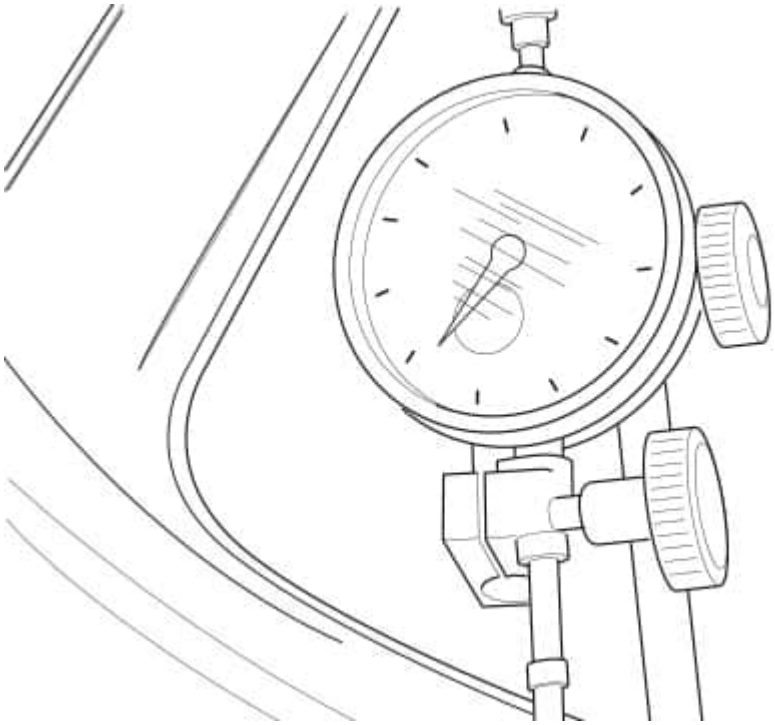
Check the wheel shaft for straightness.
Turn the shaft on a reference surface and measure maximum distortion using a feeler gauge.



Overhauling the wheel rim

After you have checked the bearings, check the rim as follows.
Visually inspect the rim for cracks, scoring and deformation: change the rim if damaged.
Insert the shaft in the wheel and position it on two fixed reference blocks.
Using a dial gauge, measure rim runout and out-of-round with respect to the shaft axis.





If the values measured are not within the tolerance limits, replace the wheel.

Removing the front wheel

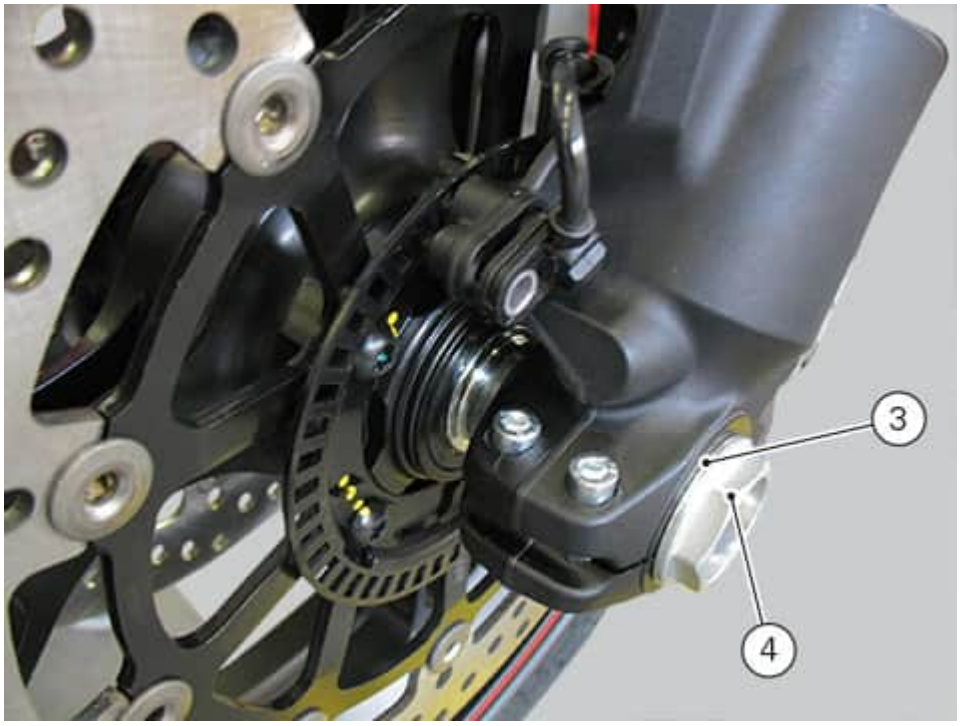
Support the bike so that the wheel to be removed is raised from the ground.
Working on both sides, remove front brake callipers (1) by loosening the two screws (2) securing the calliper to the fork leg without disconnecting them from the hoses.



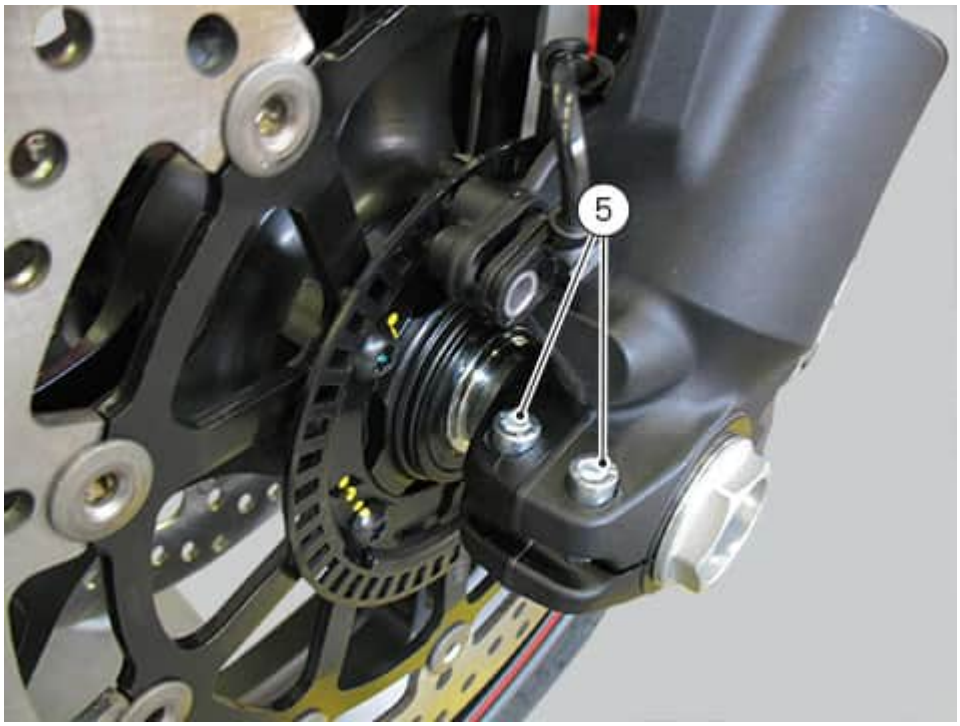
Warning

Do not operate the brake lever when the callipers are removed. This can cause the brake pad pistons to come out.

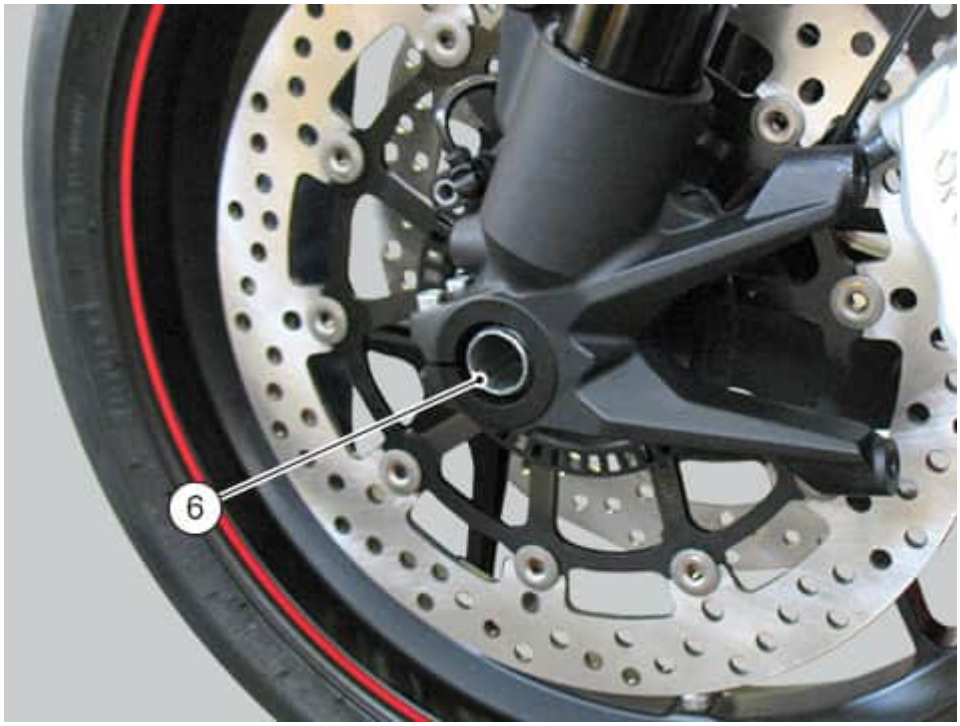
Loosen and remove nut (4) on wheel shaft left side.
Collect the washer (3).



Working on both sides, loosen screws (5) securing pin on fork legs.



Working from the left-hand side, use a plastic mallet to drive the wheel shaft (6) out from the opposite side and remove it.



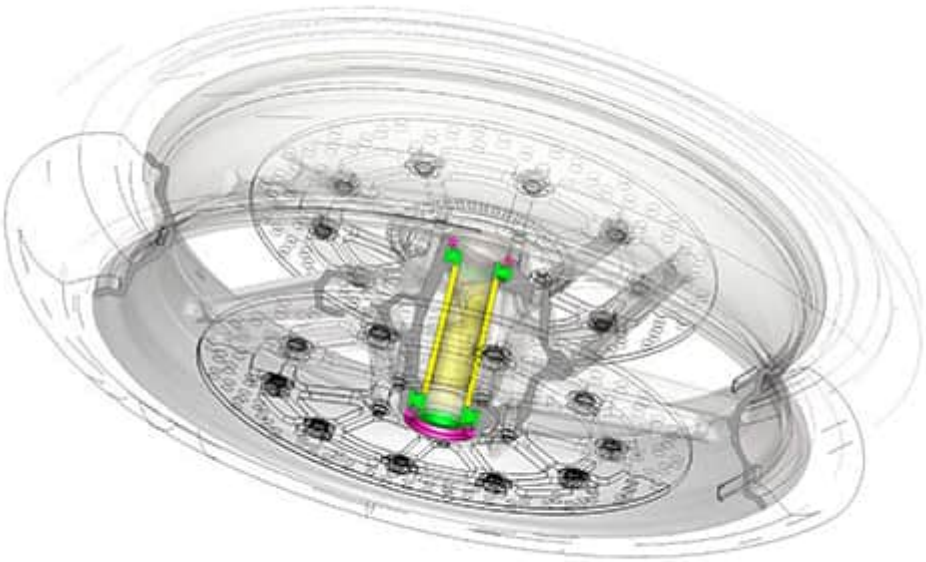
Remove the wheel and collect spacers (7) and (8).


7


8



Working on both sides, remove the sealing ring (9).



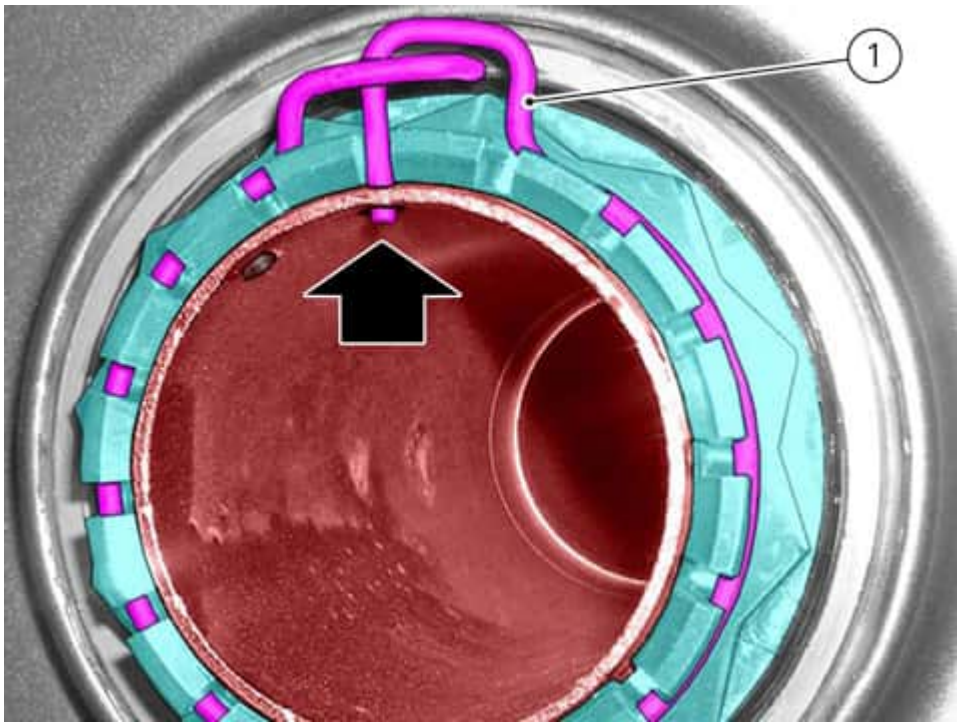
Refitting the rear wheel

Lubricate the wheel shaft threaded end with recommended grease.
Fit wheel on the shaft, matching (A) with shafts (B).



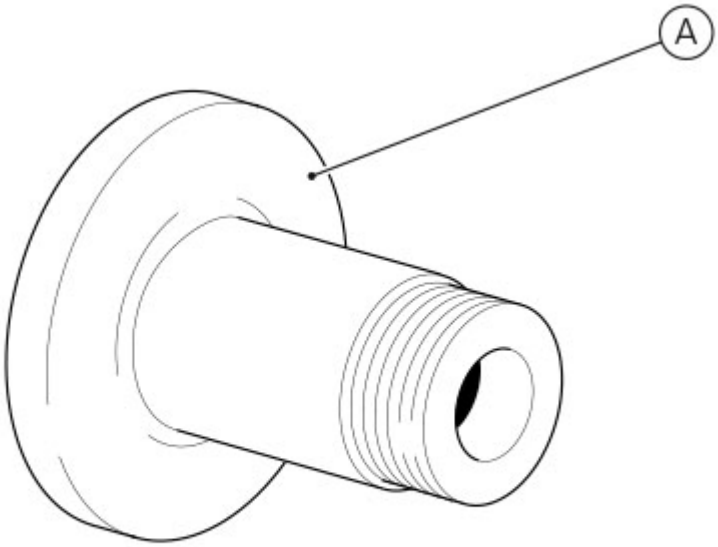
Fit the spacer (4) with the tapered side facing the wheel, and washer (3); apply the recommended grease to the nut (2) and start nut (2) by hand.
Tighten the nut (1) to a torque of 230 Nm ± 10%, checking that the hole on the nut is aligned with one of those on the wheel shaft.
Fit the clip (1), fitting the end into one of the holes in the shaft, orienting it as shown in the figure.




1

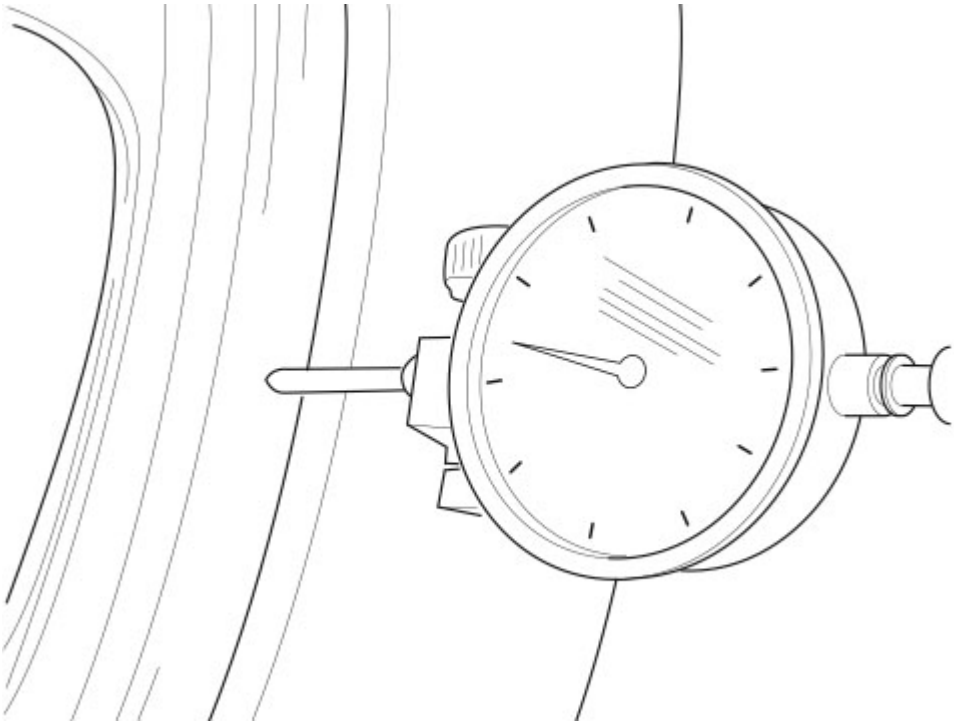
Overhauling the rear wheel

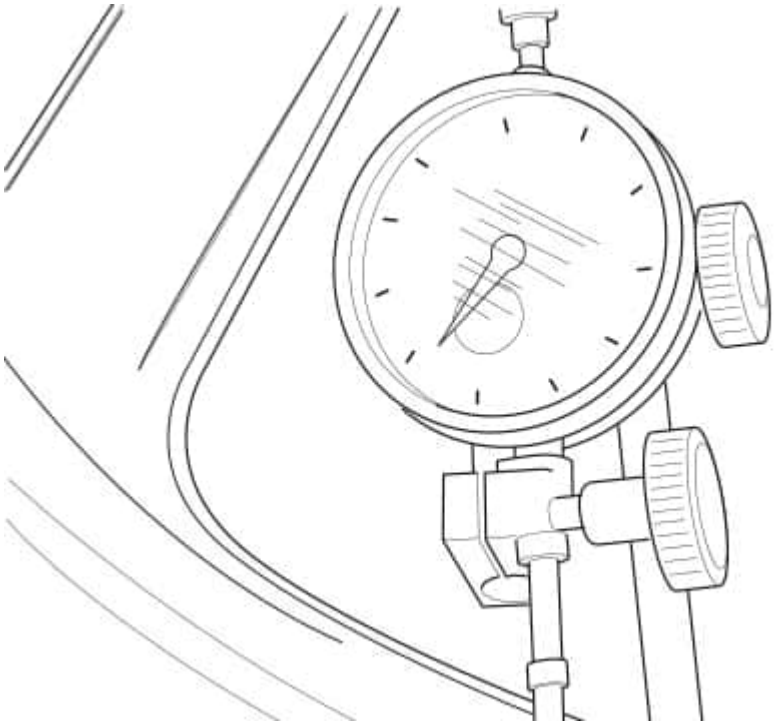
Check wheel rim conditions.
As the wheel rim has no bearings, it should be supported using the service tool (A) no. **88713.1073**.



Overhauling the wheel rim

Inspect the wheel rim as follows.
Visually inspect the rim for cracks, scoring and deformation: change the rim if damaged.
Fit the wheel rim on the service shaft no. **88713.1073** using the original fasteners.
Using a dial gauge, duly supported, measure rim runout and out-of-round relative to the shaft axis.
If the values measured are not within the tolerance limits, replace the wheel.





Removing the rear wheel

Remove the silencer (Removing the silencer).

Place the motorcycle on the rear service stand and engage the 1st gear.
Remove the circlip (1).
Using a suitable socket, loosen the wheel nut (2).
Fully unscrew the nut (2) and then slide out washer (3) and spacer (4).
Remove the rear wheel from the motorcycle.

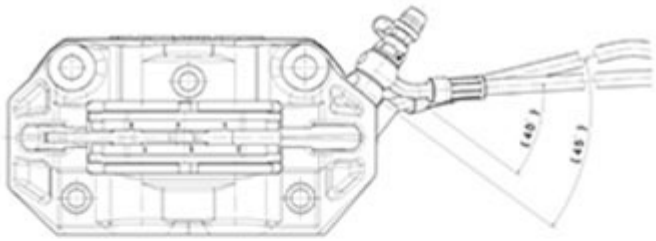


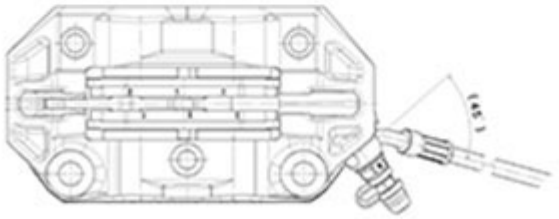
Refitting the front brake system

Upon the system refitting, pay attention to the orientation of the hose unions on the master cylinder and on the callipers.

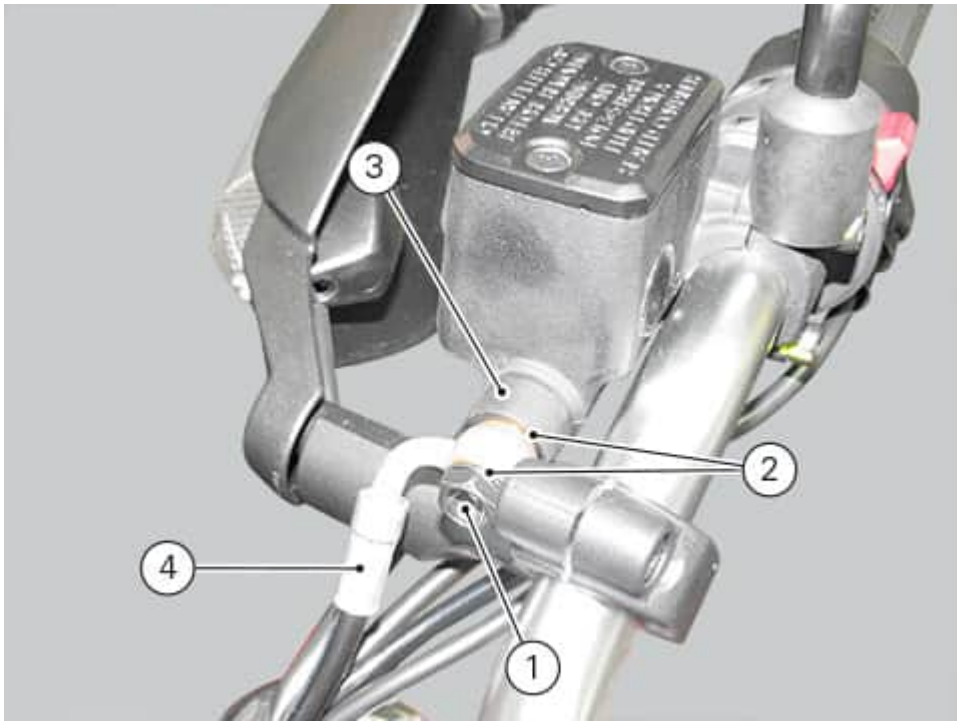
Warning

If incorrectly positioned, hoses can affect brake operation and foul moving parts. Position the component as shown in the figure.





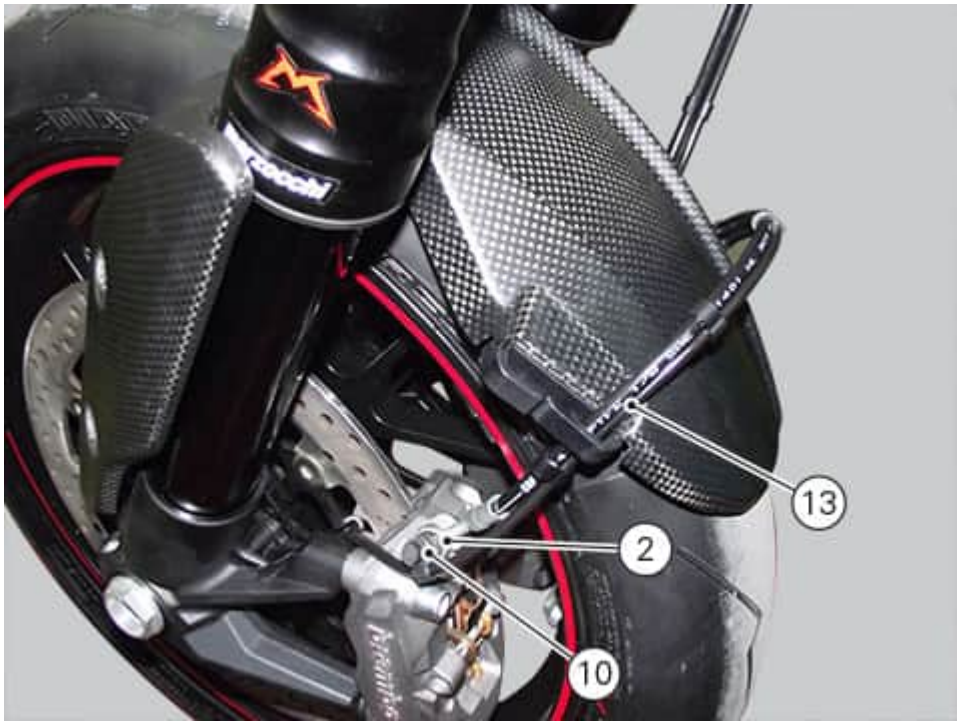
When reconnecting the brake line to the calliper or master cylinder, make sure to install the seals (2) on either side of the hose end union.
After having aimed the hose union (4), tighten screw (1) to the torque of 23 Nm ±10%.

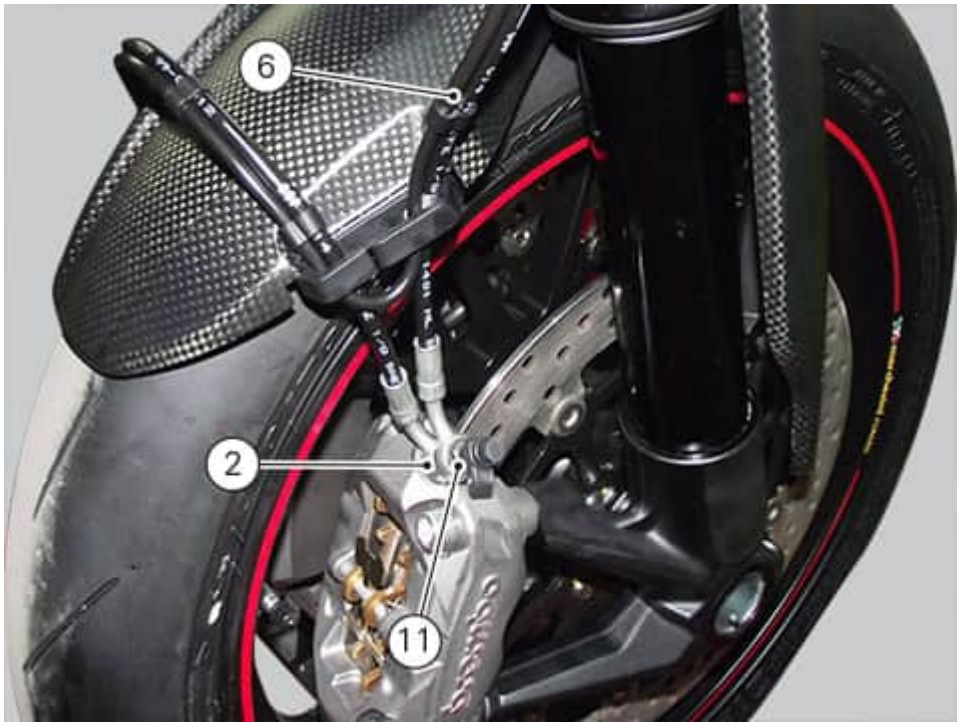


After having aimed the hose unions (6) and (13) on the front brake callipers, tighten special screws (10) and (12) to the torque of 23 Nm ±10%.

Note

Make sure that internal hose union and the external hose union are installed in the left brake calliper.

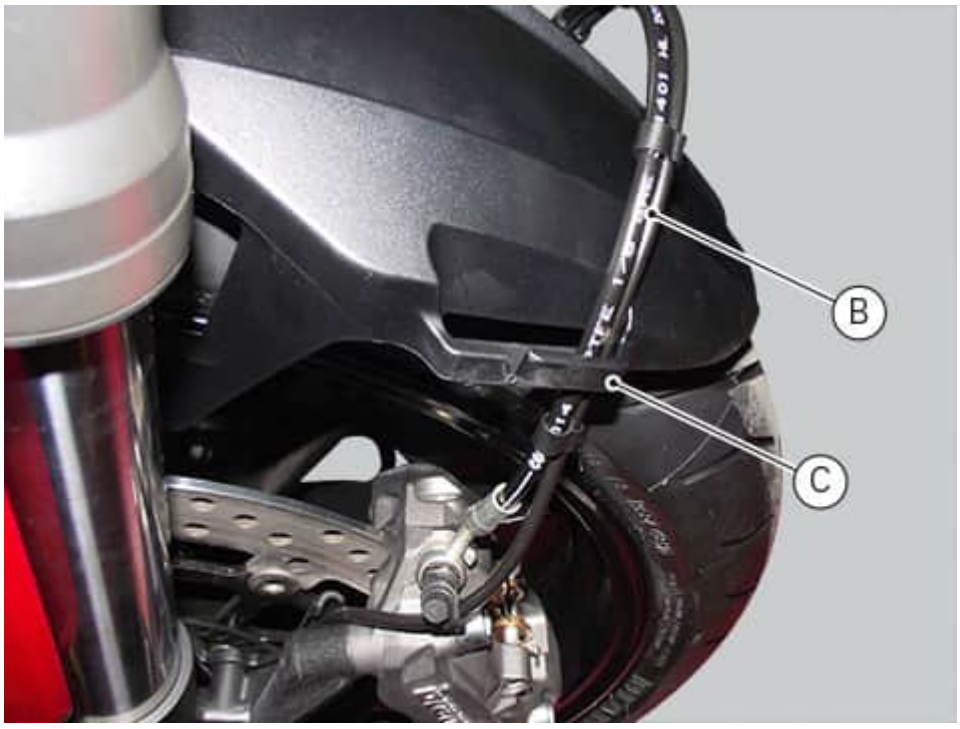




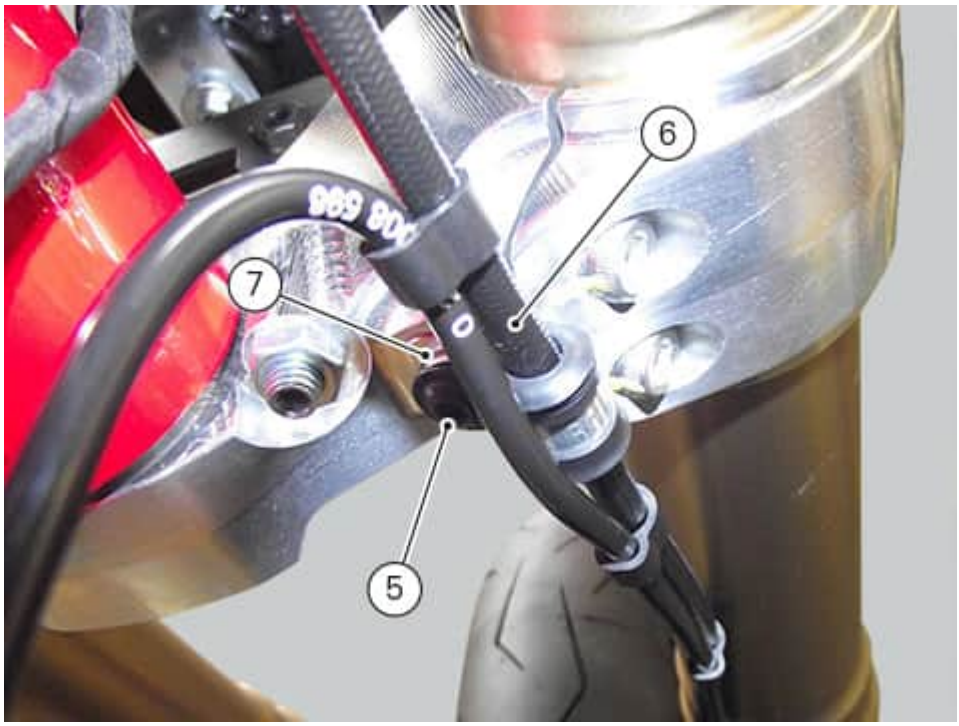
Fit the left brake calliper (9) over the disc.
Apply the recommended grease to the screws (8).
Start screws (8) to secure the callipers to the fork legs.
Operate the brake lever two or three times to pressurise the circuit so that the brake pads are brought into contact with the brake disc.
Perform the same operation to fit the right brake calliper.



Hold the lever pulled towards the handgrip and simultaneously tighten the calliper screws (8) to a torque of 45 Nm ± 5%
Reposition brake line (B) in its seat (C).



Connect the brake line to the speed sensor cable by using the special clips.
Secure the brake line (6) to the steering lower plate by means of bracket (7).
Tighten screw (5) to the specified torque of 10 Nm ± 10%.


6
7
5

Refitting the brake discs

Before refitting the brake disc to the wheel, clean all contact surfaces thoroughly and apply a medium strength threadlocker on the threads of retaining screws (1).
Fit the phonic wheel (3) working on the LH side.
Tighten the screws (1) retaining the brake disc (2) to the wheel following this sequence: 1-3-5-2-4.



Tighten screws (1) to a torque of 30Nm ± 5%.

Refit the wheel on the motorcycle (Refitting the front wheel).

Overhauling the front brake components

Important

The brake callipers manufacturer advises against servicing the brake callipers due to the safety critical nature of this component. Incorrect overhaul of this component could endanger rider safety.

Operations should be limited to replacement of the pads, fasteners and the bleed valve assembly.
The brake disc must be clean, without any signs of rust, oil, grease or dirt and no deep scoring.
To check the brake discs for wear follow the data detailed in chapter "Technical data".

Removing the brake discs

The front brake discs consist of an inner carrier, which is mounted to the wheel, and an outer rotor. Both parts must be replaced together as a pair.

Remove the front wheel (Removing the front wheel).

Undo the screws (1) securing the brake disc to the wheel, remove disc (2) and the phonic wheel (3) from the LH side.

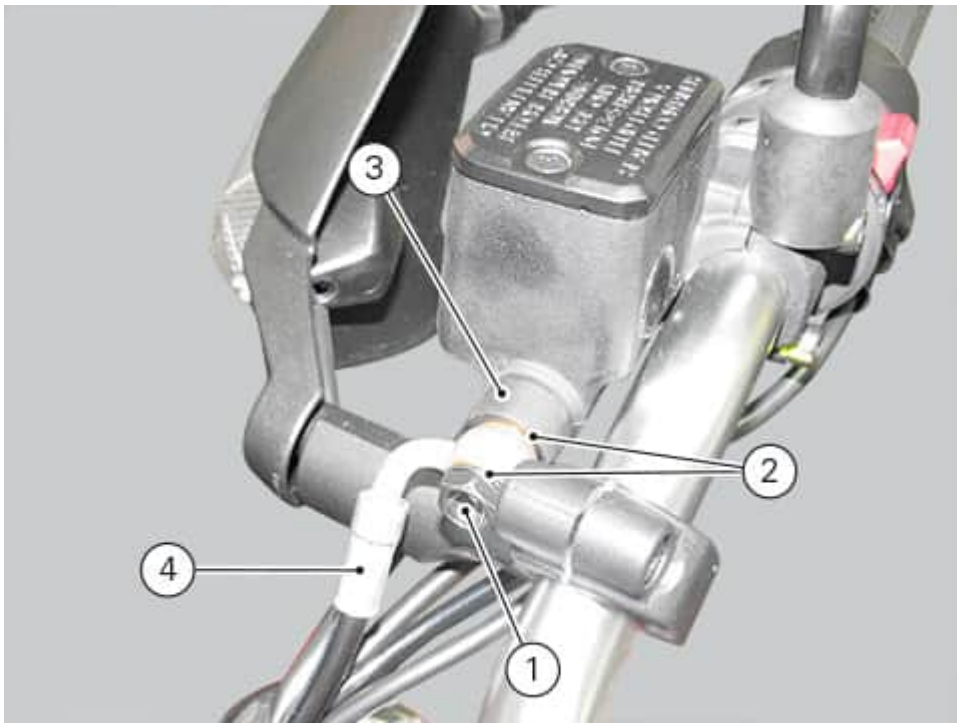


Removing the front brake system

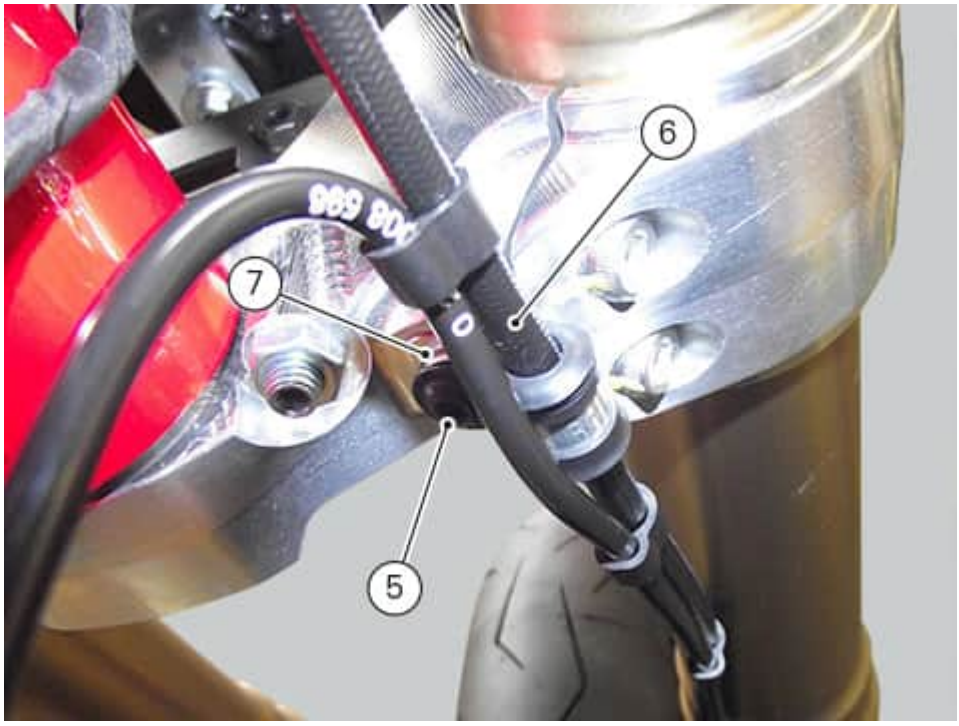
Drain the front braking system (Changing the front brake system fluid).
Remove the rear-view mirrors (Removing the rear-view mirrors).
Remove the right hand guard (Removing the hand guards).

For the front ABS brake system, please also refer to Section "ABS system operation information " and chapters "System components" and "ABS component maintenance".

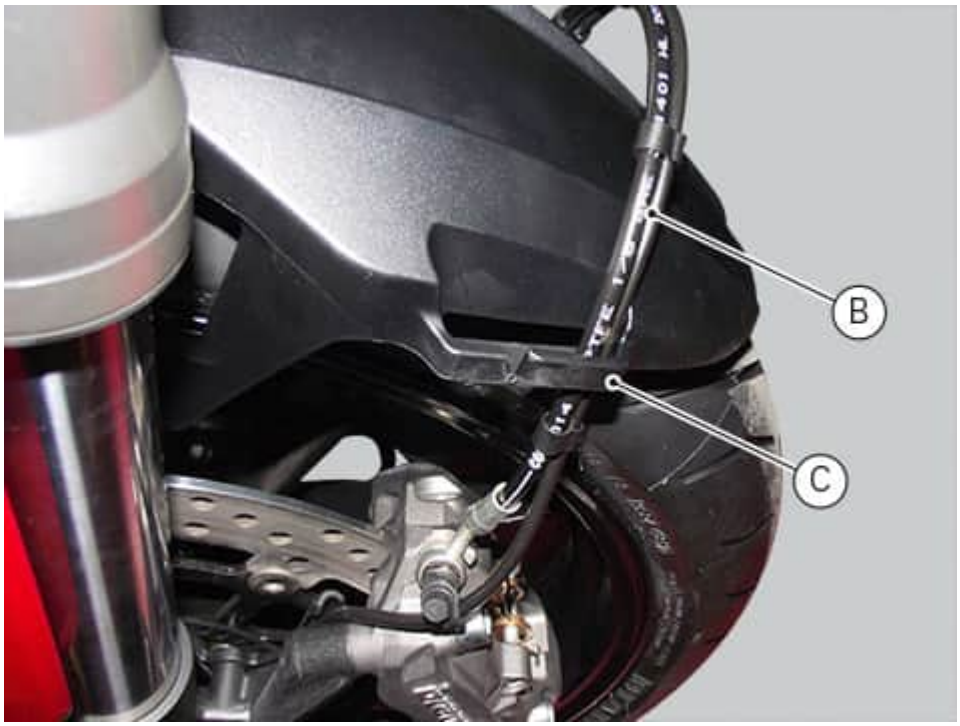
Undo the special screw (1), collecting the sealing washers (2) to release the front brake master cylinder unit (3) from hose (4).



Undo the screw (5) and slide out the front brake line (6) from the bracket (7) on the bottom yoke.



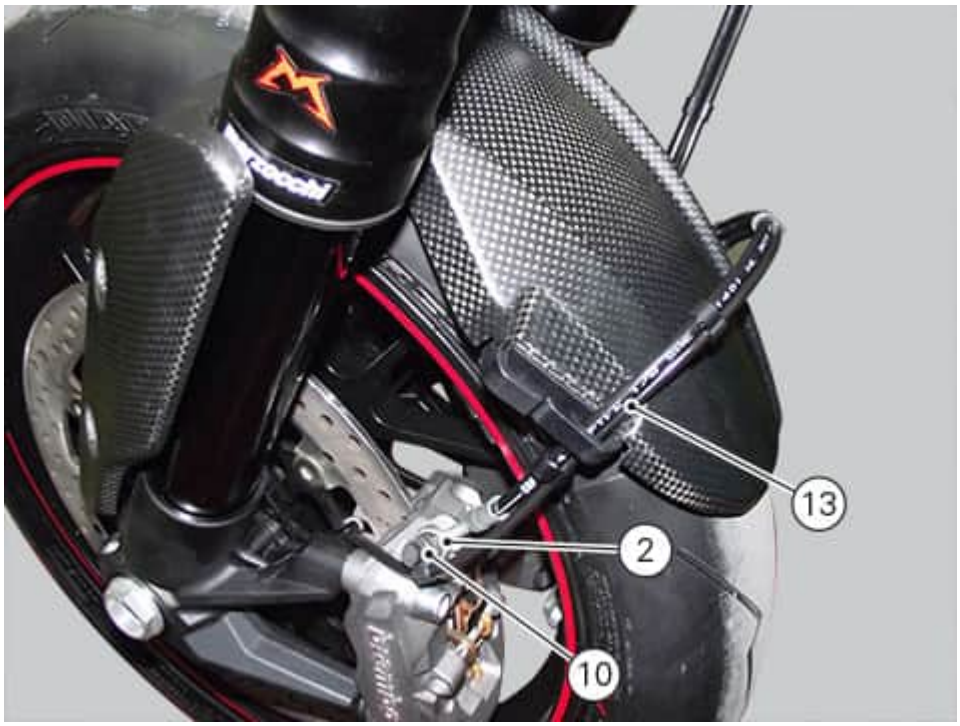
Remove the brake line from phonic wheel sensor cable by removing the closing clips.
Remove brake line (B) from its bearing surface (C) on the mudguard.

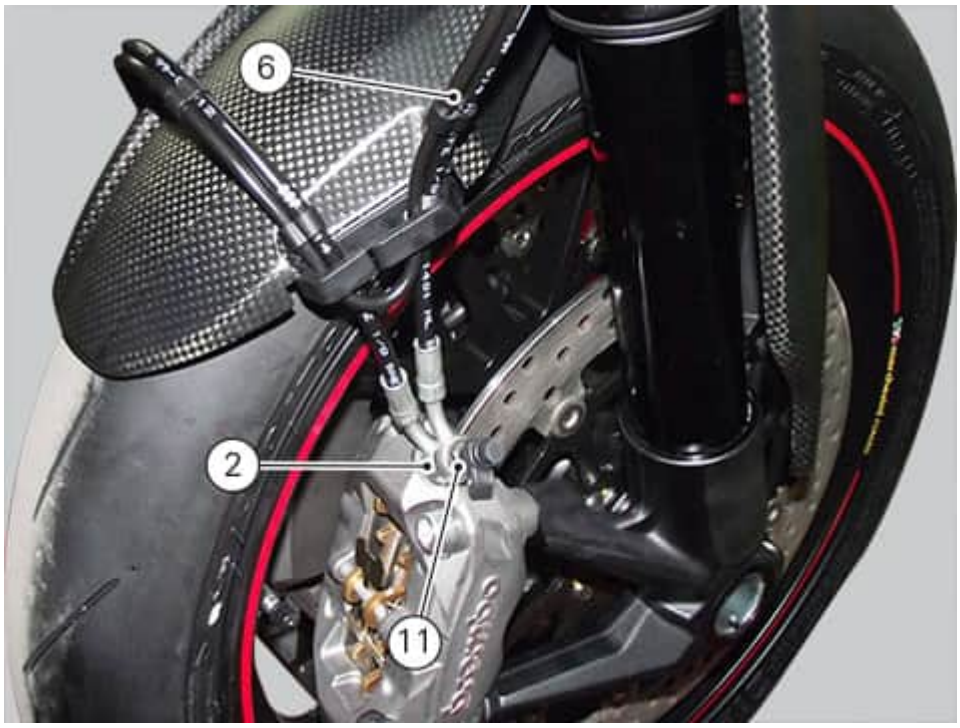


Loosen the two retaining screws (8) securing the left front brake calliper (9) to the fork leg.
Repeat the operation for the right brake calliper.



Undo the special screws (10) and (11) from both callipers and collect the seals (2).
Remove the front brake callipers from hoses (6) and (13).


13
2
10


6
2
11

Maintenance operations



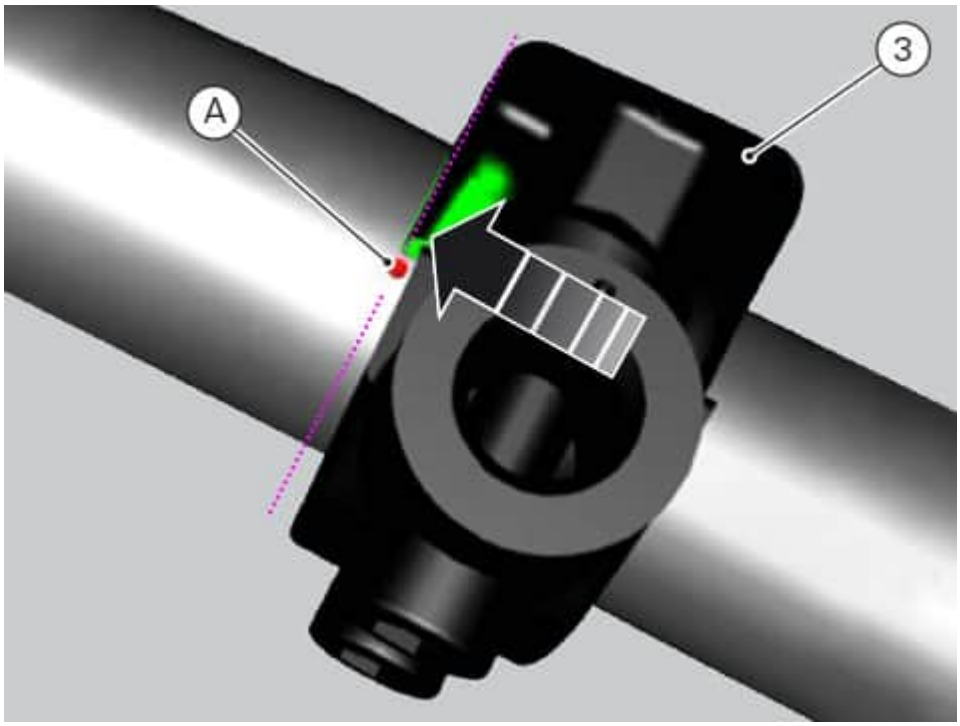
Warning

Brake fluid is corrosive and will damage paint. Avoid contact with eyes and skin. In case of accidental contact, wash thoroughly with water.

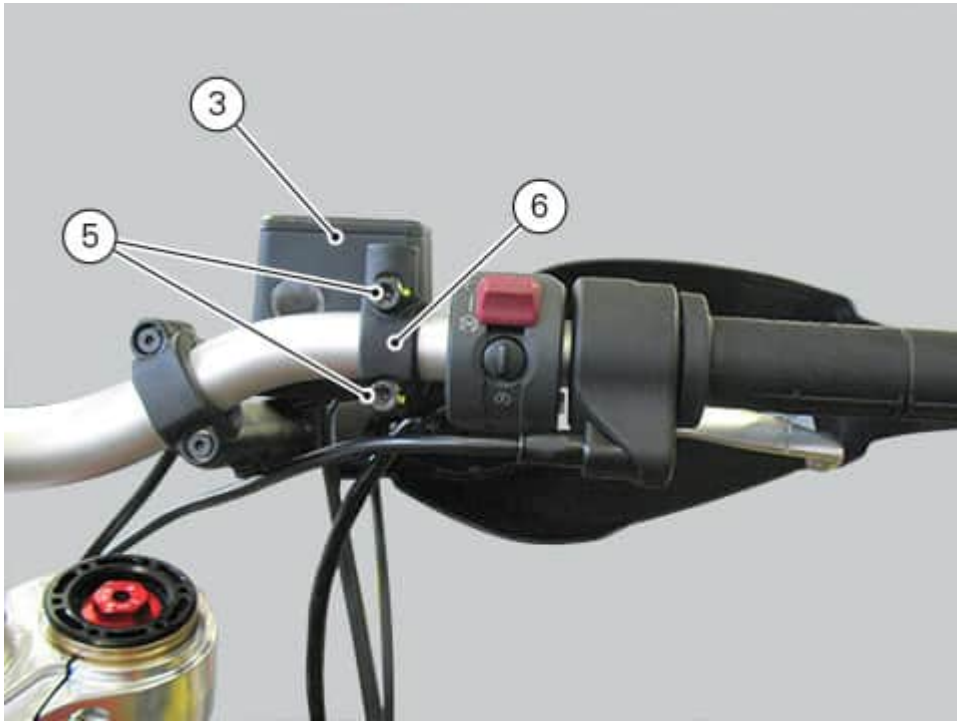
For all maintenance operations (wear check and replacement of brake pads and brake fluids, etc.) see chapter, "Maintenance operations".

Refitting the front brake master cylinder

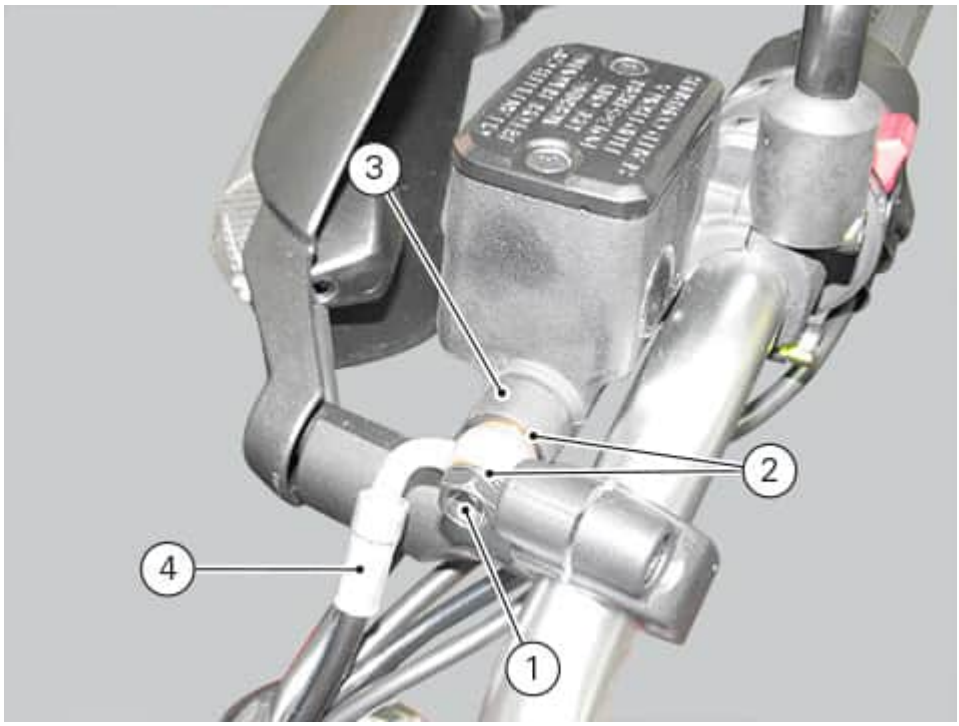
Insert the front brake master cylinder unit (3) on the right side of the handlebar so as the clamp internal edge matches with the mark (A).



Position clamp (6) and start the screws (5).
Tighten the fastening screws (5) to the specified torque of 10 Nm ± 10% following the sequence 1-2-1 starting from the upper screw.

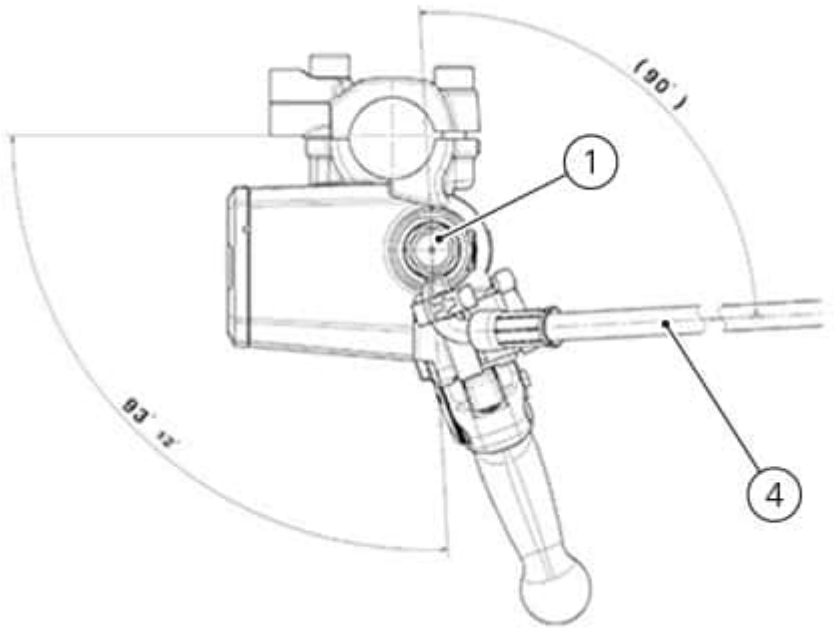


Position the hose (4) and sealing washers (2) on the master cylinder unit (3) and secure with the special screw (1), without tightening.



Warning
An incorrectly positioned hose can cause system faults and interfere with moving parts.

Aim the hose (4) as shown in the figure and then tighten the special screw (1) to a torque of 23 Nm ±10%.



Refit the right hand guard (Refitting the hand guards).
Refit the rear-view mirrors (Refitting the rear-view mirrors).
Fill the front braking system (Changing the front brake system fluid).

Removing the front brake master cylinder

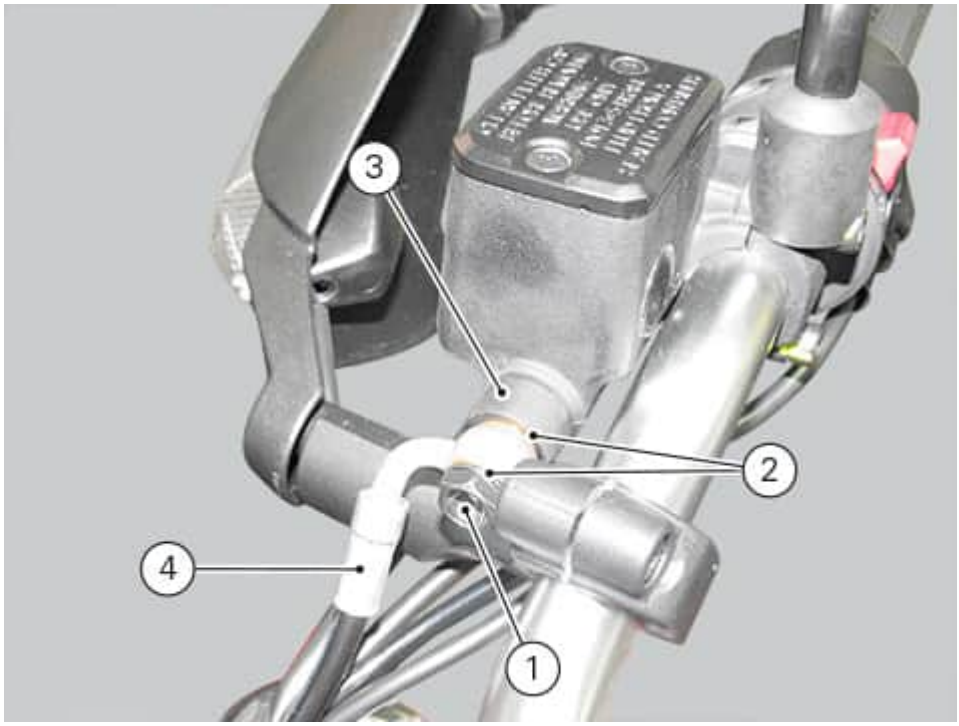
Warning

The brake master cylinder manufacturer advises against servicing the brake master cylinder due to the safety critical nature of this component. Incorrect overhaul can endanger rider and passenger safety. Maintenance operations on these units are limited to replacement of the following parts: control lever, fluid reservoir assembly and relative fasteners and master cylinder fasteners.

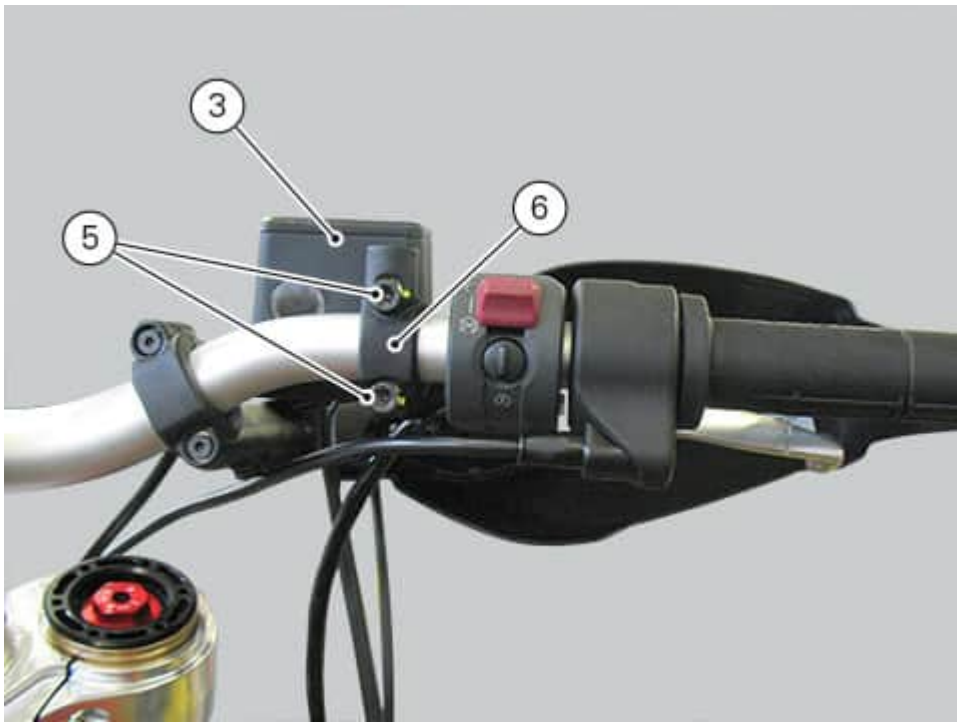
Drain the front braking system (Changing the front brake system fluid).
Remove the rear-view mirrors (Removing the rear-view mirrors).
Remove the right hand guard (Removing the hand guards).

For the front ABS brake system, please also refer to Section "ABS system operation information " and chapters "System components" and "ABS component maintenance".

Undo the special screw (1), collecting the sealing washers (2) to release the front brake master cylinder unit (3) from hose (4).



Undo the screws (5) securing the clamp (6), and then remove the front brake master cylinder assembly (3) from the handlebar.

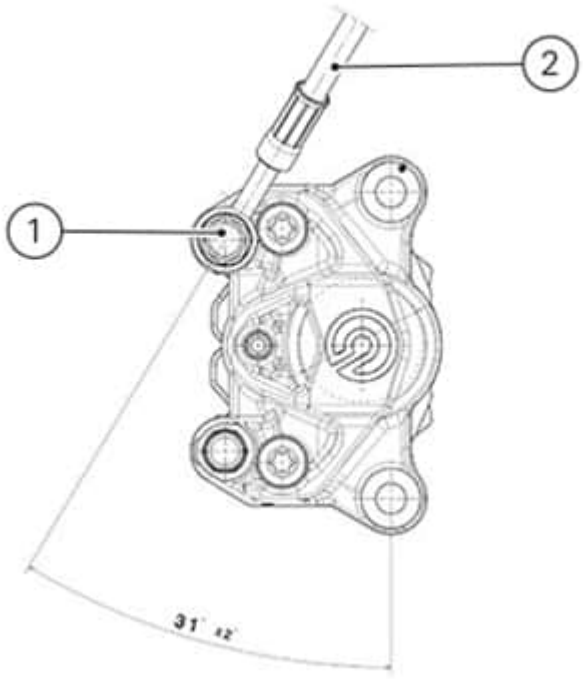

3
5
6

Refitting the rear brake calliper

If the brake lines (2) are replaced or if one of the rear brake system components has been removed, make sure that the hose unions on the master cylinder and the calliper are correctly positioned.

Warning

If incorrectly positioned, hoses can affect brake operation and foul moving parts. Position the component as shown in the figure.

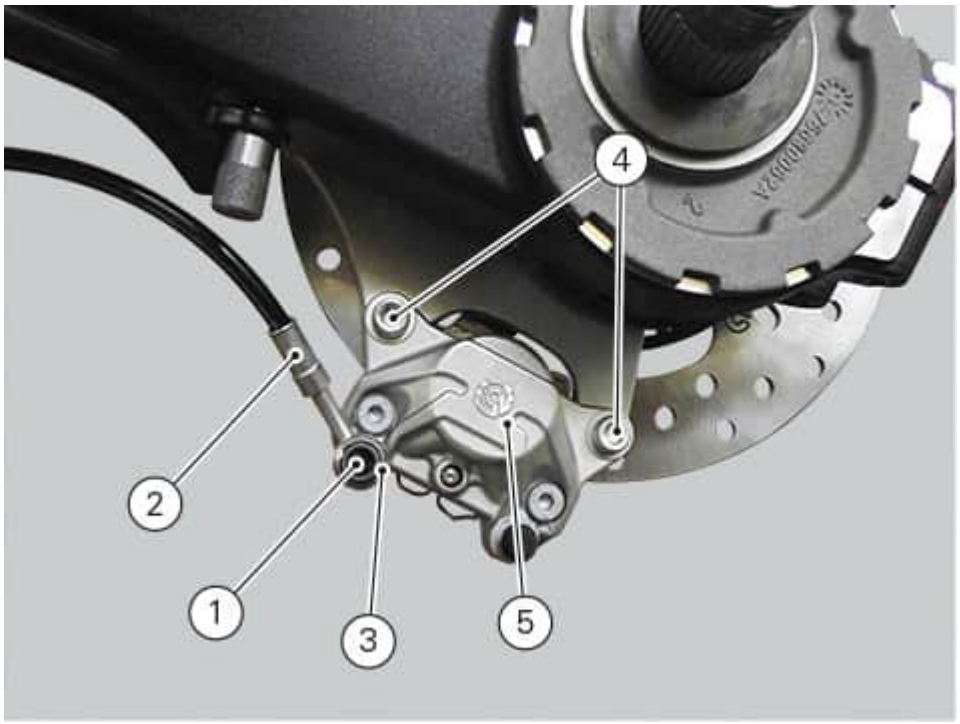


Remember to fit the copper gaskets (3) to the hose end union when reconnecting the brake line to the brake calliper (5).
After having aimed the hose union, tighten special screw (1) to the torque of 23 Nm ±10%.
If the speed sensor (6) is removed, fit it to the calliper holder bracket (A) with the spacer (8) and tighten the screw (7) to the specified torque of 10 Nm ±10%.

Note

The gap between sensor and the brake disc retaining screw must be within 0.6 and 2.2 mm.

Insert the rear brake calliper (5) on the brake disc, aligning it with the holes of the calliper mounting bracket.
Apply recommended grease on screws (4) and tighten them to 25 Nm ±5%.


4
2
1
3
5

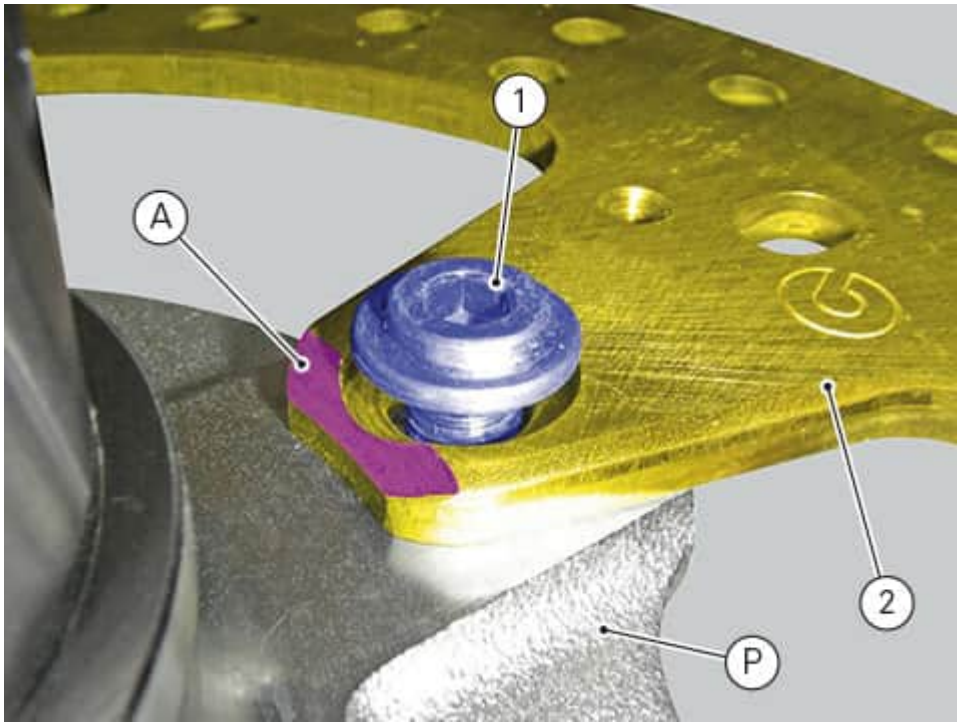
Removing the rear brake disc

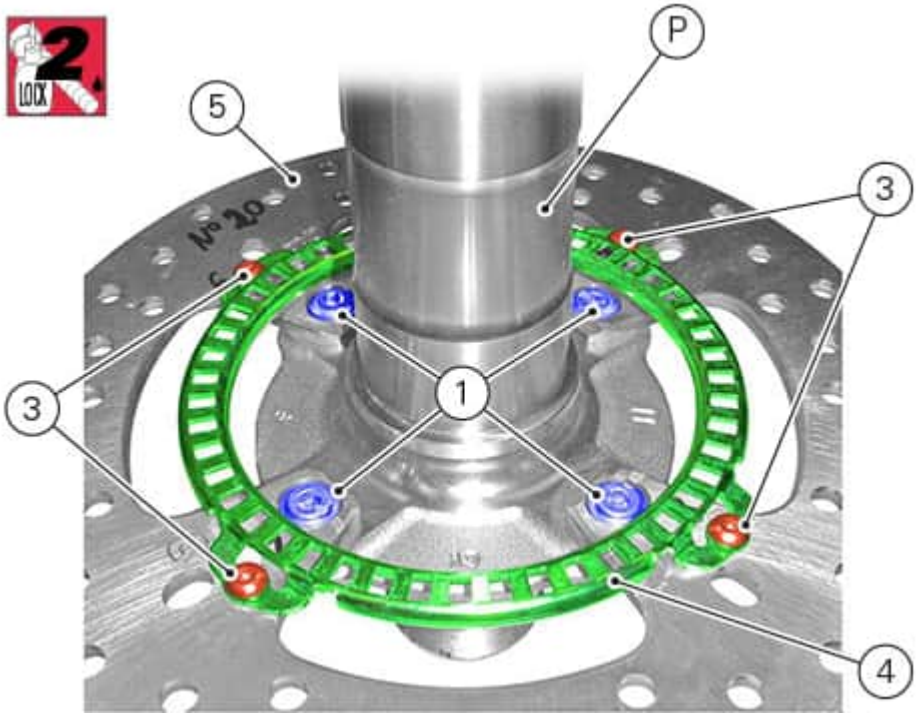
Remove the rear eccentric hub (Removing the rear wheel eccentric hub and the rear wheel shaft).

Undo and remove the four screws (1) securing the brake disc to the wheel shaft, and remove the rear brake disc (2).
Loosen the screws (3), and remove the rear phonic wheel (4).
The brake disc must be perfectly clean, with no rust, oil, grease or other dirt and no deep scoring.
To check the wear limit of the brake disc, refer to chapter "Technical data".
Position rear brake disc (5) on rear wheel shaft (P), aiming it with chamfered sides (A) facing upwards.
Fasten the disc by starting screws (1) after applying recommended threadlocker.

Note
Pay attention to align screw heads to the corresponding seats on brake disc.

Tighten the screws (1) to 27 Nm ± 10%, following a 1-2-3-4 sequence.
Position the phonic wheel (4) on brake disc (5), aiming it as shown in the figure.
Fasten phonic wheel (4) starting screws (3) after applying recommended threadlocker.
Tighten the screws (3) to a torque of 5 Nm ± 10%, in a cross pattern.
Remove the rear eccentric hub as described in Section "Removing the rear wheel eccentric hub and the rear wheel shaft".




2.
LOCK
P
5
3
3
1
4

Removing the rear brake calliper

Warning

The brake master cylinder manufacturer advises against servicing the brake master cylinder due to the safety critical nature of this component. Incorrect overhaul can endanger rider and passenger safety. Maintenance operations on these units are limited to replacement of the following parts: control lever, fluid reservoir assembly and relative fasteners and master cylinder fasteners.

Drain the rear braking system (Changing the rear brake system fluid).

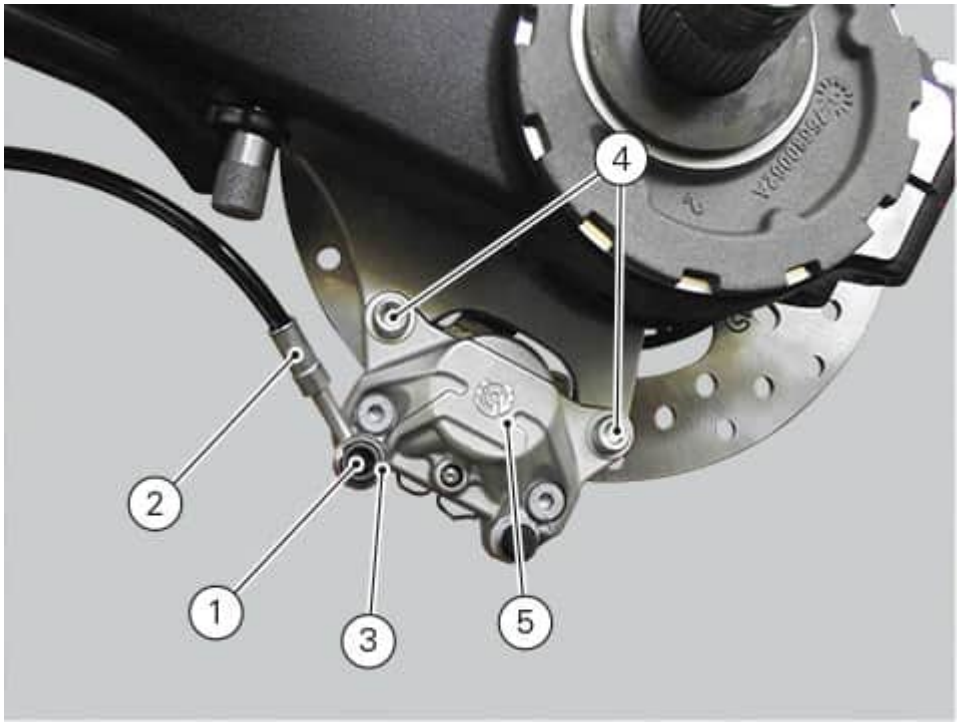
For the front ABS brake system, please also refer to Section "ABS system operation information " and chapters "System components" and "ABS component maintenance".

Undo and remove the special screw (1) securing the hose (2) to the rear brake calliper and the corresponding seals (3).
Remove the hose (2).

Undo the two fastening screws (4) securing the rear brake calliper (5) to the calliper holder bracket, and remove the brake calliper (5).
If it is necessary to remove the calliper holder bracket (A), refer to Section "Removing the rear wheel eccentric hub and the rear wheel shaft".

To replace the brake pads follow instructions in the paragraph "Checking brake pad wear and replacing rear brake pads".

To remove the speed sensor (6), undo the fastening screw (7) paying attention to the spacer defining the airgap (8).



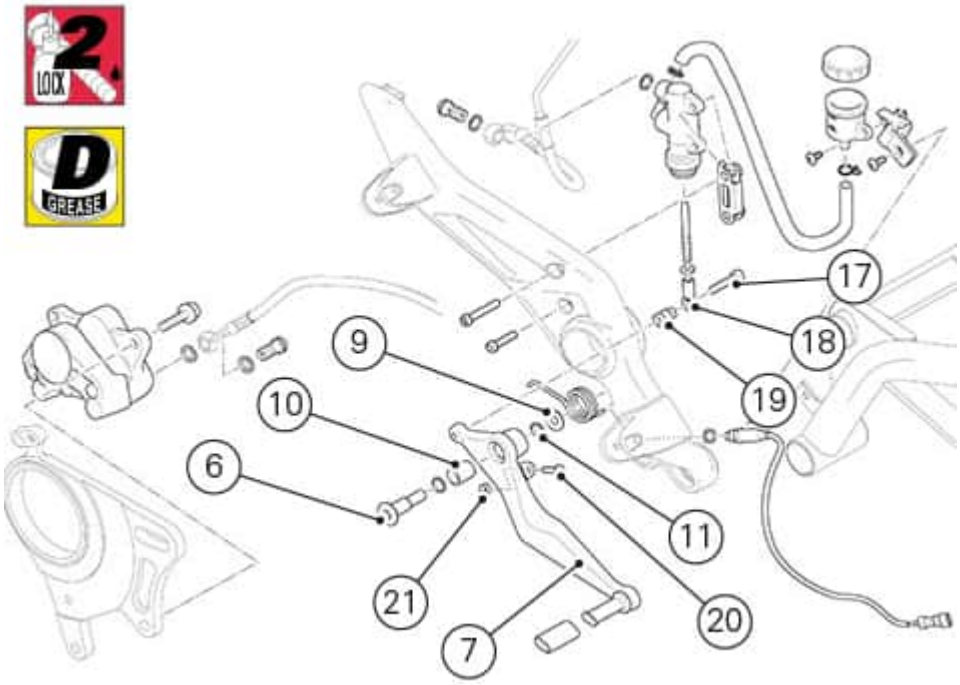


Only the following parts should be replaced:

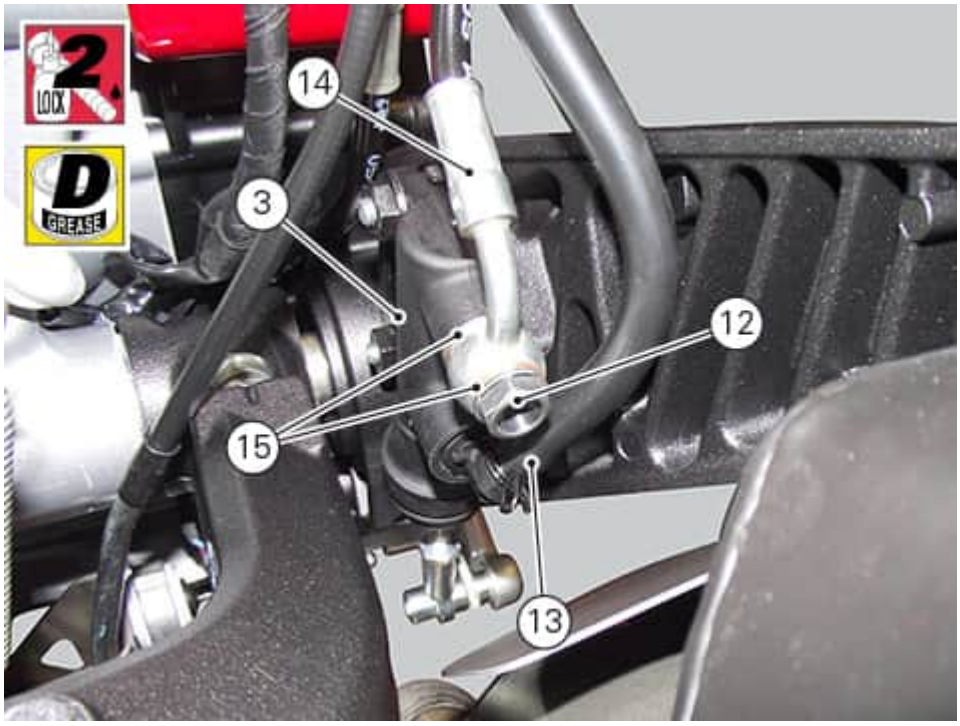
- calliper: pads, fasteners and bleed valve assembly;
- master cylinder: control pedal, bleed valve assembly, reservoir and relevant components.

Refitting the rear brake control

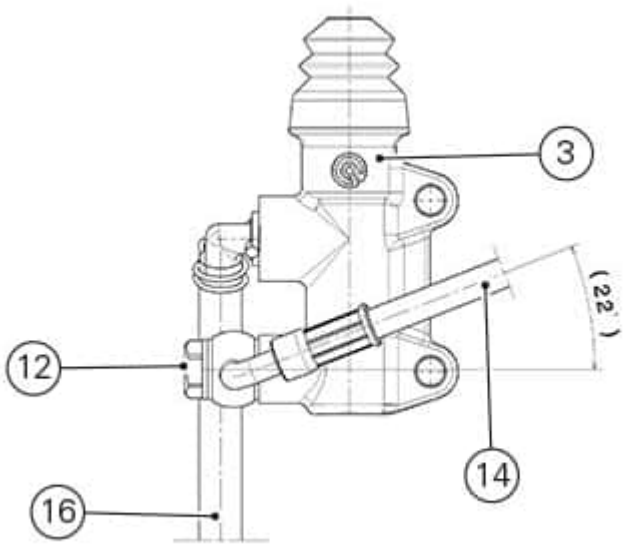
If previously removed, apply recommended threadlocker to screw (17), fit the control rod of the brake master cylinder (18) using spacer (19) by securing screw (17) to the torque of 10 Nm ±10%.
Check that the value for the adjusting screw (20) and nut (21) is the indicated one.
Apply grease on the inner surface of the bush (10) and threadlocker on the shaft (6). Install O-ring (11) onto shaft (6).
Insert shaft (6) on brake control lever (7), fit the other O-ring (11) and washer (9).



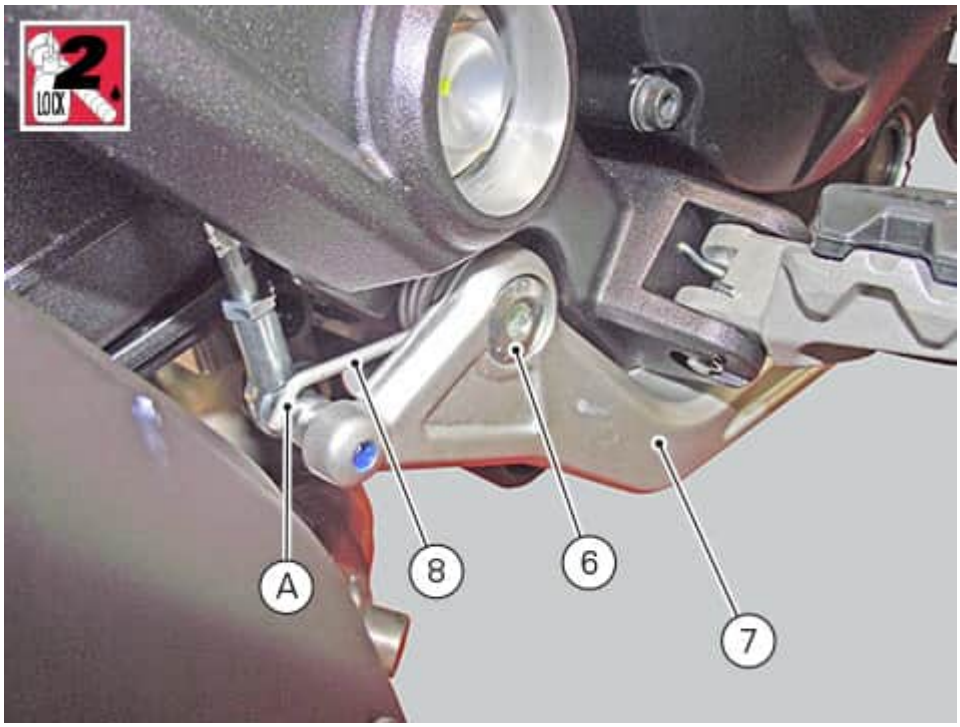
Reconnect the hose (14), locating the seals (15) on both sides of the hose end union, and secure it with the special screw (12) and securing hose (16) with hose clip (13).
Tighten the special screw (12) to a torque of 23 Nm ± 10%.



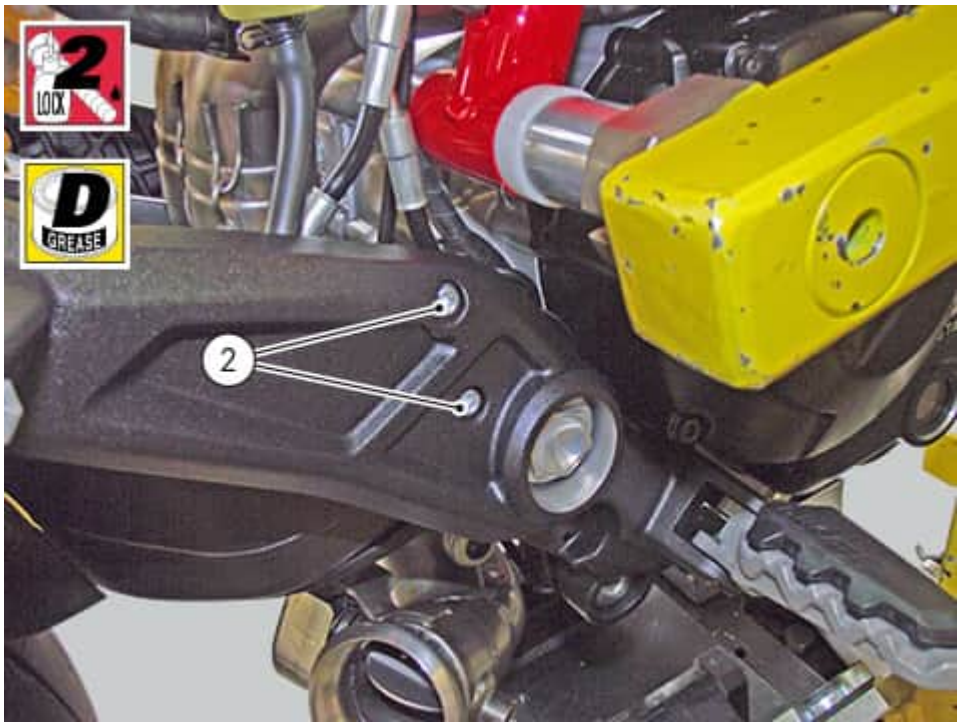
Note
Pay particular attention to the hose routing and hose coupling on the rear brake master cylinder

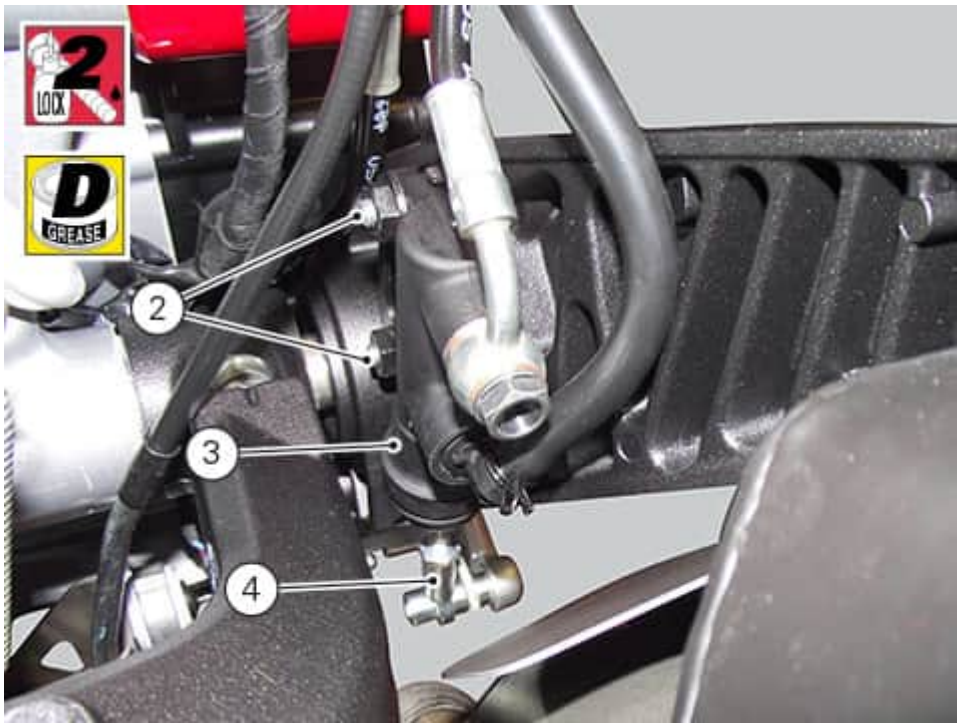


Apply the recommended threadlocker on shaft (6).
Fit brake lever (7) with spring (8) starting shaft (6).
Position the end (A) of the spring (8) as shown in the figure.
Tighten shaft (6) to a torque of 23 Nm ± 10%.

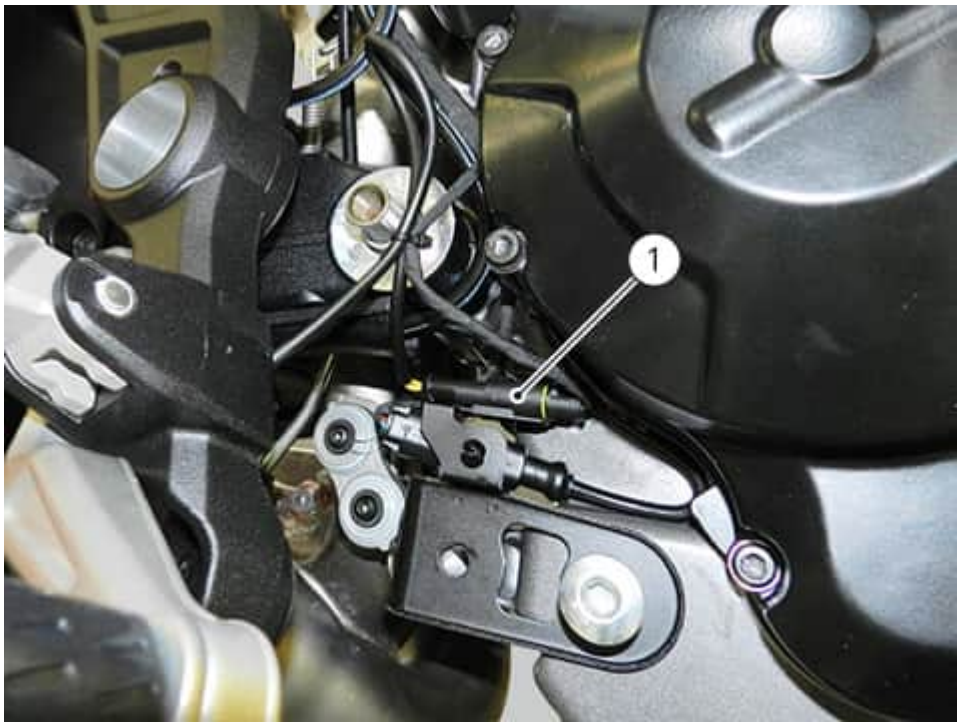


Apply the recommended threadlocker on the screws (2).
Position the rear brake master cylinder (3) on the vehicle inserting the retaining screws (2).
Insert the rod (4) inside the master cylinder (3), after applying the recommended grease.
Tighten screws (2) to a torque of 10 Nm ± 10%.





Connect rear stop switch (1) to main wiring.

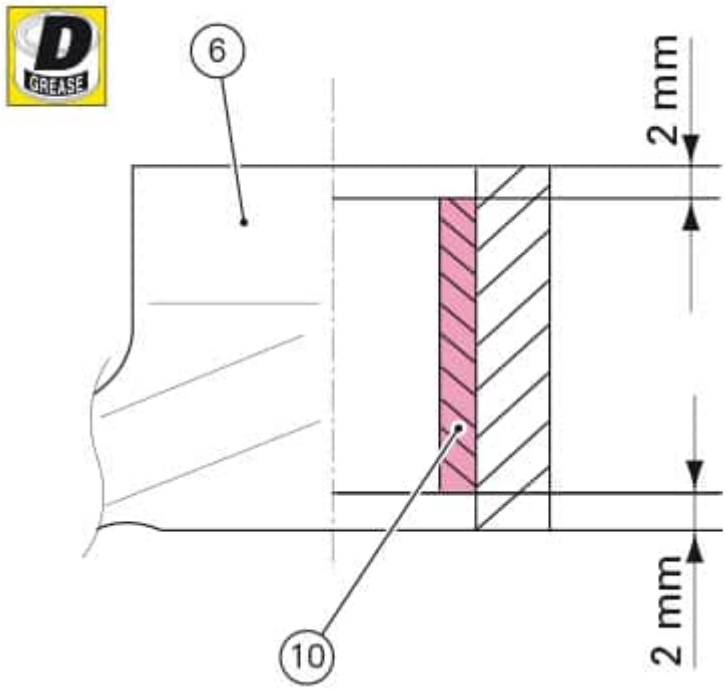


Fill the rear braking system (Changing the rear brake system fluid).

Disassembling the rear brake control

The brake master cylinder is supplied only as a complete unit; internal components cannot be replaced.
To disassemble the master cylinder's outer parts, follow the indications given in the exploded view at the beginning of this Section.
If the bush (10) inside the brake pedal (6) needs to be replaced, grease the external surface and fit the new bush using a press to insert it. The bush must be placed at 2 mm from the pedal external face.

To disassemble the various parts of the system, refer to the exploded view at the beginning of this chapter.



After performing an operation on the rear brake control, check the brake pedal position following the instructions detailed in Section "Adjusting the position of the gear pedal and rear brake pedal".

Removing the rear brake control

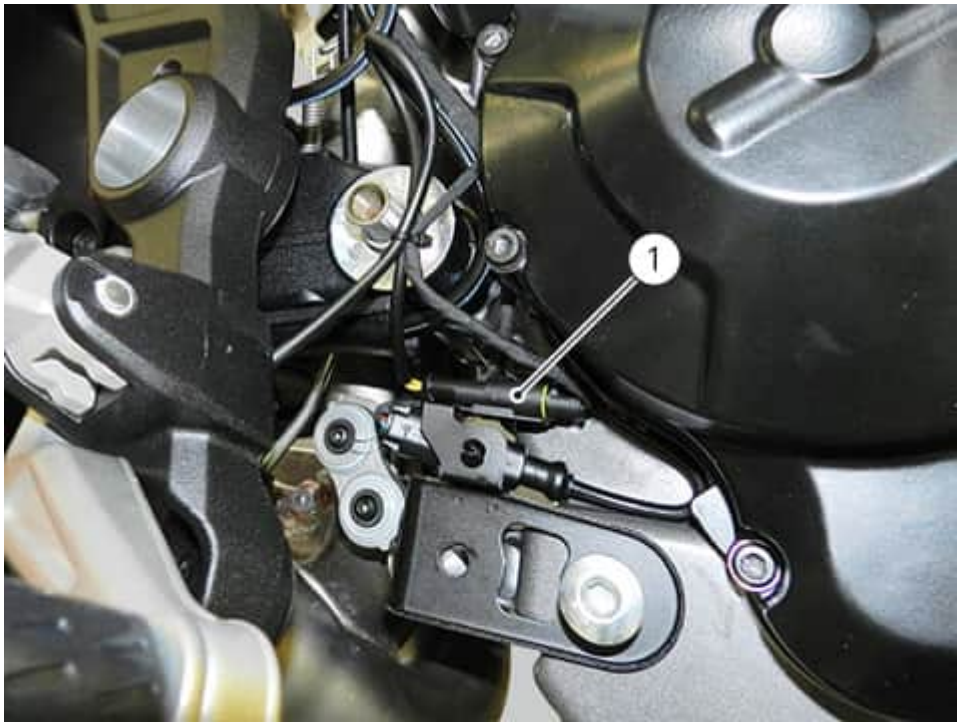
Warning

The brake master cylinder manufacturer advises against servicing the brake master cylinder due to the safety critical nature of this component. Incorrect overhaul can endanger rider and passenger safety. Maintenance operations on these units are limited to replacement of the following parts: control lever, fluid reservoir assembly and relative fasteners and master cylinder fasteners.

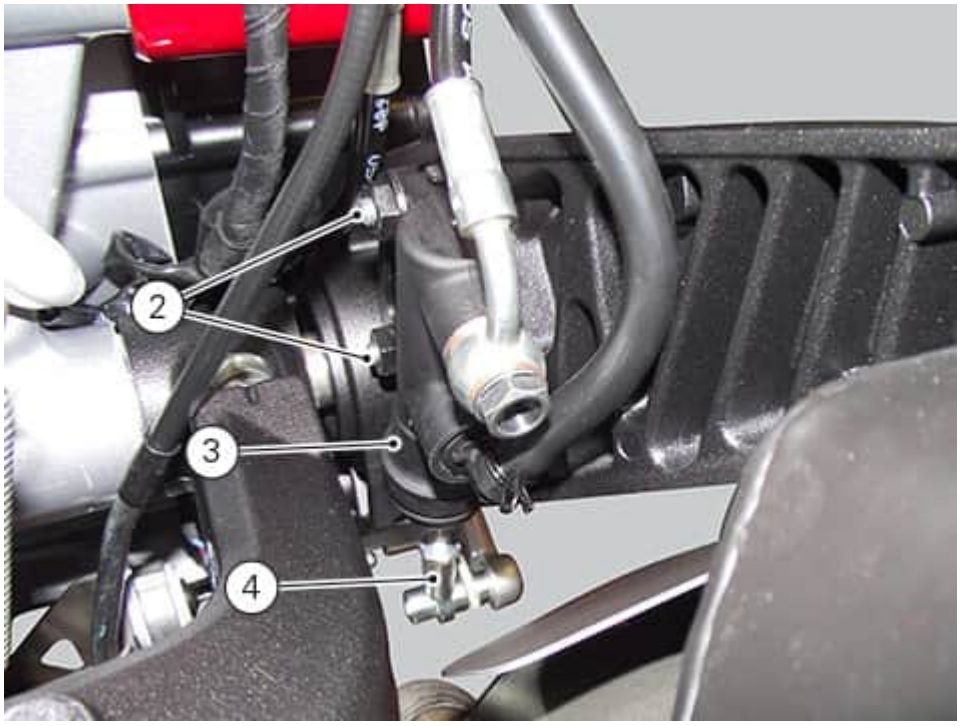
Drain the rear braking system (Changing the rear brake system fluid).

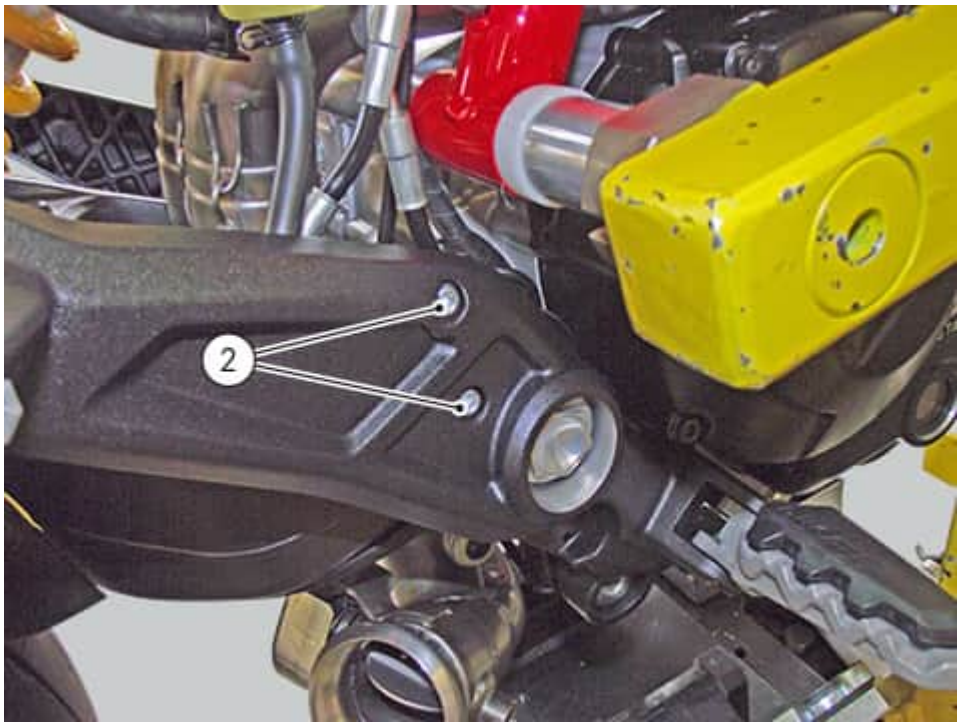
For the front ABS brake system, please also refer to Section "ABS system operation information " and chapters "System components" and "ABS component maintenance".

Disconnect rear stop switch (1) from main wiring.

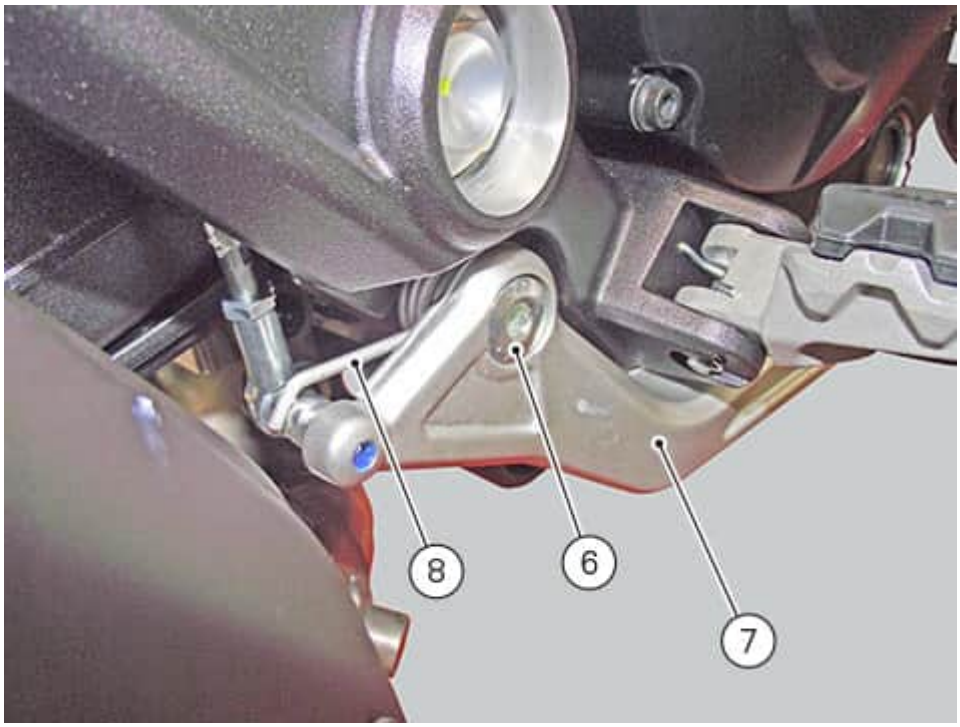


Loosen rear brake master cylinder retaining screws (2). Slide out rear brake master cylinder (3) from the adjusting rod (4), collect bracket (5) securing rear stop (1).

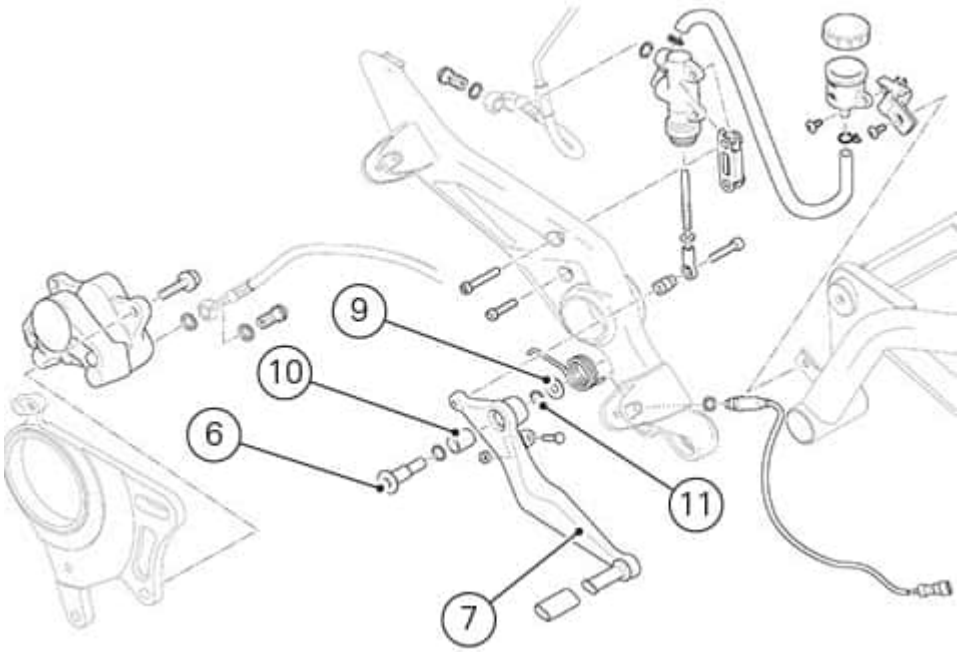




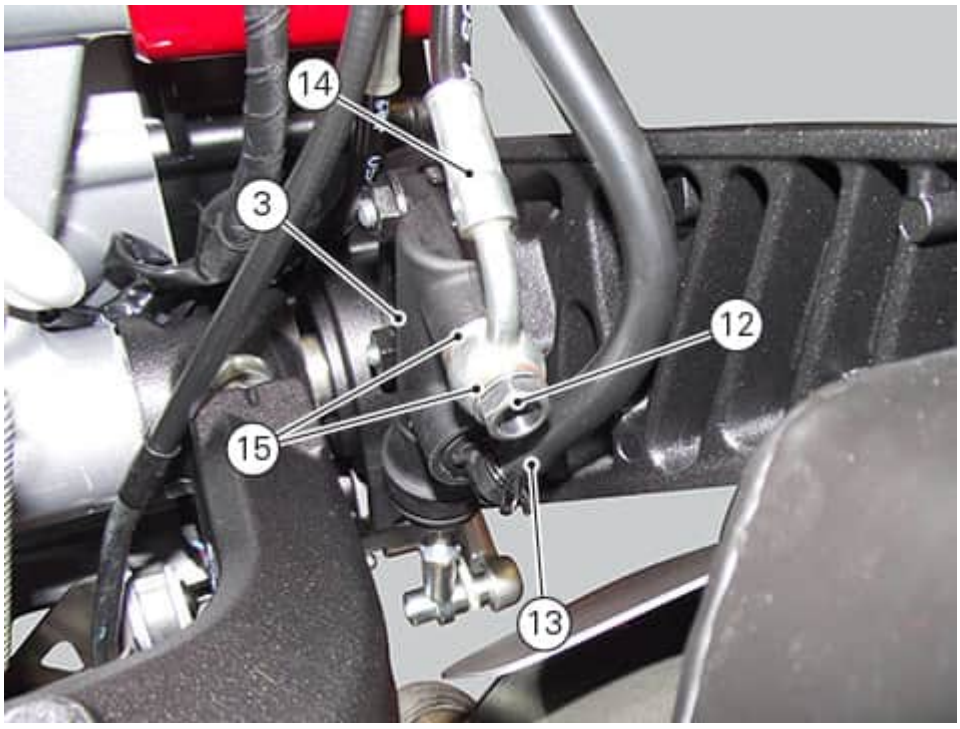
Undo pin (6) securing the brake lever (7), collecting spring (8).



Slide out the brake lever (7) and collect pin (6), washer (9), bushing (10) and O-ring (11).



Undo the special screw (12) from master cylinder (3) by removing the hose clip (13); slide out hose (14), collecting the seals (15).
Remove rear brake master cylinder (3) from vehicle.



ABS system deactivation

ABS (Antilock Braking System) intervention can be customised and possibly disabled on the instrument panel.

Warning

If the vehicle front wheel remains off the ground for a prolonged period while the vehicle is moving, the speed difference detected between the two wheels causes an ABS fault (warning light activated) and makes it impossible for the control unit to establish a reference speed.

ABS system operation information

The operation of the system is based on the analysis of the speed signals for front and rear wheels; the system is automatically deactivated if either of these signals is missing.

Note

In the event of the ABS control unit detecting a fault in the ABS electronic management system, it activates the specific fault warning indicator on the instrument panel and restores conventional braking functionality without ABS.
Hydraulic faults in the brake system and faults not directly related to the ABS system (e.g.: worn brake pads) cannot be detected by the ABS control unit.

Important

The operation of the system is based on the values read for the front and rear wheel speeds; take great care not to damage the phonic wheels and relative speed sensors when removing the wheels or when working close to these components; the phonic wheels damage may compromise the operation of the system and cause dangerous malfunctions.

ABS diagnosis

The diagnostic function of the ABS 8M ascertains the functionality of the main system components via hardware/software tests, but cannot modify the operating parameters of the ABS system.
The DDS diagnostic instrument is connected by cable to the ABS control unit communication socket (A), located beneath the seat. The connection cable between the tester and the ABS control unit has another branch with a negative and a positive clamp that must be connected to the vehicle battery to power the tester itself and enable communication with the ABS control unit.
From the SELF-DIAGNOSIS menu of the DDS instrument, select the ABS system model and wait until the correct configuration loads for analysing the configuration of the vehicle. After switching the vehicle to key-on state, the tester communicates with the ABS control unit.
Once in this configuration, a number of parameters and states of the ABS control unit and information concerning the control unit itself may be selected and displayed. If the tester receives notification from the ABS control unit that there are diagnostic errors dating from a prior test session or current test session still stored in its memory, the user is warned by specific message on the display and an audible alarm.
The ABS control unit identification number, identified by the prefix ID ECU, may be viewed from the INFO menu.

Select the function “View parameters and states”

This function allows the tester to display the following ABS system parameters and states:

Viewable parameters

Front wheel speed	The speed value for the front wheel is displayed in Km/h.
Rear wheel speed	The speed value for the rear wheel is displayed in Km/h.
System voltage value	The system voltage value, measured across the terminals of the ABS unit, is displayed in Volts

Viewable states

Hydraulic pump motor state	Indicates if the electric motor of the hydraulic pump inside the ABS unit is functioning or not.
Valve relay state	Displays the state of the main valve relay inside the ABS unit.
Rear inlet valve state	Displays the state of the normally open EV1 rear inlet valve (OFF if open, ON if closed).
Front inlet valve state	Displays the state of the normally open EV4 rear inlet valve (OFF if open, ON if closed)
Front outlet valve state	Displays the state of the normally closed AV4 rear outlet valve (OFF if closed, ON if open).

ABS switch state	Displays state of the analogue input of the ABS unit for the strategy switch off request (1 state to Uz, 0 state to GND).

Select the function “View errors”

This tester function provides the user with information concerning the error list in the ABS control unit memory, indicating if errors are stored or current. The following codes are given after a short description of the diagnosis type: MEM, indicating that the error has been stored previously by the ABS control unit but has not been detected in the current test session. ATT, indicating that the error is current and has been detected during the current test session.

Note

While ATT indicates that the error has been found during the current test session, it does not necessarily indicate that the error is actually active at the time of indication. For example: disconnecting the front wheel speed sensor causes the code ATT to be displayed after the error description, but the code continues to be displayed even once the cause of its activation has been eliminated by reconnecting the sensor, as the ABS will only check sensor operation again after the next key-off/key-on cycle. As a result, always perform a key-on/key-off cycle after any work on the ABS system, interrupting and re-establishing communication between the diagnostic instrument and the ABS control unit before checking the updated ABS error list again.

The abbreviations for all the errors displayed are given as follows:

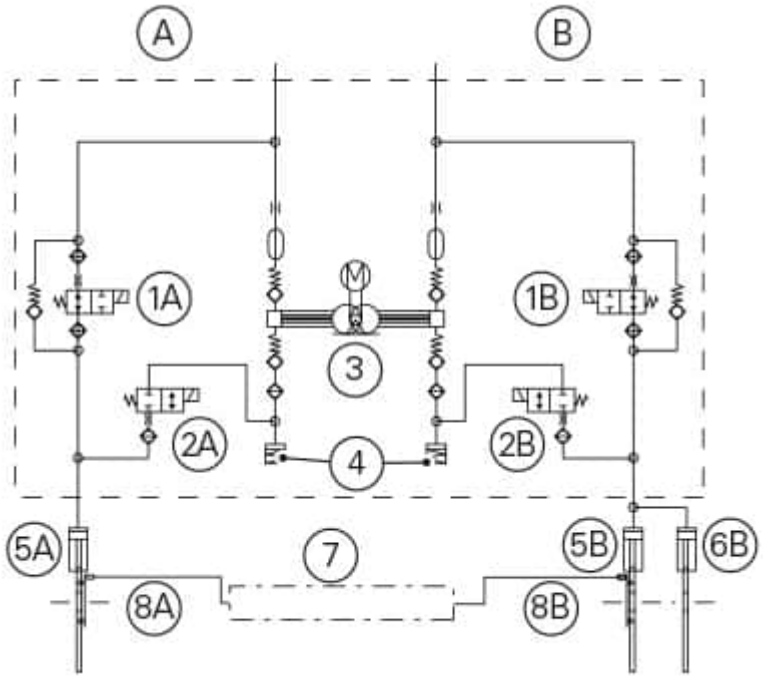
Errors	Description
Front speed sensor signal	Open circuit/short circuit to GND/short circuit to Uz of rear wheel speed sensor
Front speed sensor signal - Plausibility	Front speed sensor fault - Plausibility
Rear speed sensor signal	Open circuit/short circuit to GND/short circuit to Uz of front wheel speed sensor
Rear speed sensor signal - Plausibility	Rear speed sensor fault - Plausibility
Plausibility of difference between front and rear wheel speeds	Front and rear wheel speed difference (WSS_GENERIC)
Front inlet valve fault	Front inlet valve (EV) fault
Rear outlet valve fault	Rear outlet valve (AV) fault
Rear inlet valve fault	Rear inlet valve (EV) fault
Front outlet valve fault	Front outlet valve (AV) fault
ABS pump fault	ABS pump motor fault
Valve relay fault	Valve relay fault (Failsafe relay)
ABS electronic control unit fault	ECU fault
ABS unit power circuit fault	ABS power circuit fault

Select the function “ABS system information”

This tester function displays the identification data for the ABS system, such as Supplier reference, Software version and BARCODE.
e.g.:
Supplier ref.: DUCM696
Software version: 67890
Bar Code Data: HQOJM98200RA

1 Operating principle

The Ducati ABS brake system manages the front and rear brake systems separately.
The operating mechanism consists of a pulse generator (phonic wheel), with a ring of slots, fitted onto each wheel. There are HALL sensors on LH fork leg bottom end and on rear brake calliper holder plate. With vehicle running, they read the slots on the phonic wheel thereby detecting instant wheel speed.
These sensors output data to ABS ECU, which contains a software with a special control algorithm developed by Ducati.
The software compares the vehicle average speed with the instant wheel speed reading and assesses any slipping condition.
If control values are exceeded when the rider commands a certain pressure on brake calliper, the control unit shall hydraulically control the braking system, which is nearly locked up.
The system can modulate pressure at the calliper through a set of solenoid valves which first prevent any further increase of hydraulic pressure (EV valve closing), and then make the pressure decrease (AV valve opening).
The AV valve is opened in a series of pulses (with less than 10 milliseconds between successive pulses), to reduce pressure in steps.
When the wheel begins to turn again in response to the diminished braking force applied and its speed reaches the reference value, the AV release valve will be closed.
Simultaneously, the EV inlet valve is reopened, restoring normal operation of the brake system. The ABS control unit can monitor and modulate brake force in the three following different conditions: dry road surface (high grip), wet or slippery road surface (poor grip) and uneven road surface. ABS functionality is disabled at vehicle speeds lower than 5 km/h.
Please find below a chart explaining ABS operation.



The hydraulic component of the ABS system consists of a primary circuit (from the cylinder to the control unit and from the control unit to the calliper) and a secondary circuit (completely within the control unit). Please find below a chart explaining ABS hydraulic operation.

Key to ABS hydraulic system

A	Rear brake master cylinder
B	Front brake master cylinder
1A	EV rear - Rear calliper inlet valve
1B	EV front - Front calliper inlet valve
2A	AV rear - Rear calliper outlet valve
2B	AV front - Front calliper outlet valve

3	Brake master cylinder
4	Accumulators
5A	Rear calliper
5B	Left front calliper
6B	Right front calliper
7	ABS electronic unit
8A	Rear speed sensor
8B	Front speed sensor

Routing wiring harnesses/hoses

The routing of the ABS system wiring has been optimised to ensure the minimum obstruction.
Each section is designed to prevent interference with parts that might damage wires or cause operating failures when riding.

Table	Position	Description
Table A - Table A1	1	ABS control unit
Table A — Table A1 — Table B — Table C — Table D	2	Front brake master cylinder hose
Table A — Table A1 — Table B — Table C — Table E — Table F	3	Front calliper hose
Table A — Table A1 — Table G — Table H — Table I — Table J	4	Rear calliper hose
Table A — Table A1 — Table G — Table H — Table I — Table J	5	Rear brake master cylinder hose
Table E — Table F	6	Front speed sensor cable
Table K	7	Rear speed sensor cable
Table F	8	Front brake right calliper-left calliper hose

Table A

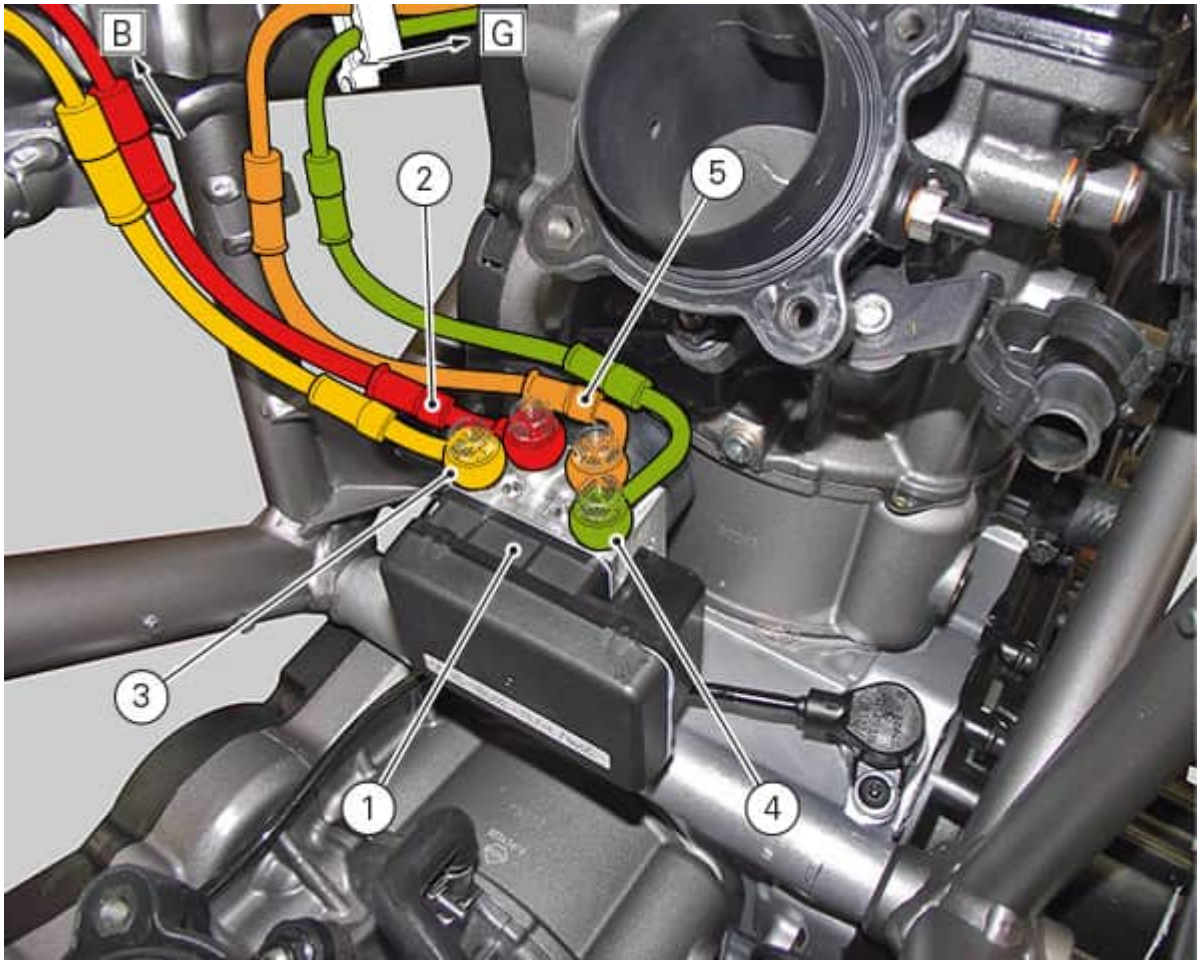


Table A1

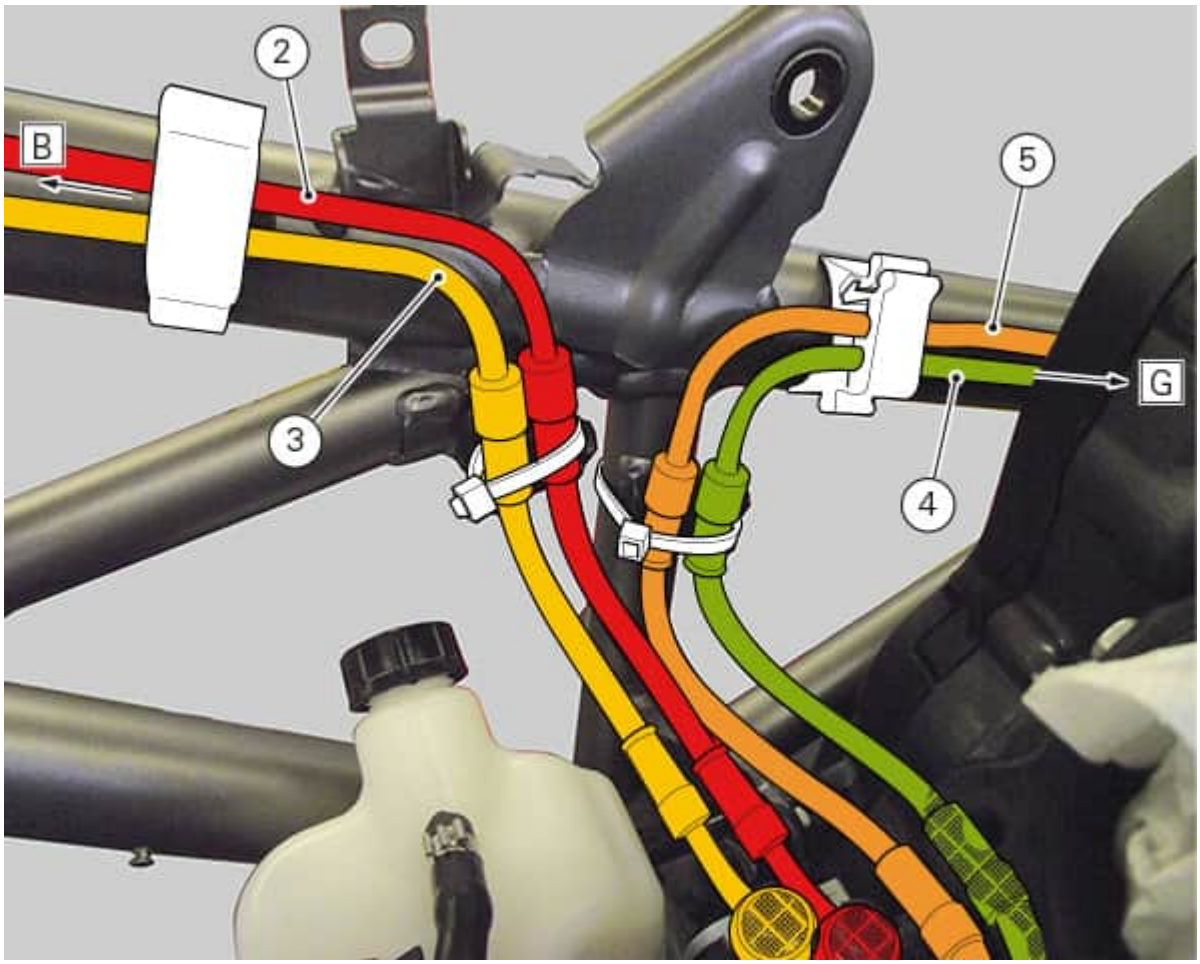


Table B

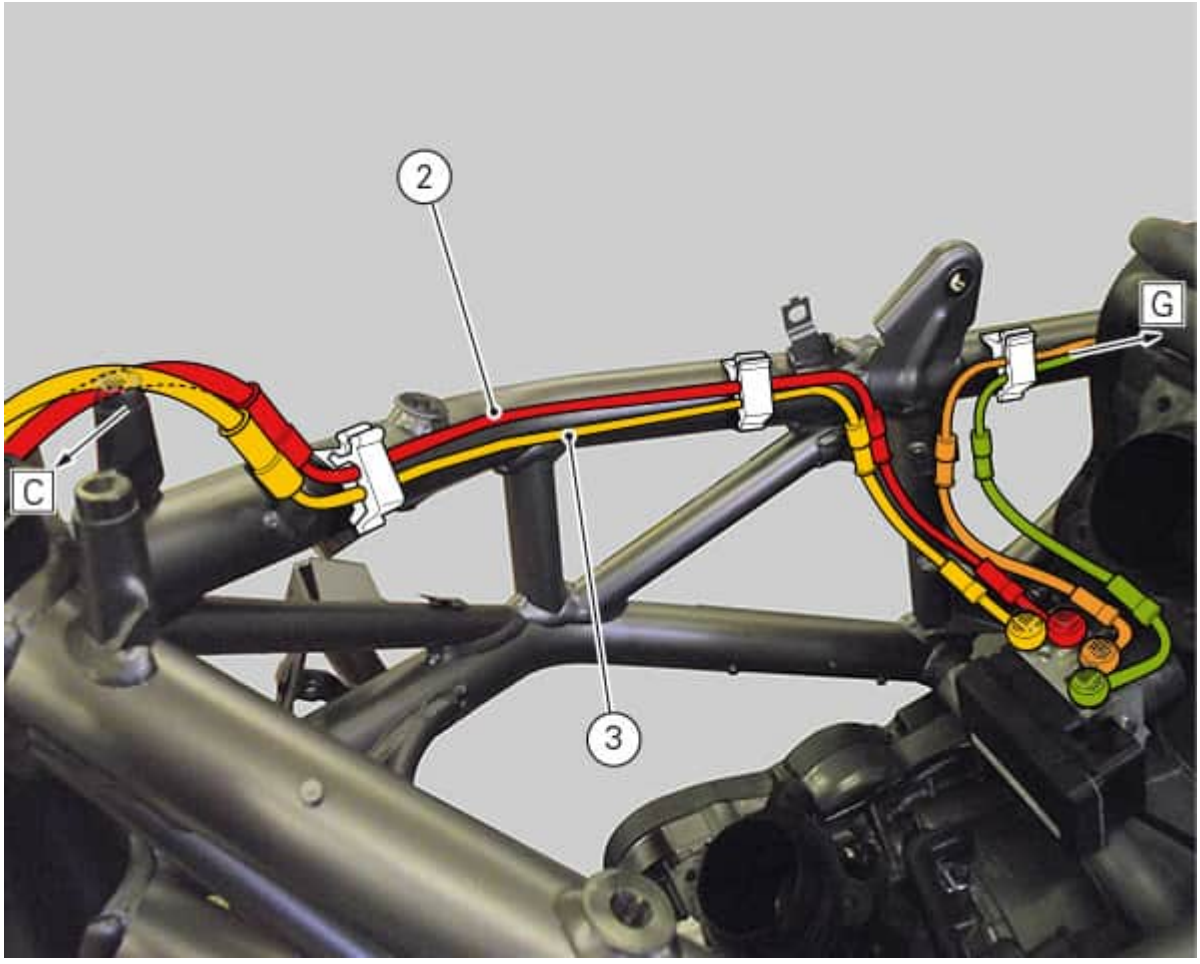


Table C

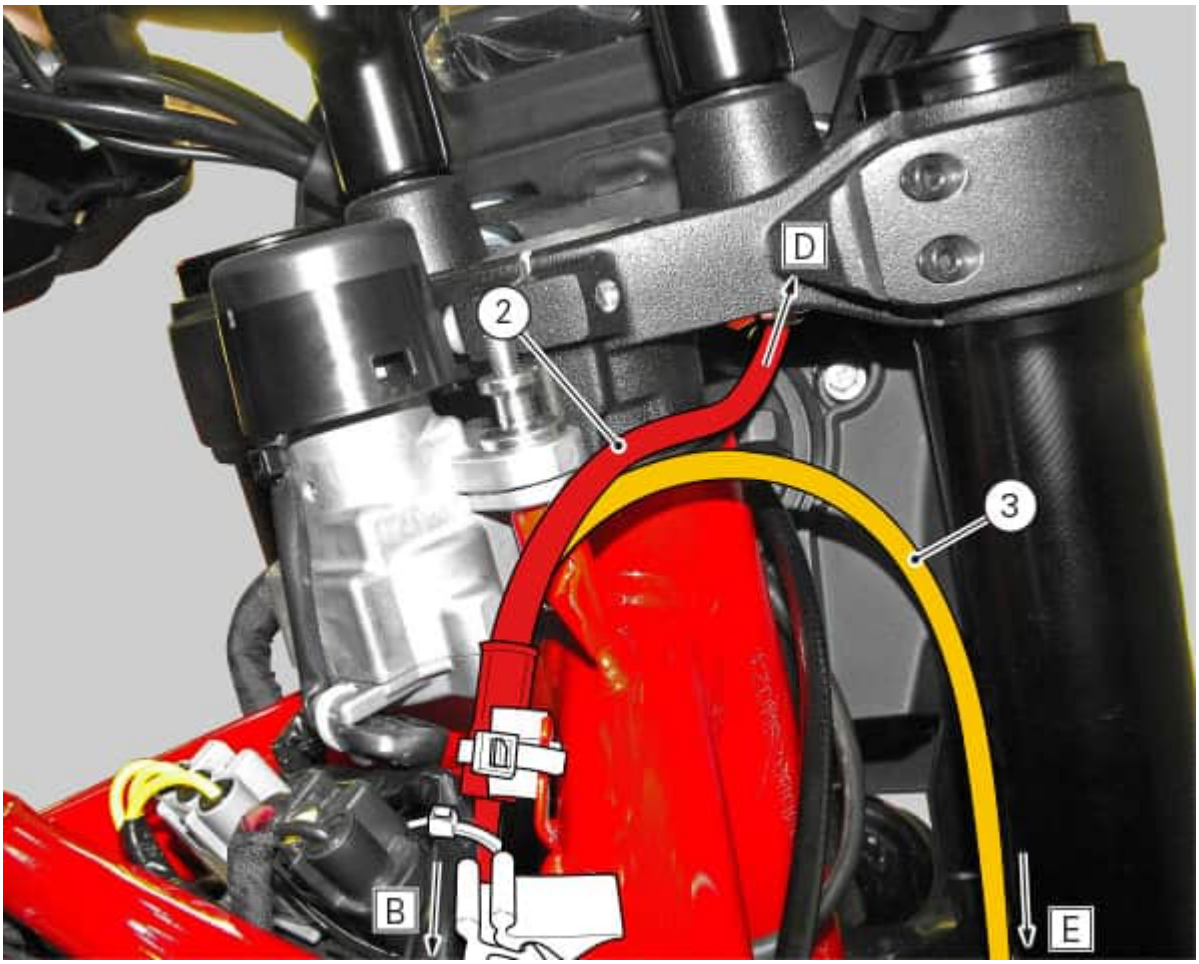


Table D

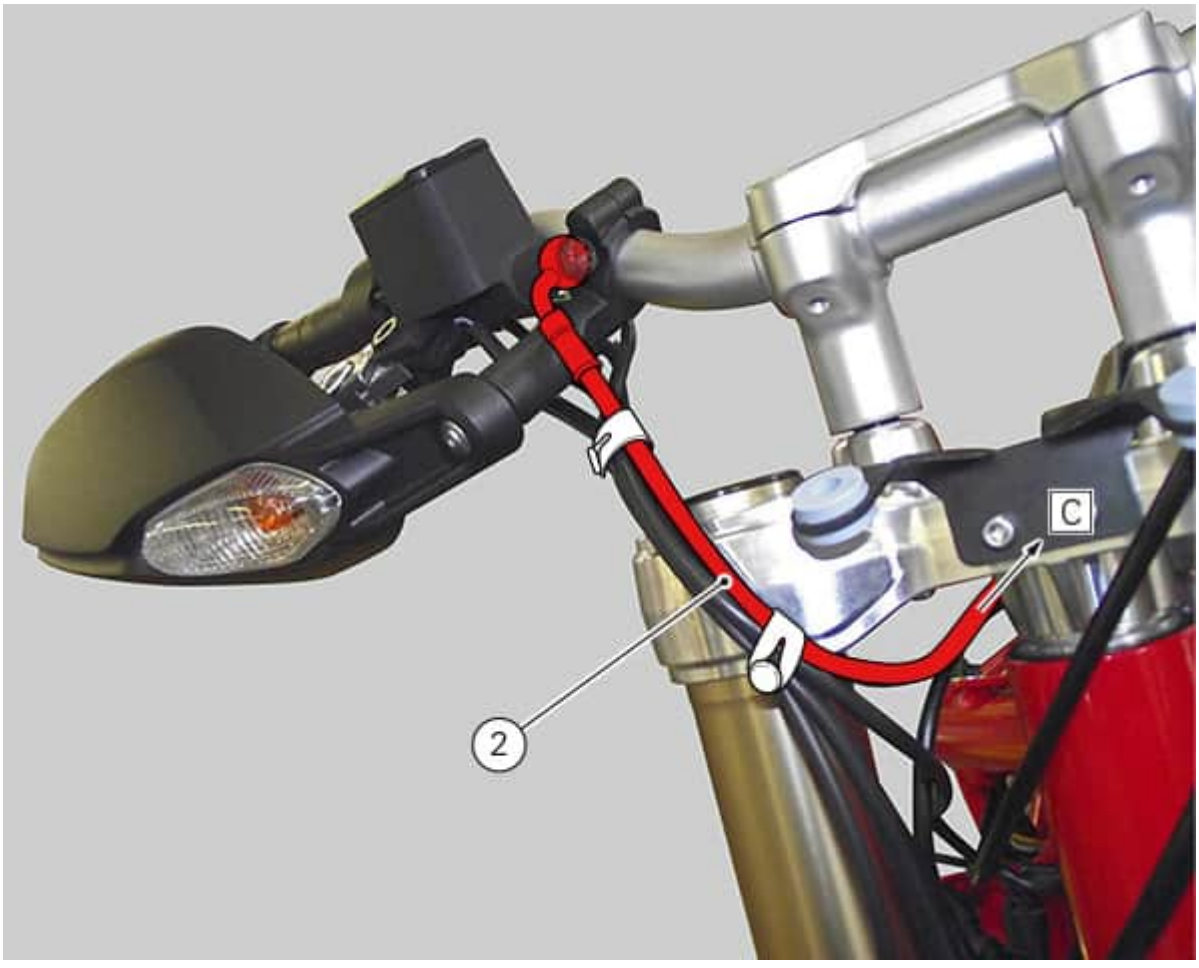


Table E

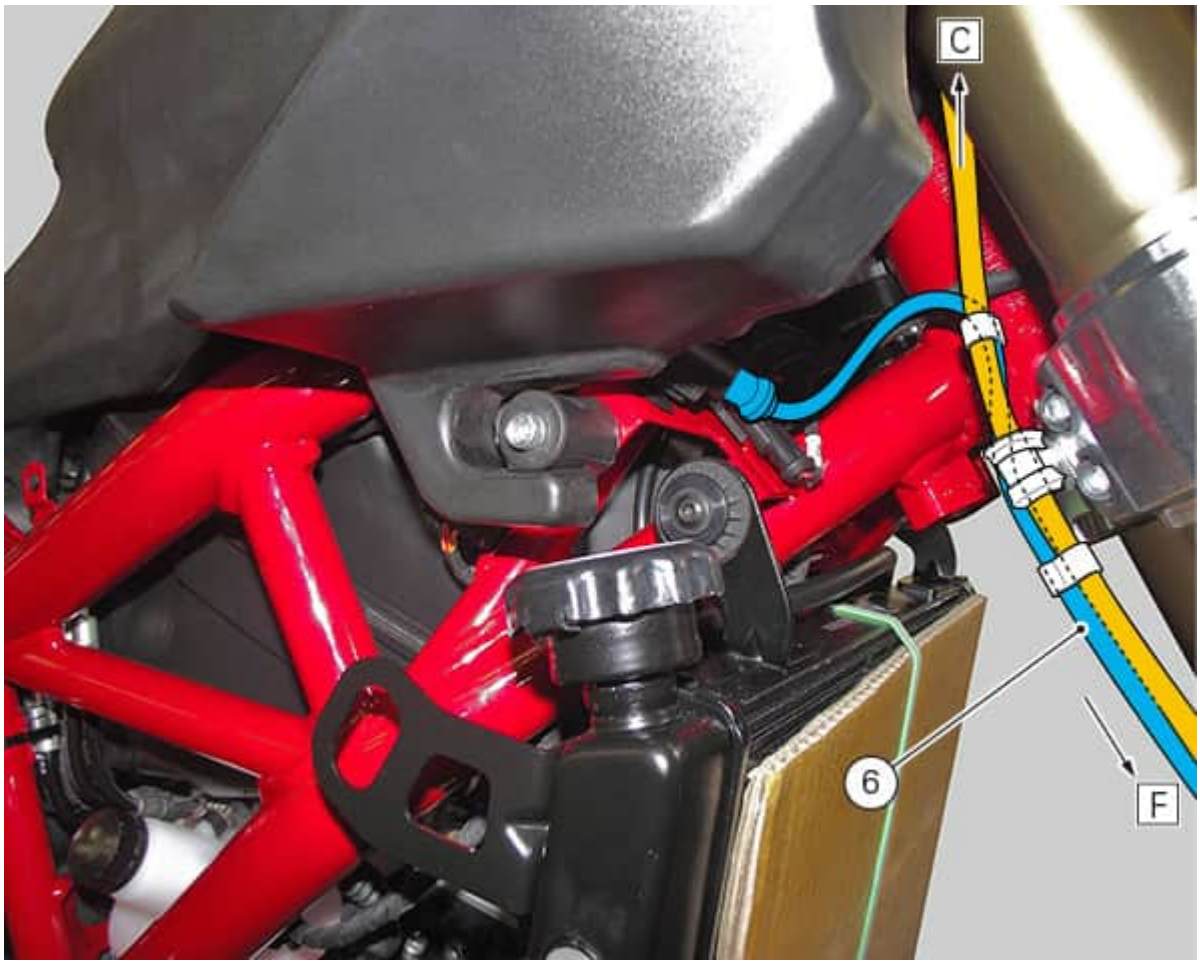


Table F

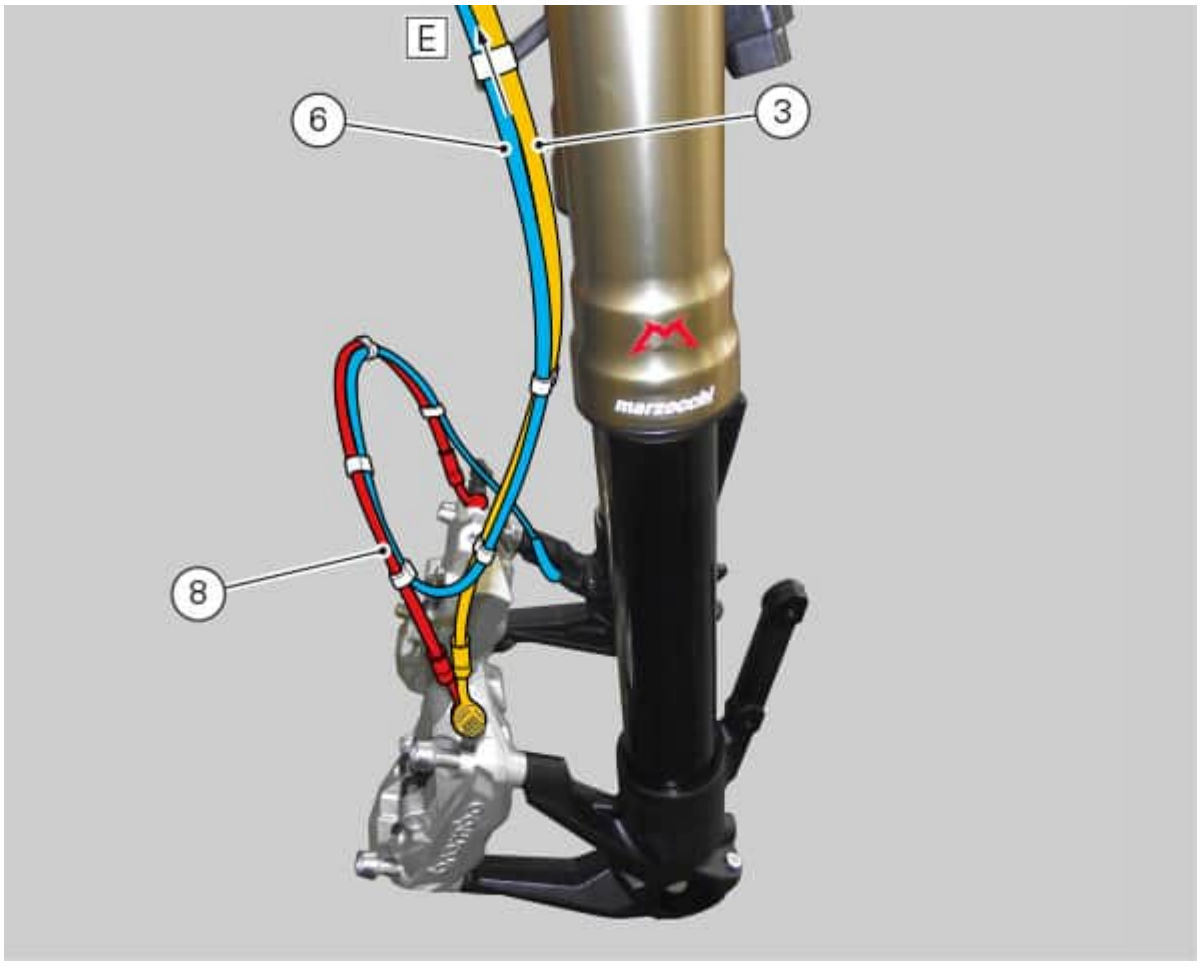


Table G

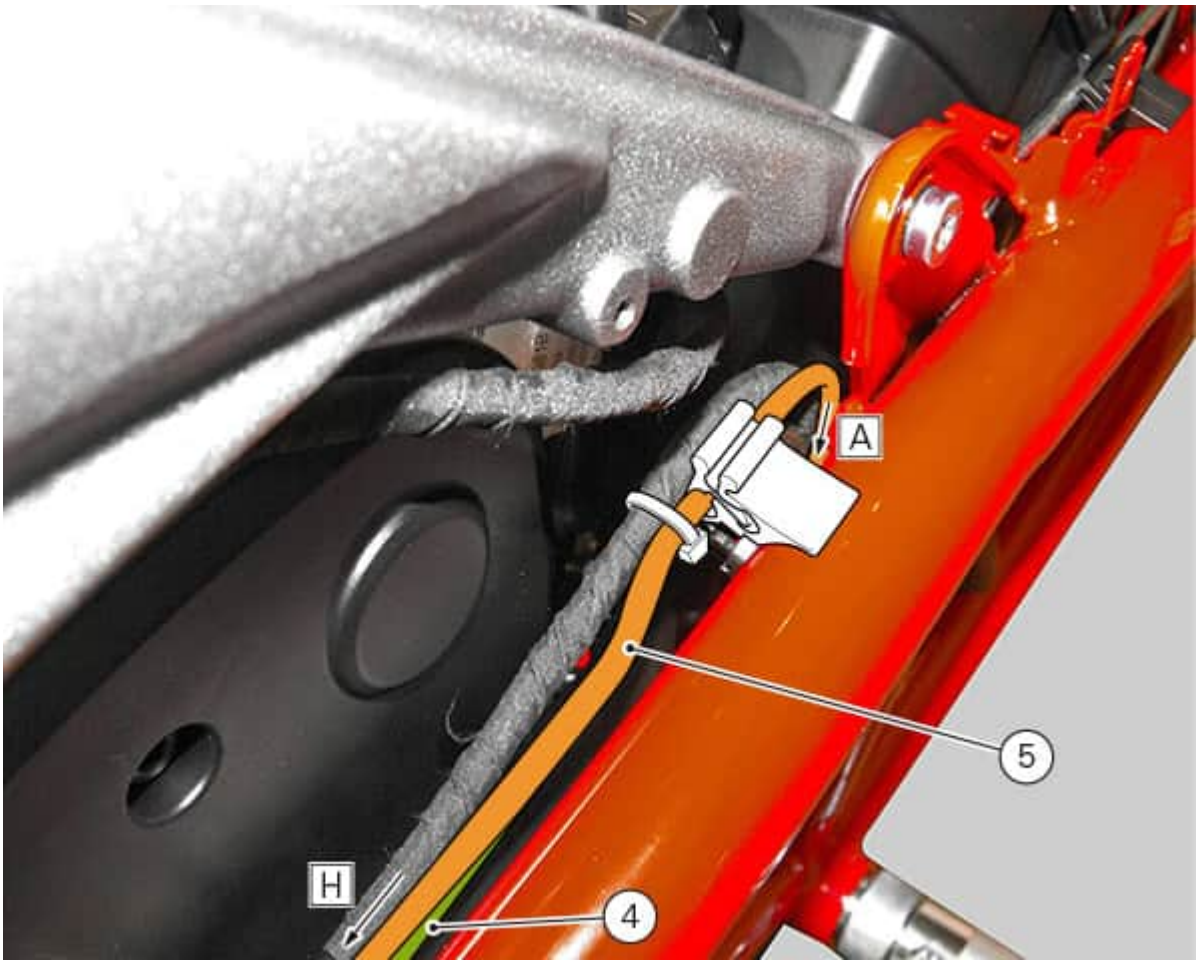


Table H

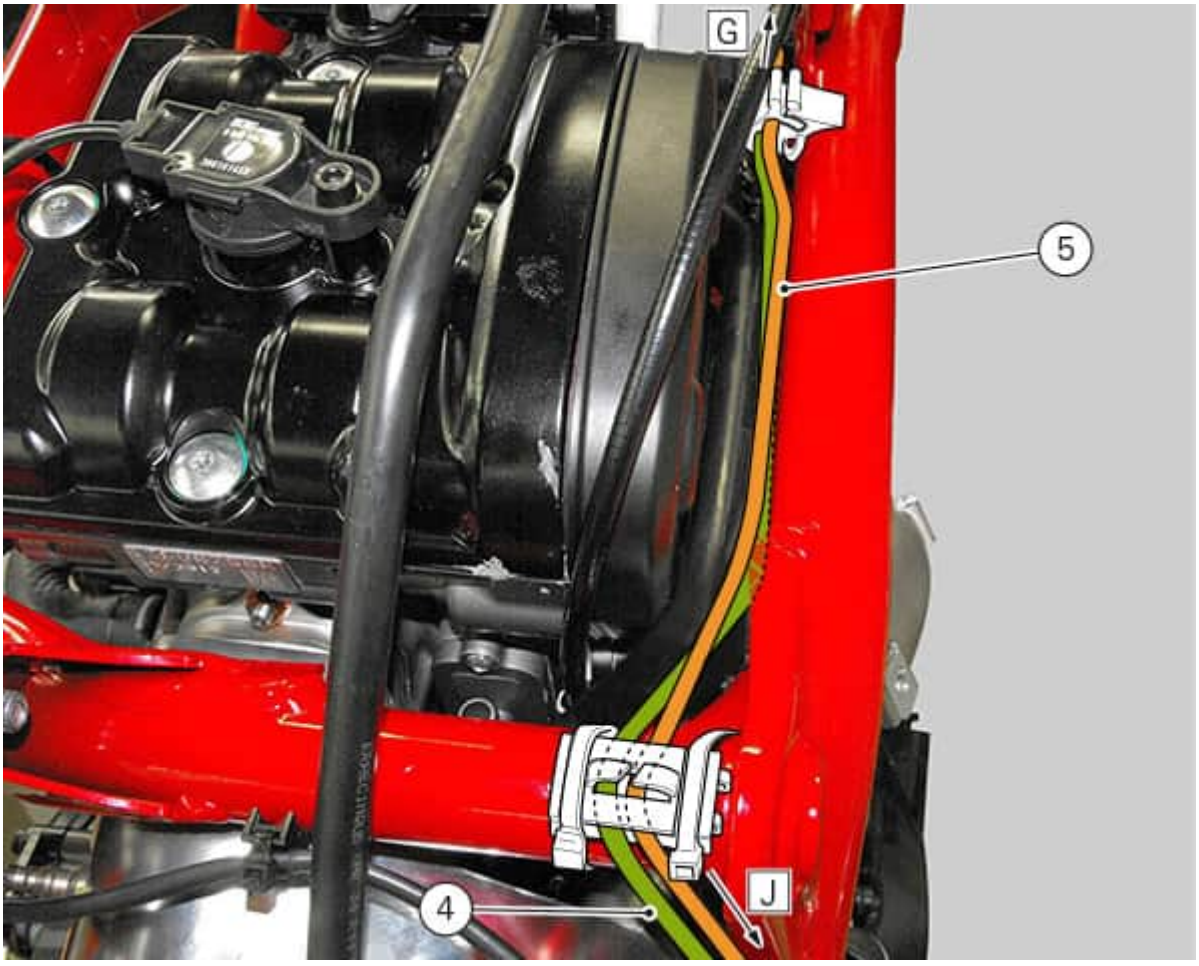


Table I

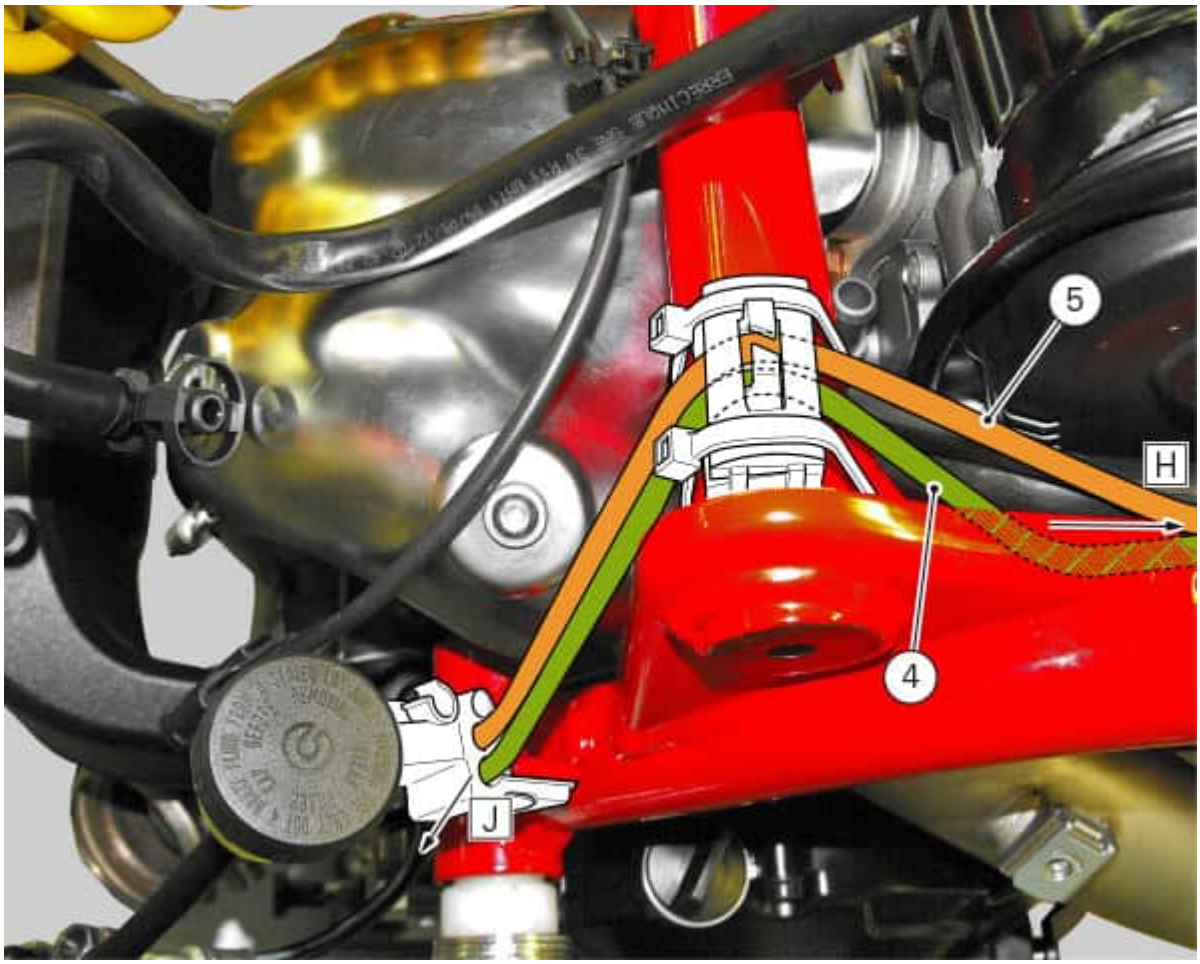


Table J

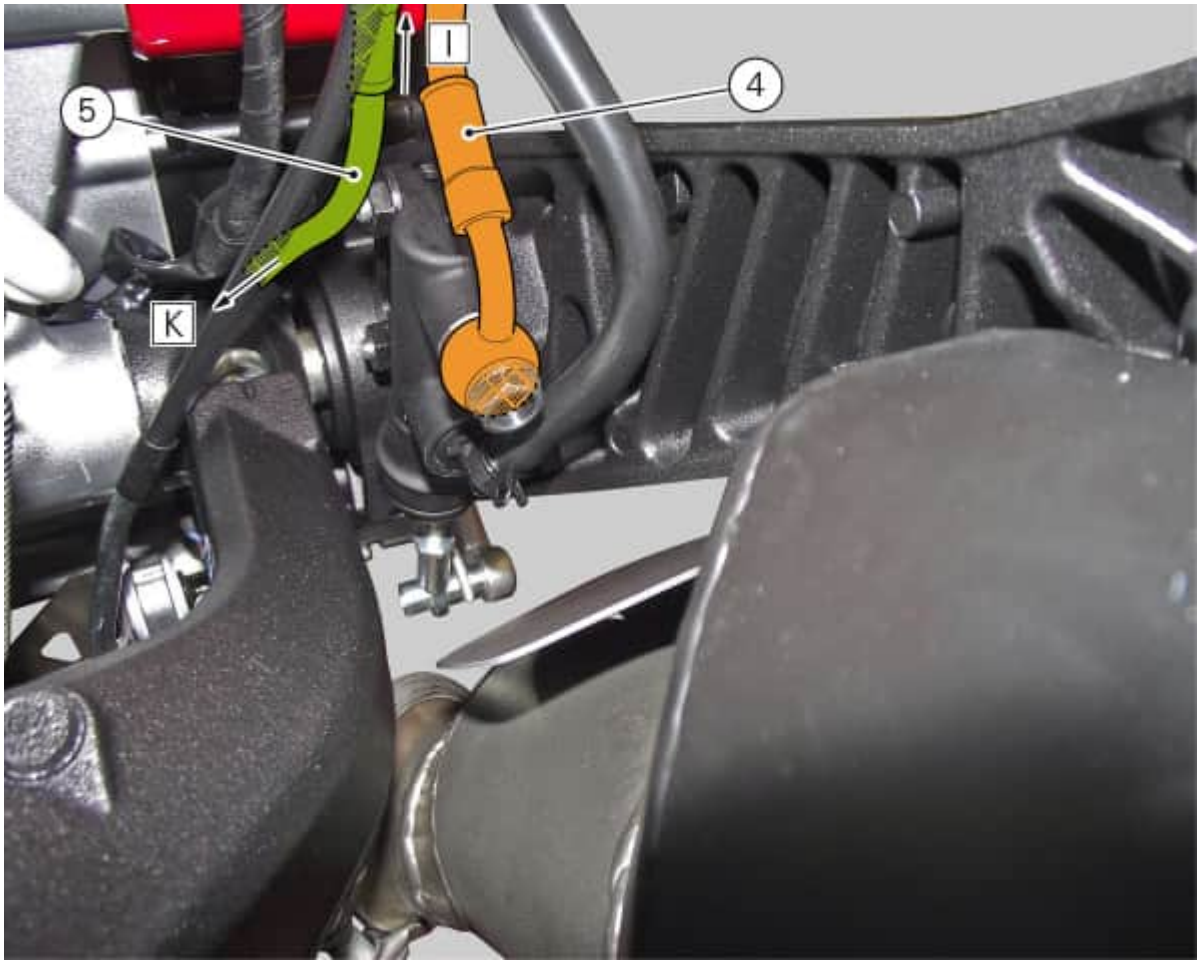
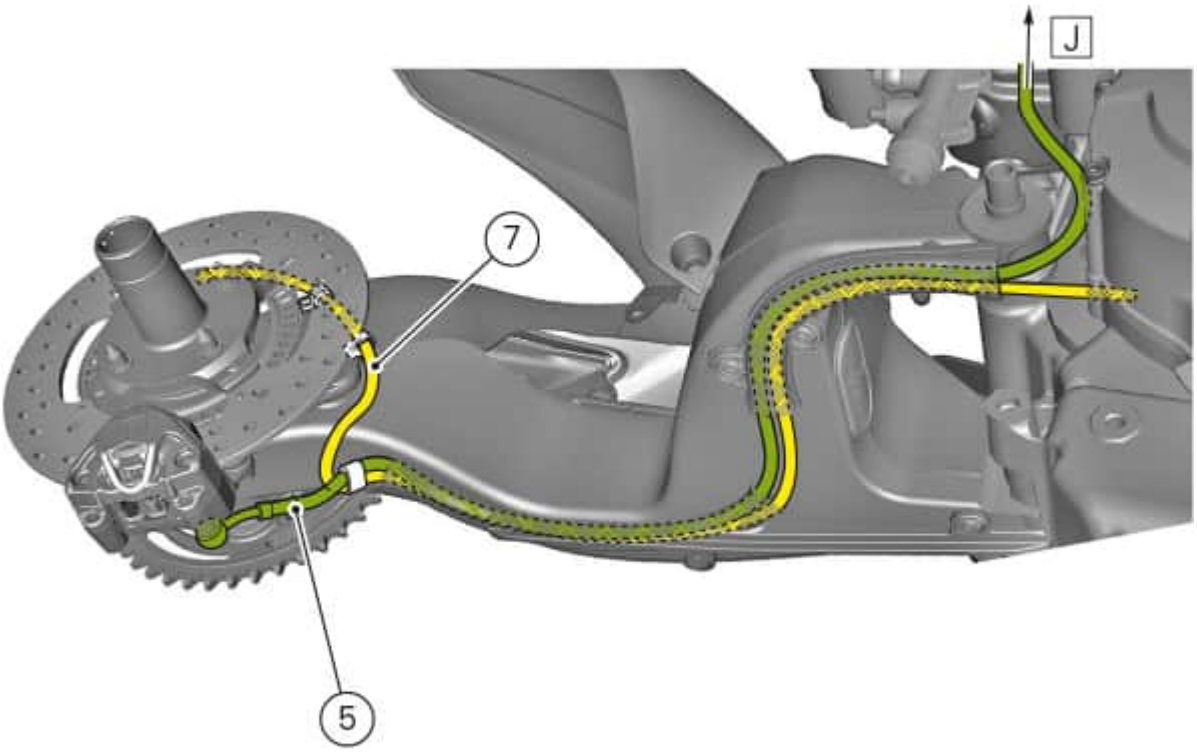
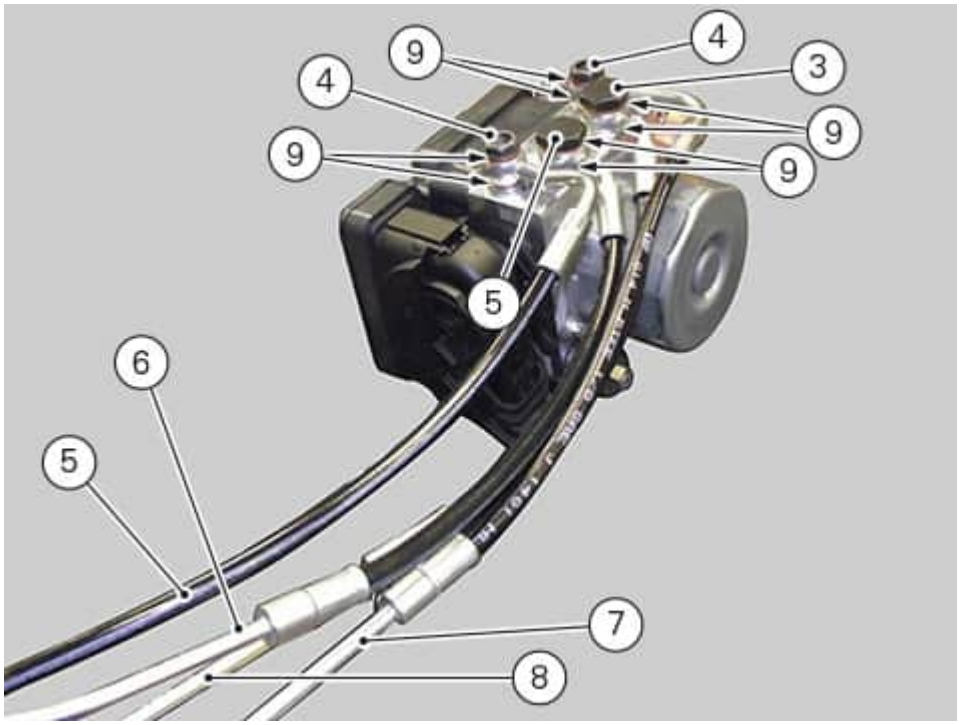


Table K

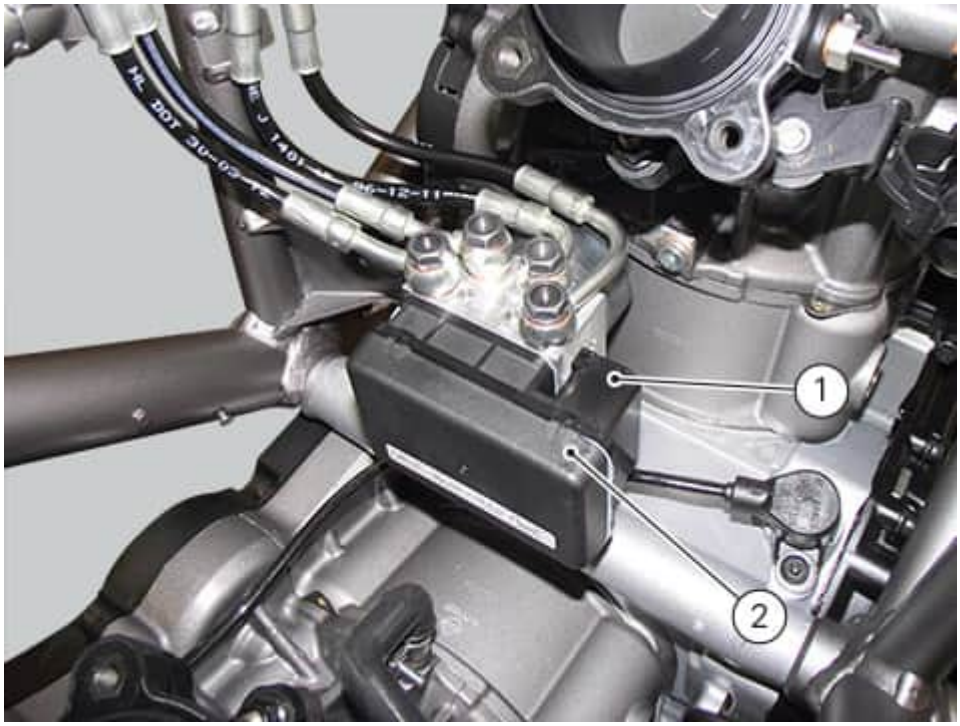

J
7
5

Refitting the ABS control unit

Hoses (8), (7), (6) and (5) must be secured in place using new sealing washers (9) on unions.
Tighten the screws (3) to a torque of 23 Nm ±10% and the screw (4) to a torque of 23 Nm ±10%.



Refit the ABS control unit (2) on the vehicle.
Connect ABS control unit (2) connector (1).



To fill brake system, follow the instructions given for changing the fluid of the system master cylinder or calliper hose is connected to ("Changing the front brake system fluid - Changing the rear brake system fluid").

Important

If the ABS hydraulic control unit has been replaced, it will be supplied with the secondary circuit already filled with fluid. Control unit must thus be assembled and the system filled and drained as a traditional system.

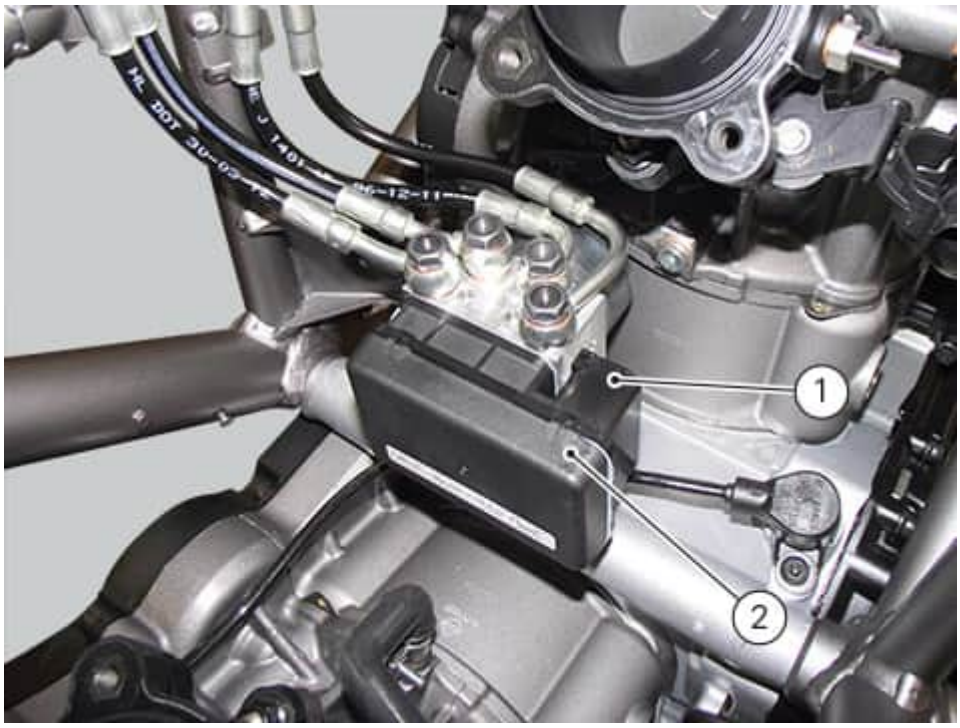
Refit the airbox (Refitting the airbox).
Refit the tank (Refitting the fuel tank).

Refit the seat (Refitting the seat).

Removing the ABS control unit

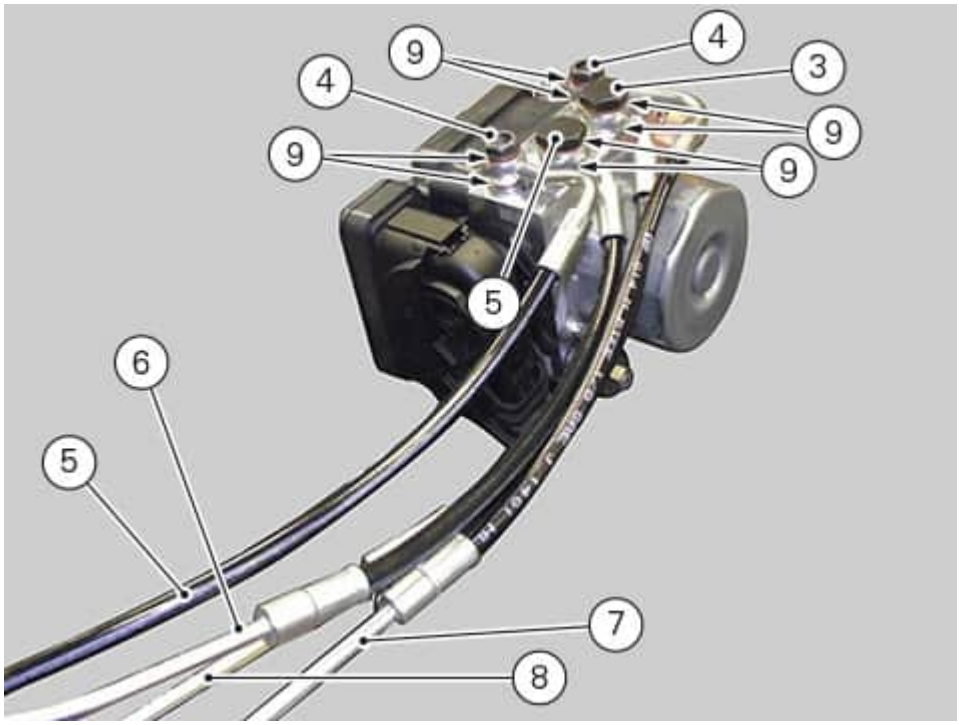
Remove the seat (Removing the seat).
Remove the fuel tank (Removing the fuel tank).
Remove the airbox (Removing the airbox).

Drain off the hydraulic fluid from brake system hoses, by disconnecting these from the calliper and master cylinder, (Changing the front brake system fluid and Changing the rear brake system fluid).
Disconnect ABS control unit (2) connector (1), lift unit from the vehicle.



Loosen the four special screws (3) and (4) retaining pipes (5), (6), (7) and (8), on ABS control unit (2), by removing the seals (9).

Warning
Whenever removed, seals must be replaced by new ones on refitting.

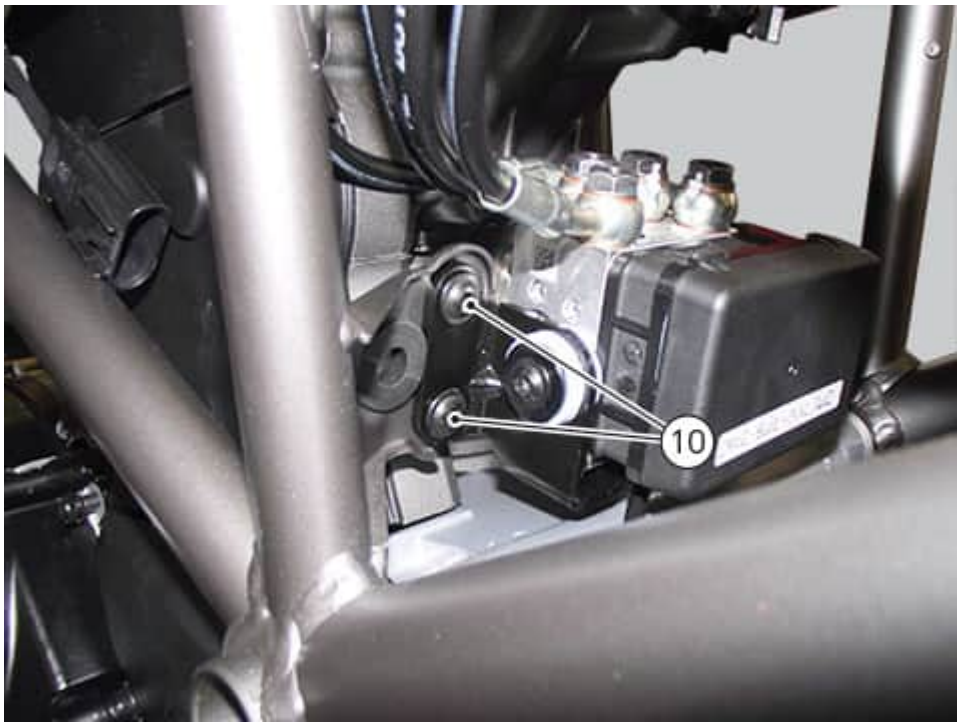


Remove the ABS control unit (2), loosening screws (10).

Important
Do not open the ABS control unit: if faulty, replace it.

Important
Do not open the ABS control unit: if faulty, replace it.

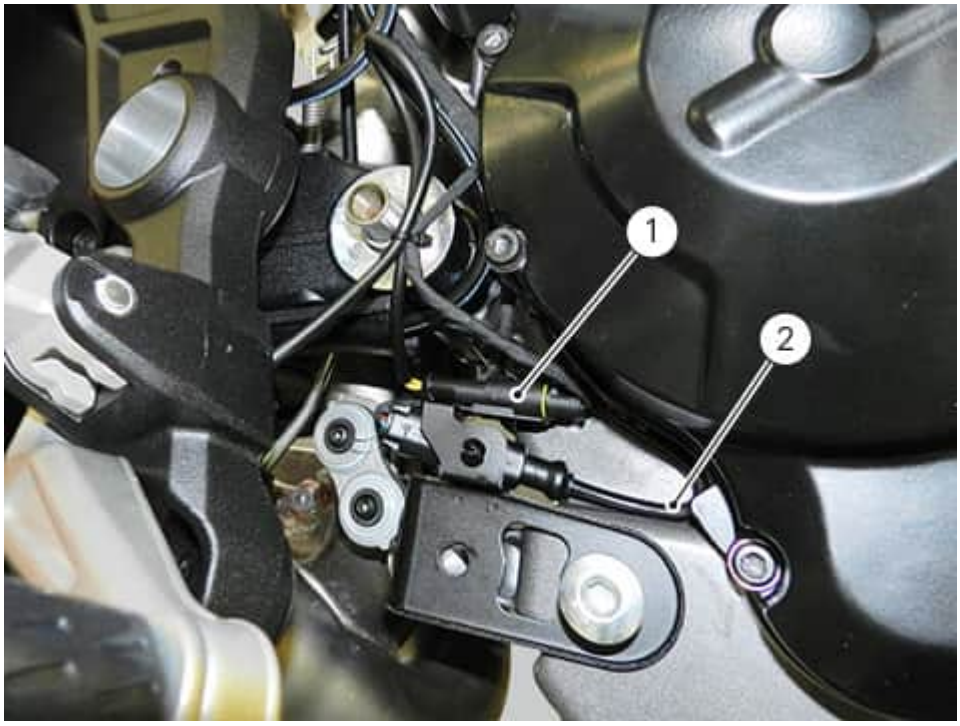
Should it be necessary to replace one or several hoses, refer to "Routing wiring harnesses / hoses" of this section.



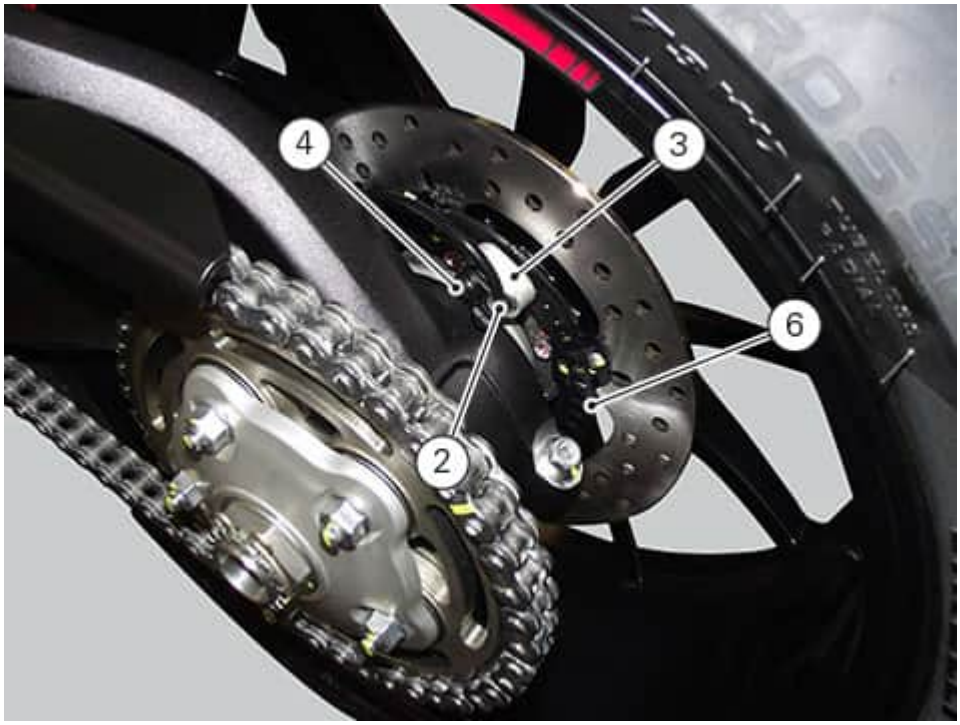
Changing the rear phonic wheel sensor

Remove the seat (Removing the seat).
Remove the rear mudguard (Removing the rear mudguard).

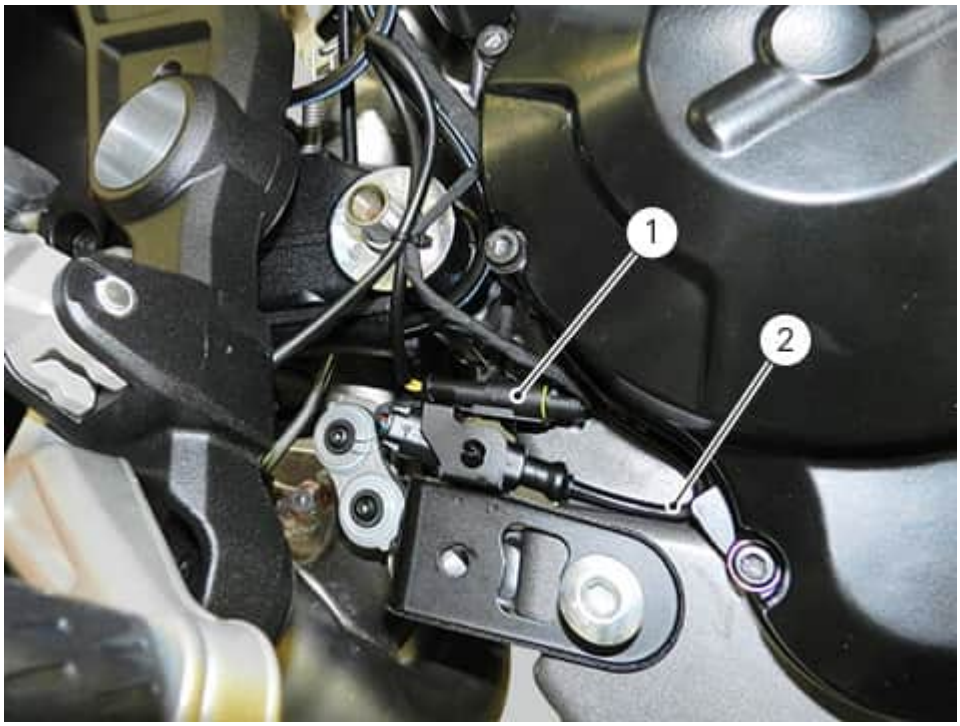
Disconnect connector (1) of rear ABS sensor (2) from main wiring.
Open all clips retaining rear ABS sensor cable (2): refer to tables under Section "Routing wiring harnesses / hoses".



Remove the rear ABS sensor (2) from its seat on rear calliper holder plate (3), by loosening retaining screw (4) and collecting calibrated sealing washer (5).
Check air gap between new rear ABS sensor (2) and rear phonic wheel (6) as explained under: "Adjusting the AIR-GAP of phonic wheel sensor".
Fasten the sensor to the calliper holder plate by tightening screw (4) to a torque of 10 Nm ±10%.



Connect connector (1) to main wiring.
Fasten all clips retaining rear ABS sensor cable (2): refer to tables under Section "Routing wiring harnesses / hoses".



Refit the rear mudguard (Refitting the rear mudguard).
Refit the seat (Refitting the seat).

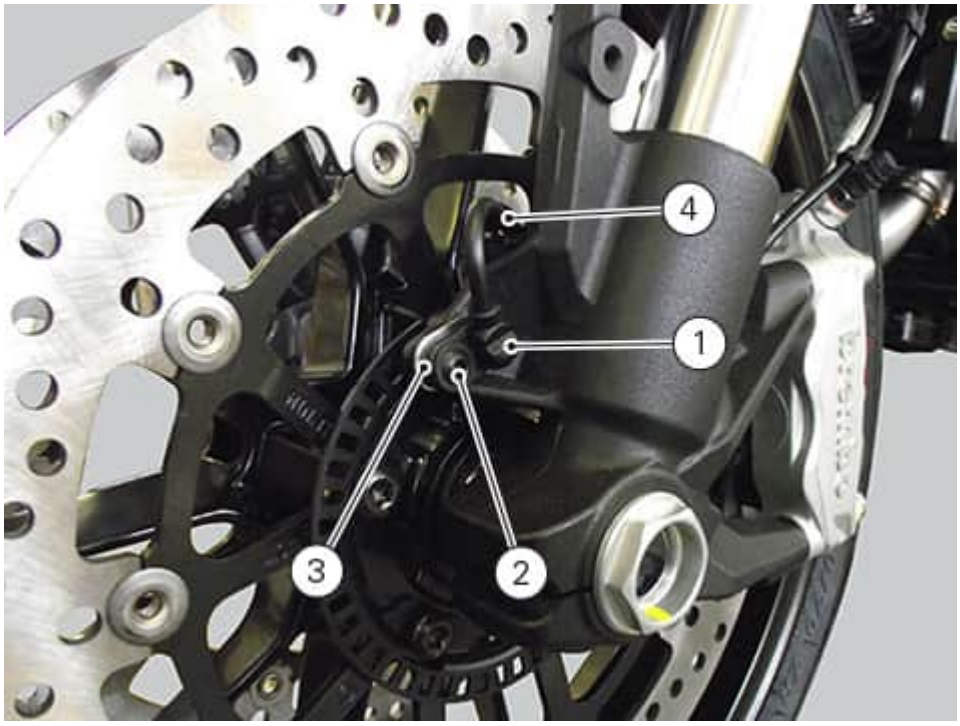
Changing the front phonic wheel sensor

Remove the right-hand fairing (Removing the fairings).

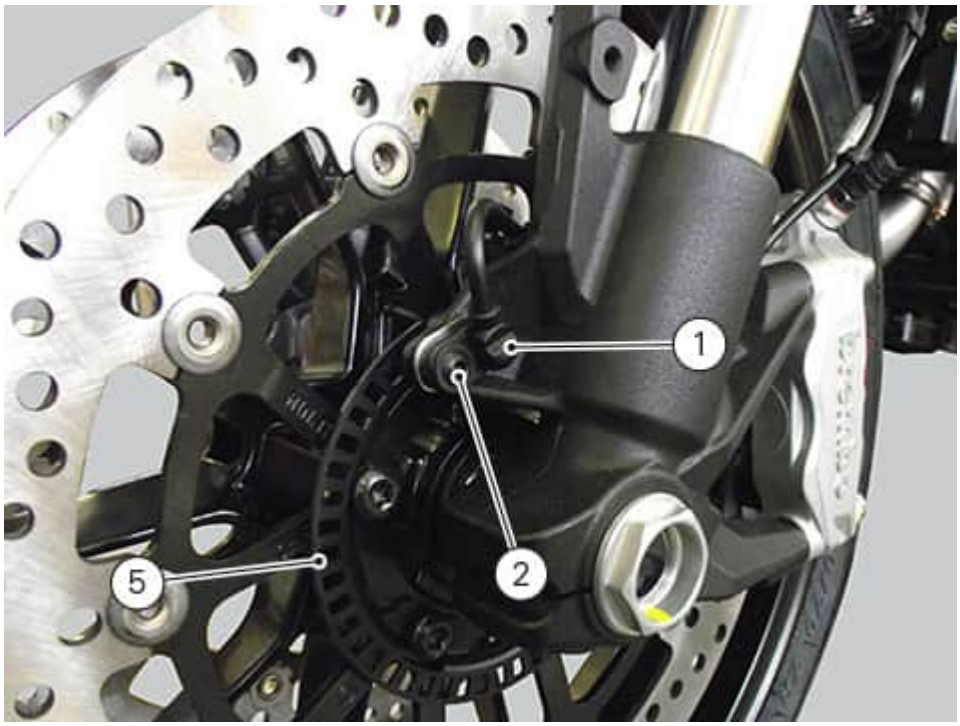


Disconnect front ABS sensor (1) connector (A) from main wiring.
Open all clips retaining front ABS sensor cable (1): refer to tables under Section: "Routing wiring harnesses / hoses".

Undo the retaining screw (2), and remove front ABS sensor (1) with calibrated gasket (3), sliding cable out from cable grommet (4).



Before refitting, make sure that contact parts between front ABS sensor (1) and its seat are free of damage and perfectly clean.
Fit the new front ABS sensor (1) on its seat inserting the screw (2).
Check air gap between front ABS sensor (1) and front phonic wheel (5) as explained under Section "Adjusting the AIR-GAP of phonic wheel sensor.".
Tighten screw (2) to a torque of 10 Nm ±10%.



Connect the connector (A) to main wiring.
Fasten all clips retaining front ABS sensor cable (1): refer to tables under Section "Routing wiring harnesses / hoses".



Refit the right fairing (Refitting the fairings).

Bleeding of the ABS hydraulic system

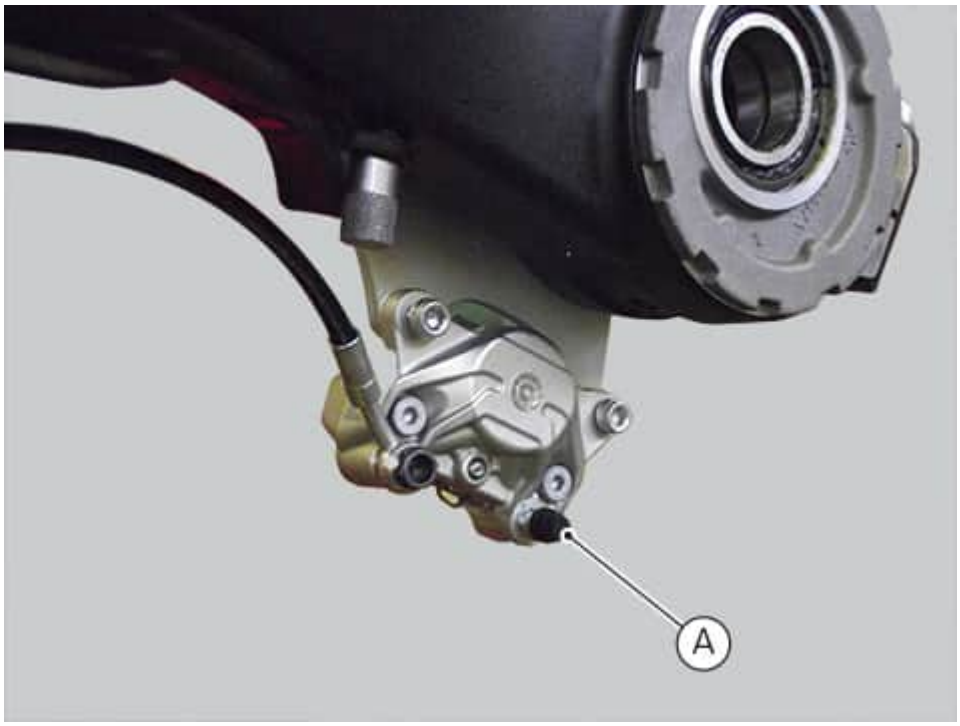
If brake controls feel “spongy” due to the presence of air bubbles in the system, bleed as usual, as described under Section "Changing the brake system fluid".
Before bleeding a brake master cylinder, move back the calliper pistons to let any air build-up in the ABS control unit flow into the master cylinder; as described under (Filling the brake system).
Purge must be carried out by means of the corresponding unions (A) placed on the callipers and the brake master cylinders.

Important
Do not undo the special screws securing the pipe unions on the ABS hydraulic control unit, unless control unit replacement is necessary.

Important
If the ABS hydraulic control unit has been replaced, it will be supplied with the secondary circuit already filled with fluid. Control unit must thus be assembled and the system filled and drained as a traditional system.





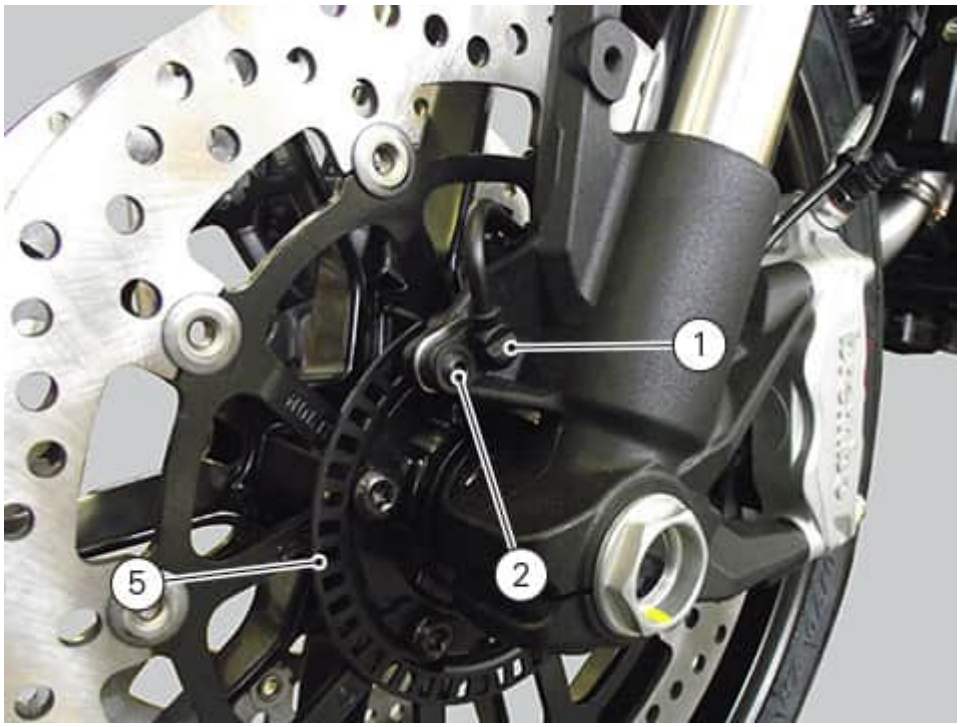

A

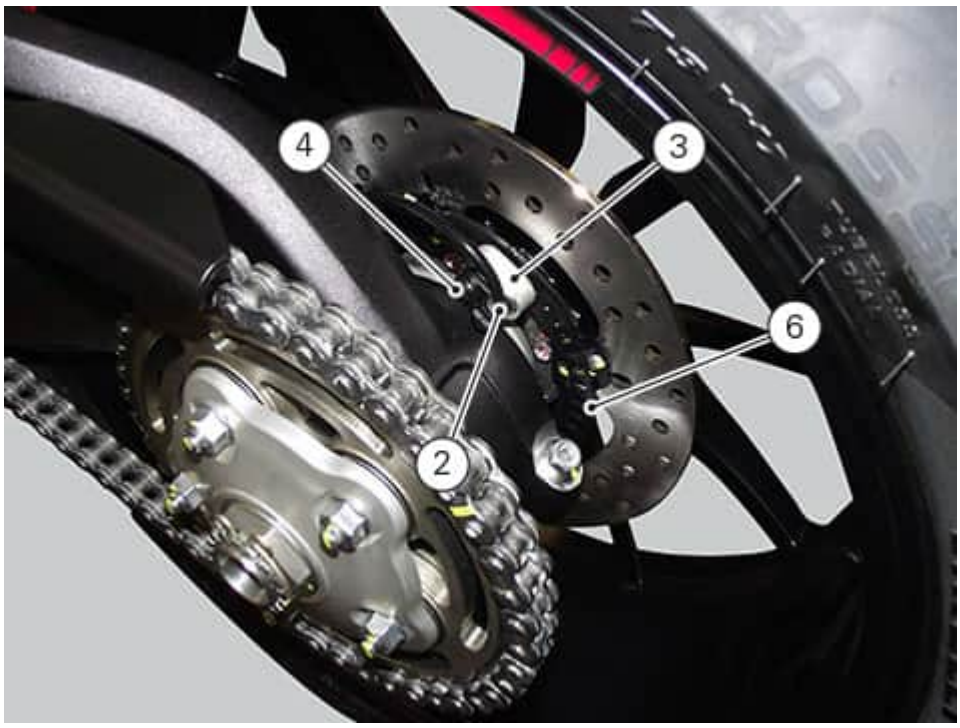
Adjusting the AIR-GAP of phonic wheel sensor

(For front as well as rear sensor) In each case of maintenance that foresees:

- replacement or refitting of the wheel;
- replacement or refitting of the phonic wheel (5) or (6);
- replacement or refitting of the brake discs;
- replacement or refitting of the speed sensor (1) or (2);
- (front) replacement or refitting of the sensor holder bracket;
- (rear) replacement or refitting of the calliper holder plate.

It is necessary to check the air-gap between the speed sensor and the phonic wheel, once the components are refitted.
For this purpose, use a feeler gauge to check the air-gap; then, carry out 4 measures of the air-gap, one every 90° of wheel turn.





If the difference between the minimum and maximum values measured is higher than 0.40 mm, replace the phonic wheel.

Once checked that the difference is lower than or equal to 0.40 mm, carry out the shimming of the speed sensor (1) or (2) by means of calibrated shims (B).

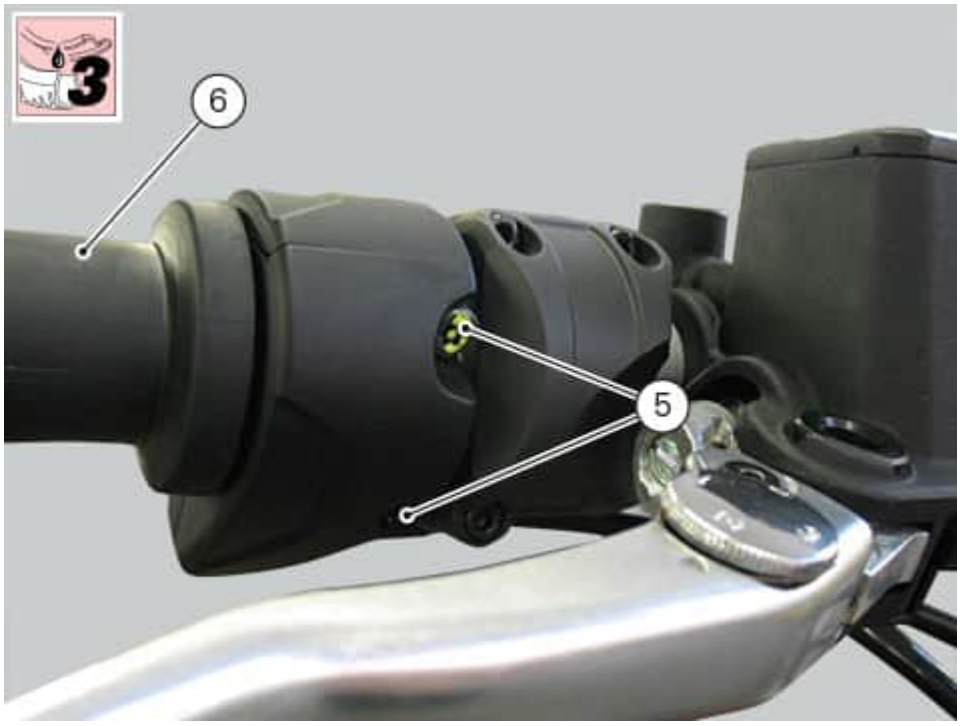


Phonic wheels cleaning

It is important to check that both phonic wheels (5) and (6) are always clean.
Otherwise: gently remove any possible dirt deposits with a cloth or metal brush.
Avoid using solvents, abrasives and aiming air or water jets directly on the phonic wheel (5) or (6).

Refitting the throttle control

Lubricate the handlebar on the handgrip seat with specified lubricant.



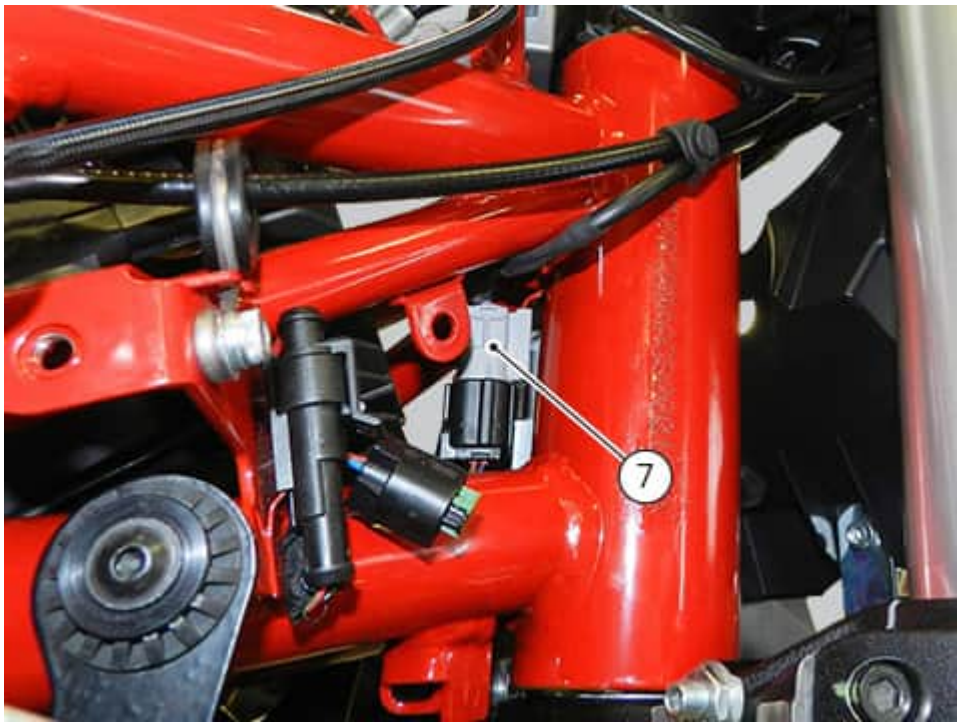
Tighten screws (5) to 4.5 Nm ± 0.5, following a 1-2-1 sequence.

Refit the right hand guard (Refitting the hand guards).

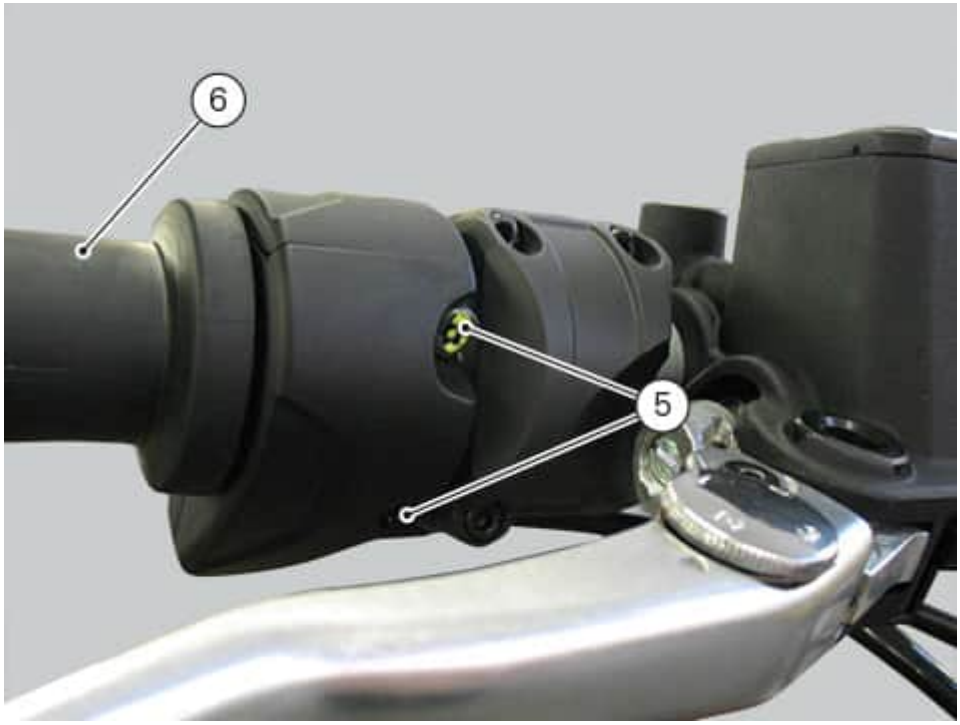
Removing the throttle control

Remove the right hand guard (Removing the hand guards).

Disconnect throttle control connector (7), fitted on vehicle right-hand side.

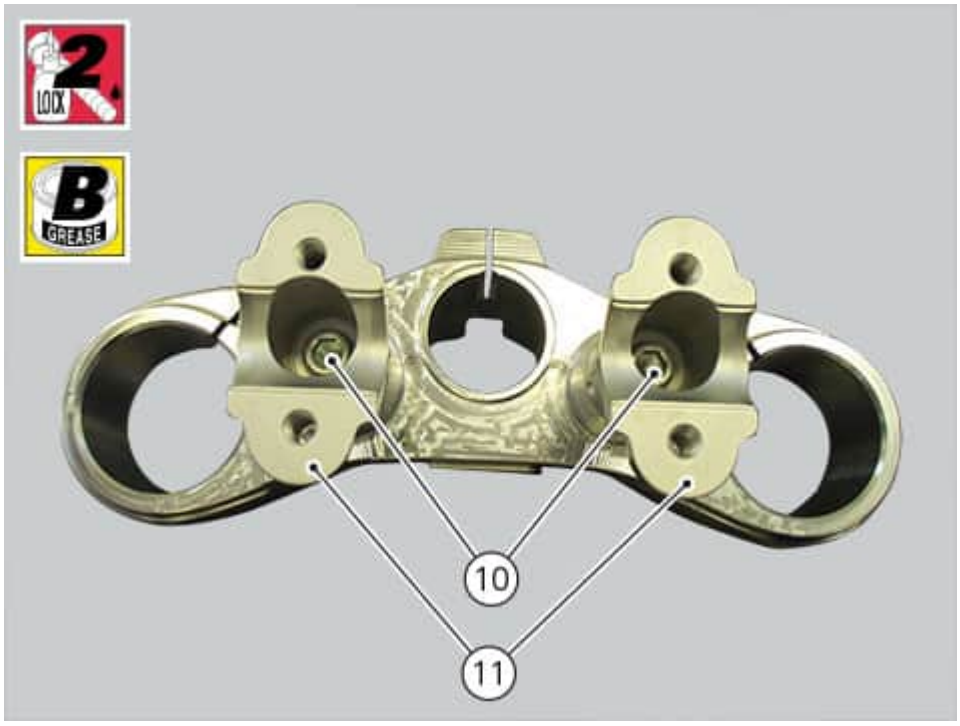


Loosen screws (5), and remove the handgrip and throttle control (6).

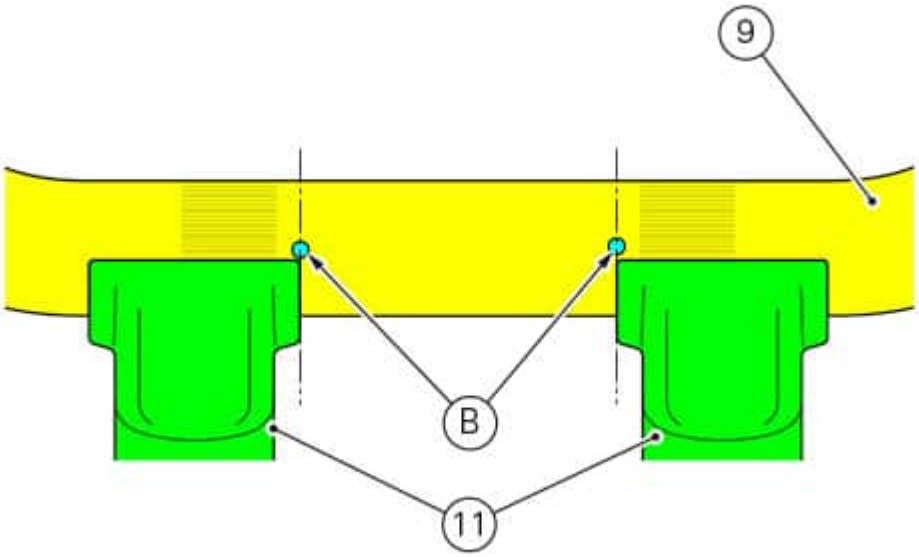


Refitting the handlebar

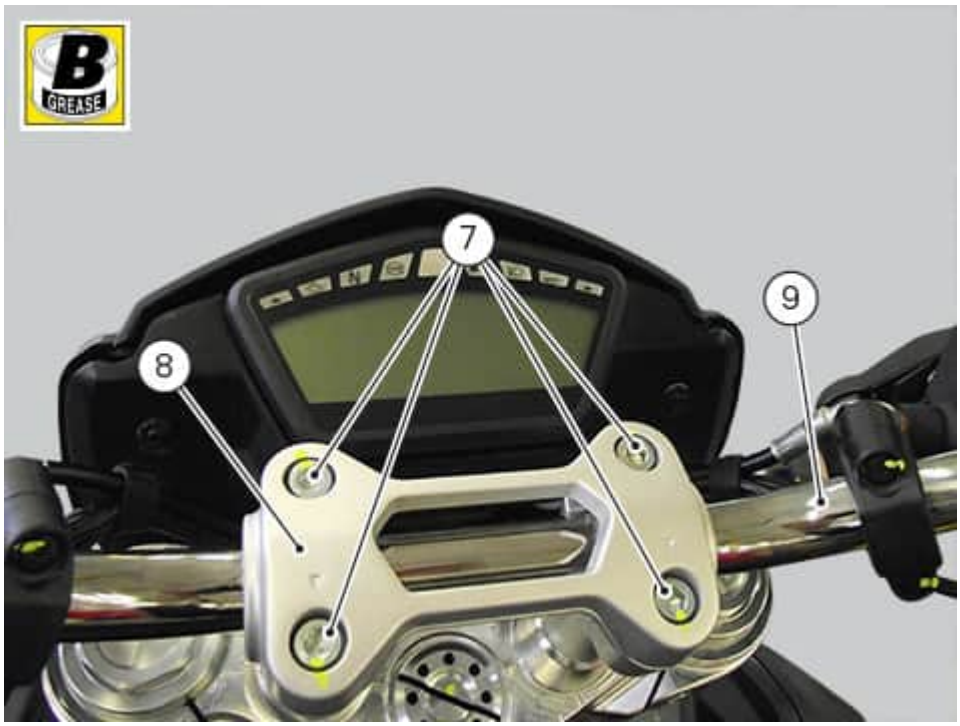
Apply the recommended grease to the underside of the screws (10).
Insert the screws (10) on the stud bolts (11).
Apply the recommended threadlocker on the thread in view of screws (10).
Fit stud bolts (11) by starting screws (10).
Tighten the screws (10) to a torque of 45 Nm ± 5%, following a 1-2-1 sequence.



Position handlebar (7) in its seat on the stud bolts (11).
Reference points (B) on handlebar must be at the same distance from stud bolts (11) and flush with the stud bolt surface.

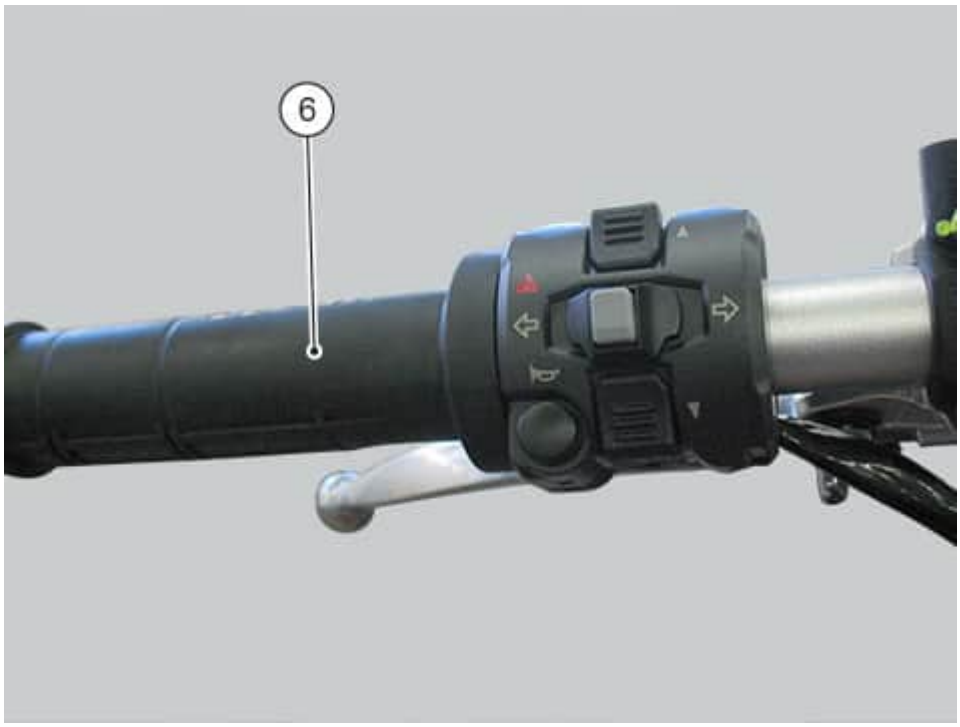


Apply specified grease to screws (7).
Refit the U-bolt (8) and insert the screws (7).
Tighten the screws (7) to a torque of 25 Nm ± 5%, following a cross pattern.

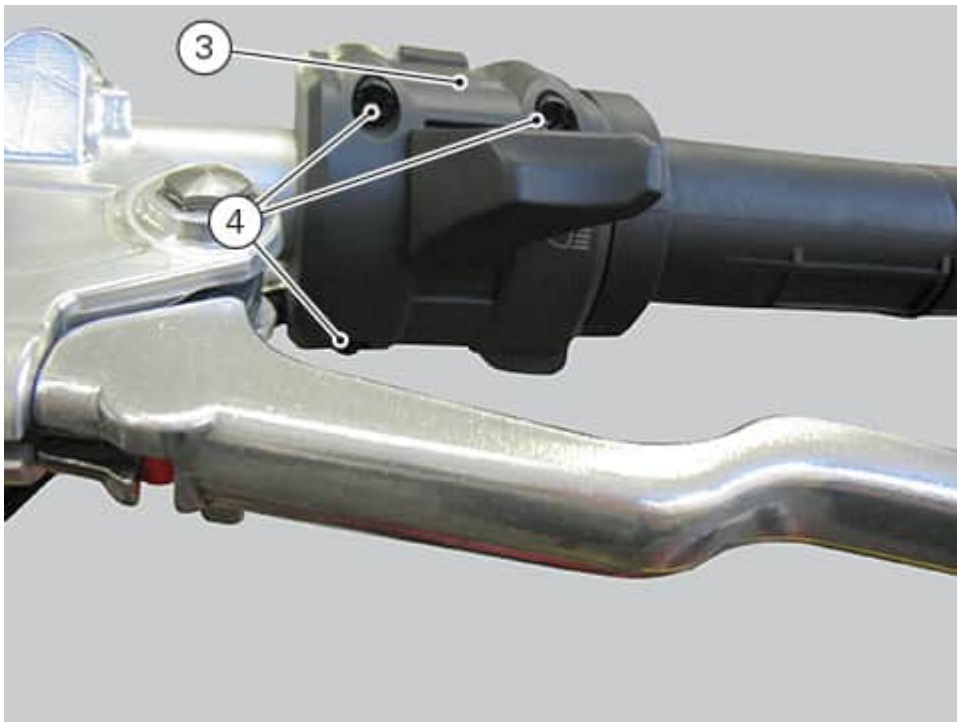


Refitting the handgrips

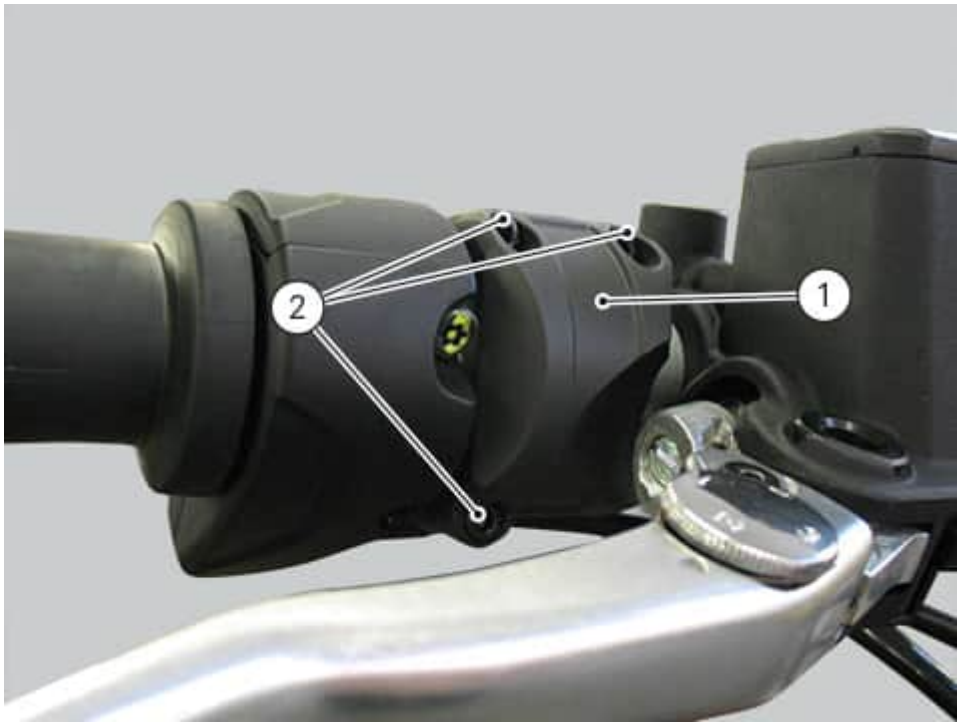
Lubricate handlebar (9) on the seat of the removed handgrips, using recommended lubricant and install the LH and RH handgrips (6) and the relevant counterweight plugs, tightening them to 2 Nm ± 10%.



Position the left-hand switch (3), connect connector to main wiring and tighten screws (4) to the torque of 1.3 Nm ± 10%.



Refit the right-hand switch (1), connect connector to main wiring and tighten screws (2) to the torque of 1.3 Nm ± 10%.



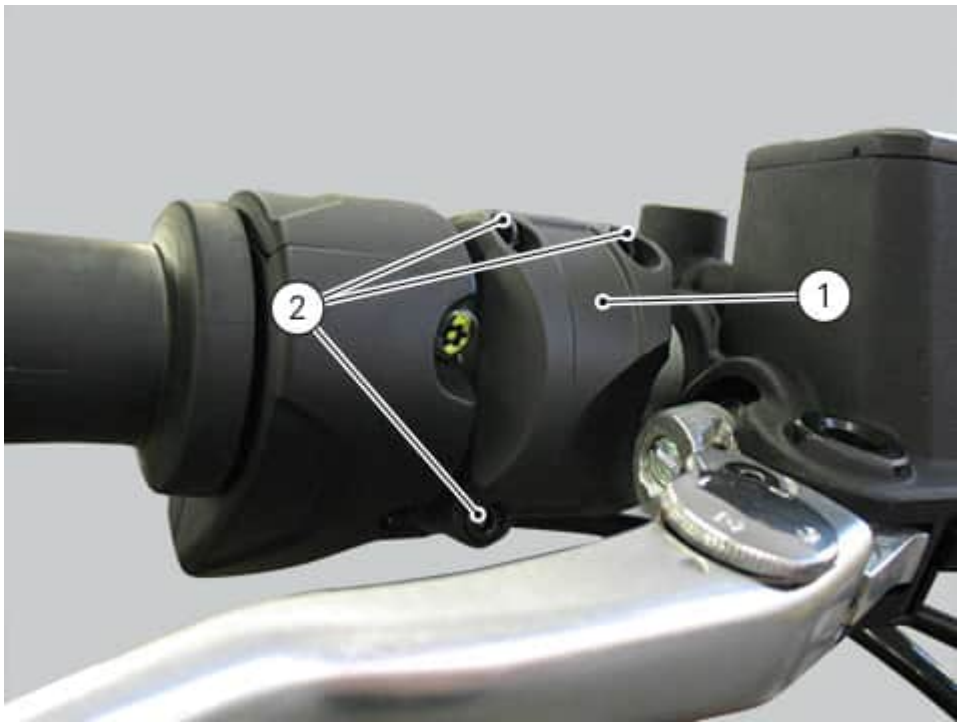
Refit front brake control, throttle control.

Refit the throttle control (Refitting the throttle control).
Refit the complete front brake control (Refitting the front brake system).
Refit the hand guards (Refitting the hand guards).

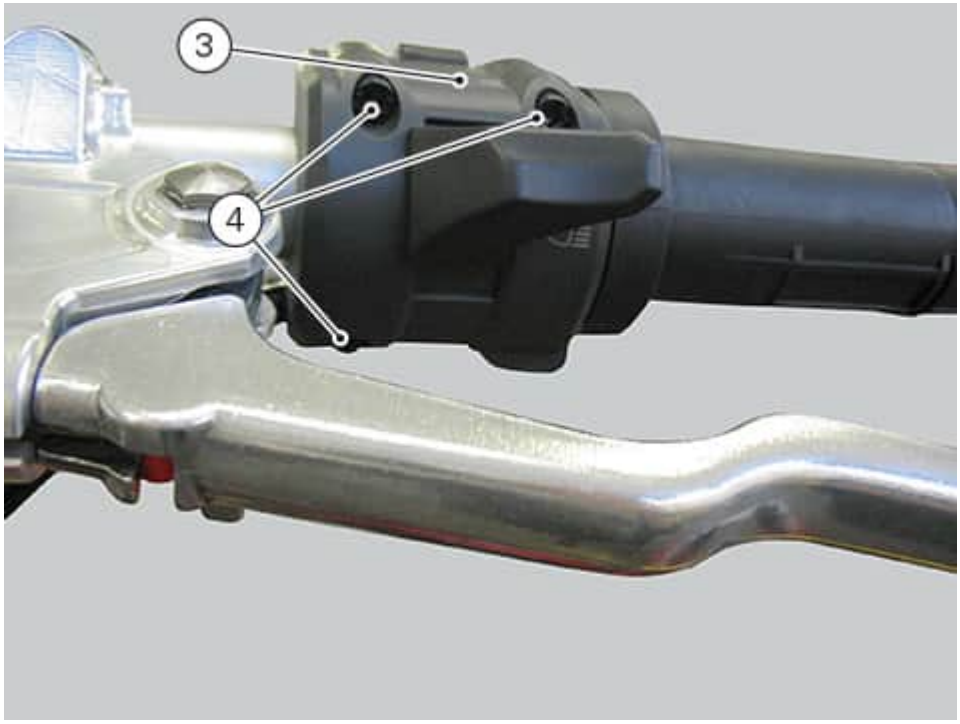
Removing the handlebar

Remove the throttle control (Removing the throttle control).
Remove the complete front brake control (Removing the front brake system).
Remove the hand guards (Removing the hand guards).

Remove right-hand switch (1), by disconnecting the connector together with the hand guard connector and loosening screws (2).

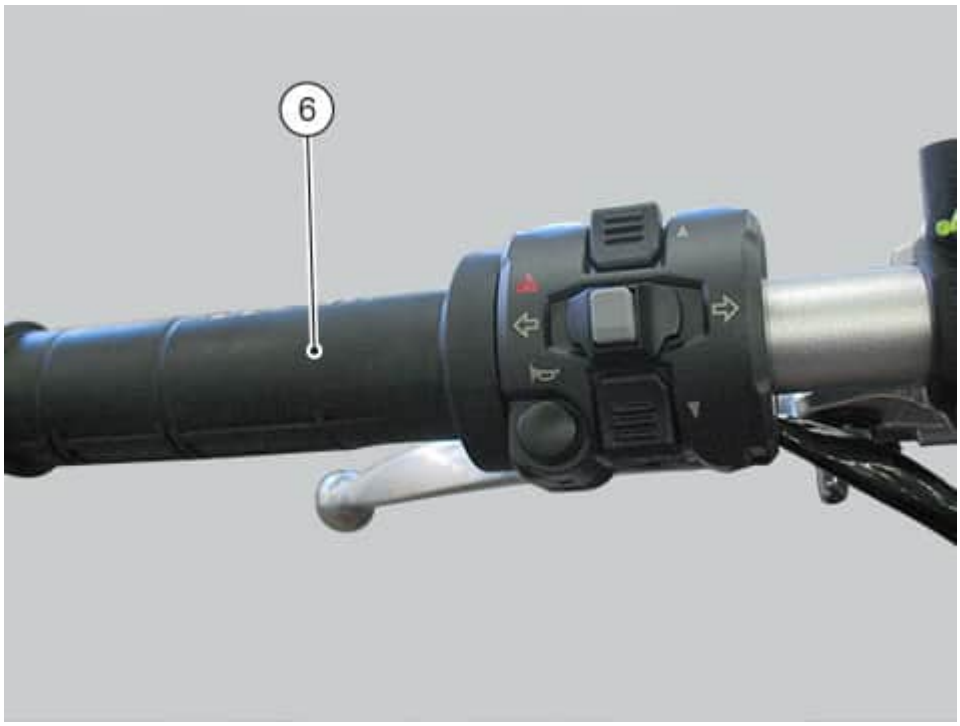


Remove left-hand switch (3), by disconnecting the connector together with the hand guard connector and loosening screws (4).

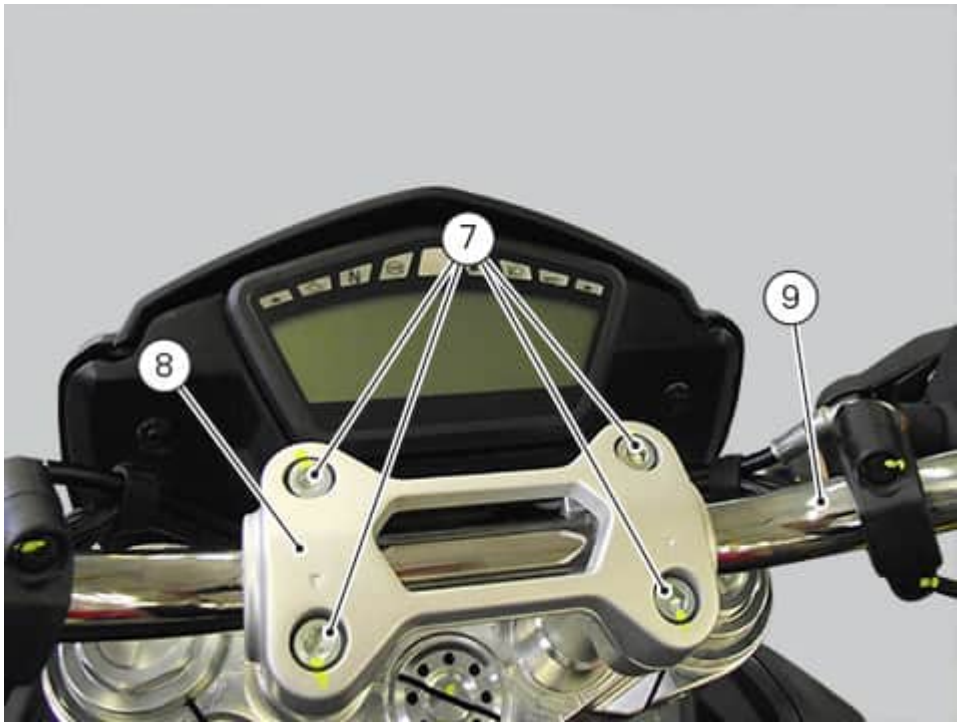


Removing right and left handgrips

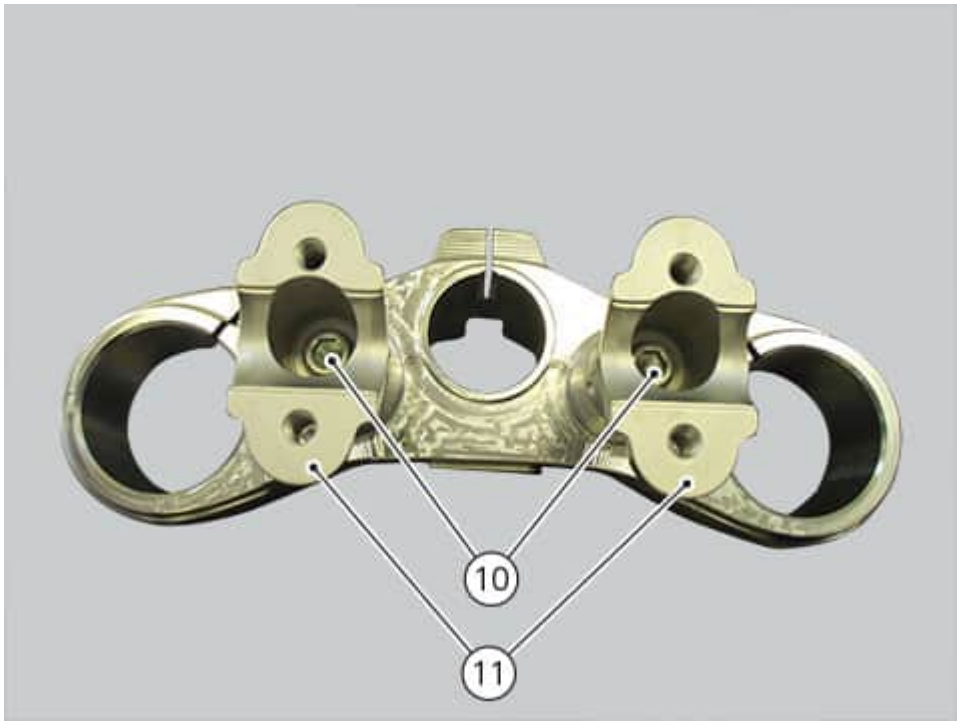
Slide out left handgrip (6) with the help of an air jet paying attention not to damage it (the figure shows the left one).

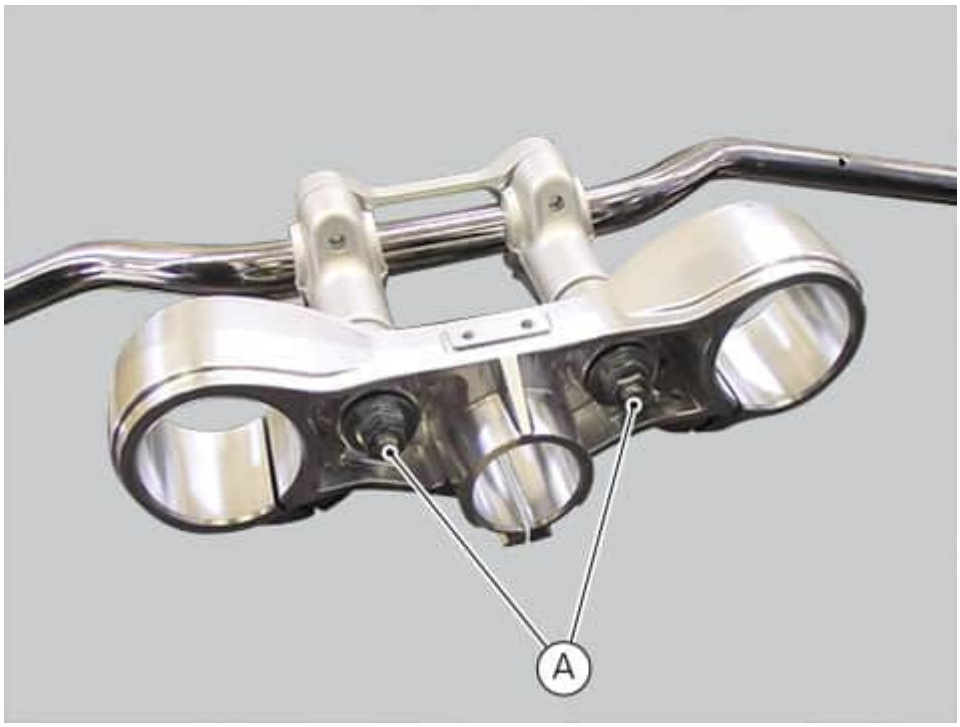


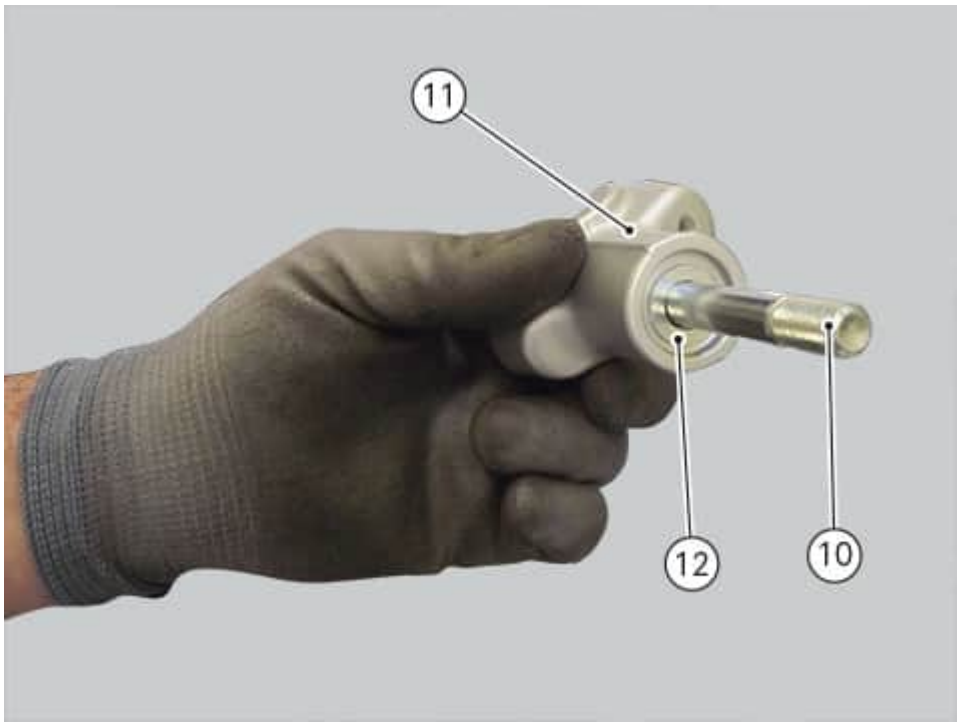
Undo and remove the screws (7).
Remove U-bolt (8) securing the handlebar.
Remove the handlebar (9).



Undo screws (10) holding nut (A) and remove stud bolts (11) from the steering head.
Collect washers (12).


10
11


A


11
12
10

Reassembling the hand guards

If disassembled, reassemble the hand guards following the disassembly procedure in reverse order. Remember to tighten screws (6) to 0.45 Nm ± 10%.

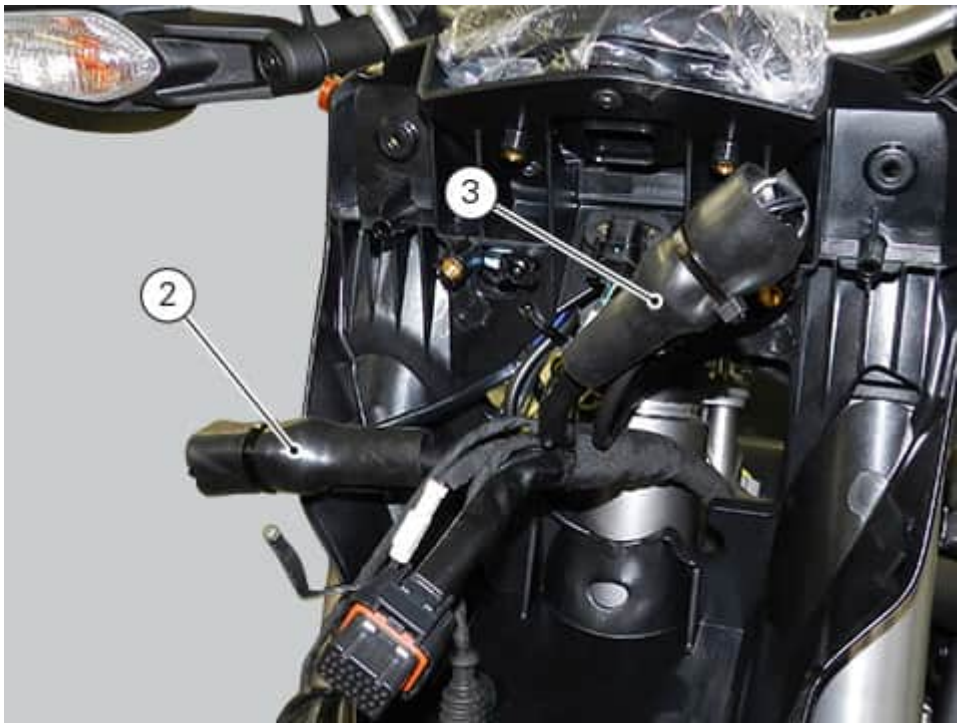


If removed, refit hand guard clamp and tighten the screws to the specified torque of 3 Nm ± 10%
Refitting the hand guards is the reverse of removal, tighten the screw (5) to a torque of 10 Nm ±10%.
Tighten screw (4) to the specified torque of 5 Nm ± 10%.





Connect again the connectors (2) and (3).



Refit the headlight fairing (Refitting the headlight fairing).

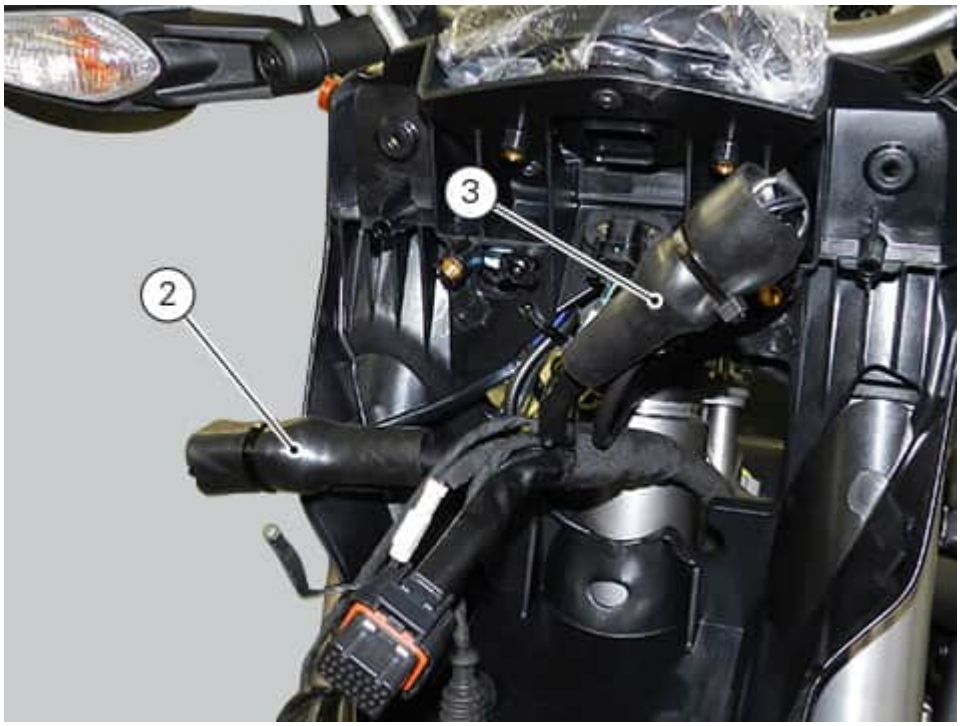
Removing the hand guards

Remove the headlight fairing (Removing the headlight fairing).

Hand guard removal is the same for both.
Here is the procedure for the RH hand guard (1).



Disconnect the connector (2), the left hand guard connector is (3).



Undo and remove the screw (4) securing the hand guard to the clamp.



Remove the rear-view mirror.
Loosen and remove the retaining screw (5) and remove the hand guard.



If necessary, disassemble the hand guard by loosening and removing screw (6).


6

Refitting the clutch assembly

Refit the clutch cable (4) on the clutch cover.

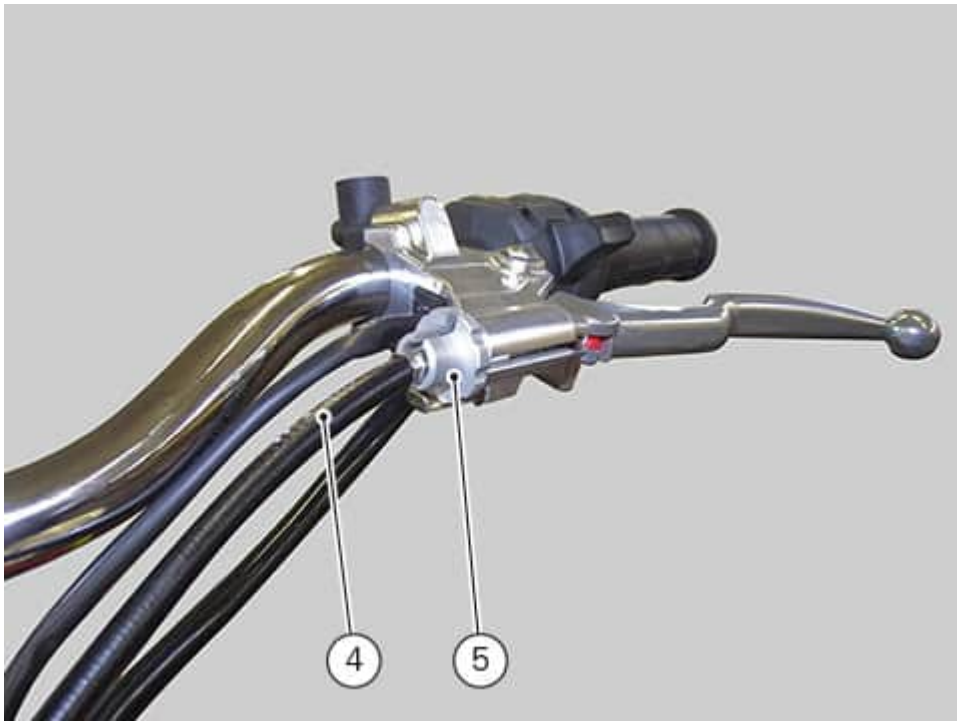


Turn adjuster (5) to tension clutch cable (4) on handlebar.
Screw adjuster (5).

Warning

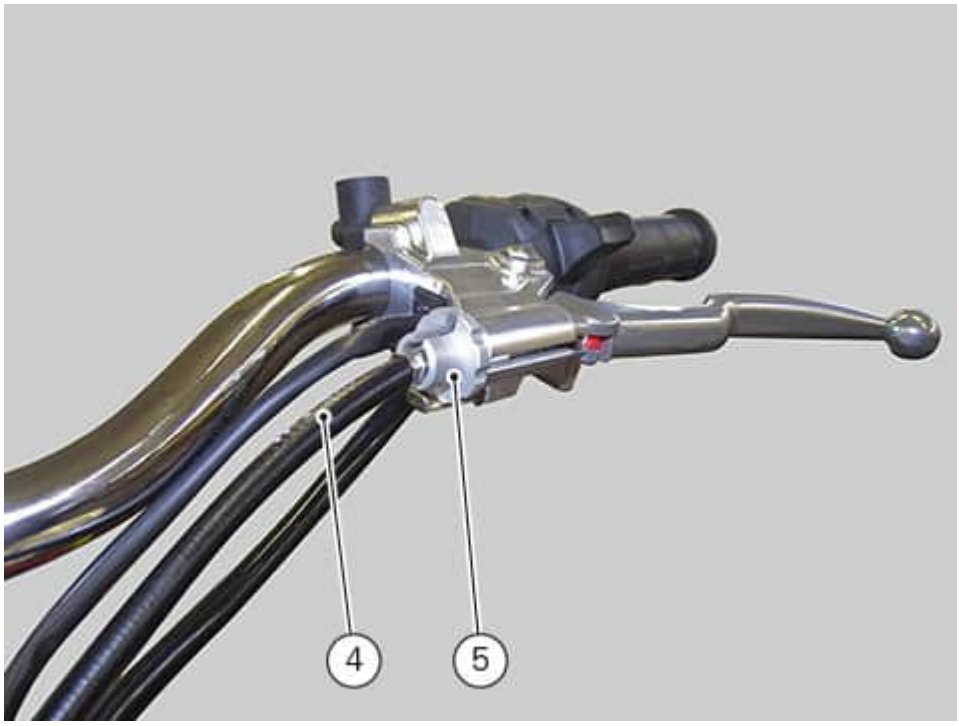
Never loosen adjuster. Adjuster must be screwed, only.

Adjuster (5) standard adjustment is 5 mm from the fully home position.
The maximum adjustment is of 11 mm.



Removing the clutch assembly

Screw clutch cable (4) fully home on clutch lever on handlebar, working adjuster (5).

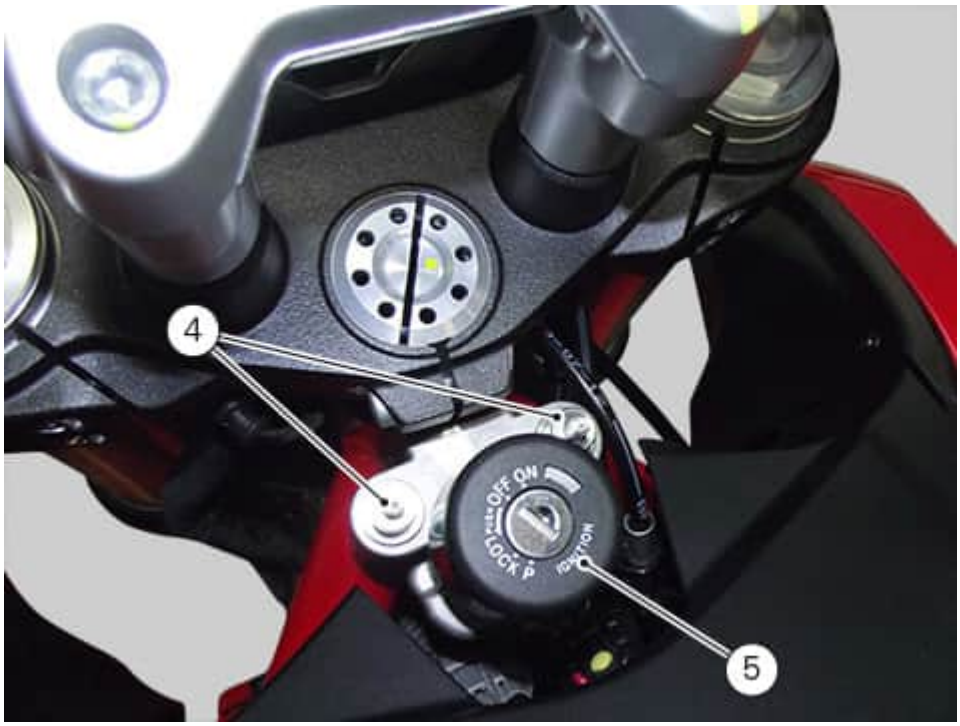


Remove the clutch cable (4) from the clutch cover.

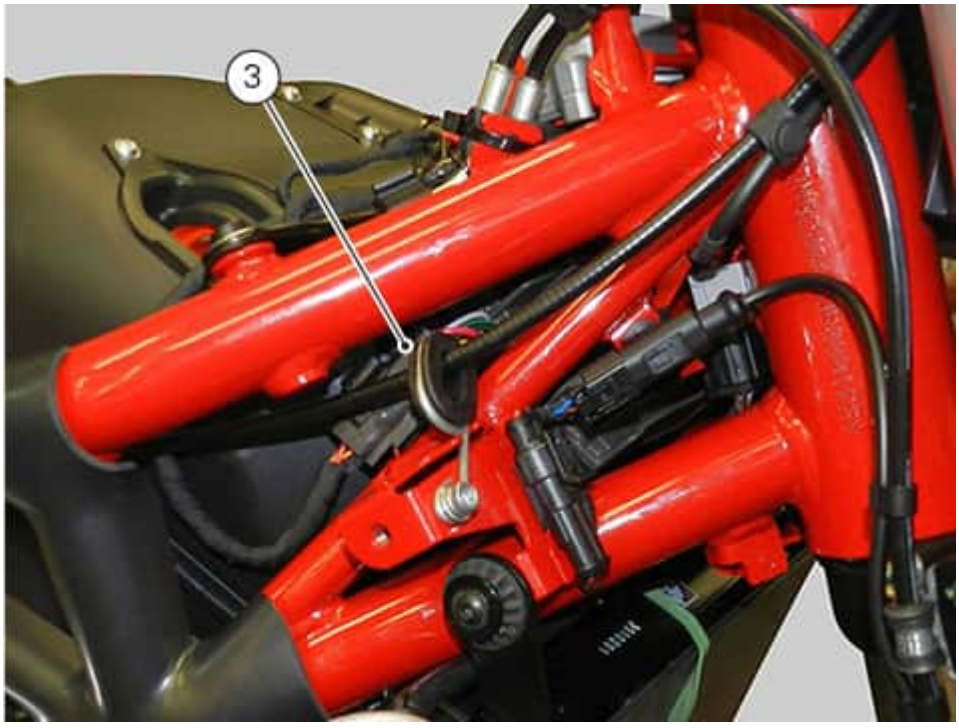


Important
Always use new special screws.

Fit the ignition switch (5) in the frame seat and start special screws (4). Tighten screws, shearing the head of the screws.

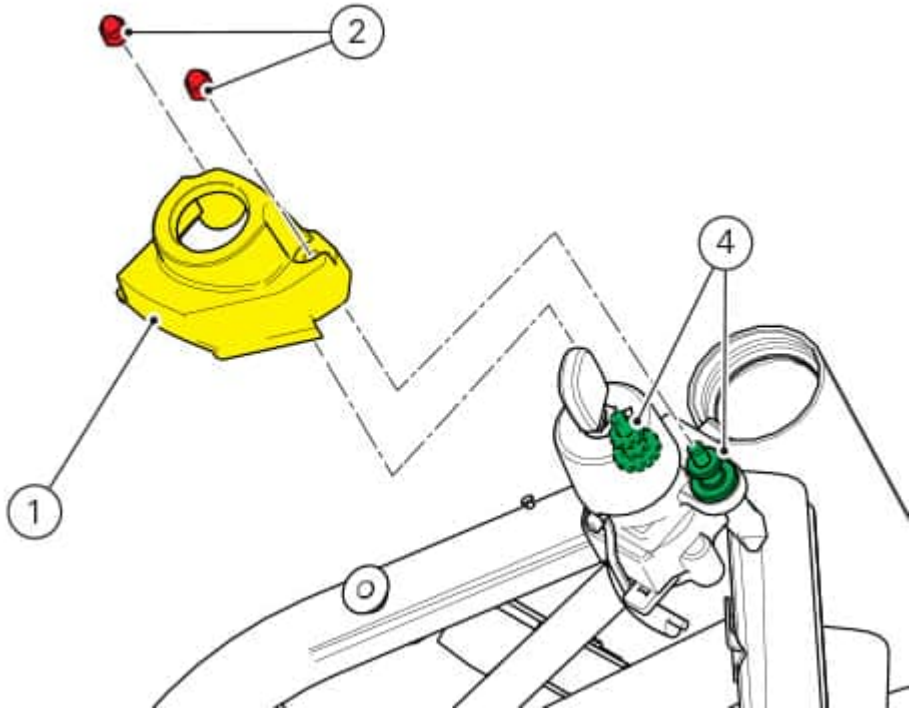


Connect ignition switch connector (3) to the main wiring.



Refit the fairings (Refitting the fairings).

Refit the ignition switch cover (1) by starting the nuts (2) on special screws (4). Tighten nuts (2) to a torque of 7 Nm ± 10%.

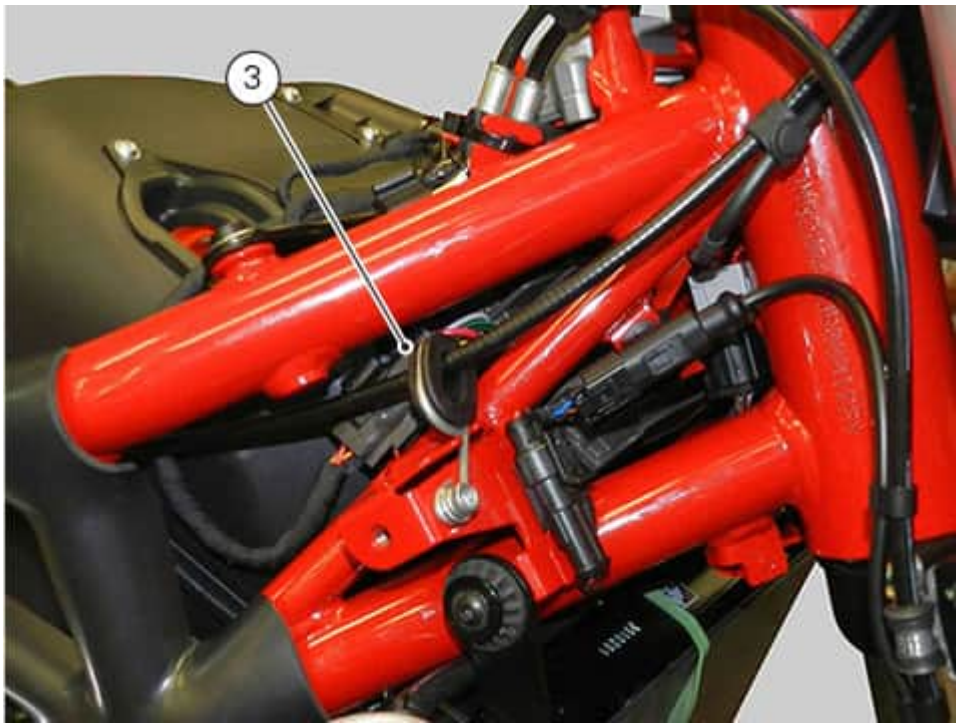

2
4
1


2
OFF
ON
LOCK
P
IGNITION
1

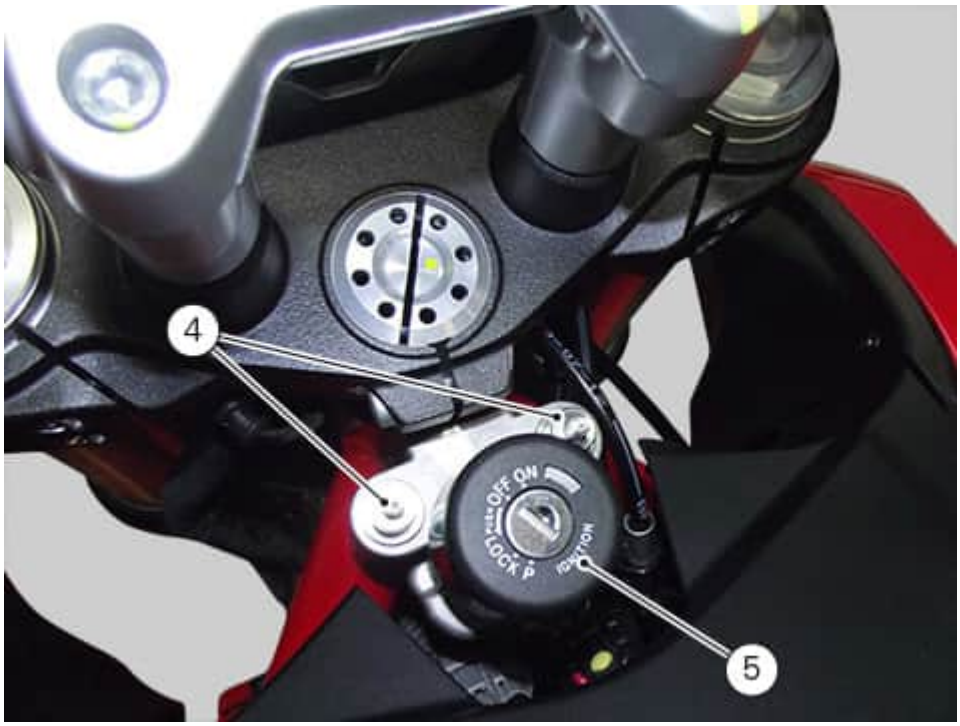
Remove the ignition switch cover (1), loosening nuts (2).



Remove the fairings (Removing the fairings)
Disconnect ignition switch connector (3) from the main wiring.

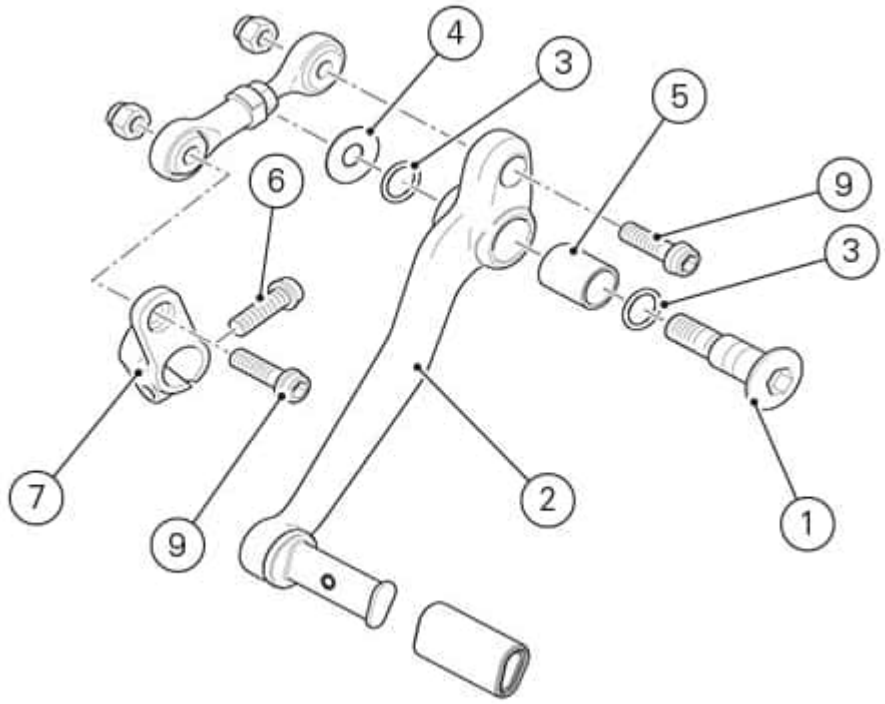


Loosen special screws (4) and remove ignition switch (5).

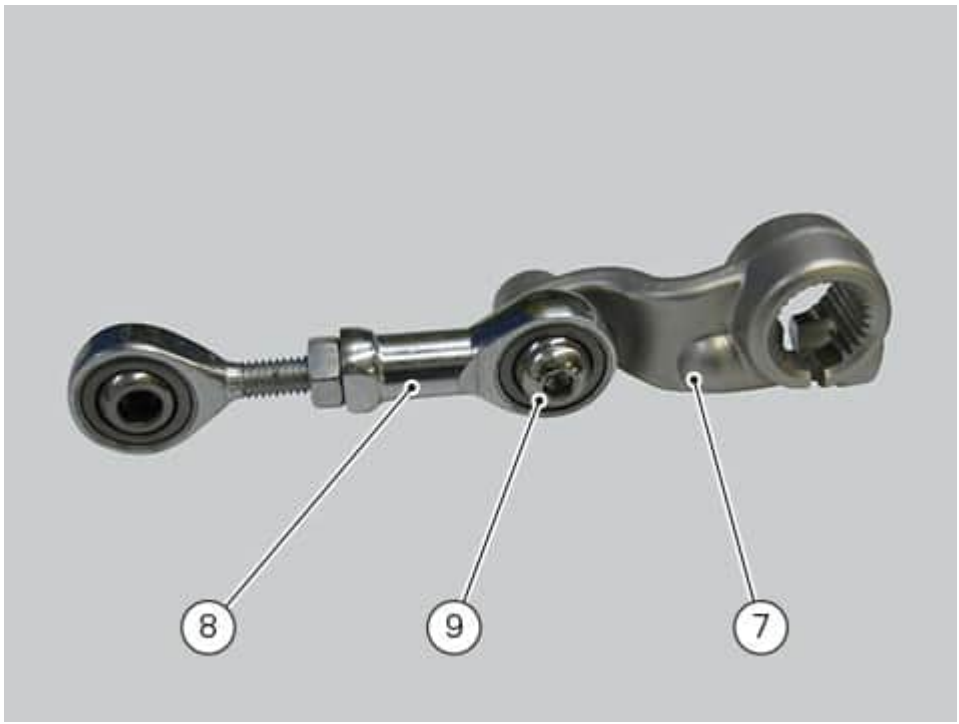

4
5
OFF ON
LOCK P
IGNITION

Refitting the gear change control

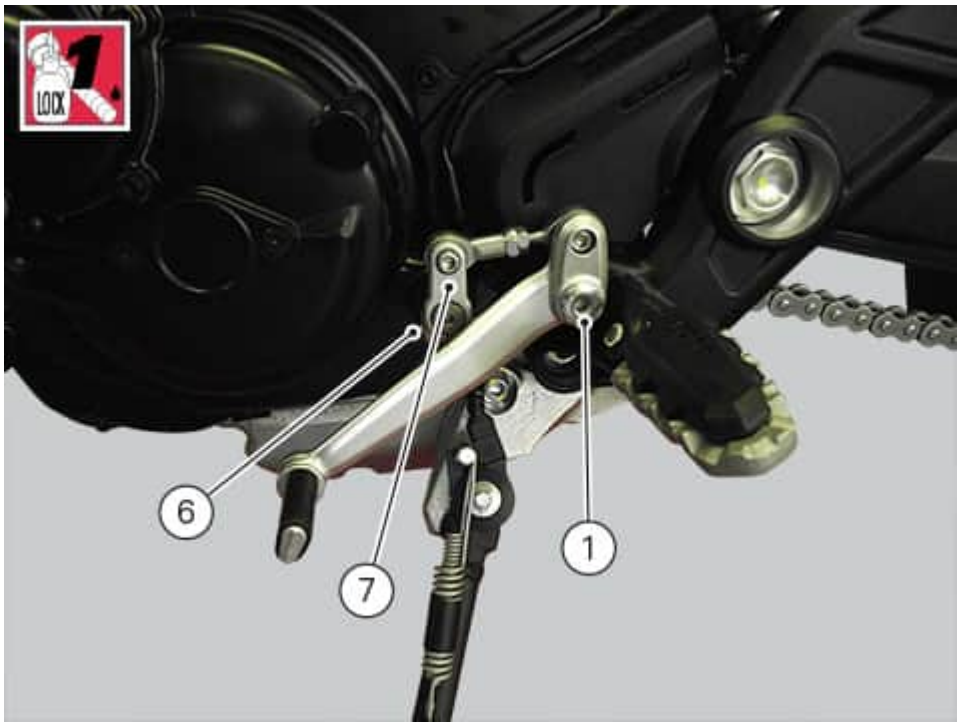
Apply the threadlocker on shaft (1).
Install O-ring (3) onto shaft (1).
Insert the shaft (1) in the gear lever (2), and insert the other O-ring (3) and the washer (4).
Fit the gear lever (1) on the footpeg plate by inserting and tightening the shaft (1) to the specified torque 23 Nm ±10%.



Fit lever (7) on gear transmission rod assembly (8), starting screw (9). Tighten screw (9) to a torque of 10 Nm ±10%.

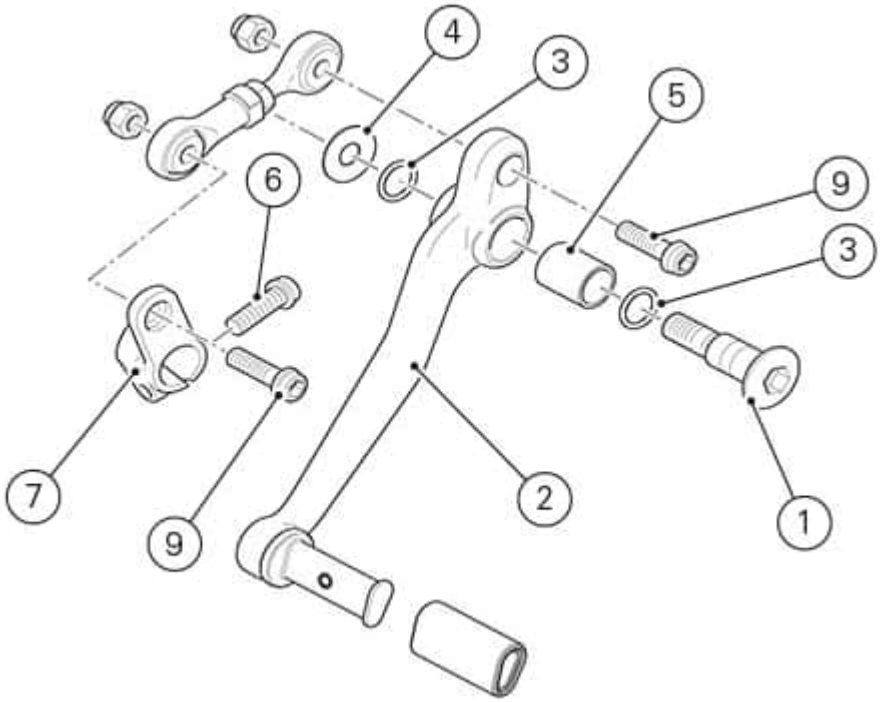


Fit the gear change unit inserting the lever (7) on the gear control pin, apply threadlocker on the screw (6) and insert it on the lever (7).
Tighten screw (6) to a torque of 10 Nm ±10%.

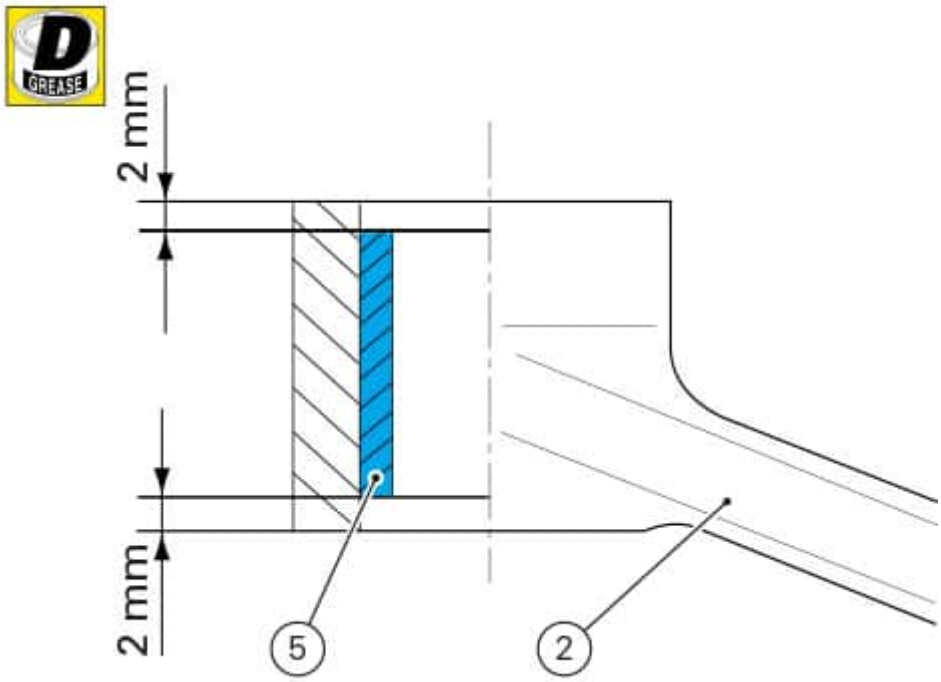

LOCK
6
7
1

Disassembling the gear change control

Refer to the exploded view for indications on disassembly and replacement of unit components.



If the bush (5) inside the pedal (2) needs replacing, grease the external surface and drive the new bush into place using a press. The bush must be seated 2 mm below the outer face of the pedal.



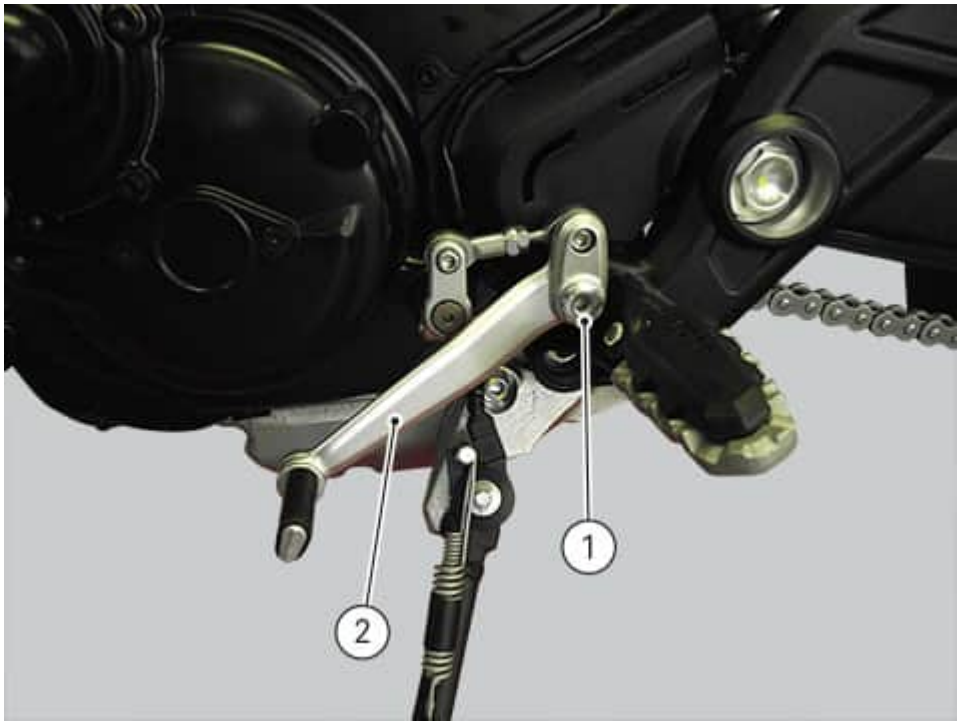
Warning

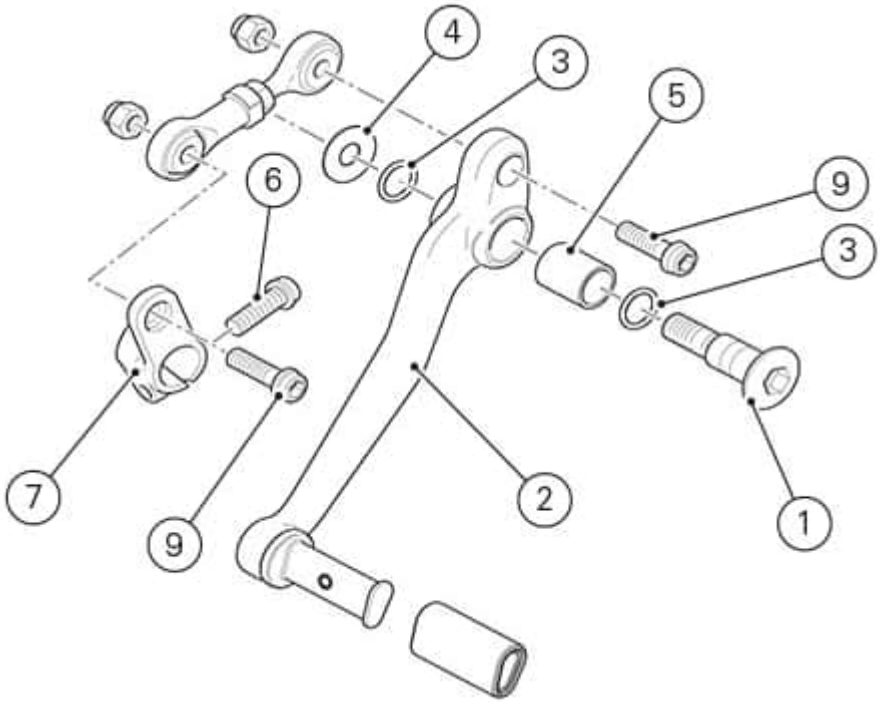
After working on the gear change control, check the position of the gear pedal.

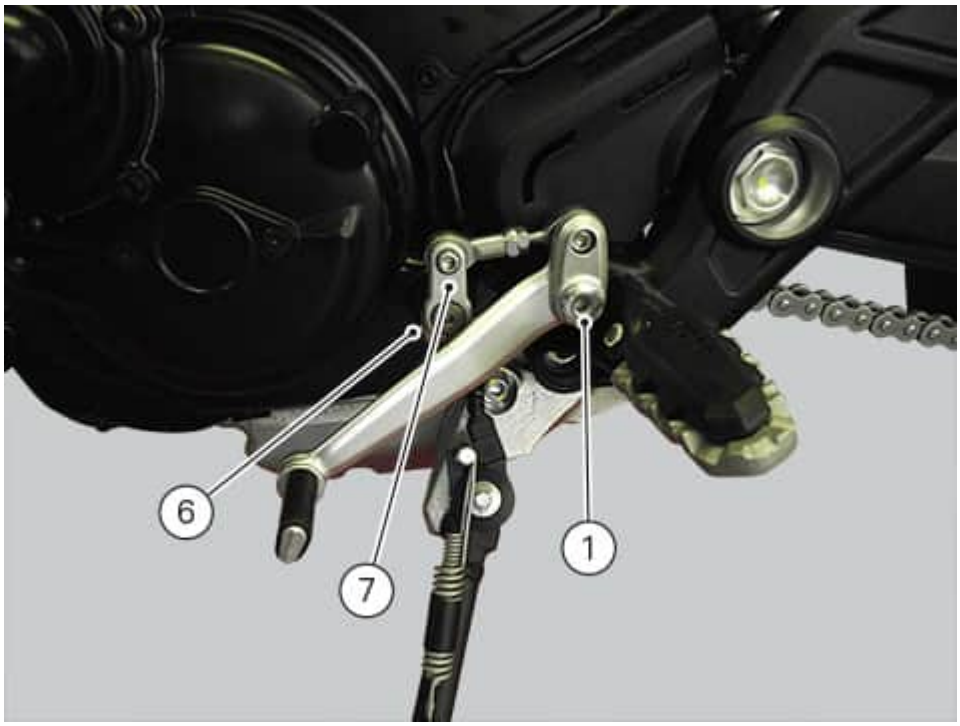
To adjust the gear pedal position, follow the instructions under Section "Adjusting the position of the gear and rear brake pedals.".

Removing the gear change control

Loosen and remove the pin (1) securing the gear pedal (2), and collect the O-rings (3), the washer (4) and bush (5).
Undo and remove the screw (6) securing the gear lever (7) to the gearbox shaft.
Remove the lever (7) complete with the gear control assembly.

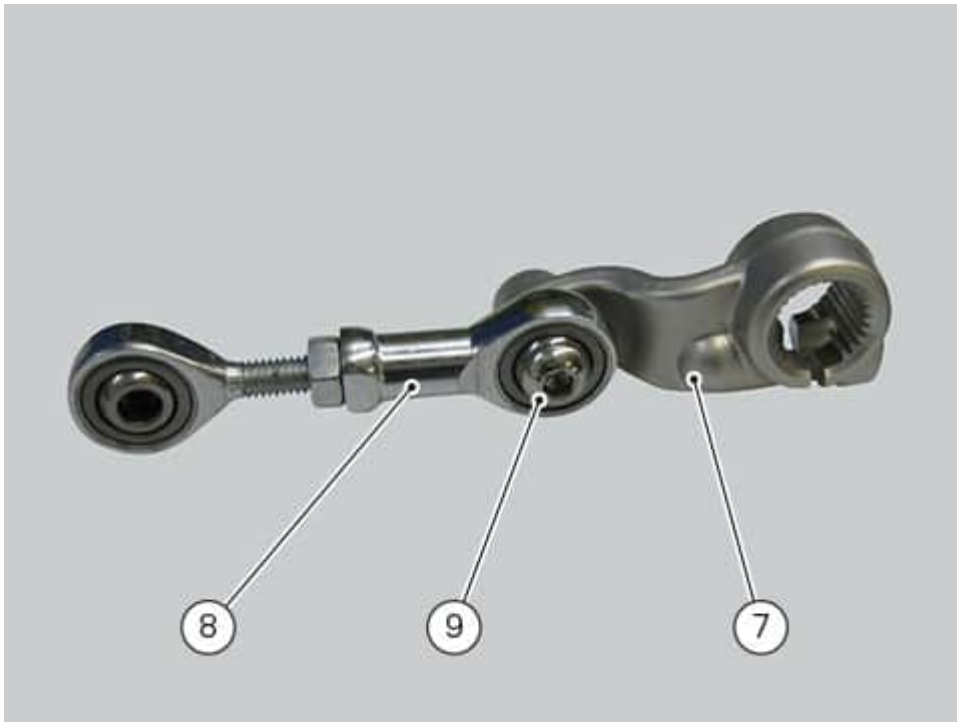






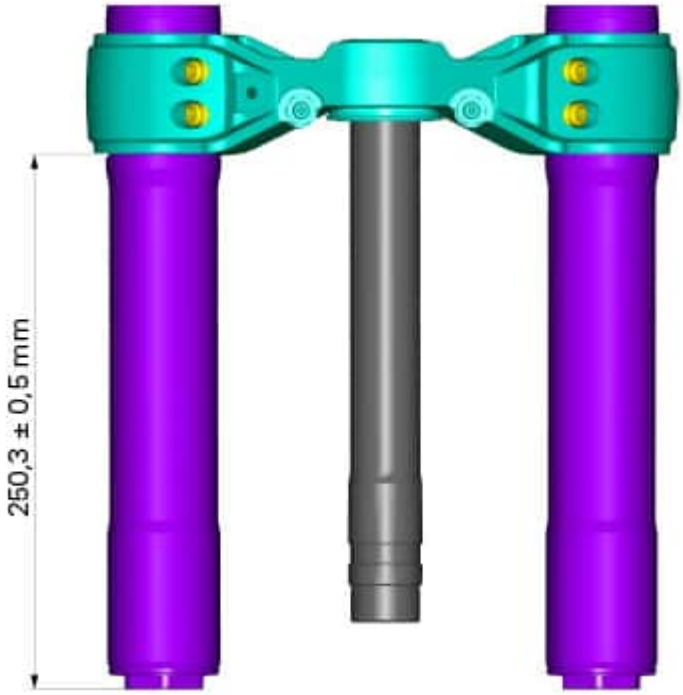
Note
Mark the position of lever with respect to the gear selector shaft.

To remove lever (7) from gear transmission rod assembly (8), loosen screw (9) then slide out lever (7).



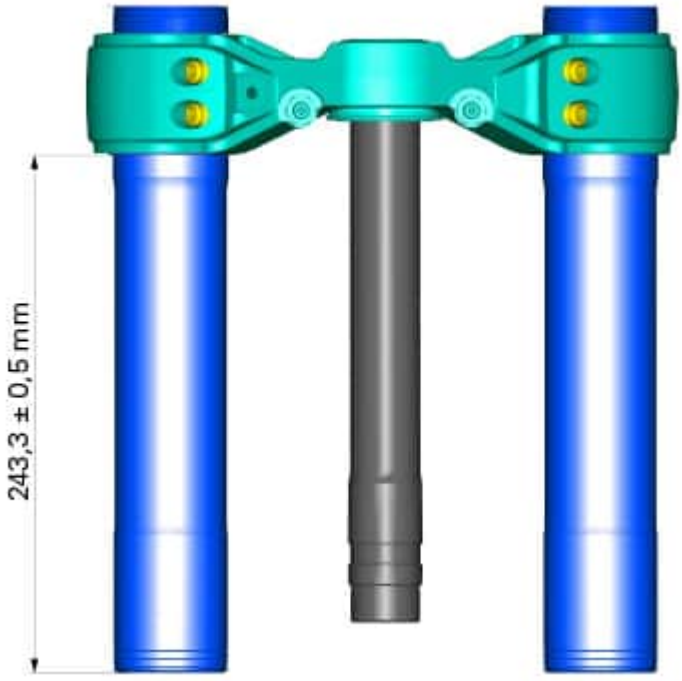
Refitting the front fork

Refit the fork legs setting them at the indicated height to the bottom yoke.



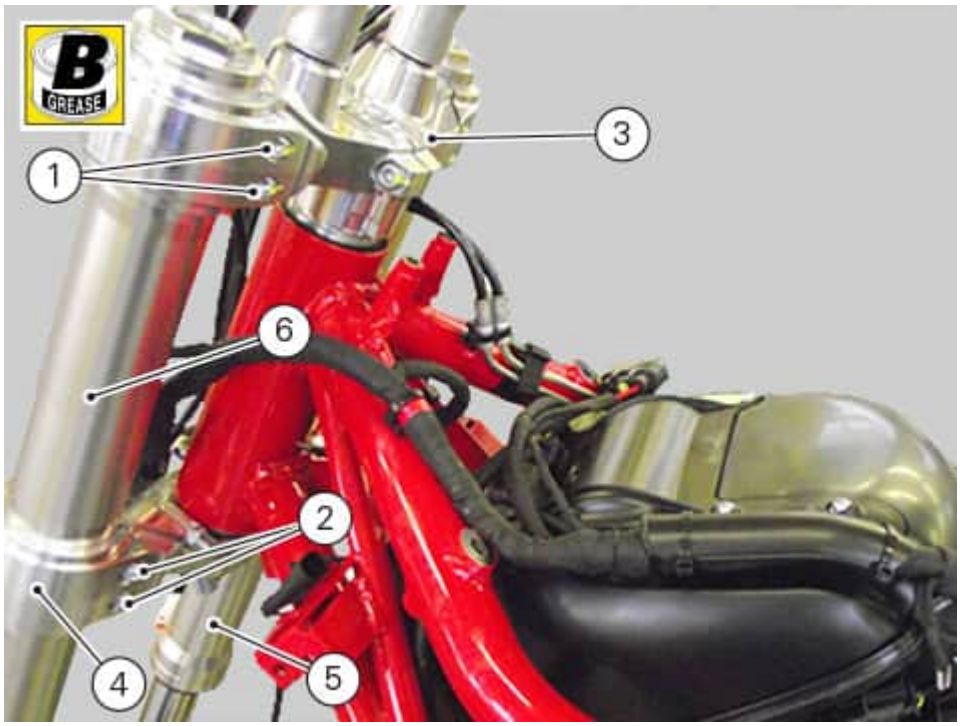
Warning
The difference in height between the two fork legs must be no greater than 0.1 mm.

SP version



Position fork legs (5) and (6) on bottom yoke (4) and steering head (3).
Fasten fork legs by tightening screws (1) to 10 Nm ±5% and screws (2) to 16 Nm ±5% retaining bottom yoke (4) and steering head (3): tighten screws (2) in a 1-2-1 sequence.
Tighten one leg at a time.

Important
If the screws were removed upon disassembly, smear their threads with the specified grease before tightening.



Refit any parts removed from the frame.

Warning

Do not use the motorcycle when front mudguard is not in place since this part supports the brake lines and avoids that they interfere with the wheel under braking.

Overhauling the front fork

General safety rules

Carefully read the procedures below before working on the fork for any reason whatsoever.
Please remember that suspension installation, maintenance and repair require specific knowledge, equipment and know-how.
After complete disassembly, always renew seals upon reassembly.
When tightening nuts or bolts close to one another, always follow a 1-2-1 sequence; comply with the specified tightening torques. Never use flammable or corrosive solvents to clean parts, since they could damage the seals.
If necessary, use specific detergents, in preference biodegradable, non corrosive, non flammable ones or having a high flash point, compatible with the seal materials.
Before reassembling, always lubricate the fork mating parts.
Always smear seal lips with some grease before reassembly.
When using a screwdriver to install or remove snap rings, O-rings, guide bushes or sealing rings, make sure not to scratch or damage the parts.

Note
It is recommended to overhaul one fork leg at a time.

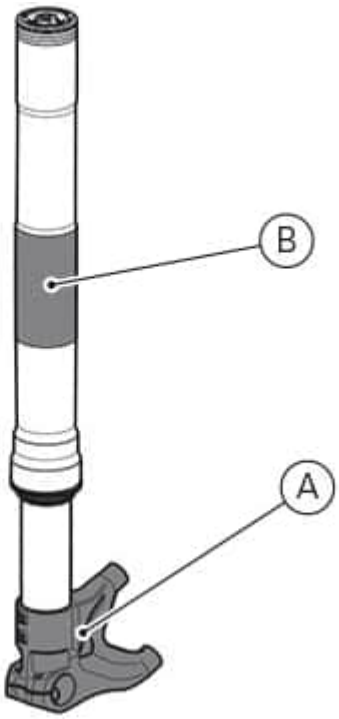
Do not modify the fork components.

Using the vice

Some service procedures might require the use of the vice to hold some fork components.

Warning
Incorrect use of the vice could damage the fork, even though damage might not be immediately visible, and jeopardise its safety features.

Carefully comply with the following instructions:
Only use the vice when it is absolutely necessary.
Always use a vice with jaws made from soft material.
Do not tighten vice too much.
Do not vice fork at positions where the least deformation might damage the part and cause suspension malfunction.
The figure below highlights the suggested areas that can be used to vice the fork: fork bottom end (A) and sleeve (B) in the area where the bottom yoke is fastened.



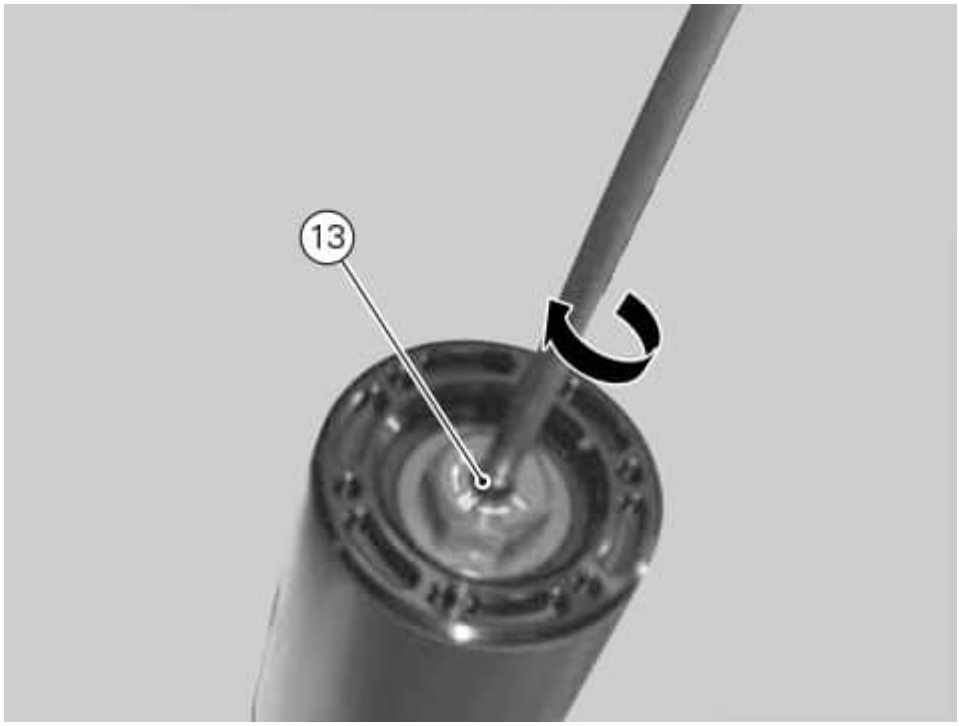
Standard equipment and tools	
	17 mm socket wrench
	19 mm socket wrench
	4 mm Allen wrench
	4 mm fork wrench
	Small flat screwdriver
	Brush
	Vice with jaws made from soft material
	Ruler
	Measuring cup
	Vessel with large opening
	Adhesive tape
	Grease (GREASE D)

Disassembling the fork leg

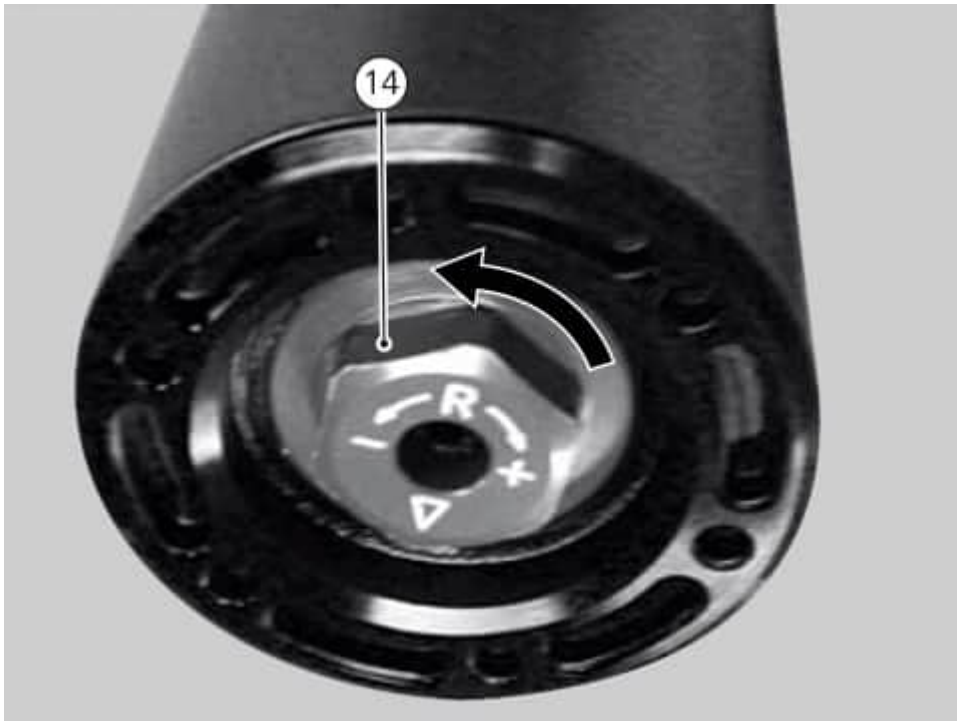
Note
If you wish to replace just the spring, this operation can be performed with fork installed to the motorcycle. Carry it out on one leg at a time. While if you need to service the fork, remove it from the motorcycle as described in the previous paragraph.

Attention
If you do not wish to change the fluid, make sure not to spill it.

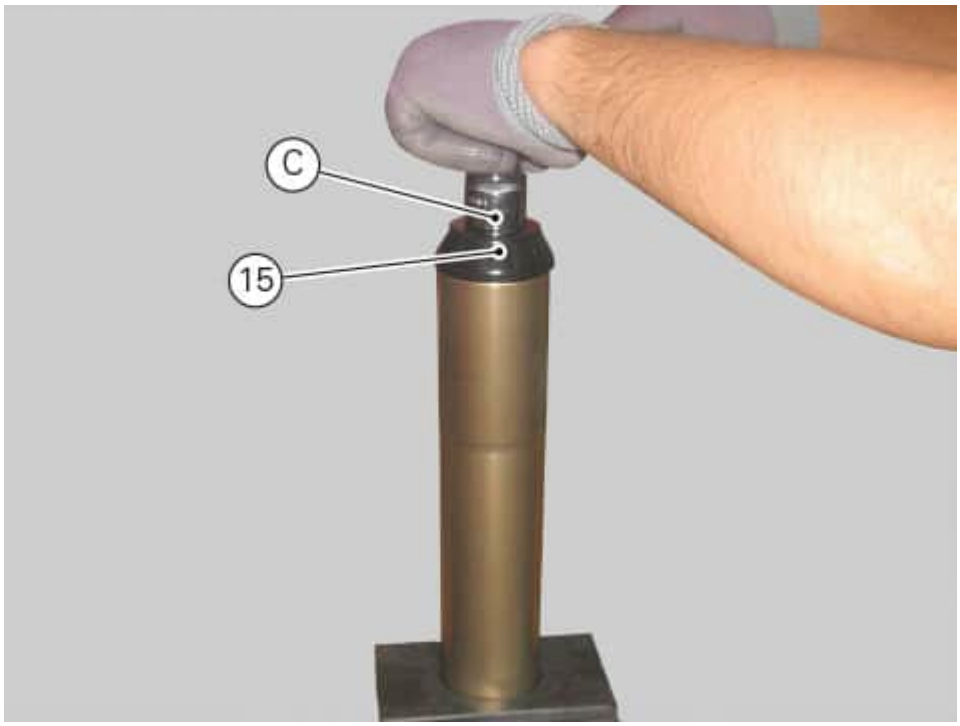
Tighten the adjuster screw (13).



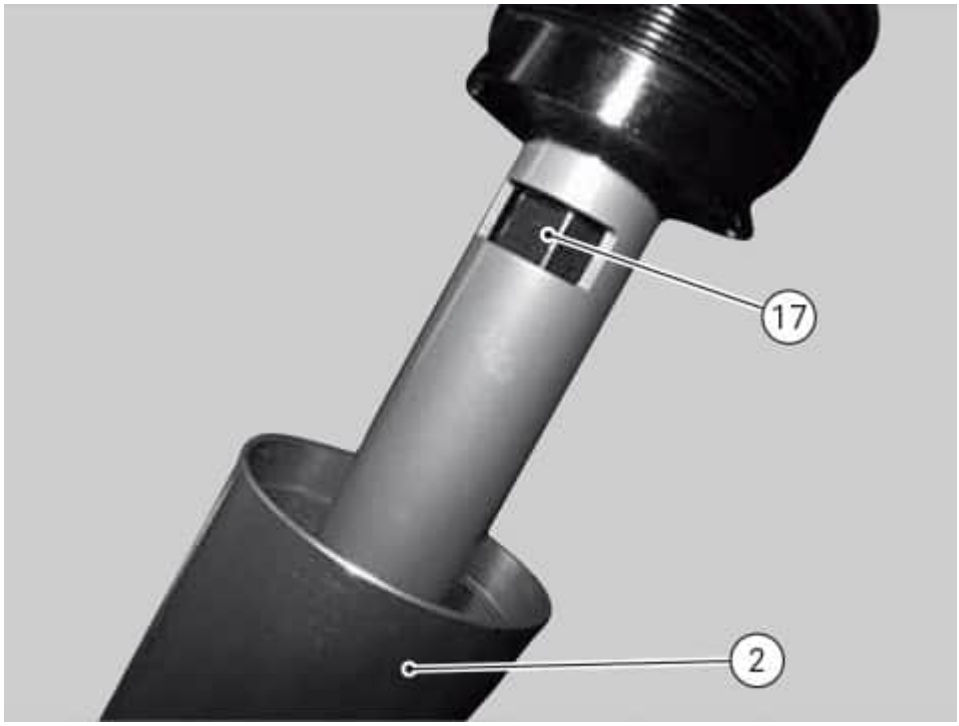
Using a 19 mm socket wrench, decrease spring preload to the minimum value by turning adjuster (14) counter clockwise.

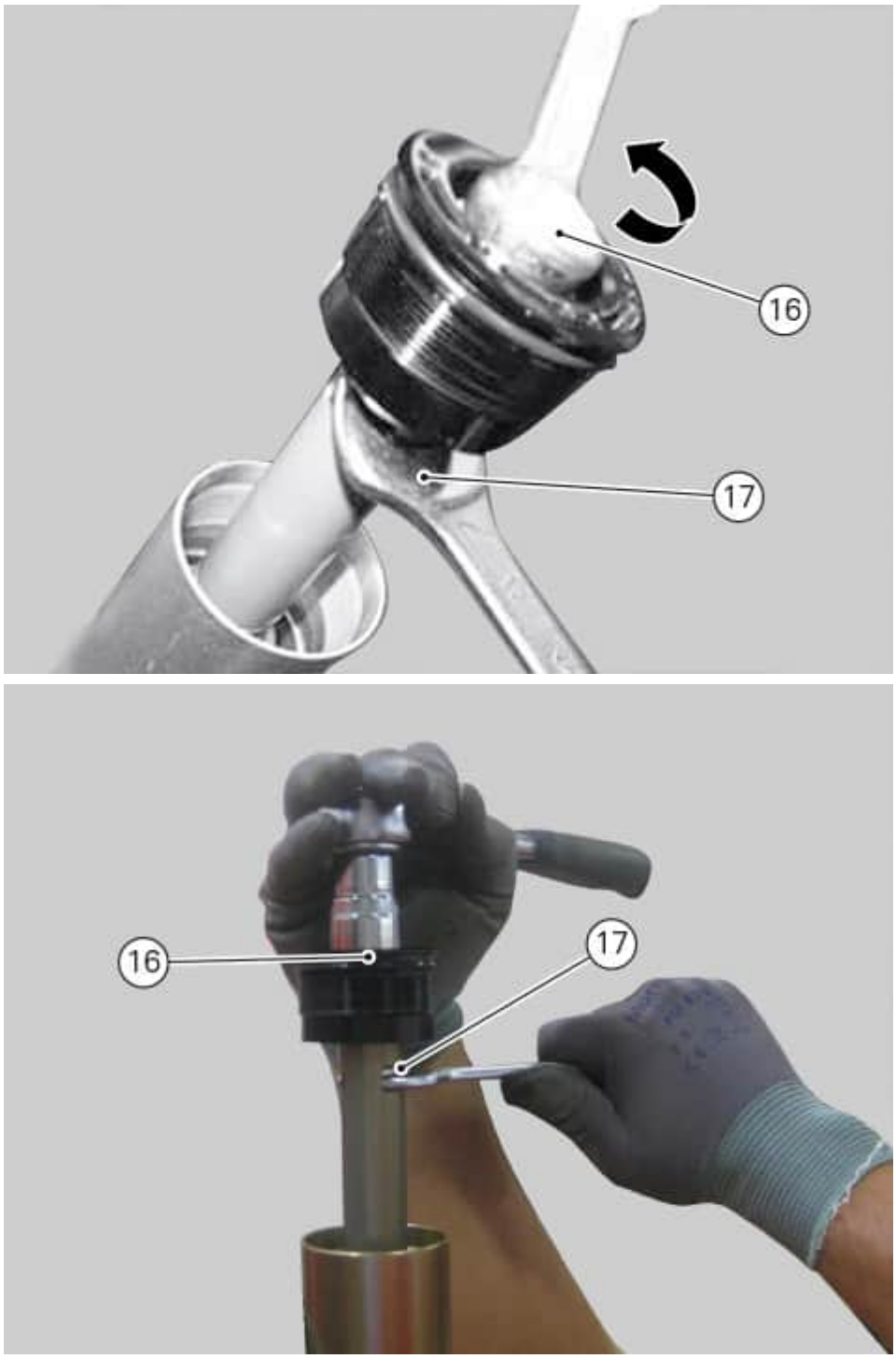


Vice the sleeve.
Completely loosen the plug (15) on the sleeve, using tool (C) part no. **88713.3091**.

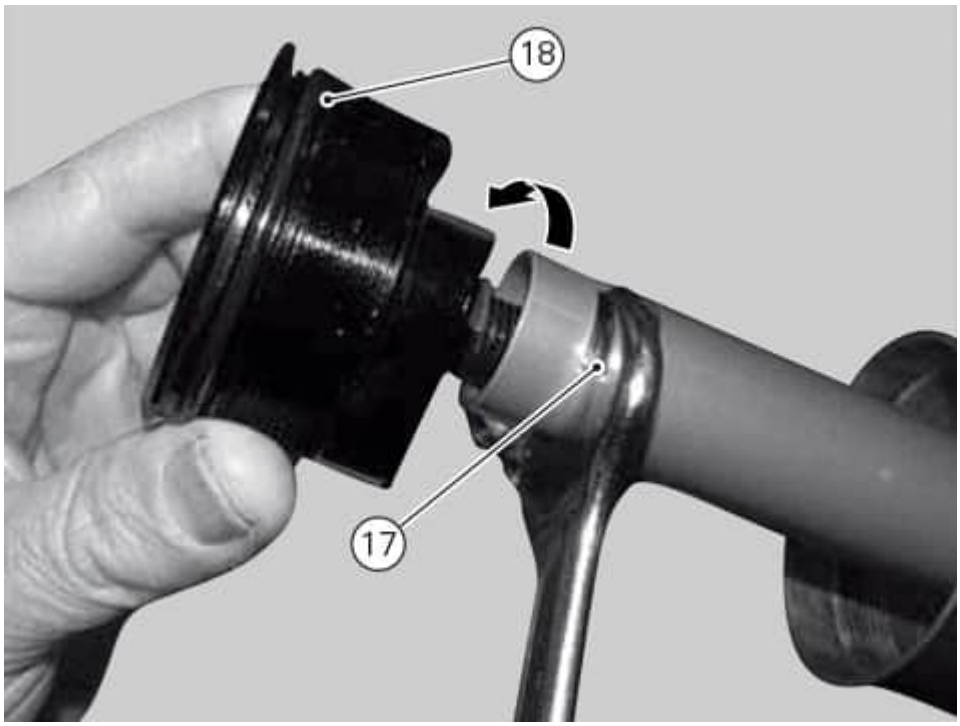


Slowly move sleeve (2) down.
Hold the lock nut (17) using a 17 mm wrench, and loosen the preload adjuster (16) using a 19 mm socket wrench.

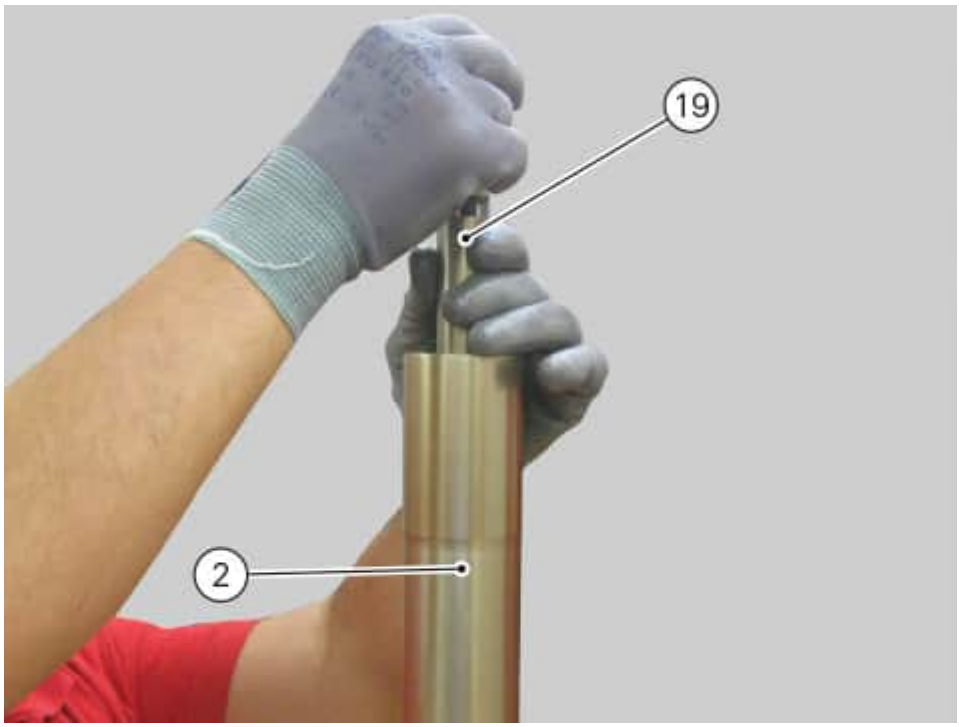


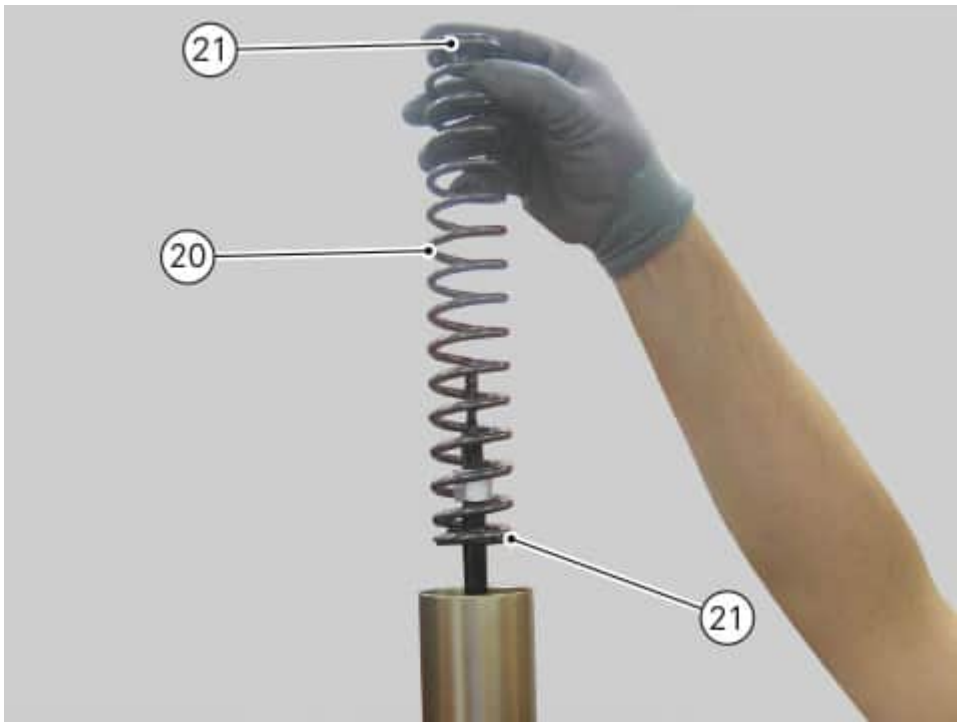


Hold the lock nut (17) using a 17 mm wrench, and loosen and remove the complete top plug (18) by hand.



From inside the sleeve (2), slide out preload spacer (19) and spring (20) together with spring guide bushes (21).





Remove sleeve (2) from the vice and tilt it to drain the fluid.



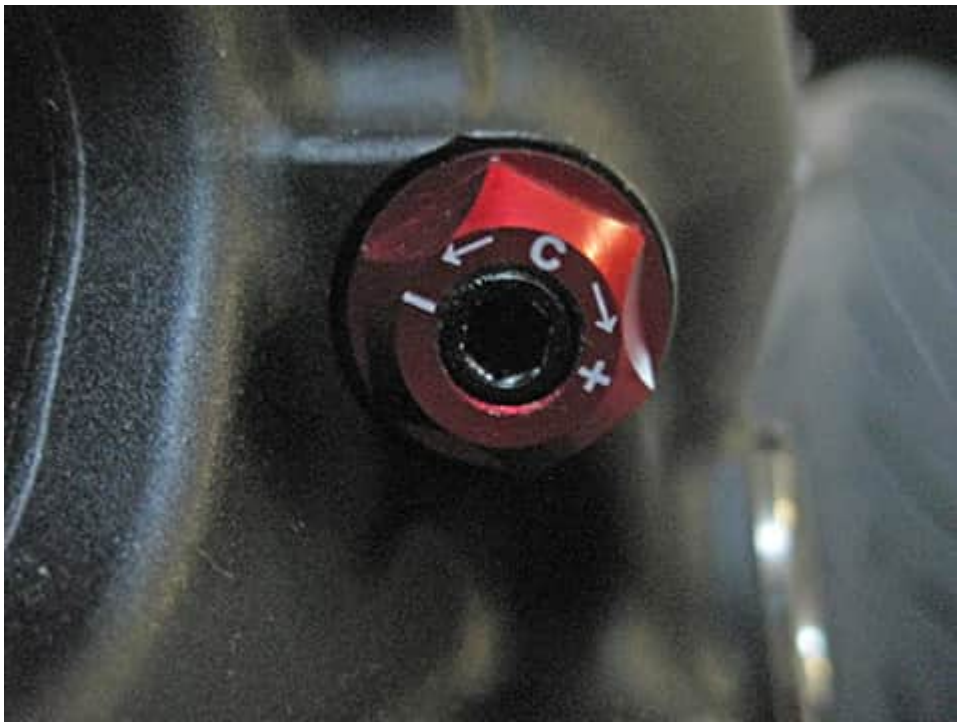
Note

Carefully look at the appearance, thickness and quality of the fluid to assess the conditions of the sealing and guiding parts; change the guide bushes and seals when fluid is thick and dark with some solid particles.

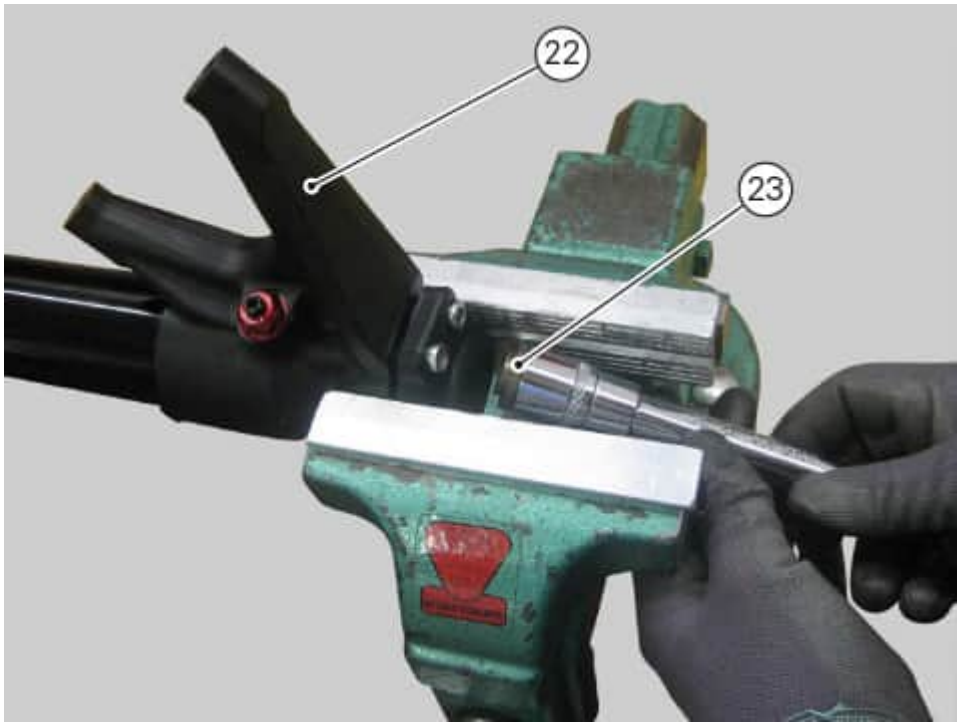
Warning

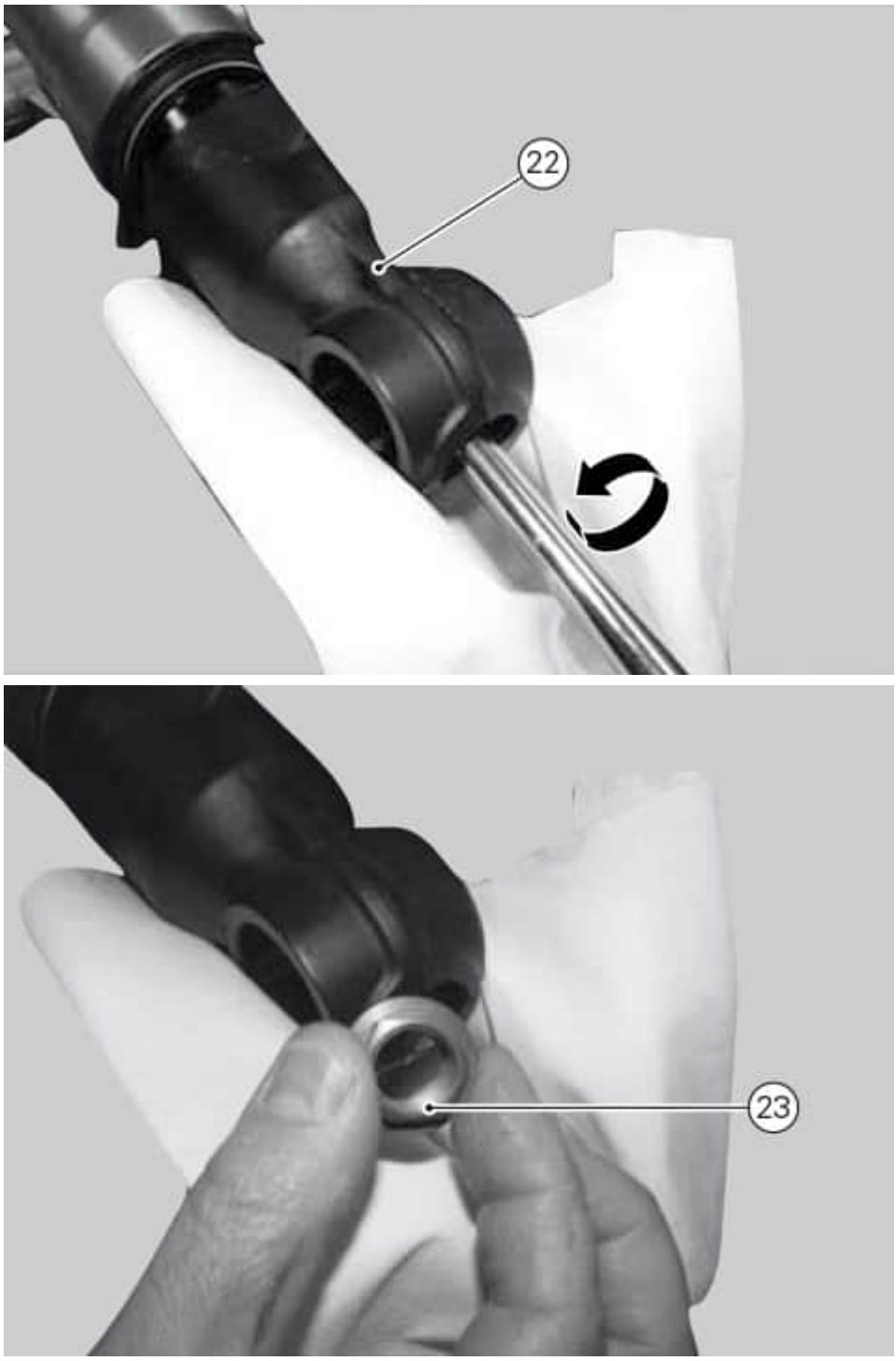
Cartridge can be removed only as soon as the fluid is completely drained.

Fully loosen the compression adjuster screw.

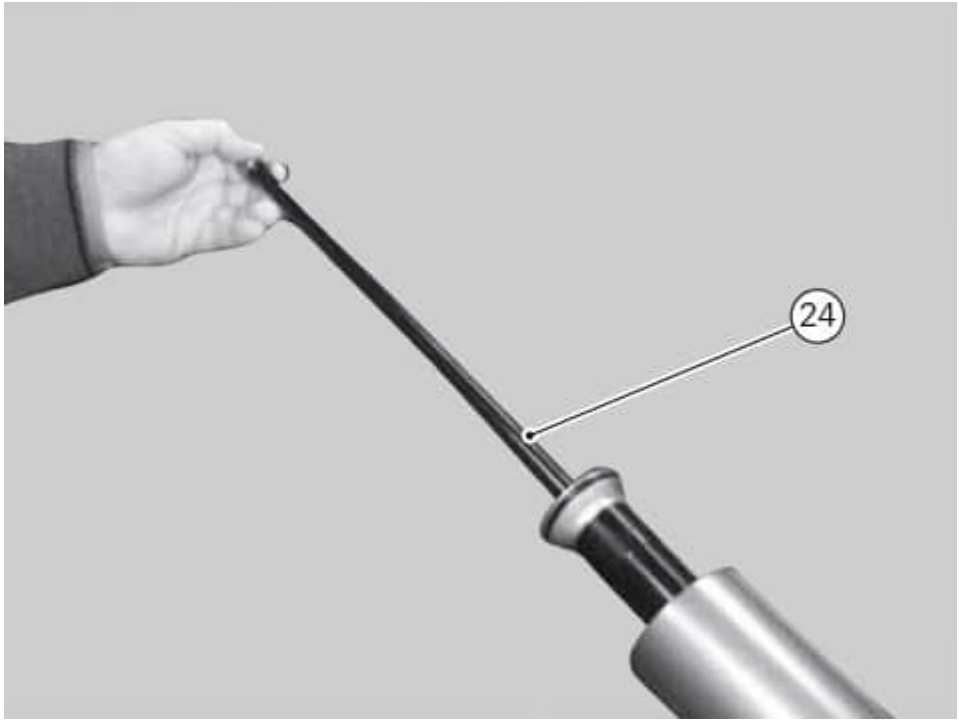


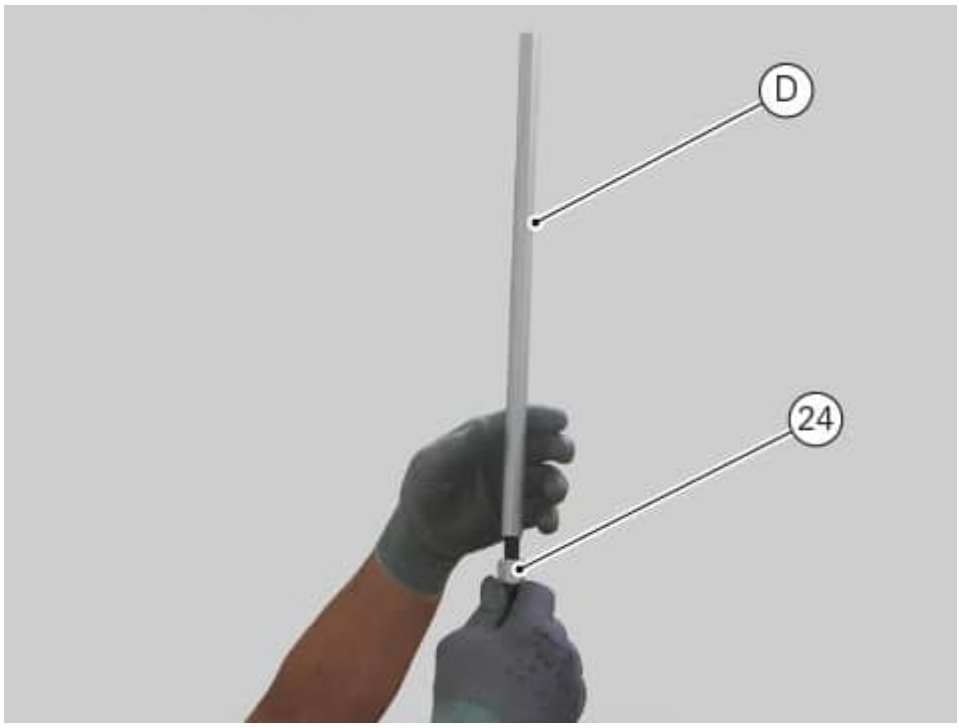
Vice the fork bottom end (22).
Loosen the cartridge lower nut (23), using a 17 mm socket wrench.





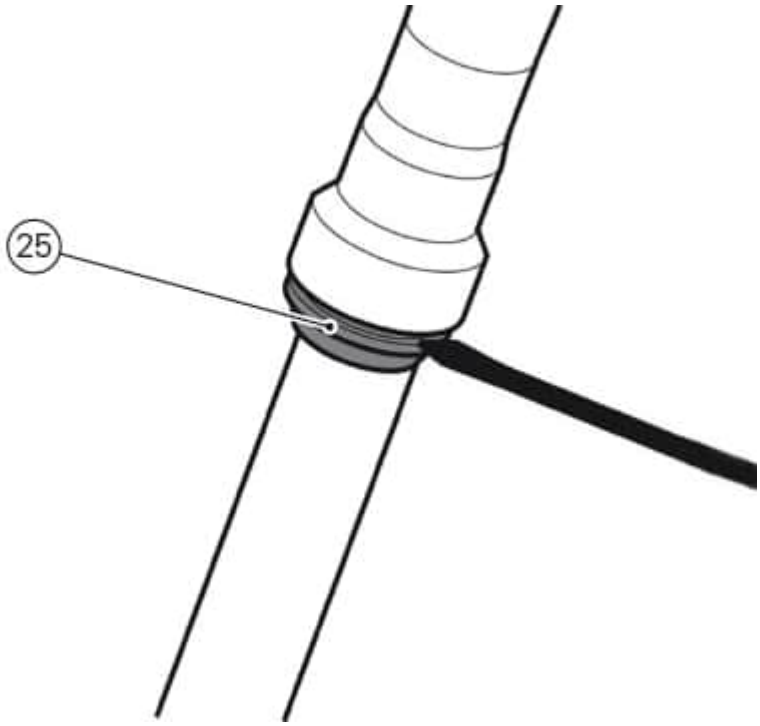
Slide out the complete cartridge (24), using tool (D) part no. 88713.3203 screwed on cartridge end.



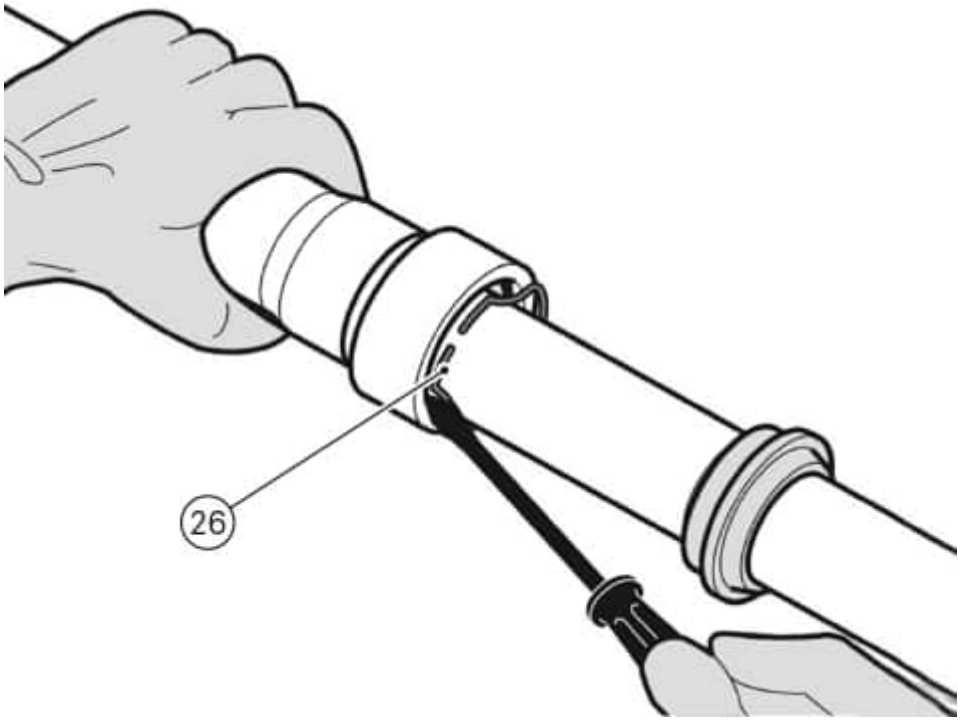


Note

Do not disassemble the cartridge, do not loosen the rebound needle and do not loosen the screw at the bottom of the cartridge. The cartridge unit cannot be serviced. If it is necessary to change some parts of the cartridge, you must change the whole unit.



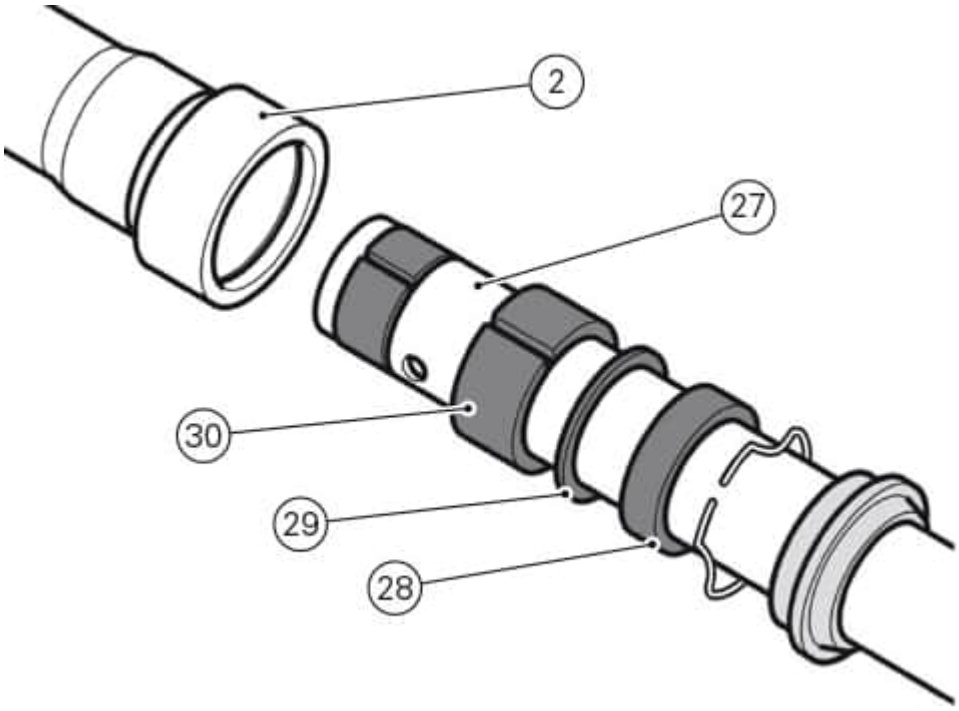
Using suitable tools, remove the snap ring (26).



Important

Make sure not to damage the leg surface treatment and the snap ring seat on the outer sleeve.

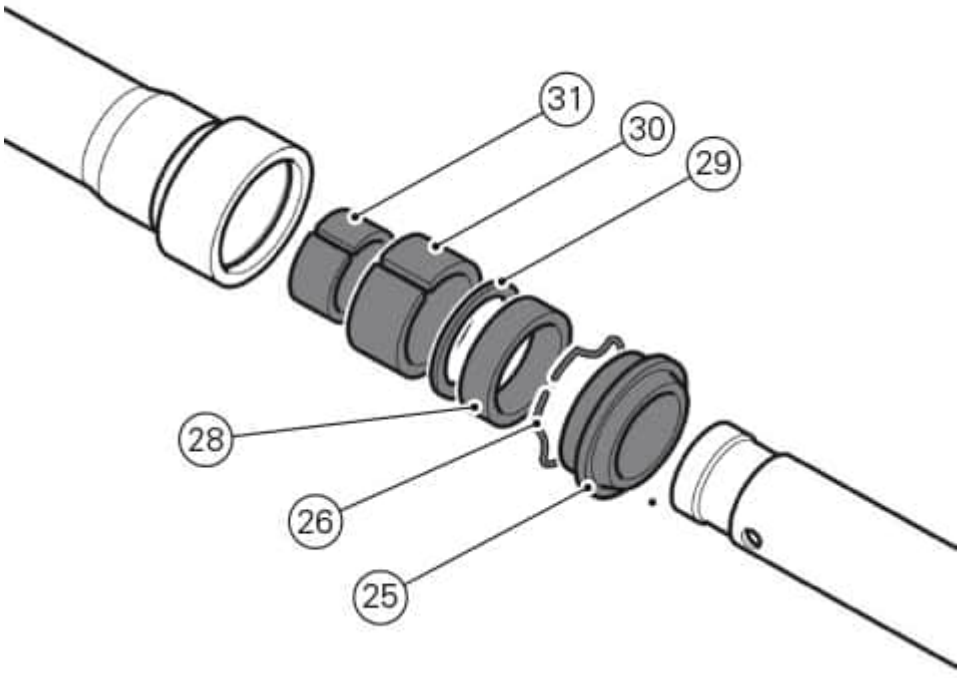
Slide out fork leg (27) from sleeve (2) by quickly hitting several times to separate them.
This will remove the following parts from sleeve: seal (28), washer (29) and the lower guide bush (30).



Remove the upper guide bush (31) by hand.
If this step is difficult to complete by hand, you can use a suitable tool and insert it in the bush slot.
Remove the following parts from fork tube: lower guide bush (30), washer (29), seal (28), snap ring (26) and dust seal (25).

Warning

The removed seals and dust seals must not be used again. Check guide bush conditions before reassembly; change if scratched or scored. Inspect the guide bush Teflon® coating and make sure it is not worn.

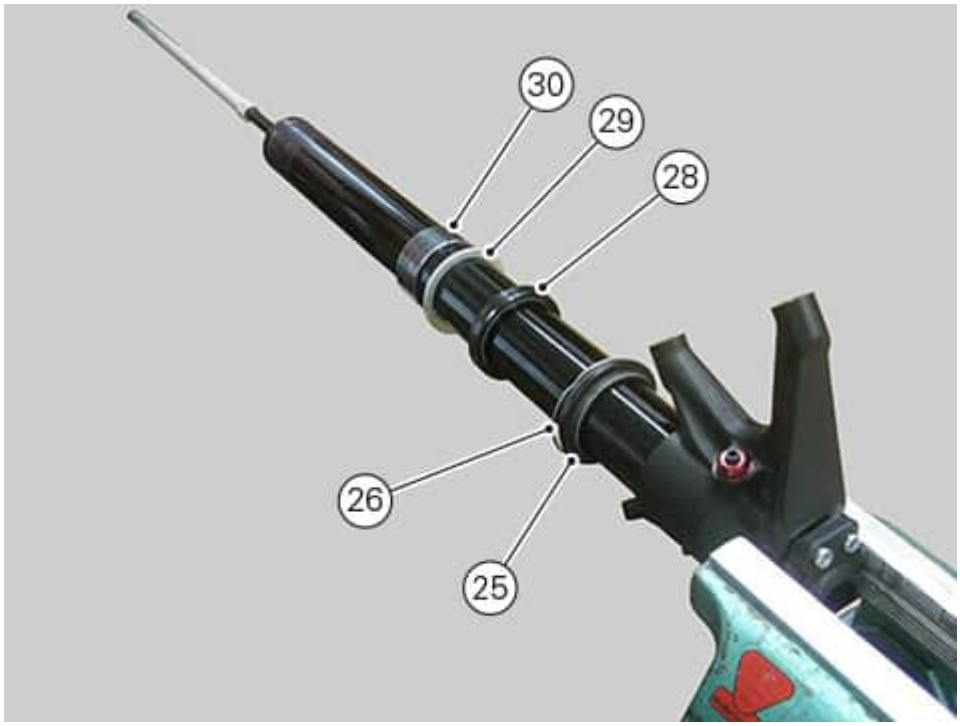


Reassembling the front fork

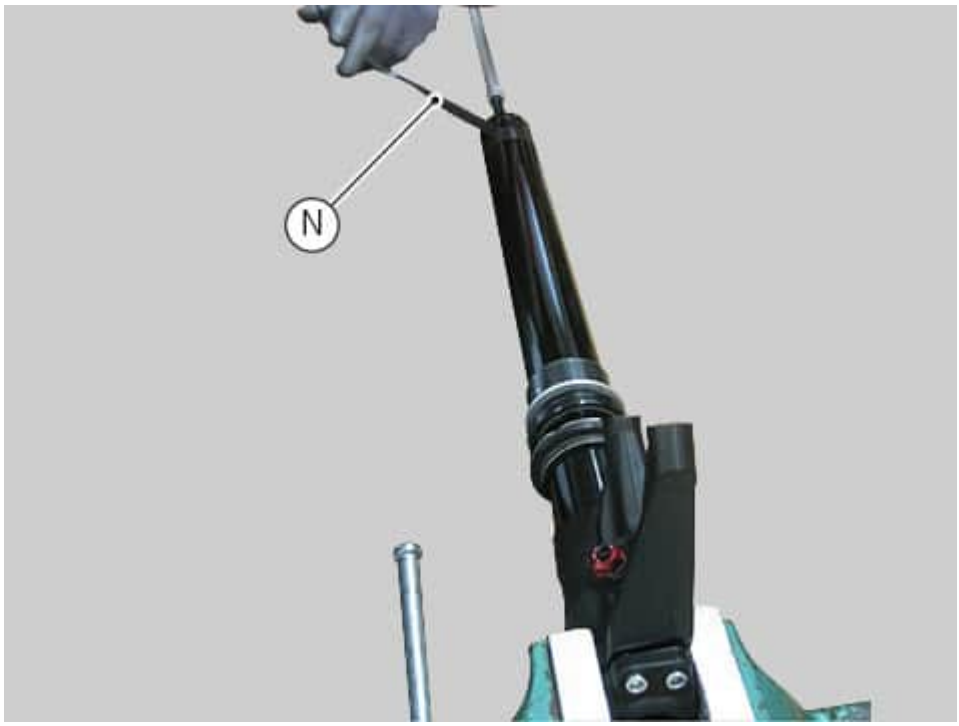
Vice the fork leg at the bottom end.
Protect tube edge and upper bushing seat with some adhesive tape.



Smear oil scraper ring and seal with a small quantity of the recommended grease.
Insert parts on fork leg in this sequence: dust seal (25), snap ring (26), seal (28), washer (29) and lower guide bush (30).
Pay special attention to positioning of seal (28), which should be fitted so that the convex side is facing the washer (29).

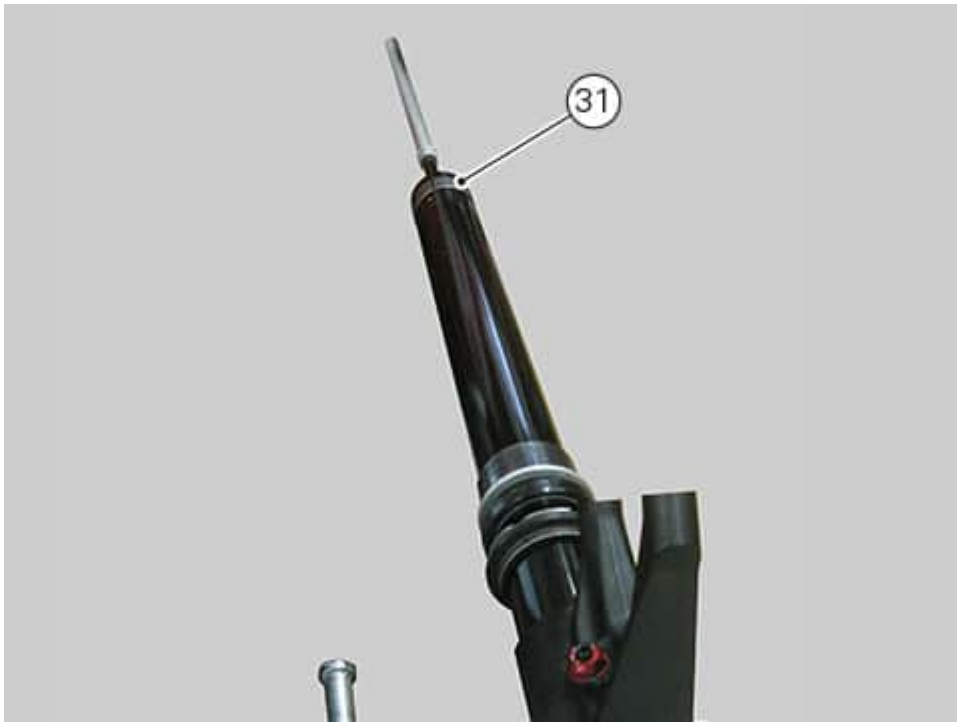


Remove the adhesive tape (N) previously applied on tube end, and clean any adhesive residues.



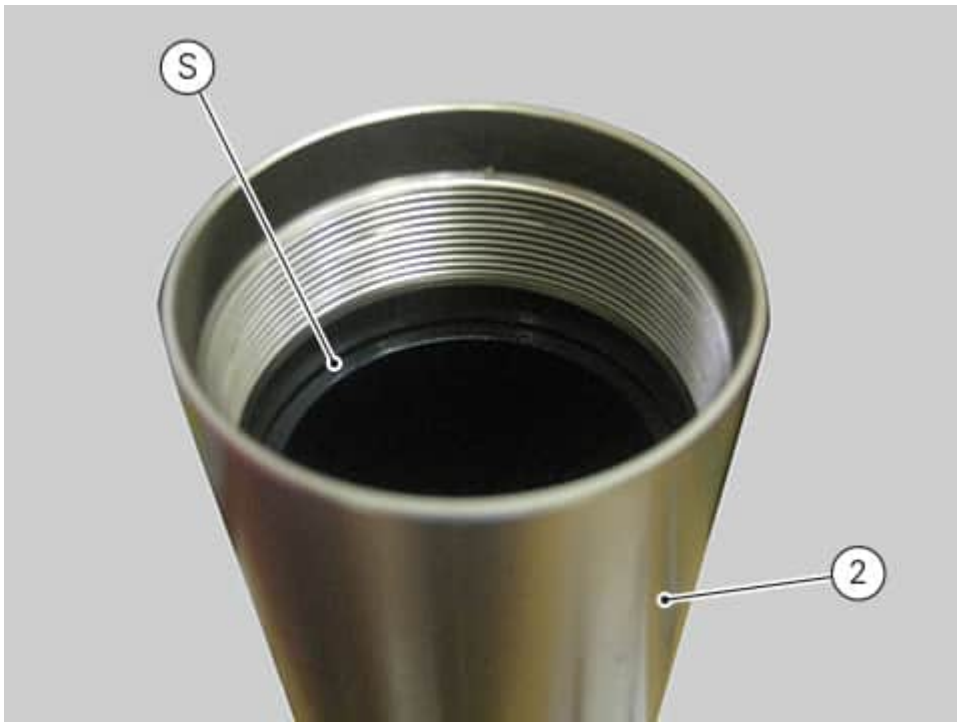
Fit the upper guide bush (31) by hand.

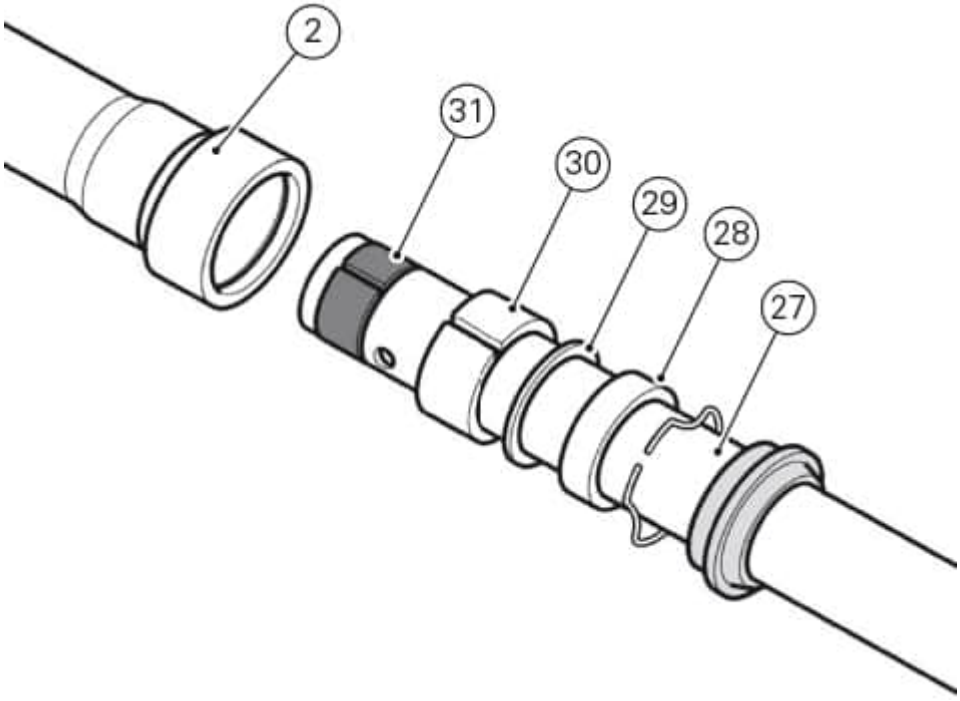
Note
If guide bush insertion is difficult to complete by hand, you can use a suitable tool and insert it in the bush slot.



Fit leg (27) into sleeve (2), making sure not to damage the upper guide bush (31).
Drive the lower guide bush (30) fully home against surface (S) in fork leg (2), on washer (29) and seal (28).

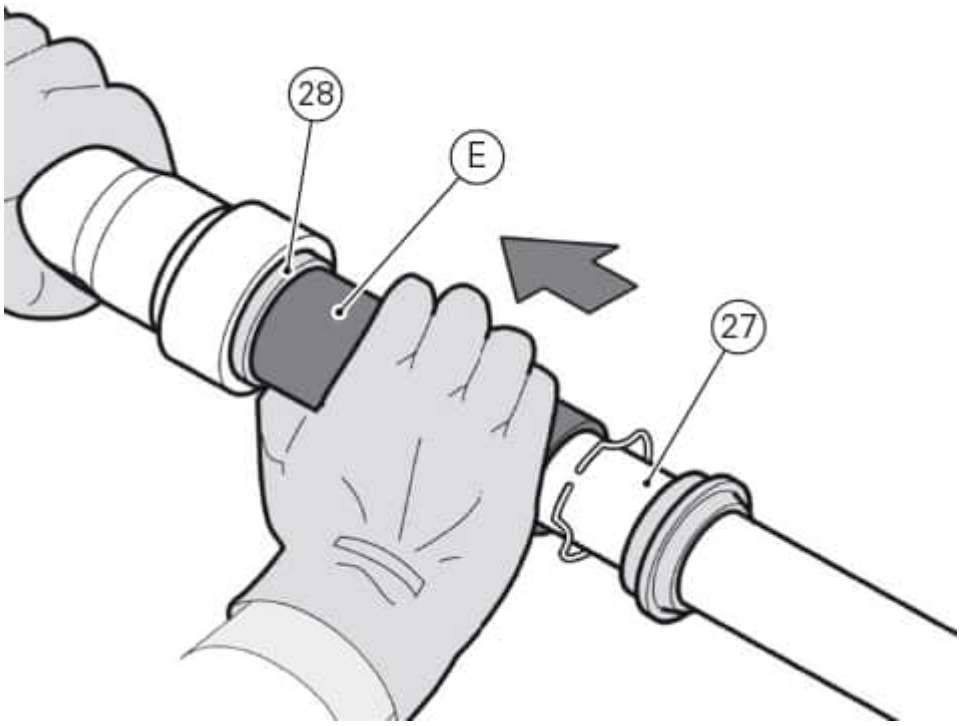
Note
Smear the bushing sliding surfaces with some fork fluid before fitting the outer sleeve on the fork leg.



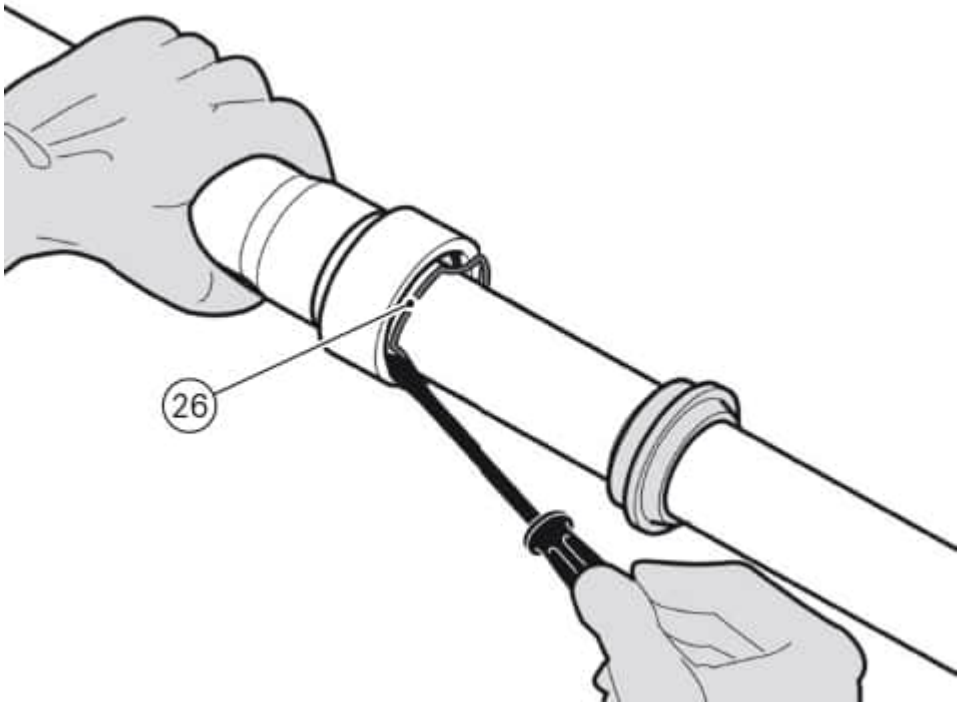


On fork leg (27), install tool (E) part no. **88713.3204** and push on seal (28), in order to fit lower guide bush, washer and seal in place.

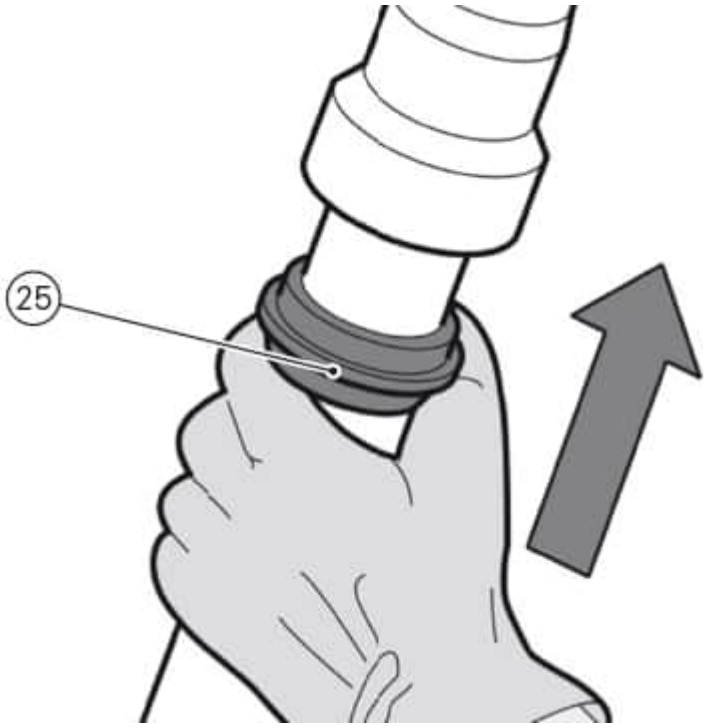




Install the snap ring (26) using a suitable tool: make sure it is duly sitting in its groove and avoid scratching the tube.



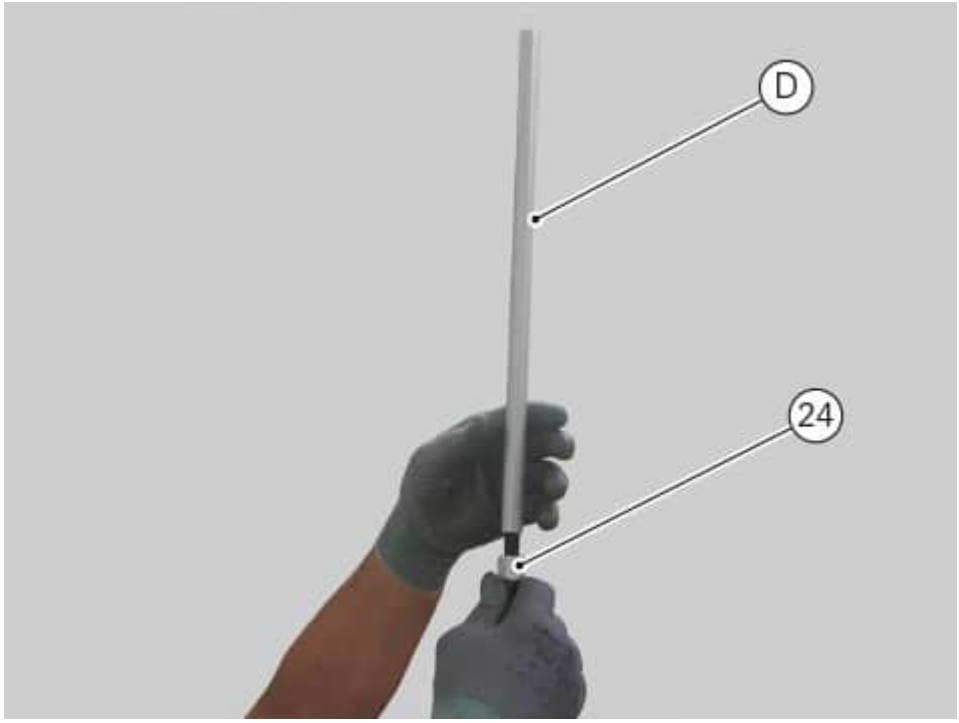
Fit the dust seal (25) and drive it in place with your hands.

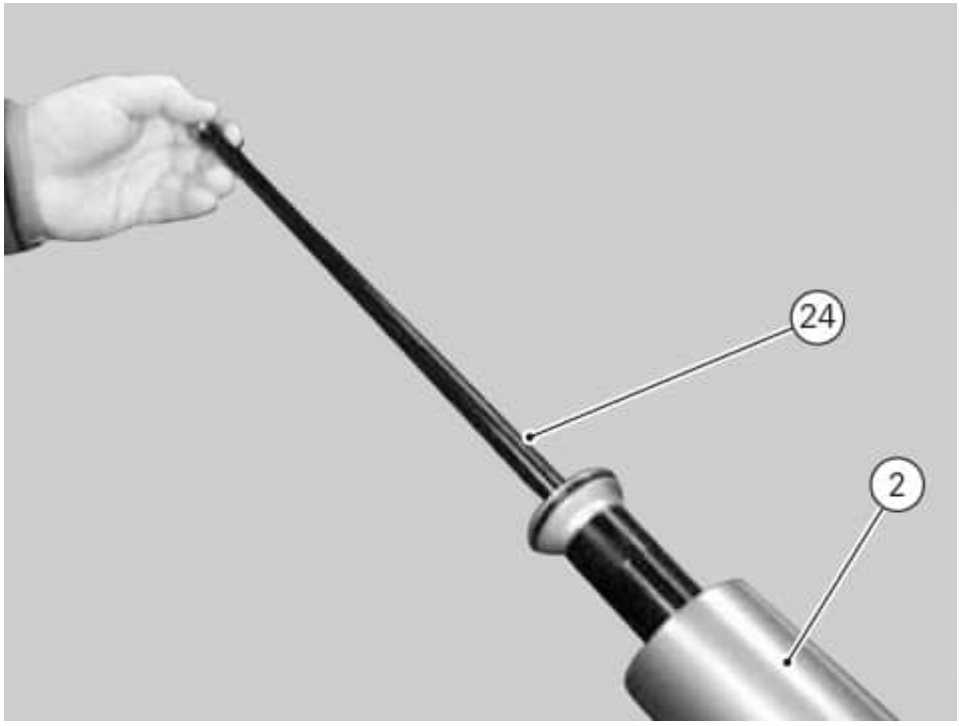


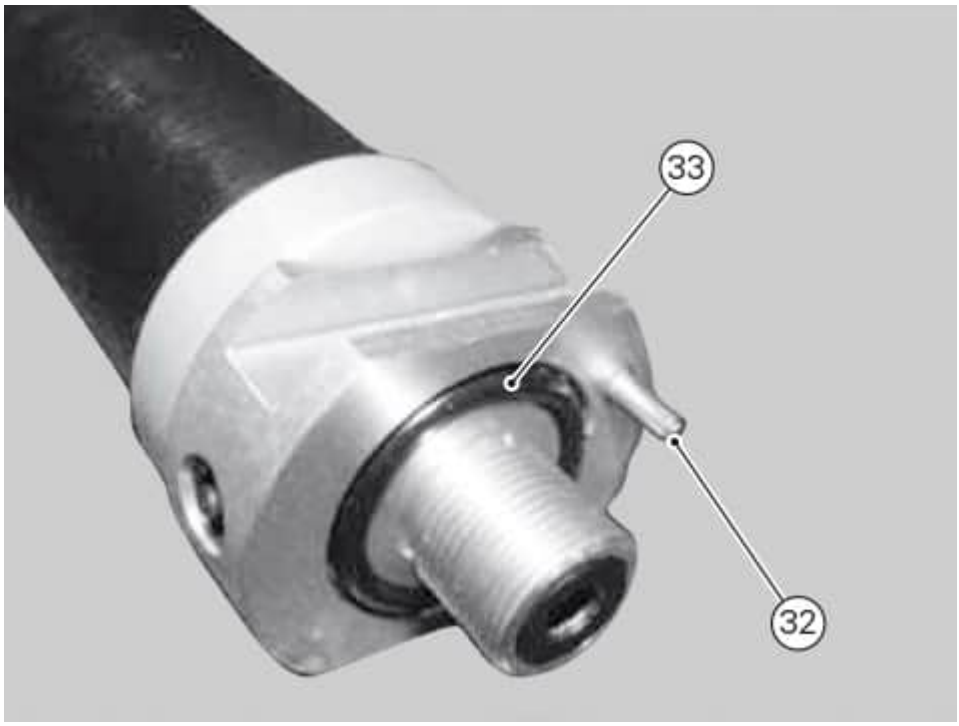
Note

Before refitting the complete cartridge, make sure that compression adjuster is fully open.

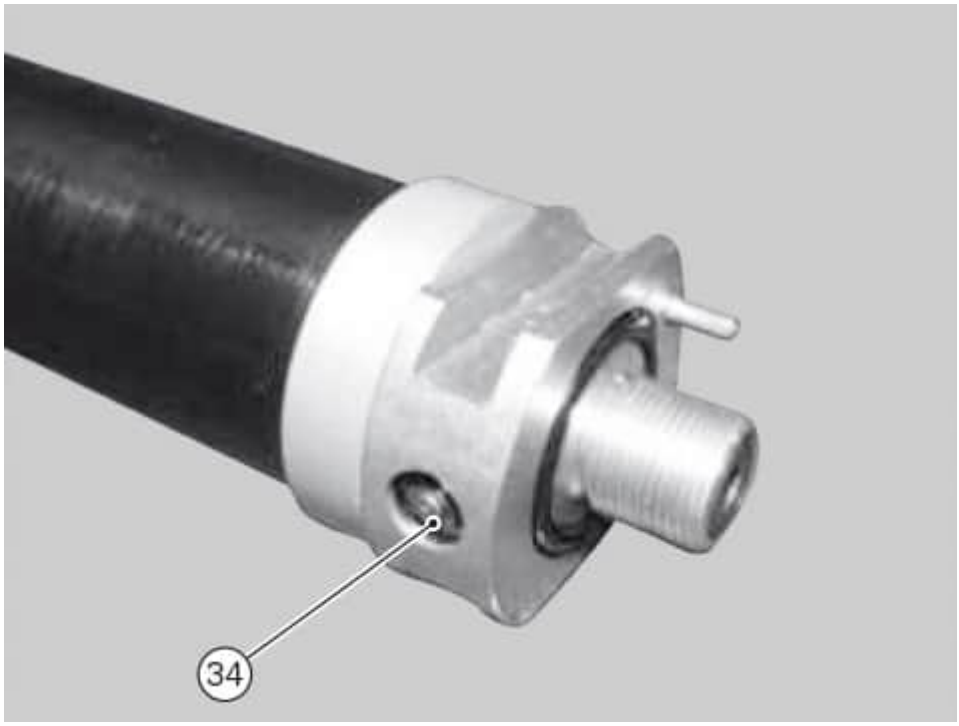
Vice the fork leg at the bottom end.
Take sleeve down on the fork leg.
Place tool (D) part no. **88713.3203** and screw it on the complete cartridge (24) to help unit insertion in the sleeve (2), making sure that pin (32) at the bottom of the cartridge is centred in its seat on fork bottom end and that O-ring (33) is properly in place.

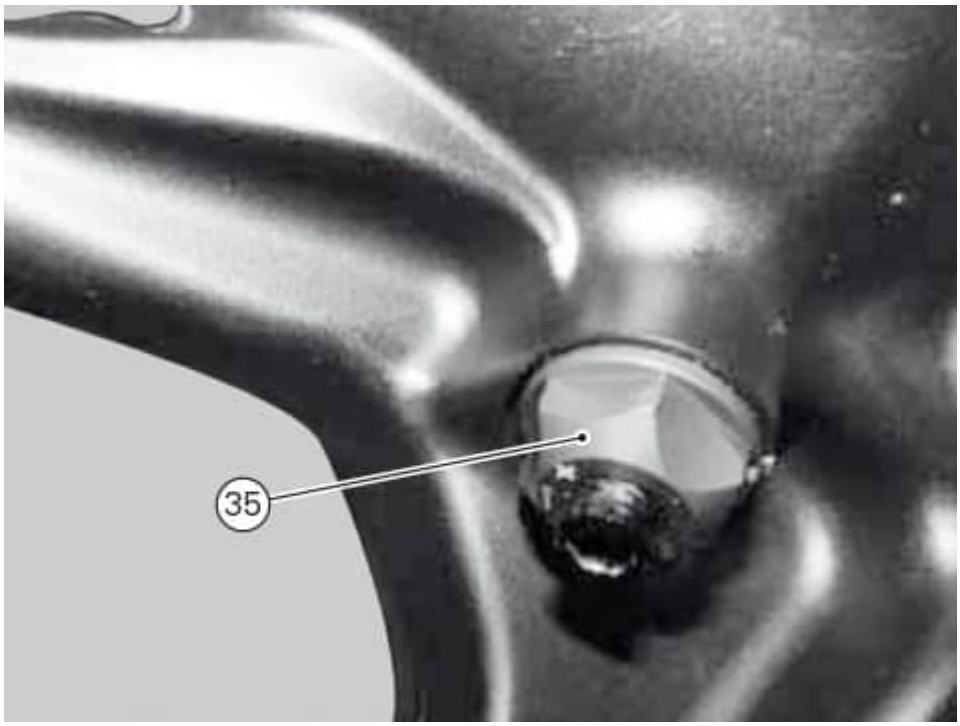

D
24

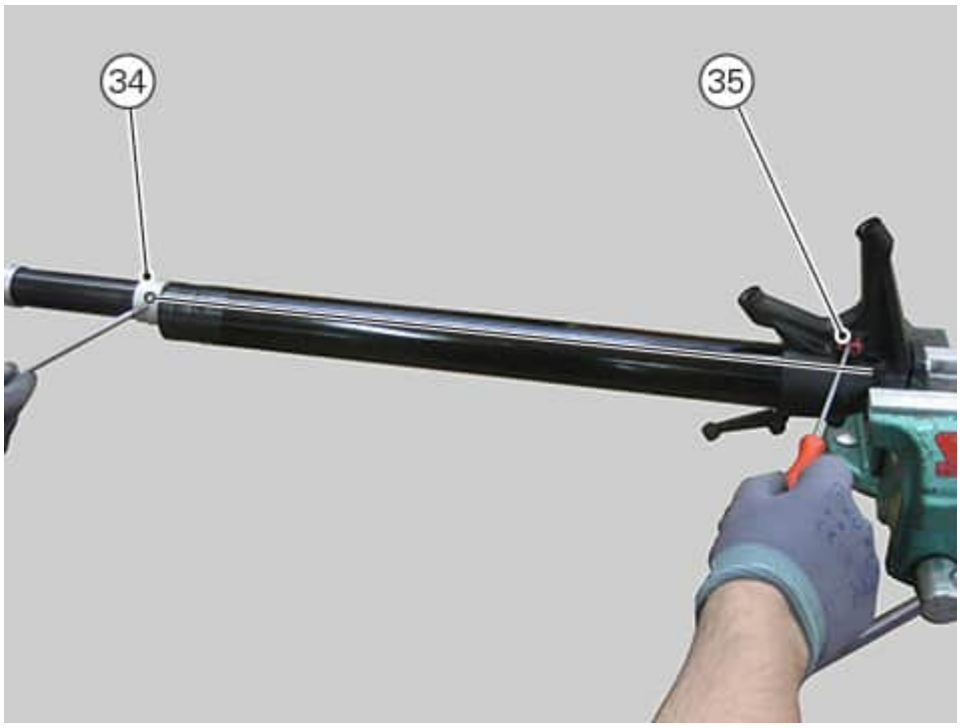

24
2



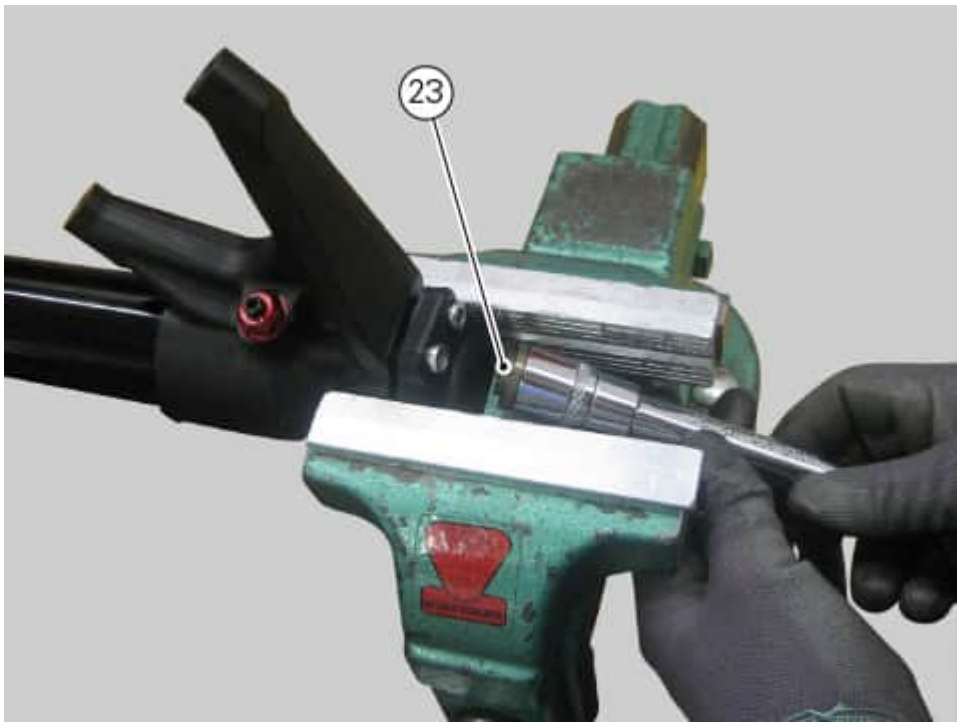
To help this operation during cartridge installation, make sure that compression needle (34) is held in line with the adjuster (35) on fork bottom end.

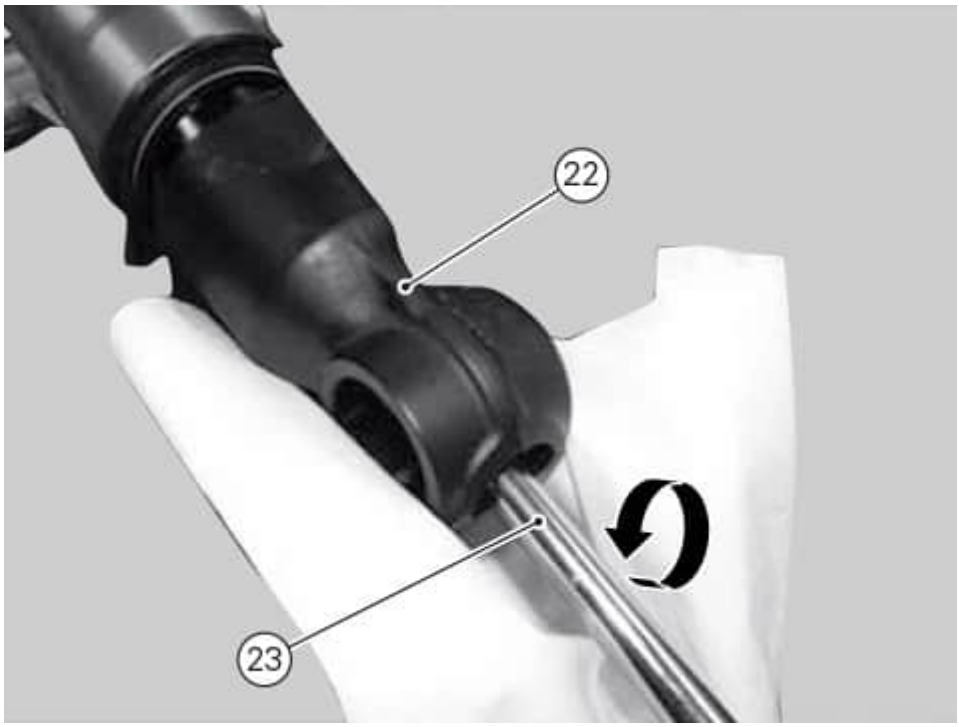




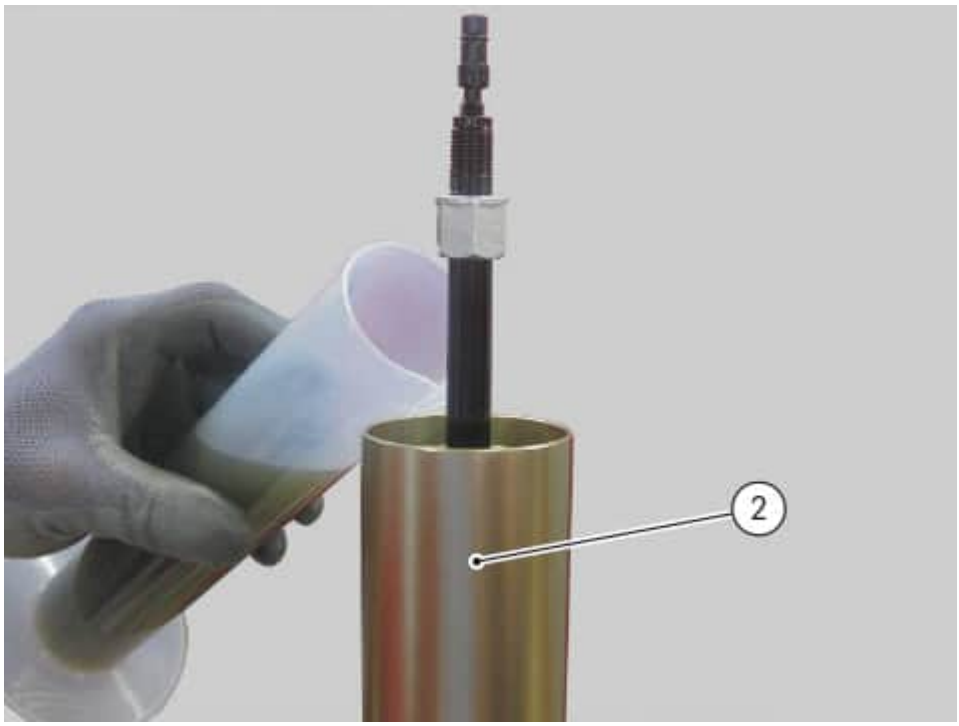


Start nut (23) on fork bottom end (22) and tighten it to 40 ± 1 Nm using a 17 mm socket wrench.





Vice the leg in vertical position.
Remove tool part no. **88713.3203** screwed on cartridge end.
Take sleeve completely up on the fork leg.
Prepare the quantity of fluid required (140 cc) in a measuring cup.
Pour the required fluid inside fork leg (2).

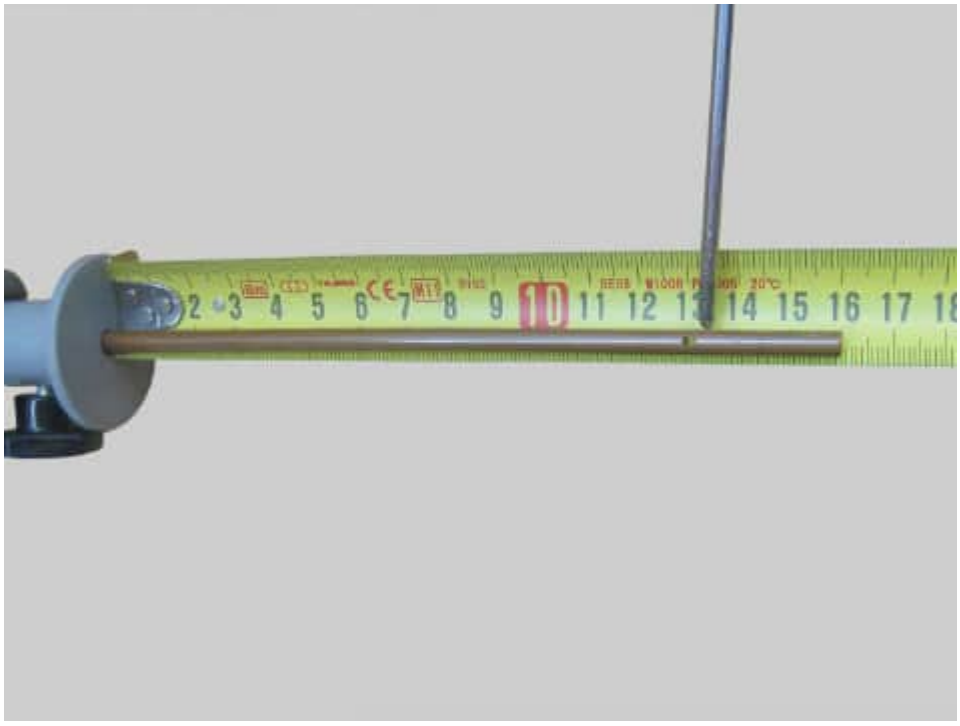


Important

When filling the fork with fluid, after installing the complete cartridge, it is not necessary to bleed the damper rod cartridge assembly to ensure fluid enters the damper rod, because the assembly cannot be taken apart so it already contains some fluid.

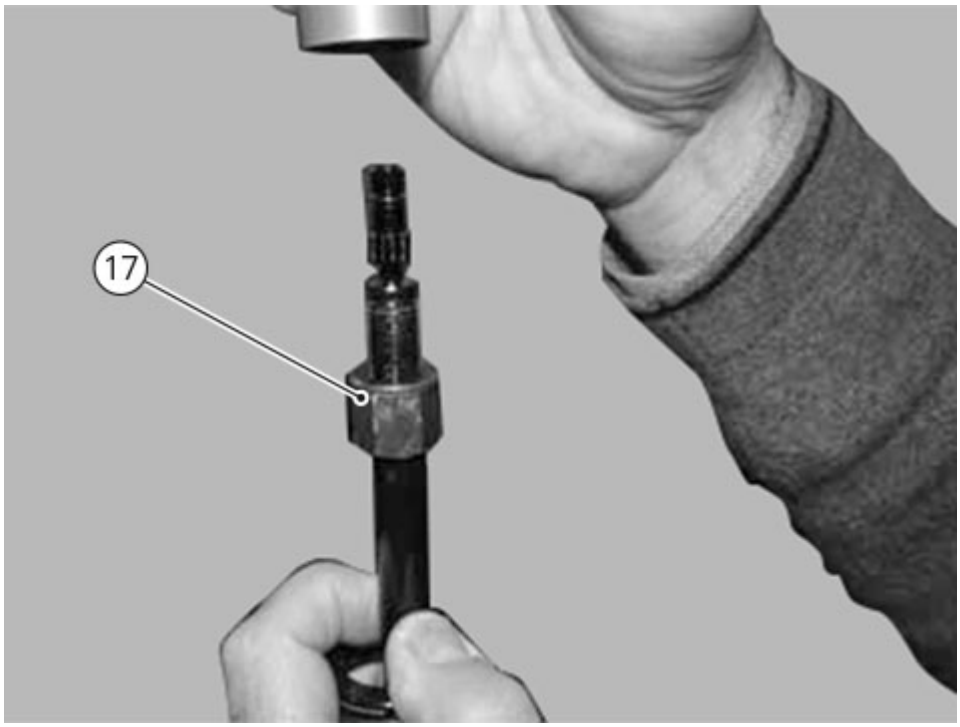
Make sure that the rebound adjuster rod is fully screwed in.

To check for proper filling, move sleeve fully down and set fluid level at 130 mm from the top edge, corresponding to air height.

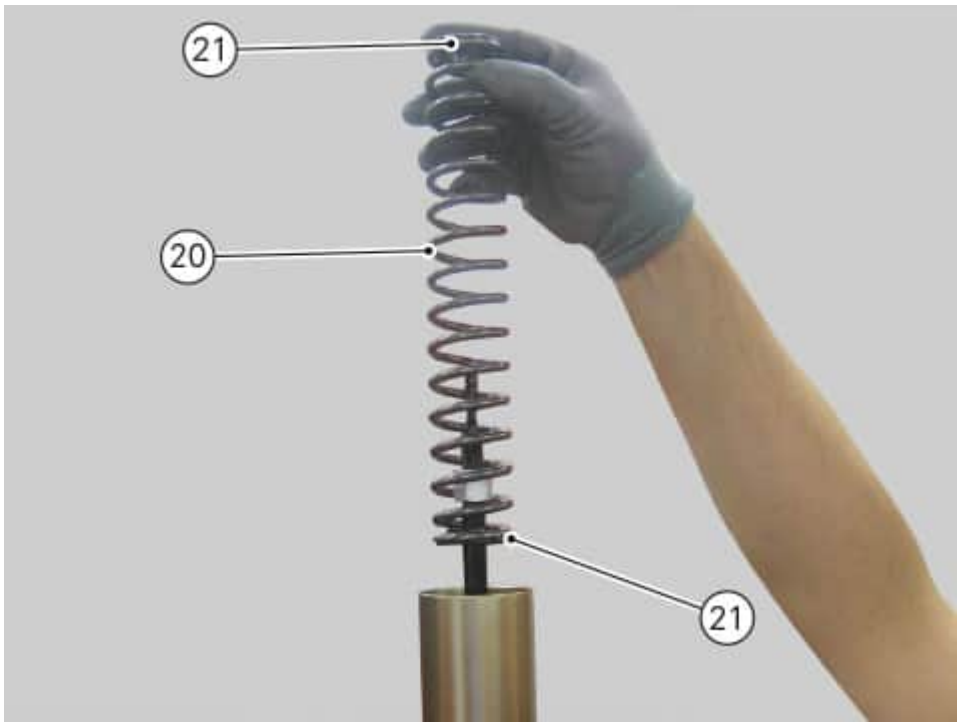




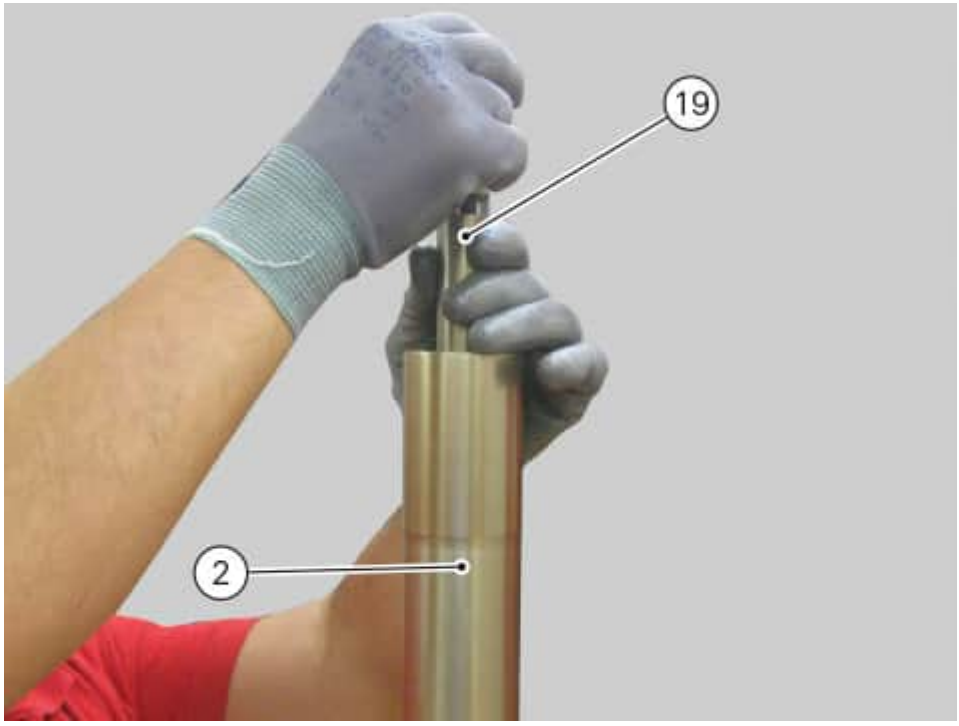
Make sure the lock nut (17) is completely screwed on the rod.



Pre-install lower guide bush (21) and upper guide bush (21) on spring (20), then fit spring inside the sleeve.



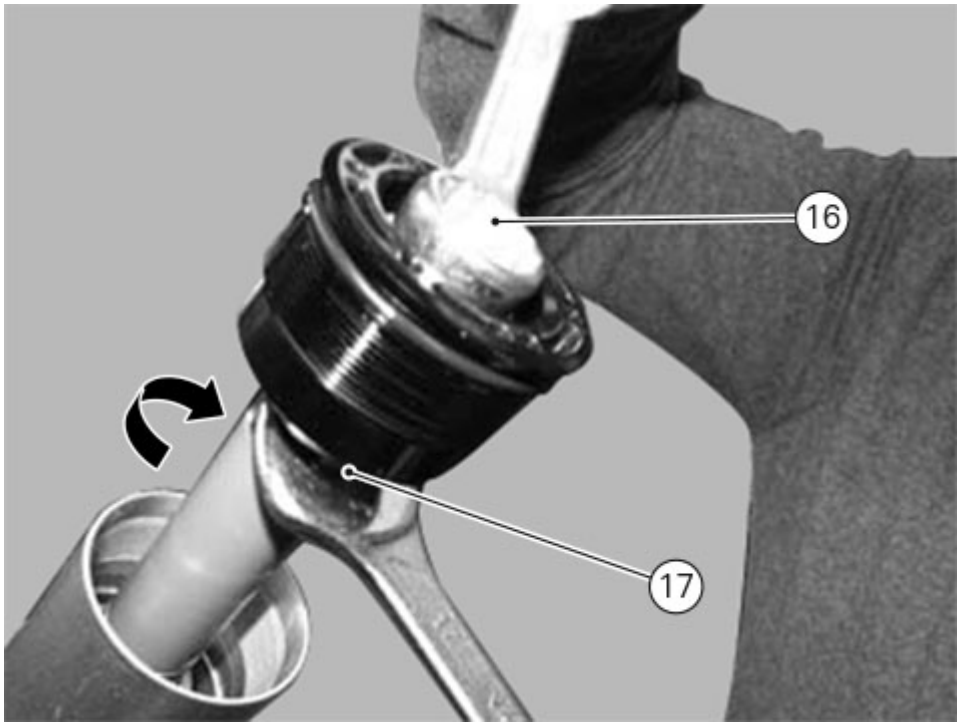
Fit preload spacer (19) into sleeve (2).

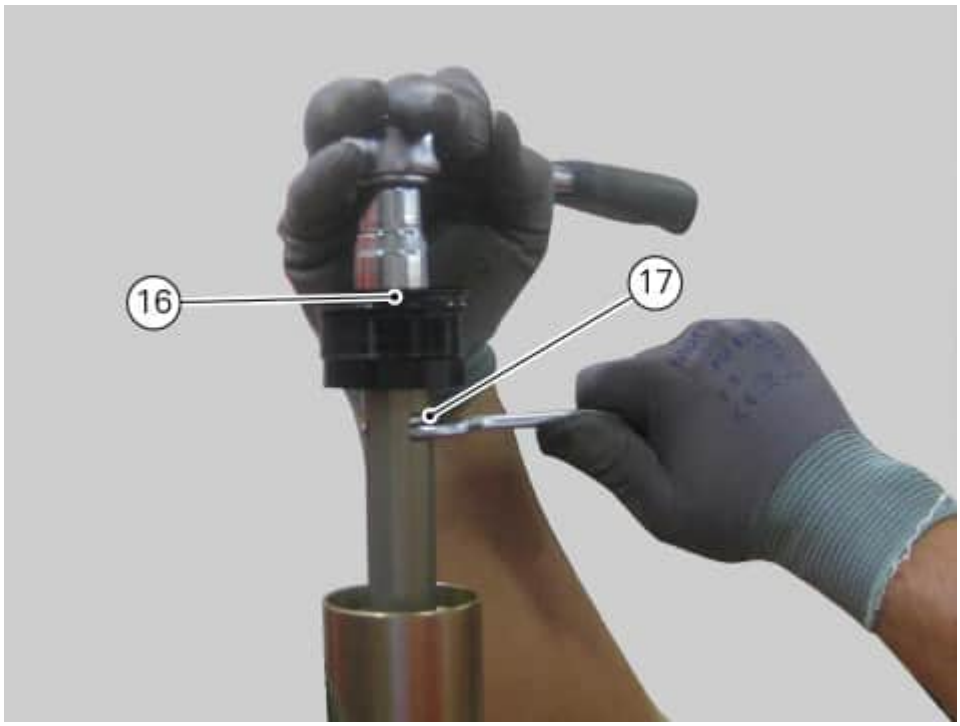


Finger tighten the plug (15) until fully home against cartridge rod.

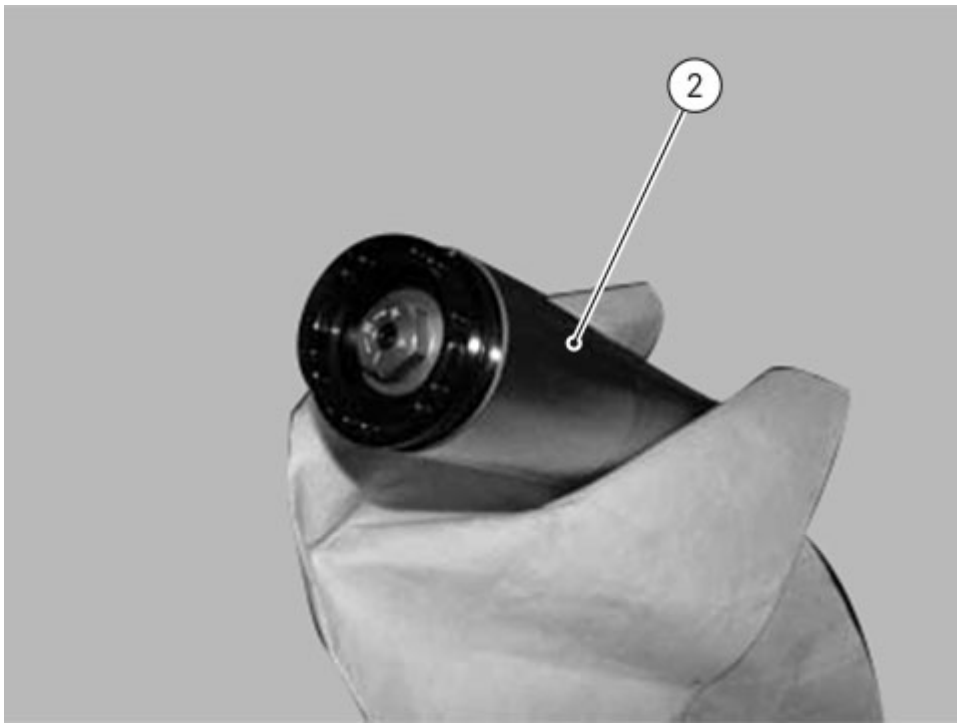


Hold spring preload adjuster (16) using a 19 mm socket wrench and tighten lock nut (17) to 20 ± 1 Nm using a 17 mm wrench.

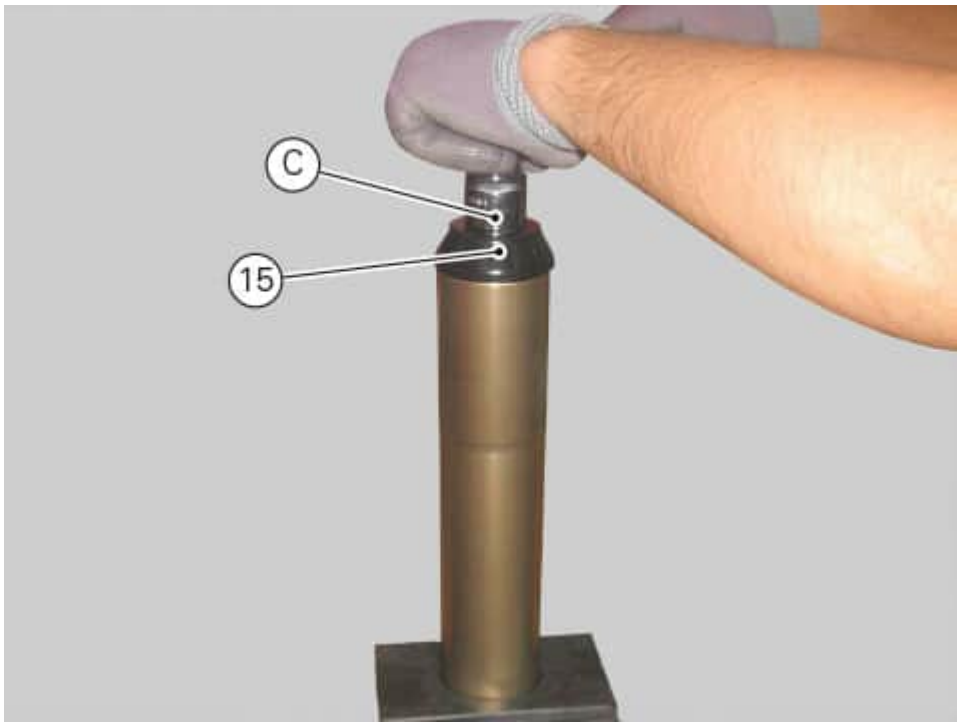




Take sleeve (2) up on the fork leg.



Tighten the plug (15), using tool (C) part no. **88713.3091** to 20 ± 1 Nm.

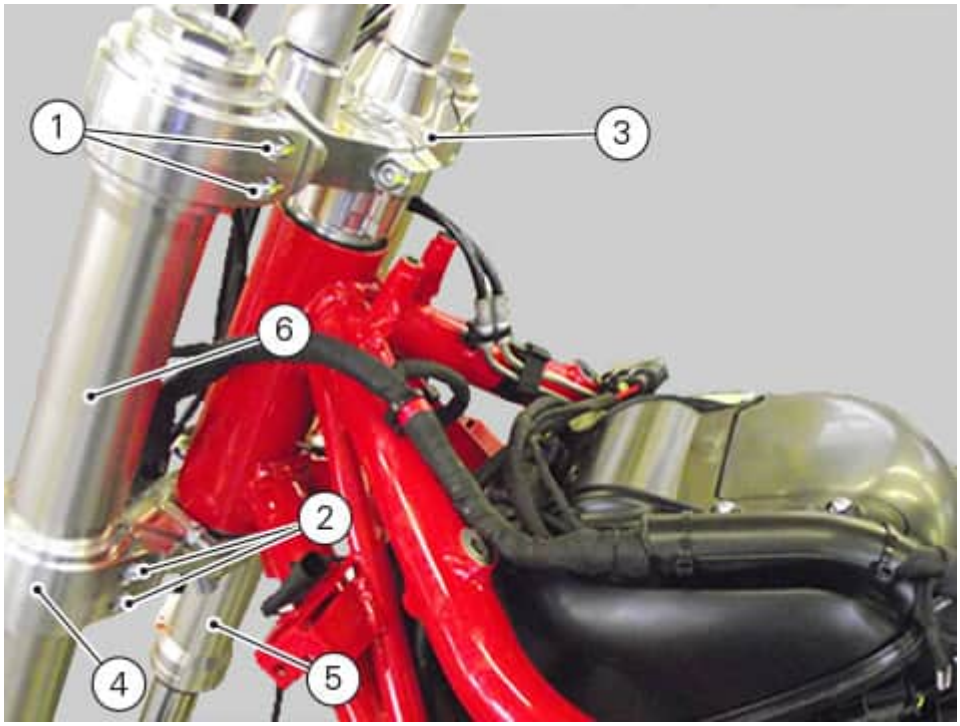

C
15

Removing the front fork

Before removing this part, it is first necessary to remove the following parts:

- front brake callipers (Removing the front brake system);
- front mudguard (- Removing the front mudguard);
- front wheel (Removing the front wheel);
- headlight fairing (Removing the headlight fairing);

Loosen the screws (1) securing the fork legs to the steering head (3).
Loosen the screws (2) securing the fork legs to the bottom yoke (4).
Withdraw the fork legs (5) and (6) downwards in order to carry out all the necessary overhaul operations.



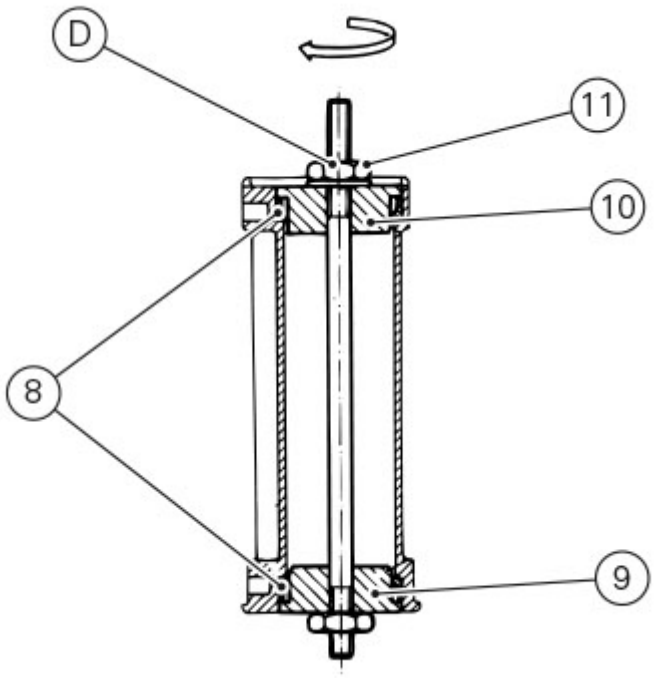
1 Refitting the steering tube components

Important

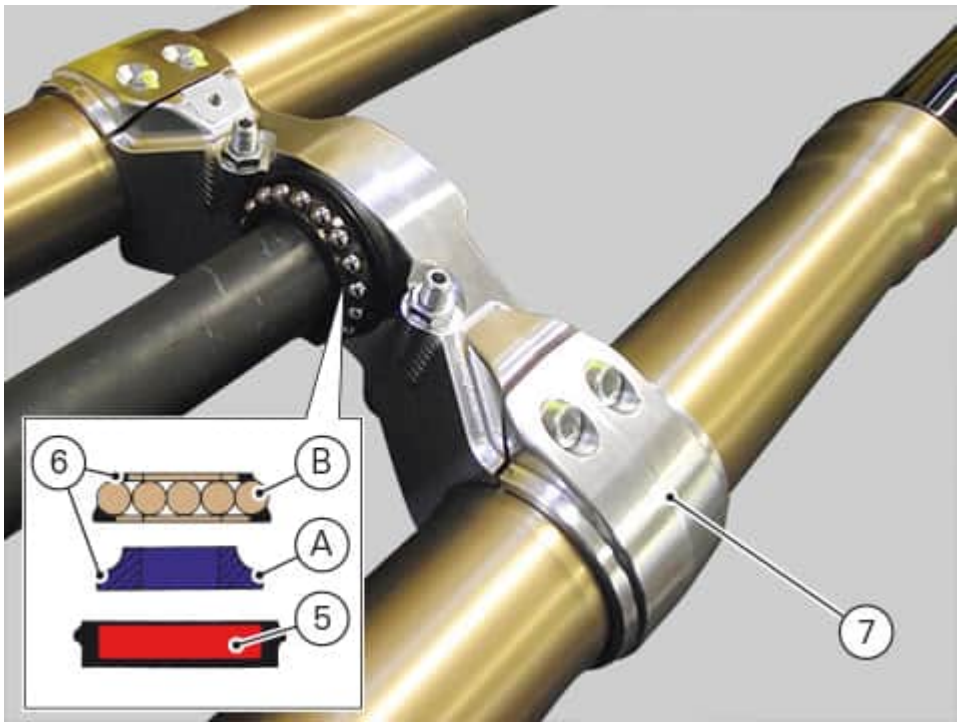
The steering tube bearings are identical but in no case may their components be swapped during refitting.

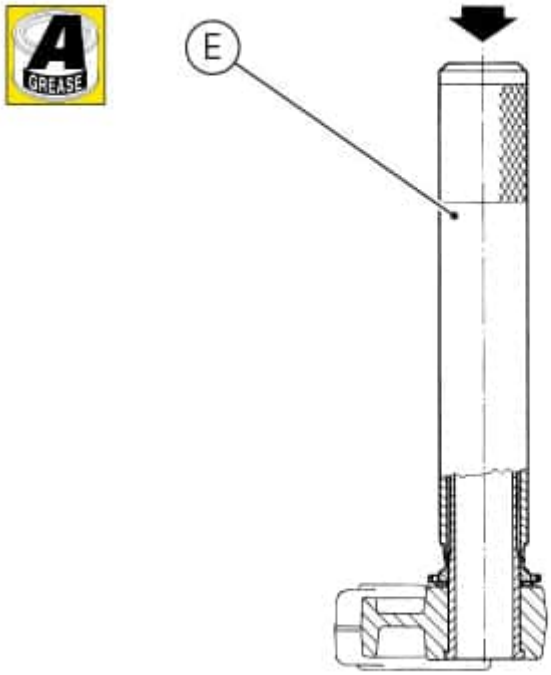
Clean all contact surfaces and lubricate with the recommended grease.
To fit the outer rings (8) of bearings (6) to the steering tube, use tool (D) no. **88713.1062**;
Proceed as follows:

- heat the steering tube to 150 °C;
- fit the outer rings (8) in their seats on the steering tube;
- fit the fixed bush (9) with threaded hole of the tool into the lower ring;
- fit the other movable bush (10) into the upper end of the tool and drive it fully home against the upper bearing race;
- tighten the nut (11), and use a wrench to seat the outer rings (8) fully in the steering tube;
- leave the tool fitted until the steering tube has cooled down to ensure that bearings are properly seated.



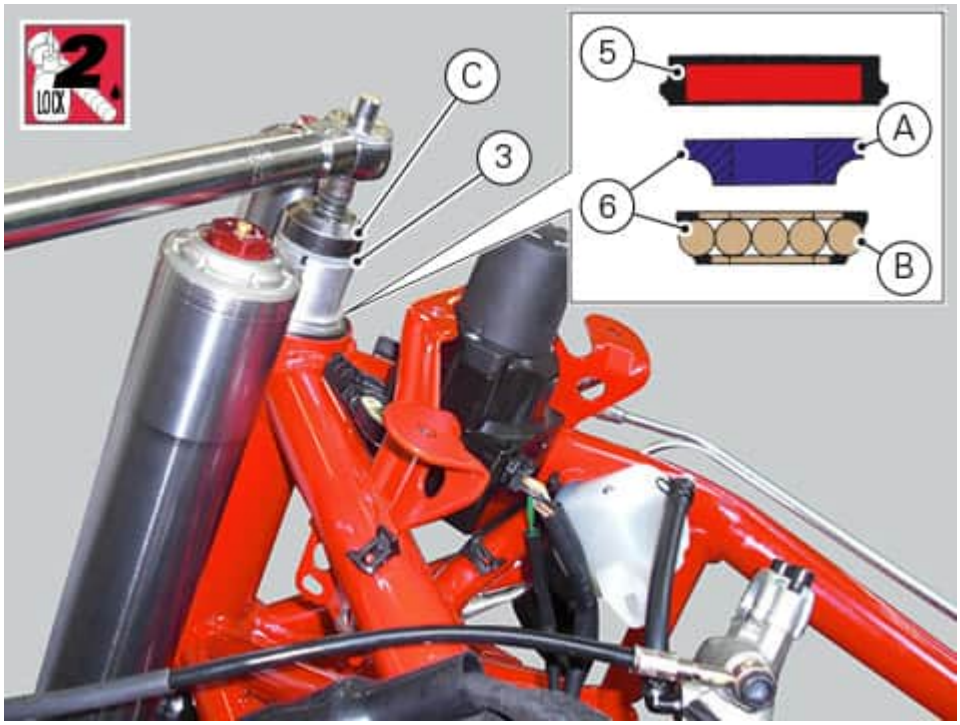
Insert the sealing ring (5) (with the rim facing upwards) and the inner ring (A) of the bottom bearing (6) onto the steering shaft after heating it for about 10 minutes to 120 °C.
Insert drift (E) no. **88713.1072**.
Push the inner ring (A) on the sealing ring (5), manually pushing for at least 10-15 seconds.
Lubricate the inner ring (A) with the recommended grease.
Fit the ball race (B) on the steering shaft with the smaller diameter of the cage facing upwards, and grease the ball race.
Insert the steering shaft into the steering tube, and push it in until it is axially seated.





Fit the bottom yoke assembly to frame.
Grease the ball race (B) and fit it to the upper outer ring (8) of the frame.
Fit the inner ring (A) of the upper bearing (6) to the steering head, with the larger diameter side of the race facing upwards.
Install the sealing ring (5) with the flat side facing upwards.

Tighten the adjuster ring nut (3) by hand until it seats against the sealing ring (5).
Fit special bush (C) no. **88713.1058** to the ring nut (3) on which the torque wrench must be fitted.
Apply recommended threadlocker on thread and tighten adjuster ring nut (3) to 30 Nm ±5%.



Fit the steering head (2) on the ring nut (3), aligning the fork leg seats with the corresponding seats on the bottom yoke.
Refit the fork legs. Apply recommended grease to the screw (1).
Tighten screw (1) on steering head to a torque of 18 Nm ±5%.



Refit the handlebar and the U-bolts (Refitting the handlebar).
Refit the headlight fairing (Refitting the headlight fairing).
Refit the front wheel (Refitting the front wheel).
Refit the front brake callipers (Refitting the front brake system).

Removing the steering tube components

Remove the front brake callipers (Removing the front brake system).
Remove the front wheel (Removing the front wheel).
Remove fork legs (Removing the front fork).
Remove the headlight fairing (Removing the headlight fairing).
Remove the handlebar and the U-bolts (Removing the handlebar).

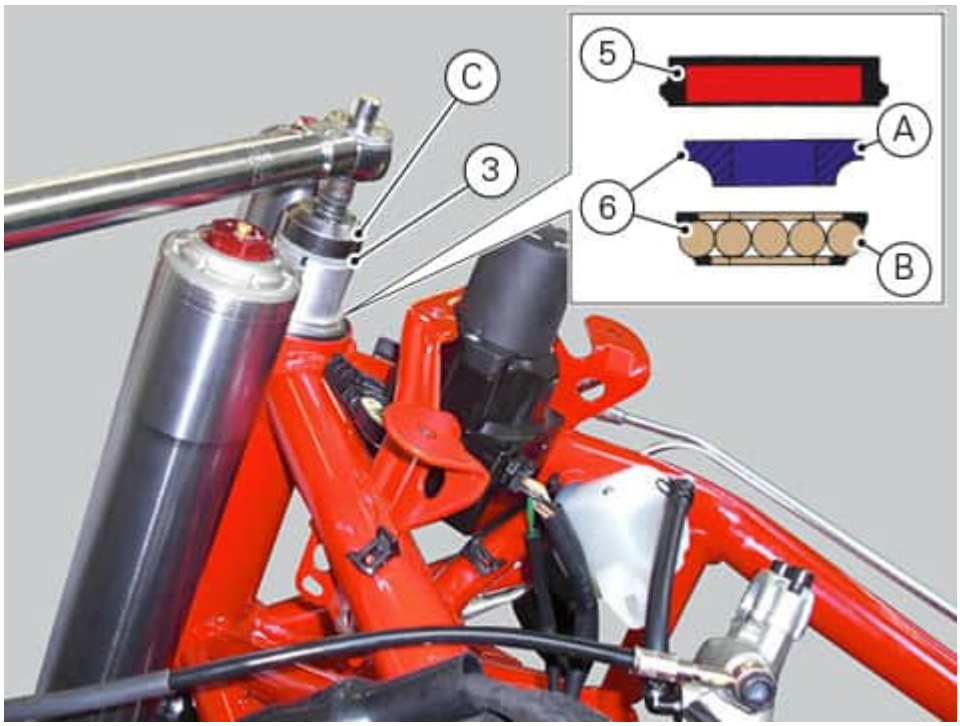
Warning

All parts fitted to the steering head and bottom yoke, including wiring and hoses, can remain on the motorcycle provided they do not hinder the following operations.

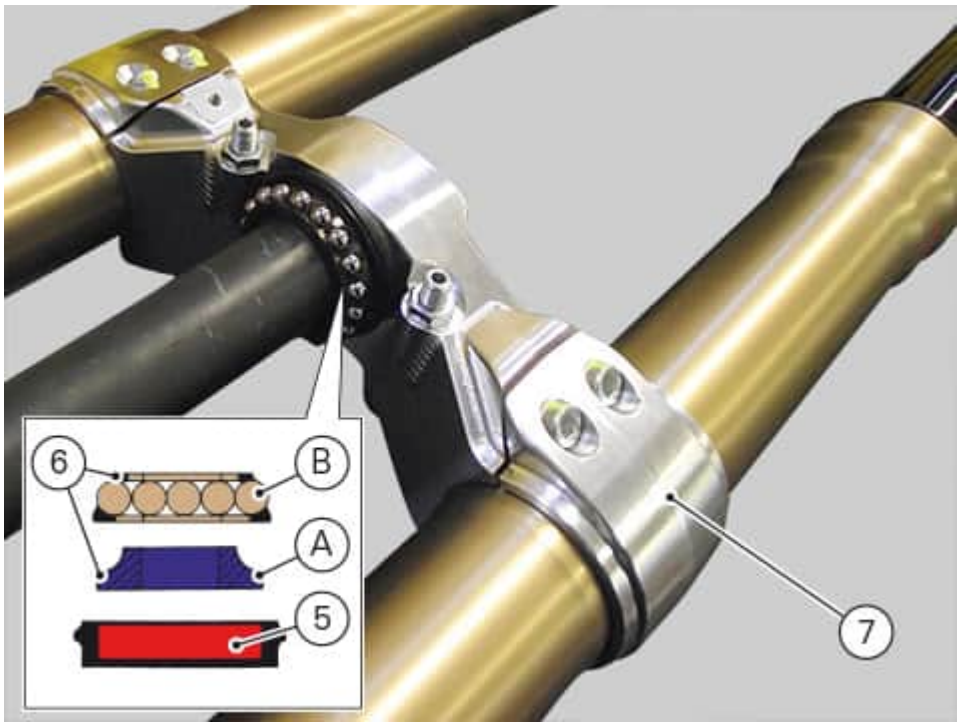
Loosen the screw (1) securing the steering head (2) to the ring nut (3).
Remove the steering head (2).



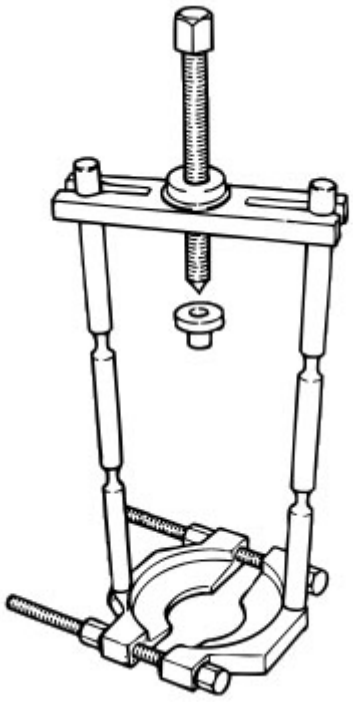
With tool (C) no. **88713.1058** loosen the ring nut (3) and unscrew it from the steering shaft.
Slide the sealing ring (5), the inner ring (A) and the ball race (B) of the upper bearing (7) off the steering shaft.



Remove the bottom yoke (7) complete with the steering shaft from the frame tube.
Remove the ball race (B) of the lower bearing (6).
The inner ring (A) of the lower bearing (6) and the sealing ring (5) will remain on the steering shaft.

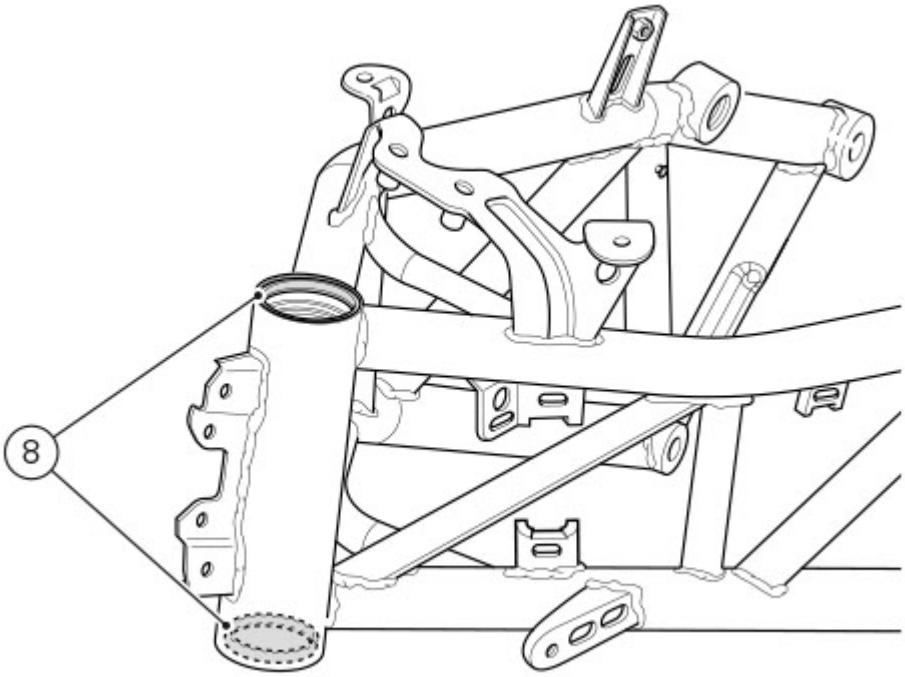


Using a universal puller (see figure), remove the inner ring (A) from the steering shaft, taking care not to damage the seat.



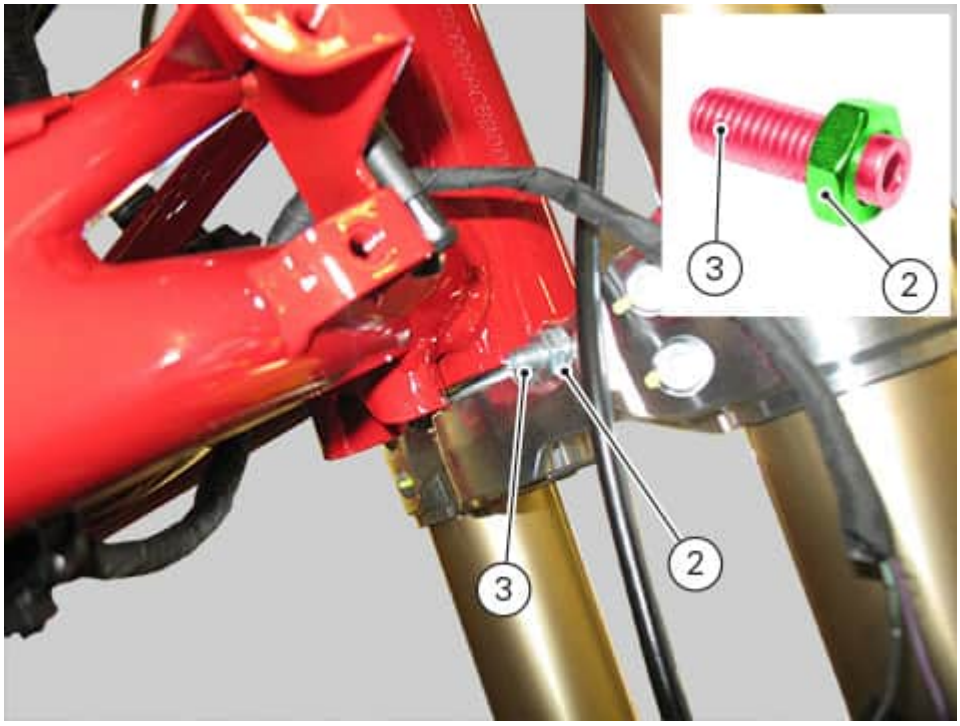
Important
The removed seals and bearings shall not be reused and must be replaced with similar new components.

Using a suitable punch, remove the outer bearing races (8) from the steering tube. Proceed with extreme care to avoid damaging the seats.

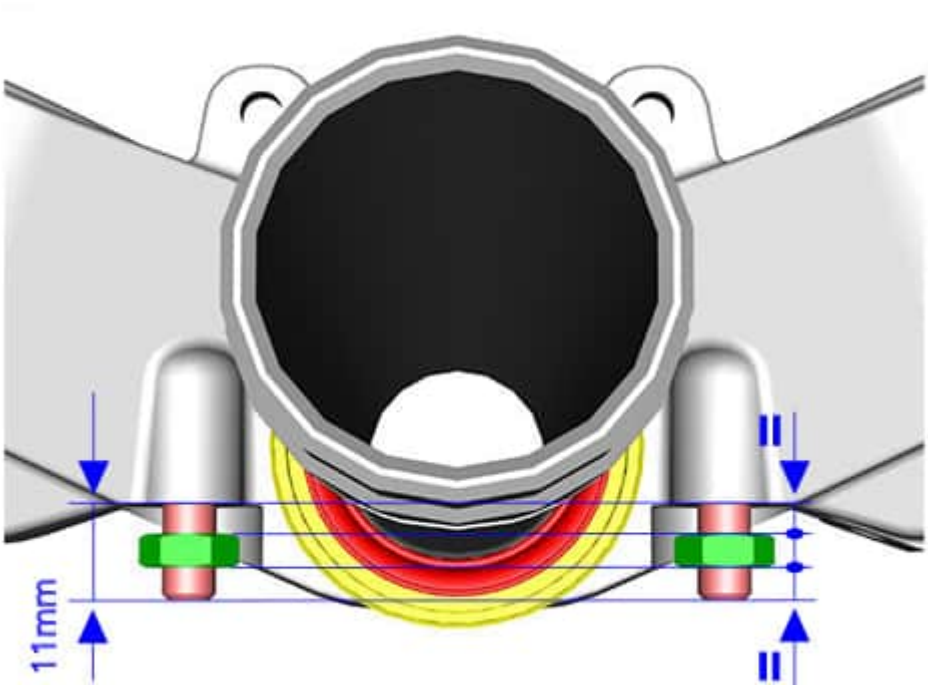

8

Steering angle adjustment

Loosen the nuts (2).



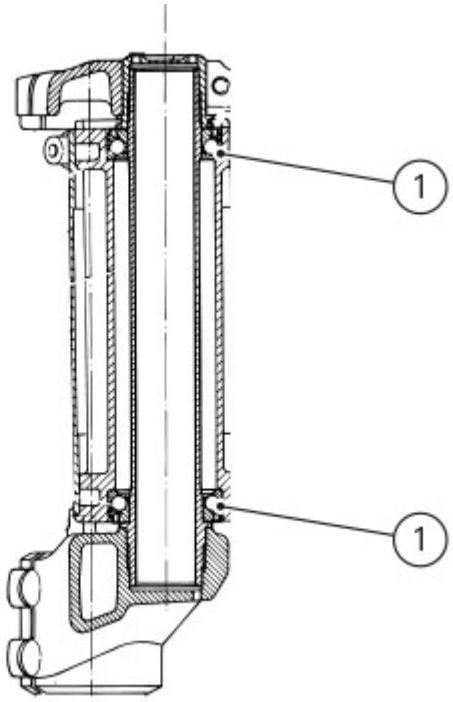
Start the nuts (2), fully home (without tightening) on the steering angle adjuster dowels (6), starting them on the opposite side with respect to the wrench.
Tighten steering angle dowels (3) on bottom yoke, until obtaining the indicated position.
Tighten nuts (2) so as they are centred with respect to the thread in view of the steering angle adjuster dowels.



1 Adjusting the steering head bearing clearance

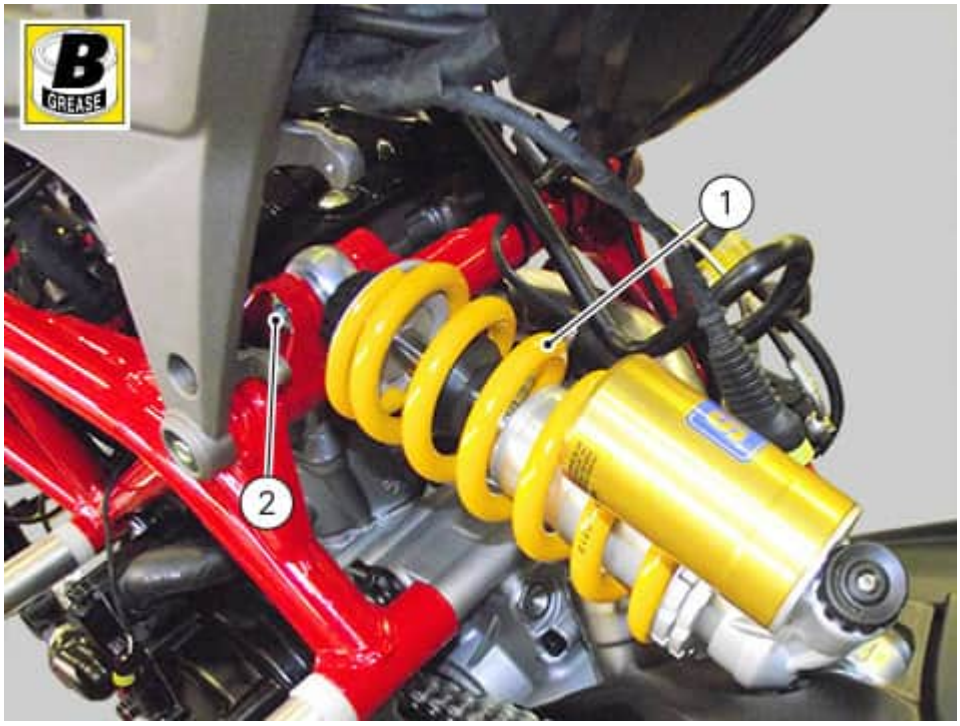
Adjust steering bearing clearance as explained under Section "Adjusting the steering head bearing clearance".

If the problems found are not solved, check the wear of steering bearings (1) and replace them, if necessary, as described in paragraph “Removing the steering tube components”.



Refitting the rear suspension

Apply recommended grease on thread and underside of top screw (3) and bottom screw (4).
Fit the shock absorber (1) top end into rear subframe and tighten screw (2); fit shock absorber bottom end to swinging arm and tighten screw (3).
Tighten the screws (2) and (3) to a torque of 42 Nm ± 5%.



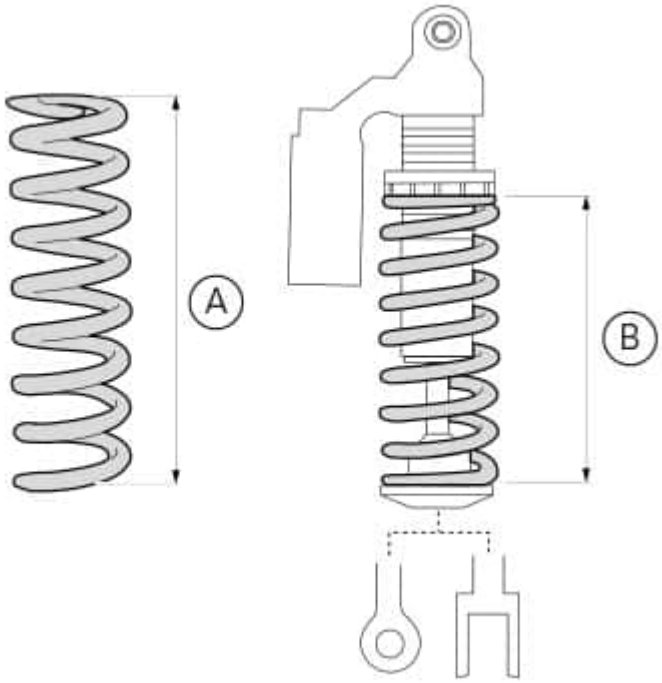


Refit the exhaust silencer (Refitting the silencer)
Refit the rear mudguard (Refitting the front mudguard)

Overhauling the rear shock absorber

Spring preload

A Spring free length
B Fitted spring length
A - B Spring preload

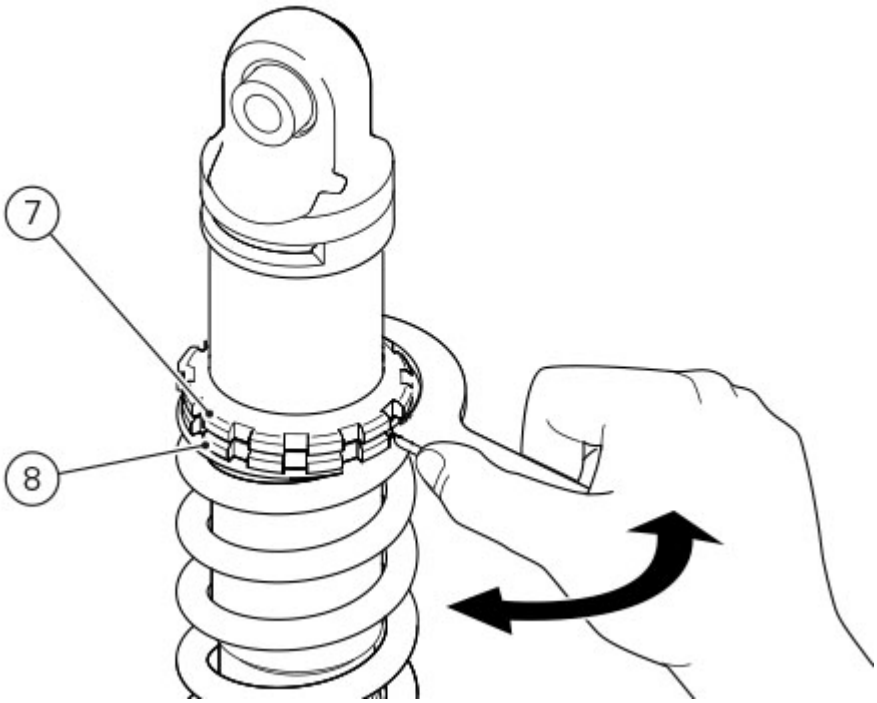


When adjusting the spring preload you move the spring seat.
This will decrease or increase the initial spring force, which will lower or raise the motorcycle rear ride height.
The spring preload is fundamental for the suspension correct operation.
If the preload is incorrectly set, any other adjustments will not help to get the intended performance from the suspension

How to Set the Spring Preload

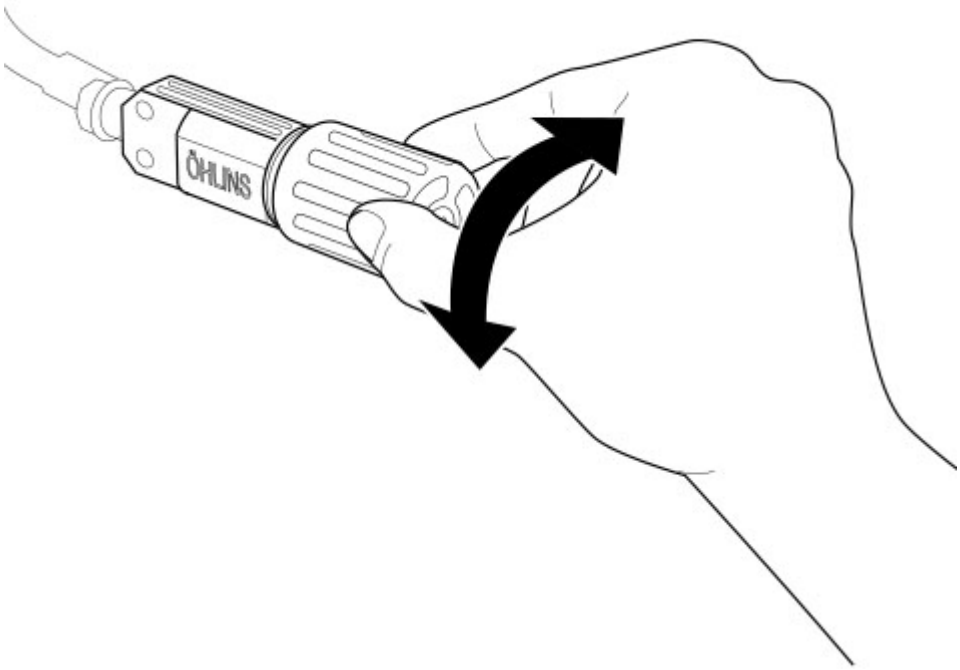
Mechanical Adjuster

Use a C-spanner.
Loosen lock nut (7).
Move the lower spring ringnut (8) to the desired position.
Turn clockwise to increase the preload, turn counter clockwise to decrease it.



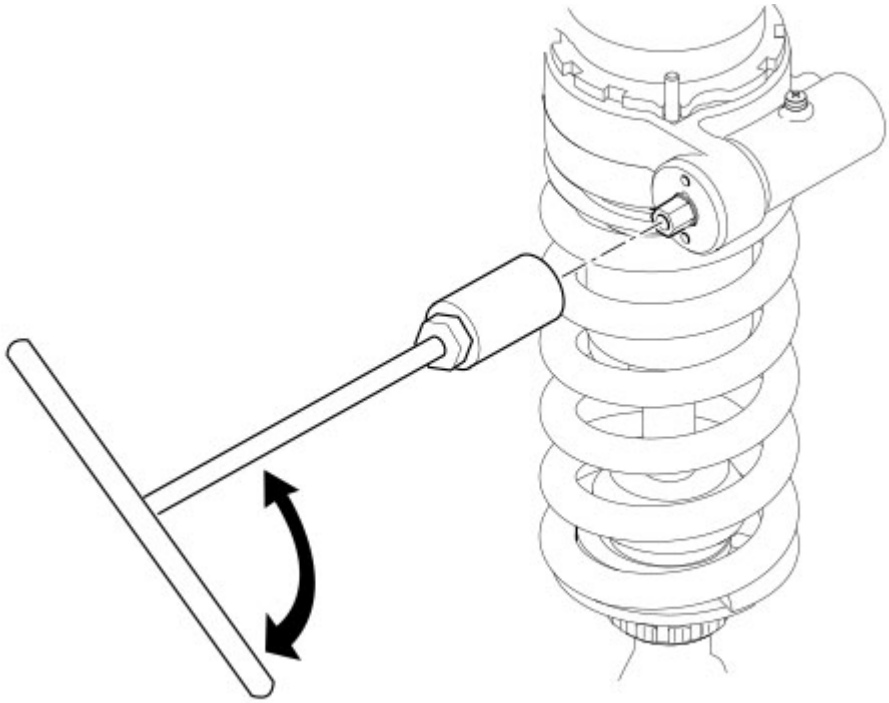
Hydraulic Adjuster

Turn the hexagon flat on the hydraulic adjuster to set the spring preload.
Turn clockwise to increase, turn counter clockwise to decrease.



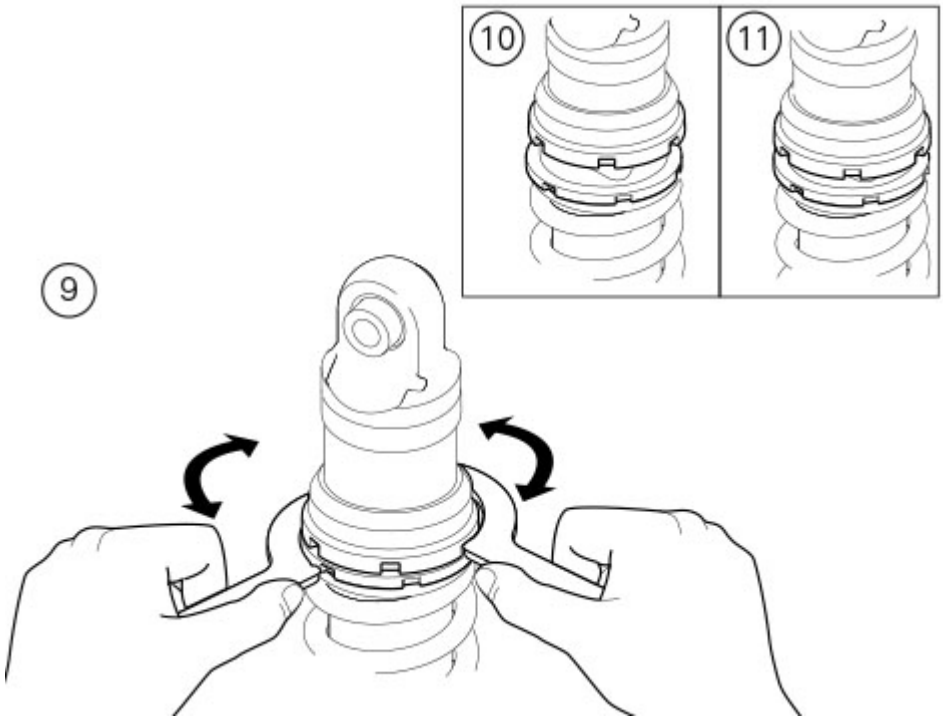
Integrated Hydraulic Adjuster

Turn the hexagon screw on the hydraulic adjuster to set the spring preload.
Turn clockwise to increase, turn counter clockwise to decrease.



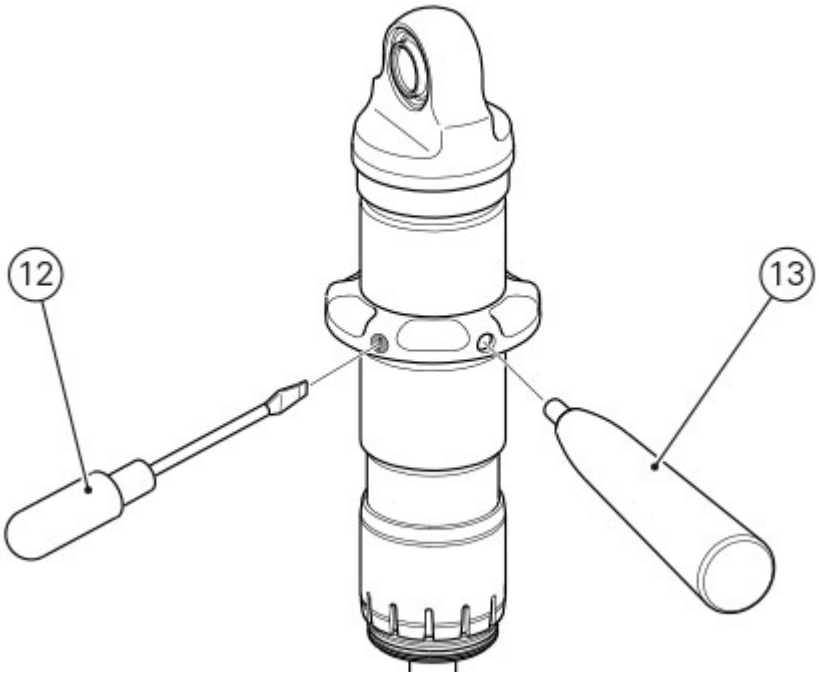
Mechanical 3-Step Adjuster

Use two C-spanners.
Turn the adjustment rings. There are three adjustment positions (9, 10 and 11).



Mechanical Adjuster

Unlock the nylon screw on the spring adjuster (12) with a screwdriver.
Use tool **03199-01** turn the spring adjuster clockwise to increase the preload (13), turn counter clockwise to decrease it.

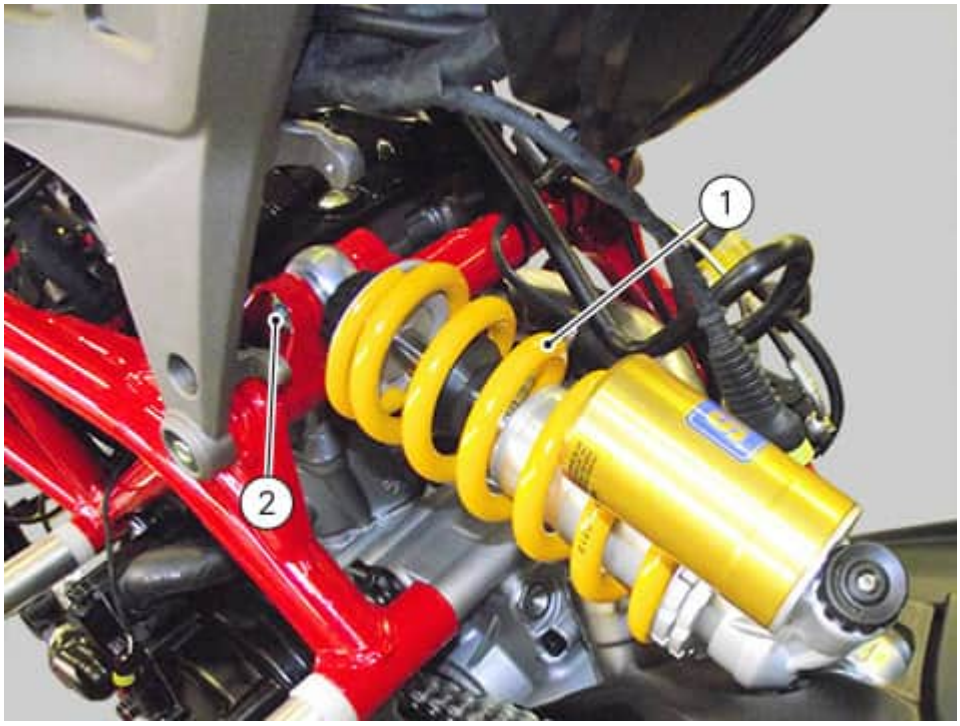

12
13

Removing the rear shock absorber

Remove the rear mudguard (Removing the rear mudguard)
Remove the exhaust silencer (Removing the silencer)

Support the rear side of the vehicle in a suitable way.

To remove the rear shock absorber (1) from the vehicle, undo the upper screw (2) and the lower screw (3).

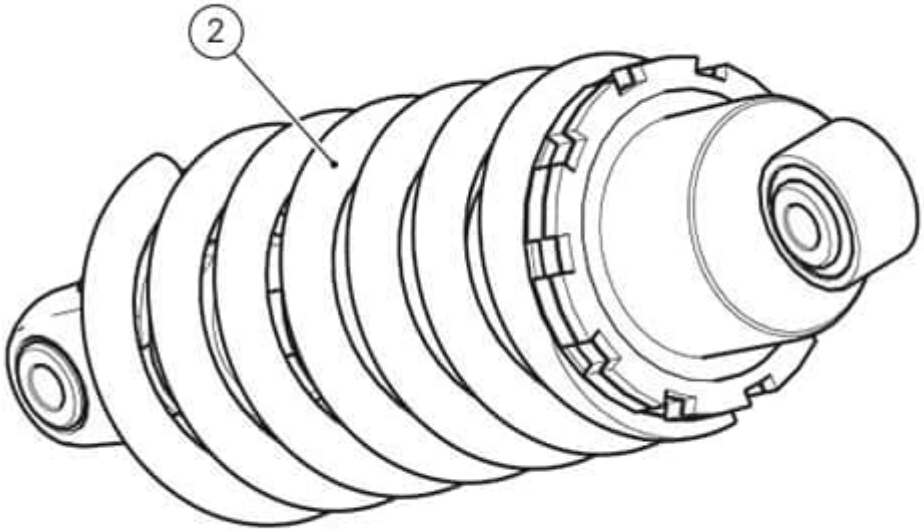




Rear suspension system

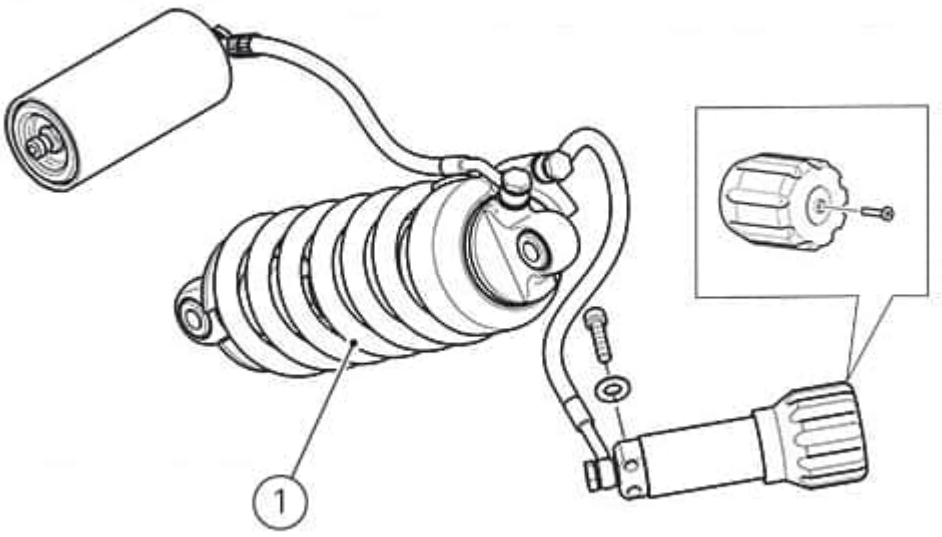
Hypermotard

The rear suspension system uses a hydraulic monoshock (1) adjustable for compression rebound and spring preload.
Shock absorber pivots onto a swinging arm at the bottom and rear subframe at the top. The whole system gives the motorcycle excellent stability.
For rear shock absorber adjustment, refer to Section "Adjusting the rear shock absorber".



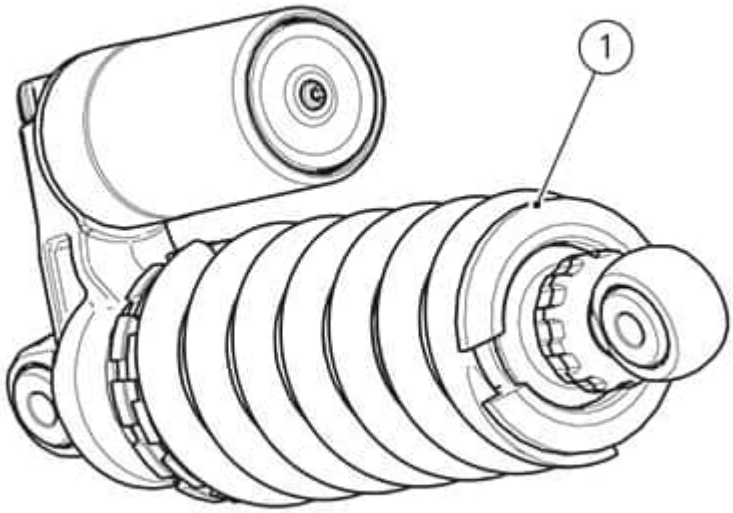
Hyperstrada

The rear suspension system uses a hydraulic monoshock (1) adjustable for compression rebound and spring preload. Shock absorber pivots onto a swinging arm at the bottom and rear subframe at the top. The whole system gives the motorcycle excellent stability. For rear shock absorber adjustment, refer to Section "Adjusting the rear shock absorber".



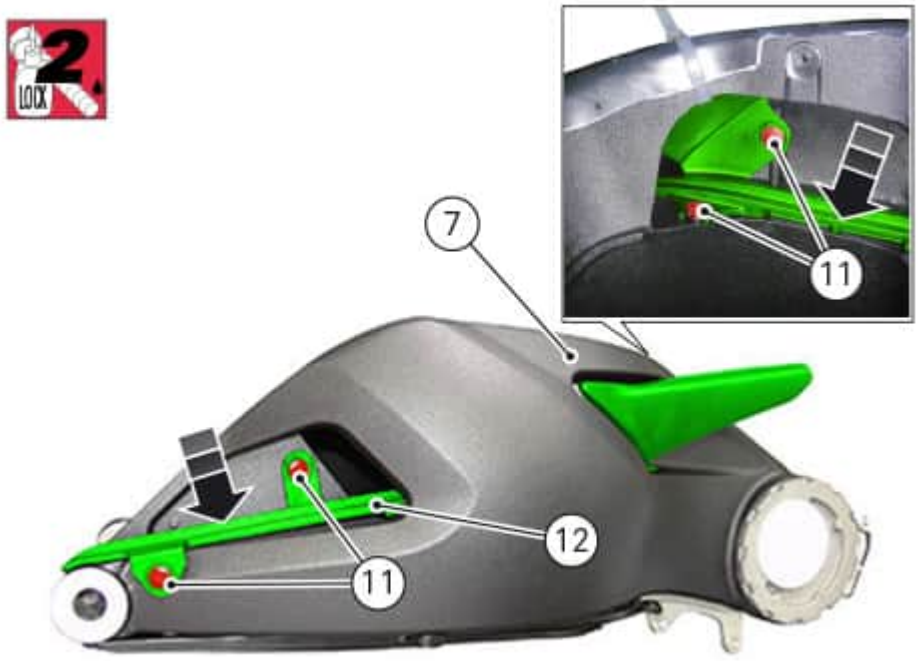
SP Hypermotard

The rear suspension system uses a hydraulic single shock absorber (1) adjustable for rebound and spring preload. Shock absorber pivots onto a swinging arm at the bottom and rear subframe at the top. The whole system gives the motorcycle excellent stability.
For rear shock absorber adjustment, refer to Section "Adjusting the rear shock absorber".

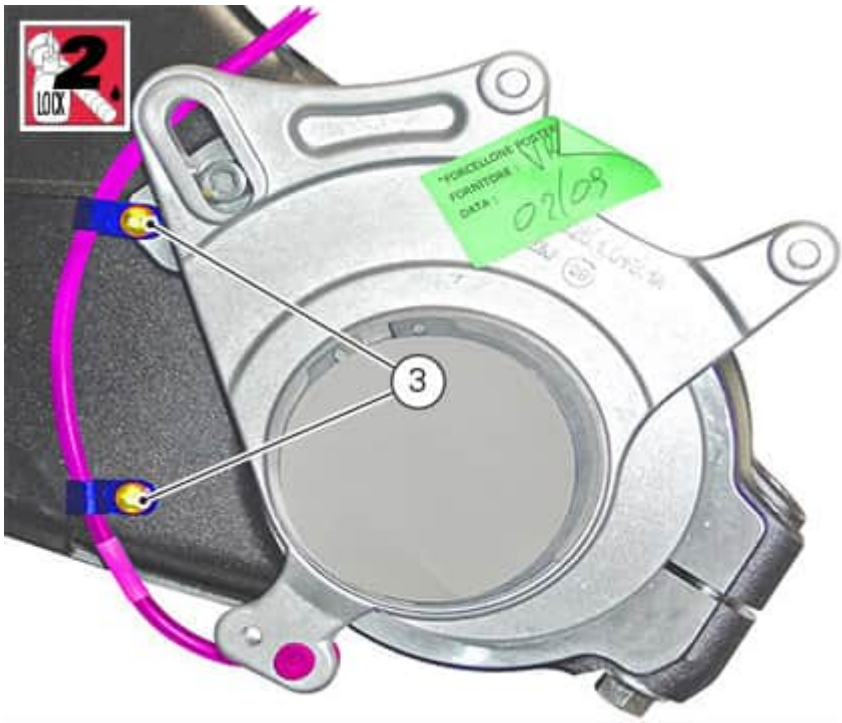


Refitting the rear swinging arm

Apply the recommended threadlocker on the screws (11).
Fit the chain guard (12) in the swingarm opening (7), secure it in place using the screws (11): tighten screws (11) to 5 Nm ±10%.



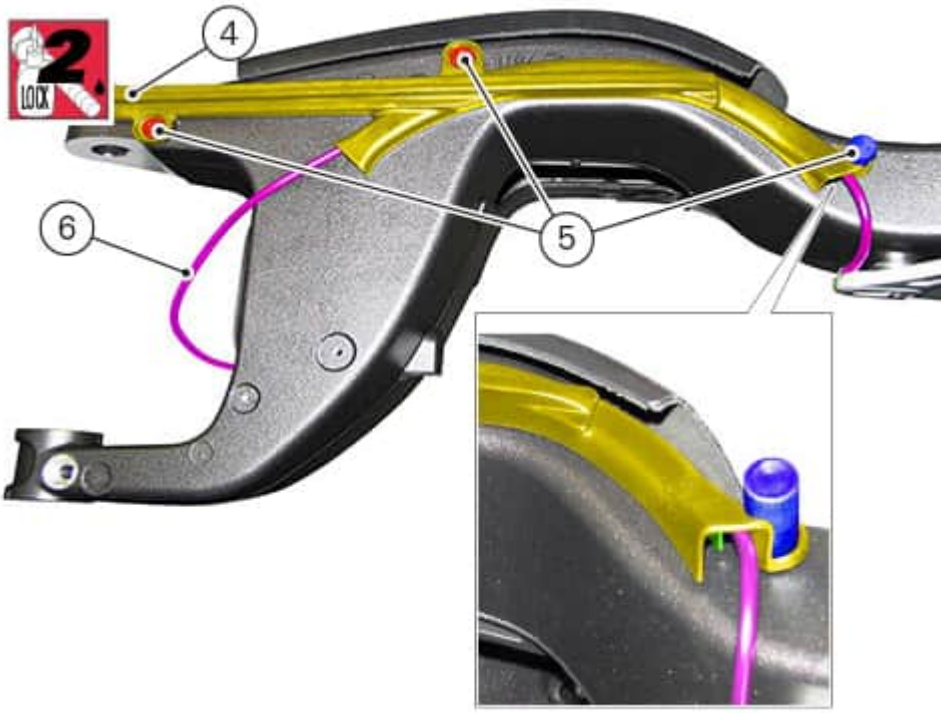
Fit the speed sensor cable in the hose clips (3), apply recommended threadlocker and tighten screws (3) to the specified torque of 2 Nm ± 10%.



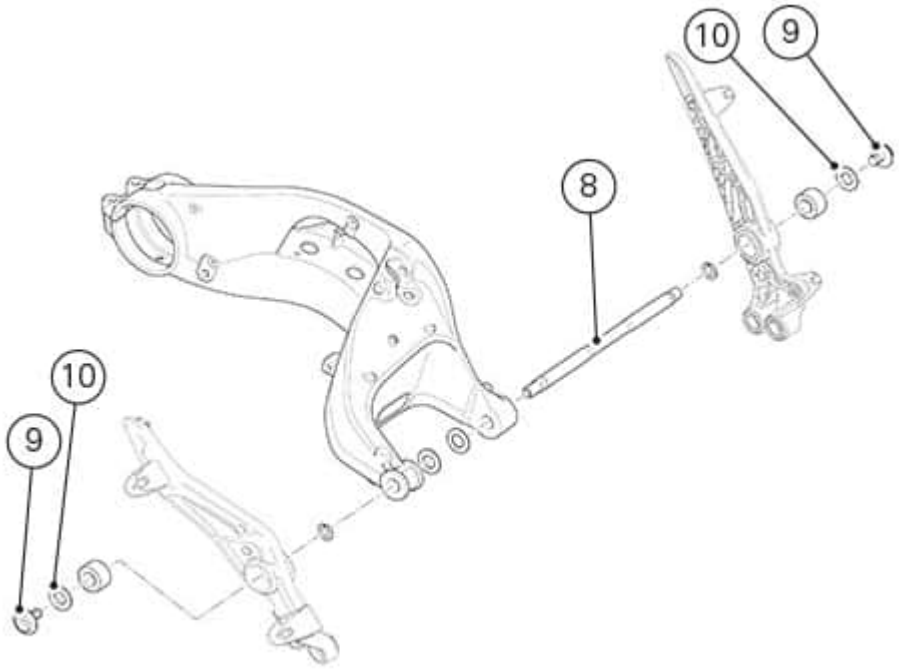
Tighten screw (1) of the speed sensor (2) applying recommended threadlocker to the torque of 7 Nm ± 10%.



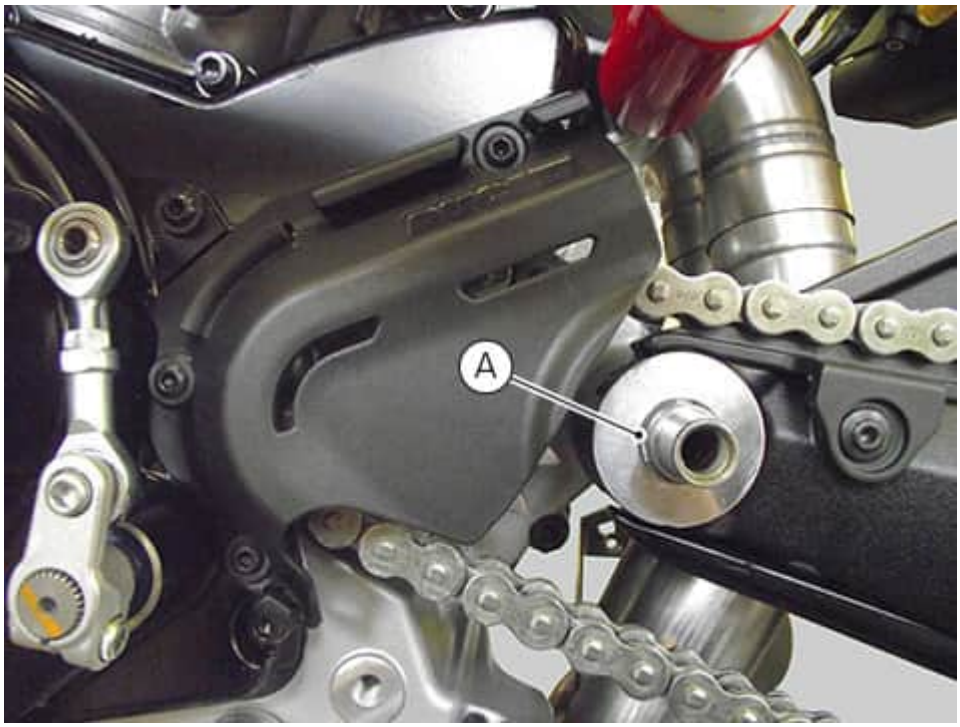
Fit chain sliding shoe (4), making sure that the sensor cable is routed as shown in the figure.
Apply recommended threadlocker and tighten screws (5) to the torque of 5 Nm ± 10%.



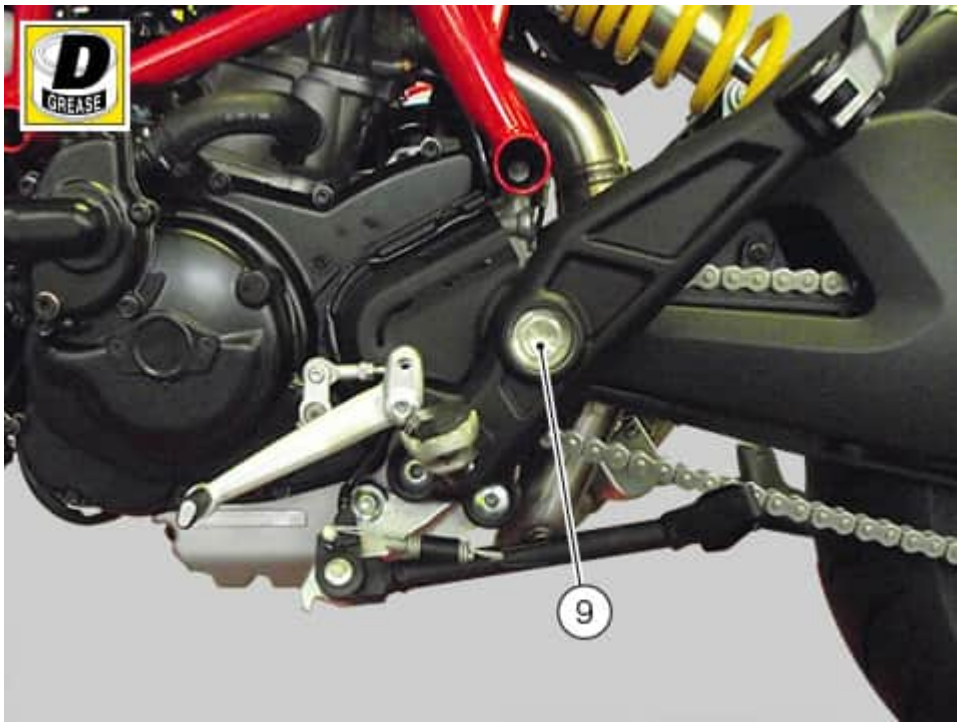
Fit the swinging arm by placing it on the special seat on the frame.
Lubricate the swinging arm shaft (8) with recommended grease and insert it fully home into the frame.



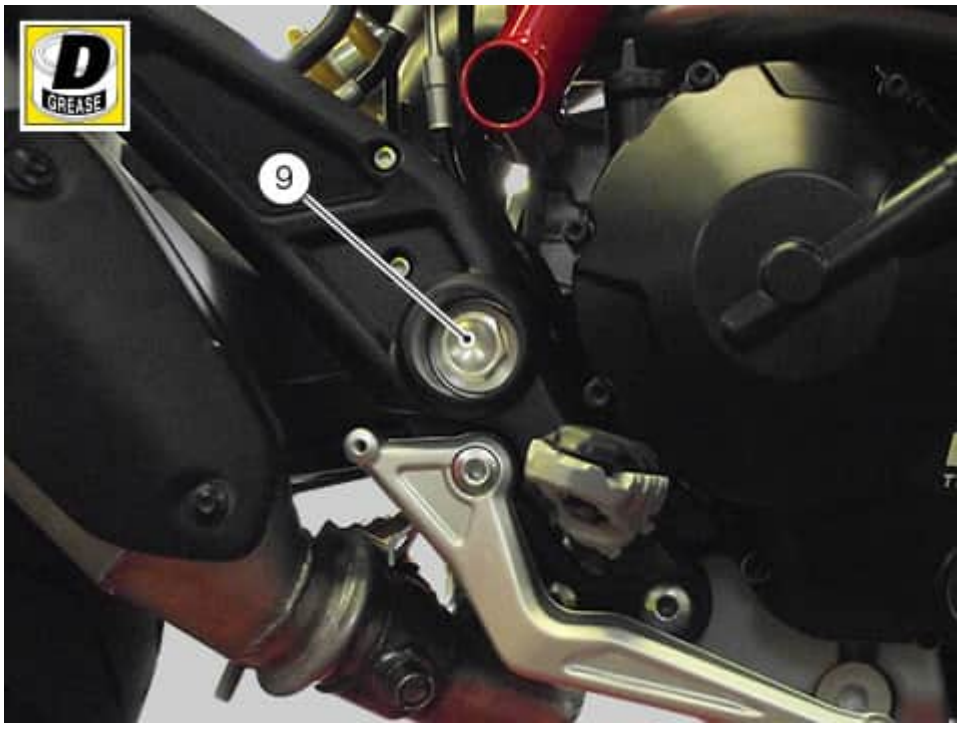
Fit the two circlips (A).



Refit the two footpeg holder plates and secure shaft with screw (9)



On the opposite side of the motorcycle fasten the swingarm shaft (8) with screw (9) after having smeared it with specified grease, fitting washer (10) between the swinging arm and the frame.
Tighten screw (9) to a torque of 72 Nm ±5%.



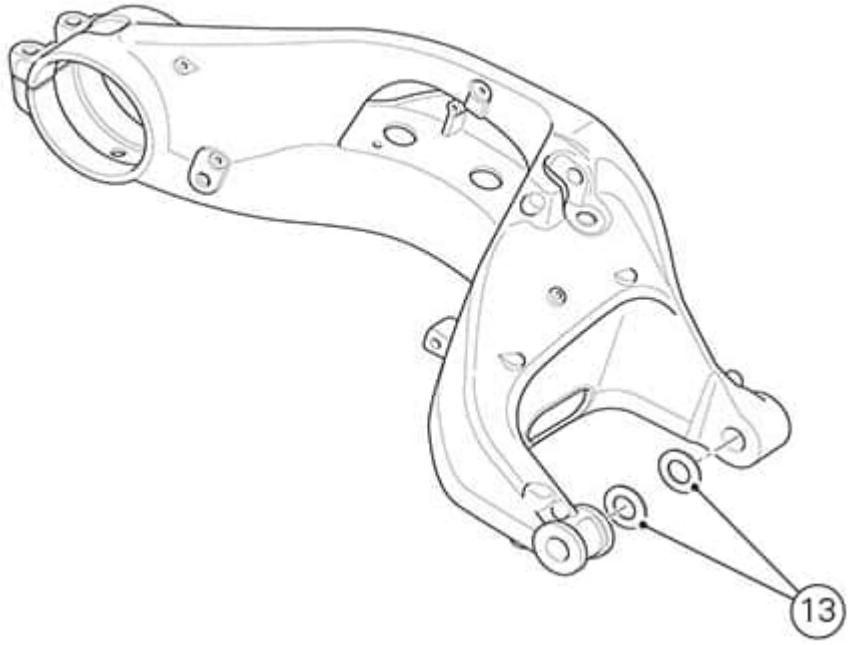
Refit the rear shock absorber.

Refit the rear brake calliper (Refitting the rear brake calliper).
Refit the rear sprocket (Refitting the rear sprocket).
Refit the rear wheel (Refitting the rear wheel).
Refit the rear mudguard (Refitting the rear mudguard).
Refit the exhaust silencer (Refitting the silencer).

Overhauling the rear swinging arm

Select the shim (13) size upon swinging arm refitting.
To check the end float, proceed as follows:

- fit shim (13), **1.8** thick on engine both sides;
- set the left side of the swinging arm on the engine and use a feeler gauge or calibrated to check the play on the engine opposite side



The maximum side play allowed is **0.10** mm.
If the gauge size is **0.18**mm and it fits with difficulties, do not fit any shim. If this is not the case, the available shim sizes are **0.20** mm and **0.10** with which it is possible to restore the specified play.

Example:

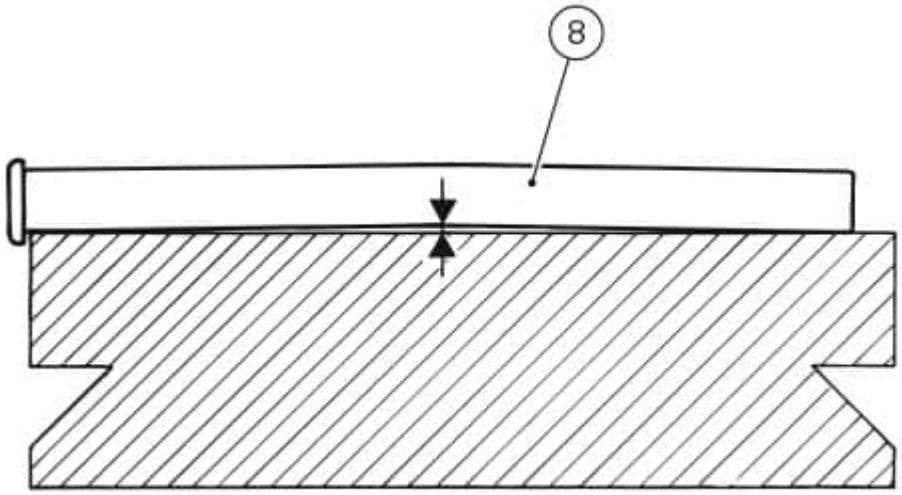
Measured play	**Left-hand side shims**	**Right-hand side shims**
0.10	-	no.1 shim (0.10 mm)
0.20	no.1 shim (0.10 mm)	no.1 shim (0.10 mm)
0.50	no.1 shim (0.20 mm)	no.1 shim (0.20 mm) + no.1 shim (0.1 mm)

Important
The shims with greater size have to be fitted on the swinging arm right-hand side.

The thinner shim must always be in contact with the swinging arm.
Do NOT fit shims with size equal to **0.1** on the left side.
The maximum value of the set of shims on the left must be **2**mm (**1.8**+ **0.2**max.)
The maximum swinging arm rear end play is within **1** mm.

Inspecting the swinging arm shaft

Before refitting the swinging arm shaft (8), check it carefully for distortion.
Turn the shaft on a reference surface and measure distortion using a feeler gauge.



Removing the swinging arm

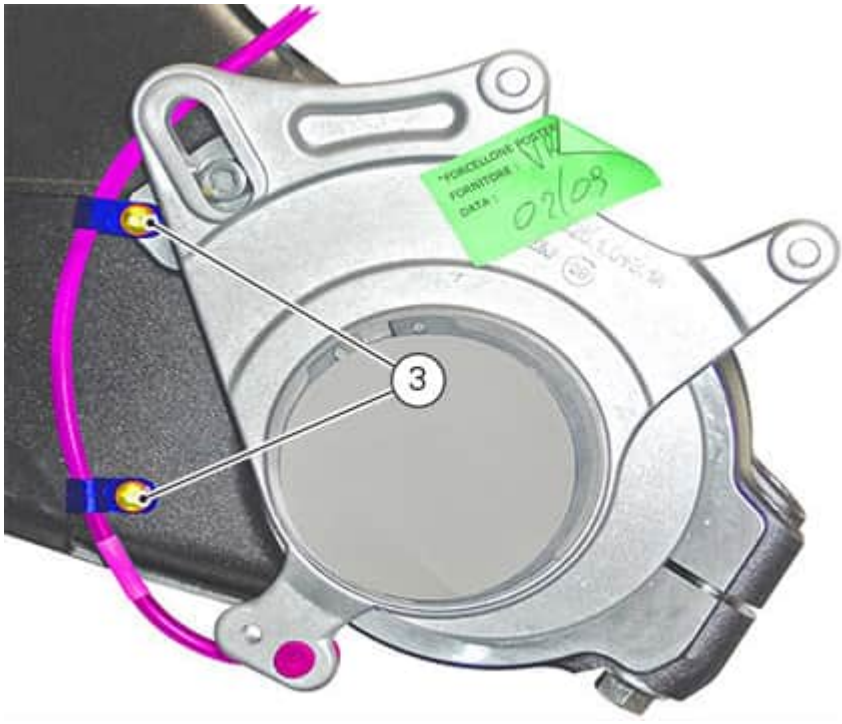
Before removing the concerned parts, you must first carry out the following operations:
Remove the exhaust silencer (Removing the silencer).
Remove the rear wheel (Removing the rear wheel).
Remove the rear sprocket (Replacing the rear sprocket).
Remove the rear brake calliper (Removing the rear brake calliper).
Remove the rear shock absorber.

Remove the rear eccentric hub as described in "Removing the rear wheel eccentric hub and the rear wheel shaft"

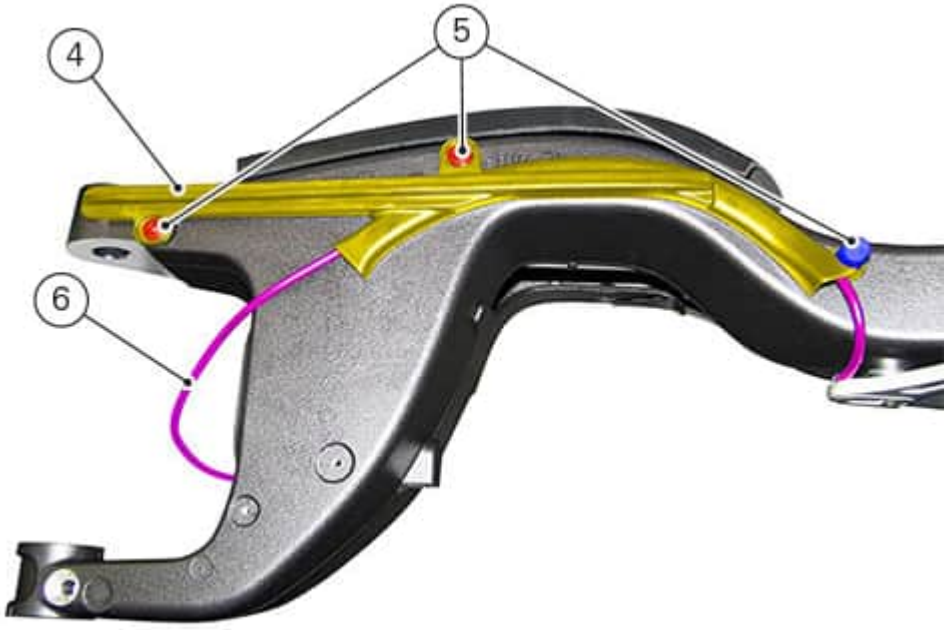
Undo screw (1) of the speed sensor and remove sensor (2).



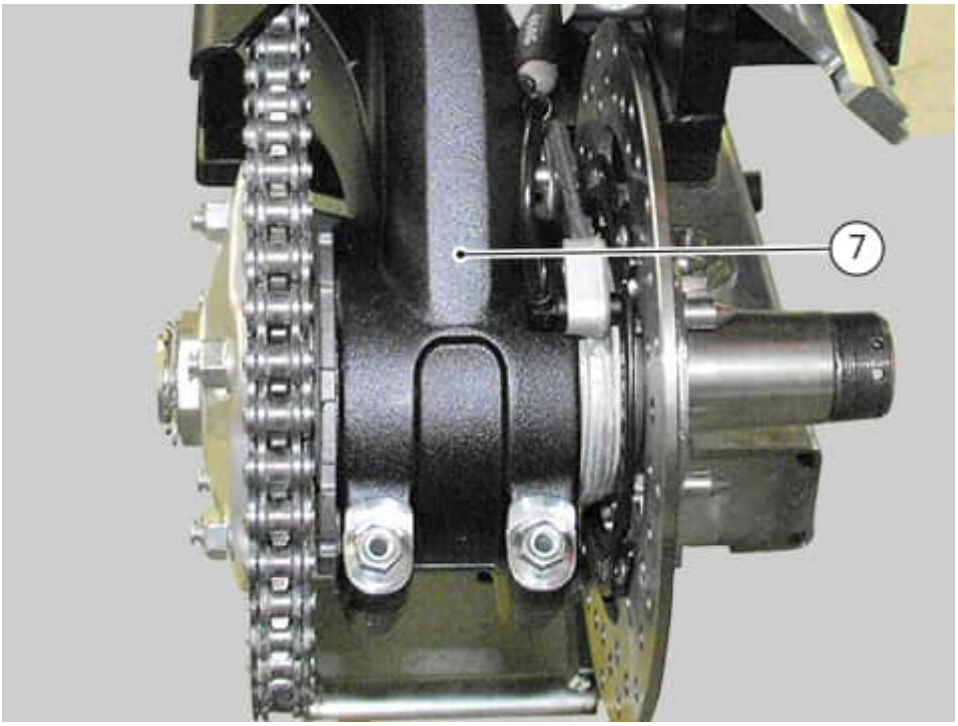
Undo and remove the screws (3) of the cable rings.



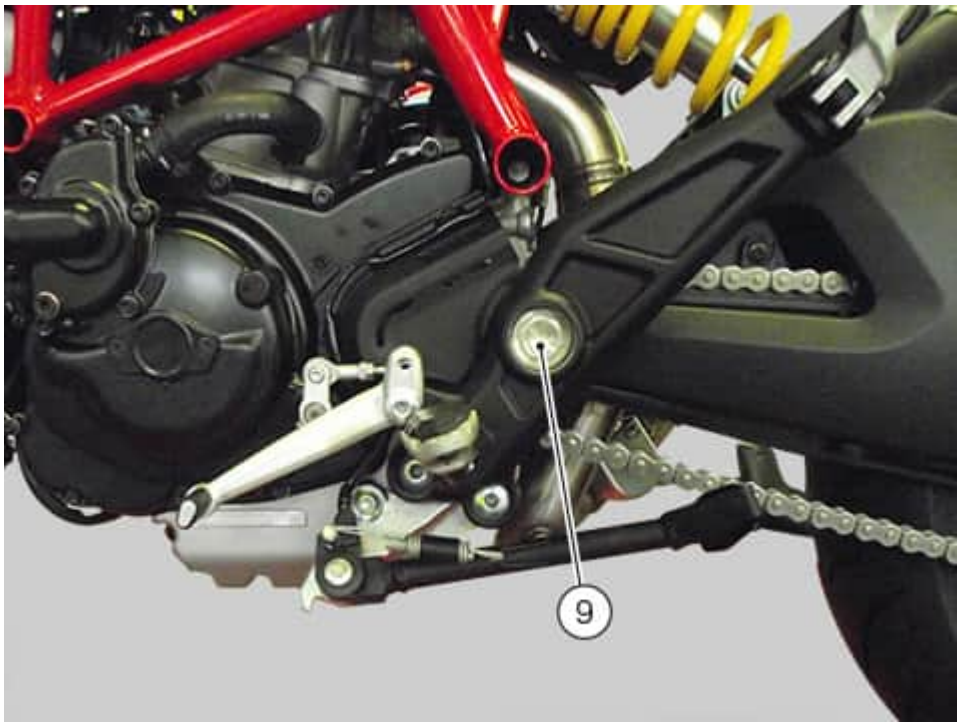
Remove chain sliding shoe (4) after undoing screws (5). Release rear speed sensor (6).



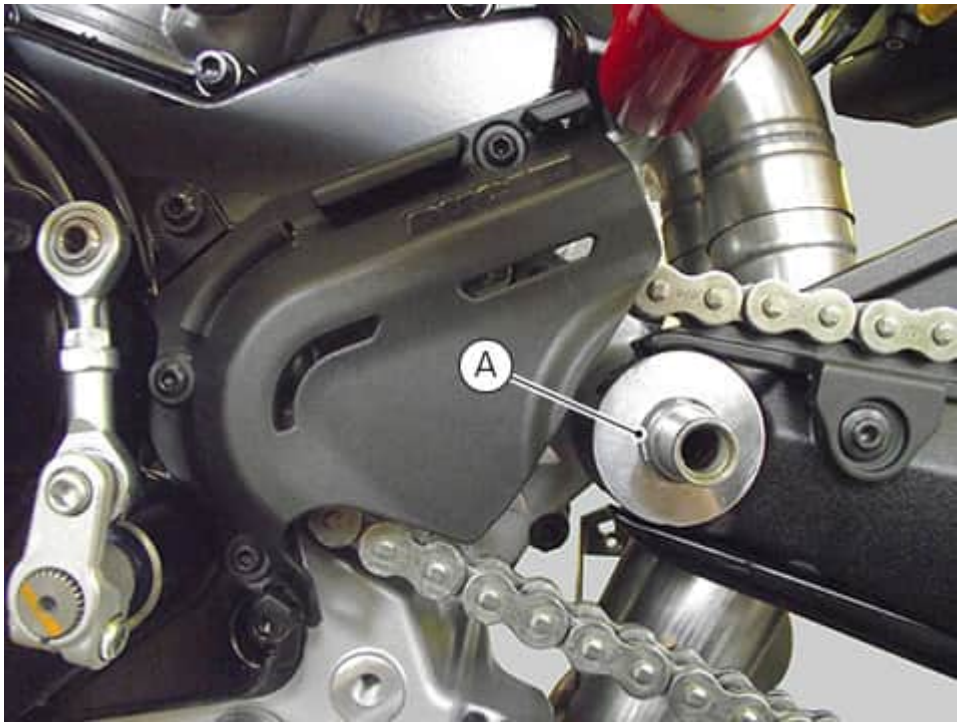
It is possible to check the supporting bearing play while the swinging arm (7) is still fitted on the motorcycle frame. Try to move the rear of the swinging arm (7) in the four directions.

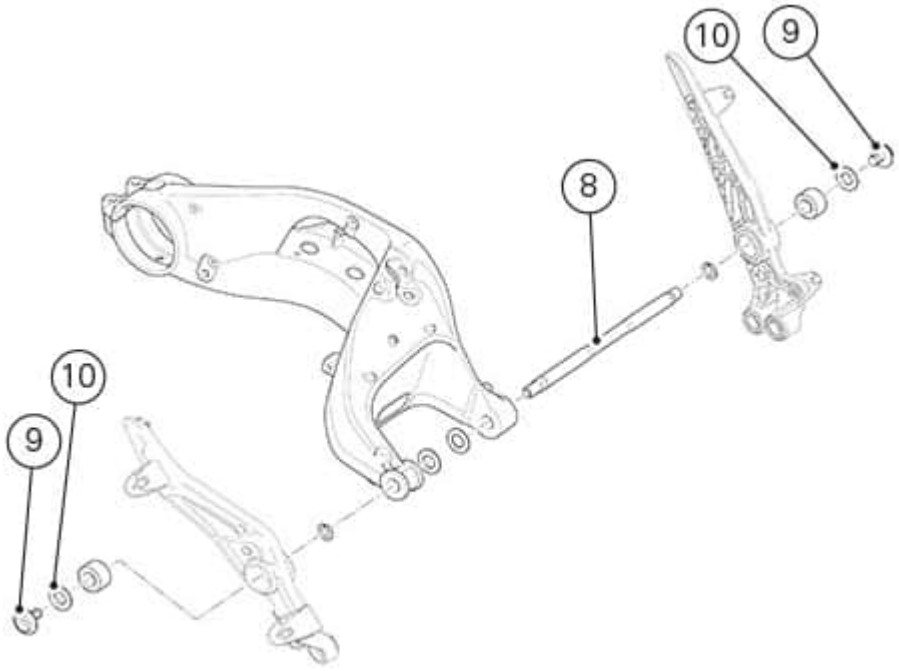


Any abnormal movement is a sign of worn bearings that could cause bike instability.
Once the play in the support bearings has been checked, the rear swinging arm (7) may be removed from the motorcycle.
Hold the swingarm shaft (8) with the screws (9) on the bike left side, and at the same time loosen the screw (9) on the opposite side: collect the washer (10).



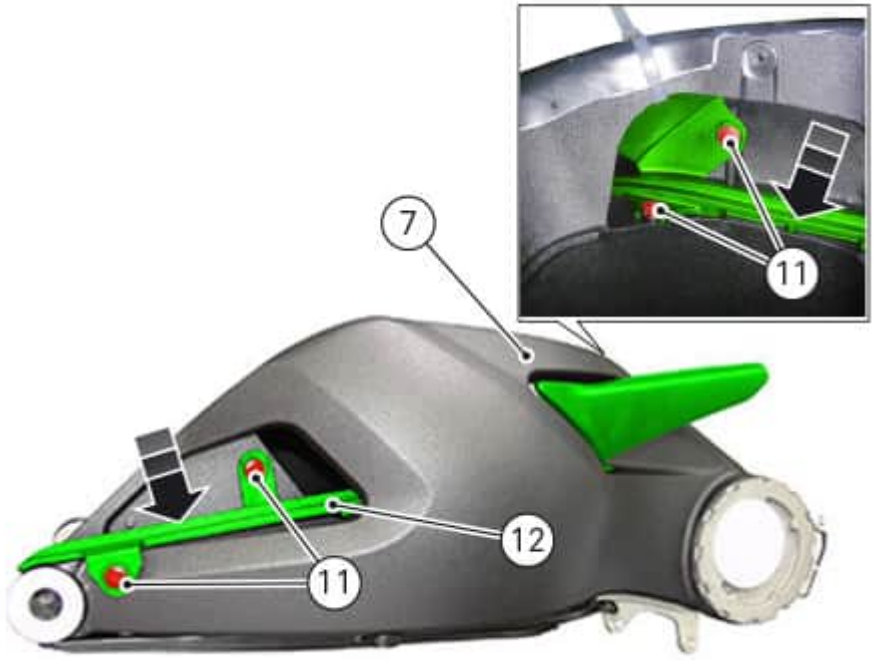
Remove the two footpeg holder plates (Removing the footpeg holder plates).
Remove circlip (A) placed on both sides.





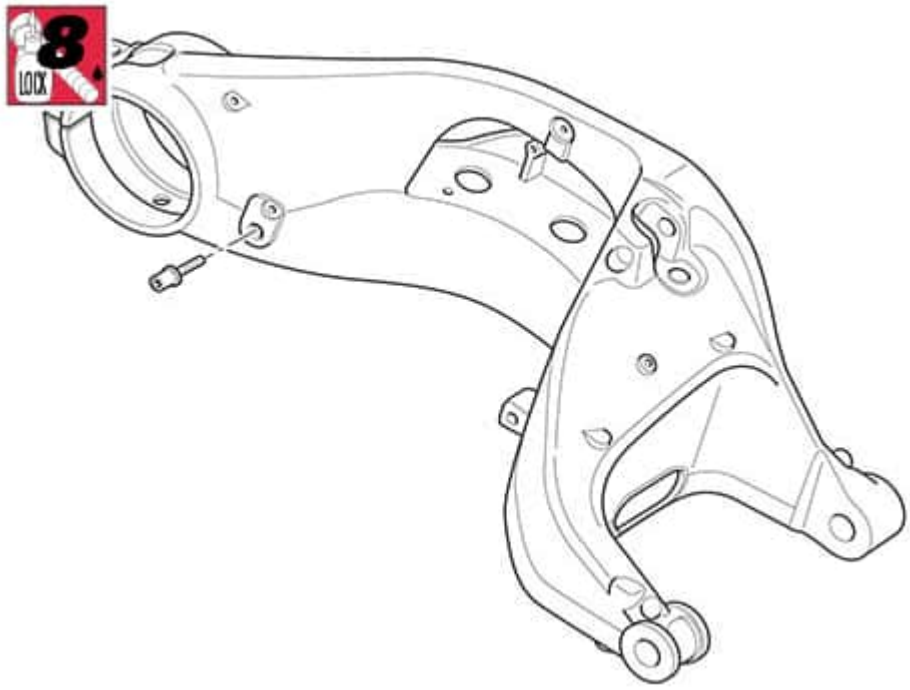
Using the drift fully extract the swingarm shaft.
Remove the swinging arm assembly from the frame.

Undo the screws (11) to remove the chain sliding shoe (12) from the swingarm (7).

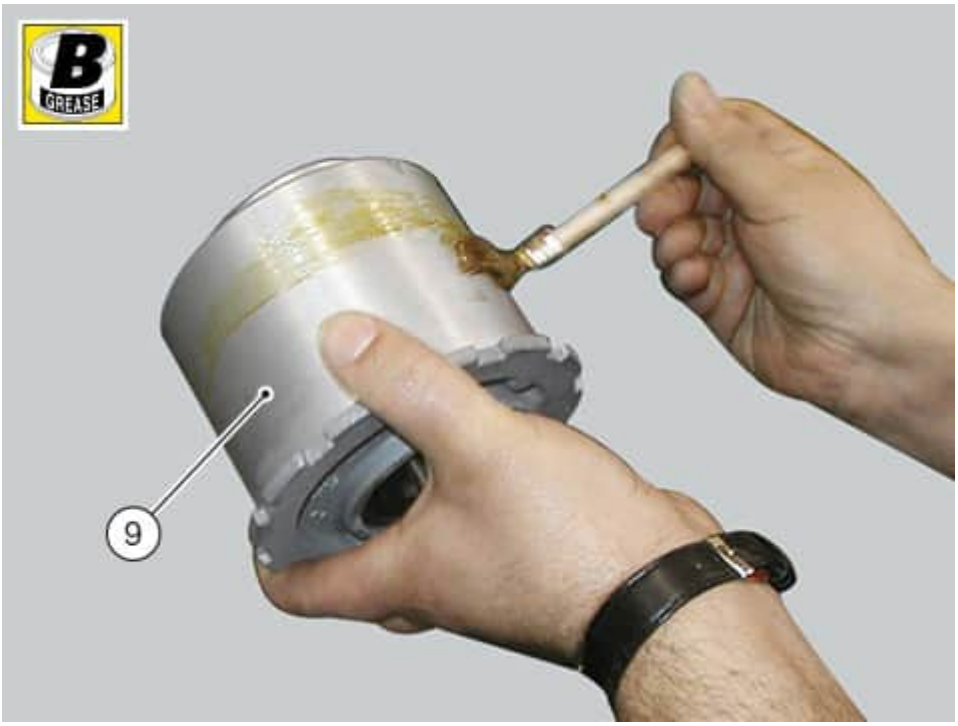


Refitting the rear wheel eccentric hub and rear wheel shaft

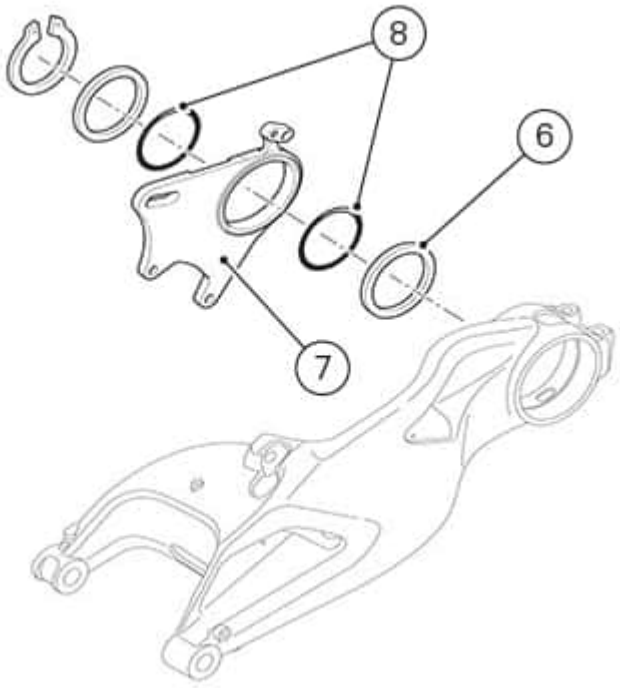
Refitting is the reverse of removal, with attention to the following points.
If the calliper bracket locating pin (10) was removed, apply the recommended threadlocker upon reassembly.
Tighten shaft (10) to a torque of 33 Nm ± 5%.



Before refitting, apply recommended grease on the eccentric hub (9).

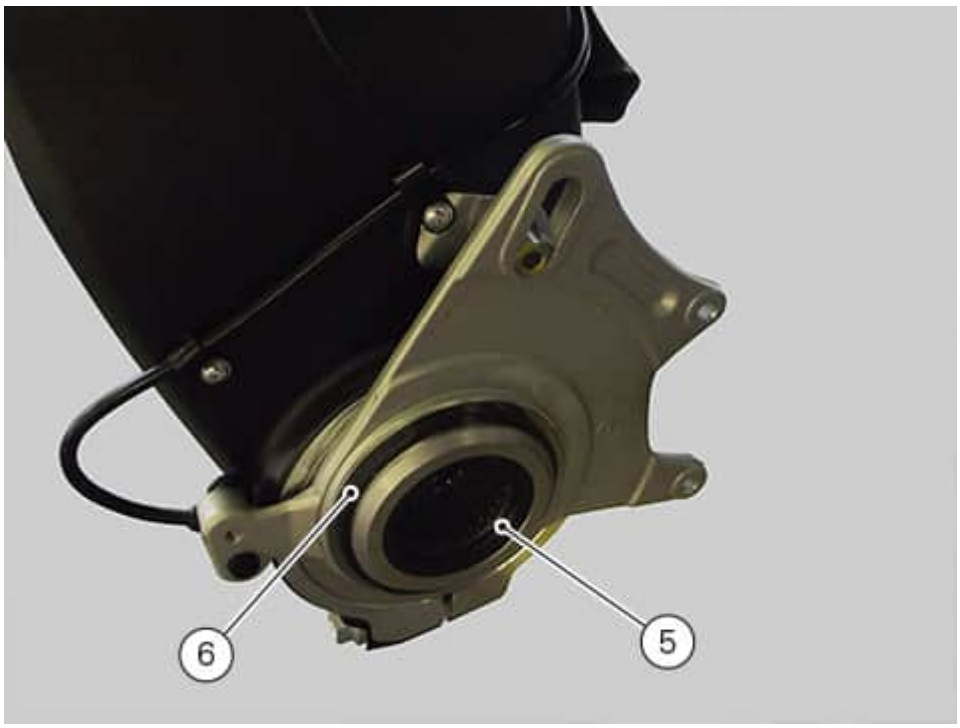


Fit the first washer (6).

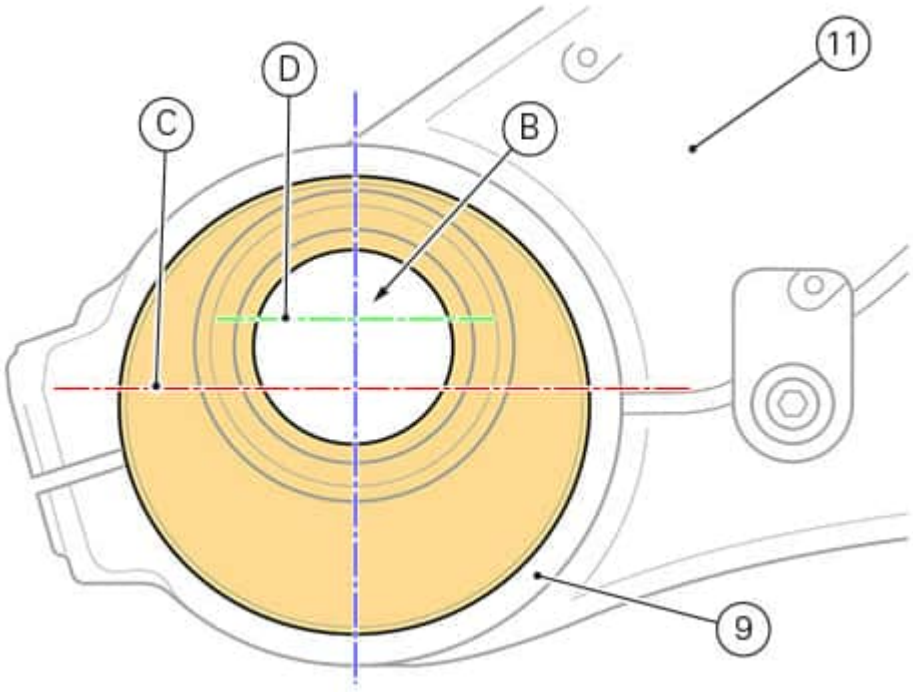


Apply recommended grease on seals (8) and position them in the seat of plate (7). Fit plate (7) to swinging arm: pin (10) must be engaged in the plate (7).

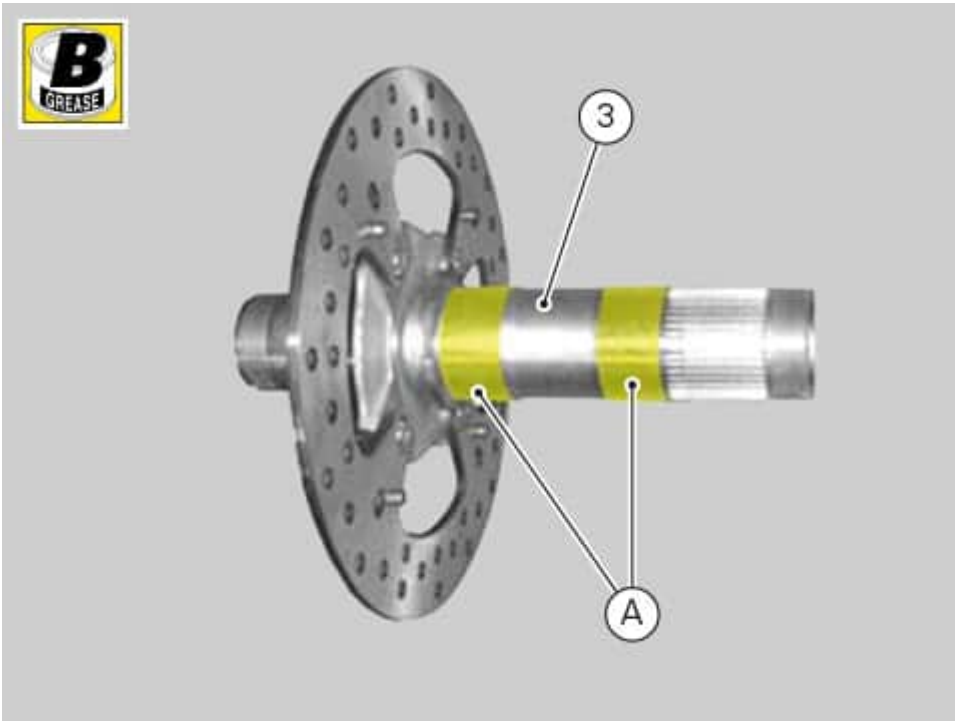
Refit the other washer (6).
Fit the circlip (5) with the sharp edge facing out.



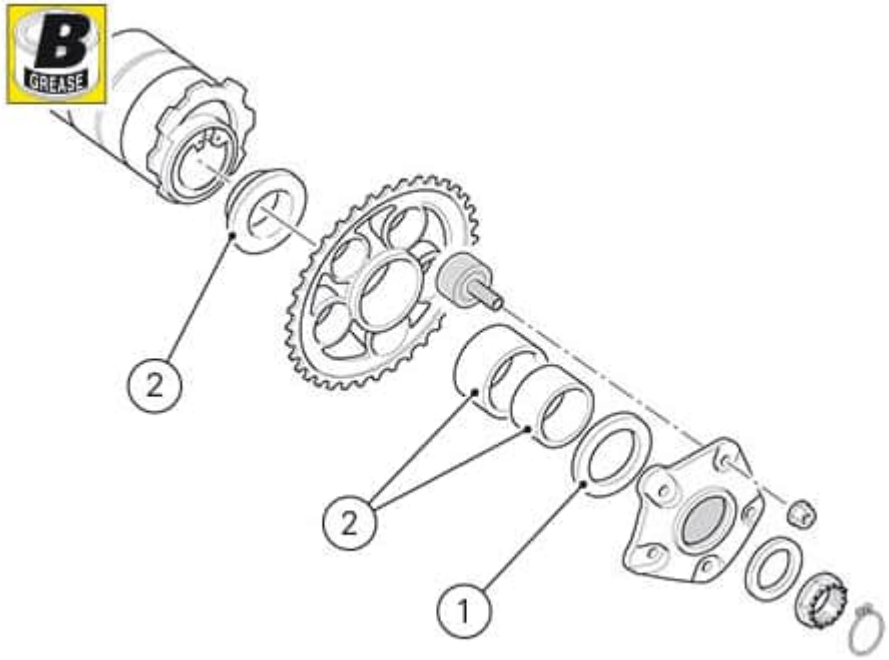
Make sure that the eccentric hub (9) position to swinging arm (11) is with the horizontal axis (D) of the hub hole (B) below the horizontal axis (C) of the hub seat.

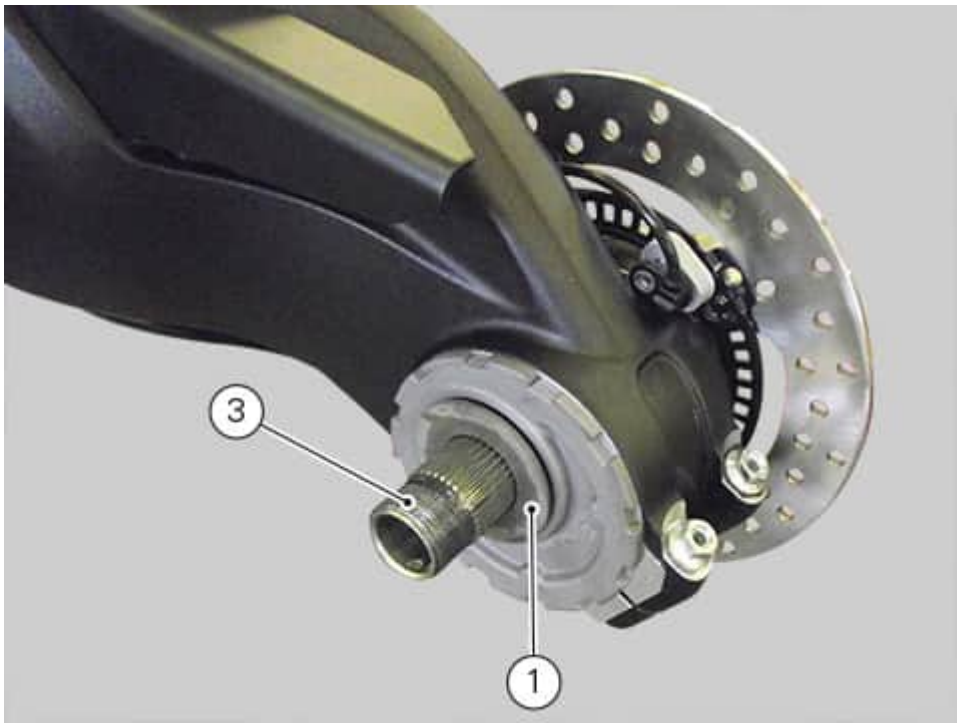


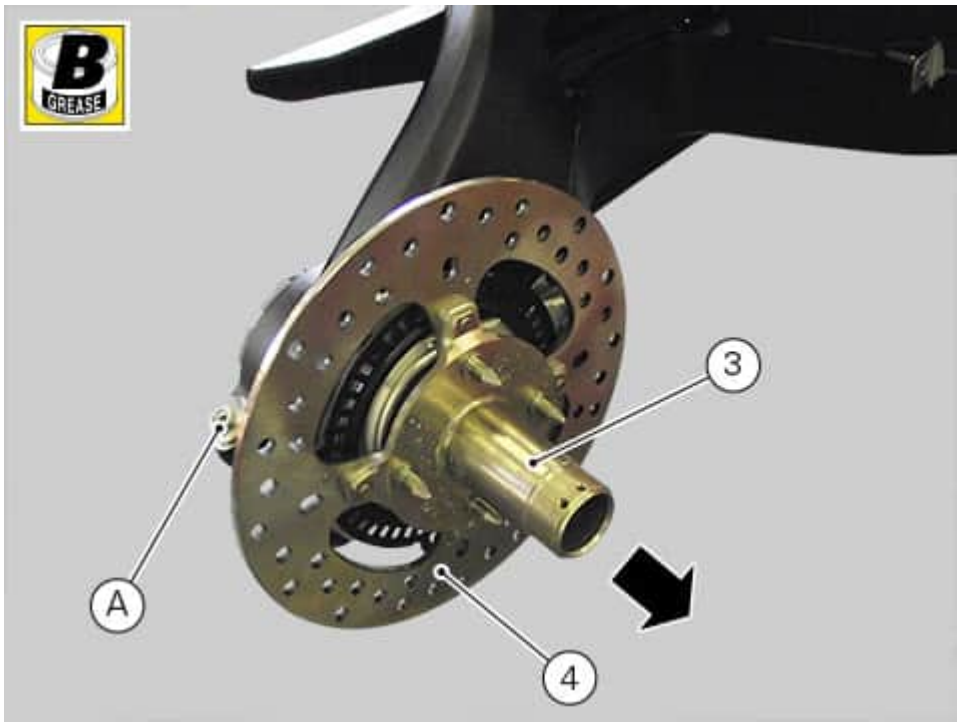
Apply an even coating of the recommended grease in the areas (A) of the shaft (3).



Insert the rear wheel shaft (3) in the hub.
Ensure the wheel shaft (3) is seated in the hub.
Fit the inner ring (2) on the wheel shaft (3).
Insert the inner ring (2) in the hub.
Apply recommended grease to screws (A) and tighten to 35 Nm ±5% in the 1-2-1 sequence.


B
GREASE
2
2
1


3
1

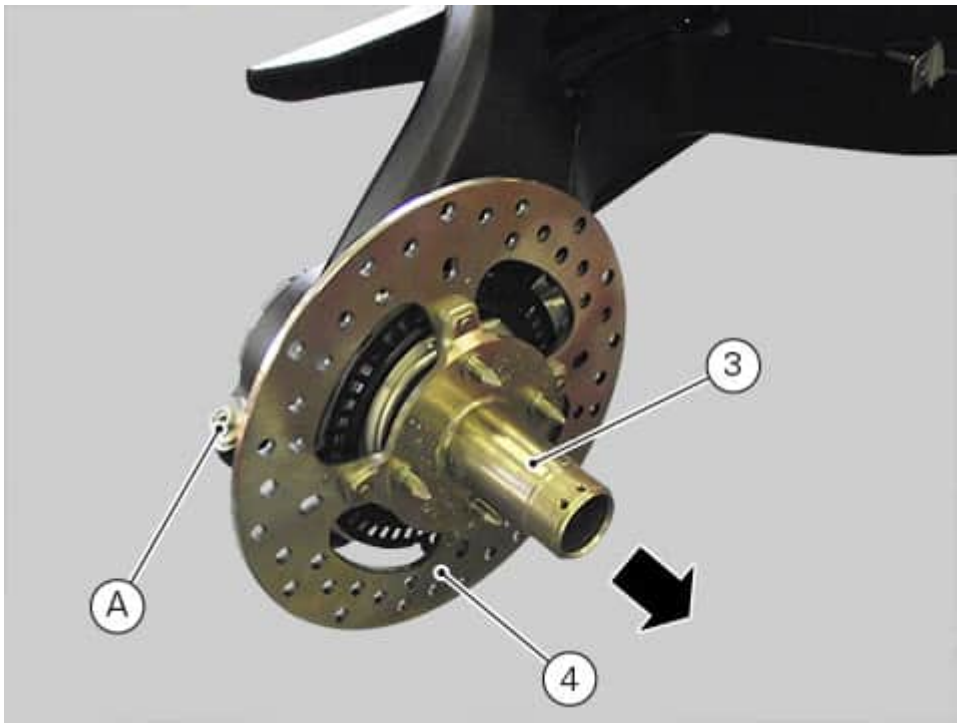


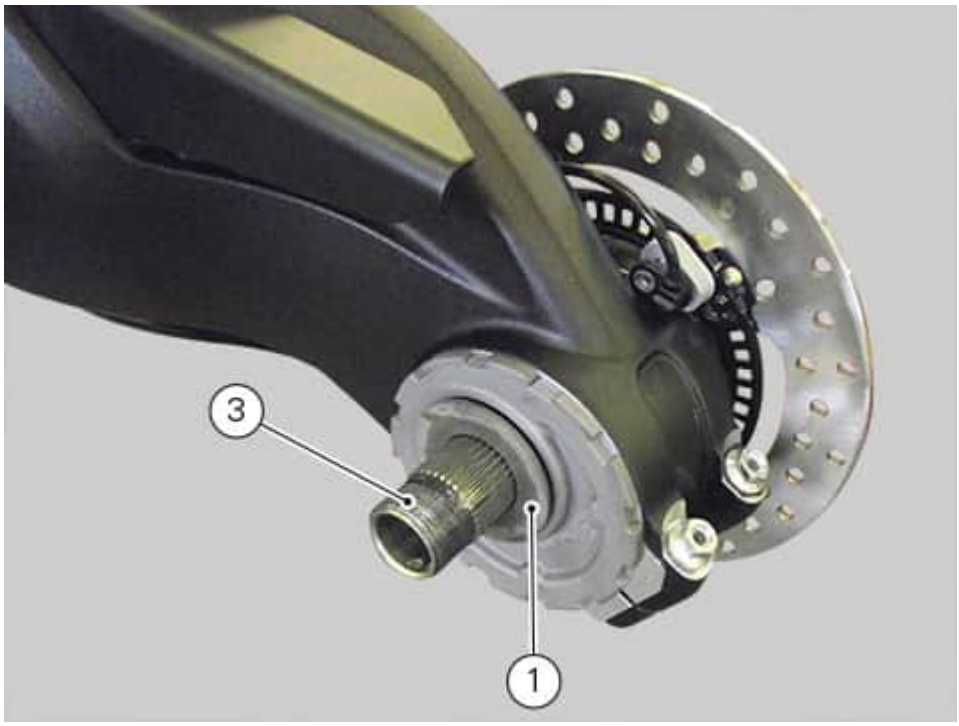
Refit the rear brake calliper (Refitting the rear brake calliper).
Refit the rear sprocket (Refitting the rear sprocket).
Refit the rear wheel (Refitting the rear wheel).
Refit the rear mudguard (Refitting the rear mudguard).
Refit the exhaust silencer (Refitting the silencer).
Tension the chain as described in Section (Adjusting the chain tension).

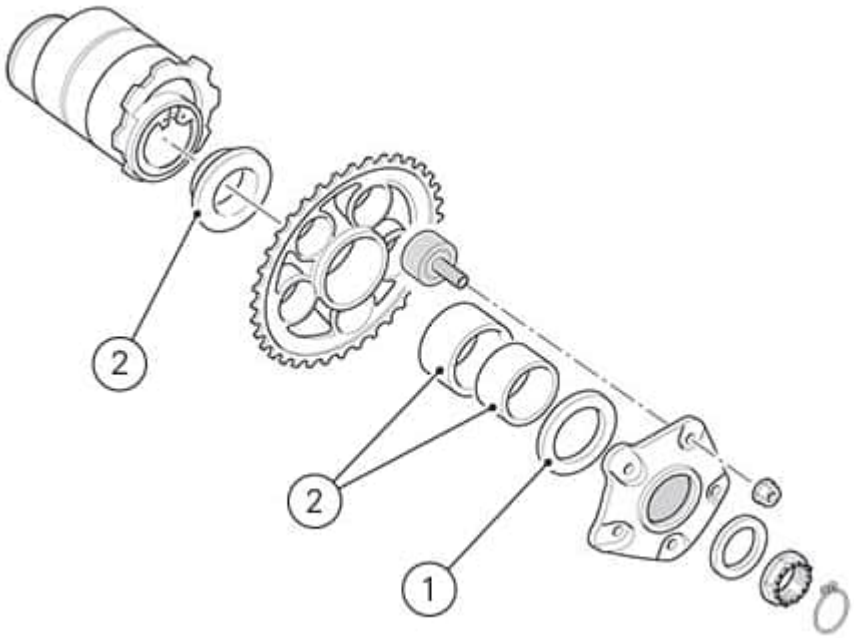
Removing the rear wheel eccentric hub and the rear wheel shaft

Remove the exhaust silencer (Removing the silencer).
Remove the rear wheel (Removing the rear wheel).
Remove the rear sprocket (Replacing the rear sprocket).
Remove the rear brake calliper (Removing the rear brake calliper).

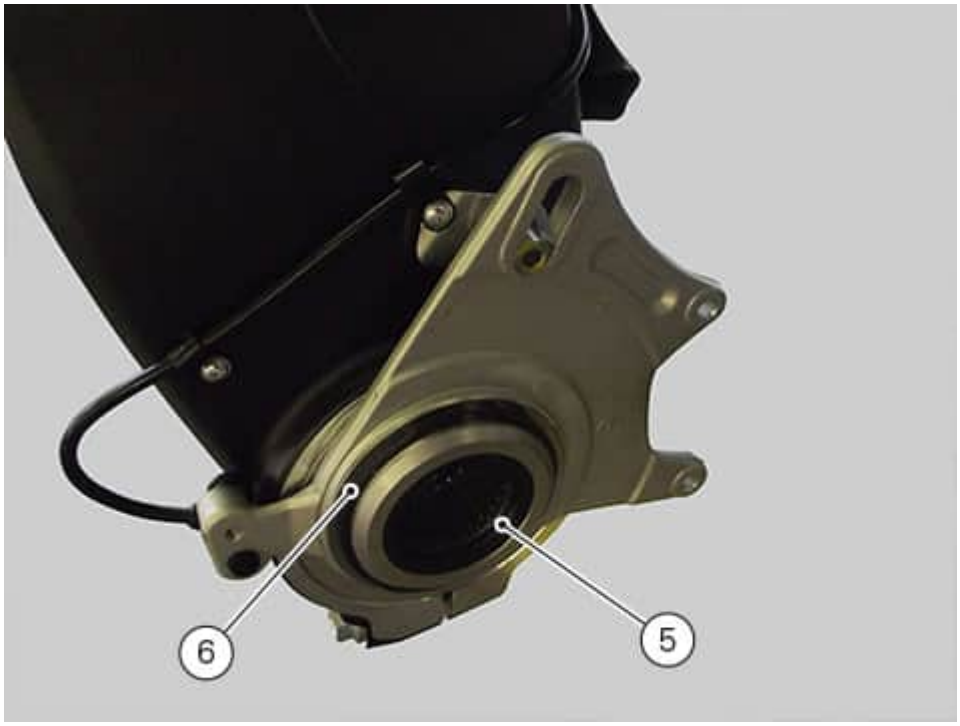
Loosen screws (A). Remove the spacer (1) and the inner ring (2) on the chain side, and remove the wheel shaft (3) with the brake disc (4) from the opposite side.

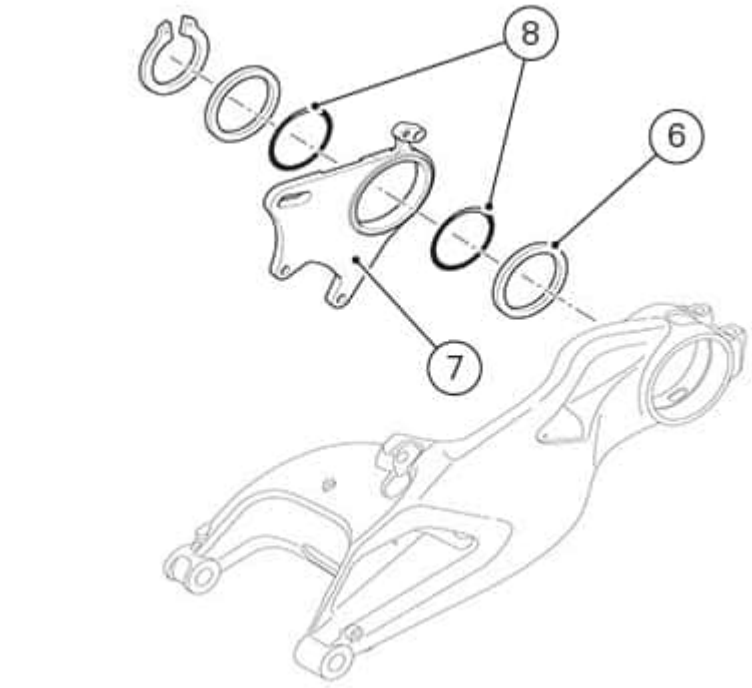


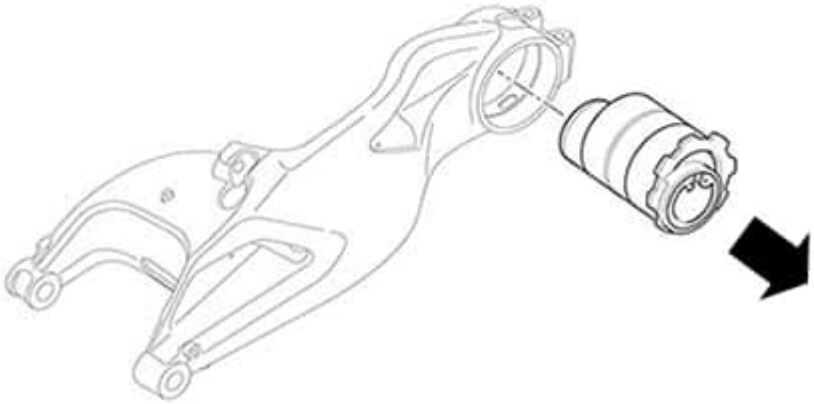




Remove the circlip (5) on the wheel side of the eccentric hub.
Remove the washer (6) and the calliper mounting bracket (7) with the O-rings (8).







Note

The rear hub is very important for vehicle dynamic safety; it is available as a single spare part since you must not service its internal parts; part no. 756.2.006.2A.

Lubricating the chain

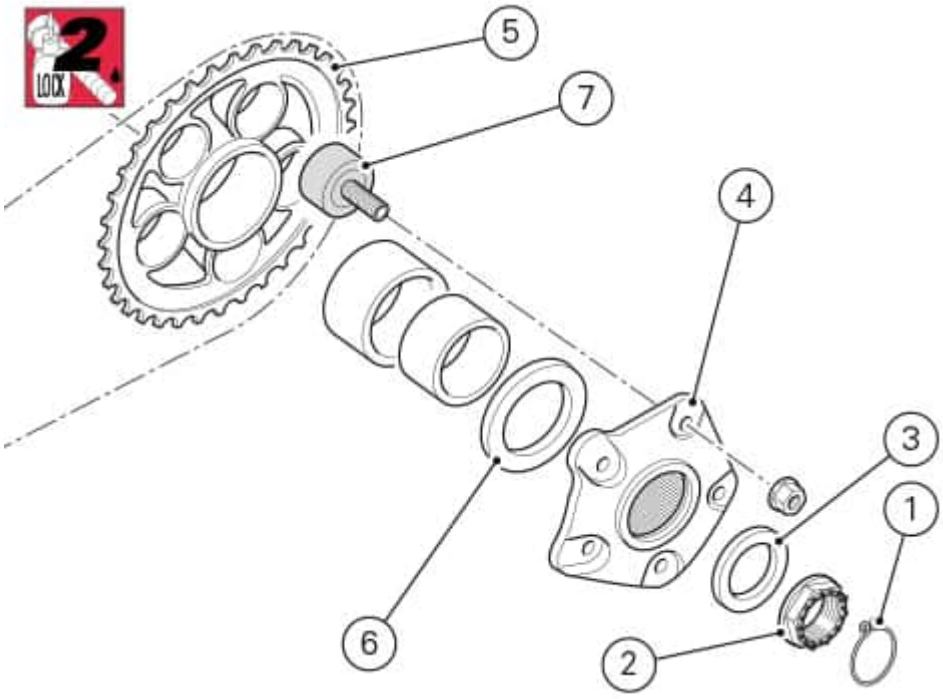
O-ring chains have sealed, life-lubed link studs and bushes.
However, these chains need to be lubricated at regular intervals to protect metal parts of the chain and the O-rings.
Lubrication also serves to keep the O-rings soft and pliable to ensure the maximum sealing efficiency.
Using a brush, apply a thin protective layer of high-density gearbox oil along the entire length of the chain both inside and outside.

Washing the chain

Chains with O-rings must be washed in oil, diesel fuel or paraffin.
Do not use fuel, trichloroethylene or other solvents which will damage the rubber O-rings.
For the same reason use only sprays specifically formulated for use with O-ring chains.

Refitting the rear sprocket

Check the cush drive dampers (7) condition and, if necessary, replace them by removing them from the flange.
Refitting is the reverse of removal.
Apply the recommended grease to the outer diameter of rear sprocket holder flange (4).
Fit rear sprocket flange (4) onto rear sprocket (5), engaging cush drive damper pins (7).
Apply recommended threadlocker to the nut thread (8).
Start nuts on cush drive damper pins threaded end (7).
Tighten the nuts (8) to a torque of 48 Nm ± 10%, following a cross pattern.



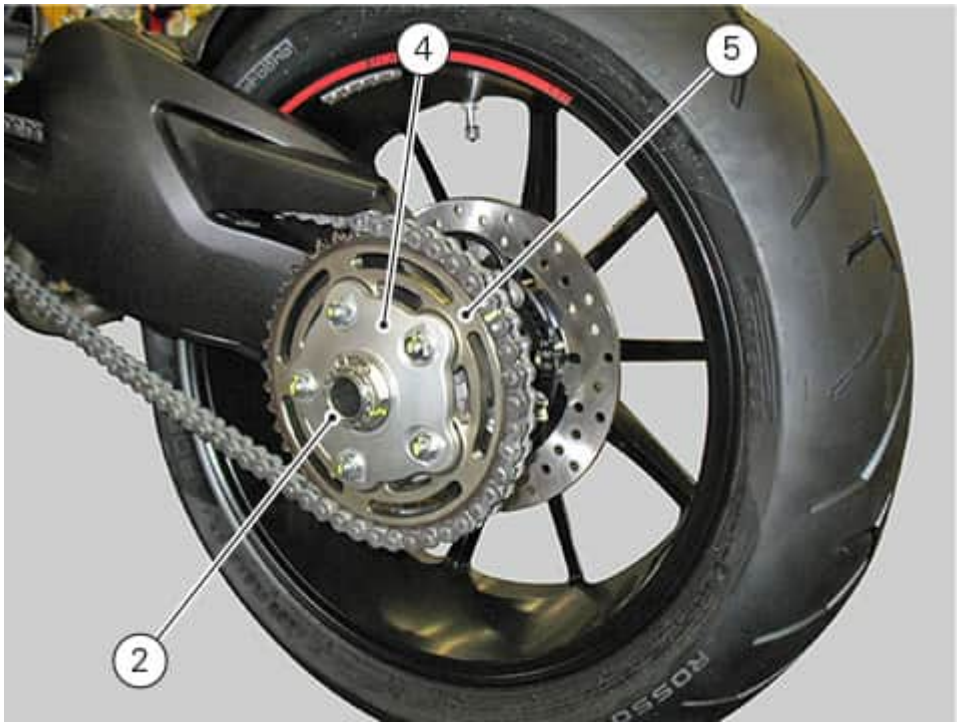
Check for wear as described under Section "Inspection of the final drive".
To refit the nut (2), follow the specifications for the wheel locking nut, in Section "Refitting the rear wheel".

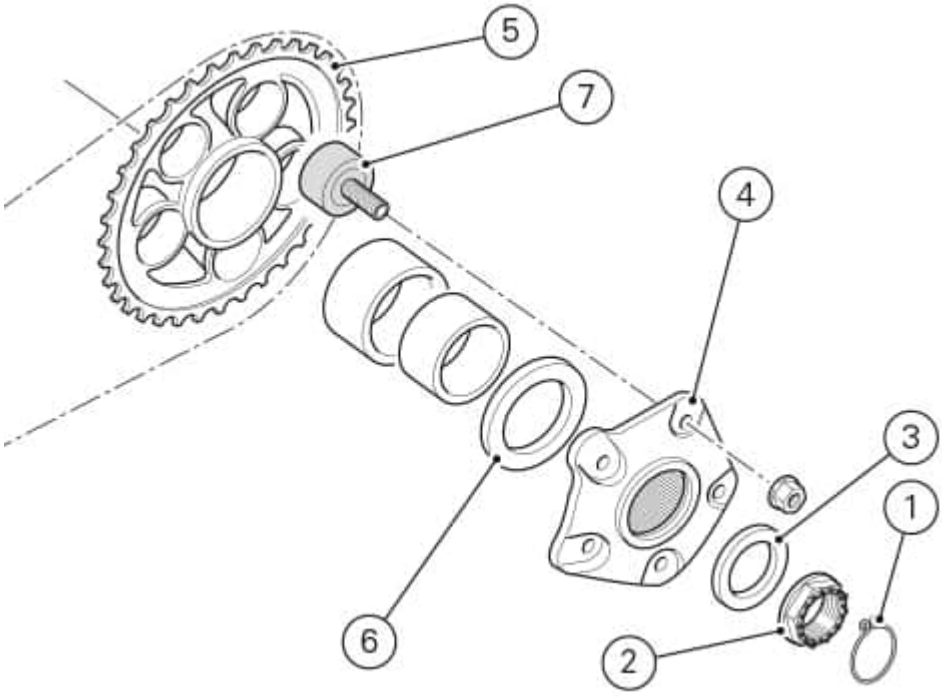


Replacing the rear sprocket

Slacken the chain
Remove the exhaust silencers (Removing the silencer).
Remove the rear wheel (Removing the rear wheel).

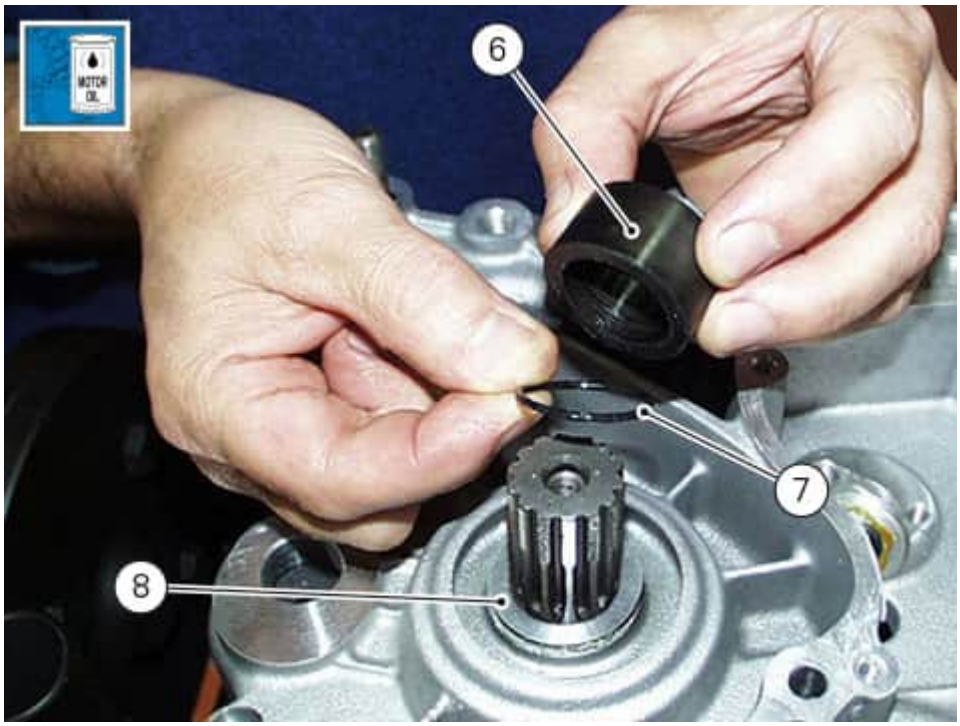
Restrain wheel shaft against rotation.
Remove the circlip (1).
Using a suitable socket wrench, loosen nut (2).
Fully unscrew the nut (2) and remove the washer (3) and the flange (4) with the sprocket (5).
Collect spacer (6).
Using a mallet, tap the sprocket flange (4) with the cush drive damper (7) off the rear sprocket (5).



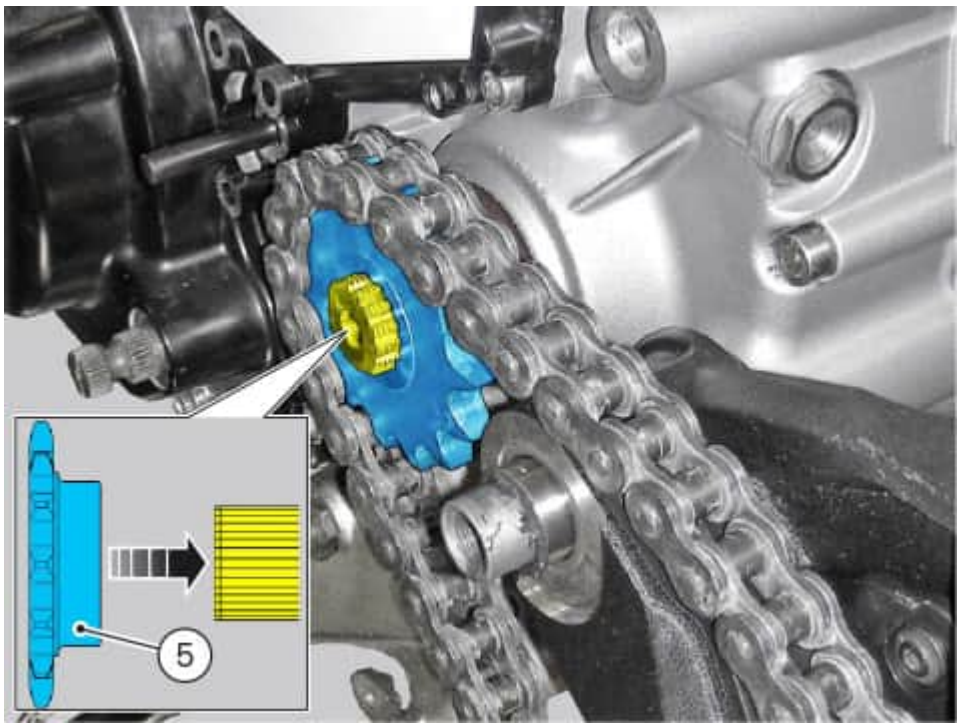


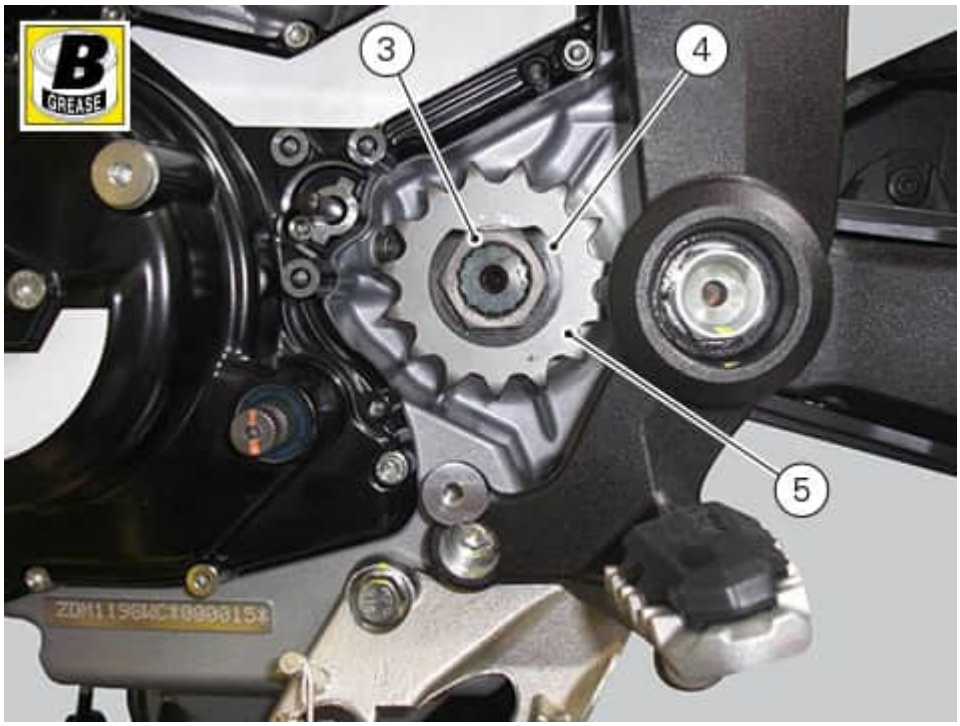
Refitting the front sprocket

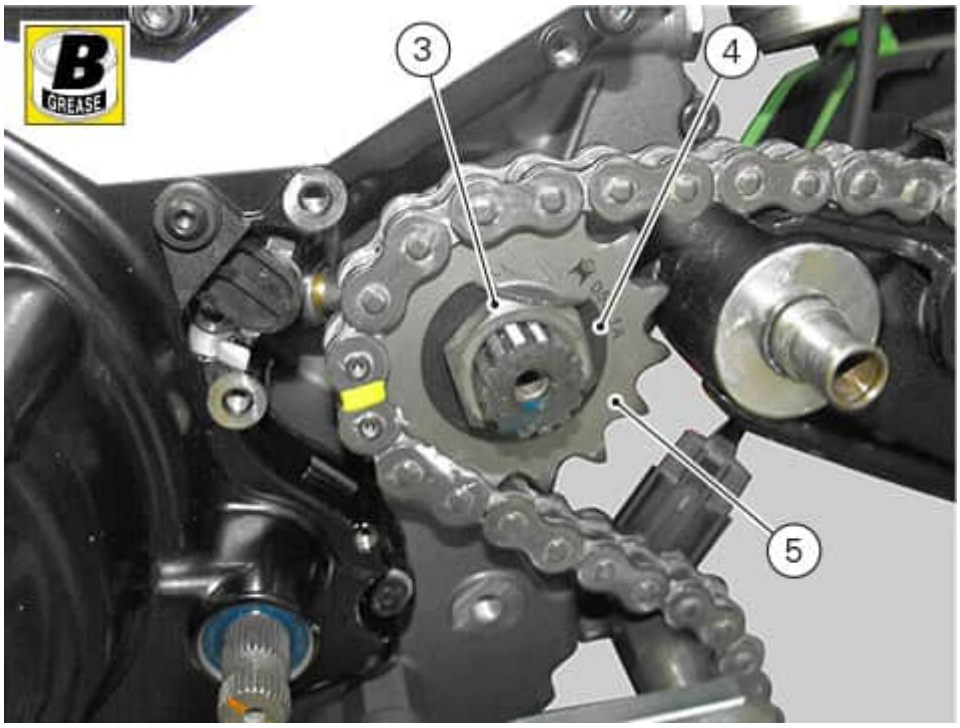
Refit the ring (8).
Grease the O-ring (7), and install it on the front sprocket spacer (6).
Fit the spacer, from the O-ring side, on the secondary shaft and drive it fully home against the inner ring of the bearing.
Before refitting the front sprocket, check that the spacer (6) is installed on the gearbox secondary shaft.



Check that the splines of the gearbox secondary shaft and the sprocket are in perfect condition.
Fit the front sprocket (5) on the gearbox secondary shaft, orienting it as shown. Fit lockwasher (4).
After having applied the recommended threadlocker, tighten the nut (3) to a torque of 186 Nm ±5%.
Bend the washer (4) over the nut.







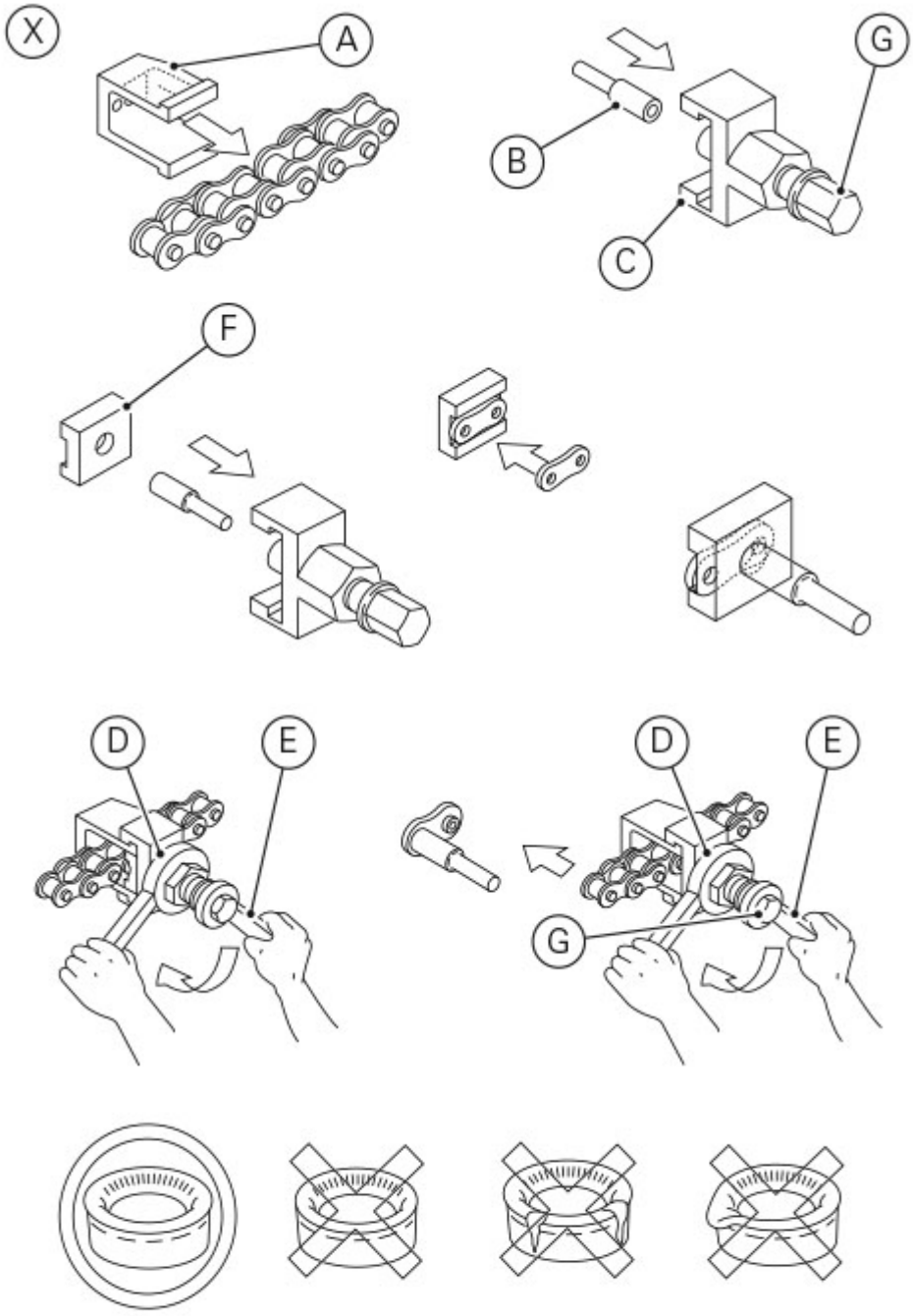
Fit the chain and close it using the tool (X) no. **88713.1344**, which was used to open the chain.
The tool consists of a holder (A), a punch (B), body (C) and two wrenches (D) and (E) and a plate holder (F).
Connect the two ends of the chain with the external link, and manually fit the plate onto the pins.

Warning
Lubricate the pins abundantly; try to avoid touching them with your hands.

Fit the holder (A) onto the external link.
Fit the punch (B) into the body (C) and the plate holder (F).
Fit the body (C) onto the holder (A) which holds the chain in position.
Manually turn the bolt (G) until the plate holder (F) is seated against the plate itself.
Use wrenches (D) and (E) to turn the bolt (G) clockwise until the chain pin is in contact with the holder (F).
Remove the holder (A) from the tool.
Manually turn the bolt (G) until the punch (B) is brought into contact with the pin to be riveted, taking care that they are aligned.
Use wrenches (D) and (E) to turn the bolt clockwise until the punch (B) is seated against the chain plate.
To complete riveting, repeat the entire procedure with the second pin.

Warning

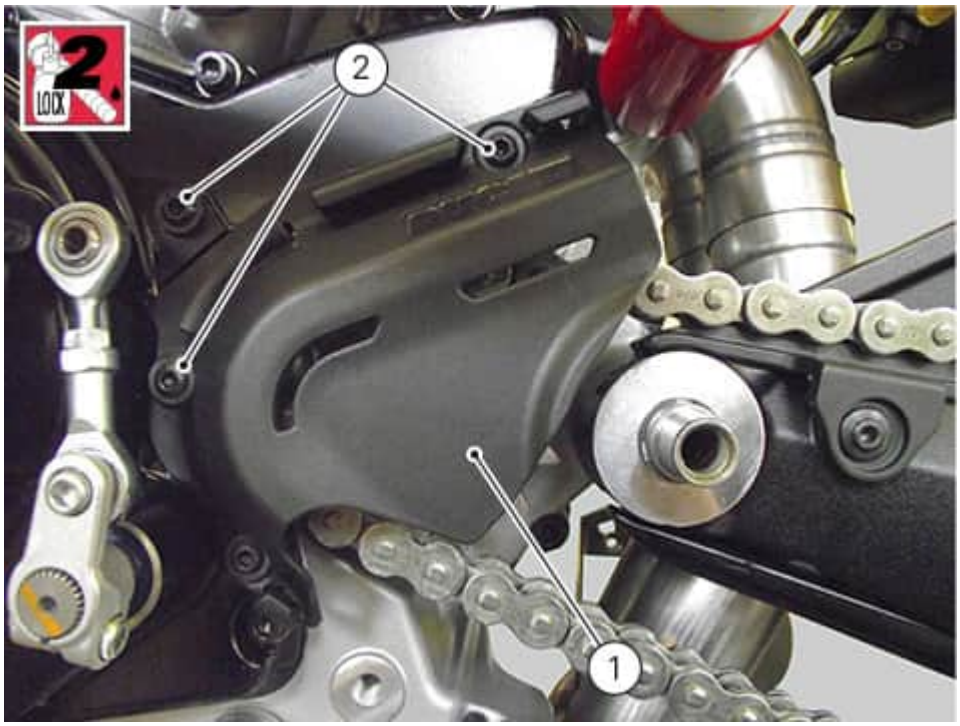
Carefully check the two pins: the figure shows the correct result of the procedure.



Tension the chain (Adjustment of chain tension).

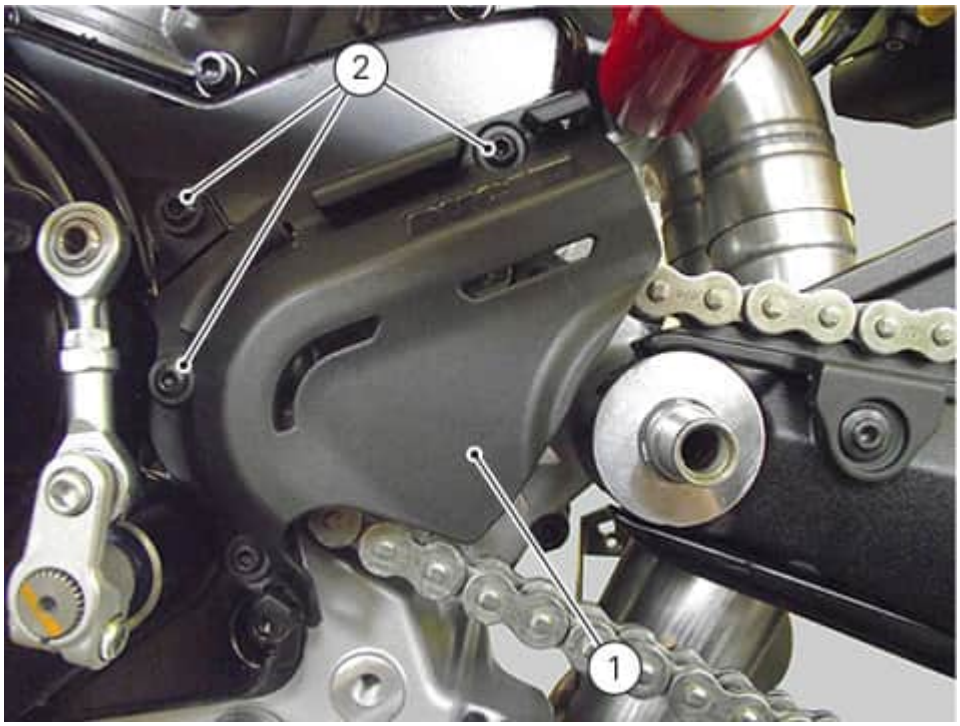
Apply the recommended threadlocker to the screws (2).

Fit the sprocket cover (1) and tighten the screws (2) to a torque of 6 Nm ±10%.

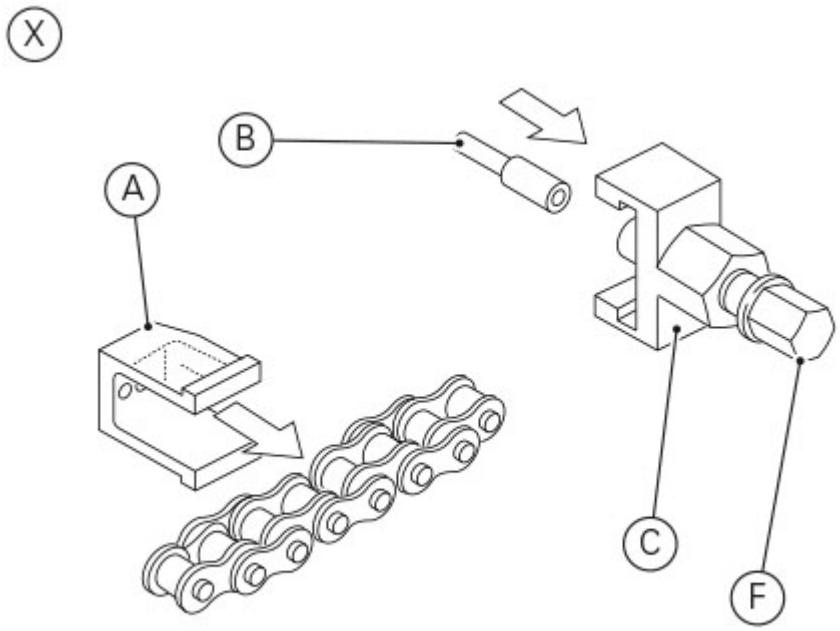

2.
LOCK
2
1

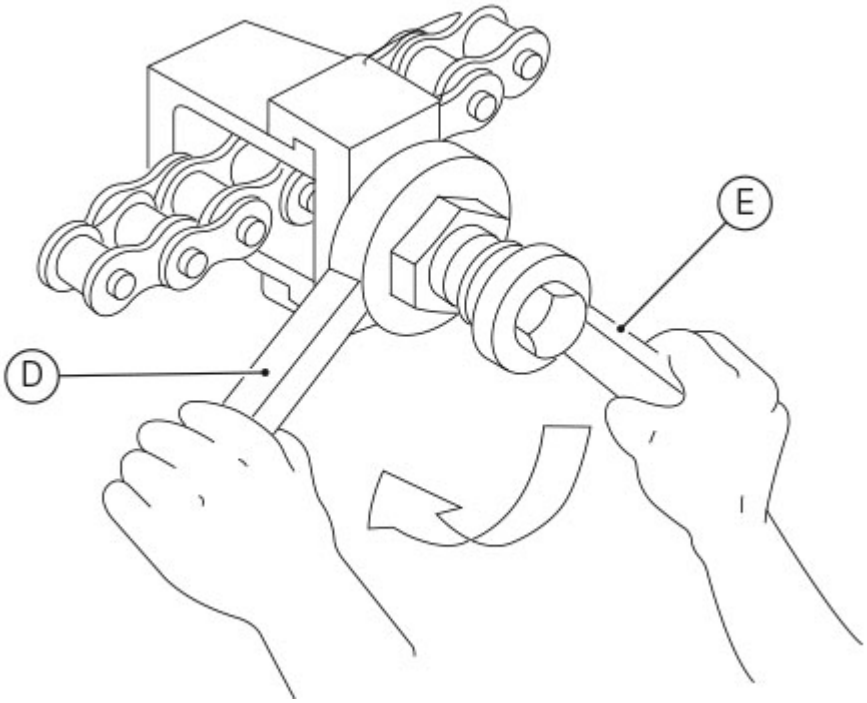
Removing the front sprocket

Undo the screws (2), and remove the chain cover (1).
Slacken the chain (Adjusting the chain tension).

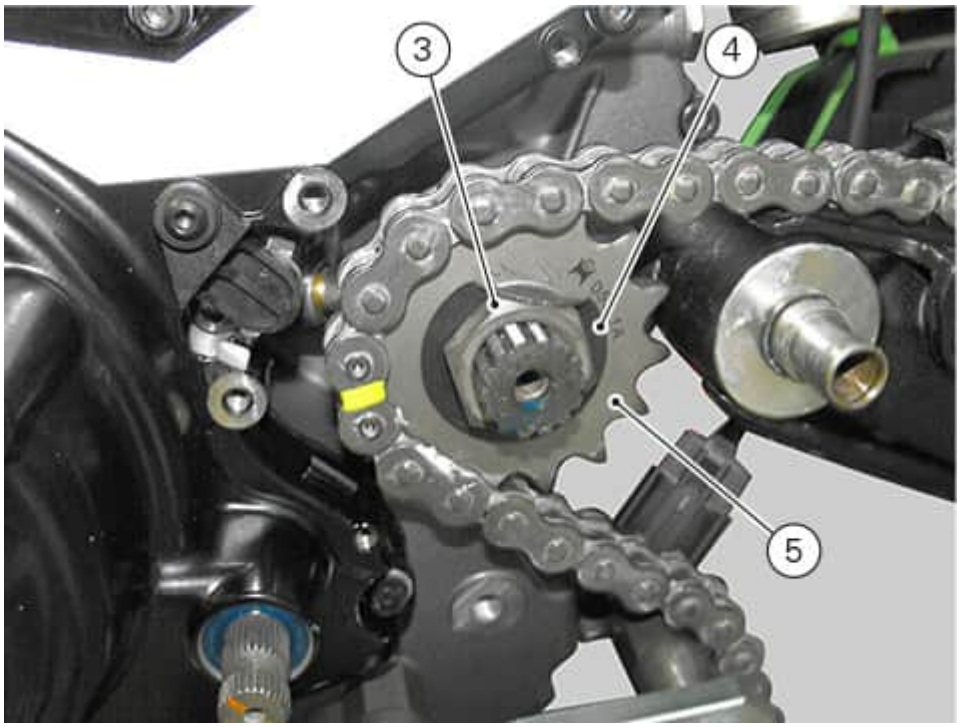


Remove the chain using tool (X) no. **88713.1344**.
The tool consists of a holder (A), a punch (B), a body (C) and two wrenches (D) and (E).
Fit the link to be opened into the holder (A).
Fit the punch (B) into the body (C) and manually undo the screw until the punch no longer protrudes.
Fit the holder (A) and the link into the body (C).
Manually turn the bolt (F) on body (C) so that the punch (B) gets against the pin, taking care that they are aligned. Fit the hexagon wrench (D) into the hexagonal part of the body (C) and the wrench (E) onto the bolt.
Turn clockwise the bolt (F) until the pin comes out.



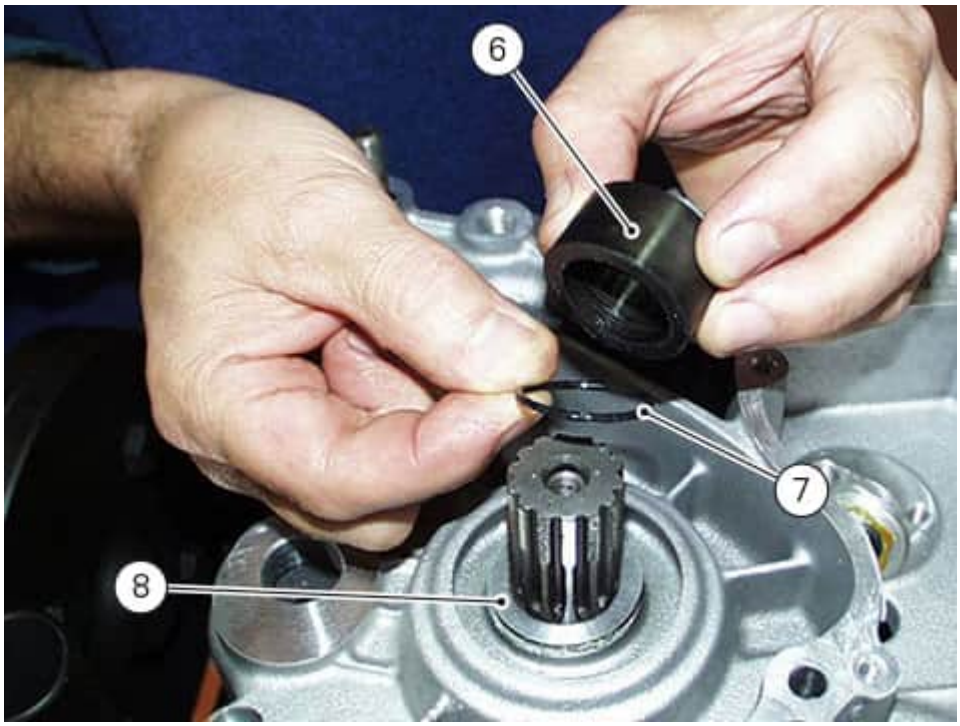


Remove the chain.
Engage a low gear and unscrew the nut (3).
Remove the nut (3) and the lockwasher (4) on the sprocket.
Remove the front sprocket (5) from the gearbox secondary shaft.



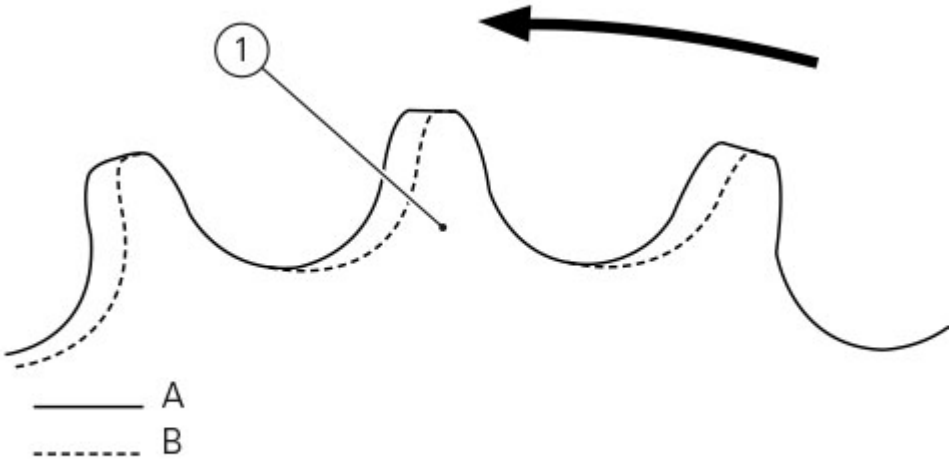
Remove the spacer (6) with O-ring (7) and washer (8) from the gearbox secondary shaft.

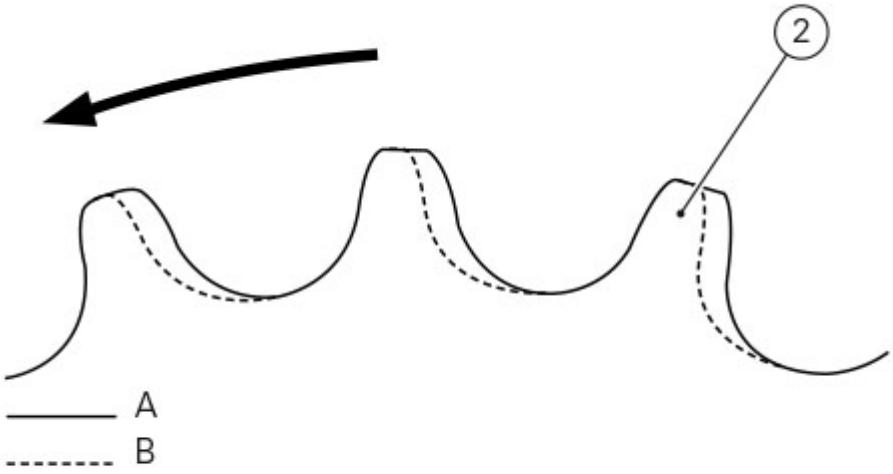
Important
The O-ring must be renewed upon removal.


6
7
8

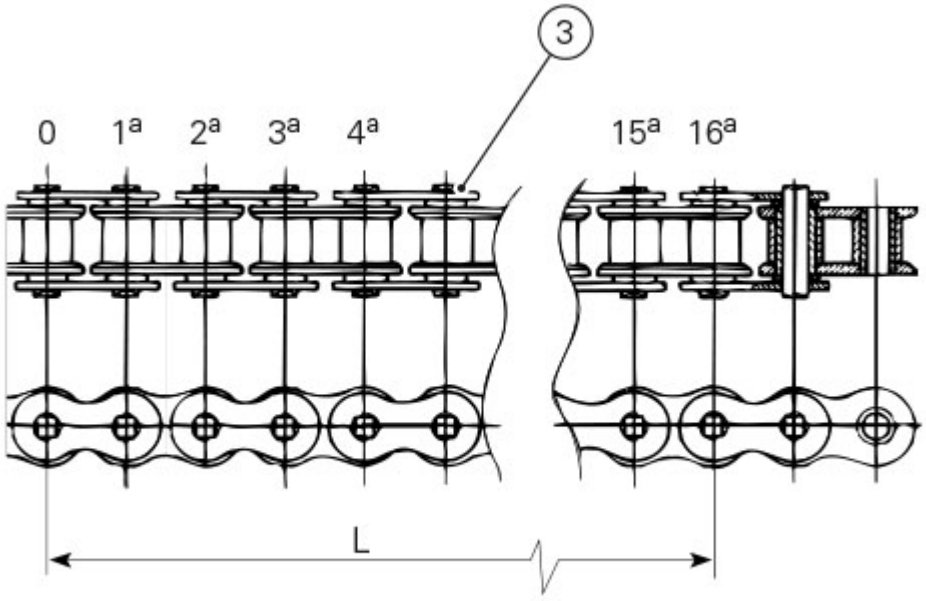
Inspection of the final drive

To check the final drive wear, visually check the front sprocket (1) and the rear sprocket (2).
If the teeth are worn as shown in the figure (dotted line), the final drive must be replaced.





To check the chain (3), keep the chain taut and measure 16 links.
If the length (L) is greater than 256.5 mm, the chain should be replaced.
Make sure that the rear sprocket (2), front sprocket (1) and chain (3) are all replaced together as a set.

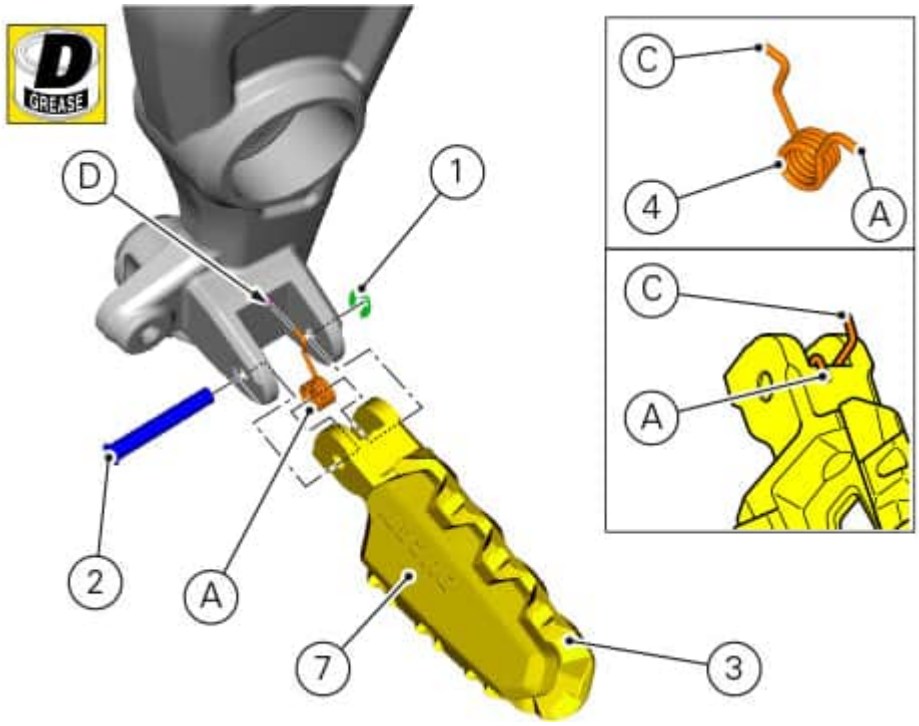

3
0
1ª
2ª
3ª
4ª
15ª
16ª
L

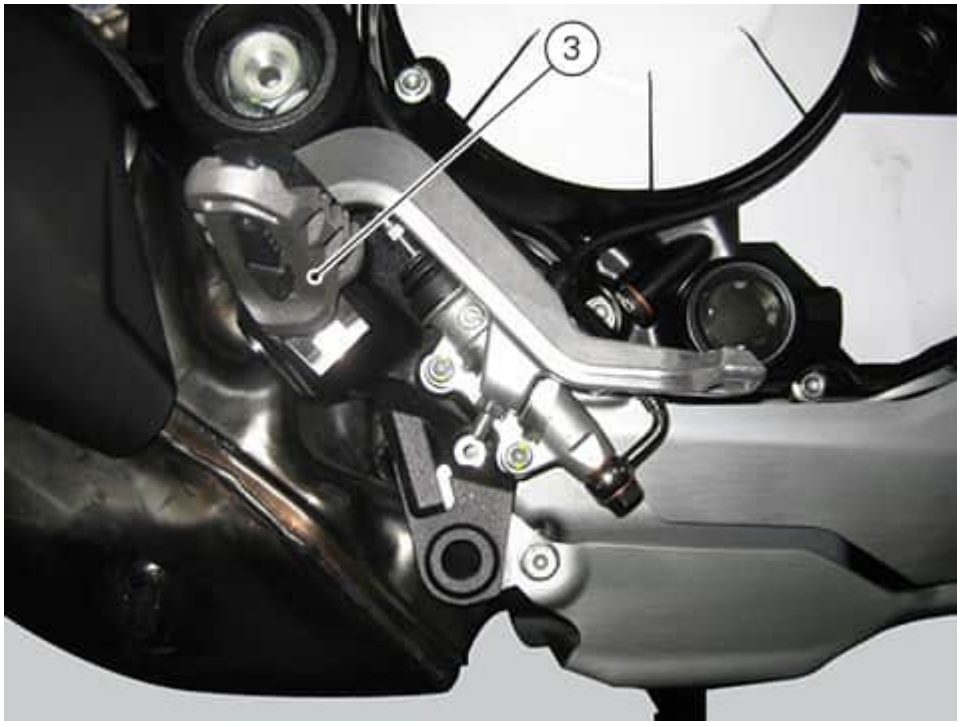
Refitting the footpegs

Refitting the front footpegs

Note
The refitting of the front RH footpeg is described in detail; the LH footpeg can be removed following the same procedure.

Position spring (4) so that the end (A) rests on the footpeg (3).
Position footpeg (3) inserting the end (C) of spring (4) in the hole (D) of the frame plate.
Fit pin (2) as shown.
Lock pin using circlip (1).
If previously removed, refit the footpeg rubber block.



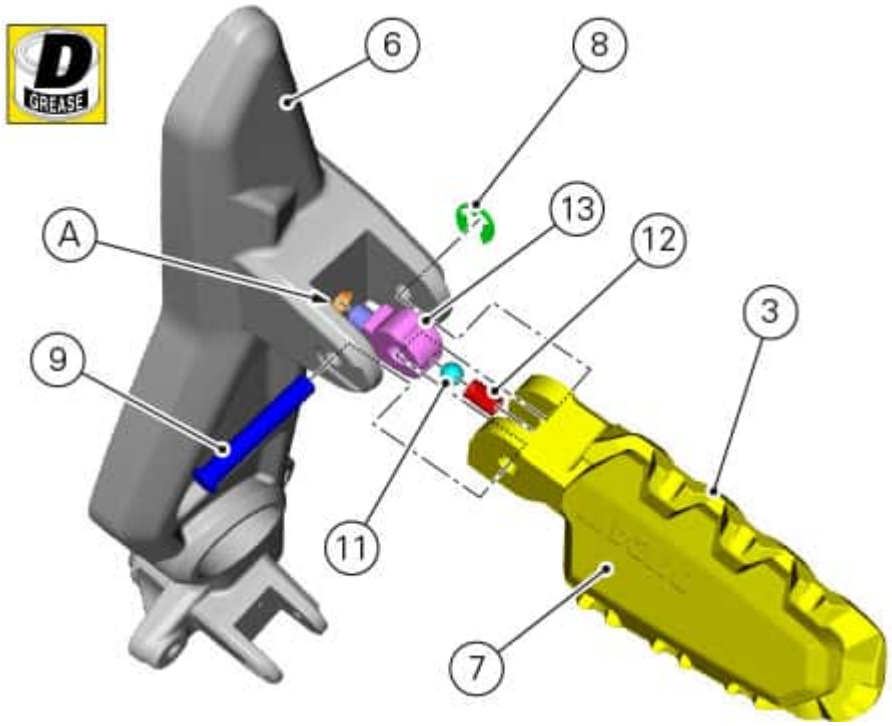


Refitting the rear footpegs

Note

Refitting of the rear RH footpeg is described in detail; the LH footpeg can be removed following the same procedure.

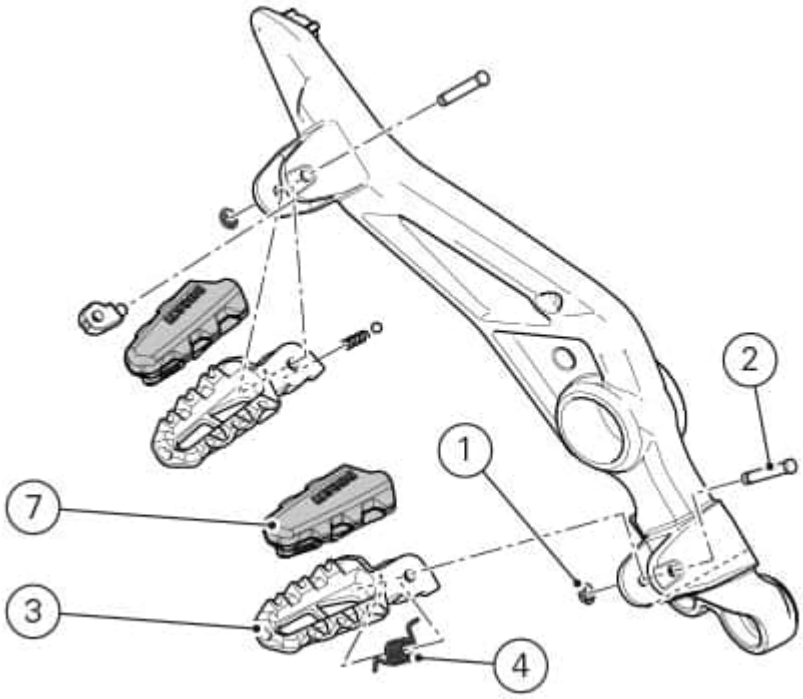
Insert spring stopper (13) into the hole (A) of the rear RH footpeg holder plate (6) as shown. If necessary, smear pin (B) retaining spring (13) with recommended grease in order to keep it in the correct position.
Insert the spring (12) into the special hole of the footpeg (3).
Fit the ball (11) on the spring (12).
Fit the footpeg (3) to rear RH footpeg holder plate (6) fitting pin (9), positioning parts as shown.
Fasten pin using circlip (8).
If previously removed, refit the footpeg rubber block (7) and engage tabs (B) in the corresponding grooves on footpeg (3), pressing until teeth on footpeg rubber block are fitted into the grooves beyond profile of footpeg.



Removing the footpegs

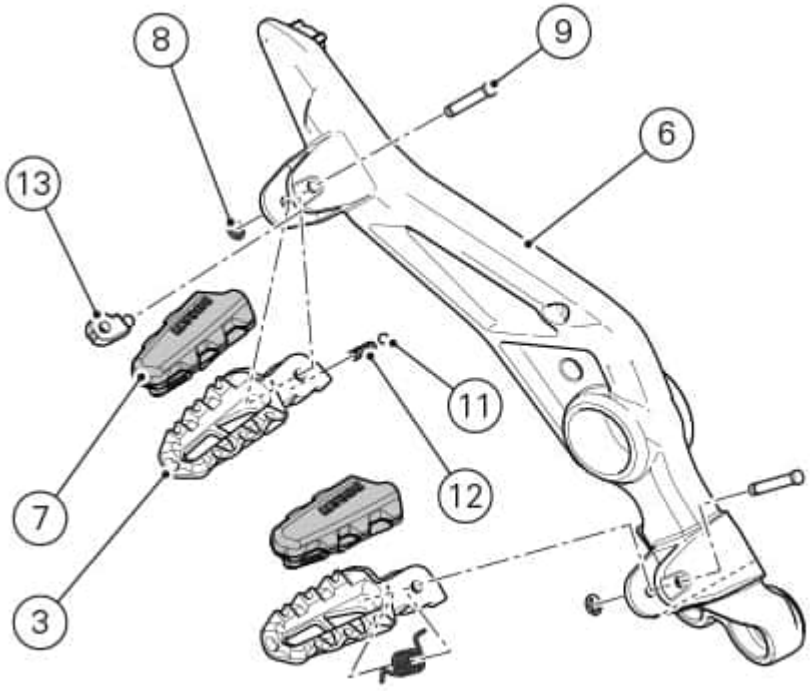
Removing the front footpegs

Remove the circlip (1) thereby releasing the pin (2).
Slide out pin (2), while supporting the footpeg (3).
Slide out footpeg (3) from its seat and collect spring (4).
If necessary, remove the footpeg rubber block (7).



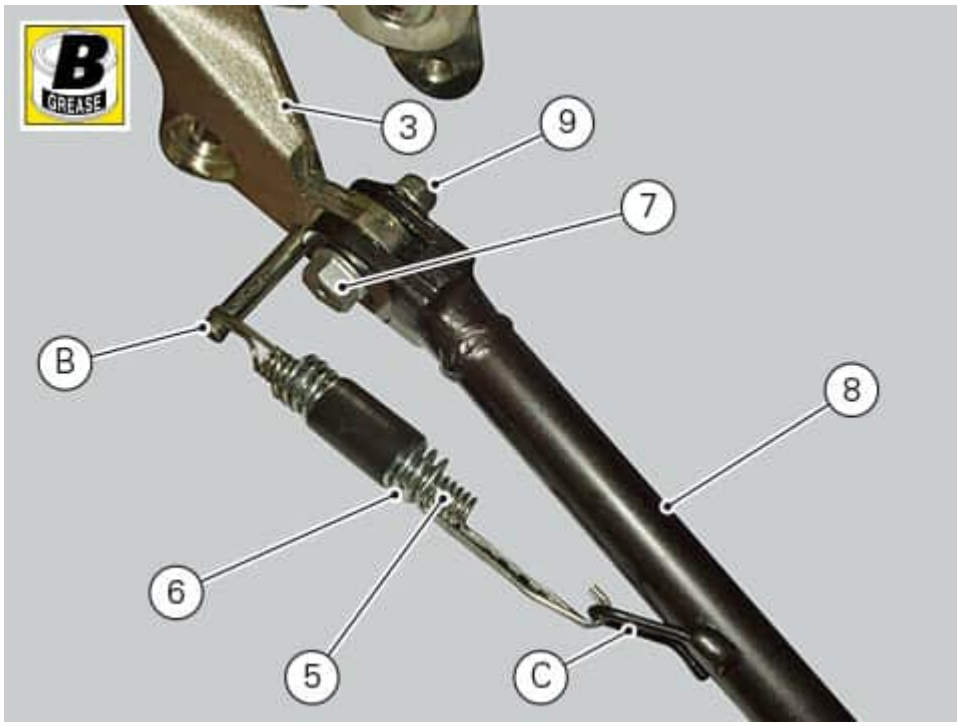
Removing the rear footpegs

If necessary, remove the rubber cap (7).
Remove the circlip (8) thereby releasing the pin (9).
Slide out pin (9) from frame (6), holding the footpeg (3) and making sure that the ball (11) and the spring (12) are not released.
Slide out footpeg (3) from its seat and collect spring (12) and ball (11).
Remove the spring stopper (13).

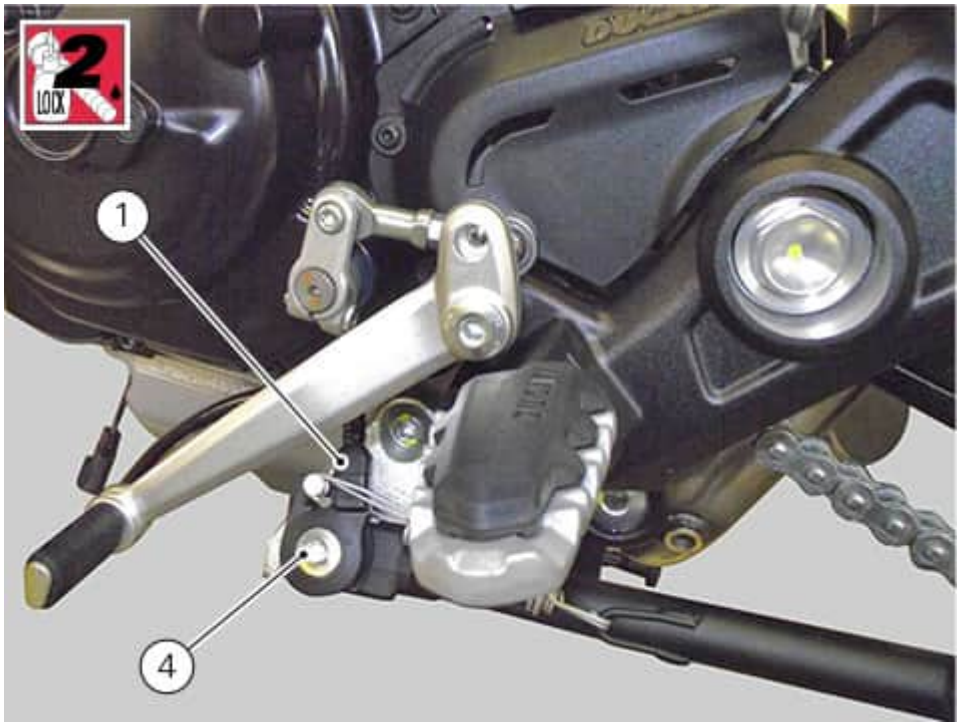


Refitting the side stand

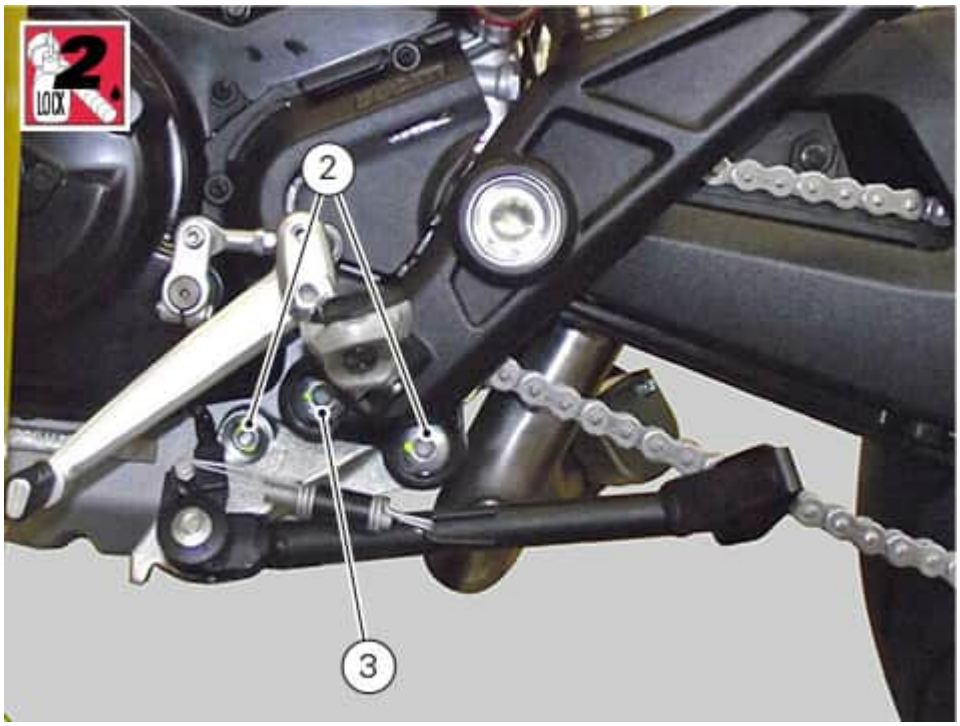
Grease the side stand leg (8) and fit it to the bracket (3). Secure it with the pin (7) and the nut (9).
Tighten nut (9) to a torque of 20 Nm ± 10%.
Position the side stand return springs (5) and (6) and attach them to fasteners (B) and (C) on bracket and stand.



Place the switch (1) on the plate, on its pin (7).
Fit the retaining screw (4) with recommended threadlocker and tighten to a torque of 5 Nm ±10%.



Position the side stand bracket (3) to the frame and fit the two screws (2) smeared with recommended threadlocker. Tighten screws (2) to a torque of 43 Nm ± 10%.



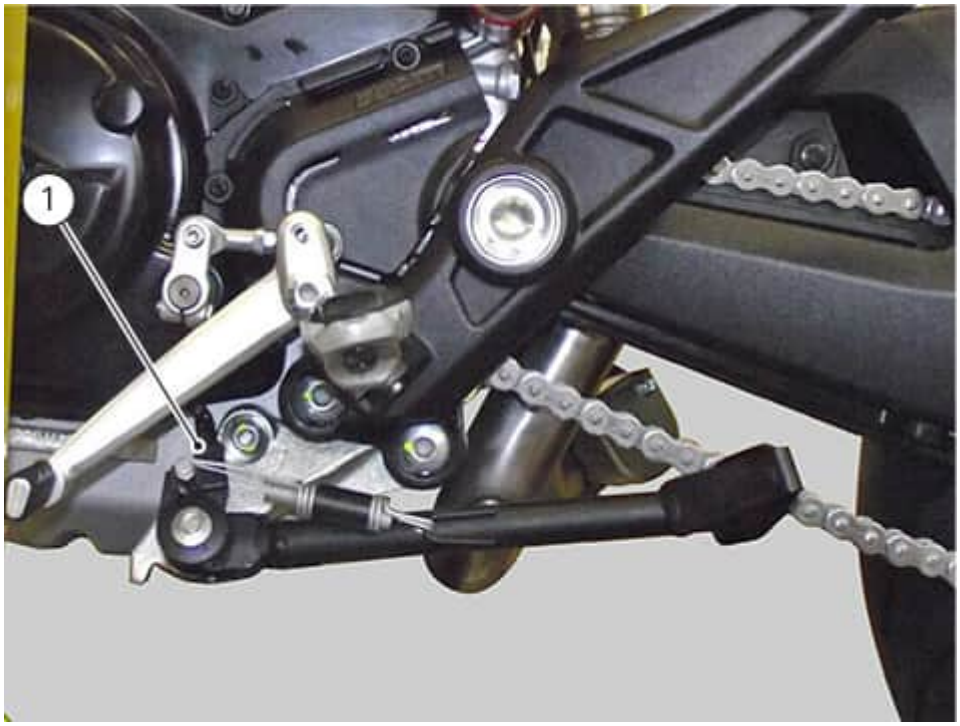
Connect the side stand switch connector (A) to the main wiring.
To position stand switch wiring, refer to table "Routing of wiring on frame".



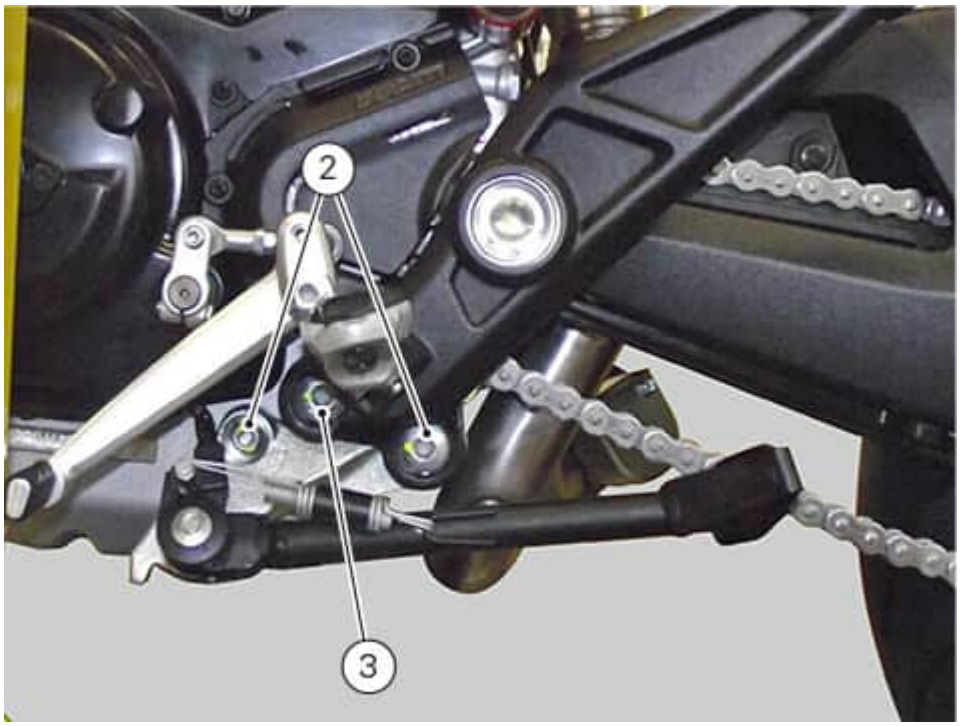
Removing the side stand

Disconnect connector (A) of the stand switch (1) from the main wiring.

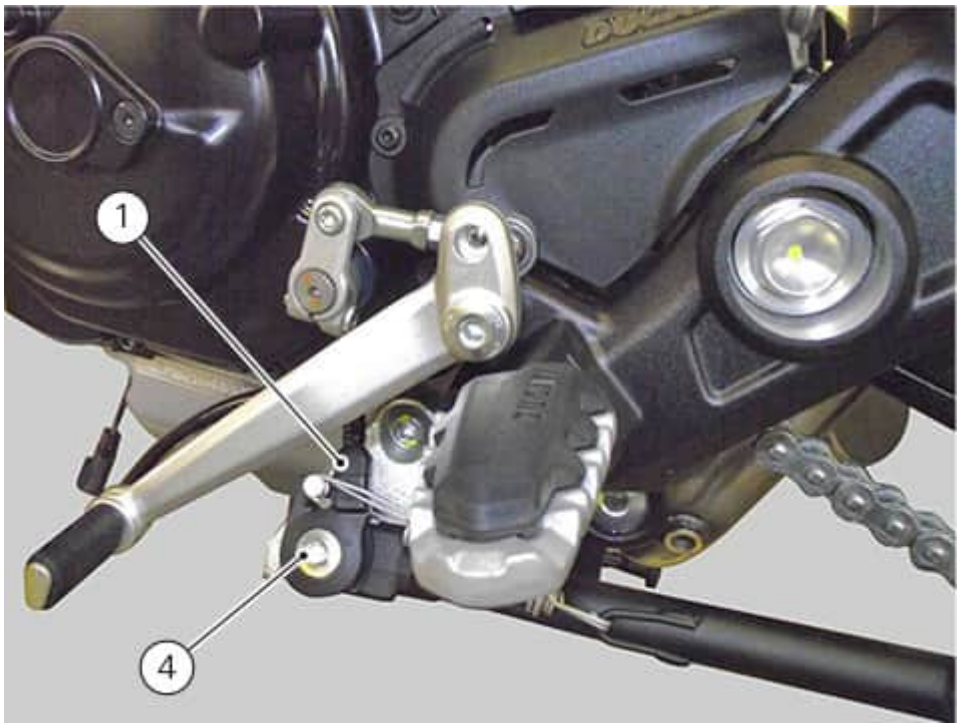




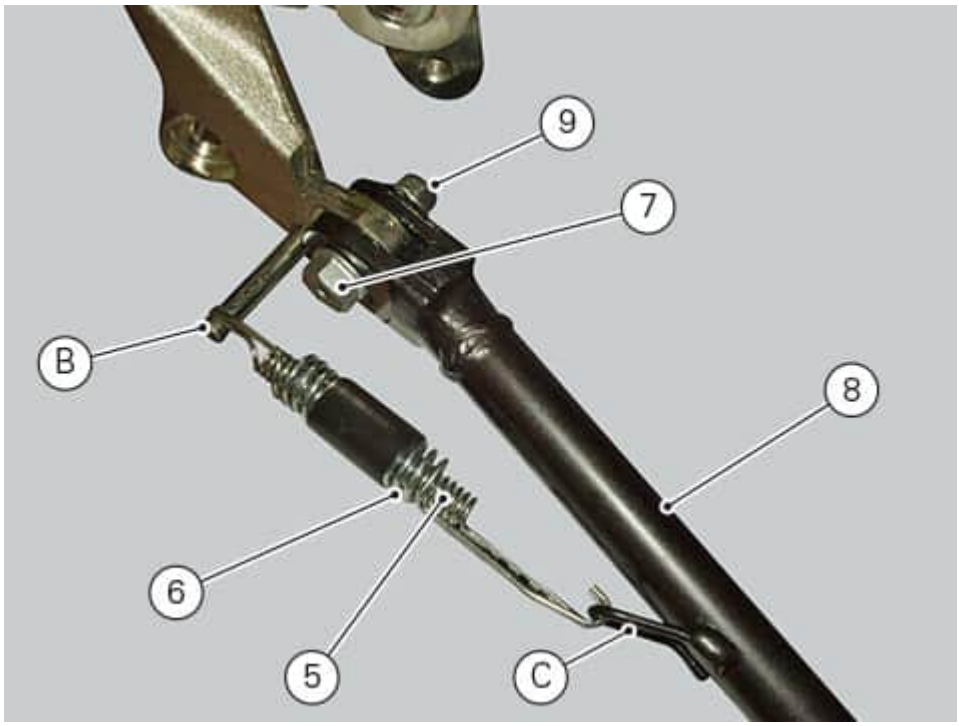
Undo the two fastening screws (2) of the side stand support plate (3) to the engine and remove the complete side stand.



Undo the retaining screw (4) and remove the side stand switch (1).



Release stand return springs (5) and (6) disengaging them from retainers (B) and (C). Unscrew the pin (7) securing the side stand to the bracket and remove side stand (8) and nut (9). Inspection



Inspecting the side stand

Fit the side stand leg to the bracket and check that there is no excessive clearance. Ensure that the ends of the side stand are not bent with respect to the shank.
A side stand which shows signs of cracking must be replaced immediately.

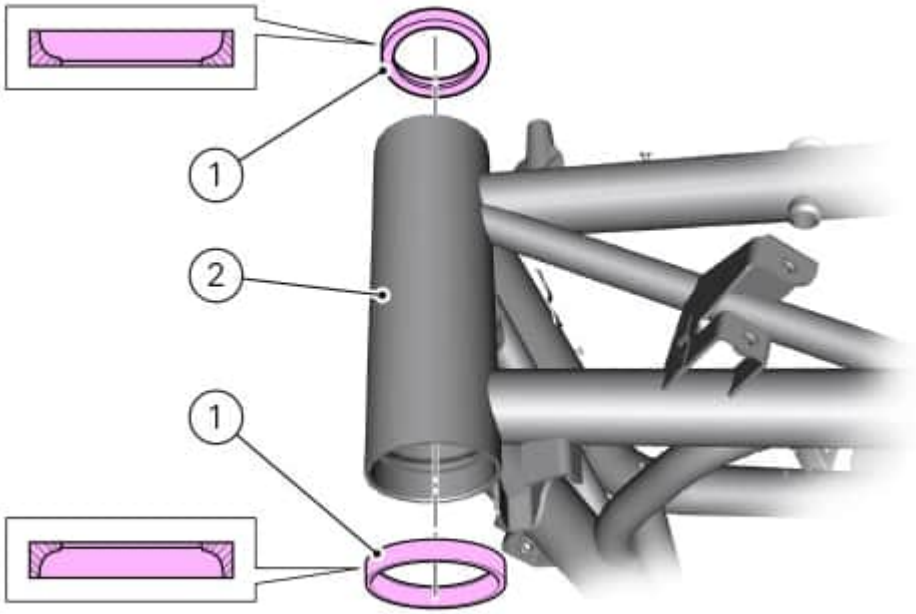
Refitting the rear subframe

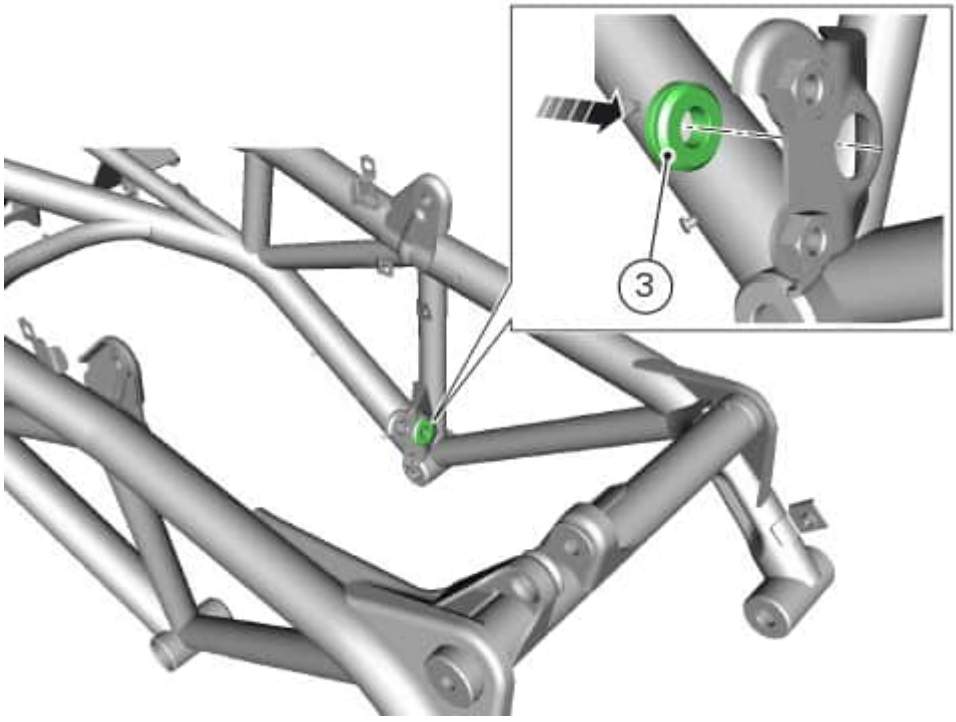
Refit left and right rear subframes.
Start the upper and lower screws (1) securing rear right subframe (2) to plates, repeat the same operation for the left side.
Tighten screws (1) and (2) to a torque of 24 Nm ± 5%.



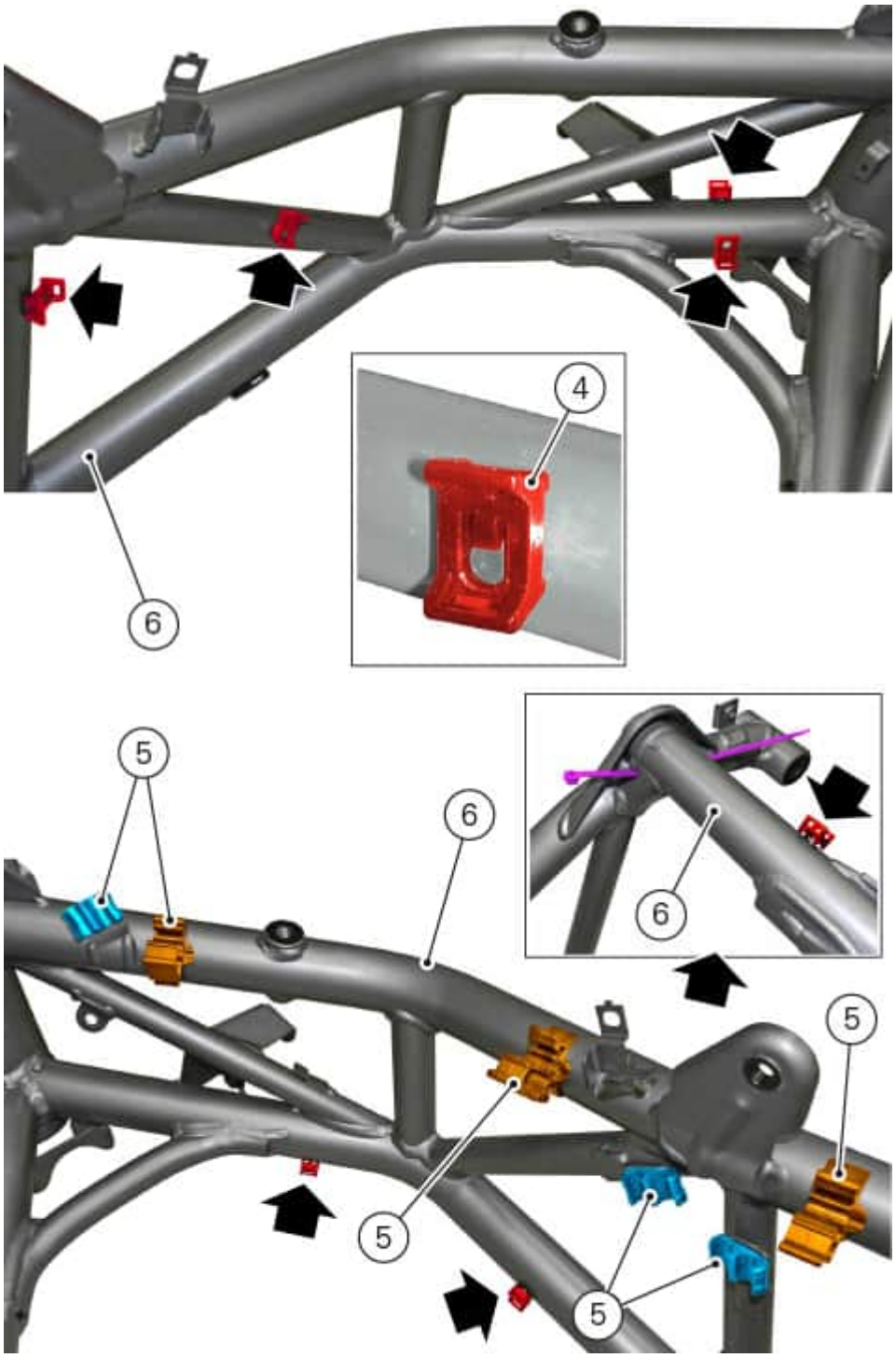
Refitting the structural parts and frame

Make sure that the two outer rings (1) in the steering tube (2) and the vibration damper (3) are fitted.

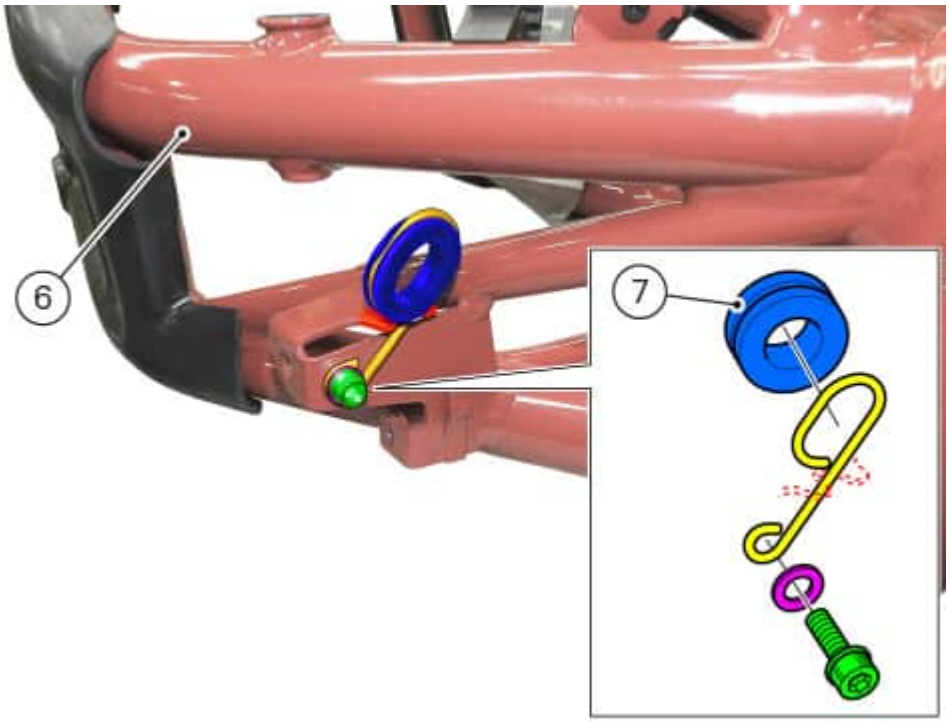




Make sure that the clips (4) and the hose clips (5) are fitted on the frame (6).



Make sure that the vibration damper is fitted (7).


6
7

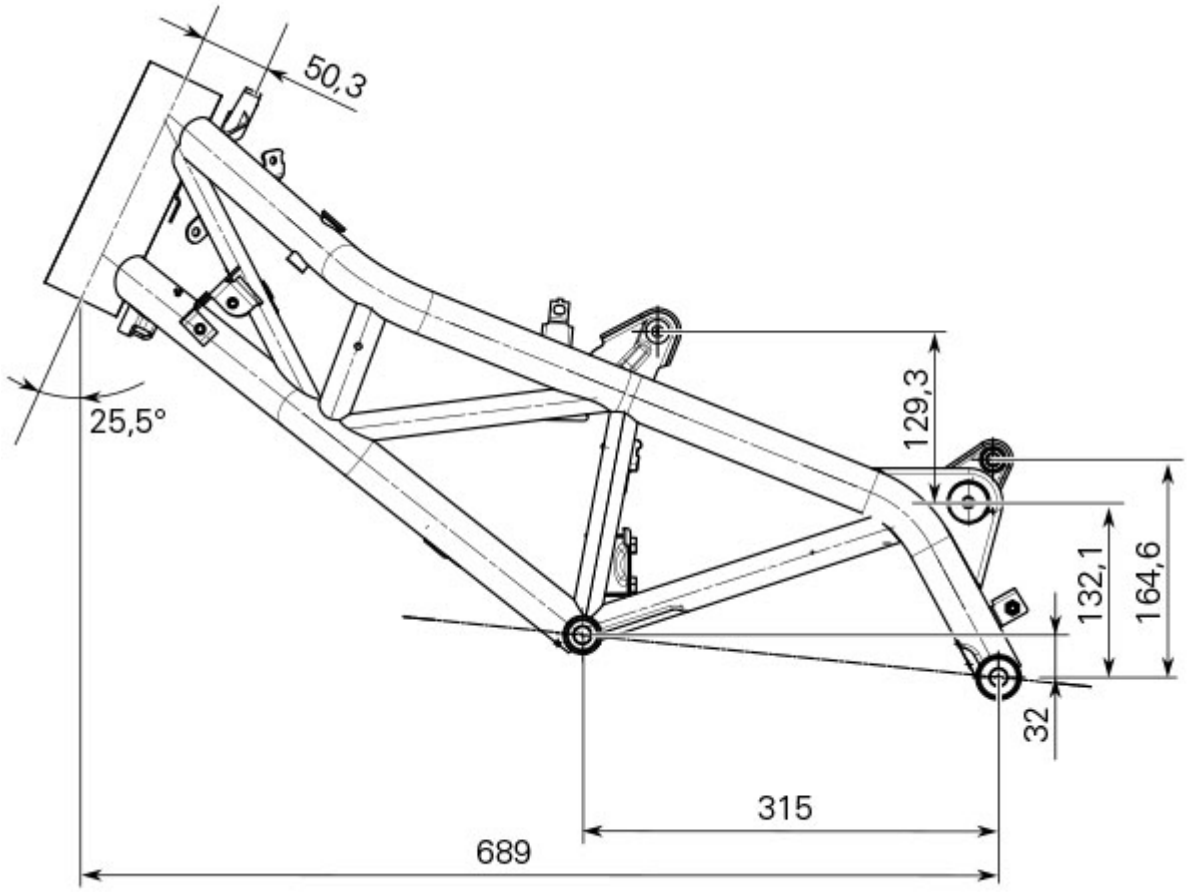
Checking the frame

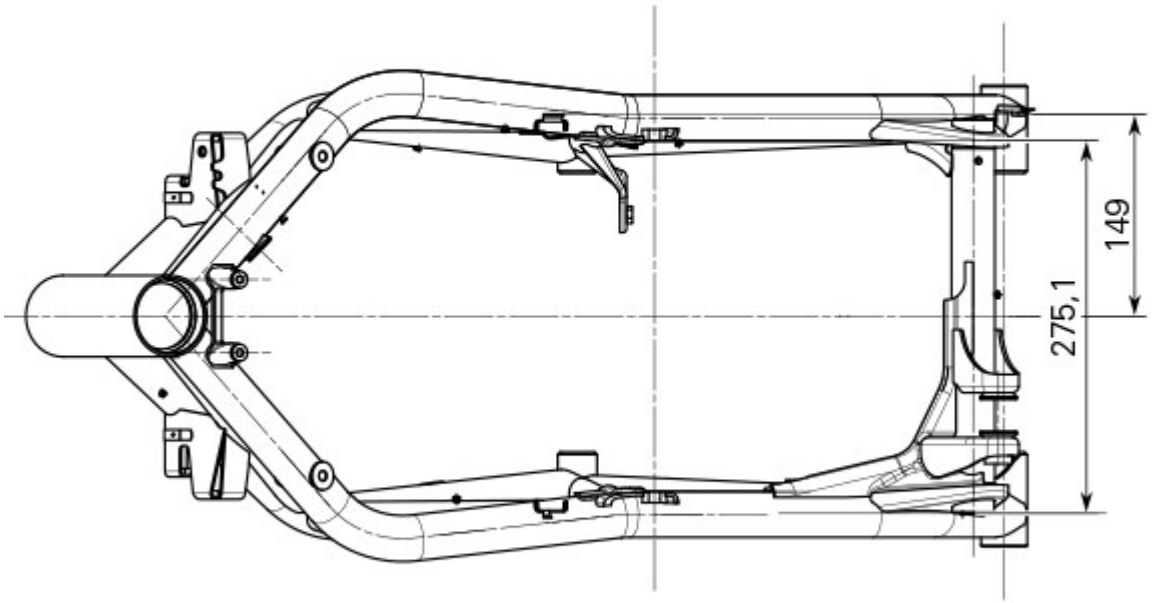
Compare the dimensions of the frame with the values indicated here to determine whether it needs to be re-aligned or replaced.

Important

Damaged frames must be changed, not repaired. Any work carried out on the frame can give rise to potential danger, infringing the requirements of EC directives concerning manufacturer's liability and general product safety.

Frame overall dimensions (mm)




149
275,1

Removing the rear subframe

Undo the upper and lower screws (1) securing rear right subframe (2) to plates, repeat the same operation for the left side.
Remove left and right rear subframes.



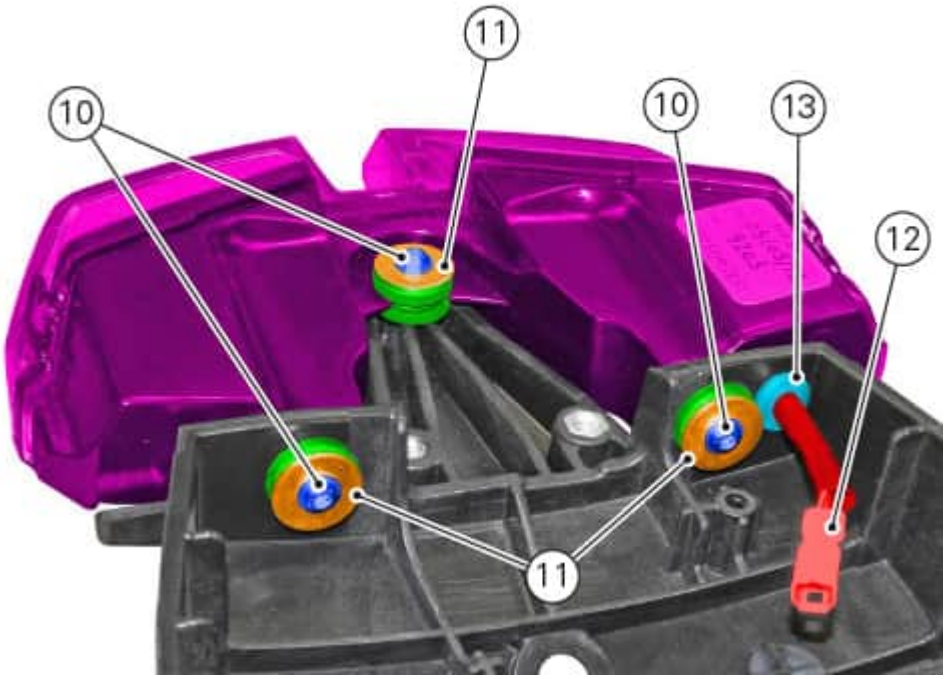
Removing structural components and frame

Before carrying out dimensional checks on the frame, remove all the fitted superstructures, referring to the removal procedures outlined in the relevant sections of this manual.
The rear subframe is a structural component of the frame.
Both serve to support motorcycle superstructures and must therefore be in perfect condition.

The list below indicates the components to be removed in a logical order.
Remove the seats (Removing the seat).
Remove the side body panels (Removing the side body panels and the tail guard, Hypermotard – Hypermotard SP) (Removing the side body panels and the tail guard, Hyperstrada).
Remove the half-fairings (Removing the fairings).
Remove the fuel tank (Removing the fuel tank).
Remove the air filter (Removing the air filters).
Remove the throttle control cable (Removing the throttle control).
Remove the airbox (Removing the airbox).
Remove the throttle body, the blow by and the oil breather pipe (Removing the throttle body).
Remove the secondary air system pipes and valve (Removing the secondary air system).
Remove the supply system and the injectors from the intake manifolds (Removing the throttle body).
Disconnect the spark plug caps.
Remove the exhaust system (Removing the exhaust system).
Drain the lubrication system (Changing the engine oil and filter cartridge).
Drain the coolant (Changing the coolant).
Remove the cooling system hoses and unions from the engine block (Removing cooling system hoses and unions).
Remove the water radiator lower retainer from the engine (Removing the water radiator).
Disconnect the starter motor/solenoid starter cable (Removing the starter motor).
Remove the gear shift (Removing the gear shift).
Remove the front sprocket (Removing the front sprocket).
Remove the side stand (Removing the side stand).
If present, remove centre stand (Removing the centre stand).
Disconnect the wiring connectors on the engine block (Routing of wiring on frame).
Remove the engine block from frame.

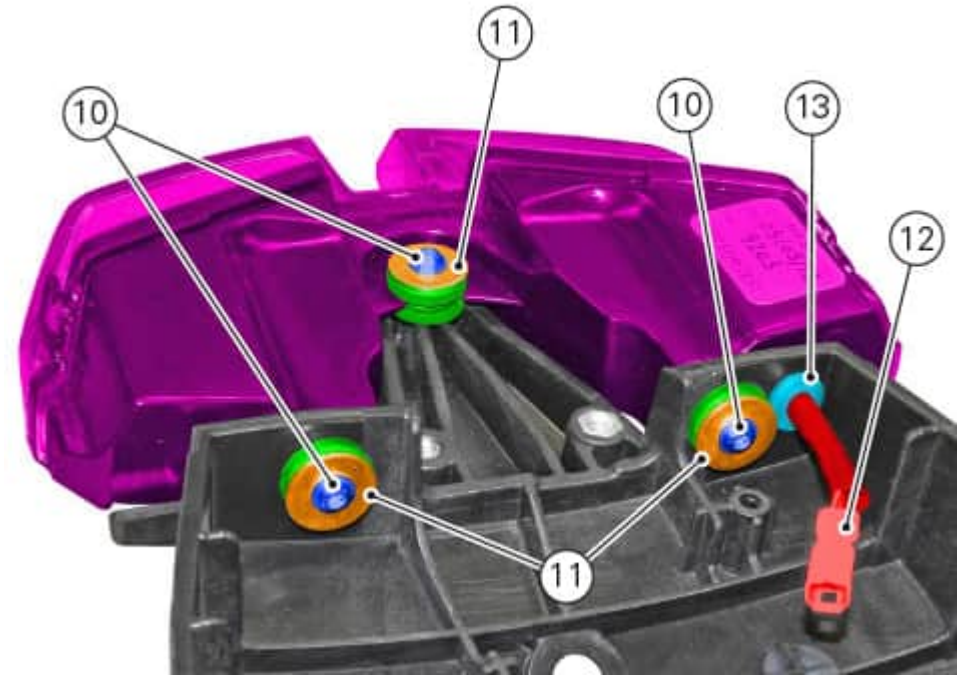
Refitting the tail light

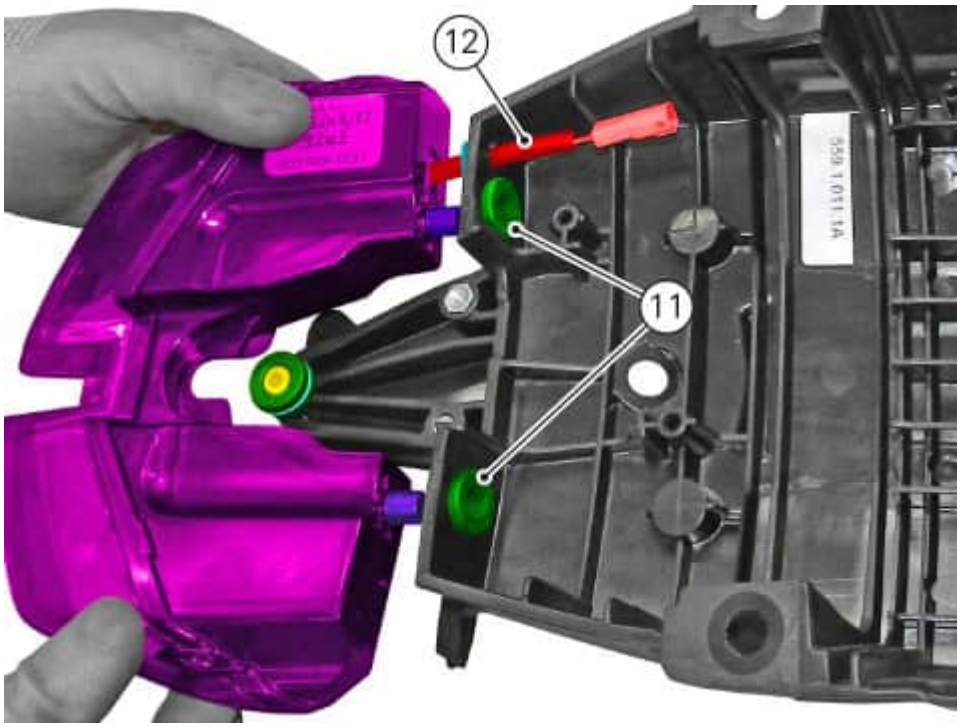
Position the tail light and tighten screws (10) to the specified torque of 18 Nm ± 10%.
Route the wiring (12) through the cable ring (13).



Removing the tail light

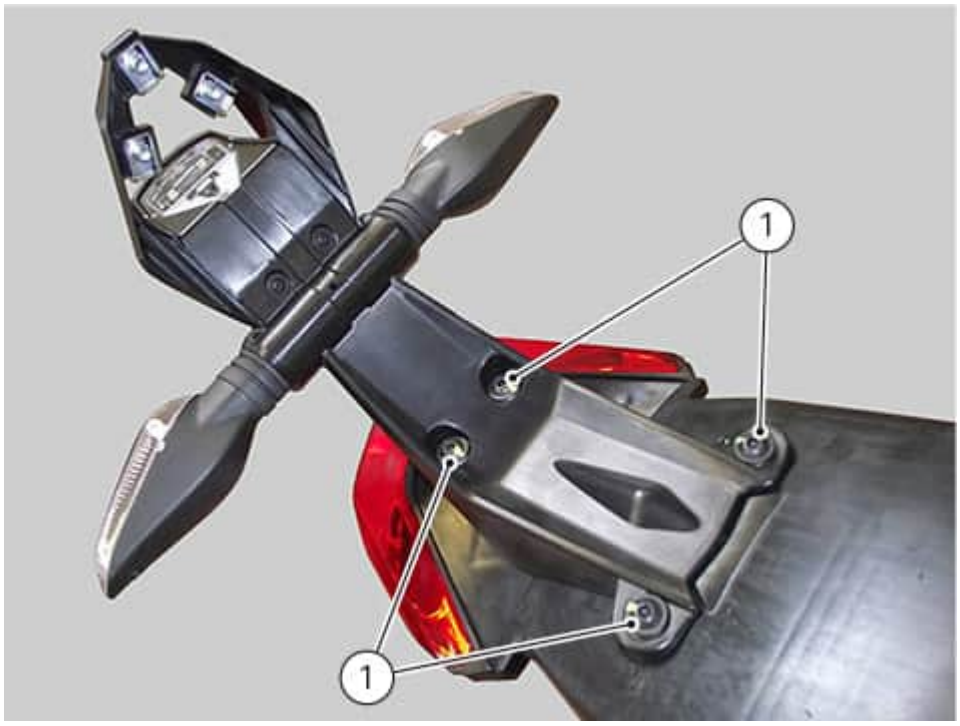
Loosen and remove the screws securing the tail light (10).
Remove the tail light by releasing the wiring (12) from cable ring (13).



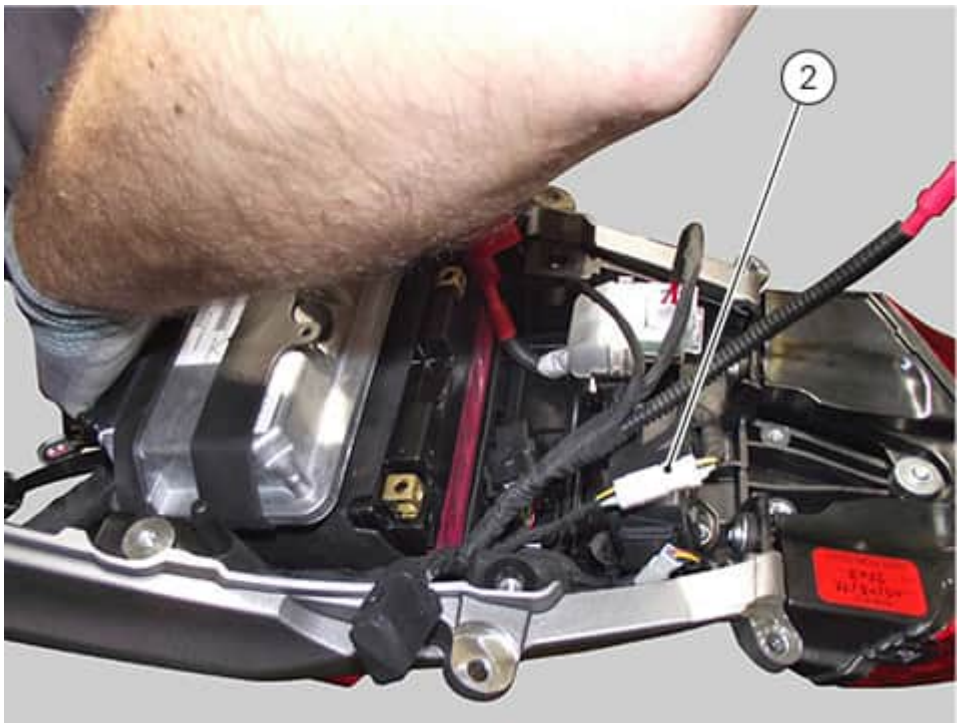


Refitting the number plate holder

Refit the number plate holder starting and tightening screws (1) to the specified torque of 20 Nm ± 10%



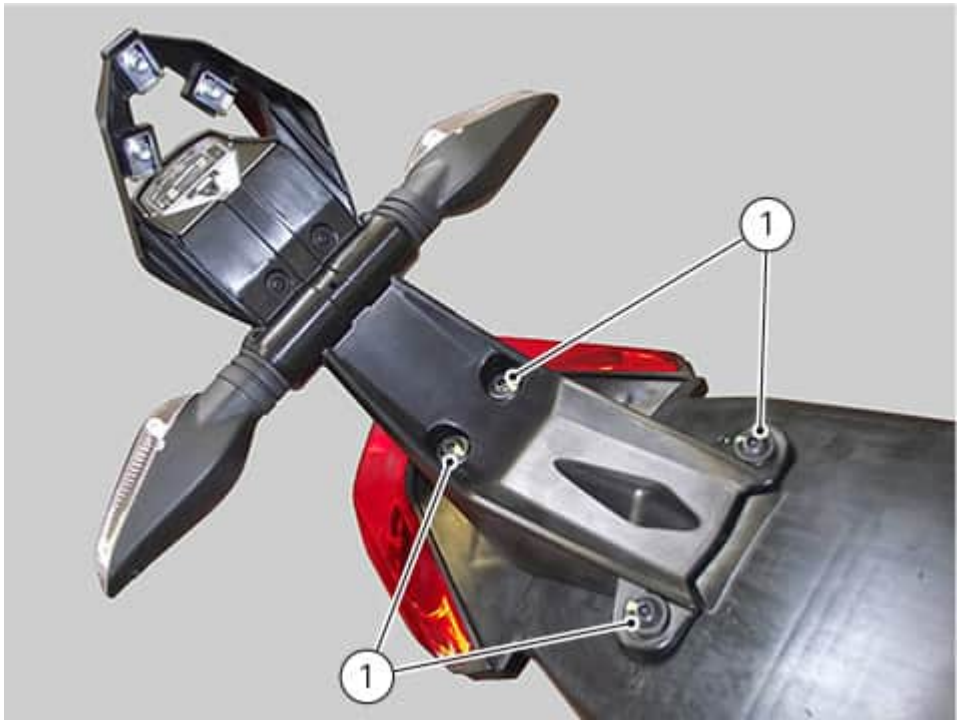
Connect the connector (2).



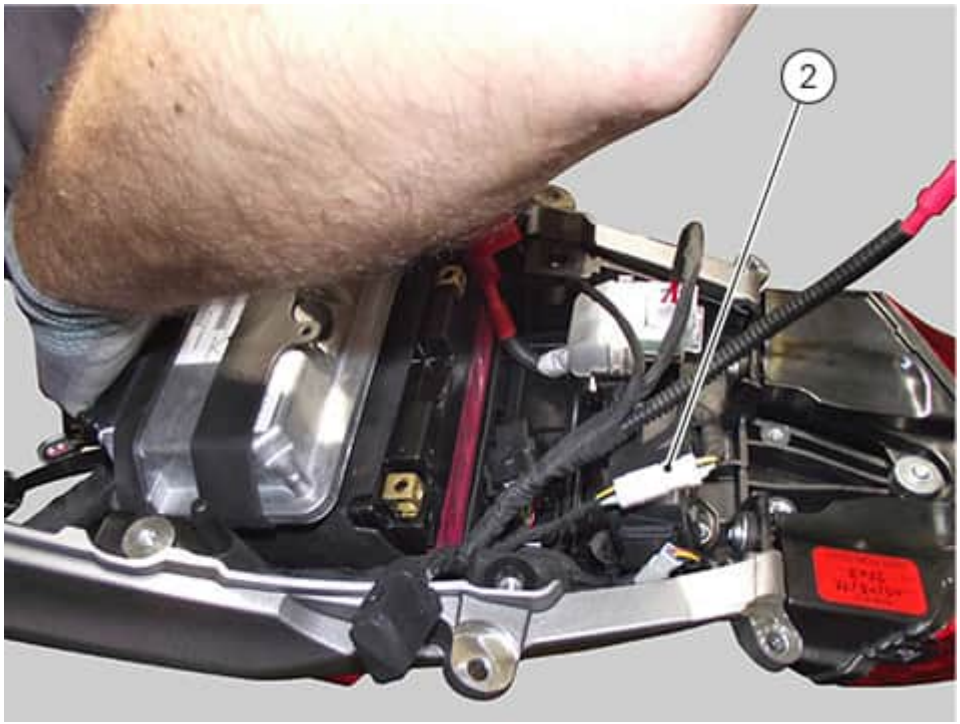
Removing the number plate holder

Remove the seat (Removing the seat).

Loosen screws (1) retaining number plate holder.



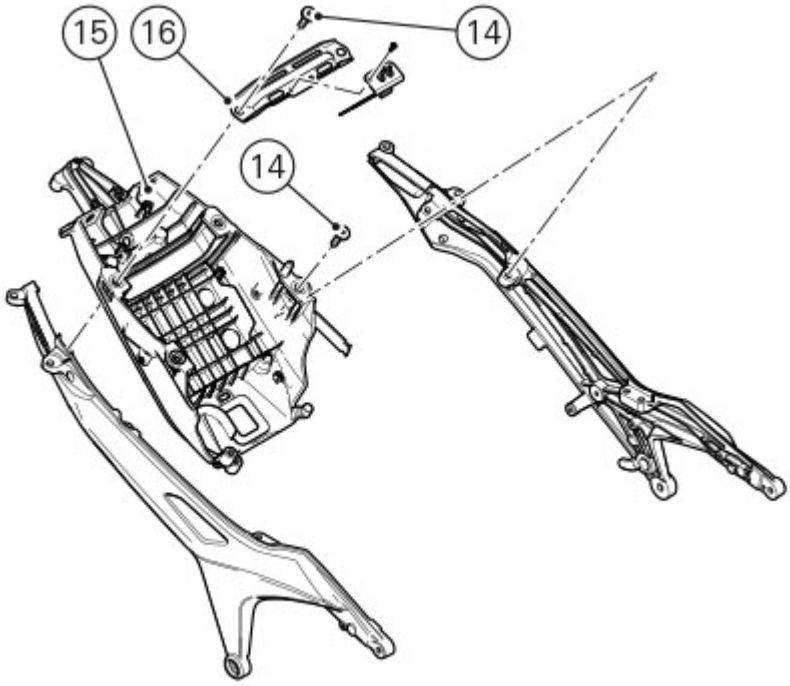
Disconnect turn indicator and number plate holder connector (2) from the main wiring.



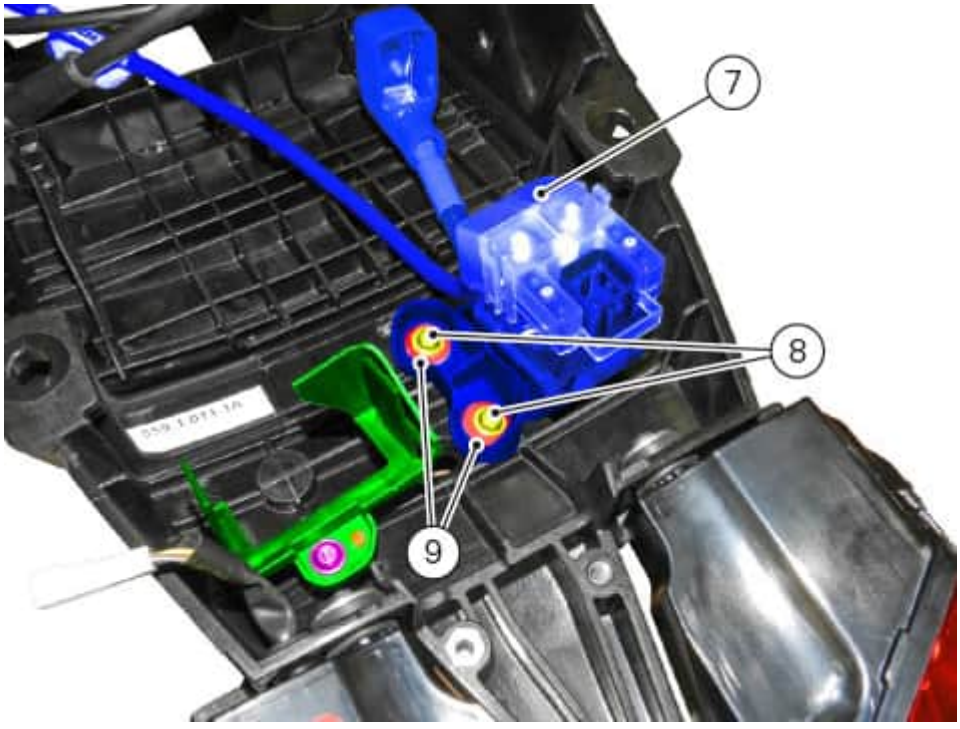
Remove the number plate holder.

Refitting the electric components compartment

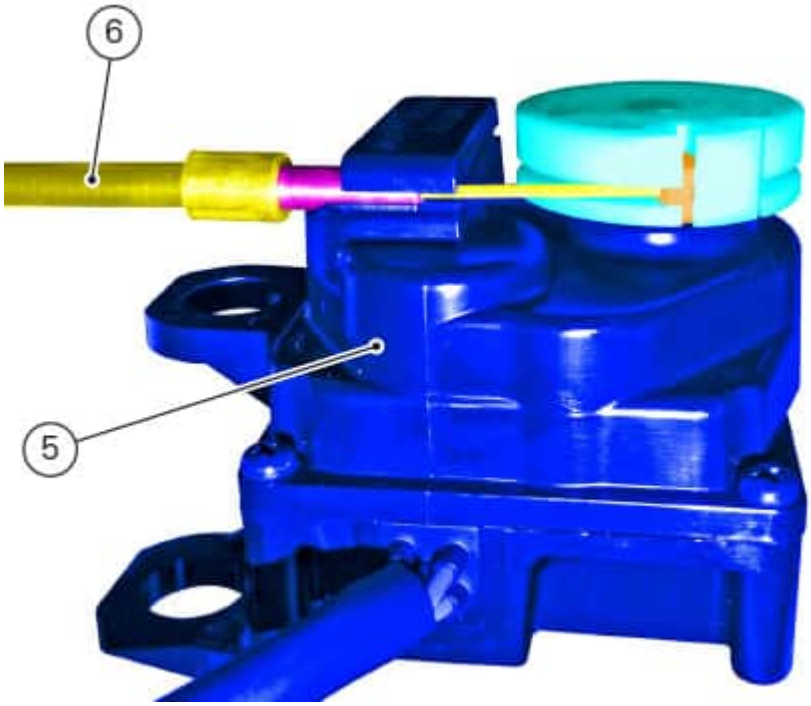
Position the electrical components compartment on the frame and tighten screws (14) to the specified torque of 18 Nm ± 10%.



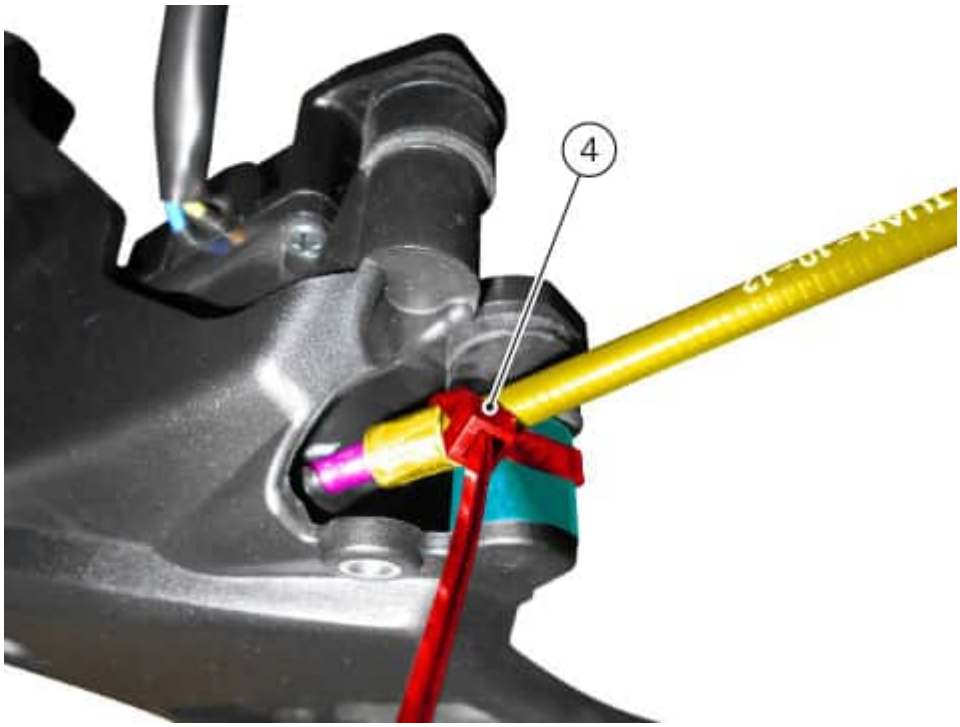
Fasten the solenoid (7) by tightening screws (8) to the torque of 5 Nm ± 10%.



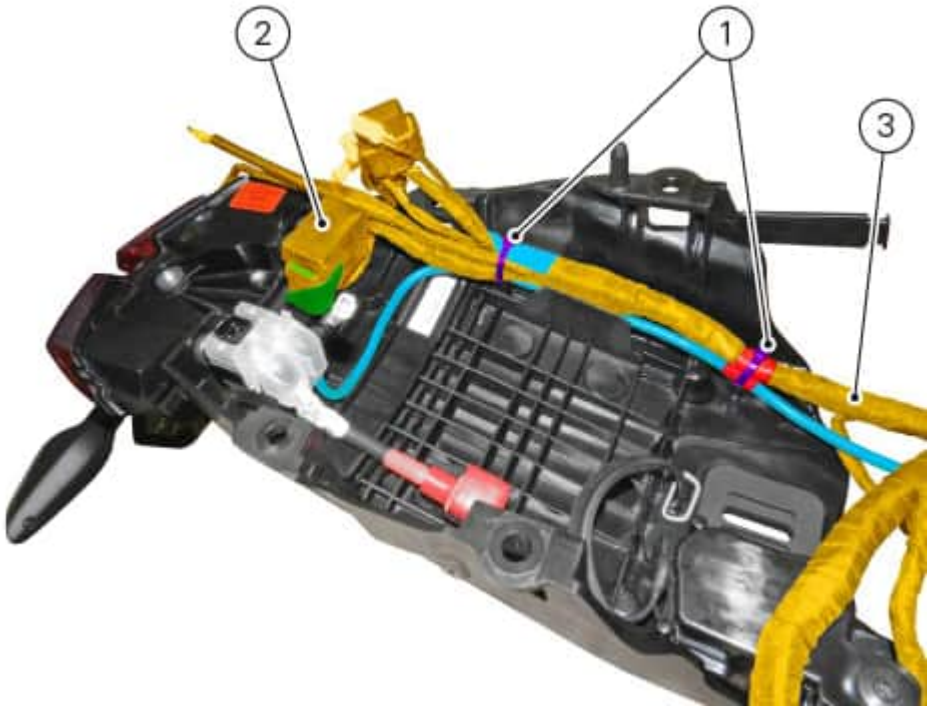
Connect exhaust valve motor (5) cable (6).



Fasten by the means of tie (4), the exhaust valve motor cable.



Position the fuse box (2) by means of special tabs.
Fasten main wiring (3) as shown in the figure, by means of clamps (1).

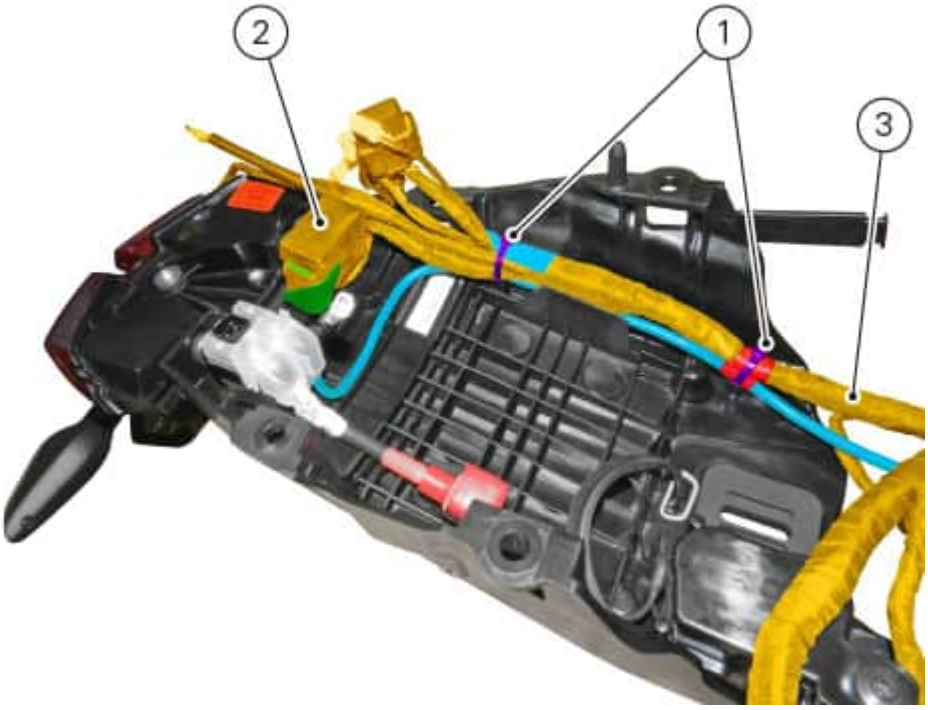


Refit the battery (Battery).
Refit the tail light (Refitting the tail light).
Refit the seat (Refitting the seat)

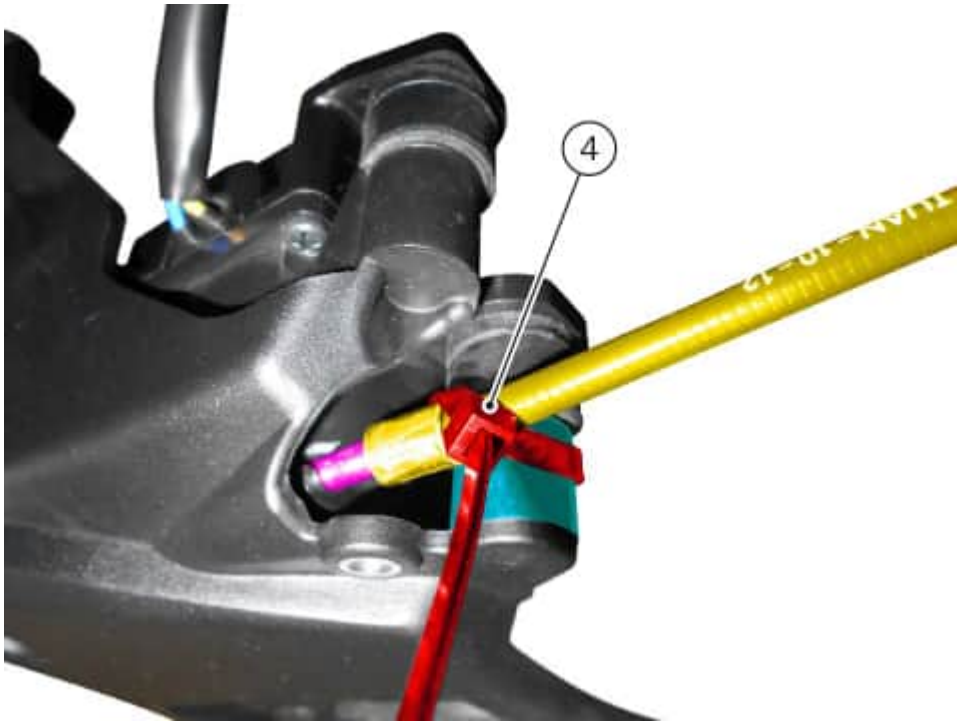
Removing the electric components compartment

Remove the seat (Removing the seat).
Remove the battery (Battery).
Remove the tail light (Removing the tail light).

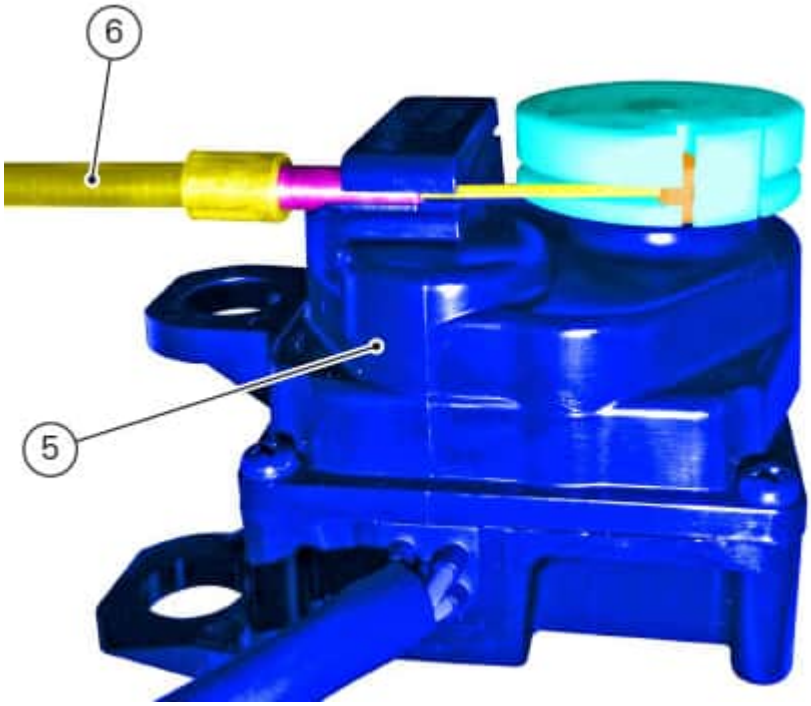
Release the main wiring (3) removing the two clips (1), releasing the fuse box (2).



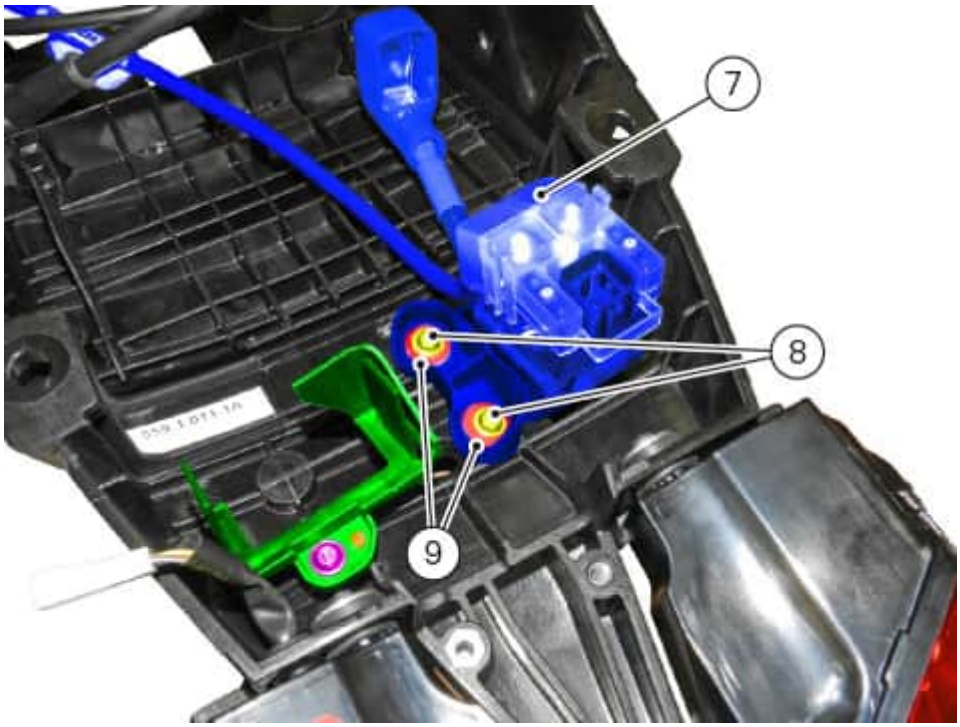
Remove tie securing exhaust valve motor cable (4).



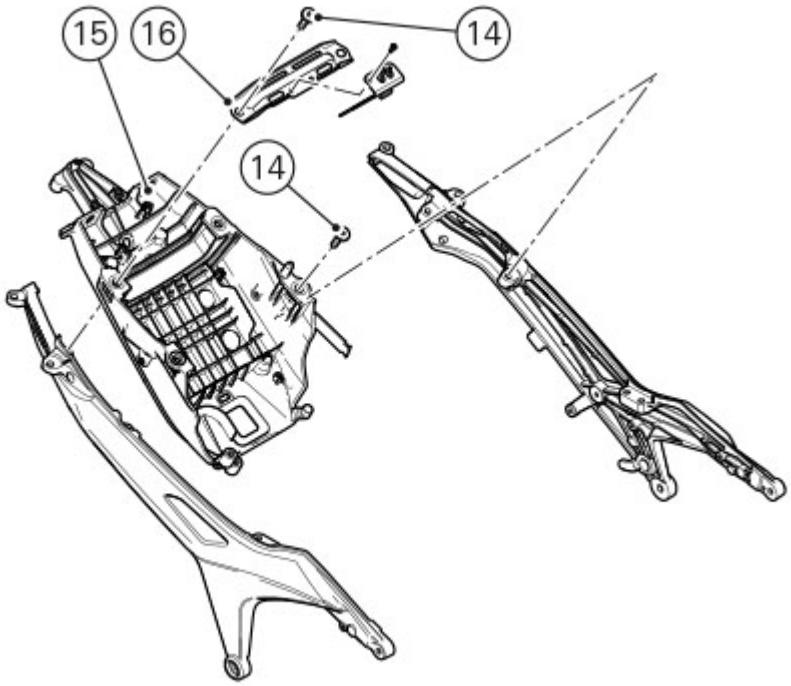
Disconnect cable (6) of the exhaust valve motor cable (5).



Remove solenoid (7), by undoing the screws (8) and collecting washers (9).

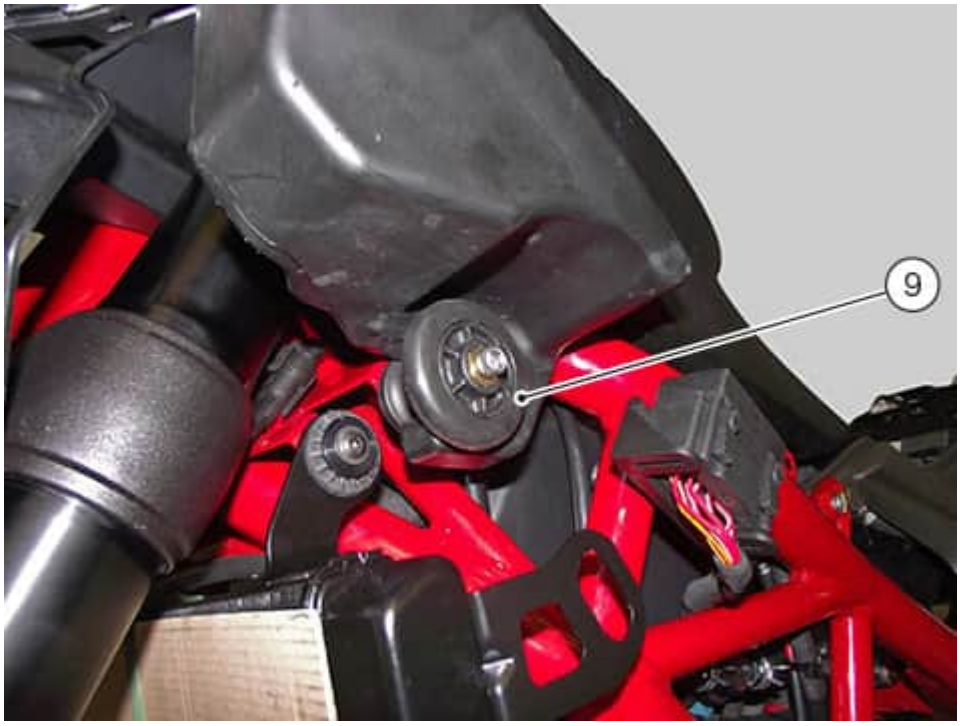


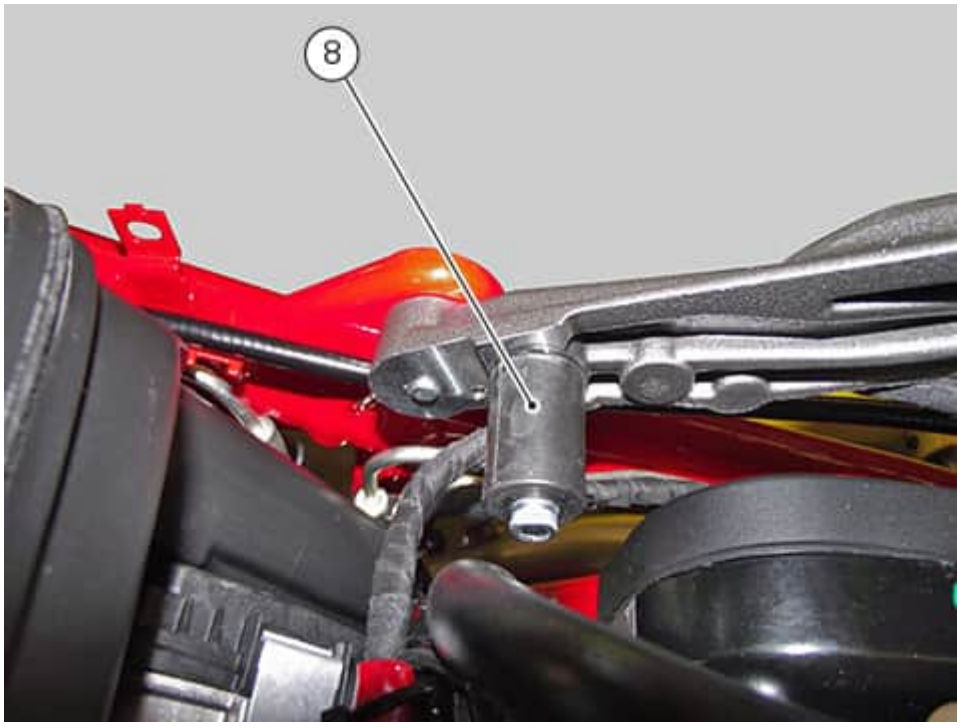
Loosen and remove the screws (14).
Remove electrical components compartment (15) collecting the rear bracket (16).


15
16
14
14

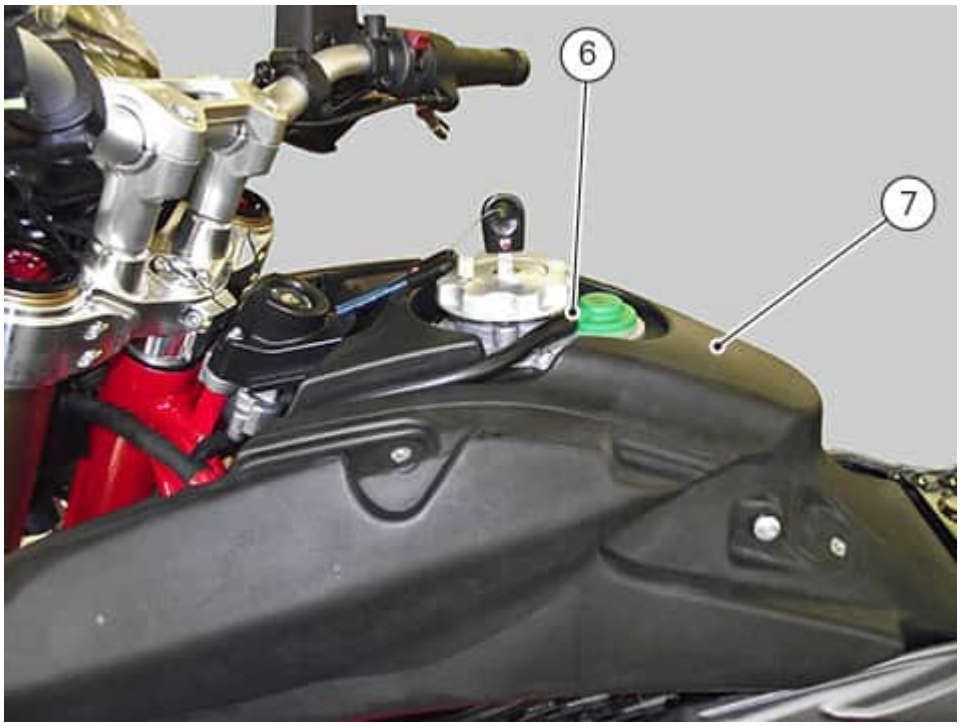
Refitting the fuel tank

Fit the tank (7) in the front mounts (9), making sure that it is secured also centrally in the mounts (8).

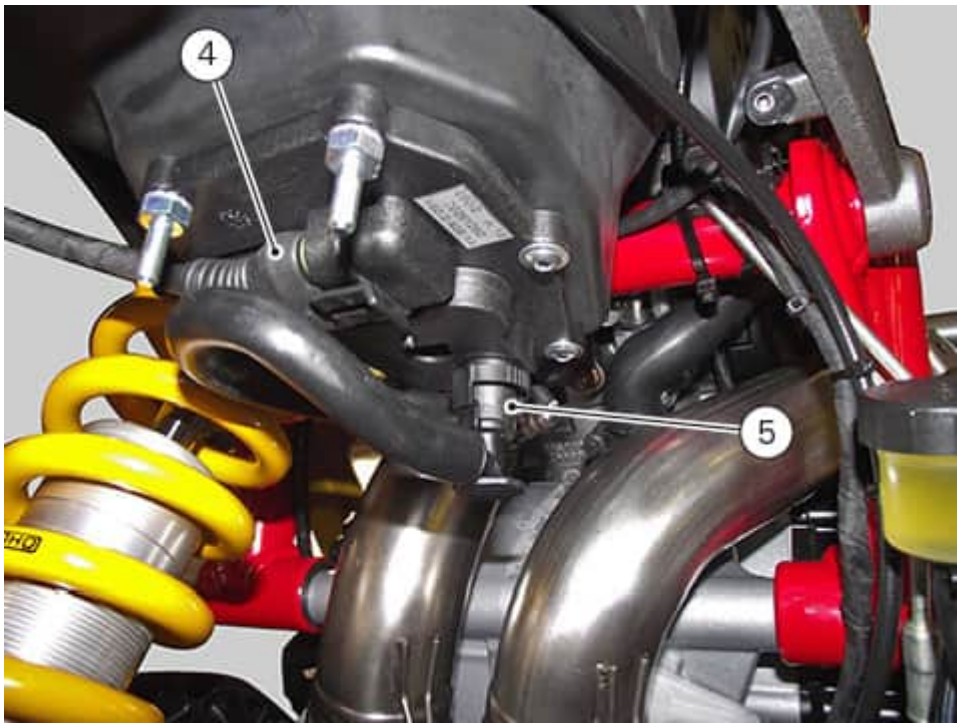




Connect the breather hose (6).



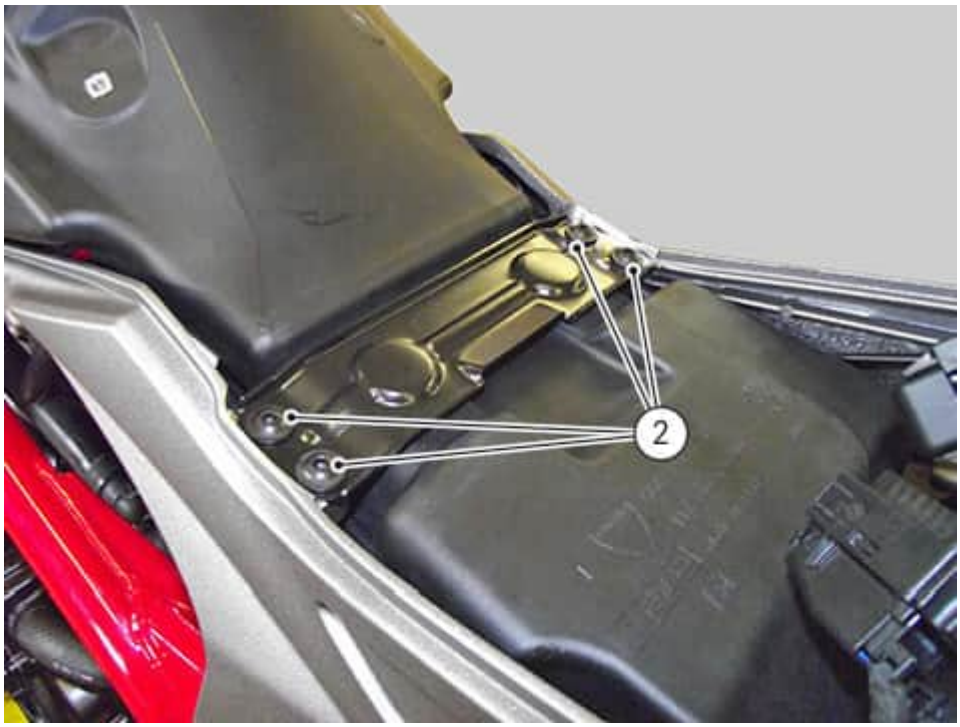
Connect the connector (4) and the fuel hose (5).



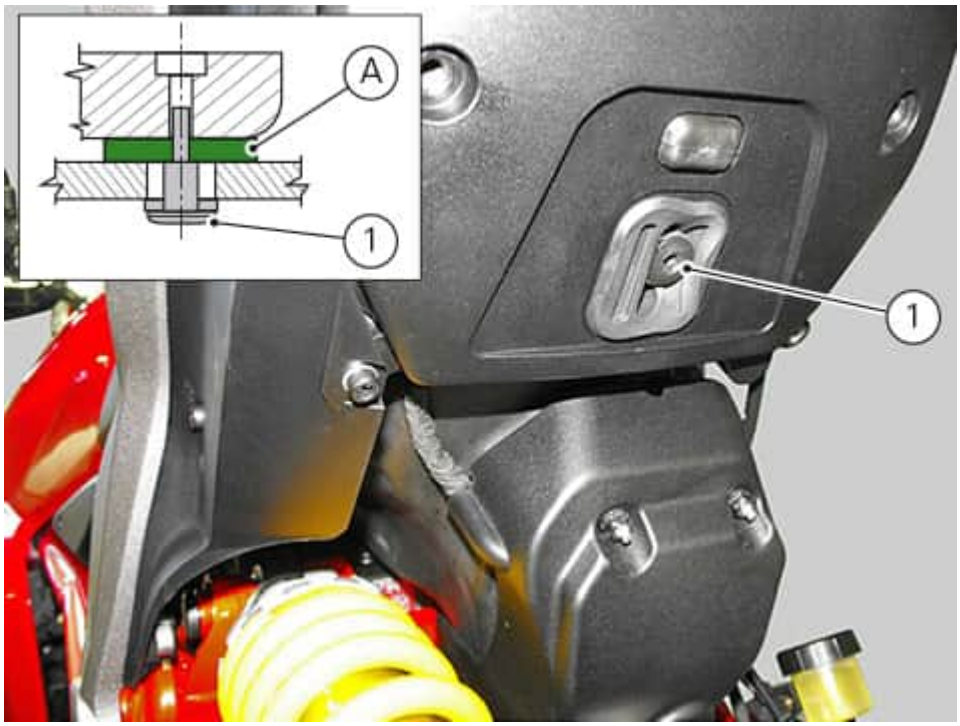
Start and tighten screws (3) of the fuel pump cover to the specified torque of 3 Nm ± 10%



Tighten fuel tank bracket screws (2) to the specified torque of 18 Nm ± 10%.



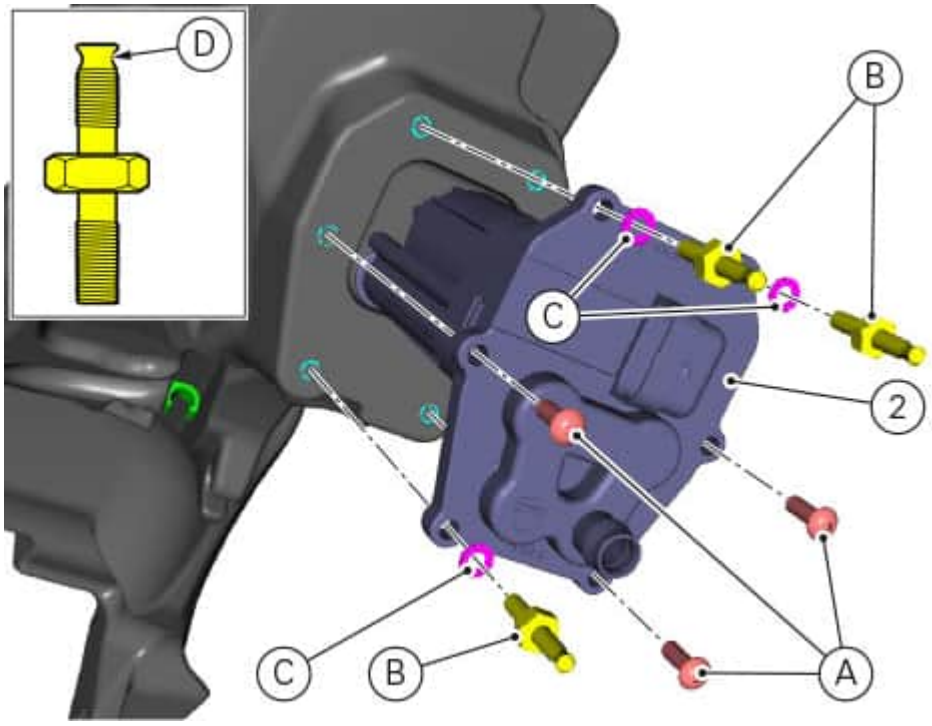
Fasten the tank by tightening rear screw (1) to the specified torque of 10 Nm ± 10%



Refit the front half-fairings (Refitting the fairings).
Refit the seat (Refitting the seat).

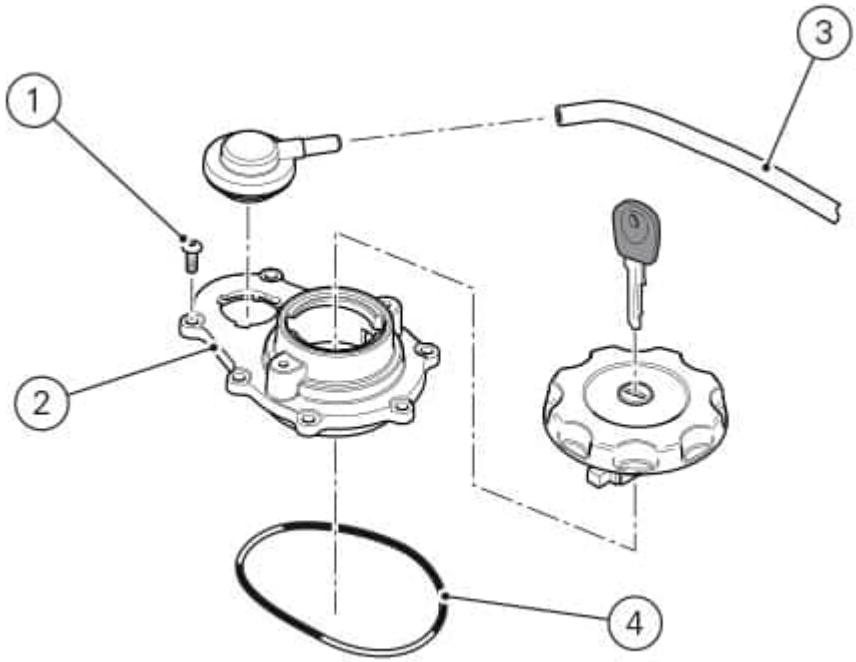
Refitting the fuel tank flange

Duly grease the seal (3), position the flange (2), and refit by reversing the steps of the removal procedure.
Aim the fuel pump (2) as shown in the figure. Start screws (A).
Start stud bolts (B) with washer (C), paying attention to fitting direction.
The side to be started is the one without the groove (D).
Tighten the screws (A) and (B) to the specified torque of 5 Nm ± 10%, following a 1-2-3-4-5-6 sequence.



Refitting the tank filler

Duly grease the new seal (4) and its seat on tank.
Position the complete filler cap (2) paying attention to fit the breather hose (3) in the relevant seats.
Start and tighten the seven securing screws (1) to a torque of 5Nm ± 10%.

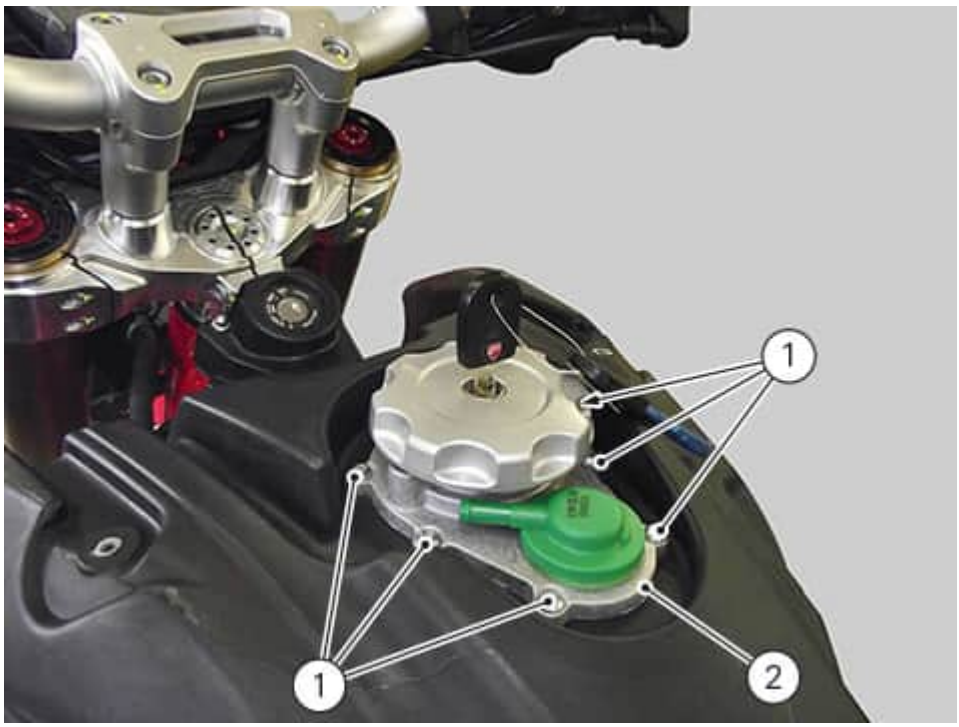


Refit the fuel tank (Refitting the fuel tank).
Refit the front half-fairings (Refitting the fairings).
Refit the seat (Refitting the seat).

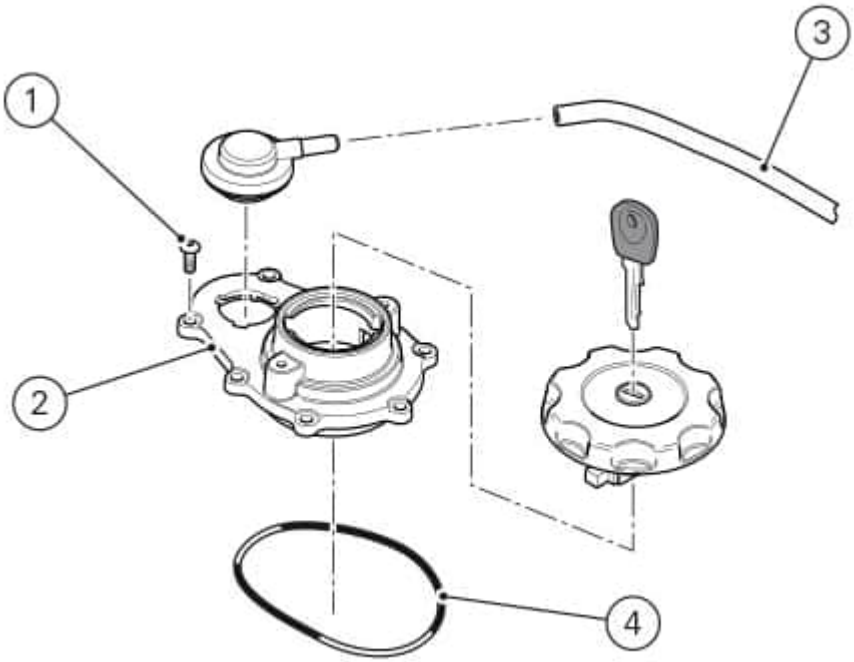
Removing the fuel tank filler

Remove the seat (Removing the seat).
Remove the front half-fairings (Removing the fairings).

Loosen and remove the seven securing screws (1) from the filler (2).



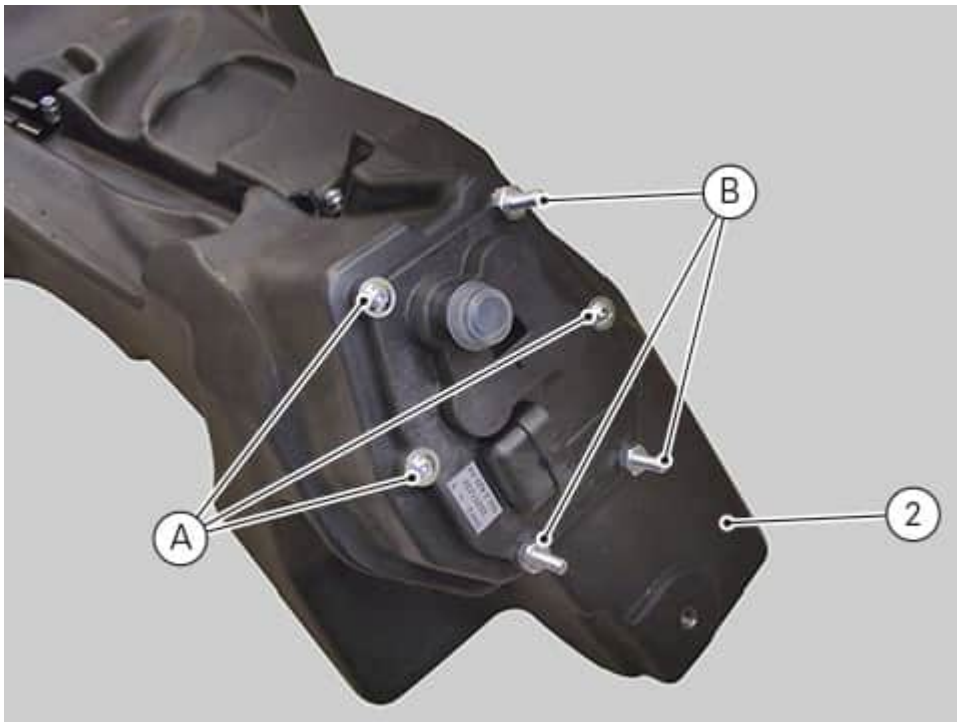
Collect fuel tank breather pipes (3) and seal (4).



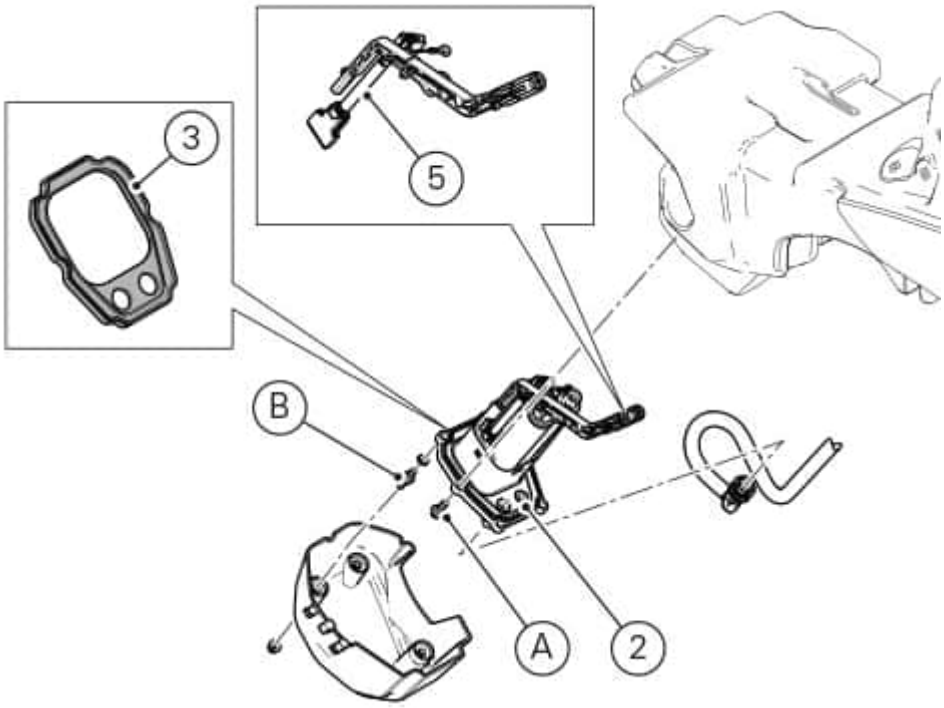
Removing the fuel tank flange

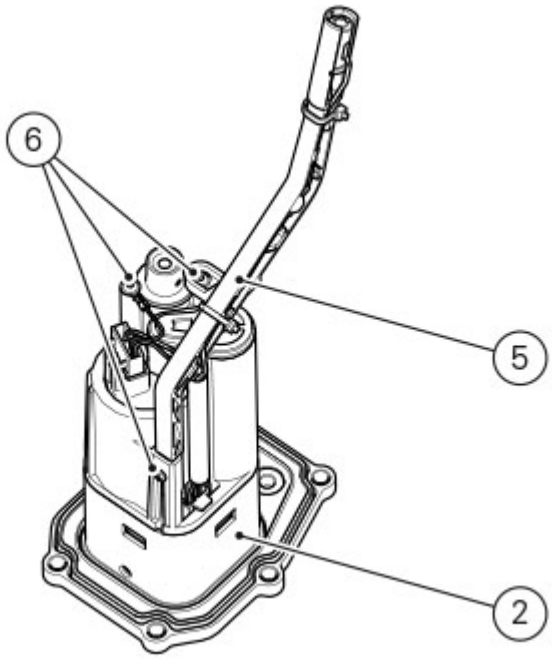
Remove the seat (Removing the seat).
Remove the front half-fairings (Removing the fairings).
Remove the fuel tank (Removing the fuel tank).

Loosen the six screws (A) and (B) securing the fuel tank flange.
Remove the fuel pump (2) from the fuel tank.



Collect the seal (3).
Loosen and remove the three retaining screws (6) and remove the thermistor (5).
Before refitting, carefully remove any deposits or scale from all parts.



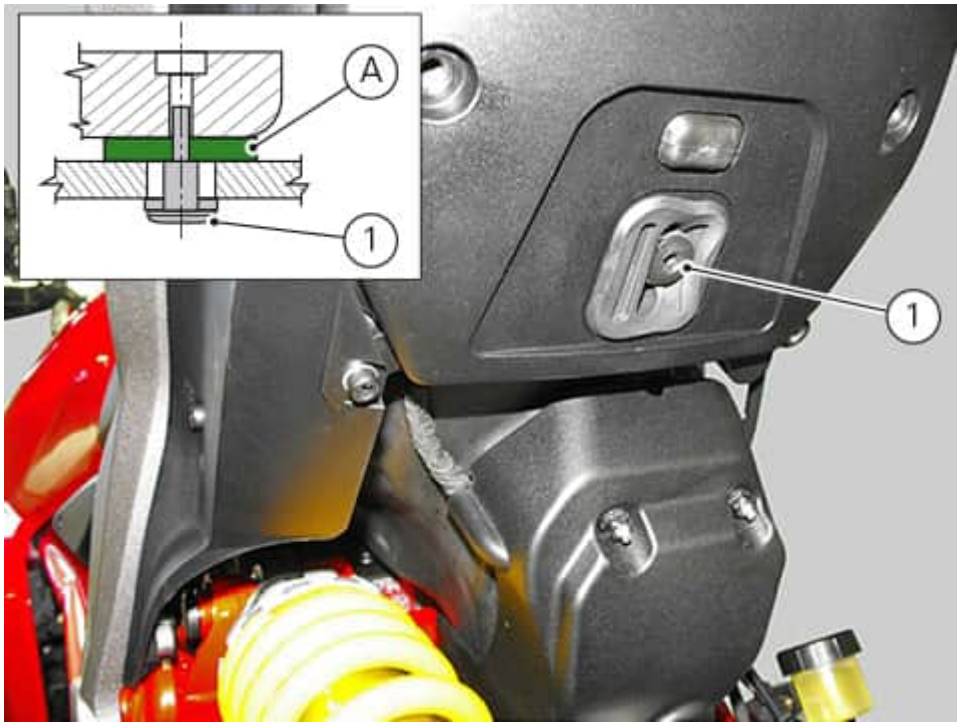

6
5
2

Removing the fuel tank

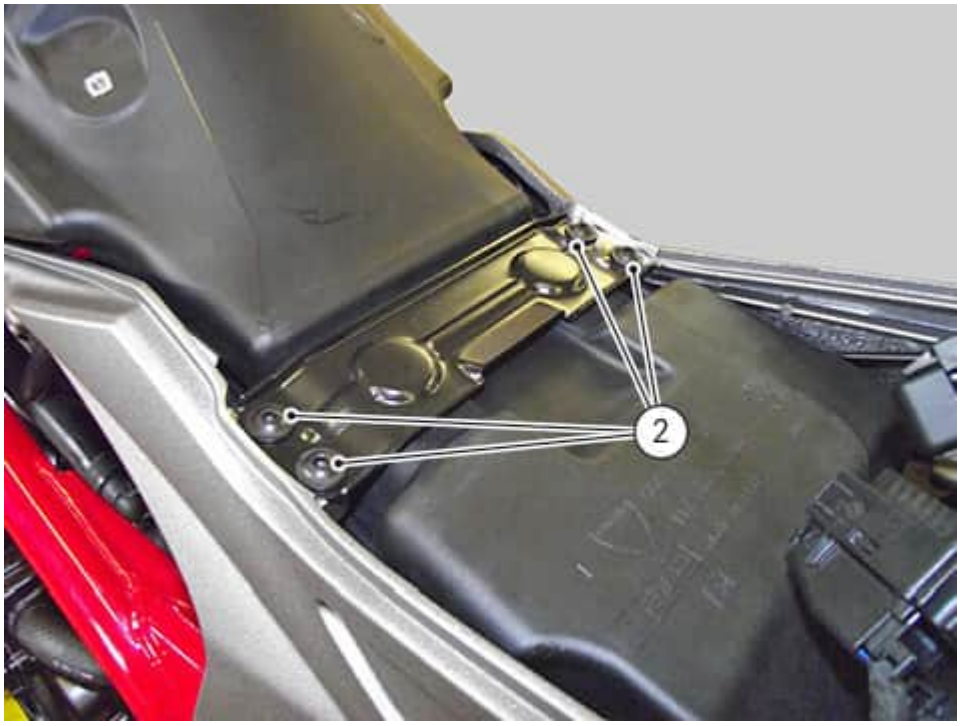
Remove the seat (Removing the seat).
Remove the front half-fairings (Removing the fairings).

Loosen and remove the rear securing screw (1) and the spacer (A), if installed.

Warning
Pay particular attention in the event the spacer is installed. It may not be installed on some models.



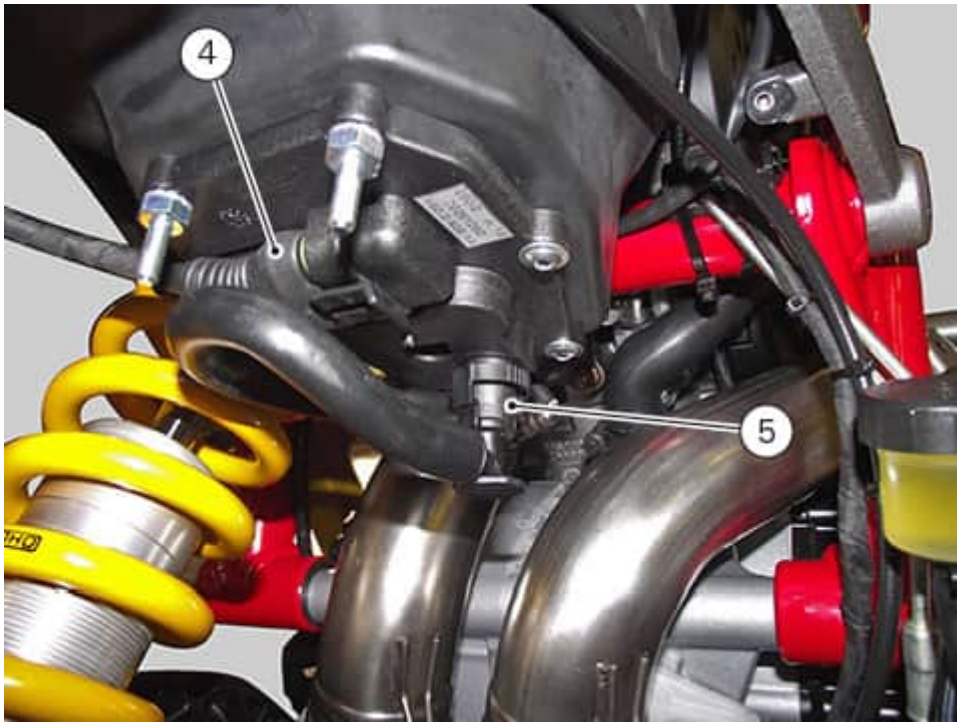
Loosen and remove the retaining screws (2) of the fuel tank mounting bracket.



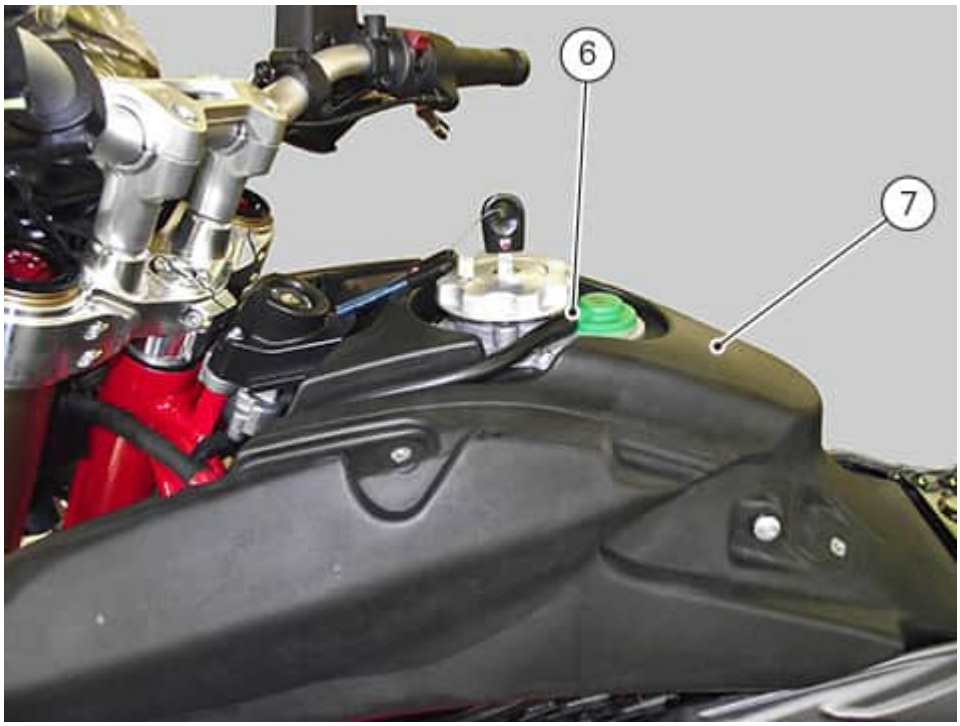
Loosen retaining screws (3) of the fuel pump cover.



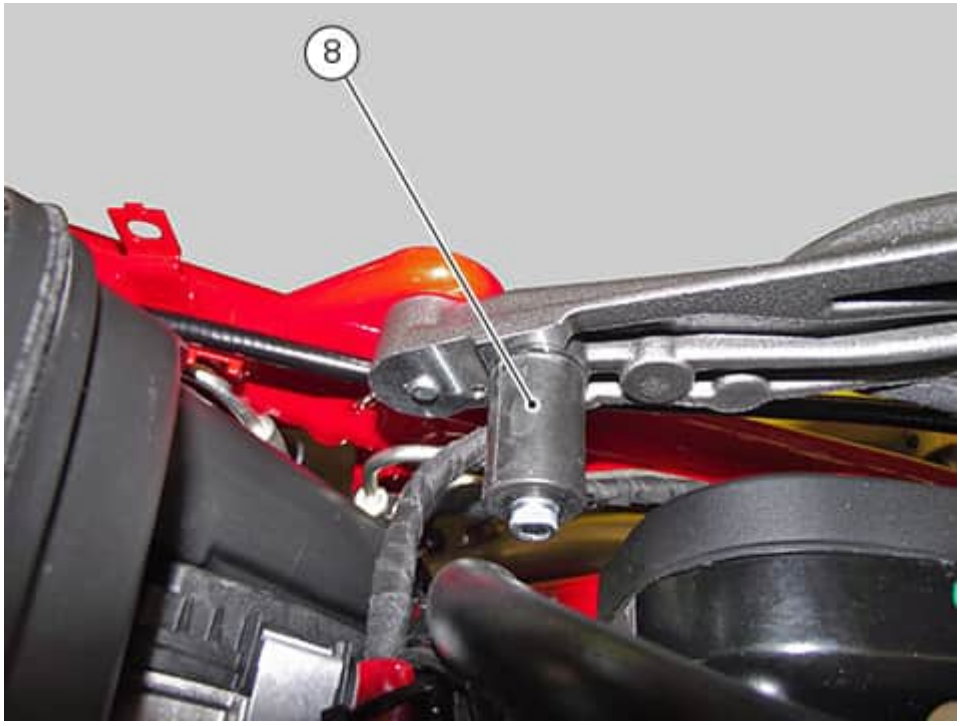
Slightly lift the tank to facilitate the following operations.
Disconnect the fuel connector (4) and disconnect the fuel hose (5).

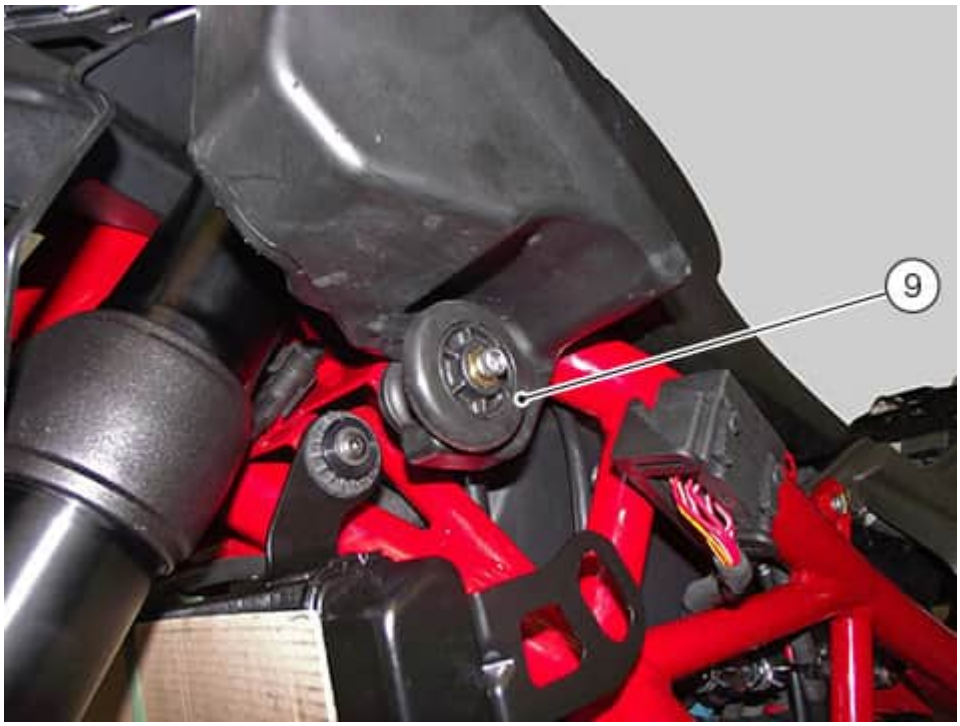


Slide out the breather hose (6), taking care not to damage it.



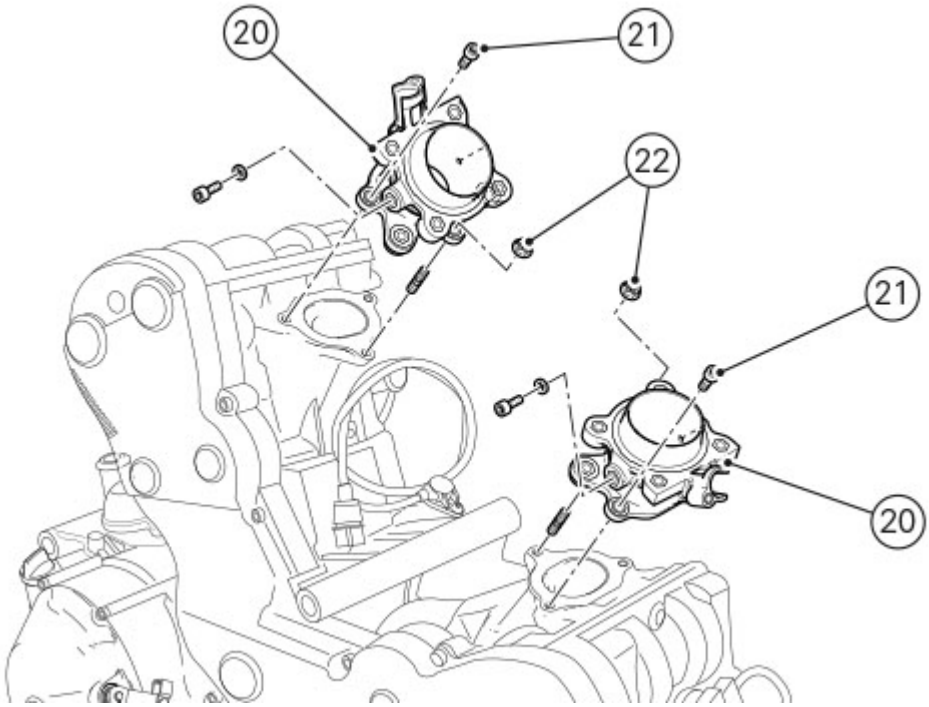
Remove the tank (7) by sliding it out from the central (8) and front (9) mounts.



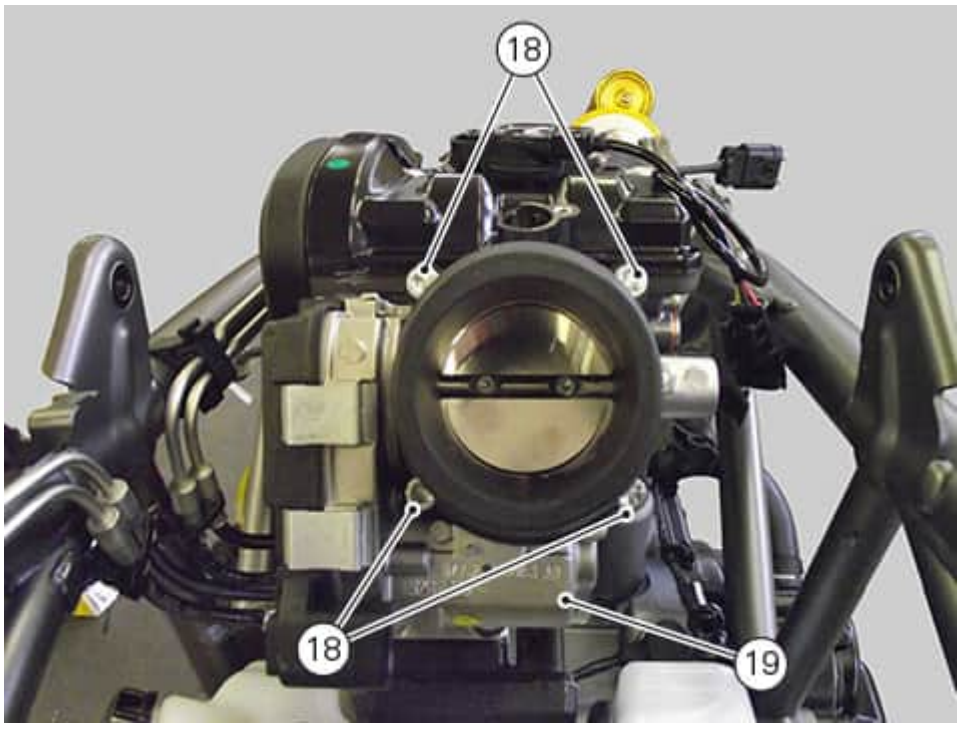

9

Refitting the throttle body

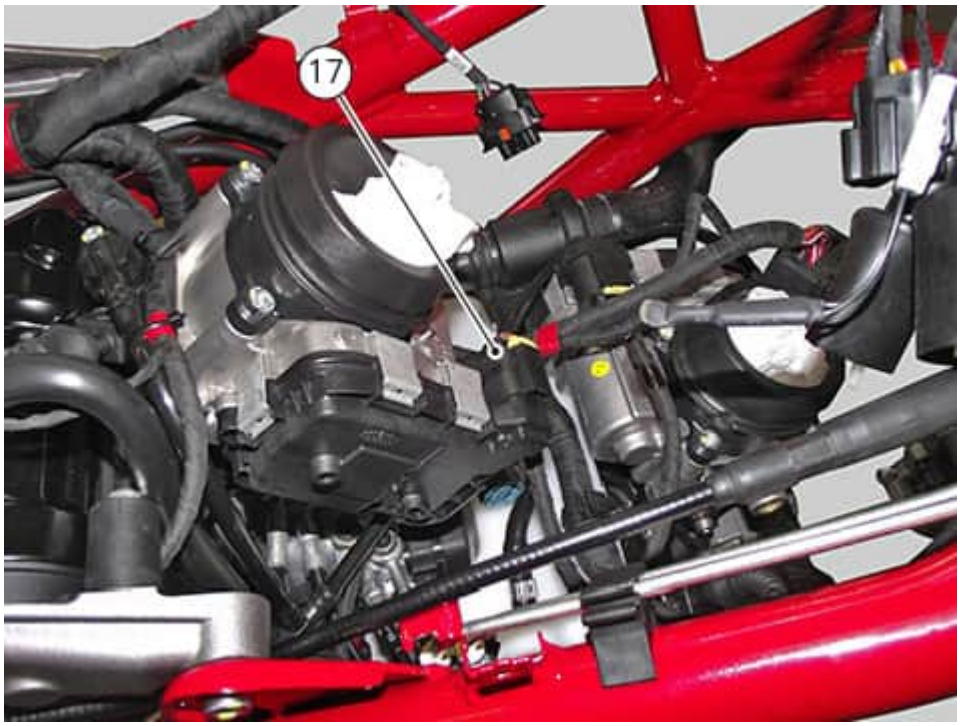
If previously removed, refit the intake funnels (20) by tightening nuts (20) to the specified torque of 10 Nm (min. 9 Nm - max. 11 Nm), and screws (21) to the specified torque of 10 Nm (min. 9 Nm - max. 11 Nm).



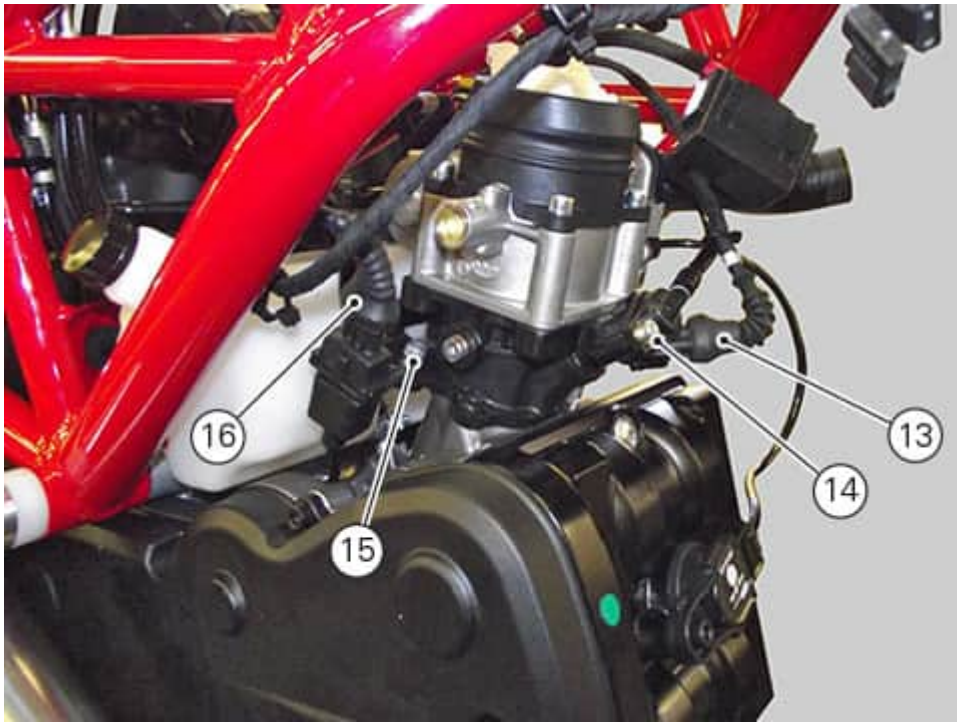
Fit the two throttle bodies (19) on the intake manifolds (20) by tightening them with screws (18) to the specified torque of 10 Nm ± 5%.



Working on both throttle bodies, connect the two connectors (17).



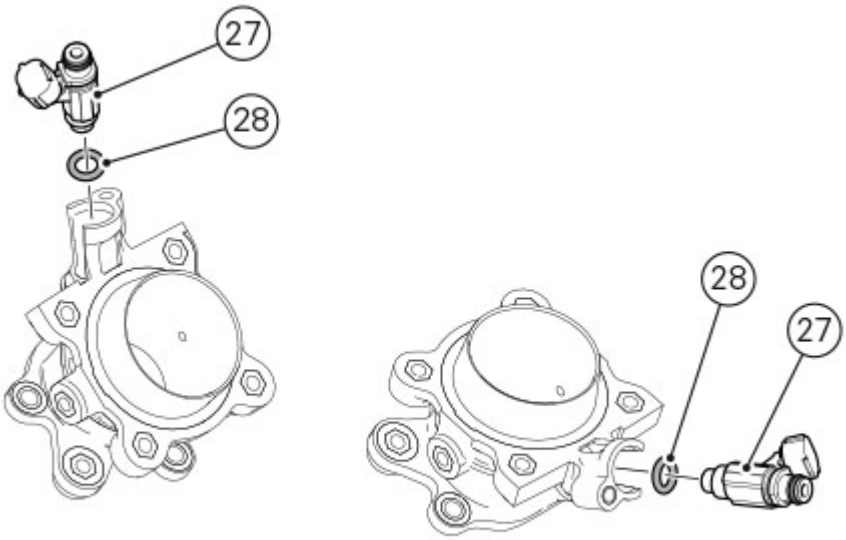
Working on front throttle body, secure the bracket of the Pick Up (15) connector by tightening screw (16) to the specified torque of 10 Nm (min. 9 Nm - max. 11 Nm).



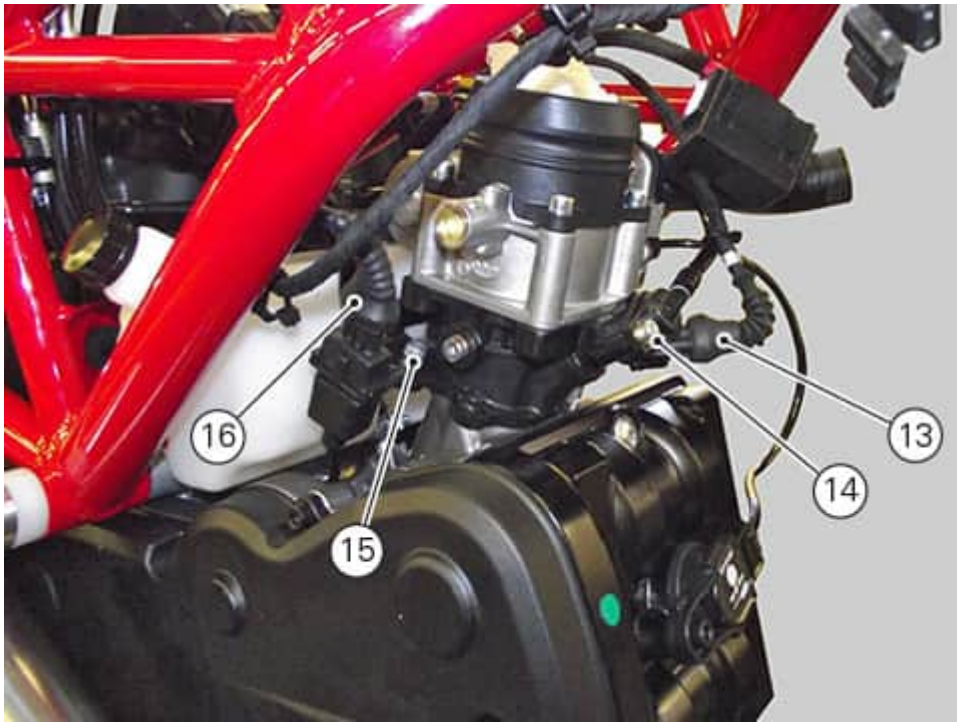
If removed, fit the injectors (27) in their relevant seat on the intake manifolds (20), taking care not to damage the O-ring (28).

Important

In order to avoid damaging the O-rings of the injectors, fit the injectors into the unions fully home, keeping them in line with their relevant seat.



Working on both injectors, tighten the screw (14) to a torque of 5 Nm ± 10%.
Connect connector (13) to the injector (27).

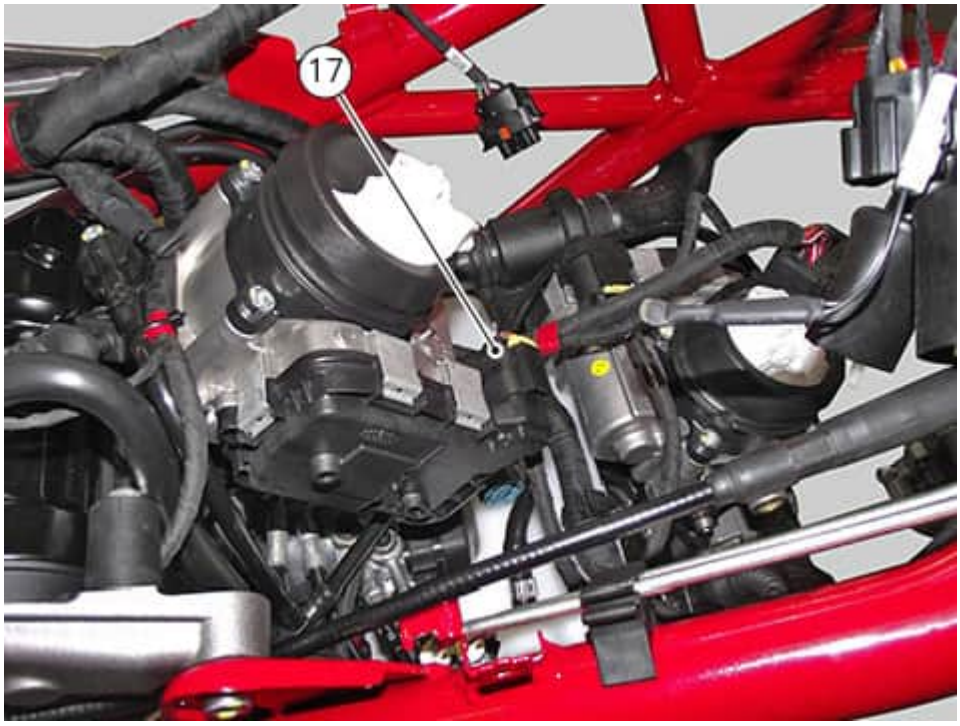


Refit the airbox (Refitting the air filters).
Refit the fuel tank (Refitting the fuel tank).
Refit the front half-fairings (Refitting the fairings).
Refit the seat (Refitting the seat).

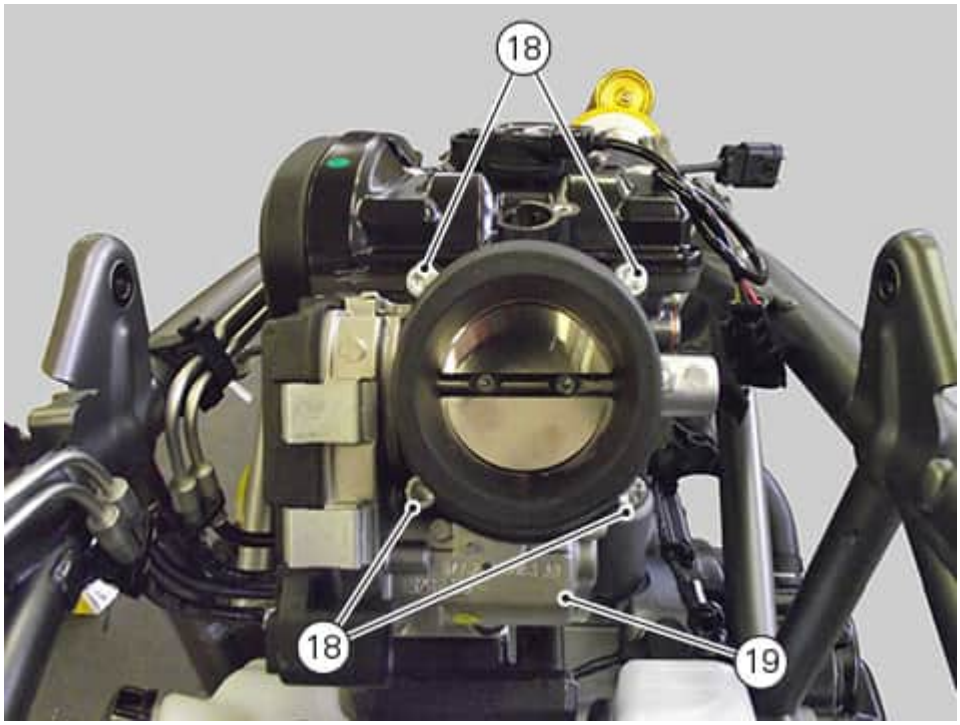
Removing the throttle body

Remove the seat (Removing the seat).
Remove the front half-fairings (Removing the fairings).
Remove the fuel tank (Removing the fuel tank).
Remove the airbox (Removing the air filters).

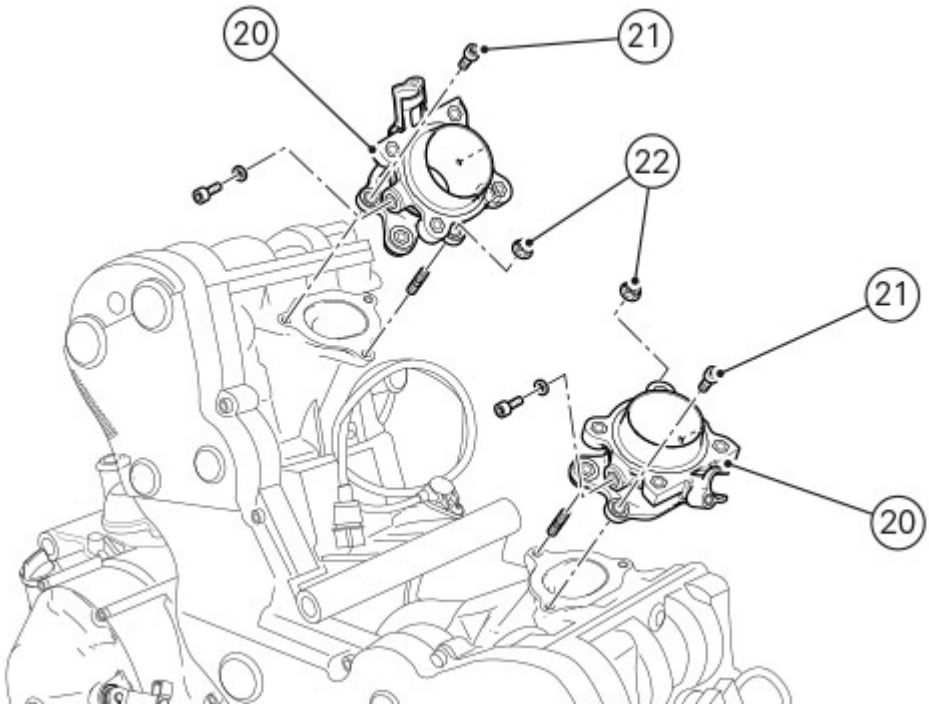
Working on both throttle bodies, disconnect the control connector of the throttle body (17).



Working on both throttle bodies, loosen and remove the securing screws (18).
Remove the throttle body (19).

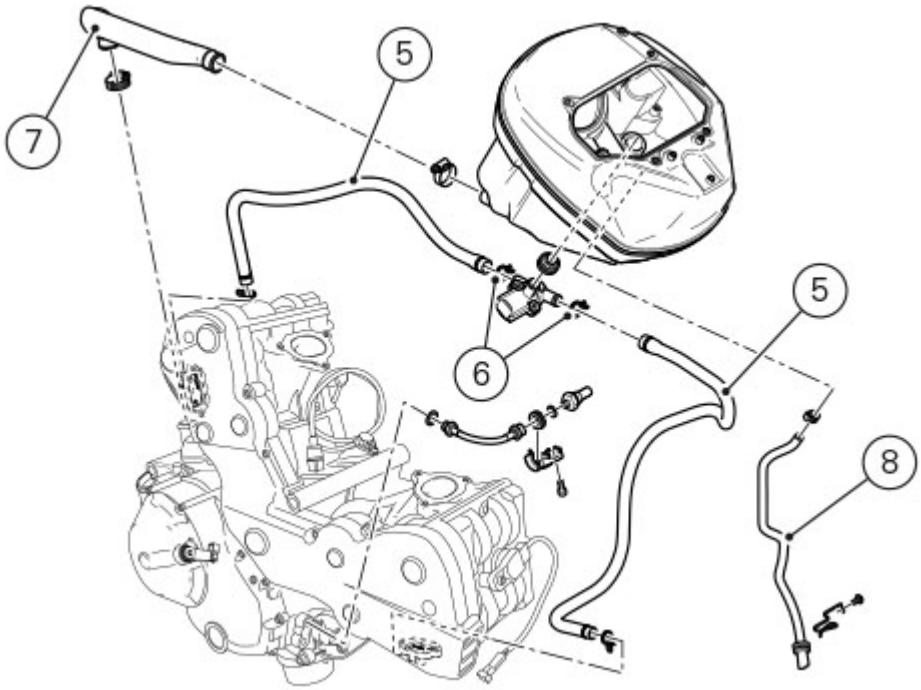


Remove the intake manifolds (20) by removing the securing screws (21) and nuts (22).

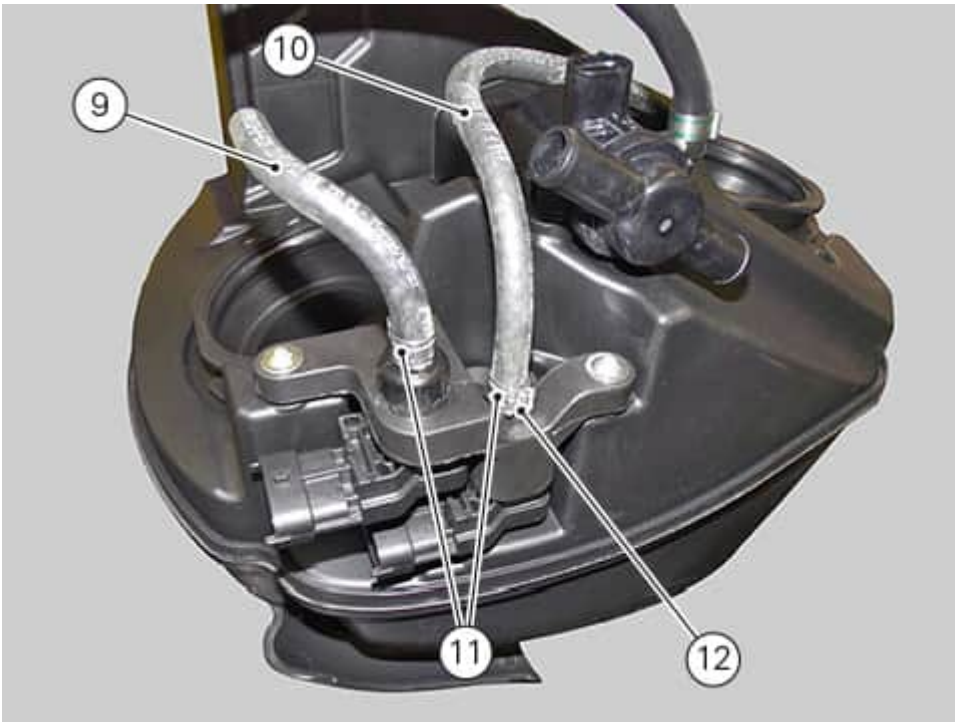

20
21
22
21
20

Refitting the airbox

Bringing the airbox near, connect air (5) and Blow By (7) hoses by tightening them to ties (6) and connect the breather pipe (8) with its relevant clamps.



Connect hoses (9) and (10) by tightening them with the two clamps (11) and (12).

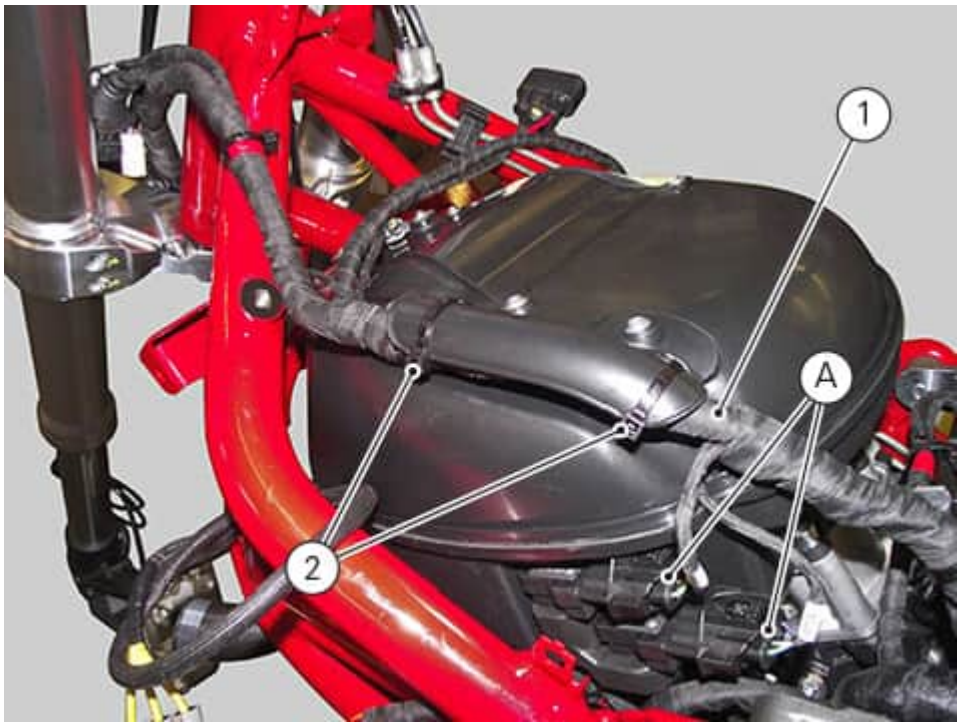


Secure the airbox to the throttle bodies by tightening the two clamps (3) and (4).





Secure main wiring (1) with two ties (2).
Connect the connectors of the Map Sensor (A).

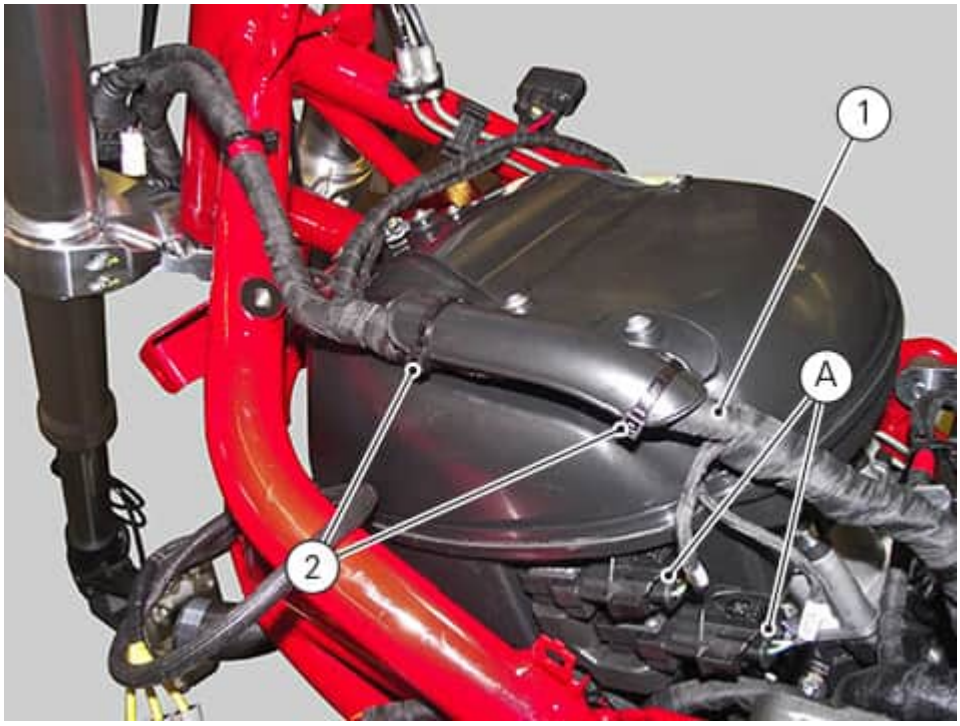


Refit the fuel tank (Refitting the fuel tank).
Refit the front half-fairings (Refitting the fairings).
Refit the seat (Refitting the seat).

Removing the airbox

Remove the seat (Removing the seat).
Remove the front half-fairings (Removing the fairings).
Remove the fuel tank (Removing the fuel tank).

Disconnect the Map Sensor connectors (A).
Cut the two ties (2) and release the main wiring (1).

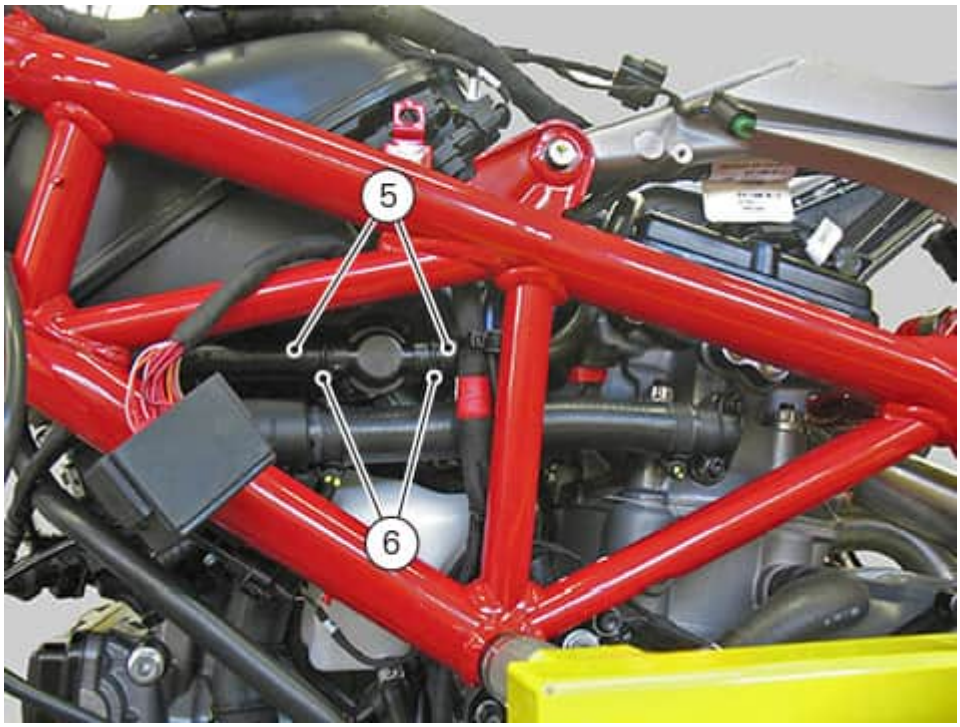


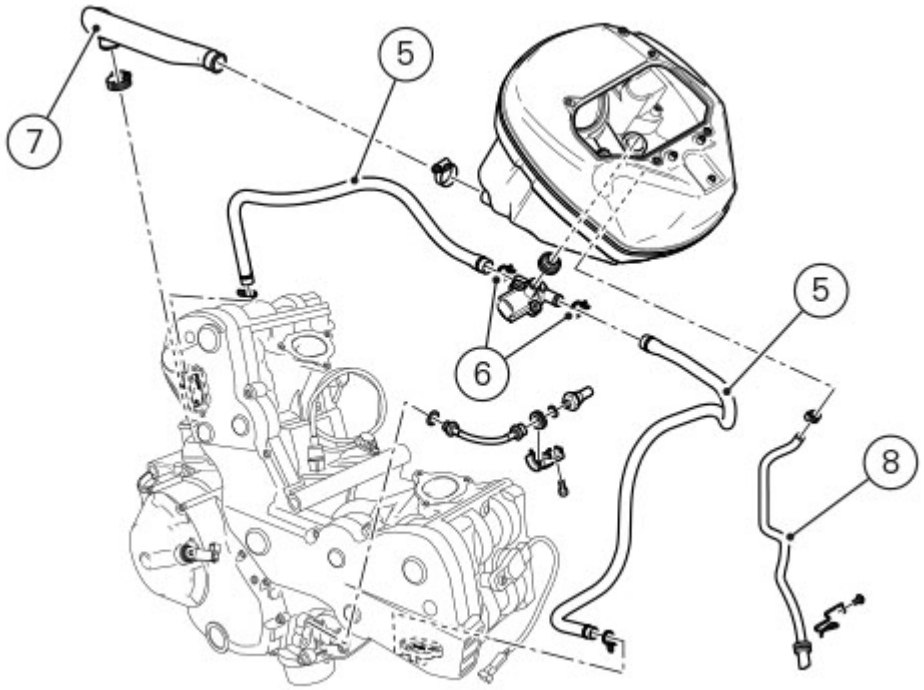
Loosen clamps (3) and (4).



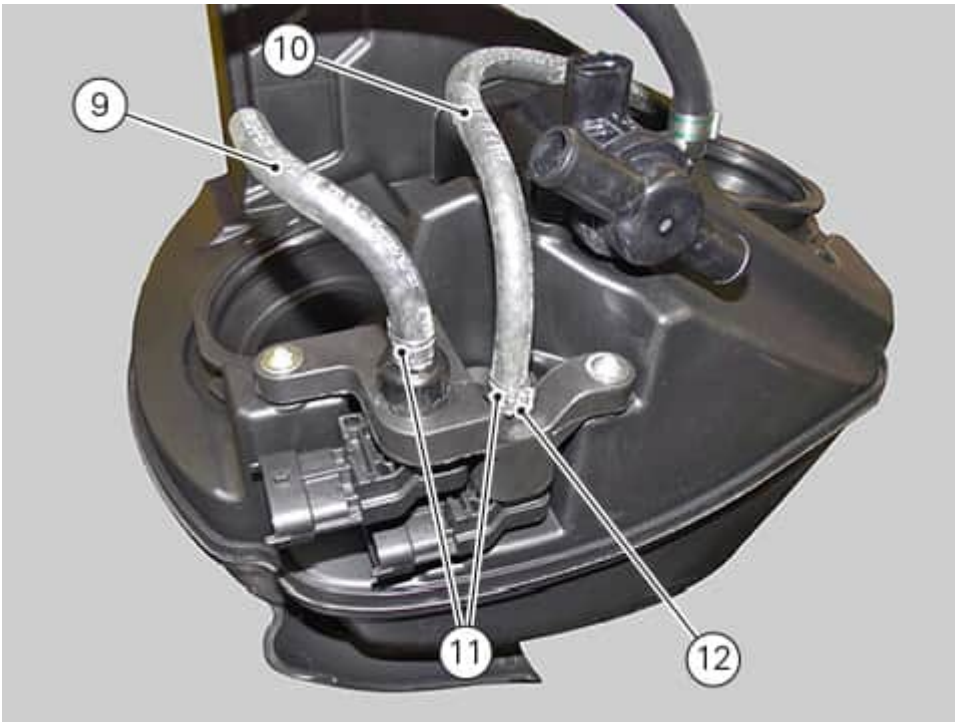


Disconnect the two air hoses (5) by loosening ties (6) and blow-by hose (7).



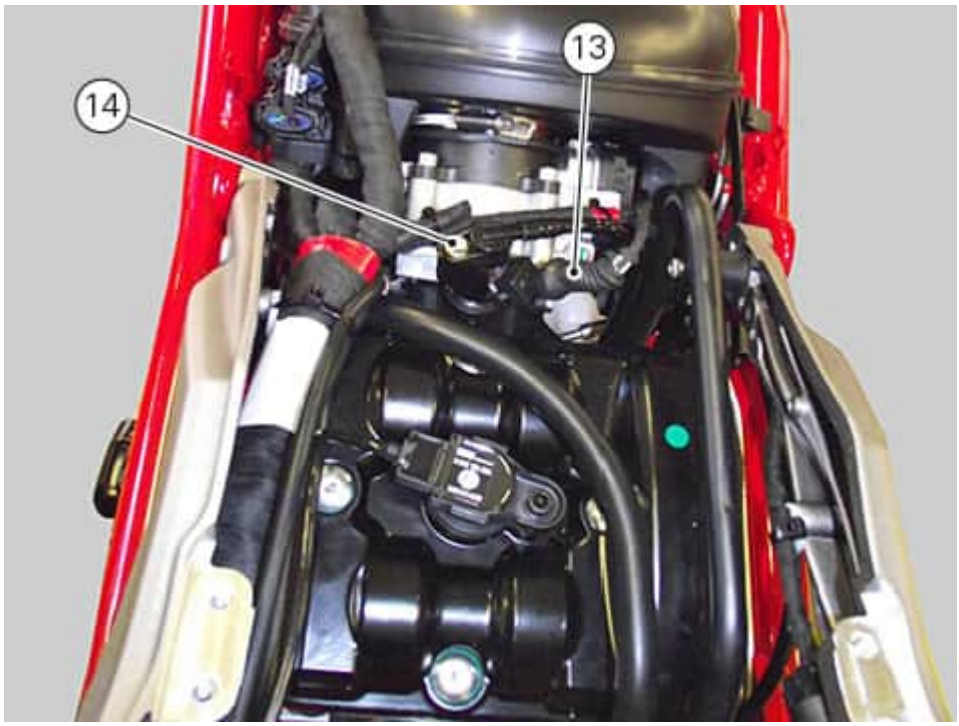


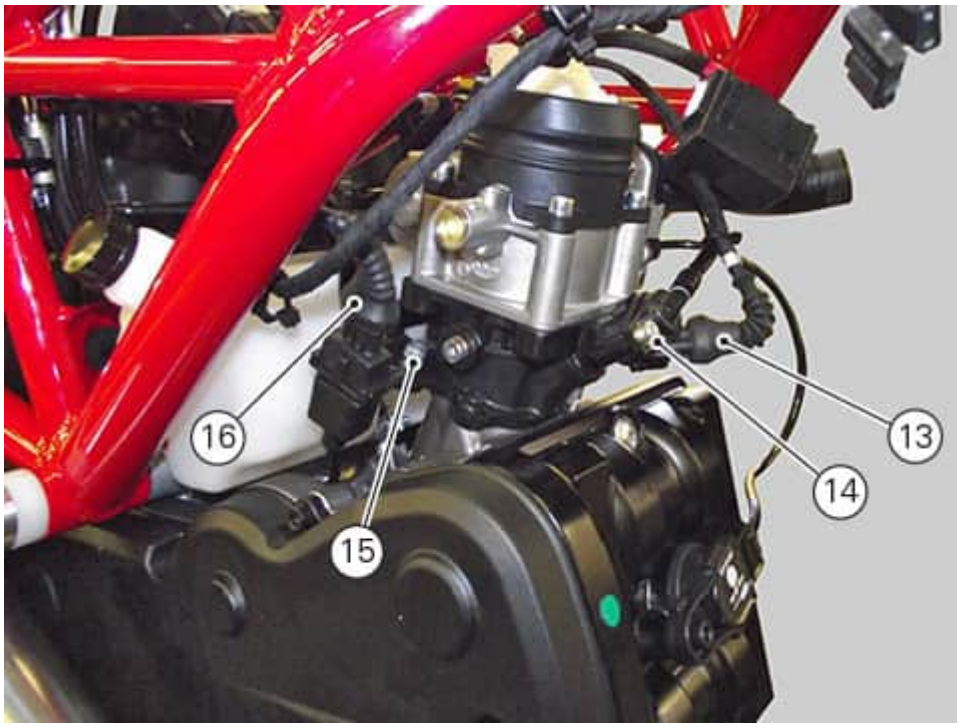
Working on the left side, disconnect the two unions (9) and (10) by removing clamps (11) and (12).



Slightly lift the airbox and disconnect the draining hoses (8).
Remove the airbox.

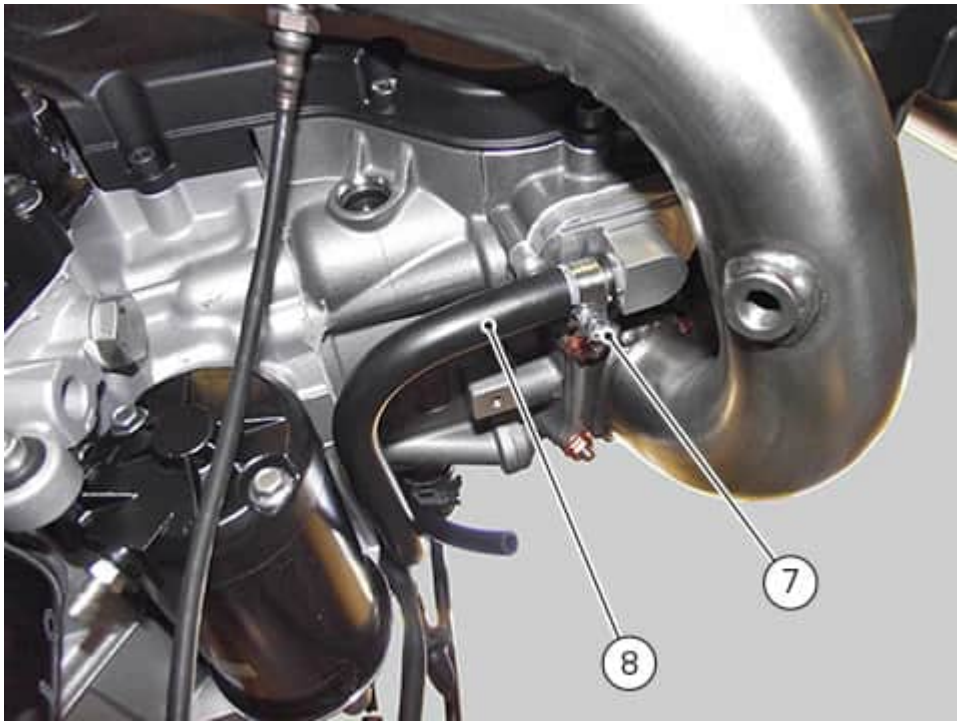
Working on both intake manifolds, disconnect the two connectors (13) from the main wiring to the injectors.
Working on both intake manifolds, loosen and remove the screw securing the injector (14) and remove the injector.
Working on the front manifold, loosen screw (15) and remove Pick Up (16).


13
14


16
15
13
14

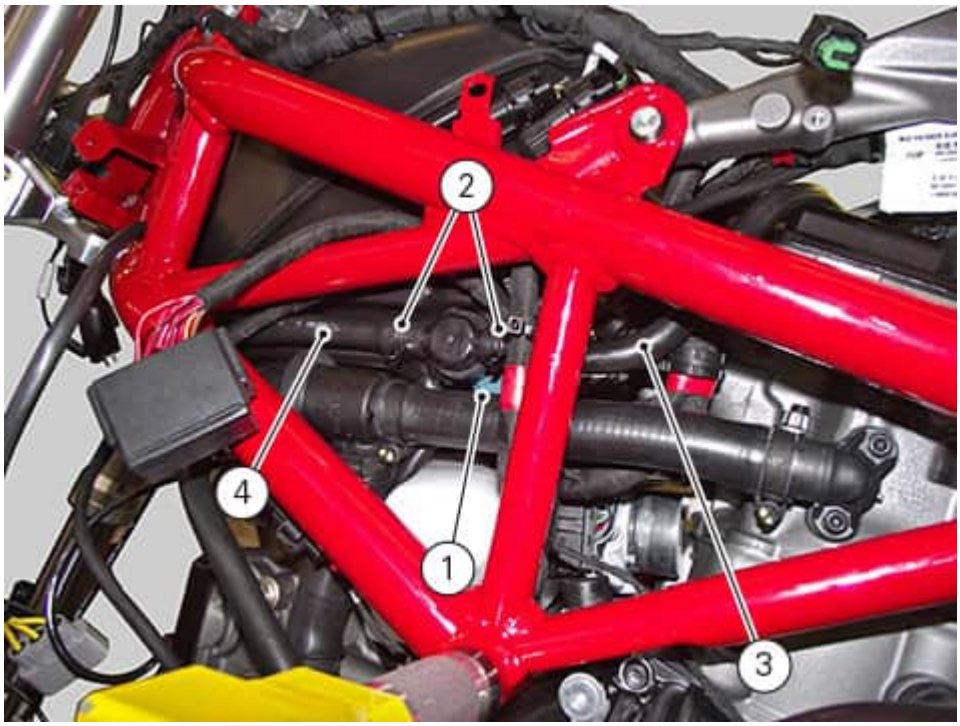
Refitting the secondary air system

Fit horizontal head (8) and vertical head (6) hoses, securing them with the relevant clamps (7) and (5).





Connect the hoses to the actuator as shown, tightening the relevant clamps (2).
Connect the connector (1).

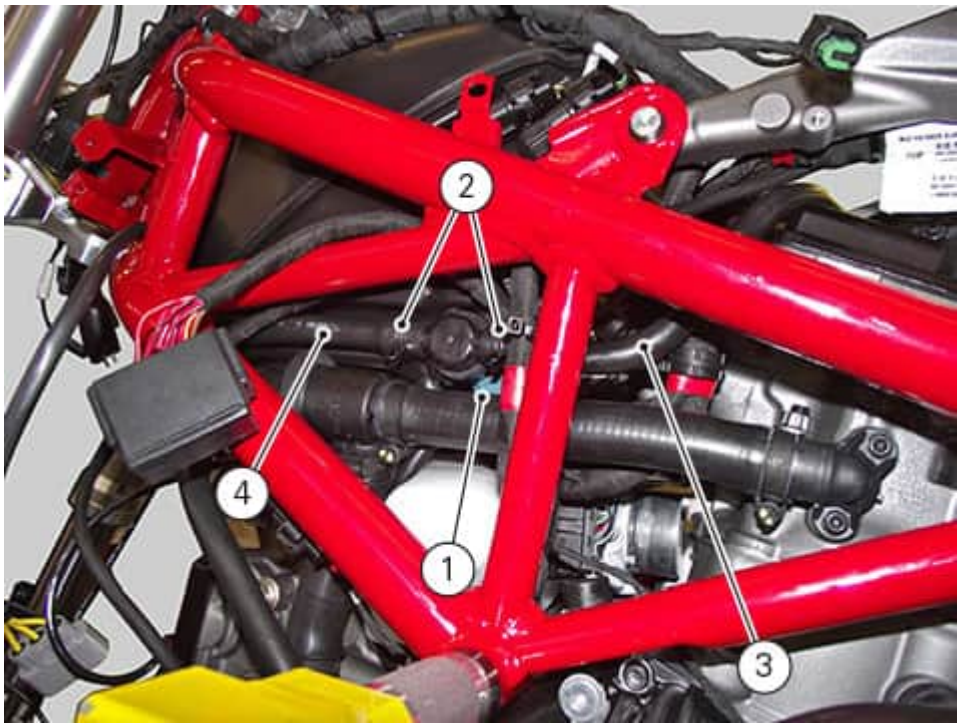


Refit the airbox (Refitting the air filters).
Refit the fuel tank (Refitting the fuel tank).
Refit the front half-fairings (Refitting the fairings).
Refit the seat (Refitting the seat).

Removing the secondary air system

Remove the seat (Removing the seat).
Remove the front half-fairings (Removing the fairings).
Remove the fuel tank (Removing the fuel tank).
Remove the airbox (Removing the air filters).

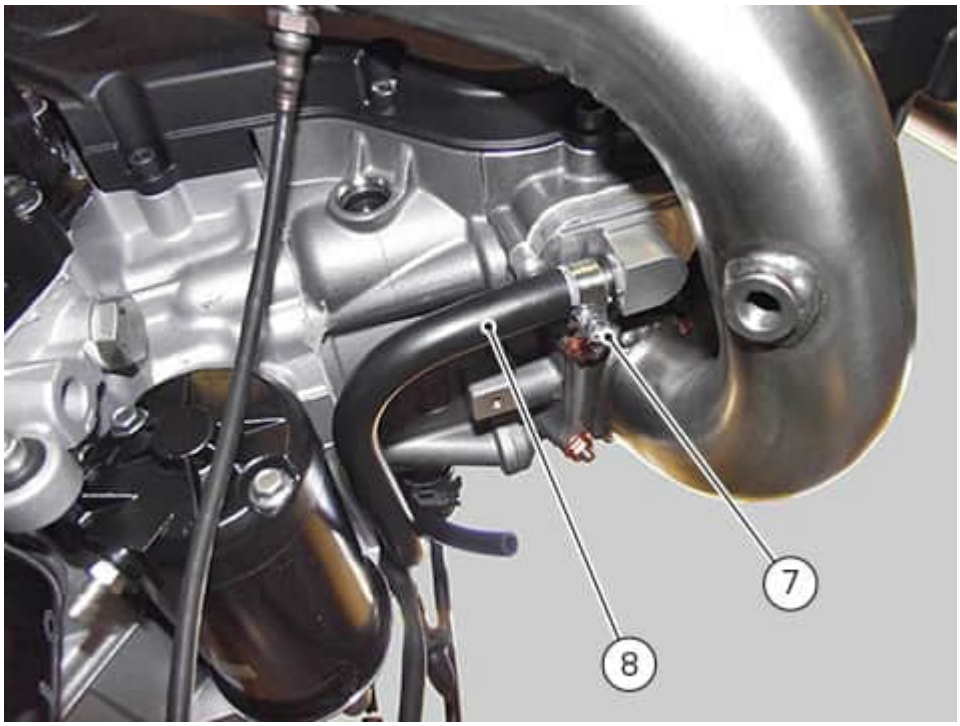
Disconnect the connector (1) from actuator.
Slide out horizontal and vertical head (4) clamps (2) and hoses (3).



Slide out clamp (5) and remove the air hoses (6) from the vertical head.



Repeat the operation on the horizontal head, sliding out clamp (7) and removing hose (8).

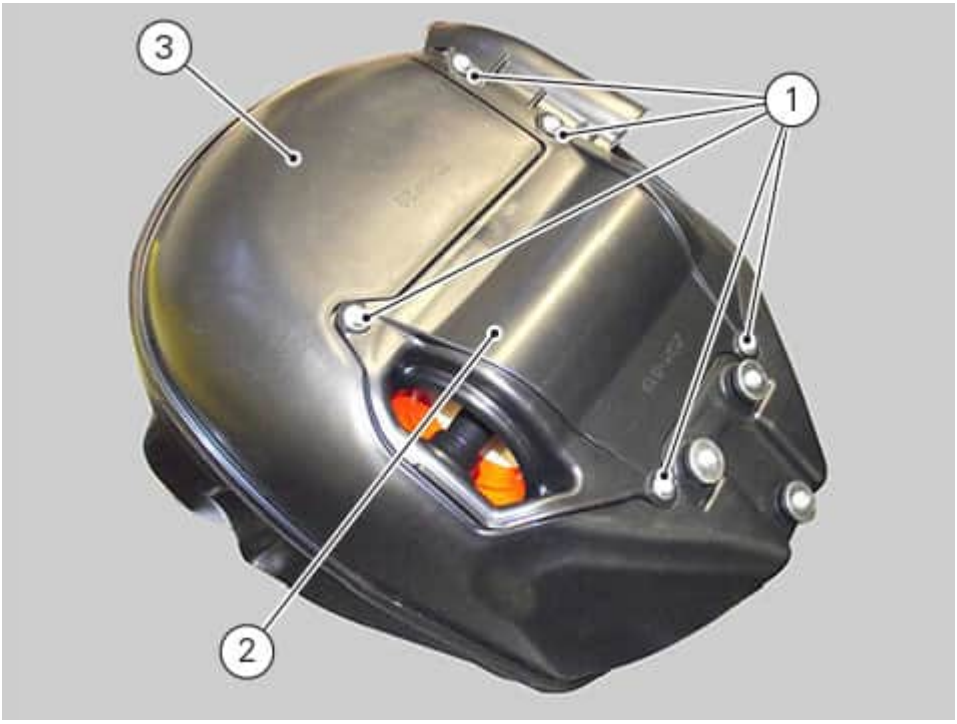

7
8

Refitting the air filters

Fit the filter (5) to the support (6) making sure that the marks are facing outwards.
Fit the filter with support inside the filter cover (7), in such a way that the thread (8) comes out from the cover.
Fasten the filter by securing the ring nut (9) to the specified torque of 6 Nm ± 10%.



Fit the cover (2) inside the airbox (3) by tightening screws (1) to the specified torque of 2 Nm ± 10%.
Make sure that the seal is correctly fitted.



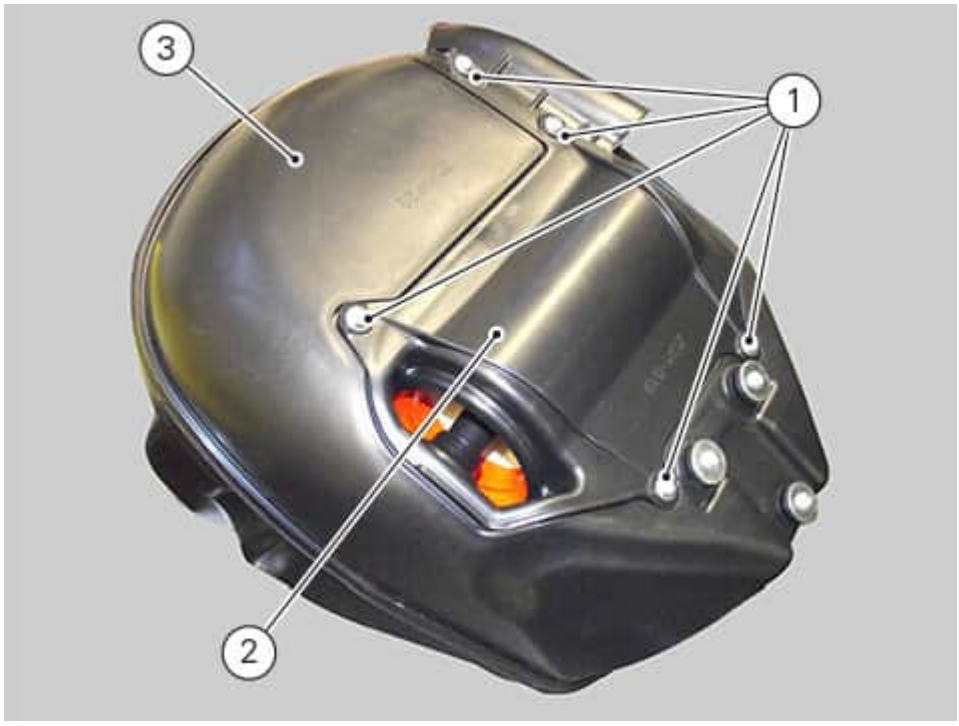
Refit the fuel tank (Refitting the fuel tank).
Refit the front half-fairings (Refitting the fairings).

Refit the seat (Refitting the seat).

Removing the air filters

Remove the seat (Removing the seat).
Remove the front half-fairings (Removing the fairings).
Remove the fuel tank (Removing the fuel tank).
Remove the airbox.

Loosen and remove the five retaining screws (1) and remove the cover (2) from the airbox (3).

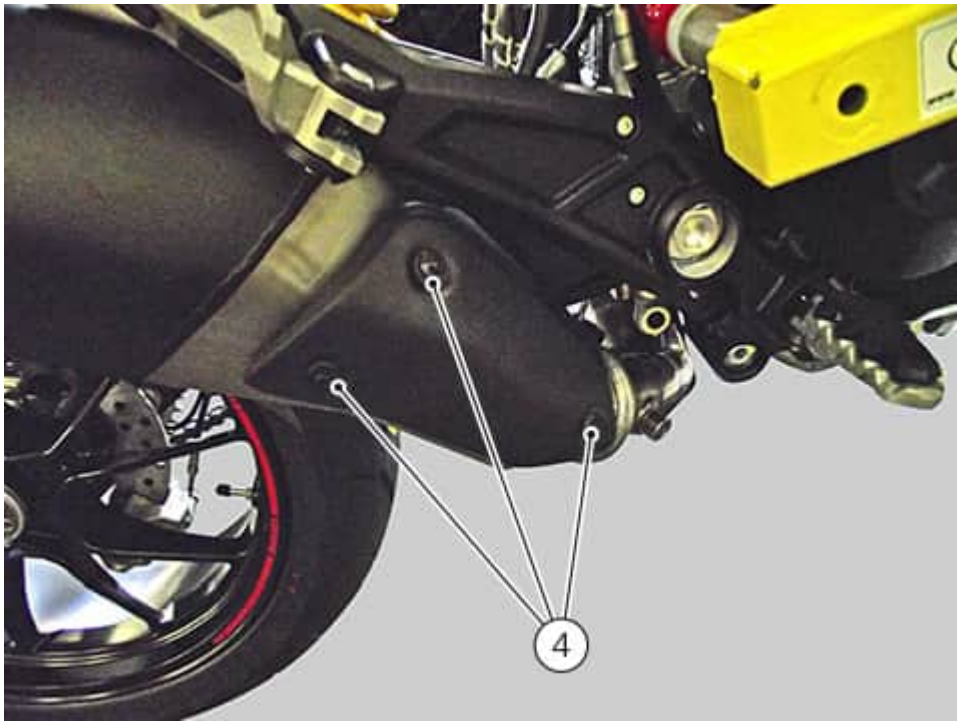


Loosen the ring nut (4) and remove the filter (5).

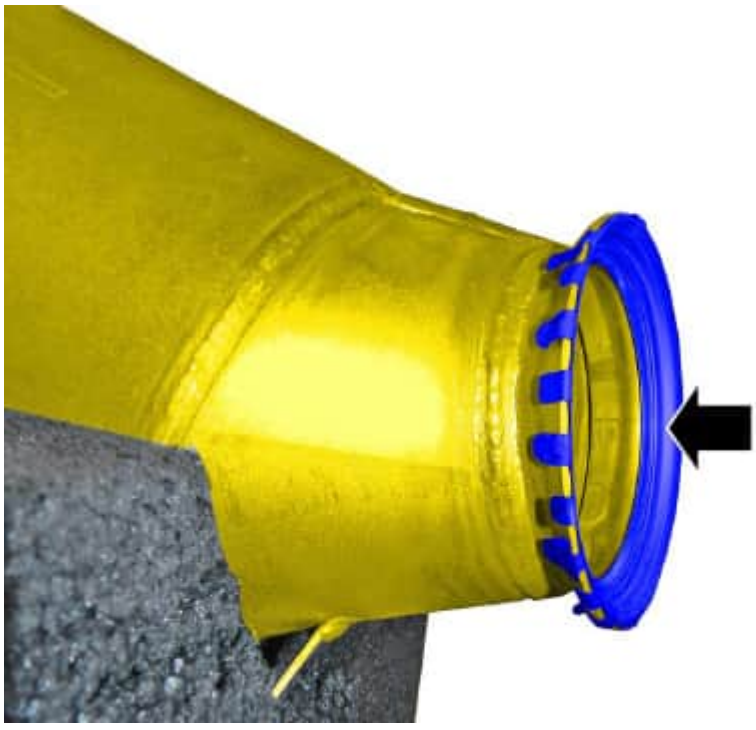


Refitting the silencer

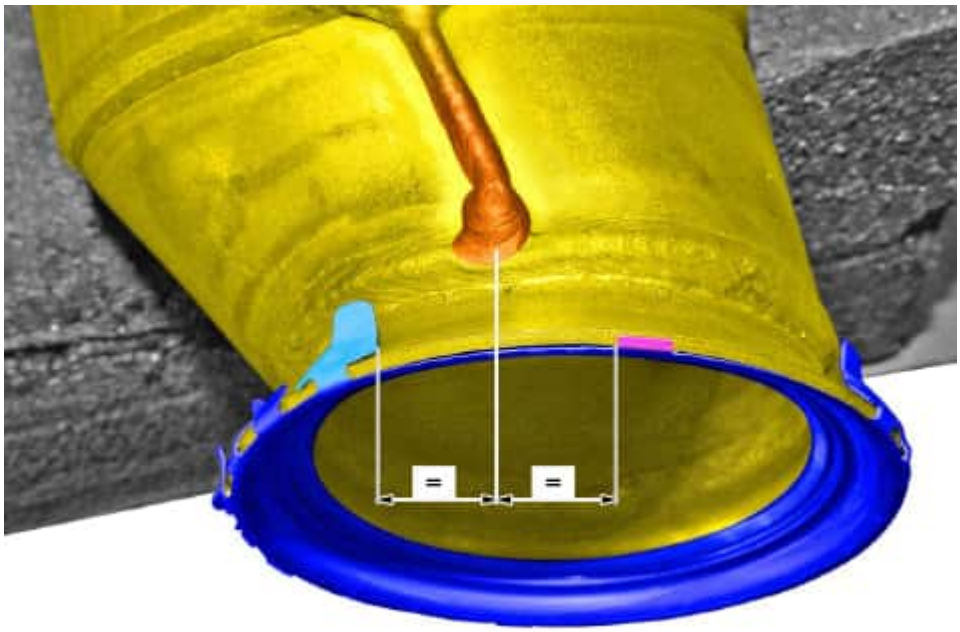
If previously removed, secure the heat guard by securing screws (4) to the specified torque of 8 Nm ± 10%.



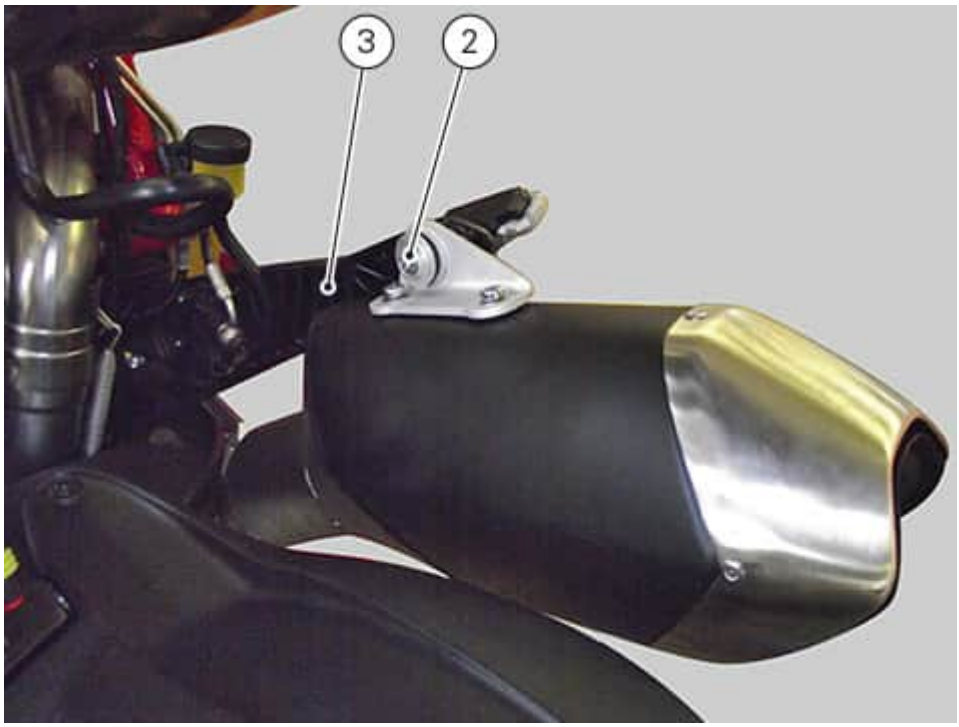
Before fitting the silencer, check the seal integrity.
If it is worn or damaged, replace it with a new one.



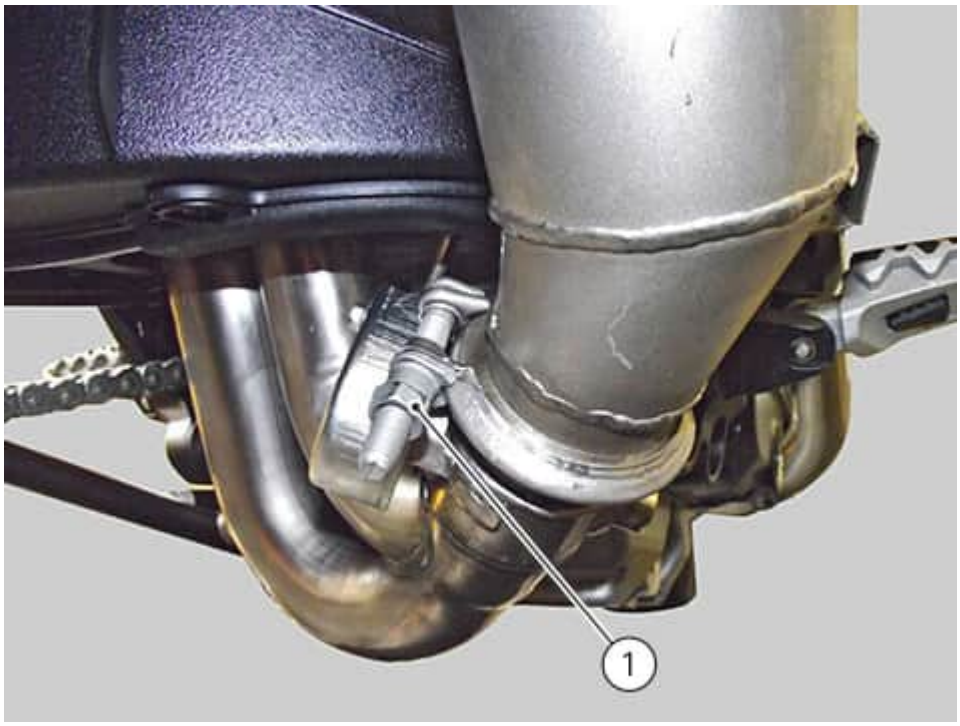
Upon fitting make sure that the two edges of the seal are centred on the welding, as shown in the figure.



Fit the silencer in the exhaust and tighten screw (2) to the specified torque of 22 Nm ± 10%.

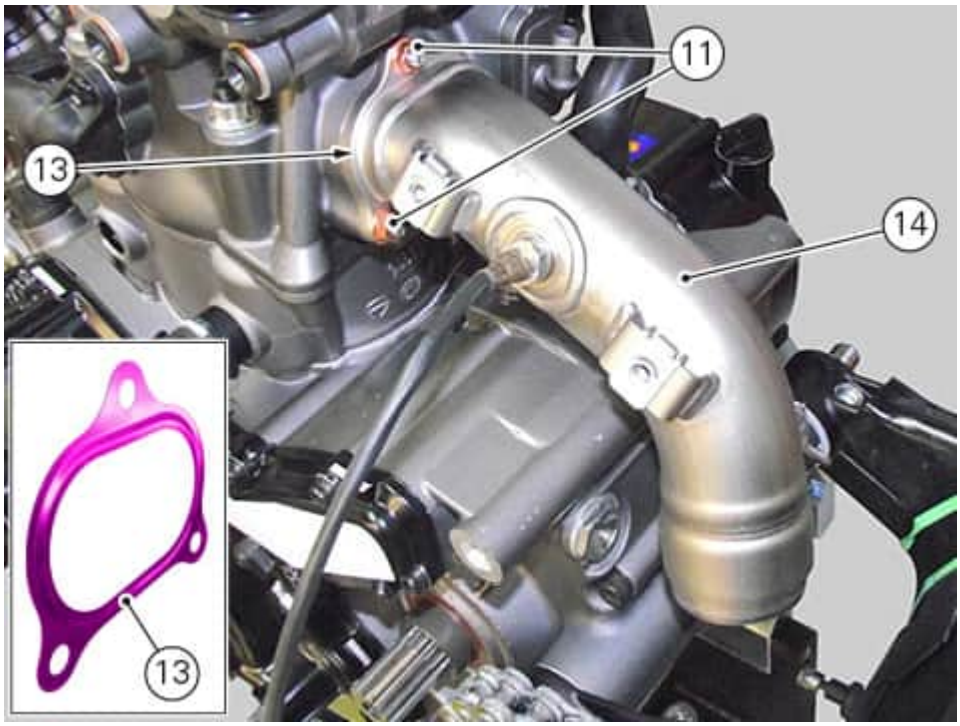


Tighten clamp (1) to the specified torque of 25 Nm ± 10%.

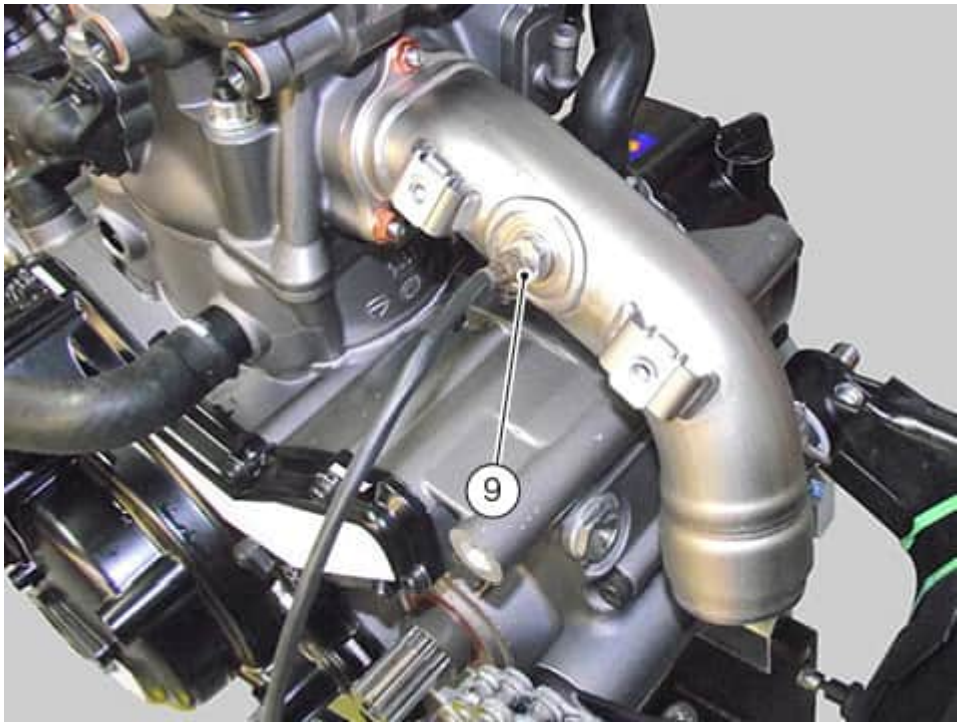

1

Refitting the exhaust system

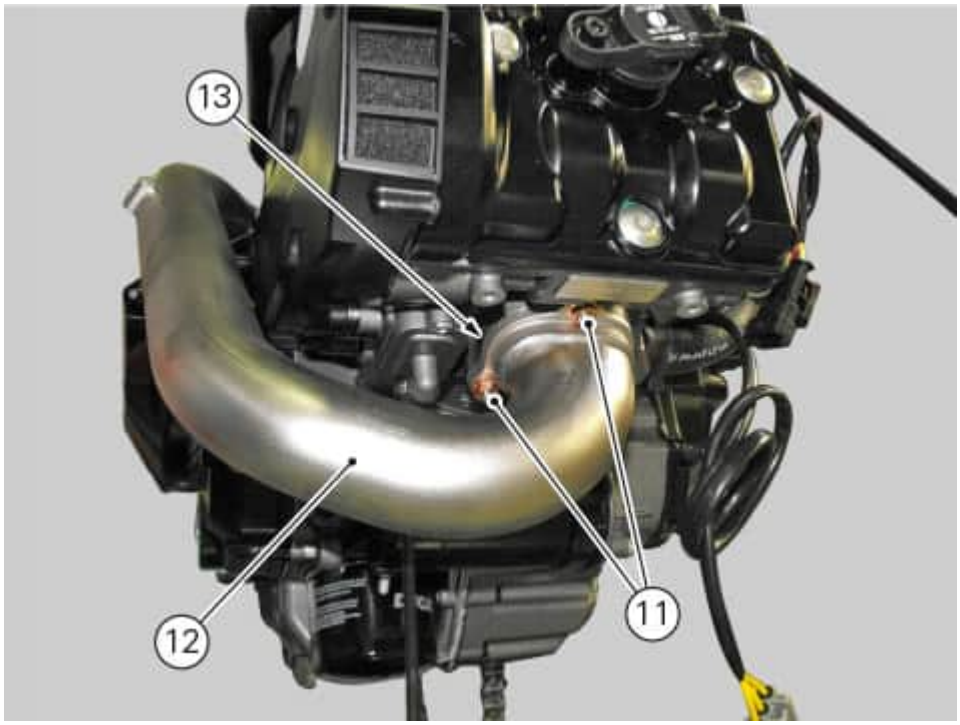
Fit the vertical exhaust manifold (14) on the vertical cylinder head with the gasket (13).
The rounded side must face the exhaust.
Tighten the securing nuts (11) to the torque of 10 Nm ± 10% by using the special tool **887134198**.



If previously removed, tighten the vertical lambda sensor (9) to the torque of 18 Nm ± 1.5.



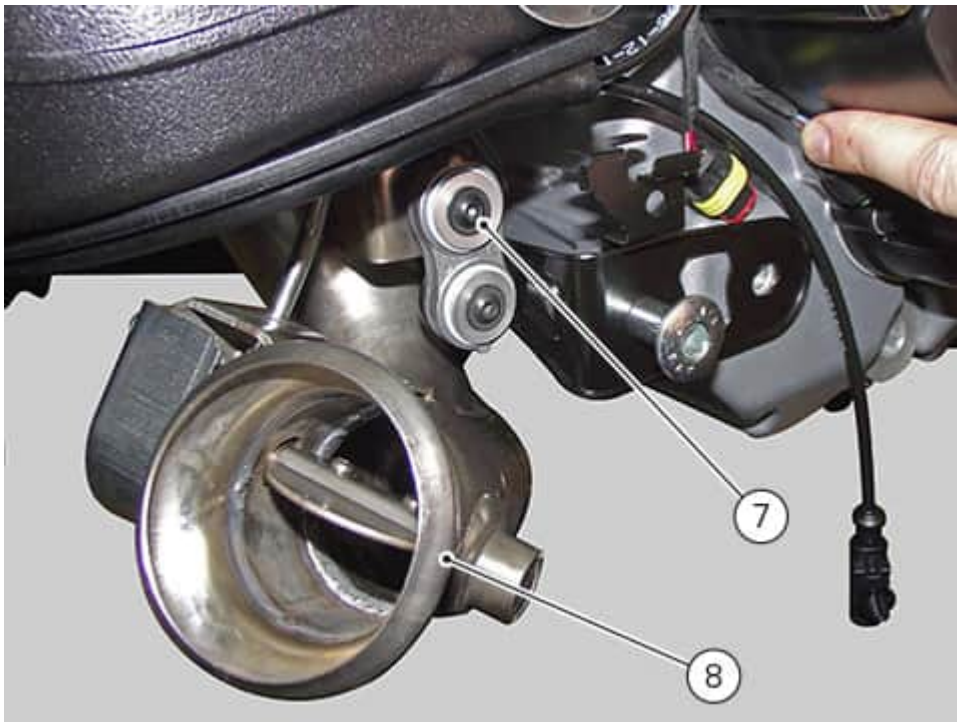
Fit the horizontal exhaust manifold (12) on the horizontal cylinder head with the gasket (13).
The rounded side must face the exhaust, as previously shown.
Tighten the securing nuts (11) to the torque of 10 Nm ± 10% by using the special tool **887134198**.



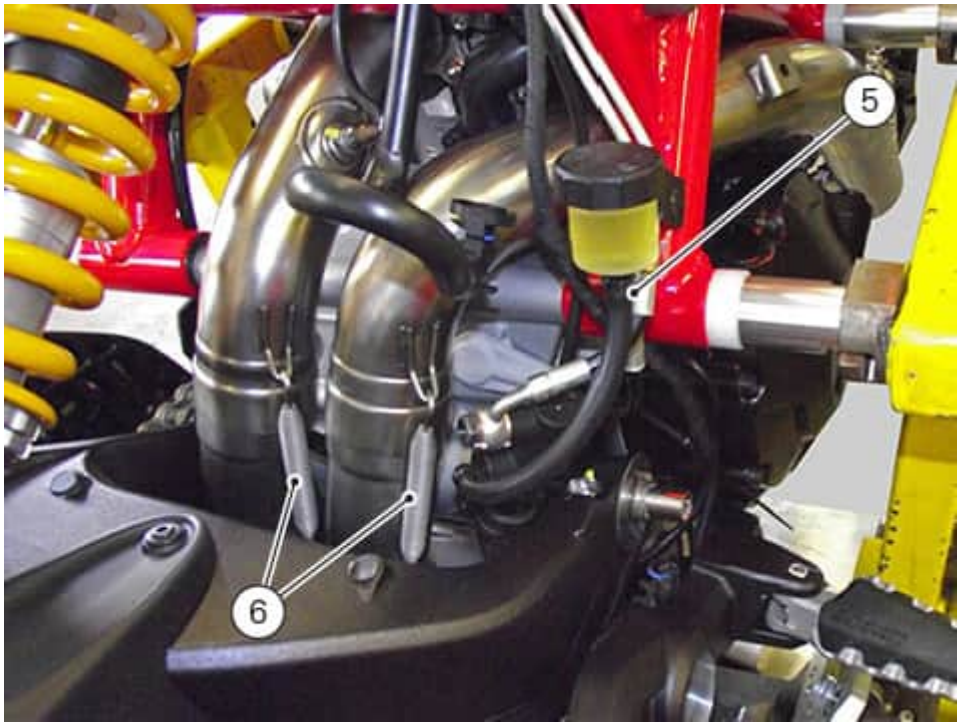
If previously removed, tighten the horizontal lambda sensor (10) to the torque of 18 Nm ± 1.5.



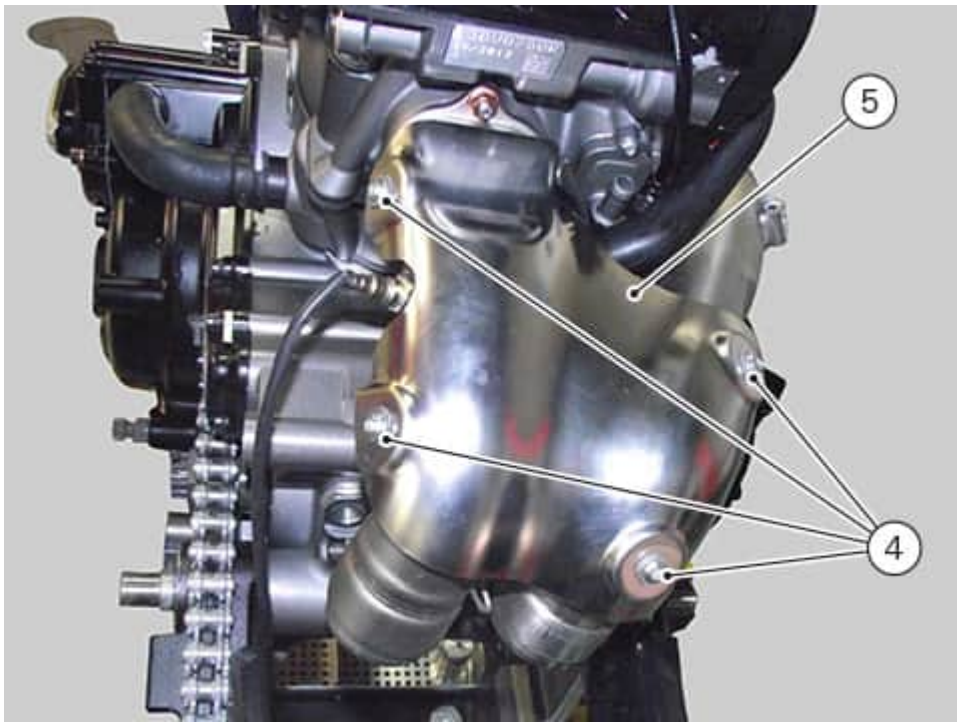
Fit the central exhaust pipe (8) securing the screw (7).

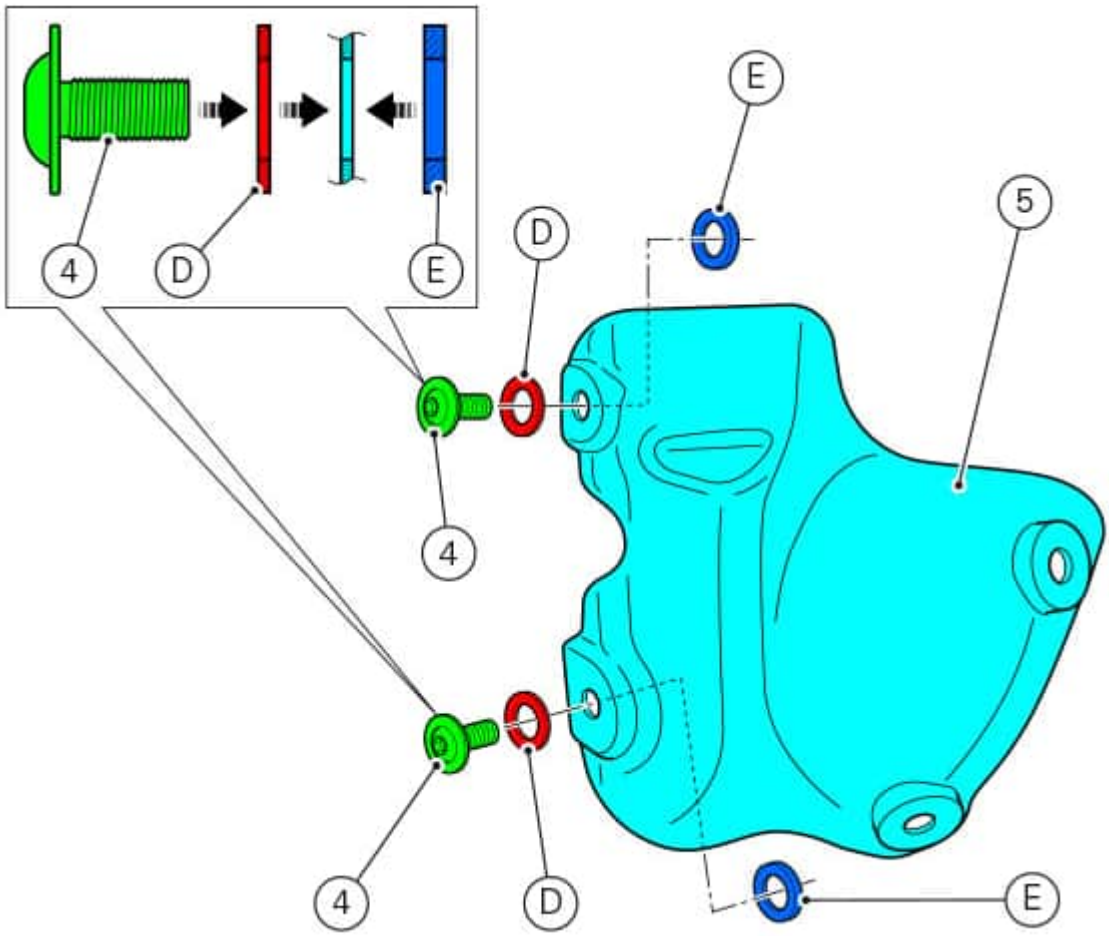


Fit the two retaining springs (6).
Tighten the two retaining screws (7) to the specified torque of 22 Nm ± 10%.

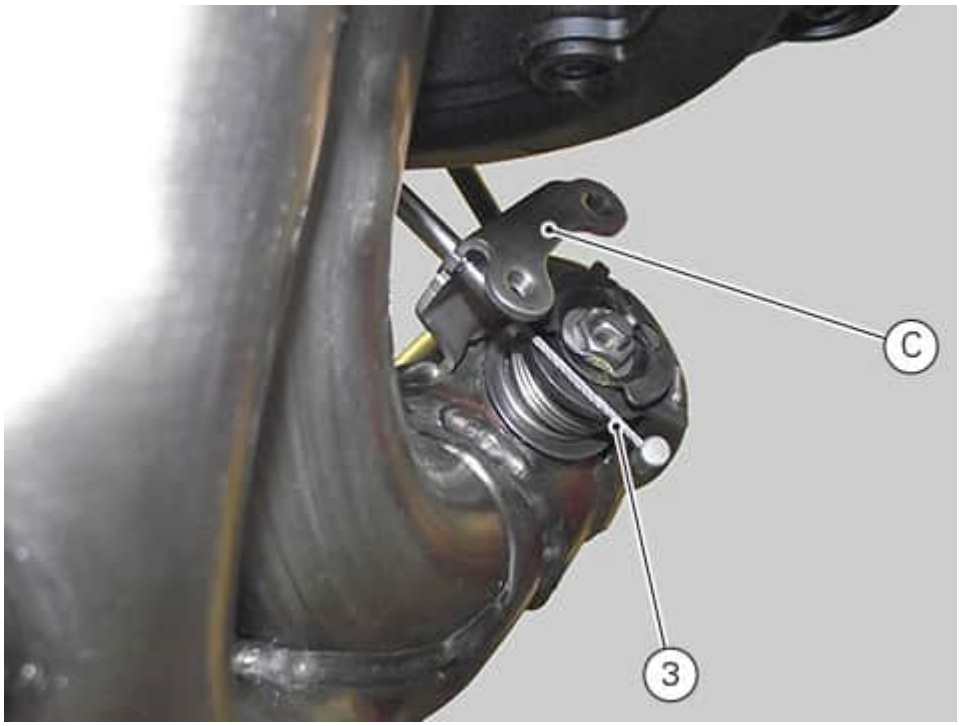


Fit the heat guard (5) tightening screws (4) to the specified torque of 8 Nm ± 10%.
Remember to fit in the two left screws the "thicker" washers (E) and the "narrow" washers (D), as shown in the figure.

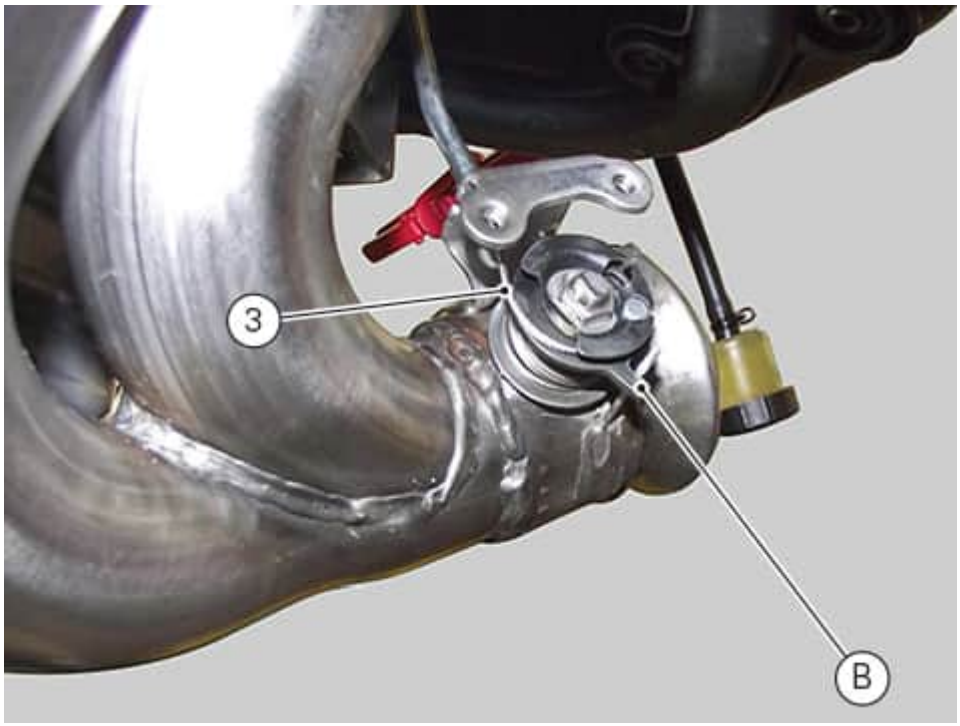




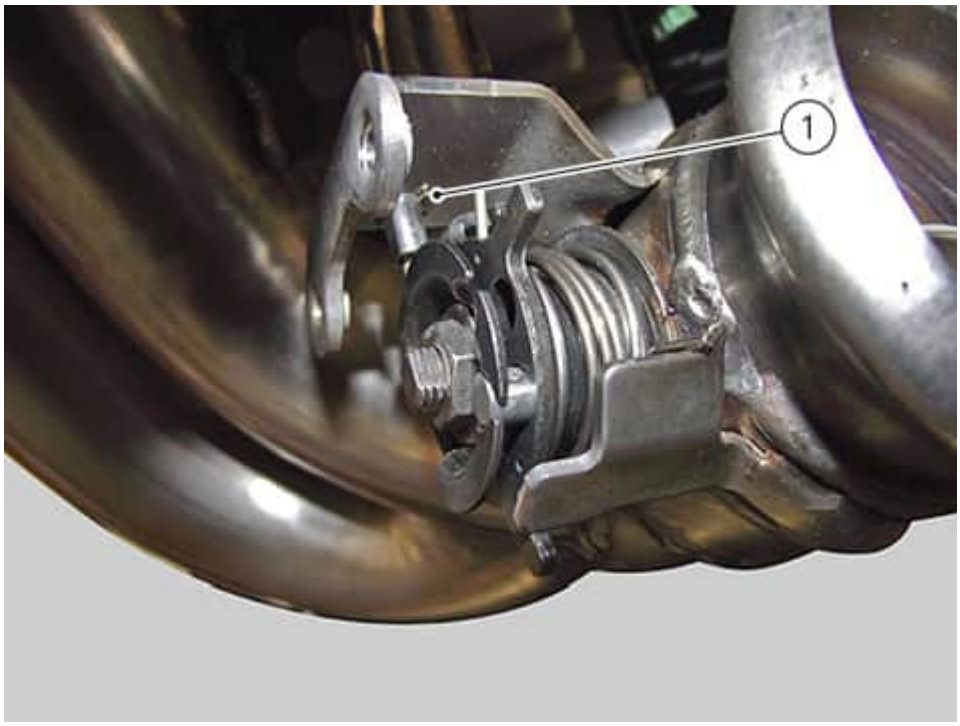
Fit control cable (3) in plate (C).



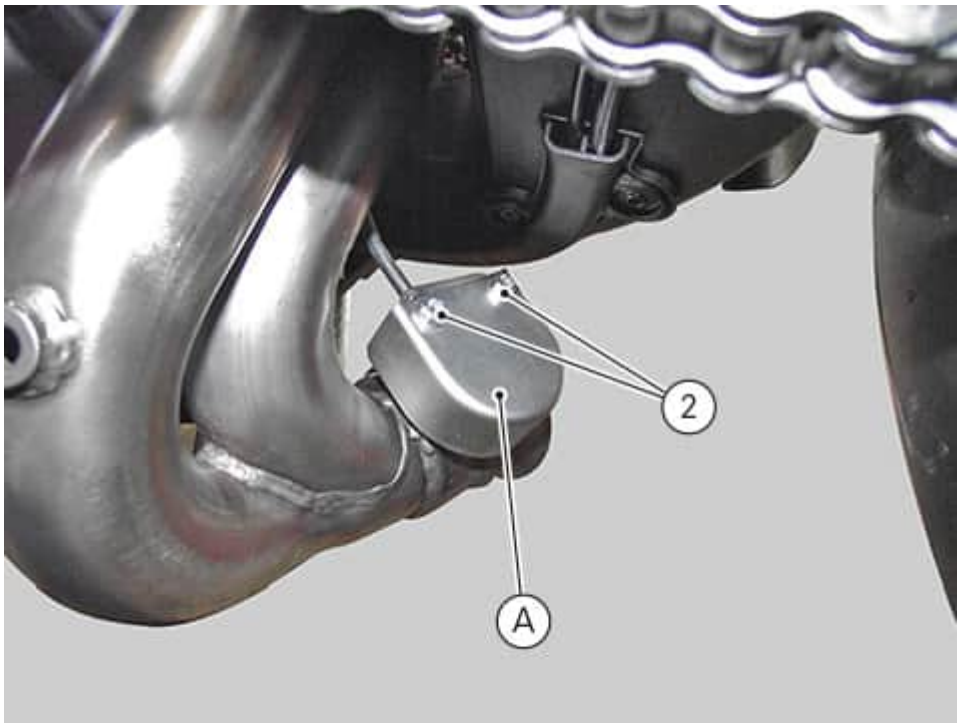
Turn the pulley (B) of the exhaust valve to make the control cable entry easier (3).



Secure the cable with circlip (1).

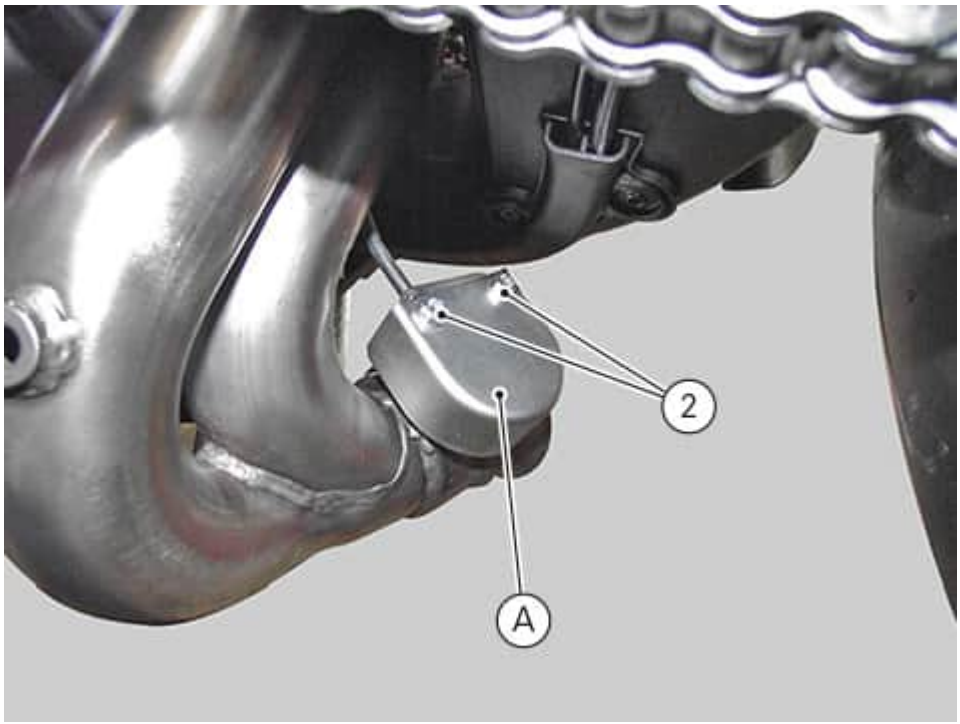


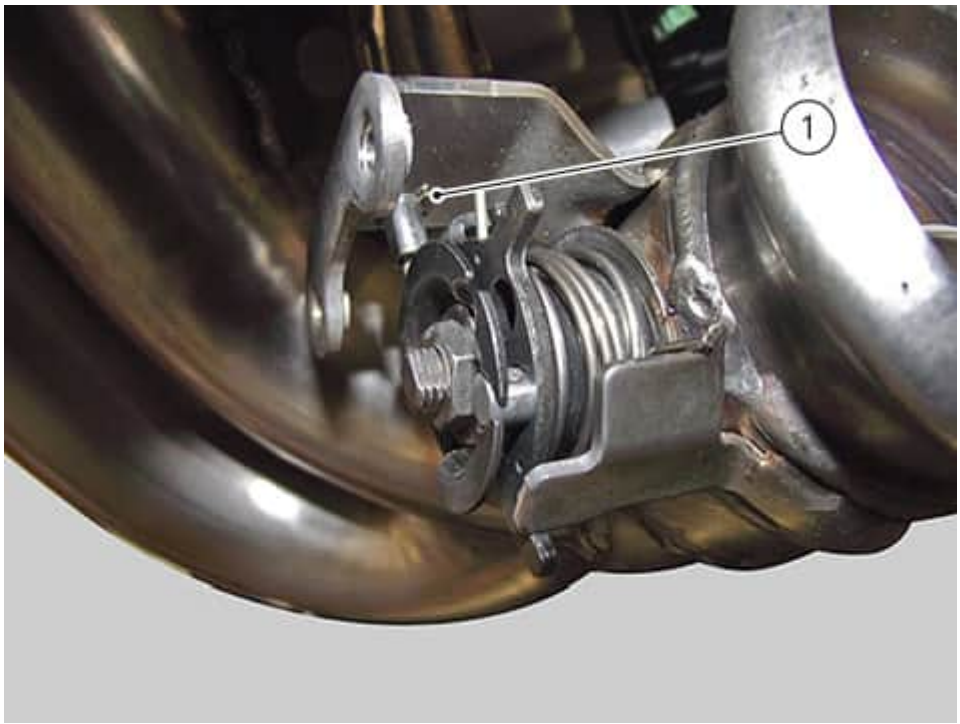
Secure the pulley guard (A) by tightening screws (2) to the specified torque of 10 Nm ± 10%.



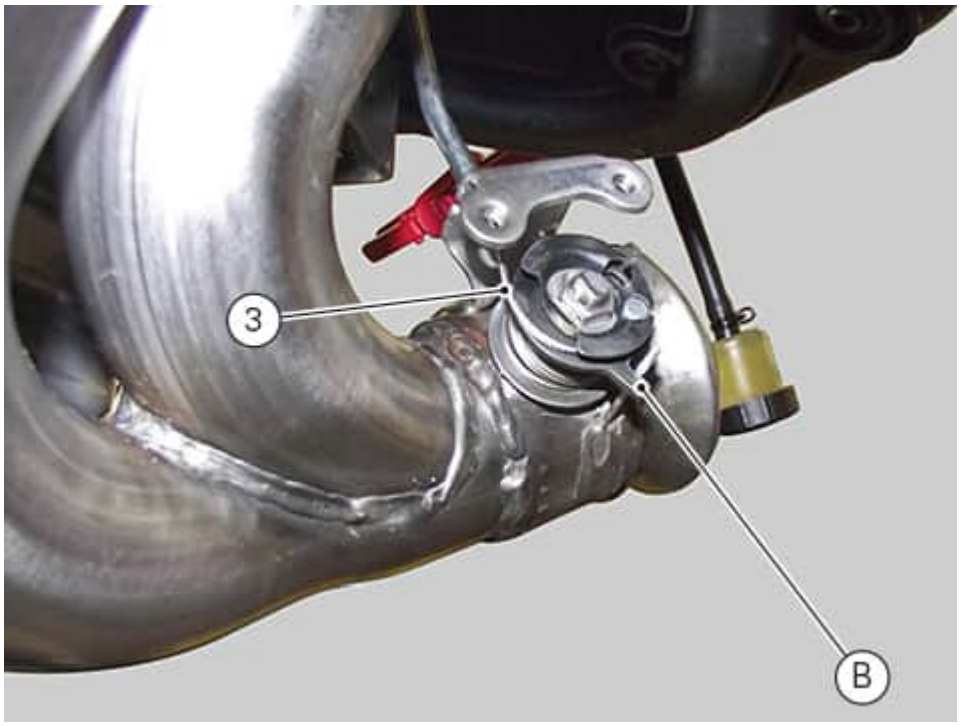
Removing the exhaust system

Remove guard (A) by loosening the two retaining screws (2).
Remove circlip (1).

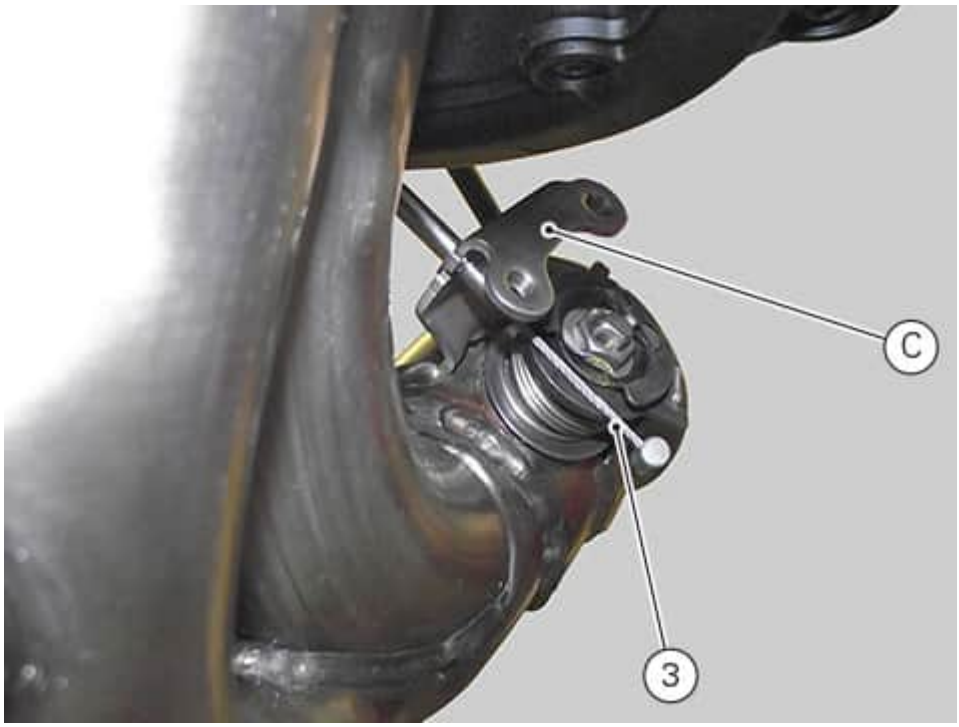




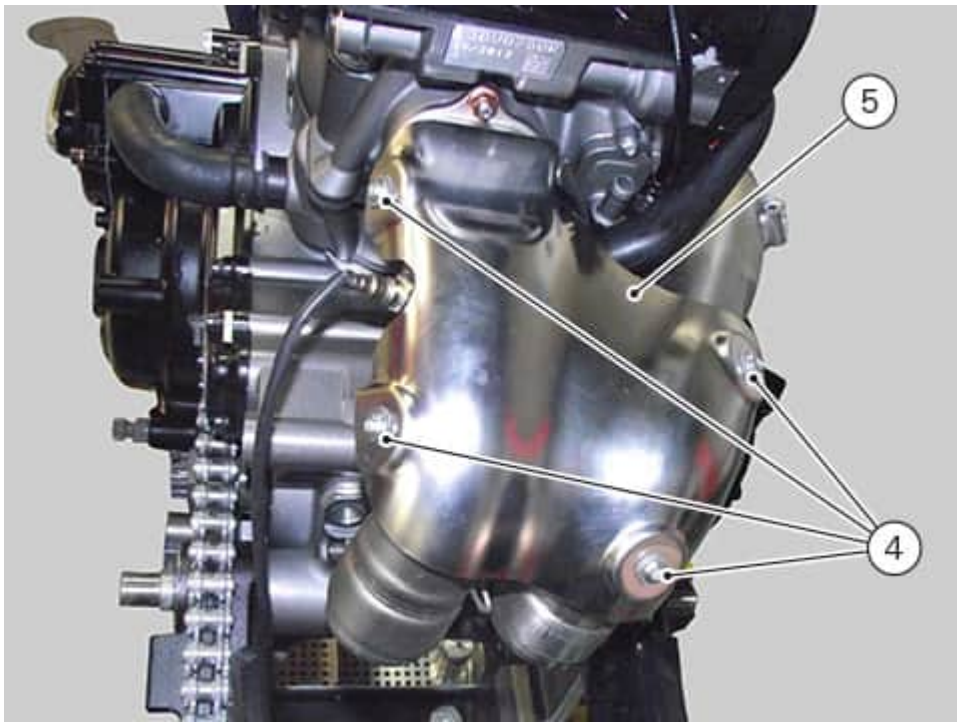
Turn the pulley (B) of the exhaust valve to facilitate the control cable exit (3).
Slide out from the pulley (B) the control cable (3).



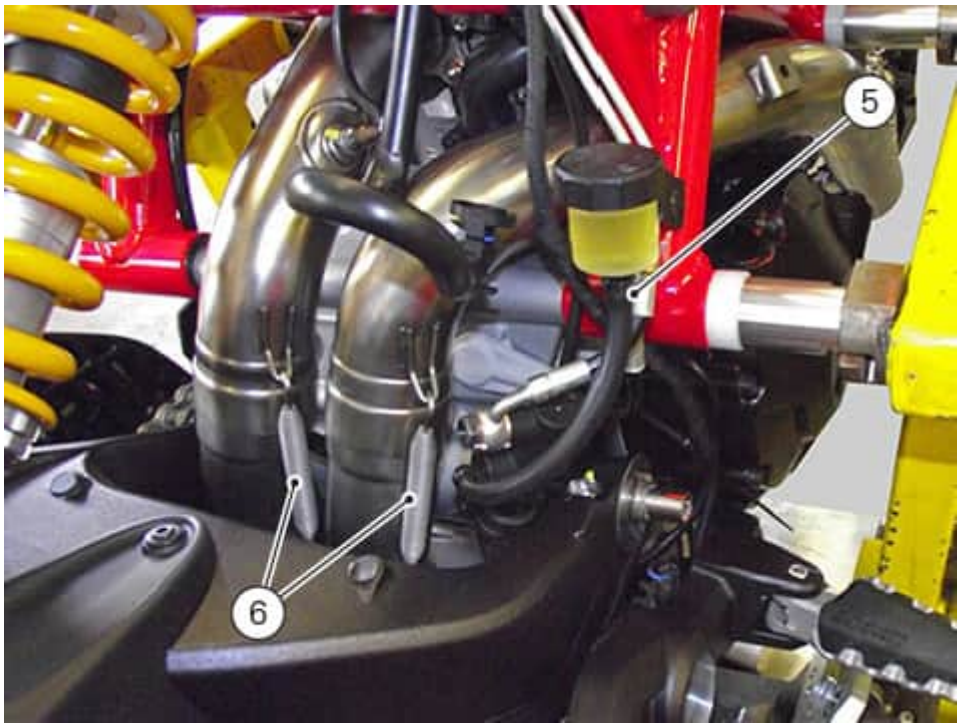
Release control cable (3) from plate (C).



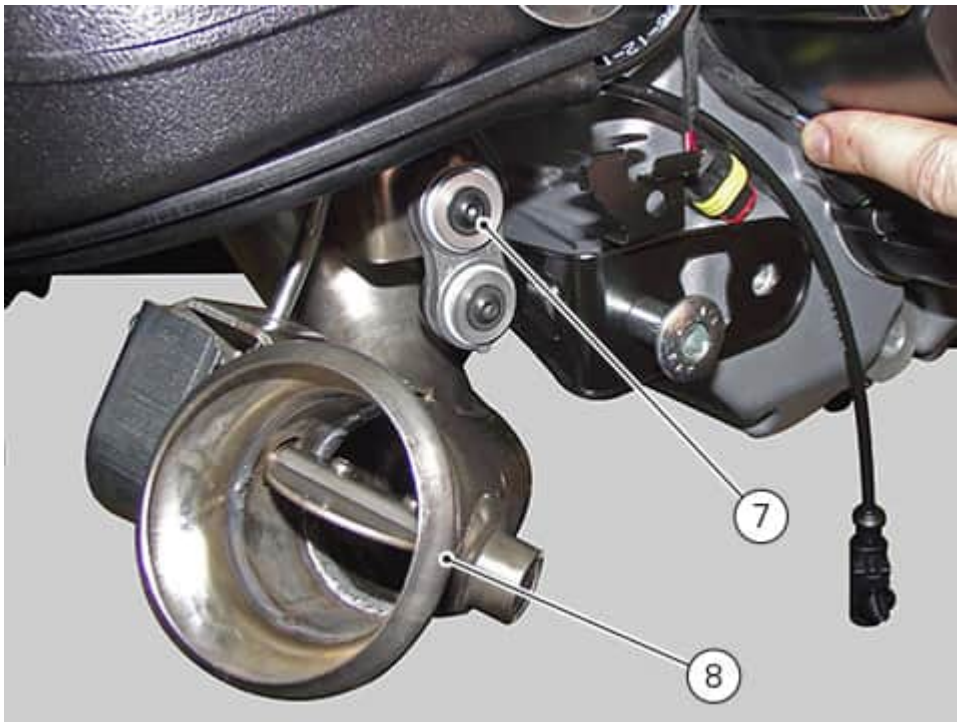
Loosen the retaining screws (4) and remove heat guard (5).



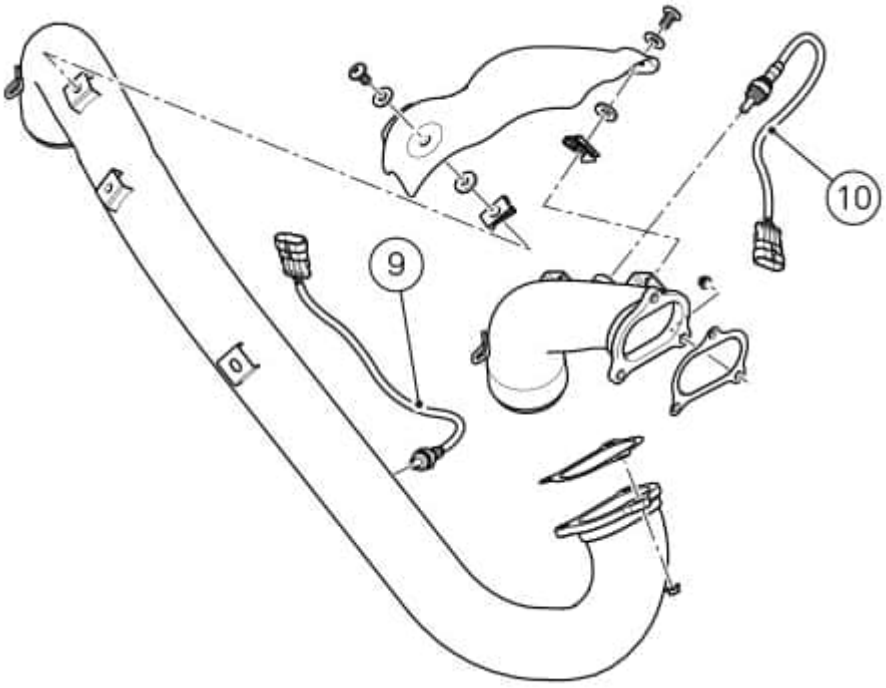
Remove the two retaining springs (6).

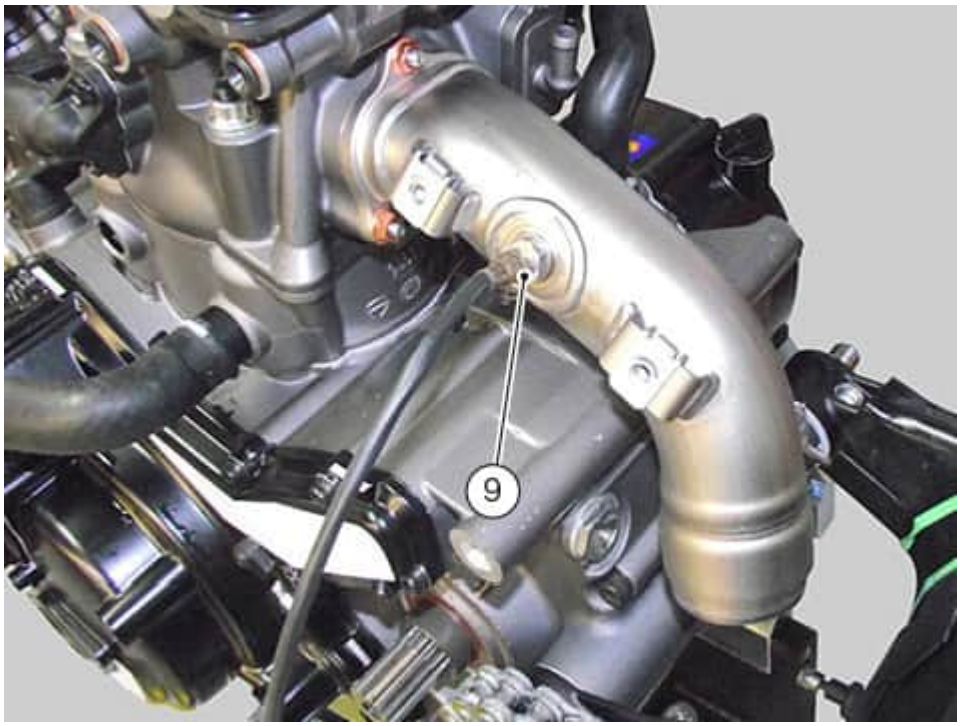


Working on the right side of the vehicle, loosen and remove screw (7).
Remove the exhaust pipe (8).



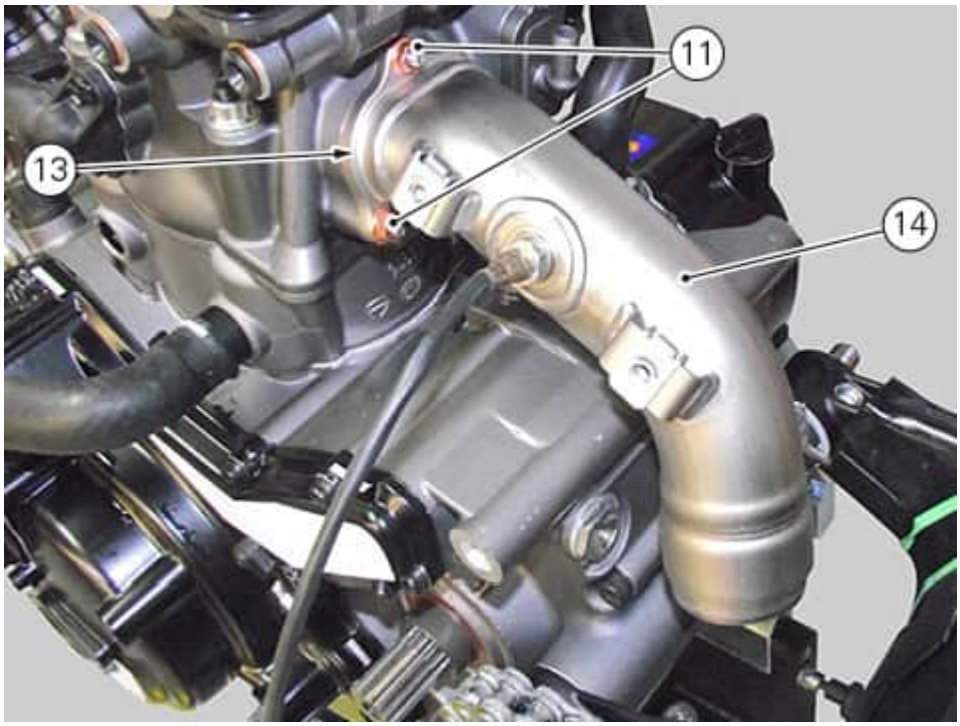
Loosen and remove the lambda sensor of the horizontal cylinder (9) and the vertical cylinder (10).

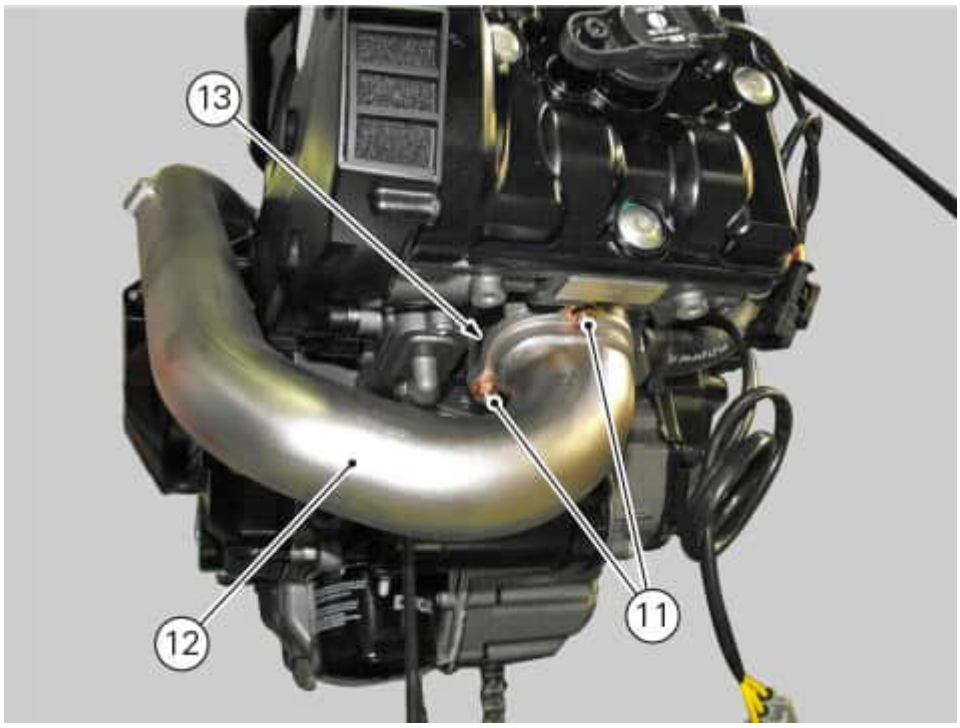






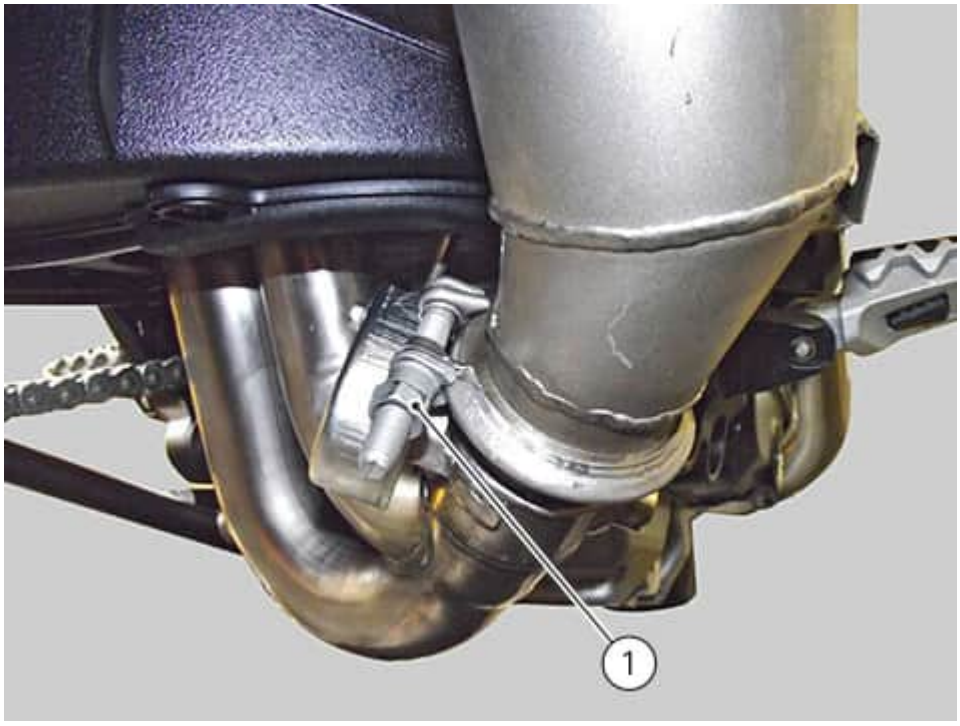
Using tool **887134198** loosen and remove the three retaining nuts (11) and remove the vertical manifold (14) with the gasket (13).
Repeat the operation for the horizontal cylinder manifold.


11
13
14

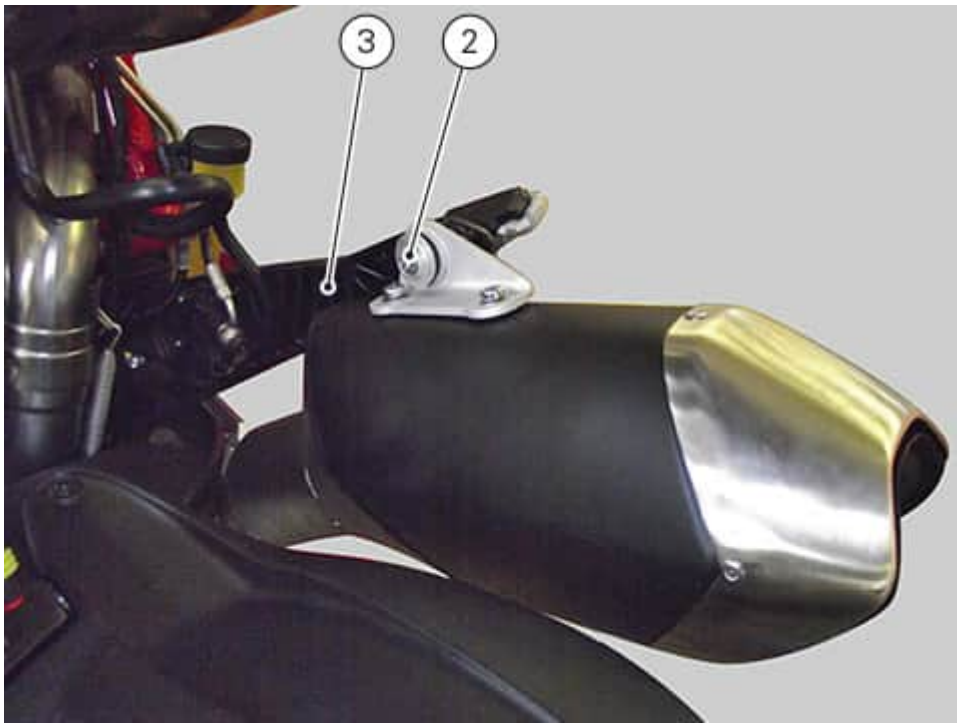

13
11
12

Removing the silencer

Loosen the clamp (1).

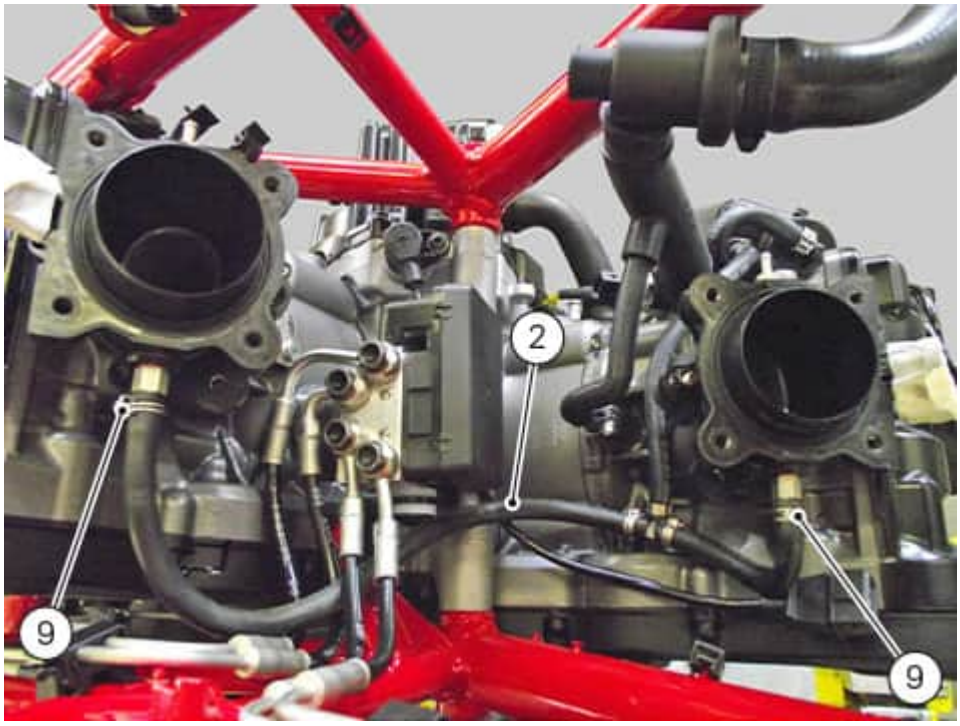


Loosen screw (2) securing silencer to footpeg (3).
Remove the silencer.

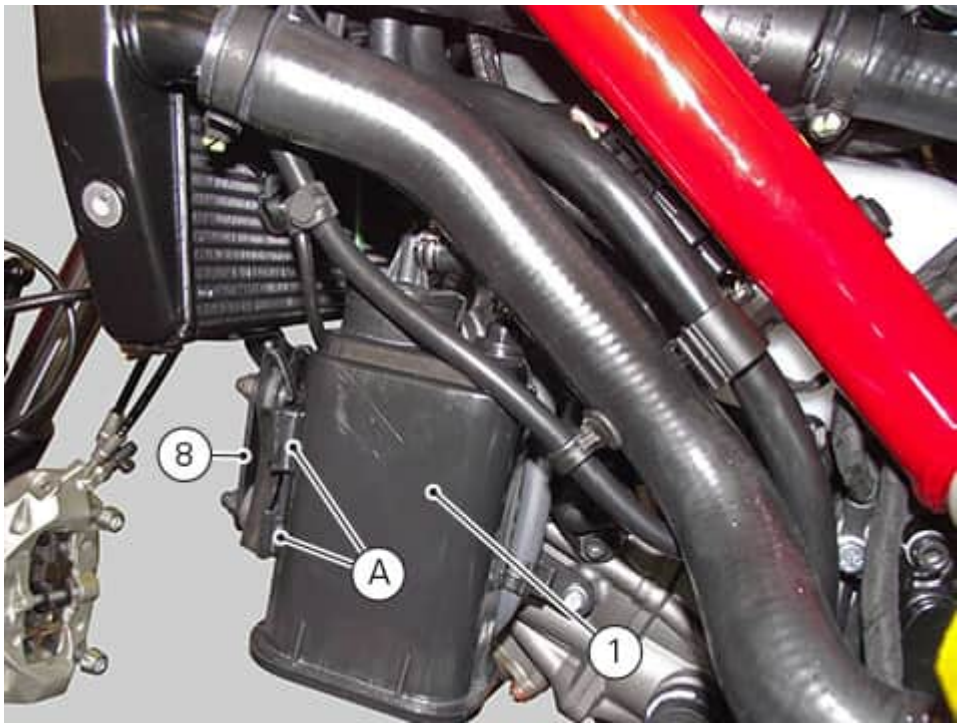


Refitting the Canister filter

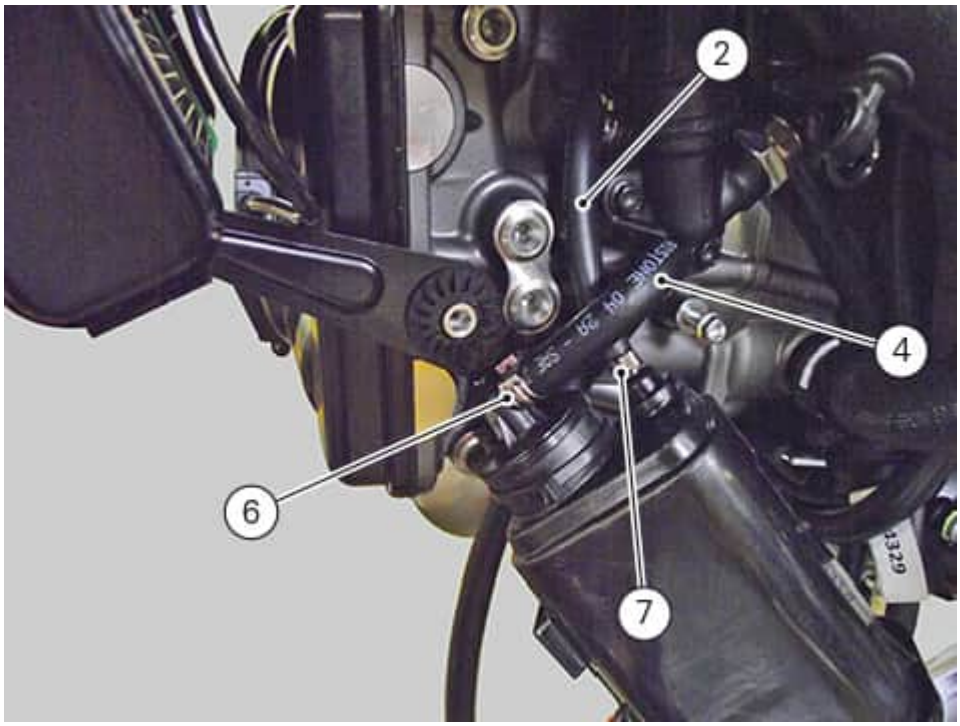
Fit hoses (2) onto intake manifolds and secure them with clamps (9).



Fit canister filter from the top. It must be fitted into plate (8) guides (A).



Connect hose (2) to the canister filter by tightening it with clamp (7).
Connect hose (4) to the canister filter by tightening it with clamp (6).

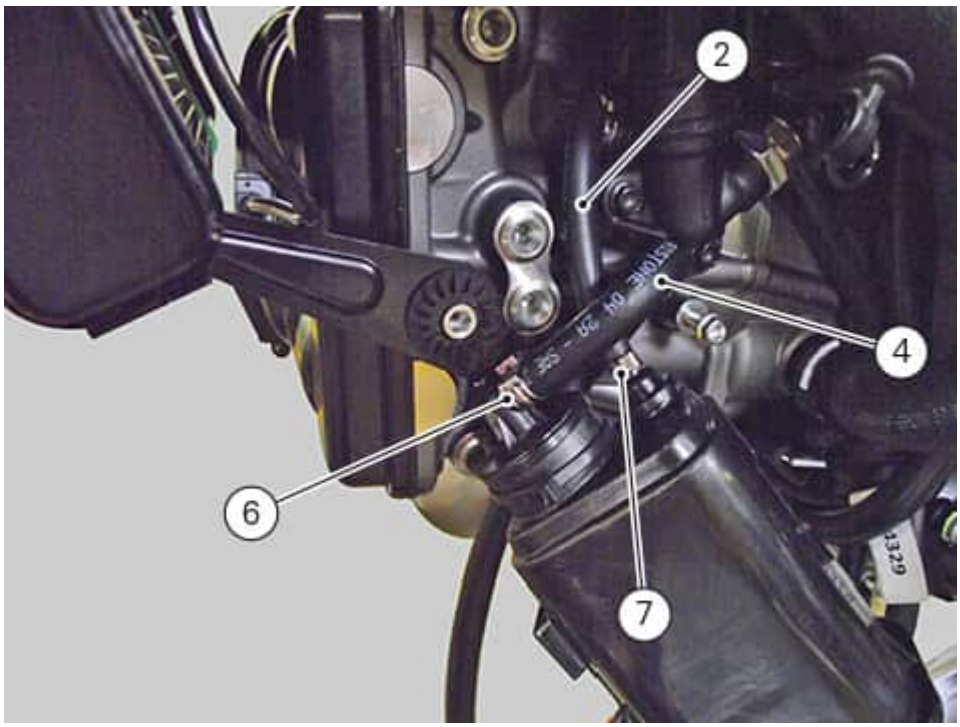


Refit the front half-fairings (Refitting the fairings).

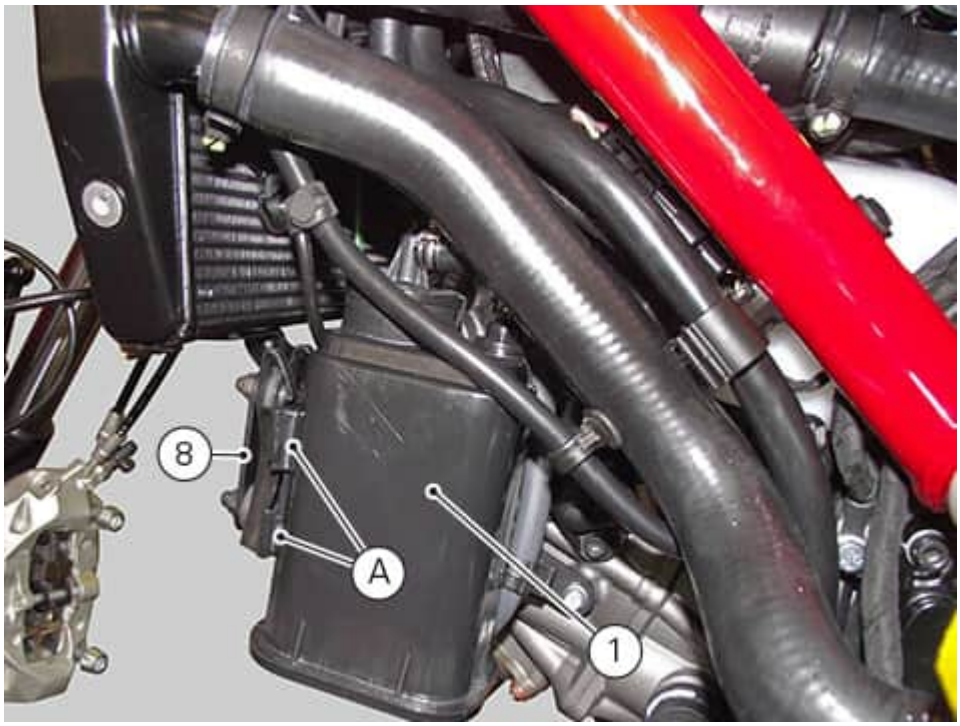
Removing the canister filter

Remove the front half-fairings (Removing the fairings).

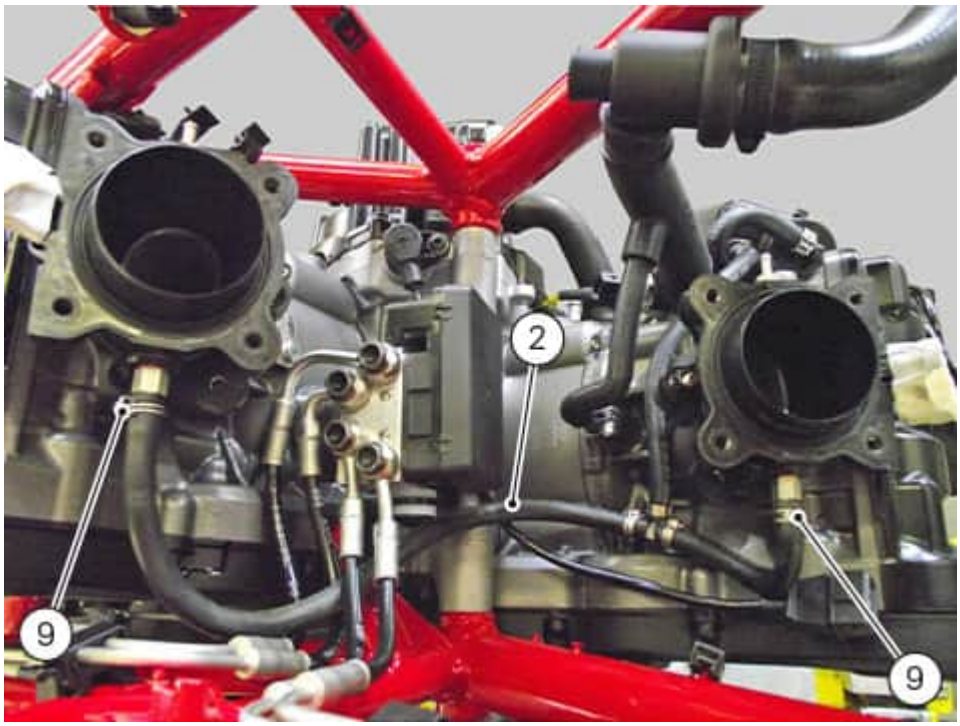
Disconnect the hose (4), removing the clip (6).
Disconnect the hose (2), removing the clip (7).



Remove canister filter (1) by sliding it upwards on the plate (8) guides (A).

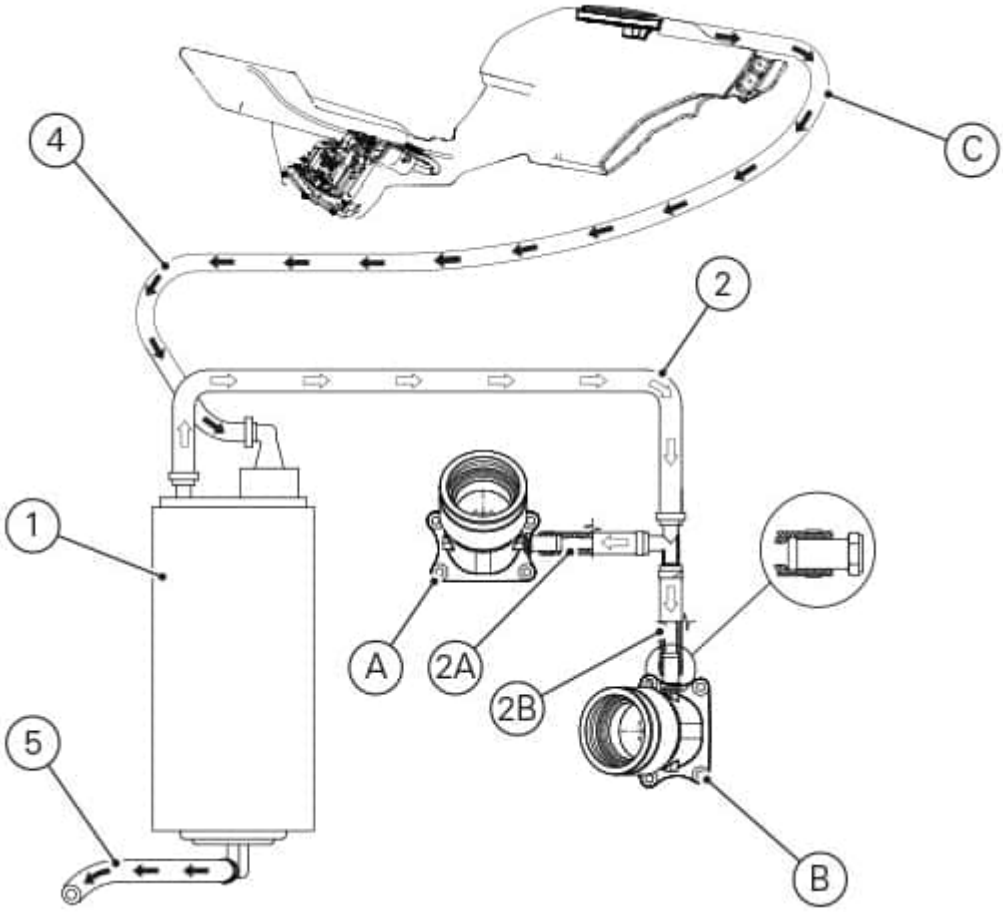


To remove the hoses feeding fuel to the intake manifolds, remove the clamps (9), and slide out the hoses (2) from the intake manifolds.


2
9
9

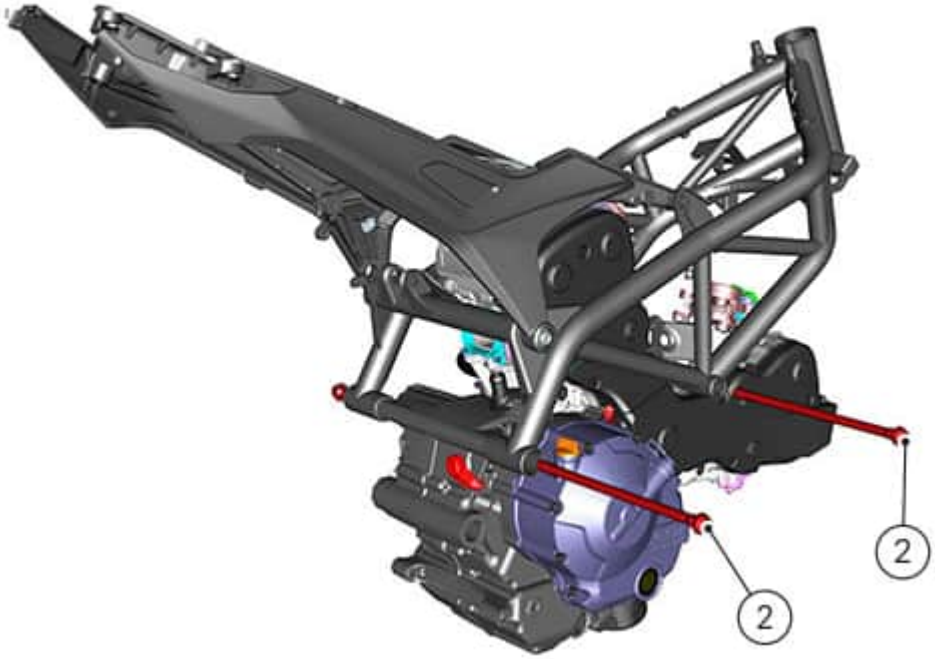
Canister filter system

USA models are equipped with an additional system featuring a Canister filter that prevents fuel fumes from being discharged into the atmosphere.
The breather hose (4) is connected to the Canister filter (1); when the fuel has been filtered, it is returned through the hose (2) to the intake manifolds (A) and (B) via the hoses (2A) and (2B).
Breather hose (C) and hose (5) vent to the ground.
For correct positioning of the connection hoses refer to the indications given below.

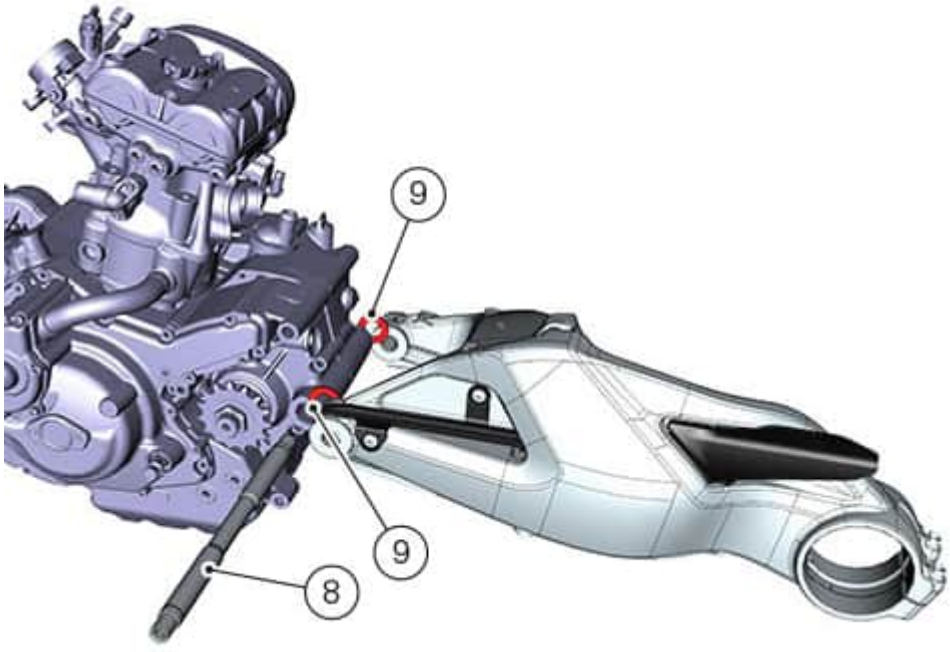


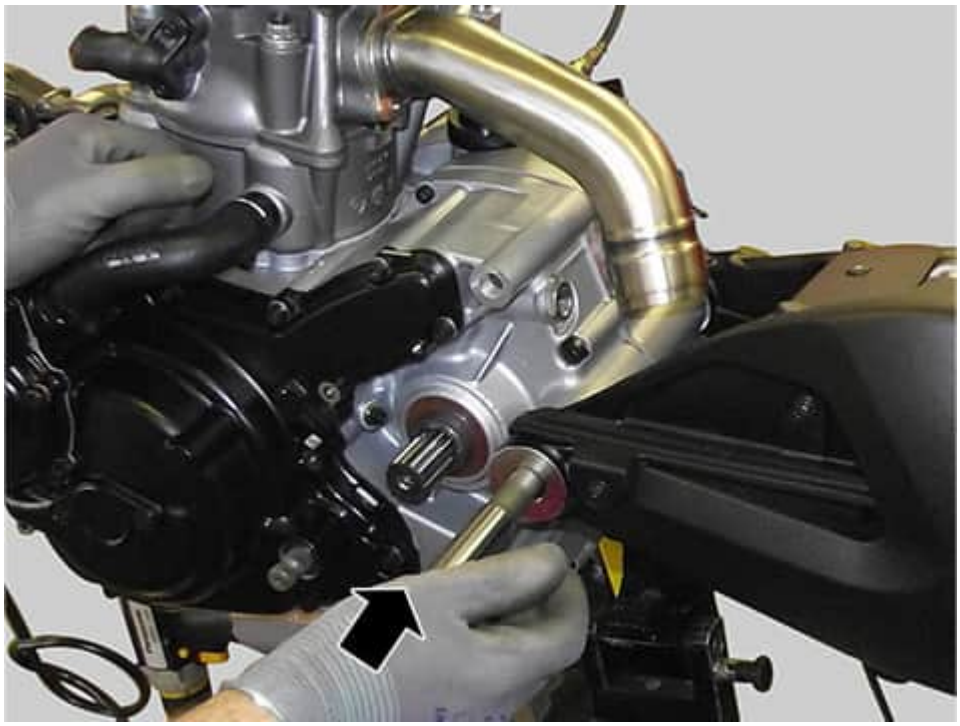
Refitting the engine

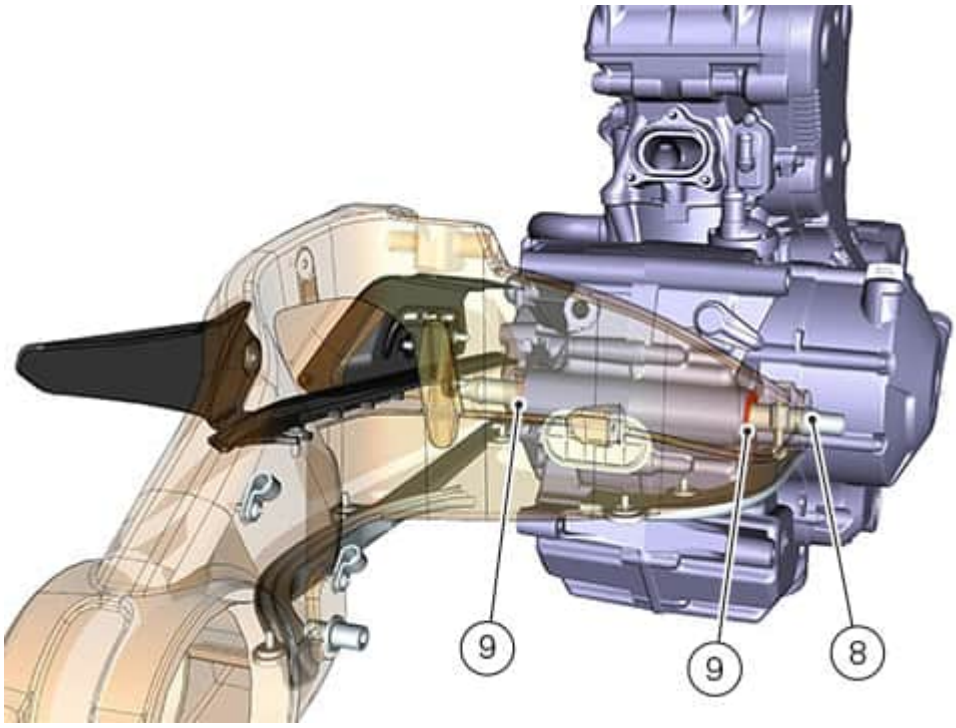
Place the complete engine block in the frame.
Start upper support screws (2).



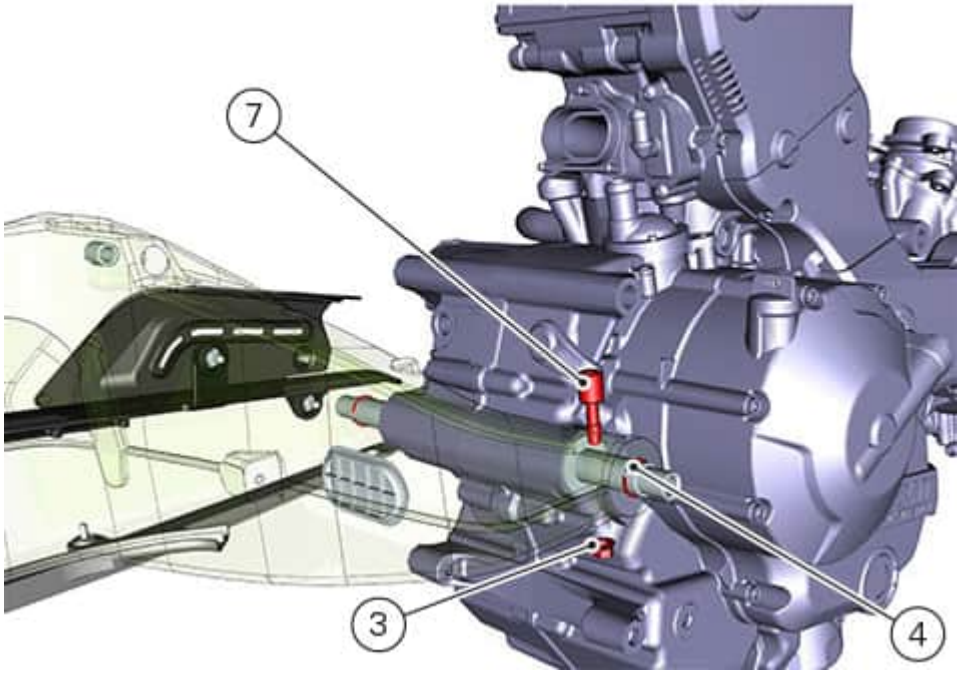
Place the swinging arm on the engine block with suitable shims (9).
On the LH side, insert swingarm shaft (8) fully home to fix the swinging arm to the engine block.

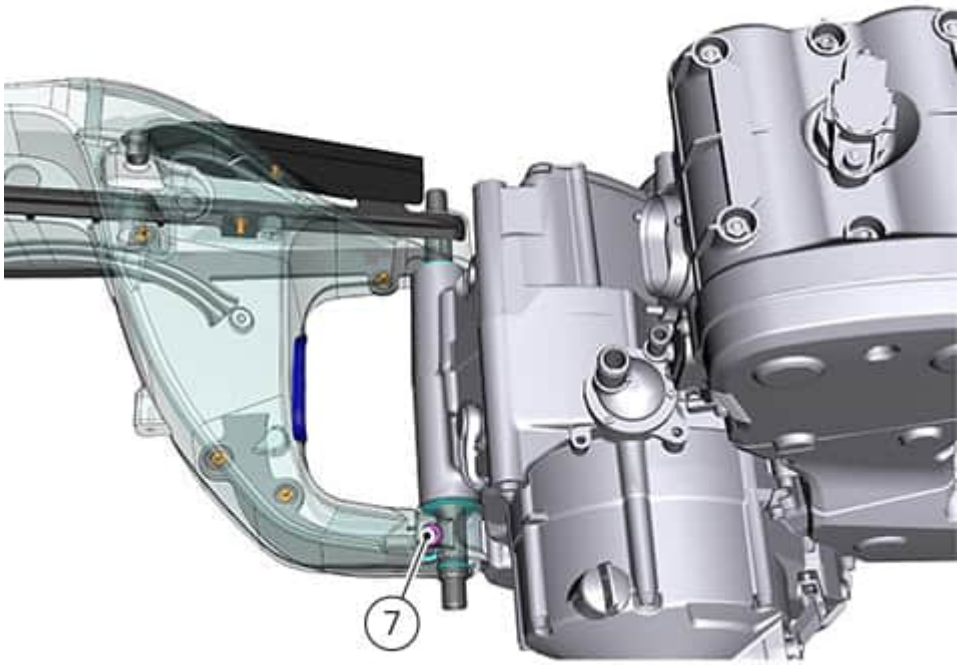


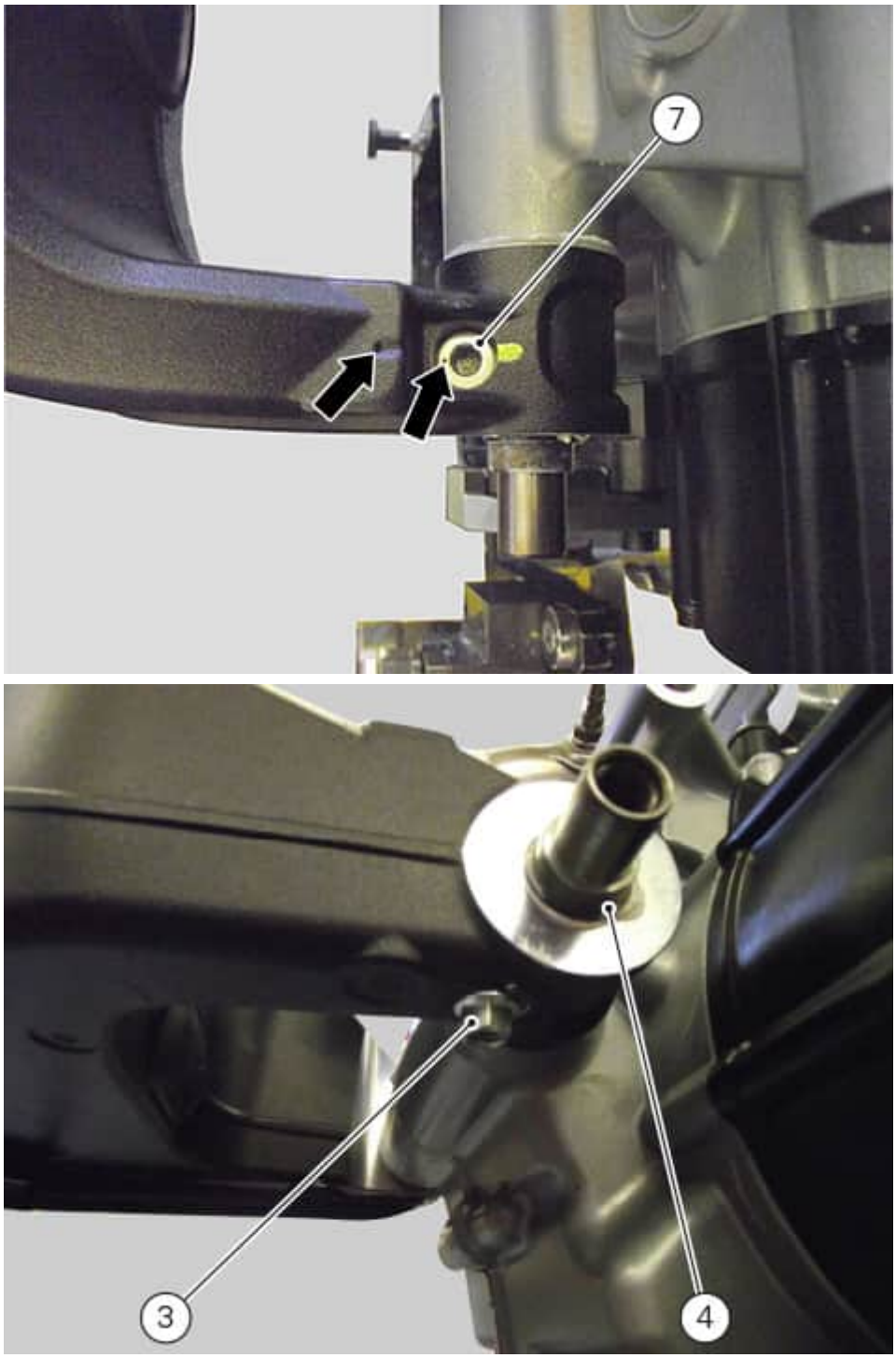




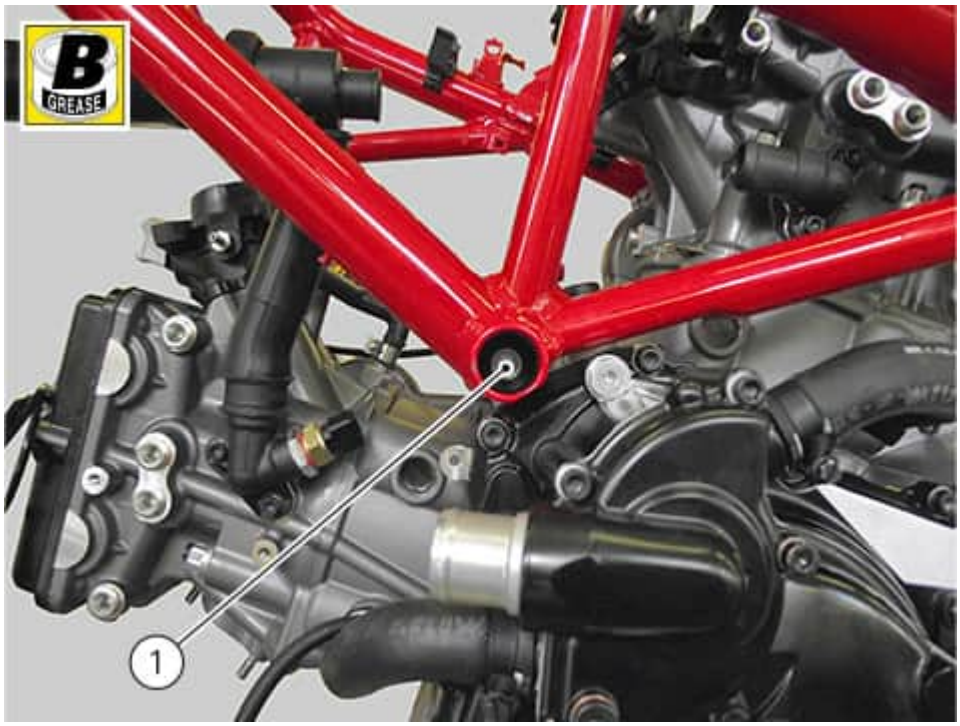
Check that clamp (7) special screw on the RH side of the swinging arm has been properly positioned, i.e. its reference points match the reference on the swinging arm.
On the RH side, start nut (3) that retains swinging arm clamp special screw (7), hold nut (3) and tighten screw (7) to a torque of 18 Nm ± 5%.
Fit snap ring (4).

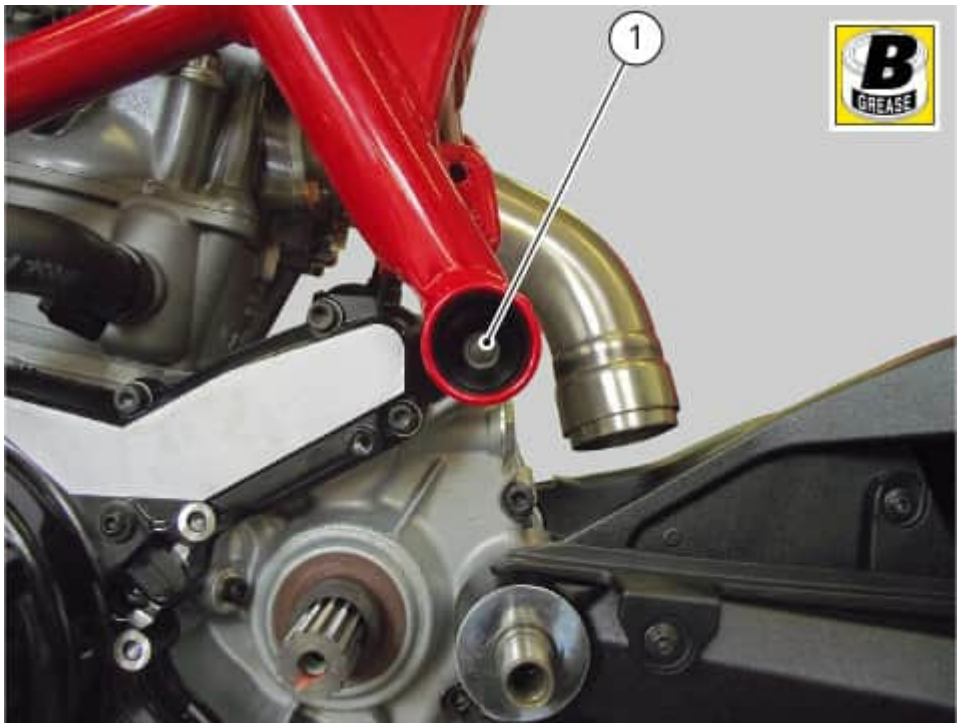

7
3
4

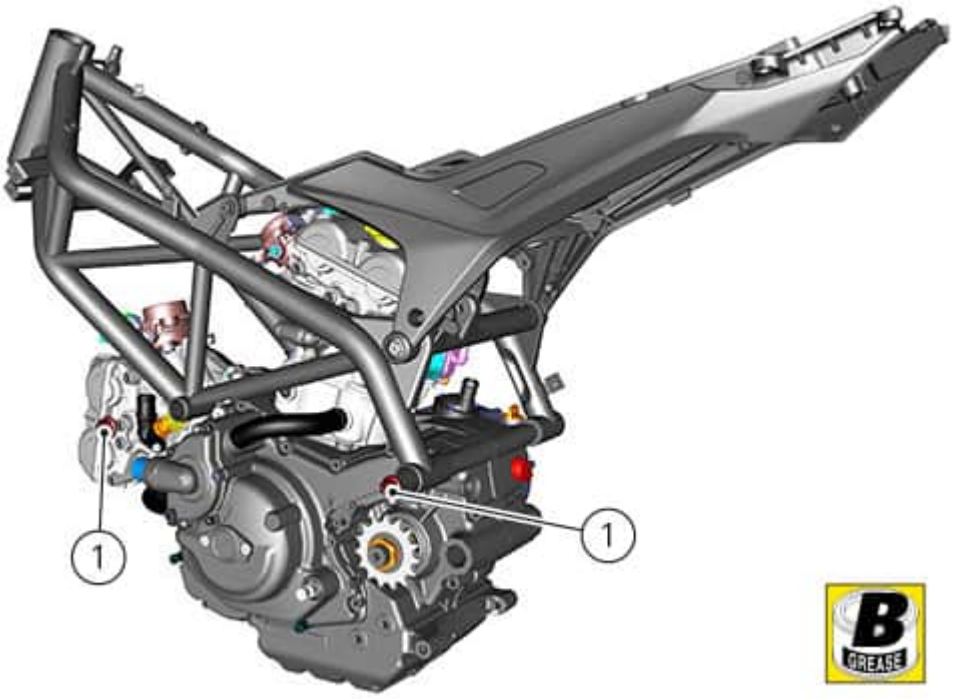

7



Apply specified grease on nuts (1) and start them on the frame LH side, on engine upper supporting screws (2). Tighten nuts (1) to a torque of 60 Nm ± 5%.


B
GREASE
1


1
B
GREASE



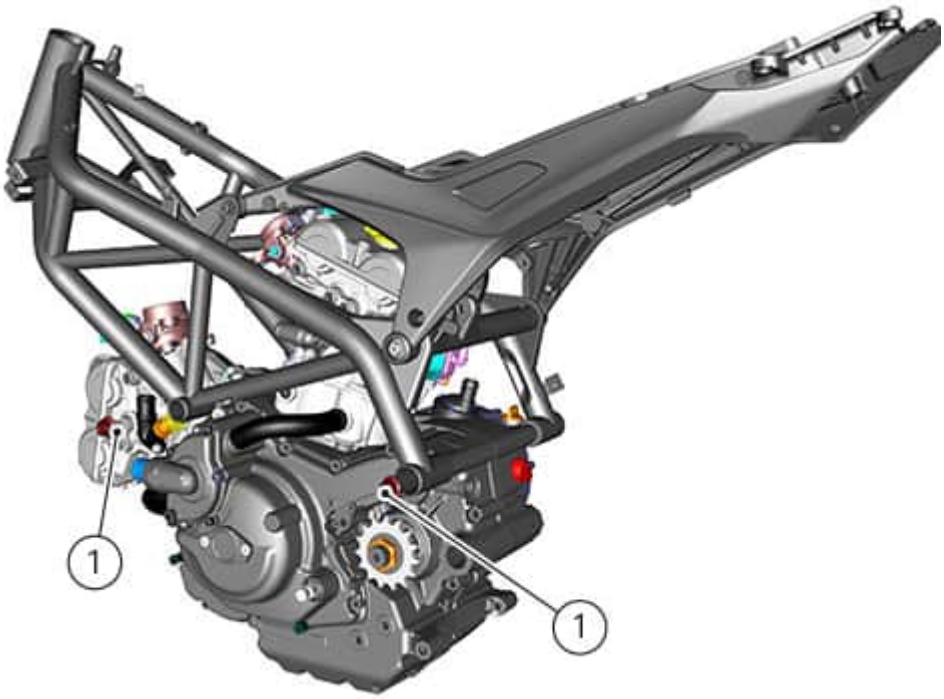
Connect the wiring connectors on the engine block (Routing of wiring on frame).
Refit the side stand (Refitting the side stand).
Refit the front sprocket (Refitting the front sprocket).
Refit the clutch pushrod cable on the clutch cover (Refitting the clutch cover).
Refit the gear shift (Refitting the gear shift).
Connect the starter motor/solenoid starter cable (Routing of wiring on frame).
Refit the water radiator lower retainer on the engine block (Refitting the water radiator).
Refit the cooling system hoses and unions on the engine block (Refitting the cooling system hoses and unions).
Fill the cooling system (Changing the coolant).
Connect the rear oil pressure sensor to the main wiring (Routing of wiring on frame).
Fill the lubrication system (Changing the engine oil and filter cartridge).
Refit the footpegs (Refitting the footpegs).
Connect the cables to the coils.
Refit the supply system and the injectors on the intake manifolds (Refitting the throttle body).
Refit the oil breather pipe, the blow-by pipe and the throttle body (Refitting the throttle body).
Refit the airbox and the air filter (Refitting the airbox).
Refit the fuel tank (Refitting the fuel tank).
Refit the seat (Refitting the seat).

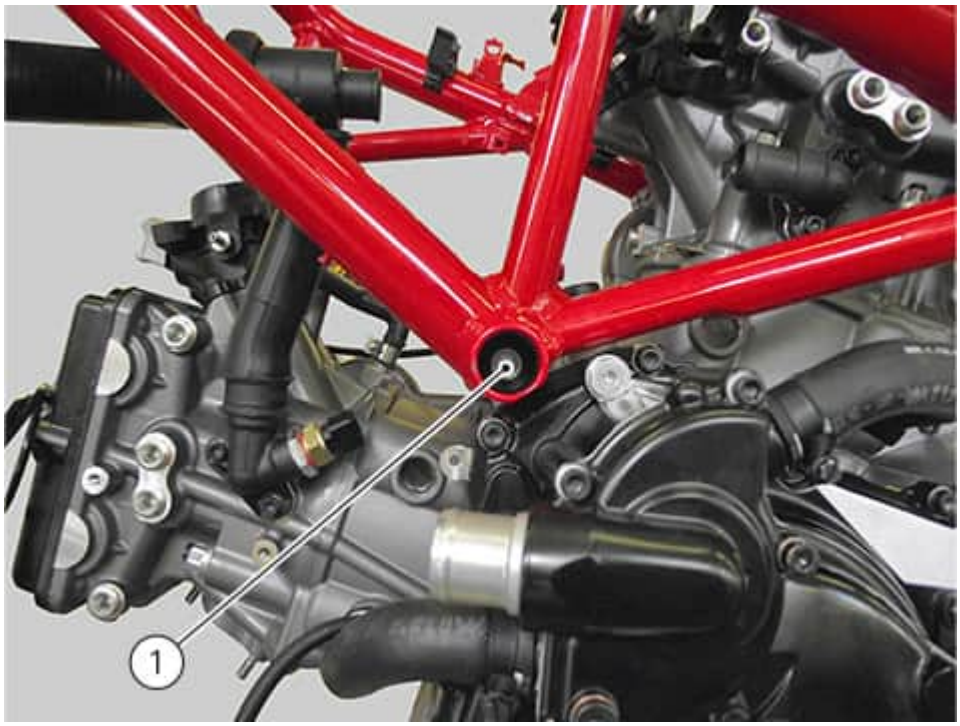
Removing the engine

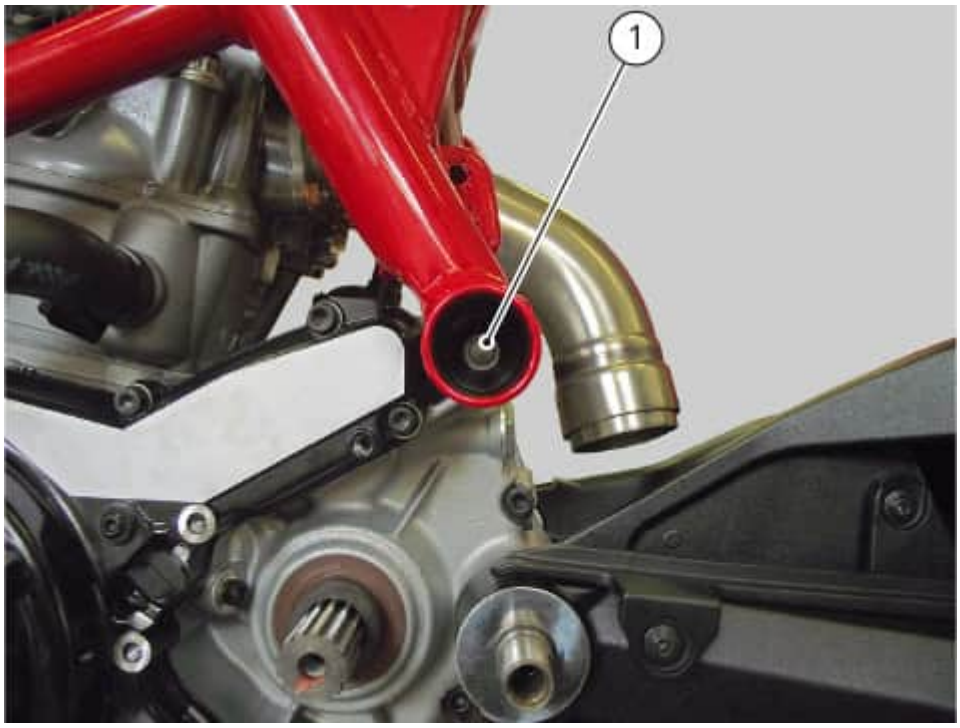
In order to remove engine you must first remove a series of other components from the motorcycle.
The removal procedures are described in the relative sections of this manual.
The list below indicates the components to be removed in a logical order.
This section describes only the operations to be carried out after having removed all the parts indicated in the list.

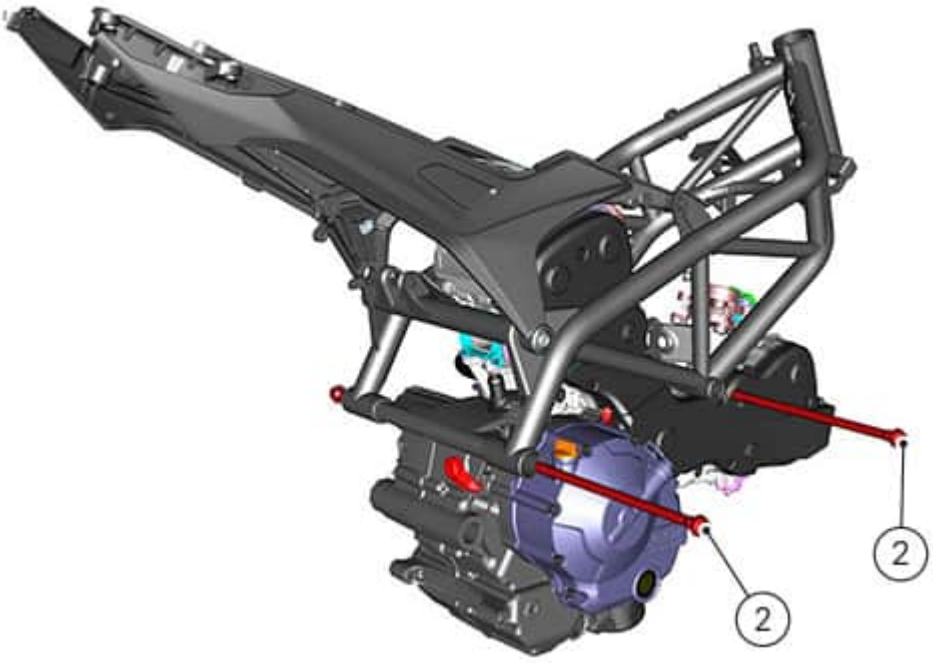
Remove the seat (Removing the seat).
Remove the fuel tank (Removing the fuel tank).
Remove the airbox, the throttle body, the blow by and the oil breather pipe (Removing the airbox).
Remove the supply system and the injectors from the intake manifolds (Removing the throttle body).
Disconnect the cables from the coils.
Remove the footpegs (Removing the footpegs).
Drain the lubrication system (Changing the engine oil and filter cartridge).
Disconnect the rear oil pressure sensor from the main wiring (Routing of wiring on frame).
Drain the coolant (Changing the coolant).
Remove the cooling system hoses and unions from the engine block (Removing cooling system hoses and unions).
Remove the water radiator lower retainer from the engine (Removing the water radiator).
Disconnect the starter motor/solenoid starter cable (Routing of wiring on frame).
Remove the gear shift (Removing the gear shift).
Remove the clutch pushrod cable from the clutch cover (Removing the clutch cover).
Remove the front sprocket (Removing the front sprocket).
Remove the side stand (Removing the side stand).
Disconnect the wiring connectors on the engine block (Routing of wiring on frame).

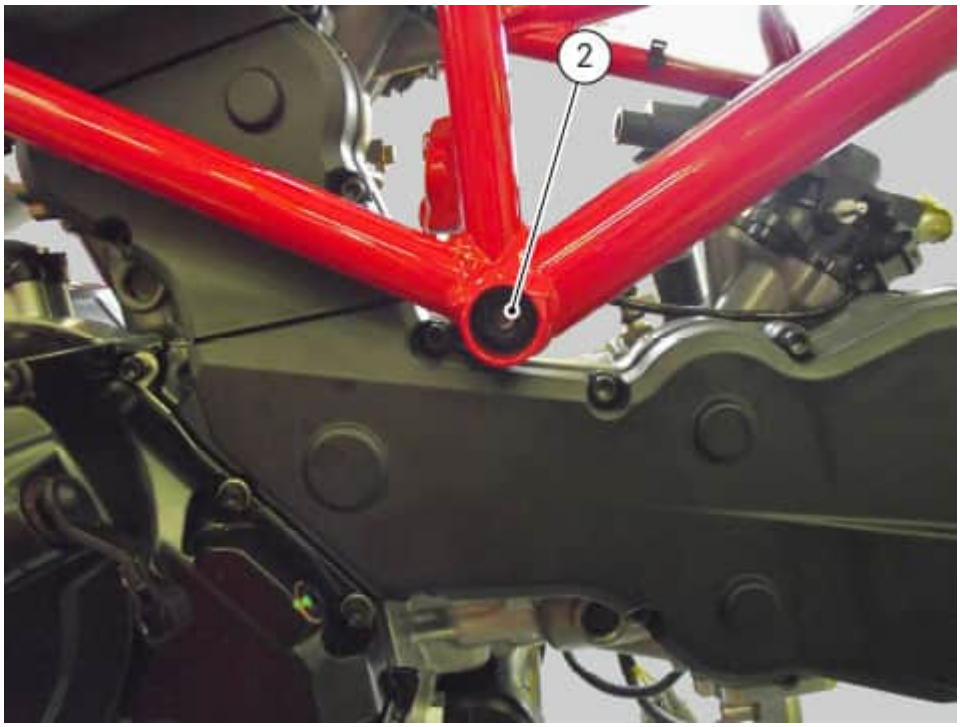
Install a support beneath the engine to support it during removal from the frame.
Remove the protection plugs from the frame tubes near the engine pivot points.
Loosen nuts (1) on the frame LH side, on engine upper supporting screws (2).

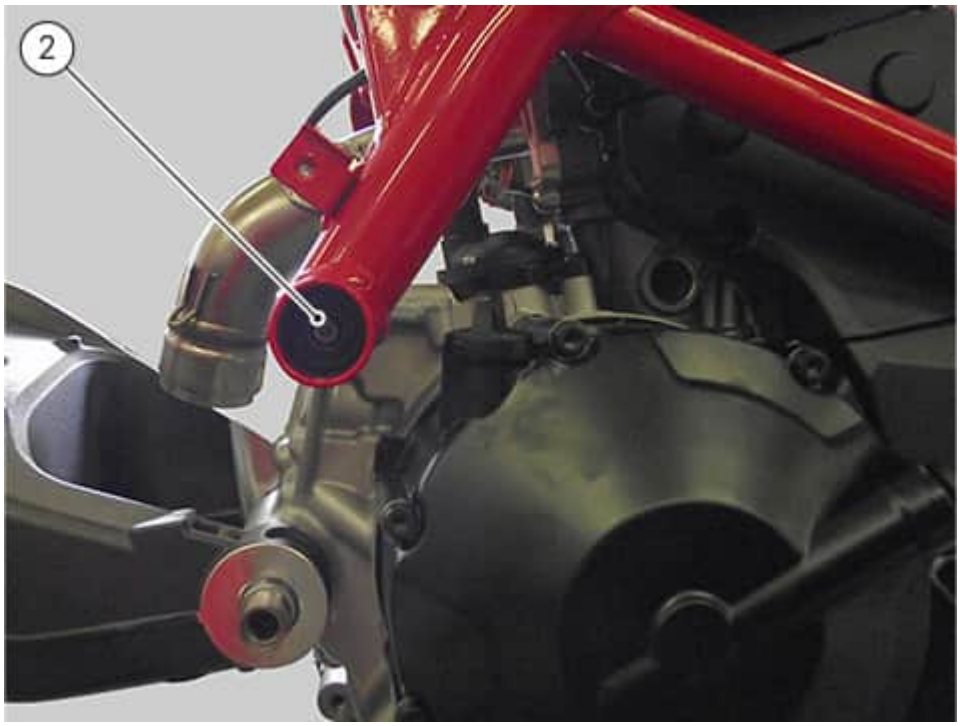



1

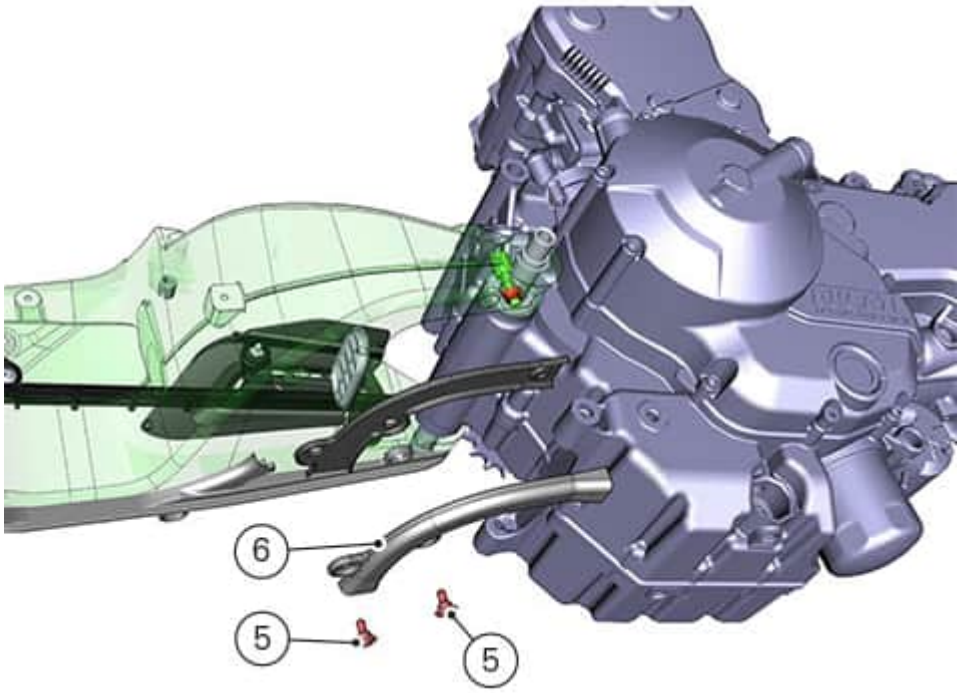

1

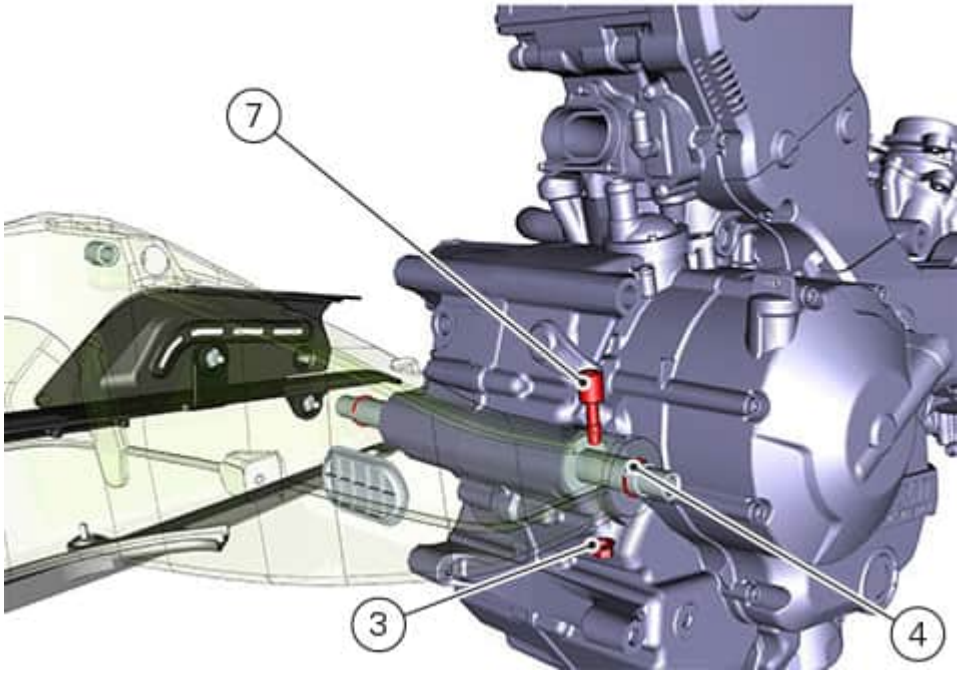

2
2

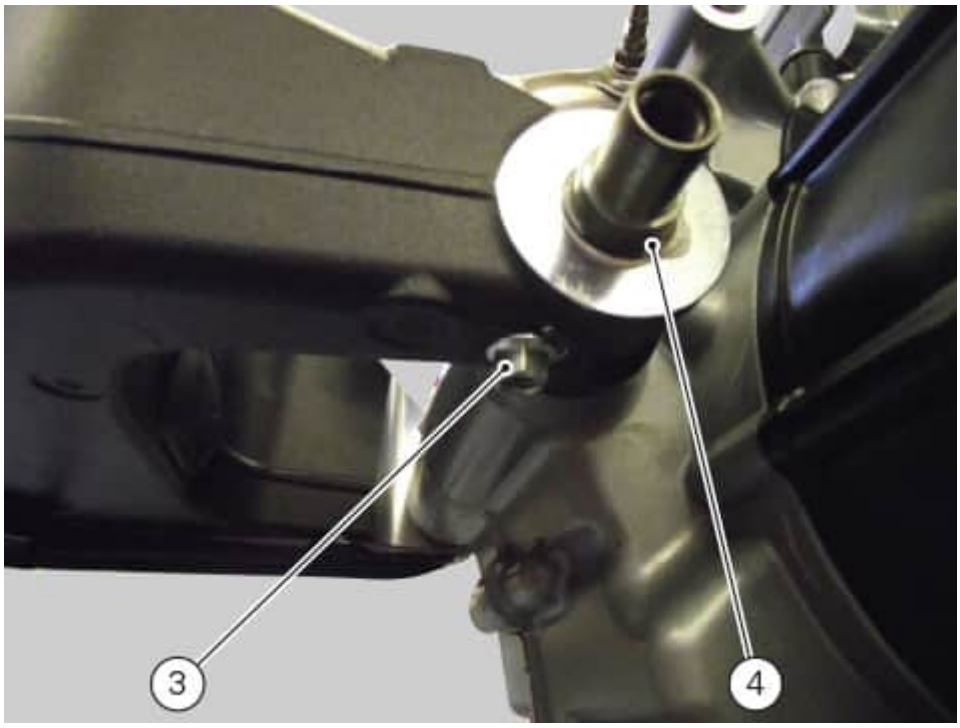

2

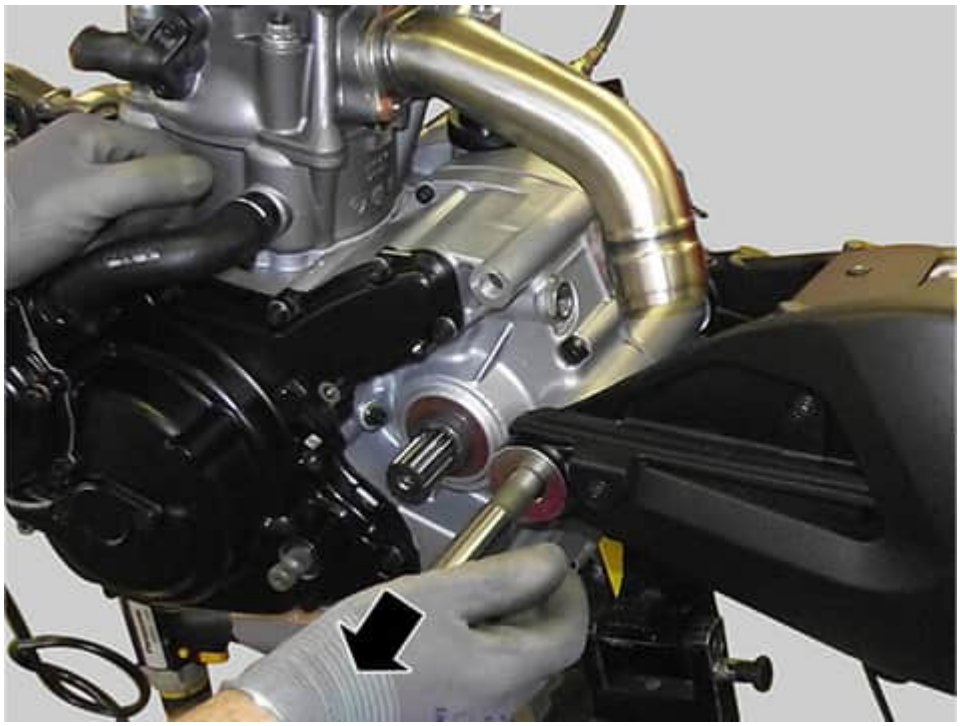


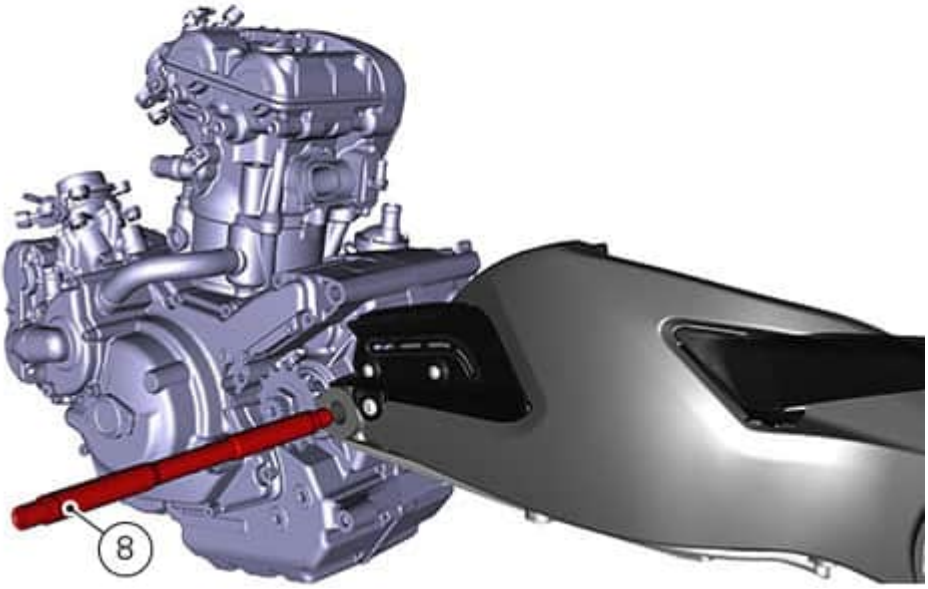
Loosen screws (5) retaining the rear brake hose protection (6).
On the RH side, loosen nut (3) that retains the swinging arm clamp special screw (7) and remove snap ring (4); on the LH side, slide out swingarm shaft (8).



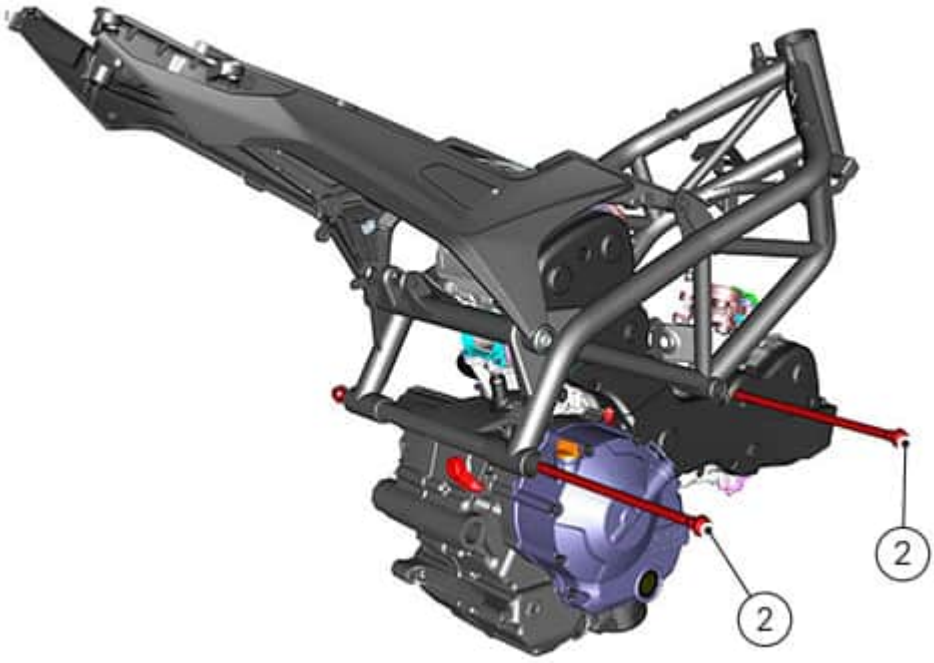

7
3
4


3
4





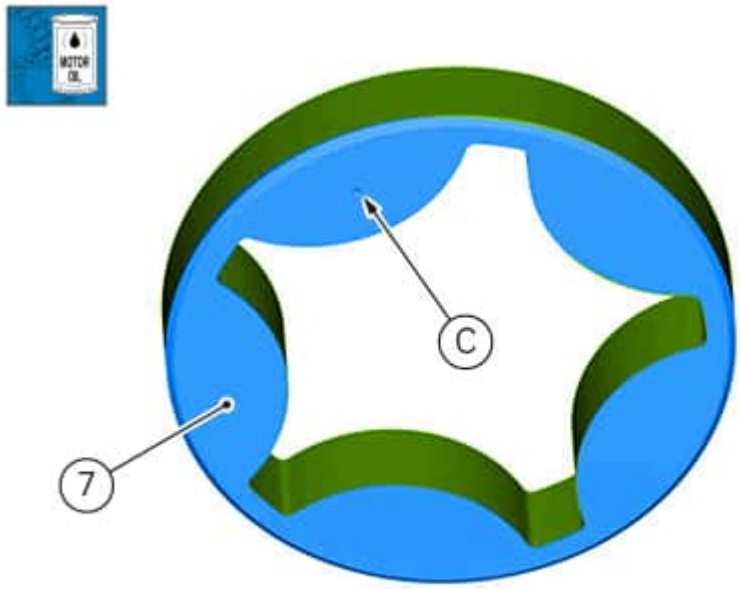
Remove upper support screws (2).



Loosen the complete engine block from the frame by lowering and pushing it forwards.

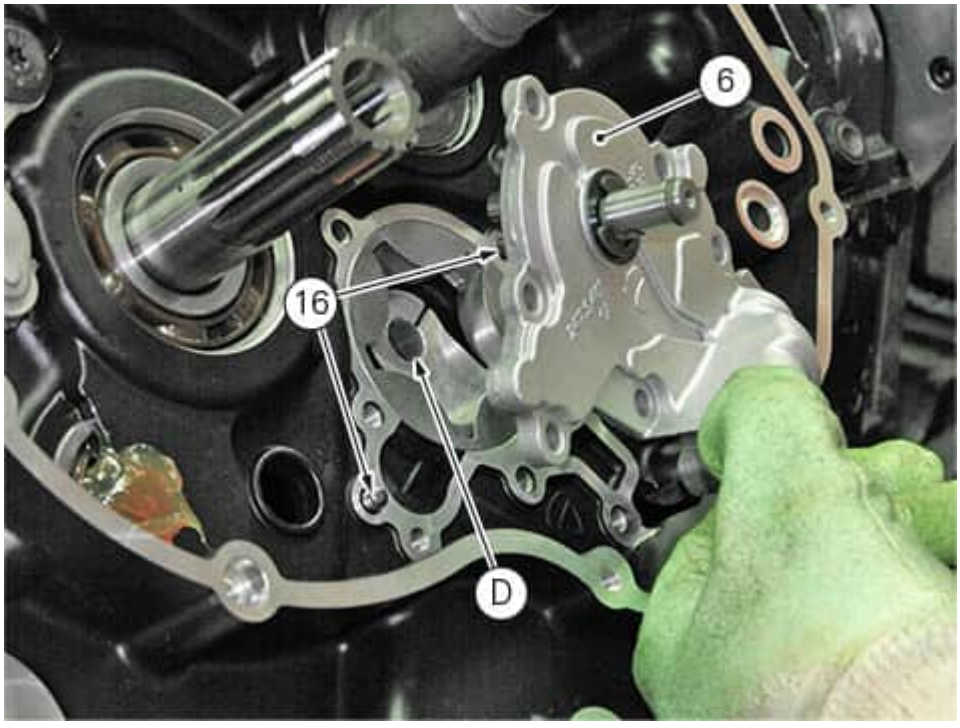
Refitting the oil pump

After having lubricated it with the indicated product on the mating surface between crankcase and inner rotor lobe, fit oil pump outer rotor lobe (7) on crankcase, with reference (C) visible.

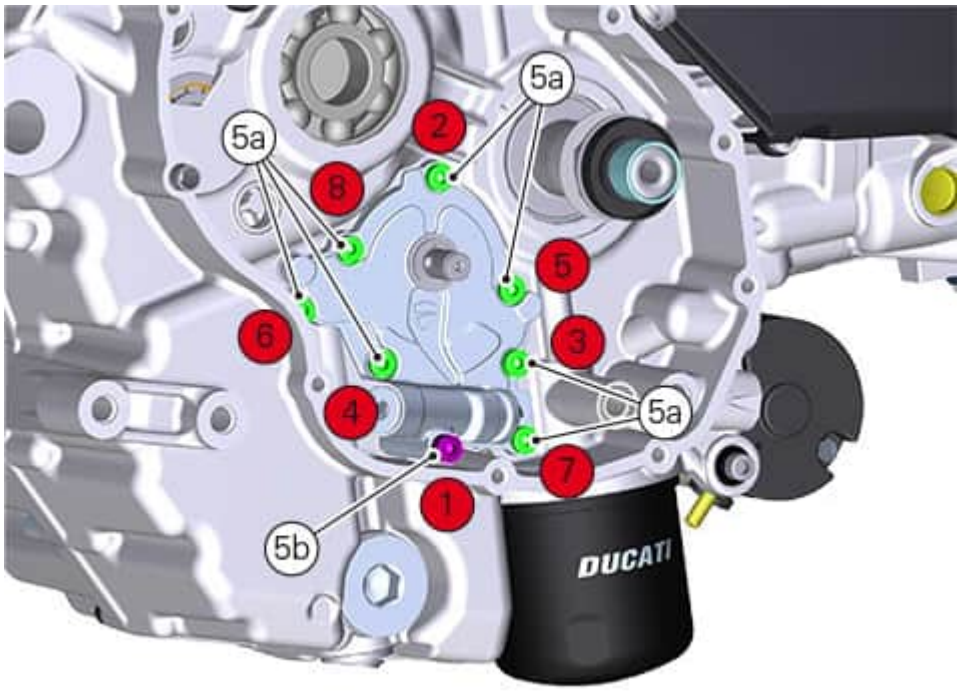


Check that the two reference pins (16) are present on crankcase.
Lubricate inner rotor lobe (14) with the indicated product.
Fit the assembled oil pump cover assembly (6) (Reassembling the oil pump) and centre it following the mandatory positions given by:

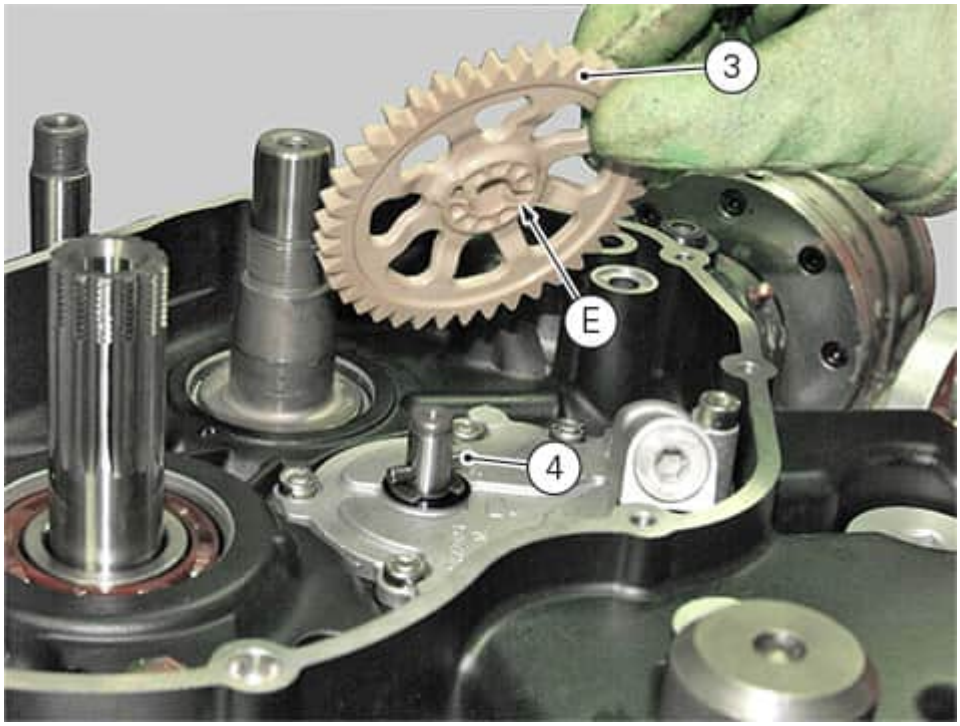
- crankshaft seat (D) on crankcase;
- inner rotor lobe with outer rotor lobe;
- reference pins (16).



Start the screws (5a) and (5b) that retain the pump cover, and tighten them to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).

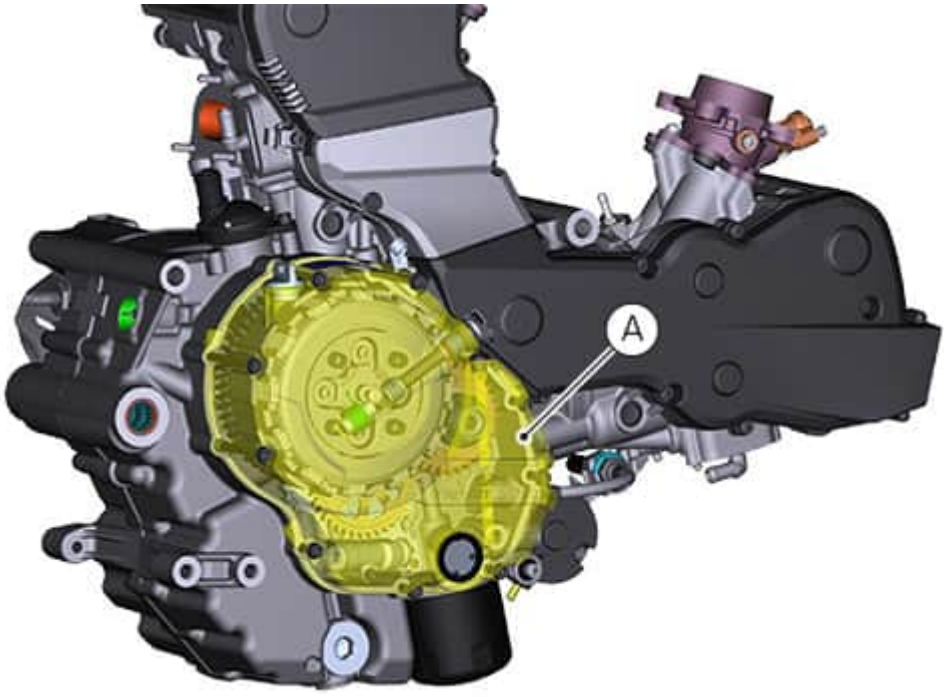


Insert rotation pin (4) inside pump shaft.
Fit gear (3) by inserting pin (4) inside its seat (E).
Fit shim (2) and snap ring (1) inside shaft.





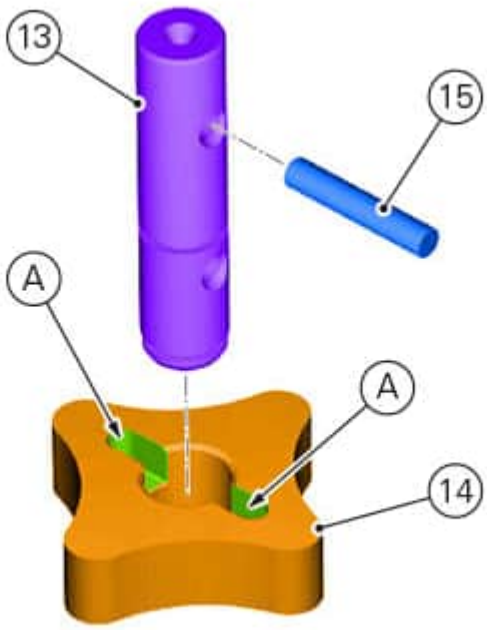
Refit the primary drive gear (Refitting the primary drive gear).
Refit the clutch housing, clutch plate pack and hub unit (Refitting the clutch).
Refit the clutch cover (A) (Refitting the clutch cover).



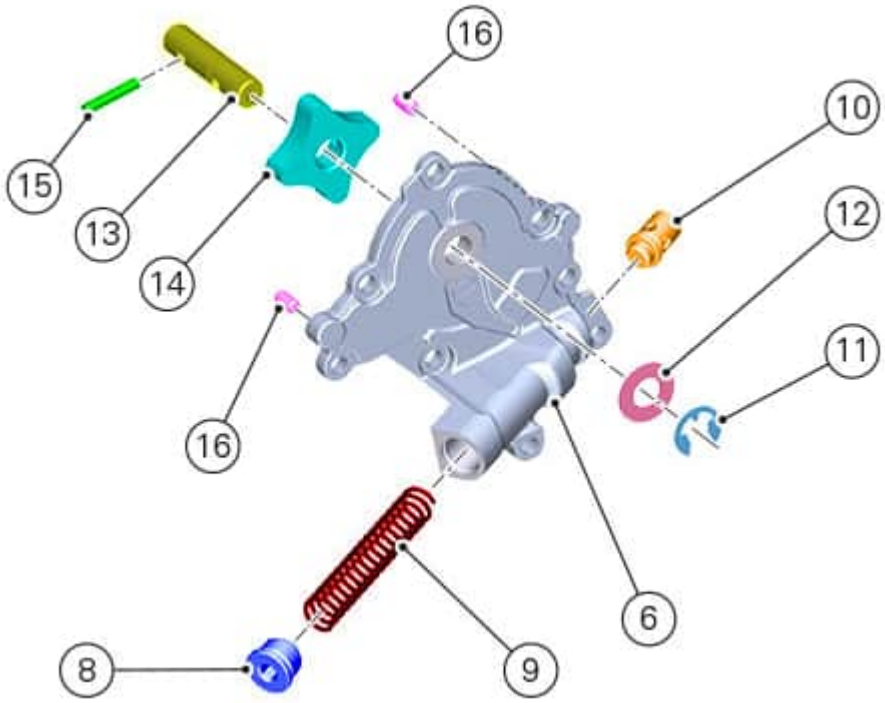
Fill the lubrication system with oil (Changing the engine oil and filter cartridge).

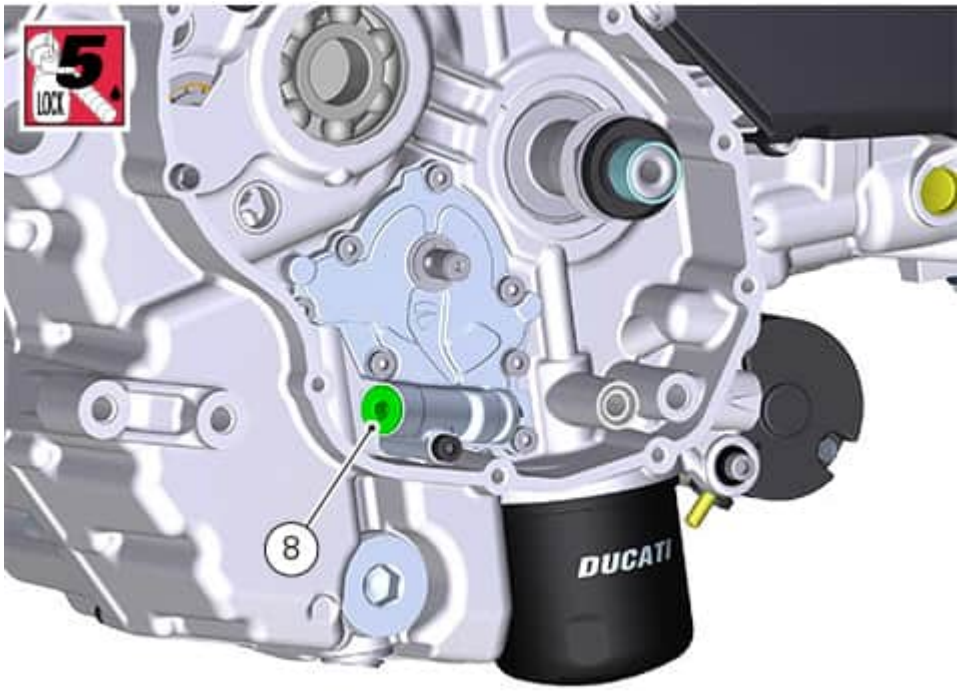
Reassembling the oil pump

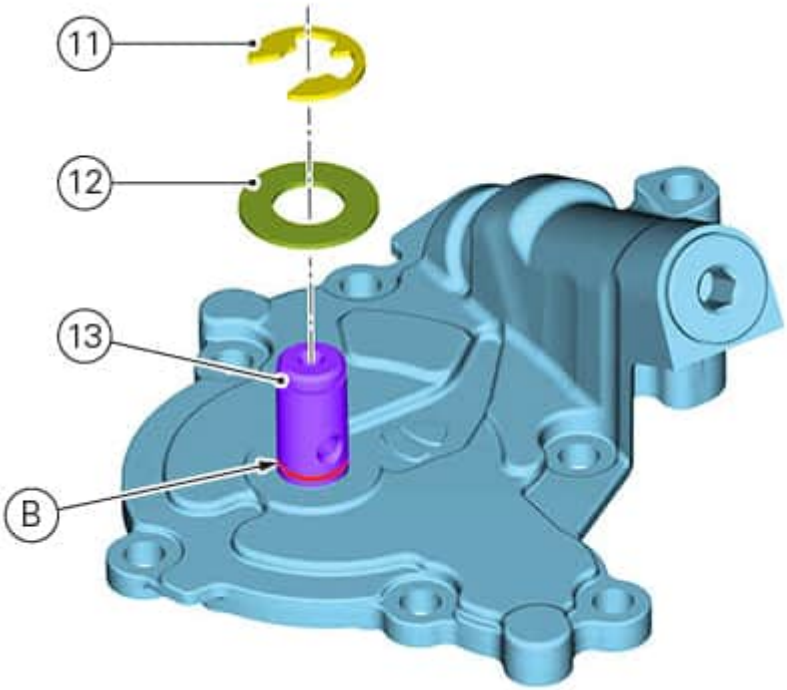
Insert pin (15) inside pump shaft (13).
Insert inner rotor lobe (14) fully home inside pin (15), then centre pin inside groove (A).

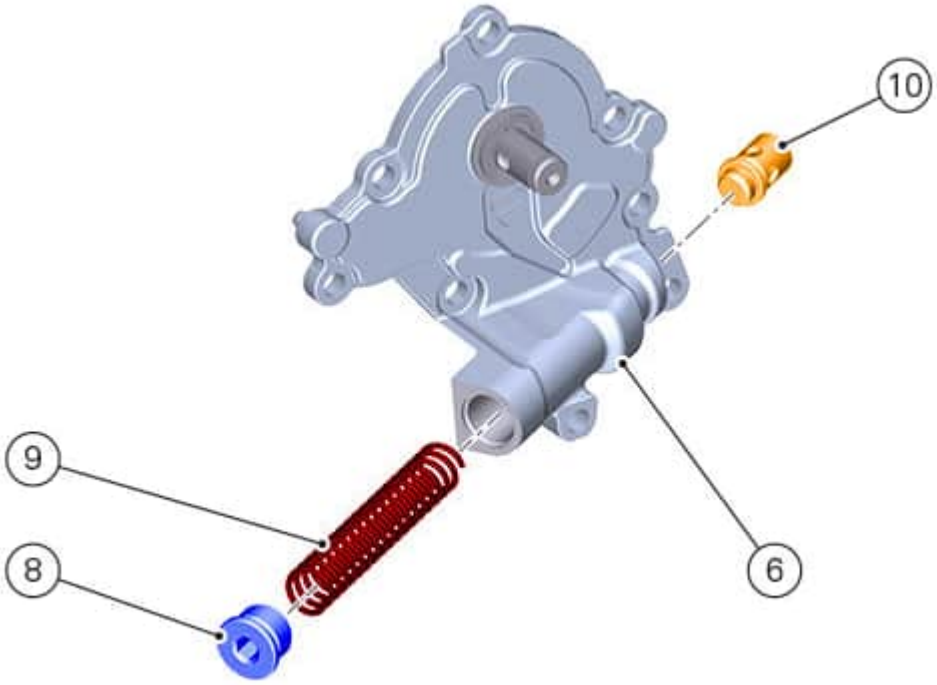


Fit pump shaft (13) working on oil pump cover (6) inner side.
Fit shim (12) and snap ring (11), inserting it inside groove (B).
Fit by-pass valve (10), spring (9) and tighten plug (8) to a torque of 10 Nm (Min. 9 Nm – Max. 11 Nm) after having applied the specified threadlocker.



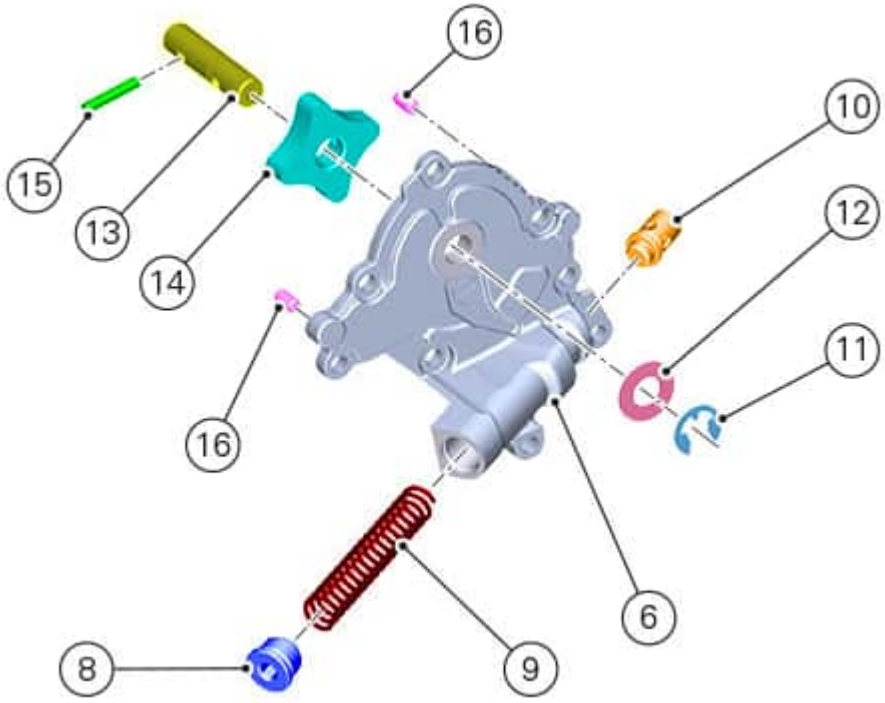

5.
LOX
8
DUCATI


11
12
13
B


10
9
8
6

Disassembling the oil pump

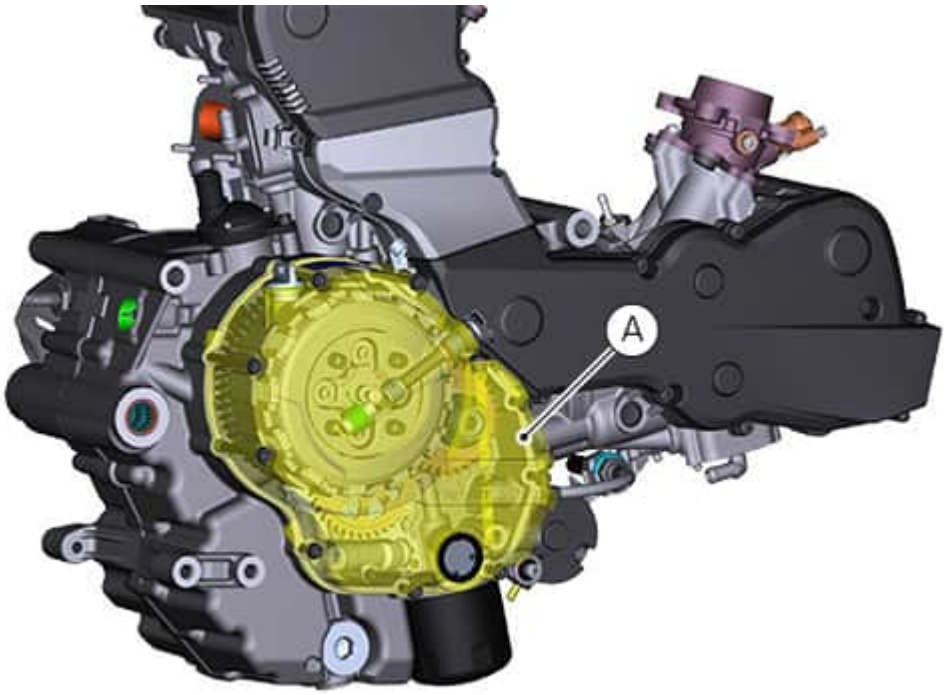
Remove the plug (8) and extract the spring (9) and by-pass valve (10).
Remove circlip (11) and collect shim (12).
Then, working on cover (6) inner side, slide out pump shaft (13) and, after having collected inner rotor lobe (14), slide out pin (15) as well.
Collect the two reference pins (16) present on oil pump cover (6).
Check the conditions of the removed components.



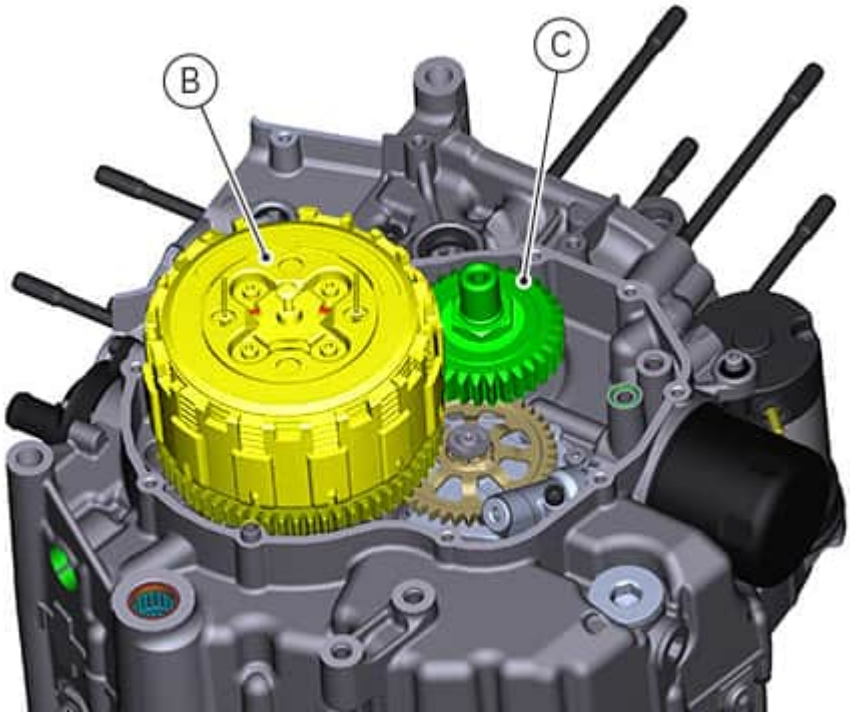
Removing the oil pump

Empty the lubrication system (Changing the engine oil and filter cartridge).

Remove the clutch cover (A) (Removing the clutch cover).



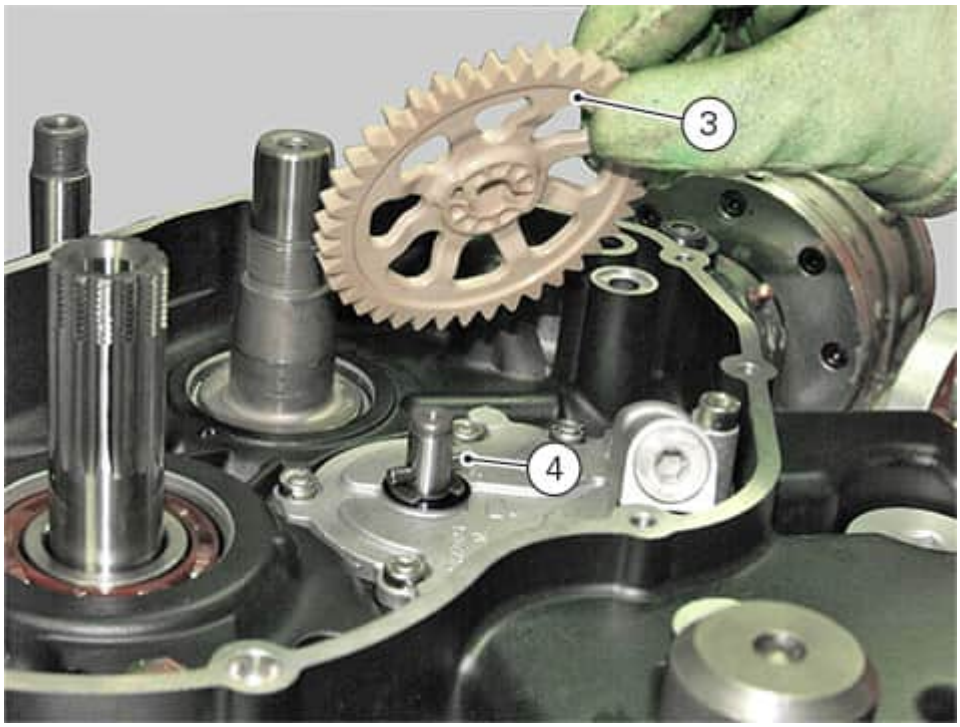
Remove the hub, clutch plate pack and clutch housing unit (B) (Removing the clutch).
Remove the primary drive gear (C) (Removing the primary drive gear).



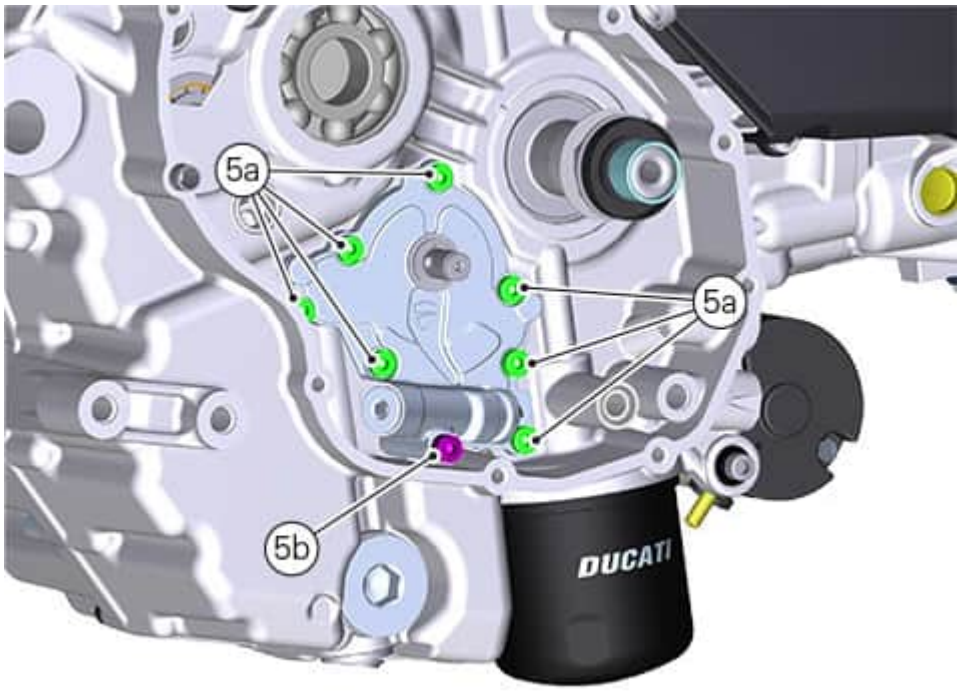
Remove the snap ring (1) and shim (2).

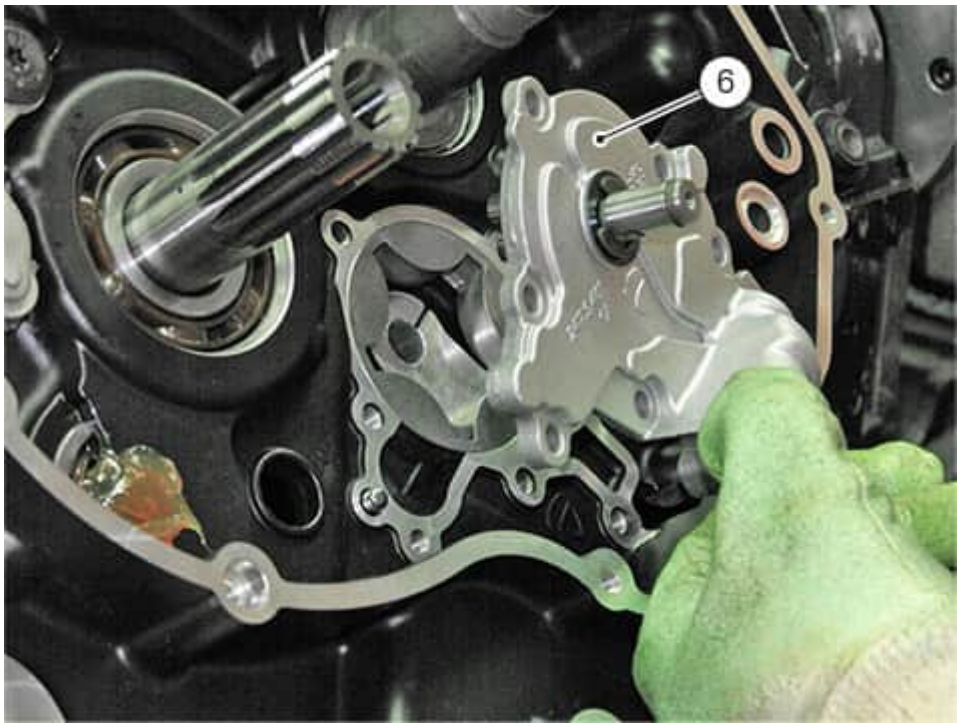


Slide out oil pump gear (3) and collect rotation pin (4).

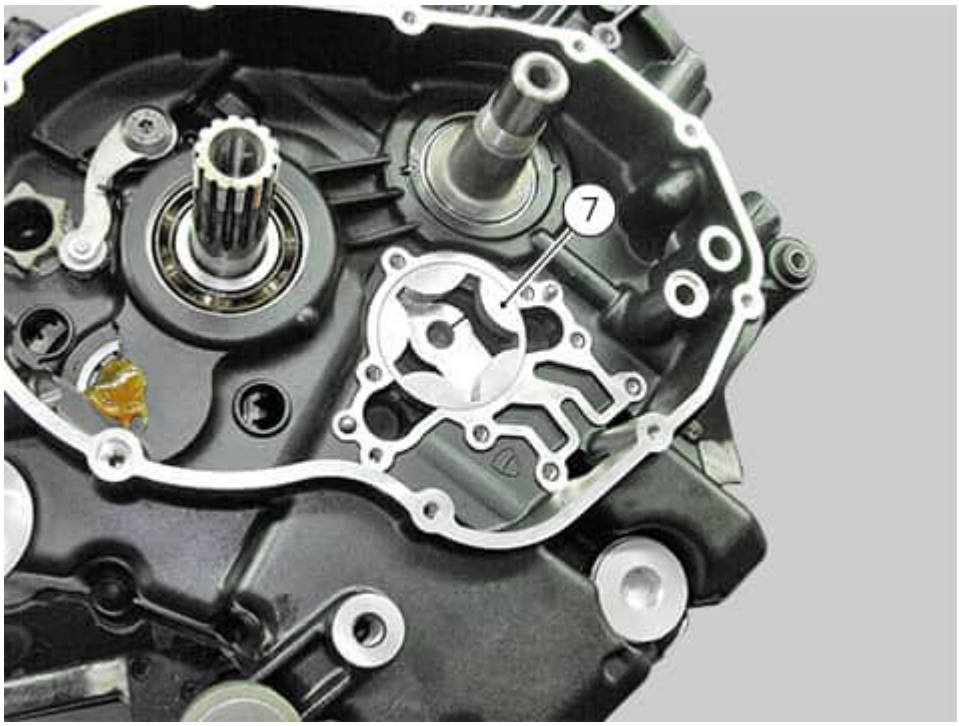


Loosen the seven screws (5a) and screw (5b), then remove the complete oil pump cover (6).





Remove oil pump outer rotor lobe (7) from crankcase.

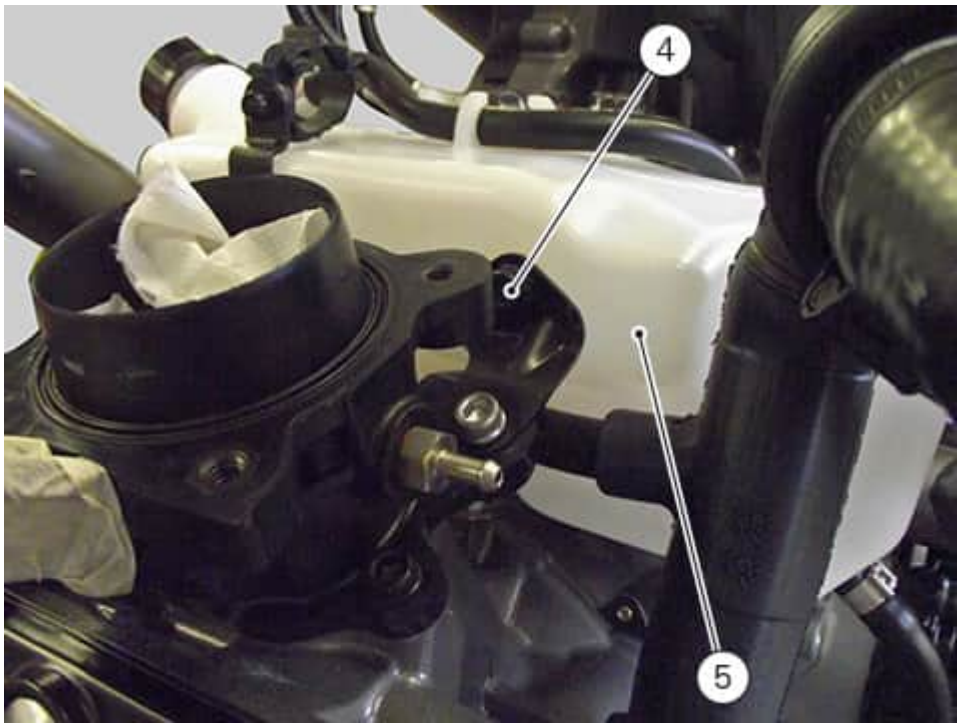

7

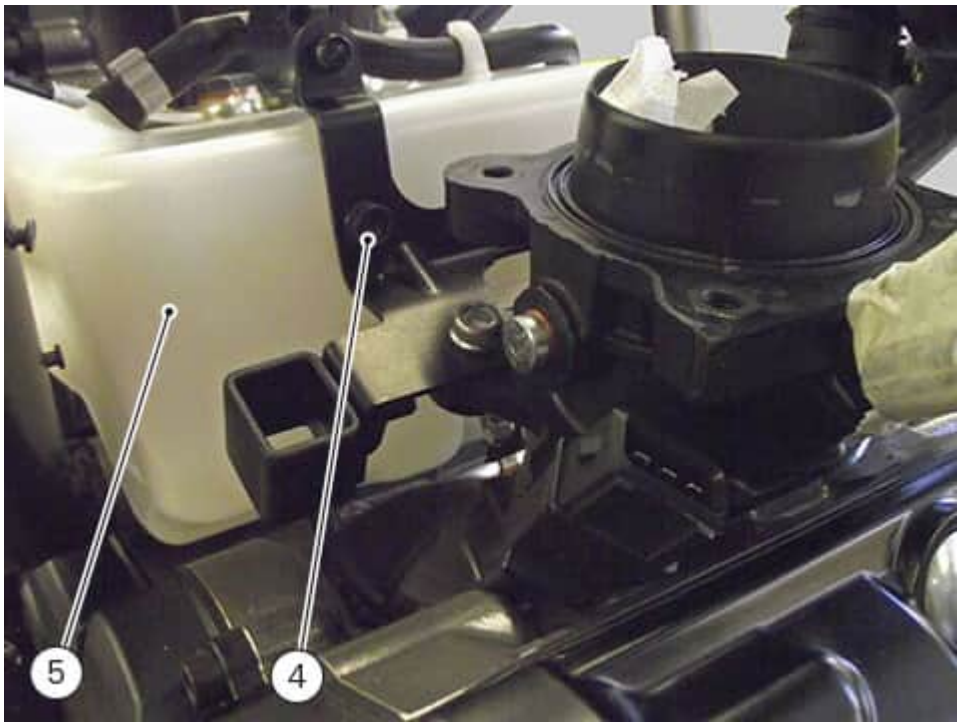
Refitting the water tank

Refit water tank (5).

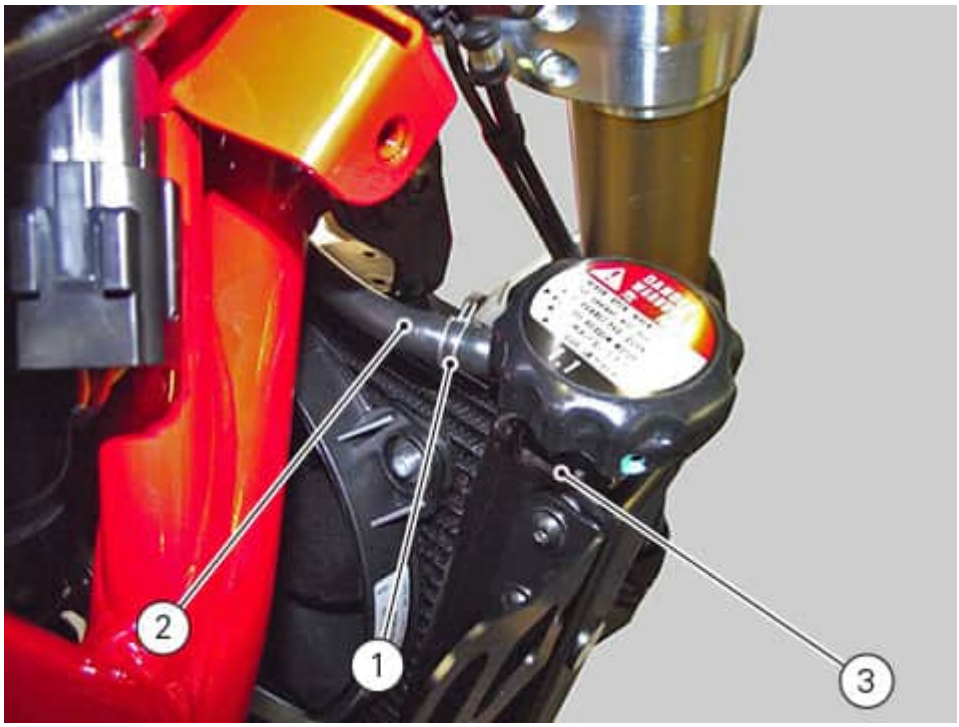


Tighten screws (4) retaining water tank (5) to a torque of 10 Nm ± 10%.





Position hose (2) on radiator plug (3) and secure the hose with clamp (1).

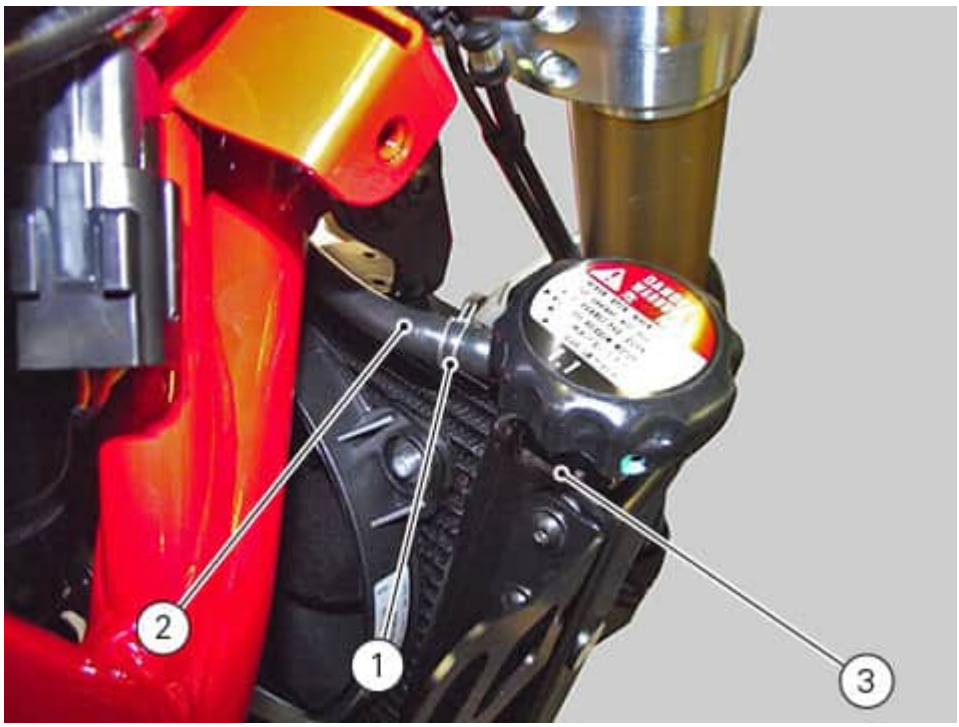


Refit the right fairing (Refitting the fairings).
Fill the cooling system (Changing the coolant).

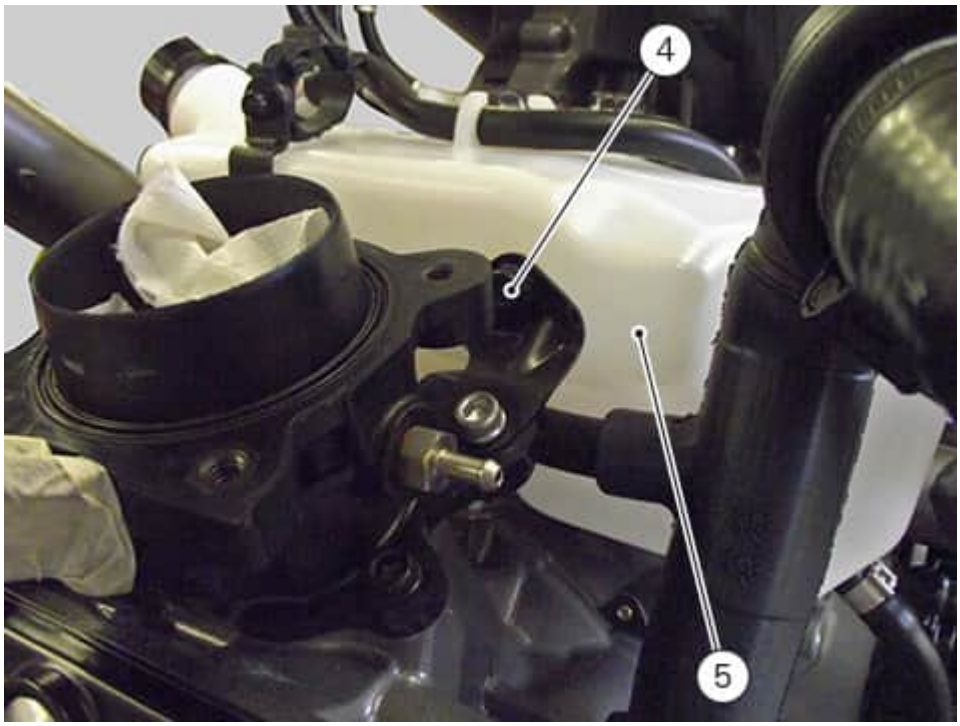
Removing the water tank

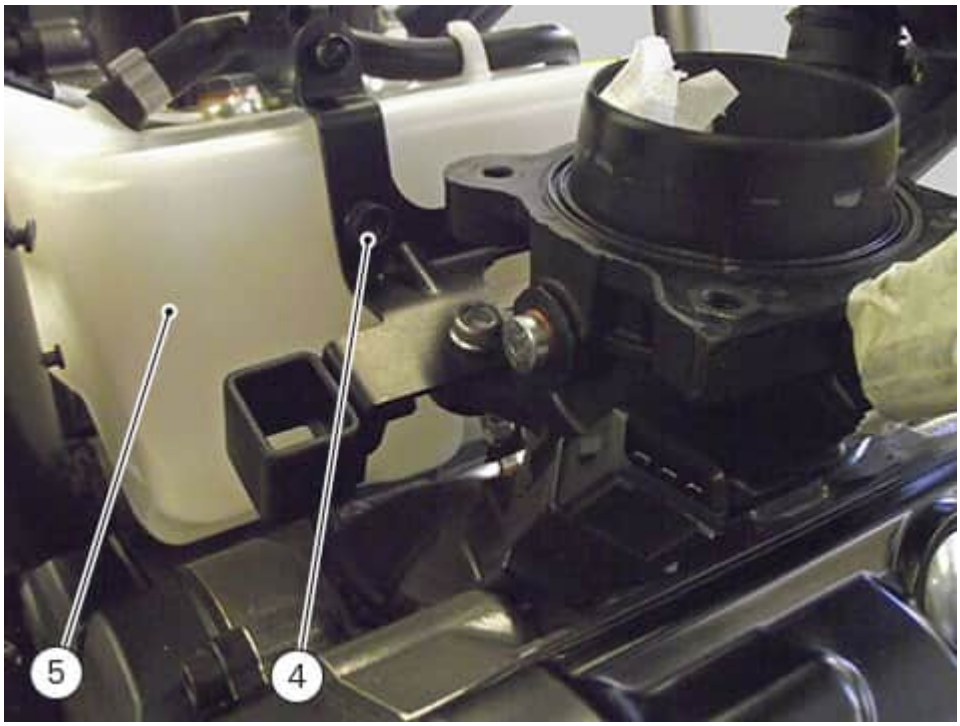
Empty the cooling system (Changing the coolant).
Remove the RH side fairing (Removing the fairings).

Loosen clamp (1) and slide hose (2) out of radiator (3).



Loosen retaining screws (4) on water tank (5).



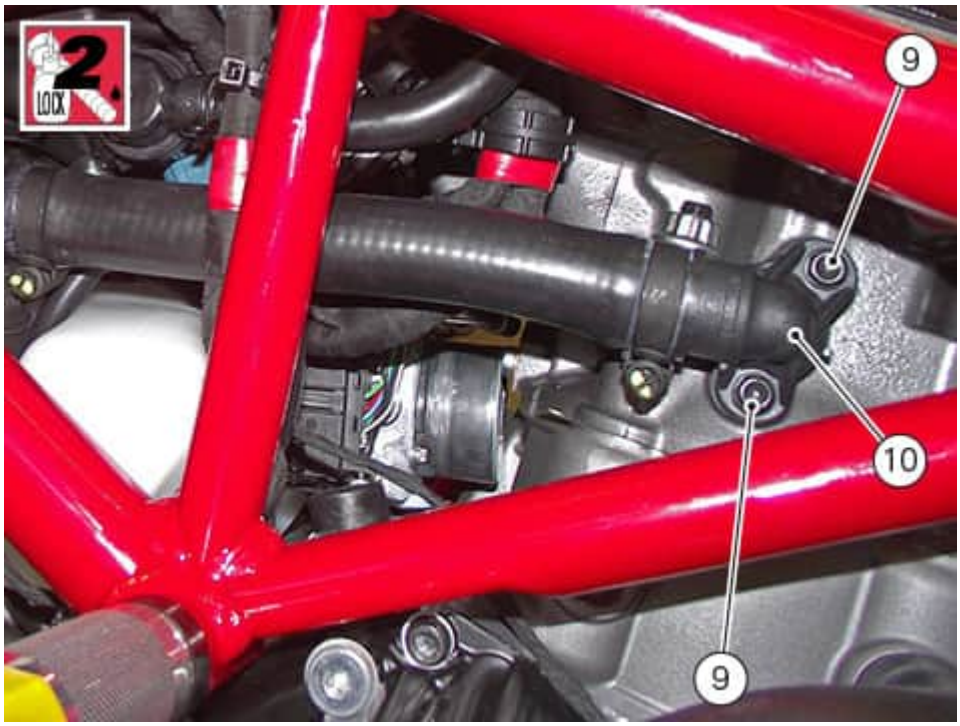


Move water tank (5) outwards.

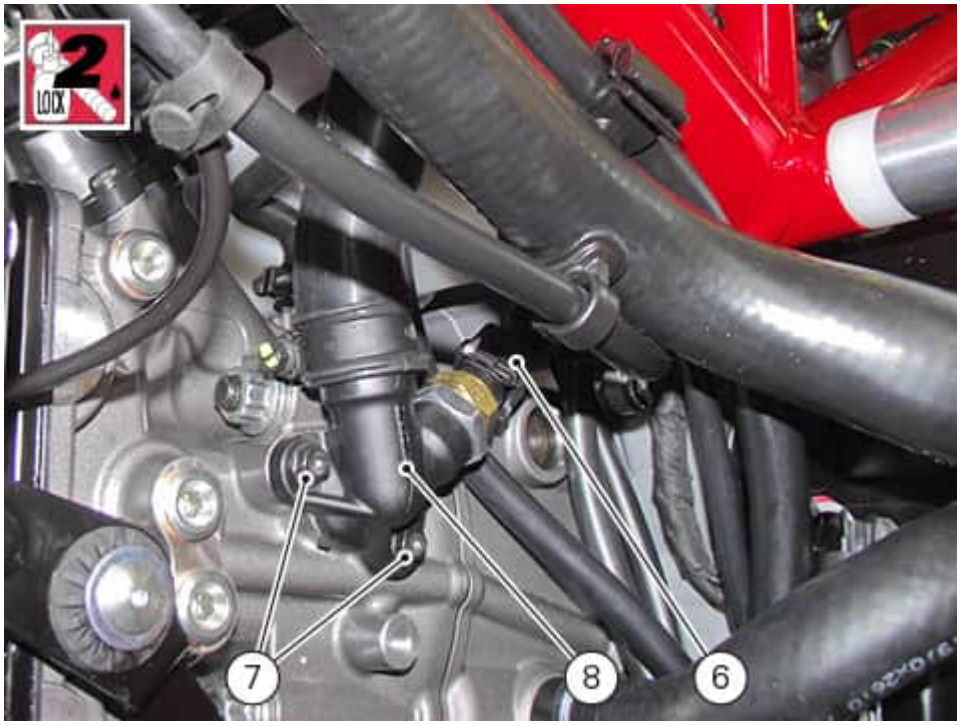


Refitting the cooling system hoses and unions

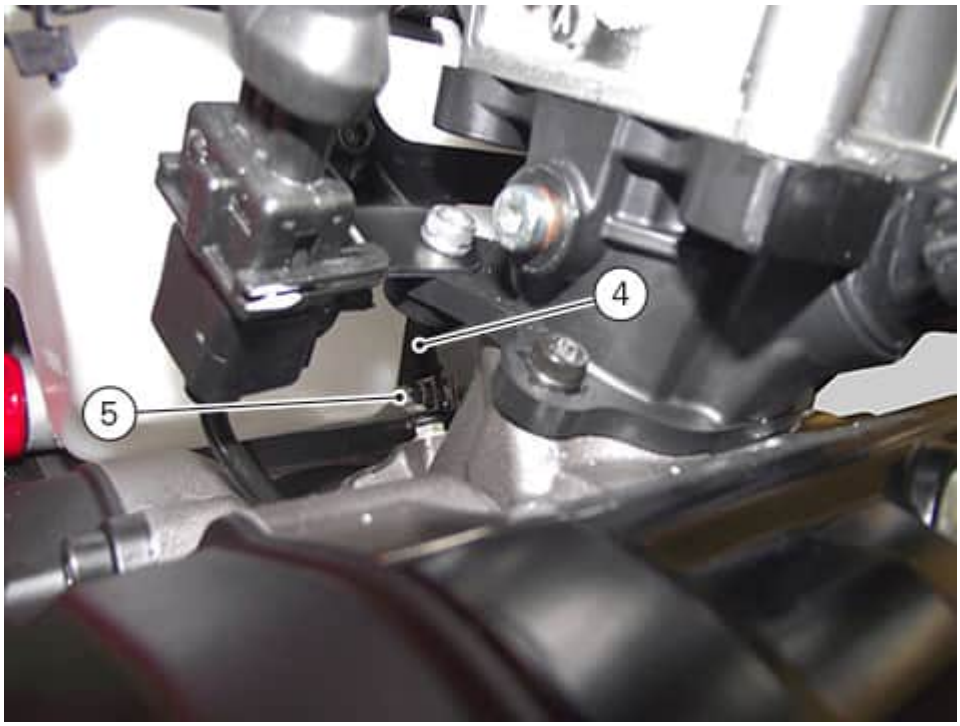
If previously removed, place union (10) on the vertical head.
If screws (9) are not new, apply specified threadlocker to screws (9).
Tighten the screws (9) to a torque of 6 Nm (Min. 5 Nm - Max 7 Nm).



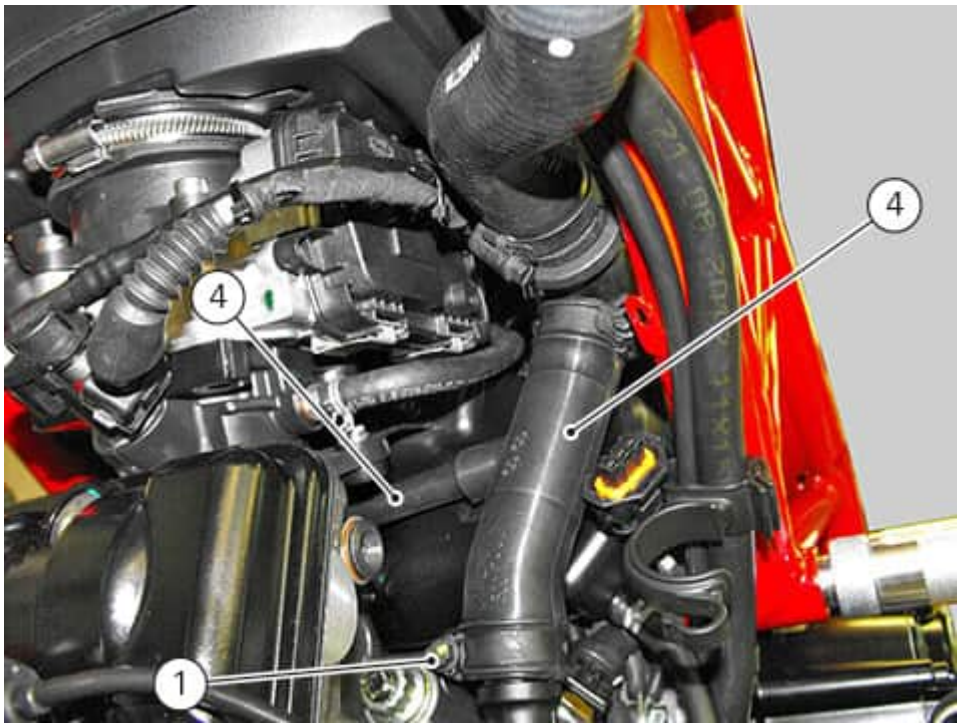
If previously removed, place union (8) on the horizontal head.
If screws (7) are not new, apply specified threadlocker to screws (7).
Tighten the screws (7) to a torque of 6 Nm (Min. 5 Nm - Max 7 Nm).
Connect water temperature sensor (6) to the main wiring.



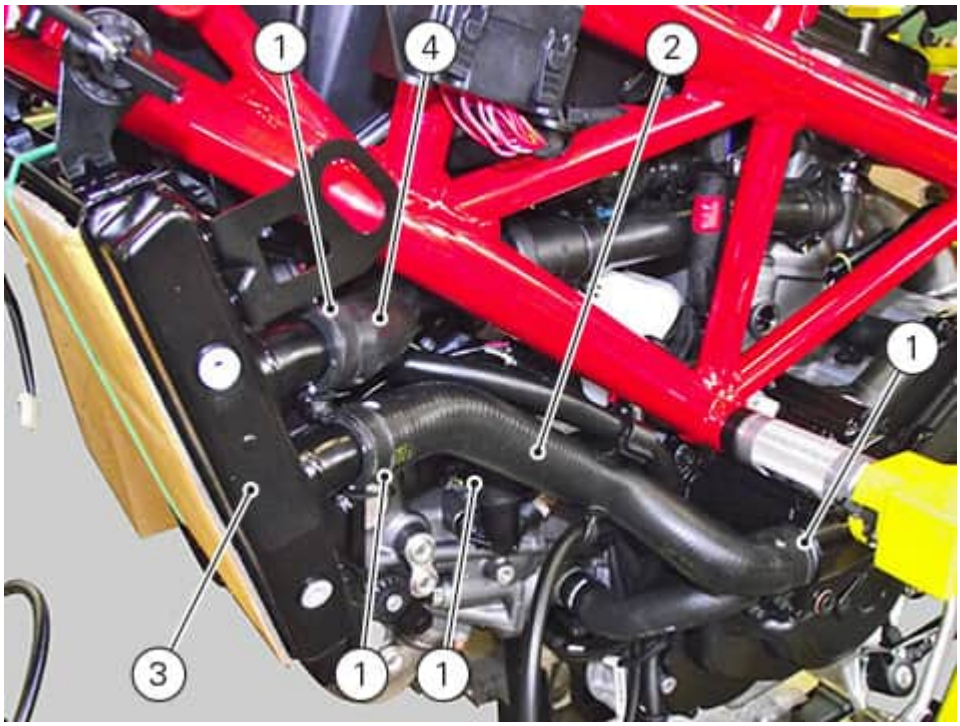
Refit radiator / thermostat hose (4) on the motorcycle. Fasten the hose to the horizontal head by tightening clip (5) to a torque of 0.6 Nm ± 10%.

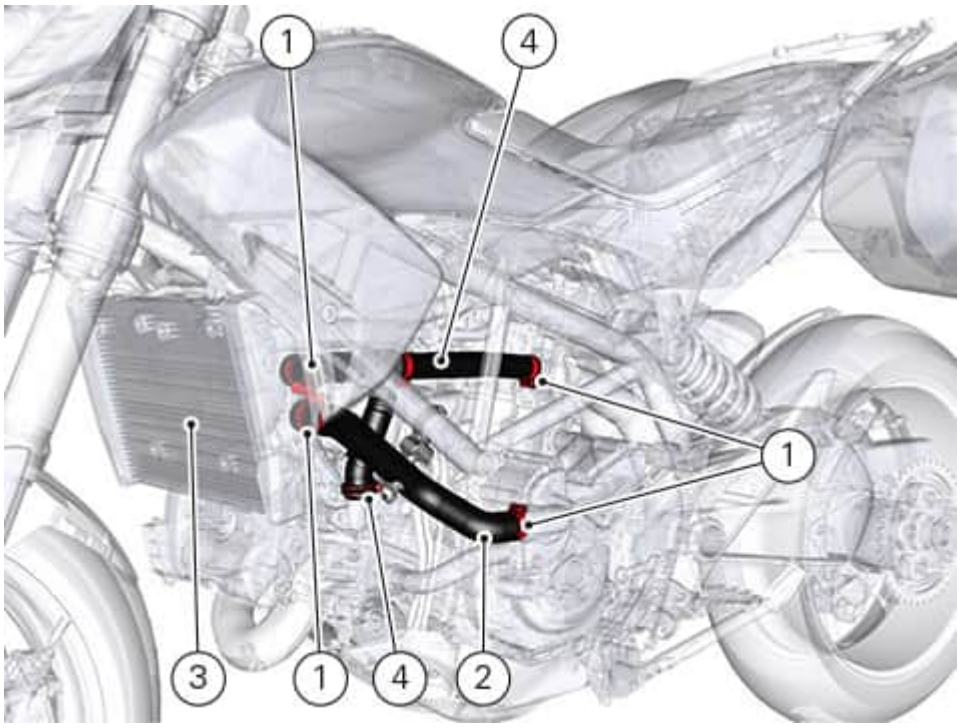


Fix hose (4) on the horizontal head union by means of clip (1). Tighten clip (1) to a torque of 2.5 Nm ± 10%.



Fasten hose (4) to water radiator (3) by tightening clip (1) to a torque of 2.5 Nm ± 10%.
Fit hose (2) on water radiator (3) by tightening clip (1) to a torque of 2.5 Nm ± 10%.



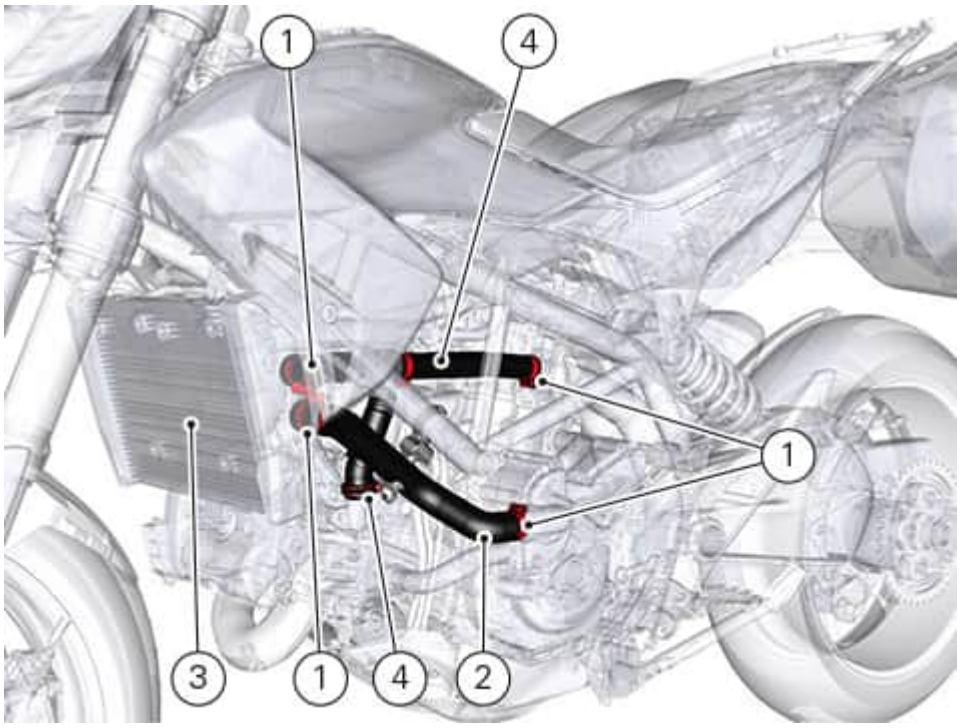


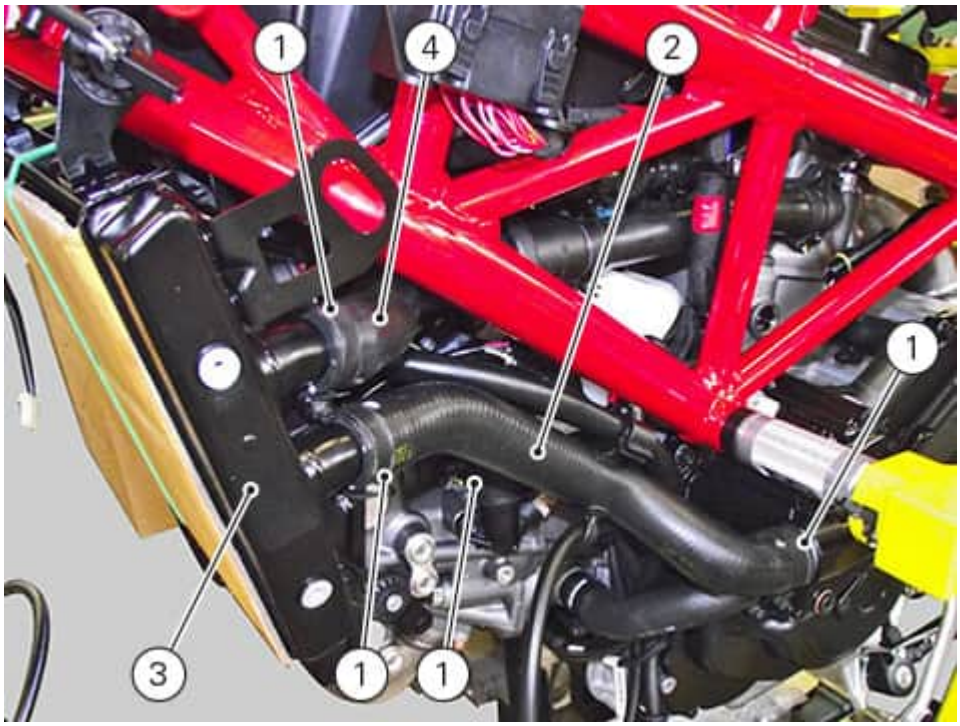
Fill the cooling system (Changing the coolant).
Refit the LH fairing (Refitting the fairings).
Refit the seat (Refitting the seat).

Removing the cooling system hoses and unions

Remove the seat (Removing the seat).
Remove the LH fairing (Removing the fairings).
Drain the coolant (Changing the coolant).

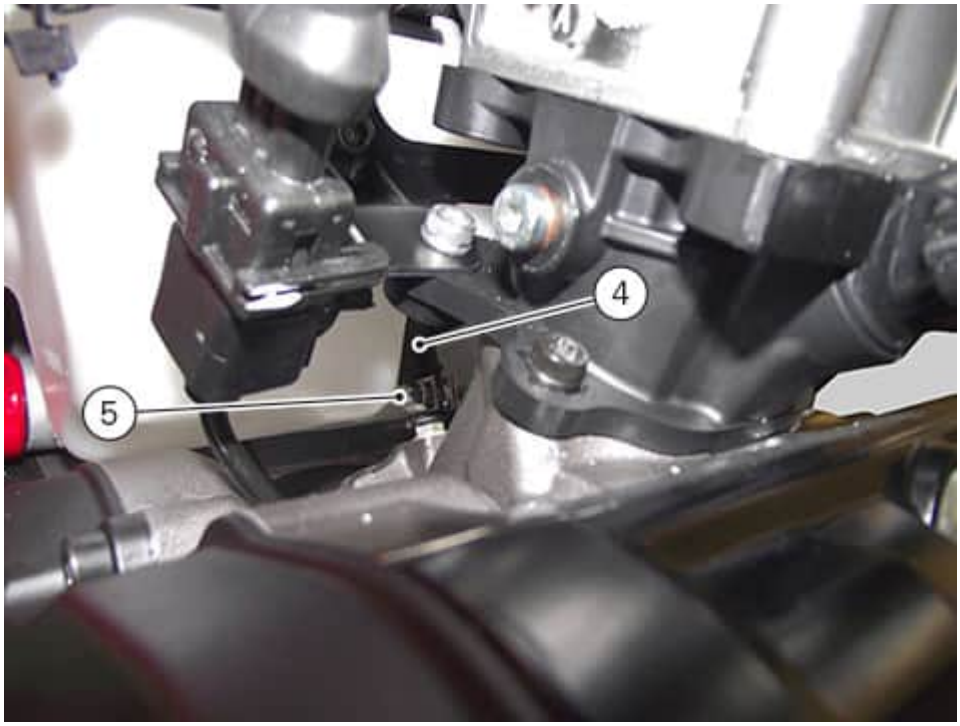
Loosen clamps (1) retaining the water radiator (3) hose (2) to the pump and the fixing clamps of the radiator/thermostat hose (4) to the thermostat.
Remove the hose (2).



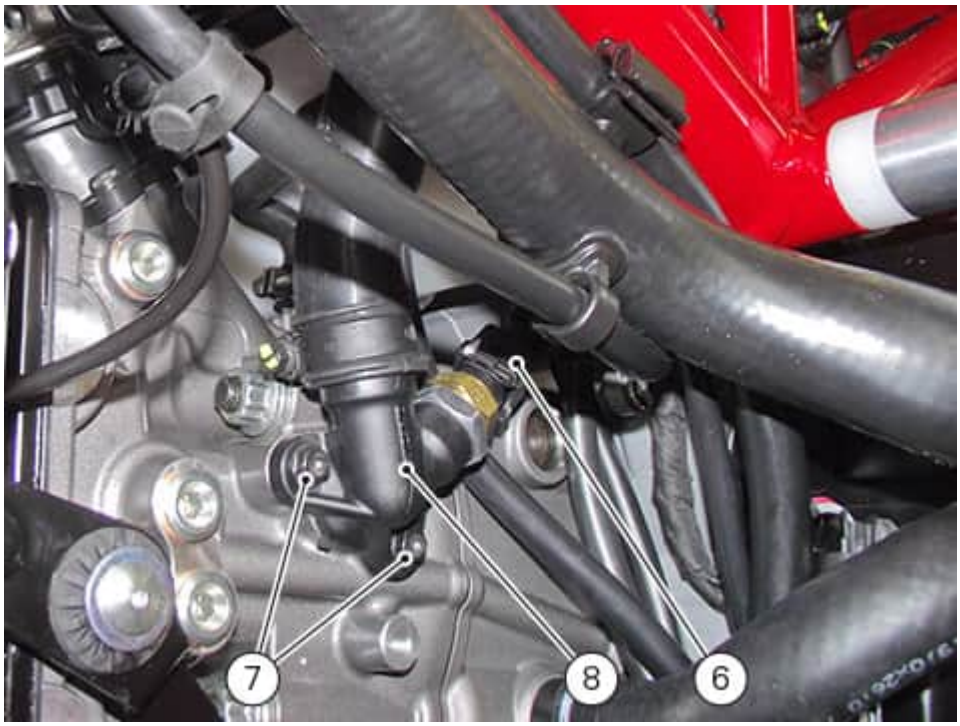




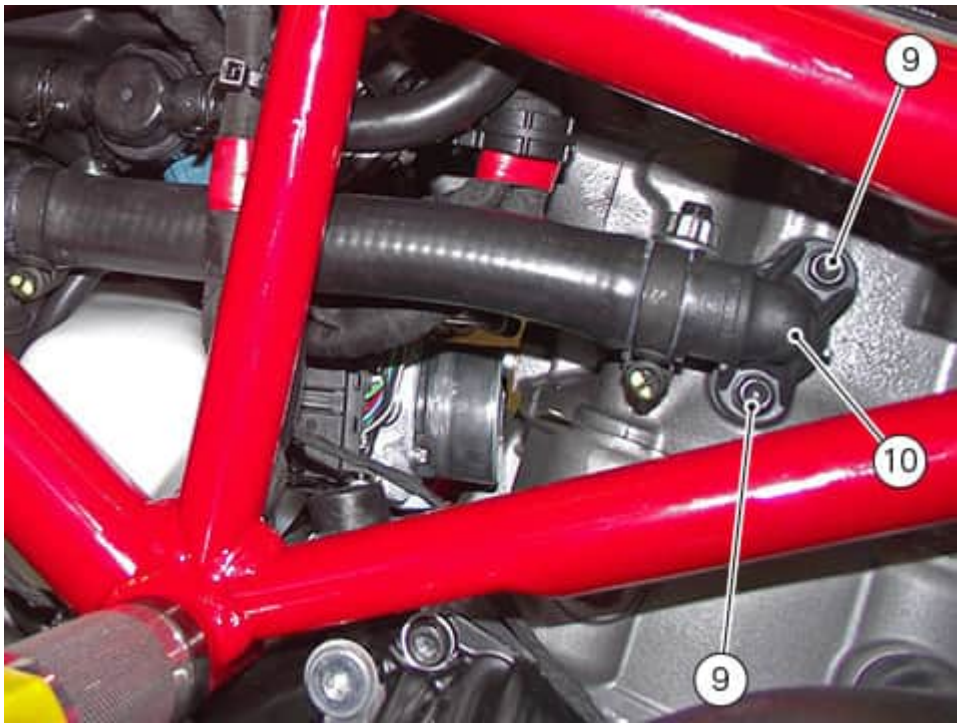
Loosen clip (5) of radiator / thermostat hose (4) to the horizontal head.
Remove the hose (4).



If necessary, disconnect sensor (6) from main wiring harness.
Loosen the screws (7) and remove union (8).

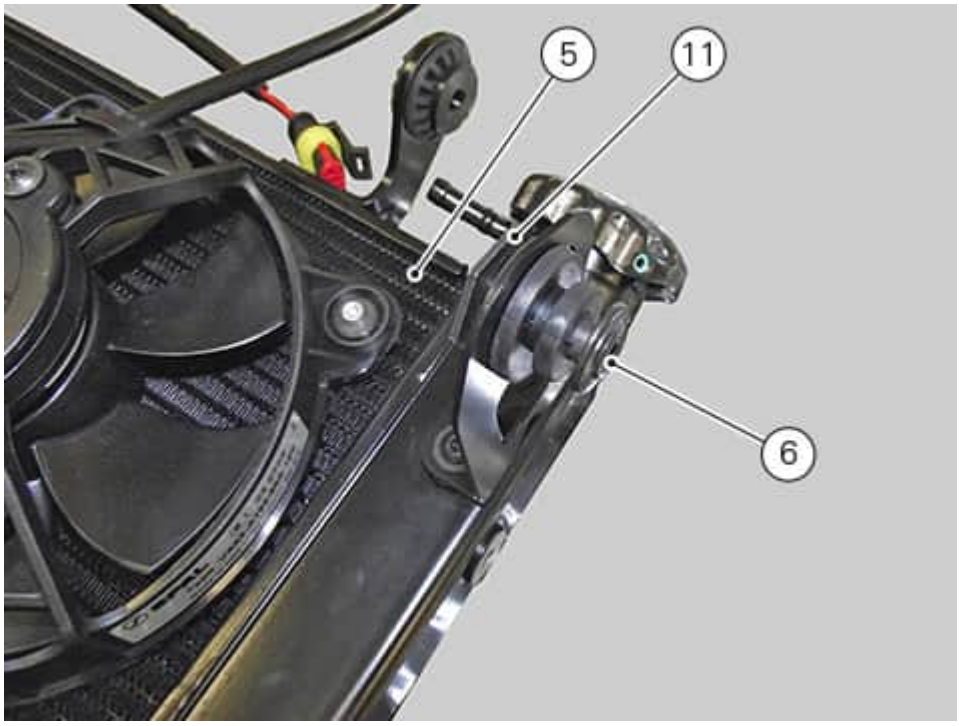


If necessary, loosen the screws (9) and remove union (10).

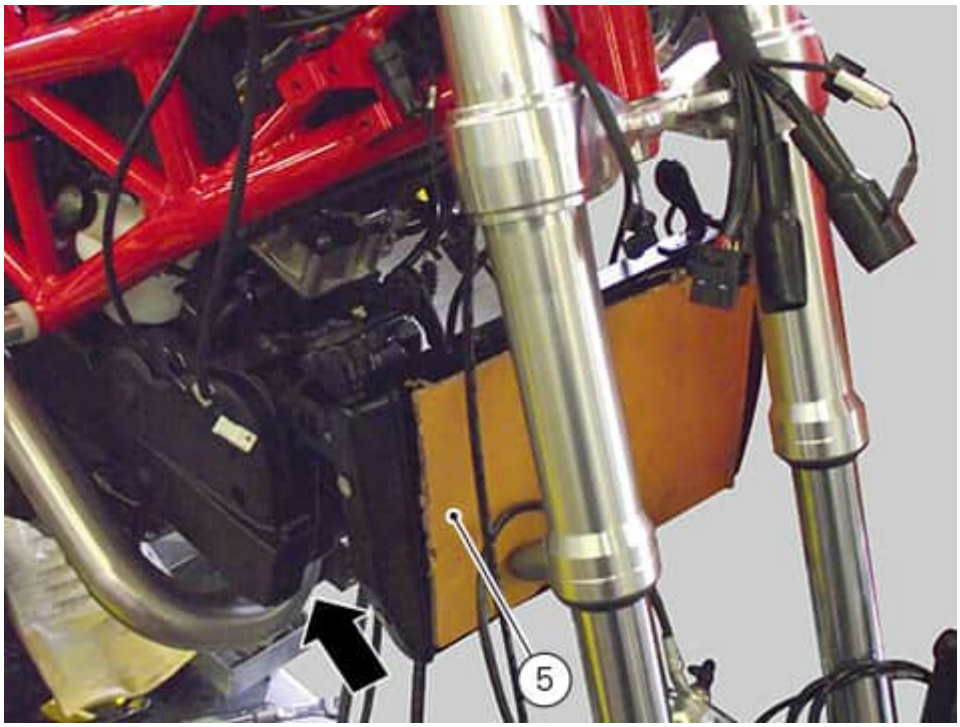


Fitting the radiator

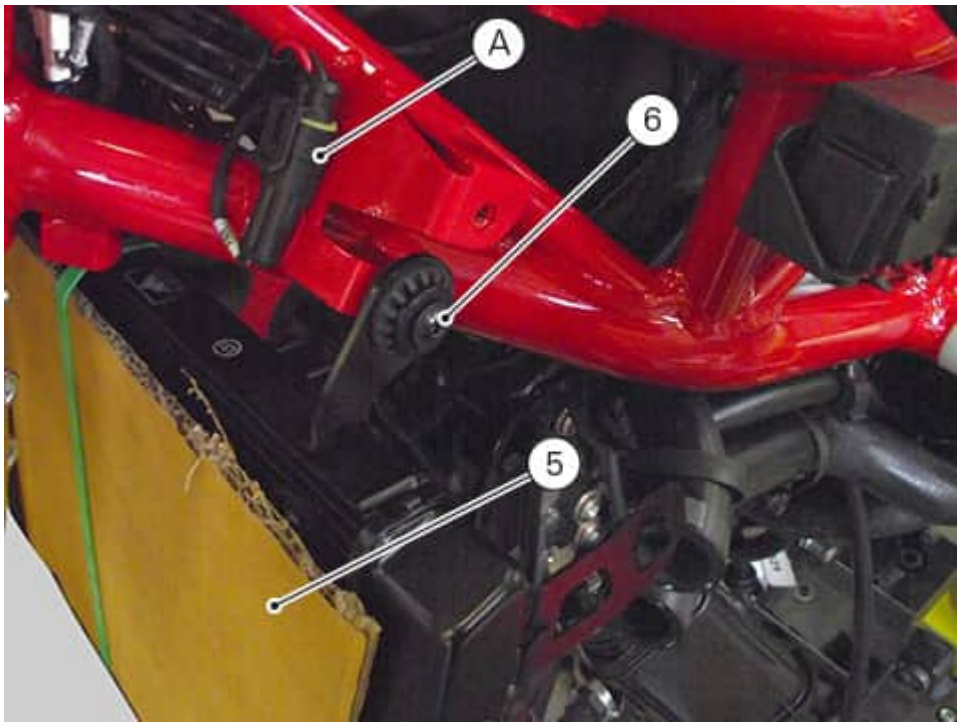
Make sure that spacers (11) for screws (6) are fitted on radiator (5).

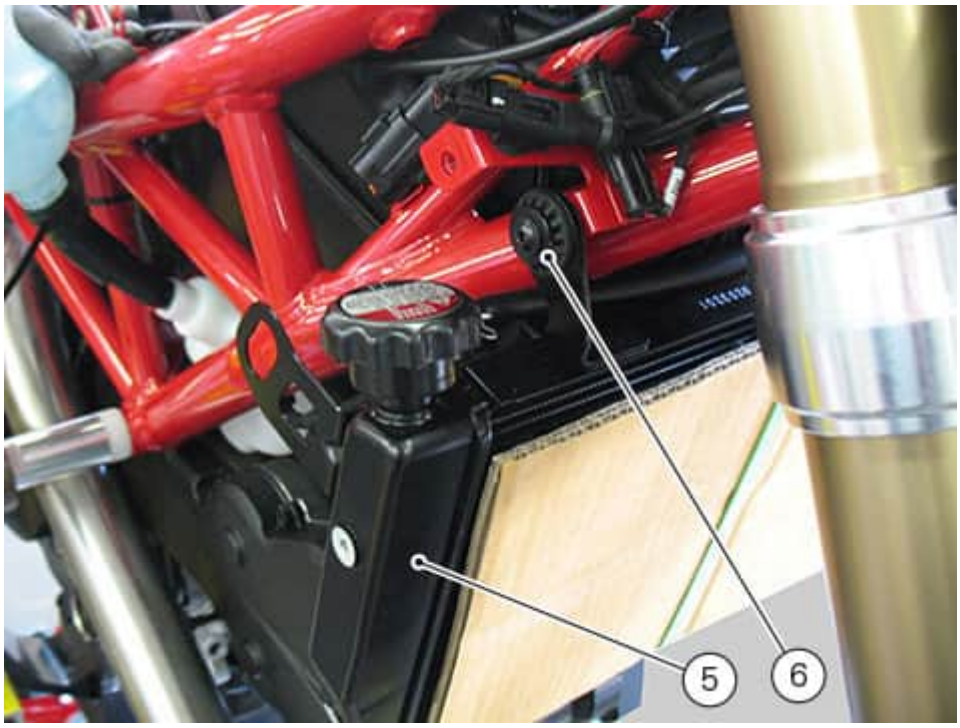


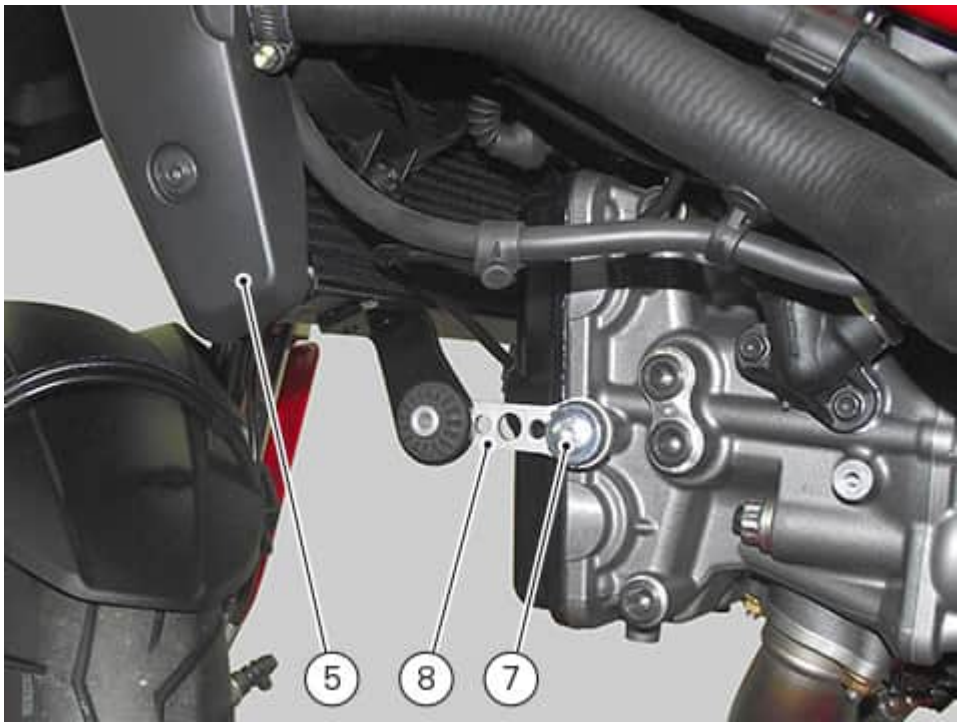
Place water radiator (5) on the vehicle.



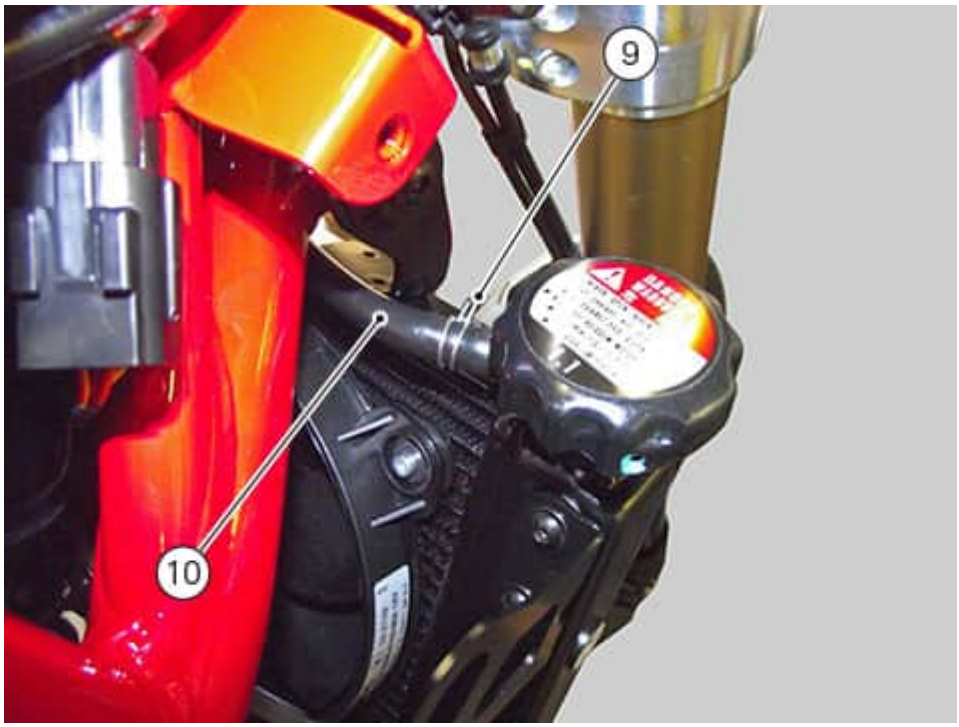
Start screws (6) securing water radiator (5) to the frame.
Start screw (7) that retains bracket (8) of radiator (5) to the horizontal head.
Tighten screws (6) to a torque of 10 Nm ± 10%.
Tighten the screw (7) to a torque of 5 Nm ± 5 %.
Connect electric fan harness (A) to main wiring.


A
6
5

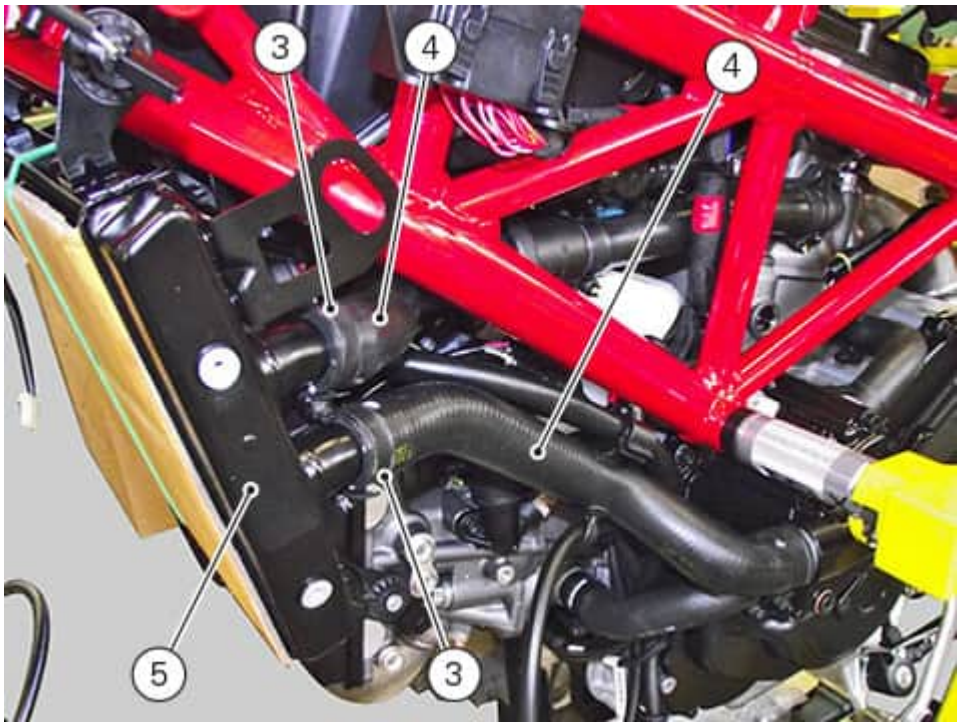

5
6



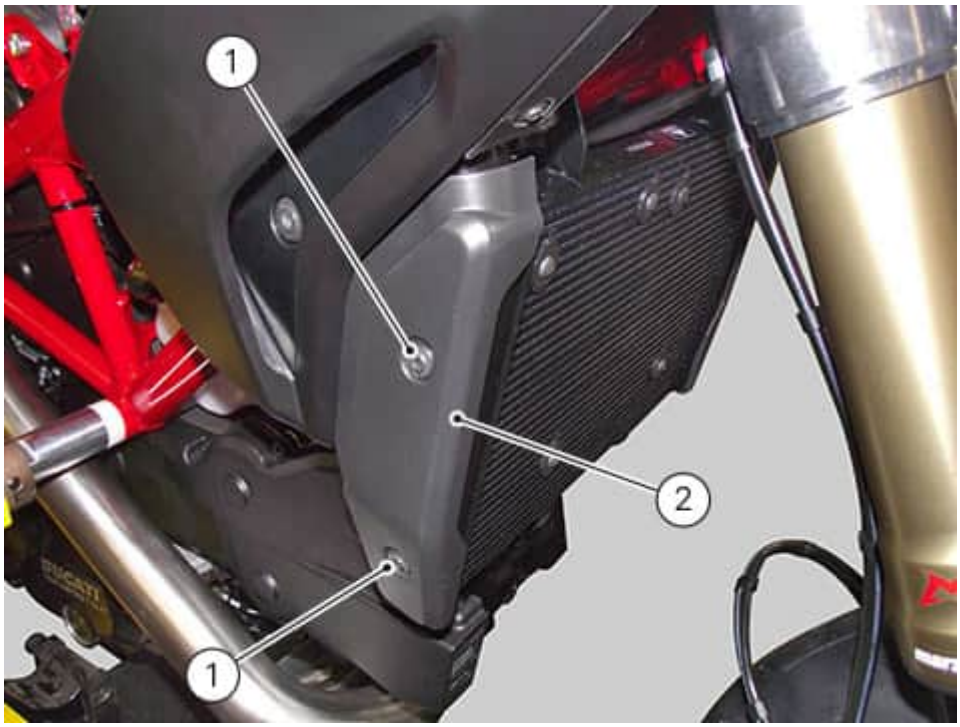
Connect hose (10) to the radiator and fix it with clip (9).

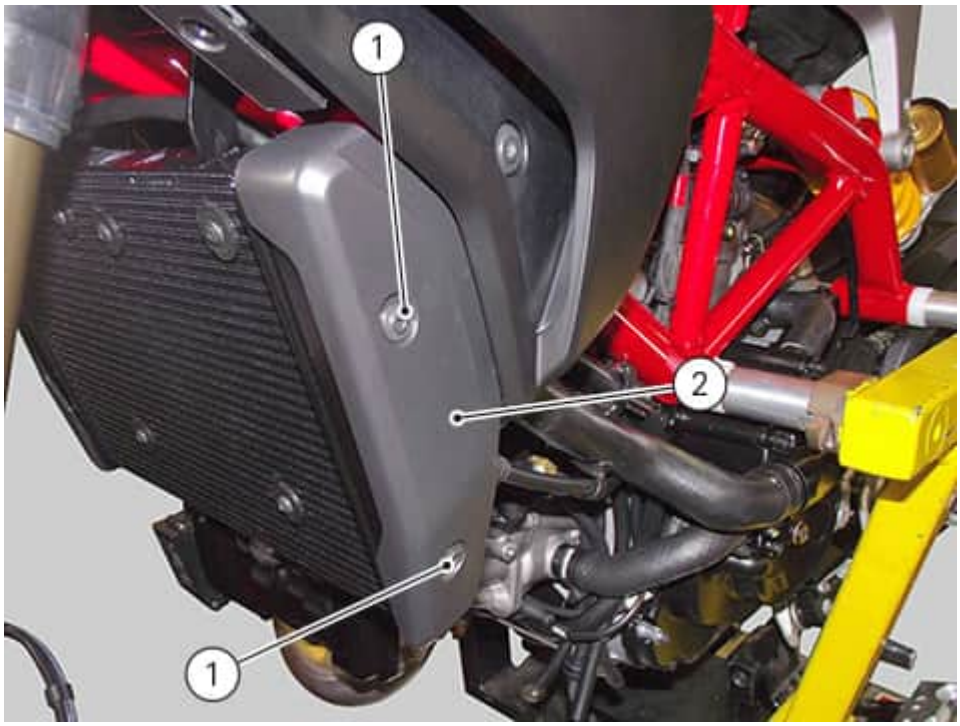


Position hoses (4) on radiator (5) and fix them with clips (3). Tighten clips (3) to a torque of 2.5 Nm ± 10%.



Position radiator protections (2) and fix them with screws (1).

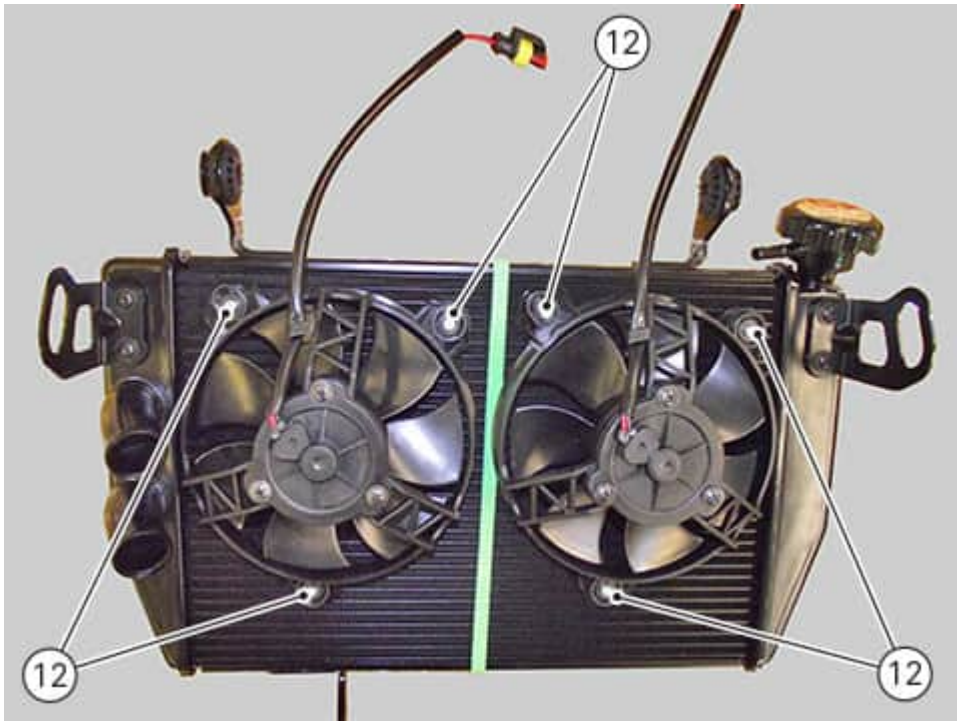




Fill the cooling system (Changing the coolant).
Refit the LH fairing (Refitting the fairings).
Refit the seat (Refitting the seat).

Replacing the electric fan

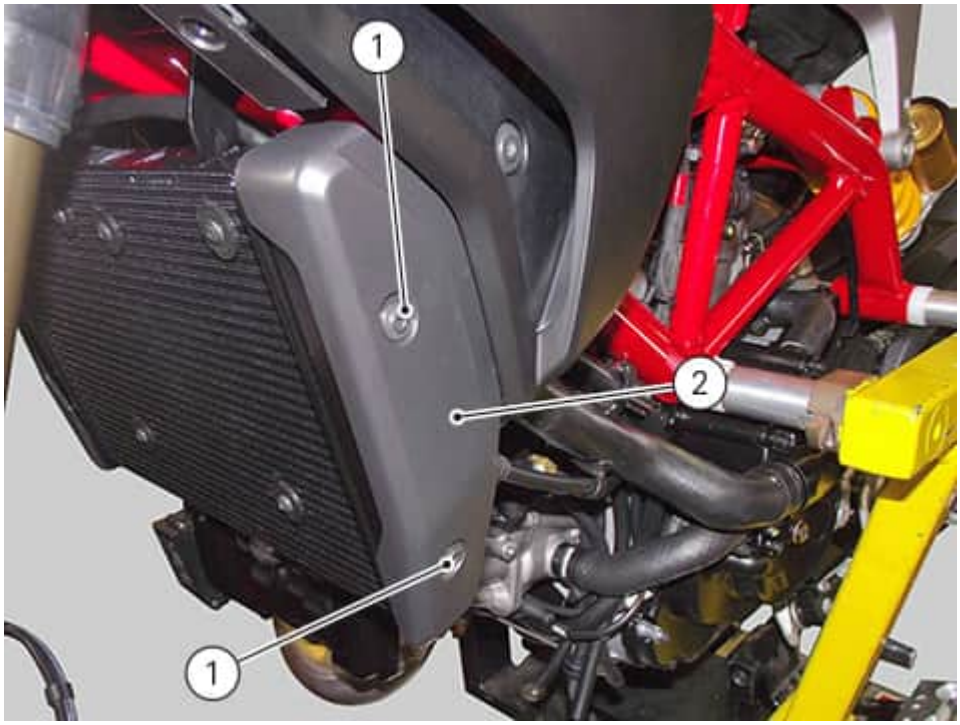
Loosen the three screws (12) securing the electric fan (13) to radiator (5).
Repeat the same procedure for the other electric fan (14).
Upon refitting, tighten screws (12) to a torque of 1.5 Nm ± 10%.

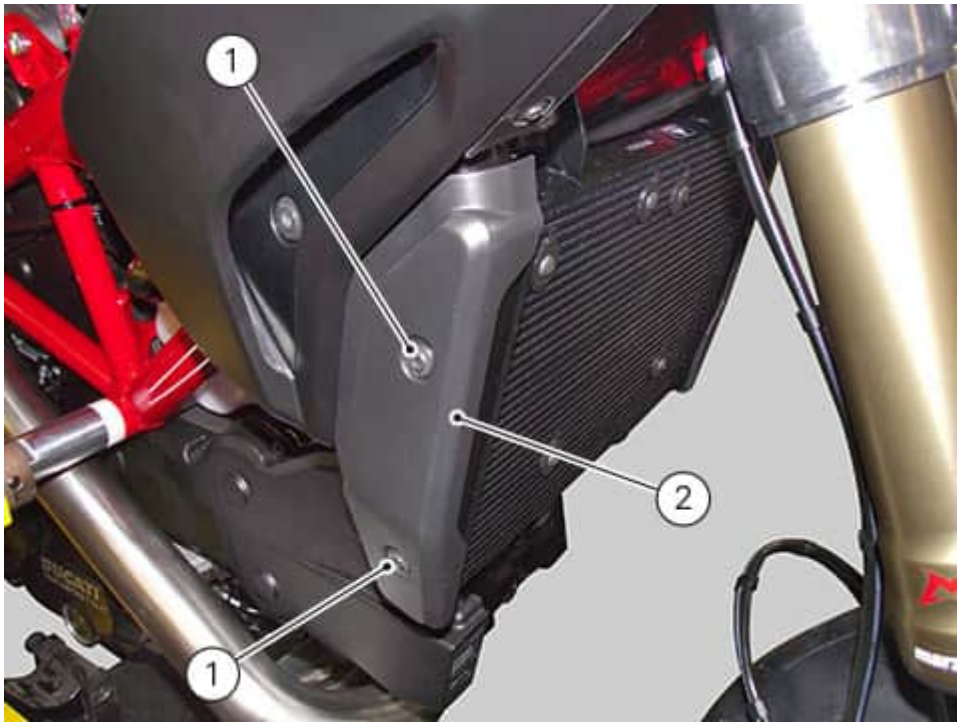


Removing the radiator

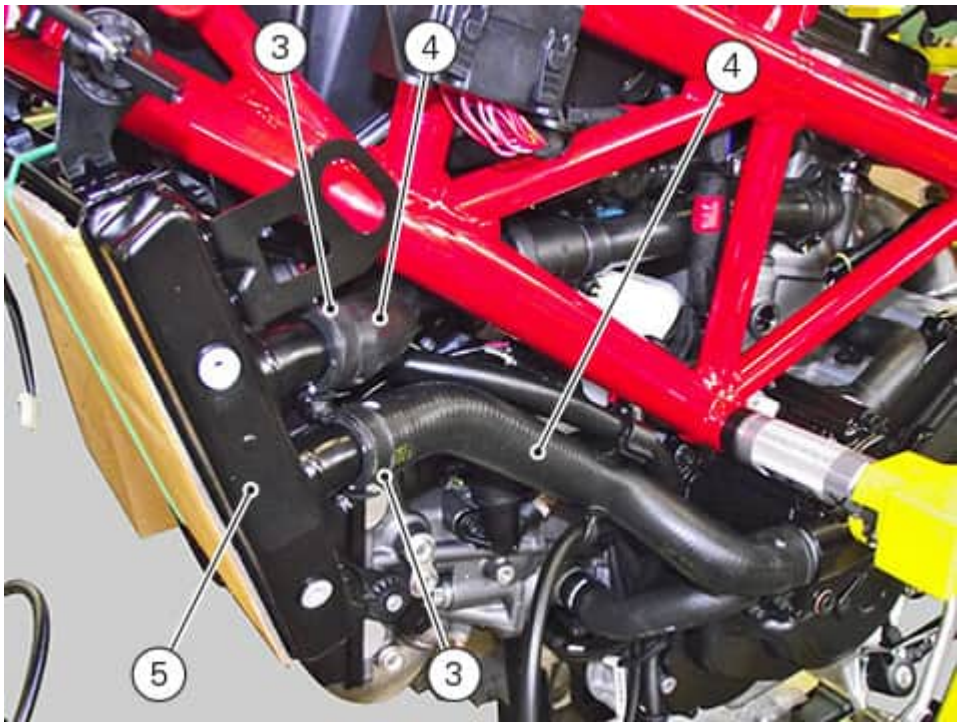
Remove the seat (Removing the seat).
Remove the LH fairing (Removing the fairings).
Empty the cooling system (Changing the coolant).

Undo screws (1) and protections (2) from the radiator.

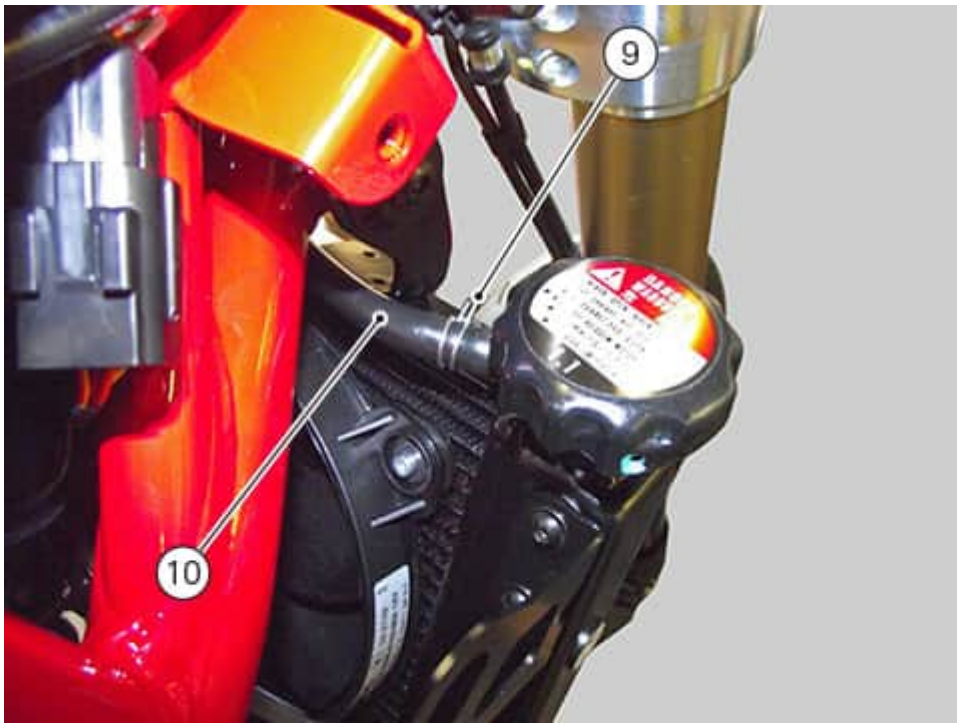




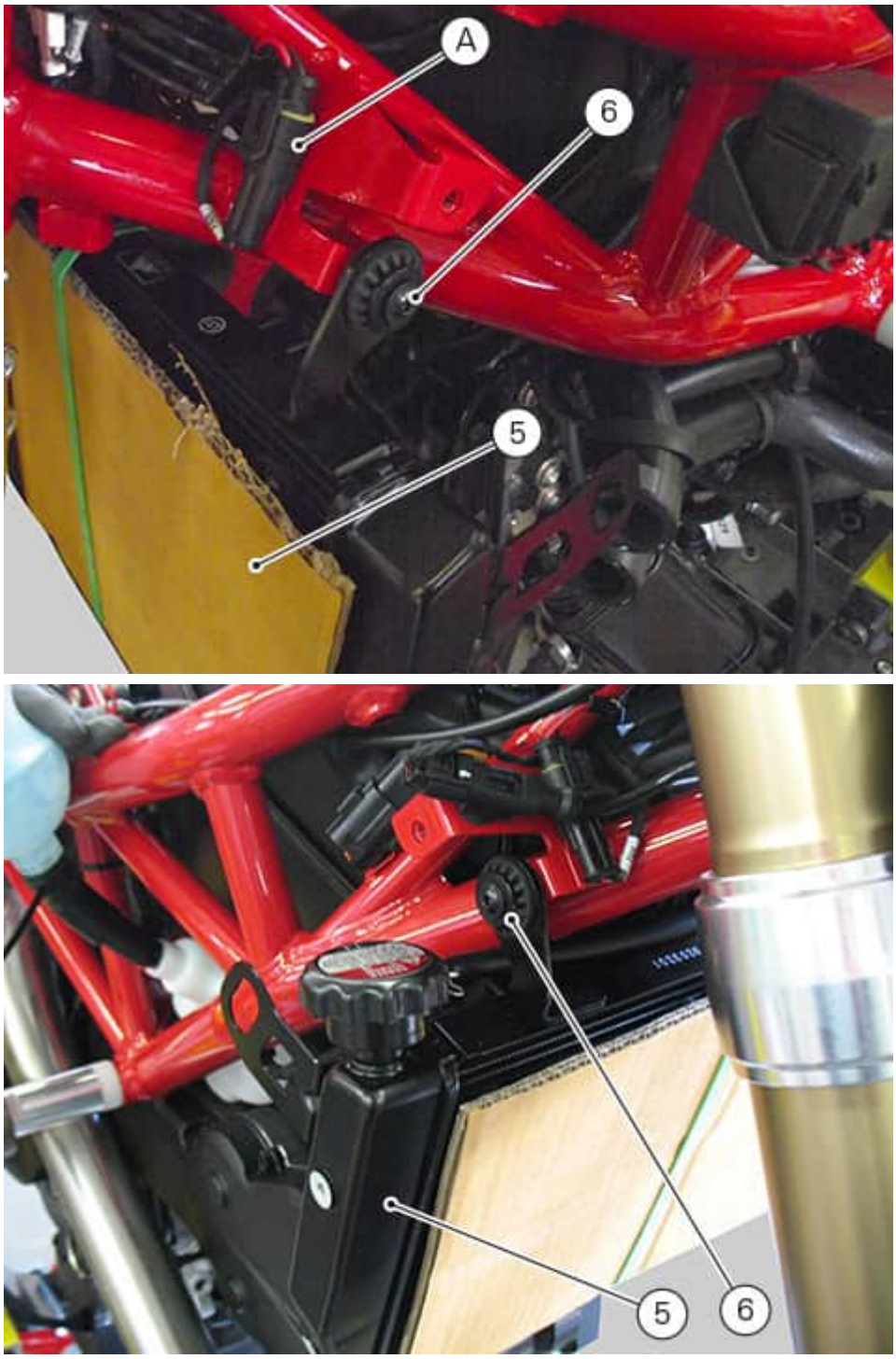
Loosen clamps (3) retaining pipes (4) to water radiator (5).



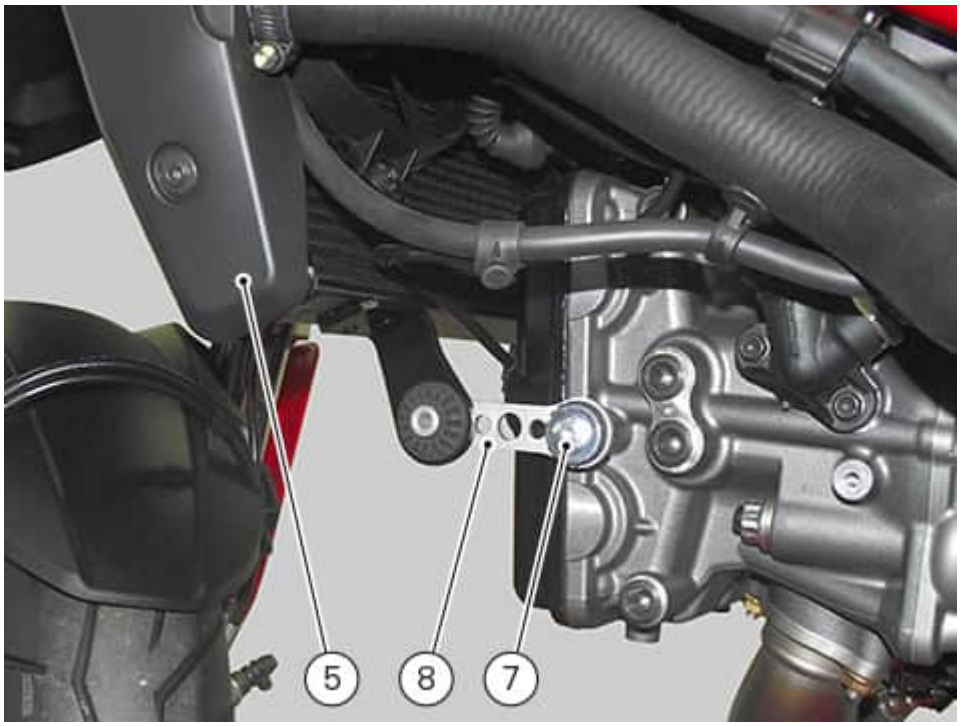
Remove clamp (9) to slide hose (10) out of the radiator.



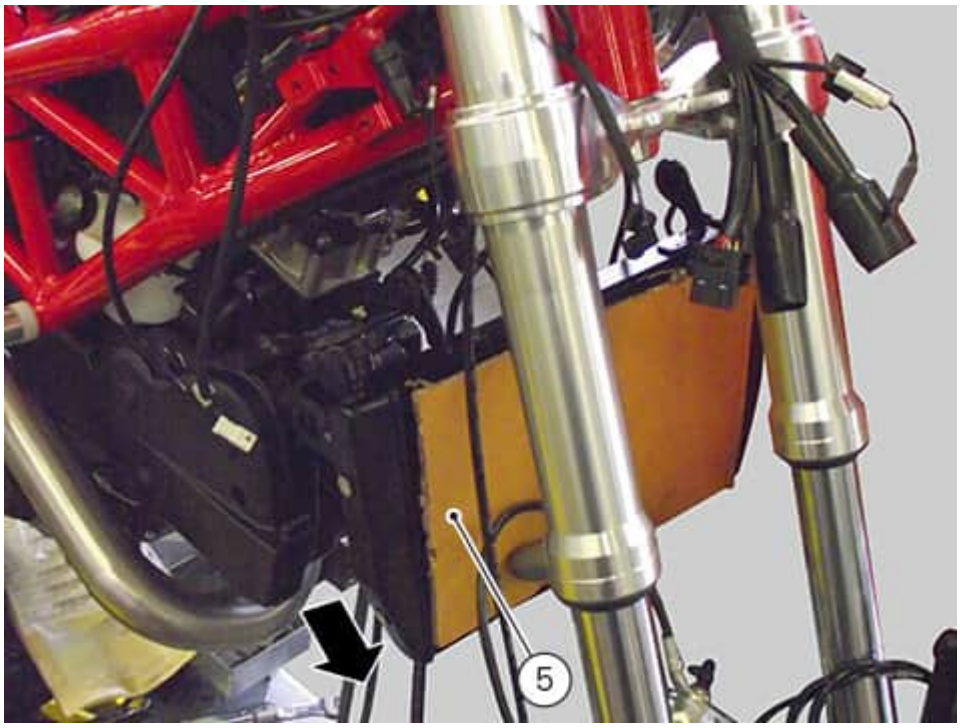
Disconnect electric fan harness (A) from main wiring.
Loosen screws (6) securing water radiator (5) to the frame.



Loosen screw (7) that retains bracket (8) of radiator (5) to the horizontal head.



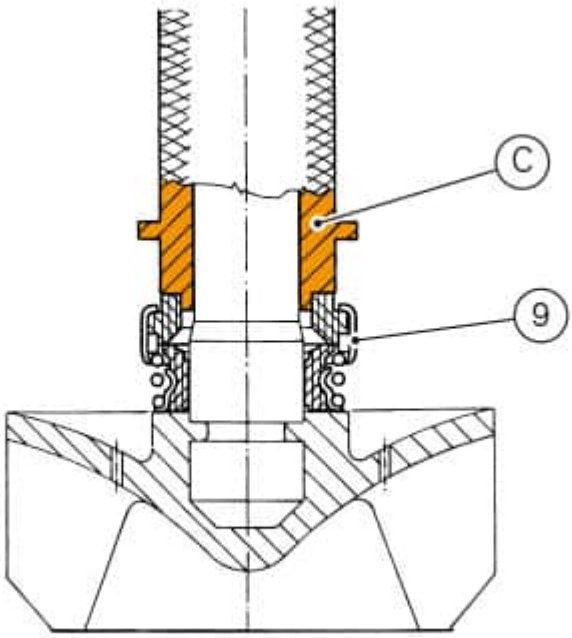
Remove radiator (5).



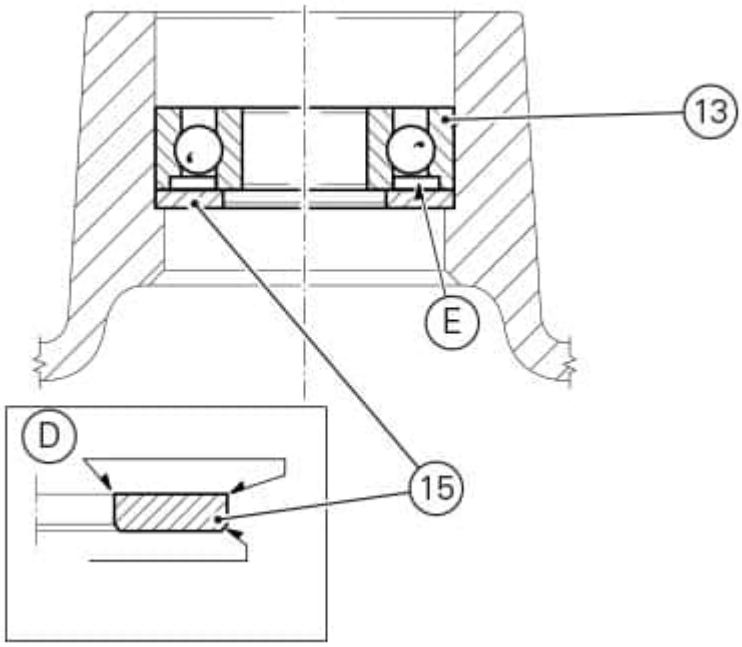
Refitting the water pump

Clean the seat in the cover, any parts you intend to reuse, and the impeller shaft. Lubricate with engine oil and refit as follows.
Use drift (C) no. **88713.0869** to fit the new mechanic seal (9) on the impeller shaft.

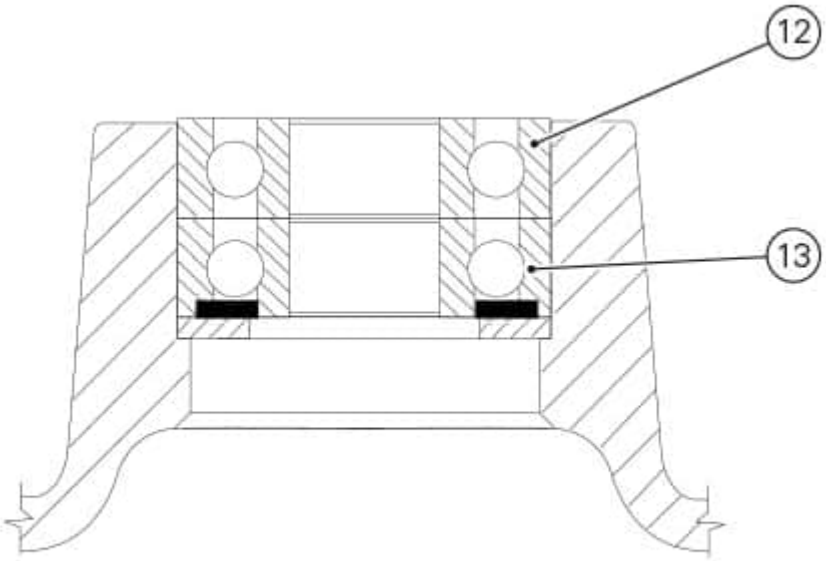




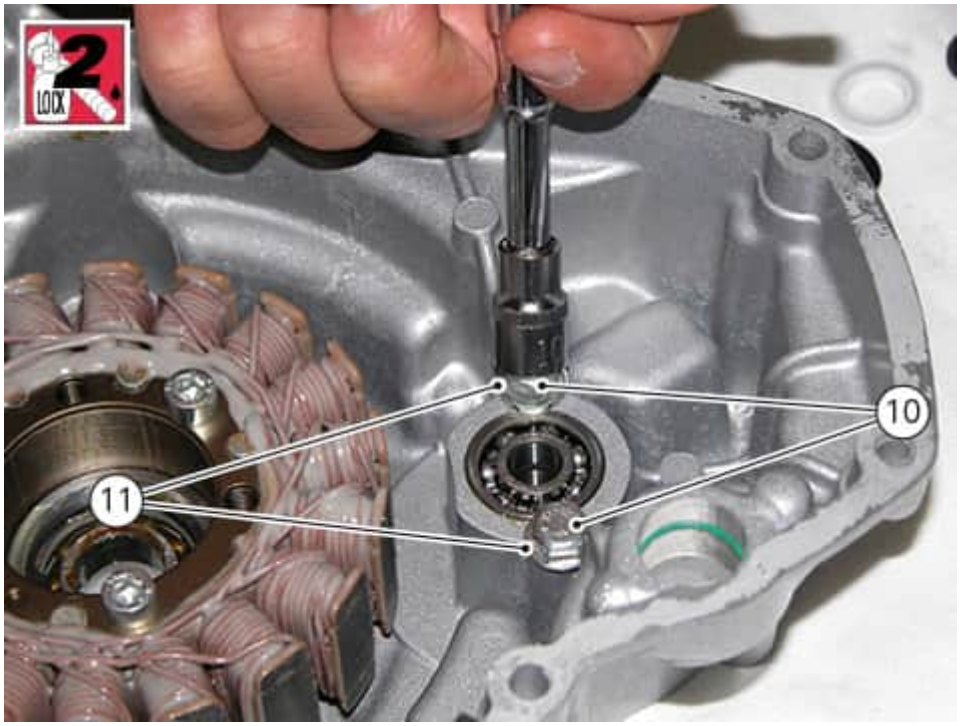
Working on cover internal side, insert the inner spacer (15) with the sharp edge (D) outwards.
Using a suitable drift working on the outer ring, drive bearing (13) - with the shielded side (E) facing the cover - fully home on the spacer (15).



Fit the other bearing (12), driving it fully home on bearing (13).

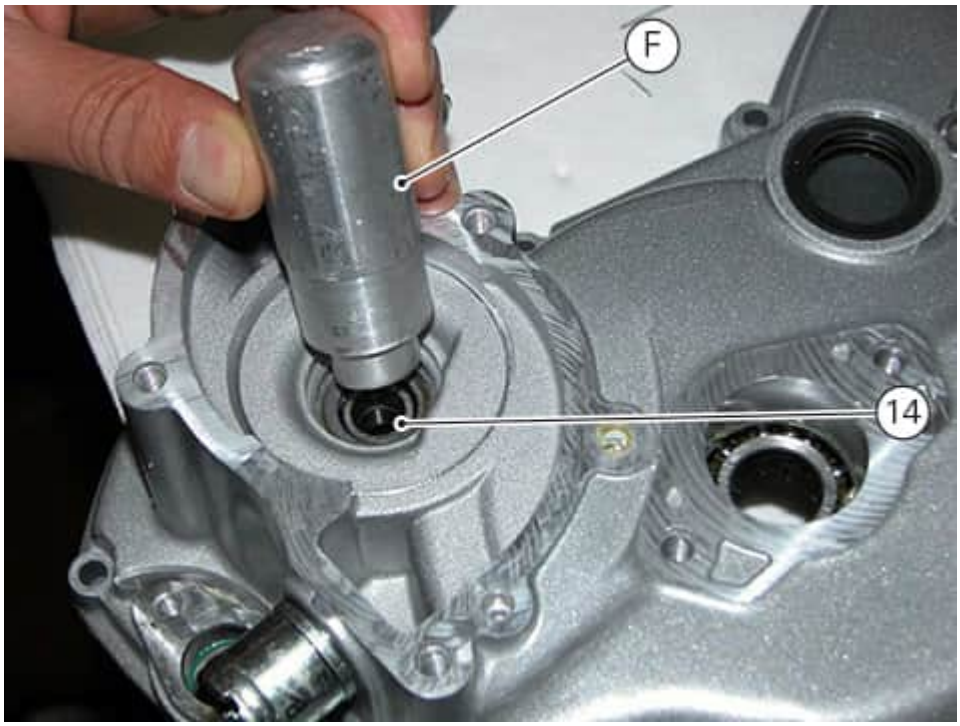


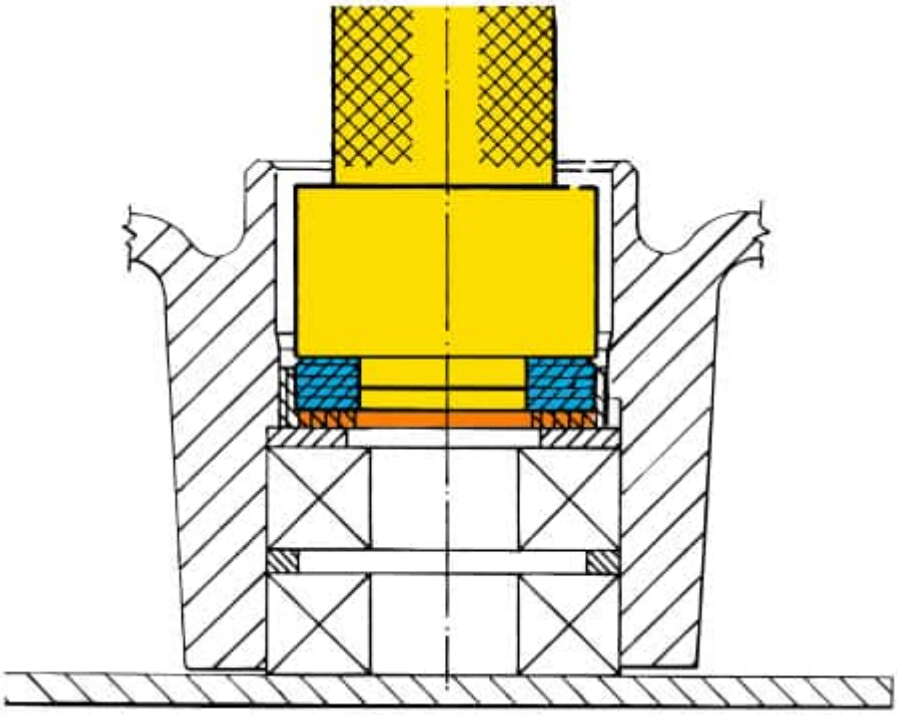
Apply the recommended threadlocker on the screws (10).
Fit the two screws (10) with the washers (11), and tighten to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).



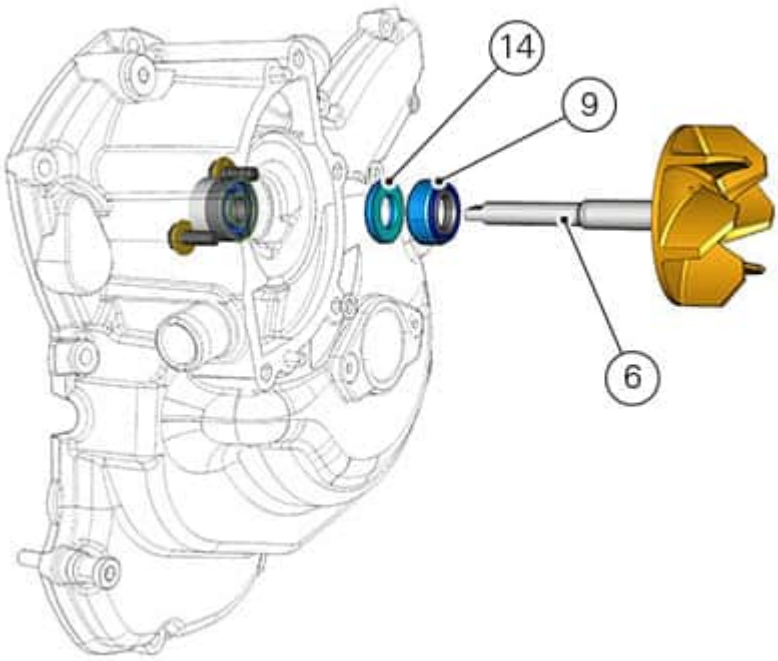
Turn the cover upside down and use drift (F) no. **88713.0870** to install counter-washer (14) fully home on spacer (15).

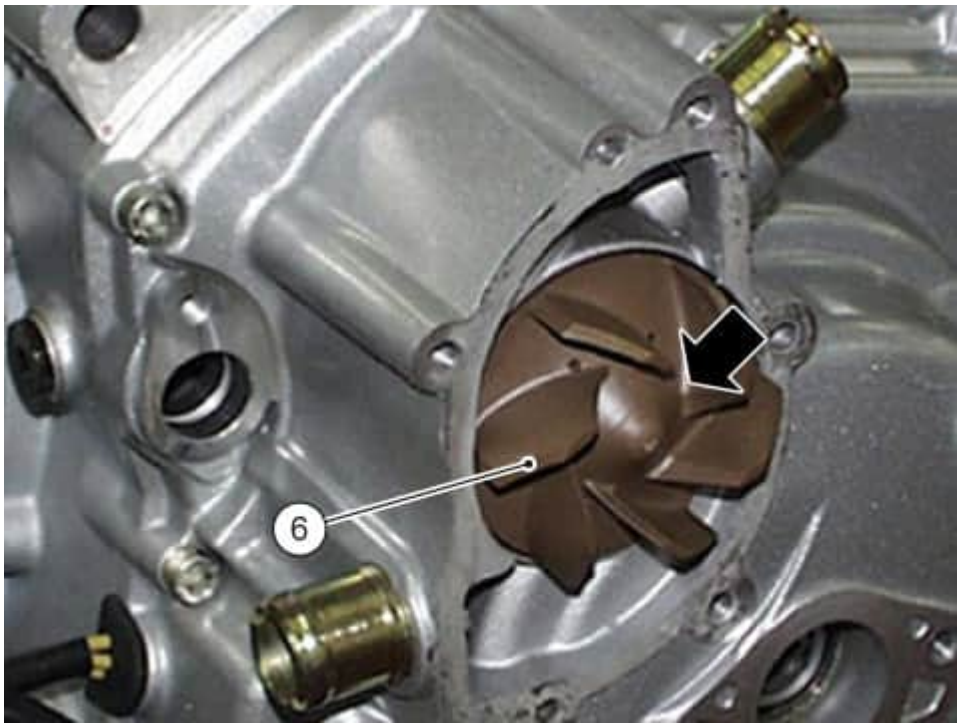
Counter-washer (14) must be positioned so that the white side is facing upwards.



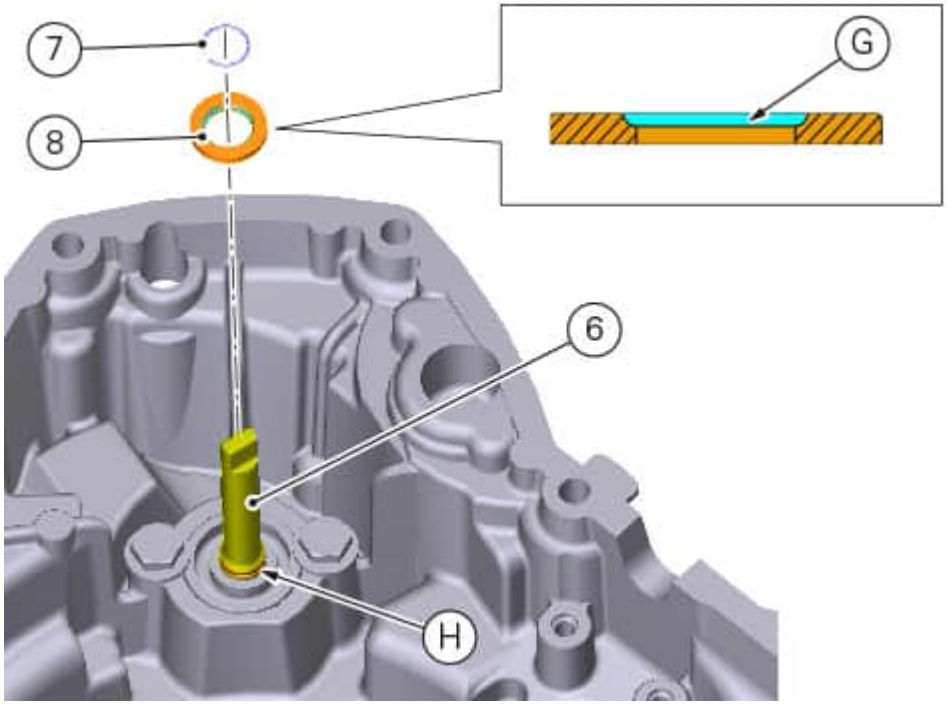


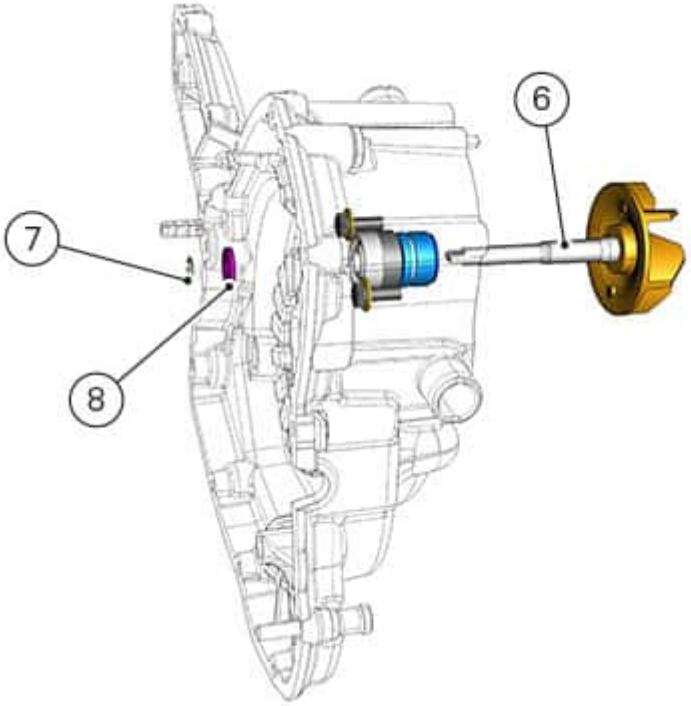
Fit the impeller shaft (6) with the previously installed mechanical seal (9).

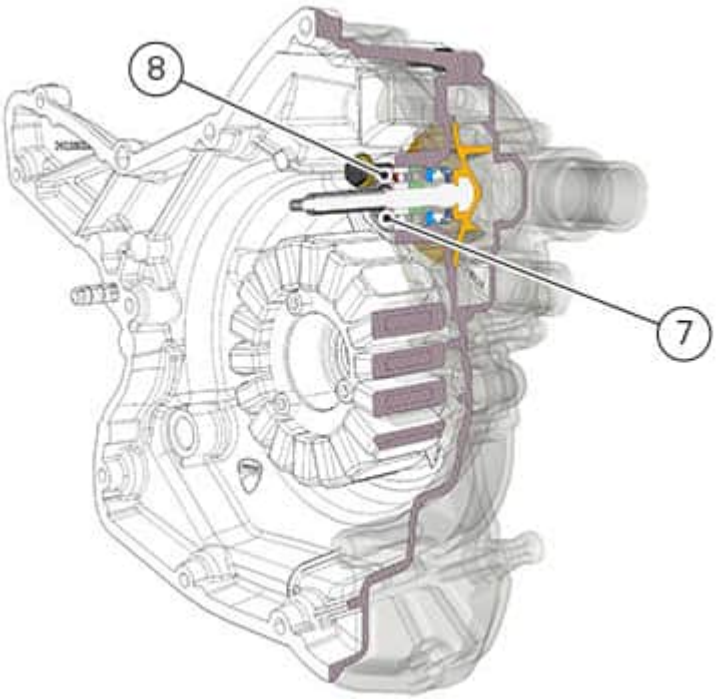


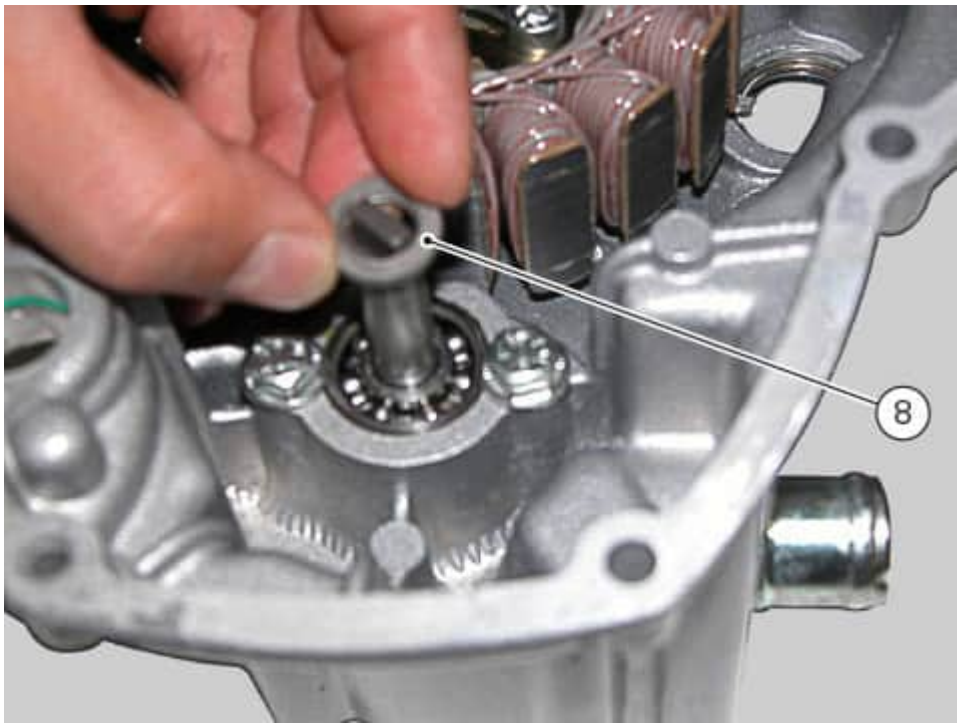


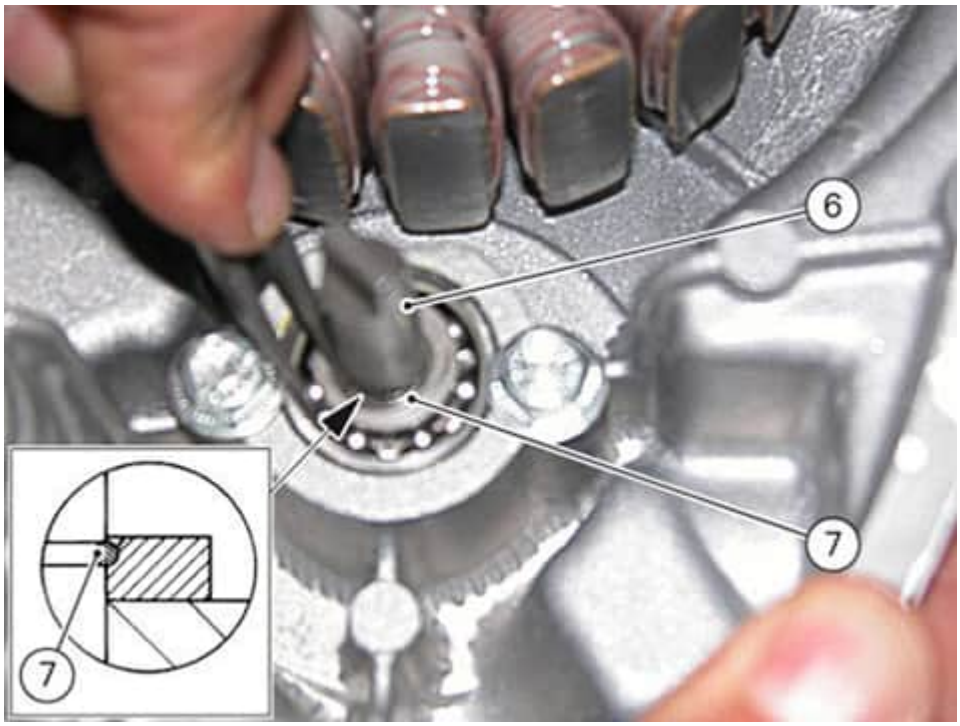
Fit spacer (8) so that groove (G) on the internal diameter where ring (7) shall be fitted, faces upwards.
Bring the oil seal fully home.
Install ring (7) in the suitable groove (H) on the impeller shaft.
Turn the impeller (6) and make sure that it can rotate freely, without excessive resistance.
Clean the mating surface thoroughly on the pump cover and on the generator cover.


7
8
G
6
H

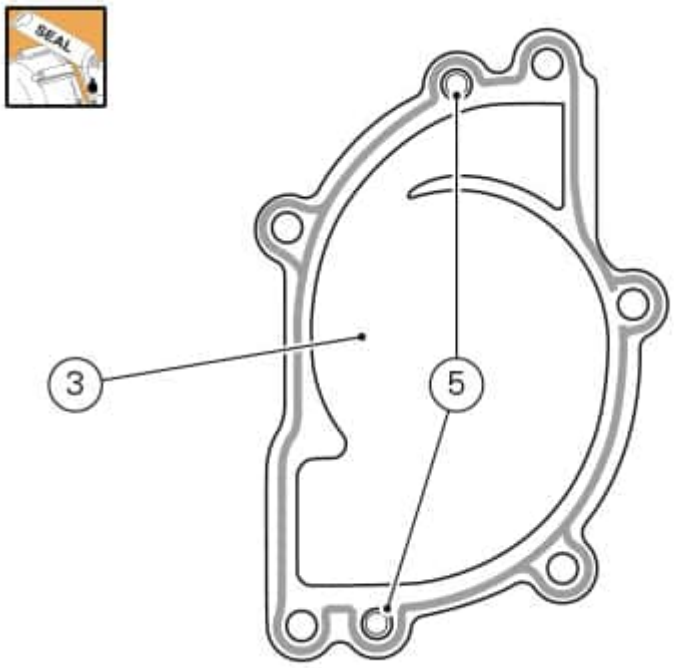

6
7
8


8
7

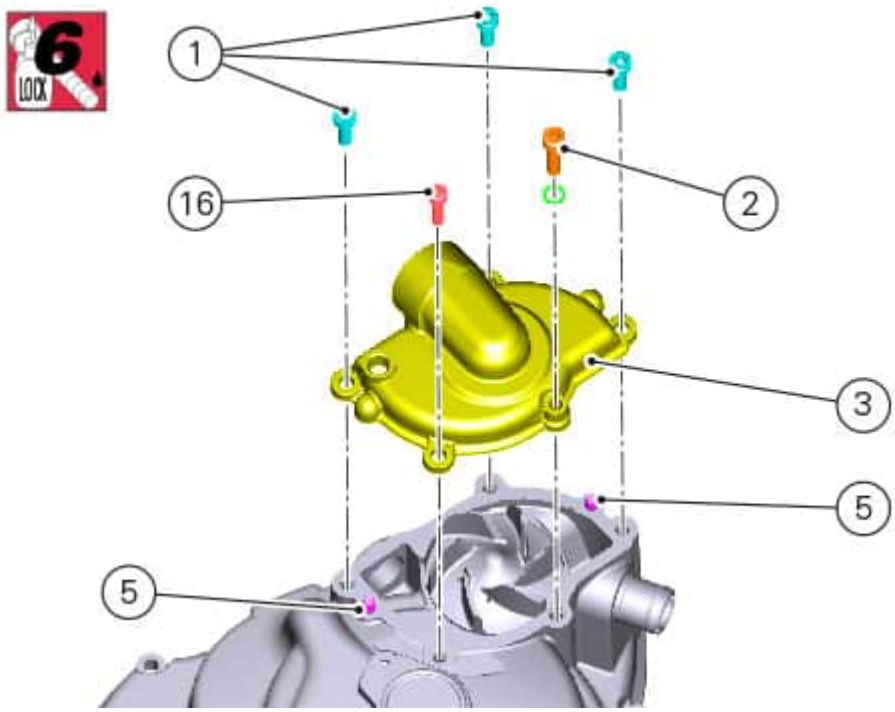

8

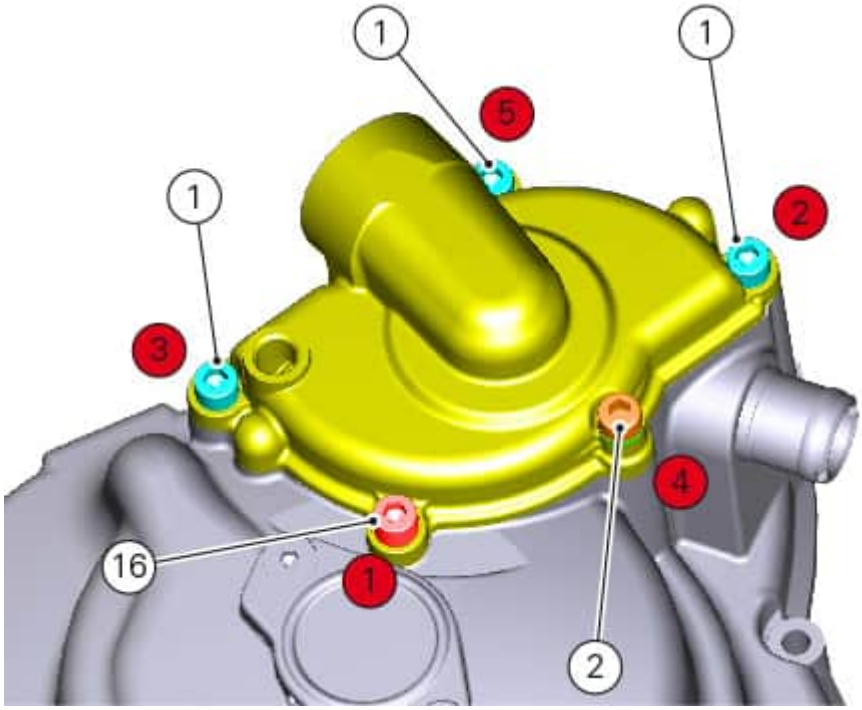


Apply on water pump cover (3) a bead of sealing compound as shown in the figure.
Fit centring dowels (5) and position the cover (3) on the generator cover.



Start screws (1).
Apply the specified threadlocker to screw (16) and start it.
Apply the specified threadlocker to screw (2) and start it.
Tighten the screws to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm), respecting the sequence shown in the figure.
After tightening, remove any excess of threadlocker.





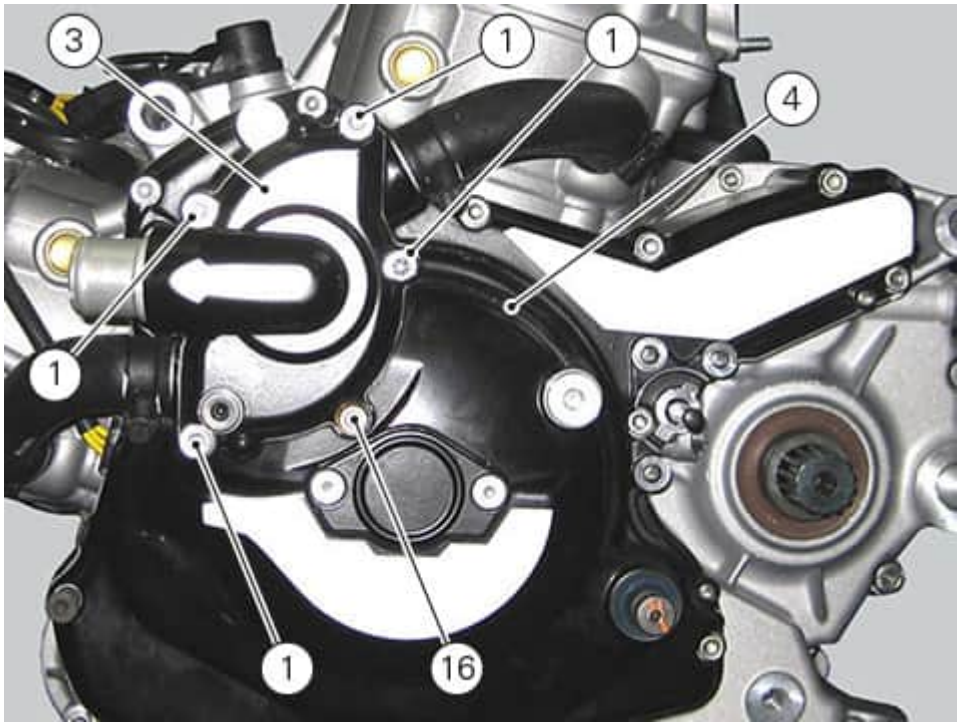
Fill the system with engine oil (Changing the engine oil and filter cartridge).
Fit the cooling system hoses on the water pump cover (Refitting cooling system hoses and unions).
Fill the cooling system (Changing the coolant).
Fit the half-fairings (Refitting the tank fairings).

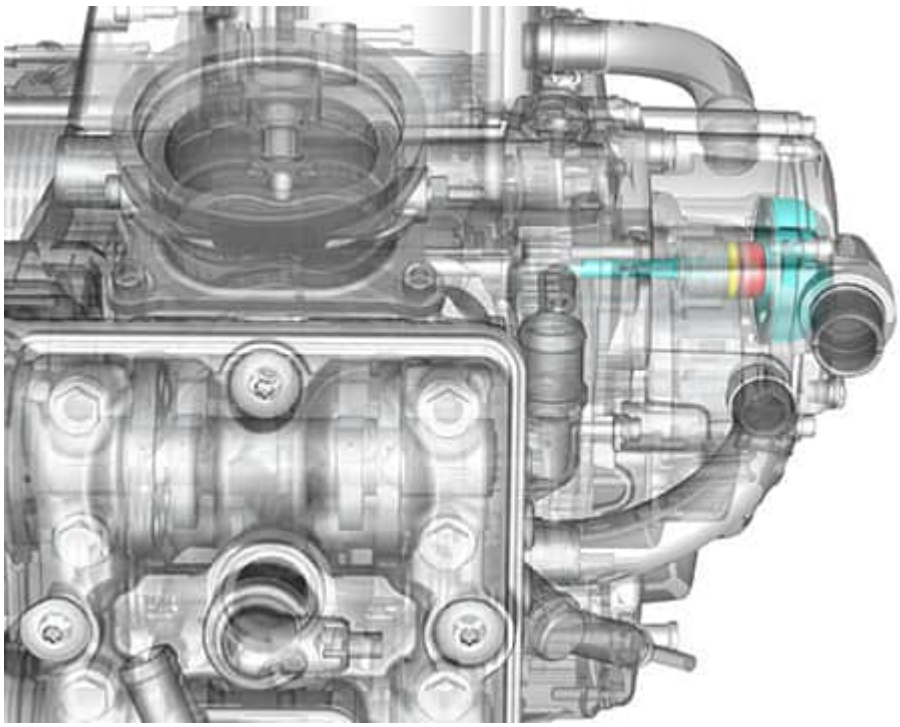
Removing the water pump

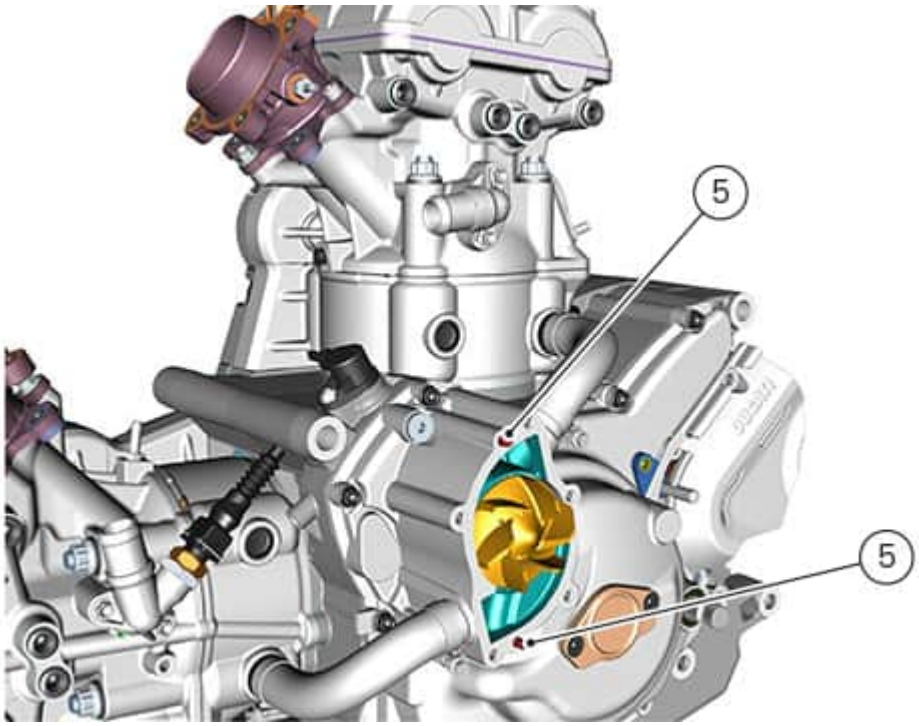
Remove the fairings (Removing the fairings).
Drain the coolant (Changing the coolant).
Remove the cooling system hoses from the water pump cover (Removing cooling system hoses and unions).
Drain the engine oil (Changing the engine oil and filter cartridge).

Note
For clarity, the figures show the engine removed from the frame.

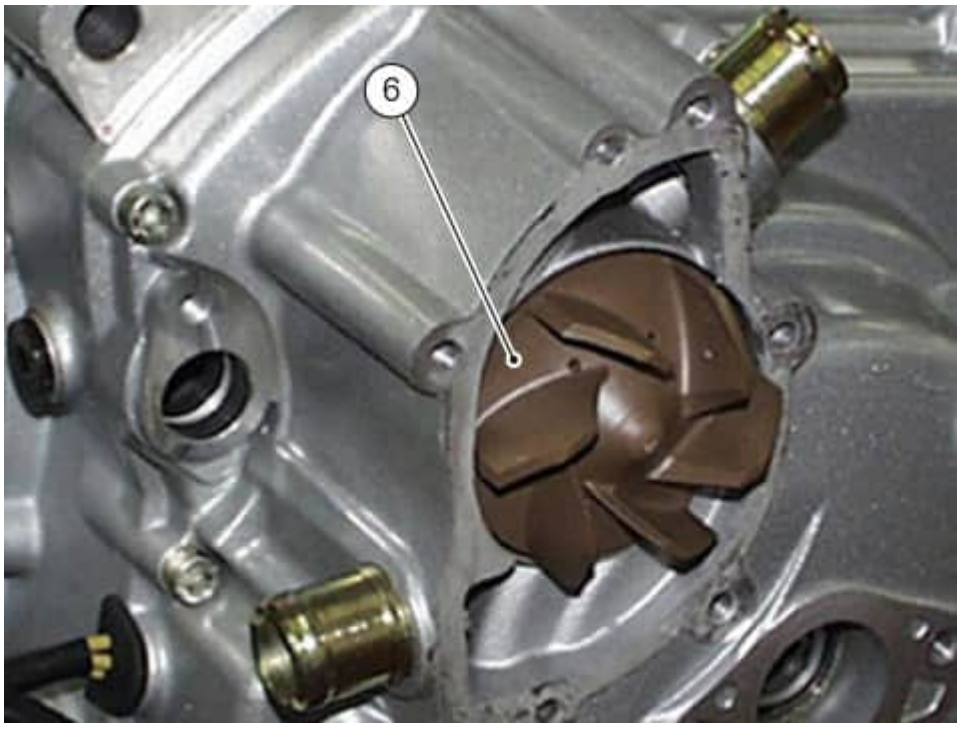
Loosen and remove screws (1), (2) and (16) with the relevant washer securing the water pump cover (3) to the generator cover (4).
Remove the water pump cover (3) and collect dowels (5).

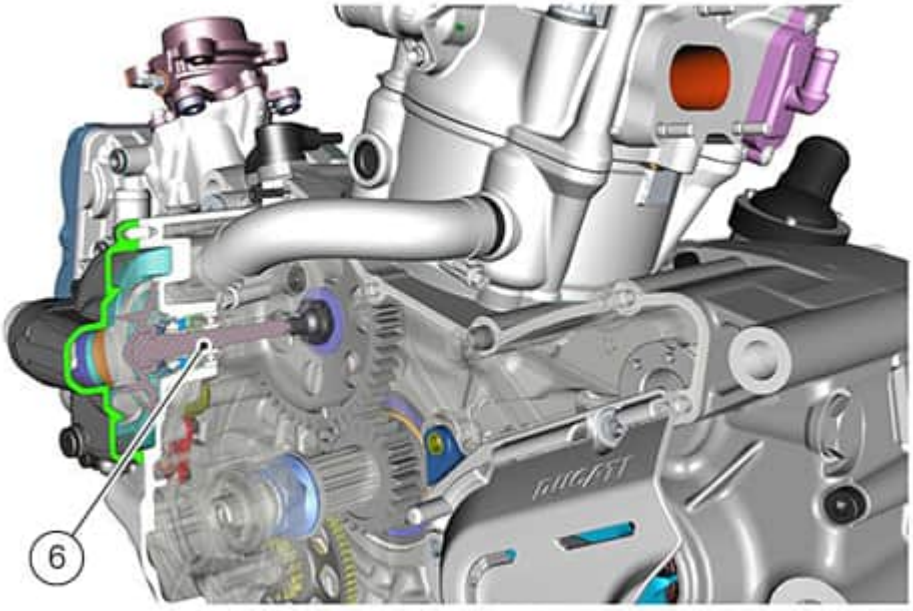


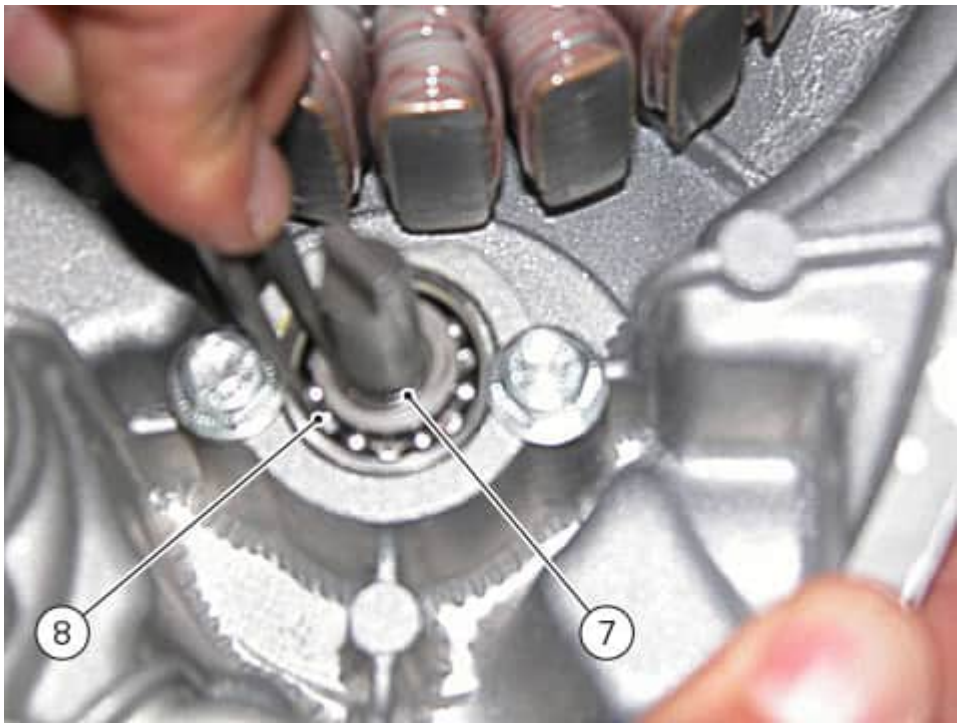


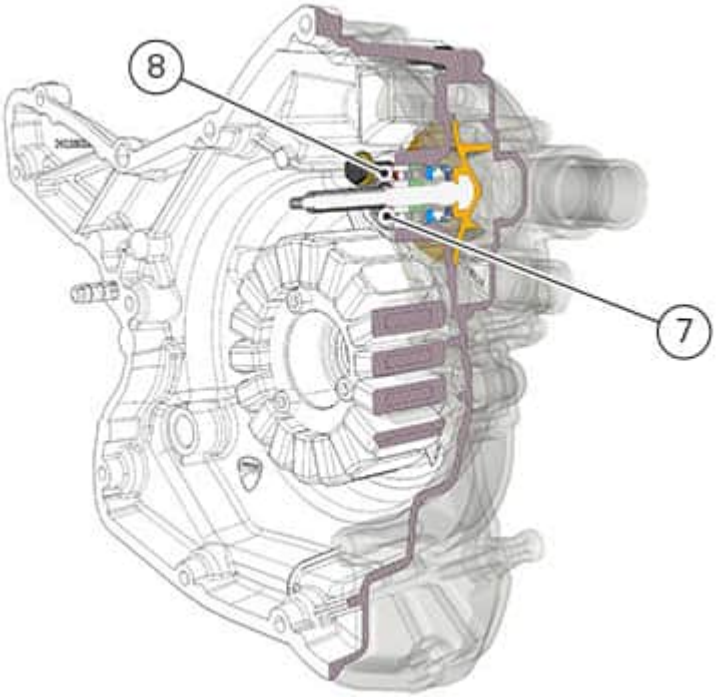


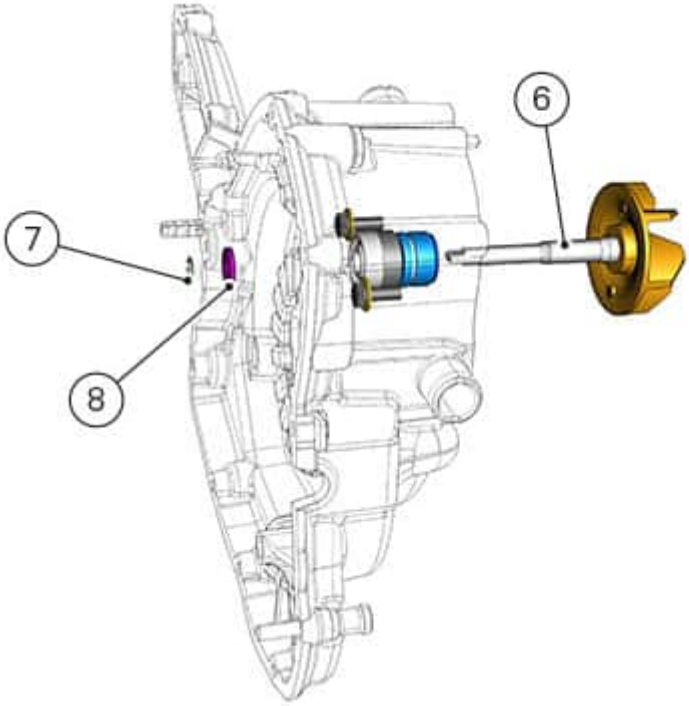
Clean the pump housing from any coolant scale. Check the bearing wear by turning the impeller shaft (6); in case of excessive clearance, it is necessary to replace them as follows.
Remove the snap ring (7) from the impeller shaft, and the washer (8) underneath.



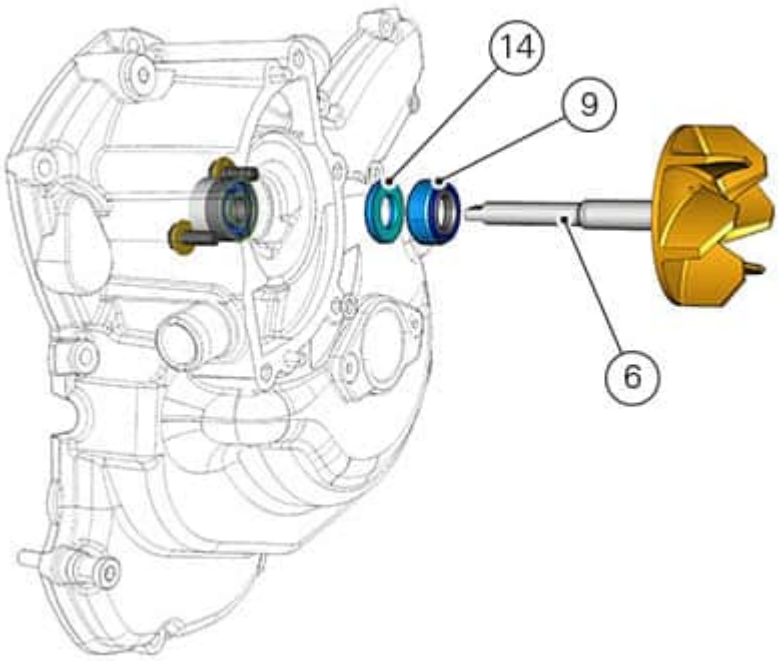

6


8
7

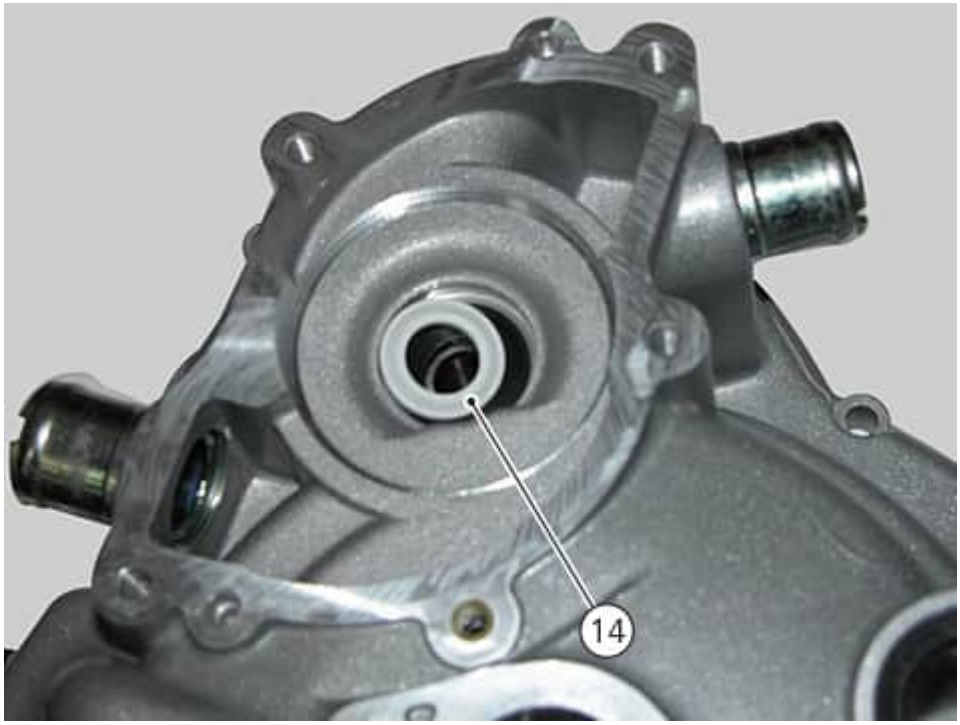




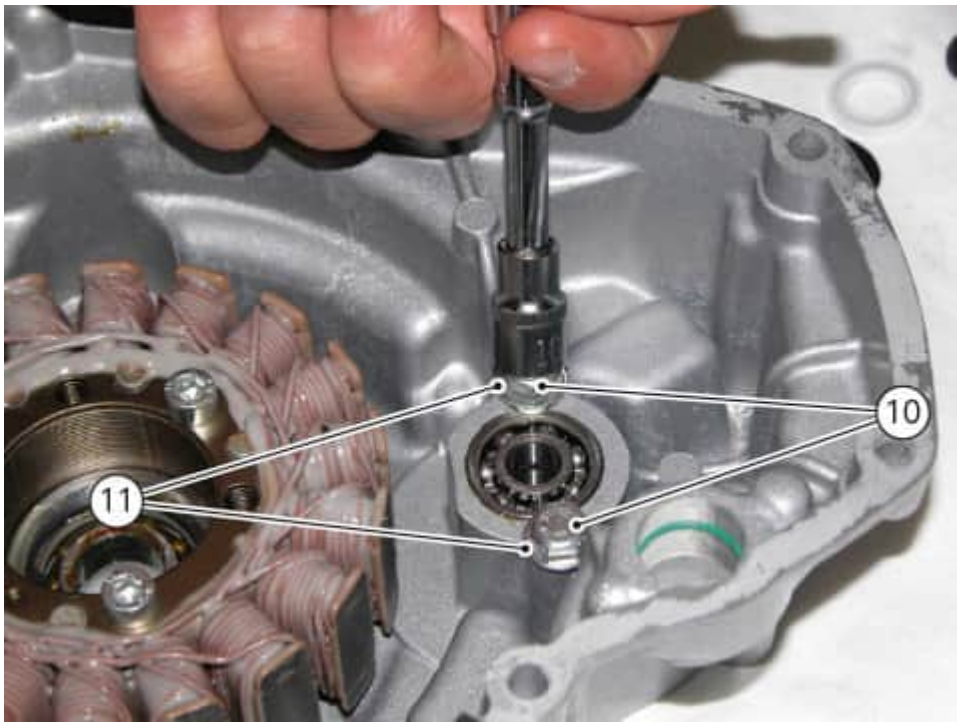
Slide off the impeller (6) with the sealing ring (9) from the outside.



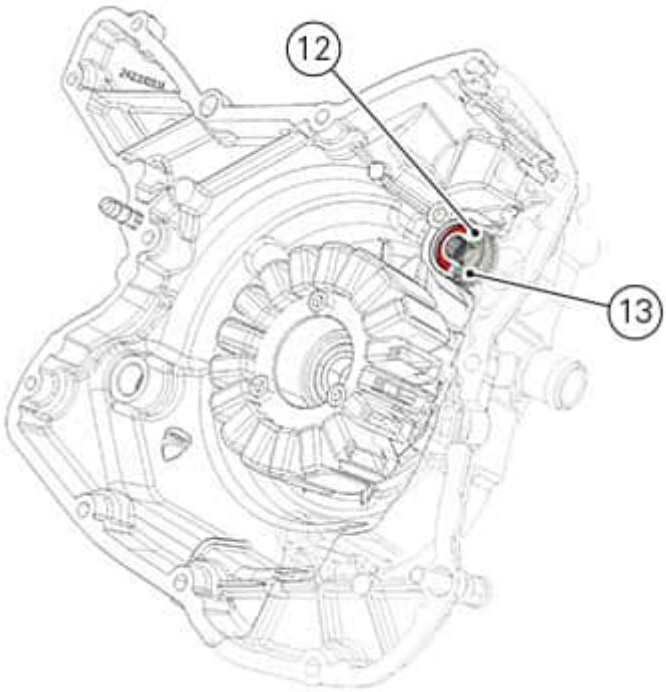
Collect the ceramic washer and the seal ring union (14).

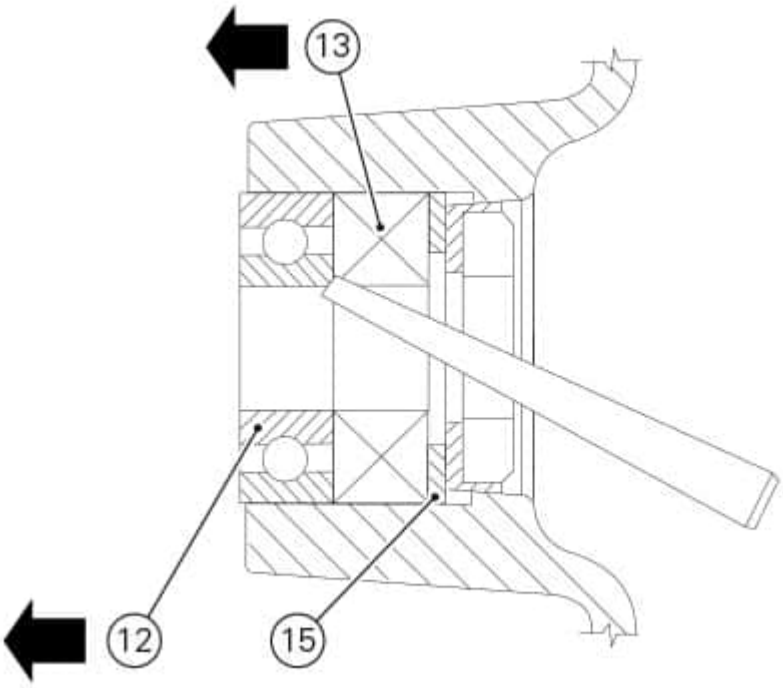


Undo and remove the screws (10) with the washer (11).

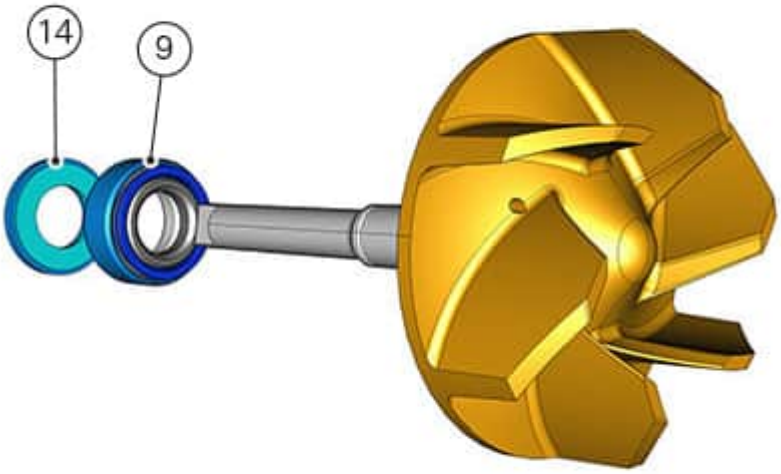


Working from the impeller side, use a suitable drift to press on the inner ring of end bearing (12) until it can be extracted from the cover.
Use the same technique to remove the other bearing (13).
Remove the inner spacer (15).





Check the condition of the mechanical seal components (9) and of the counter-washer (14): there should be no signs of deformation, cracking, or excessive wear.
In case of damage, both components must be replaced.

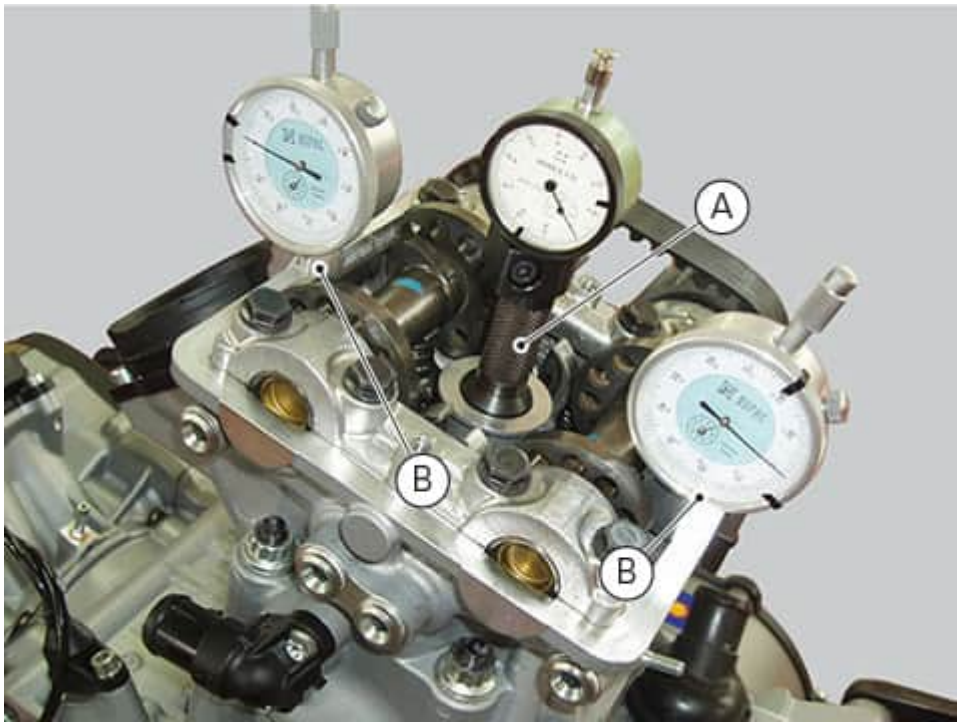


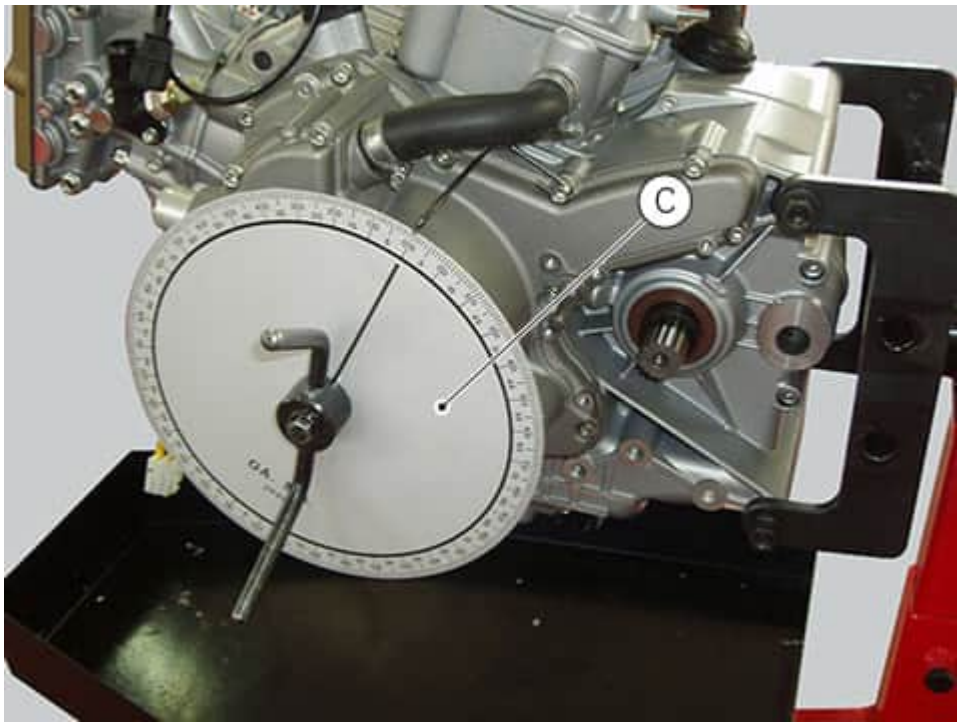
Checking the engine timing

Remove the seat (Removing the seat).
Remove the side fairings (Removing the fairings).
Remove the fuel tank (Removing the fuel tank).
Remove the airbox, the blow by and the oil breather pipe (Removing the airbox).
Remove the supply system and the injectors from the intake manifolds (Removing the throttle body).
Remove the water radiator lower retainer from the engine (Removing the water radiator).
Remove the cylinder head covers (Removing the camshafts).
Remove the vertical head exhaust pipe (Removing the exhaust system).
Remove the timing belt covers (Removing the timing belt external covers).

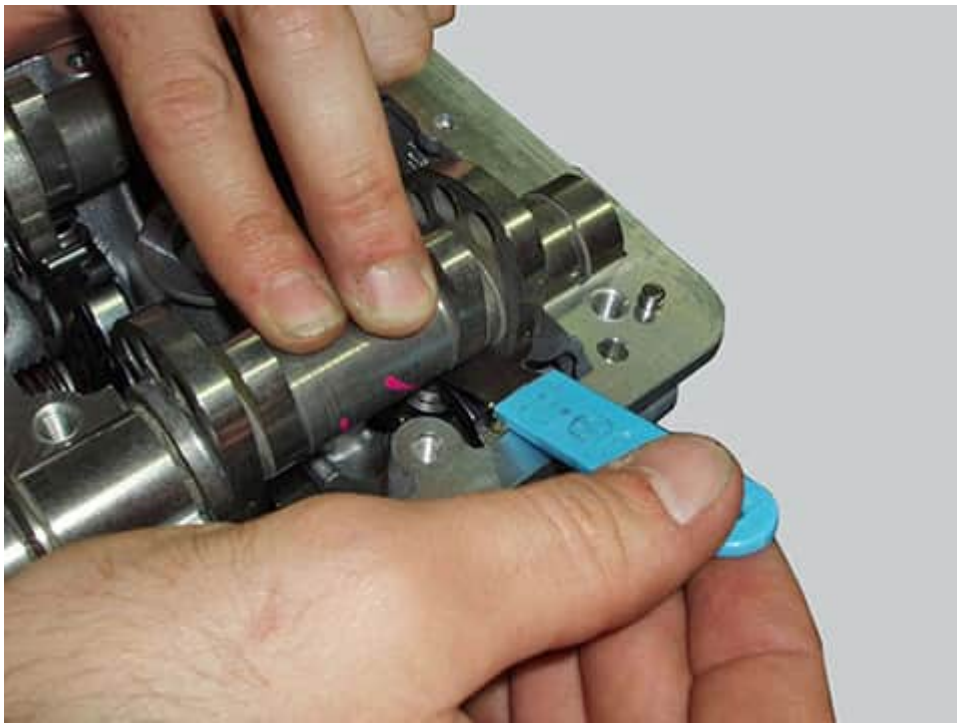
Note
For clarity, the figures show the engine removed from the frame.

Move the piston of the cylinder being checked to TDC upon combustion stage: in this condition, all valves are closed and the camshafts come in rest position and, therefore, free to rotate.
Install tool no. **88713.2087** (A) in the spark plug bore to determine the piston TDC, the gauges (B) on tool no. **88765.1690** and the timing check tool (C) no. **88765.1657** (degree wheel with graduated disk).

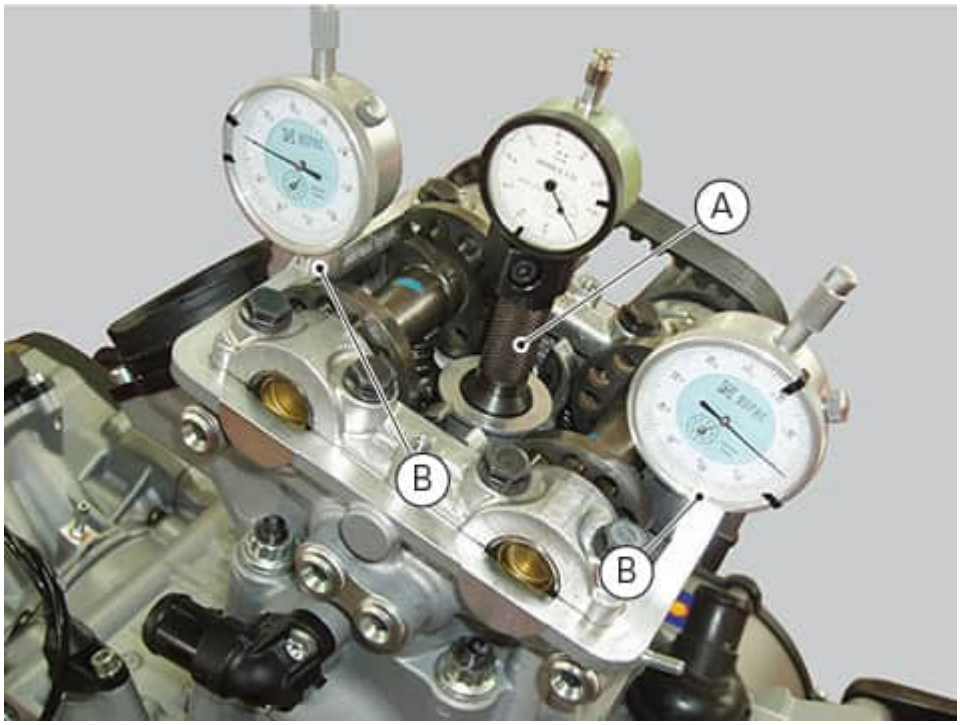


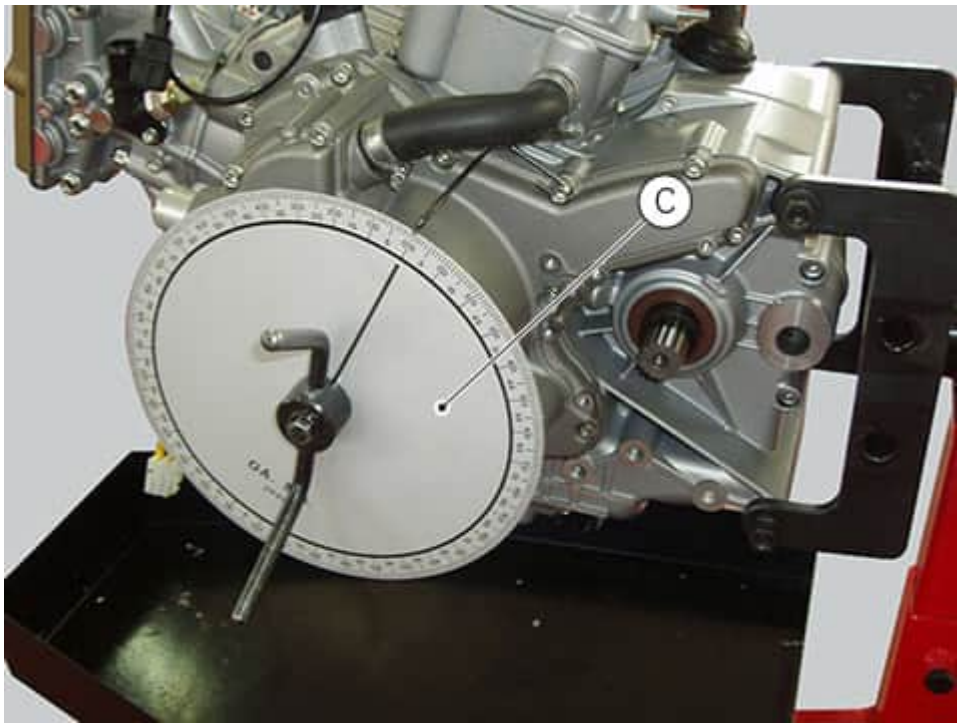


Set the opening valve clearance to zero when the camshafts are in rest position by fitting a feeler gauge, of suitable thickness, between the upper rocker arm and the opening shim.
Check that in this condition the camshaft can rotate. If it moves stiffly, use a thinner feeler gauge.

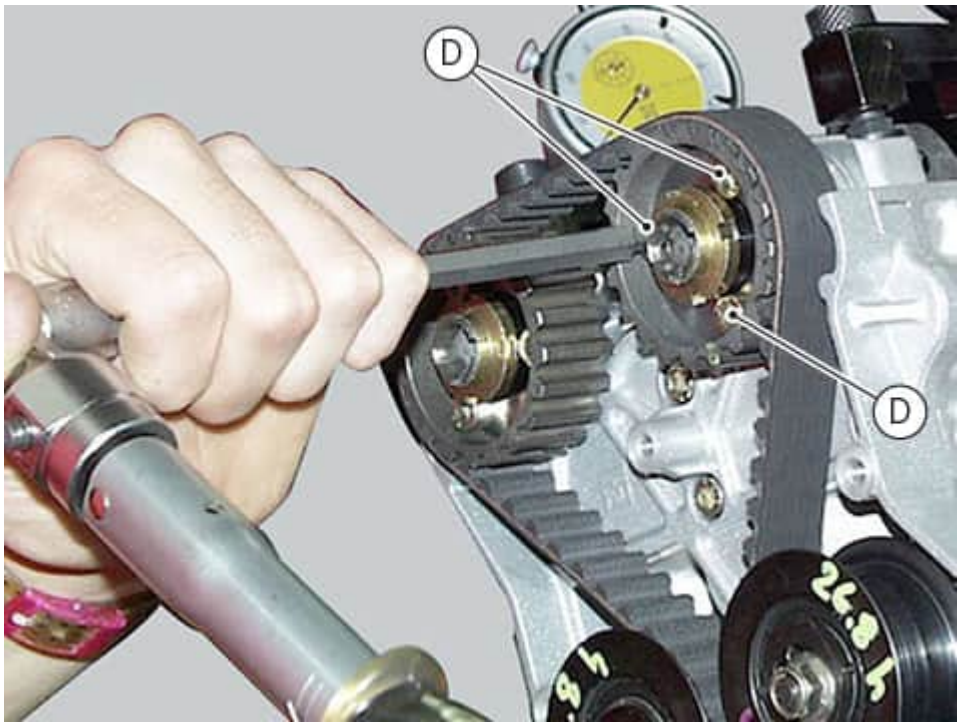


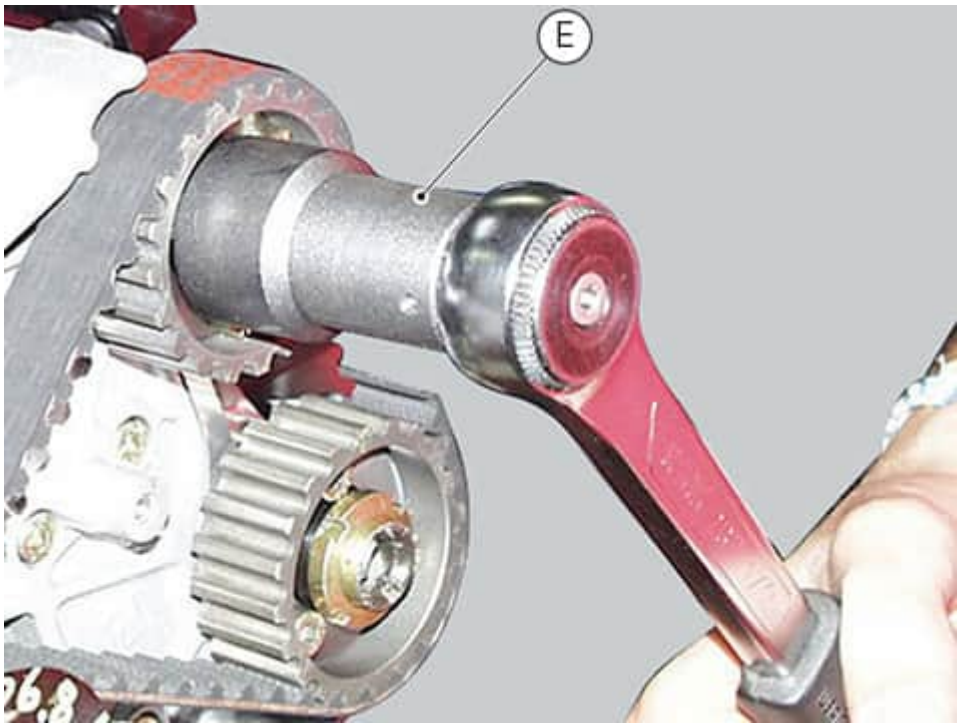
In this condition, with the piston of the horizontal cylinder at TDC with the valves fully closed as confirmed by the reading on gauge (A), set the gauges (B) to zero.
Tension the belts to the specified value.
Turn the degree wheel (C) counter clockwise until the gauge dial (B), on the exhaust side, shows a lift of 1 mm.
Check that the value of the angular displacement read on the degree wheel (C) is the specified one.
Continue to rotate in the same direction until you obtain a lift of 1 mm on the intake side.
Check the angular value on the degree wheel.
Continue to rotate until you obtain an intake valve lift of 1 mm on the gauge (B), during closure of the valve for the compression stroke.
Check the angular displacement value with the specified one.
Continue to rotate the degree wheel (C) counter clockwise until you obtain a lift of 1 mm of the exhaust valve, when opening or closing the valve.
Check the angular displacement value against the specified value.
Repeat the procedure for the vertical cylinder.
A tolerance of ±3° is allowed in the values detected with the described procedure compared to the specified ones.





Remove the installed tools to check timing. Then tension the belts to the prescribed operation value.
In case of values different from the described ones, loosen the fixing screws (D) of the timing belt rollers and correct the value detected by turning the ring nut of the timing shaft with the supplied wrench (E) no. **88713.1806**.
Then block the three screws (D) retaining the timing belt roller to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) and mark the new position on the components.





Specified values:

Adjusting the belt tension			
	Reference	Assembly value (new belt)	Recovery value (used belt)
Cold belt tension adjustment	DDS	110±5 Hz (horizontal)	80±5 Hz (horizontal)
		110±5 Hz (vertical)	80±5 Hz (vertical)
	Cold min. limit value		70 Hz
	Tension value accepted upon engine overhaul	HORIZONTAL	VERTICAL
		Tension (Hz) ±5	Tension (Hz) ±5

		Min. 80	Min. 88
		Max. 100	Max. 100

Timing diagram		
Timing diagram with valve clearance of 1 mm	Intake	Opening 4° B.T.D.C. Closing 52° A.B.D.C.
	Exhaust	Opening 58° B.B.D.C. Closing 7° A.T.D.C.
Intake valve diameter	35.5 mm	
Exhaust valve diameter	28.8 mm	

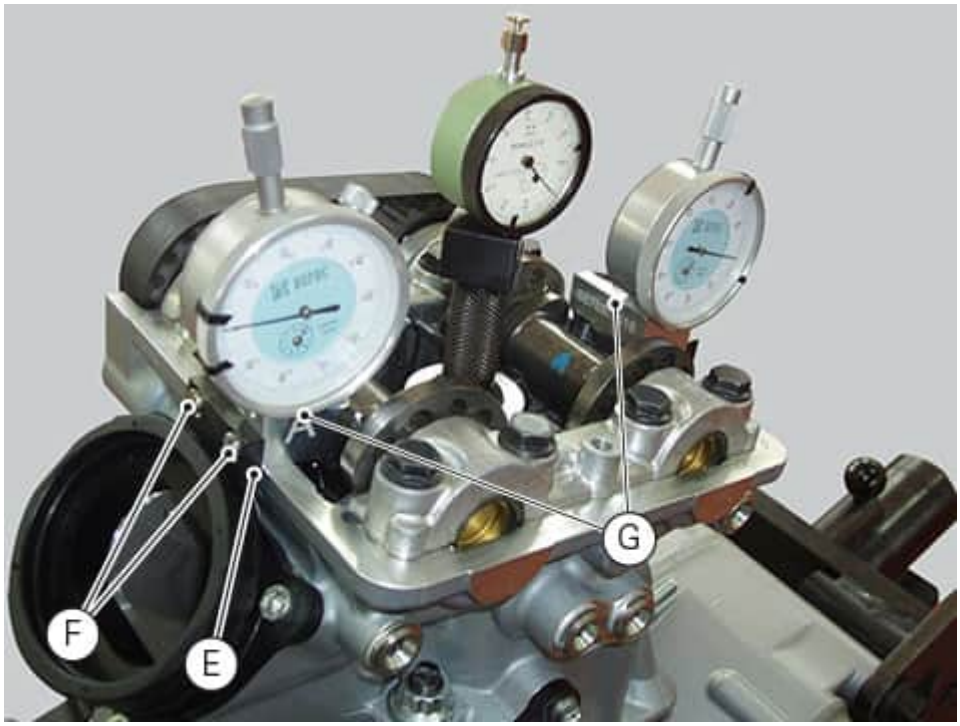
Refit the timing belt covers (Refitting the timing belt external covers).
Refit the cylinder head covers (Refitting the camshafts).
Refit the water radiator lower retainer on the engine block (Refitting the water radiator).
Refit the vertical head exhaust pipe (Refitting the exhaust system).
Refit the supply system and the injectors from the intake manifolds (Refitting the throttle body).
Refit the airbox, the blow by and the oil breather pipe (Refitting the airbox).
Refit the fuel tank (Refitting the fuel tank).
Refit the side fairings (Refitting the fairings).
Refit the seat (Refitting the seat).

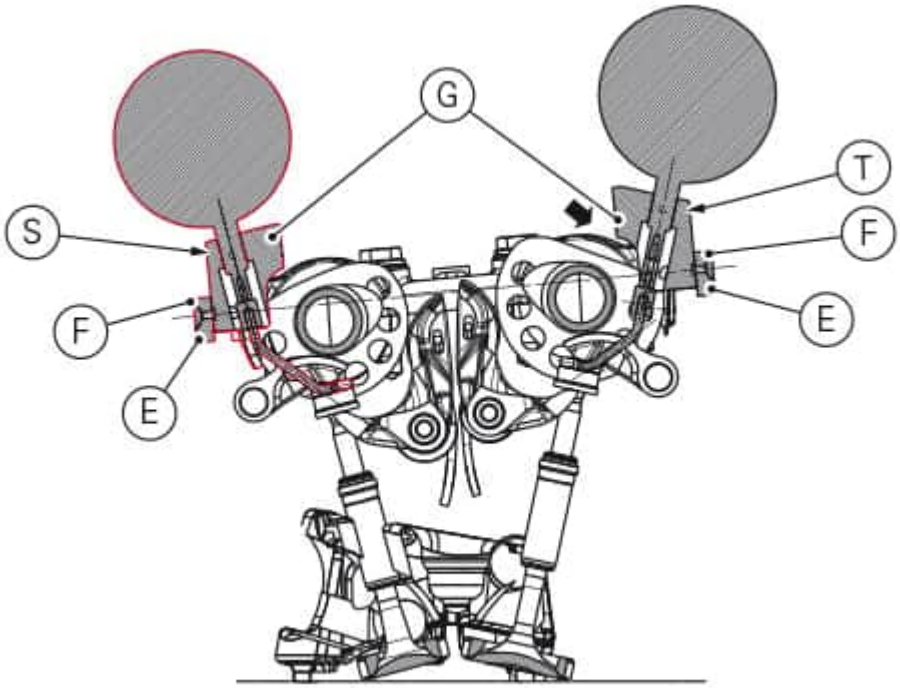
Checking valve lift

Remove the seat (Removing the seat).
Remove the side fairings (Removing the fairings).
Remove the fuel tank (Removing the fuel tank).
Remove the airbox, the blow by and the oil breather pipe (Removing the airbox).
Remove the supply system and the injectors from the intake manifolds (Removing the throttle body).
Remove the water radiator lower retainer from the engine (Removing the water radiator).
Remove the cylinder head covers (Removing the camshafts).

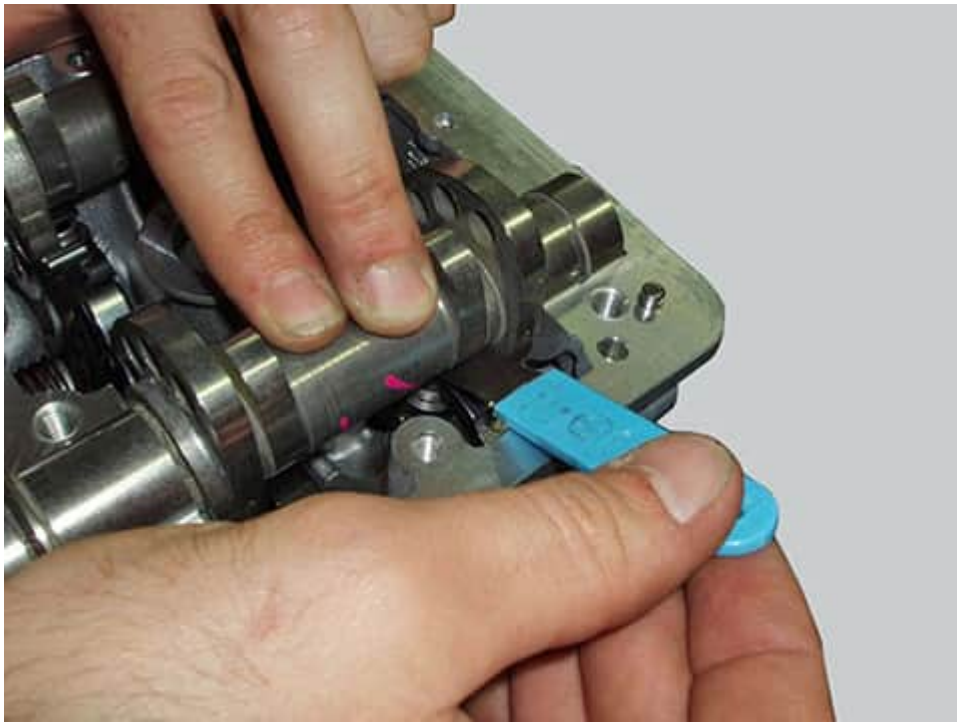
Note
For clarity, the figures show the engine removed from the frame.

Move the piston of the cylinder being checked to TDC upon combustion stage: in this condition, all valves are closed and the camshafts come in rest position and, therefore, free to rotate; check the valve lift.
Fit tool (G) no. **88765.1690** on the head: support (S) of tool no. **88765.1690** with the intake indication must be positioned on the exhaust side whereas support (T) of tool no. **88765.1690** with the exhaust indication must be positioned on the intake side.
Seat the plate (E) and tighten the screws (F).

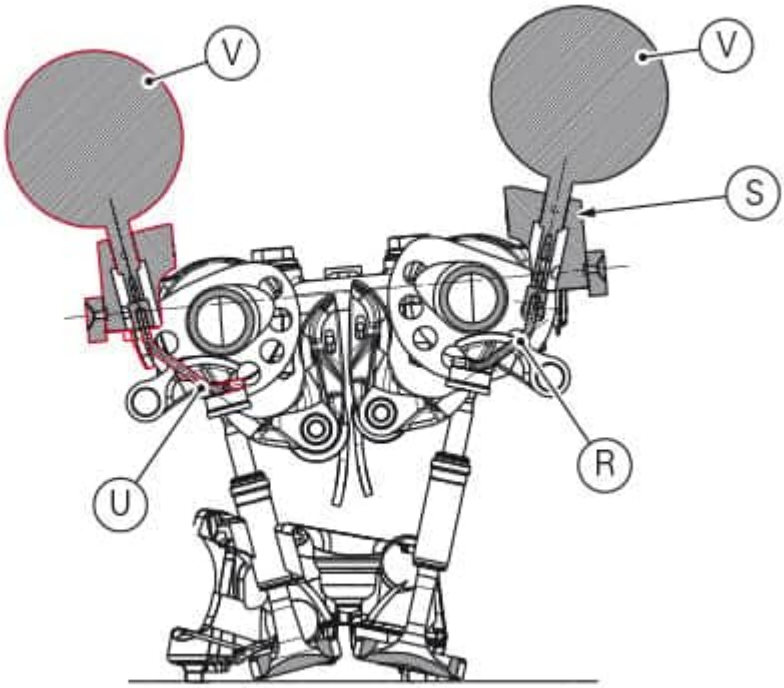




Set the opening valve clearance to zero when the camshafts are in rest position by fitting a feeler gauge, of suitable thickness, between the upper rocker arm and the opening shim.



Lock dial gauge (V) into the seat support (T) and position probe (R) against the face of the closing shim.
Set the dial gauge to zero when the valve is fully closed.
Rotate the intake camshaft so as to allow the intake valves to lift fully.
Check on the dial gauge that the measured value corresponds to the prescribed one.
Repeat the same operation for the exhaust valves, using dial gauge (V) in support seat (S) and probe (U).



Specified values:

Valve lift	
Valve lift - valve clearance of 0 mm	Intake 11.3 mm Exhaust 9.6 mm

Timing diagram		
Timing diagram with valve clearance of 1 mm	Intake	Opening 4° B.T.D.C. Closing 52° A.B.D.C.
	Exhaust	Opening 58° B.B.D.C. Closing 7° A.T.D.C.
Intake valve diameter	35.5 mm	
Exhaust valve diameter	28.8 mm	

Refit the cylinder head covers (Refitting the camshafts).
Refit the water radiator lower retainer on the engine block (Refitting the water radiator).
Refit the supply system and the injectors from the intake manifolds (Refitting the throttle body).
Refit the airbox, the blow by and the oil breather pipe (Refitting the airbox).
Refit the fuel tank (Refitting the fuel tank).
Refit the side fairings (Refitting the fairings).
Refit the seat (Refitting the seat).

Checking and adjusting the valve clearance

Remove the seat (Removing the seat).
Remove the side fairings (Removing the fairings).
Remove the fuel tank (Removing the fuel tank).
Remove the airbox, the blow by and the oil breather pipe (Removing the airbox).
Remove the supply system and the injectors from the intake manifolds (Removing the throttle body).
Remove the water radiator lower retainer from the engine (Removing the water radiator).
Remove the cylinder head covers (Removing the camshafts).

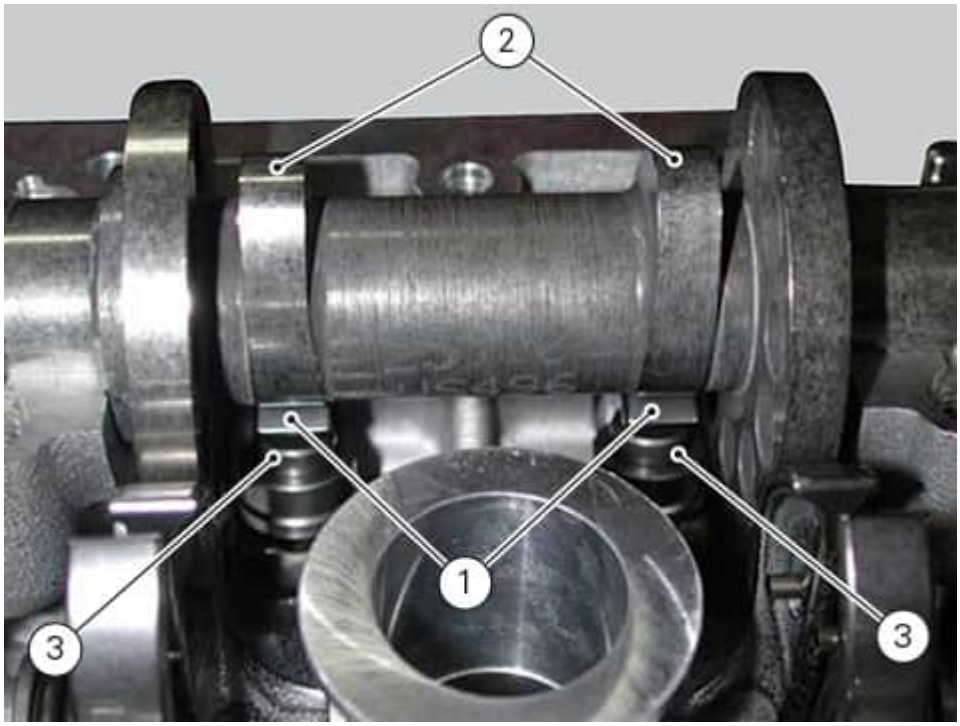
Note
For clarity, the figures show the engine removed from the frame.

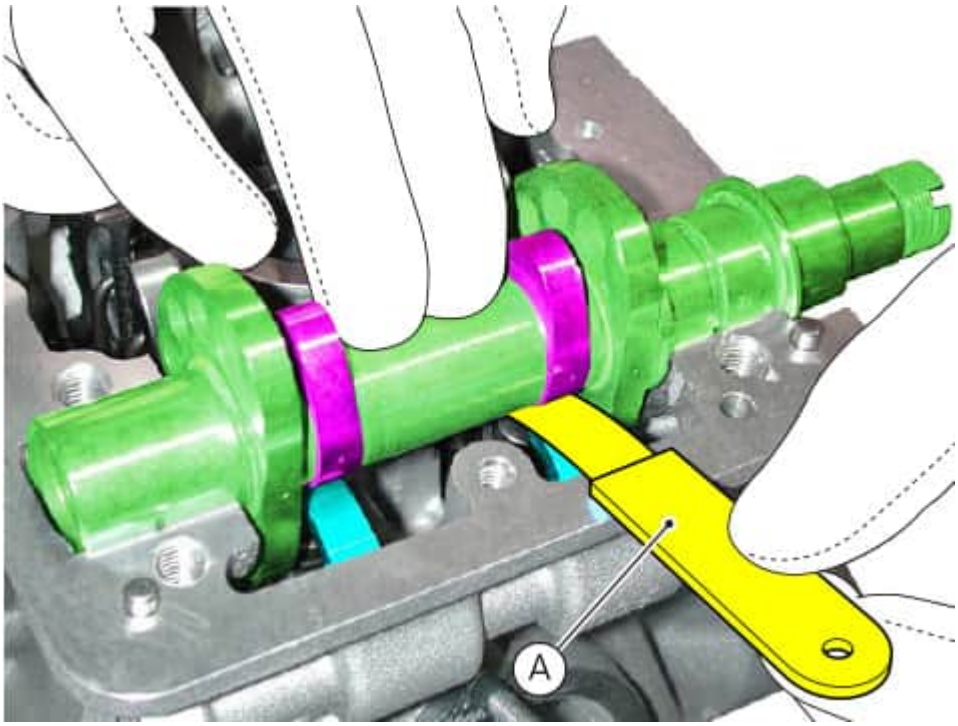
Move the piston of the cylinder being checked to TDC upon combustion stage: in this condition, all valves are closed and the camshafts come in rest position and, therefore, free to rotate; check the valve clearance on the cylinder head you are working on.

Checking the opening clearance

Using a feeler gauge (A), check the clearance between the opening rocker arm (1) and the lowest point of the camshaft lobe (2), taking care not to compress the rocker arm return spring. The value must be within the prescribed ones.
If not so, remove the opening shim (3) and replace it with one of suitable height to obtain the prescribed clearance.

Note
Opening rocker arm shims measuring 1.80 to 3.45 are available as spare parts: the size is punched on the shim.



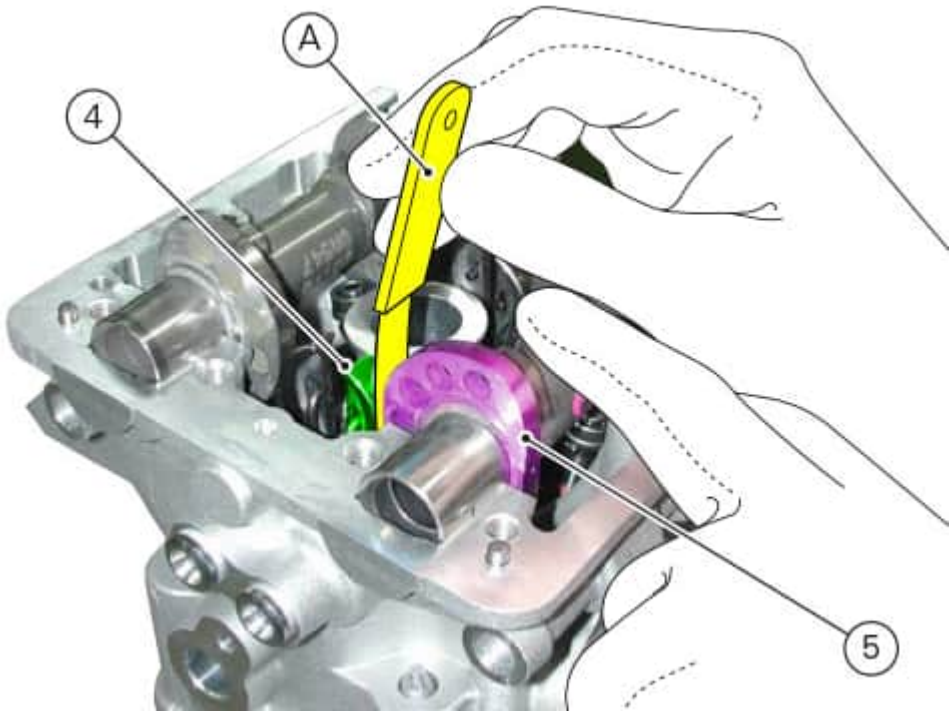


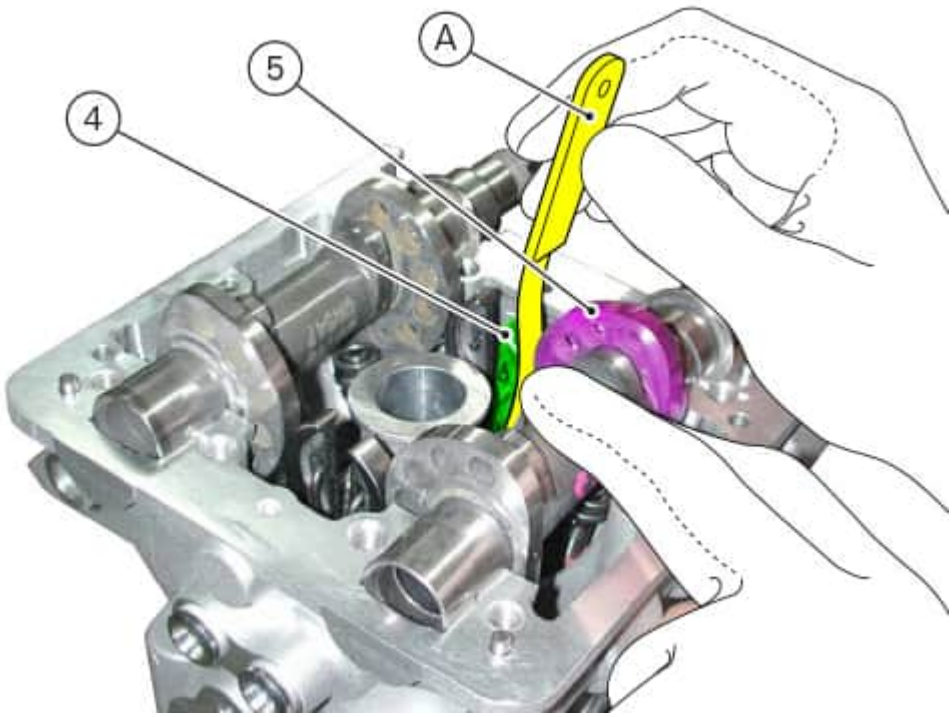
Checking the closing clearance

Using a feeler gauge (A), check the clearance between the closing rocker arm (4) sliding shoe and the highest point of the camshaft lobe (5).
The value must be within the prescribed ones.
If not so, remove the closing shim and replace it with one of suitable height to obtain the prescribed clearance.

Note

Closing rocker arm shims measuring 2.2 to 4.5 are available as spare parts: the size is punched on the shim.





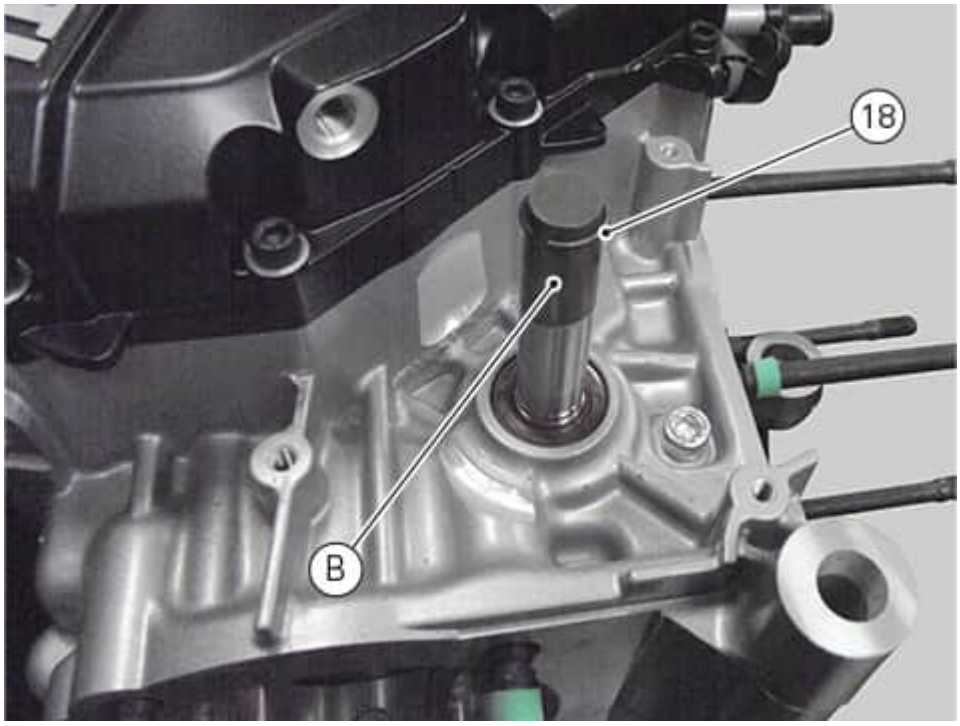
Specified values:

	Assembly value	Check value every 24.000 Km
Opening rocker arm - intake	0.13÷0.18 mm	0.10÷0.25 mm
Opening rocker arm - exhaust	0.13÷0.18 mm	0.10÷0.25 mm
Closing rocker arm - intake	0.05÷0.10 mm	0.05÷0.15 mm
Closing rocker arm - exhaust	0.05÷0.10 mm	0.05÷0.15 mm

Refit the cylinder head covers (Refitting the camshafts).
Refit the water radiator lower retainer on the engine block (Refitting the water radiator).
Refit the supply system and the injectors from the intake manifolds (Refitting the throttle body).
Refit the airbox, the blow by and the oil breather pipe (Refitting the airbox).
Refit the fuel tank (Refitting the fuel tank).
Refit the side fairings (Refitting the fairings).
Refit the seat (Refitting the seat).

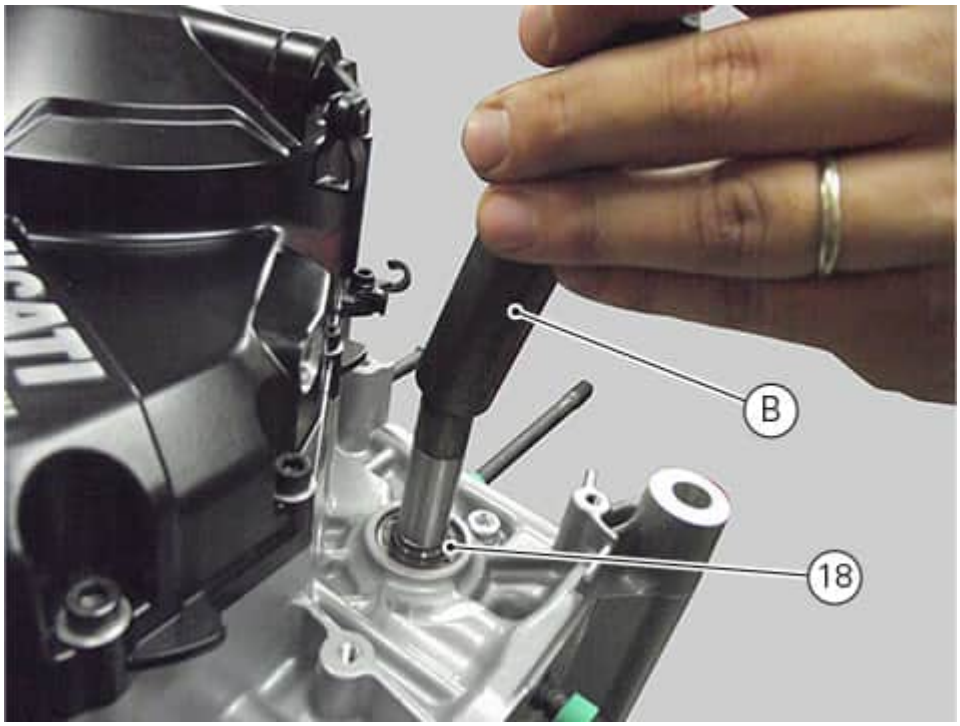
Refitting the timing layshaft pulleys

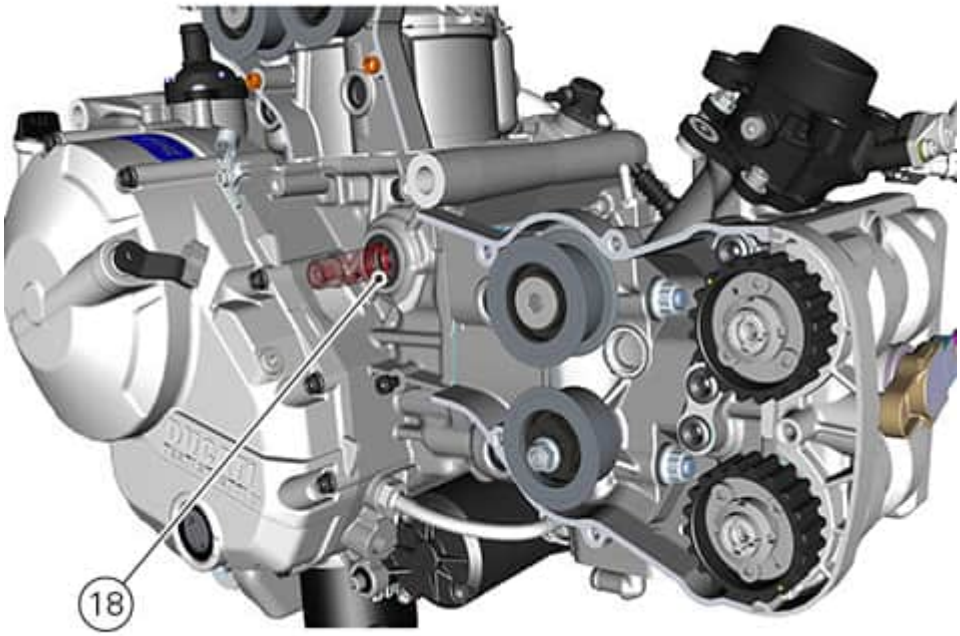
To fit the snap ring (18) in the timing layshaft seat, use the two components of tool (B) no. **88713.2834**: one must be positioned on the timing layshaft to prevent the ring from damaging it; the other tool component must be used to install the ring in the shaft in the correct position.



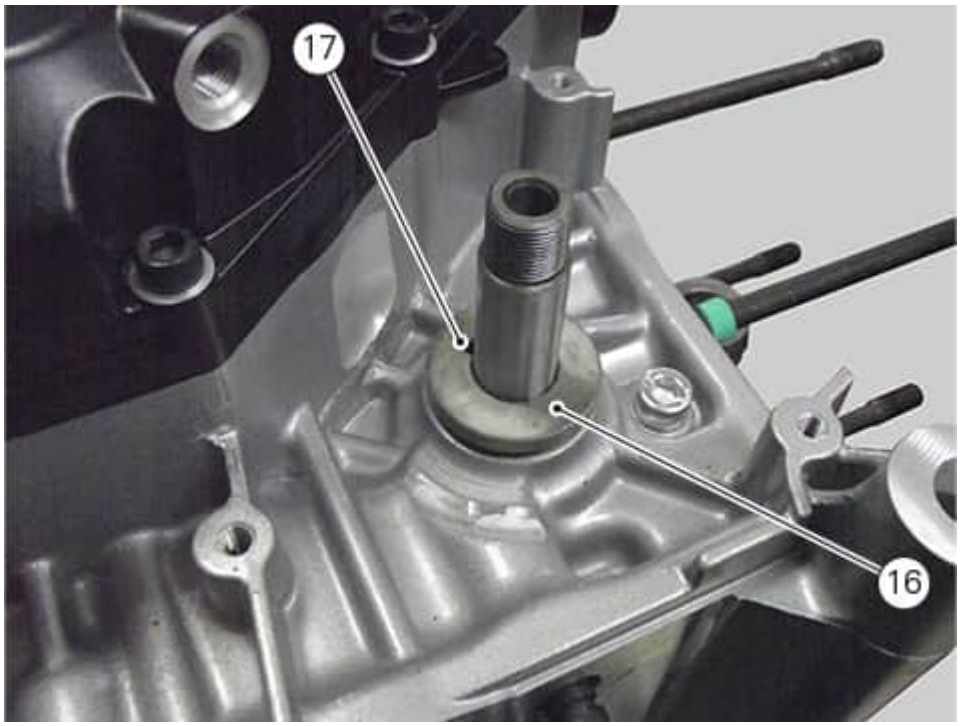


When ring (18) is in the correct position on the shaft, remove the tool.

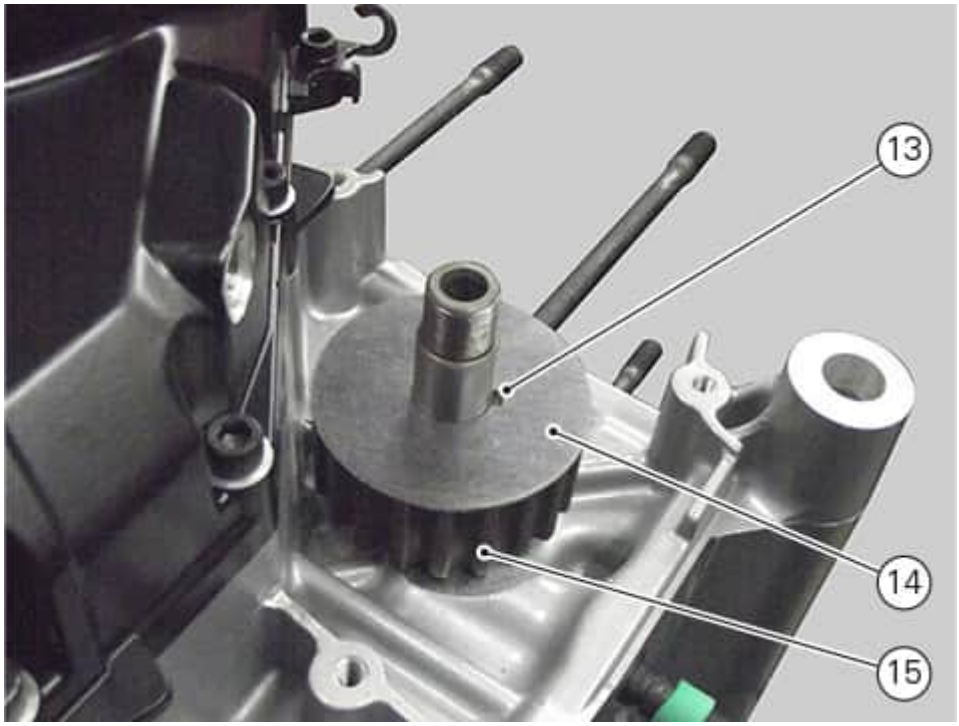




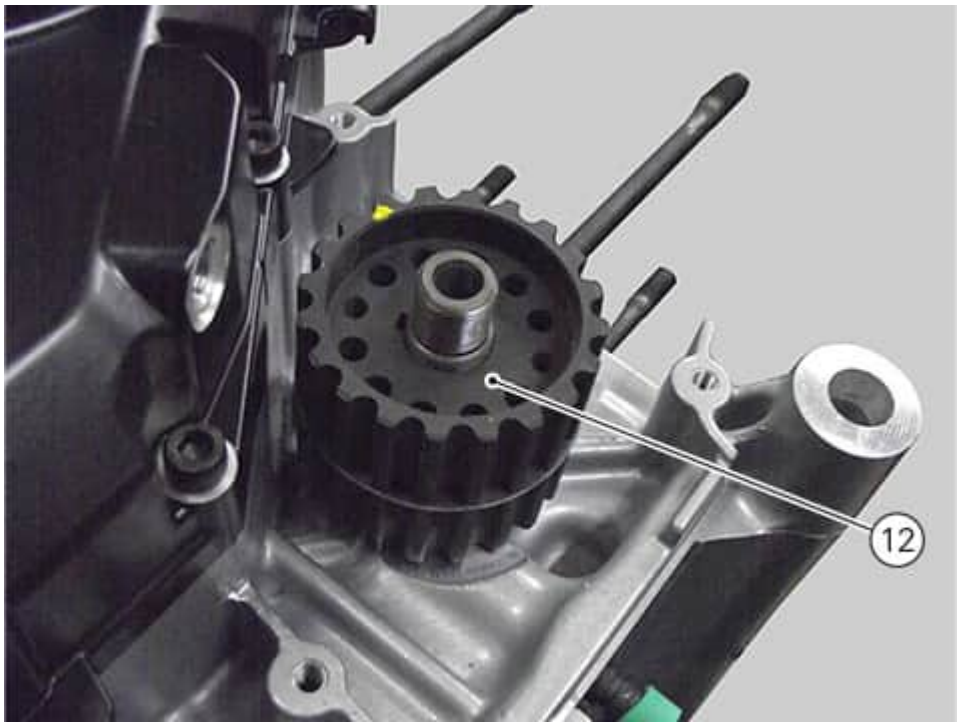
Install the inner spacer (16) on the timing layshaft, taking care to match the key notch.
Fit the first key (17) on the timing layshaft.



Locate the inner pulley (15).
Refit the second key (17) and the washer (14).

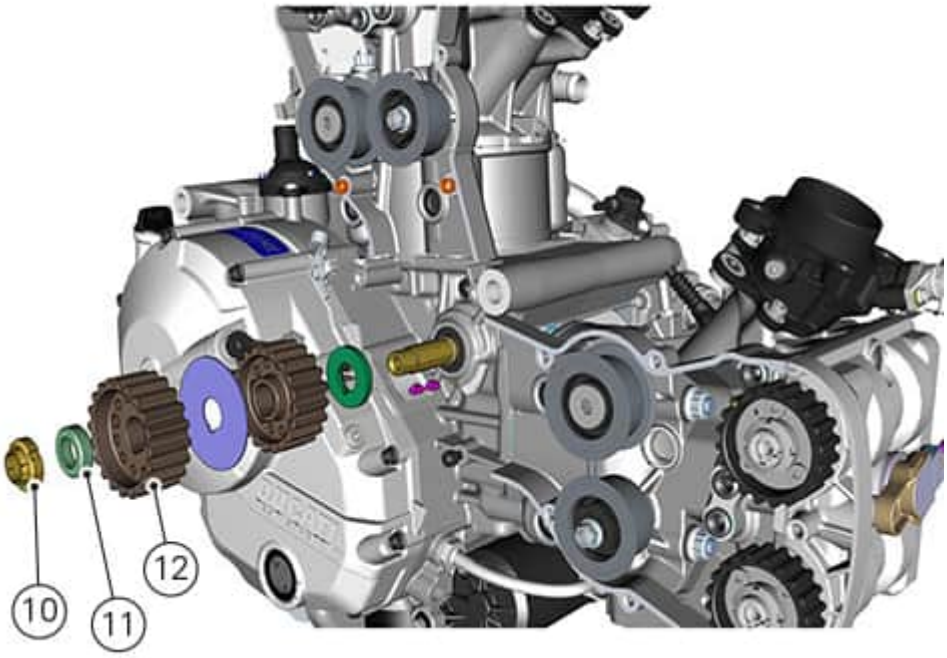


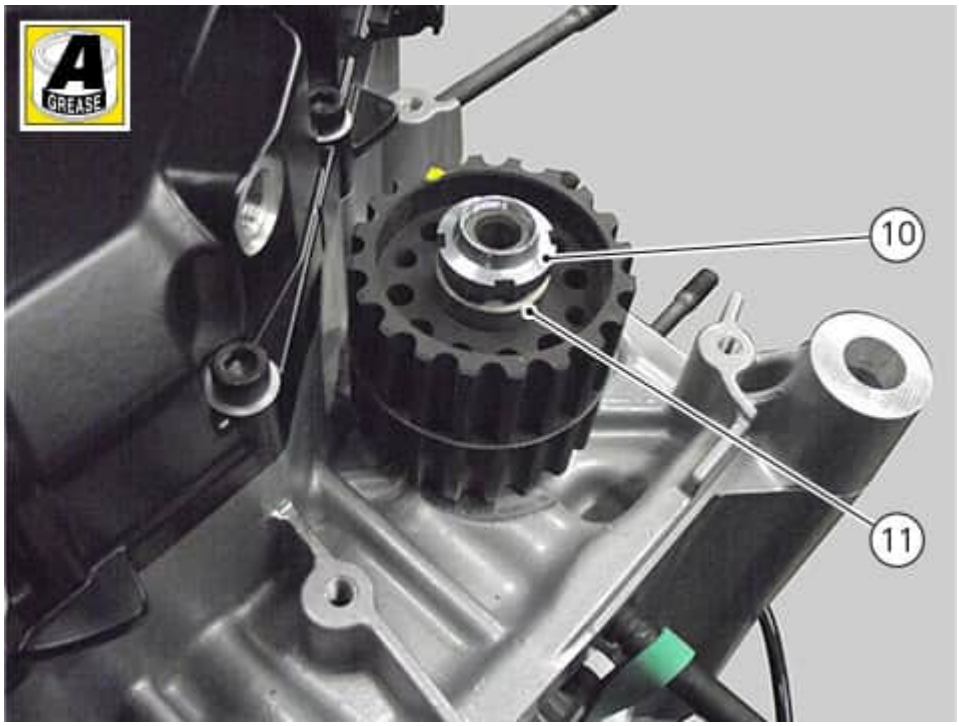
Locate the outer pulley (12).



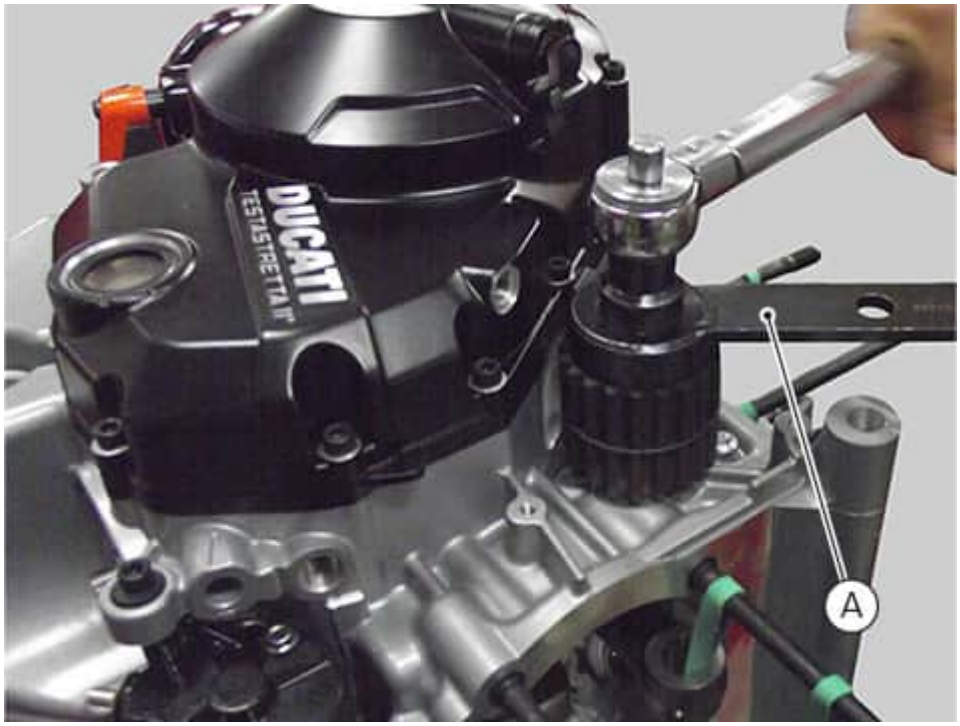
Position the spacer (11).
Smear the ring nut (10) with specified grease and start it.

Important
To prevent the ring nuts from loosening and consequent serious engine damage, always use new self-locking ring nuts on all the timing belt rollers.





Block with tool no. **88713.1805** the rotation of the belt rollers and tighten to 71 Nm (Min. 64 Nm - Max. 78 Nm) the self-locking ring nut using the insert supplied with the wrench and a torque wrench.



Refit the mobile tensioners and the timing belts (Refitting the timing belts).
Refit the external timing belt covers (Refitting the timing belt external covers).
Refit the vertical head exhaust pipe (Refitting the exhaust system).
Refit the fuel tank (Refitting the fuel tank).
Refit the side fairings (Refitting the fairings).
Refit the seat (Refitting the seat).

Removing the timing layshaft pulleys

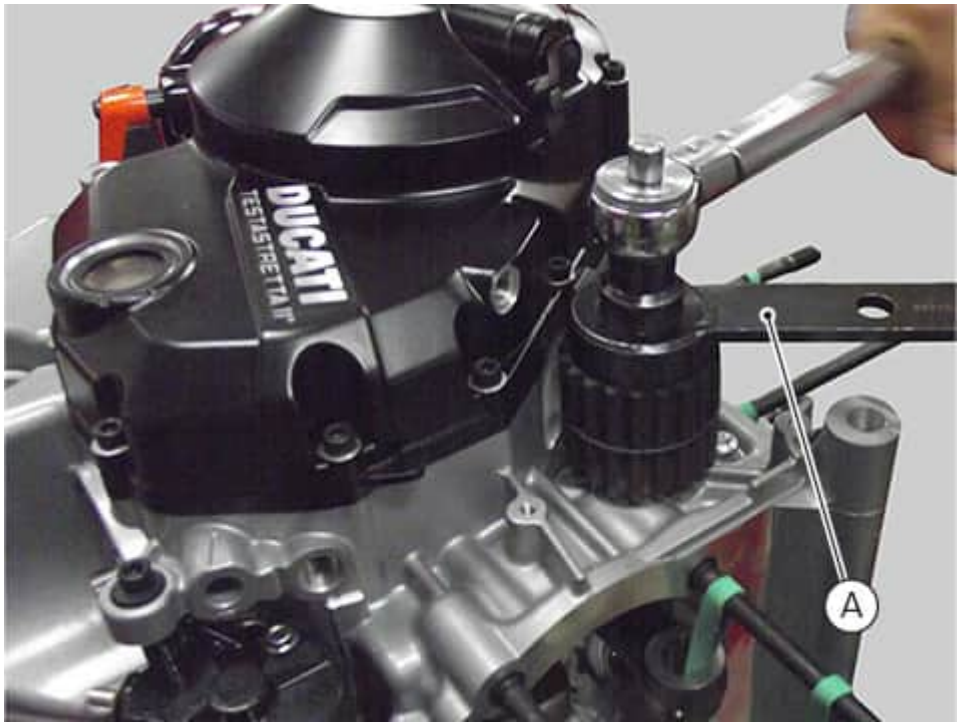
Note
The figures show an engine block removed from the frame.

To work with the engine block installed in the frame it is necessary to remove the components indicated below.
Remove the seat (Removing the seat).
Remove the side fairings (Removing the fairings).
Remove the fuel tank (Removing the fuel tank).
Remove the vertical head exhaust pipe (Removing the exhaust system).
Remove the external belt covers (Removing the timing belt external covers).
Remove the mobile tensioners and timing belts (Removing the mobile tensioner/timing belt).

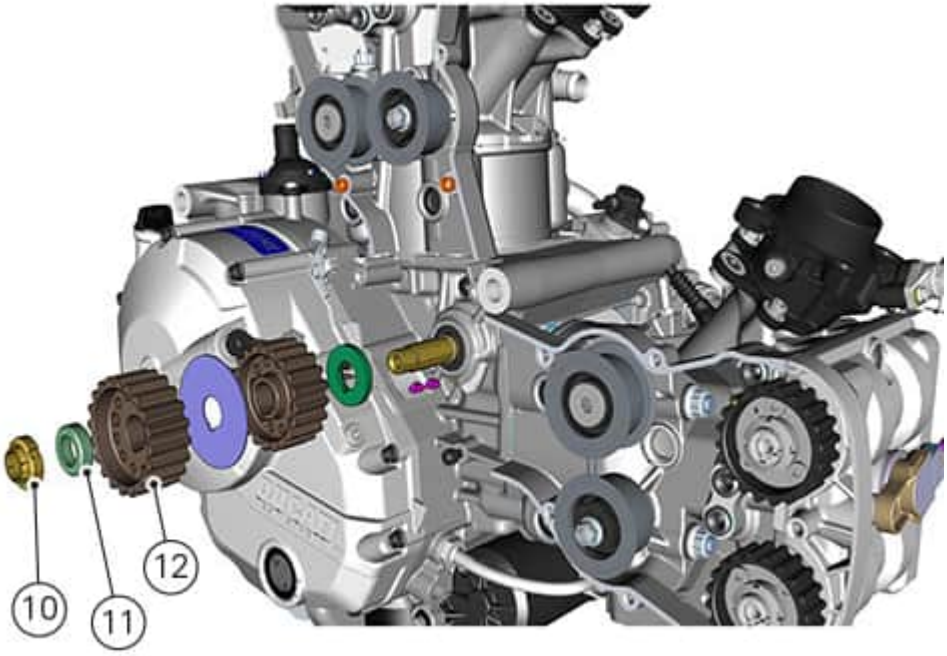
Block with tool (A) no. **88713.1805** the rotation of the driving belt rollers on the crankcase.

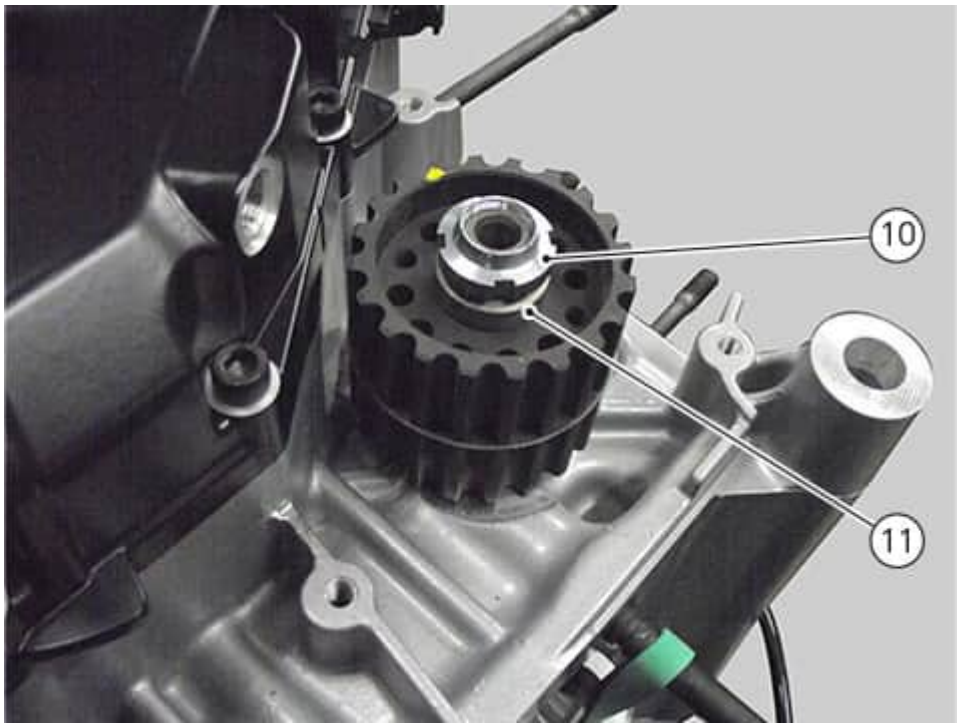
Important
If this operation is carried out with the engine installed in the frame, hold the driving pulleys against rotation using tool no. 88713.2011 mounted on the generator cover.

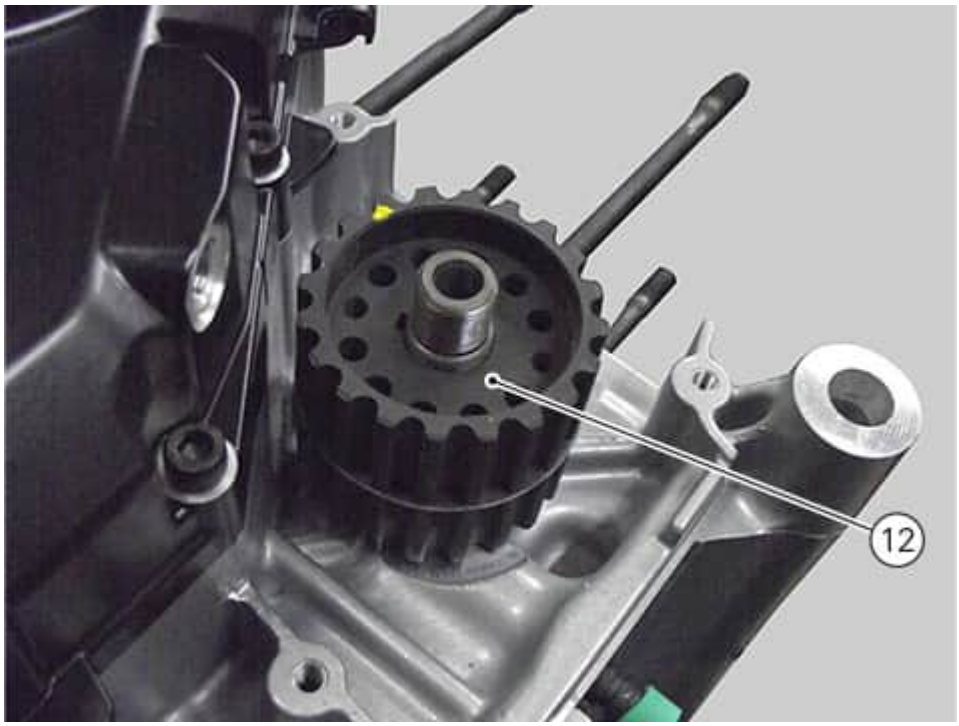
Loosen the ring nut (10) using the socket supplied with the tool.



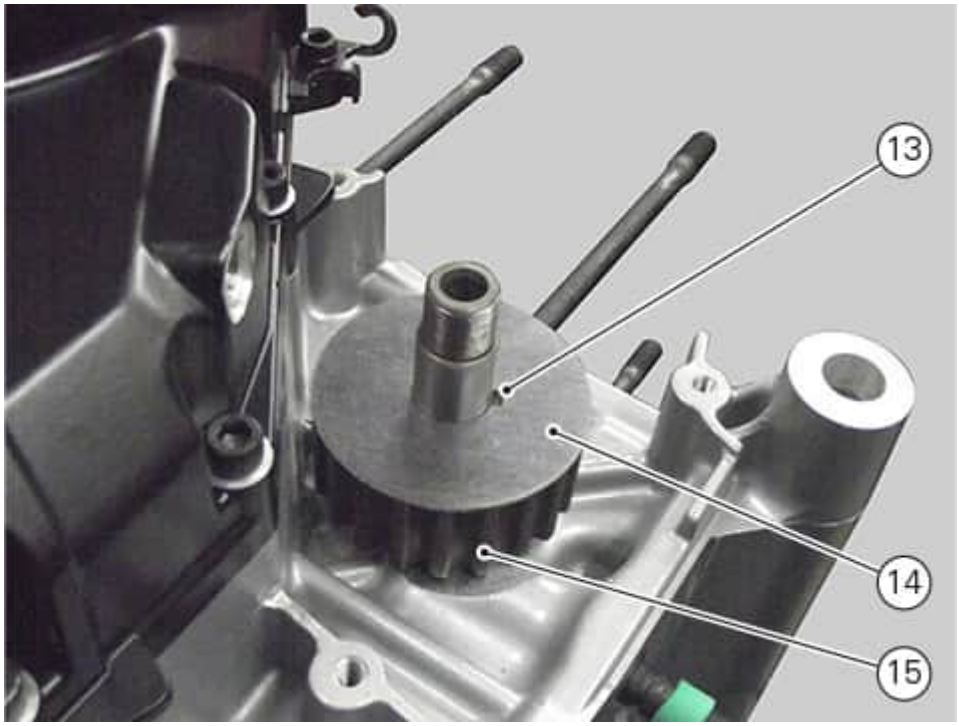
Remove the ring nut (10), the spacer (11) and the outer pulley (12).


10
11
12

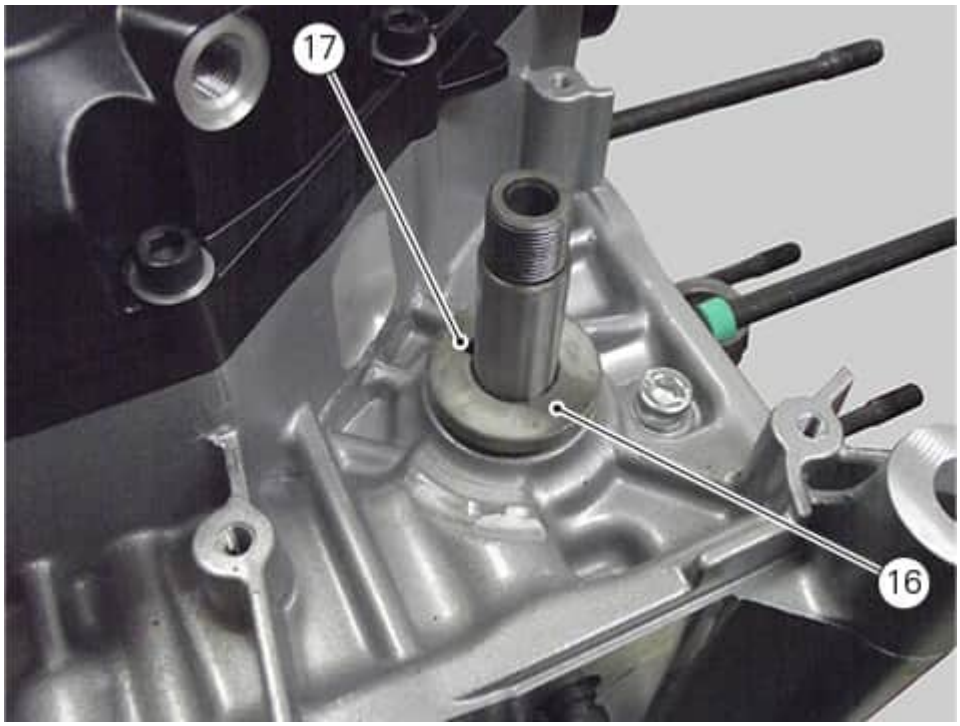

10
11



Remove the first key (13) from the timing layshaft.
Remove the spacer (14) and the inner pulley (15).

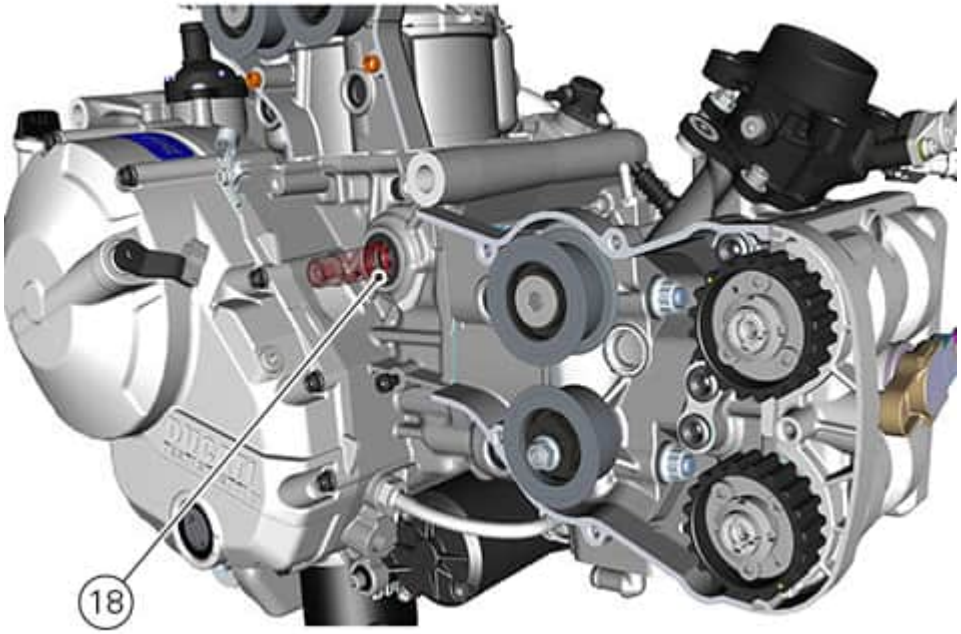


Remove the inner spacer (16) and second key (17) on the timing layshaft.



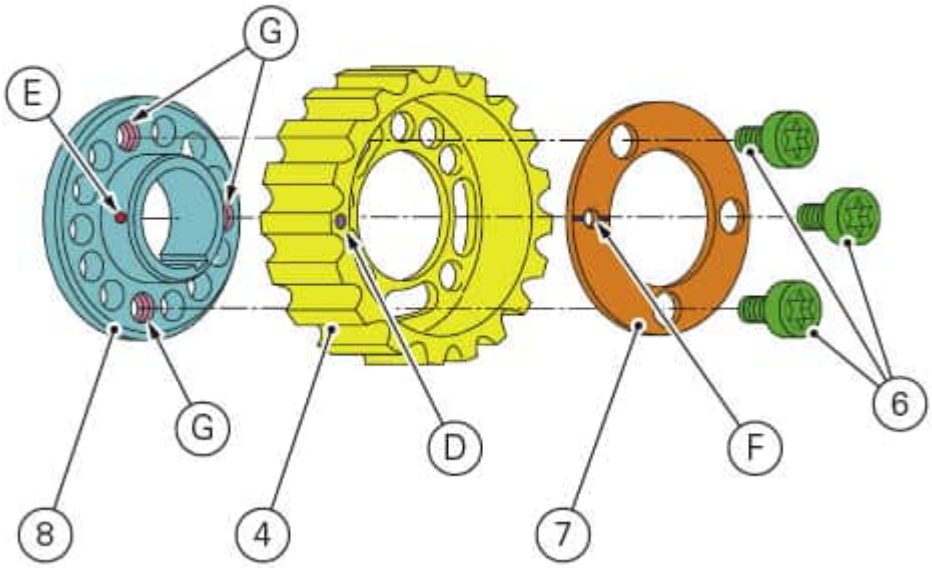
It is now possible to remove the snap ring (18) on the timing layshaft.

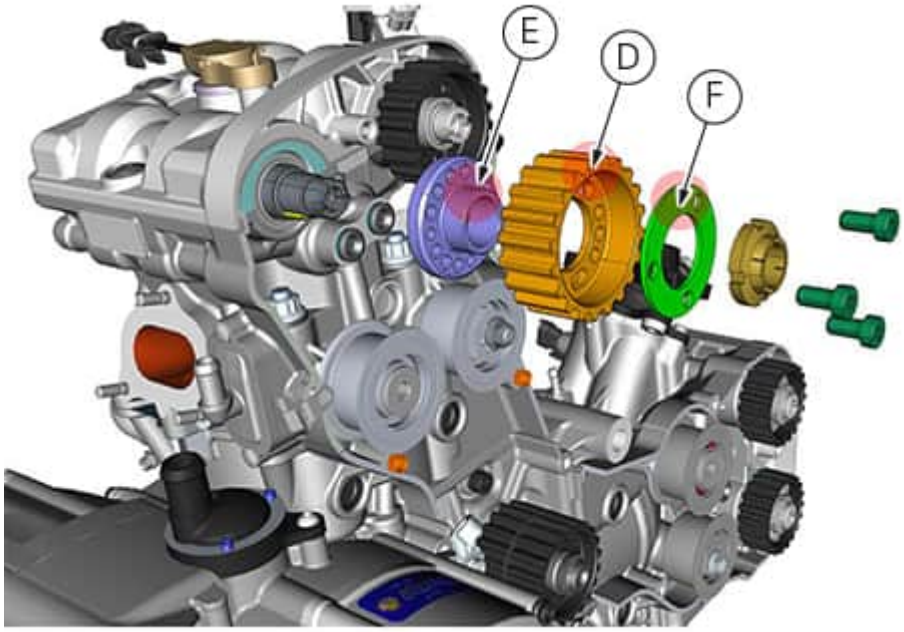



18

Reassembling the camshaft pulleys

Fit the pulley (4) on the flange (8), aligning the timing pulley mark (D) with the flange timing mark (E).
Install the washer (7) up against the pulley, aligning the timing notch (F) with the pulley and flange timing marks.
Insert the three screws (6) in the threaded holes (G) of the flange.
Tighten the screws (6) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).





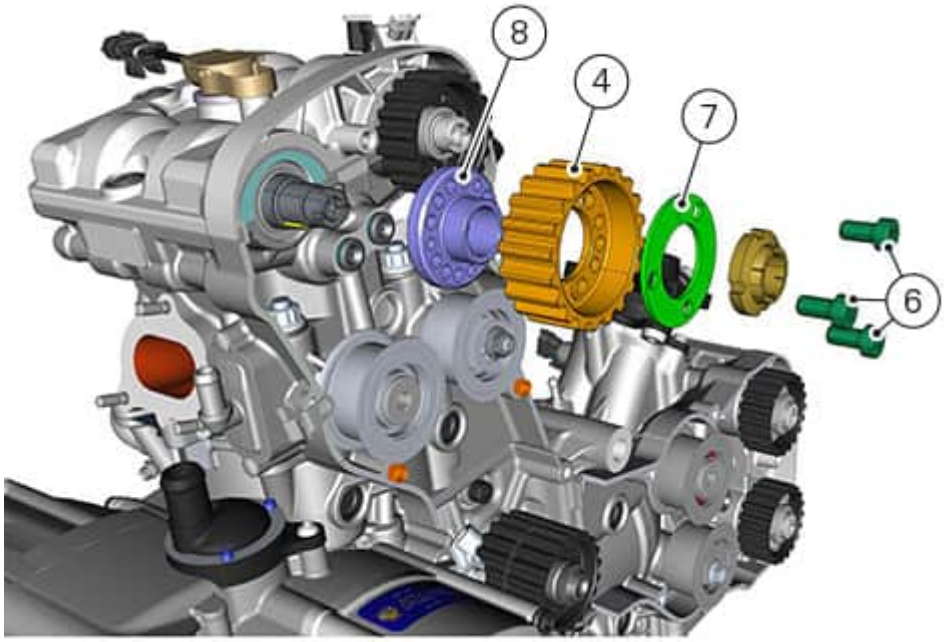
Refit the belt rollers on the piston-cylinder assemblies (Refitting the head belt rollers-fixed tensioner).
Refit the mobile tensioners and the timing belts (Refitting the timing belts).
Refit the external timing belt covers (Refitting the timing belt external covers).
Refit the vertical head exhaust pipe (Refitting the exhaust system).
Refit the fuel tank (Refitting the fuel tank).
Refit the side fairings (Refitting the fairings).
Refit the seat (Refitting the seat).

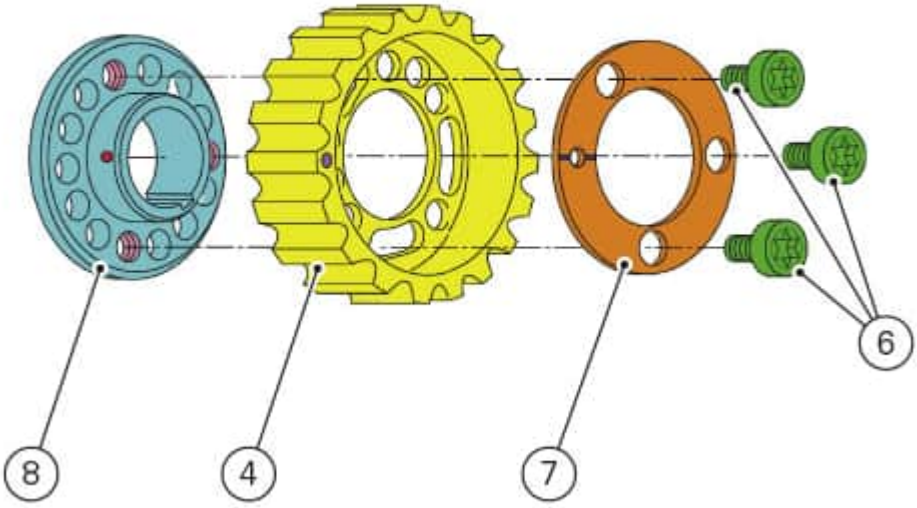
Disassembling the camshaft pulleys

Note
The figures show an engine block removed from the frame.

To work with the engine block installed in the frame it is necessary to remove the components indicated below.
Remove the seat (Removing the seat).
Remove the side fairings (Removing the fairings).
Remove the fuel tank (Removing the fuel tank).
Remove the vertical head exhaust pipe (Removing the exhaust system).
Remove the external belt covers (Removing the timing belt external covers).
Remove the mobile tensioners and timing belts (Removing the mobile tensioner/timing belt).
Remove the belt rollers from the piston-cylinder assemblies (Removing the head belt rollers-fixed tensioner).

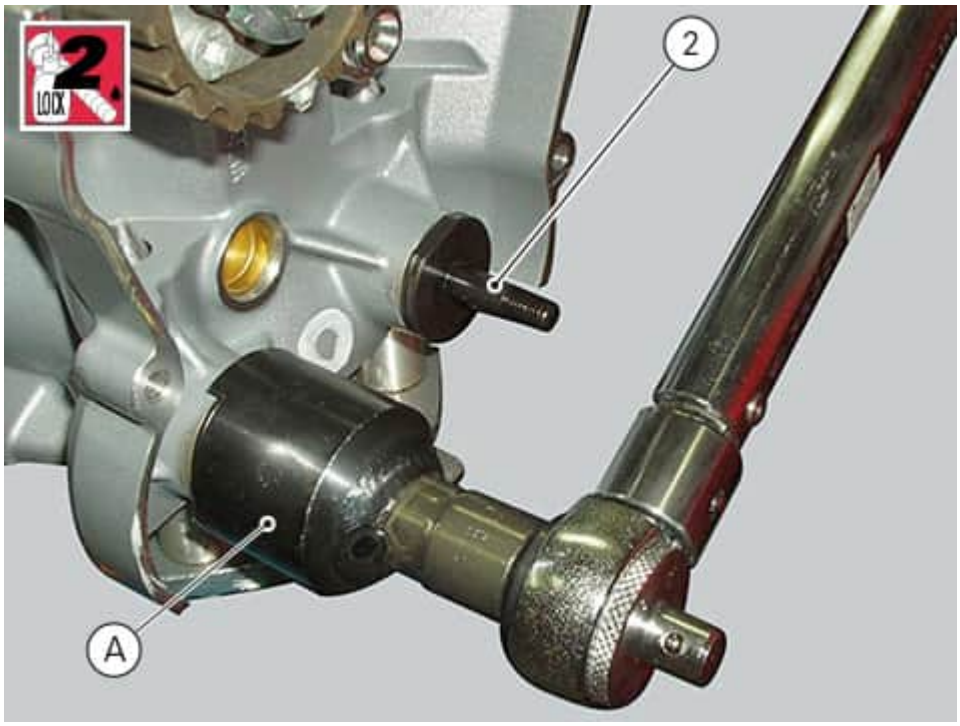
Undo and remove the screws (6).
Slide off the washer (7).
Withdraw the camshaft pulley (4) from the spacer flange (8).

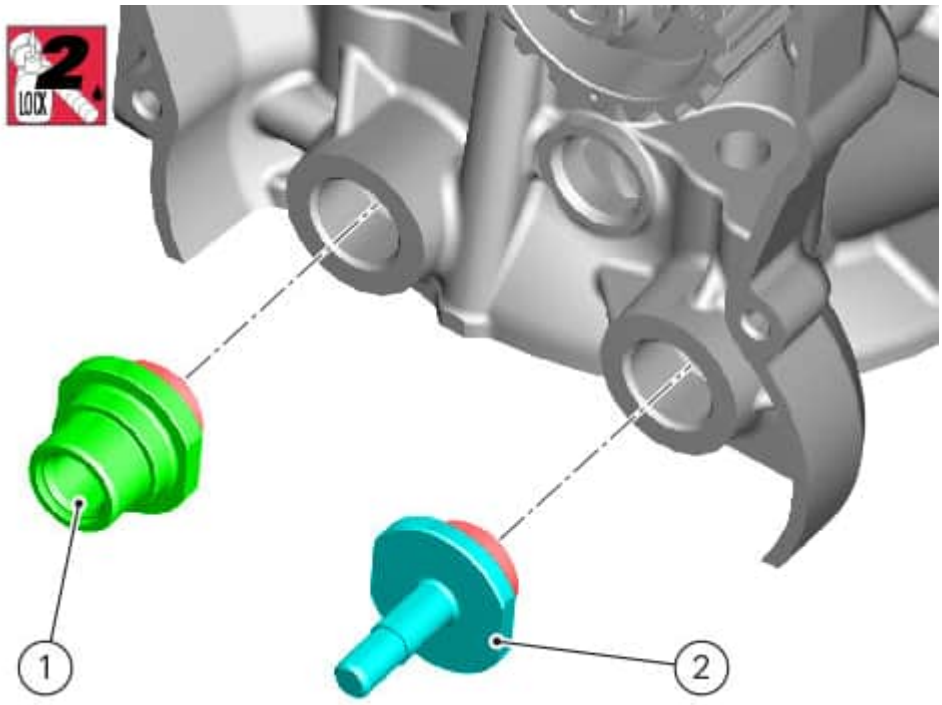


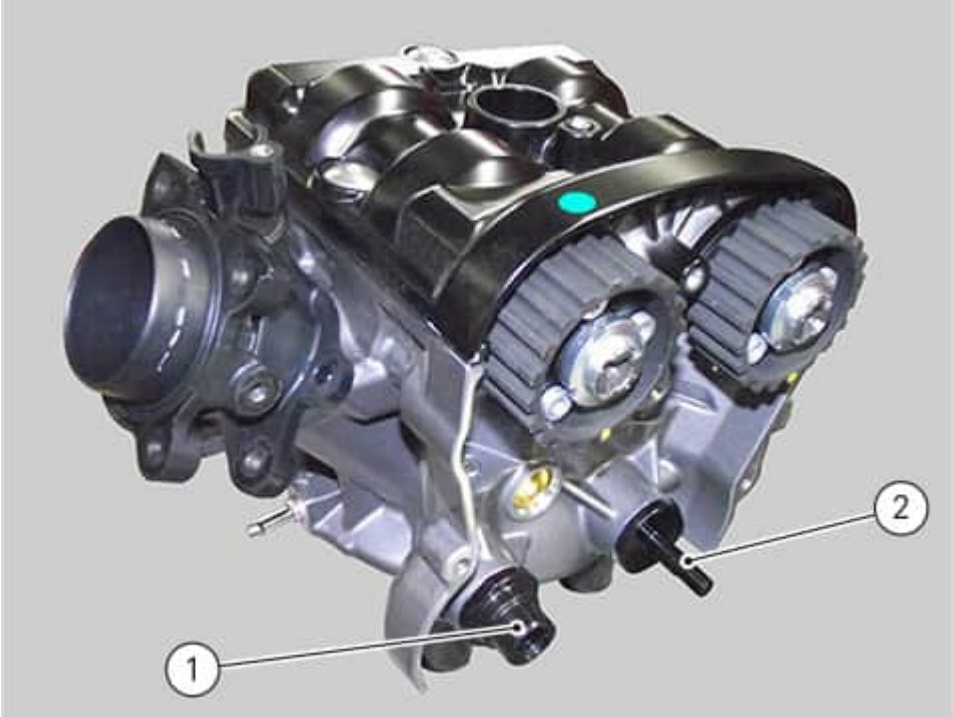


Refitting the tensioner pins

Apply specified threadlocker on the bigger thread of mobile tensioner pins (2).
As an alternative to the pre-applied Loctite, apply specified threadlocker on the bigger thread of fixed tensioner pins (1).
Insert the tensioner pins (1) and (2) on the heads and tighten them with tool (A) no. **88713.1821**.
Tighten the tensioner pins (1) to a torque of 45 Nm (Min. 40 Nm - Max. 50 Nm).
Tighten the tensioner pins (2) to a torque of 50 Nm (Min. 45 Nm - Max. 55 Nm).







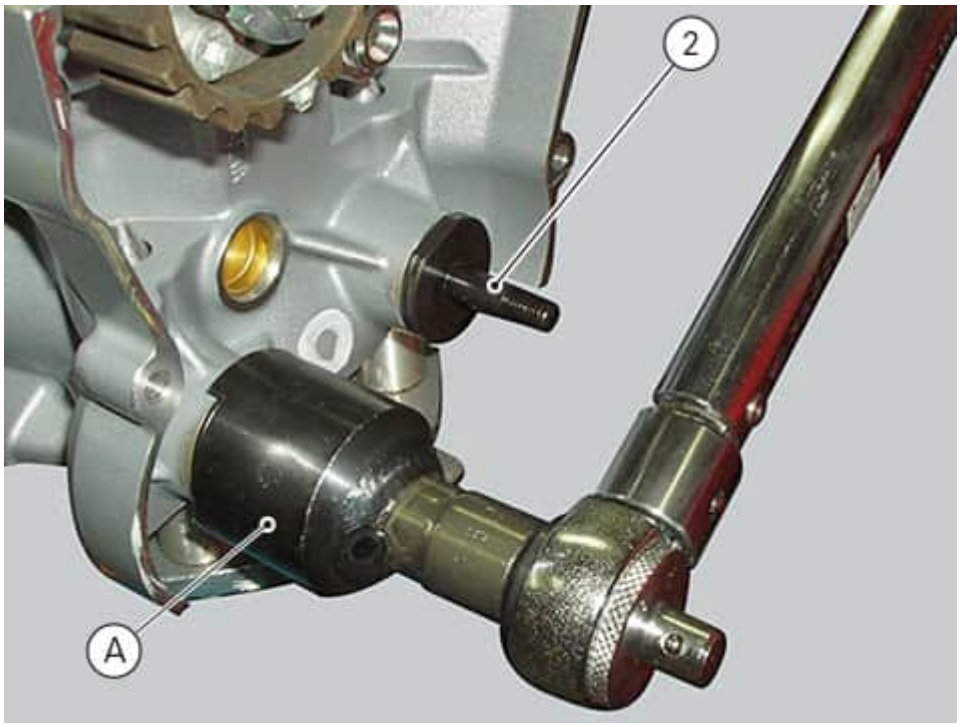
Refit the belt rollers on the piston-cylinder assemblies (Refitting the head belt rollers-fixed tensioner).
Refit the mobile tensioners and the timing belts (Refitting the timing belts).
Refit the external timing belt covers (Refitting the timing belt external covers).
Refit the vertical head exhaust pipe (Refitting the exhaust system).
Refit the fuel tank (Refitting the fuel tank).
Refit the side fairings (Refitting the fairings).
Refit the seat (Refitting the seat).

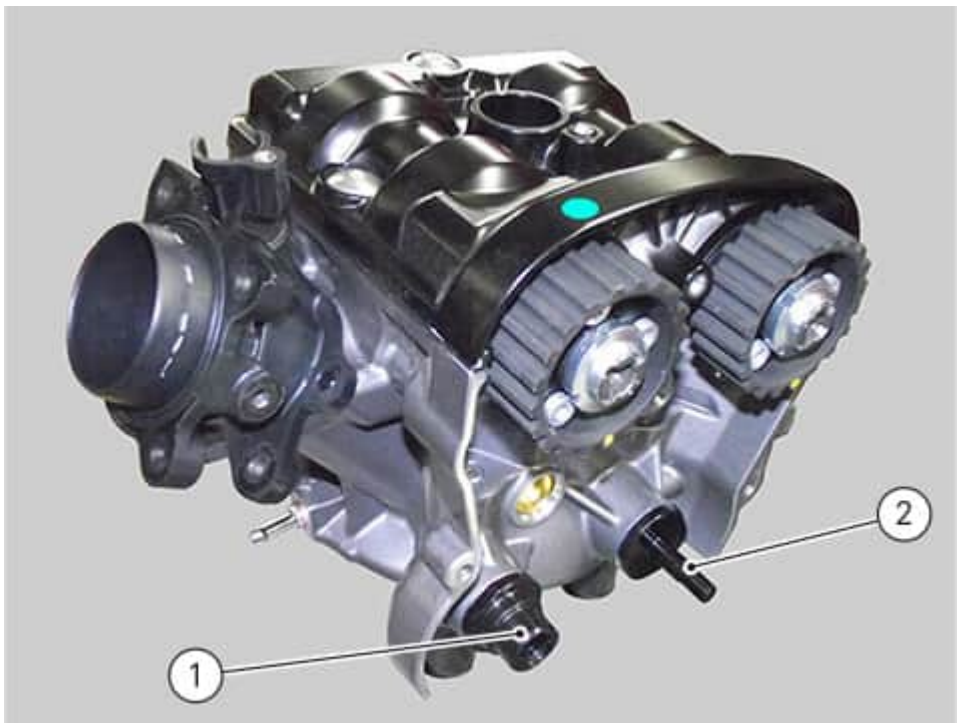
Removing the tensioner pins

Note
The figures show an engine block removed from the frame.

To work with the engine block installed in the frame it is necessary to remove the components indicated below.
Remove the seat (Removing the seat).
Remove the side fairings (Removing the fairings).
Remove the fuel tank (Removing the fuel tank).
Remove the vertical head exhaust pipe (Removing the exhaust system).
Remove the external belt covers (Removing the timing belt external covers).
Remove the mobile tensioners and timing belts (Removing the mobile tensioner/timing belt).
Remove the fixed tensioners from the piston-cylinder assemblies (Removing the head belt rollers-fixed tensioner).

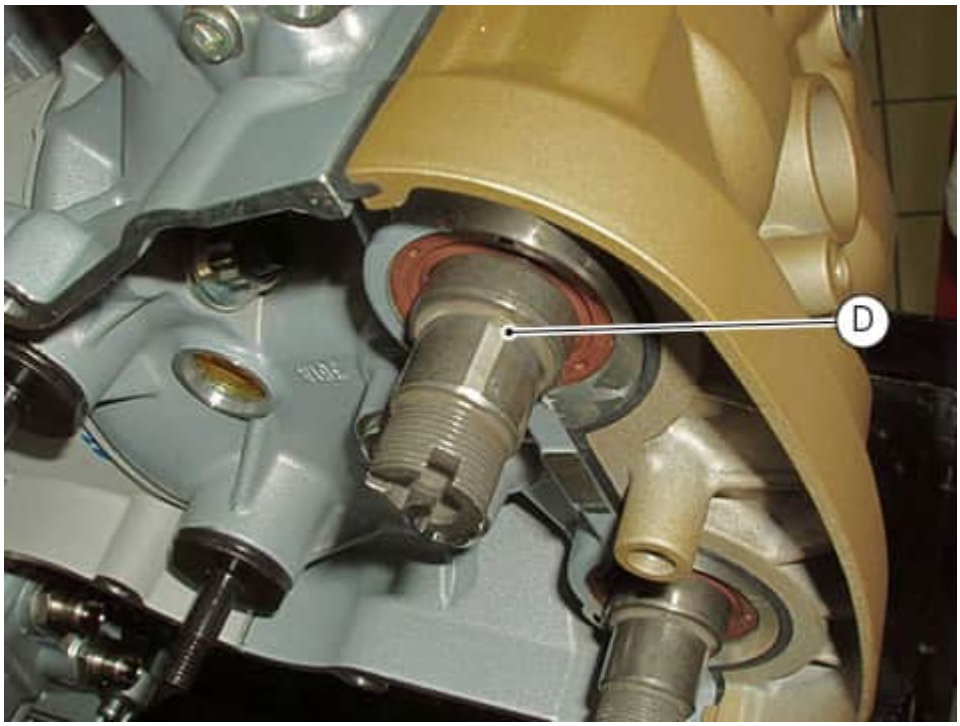
Use tool (A) no. **88713.1821** to remove tensioner pins (1) and (2) from the heads.

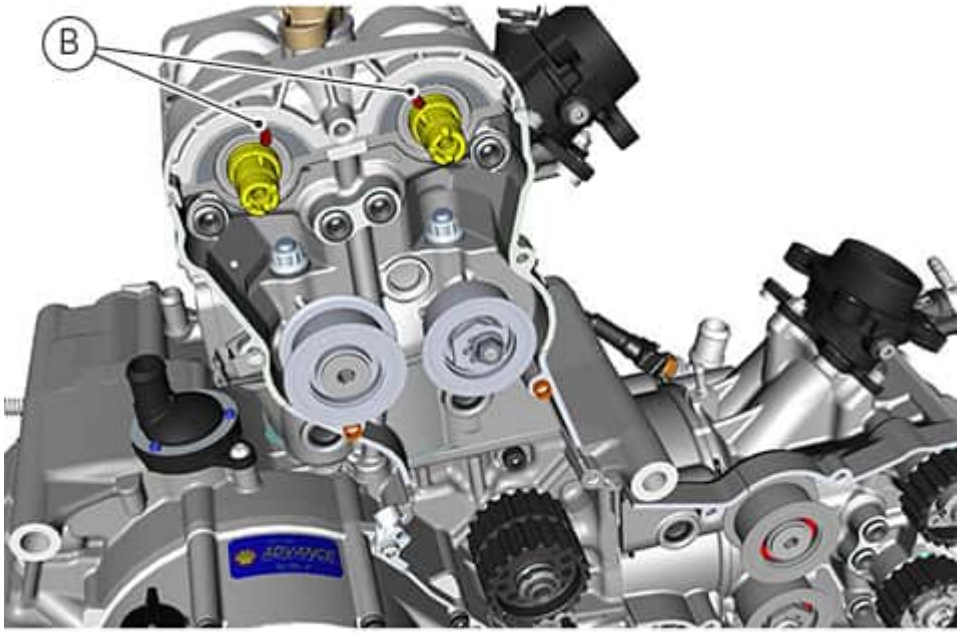


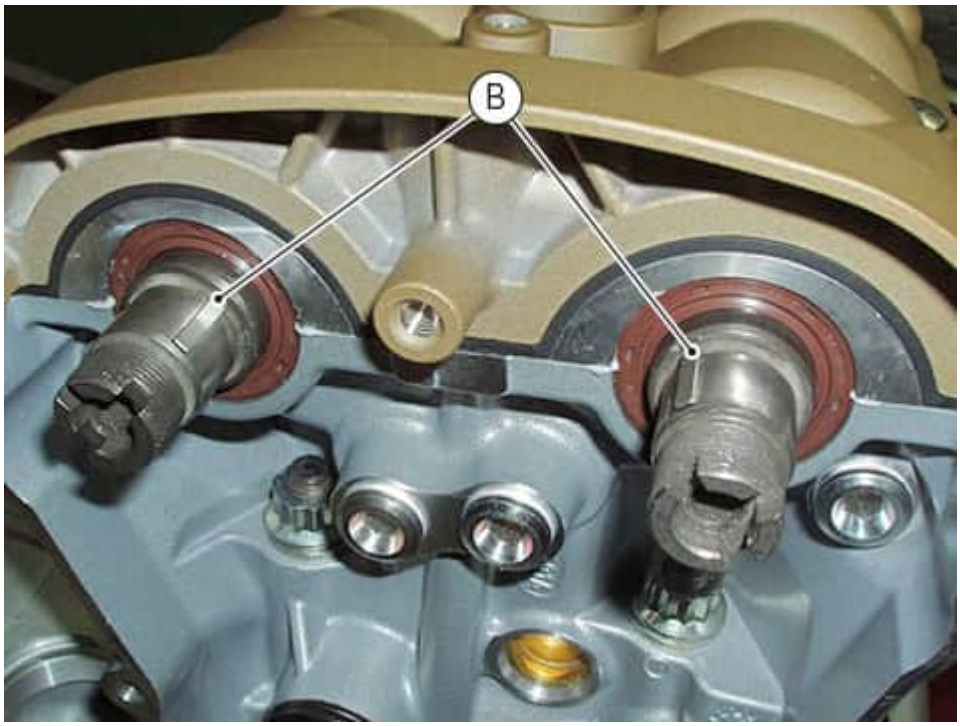


Refitting the cylinder head pulley/fixed tensioner

Make sure that tab (B) is properly installed in the relevant seat of each camshaft and that tab seat (D) is in proper conditions.

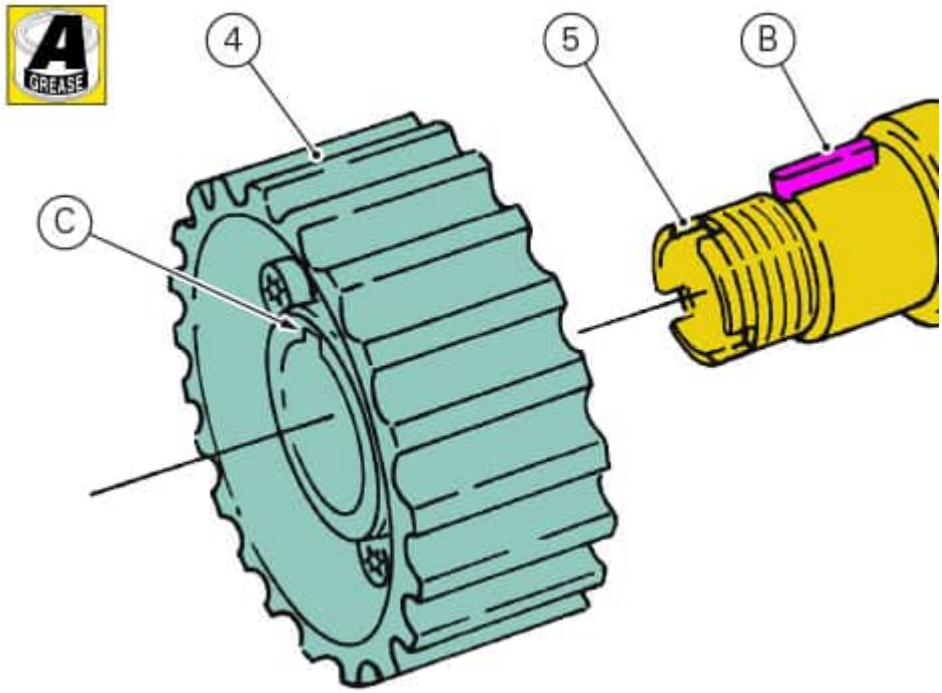


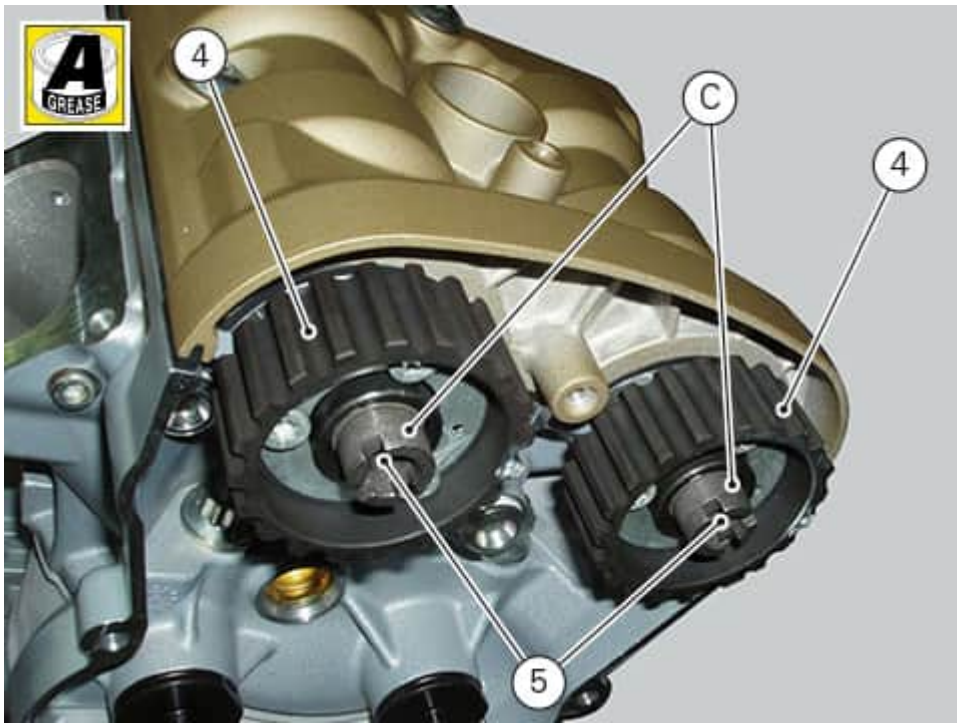




Fit belt roller (4) on camshaft (5), inserting key (B) in the pulley slot (C).
Apply the recommended grease to the threads of the camshaft.
Carry out the same operations on the other camshaft.

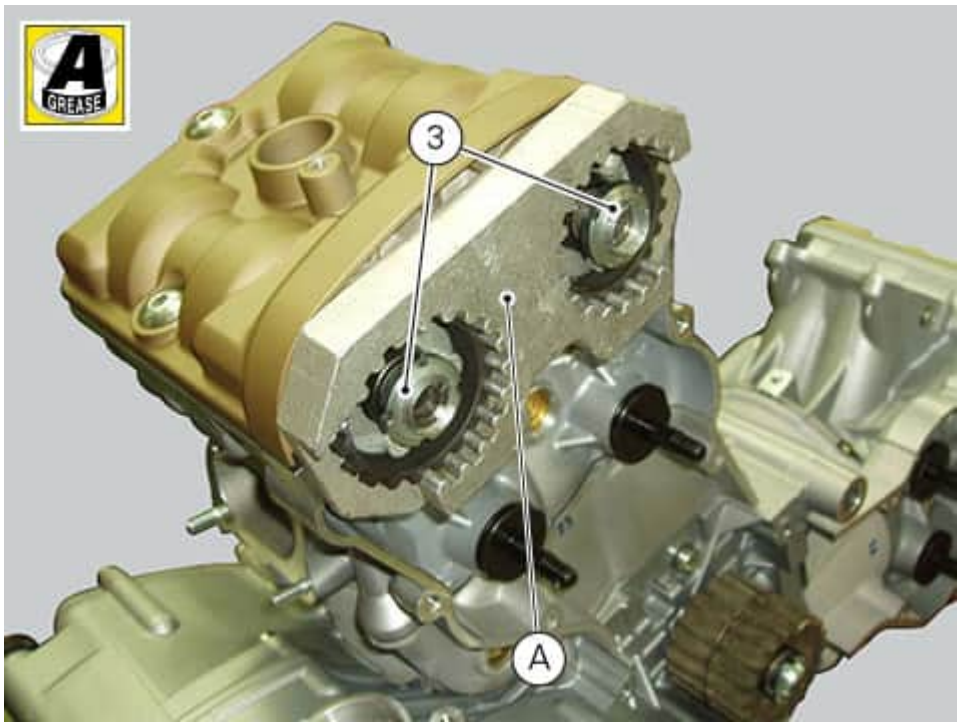




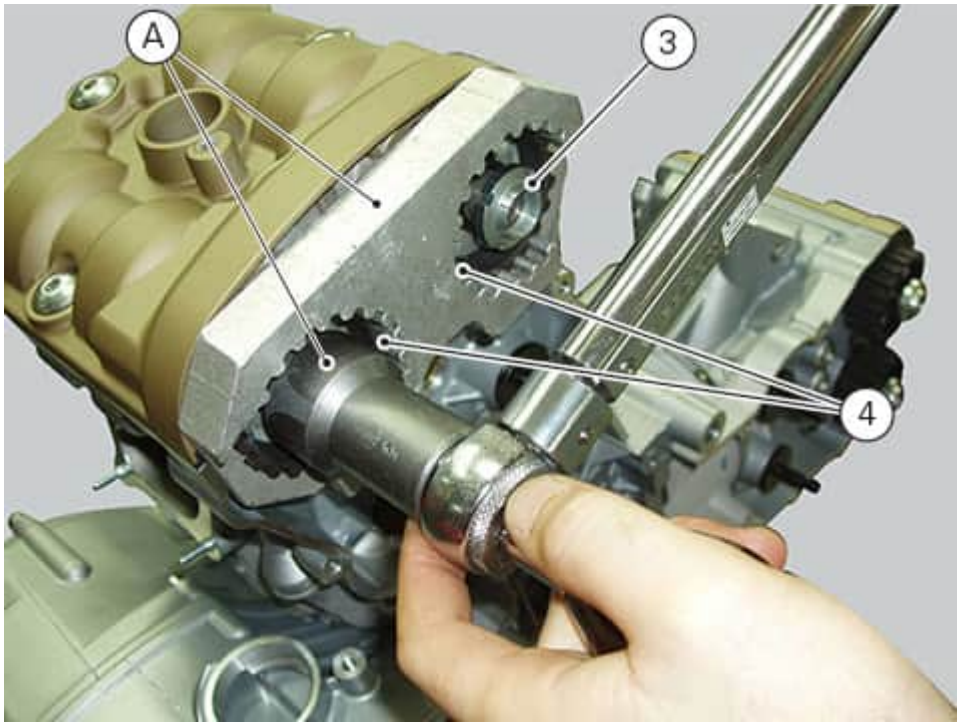


Insert tool (A) no. **88713.1806** in the belt rollers to prevent them from rotating.
Apply the recommended grease to the mating face of the ring nut (3).
Fit the ring nut (3).
Carry out the same operations on the other camshaft.

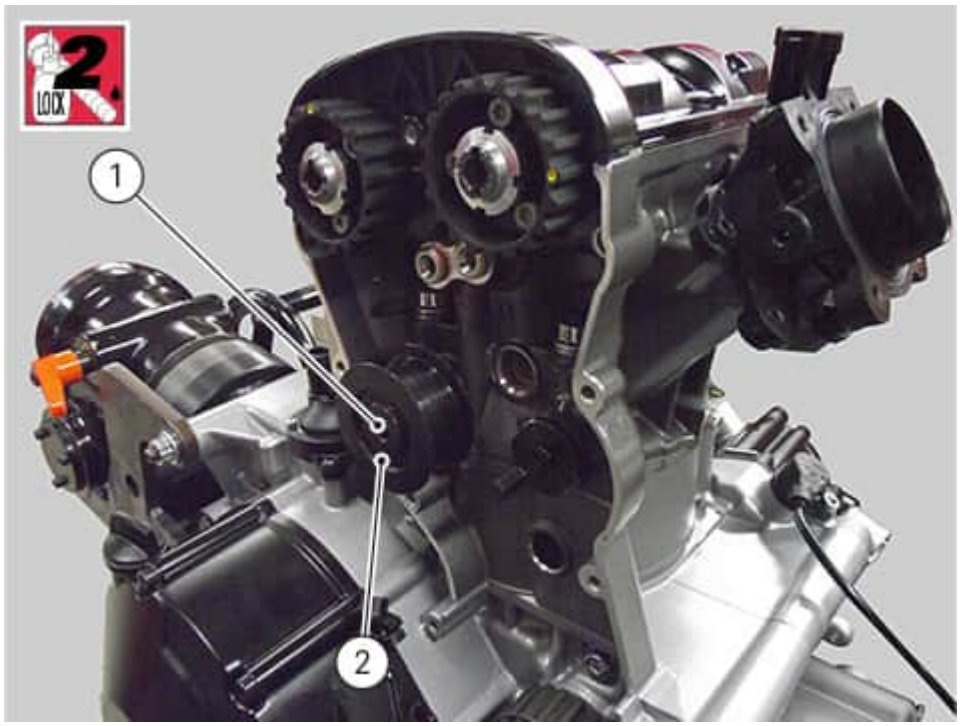
Important
Always fit new nuts on reassembly.

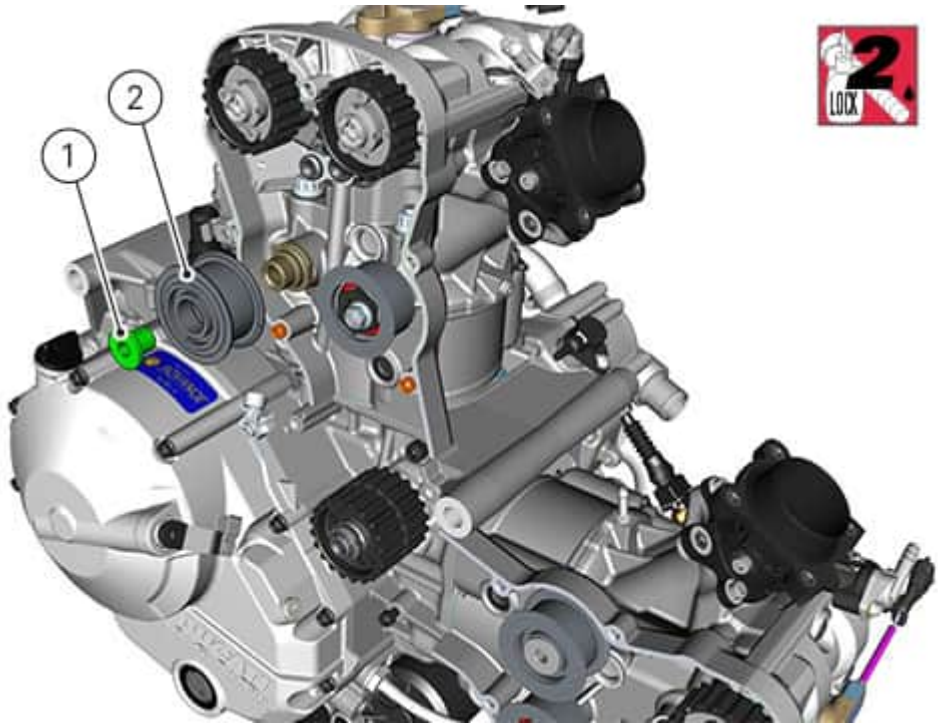


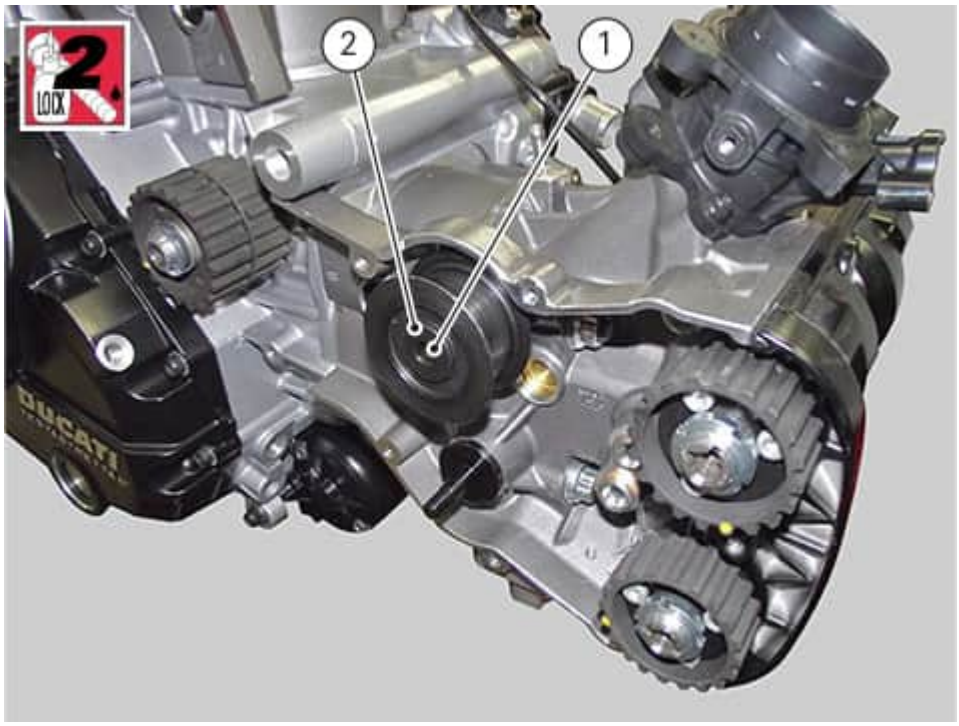
Use the bush supplied with tool (D) no. **88713.1806**, and a torque wrench to tighten ring nuts (3) of belt rollers (4) to 71 Nm (Min. 64 Nm - Max. 78 Nm).

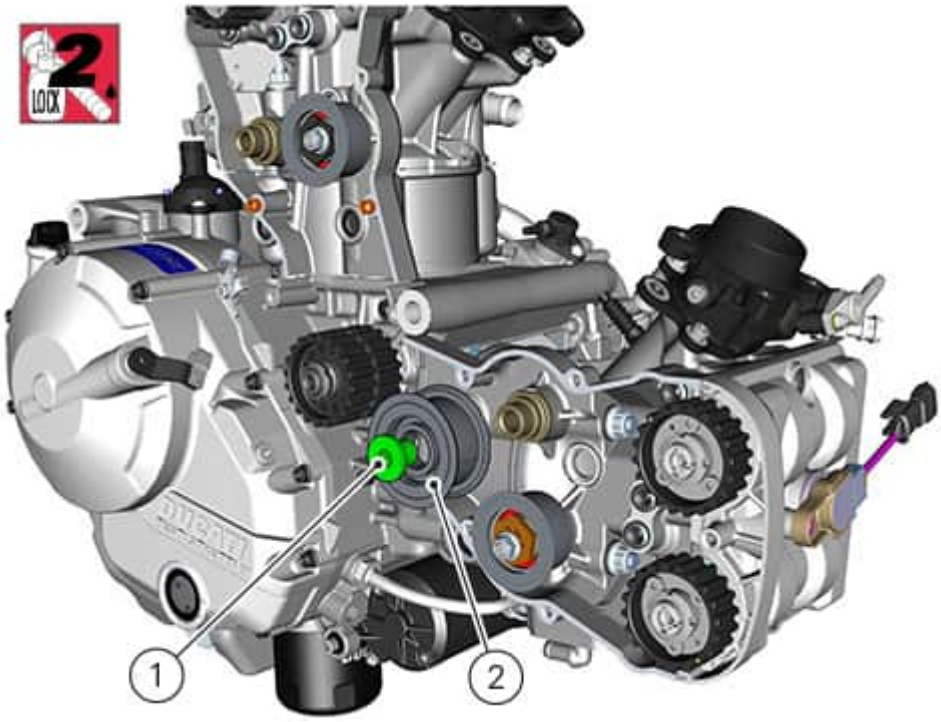


Insert fixed tensioners (2), with the relevant bearings, in the head pins, apply specified threadlocker to screws (1) and tighten them to a torque of 50 Nm (Min. 45 Nm - Max. 55 Nm).

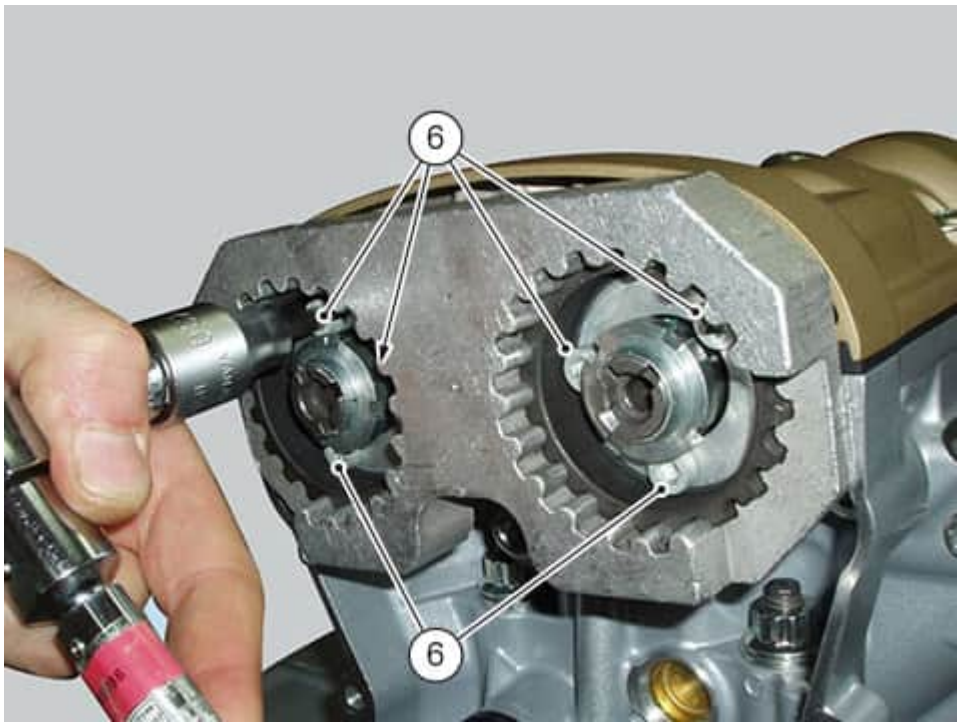

2.
LOCK
1
2


2.
LOCK
1
2





Undo the locking screws (6) of the pulleys, by turning them counter clockwise by 90° ± 5°.
Check that the pulleys have no end float and can rotate freely at all points along the full length of the slots.



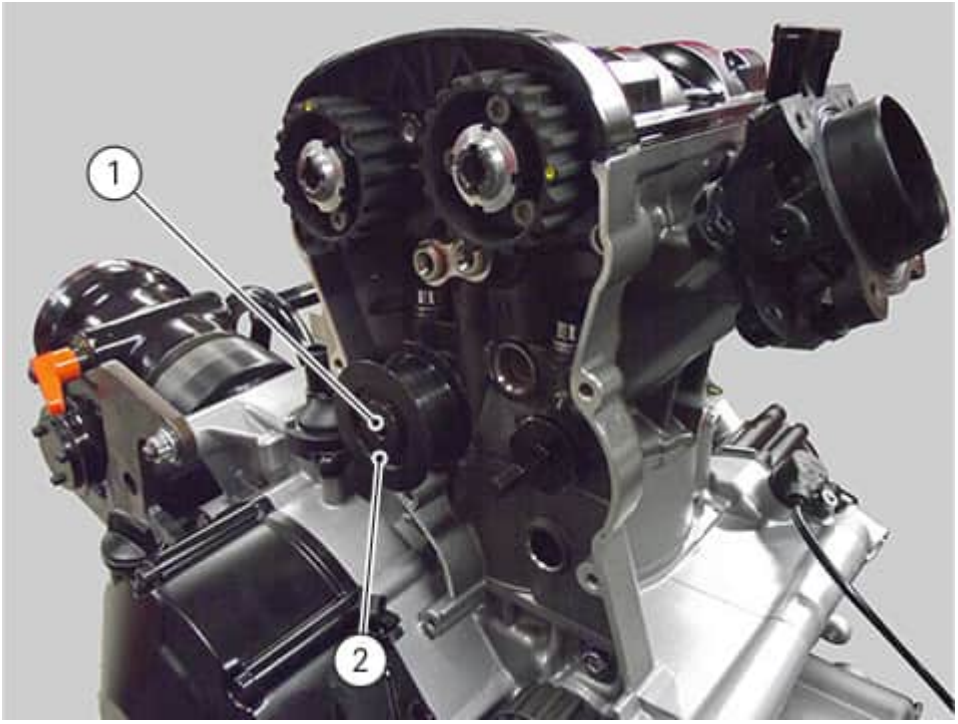
Refit the mobile tensioners and the timing belts (Refitting the timing belts).
Refit the external timing belt covers (Refitting the timing belt external covers).
Refit the vertical head exhaust pipe (Refitting the exhaust system).
Refit the fuel tank (Refitting the fuel tank).
Refit the side fairings (Refitting the fairings).
Refit the seat (Refitting the seat).

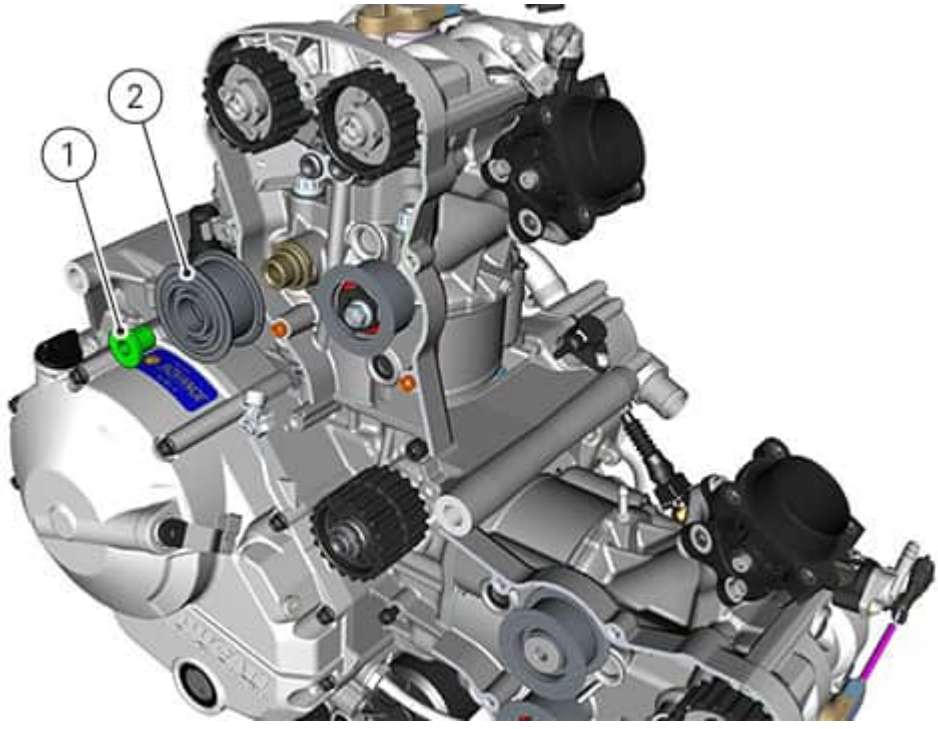
Removing the head belt rollers-fixed tensioner

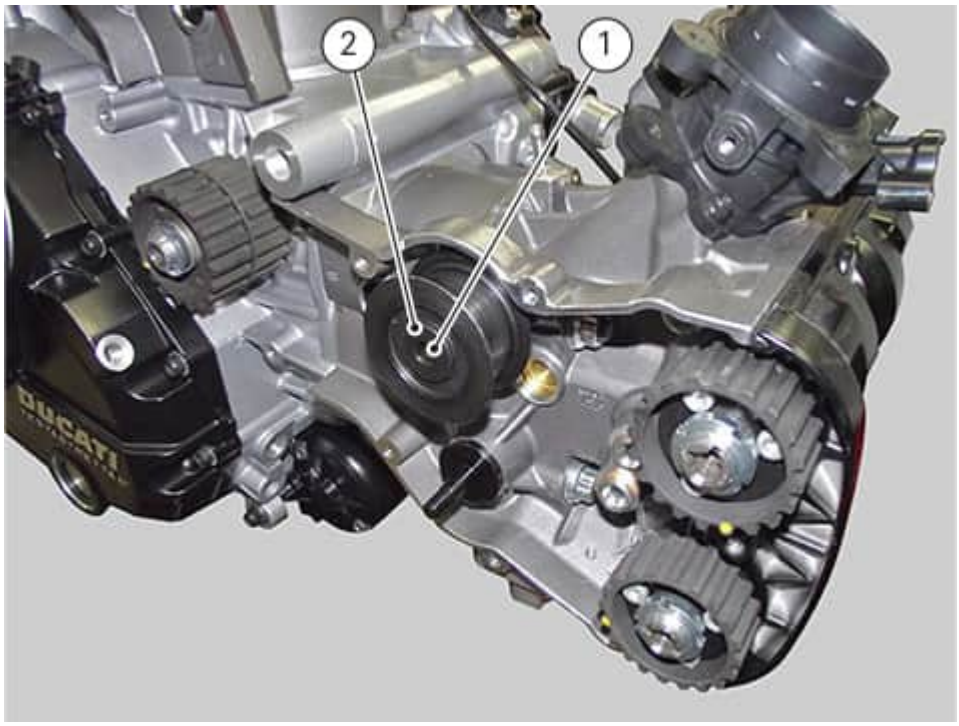
Note
The figures show an engine block removed from the frame.

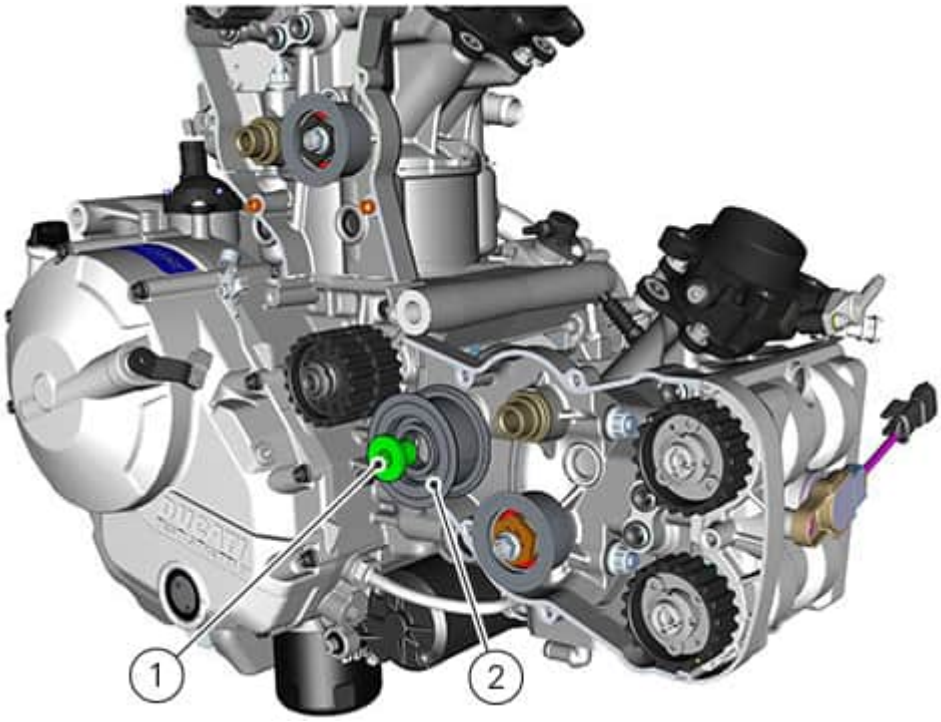
To work with the engine block installed in the frame it is necessary to remove the components indicated below.
Remove the seat (Removing the seat).
Remove the side fairings (Removing the fairings).
Remove the fuel tank (Removing the fuel tank).
Remove the vertical head exhaust pipe (Removing the exhaust system).
Remove the external belt covers (Removing the timing belt external covers).
Remove the mobile tensioners and timing belts (Removing the mobile tensioner/timing belt).

Undo screws (1) to remove the fixed tensioners (2) from the piston/cylinder assemblies.





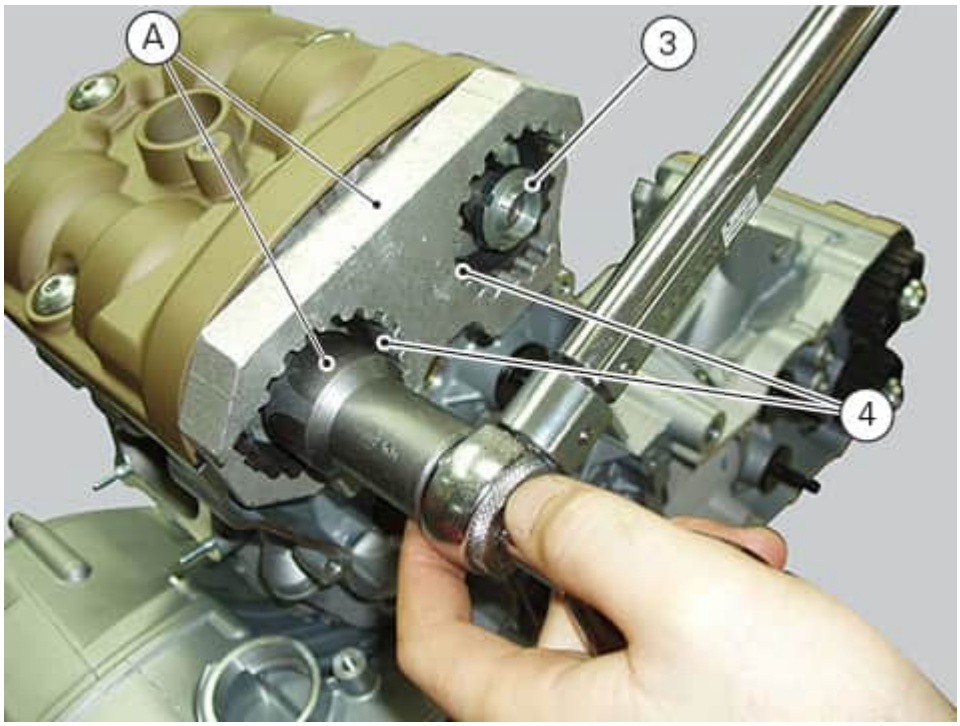




Fit tool (A) part no. **88713.1806** in the pulleys to lock their rotation and use the supplied bush to loosen the fixing ring nuts (3) of the pulleys.

Important
Upon reassembly, always use new ring nuts.

Remove the ring nuts (3) and the pulleys (4) from the camshafts.

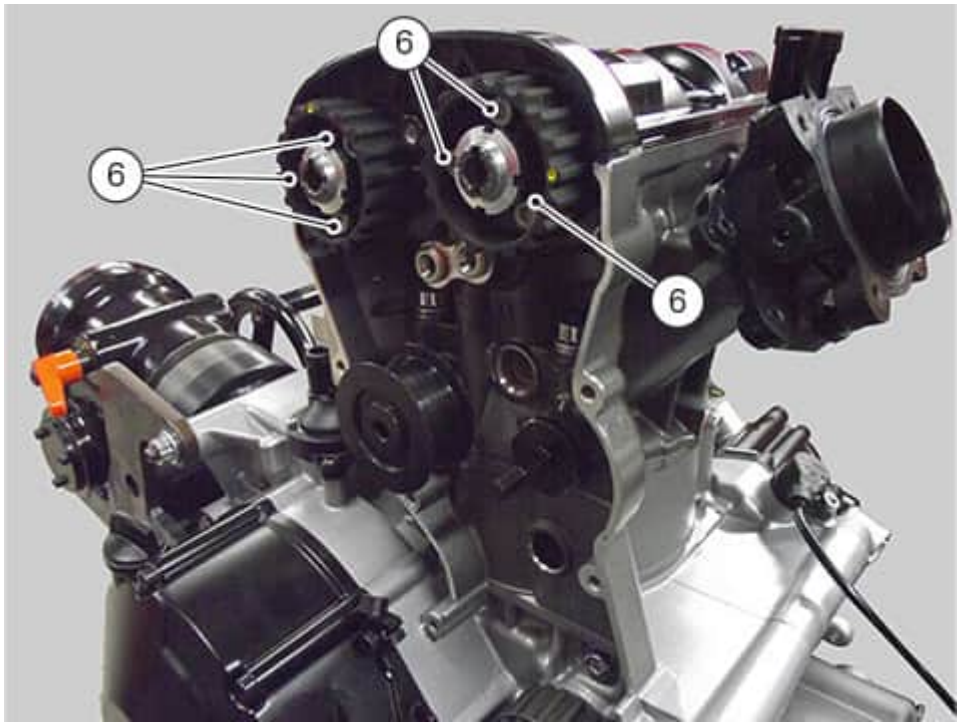

A
3
4

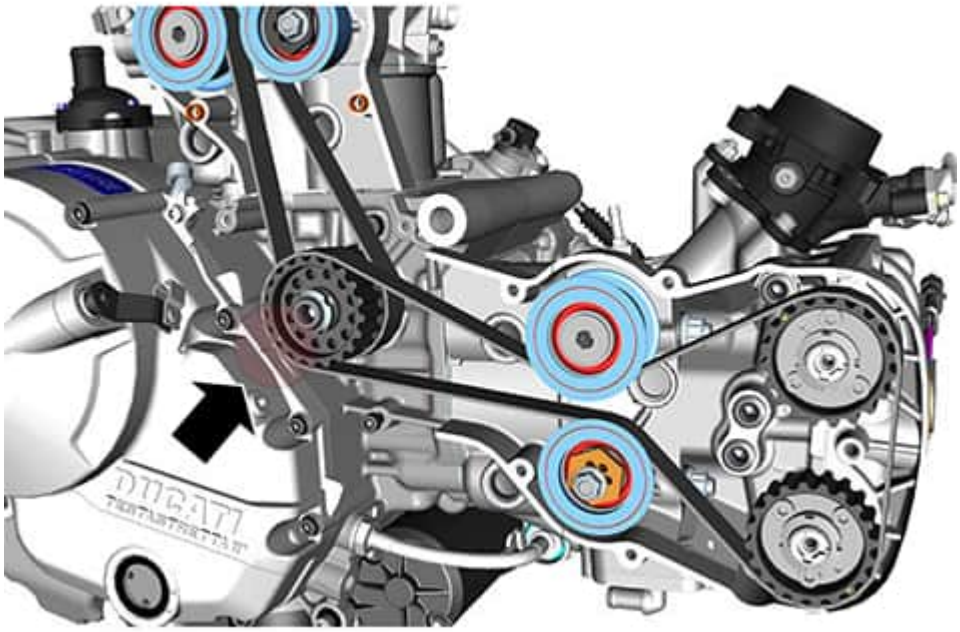
Refitting the timing belts

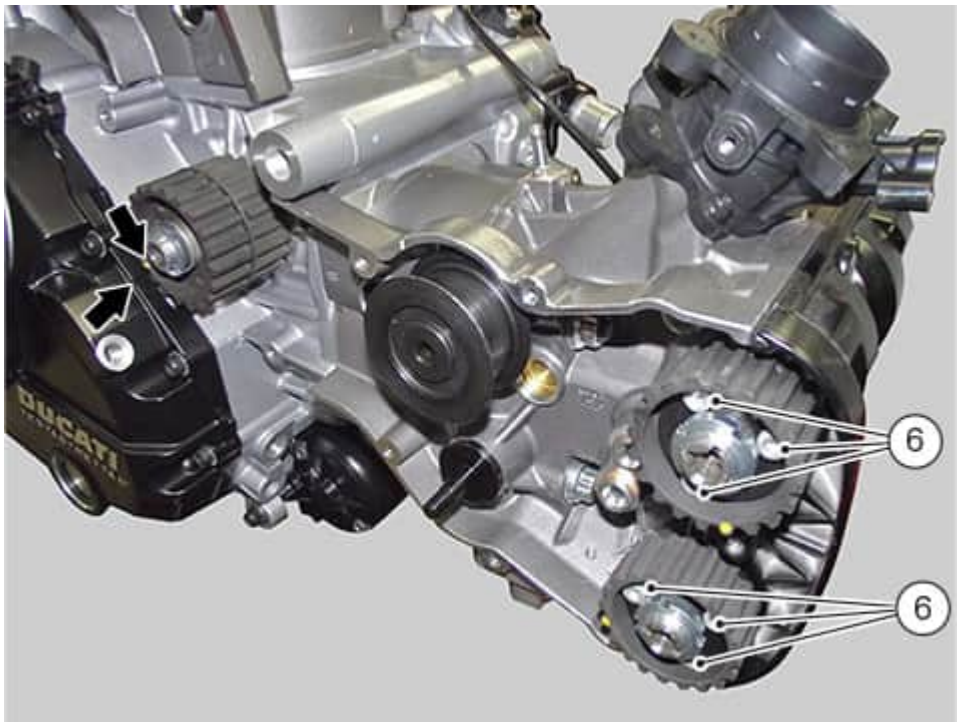
Note

The figures show an engine block removed from the frame, but the operation can also be performed with engine on the frame.

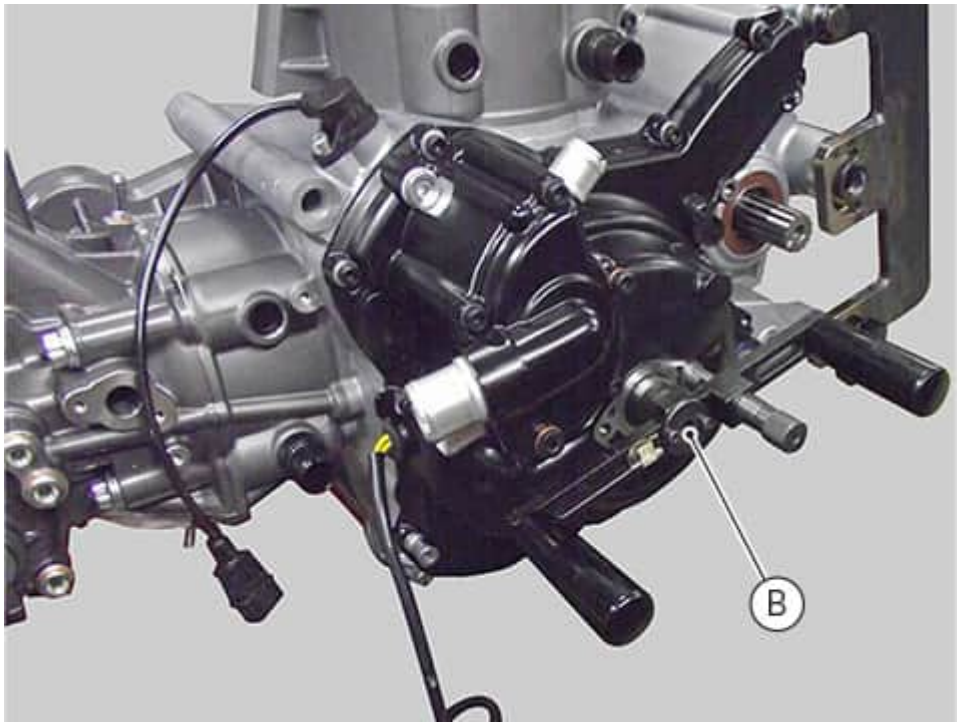
Loosen the screws (6) securing the timing side belt rollers.
Make sure that the reference points on the timing layshaft pulley matches those on the clutch cover.



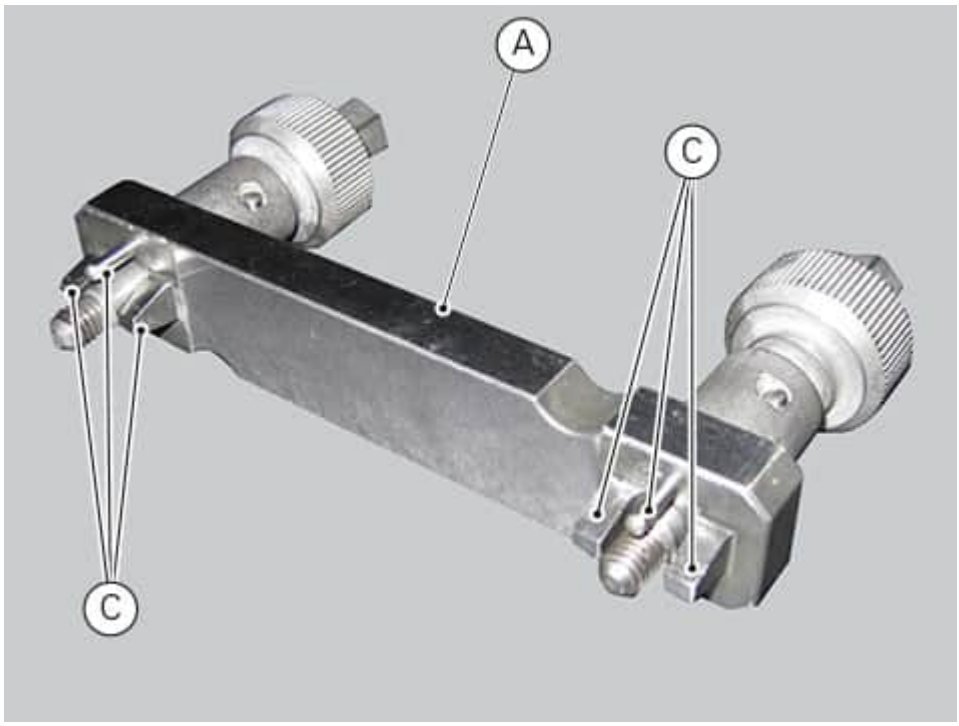


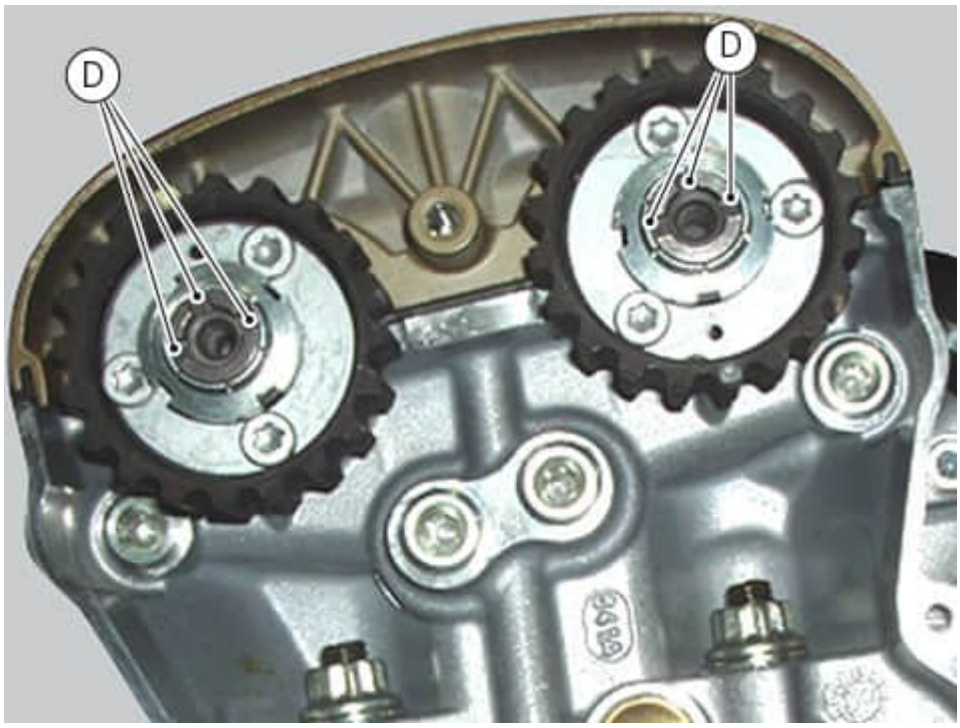


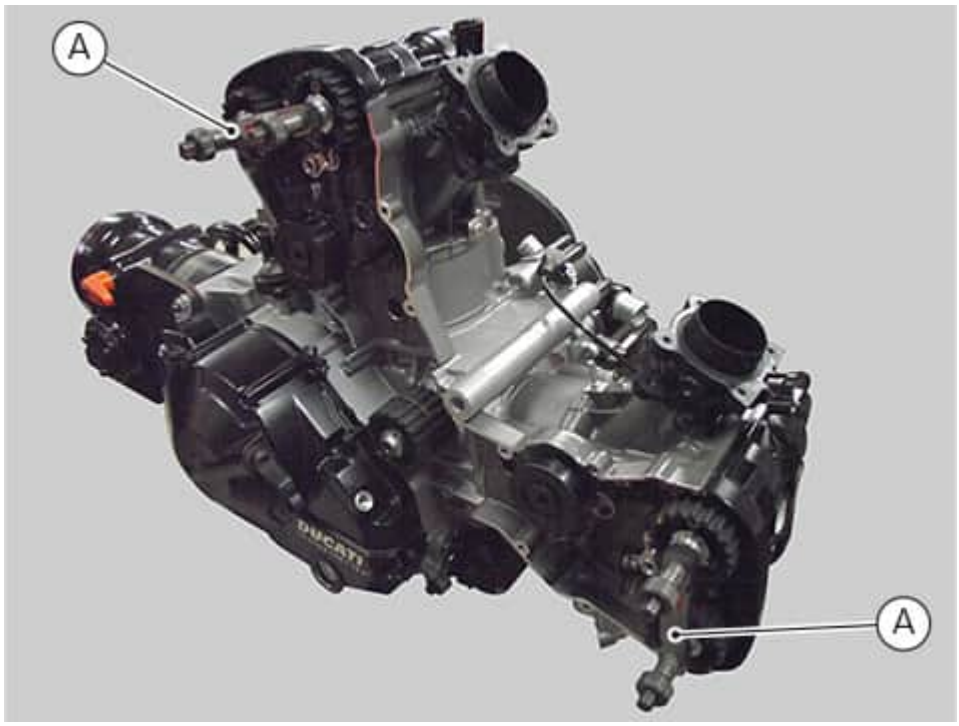
Fit on generator cover the tool (B) no. **88713.2011** in the generator seat to prevent the rotation of the crankshaft and block it with the suitable pin. Then tighten the screw of the tool.



Fit tools (A) no. **88765.1623** in the belt rollers to prevent them from rotating.
Use the tool to insert pins (C) in seats (D) of the camshafts.

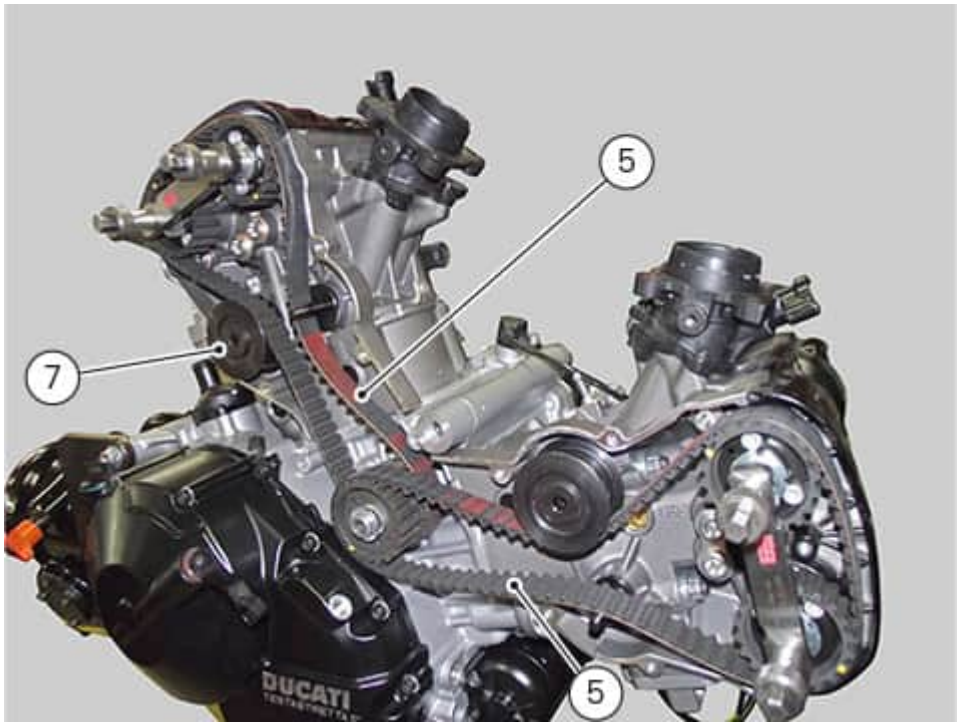

A
C
C


D
D

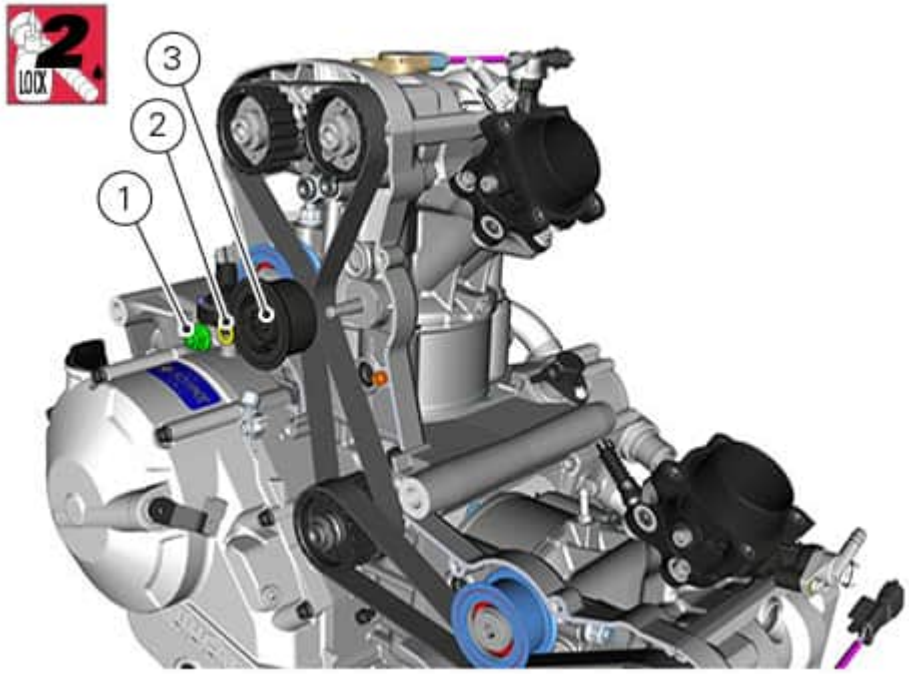


To install the vertical head belt (5) let it adhere against the head pulleys, pass it behind the fixed tensioner (7) and then follow the same procedure to fit belt (5) of the horizontal piston/cylinder.

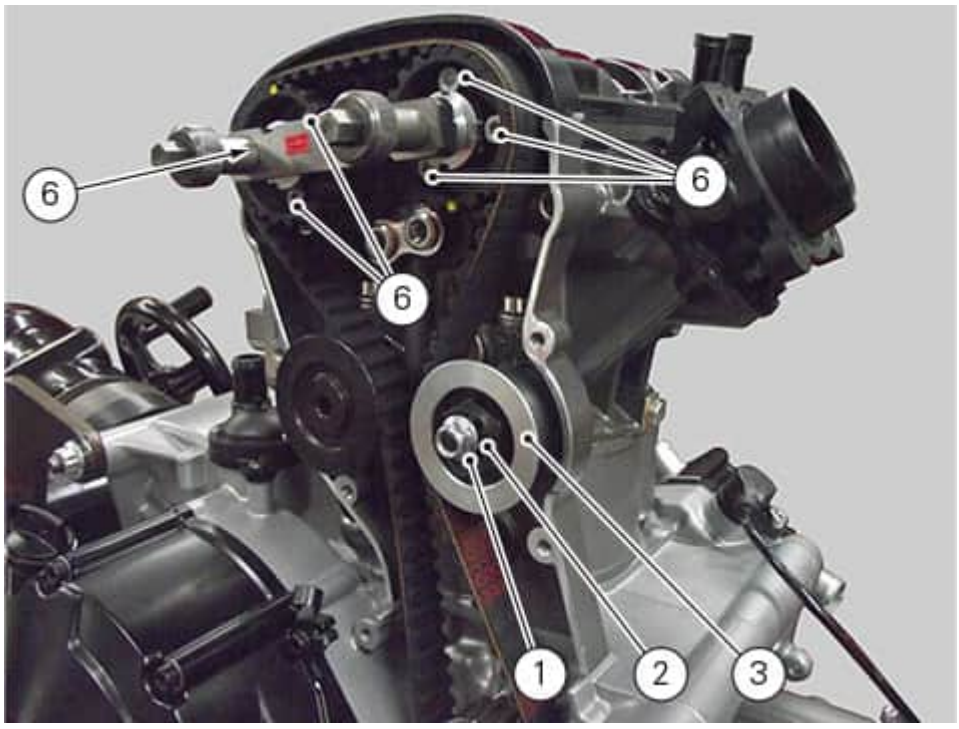
Note
If the used belts are to be refitted, position them in their original direction of rotation and on their original cylinder.

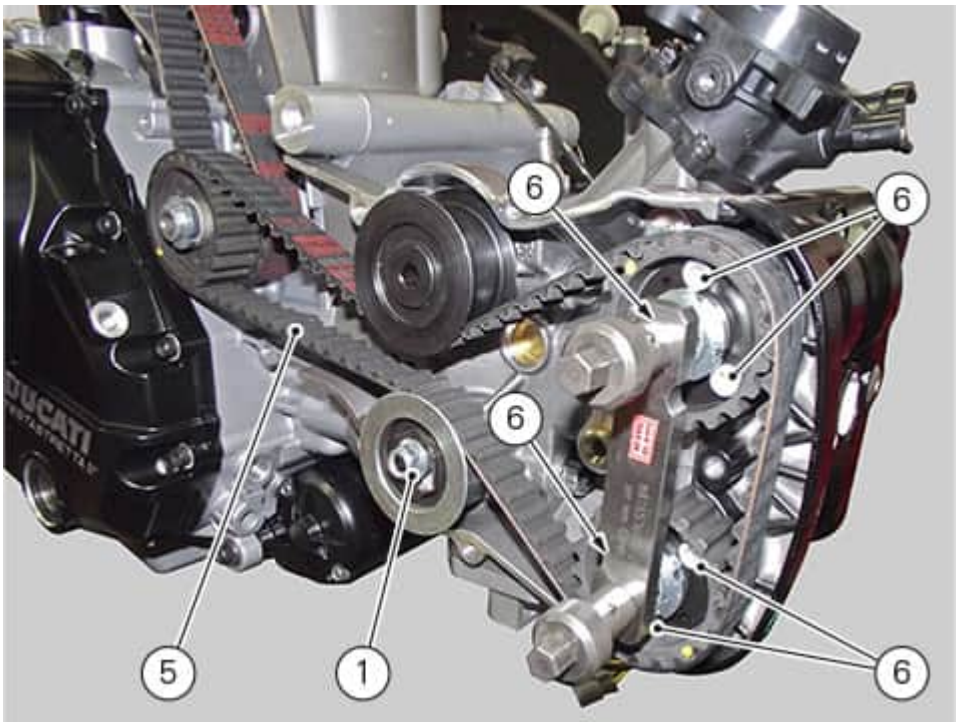


Fit the mobile tensioner (3) and the washer (2) on the cylinder head pin.
Apply recommended grease on mobile tensioner pin threads, and on nut (1) mating surface.
Start the nut (1).



Check the tensioning value and adjust the vertical head and horizontal head belt.
After reaching the required tension make sure that nuts (1) retaining mobile tensioners (3) are tightened to 25 Nm (Min. 22 Nm - Max. 28 Nm) and screws (6) of head belt rollers to 10 Nm (Min. 9 Nm - Max. 11 Nm).





Remove the pulley and crankshaft blocking tools.

Note
If the above operations have been carried out with the engine installed in the frame, refit the previously removed parts.

Refit the external timing belt covers (Refitting the timing belt external covers).
Refit the vertical head exhaust pipe (Refitting the exhaust system).
Refit the fuel tank (Refitting the fuel tank).
Refit the side fairings (Refitting the fairings).
Refit the seat (Refitting the seat).

	Reference	Assembly value (new belt)	Recovery value (used belt)
Cold belt tension adjustment	DDS	110±5 Hz (horizontal)	80±5 Hz (horizontal)
		110±5 Hz (vertical)	80±5 Hz (vertical)
	Cold min. limit value		70 Hz
	Tension value accepted upon engine overhaul	HORIZONTAL	VERTICAL
		Tension (Hz) ±5	Tension (Hz) ±5
		Min. 80	Min. 88
		Max. 100	Max. 100

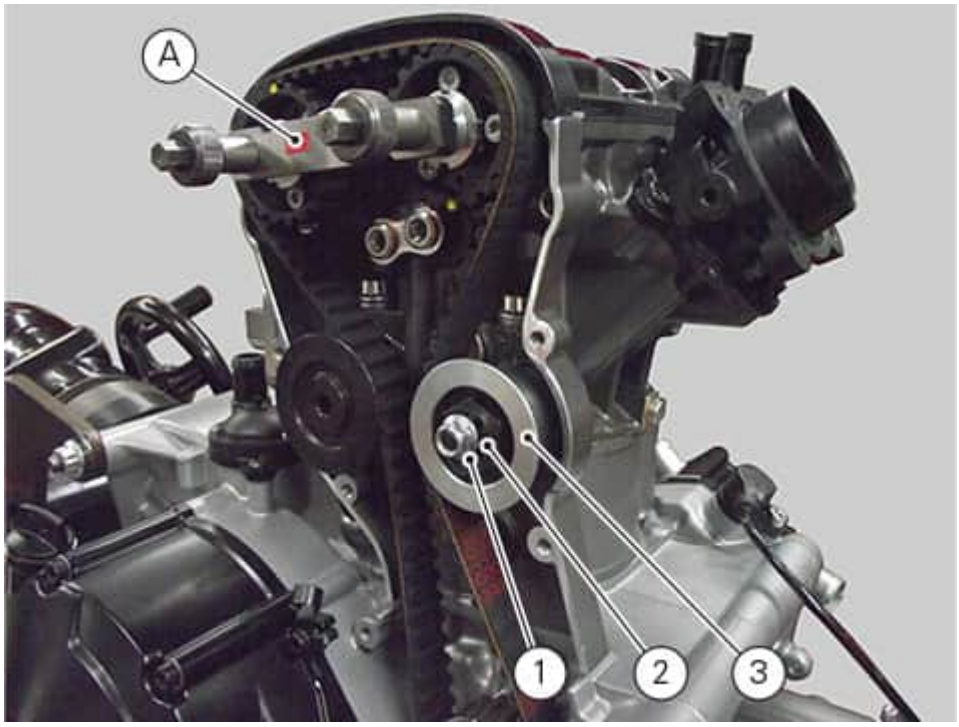
Removing the mobile tensioner-timing belt

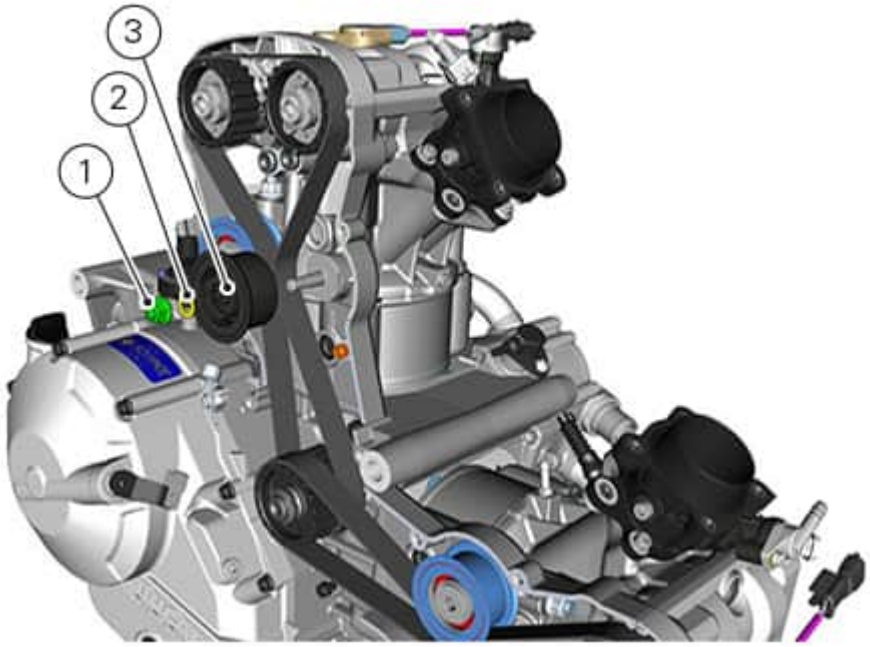
Note
The figures show an engine block removed from the frame.

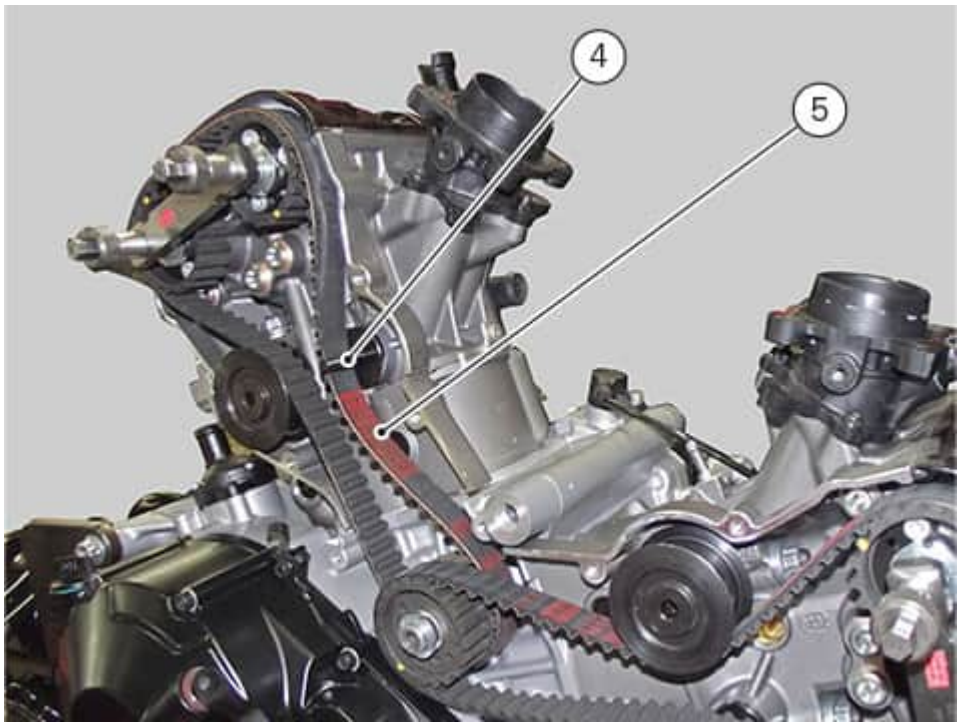
To work with the engine block installed in the frame it is necessary to remove the components indicated below.
Remove the seat (Removing the seat).
Remove the side fairings (Removing the fairings).
Remove the fuel tank (Removing the fuel tank).
Remove the vertical head exhaust pipe (Removing the exhaust system).
Remove the external belt covers (Removing the timing belt external covers).

Fit tool (A) part no. **88765.1623** in the belt rollers to prevent them from rotating.

Loosen the nut (1) and remove the washer (2) and the mobile tensioner (3) from the pin (4) on the cylinder head.
Remove the timing belt (5) from the vertical head.



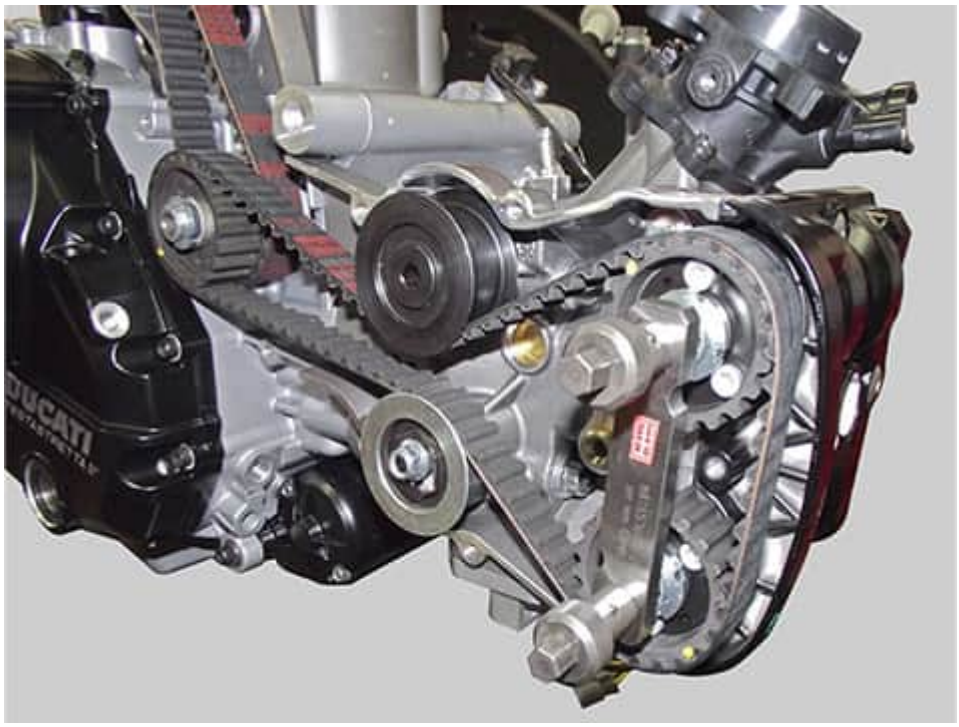




Important

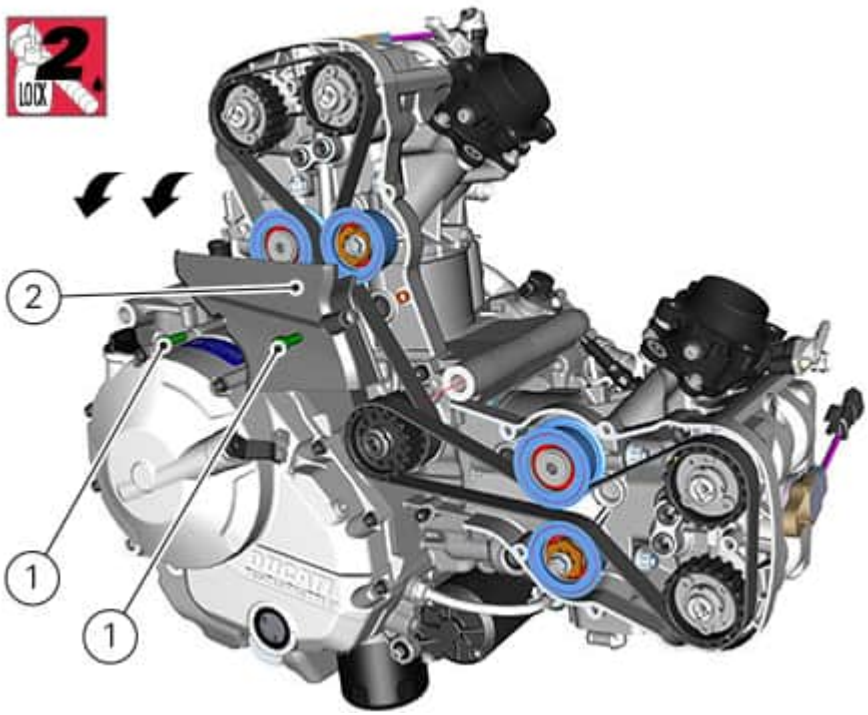
If the belts are to be re-used, mark the direction of rotation with an arrow and also mark the piston-cylinder assy they belong to.

Repeat the procedure for the other piston-cylinder assy.

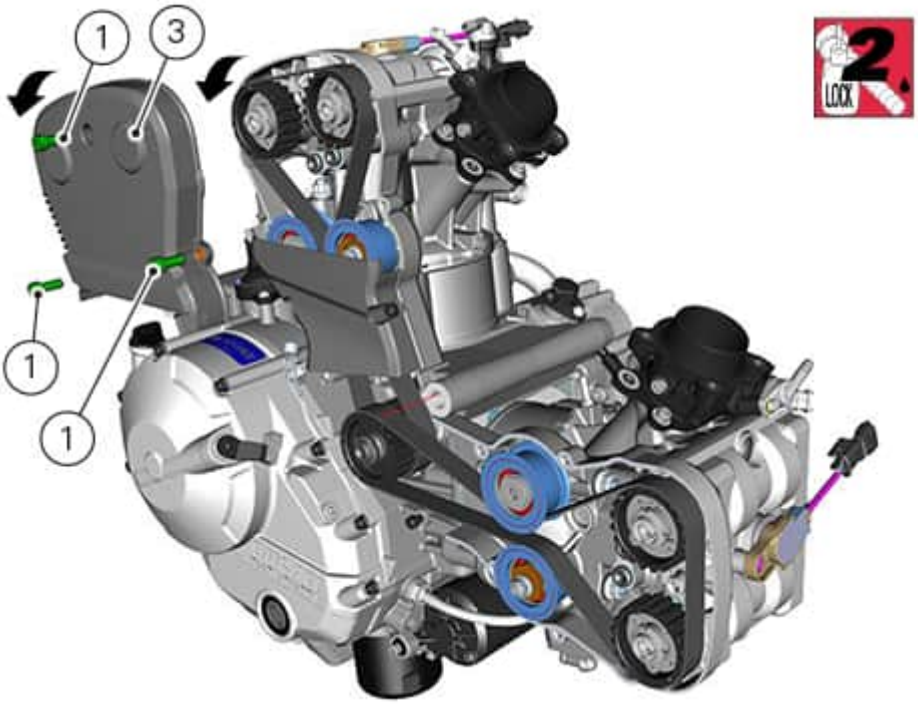


Refitting the timing outer covers

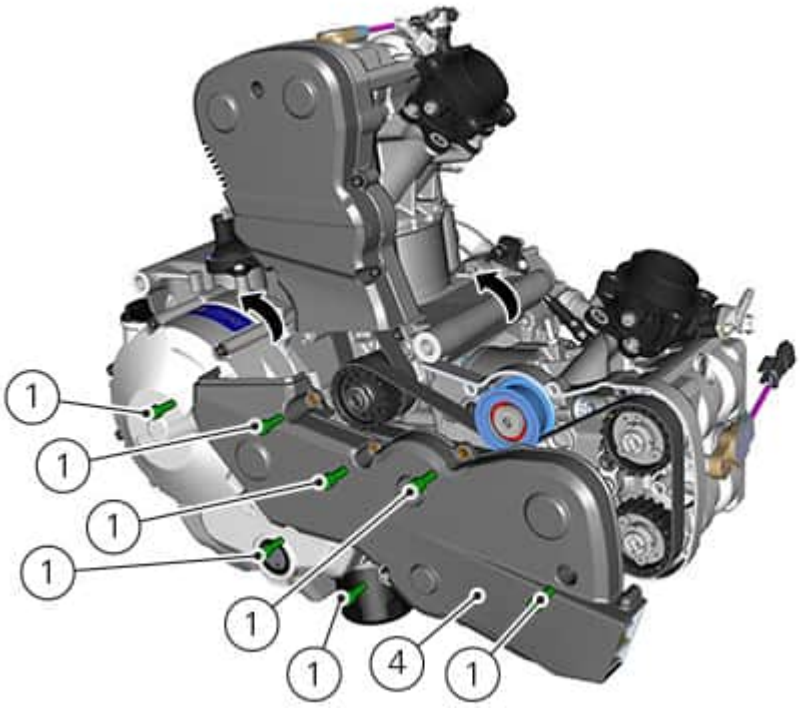
Position central belt cover (2) on the vertical head by inserting it from below.
If they are not new, apply specified threadlocker to retaining screws (1) and start them.



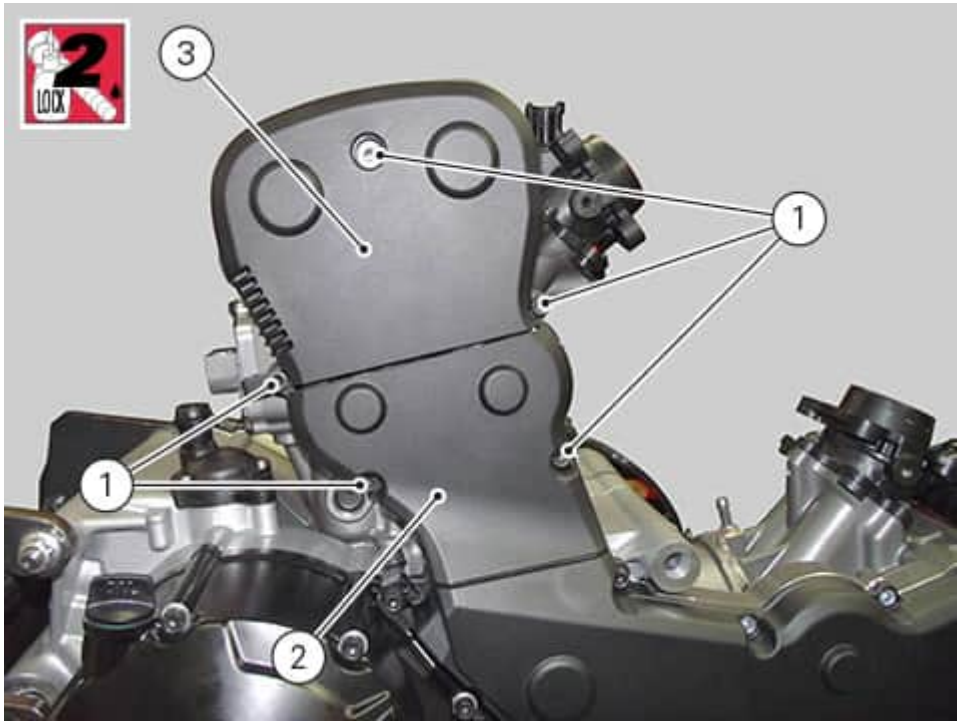
Position vertical belt cover (3) on the vertical head by inserting it from below.
If they are not new, apply specified threadlocker to retaining screws (1) and start them.

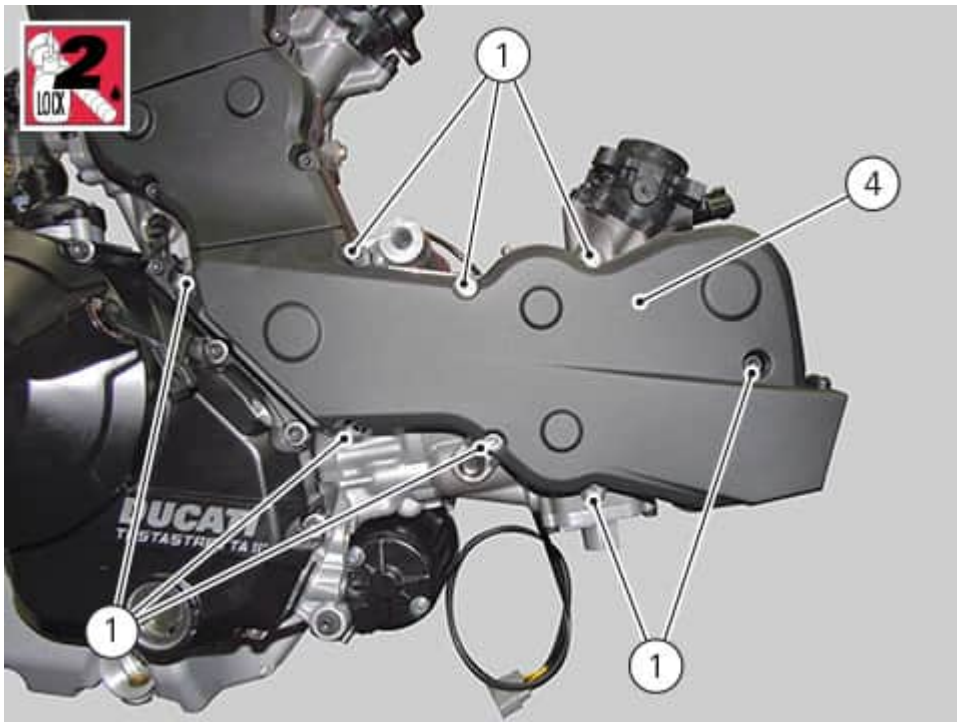


Position horizontal belt cover (4) on the horizontal head by inserting it from above.
If they are not new, apply specified threadlocker to retaining screws (1) and start them.



Tighten screws (1) that retain covers (2), (3) and (4) to a torque of 10 Nm (Min. 9Nm – Max. 11 Nm).





Note
If the above operations have been carried out with the engine installed in the frame, refit the previously removed parts.

Refit the vertical head exhaust pipe (D) (Refitting the exhaust system).
Refit the fuel tank (C) (Refitting the fuel tank).
Refit the side fairings (B) (Refitting the fairings).
Refit the seat (A) (Refitting the seat).



Removing the timing belt covers

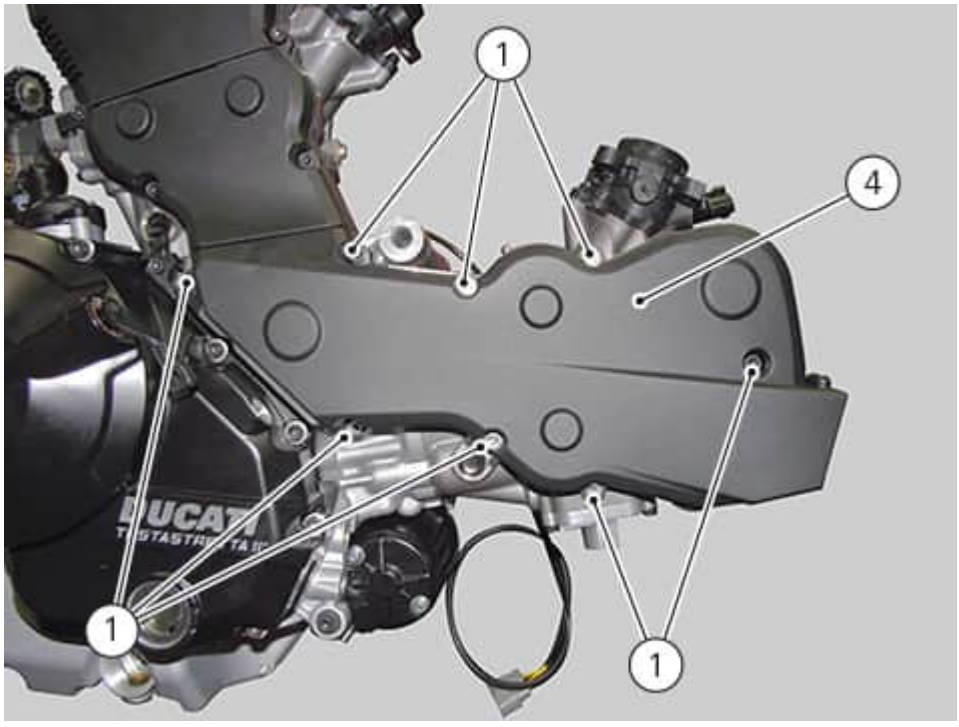
Note
The figures show an engine block removed from the frame.

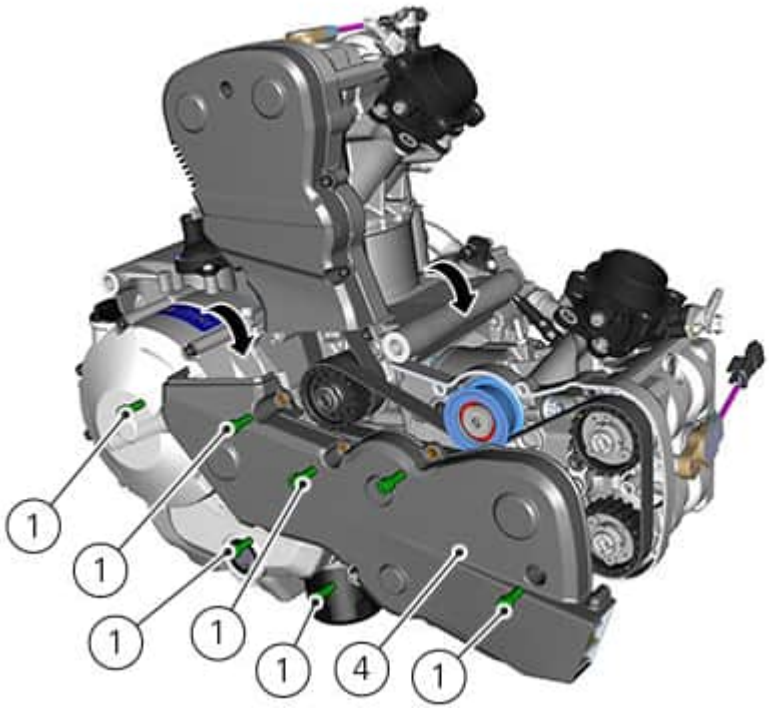
To work with the engine block installed in the frame it is necessary to remove the components indicated below.
Remove the seat (A) (Removing the seat).
Remove the side fairings (B) (Removing the fairings).
Remove the fuel tank (C) (Removing the fuel tank).
Remove the vertical head exhaust pipe (D) (Removing the exhaust system).



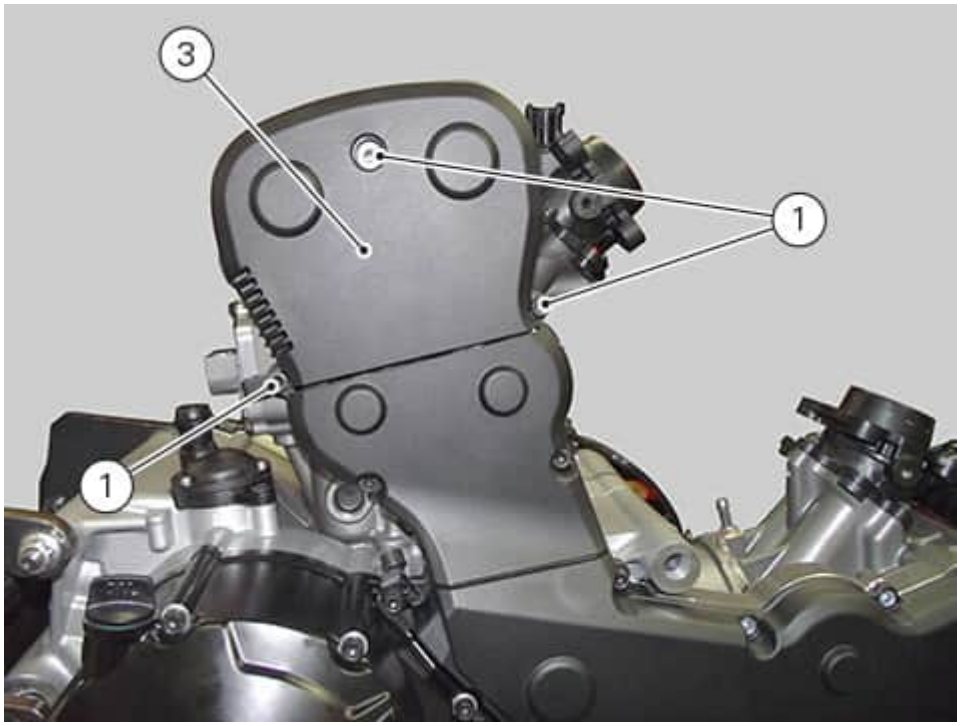
Warning
To remove the belt covers, follow the removal order indicated below.

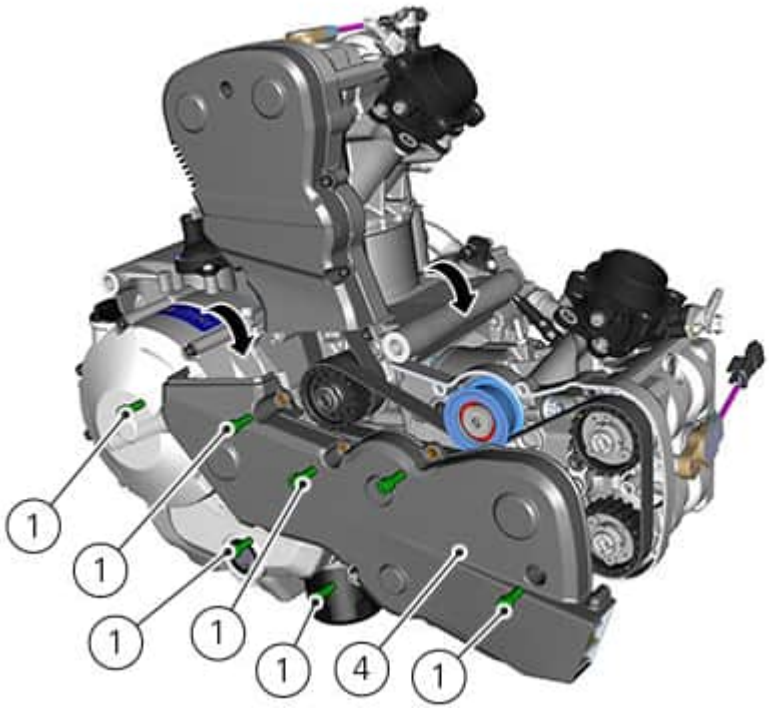
Loosen screws (1) that retain the horizontal belt external cover (4) and remove it from the horizontal head by sliding the cover downwards.



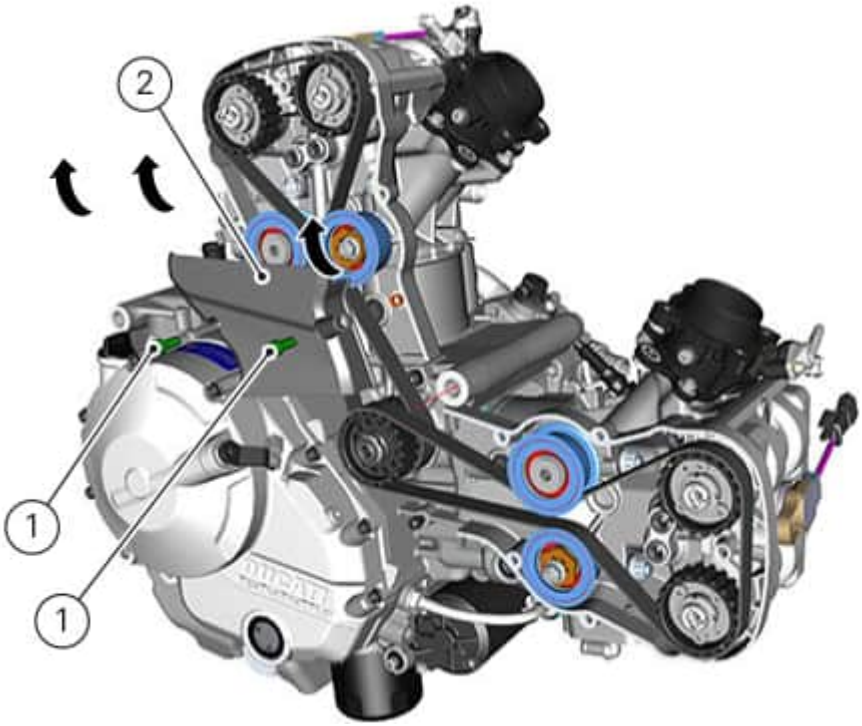


Loosen screws (1) that retain the vertical belt lower external cover (2) and remove it from the vertical head by sliding the cover downwards.





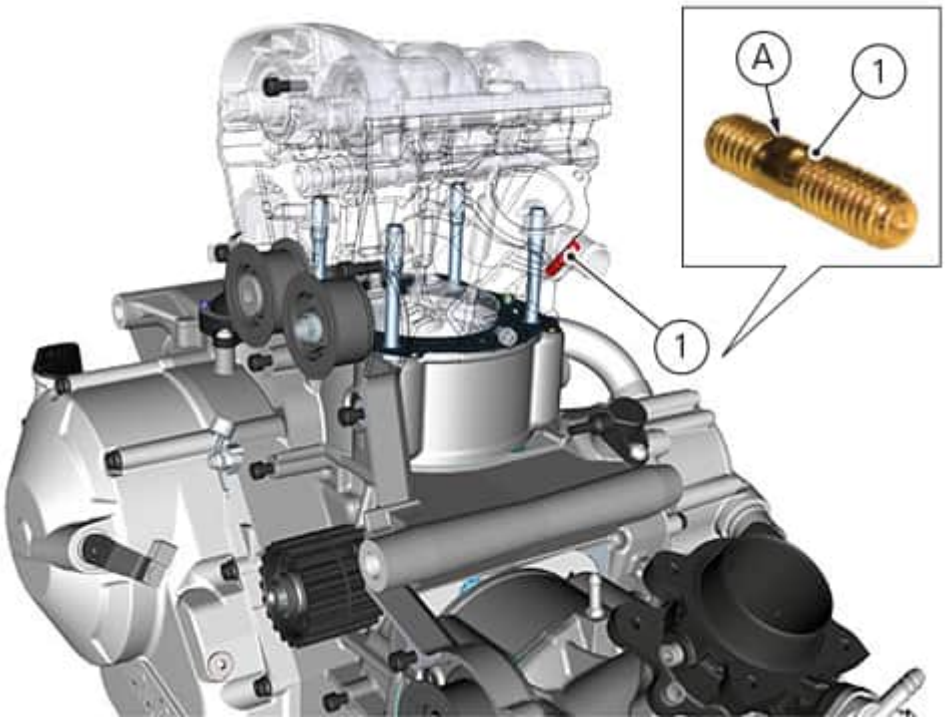
Loosen screws (1) that retain the belt central cover (2) and remove it from the vertical head by sliding it upwards.



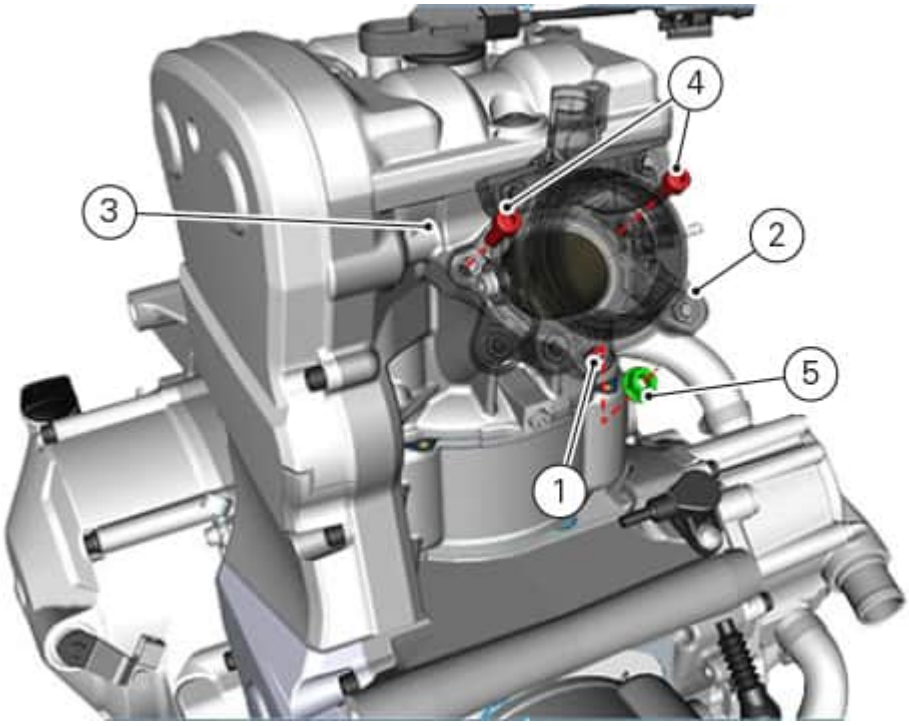
Refitting the intake manifold

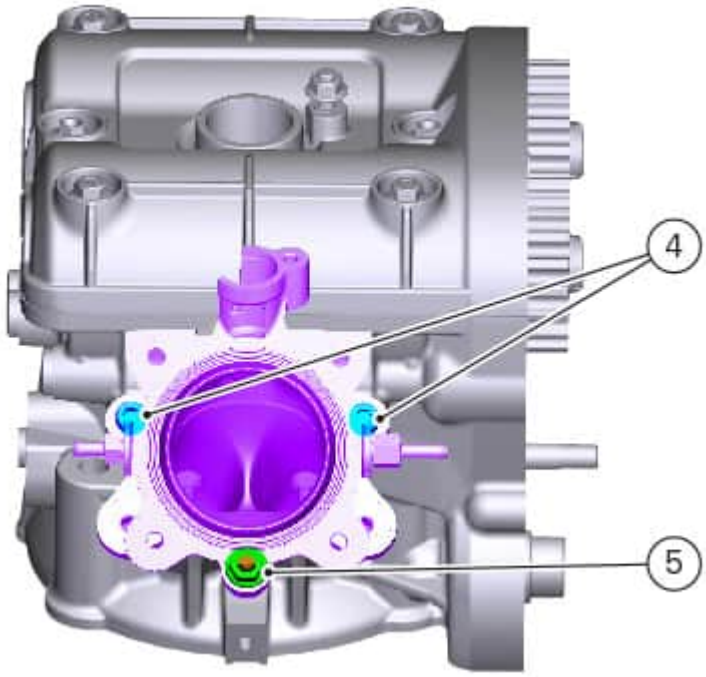
Note
The described operations regard the horizontal cylinder head. For the vertical head, follow the same procedure.

Apply the recommended threadlocker to the short thread (A) of stud bolt (1).
Screw the stud bolt in the flange lower hole and tighten it to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).
After tightening, remove any excess of threadlocker.



Position intake manifold (2) on cylinder head (3) by centring stud bolt (1).
Fix the manifold by starting screws (4) and nut (5).
Tighten the screws and the nut to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).





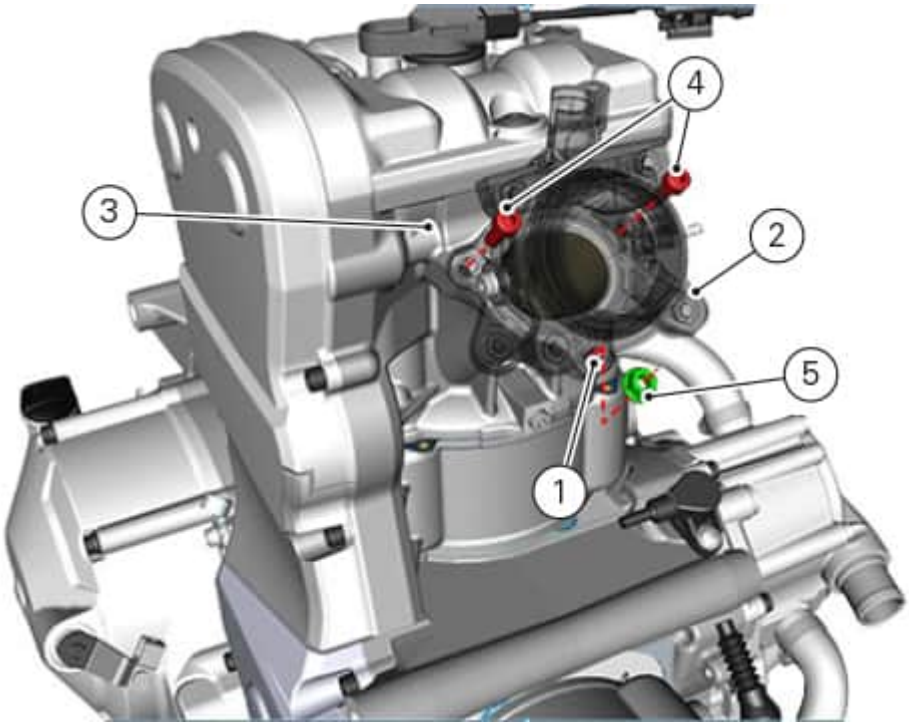
Refill the cooling system (Changing the coolant).
Refit the airbox (Refitting the airbox), the intake manifold injectors, the throttle body (Refitting the throttle body), the blow-by and the oil breather pipe.
Refit the fuel tank (Refitting the fuel tank).
Refit the side fairings (Refitting the fairings).
Refit the seat (Refitting the seat).

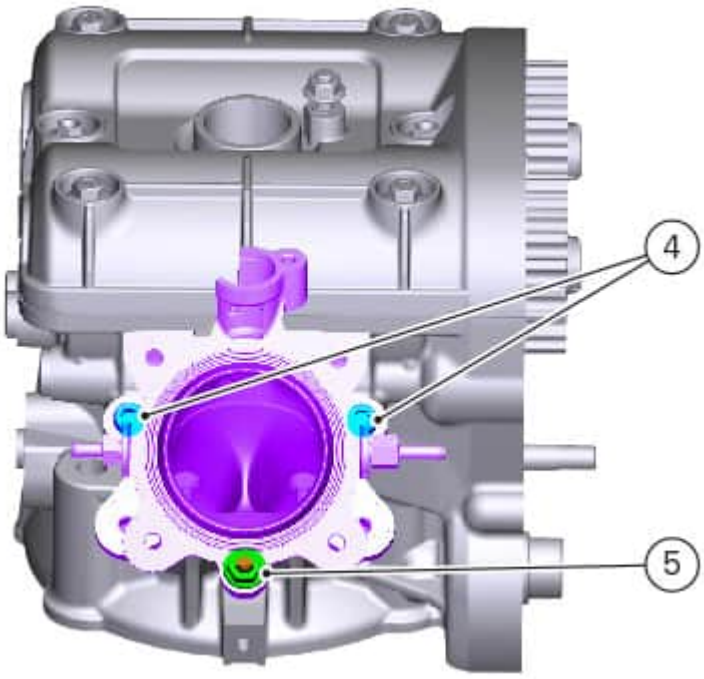
Removing the intake manifold and water union

Note
The described operations regard the horizontal cylinder head. For the vertical head, follow the same procedure.

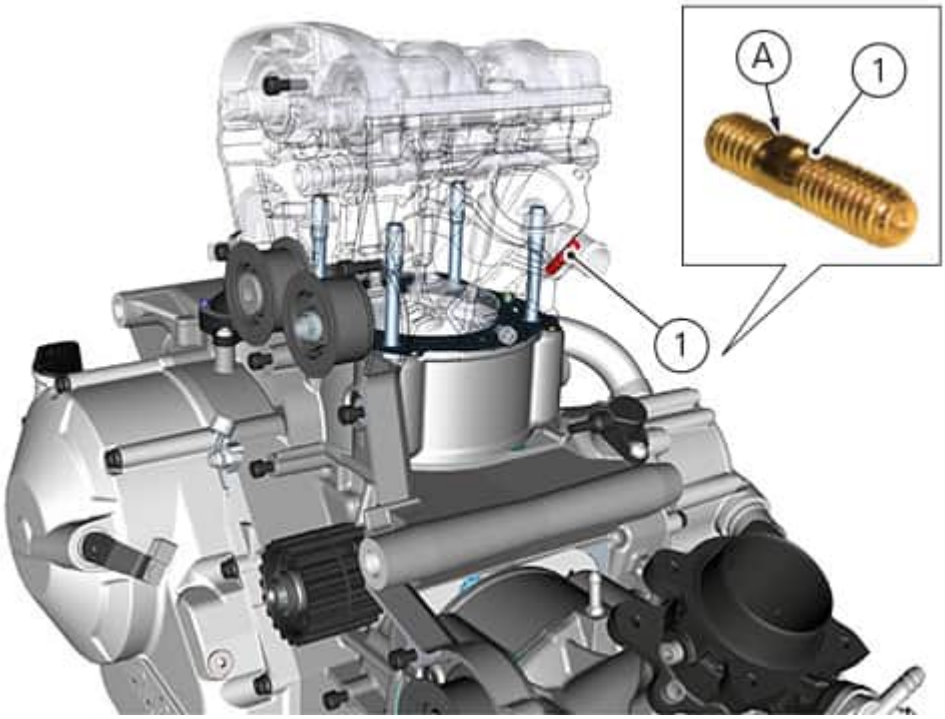
Remove the seat (Removing the seat).
Remove the side fairings (Removing the fairings).
Remove the fuel tank (Removing the fuel tank).
Remove the airbox (Removing the airbox), the intake manifold injectors, the throttle body (Removing the throttle body), the blow-by and the oil breather pipe.
Empty the cooling system (Changing the coolant).

Loosen screws (4) and nut (5) that retain the intake manifold (2) on cylinder head (3) with stud bolt (1).



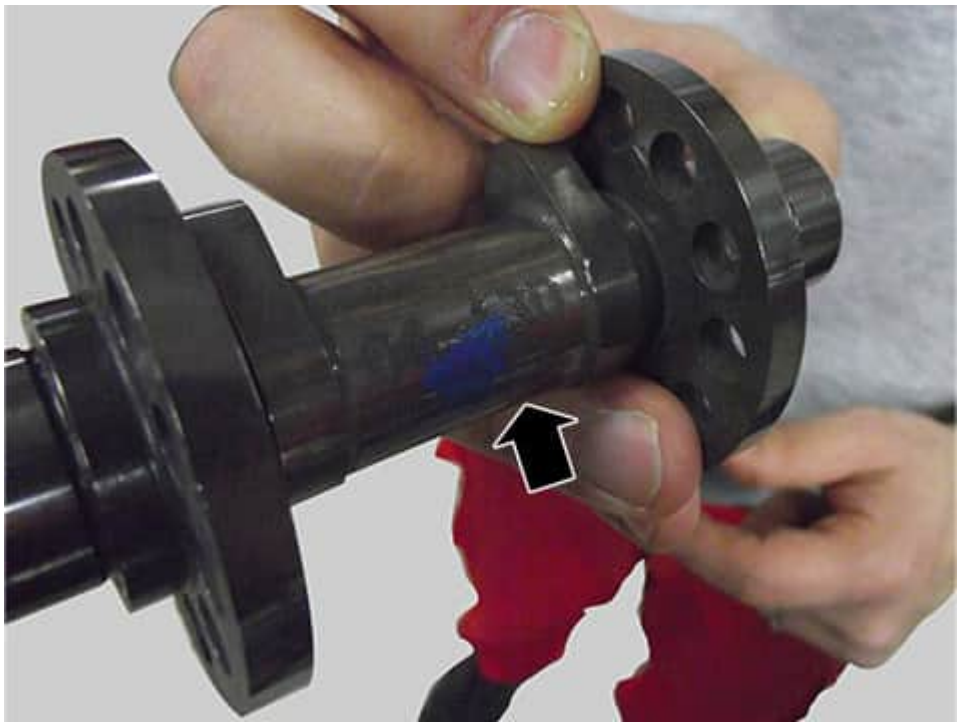


Loosen stud bolt (1): the stud bolt thread (A) is the short one.

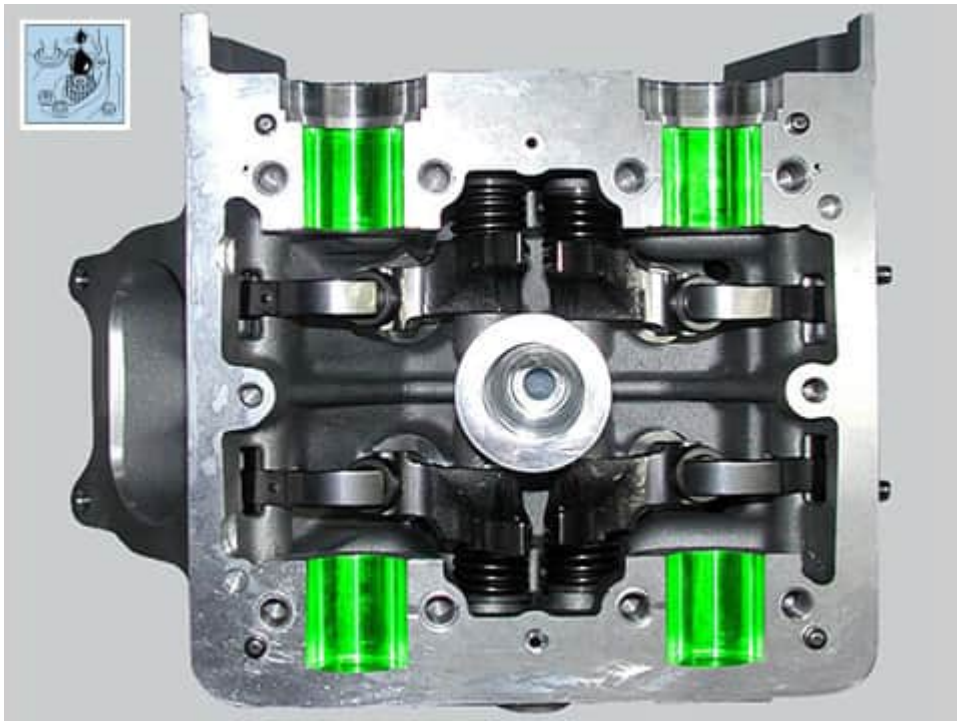

A
1
1

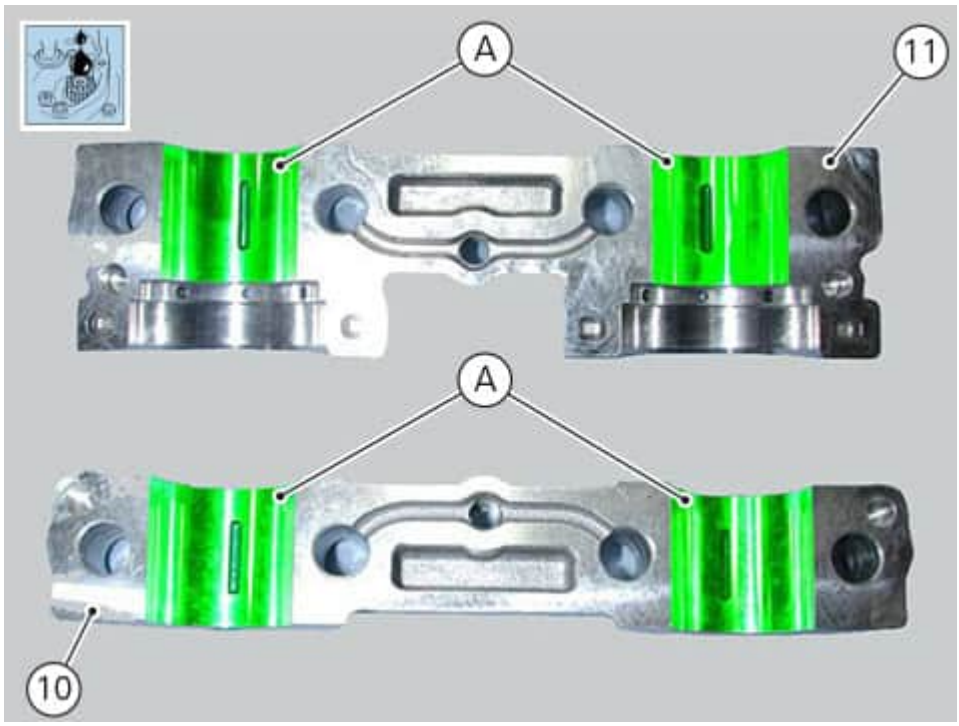
Refitting the camshafts

Check that the camshafts (marked "VA" and "VS" for the vertical head and "OS" and "OA" for the horizontal head) are clean and in good condition.
If the camshafts are not new, use emery cloth to remove signs of wear on the cam and support surfaces, working on a flat surface.



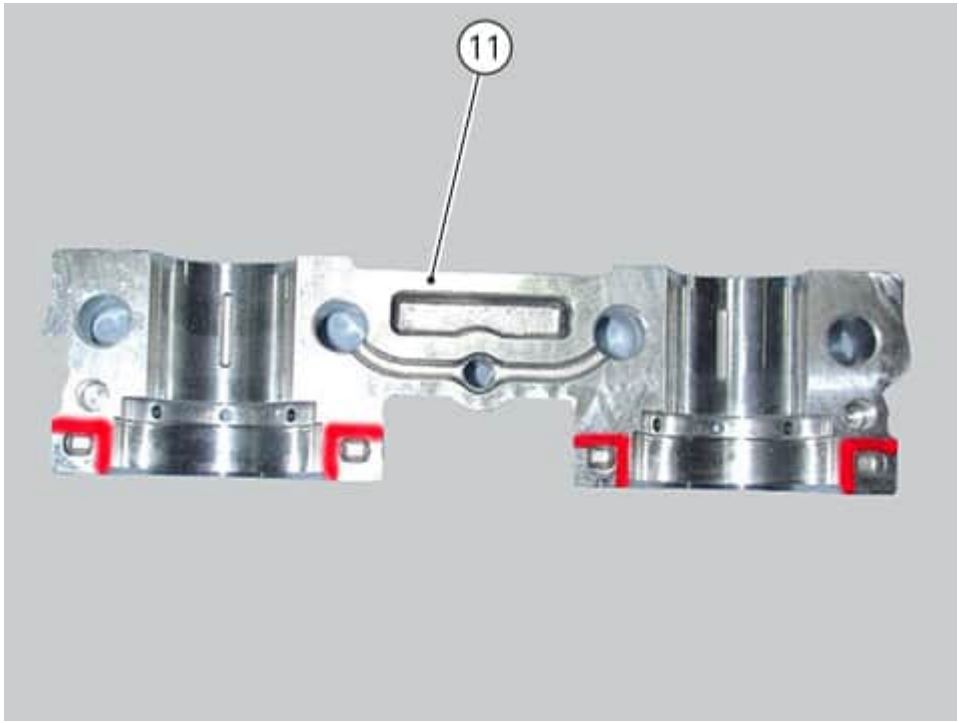
Use specified lubricant (Molycote M55 Plus) both on the cylinder head and on supports (10) and (11), to lubricate the seats of the camshafts (see green areas).
Fill tanks (A) with specified lubricant (Molycote M55 Plus).



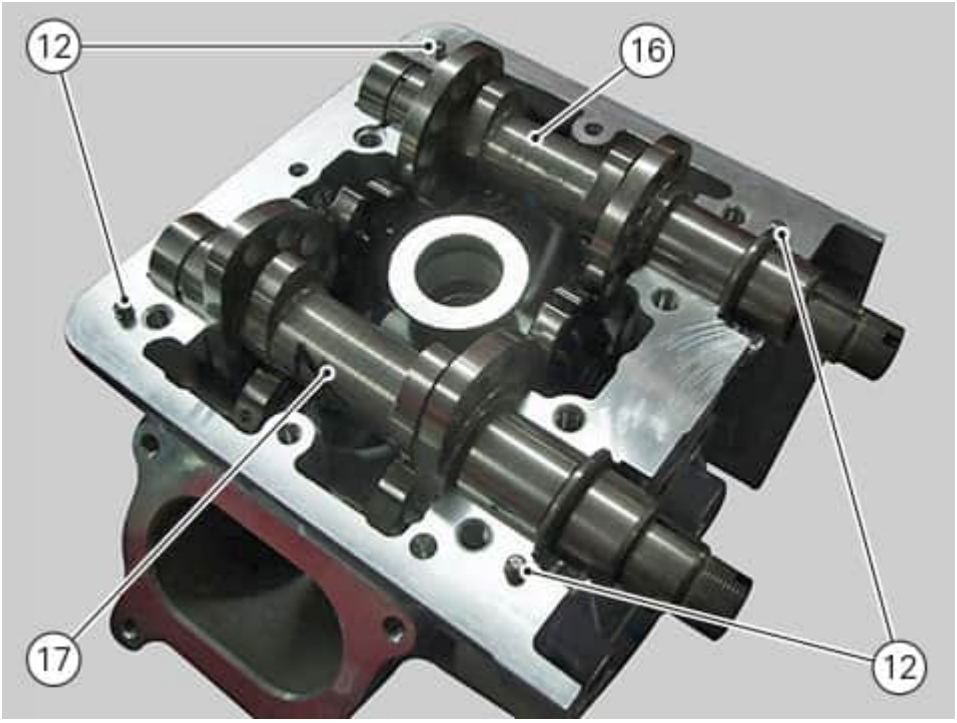


Apply sealant (Three Bond 1215 sealing compound) at the four points (highlighted in red) of the support surface (11) shown in red in the figure.
Clean off any excess of sealant.

Apply sealant only on the timing side support (11) and not on support (10).



Install the camshafts (16) and (17) in the cylinder head, and rotate them to distribute the lubricant evenly.
Check that the centring dowels (12) are present.



Pre-tighten screws (8) and special screws of caps (10) and (11) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).

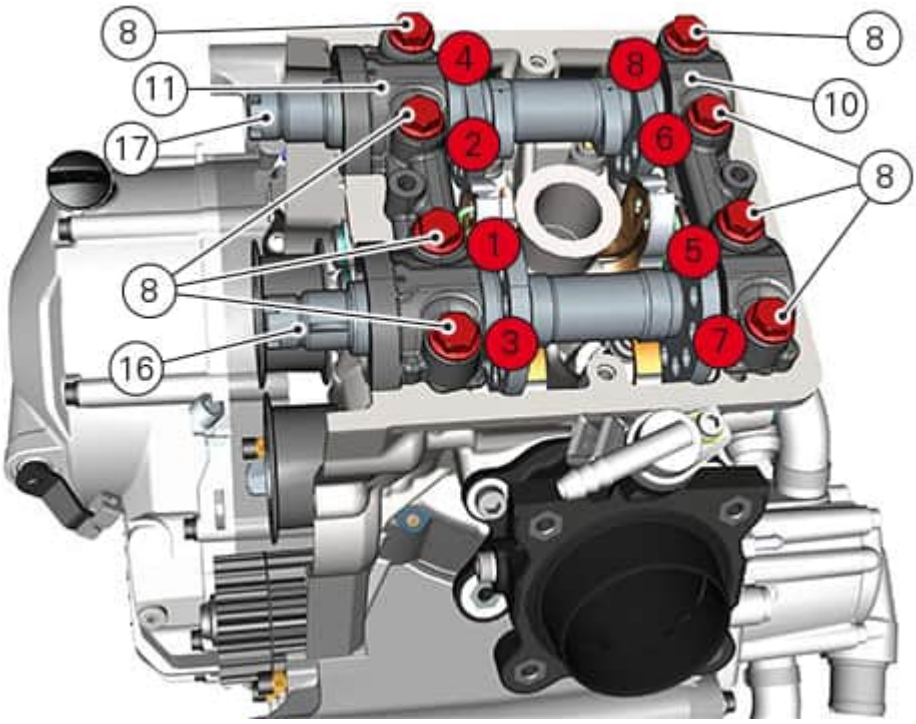
Note
Pre-tighten one cap at a time in the sequence indicated in the figure.

Then tighten screws (8) to a torque of 22.5 Nm (Min. 21 Nm - Max. 25 Nm).

Note
Tighten one cap at a time in the sequence indicated in the figure.

Remove any excess of sealant from between the cylinder head and the cap (11).
Turn the camshafts (16) and (17) by hand to check that they rotate freely.

Note
The first screw to be tightened must the one indicated in the figure (intake and timing side).



Important
Now, proceed checking the valve clearance.

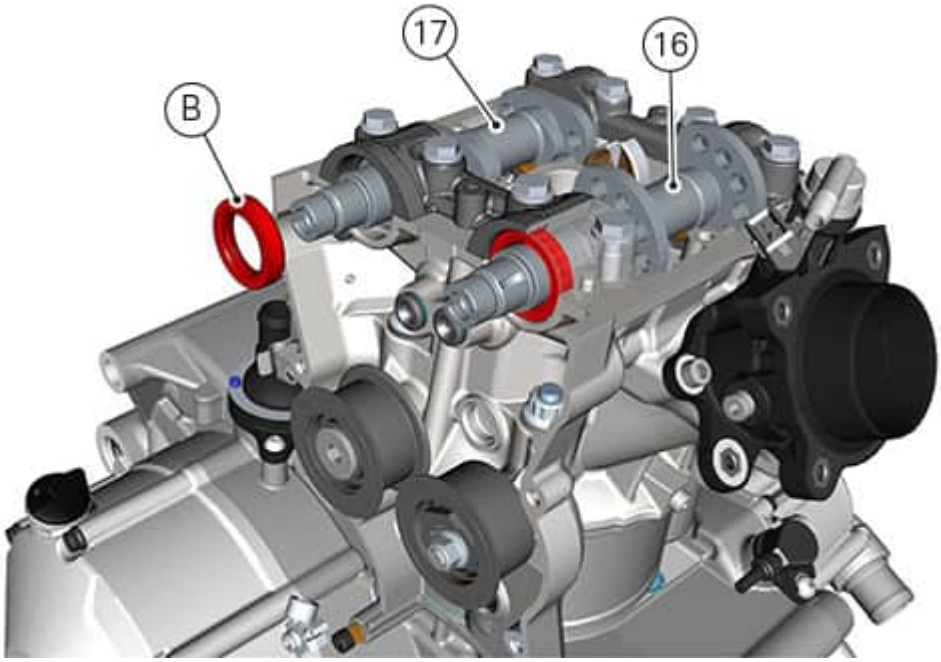
Sealing rings
Before installing seal rings (15) make sure that the relevant seats (B) on the head are perfectly clean.
Remove any excess of previously applied lubricant.

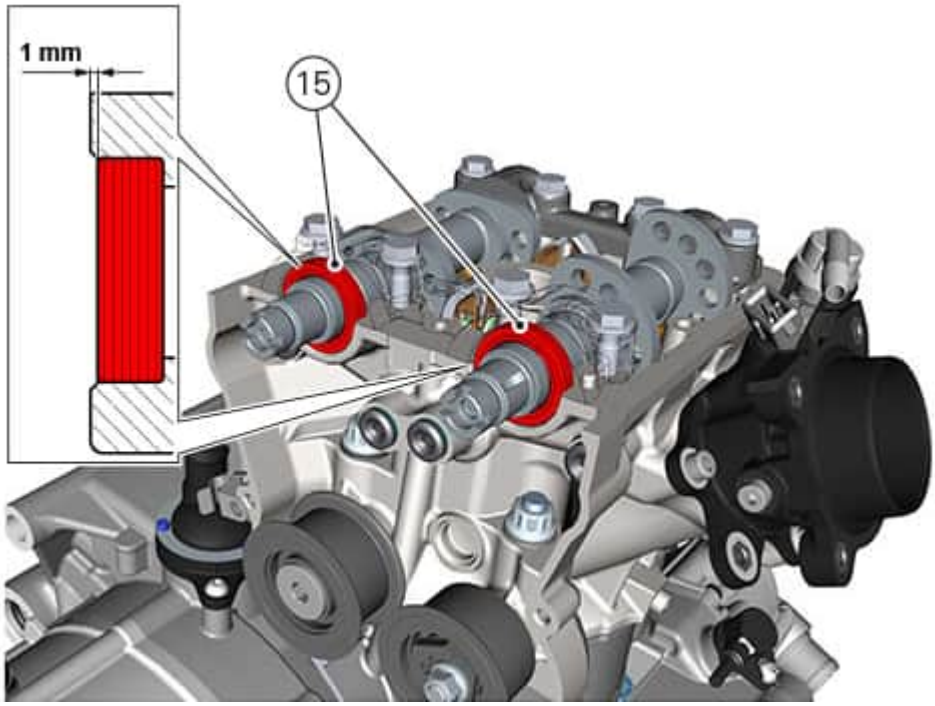
Lubricate seats (B) with KLÜBERPLUS S 06/100 (or denatured alcohol).
Only in case the ring has not been previously lubricated, lubricate the internal diameter of seal rings (15) with Shell Retinax LX2 grease (or alike), or lubricate the cap external diameter with engine oil (better if wrapping the cap in a cloth soaked in engine oil).

Note
Always make sure that the cap, the seal rings and their seats are free from surface flaws (dents, scratches, etc.) and dirt (dust, other solid residues).

Fit seal rings on camshafts (16) and (17) using tool (Z) **88713.2861**.

Note
Once installed, the seal rings must be positioned as indicated. Clean any excess of lubricant with a clean cloth.

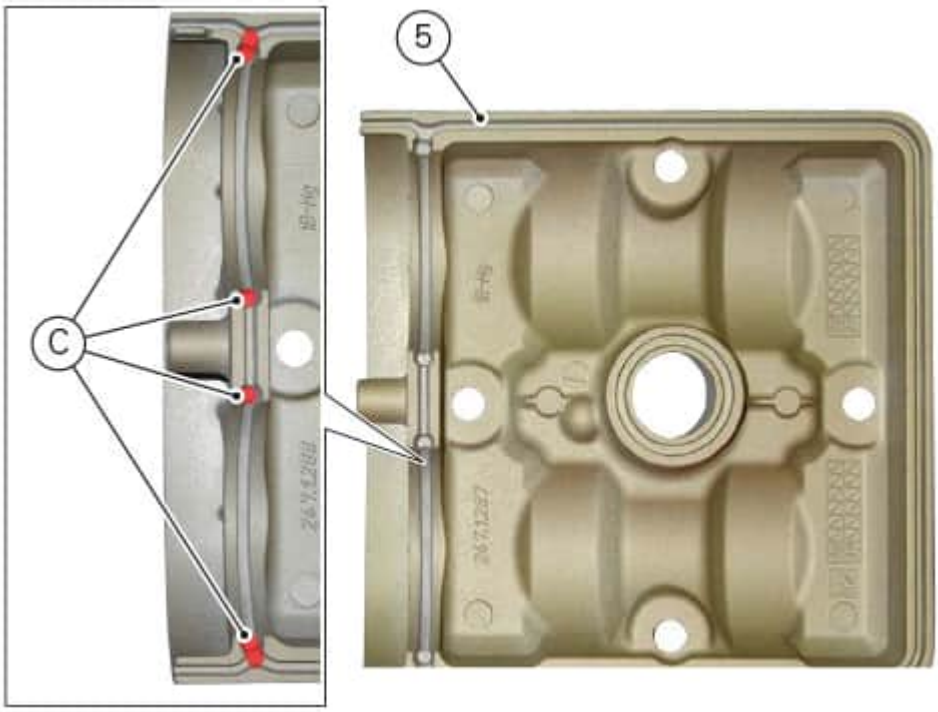




Cylinder head cover

Note
Some figures below show magnesium head cover, but the model described in the manual is equipped with aluminium alloy covers.

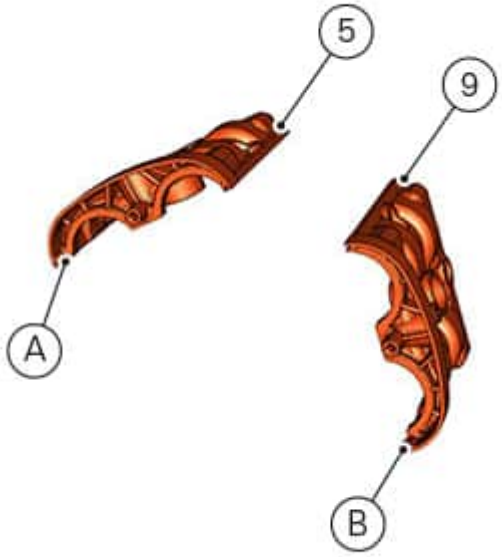
Apply sealant (Three Bond 1215 sealing compound) at the four points (C) highlighted in red of the cylinder head cover (5) as shown.

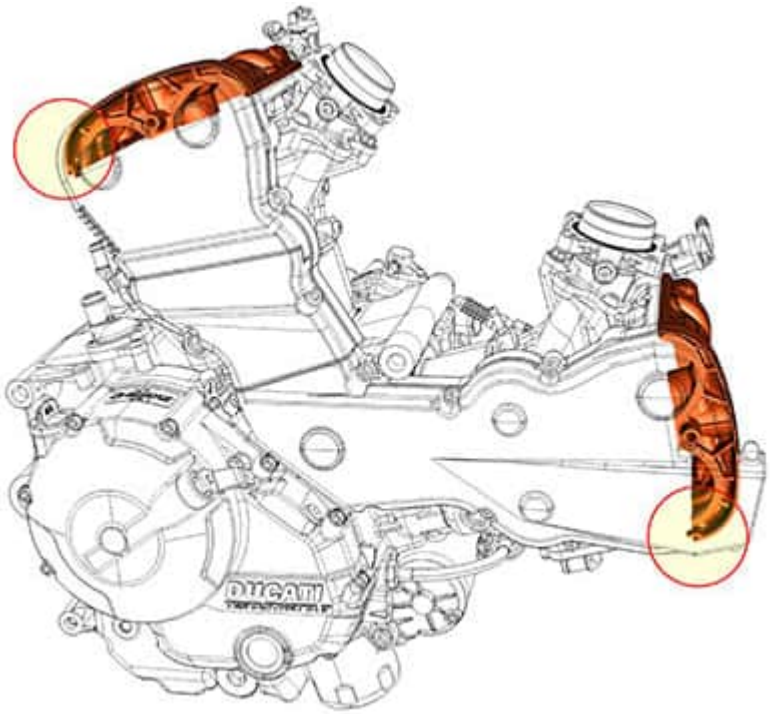


Fit the gaskets (6) and (7) on the cylinder head cover (5), as shown in the figure.

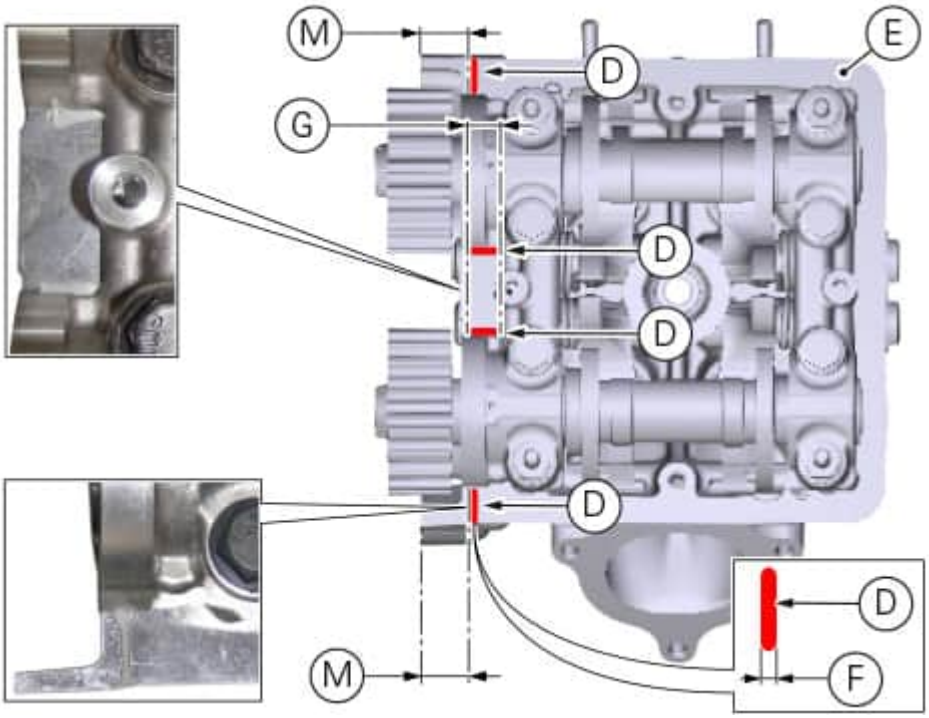


Cylinder head cover identification: the vertical head cover (5) has a tooth (A) on the left-hand side (exhaust side), whereas cover (9) has a tooth (B) on the right-hand side (exhaust side).

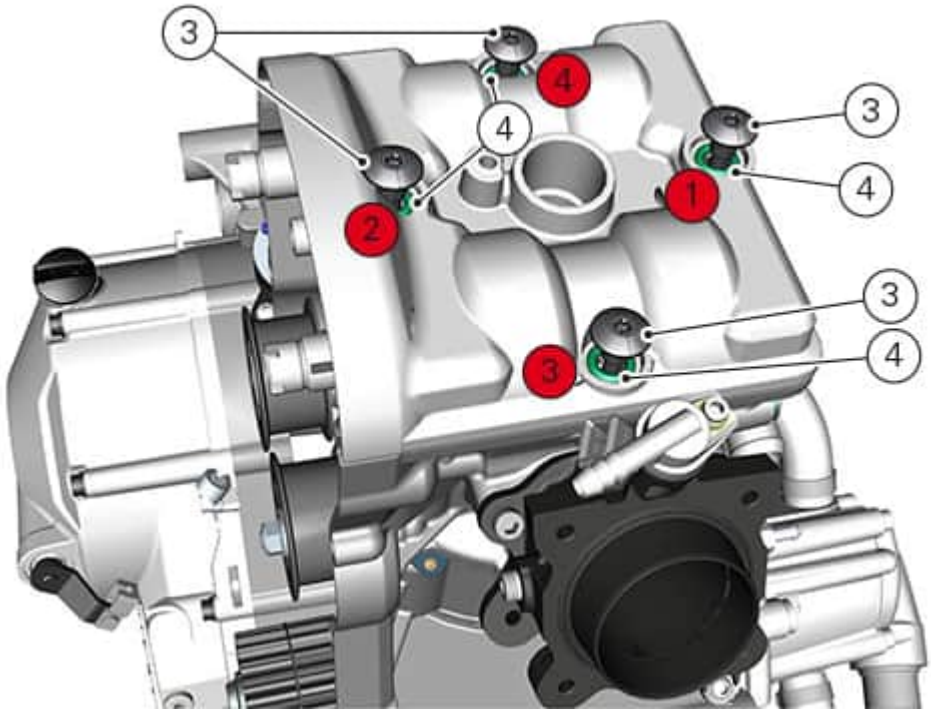




Apply a bead (F) of 2 mm (max. 4 mm) of sealant (Three Bond 1215 sealing compound) on the four areas (D) of head surface (E) (approximately in the middle of the cap machined surface, as indicated), by respecting the values and position (G), i.e. 10 ÷ 11 mm from the cap edge.
Value (M) is approximately 19 mm.



Fit cover (5) with pre-fitted gasket on the head, as shown.
Centre the cover in the four fixing holes.
Fit O-rings (4) on screws (3).
Tighten the screws (3) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm), respecting the indicated sequence.
Thoroughly remove any excess of previously applied sealant between cylinder head and cover.



Valve clearance specified values:

	Assembly value	Check value every 24.000 Km
Opening rocker arm - intake	0.13÷0.18 mm	0.10÷0.25 mm
Opening rocker arm - exhaust	0.13÷0.18 mm	0.10÷0.25 mm
Closing rocker arm - intake	0.05÷0.10 mm	0.05÷0.15 mm
Closing rocker arm - exhaust	0.05÷0.10 mm	0.05÷0.15 mm

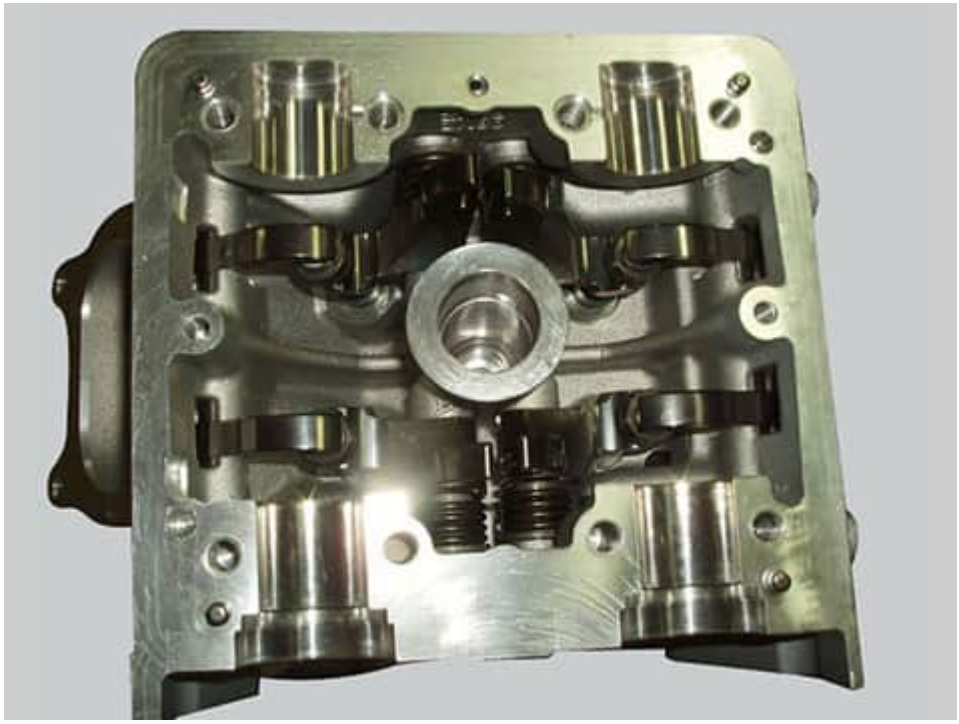
Refit the water radiator lower retainer on the engine block (Refitting the water radiator).
Refit the cooling system hoses and unions on the engine block (Refitting the cooling system hoses and unions).
Refill the cooling system (Changing the coolant).
Refit the airbox (Refitting the airbox), the intake manifold injectors, the throttle body (Refitting the throttle body), the blow-by and the oil breather pipe.
Refit the fuel tank (Refitting the fuel tank).
Refit the side fairings (Refitting the fairings).
Refit the seat (Refitting the seat).

Check of the camshafts and supports

Check the cam contact surfaces for scratches, grooves, steps and waving.
Worn cams are frequently the cause of poor timing, which leads to loss of engine power.
Place the camshaft between two opposite centres and check the run-out on the areas indicated using two dial gauges.
Service limit: 0.1 mm.

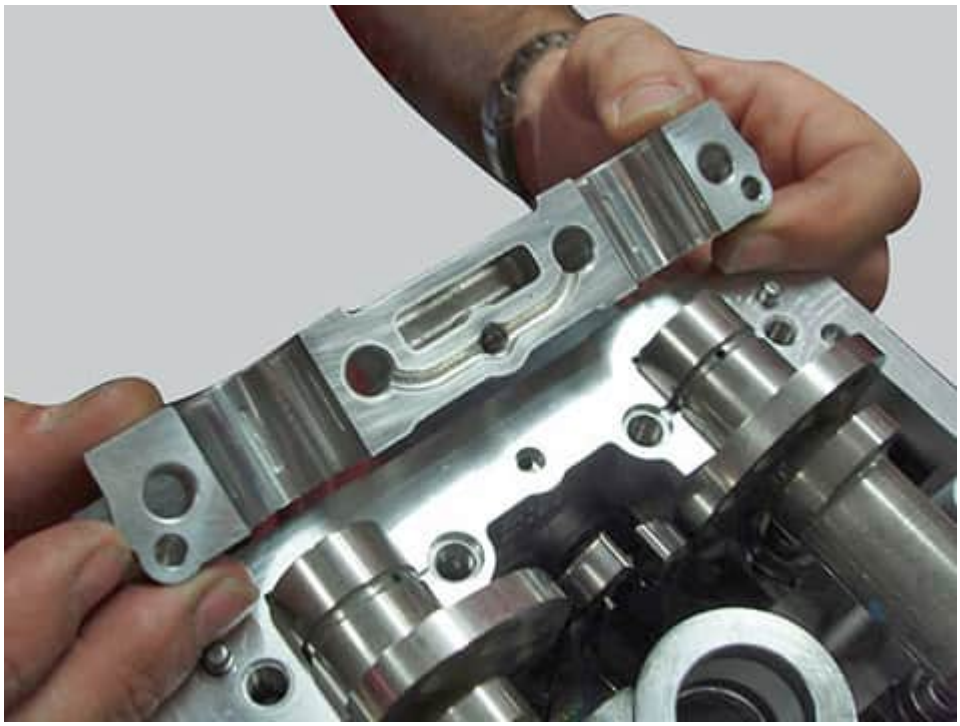


Visually inspect the camshaft tracks for scoring and abnormal wear.
If any of the above defects are found, the camshaft should be replaced.
If you find scoring or excessive wear, check the operation of the engine lubrication circuit.







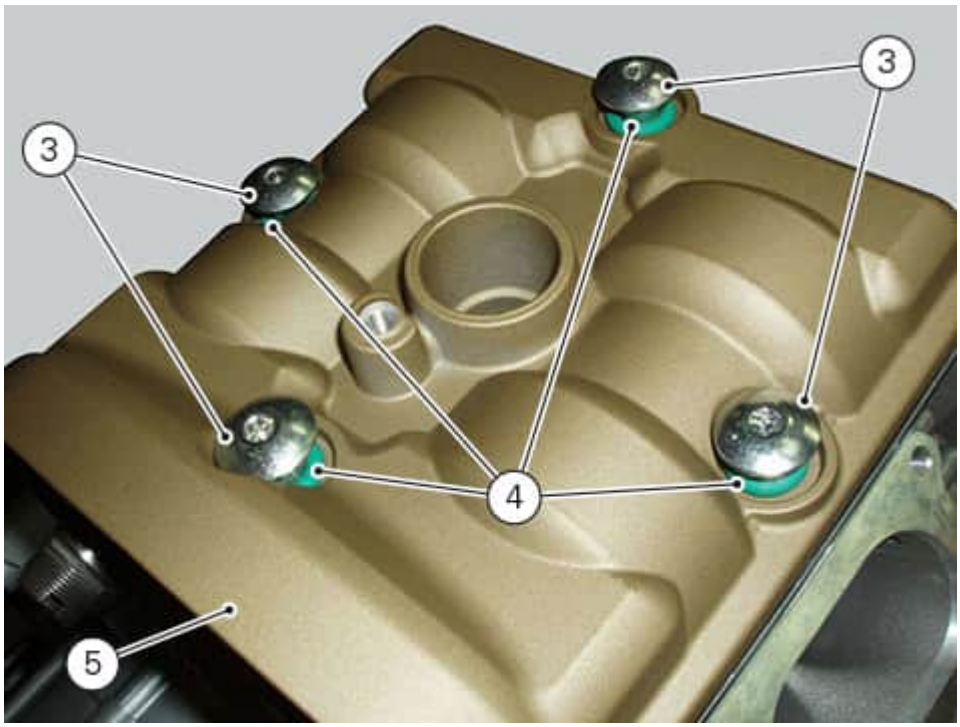


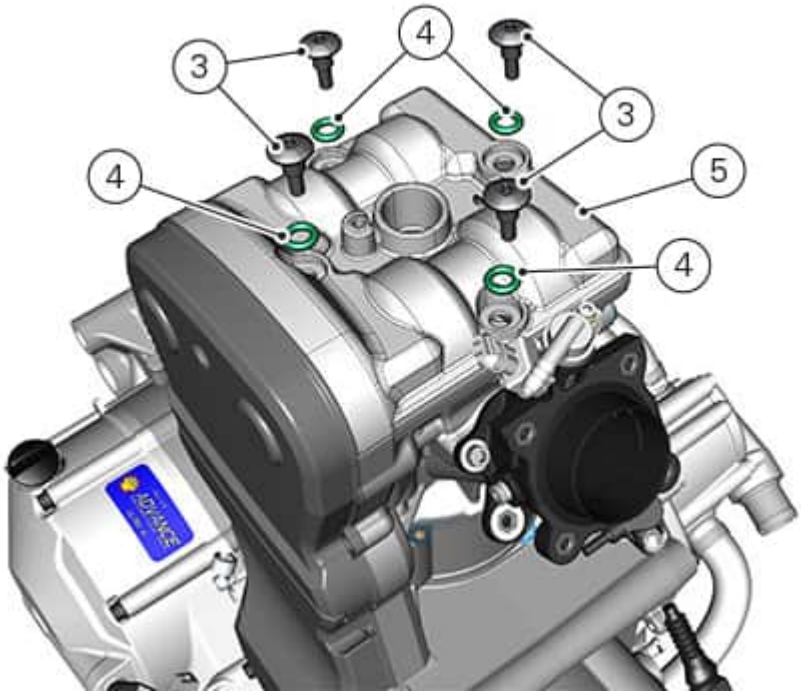
Removing the camshafts

Remove the seat (Removing the seat).
Remove the side fairings (Removing the fairings).
Remove the fuel tank (Removing the fuel tank).
Remove the airbox, the blow by and the oil breather pipe (Removing the airbox).
Remove the supply system and the injectors from the intake manifolds (Removing the throttle body).
Drain the coolant (Changing the coolant).
Remove the cooling system hoses and unions from the engine block (Removing cooling system hoses and unions).
Remove the water radiator lower retainer from the engine (Removing the water radiator).
Remove the spark plugs.

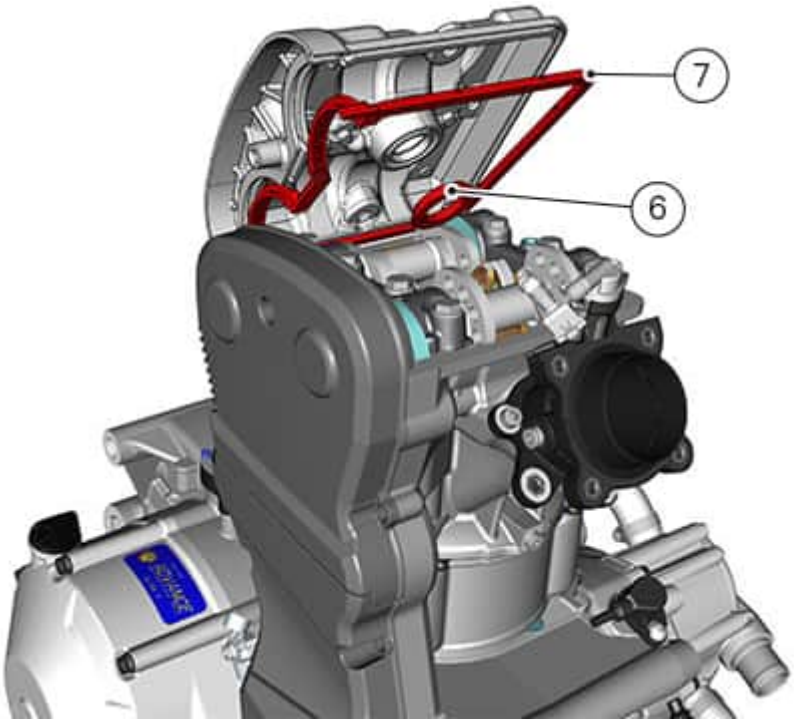
Note
Some figures below show magnesium head cover, but the model described in the manual is equipped with aluminium alloy covers.

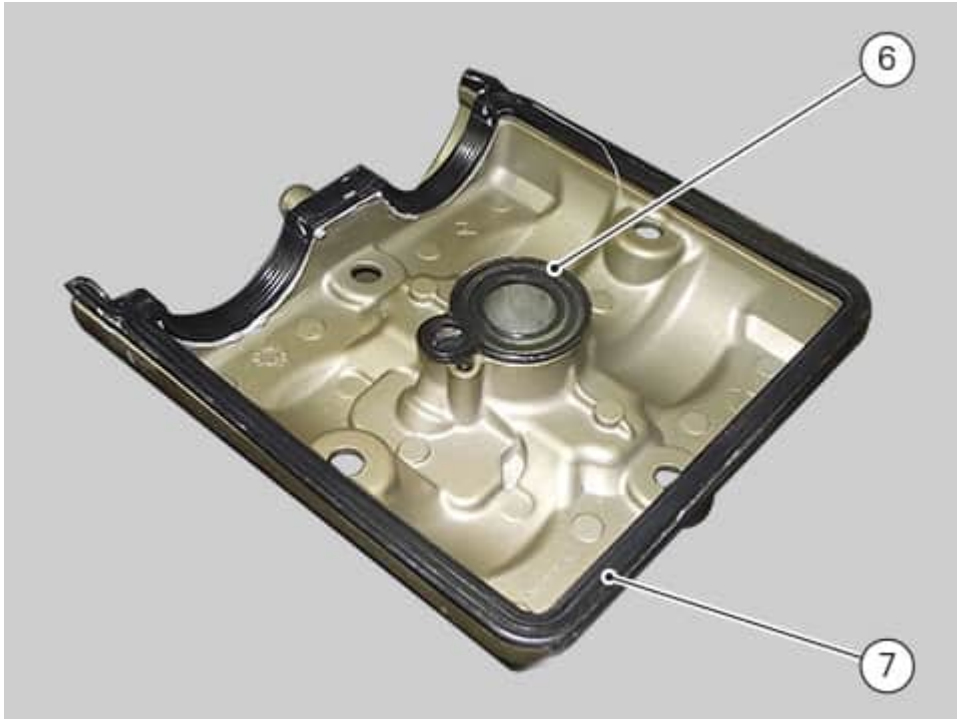
Undo and remove the screws (3) and the O-rings (4) from the cylinder head covers.
Remove the cylinder head cover (5).



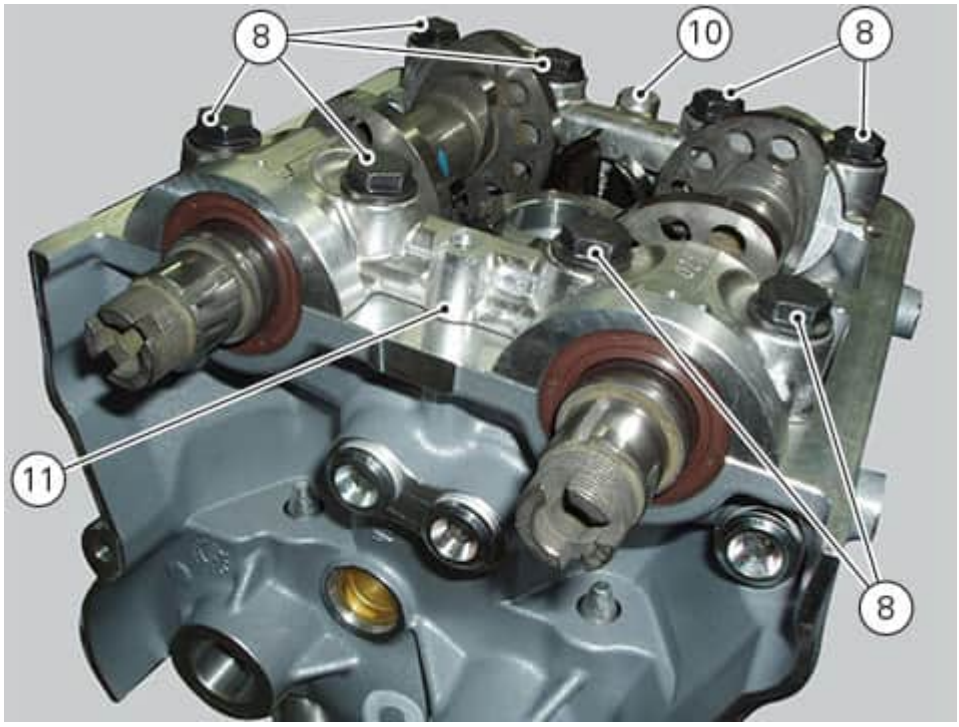


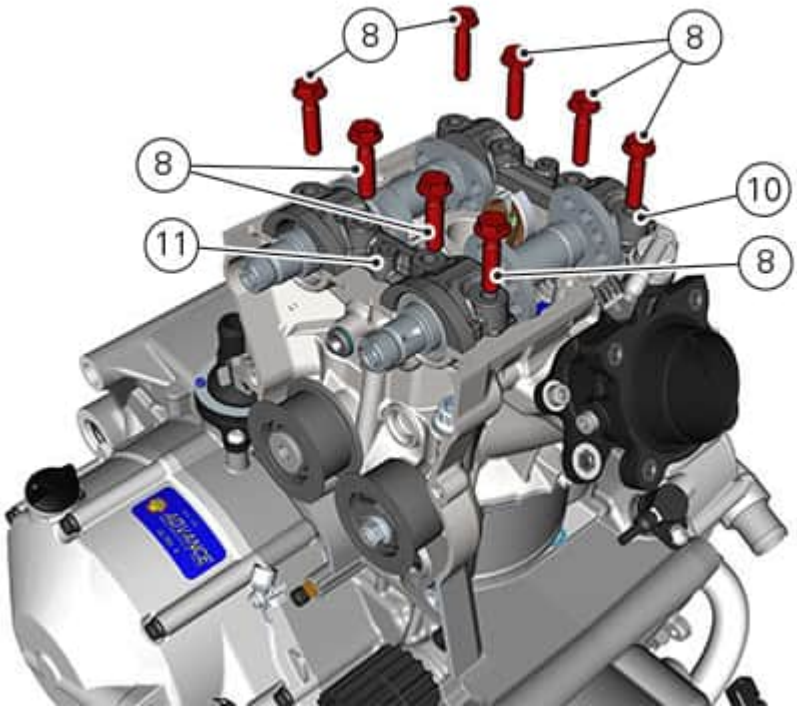
Remove gaskets (6) and (7) from the cylinder head cover (5).

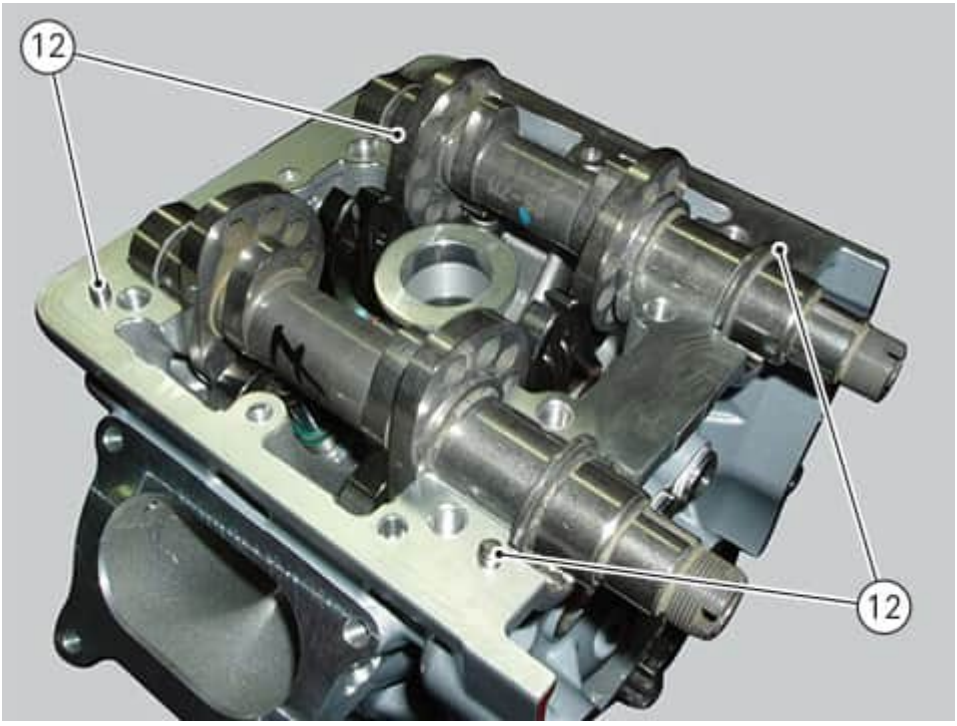


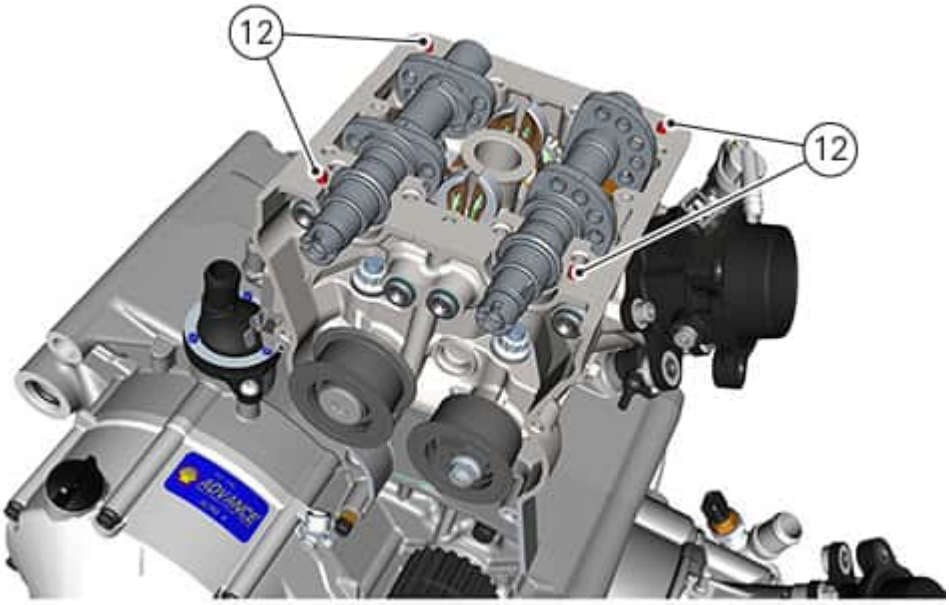


Repeat the same procedure for the other head cover.
Undo the screws (8) securing the camshaft supports.
Withdraw the camshaft supports (10) and (11) straight out from the cylinder head, taking care not to damage the machined faces and centring dowels (12).

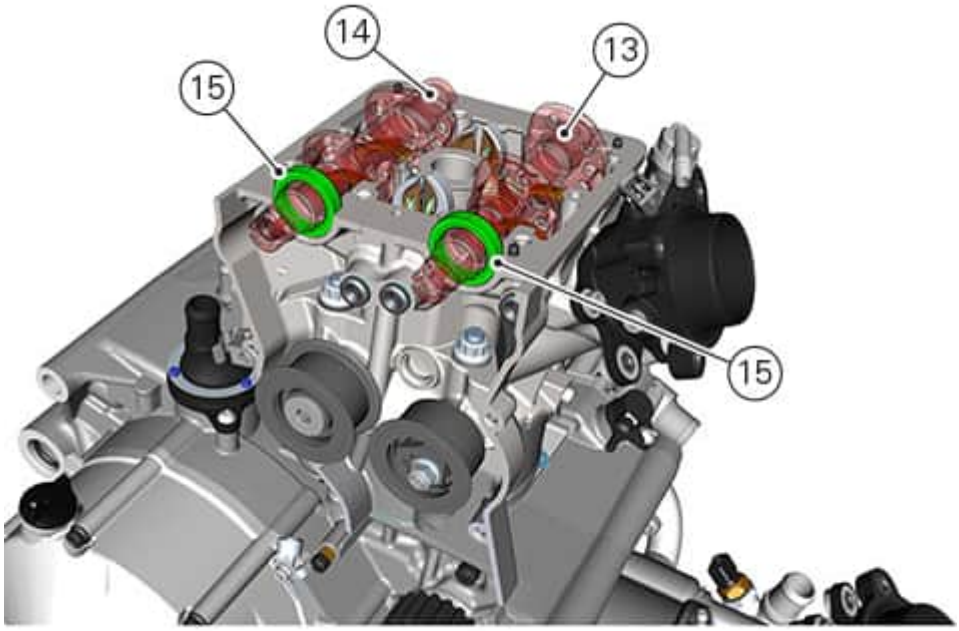



8
8
8
10
11
8


12
12



Remove the exhaust side camshafts (13) and (14) and slide out sealing rings (15) positioned at their ends. Repeat the same procedure for the other cylinder head.



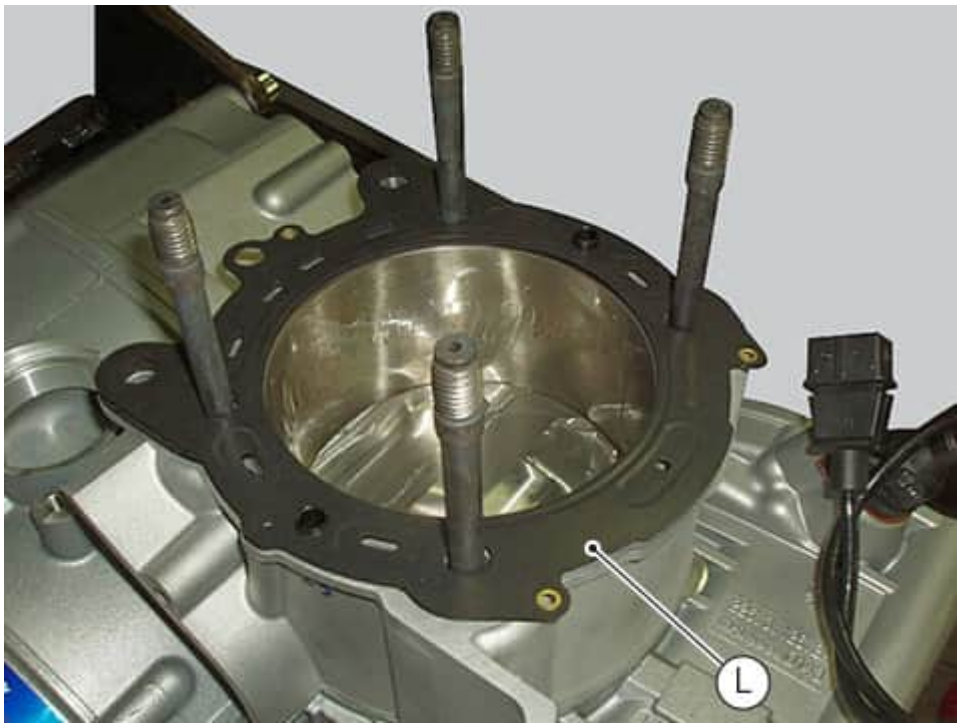
Refitting the cylinder head assemblies

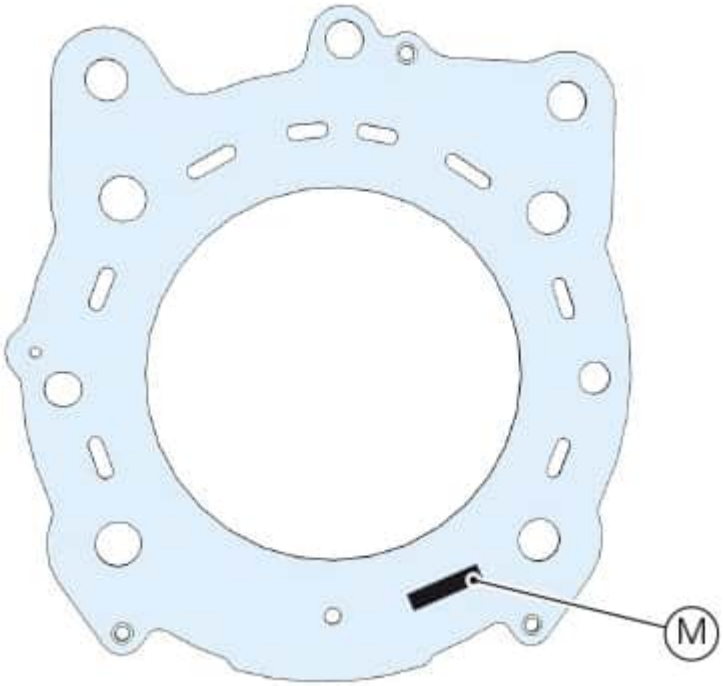
Warning

To prevent oil leaks in the contact area between cylinders and crankcase, each time the head is removed, cylinder and piston must be removed as well to clean the mating faces of crankcase and cylinder and restore the worn gaskets and O-rings and apply again sealing compound.

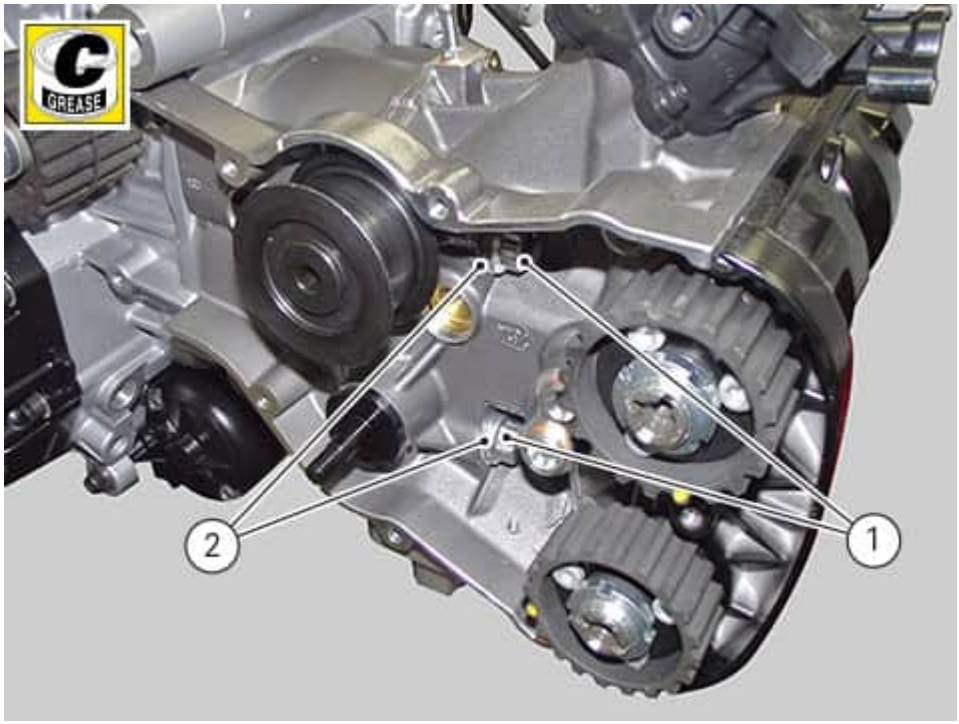
Before fitting the head, check that the gasket is fitted on the mating surface between head and cylinder.

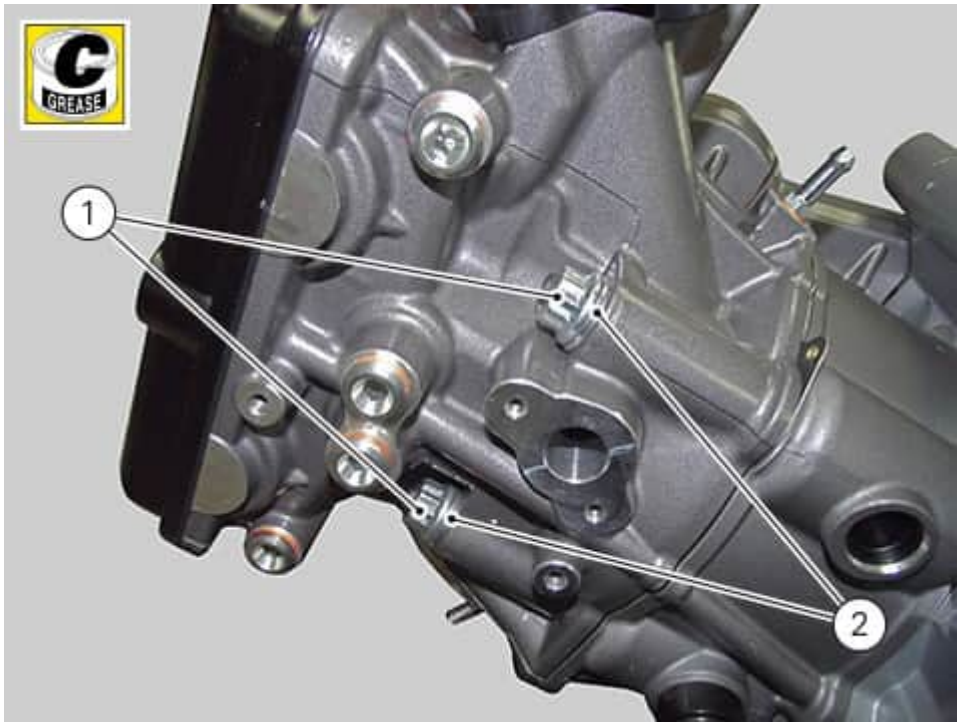
When fitting the gasket, side (L) with the stamped part no. (M) must be in contact with the cylinder head.

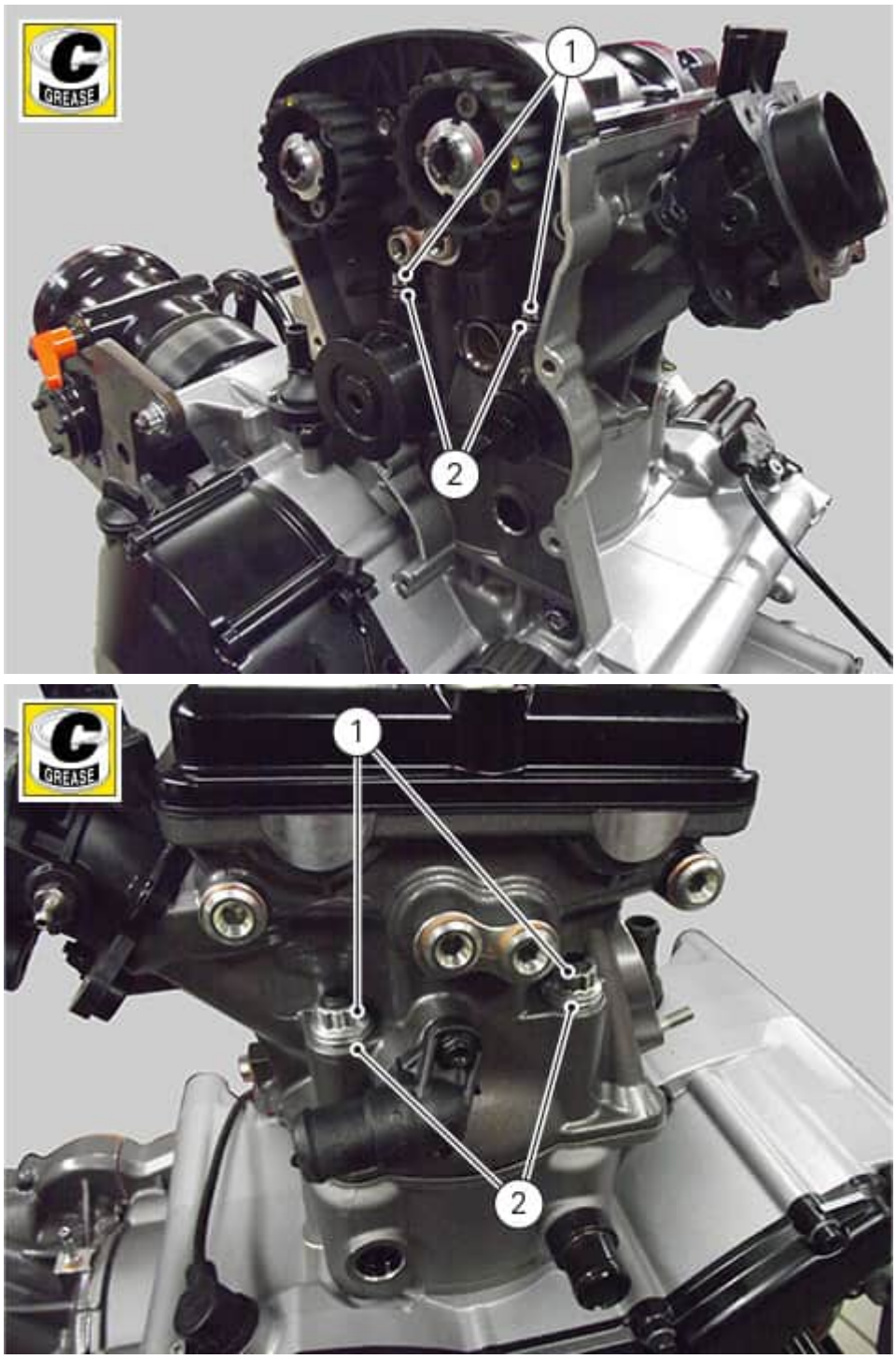




Lower the cylinder head carefully over the thru bolts. Take care not to damage the threads.
Apply specified grease on the underhead of nuts (1) and on the thru bolt thread.
Fit the special washers (2) and polygonal nuts (1) onto the cylinder head thru bolts.
Screw the polygonal nuts (1) on the thru bolts following a cross pattern using tool no. **88713.2676** together with a torque wrench.
Apply a snug torque of 20 Nm to nuts (1), a pre-tightening to a torque of 40 Nm (Min. 38 Nm - Max. 48 Nm) and a tightening to a torque of 60 Nm (Min. 57 Nm - Max. 63 Nm).


C
GREASE
2
1

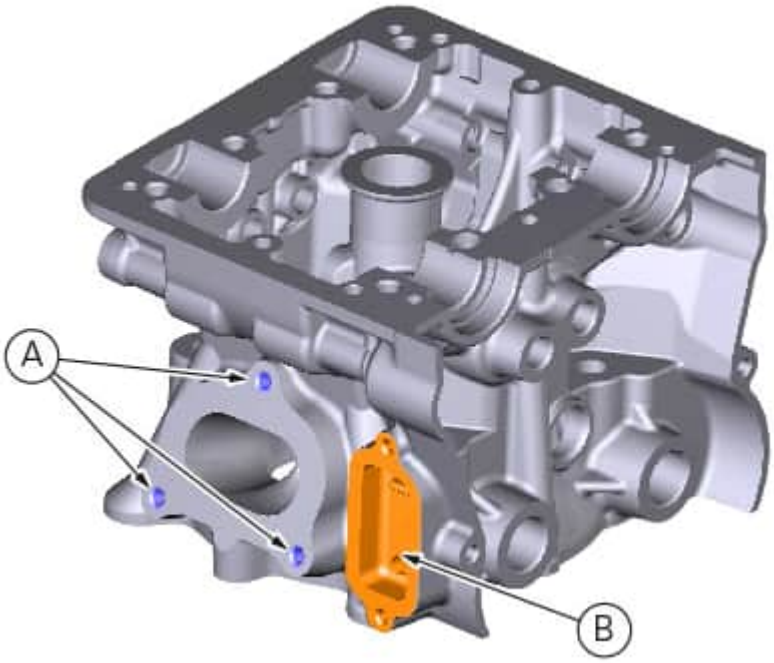

C
GREASE
1
2



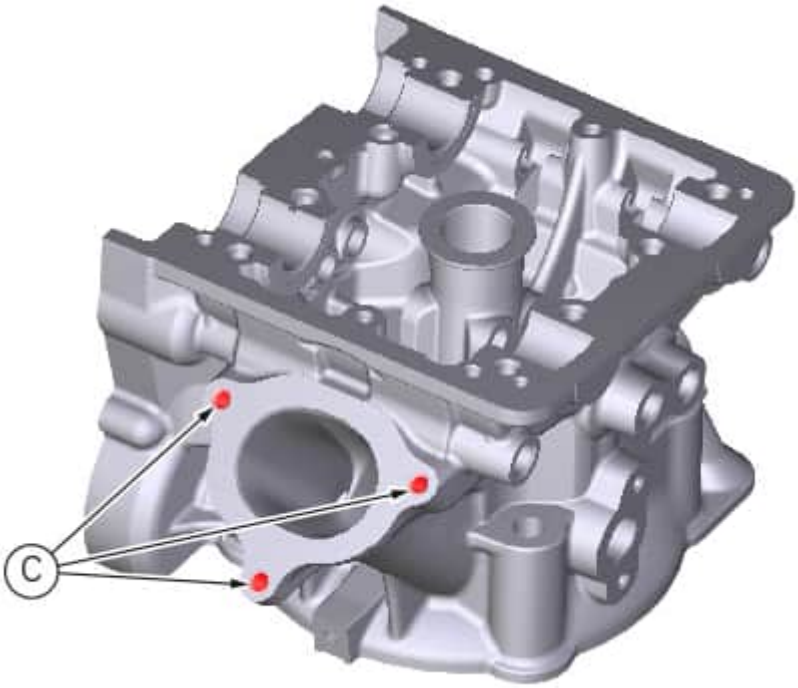
Refit the intake manifolds (Refitting the intake manifold and water union).
Refit the timing belts (Refitting the timing belts) and the timing belt external covers (Refitting timing belt external covers).
Refit the exhaust system (Refitting the exhaust system).
Refit the water radiator on the engine (Refitting the water radiator).
Refit the cooling system hoses and unions on the engine block (Refitting the cooling system hoses and unions).
Refill the cooling system (Changing the coolant).
Refit the injectors on the intake manifolds and the supply system.
Refit the blow-by and the oil breather pipe, the throttle body (Refitting the throttle body) and the airbox (Refitting the airbox).
Refit the fuel tank (Refitting the fuel tank).
Refit the side fairings (Refitting the fairings).
Refit the seat (Refitting the seat).

Reassembling the cylinder head

The exhaust side can be recognised by the presence of three threaded holes (A) on the flange and a recess to fix the secondary air cover (B).



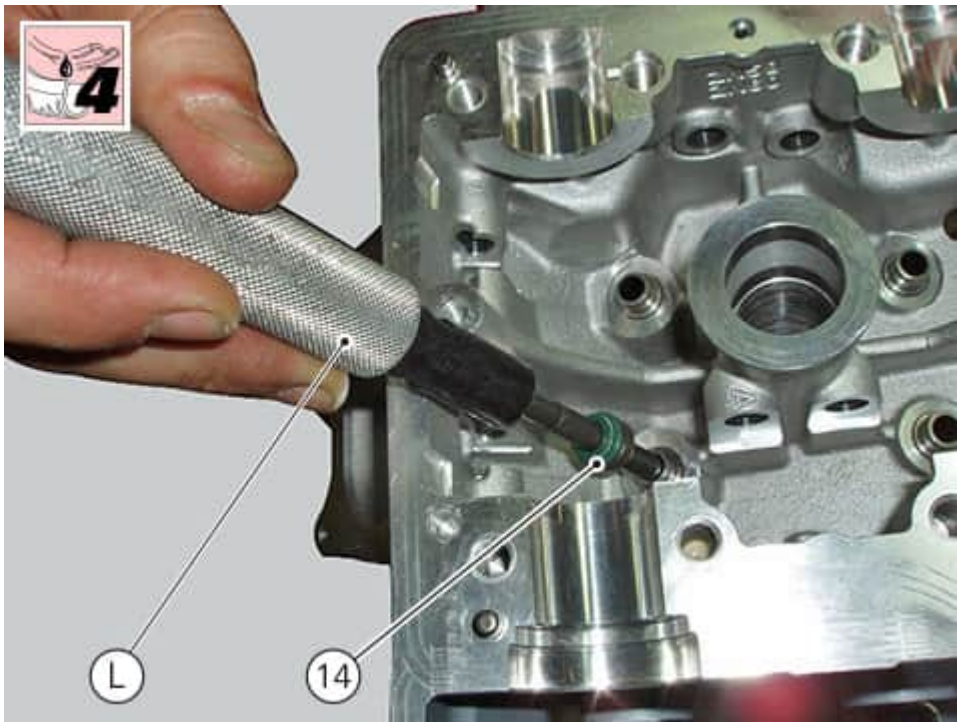
The intake side can be identified by the presence of threaded holes (C) on the flange.



All the figures in this chapter refer to a vertical cylinder head.

Valve guide sealing rings

Position the cylinder head on the appropriate support **88713.2103**.
Use denatured alcohol to lubricate the valve guide sealing rings (14) and insert them from the spring side onto tool (L) no. **88713.2442**.
Fit the end of the tool into the valve guide and use a hammer to tap the sealing rings (14) home into the valve guides.

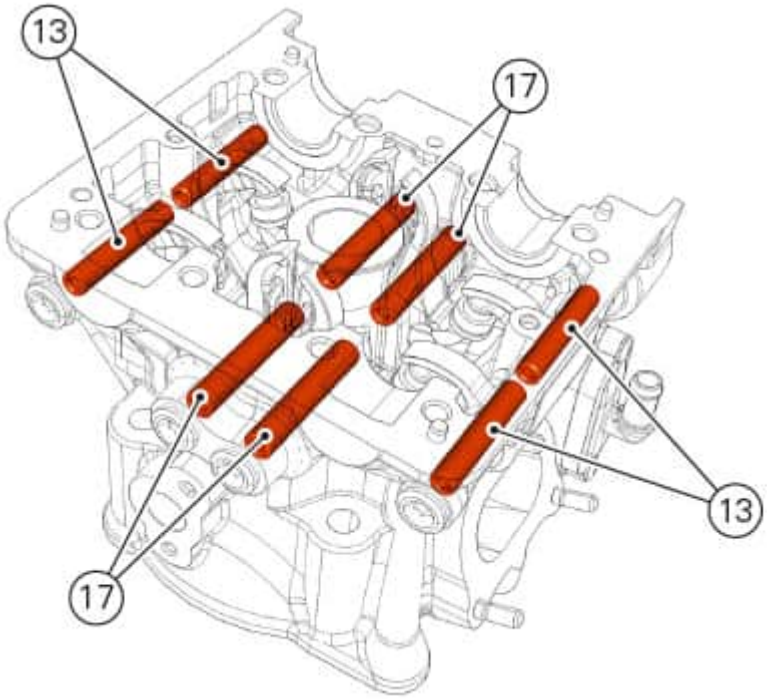


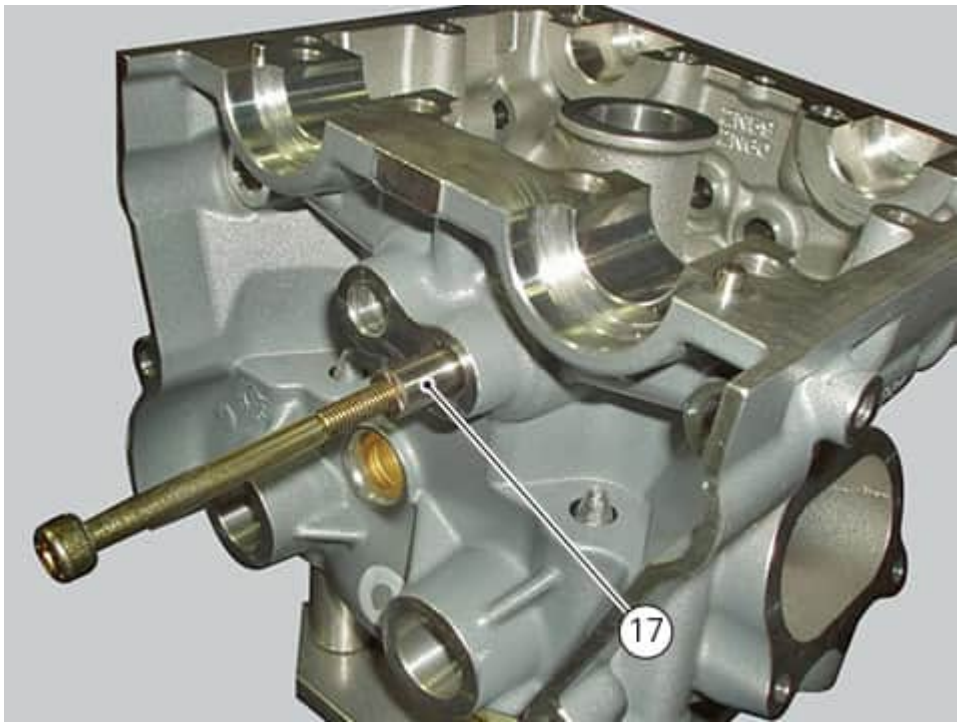
Reassembling the closing rocker arms

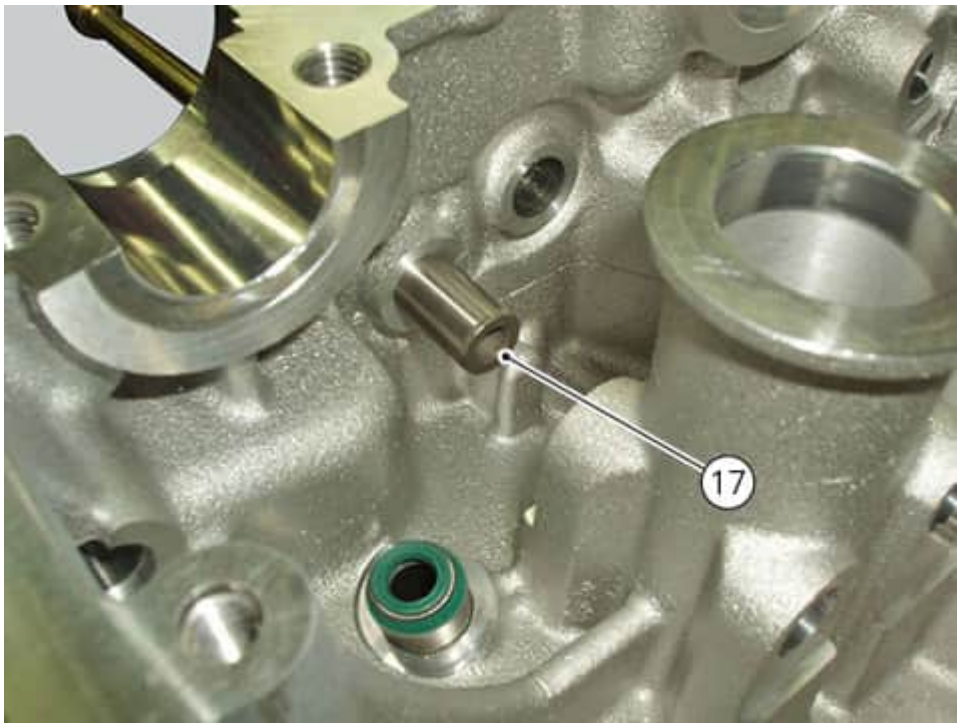
Check that the rocker arms are not scored or show signs of breakage in the area of contact with the camshaft and shim.

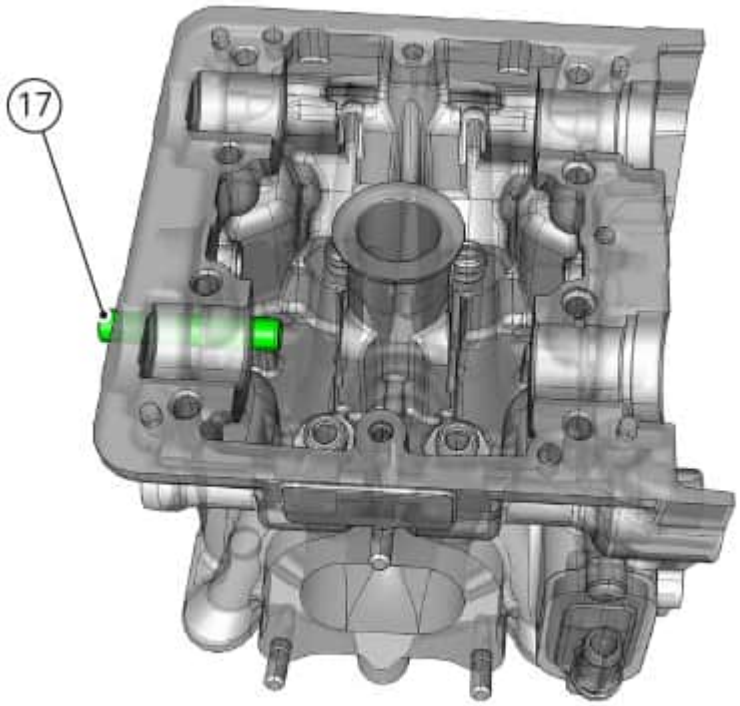
The closing rocker arm shafts (17) feature a 10 mm diameter, whereas the opening rocker arm shafts (13) feature a 9 mm diameter.

Using an M6 screw, position the closing rocker shaft (17) towards the exhaust side of the cylinder head.



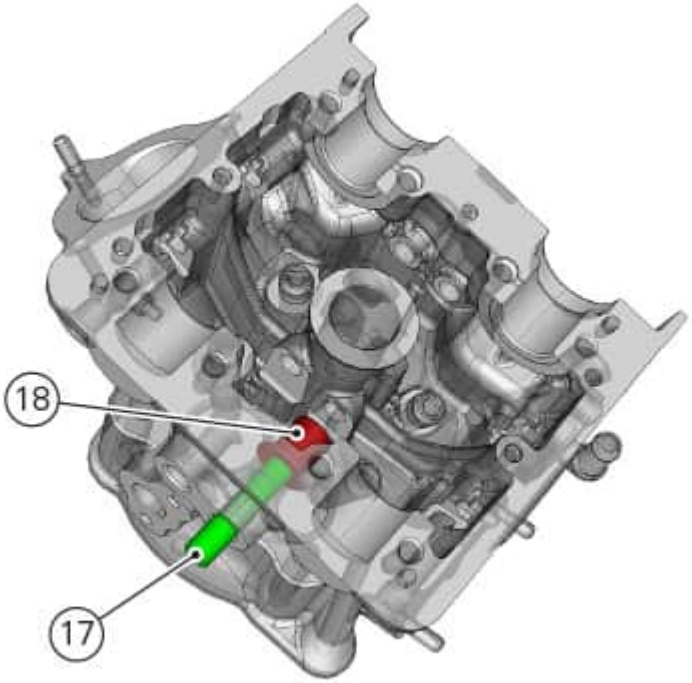

17


17

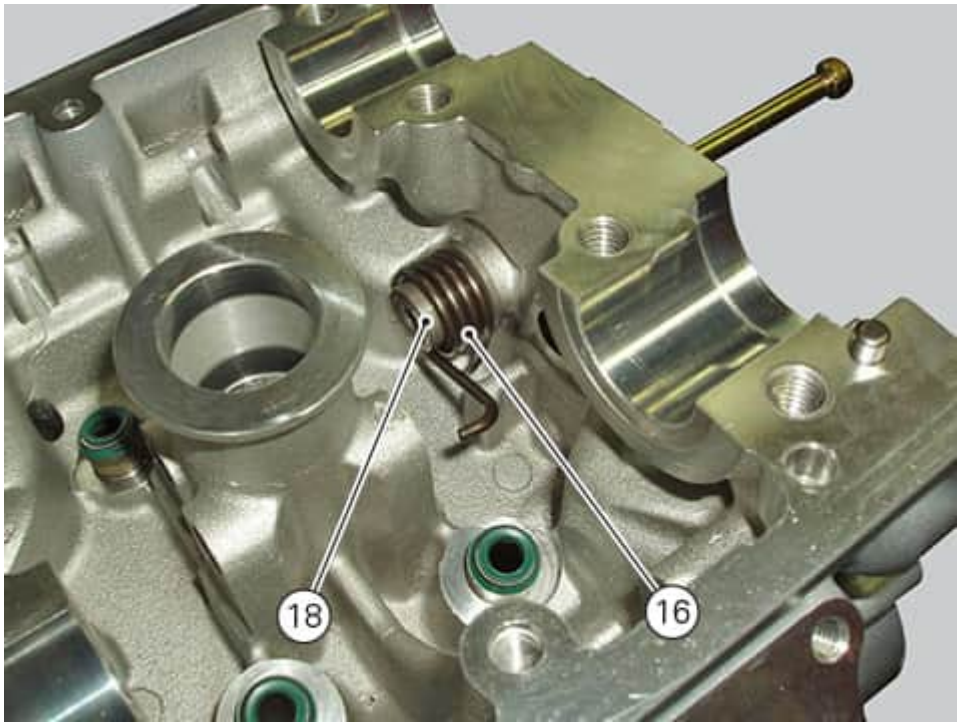


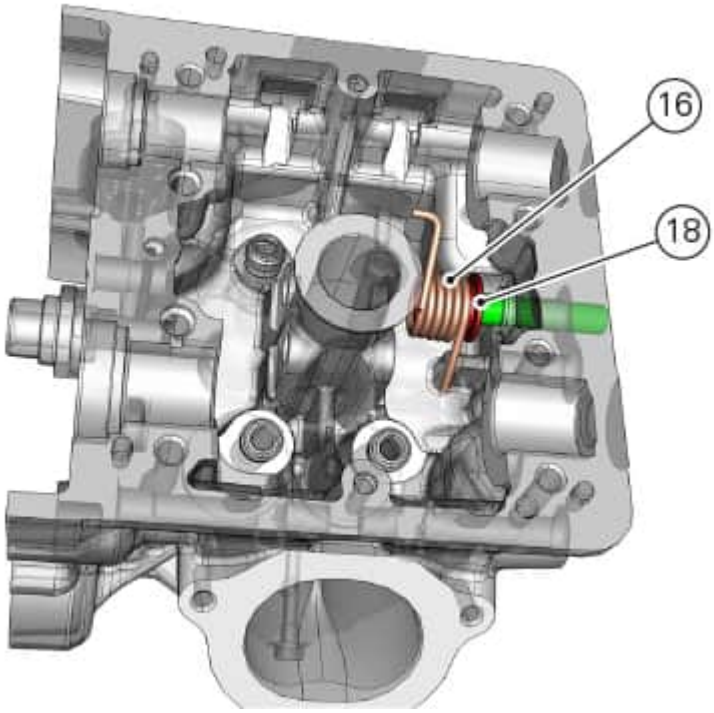
Locate the spacer (18) on the shaft.

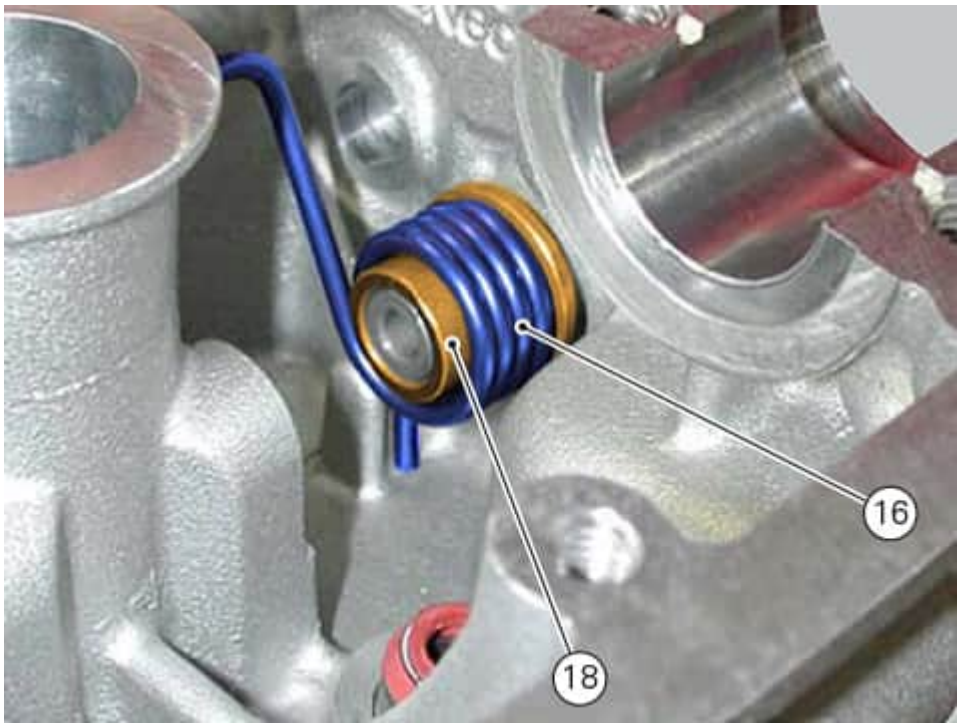




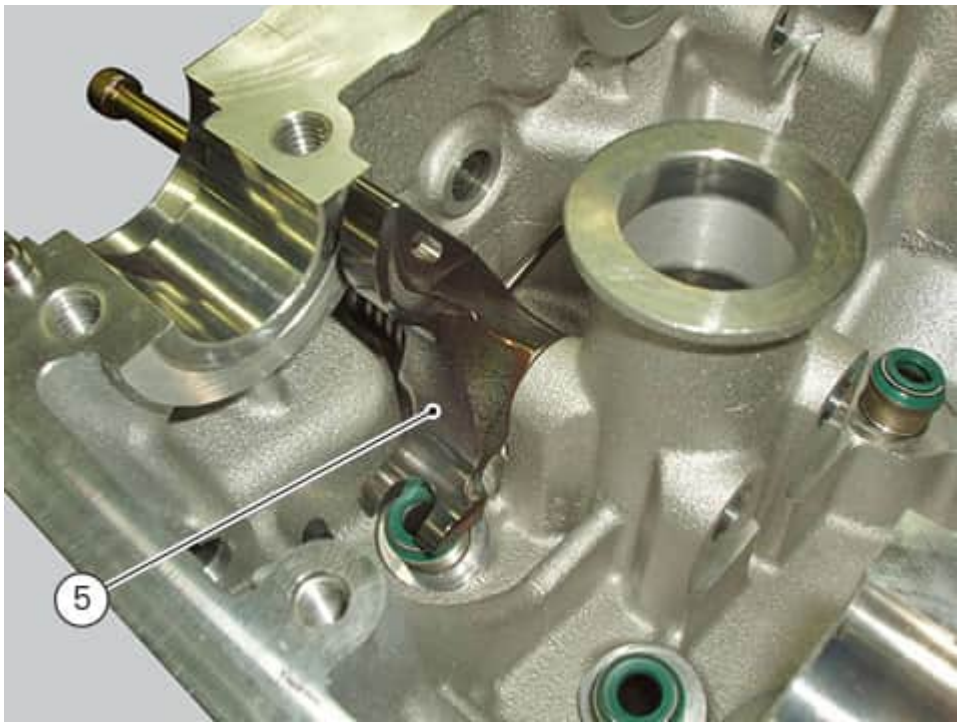
Place spring (16) on spacer (18), as shown in the figure, by engaging one end in the relevant seat on the cylinder head.



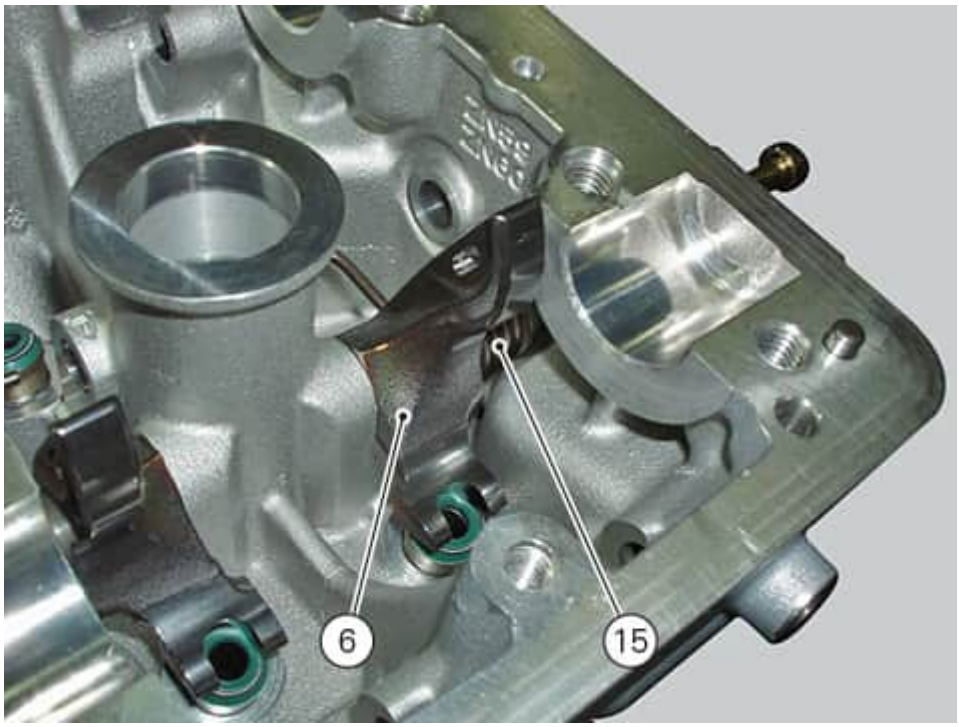




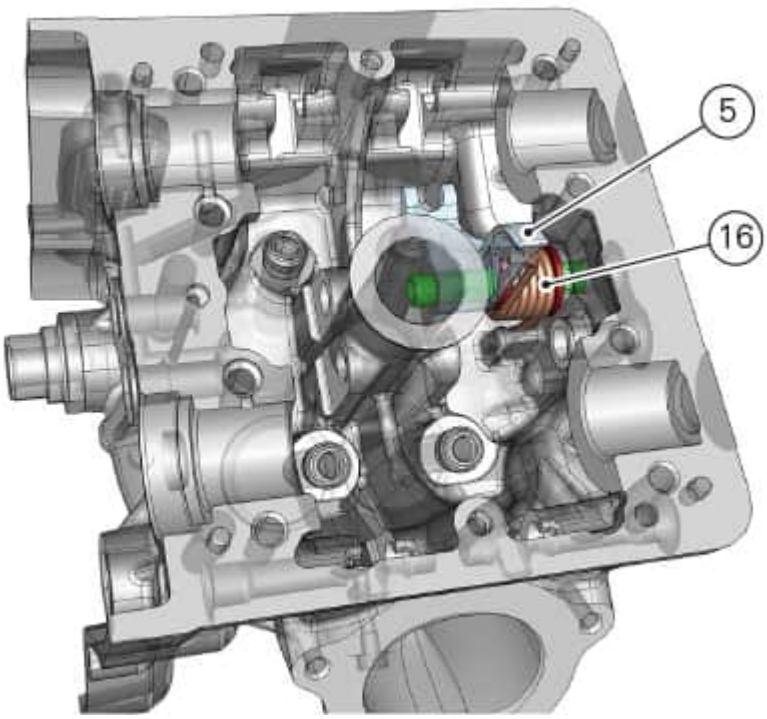
Place the closing rocker arm (5) in its seat having care that the through hole is aligned with the closing rocker arm shaft; then push the shaft fully home.

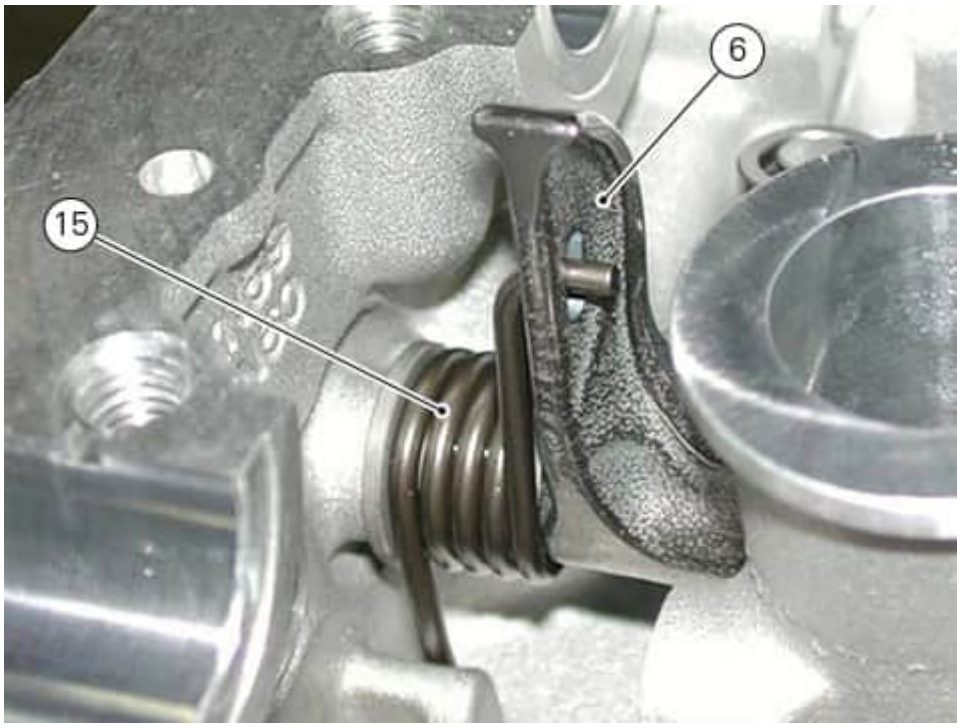


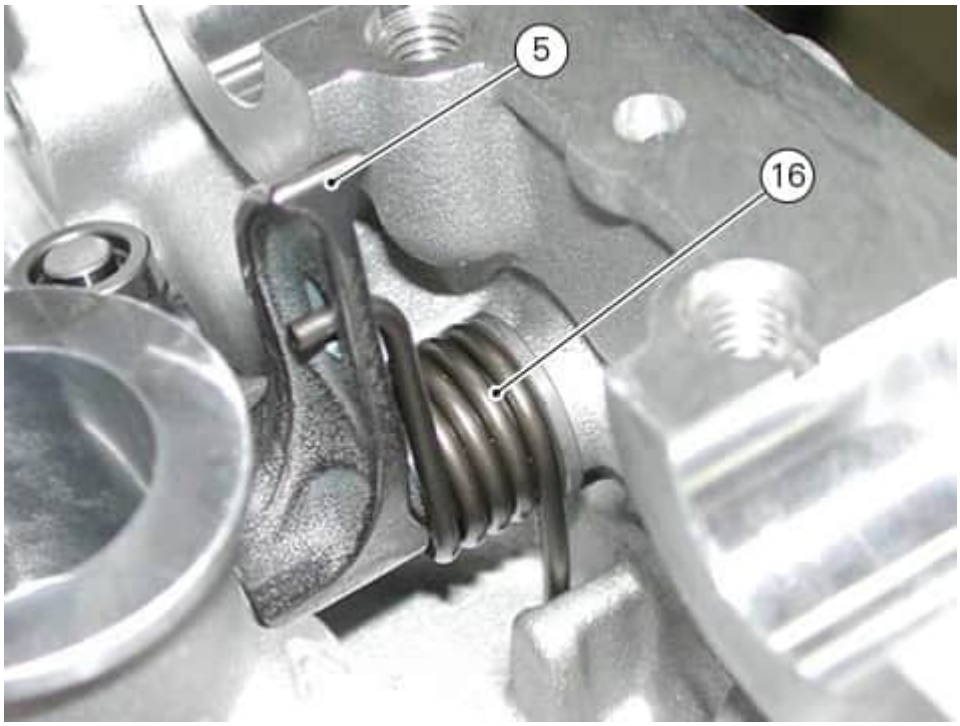
Proceed in a similar manner to install the closing rocker arm (6) with the spring (15).



Load the springs (16) and (15) on the closing rocker arms (5) and (6) respectively using the tool no. **88713.2069**.


5
16

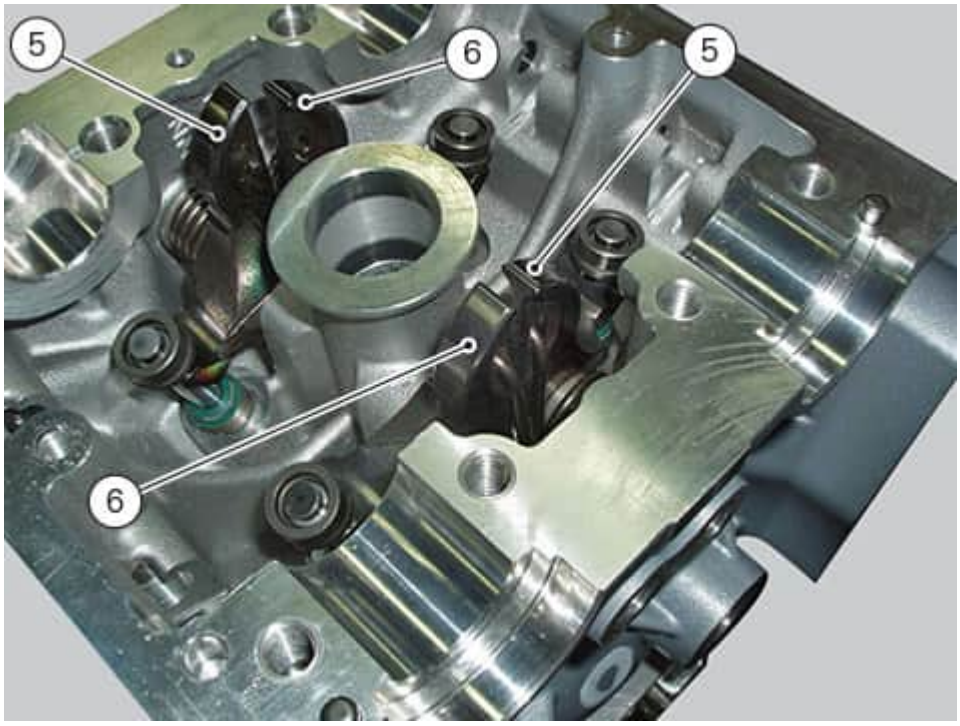

6
15



Fit closing rocker arms (6) and (5), the relevant springs and the relevant shafts on the exhaust side as for the intake side.

Note
Always install the closing rocker arms on the exhaust side before those on the intake side.

Warning
Take care not to damage the shoe of the closing rocker arm with the intake spring during assembly.

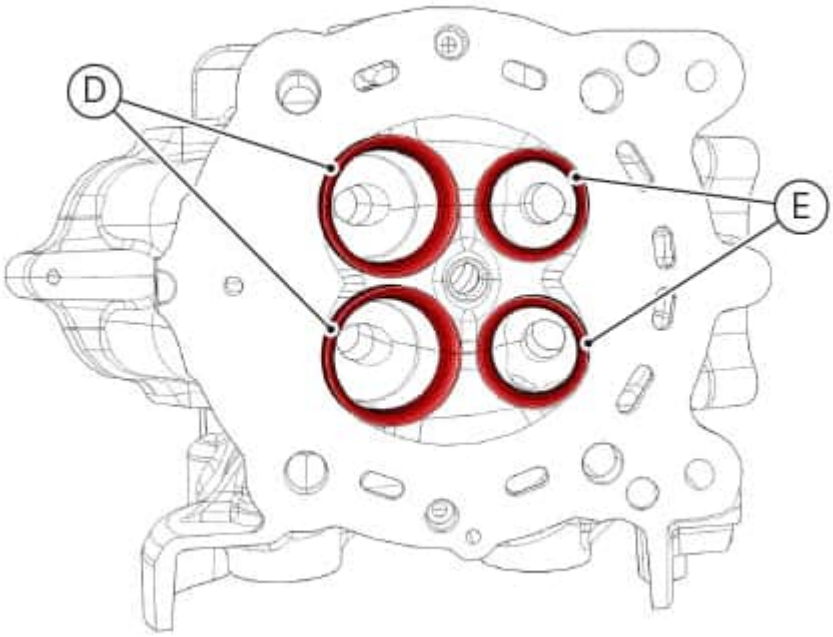


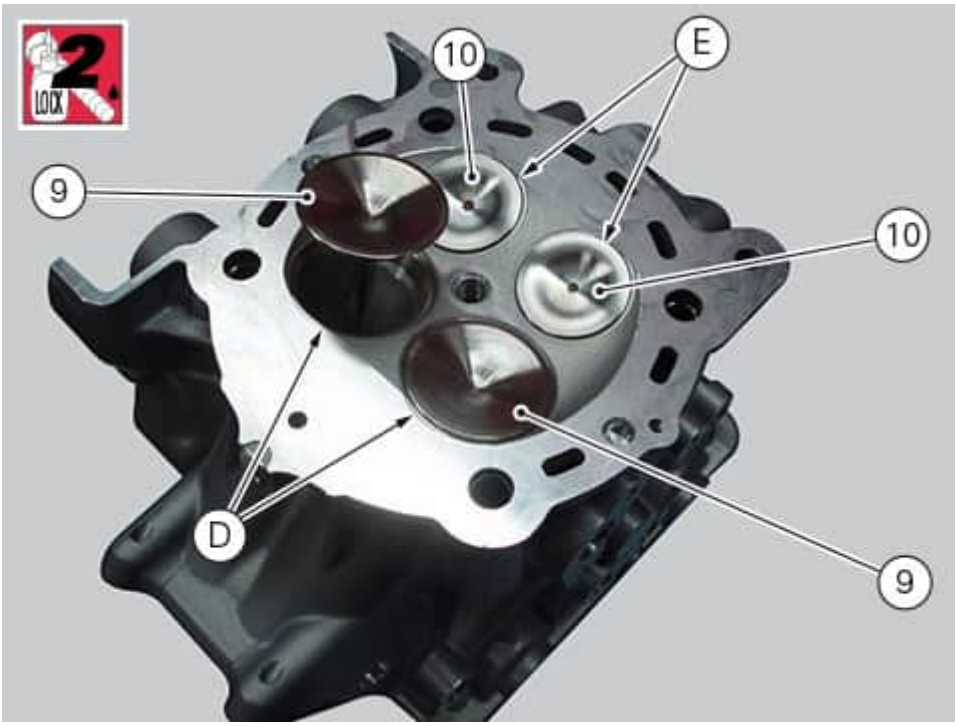
Refitting valves, closing shims and split rings

Carefully clean the two intake valve seats (D) and the two exhaust valve seats (E). Use engine oil to lubricate the central part of the two intake valve (9) and of the two exhaust valve (10) stems.

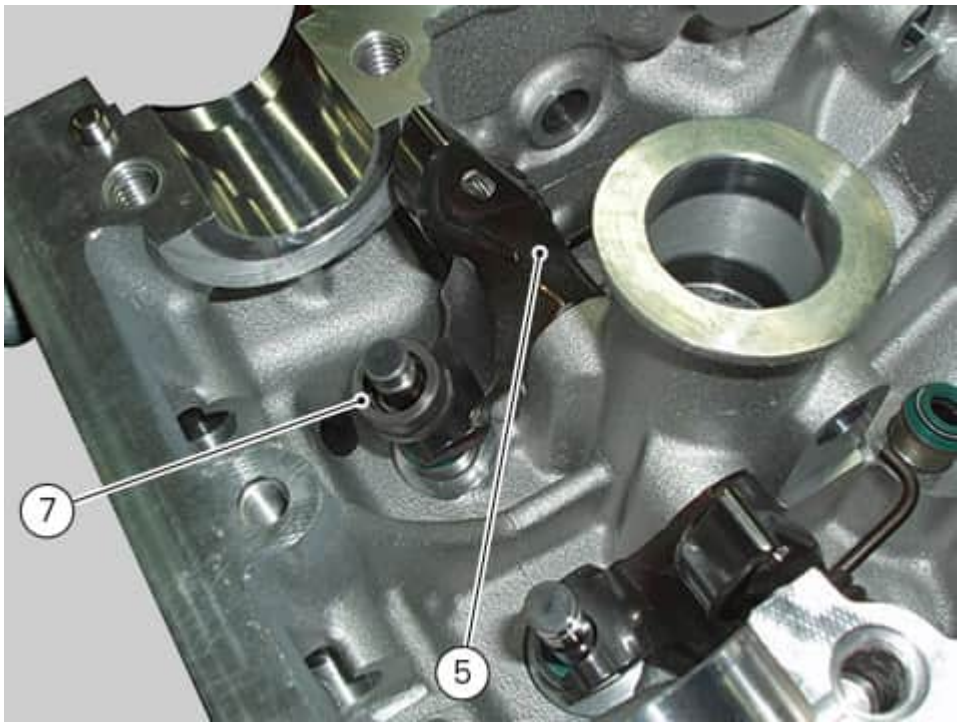
Warning
Apply engine oil on the valve stems only in the indicated area, having care not to oil the groove.

Fit the valves in their seats on cylinder head, fully home.

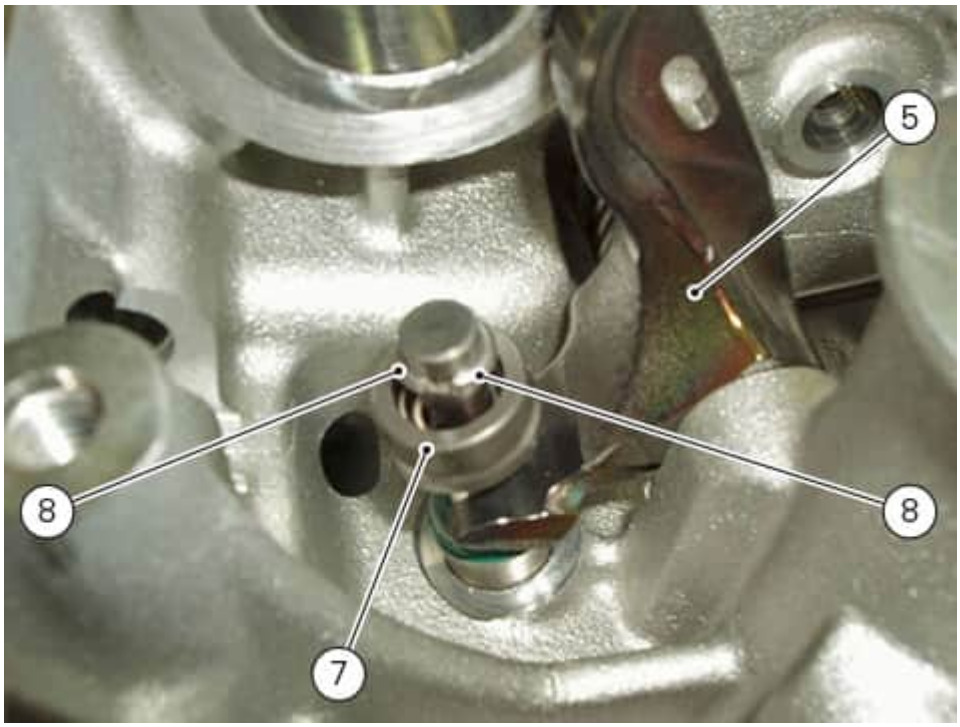


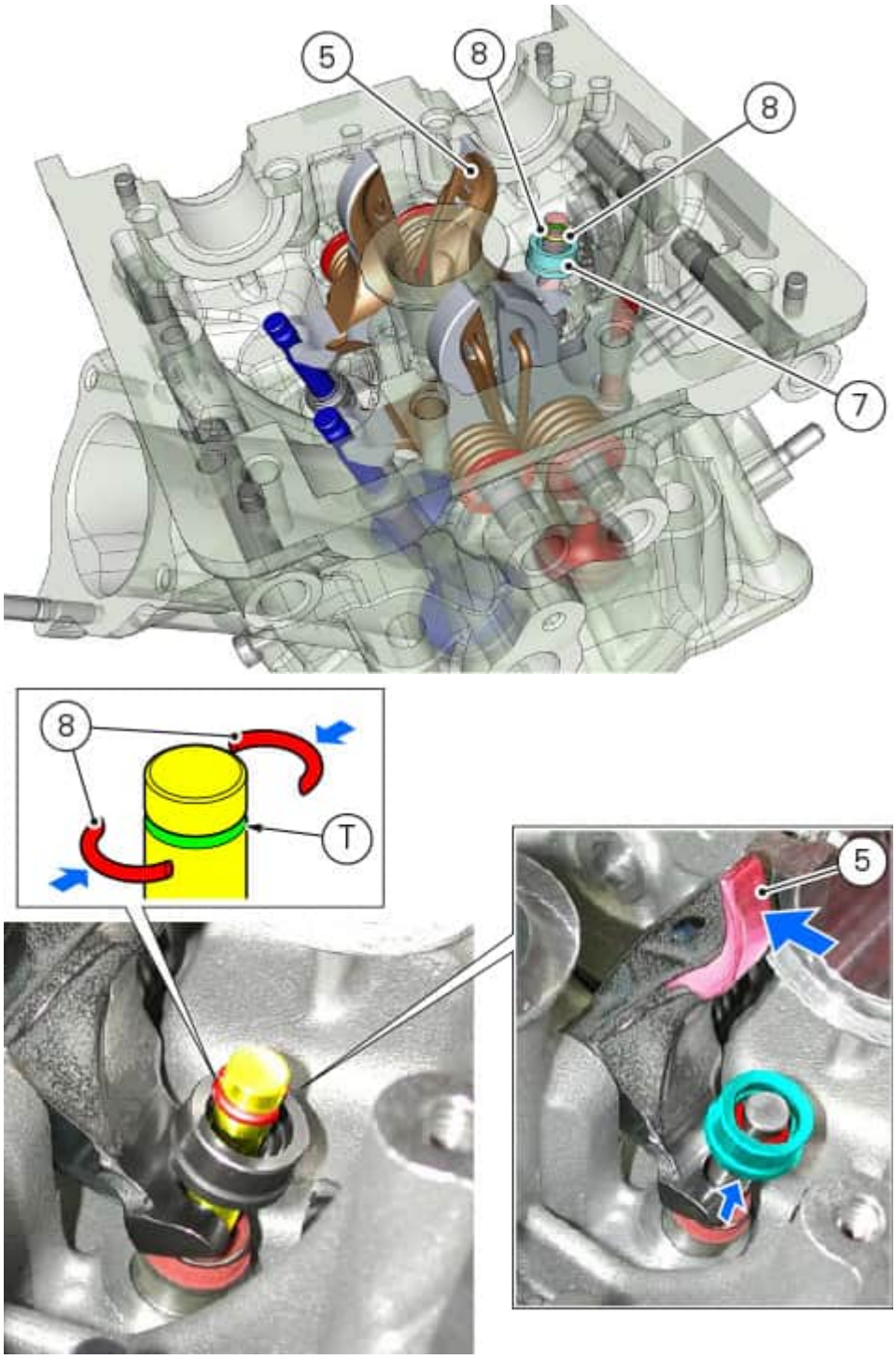


Hold the closing rocker arm (5) pushed downwards and fit the closing shim (7) on the valve stem up to reach the rocker arm. If using the old cylinder head, start by refitting the original shim.

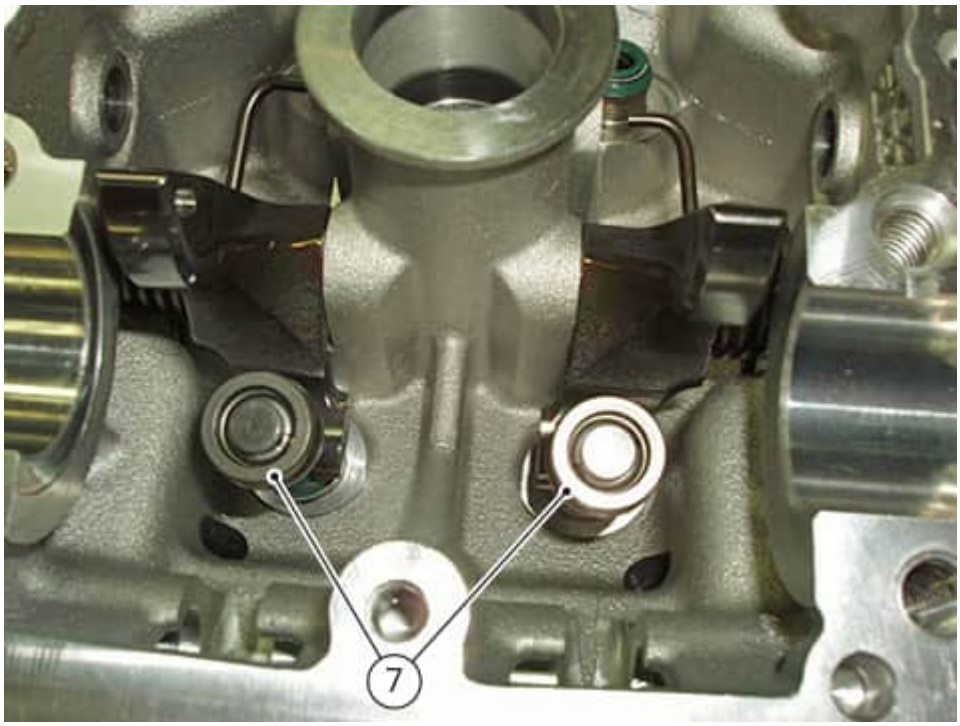


Insert the new split rings (8) in the valve groove (T) and release the rocker arm to correctly position shim (7).
Turn the closing rocker arm (5), and compress the spring as much as possible while holding valve, shim and split rings in the valve closed position.
Release the rocker arm with a quick movement, so that the split rings seat in the shim.





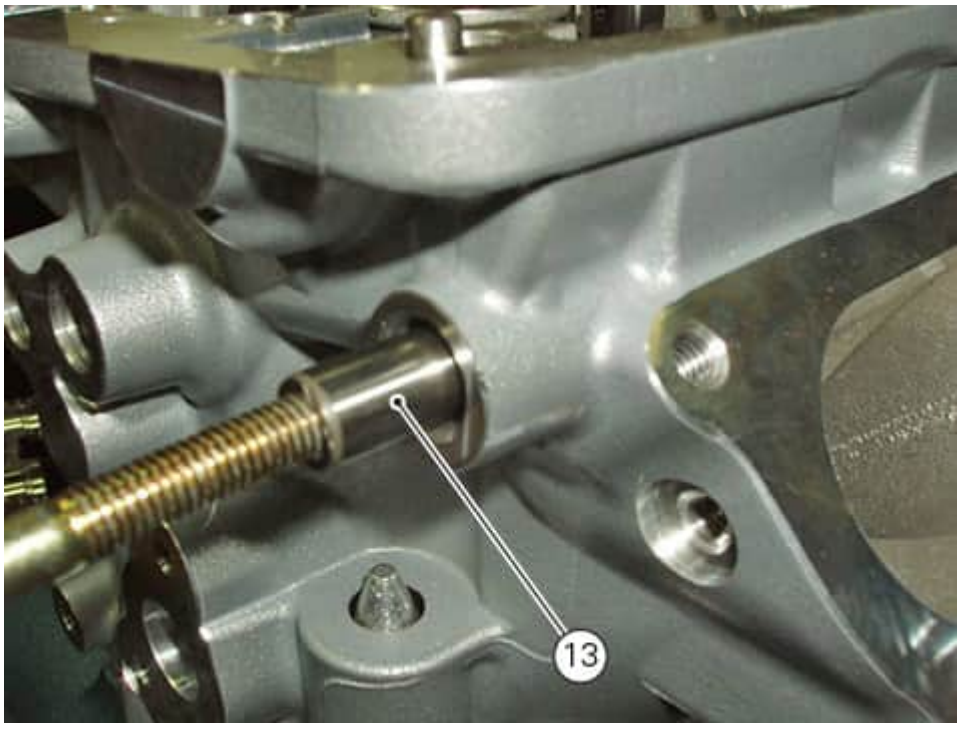
Repeat the procedure with the opposite valve and check that the top of the valve stem is aligned with the surface of the shim (7); if it is not the case, repeat the split ring installation procedure.

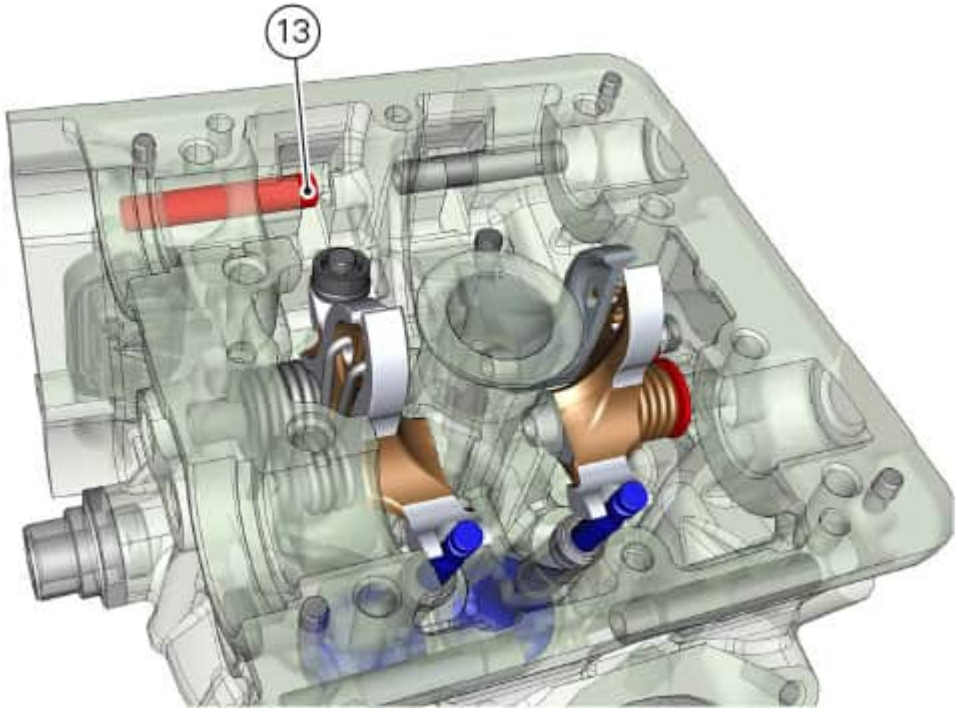


Install the closing shims on the intake valves (9) using the method described above for the exhaust valves. Refit the camshafts (Refitting the camshafts) to check the valve clearance when closed.

Refitting the opening shims and opening rocker arms

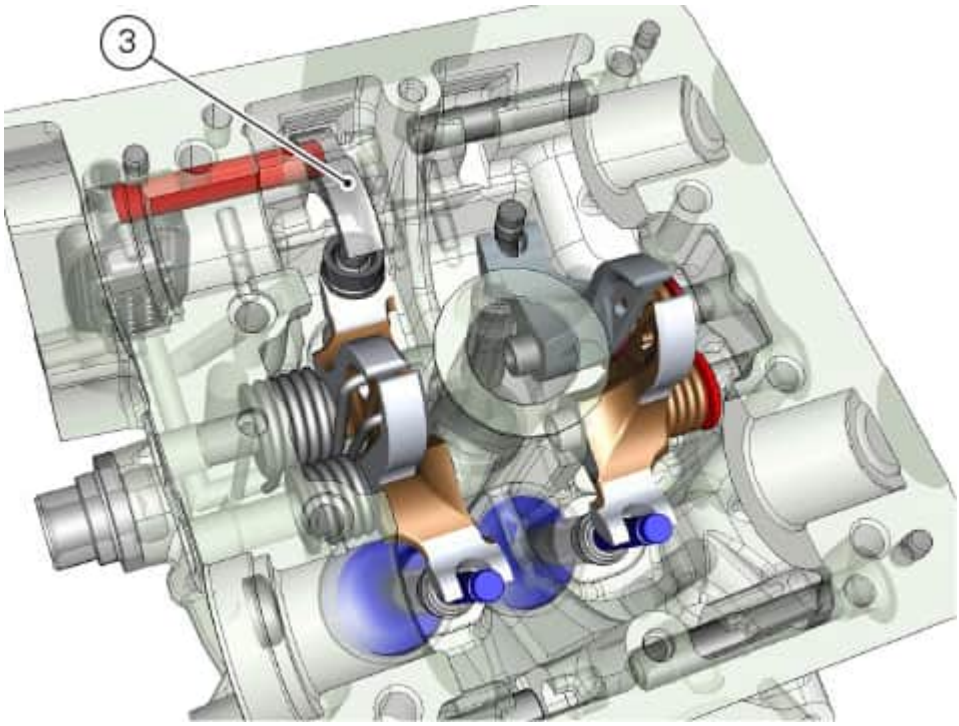
Using an M6 screw, position the opening rocker arm shaft (13) (diameter 9 mm).



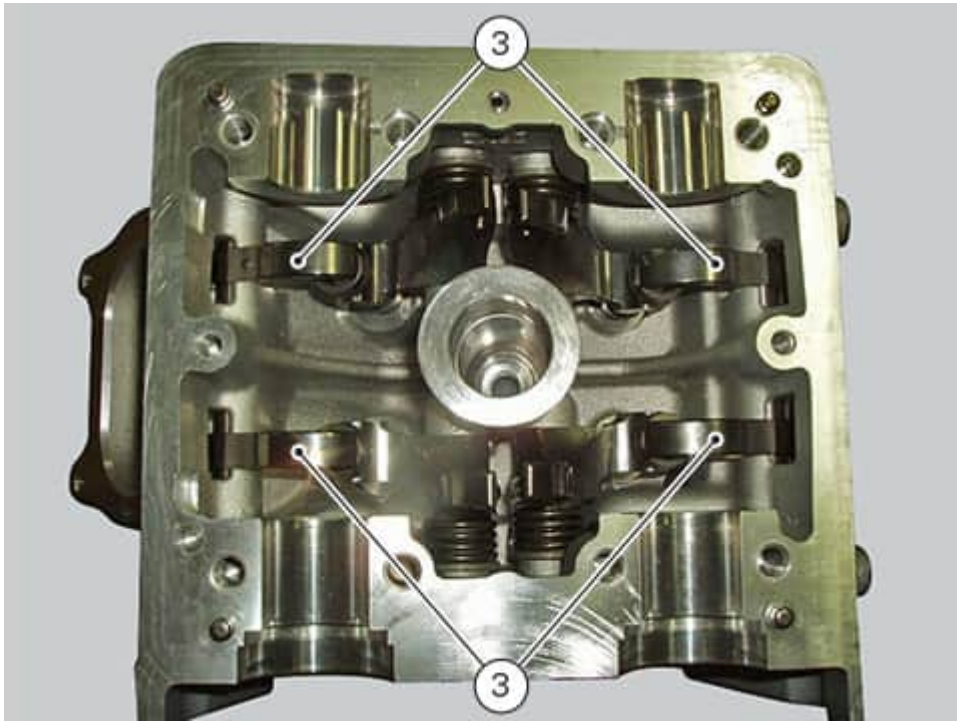


Locate the opening rocker arm (3) and drive the shaft home.

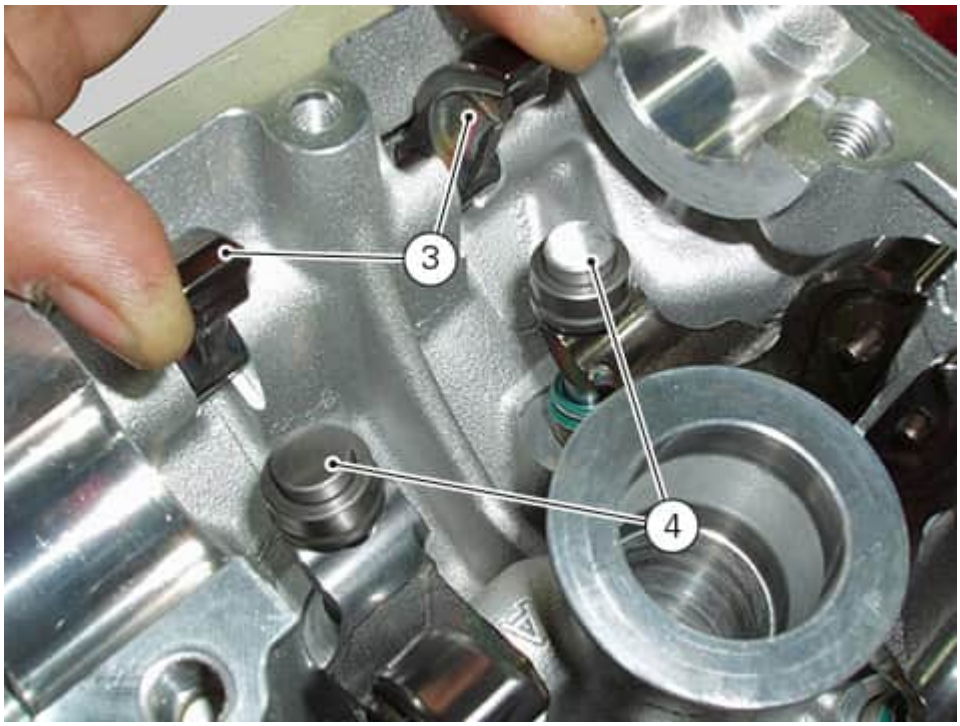


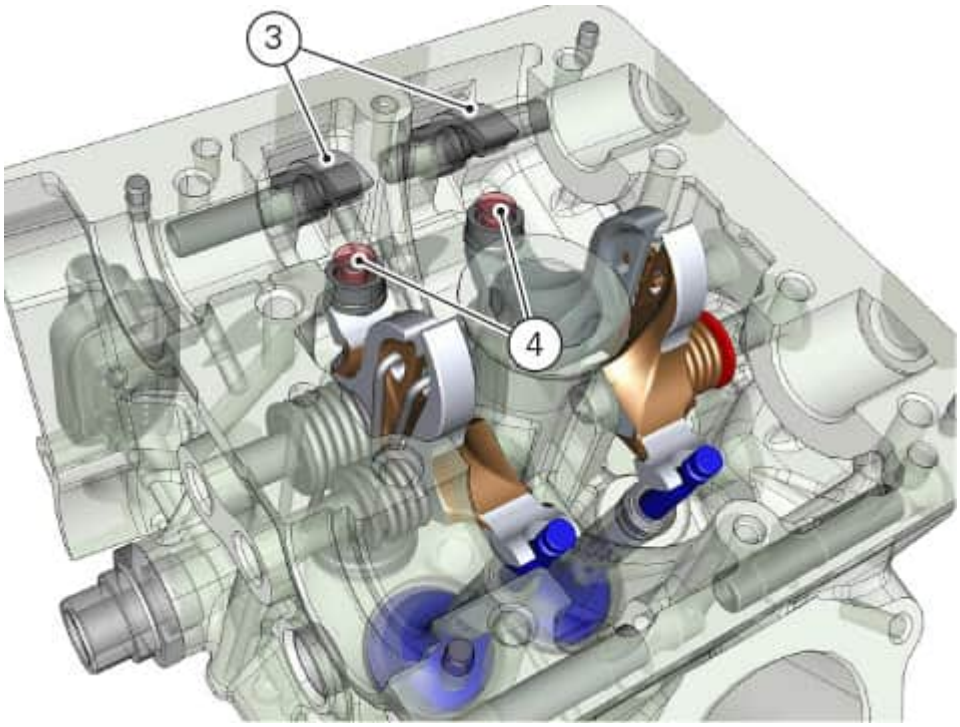


Install the four rocker arms (3) as described above.

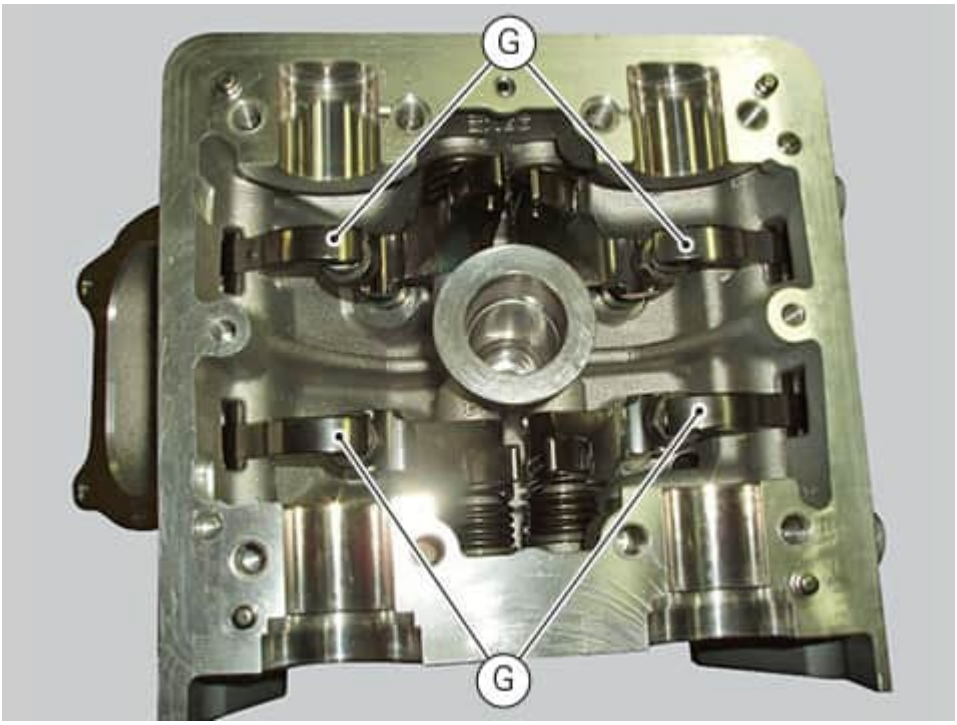


Raise the opening rocker arm (3) and install the opening shim (4) fully against the valve stem.





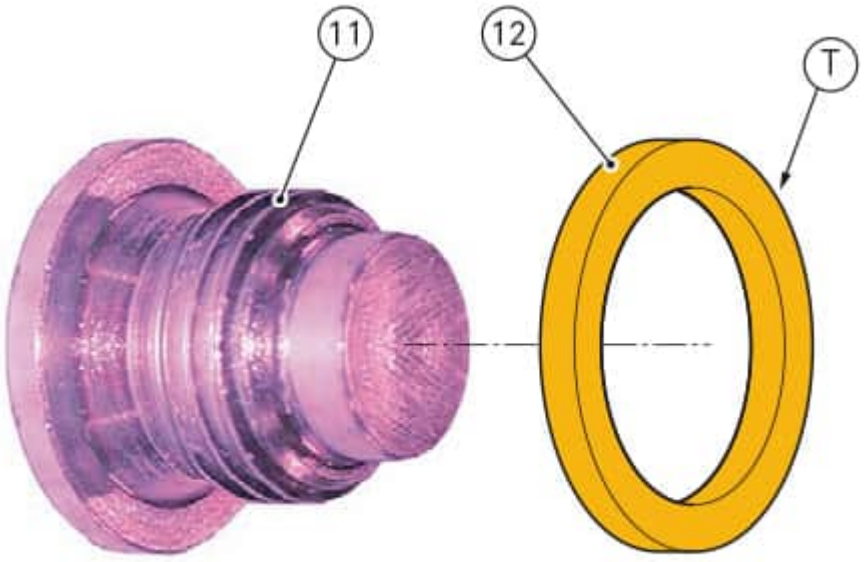
Release the rocker arm so that it rests against the shim.
Ensure the shim is correctly seated by lightly tapping the rocker arm shoe (G) with plastic mallet.
Refit the camshafts and check the valve clearance when open.

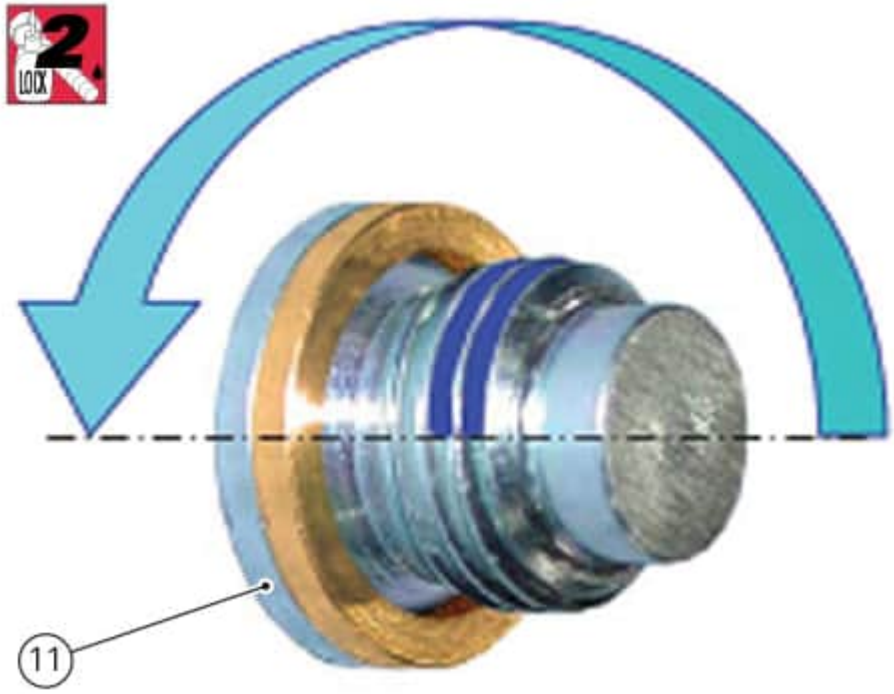


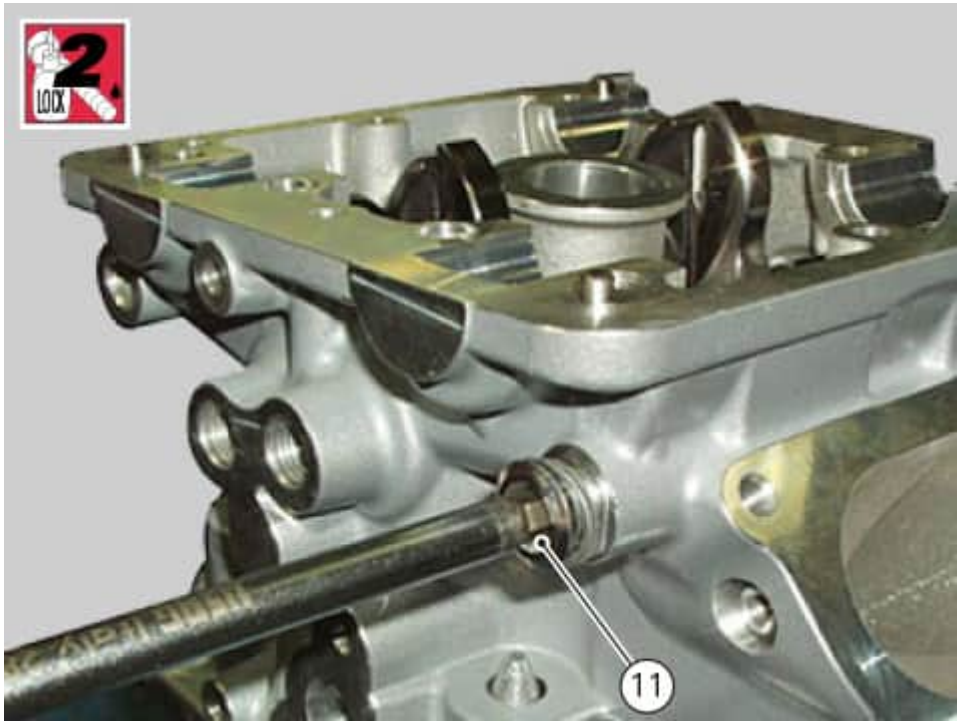
Insert the gaskets (12) on the opening and closing rocker arm shaft plugs (11), orienting them (preferably) with the square edge side (T) facing the cylinder head.
Apply the recommended threadlocker on the plug (11) threads: apply the product on the first two plug threads, spreading it for the half circumference (about 180°).

Tighten the plugs to a torque of 15 Nm (Min. 14 Nm - Max. 16 Nm).

Note
After tightening, remove any excess of product.





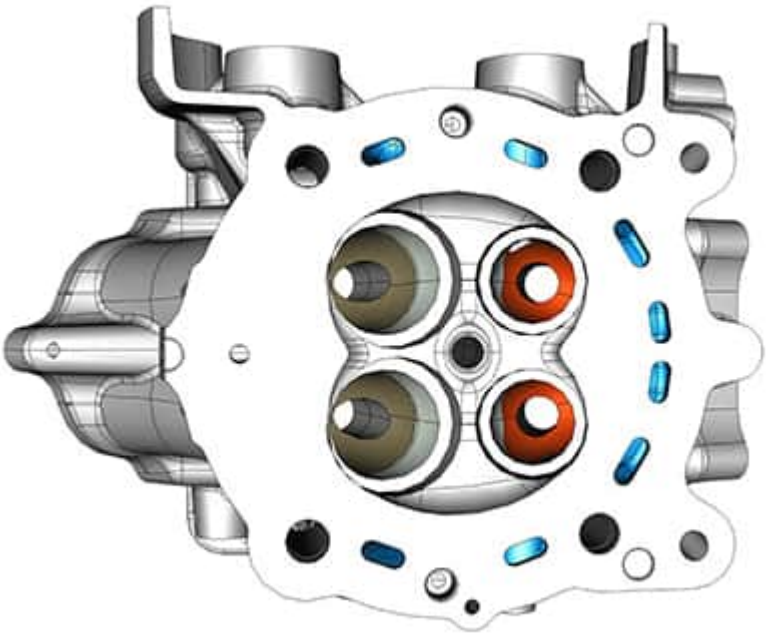


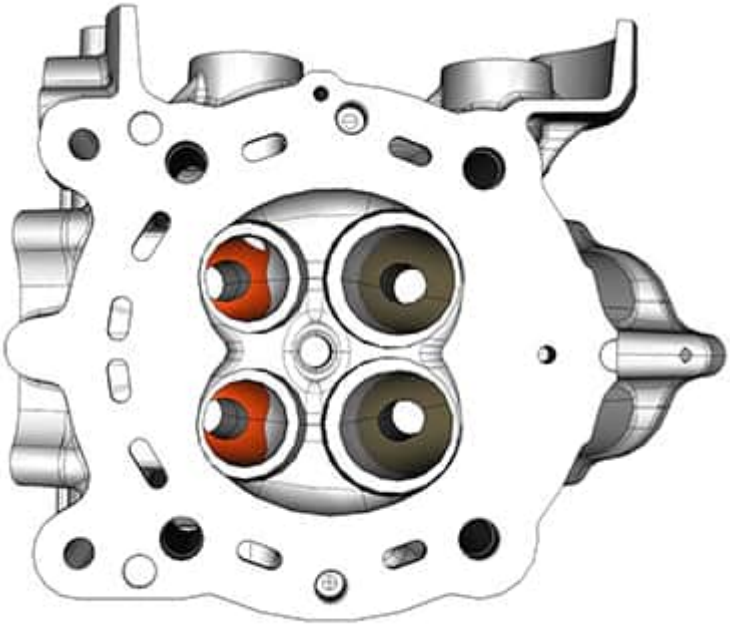
Refit the camshaft supports (Refitting the camshafts).
Refit the timing pulleys (Refitting the timing layshaft pulley).
Refit the cylinder head covers (Refitting the camshafts).
Refit the coils.
Refit the complete head (Fitting the complete heads).

Overhauling the cylinder head components

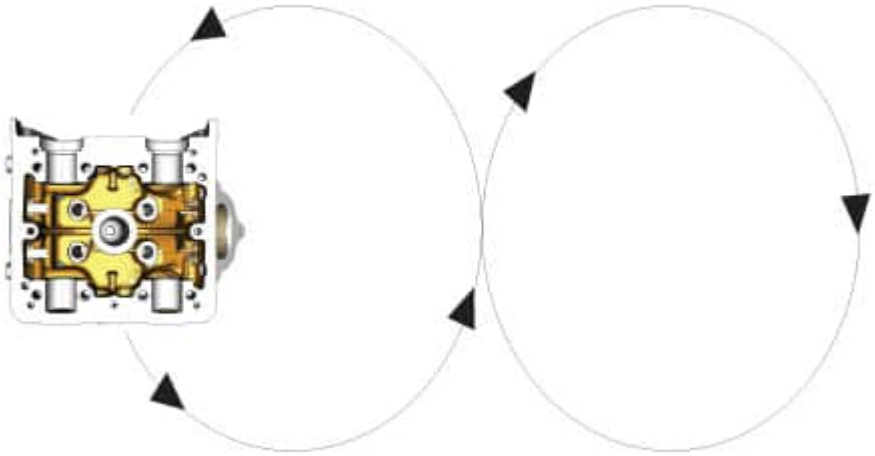
Cylinder heads

Remove any carbon deposits from the combustion chamber and its ducts.
Remove any scale from the coolant ducts.
Check for cracking and inspect the sealing surfaces for scoring, steps or other damage.





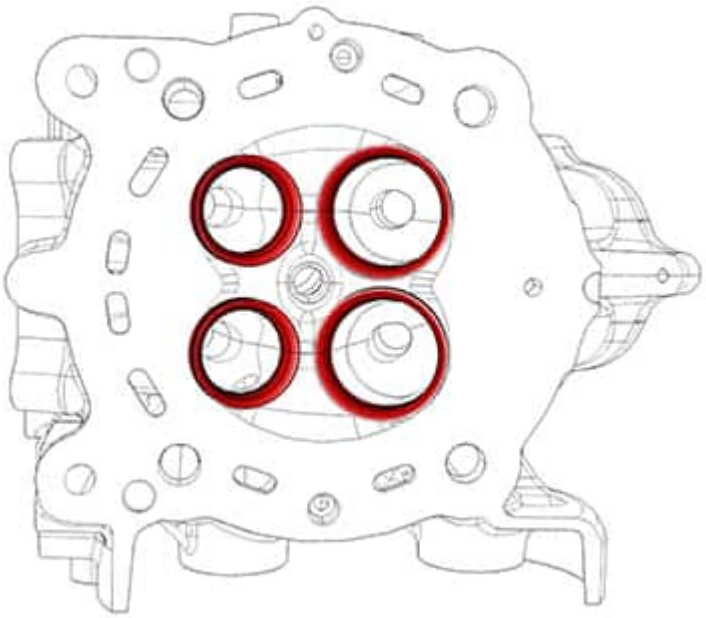
Check that the cylinder mating surfaces of the cylinder head are free of carbon deposits and scale. If this is not the case, spread diamond lapping paste (6 to 12 micron thickness) on a reference surface and slide the cylinder head on the surface as shown in the figure until a flat surface is obtained.

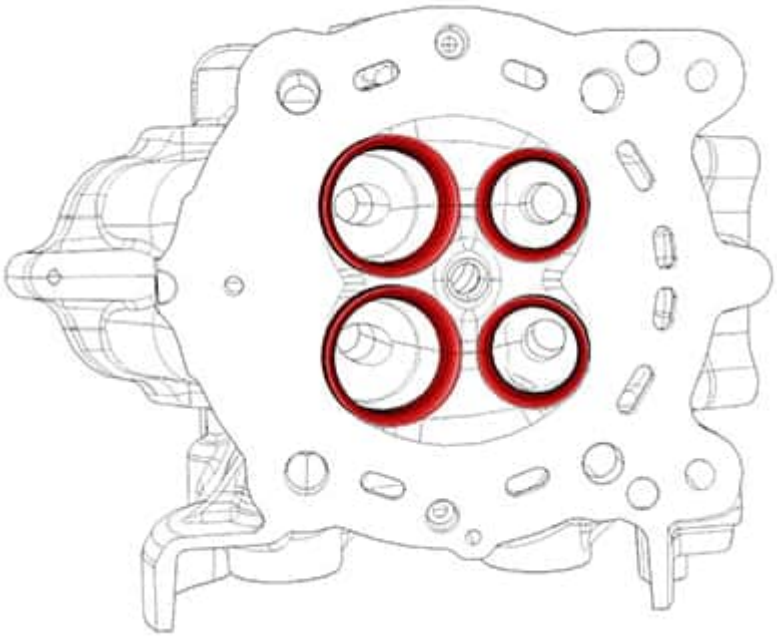


Valve seats

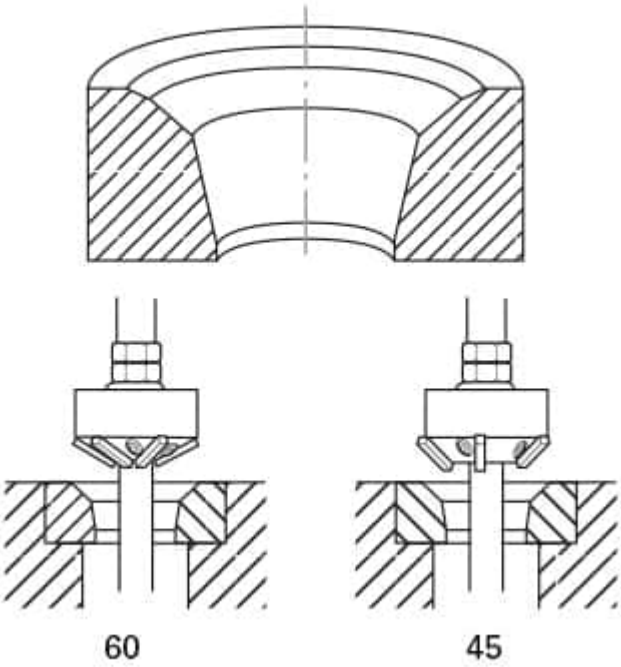
Visually inspect the valve seats: there must be no pitting or cracks.







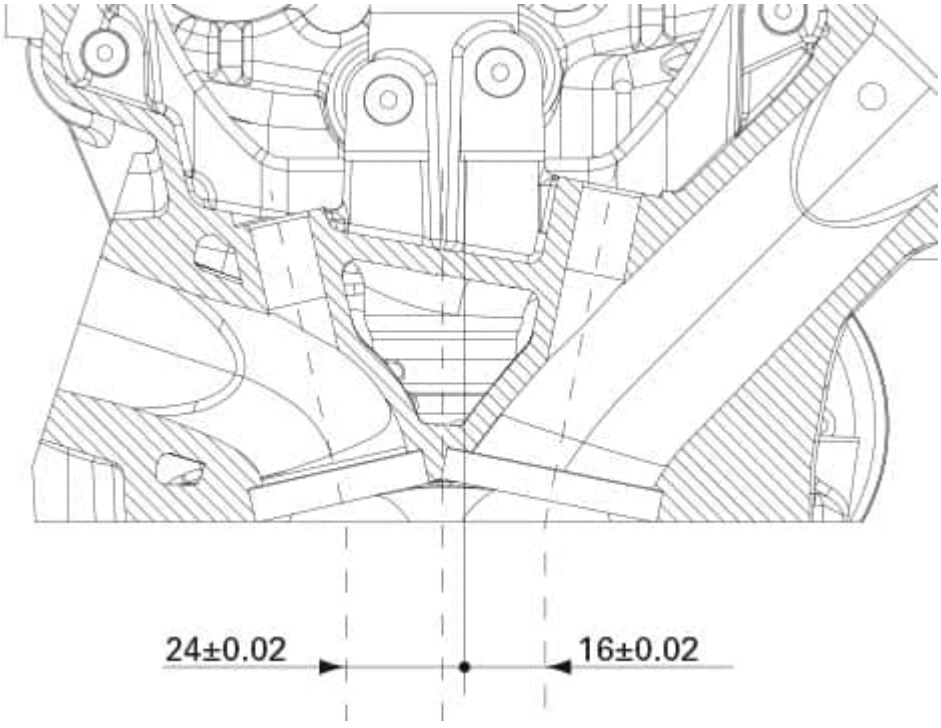
Minor damage can be repaired by grinding with special 45° and 60° single-blade grinders. Grind the valves and check the seal.



If the valve seats are excessively damaged, fit oversize seats. Replacement seats are available with 0.03 and 0.06 mm oversized outside diameters.

Important
When you change the valve seats, change the valve guides as well.

Proceed as follows.
Remove the worn seats, grinding carefully to avoid any damage to cylinder head housings.
Check the diameter of head housings and choose the oversized valve seat that will give an interference fit of 0.04 to 0.10 mm.

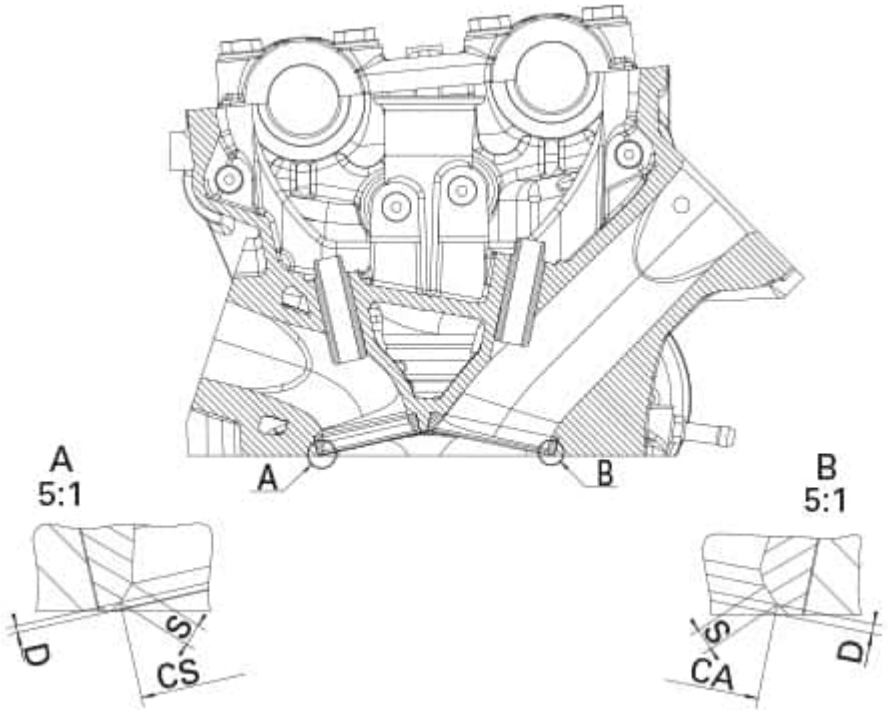


Heat the cylinder head gradually and evenly up to 150 °C and chill the new valve seats in dry ice.
Drive the seats perfectly square into the head housings using the appropriate valve guide seat installers **88713.2846** and **88713.2847**.
Allow the cylinder head to cool down and grind the seats to the following dimensions:
CA = Ø 41.6 ± 0.025 mm.
CS = Ø 33.6 ± 0.025 mm.
S = 1.2 mm.

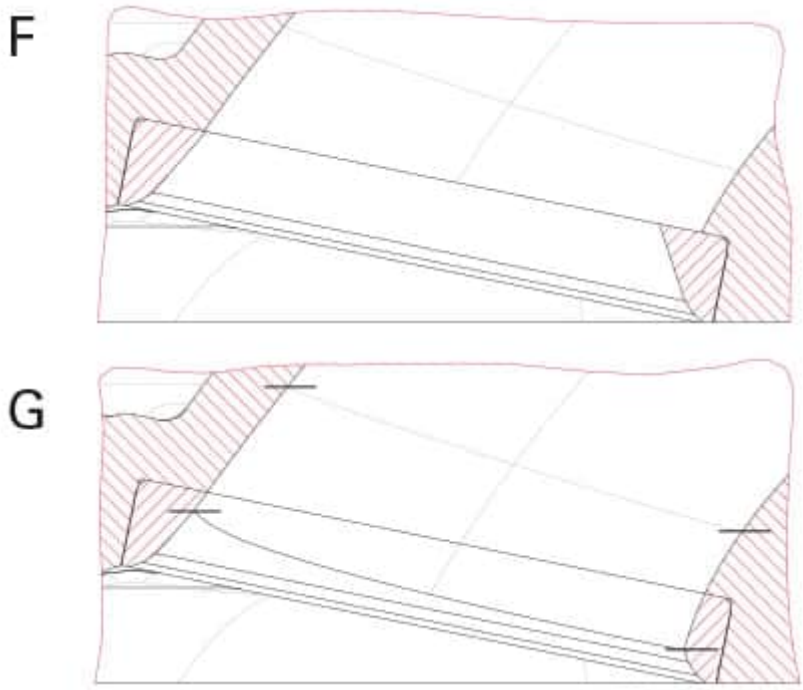
D = 0.2 to 0.4 mm.

Important

Do not use any lapping compound after final grinding.



It is advisable to lap the radius between the intake valve seats and the intake ducts (F = before; G = after).

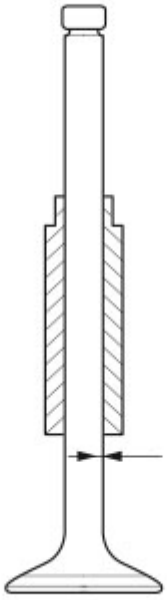


Valve guides

Check the internal surface of the valve guides: there should be no signs of deformation or cracking.



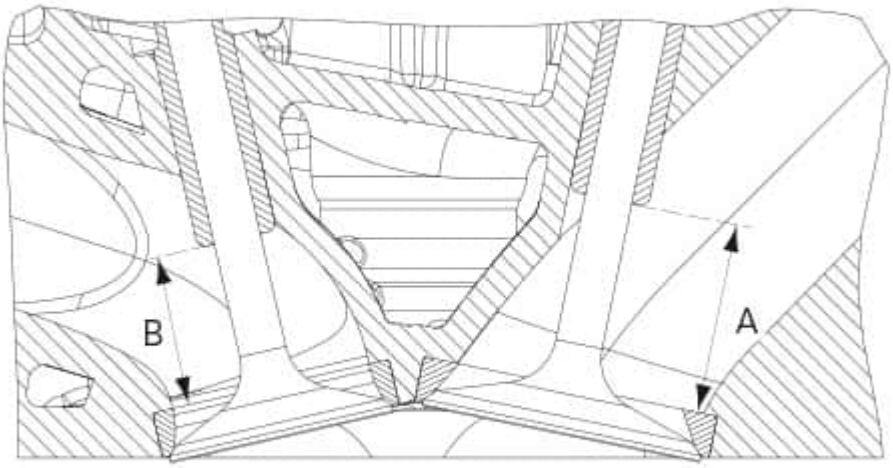
Thoroughly check the dimensions of the valve guide.
Measure the inside diameter with a suitable gauge.
Measure the diameter at different positions of the valve guide.



The clearance upon fitting must be: maximum detected value - minimum detected value = 0.03÷0.045 mm.
The maximum permissible wear limit is 0.08 mm.
Change the valve guides when the ovality exceeds permissible limit or the valve stem clearance is outside the tolerance range.
When you change the valve guide, you must also change the valve.
Valve guides as spare parts are available with outside diameter oversized by 0.03, 0.06 and 0.09 mm.
Change the valve guides as follows:

- heat up the cylinder head gradually and evenly up to 150 °C;
- remove the original valve guides using tool no. **88713.2842**;
- allow the cylinder head to cool down and check the condition of the seats;
- choose suitable valve guides to obtain an interference fit in the cylinder head of 0.022 to 0.051 mm;
- heat up the cylinder head again and chill the new valve guides in dry ice;
- lubricate the seats in the cylinder head and install the valve guides using the appropriate service tools and with reference to the dimensions given in the figure;

A= 22.4±0.15 mm.
B= 28.45±0.15 mm
Hone the mating surface with a reamer.



Checking the valve

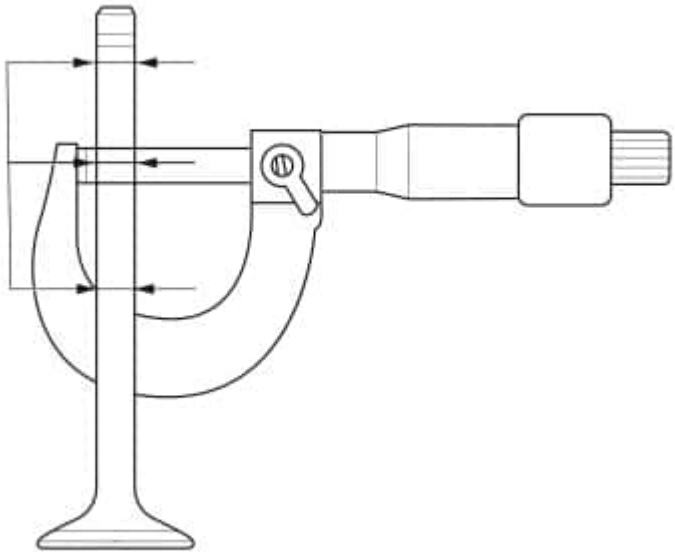
Check that the stem and the valve seat contact surface are in good condition.
There must be no pitting, cracks, deformations or signs of wear.

Warning

The valves cannot be ground.



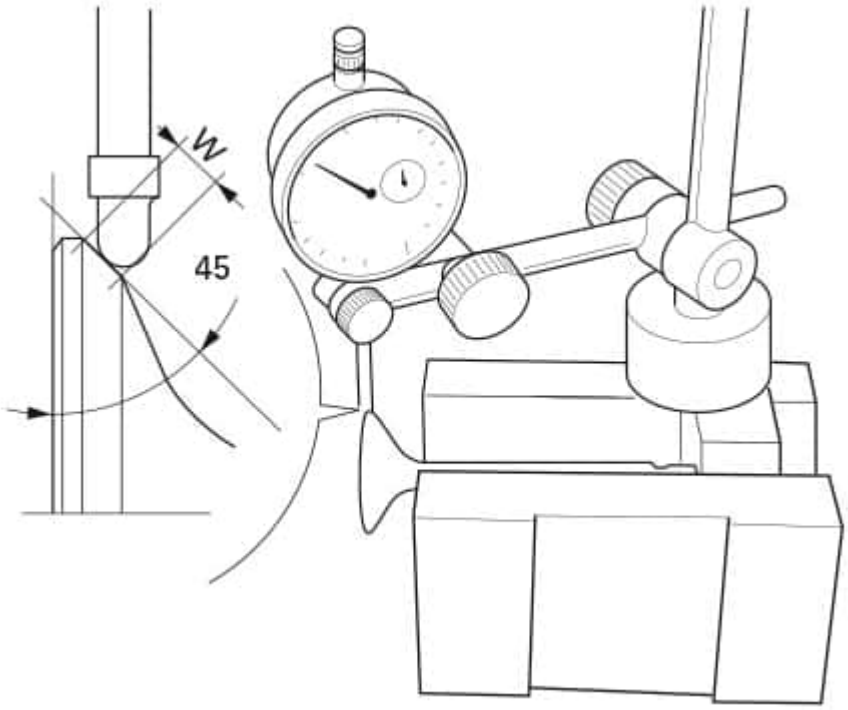
Perform the following checks.
Measure the diameter of the valve stem at various points along the section that runs in the valve guide.

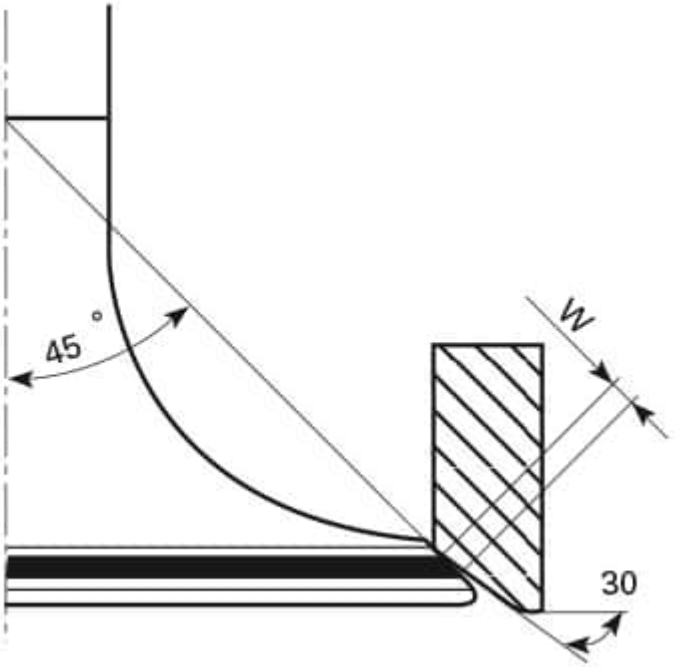


Check the valve stem for buckling. Place it on a "V" reference and measure deformation with a dial gauge.
Service limit: 0.053 mm.
Check the valve stem for buckling. Place the valve on a "V" reference block, set a dial gauge perpendicular to head and measure concentricity of valve face at 45°.

- nominal concentricity: 0.01 mm;
- service limit: 0.03 mm.

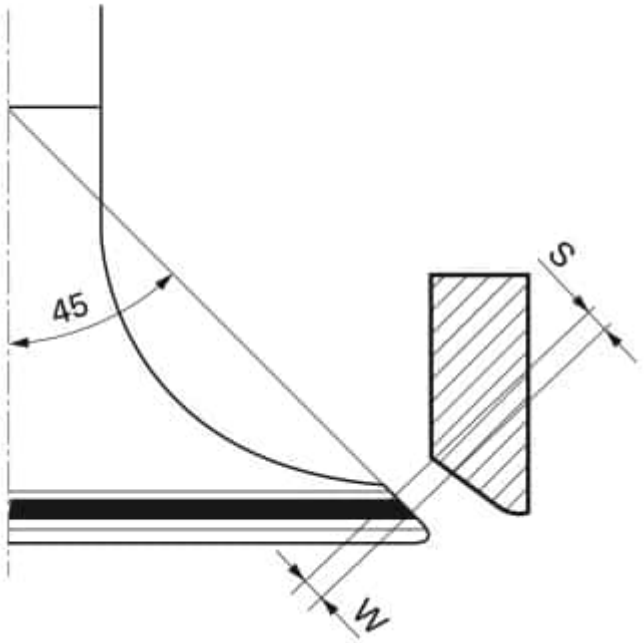
Use Prussian blue or a mixture of minium and oil to check that the contact surface (W) between valve and seat is 1.4 to 1.6 mm (1.05 to 1.35 mm when new).
Grind the seat if the dimension measured is greater than the above limit.





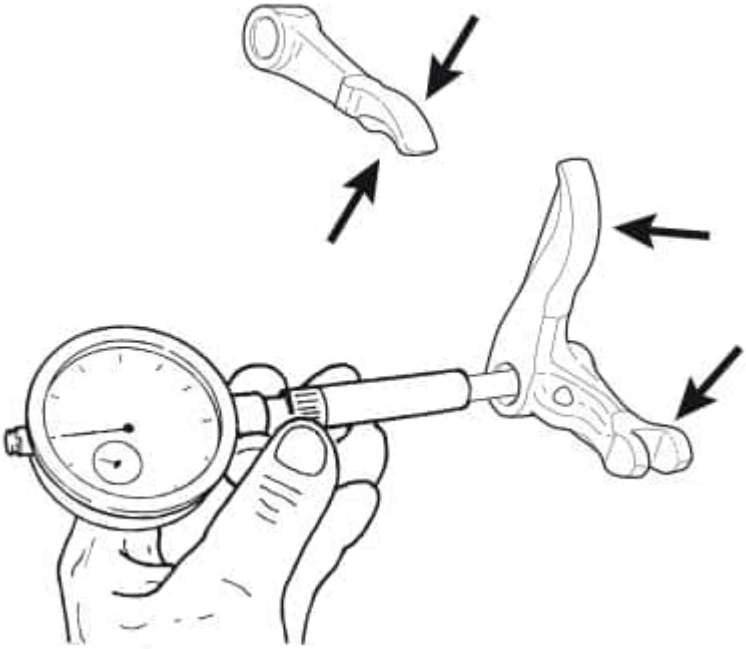
Checking the valve seal

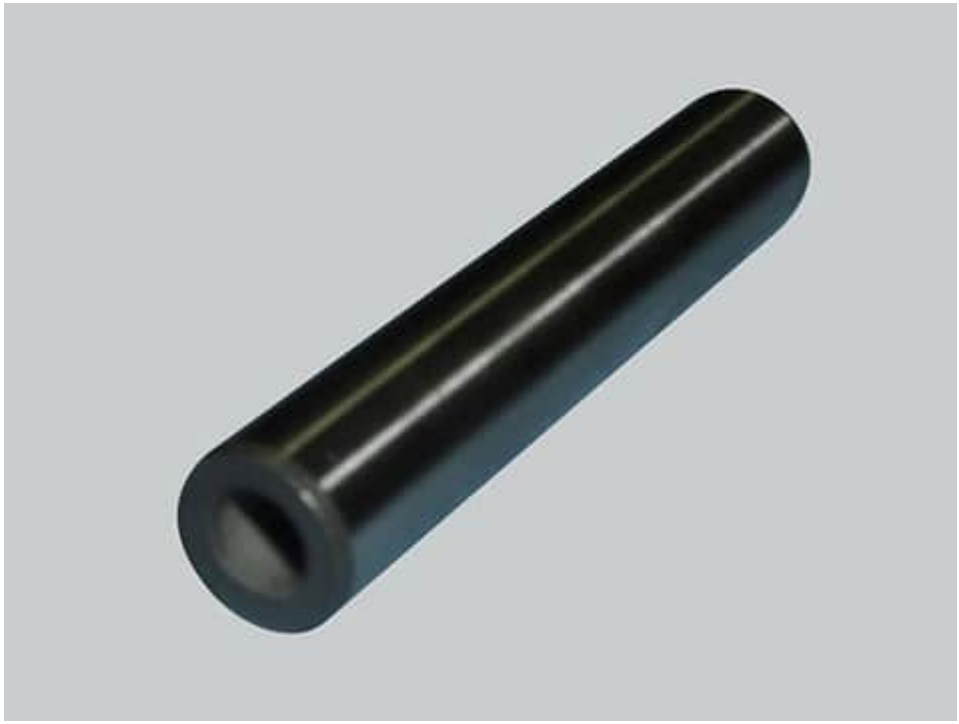
After grinding the seats it is important to check the seal between valve face and seat: if the seat contact area (S) on the valve is wider than the 45° band (W) this could lead to poor sealing.



Checking the rocker arms

Check for signs of wear, grooves or chrome flaking off.
Check the condition of rocker arm bore and shaft.
Clearance upon fitting: 0.025÷0.049 mm
Wear limit: 0.08 mm.

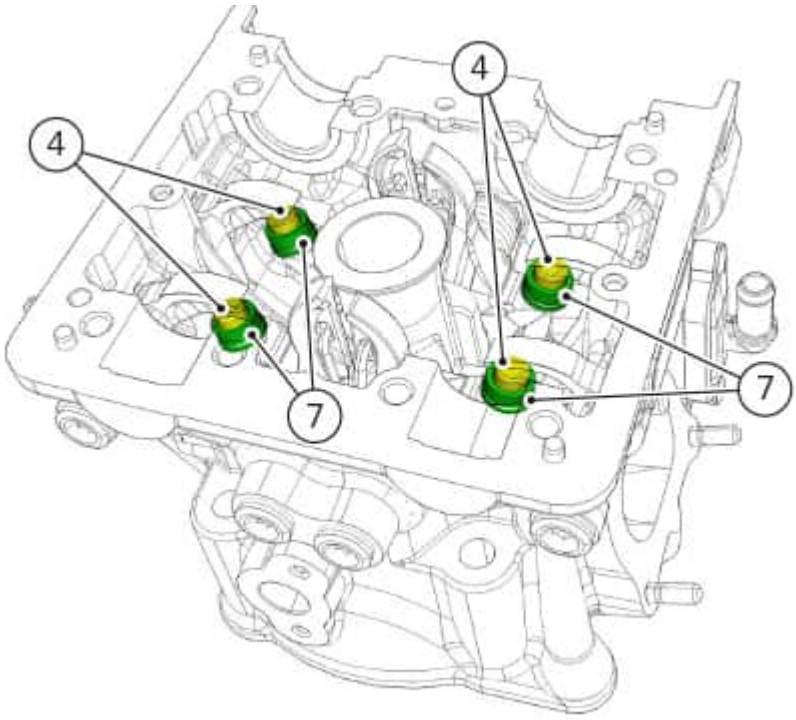


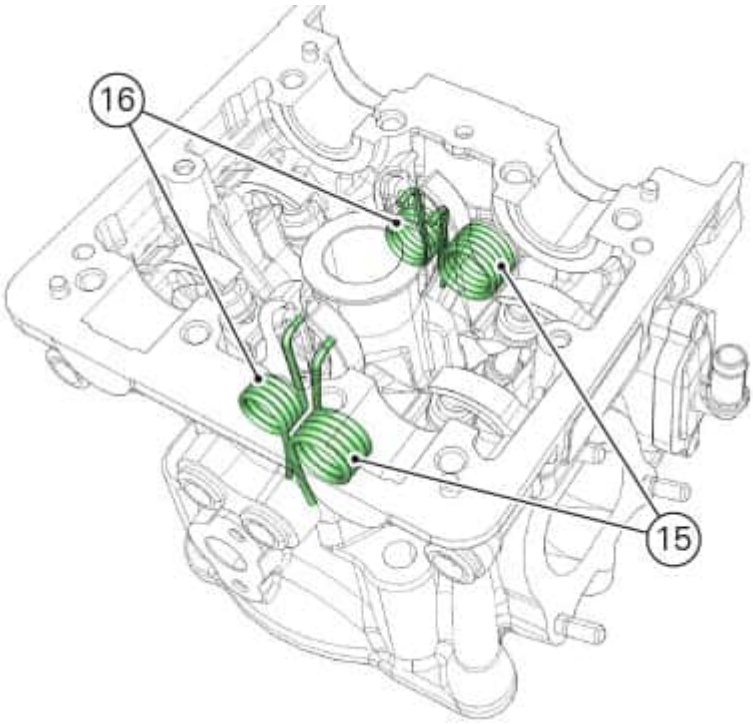


Opening and closing shims - Springs

Check the condition of the contact surfaces of the valve closing (7) and opening (4) shims: there must be no signs of wear.

Check the conditions of the return springs (15) and (16) of the closing rocker arms: no cracks, deformations or failure must be present.

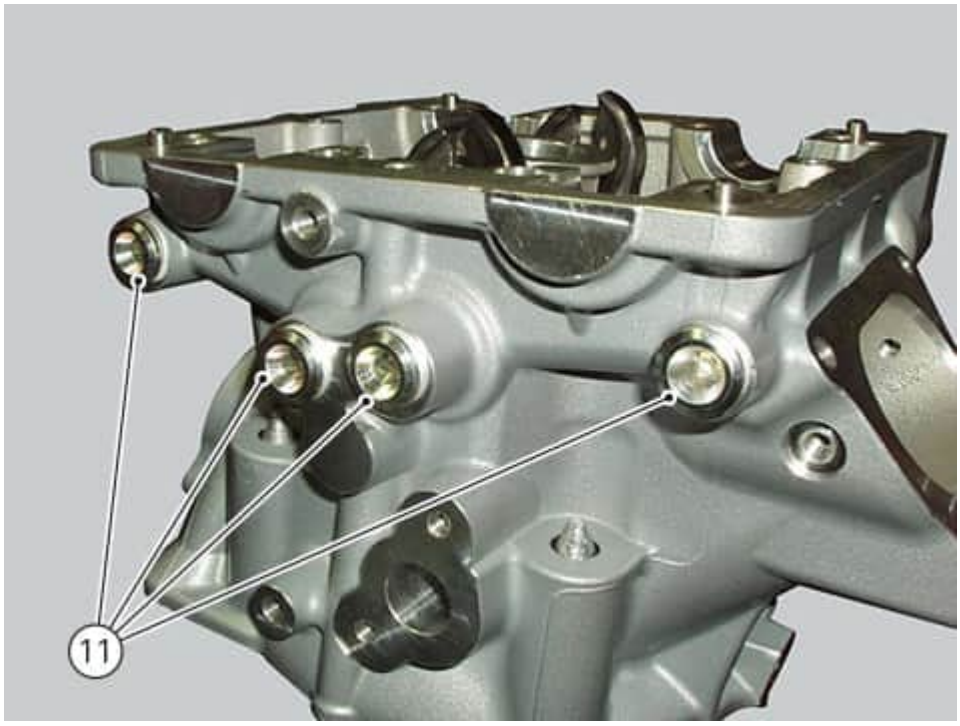

4
4
7
7

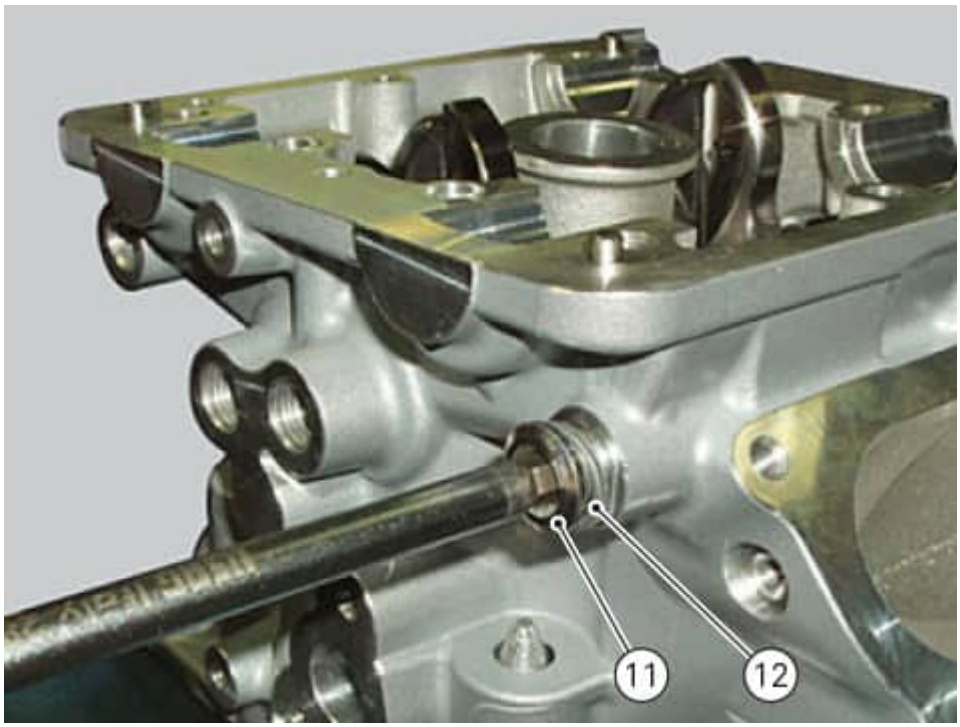

16
15

Removing the valve rocker arms

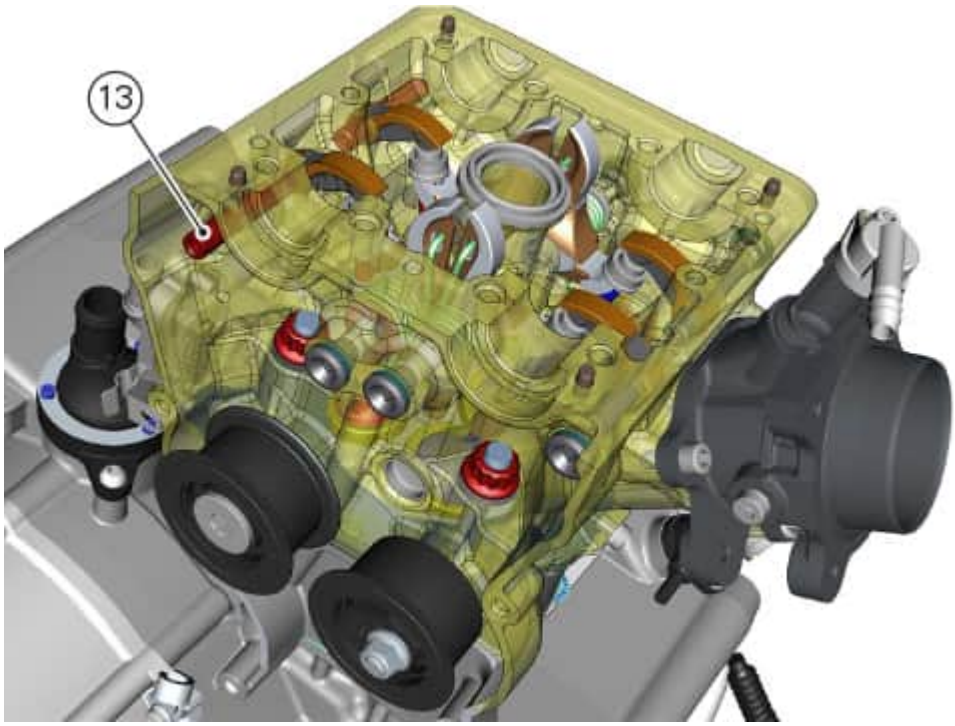
Remove the complete head from the engine (Removing the engine heads).
Remove the timing pulleys (Removing the timing layshaft pulleys).
Remove the coils.
Remove the cylinder head covers, the camshaft supports and the camshafts (Removing the camshafts).

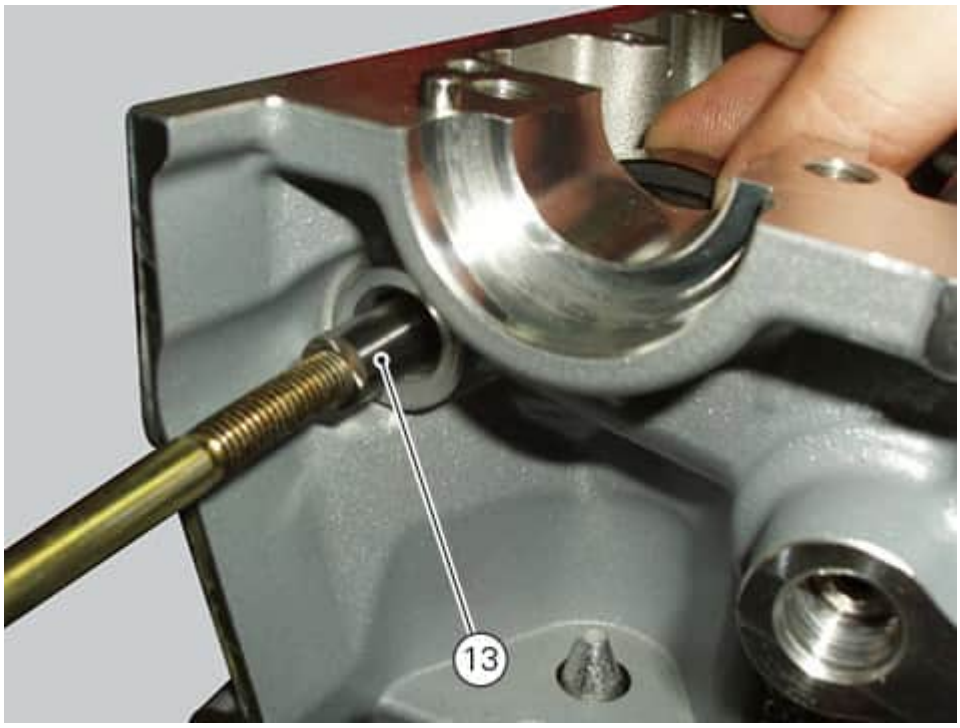
Loosen the eight plugs (11) and collect seals (12).

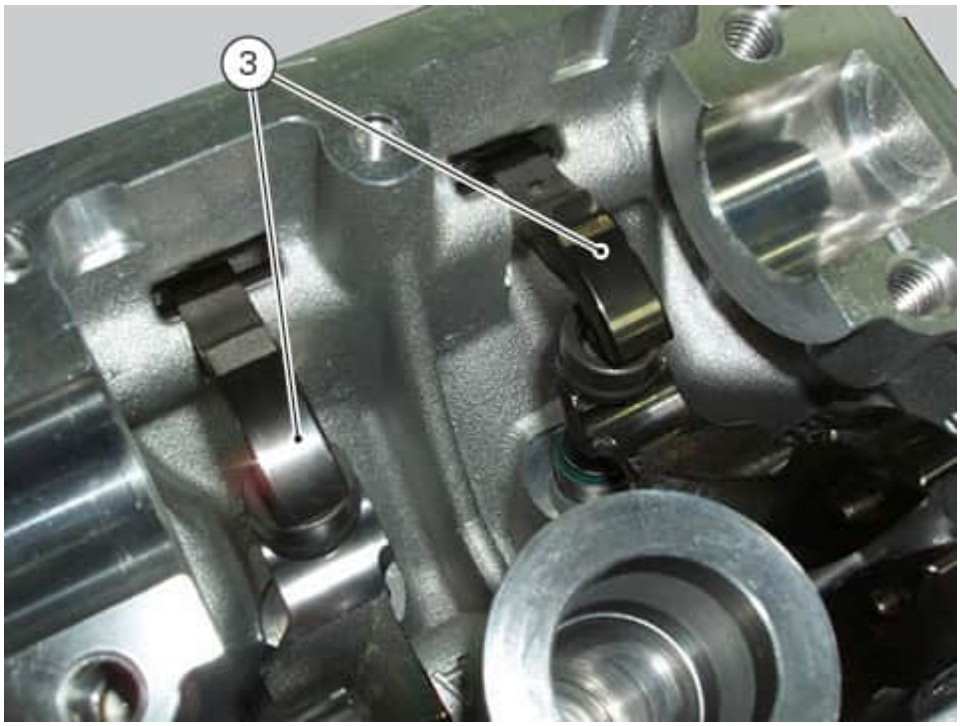




Using an M6 screw, withdraw the shafts (13) of the opening rocker arms (3) on the exhaust and intake sides.
Remove the opening rocker arms (3).

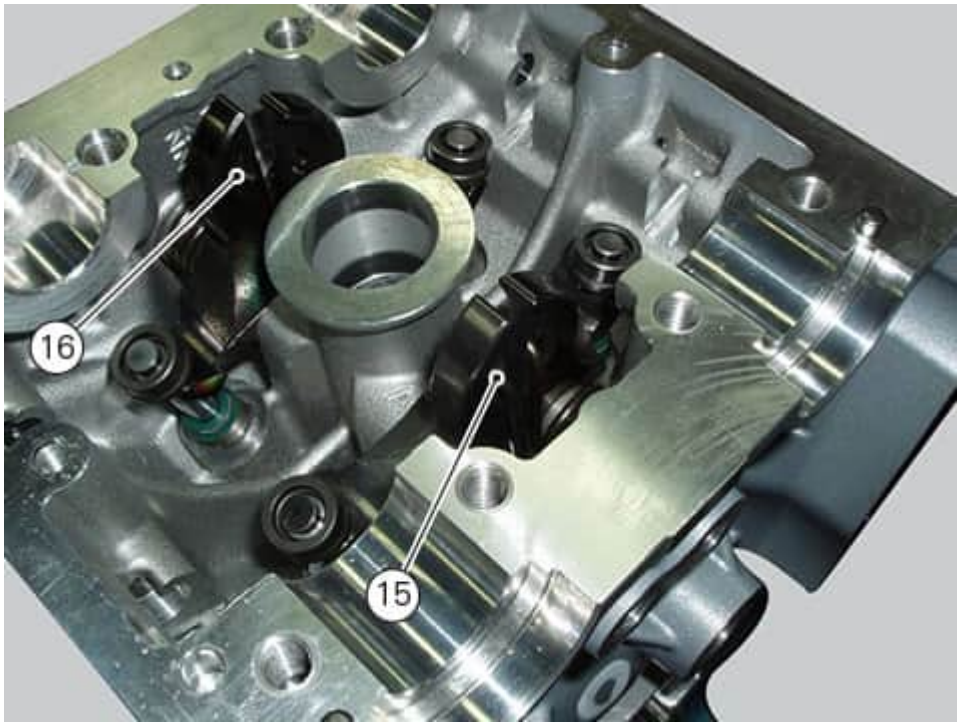

13

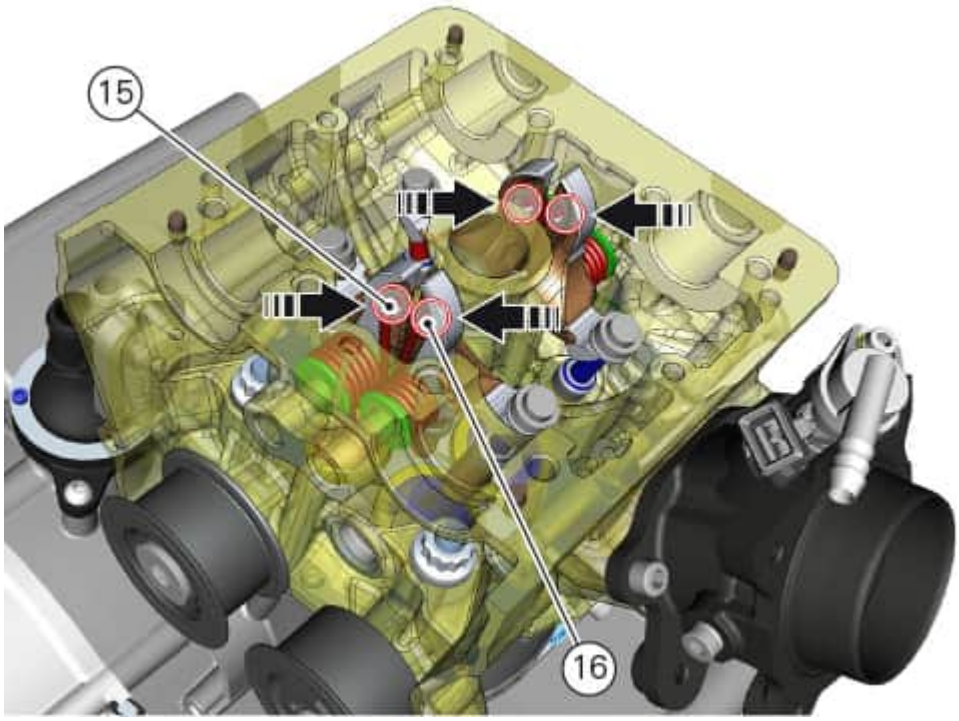

13



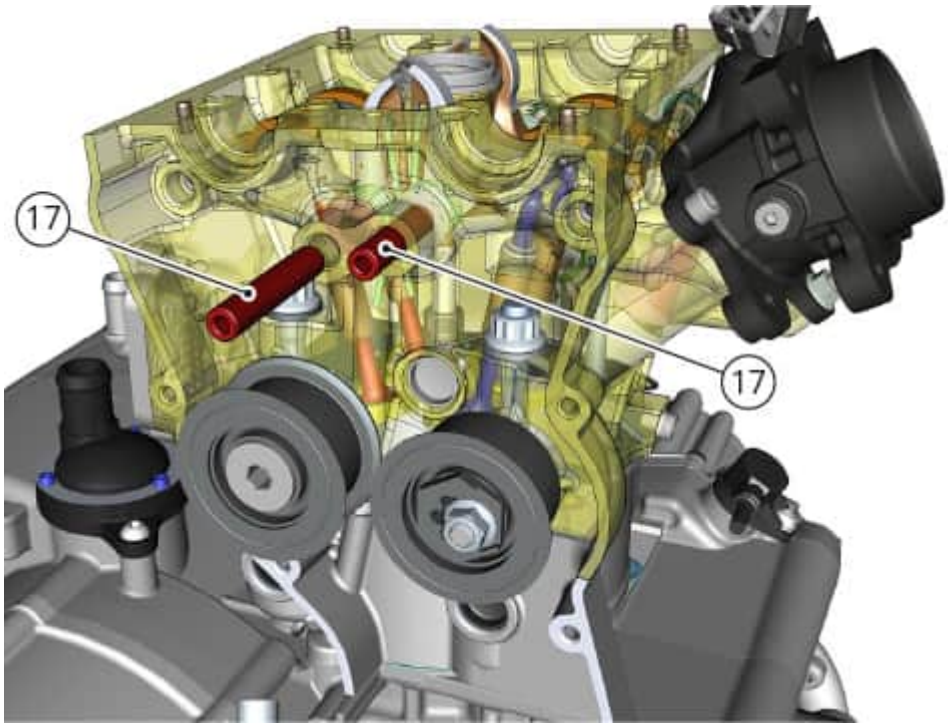
Using the pawl of the rocker arm spring tensioning kit no. **88713.2069** installed between the spring and the inner wall of the cylinder head, move the straight end of return springs (15) and (16) and insert it in the drilled shaft.

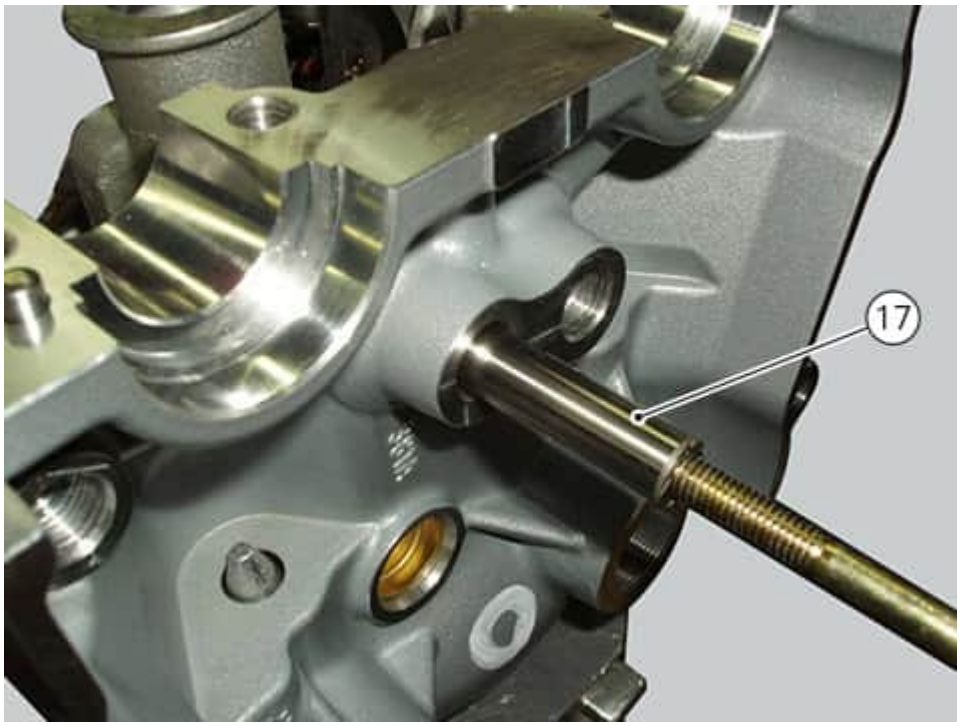
Springs (16) and (15) must be removed from inside the swinging arm hole.
Use the shaft to slide the end of the spring into its rest position.



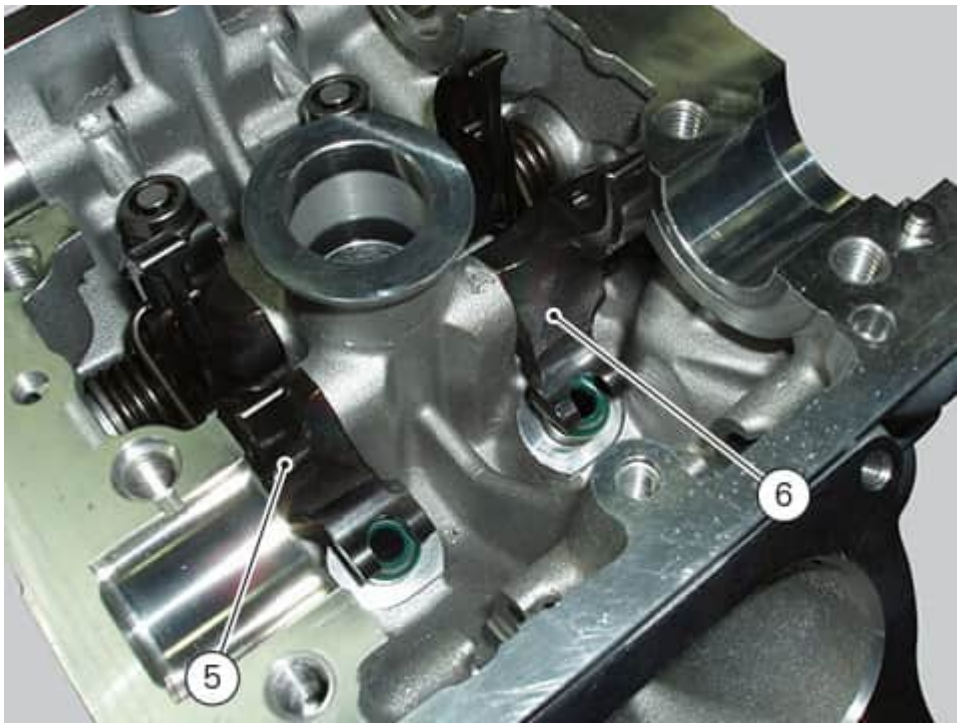


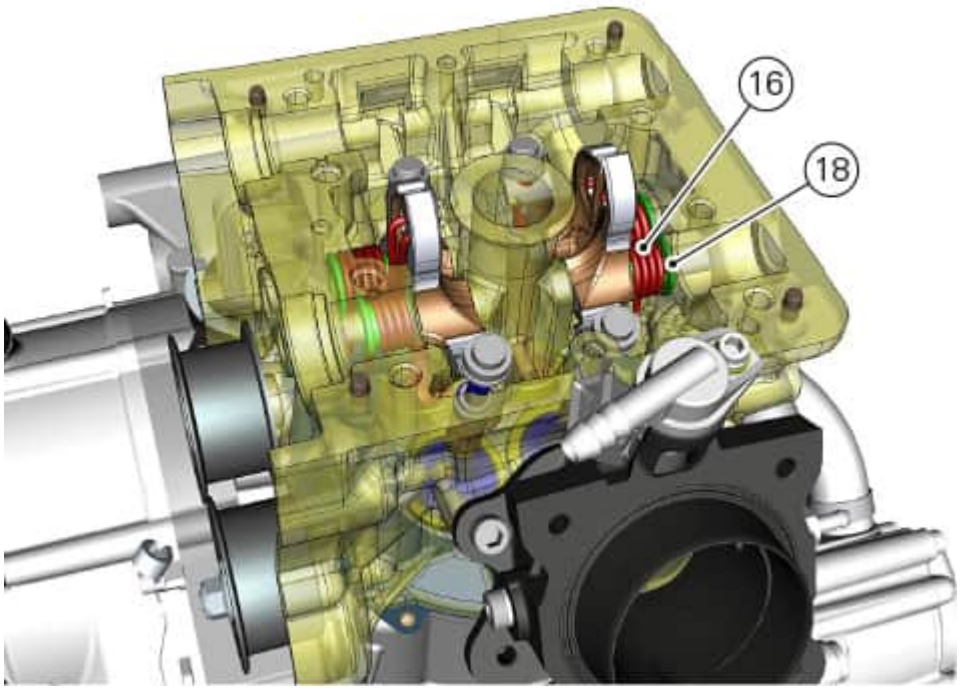
Using an M6 screw, withdraw the shafts (17) of the closing rocker arms on the exhaust and intake sides.

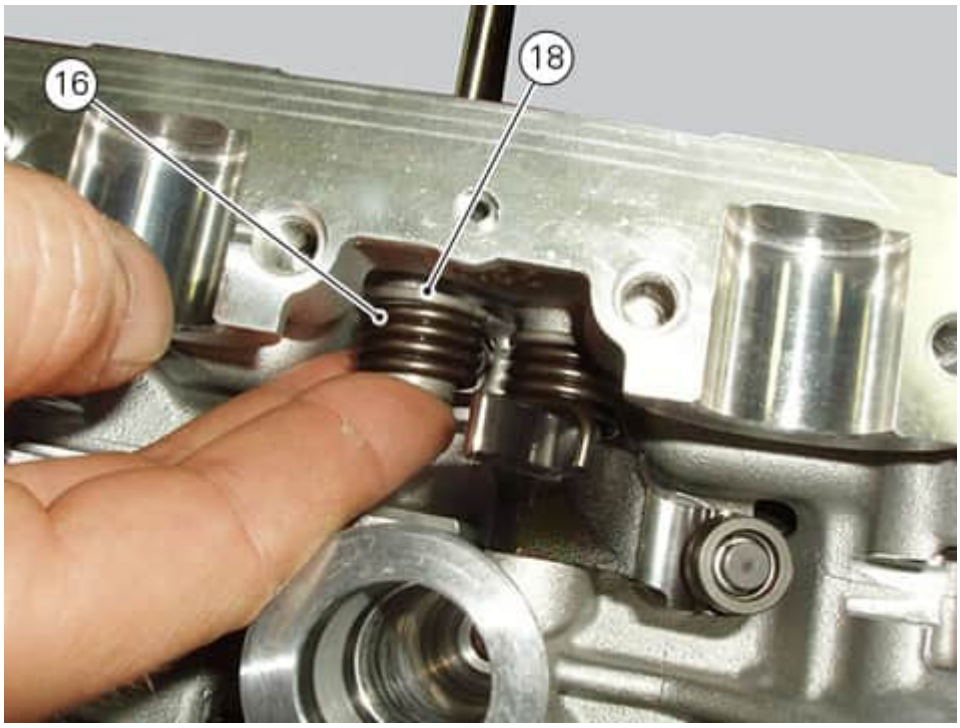


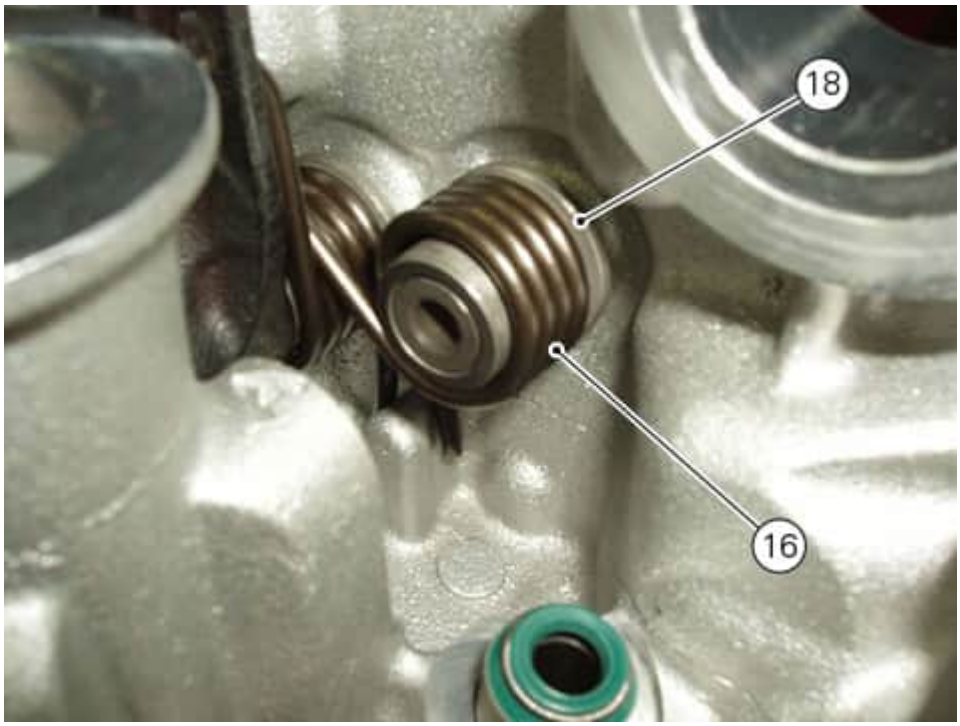


Remove the closing rocker arms (6) and (5), the springs (16) and (15) with the spacers (18).

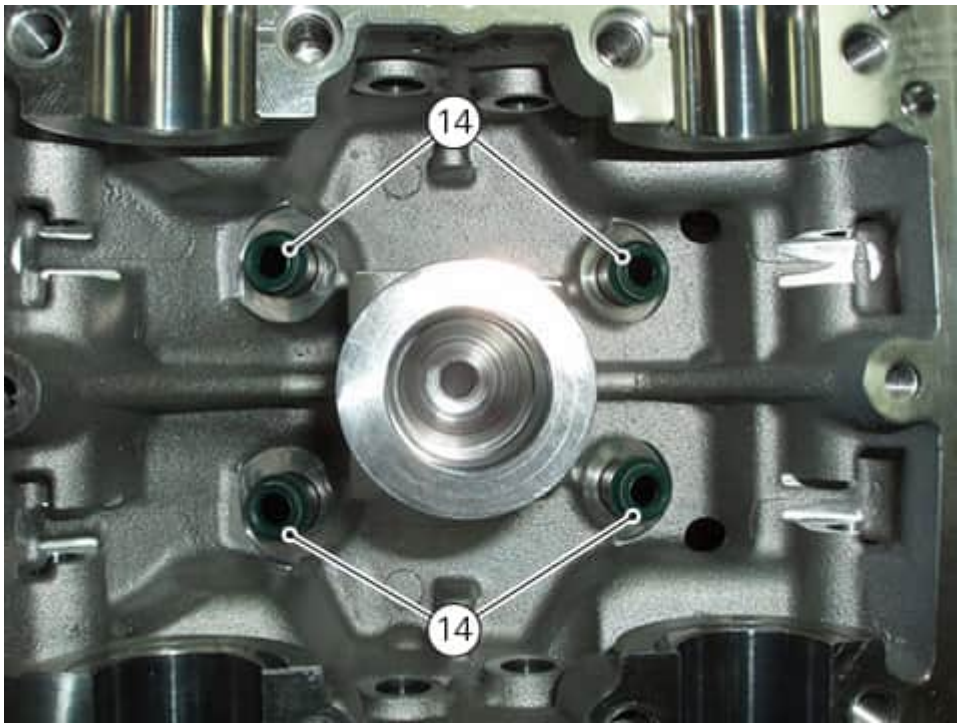



16
18


16
18



Remove the sealing rings (14) from the ends of the valve guides.

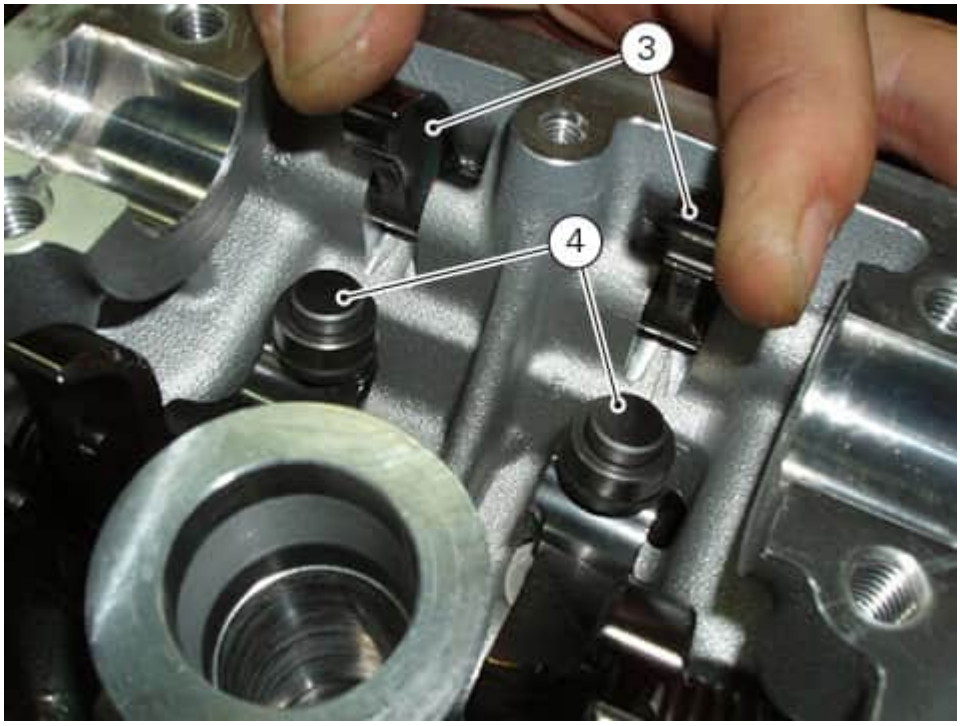


Repeat the same procedure for the other cylinder head.

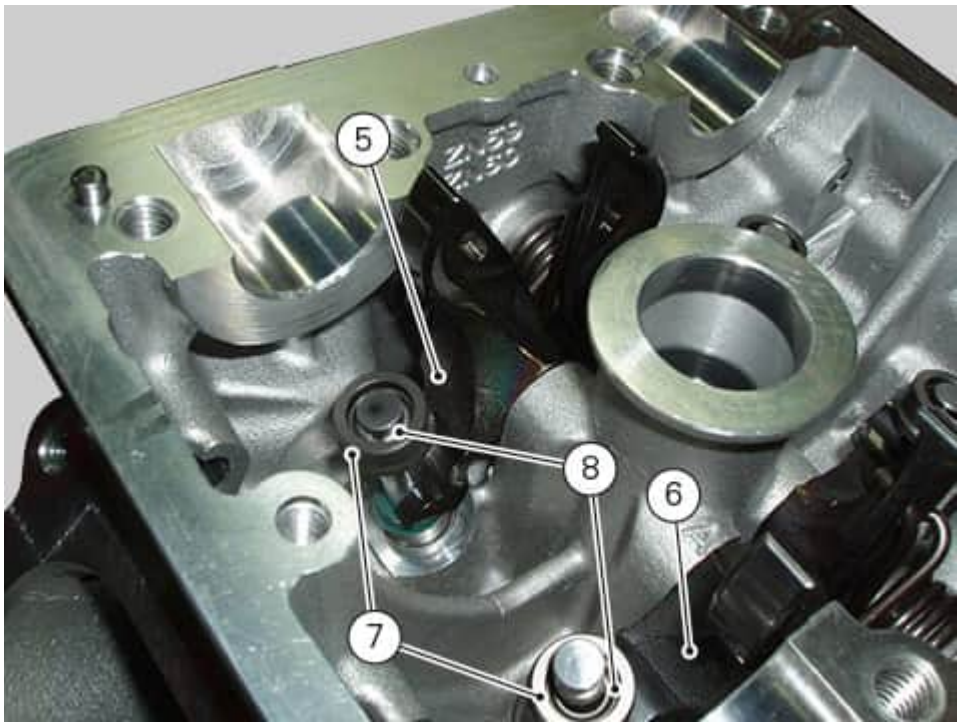
Removing the valves

Remove the complete head from the engine (Removing the engine heads).
Remove the timing pulleys (Removing the timing layshaft pulleys).
Remove the coils.
Remove the cylinder head covers, the camshaft supports and the camshafts (Removing the camshafts).

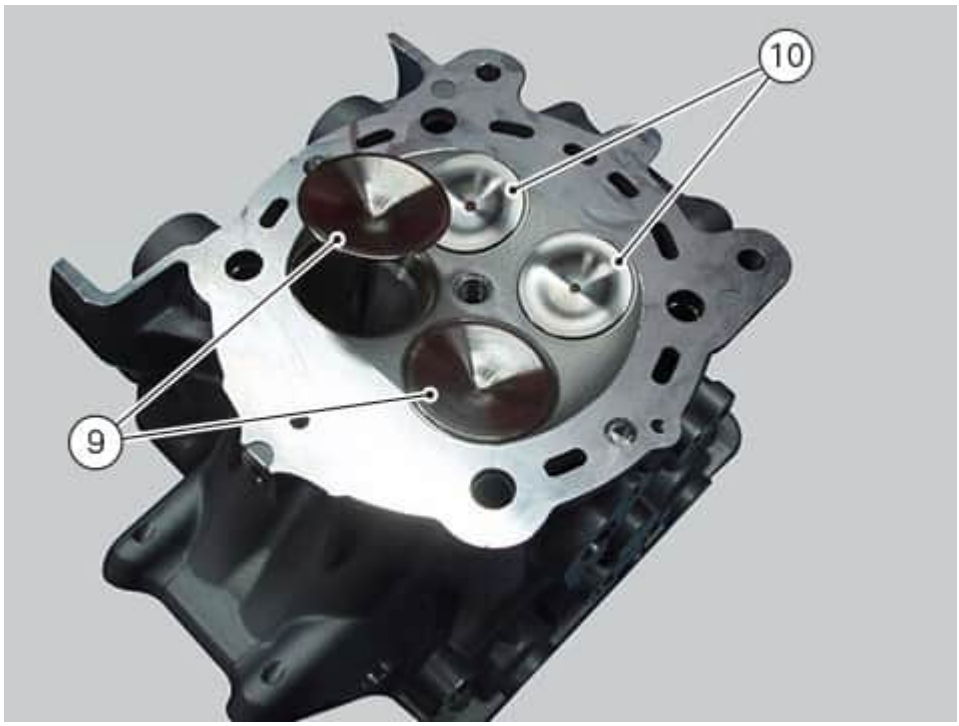
Raise rocker arm (3) and remove the opening shim (4) from the valves with a pair of pliers.



Push down the closing rocker arms (5) and (6) and the closing shim (7).
Remove the split rings (8) from the valves with a magnetic screwdriver.
Extract the closing shims (7) from the valve using a pair of pliers.



Withdraw the valves (9) and (10) from underside of the cylinder head.



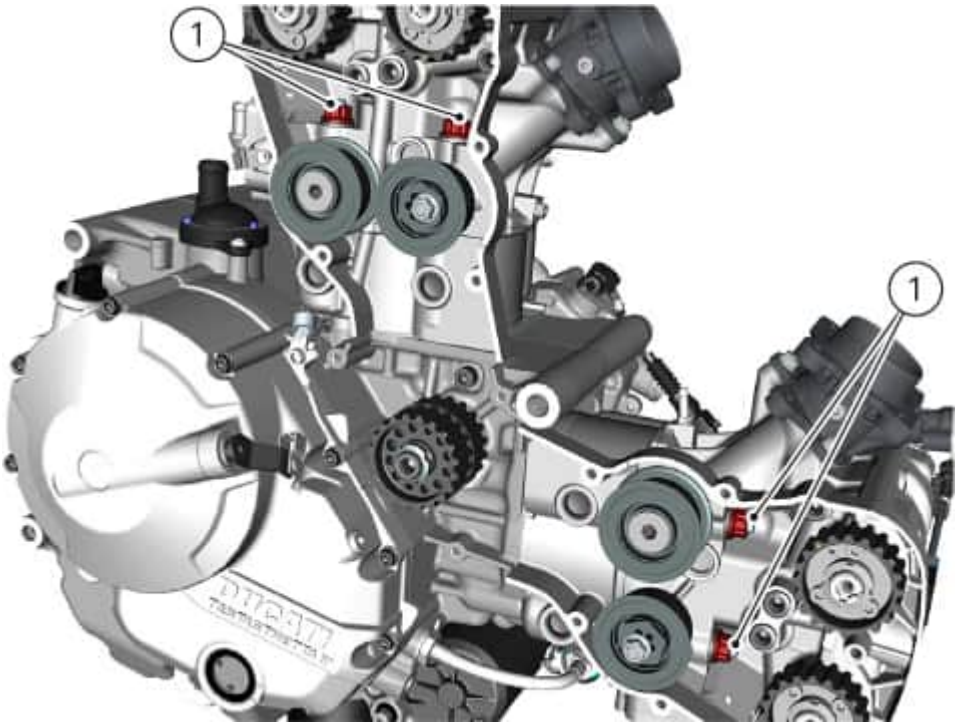
Repeat the same procedure for the other cylinder head.

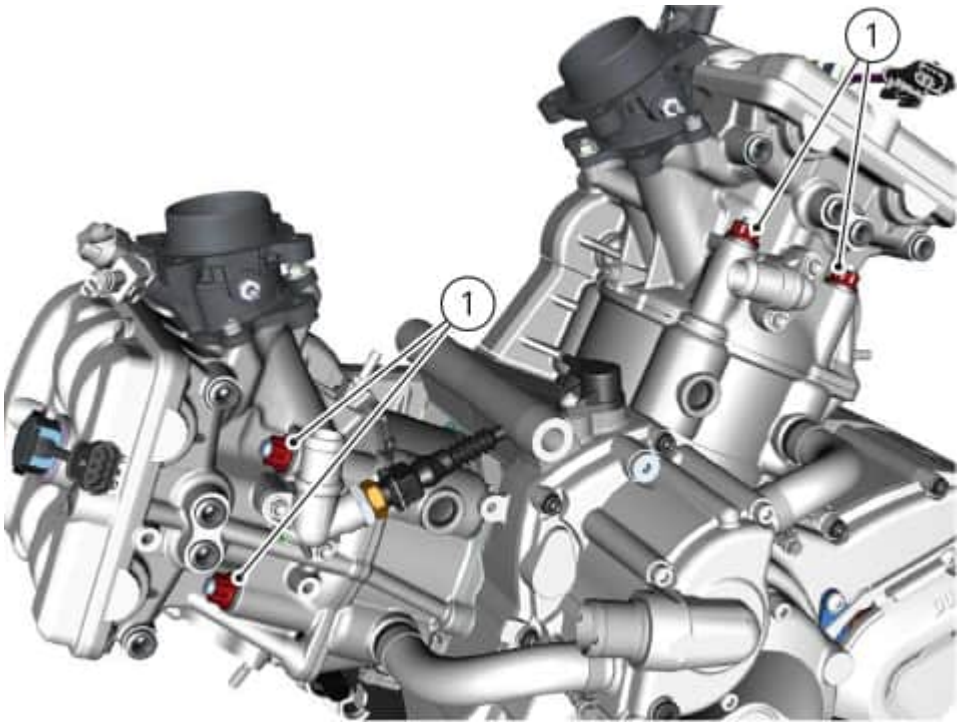
Removing the cylinder heads

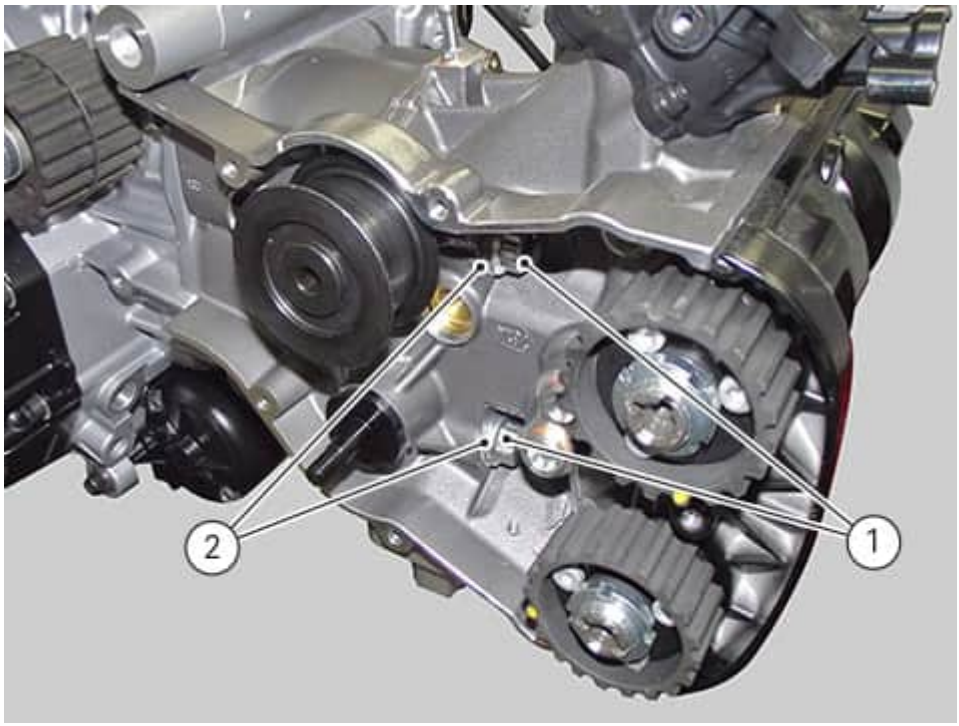
Note
The figures show an engine block removed from the frame.

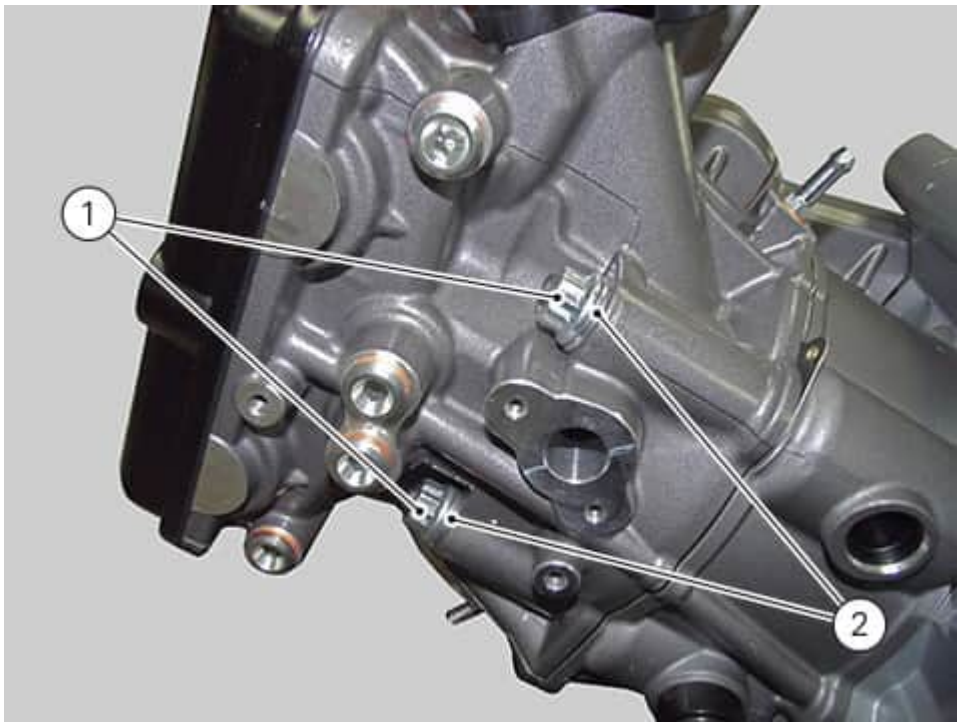
To work with the engine block installed in the frame it is necessary to remove the components indicated below.
Remove the seat (Removing the seat).
Remove the side fairings (Removing the fairings).
Remove the fuel tank (Removing the fuel tank).
Remove the airbox (Removing the airbox), the throttle body (Removing the throttle body), the blow-by and the oil breather pipe.
Remove the supply system and the injectors from the intake manifolds.
Drain the coolant (Changing the coolant).
Remove the cooling system hoses and unions from the engine block (Removing cooling system hoses and unions).
Remove the water radiator lower retainer from the engine (Removing the water radiator).
Remove the exhaust system (Removing the exhaust system).
Remove the timing belt external covers (Removing the timing belt covers) and the timing belts (Removing the mobile tensioner/timing belt).

Use tool part no. **88713.2676**, undo the nuts (1) on the cylinder head thru bolts.
Remove the polygonal nuts (1) and special washers (2).
Remove the cylinder head assembly by lifting it off the engine thru bolts.

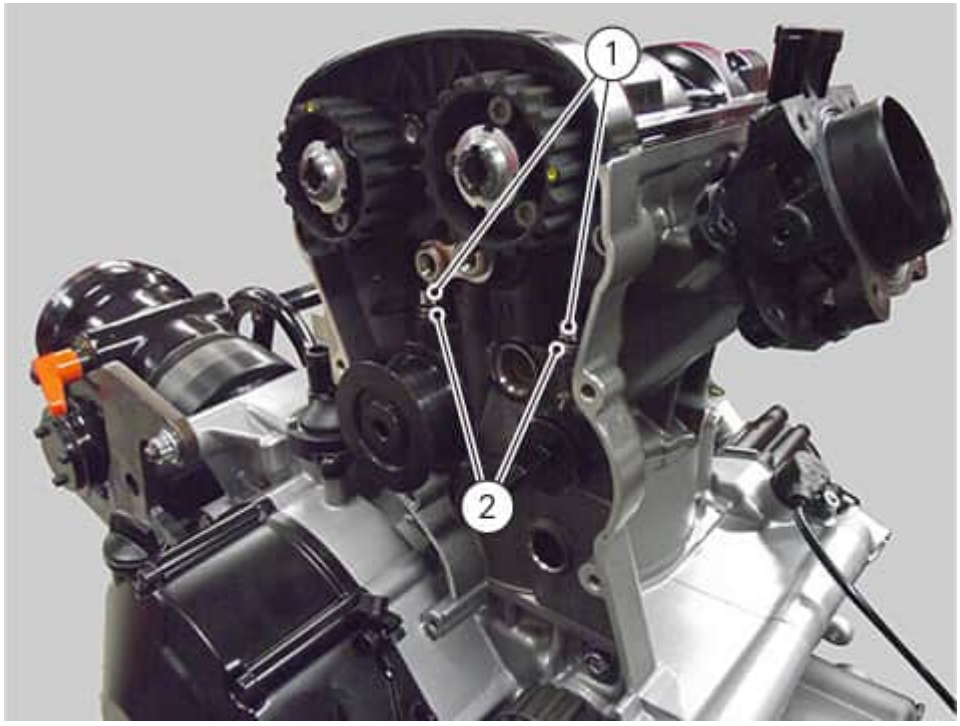


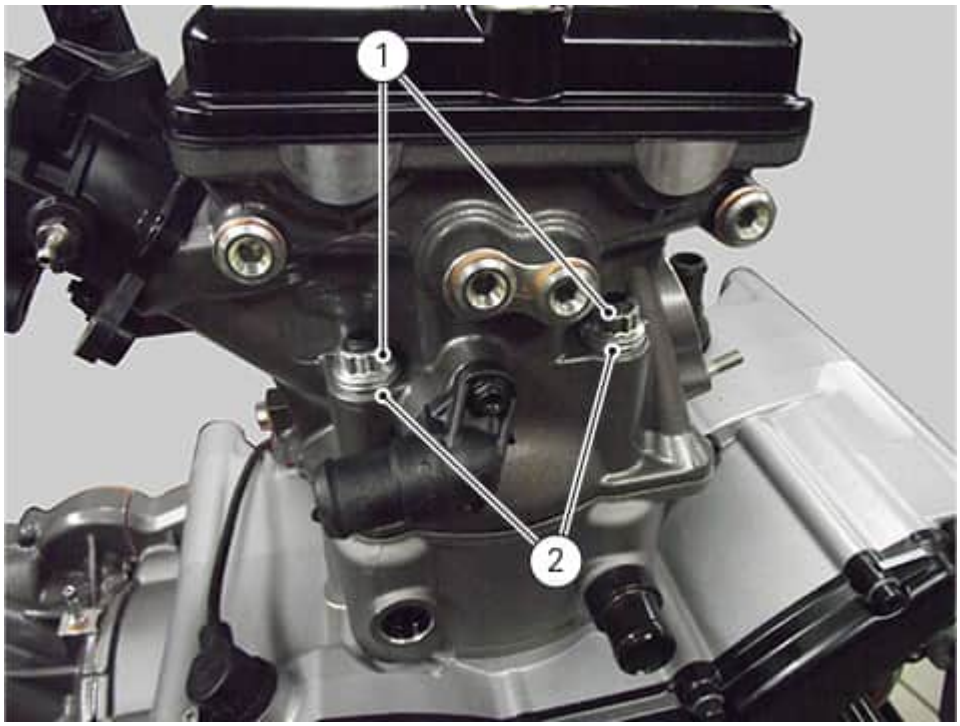

1
1


2
1



Repeat the same procedure for the other cylinder head.




1
2

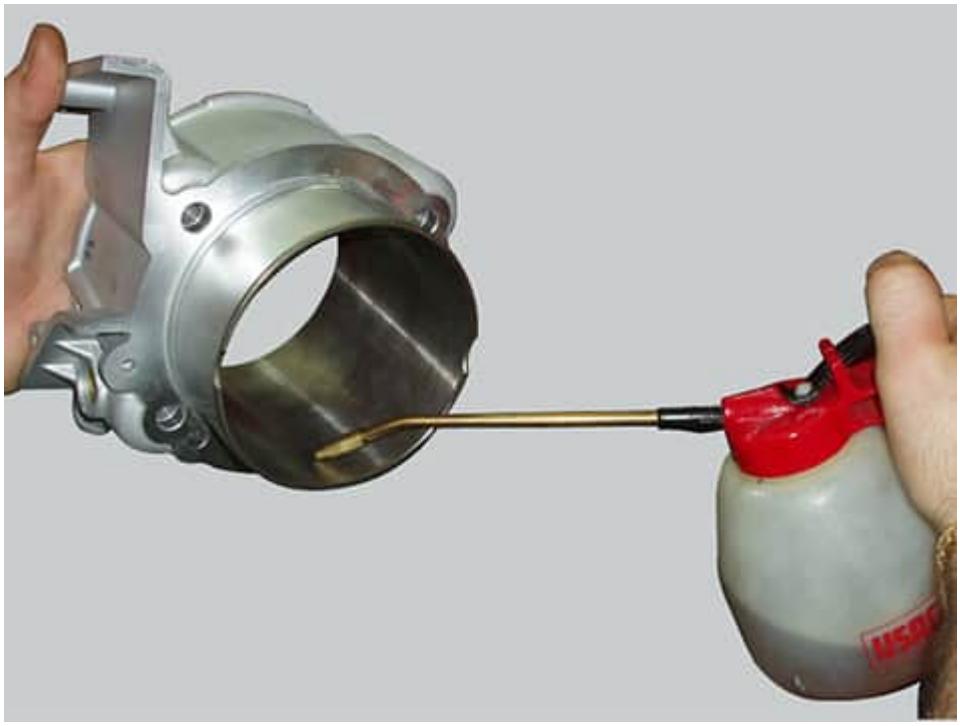
Refitting the cylinder/piston assembly

If new units are used, it is necessary to couple the cylinders and pistons of the same selection (see chapter "Overhauling the cylinder/piston components").

Note

If the pistons have been separated from their cylinders, before reassembling these components, position the piston ring gaps at 120° from one another (the markings must always face the piston crown).

Use a universal tool to carefully insert the piston into the cylinder (first lubricate the inside of the cylinder with engine oil). Position the cylinder with the smallest valve recess is on the side of the exhaust.

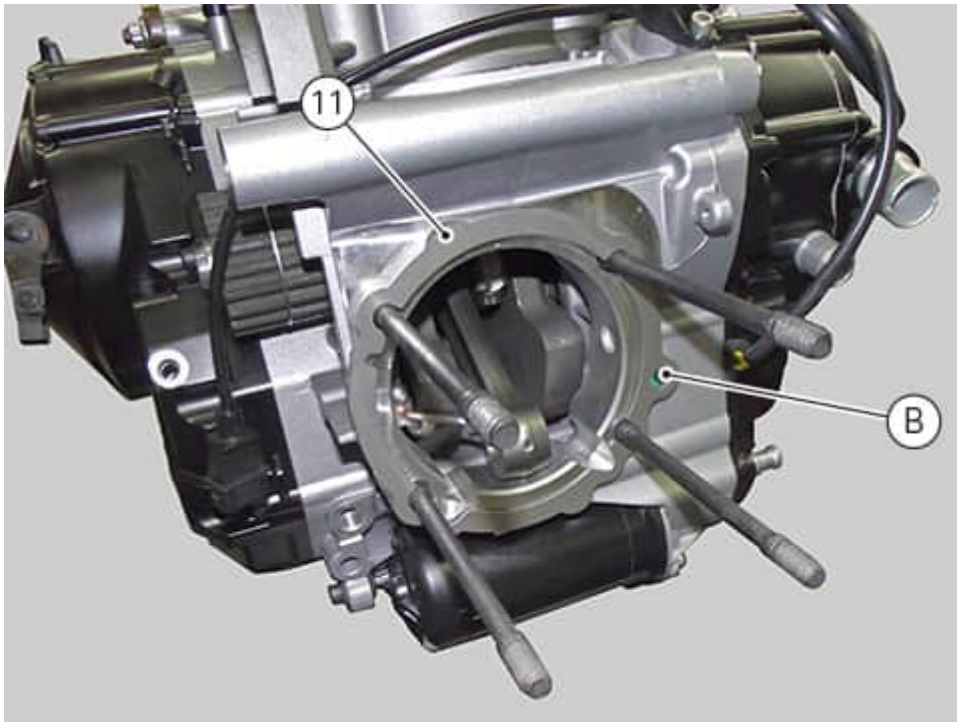


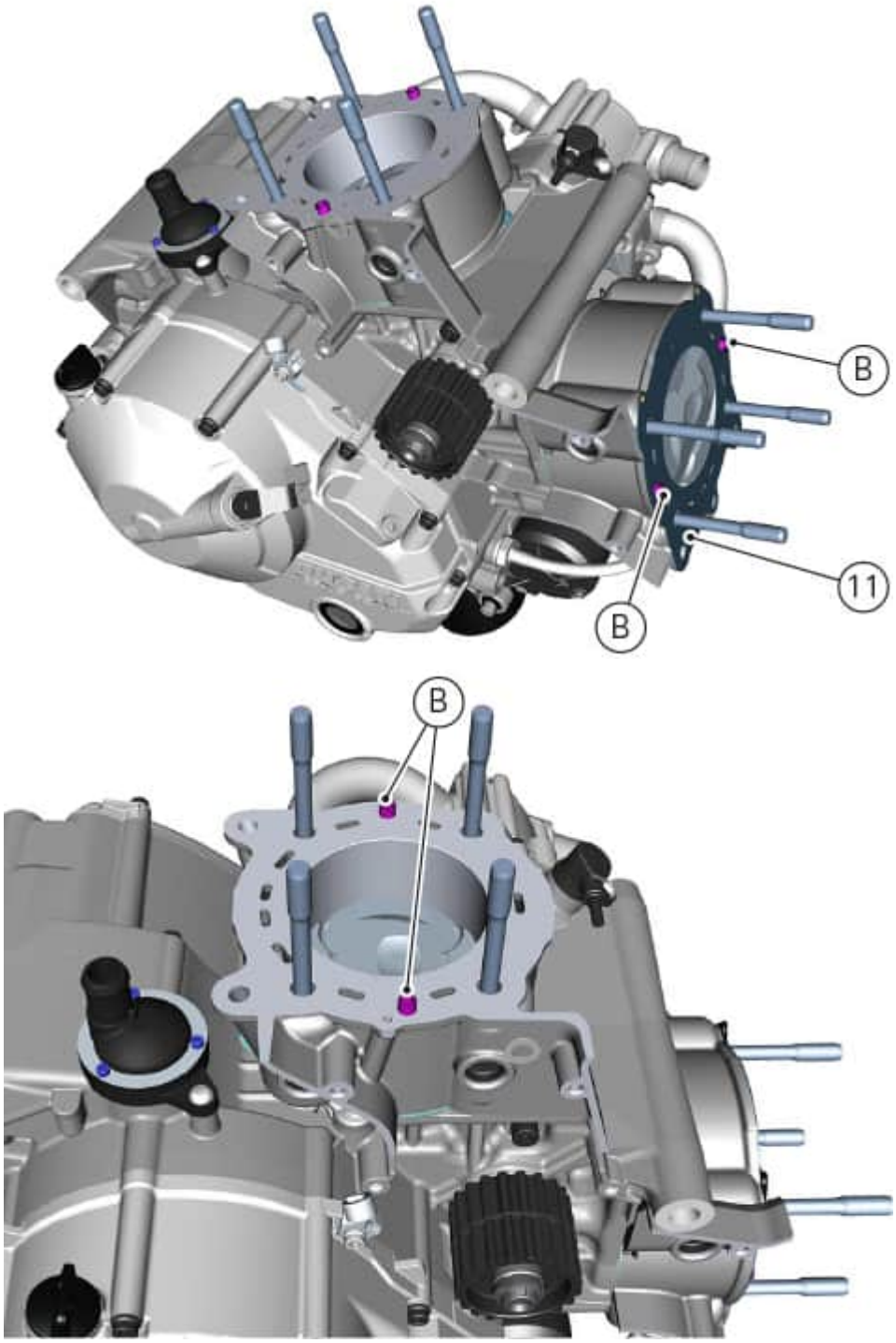




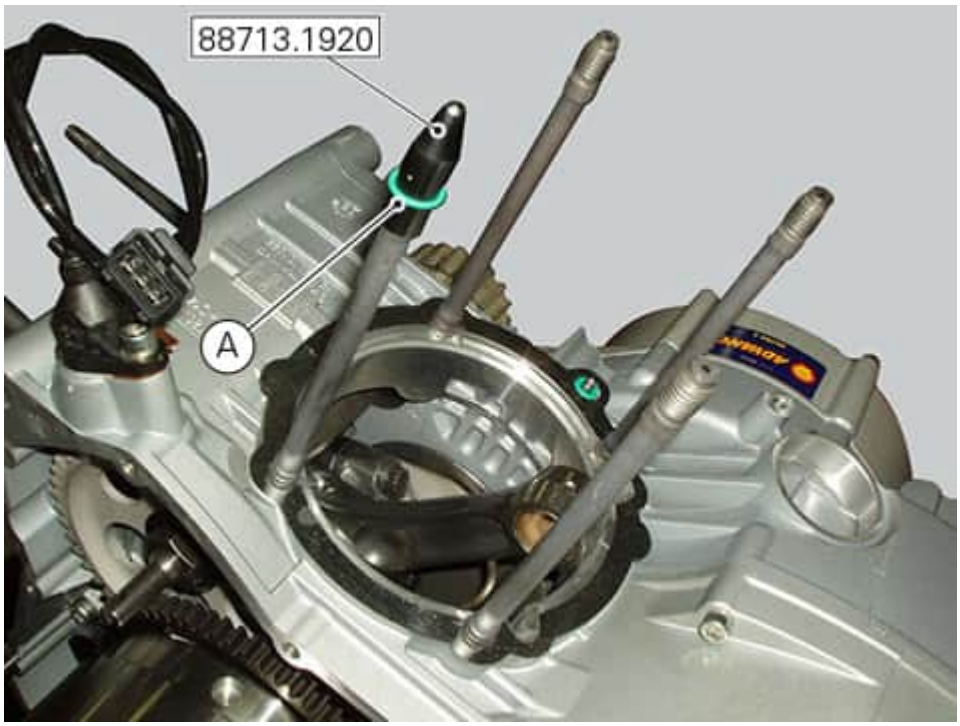
Remove any deposits and degrease the contact surfaces of the crankcase half and the cylinders. Check that the cylinder centring dowels (B) are fitted on the crankcase.

Apply sealant to the gasket (11) then locate the gasket on the crankcase.

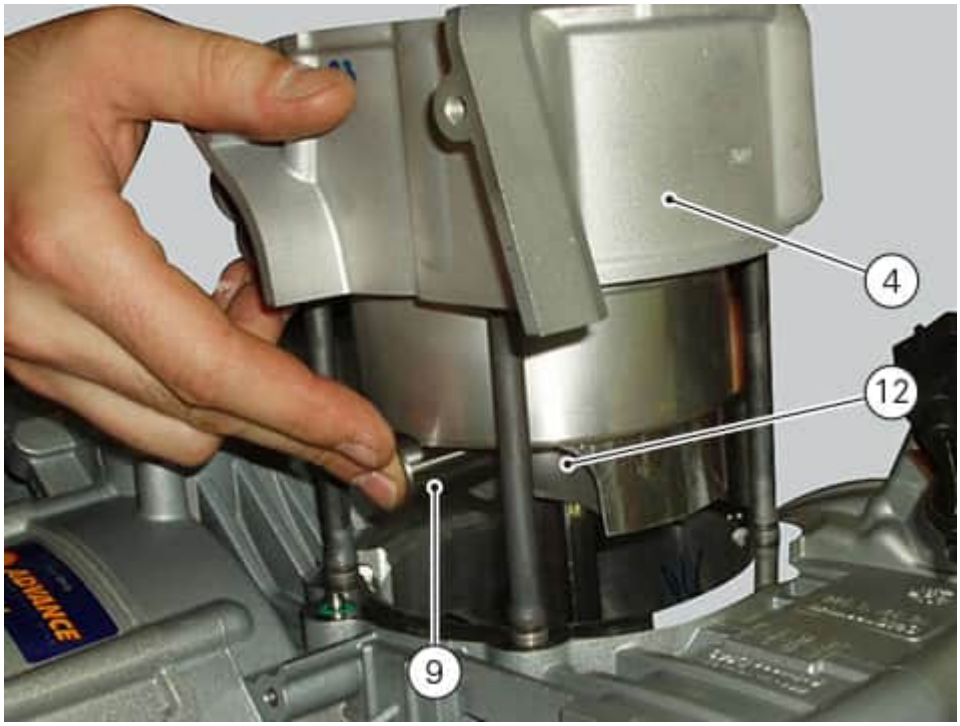




Using cap no. 88713.1920, fit the O-rings (A) on each thru bolt and guide them into their seats in the crankcase.



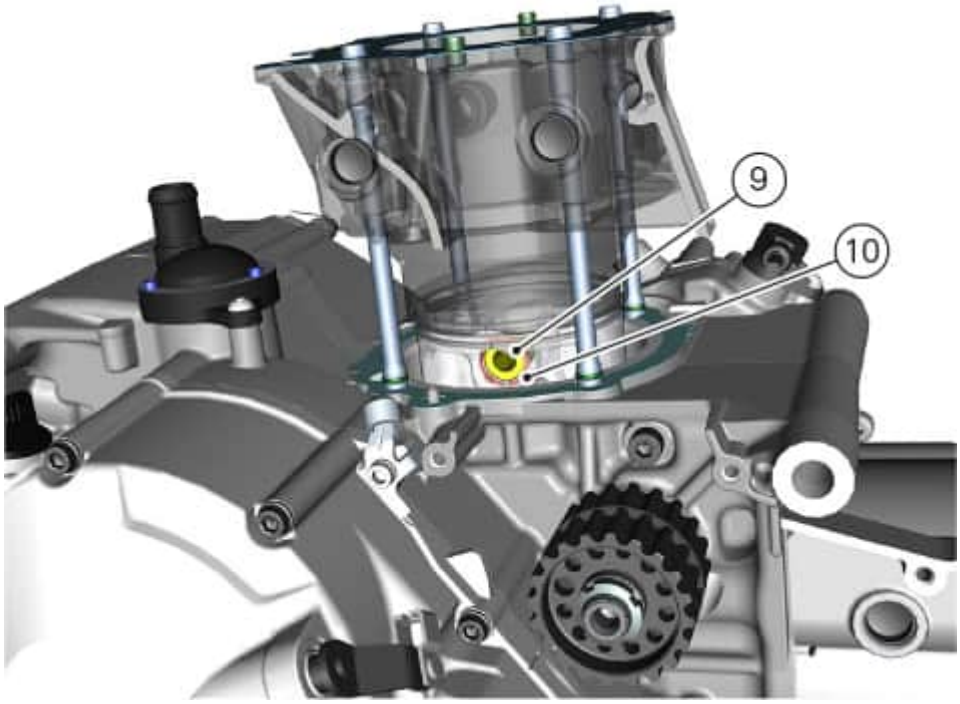
Bring the connecting rod small end close to TDC and slide the cylinder-piston assembly (12) and (4) onto the crankcase thru bolts.
Push the connecting rod small end into the piston close to the gudgeon pin (9) hole. Lubricate and insert the gudgeon pin.

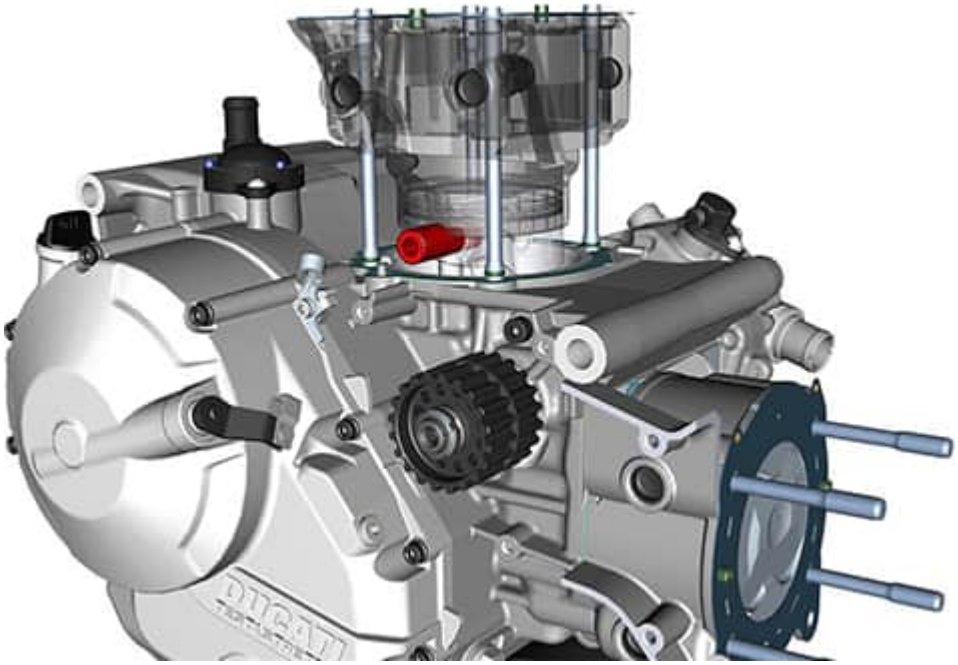


The gudgeon pin (9) must slide smoothly in the connecting rod small end bush and in the piston (12).
Close the crankcase opening with a cloth to prevent foreign objects from falling inside and then fit the snap ring (10).

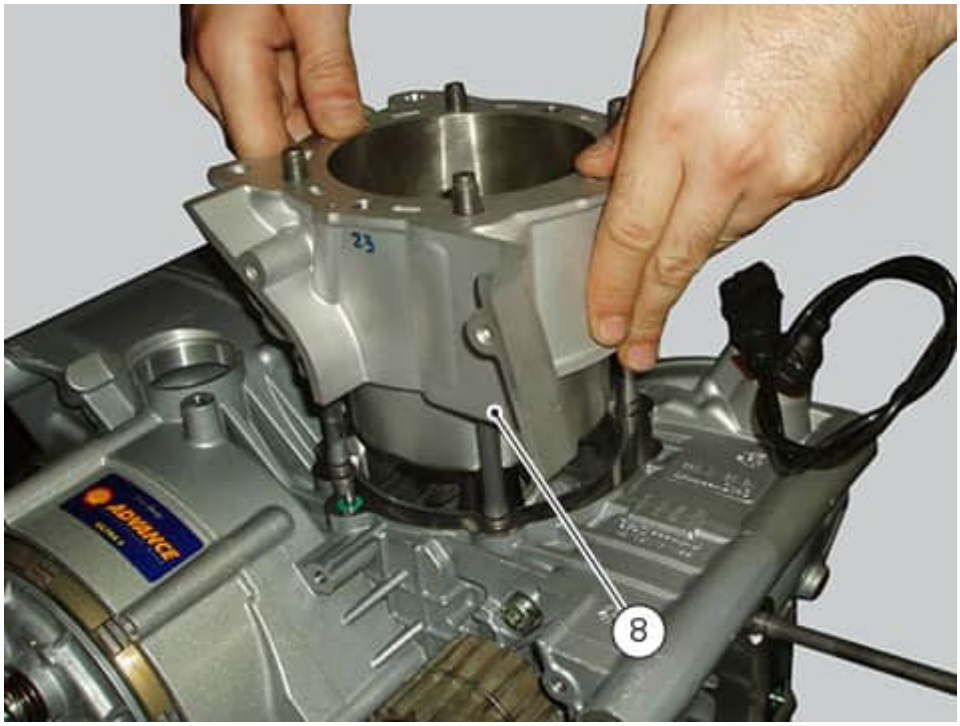
Important
Always fit new circlips upon reassembly.


12
10
9

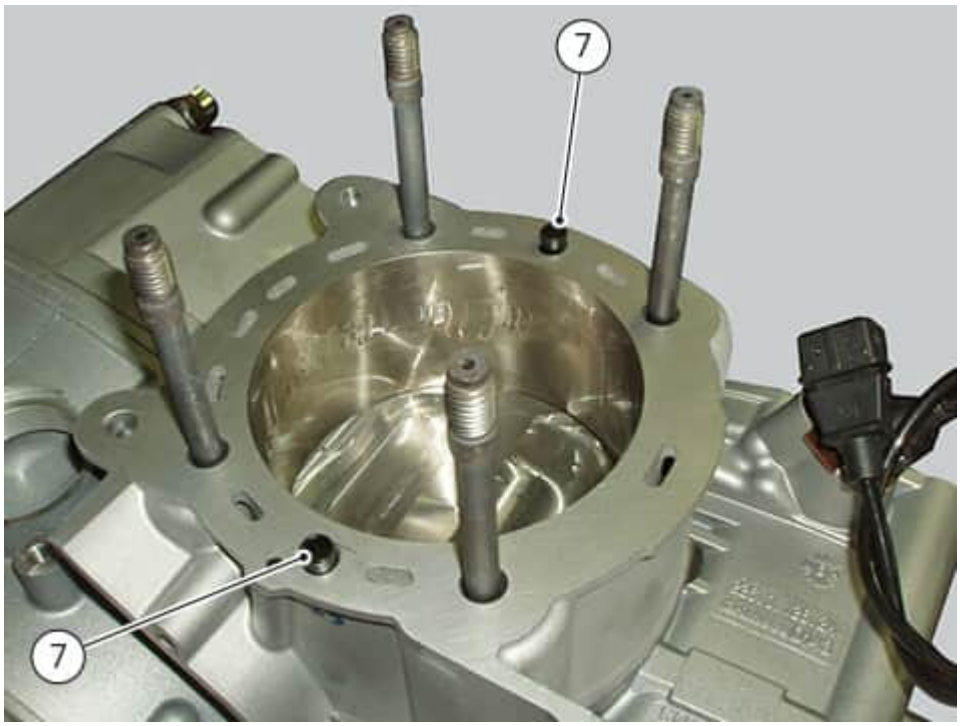

9
10



Push the cylinder (8) down until it seats against the crankcase.



Refit the bushes (7).



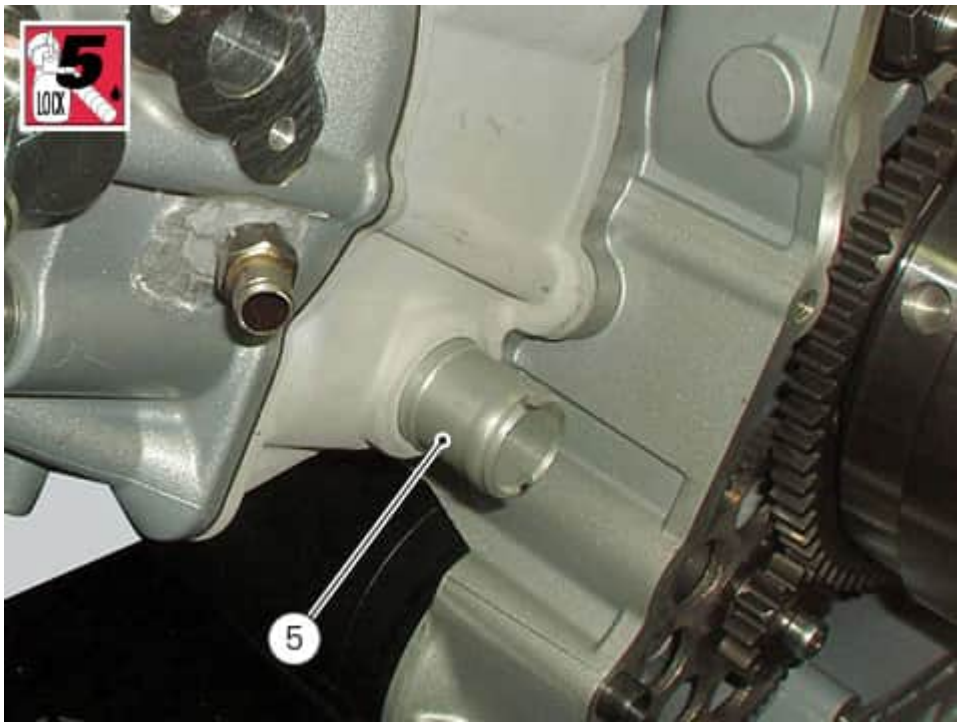
Fit the cylinder head gasket (6) over the thru bolts. The side marked with the part number must be facing the cylinder head.

Note

The shape of the gasket prevents incorrect fitting, provided that the fluid flow holes are aligned with those on the cylinder.

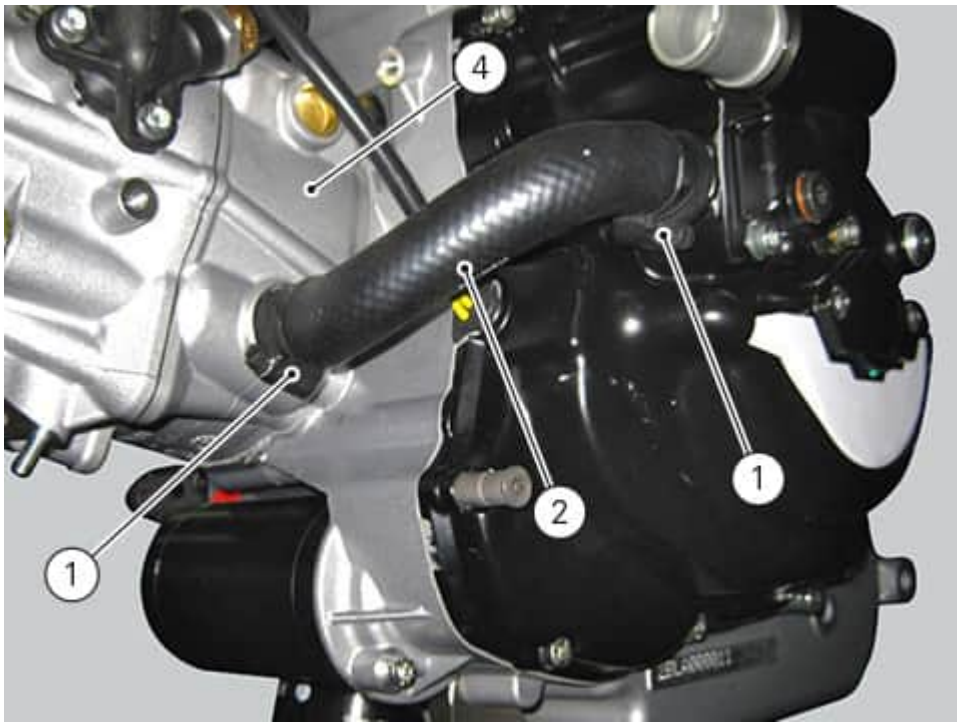


Repeat the procedure for the other cylinder and refit the cylinder heads (Refitting the cylinder head assemblies). In case they have been removed, apply prescribed threadlocker to unions (5) and tighten them to a torque of 25 Nm (Min. 23 Nm - Max. 27 Nm) (Engine tightening torque values).



Fit hoses (2) and (3), and tighten the clamps (1) to a torque of 2.5 Nm (Min. 2 Nm - Max. 3 Nm) (Engine tightening torque values).



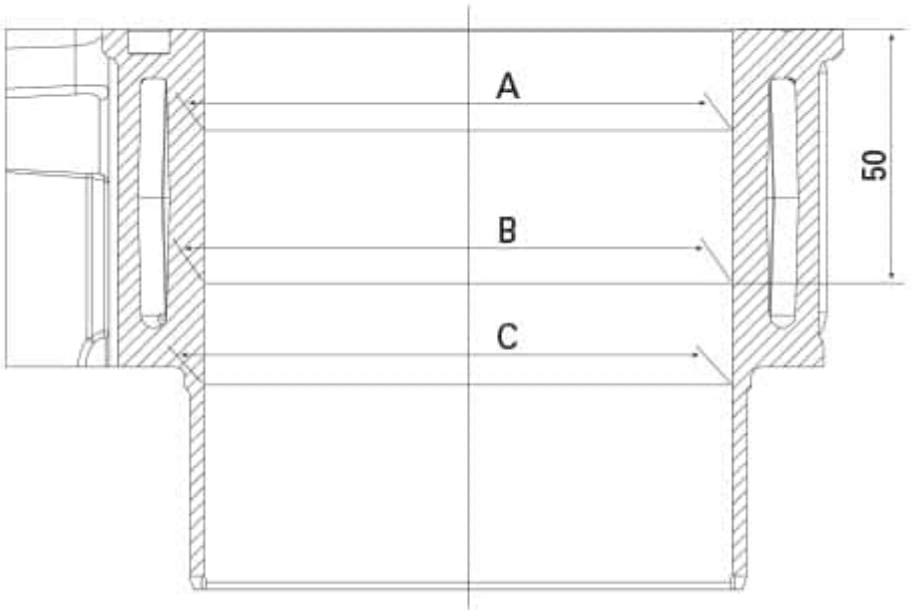


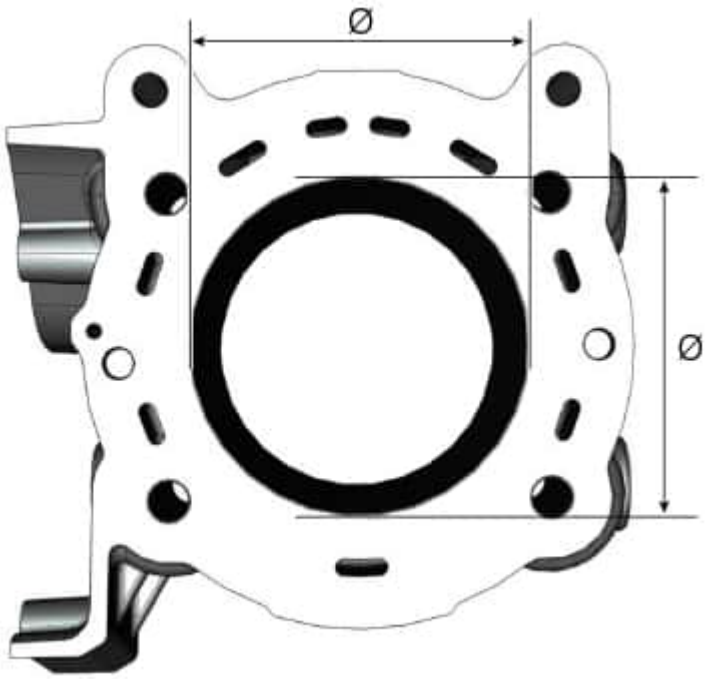
Refit the heads on the engine block (Refitting the cylinder head assemblies).
Refit the intake manifolds (Refitting the intake manifold and water union).
Refit the timing belts (Refitting the timing belts) and the timing belt external covers (Refitting timing belt external covers).
Refit the exhaust system.
Refit the water radiator on the engine (Refitting the water radiator).
Refit the cooling system hoses and unions on the engine block (Refitting the cooling system hoses and unions).
Refill the cooling system (Changing the coolant).
Refit the injectors on the intake manifolds and the supply system.
Refit the blow-by and the oil breather pipe, the throttle body (Refitting the throttle body) and the airbox (Refitting the airbox).
Refit the air filter (Refitting the air filters).
Refit the fuel tank (Refitting the fuel tank).
Refit the side fairings (Refitting the fairings).
Refit the seat (Refitting the seat).

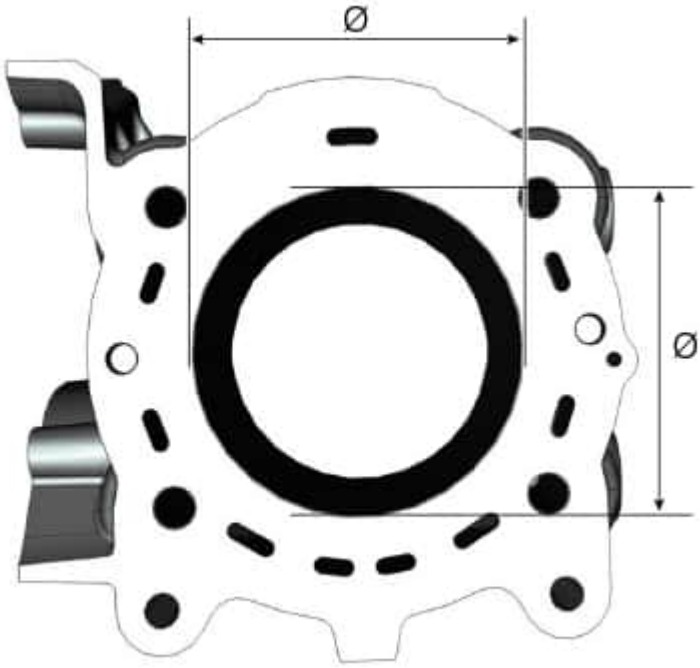
Overhauling the cylinder/piston components

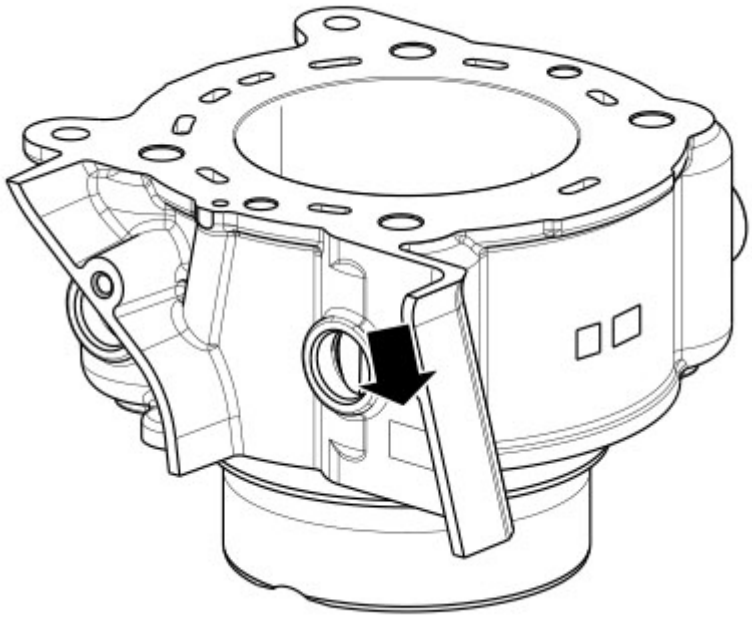
Overhauling the cylinder

Check that the walls of the cylinder are perfectly smooth. Measure the cylinder diameter at 50 mm from the top face and determine the size class to which it belongs in accordance with the values specified in Section "Cylinder/piston".
Repeat measurement of the diameter at three heights "A" (10 mm from the upper surface), "B" (50 mm from the upper surface) and "C" (100 mm from the upper surface) and in two directions at 90° between them; check that the measurements of taper and ovality fall within the range specified in Section "Cylinder/piston".
In the event of damage or excessive wear the cylinder must be replaced as it has a silicon carbide coating (which provides the cylinder walls with excellent anti-friction and anti-wear properties) and therefore cannot be ground.
The cylinders are marked with letters (stamped between the two oil return ways) indicating their size class.
Always match cylinders with pistons from the same size class.



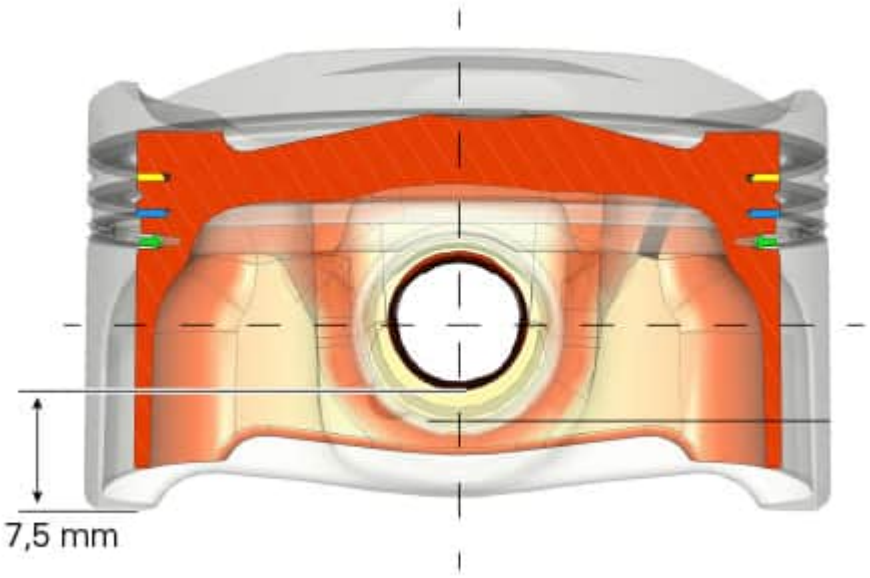






Overhauling the piston

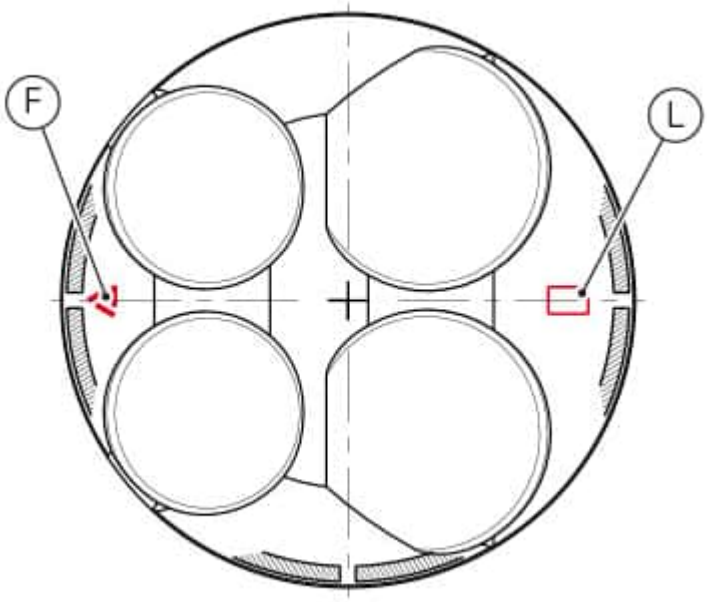
Clean the piston crown and piston ring grooves, removing any carbon deposits.
Visually inspect the piston and check its dimensions carefully: there must be no signs of scuffing, scoring, cracks, or other damage.
The piston diameter must be measured at 7.5 mm up from the bottom of the skirt and in perpendicular direction to the gudgeon pin axis.
The pistons must always be replaced as a pair.



Checking the piston-cylinder clearance

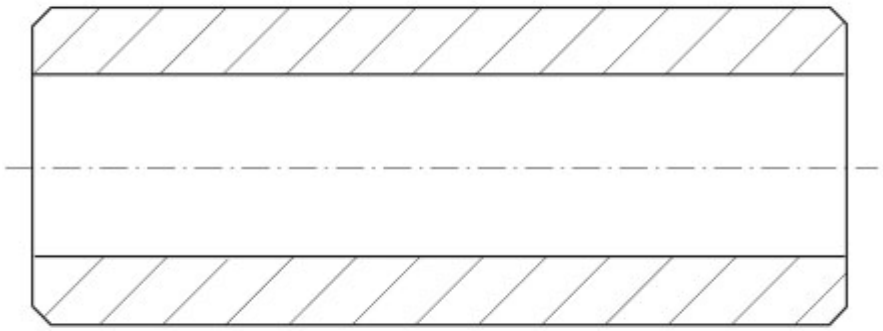
The pistons are marked with a symbol (selected letter (L) punched onto the piston crown) that indicates the size class to which they belong.
Always match cylinders with pistons from the same size class.
(F): arrow that indicates the exhaust side.
For the correct values, refer to chapter "Cylinder/piston".



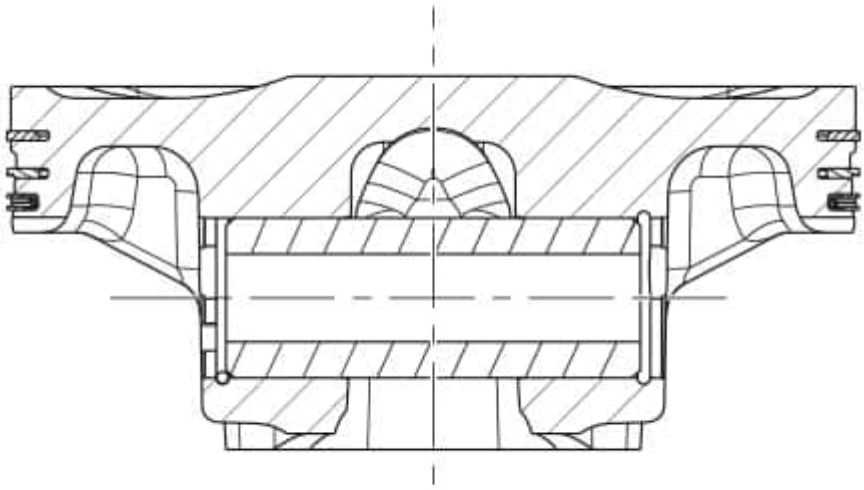


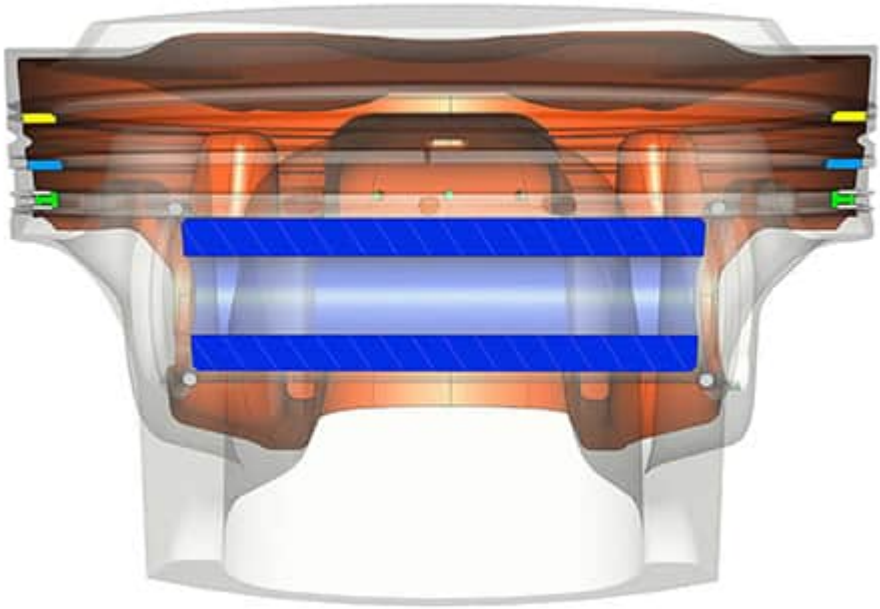
Overhauling the gudgeon pins

Gudgeon pins must be perfectly smooth without signs of scoring, steps, or blueing due to overheating.
The well-lubricated gudgeon pin must slide smoothly inside the piston without stiffness.
For the coupling clearance values with the piston and the connecting rod, see chapter "Cylinder/Piston".
If a new gudgeon pin is fitted, you must also change the connecting rod small end bush.









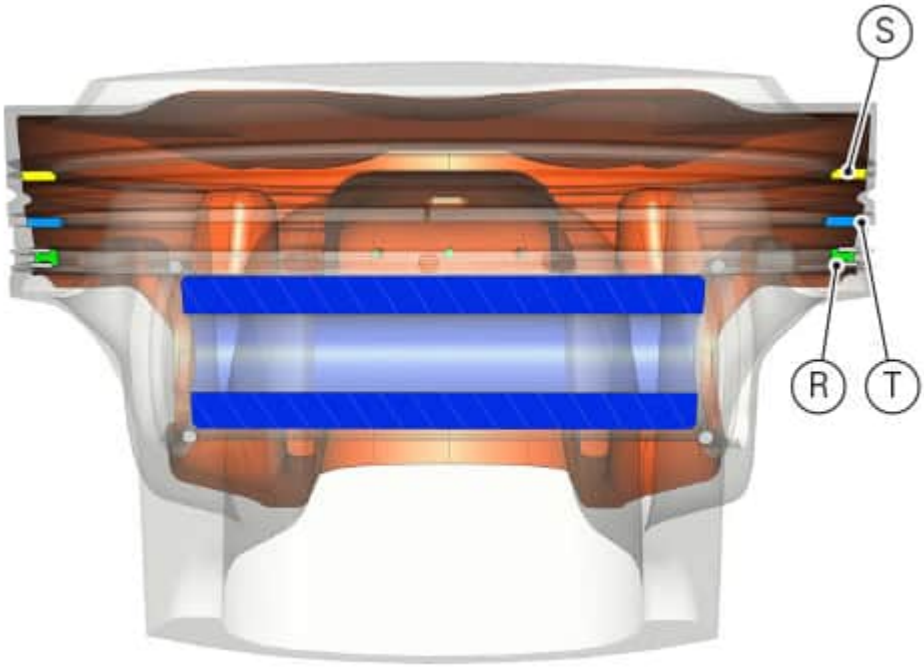
Overhauling the piston rings

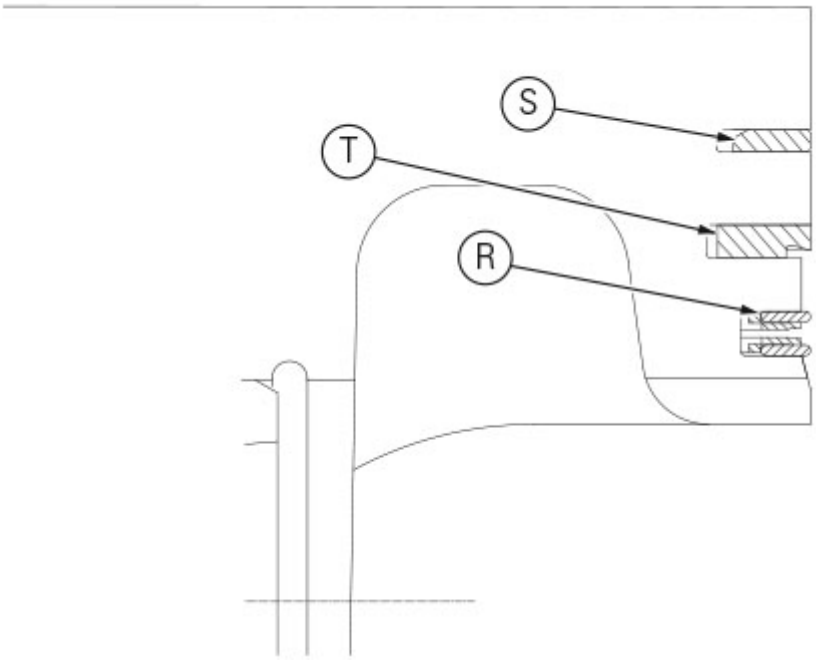
The piston rings must not show any signs of scuffing or scoring.
Spare pistons are supplied complete with piston rings and gudgeon pin.

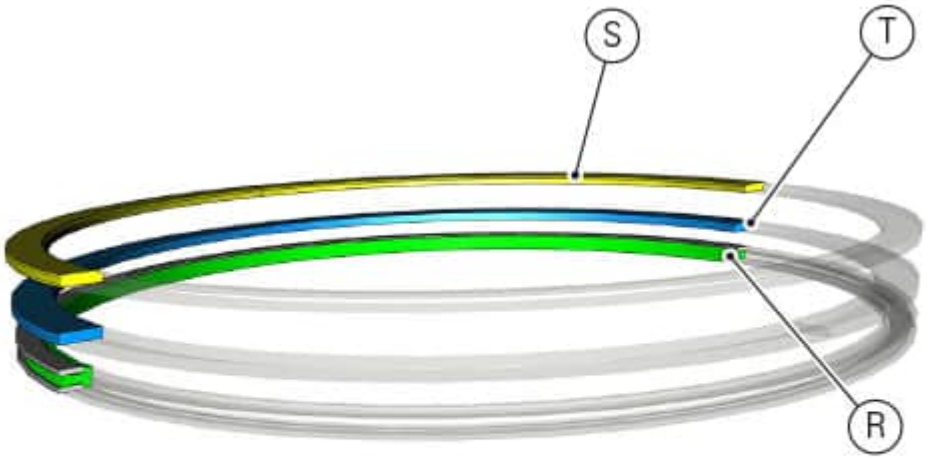


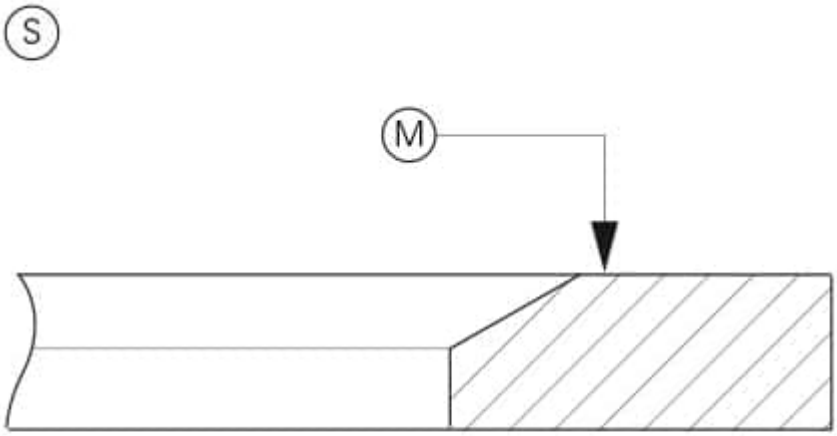
Checking the piston ring-grooves clearance

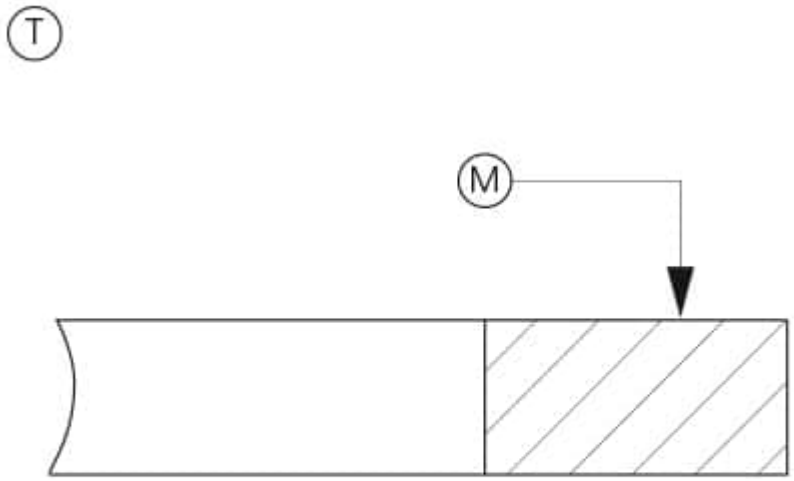
The maximum permissible wear limit is 0.15 mm for the top ring (1st ring "S") and 0.10 mm for the others (2nd ring "T" and oil scraper ring "R").
The piston rings must always be fitted with markings (M) facing upwards.

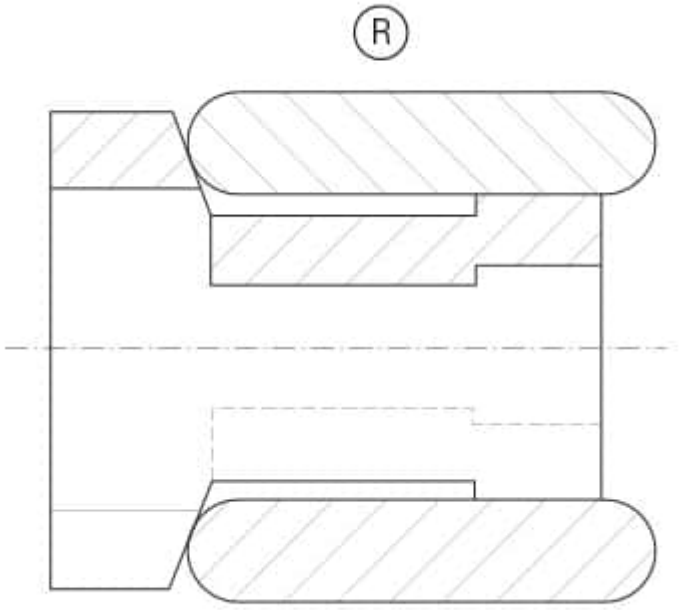

S
R
T


S
T
R


S
T
R


S
M

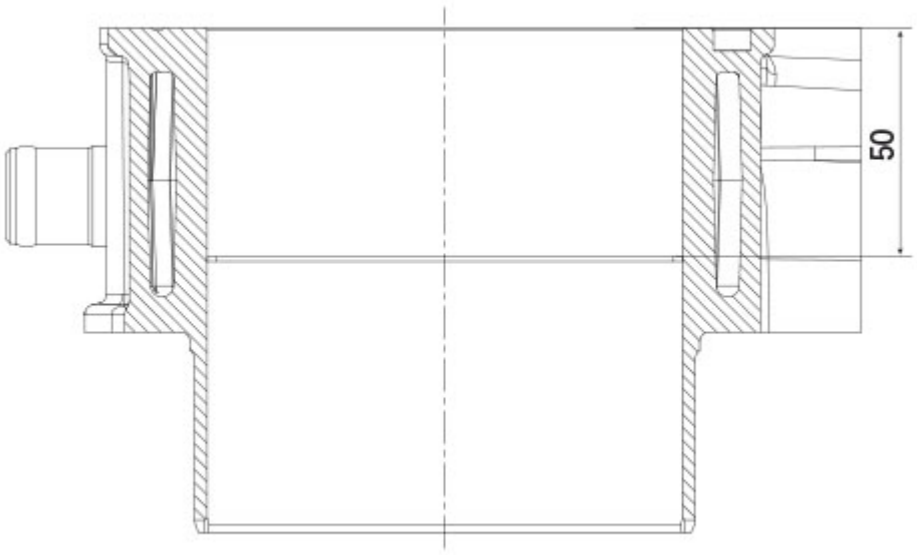


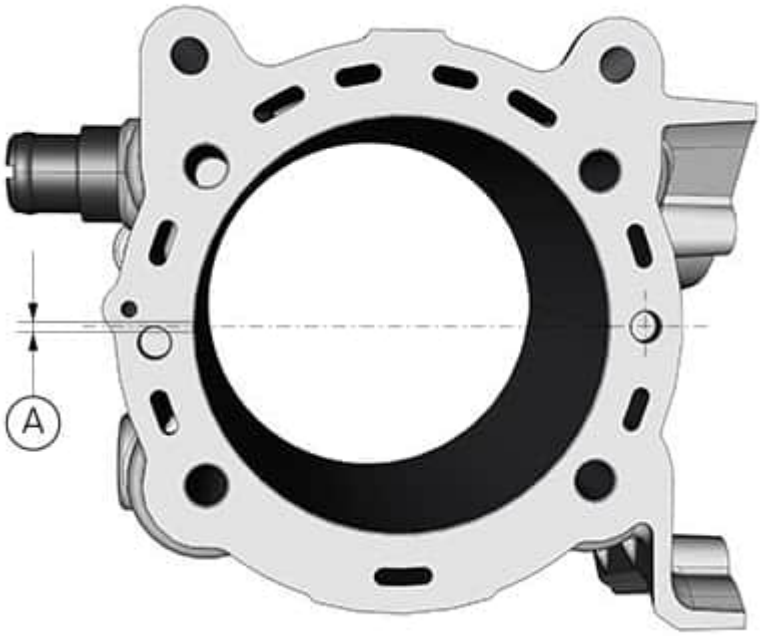


Checking the piston ring/cylinder clearance

Insert the piston ring 50 mm from the top face of the cylinder; make sure that the ring is positioned perfectly square to the cylinder axis by checking with a gauge at several points around the ring that the top surface of the ring is 50 mm from the cylinder top face.
Measure the piston ring gap (A):

	Distance (A) mm	Wear limit
Upper piston ring	0.2 to 0.4	0.8
Intermediate piston ring	0.3 to 0.5	0.8
Oil scraper ring	0.2 to 0.7	1.0


50

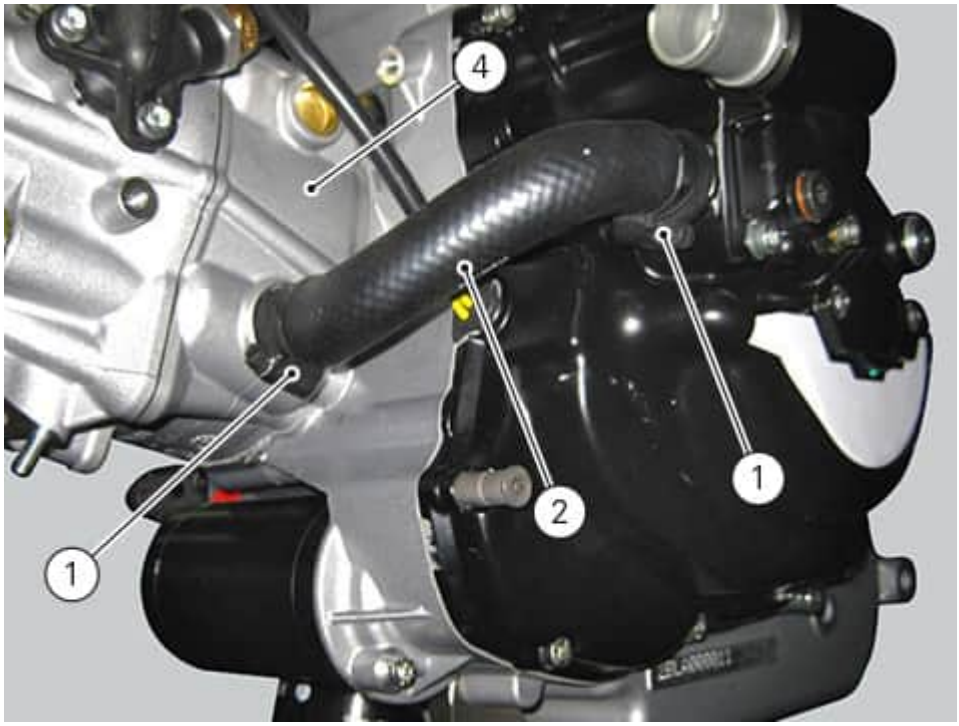

A

Removing the cylinder/piston assembly

Note
The figures show an engine block removed from the frame.

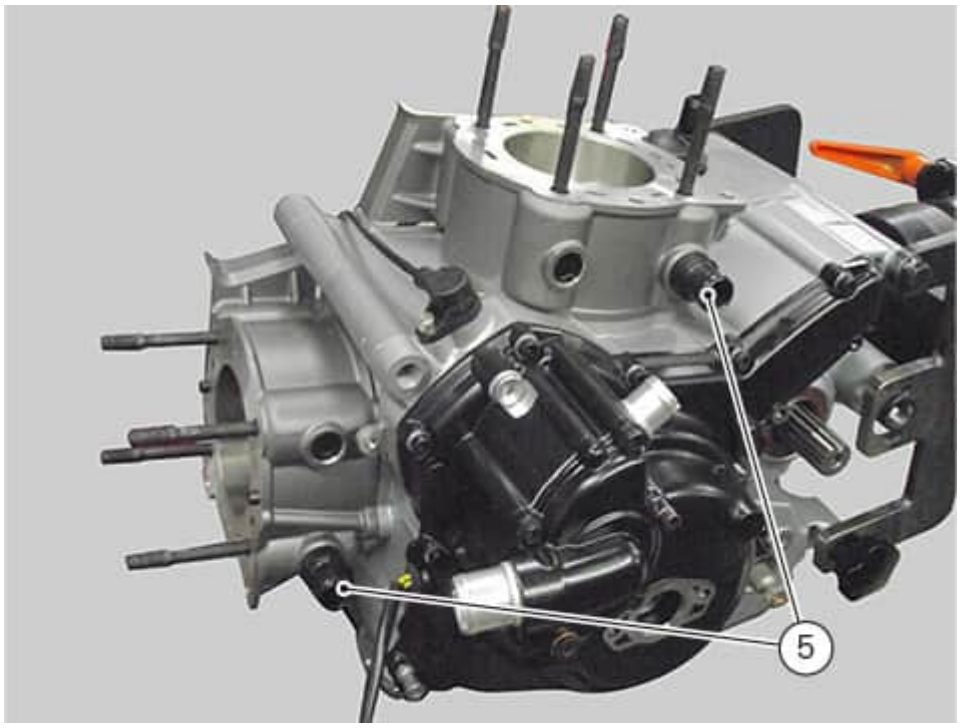
To work with the engine block installed in the frame it is necessary to remove the components indicated below.
Remove the seat (Removing the seat).
Remove the side fairings (Removing the fairings).
Remove the fuel tank (Removing the fuel tank).
Remove the airbox (Removing the airbox), the throttle body (Removing the throttle body), the blow-by and the oil breather pipe.
Remove the supply system and the injectors from the intake manifolds.
Drain the coolant (Changing the coolant).
Remove the cooling system hoses and unions from the engine block (Removing cooling system hoses and unions).
Remove the exhaust system (Removing the exhaust system).
Remove the timing belt external covers (Removing the timing belt covers) and the timing belts (Removing the mobile tensioner/timing belt).
Remove the intake manifolds (Removing the intake manifold and water union).
Remove the heads from the engine block (Removing the engine heads).

Loosen the clamps (1) and remove the hoses (2) and (3) from the cylinders (4) and from the generator cover.





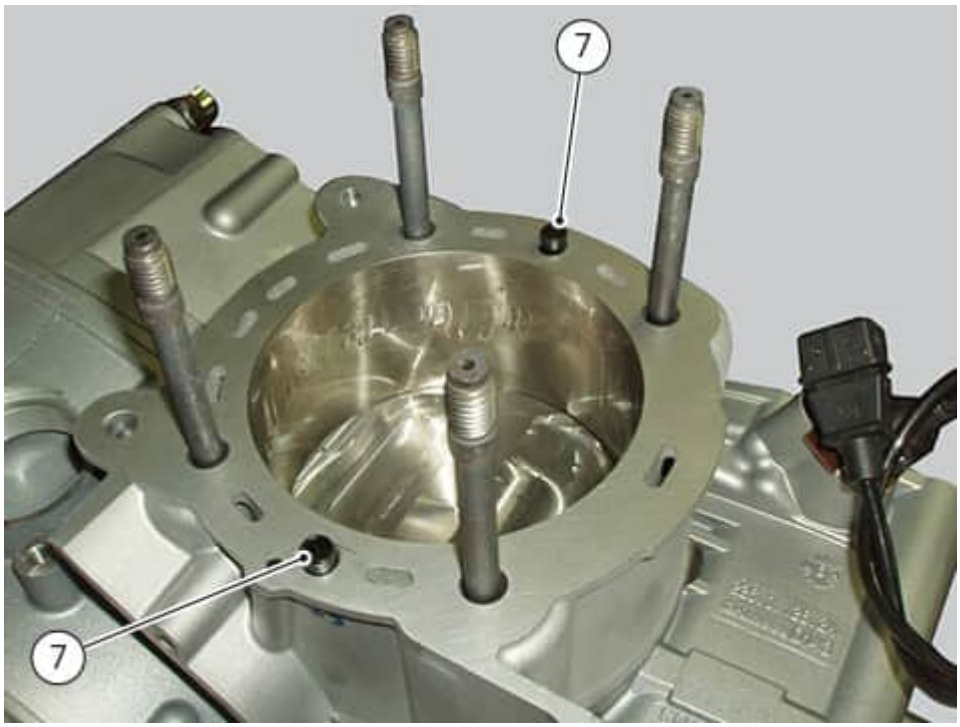
If damaged, unscrew the unions (5).



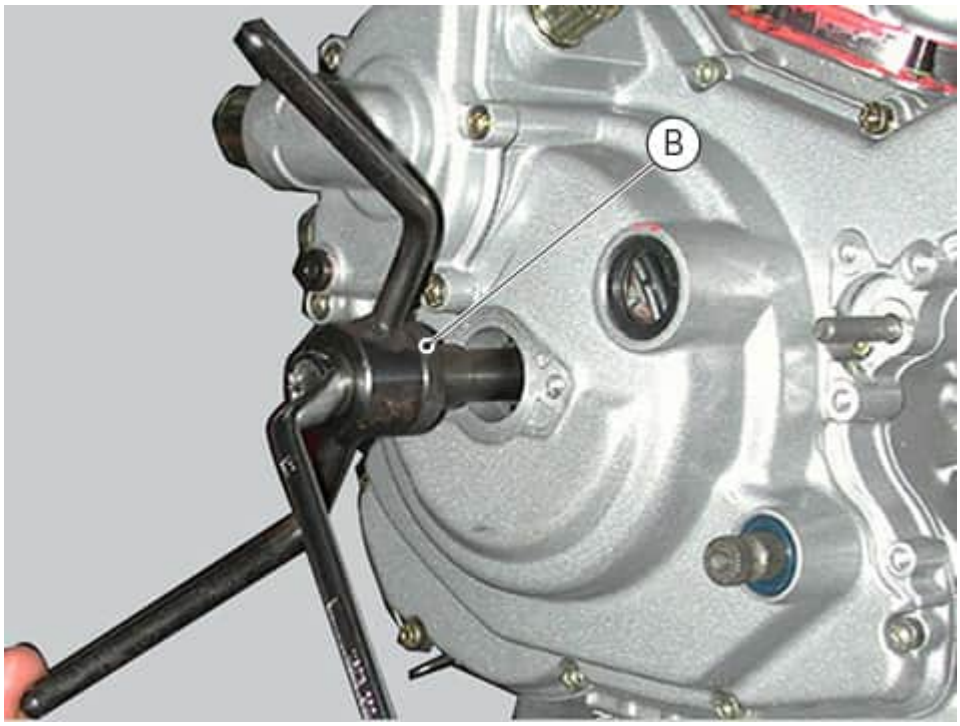
Remove the cylinder head gasket (6) from the piston-cylinder assy.



Remove the bushes (7).

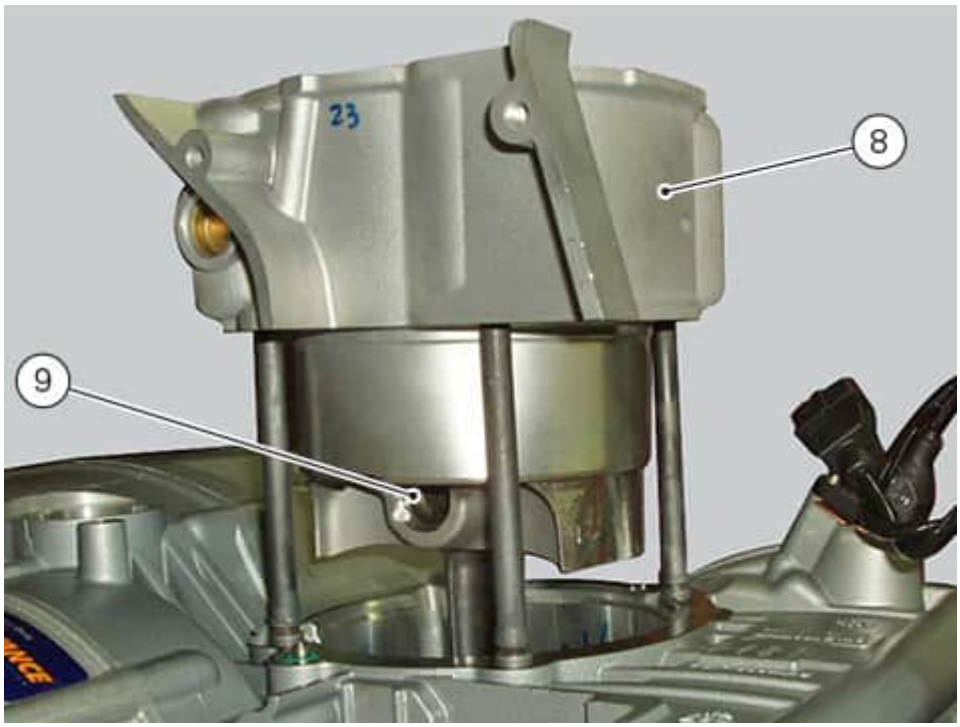


Use tool (B) no. **88765.1657** to bring the piston of the horizontal cylinder near the TDC.



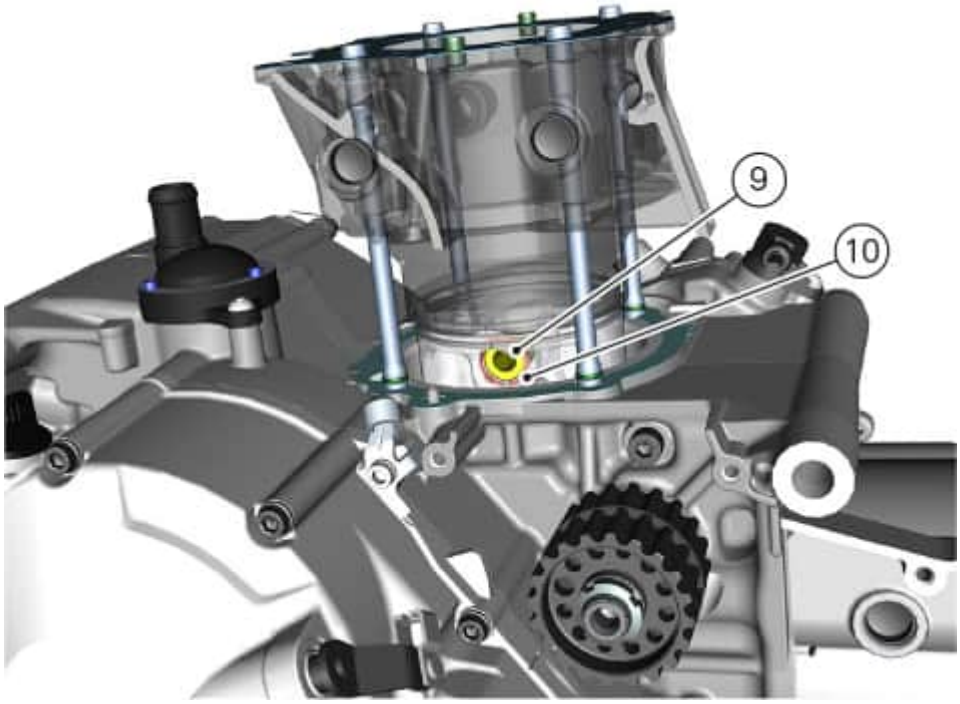
Carefully lift the cylinder (8) off the crankcase, keeping it vertical. If necessary, rock the cylinder slightly using both hands or tap its base gently with a rubber mallet.
Continue to lift the cylinder until you can access the gudgeon pin (9).

Since insertion of piston in the cylinder is a difficult operation to perform at the time of reassembly, remove the piston together with the barrel as described below.
Stuff the crankcase opening with a rag or soft paper to prevent foreign material from falling inside.

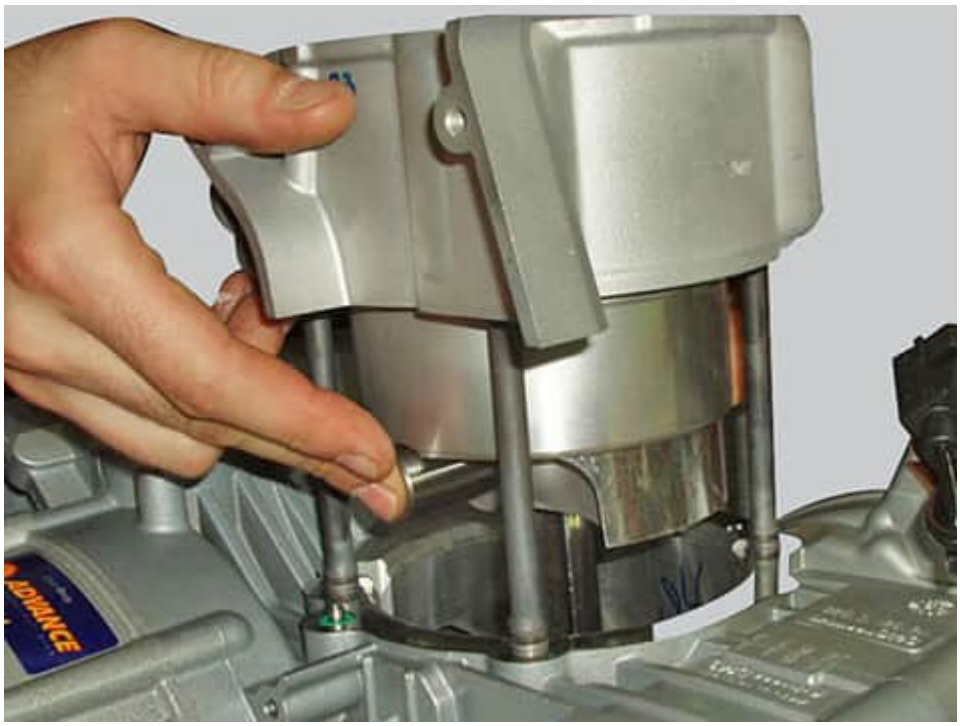


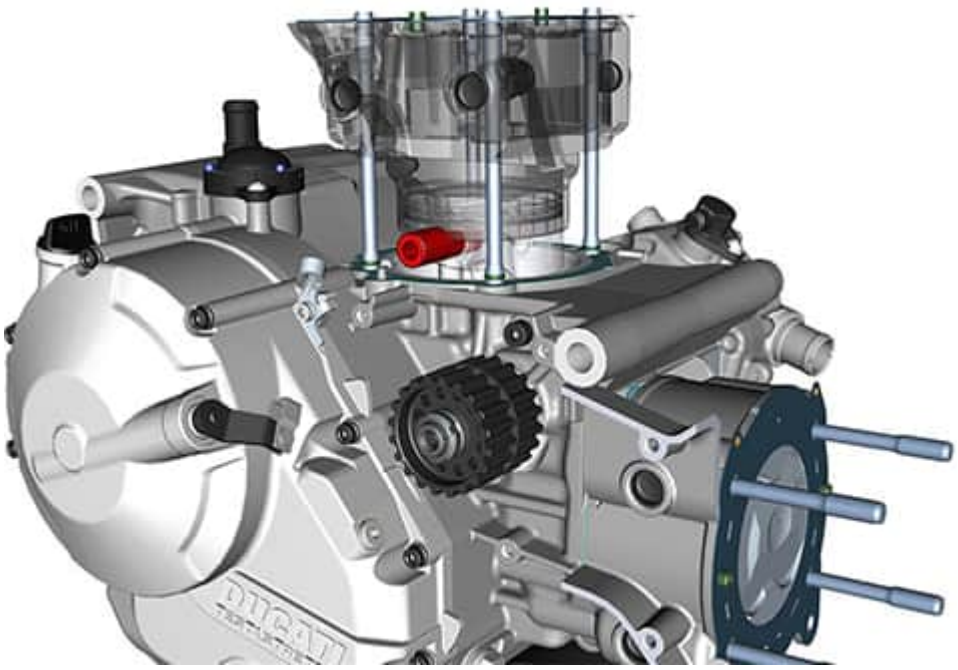
Remove the snap ring (10) from the gudgeon pin (9) on the clutch side.



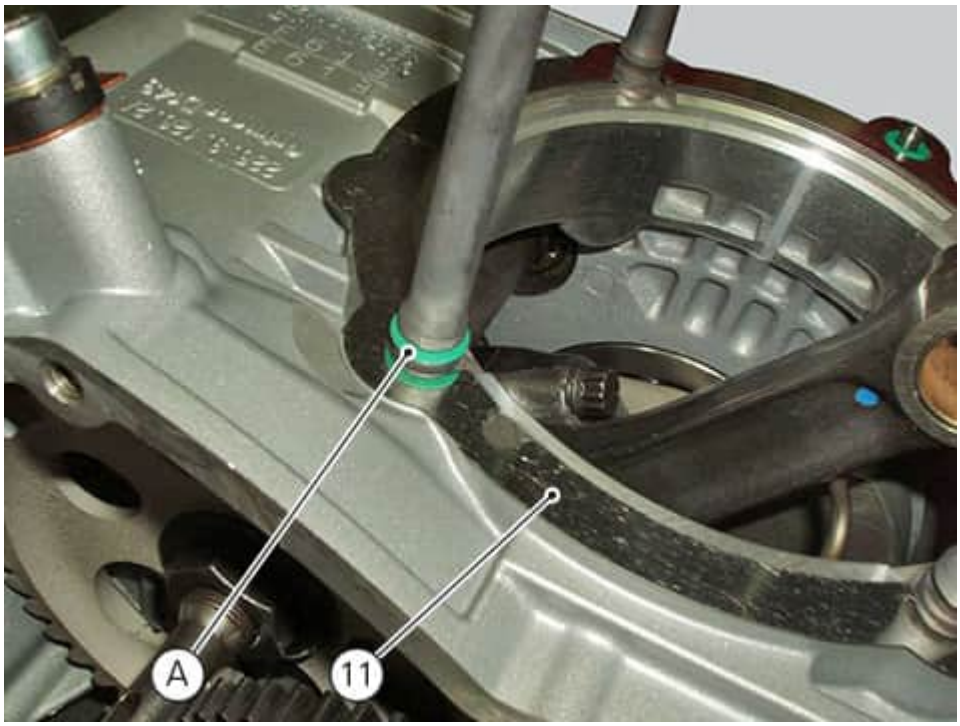


Working from the opposite side, drive out the gudgeon pin sufficiently to release the connecting rod.
Lift the cylinder-piston assembly clear of the crankcase thru bolts.
If work is to be carried out on the piston, carefully withdraw it from the cylinder.





Remove from the cylinder head thru bolts the four O-rings (A) located on the crankcase between the cylinder and the gasket (11).



To remove the vertical cylinder-piston assembly, bring the vertical piston to TDC and proceed as for removal of the horizontal cylinder.

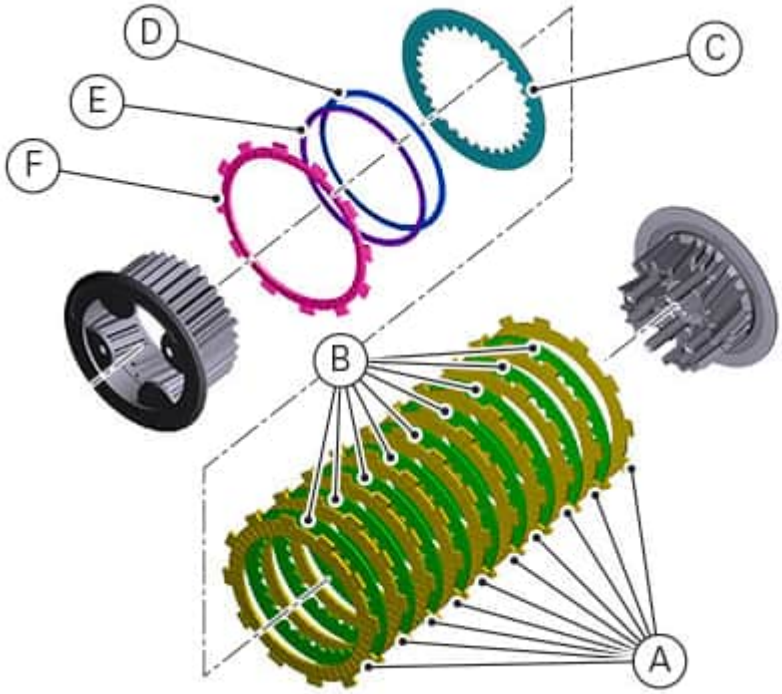
Important

Mark the pistons to show from which cylinder they were removed:
V= Vertical - O= Horizontal.

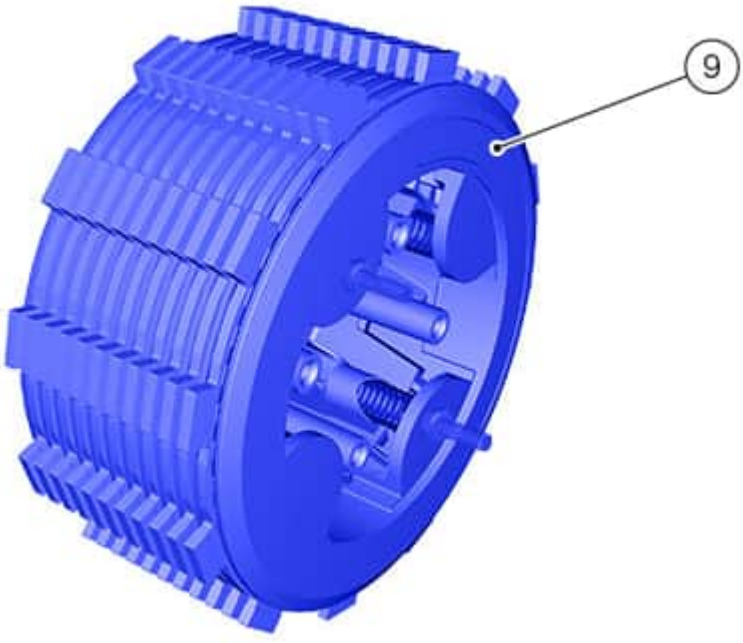
Refitting the clutch

If the hub - plates - drum assy (9) was disassembled, take special care to clutch plate positioning upon reassembling.
Insert the clutch plate pack on hub:
The plate pack (9) consists of:

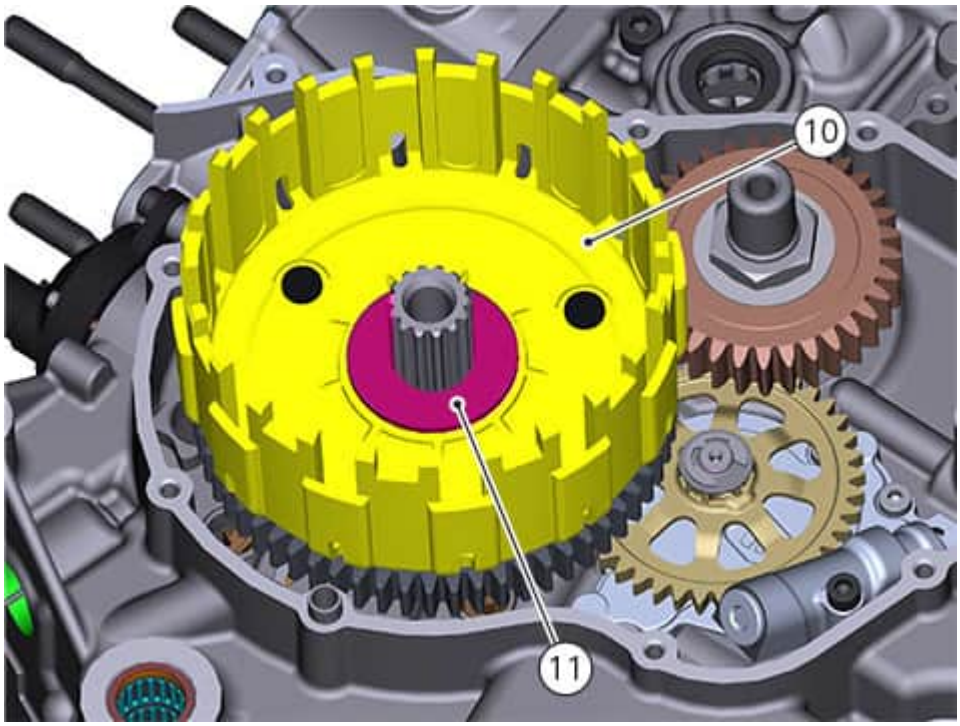
- 10 driving plates (A) with 3.5 mm thickness;
- 9 driven plates (B) with 1.5 mm thickness;
- 1 turned driving plate (C) with 3.5 mm thickness;
- 1 spacer (D) with 1.6 mm thickness;
- 1 Belleville washer (E) with 1.4 mm thickness;
- 1 driven plate (F) with 1.5 mm thickness.



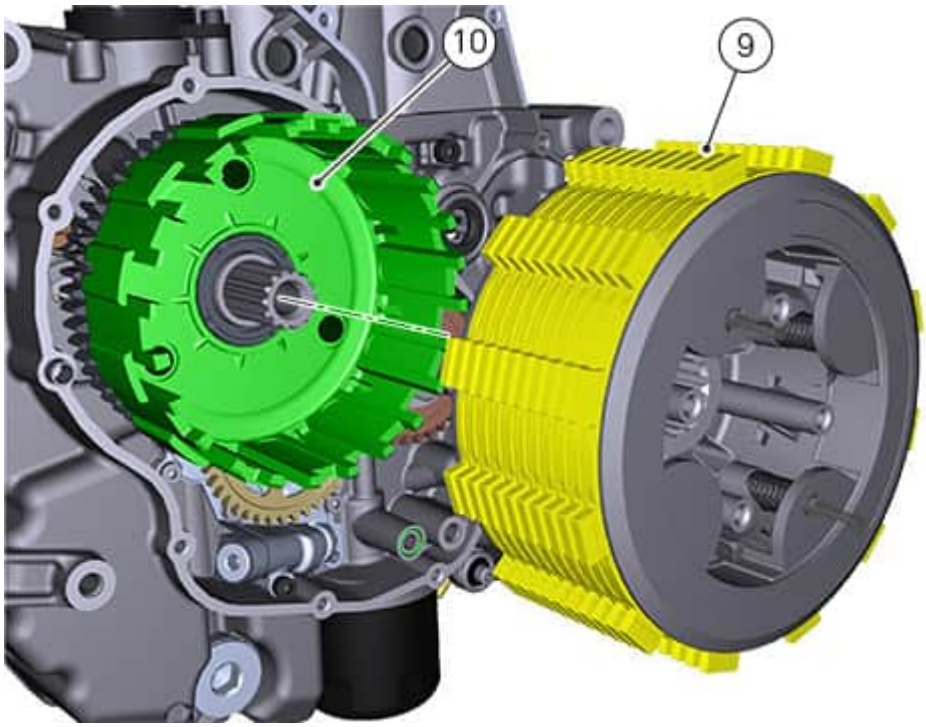
Fit the clutch plate pack with hub inside drum.
Fit the two service pins (P).

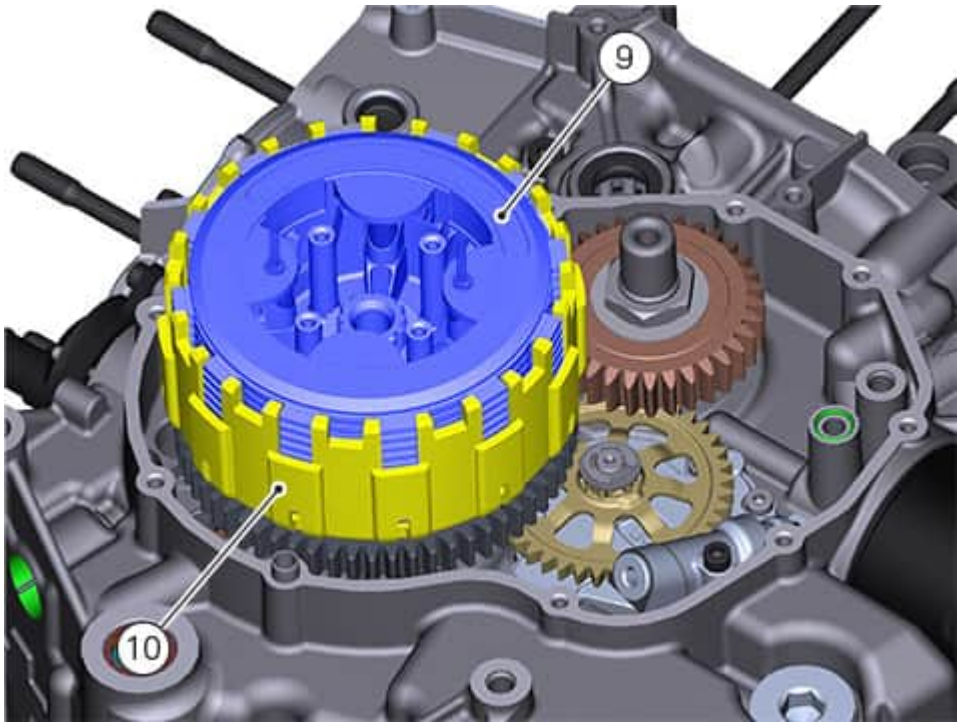


Fit the spacer (11) to the clutch housing (10).

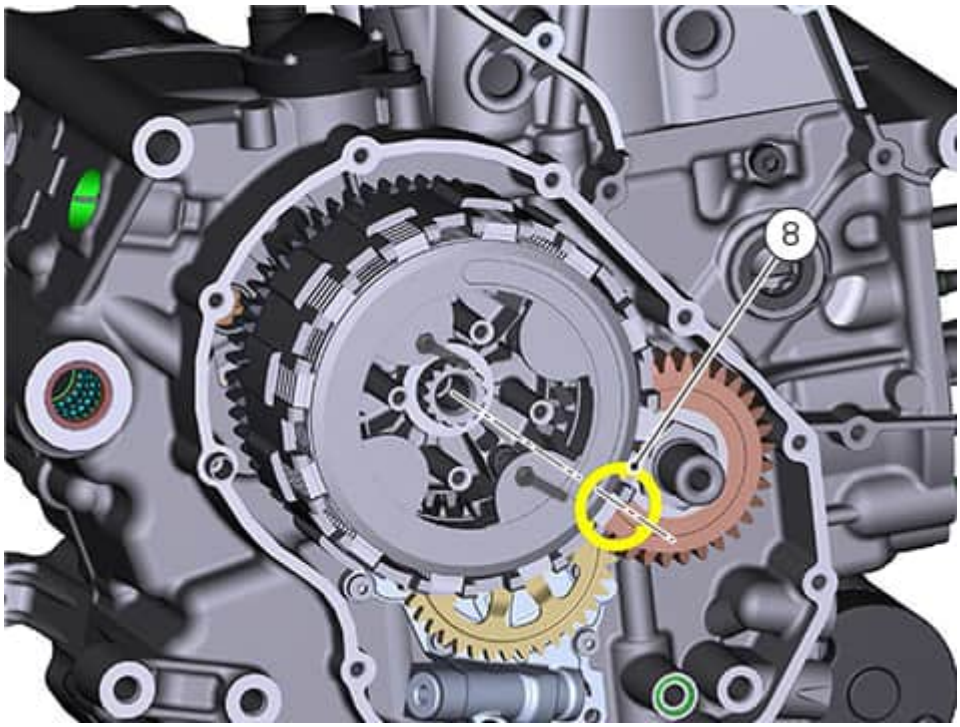


Fit the hub-plates-drum assy (9) to the clutch housing (10).

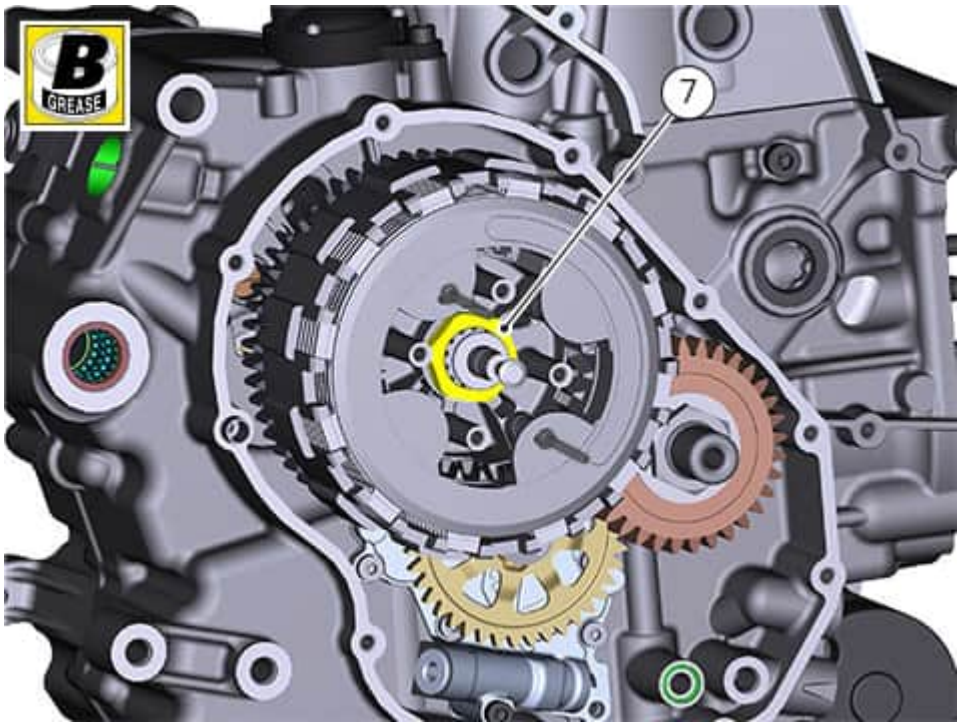


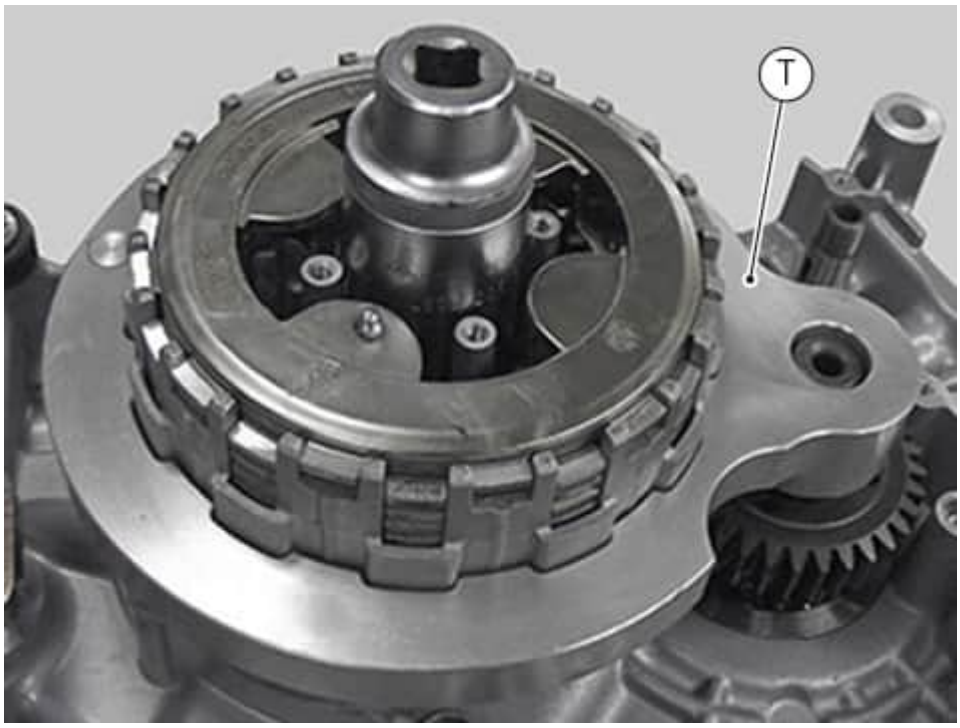


Fit lock washer (8) on primary shaft, driving it fully home inside clutch unit.

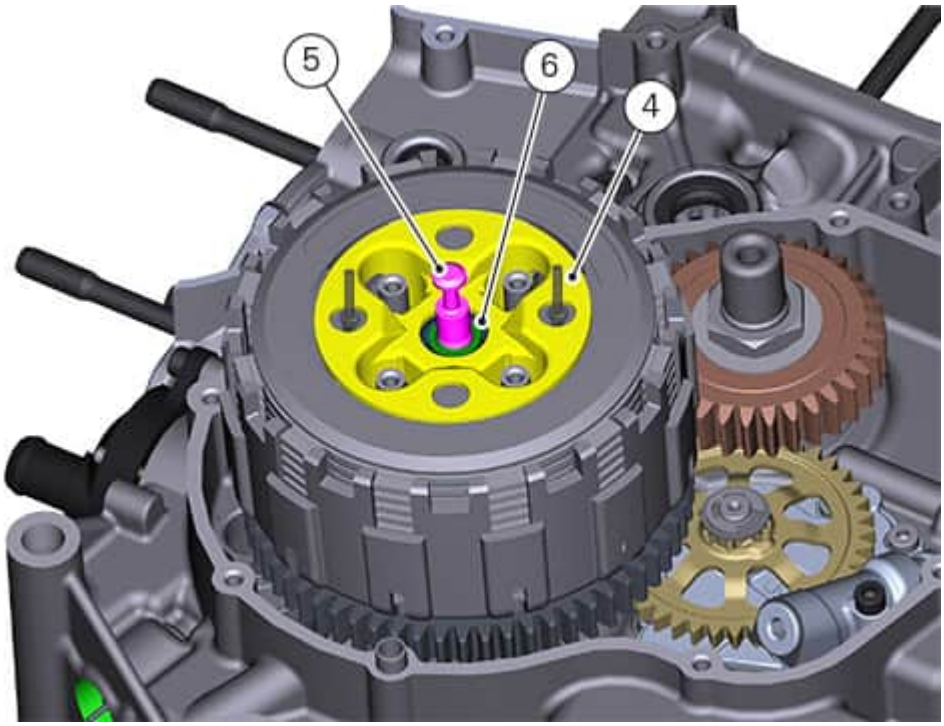


Apply the specified grease on nut (7) mating surface and on primary shaft thread, then insert nut driving it fully home by hand inside primary shaft.
Lock clutch housing with tool (T) no. **88713.2556**, so as to hold it when tightening nut (7).
Tighten nut (7) to a torque of 190 Nm (Min. 180 Nm - Max. 200 Nm).
Remove tool (T) no. **88713.2556**.

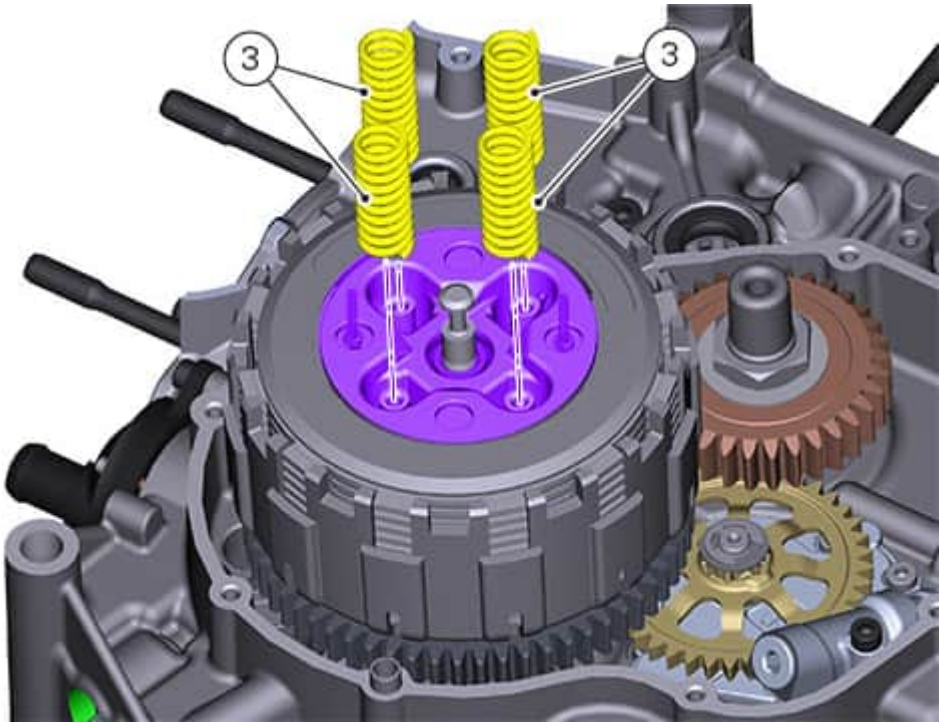


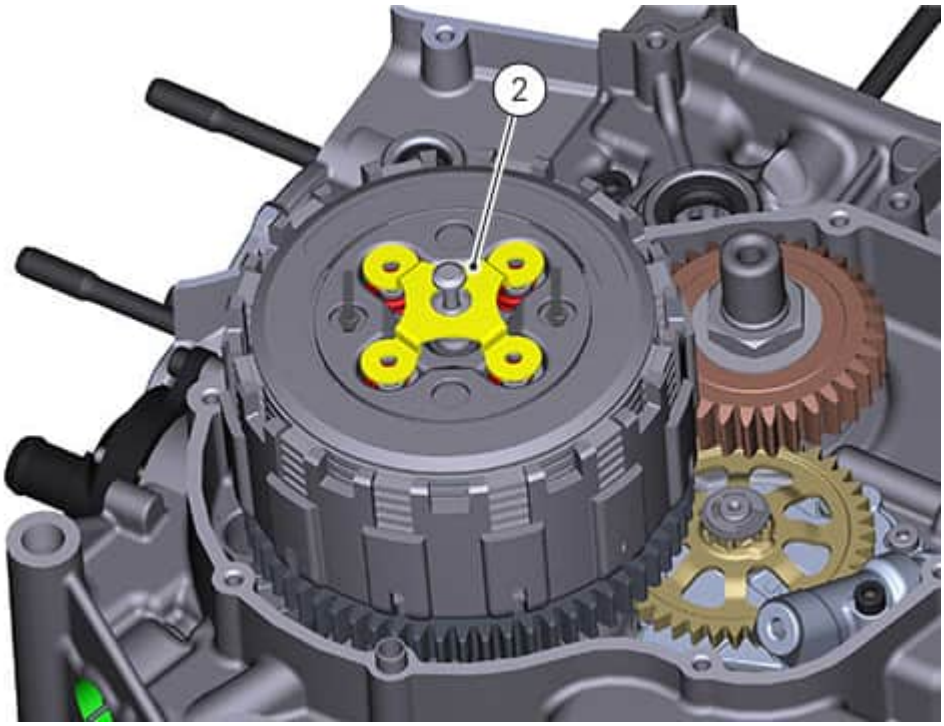


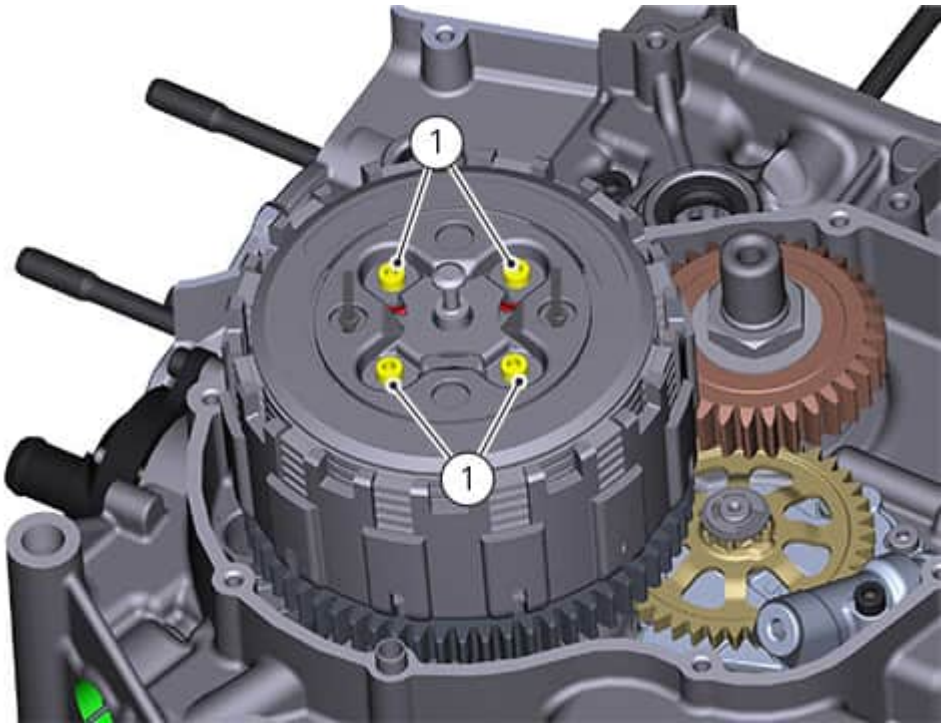
Check the presence of bearing (6) on the pusher plate (4). Position pusher plate (4) with the clutch control pin (5).



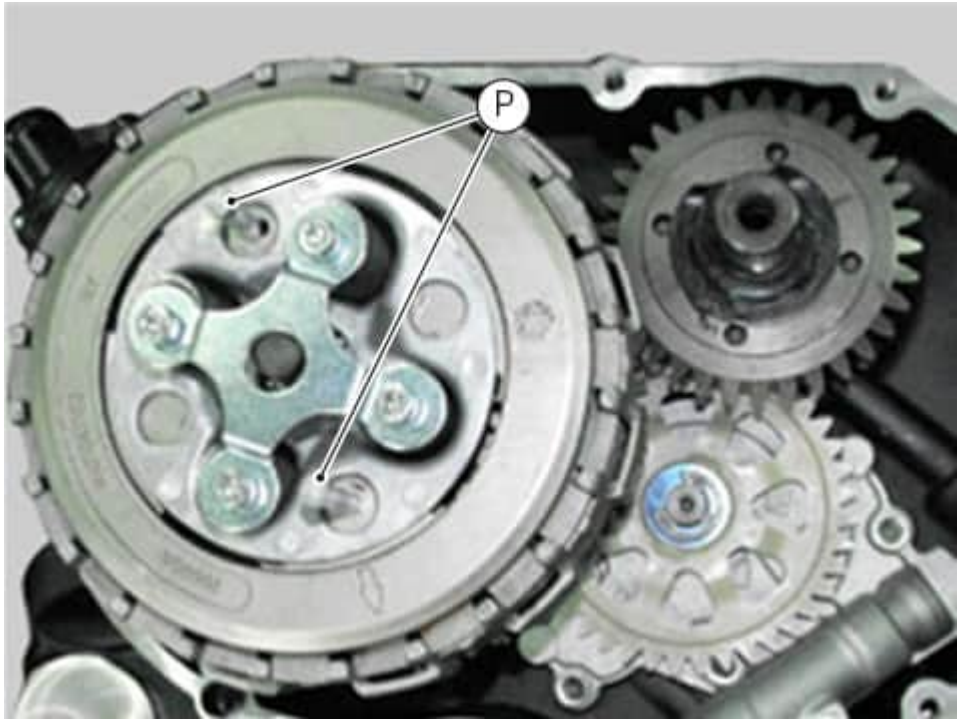
Fit springs (3) and ring (2) on pusher plate (4). Start screws (1) and tighten them to a torque of 5 Nm (Min. 4.5 Nm - Max. 5.5 Nm).







Remove the two service pins (P).

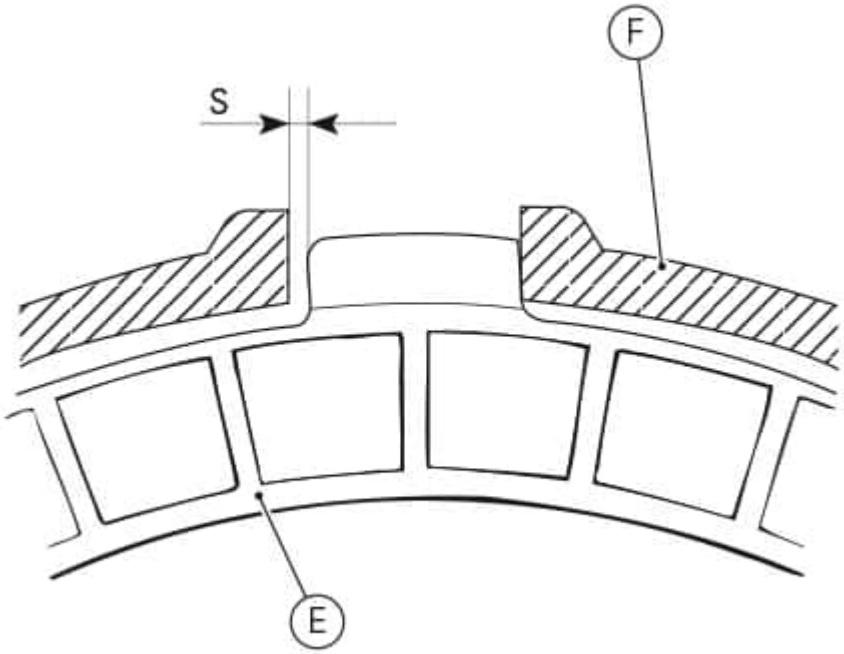


Refit the clutch cover (Refitting the clutch cover).
Fill the engine with oil (Changing the engine oil and filter cartridge).

Check and overhaul of the components

Clearance between the clutch drum and drive plates

Insert a drive plate (E) in the clutch drum (F) and measure the clearance (S) with a feeler gauge.
Clearance "S" must not exceed 0.6 mm.
If it does, renew the plates and, if necessary, the clutch drum.

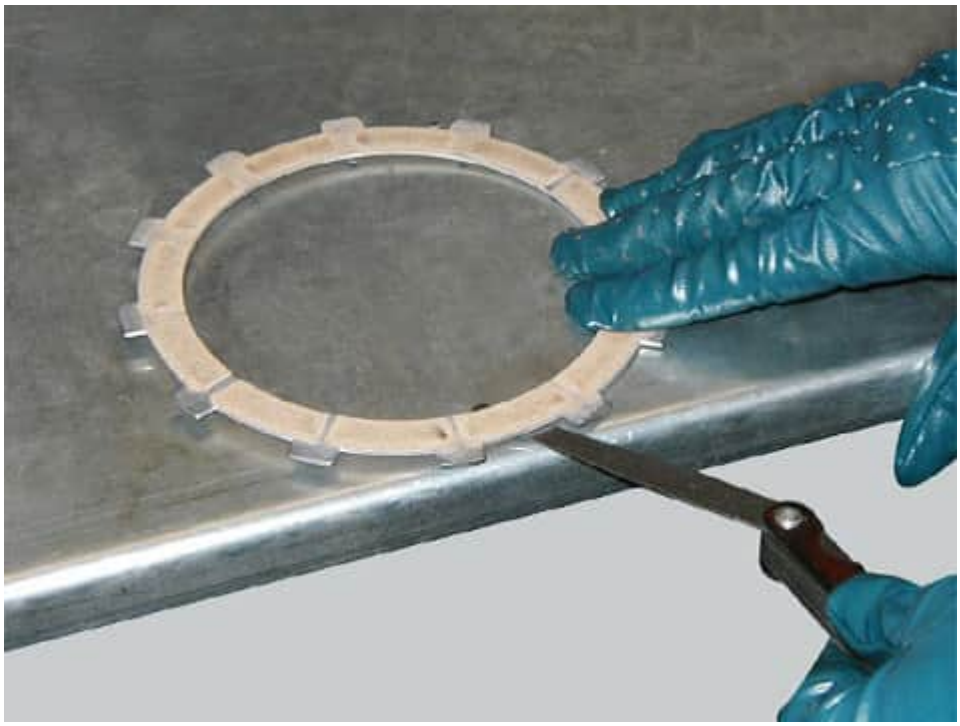


Overhaul of the clutch plates

The clutch plates must not show any signs of blackening, grooves or deformation.
Measure the thickness of the drive (friction) plates; it should not be less than 2.6 mm.

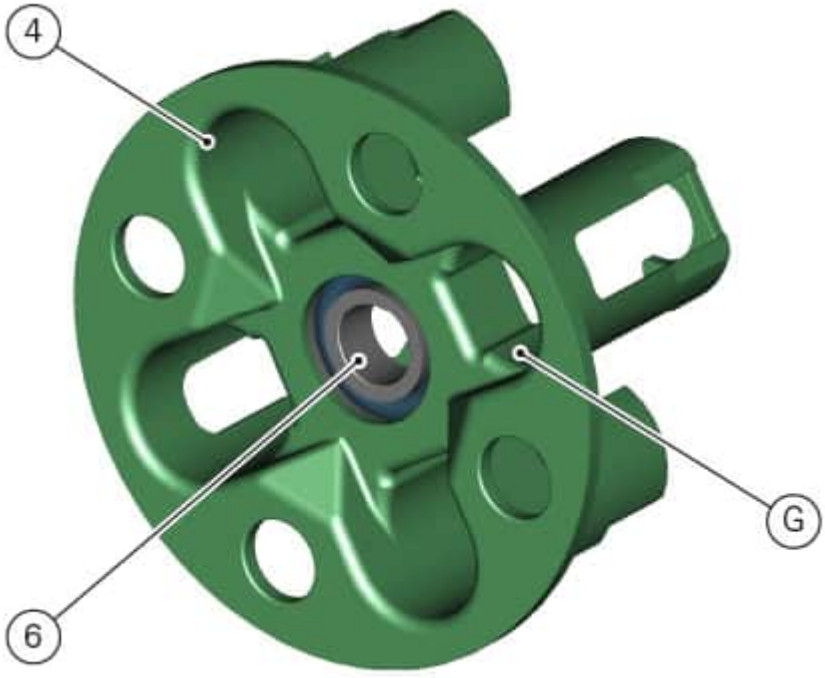
Important
The total thickness of the plates pack must not be less than 46.1 mm.

Place the plate on a flat surface and check the amount of deformation with a feeler gauge.
Max. flatness error: 0.2 mm.



Overhaul of the pusher plate

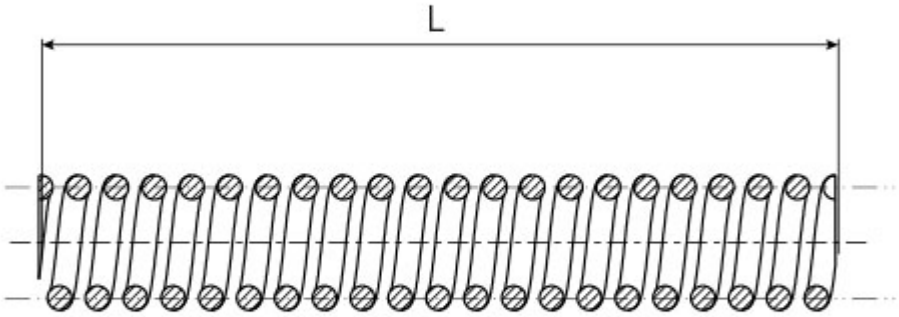
Check bearing (6) conditions: replace the bearing if the play is excessive.
Check the contact surfaces of the last driven plate; if extremely scored, polish it in the same manner as described previously for the cylinder head surface (Overhauling the head components).
Check conditions of the spring guide bucket tappets (G) of the pusher plate (4).



Pusher plate springs

(L) can indicate two lengths:

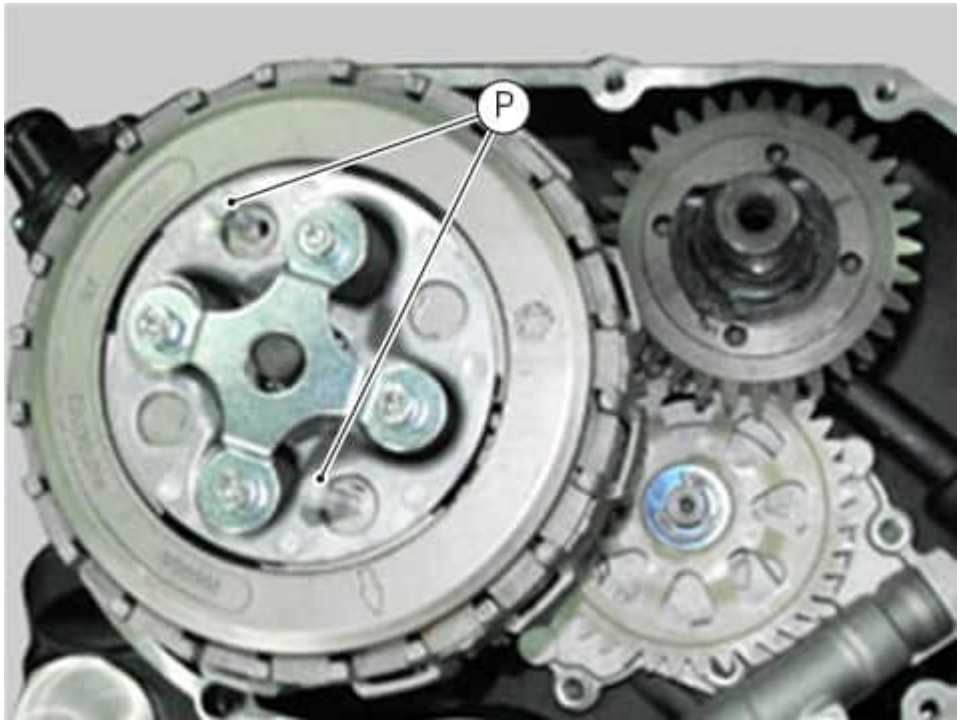
- free length = 56.19;
- working length = 42.6.


L

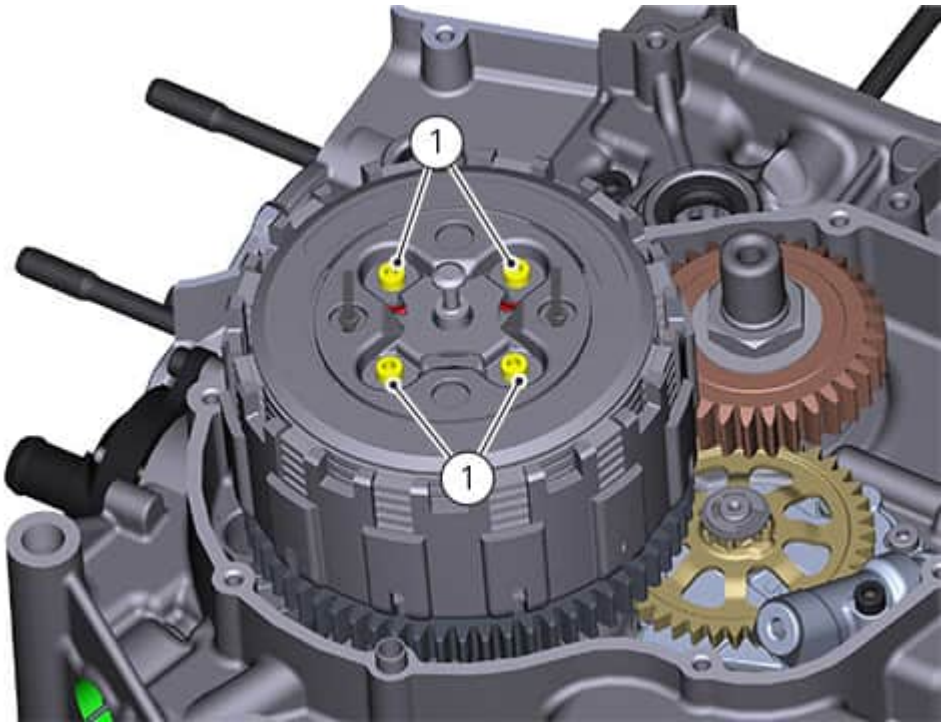
Removing the clutch

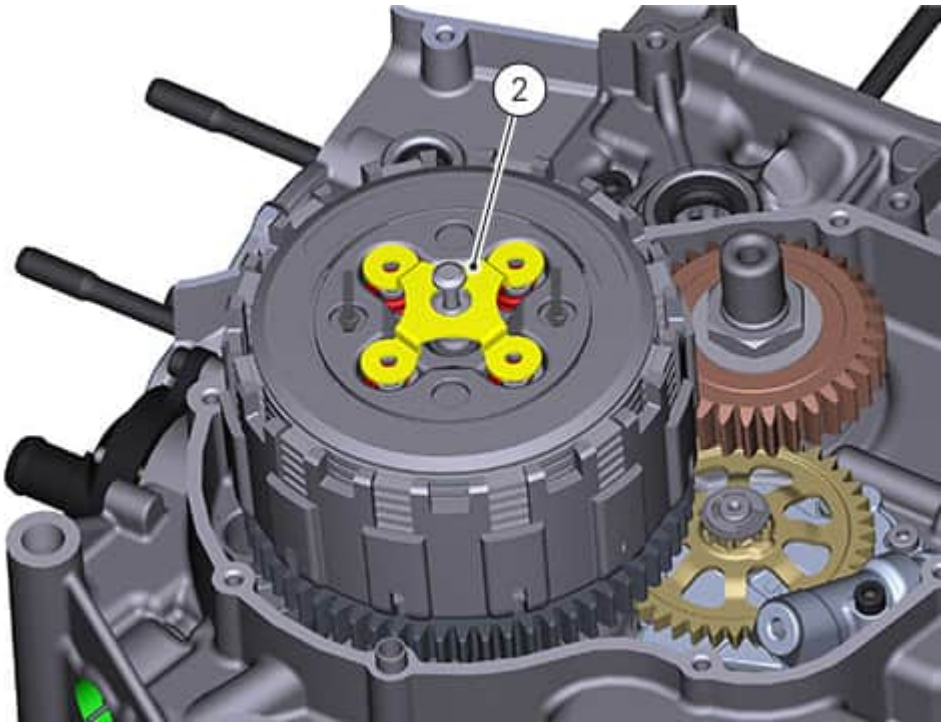
Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the clutch cover (Removing the clutch cover).

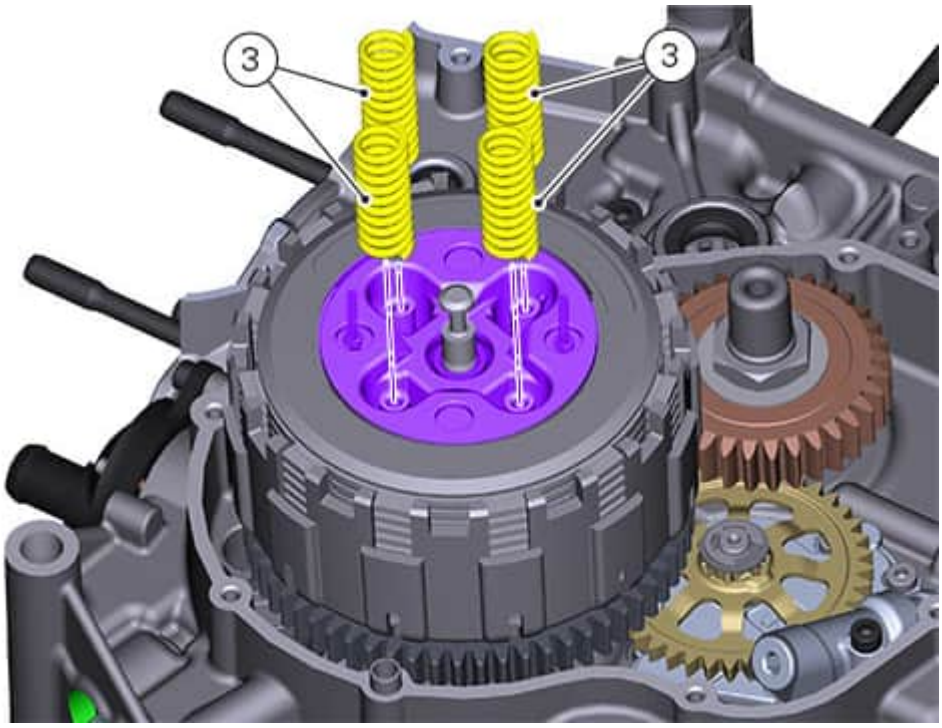
Fit the two service pins (P) inside their seats on hub.



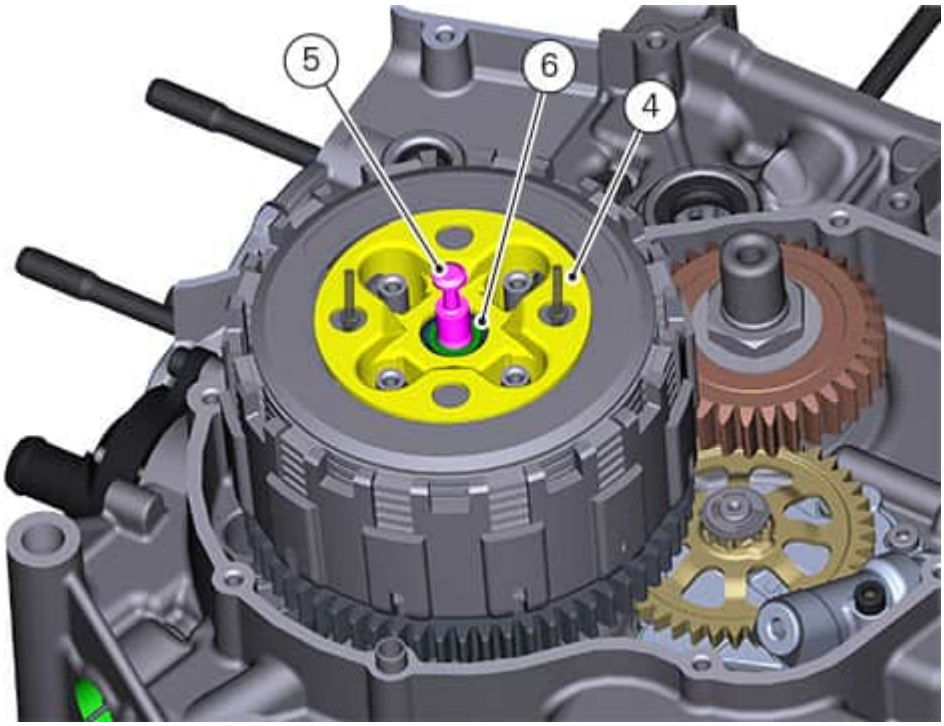
Undo the fixing screws (1) and remove the ring (2) and the springs (3) from the pusher plate (4).



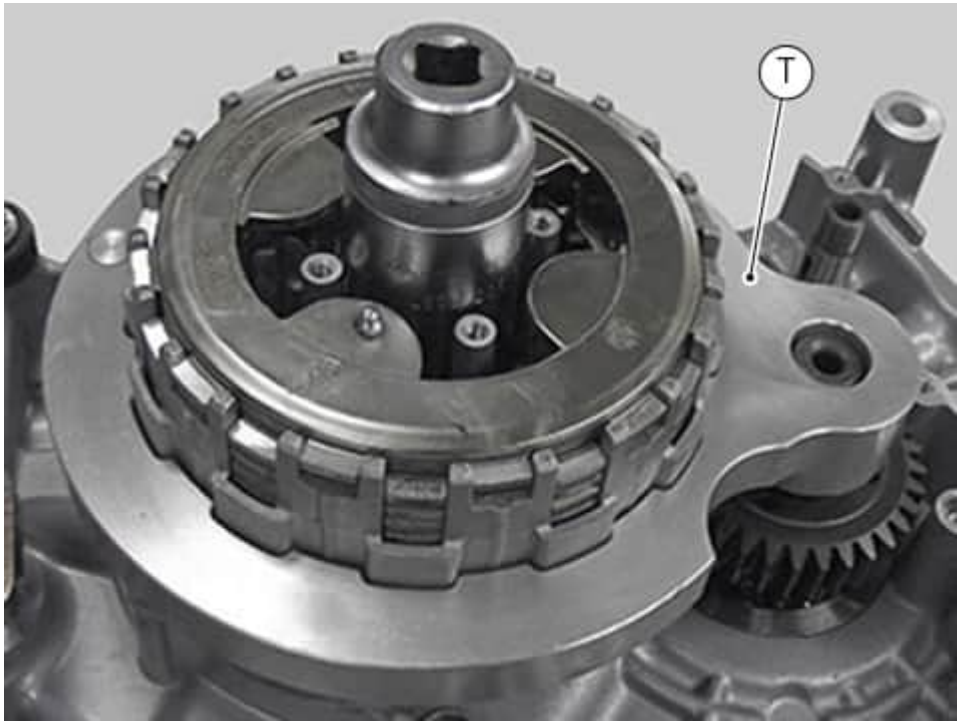


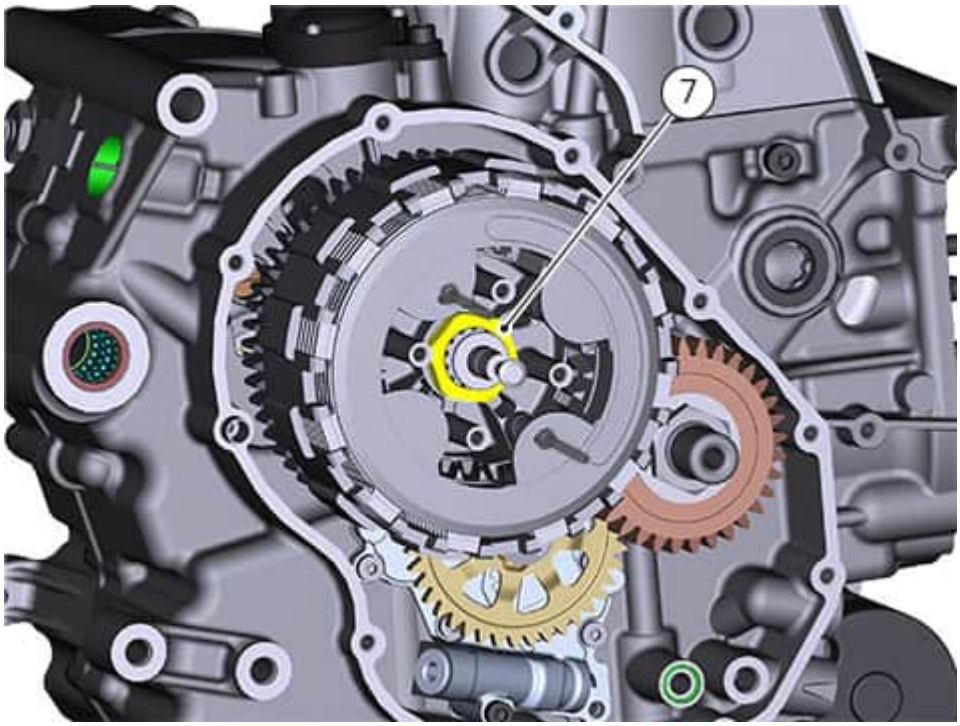


Slide out the pusher plate (4) with the clutch control pin (5).
If necessary, using a suitable diameter drift, remove the bearing (6) fitted on pusher plate inner side (4).

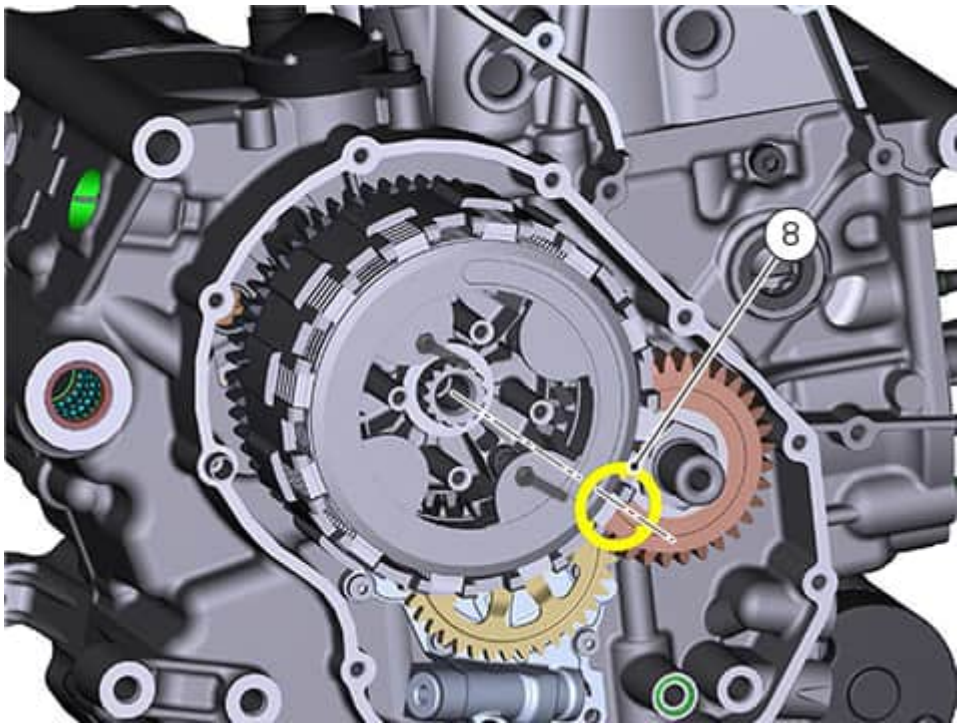


Lock clutch housing with tool (T) no. **88713.2556** and loosen retaining nut (7).

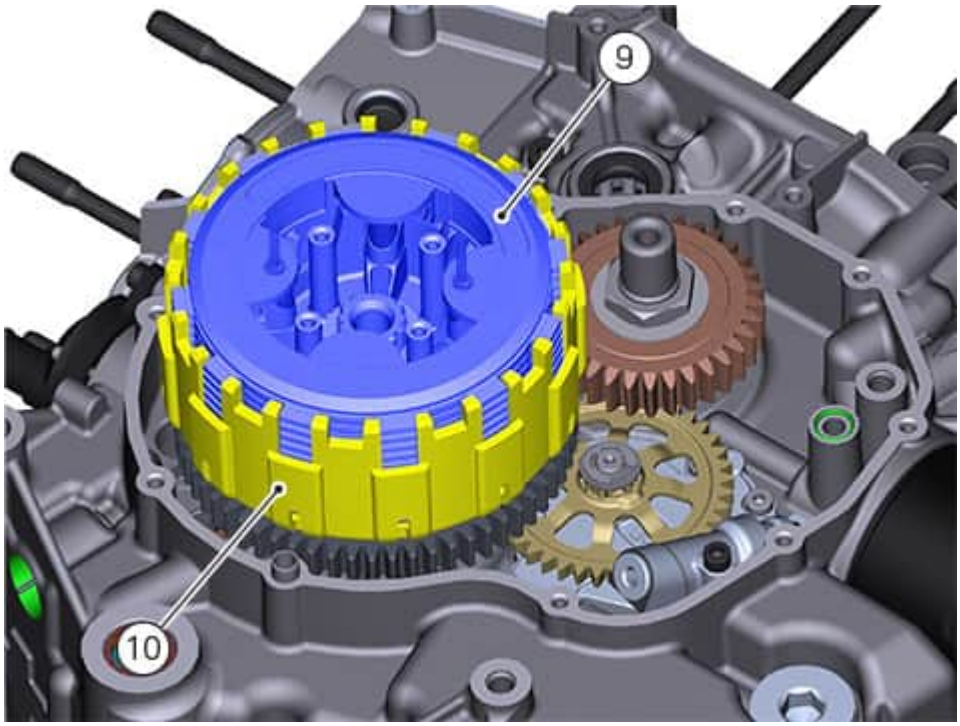


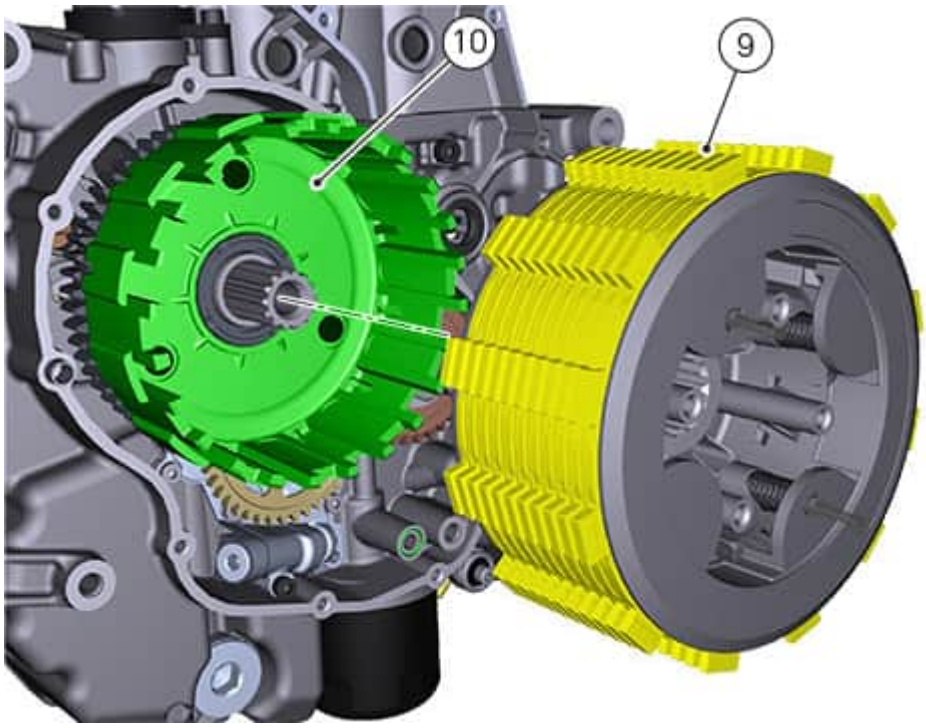


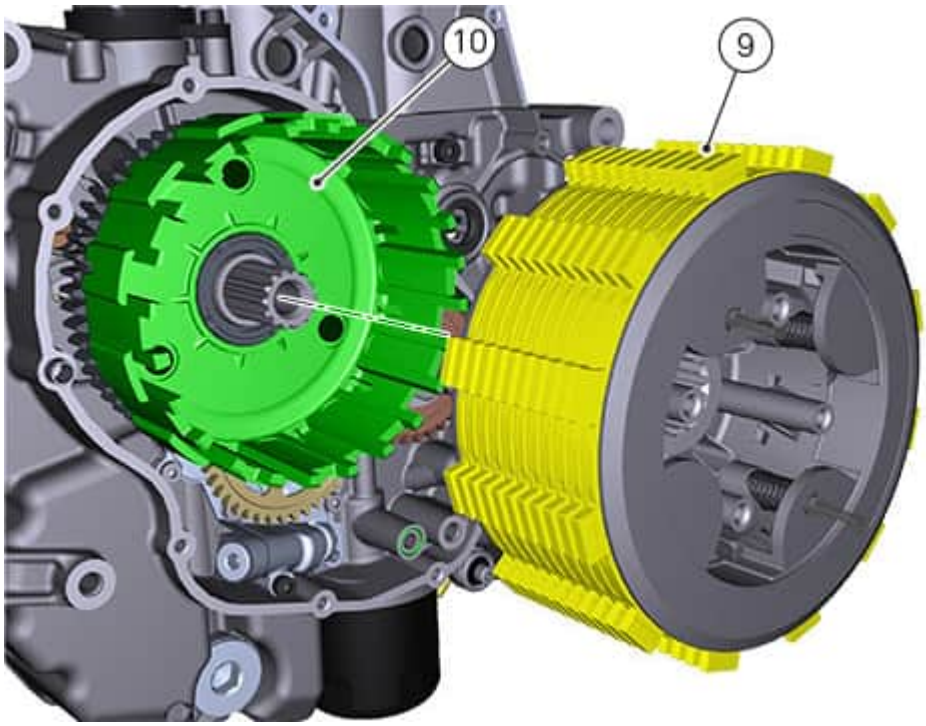
Remove the lock washer (8).

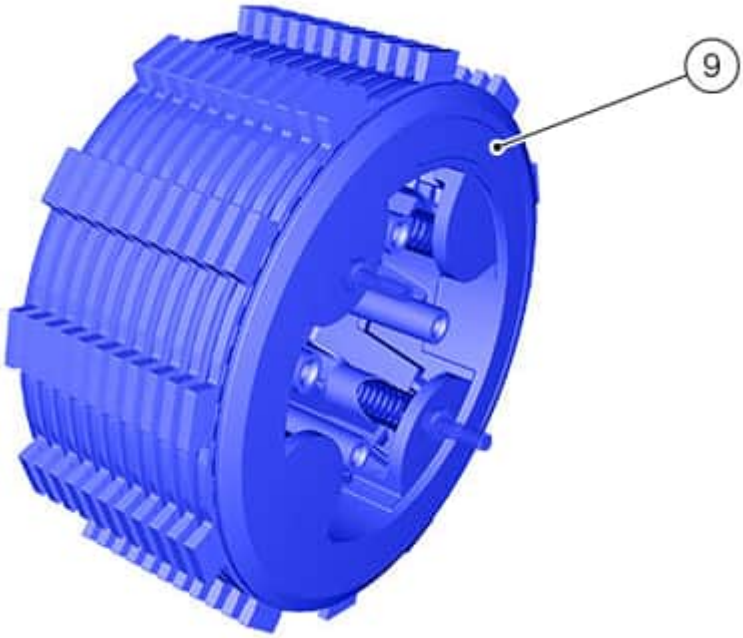


Slide the hub-plates-drum assy (9) out of clutch housing (10), marking them so as to refit them in the same position in which they were removed.

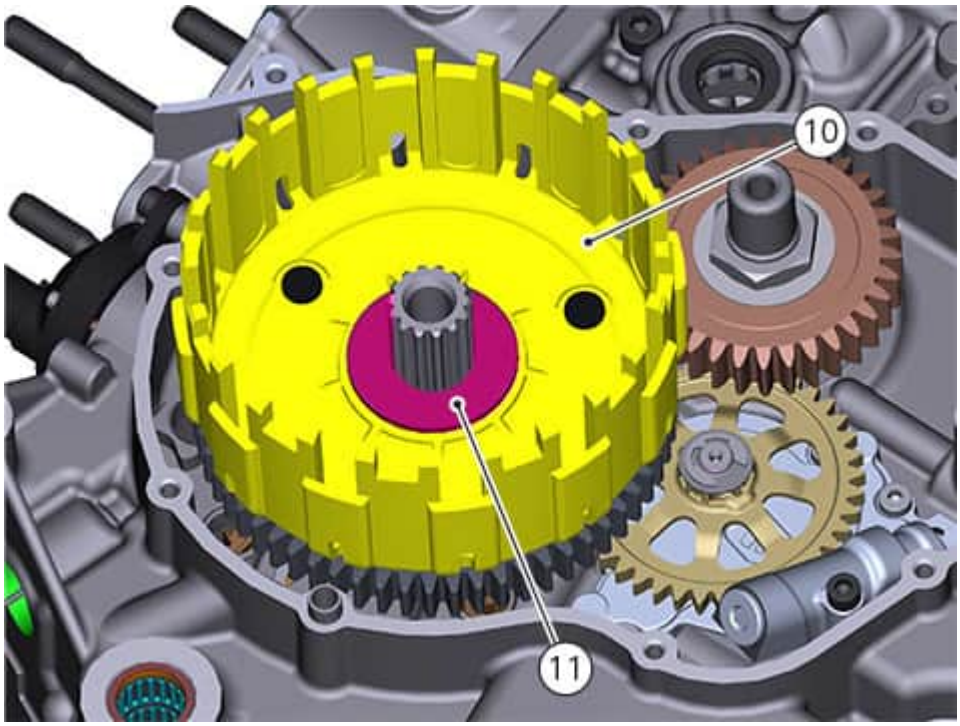

9
10


10
9



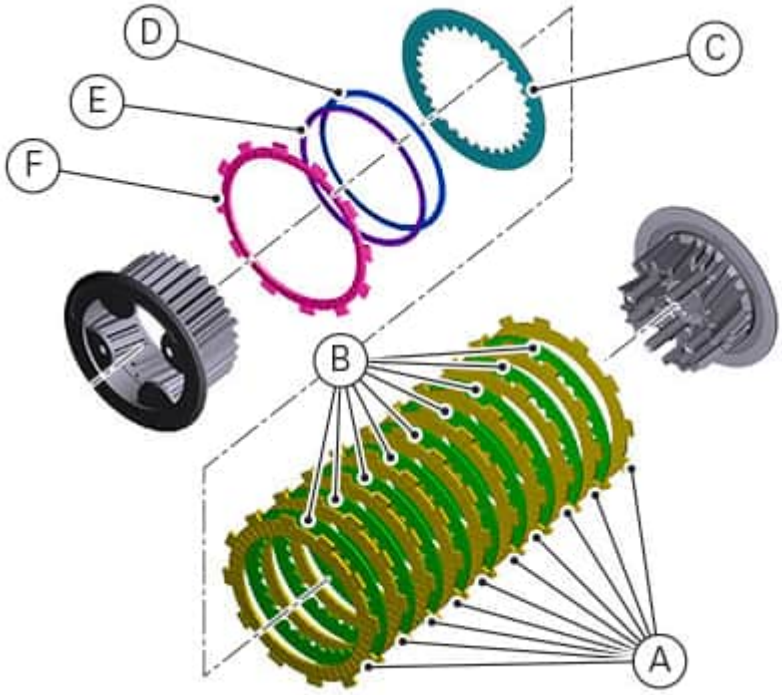


Remove the spacer (11) from the clutch housing (10).



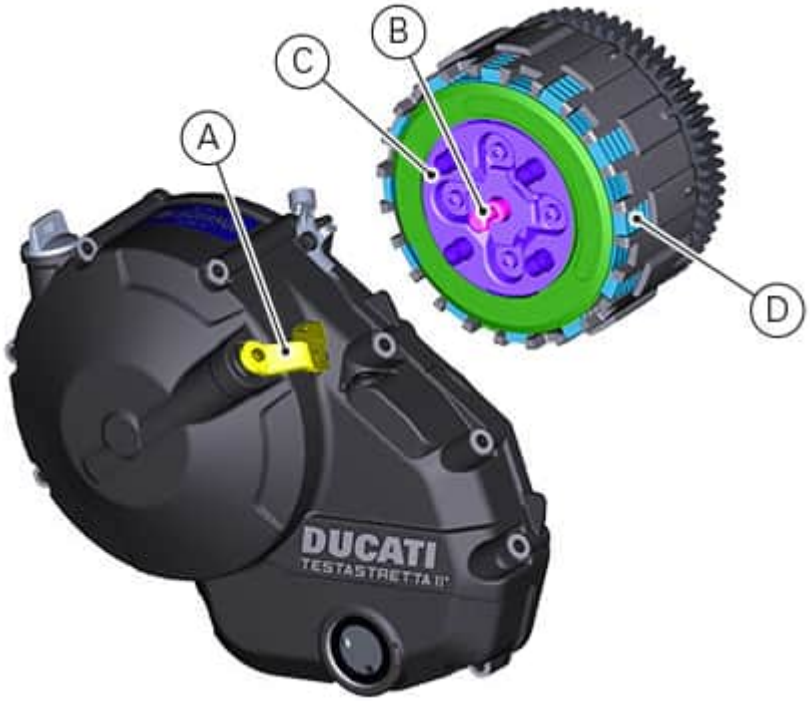
The plate pack (9) consists of:

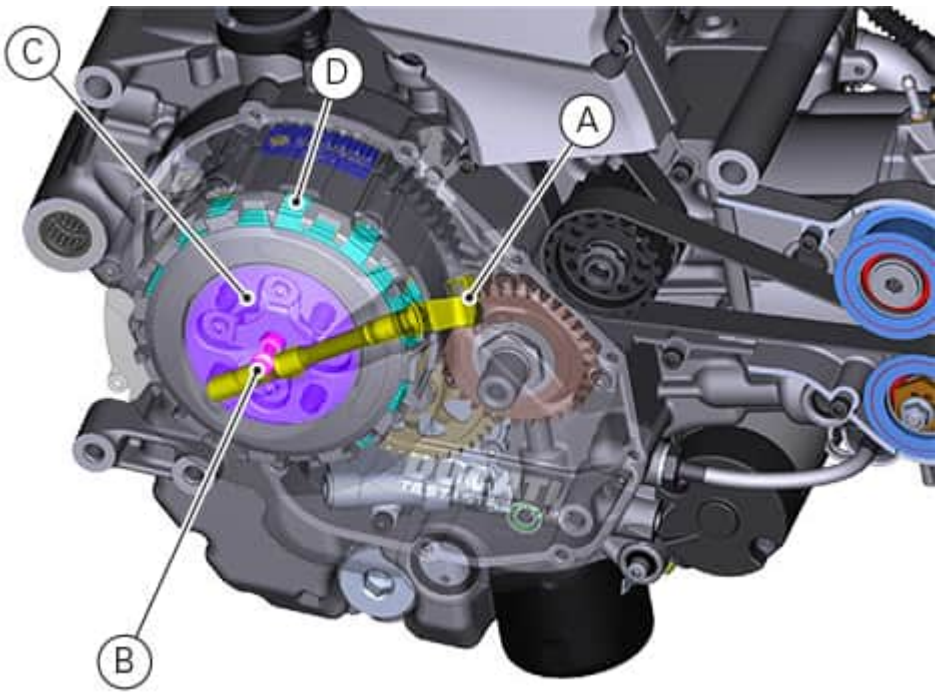
- 10 driving plates (A) with 3.5 mm thickness;
- 9 driven plates (B) with 1.5 mm thickness;
- 1 turned driving plate (C) with 3.5 mm thickness;
- 1 spacer (D) with 1.6 mm thickness;
- 1 Belleville washer (E) with 1.4 mm thickness;
- 1 driven plate (F) with 1.5 mm thickness.



Description of the clutch assembly

The clutch is disengaged by a drive unit (lever (A) and spring) positioned on clutch cover. The drive unit directly operates on clutch control pin (B) that, in its turn, operates the pressure plate (C) positioned at the top of plate pack (D).
Drive is transmitted from the crankshaft to the gearbox primary shaft by a gear integrated with the clutch housing/primary drive gear pair (A).
Accommodated in the clutch housing is a set of driving and driven plate pack (D). When the clutch is operated, the driven plates push away a drum (3) which is splined onto the gearbox primary shaft.
Before working on the internal clutch parts, check that the clutch operates correctly. Then deal with the problem in a systematic manner.





The following is a list of possible causes of clutch malfunction.

A clutch which does not disengage may be caused by:

- excessive play of the control lever;
- distorted clutch plates;
- incorrect spring tension;

- faulty clutch release mechanism;
- excessive wear of the hub or clutch housing.

A clutch which slips may be caused by:

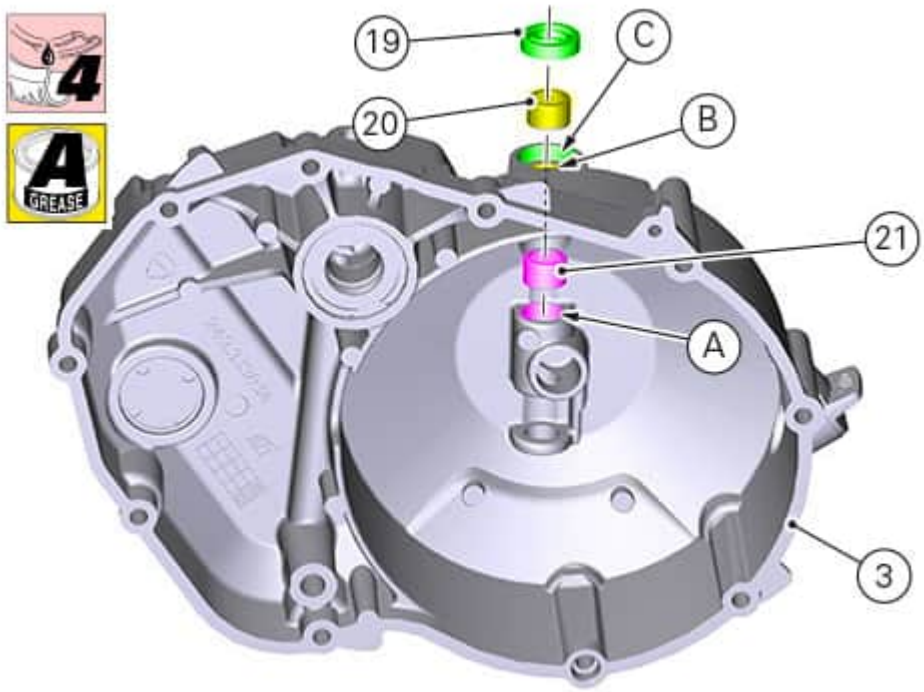
- no backlash of the control lever;
- worn clutch plates;
- weakened springs;
- faulty clutch release mechanism;
- excessive wear of the hub or clutch housing.

A noisy clutch may be caused by:

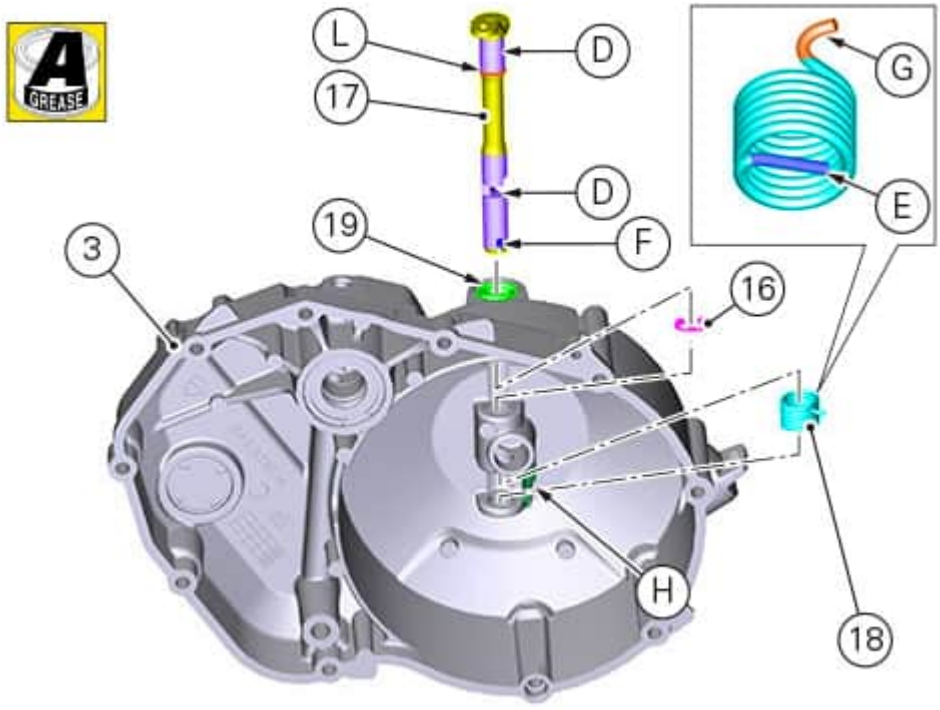
- excessive backlash between the primary drive gears;
- damaged primary drive gear teeth;
- excessive housing between driving plate tabs and the clutch housing;
- worn gear/clutch housing bearings;
- the presence of metal particles (filings) on the gear teeth.

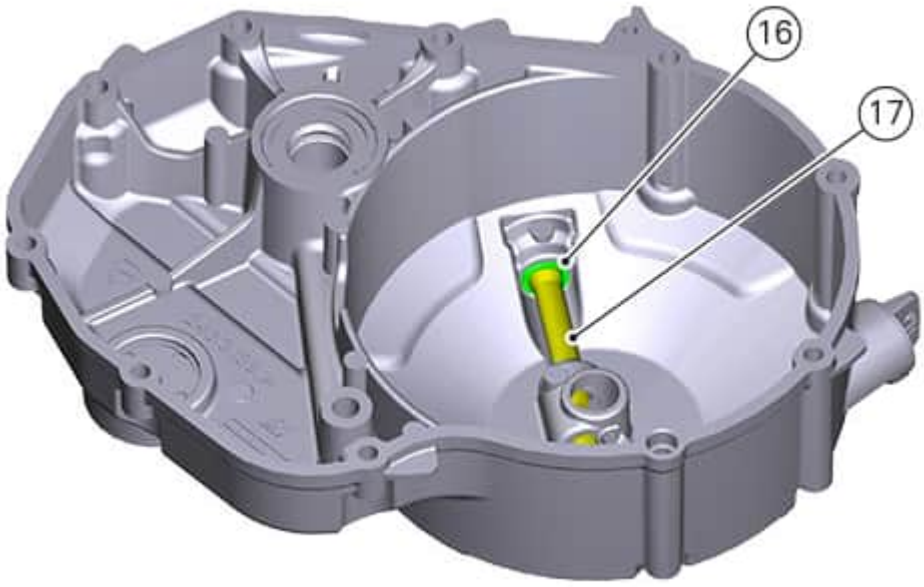
Reassembling the clutch cover

Apply specified grease on roller bearing (21) and position it fully home in seat (A) of cover (3).
Apply specified grease on roller bearing (20) and position it fully home in seat (B) of cover (3) on roller bearing (20).
Apply specified lubricant on seal ring (19) and position it fully home in seat (C) of cover (3).

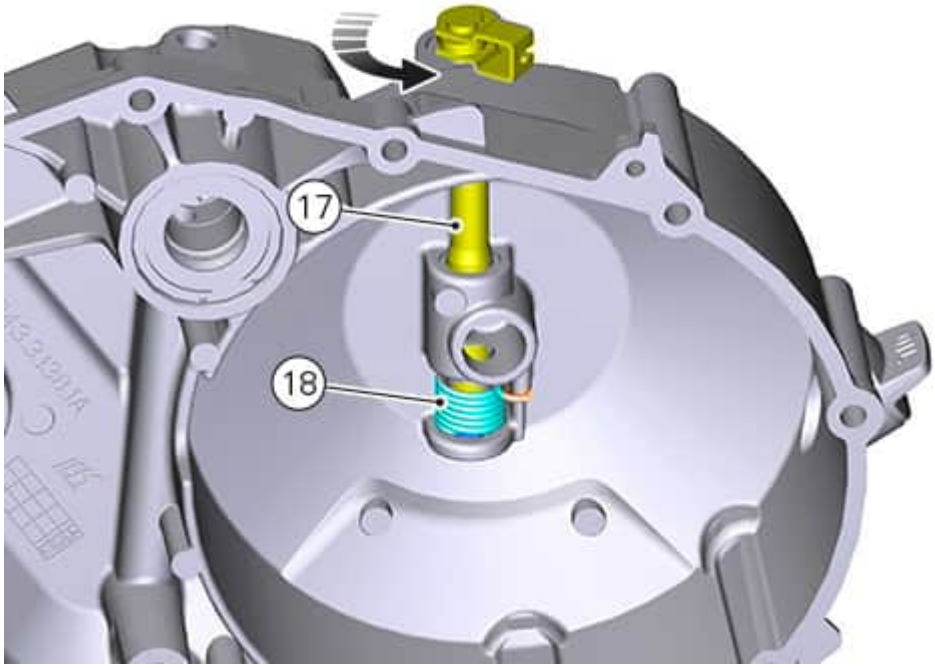


Lubricate sliding pins (D) of clutch drive shaft (17) with specified grease.
Insert clutch drive shaft (17) in seal ring (19) having care not to damage it.
To insert the clutch drive shaft (17) inside clutch cover (3), position spring (18) considering that part (E) has to be engaged in recess (F): bring the clutch drive shaft (17) fully home on clutch cover (3).
Rotate clutch drive shaft (17) counter clockwise until part (G) touches bearing surface (H).
Insert snap ring (16) of clutch drive shaft (17) fully inside groove (L).

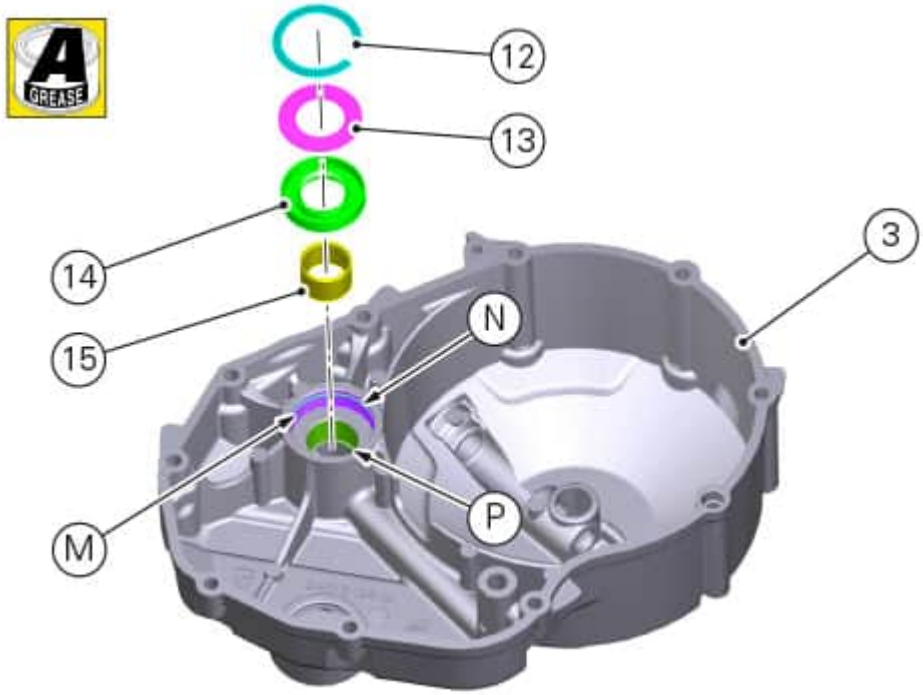


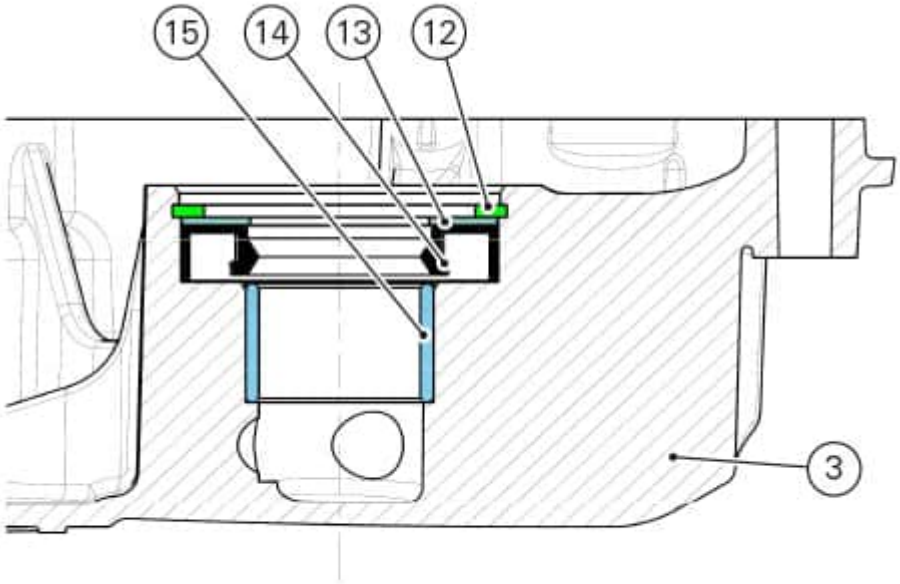


Check spring (18) operation by acting on, it in the direction of the arrow on clutch drive shaft (17), and ensuring that the shaft goes back to its initial position once released.

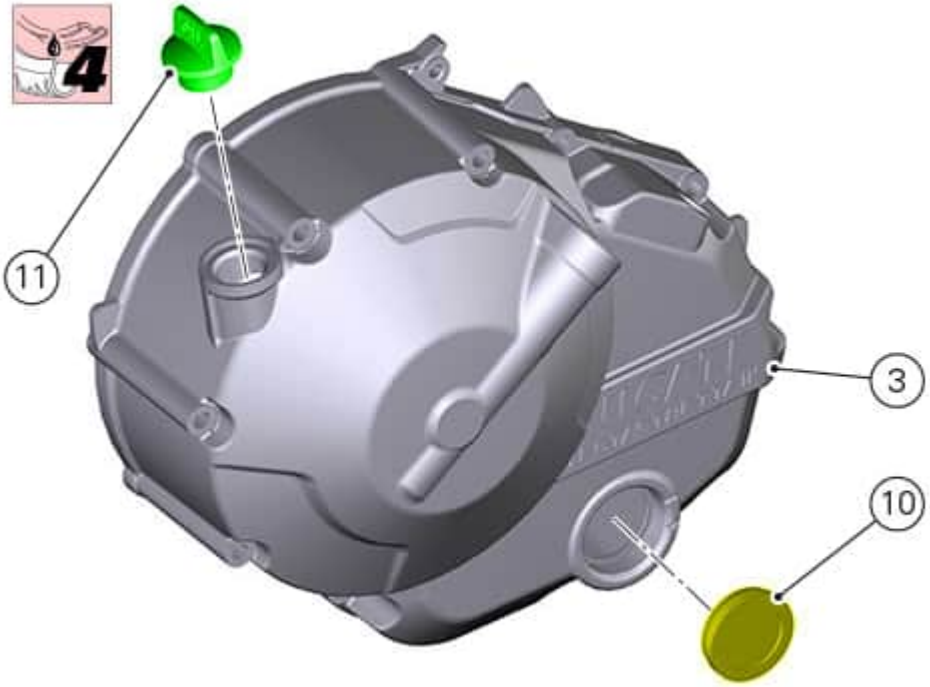


Apply recommended grease to the bushing seat (22).
Drive crankshaft bushing (15) in bushing (22) seat.
Apply specified grease to the seal ring (14). Install seal ring (14) in seat (M) of clutch cover (3), positioning the side with the spring as shown.
Fit spacer (13) and snap ring (12).
Make sure that the snap ring is completely inside seat (N) of clutch cover (3).



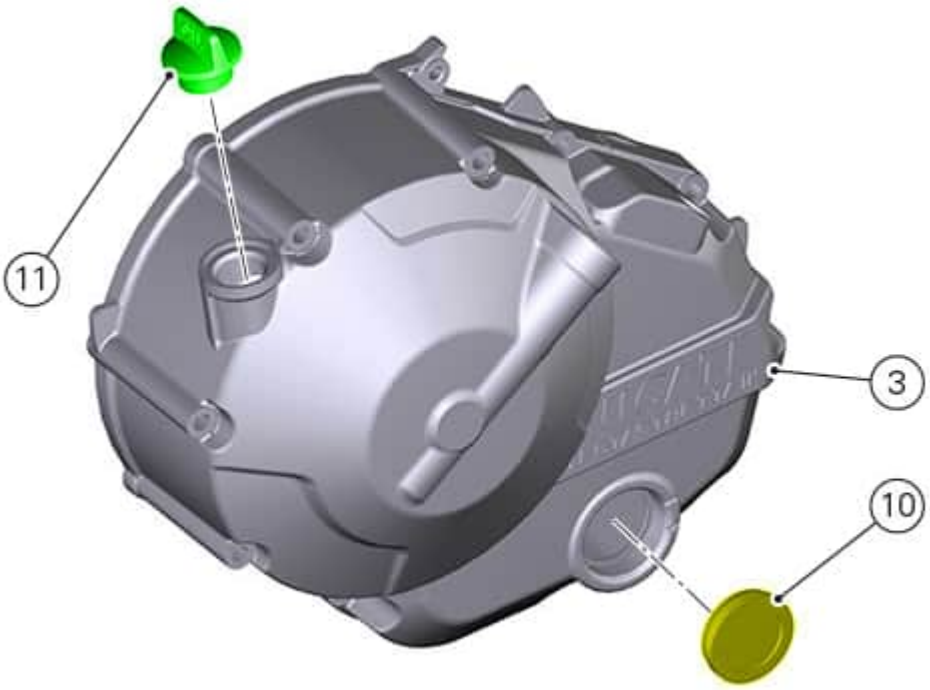


Apply specified grease to the oil sight glass (10). Position it on clutch cover (3).
Tighten filler plug (11) to a torque of 5 Nm (min 4.5 Nm — max 5.5 Nm).

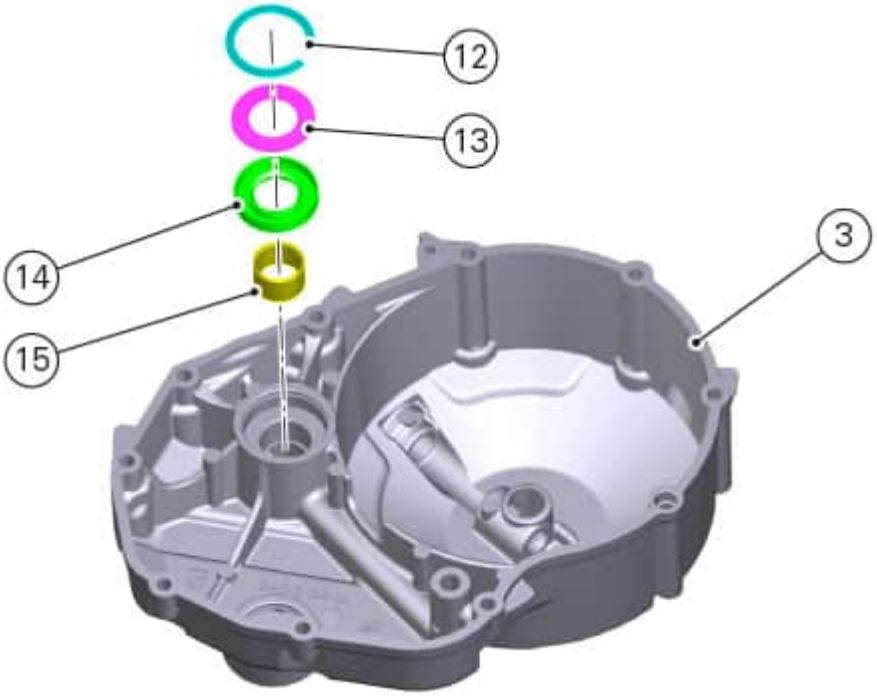

4
11
3
10

Disassembling the clutch cover

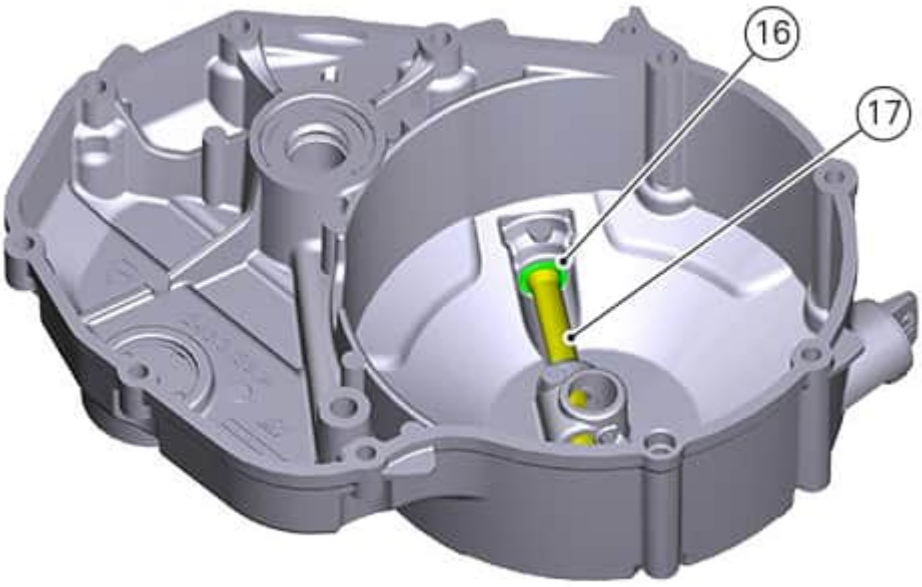
Remove oil sight glass (10) and plug (11) from cover (3).

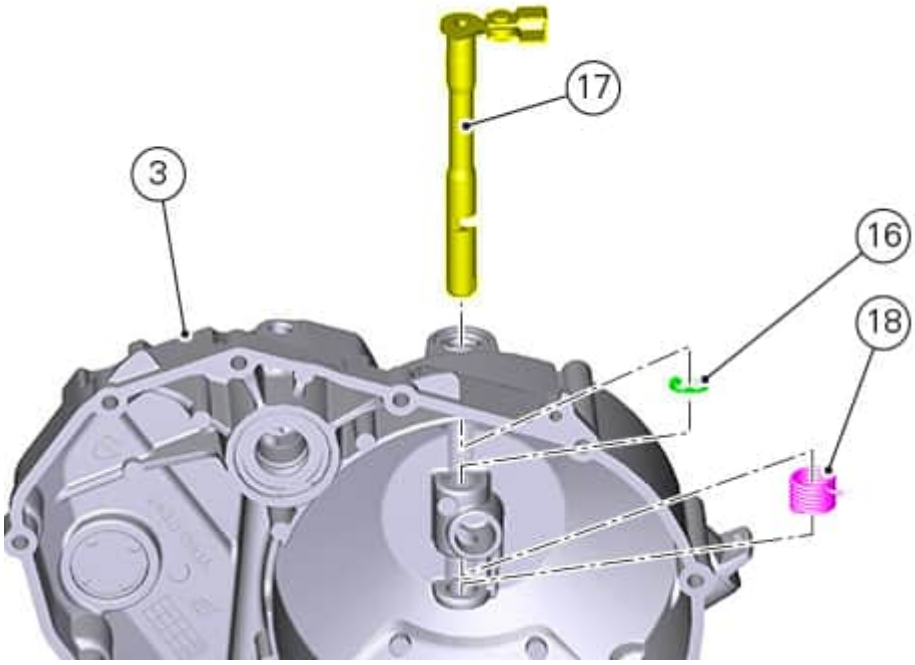


Remove snap ring (12), shim (13), seal ring (14) and crankshaft bushing (15) from cover (3).

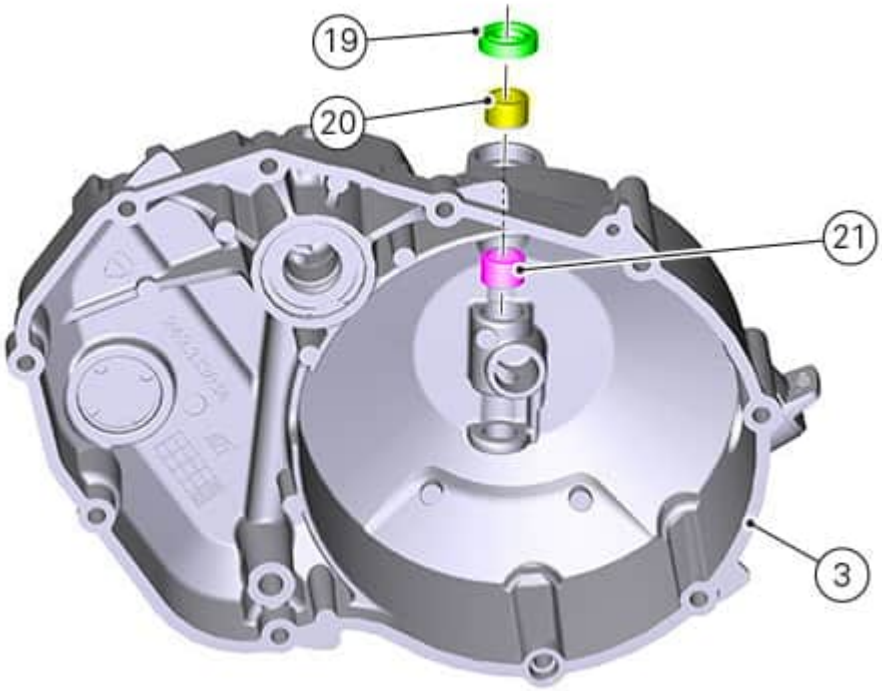


Remove snap ring (16) from cover (3). Slide out clutch drive shaft (17) and spring (18).



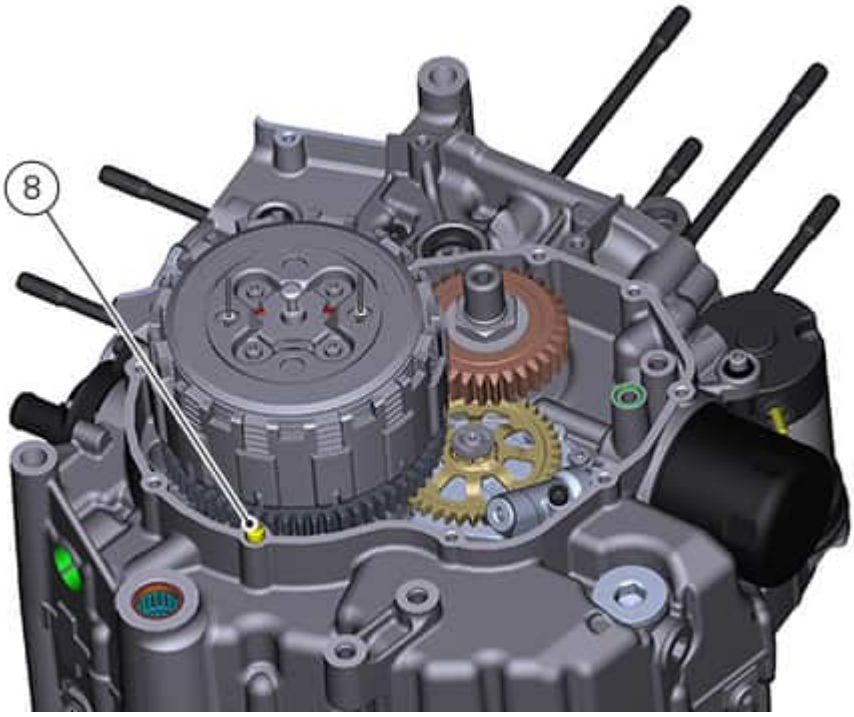


Remove seal ring (19), roller bearings (20) and (21) from cover (3).

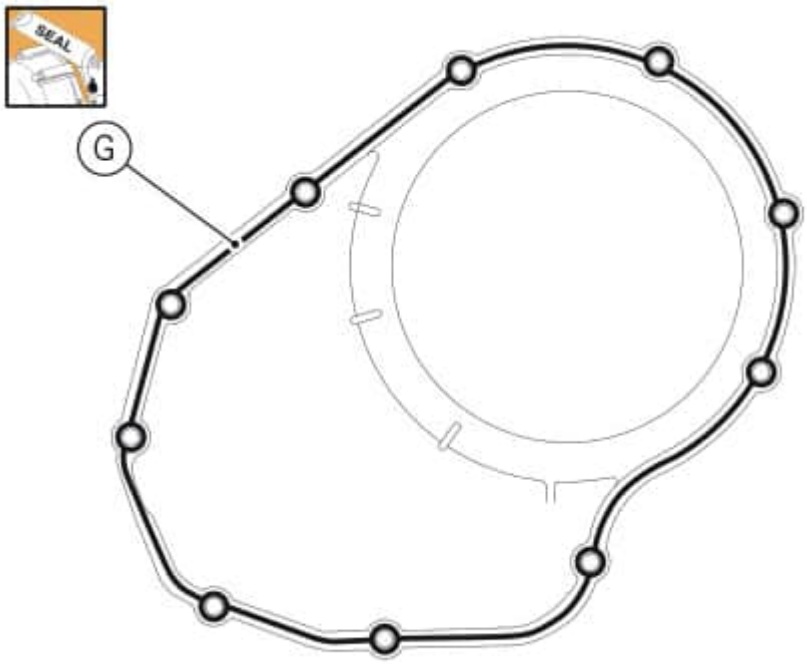

19
20
21
3

Refitting the clutch cover

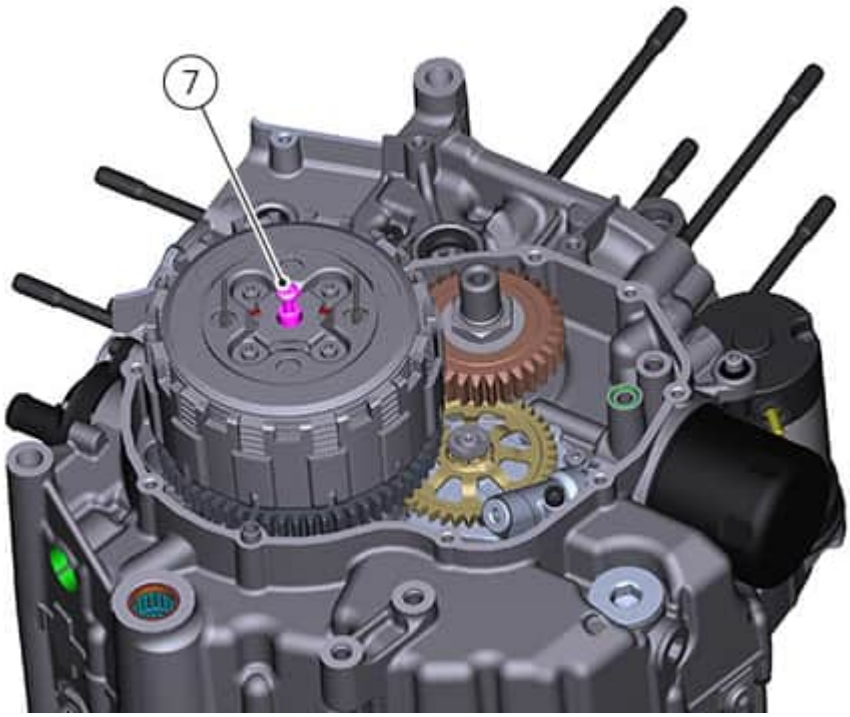
Clean and degrease cover and casing mating surfaces. Check that the casing features the centring bushing (8).

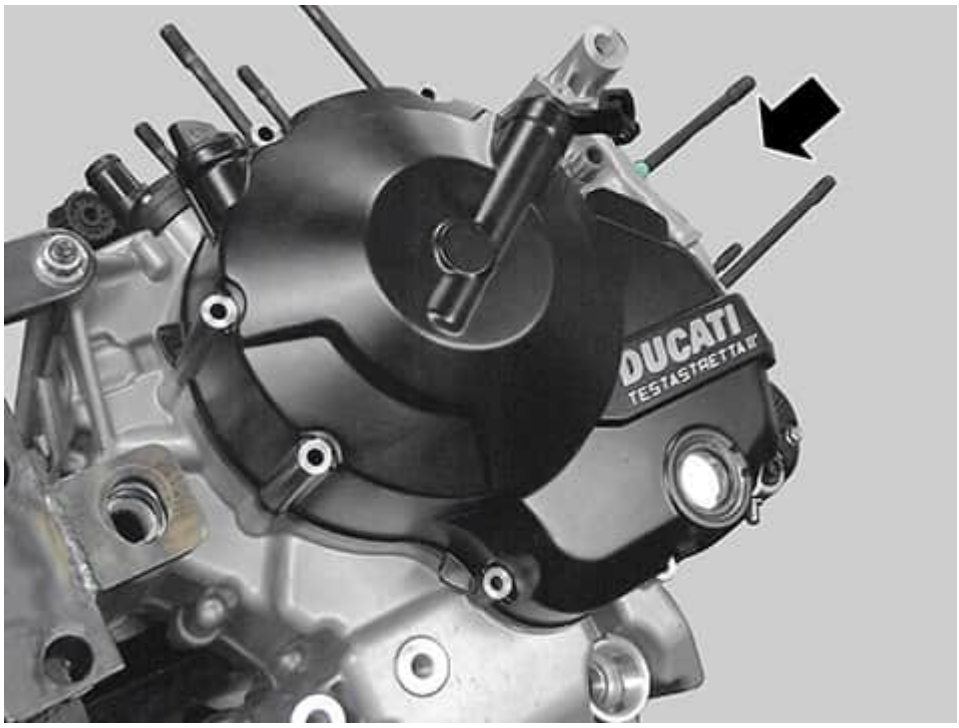


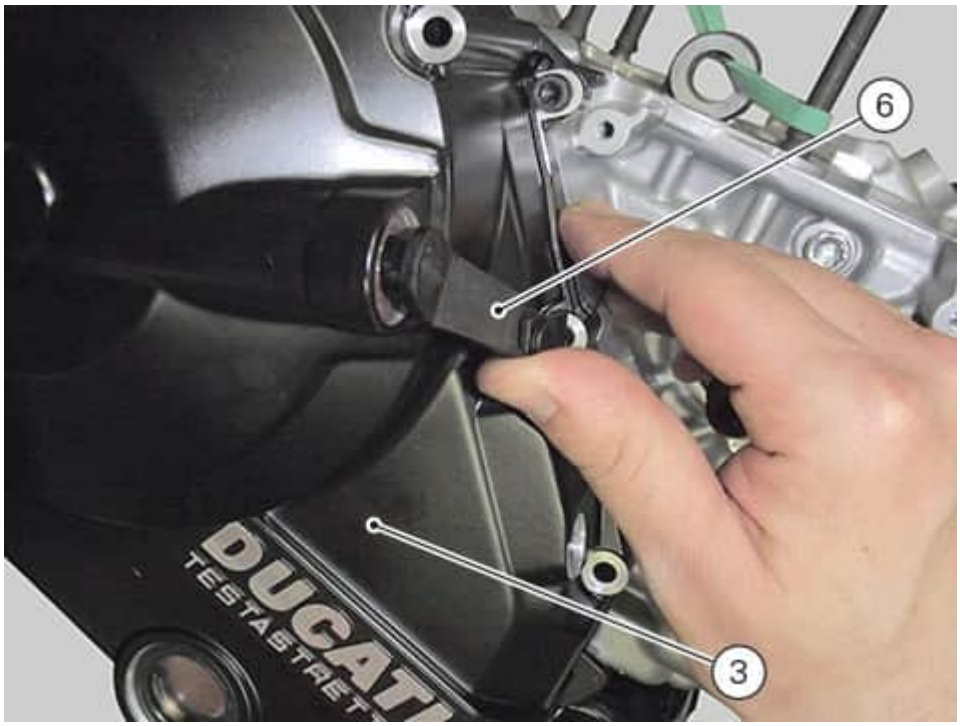
Apply an even, regular bead of DUCATI sealing compound (G) on the mating surface of the crankcase half and around all holes.



Bring cover near the crankcase half and, operating on clutch cover lever (6), make sure that clutch control pin (7) is duly inserted inside its seat on cover (3).


7

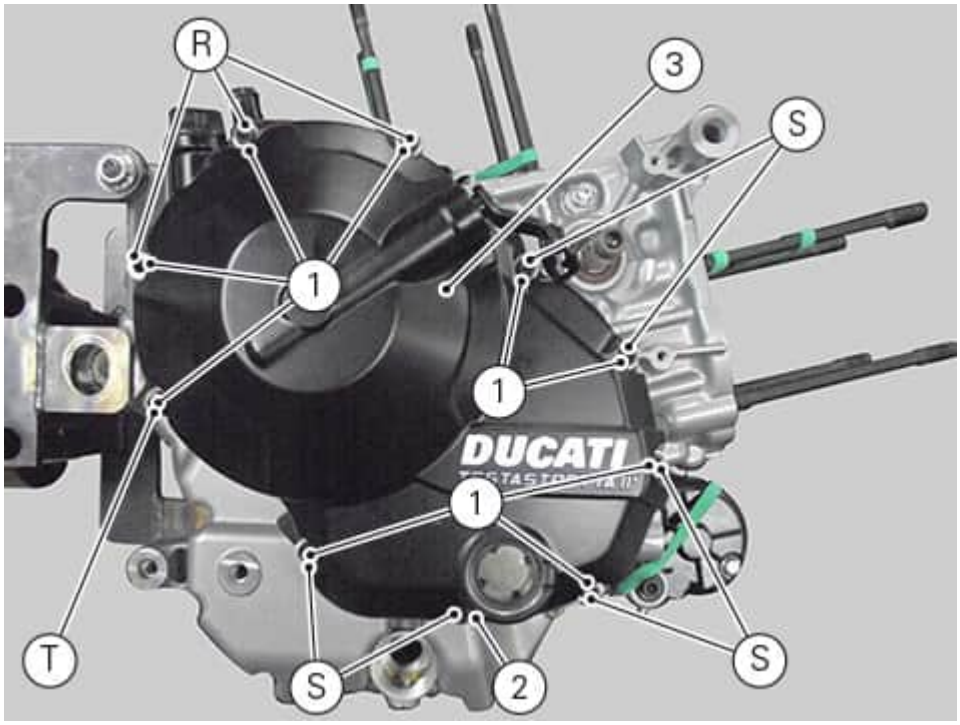

DUCATI
TESTASTRETTA



Start the fastening screws (1) and (2) inside the clutch cover (3).

Ref.	Quantity	Description
1-R	3	M 6 x 80
1-S	5	M 6 x 30
2-S	1	M 6 x 30
1-T	1	M 6 x 90

Tighten the screws to a torque of 13.5 Nm (Min. 12.5 - Max. 14.5).



In the Touring version, screw (2) is replaced by a stud bolt (9) to be tightened to the same torque of the screws.



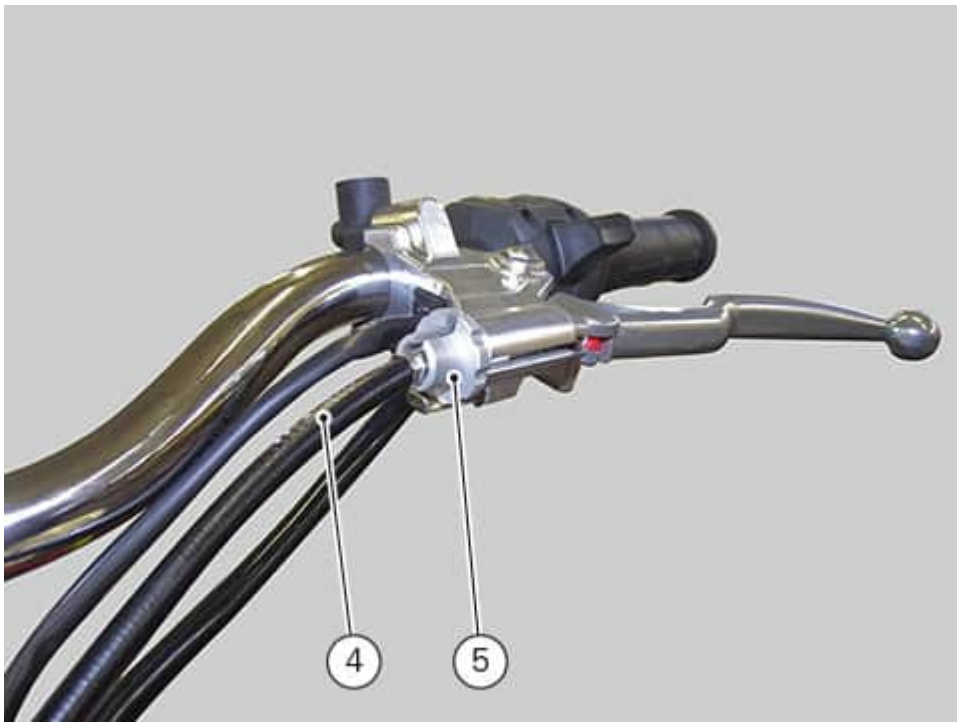
Refit the clutch cable (4) on the clutch cover.



Turn adjuster (5) to tension clutch cable (4) on handlebar.
Screw adjuster (5).

Warning
Never loosen adjuster. Adjuster must be screwed, only.

Adjuster (5) standard adjustment is 5 mm from the fully home position.
The maximum adjustment is of 11 mm.

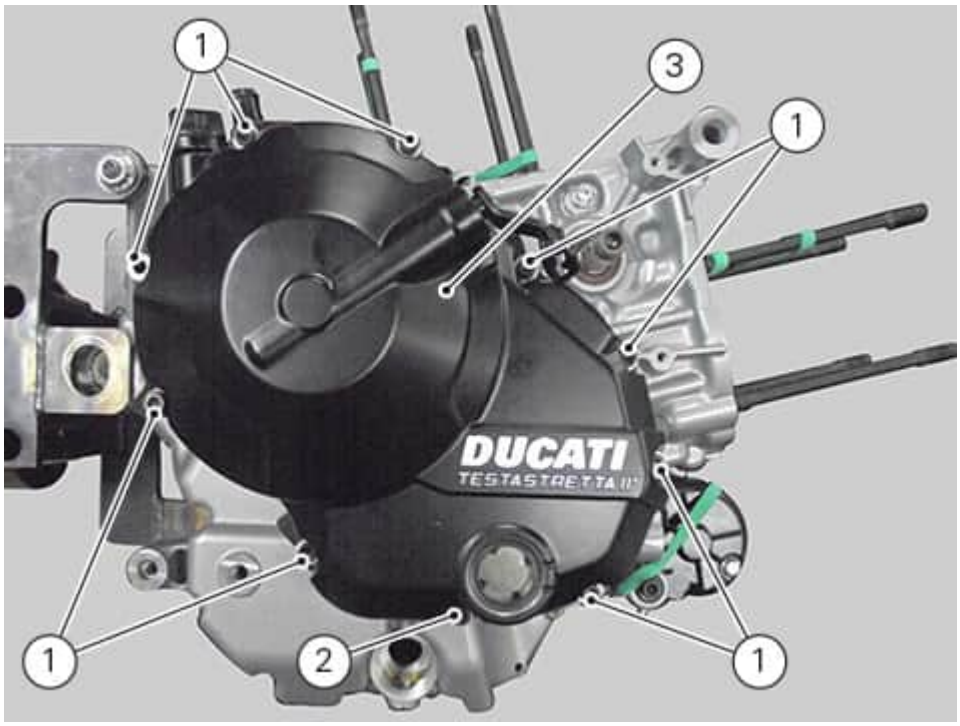


Fill the engine with oil (Changing the engine oil and filter cartridge).

Removing the clutch cover

Drain the engine oil (Changing the engine oil and filter cartridge).

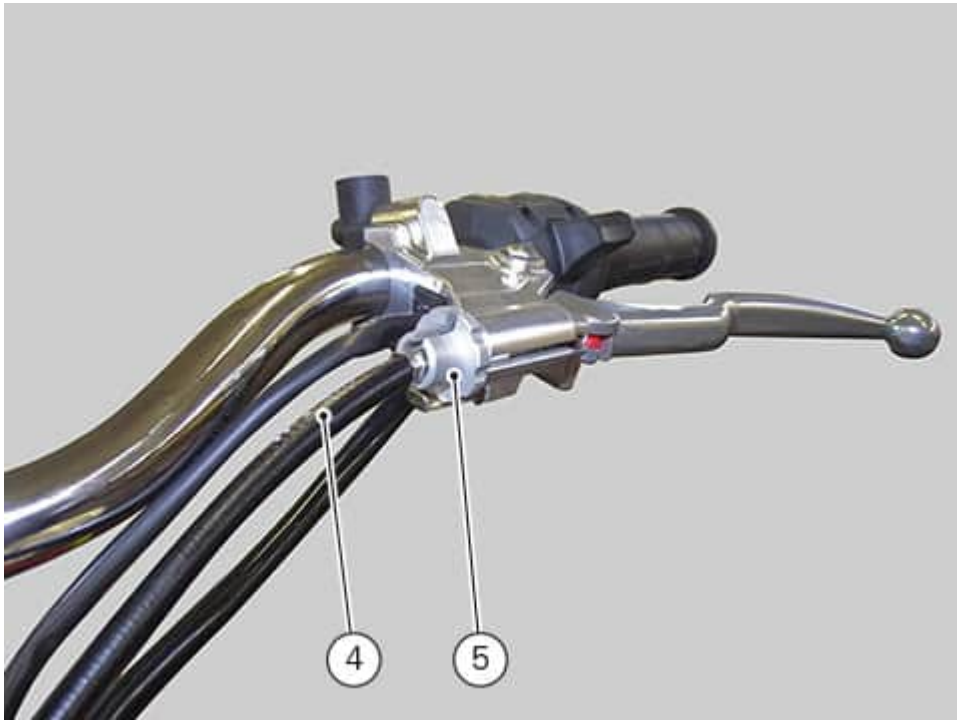
Loosen the fastening screws (1) and (2) on the clutch cover (3).



Warning

Never loosen adjuster. Adjuster must be screwed, only.

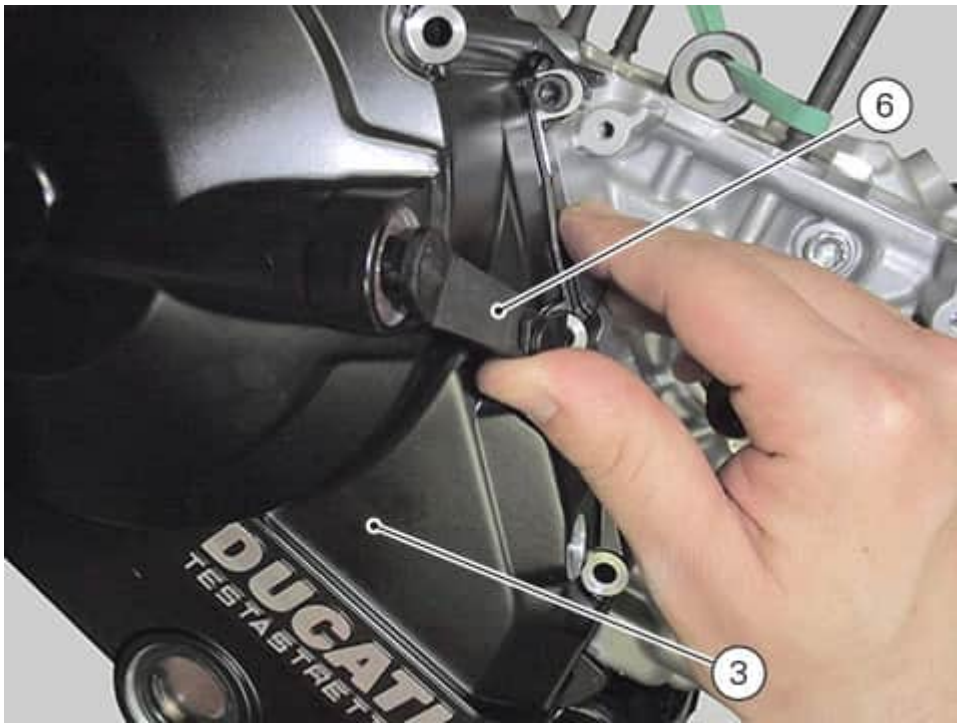
Screw clutch cable (4) fully home on clutch lever on handlebar, working adjuster (5).

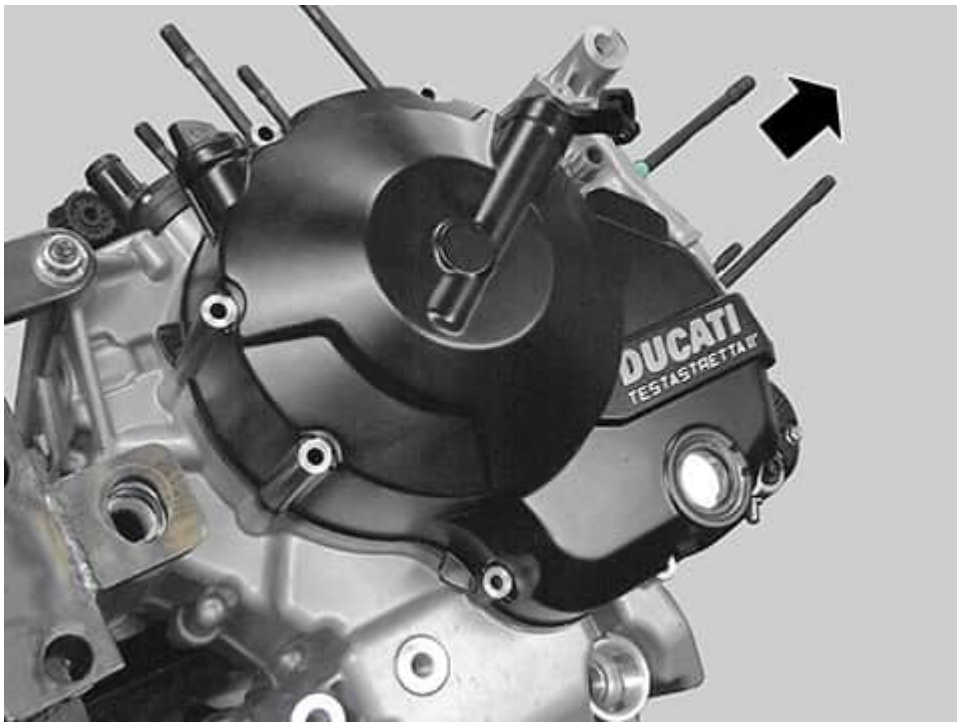


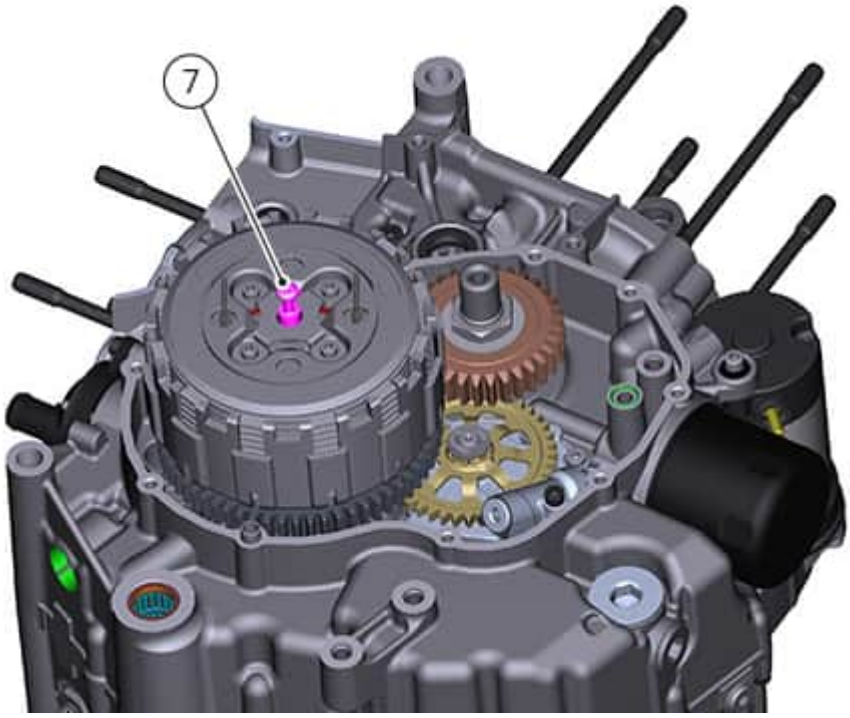
Remove the clutch cable (4) from the clutch cover.



Working on clutch cover lever (6), slowly remove cover (3) to release it from clutch control pin (7).

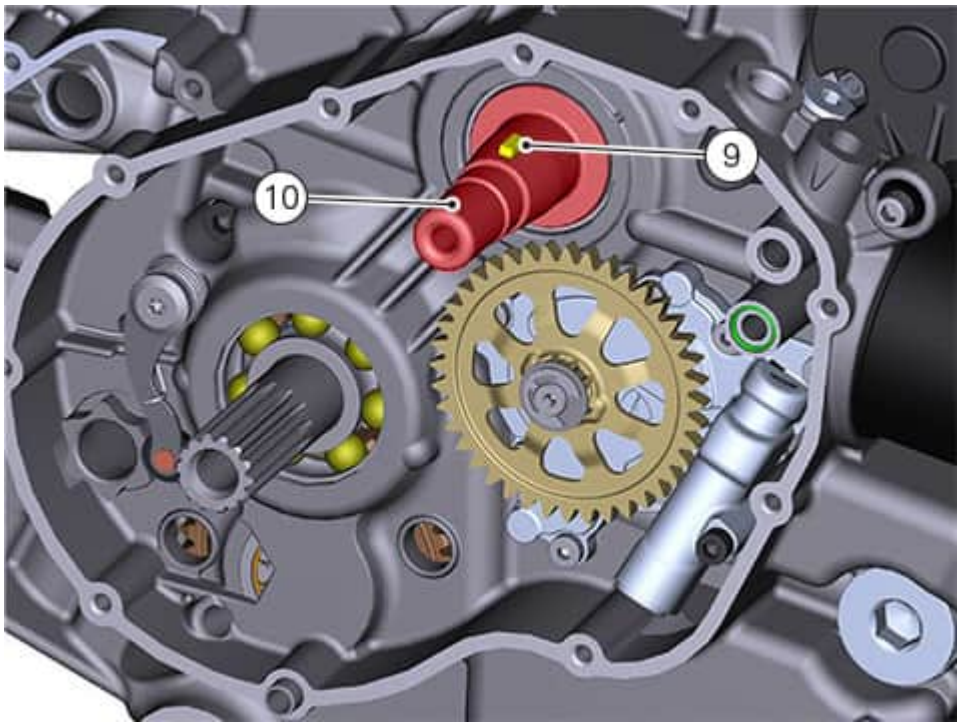



DUCATI
TESTASTRETTA


7

Refitting the primary drive gears

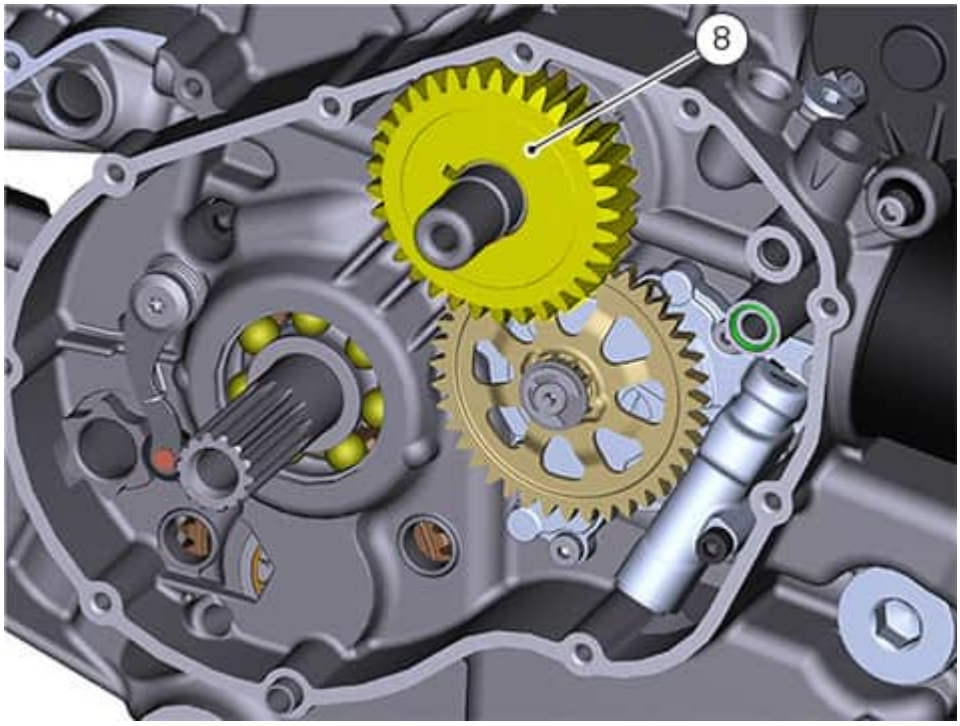
Fully degrease the crankshaft splined end and the corresponding spline on the primary drive gear. Check that tab (9) and inner spacer (10) are positioned on the crankshaft.



Fit the driving gear (8) onto the crankshaft with the oil pump drive sprocket facing the crankcase.
Temporarily secure the gear with the washer (6) and nut (7).

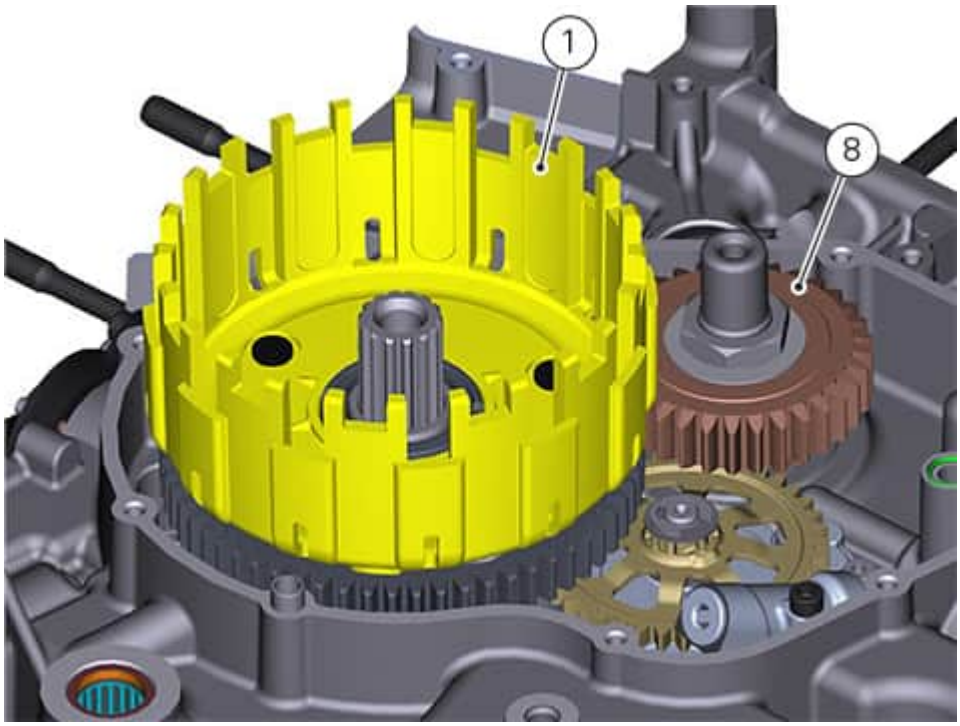
Important

If fitting a new primary driving gear (8), check the backlash.

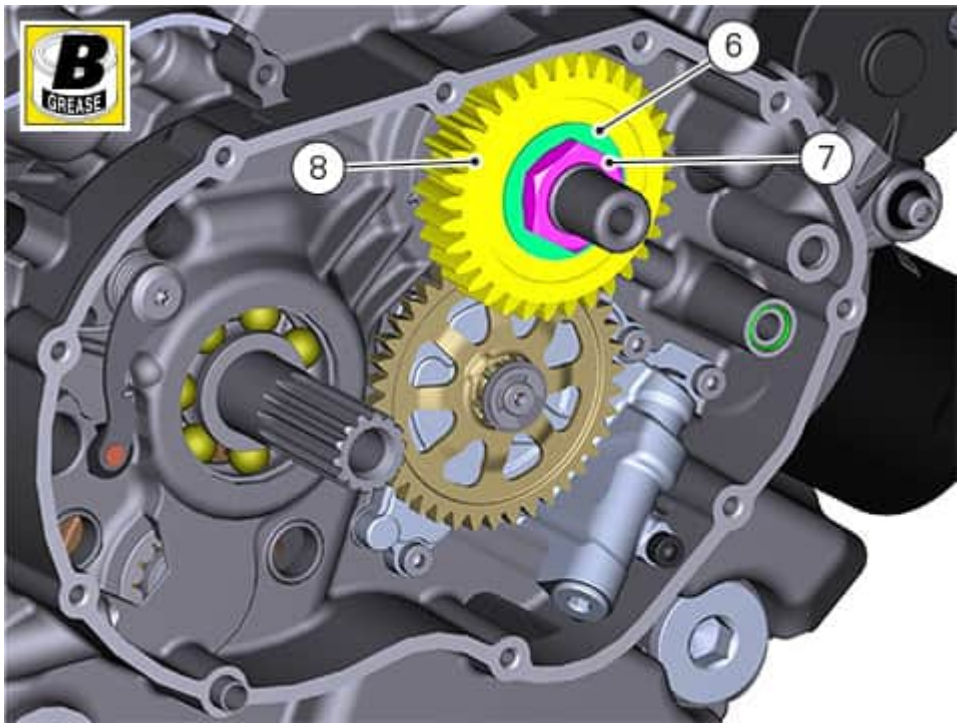


To check the backlash, temporarily fit the clutch housing (1) complete with inner spacer, the driven gear (3) and the inner race on the gearbox primary shaft.
Fix a dial gauge to the crankcase, positioning the stylus against a gear tooth.
Turn the driven gear (3) to mesh the teeth and check that backlash ranges between 0.05 and 0.07 mm.
Repeat the check at 16 different points of the driven gear.
If the measured values are outside the tolerance limits, try changing the position of driven gear (3) on the primary shaft, leaving the driving gear (8) on the crankshaft in the same position.

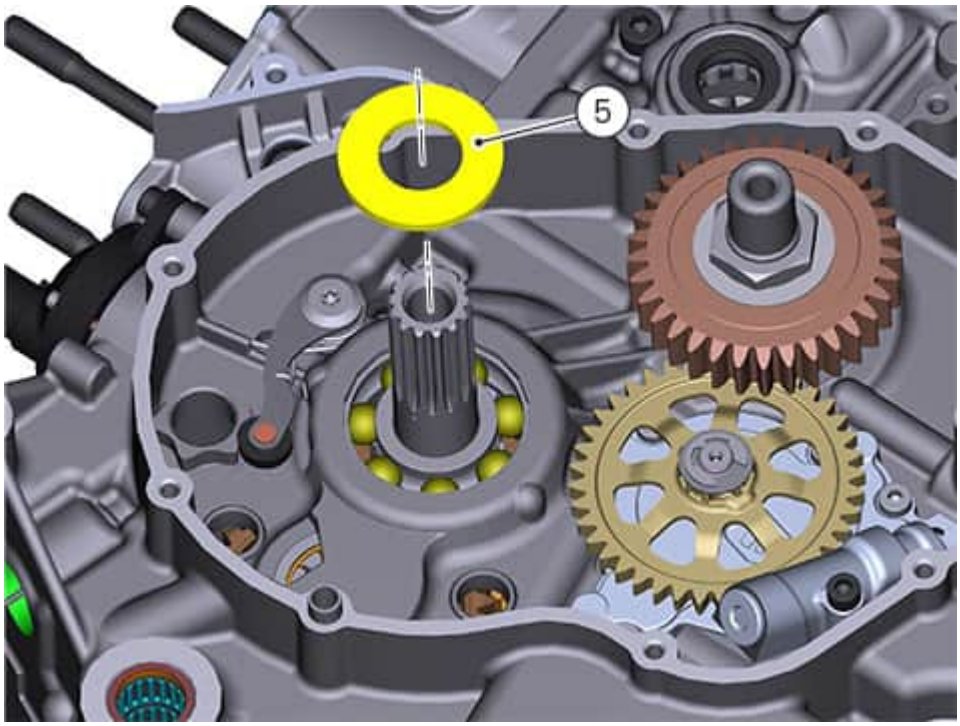
If the backlash is still outside the tolerance limits, replace the complete primary drive gears: gear (3) and gear (8).

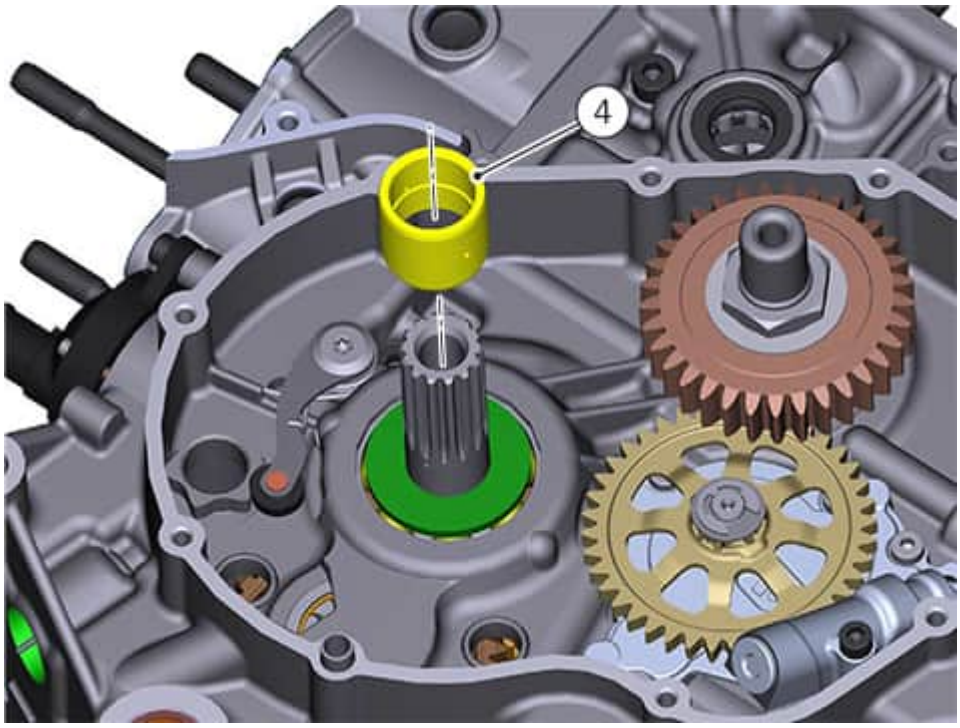


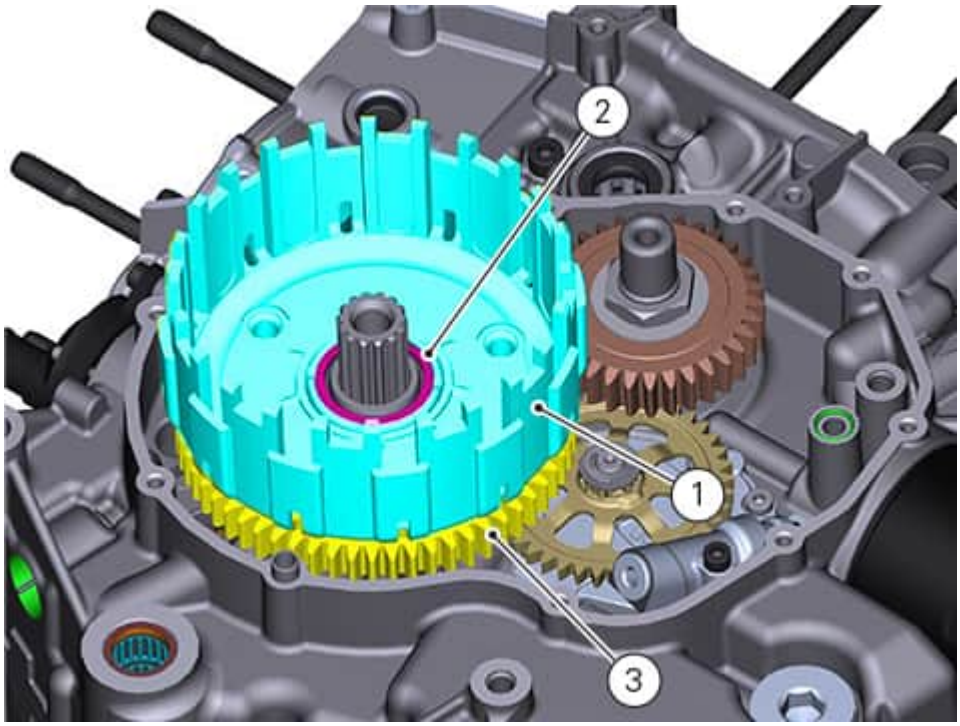
After having checked the backlash, lock gear (8) using tool no. **88713.0137**, apply the specified grease on nut (7), and tighten it to a torque of 190 Nm (Min. 171 Nm - Max. 209 Nm).
Bend the washer (6) over the nut (7).



Thoroughly degrease clutch housing (1), inner ring (4) and inner spacer (5) contact surfaces.
Insert inner spacer (5) inside primary shaft, with the flat side facing outside.
Fit the inner ring (4), the clutch housing (1) along with the driven gear (3) with needle bearing (2).


5


4

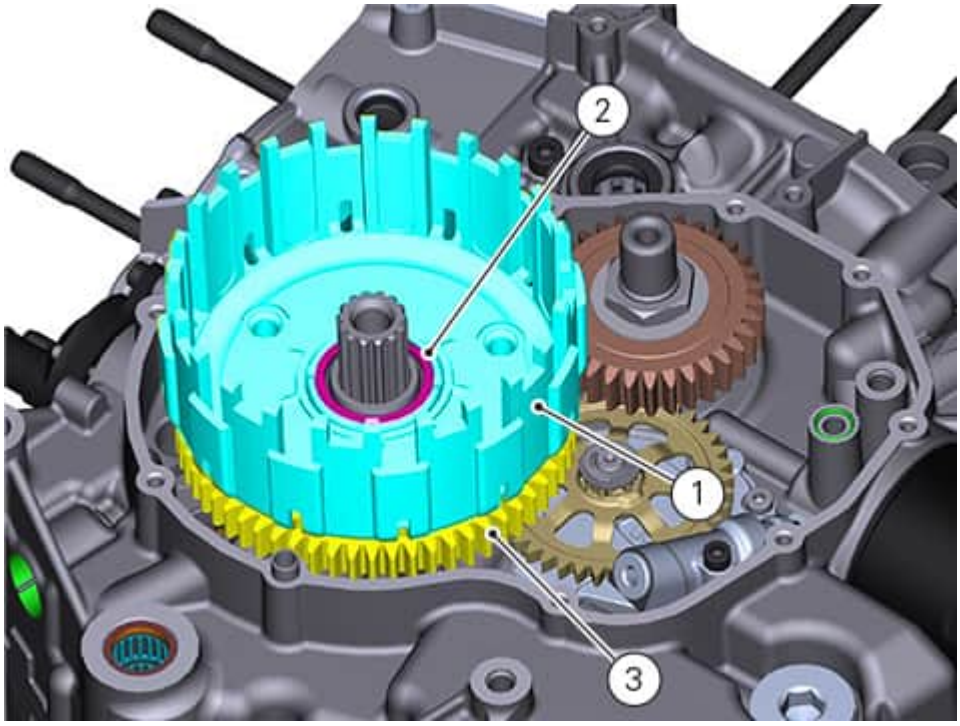


Refit the clutch unit (Refitting the clutch).
Refit the clutch cover (Refitting the clutch cover).
Fill the engine with oil (Changing the engine oil and filter cartridge).

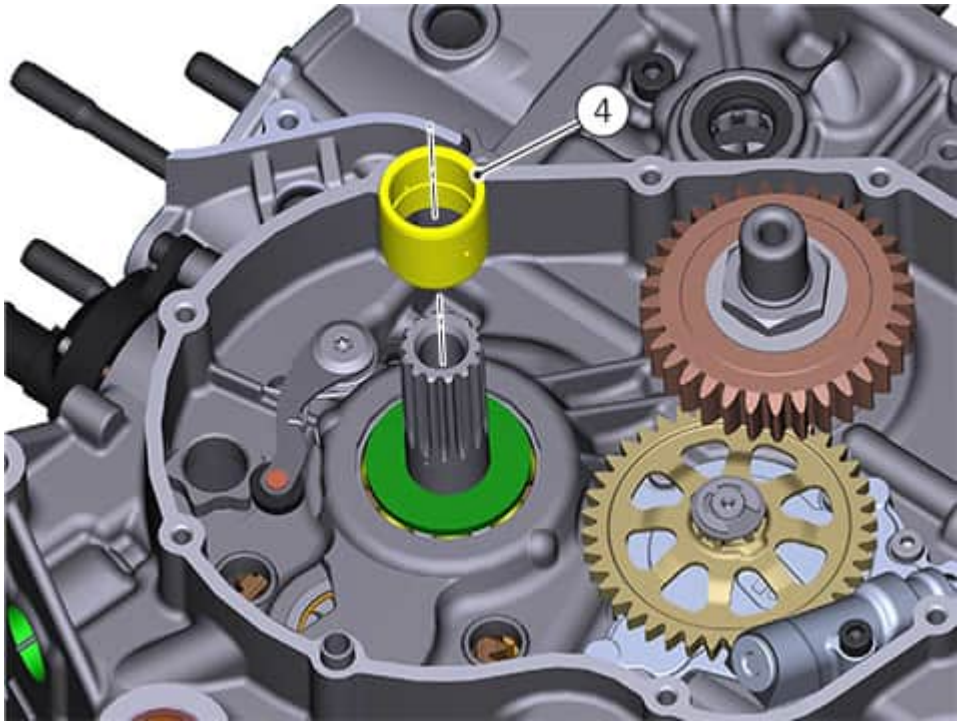
Removing the primary drive gears

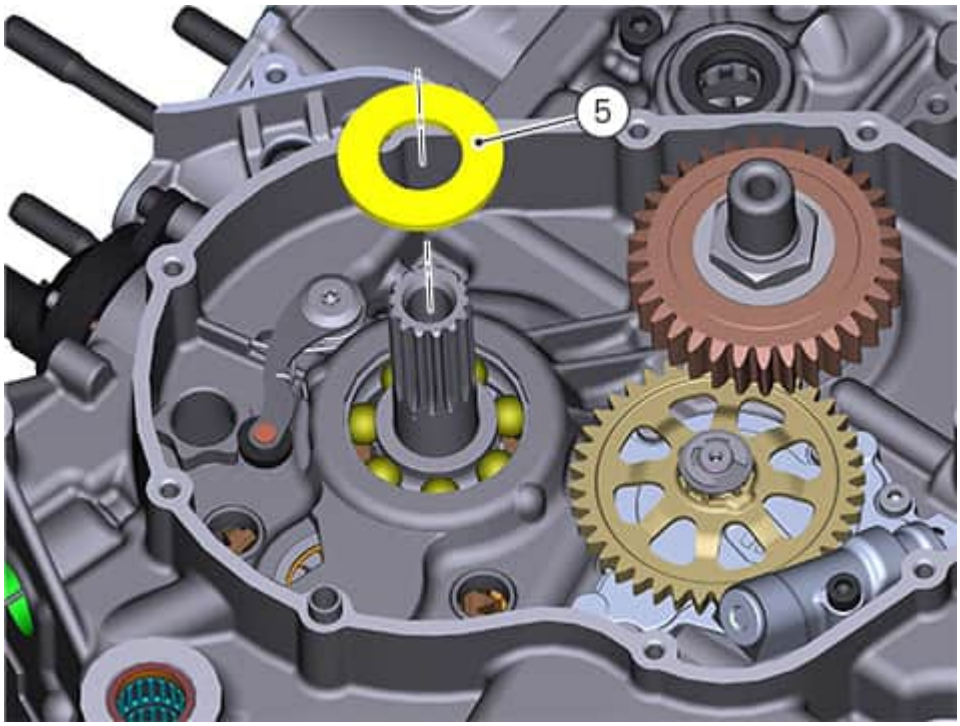
Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the clutch cover (Removing the clutch cover).
Remove the clutch unit (Removing the clutch).

Remove the clutch housing (1) complete with needle bearing (2) and primary driven gear (3).

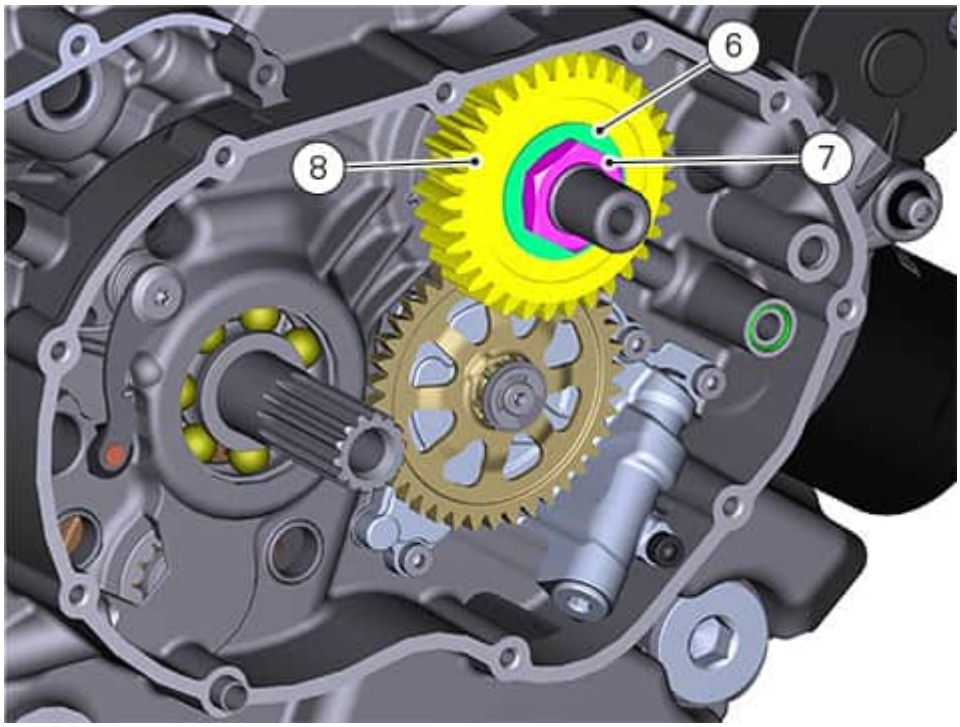


Remove inner ring (4) and inner spacer (5).

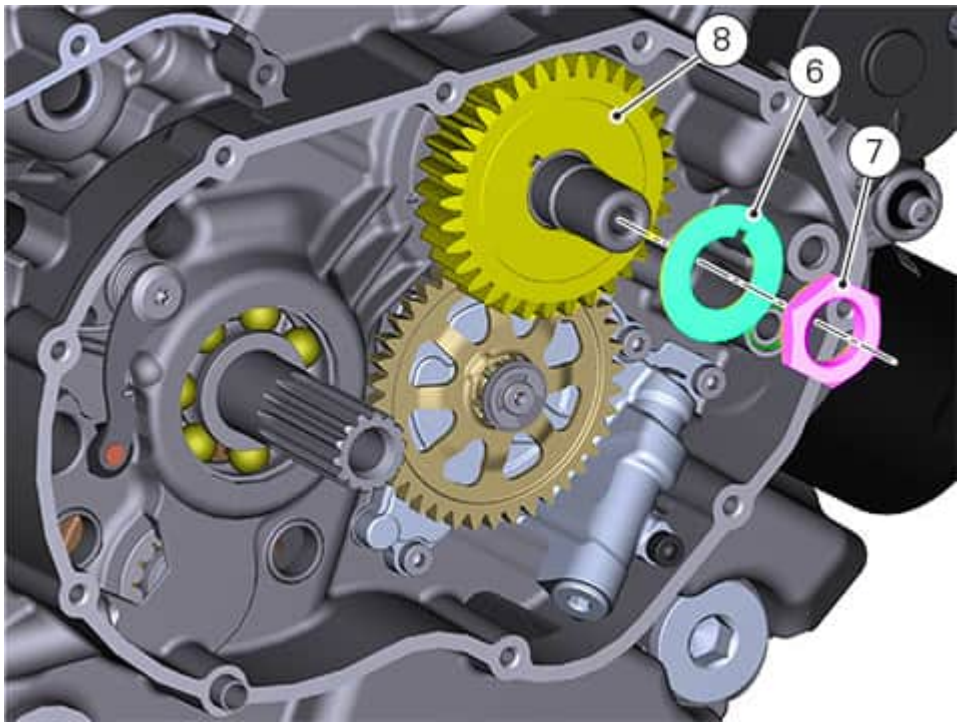




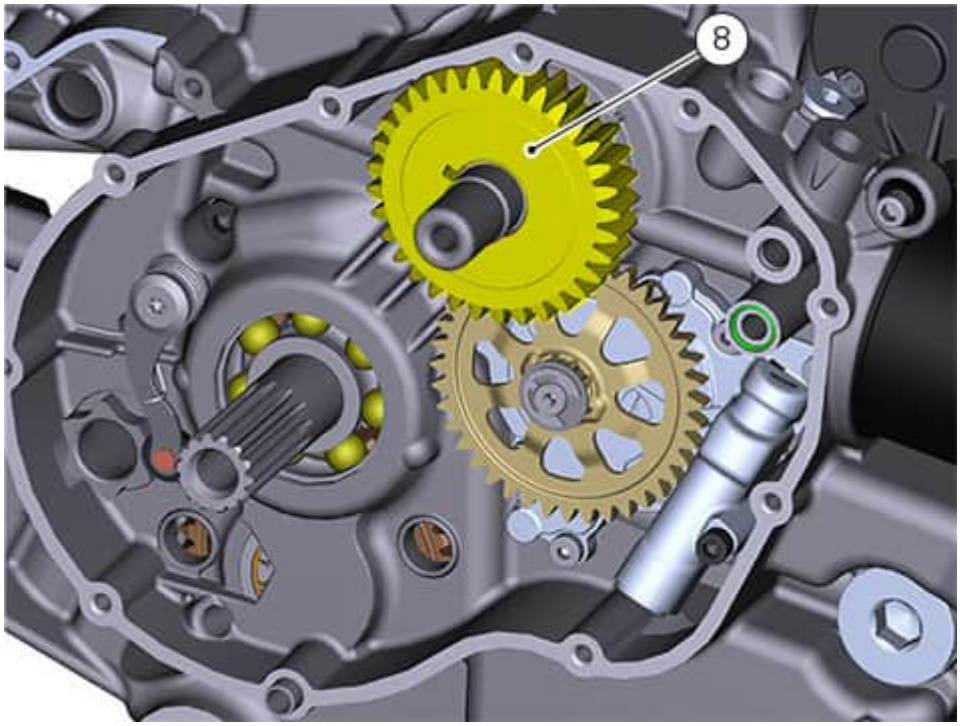
Straighten out lock washer (6) on primary drive driving gear (8) fastening nut (7).



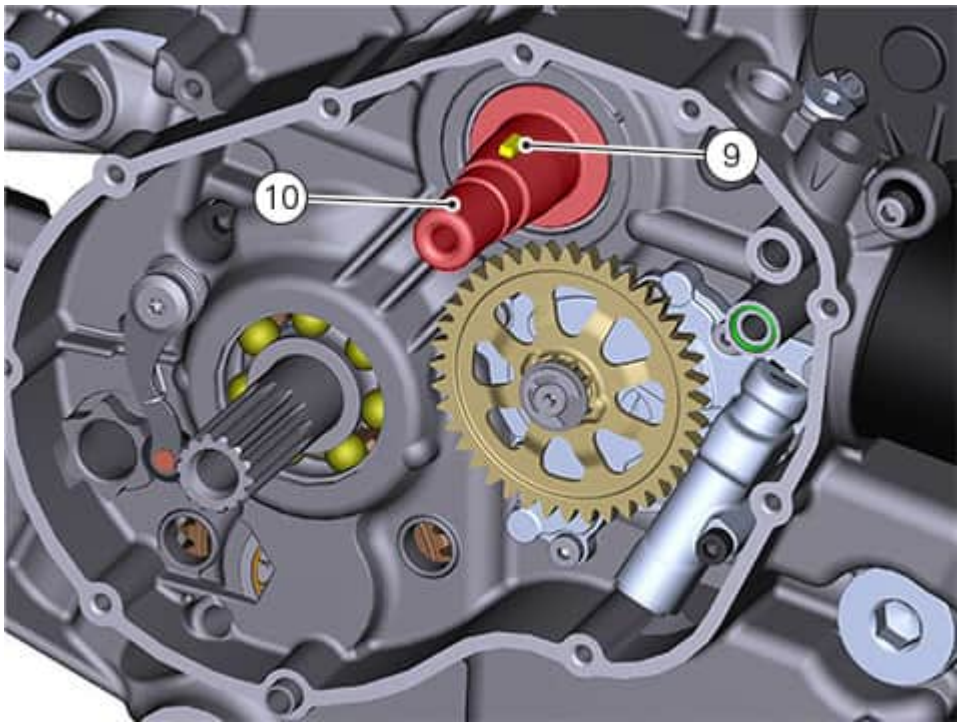
Lock the primary drive gear (8) with holding tool no. **88713.0137** and loosen sprocket nut (7).
Remove the nut (7) and the lockwasher (6).



Remove the primary drive driving gear (8) using puller **88713.2092** and placing a brass or aluminium pad between crankshaft and puller screw.

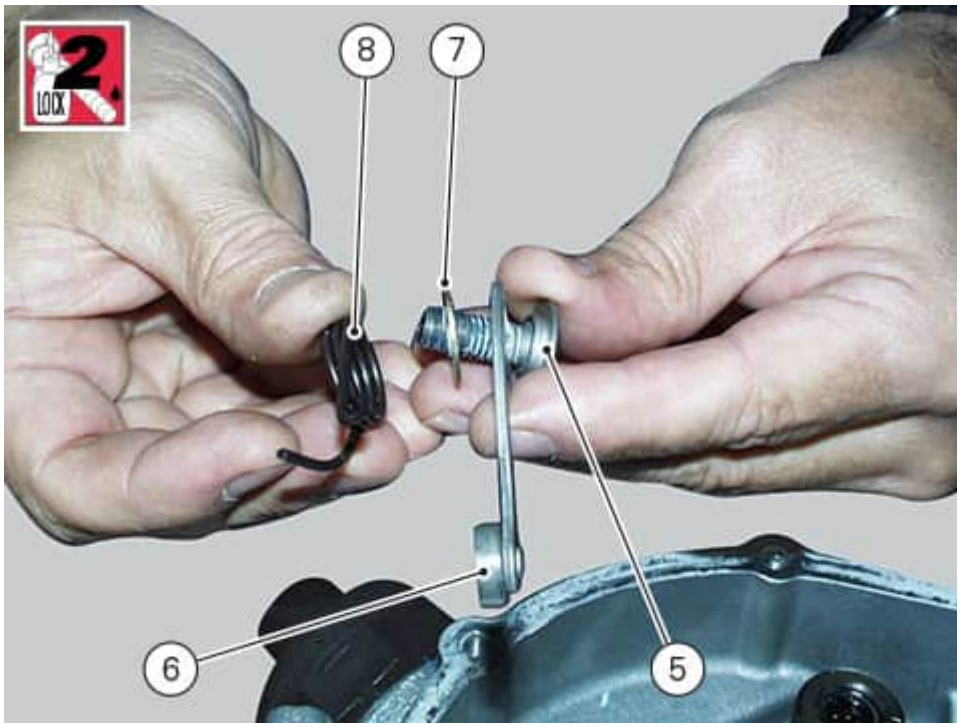


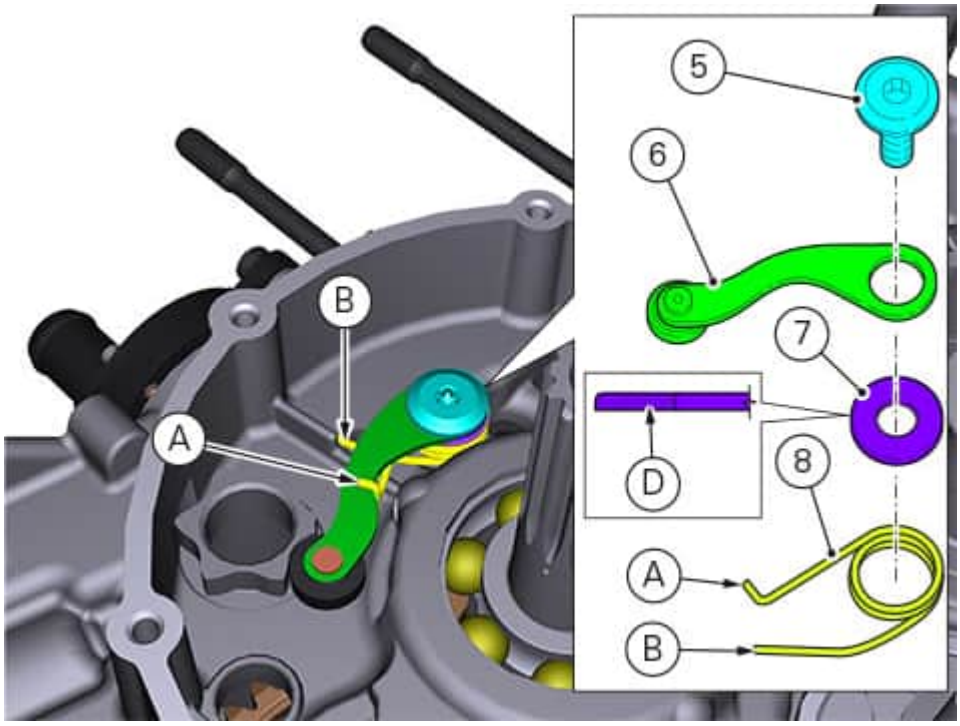
Pay attention to tab (9) positioned on the crankshaft and to the internal spacer (10).


9
10

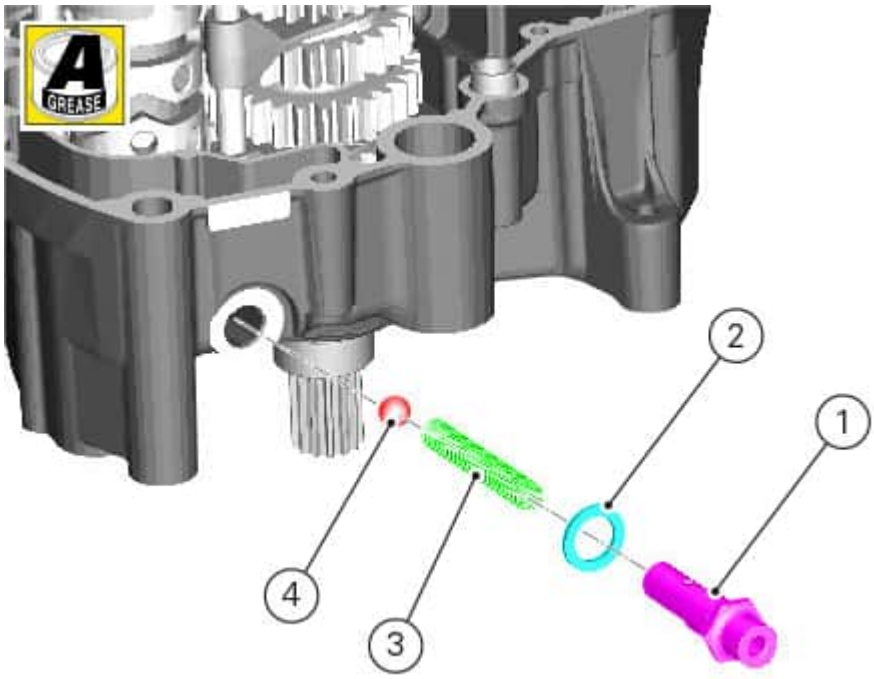
Refitting the gear interlock plunger and ratchet

On the special screw (5), fit the gear ratchet (6), orienting it as shown in the figure, the washer (7) with the square edge side (D) facing the clutch-side crankcase half, and the spring (8), positioning it so that the hook end (A) is facing the gear ratchet.
Locate the hook (A) of the spring on the gear ratchet as shown in the figure.
Apply threadlocker to the screw thread.
Start the screw in the crankcase half.
Position end (B) of the spring so that it rests against rib (C) of the crankcase half, as shown in the figure.
Tighten screw (5) to a torque of 18 Nm (Min. 16 Nm - Max. 20 Nm).
Manually move the gear ratchet to check for proper spring operation.





Grease and then fit the ball (4), spring (3), and seal (2) to the gear interlock plunger (1).
Tighten the gear interlock plunger to a torque of 30 Nm (Min. 27 Nm - Max. 33 Nm).

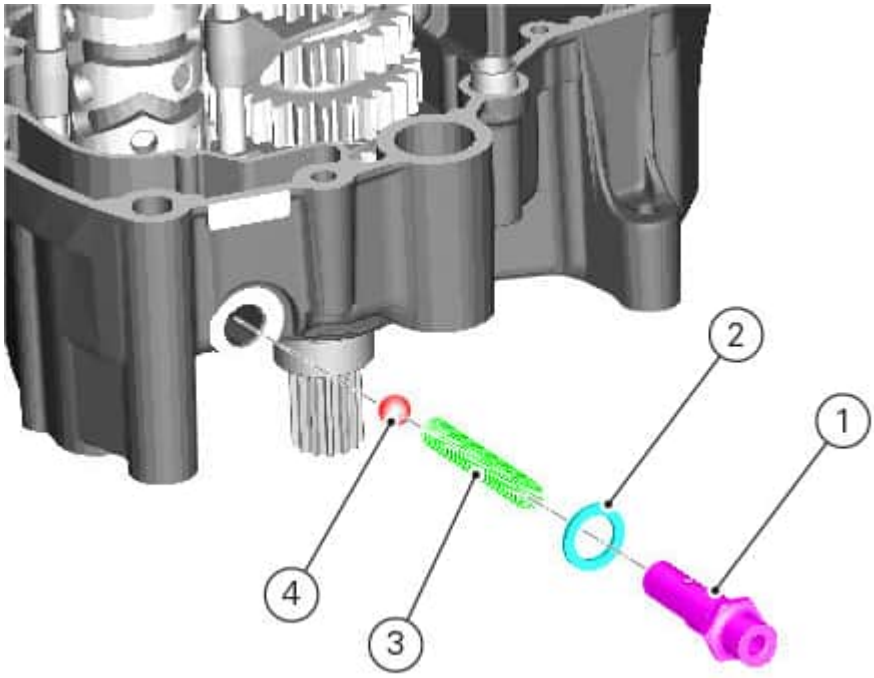


Refit the primary drive gear (Refitting the primary drive gear and checking backlash).
Refit the clutch unit (Refitting the clutch).
Refit the clutch cover (Refitting the clutch cover).
Fill the system with engine oil (Changing the engine oil and filter cartridge).

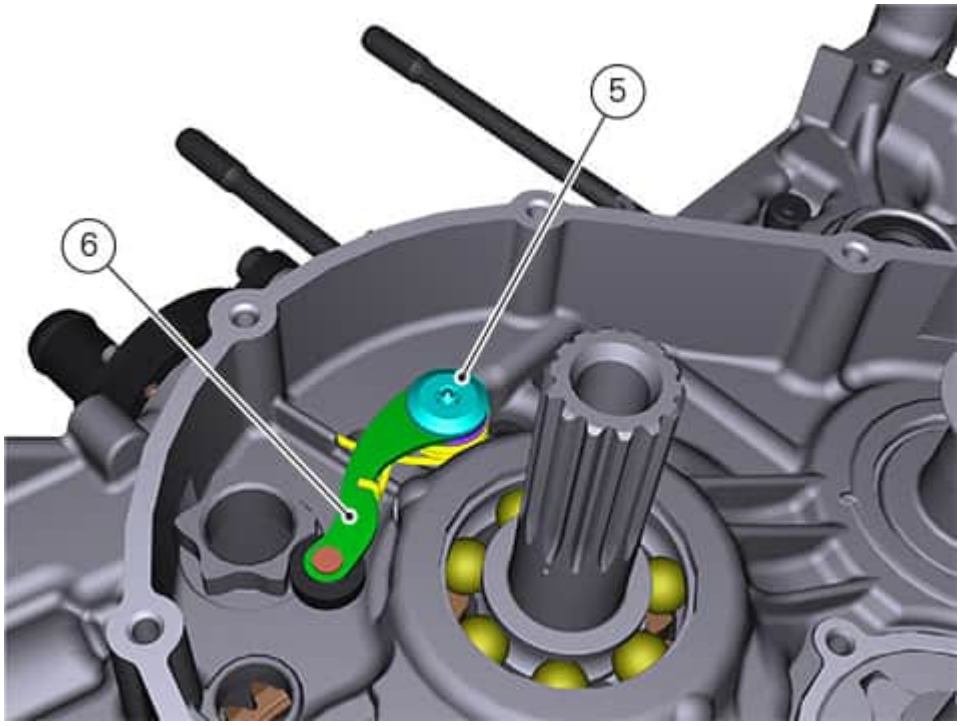
Disassembling gear interlock plunger and ratchet

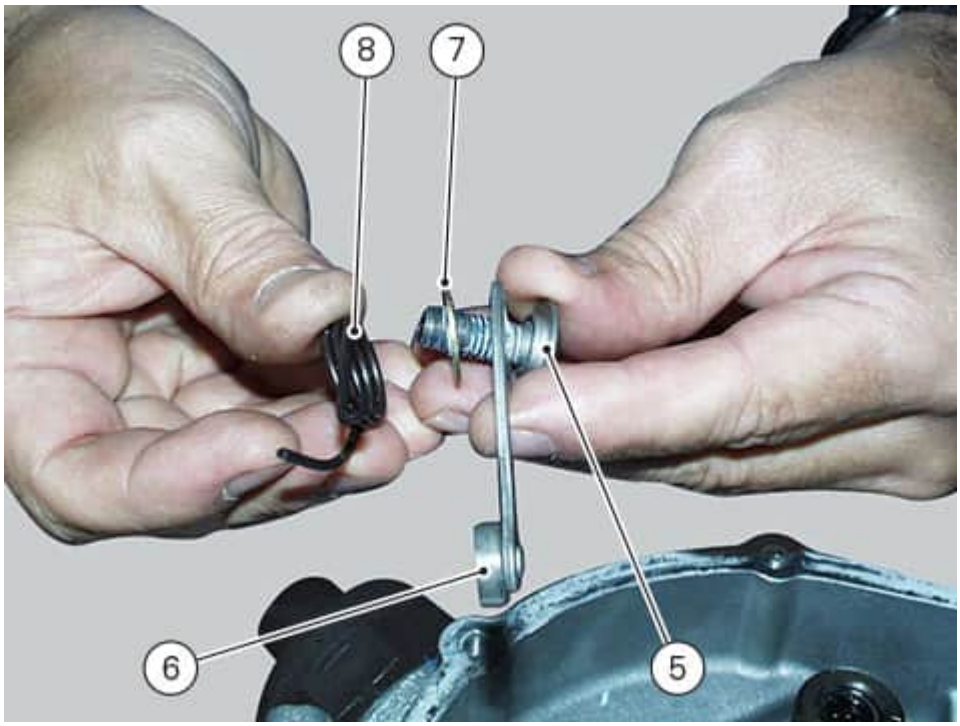
Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the clutch cover (Removing the clutch cover).
Remove the clutch unit (Removing the clutch).
Remove the primary drive gear (Removing the primary drive gear).

Undo the interlock plunger screw (1) and remove the seal (2), the spring (3) and the ball (4).



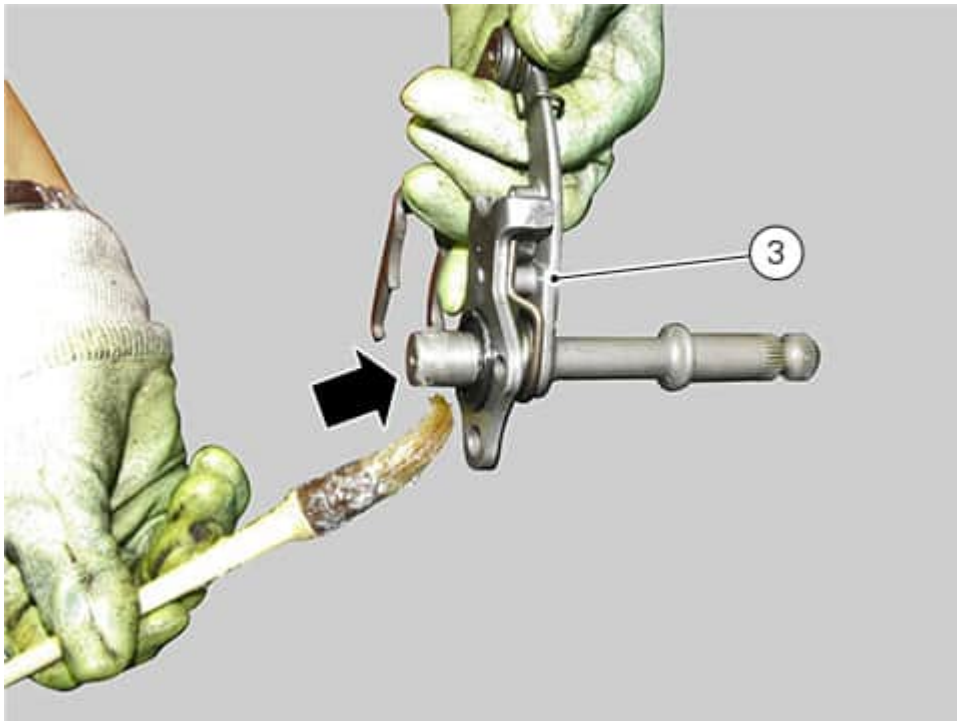
Undo the clutch-side crankcase half screw (5) and remove the ratchet (6), the washer (7) and the spring (8).



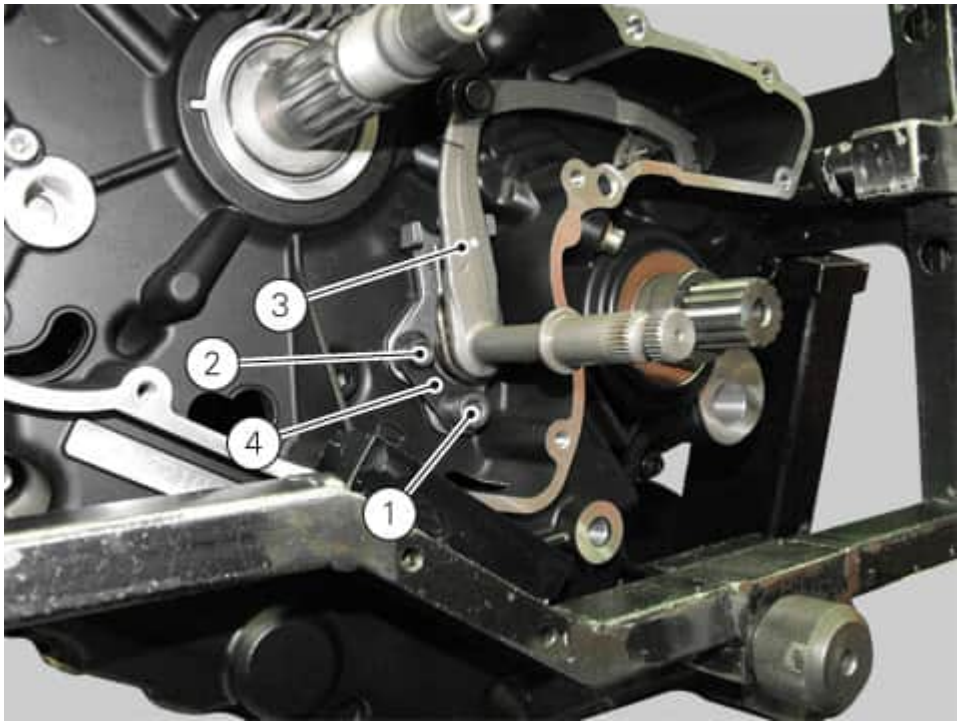

8
7
6
5

Refitting the gearchange mechanism

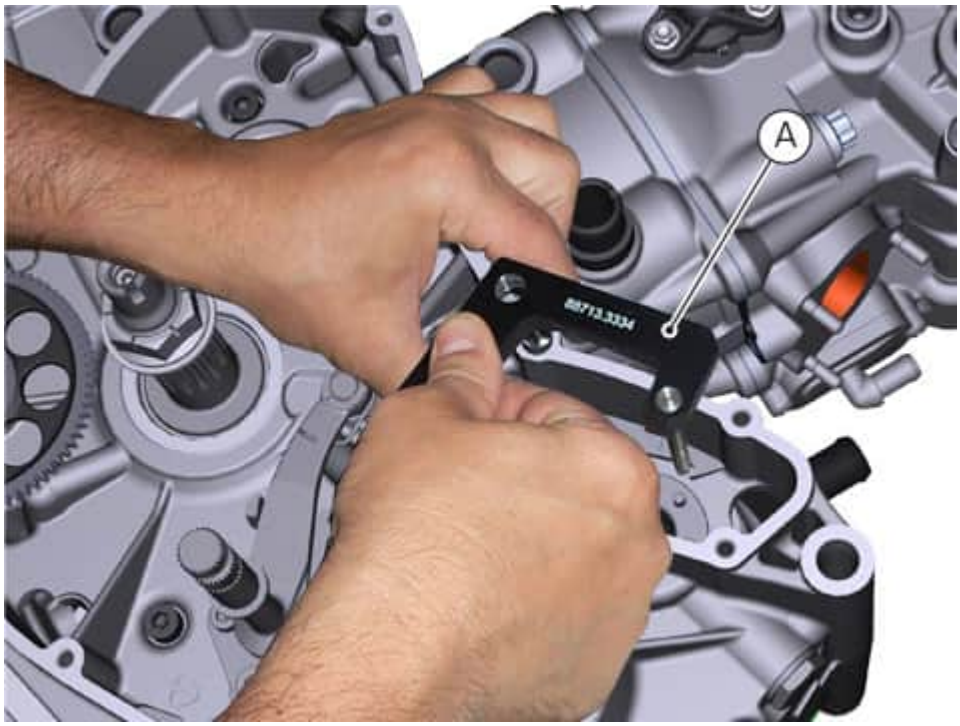
Apply the recommended grease to mechanism pin (3).



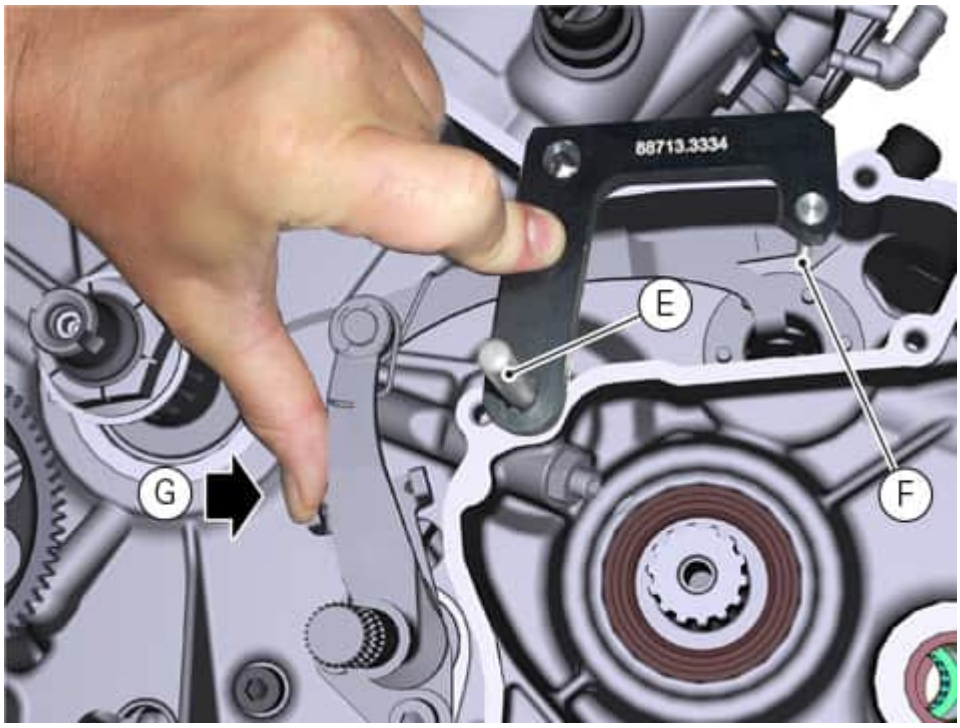
Position the gearbox drum selector fork in the centre of the gear rollers.
Position the gearchange mechanism (3) together with control shaft, spring and plate into the chain-side crankcase half.
Insert the screws (1) and (2) with the spacer (4).
Temporarily fit gearchange lever (or a service lever) and engine sprocket and shift to neutral gear.

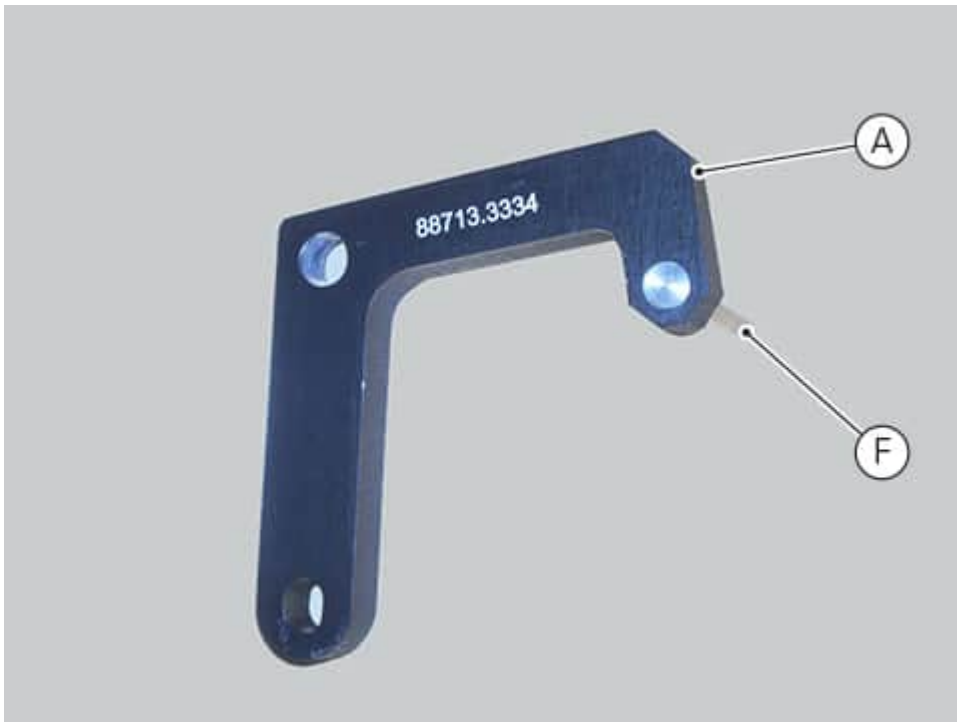


Set tool (A) part no. **88713.3334** on the gearbox pawl.



Place tool (A) part no. **88713.3334** inserting a service pin (E) into the tool hole, block the pin (F) of the tool in the gear pawl pressing with the hand in the point (G) (pawl stroke stop plate) towards the right, as shown in photo.



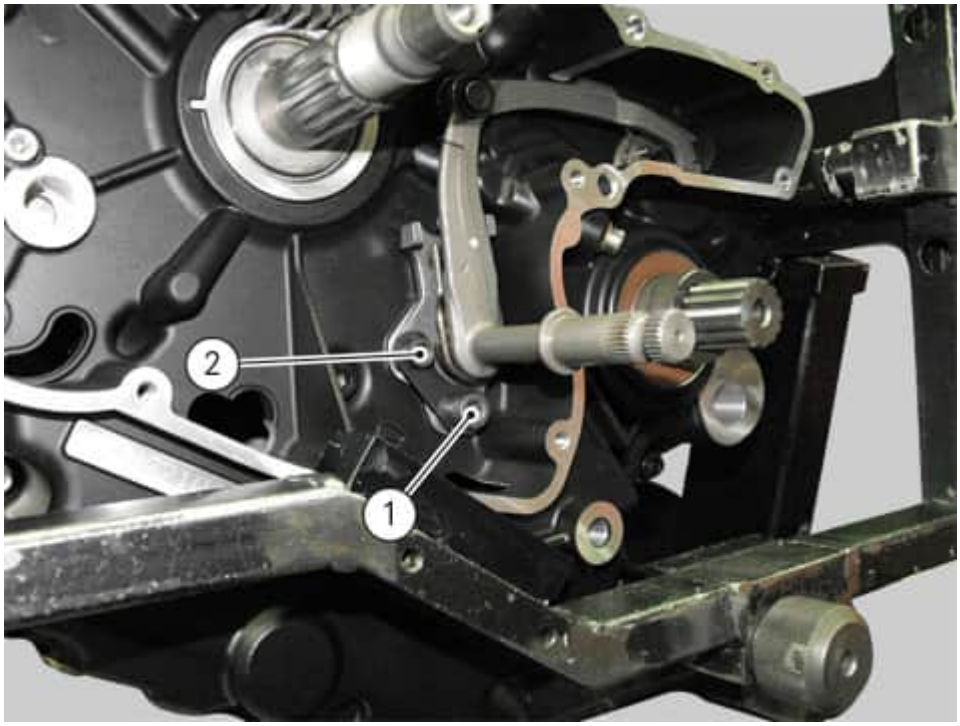


In this position, after having applied specified threadlocker to screws (1) and (2), tighten screw (1) to a torque of 36 Nm (Min. 34 Nm - Max. 38 Nm) and the screw (2) to a torque of 16 Nm (Min. 15 Nm - Max. 17 Nm).

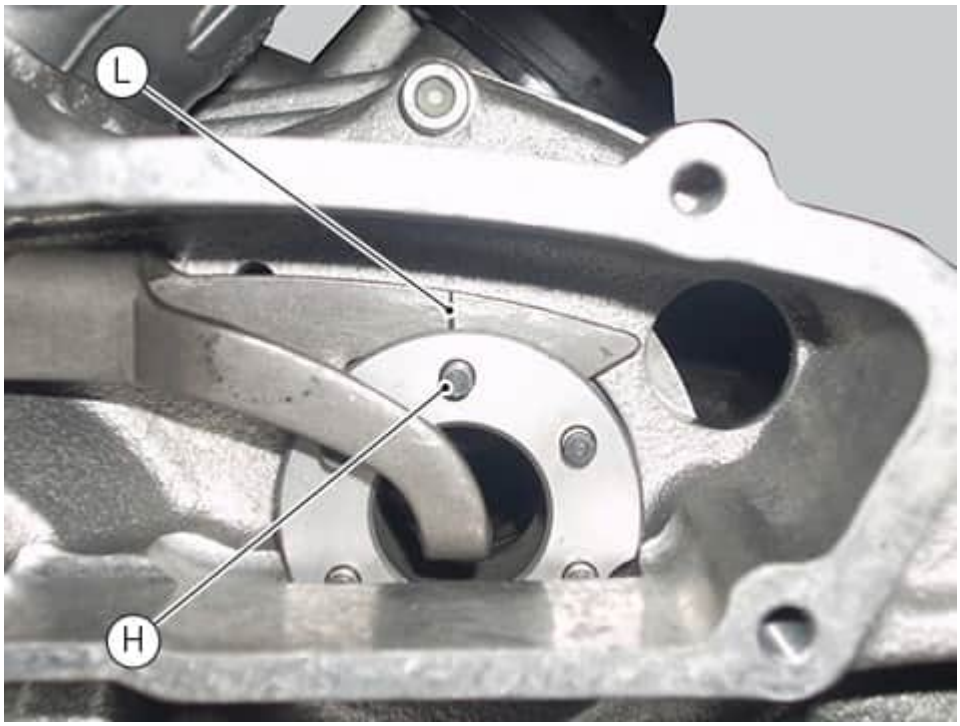
Warning

Make sure that the gearchange mechanism fixing screws are those indicated in our spare part catalogues. They must be screws of class 12.9 in order to respect the tightening torque indicated above.

Start tightening the first screw (1), and continue with screw (2).



Remove service tool.
Check that the pin (H) placed on the gearbox selector drum is aligned with the notch (L) on the gear pawl (with gear in neutral).



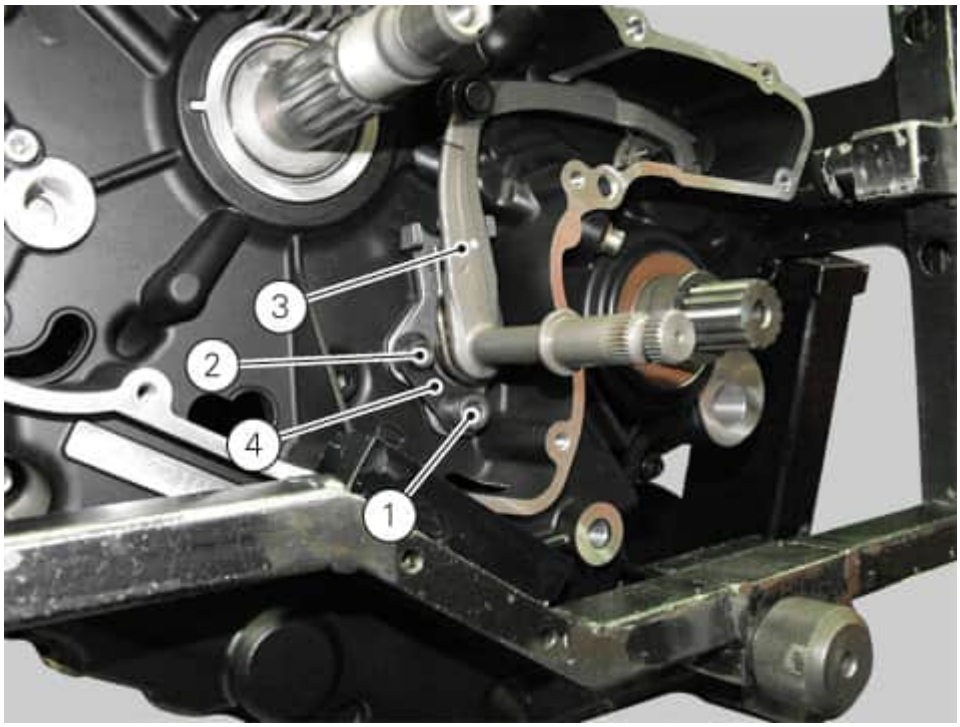
With the gearbox in neutral, check that the lever travel is the same when shifting up and down. The same should apply when a gear is engaged.
Operate the gearchange lever and turn the front sprocket at the same time to check that all the gears engage when shifting up and down.
Remove the previously installed lever and sprocket.

Refit the flywheel/generator assembly and the generator cover (Refitting the flywheel/generator assembly).
Refit the pump-water radiator hose (Refitting cooling system hoses and unions).
Refit the pump-cylinder hoses (Refitting the cylinder/piston assembly).
Refill the cooling system (Changing the coolant).
Refit the gear shift (Refitting the gearbox unit).
Fill the system with engine oil (Changing the engine oil and filter cartridge).

Removing the gearchange mechanism

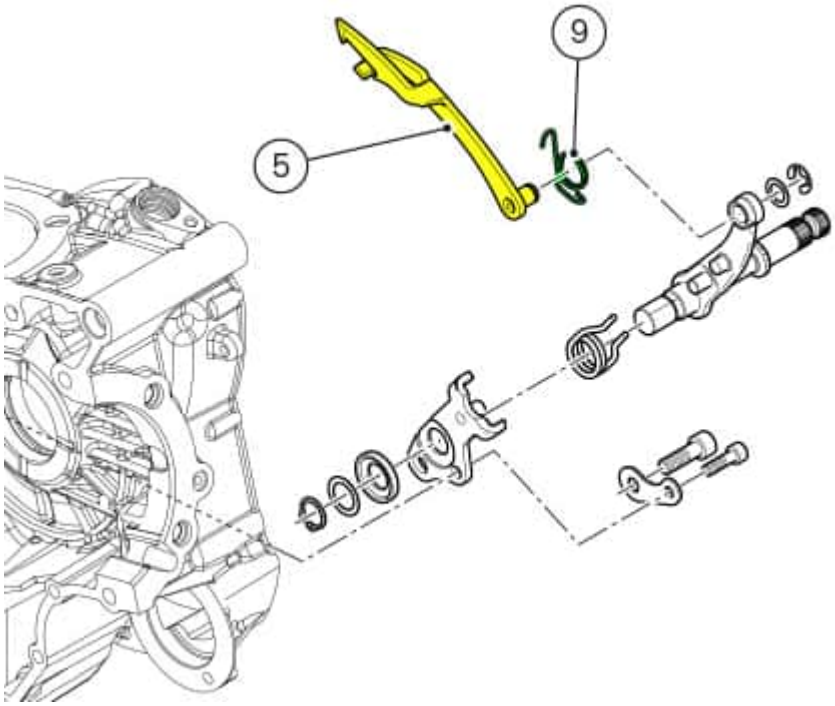
Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the gear shift (Removing the gearbox unit).
Drain the coolant (Changing the coolant).
Remove the pump-cylinder hoses (Removing the cylinder/piston assembly).
Remove the pump-water radiator hose (Removing cooling system hoses and unions).
Remove the generator cover (Removing the generator cover) and the flywheel-generator assembly (Removing the flywheel/generator assembly).

Undo and remove the fixing screws (1) and (2) of the complete gearchange mechanism (3) and collect the spacer (4).
Remove the gearchange mechanism complete with the shaft, spring, and plate.

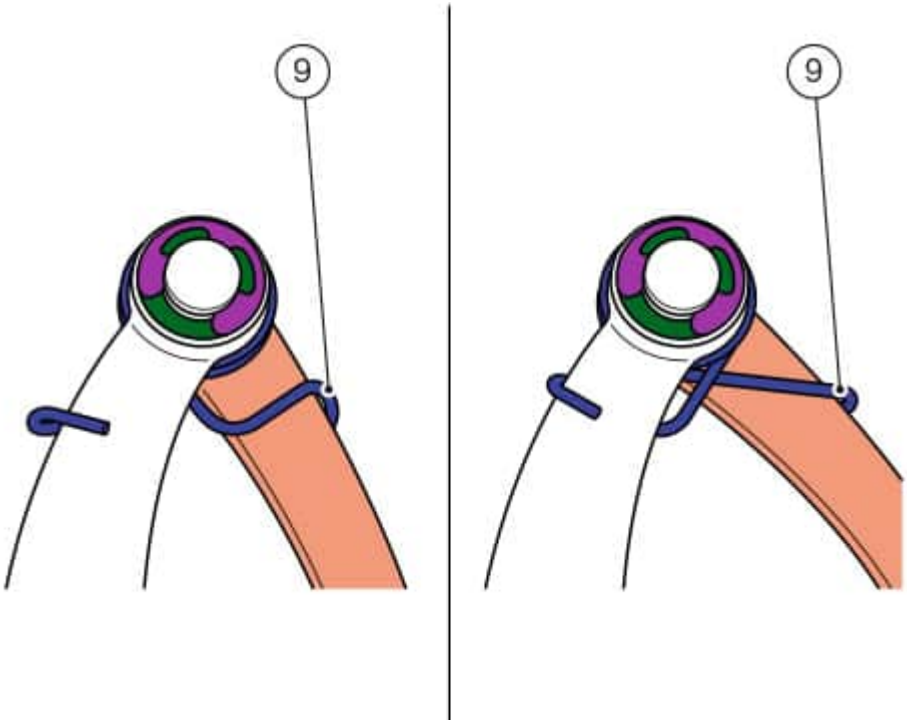


Visually inspect the gear selector fork (5) for wear, particularly around the area where it contacts the selector drum.

If it proves necessary to change components, disassemble the gearchange mechanism as shown in the exploded view.

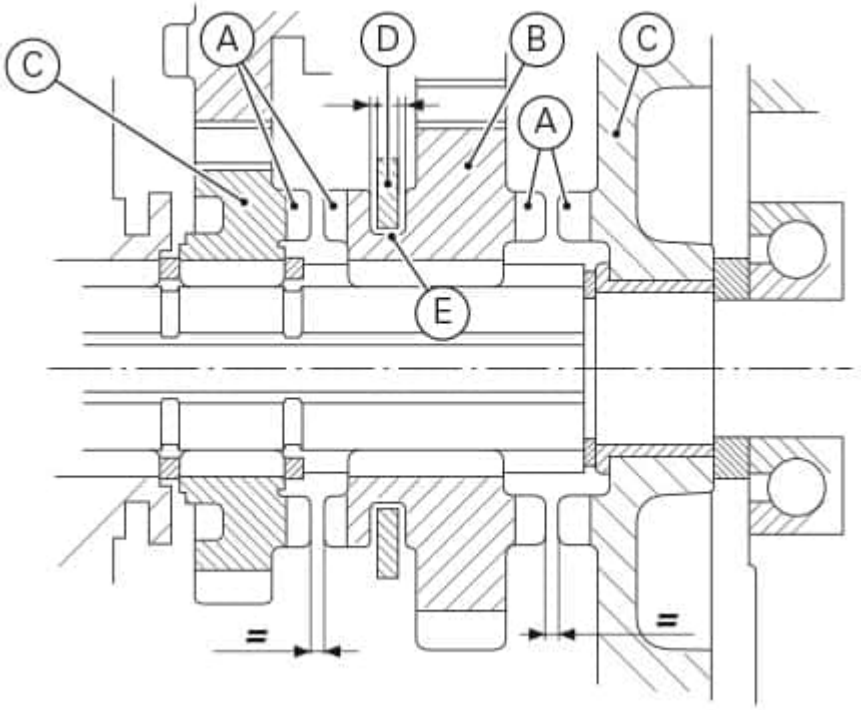


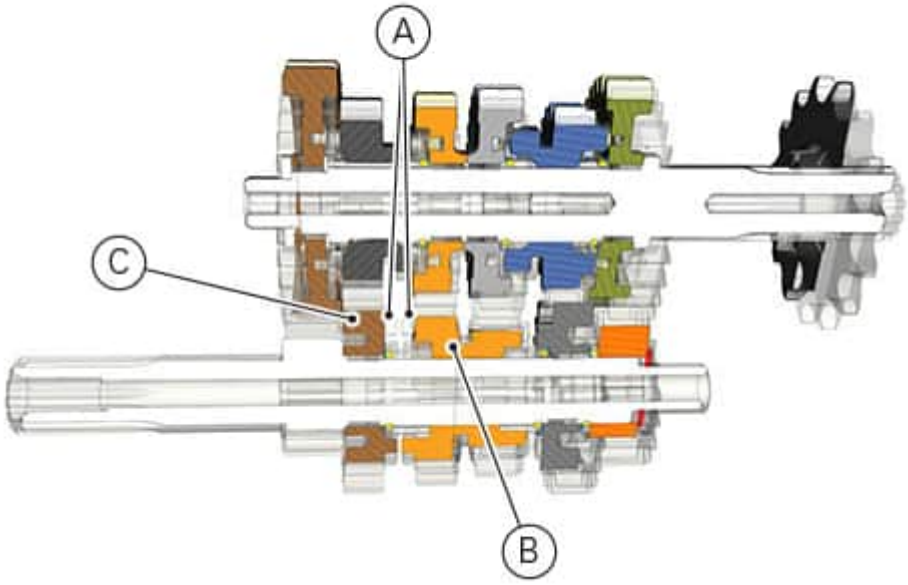
Upon reassembly, check that the spring (9) is installed correctly as shown in the figure.



Reassembling the gearbox assembly

To refit the gearbox components follow the procedure under chapter "Closing the crankcase" relating to the reassembly of the crankcase.
As a final practical test, ensure that with the gearbox in neutral the front coupling dogs (A) of sliding gears (B) are equidistant on both sides with respect to the corresponding coupling dogs on the fixed gears (C).
Check also that there is always a small amount of clearance between fork (D) and relative groove (E) on sliding gear (B) when engaging the gears.



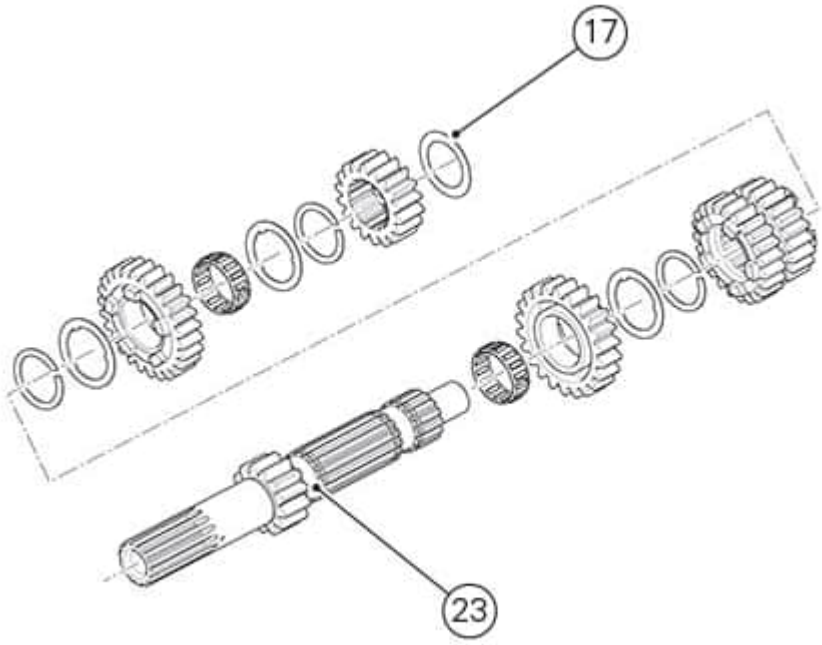


Close the crankcase halves (Closing the crankcase).
Refit the primary drive gear (Refitting the primary drive gear and checking backlash).
Refit the clutch unit (Refitting the clutch).
Refit the clutch cover (Refitting the clutch cover).
Refit the starter motor (Refitting the starter motor).
Refit the complete generator (Fitting the flywheel/generator assembly) and the generator side cover (Fitting the generator cover).
Refit the oil pump (Refitting the oil pump).
Refit the complete cylinder/piston assembly (Refitting the cylinder/piston assembly).
Refit the complete cylinder head assembly (Refitting the cylinder heads).

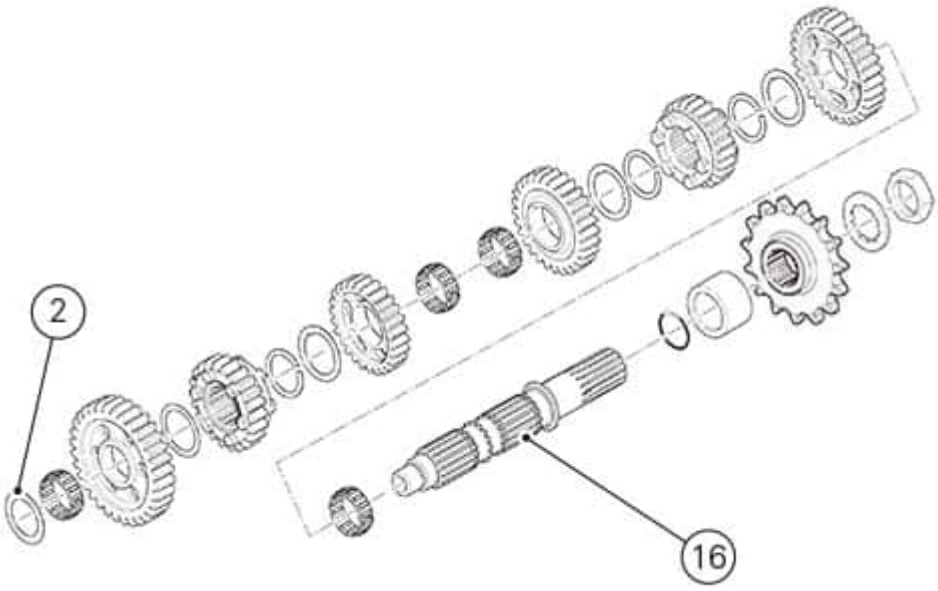
Refit the timing pulleys (Refitting the timing layshaft pulley).
Refit the timing belts (Refitting the timing belts).
Refit the lateral timing belt covers (Refitting the timing belt external covers).
Refit the engine in the frame (Refitting the engine).

Reassembling the gearbox shafts

The figure shows all components that must be fitted on the primary shaft (23) with washer (17).

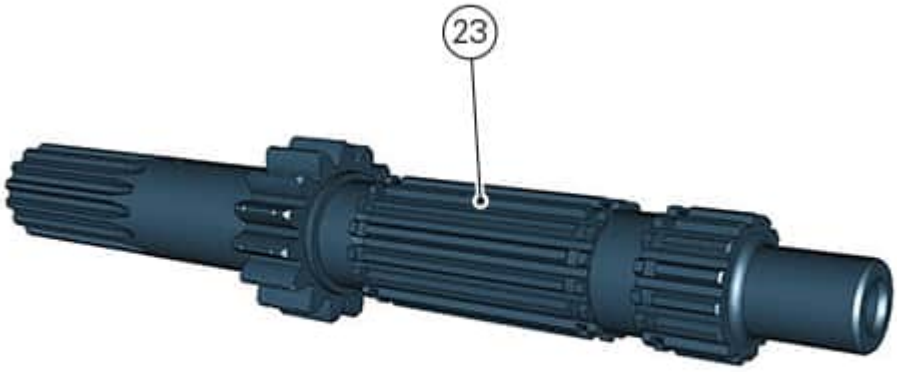


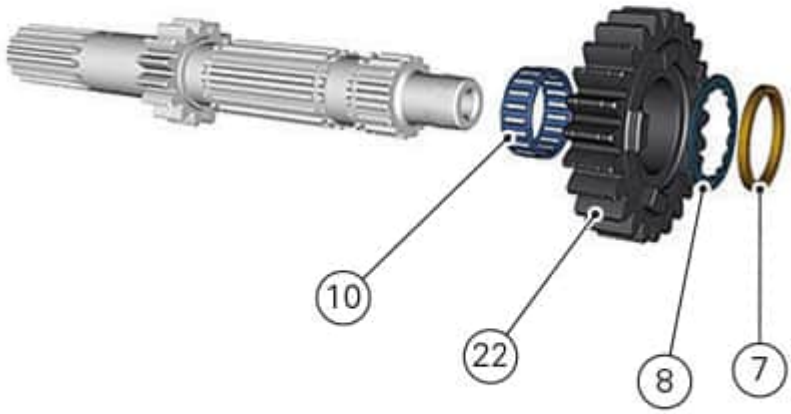
The figure shows all components to be fitted on the secondary shaft (16) with washer (2).



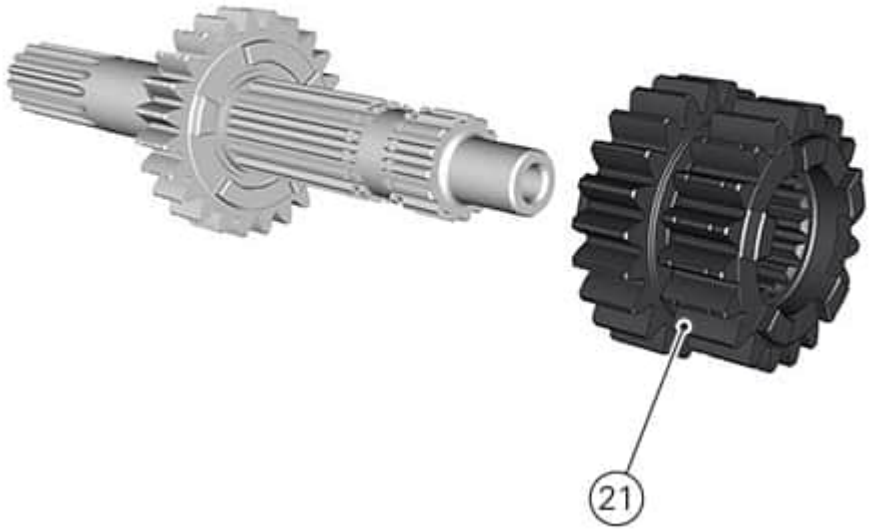
Reassembling the gearbox primary shaft

Fit roller bearing cage (10), fifth speed driving gear (22), splined washer (8) and snap ring (7) on the primary shaft (23).
Upon fitting the snap ring (7), check that it is fully inserted into its grooves on the shaft.
Push the snap ring into position with a suitable size tubular drift.

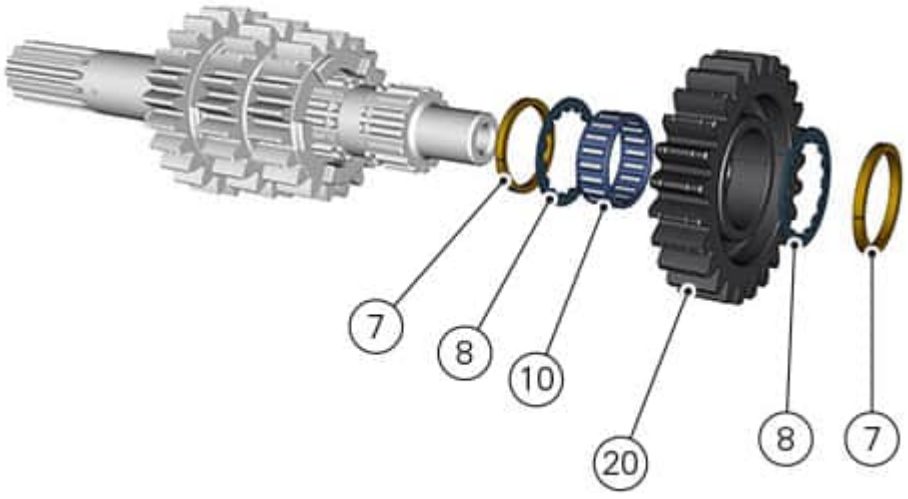




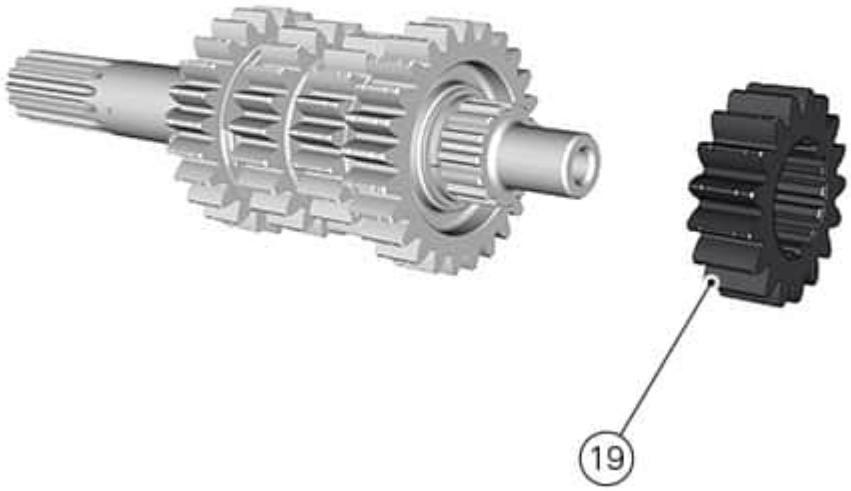
Engage the third and fourth speed driving gear (21).



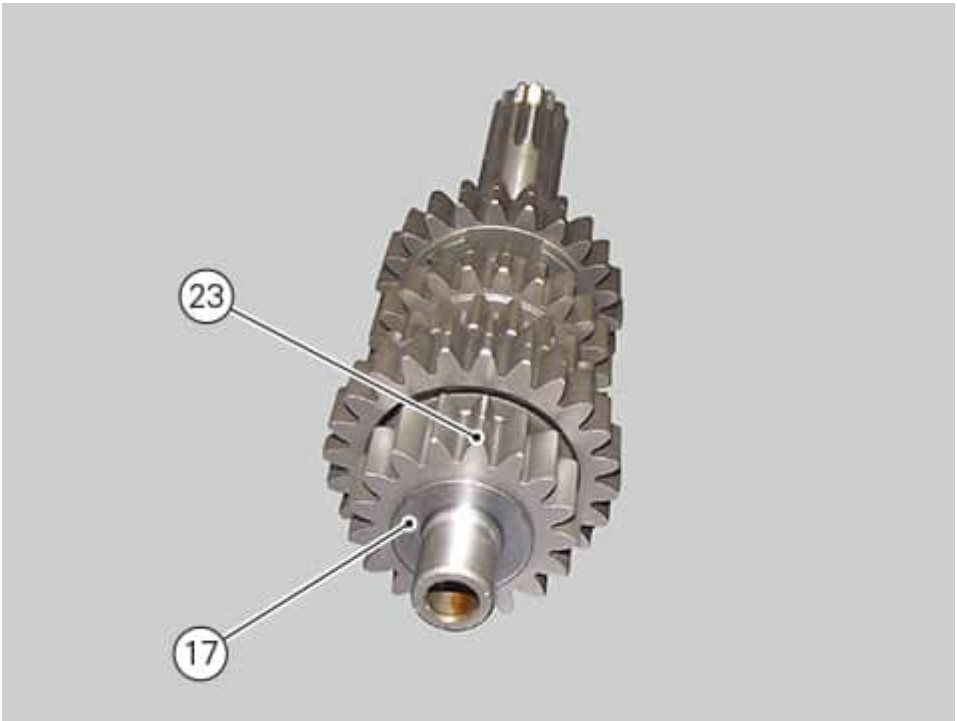
Fit snap ring (7), splined washer (8), roller bearing cage (1) and sixth speed driving gear (20) on the shaft.
Then fit the other splined washer (8) and the snap ring (7).
Upon fitting snap rings (7), check that they are fully inserted into their grooves on the shaft.
Push the snap rings into position with a suitable size tubular drift.



Engage the second speed driving gear (19).

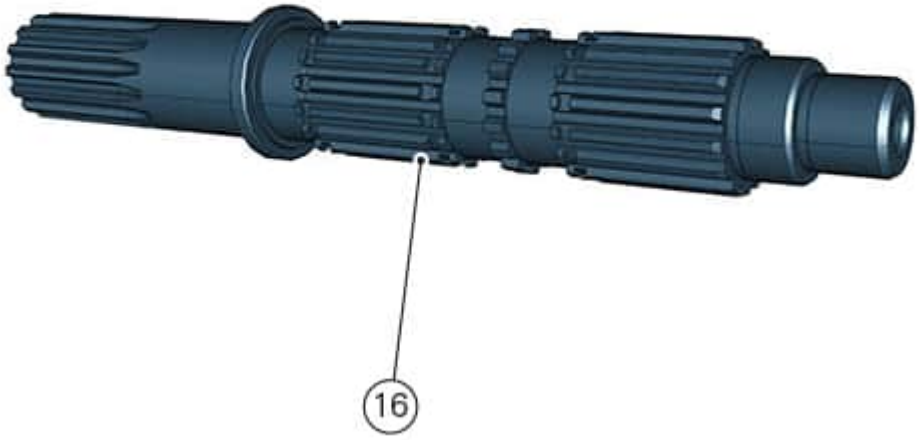


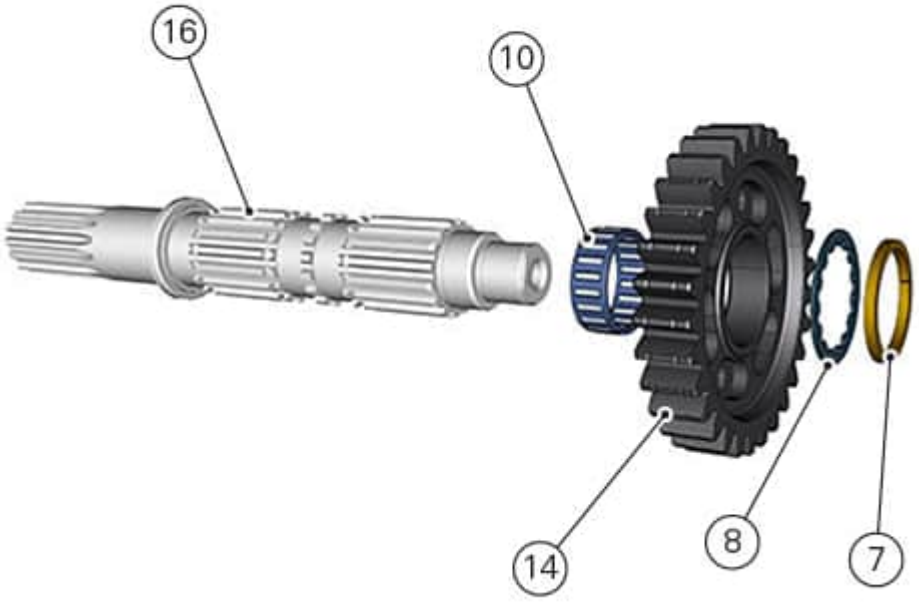
Refit the chain side washer (17) on the primary shaft (23).



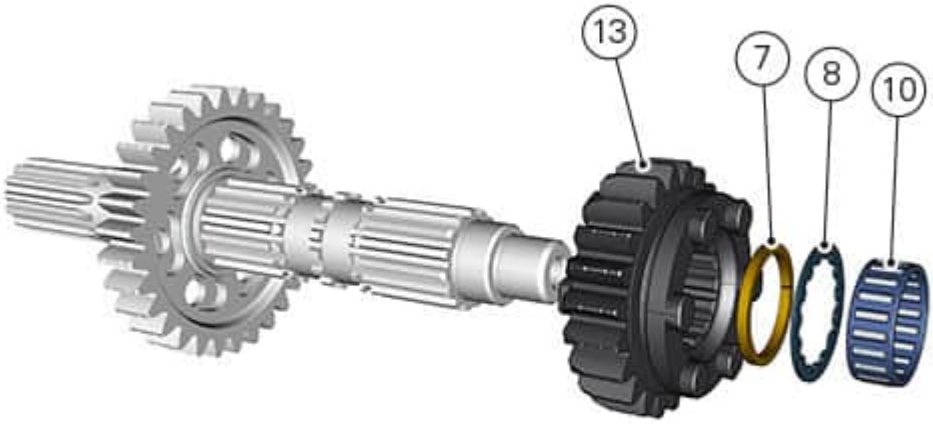
Reassembling the gearbox secondary shaft

Refit roller bearing cage (10), second speed driven gear (14), splined washer (8) and snap ring (7) on the secondary shaft (16).
Upon fitting the snap ring (7), check that it is fully inserted into its grooves on the shaft.
Push the snap ring into position with a suitable size tubular drift.

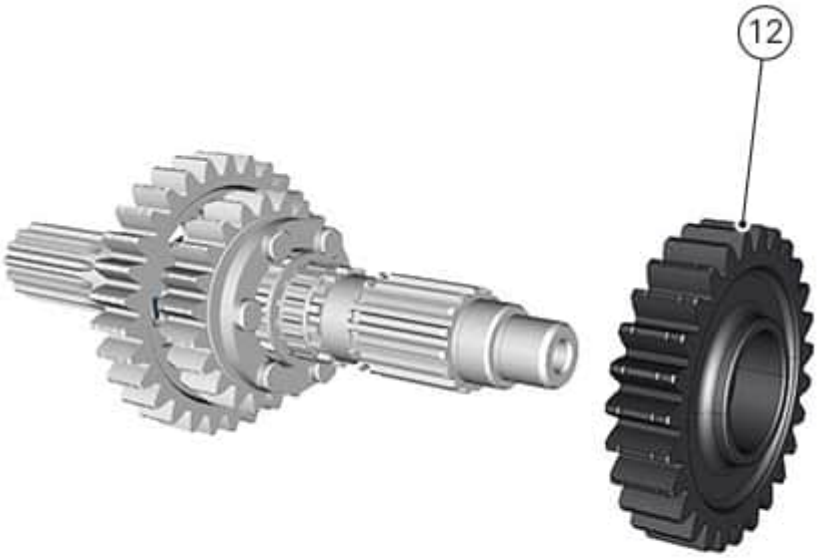




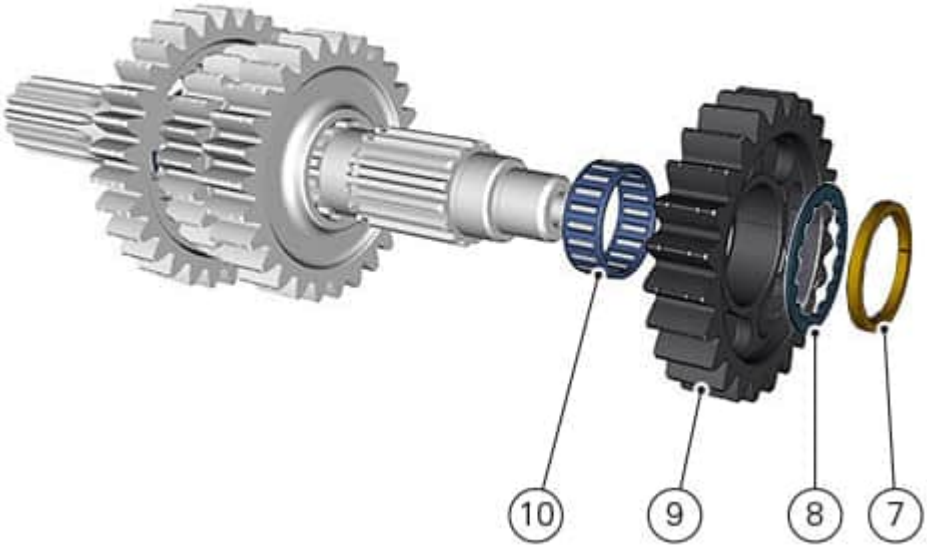
Engage the sixth speed driven gear (13). Fit snap ring (7), splined washer (8) and roller bearing cage (10).
Upon fitting the snap ring (7), check that it is fully inserted into its grooves on the shaft.
Push the snap ring into position with a suitable size tubular drift.



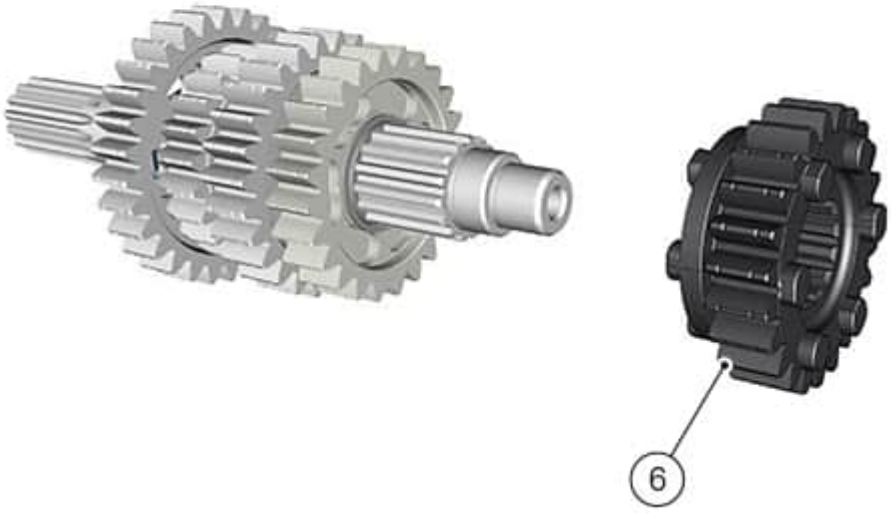
Fit the 3rd speed gear (12).



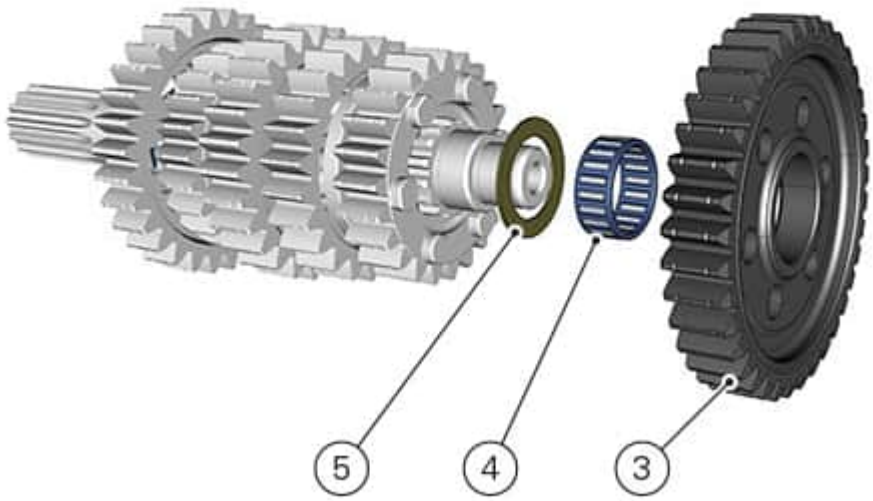
Install the roller bearing (10).
Fit the 4rd speed gear (9).
Fit washer (8) and another snap ring (7) in the shaft.
When installing snap ring (7) make sure it is completely inside the shaft grooves. It is a good rule to use a tubular drift with suitable dimensions to push the ring.



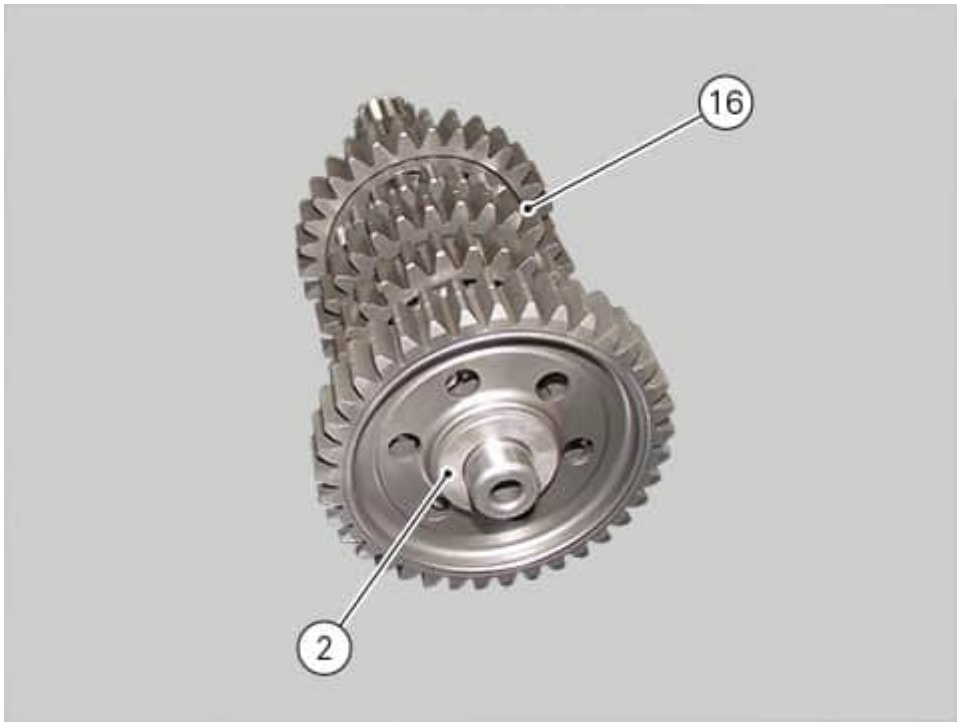
Fit the fifth speed driven gear (6) on the shaft.



Fit washer (5), roller bearing cage (4) and first speed driven gear (3).



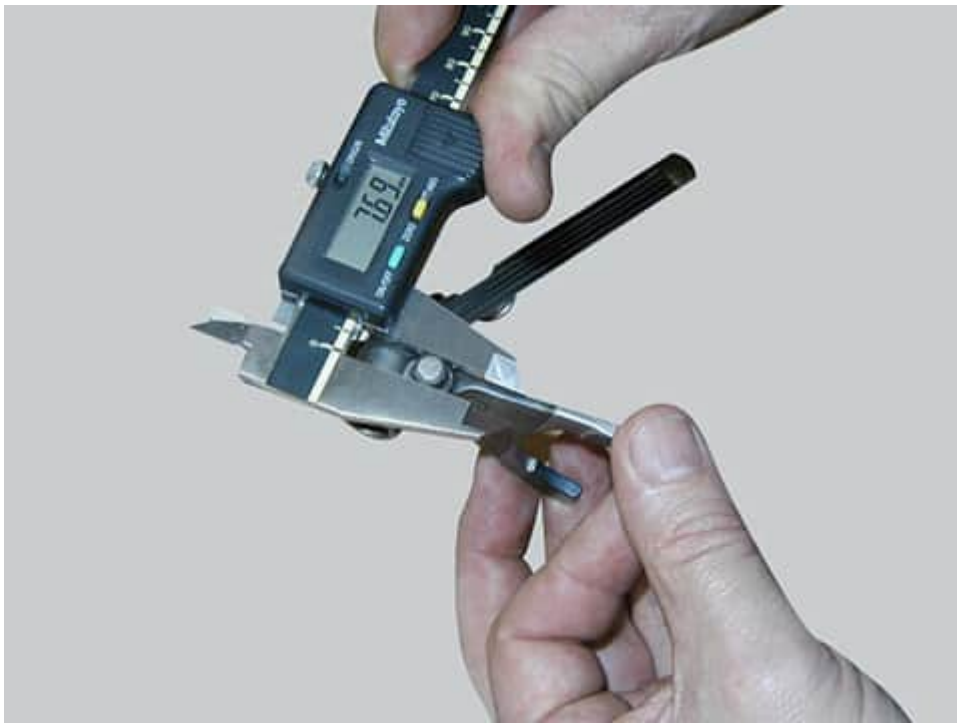
Refit clutch side washer (2) on the secondary shaft (16).



Inspection of the gear selector drum

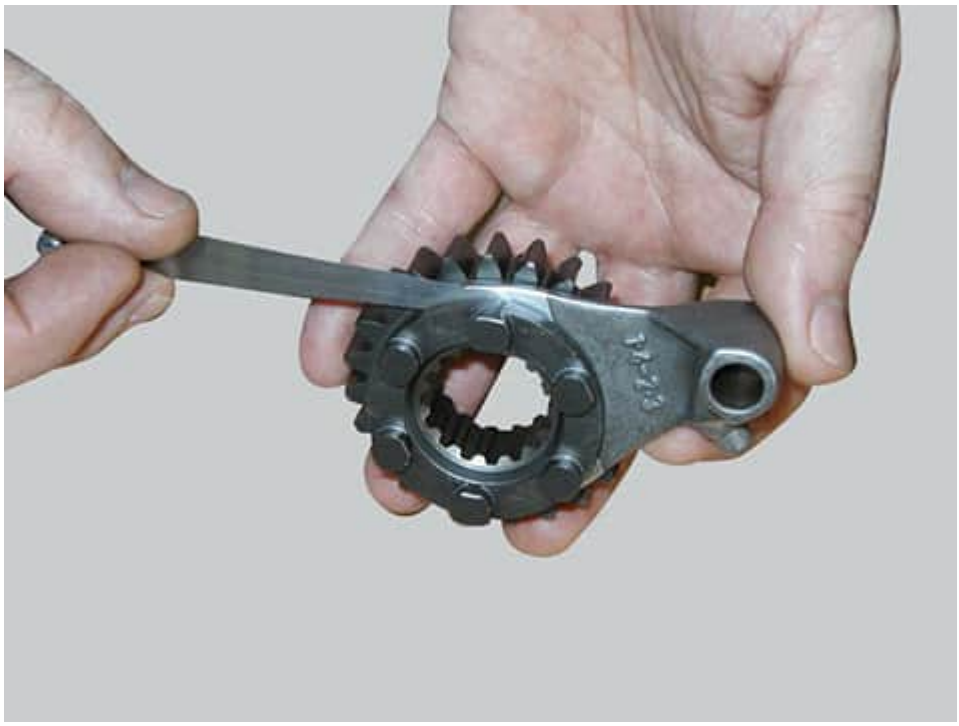
Use a gauge to measure the clearance between fork pin and the slot on the selector drum.
If the service limit is exceeded, determine which part must be replaced by comparing these dimensions with those of new components.
Also check the wear on the drum support pins; these must not show any signs of scoring, burrs, or deformation.
Turn the drum in the crankcase to establish the extent of radial play.
If play is excessive, change whichever part is most worn.

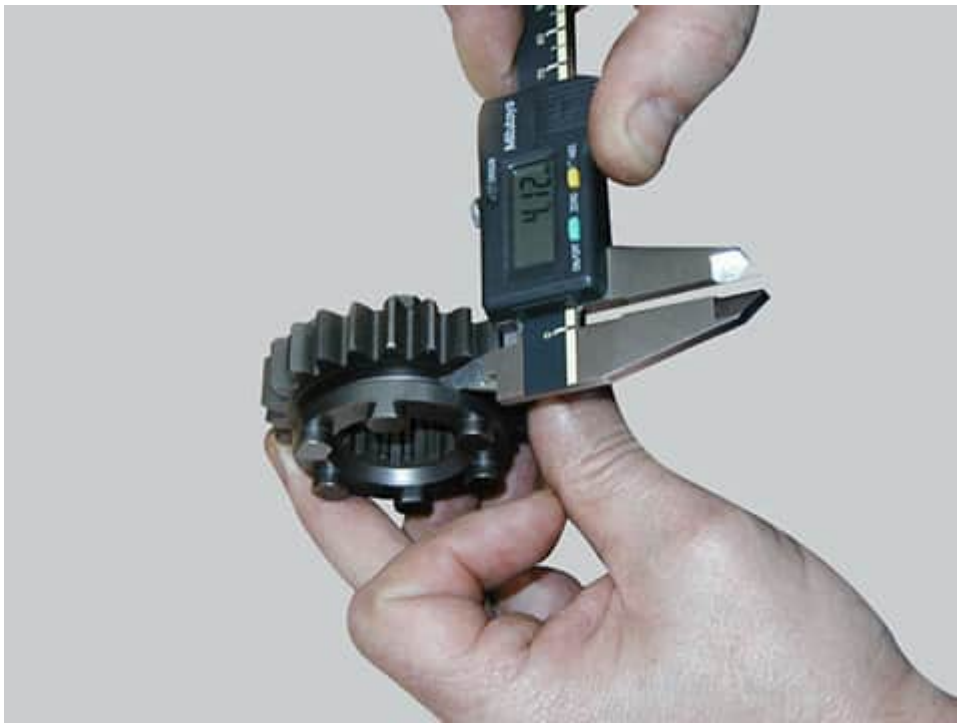




Inspection of the gear selector forks

Visually inspect the gear selector forks. Bent forks must be renewed as they may lead to difficulties in gear changing or may suddenly disengage when under load.
Use a feeler gauge to check the clearance of each fork in its gear groove.
If the service limit has been exceeded, check whether or not it is necessary to replace the gear or the fork by referring to the service limits specified for each part.

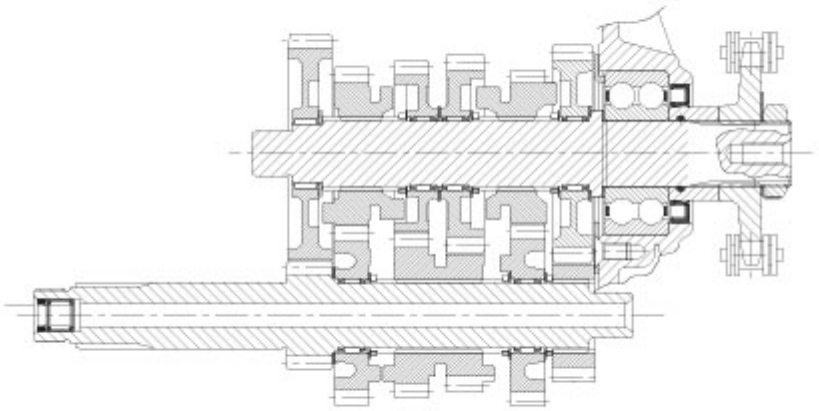





Mitutoyo

Overhaul of the gearbox

Check the condition of the front coupling dogs of the gears. They must be in perfect condition and with no sign of wear on the edges of the teeth.
The idler gears must rotate freely on their shafts.
When refitting, make sure the circlips are correctly positioned.
Check the needle roller bearings for wear.
The threads and splines of the shafts must be in perfect condition.
Also check that the component parts of the gear selector mechanism are in good condition.



Engage the gears and check that the gearchange mechanism does not stick (selector fork - gear groove, and fork pin - desmodromic drum groove) due to incorrect end float.
Restore the correct endfloat by shimming the gearbox shafts and the selector drum with suitable shims.

Disassembling the gearbox shafts

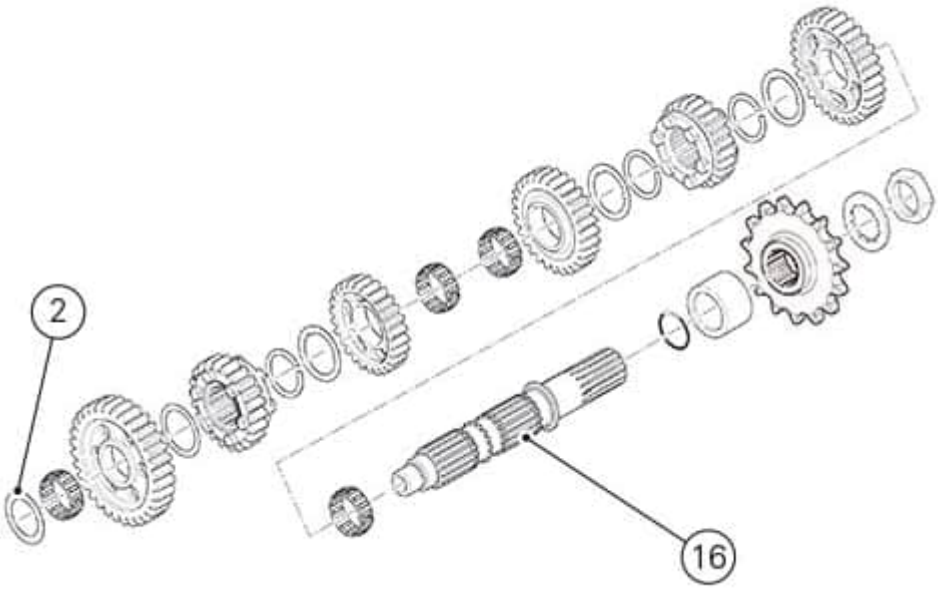
Place the shaft in a vice in such a way to facilitate the disassembly operations.

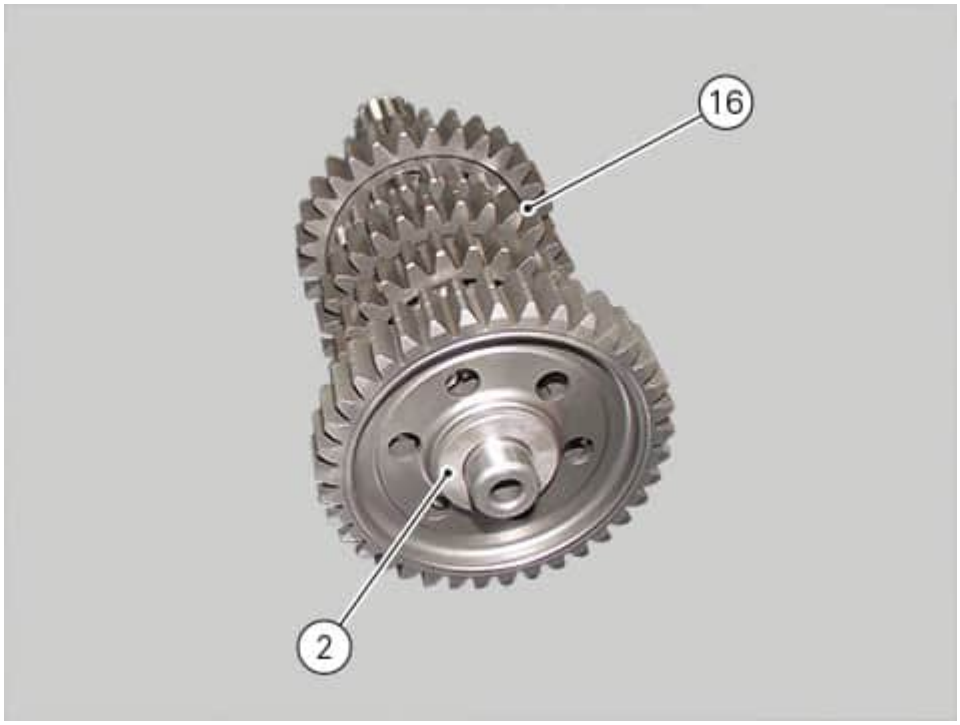
Important

Take care not to invert the shim position upon reassembly: this would potentially lead to jamming when using the gear selector control, making it necessary to reopen the crankcase.

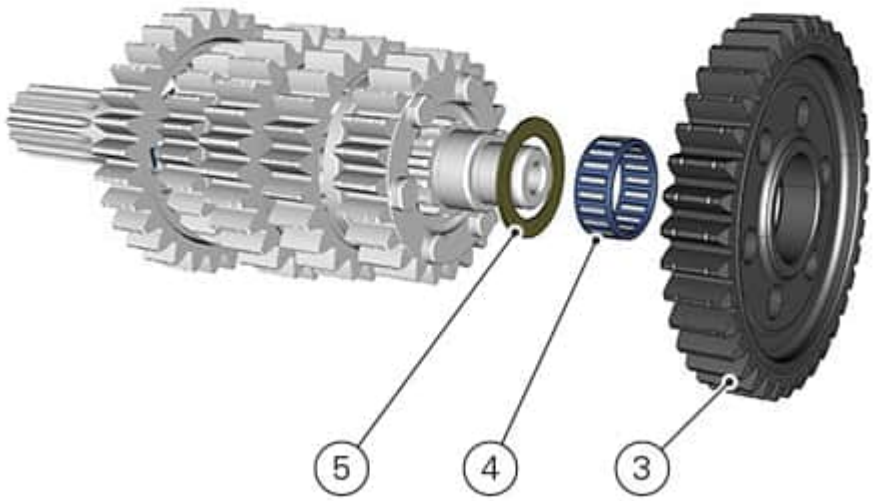
Disassembling the gearbox secondary shaft

Remove clutch side washer (2) from the secondary shaft (16).

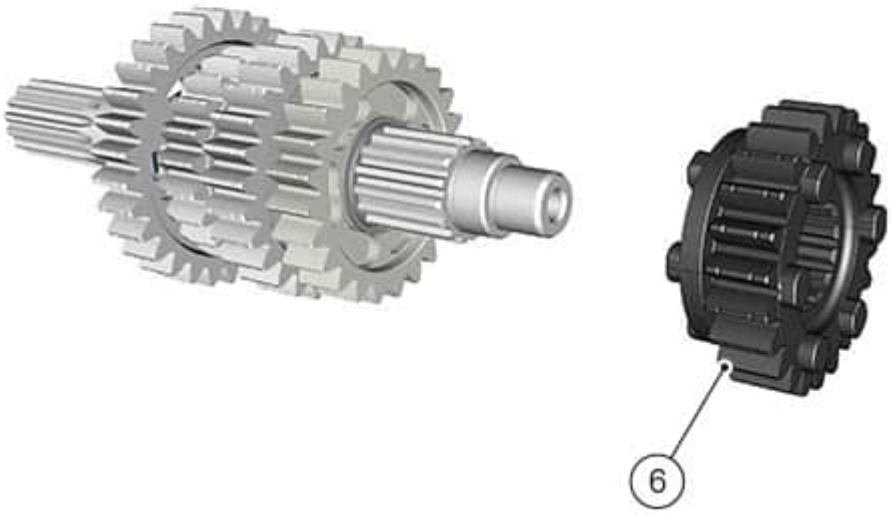




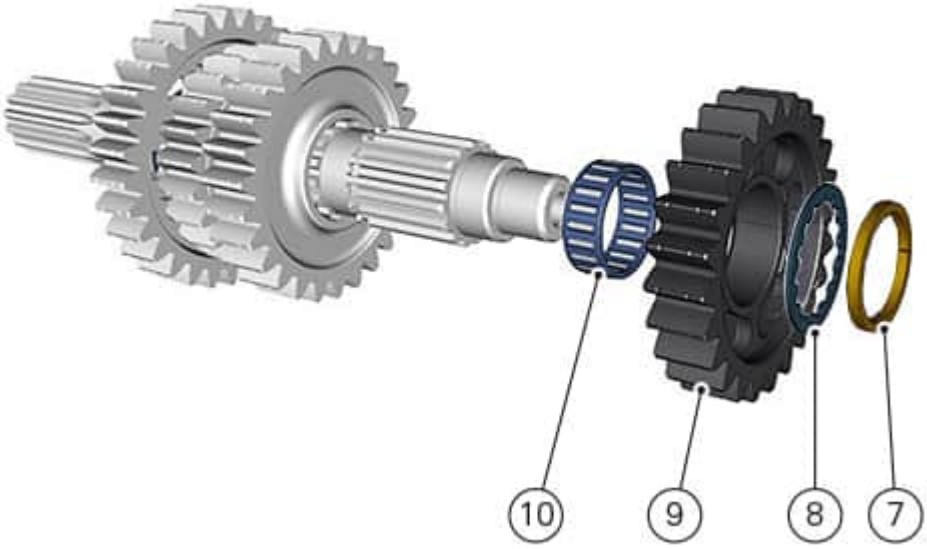
Withdraw the first speed driven gear (3) with the roller cage (4) and the shim (5).



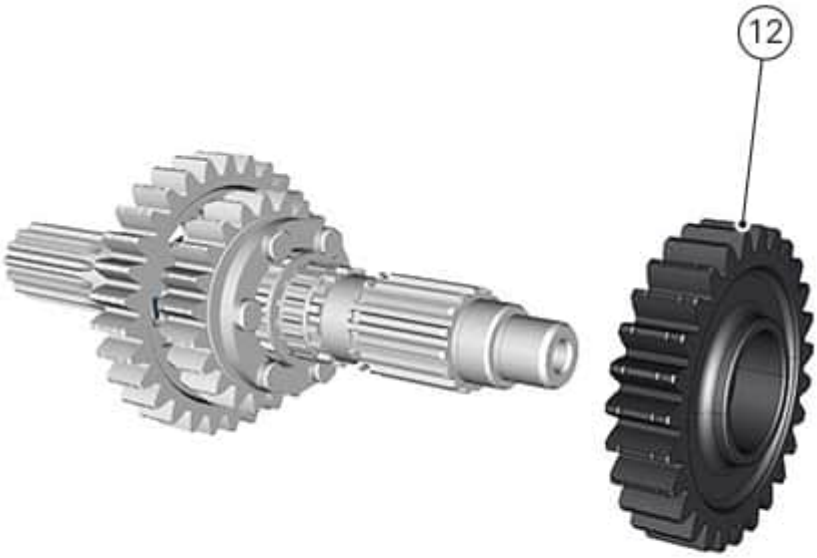
Remove the fifth speed driven gear (6).



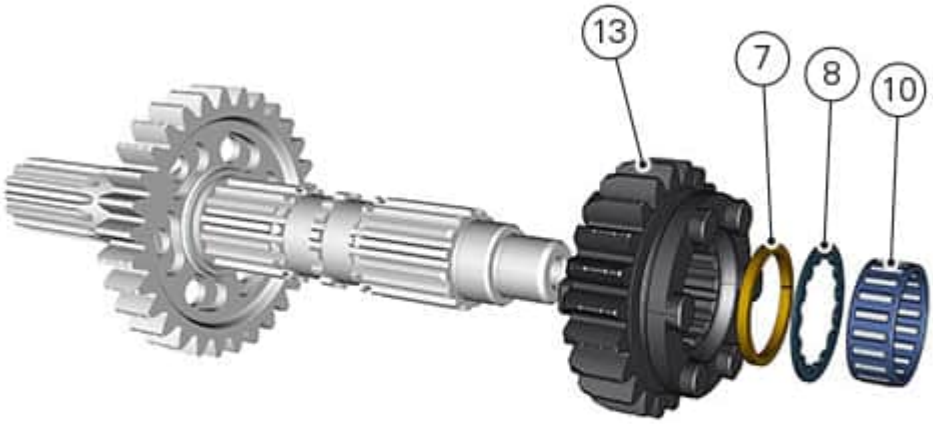
Slide off the splined washer (8).
Use two flat blade screwdrivers to remove the snap ring (7) from its seat, taking care not to damage the shaft surface.
Remove the fourth speed driven gear (9) with its roller bearing cage (10).



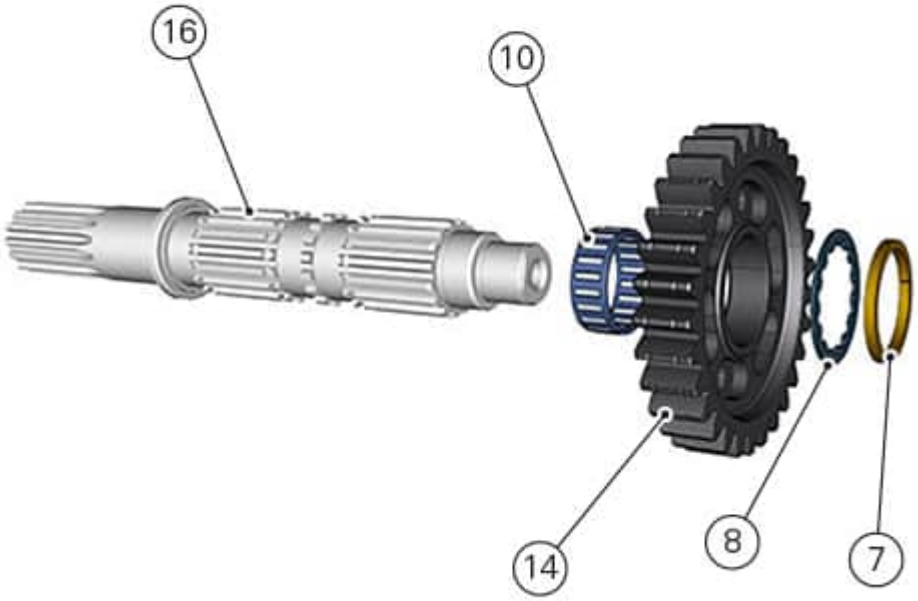
Remove the third speed driven gear (12).

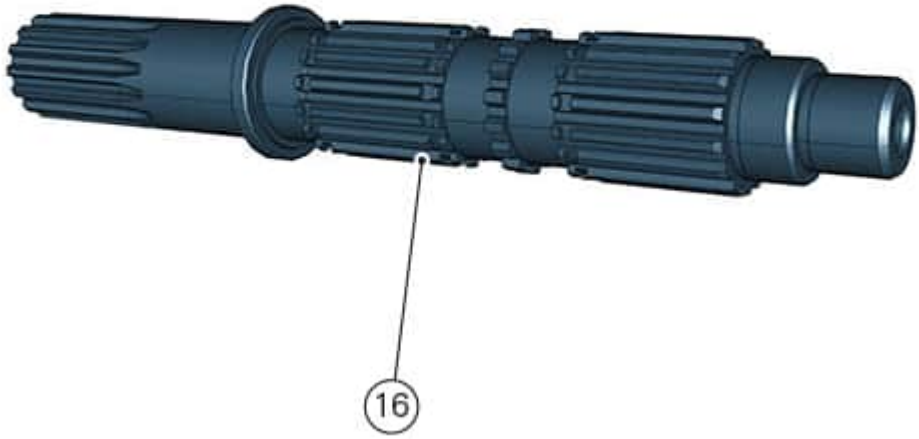


Remove the roller bearing cage (10), the splined washer (8) and the snap ring (7). Remove the sixth speed driven gear (13).



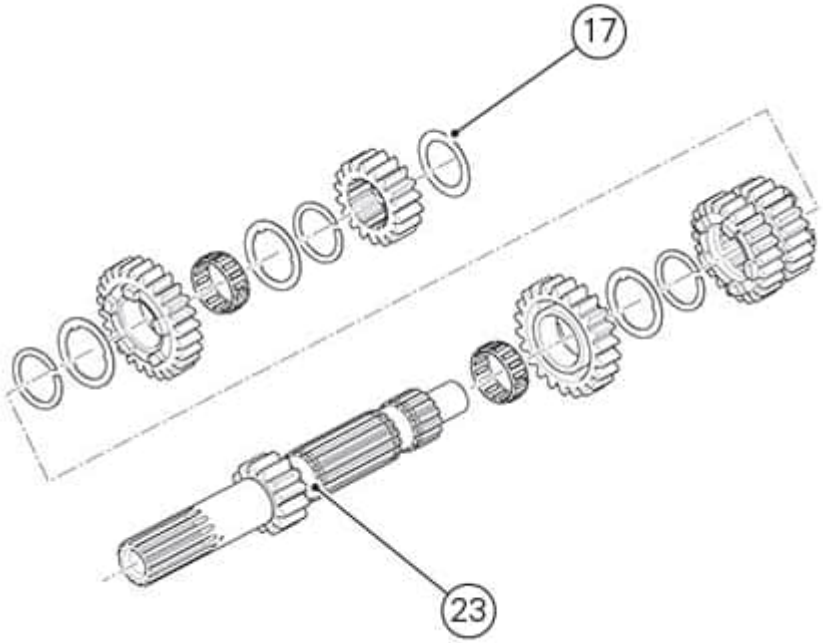
Remove the snap ring (7) and withdraw the splined washer (8) and the second speed driven gear (14). Withdraw the roller bearing cage (10). All the components have thus been removed from gearbox secondary shaft (16).

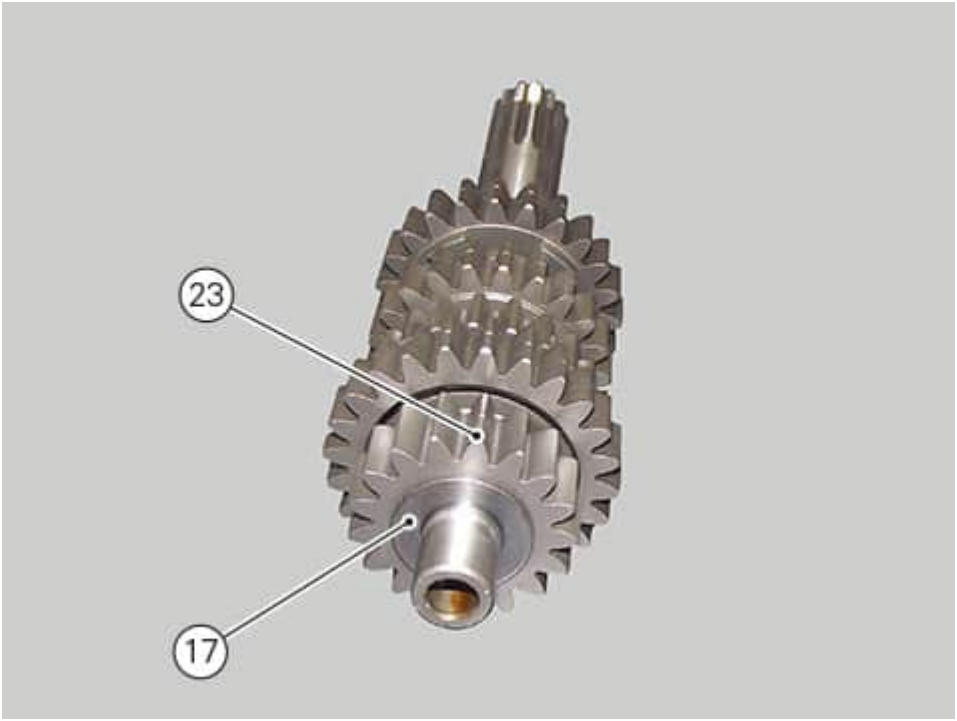




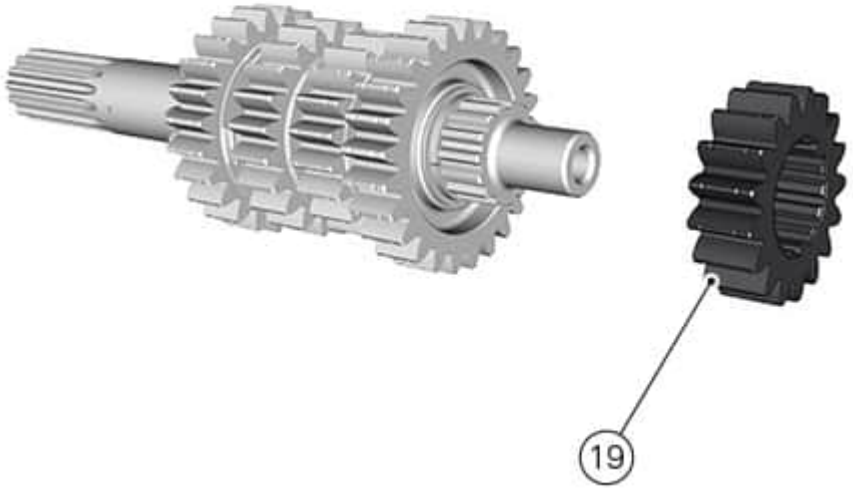
Disassembling the gearbox primary shaft

Remove chain side washer (17) from the primary shaft (23).





Remove the second speed driving gear (19).

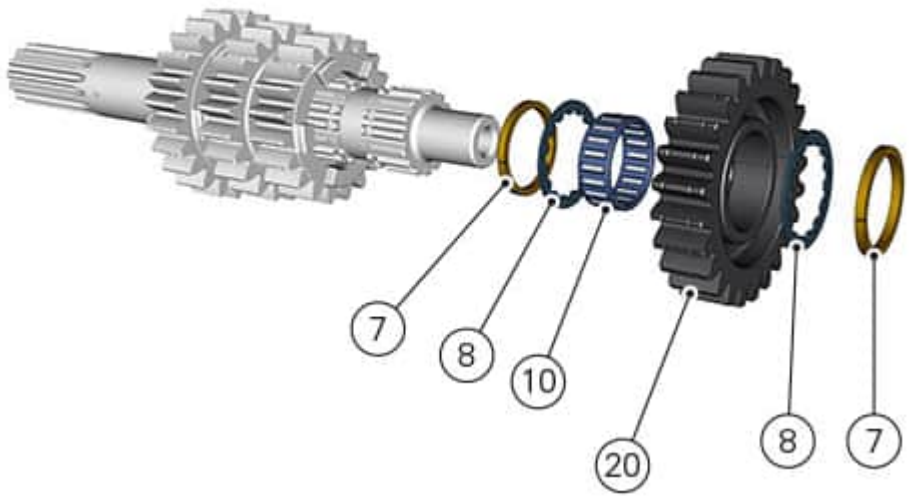


Use two screwdrivers to prise out the snap ring (7) and the splined washer (8).

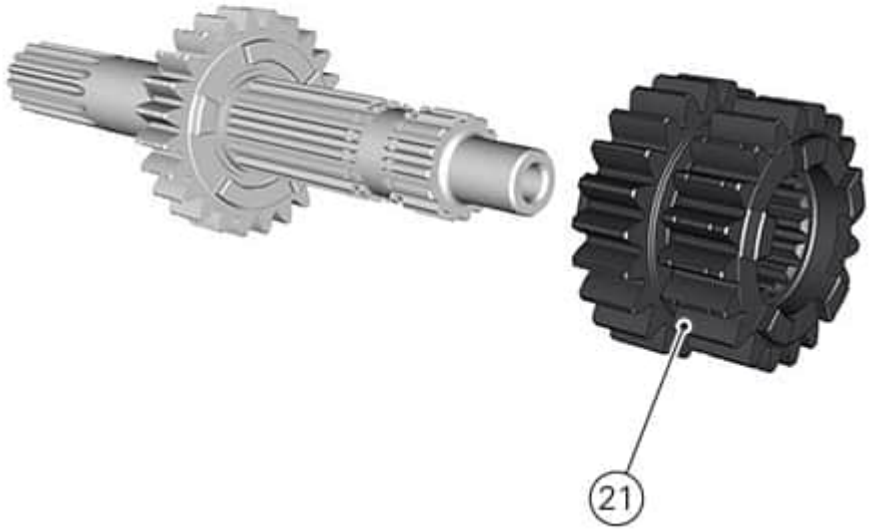
Important

Take care to avoid damaging the surface of the shaft while removing the snap ring.

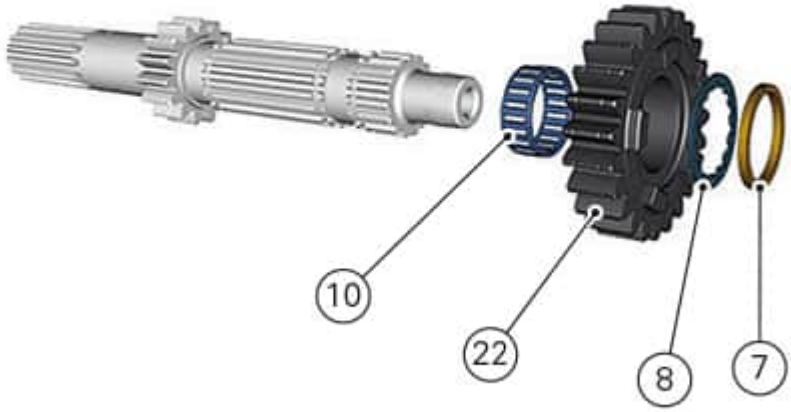
Remove the sixth speed driving gear (20) with its roller cage (10).
Then remove the splined washer (8) and the snap ring (7).

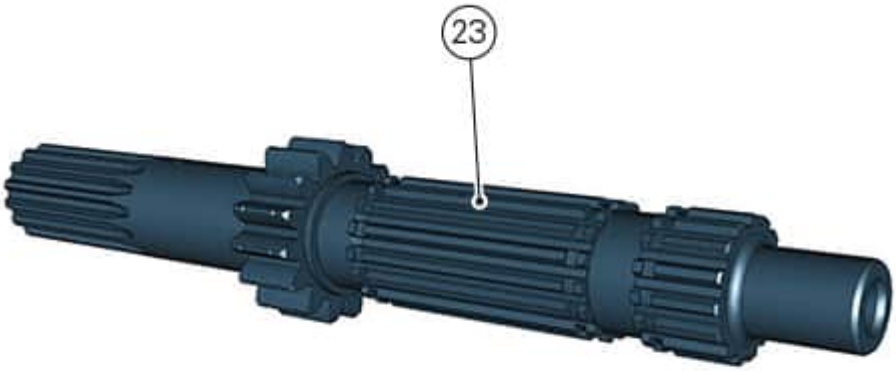


Withdraw the third and fourth speed driving gear (21).



Remove the snap ring (7) and the splined washer (8).
Slide out the fifth speed driving gear (22) with the relevant roller bearing cage (10) from the primary shaft (23).

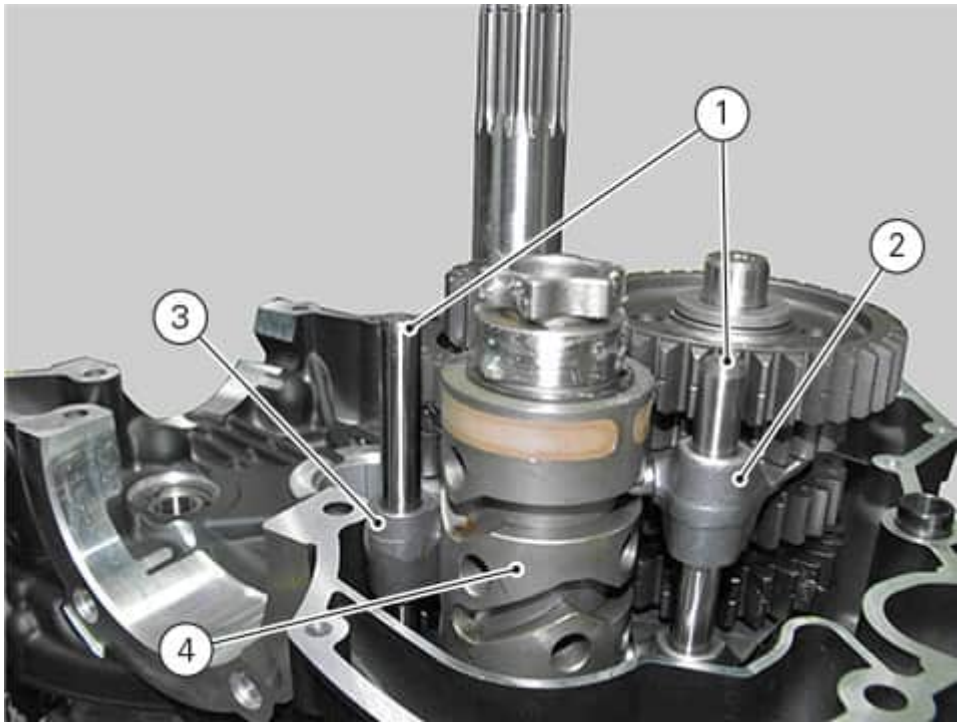

10
22
8
7


23

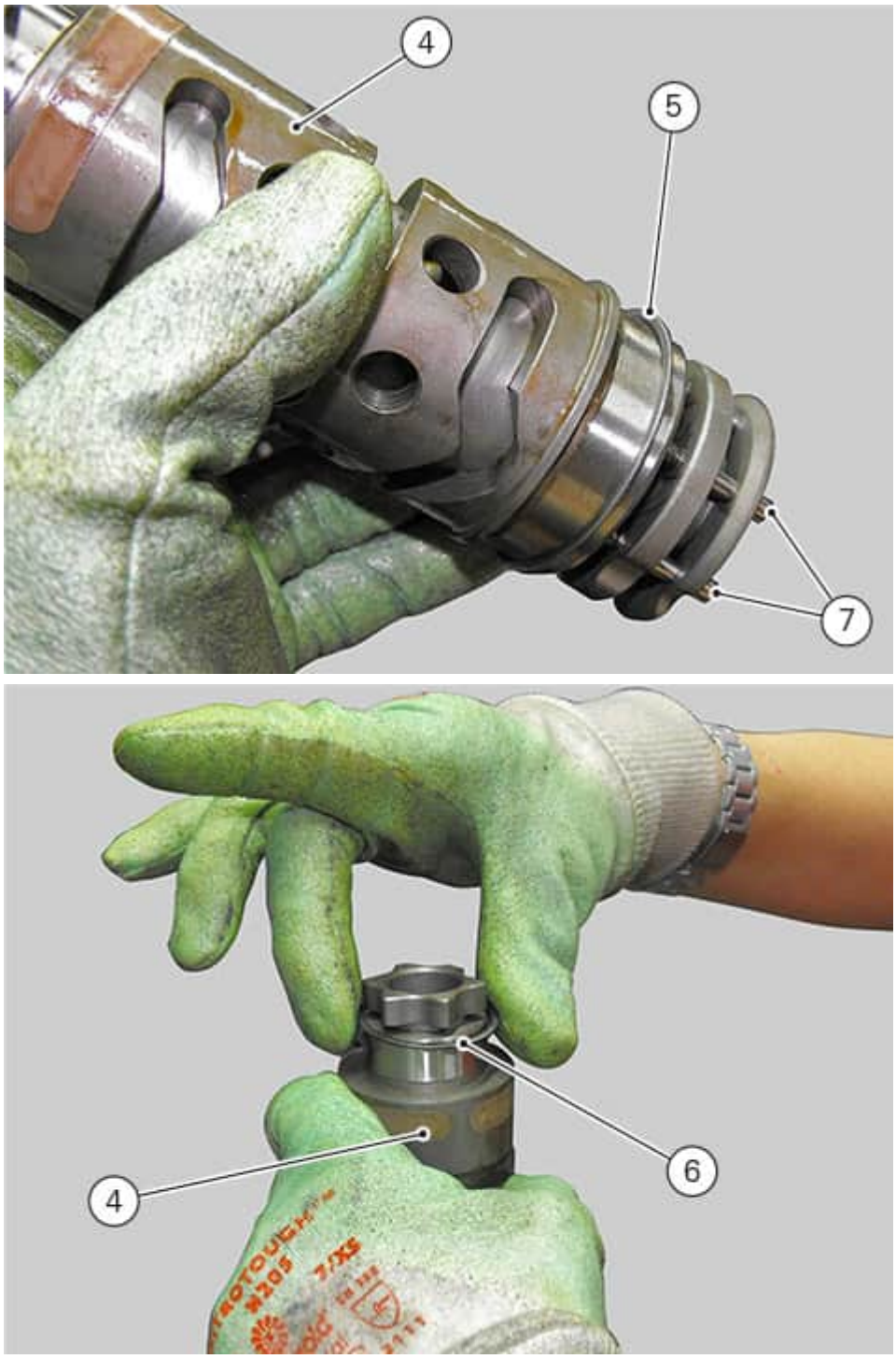
Removing the gearbox assembly

Remove the engine from the frame (Removing the engine).
Remove the external belt covers (Removing the timing belt external covers).
Remove the camshaft assembly (Removing the camshafts).
Remove the complete cylinder head assembly (Removing the cylinder heads).
Remove the complete cylinder/piston assembly (Removing the cylinder/piston assembly).
Remove the generator side cover (Removing the generator cover) and the complete generator (Removing the flywheel/generator assembly).
Remove the oil pump (Removing the oil pump).
Remove the starter motor (Removing the starter motor).
Remove the clutch cover (Removing the clutch cover).
Remove the clutch unit (Removing the clutch).
Remove the primary drive gear (Removing the primary drive gear).
Separate the crankcase halves (Separating the crankcase halves).

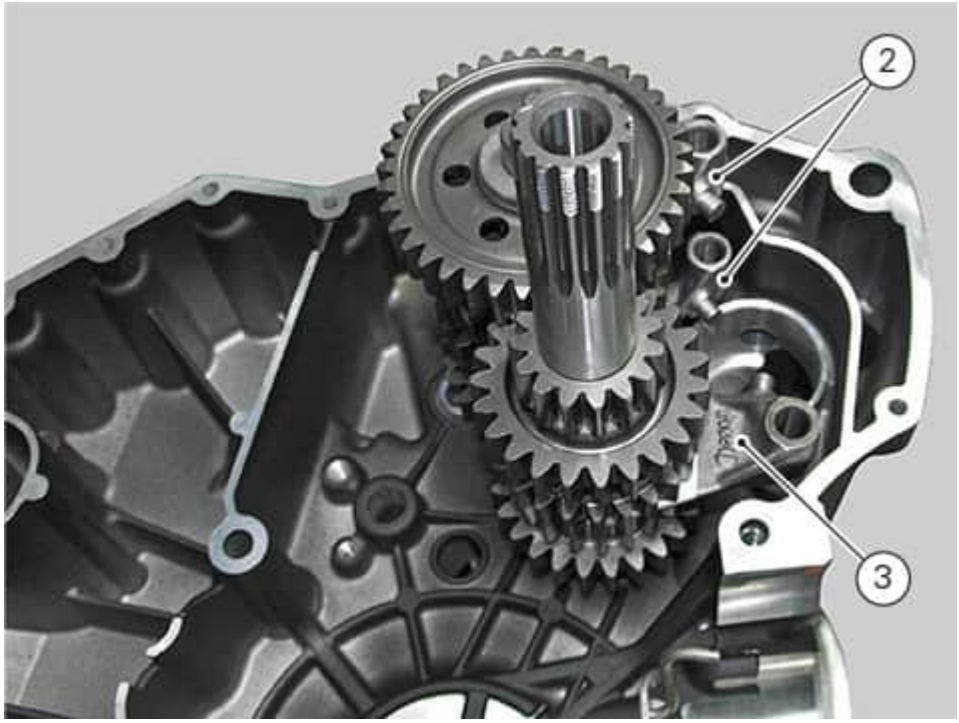
Withdraw the selector fork shafts (1).
Move the forks (2) and (3) to disengage them from the slots in the gear selector drum (4).



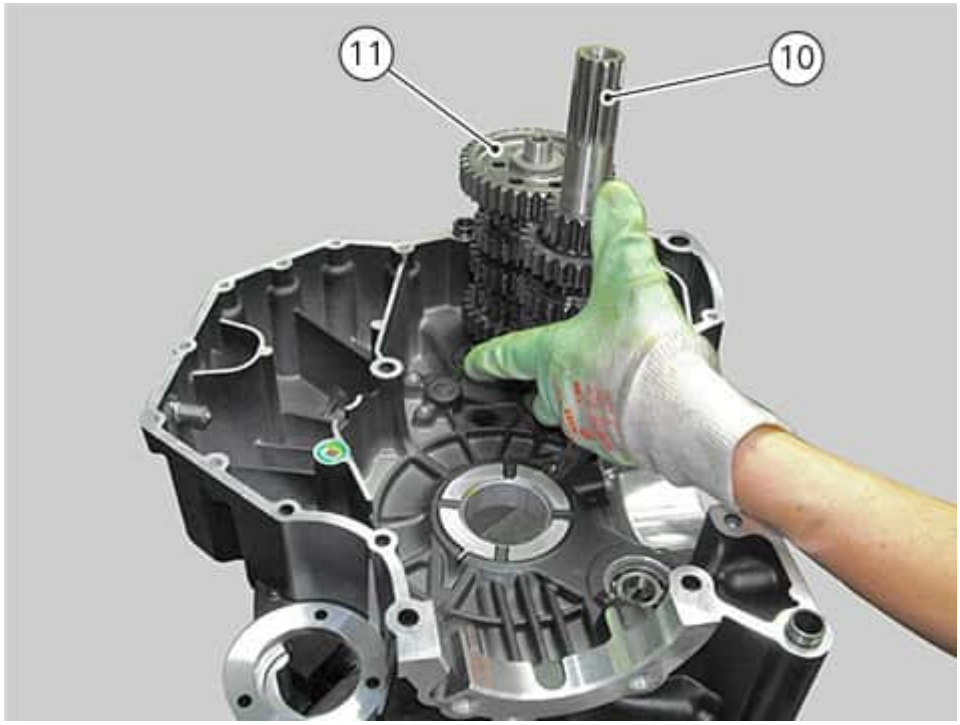
Remove the gear selector drum (4) taking care not to invert the fitted shims (5) and (6).
Once removed, it is possible to replace the special rollers (7).

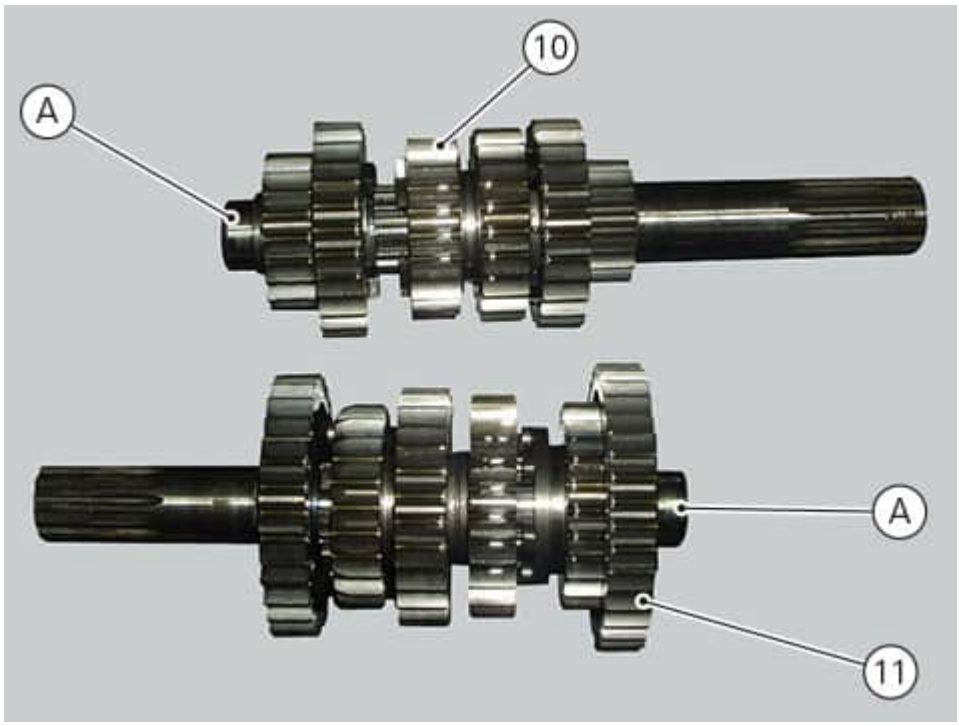


Remove gear selector forks (2) and (3).



Remove the gearbox primary (10) and secondary (11) shafts complete with gears, taking care to recover the shim washers on the ends of the shafts.
If the bearing inner rings (A) are left on the shafts, slide them off the ends of the gearbox primary (10) and secondary (11) shafts (Separating the crankcase halves).



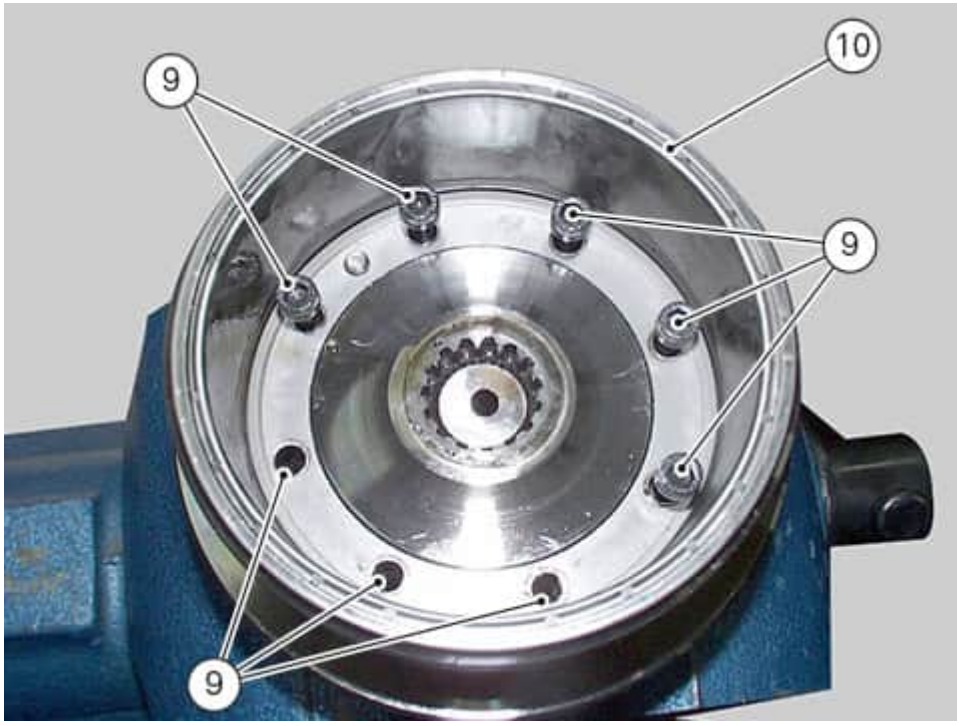

10
A
A
11

Overhaul of the flywheel/generator assembly

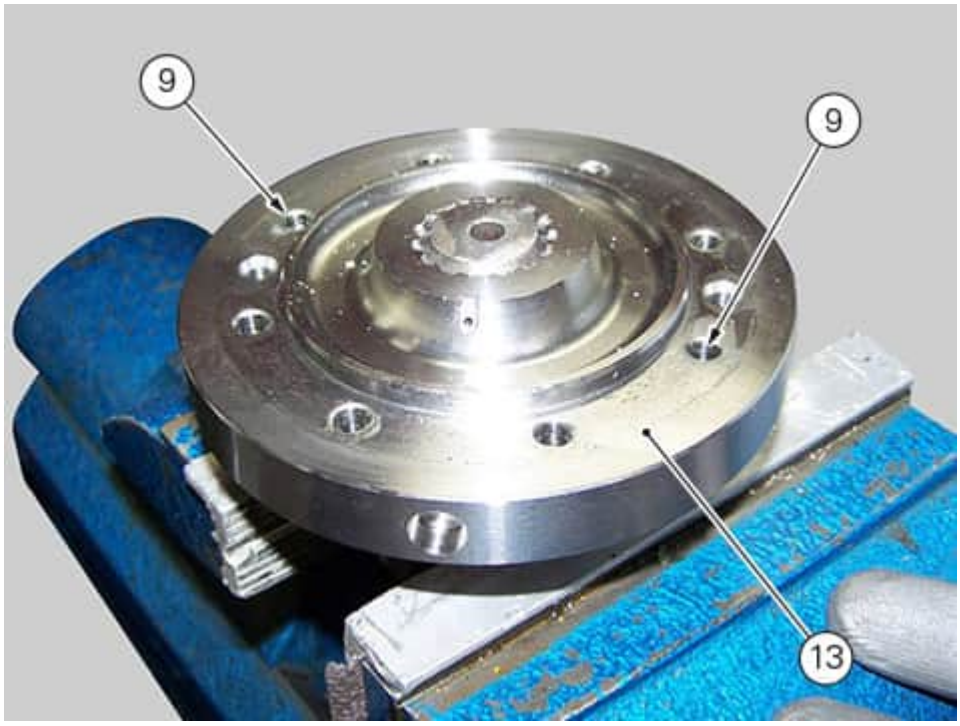
Examine the inner part of generator rotor (8) for signs of damage.
Check that the starter clutch is working properly and that the roller races do not show signs of wear or damage of any kind.
Disassemble the unit if you find faulty operation.

Disassembly of the flywheel-alternator assembly.

Unscrew the eight screws (9) and remove the alternator rotor (10) from the flywheel.



Insert two of the screws (9) just removed from the flywheel rotor-side in their holes in order to remove the flange (11) and the starter clutch (12) from the flywheel (13).
The starter clutch is a slight interference fit on the flange.
Use a suitable drift to remove it.



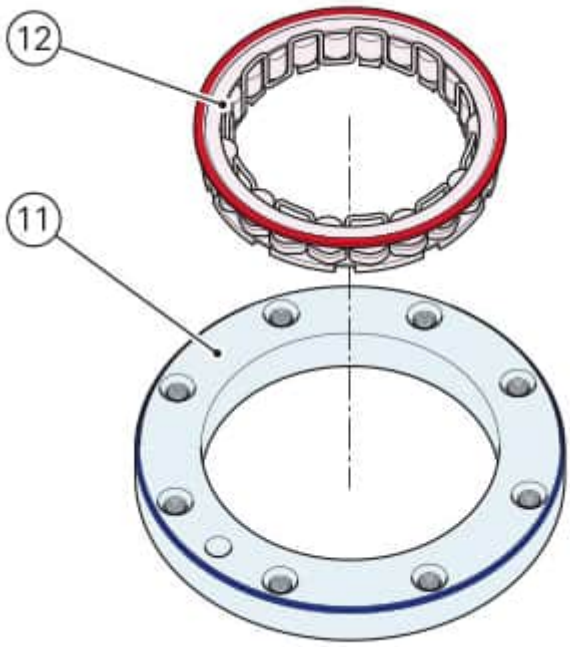


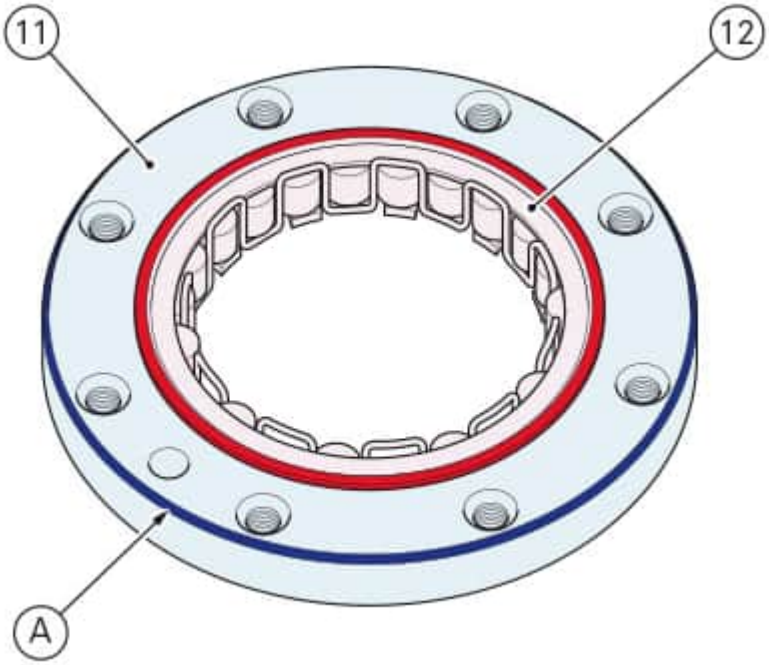
Reassembly of the flywheel-alternator assembly

Install the starter clutch (12) in the flange (11) and take it fully home.

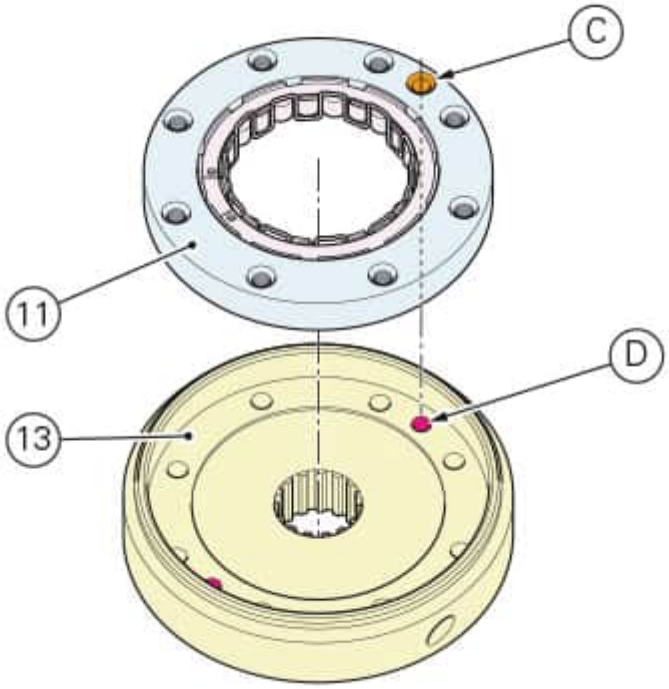
Important

Aim flange so that the side with the chamfered edge is facing the starter clutch.



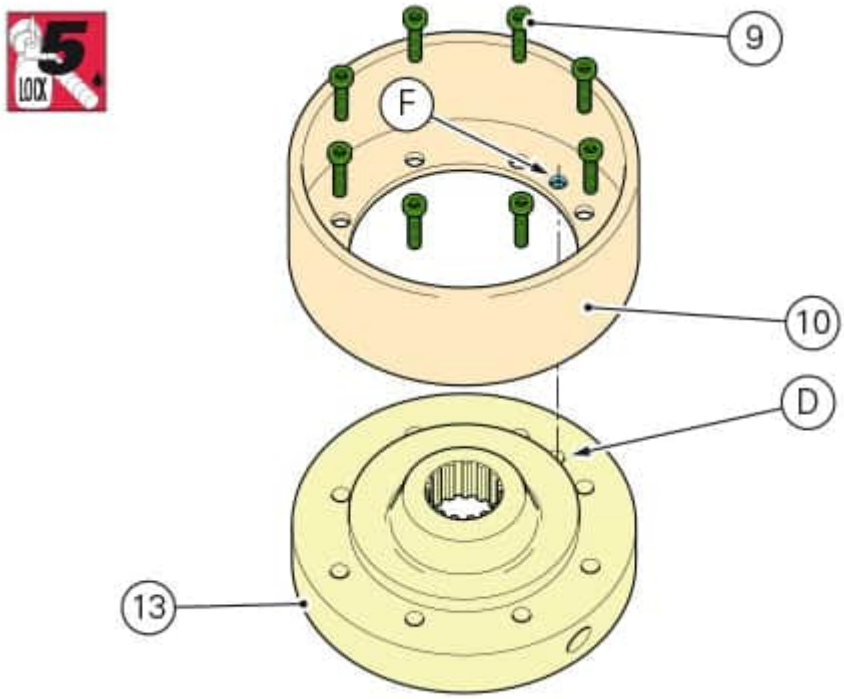


Seat the flange (11) with the starter clutch inside the flywheel (13), aligning flange centring hole (C) with flywheel centring hole (D).
Insert a pin or a wrench inside the hole (E) on the rotor flywheel in order to line up flywheel holes with flange threading.
This is a useful tip, as the holes cannot be aligned after having fitted the flange to the flywheel due to the interference fit.
Orient the flange with the round edge side facing the flywheel.

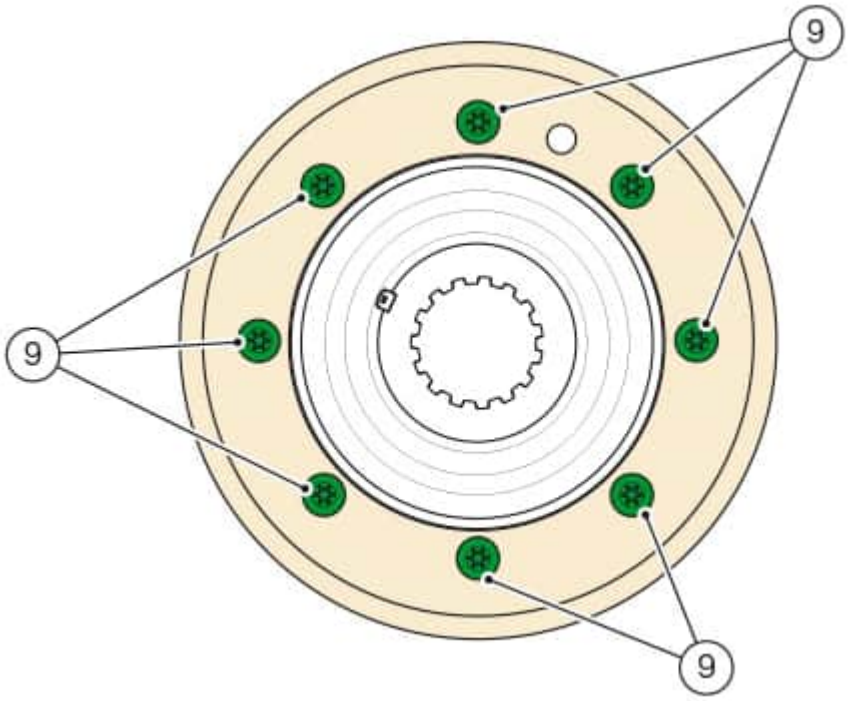




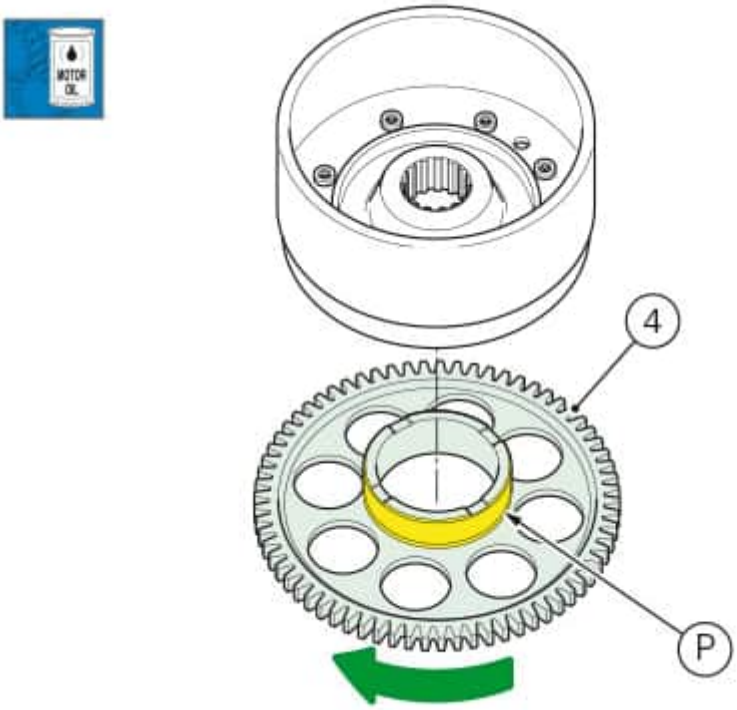
Install the rotor (10) on the flywheel (13), aligning the flywheel centring hole (D) with the rotor centring hole (F). If screws are not new, smear some threadlocker on the rotor/flywheel retaining screws (9) and start them in their holes.



Tighten screws (9) to a torque of 13 Nm (Min. 11 Nm - Max. 15 Nm).



Lubricate the race (P) of the driven gear (4) with engine oil.

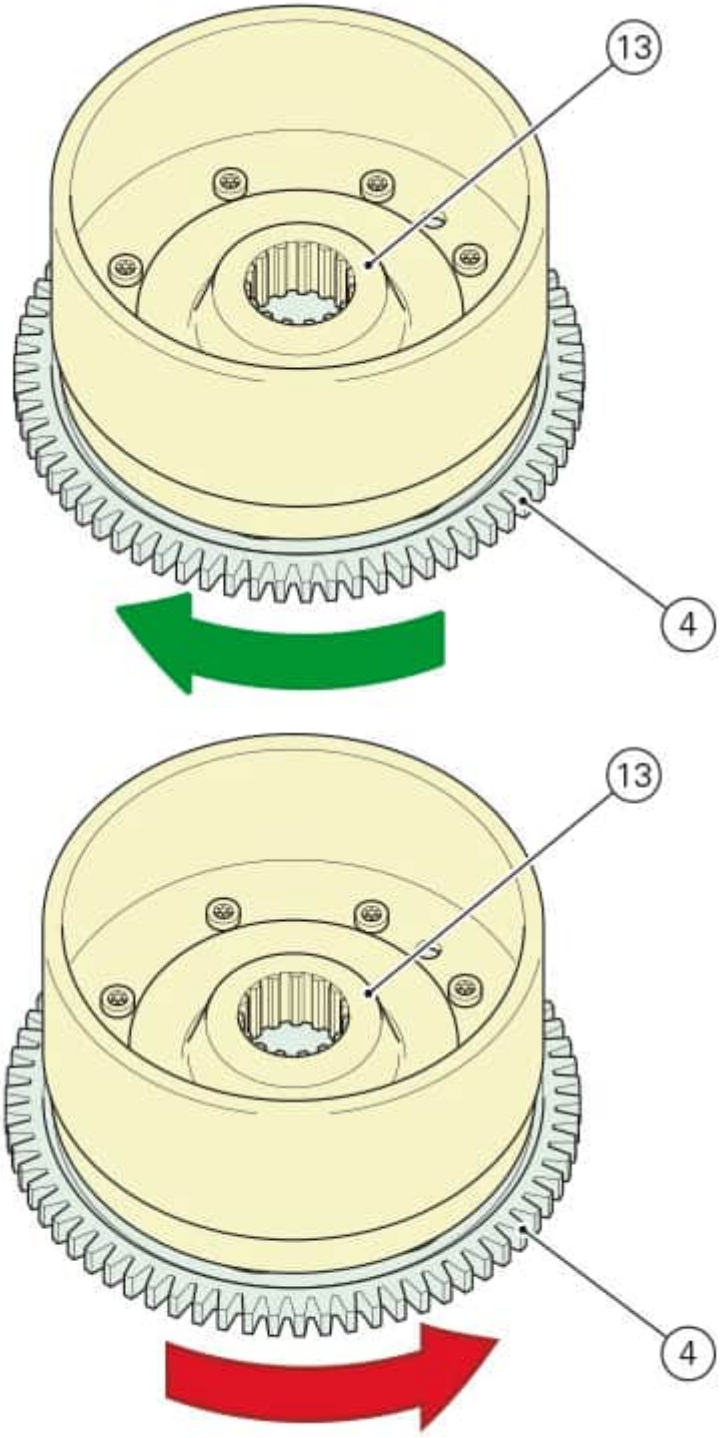


Install the driven gear (4) on the starter clutch (13), ensuring it is properly seated.

Note

To help insertion, turn the driven gear in the direction indicated by the "green" arrow.

Check that the driven gear can rotate freely in the direction of the green arrow but not in the direction of the red arrow.
If either of these two conditions is not met, this means that the starter clutch has not been installed correctly.

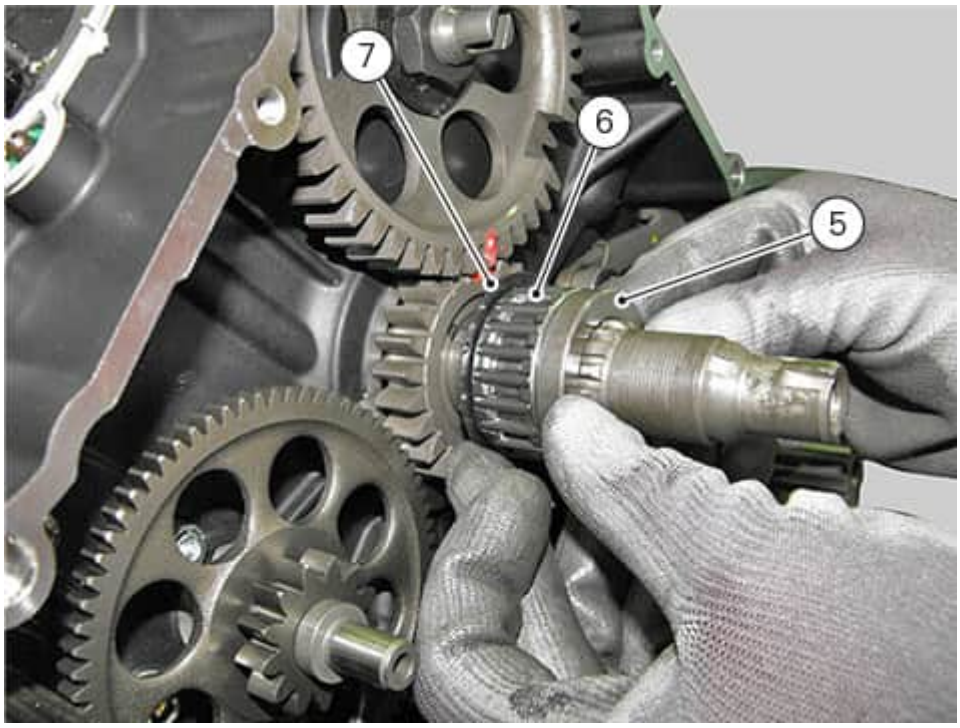

13
4
13
4

Fitting the flywheel/generator assembly

Fit the roller cage unit (6) with washer (7) and internal race (5), applying prescribed grease on the washer (7).



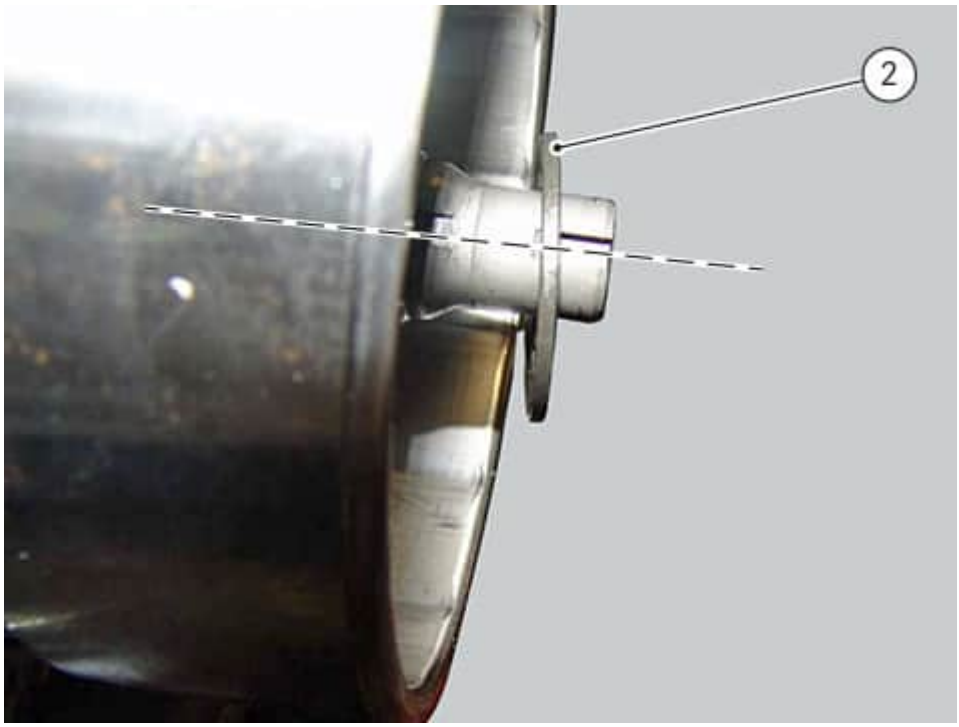
Install the roller bearing cage (6), washer (7) and inner race (5) assembly on the crankshaft.



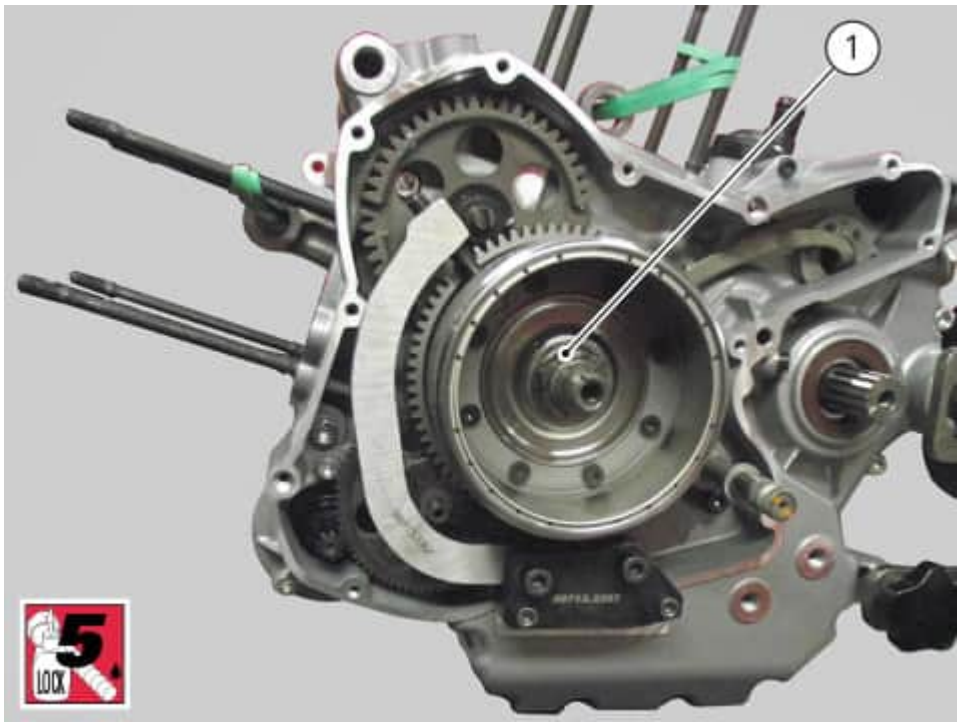
Install the flywheel assembly (3) with the gear (4), aligning the notches as shown in the photo.



Fit the washer (2) on the end of the crankshaft.



Apply the recommended threadlocker to the thread of the crankshaft and the nut (1).
Start the nut (1).
Lock the flywheel rotation with the special tool no. **88713.3367** and tighten the nut (1) to a torque of 330 Nm (Min. 313 Nm - Max. 346 Nm).



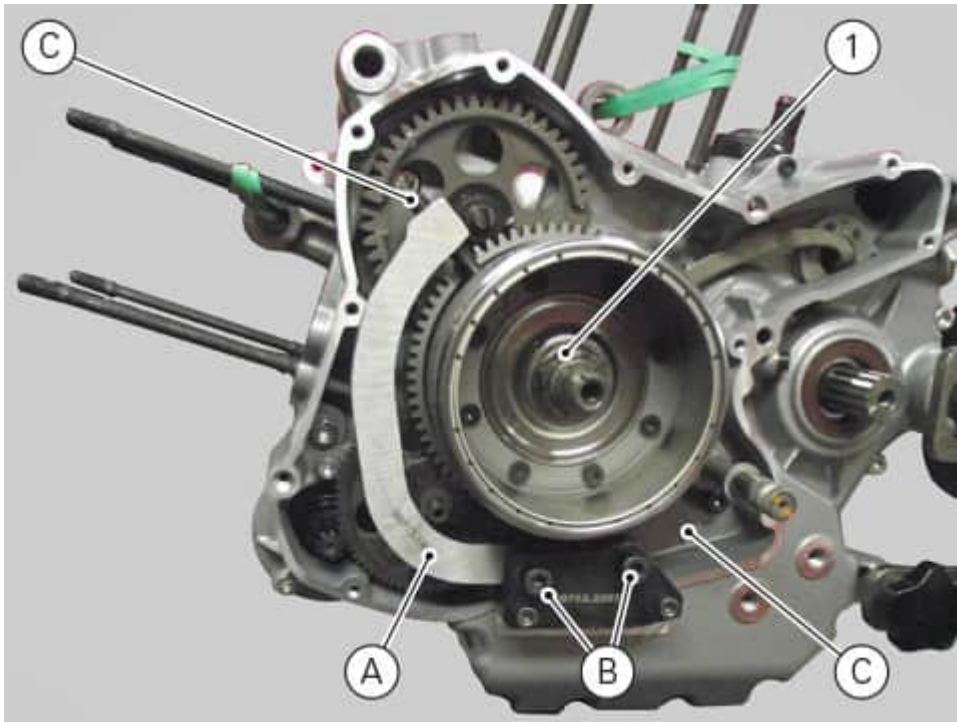
Refit the generator cover (Fitting the generator cover).
Refit the cooling system hose (Refitting cooling system hoses and unions).
Refit the pump-cylinder hoses (Refitting the cylinder/piston assembly).
Fill with engine oil (Changing the engine oil and filter cartridge).
Refill the cooling system (Changing the coolant).
Refit the tank (Refitting the fuel tank).
Refit the seat (Refitting the seat).

Removing the flywheel/generator assembly

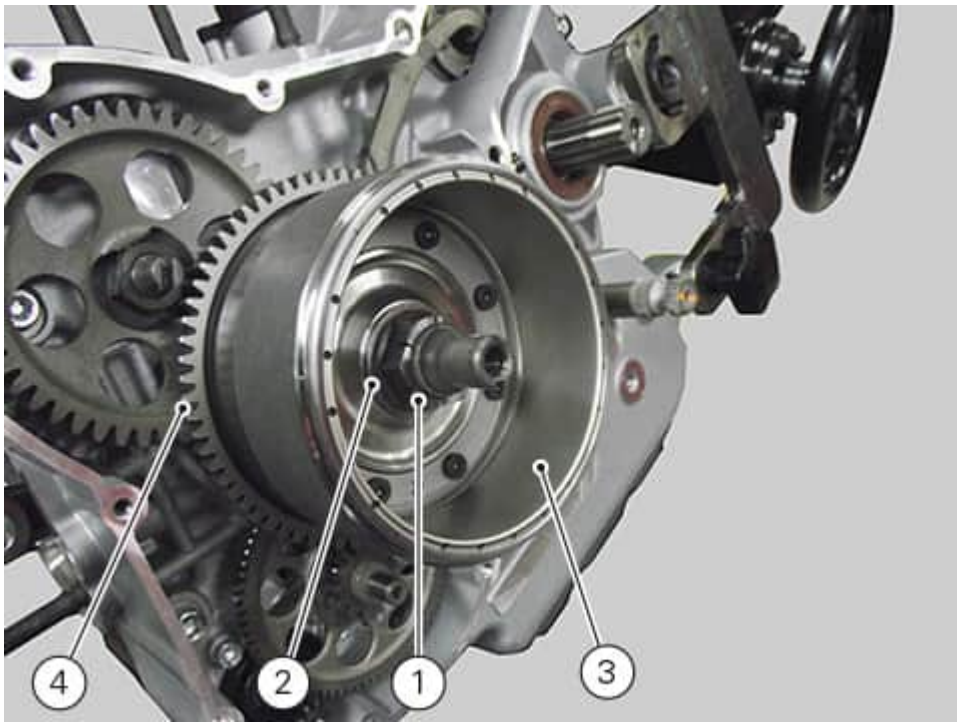
Drain the coolant (Changing the coolant).
Remove the seat (Removing the seat).
Remove the fuel tank (Removing the fuel tank).
Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the cooling system hoses (Removing cooling system hoses and unions).
Remove the generator cover (Removing the generator cover).

Fix tool (A) part no. **88713.3367** to the mounting holes M10 (B) of side stand.
Secure the tool to the flywheel with the screws (C). Unscrew the generator-flywheel retaining nut (1).

Warning
While unscrewing the nut, apply axial pressure to the socket to avoid damage or injury in the event of the wrench suddenly slipping off the nut.

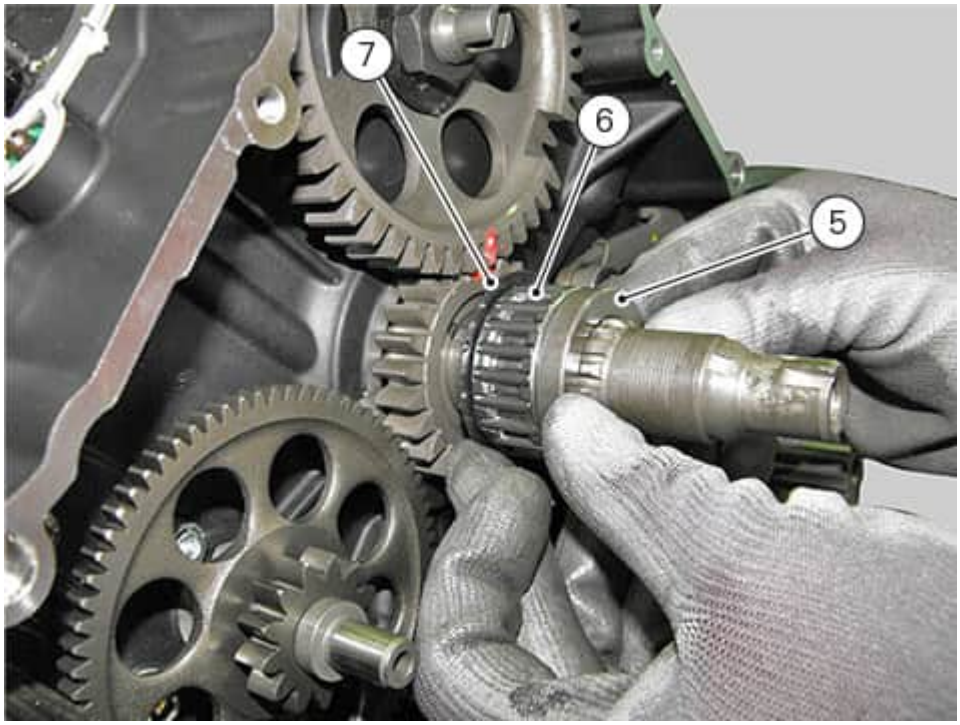


Remove the nut (1), the washer (2) and the flywheel assembly (3) with the driven gear (4) from the crankshaft.



Remove the inner ring (5), the needle roller bearing cage (6) and the washer (7).

Check the inner ring (5), the needle roller bearing cage (6) and the washer (7) for wear.
Replace if worn.

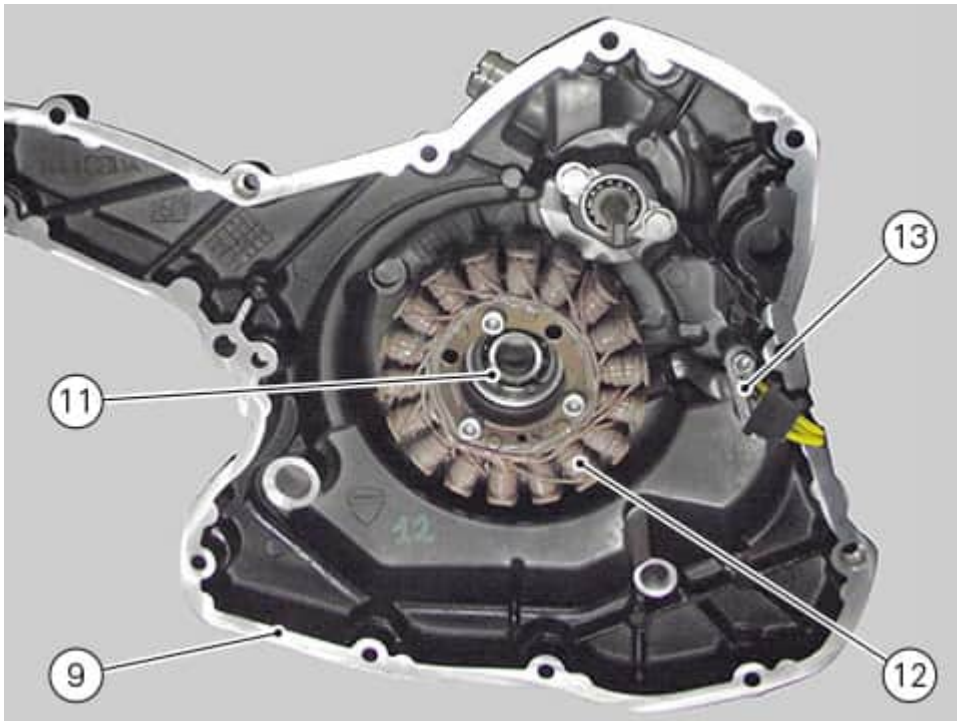


Fitting the generator cover

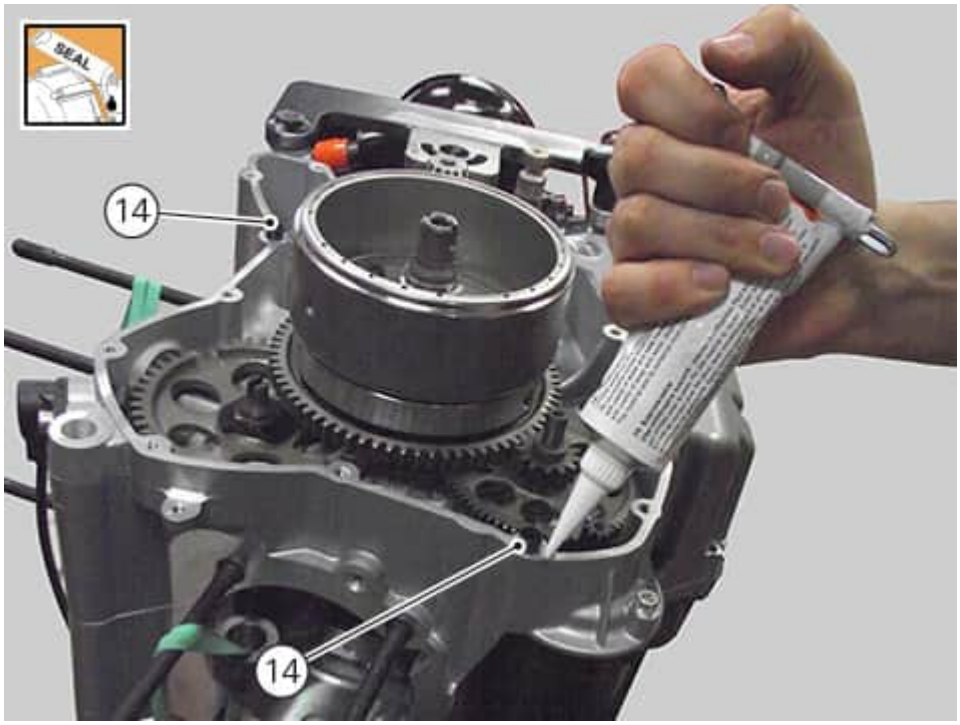
Before the assembly, make sure that the following parts are fitted on the generator cover (9):

- the crankshaft bearing (11) with the circlip;
- the generator stator (12) with cable locking bracket (13).

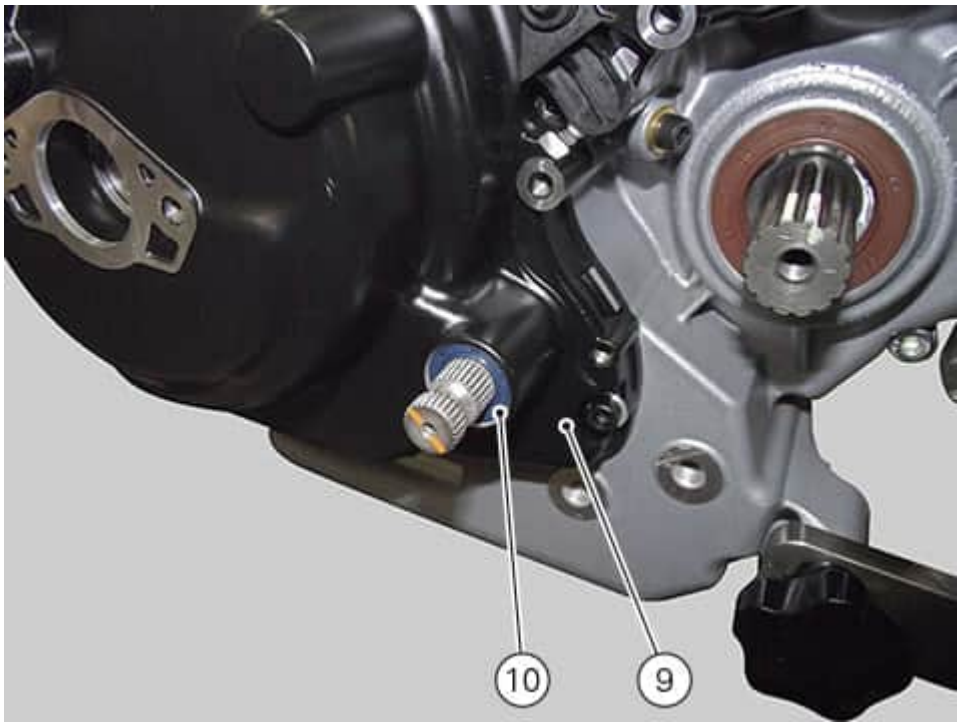
Fit the water pump assembly (Refitting the water pump).



Remove any scale and grease from the mating surfaces of the left-hand crankcase half and the generator cover.
Fit the two centring bushes (14).
Spread a continuous uniform bead of DUCATI sealing compound on the cover mating surface, and around the holes for the screws and bushes.



Grease the crankshaft and the gearchange lever shaft ends to facilitate installation of the cover and to prevent the sealing ring (10) from being damaged, if already installed in the cover.
While positioning the cover (9) on the crankcase half, slightly turn the timing layshaft belt rollers to facilitate insertion of the pump control shaft.



Starter motor gear pin (C) must be fitted to generator cover hole (B).





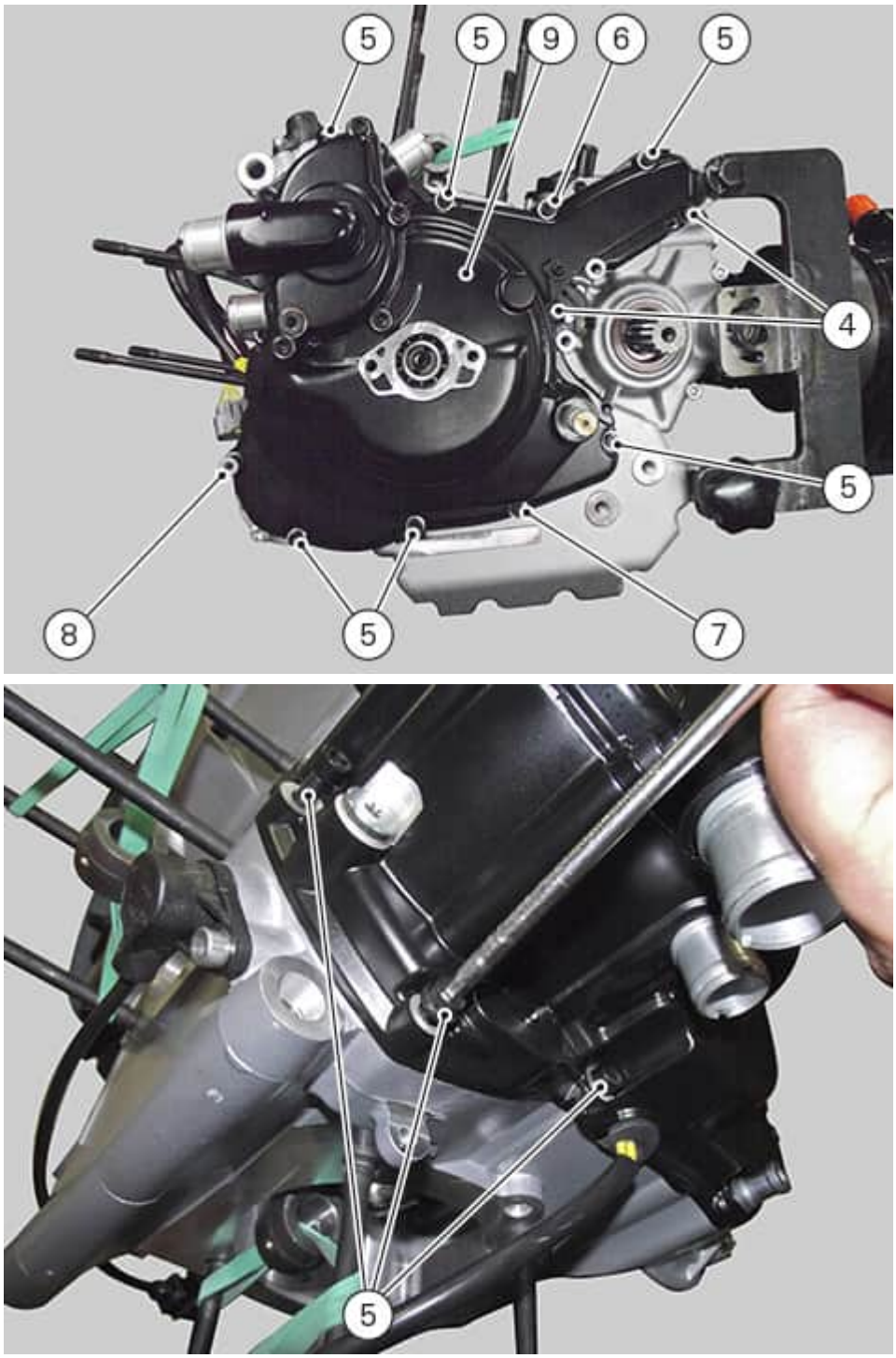
Tap the cover at different positions with a rubber mallet to facilitate its location on the shafts and centring bushes.

Note
Should it be necessary to remove the cover again, fit the puller no. 88713.1749 in the threaded holes, at the crankshaft.

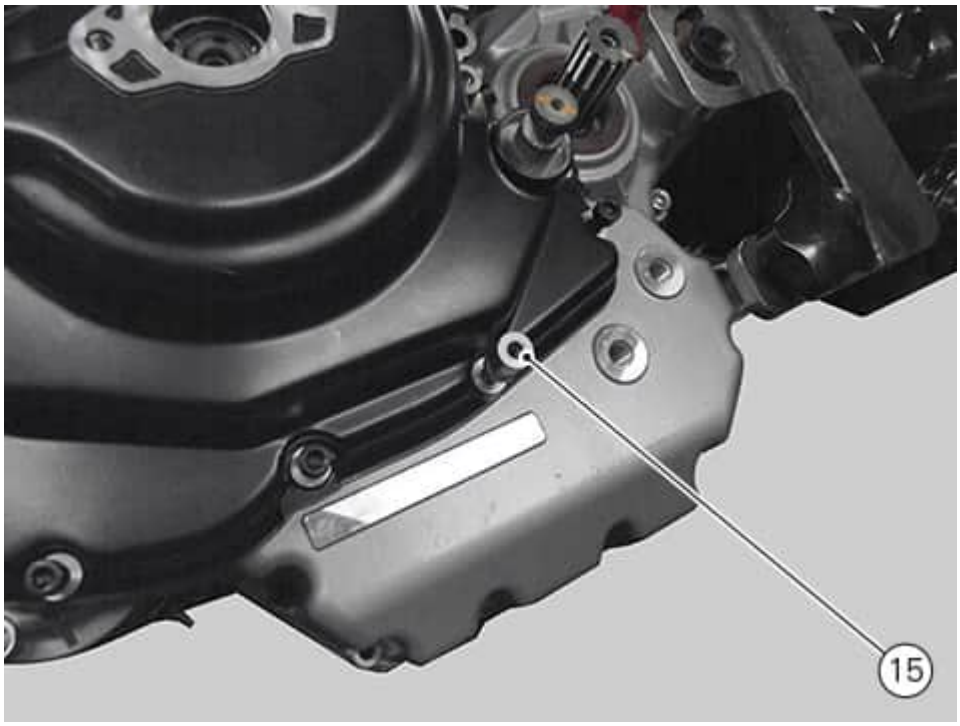
Insert the fixing screws in their holes following the indications given in the table.

Ref.	Q.ty	Description
5	8	M6x25 mm screws
4	2	M6x20 mm screws
6	1	M6x30 mm screws
7	1	M6x25 mm special screw
8	1	M6x30 mm special screw

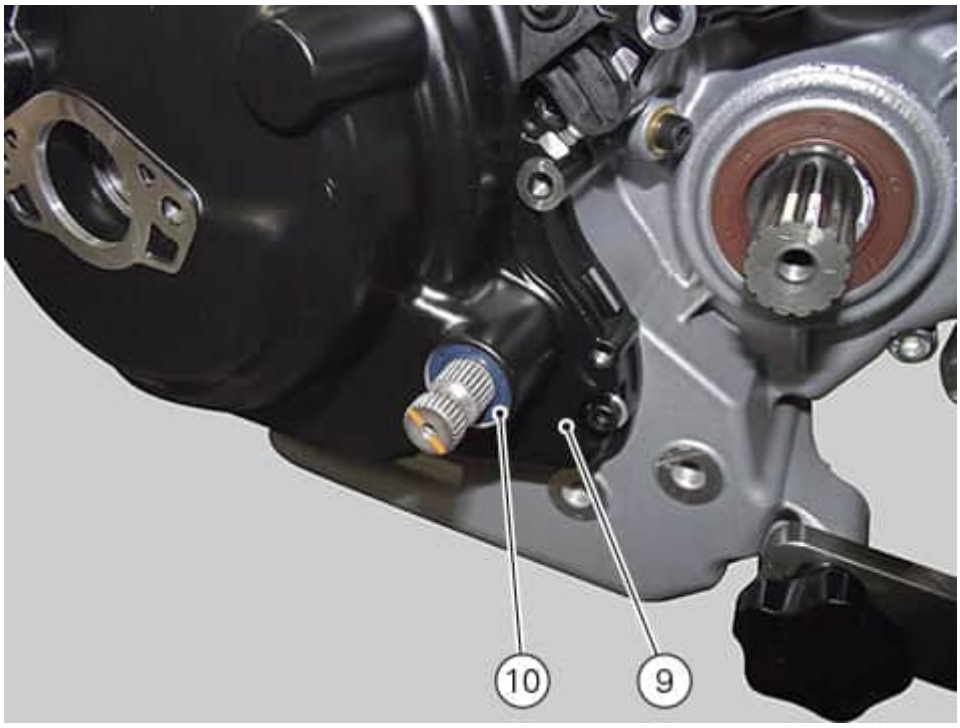
Tighten the retaining screws to a torque of 13.5 Nm (Min. 12.5 Nm - Max. 14.5 Nm).



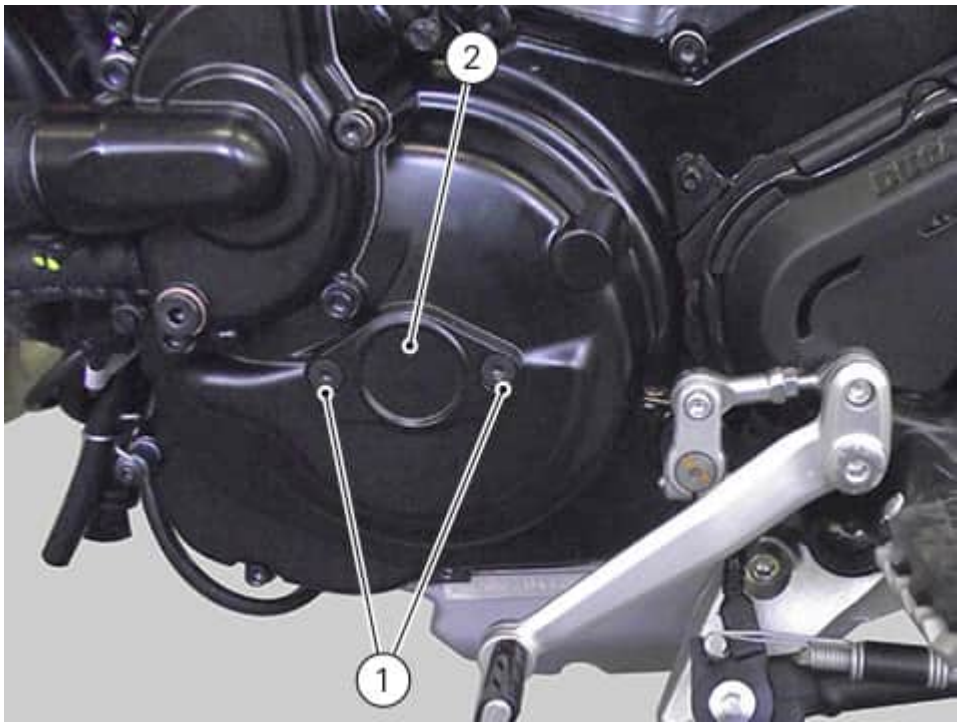
In the Touring version, screw (7) is replaced by a stud bolt (15) to be tightened to the same torque of the replaced screw.



Damp the sealing ring (10) with alcohol and install it on the generator cover (9), at the gearchange lever shaft.



Make sure that the O-ring (3) is installed on the cover (2).
Apply grease to the screws (1).
Tighten the two fixing screws (1) of the cover (2) matching the crankshaft to a torque of 5 Nm (Min. 4.5 Nm - Max. 5.5 Nm).



Connect the generator cable connector to the main wiring (A).

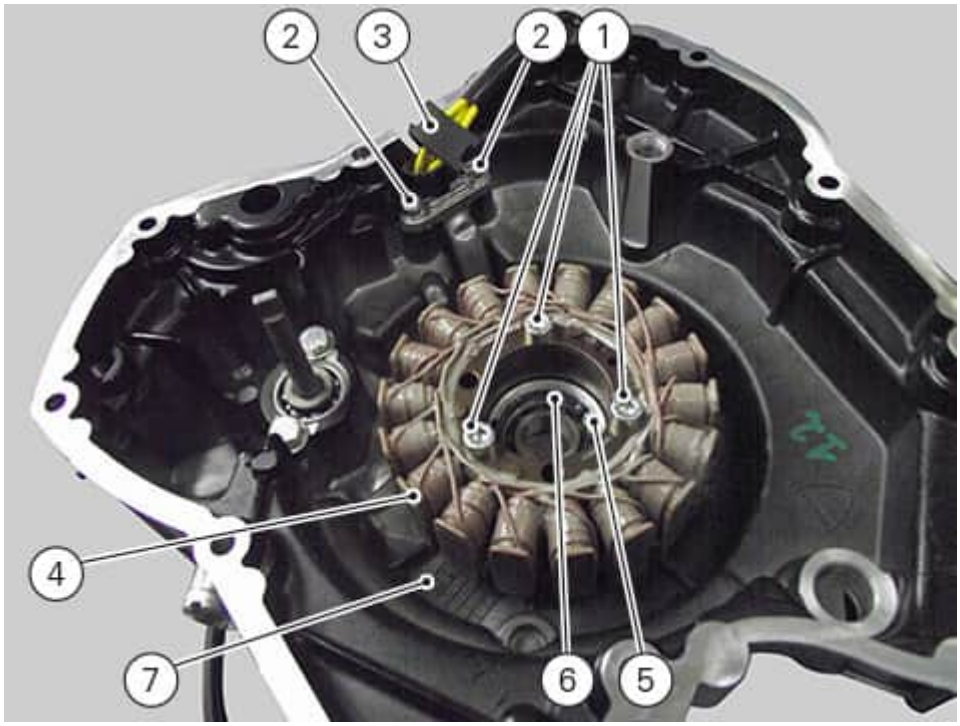


Refit the cooling system hose (Refitting cooling system hoses and unions).
Refit the pump-cylinder hoses (Refitting the cylinder/piston assembly).
Fill with engine oil (Changing the engine oil and filter cartridge).
Refill the cooling system (Changing the coolant).
Refit the tank (Refitting the fuel tank).
Refit the seat (Refitting the seat).

Disassembling the generator cover

Undo the three stator retaining screws (1) and the retaining screws (2) of the cable guide bracket (3) from inside the generator cover.
Remove the stator (4) and the cable guide bracket (3).

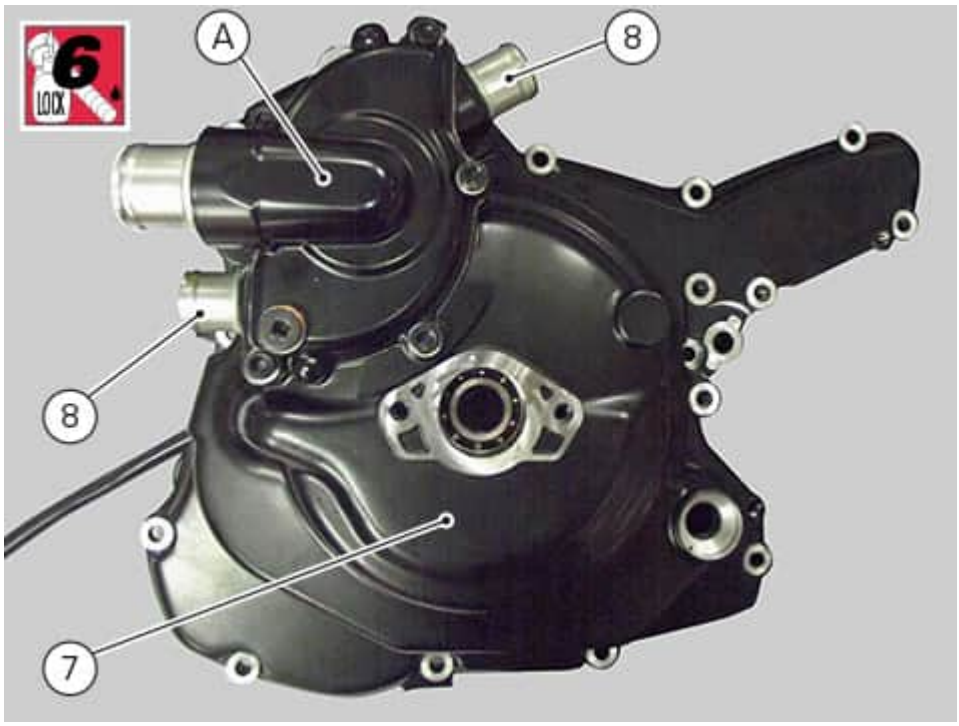
The generator cover is fitted with a bearing (5), held in place by the circlip (6), which is located on the end of the crankshaft.
Remove the circlip (6) with suitable pliers.
Remove the bearing (5) using a universal puller.
Be careful when fitting the new bearing (5) to ensure it is positioned with the shielded side facing away from the cover.
Secure the bearing with the circlip (6), ensuring that it is correctly fitted in its seat in the generator cover (7).



Loosen the unions (8) delivering water to the horizontal and vertical cylinder assemblies.
When fitting the new components, apply the recommended sealant and tighten to a torque of 25 Nm (Min. 23 Nm - Max. 27 Nm).

The unions (8) may also be removed without removing the generator cover (7) from the engine.

Remove the water pump components (A) (Removing the water pump).


6.
LOCK
A
8
8
7

Removing the generator cover

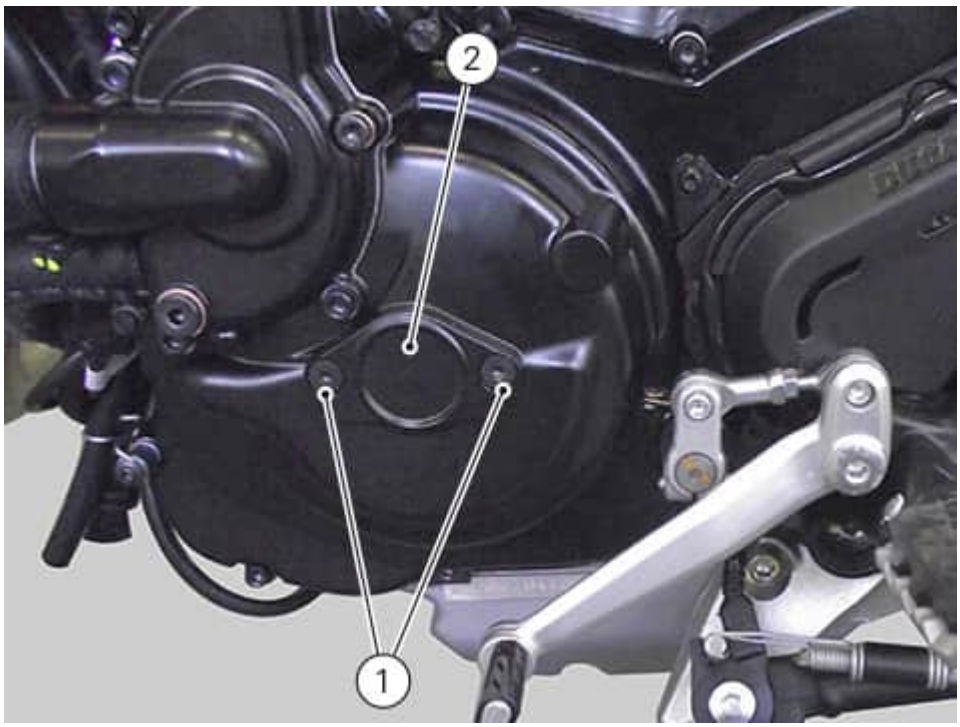
Drain the coolant (Changing the coolant).
Remove the seat (Removing the seat).
Remove the fuel tank (Removing the fuel tank).
Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the cooling system hoses (Removing cooling system hoses and unions).

Note
This operation is described for an engine removed from the frame since all reassembly procedures are easier with the engine on the bench.

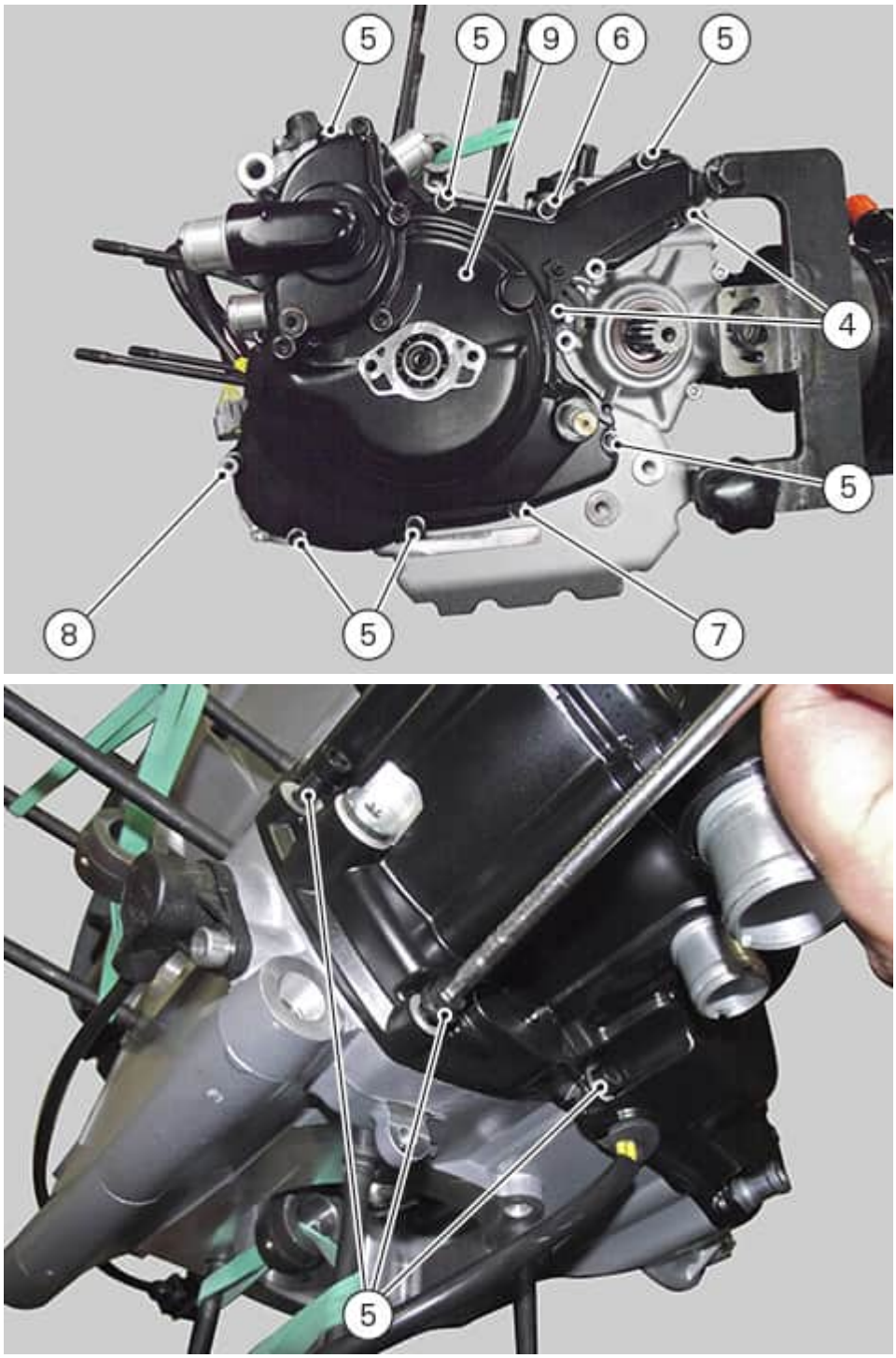
Disconnect generator cable connector (A) from voltage regulator.



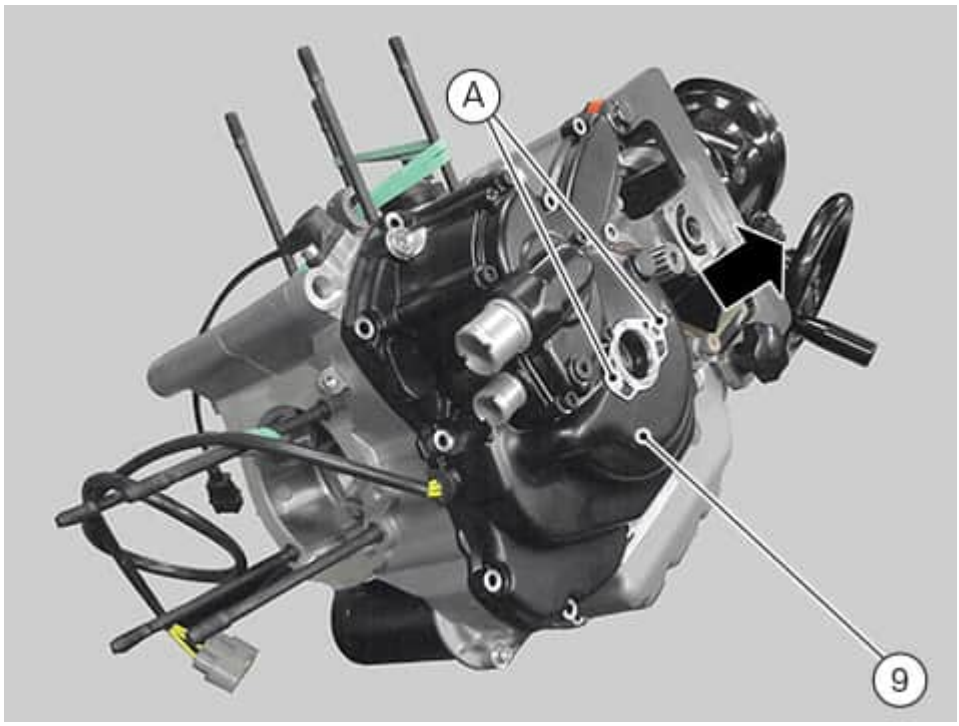
Undo the two retaining screws (1) of cover (2) over the end of the crankshaft and collect the relevant gasket.



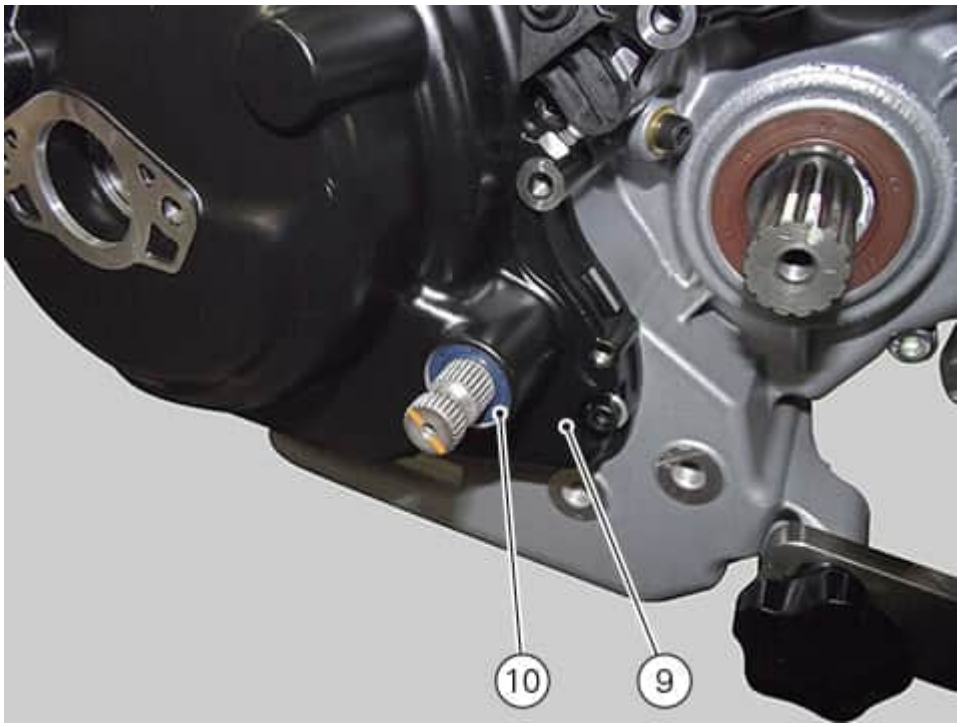
Loosen screws (4), (5) and (6) and stud bolts (7) and (8) securing generator cover (9).



Fix service tool no. **88713.1749** to the holes (A) left vacant by the screws (1) you have just removed. Turn the tool shaft slowly to separate the cover (9) from the LH crankcase half.

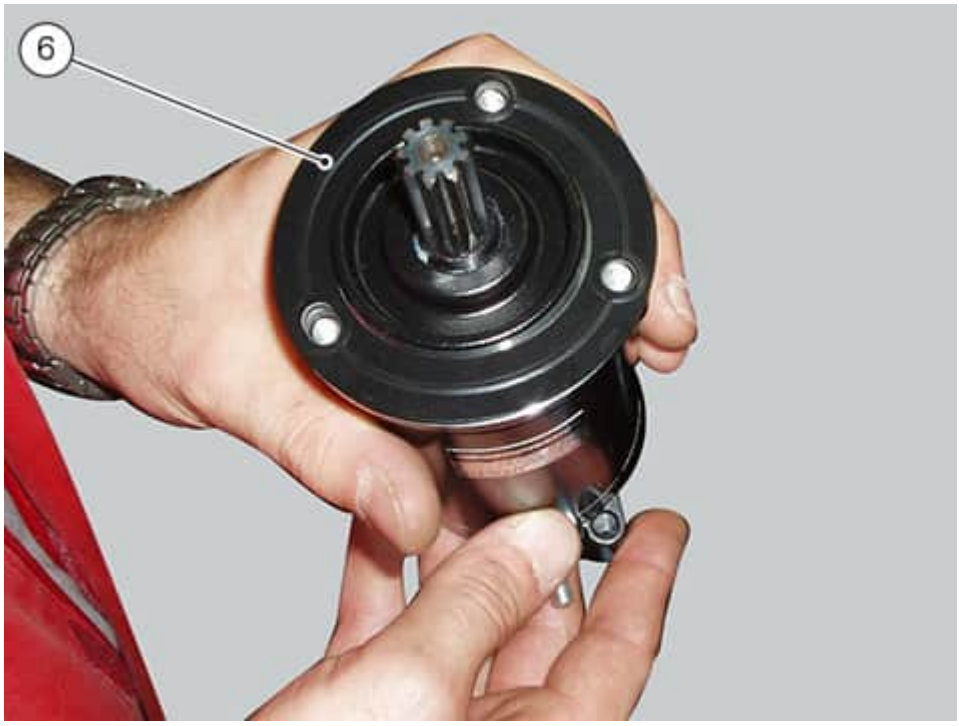


There is a sealing ring (10) on the cover (9) at the gearchange lever shaft that may be damaged when removing the generator cover.
Always check the condition of this sealing ring and replace it if damaged.

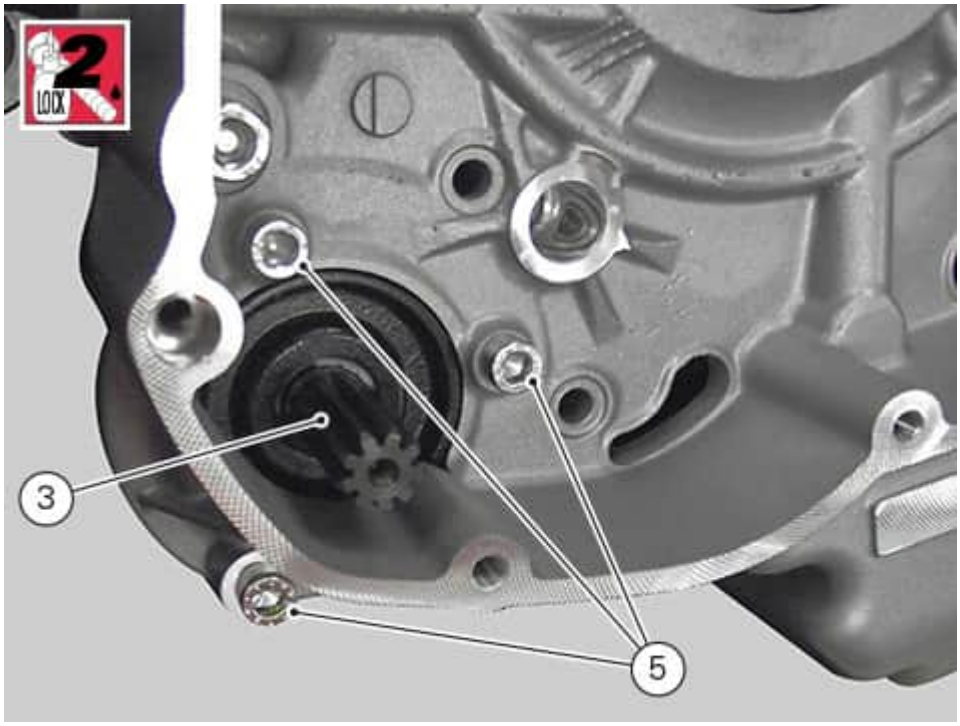


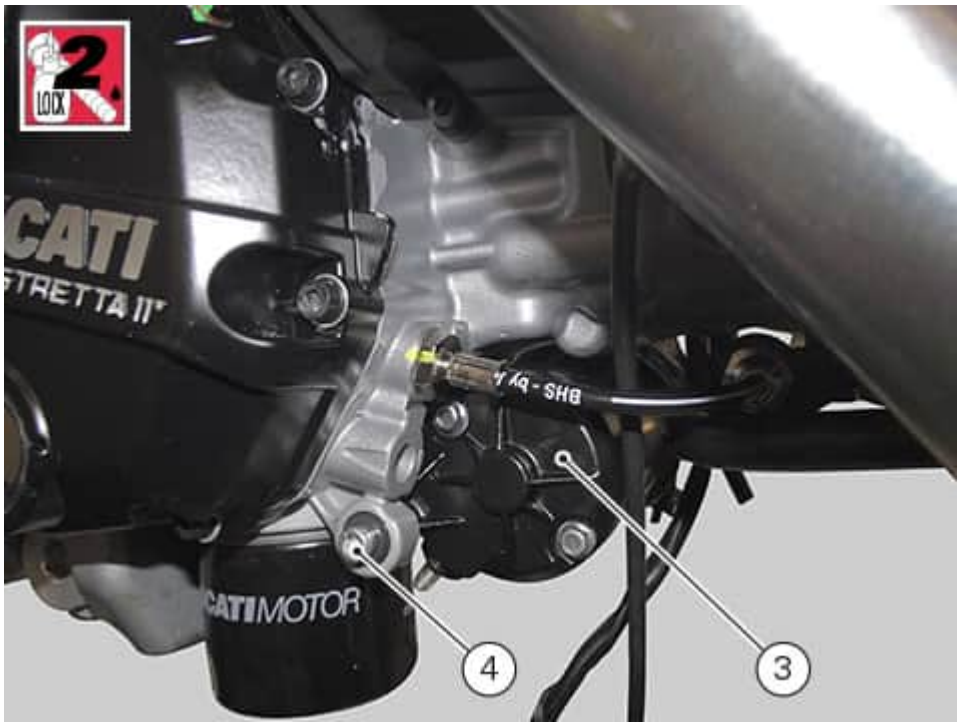
Refitting the starter motor

Visually check the gasket (6) for wear and replace it if necessary.



Position the gasket (6) and starter motor on the crankcase.
If screws (5) are not new, apply specified threadlocker and start them.
Tighten screws (5) to a torque of 10 Nm (min. 9 Nm. - Max. 11 Nm).

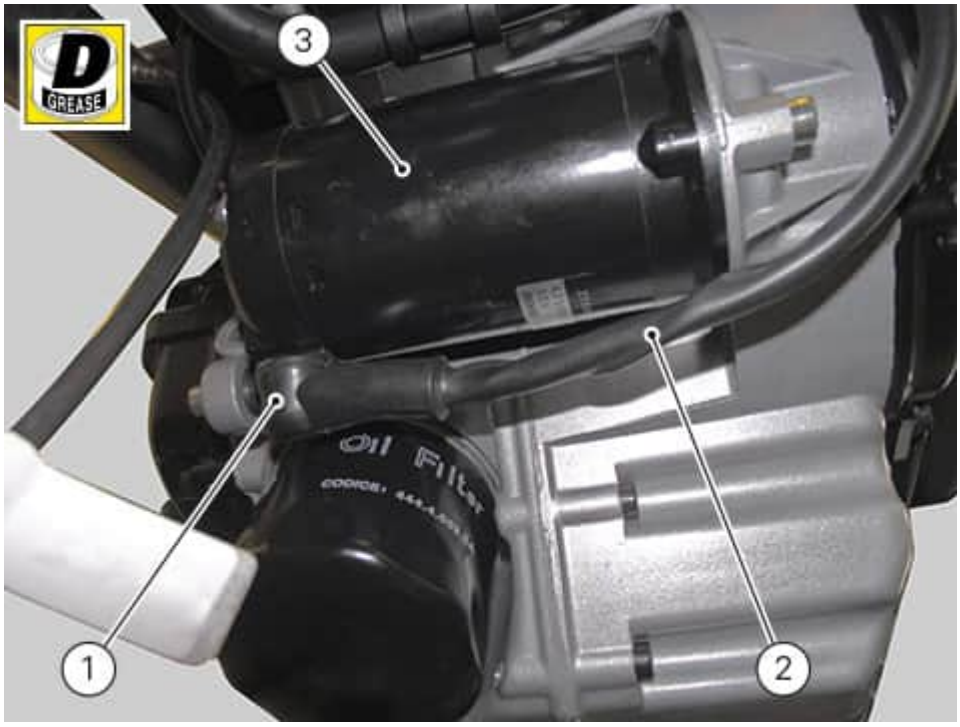




Place starter motor/solenoid starter cable (2) and tighten starter motor fastening nut (3) to a torque of 5 Nm ± 10%.

Important
Fill the protection cap with protective grease before fitting it on the starter motor.

Position protection cap (1).

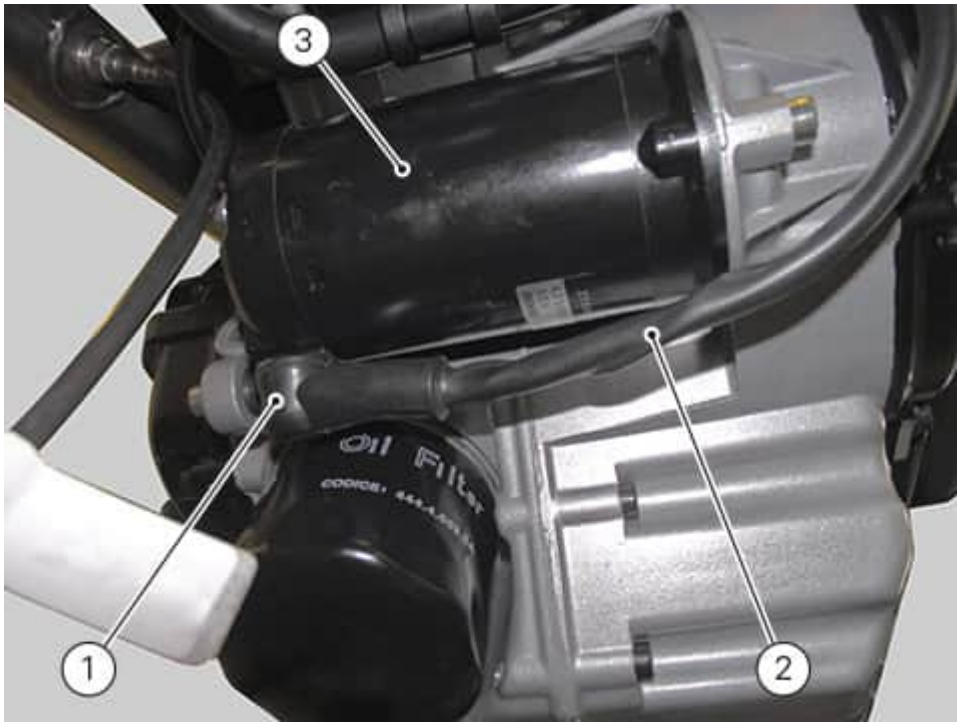


Refit the starter motor idler gear (Refitting the starter motor idler gear).
Refit the complete generator (Fitting the flywheel/generator assembly) and the generator side cover (Fitting the generator cover).
Refit the cooling system hose (Refitting cooling system hoses and unions).
Refill the cooling system (Changing the coolant).
Fill the engine with oil (Changing the engine oil and filter cartridge).

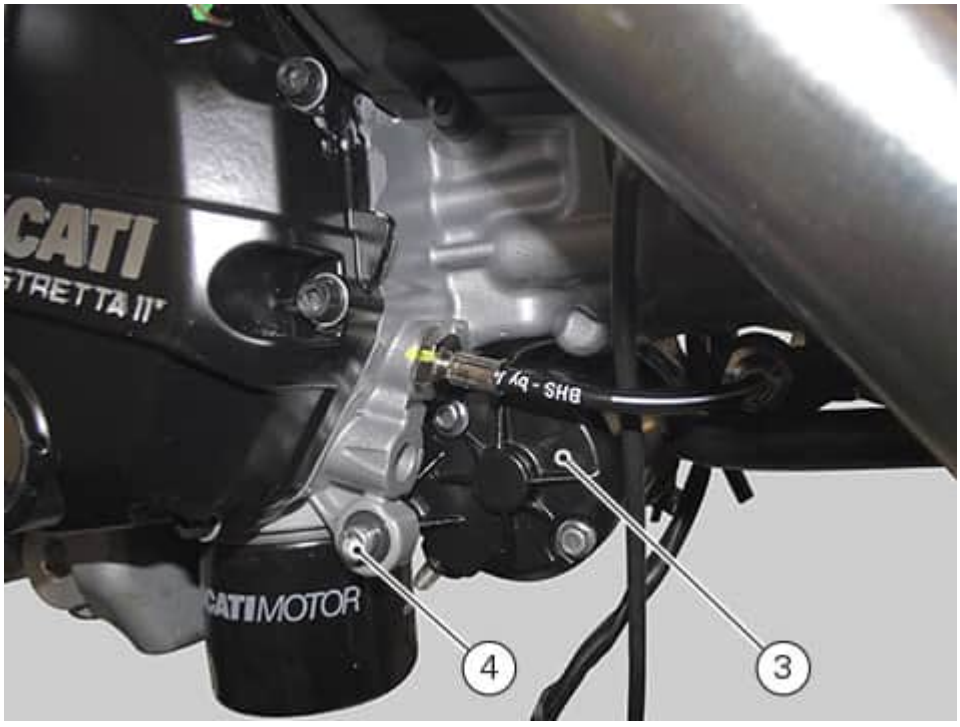
Removing the starter motor

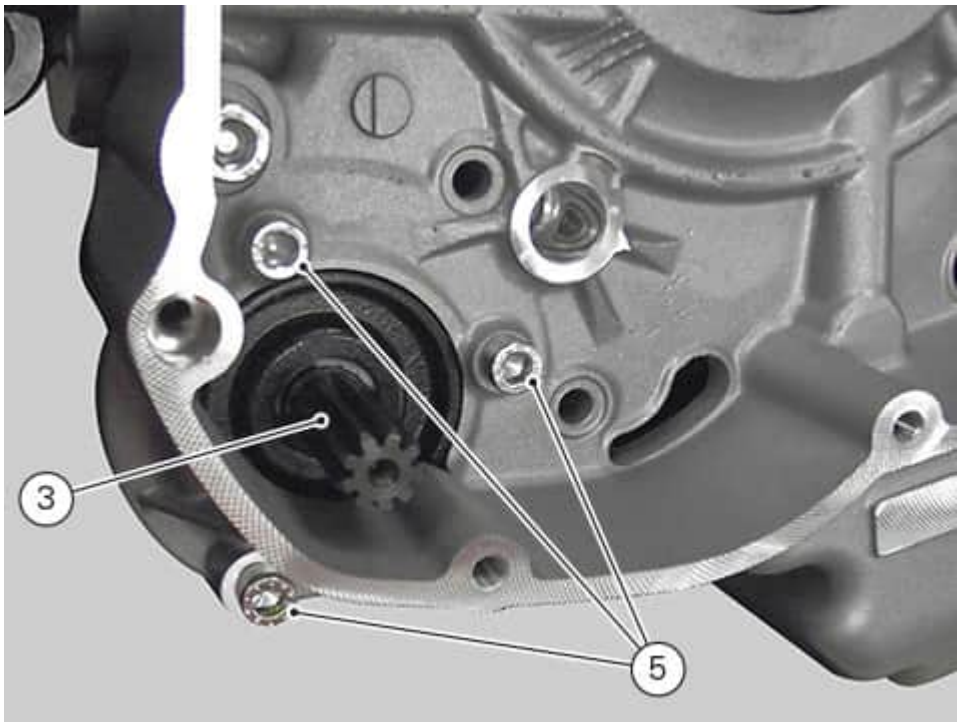
Drain the engine oil (Changing the engine oil and filter cartridge).
Drain the coolant (Changing the coolant).
Remove the cooling system hoses (Removing cooling system hoses and unions).
Remove the generator cover (Removing the generator cover).
Remove the flywheel/generator assembly (Removing the flywheel/generator assembly).
Remove the starter motor idler gear (Removing the starter motor idler gear).

Remove protection cap (1) of starter motor /solenoid starter cable.
Loosen the screw located under cap and remove starter motor cable (2) from starter motor (3).



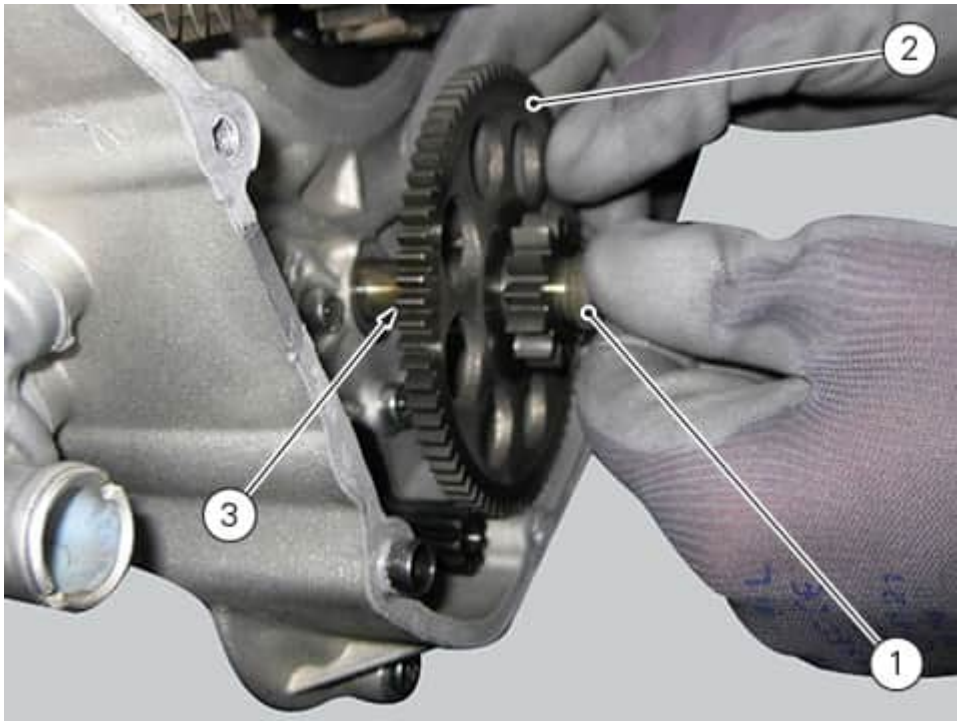
Loosen the screws (4) and (5) securing starter motor to crankcase and remove the starter motor.

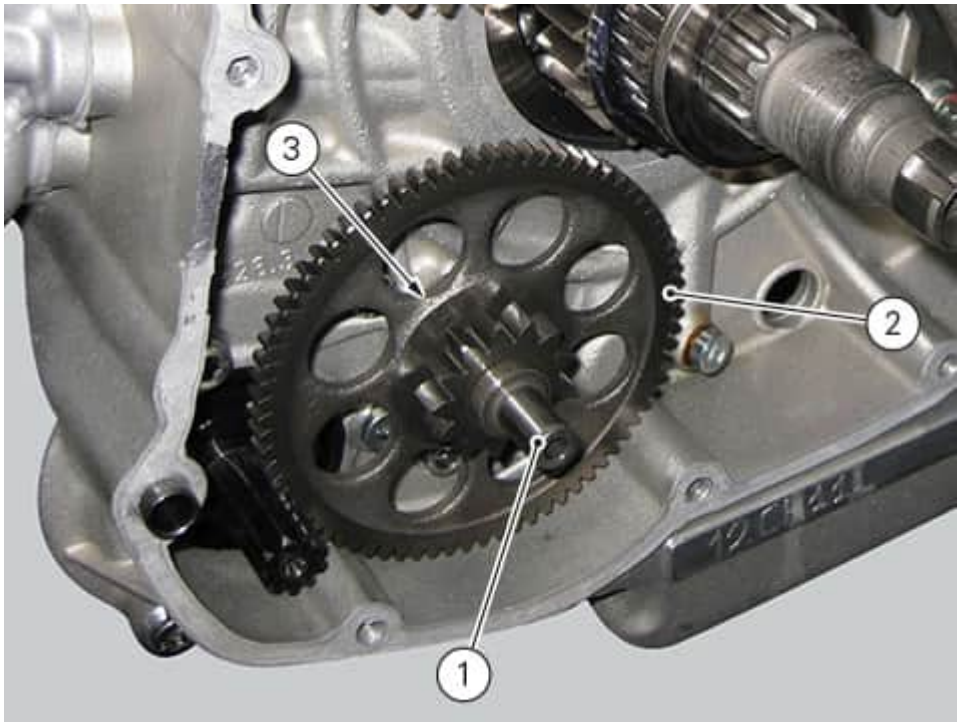



3
5

Refitting the starter motor gear

Position the washer (3) and the gear (2) on the pin (1) and drive it fully home on the crankcase half.





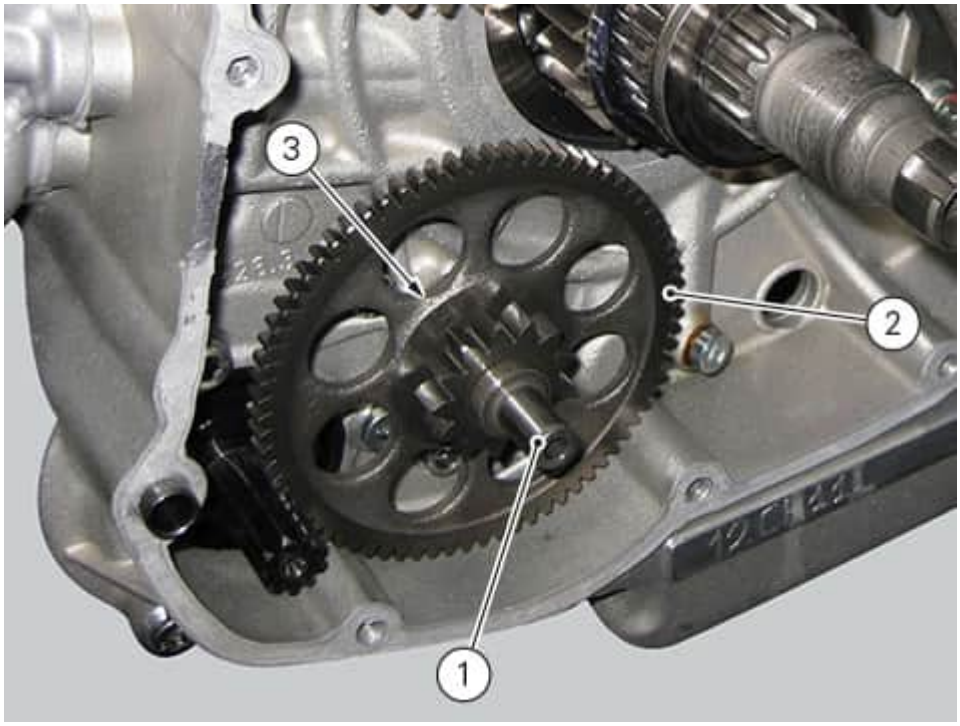
Refit the complete generator (Fitting the flywheel/generator assembly) and the generator side cover (Fitting the generator cover).
Refit the cooling system hose (Refitting cooling system hoses and unions).
Refill the cooling system (Changing the coolant).
Fill the engine with oil (Changing the engine oil and filter cartridge).

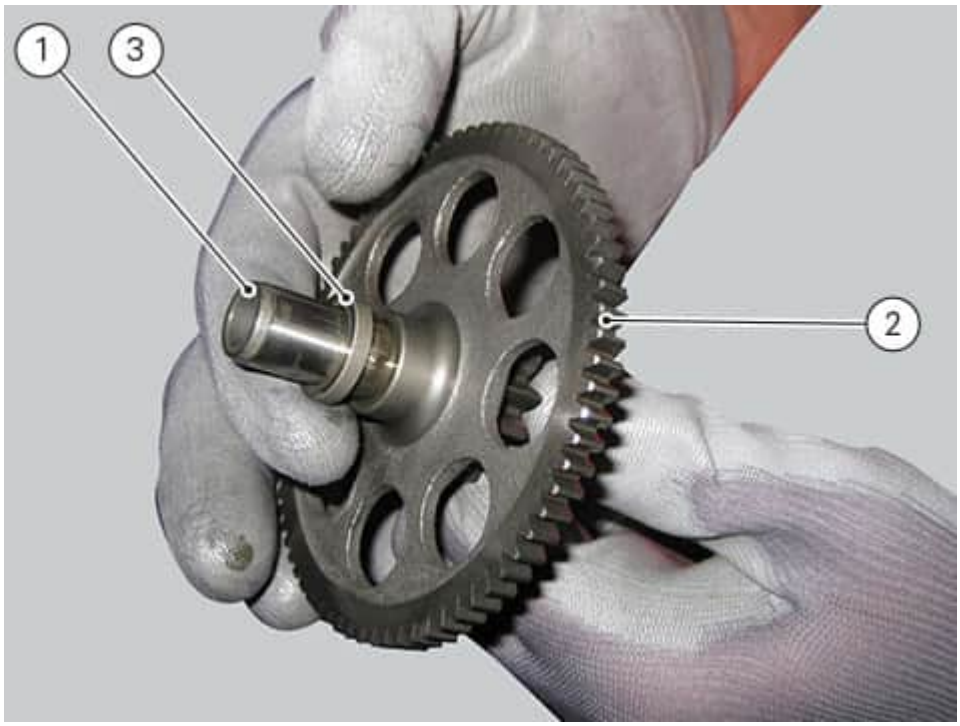
Removing the starter motor idler gear

Drain the engine oil (Changing the engine oil and filter cartridge).
Drain the coolant (Changing the coolant).
Remove the cooling system hoses (Removing cooling system hoses and unions).
Remove the generator cover (Removing the generator cover).
Remove the flywheel/generator assembly (Removing the flywheel/generator assembly).

Slide out the transmission pin (1) with gear (2) and washer (3).

Warning
Be careful when performing this operation since the washer could fall inside the crankcase halves.





At this point, it is possible to remove the starter motor (Removing the starter motor).

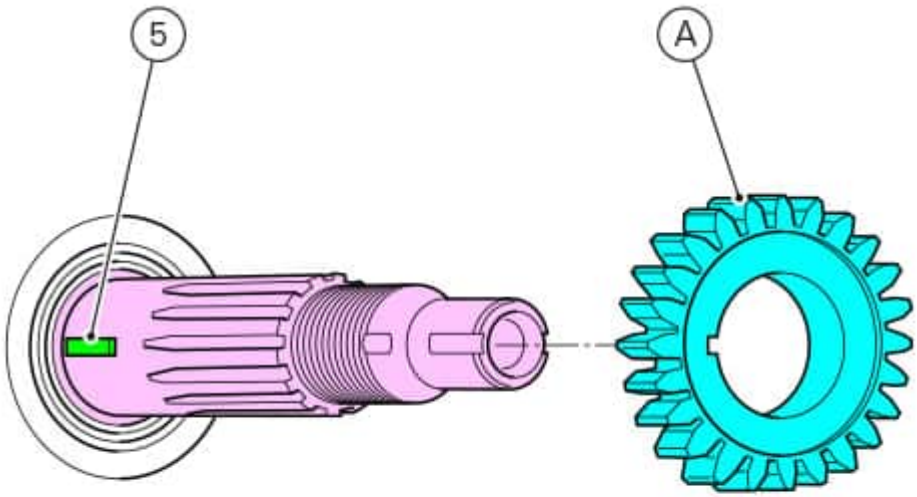
Refitting the timing gears

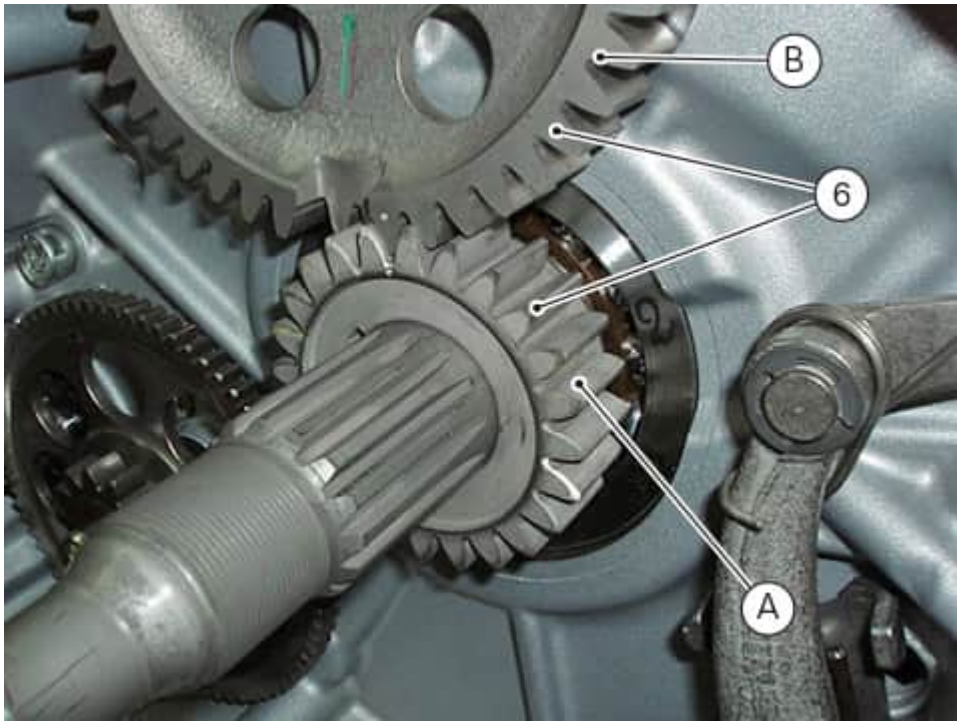
Before reassembling the removed parts, check timing gears (6) for wear. Change, if necessary.

Important

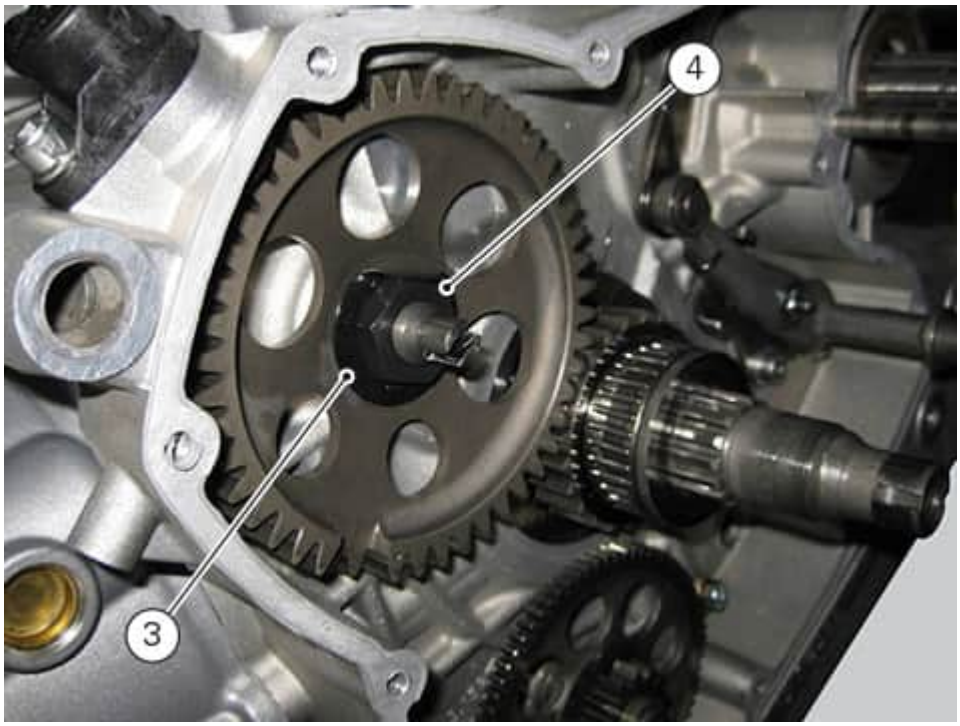
The timing gears must always be replaced as a pair.

Refitting is the reverse of removal.
When introducing the driven gear (B) check that the key (5) is correctly fitted on the timing layshaft, align the gear slot with the key matching the driving gear timing mark (A) with the gear (B).





On completion of the refitting operations, check that washer (3) is staked against nut (4) in such a way to prevent the nut from working loose.

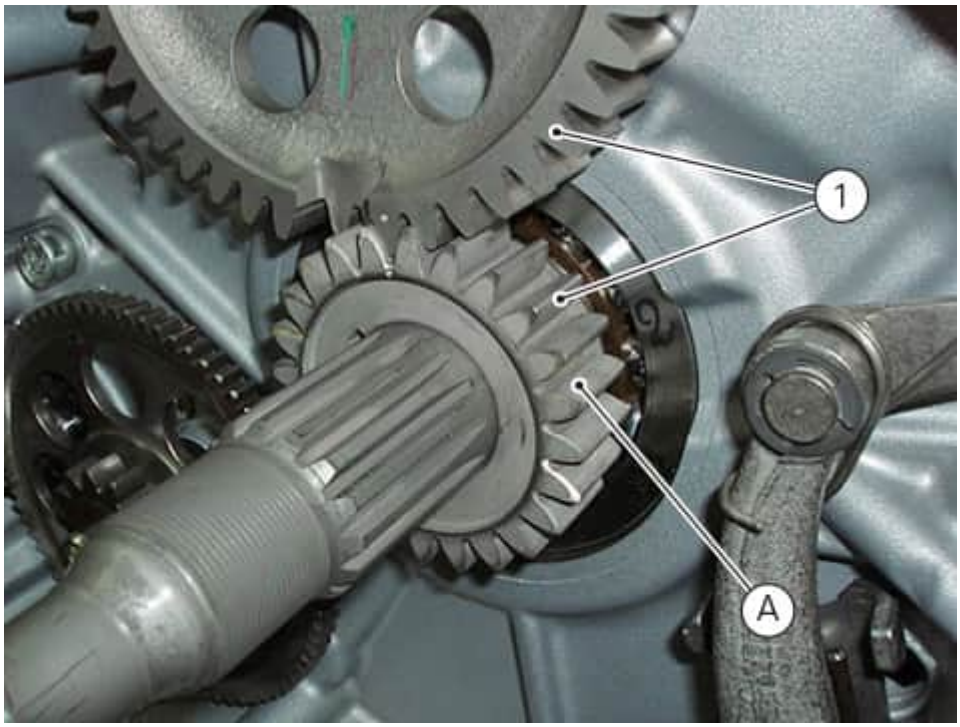


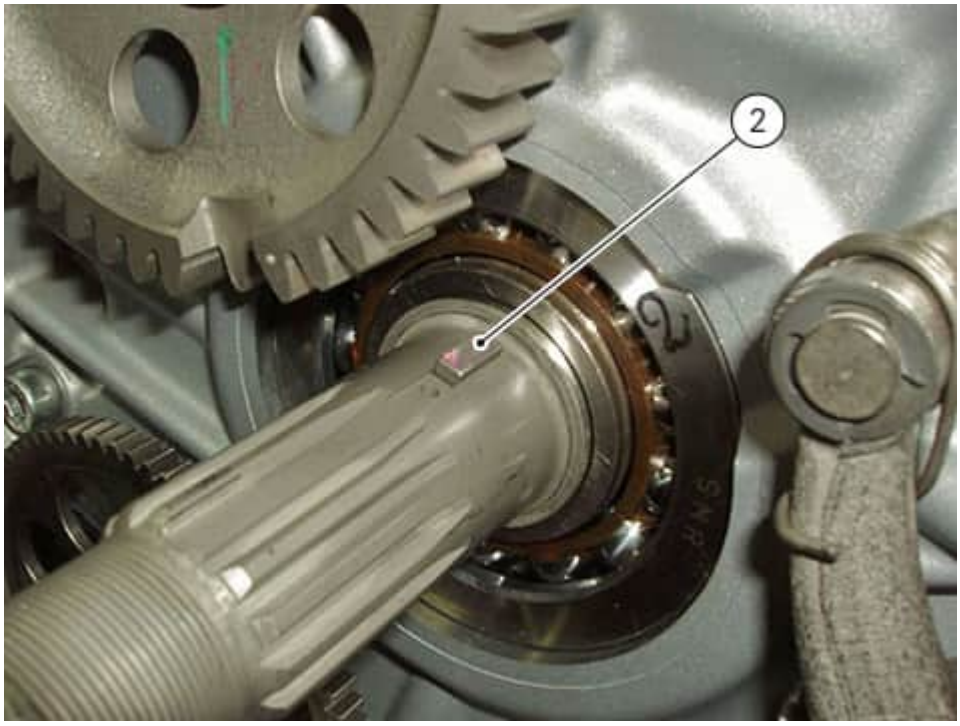
Refit the complete generator (Fitting the flywheel/generator assembly) and the generator side cover (Fitting the generator cover).
Refit the cooling system hose (Refitting cooling system hoses and unions).
Refill the cooling system (Changing the coolant).
Fill the engine with oil (Changing the engine oil and filter cartridge).

Removing the timing gears

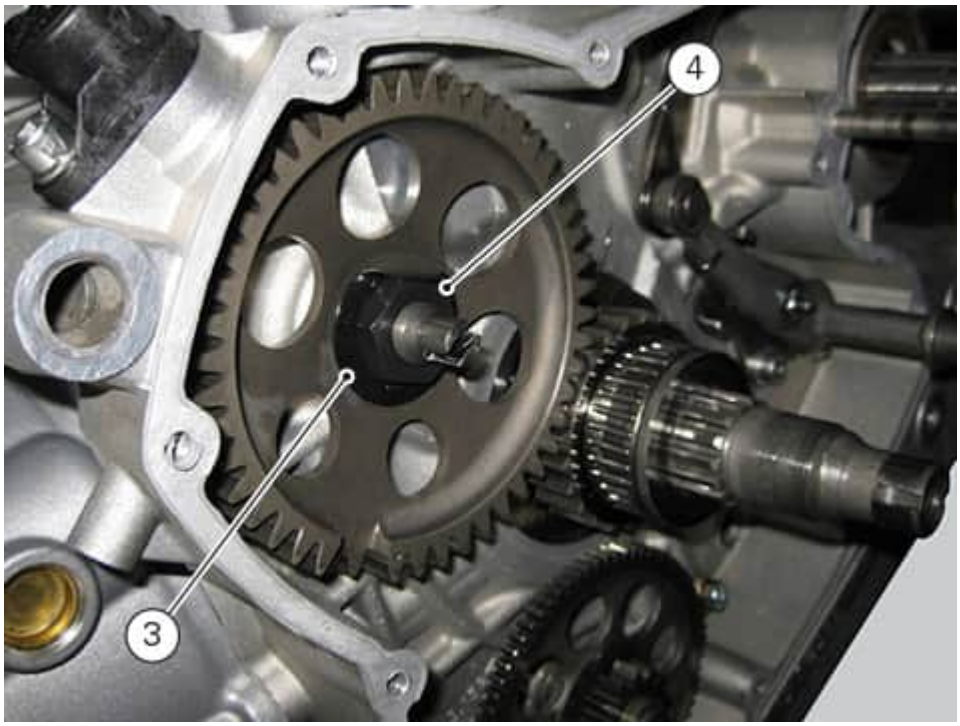
Drain the engine oil (Changing the engine oil and filter cartridge).
Drain the coolant (Changing the coolant).
Remove the cooling system hoses (Removing cooling system hoses and unions).
Remove the generator cover (Removing the generator cover).
Remove the flywheel/generator assembly (Removing the flywheel/generator assembly).

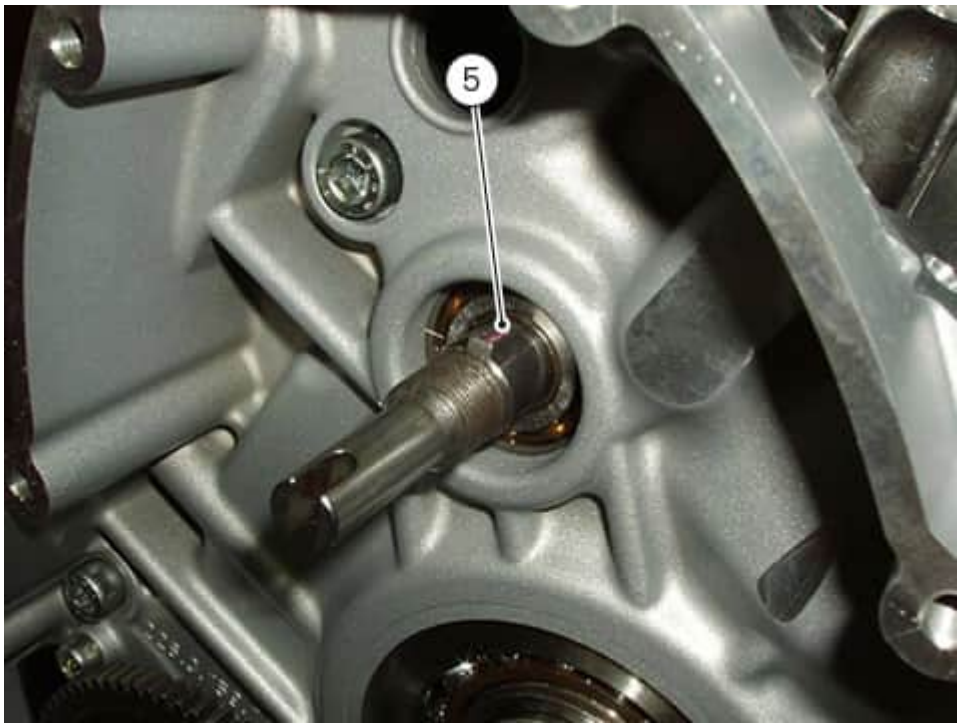
Slide out the driving gear (A) of the timing gear pair (1) and remove the key (2).





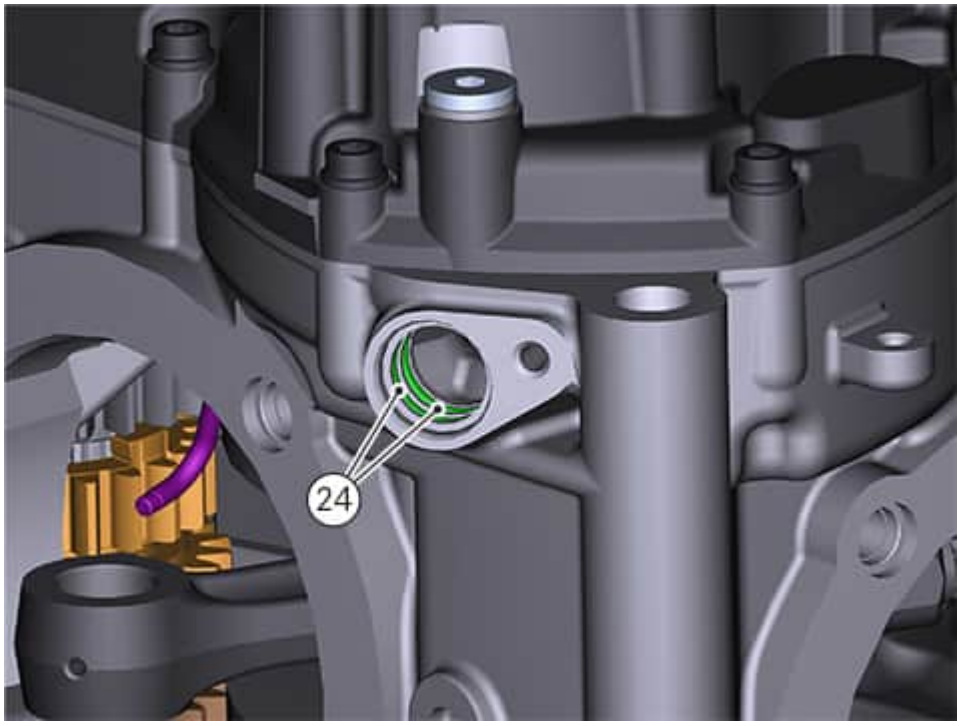
Straighten out the lock washer (3) of nut (4).
Restrain the timing gear by inserting a pin in one of the holes, and unscrew the locking nut (4).
Remove the nut (4), washer (3), timing driven gear (B) and key (5) from the timing layshaft.


4
3

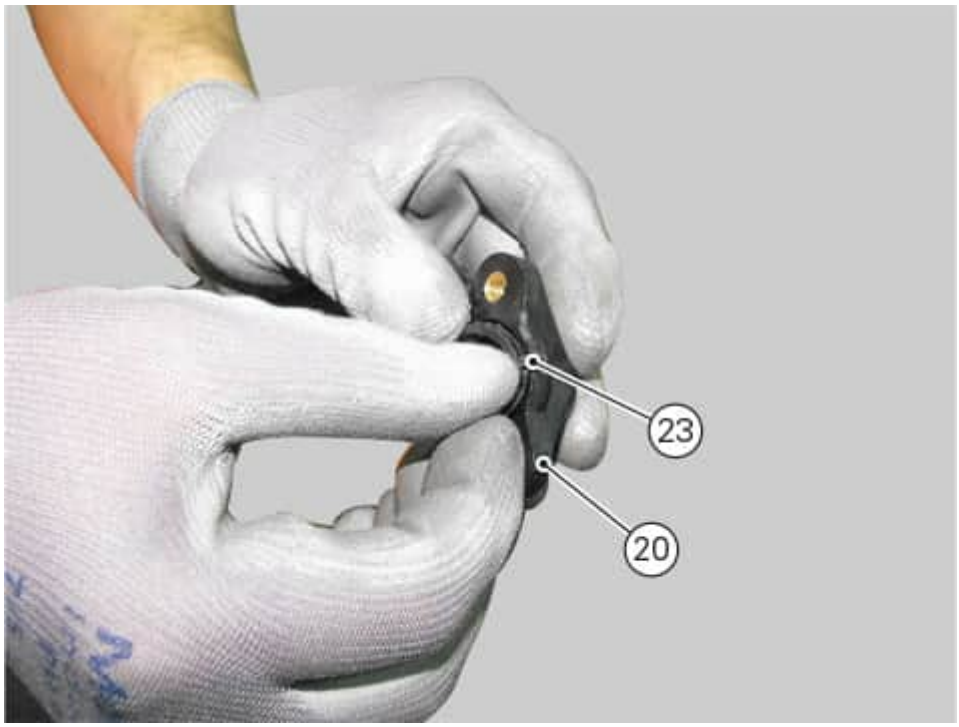

5

Refitting the external components

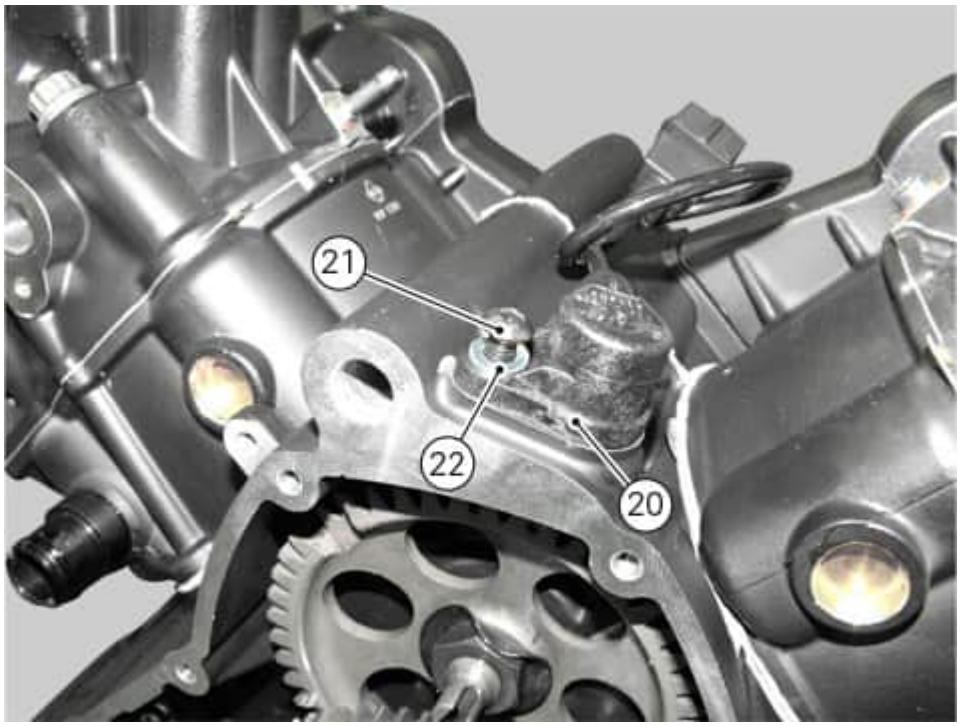
Make sure that the O-rings (24) are fitted on the crankcase.



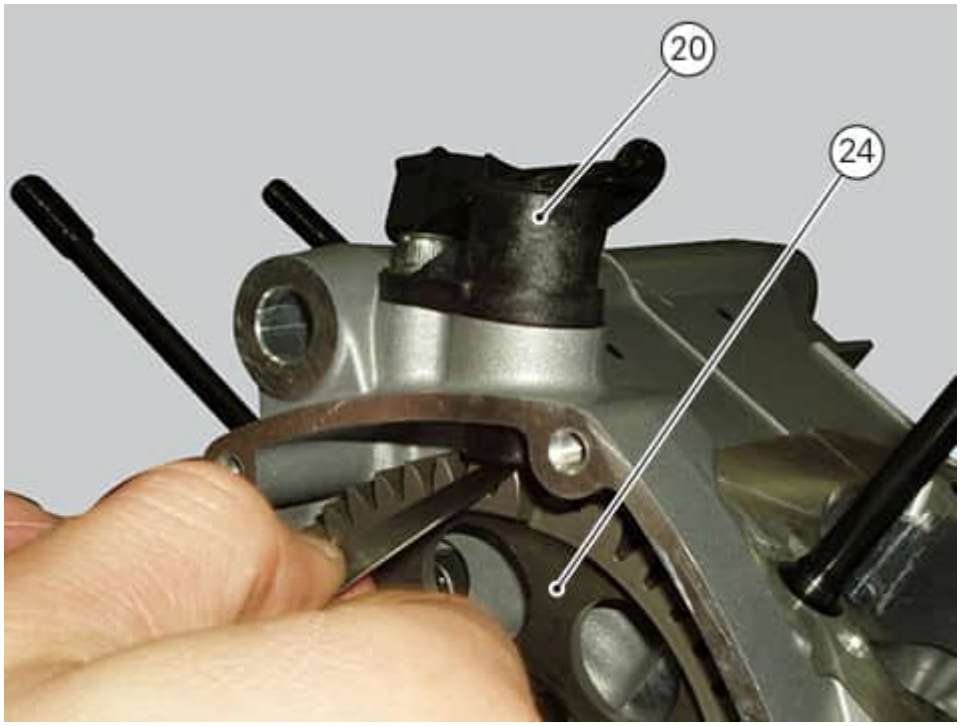
Check for the presence of seal (23) on sensor (20).



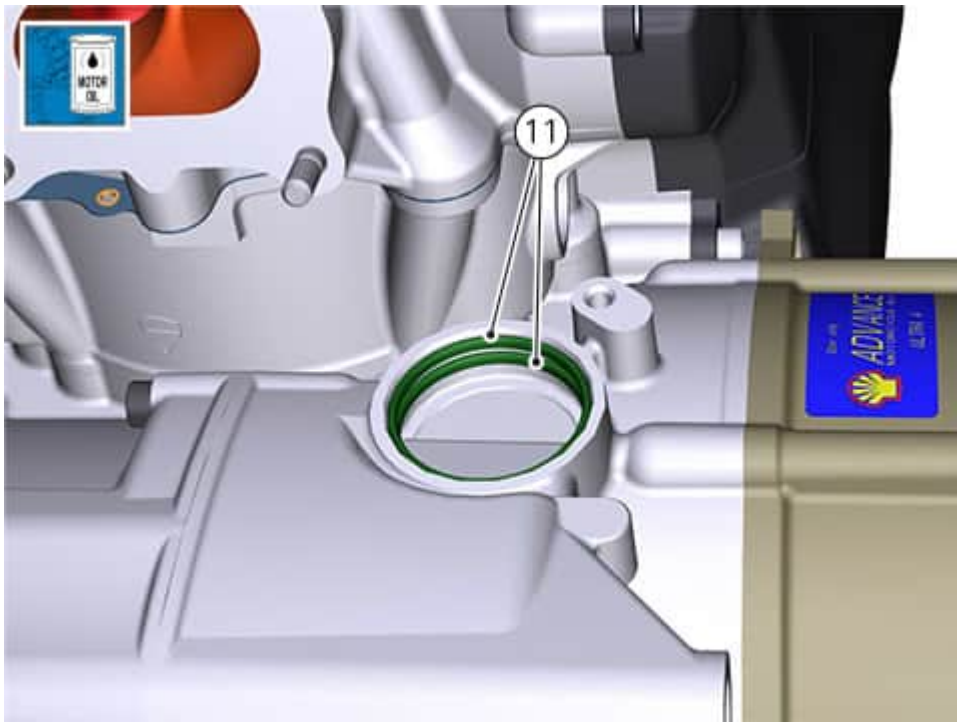
Fit the engine sensor (20) in its seat in the crankcase half.
Start the screw (21) with the washer (22) and tighten to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).



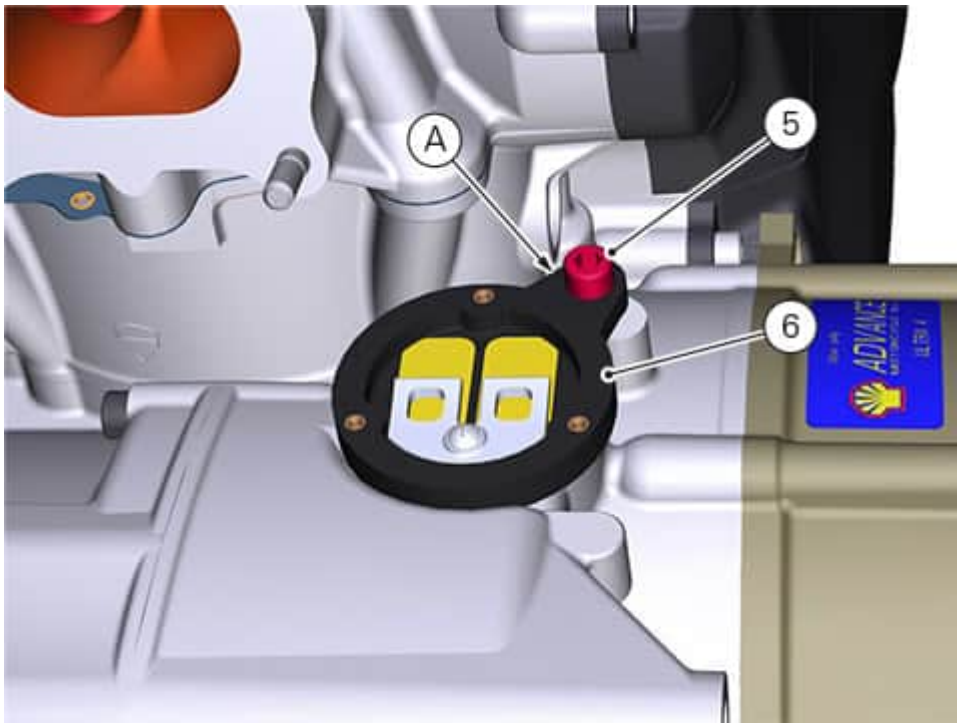
Use a feeler gauge to check the clearance between the engine sensor (20) and the timing gear (24). The value must be between 0.6 and 0.8 mm.



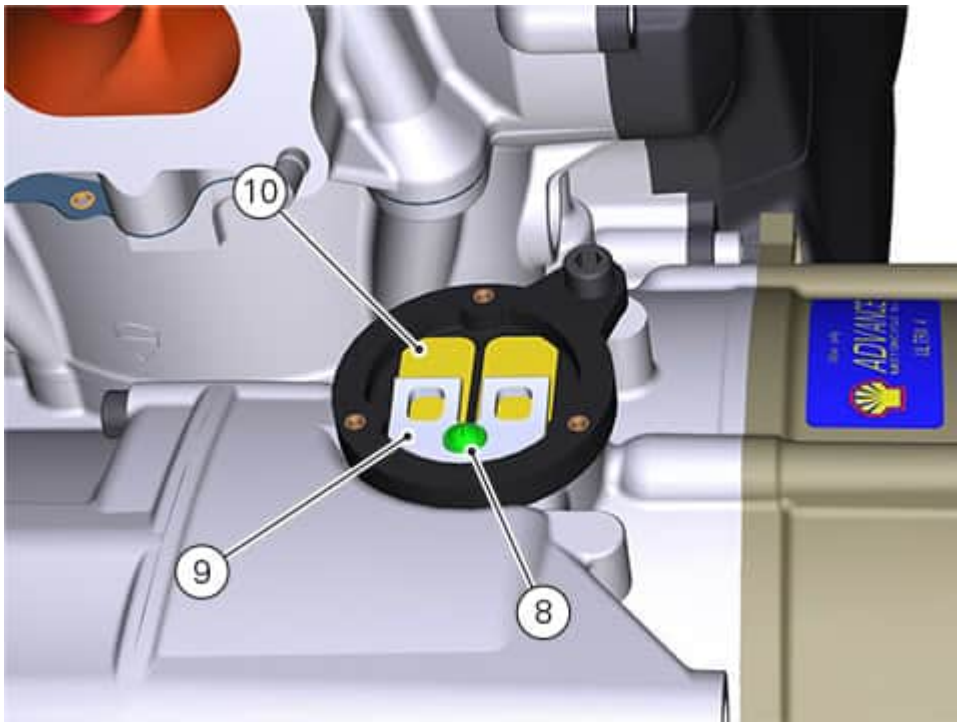
If previously disassembled, reassemble the oil vapour breather valve as follows:
Fit two new O-rings (11) after having lubricated them with the indicated product.



Fit lower flange (6) on crankcase and tighten screw (5) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).



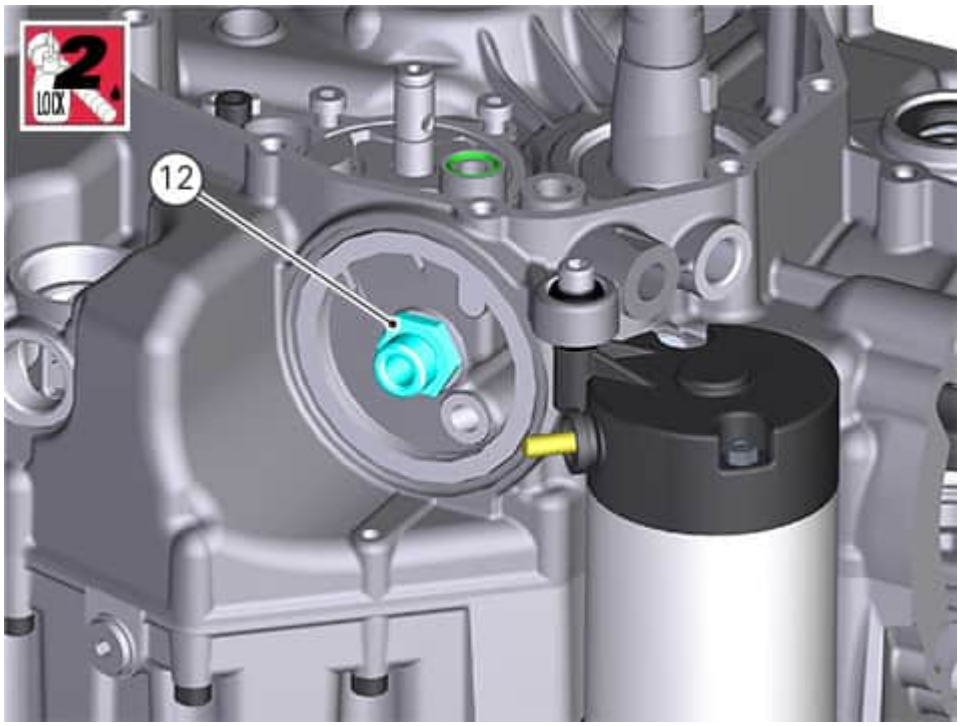
Fit reed valve (10), spacer (9), and tighten screw (8).



Fit seal (4), breather valve union (3), flange (2), and tighten the three screws (1) to a torque of 1 Nm ± 10%.

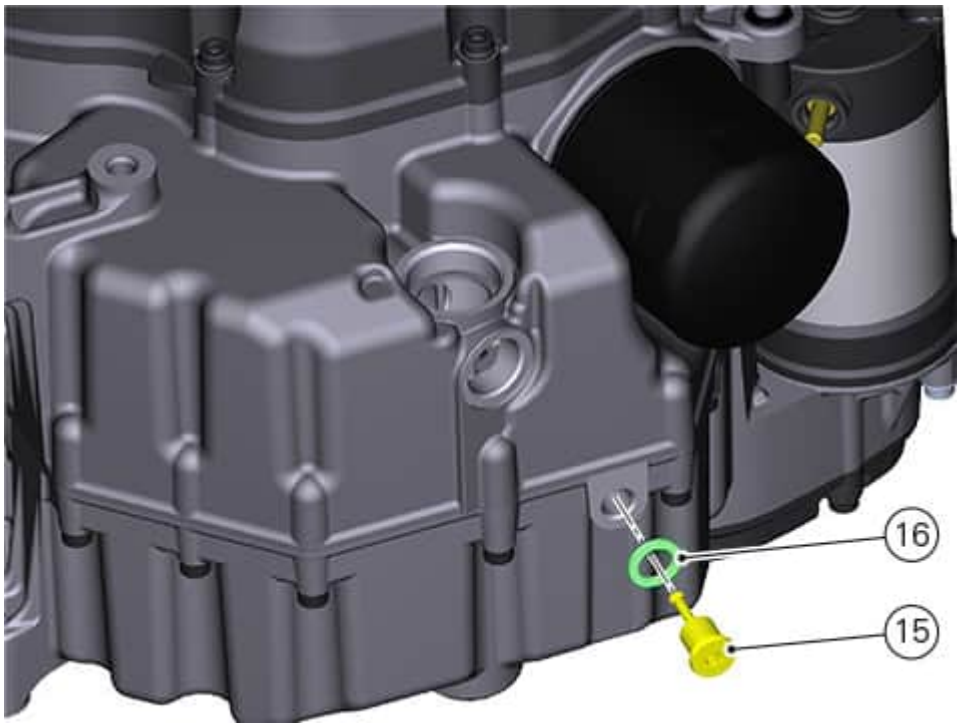


Apply the specified threadlocker on the thread of nipple (4) to be screwed inside crankcase half.
Start and then drive fully home oil filter cartridge supporting nipple (4) inside crankcase half.
Tighten the nipple to a torque of 42 Nm (Min. 38 Nm - Max. 46 Nm).

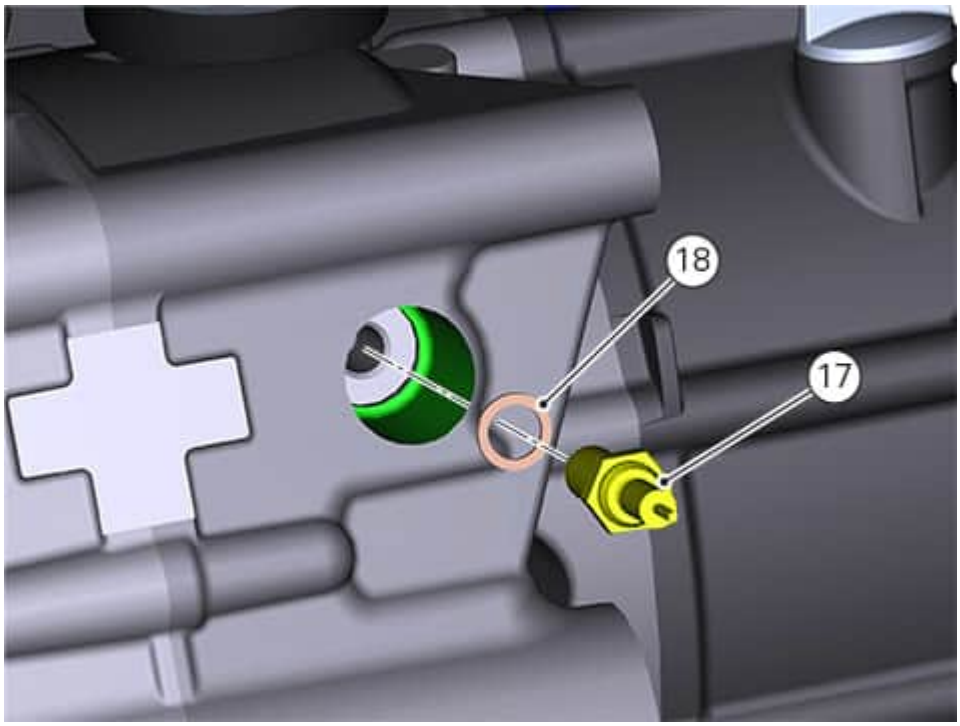


Fit the seal (16) on the oil drain plug (15). Position the seal so that the side with the square edge (B) is facing the chain side crankcase half.
Clean the plug thread, apply a bead of THREE BOND TB1215 along the plug thread spreading it by the entire circumference (360°).
Screw the drain plug (15) with seal (16) to a torque of 20 Nm (Min. 18 Nm - Max. 22 Nm).

Note
After tightening, remove any excessive sealant.



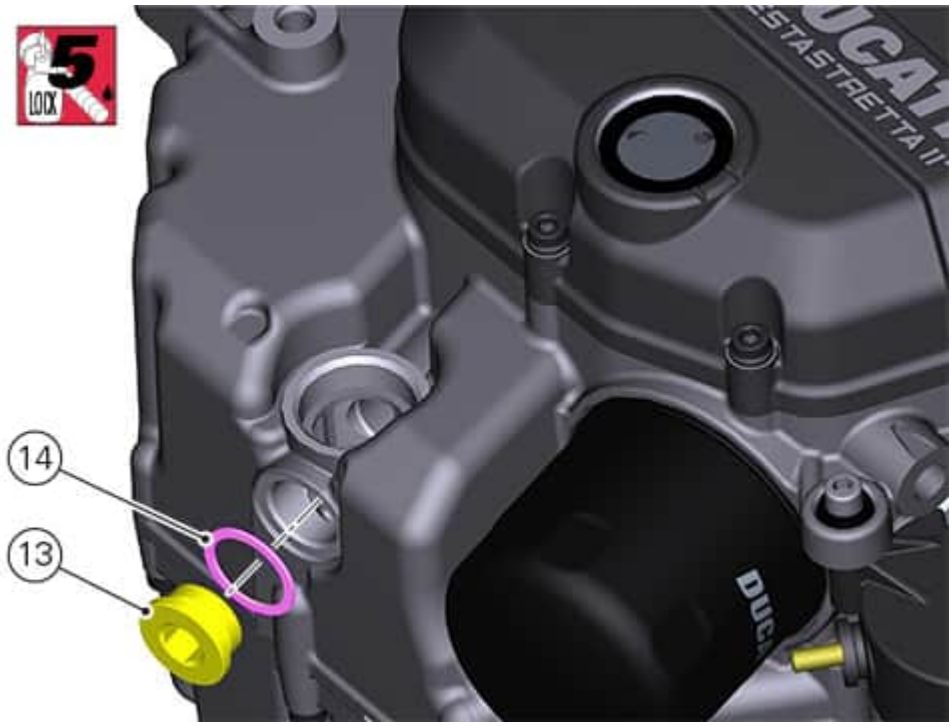
Refit the neutral sensor (17) and the relevant seal (18).



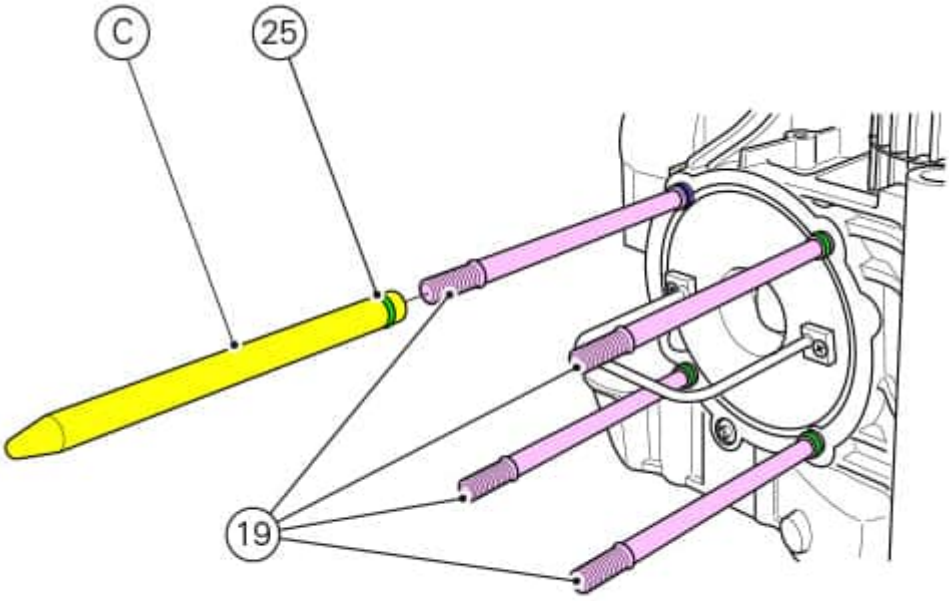
Refit the mesh filter (A) (Changing the engine oil and filter cartridge).



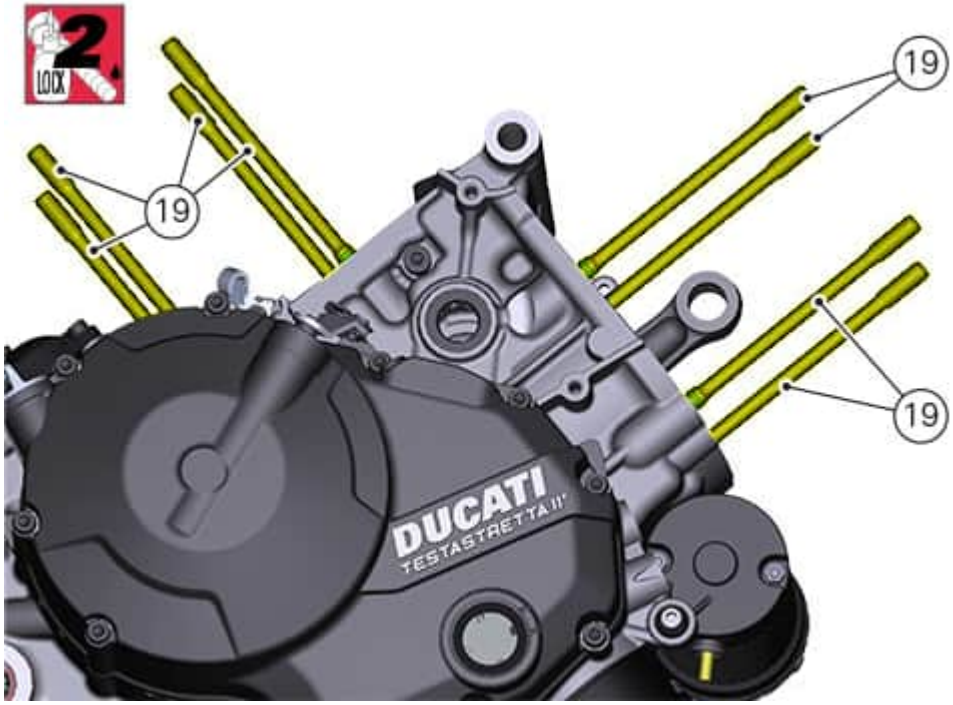
Fit the seal (24) on the mesh filter plug (23).
Seal must be positioned so that the cutting edge faces the crankcase half.
Apply the specified threadlocker to the plug.
Start plug inside crankcase half, and then tighten it to a torque of 25 Nm (Min. 22 Nm - Max. 28 Nm).
After tightening, remove any excess of threadlocker.



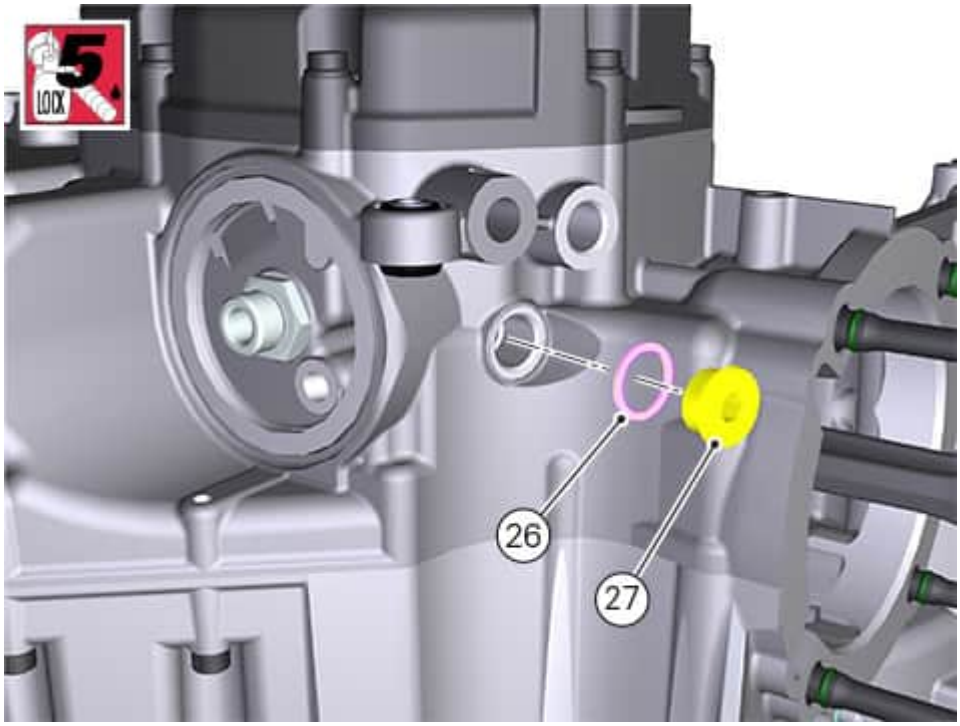
Check the condition of the O-rings (25) of the stud bolts (19) and replace them if necessary.
Use tool (C) part no. **88713.1920**, to fit the O-rings (25) in the suitable seats (D) of stud bolts (19).



Now fit the stud bolts (19) on the crankcase halves, applying sealant on the thread and tightening to a torque of 30 Nm (Min. 28 Nm - Max. 32 Nm).
Use the appropriate commercial tool for this operation.



If previously removed, fit the seal (26) on the service plug (27): the seal must be positioned so that the square edge faces the clutch-side crankcase half.
Apply the specified threadlocker on the plug thread (27), insert it in the crankcase half and tighten to a torque of 25 Nm (Min. 22 Nm - Max. 28 Nm).



Refit the mesh filter (Changing the engine oil and filter cartridge).
Refit the primary drive gear (Refitting the primary drive gear and checking backlash).
Refit the oil pump (Refitting the oil pump).
Refit the clutch unit (Refitting the clutch).
Refit the clutch cover (Refitting the clutch cover).
Refit the starter motor (Refitting the starter motor).
Refit the complete generator (Fitting the flywheel/generator assembly) and the generator side cover (Fitting the generator cover).
Refit the complete cylinder/piston assembly (Refitting the cylinder/piston assembly).
Refit the complete cylinder head assembly (Refitting the cylinder heads).
Refit the timing pulleys (Refitting the cylinder head pulleys/fixed tensioners).
Refit the timing belts (Refitting the timing belts).
Refit the external timing belt covers (Refitting the timing belt external covers).
Refit the engine in the frame (Refitting the engine).

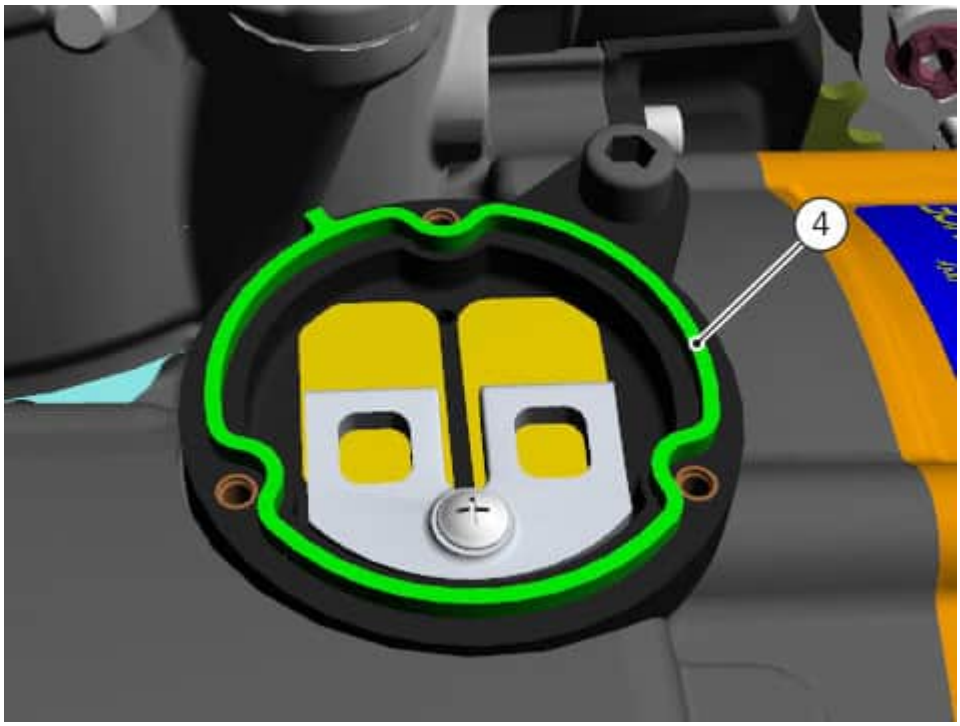
Removing outer components

Remove the engine from the frame (Removing the engine).
Remove the external belt covers (Removing the timing belt external covers).
Remove the camshaft assembly (Removing the camshafts).
Remove the complete cylinder head assembly (Removing the cylinder heads).
Remove the complete cylinder/piston assembly (Removing the cylinder/piston assembly).
Remove the generator side cover (Removing the generator cover) and the complete generator (Removing the flywheel/generator assembly).
Remove the starter motor (Removing the starter motor).
Remove the clutch cover (Removing the clutch cover).
Remove the clutch unit (Removing the clutch).
Remove the oil pump (Removing the oil pump).
Remove the primary drive gear (Removing the primary drive gear).

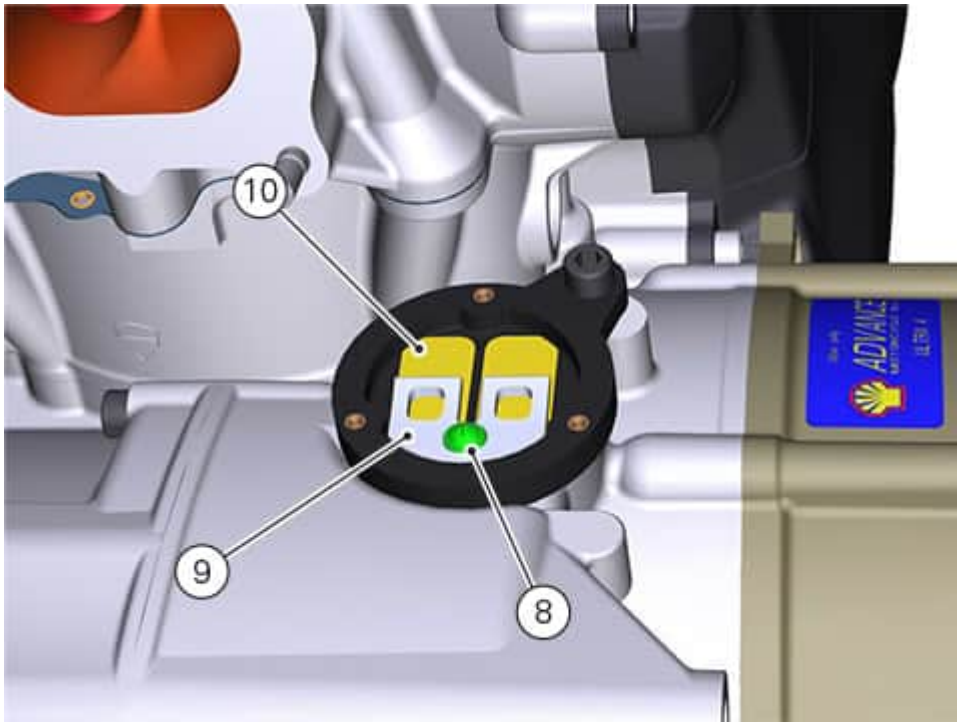
Loosen the screws (1) and remove flange (2).
Remove the oil breather valve (3) union from the engine.



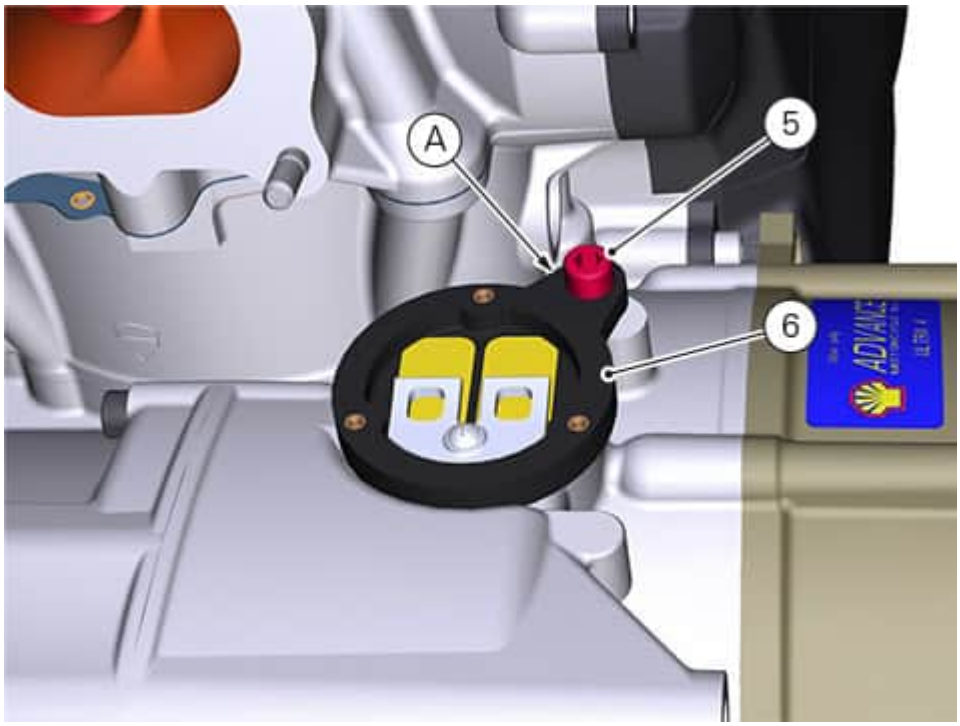
Remove gasket (4).



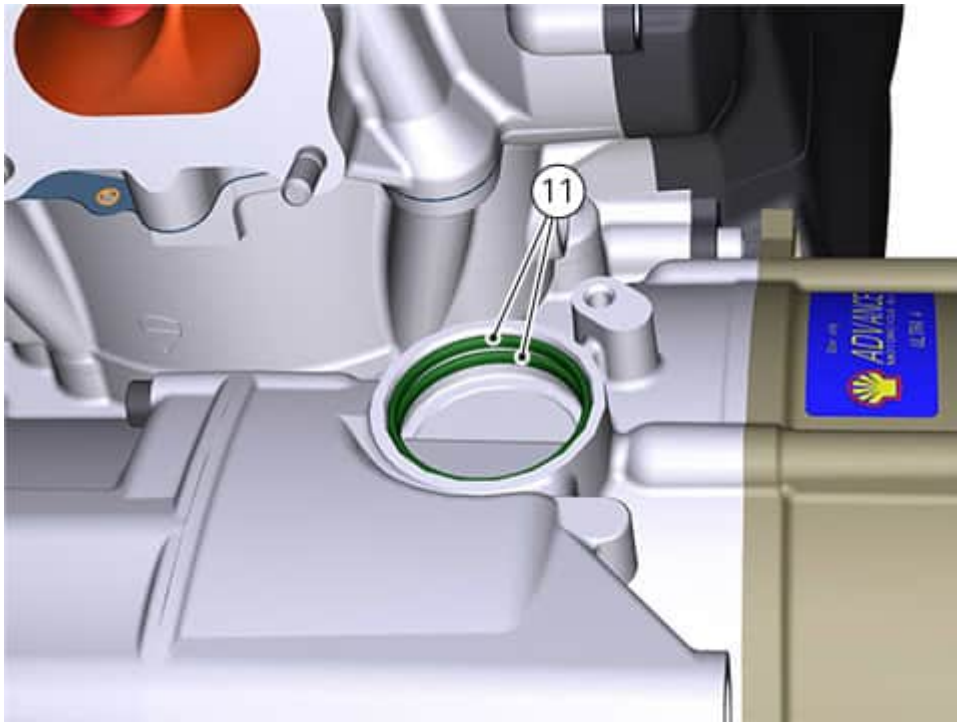
Undo screw (8) and remove spacer (9).
Remove reed valve (10).



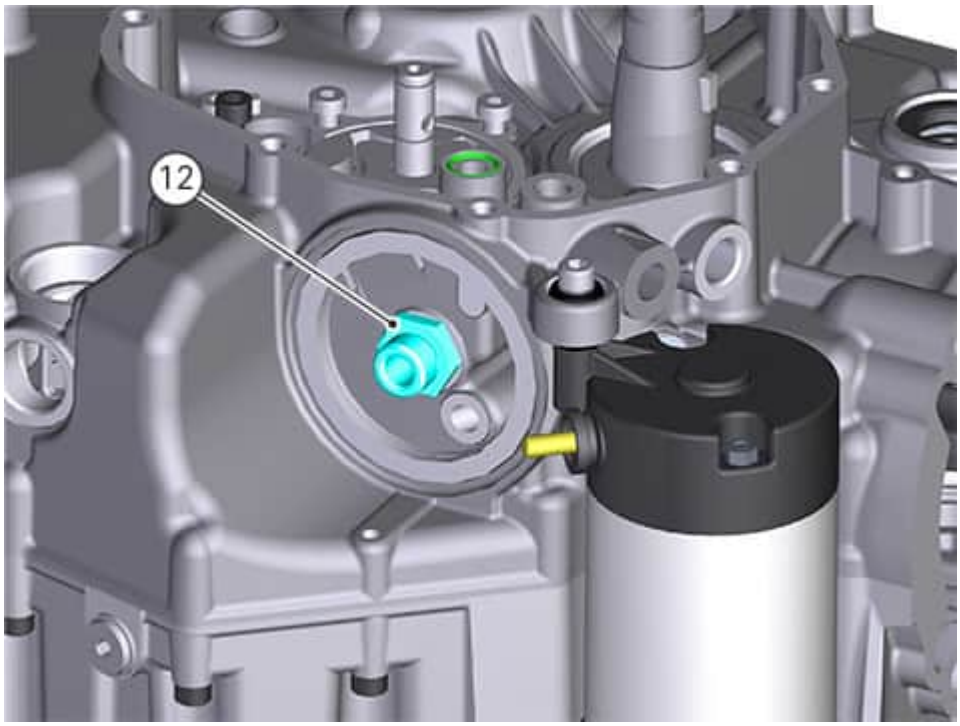
Loosen screw (5), recover spacer (7) and remove lower flange (6).



Collect the two O-rings (11).
Check the condition of the two O-rings (11) and replace them if necessary.



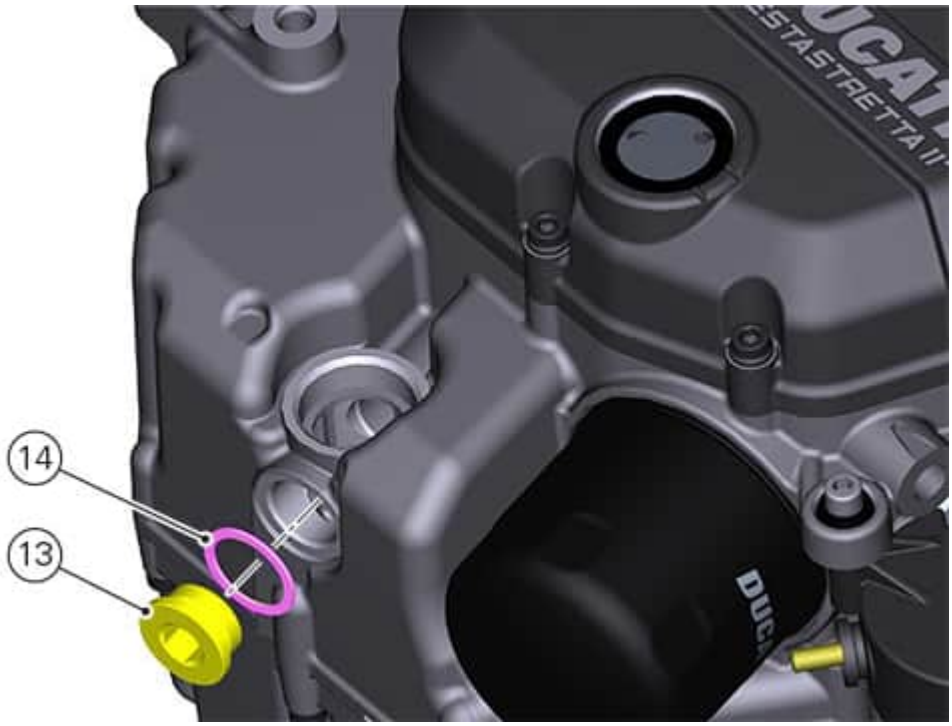
Loosen and remove oil filter supporting nipple (12).



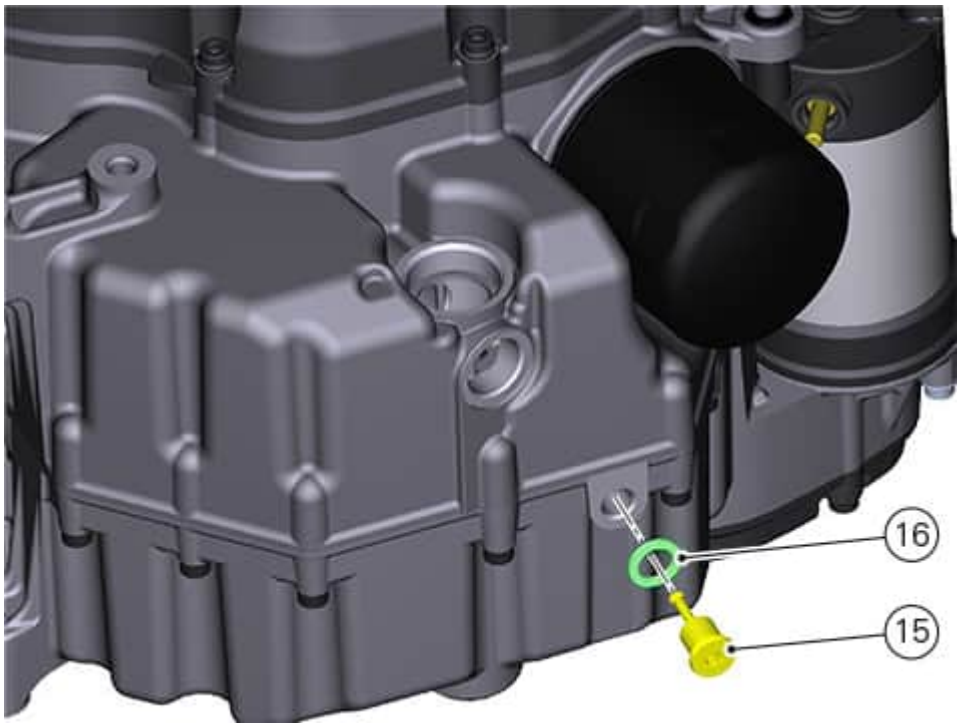
Remove plug (A) of the mesh filter and the mesh filter itself from the clutch-side crankcase half (Changing the engine oil and filter cartridge).



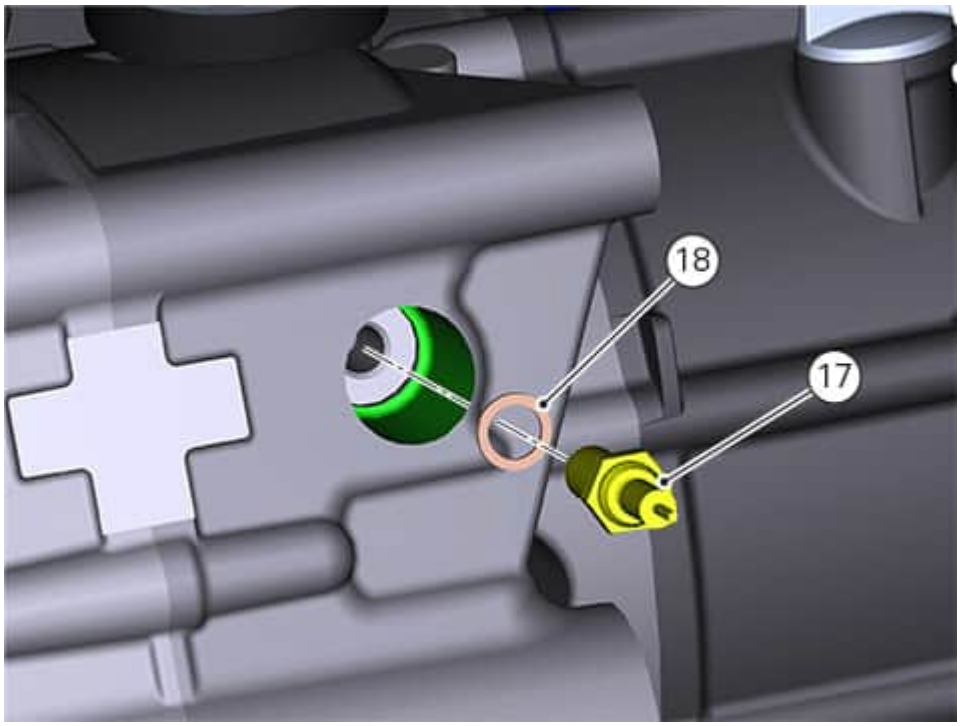
Loosen plug (13), taking care not to damage seal (14).



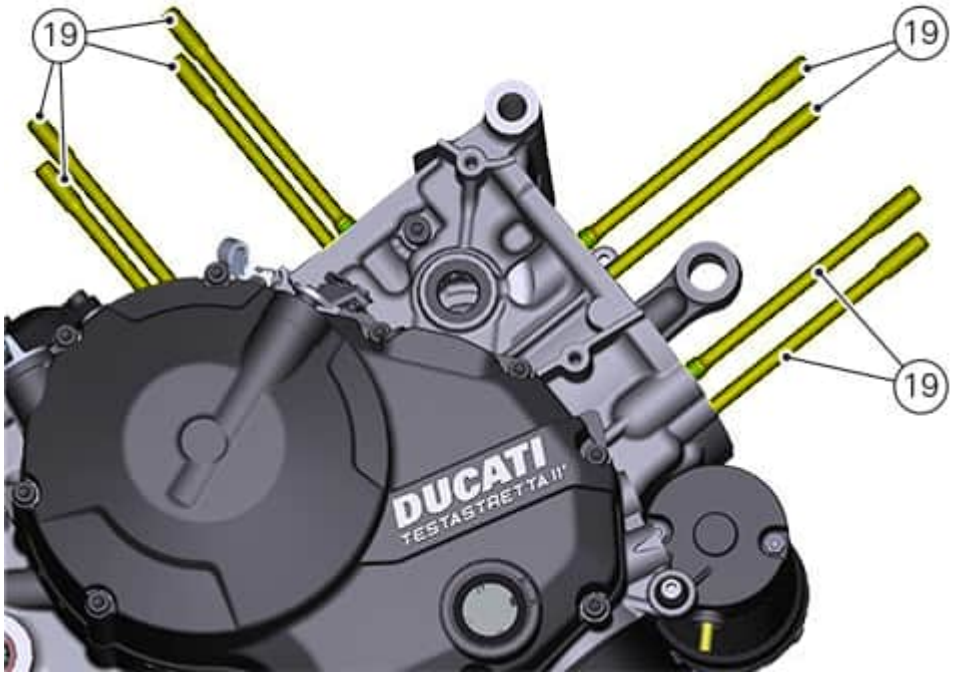
Remove the drain plug (15) with its seal (16).



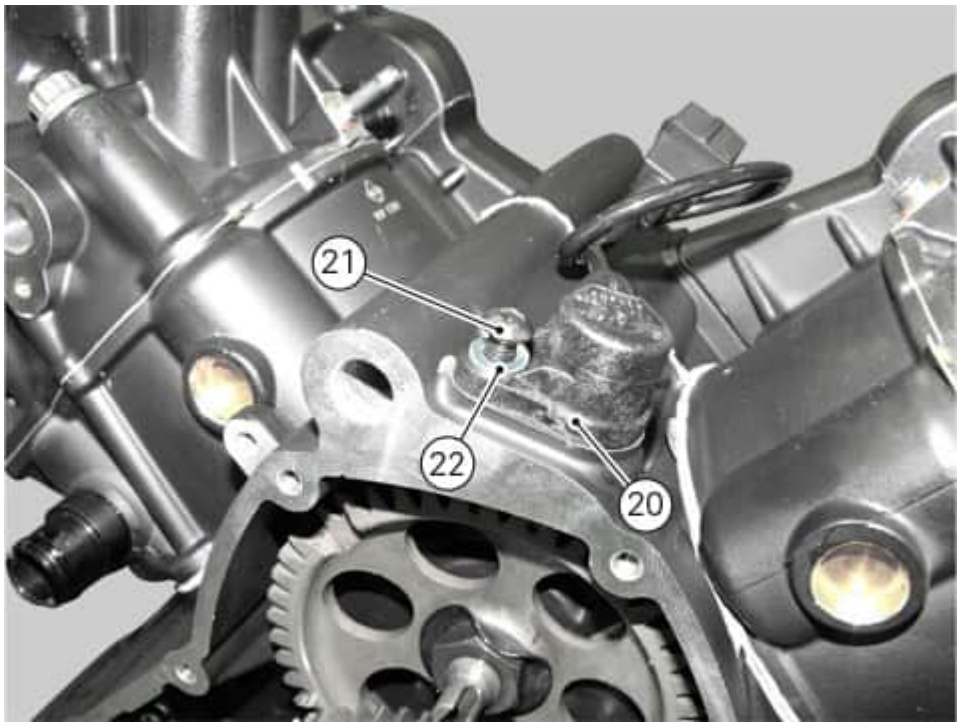
Remove the neutral sensor (17) and the relevant seal (18).



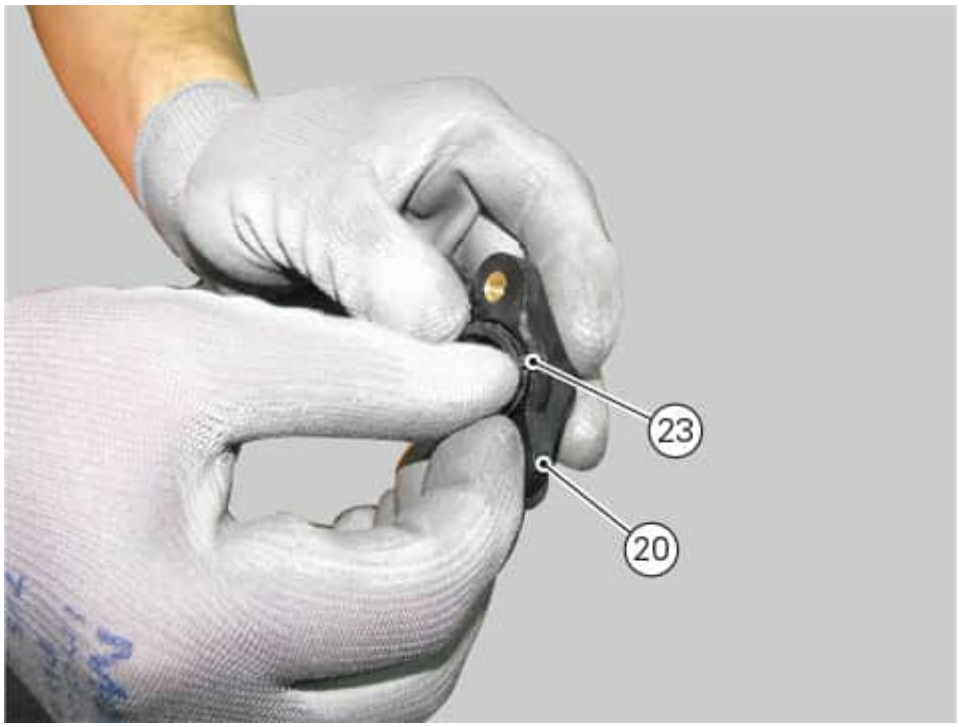
Remove the cylinder head stud bolts (19) with the aid of an appropriate tool.



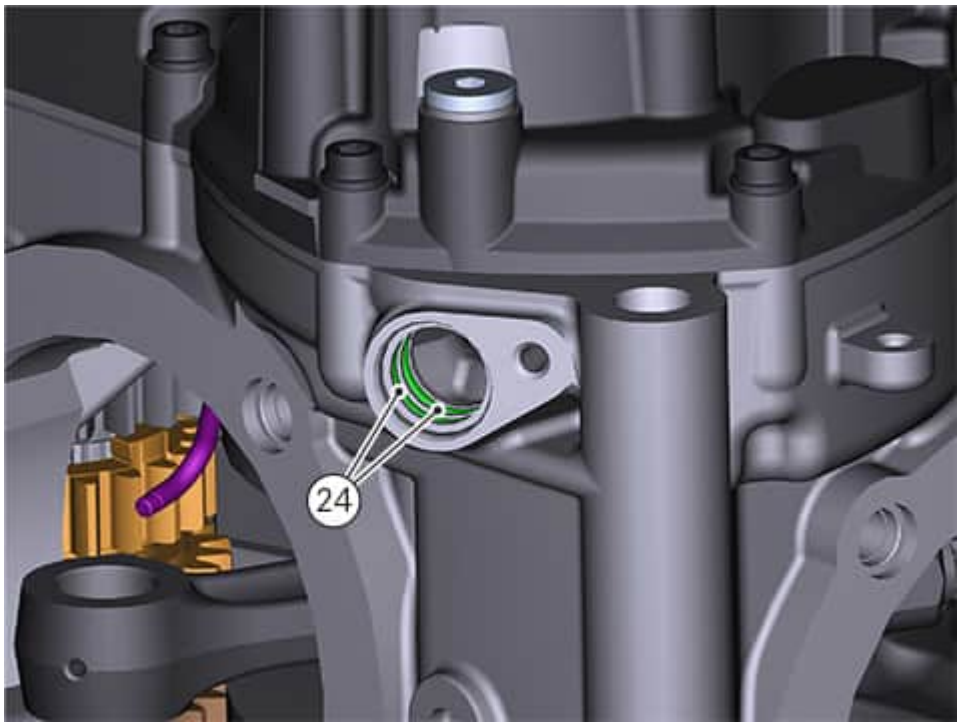
To remove the engine sensor (20), undo the screw (21) and collect the washer (22).



Check the conditions of sensor seal (23) and replace the sensor if necessary.

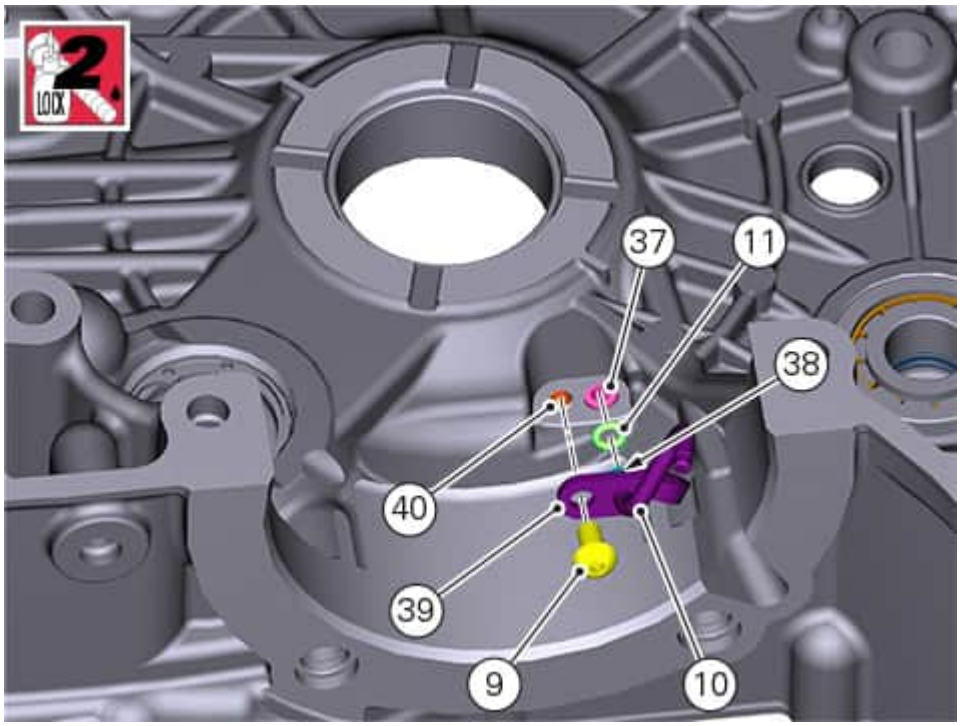


Check the condition of O-rings (24) and replace them if necessary.

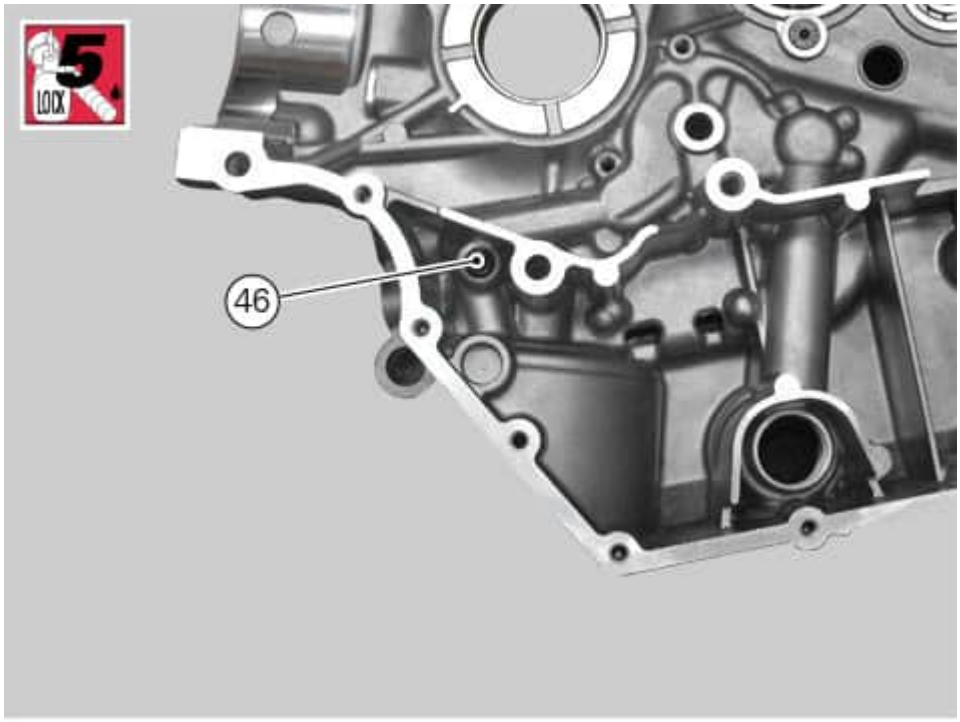

24

Closing the crankcase

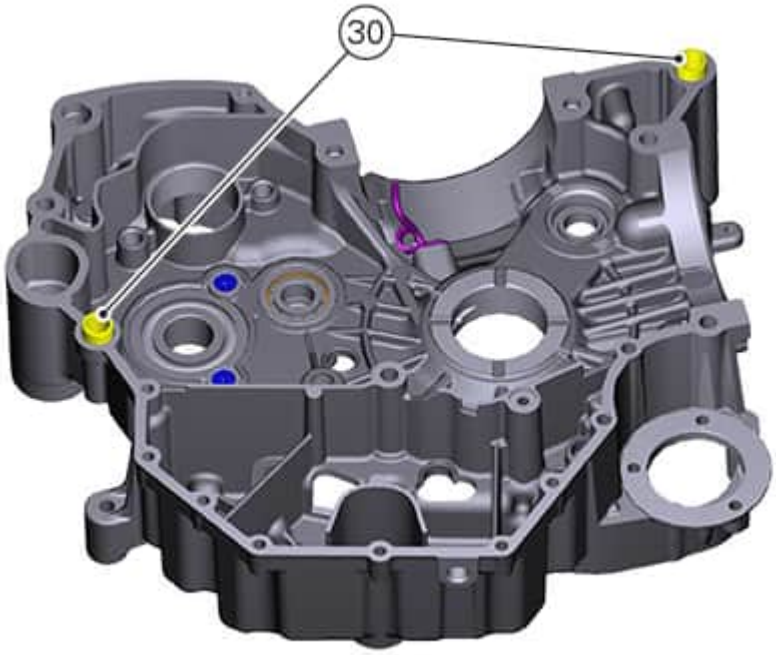
Install the O-ring (11) in its seat (37) in the crankcase half. Fit the hose (10) in the crankcase half, inserting the end (38) fully in the O-ring.
Align the hole (39) of the hose with the threaded hole (40) in the crankcase half.
Position the relevant bushing under squirter (10) of the generator side crankcase half.
Apply threadlocker to the screw (9) and start it in the threaded hole (40).
Tighten screw (9) to a torque of 8 Nm (Min. 7 Nm - Max. 9 Nm).

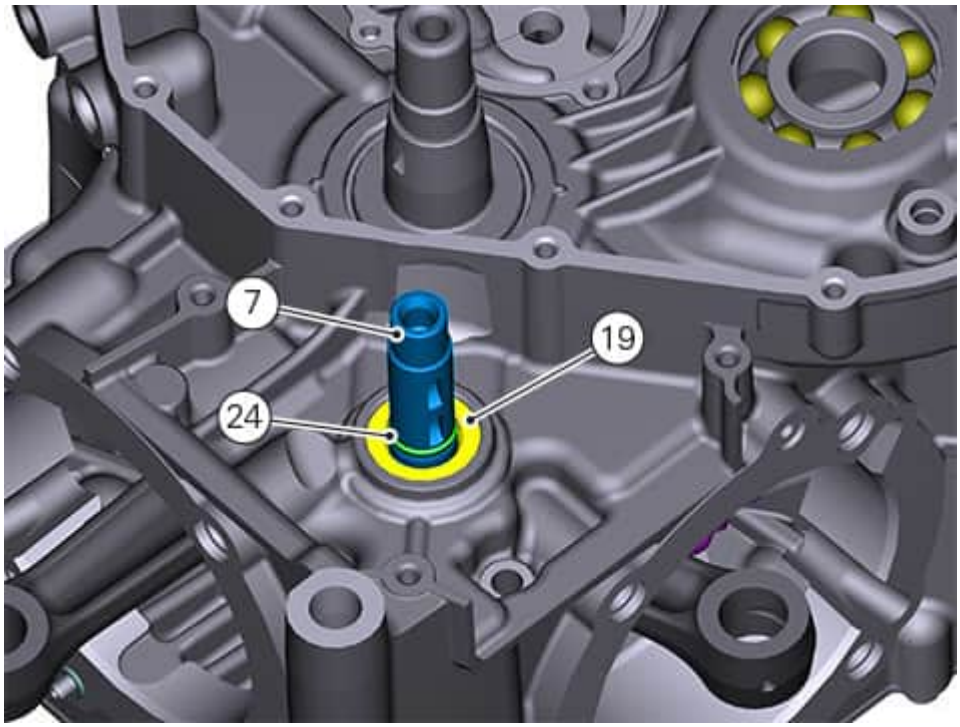


If previously removed, apply specified threadlocker to dowel (46) and tighten to a torque of 20 Nm (Min. 18 Nm - Max. 22 Nm).



Check that the two centring bushes (30) are correctly fitted.
Install the timing layshaft (7) in the roller bearing (19) on the clutch-side crankcase half.
To avoid damaging the sealing ring (24) on the timing layshaft, protect the threaded end of the shaft with the special protective cap part no. **88713.3520**.
Dampen sealing ring (24) with alcohol and fit it on the timing layshaft. Push seal until it contacts the roller bearing (19).

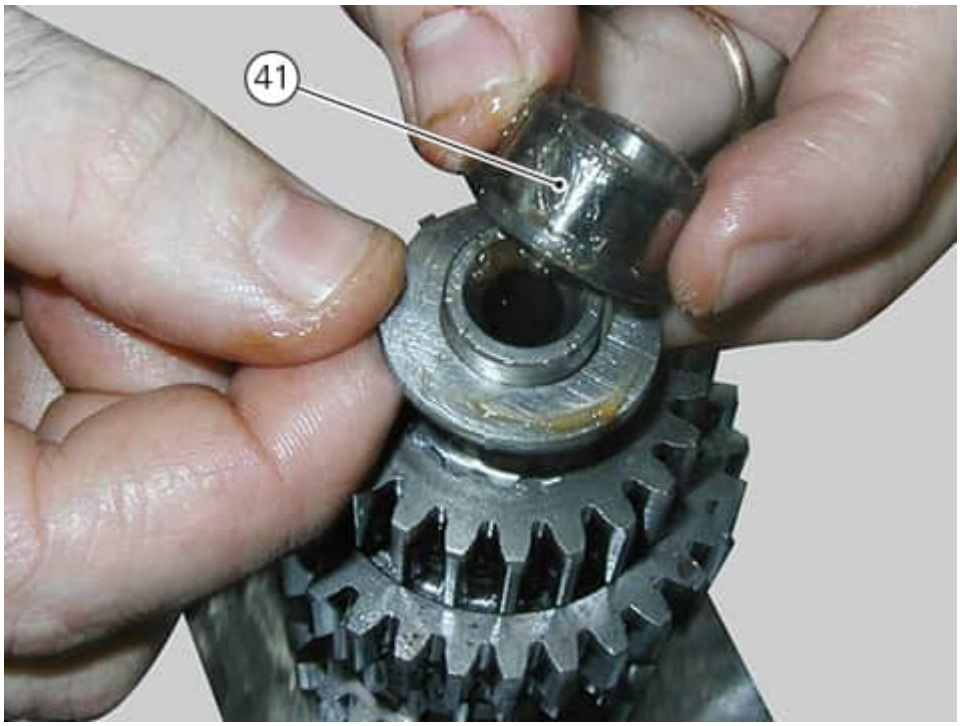




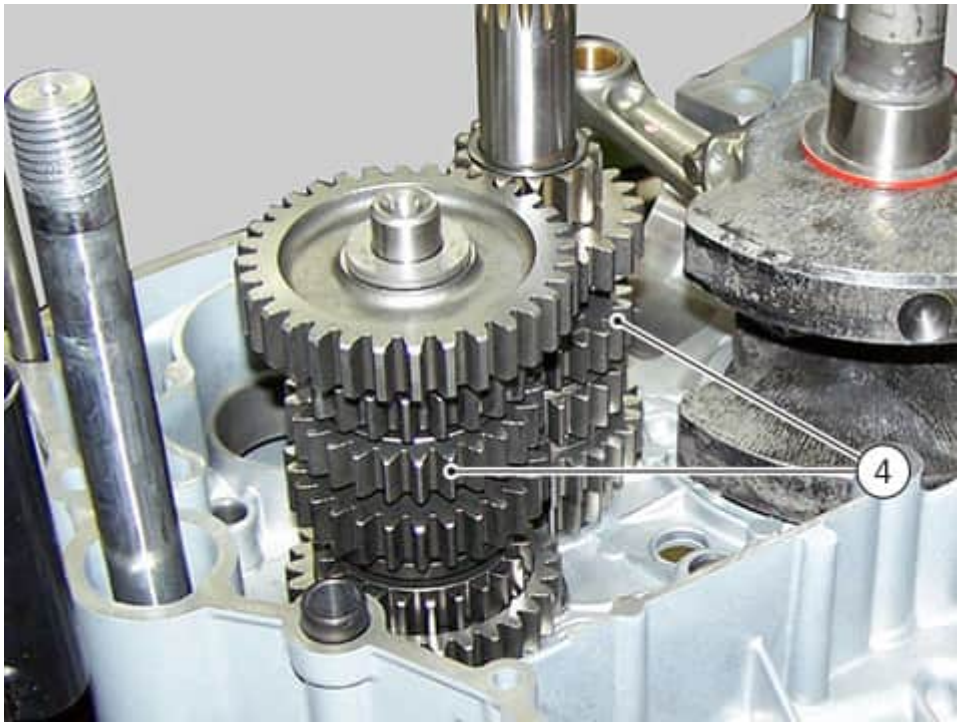
The gearbox assembly inner races (41) of gearbox shafts end bearings are fitted in the bearings themselves.

Note

When refitting used components, before installing the gearbox assembly in the crankcase half, make sure that the inner races of the gearbox shaft end bearings are fitted into the correct bearings and have not been left on the shafts.

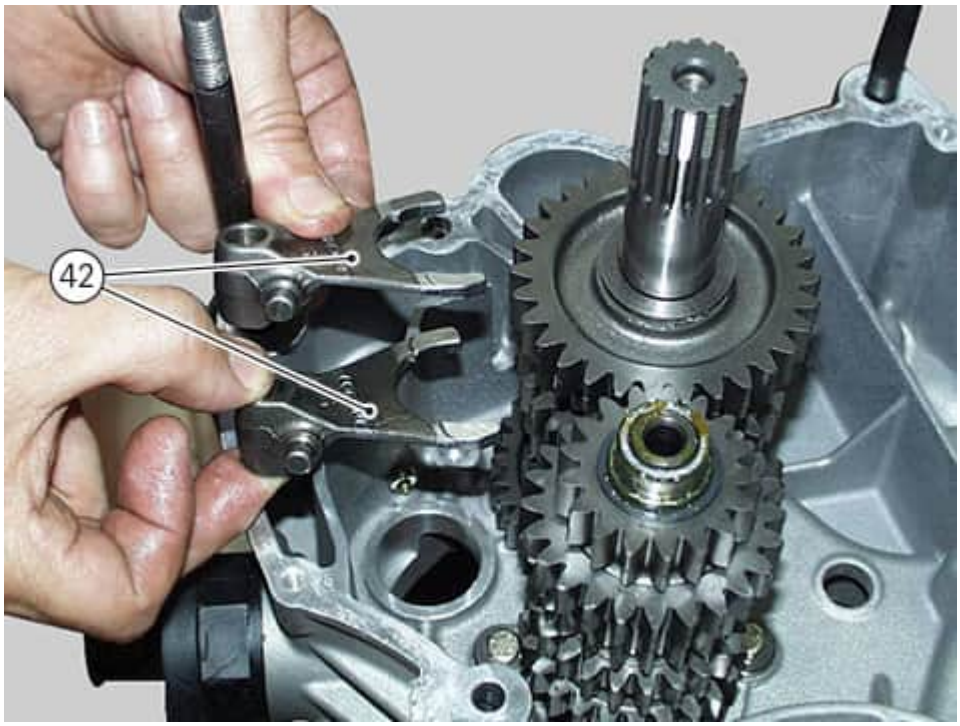


Match gearbox shafts (4) and fit them to the clutch side crankcase half, fitting the suitable shim for the gearbox secondary shaft.

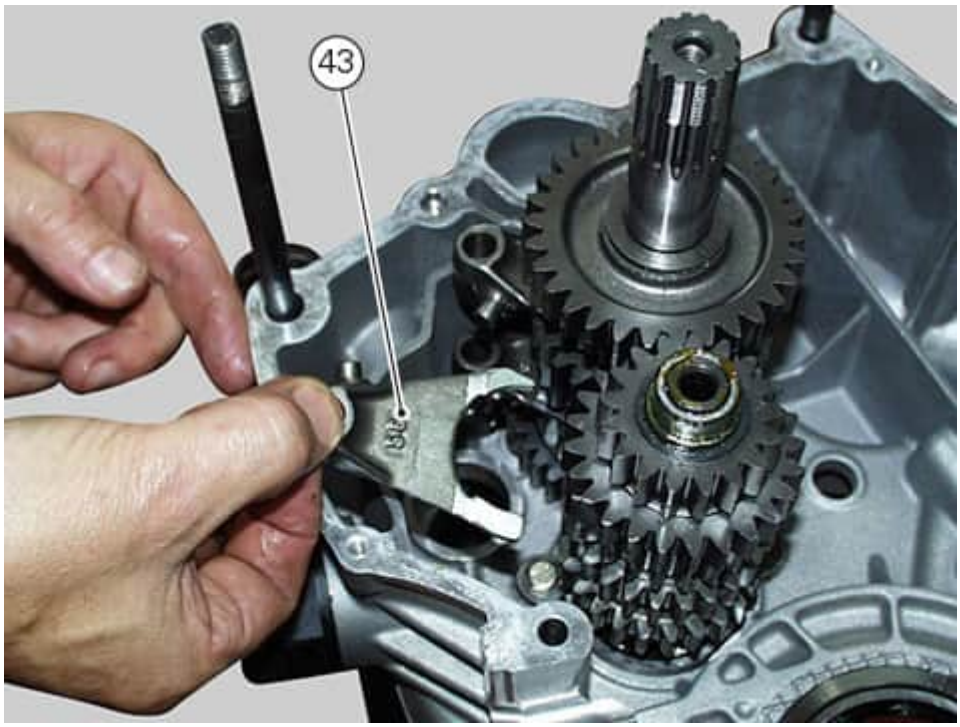


Insert the forks of 1st - 4th and 2nd - 3rd speed (42) inside the sliding grooves of the secondary shaft driven gears.

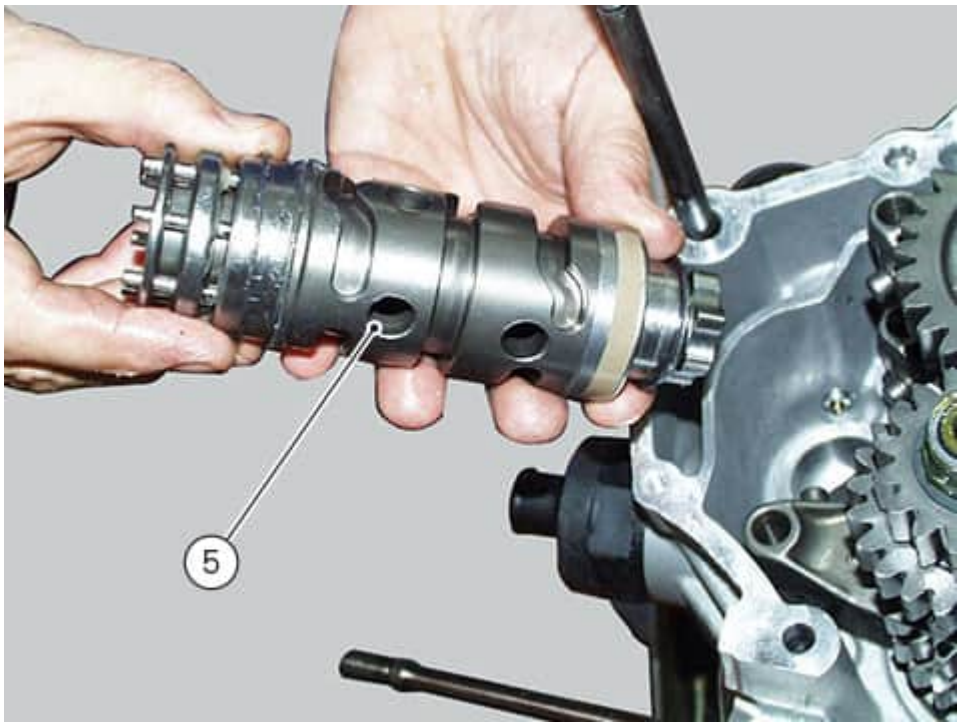
Note
The two selector forks are identical.



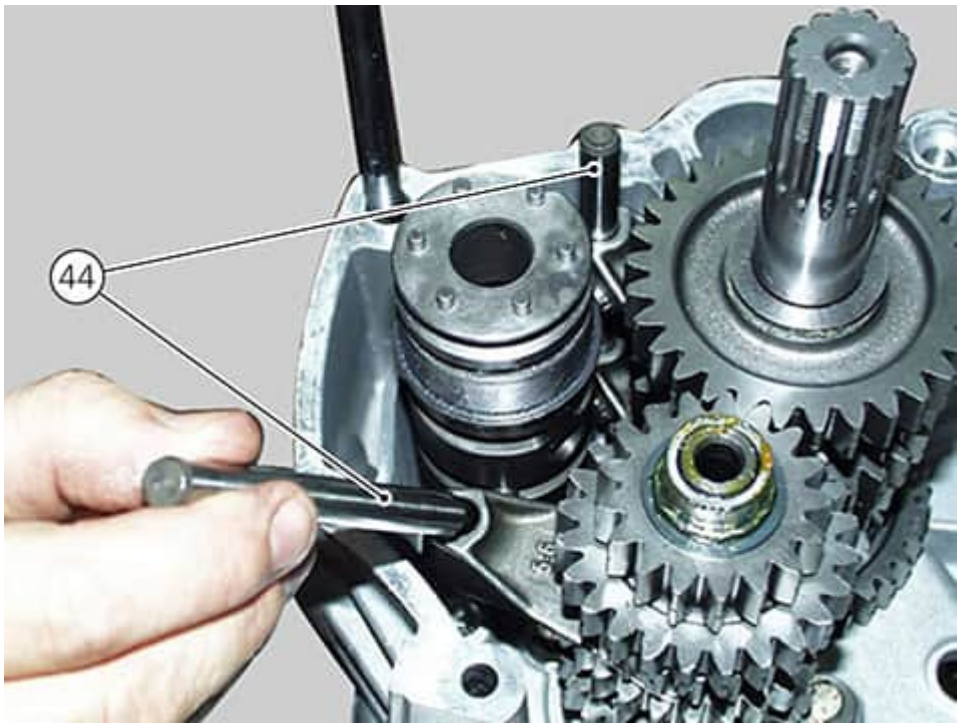
Insert the fork of 5th - 6th speed (43) inside the primary shaft driven gear.



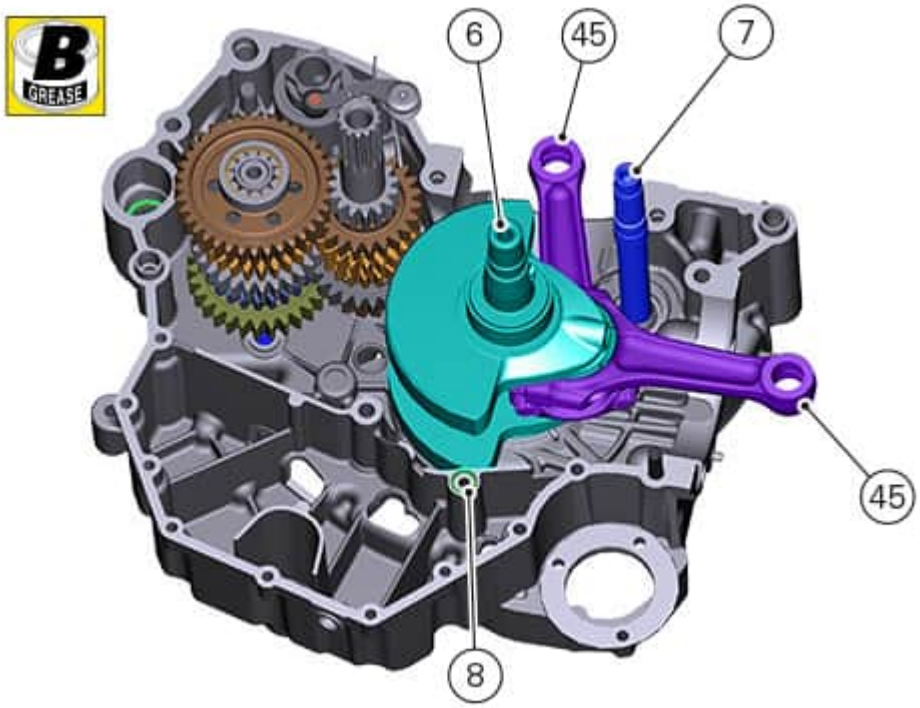
Fit the fork selector drum (5) with the calculated shims on crankcase half.



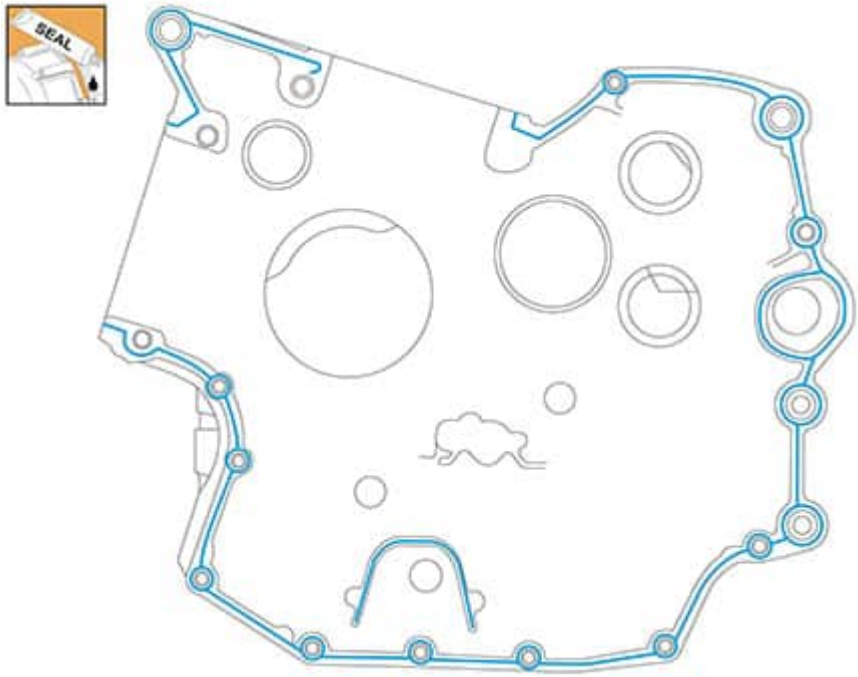
Install pins (44) in the previously installed forks.



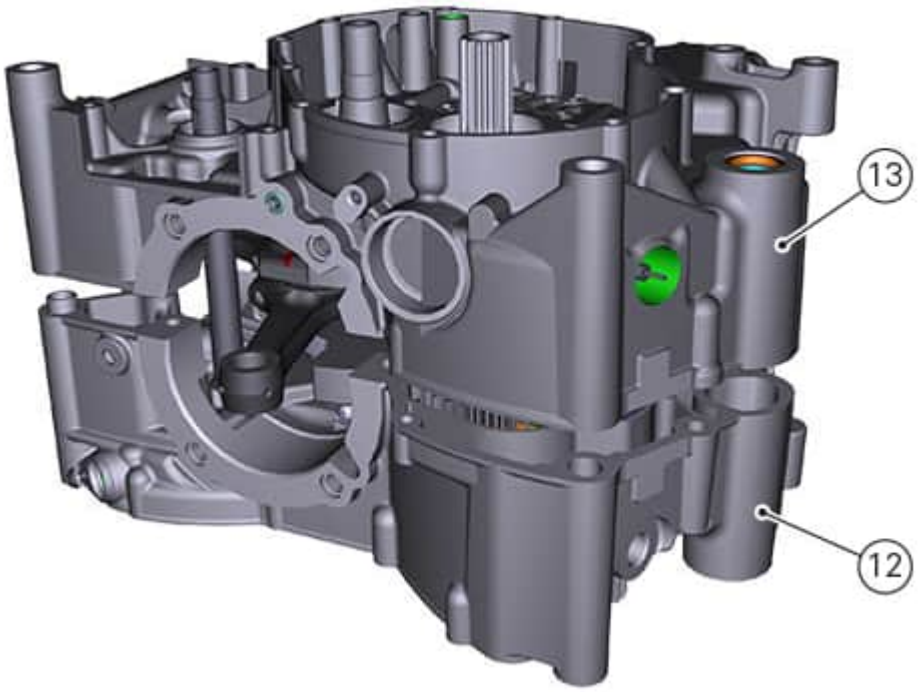
Fit crankshaft (6) with the specially calculated shim inside clutch side crankcase half bearing, positioning connecting rods (45) in the relevant seats of the cylinders.
After having duly greased it to hold it in position, install the O-ring (8) on the oil channel, between the two crankcase halves.
Make sure that the connecting rods (45) are correctly positioned in the relevant cylinder seats.
Incorrect positioning of the connecting rods at this stage will inevitably lead to the need to re-open the crankcase halves.



Apply an even, regular bead of DUCATI sealing compound on the mating surface of the crankcase halves and around all holes, as shown.



Bring the crankcase halves (12) and (13) together, tapping with a rubber mallet in the area of the shafts if necessary.

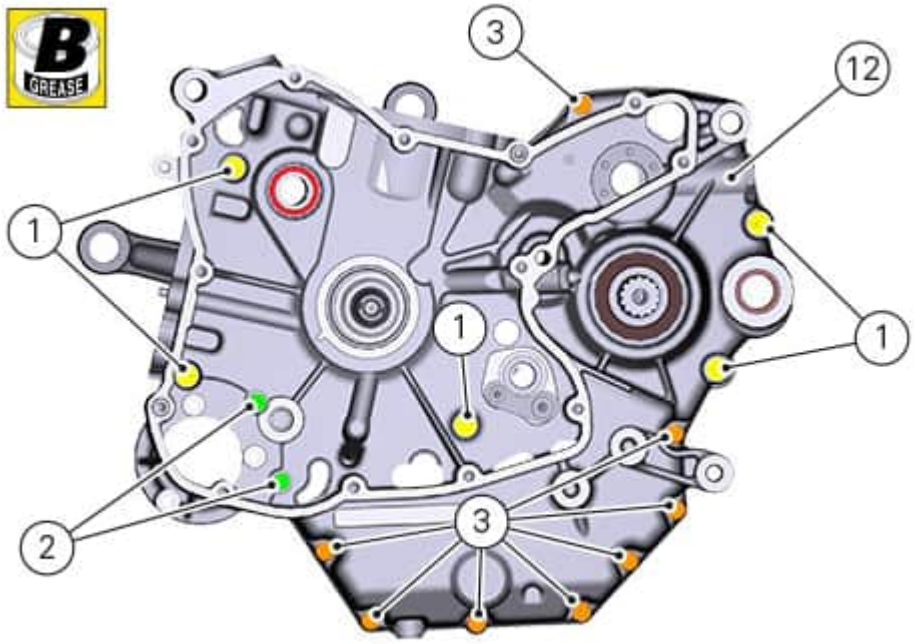


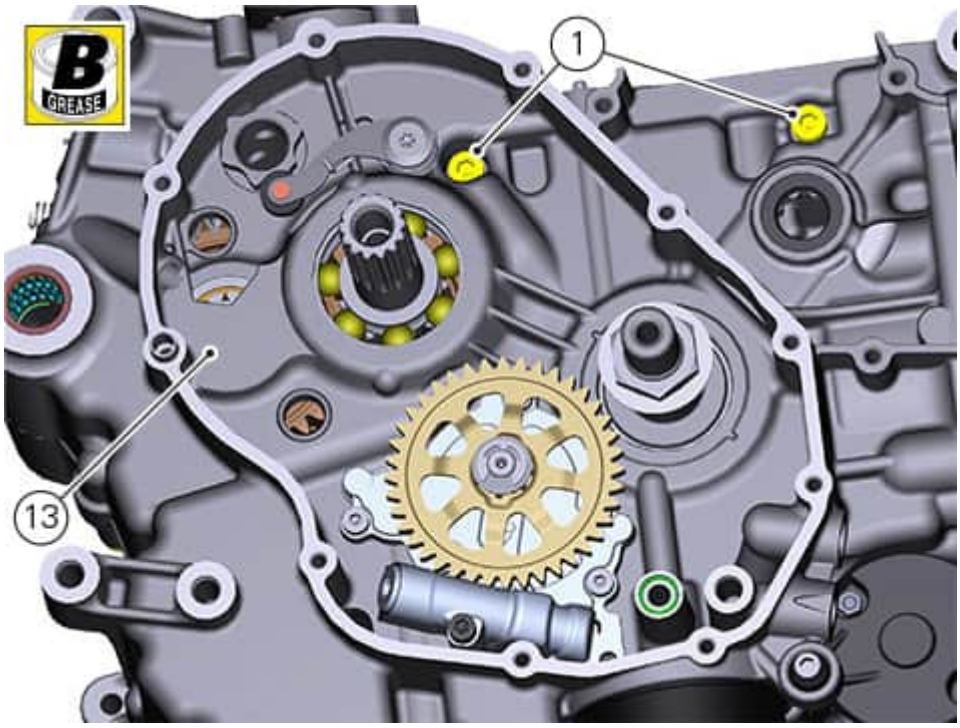
Apply specified grease on the retaining screws and start them on the generator side crankcase half (12) and on the clutch side crankcase half (13) by paying attention to the different lengths.

Ref.	Q.ty	Description
1	7	screws M8 x 75 mm
2	2	screws M6 x 75 mm
3	7	screws M6 x 35 mm

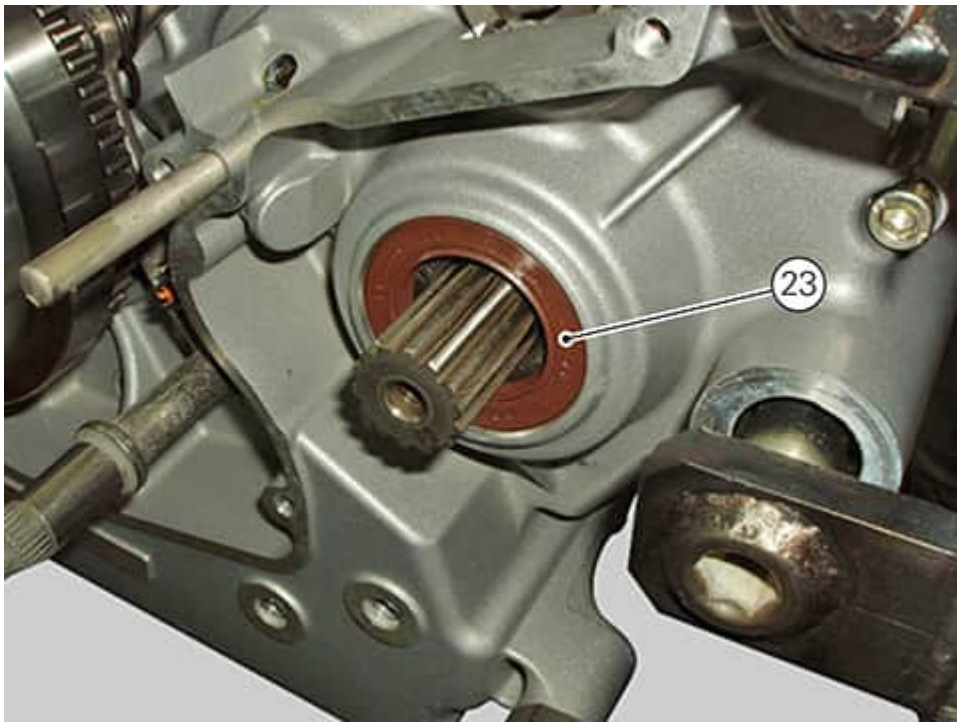
Start and progressively drive fully home the jointing screws starting with those with a larger diameter (M8).
Install two M8 screws (1), on the clutch side crankcase half (13).
Tighten all screws to the indicated torque:

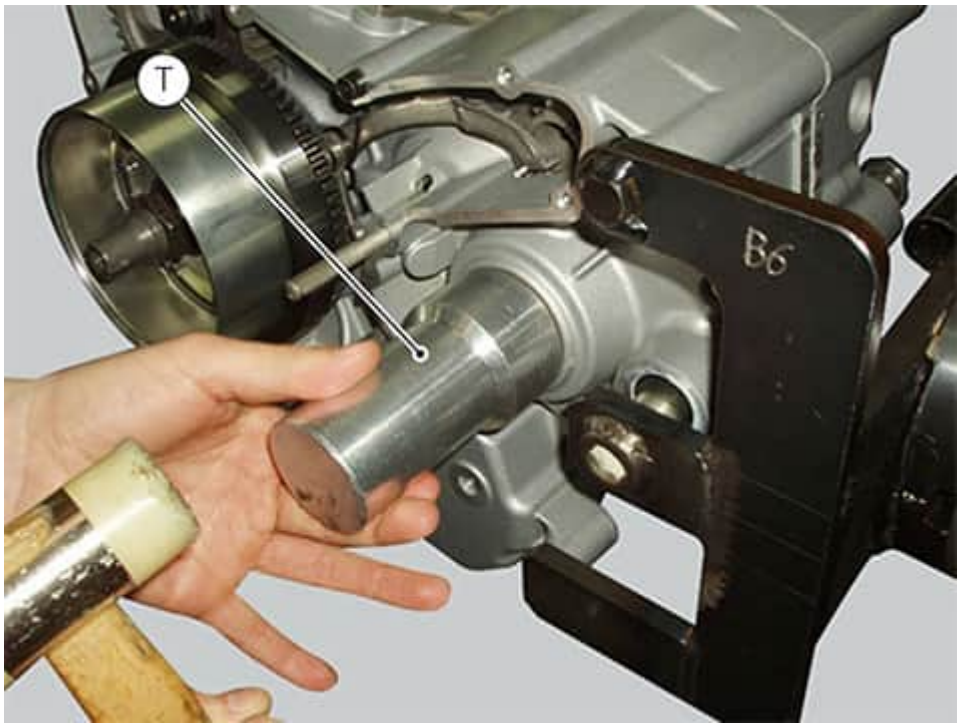
- screws (1) first to a snug torque of 19 Nm (Min. 17 Nm - Max. 21 Nm), then to a tightening torque of 25 Nm (Min. 22 Nm - Max. 28 Nm);
- screws (2) and (3) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).





Check crankshaft rotation on main bearing shells, and make sure that all fitted parts turn or move correctly.
If not already done, fit the sealing ring (23) on the gearbox secondary shaft with the special drift (T).





Refit the mesh filter (Changing the engine oil and filter cartridge).
Refit the primary drive gear (Refitting the primary drive gear and checking backlash).
Refit the oil pump (Refitting the oil pump).
Refit the clutch unit (Refitting the clutch).
Refit the clutch cover (Refitting the clutch cover).
Refit the starter motor (Refitting the starter motor).
Refit the complete generator (Fitting the flywheel/generator assembly) and the generator side cover (Fitting the generator cover).
Refit the complete cylinder/piston assembly (Refitting the cylinder/piston assembly).
Refit the complete cylinder head assembly (Refitting the cylinder heads).
Refit the timing pulleys (Refitting the cylinder head pulleys/fixed tensioners).
Refit the timing belts (Refitting the timing belts).
Refit the external timing belt covers (Refitting the timing belt external covers).
Refit the engine in the frame (Refitting the engine).

Shimming the shafts

Before assembling the crankcase halves, it is necessary to check the size of the shims that determine the end float of the gearbox shafts.

Shimming the gearbox shafts		
The following shims are supplied as spare parts: one for each shaft.		
Gearbox primary shaft	Chain side	1.6 mm
Gearbox secondary shaft	Clutch side	3.15 mm

Shimming the gearbox drum		
The following shims are supplied as spare parts.		
Gear shift drum	Chain side	0.9 mm
Gear shift drum	Clutch side	1.0 mm

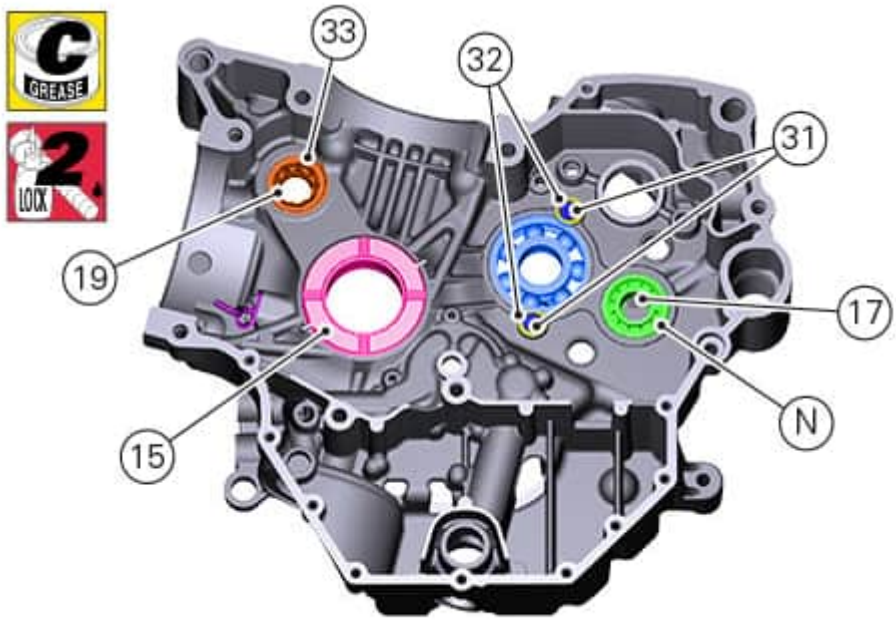
Reassembling the crankcase halves

The crankcase halves must be in good condition and perfectly clean. The mating surfaces must be perfectly flat and free from burrs.

Reassembling the clutch side crankcase half (13)

The following parts must be present on the internal side of the crankcase half:

- the secondary shaft bearing (17); apply grease on the bearing rollers. Drive the inner race (N), removed previously, fully home in the bearing. Apply grease to the inner race;
- the primary shaft bearing (21), secured with the screws (31) and the retaining spacers (32): apply recommended threadlocker to the screws (31), and tighten to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm);
- the roller bearing (19) with circlip (33) installed at the timing layshaft.
  - the main bearing shells (15).



Reassembling the generator side crankcase half (12)

The following parts must be present on the internal side of the crankcase half:

- the double-race ball bearing (16) supporting the selector fork shaft. If removed, apply threadlocker to the screws (34). Start screws (34) with retaining spacers (35). Tighten the screws (34) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).
- the gearbox primary shaft end bearing (20) with inner spacer (22): apply grease on the bearing needle rollers. Drive the inner race (R), removed previously, fully home in the bearing. Apply grease to the inner race.
- the main bearing shells (14).
- the ball bearing (18) with circlip (33) at the timing layshaft, aiming it so that the plastic cage closed side is facing the crankcase half.



Note

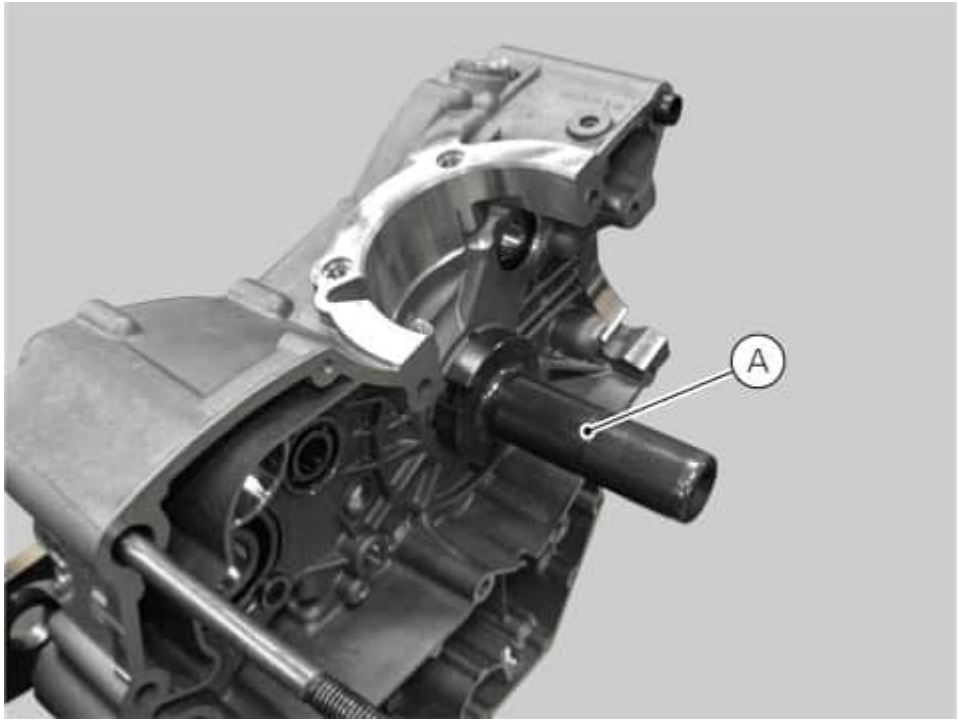
Bearings do not have a specific mounting position, however it is good practice to install the bearings so that the written side is facing upwards.

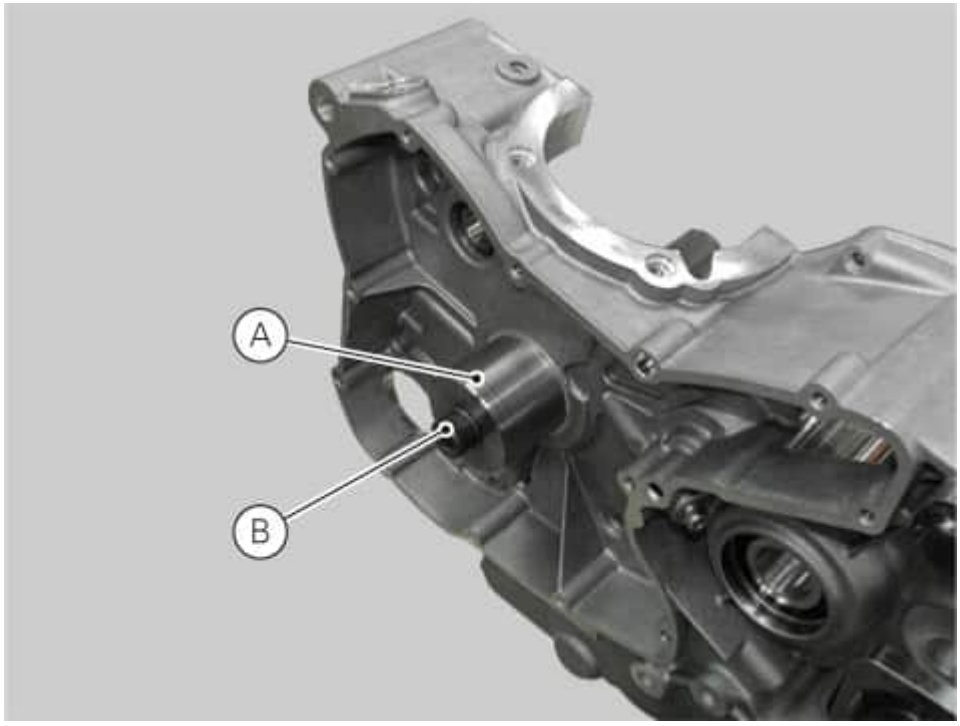
Main bearing shells

Remove the engine from the frame (Removing the engine).
Remove the external belt covers (Removing the timing belt external covers).
Remove the timing belts (Removing the mobile tensioner/timing belt).
Remove the timing pulleys (Disassembling the timing shaft pulleys).
Remove the complete cylinder head assembly (Removing the cylinder heads).
Remove the complete cylinder/piston assembly (Removing the cylinder/piston assembly).
Remove the generator side cover (Removing the generator cover) and the complete generator (Removing the flywheel/generator assembly).
Remove the starter motor (Removing the starter motor).
Remove the clutch cover (Removing the clutch cover).
Remove the clutch unit (Removing the clutch).
Remove the oil pump (Removing the oil pump).
Remove the primary drive gear (Removing the primary drive gear).
Remove the mesh filter (Changing the engine oil and filter cartridge).
Separate the crankcase halves (Separating the crankcase halves).

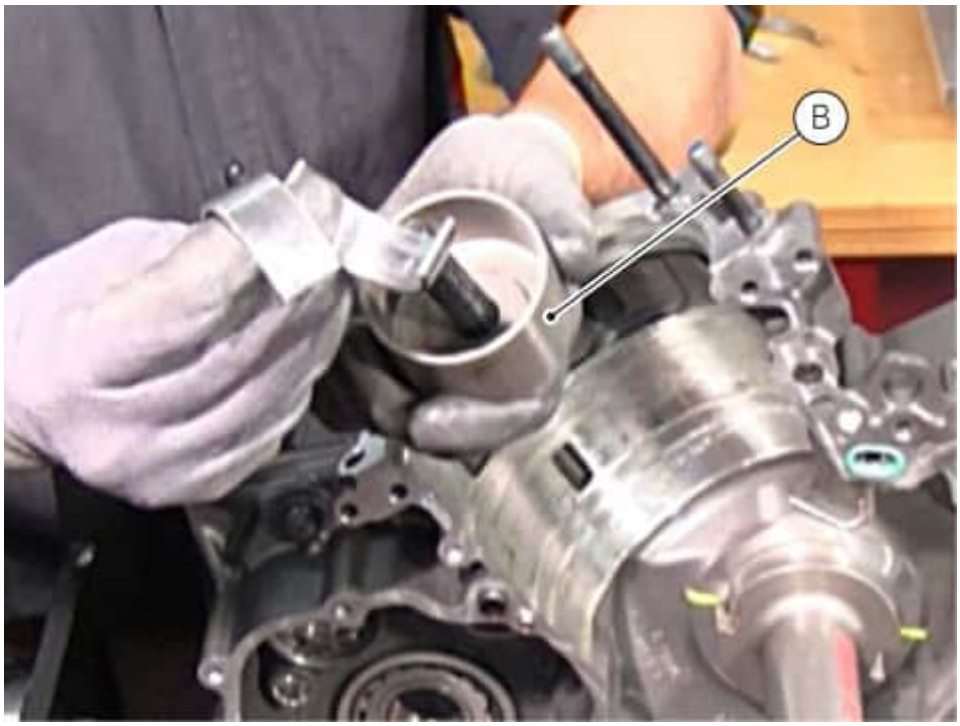
Remove the crankshaft bearing shells (14) and (15) using tool (A) part no. **88713.4145**, set drift inside the casing and the cap on the outside.
Tighten screw (B) fully home.







Loosen screw (B) and remove main bearing shells (28) from tool.



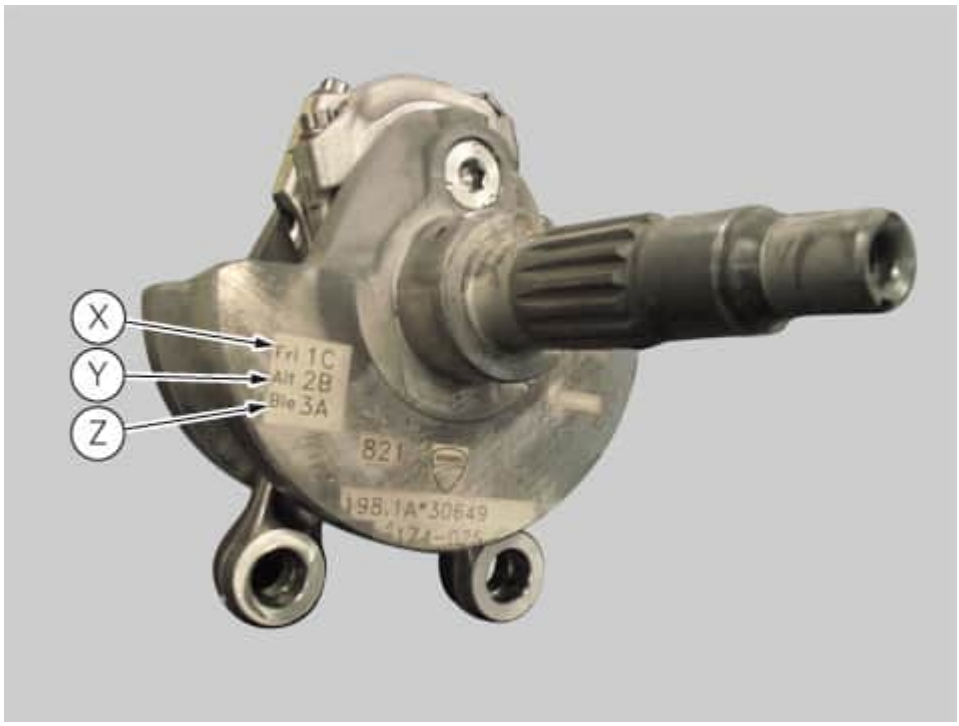
Crankshaft is supplied in classes ranging from "A" to "D"

Select the bearing shells according to crankshaft and crankcase punching, as follows:
X - **Fri (X)**: shimming on clutch side
Y - **Altc (Y)**: Shimming on generator side
Z - **Bie (Z)**: type of selected con-rod

MAIN BEARING SHELLS CLASS					
Crankshaft class	Crank pin size (mm)	Crankcase class	Crankcase hole size (mm)	Shell colour	Bearing shell thickness (mm)
A	49.992 to 45.000	A	49.000 to 49.008	RED	1.994 to 1.999
A	49.992 to 45.000	B	49.008 to 49.016	BLUE	1.998 to 2.003
B	49.984 to 49.992	A	49.000 to 49.008	BLUE	1.998 to 2.003
B	49.984 to 49.992	B	49.008 to 49.016	YELLOW	2.002 to 2.007
C	44.976 to 44.984	A	49.000 to 49.008	YELLOW	2.002 to 2.007
C	44.976 to 44.984	B	49.008 to 49.016	BLACK	2.006 to 2.011
D	44.968 to 44.976	A	49.000 to 49.008	BLACK	2.006 to 2.011
D	44.968 to 44.976	B	49.008 to 49.016	GREEN	2.010 to 2.015
COUPLING CLEARANCE **0.037 to 0.063**					

The size class of the two main journals is punched on the crankshaft counterweight and the CLUTCH and CHAIN side are clearly indicated.
Both casings are clearly marked with main journal size class.

Important
As shown in the figure, the size class of the two main journals is punched on the crank web and CLUTCH side and CHAIN side are clearly indicated.

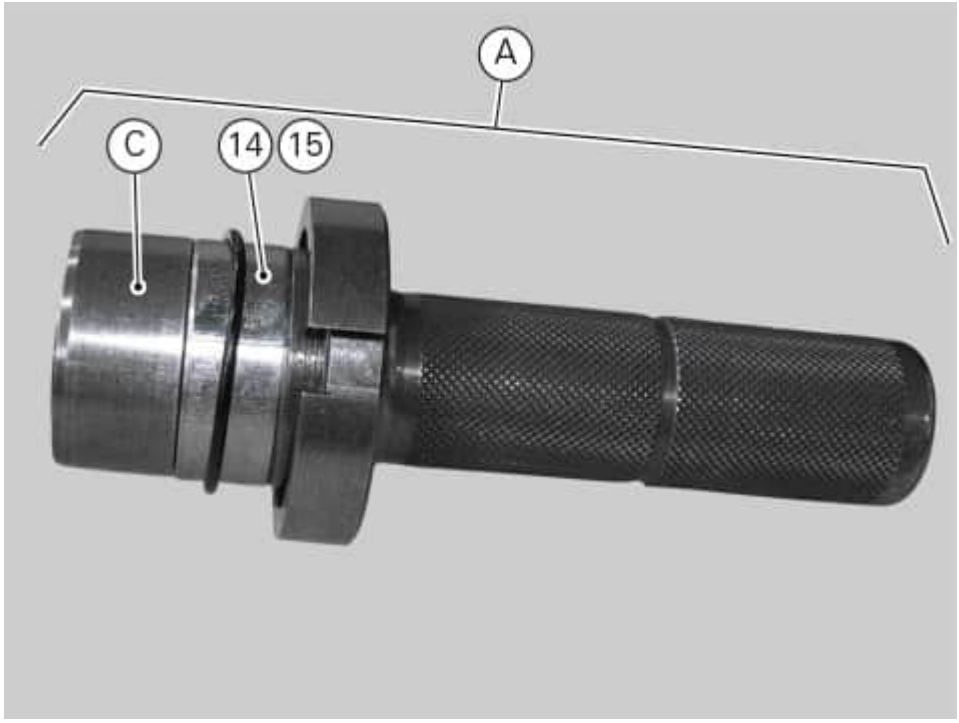


Important

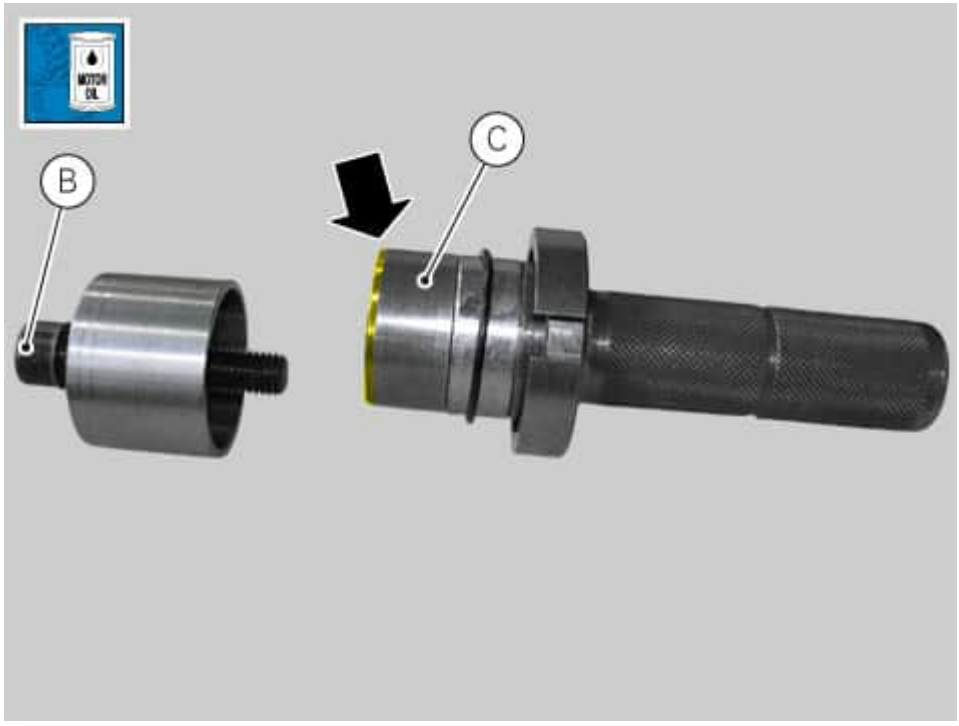
As shown in the figure, both casings are clearly marked with main journal size class.

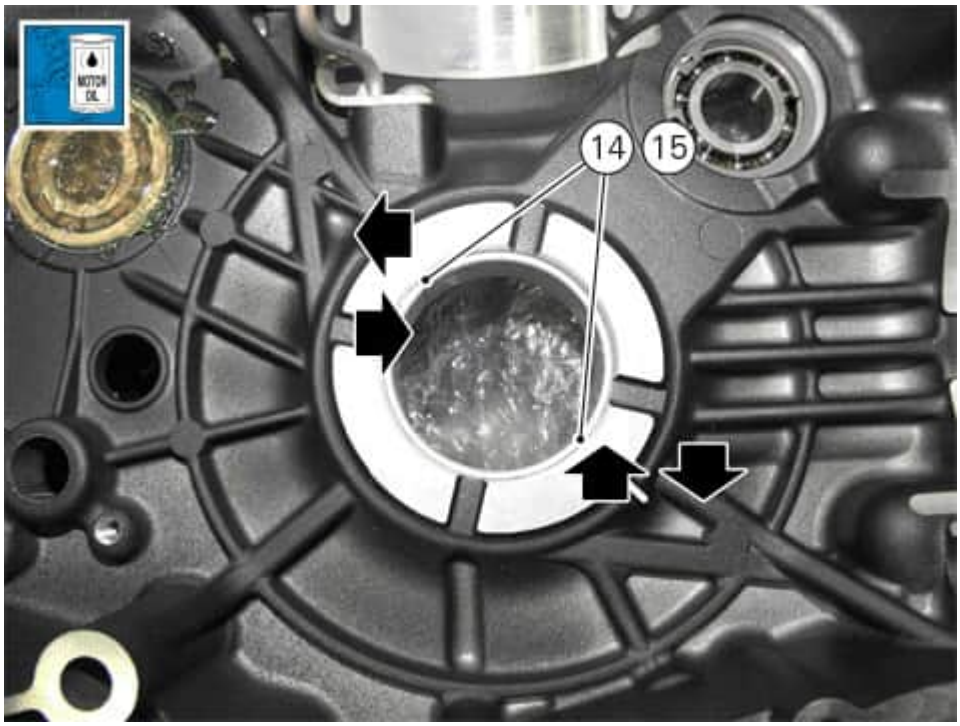


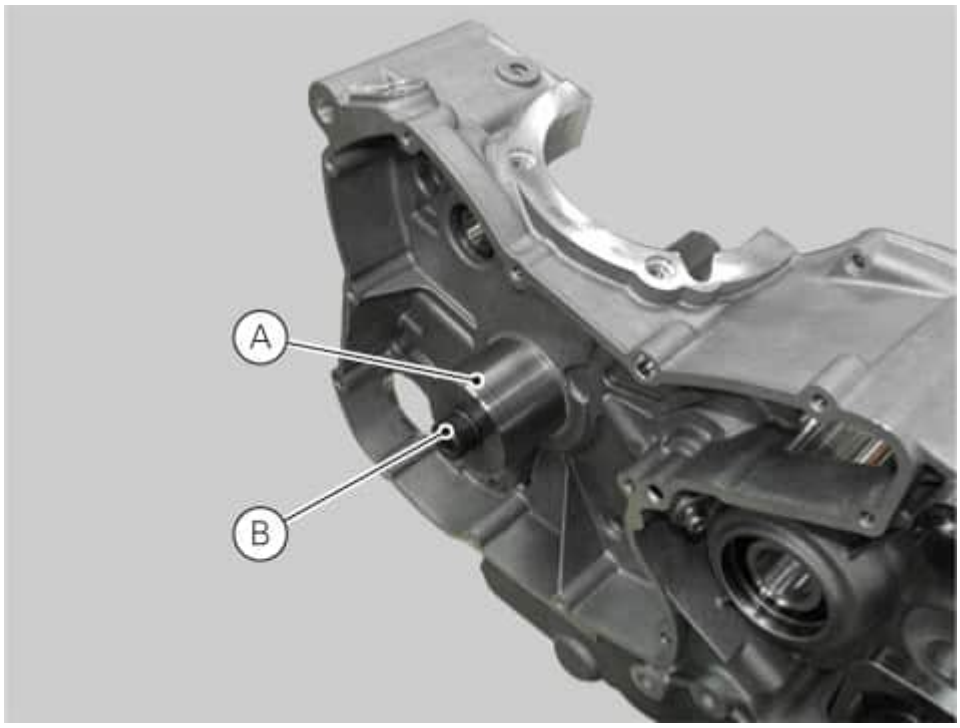
Position the new main bearing shells (14) and (15) in the drift of tool (A) part no. **88713.4145** and insert bushing (C) fully home.



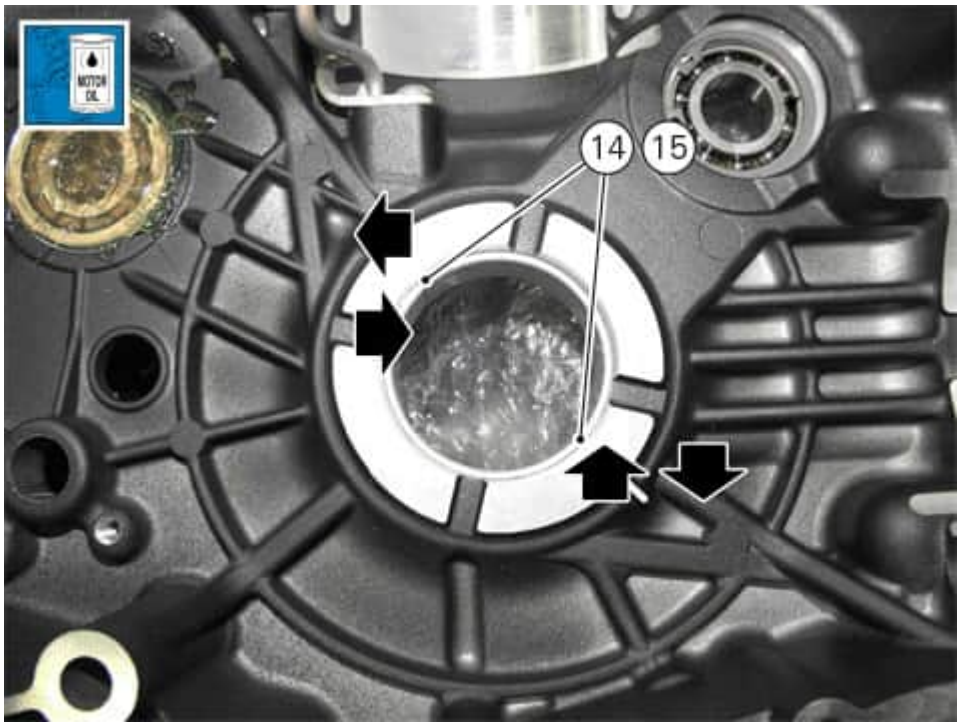
Smear tool (A) part no. **88713.4145** with engine oil.
Fit the main bearing shells using the tool drift part no. (A) **88713.4145** and positioning the shell parting line at a right angle to cylinder centreline, as shown.
Drive screw (B) fully home.







Remove tool (A) part no. **88713.4145** and check that the main bearing shells (28) have been correctly fitted.



Refit the components in the reverse order of removal.

Overhauling the crankcase halves

Remove the engine from the frame (Removing the engine).
Remove the external belt covers (Removing the timing belt external covers).
Remove the timing belts (Removing the mobile tensioner/timing belt).
Remove the timing pulleys (Disassembling the timing shaft pulleys).
Remove the complete cylinder head assembly (Removing the cylinder heads).
Remove the complete cylinder/piston assembly (Removing the cylinder/piston assembly).
Remove the generator side cover (Removing the generator cover) and the complete generator (Removing the flywheel/generator assembly).
Remove the starter motor (Removing the starter motor).
Remove the clutch cover (Removing the clutch cover).
Remove the clutch unit (Removing the clutch).
Remove the oil pump (Removing the oil pump).
Remove the primary drive gear (Removing the primary drive gear).
Remove the mesh filter (Changing the engine oil and filter cartridge).
Separate the crankcase halves (Separating the crankcase halves).

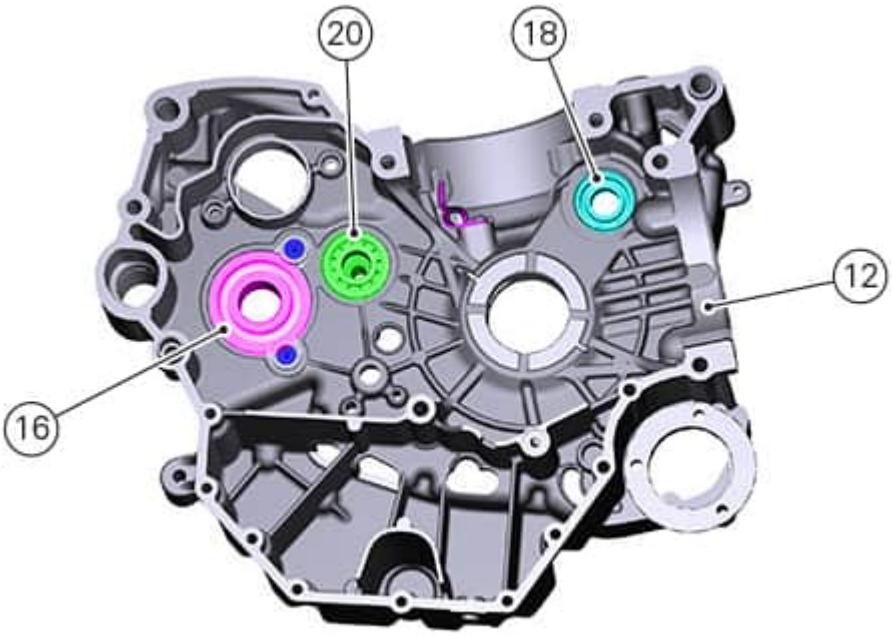
Visually inspect the crankcase halves (12) and (13).

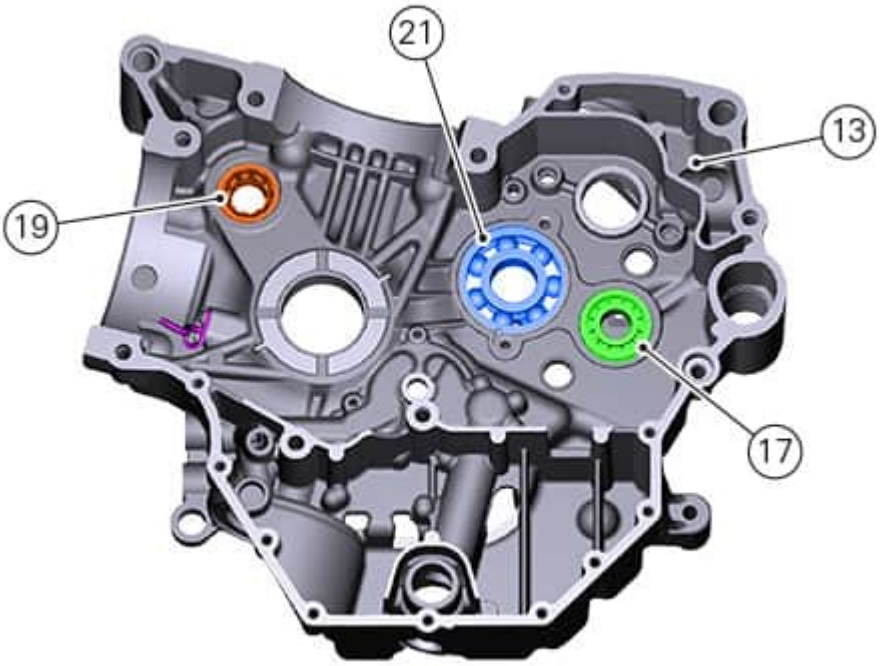
Important
If crankcase halves have to be replaced, they are supplied as a new spare part set.

Check that the surfaces of the crankcase halves are perfectly flat using a reference surface.

Warning
When overhauling an engine it is good practice to replace all the crankcase bearings.

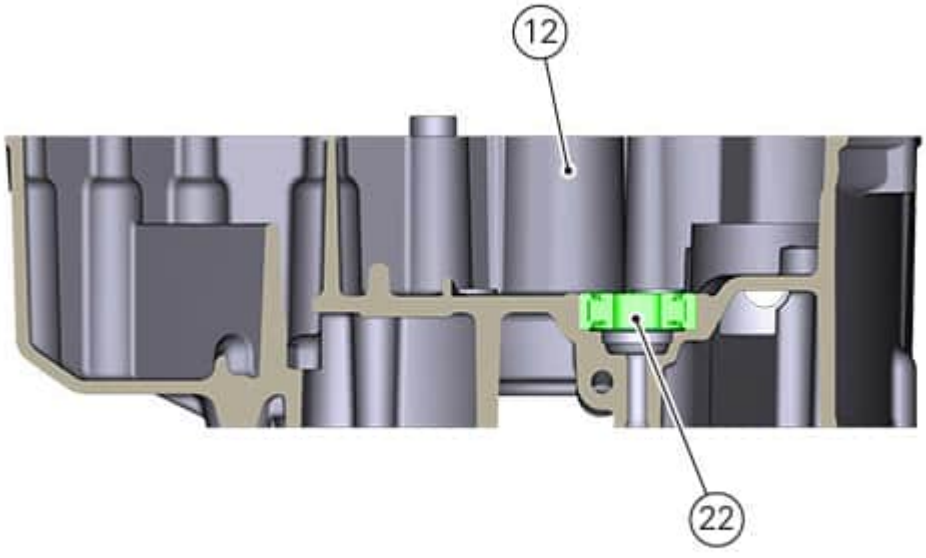
Replace the bearings (16) and (17) on the ends of the gearbox secondary shaft and timing layshaft bearings (18) and (19).
Replace primary shaft bearings (20) and (21).

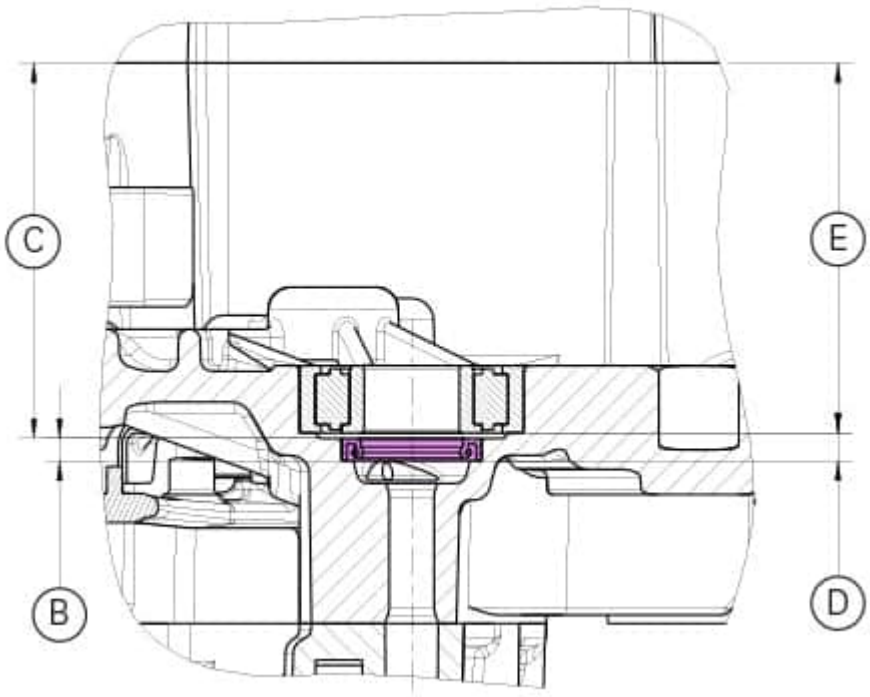




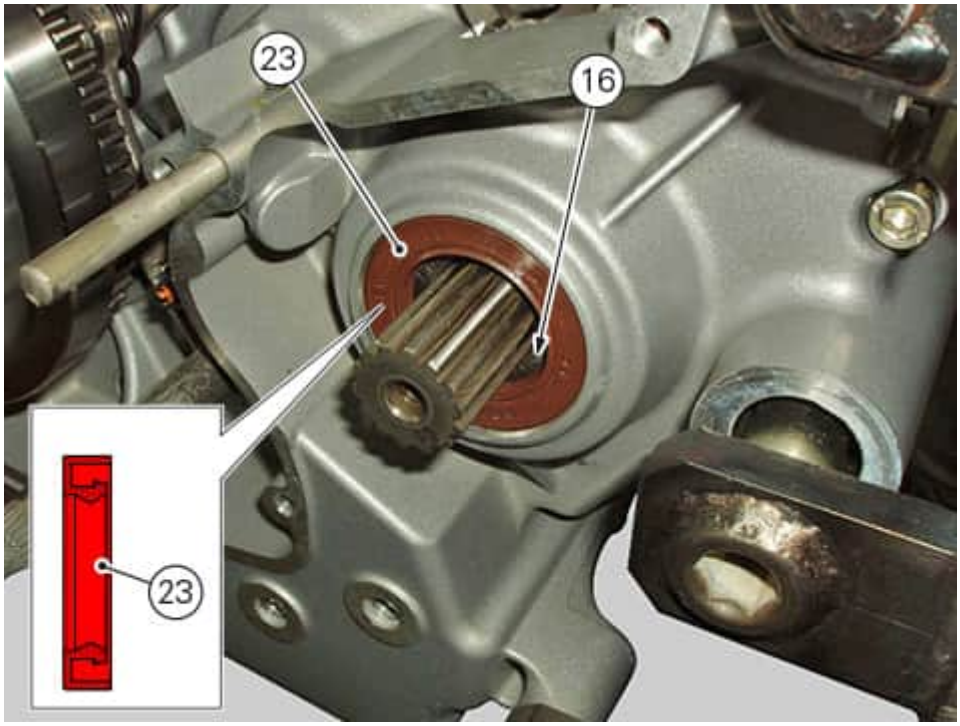
At each overhaul it is recommended to also replace the sealing ring (22) positioned between bearing (20) and chain-side crankcase half (12).
Upon assembling, lubricate ring (22) with KLÜBERPLUS S 06/100 (or denatured alcohol), then drive it fully home inside crankcase half and aim it as shown.
Check ring positioning value. It must be:

- oil seal height (B) 4 ± 0.2 mm;
- oil seal positioning (C) 67 ± 0.2 mm;
- (D) 5.0 ÷ 5.02 mm;
- (E) 66.0 ÷ 66.05 mm.

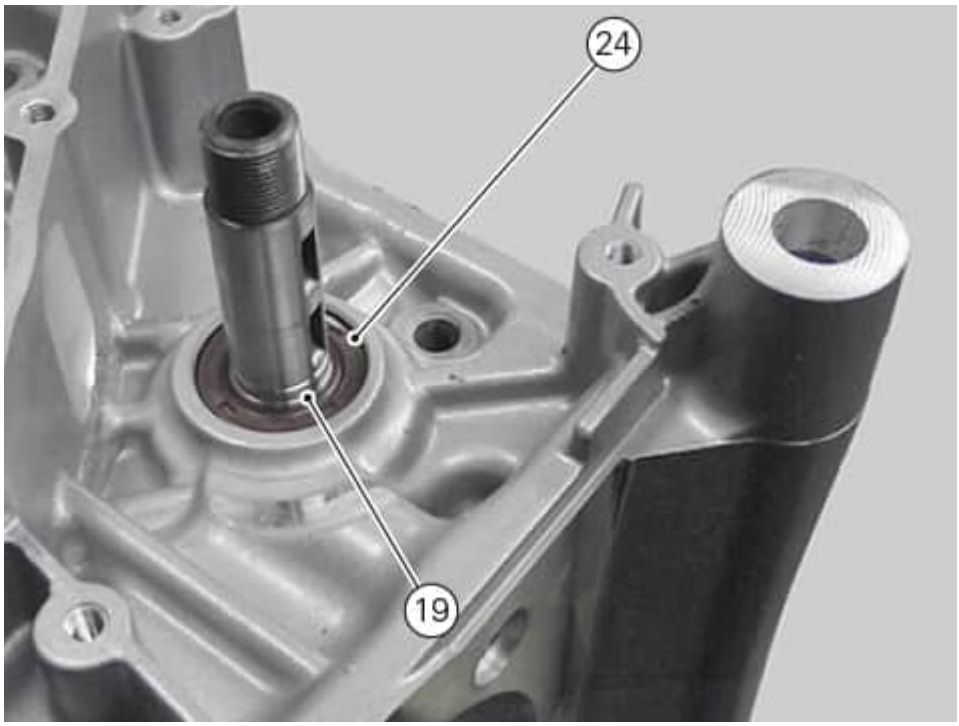




At each overhaul it is recommended to replace also the sealing ring (23) on the outside of bearing (16).
Upon assembling, lubricate ring (23) with KLÜBERPLUS S 06/100 (or denatured alcohol), then fit it as shown.



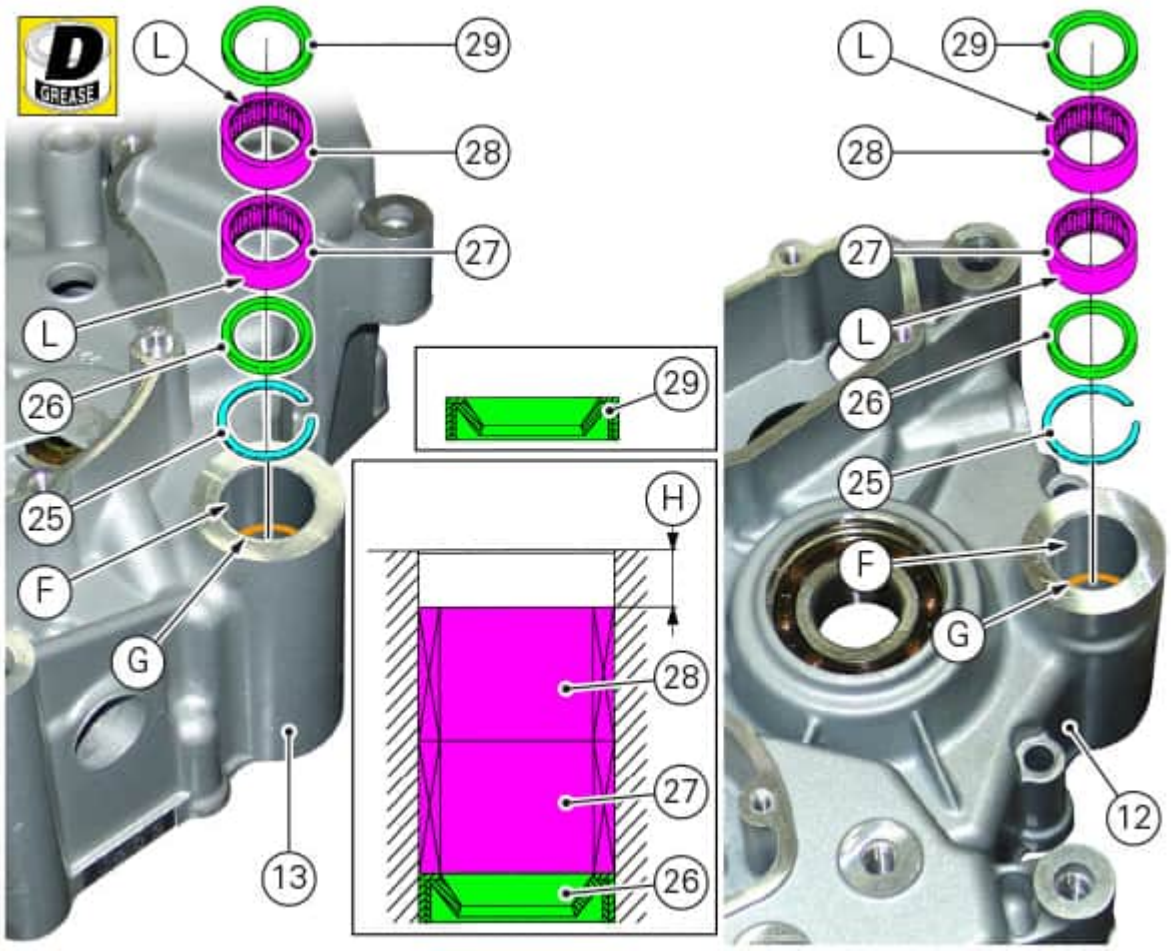
At each overhaul it is recommended to replace also the sealing ring (24) on the outside of bearing (19).



If the needle roller bearings for the swingarm shaft have been removed, fit snap ring (25) in hole (F) of crankcase half (12) or (13) in its seat (G).
Smear specified grease inside hole (F).
Drive seal (26) and needle roller bearings (27) and (28), complying with the value (H) of 4.8 ÷ 5.0 mm and making sure that the three parts are fully home one against the other.
While driving, position the three parts as follows:

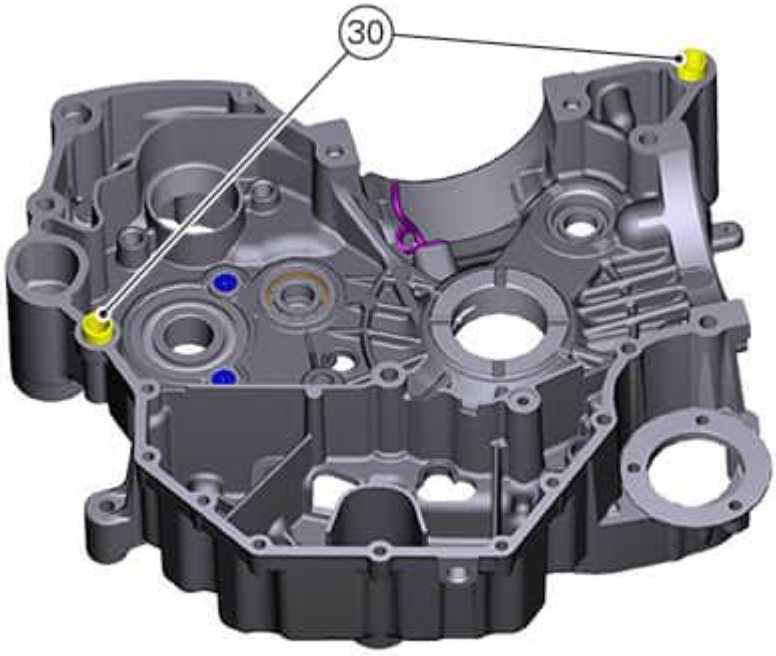
- seal (26) must be positioned as indicated;
- needle roller bearing (27) must be positioned so that the side with "markings" (L) faces the casing;
- needle roller bearing (28) must be positioned so that the side with "markings" (L) facing upwards.

Drive seal (29), positioning it as shown in figure "D", fully home against needle roller bearing (5).
Smear specified grease inside needle roller bearings.



Check the condition of centring bushes (30). If apparently distorted or loose in their seats, change them using suitable tools.
When the centring bushes (30) are hard to remove from casing, use a left-hand tap to force bushes out.

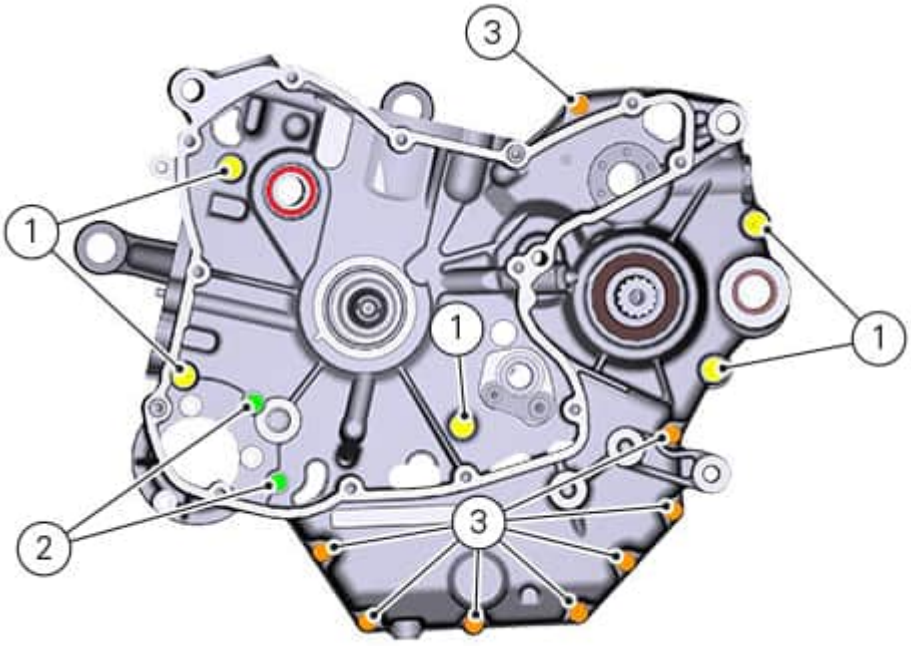
Important
The bushes must always be replaced when they have been removed using the above procedure.



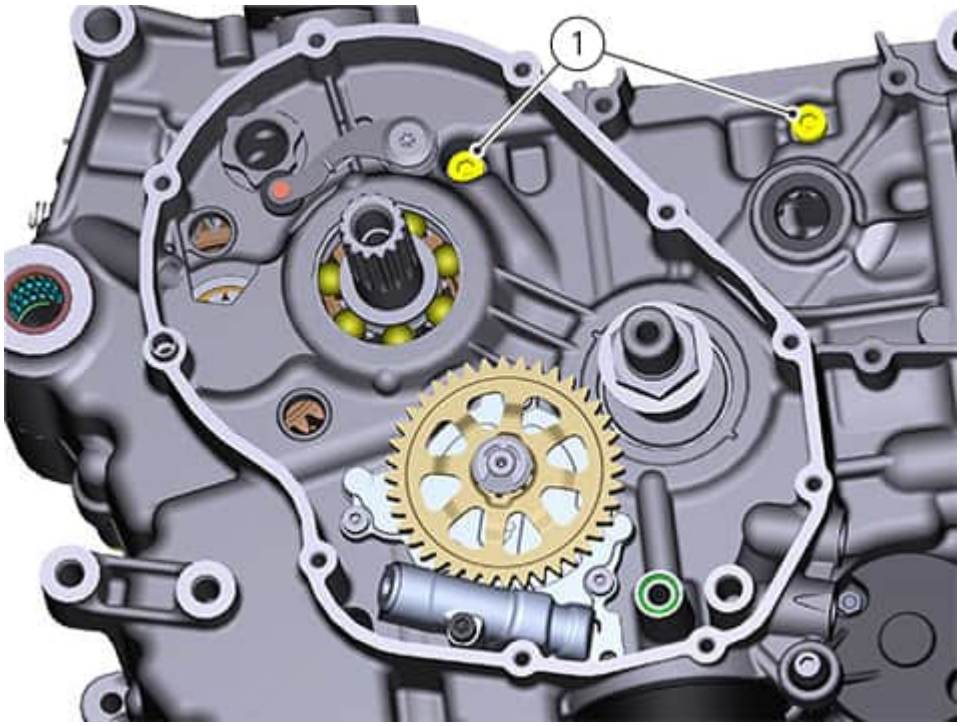
Separating the crankcase halves

Remove the engine from the frame (Removing the engine).
Remove the external belt covers (Removing the timing belt external covers).
Remove the timing belts (Removing the mobile tensioner/timing belt).
Remove the timing pulleys (Disassembling the timing shaft pulleys).
Remove the complete cylinder head assembly (Removing the cylinder heads).
Remove the complete cylinder/piston assembly (Removing the cylinder/piston assembly).
Remove the generator side cover (Removing the generator cover) and the complete generator (Removing the flywheel/generator assembly).
Remove the starter motor (Removing the starter motor).
Remove the clutch cover (Removing the clutch cover).
Remove the clutch unit (Removing the clutch).
Remove the oil pump (Removing the oil pump).
Remove the primary drive gear (Removing the primary drive gear).
Remove the mesh filter (Changing the engine oil and filter cartridge).

Loosen crankcase half jointing screws (1), (2) and (3) on generator side.

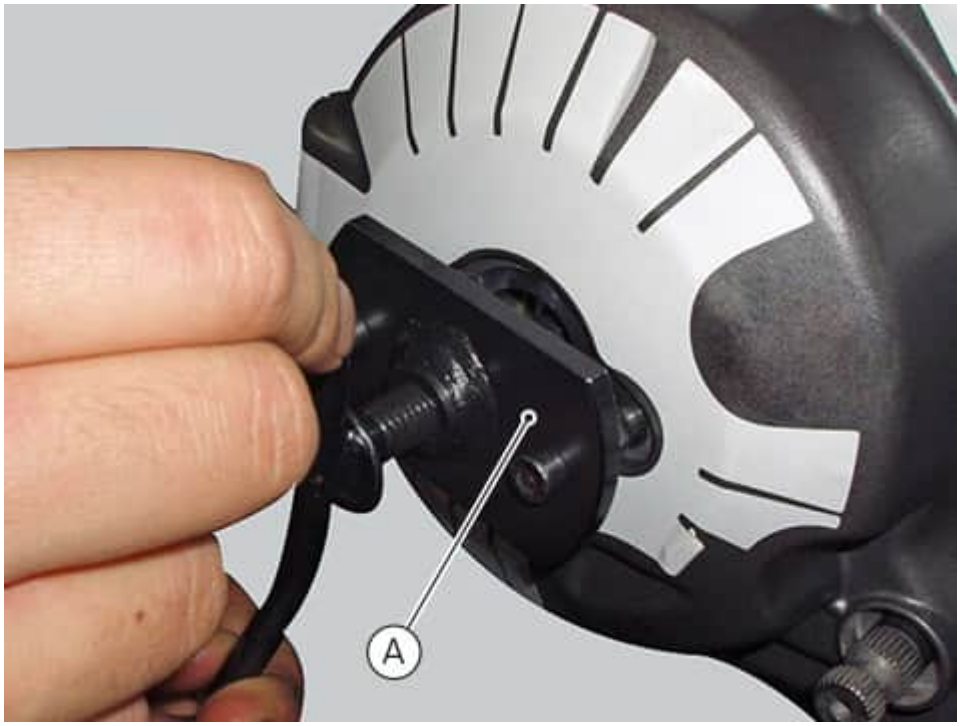


Loosen the jointing screws (1) on clutch side crankcase half at the vertical cylinder seat.

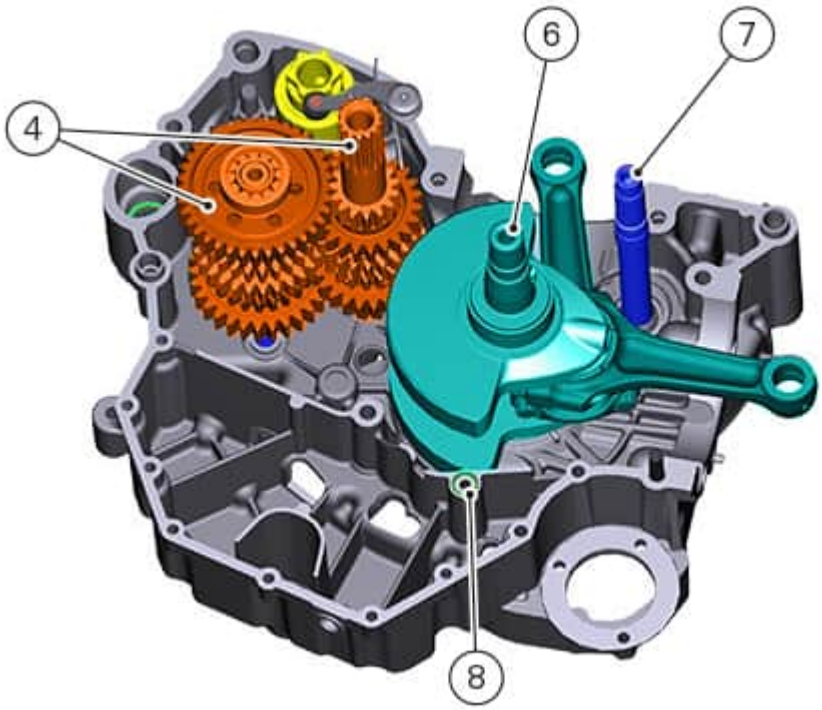


Reuse the generator cover or a service cover with puller (A) no. **88713.1749** duly fitted.
Secure cover to crankcase half with some of the original screws and begin separation by turning the central pin of the tool.
Tap the end of the gearbox secondary shaft with a plastic mallet to separate the crankcase halves.

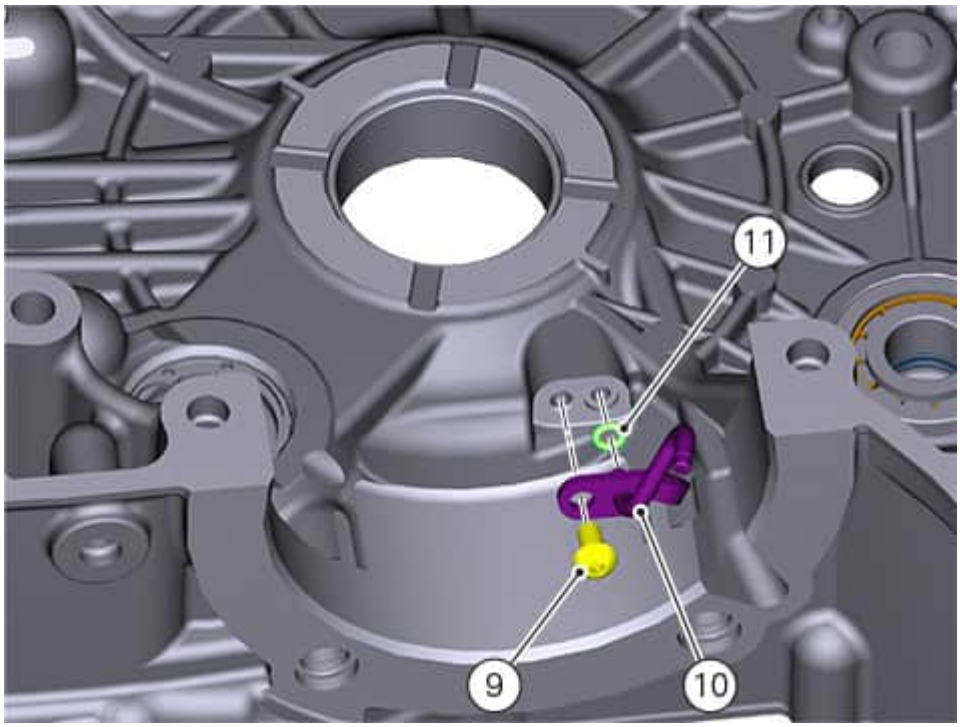
Note
Take care not to lose the shim washers on the shafts and on the selector drum.



Remove the gearbox shafts (4) and the gearbox selector drum (5) from the crankcase halves.
Slide out crankshaft (6) using a plastic mallet.
Remove the timing layshaft (7).
Recover O-ring (8) in the oil passage between crankcase halves.

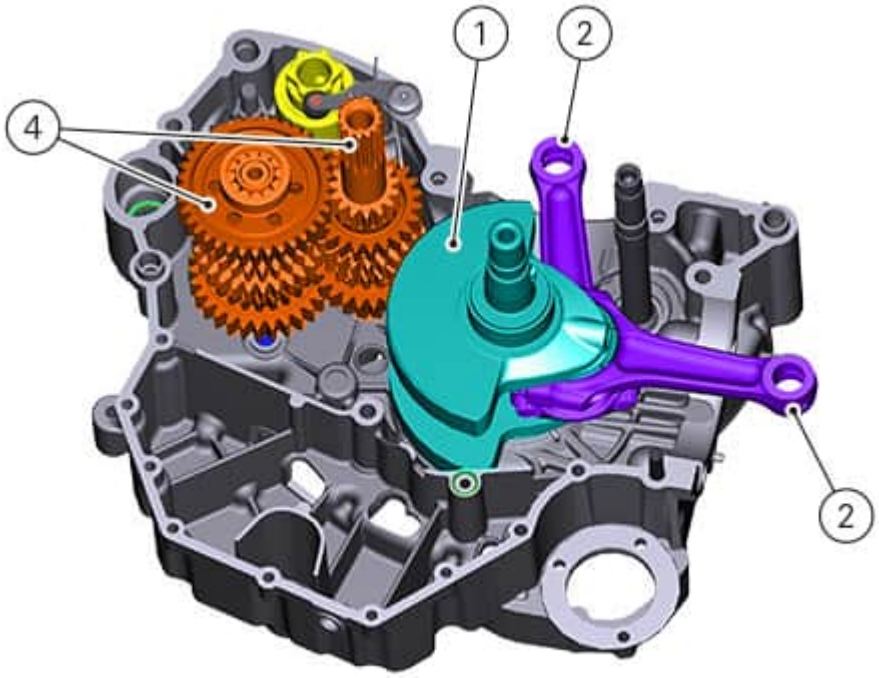


If necessary, loosen the screws (9), remove squirters (10) and collect the relevant O-rings (11).



Refitting the connecting rod assembly

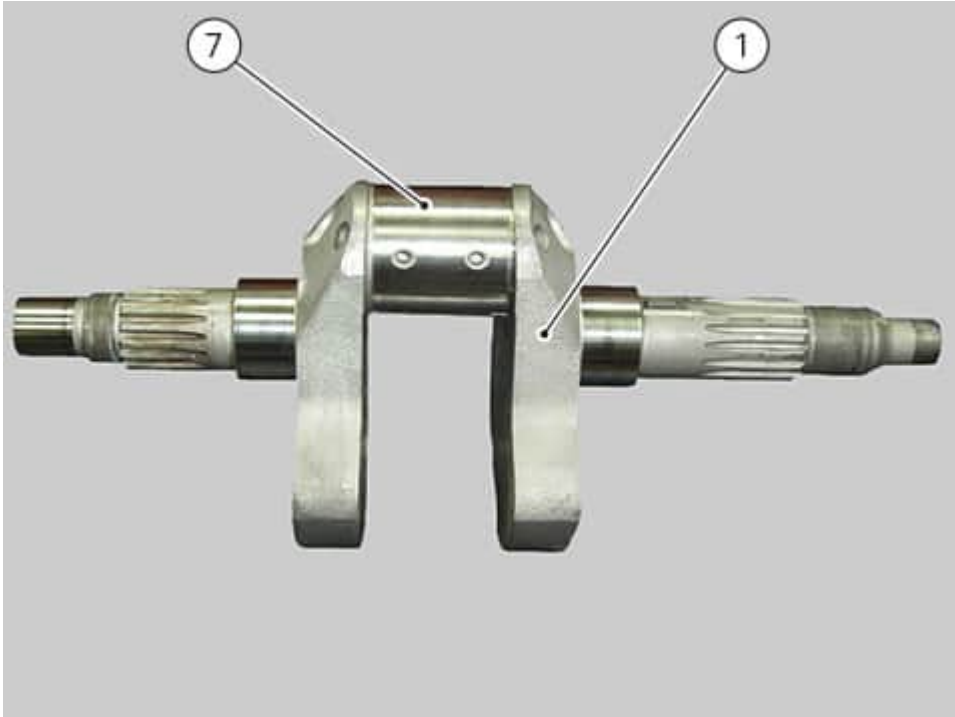
Install the complete connecting rod assembly inside crankcase half and proceed to shimming.
Make sure that the connecting rods (2) are correctly positioned in the relevant cylinder seats.
Incorrect positioning of the connecting rods at this stage will inevitably lead to the need to re-open the crankcase halves.



Close the crankcase halves (Closing the crankcase).
Refit the mesh filter (Changing the engine oil and filter cartridge).
Refit the primary drive gear (Refitting the primary drive gear and checking backlash).
Refit the oil pump (Refitting the oil pump).
Refit the clutch unit (Refitting the clutch).
Refit the clutch cover (Refitting the clutch cover).
Refit the starter motor (Refitting the starter motor).
Refit the complete generator (Fitting the flywheel/generator assembly) and the generator side cover (Fitting the generator cover).
Refit the complete cylinder/piston assembly (Refitting the cylinder/piston assembly).
Refit the complete cylinder head assembly (Refitting the cylinder heads).
Refit the timing pulleys (Refitting the timing layshaft pulley).
Refit the timing belts (Refitting the timing belts).
Refit the lateral timing belt covers (Refitting the timing belt external covers).
Refit the engine in the frame (Refitting the engine).

Reassembling the connecting rod assembly

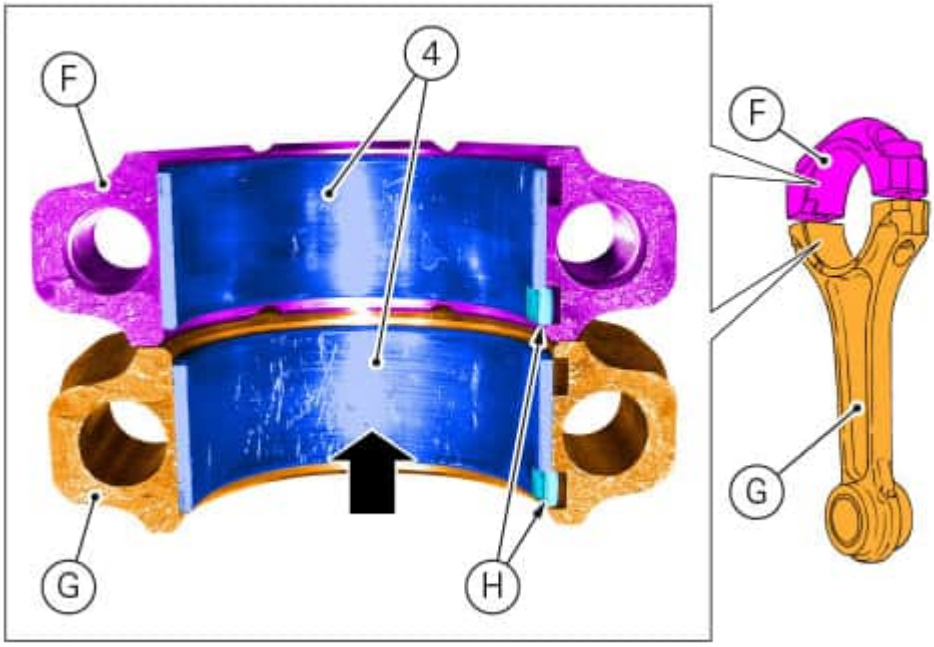
Before starting, check that the crankshaft main bearing and big-end journals are free of burrs or evident signs of machining: if necessary, clean the surfaces with very fine emery cloth and oil.
Check that the grooves are in perfect condition with no signs of forcing.
Thoroughly clean and lubricate the crank pin (7) on the crankshaft (1) and lubricate it with ROTHEN EXTRA additive.



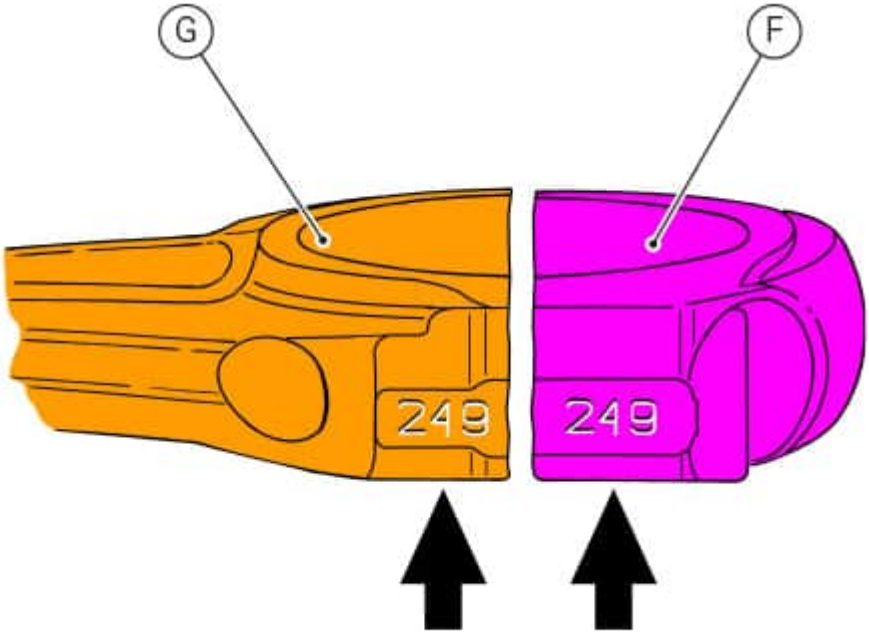
Take the bearings (4) necessary to shaft/connecting rod coupling, following the indications.

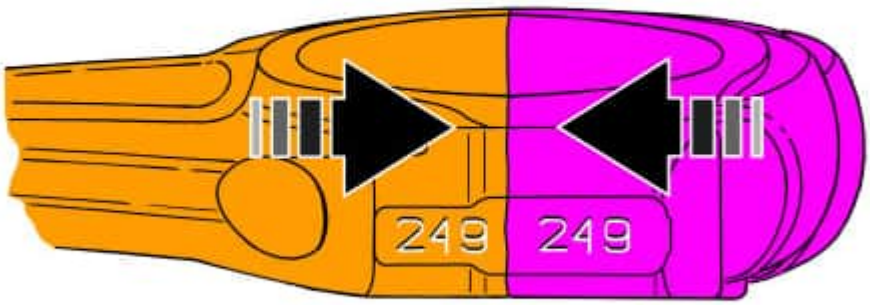
Crankshaft class	Connecting rod class	Bearings colour
A	A	RED - RED
B	A	BLUE - BLUE

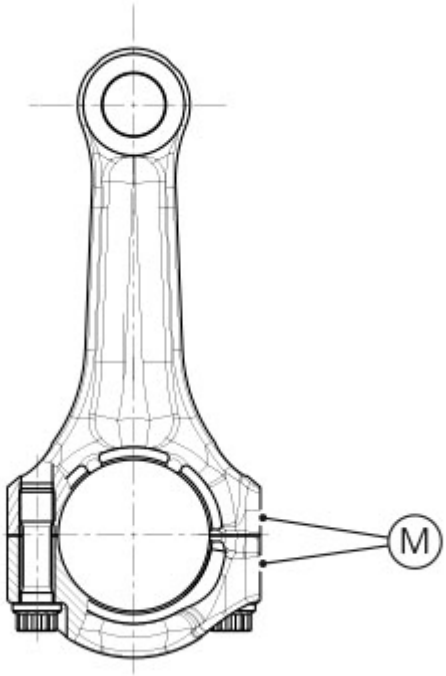
Insert the bearing shells in the connecting rod seats matching the tooth (H) of the bearings with the corresponding marks on the connecting rod cap (F) and on the connecting rod small end (G). It is essential that the tooth (M) adheres perfectly to its own seat.
Lubricate shank bearing (4) with lubricant ROTHEN EXTRA additive.



Fit connecting rods inside crankshaft.
Join the connecting rod cap (F) with the corresponding connecting rod small end (G), ensuring that the laser marking (M) of the progressive number stamped on the two pieces is the same, as shown in the figure.



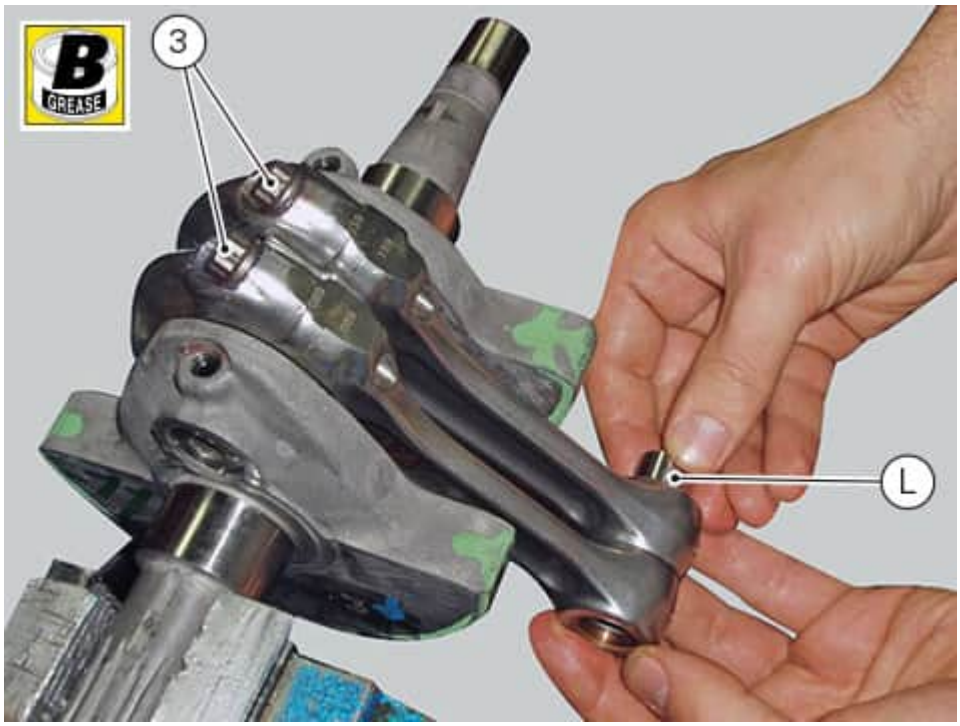




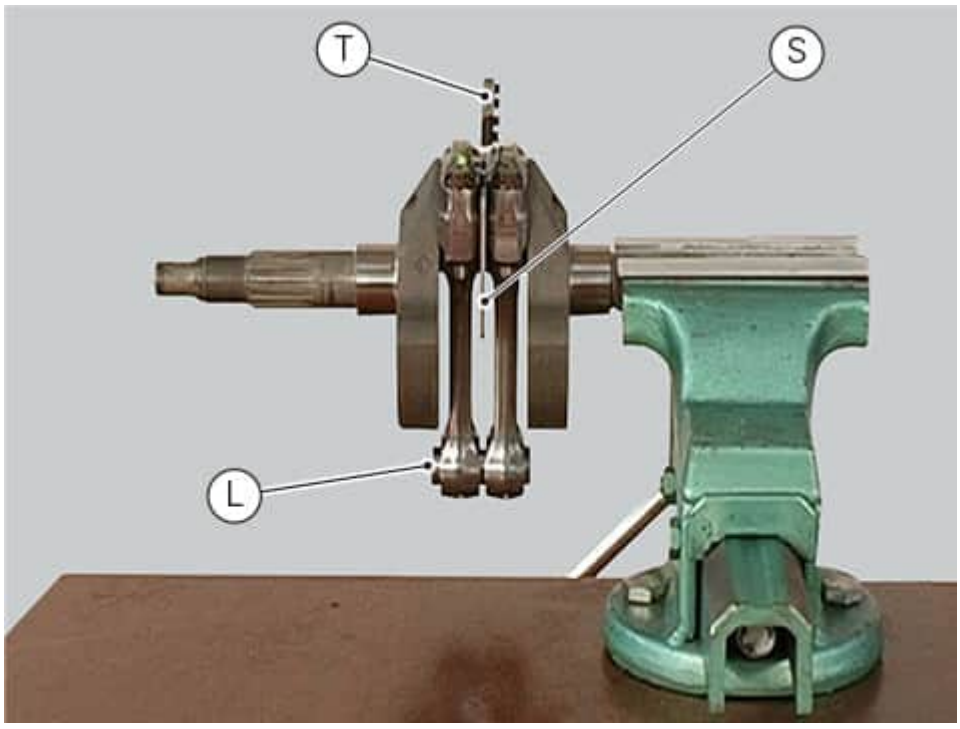
Warning
The grease utilised is irritant in contact with the skin; wear protective gloves.

Important
Lubrication of con-rod bolts is essential to obtain the correct coupling and to prevent breakage of the parts.

The con-rod screws may only be used for one tightening.
Tighten the screws (3) fully home by hand.
If this proves difficult or if the screws jam, undo them and lubricate them again.
Remove any excess grease. Tighten the screw by hand until the head seats against the connecting rod.
Temporarily fit the gudgeon pin (L) to align the connecting rods.



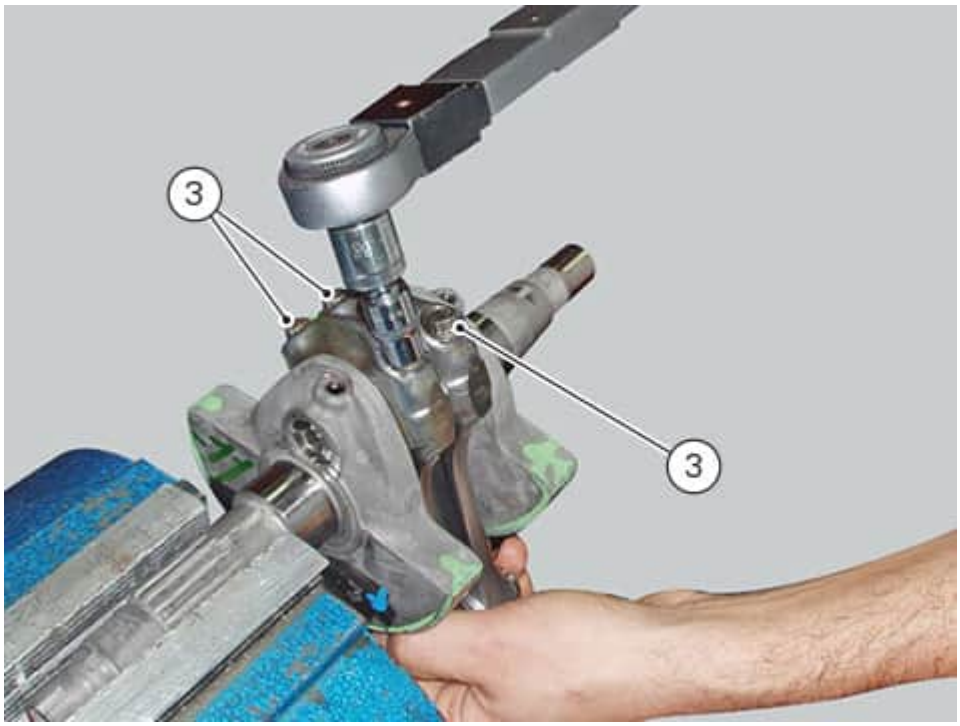
Fit the spacer (S) of the tool no. **88713.2878** between the connecting rods and take up residual axial clearance with the fork feeler gauge (T) of the tool no. **88713.2878** which is available in the following thickness values:
- 0.1 mm - 0.2 mm - 0.3 mm.



Using a torque wrench as shown in the figure, tighten screws (3) to the values specified here below:

- tighten to 35 Nm;
- pause of 2 seconds and 360° loosening;
- snug to 20 Nm;
- snug to 35 Nm;
- tighten with a rotation of 65°±1°;
- torque check 70÷103 Nm.

Remove the feeler gauge and check that connecting rods/crankshaft end float is: 0.15÷0.35 mm.


3
3

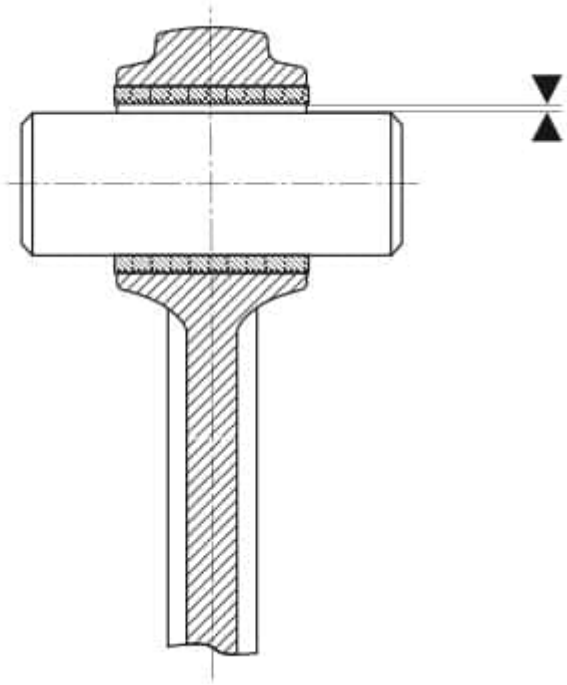
Overhauling the connecting rod assembly

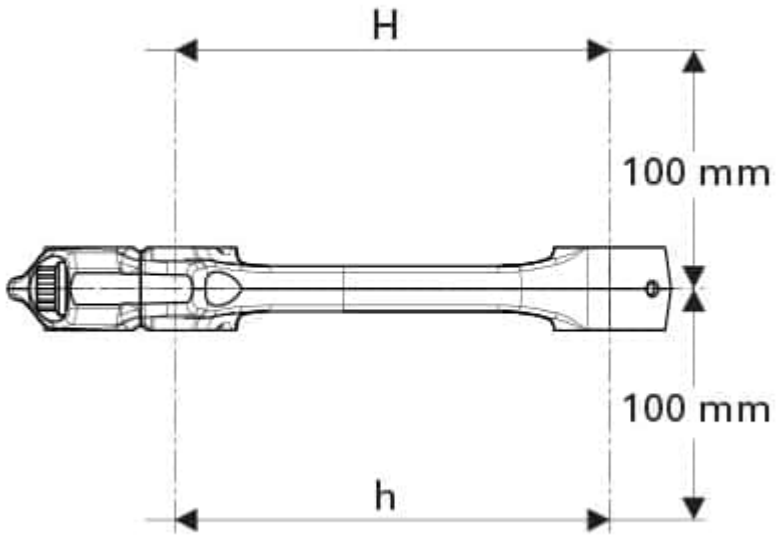
Remove the engine from the frame (Removing the engine).
Remove the external belt covers (Removing the timing belt external covers).
Remove the timing belts (Removing the mobile tensioner/timing belt).
Remove the timing pulleys (Disassembling the timing shaft pulleys).
Remove the complete cylinder head assembly (Removing the cylinder heads).
Remove the complete cylinder/piston assembly (Removing the cylinder/piston assembly).
Remove the generator side cover (Removing the generator cover) and the complete generator (Removing the flywheel/generator assembly).
Remove the starter motor (Removing the starter motor).
Remove the clutch cover (Removing the clutch cover).
Remove the clutch unit (Removing the clutch).
Remove the oil pump (Removing the oil pump).
Remove the primary drive gear (Removing the primary drive gear).
Remove the mesh filter (Changing the engine oil and filter cartridge).
Separate the crankcase halves (Separating the crankcase halves).
Remove the connecting rod assembly from the crankcase halves (Removing the connecting rod assembly).
Disassemble the connecting rod assembly (Disassembling the connecting rod assembly).

Make the following dimensional checks on the connecting rods:

- clearance with gudgeon pin upon fitting.

In case of excessive wear, replace the connecting rod. The small end bush must be in good condition and firmly driven into its seat. Check the parallelism error measured at 100 mm from the connecting rod longitudinal axis: it must be H-h lower than 0.02 mm (H standard height when new is 124 mm); change the con-rod if it is not so.
Connecting rod big-end diameter must be within the specified limits.
It is preferable to use crankshafts and connecting rods of the same size class.

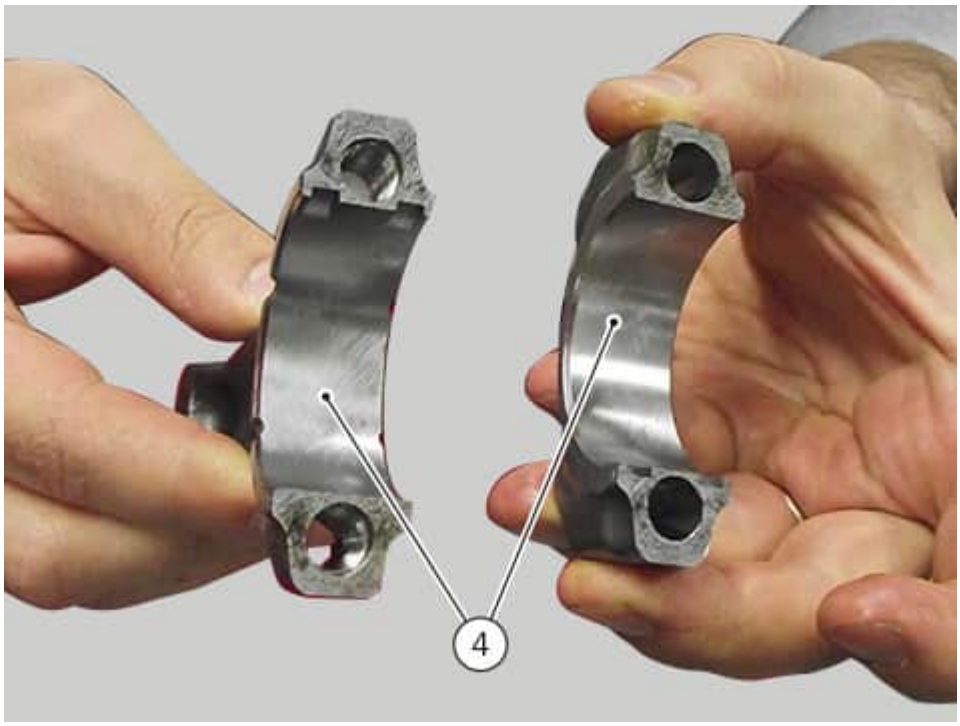




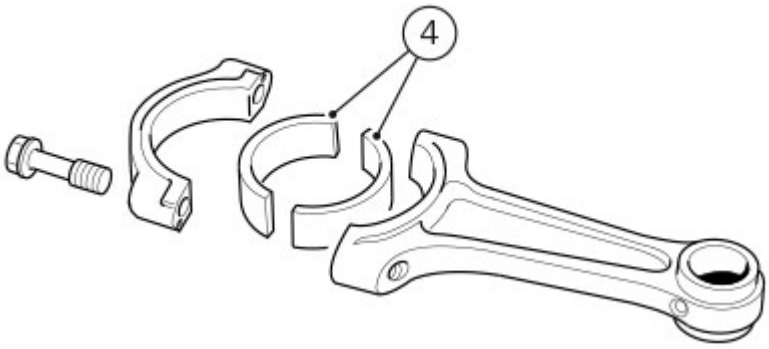
Replacing connecting rod big end bearings

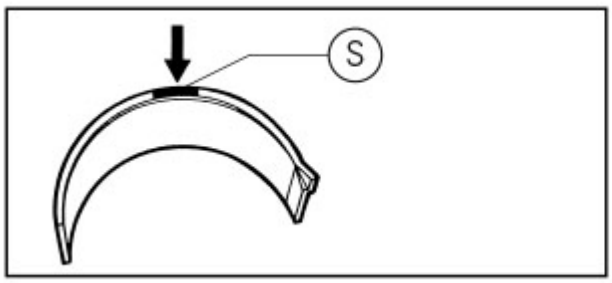
It is good practice to replace the bearings (4) each time the engine is overhauled.
Spare bearings are supplied ready for fitting and they must not be reworked with scrapers or emery cloth.





The bearings may belong to two different size classes, each identified by a specific colour (S) (RED and BLUE).





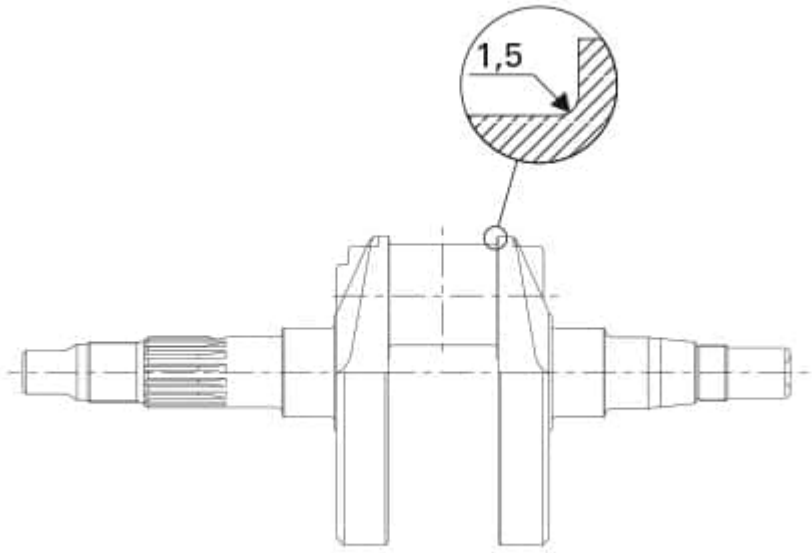
The bearings are comprised of an external steel ring, the inner face of which is electroplated with a lead-based compound.
The table shows the appropriate bearings to be fitted according to the size class of the crankshaft.

Crankshaft class	Connecting rod class	Bearings colour
A	A	RED - RED
B	A	BLUE - BLUE

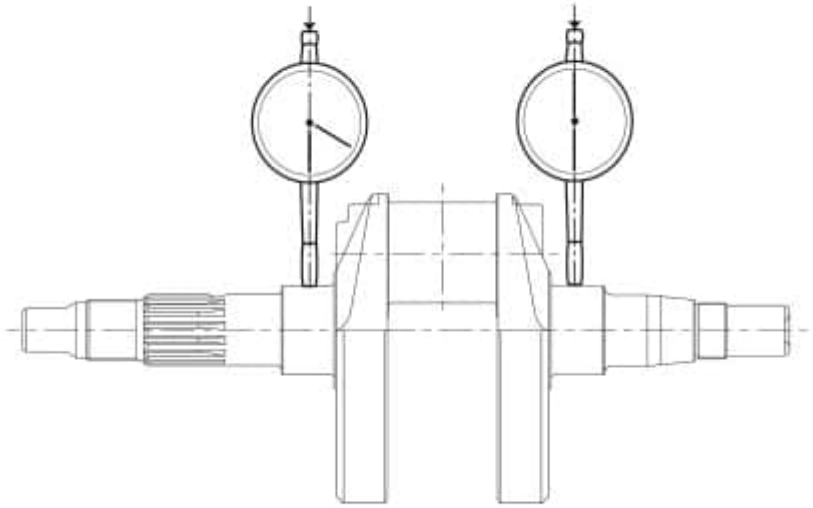
Overhauling the crankshaft

The journals for main bearings and crank pin should not be scored or grooved.
The threads, keyways, and slots must be in good condition.
Check for fretting or burrs in the fillet between journal and shoulder.
Fillet radius: 1.5 mm.

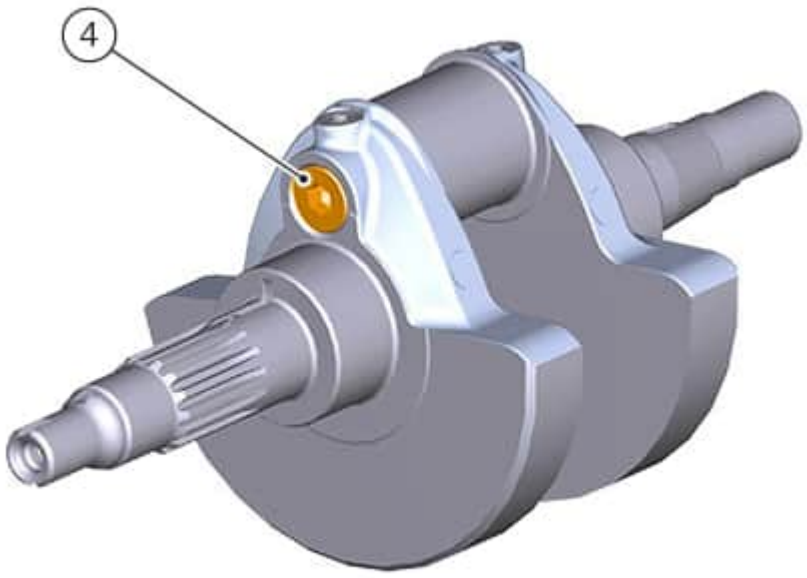
Use a micrometer to measure oval and taper of the crank pin. Measure oval and taper in several different directions.



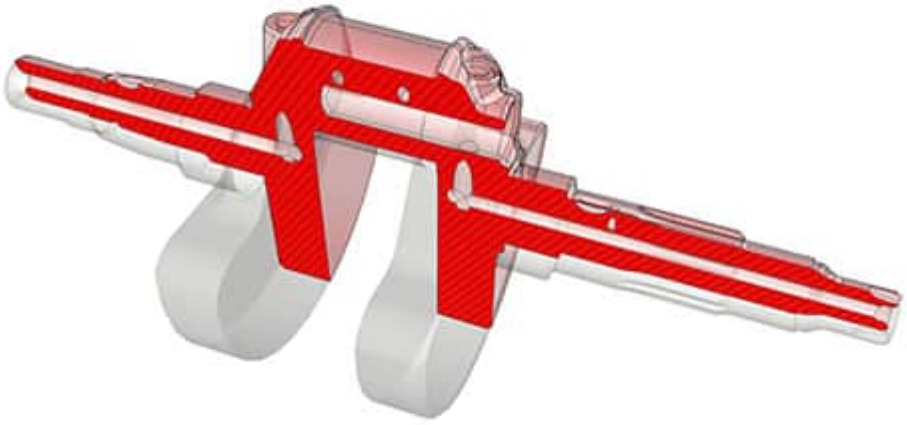
Use a dial gauge to measure the alignment of the main journals by positioning the crankshaft between two centres.

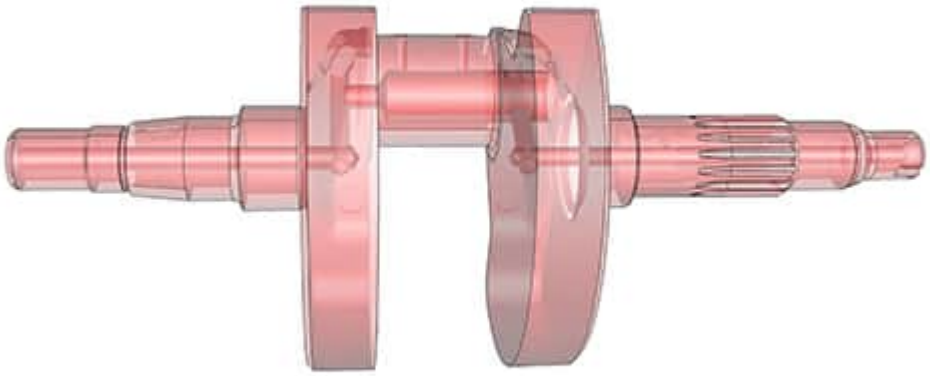


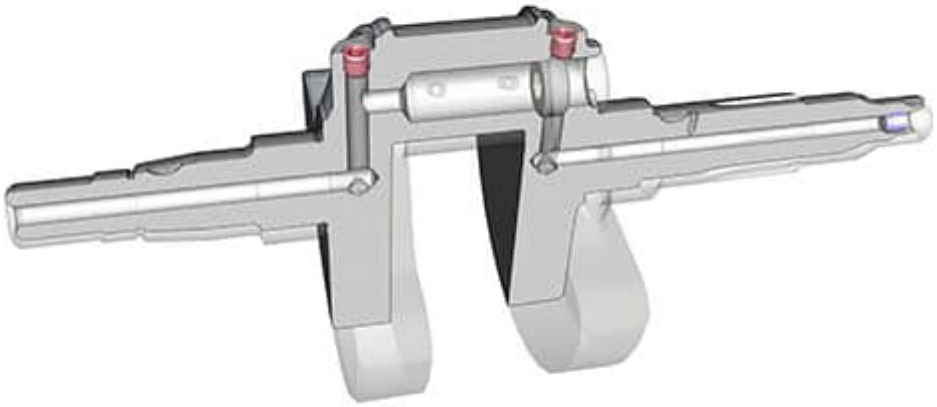
To carry out this operation, use a heat gun able to reach 150 °C.
Loosen the plug (4) of the crankshaft, heating the latter, if necessary, to remove the sealant applied upon assembly.

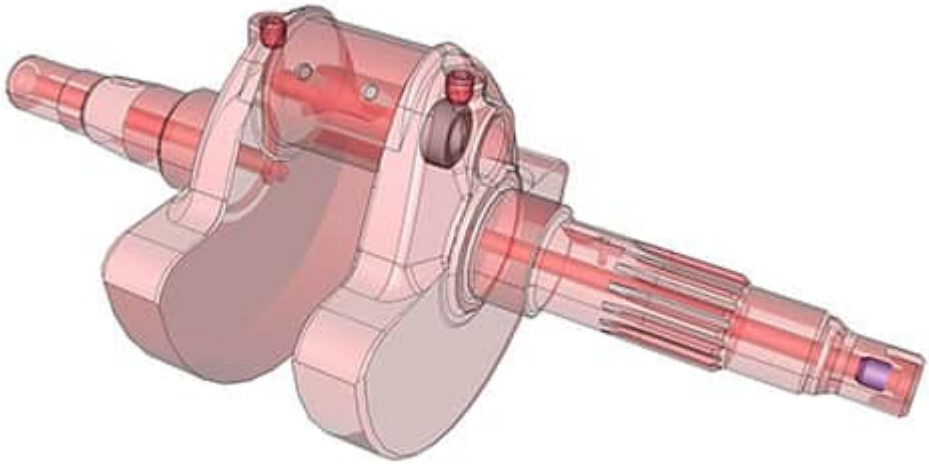


Clean all the oilways using suitable diameter metal brushes and then blow with compressed air to remove any residues that may have accumulated and may be restricting the oil flow.

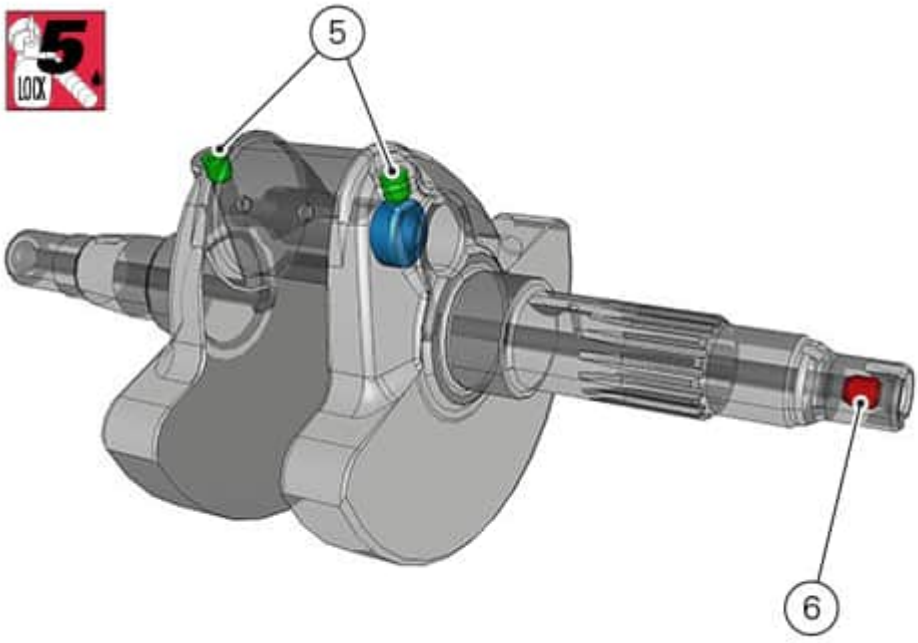


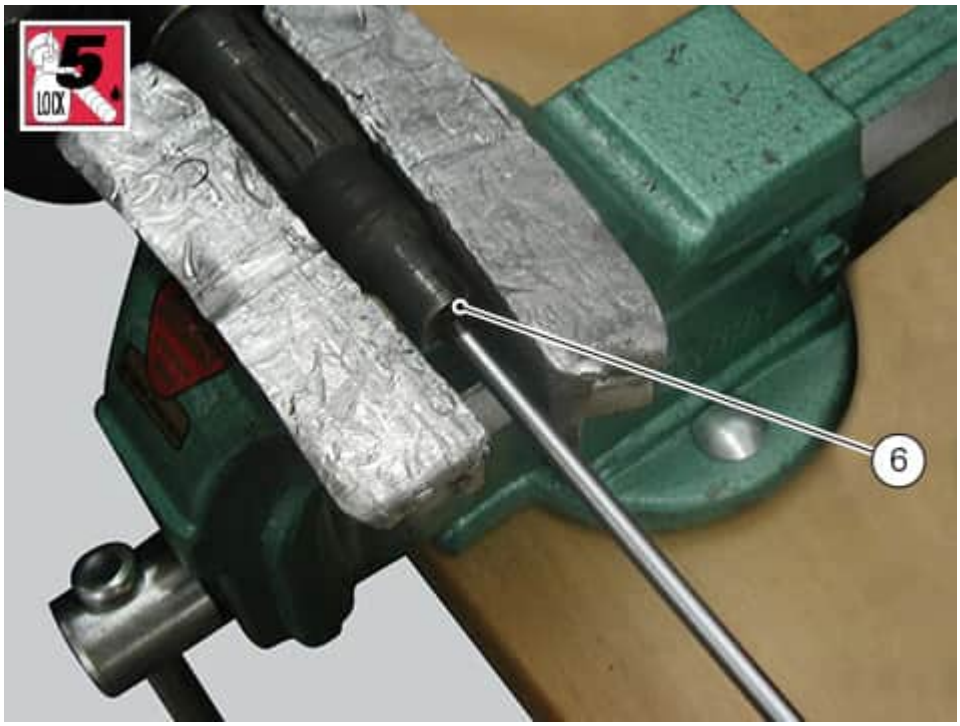






Apply specified threadlocker to the threads of dowels (5) and (6), then refit them.
Tighten dowels to a torque of 13 Nm (Min. 11 Nm - Max. 15 Nm).





Big-end bearing-crank pin clearance

In order to correctly couple big-end bearings and crank pin, proceed as follows:

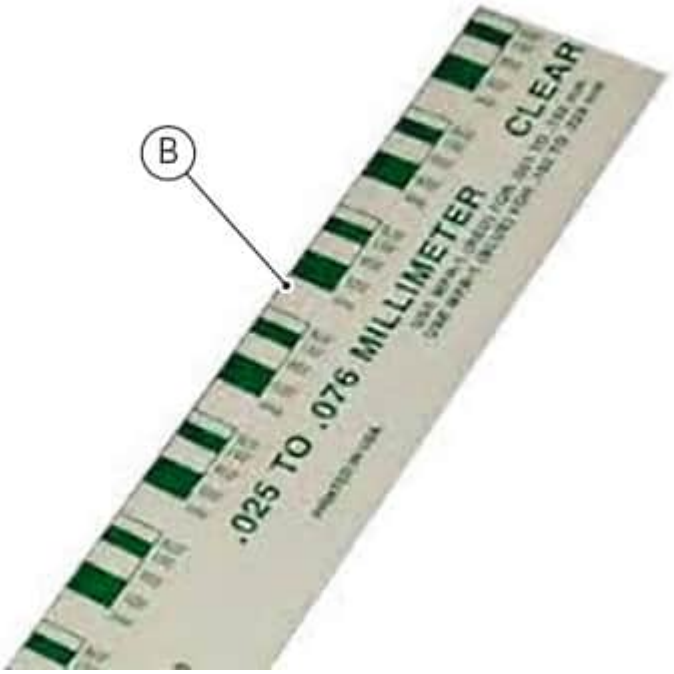
- apply a strip (A) of GREEN "Plastigauge PG-1" to the crank pin;
- fit the connecting rod and the original big-end bearings.

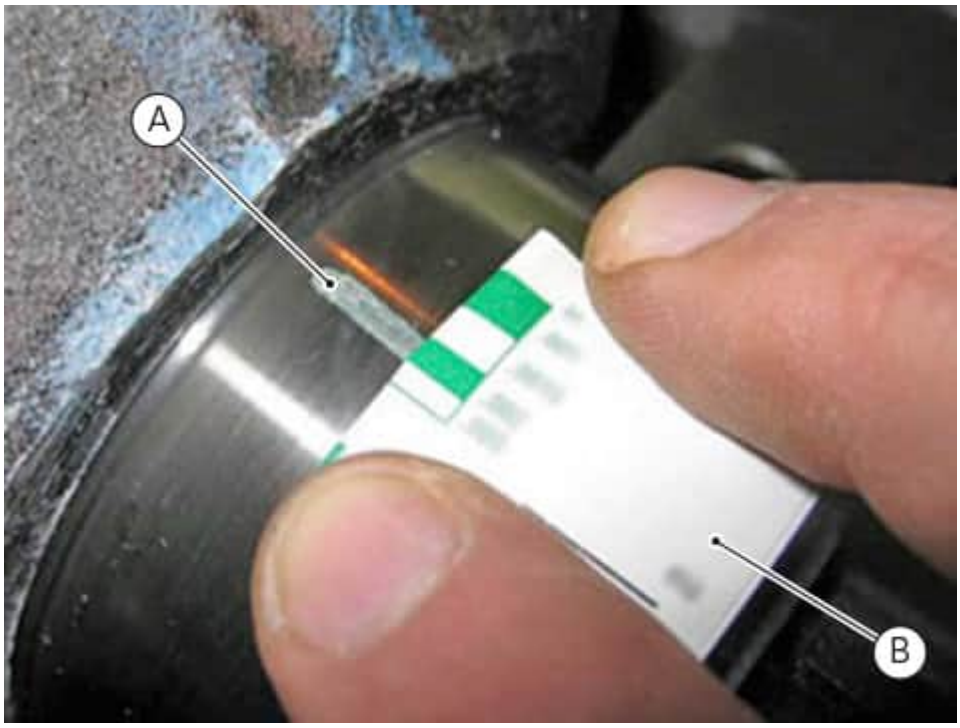
Tightening procedure
Tighten the connecting rod bolts (Class 14.9) as described below:

- apply the recommended threadlocker to the thread;
- tighten the screw to a torque of 35 Nm ± 10% at 50 rpm;
- wait for 2 seconds then loosen by 360° at 30 rpm;
- tighten to a snug torque of 20 Nm ± 10% at 30 rpm;
- tighten to a snug torque of 35 Nm ± 10% at 10 rpm;
- tighten with a rotation of 65° ± 1° at 14 rpm;
- Check the applied tightening torque (Min. 70 Nm - Max. 113 Nm).

Continue the coupling procedure as described below:

- loosen the screws and remove the connecting rod;
- check the thickness of the strip of "GREEN Plastigauge PG-1" (A), using the suitable reference scale (B);
- the thickness measured with scale (B) represents the actual clearance: if it is not within the specified limits (Crankshaft), it is necessary to replace the bearings or the crankshaft and repeat the procedure;
- If the clearance value complies with the established limits, carefully remove the strip of "GREEN Plastigauge PG-1" (A) from the crankshaft and repeat the tightening procedure as described.


B
.025 TO .076 MILLIMETER
CLEAR


A
B

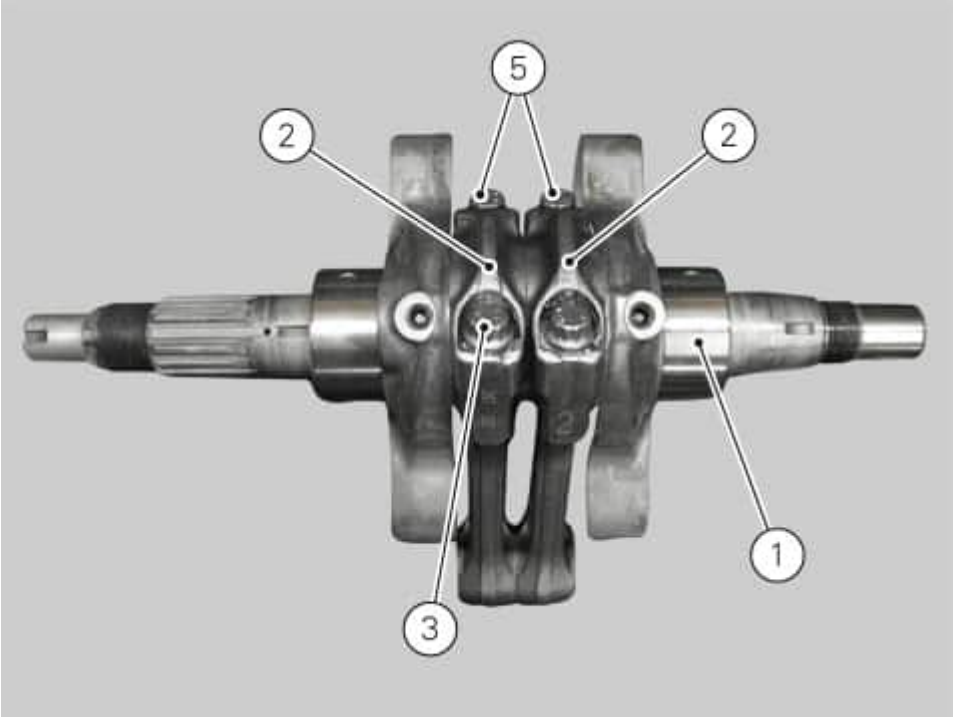
Disassembling the connecting rod assembly

Remove the engine from the frame (Removing the engine).
Remove the external belt covers (Removing the timing belt external covers).
Remove the timing belts (Removing the mobile tensioner/timing belt).
Remove the timing pulleys (Disassembling the timing shaft pulleys).
Remove the complete cylinder head assembly (Removing the cylinder heads).
Remove the complete cylinder/piston assembly (Removing the cylinder/piston assembly).
Remove the generator side cover (Removing the generator cover) and the complete generator (Removing the flywheel/generator assembly).
Remove the starter motor (Removing the starter motor).
Remove the clutch cover (Removing the clutch cover).
Remove the clutch unit (Removing the clutch).
Remove the oil pump (Removing the oil pump).
Remove the primary drive gear (Removing the primary drive gear).
Remove the mesh filter (Changing the engine oil and filter cartridge).
Separate the crankcase halves (Separating the crankcase halves).
Remove the connecting rod assembly from the crankcase halves (Removing the connecting rod assembly).

To disassemble the connecting rod assembly, loosen screws (3) and separate connecting rods (2) from crankshaft (1).

Important

Take care not to mix up components of different connecting rods and maintain the original orientation.



Removing the connecting rod assembly

Remove the engine from the frame (Removing the engine).
Remove the external belt covers (Removing the timing belt external covers).
Remove the timing belts (Removing the mobile tensioner/timing belt).
Remove the timing pulleys (Disassembling the timing shaft pulleys).
Remove the complete cylinder head assembly (Removing the cylinder heads).
Remove the complete cylinder/piston assembly (Removing the cylinder/piston assembly).
Remove the generator side cover (Removing the generator cover) and the complete generator (Removing the flywheel/generator assembly).
Remove the starter motor (Removing the starter motor).
Remove the clutch cover (Removing the clutch cover).
Remove the clutch unit (Removing the clutch).
Remove the oil pump (Removing the oil pump).
Remove the primary drive gear (Removing the primary drive gear).
Remove the mesh filter (Changing the engine oil and filter cartridge).
Separate the crankcase halves (Separating the crankcase halves).

After separating the crankcase halves, remove the crankshaft (1) complete with connecting rods (2).

