DUCATI Superbike 899 panigale 2014 workshop manual draft version

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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 or SHELL Gadius S2 V220 AD 2
	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 (or THREE BOND TB1324)
	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 (former 648 BV)
	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 (As an alternative THREE BOND TB1378B)
	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 (former 648 AV)
	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	THREE BOND 1207B
		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 D321R Molykote M55 Plus
		Emulsion for lubrication of rubber.	P 80
		Protection lubricant emulsion.	KLUBERPLUS S 06/100
		Lubricant for mechanical elements	Castor oil

General maintenance indications

Useful tips

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

- when diagnosing faults, primary consideration should always be given to what the customer reports about motorcycle operation since this information can highlight anomalies; 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 comply fully 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 crosswise sequence.
- Always mark any parts and positions which might easily be confused at the time of reassembly.
- Use exclusively Ducati original replacement parts and the recommended brands of lubricants.
- Use special service 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 in an enclosed space.

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 fume 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 lining debris

Never clean the brake assemblies 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.

Lights/instrument panel

	Reference	Technical specifications
Headlight	low beam lamp type	No. 2 halogen light bulbs H11 OSMAR 64211C 12 V - 55 W
	high beam lamp type	No. 2 halogen light bulbs H11 OSMAR 64211C 12 V - 55 W
Parking light	Bulb type	LED
Tail light	Bulb type	No. 2 REBEL LXM2-PH01-0060 LEDs.
Stop lights	Bulb type	No. 8 LA G6SP-CBEA-24-1 LEDs.
Front turn indicators	Bulb type	LED
Rear turn indicators	Bulb type	No. 4 ORSAM LYE65F LEDs
Number plate light	Bulb type	No. 3 CREE CLA1A-WKW-CXAYB453 LEDs
Fuses	Regulator	30 A
Front left fuse box key	-	-
	GPS	5 A
	Key-sense	10 A
	Diagnostics	5 A
	Throttle opening relay (ETV)	10 A
	Instrument panel	10 A
	Spare	5 A
	Spare	10 A
	Spare	20 A
Front right fuse box key	Injection relay	20 A
	Lights	10 A
	ECU	10 A
	Black Box System (BBS)	15 A
	Spare	5 A
	Spare	10 A
	Spare	20 A

Injection system

	Make	Type
Control unit	MITSUBISHI	Indirect electronic injection type: a/n / a/n.

Fuel system

Important

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

Warning

Vehicle is compatible only with fuels with a max. ethanol content 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 specifications for the US market.	95-98 RON Unleaded fuel with a minimum octane rating of 90 (RON+MON)/2
Throttle body	Elliptical with oval cross-section, Ø 67mm. With full ride-by-wire system
Injectors per cylinder	1
Firing points per injector	12

Ignition system

	Reference	Technical specifications
Ignition	Type	Inductive electric discharge I.A.W. type
Starting	Type	12 V - 0.6 kW starter motor
Spark plugs	Make and type	NGK MAR09A-J

Charging system/generator

	Reference	Technical specifications
Battery	Voltage	12 V
	Charge	6.5 Ah
	Type	Sealed
Generator	Capacity	14 V - 510 W

Hydraulic brakes

	Reference	Standard value	Service limit
FRONT			
Brake disc	Type	Semi-floating drilled dual disc	
	Thickness	5 mm	
	Flange material	Aluminium	
	Braking surface material	Stainless steel	
	Diameter	330 mm	
Brake calliper	Make	Brembo	
	Type	M 4.32 b	
	Calliper cylinder diameter	32	
	Pad friction material	TT 2187 FF	
Master cylinder	Type	PR 18/21	
	Master cylinder diameter	16	
REAR			
Brake disc	Type	Fixed drilled disc	
	Thickness	5 mm	
	Material	Stainless steel	
	Diameter	245 mm	
Brake calliper	Make	Brembo	
	Type	P34e	
	Calliper cylinder diameter	34	
	Pad friction material	Ferodo Ferit I/D 450 FF	
Master cylinder	Type	PS13	
	Master cylinder diameter	13	

Rear suspension

	Reference	Technical specifications
Type		SACHS: The rear suspension uses a pressurised hydraulic monoshock with adjustable rebound, compression and spring preload.
Shock absorber	Hydraulic damping standard setting. Undo adjusters from the fully closed position (turn clockwise).	Compression: 2.5 turns Rebound: 12 clicks
	Spring preload	17 mm
	Wheel travel	130 mm

Rear wheel

	Reference	Standard value	Service limit
Minimum tread depth	In the most worn part		2 mm
Tyre pressure	Cold	2.5 bar - 2.55 Kg/sq. cm	
Swinging arm shaft runout	On 100 mm		0.2 mm
Wheel rim runout	Radial	0.8 mm	2 mm
	Sideways	0.5 mm	2 mm
Drive chain	Make	Regina 520 ZRDK	
	No. of links	106	

Front suspension

	Reference	Technical specifications
Type		SHOWA: Hydraulic upside-down fork with external adjusters for rebound, compression, and preload of fork leg inner springs. Stanchion diameter: 43mm
	Wheel travel	120 mm
Fork	Oil quantity, per leg	563 ± 2 cc (per leg)
	Standard setting	Rebound: 5 clicks Compression: 4 clicks Spring preload: 4 turns

Front wheel

	Reference	Standard value	Service limit
Minimum tread depth	In the most worn part		2 mm
Tyre pressure	Cold	2.5 bar - 2.55 Kg/sq. cm	
Wheel shaft runout	On 100 mm		0.2 mm
Wheel rim runout	Radial	0.8 mm	2 mm
	Sideways	0.5 mm	2 mm

Gearbox

	Reference	Standard value	Service limit
Gearbox shafts	End float		n.a.
Selector drum	End float		n.a.
Gear selector fork	Side slider thickness	5.75 ÷ 5.85 mm	n.a.
	Central slider thickness	5.25 ÷ 5.55 mm	n.a.
	Fork to gear clearance for side sliders	0.1 ÷ 0.3 mm	n.a.
	Fork to gear clearance for central slider	0.4 ÷ 0.8 mm	n.a.

Cylinder/piston

	Reference	Standard value	Service limit
	Cylinder liner nominal diameter	100 mm	
	Max. bore ovality		n.a.
	Max. bore taper		n.a.
	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-to-bore clearance		0.025 ÷ 0.045 mm	
Piston	Nominal diameter		
	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	
Connecting rod	Connecting-rod big-end diameter	49 mm	
	Crankshaft class	Connecting rod class	Bearings colour
Big-end bearing pairings	A A B B C C	X Y X Y X Y	Blue Blue + Yellow Blue + Yellow Yellow Yellow Yellow + Black
Big-end bearing-to-crankpin clearance	Pin selection	0.053 ÷ 0.075 mm	
Gudgeon pin–to-piston clearance		0.015 ÷ 0.025 mm	
	Nominal diameter	Ø 22 mm	
	Piston	Ø 22 mm / 0.020 ÷ 0.015	
	Gudgeon pin	Ø 22 mm / 0 ÷ 0.005	
Gudgeon pin-to-connecting rod clearance		0.035 ÷ 0.050 mm	
Engine cylinder compression measured with DDS2		n.a.	n.a.

Crankshaft

	Reference	Standard value	Limit value
Crankshaft	Ovality		n.a.
	Taper		n.a.
	Main bearing journal alignment		n.a.

Timing system/valves

	Reference	Assembly value	Checking clearance upon set mileage (Km 24,000 / mi 15,000)
Timing diagram	With 1 mm valve clearance		
	Intake	Opening 16° B.T.D.C. Closing 56° A.B.D.C.	
	Exhaust	Opening 63° B.B.D.C. Closing 9° A.T.D.C.	
	Intake valve diameter	41.8 mm	
	Exhaust valve diameter	34mm	
Valve lift	With 0 mm valve clearance	Intake 13.8 mm Exhaust 12 mm	
	Opening rocker arm - intake	0.15÷0.20 mm	0.10÷0.25 mm
	Opening rocker arm - exhaust	0.15÷0.20 mm	0.10÷0.25 mm
	Closing rocker arm - intake	0.08÷0.13 mm	0.08÷0.25 mm
	Closing rocker arm - exhaust	0.08÷0.13 mm	0.08÷0.25 mm

Transmission

	Reference	Technical specifications
	Clutch	Wet type with multiple plates
	Clutch control	Hydraulic
	Gearbox	6 speed
	Primary drive	30/53
	Final drive	15/44
	Gearbox type	With constant mesh spur gears, operated by a lever on the left side of the motorcycle
Transmission	Gear ratios	
	1st	15/37
	2st	16/30
	3st	18/27
	4st	20/25
	5st	22/24
	6st	24/23

Colours

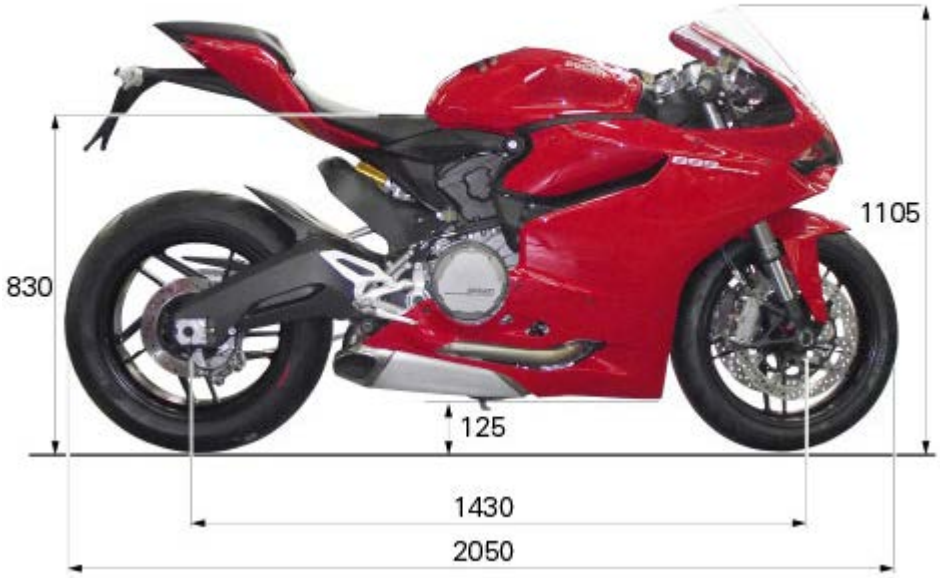
Description	Part no.
Ducati Anniversary Red Primer (Acriflex White) Sub-frame Matt Black 4 Gloss Monocoque grey frame Black wheel rims	473.101 (PPG) LMC06017 (LECHLER)
Arctic White Silk Primer (Dual primer Arctic White) Primer (Pearl White Ducati SF) Clear lacquer Sub-frame Matt Black 4 Gloss Monocoque grey frame Black wheel rims	L2920057 (LECHLER) L2909004 (LECHLER) 96598 (LECHLER)

General

	Reference	Technical specifications
Motorcycle dimensions	Total length	2050 mm
	Total width	730mm
	Total height	1105 mm
	Seat height	830 mm
	Minimum ground clearance	125 mm
	Front footpeg height	404 mm
	Wheelbase	1430 mm
Frame	Type	Aluminium alloy monocoque frame
Subframe	Type	Steel tubular trellis rear subframe
	Steering head angle	24.5°
	Steering angle	27° left side / 27° right side
	Trail	100 mm
	Front suspension	SHOWA: Hydraulic upside-down fork with external adjusters for rebound, compression, and preload (for inner springs of fork legs). Stanchion diameter: 43 mm
	Front wheel travel	120 mm
	Rear suspension	SACHS: The rear suspension uses a pressurised hydraulic monoshock absorber with adjustable rebound, compression and spring preload. Wheel travel: 130 mm
	Front wheel rim	5-spoke, light-alloy rims
	Front wheel rim size	MT 3.50x17”
	Front tyre size	120/70 - ZR 17
	Rear wheel rim	5-spoke, light-alloy rims
	Rear wheel rim size	MT 5.50x17”
	Rear tyre size	180/60 - ZR 17
	Type of tyres	Radial tubeless tyres
	Front brake	Hydraulic with 2 callipers

	Rear brake	Hydraulic with 1 calliper
Engine	Type	Twin cylinder, four-stroke, 90° "L" type, longitudinal, with deep sump die-cast crankcase
	Bore	100 mm
	Travel	57.20 mm
	Displacement	898.50cu. dm
	Compression ratio	12.5±0.5:1
	Timing system	Double overhead camshaft (DOHC) driven by chain and gearwheels, 4 valves per cylinder, desmodromic system
	Lubrication system	Forced lubrication by pump with two cooling radiators
	Oil pump type	Forced with Ducati gear pump with horizontal oil filter and oil pipes with nipples, twin seal unions
	Cooling system	Fluid with two radiators with one closed circuit fan and mixing thermostat
	Air filter	One filtering element in the air-box
	Crankshaft type	One-piece

Dimensions



Fuel, lubricants and other fluids

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

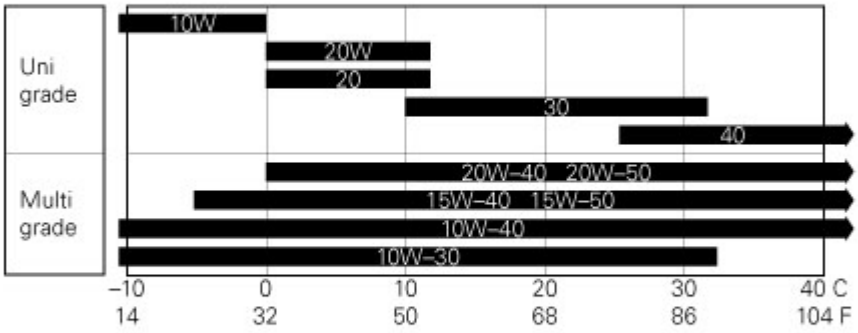
Fuel, lubricants and other fluids	Type	cu. dm(litres)
Fuel tank, including a reserve of 5cu. dm (litres)	Unleaded fuel with 95-98 RON fuel octane rating (at least) For the US market, unleaded fuel with 90 (RON+MON)/2 fuel octane rating (at least).	17
Oil sump and filter	SHELL Advance 4T Ultra	3.7cu. dm (litres)
Front/rear brake and clutch circuits	SHELL - Advance Brake DOT 4 special hydraulic fluid	
Protectant for electric contacts	SHELL - Advance Contact Cleaner spray used to protect electric systems	
Front fork	SHELL - Advance Fork 7.5 or Donax TA	563 ± 2 cc (per leg)
Cooling system	ENI Agip Permanent Spezial antifreeze (do not dilute, use pure)	2.3cu. dm

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

Warning
Vehicle is compatible only with fuels with a max. ethanol content 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.

Oil viscosity
SAE 15W-50
The other viscosity grades specified in the table can be used where the average ambient temperatures are within the limits shown.


Uni grade
Multi grade
10W
20W
20
30
40
20W–40
20W–50
15W–40
15W–50
10W–40
10W–30
–10 0 10 20 30 40 C
14 32 50 68 86 104 F

Frame tightening torque values

Part	Thread (mm)	Nm ±10% Tolerance	Notes
ACCESSORIES AND OUTFIT			
Passenger seat strap nut	M6x1	8	Grease B (on underside only)
ABS			
Screw retaining ABS bracket to horizontal head	M6x1	10	
Screw retaining ABS control unit rubber block to bracket	M6x1	8	
Fastener retaining ABS brake lines to control unit	M12x1	23	
Fastener retaining brake lines to ABS control unit	M10x1	23	
Fastener retaining ABS control unit rubber block to bracket	M6x1	6.8	
Fastener retaining ABS line front and rear grommets to frame	M6x1	5	LOCK 2
STAND			
Side stand pivot fastener	M8X1.25	25	Grease B
Stand spring rod stop grub screw fastener	M6x1	5	LOCK 8
Spring centring rod hinge pivot fastener		Interference fit and caulking	
Side stand magnet fastener		Glueing with silicone and caulking	
CHAIN - FRONT SPROCKET			
Front sprocket cover retaining screw	M5X0.8	4	LOCK 2
Front sprocket retaining screw	M10X1.25	55 *	Grease B
Chain slider retaining screw	M6x1	13	
LIGHTS			
Screw securing cover to conveyor	M3.5	1	
Screw securing conveyor to headlight	M5x0.8	4	
Screw securing headlight to support	M5x0.8	5	Grease B
Screw securing headlight to tail guard compartment	M4.5 st	3	
Screw securing mirrors to subframe	M5x0.8	6	
Screw securing turn indicators to number plate holder	M5x0.8	3	

INSTRUMENT PANEL			
Nut retaining silent block to headlight support	M5x0.8	3	
FRONT FORK			
Steering shaft to bottom yoke fastener	M37x1	40	LOCK 5
Screw retaining bottom yoke clamps to forks	M6x1	8*	Grease B (Sequence: 1-2-3 / 2-1-3)
Nut retaining steering stop screw	M6x1	10	LOCK 2
Screw retaining splash guard to bottom yoke	M5x0.8	5	
Screw retaining Showa fork bottom end clamps to shaft	M6x1	10*	Grease B (Sequence: external-internal-external)
Screw retaining steering head clamps to forks	M8x1.25	22*	Grease B
Screw retaining steering head clamps to steering shaft	M8x1.25	22*	Grease B
Ring nut retaining steering shaft pack	M35x1	25*	Grease C
Screw retaining steering damper to frame	M6x1	10	LOCK 1
Screw retaining steering damper to handlebar	M6x1	10	LOCK 1
ELECTRICAL - ELECTRONIC SYSTEM			
Electrical system mounts to frame fastener	M5x0.8	5	LOCK 1
Screw securing battery support to engine	M6x1	10	
Screw securing cover to battery support	M5x0.8	5	
Screw securing fuse cable protection to battery support	M5 st	3	
Screw retaining cable eyelets to solenoid starter	M6x1	4	
Nut retaining cable eyelets to starter motor	M5x0.8	3	Grease C
Screw retaining wiring bracket to head	M5x0.8	4	LOCK 1
Self-locking nut retaining solenoid starter support to generator cover	M5x0.8	6	
Screw retaining voltage regulator	M6x1	8	
Screw retaining control unit bracket	M5x0.8	3	
Coil retaining screw	M6x1	8	
Map sensor retaining screw	M6x1	2	
Screw retaining throttle shells	M5x0.8	1.5	
Screw retaining right switch shells	M4x0.7	1.3	
Screw retaining left switch shells	M4x0.7	1.3	

Side stand switch retaining screw	M4x0.5	3	LOCK 2
Ignition switch special retaining screw	M6x1	10	Pre-applied threadlocker on new part - LOCK 2 for reuse
Speed sensor retaining screw	M6x1	10	
Lambda sensor fastener	M12x1.25	25	Pre-applied grease on new part - Grease B for reuse
Number plate light retaining screws	3	0.7	
Air temperature sensor retaining screw	M5x0.8	3	
Rear stop switch fastener	M8x1	5	
Horn retaining screw	M8x1.25	18	Pre-applied threadlocker on new part - LOCK 2 for reuse
Exhaust valve motor retaining screw	M5 st	4	
Screw retaining motor cover to extractor	M5 st	4	
Screw retaining actuator to air-box bottom	M5x0.8	4	
Screw retaining secondary air system pipe support clamp	M3.5 st	1	
Screw retaining wiring tab on left-hand seat-tank cover	M4x0.5	2	
Screw retaining BBS bracket to subframe	M5x0.8	5	
FRONT BRAKE			
Screw retaining front brake master cylinder to handlebar	M6x1	10	(Sequence: 1-(UP)-2-1)
Brake fluid reservoir plate retaining screw	M6x1	10	
Self-locking nut retaining brake fluid reservoir to plate	M5x0.8	5	
Screw retaining brake line union to brake master cylinder	M10x1	23	
Screw retaining brake line union to right-hand brake calliper	M10x1	23	
Screw retaining brake line union to left-hand brake calliper	M10x1	23	
Braking system black bleeder	M6x1		
Screw retaining callipers to fork end terminals	M10x1.25	45*/pre-tightening 2*	Grease B
Screw retaining front brake line guide to bottom yoke	M5x0.8	5	
REAR SWINGING ARM			
Fastener retaining right-hand swinging arm shaft to engine block	M20x1.5	100*	Grease B
Fastener retaining left-hand swinging arm shaft to engine block	M20x1.5	100*	Grease B

Chain sliding shoe retaining screw	M6x1	8	Pre-applied threadlocker on new part - LOCK 2 for reuse
Chain splash guard black retaining screw	M5x0.8	5	Pre-applied threadlocker on new part - LOCK 2 for reuse
REAR BRAKE			
Union retaining screw	M10x1	23	
Rear brake fluid reservoir retaining screw	M6x1	2	
Screw retaining front brake master cylinder support to footpeg bracket	M5x0.8	6	Use pre-torque setting
Screw retaining rear brake master cylinder support to footpeg bracket.	M6x1	10	LOCK 1
Screw retaining rear brake master cylinder to support	M6x1	8	
Screw retaining rear brake calliper to plate	M8x1.25	25*	Grease B
Special nut retaining brake line cable ring to clutch cover	M5x0.8	5	
Rear brake line-calliper holder plate clamp fastener	M6x1	8	
Screw retaining calliper holder plate to swinging arm	M5x0.8	6	
NUMBER PLATE HOLDER			
Screw retaining lower to upper number plate holder	M5 st	5	
Screw retaining number plate holder to subframe	M5x0.8	6	
Screw retaining number plate holder plate to number plate holder	M6x1	5	
Nut retaining cat's eye to number plate holder plate	M4x0.5	2	
HANDLEBAR - CLUTCH CONTROL			
Screw retaining clutch master cylinder to handlebar	M6x1	10	Sequence 1 (up) -2 - 1
Clutch fluid reservoir plate retaining screw	M6x1	-	
Nut retaining brake fluid reservoir to plate	M5x0.8	-	
Union special retaining screw	M10x1	-	
Braking system bleeder	M6x1	-	
Union retaining screw	M10x1	-	
Screw retaining clutch slave cylinder to engine block	M6x1	10	Sequence: 1-2-3-1
Screw retaining handlebar clamp to forks	M8x1.25	22*	Grease B
Screw retaining handlebar clamp to tube	M6x1	8	Grease B (Sequence:

			external-internal-external)
Fastener retaining counterweight to handlebar	M18x1.5	25	LOCK 1
REAR SUSPENSION			
Screw retaining support to engine block	M8x1.25	25*	Grease B
Screw retaining rocker arm to left support	M8x1.25	60*	Grease B
Special screw retaining suspension actuating rod clamp	M6x1	10*	Grease B
Special screw retaining suspension linkage to swinging arm	M10x1.25	45*	Grease B
Nut retaining suspension linkage to rocker arm	M10x1.25	45*	Grease B
Screw retaining shock absorber to engine block	M10x1.5	45*	Grease B
Screw retaining shock absorber to rocker arm	M10x1.5	45*	Grease B
Screw retaining shock absorber spring guard	M5x0.8	6	
Rear suspension linkage centre distance adjustment	M14x1		GREASE C
FRONT MUDGUARD			
Mudguard clip retaining screw	M3.5 st	0.4	
Screw retaining mudguard to bracket	M6x1	10	
WATER RADIATOR			
Screw retaining radiator support to frame	M5x0.8	6	Grease B
Black large head screw retaining radiator support to horizontal head	M5x0.8	4	LOCK 1
Black screw retaining radiator support cover	M5x0.8	2.5	
Screw securing upper radiator to radiator support	M5x0.8	5	Grease B
Screw retaining heat exchanger breather pipe eyelet	M10x1	14	
Screw retaining electric fan to front extractor	M5 st	3	
Screw retaining rear to front extractor	M5 st	4	
Screw securing extractor to radiator support	M5x0.8	5	Grease B
Black screw retaining extractor to sump	M5x0.8	4	Pre-applied threadlocker on new part - LOCK 2 for reuse
Screw for clamp retaining water pipes to radiators and distributor	-	2.5	
FOOTPEGS AND LEVERS			
Screw retaining left support to engine block	M8x1.25	25*	Grease B

Screw retaining left support and stand to engine block	M8x1.25	25*	Grease B
Screw retaining left support clamp to swinging arm shaft	M8x1.25	8*	Grease B
Screw retaining left footpeg holder plate to support	M8x1.25	25*	Grease B
Screw retaining left heel guard to footpeg holder plate	M5x0.8	6	
Pin retaining gearchange pedal to footpeg holder plate	M8x1.25	25	Grease C on collar
Nut retaining ball joint to rod	M6x1	5	LOCK 1
Nut retaining quick-shift actuator to rod	M8x1.25	15	LOCK 1
Screw retaining complete rod to gearchange pedal	M6x1	10	LOCK 1
Screw retaining complete rod to gearchange lever	M6x1	10	
Screw retaining gearchange lever clamp to selector shaft	M6x1	10	
Screw retaining right-hand support to engine block	M8x1.25	25*	
Screw retaining right-hand support clamp to swinging arm shaft	M8x1.25	8*	Grease B
Screw retaining right-hand footpeg holder plate to support	M8x1.25	25*	Grease B
Screw retaining the rear side of right-hand heel guard	M5x0.8	6	LOCK 2
Screw retaining front side of right-hand heel guard/master cylinder support	M5x0.8	6	LOCK 2
Pin retaining rear brake lever to footpeg holder plate	M8x1.25	25	Grease C on collar
Nut retaining rear brake lever adjuster screw	M6x1	8	
Nut retaining fork to rear brake linkage	M6x1	7.5	
Pin retaining rear brake linkage to brake lever	M6x1	10	LOCK 2
Screw retaining passenger footpeg holder plates	M6x1	10	
Screw retaining front side of footpeg holder plates to subframe	M8x1.25	25	
Screw retaining rear side of footpeg holder plates to subframe	M8x1.25	25	
REAR MUDGUARD			
Screw retaining rear mudguard to swinging arm	M5x0.8	5	Pre-applied threadlocker on new part - LOCK 2 for reuse

FRONT WHEEL			
Screw retaining brake discs and phonic wheel to wheel rim	M8x1.25	30*	
Nut retaining front wheel pack to left fork leg	M25x1.25	63*	Grease B (on thread and underhead)
REAR WHEEL			
Screw retaining brake disc and phonic wheel to wheel rim	M8x1.25	25*	DRILOC 218
Screw retaining cush drive damper pin to driving flange	M14x1.5	44*	Lock 5
Screw securing rear wheel shaft to fixed chain tensioner slider	M30x1.5	20*	Lock 8
Screw retaining rear sprocket to driving flange.	M10x1	44	Lock 2
Nut retaining rear wheel pack to double-sided swinging arm	M30x1.5	180	
Screw retaining chain slider adjuster	M8x1.25	8	
FUEL TANK			
Male quick coupling fastener	1/4 NPT	5.5*	LOCK 6
Tank front hinge spacer retaining screw	M6x1	10	Grease B
Tank plug retaining screw	M5x0.8	4	
Tank support top bracket front retaining nut	M5x0.8	6	
Tank support top bracket rear side screw	M6x1	10	Grease B
Screw retaining rear tank bracket/seat to subframe	M5x0.8	4	
Tank to subframe rear fastener	M6x1	10	
EXHAUST			
Copper nut retaining manifold to head	M6x1	10	
Screw retaining heat guard to horizontal manifold	M5x0.8	5	
CO plug fastener	G 1/8" A	25	Grease I
Copper nut retaining manifold to head	M6x1	10	
CO plug fastener	G 1/8" A	25	Grease I
Screw retaining exhaust silencer to central body	M6x1	10	
Nut retaining front bracket to silencer	M6x1	10	
Screw retaining silencer front bracket to engine block	M8x1.25	25	Grease B
Screw retaining rear bracket to silencer	M6x1	10	

Screw retaining silencer rear bracket to engine block	M8x1.25	25	Grease B
Screw retaining heat guard to vertical manifold	M5x0.8	4	
Self-locking nut retaining Bowden cable heat guard to sump screws	M5x0.8	6	
Fastener retaining silencer bracket to footpeg holder plate (Japan version)	M5x0.8	6	LOCK 2
Fastener retaining silencer bracket to carbon tailpipe (Japan version)	M6x1	15	
Fastener retaining tailpipe bracket spring unit to silencer bracket (Japan version)	M8x1.25	15	
Fastener retaining heat guard to carbon tailpipe (Japan version)	M5x0.8	4	
SEAT			
Screw retaining seat spacer to tank bracket	M5x0.8	3	
FRAME			
Nut retaining frame to engine heads	M10x1	45*	Grease B
Screw retaining plug for ABS holes on frame	M5x0.8	5	LOCK 2
Side screws retaining switch bracket to frame	M6x1	10	Grease B
Central screw retaining switch bracket to frame	M6x1	10	Grease B
Screw retaining rear subframe to frame	M8x1.25	28*	Grease B
Screw retaining rear subframe to vertical head	M8x1.25	22*	Grease B
Special screw retaining tail guard compartment to rear subframe	M8x1.25	18	
Nut retaining seat lock pawl to side body panel	M22x1.5	3	
Screw retaining seat latch to tail guard compartment	M6x1	8	
Screw retaining steel subframe to vertical head	M8x1.25	22*	Grease B
Screw retaining side body panels to steel subframe	M5x0.8	5	
Screw retaining cylinder head cover to steel subframe side panels	M5x0.8	5	
AIR INLET/OIL BREATHER			
Bottom screw retaining front subframe to frame	M6x1	10	Grease B
Top screw retaining front subframe to frame	M6x1	10	Grease B
Screw retaining instrument panel cover to	M5x0.8	3	LOCK 1

front subframe			
FUEL SYSTEM			
Screw retaining throttle body to intake manifolds	M6x1	10	LOCK 1
Nut retaining intake funnels to throttle body	M5x0.8	6	
Screw retaining injector caps to throttle body/shower	M5x0.8	6	
Screw retaining GAC to fuel tank	M5x0.8	5	Grease B
Injector caps to throttle body fastener	M5x0.8	6	
GAC to fuel tank fastener	M5x0.8	5	
FAIRINGS			
Screw retaining headlight fairing to subframe	M5x0.8	5	
Screw retaining Plexiglas to headlight fairing	M4x0.5	0.2	
Screw retaining headlight fairing splash guard to headlamp	M5x0.8	5	
Black special screw retaining left upper half-fairing to headlight fairing	M5x0.8	2.5	
Black special screw retaining left upper half-fairing to electrical system support	M5x0.8	2.5	
Black special screw retaining left upper half-fairing to lower half-fairing	M5x0.8	2.5	
Black special screw retaining left lower half-fairing to left support.	M5x0.8	5	
Black special screw retaining left lower half-fairing to rear extractor	M5x0.8	2.5	
Black special screw retaining right upper half-fairing to headlight fairing	M5x0.8	2.5	
Black special screw retaining right upper half-fairing to electrical system support	M5x0.8	2.5	
Black special screw retaining right upper half-fairing to lower half-fairing	M5x0.8	2.5	
Black special screw retaining right lower half-fairing to right support	M5x0.8	5	
Black special screw retaining right lower half-fairing to rear extractor	M5x0.8	2.5	
Special screw securing lower half-fairings to radiator support	M5x0.8	2.5	
Side black special screw securing half-fairings to radiator support	M5x0.8	2.5	
Black special screw retaining left side body panel to subframe	M5x0.8	2.5	
Black special screw retaining left side body panel to tail guard compartment	M5x0.8	2.5	

Black special screw retaining right side body panel to subframe	M5x0.8	2.5	
Black screw retaining right side body panel to tail guard compartment	M5x0.8	2.5	
Black screw retaining tail guard frame to tail guard compartment	M5x0.8	2.5	
Black screw retaining tail guard frame to tail guard side panels	M5x0.8	2.5	
Special nut retaining ignition switch cover to bracket	M5x0.8	8	
Fastener retaining switch cover to conveyor covers	M5x0.8	2.5	
Fastener retaining Japan sound-deadening panel to engine	M5x0.8	5	

*dynamic safety-critical point; tightening torque tolerance must be Nm ±5%.

Vehicle pre-delivery

1. Transport packaging integrity visual check (where applicable):
2. Transport packaging removal (where applicable);
3. Motorbike integrity visual check;
4. Check of the supplied kit completeness (refer to the parts list supplied together with the kit);
5. Plexiglas assembly (Fitting the headlight fairing);
6. Rear-view mirror assembly (Refitting the rear-view mirrors);
7. If requested by the Customer, passenger footpeg and seat assembly (Refitting the passenger seat);
8. Battery start-up (Recharging the battery- Topping up the electrolyte) and fitting on the vehicle (Refitting the battery);
9. Final drive correct tensioning check;
10. Tyre pressure check (front: 2.5 bar, rear: 2.5 bar);
11. Brake and clutch fluid check and coolant check (top-up if necessary);
12. Engine oil level check (top-up if necessary);
13. Lights, turn indicators, horn and controls check. Headlight beam height adjustment check. Handlebar freedom of movement and possible interference check;
14. Keys and RH/LH steering lock operation check;
15. Check front and rear wheel shaft tightening (front: 63 Nm±5% - Rear 20 Nm±5%);
16. Check the brake calliper retaining screws tightening (front: 45 Nm±5% - Rear 25 Nm±5%);
17. Fuel top-up until the reserve warning light turns off (approx. 5 litres);
18. Engine stop switch, side stand switch and clutch lever switch operation check;
19. Check for available technical updates (if any) and recall campaigns on DCS;
20. Assembly of Ducati Performance accessories (if applicable) as reported on the Customer order and check of their correct operation;
21. Final inspection and road test (safety devices and electric-fan correct operation check);
22. ECU trouble codes reading with DDS 2.0 and Software updates check (use the Global Scan function);
23. Clean the motorcycle;
24. Motorbike warranty activation and on-board documentation filling in (Warranty General Terms and Conditions);
25. Showing motorbike functions to the Customer and providing the supplied documentation.

Scheduled maintenance chart: operations to be performed by the customer

List of operations and type of intervention [set mileage (km/mi) or time interval *]	km. x1000	1
	mi. x1000	0.6
Check the engine oil level		•
Check brake and clutch fluid level		•
Check tyre pressure and wear		•
Check the drive chain tension and lubrication. If necessary, contact your dealer to adjust		•
Check brake pads. If necessary, contact your dealer to replace pads		•

* Service on the set interval, whichever comes first (mileage or months)

Scheduled maintenance chart

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

 Warning

This scheduled maintenance chart is designed for a road use of the 899 Panigale. If it is used on the track, even if not during sport competitions, all parts of the motorcycle are more stressed so the routine maintenance operations must be carried out more frequently than indicated.

List of operations and type of intervention	km x 1000	1	12	24	36	48	Time Months
	mi x 1000	0.6	7.5	15	22.5	30	
Reading of the error memory with DDS 2.0 and check of software version update on control units		•	•	•	•	•	12
Check the presence of any technical updates and recall campaigns		•	•	•	•	•	12
Change engine oil and filter		•	•	•	•	•	12
Clean the engine oil mesh filter assembly				•		•	
Check and/or adjust valve clearance				•		•	
Visual check for wear of the chain timing system						•	
Change the spark plug				•		•	
Clean air filter			•		•		
Change air filter				•		•	
Check the proper tightening of the clutch cover and clutch protection cover screws			•	•	•	•	
Check the proper tightening of the oil sump screws				•		•	
Check brake and clutch fluid level		•	•	•	•	•	12
Change brake and clutch fluid							24
Check brake pad wear. Change, if necessary		•	•	•	•	•	12
Check the proper tightening of brake calliper bolts and brake disc flange							12

screws	•	•	•	•	•	
Check front and rear wheel nuts tightening	•	•	•	•	•	12
Check wheel hub bearings			•		•	
Check and lubricate the rear wheel shaft			•		•	24
Check the cush drive damper on rear sprocket			•		•	
Check the proper tightening of final drive front and rear sprocket nuts	•	•	•	•	•	12
Check final drive chain sliding shoe wear	•	•	•	•	•	12
Check final drive chain tension and lubrication	•	•	•	•	•	12
Check steering bearings and lubricate, if necessary			•		•	24
Change front fork fluid						36
Visually check the front fork and rear shock absorber seals	•	•	•	•	•	12
Check for proper tightening of the frame-to-engine fasteners		•	•	•	•	12
Check the freedom of movement and tightening of the side stand	•	•	•	•	•	12
Visually check the fuel lines		•	•	•	•	12
Check rubbing points, clearance, freedom of movement and positioning of hoses and electric wiring	•	•	•	•	•	12
Lubricate the levers at the handlebar and pedal controls		•	•	•	•	12
Change coolant						36
Check the coolant level	•	•	•	•	•	12
Check electric fan operation	•	•	•	•	•	12
Check tyre pressure and wear	•	•	•	•	•	12

Check the battery charge level	•	•	•	•	•	12
Check idling	•	•	•	•	•	12
Check secondary air system operation			•		•	
Check the operation of the safety electrical devices (side stand sensor, front and rear brake switches, engine stop switch, gear/neutral sensor)	•	•	•	•	•	12
Check lighting, turn indicators, horn and controls	•	•	•	•	•	12
Reset the Service indication through the DDS 2.0	•	•	•	•	•	12
Road test of the motorcycle, testing safety devices (ex. ABS and DTC)	•	•	•	•	•	12
Clean the motorcycle	•	•	•	•	•	12
Fill out Warranty Certificate with service data	•	•	•	•	•	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 adjuster (1) located on the front connection holding the shock absorber to the crankcase half adjusts the damping during the rebound phase (return).
The adjuster (2) located on the expansion reservoir of the shock absorber adjusts the damping during the compression phase.
The ring nuts (3) adjust the preload of the rear shock absorber spring.
To change spring preload, slacken the upper locking ring nut. Then TIGHTEN or SLACKEN the lower ring nut to INCREASE or DECREASE spring preload.
After setting spring preload as desired, tighten the upper locking ring nut.

STANDARD setting: from the fully closed position (clockwise), loosen as follows:
Compression: 2.5 turns from fully closed position.
Rebound: 12 clicks from fully closed position.
Spring preload: 17 mm.

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. You may find that rebound damping needs adjusting as well.

SELECTING SUSPENSION SETTINGS

Ducati recommends front and rear suspension settings as specified in the table: the indicated settings are mere suggestions since they depend on riding conditions as well as on the rider's skills and needs in terms of comfort.
Standard settings of the vehicle as delivered (factory settings specified in the previous paragraphs) correspond to a calibration which considers all use conditions (riding conditions, rider's skills and needs), and is the best solution for a sport use of the motorcycle on the road.

Important
The settings indicated in the table do not depend on the riding modes set by the rider on the instrument panel.

Track - Performance use		
Parameter	**Front fork**	**Rear shock absorber**
Spring preload	6 turns from fully open position	19 mm (÷ 2 mm)

Compression	1 turn from fully closed position	0.5 turns from fully closed position
Rebound	2.5 turns from fully closed position	8 clicks from fully closed position

ROAD - Comfort use		
Parameter	**Front fork**	**Rear shock absorber**
Spring preload	2 turns from fully open position	17 mm
Compression	7 turns from fully closed position	3.5 turns from fully closed position
Rebound	5 turns from fully closed position	15 clicks from fully closed position

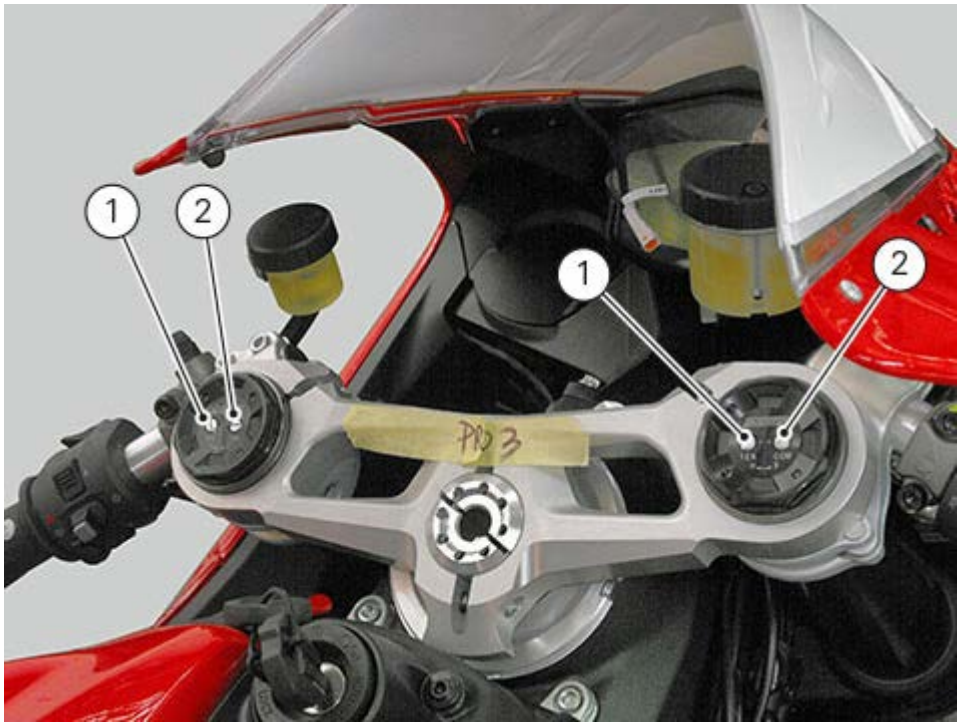
Adjusting the front fork

The front fork used on this motorcycle has rebound, compression and spring preload adjustment. Adjustment is done by external screw adjusters.

- For rebound adjustment (1);
- for compression adjustment (2);
- for spring preload adjustment (3).

Put the motorcycle on the side stand and make sure it is stable.
Turn adjuster (1) at the top end of each fork leg with a flat-blade screwdriver to adjust rebound.
Turn adjuster (2) at the top end of each fork leg with a flat-blade screwdriver to adjust compression.

Turn adjusters (1) and (2) to adjust damping. The stiffest damping setting is obtained with the adjuster turned fully in to the "0" position. Starting from this position, turning counter clockwise, you can count the turns.
To change preload of the spring inside each fork leg, turn the adjuster (3) with a hexagon wrench, starting from the fully open (counter clockwise) position.



STANDARD settings are as follows:
Compression: 4 turns (from fully closed position).
Rebound: 5 turns (from fully closed position).
Spring preload: 4 turns (from fully open position).

SELECTING SUSPENSION SETTINGS

Ducati recommends front and rear suspension settings as specified in the table: the indicated settings are mere suggestions since they depend on riding conditions as well as on the rider's skills and needs in terms of comfort.
Standard settings of the vehicle as delivered (factory settings specified in the previous paragraphs) correspond to a calibration which considers all use conditions (riding conditions, rider's skills and needs), and is the best solution for a sport use of the motorcycle on the road.

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Track - Performance use		
Parameter	**Front fork**	**Rear shock absorber**
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ROAD - Comfort use		
Parameter	**Front fork**	**Rear shock absorber**
Spring preload	2 turns from fully open position	17 mm
Compression	7 turns from fully closed position	3.5 turns from fully closed position
Rebound	5 turns from fully closed position	15 clicks from fully closed position

Changing the front fork fluid

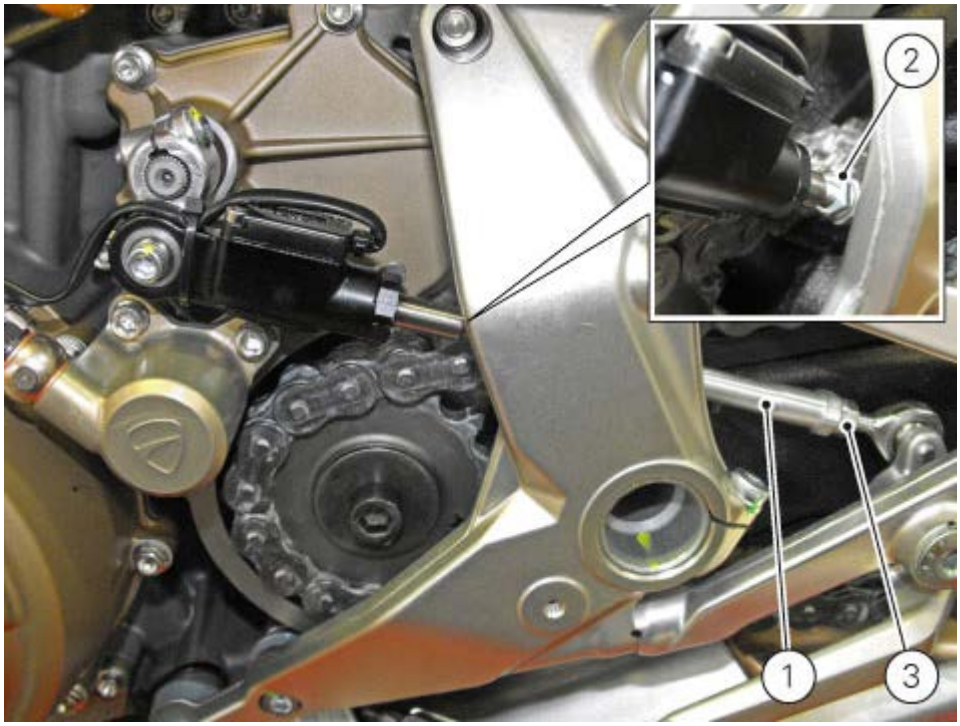
To change the fork fluid, refer to "Scheduled maintenance chart" and read the procedure under "Overhauling the front fork".

Adjusting the position of the gearchange pedal and rear brake pedal

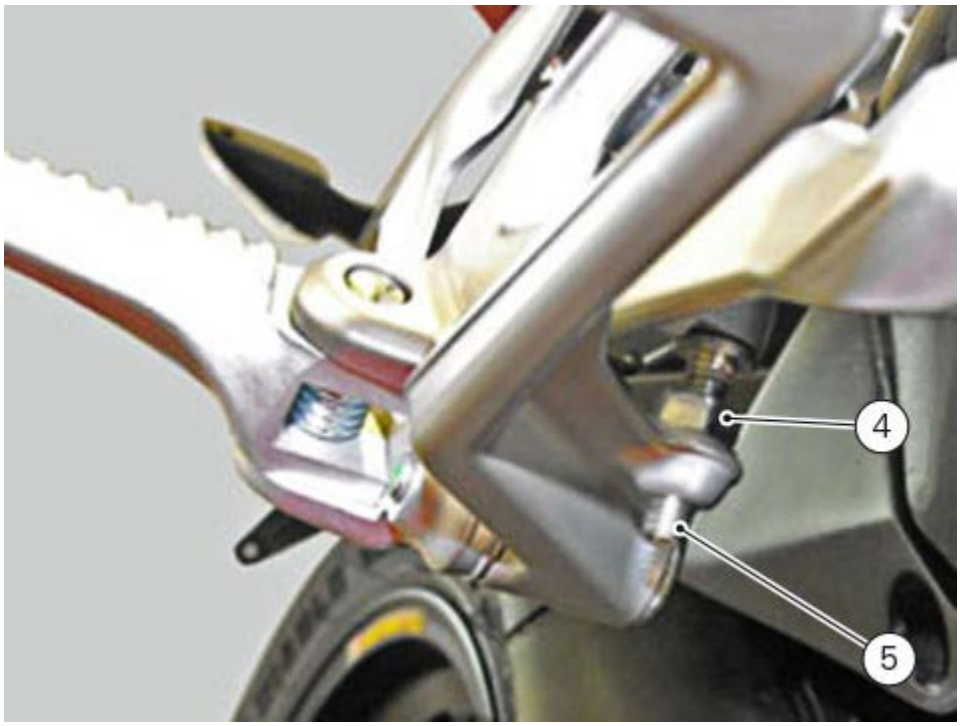
The position of the gear change and rear brake pedals in relation to the footpegs can be adjusted to suit the preferred riding position.
To adjust the position of the gearchange pedal, proceed as follows:
hold the linkage (1) and slacken the lock nuts (2) and (3).

Note
Nut (2) has a left-hand thread.

Fit an open-end wrench to hexagonal element of linkage (1) and rotate until setting pedal in the desired position.
Tighten both lock nuts onto linkage.



To adjust the position of the rear brake pedal, proceed as follows.
Loosen lock nut (4).
Turn pedal stroke adjusting screw (5) until pedal is in the desired position.
Tighten the lock nut (4).
Operate the pedal by hand to check that there is 1.5 to 2 mm of free play before the brake bites.

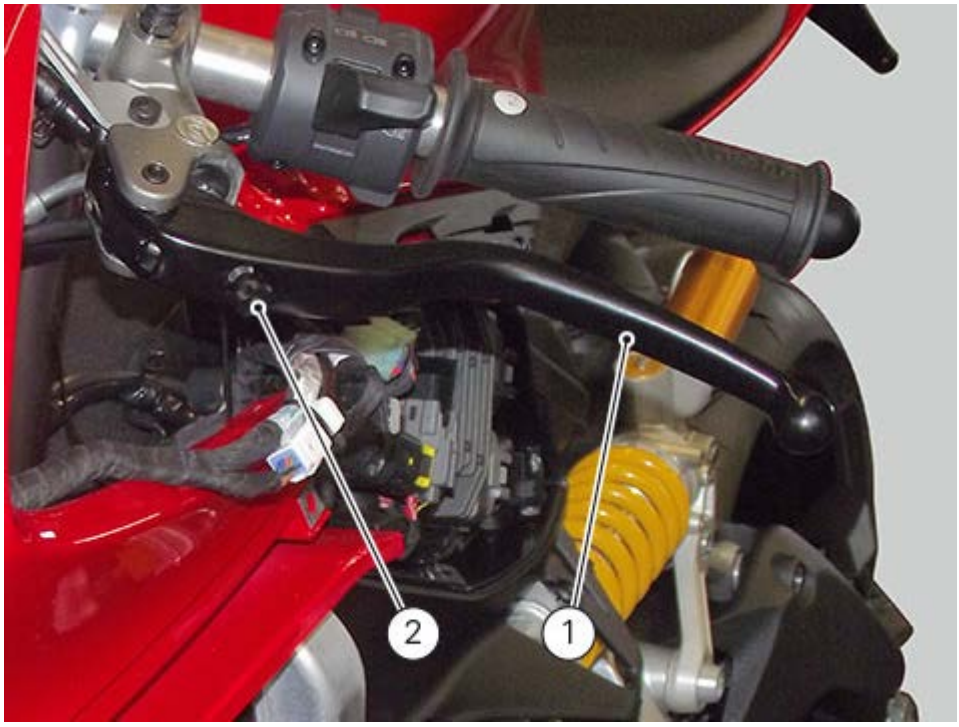

4
5

Adjusting the clutch lever and front brake lever

Attention

Any adjustment of clutch and brake levers must only be carried out when motorcycle is stationary.

Lever (1) disengages the clutch. It features a dial adjuster (2) for lever distance from the twistgrip on handlebar.
The lever distance can be adjusted through 10 clicks of the dial (2). Turn clockwise to increase lever distance.
Turn the adjuster counter clockwise to decrease lever distance.
When the clutch lever (1) is operated, drive from the engine to the gearbox and the drive wheel is disengaged. Using the clutch properly is essential to smooth riding, especially when moving OFF.



The position of the front brake lever can be adjusted in the same way.

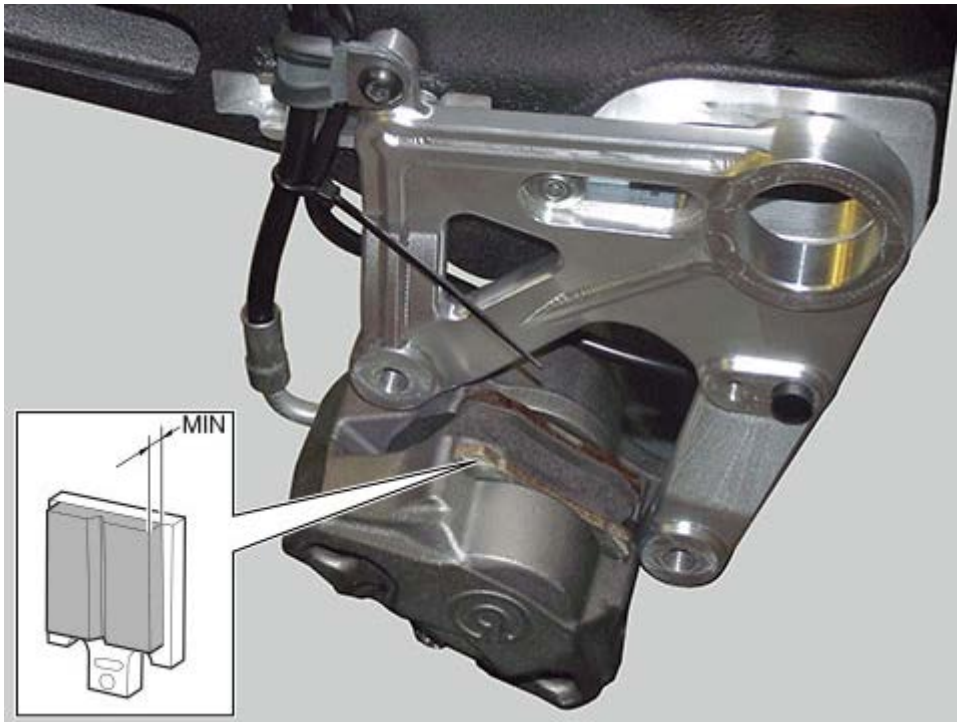
Any adjustment of clutch and brake levers must only be carried out when motorcycle is stationary.

Checking rear brake pad wear

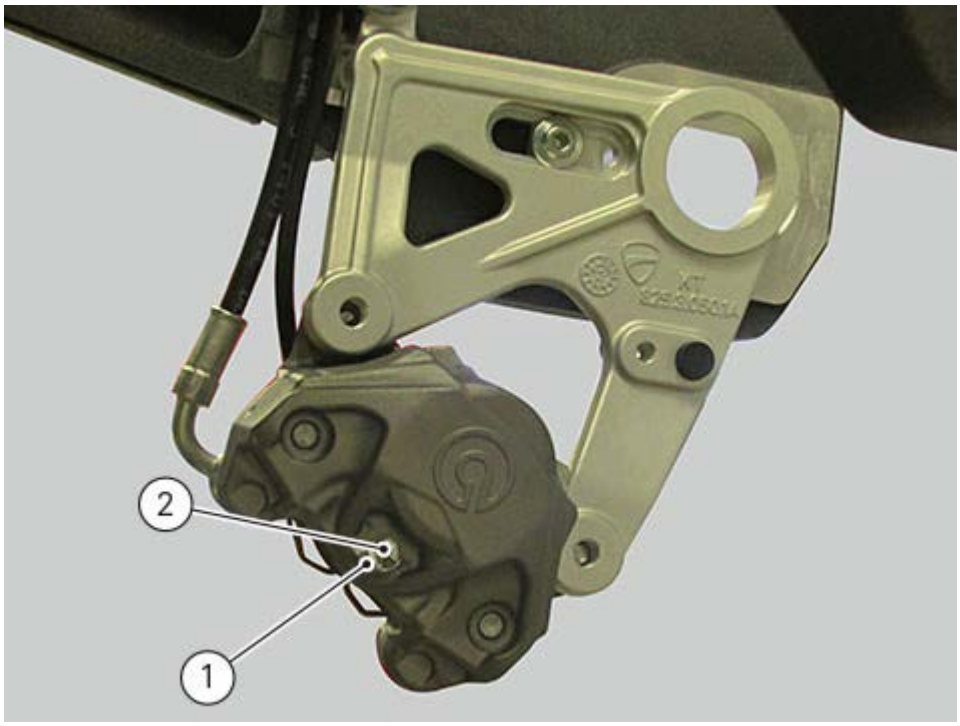
Warning
Brake fluid is corrosive and will damage paint. Avoid contact with eyes and skin. In case of accidental contact, wash thoroughly with water.

Check brake pads wear through the inspection hole in the callipers.
Change both pads if friction material thickness of even just one pad is about 1 mm.

Warning
Friction material wear beyond this limit would lead to metal support contact with the brake disc thus compromising braking efficiency, disc integrity and rider safety.

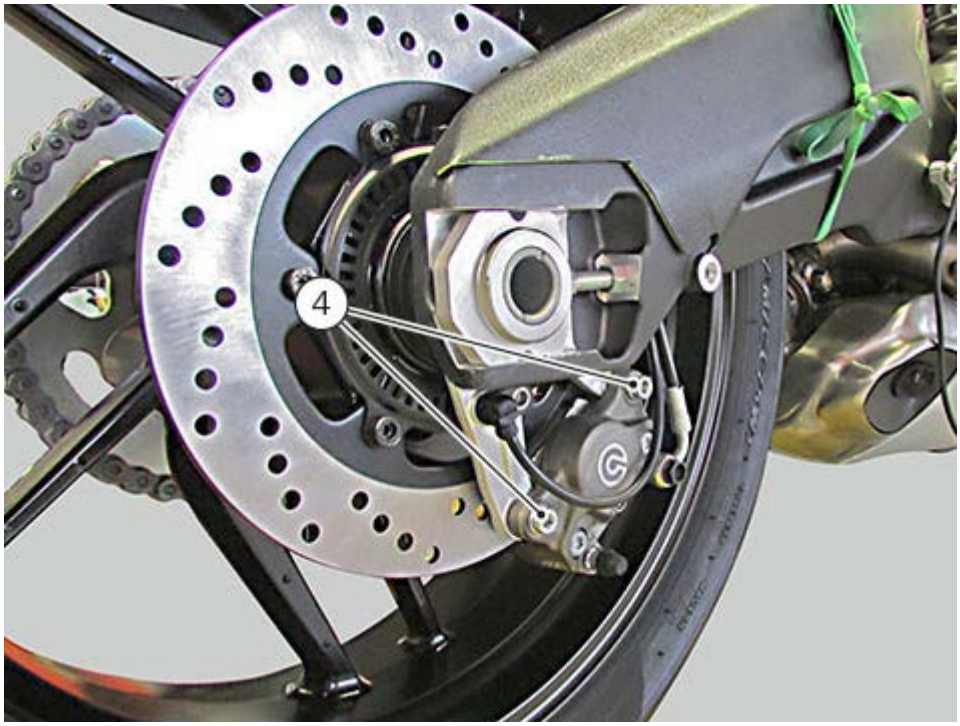


Change the brake pads as follows.
Remove the snap ring (1) from the pad retaining pin (2).

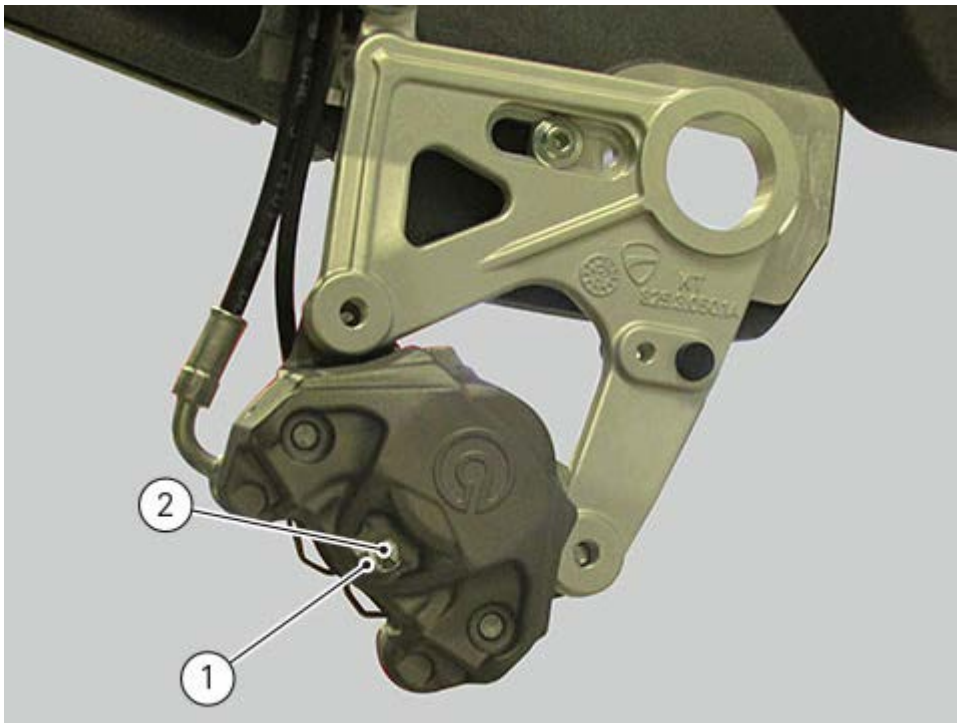


Slide out the brake pad retaining pin (2).
Remove pad retaining clip (3) from between the two calliper halves.

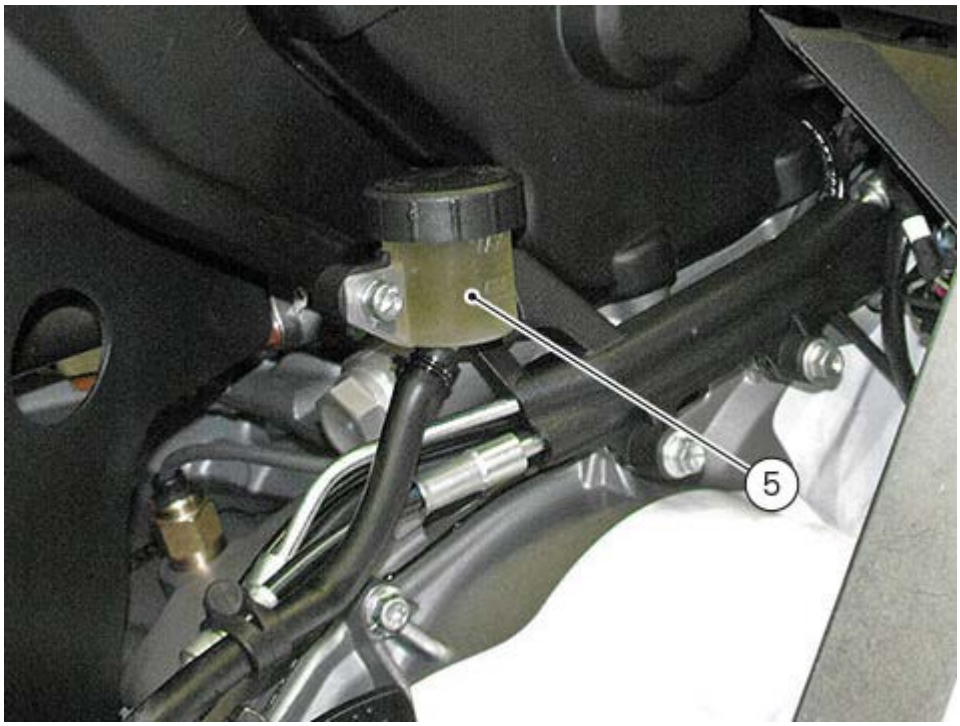
Remove the rear brake calliper by loosening the screws (4).
Force the calliper pistons back into their seats by forcing the old brake pads apart.
Remove the worn pads.



Fit the new pads.
Refit rear brake calliper, then start and tighten the screws (4) to 25 Nm ± 5%.
Insert pad retaining clip (3) and centring pin (2), locking it in place with ring (1).



Operate the brake pedal repeatedly so that the pads firmly bed in against the disc thanks to the brake fluid pressure.
Check that the fluid level inside reservoir is between the MIN and MAX marks. If this is not the case, unscrew the reservoir cover (5) and top up.


5

Checking front brake pad wear

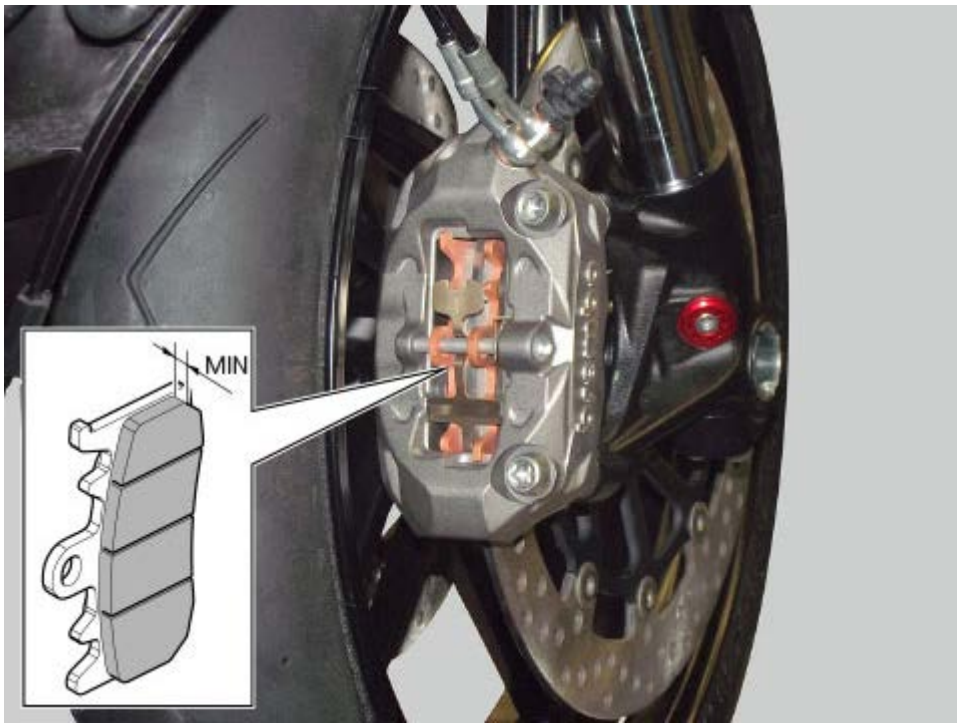
Warning
Brake fluid is corrosive and will damage paint. Avoid contact with eyes and skin. In case of accidental contact, wash thoroughly with water.

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.

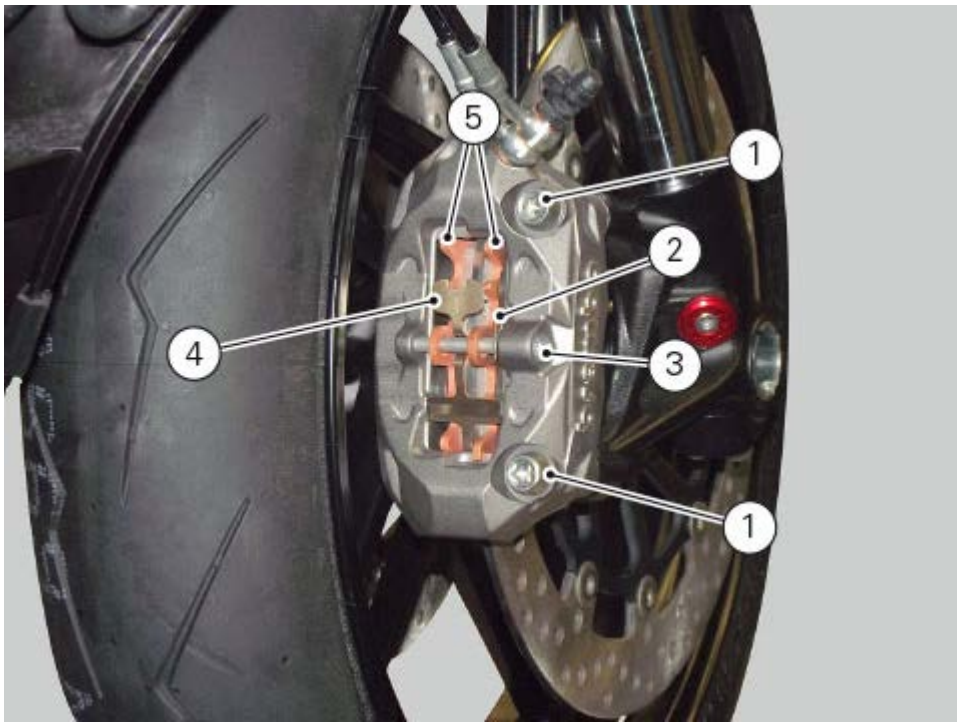
Check through the calliper slot and make sure that the friction material on pads is visible.

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

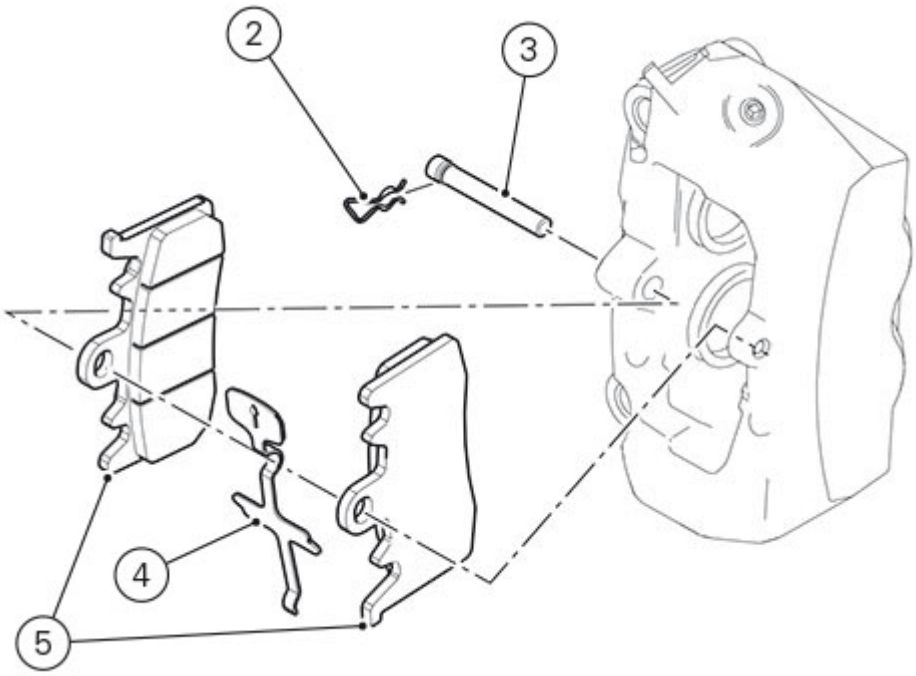
Note
Work in the same way on both front brake callipers.



Loosen the two screws (1) and remove calliper from disc.
Remove the safety split pin (2).
Turn shaft (3) clockwise and slide it out.
Remove the spring (4).



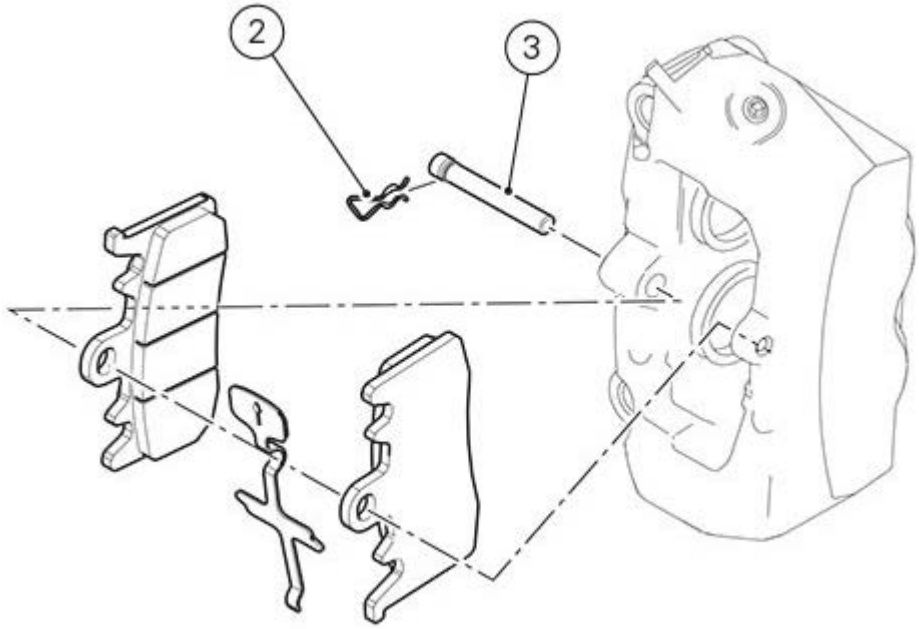
Force the calliper pistons back into their seats by forcing the old brake pads apart.
Remove the worn pads (5).



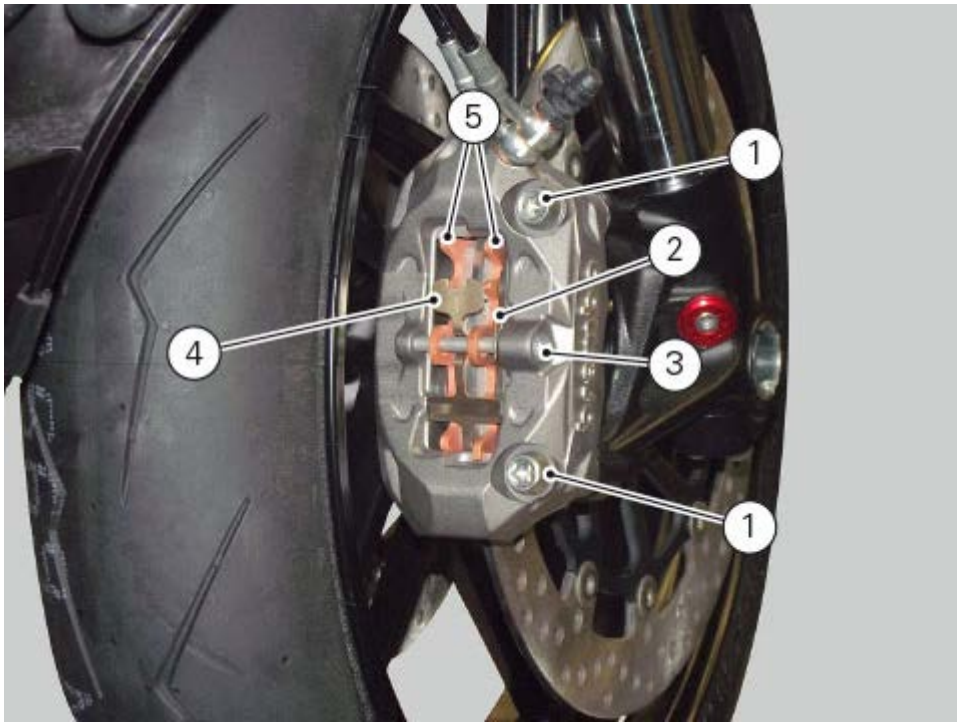
Note
Change pads that have a shiny or “vitrified” appearance.

Fit the new pads and their spring (4) making sure to position it as shown.

Fit the pad retaining pin (3) and fasten it with safety split pin (2).

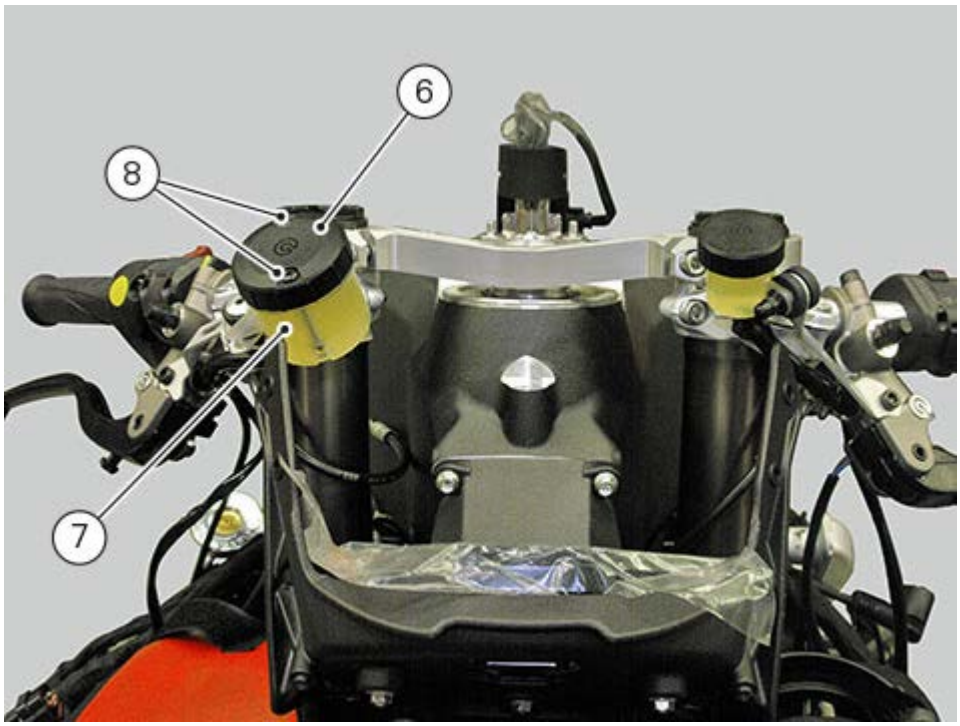


Tighten screws (1) to a torque of 25 Nm ± 5%.



Turn the pad retaining pin (3) counter clockwise.
Operate the brake lever repeatedly so that the pads firmly bed in against the disc thanks to the brake fluid pressure.
Check through the inspection glass that the level in the master cylinder reservoir is not below the MIN mark.
If necessary, top up as follows.

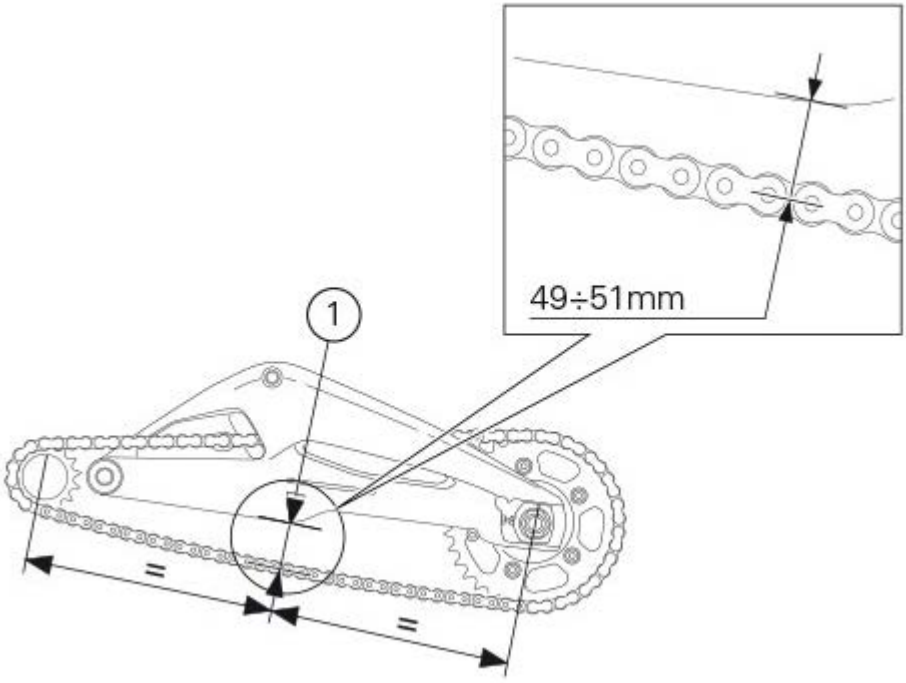
Turn the handlebar so that the reservoir is levelled.
Remove the cover (6) with membrane from the front brake fluid reservoir (7) by loosening the screws (8).
Top-up with specified fluid until reaching the MAX. mark.



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

Adjusting the chain tension

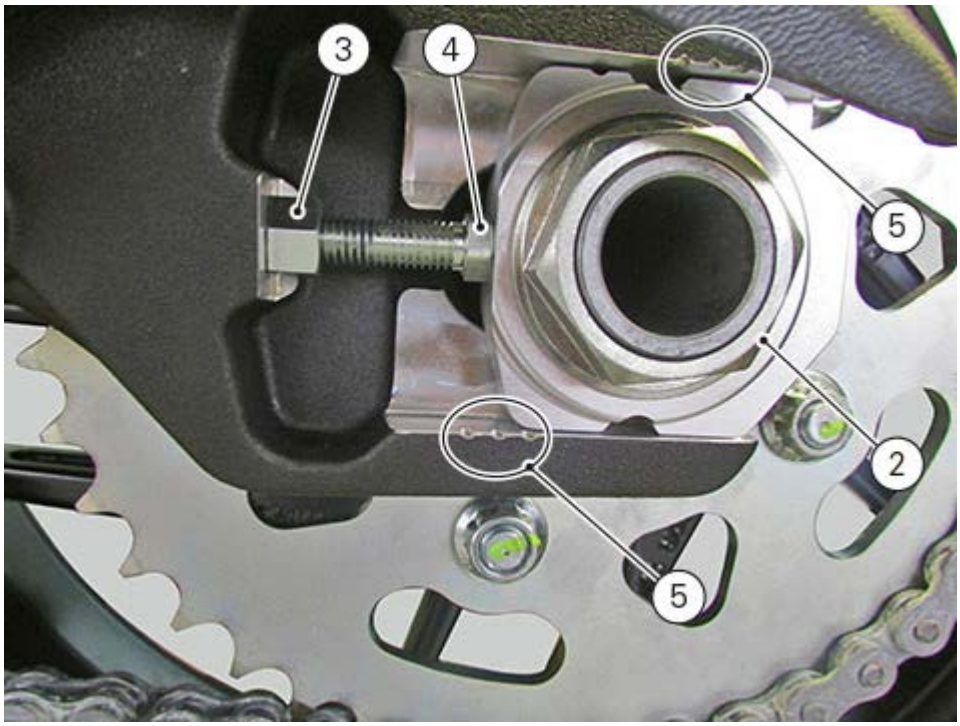
Kill the engine and set gear to neutral.
Set motorcycle on the side stand.
With a finger on chain lower section, at the centre point (1) between front and rear sprocket, make sure that the vertical slack ranges between 49 and 51 mm.
Move the vehicle, and check chain slack in other positions.



Important
Se la catena di trasmissione è troppo tesa o troppo lenta, registrarla in modo che la misura rientri nei valori indicati.

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

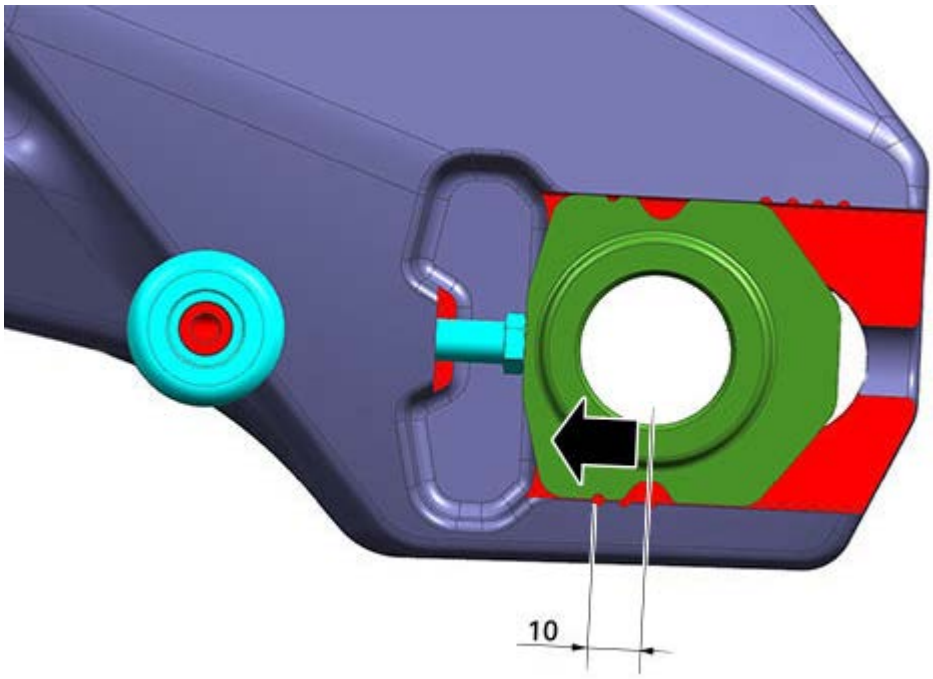
Set the vehicle on the stand.
Loosen nut (2) and lock nuts (3), working on both sides of the vehicle.
Adjust chain slack by means of adjusters (4), making sure that the same references (5) match on either side of the vehicle.



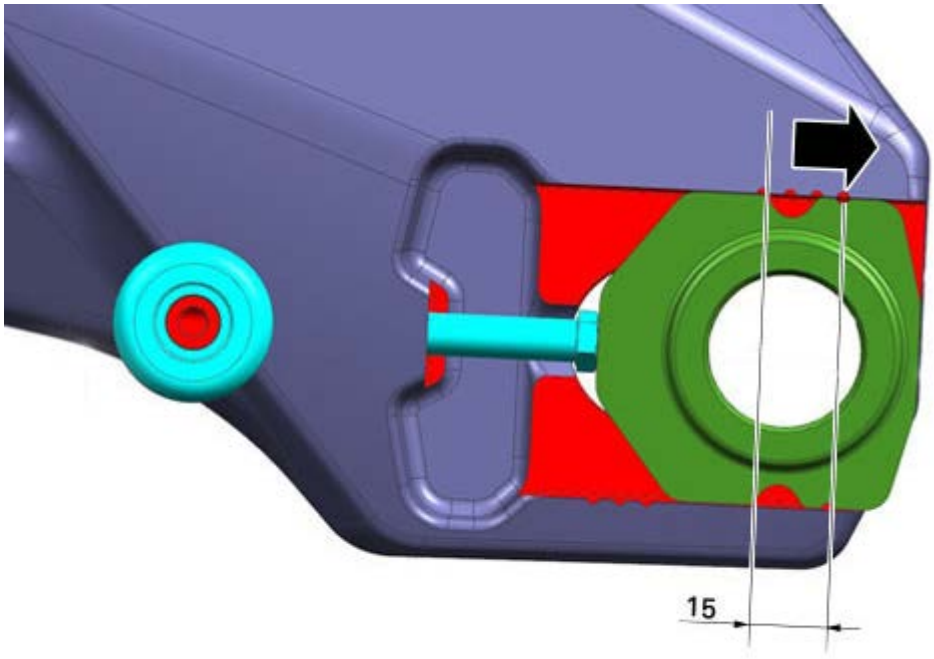
Slider (6) can be positioned in two different ways, depending on wheel shaft position compared to swinging arm slot.

From point "0" (zero), shaft can slide 10 mm forward or, 15 mm backward.

If slider is at the front (10 mm), the "nose" should be facing the rear end.



While if slider is at the rear (15 mm), the "nose" should be facing the front end.

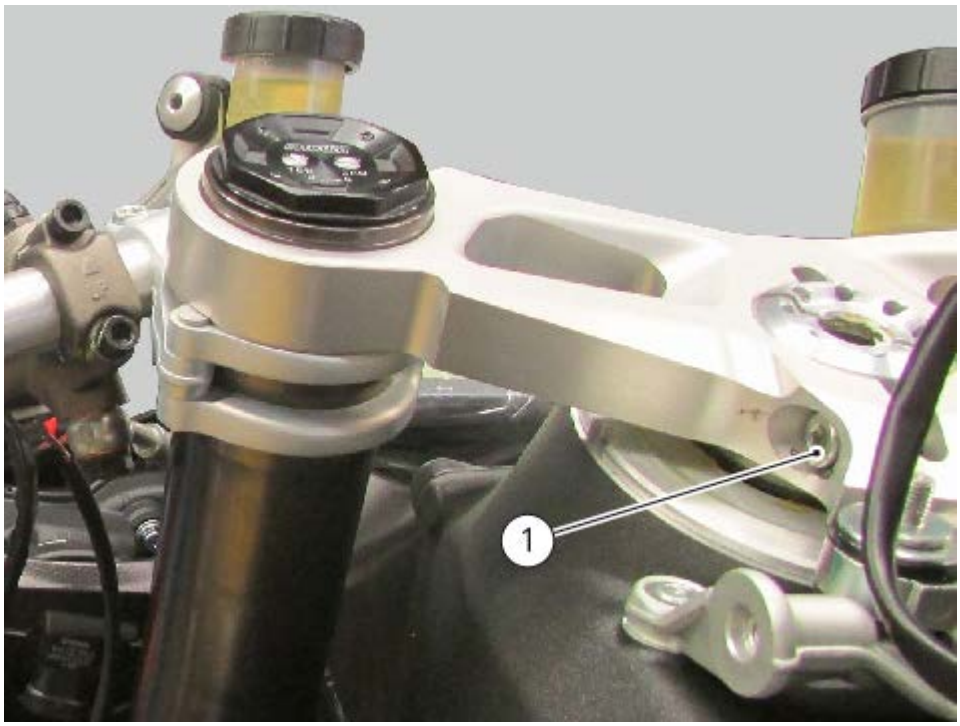


As soon as chain slack is adjusted, tighten lock nuts (3) and nut (2) to the specified torque.

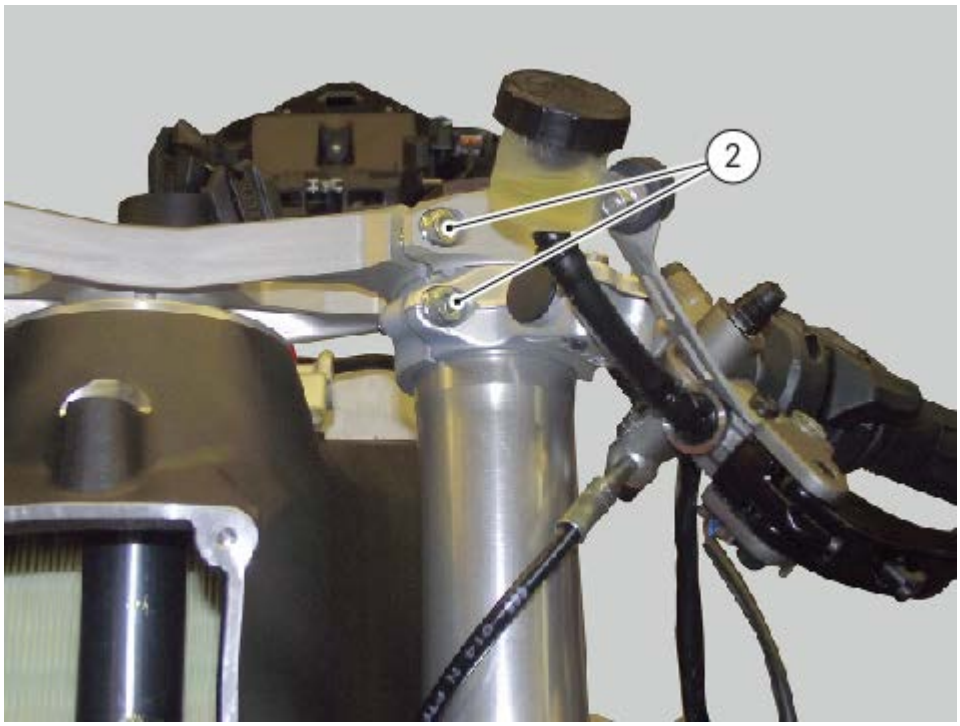
Adjusting the steering head bearing play

Excessive handlebar play or shaking fork in the steering head indicate that the play of 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 the special tool no. **88713.1058** lock the ring nut (3) to 30 Nm ±5%.
Push the steering head against the ring nut (3) and tighten the screw (1) to 24 Nm ±5% and screws (2) to 20 Nm ±5%.

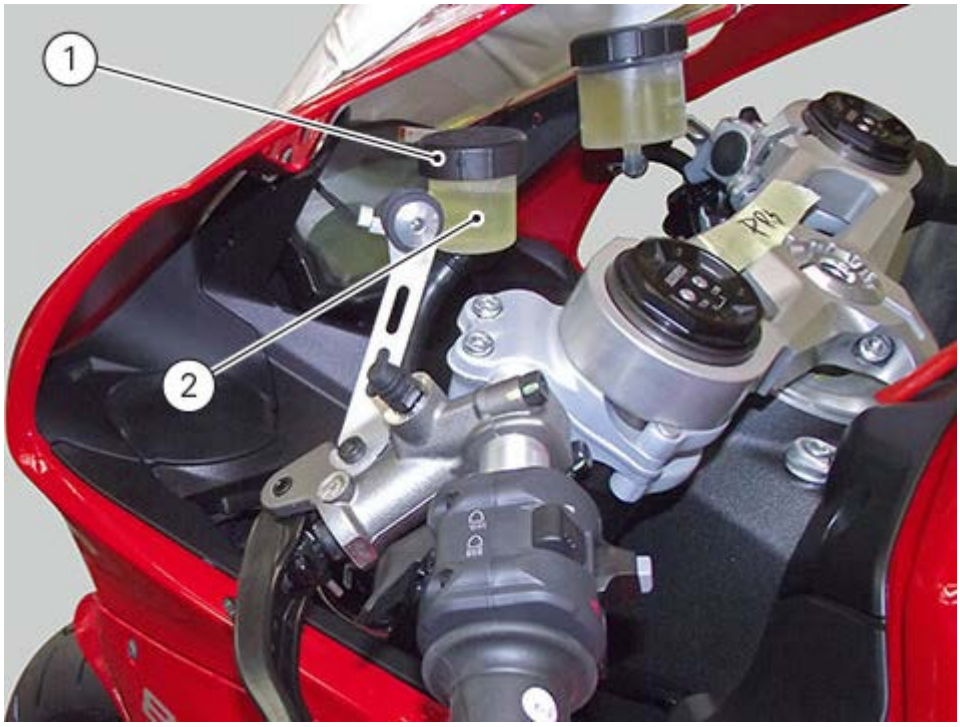

3

Filling the clutch hydraulic circuit

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

Remove the cover (1) with the membrane from the clutch fluid reservoir (2).
Fill the reservoir with specified fluid (Fuel, lubricants and other fluids) taken from an intact container.

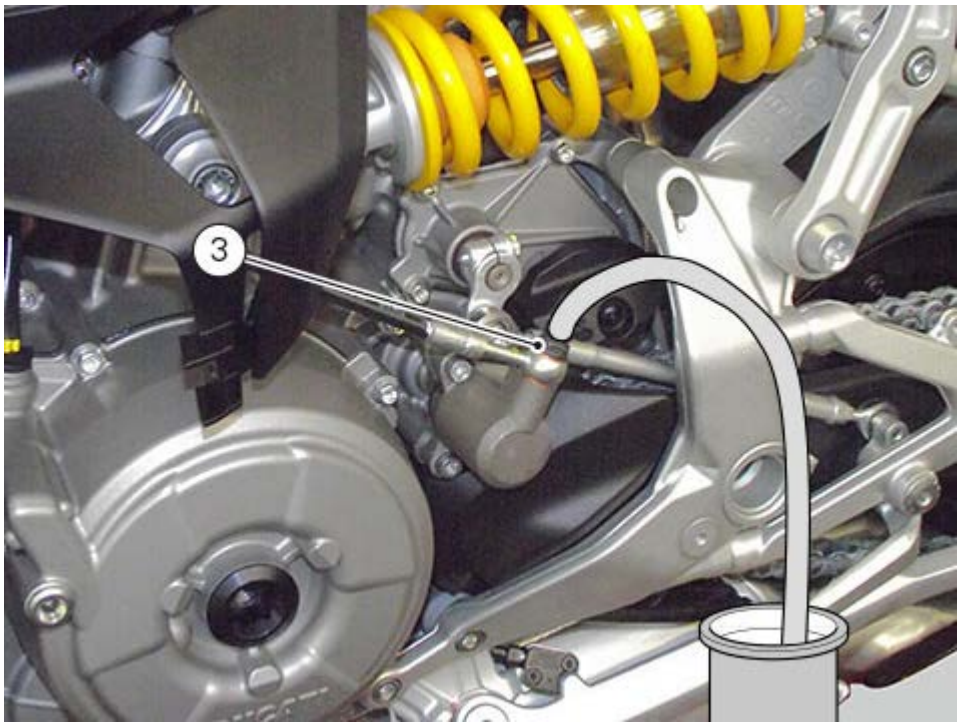
Important
During the following operation, fluid level must remain topped up at all times. The end of the transparent plastic tubing must remain immersed in the discharged fluid at all times.



Operate the clutch lever several times to fill the circuit and expel any air.
Connect the bleeding tool to the bleed valve (3).

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

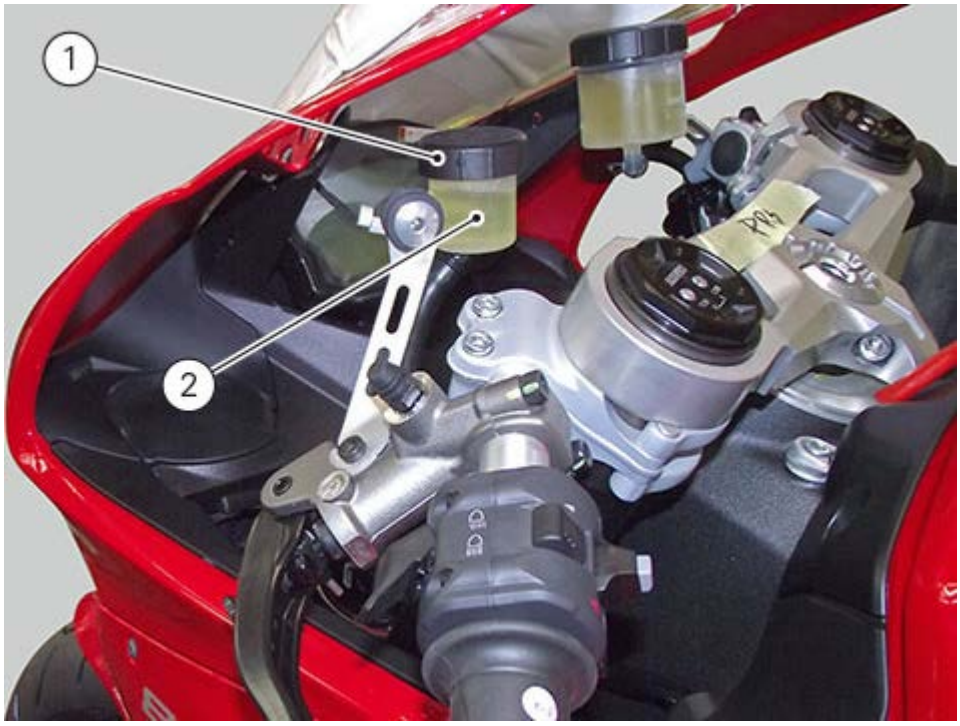
Pump with the bleeding tool and open the bleed valve (3) making sure that the level does not fall below the MIN mark.
Repeat the last operation until the fluid flowing from the tube is completely free of air bubbles.
If you do not have a bleeding tool available, connect a transparent plastic tubing to the bleed valve (3) as outlined in the draining procedure.

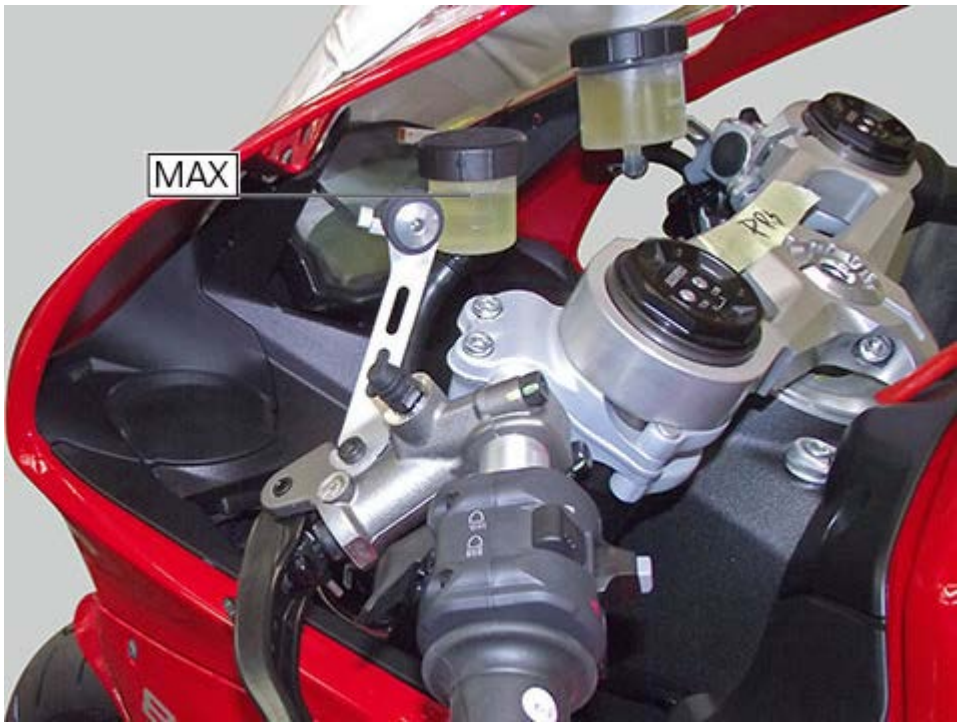


Open the bleed valve by **1 / 4** of a turn and operate the clutch lever several times until the fluid flows out of the bleed valve (3).
Pull the lever fully and then loosen the bleed valve by at least **1 / 4** of a turn. Wait for a few seconds; then release the lever gradually while simultaneously closing the bleed valve (3).

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

Repeat the bleeding operation until the fluid emerging from the plastic tube is free of air bubbles.
Close the bleed valve (3) to 4 Nm ±10% and install the protection cap.
Top up the fluid level to approximately **3** mm above the MIN mark of the reservoir.
Refit the cover (1) with the membrane on the clutch fluid reservoir (2).

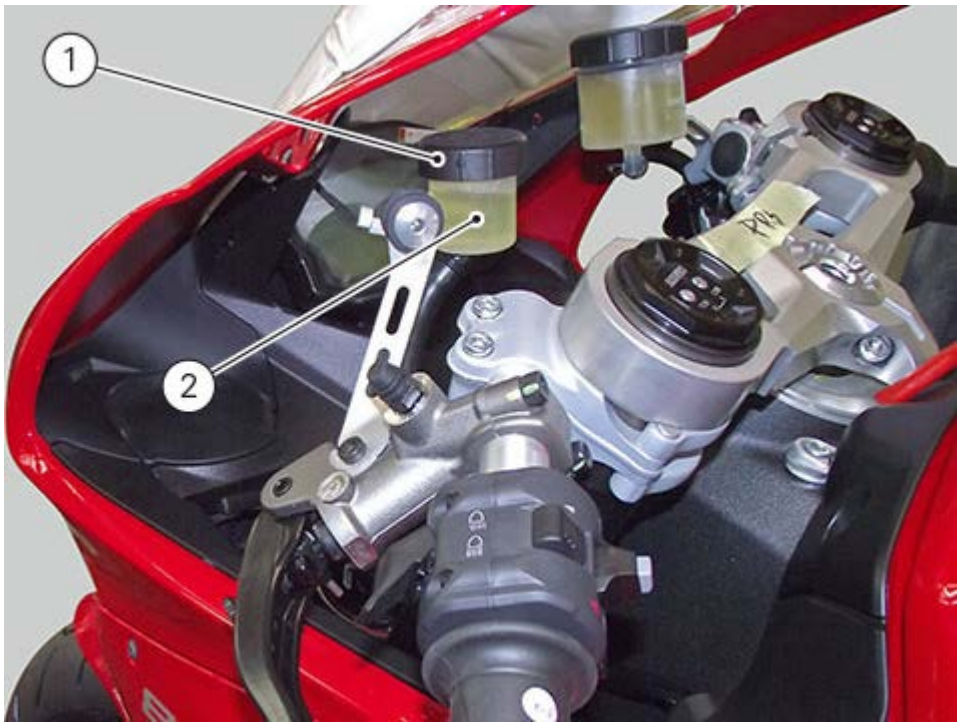



MAX

Draining the clutch hydraulic circuit

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

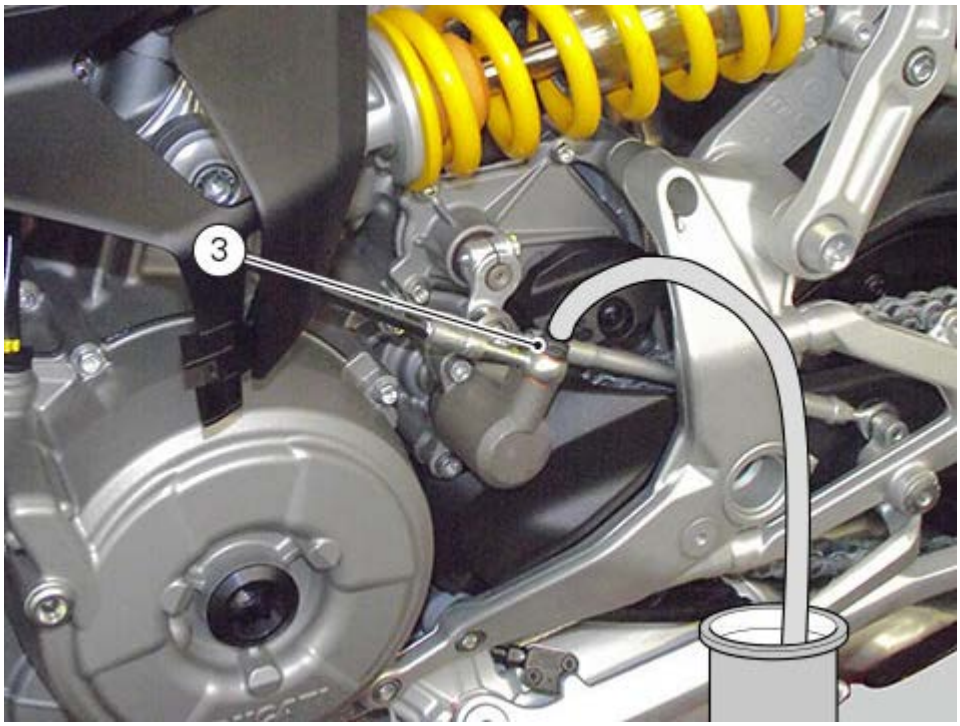
Remove the cover (1) with the membrane from the clutch fluid reservoir (2).



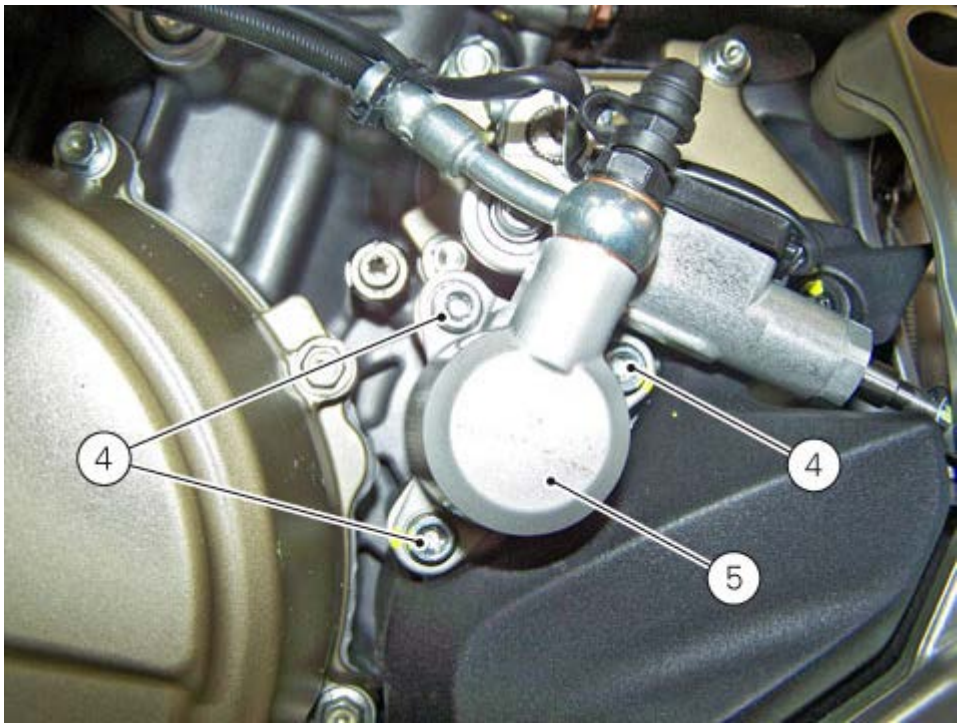
Remove the cap to expose the bleed valve (3).
Connect a clutch circuit bleeding tool to the clutch slave cylinder bleed valve (3).

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

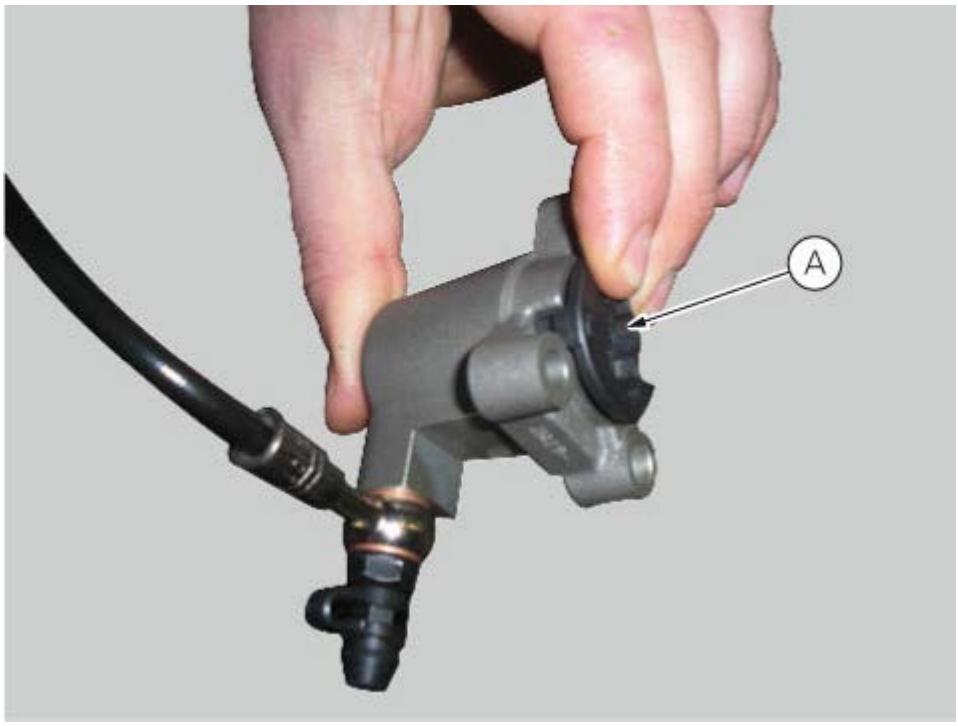
Open the bleed valve and pump with the bleeding tool until no more fluid flows out.
If you do not have a bleeding tool available, attach a transparent plastic tubing to the bleed valve (3) and insert the other end of the tubing in a container for old clutch fluid placed on the floor.



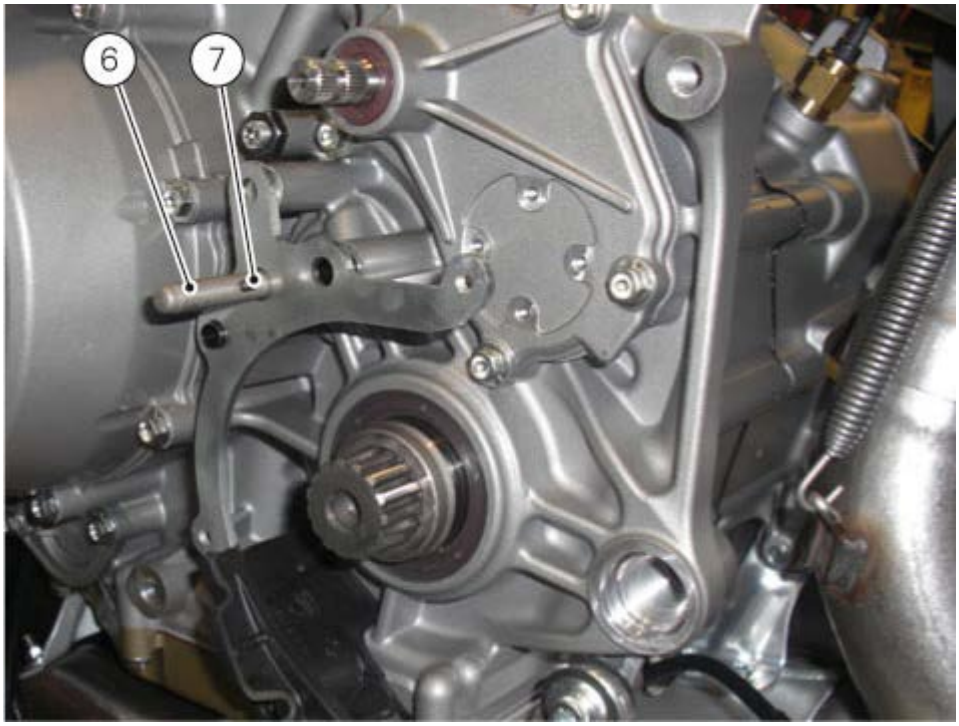
Unscrew the bleed valve by **1 / 4** of a turn.
Operate the clutch lever until all the fluid has been drained.
To help fully drain the circuit, it is recommended to remove the clutch slave cylinder.
Undo the screws (4) and slide out the clutch slave cylinder (5).



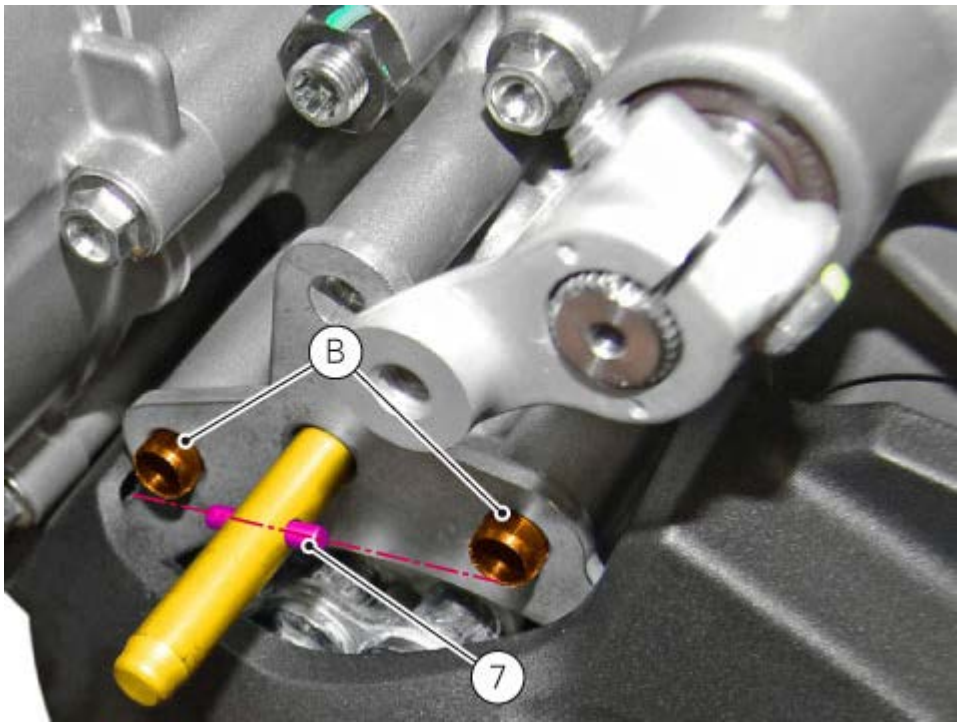
Push the internal piston (A) to force out all the fluid from inside the unit.



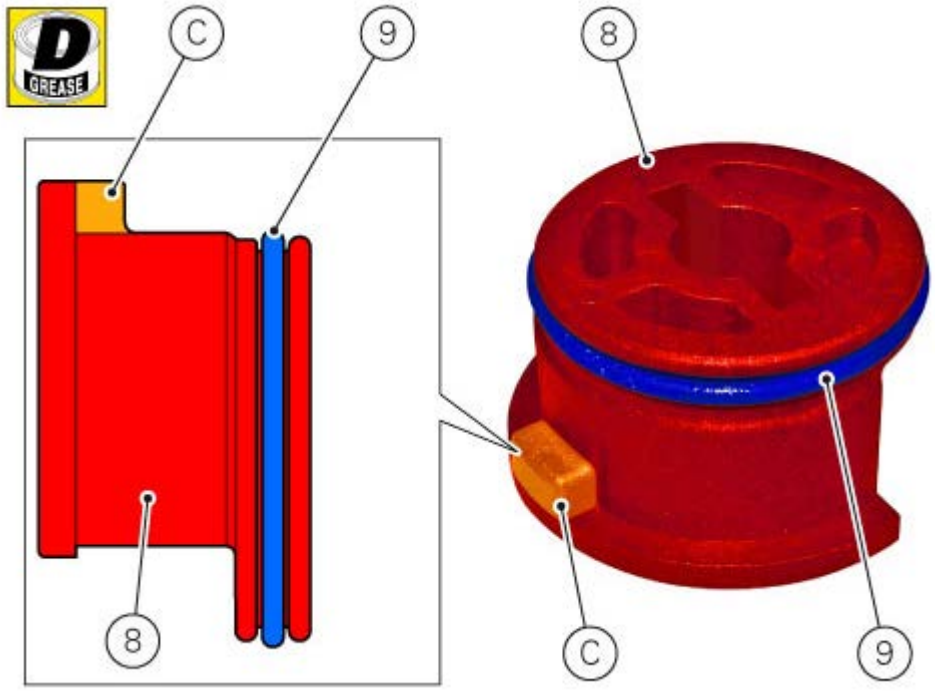
Make sure the anti-rotation pin (7) is fitted on the clutch pushrod (6).

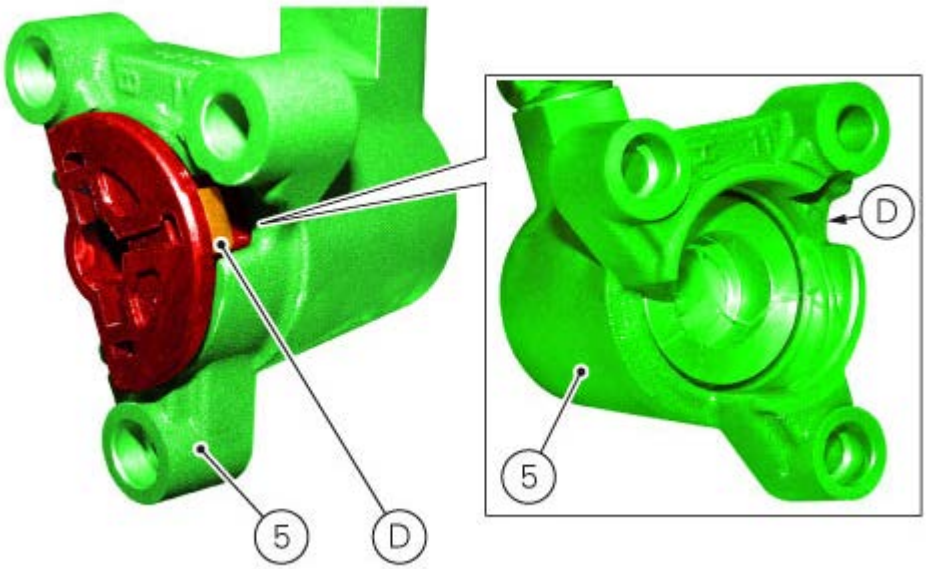


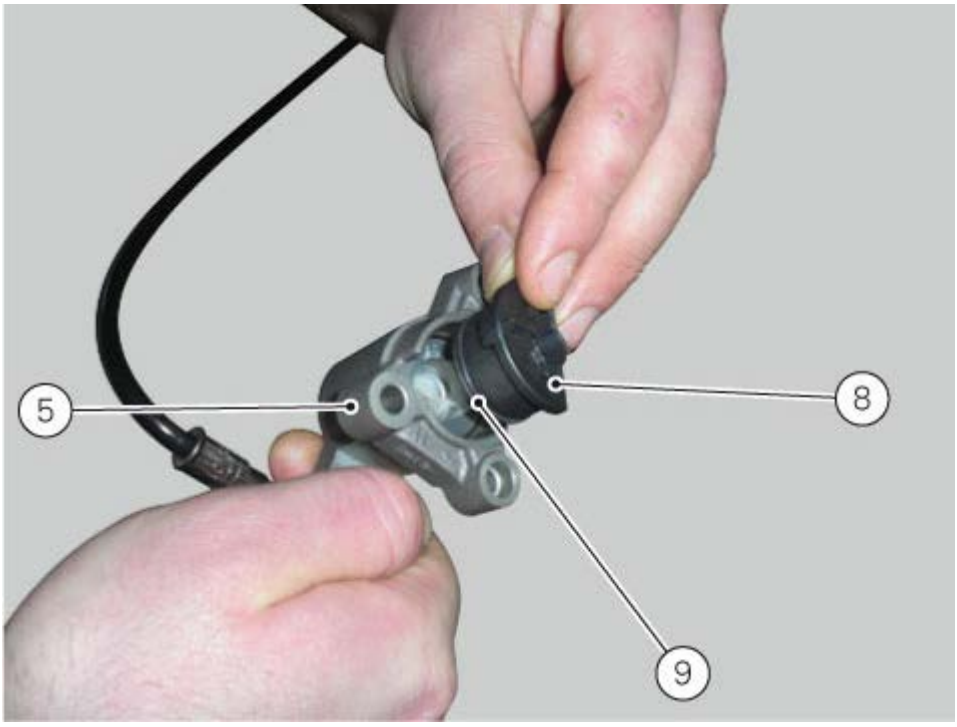
Fit the anti-rotation pin (7) in line with pins (B) on clutch-side casing, as shown in the figure.



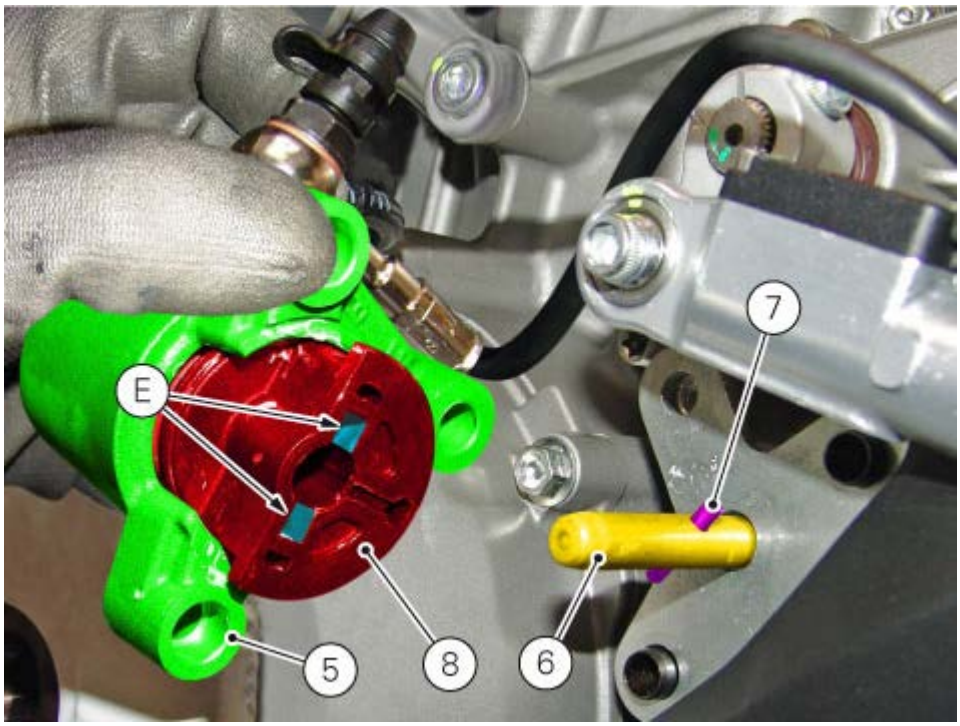
Install seal (9) on anti-rotation insert (8).
Apply the recommended grease to the seal (9).
Insert the anti-rotation insert (8) into clutch slave cylinder (5), making sure to match tab (C) on insert (8) with slot (D) on cylinder unit.







Insert clutch slave cylinder (5), including anti-rotation insert (8), on clutch pushrod (6) already positioned.
The anti-rotation pin (7) must engage into the corresponding slots (E) on anti-rotation insert (8).

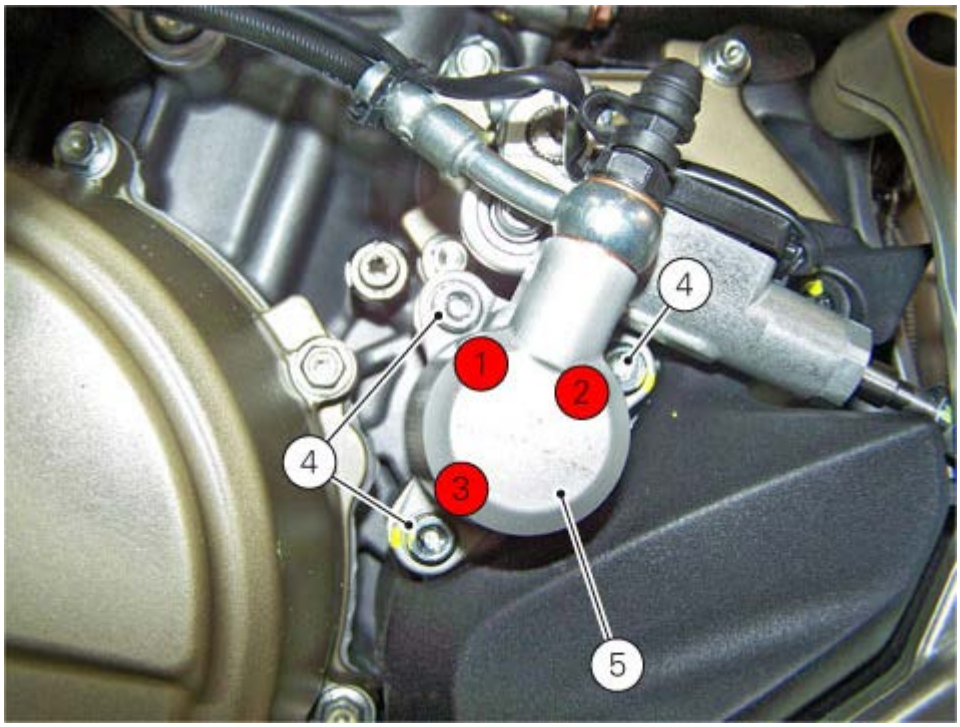


Fix the clutch slave cylinder (5) by starting the screws (4).

Note

To bring the clutch slave cylinder (5) internal surface near the casing cover as evenly as possible, screw and tighten the screws (4) alternatively in steps.

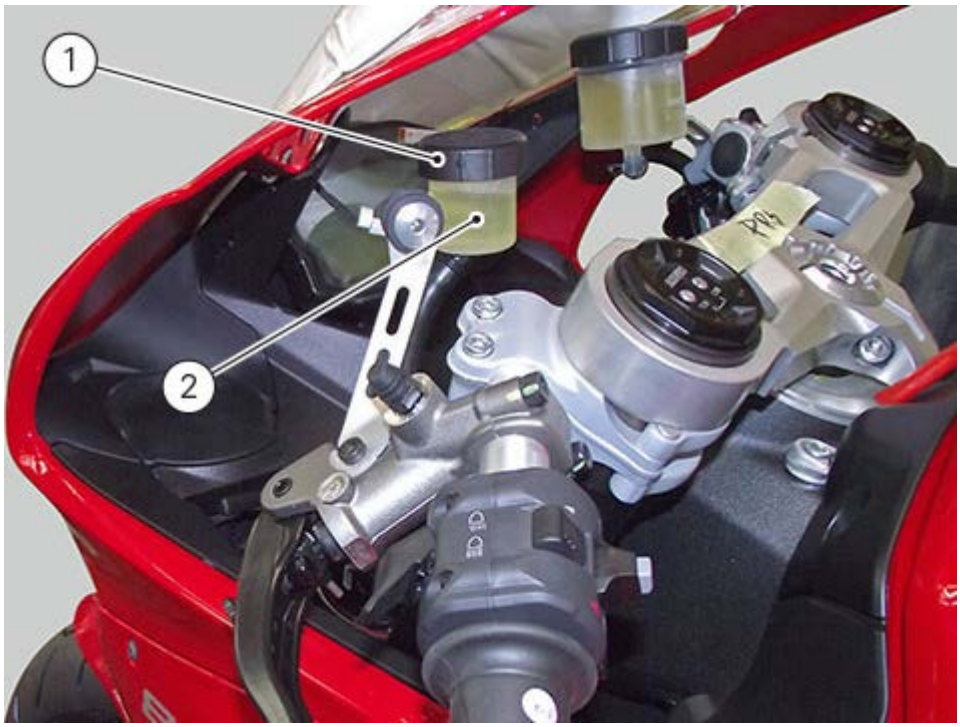
Tighten the screws (4) to a torque of 10 Nm ±10%, in the sequence 1 - 2 - 3 - 1.

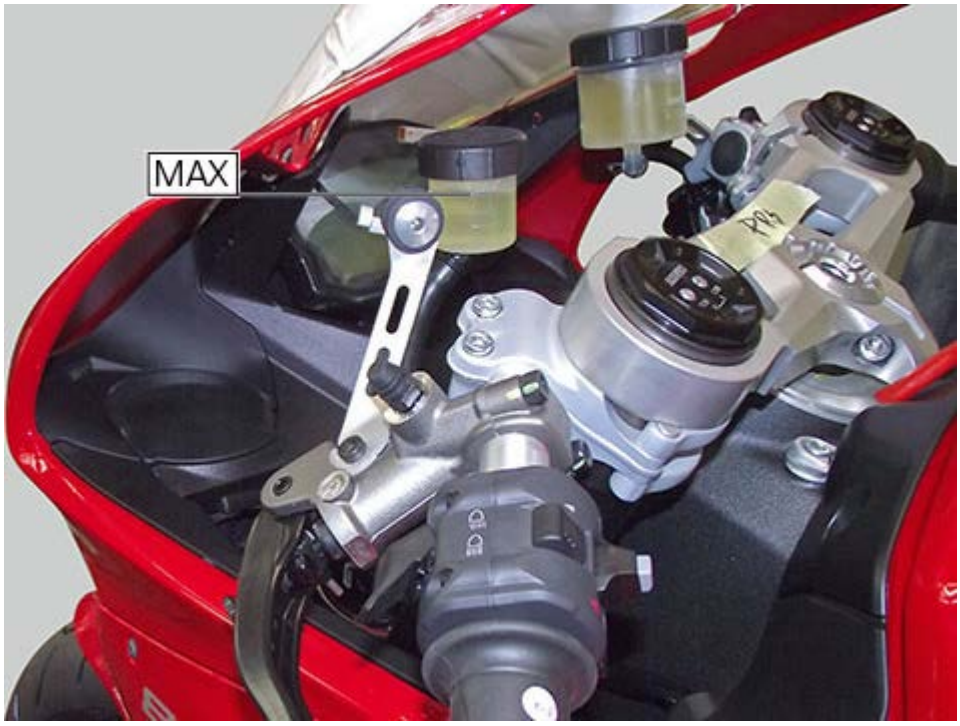


Changing the clutch fluid

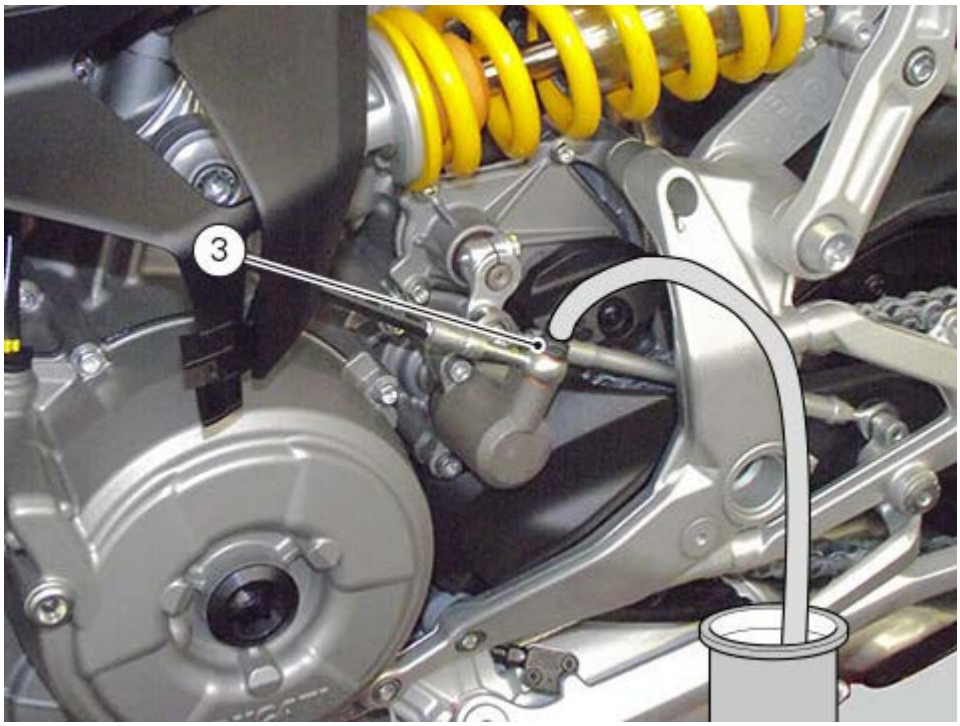
Warning
Clutch fluid is corrosive and will damage paint. Avoid contact with eyes and skin. In case of accidental contact, wash thoroughly with water.

Remove the cover (1) with the membrane from the clutch fluid reservoir (2).
Siphon the fluid from the reservoir (2).
Fill the reservoir (2) with new fluid up to the MAX mark.





Operate the lever two or three times until the circuit is pressurised.
Hold the lever pulled towards the handgrip.
Attach a transparent plastic tubing to the bleed valve (3) and insert the other end of the tubing in a container placed on the floor.
Open the bleed valve (3) to allow fluid to flow out.



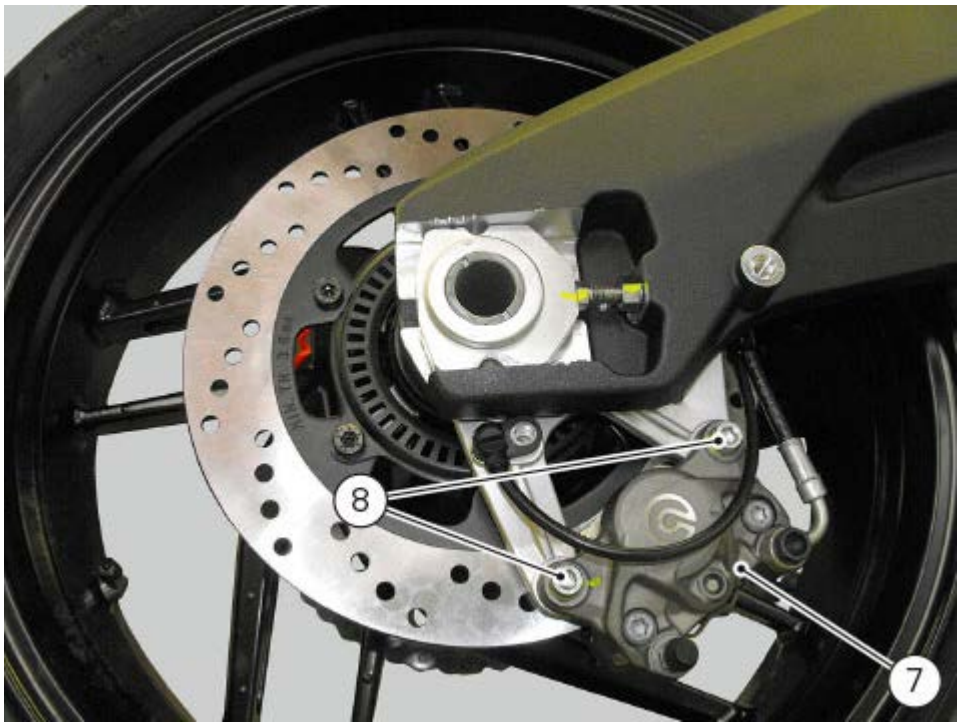
Attention

During the filling operation, always keep the fluid level above the MIN mark to avoid any air bubbles in the circuit.

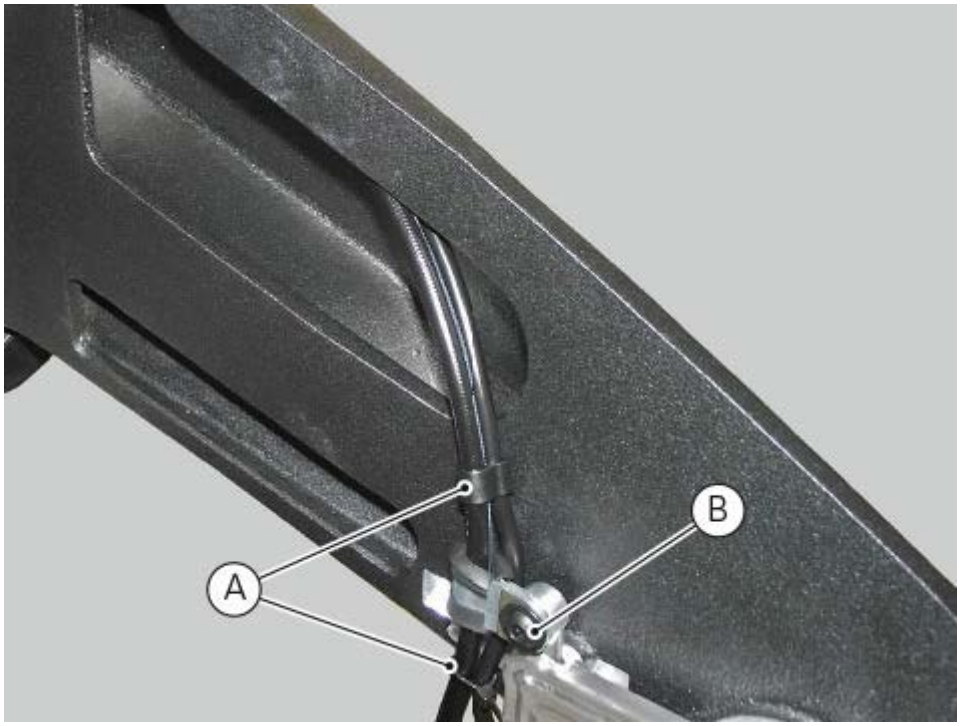
Allow the fluid to flow from the bleed valve (3) until it changes colour.
Re-tighten the bleed valve (3) and tighten to 4 Nm ±10% and restore the correct level of fluid in the reservoir.

Changing the fluid in the rear brake circuit

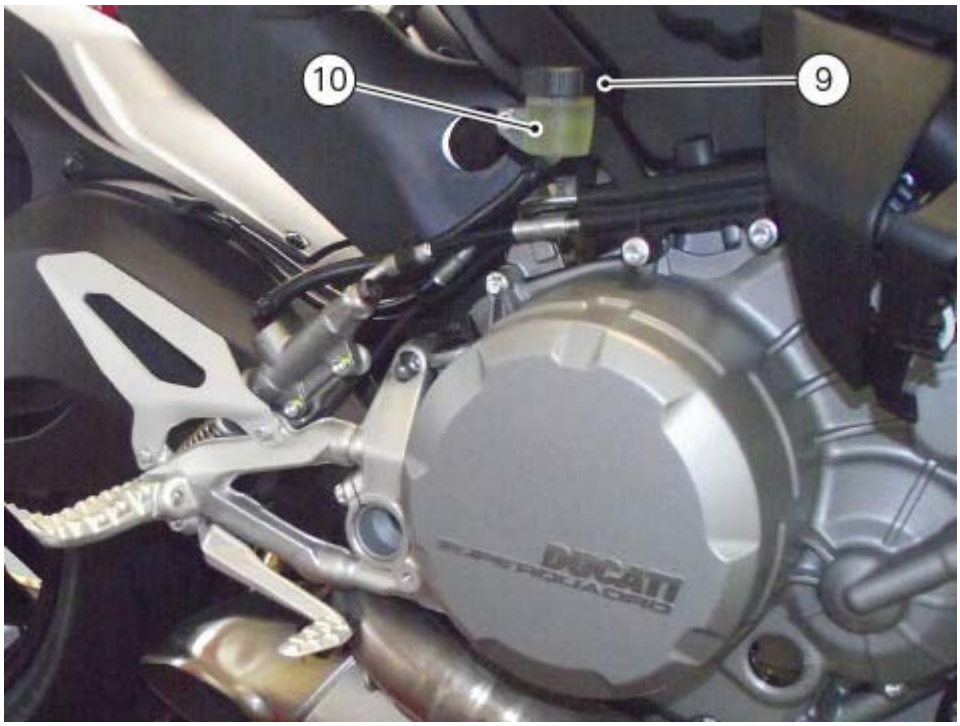
Loosen screws (8) and remove the rear brake calliper (7).
Remove the rear wheel (Removing the rear wheel).



Remove ties (A), loosen screw (B) to release brake line.



Unscrew the cover (9) of the rear brake fluid reservoir (10).

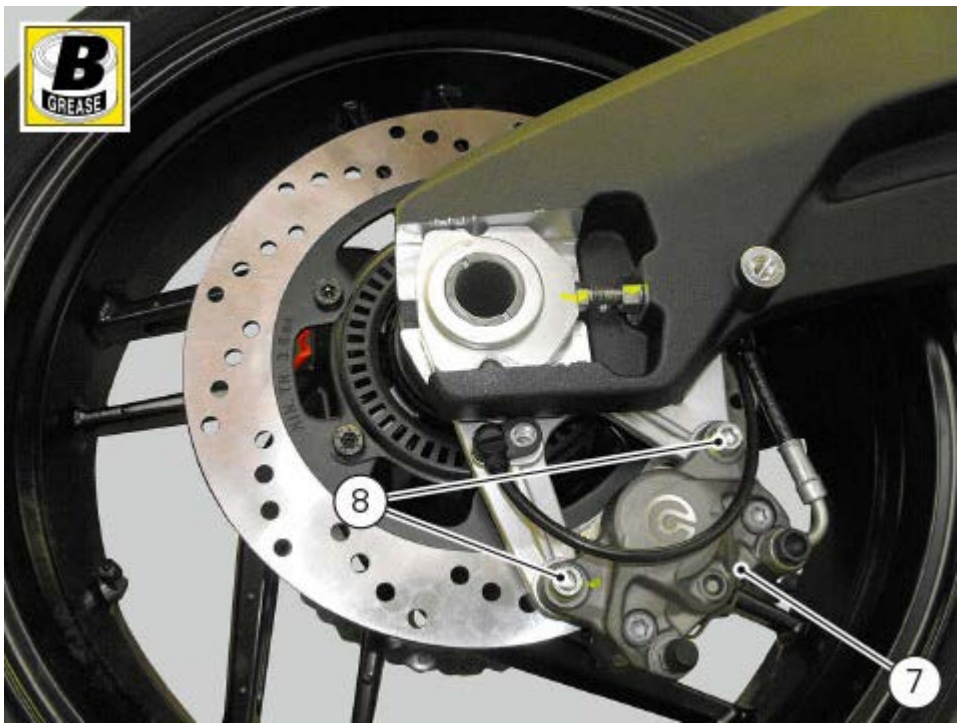


Keep the rear brake calliper (7) at the highest position possible (with bleeder up) throughout the whole procedure.
Insert a shim between rear brake calliper pads, having the same thickness as the disc.
Attach a transparent plastic tubing to the bleed valve (11) and insert the other end of the tubing in a container.

1 Operate the brake pedal to pressurise the circuit.
2 Keep pedal pushed down.
3 Loosen bleed valve (11) by 1/4 of a turn so as to drain all fluid and push fully until pedal stops.
4 Tighten the bleed valve.
5 Let go of the brake lever and top up the reservoir until fluid level is between min. and max. During this operation, always make sure that the fluid level is above the minimum level so as to prevent the system from sucking air from the reservoir.

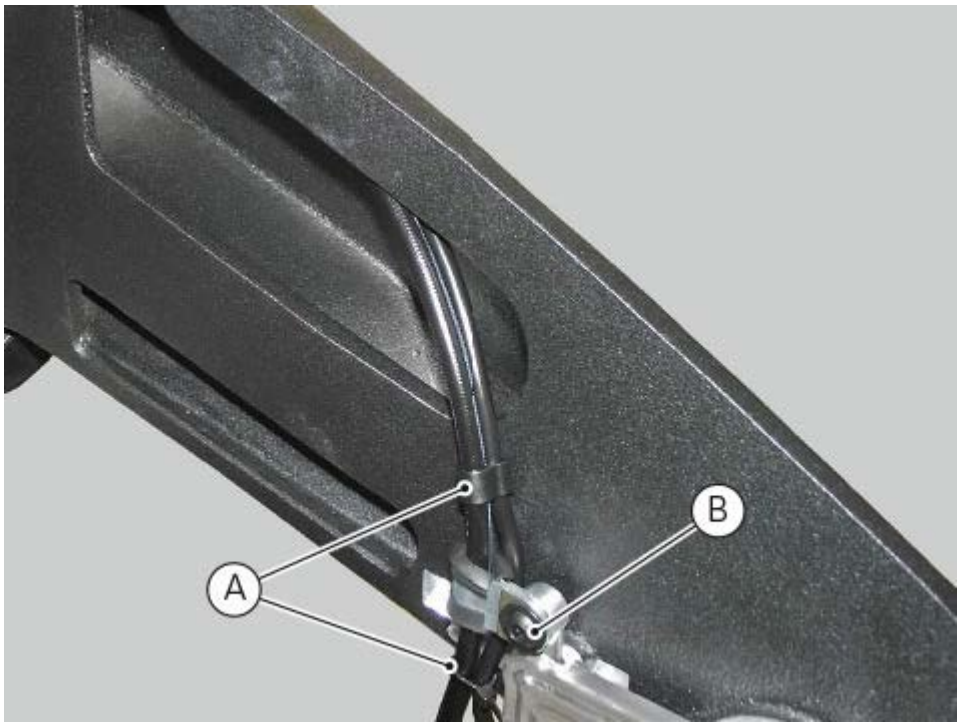
Repeat steps 1 to 5 until new fluid comes out. Now, tighten the bleed valve (11) to 12 Nm ±10%.
Use a piece of paper towel and clean the hole of bleeder cap to remove any residues of fluid and then refit the rubber cap.
Move pistons fully back against pads and then top up fluid MAX level inside the reservoir.
Remove shim from rear brake calliper.

Apply the recommended threadlocker on screw (8).
Fit the rear brake calliper on brake disc and align it with the holes on calliper holder plate; tighten screws (8) to 25 Nm ±5%.



Repeatedly operate the lever until pads get close to disc and check again that fluid level in the reservoir is between MIN. and MAX. marks, top up if necessary.
Remove membrane from cover, clean it and dry it with paper towel before refitting it onto reservoir.
Tighten the cover (9) of the rear brake fluid reservoir (10).

Refit ties (A), fasten brake line by tightening screw (B).
Refit the rear wheel (Refitting the rear wheel).



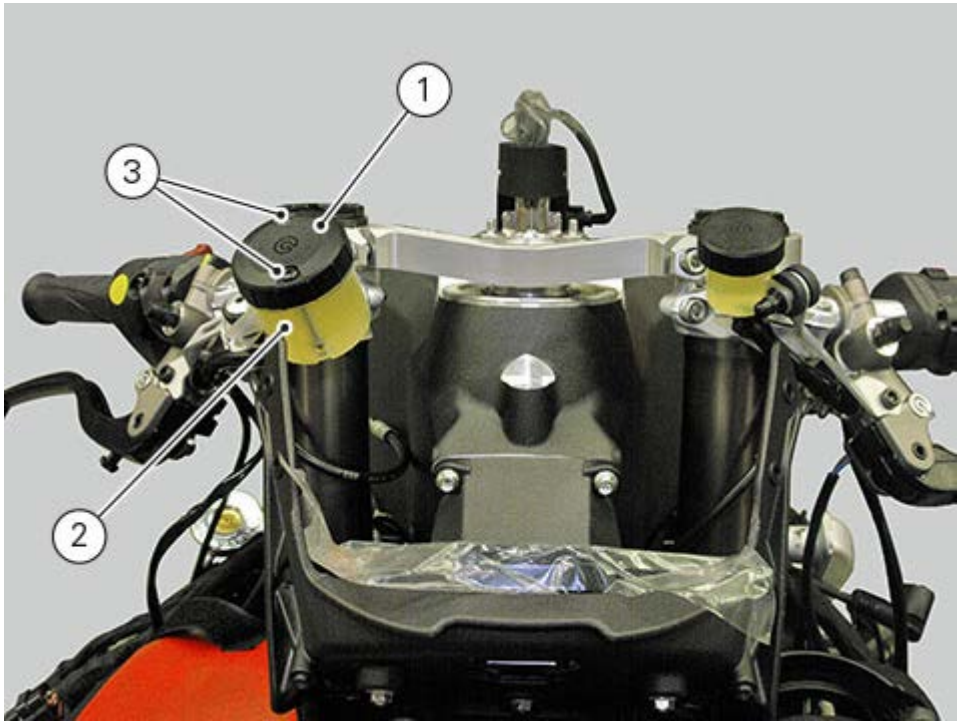
Road test the motorcycle at approx. 50 Km/h and then operate the rear brake only to brake until the ABS is triggered at least 10 times.
Check again that rear brake lever stroke has not increased: if it is not so, repeat the bleeding procedure.

Changing the fluid in the front brake system

Warning

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

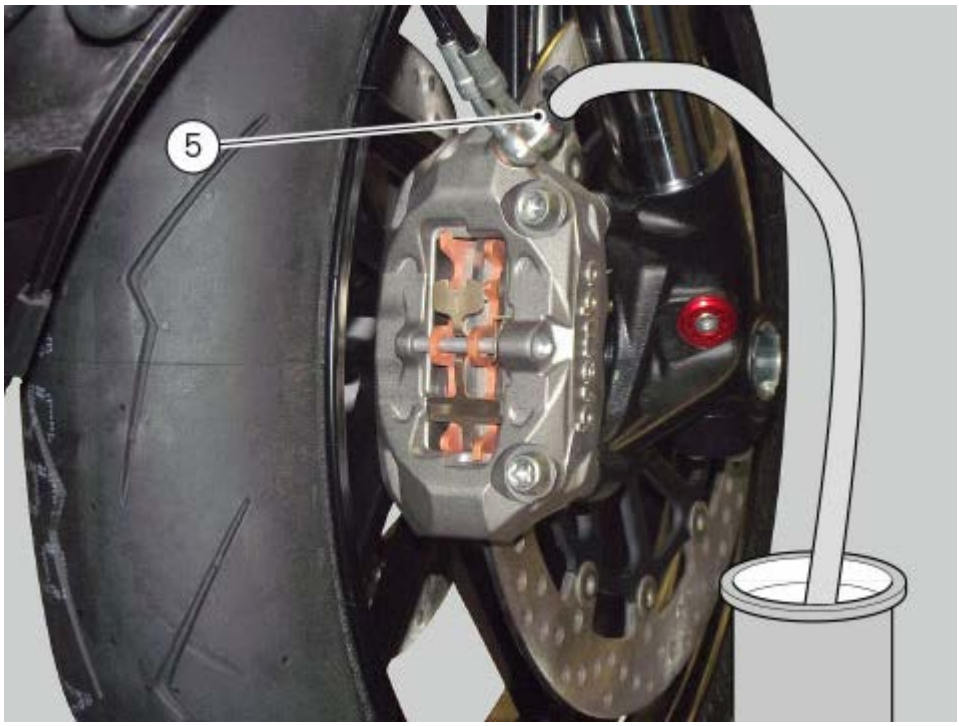
Remove the cover (1) with membrane from the front brake fluid reservoir (2) by undoing the screws (3). Siphon the fluid from the reservoir (2).



Refit the membrane (without the plug) on the reservoir to avoid brake fluid splashes during the following operations.

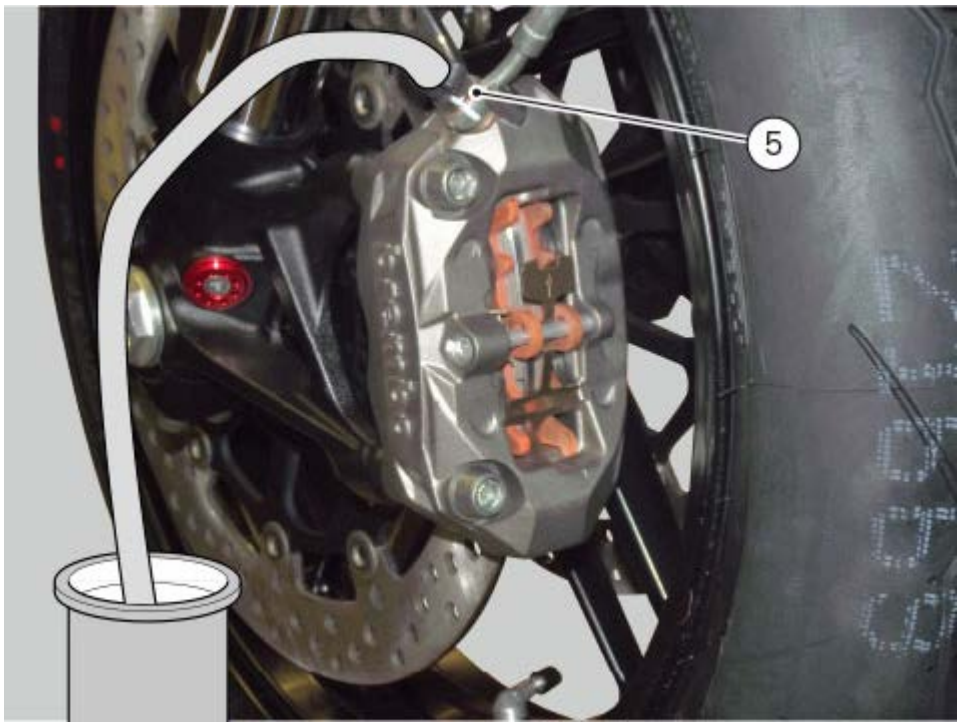
Move the brake calliper pistons back: to carry out this operation undo the fixing screws (4) of the callipers on the fork bottom end and push both pads of every calliper, taking them apart; during this operation, be careful with the fluid level, which must always be sucked out each time it flows back in the reservoir.

Once all pistons of both callipers are fully moved back and all the fluid in the reservoir has been sucked out, connect a transparent tube to the bleed valve (5) and set the other end in a container placed on the floor.

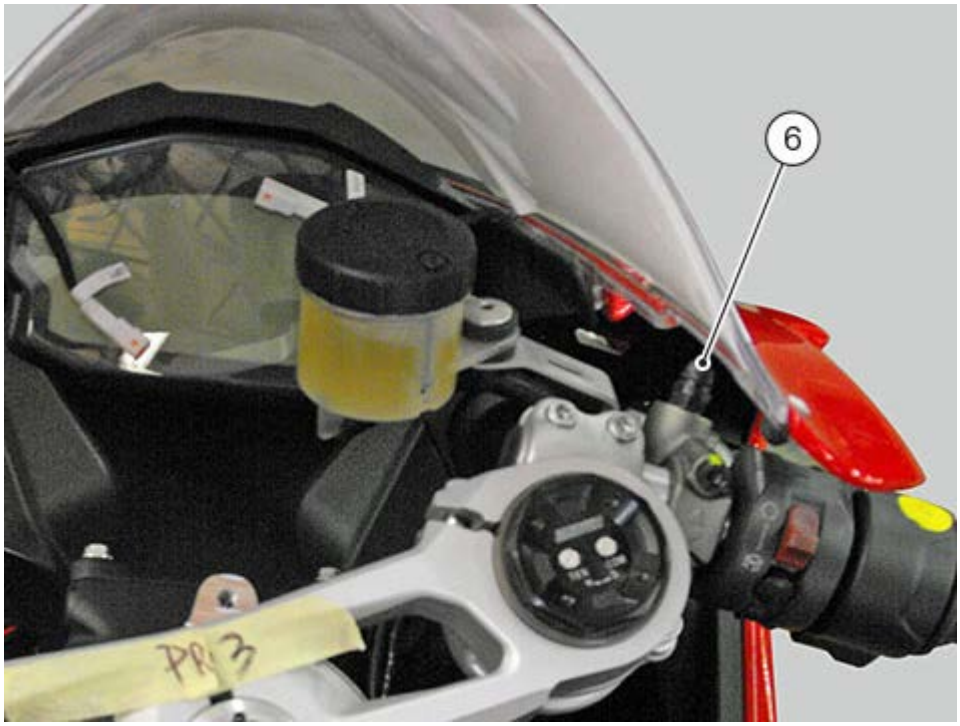


Fill the front brake fluid reservoir with new fluid up to the MAX mark.
Pull the lever to make a 20-30 mm stroke and keep the lever in this position using a non-elastic clamp.

Loosen the bleed valve of the left-hand calliper (as seen by the rider) (5) and then take the lever through the whole stroke to allow fluid to flow out.
The lever is resting against the handgrip.
Tighten the bleed valve (5) and then let go of lever.



Repeat the above operation until the old fluid flows out completely.
In particular, to completely eliminate any air possibly trapped at the highest point of the front brake master cylinder, perform the same procedure on the bleed valve (6).



Then, with the bleed valve definitely closed, repeatedly pull the lever until a pressure is detected in the brake system.

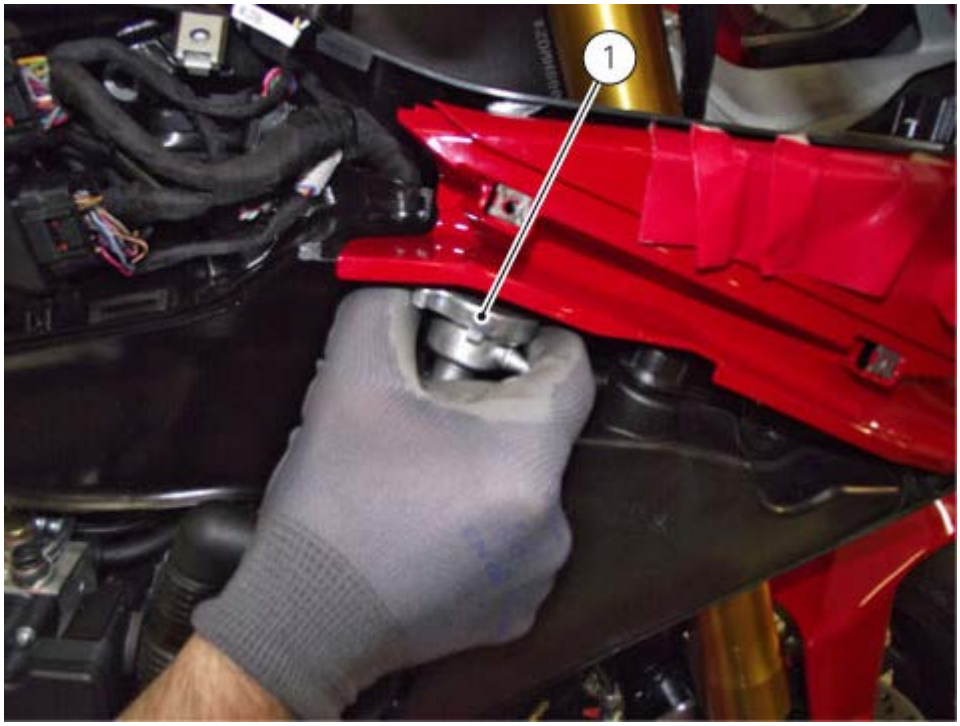
Warning
After draining the old fluid from the reservoir and while filling the system, always keep the fluid level above the MIN mark to avoid any air bubbles in the circuit.

Change the coolant

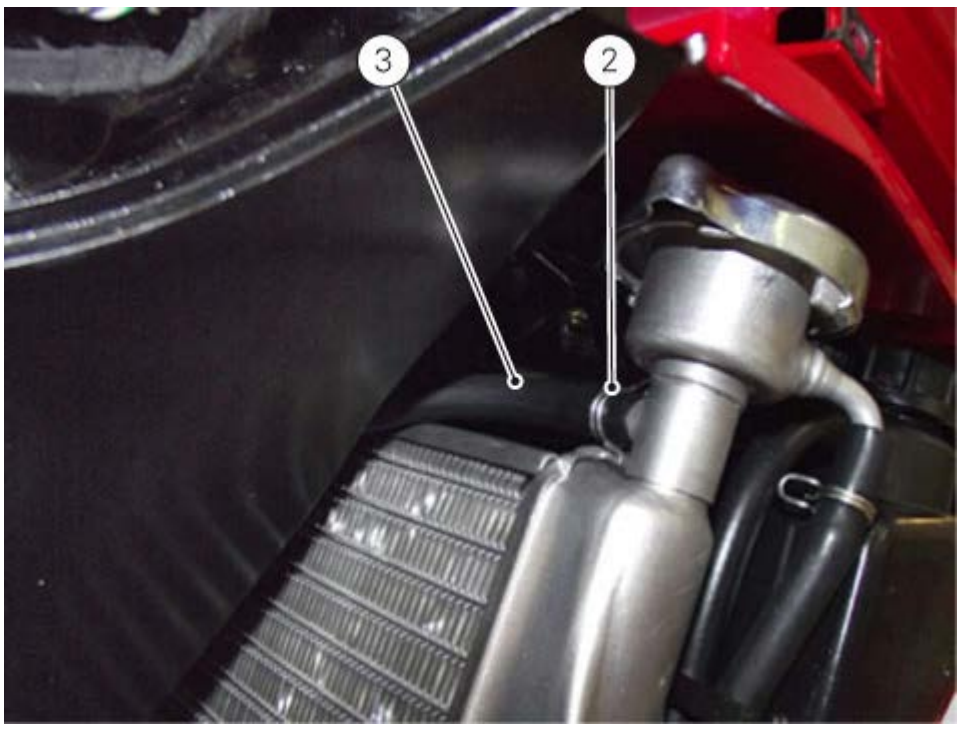
Warning
Make sure the engine is cold before proceeding. Attempting to change the coolant with the engine hot could lead to burns from hot coolant or scalding steam.

Remove both fairings (Removing the side fairings).

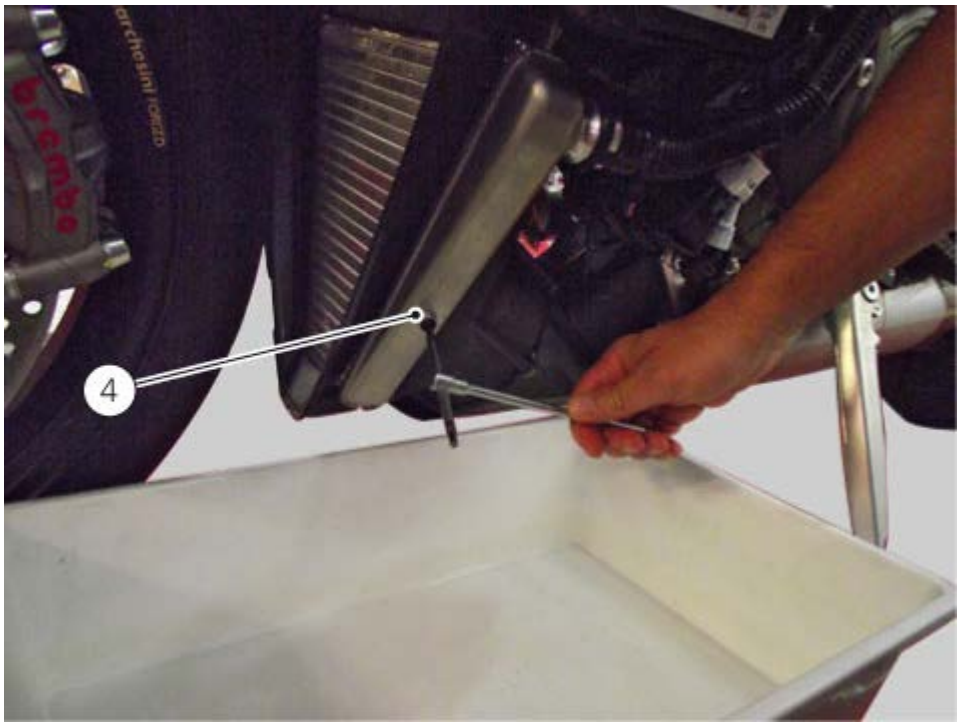
Place a container under the engine and set the motorcycle on its side stand.
Remove the expansion reservoir remote filler plug (1).



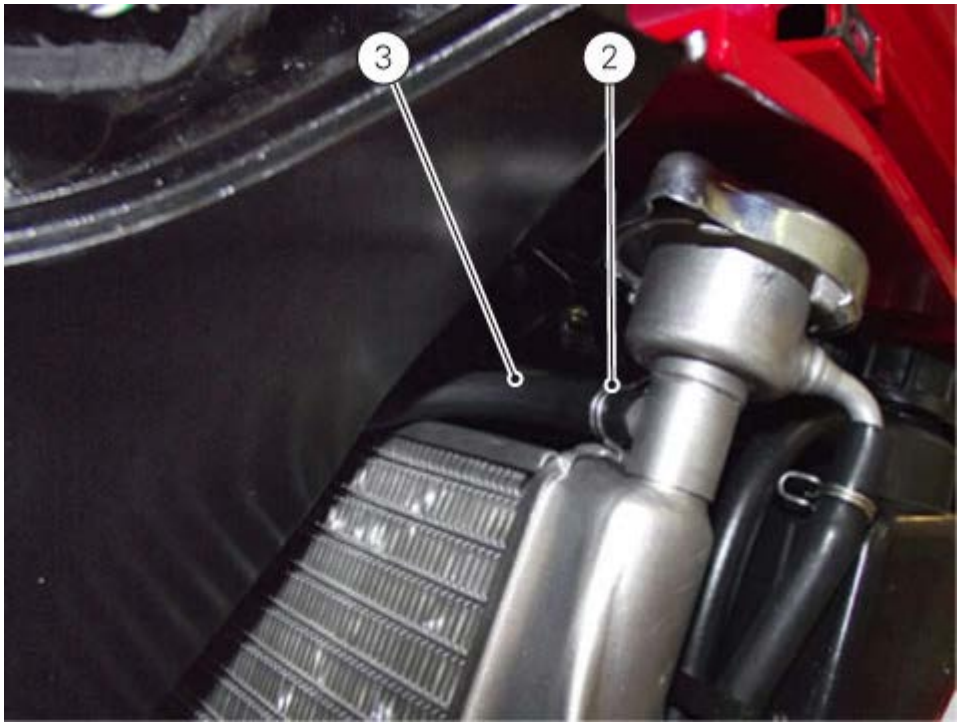
Slacken clamp (2), disconnect hose (3) and allow all coolant to drain in a container.



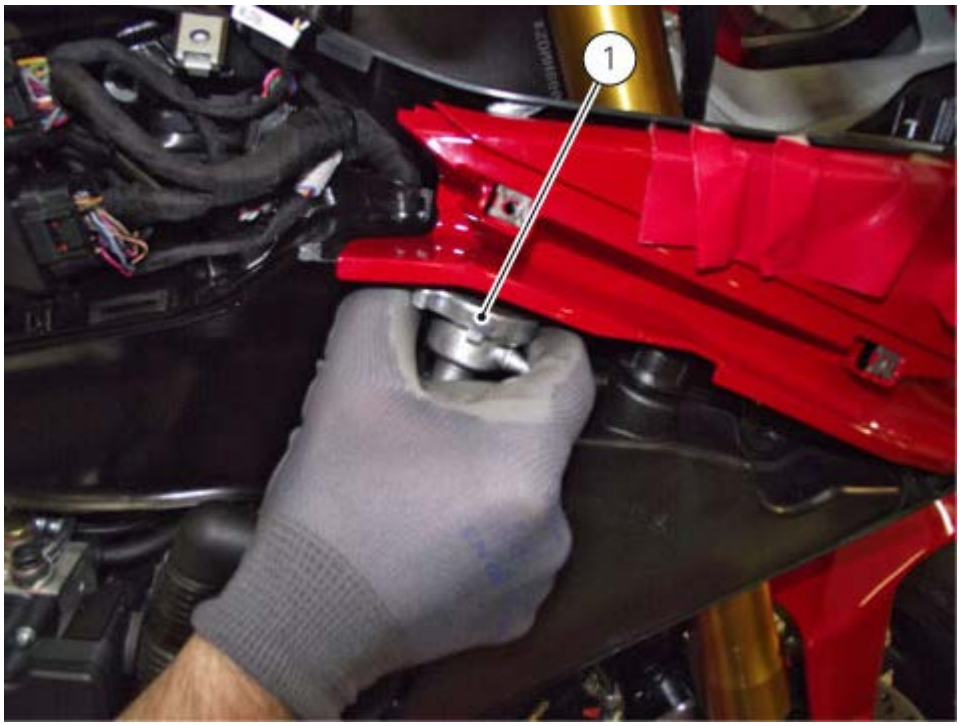
Loosen plug (4) on lower radiator drain hole.
Allow the coolant to drain off completely.
Screw plug (4) on fluid drain hole.



Connect the hose (3) and fasten it with the clamp (2).



Fill the circuit with new coolant through the remote filler plug (1) and then screw it back in place.



Wait several minutes for the coolant to fill all the internal passages.
Start 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 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.

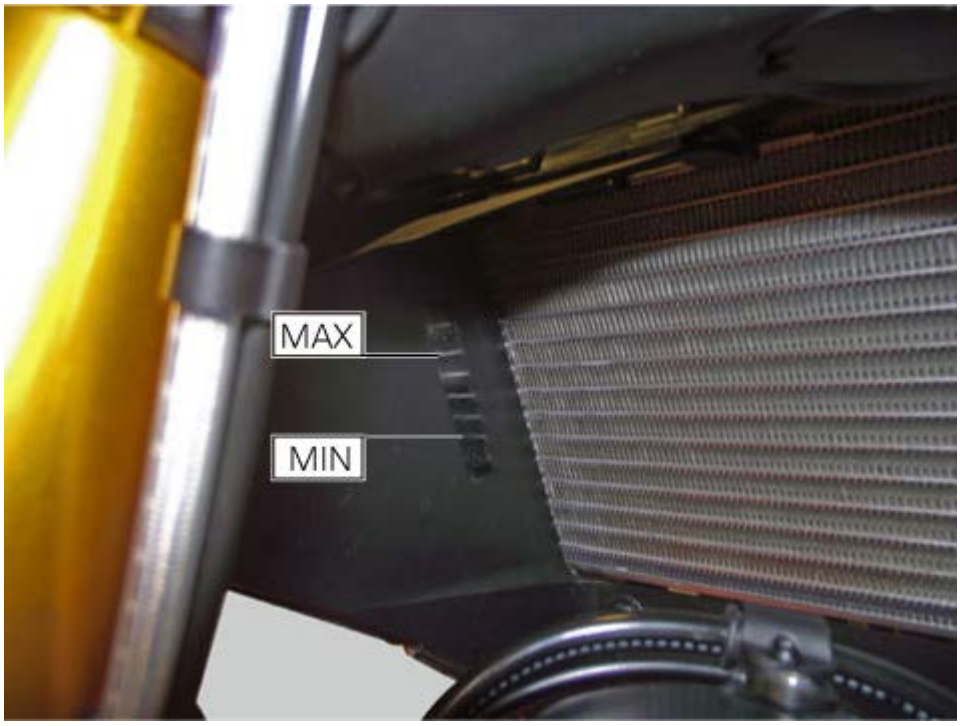
Important
Check the circuit for possible leaks.

Top up the coolant through the expansion reservoir filler to bring the level up to the MAX. mark.
Tighten the plug (5) of the expansion reservoir.

Refit both fairings (Refitting the side fairings).

Check the coolant level

Check the coolant level contained in the expansion reservoir, on the right-hand side of the vehicle at the intervals specified in the "Routine maintenance table".
The coolant level must be between the MAX. and MIN marks on the reservoir.



If the level is low, top up with the recommended coolant.

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

Remove the filler plug (1) and top up with new coolant to the specified level.
Refit the plug (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:
ANTIFREEZE: **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.

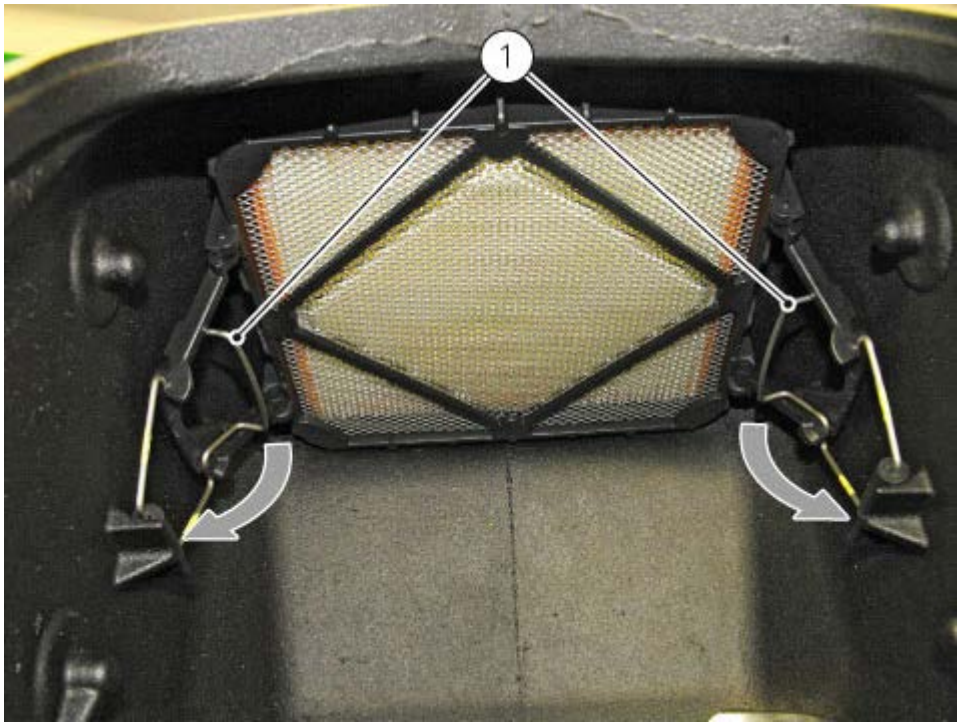
Refit the right-hand fairing (Refitting the side fairings).

Changing and cleaning the air filters

The air filter must be replaced at the intervals specified in the “Scheduled maintenance chart”.

Remove the rider seat (Removing the rider seat).
Remove the fuel tank (Removing the fuel tank).
Remove injector hoses (Removing the airbox and throttle body).

Release the air filter retaining clips (1).
Slide air filter cartridge out of its seat.



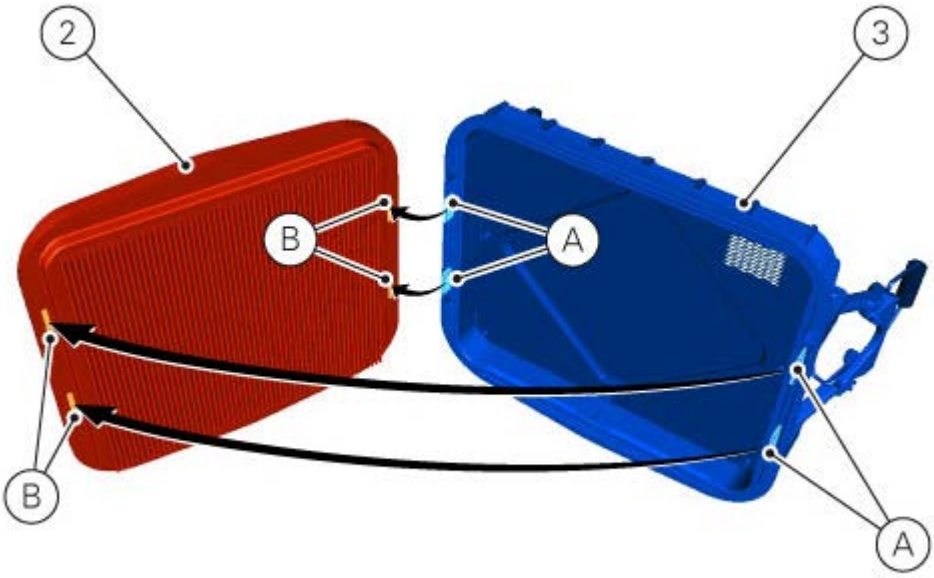
Remove the air filter from its support.

The filter can be cleaned with a jet of compressed air or replaced, if necessary.

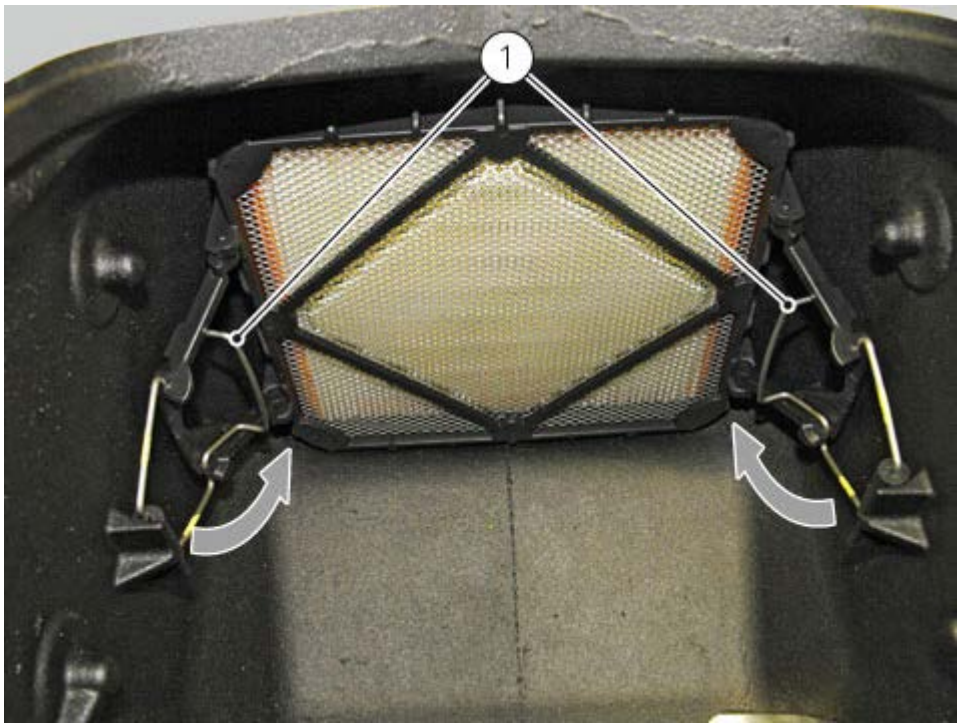
Important

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.

Install air filter (2) to support (3), while fitting tabs (A) in slots (B), fully home.



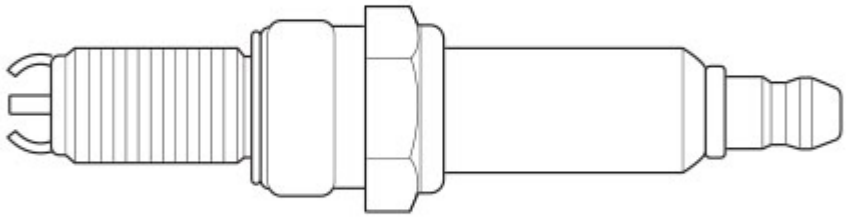
Duly reinstall the air filter cartridge in its seat on the frame, taking care so that the cartridge rubber part perfectly matches its seat in the frame.



Refit injector hoses (Refitting the airbox and throttle body).
Refit the fuel tank (Refitting the fuel tank).
Refit the rider seat (Refitting the rider seat).

Replacing the spark plugs pursuant to maintenance schedule

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 and check spark plug gap.



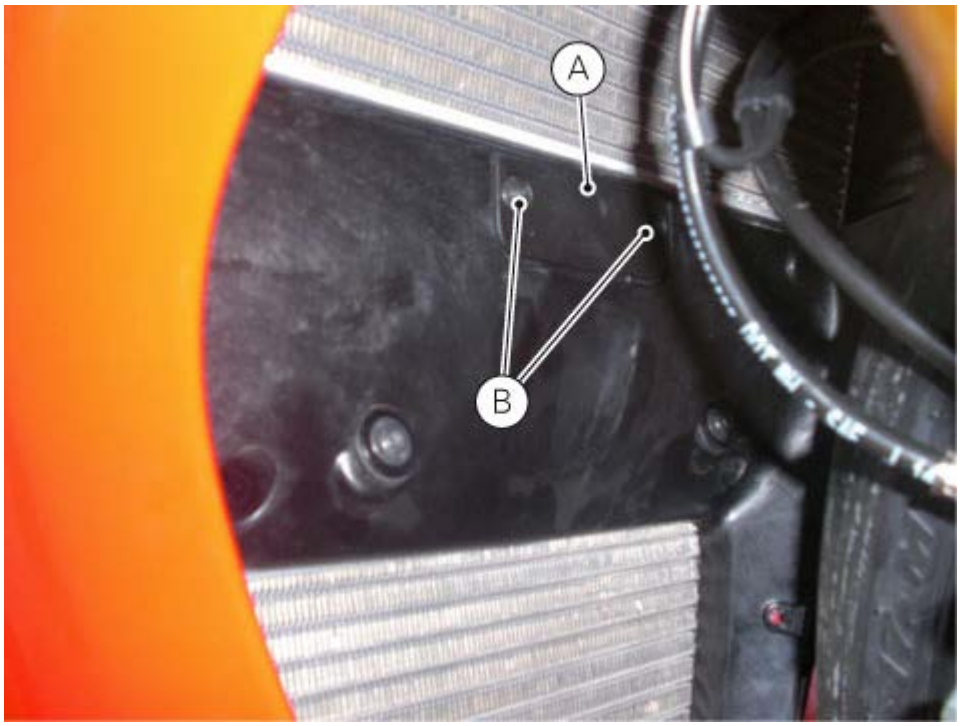
Important
Check the gap between the central and side electrodes. Replace the spark plug if measured value is different from the specified one or the spark plug shows clear signs of carbon deposits.

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.

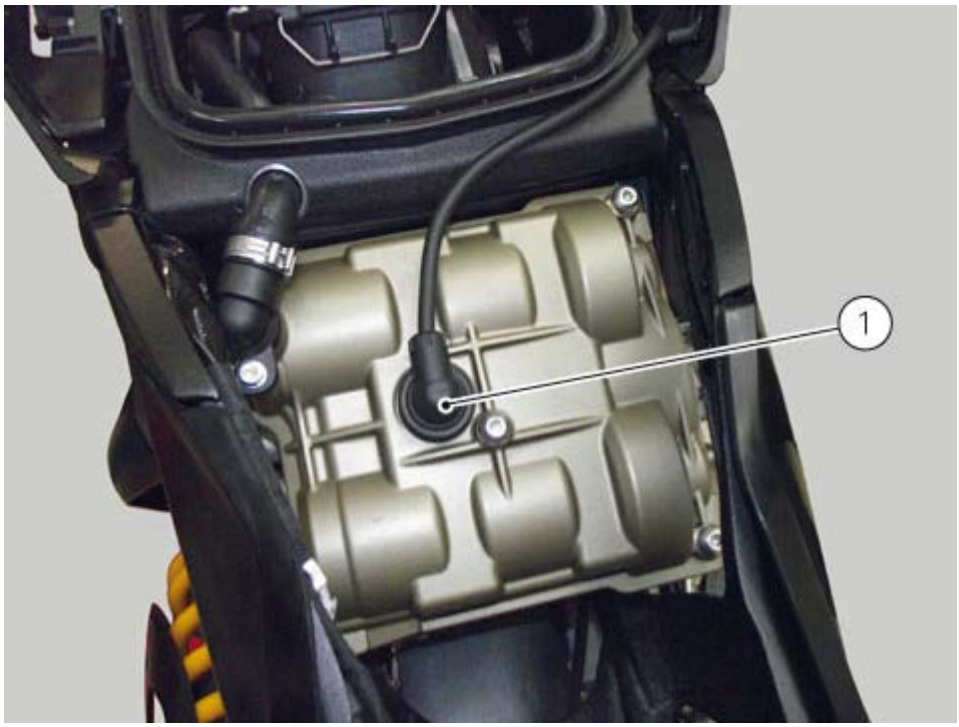
Spark plug type
Make: NGK
Type: MAR09A-J.

Remove the following parts to reach the vertical head spark plug:
Remove the rider seat (Removing the rider seat).
Remove the fuel tank (Removing the fuel tank).

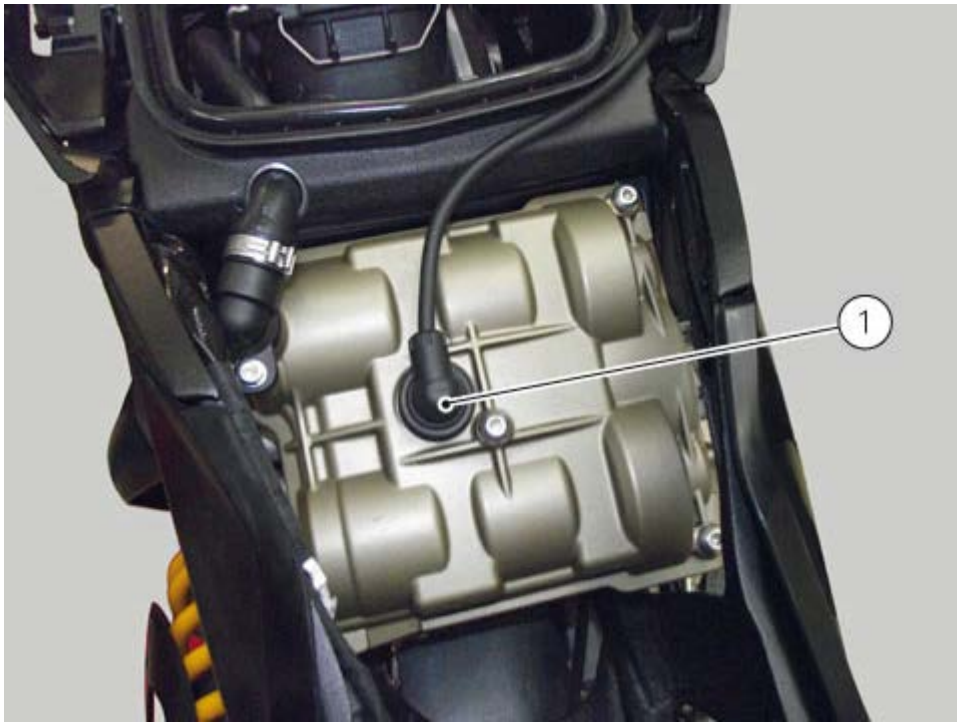
Remove the following parts to reach the horizontal head spark plug:
Remove the water radiator (Removing the water radiator).
Loosen the screws (B) and remove the cover (A).



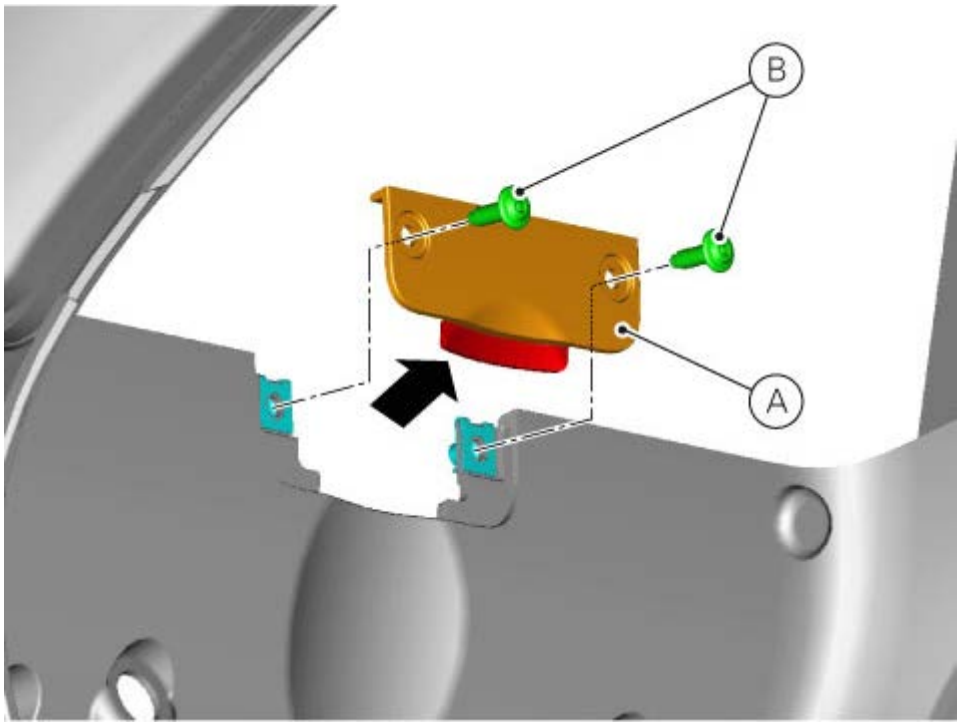
Remove the coil-spark plugs cables (1) of both spark plugs.
Use tool part no. **88713.2877** and replace the spark plugs.



Lay down the coil-spark plug cables (1) as required.



Fit cover (A) inserting it from the top to engage its lower side first.
Start and tighten the screws (B) to 2.5 Nm ± 10% to fasten cover (A).



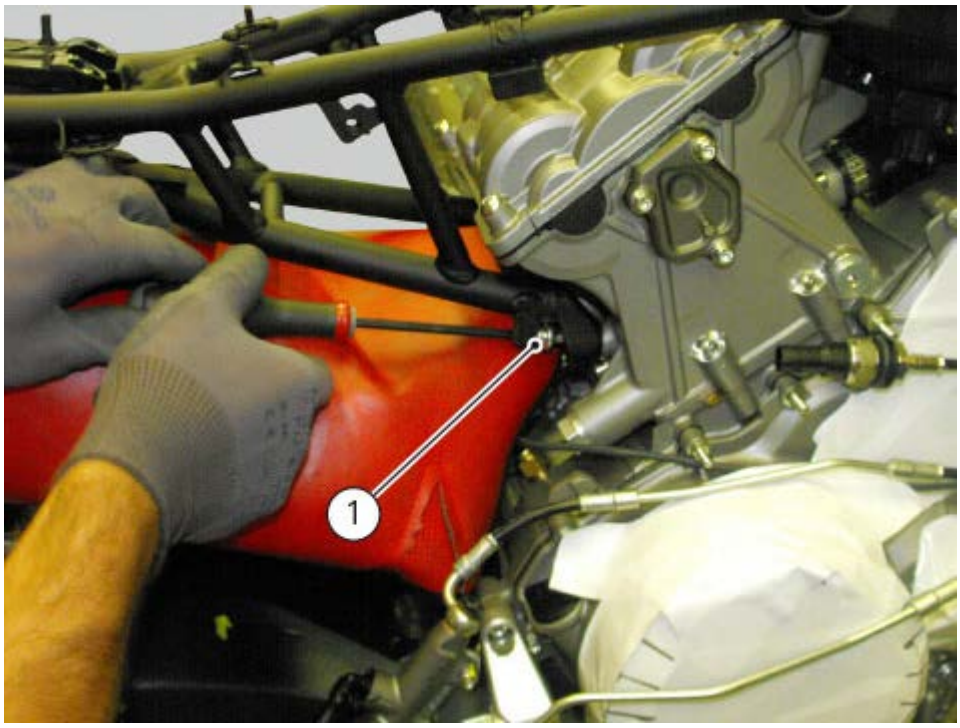
Refit the water radiator (Refitting the water radiator).
Refit the fuel tank (Refitting the fuel tank).
Refit the rider seat (Refitting the rider seat).

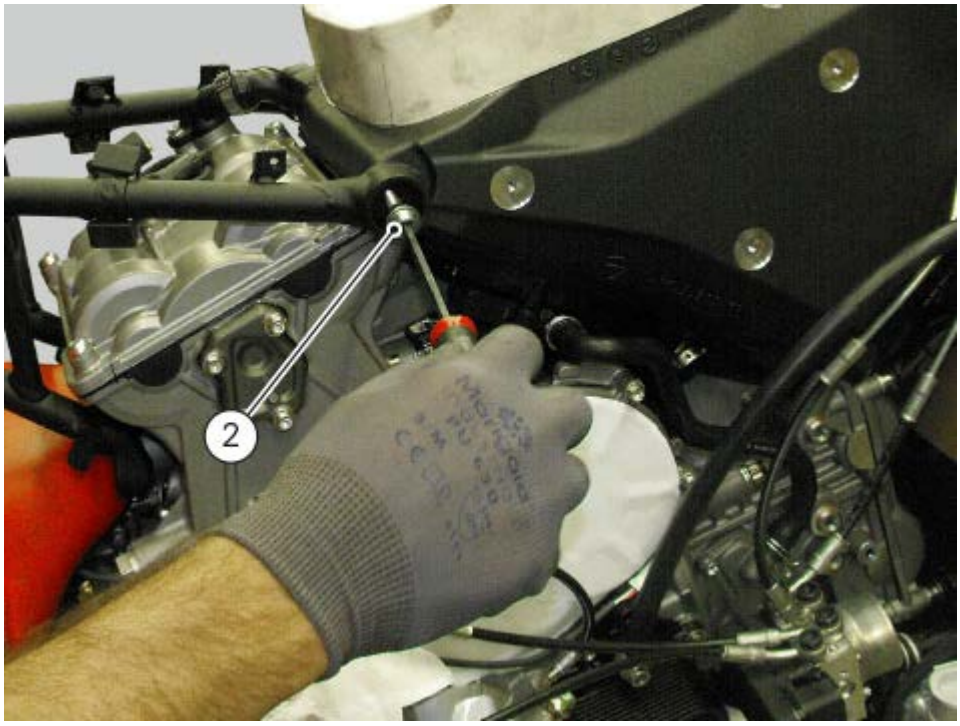
Checking valve clearance

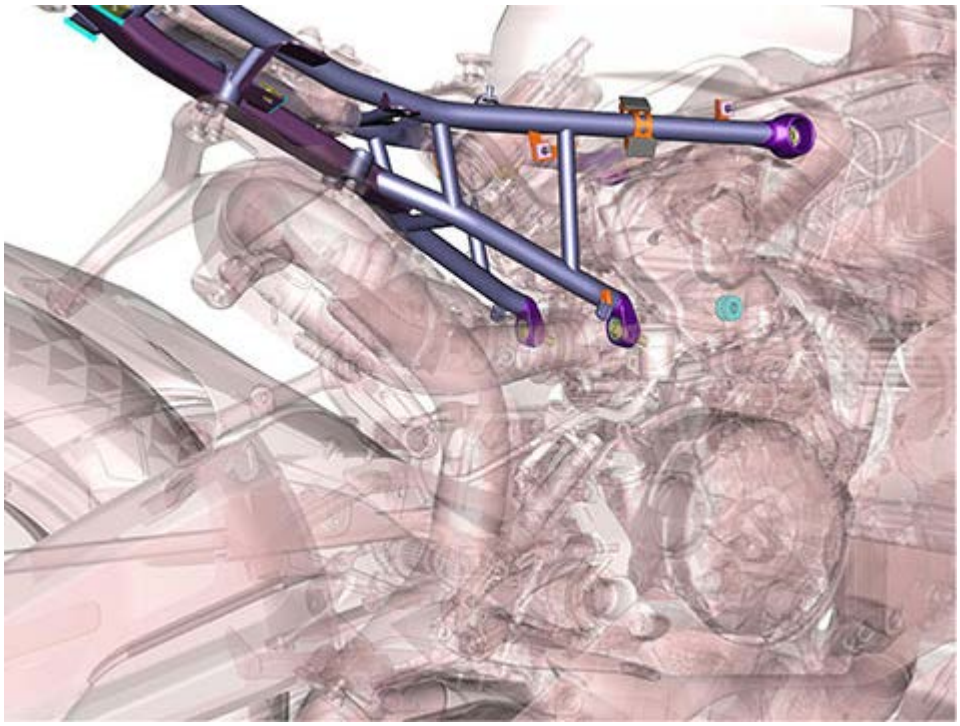
To check valve clearance, it is necessary to have access to the cylinder head covers and then remove the components listed below.

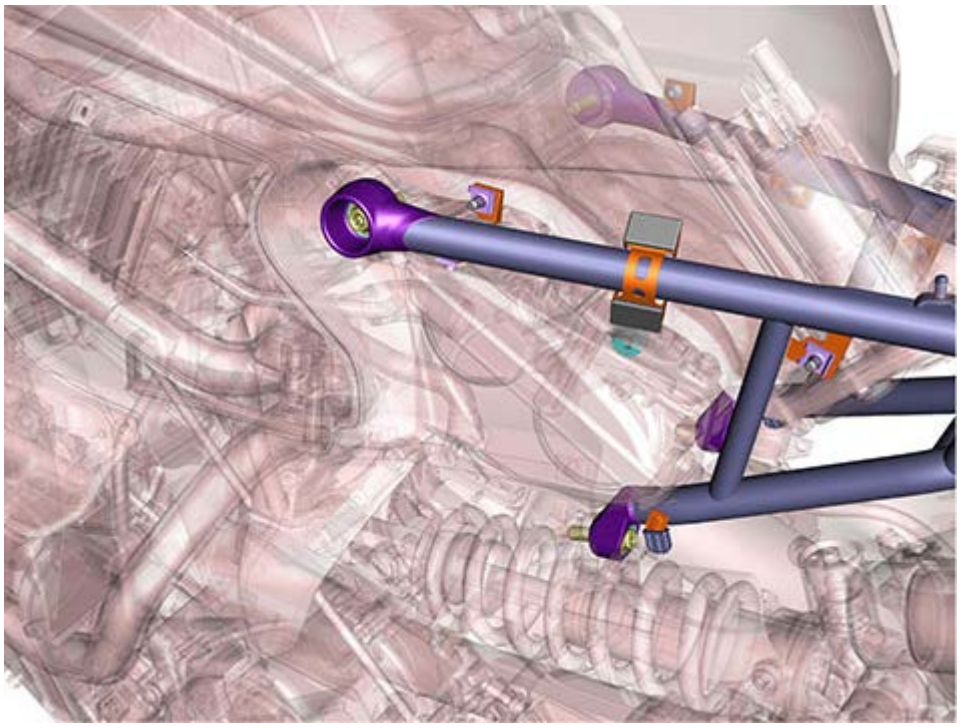
Remove the rider seat (Removing the rider seat).
Remove both fairings (Removing the side fairings).
Remove the fuel tank (Removing the fuel tank).
Remove the radiator unit (Removing the water radiator).

Working on both sides, lift the rear subframe by loosening lower screws (1) and upper screws (2).

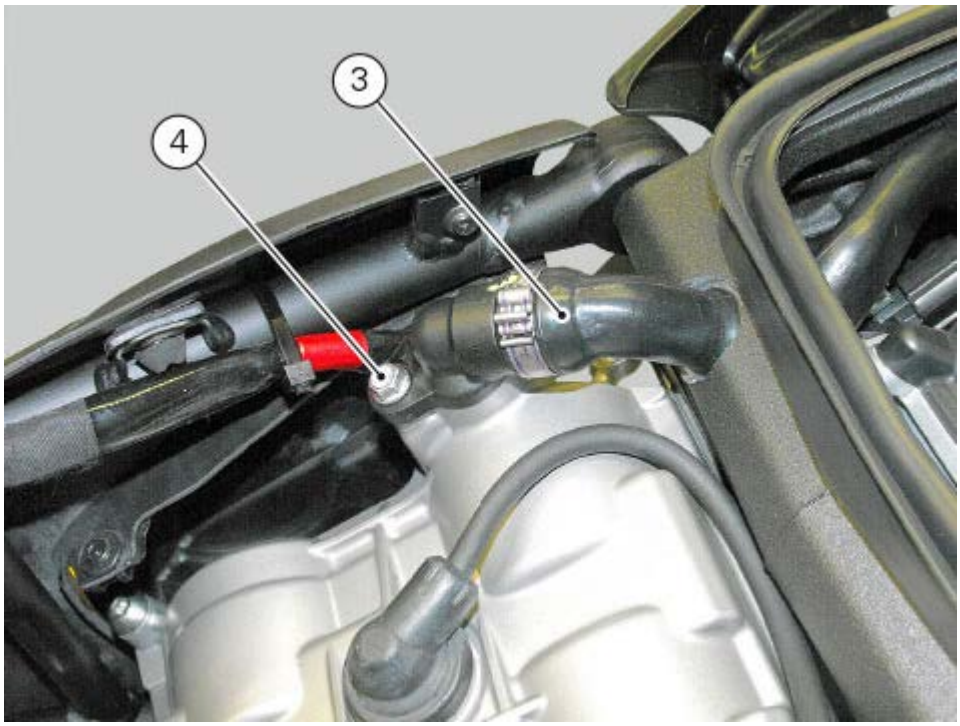








Loosen screw (4) to remove blow-by outlet fitting (3) from vertical head cover.



Remove head covers as explained under "Removing the camshafts".

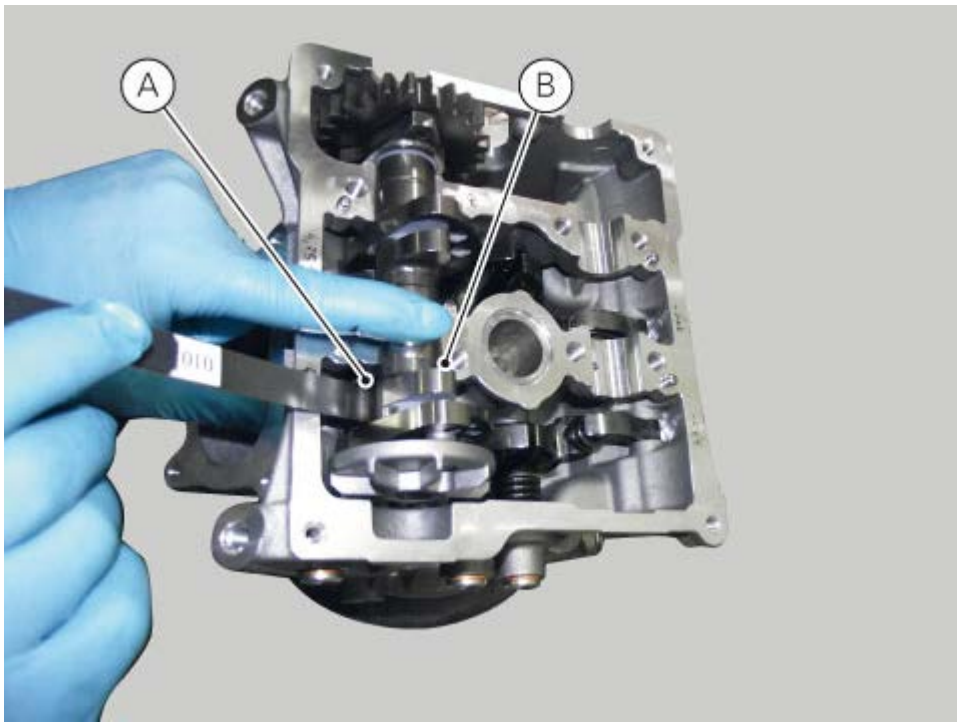
Using handle of tool no. **88713.3824** turn the crankshaft so that the valve to be inspected is in rest position.
With the valve in the rest position, slide a feeler gauge between rocker arm slider (A) and the lowest side of the cam (B) to measure the clearance.

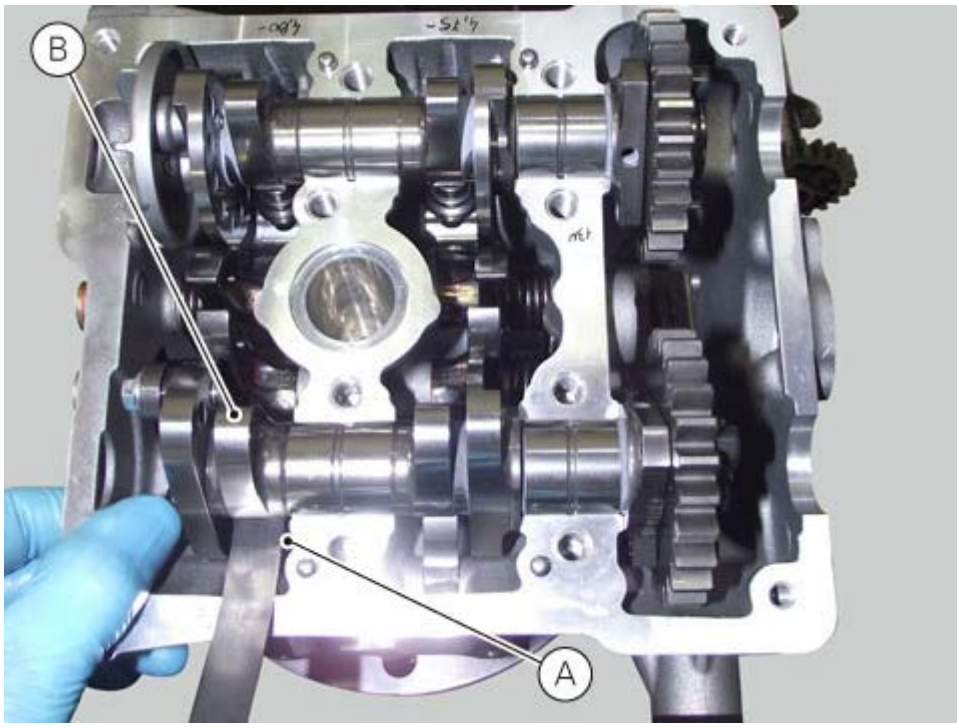
Important
Hold the feeler gauge at a distance of at least 4-5 cm from the point of measurement between cam and rocker arm, as shown in the figure.

The clearance must be within the specified limits:

Opening rocker arm	
INTAKE:	
Operation	0.15÷0.20 mm
Inspection	0.10÷0.25 mm
EXHAUST:	
Operation	0.15÷0.20 mm
Inspection	0.10÷0.25 mm

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

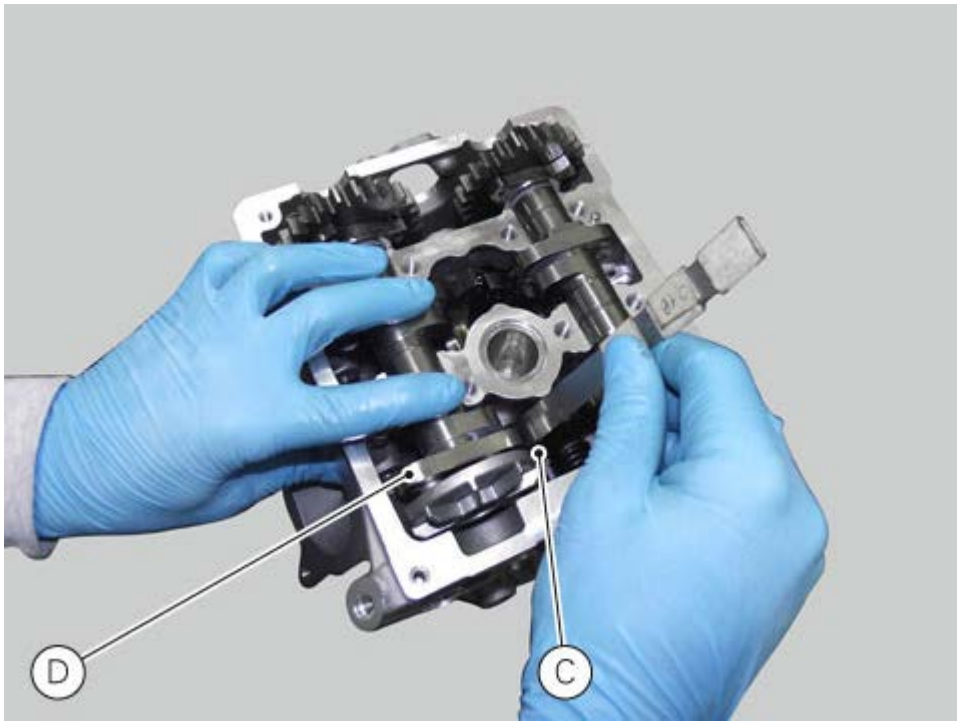


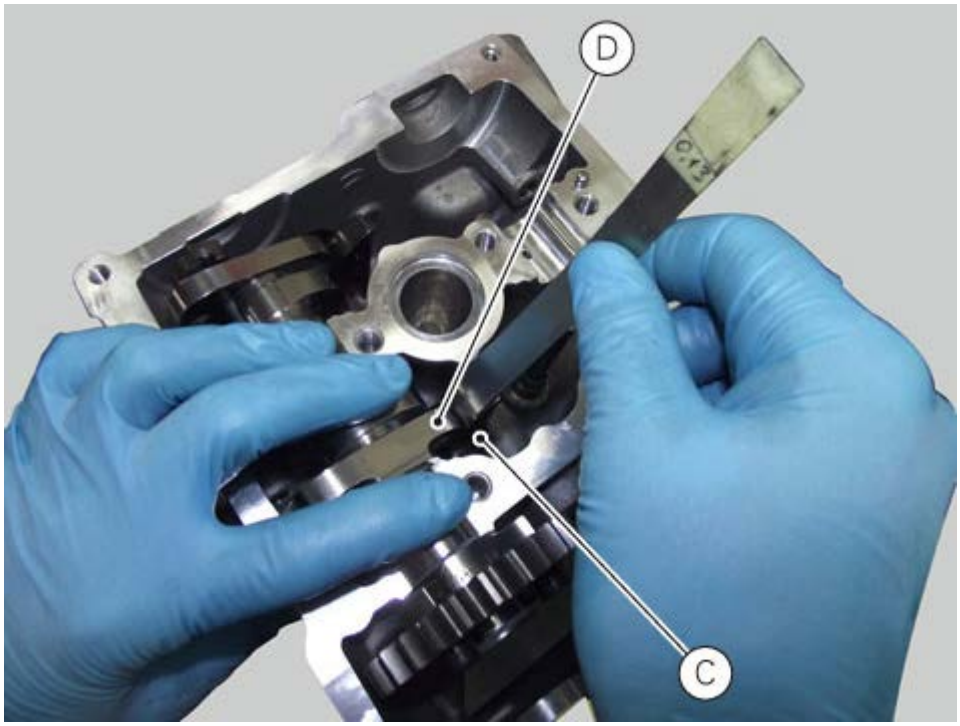


With the valve in the rest position, slide a feeler gauge between closing rocker arm slider (C) and the highest side of the cam (D) to measure the clearance.

Closing rocker arm	
INTAKE:	
Operation	0.08÷0.13 mm
Inspection	0.08÷0.25 mm
EXHAUST:	
Operation	0.08÷0.13 mm
Inspection	0.08÷0.25 mm

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





If detected values exceed the specified limits, replace opening and/or closing shim, as described in paragraph “Removing the valves”, with one featuring an adequate thickness to obtain the specified clearance.

Note
The charts below indicate the available spare opening and closing shims: each part is marked with the size.

840.2.001.2A Opening rocker shim		
840.1.031.2A - 1.8	840.1.012.2A - 2.55	840.1.027.2A - 3.3
840.1.032.2A - 1.85	840.1.013.2A - 2.6	840.1.028.2A - 3.35

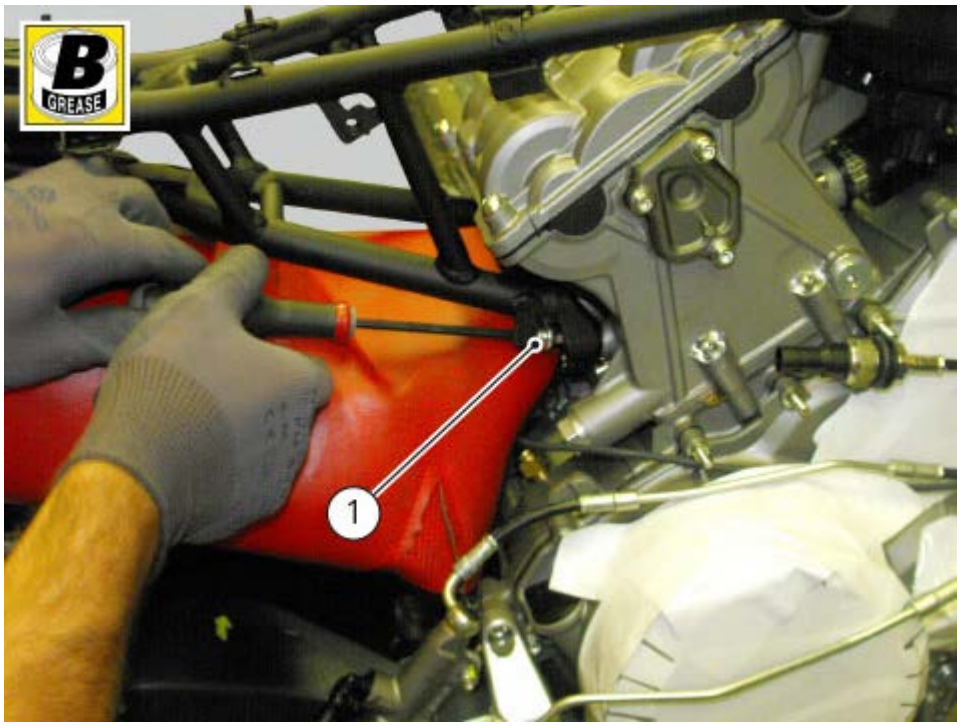
840.1.033.2A - 1.9	840.1.014.2A - 2.65	840.1.029.2A - 3.4
840.1.034.2A - 1.95	840.1.015.2A - 2.7	840.1.030.2A - 3.45
840.1.001.2A - 2.0	840.1.016.2A - 2.75	840.1.072.2A - 3.6
840.1.002.2A - 2.05	840.1.017.2A - 2.8	840.1.073.2A - 3.8
840.1.003.2A - 2.1	840.1.018.2A - 2.85	840.1.108.2A - 3.5
840.1.004.2A - 2.15	840.1.019.2A - 2.9	840.1.109.2A - 3.55
840.1.005.2A - 2.2	840.1.020.2A - 2.95	840.1.110.2A - 3.65
840.1.006.2A - 2.25	840.1.021.2A - 3.0	840.1.111.2A - 3.7
840.1.007.2A - 2.3	840.1.022.2A - 3.05	840.1.112.2A - 3.75
840.1.008.2A - 2.35	840.1.023.2A - 3.1	840.1.113.2A - 3.85
840.1.009.2A - 2.4	840.1.024.2A - 3.15	840.1.114.2A - 3.9
840.1.010.2A - 2.45	840.1.025.2A - 3.2	
840.1.011.2A - 2.5	840.1.026.2A - 3.25	

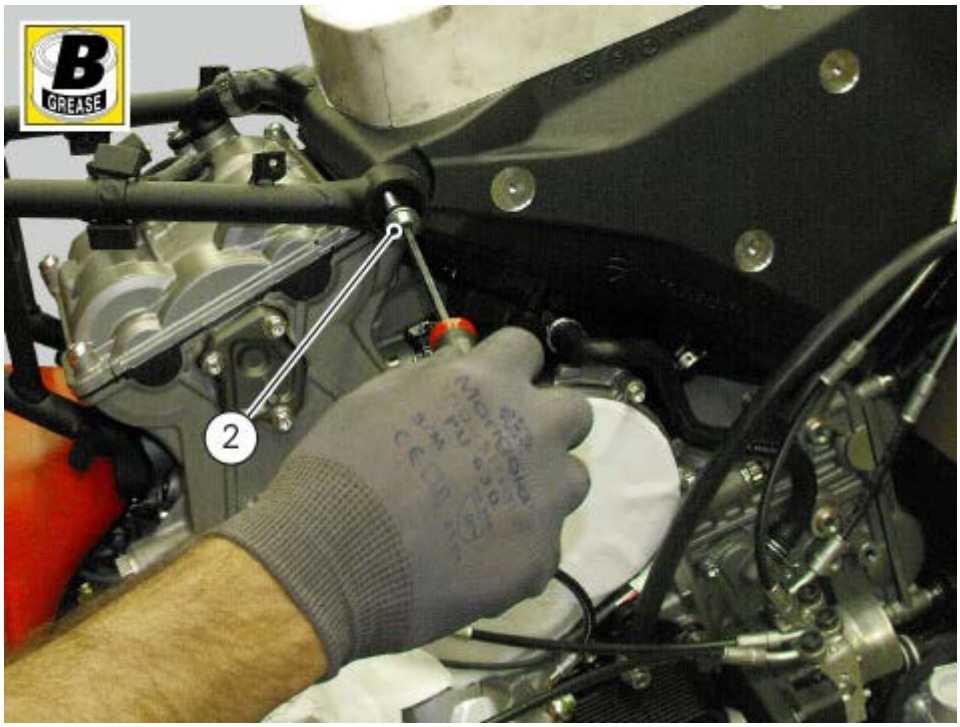
840.2.002.2B Closing rocker shim (split rings)		
840.1.041.2B - 2.2	840.1.057.2B - 3.0	840.1.073.2B - 3.8
840.1.042.2B - 2.25	840.1.058.2B - 3.05	840.1.074.2B - 3.85
840.1.043.2B - 2.3	840.1.059.2B - 3.1	840.1.075.2B - 3.9
840.1.044.2B - 2.35	840.1.060.2B - 3.15	840.1.076.2B - 3.95
840.1.045.2B - 2.4	840.1.061.2B - 3.2	840.1.077.2B - 4.0
840.1.046.2B - 2.45	840.1.062.2B - 3.25	840.1.078.2B - 4.05
840.1.047.2B - 2.5	840.1.063.2B - 3.3	840.1.079.2B - 4.1
840.1.048.2B - 2.55	840.1.064.2B - 3.35	840.1.080.2B - 4.15
840.1.049.2B - 2.6	840.1.065.2B - 3.4	840.1.081.2B - 4.2
840.1.050.2B - 2.65	840.1.066.2B - 3.45	840.1.082.2B - 4.25
840.1.051.2B - 2.7	840.1.067.2B - 3.5	840.1.083.2B - 4.3
840.1.052.2B - 2.75	840.1.068.2B - 3.55	840.1.084.2B - 4.35
840.1.053.2B - 2.8	840.1.069.2B - 3.6	840.1.085.2B - 4.4
840.1.054.2B - 2.85	840.1.070.2B - 3.65	840.1.086.2B - 4.45
840.1.055.2B - 2.9	840.1.071.2B - 3.7	840.1.087.2B - 4.5
840.1.056.2B - 2.95	840.1.072.2B - 3.75	

Refit head covers as explained under "Refitting the camshafts".

Apply the recommended grease to the screws (1) and (2).

Lower the rear subframe, and fasten it by starting the lower screws.
Tighten screws (1) to a torque of 22 Nm and screws (2) to a torque of 28 Nm.





Refit the radiator unit (Refitting the water radiator).
Refit the fuel tank (Refitting the fuel tank).
Refit both fairings (Refitting the side fairings).
Refit the rider seat (Refitting the rider seat).

Changing the engine oil and filter cartridge

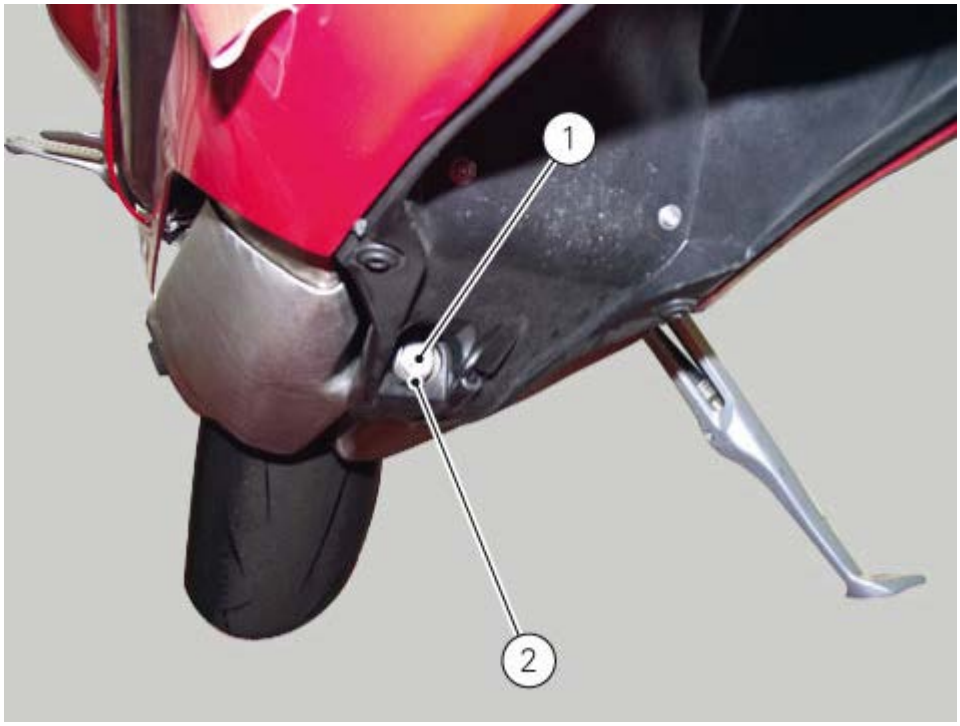
Note

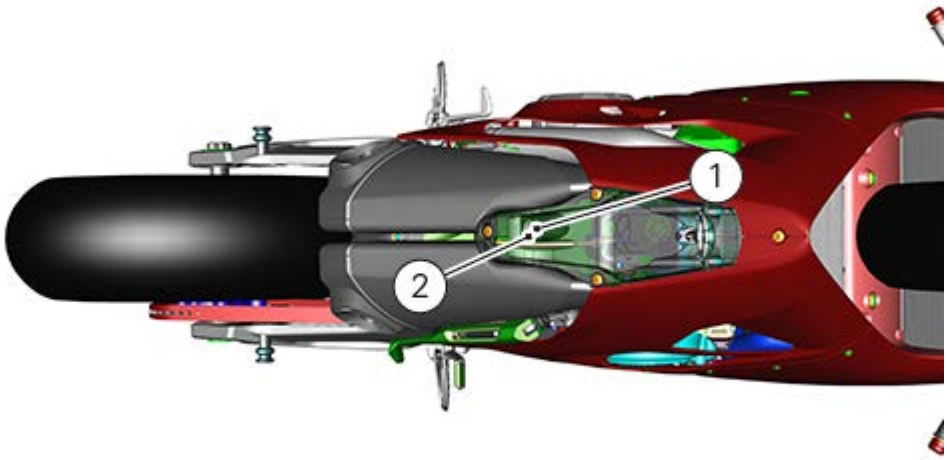
This operation has to be carried out with hot engine (but turned off) because the oil in these conditions is more fluid and its evacuation is faster and complete.

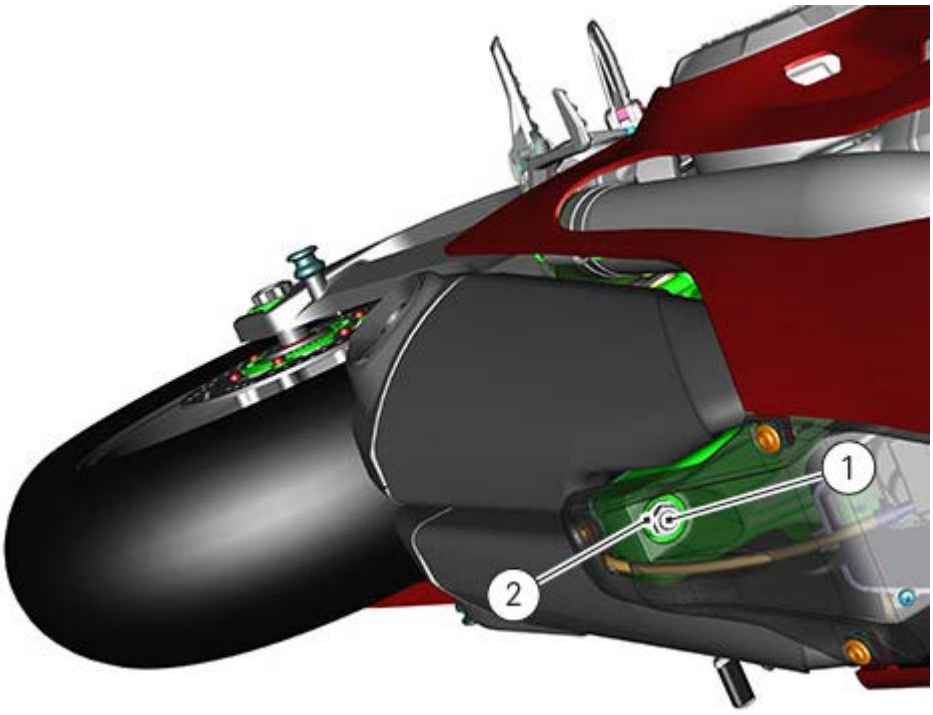
Remove the drain plug (1) with seal (2) from the oil sump and allow the oil to drain off.

Warning

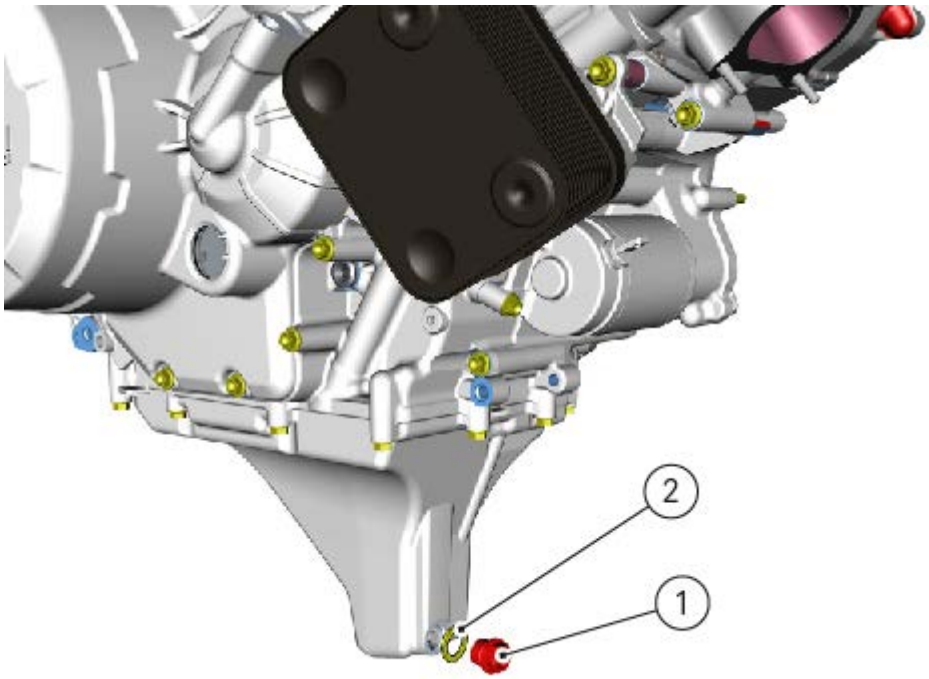
Dispose of oil and/or filter cartridges in compliance with environmental protection regulations.



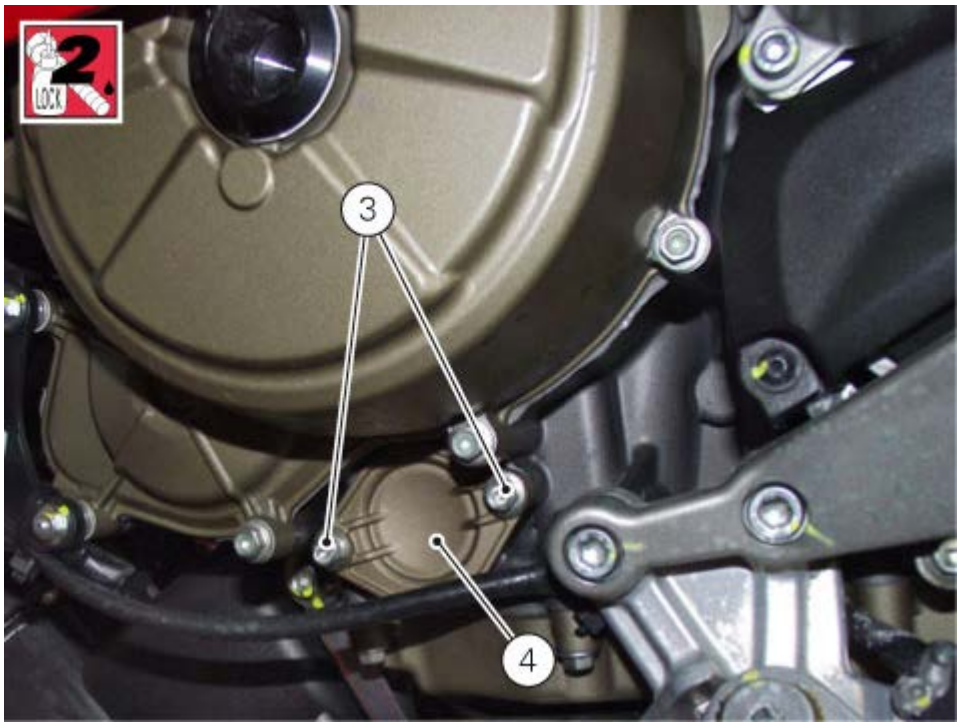




Remove any metal deposits from the end of the magnetic drain plug (1). Clean the threads of the drain plug and apply THREE BOND TB1215. Refit the drain plug complete with gasket (2) to the sump. Position gasket (2) so that the side with the sharp edge is facing the chain side casing.
Tighten the drain plug (1) to a torque of 14 Nm (Min. 13 Nm - Max. 15 Nm).

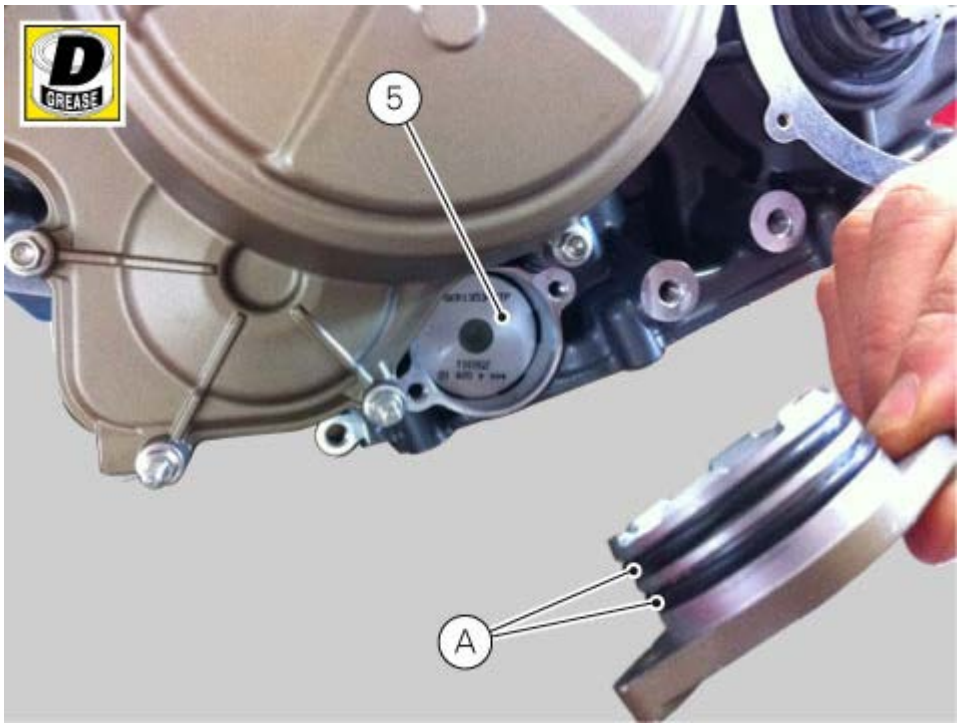


Remove the left-hand side fairing (Removing the side fairings).
Undo the screws (3) and remove the oil filter cover (4).

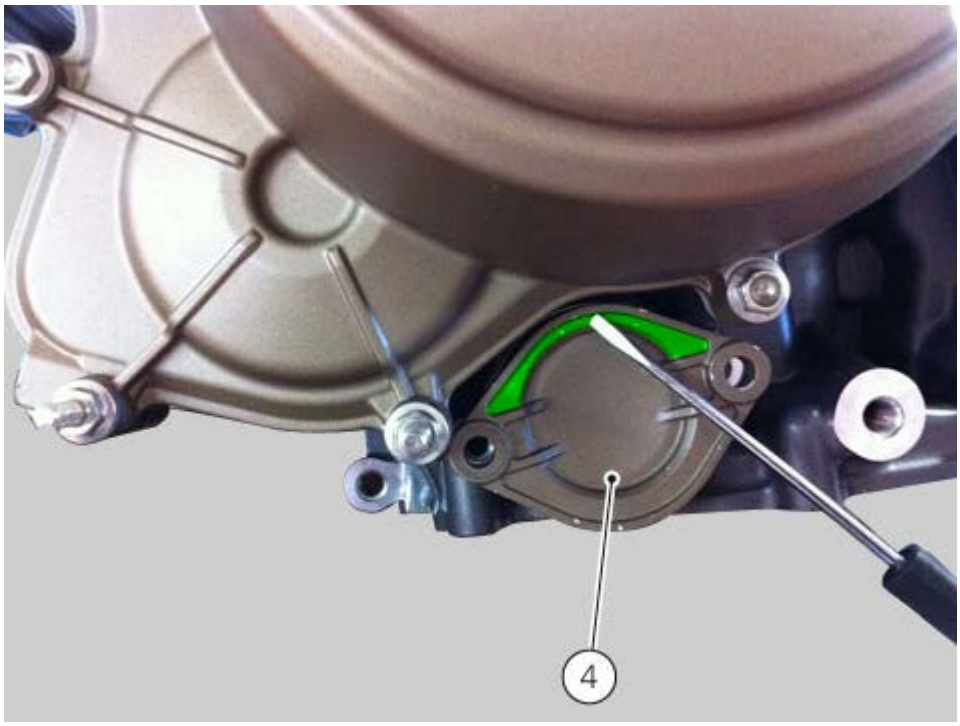


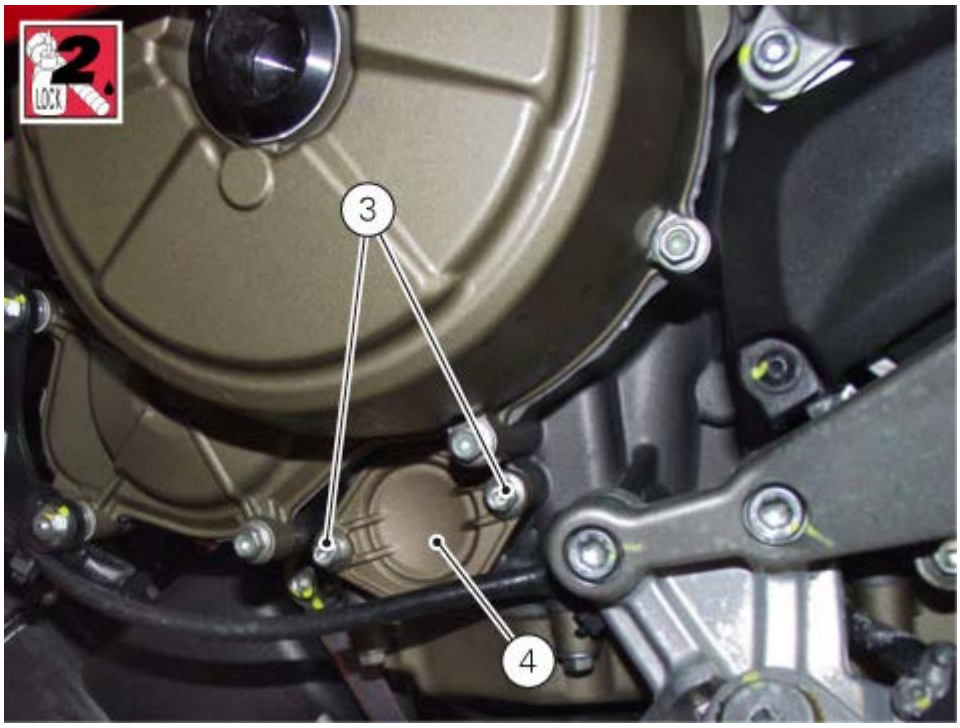
Important
Dispose of the used filter, do not re-use it.

Change oil filter cartridge (5) with a new one.
Fit oil filter cartridge (5) in the relevant seat on casing, fully home.
Grease the O-rings (A) installed on oil filter cover (4).



Fit oil filter cover (4), paying attention to its positioning: the thinner side should be upward.
Apply recommended threadlocker on screws (3) and tighten them to 13 Nm (Min. 12 Nm - Max. 14 Nm).

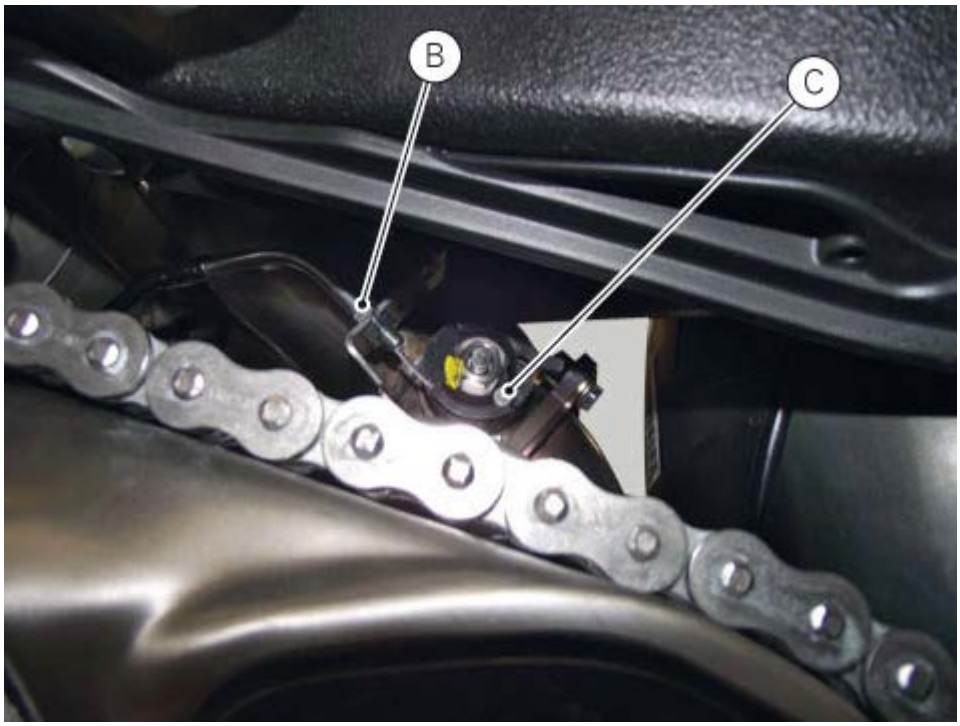




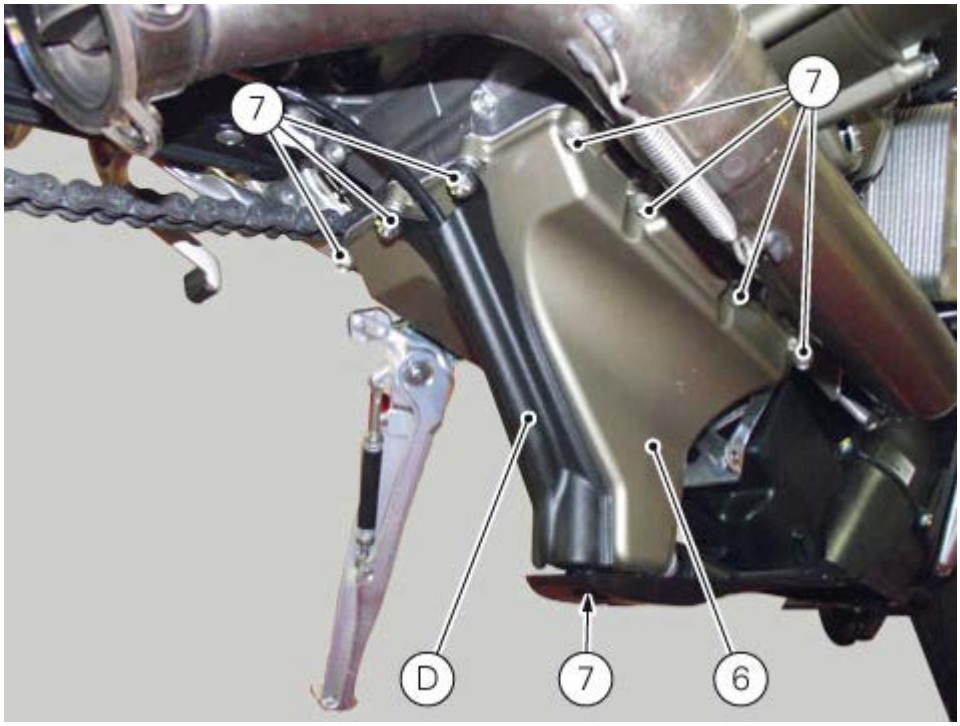
Every two oil changes, clean the oil intake mesh filter.

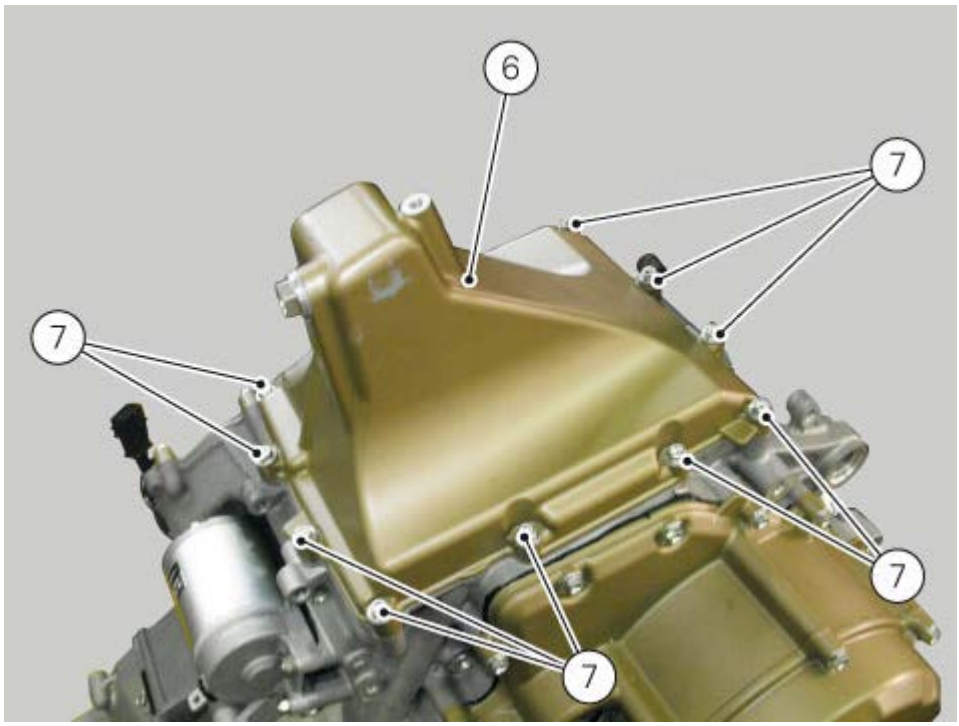
Remove the exhaust tailpipes (Removing the silencers).
Remove the right-hand side fairing (Removing the side fairings).

Loosen nut (B), disengage pawl (C) and remove exhaust valve cable with guide plate (D).

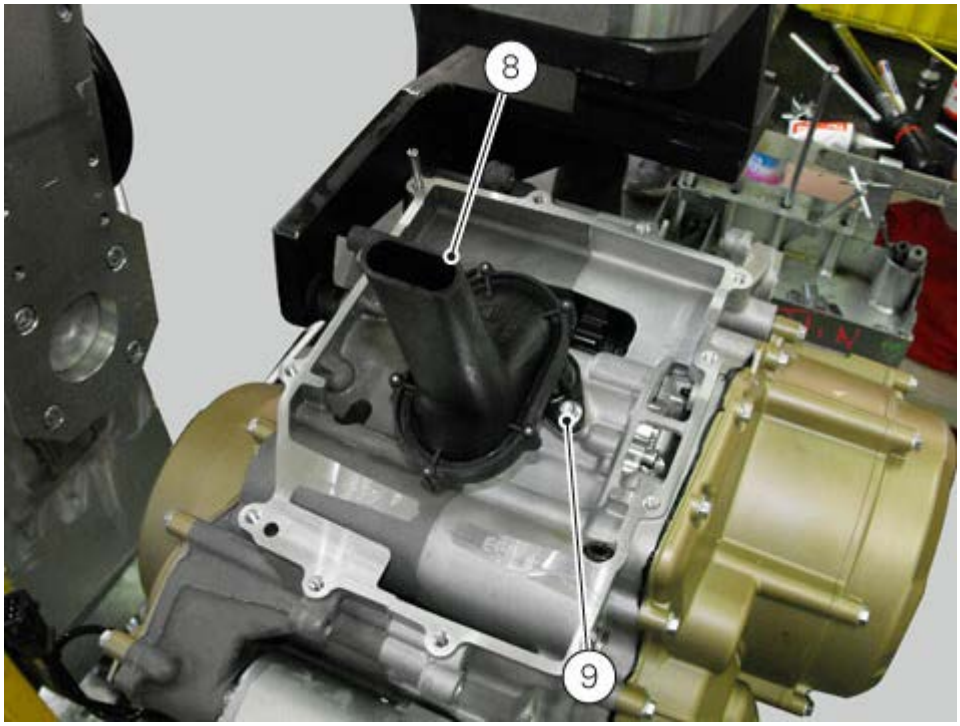


Loosen screws (7) and remove the oil sump (6) moving aside the lower end of radiator support.

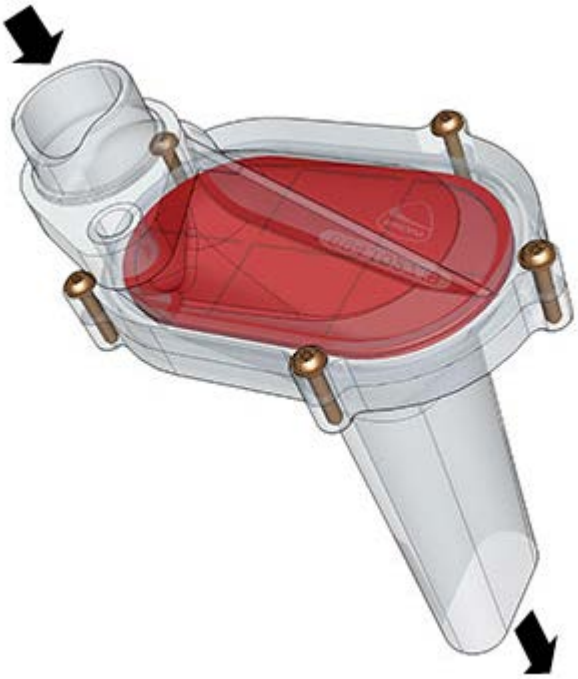




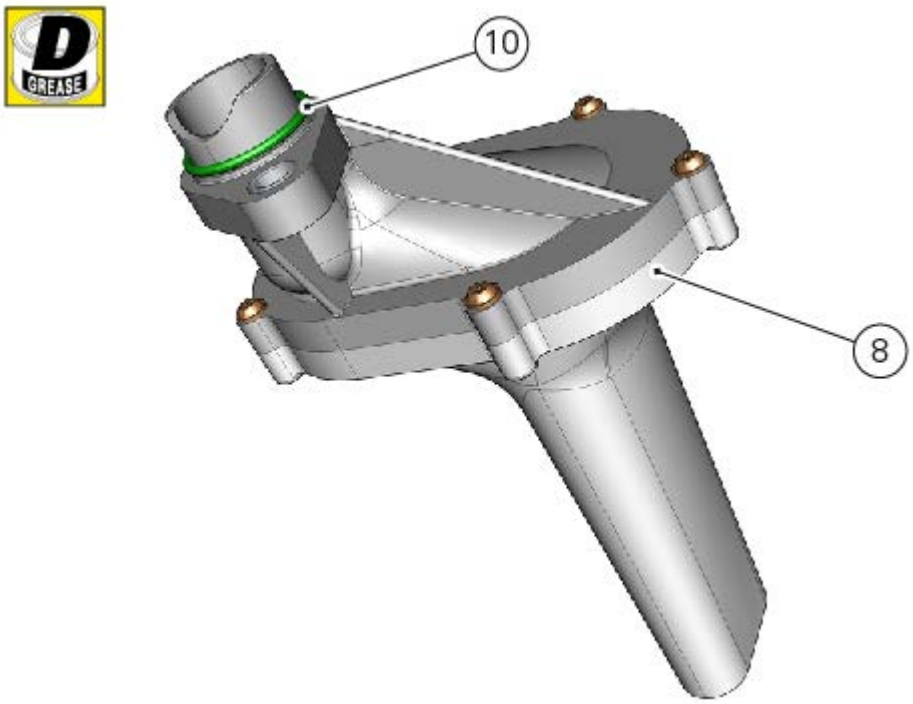
Loosen screw (9) and remove the complete mesh filter assembly (8).



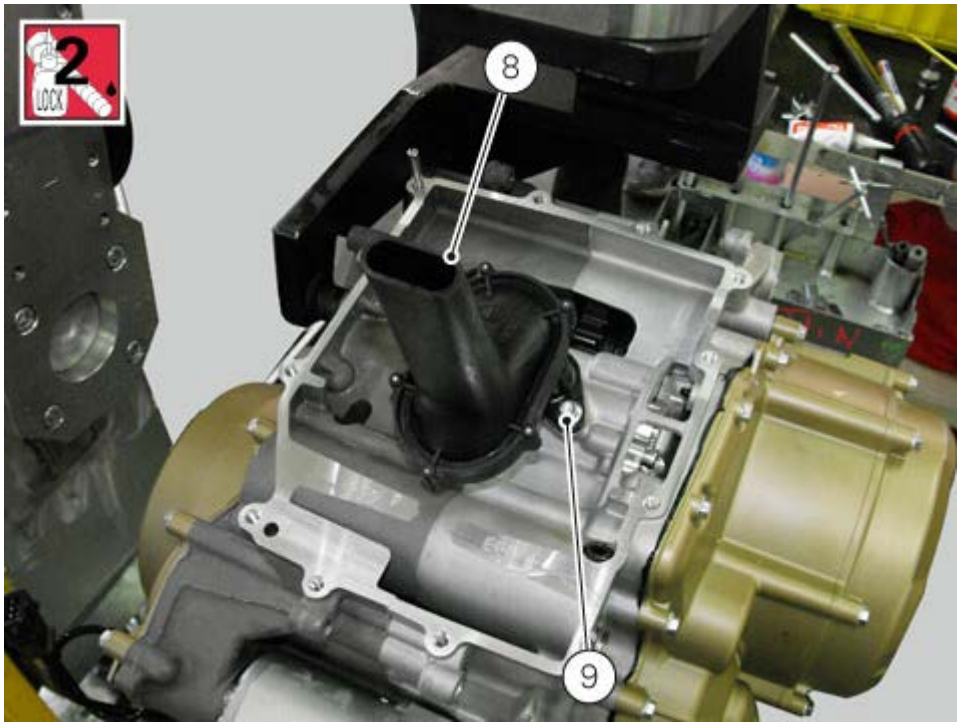
Blow clean with compressed air, aiming the jet from inside out.



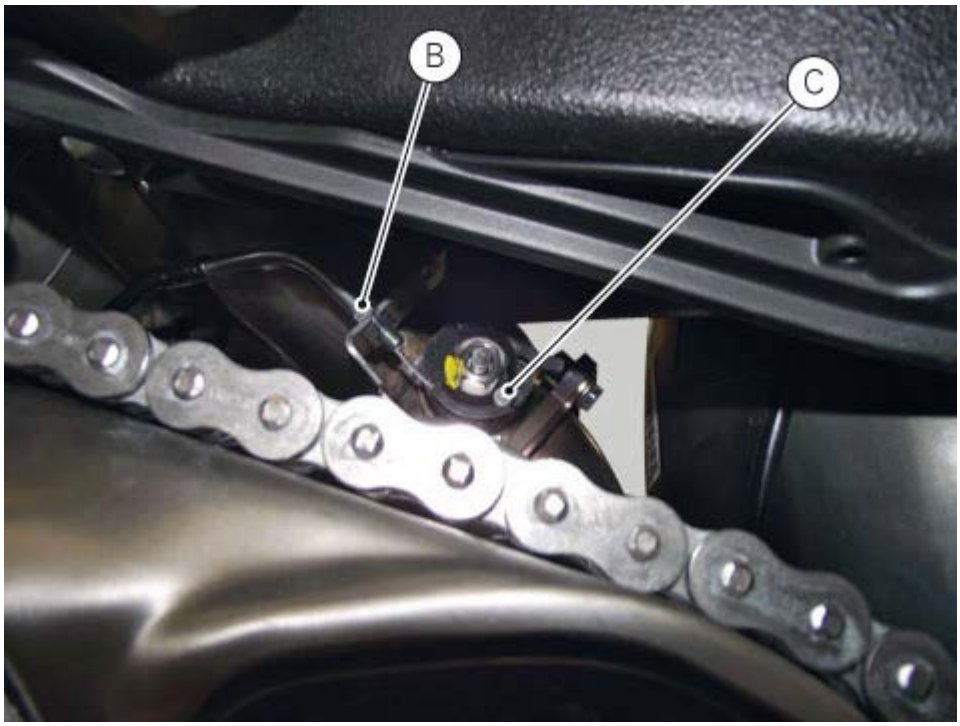
Fit seal (10) on oil drain plug, positioned with the sharp edge facing the oil sump.
Apply recommended grease on seal (10) and install it to the complete mesh filter assembly (9).



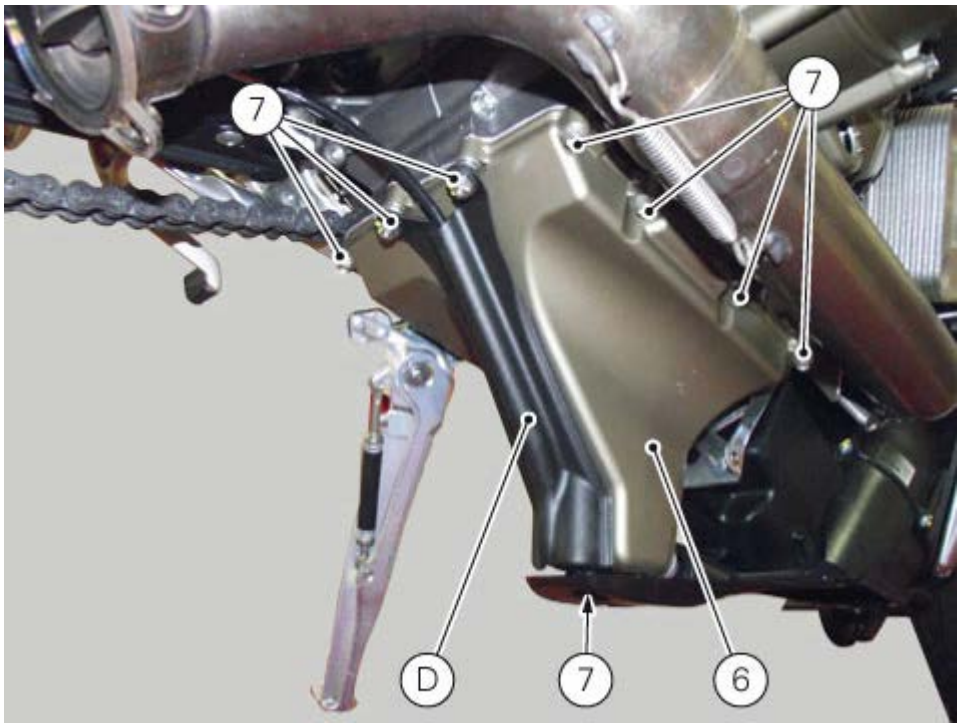
Apply the recommended threadlocker on screw (9).
Fit the complete mesh filter assembly (8) and push flange fully home against the casing, tighten screw (9) to 10 Nm (Min.9 Nm – Max. 11Nm).

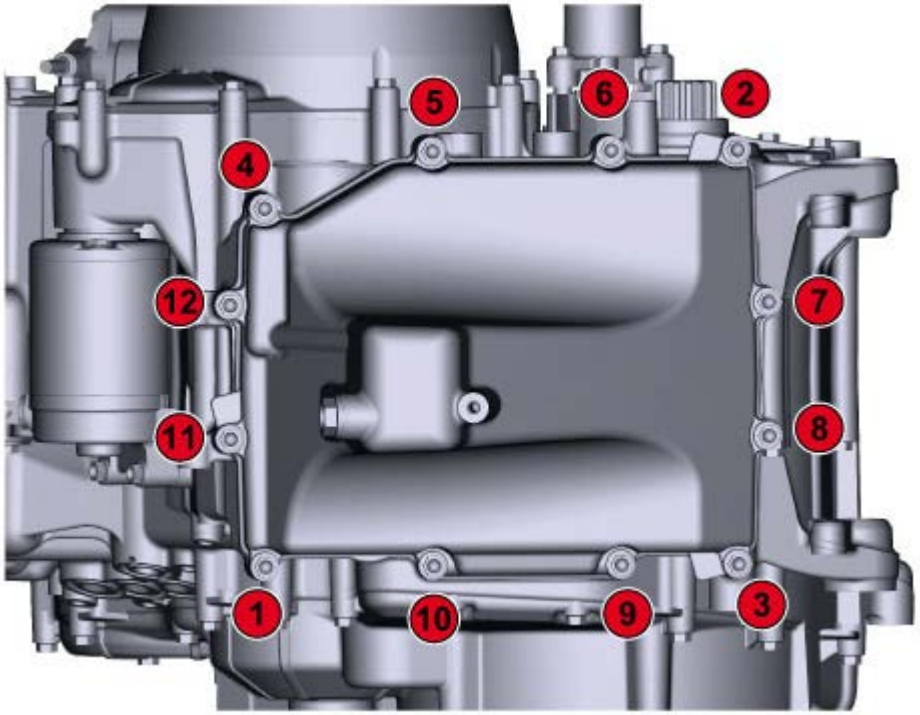


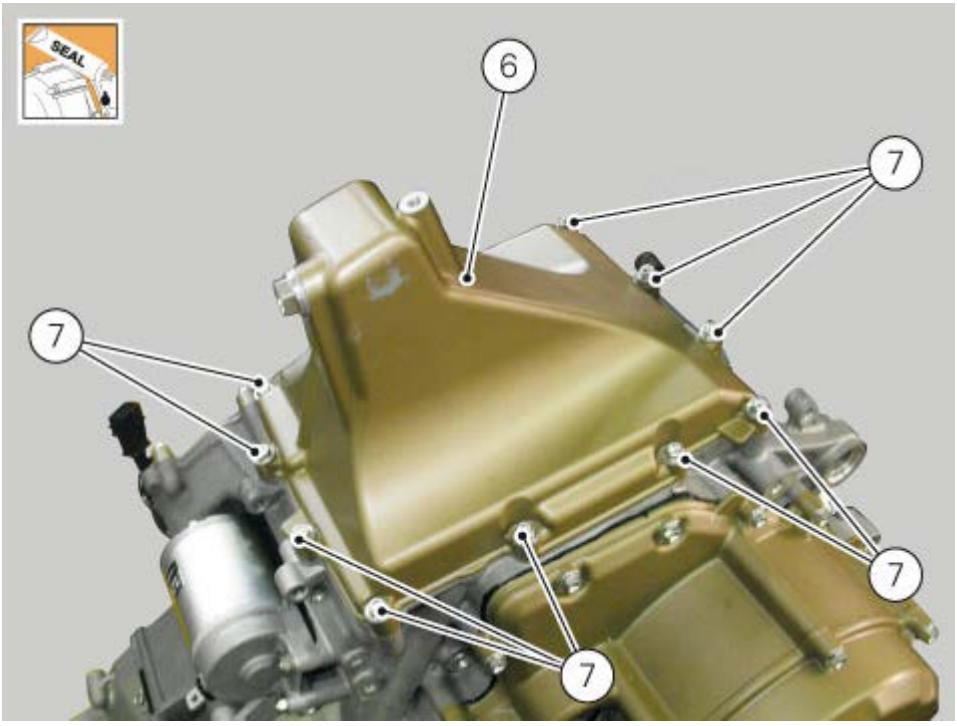
Thoroughly clean the mating surface between oil sump and crankase.
Smear oil sump mating surface with sealing compound.
Fit sump on crankcase and duly centre it using the pilot pins.
Engage pawl (C) in exhaust valve seat and tighten nut (B).



Fit guide plate (D) on oil sump and start screws (7).
Tighten screws (7) to 13 Nm (Min.12 Nm – Max.14 Nm) following the indicated sequence.







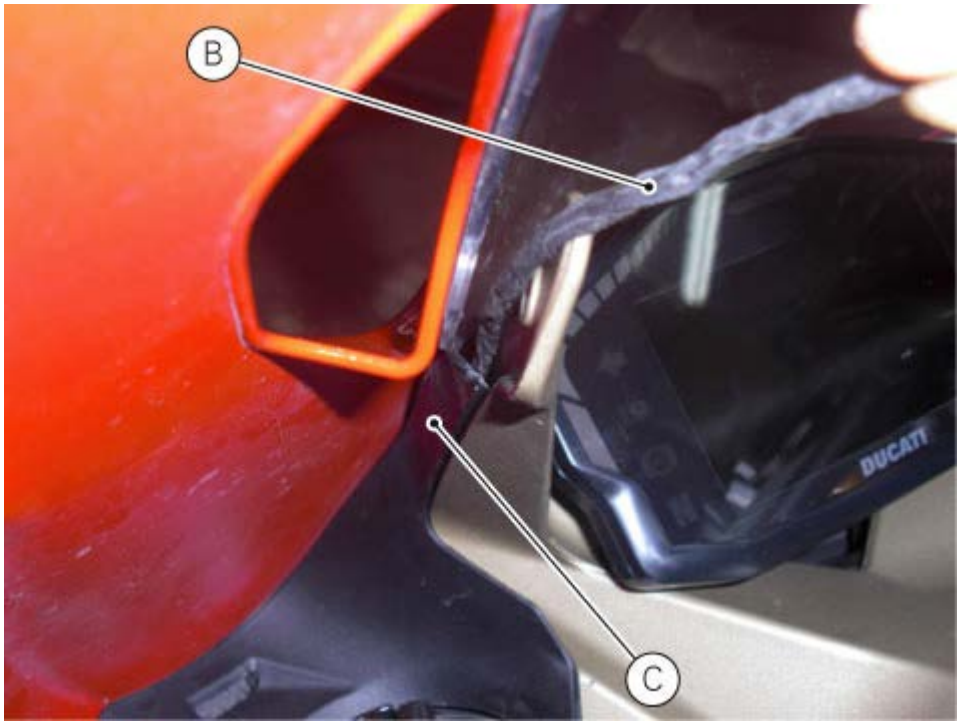
Refit the exhaust tailpipes (Refitting the silencers).
Refit the fairings (Refitting the side fairings).

Checking the engine oil level

The engine oil level can be checked through the sight glass (1) set on oil sump right-hand side.
When checking oil level, the motorcycle should be perfectly upright and the engine cold.
Allow a few minutes for the oil level to stabilize after stopping the engine.
The level shall be between the MIN and MAX marks. If it is too low, top it up.
Remove filler plug (2) and add the specified oil until the required level is reached.
Refit filler plug (2).

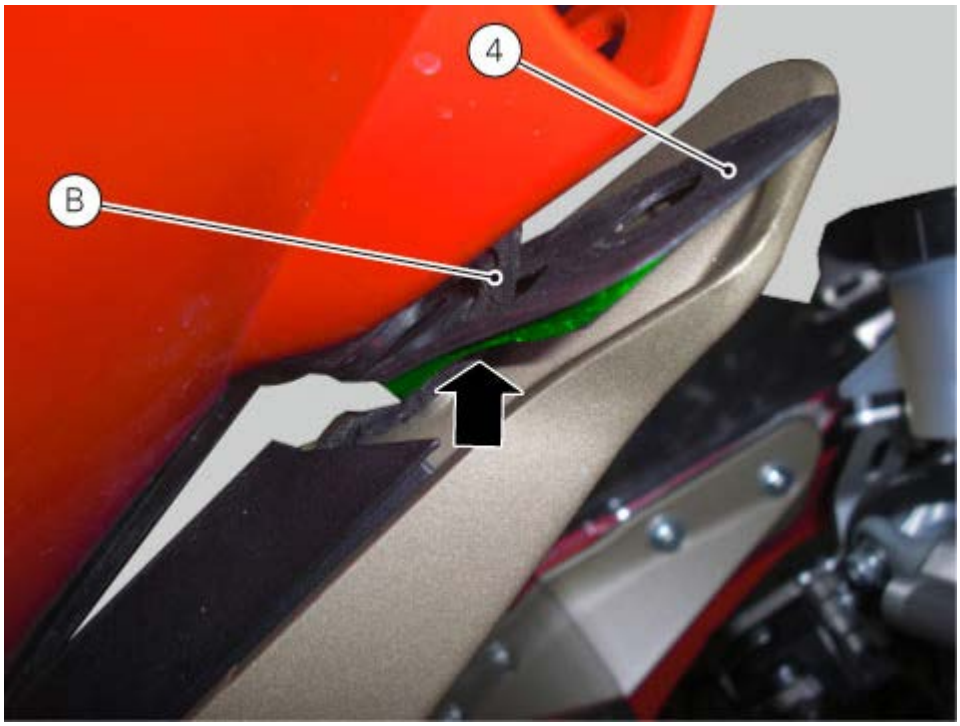
Installation of the rear-view mirrors.

Before refitting the rear-view mirrors, lay down the main wiring (B) of turn indicator inside the recess on headlight fairing (C) and make sure it slides smoothly.

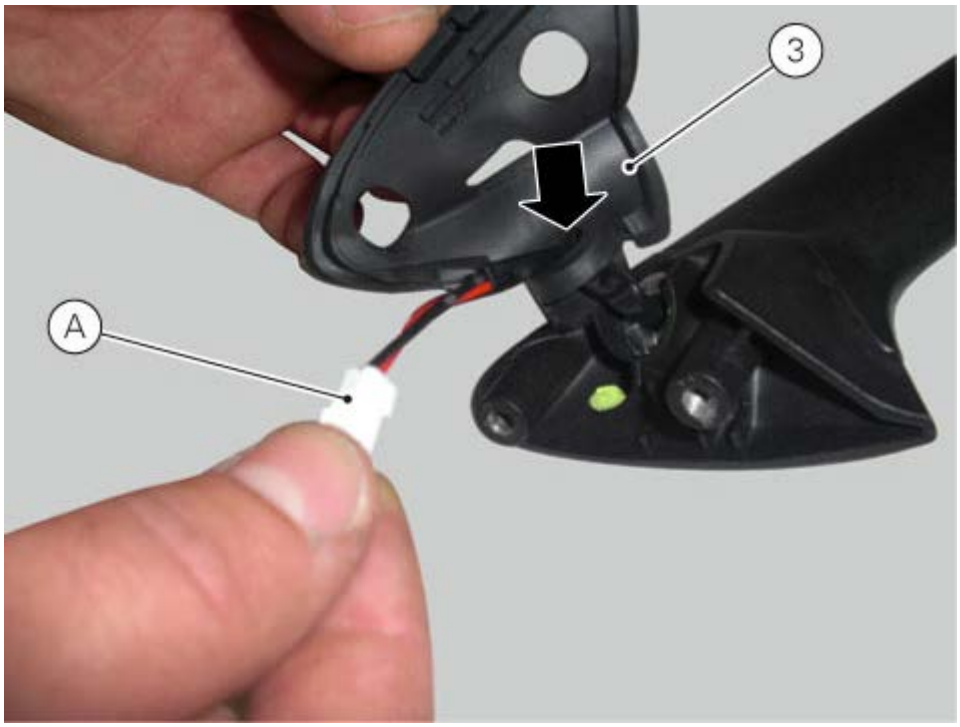


Insert the main wiring (B) of turn indicator through the hole on gasket (4) located between headlight fairing and subframe.

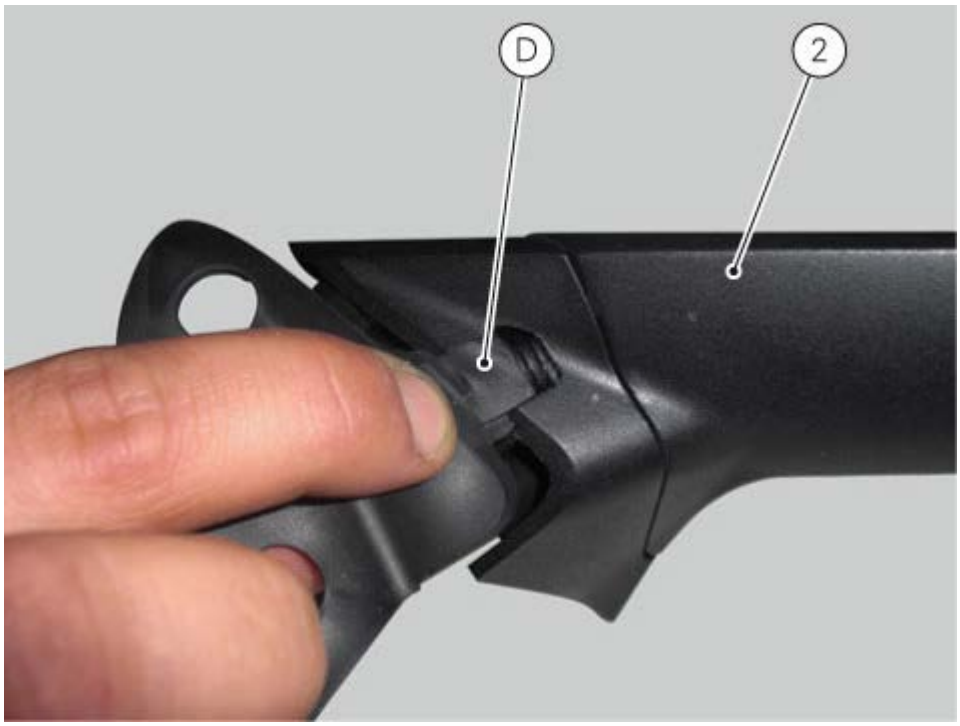
Position gasket located between headlight fairing and subframe (4) between headlight fairing and headlight support, with the protruding part facing the headlight support.
Insert turn indicator wiring connector in the relevant hole on headlight fairing and push it out.



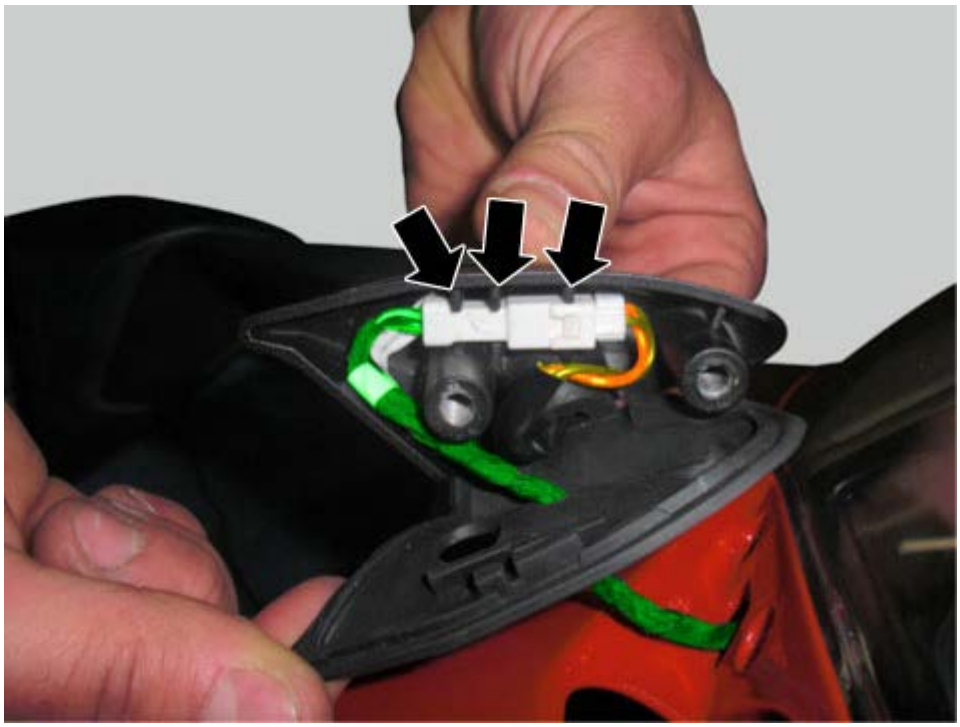
Push turn indicator connector (A) through the hole on gasket (3) located between mirror and headlight fairing.



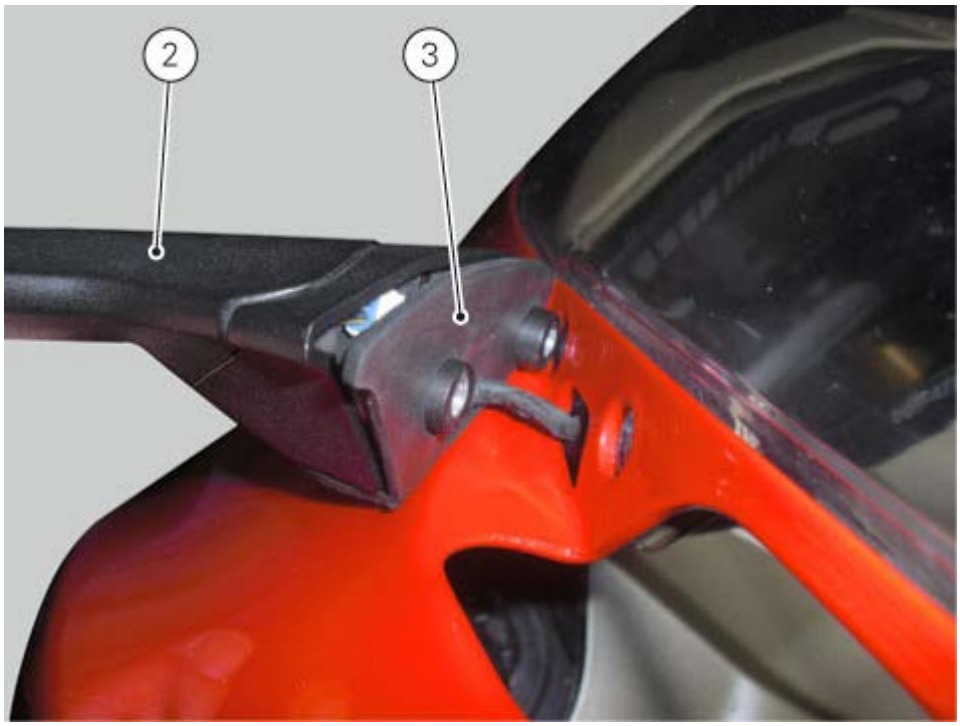
Install gasket (3) located between mirror and headlight fairing and fit tab (D) inside recess on rear-view mirror (2).



Connect turn indicator connector to main wiring harness and lay down connectors in the relevant seat, inside the rear-view mirror support, as shown.



Position the rear-view mirror (2) and insert the bushes of mirror-to-headlight fairing gasket (3) in the holes on headlight fairing.



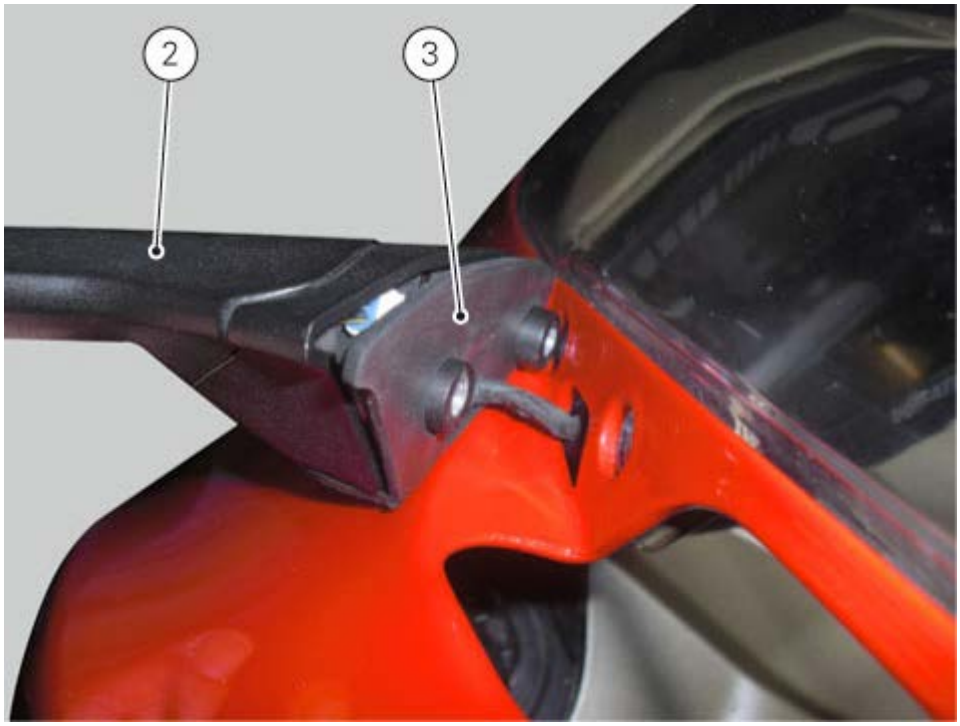
Start the screws (1) and tighten them to a torque of 6 Nm ± 10%.

Carry out the same operations to refit the right-hand side mirror.

Removal of the rear-view mirrors

Loosen screws (1) retaining the left-hand rear-view mirror.

Release the rear-view mirror (2) and remove gasket (3) between mirror and headlight fairing.



Detach gasket (3) located between mirror and headlight fairing and disconnect turn indicator connector (A) from wiring.
Carry out the same operations to remove the other mirror.
Wrap the mirrors in protective material and set them aside to avoid damaging them.


A

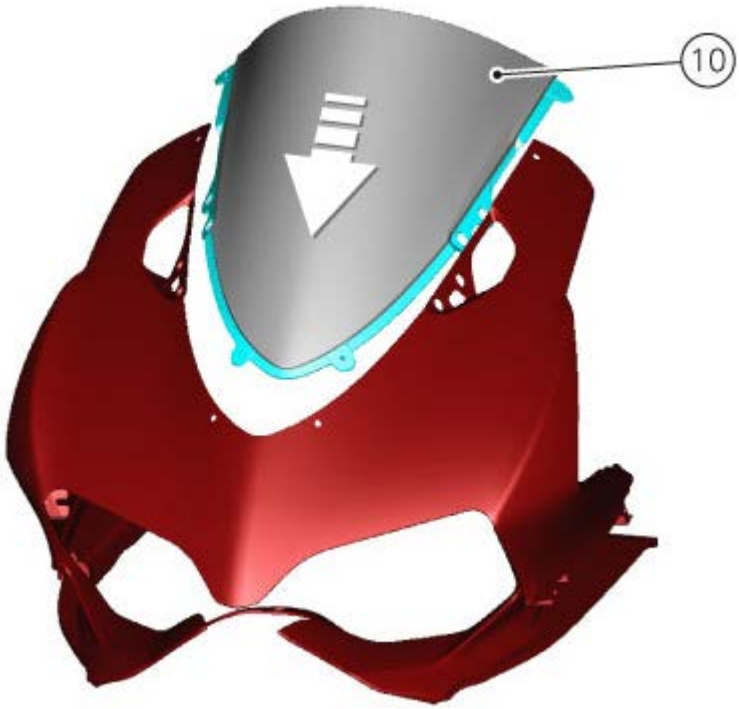
Refitting the headlight fairing

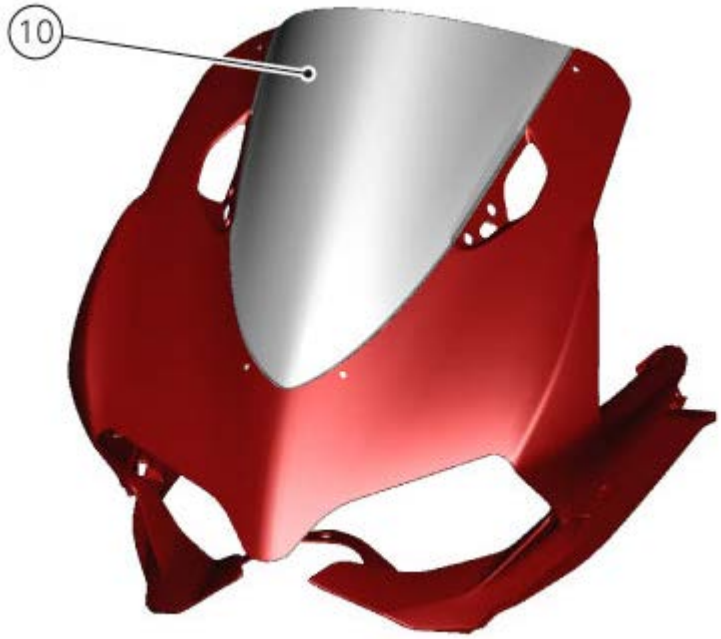
Important

At every reassembly, to avoid damaging the painted areas and the Plexiglas windscreen, always place the nylon washers at the retaining screws.

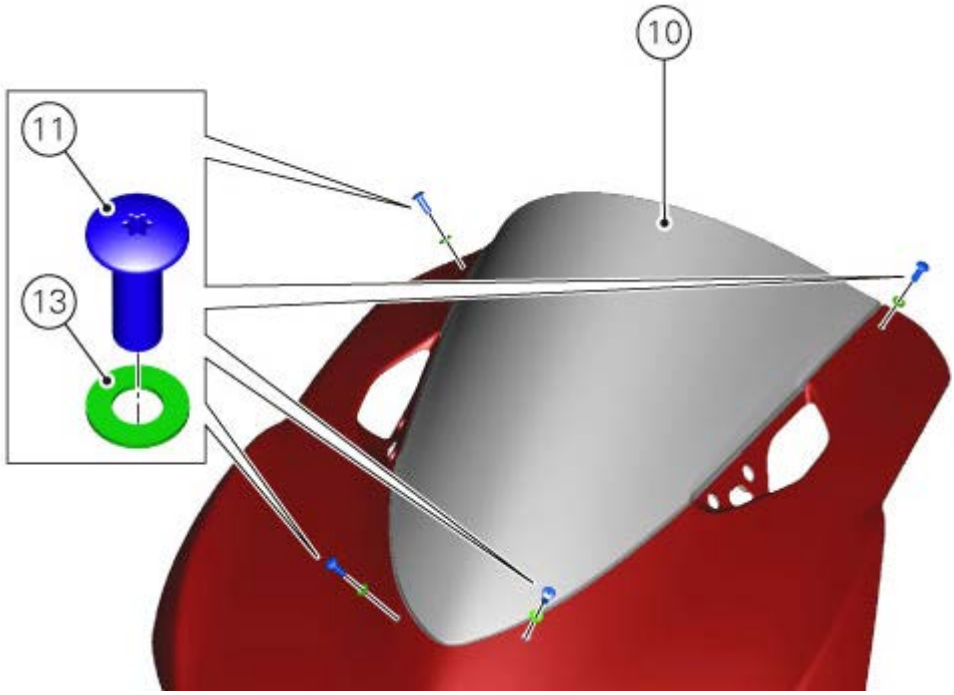
Remove the protective film from the Plexiglas (10).

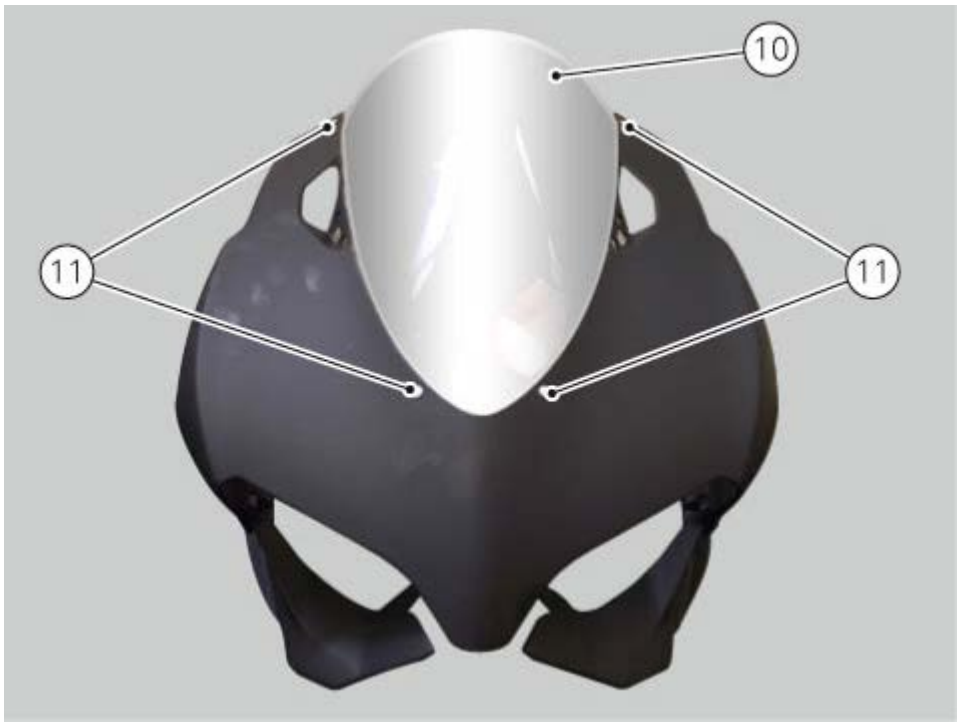
Place Plexiglas (10) by fitting its lower edge under the headlight fairing profile, as shown in the figure.





Fit nylon washers (13) onto screws (11).
Fit Plexiglas (10) by inserting screws (11) into the relevant headlight fairing holes and by starting, from the inner side, the inserts (12) aimed as shown in the figure.
Tighten screws (11) to a torque of 0.2 Nm ± 10%.

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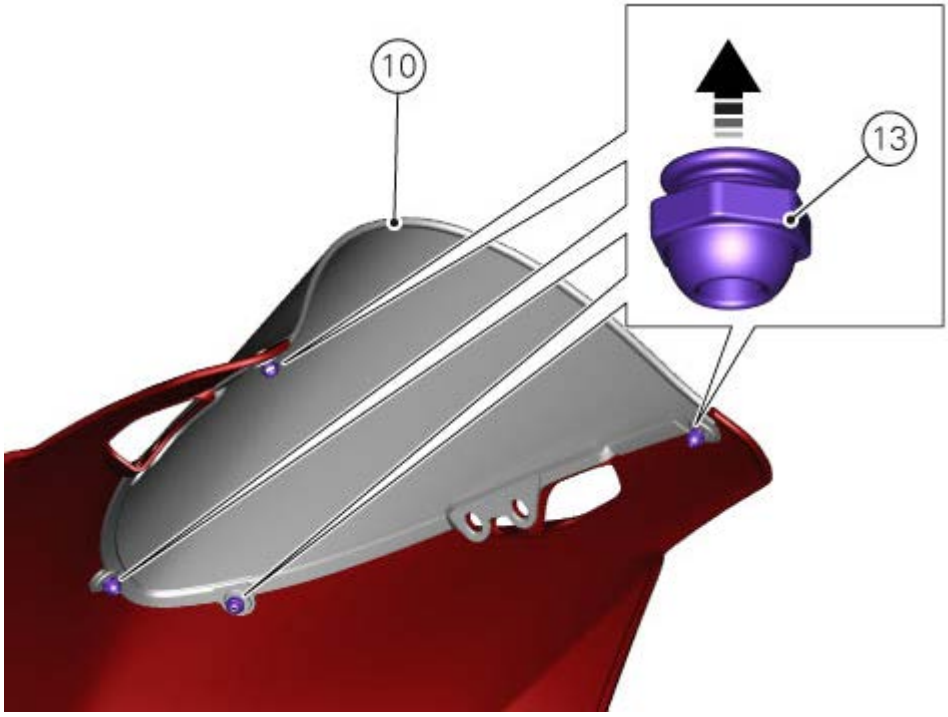
11
11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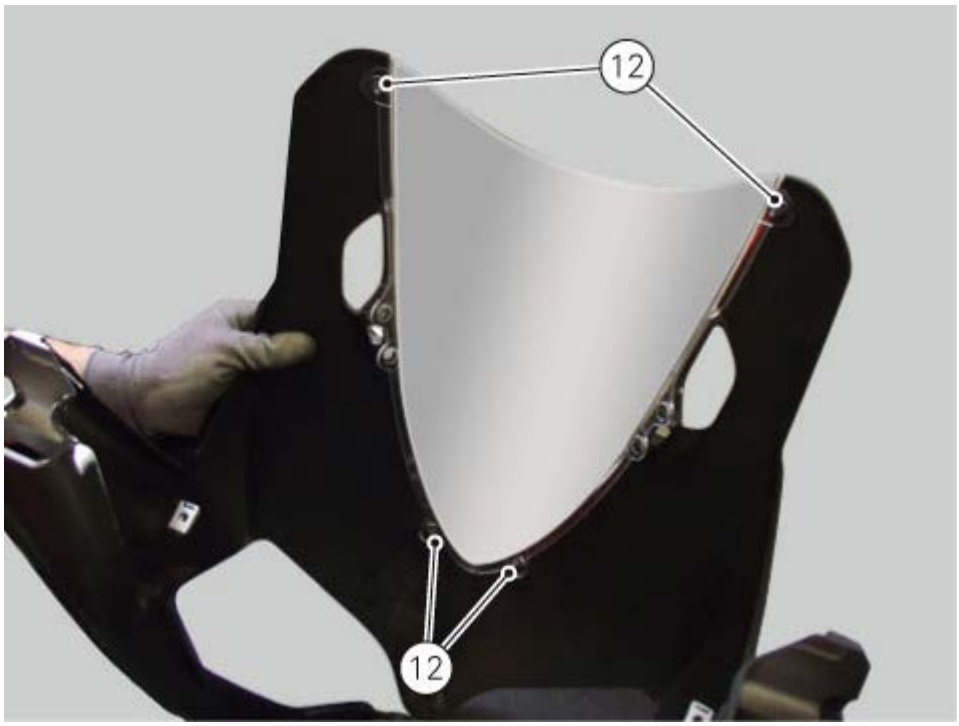
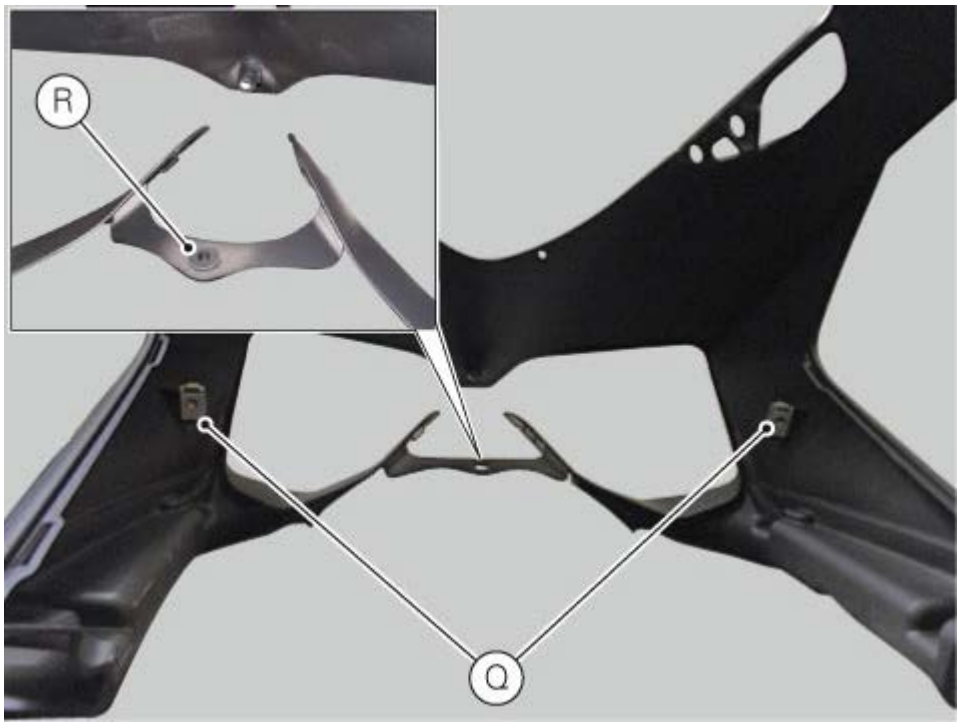
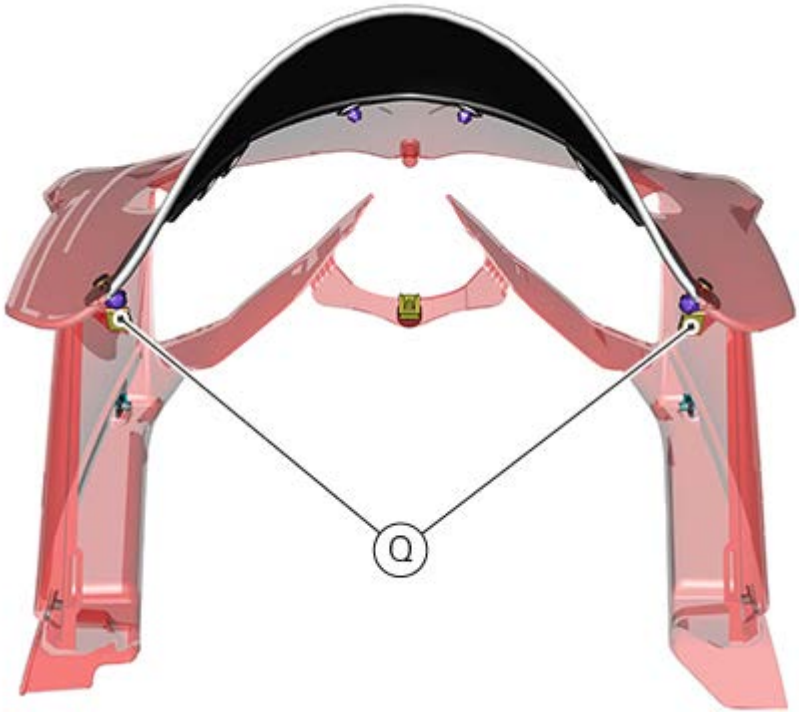
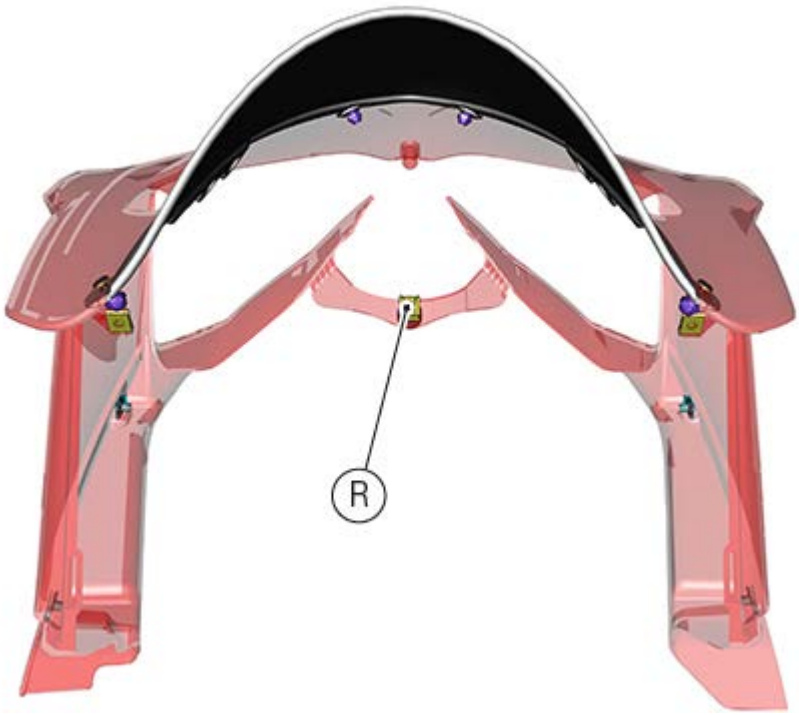
13



Make sure that the threaded inserts (Q) and the rubber block (R) are installed on the headlight fairing.

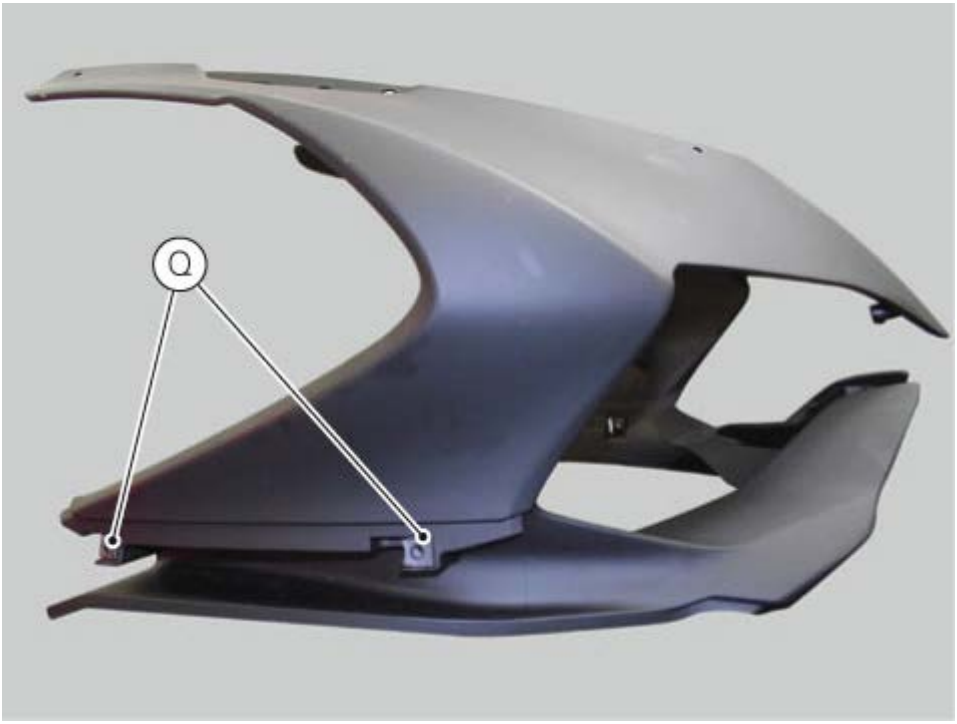

R
Q

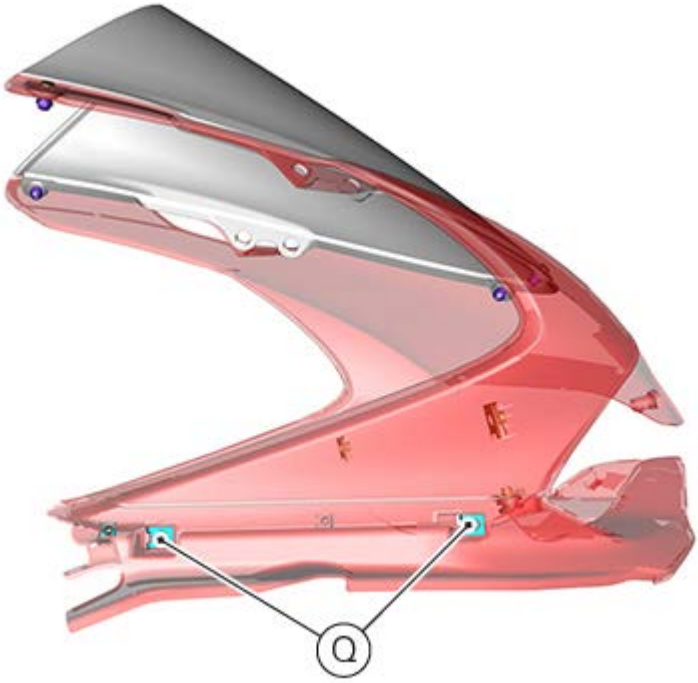

Q


R

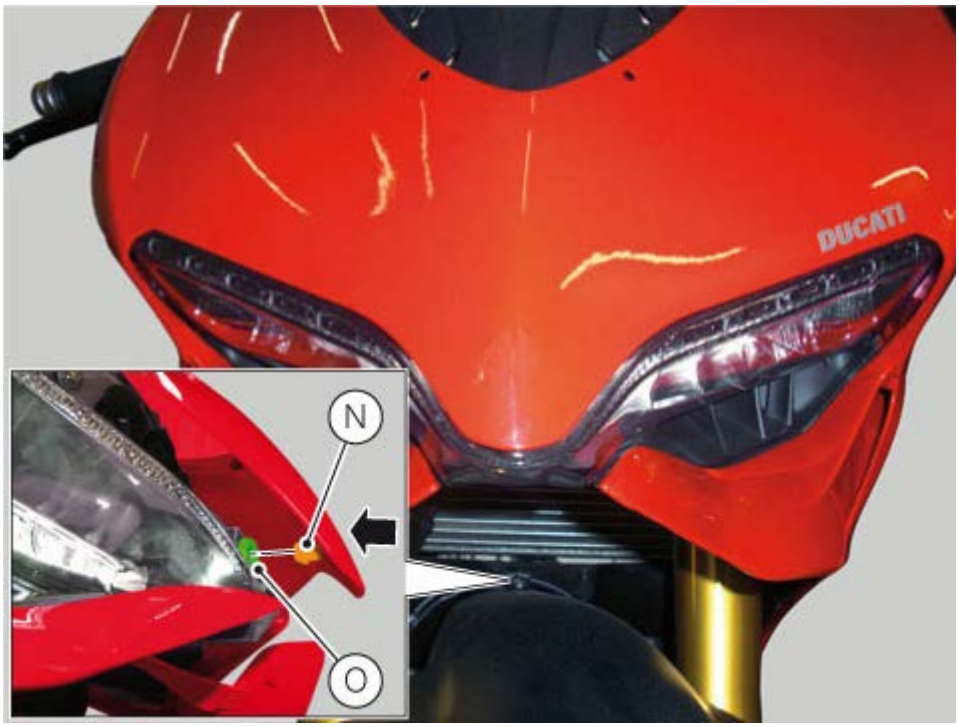

Q

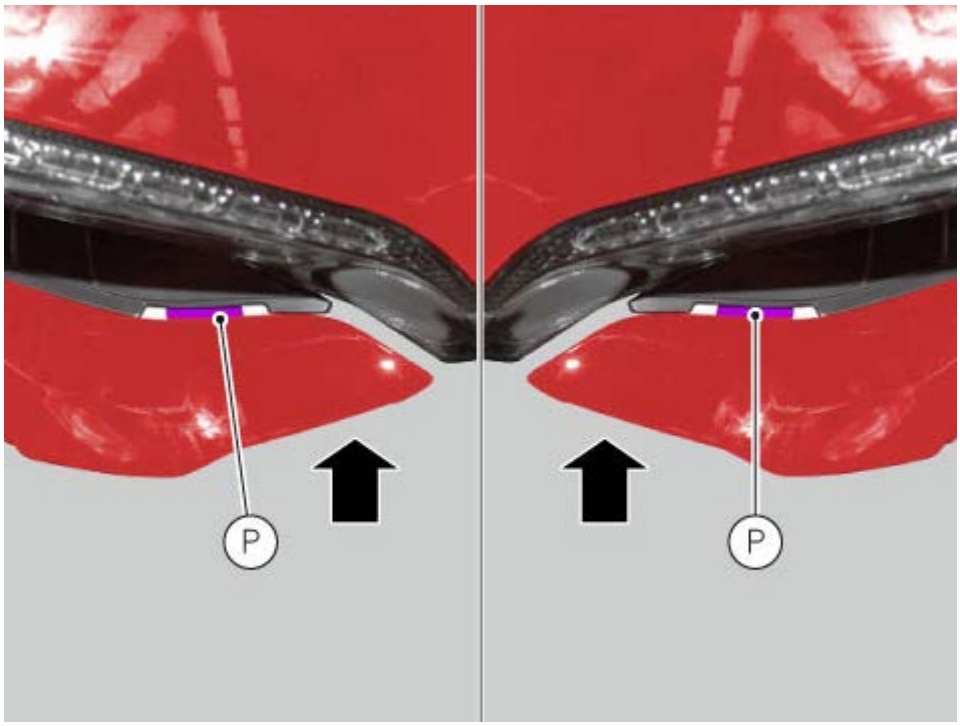

Q

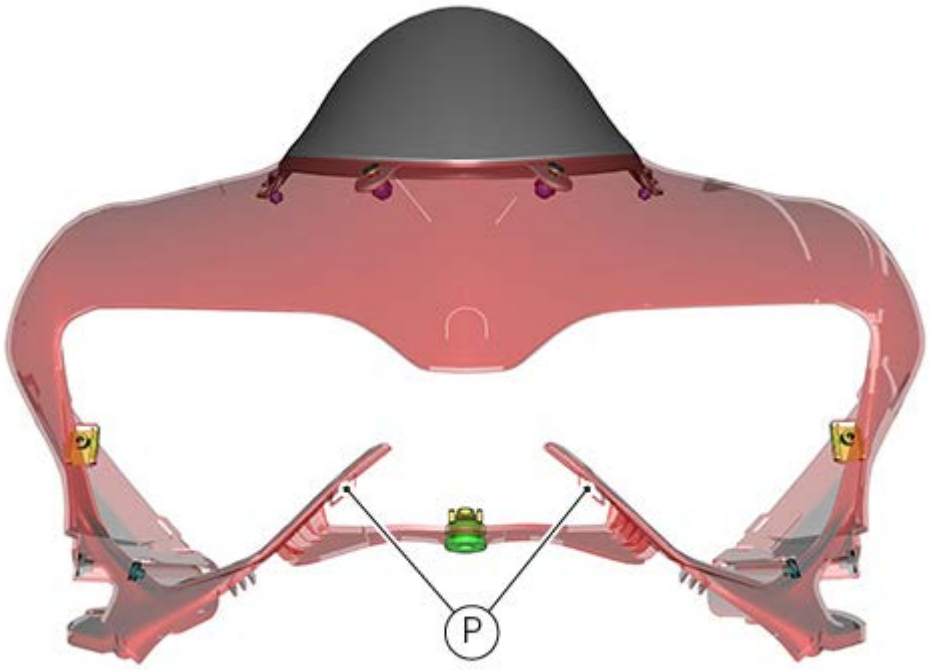

Q



Make sure that the turn indicators wiring harness is positioned in the special grooves along the headlight fairing supports.
Take the headlight fairing close to the headlight assembly. Start pin (N) of headlight fairing in the rubber block (O) and tabs (P) under the lower profile of the headlight, as shown in the figure.

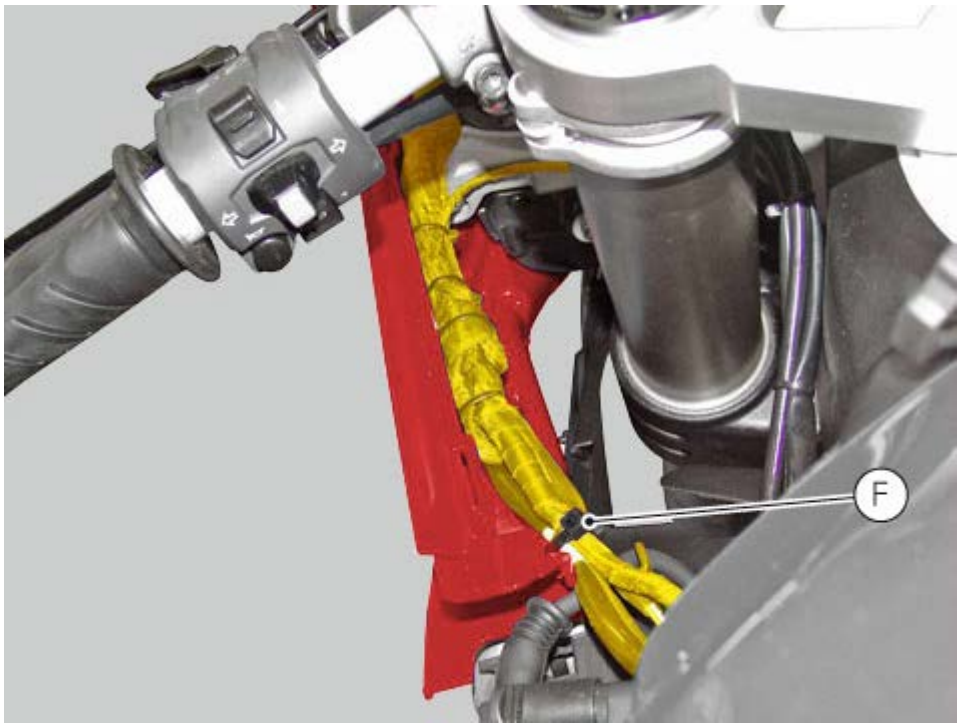




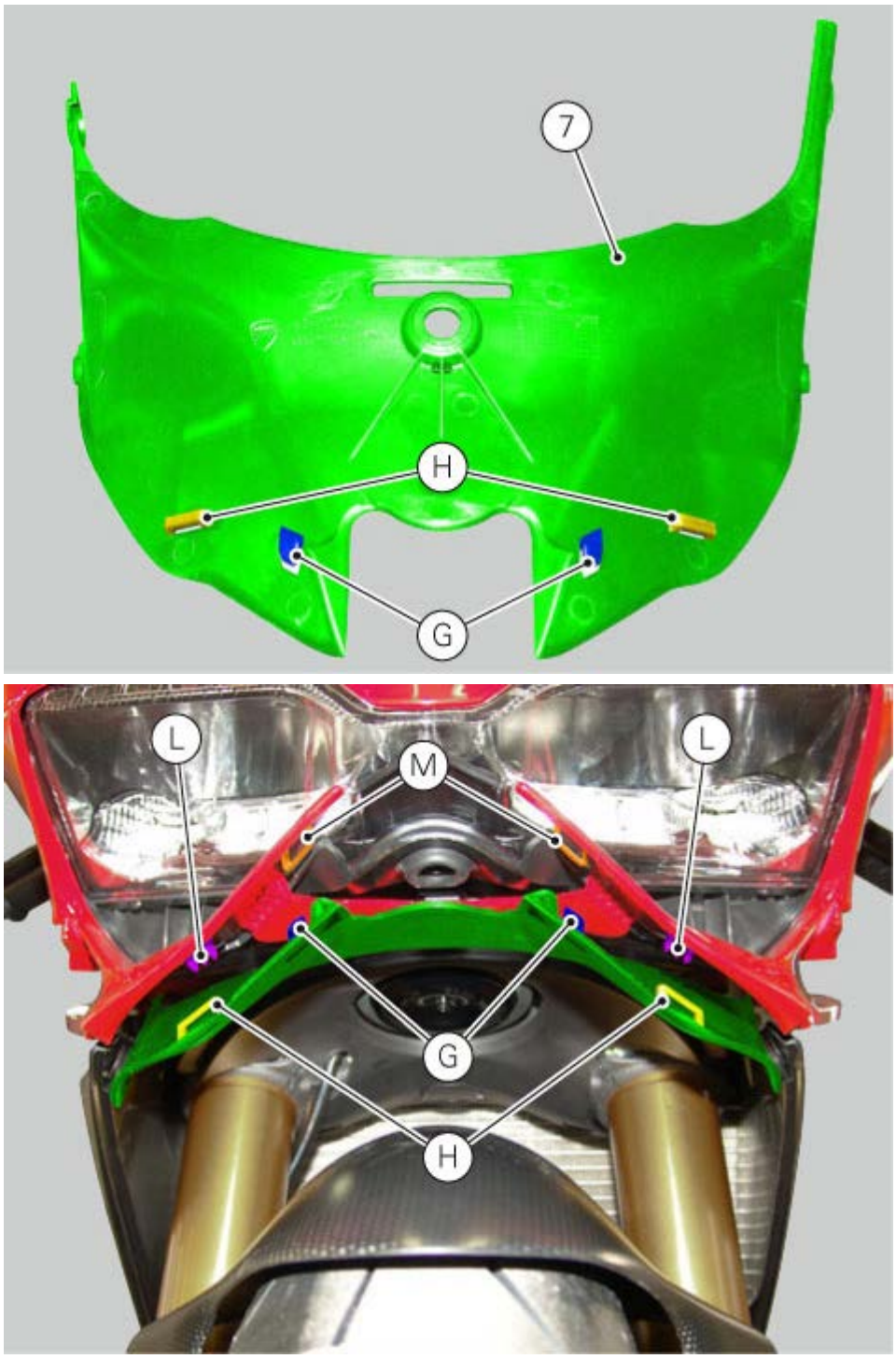


Insert and tighten screws (9) (on both sides of the headlight subframe).
Tighten screws (9) to a torque of 5 Nm ± 10%.

Fit a self-locking tie (F) in the relevant opening on the headlight fairing and secure the main wiring harness.



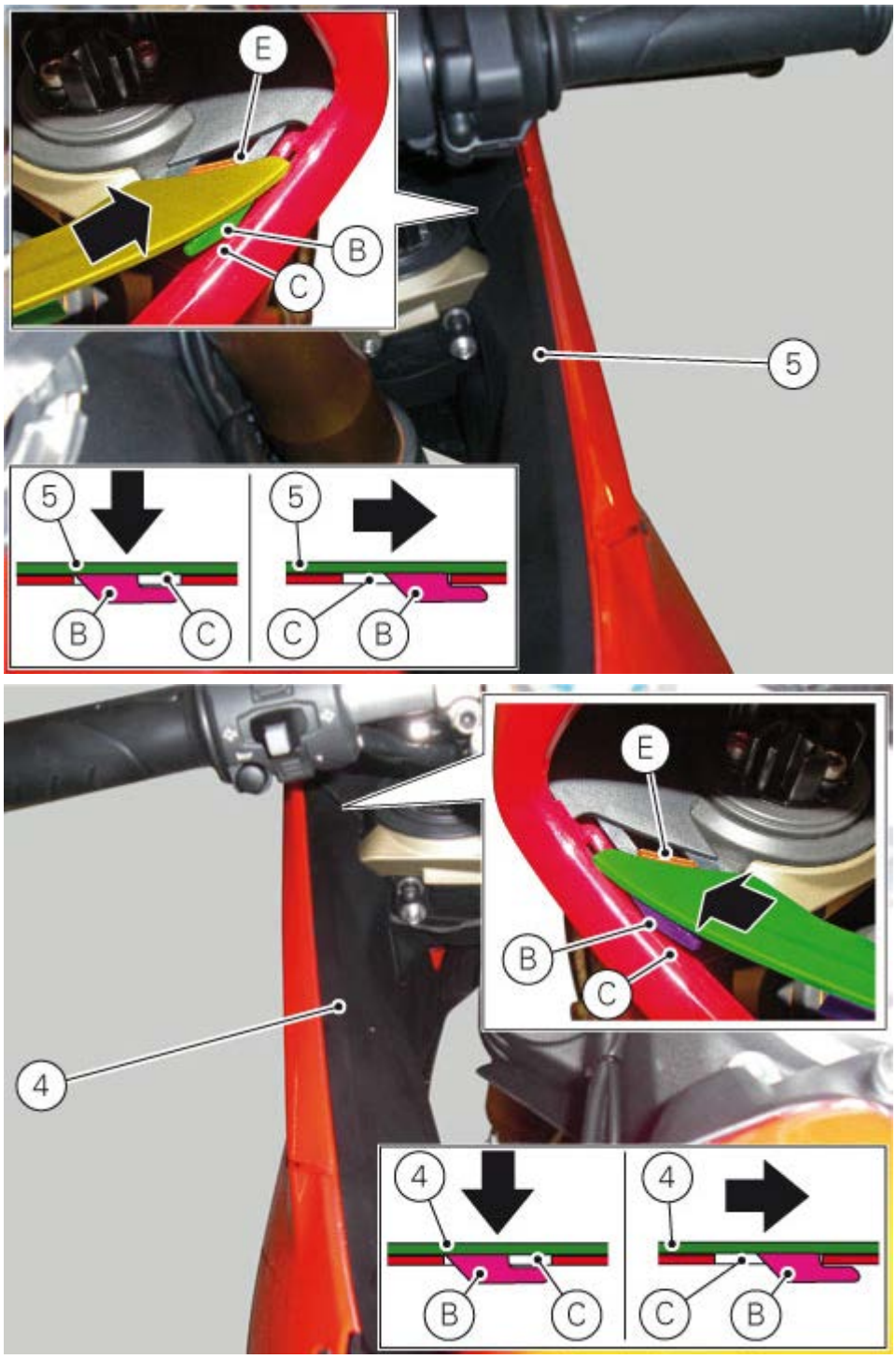
Place splash guard (7) by inserting tabs (G) into the slots (M) of the headlight fairing and by fitting the teeth (L) of the headlight fairing into slots (H).



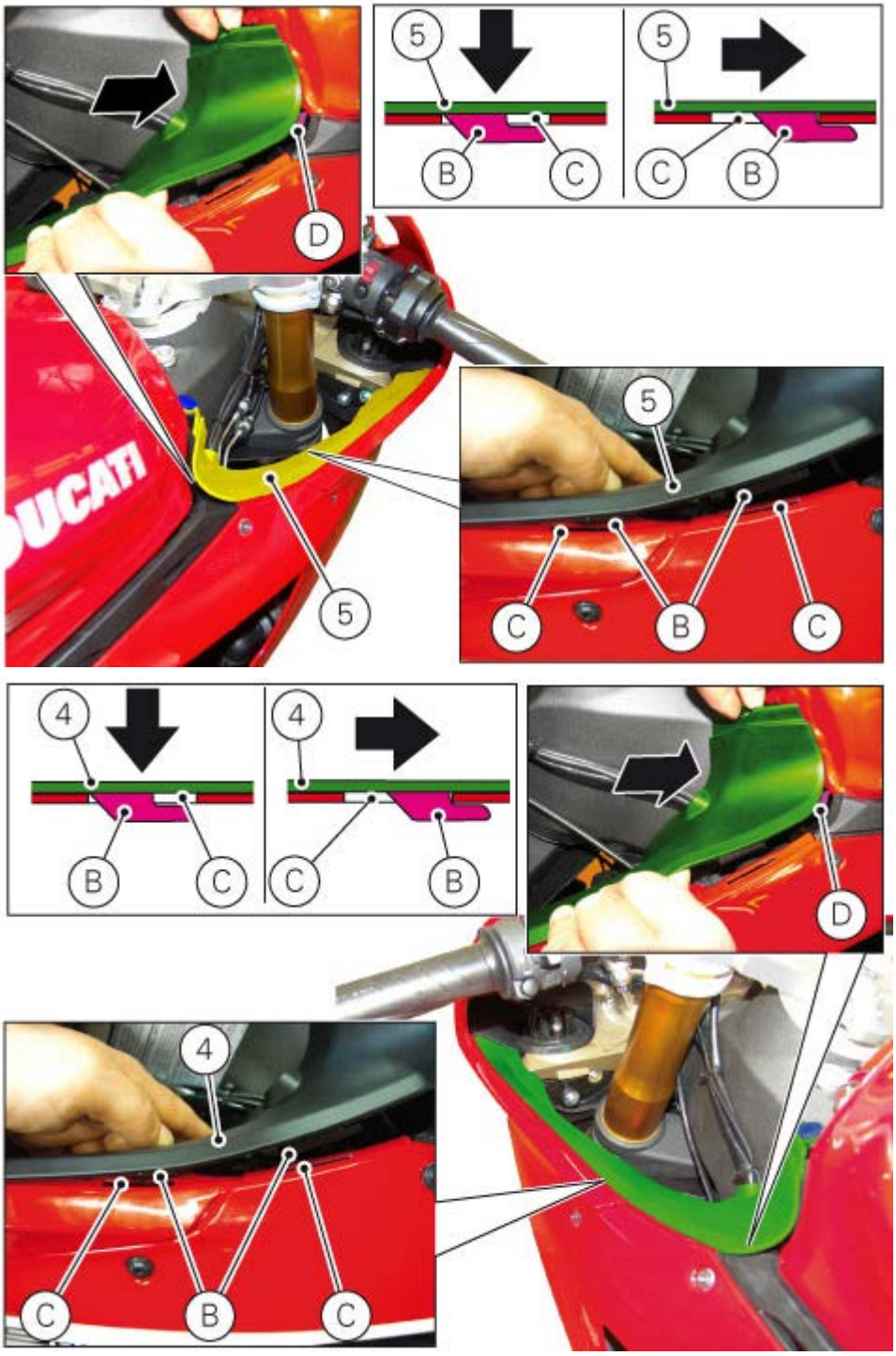
Fit splash guard (7) sides using the quick-release fasteners (7), and press to take pin fully home.

Refit splash guard (7) by tightening and fastening screw (6) to a torque of 5 Nm ±10%.

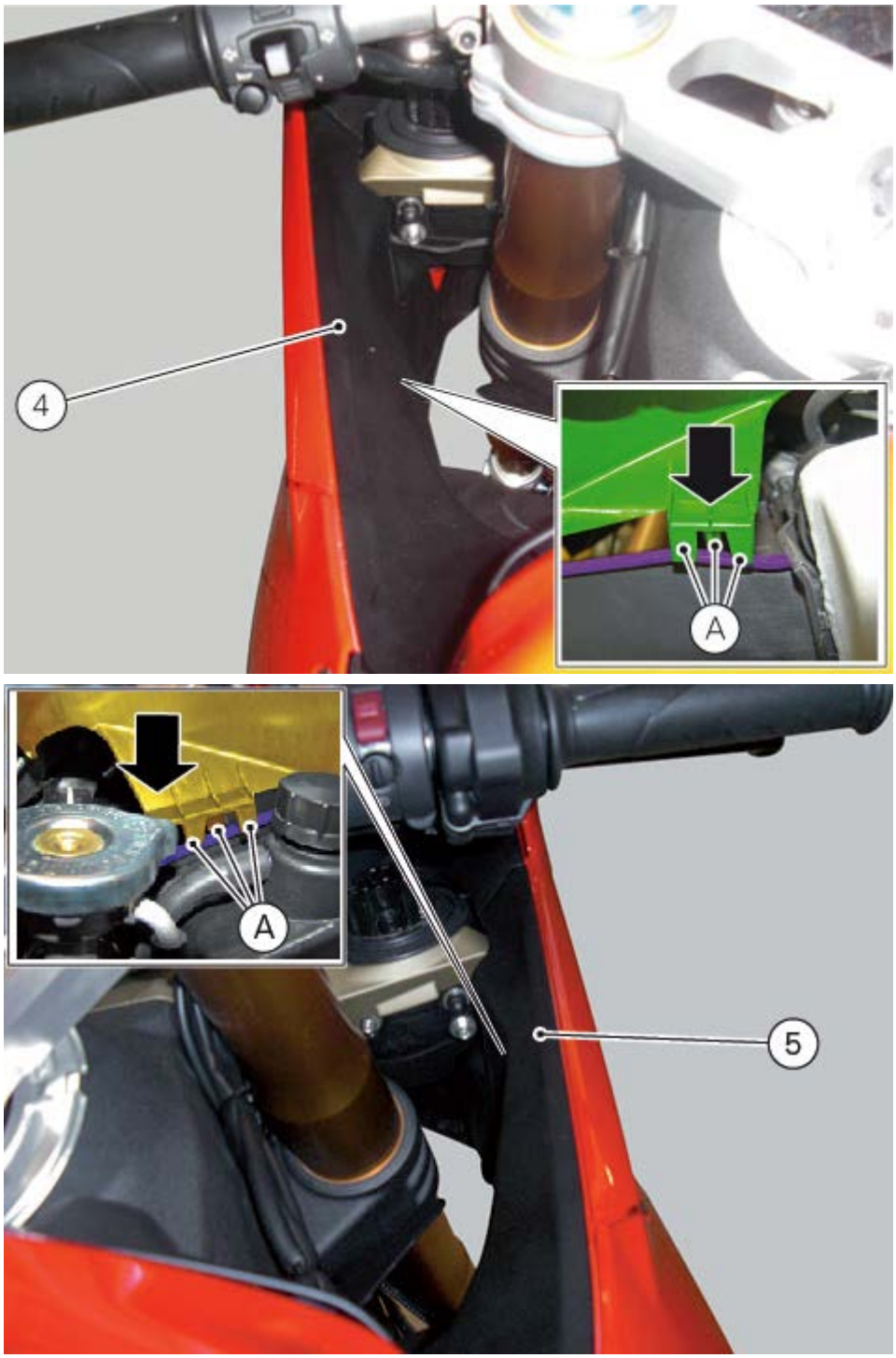
Place the air conveyor covers (4) and (5) by inserting the tab (E) into the seat on the instrument panel cover and then fit tab (B) into slot (C) of the fairing, as shown in the figure.



Insert tabs (D) in the seat on the fairing and tabs (B) in the slots (C) of the fairing, as shown in the figure.

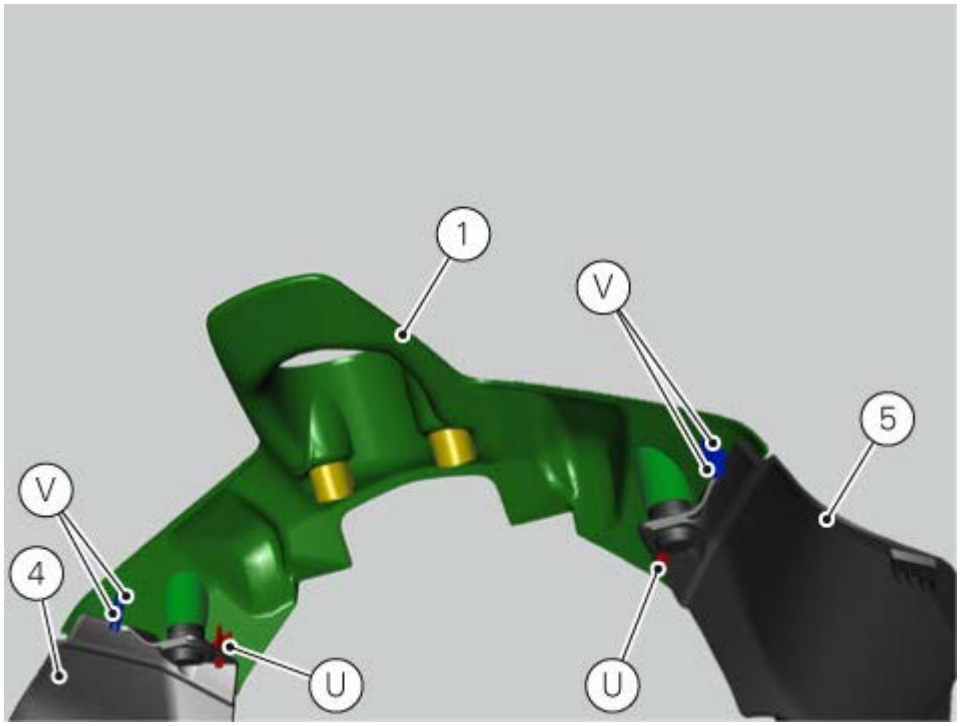


Secure air conveyor covers (4) and (5) by engaging teeth (A) on the radiator mount profile.

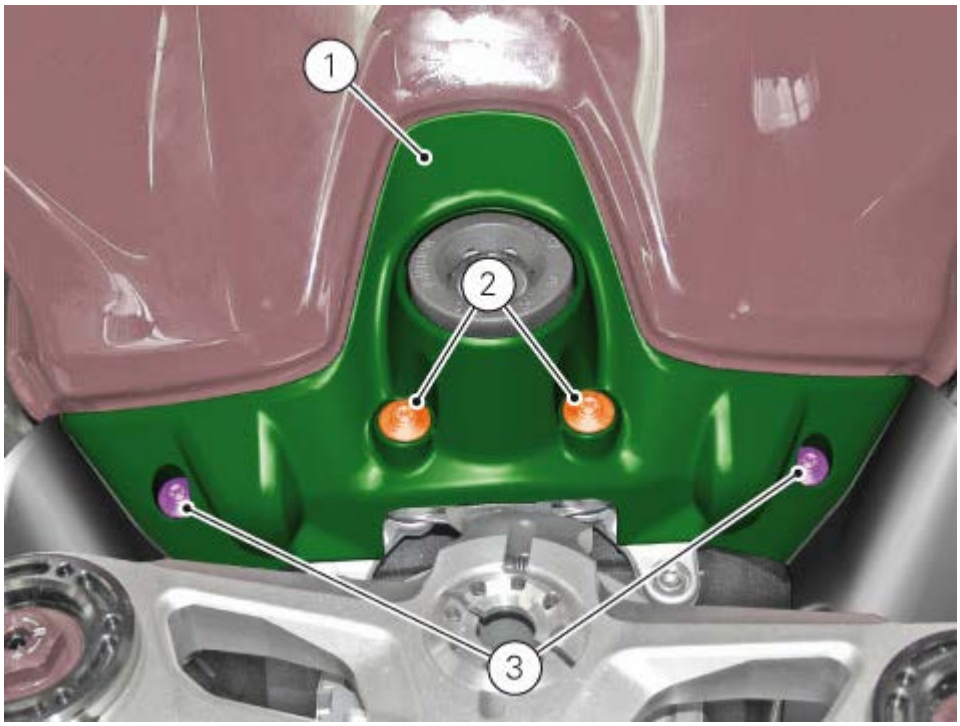


Make sure that the horn cable comes out from the left air conveyor cover (4) in the area indicated by the arrow and that it is positioned as shown in the figure.

Place the ignition switch cover (1) by inserting the poppets (S) on the stud bolts (T).
Make sure that pins (U) are inserted in the special holes on the air conveyor covers (4) and (5) and that tabs (V) are placed on the upper profiles of the air conveyor covers, as shown in the figure.



Start nuts (2) and screws (3).
Tighten nuts (2) to a torque of 8 Nm ± 10% and screws (3) to a torque of 2.5 Nm ± 10%.

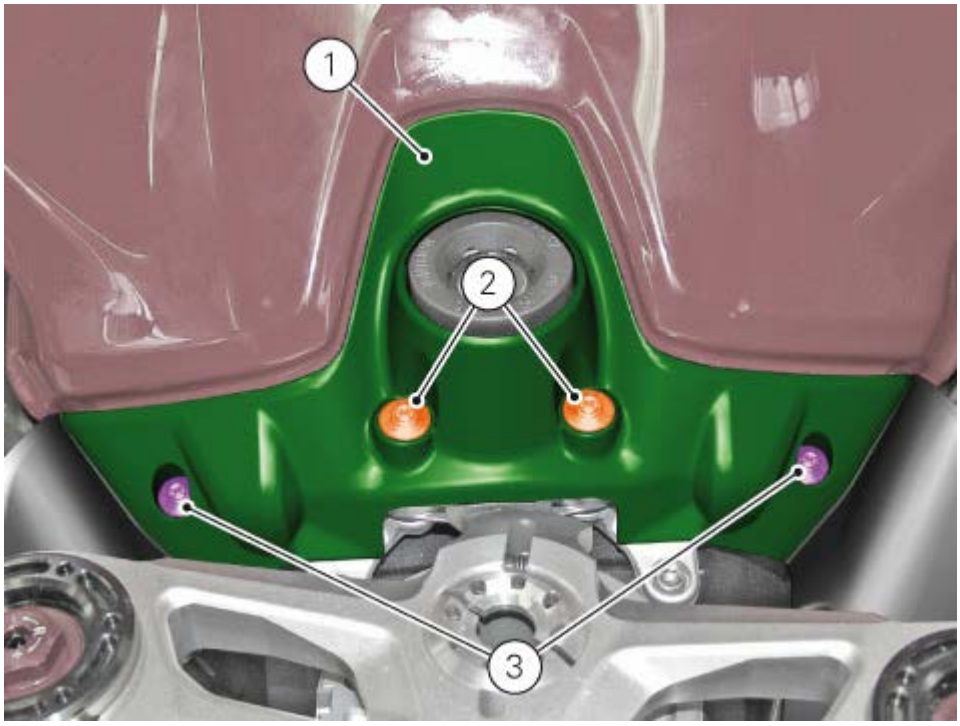


Refit the fairings (Refitting the side fairings).
Reassemble the rear-view mirrors (Refitting the rear-view mirrors).

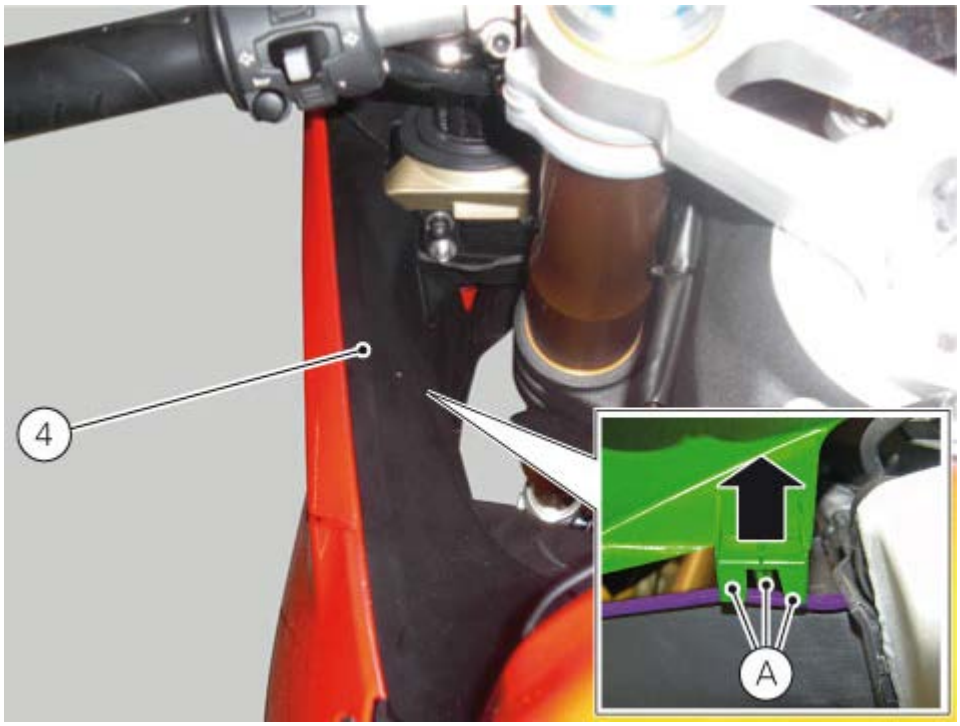
Removing the headlight fairing

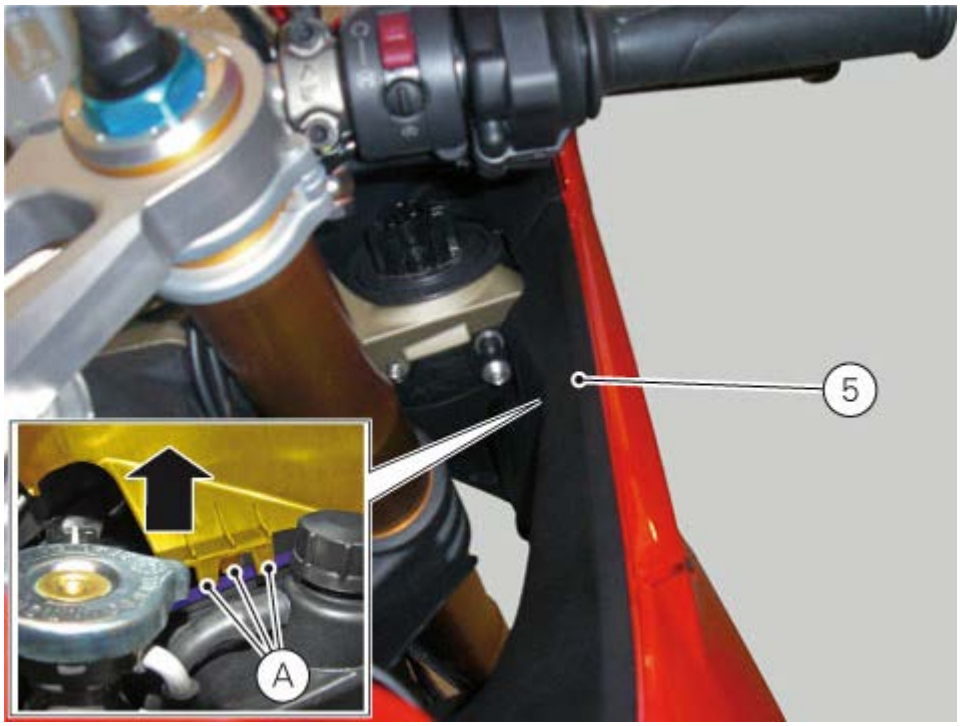
Remove the rear-view mirrors (Removing the rear-view mirrors).
Remove the fairings (Removing the side fairings).

Remove ignition switch cover (1) by loosening nuts (2) and screws (3).

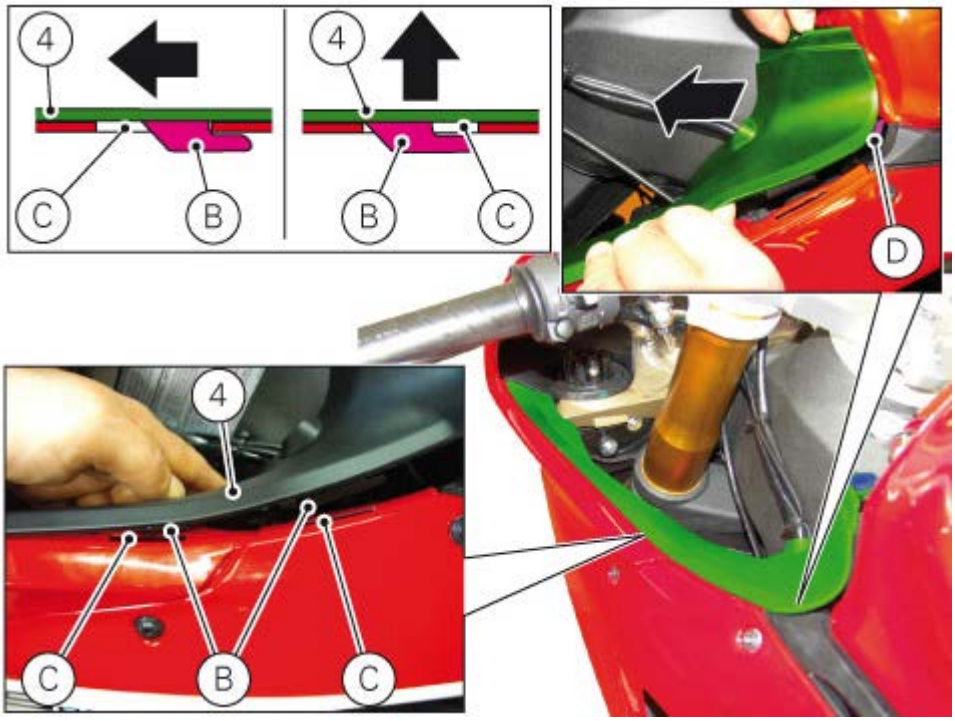


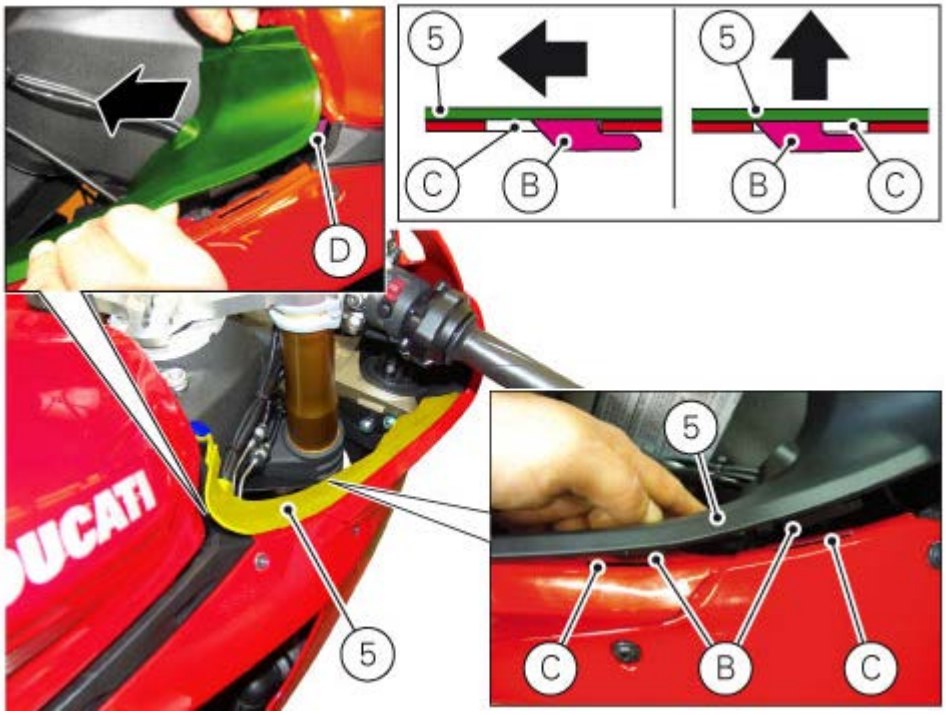
Lift the inner side of the air conveyor covers (4) and (5) by disengaging teeth (A) from the radiator mount profile.



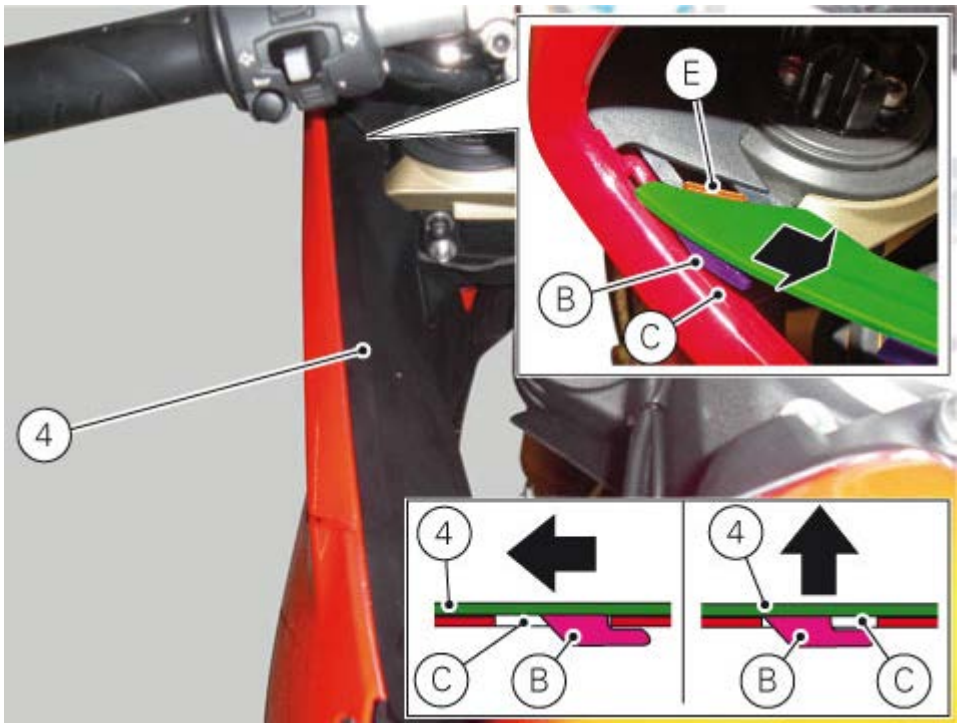


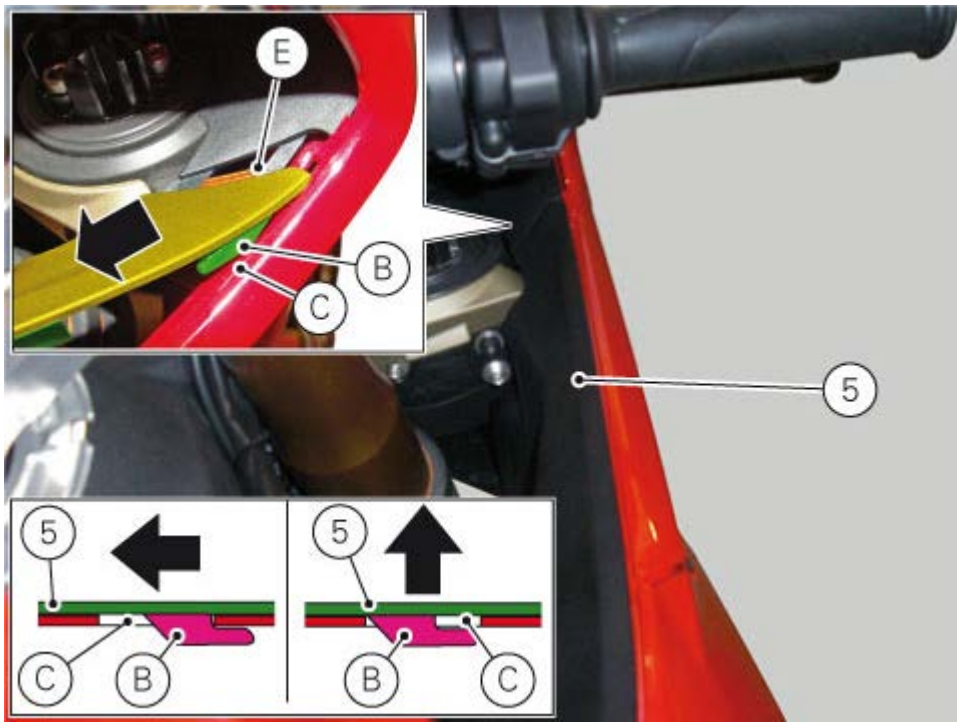
Move air conveyor covers (4) and (5) towards the front side of the motorcycle and lift them up while disengaging tabs (B) from the slots (C) of the fairing, as shown in the figure.
Then move air conveyor covers (4) and (5) towards the front side of the motorcycle and disengage tab (D) from its seat on the fairing.



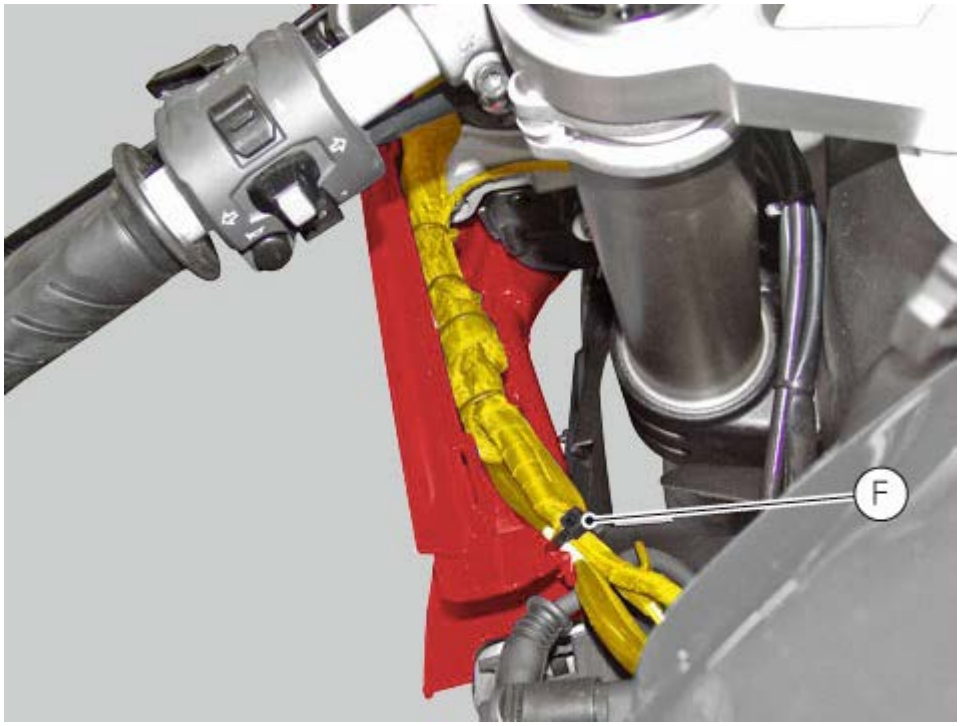


Move the air conveyor covers (4) and (5) towards the front side of the motorcycle and lift them up while disengaging tab (B) from fairing slot (C), as shown in the figure.
Then move the air conveyor covers (4) and (5) towards the rear side of the motorcycle and release tab (E) from its seat on instrument panel cover.





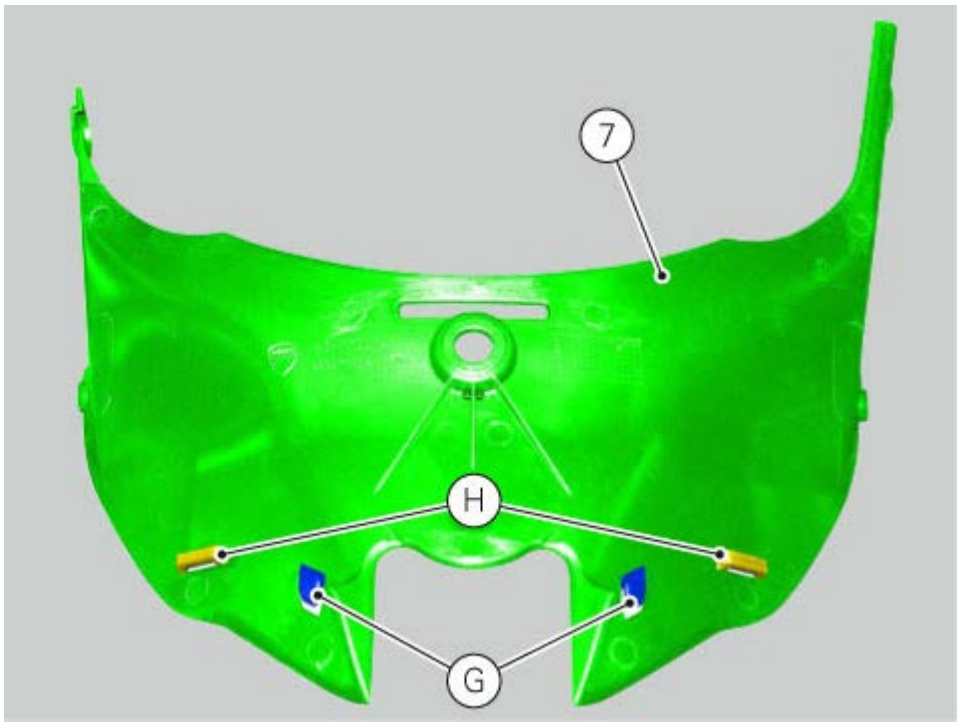
Remove tie (F) and release the main wiring front harness from the headlight fairing.

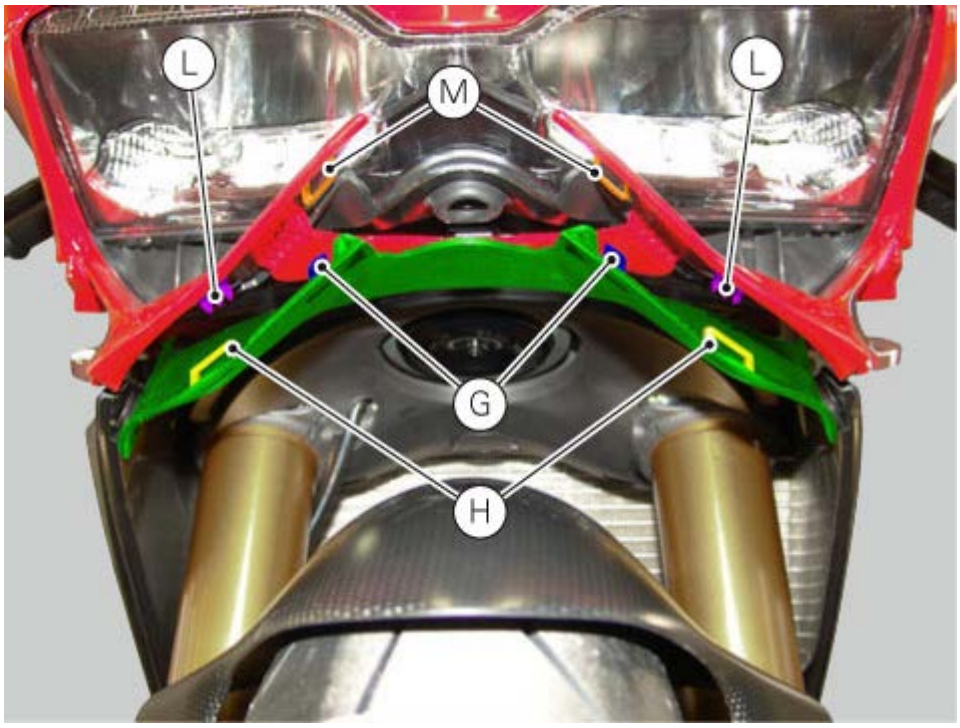


Loosen and remove screw (6) securing splash guard (7).

Remove quick-release fasteners (8) from splash guard (7).

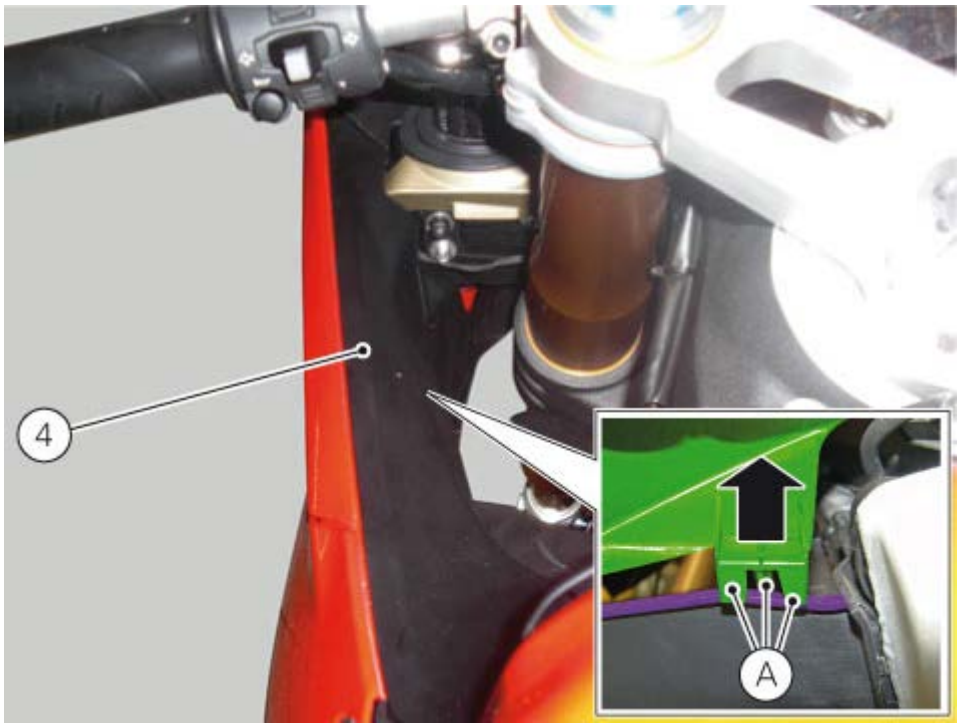
Disengage splash guard (7) from the headlight fairing by pulling it towards the rear side of the motorcycle, so as to disengage tabs (G) from headlight fairing slots (H) and headlight fairing teeth (L) from slots (M).

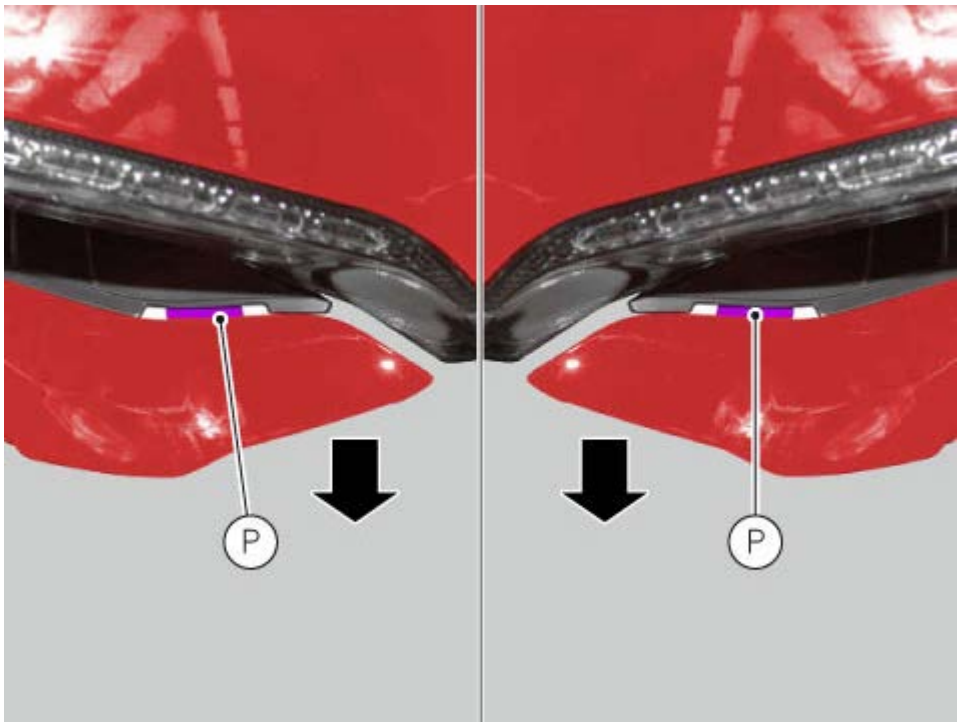




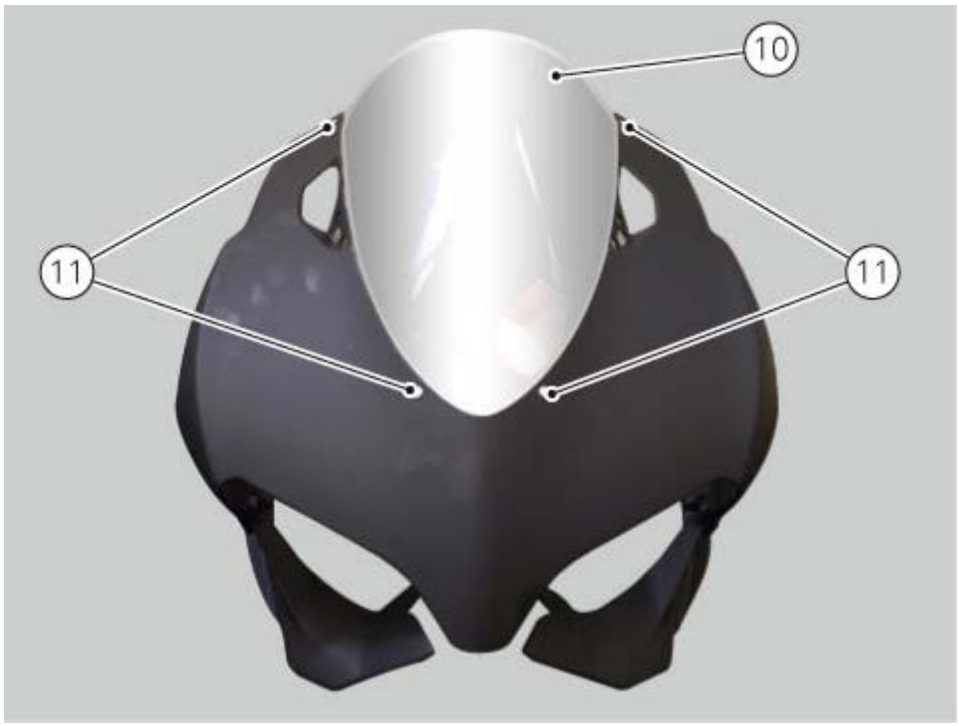
Undo screws (9) on both sides of the headlight subframe.

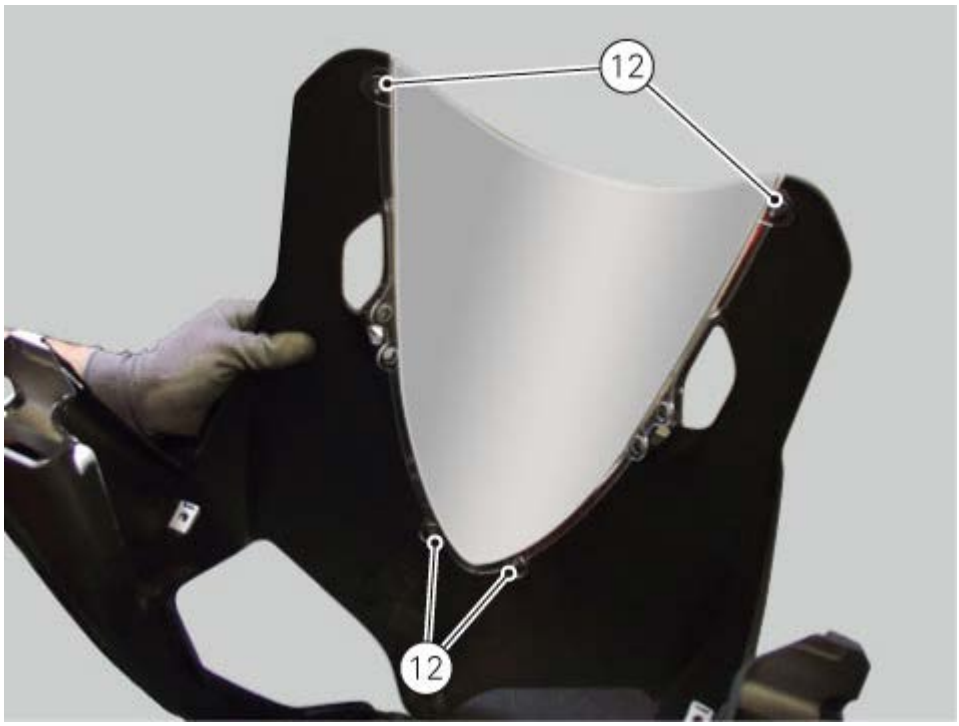
Slide the headlight fairing forward so as to remove pin (N) from vibration damper (O) and tabs (P) from the lower side of the headlight assembly.





When the Plexiglas (10) must be replaced, undo screws (11) with washer and remove the Plexiglas keeping inserts (12).



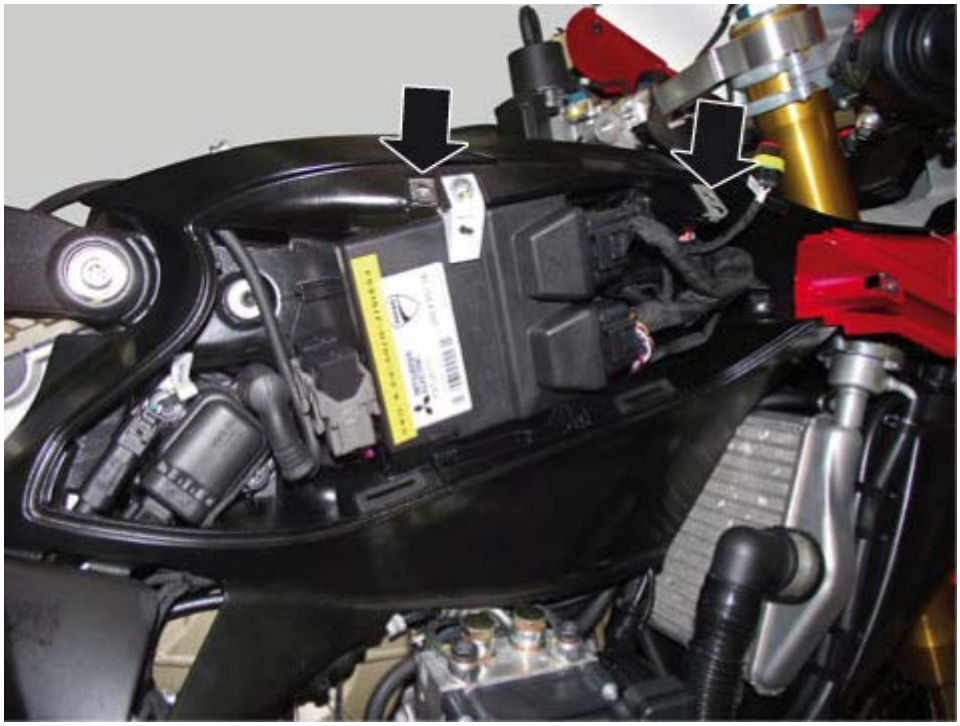

12
12

Refitting the side fairings

Warning

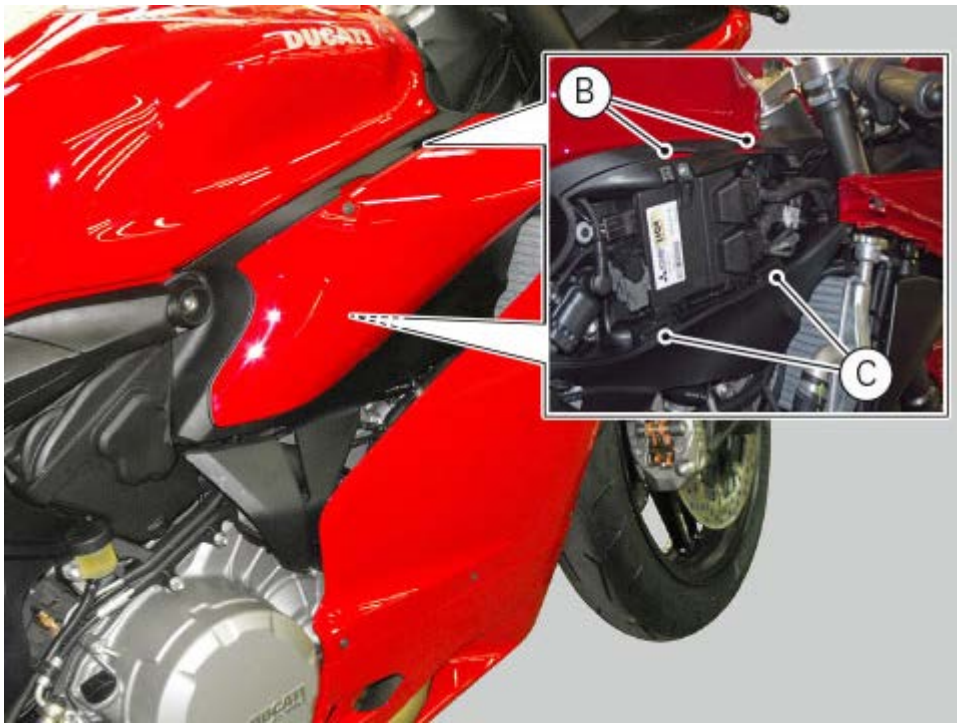
Failed or incorrect refitting of one of the removed components could cause its sudden detachment while riding resulting in loss of control of the motorcycle.

Fit the clips in the areas shown on the right and left-hand side of the electrical component support, positioning them as shown in the figure.



Place the right-hand fairing by sliding its lower lug on the inner side of the rear brake lever, as shown in the figure.

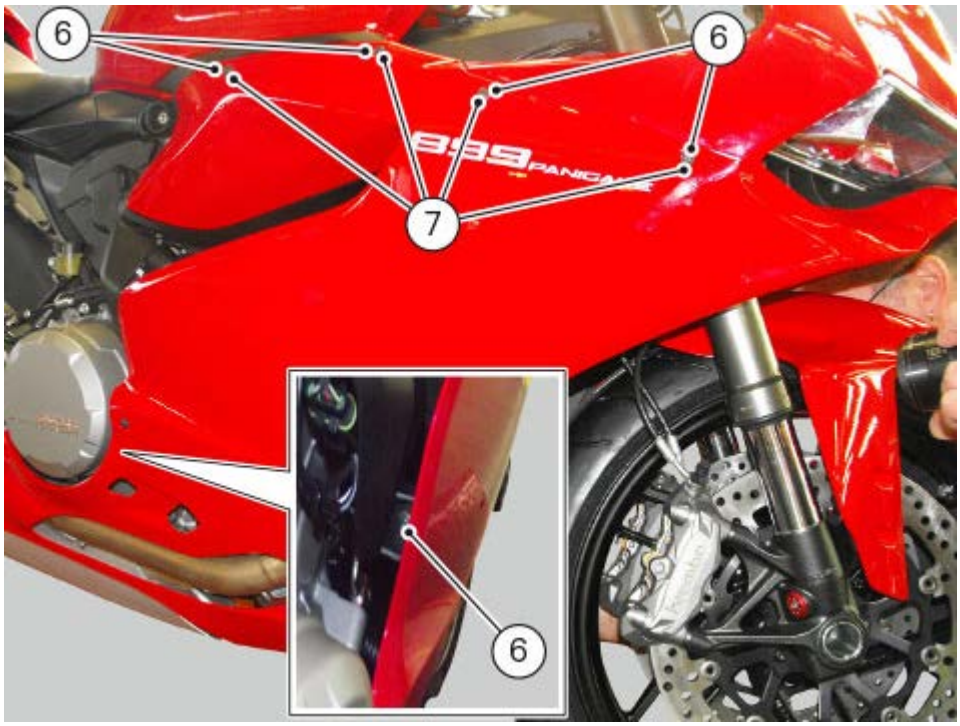
Fit teeth (B) behind the profile of the electrical component support and fit tabs (C) inside the vibration dampers.
Move right-hand fairing towards the rear side of the vehicle making sure that the front profile of the fairing matches with the front profile of the radiator support, as shown by the arrow.



Secure right-hand fairing as follows:

- start screws (6) with washers (7) securing the upper side;
- start screw (6) securing the inner side;
- start screw (4) with washer (5) securing the rear external side;
- start screw (3) securing the front inner side;
- start screw (2) securing the lower side.

Tighten screws (2), (3) and (6) to a torque of 2.5 Nm ± 10% and screw (4) to a torque of 5 Nm ± 10%.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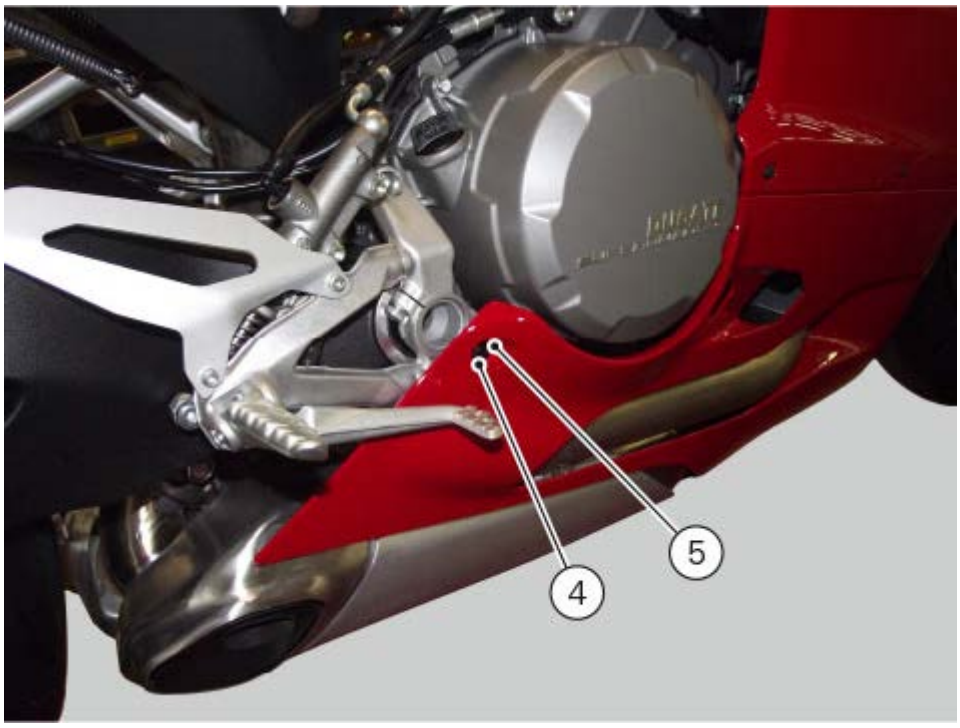
6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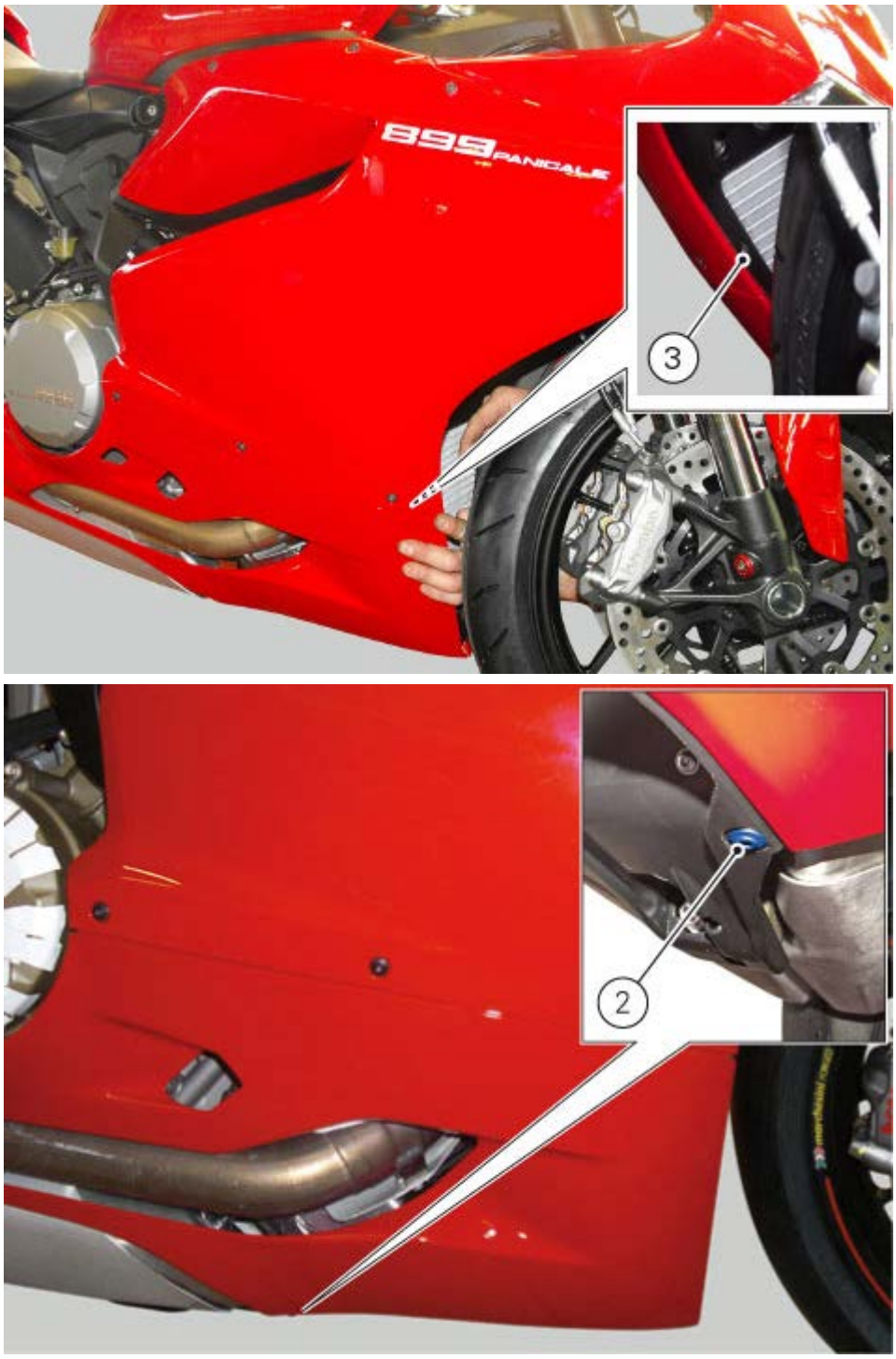
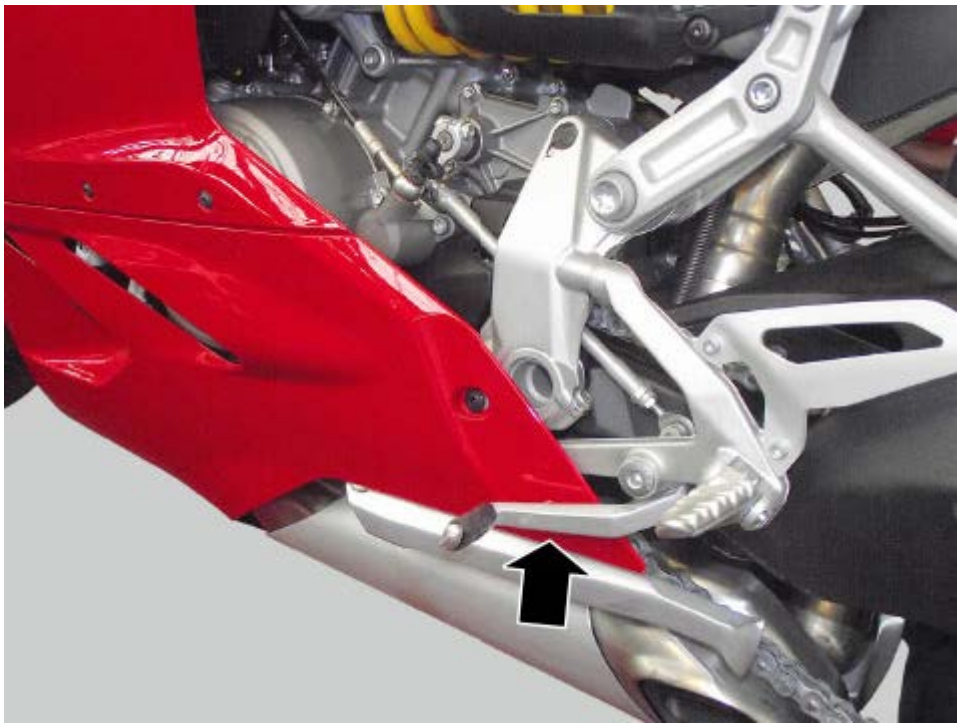
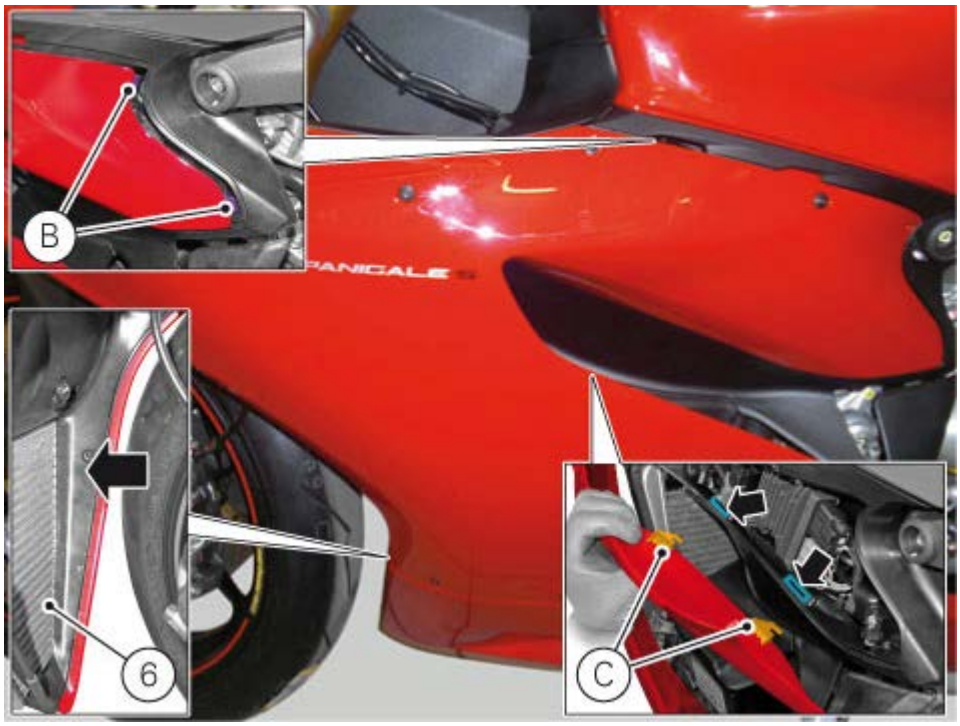


Fit right-hand fairing at the front, inner side, using quick-release fastener (A),and press to take pin fully home.

Place the left-hand fairing by sliding its lower lug on the inner side of the gearchange lever, as shown in the figure.



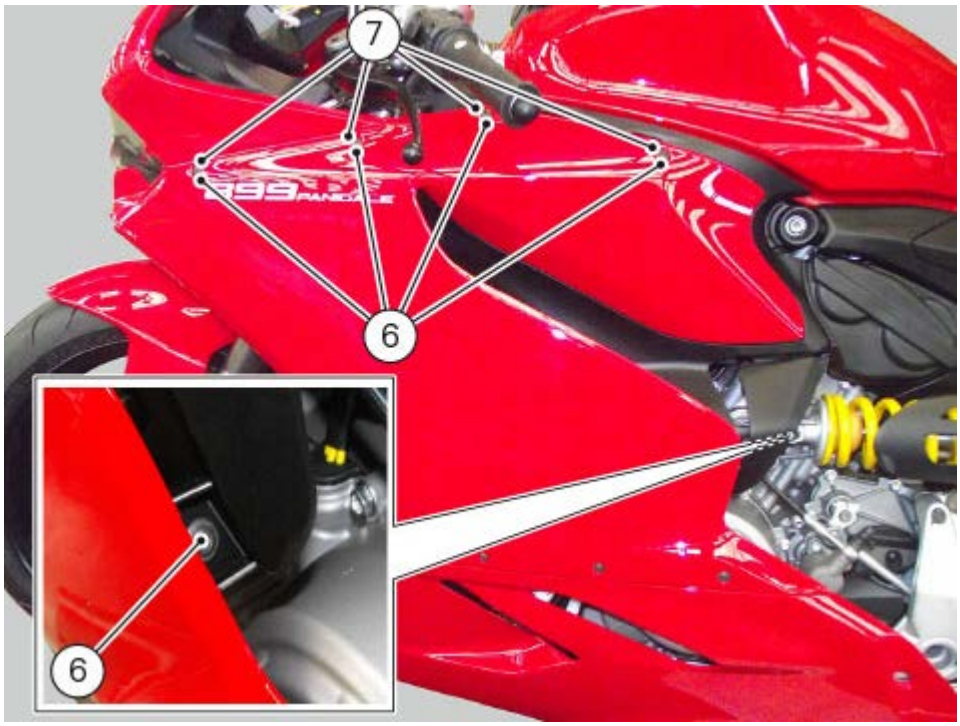
Fit teeth (B) behind the profile of the electrical component support and fit tabs (C) inside the vibration dampers.
Move right-hand fairing towards the rear side of the vehicle making sure that the front profile of the fairing matches with the front profile of the radiator support, as shown by the arrow.

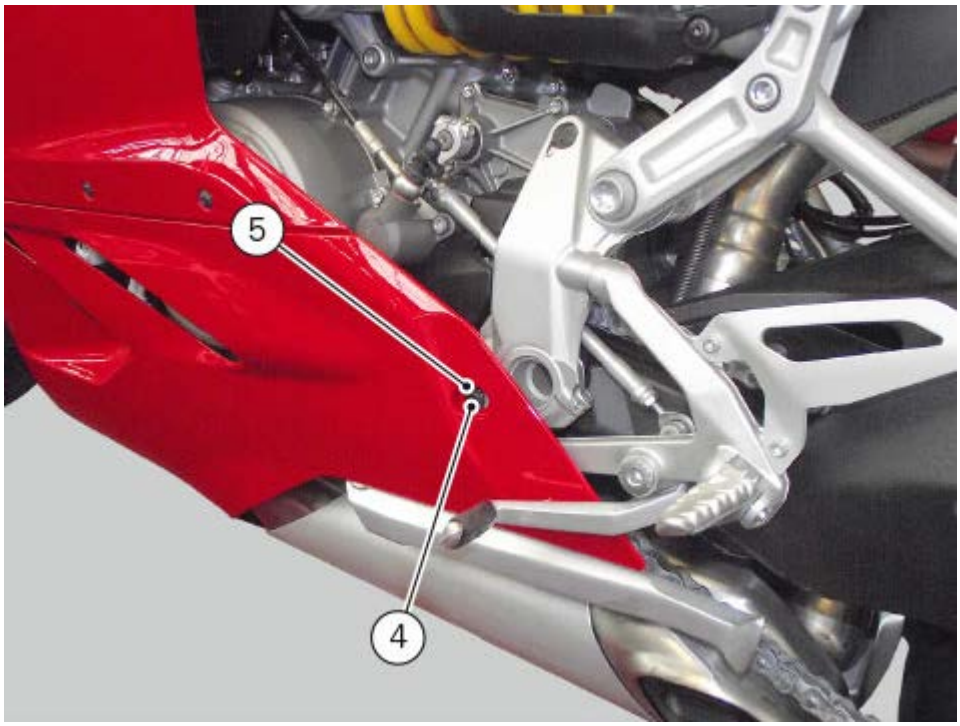


Secure left-hand fairing as follows:

- start screws (6) with washers (7) securing the upper side;
- start screw (6) securing the inner side;
- start screw (4) with washer (5) securing the rear external side;
- start screw (3) securing the front inner side;
- start screw (1) securing the lower side.

Tighten screws (1), (3) and (6) to a torque of 2.5 Nm ± 10% and screw (4) to a torque of 5 Nm ± 10%.

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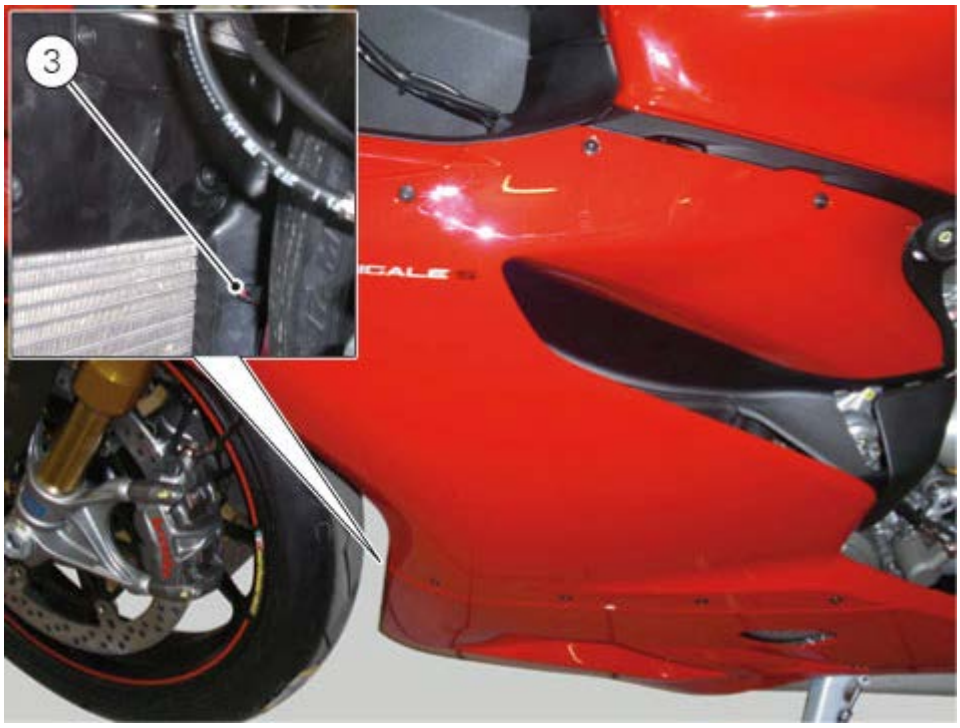
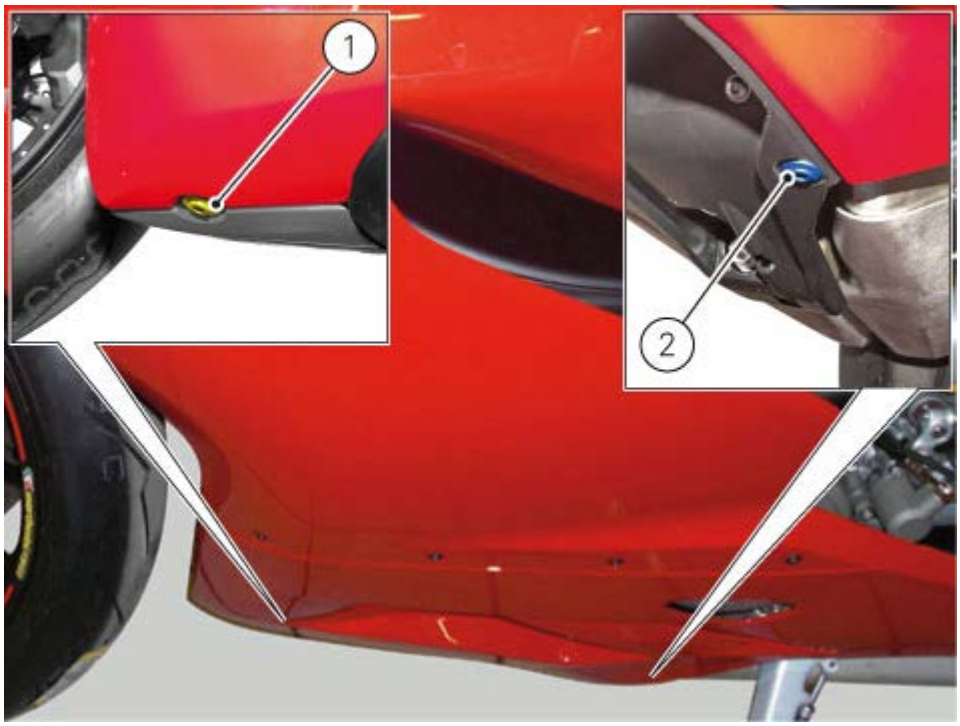
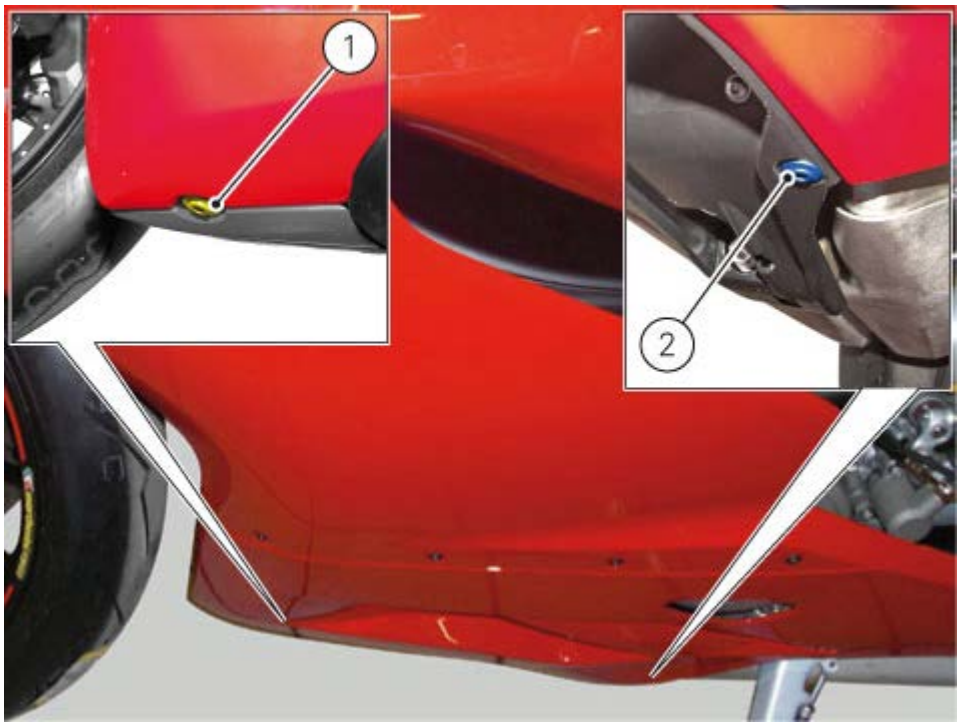

3



Fit right-hand fairing at the front, inner side, using quick-release fastener (A),and press to take pin fully home.

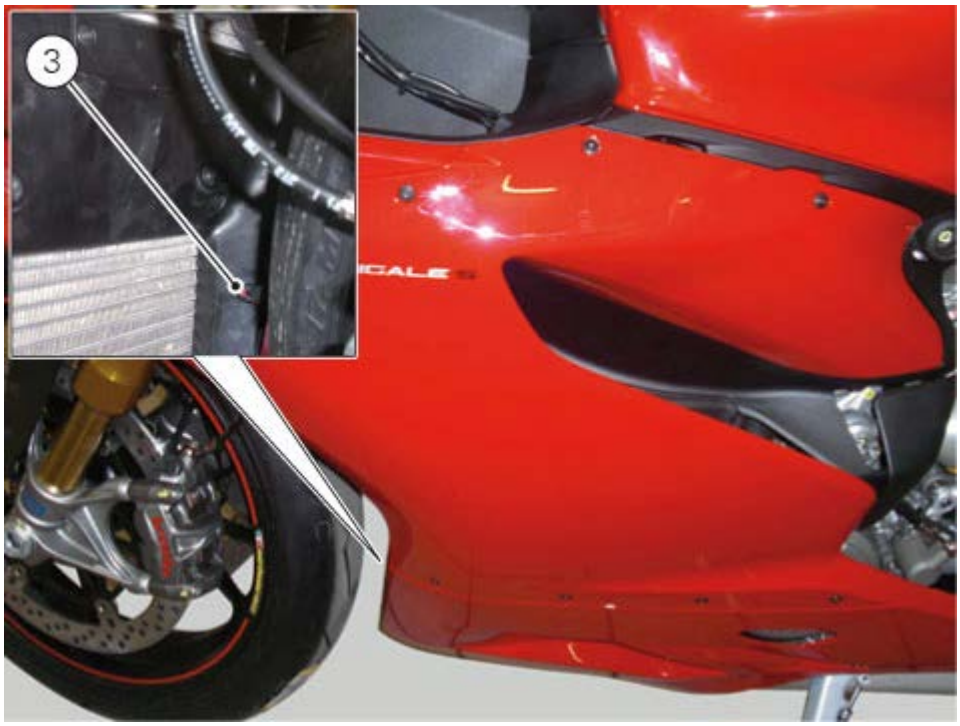
Removing the side fairings

Loosen screws (1) and (2) securing the left-hand fairing lower side.

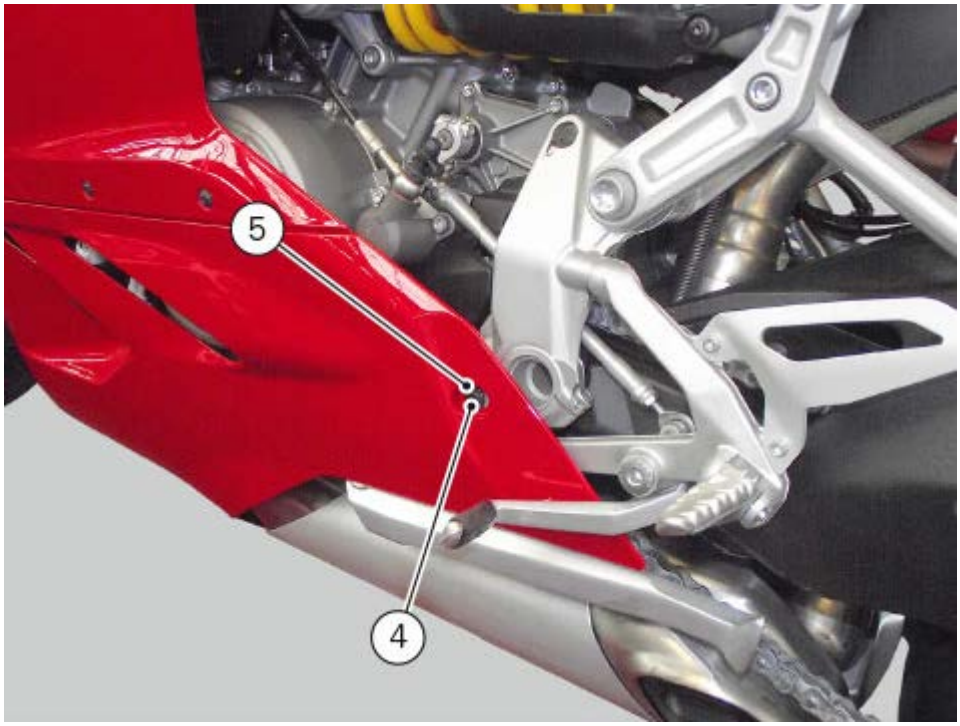


Remove the quick-release fastener (A) securing splash guard to left-hand fairing.

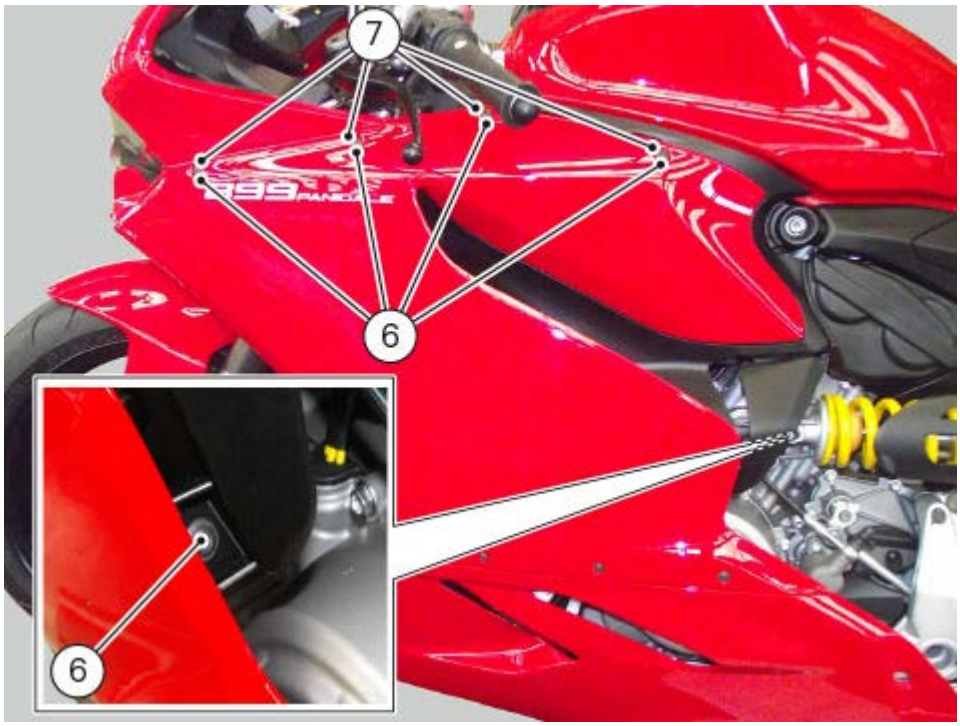
Undo screw (3) securing left-hand fairing front inner side.



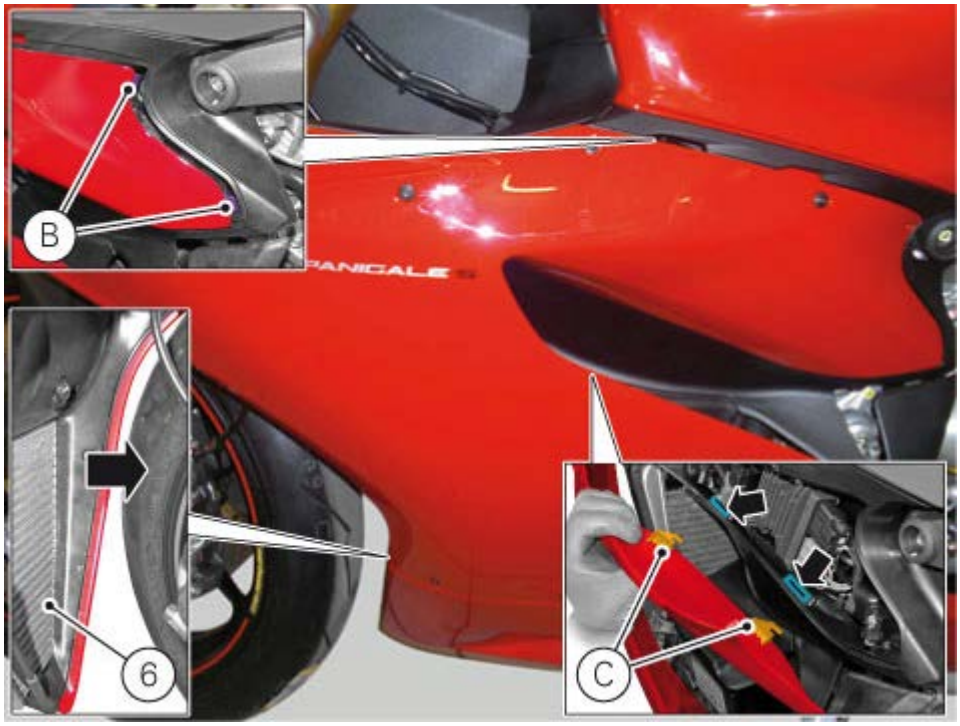
Undo screw (4) securing left-hand fairing rear side, and keep washer (5).



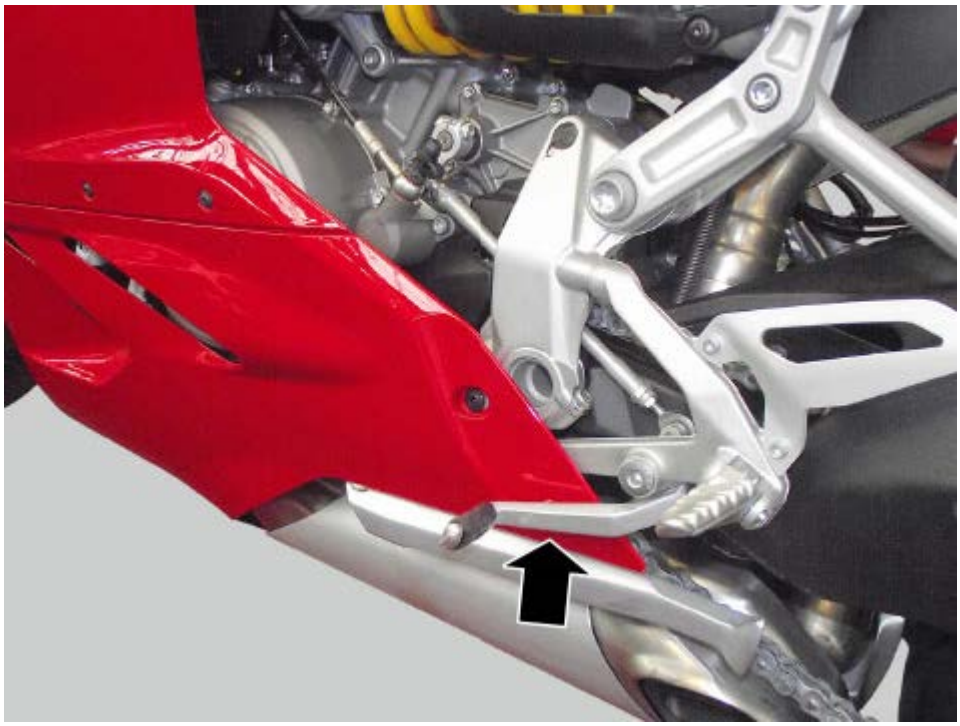
Undo screws (6) securing left-hand fairing to the vehicle by keeping washers (7).

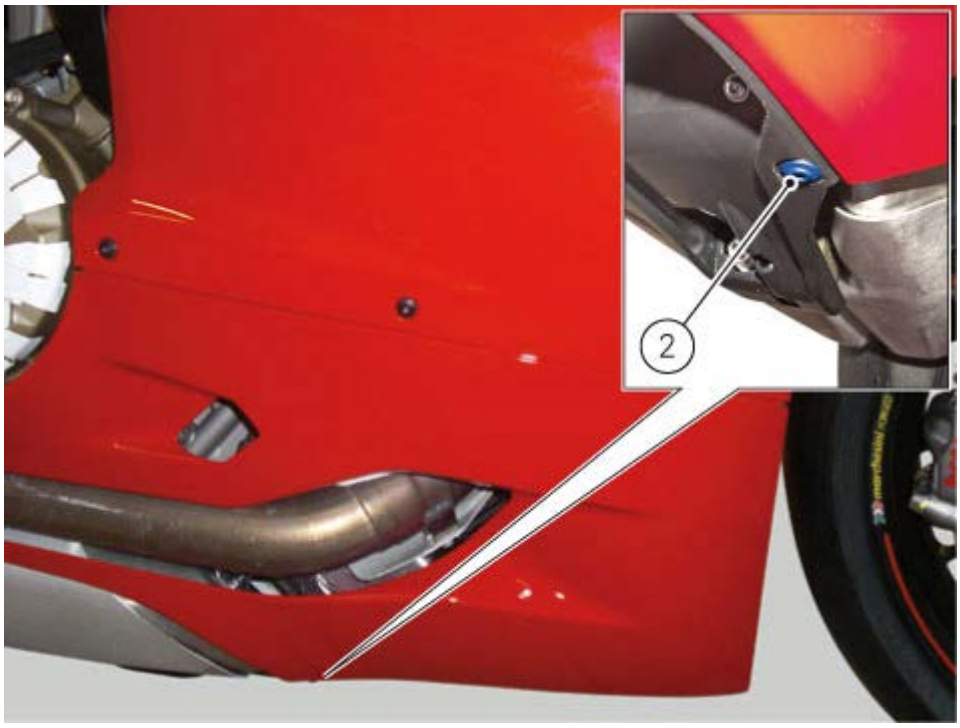


Remove left-hand fairing by moving it to the front side of the motorcycle, making sure that the front profile of the fairing detaches from the profile of the radiator unit.
Remove teeth (B) and tabs (C) from the electrical component support.



Warning
During the operation, make sure that the lower side of the fairing is positioned on the inner side of the gearchange lever.

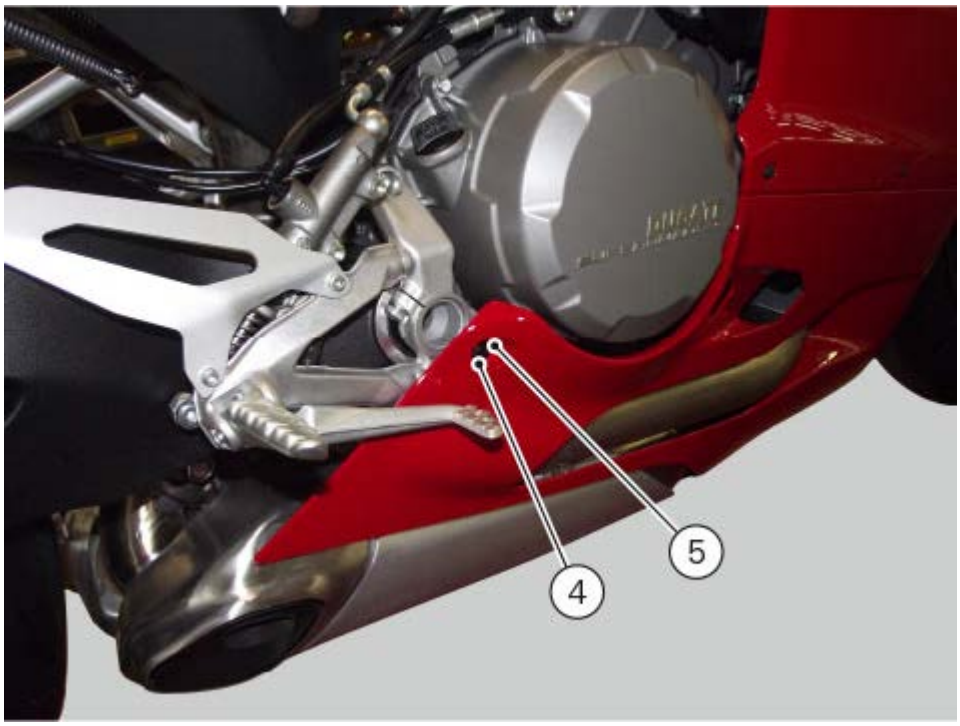




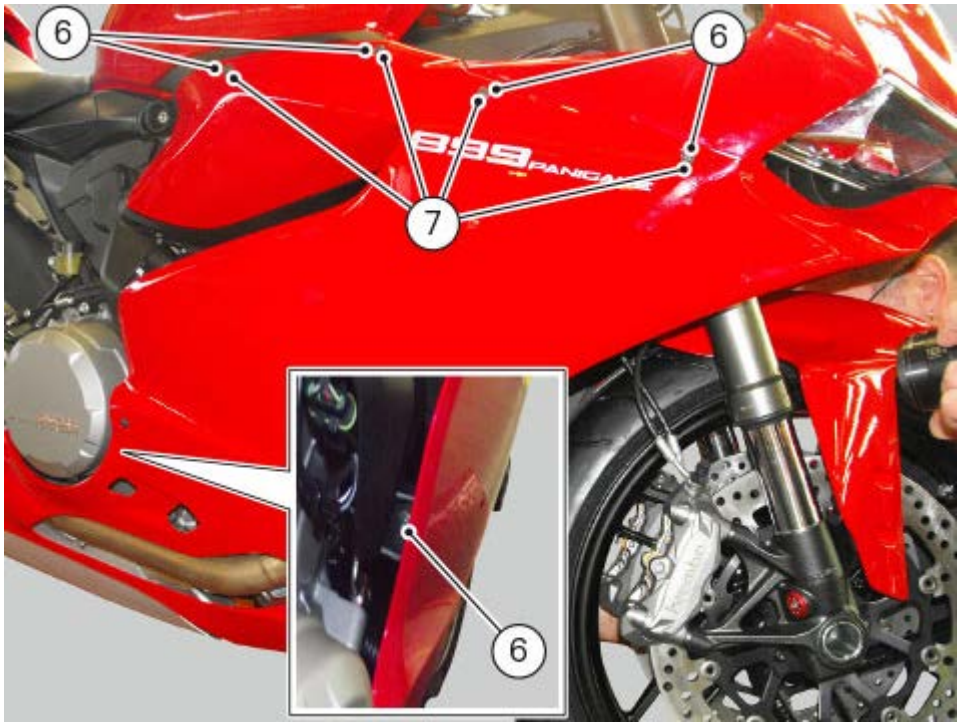
Remove the quick-release fastener (A) securing splash guard to right-hand fairing.

Undo screw (3) securing left-hand fairing front inner side.

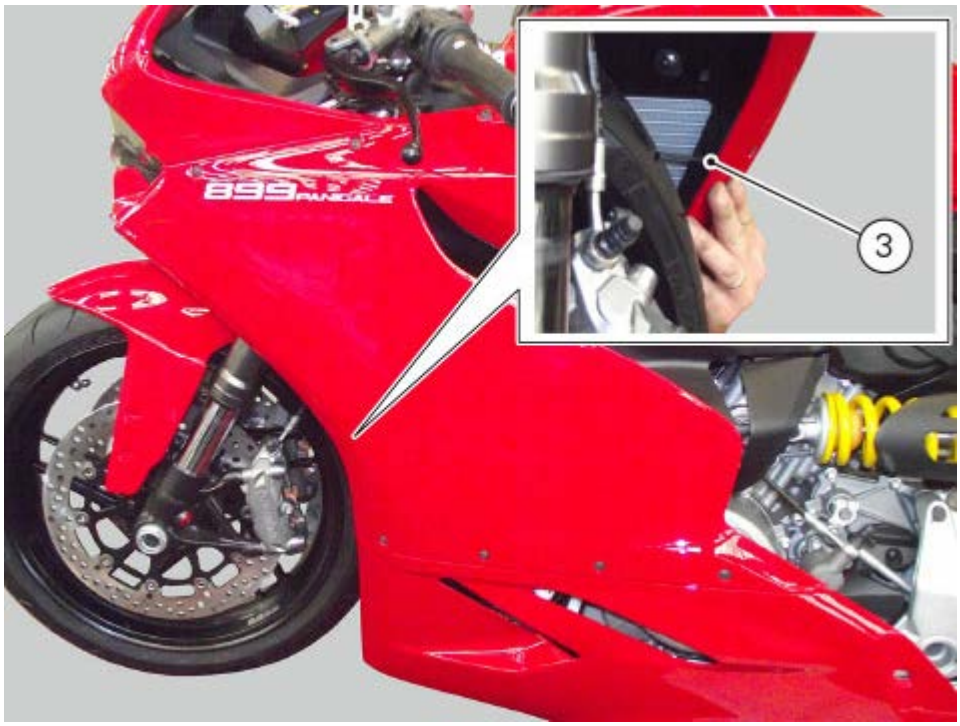
Undo screw (4) securing the rear side of right-hand fairing, and keep washer (5).



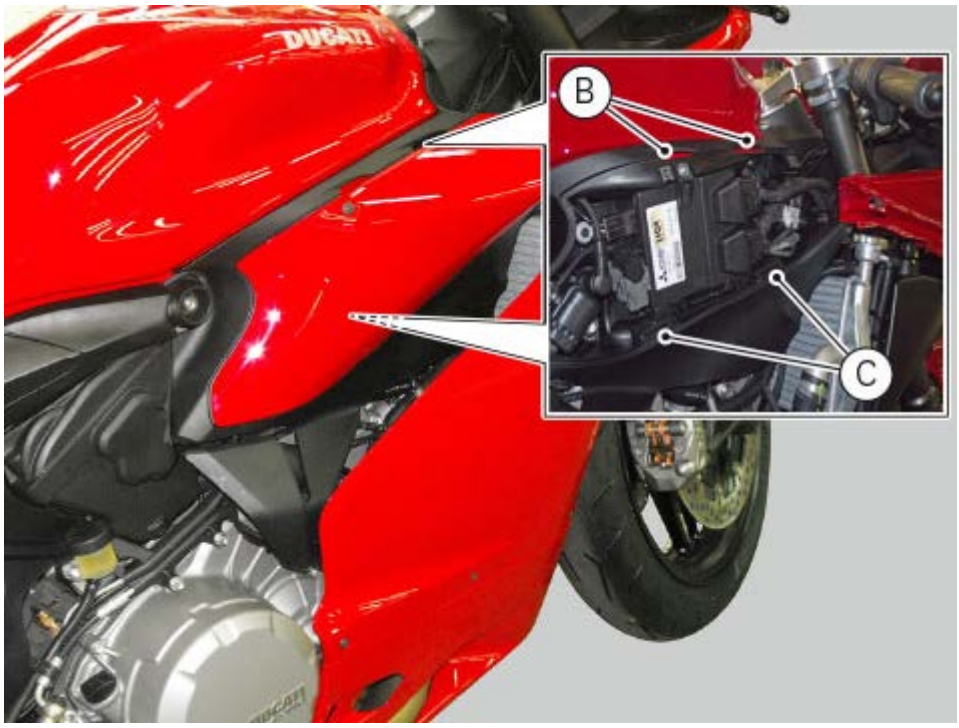
Undo screws (6) securing right-hand fairing to the motorcycle and keep washers (7).



Undo screw (3) securing the right-hand fairing inner side at the front.



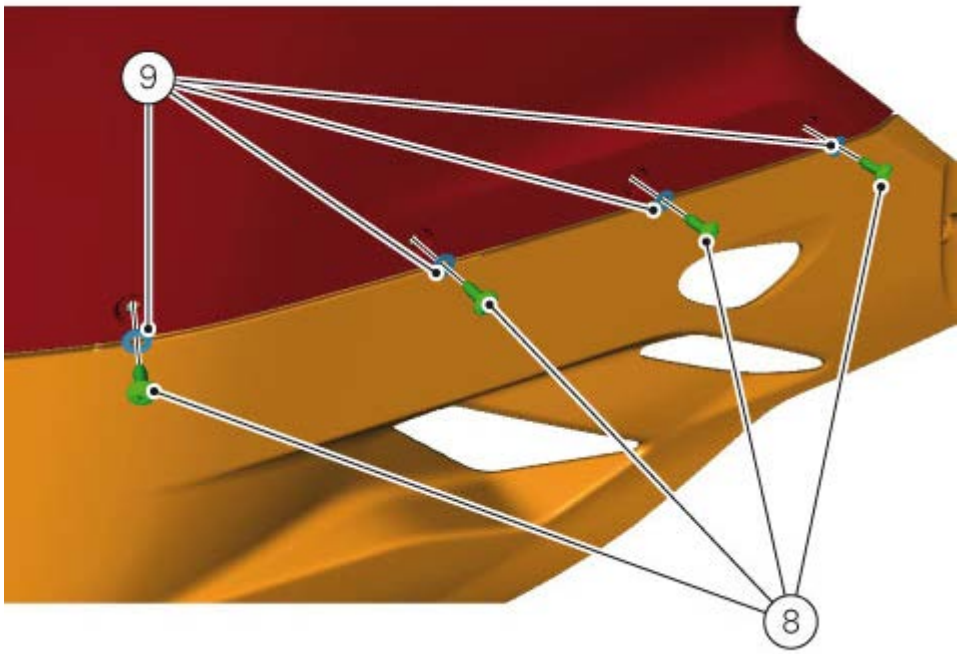
Remove right-hand fairing moving it to the front side of the motorcycle, making sure that the front profile of the fairing detaches from the profile of the radiator unit.
Disengage the fairing teeth from the relevant upper seats (B) and disengage tabs from their lower seats (C) on the electrical component support.



Warning
During the operation, make sure that the lower side of the fairing is positioned on the inner side of the brake lever.

Disassembling the fairing

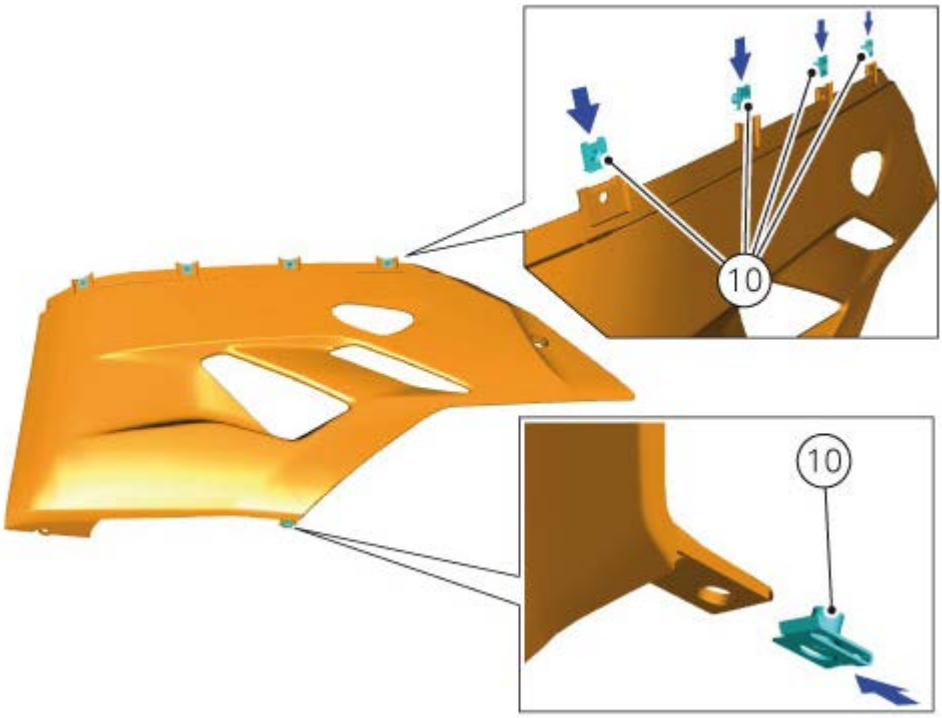
In order to disassemble the left-hand fairing, loosen screws (8) securing upper half-fairing to the lower one and keep washers (9).



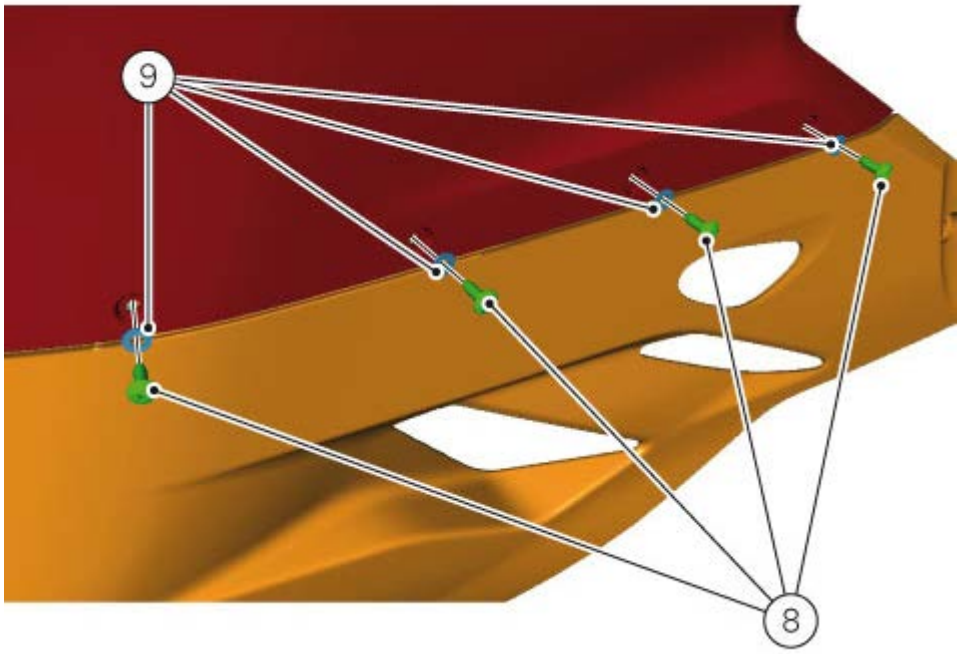
Carry out the same procedure for right-hand fairing disassembly.

Reassembling the fairing

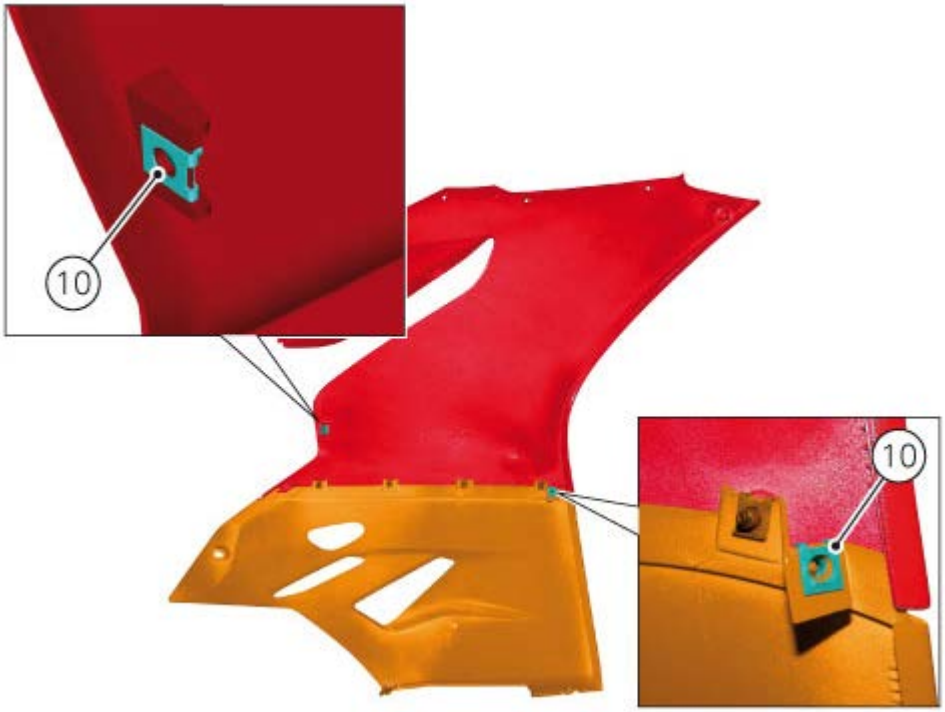
Install clips (10) in the lower half-fairing.



Fit nylon washers (9) onto screws (4).
Assemble the lower half-fairing to the upper half-fairing as shown in the figure, and start screws (8).
Tighten screws (5) to a torque of 2.5 Nm.



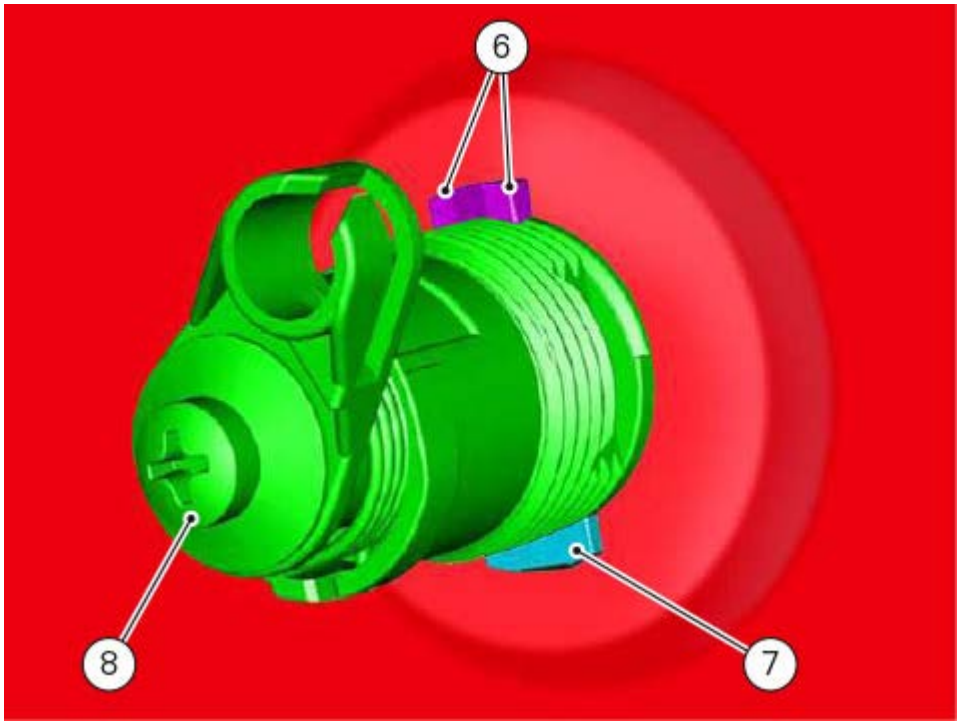
Install clips (10) in the upper half-fairing.



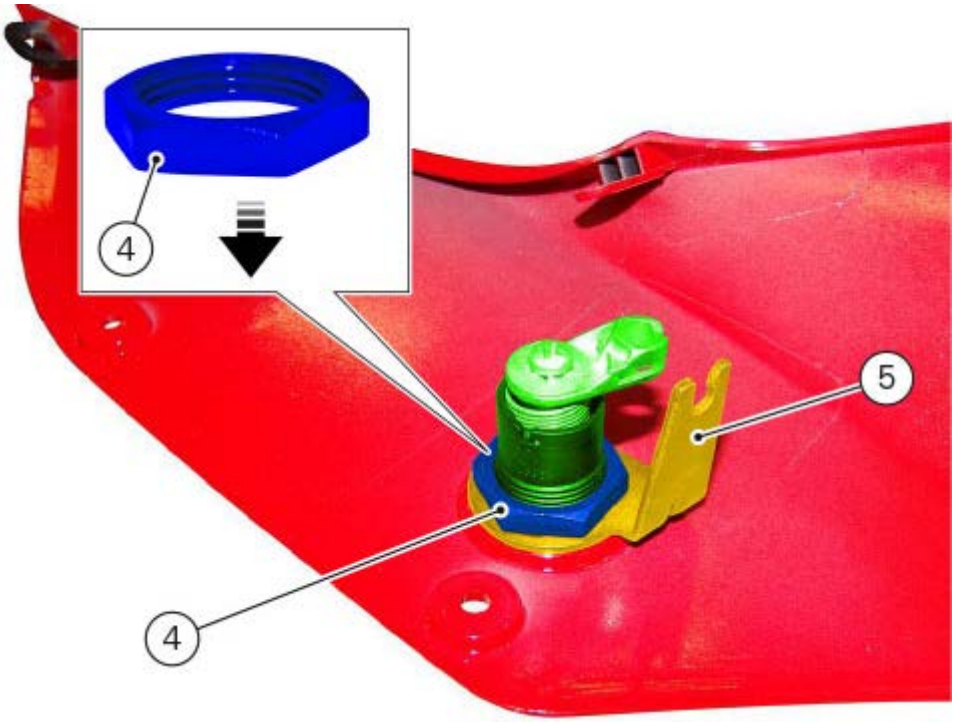
Carry out the same procedure for right-hand fairing reassembly.

Refitting the seat release mechanism

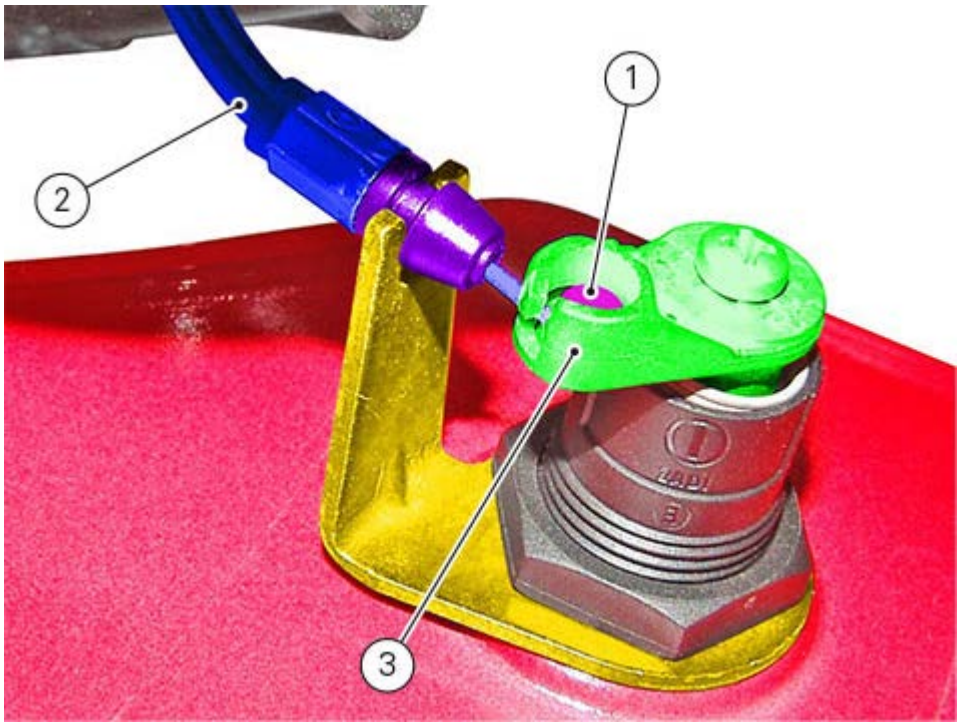
Fit lock (8) in the relevant hole on the right-hand side panel of the tail guard.
Fit the two tabs (6) and (7) into the relevant recesses on the cover.



Fit plate (5) by starting nut (4) and tighten it to the specified torque of 3 Nm ± 10%.
Make sure to position the nut with the rounded side facing out.

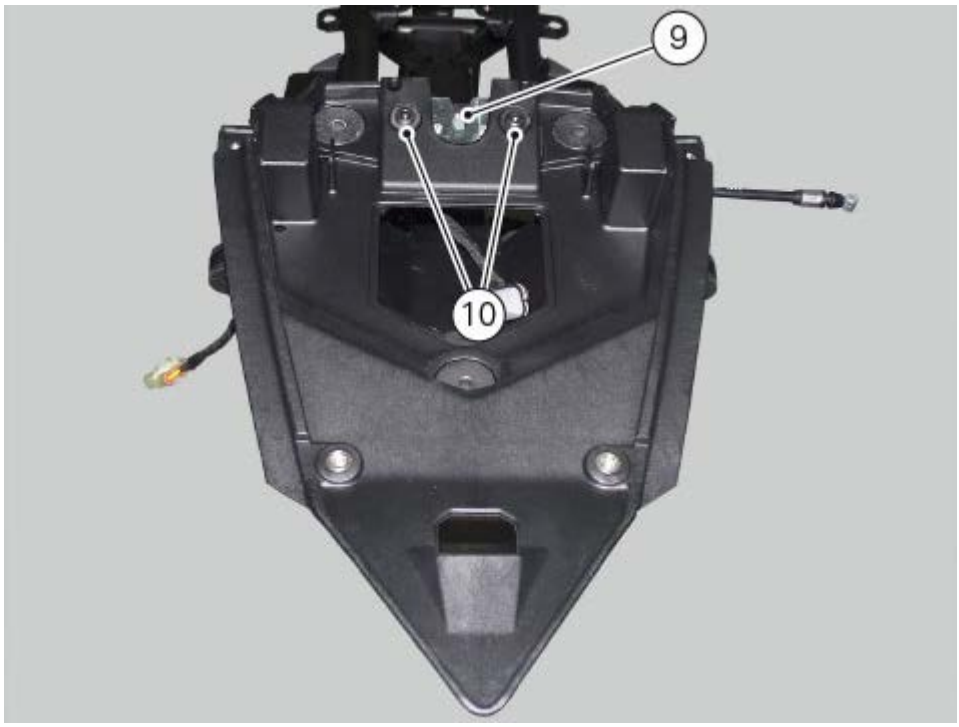


Fit nipple (1) into its seat (3).



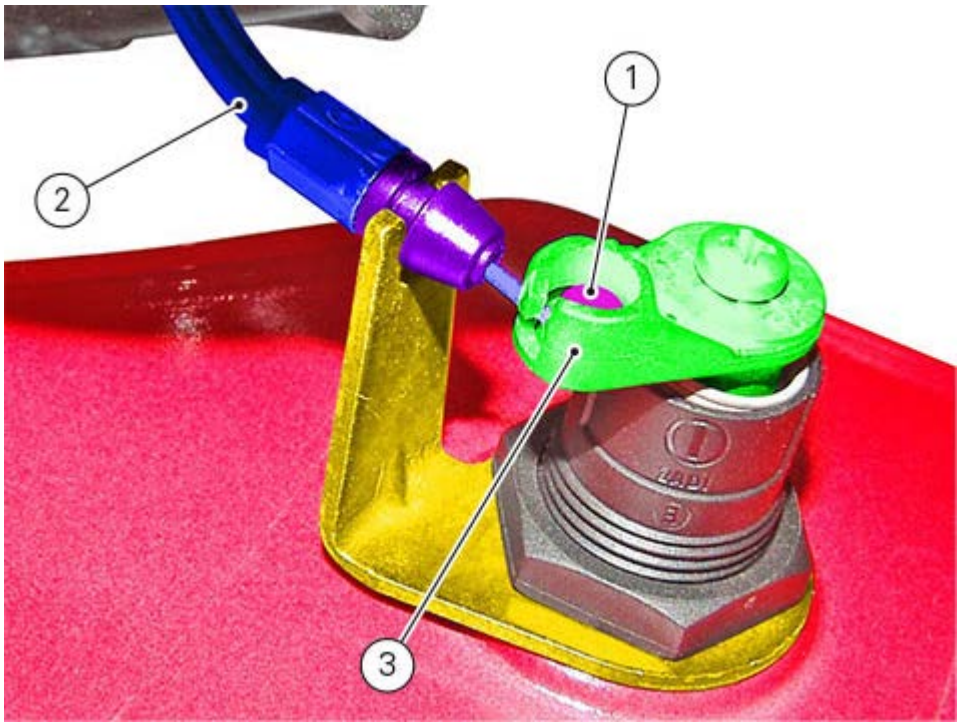
Refit the right-hand side body panel (Refitting the side body panels).

Tighten the two screws (10) to the specified torque of 8 Nm ± 10%.



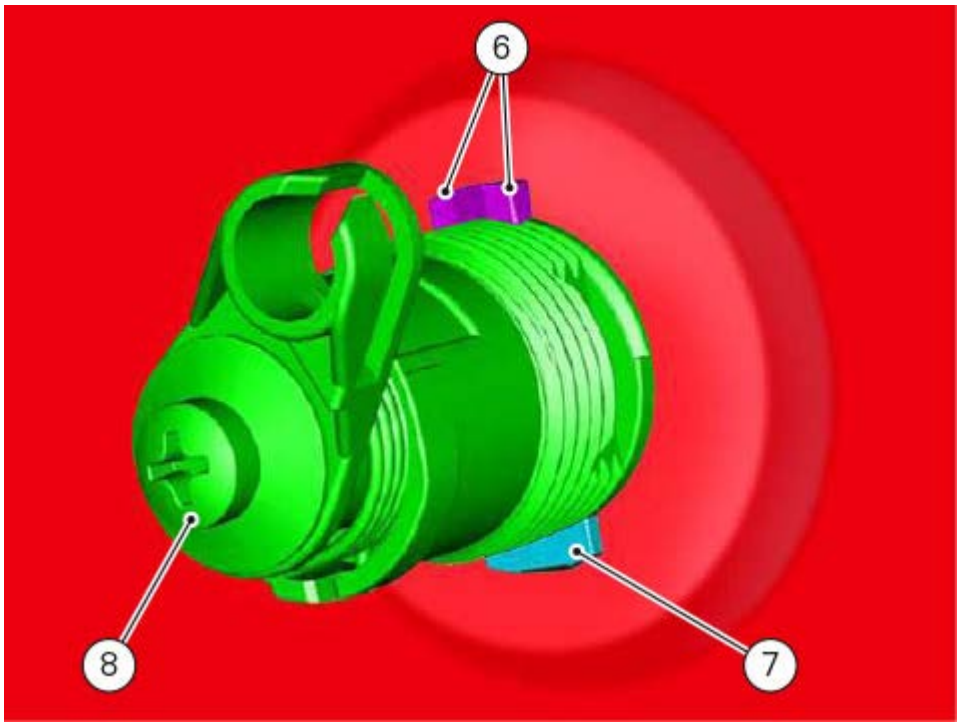
Removing the seat release mechanism

Remove right-hand side body panel (Removing the side body panels).
Slide nipple (1) of the seat lock cable (2) out of its seat (3).

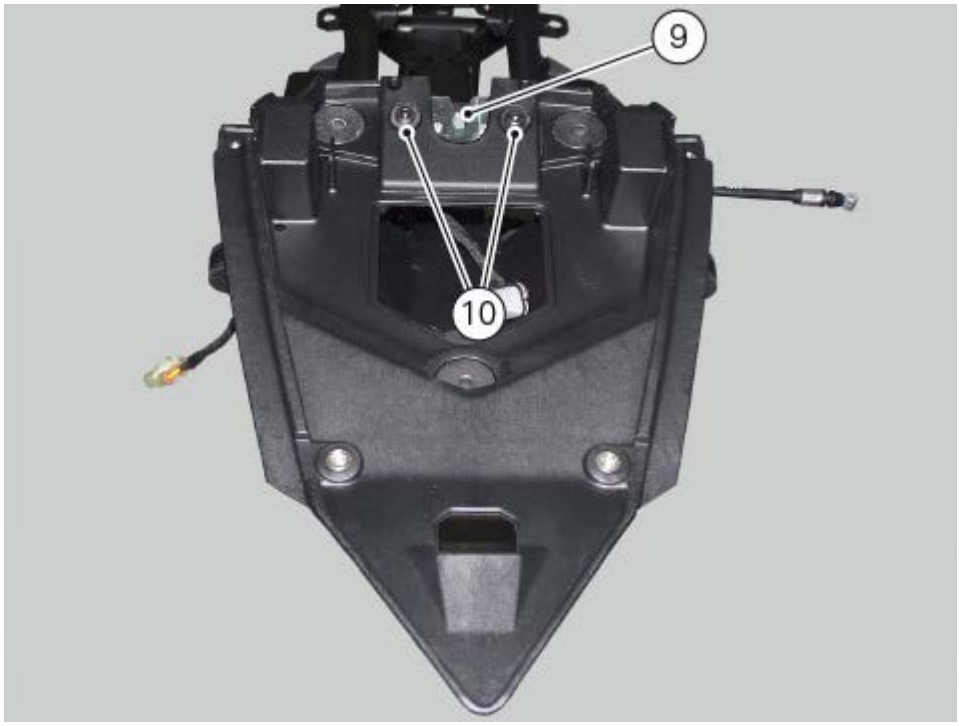


Unscrew nut (4) and remove the plate (5).

Remove the two securing tabs (6) and (7).
Remove lock (8)

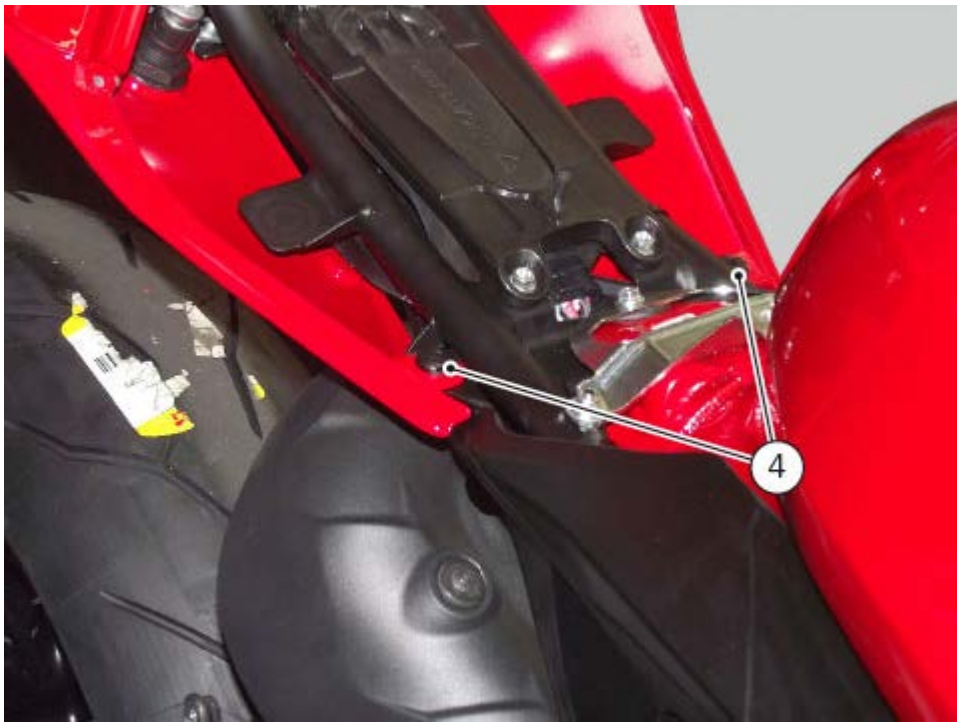


Remove latch (9) by loosening the two screws (10).

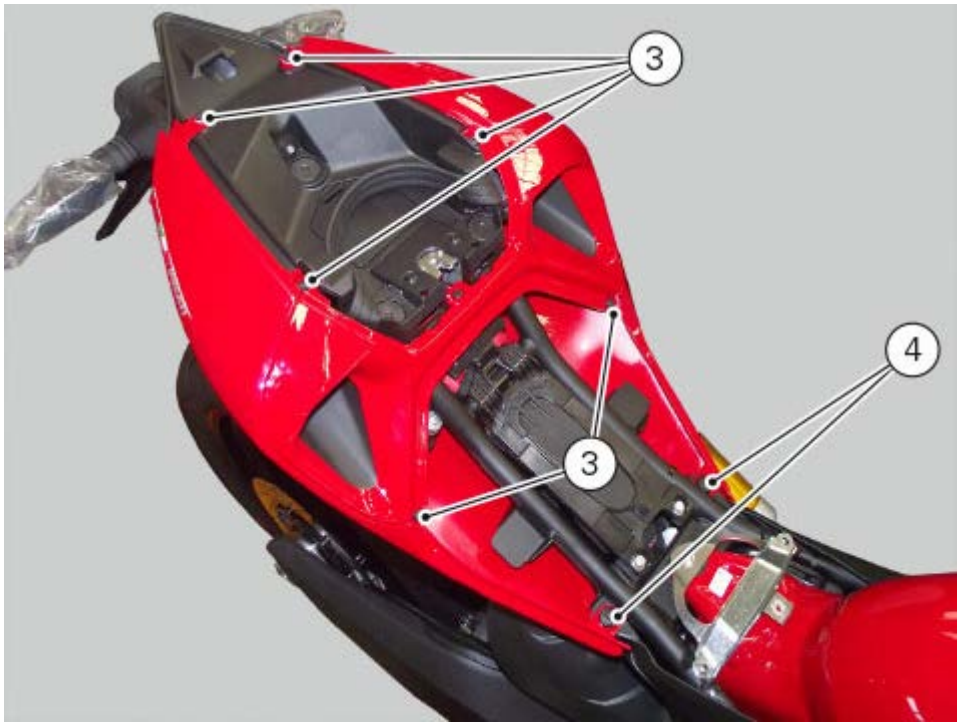


Refitting the side body panels

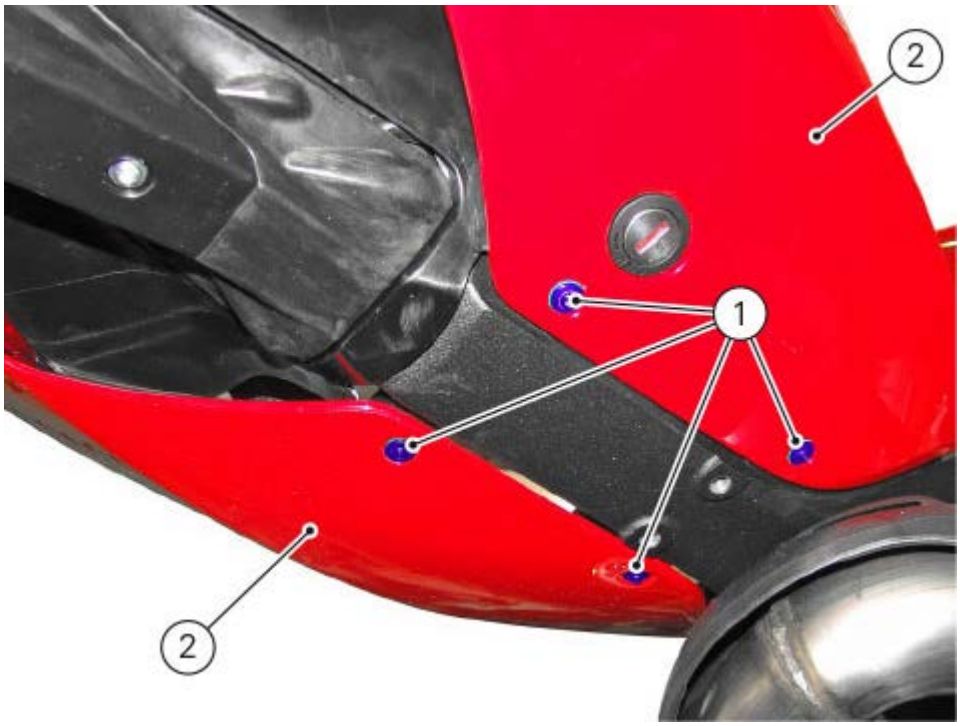
Fit the side body panels and secure them by means of quick-release fastener (4).



Tighten upper screws (3) to the specified torque of 2.5 Nm ± 10%.

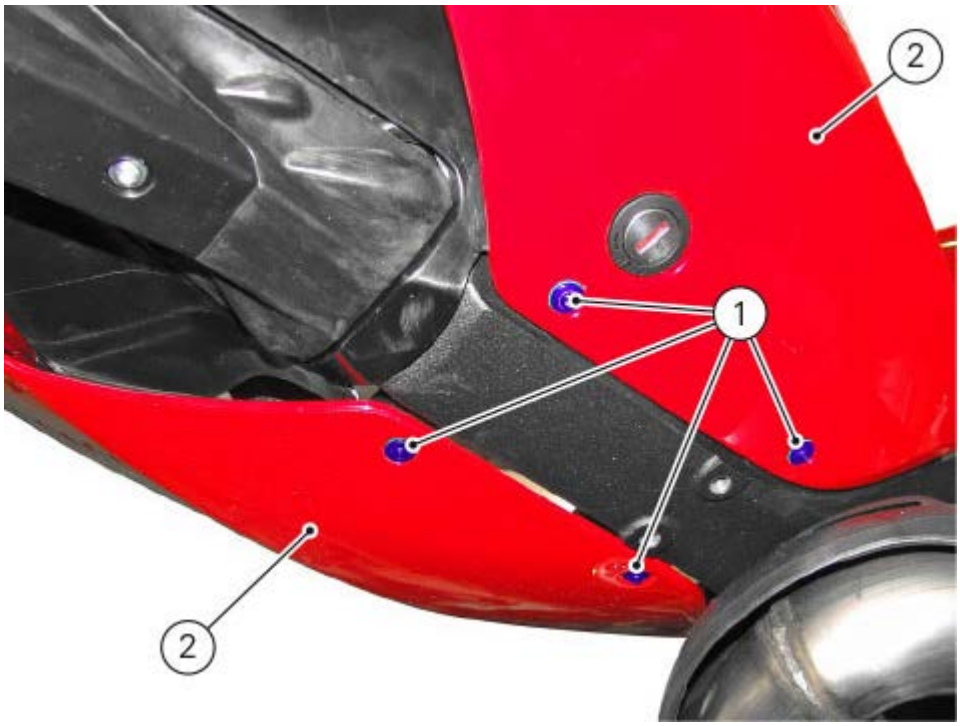


Tighten lower screws (1) to the specified torque of 2.5 Nm ± 10%.

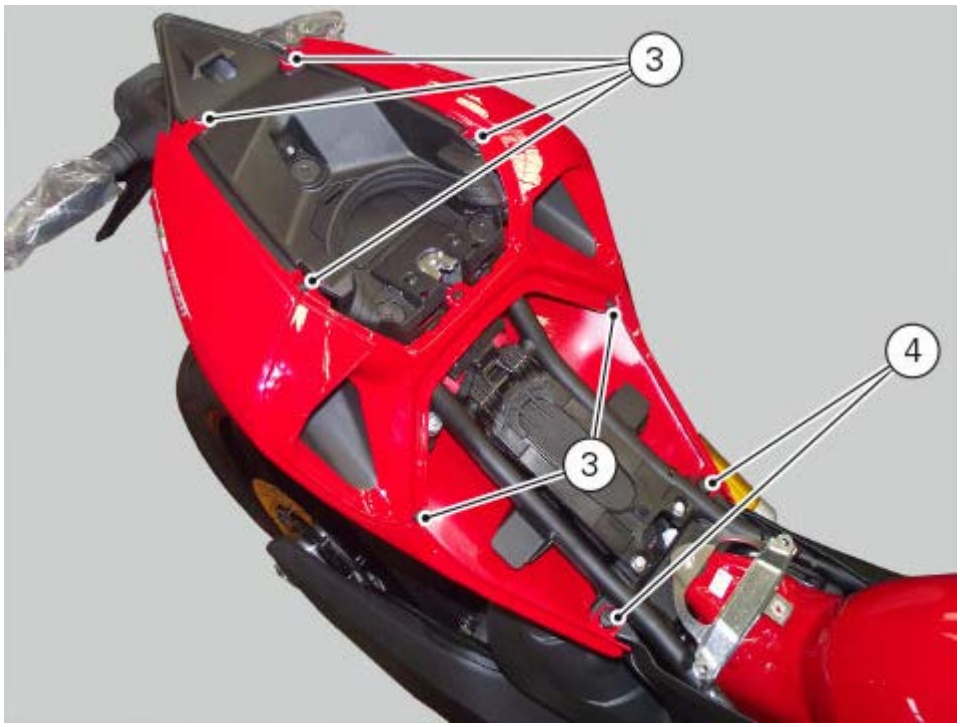

2
1
2

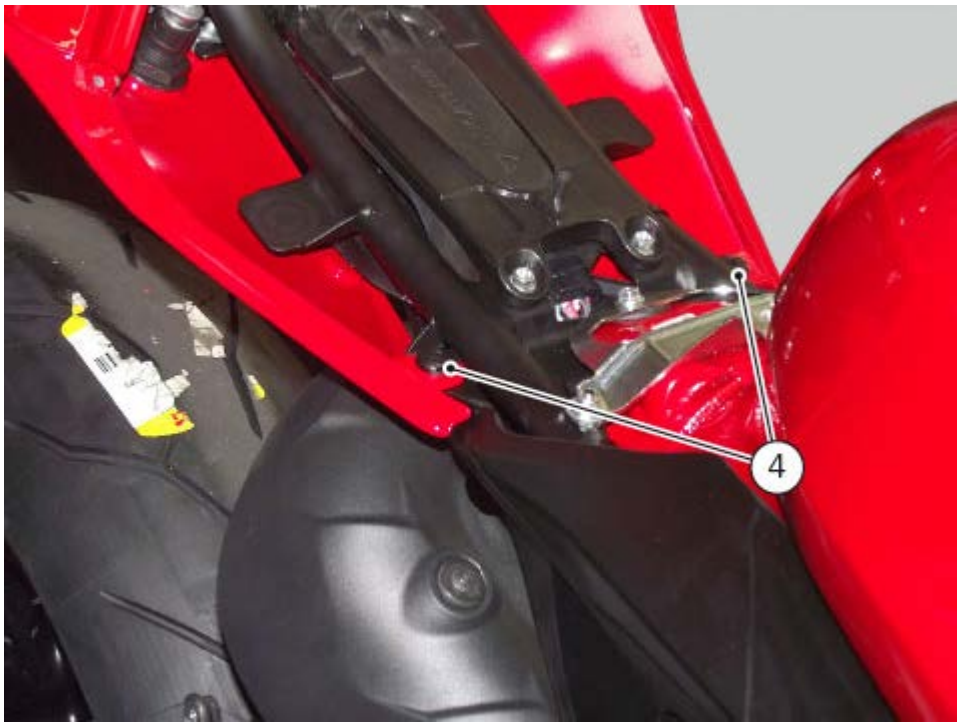
Removing the side body panels

Undo and remove the four lower screws (1) on side body panels (2).



Loosen and remove the upper screws (3).
Remove the quick-release fastener (4).

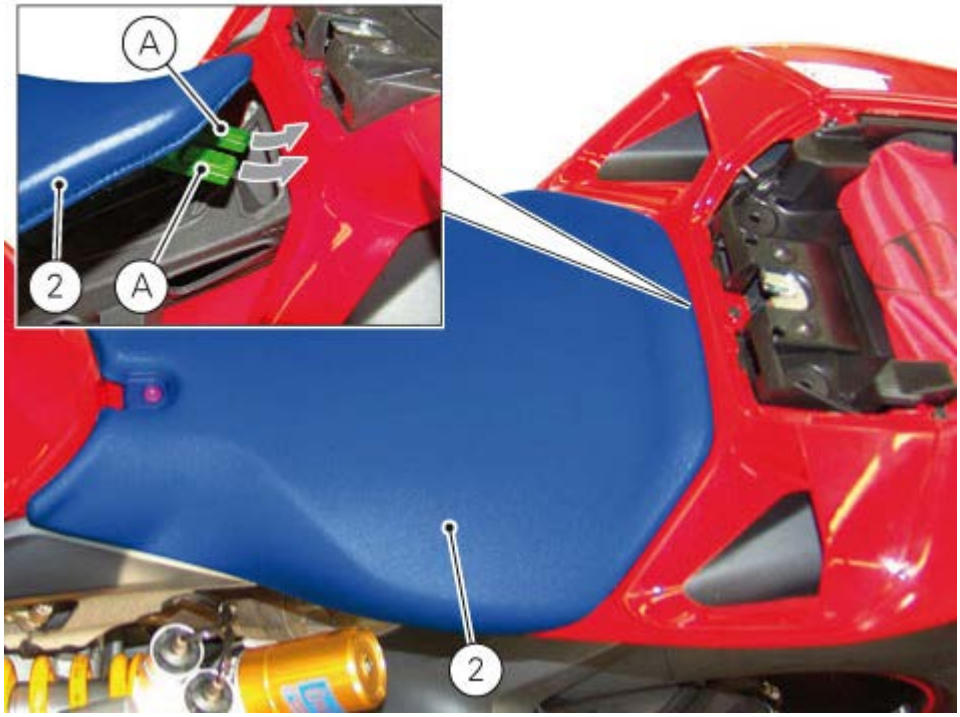




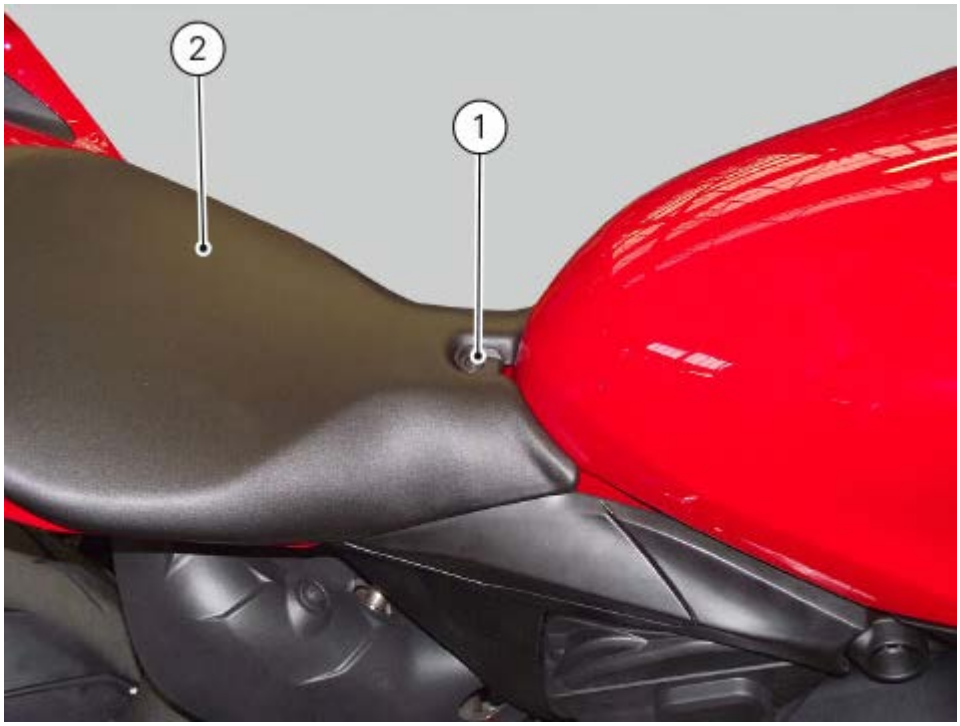
Remove the side body panels

Refitting the rider seat

Position seat (2) on the vehicle by inserting brackets (A) in the opening on the rear subframe.

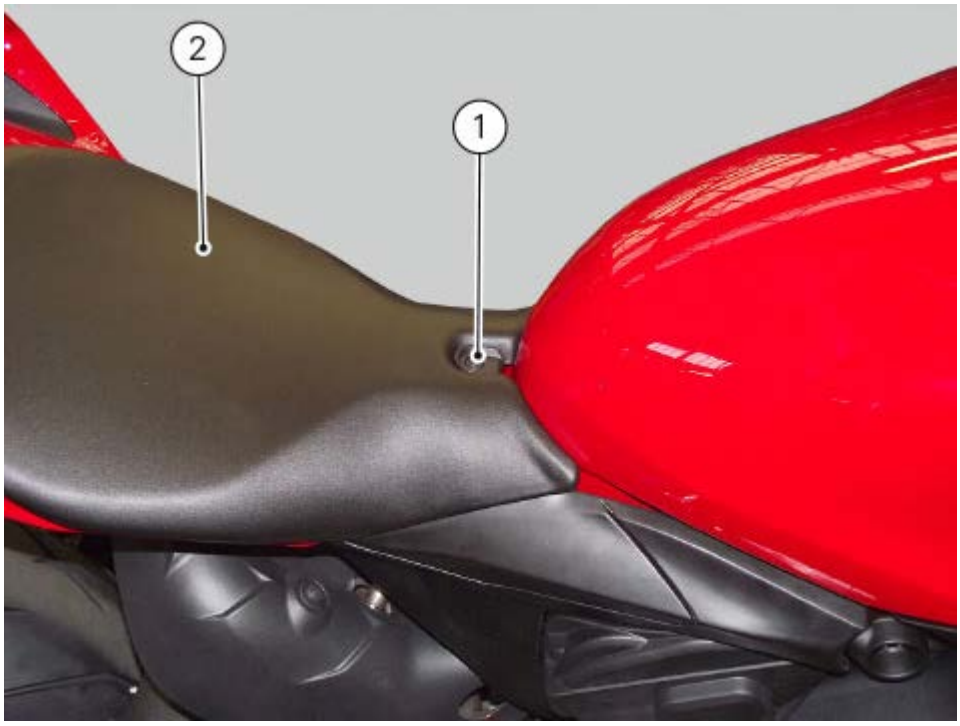


Start screw (1) and tighten it to a torque of 5 Nm ± 10%.



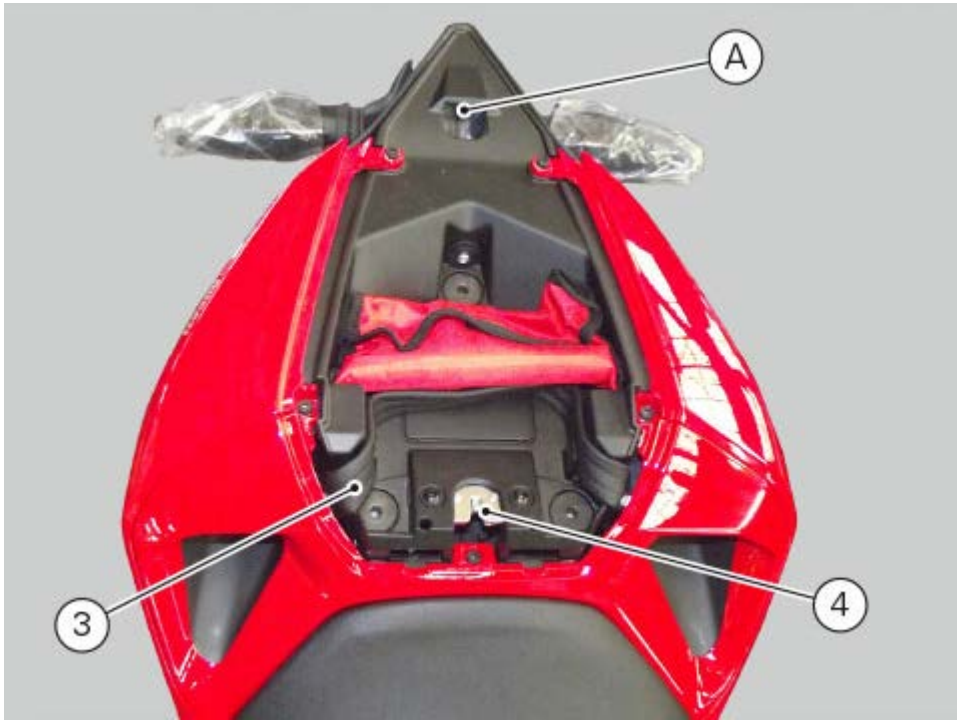
Removing the rider seat

Undo screw (1) securing seat to subframe.
To remove rider seat (2) from vehicle, slightly pull it towards the tank by lifting it.

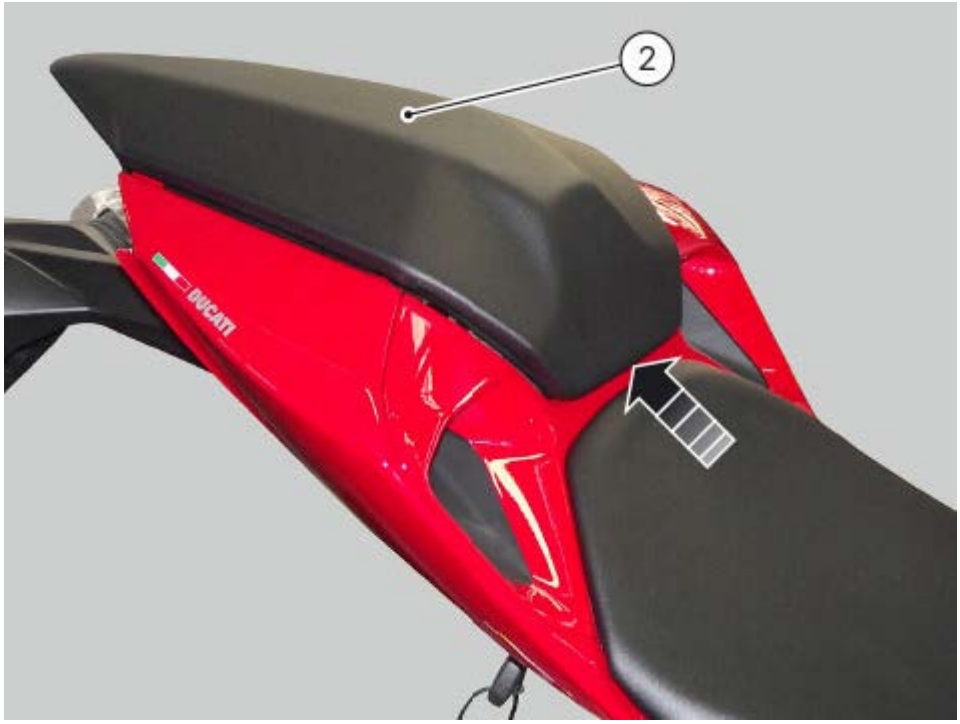


Refitting the passenger seat

Position passenger strap (3) behind the tabs of the glove compartment.
Fit seat (2) by inserting rear bracket inside glove compartment opening (A) and position front stud bolt on the recess on the latch (4).



Slide cover (2) or passenger seat towards the rear side of the motorcycle until the latch securing the stud bolt engages with an audible click.



Passenger strap

Remove passenger seat (Removing the passenger seat).

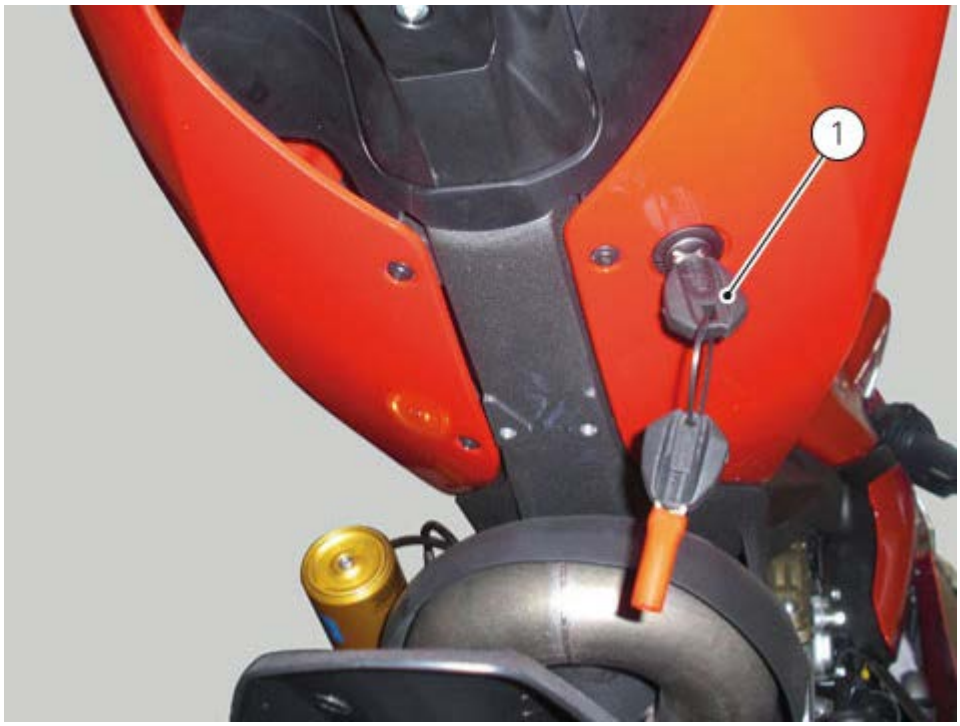
To use strap (3), lift it from its seat and disengage it from glove compartment tabs (B).

Insert the front side of passenger seat (2) in the strap (3), as shown in the figure.
Settle the strap (3) in the passenger seat by slightly pulling its ends.
Close passenger seat as shown in "Refitting the passenger seat" of this paragraph.

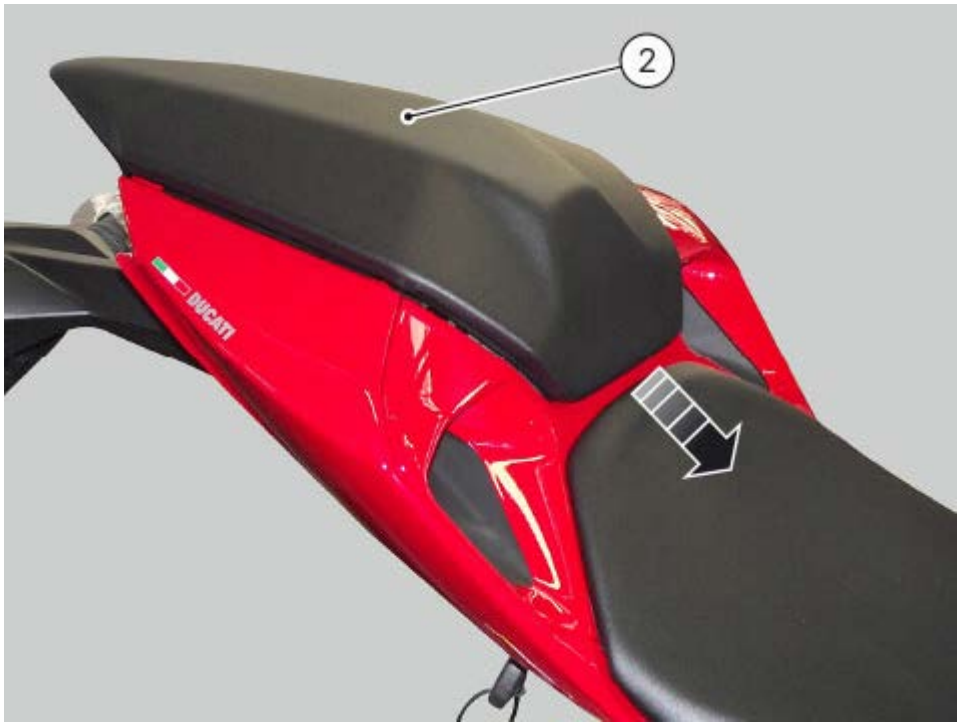

2
3

Removing the passenger seat

Insert key (1) into the seat lock and turn it until the seat catch disengages with an audible click.

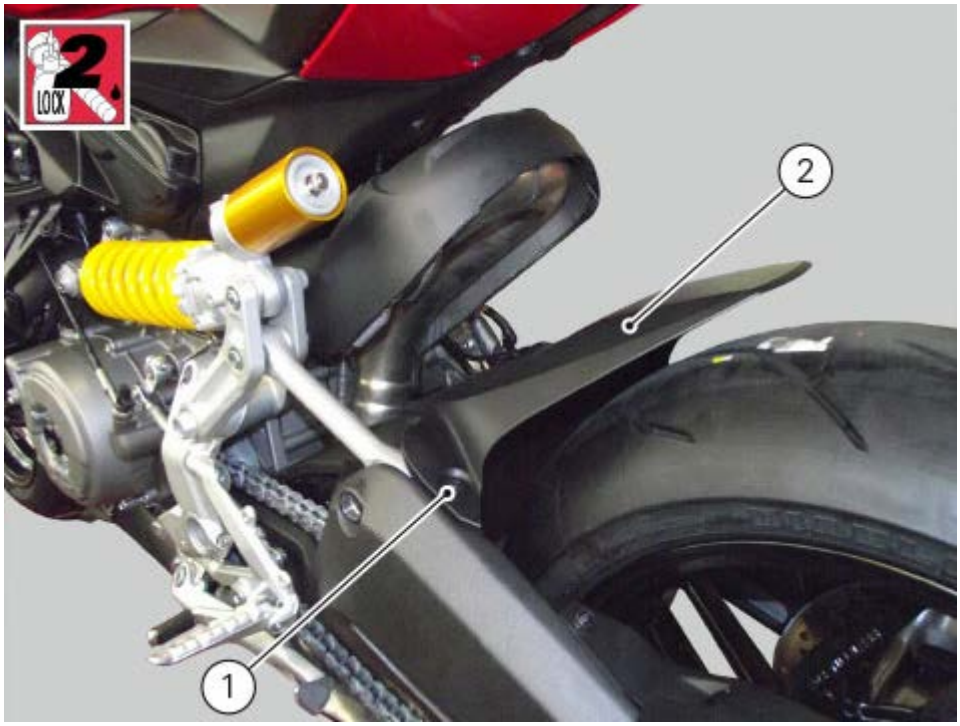


Pull the seat (2) towards motorcycle front end until releasing it.



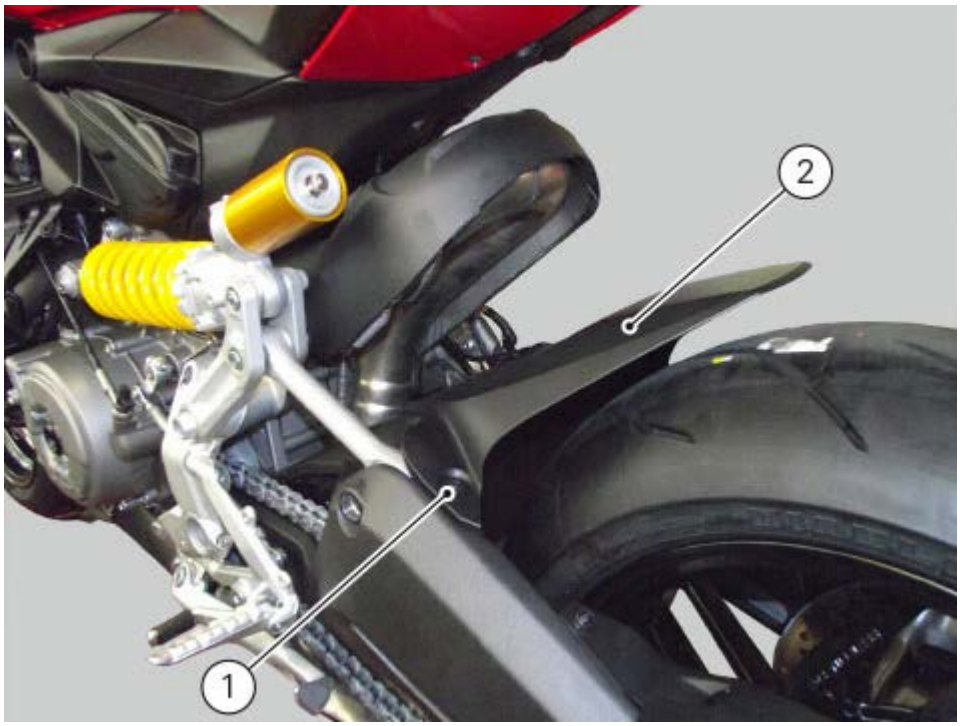
Refitting the rear mudguard

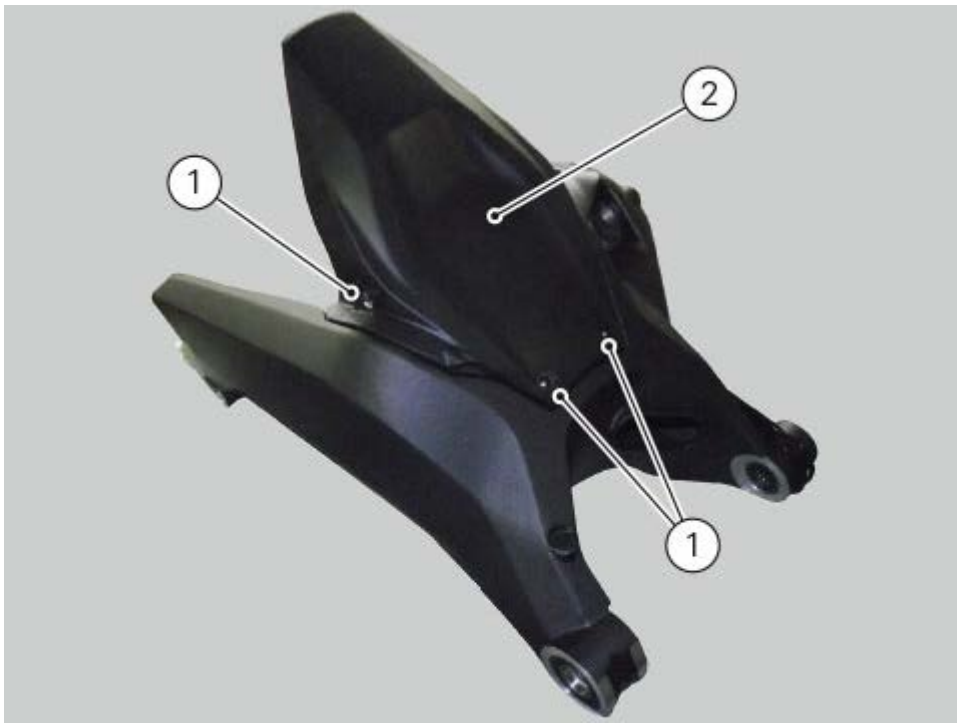
Fit rear mudguard (2) on swinging arm and start screws (1) with the recommended threadlocker. Tighten screws (1) to a torque of 5 Nm ± 10%.



Removing the rear mudguard

Loosen screws (1) and remove the rear mudguard (2) from the swinging arm.

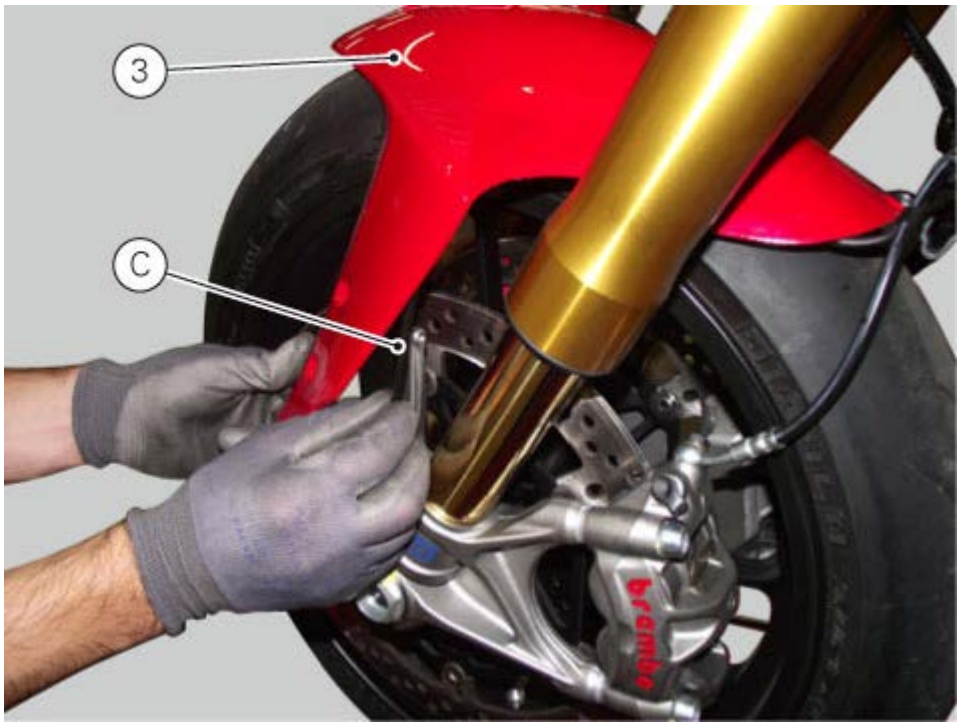




Refitting the front mudguard

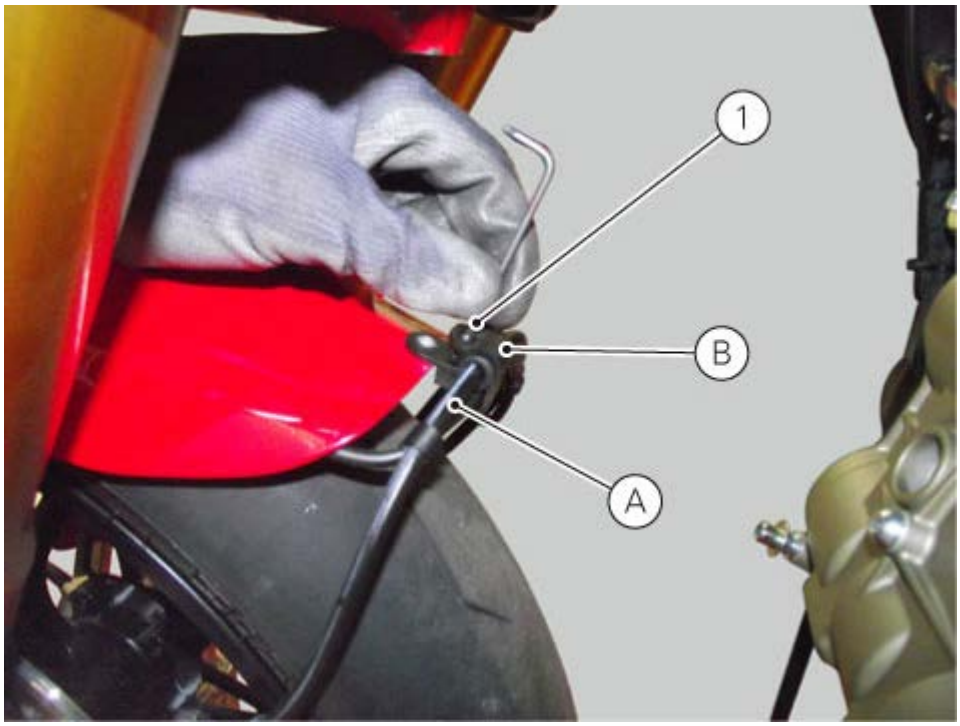
Warning
Do not ride the motorcycle without the front mudguard fitted to avoid the risk of the brake hoses fouling the wheel when braking.

Fit front mudguard (3) and engage the cable (C) of the front speed sensor.

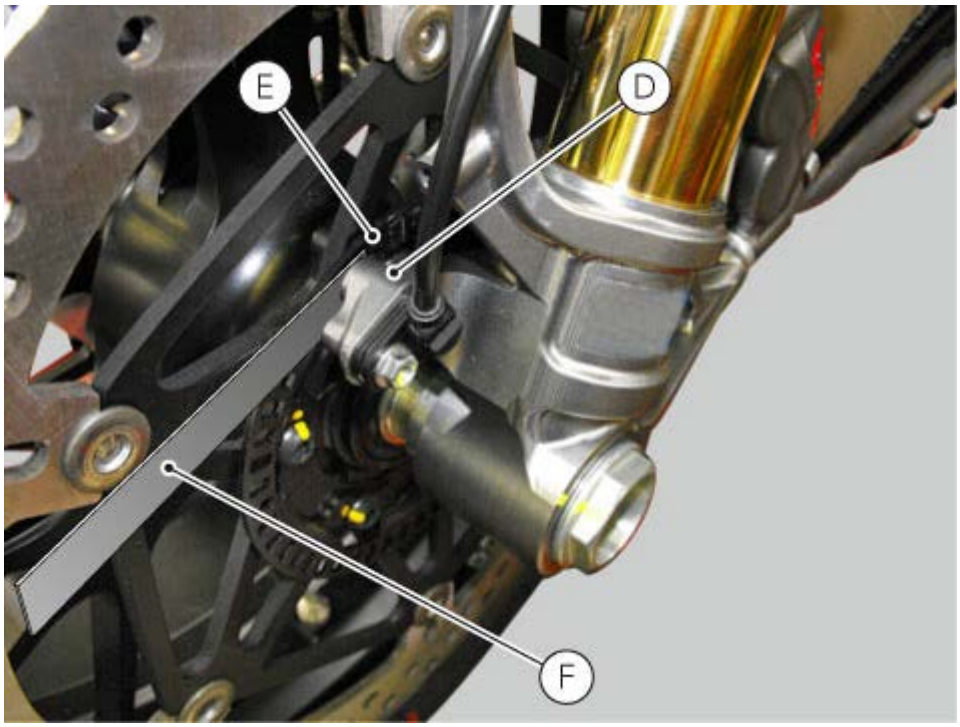


Position front mudguard (3) and start special screws (2) with specified threadlockers.
Tighten screws (2) to a torque of 10 Nm ± 10%.

Insert, by centring it, the rubber block of front brake lines (A) in the hose guide (B).
Fold hose clip (B), securing it by starting and tightening screw (1) to a torque of 0.4 Nm ±10%.

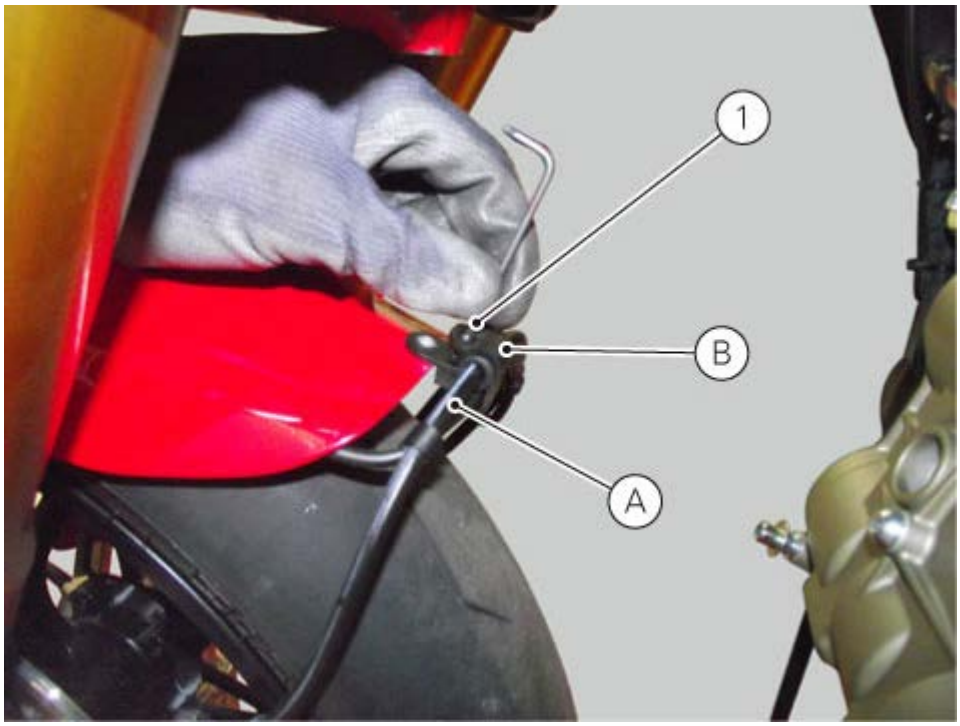


It is necessary to check the air gap between speed sensor (D) and phonic wheel (E).
Use a feeler gauge (F) to check the air-gap: measure the air-gap at four points, one every 90° of the wheel.
The phonic wheel sensor air-gap range should be **1.3** mm ÷ **1.9** mm.



Removing the front mudguard

Undo screw (1) and remove the front brake lines (A) from hose guide (B).
The hose guide (B) is fastened to front mudguard by means of a shear rivet with two washers in-between.



Working on both sides, undo and remove special screws (2).
Remove the front mudguard.

Warning
The ABS sensor bracket is placed on left fork leg, take particular care during front mudguard removal.

Remove front mudguard (3) by disconnecting front speed sensor cable (C) upper end.

Note
On US versions, a cat's eye is mounted on the front mudguard.

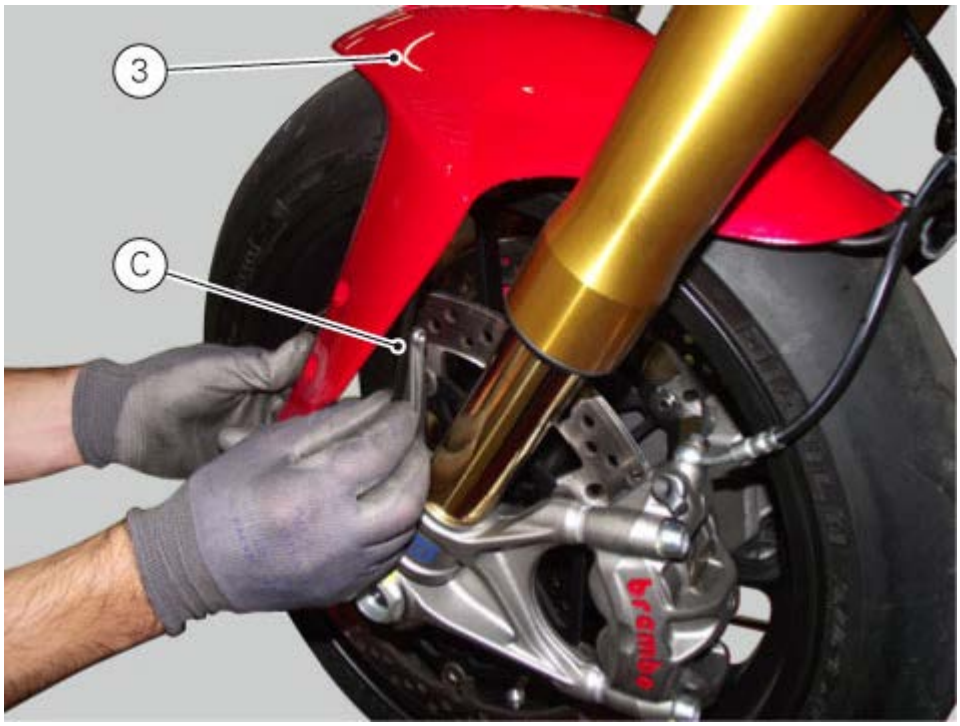

3
C
brembo

Table V

Table V – 48

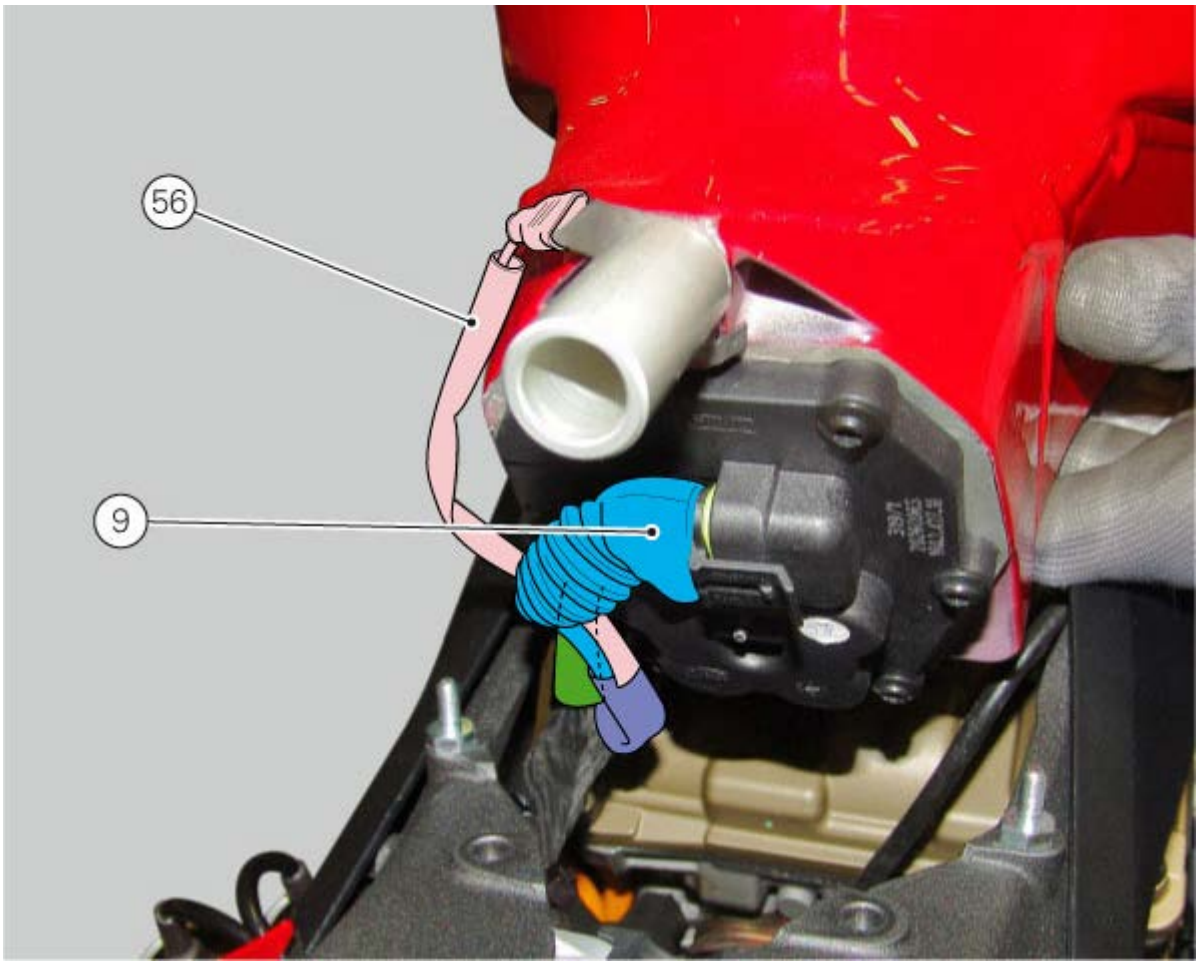
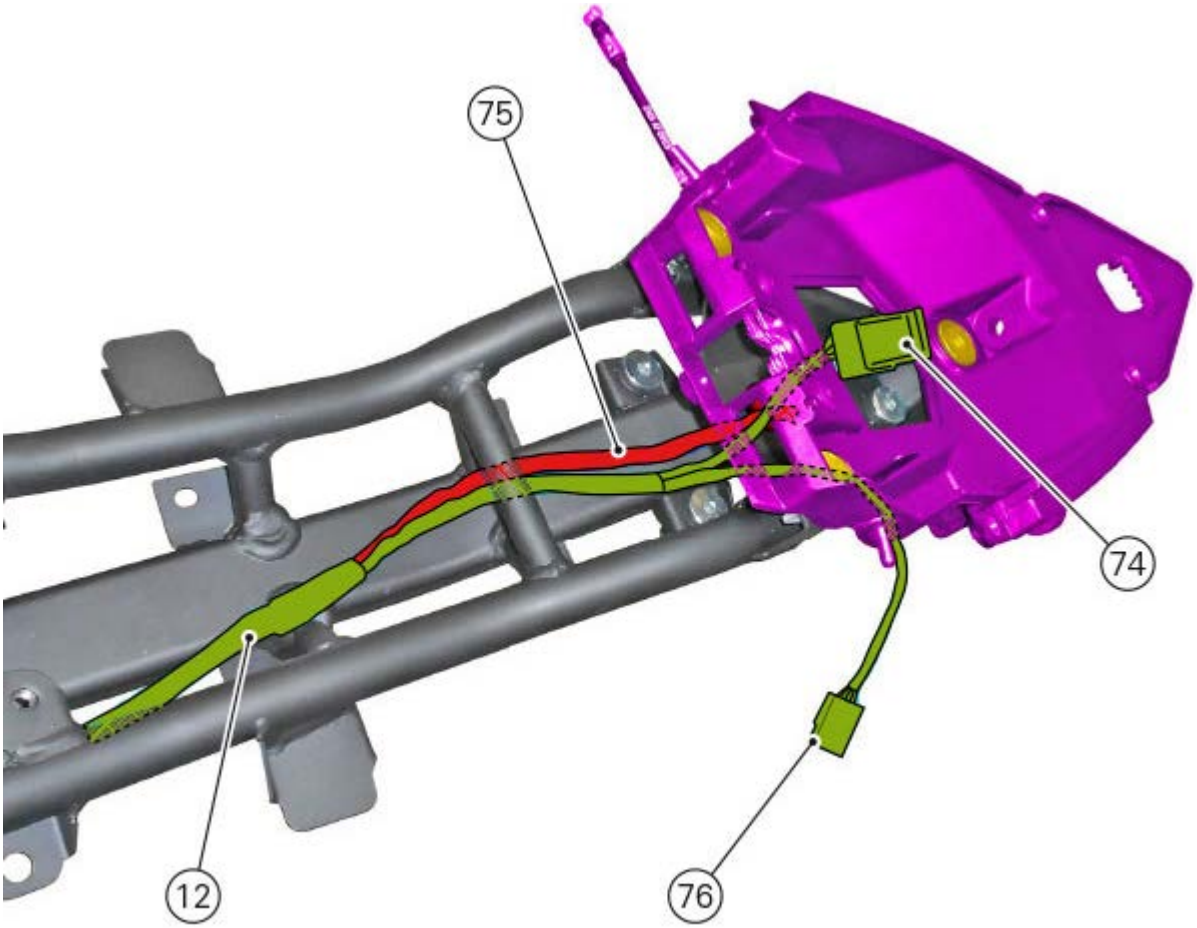


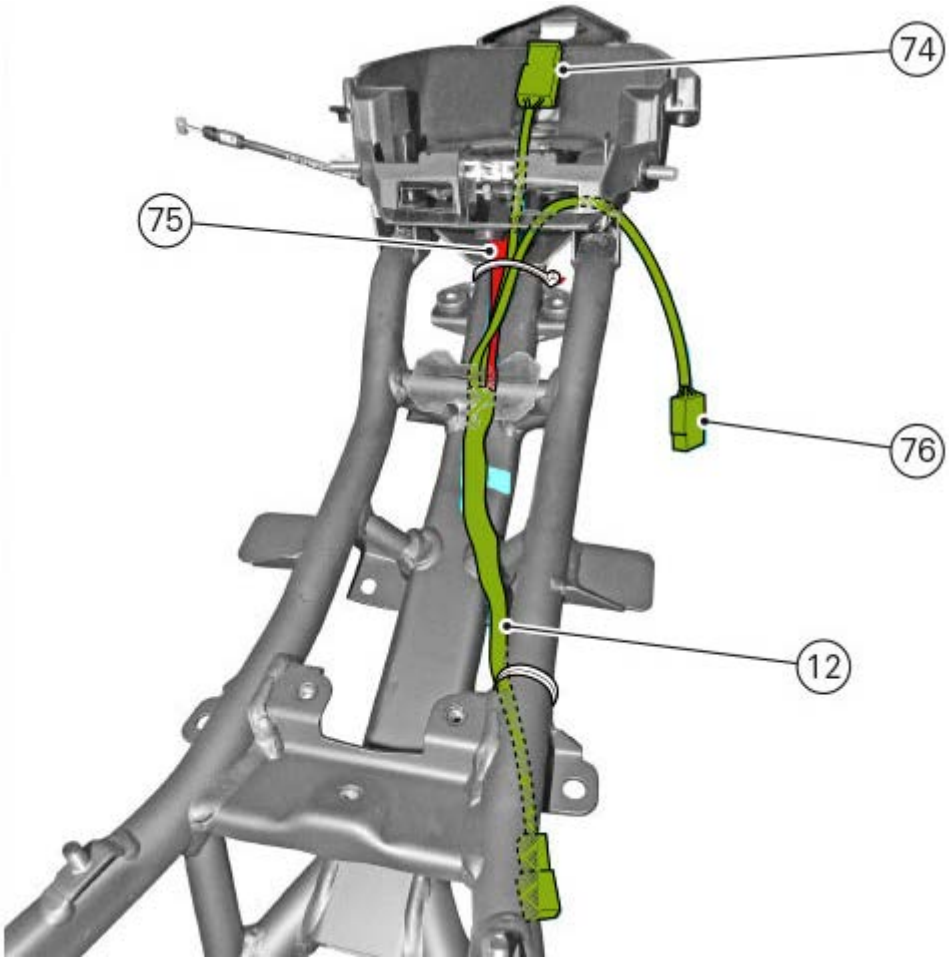
Table T

Table T – 46

Table S

Table S – 45


75
74
12
76


74
75
76
12

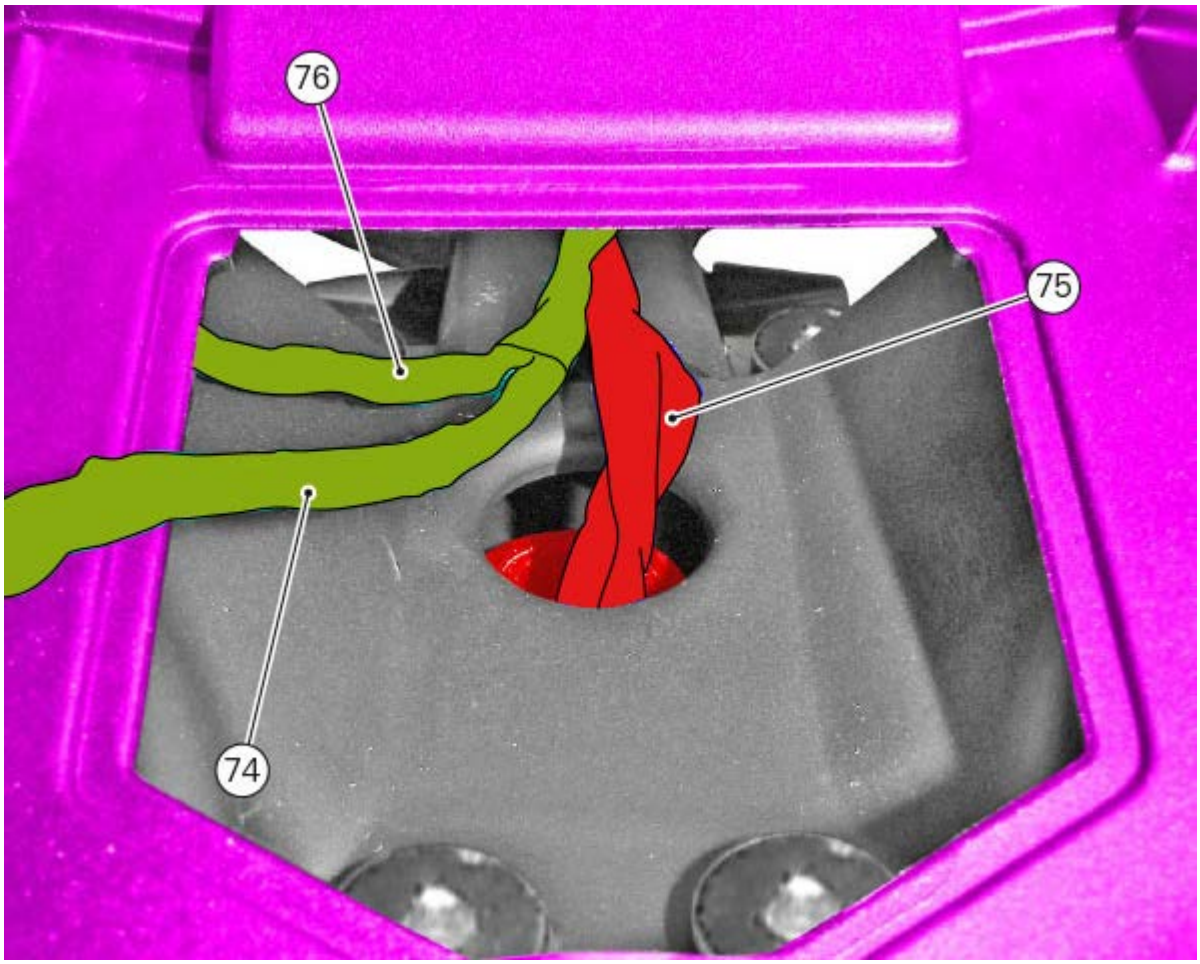
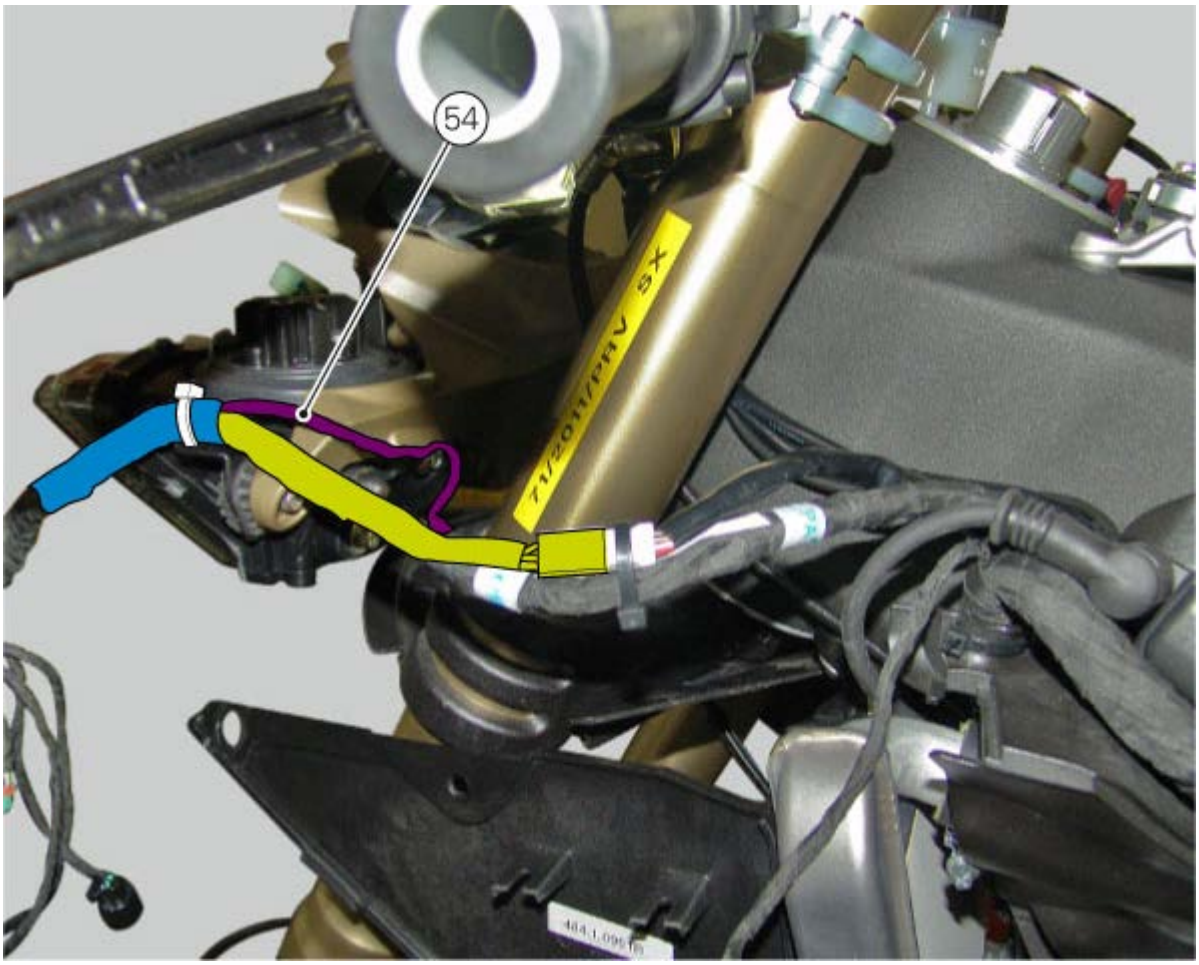

76
75
74

Table R

Table R – 44




54

Table Q

Table Q – 52

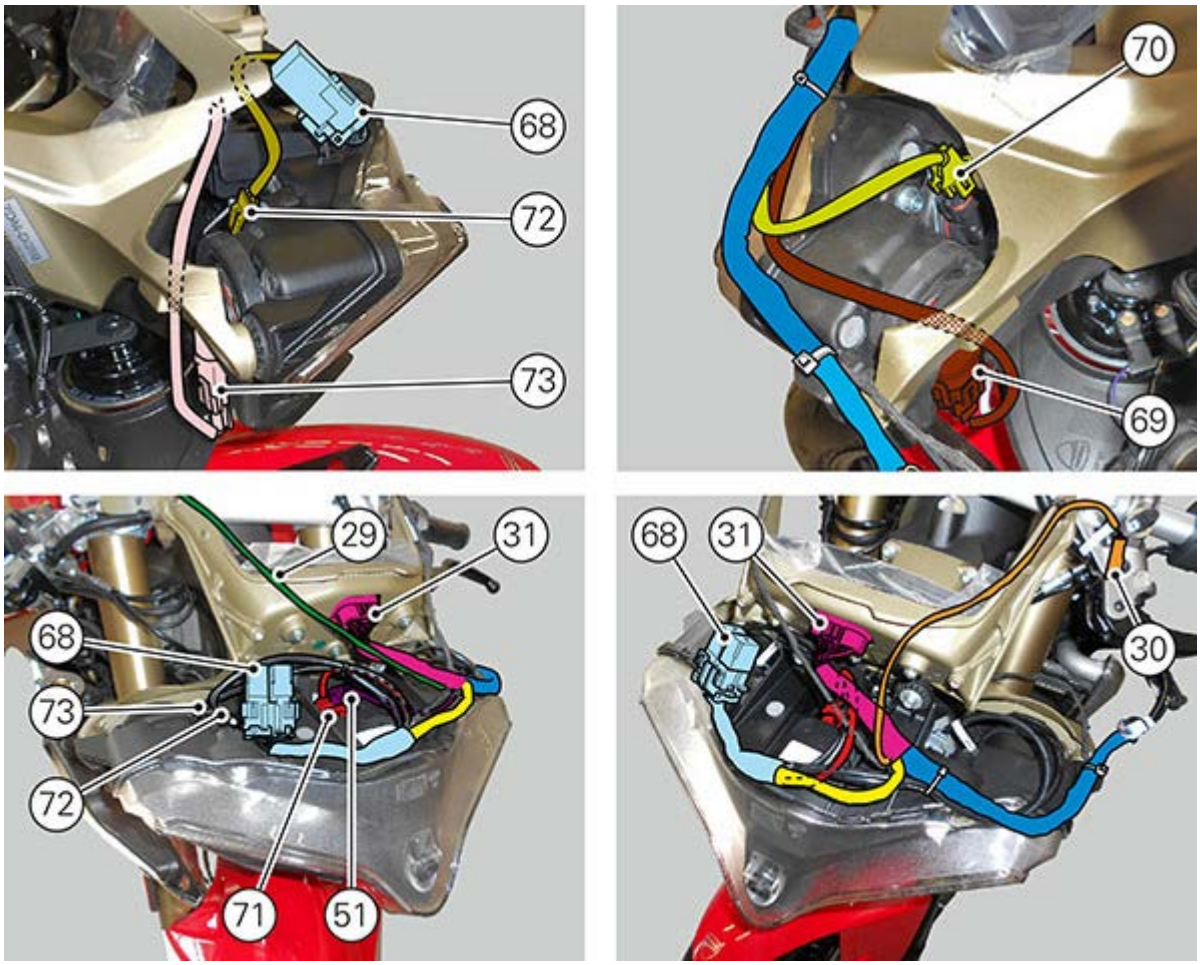
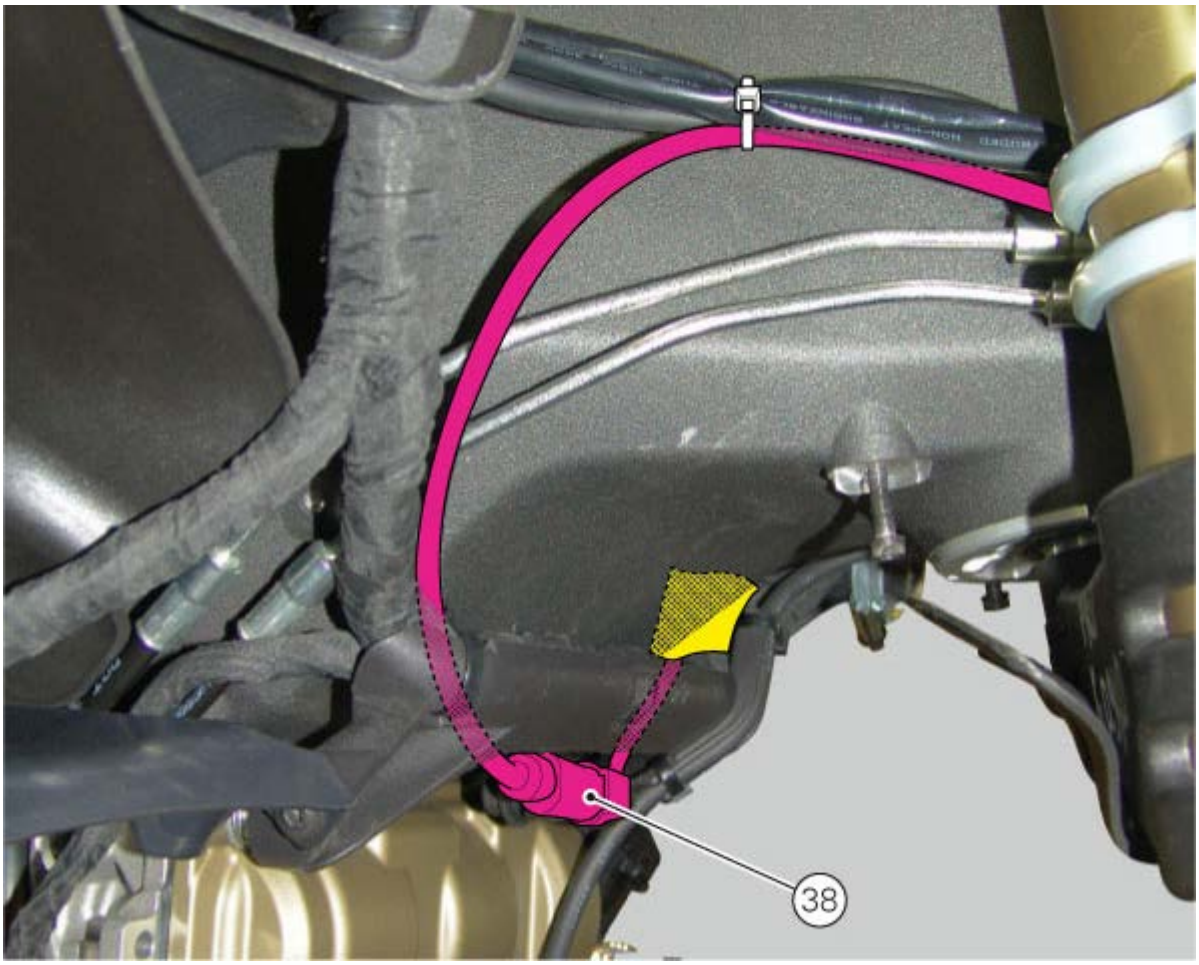
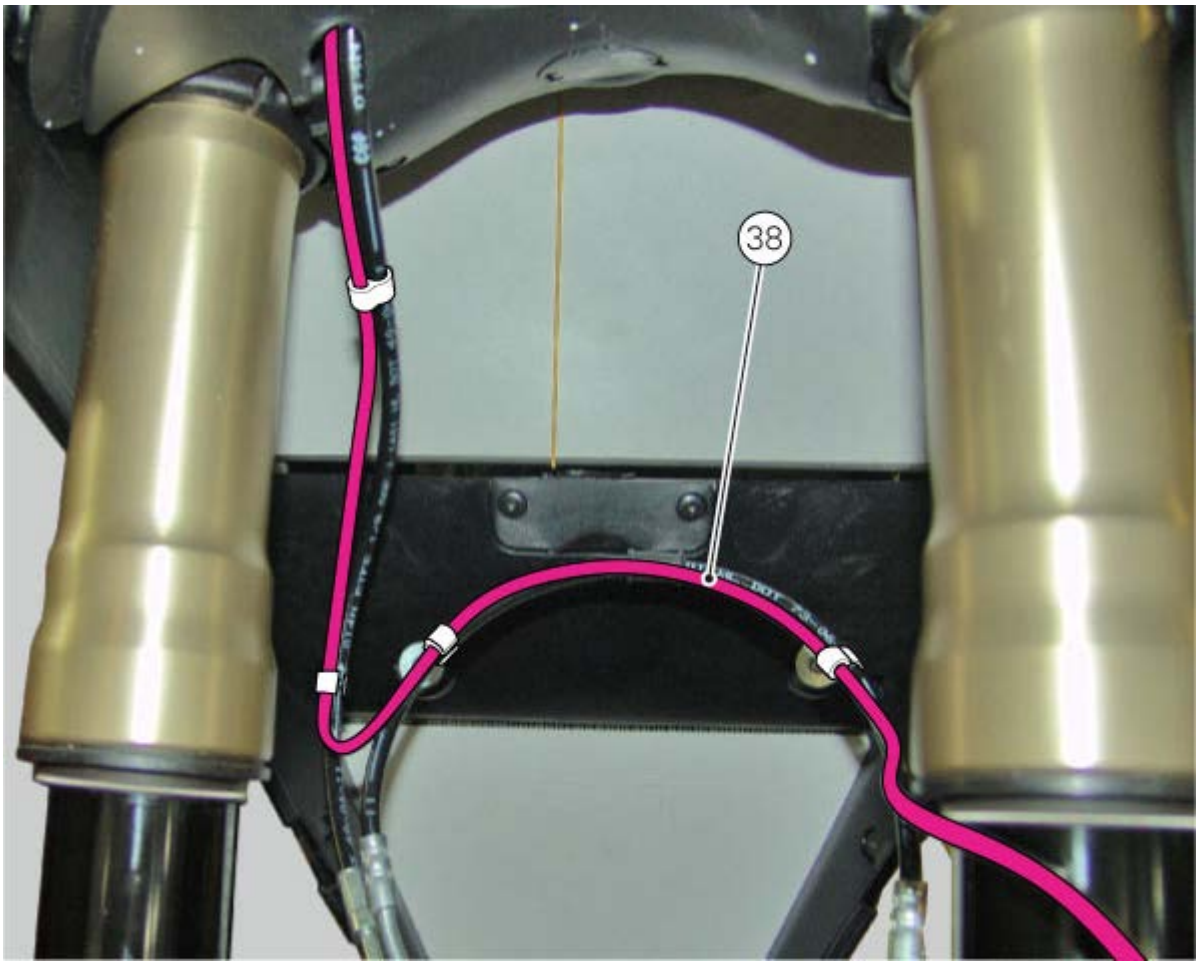


Table P

Table P – 42




71/2011/RV DX
38


38

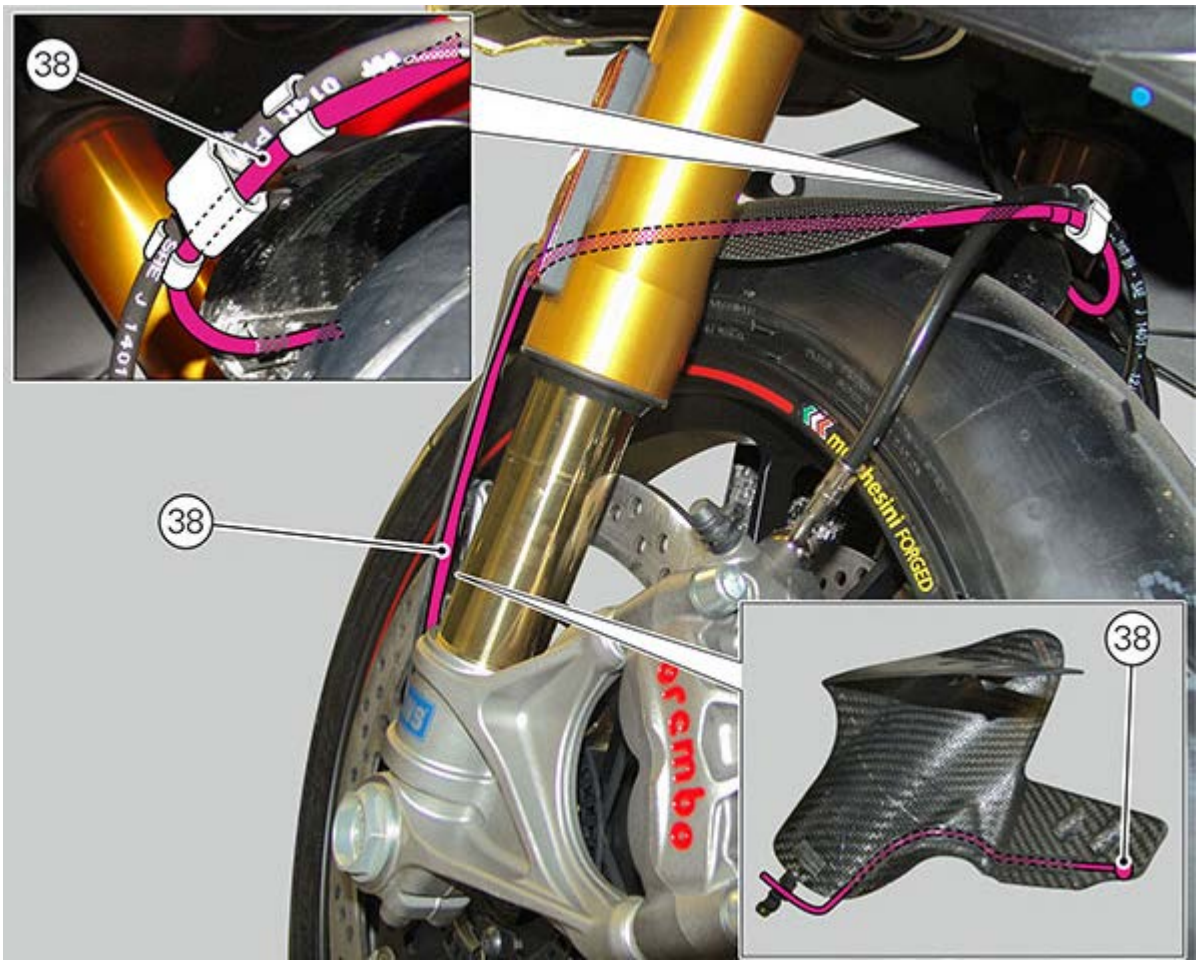
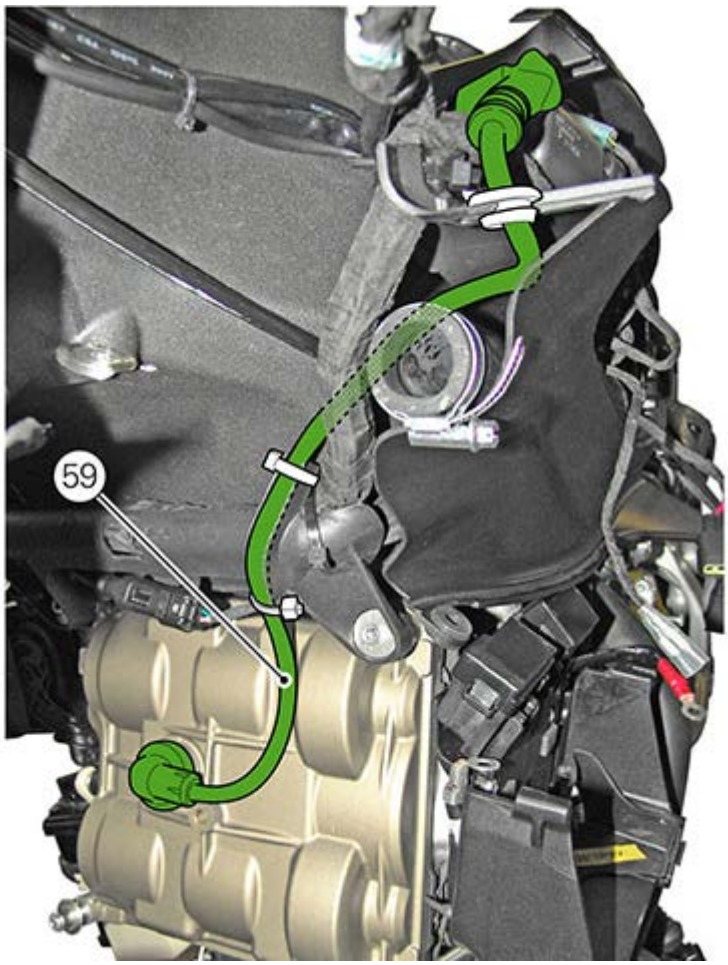

38
38
38
brembo
hesini FORGED

Table O

Table O – 41



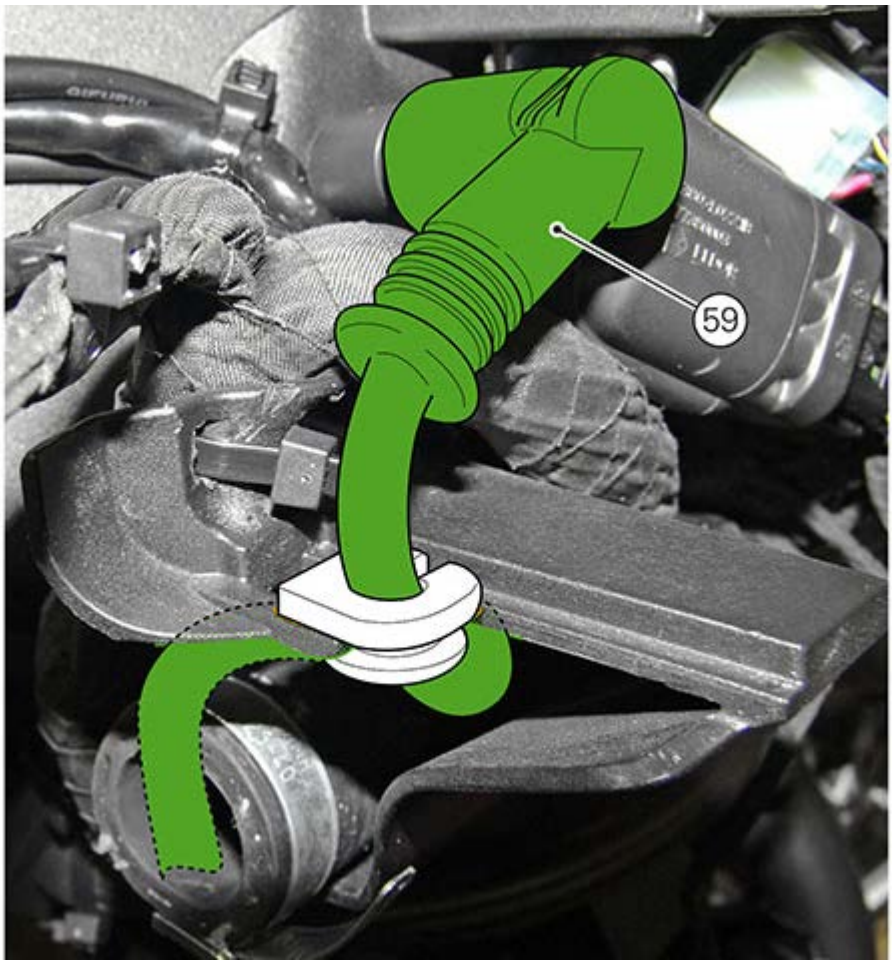

59

Table N

Table N – 38

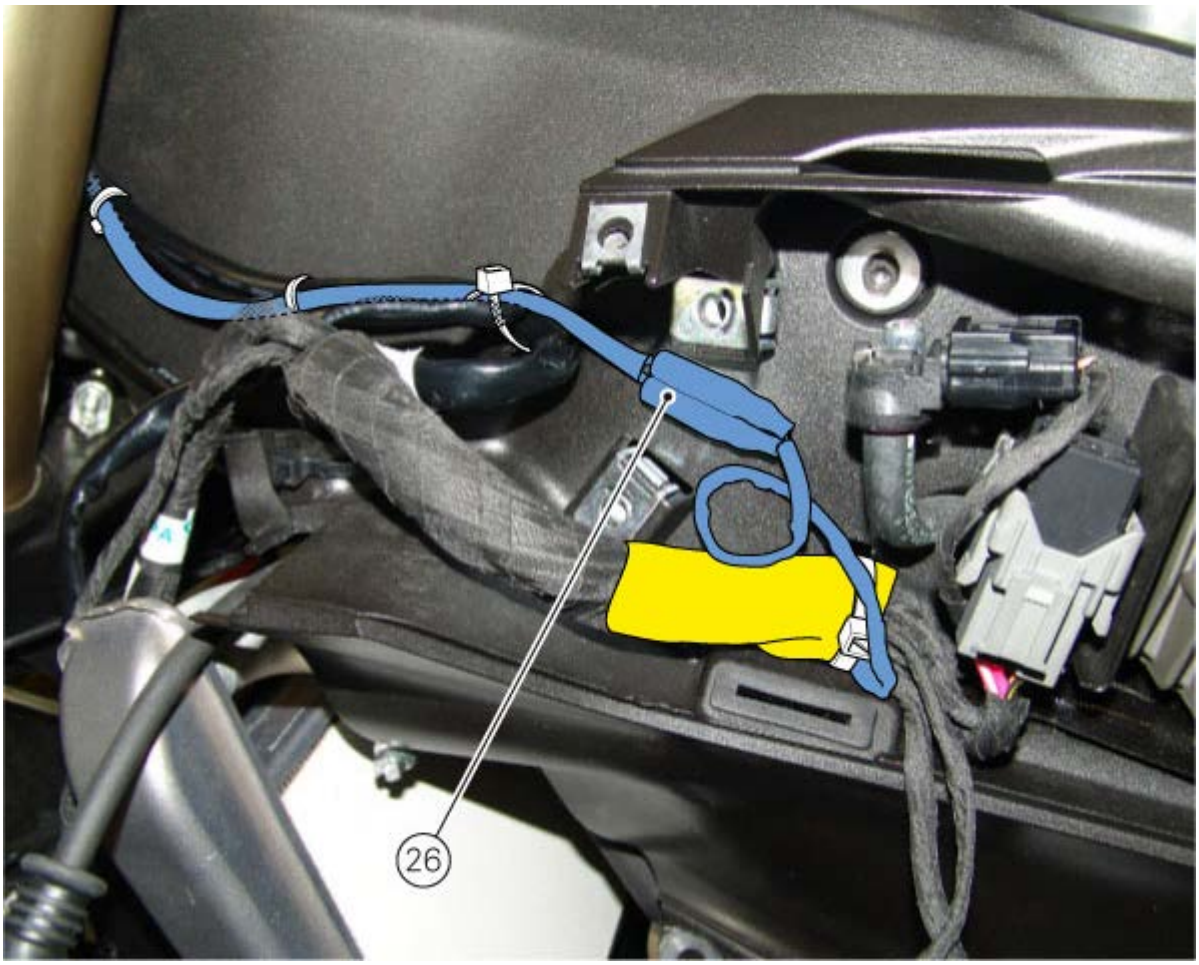


Table N – 39

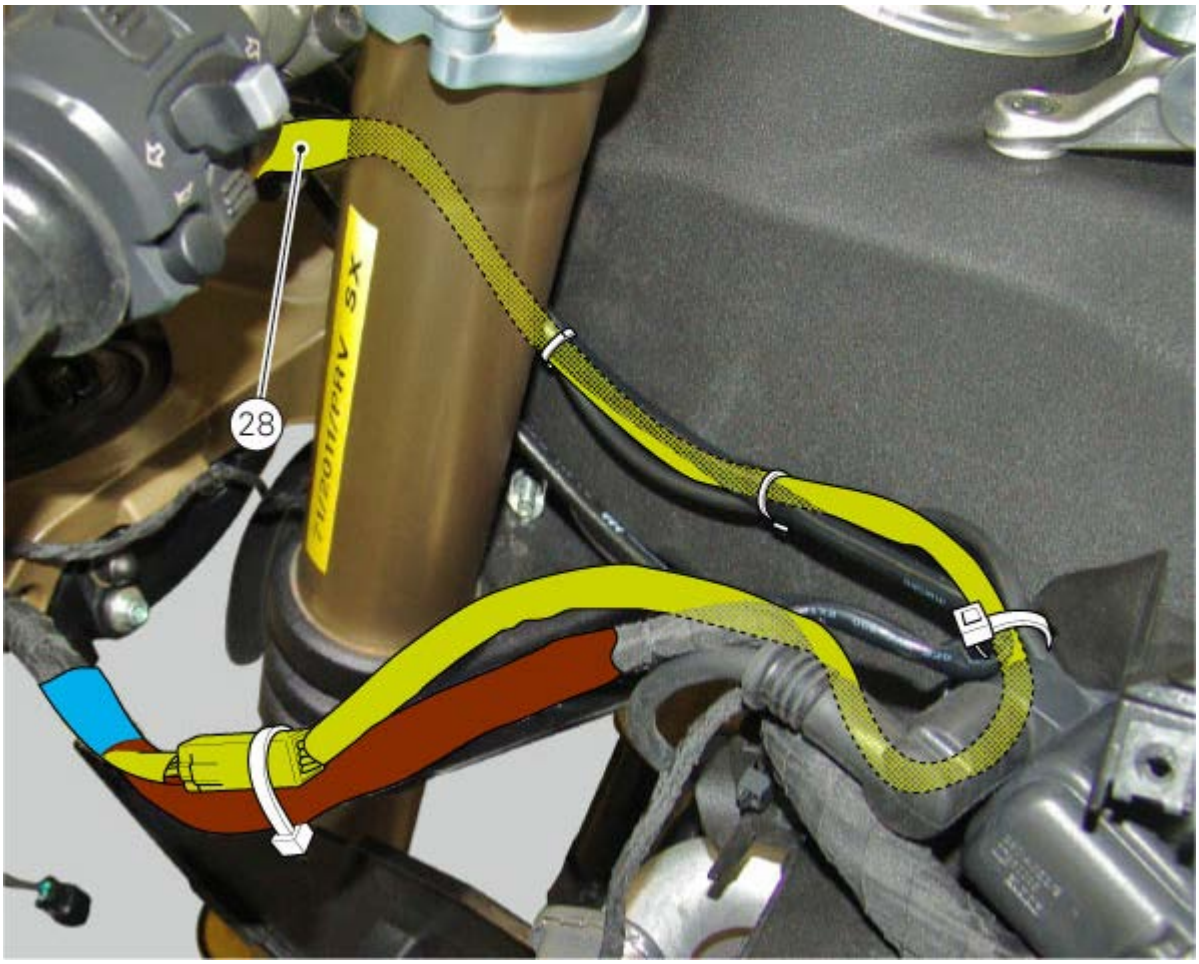


Table N – 40

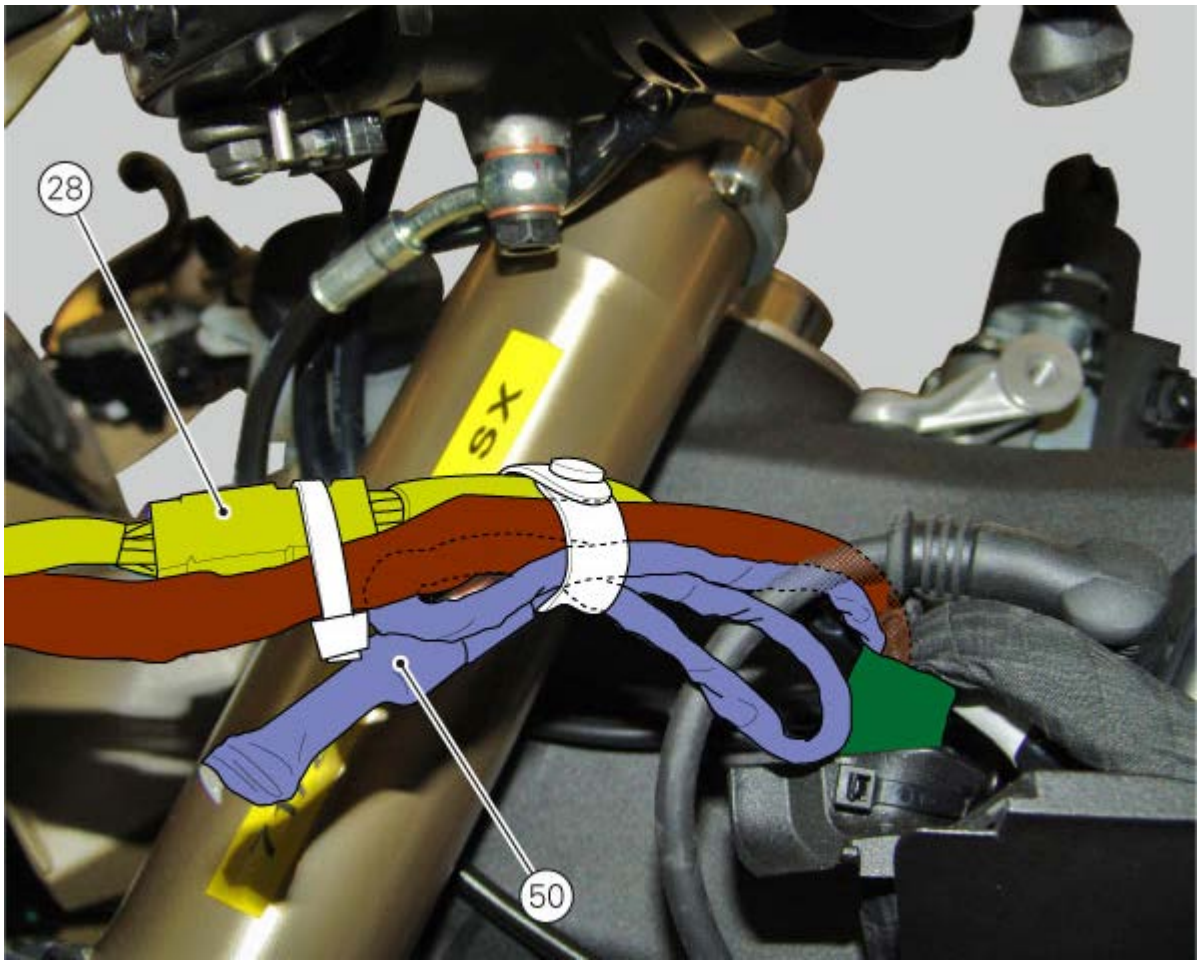

28
SX
50

Table L

Table L – 30

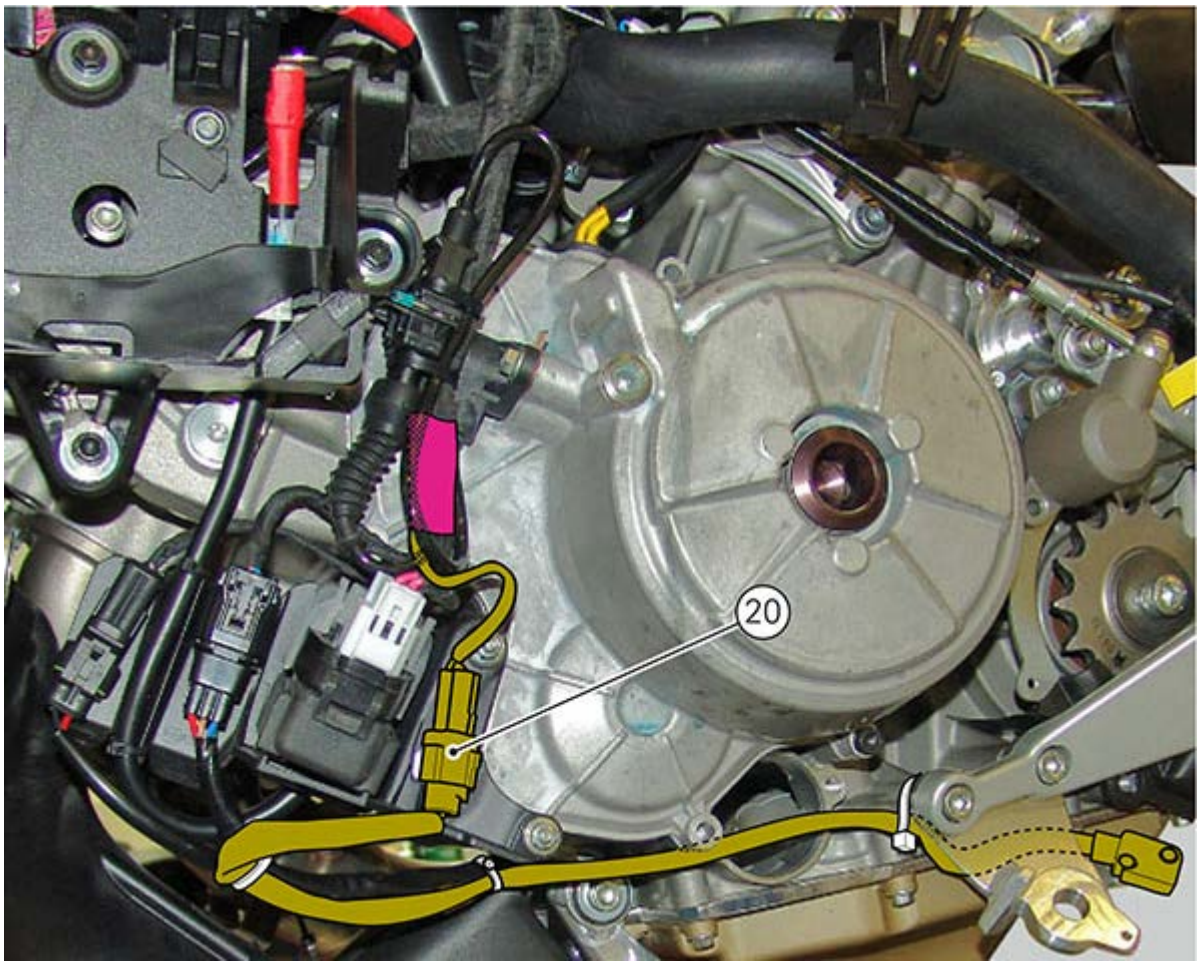
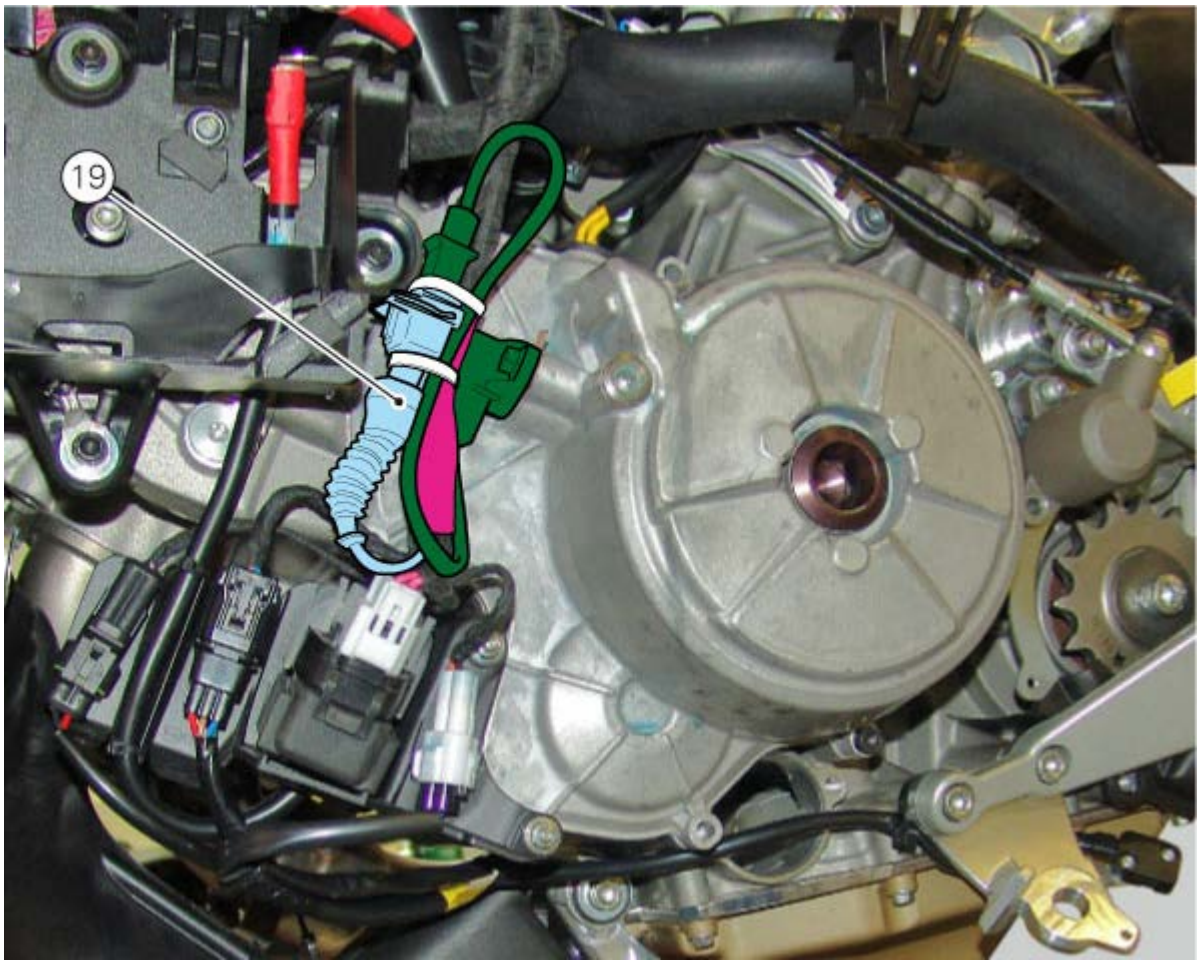


Table L – 31



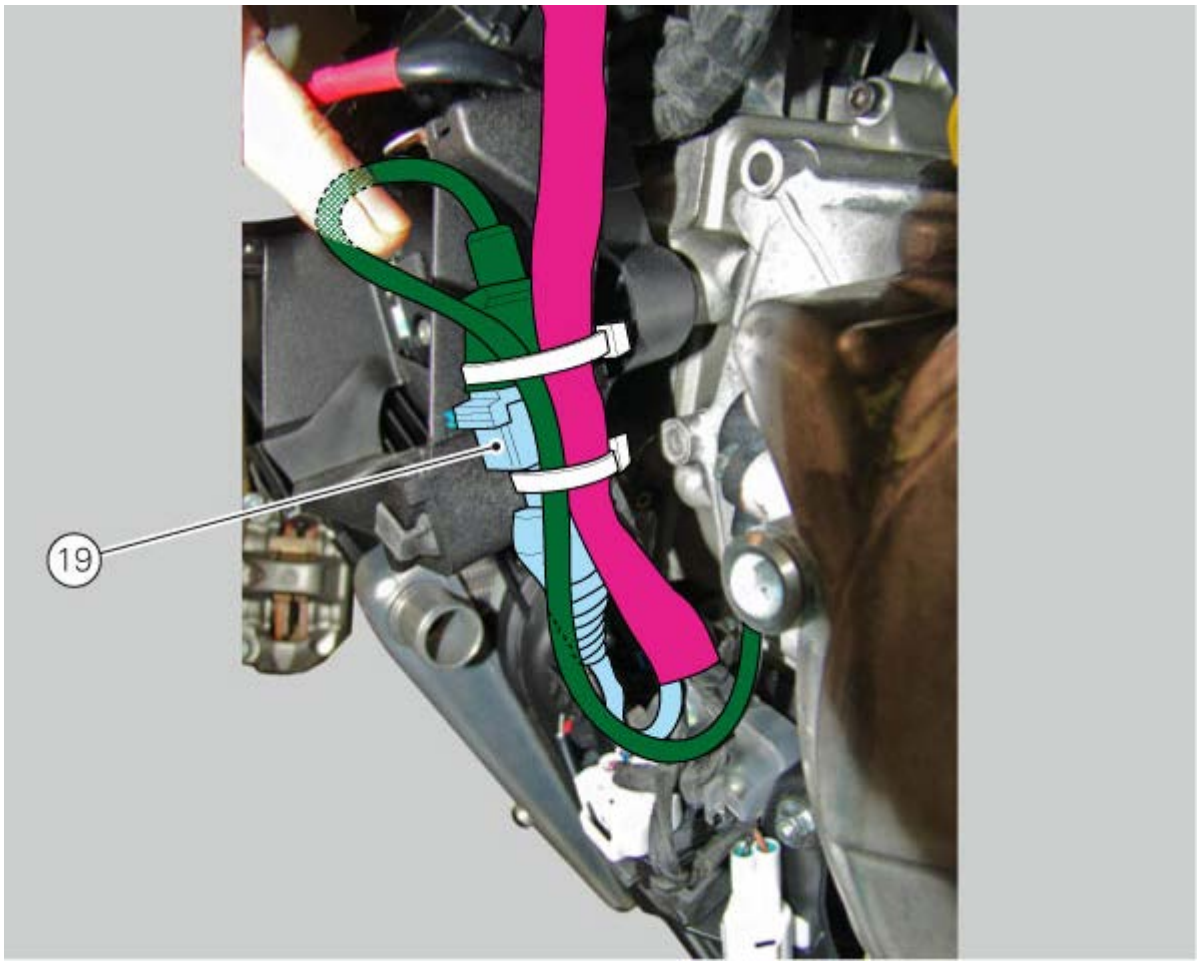


Table L – 32

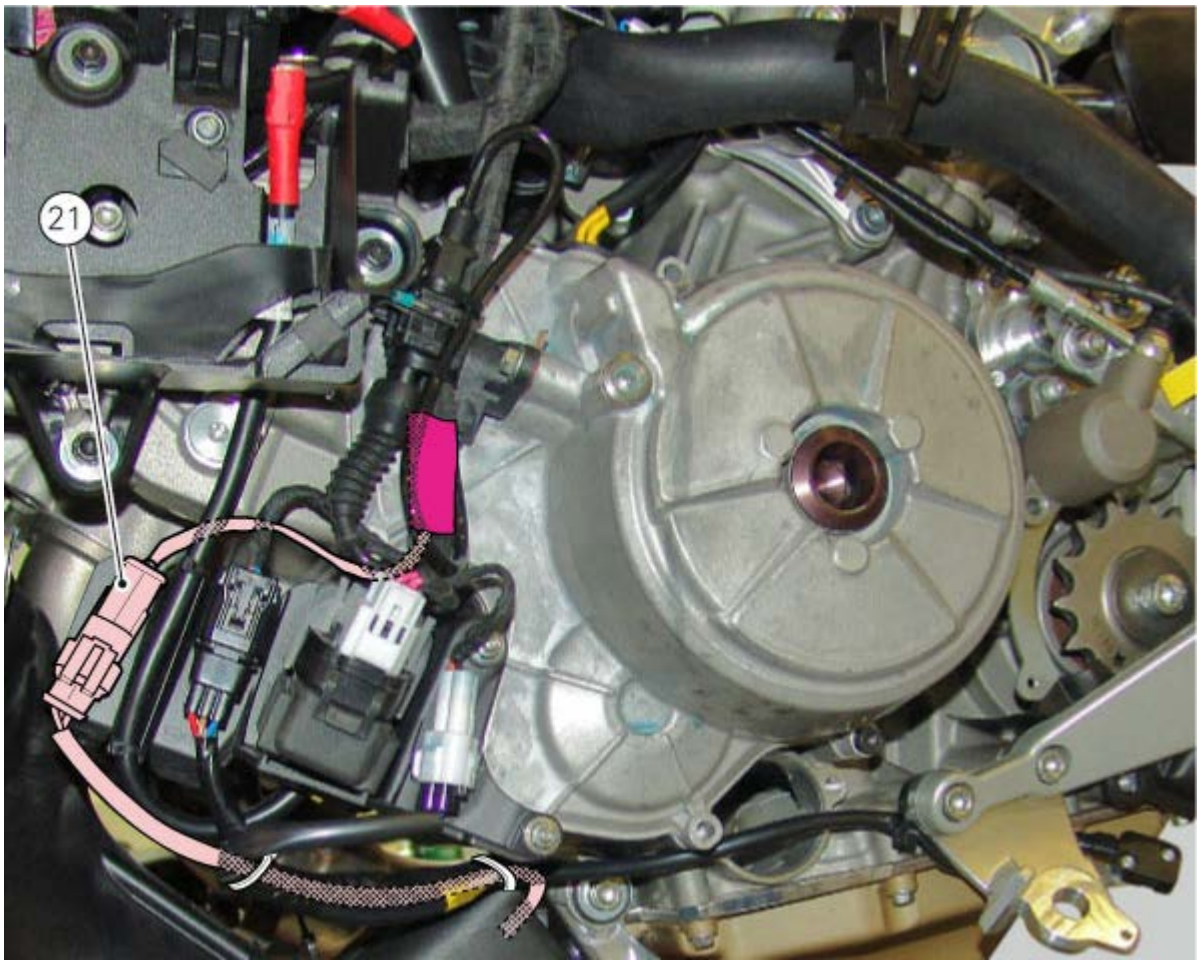


Table L – 33

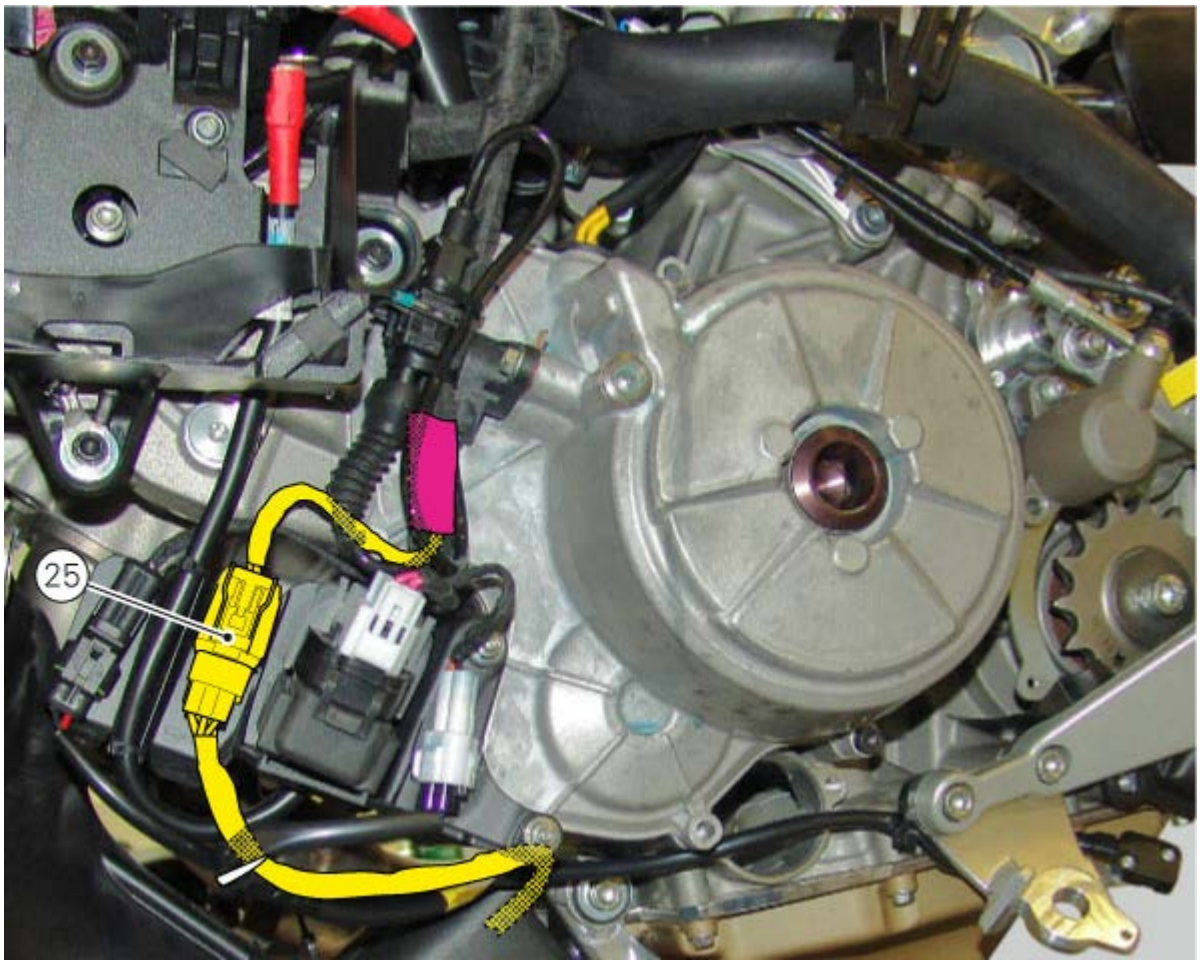


Table L – 34

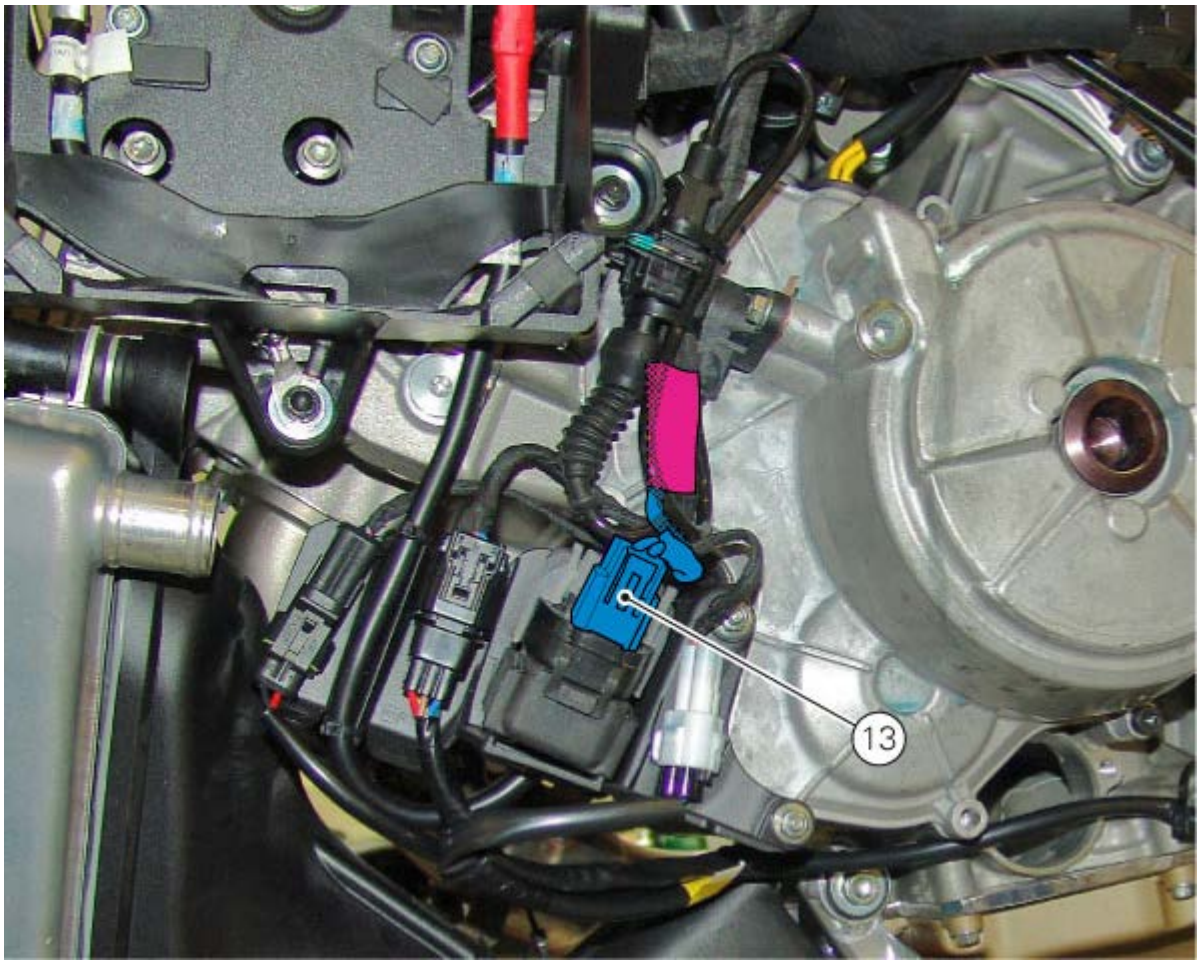


Table L – 35

Table L – 36

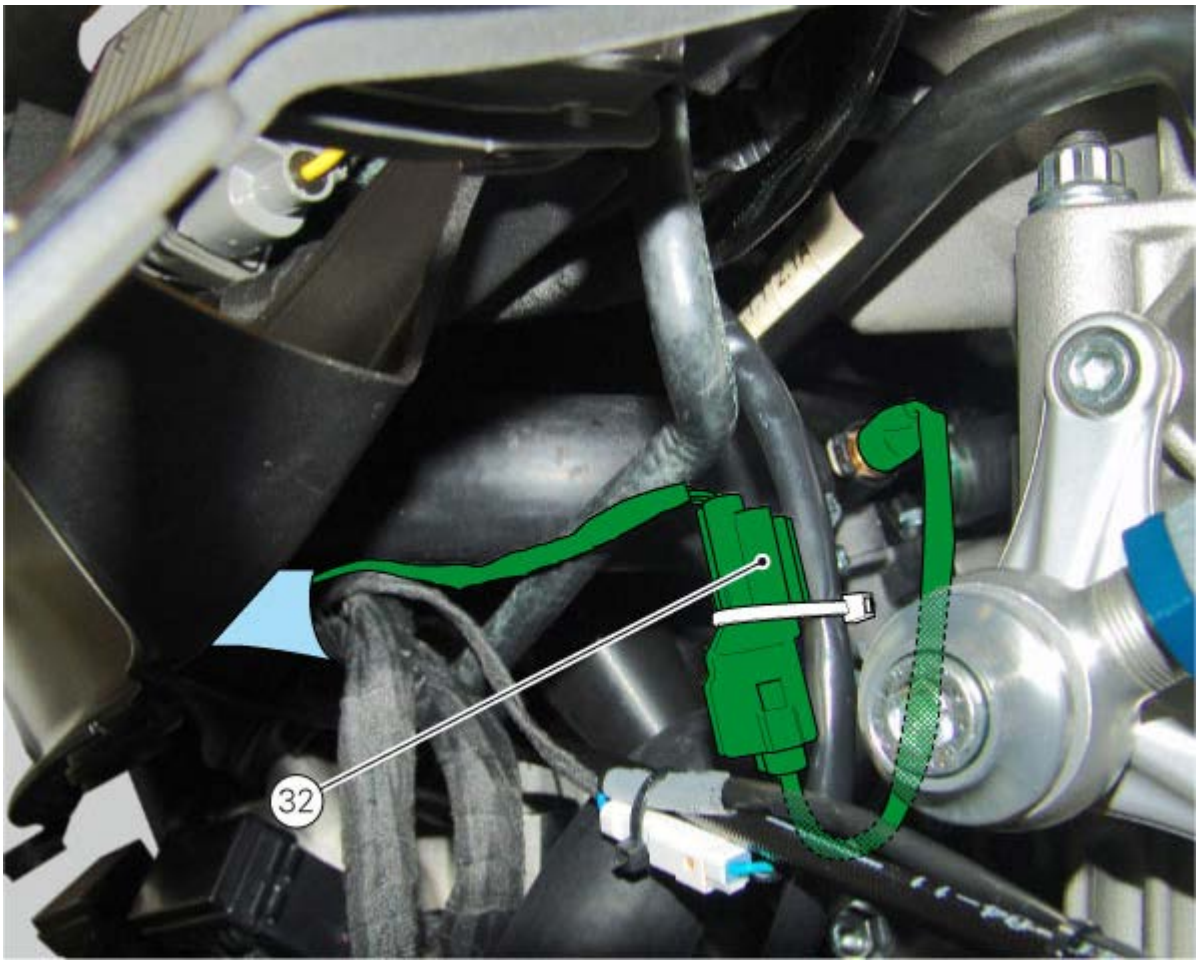


Table K

Table K – 29

Table J

Table J – 22

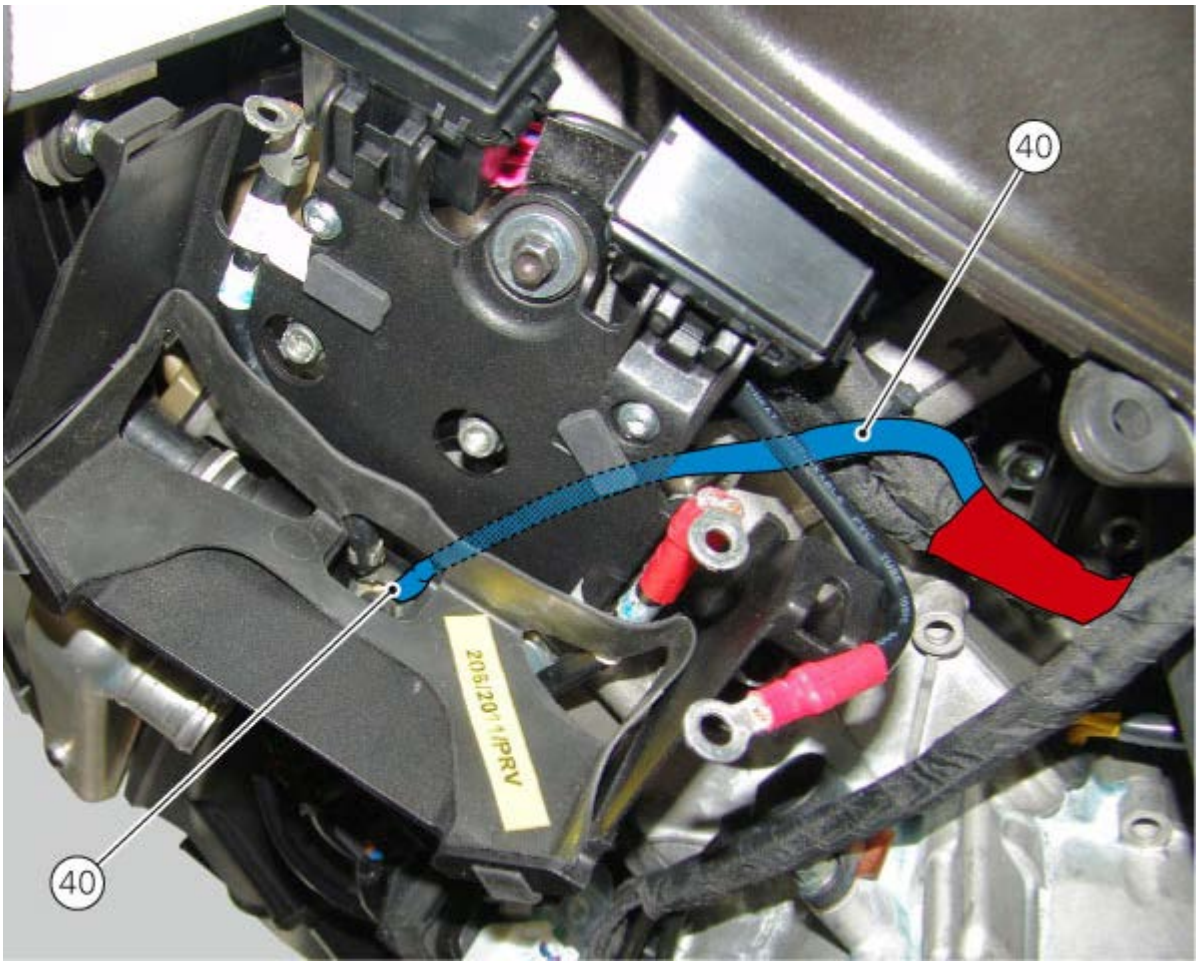


Table J – 23

Table J – 24

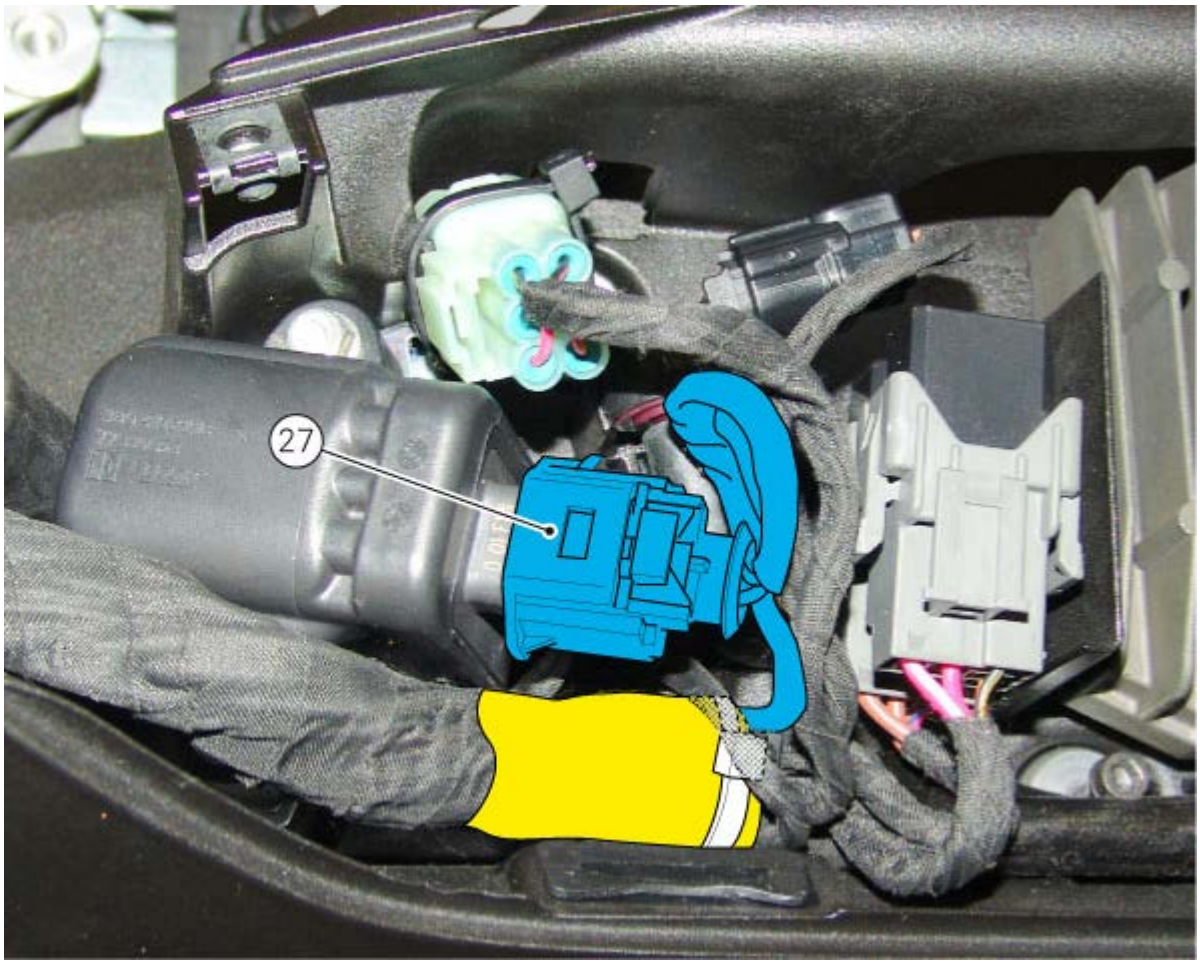


Table J – 25

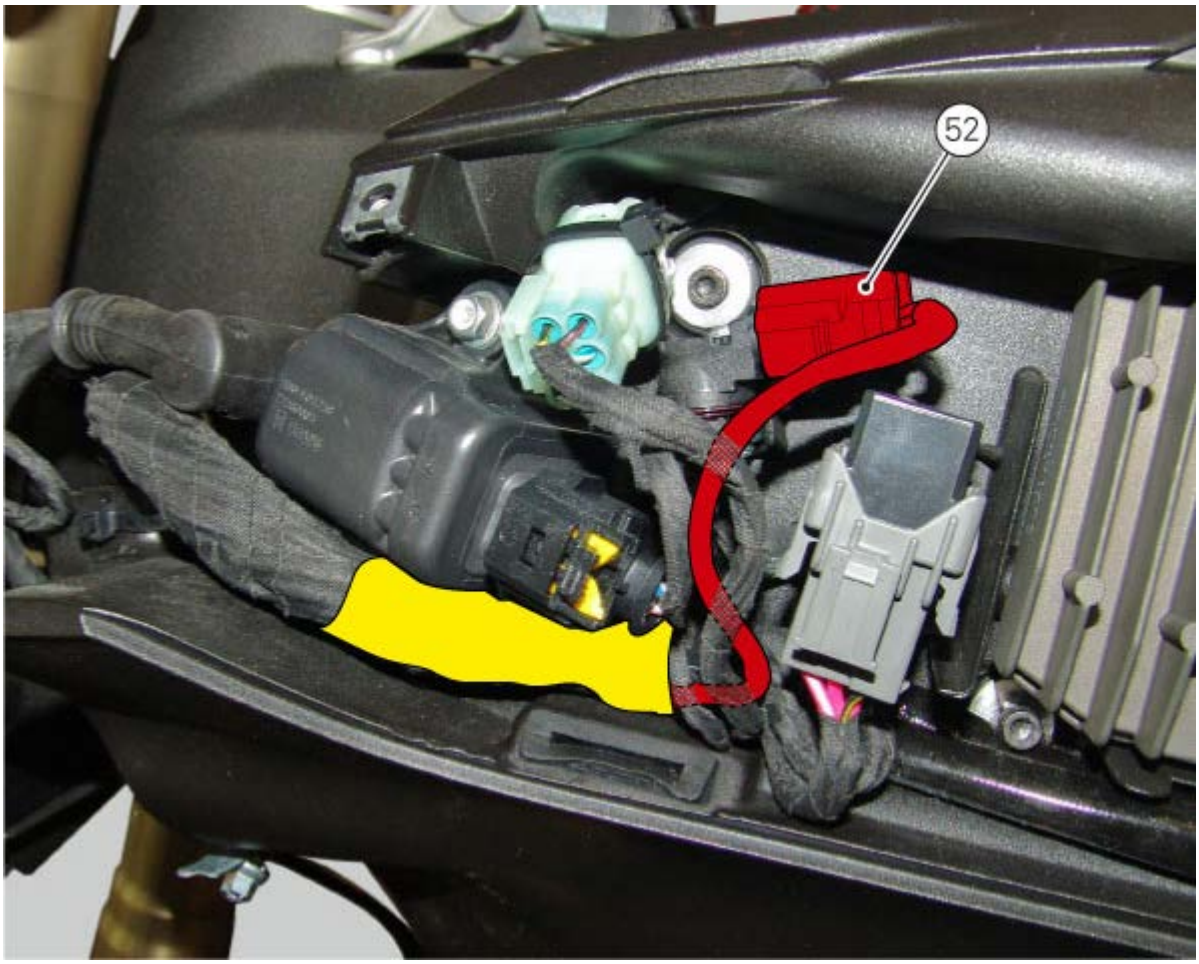


Table J – 26

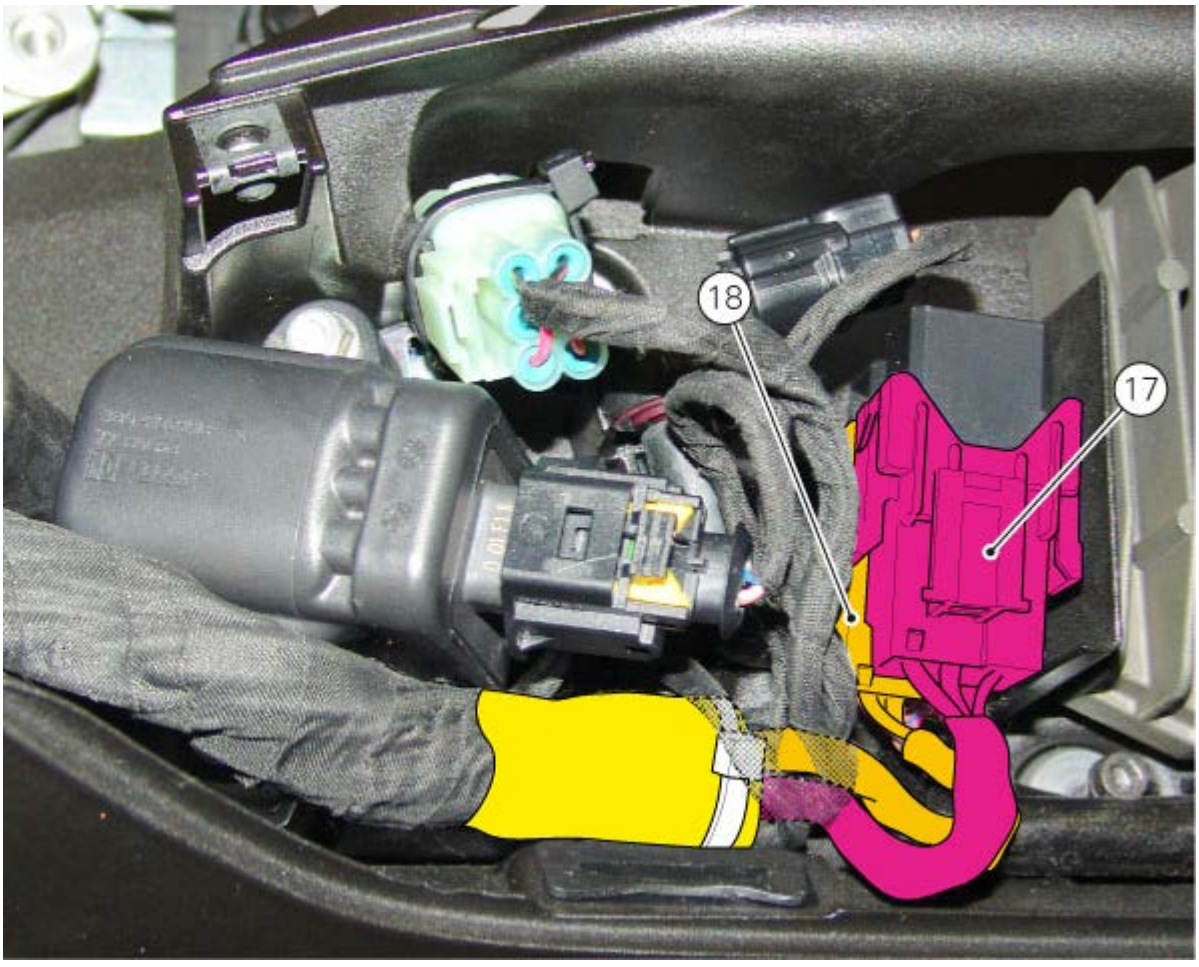


Table J – 27

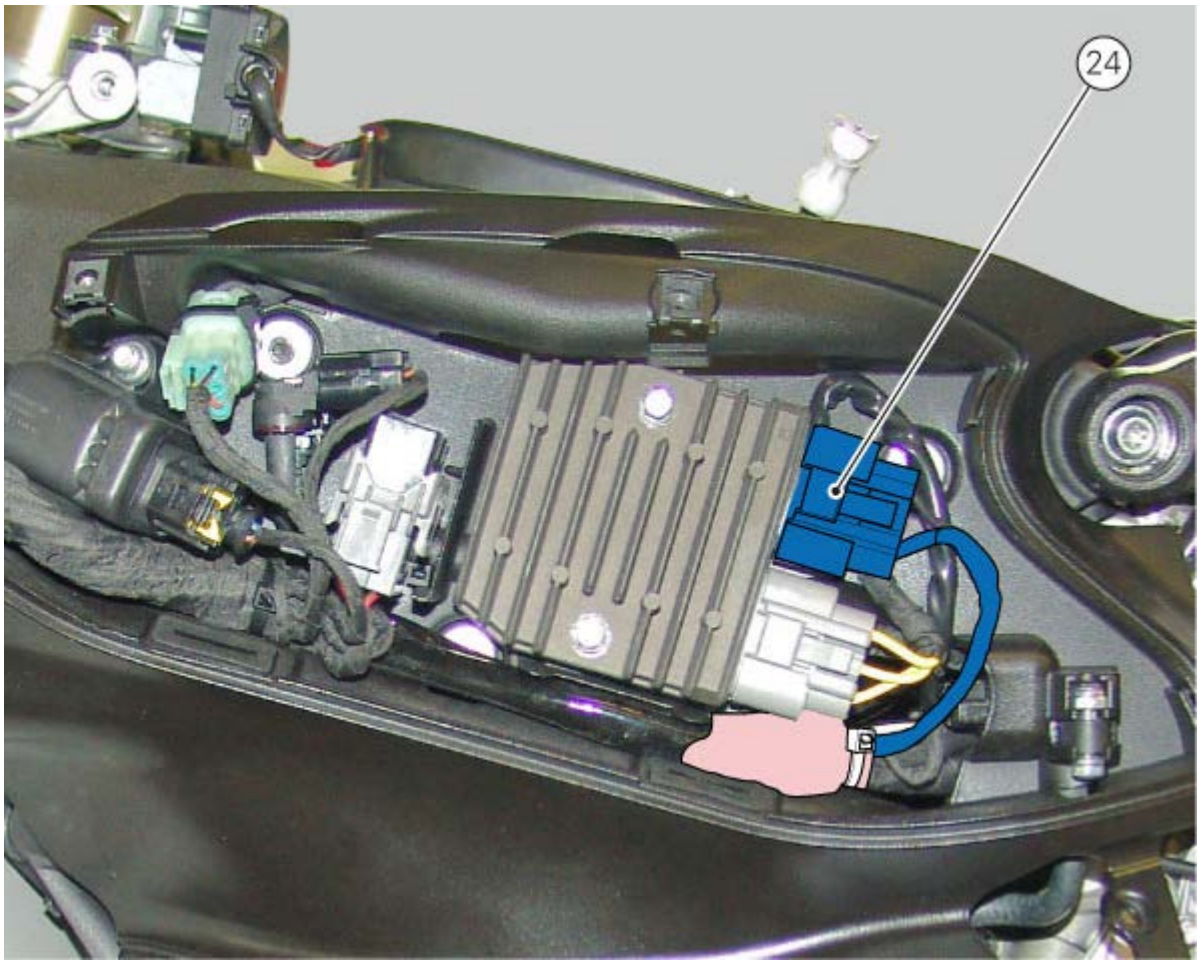


Table J – 28

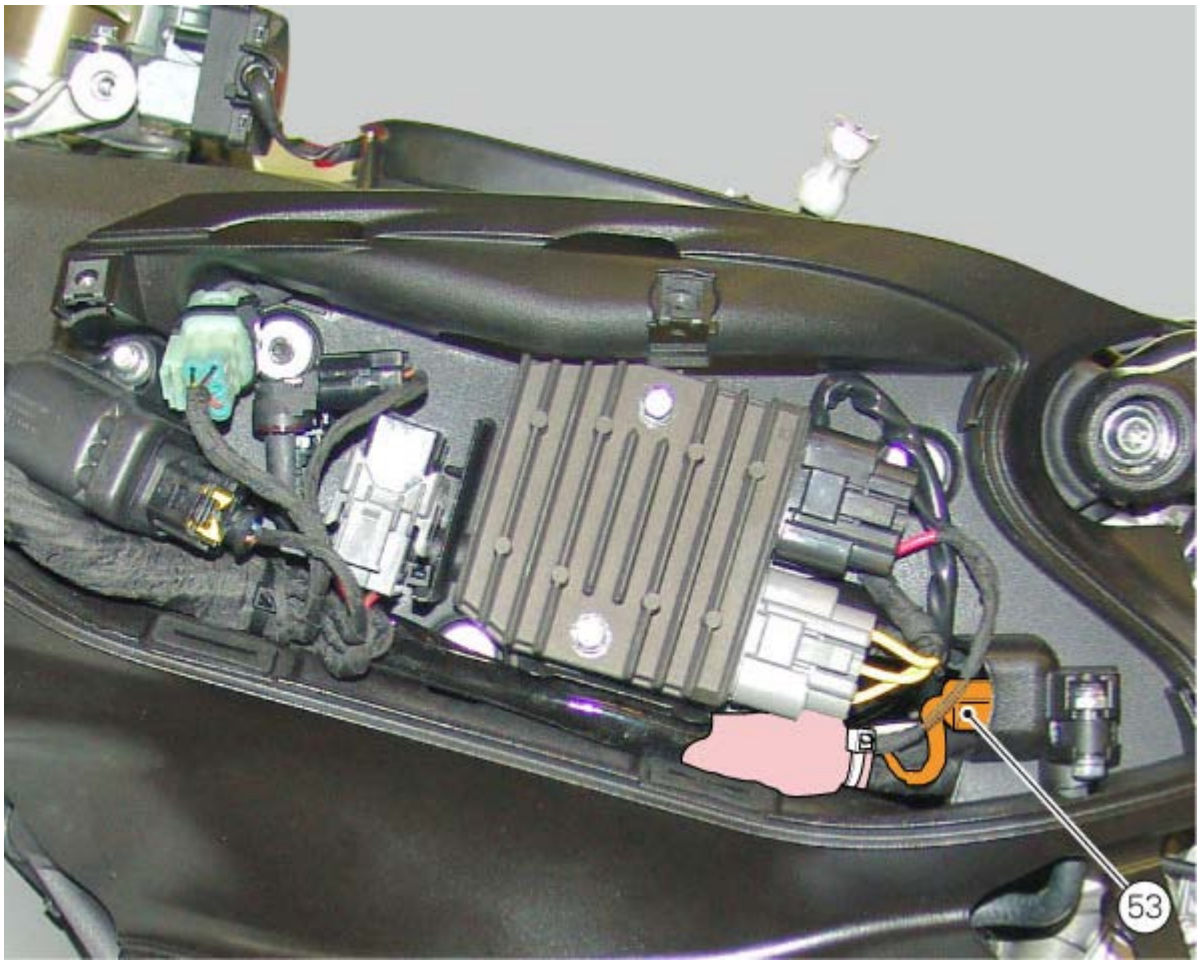


Table I

Table I – 21

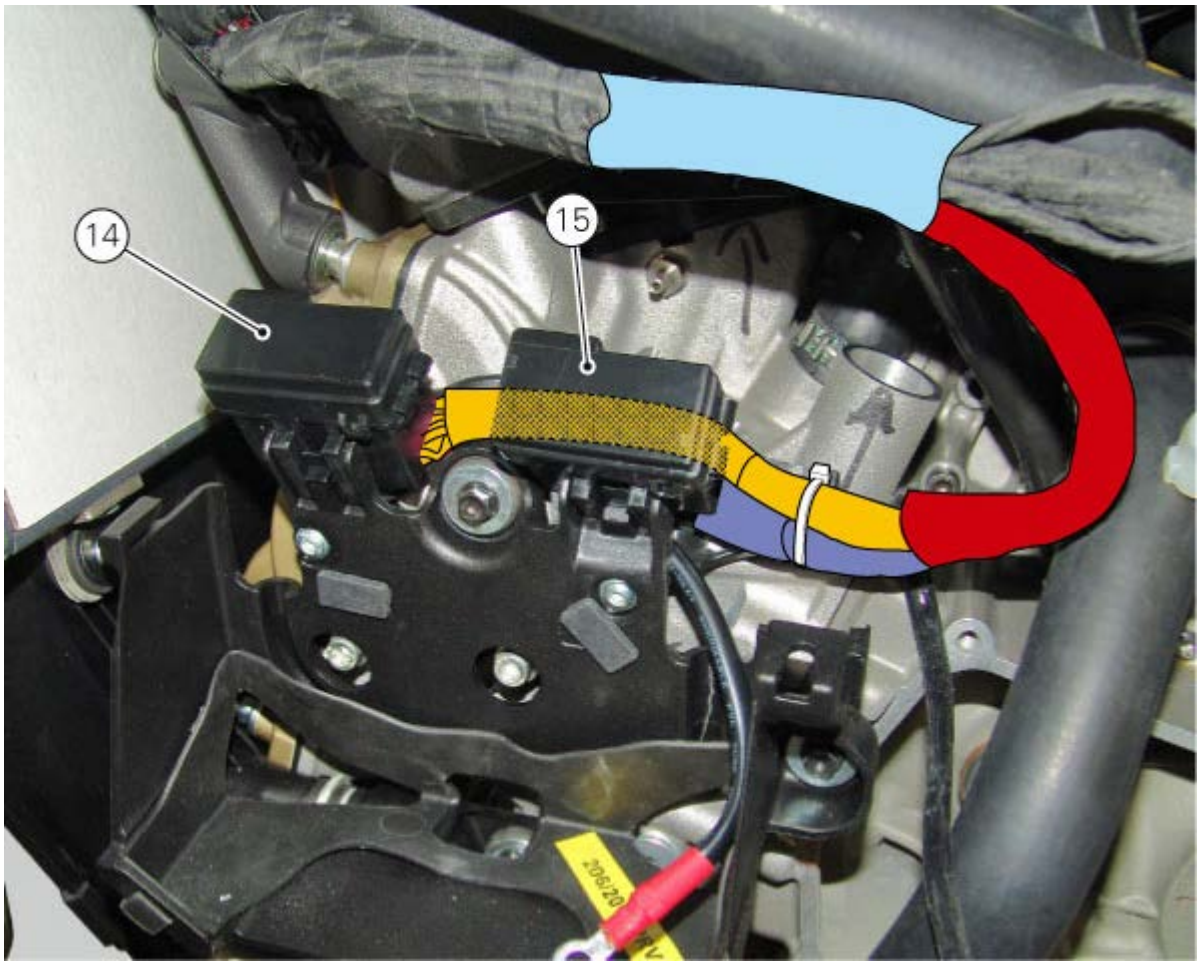


Table H

Table H – 20

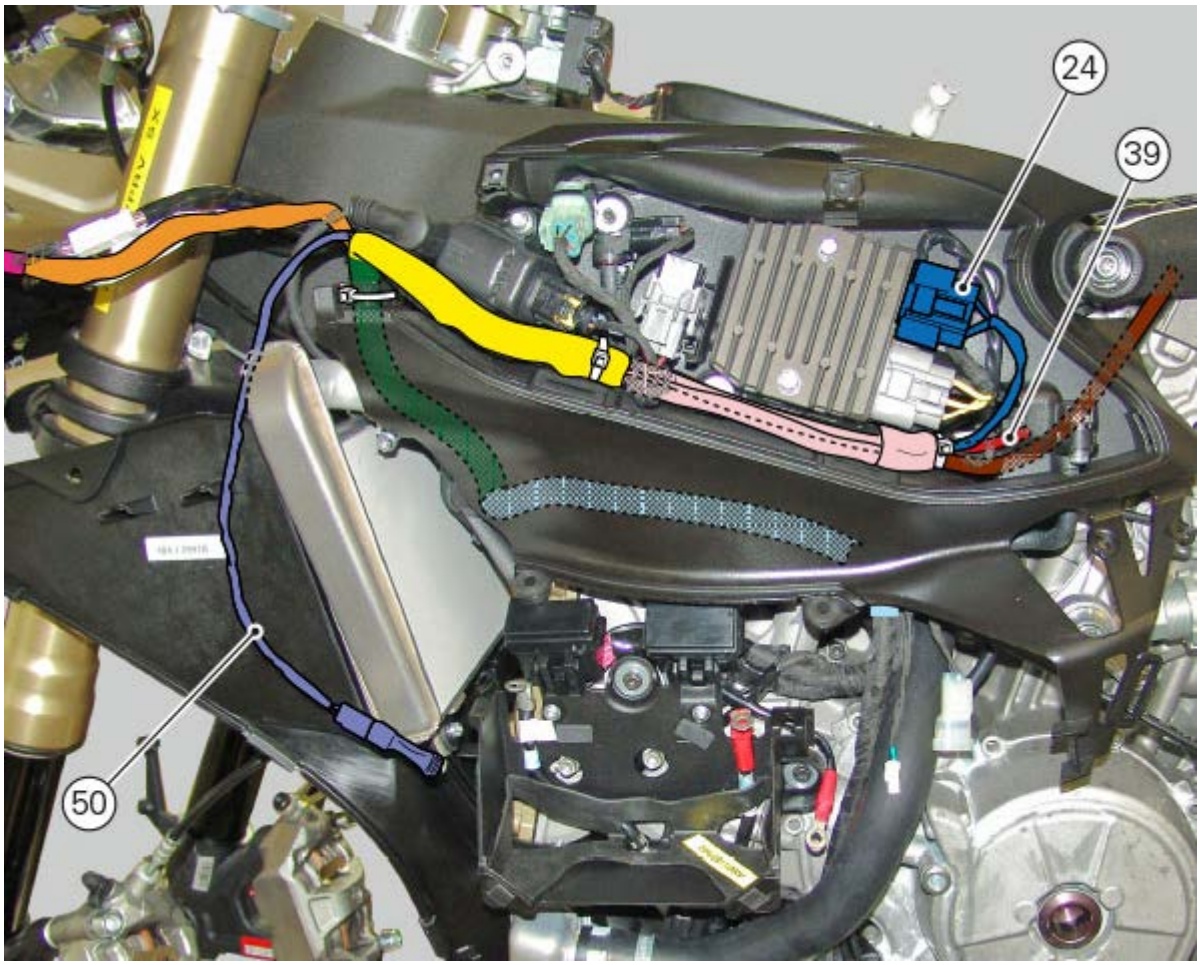


Table G

Table G – 19

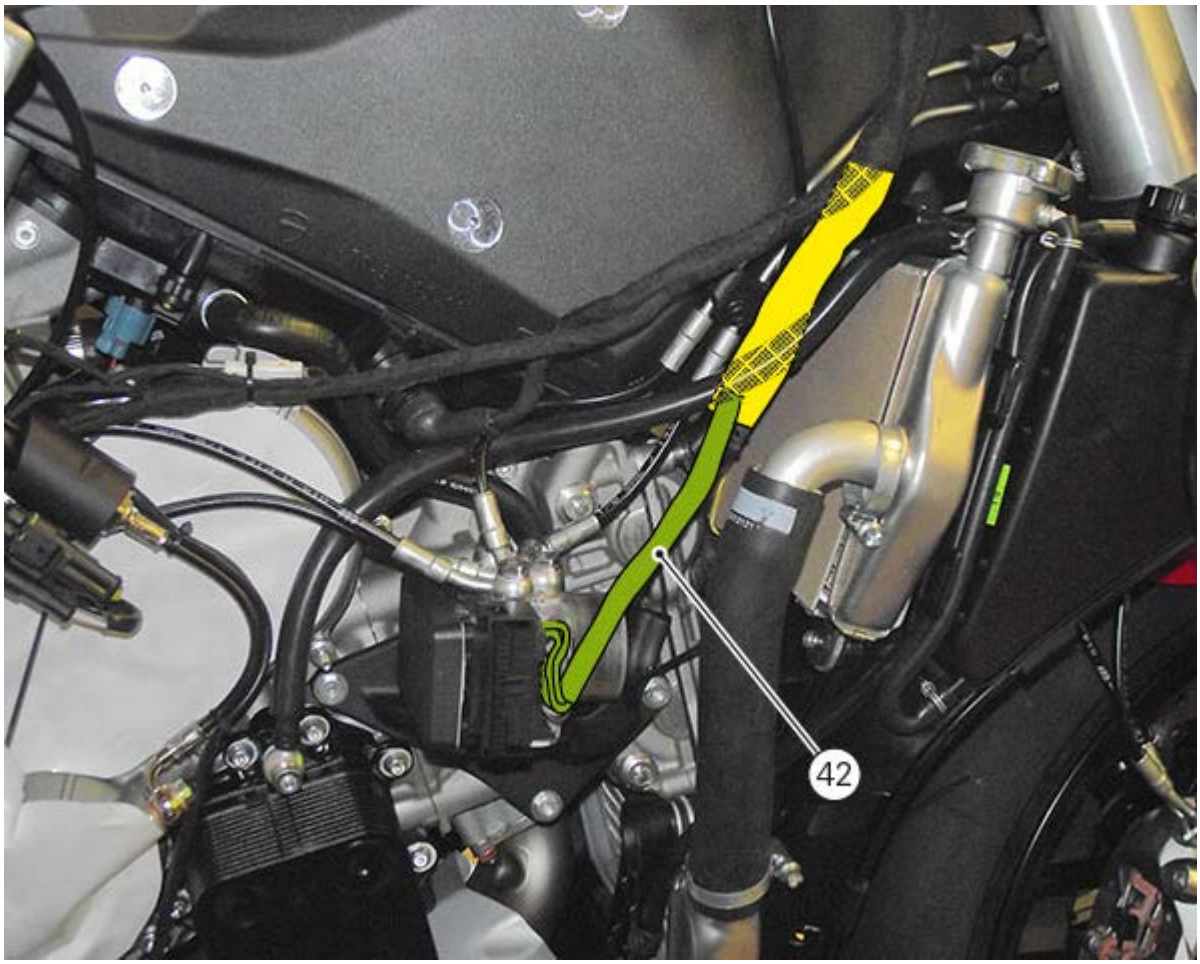

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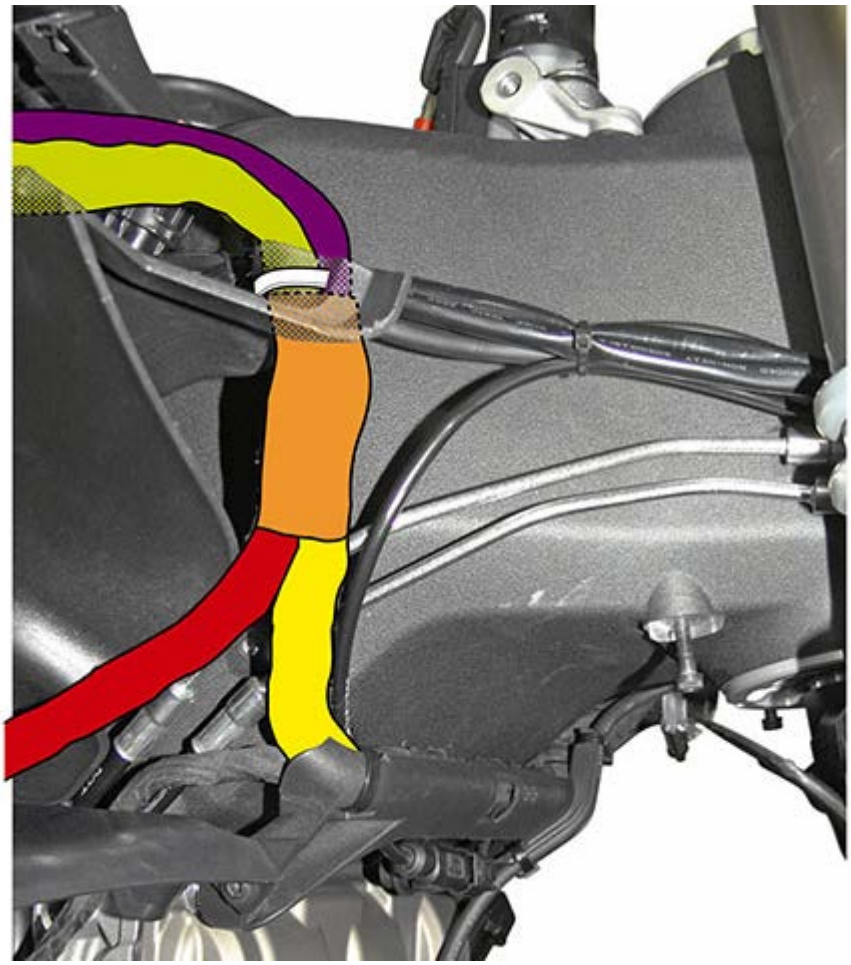
Table F

Table F – 18



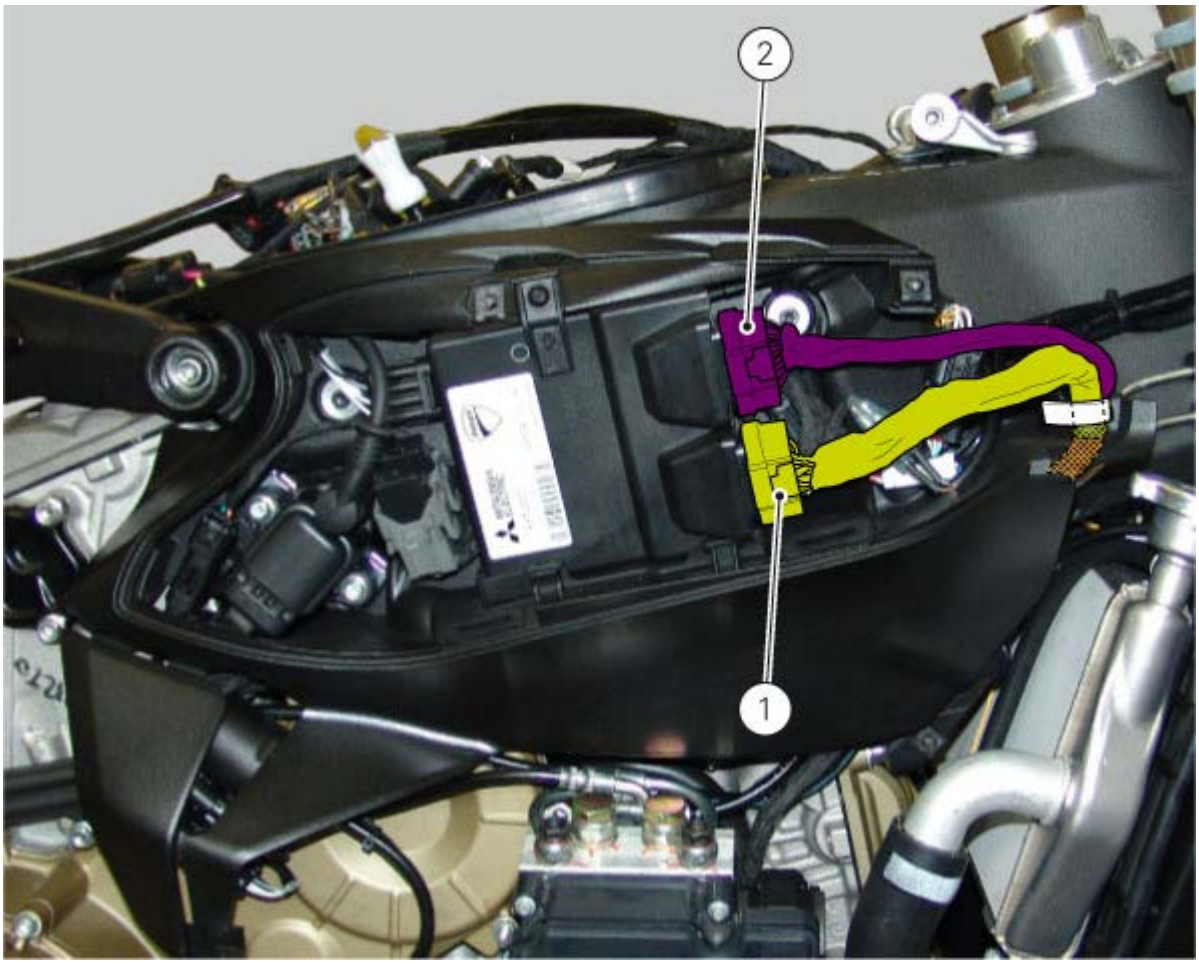

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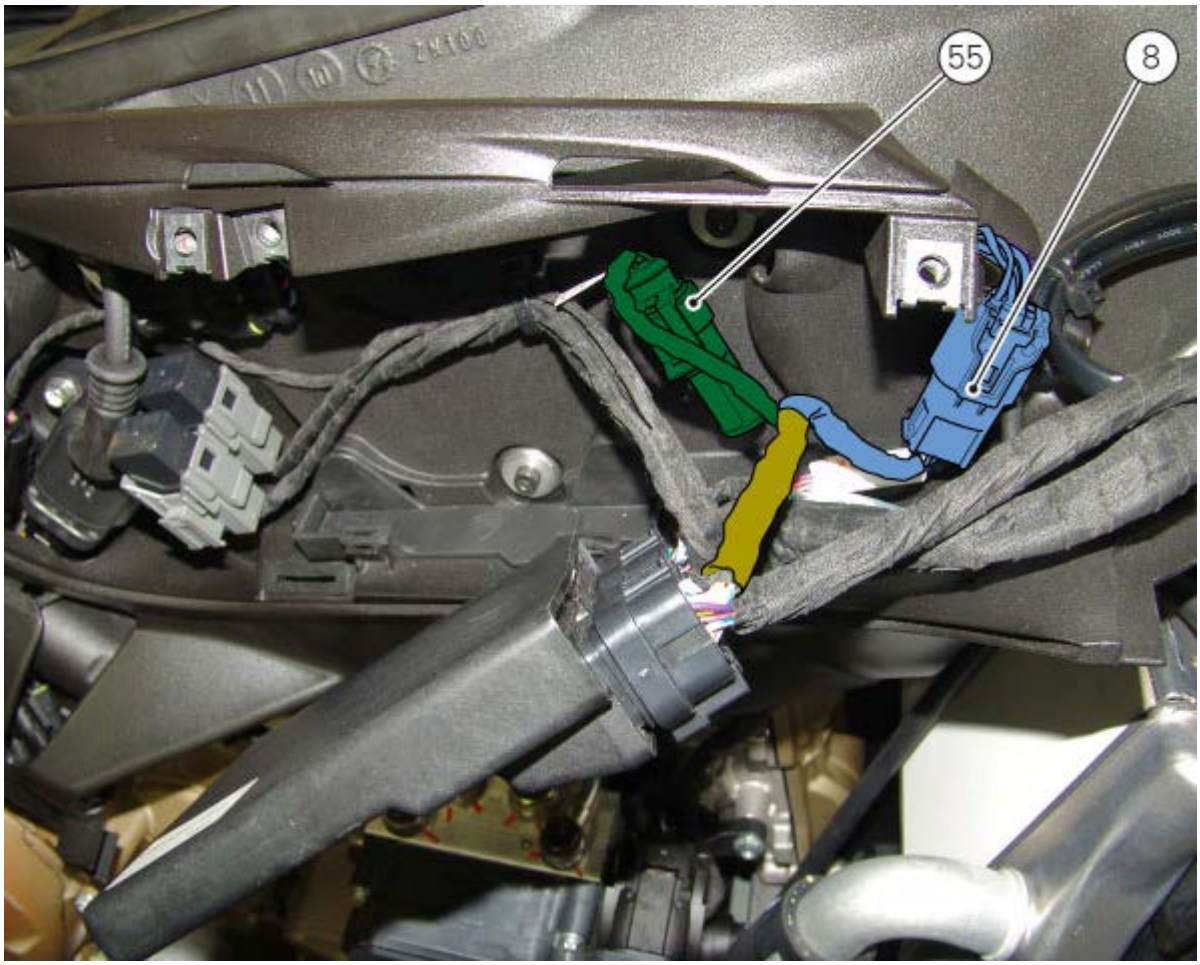
Table D

Table D – 13



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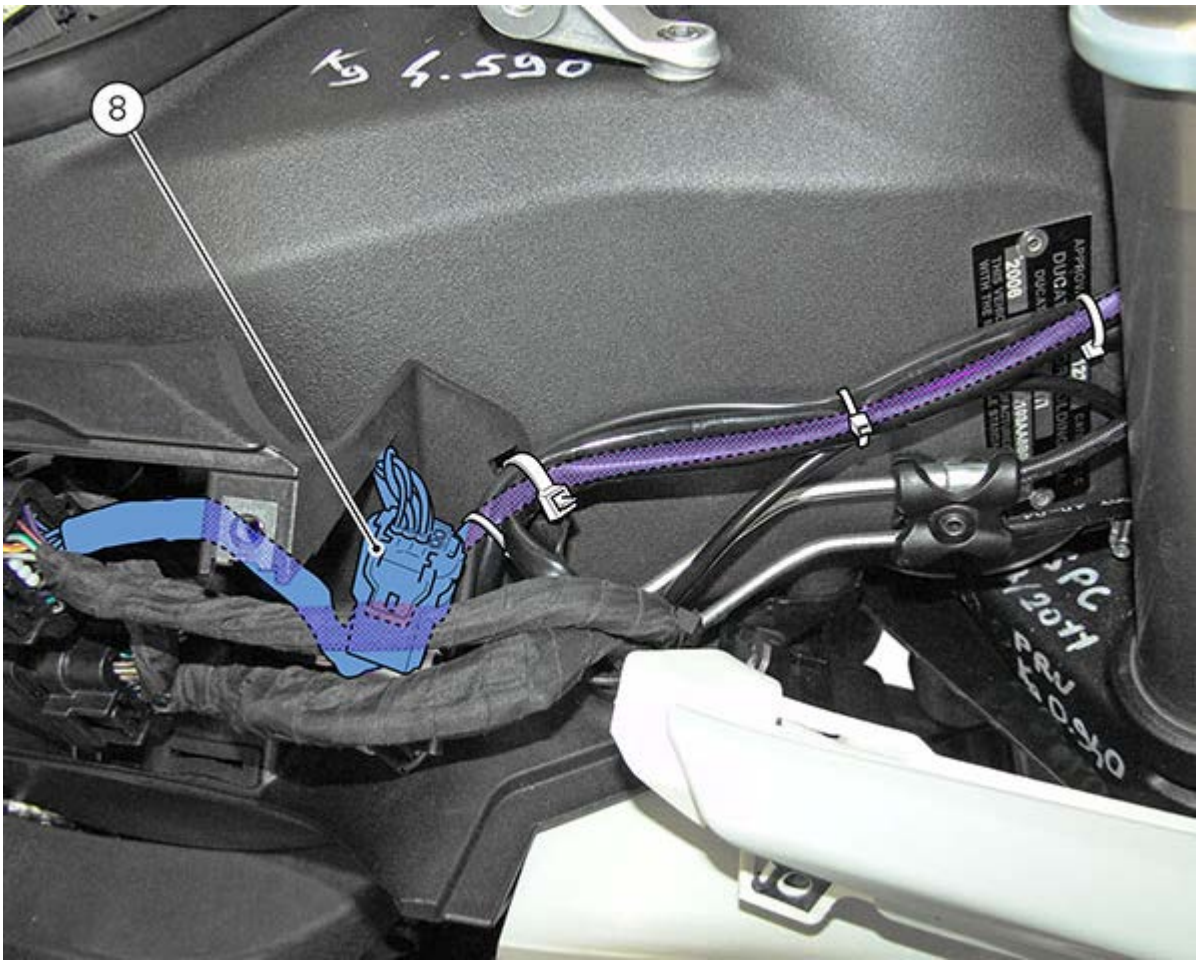


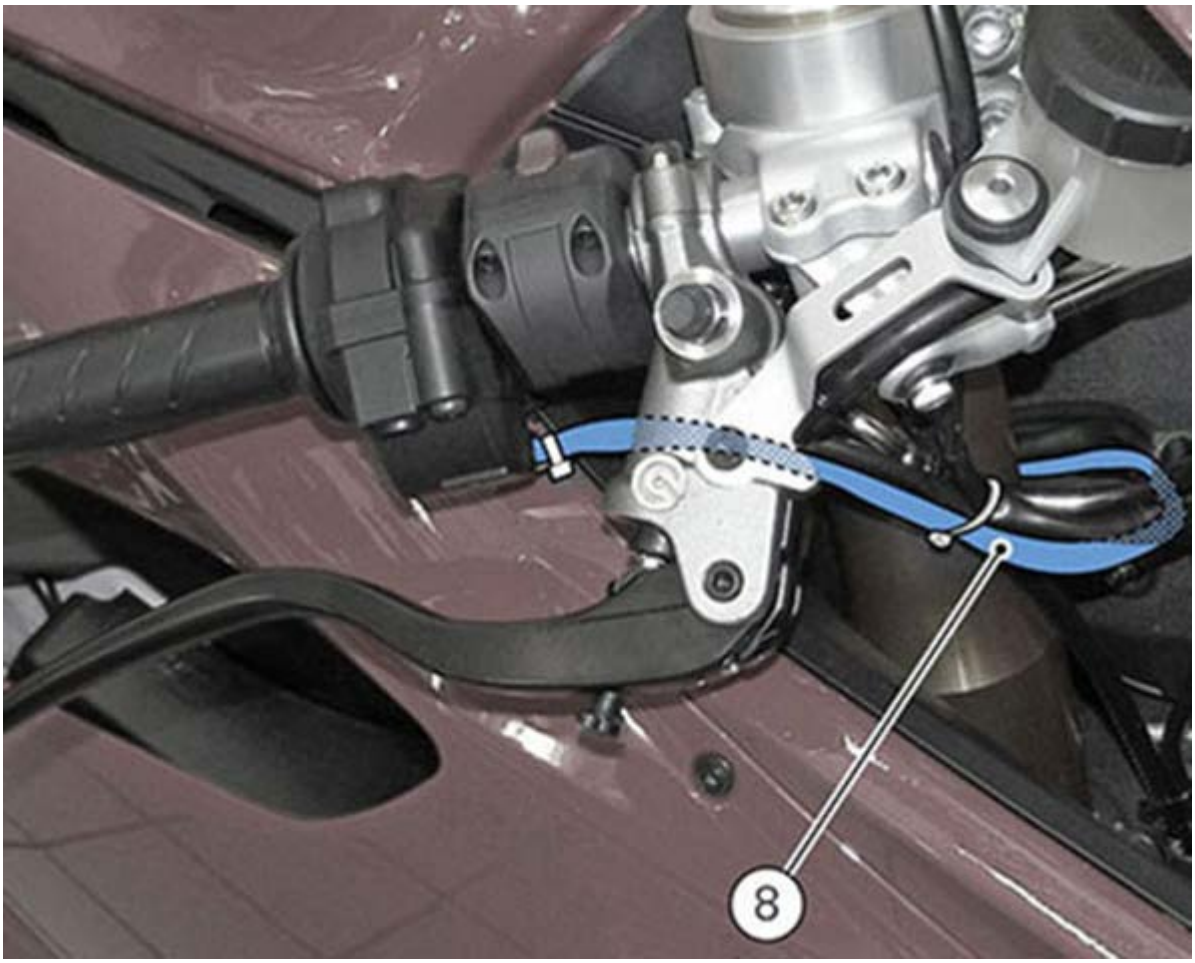
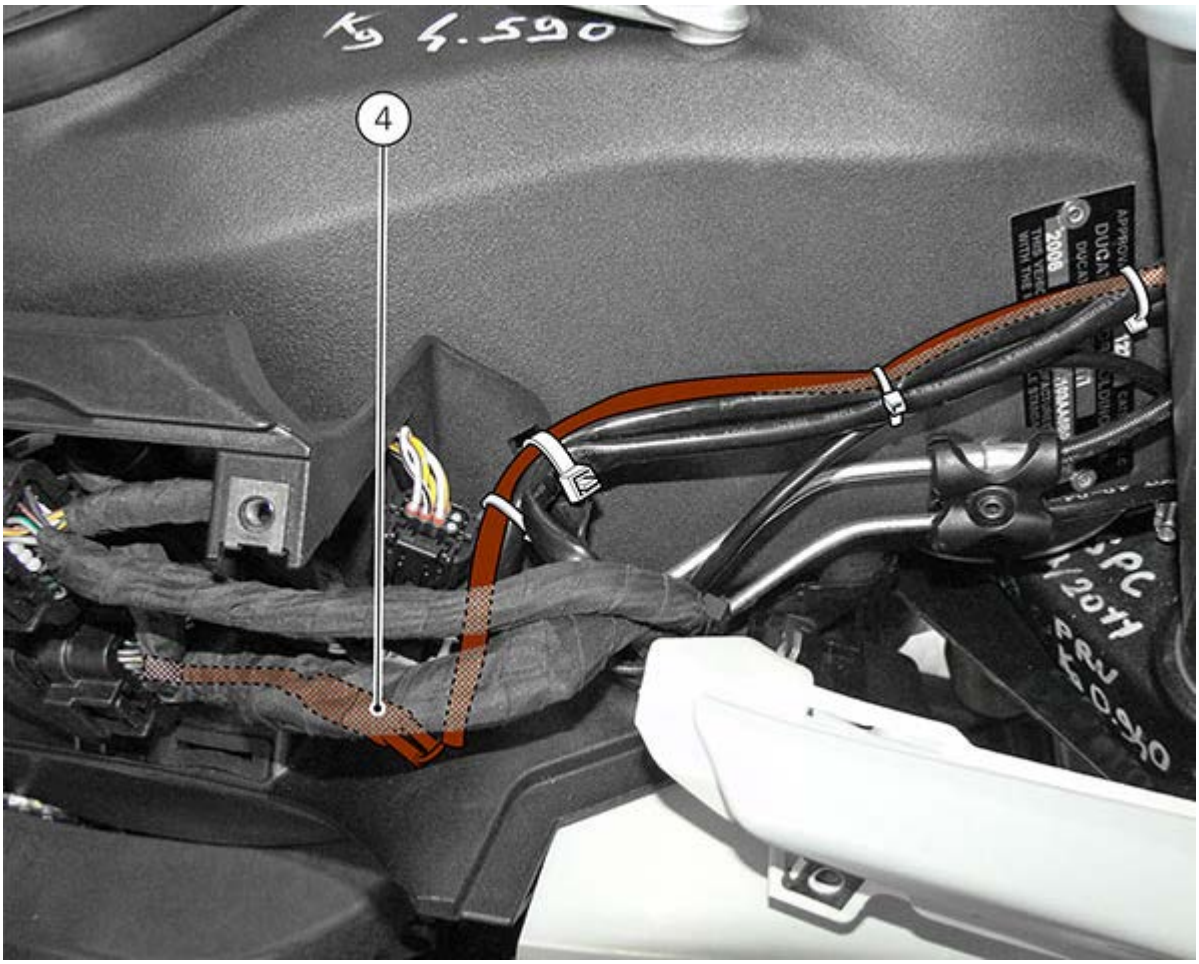
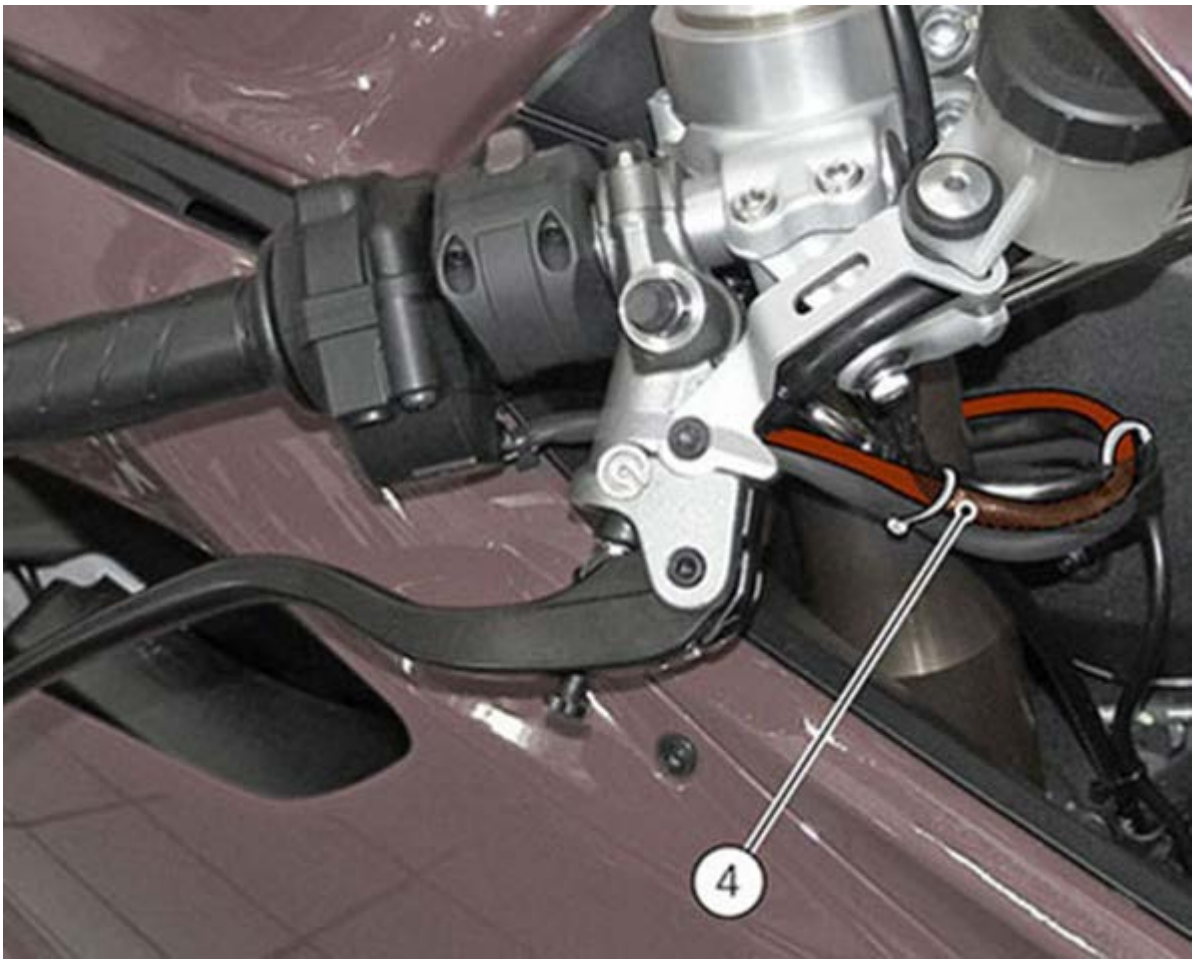


Table D – 15





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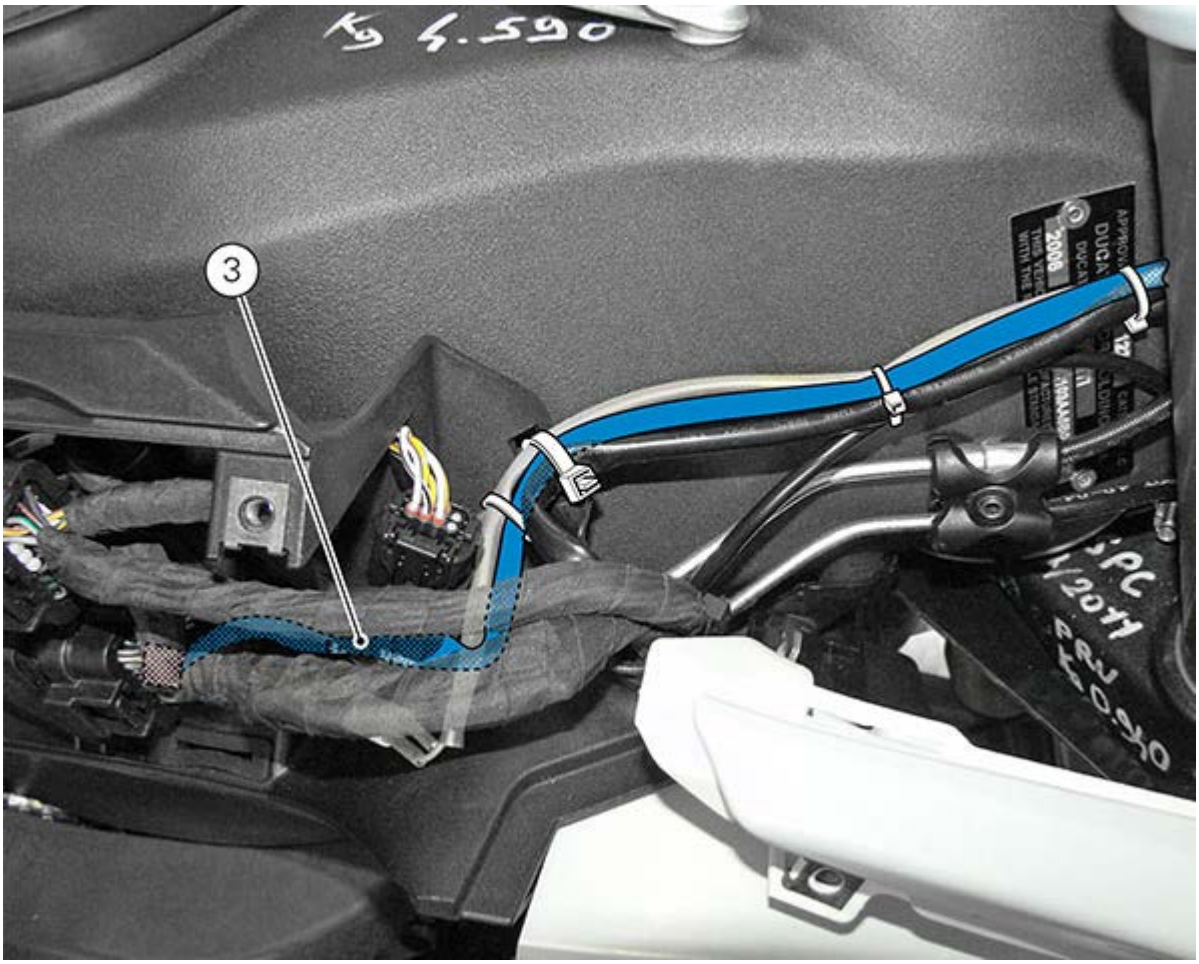
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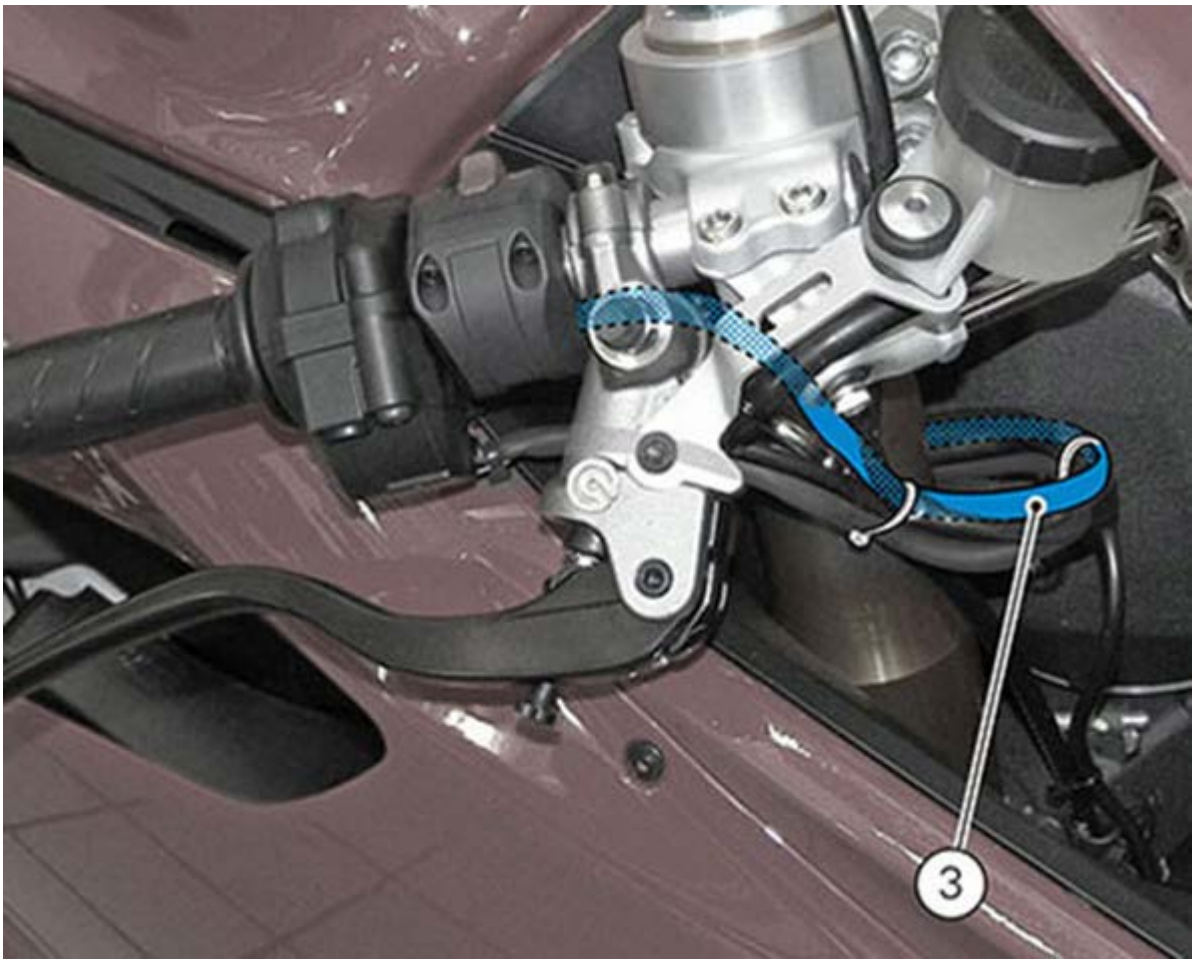
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Table C

Table C – 12

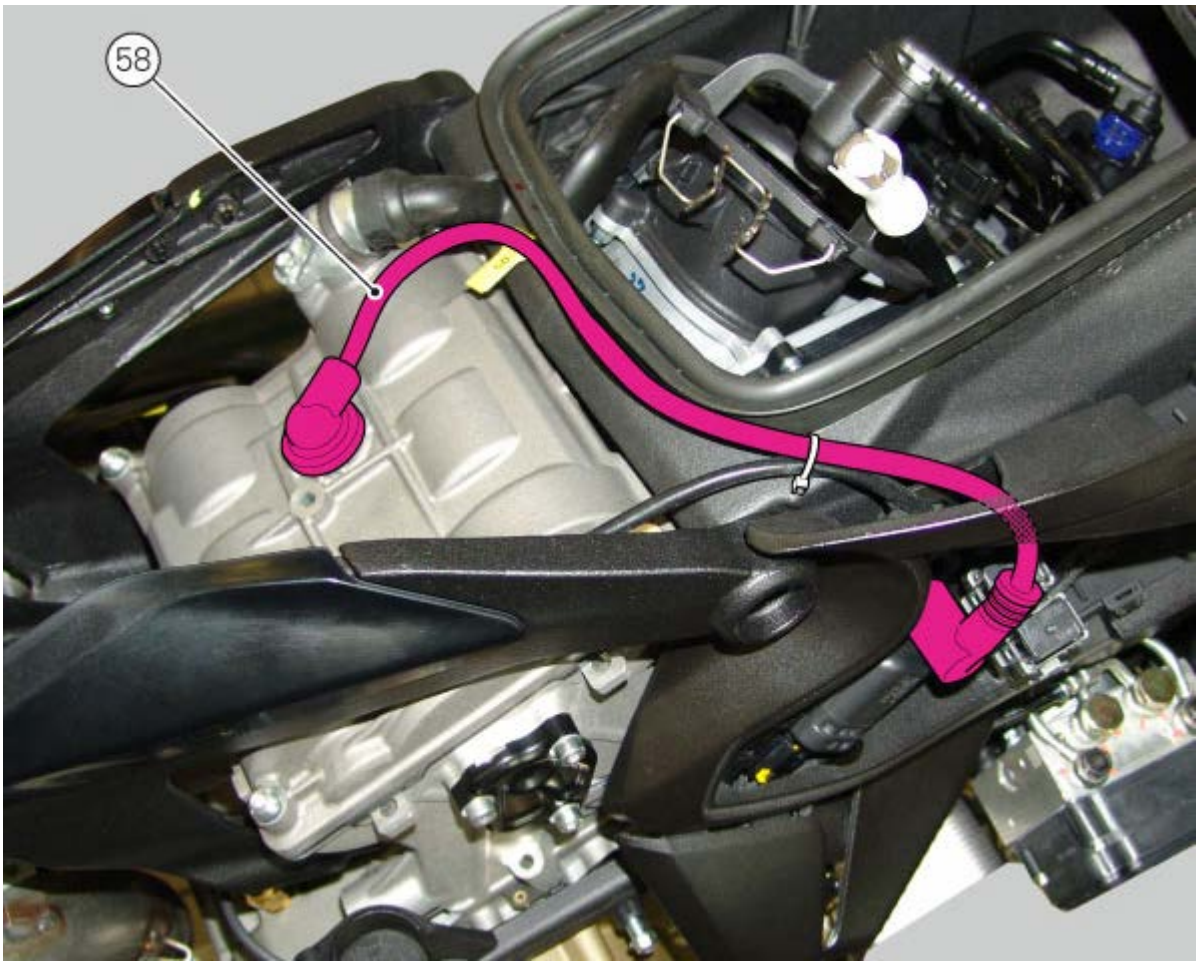
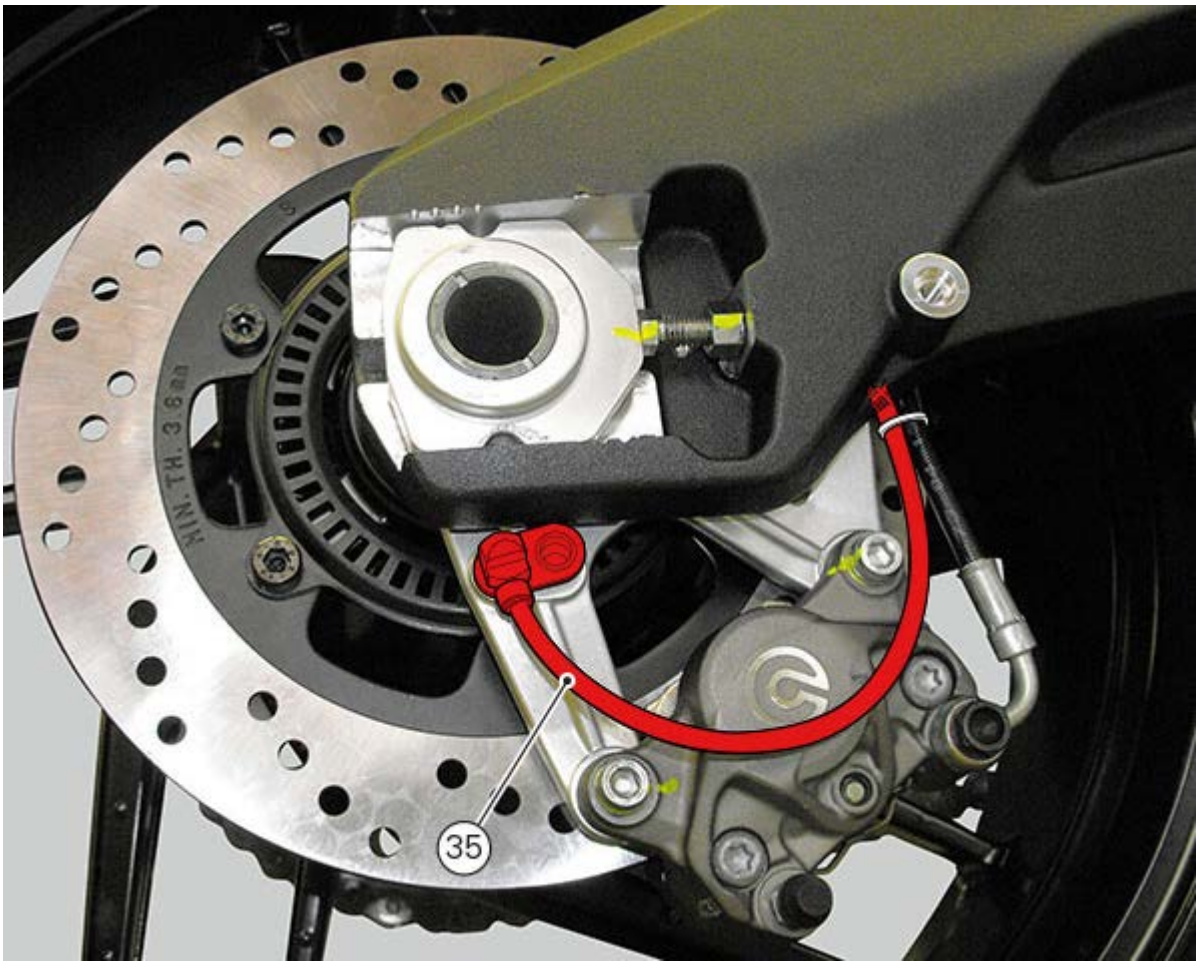
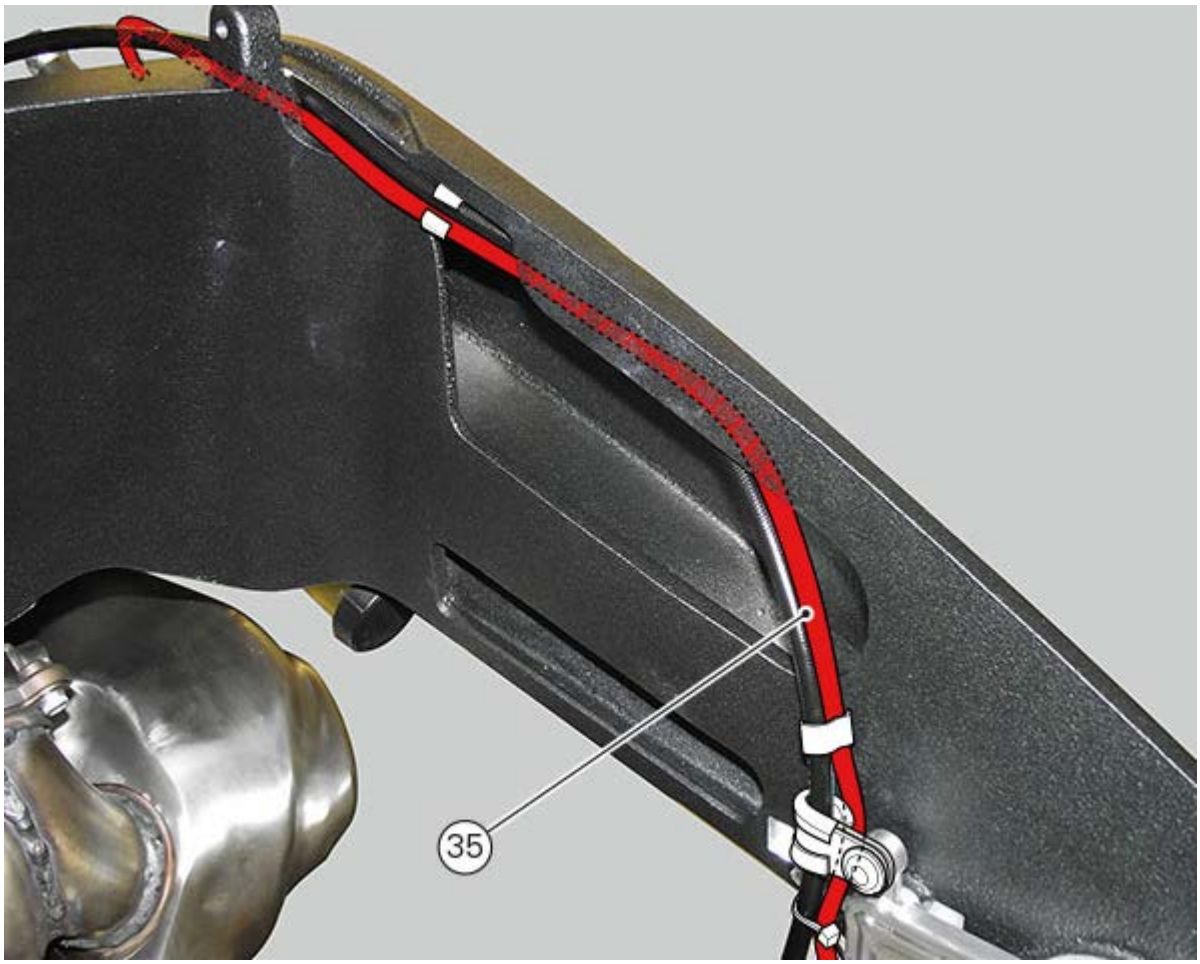


Table B

Table B – 02

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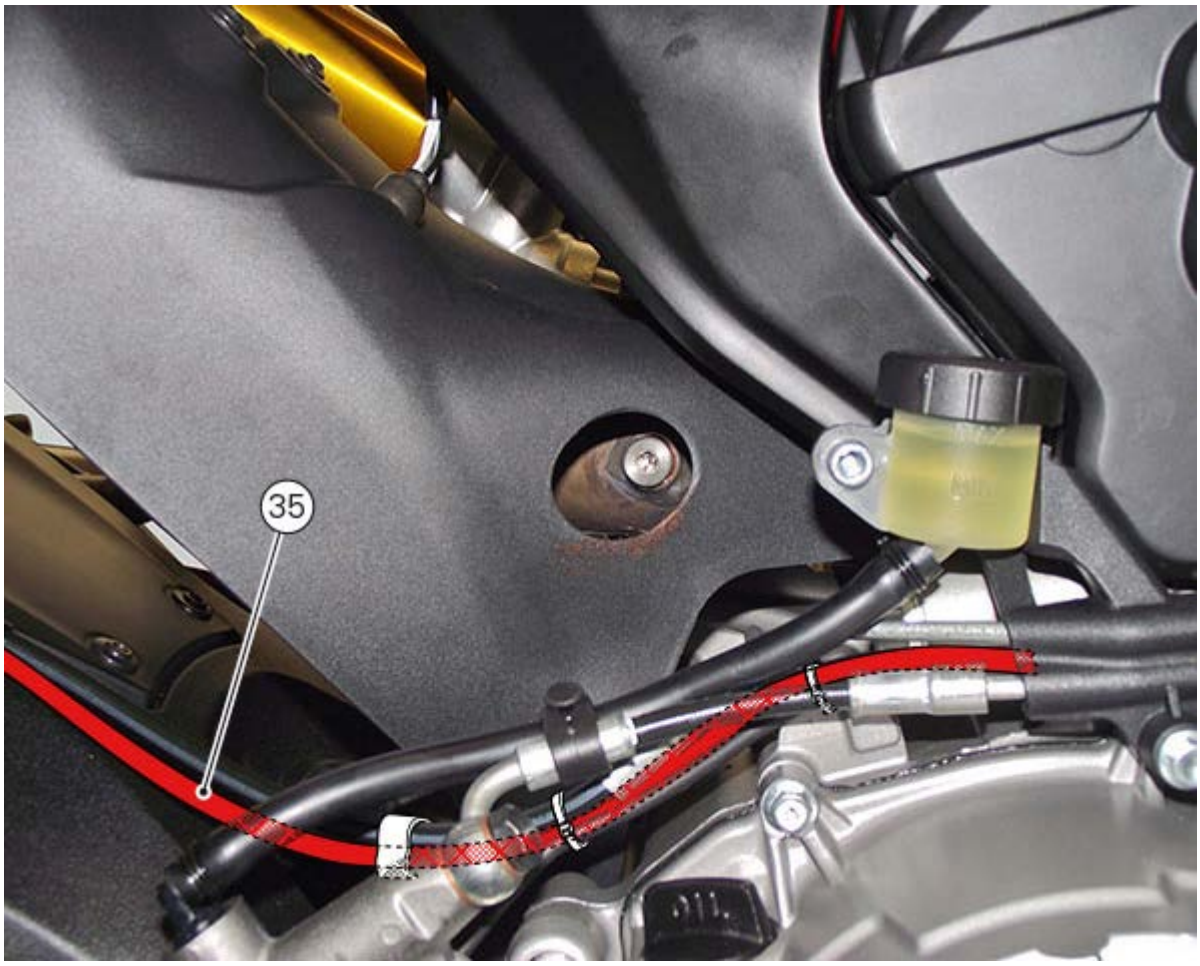
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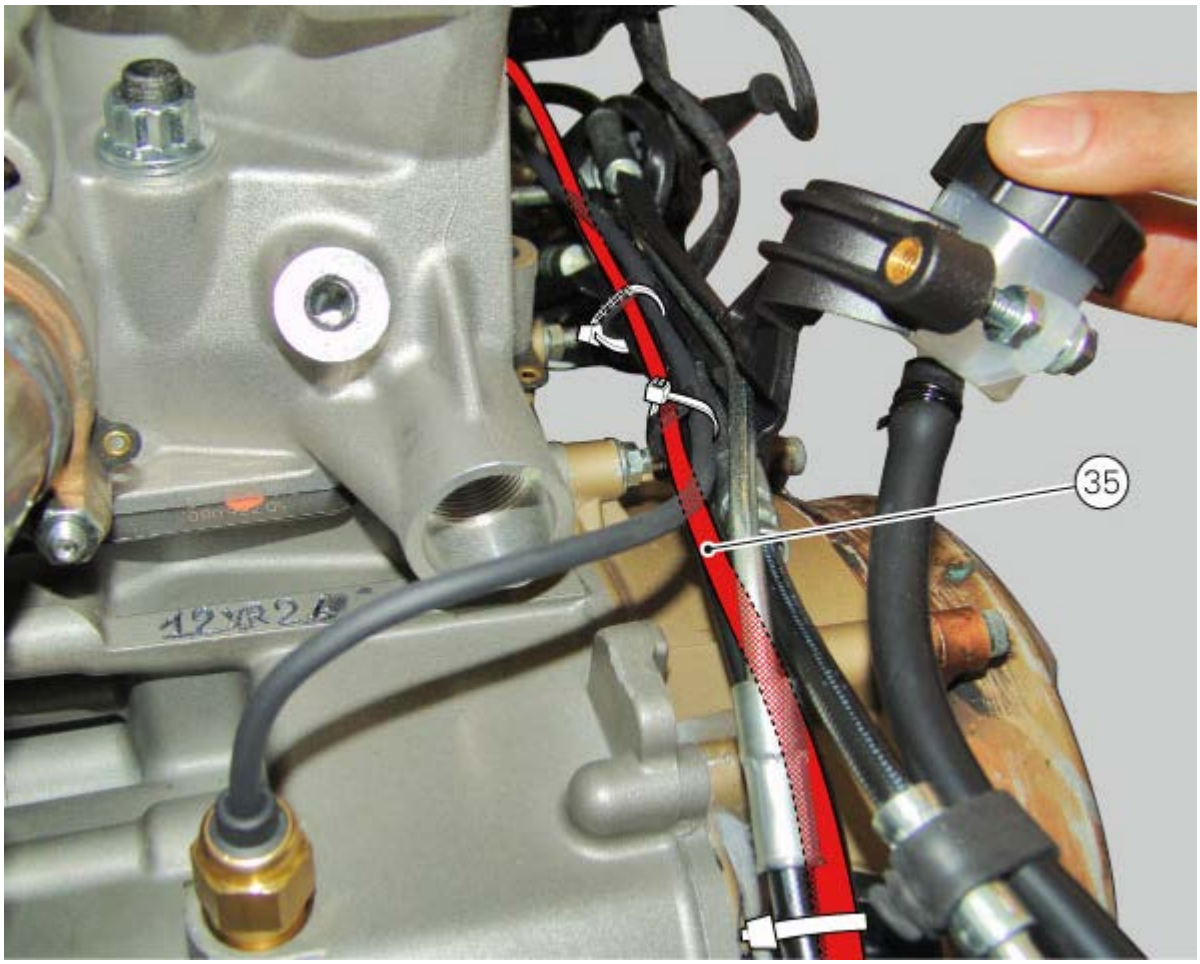

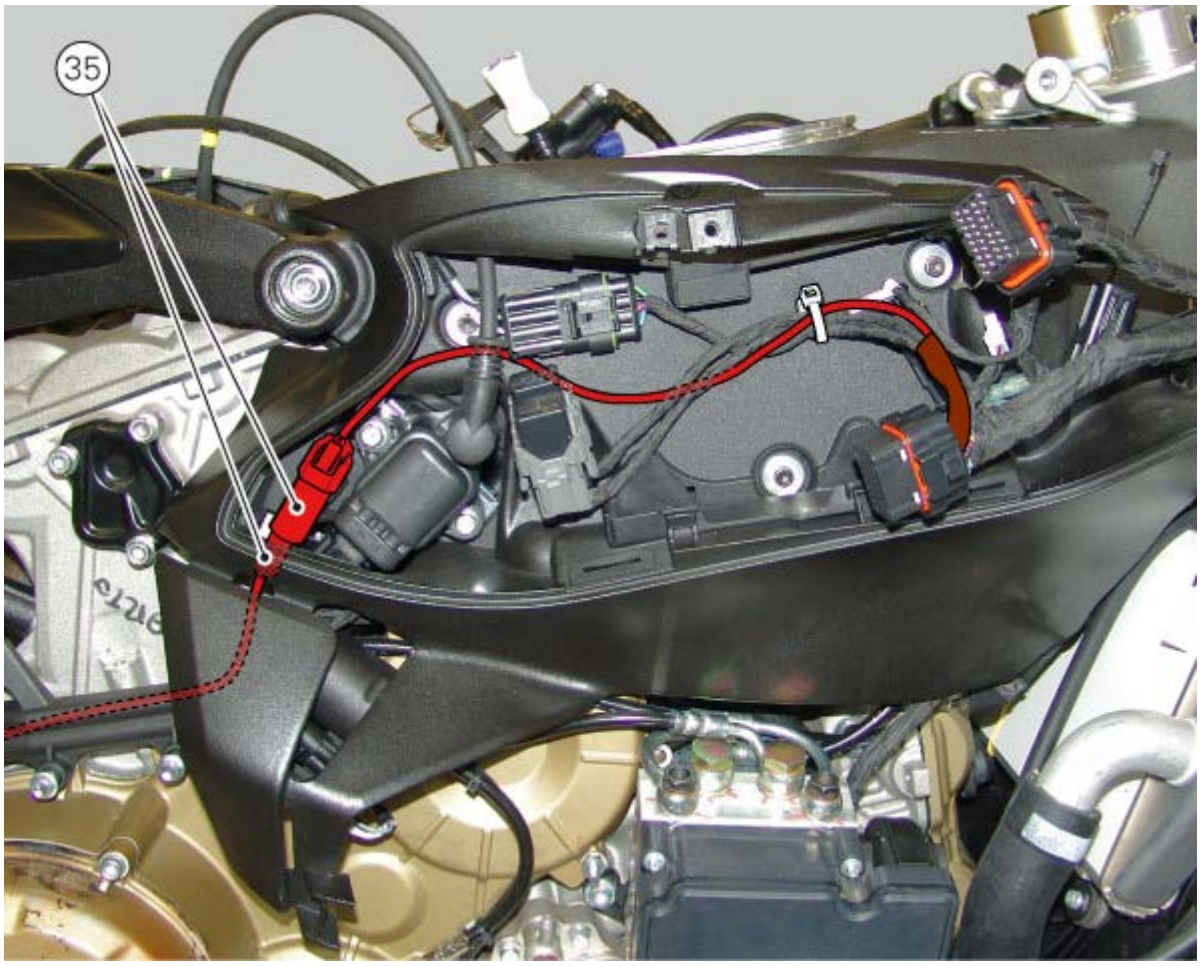

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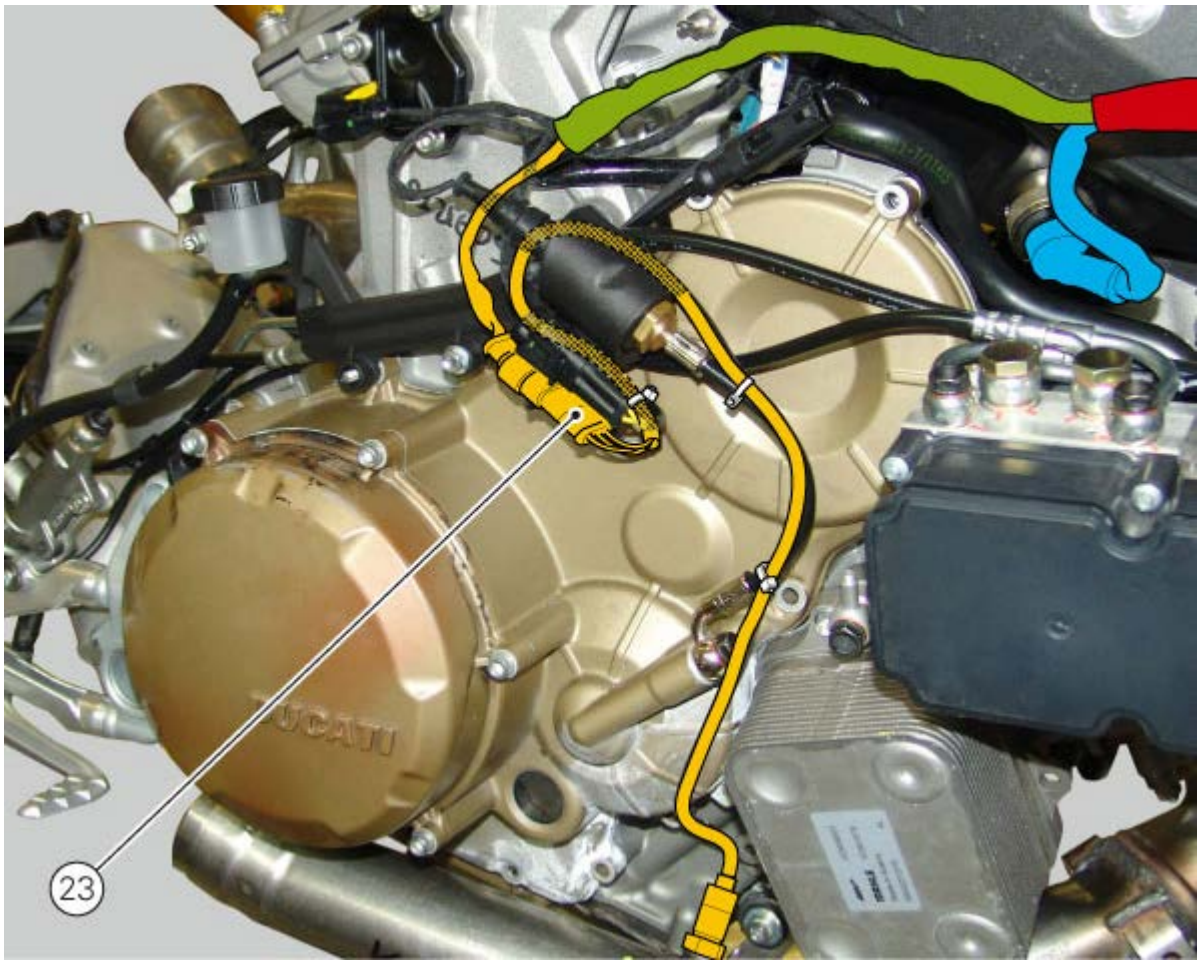

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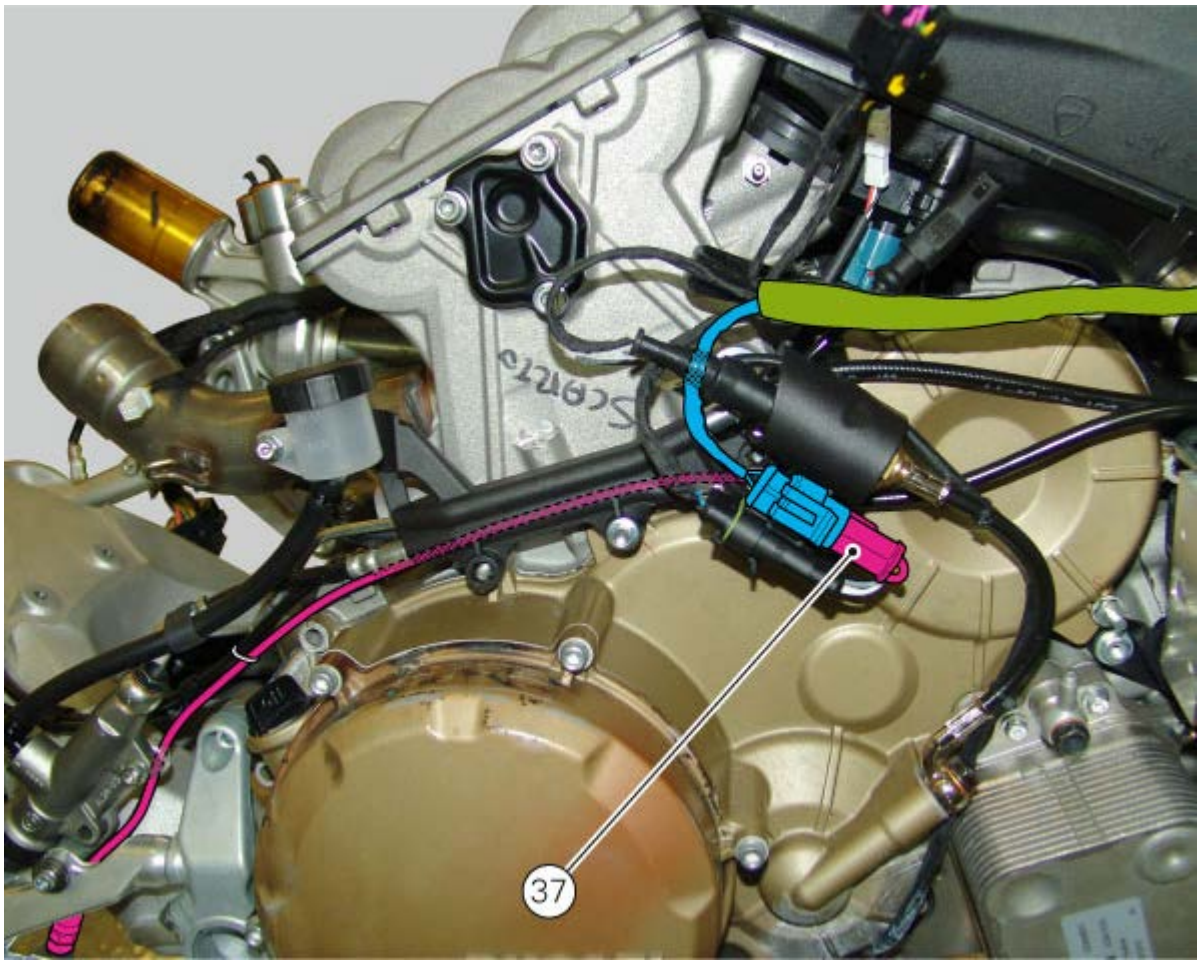
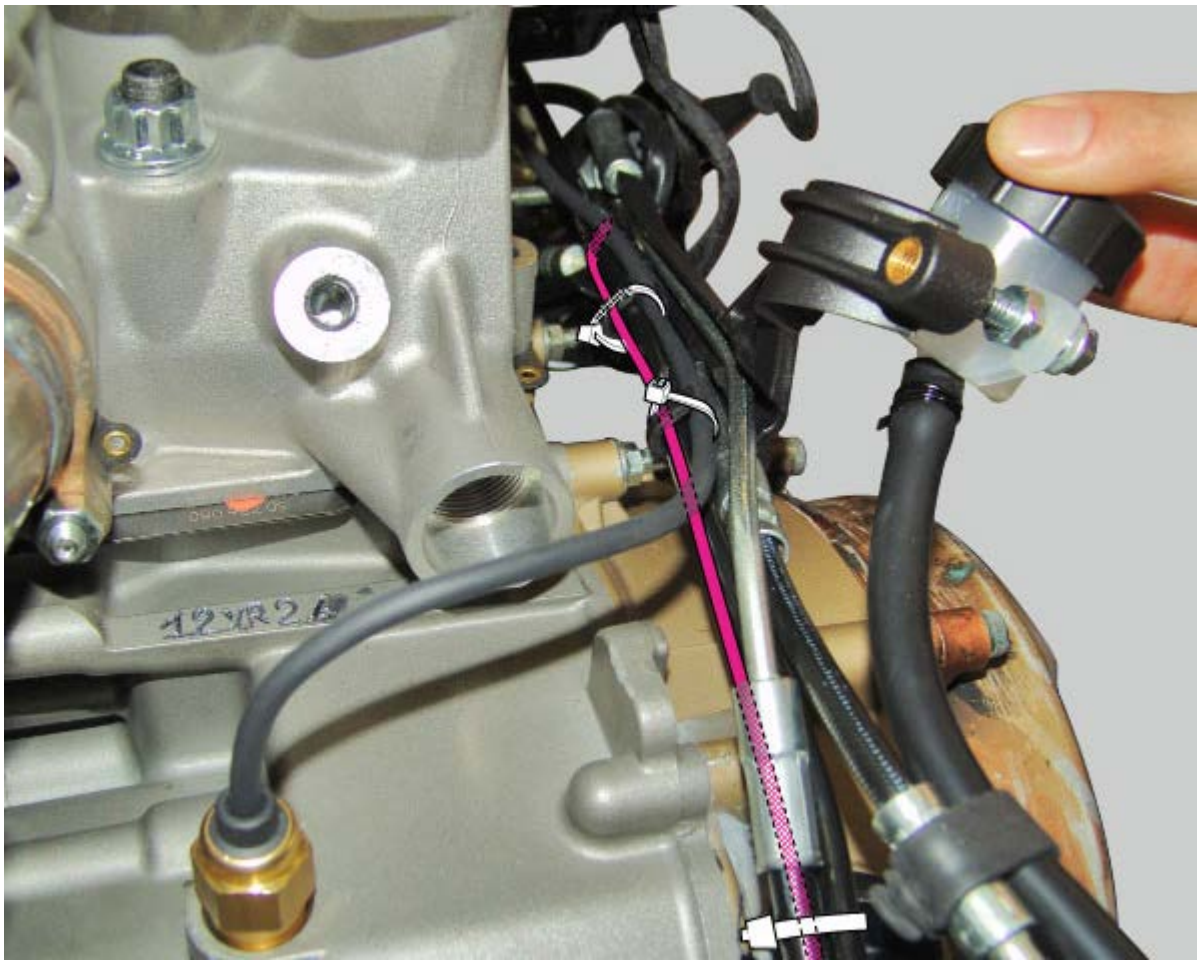




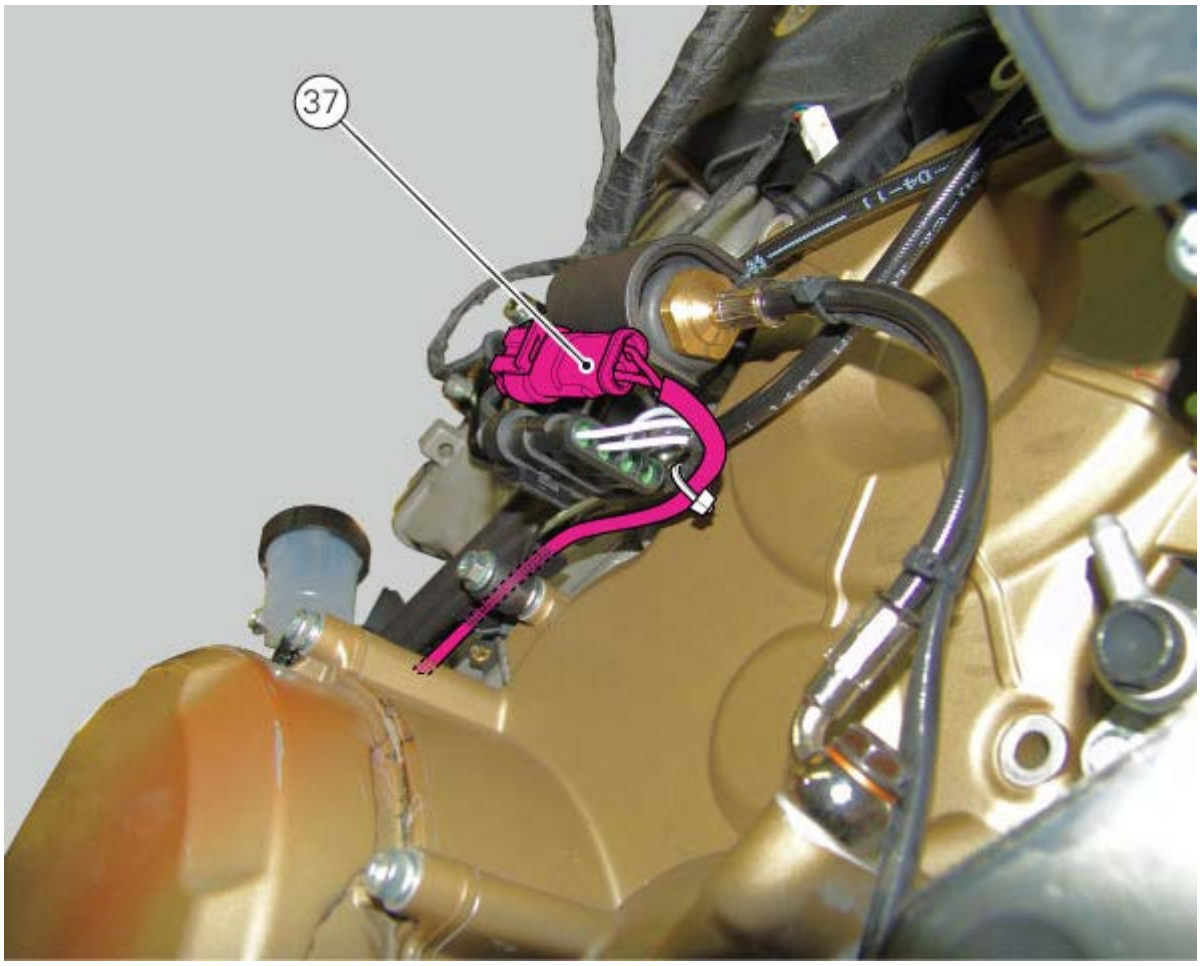


Table B – 05

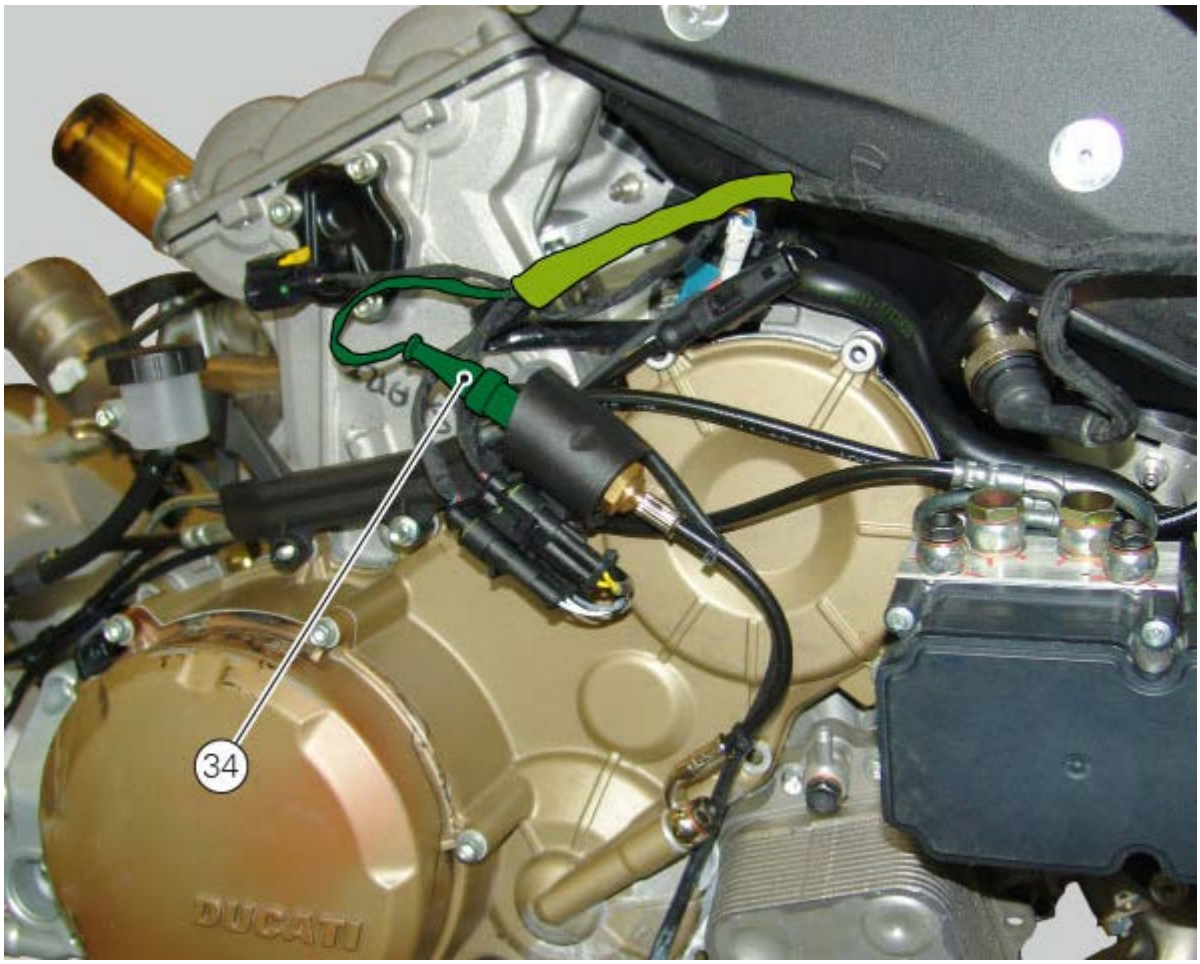


Table B – 06

Table B – 07

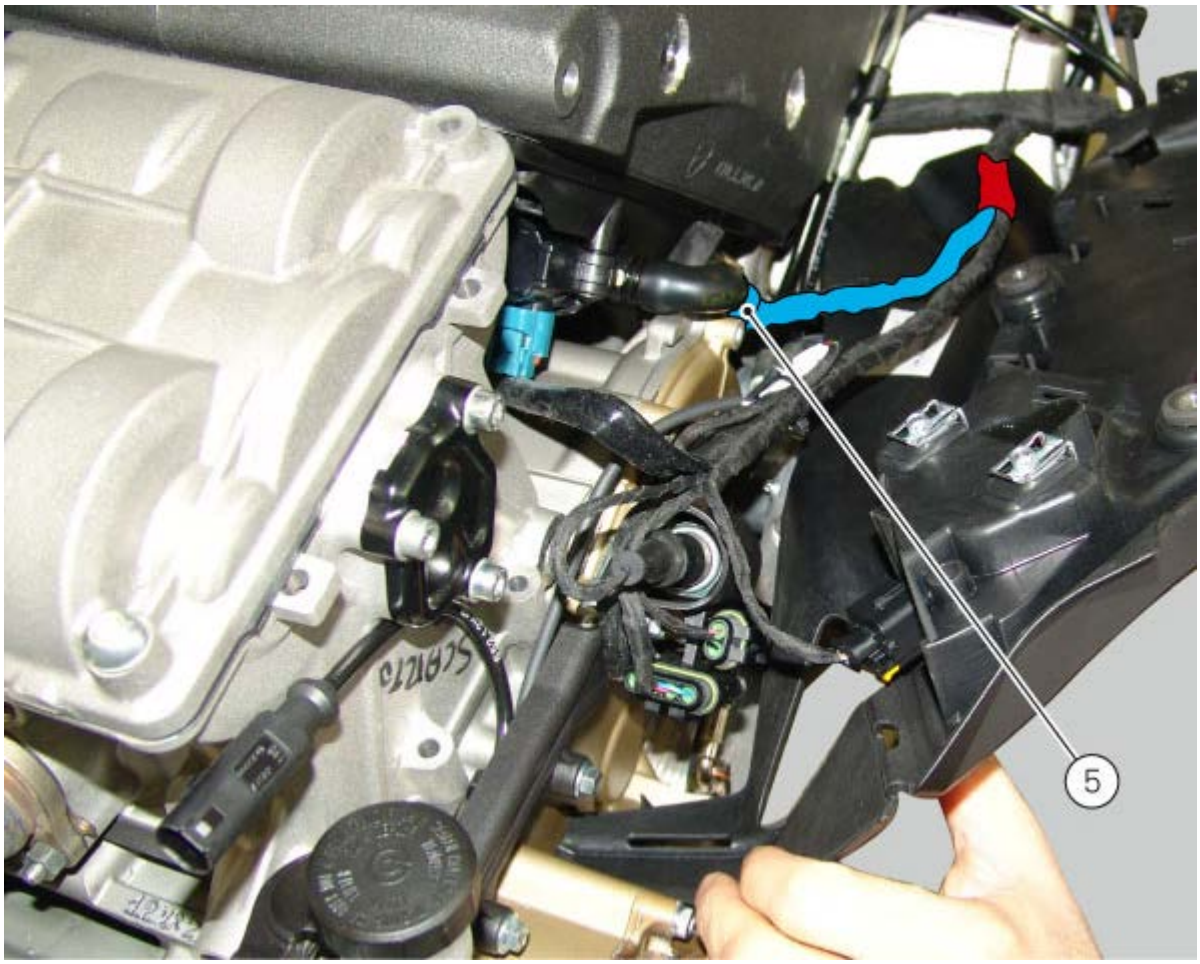
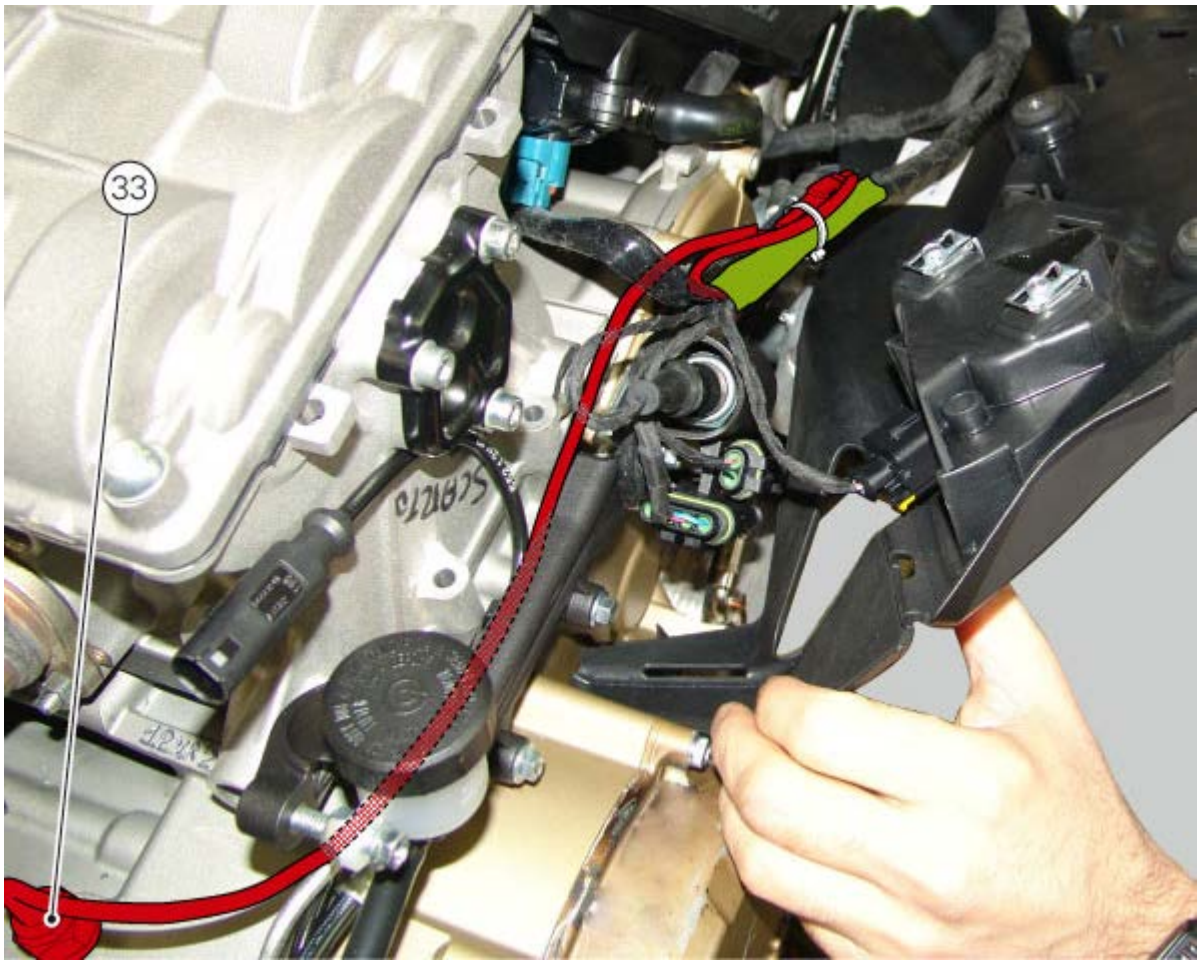
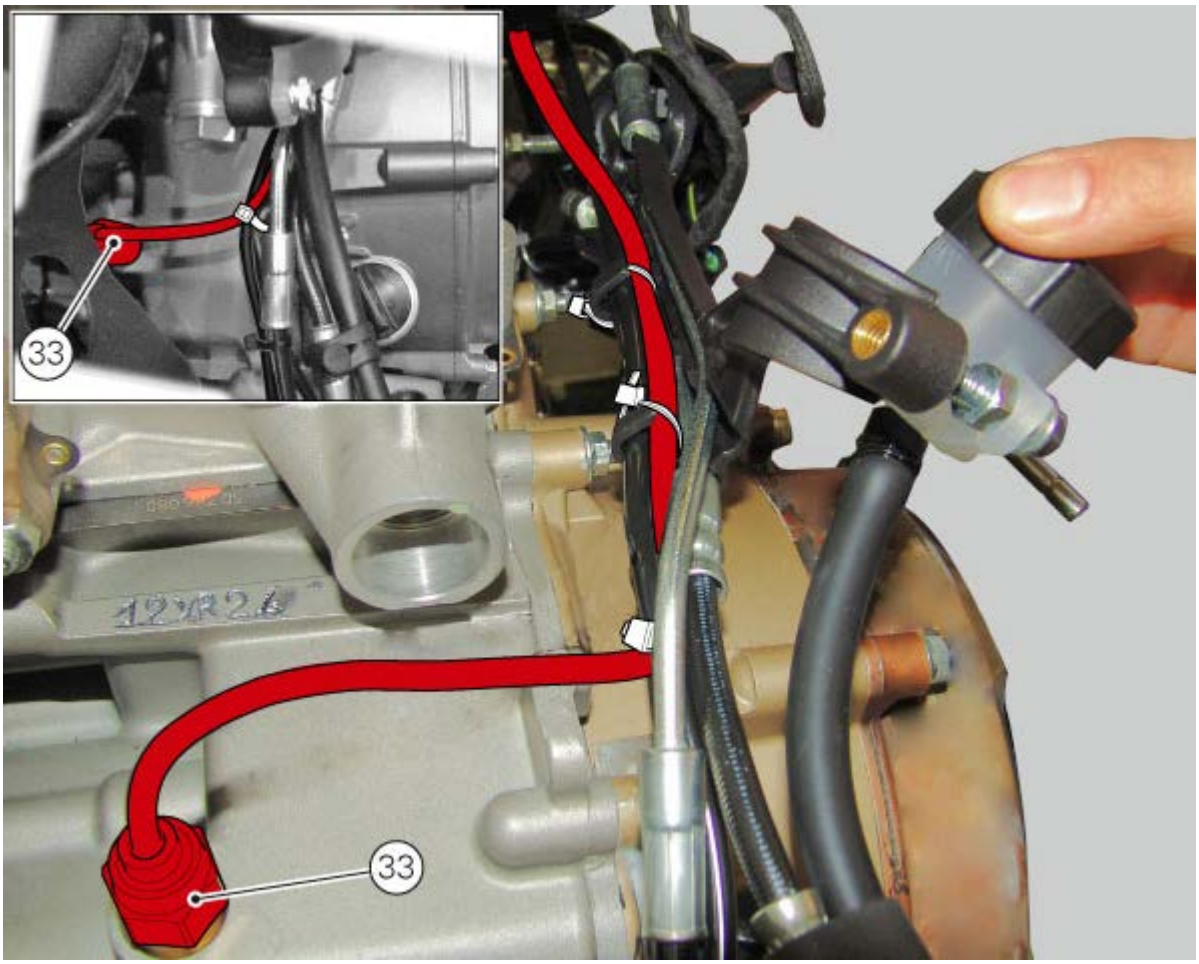


Table B – 08





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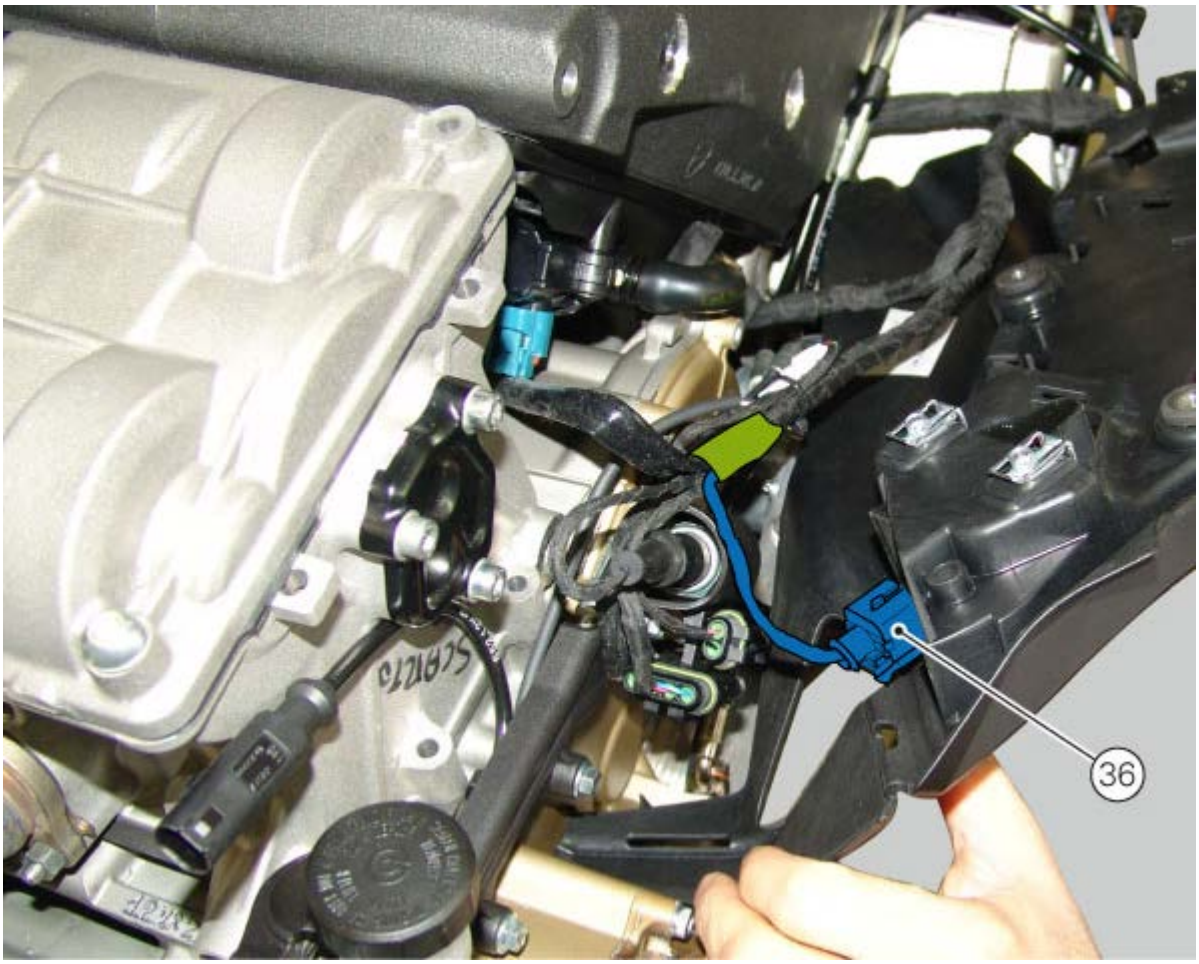


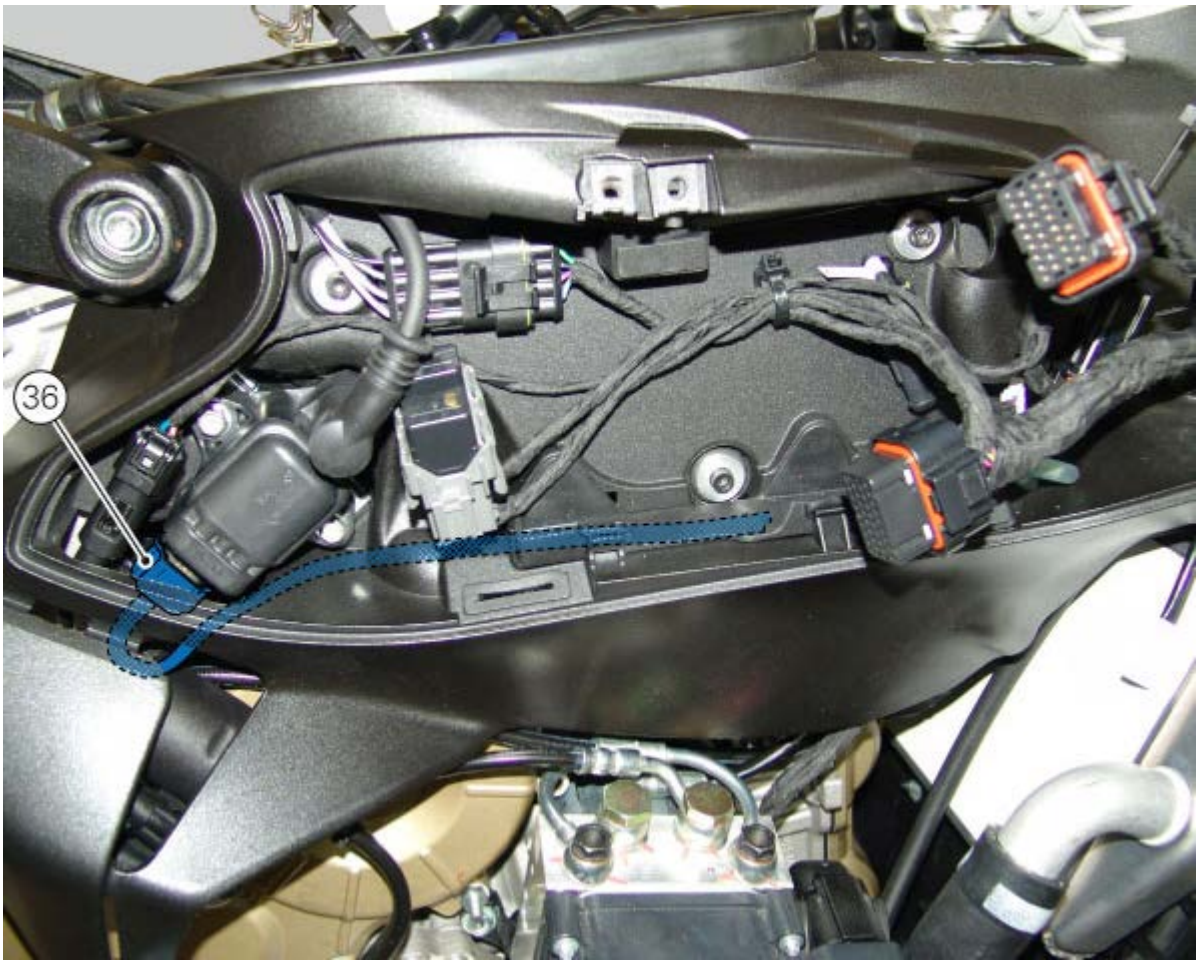
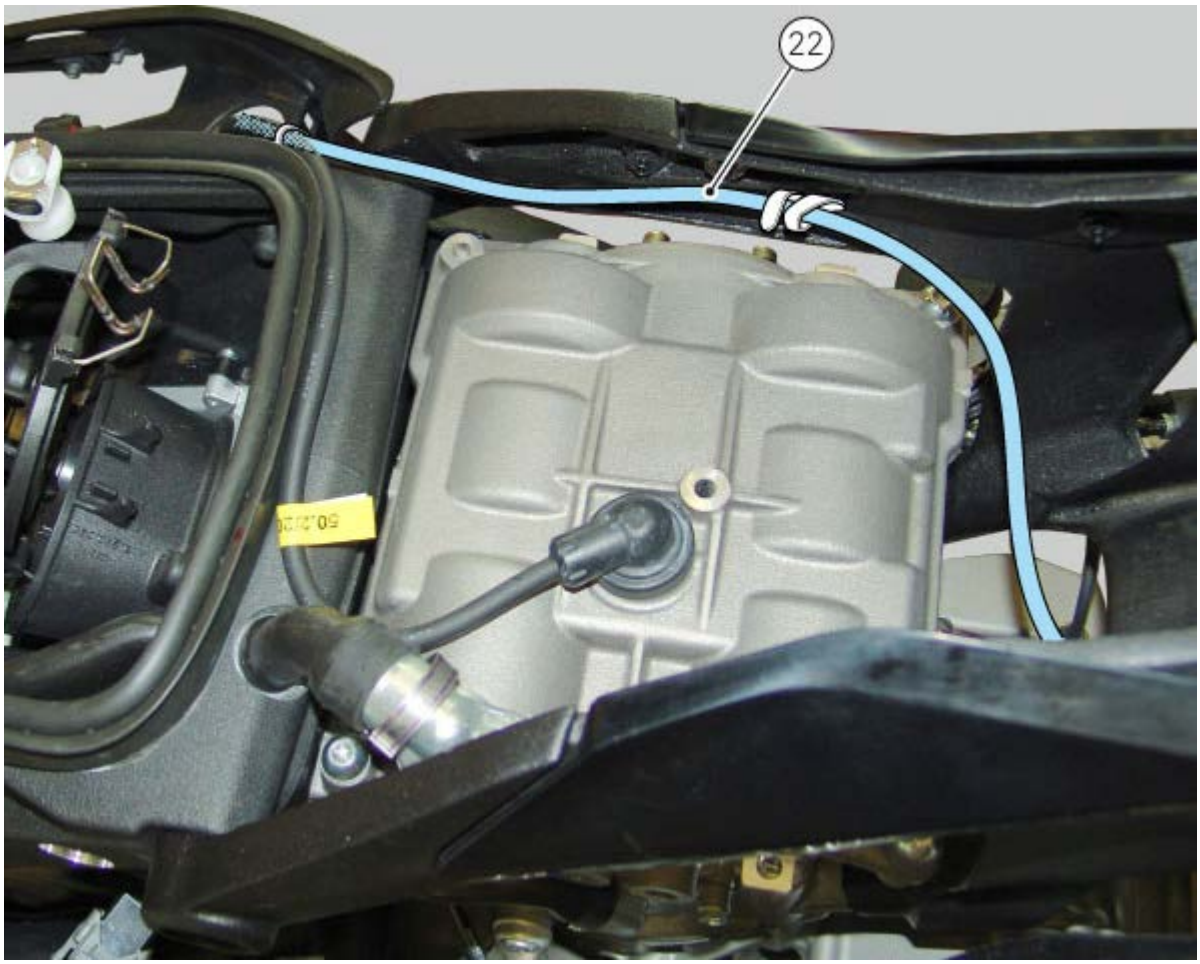


Table B – 10



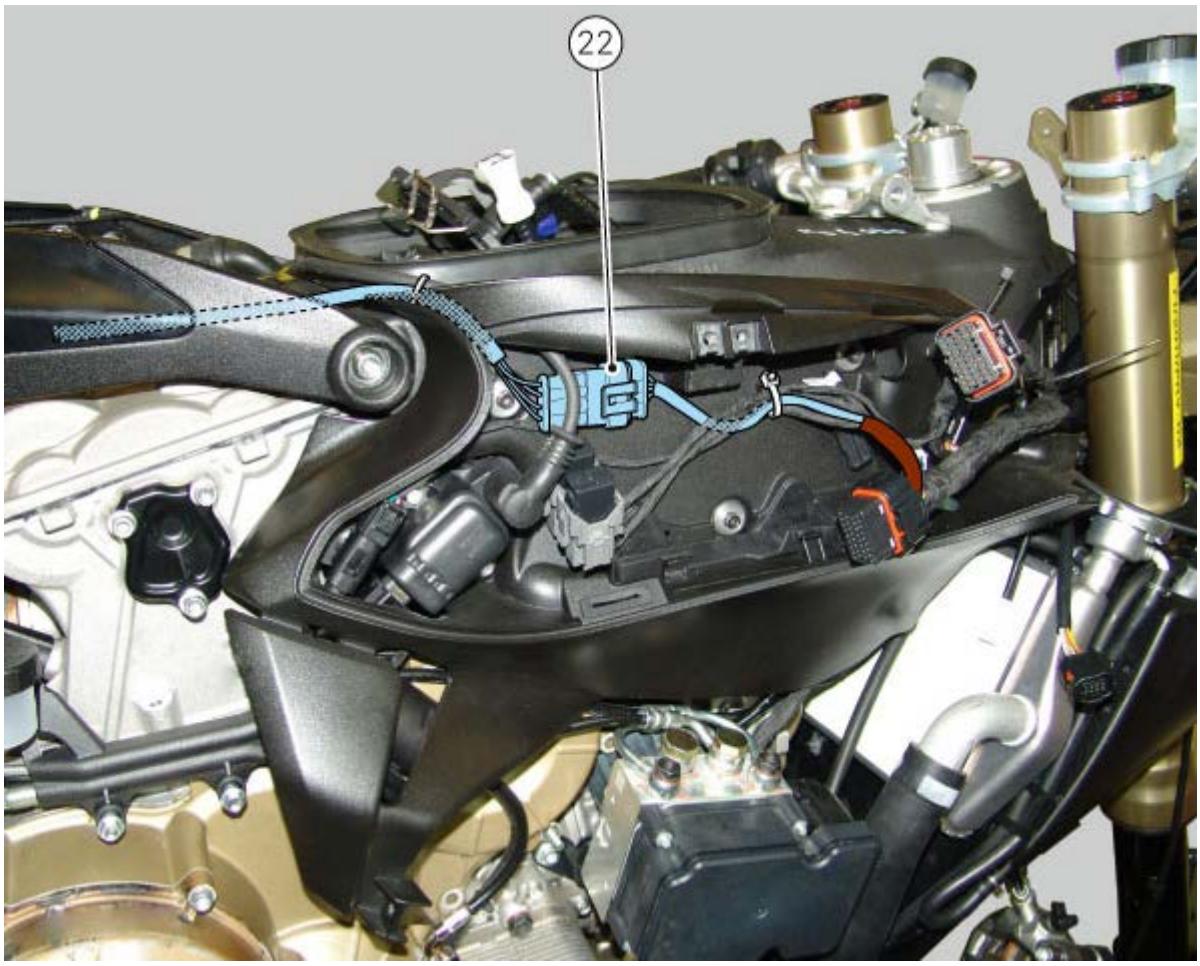


Table B – 11

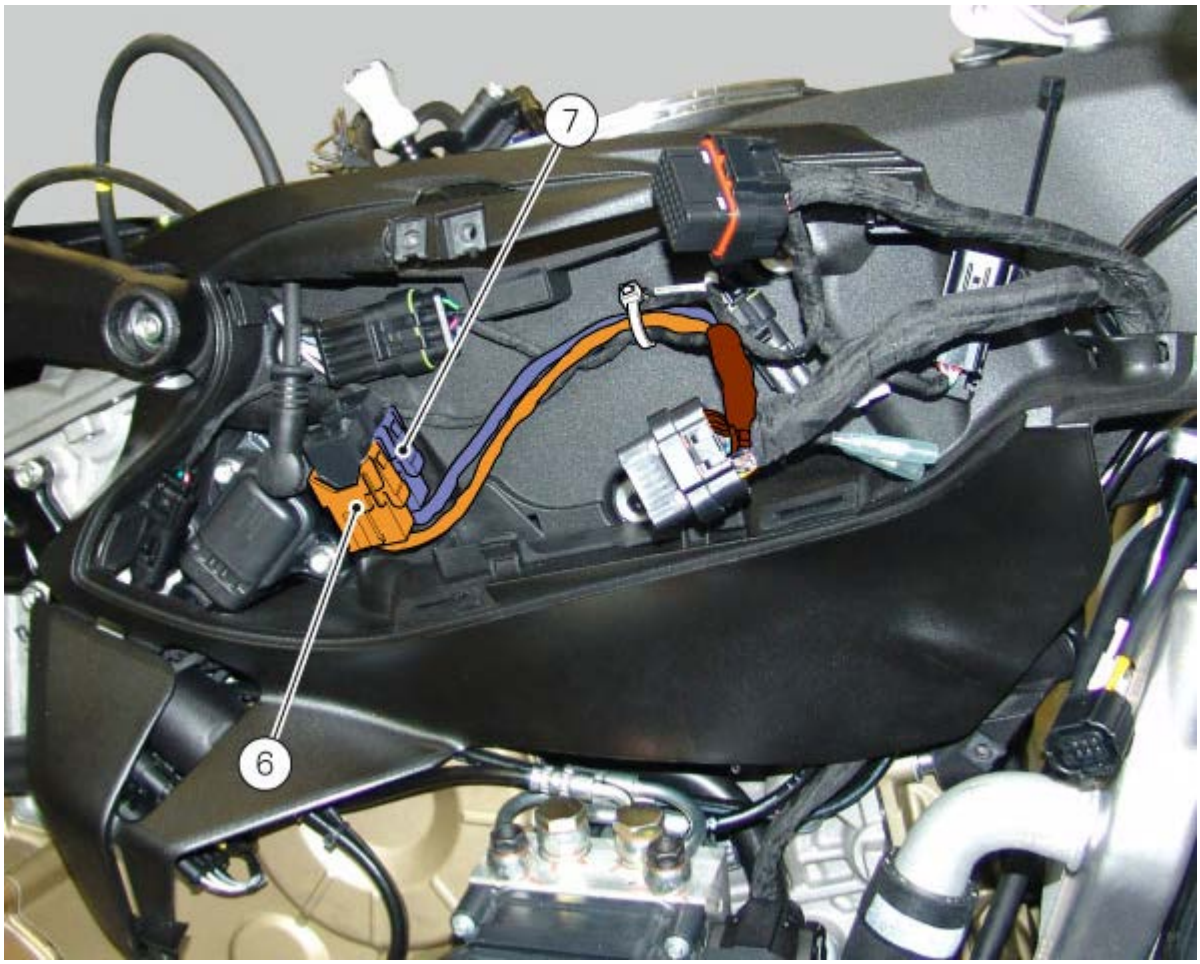

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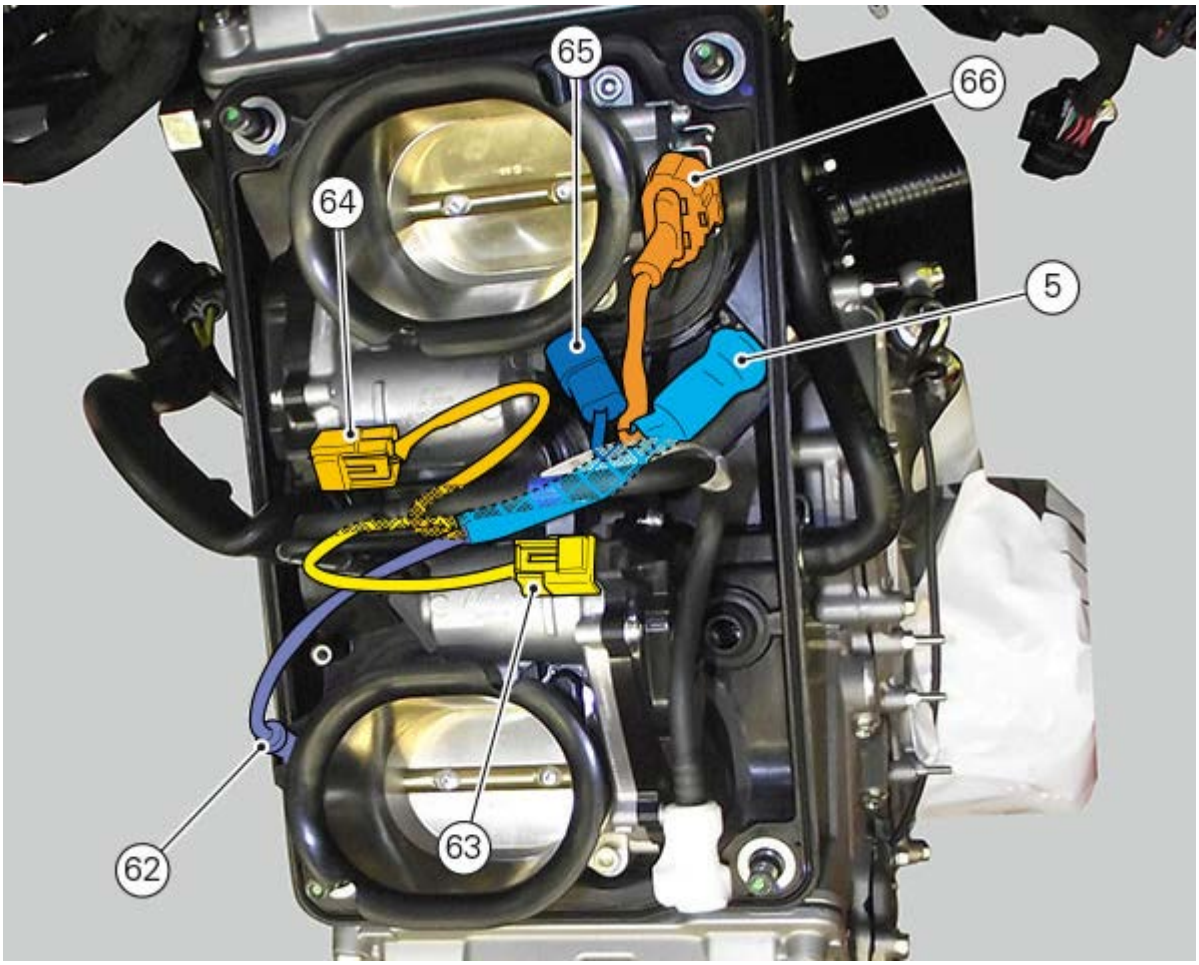
Table A

Table A - 01



Routing of wiring on frame

Table	Position	Part	Reference
Table A	5	01	Main injection wiring inside of the airbox
Table A	62	01	Vertical TPS
Table A	63	01	Vertical ETV
Table A	64	01	Horizontal ETV
Table A	65	01	Main horizontal injector
Table A	66	01	Horizontal TPS
Table B	35	02 (A-B-C-D-E)	Rear speed sensor cable
Table B	23	03	Horizontal lambda sensor cable
Table B	37	04 (A-B-C)	Rear brake switch cable
Table B	34	05	Pressure switch cable
Table B	10	06	Secondary air system actuator cable
Table B	5	07	Main injection connector cable
Table B	33	08 (A-B)	Gear sensor cable
Table B	36	09 (A-B)	Vertical coil cable
Table B	22	10 (A-B-C)	Vertical lambda sensor cable
Table B	7	11	Horizontal ETV relay cable
Table B	6	11	Vertical ETV relay cable
Table C	58	12	Vertical spark plug cable
Table D	55	13	Control unit diagnostic cable
Table D	8	13 / 14 (A-B)	Throttle cable
Table D	4	15 (A-B)	Front brake switch cable
Table D	3	16 (A-B)	RH switch cable
Table F	1	18 (A-B)	ECU control unit cable
Table F	2	18 (A-B)	ECU control unit cable
Table G	42	19 (A-B)	ABS control unit cable
Table H	39	20 (A-B-C)	Main ground
Table H	24	20 (A-B-C)	Voltage regulator
Table H	50	20 (A-B-C)	GPS presetting

Table I	14	21 (A-B)	Fuse box 1 cable
Table I	15	21 (A-B)	Fuse box 2 cable
Table I	44	21 (A-B)	ABS positive
Table J	40	22	Wiring ground cable
Table J	16	23	Ignition switch cable
Table J	27	24	Horizontal coil cable
Table J	52	25	Vertical MAP sensor cable
Table J	17	26	Injection relay cable
Table J	18	26	E-lock relay cable
Table J	24	27 / 20	Voltage regulator cable
Table J	53	28	Horizontal MAP sensor cable
Table K	57	29	Regulator-generator cable
Table L	20	30	Side stand cable
Table L	19	31 (A-B)	Pick-up cable
Table L	21	32	Air extractor fan cable
Table L	25	33	Exhaust valve motor cable
Table L	13	34	Solenoid starter cable
Table L	41	35 (A-B)	Quick shifter cable
Table L	32	36	Water temperature sensor cable
Table N	26	38 (A-B-C)	Clutch switch cable
Table N	28	39 (A-B) / 40	LH switch cable
Table N	50	40 / 20	GPS presetting cable
Table O	59	41 (A-B)	Horizontal spark plug cable
Table P	38	42 (A-B-C-D)	Front speed sensor cable
Table Q	31	52	Instrument panel cable
Table Q	51	52	Air temperature sensor cable
Table Q	29	52	Right turn indicator cable
Table Q	30	52	Left turn indicator cable
Table Q	68	52	Light relay
Table Q	69	52	Left-hand low beam
Table Q	70	52	Left-hand high beam

Table Q	71	52	Parking light
Table Q	72	52	Right-hand high beam
Table Q	73	52	Right-hand low beam
Table R	54	44 (A-B)	Horn cable
Table S	12	45 (A-B-C-D)	Tail light cable
Table S	74	45 (A-B-C-D)	Diagnostic socket
Table S	75	45 (A-B-C-D)	Number plate light/turn indicators
Table S	76	45 (A-B-C-D)	Tail light
Table S	77	45 (A-B-C-D)	Number plate light
Table S	78	45 (A-B-C-D)	LH rear turn indicator
Table S	78	45 (A-B-C-D)	RH rear turn indicator
Table T	11	45	BBS cable
Table V	9	48	Tank fuel pump cable
Table V	56	48	Tank fuel pump ground cable

Key to wiring diagram

1 Right-hand switch
2 E-LOCK control unit
3 E-LOCK relay
4 Fuse box 1
5 Fuse box 2
6 Engine control unit
7 APS
8 Starter motor
9 Fused solenoid
10 Battery
11 Engine ground
12 Regulator
13 Generator
14 Rear right turn indicator
15 Tail light
16 Rear left turn indicator
17 Number plate light
18 Diagnostic socket
19 Vehicle control unit (BBS)
20 Ex-up drive
21 Gear sensor
22 Rear speed sensor
23 Front speed sensor
24 Fuel pump
25 Fuel level
26 Vertical coil
27 Horizontal coil
28 Timing/rpm sensor
29 Vertical lambda sensor
30 Horizontal lambda sensor
31 Quick shifter
32 Side stand switch
33 Oil pressure sensor
34 Rear stop switch
35 Clutch switch
36 Front stop switch
37 Fuel pump relay
38 Vertical ETV relay
39 Horizontal ETV relay
40 Vertical MAP sensor
41 Horizontal MAP sensor
42 Water temperature sensor
43 Air temperature sensor
44 Horizontal TPS
45 Vertical TPS
46 Main horizontal injector
47 Main vertical injector
48 Horizontal ETV drive
49 Vertical ETV drive
50 Secondary air actuator
51 ABS control unit
52 Left-hand switch
53 Horn
54 GPS
55 Front left turn indicator
56 Instrument panel
57 Left high beam
58 Left low beam
59 Parking light
60 Right low beam
61 Right high beam
62 Front right turn indicator
63 Low beam relay
64 High beam relay
65 Fan

Rectifier-regulator

The regulator (1) is located on vehicle left-hand side.
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.

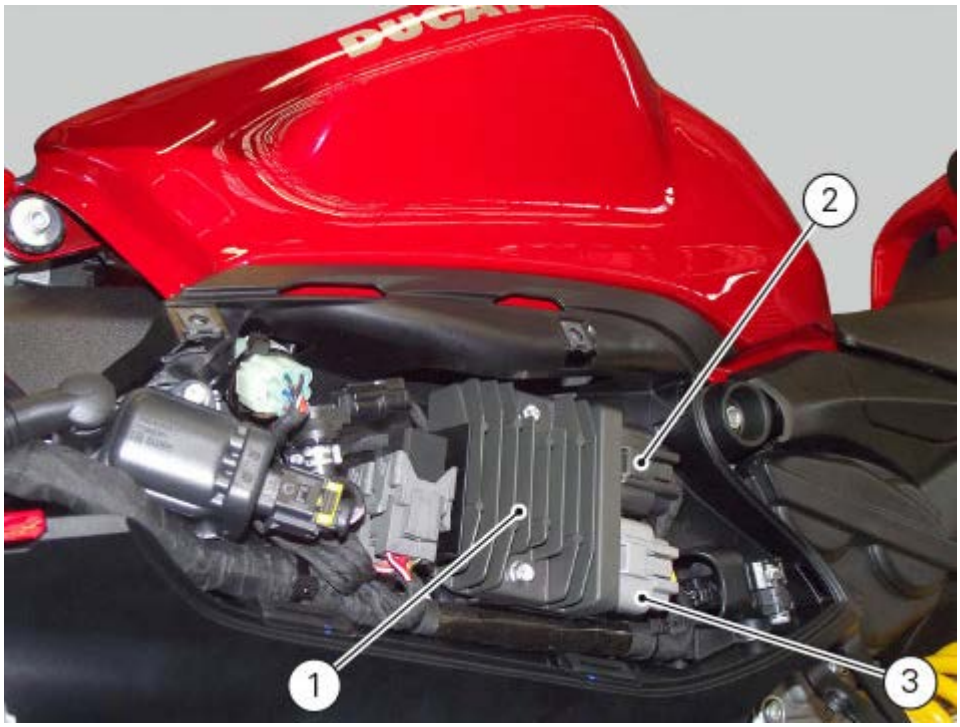
Note
Check the charging current by using the “DDS” diagnosis instrument.

Removing the regulator

Remove the left-hand side fairing (Removing the side fairings).

Disconnect the voltage regulator connector (2) and the generator connector (3).
Loosen the two front screws on regulator (1) and remove 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 the screws to the specified torque of 10 Nm ± 10%.
Connect the connectors (2) and (3).

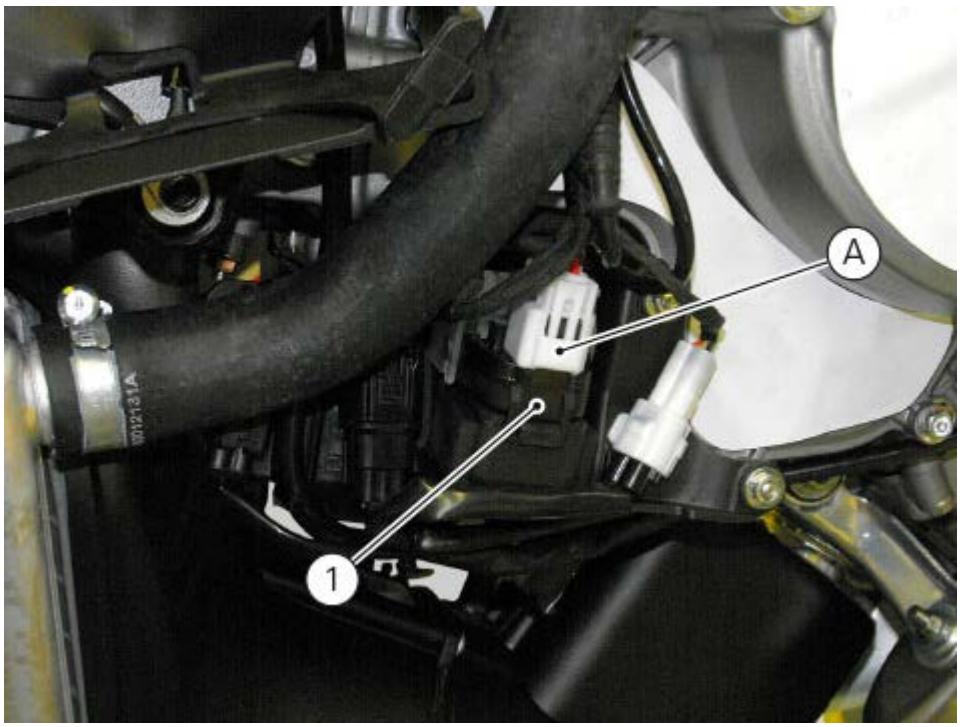
Important
Do not disconnect the battery cables when engine is running because this would cause irreparable damage to the regulator.

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

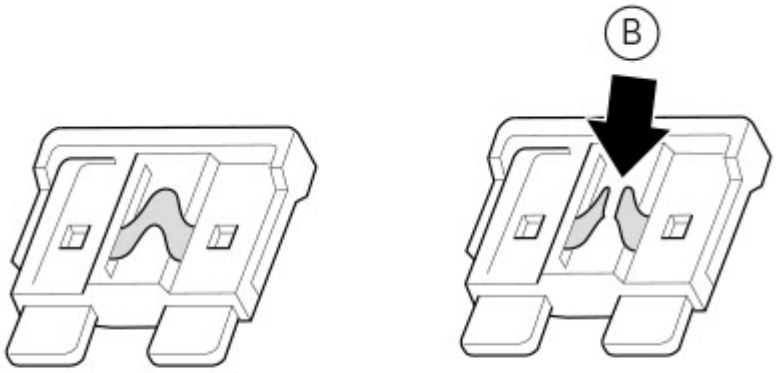
Regulator fuse

The 30 A fuse, positioned inside electromagnetic switch (1), on the left side of the motorcycle, the

electronic regulator.
Remove the left-hand side fairing (Removing the side fairings).
Disconnect connector (A), remove protection cap (2) and remove the fuse.



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



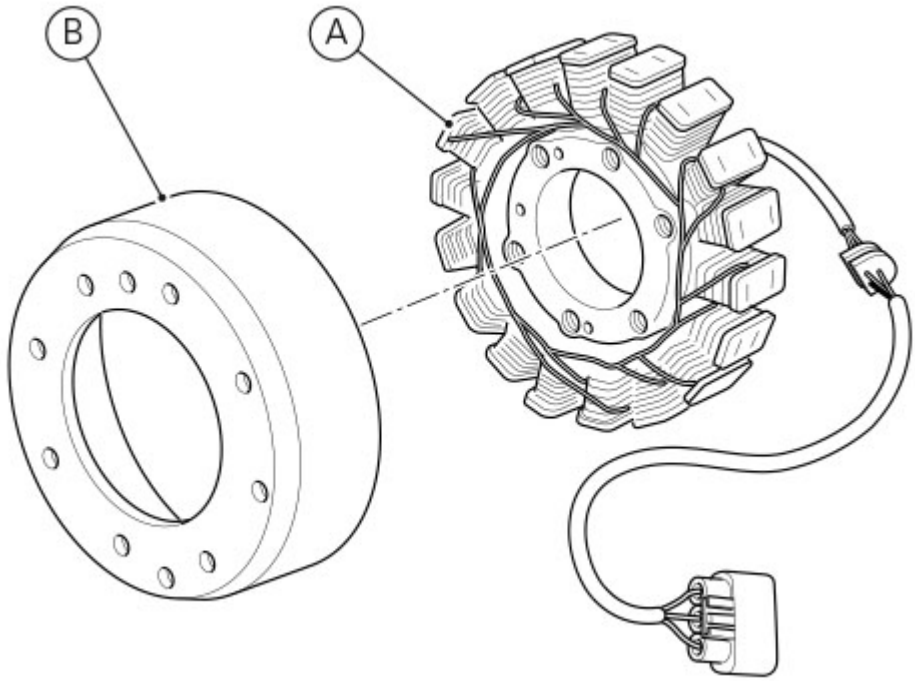
Important
Switch the ignition key to OFF before replacing the fuse to avoid possible short-circuits.

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.

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

Generator

It is equipped with a 14 V, 510 W generator, consisting of a fixed element (stator, A) located in the generator cover and of a movable element (rotor, B) fixed 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

Remove the left-hand side fairing (Removing the side fairings).
Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the clutch slave cylinder (Removing the clutch slave cylinder).

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 (refer to the table in “Routing of wiring on frame”.

Refit the clutch slave cylinder (Refitting the clutch slave cylinder).
Fill the system with engine oil (Changing the engine oil and filter cartridge).
Refit the left-hand side fairing (Refitting the side fairings).

Battery

Before carrying out any operations on the battery, keep in mind the safety standards (General safety rules).

Warning
When under charge, batteries produce explosive gases. Keep batteries away from heat sources, sparks or open flames.

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.

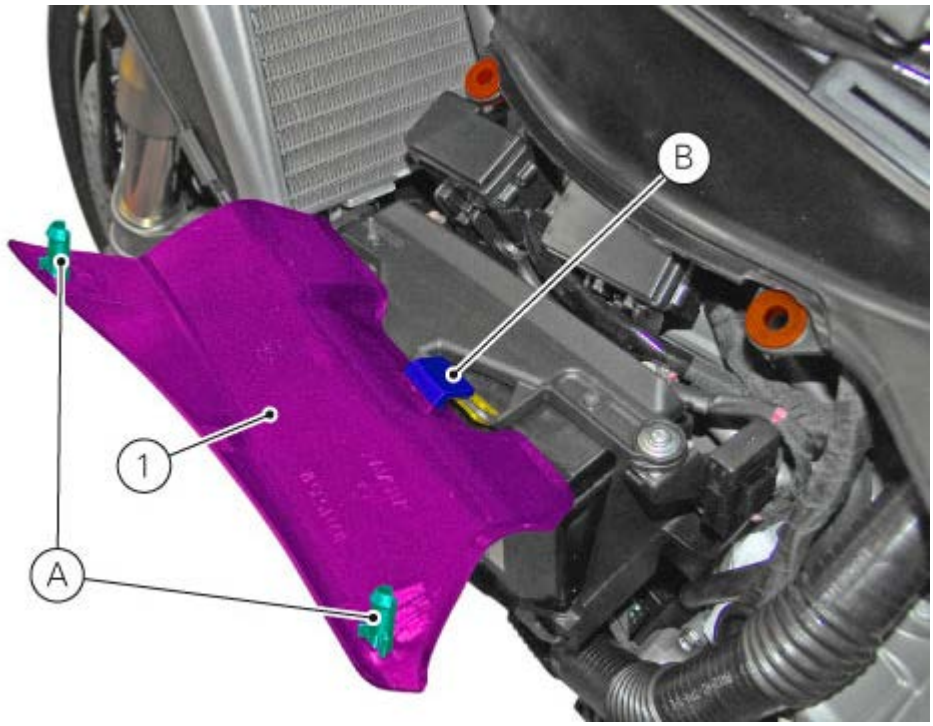
Important
If the motorcycle is left unused for more than 30 days, remove the battery and store it in a safe, cool place.

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

Removing the battery

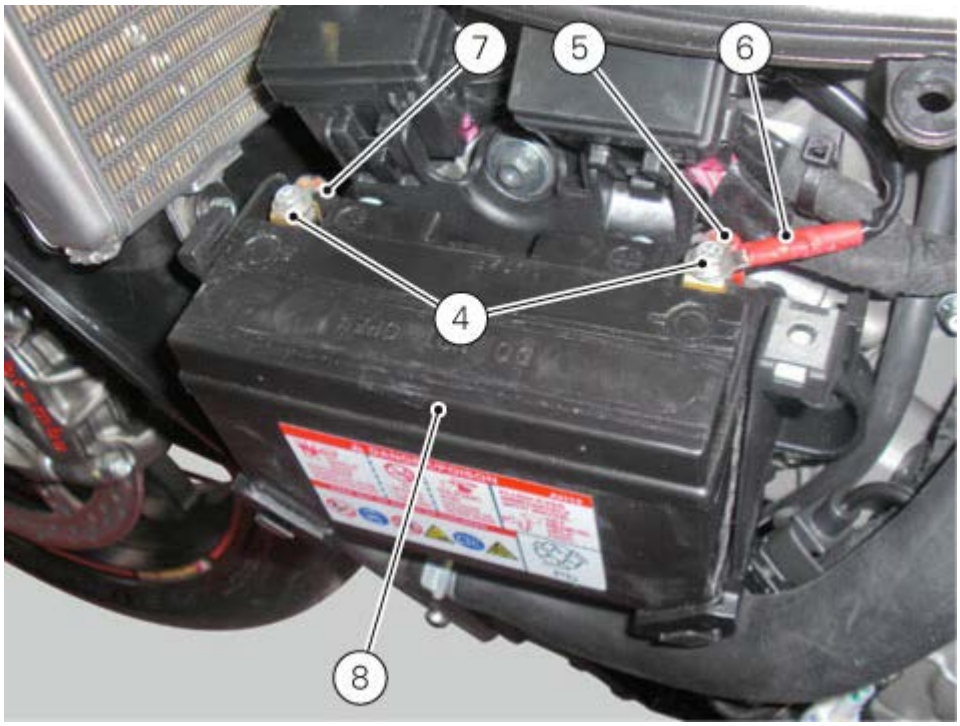
Remove the left-hand side fairing (Removing the side fairings).

Release pins (A) and then tab (B) to remove the fuse cover (1).



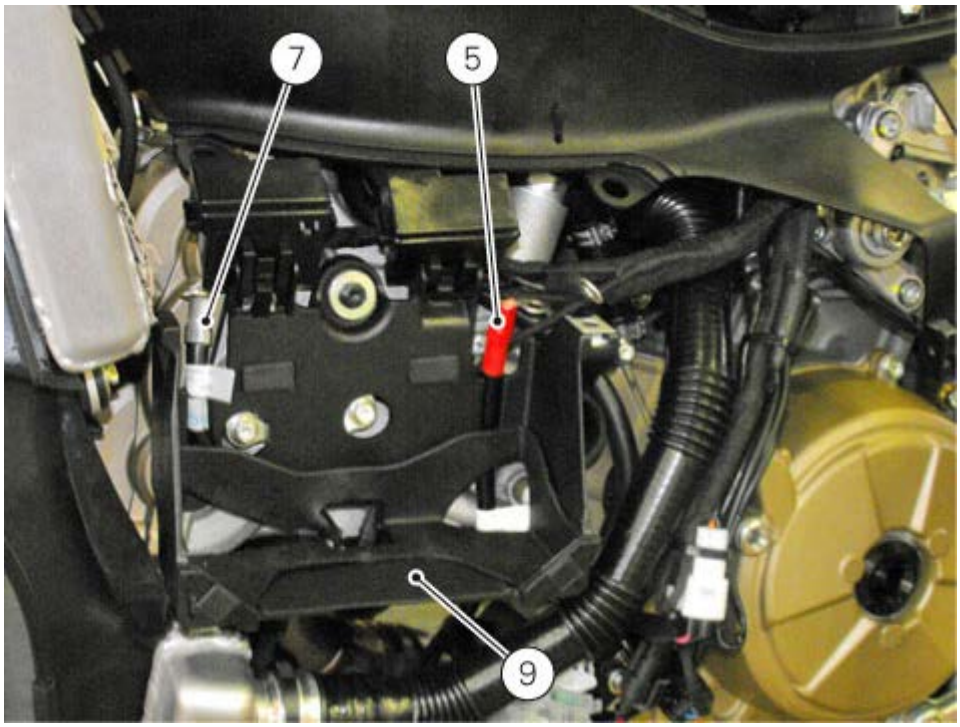
Undo the screw (2) and remove the battery mounting bracket (3).

Loosen the screws (4), remove the positive cable (5) and (ABS) positive cable (6) from the positive terminal and the negative cable (7) from the negative terminal always starting from the negative one (-) then remove the battery (8) by pulling it up.

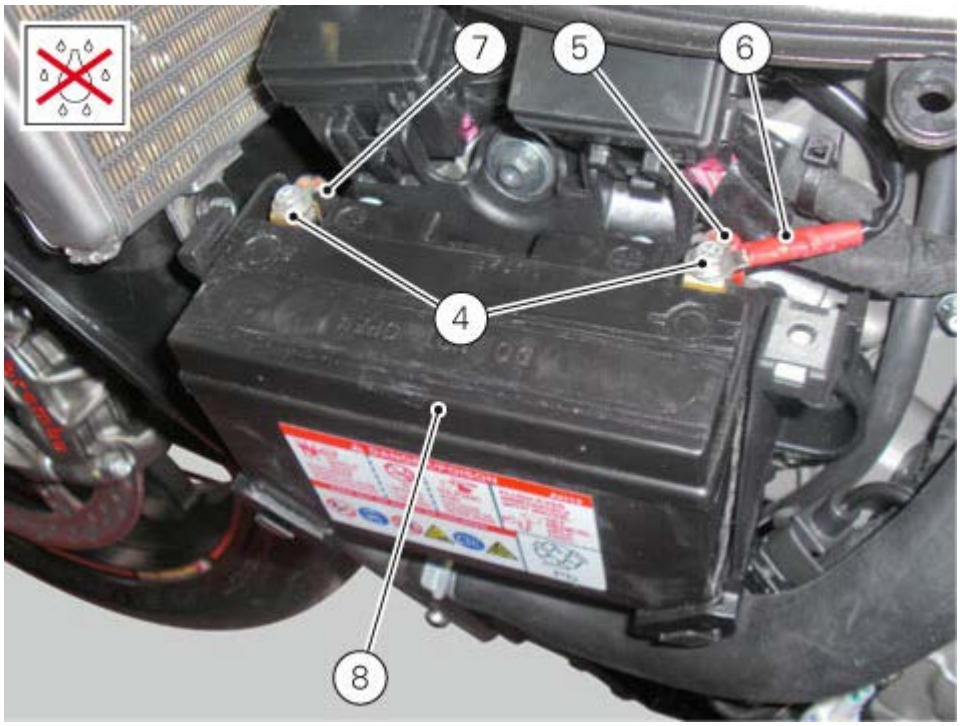


Refitting the battery

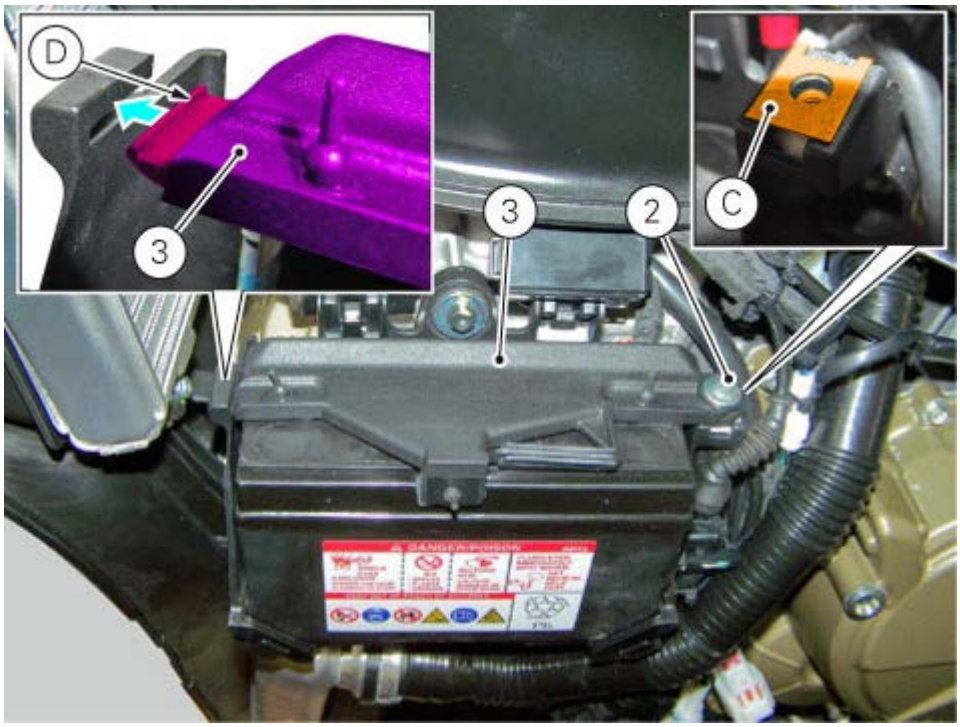
Before refitting the battery to its mount, make sure that the positive cable (5) and the negative cable (7) are perfectly fitted in their seats and that mat (9) is installed on battery mount.



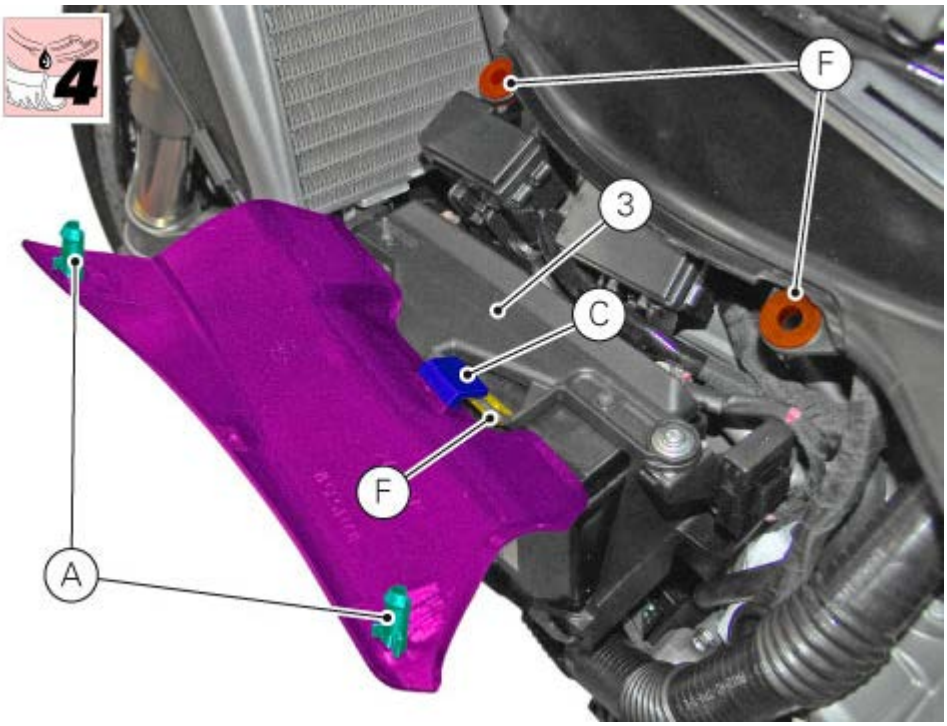
Fit the battery (8) on its mount, connect the positive cable (5) and ABS positive cable (6) to the positive terminal, and the negative cable (7) to the negative terminal of the battery, always starting from the positive one (+), and start the screws (4).
Position cables (5), (6) and (7) as shown in the figure.
Ensure that the battery contacts are not oxidised and tighten screws (3) on terminals to 5 Nm ±10%.
Apply a water repellent spray on battery terminals to prevent oxidation.



Make sure that clip (C) is in place on battery mount.
Fit the battery mounting bracket (3), engaging tab (D) in the slot on battery mount and fastening it by starting screw (2).
Tighten screw (2) to a torque of 2 Nm ± 10%.



Apply KLÜBERPLUS S 06/100 on pins (A).
Install the fuse cover (1) engaging tab (C) in the vibration damper (E) on battery mounting bracket (3) and then engage pins (A) in the vibration dampers (F) on left-hand side electrical component support.


4
F
3
C
F
A

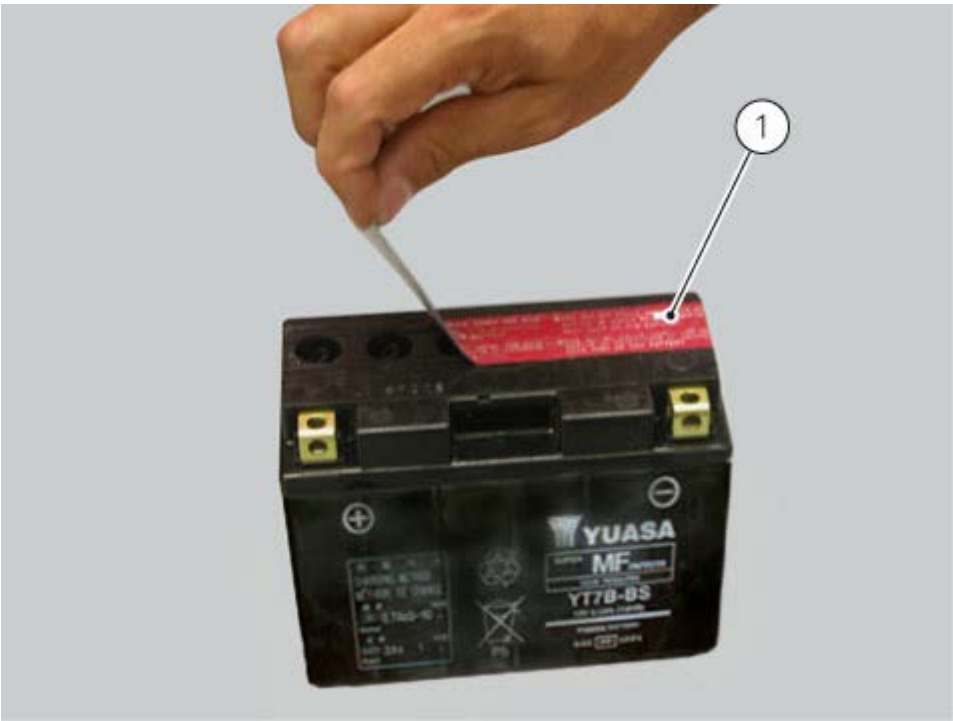
Topping up the electrolyte

Remove the battery from the motorcycle (Removing the battery).

Warning

Before carrying out any operations on the battery, keep in mind the safety standards (General safety rules). The electrolyte in the battery is toxic and can cause burns if it comes into contact with the skin because it contains sulphuric acid. Wear protective clothing, a face-mask and goggles when adding electrolyte. If the liquid 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, 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.

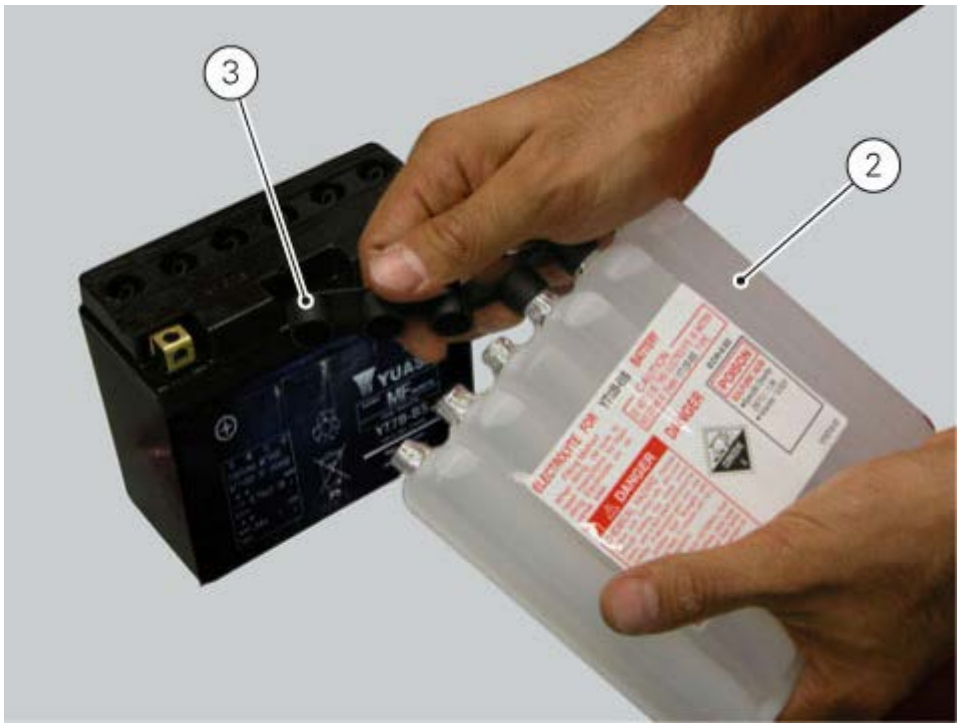
Place the battery on a flat surface. Remove the protective film (1).



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).



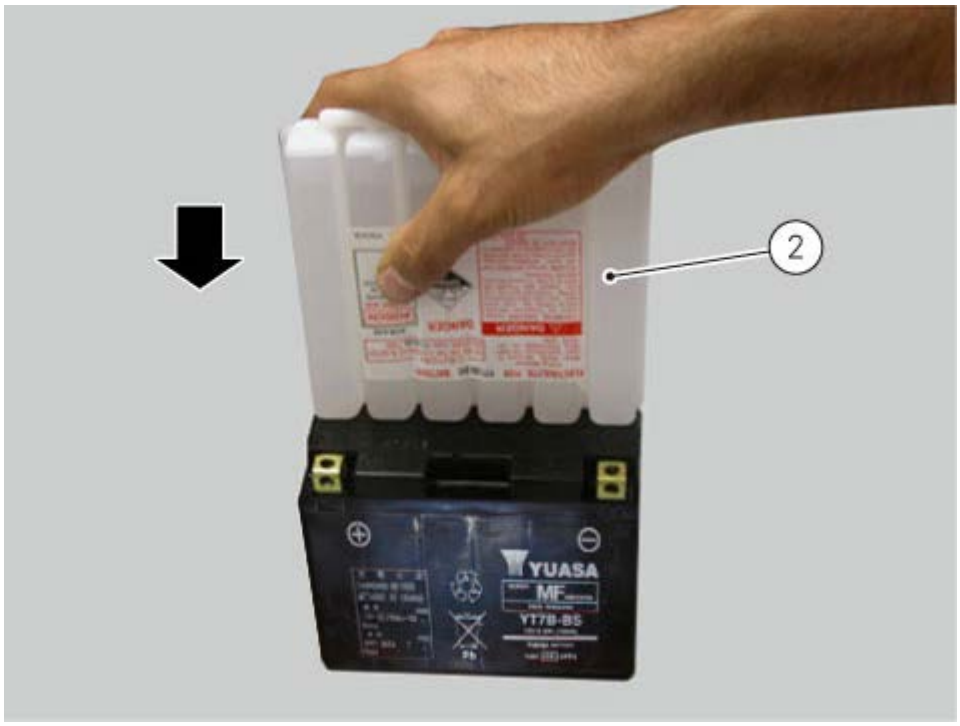
Important

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

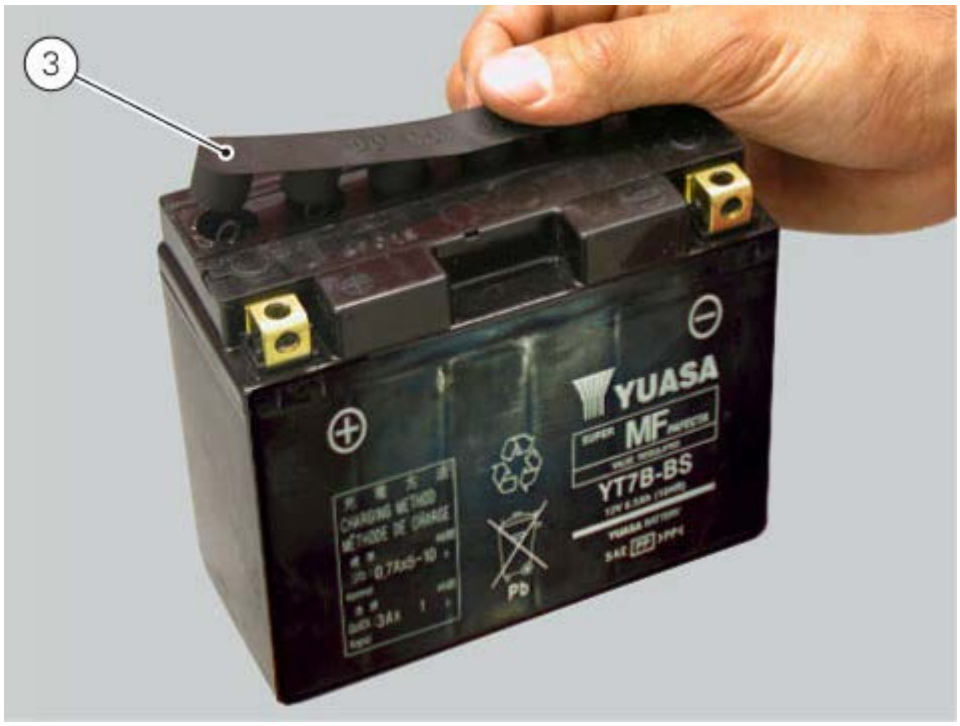
Do not tilt the electrolyte container as this could interrupt the flow temporarily or even permanently.

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.

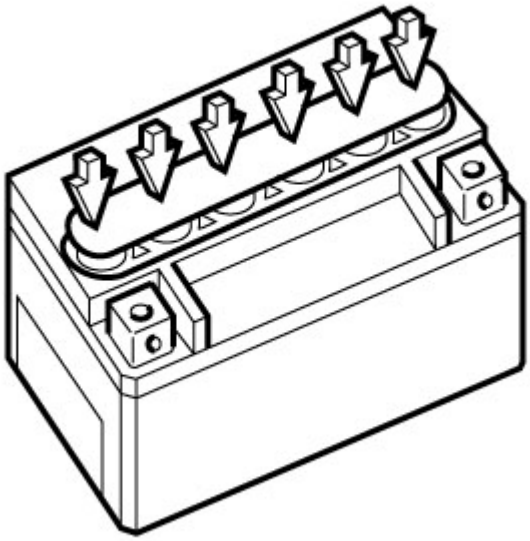
Make sure that all the electrolyte has flowed out. Carefully extract the container (2) from the battery.
Fit the cap strip (3) previously removed from the electrolyte container (2) to the battery, and ensure the caps plug off all filler holes.



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 fixing it. Recharge the battery as described in the paragraph "Recharging the battery".

Note
When using an automatic reduction battery charger, ensure that the charger current (ampere) is equal 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	0.7	5-10
Fast	12	3.0	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 2 (Ducati Diagnosis System 2.0)” diagnosis instrument, which is equipped with clamp-type amperemeter.
You can determine the engine rpm required for generator to produce enough current to charge the battery, feed the injection/ignition system and all electric items fitted to the motorcycle. When applied to a cable, the clamp-type ammeter detects the magnetic field generated by the current passing through that cable.

Warning
The clamp-type ammeter must not be connected to wires through which electrical current is flowing.

Insert the clamp-type ammeter on the battery positive terminal lead with the arrow on the clamp pointing towards the battery positive terminal (+).
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. If the current has a negative sign, this means that the charging system is not able to power the electrical loads and a significant amount of the current required must be supplied by the battery, which is therefore discharging.

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.

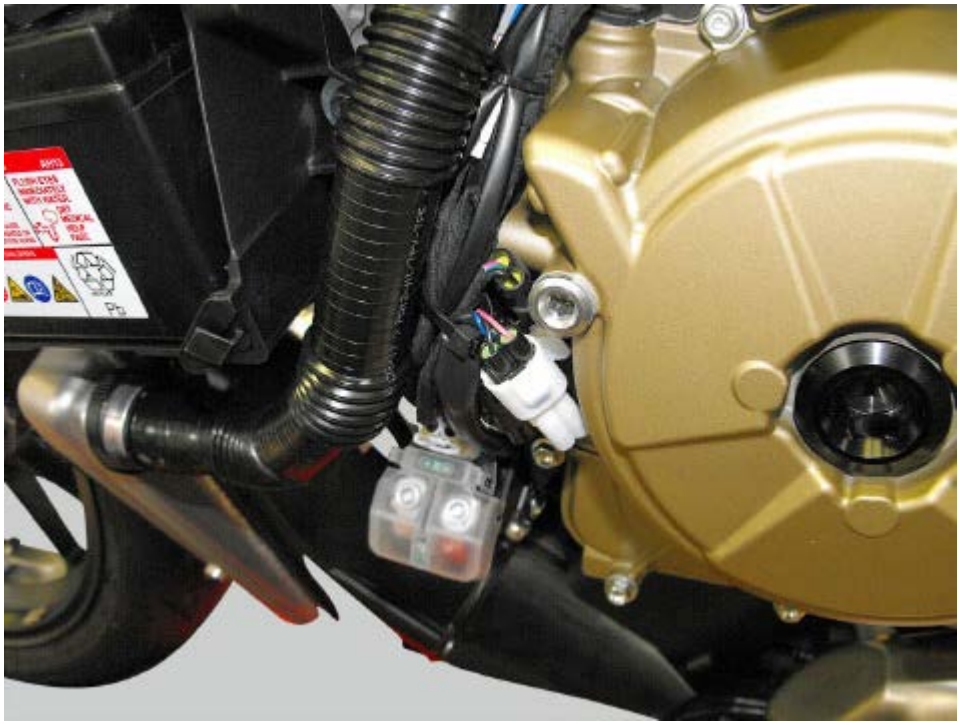
Solenoid starter

The solenoid starter is located on vehicle left-hand side.

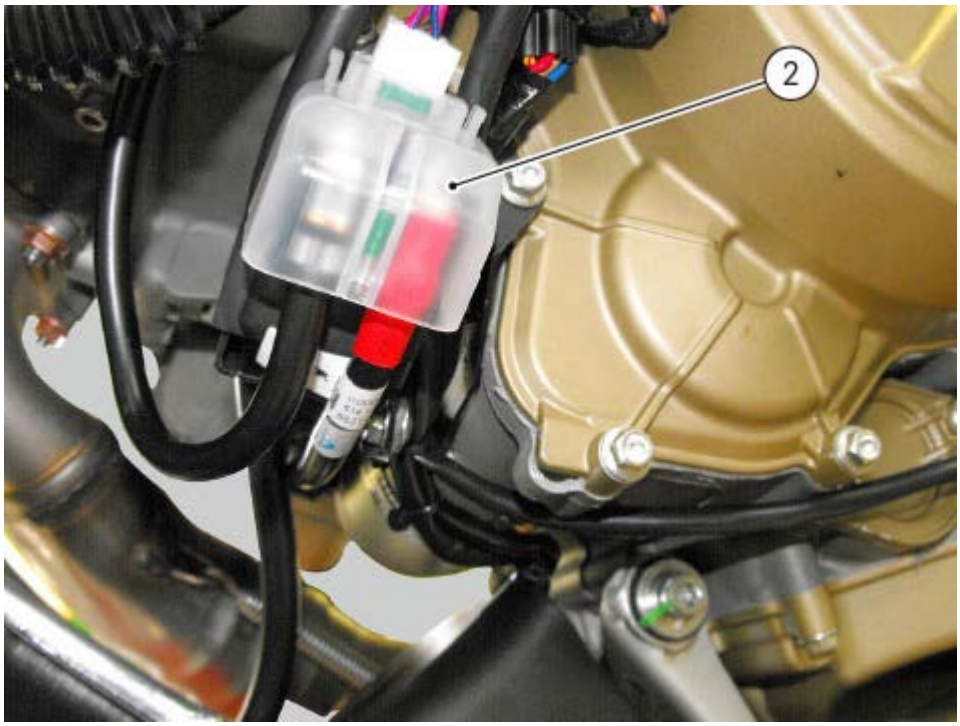
Remove the left-hand side fairing (Removing the side fairings).
Disconnect the battery (Battery).

Disconnect the solenoid starter connector (1) from the wiring.

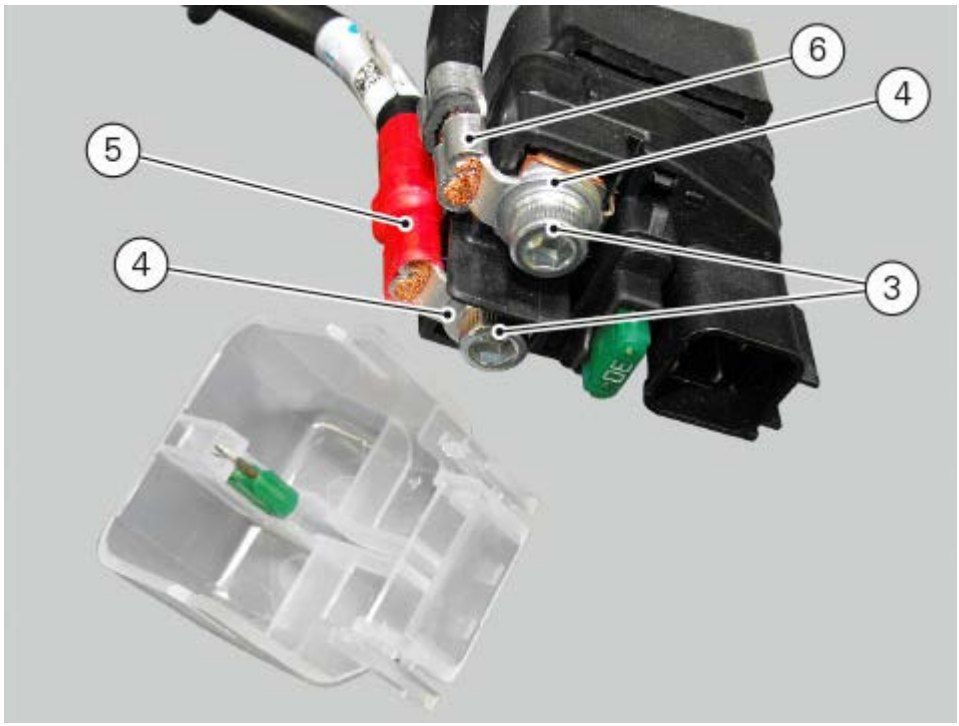
Slide out solenoid starter from its seat.



Remove protection (2)

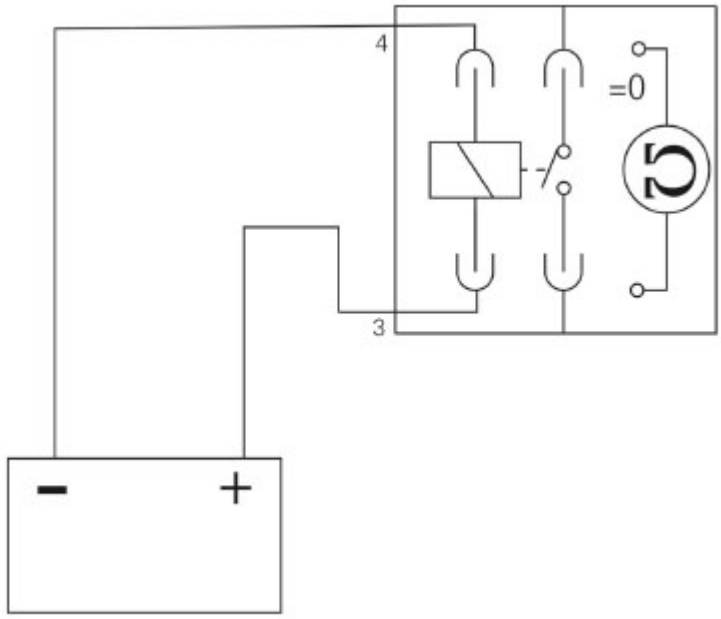


Undo the screws (3), taking care to collect the spring washers (4).
Remove the starter motor-solenoid starter cable (5) and the solenoid starter-battery cable (6).



Checking operation of the solenoid starter

Apply **12** V (battery voltage) across the positive terminal and negative terminal of the connector.
With a multimeter connected between the two poles (threaded pins) of the solenoid starter, check for electric continuity.
If there is no electric continuity, ensure that the terminals are not oxidised and apply water repellent spray. Change the solenoid starter if the malfunction persists.

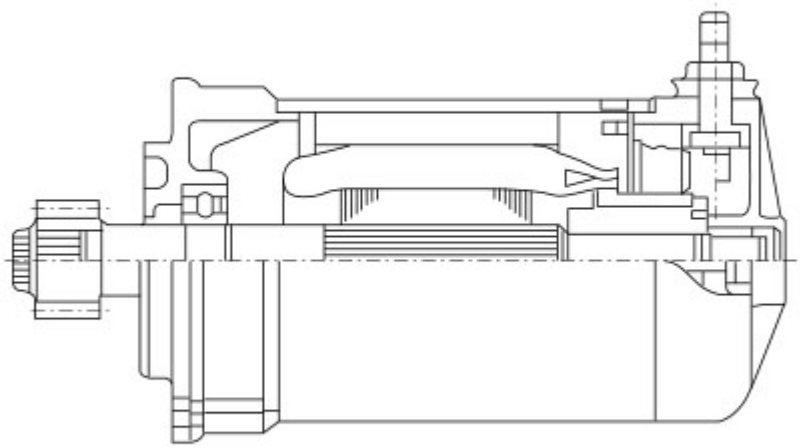


Lay down the starter motor-solenoid starter cable (5) and the solenoid starter-battery cable (6). Start screws (3) with washers (4). Tighten screws (3) to the specified torque of 10 Nm ± 10%. Refit protection cover (2). Fasten solenoid starter in its seat and connect the connector.

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

Starter motor

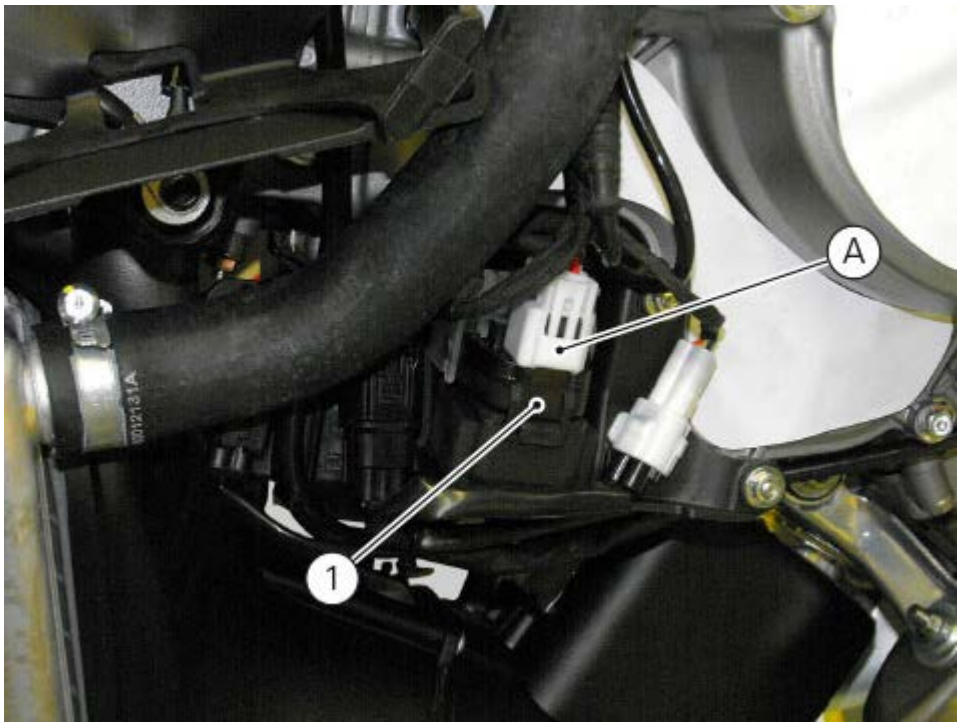
Power:
0.6 kW / **12** V
Direction of rotation:
counter clockwise viewed from power take-off side.

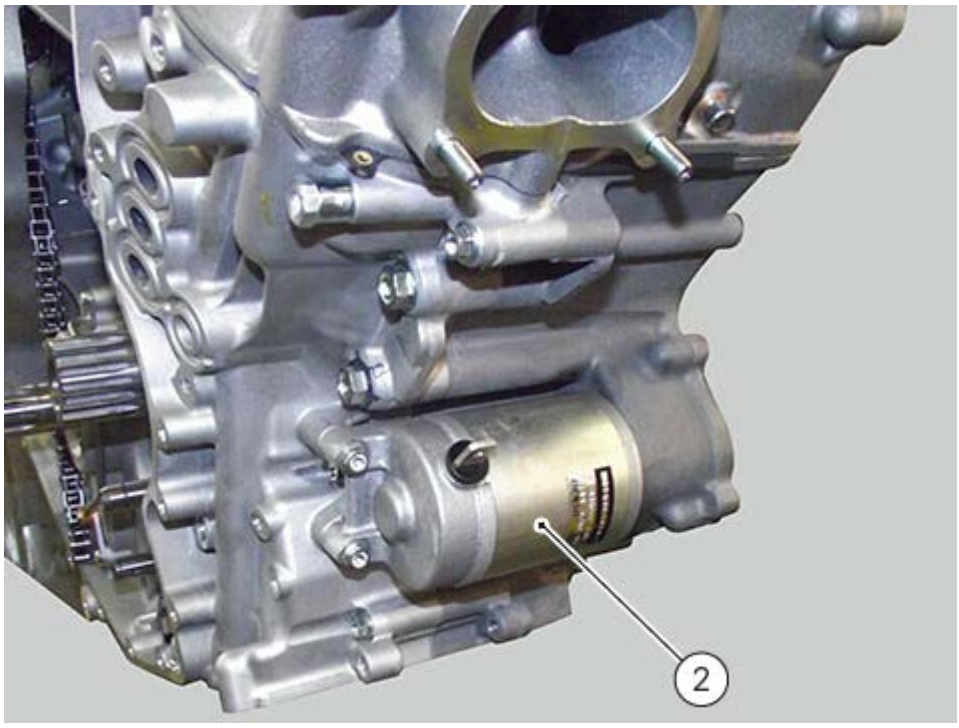


The starter motor is highly compact and reliable, therefore rarely raises any operating issue. In case of malfunction, ensure that the starter motor wiring terminal is properly tightened under the nut and shows no sign of oxidation. If the terminal is properly tightened and free from oxidation, remove 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 electric starting system consists of a solenoid starter (1) and a starter motor (2).





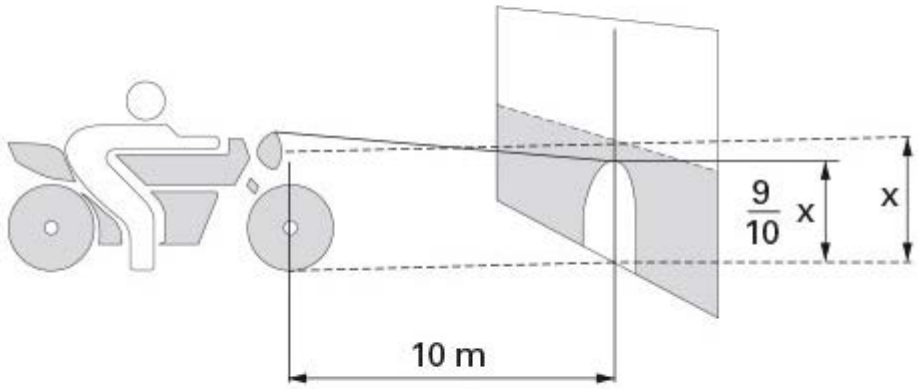
Aligning the headlight

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.

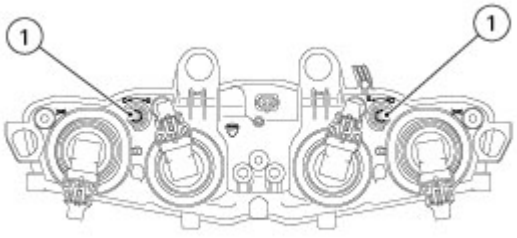
Note
If possible, perform this check in dim light.

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.



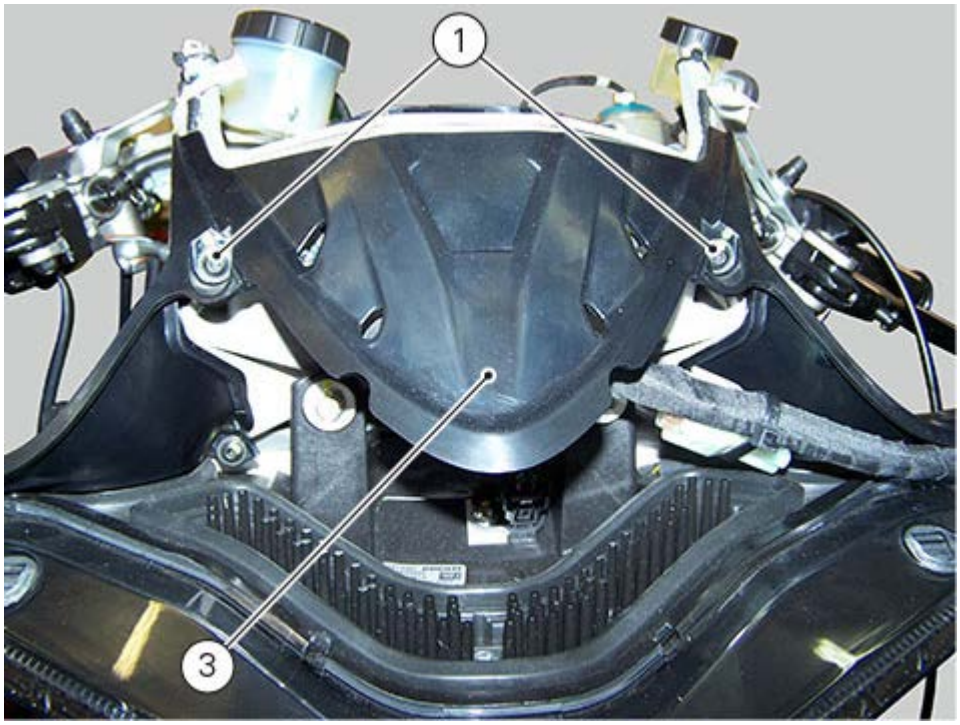
The vertical alignment of the headlight can be manually adjusted by turning the two screws (1).
Turn clockwise to raise the beam, counter clockwise to lower it.

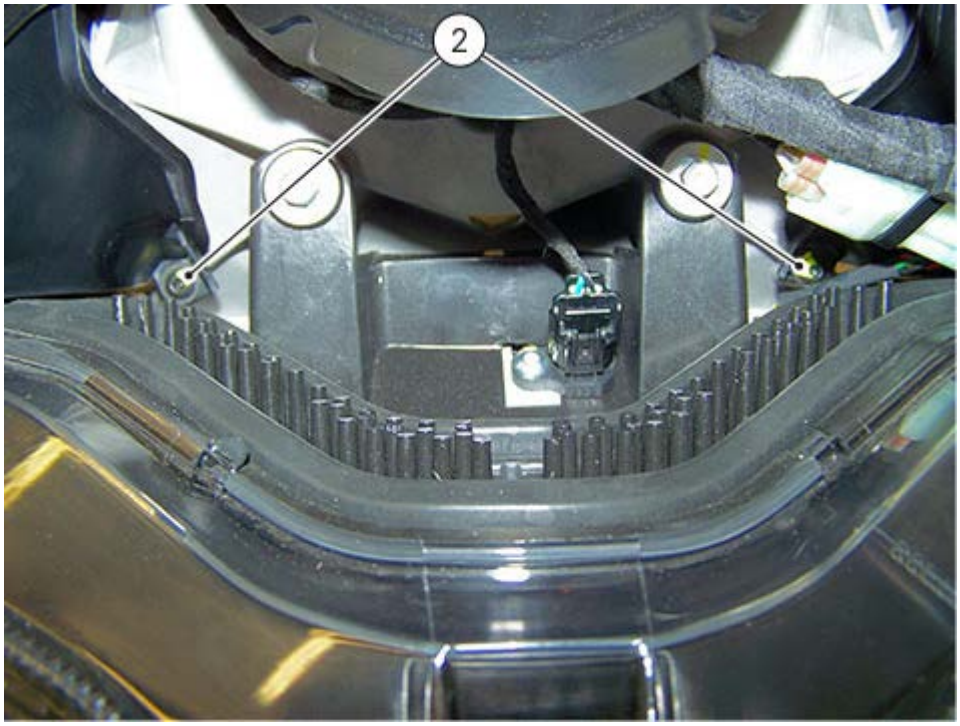


Replacement of the headlight

Removal of the headlight

Remove the headlight fairing.
Loosen the four screws (1) and (2) securing instrument panel cover (3) to front subframe, and remove instrument panel cover (3).

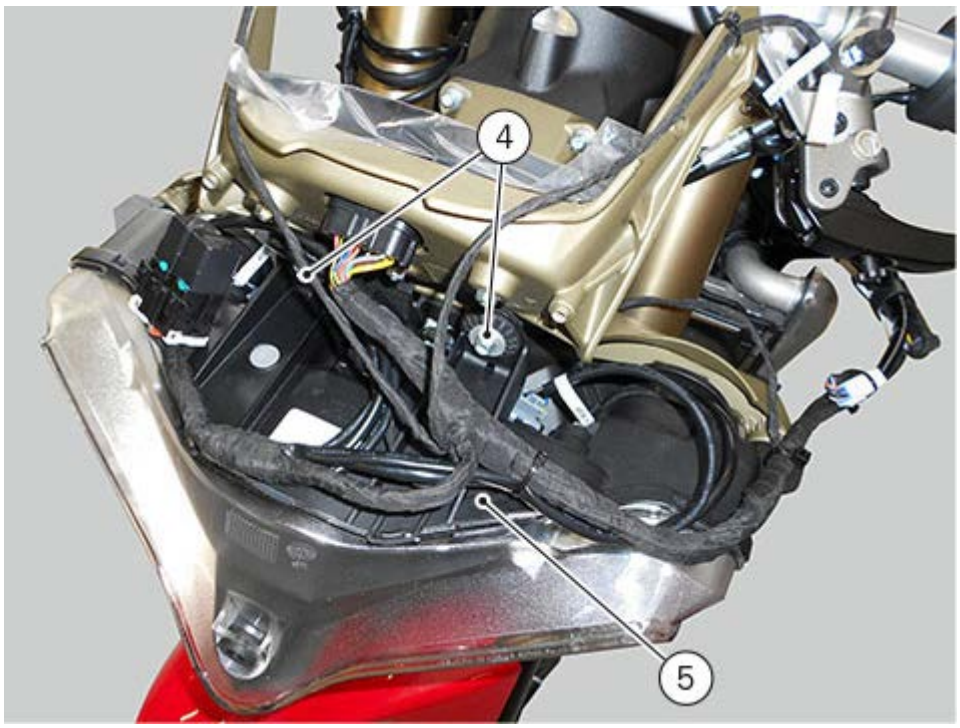


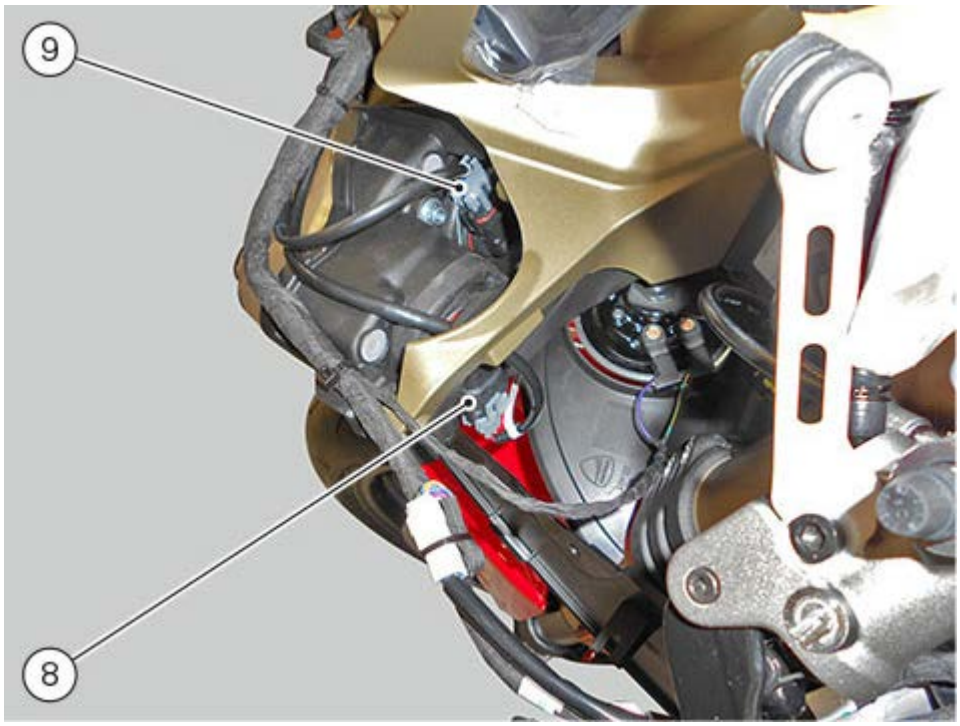


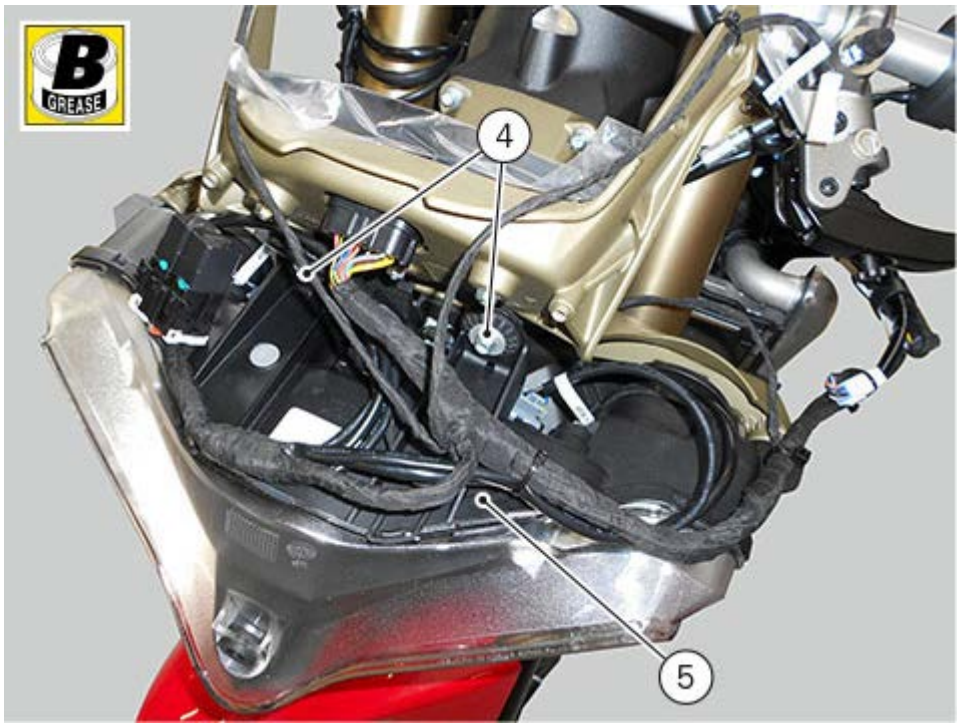
Loosen the two screws (4) securing headlight (5) to front subframe.
Disconnect the following connectors between headlight and main wiring:

- parking light connector (7);
- LH low beam connector (8);
- LH high beam connector (9);
- RH high beam connector (10);

- RH low beam connector (11).







Remove headlight.

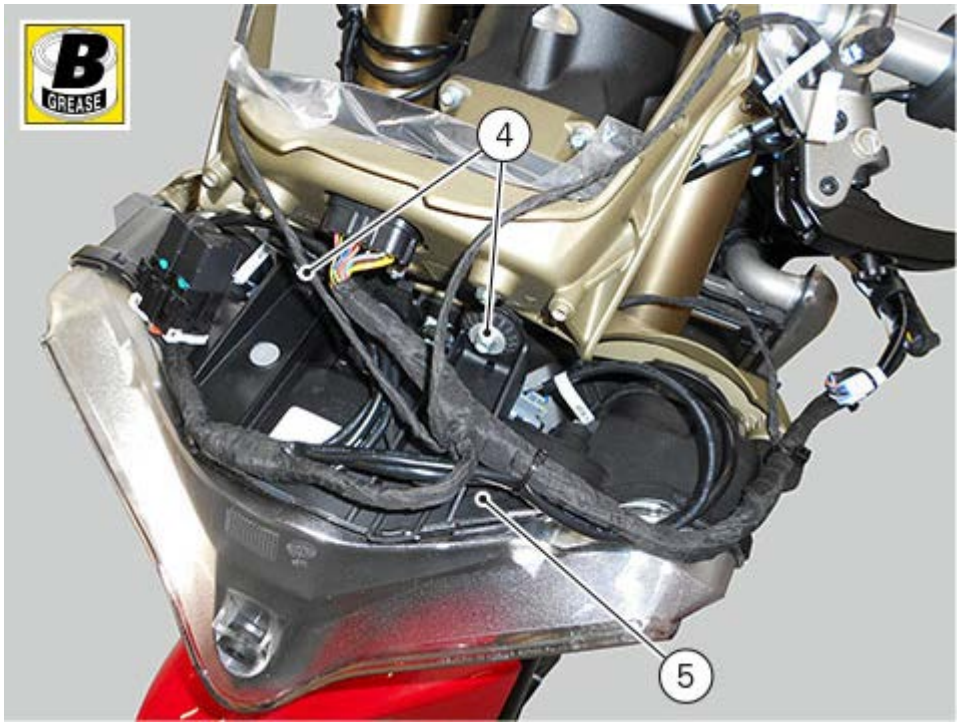
Installation of the headlight

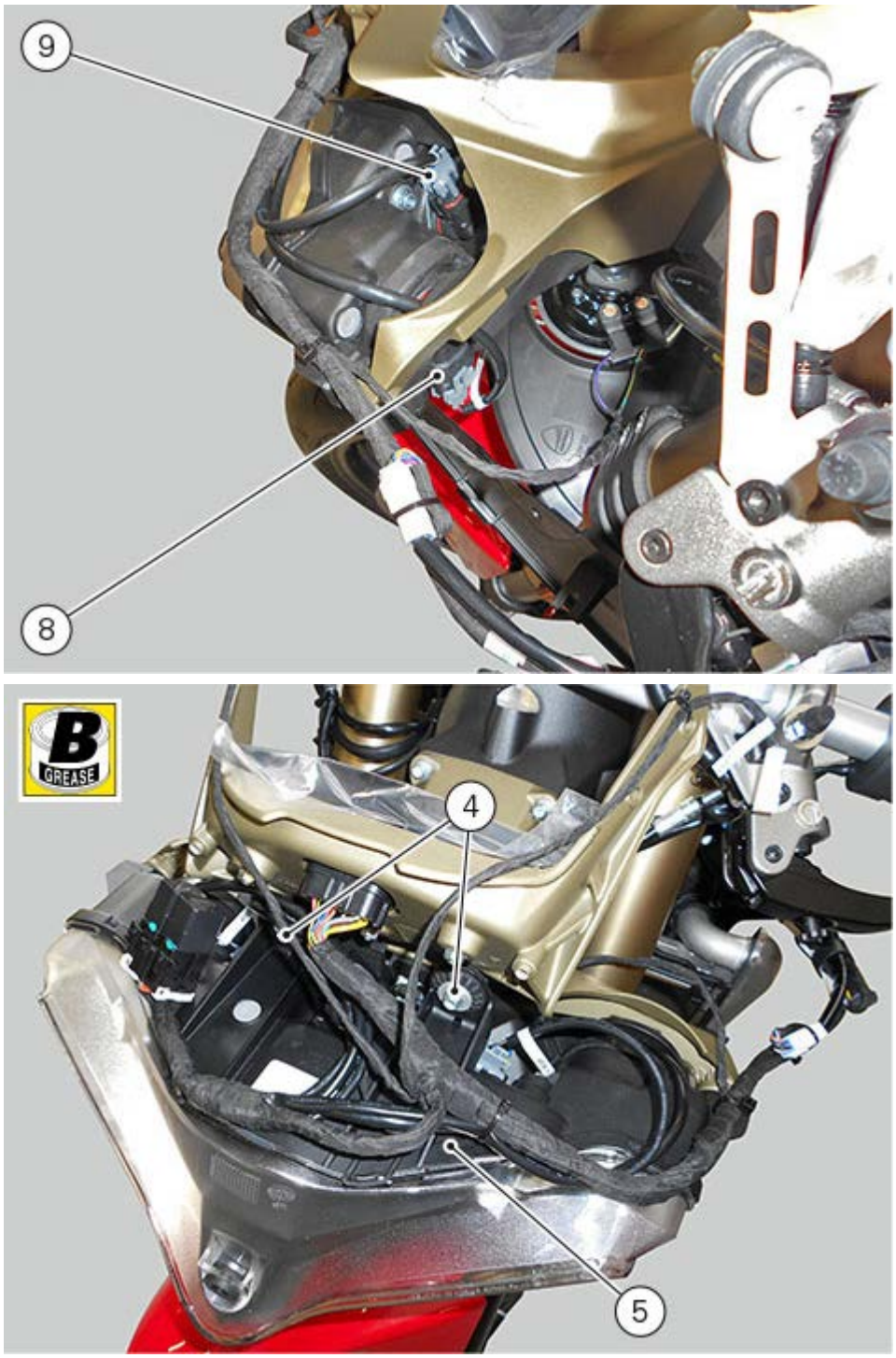
Refit headlight onto front subframe.
Connect the following connectors between headlight and main wiring:

- parking light connector (7);
- LH low beam connector (8);
- LH high beam connector (9);
- RH high beam connector (10);
- RH low beam connector (11).

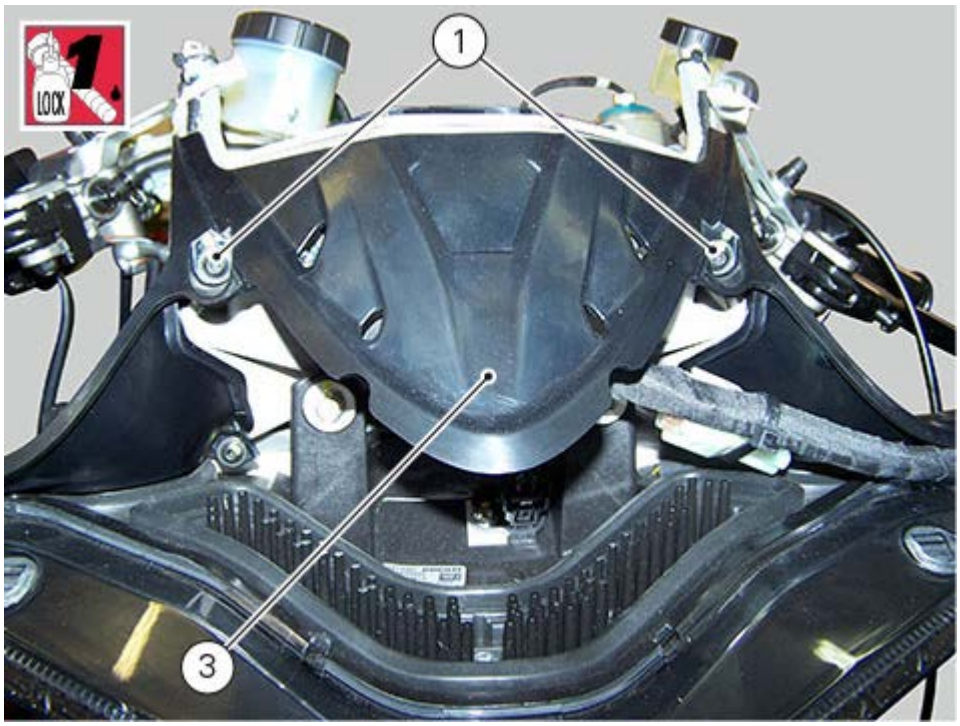
Apply recommended grease to the screws (4).

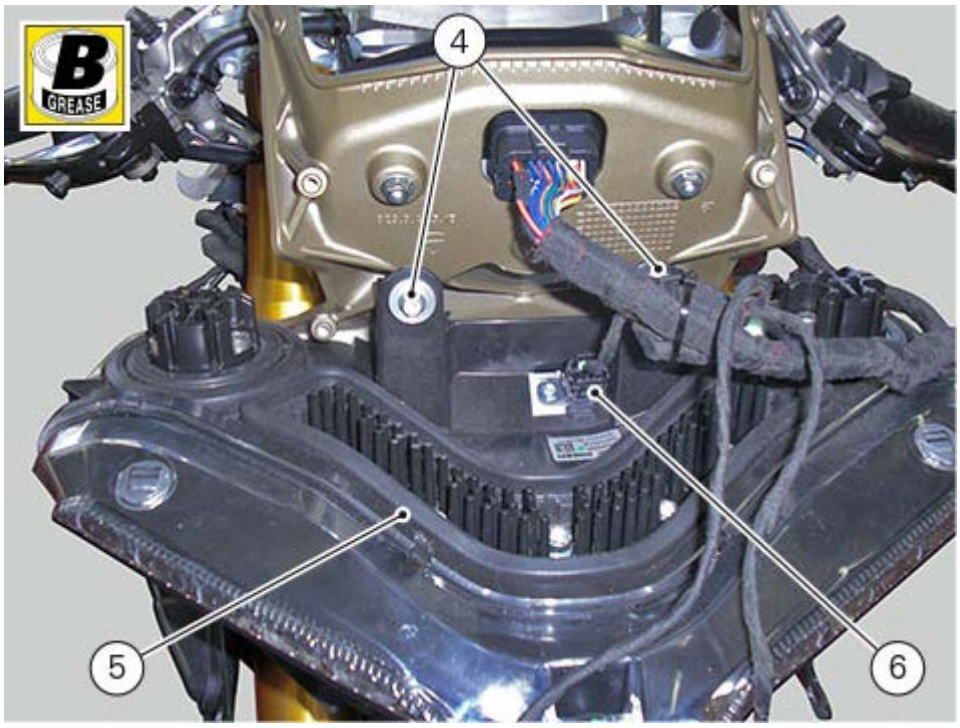
Tighten the two screws (4) securing headlight (5) to front subframe to a torque of 5 Nm ± 10%.





Position instrument panel cover (3) onto headlight.
Smear screws (1) and (2) with recommended threadlocker.
Tighten the screws (1) and (2) to a torque of 3 Nm ± 10%.





Refit the headlight fairing.

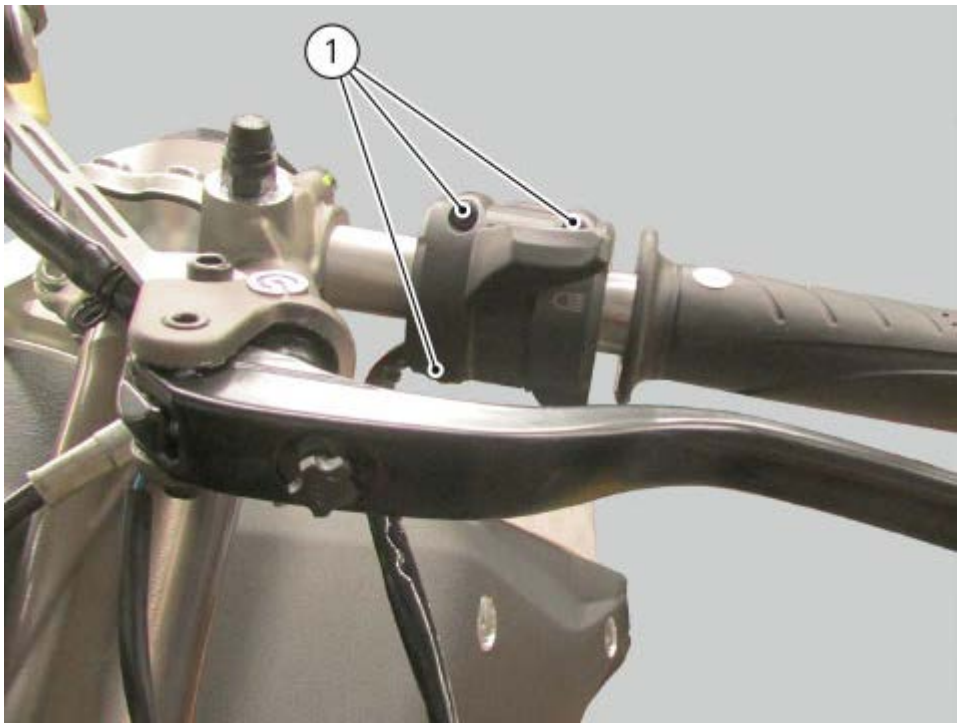
Checking the indicators and lights

In the event of a fault, the internal connections of the device must be checked in all operating conditions. To do this, it is necessary to disconnect the switch connector from the main wiring. Then analyse the switch using an analogue or digital multimeter.

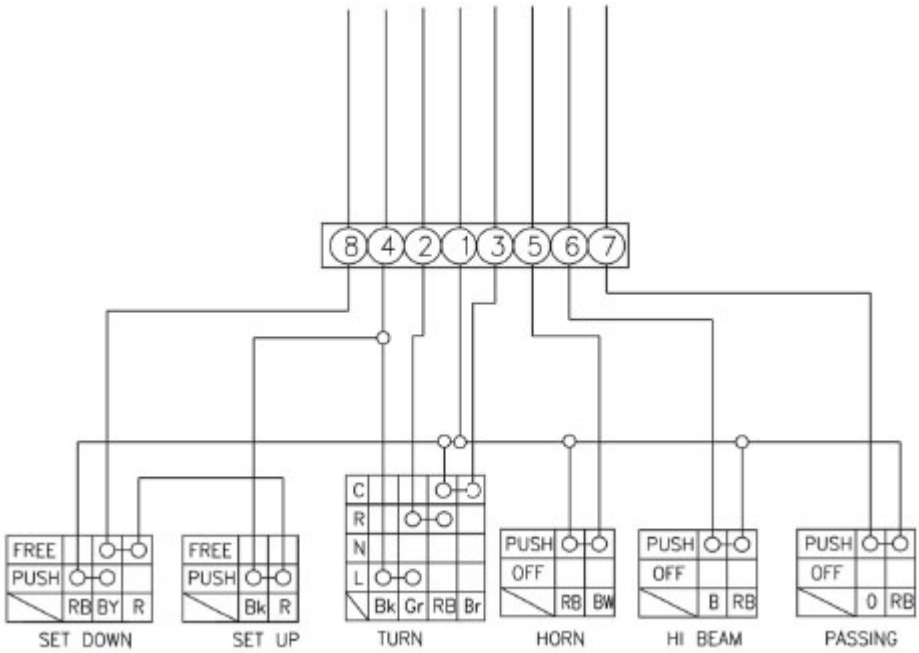
Note
The same test may be done using the “DDS 2” diagnosis instrument.

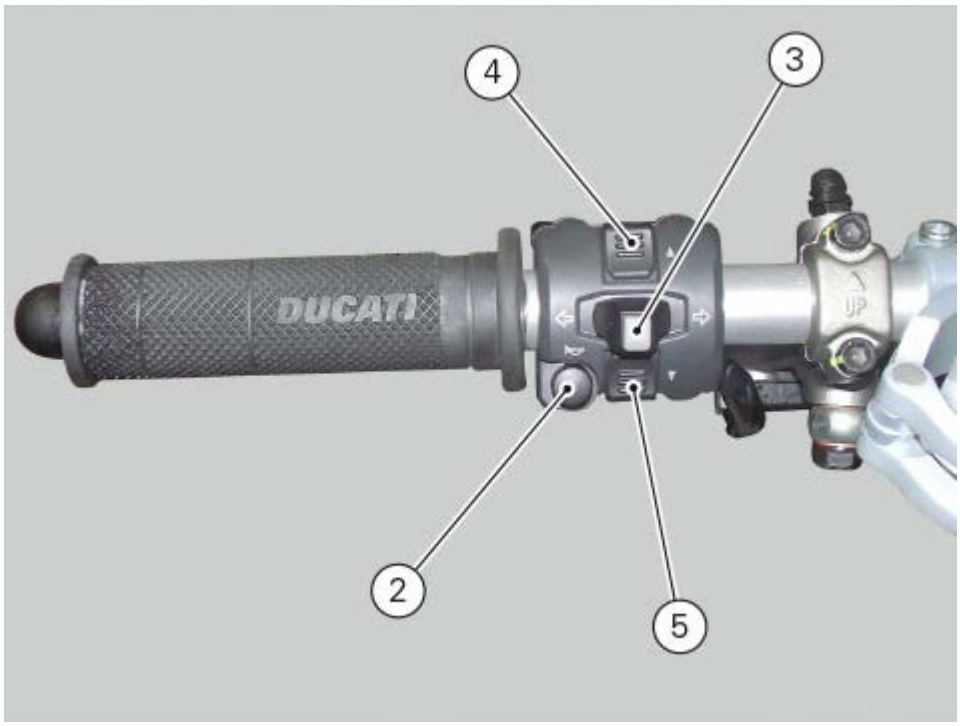
Checking the left-hand switch

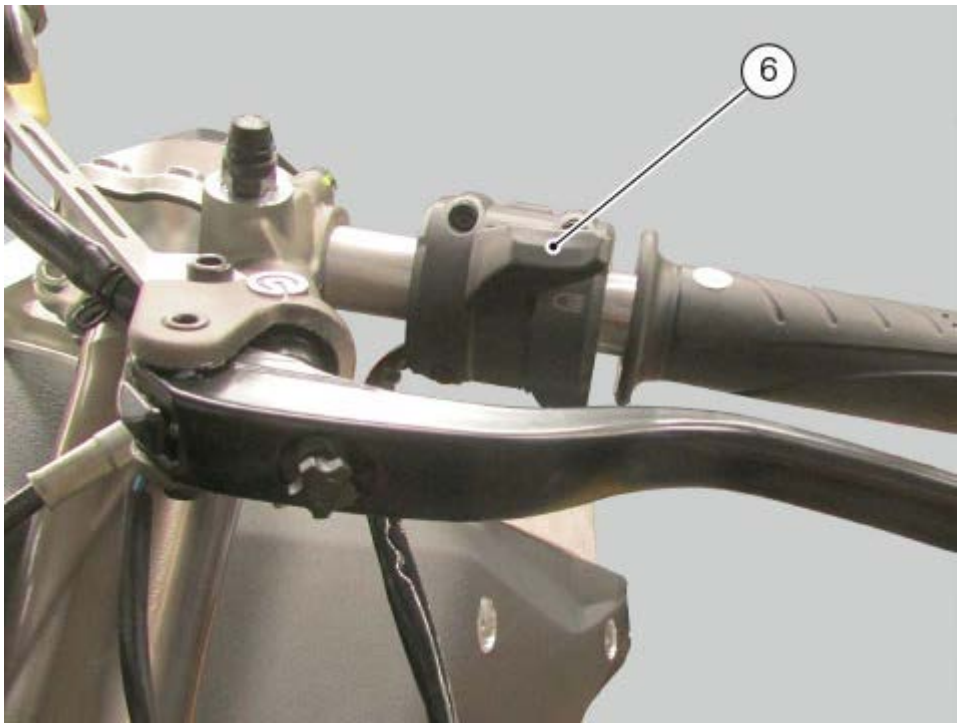
To remove the left-hand switch, undo the screws (1) and disconnect it from the electric system.



The colours mentioned in the following descriptions refer to the colour of the wires from the switch and not to the colour of the main electric system wires.







HORN button (2)
Connect the terminals of a multimeter to the Red/Blue and White/Blue cables to check for electric continuity, which must be available when HORN is pressed. When the HORN button is pressed, the resistance value read by the multimeter should be close to zero and, if available, a continuity beep should be heard. When the HORN button is not pressed, the resistance value should be infinity (there is no continuity as the electrical contacts inside the push-button are open) and no continuity beep should be heard, if provided. If these conditions are not met, the device must be replaced.

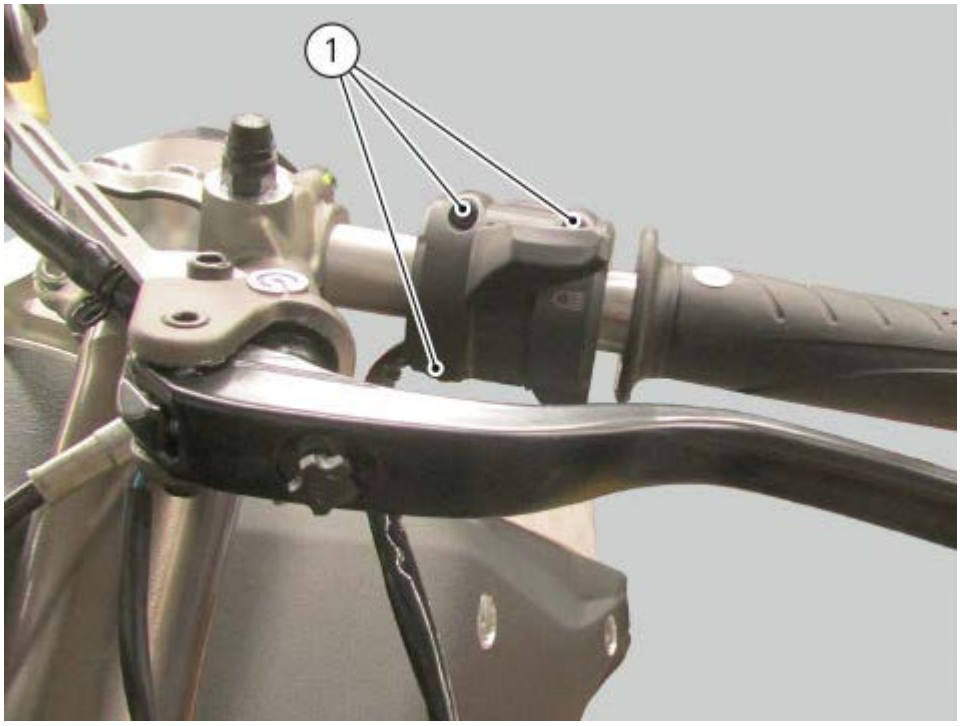
Turn indicator switch (TURN) (3)
Connect the multimeter to the Red/Blue and Grey wires arriving from the turn indicator switch and check for electrical continuity when operating the right turn signal. Repeat the above procedure for the left turn indicator, but connect the multimeter to the Black and Grey wires.

Low beam and high beam (Hi Beam) (6) Test using the same procedure, applying the probes of the meter to the Red/Blue and Blue wires and moving switch down.

Flash switch (PASSING) (6)
Check for continuity between the Red/Blue and Orange wires. Unlike the Hi Beam, switch (6) should be pressed.

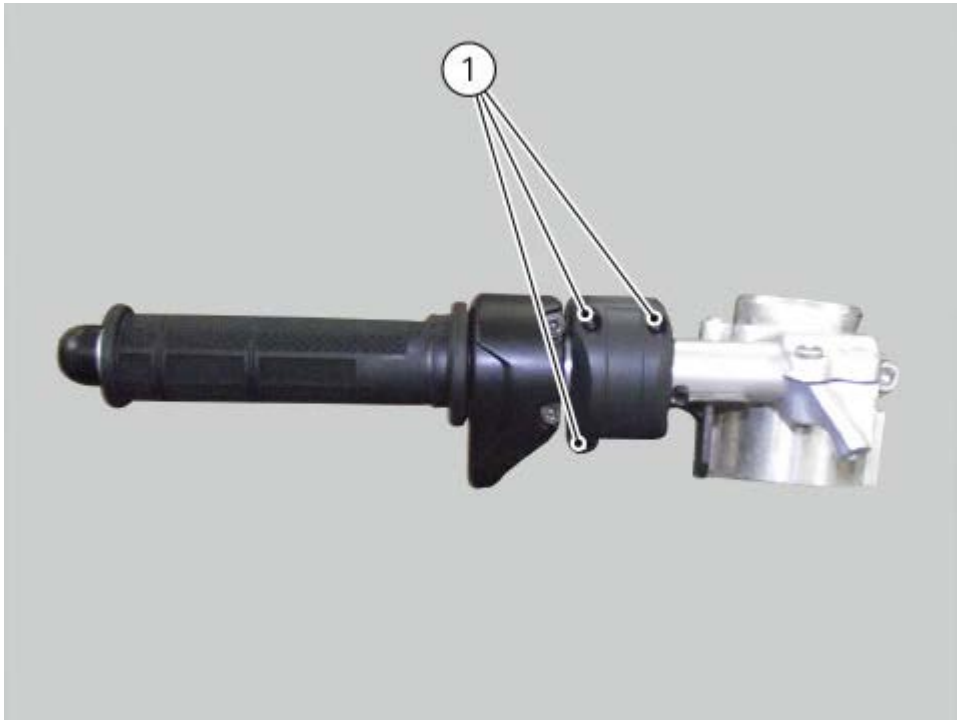
Control switch (SET UP) (SET DOWN) (4)(5)
Connect the multimeter to the Red and Black wires arriving from the instrument panel function selector switch and check for electrical continuity when pressing button (4). Repeat the same procedure, press button (5) and connect the multimeter to the Red/Blue and Blue/Yellow wires.

Refit the left-hand switch by tightening the screws (1) to the specified torque.

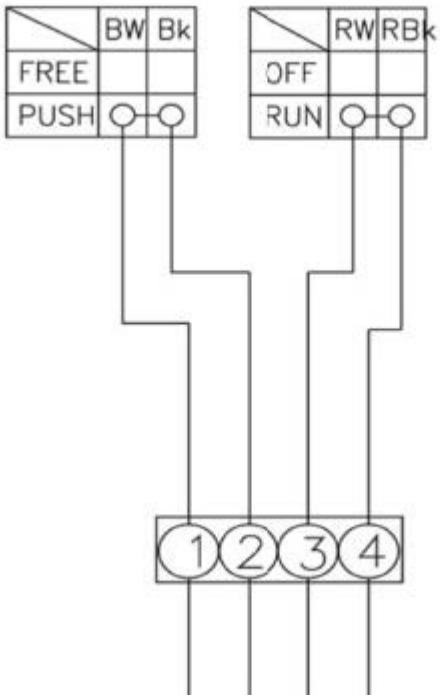


Checking the right-hand switch

To remove the right-hand switch, loosen the retaining screws (1) and disconnect it from the electric system.



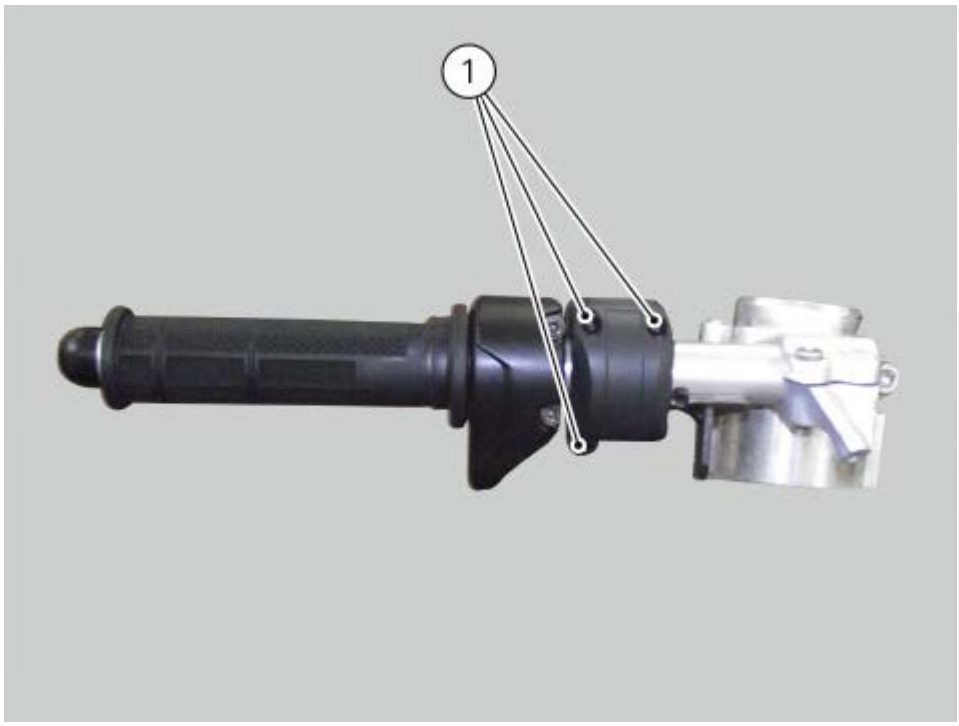
The colours mentioned in the following descriptions refer to the colour of the wires from the switch and not to the colour of the main electric system wires.



Engine stop button
Using a multimeter, check for continuity between the Red/White and Red/Black wires. When the button is in RUN position, there should be electrical continuity between the two wires. When the button is in the OFF position, there should be no electrical continuity between the two wires. If these conditions are not met, the engine stop switch is not working correctly and must be replaced.

Starter button
Proceed as described for the engine stop button and check for continuity between the Blue/White and Black wires when the starter button is pressed. If there is no continuity, the starter button is faulty and must be replaced. Colours mentioned in the descriptions refer to the colour of wires from the switch and not to the colour of the main electric system wires.

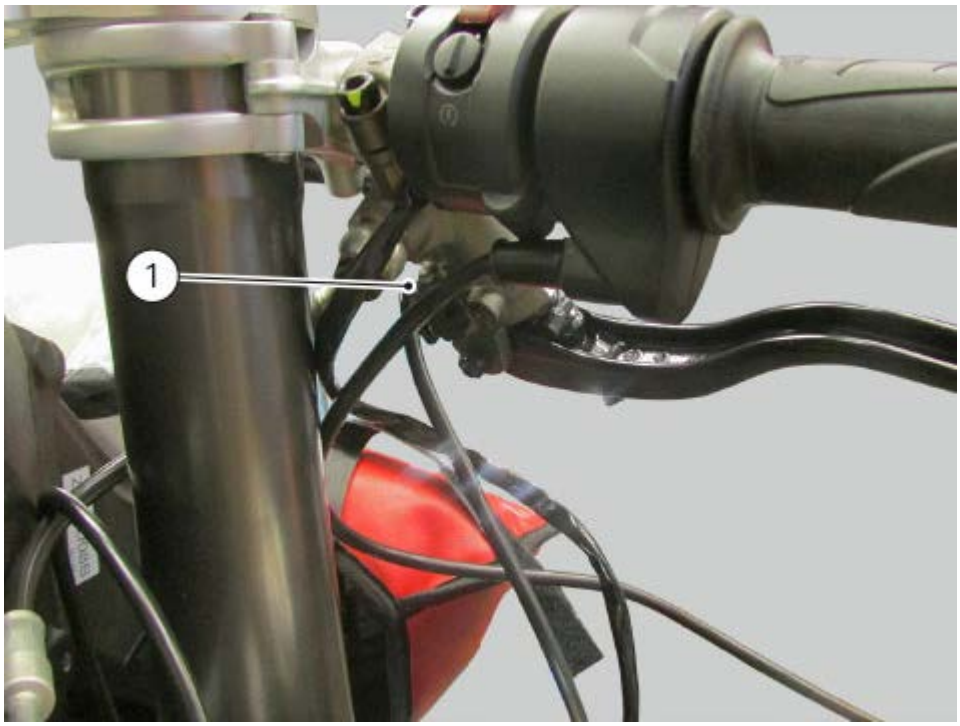
Refit the right-hand switch by tightening the screws (1) to the specified torque.

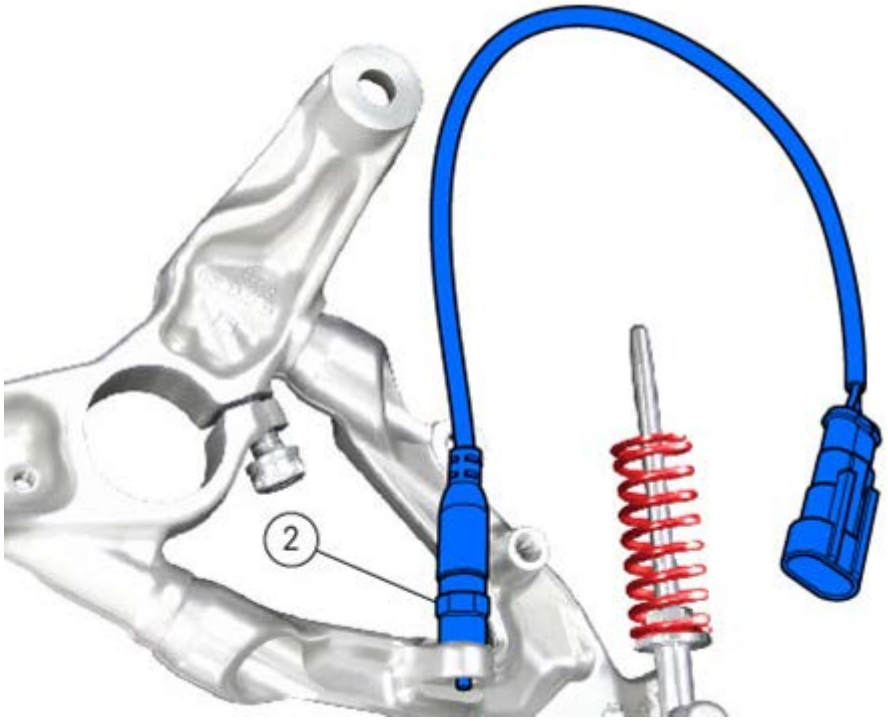


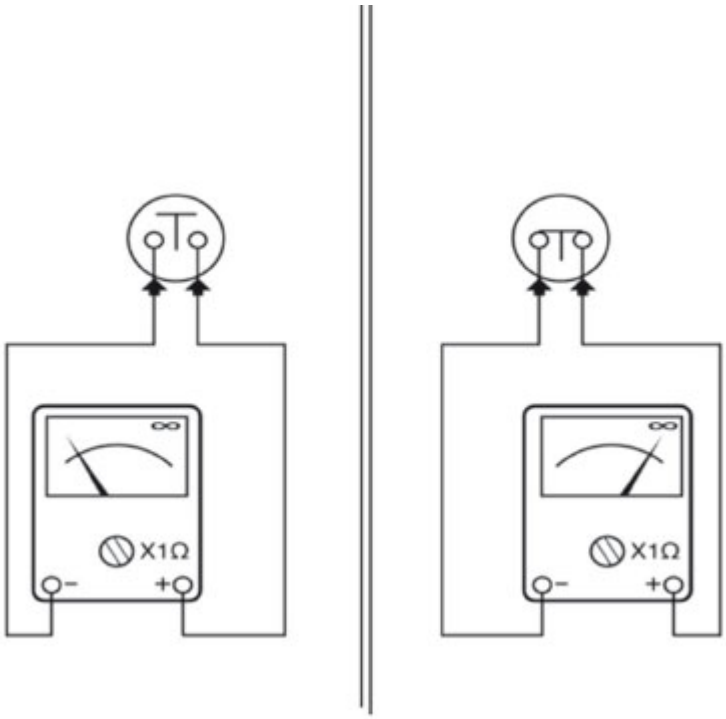
Checking the front and rear brake light, neutral light, oil pressure and clutch switches

Brake light switches
To check operation of the front (1) and rear (2) brake light switches use a multimeter: when the front or rear brake is operated, there must be electric continuity between the terminals of the corresponding

switch. No electric continuity should be available when brakes are not operated. If these tests fail to produce positive results, the part in question must be replaced.

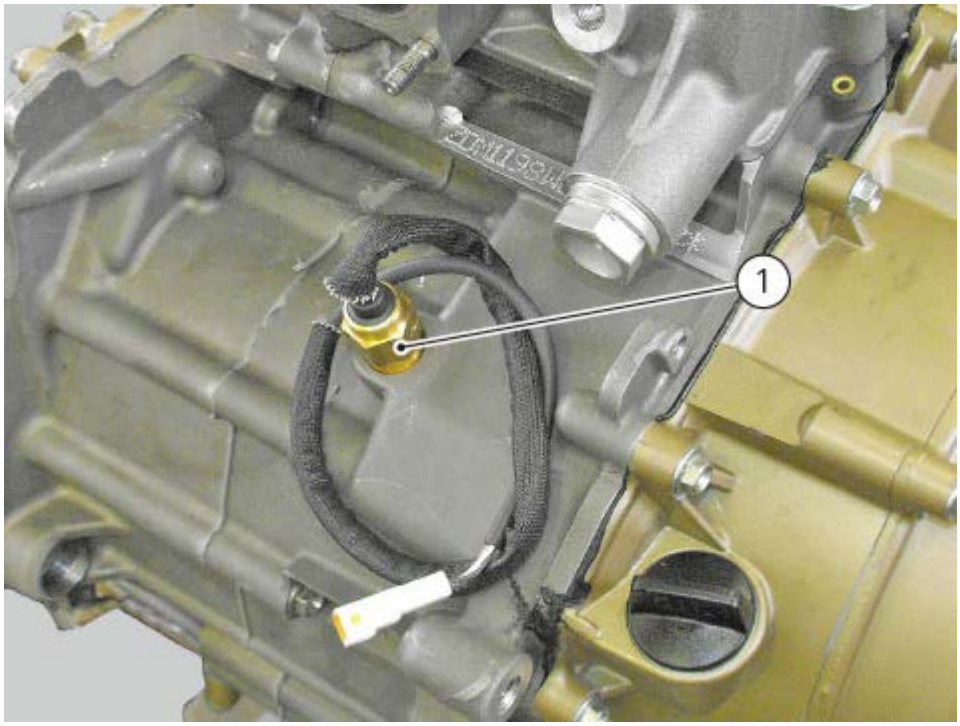


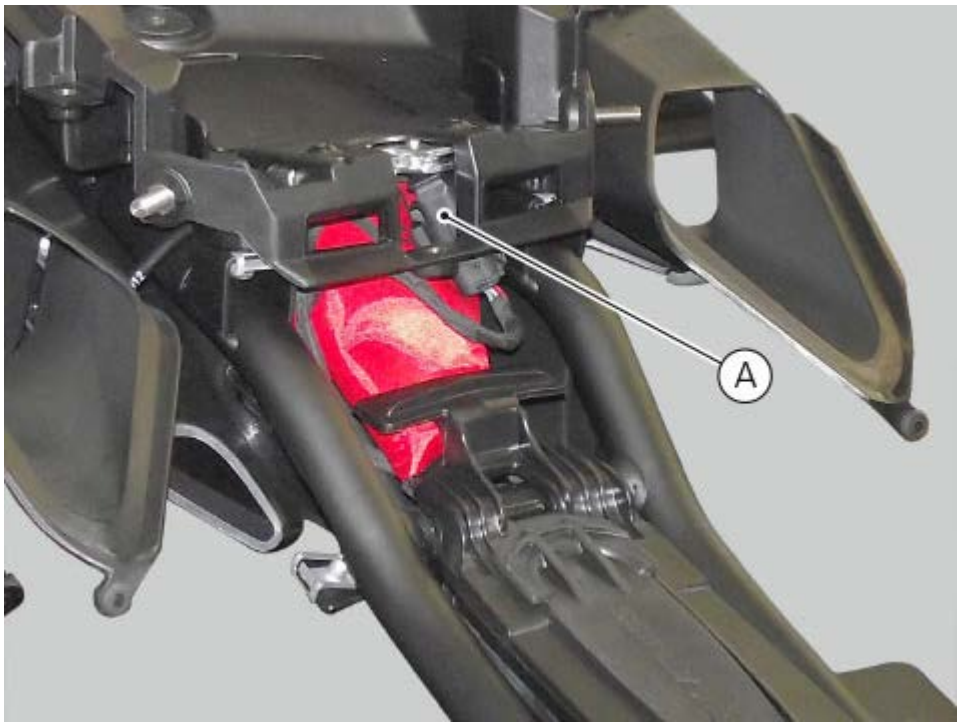




Gear sensor

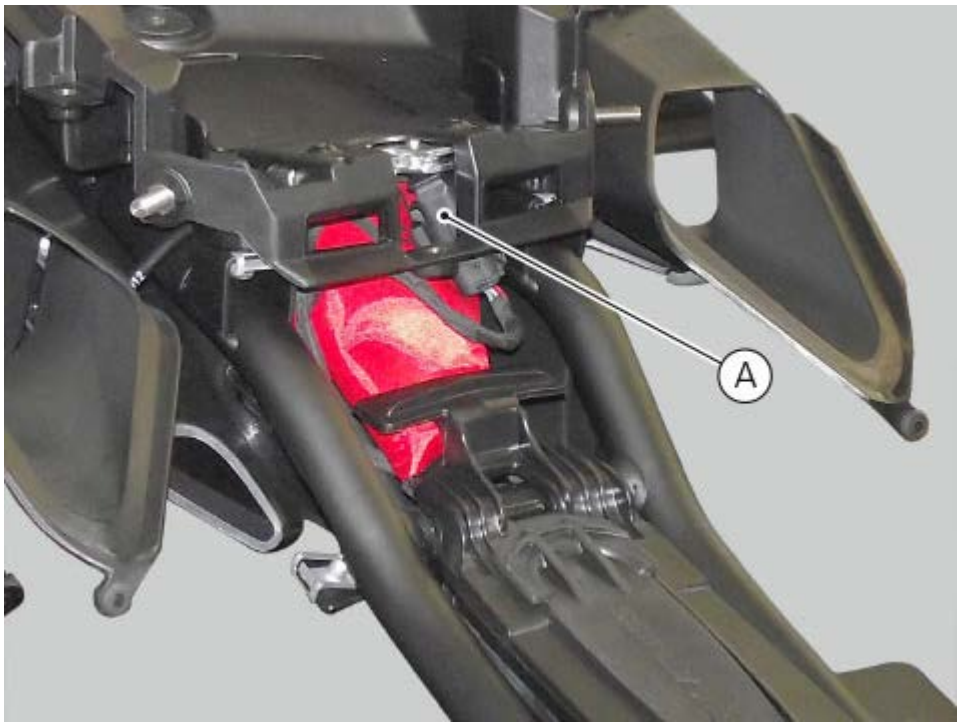
To check operation of the gear sensor (1), connect the DDS 2 to the system through connector (A) located at the rear end of the vehicle.



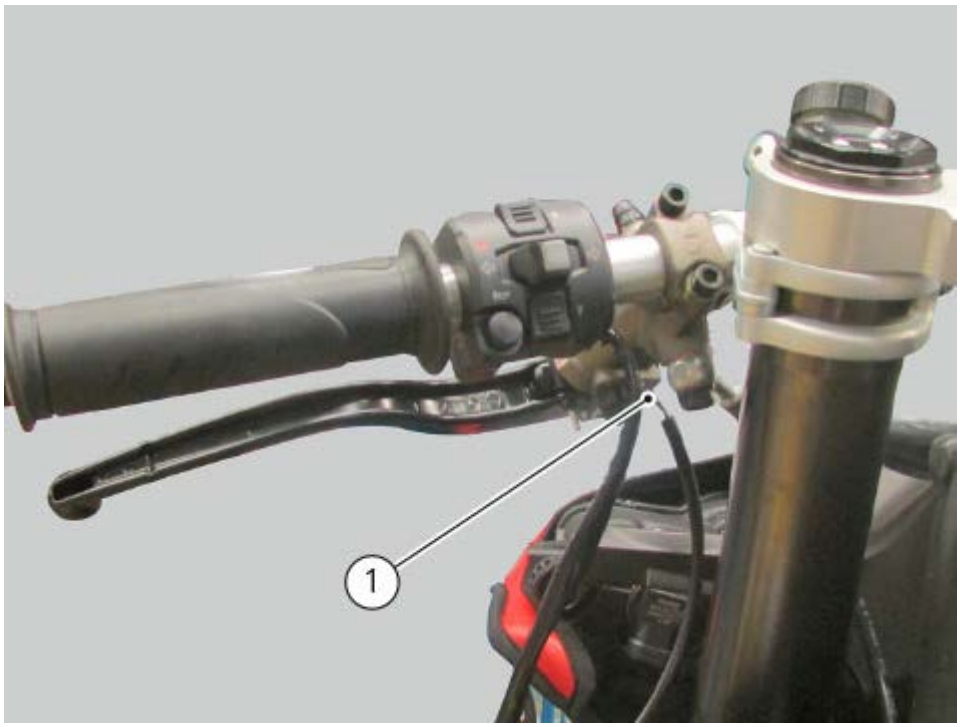


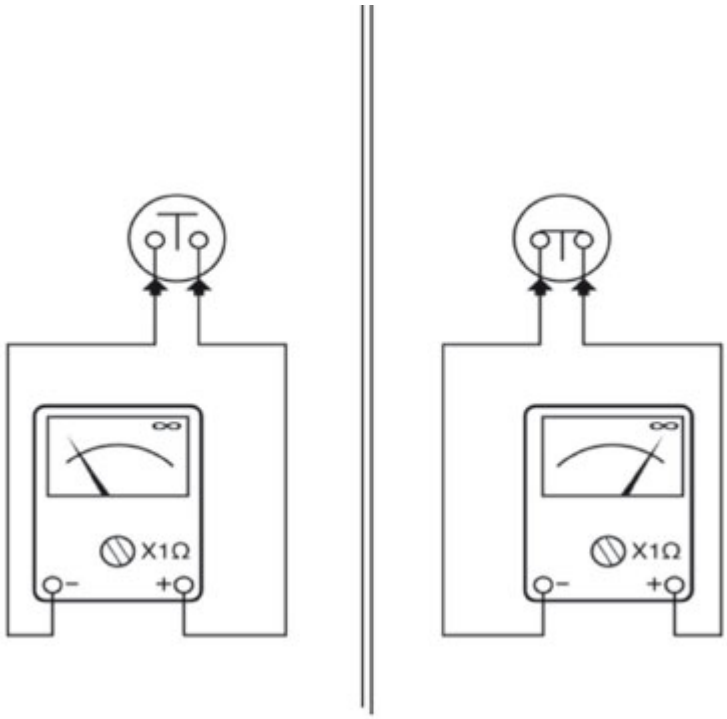
Oil pressure sensor
To test the operation of the engine oil pressure sensor (1), proceed as follows.

Use the diagnosis instrument to check that oil pressure in the engine lubrication circuit complies with the specified values.
If the engine oil pressure value is outside the specified range, check the lubrication circuit components and service as necessary.
Switch on the instrument panel (ignition key turned to ON) without starting the engine, disconnect the electrical terminal from the pressure sensor and connect it to ground. If the warning light does not illuminate, this means the sensor is defective and must be replaced. If the warning light illuminates, start the engine. If the warning light does not turn off, connect the DDS 2 to the connector (A) located at the rear end of the vehicle and check the system.



Clutch switch
For the clutch switch (1) proceed in the same manner as for the brake light switches.





Water temperature sensor

The coolant temperature sensor (1) outputs the electric signal to the engine control unit, which shares it with the instrument panel through the CAN line. Check sensor (1) operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket. After selecting the proper items on the menu, read the engine coolant temperature value among the different displayed engine parameters. With cold engine, the DDS 2 air temperature reading shall be similar to the coolant one. With hot engine and cooling fan just triggered, coolant temperature value shall be similar to the one required for activating the electric fan. Should the outcomes of these tests be negative, replace the engine coolant temperature sensor. Should the DDS 2 detect an error such as "coolant temperature sensor short circuit or open circuit" inside the control unit memory, check the electric system parts connecting sensor to control unit. If this section of the electric system is not faulty (no open circuit, no short circuits, no short circuit to ground), replace the sensor.

Air temperature sensor

The air temperature sensor (1), located on vehicle central part, detects the ambient temperature. This signal is output to the control unit, which shares it with the instrument panel through the CAN line. In this way map corrections are made possible.

Check sensor (1) operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket. After selecting the proper items on the menu, read the air temperature value among the different displayed parameters. Then compare it with the actual value. Change the sensor if reading is incorrect.

Checking the fuses

Remove the left-hand side fairing (Removing the side fairings).

The main fuse box (1) is located on the vehicle left side, above the battery.
The fuses can be reached by removing the protection lid with tab (B).

For the ampere values, refer to the following table.

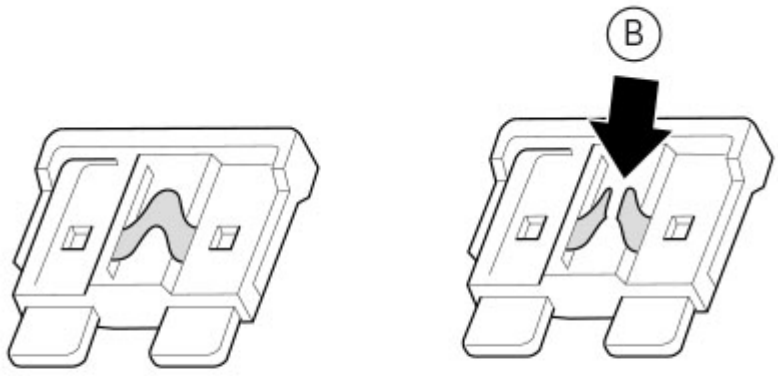
BOX 2	
Description	Ampere (A)
GPS	5
KEY	10

DIAGNOSTIC	5
ETV	10
DASH	10

BOX 3	
Description	Ampere (A)
ABS	30
ABS	15
INJECTION	20
LIGHTS	10
BBS	15

Important
Before replacing a damaged fuse with a new one of the same rating, identify the cause of the problem.

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



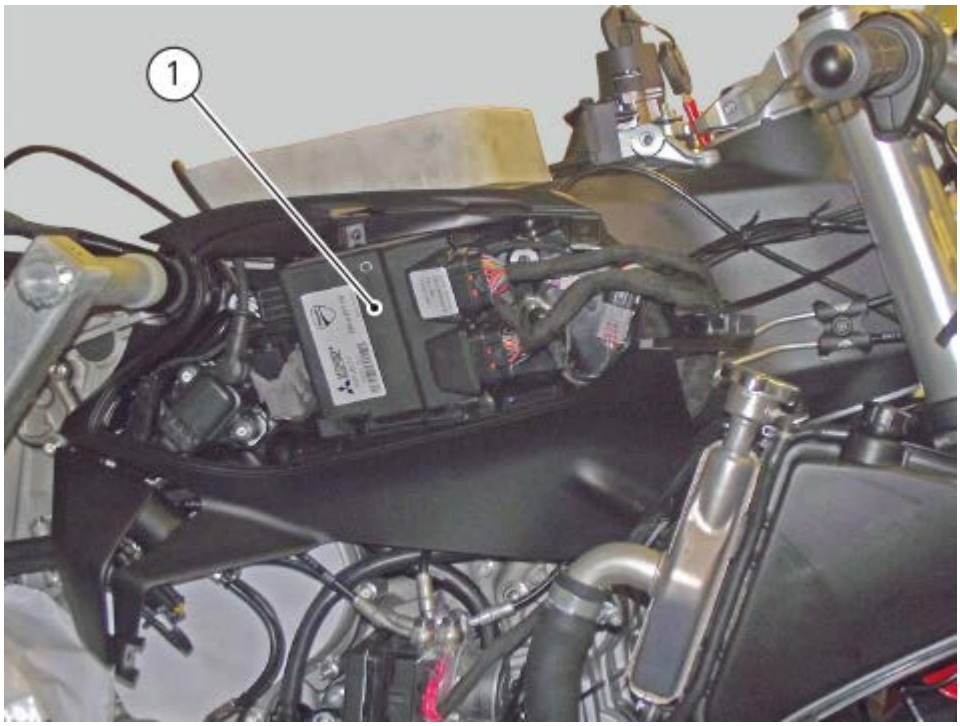
Important
Switch the ignition key to OFF before replacing the fuse to avoid possible short-circuits.

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.

SYSTEM COMPONENTS

Engine Control Unit (ECU)

The engine control unit (1) is an electronic digital microprocessor-based unit.



It controls both the injectors and the coils, thus controlling fuel injection and ignition in accordance with the engine operating conditions detected by the following sensors:

- Absolute pressure sensor (measures the barometric pressure).
- Air temperature sensor (measures intake air temperature).
- Engine temperature sensor (measures the coolant temperature).
- Timing/rpm sensor (for engine rotation speed and the position of each cylinder relative to TDC).
- Throttle position sensor (measures the throttle opening angle).

The ECU also monitors battery voltage so that it can adjust injector opening time and ignition coil charging time accordingly.
The ECU determines the following values:

- Quantity of fuel delivered to each cylinder.
- Injector closing time and therefore injection timing relative to the end of the intake stroke for each cylinder.
- Spark advance.

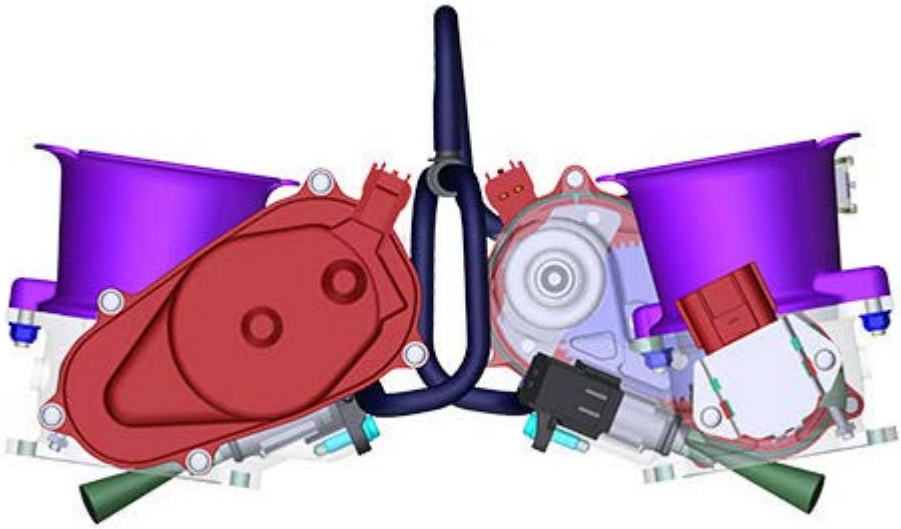
Important

The maps, which include spark advance values, injection times, crankshaft angle for injector closing and all correction curves as a function of temperature and atmospheric pressure values, are stored in the Flash Eprom of the ECU. The above values are preset by the Manufacturer after testing the motorcycle under different riding conditions. These settings cannot be changed.

If the control unit has been removed, connect it properly upon refitting.

Electric injector

The injectors deliver the correct quantity of fuel required for optimal engine operation.



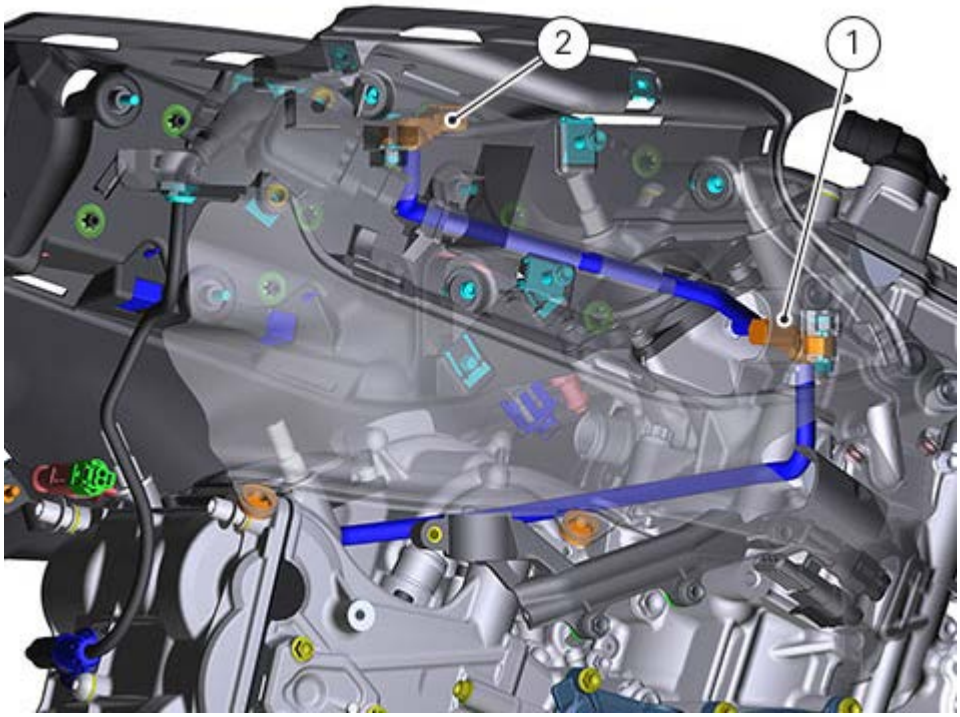
The ECU controls injector opening by feeding current to the coil of an electromagnet which creates a magnetic field to attract the armature, thereby generating fuel spray. If we consider the fuel physical characteristics to be constant (viscosity, density), as well as the injector delivery and pressure head (controlled by the fuel pressure regulator), the amount of fuel injected depends on the duration for which the injector is open. This time is determined by the ECU in accordance with the engine operating conditions. In this way correct fuel delivery in ensured. To remove and refit the injectors, refer to chapter (Removing the throttle body).

Check for injector correct operation with the diagnosis instrument DDS 2.

The fuel output must be even and the jet should be fully atomised, without droplets.
Do not leave the engine stopped for a long time with the fuel circuit full. The fuel could clog the injectors and make them inoperable. Periodically, after lengthy periods without running the engine, we recommend adding "TUNAP 231" to the fuel in the tank to help clean critical sections of the fuel circuit.

Map sensor

The map sensors, for horizontal cylinder (1) and vertical cylinder (2), measure the air pressure to calculate the exact quantity of fuel to be injected.
They detect the intake pressure and the control unit compares such value with that of the external temperature to determine the air quantity that is flowing inside of the cylinders. Then, it controls the injectors to supply the correct quantity of fuel to obtain an optimal air/fuel ratio.



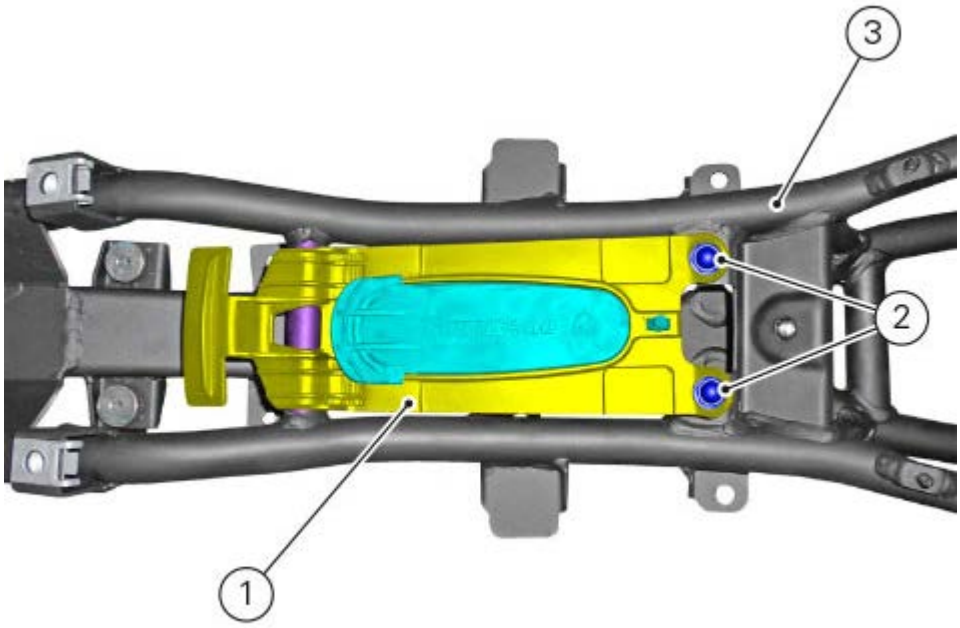
Check for injector correct operation with the diagnosis instrument DDS 2.

BBS (Black Box System)

Black Box System or central electronics with integrated DTC system for traction control. It is located under the rider's seat.

The BBS, like the Dashboard, is connected to sensors and actuators. The BBS shares on the network all information sent by the various sensors, processes it and controls the actuators accordingly. Beside this, the BBS stores all malfunction errors recorded by the control units.
The BBS software features the DTC function to control the engine power and prevent the driving wheel from slipping upon accelerations.

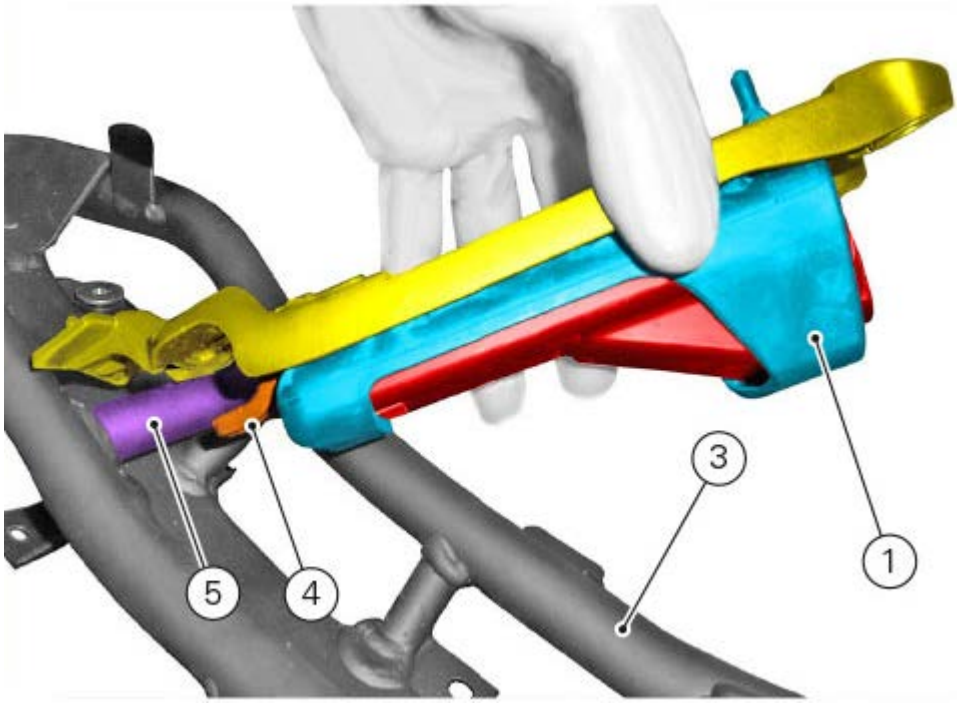
To remove the BBS (1) from the vehicle disconnect the connector and loosen the two screws (2).
Slide out the BBS.



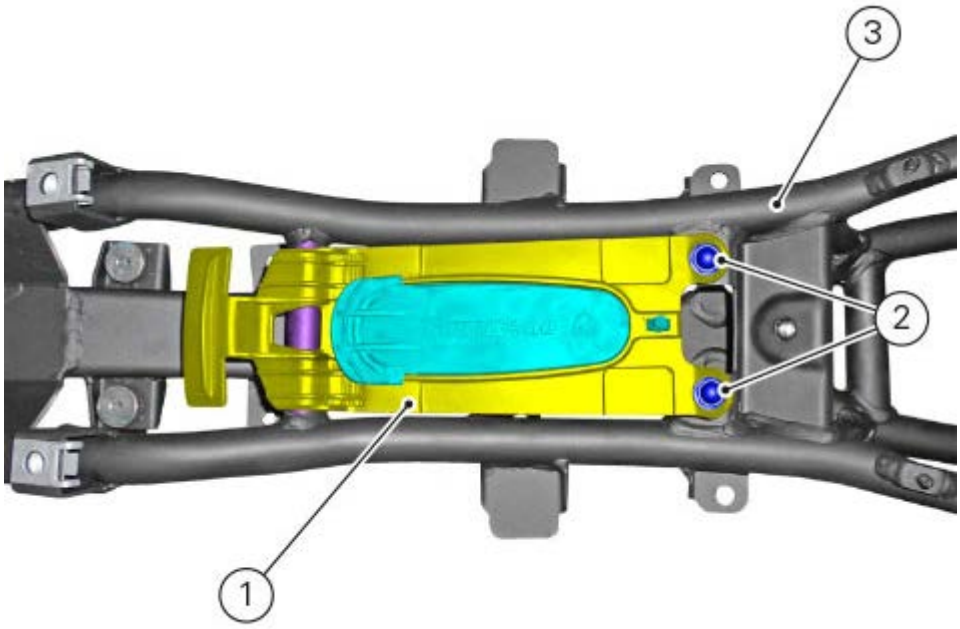
Check for injector correct operation with the diagnosis instrument DDS 2.

To refit the BBS (1), place it on the rear subframe (3).

Engage support tooth (4) under the trellis frame (5).



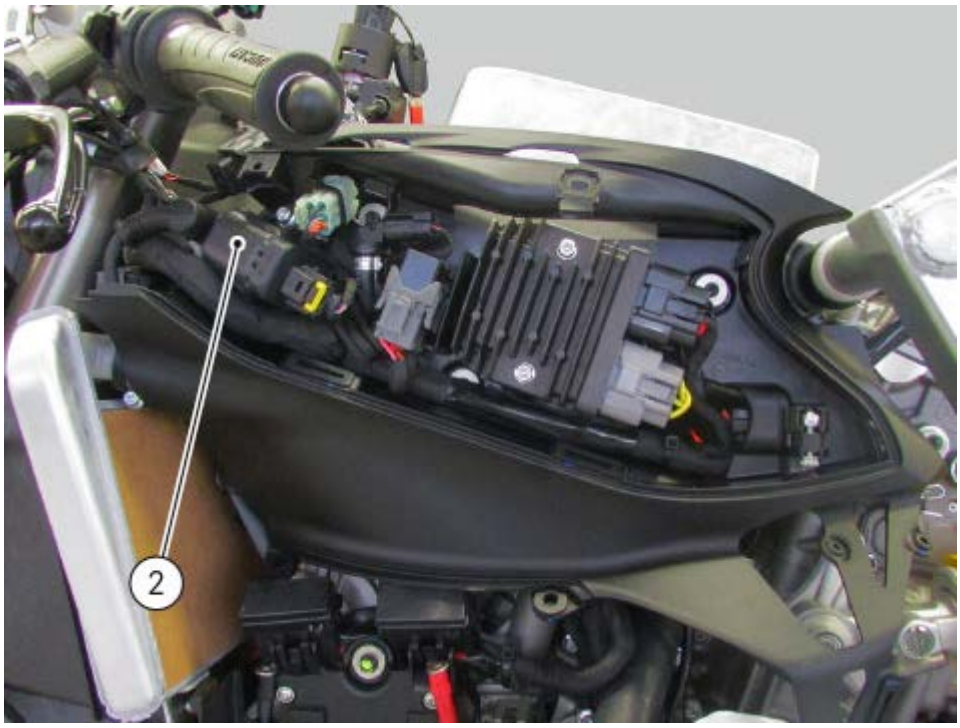
Fix the BBS control unit (1) by tightening the screws (2) to a torque of 4 Nm ± 10%.



Coils

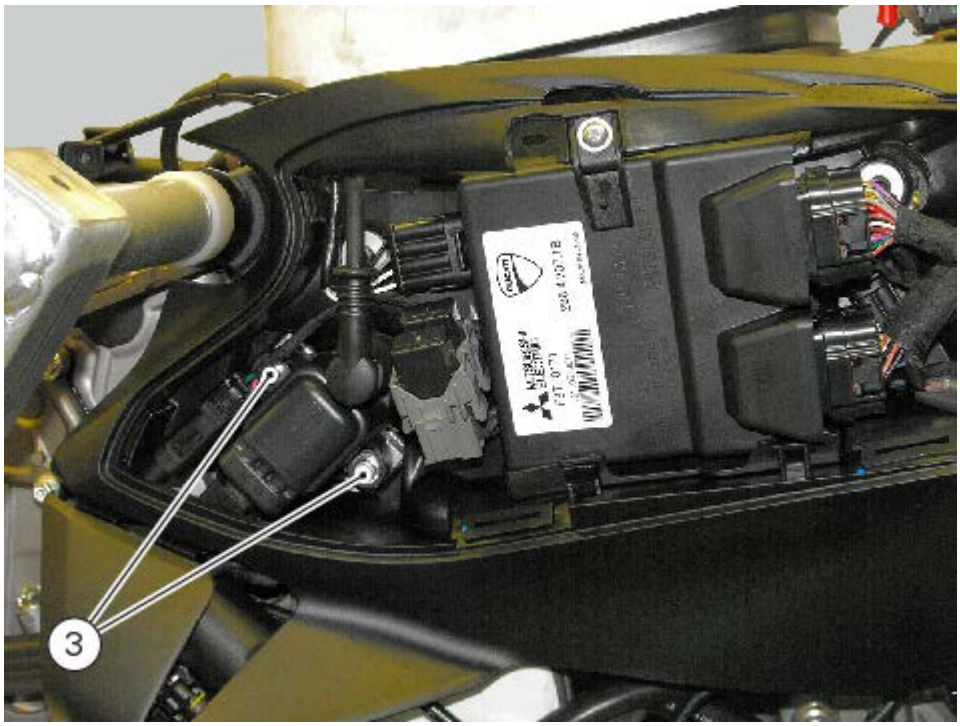
The ignition coil must increase the input voltage of the current alternator. It must bring the voltage to such a level to allow generating a spark in the spark plug.

The vehicle features two coils, one for the vertical cylinder (1) and one for the horizontal cylinder (2).



Check for injector correct operation with the diagnosis instrument DDS 2.

The procedure below refers to one coil but it applies to both coils.
Undo the two retaining screws (3), disconnect the coil and remove it.



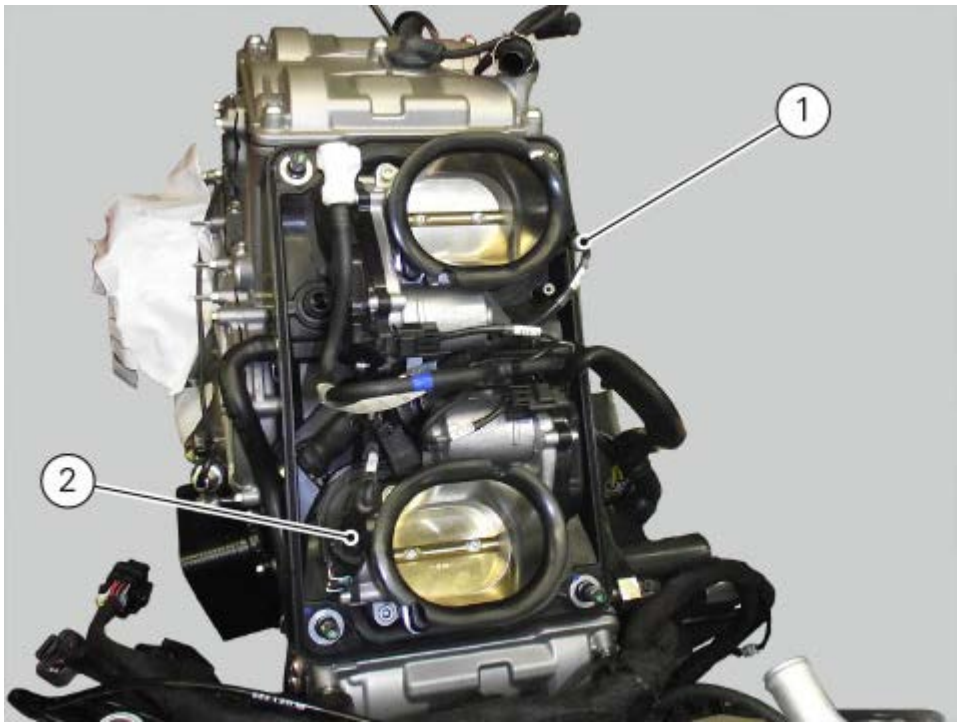
ETV (Electronic Throttle Valve)

The ETV (1) is the motor that controls the throttle valve opening and closure. It is located on the throttle body and in case of failure it is not possible to replace only the ETV, but it is necessary to replace the complete throttle body. Then, it is necessary to reset the TPS.

Check for injector correct operation with the diagnosis instrument DDS 2.

TPS (Throttle Position System)

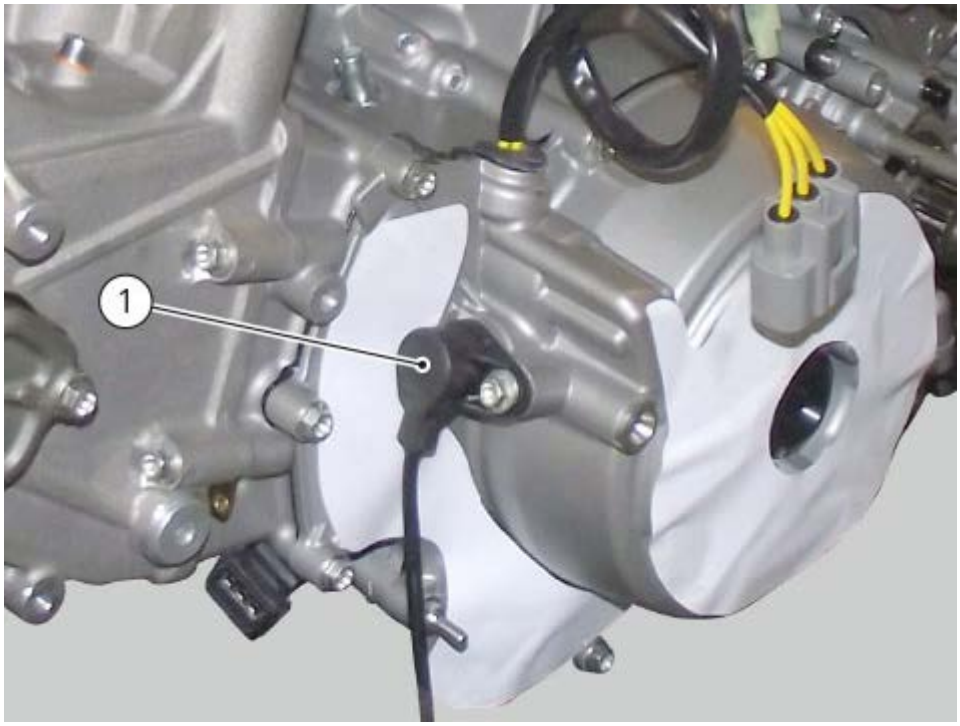
It is the potentiometer fitted on the throttle body. Its function is to send a signal to the control unit about the throttle position. The vehicle is provided with two TPS, one on the horizontal cylinder throttle body (1) and the other on the vertical cylinder throttle body (2).
In case of failure it is not possible to replace only the TPS, but it is necessary to replace the complete throttle body.

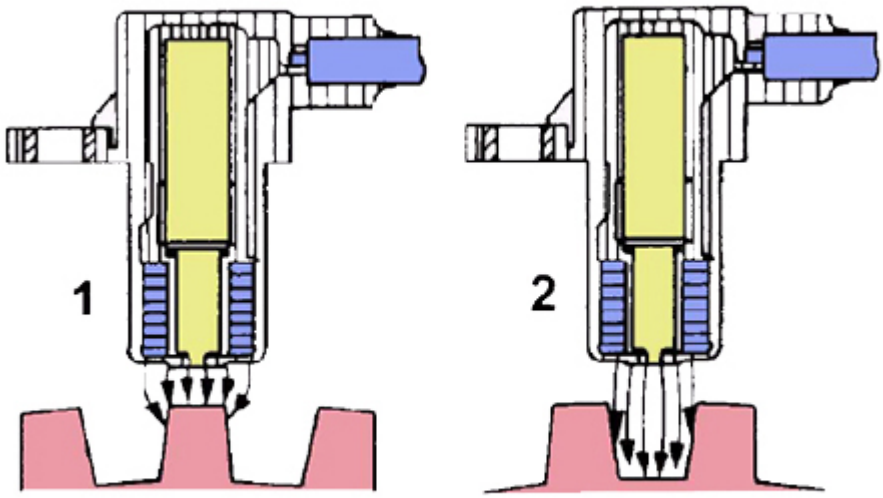


Check for injector correct operation with the diagnosis instrument DDS 2.

Pick-Up sensor

The engine rpm sensor (1) is an inductive sensor that detects the teeth of a phonic wheel by means of an alternate signal proportional to the teeth passage speed.
The toothed pulley usually features Xn teeth with a gap of two teeth as reference for the first cylinder TDC.

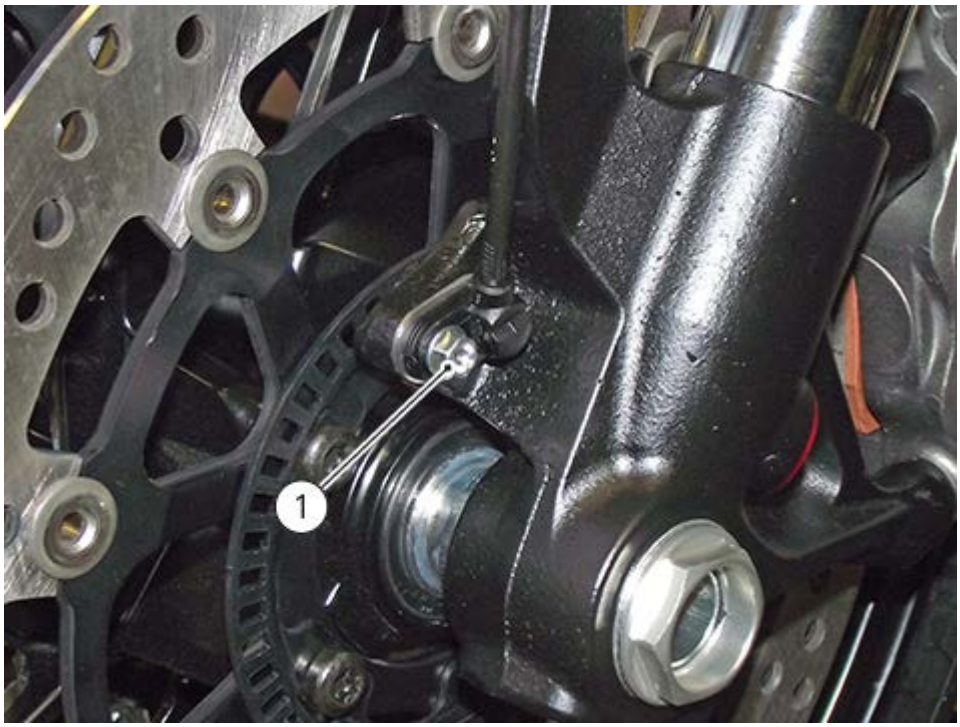


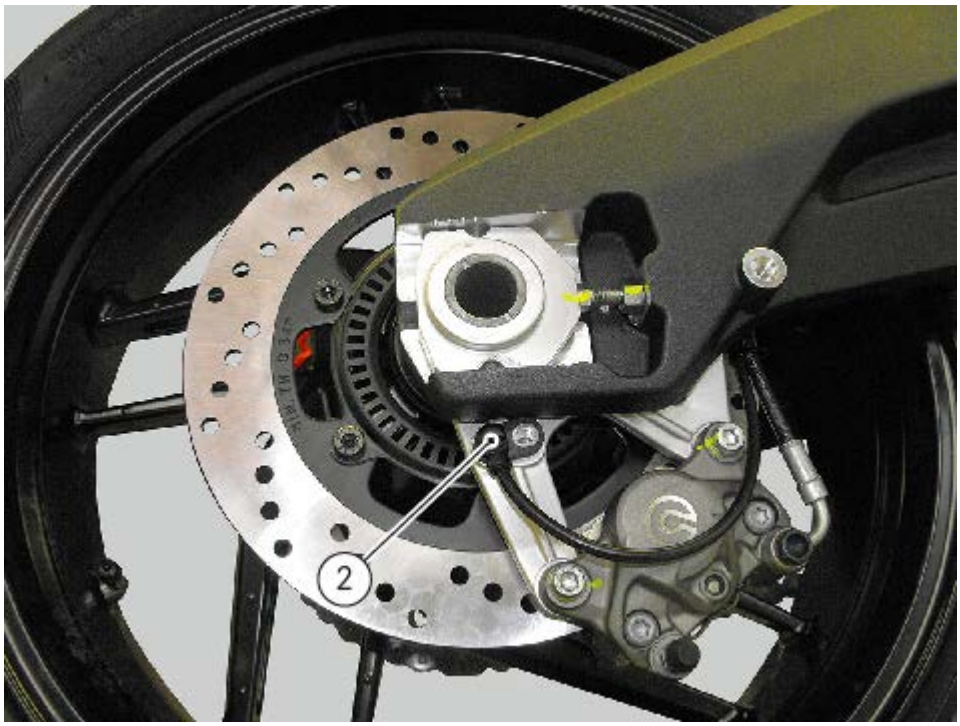


Check for injector correct operation with the diagnosis instrument DDS 2.

DTC (Ducati Traction Control)

The traction control is managed by the BBS. Thanks to the front speed sensor (1) and to the rear speed sensor (2), the control unit can control vehicle traction according to the speed difference between the two wheels.





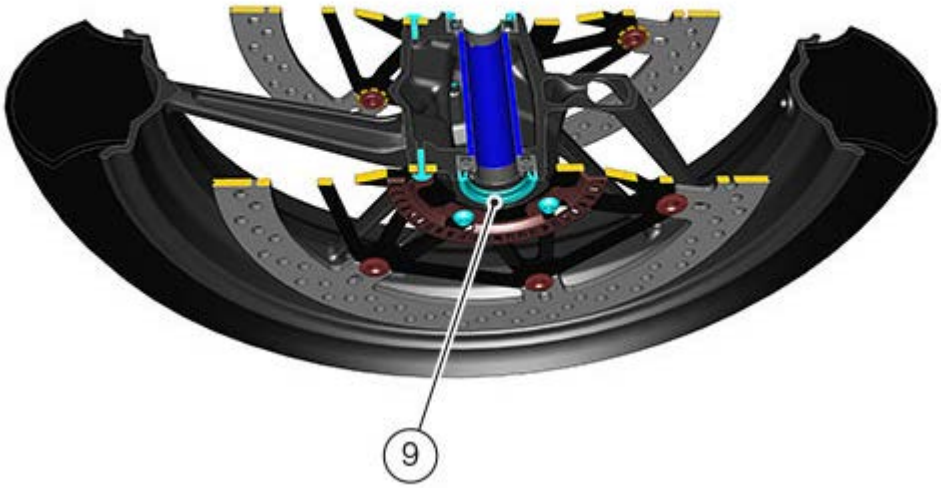
Check for injector correct operation with the diagnosis instrument DDS 2.

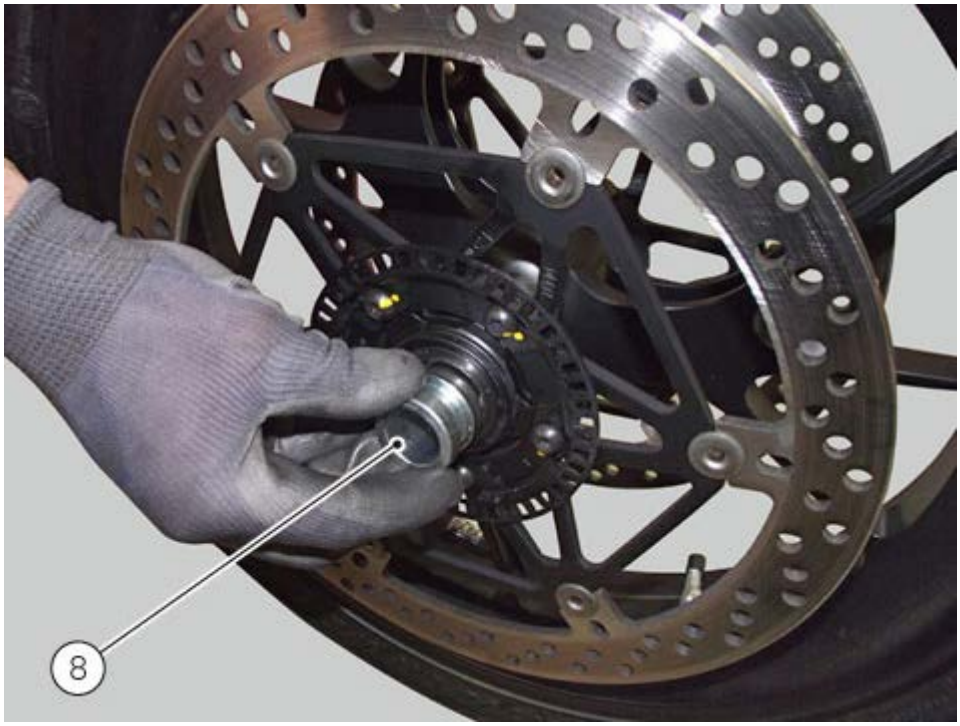
CAN line

This model utilises a CAN line (Controller Area Network) which has made it possible to greatly simplify the layout of the electrical system and consequently reduce its overall weight. The CAN network is connected to two nodes: the instrument panel and the Magneti engine control unit. Thanks to this communication line no sensor doubles are required as sensor signals are shared by both electronic units. Sensors are connected to closer electronic unit (instrument panel or engine control unit), which sends the signals to the network to be processed by the control units. CAN line consists of two wires for digital signal transfer; they both carry precise and perfectly decipherable data. The instrument panel and the engine control unit, which are connected to the CAN line, are fitted with special hardware which acknowledges whether a pulse sequence includes pertaining data to be processed by the computing unit.

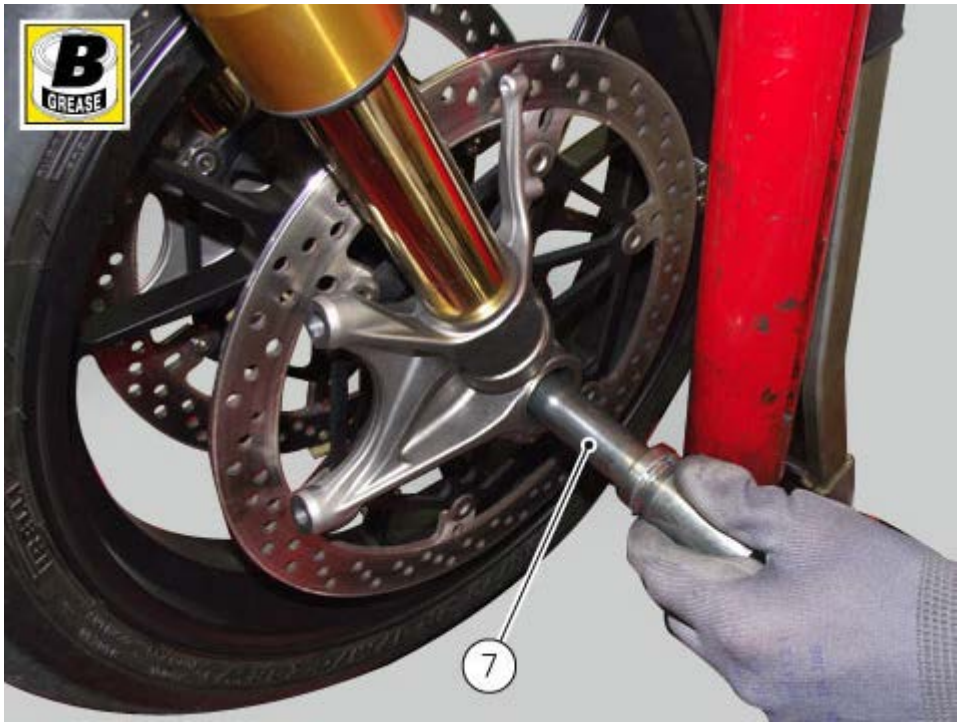
Refitting the front wheel

When all the necessary inspections have been completed, refit the wheel as follows.
Fit the spacers (8) to the sealing rings (9) on the sides of the wheel hub.



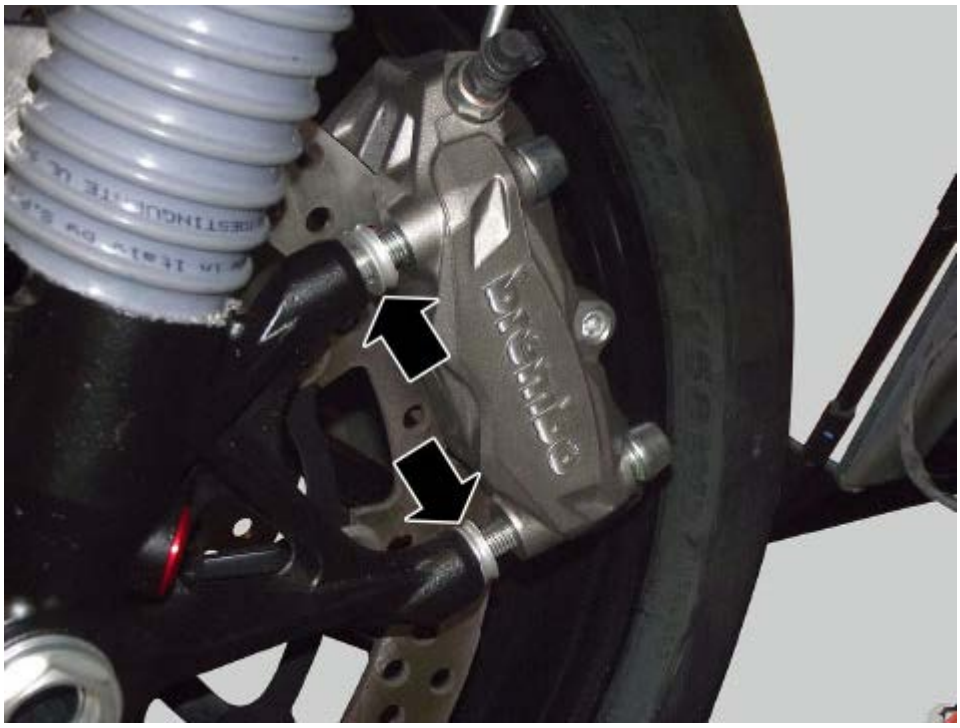


Fit the complete wheel between the fork legs.
Apply the recommended grease on wheel shaft (7), thread included.
Take pin (7) fully home into the wheel hub.

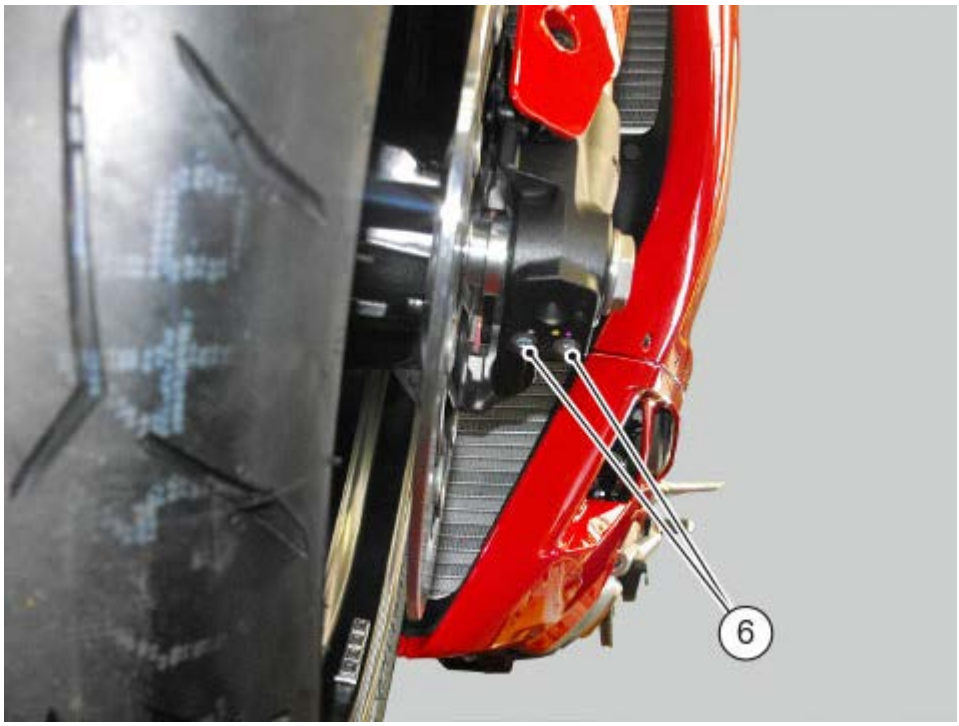


Fit the washer (5) on the end of the wheel shaft.
Apply the recommended grease on the thread and underside of the locking nut (4), then screw it.
Tighten nut (4) to a torque of 63 Nm ± 5 %.

Apply the recommended grease to the thread and underside of calliper retaining screws (1).
Fit the two spacers.
Pre-tighten the two retaining screws (1) of the brake callipers to a torque of 2 Nm ±10%.
Operate the front brake lever two or three times.
Hold the lever pulled towards the handgrip and simultaneously tighten the screws (1) to a torque of 45 Nm ± 5%.



Before tightening the screws (6) under the fork legs, lower the motorcycle to the ground and push up and down the handlebars to load the suspension; so the fork legs will become properly seated onto the wheel shaft.
Tighten the screws (6) to a torque of 6 Nm ± 5%, following a 1-2-1 sequence.

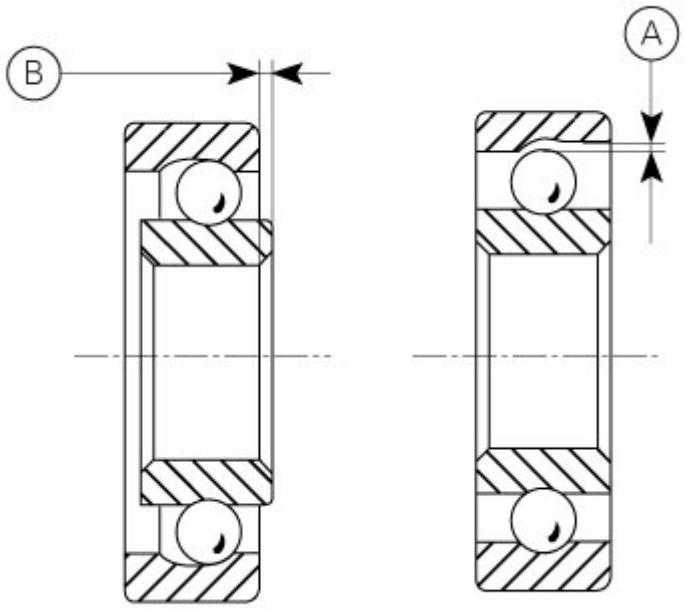

6


6

Overhauling the front wheel

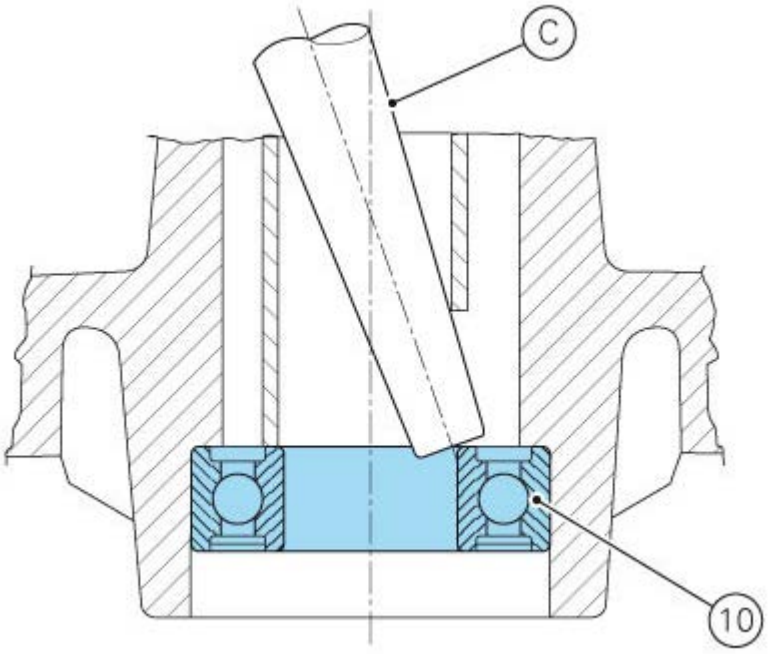
Wheel bearings

Before checking the dimensions, check the wear on wheel hub bearings. Check for wear by hand after cleaning and degreasing the bearings in their seats.
Turn the inner race.
Check the amount of radial (A) and axial (B) play; excessive play will cause vibration and make the bike unstable and require part replacement.

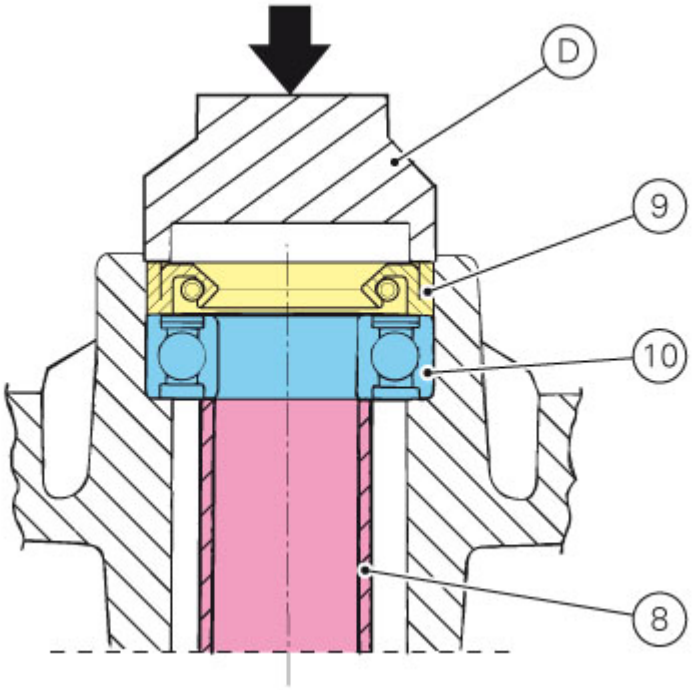


To remove the bearings and the seal rings from the wheel hub follow the instructions below.
Position a drift (C) against the inner race of the bearing (10).
Tap with a hammer until knocking out the bearing (10).
Apply the drift at different points to keep the bearing square during removal.

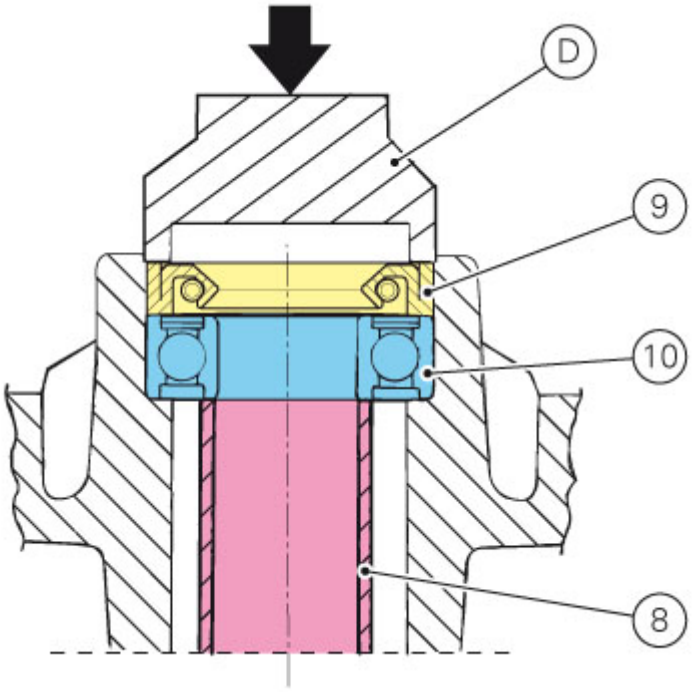
Important
Once removed, the used bearings and sealing rings must not be refitted.



Before fitting new bearings, check that the housing 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 (D) that only bears on the outer race of the bearing (10), drive the bearing fully into its seat.



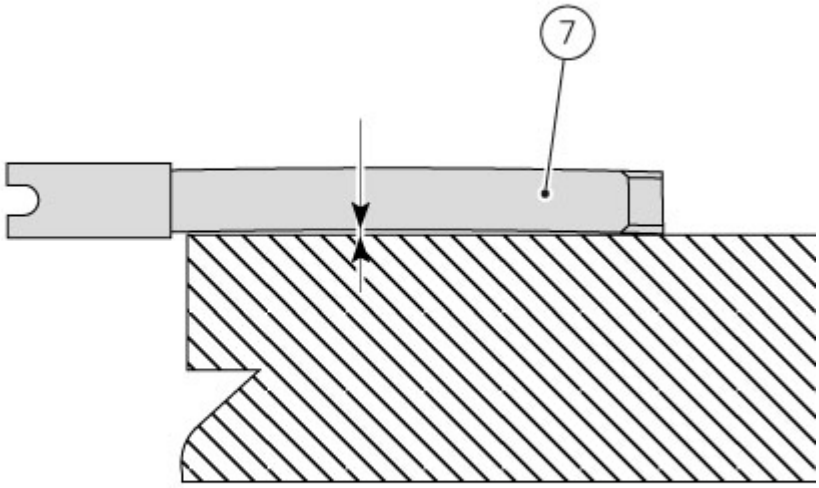
Use the same method to install the sealing rings (9).
Ensure that spacer (8) is fitted between the two wheel bearings.



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

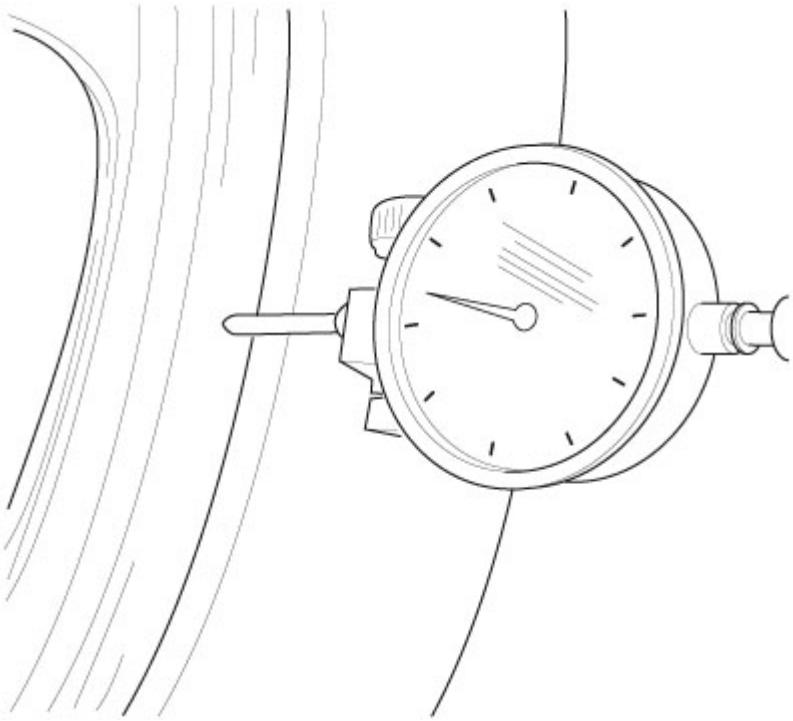
Inspecting the wheel axle

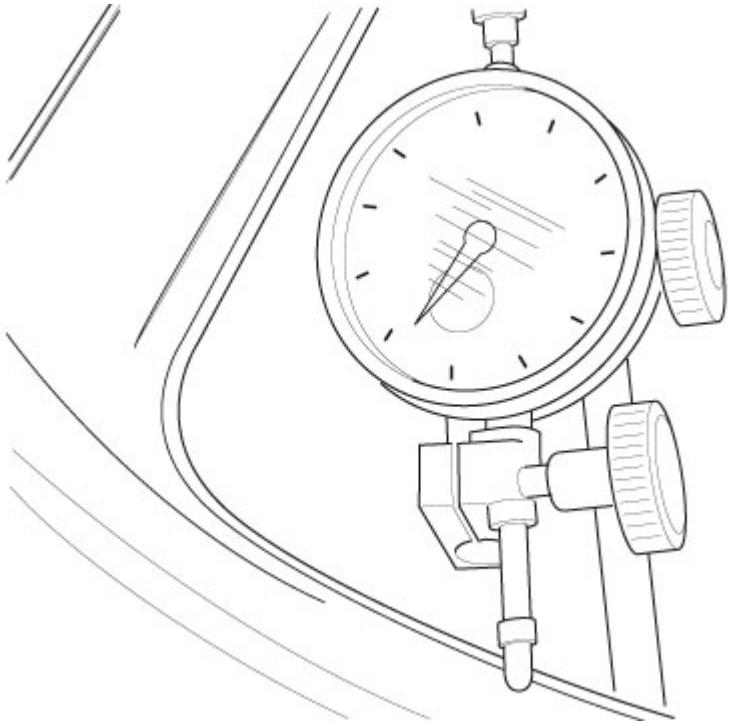
Check the wheel shaft (7) for straightness. Turn the shaft on a reference surface and measure maximum distortion using a feeler gauge .



Overhauling the wheel

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 axle in the wheel and mount it on two fixed reference blocks.
Using a dial gauge, measure rim runout and out-of-round relative to the shaft axle .





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

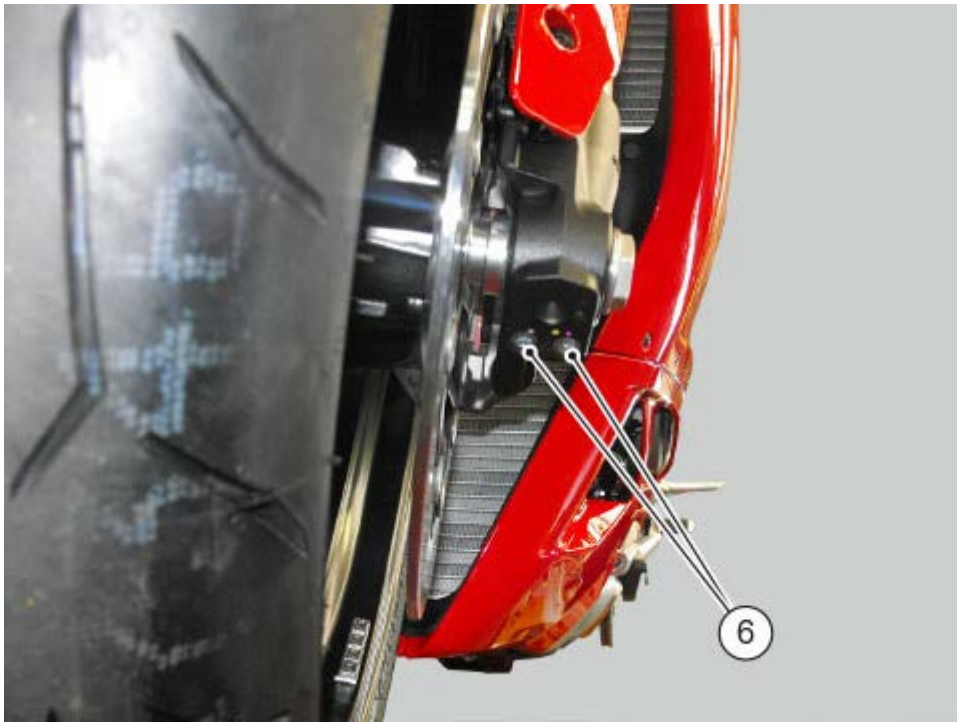
Removing the front wheel

Support the bike so that the front wheel is raised from the ground.
Loosen the two retaining screws (1) securing the front brake callipers (2) to the fork legs, without disconnecting them from hoses, and then remove front brake callipers from the front wheel (3).

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

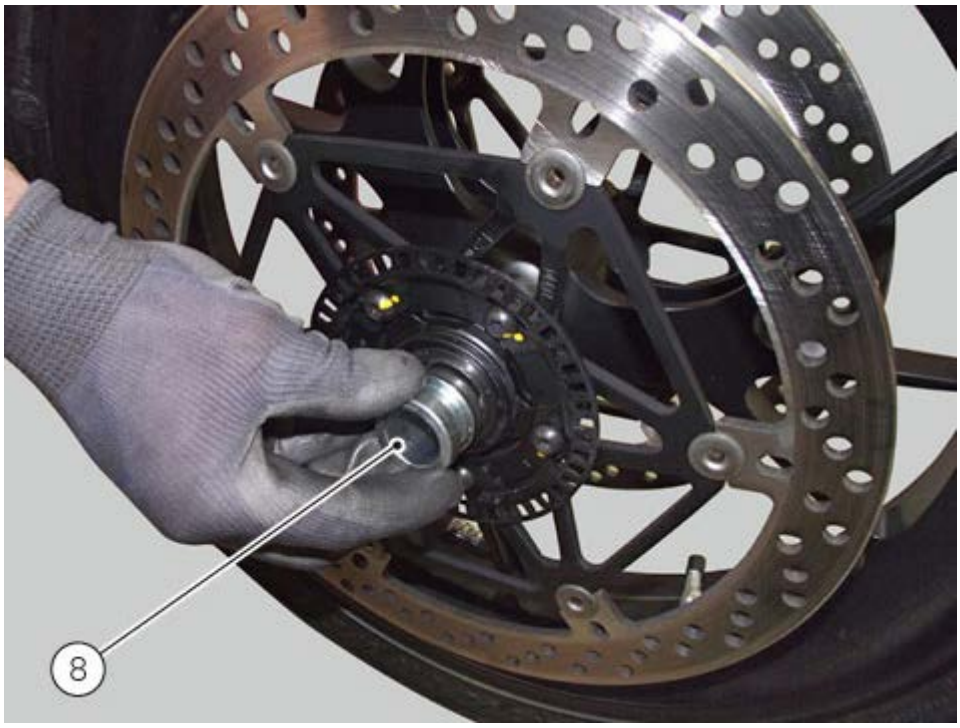
Loosen and remove nut (4) on wheel shaft left side. Recover the washer (5).

Loosen the wheel shaft screws (6) under the fork legs.

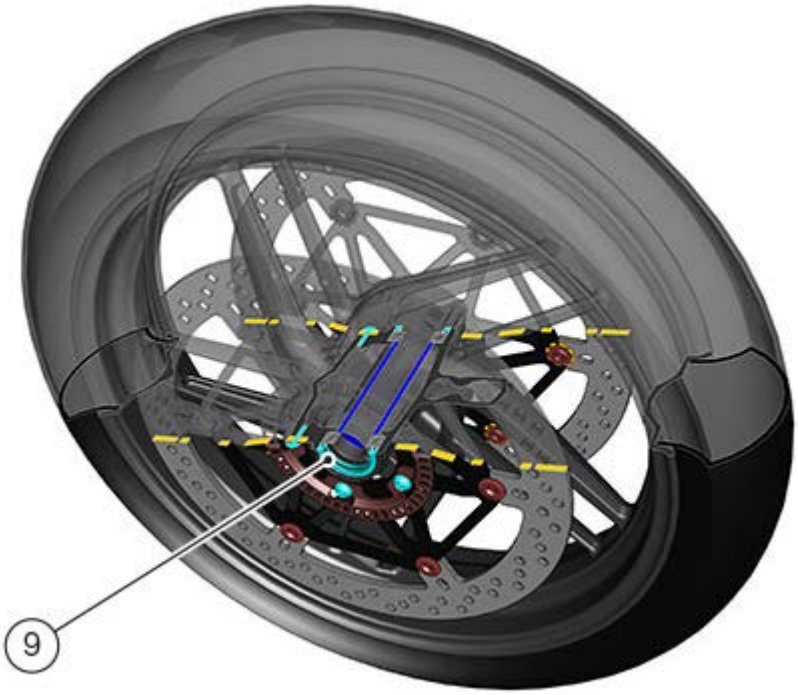


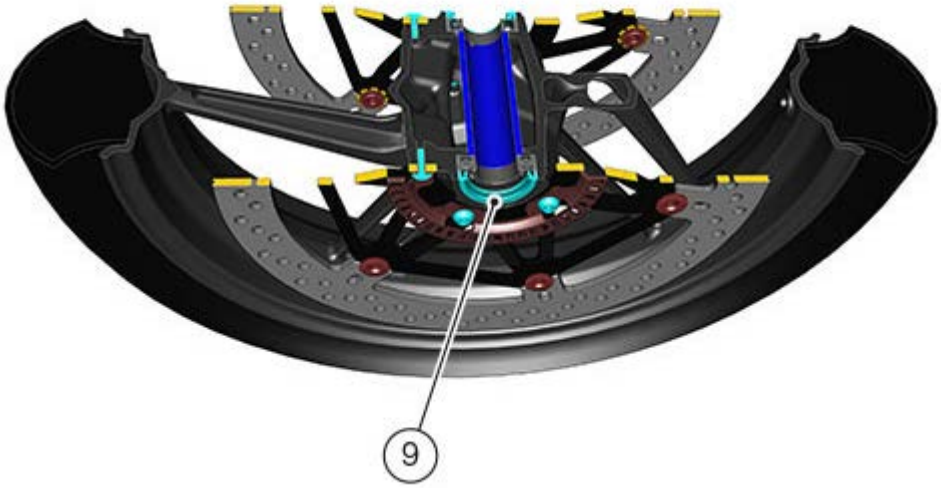
Remove the wheel shaft (7) from wheel.

Remove the wheel and recover the two spacers (8).



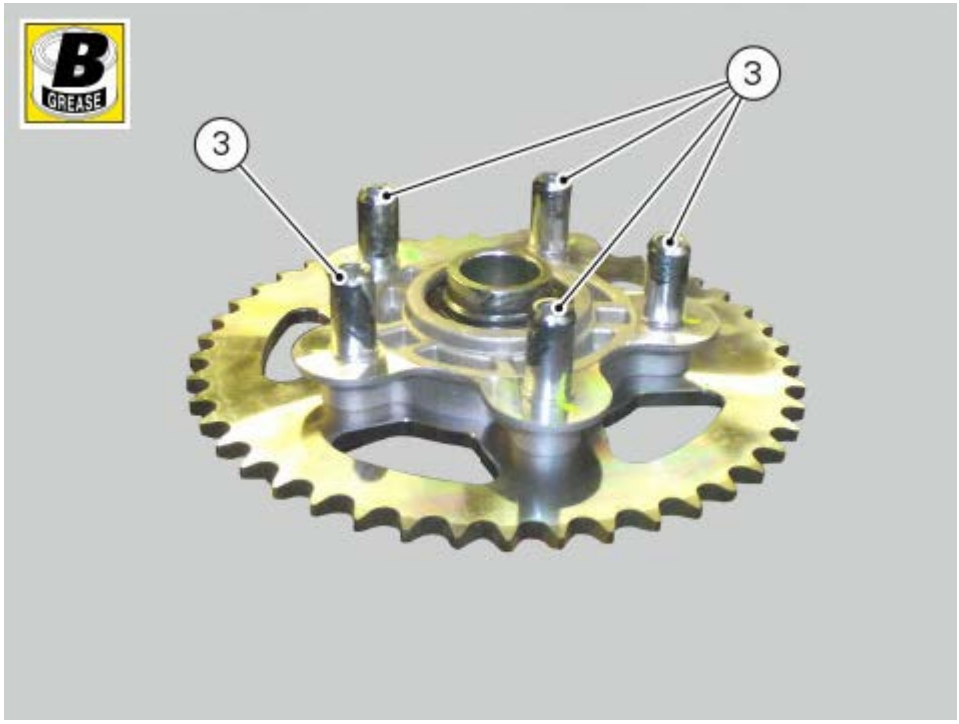
Working on both sides, remove the sealing ring (9).


9

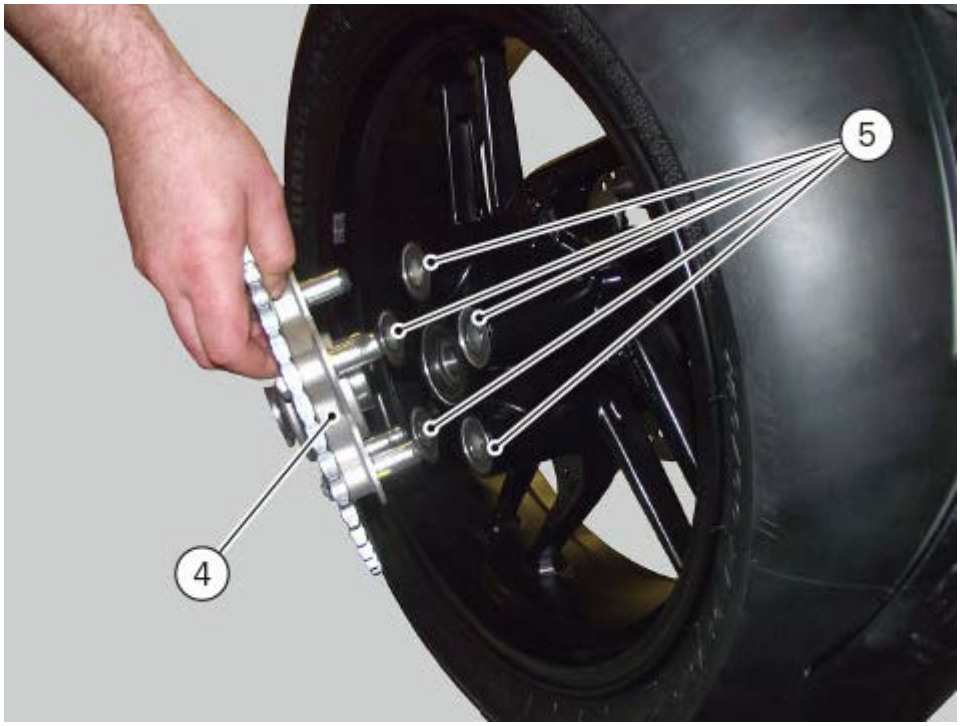

9

Refitting the rear wheel

Use specified grease to lubricate the pin ends (3) of the rear sprocket flange.

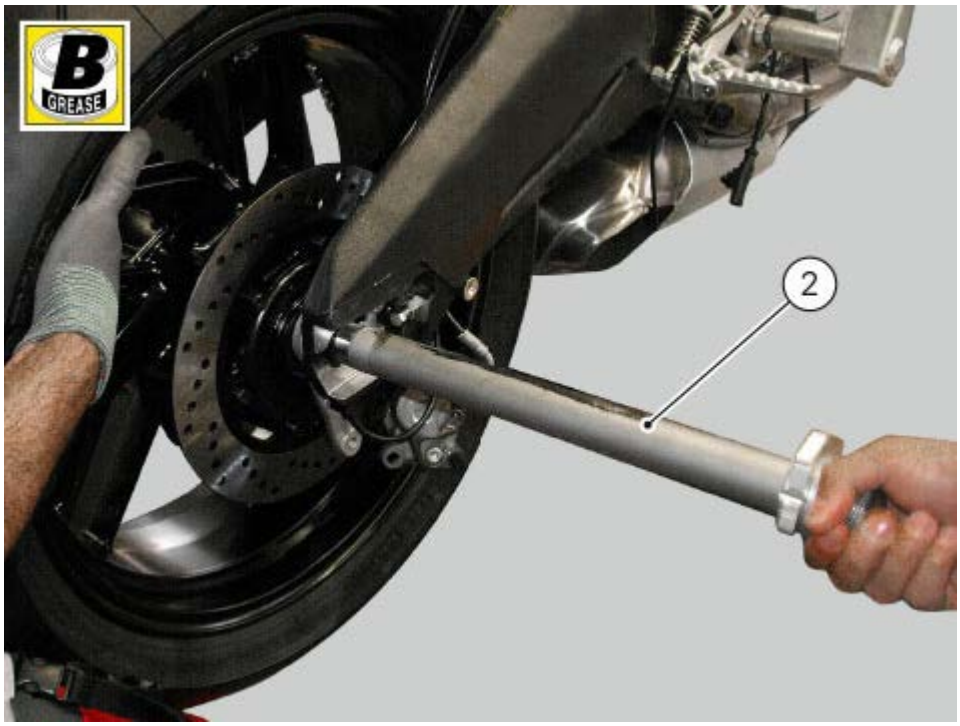


Place rear sprocket flange (4) inside vibration damping pads (5).



Fit spacer (6) in the relevant seat.

Reposition the chain on the rear sprocket.
Insert the retaining pin after having lubricated it with specified grease.



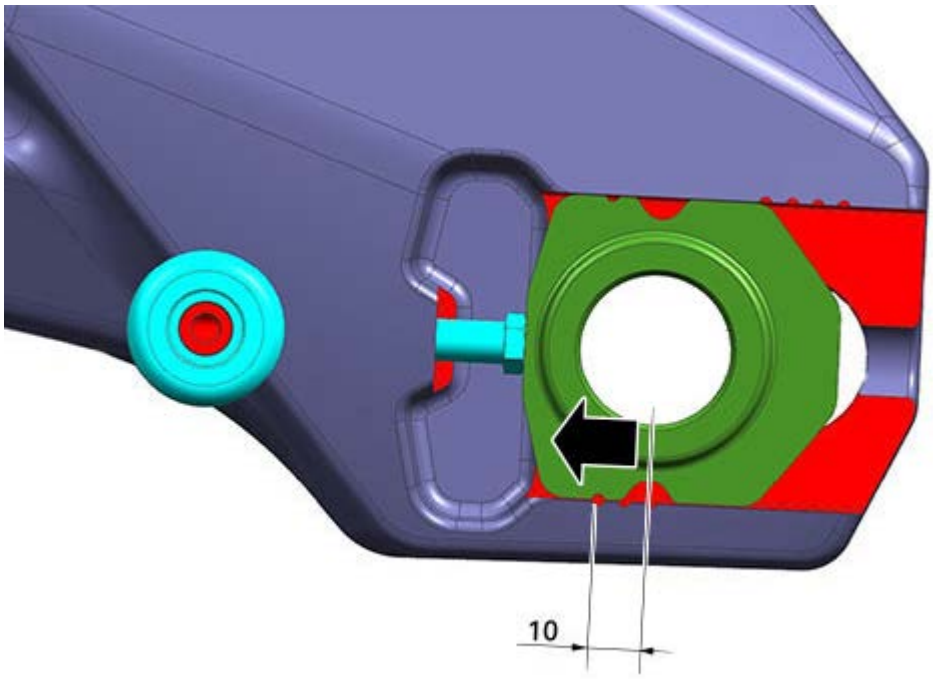
Before tightening nut (1) keep the chain tensioned (Adjusting the chain tension).

Tighten nut (1) to a torque of 180 Nm ± 10%.

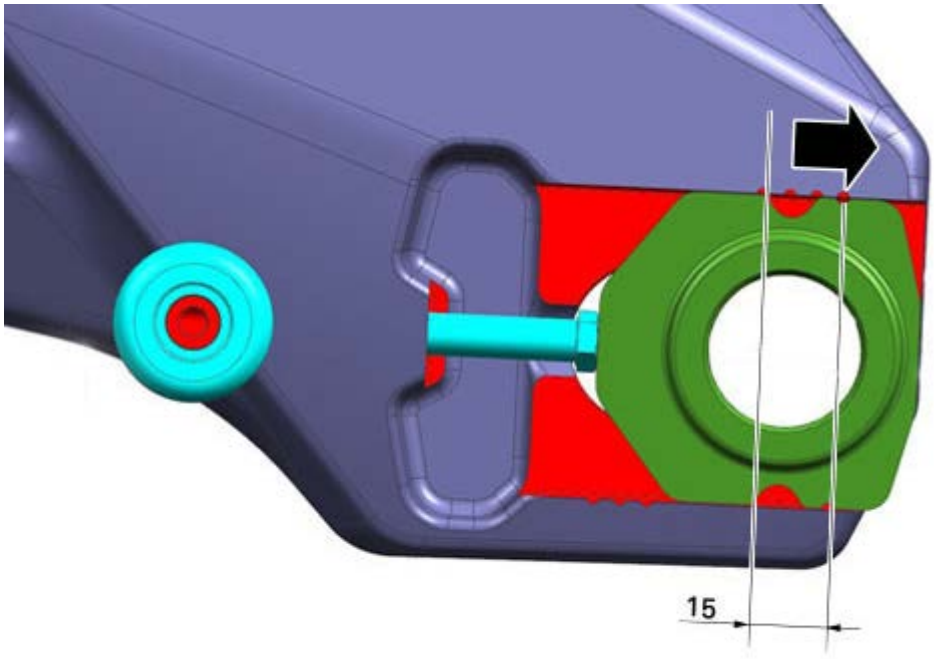
The slider can be positioned in two different ways, depending on wheel shaft position compared to swinging arm slot.

From point "0" (zero), shaft can slide 10 mm forward or, 15 mm backward.

If slider is at the front (10 mm), the "nose" should be facing the rear end.



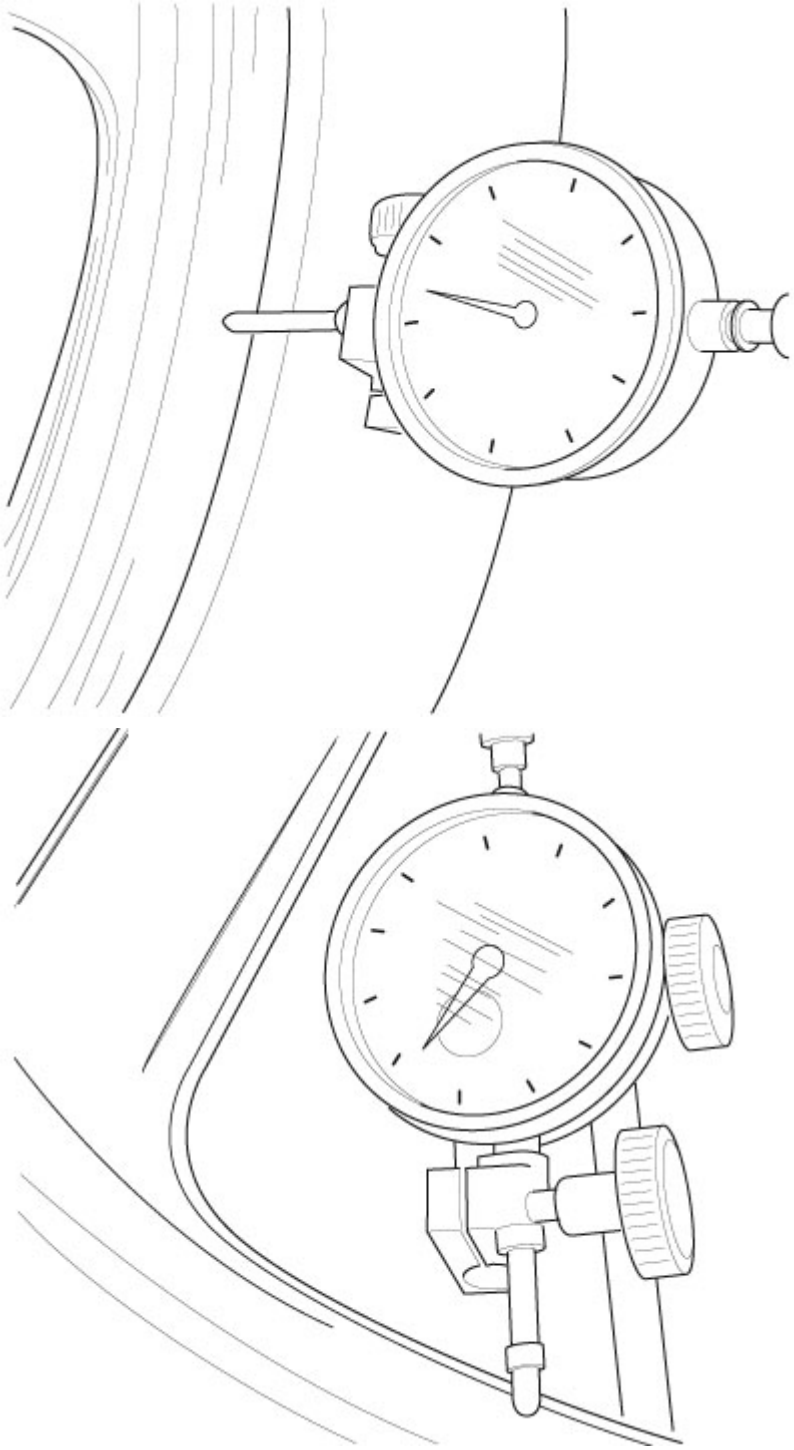
While if slider is at the rear (15 mm), the "nose" should be facing the front end.



Overhauling the rear wheel

Overhauling the wheel rim

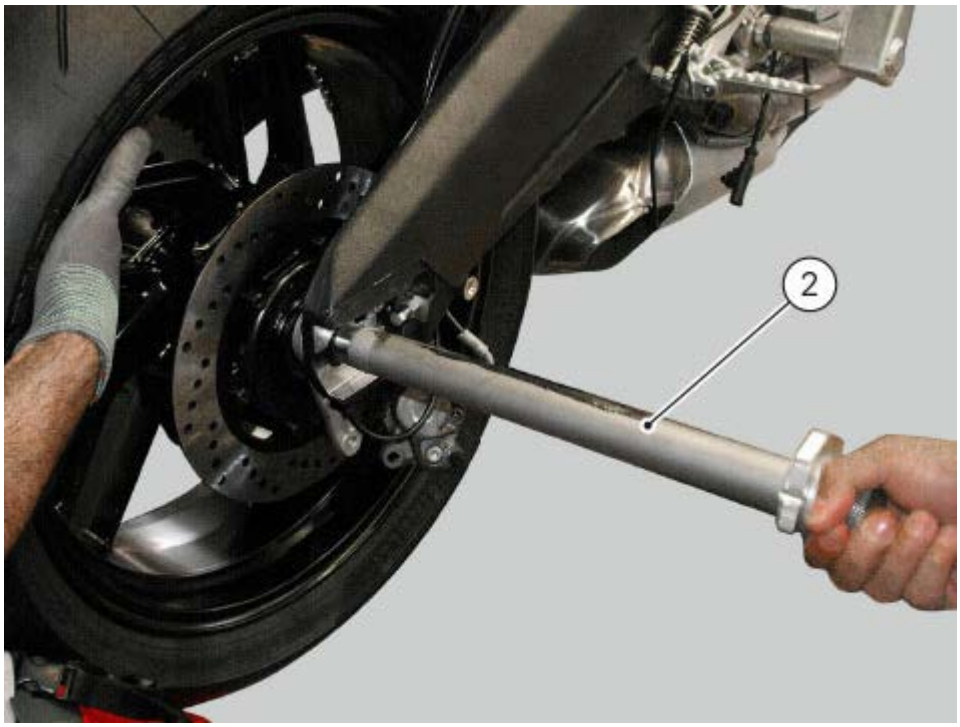
Inspect the wheel rim as follows.
Visually inspect the rim for cracks, scoring and deformation: change the rim if damaged.
Using a dial gauge, duly supported, measure rim runout and out-of-round relative to the shaft axle.
If the values measured are not within the tolerance limits, replace the wheel.

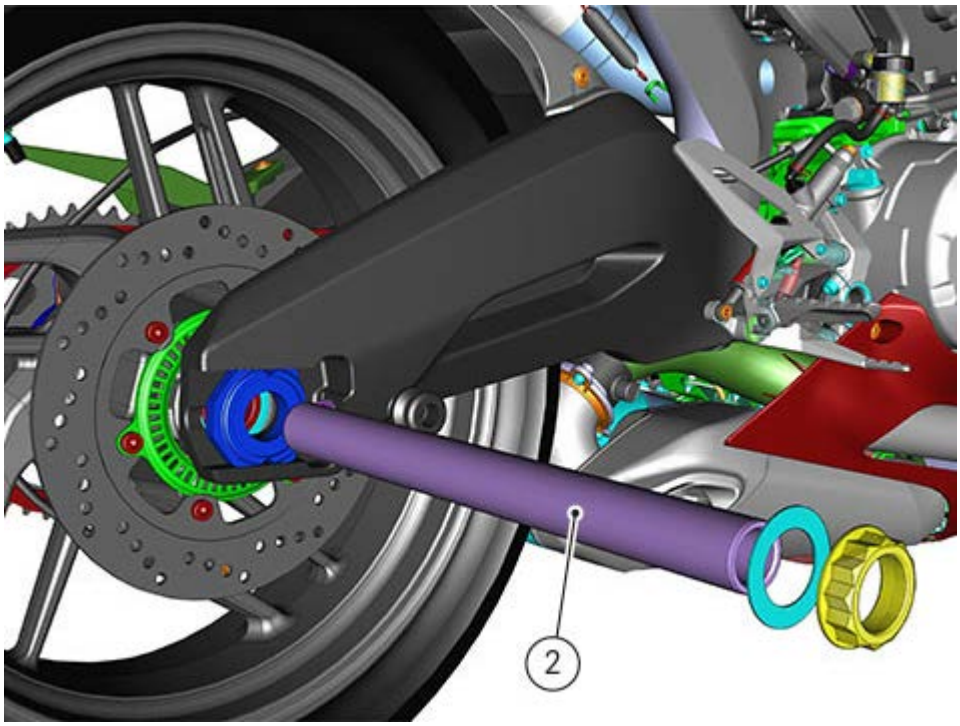


Removing the rear wheel

Properly support the motorcycle with the service stand and engage the first gear.
Loosen and remove retaining nut (1) of the rear wheel shaft.

Remove pin (2) while supporting the wheel.





Remove the chain and the rear wheel and collect the spacer.
Properly support the vehicle while removing the wheel.

Overhauling the front brake components

Important

Critical safety components. The brake calliper manufacturer recommends you not to attempt to service the internal components of the brake callipers. 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 wear of the brake discs follow the data detailed in table Hydraulic brakes.

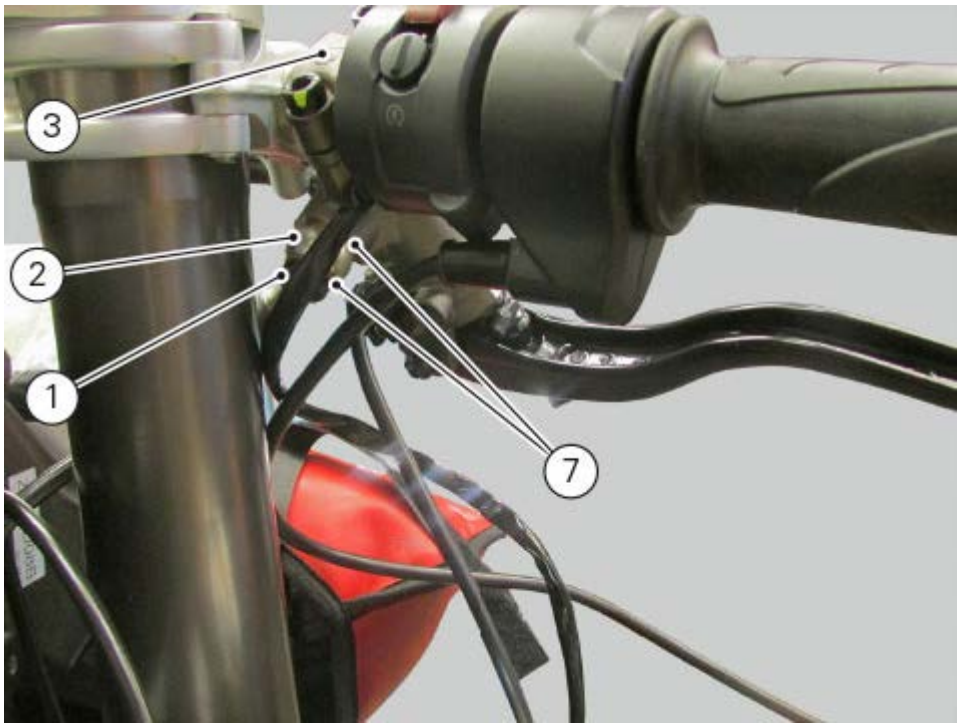
Removing the front brake master cylinder

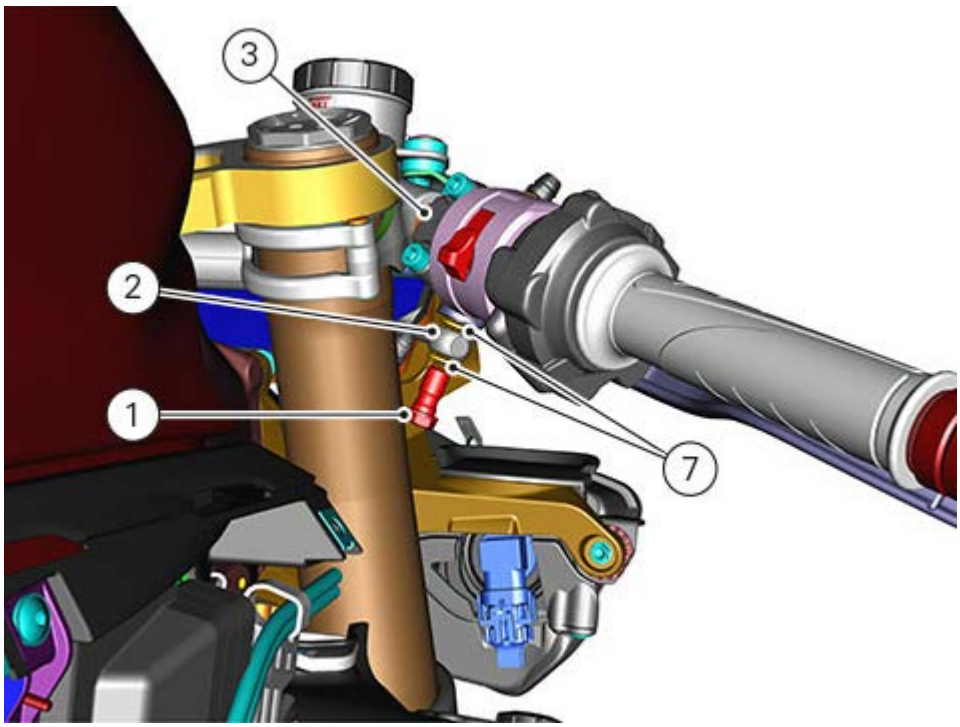
Warning

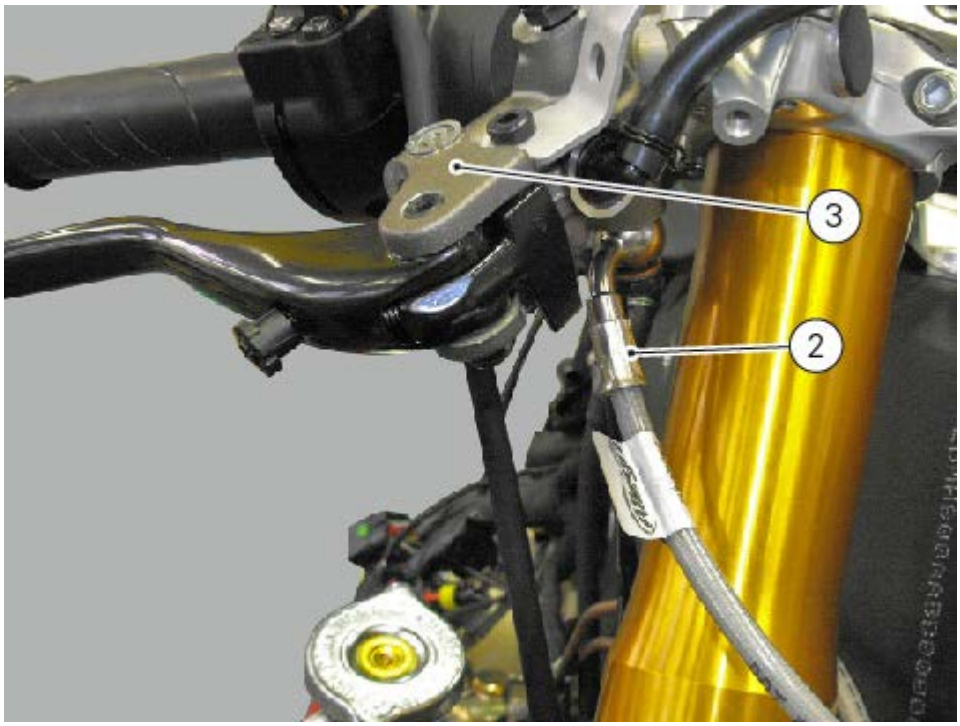
The brake master cylinder manufacturer advises against servicing the brake master cylinder due to the safety critical nature of this component. Incorrect overhaul can endanger rider and passenger safety. Maintenance operations on these units are limited to replacement of the following parts: control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

Drain the braking system (Changing the front brake system fluid).
Remove the right-hand side fairing (Removing the side fairings).

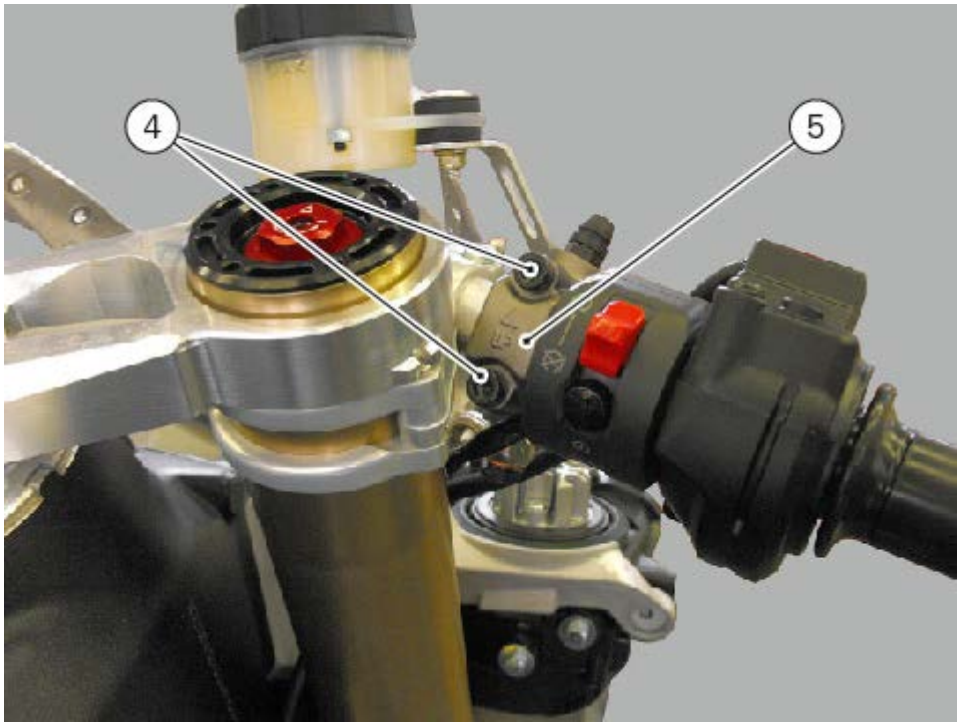
Loosen the special screw (1) that retains hose (2) to the front brake master cylinder (3).
Collect the two washers (7).



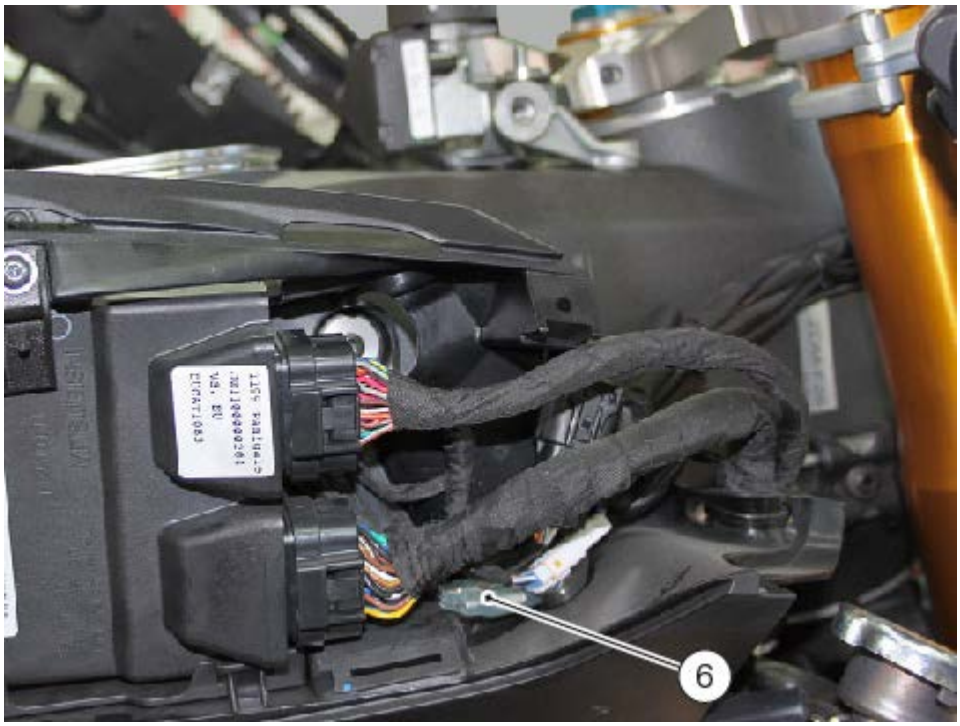




Loosen screws (4) retaining U-bolt (5) of the front brake master cylinder.



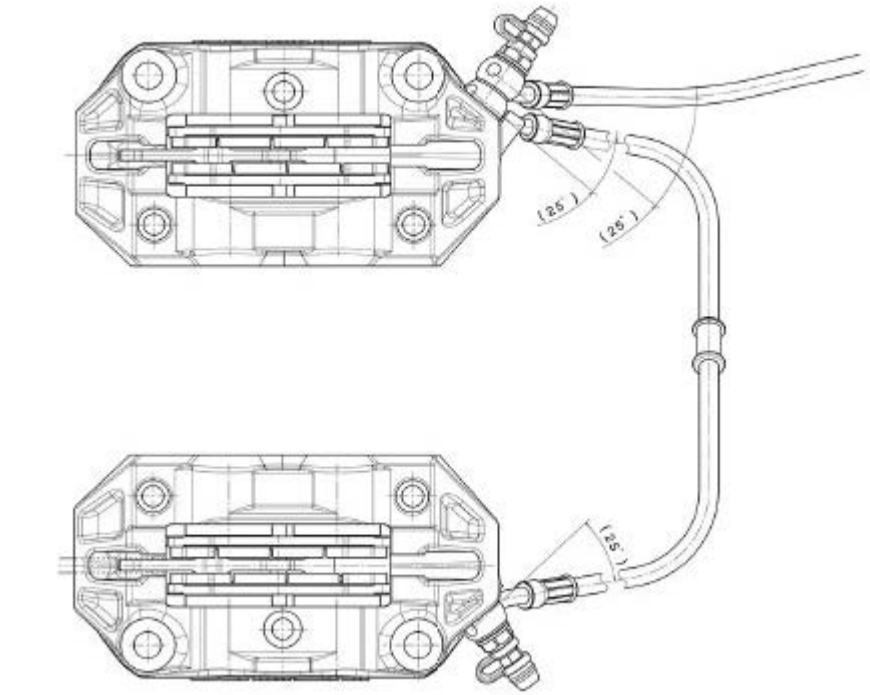
Disconnect the front brake switch connection (6) from the main wiring harness.

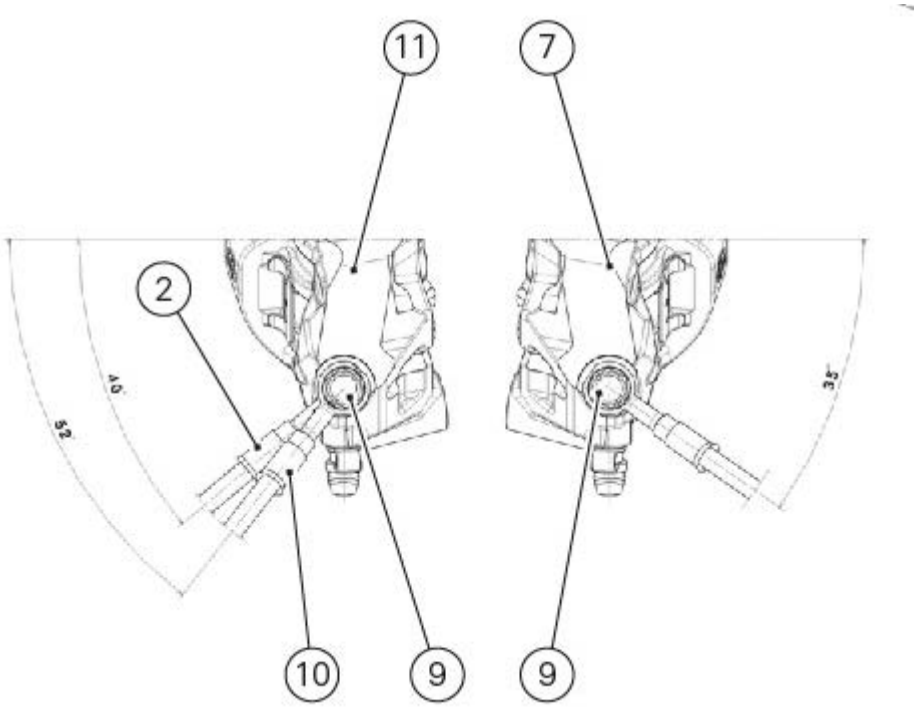


Remove the front brake master cylinder unit from the handlebar.

Refitting the front brake system

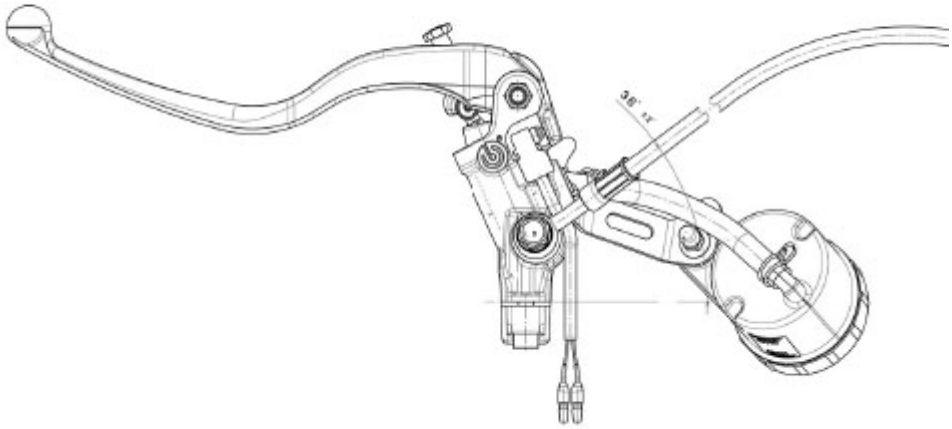
If the brake hoses (10) and (2) have been removed from the front brake callipers, position them respecting the indicated values.
Start screws (9) with washers (8).
Tighten screws (9) to a torque of 23 Nm ± 10%.



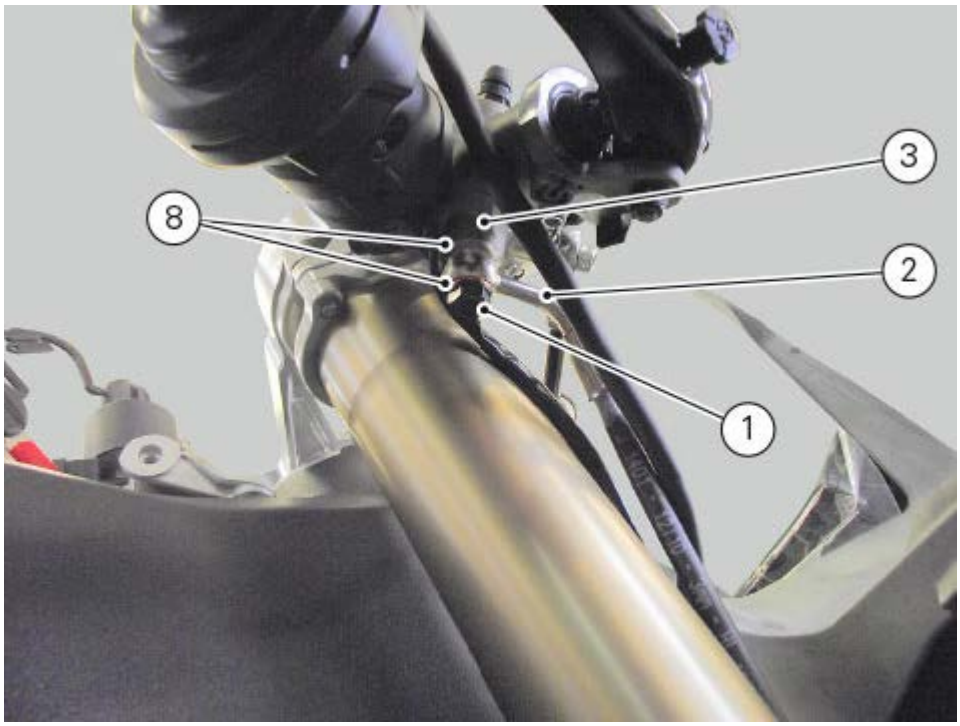


Insert hose front brake (2) in the splash guard and slide it upwards.

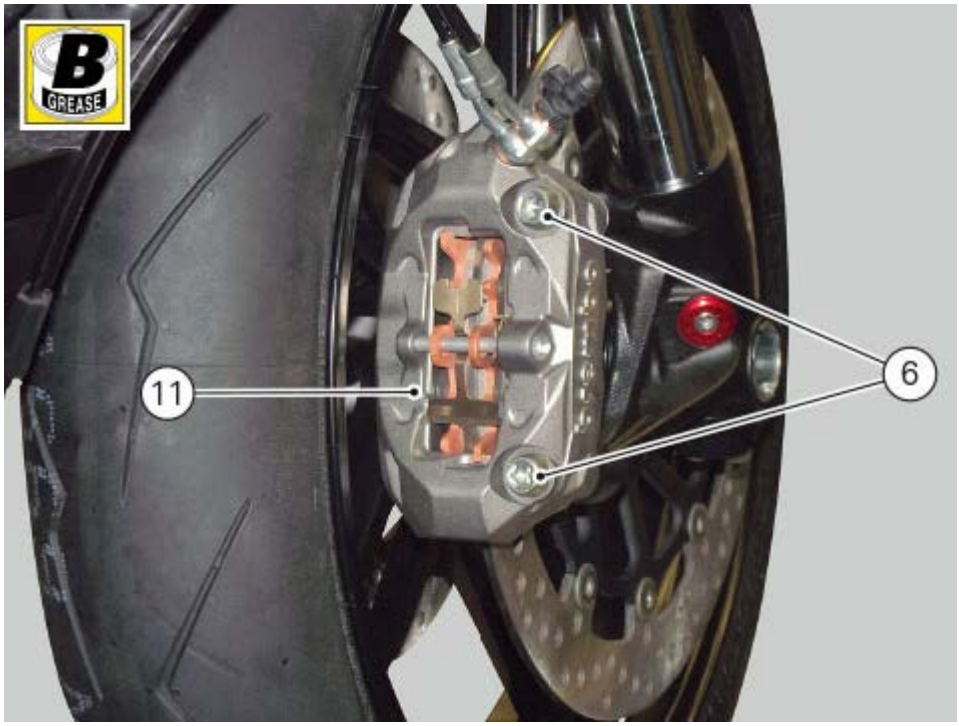
Place the hose on the front brake master cylinder by respecting the indicated values.

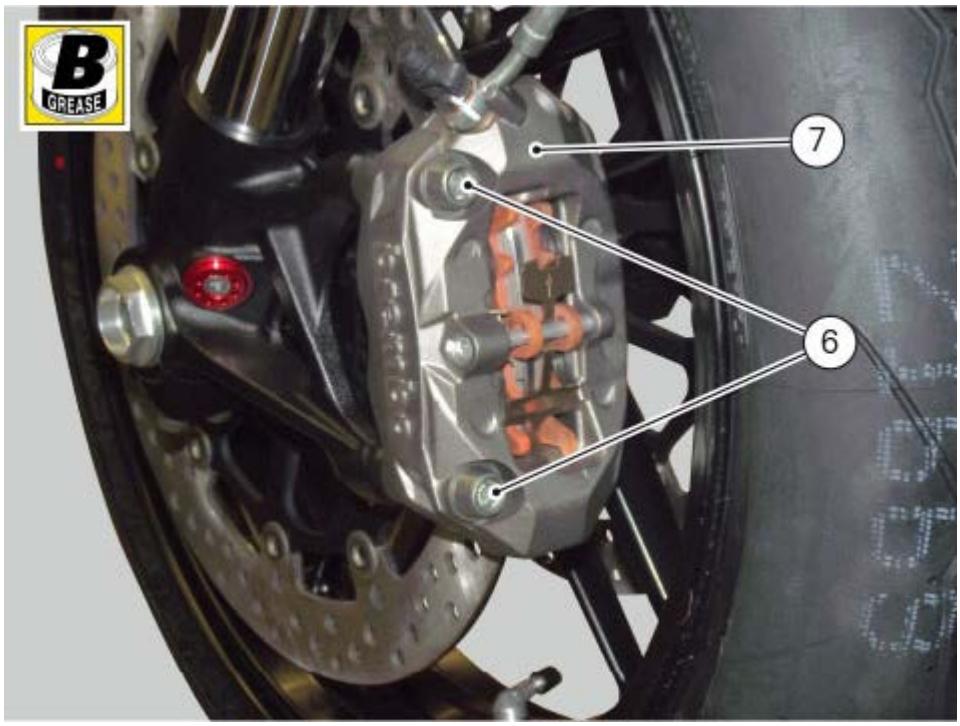


Start special screw (1) that retains hose (2) to the front brake master cylinder (3) with two washers (8). Tighten the screw (1) to a torque of 23 Nm ± 10%.



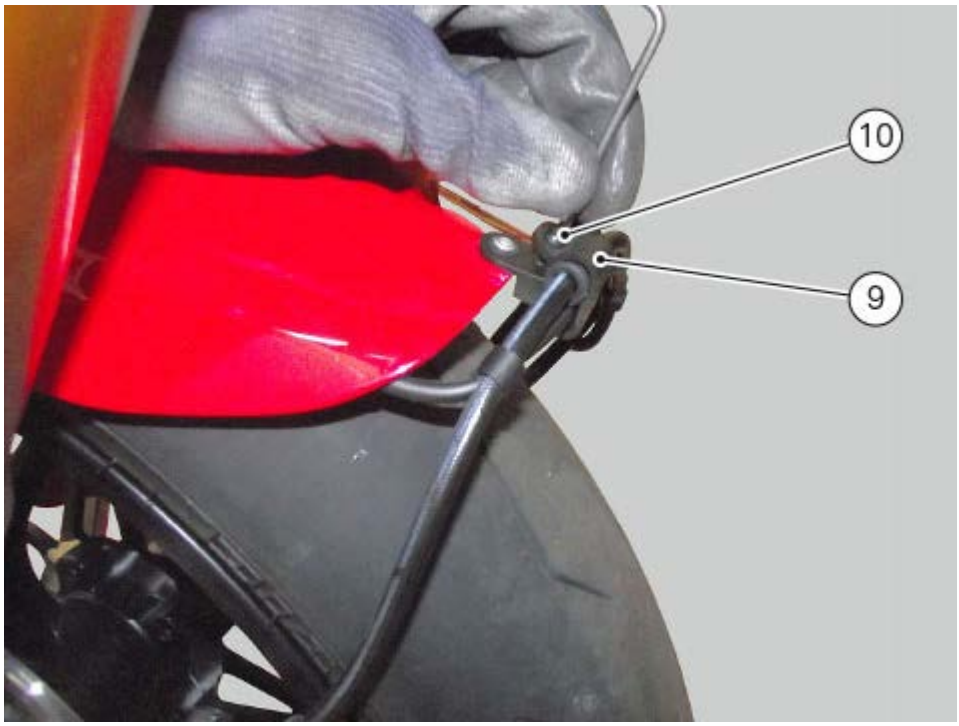
Fit the left brake calliper (7) over the disc.
Apply the recommended grease to the screws (6).
Pre-tighten screws (6) to a torque of 2 Nm ± 5 % to fasten the callipers to the fork legs.
Operate the brake lever two or three times to pressurise the circuit so that the brake pads are brought into contact with the brake disc.
Perform the same operation to fit the right brake calliper (11).
Hold the lever pulled towards the handgrip and simultaneously tighten the calliper screws (6) to a torque of 45 Nm ± 5%.



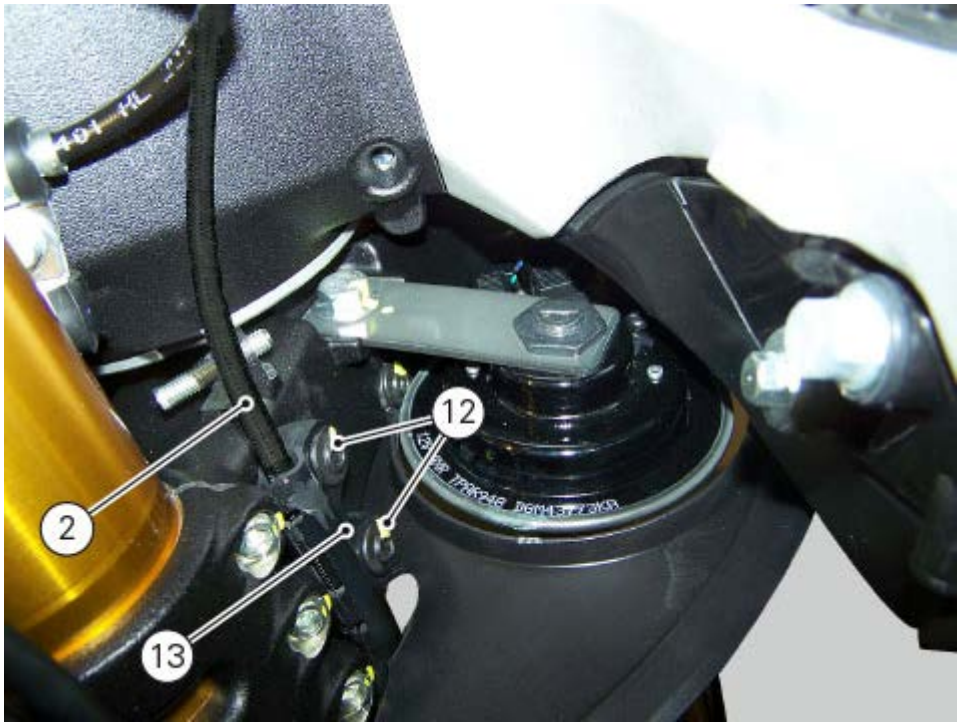


Insert the brake hoses in ring (5).

Tighten screw (4) retaining ring (5) of the front brake hoses to a torque of 0.35 Nm ± 10%.



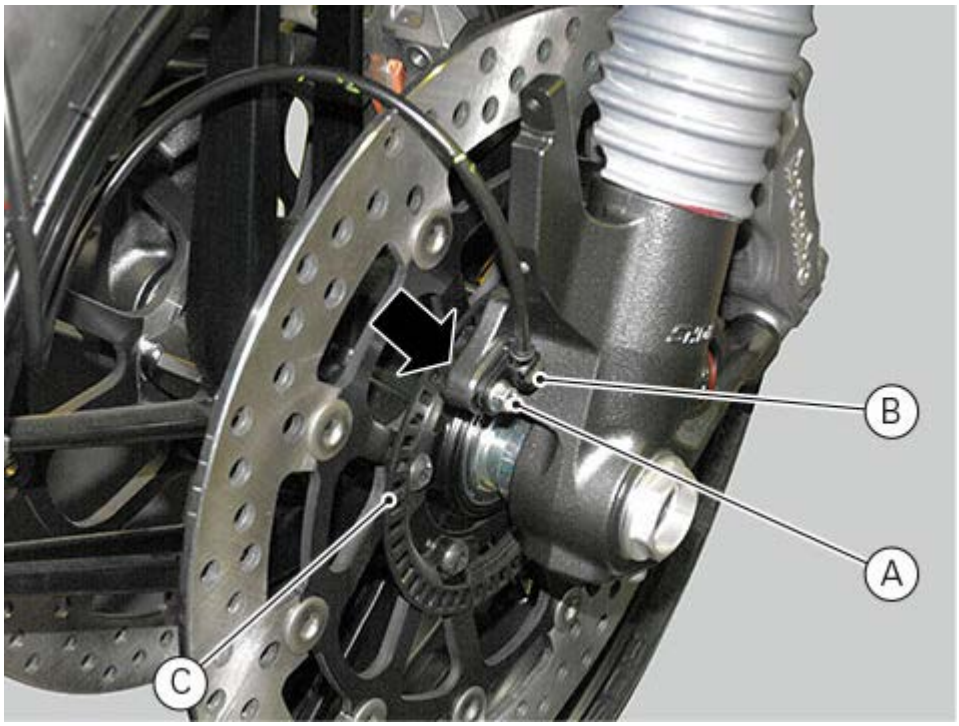
Position cable ring (13) and start the screws (12). Tighten screws (12) to a torque of 5 Nm ± 10%.



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

Airgap

To have a correct airgap, the distance between ABS sensor (B) and phonic wheel (C) (see arrow) must be within 1.3 mm and 1.9 mm.
To do this, use two feeler gauges of 1.3 mm and 1.9 mm. If the Airgap is correct, only the feeler gauge of 1.3 mm must pass.



To do this, use two feeler gauges of 0.2 mm and 0.5 mm.

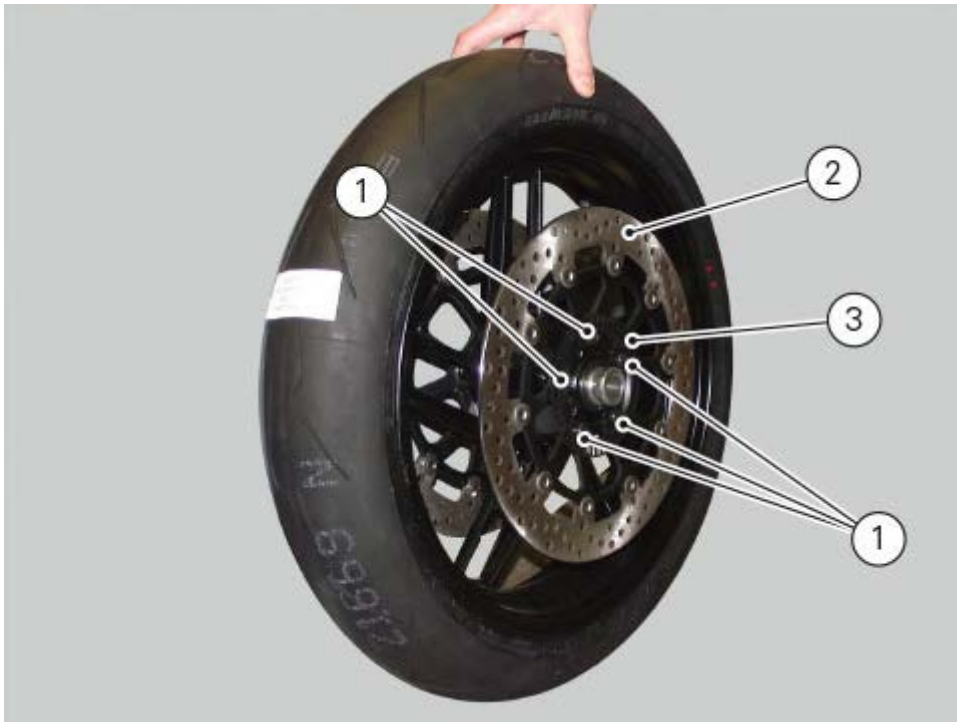
Note
Perform the test in three points of the phonic wheel, at a distance of 120° one from the other.

Important
The sum of the feeler gauge must never exceed 3 mm.

Important
Always take the measurement with the retaining screw (B) fully home.

Refitting the brake discs

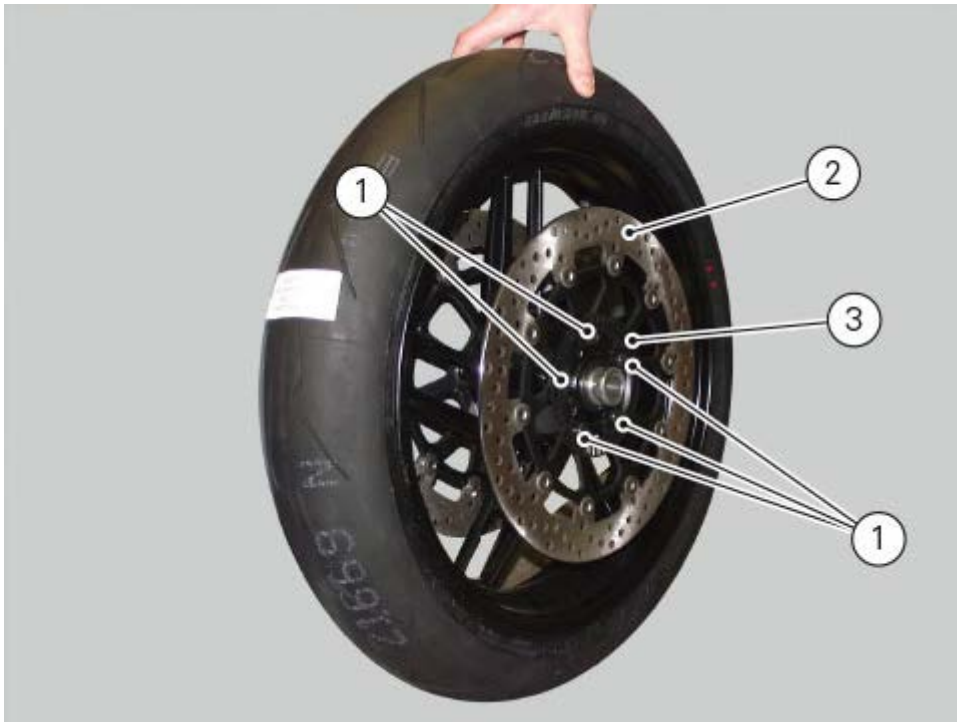
When refitting the disc on the rim, perfectly clean the bearing surfaces.
Fit the phonic wheel (3) working on the LH side.
Screw screws (1) that retain brake disc (2) to the wheel.
Tighten screws (1) to a torque of 30 Nm ± 5%.



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.

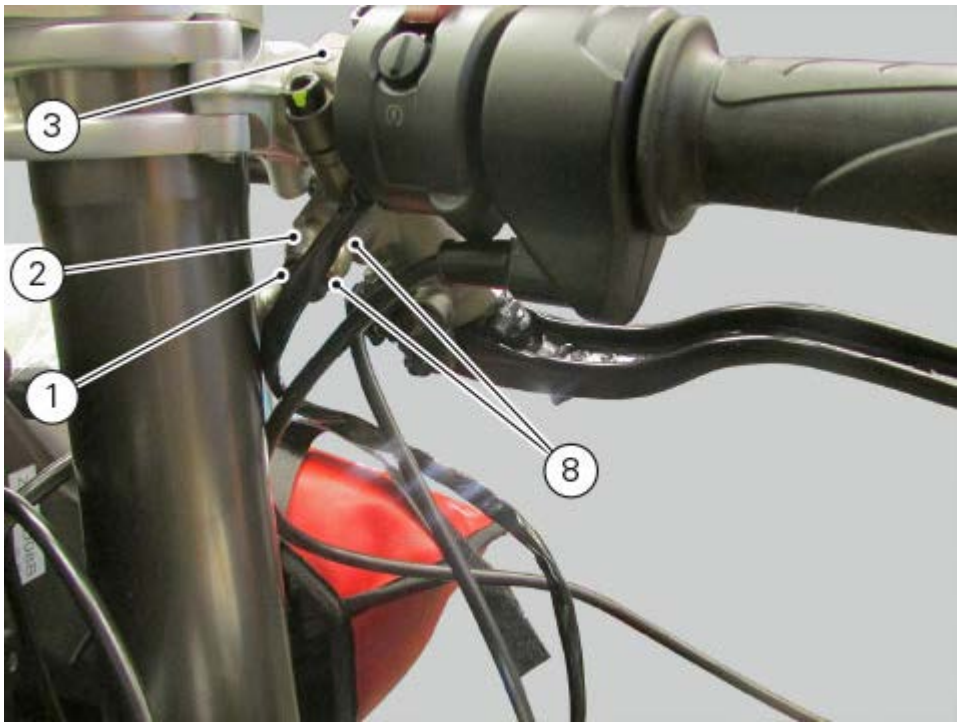
Undo the screws (1) securing the brake disc to the wheel, remove disc (2) and collect the phonic wheel (3) from the LH side.

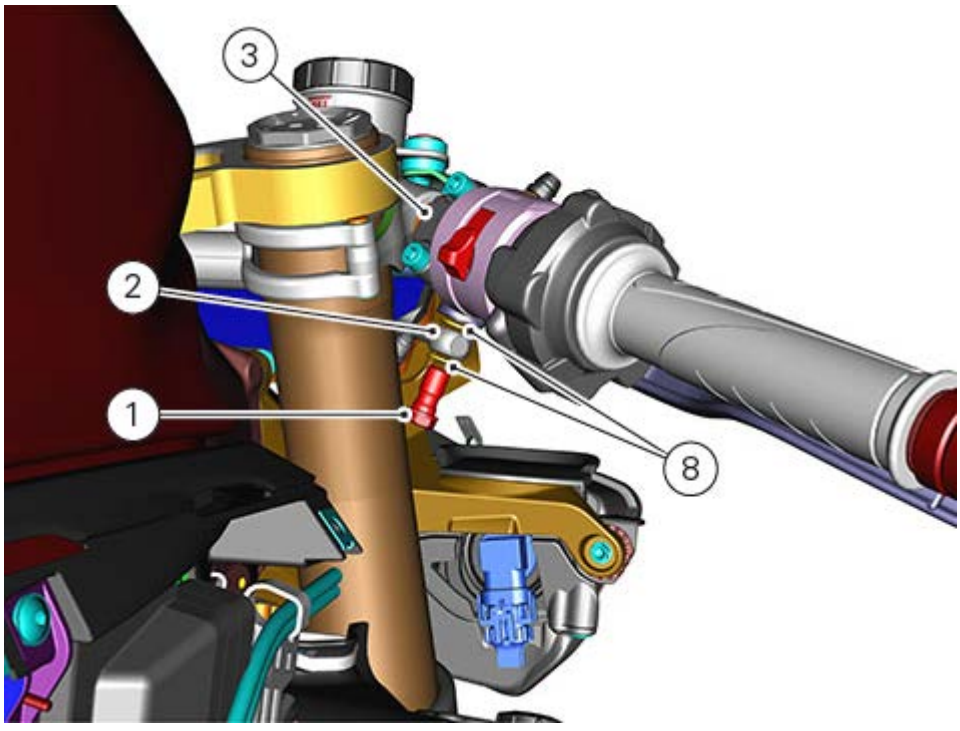


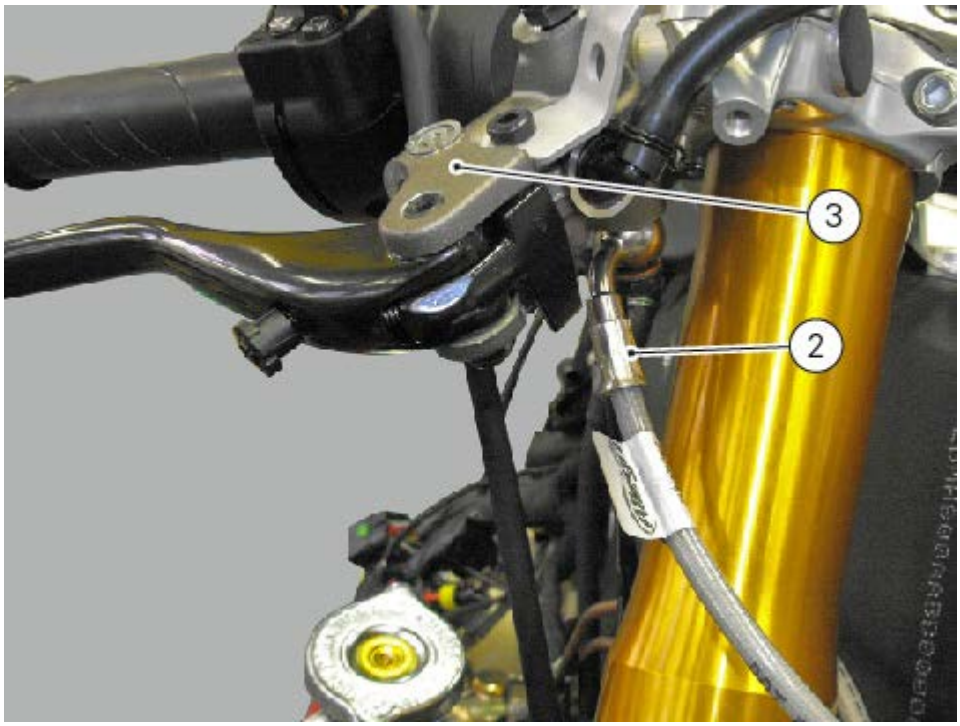
Removing the front brake system

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

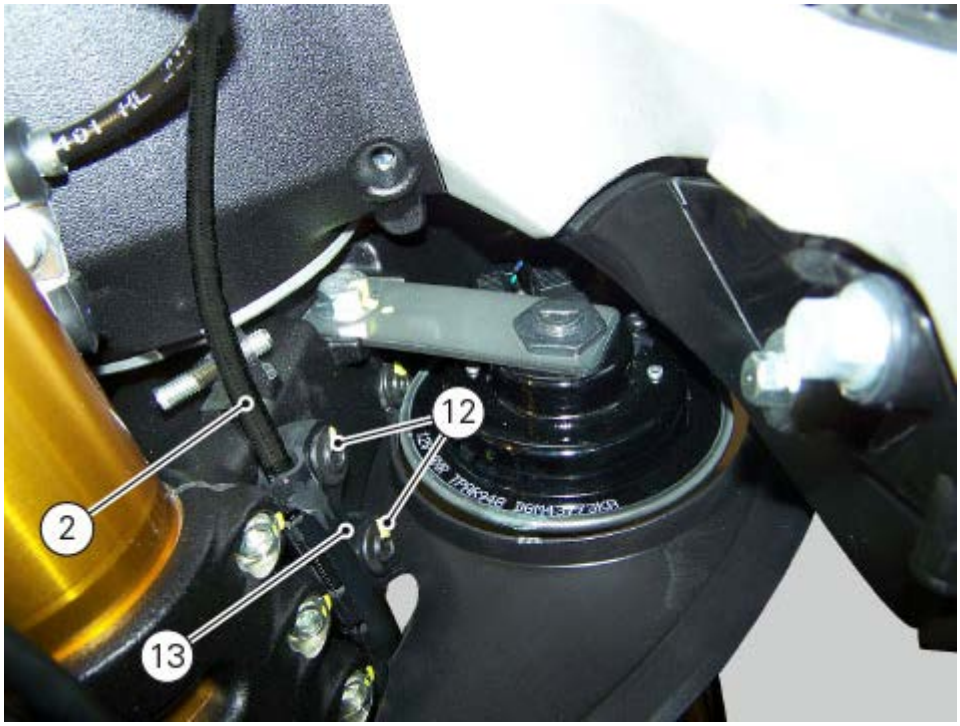
Loosen the special screw (1) that retains hose (2) to the front brake master cylinder (3). Collect the two washers (8).





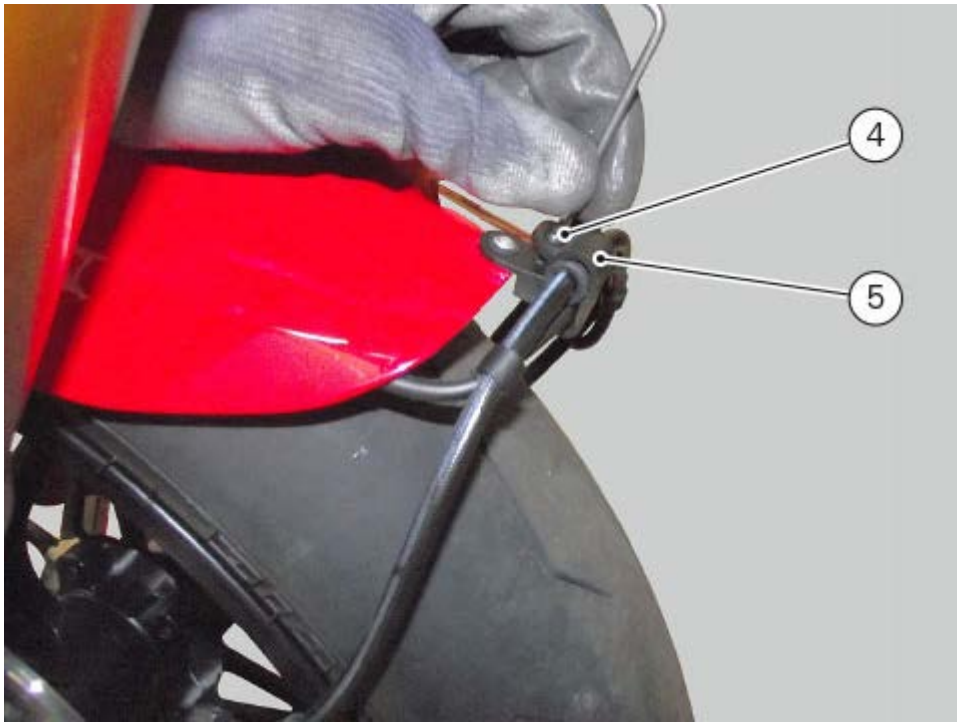


Loosen screws (12) of cable ring (13) retaining hose (2).

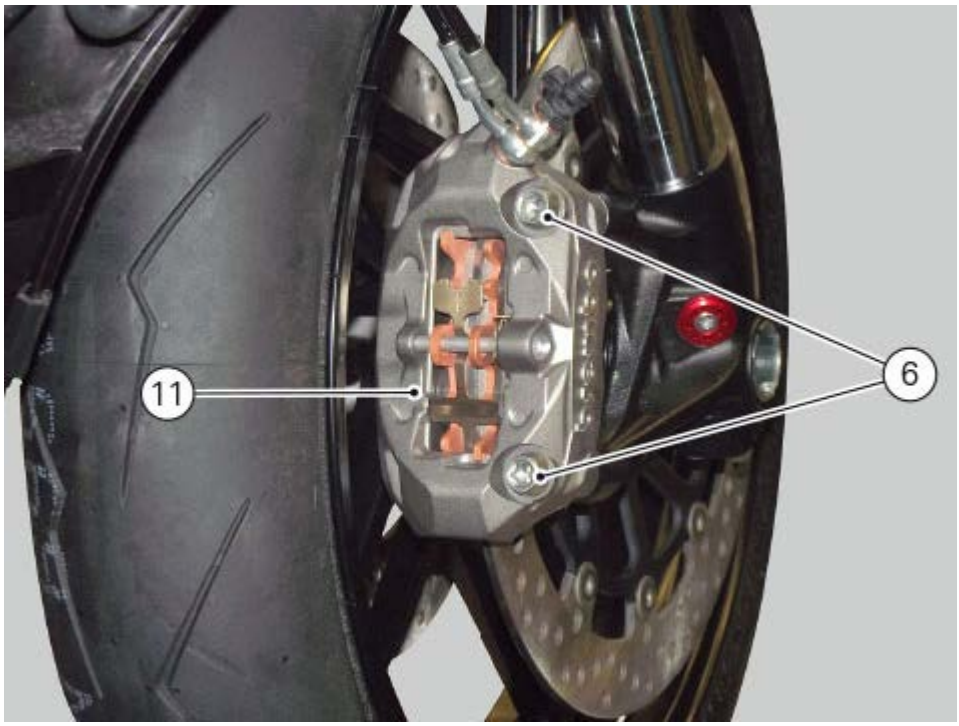


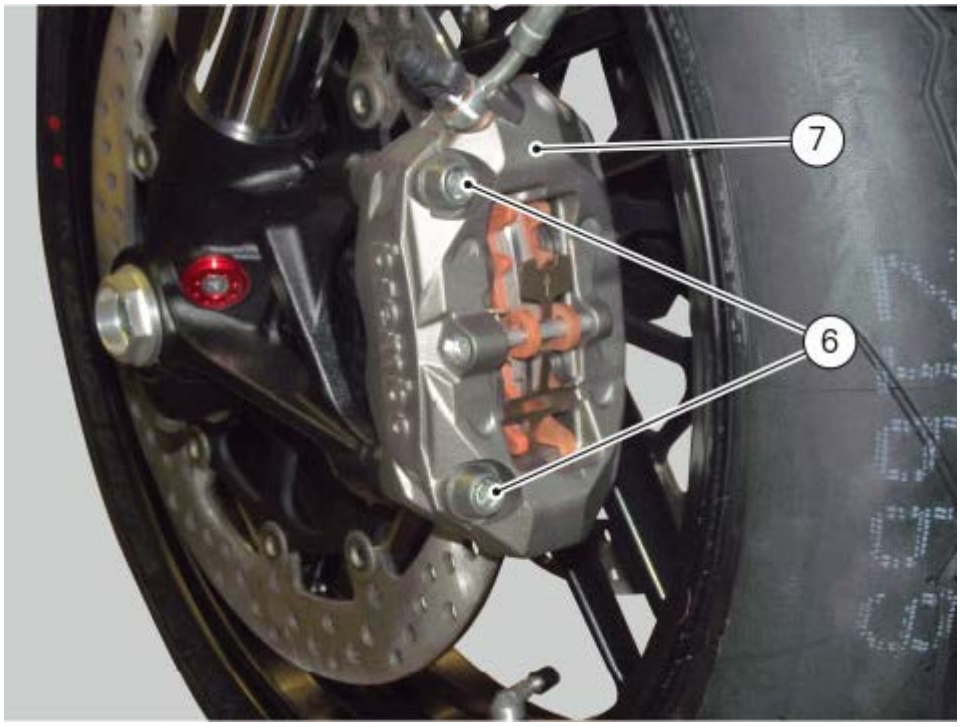
Slide front brake hose (2) downwards.

Loosen screw (4) retaining cable ring (5) of the front brake hoses.



Loosen screws (6) retaining front LH (7) and RH (11) brake calliper to the fork bottom ends.

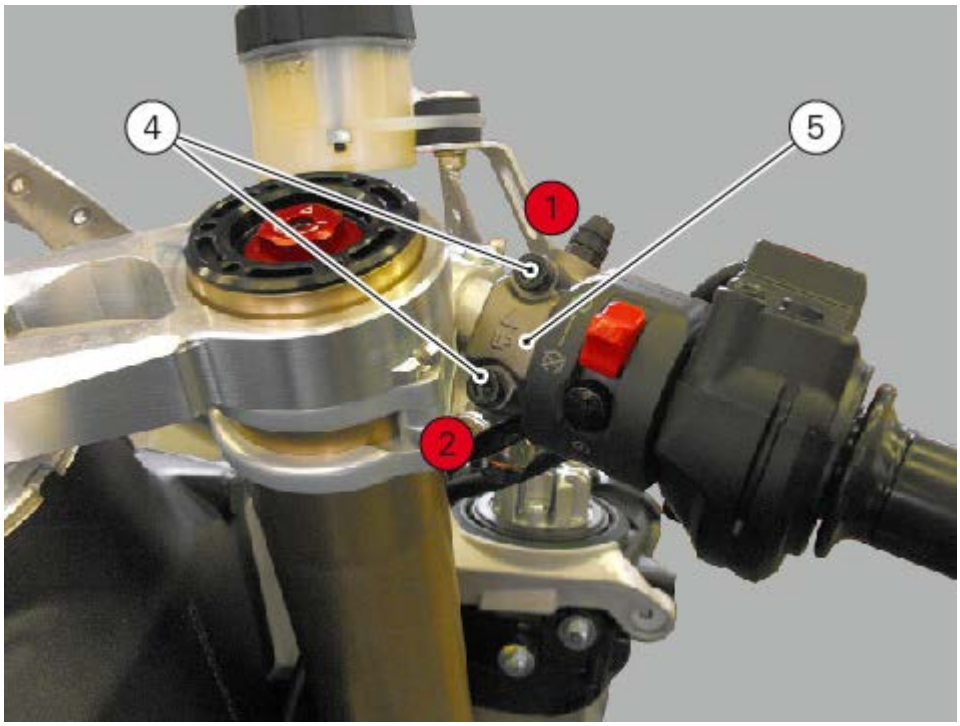




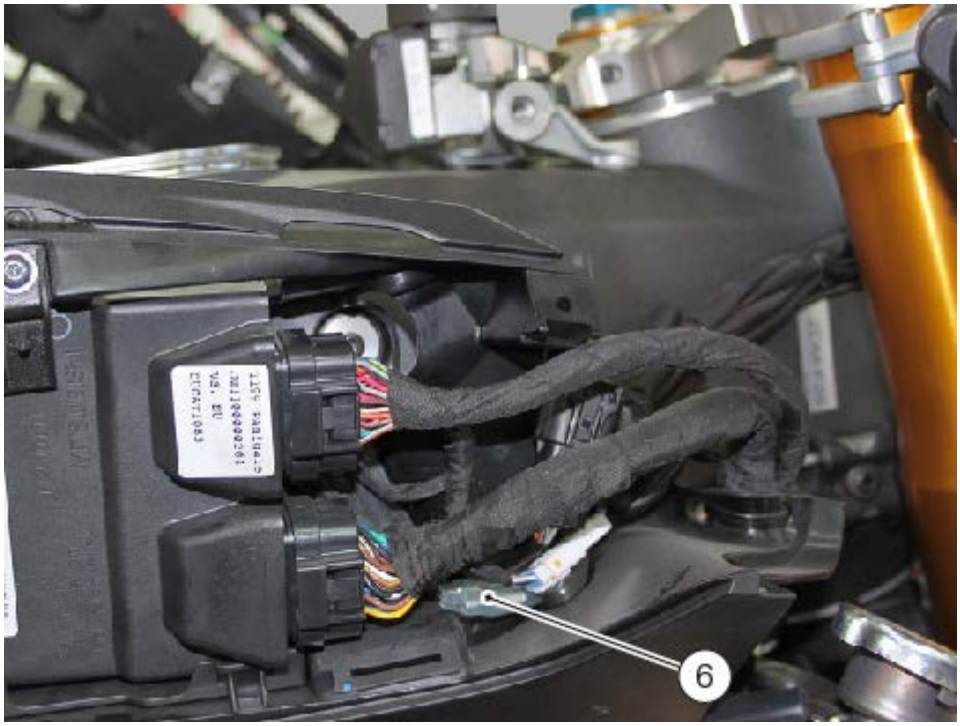
Remove the front brake hoses and callipers from the motorcycle.

Refitting the front brake master cylinder

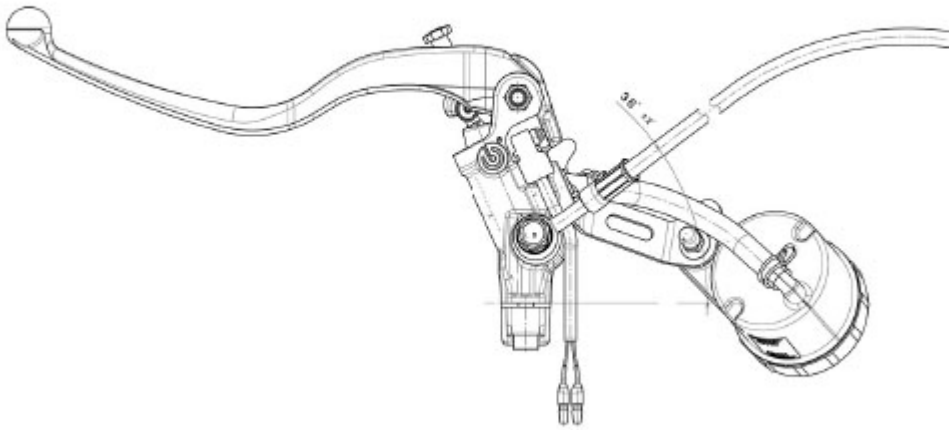
Refit the front brake master cylinder unit on the handlebar.
Start screws (4) retaining U-bolt (5) of the front brake master cylinder.
Tighten the screws (4) to 10 Nm ± 10%, following a 1-2-1 sequence.



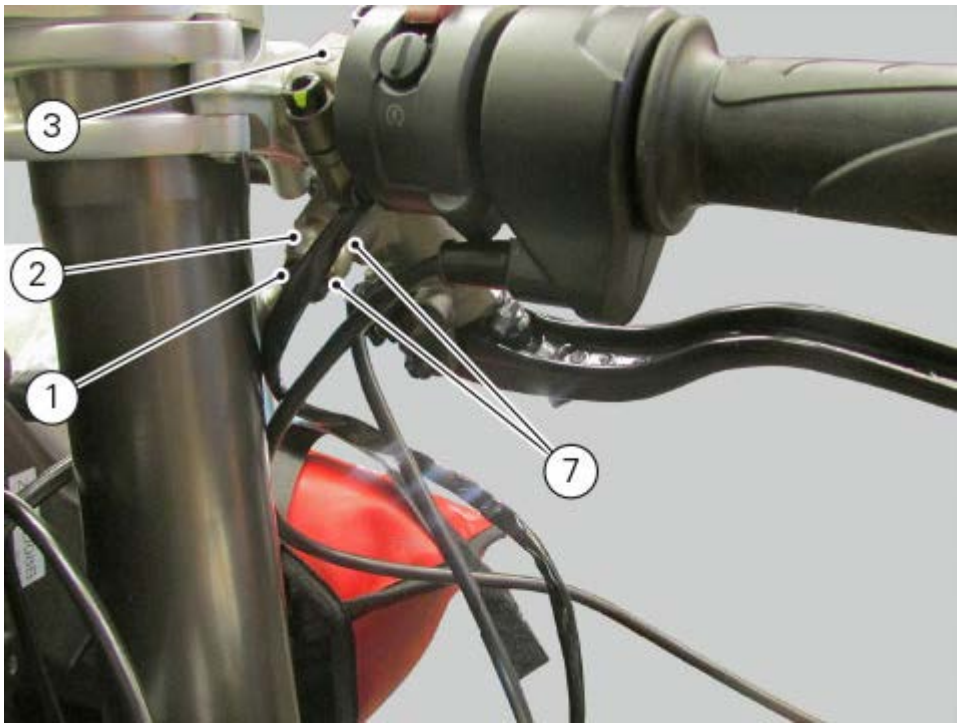
Connect the front brake switch connection (6) to the main wiring harness.

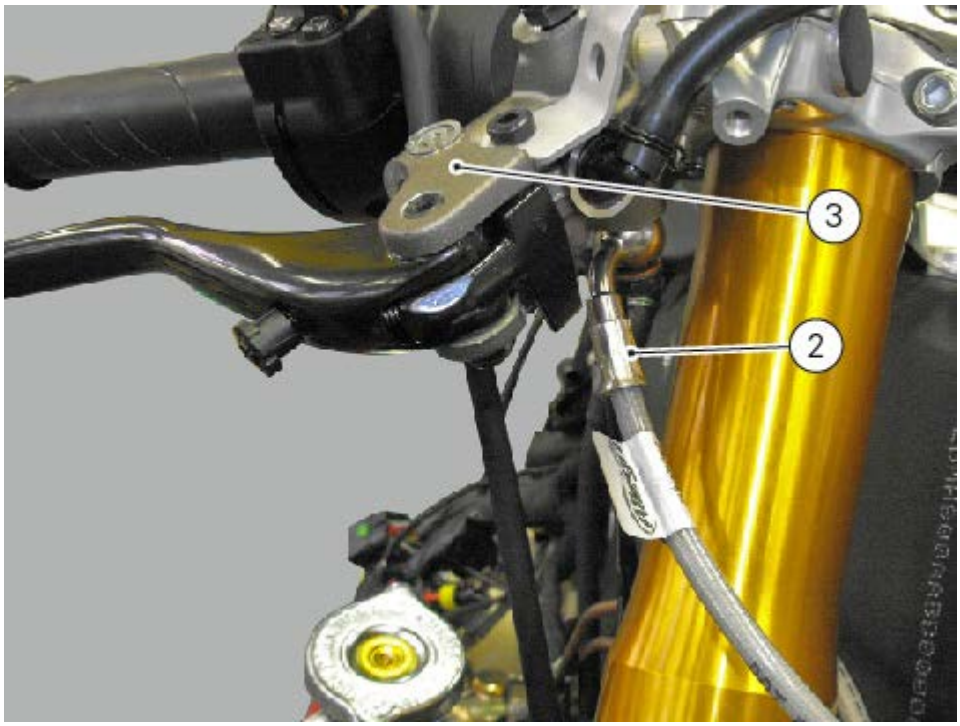


Place the hose on the master cylinder by respecting the indicated value.



Start special screw (1) that retains hose (2) to the front brake master cylinder (3) with washers (7). Tighten the screw (1) to a torque of 23 Nm ± 10%.

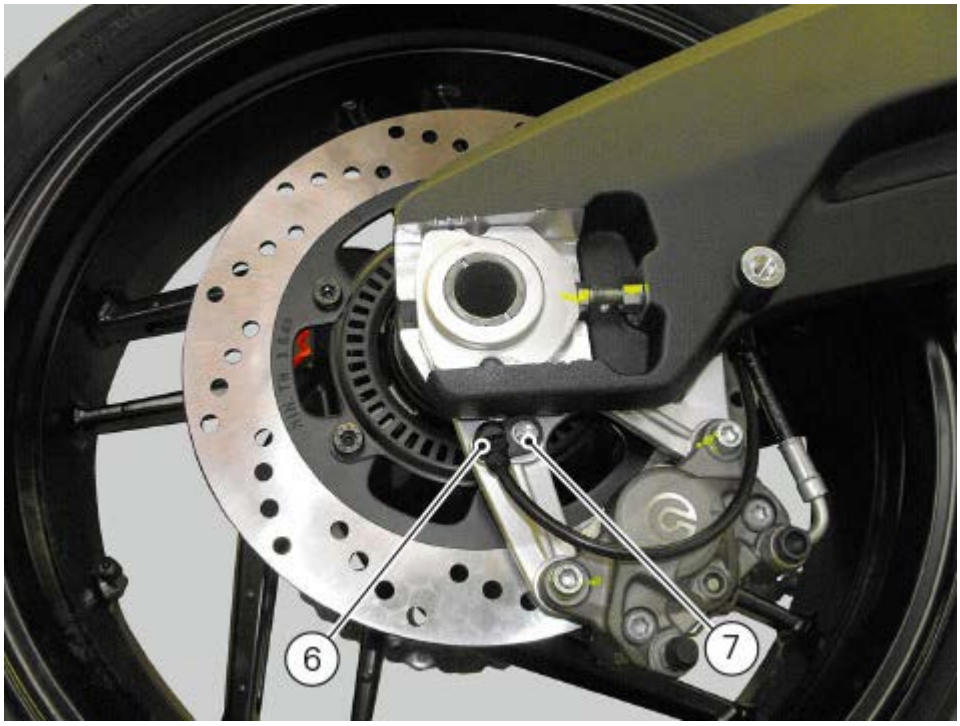




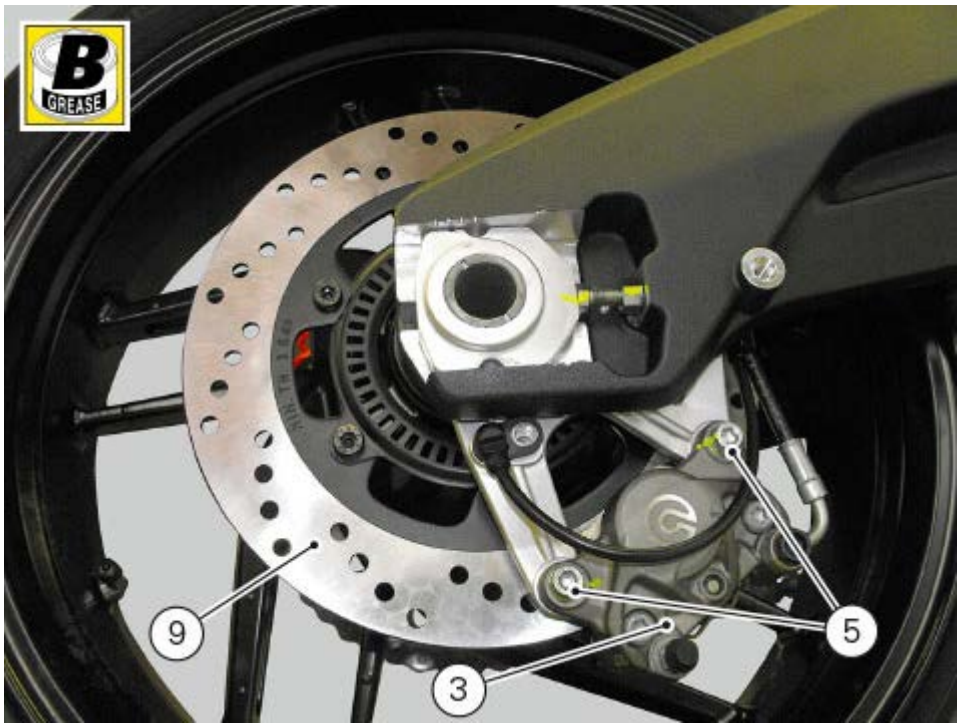
Refit the right-hand fairing (Refitting the side fairings).
Fill the braking system (Changing the front brake system fluid).

Refitting the rear brake calliper

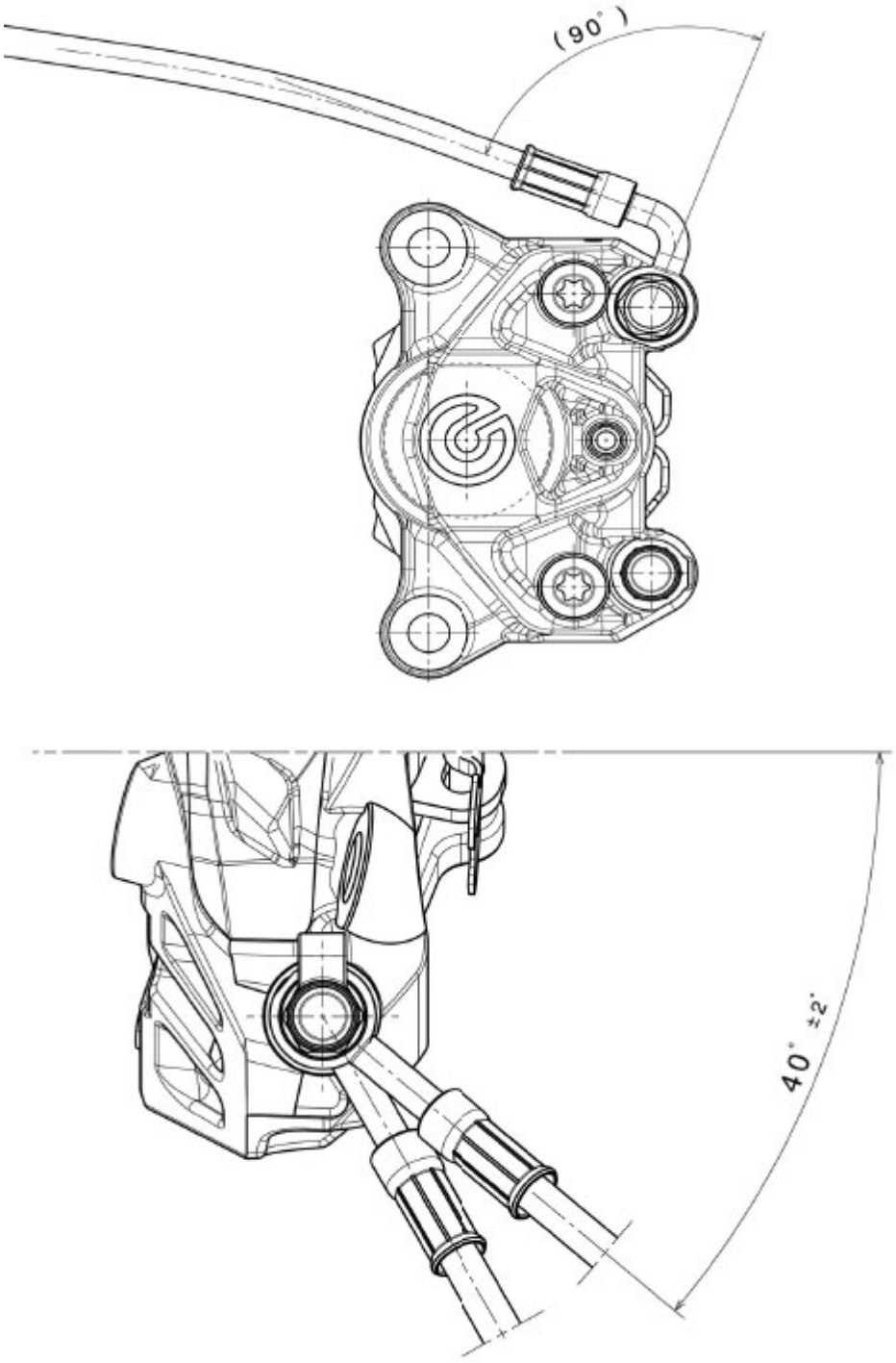
Start retaining screw (7).
Tighten the screw (7) to a torque of 10 Nm ± 10%.



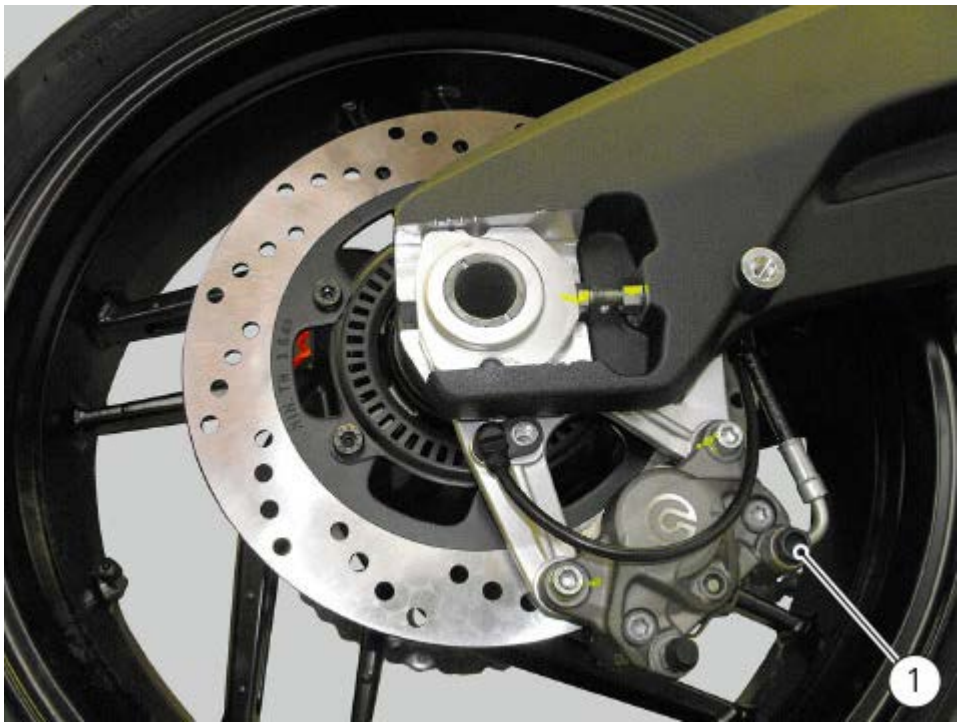
Smear screws (5) with specified grease.
Start screws (5) that retain the rear brake calliper (3) to the brake disc (9).
Tighten screws (5) to a torque of 25 Nm ± 5%.



Place the hose on the rear brake calliper by respecting the indicated values.
Start screw (1) with the two washers.



Tighten the special screw (1) to a torque of 23 Nm ± 10%.

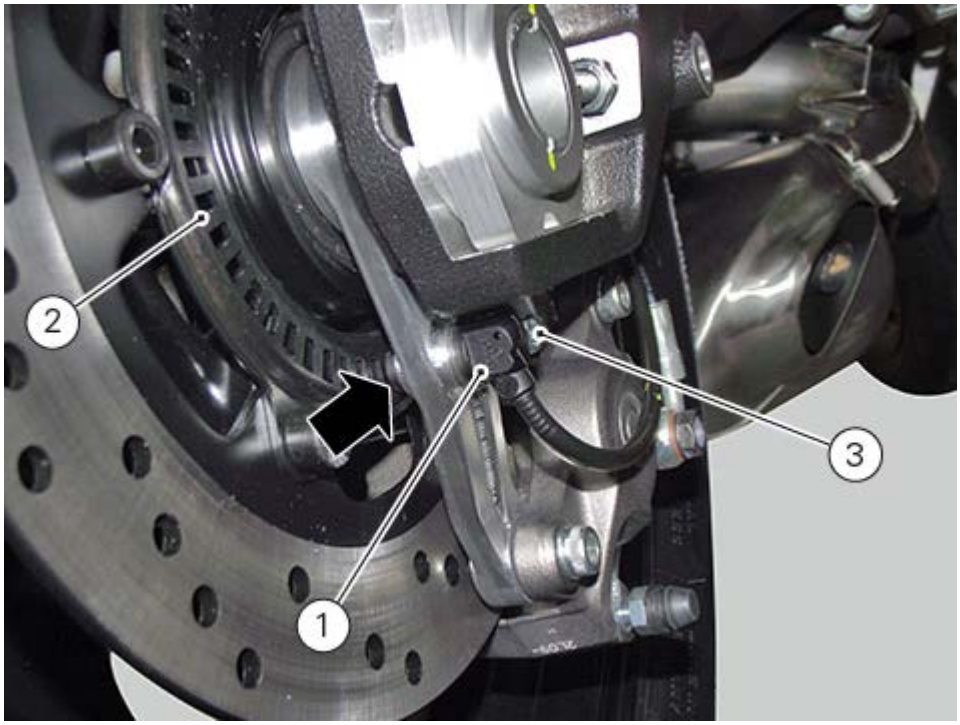


Fill the braking system (Changing the rear brake system fluid).

Position speed sensor (6) so as to obtain a correct airgap as explained below.

Airgap

To have a correct airgap, the distance between ABS sensor (1) and phonic wheel (2) (see arrow) must be within 1.3 mm and 1.9 mm.
To do this, use two feeler gauges of 1.3 mm and 1.9 mm. If the Airgap is correct, only the feeler gauge of 1.3 mm must pass.



To do this, use two feeler gauges of 0.2 mm and 0.5 mm.

Note
Perform the test in three points of the phonic wheel, at a distance of 120° one from the other.

Important

The sum of the feeler gauge must never exceed 3 mm.

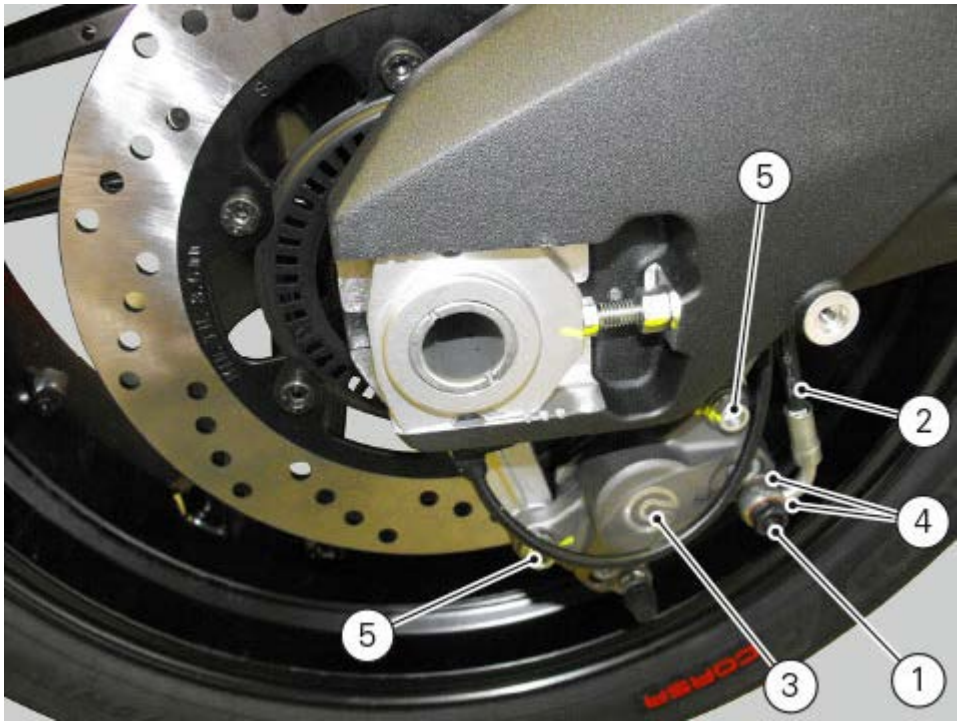
Important

Always take the measurement with the retaining screw (3) fully home.

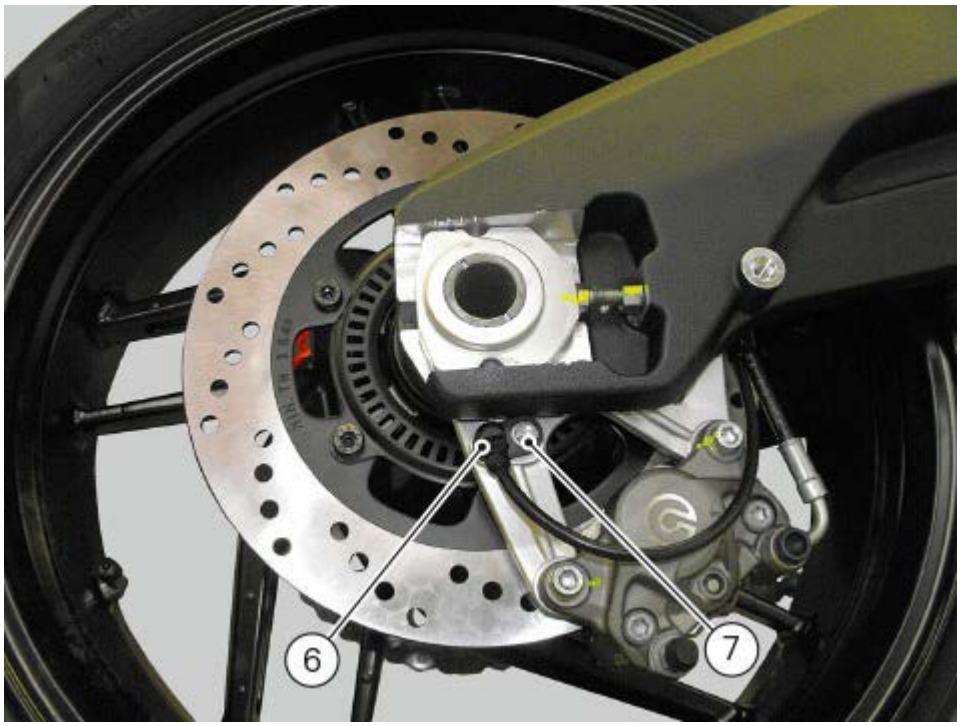
Removing the rear brake calliper

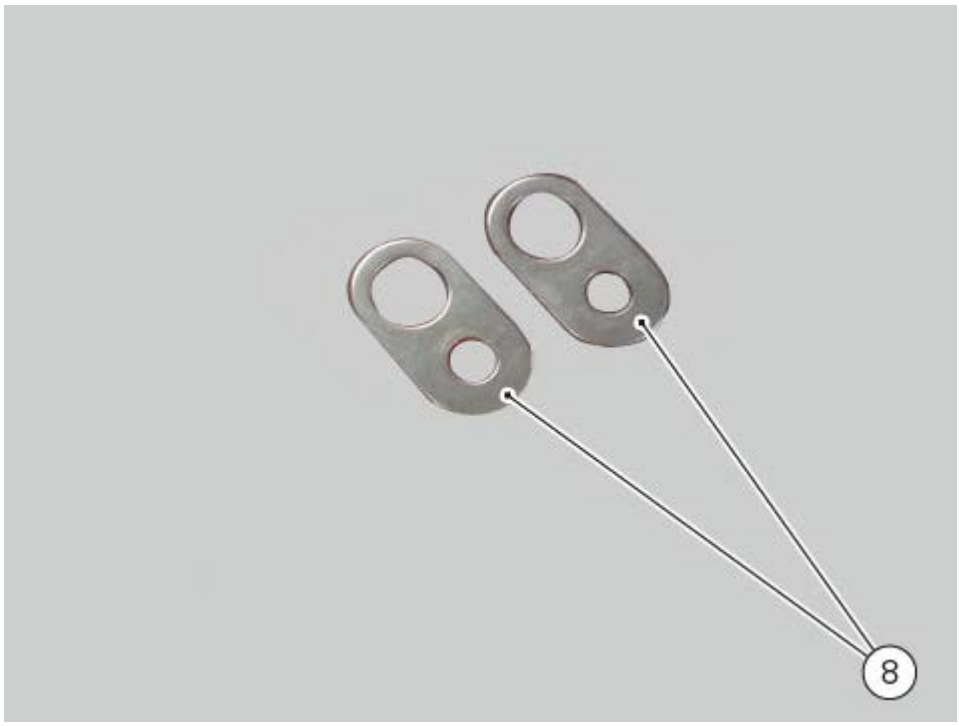
Drain the braking system (Changing the rear brake system fluid).

Loosen the special screw (1) that retains hose (2) to the rear brake calliper (3).
Collect the two washers (4).
Undo the two fixing screws (5) securing the rear brake calliper (3) to the calliper holder bracket, and remove the brake calliper (3).



To remove the speed sensor (6), undo the retaining screw (7) paying attention to the three airgap spacers (8).





As far as the calliper is concerned, only the following parts should be replaced:

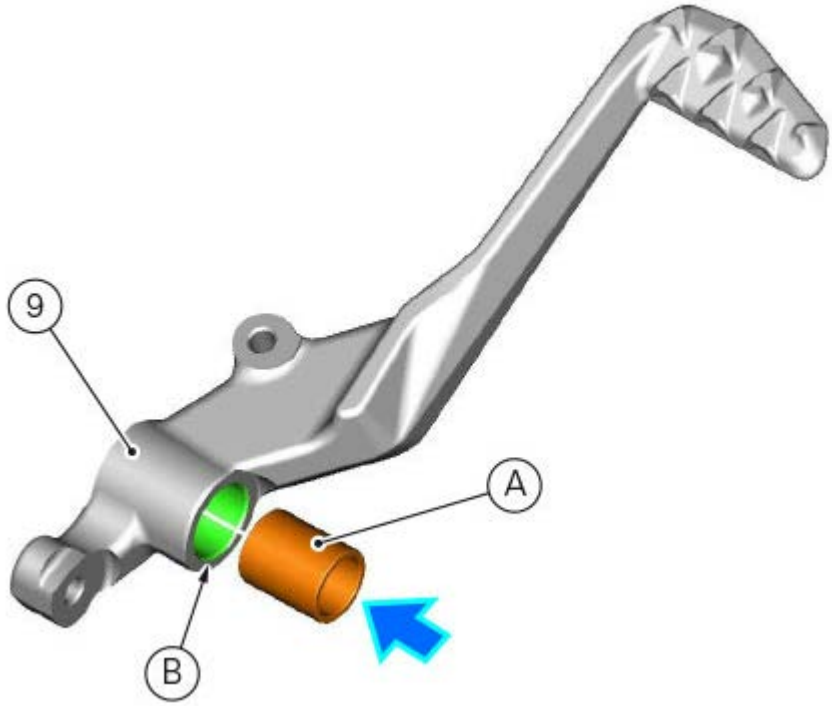
- pads;
- retaining components;
- drain unit.

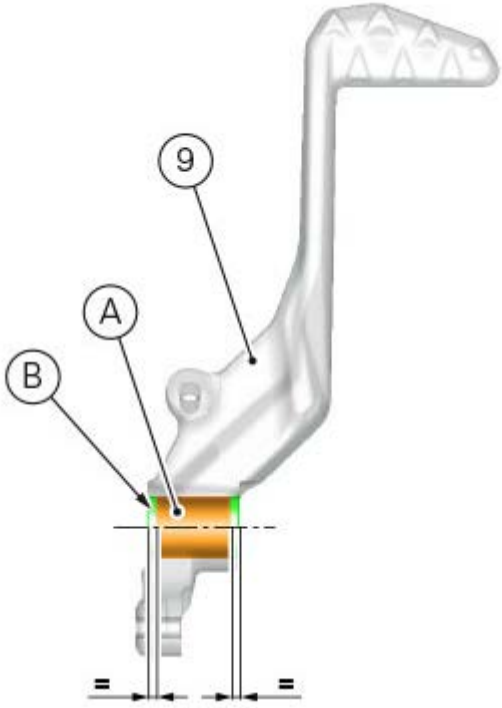
Refitting the rear brake control

Make sure that bushing (A) is positioned in the relevant seat (B) on rear brake lever (9).

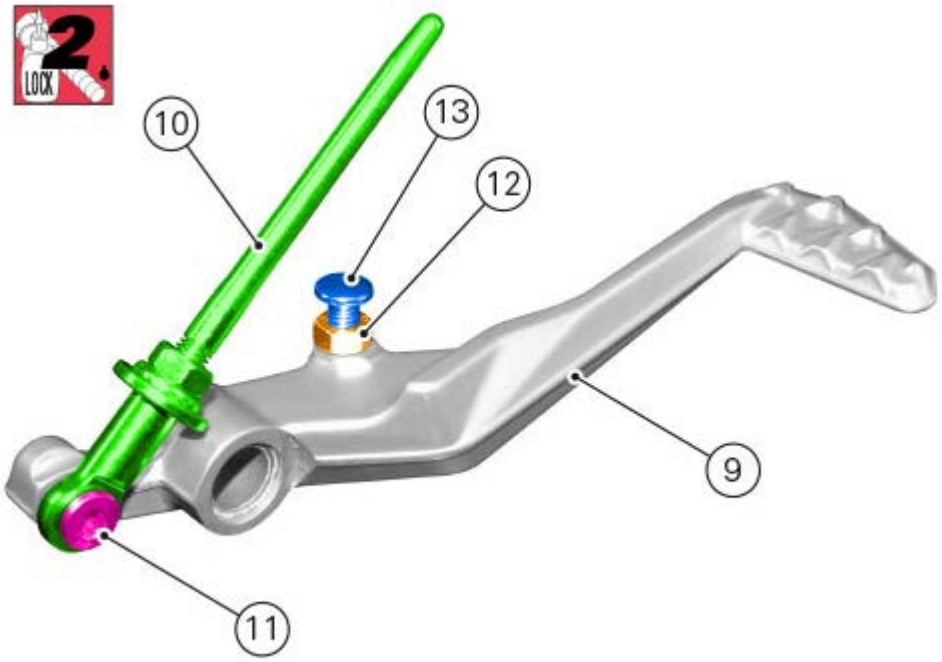
Important

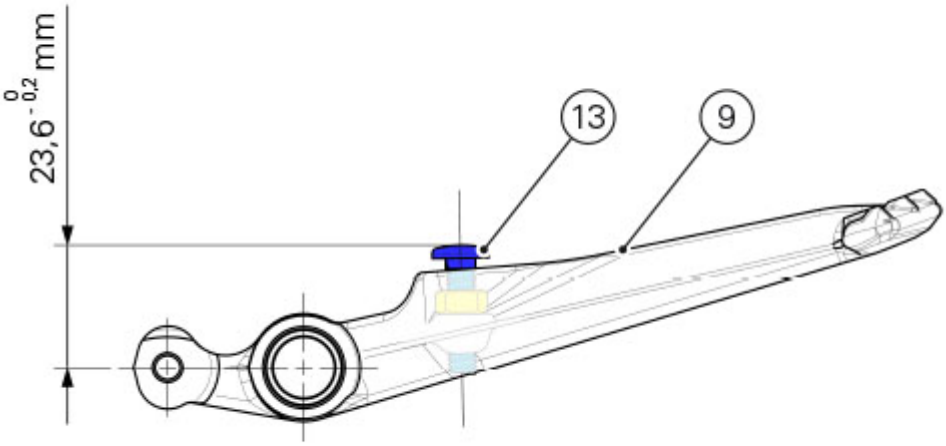
Bushing (A) must be at the same distance from the external edges of seat (B), as shown.



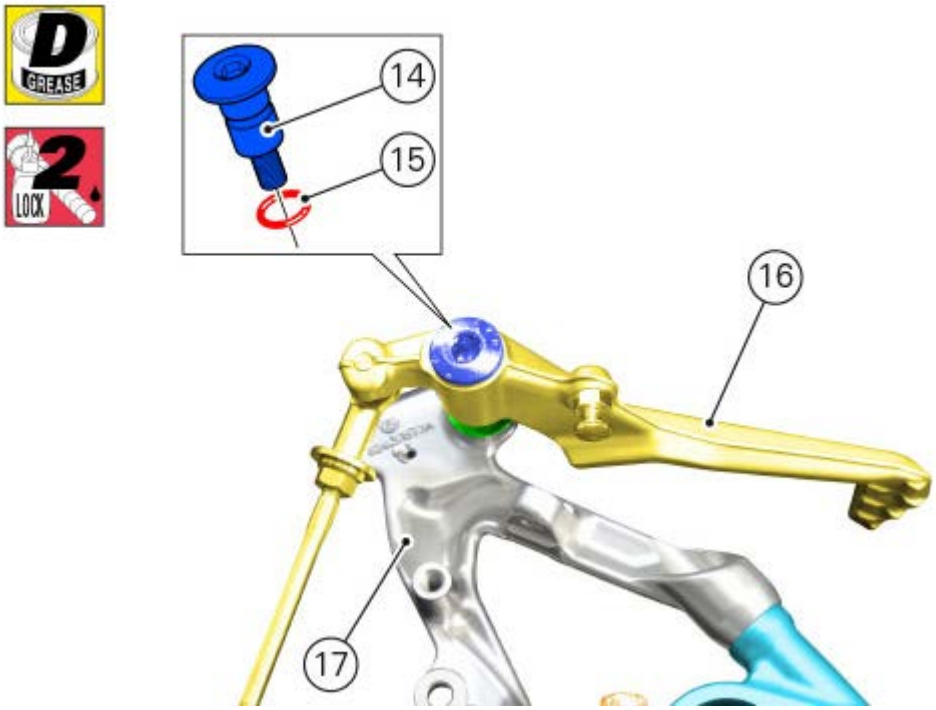


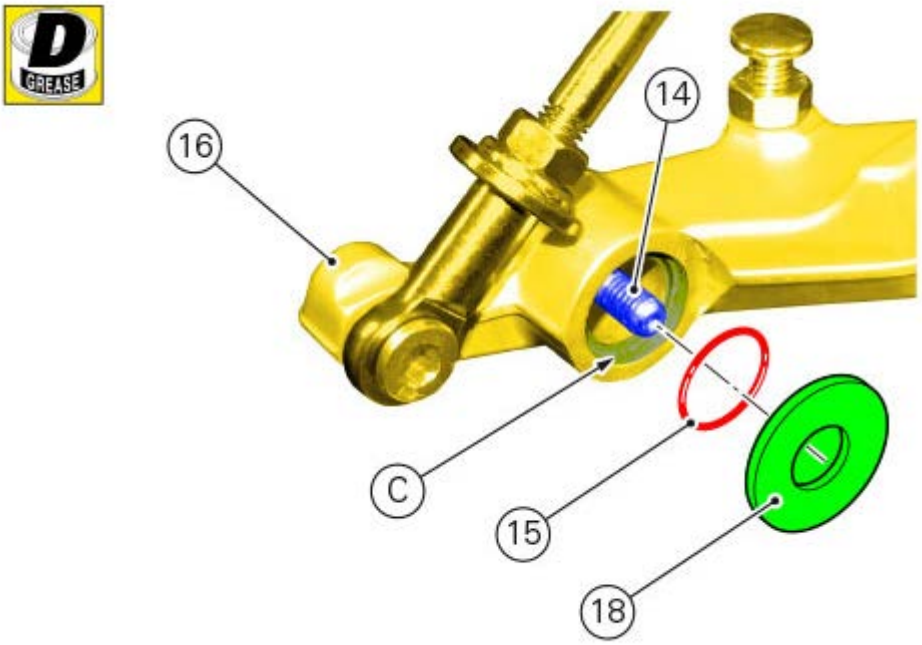
Fit the rear brake master cylinder rod (10) onto screw (11).
Apply the recommended threadlocker on the thread in view of screw (11).
Fit the rear brake master cylinder rod (10) onto brake lever (9) and start screw (11).
Tighten the screw (11) to a torque of 10 Nm ± 10%.
Tighten nut (12) on adjuster (13).
Tighten adjuster (13) on brake lever, until obtaining the indicated position.
Hold adjuster (13) and tighten nut (12) to 8 Nm ± 10% onto the surface of brake lever (9).



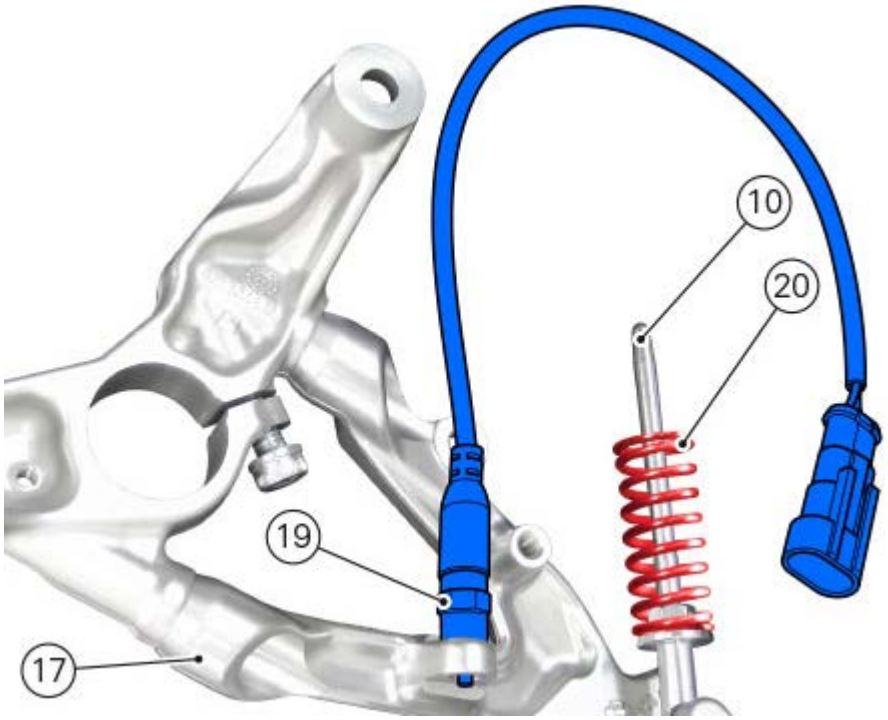


Apply recommended grease in the O-ring seat onto screw (14), insert the first O-ring (15) on screw (14).
Apply the recommended threadlocker to the screw thread (14).
Insert screw (14) in the indicated hole on brake lever assembly (16).
Apply recommended grease in the O-ring seat (C) onto brake lever assembly (16), insert the second O-ring (15) on screw (14).
Fit the washer (17) on screw (14).
Fit the brake lever assembly (16), positioning it as shown, on the front right-hand footpeg holder plate (17) and start screw (14).
Tighten the screw (14) to a torque of 25 Nm ± 10%.

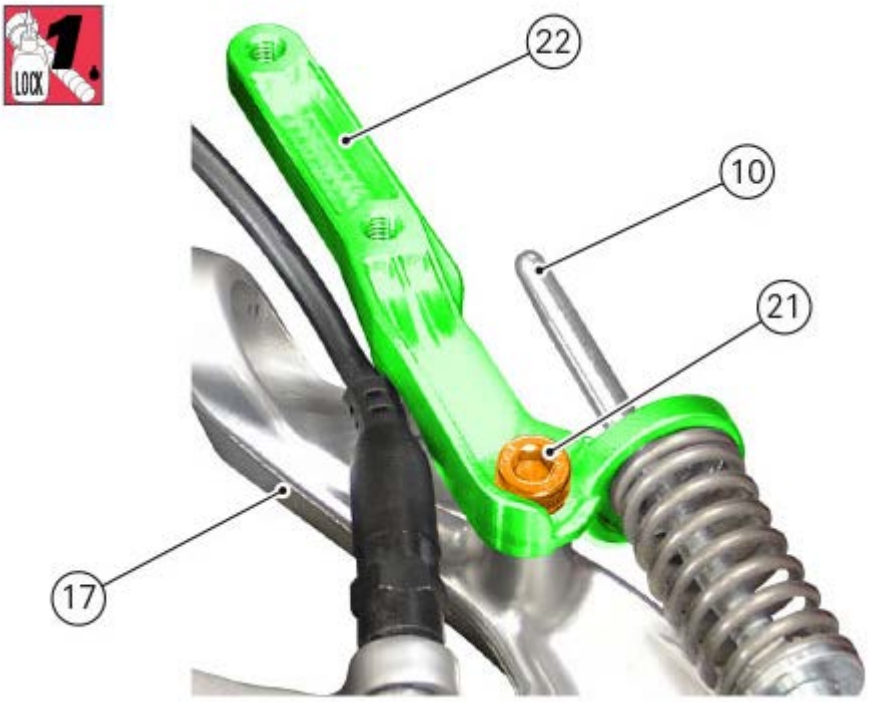


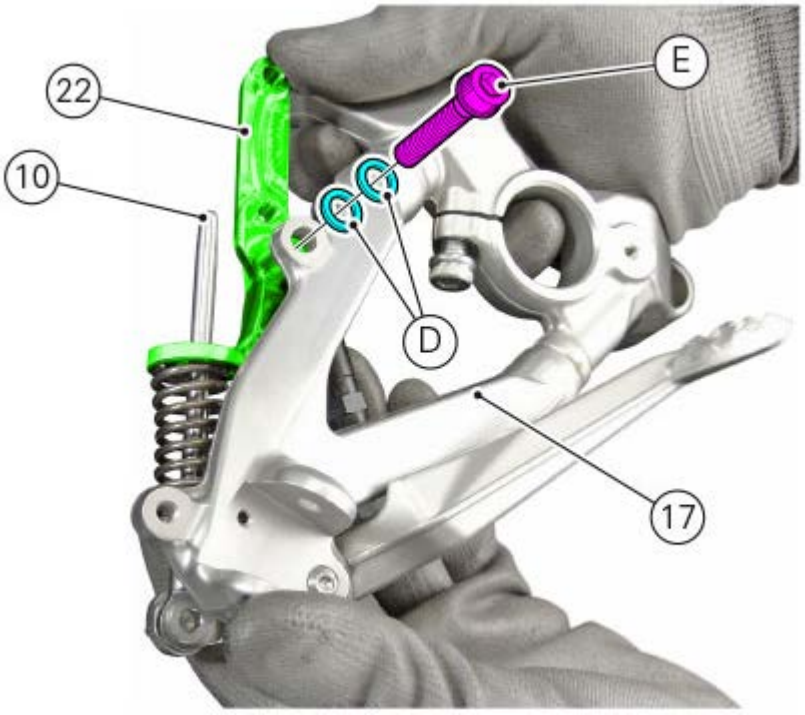


If previously removed, fit the rear brake sensor cable (19), do it finger tight onto front RH footpeg holder plate (17).
Tighten rear brake sensor cable (19) to a torque of 5 Nm ± 10%.
Fit the spring (20) onto rear brake master cylinder rod (10).

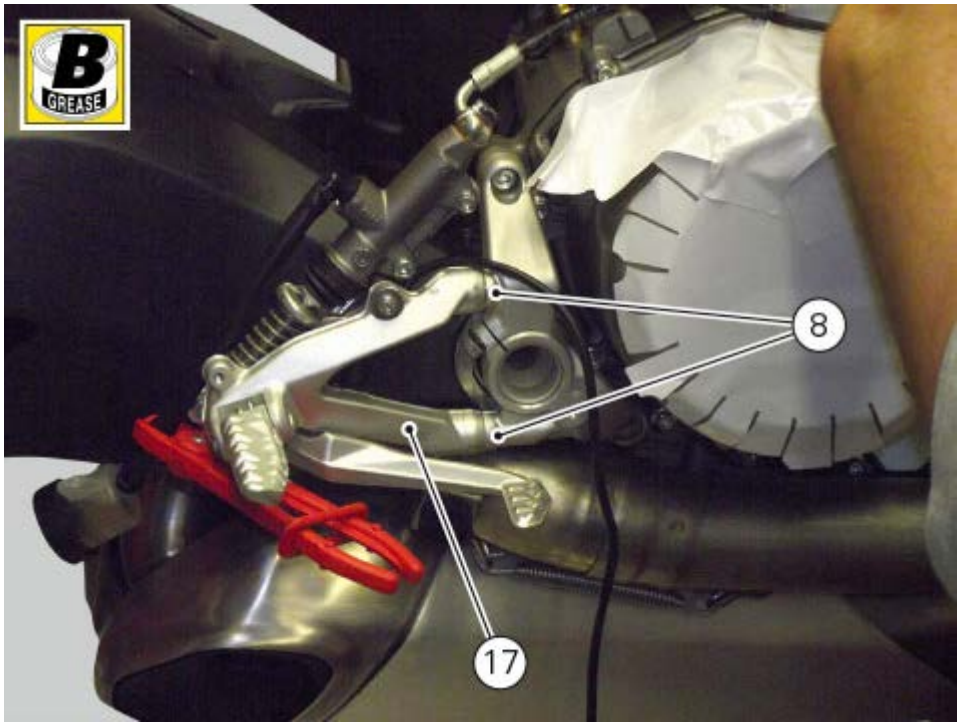


Apply specified threadlocker on the screw thread (21).
Fit spring compression plate (22) onto rear brake master cylinder rod (10) and fasten it inside front right-hand footpeg holder plate (17) by starting screw (21).
Fit two service washers (D) onto screw (E): screw (E) will be used later, to fasten the RH heel guard.
Every service washer (D) must be 5 mm x 15 mm (diameter) x 1.5 mm (thickness).
On the outside, start screw (E) with washers (D).
Tighten the screw (21) to a torque of 10 Nm ± 10%.
Tighten screw (E) to a torque of 6 Nm ± 10%.

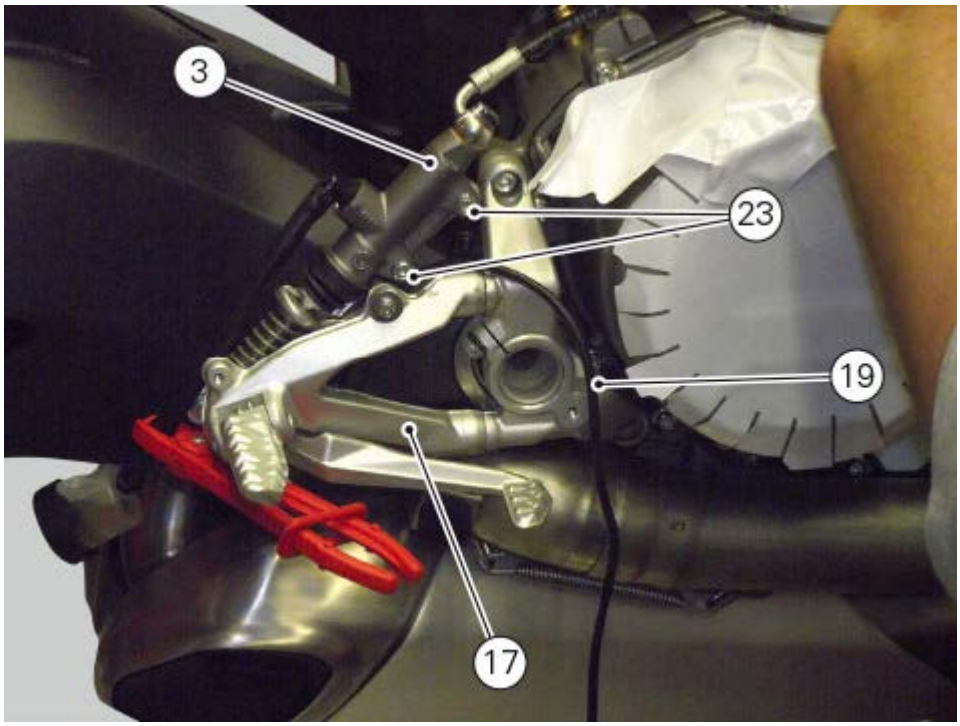




Refit the RH footpeg (17) of the rear brake control.
Smear screws (8) with specified grease.
Start the screws (8) and tighten them to a torque of 25 Nm ± 5%.

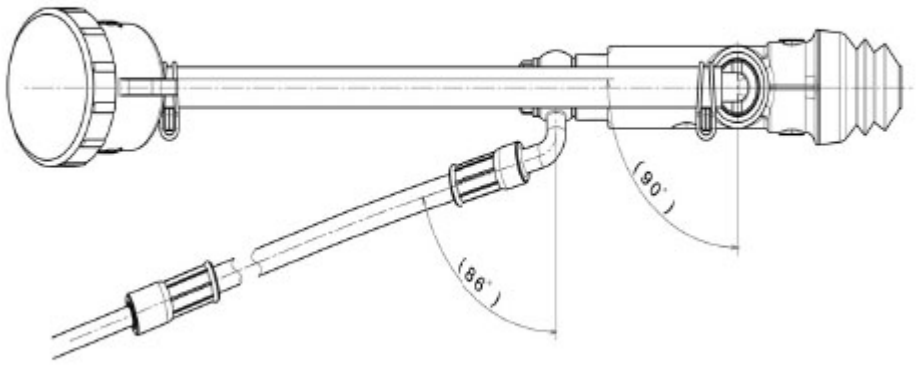


Position the rear brake master cylinder (3) onto the right-hand footpeg holder plate (17) and tighten screws (23) to 8 Nm ± 10%.
Connect the rear brake sensor cable (19) to the main wiring harness.

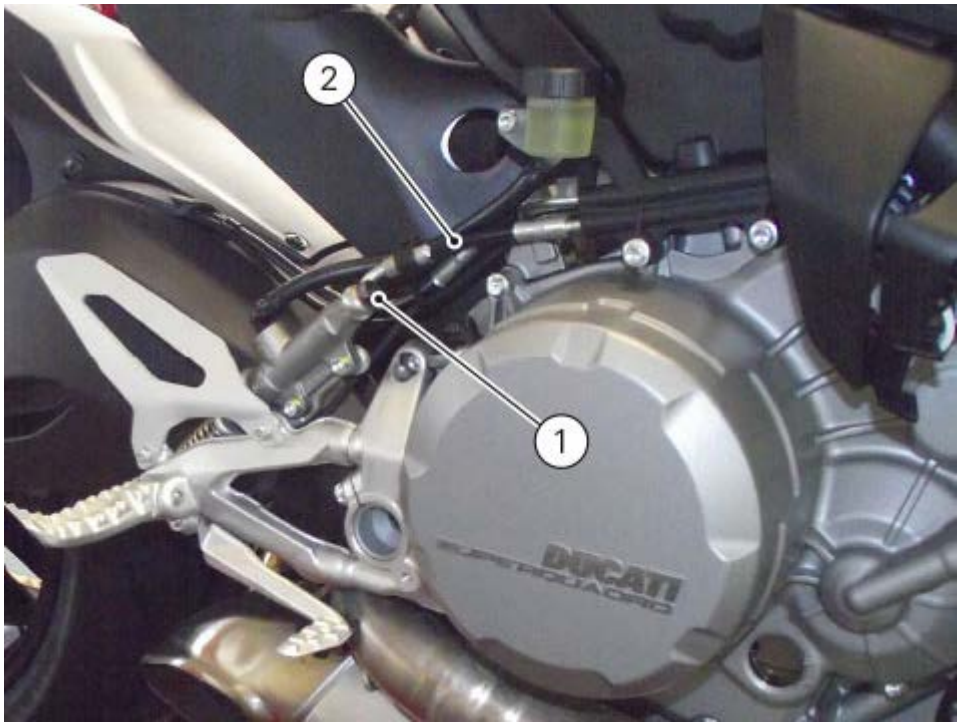


Position fluid reservoir (6) on cable ring (7). Start retaining screw (5).
Tighten it to a torque of 2 Nm ± 10%.

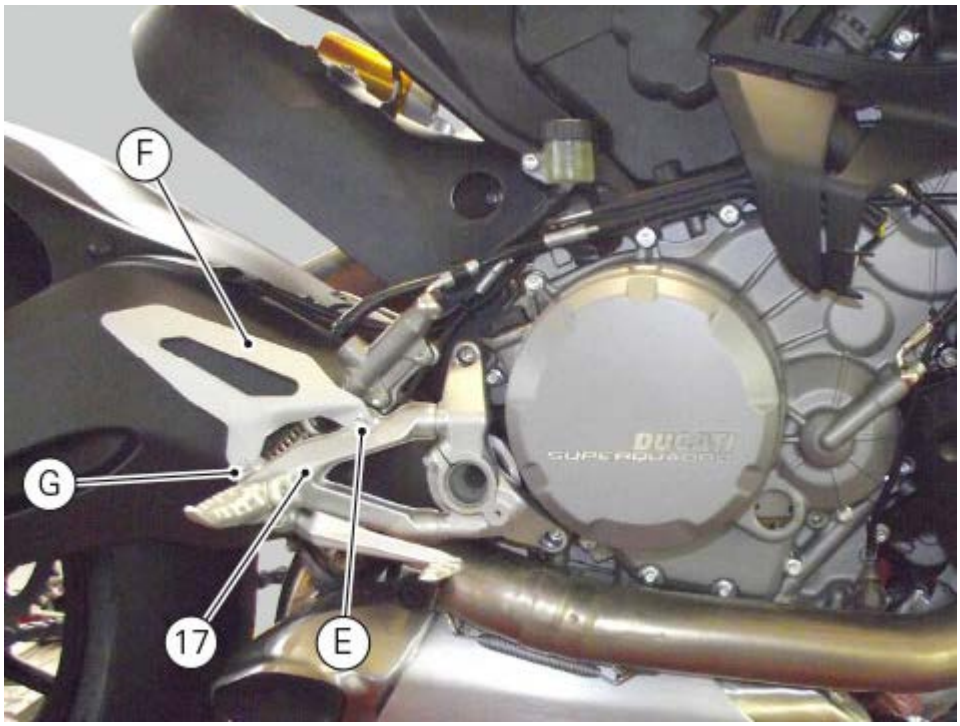
Place the hose on the rear brake master cylinder by respecting the indicated value.
Start screw (1) with the relevant washers.



Tighten the screw (1) to a torque of 23 Nm ± 10%.



Refit the RH heel guard (F) on the RH footpeg holder plate (17).
Loosen the previously used screw (E) from heel guard (F) and remove it together with the service washers used.
Smear screws (E) and (G) with specified threadlocker, and start them.
Screw (E) of heel guard (F) also fastens rear brake master cylinder support onto footpeg holder plate.
Tighten screws (E) and (G) to a torque of ± 6 Nm 10%.

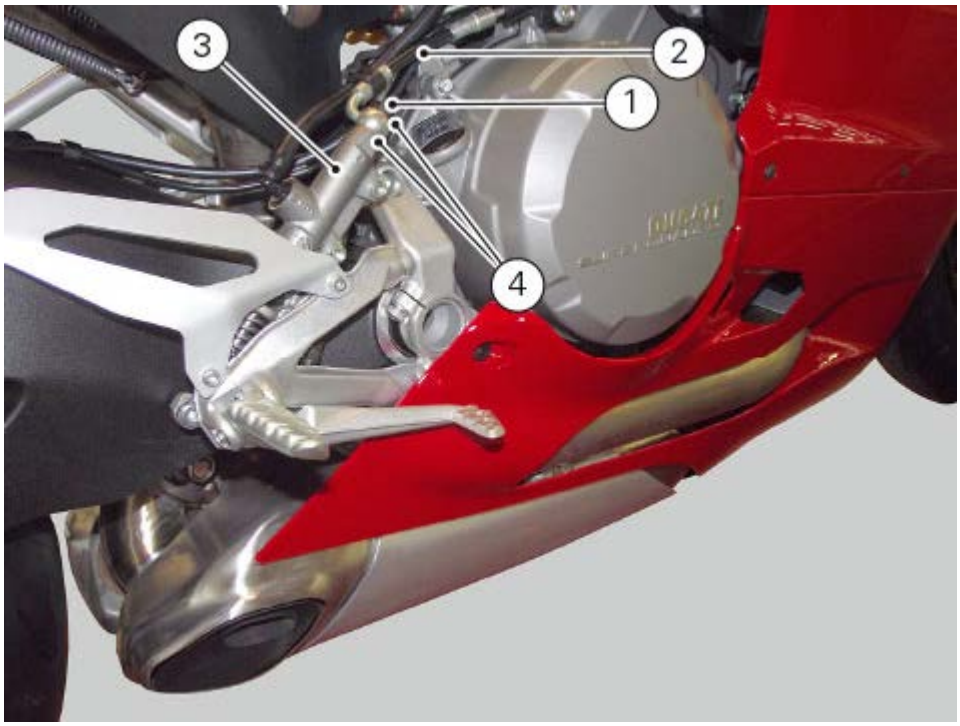


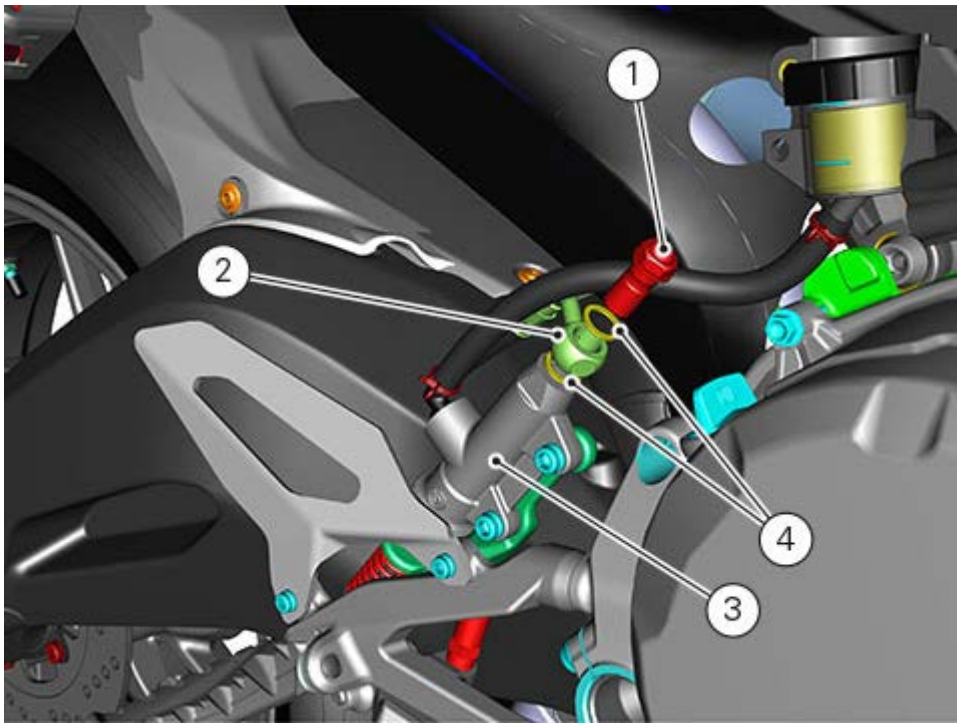
Fill the braking system (Changing the rear brake system fluid).

Removing the rear brake control

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

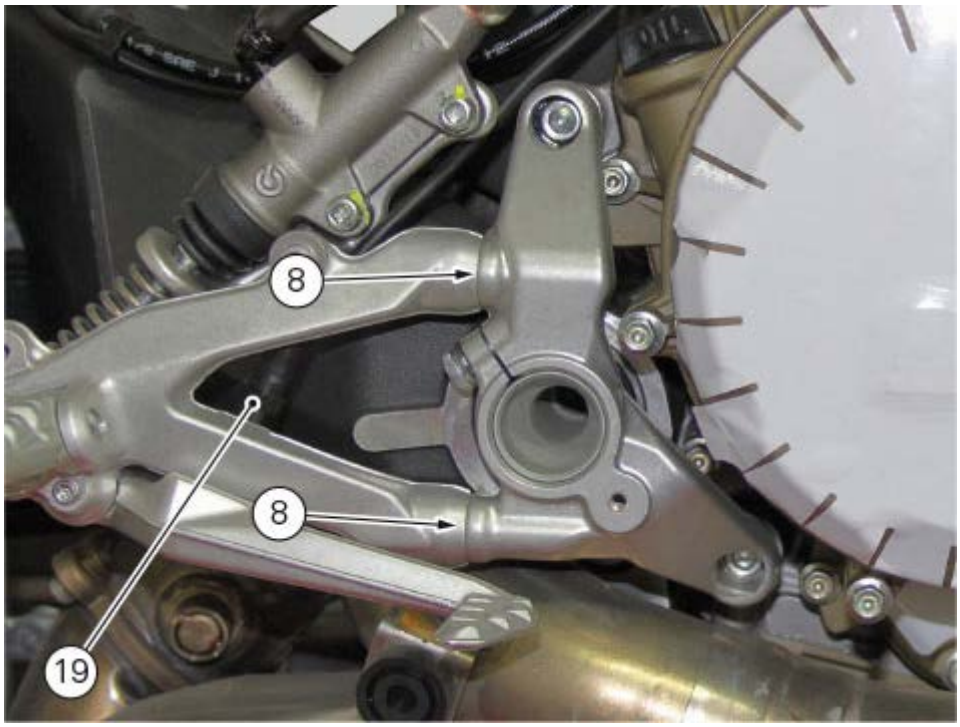
Loosen the special screw (1) that retains hose (2) to the rear brake master cylinder (3). Collect the two washers (4).

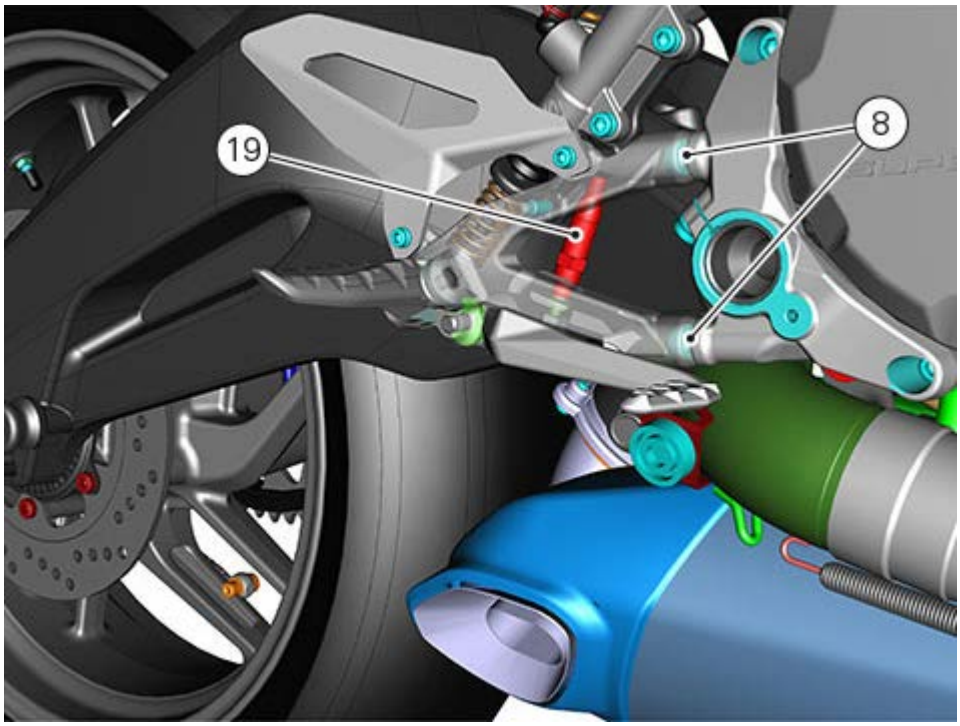




Loosen screw (5) securing the fluid reservoir (6) to cable ring (7).

Disconnect the rear brake sensor cable (19) from the main wiring harness.
Remove the RH footpeg by loosening screws (8).





As far as the master cylinder is concerned, only the following parts should be replaced:

- control pedal;
- drain unit;
- reservoir and components.

Positioning ABS wiring / 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
- -	1	ABS control unit hose to front brake calliper
-	2	ABS control unit hose to front brake master cylinder
- -	3	ABS control unit hose to rear brake calliper
-	4	ABS control unit hose to front brake master cylinder
	5	Front LH brake calliper hose to RH one

Table A

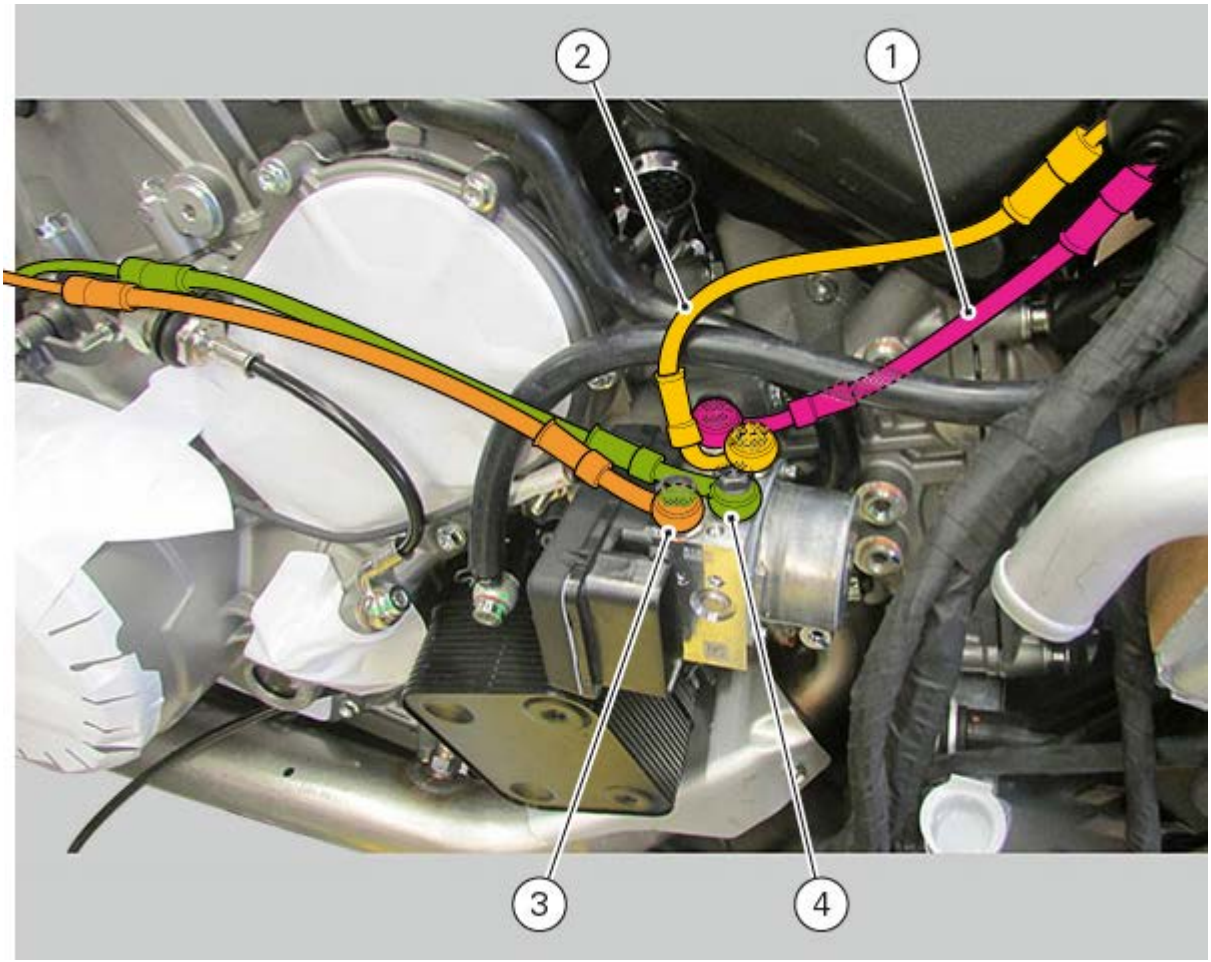
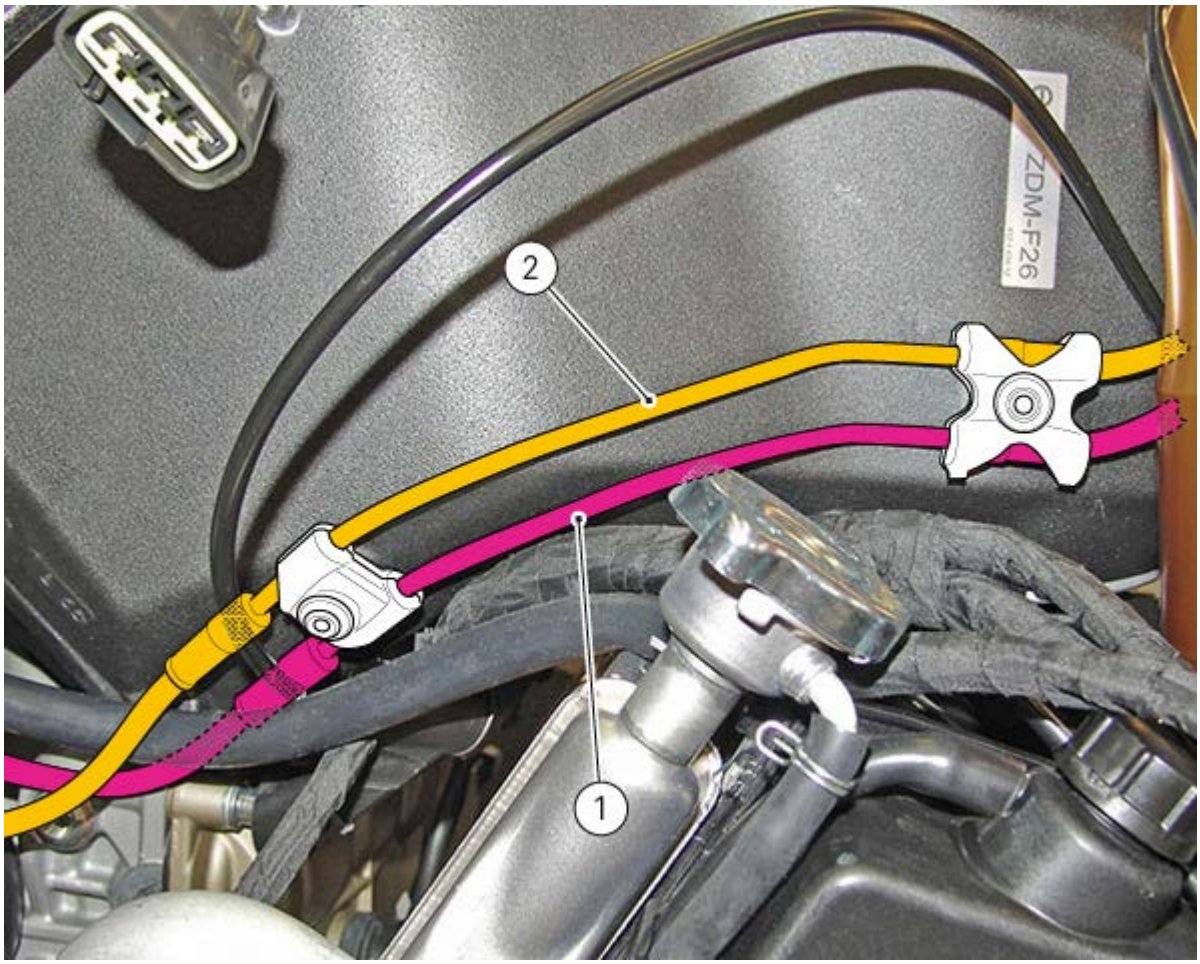
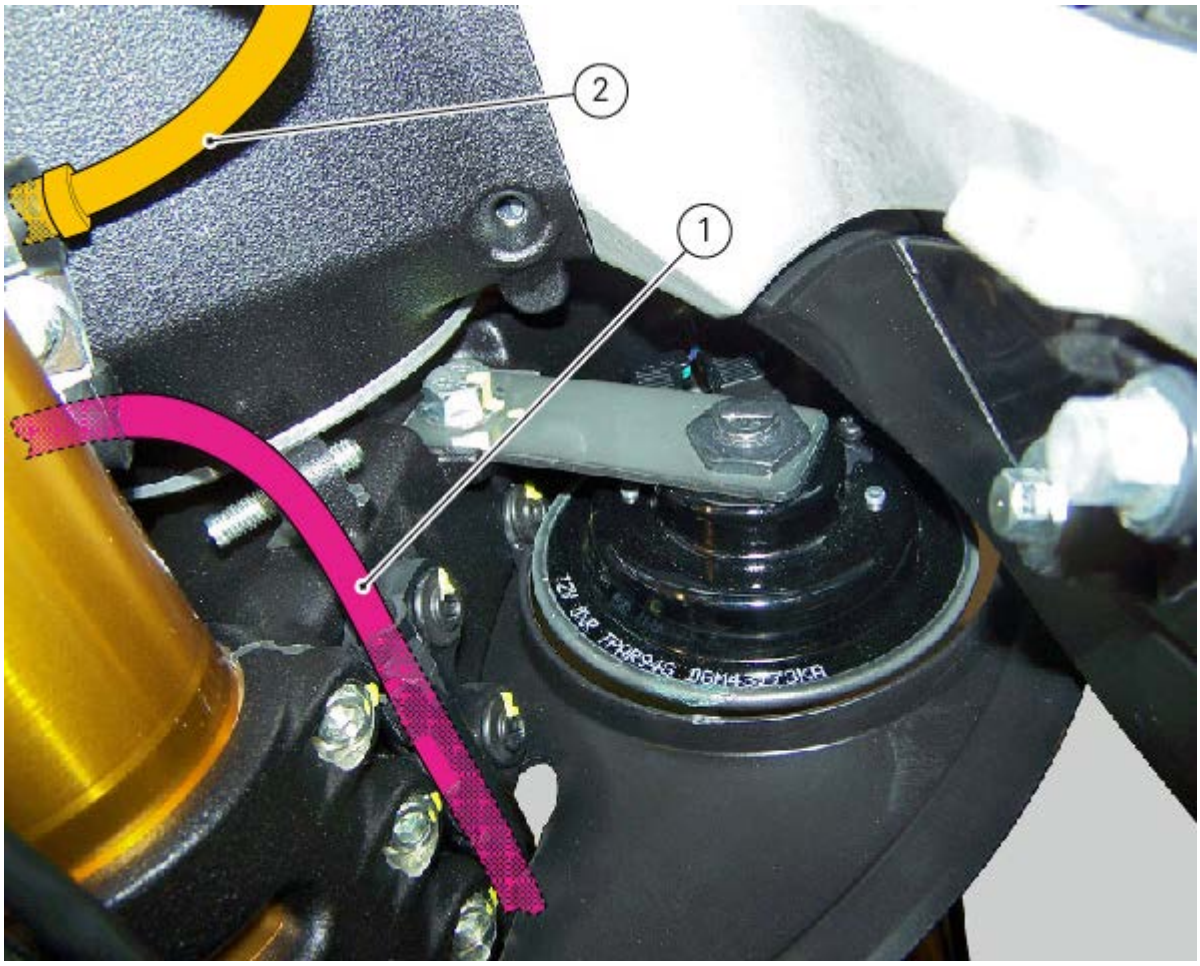


Table B


2
1
ZDM-F26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1

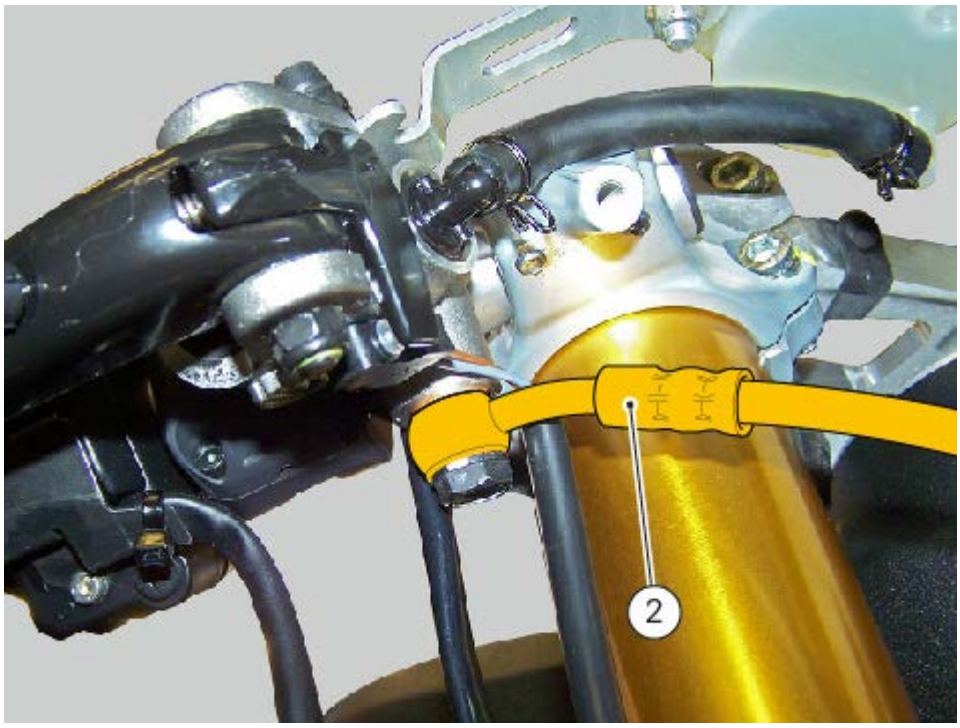
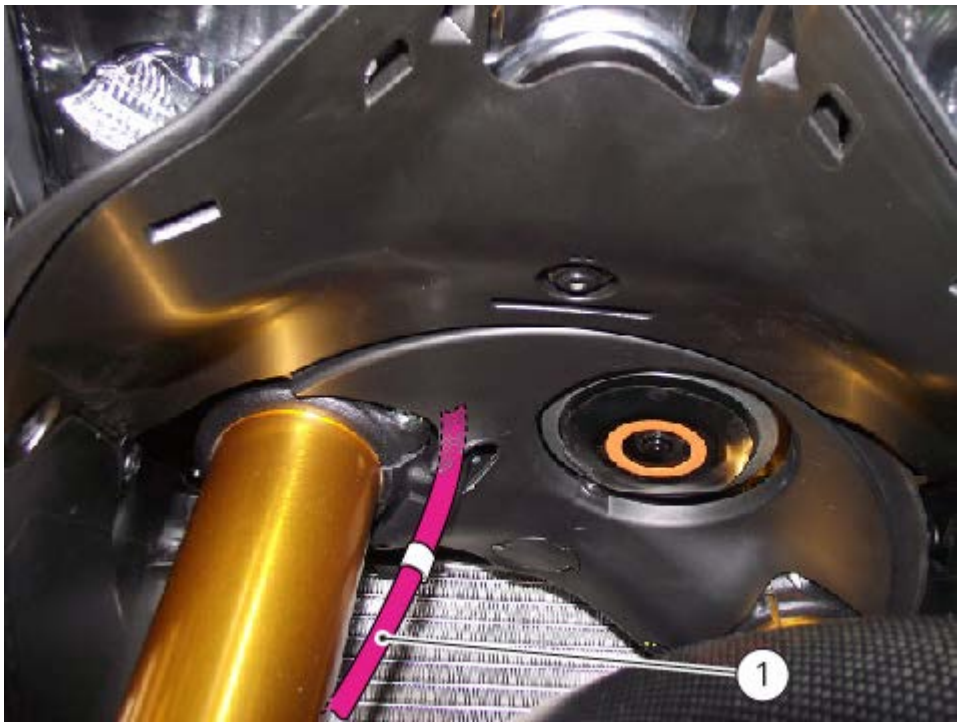
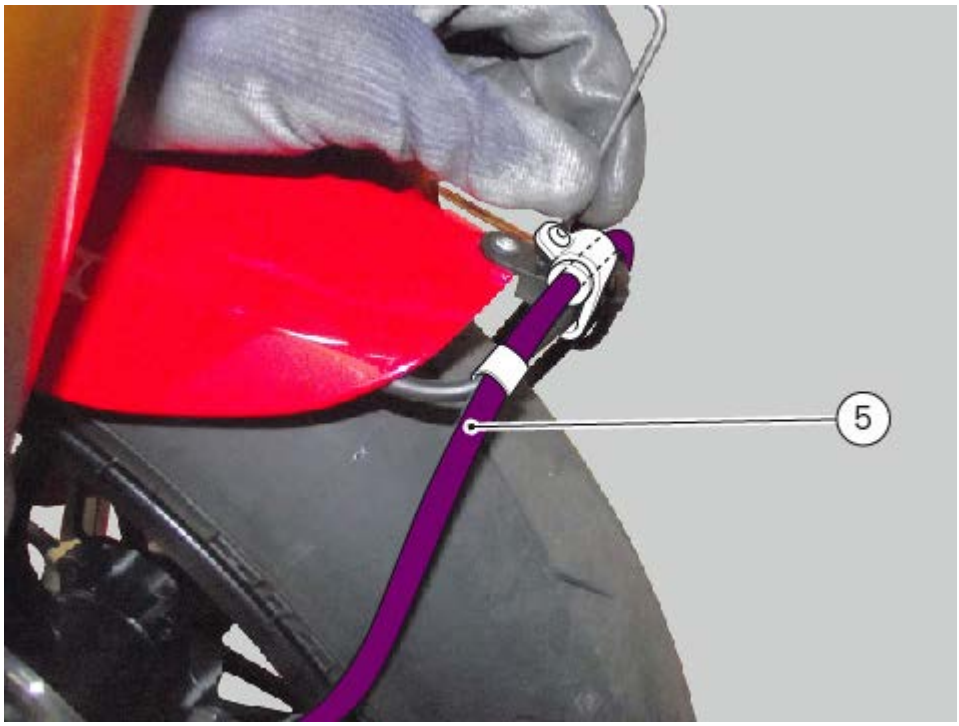


Table C


1


5
1



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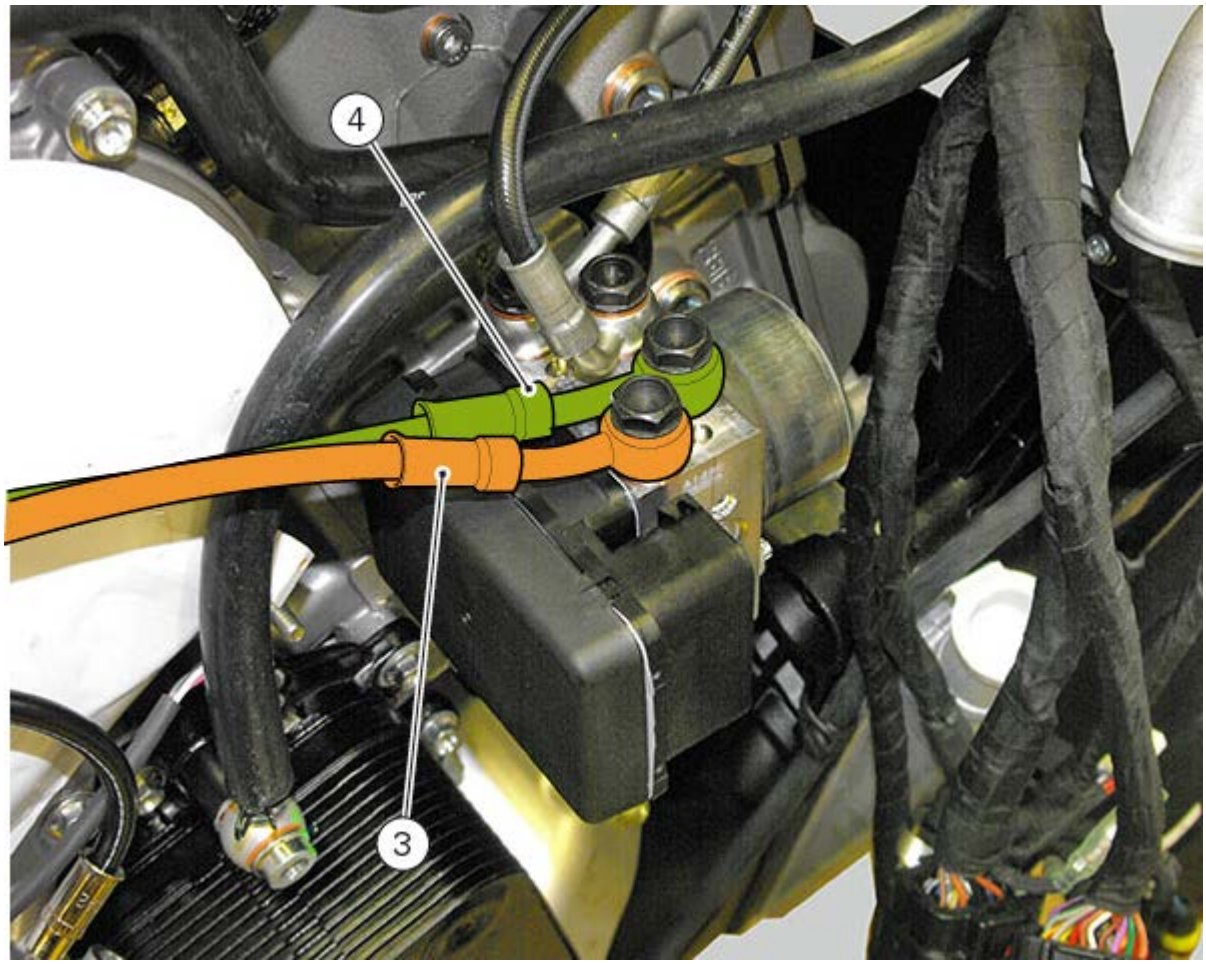

4
3


3
4

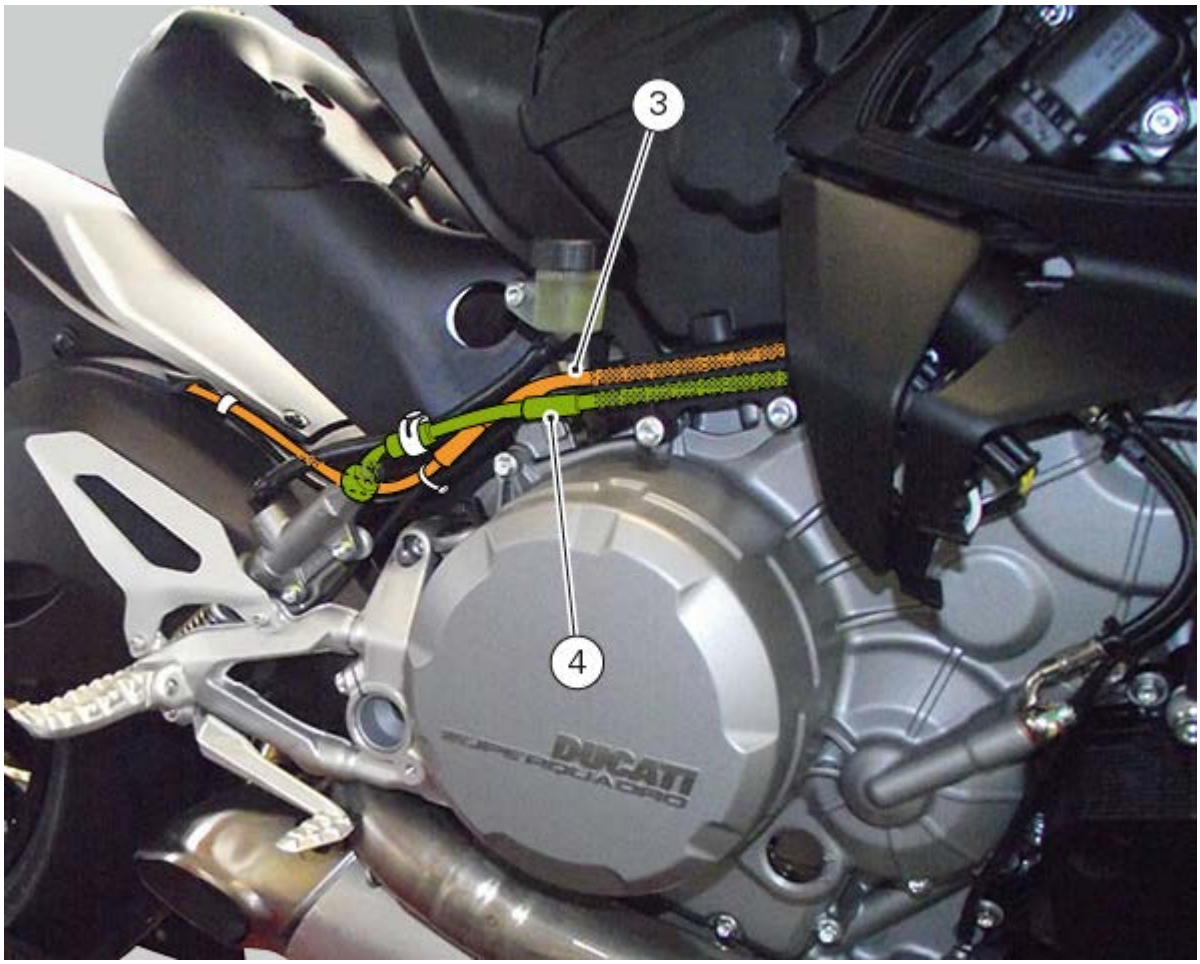
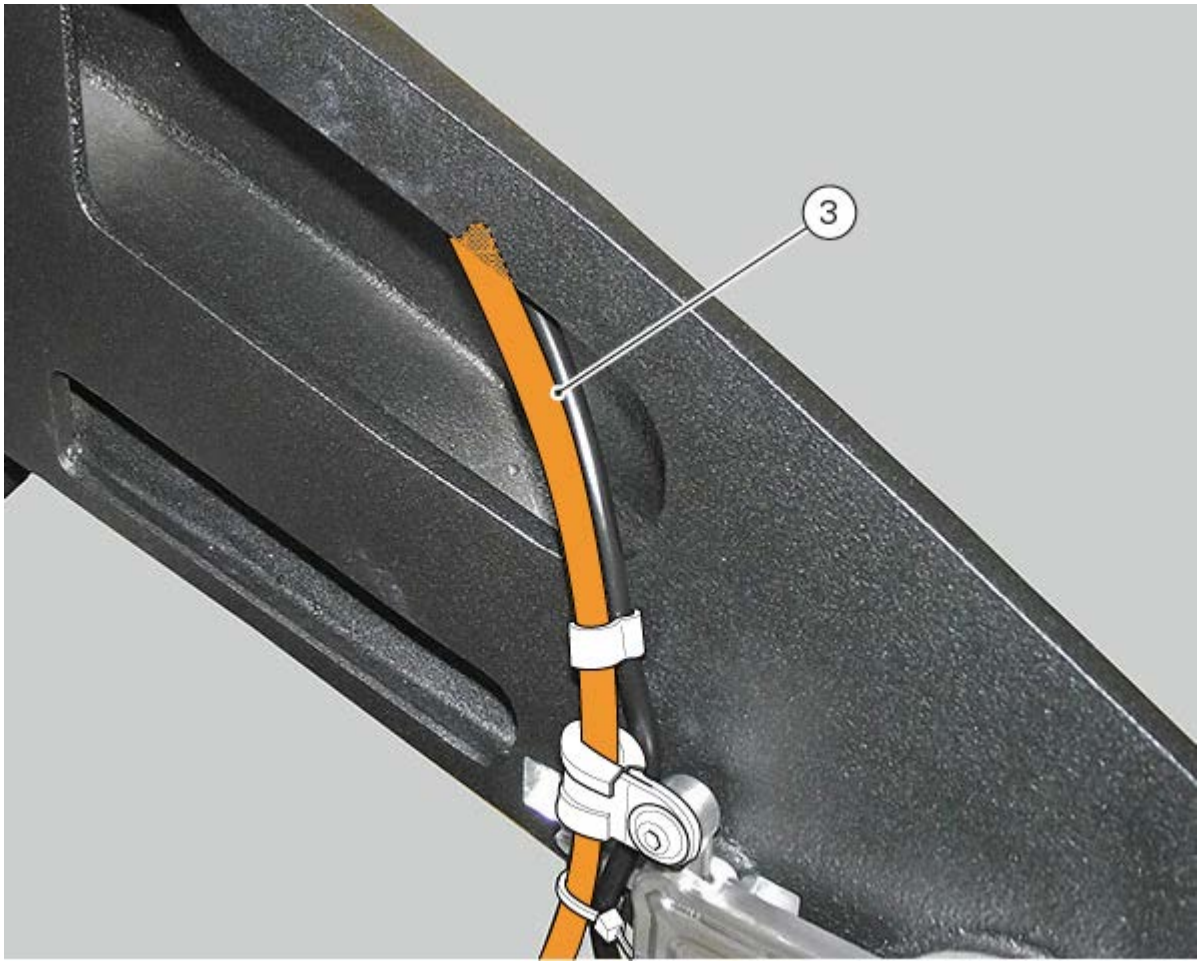


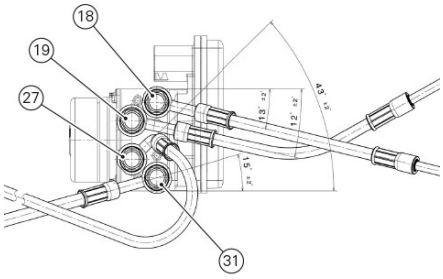
Table E

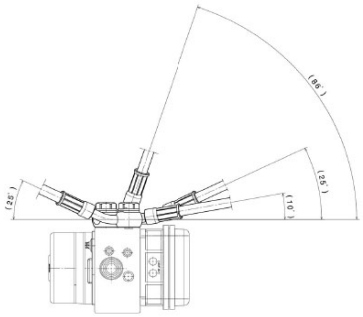


Refitting the ABS control unit

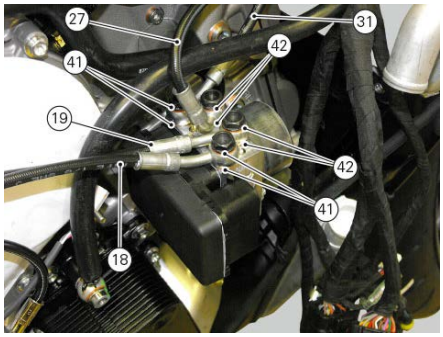
In case of replacement or removal of the brake hoses (18), (19), (27) and (31) on the ABS control unit, it is necessary to pay special attention to the union position on the control unit.

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

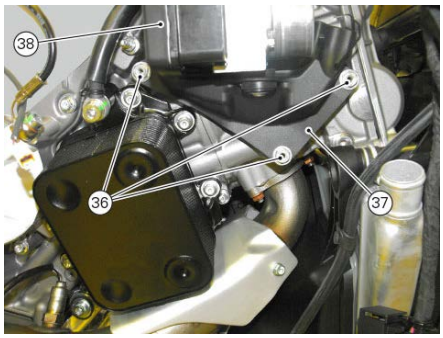




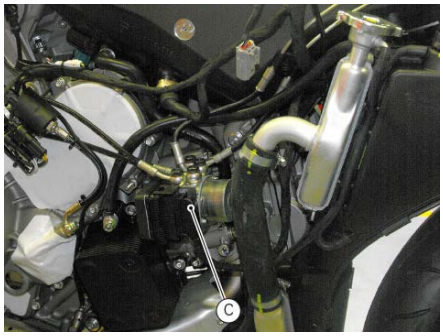
Hoses (18), (19), (27) and (31) must be secured by fitting some new washers (41) between unions.
Tighten screws (39) and (40) securing the hoses indicated below to the ABS control unit to a torque of 23 Nm ± 10%:
ABS control unit hose to rear brake calliper (18);
ABS control unit hose to rear brake master cylinder (19);
ABS control unit hose to front brake master cylinder (27);
ABS control unit hose to front brake calliper (31).



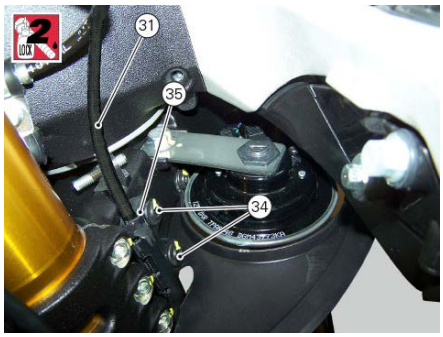
Place support (37) of ABS control unit (38) on the horizontal head.
Tighten screws (36) retaining support (37) to a torque of 10 Nm ± 10%.



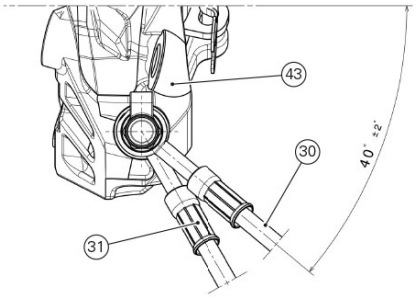
Connect wiring (C) to the ABS control unit.



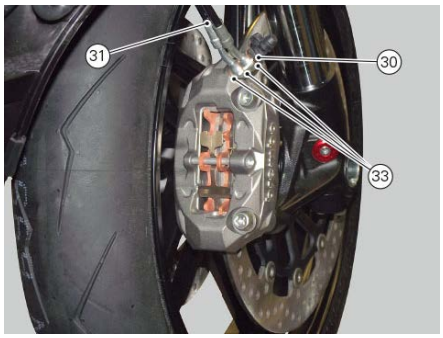
Insert hose (31) in cable ring (35). Apply the recommended threadlocker to the screws (34). Tighten screws (34) to a torque of ± 5 Nm 10%.



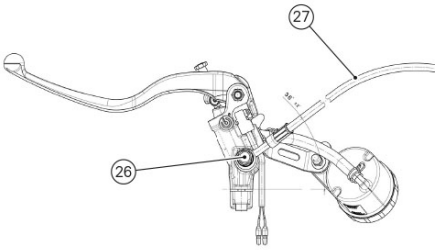
Fit always new washers (33).
Position the front brake calliper - ABS control unit hose (31) and the RH - LH calliper hose (43) on the calliper respecting the values indicated in the figure. Start screw (30).



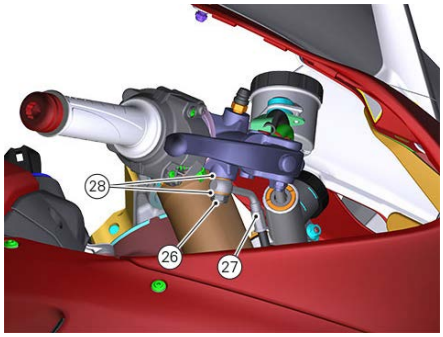
Tighten the special screw (30) that retains ABS control unit - front brake calliper hose (31) to the brake calliper to a torque of 23 Nm ± 10%.

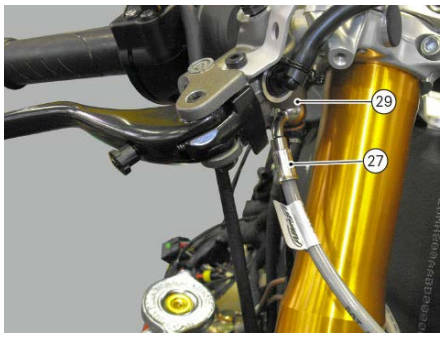


Fit always new washers (28).
Position the ABS control unit - front brake master cylinder hose (27) on the master cylinder respecting the values indicated in the figure. Start screw (26).

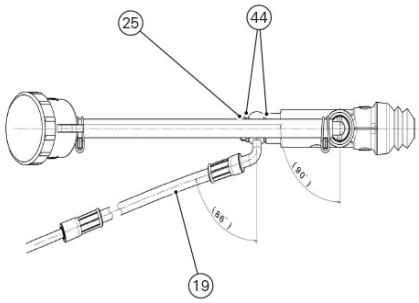


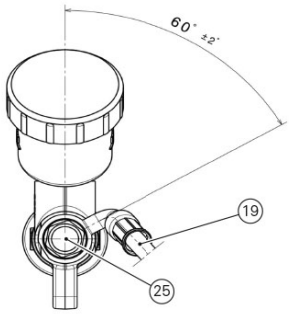
Tighten the special screw (26) that retains ABS control unit - front brake master cylinder hose (27) to the brake master cylinder (29) to a torque of 23 Nm ± 10%.





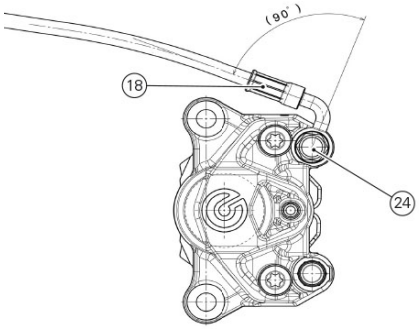
Fit always new washers (44).
Position the ABS control unit hose - rear brake master cylinder hose (19) on the rear brake master cylinder, respecting the indicated values. Start screw (25).

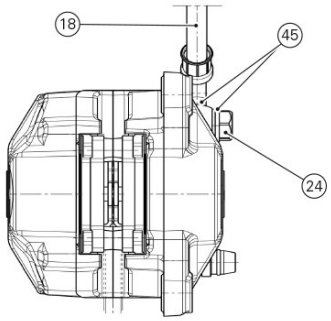




Tighten the special screw (25) that retains ABS control unit hose - rear brake master cylinder hose (19) to the master cylinder to a torque of 23 Nm ± 10%.

Fit always new washers (45).
Position the ABS control unit hose- rear brake calliper hose (18) on the rear brake calliper. Start screw (24).



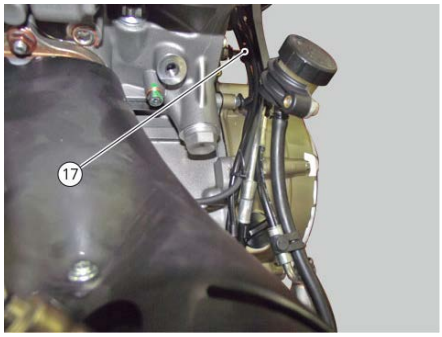


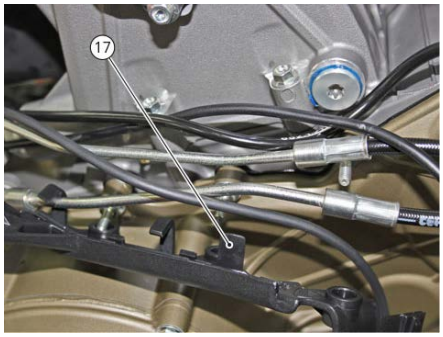
Tighten the special screw (1) that retains ABS control unit hose - rear brake calliper hose to the calliper to a torque of 23 Nm ± 10%.

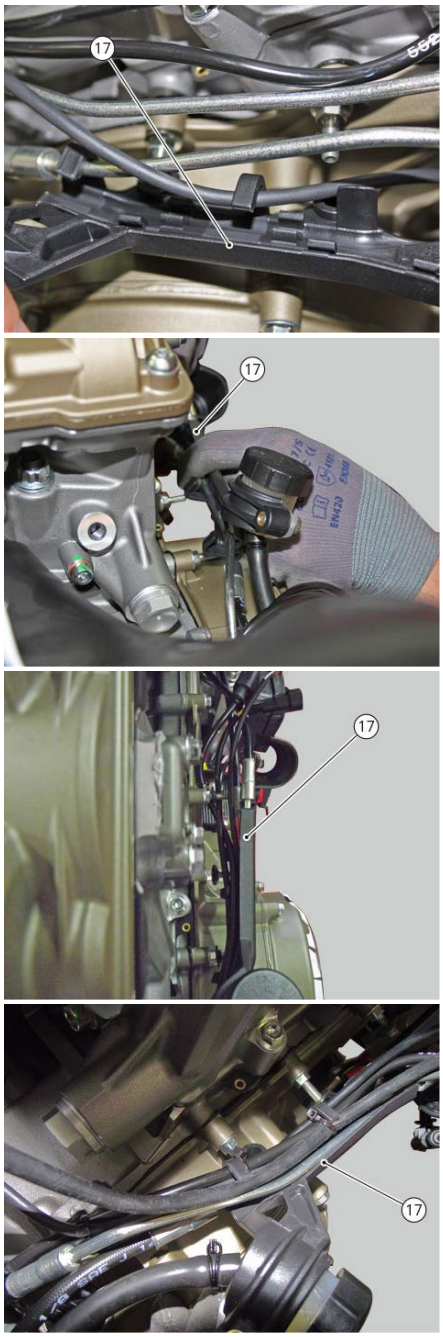
Apply the recommended threadlocker to the screws (20).
Loosen screws (20) securing cable ring (21). Tighten the screws to a torque of 3.5 Nm ± 10%.

Apply the recommended threadlocker to the screw (20).
Start screw (20) that secure cable ring (21). Tighten the screw to a torque of 3.5 Nm ± 10%.

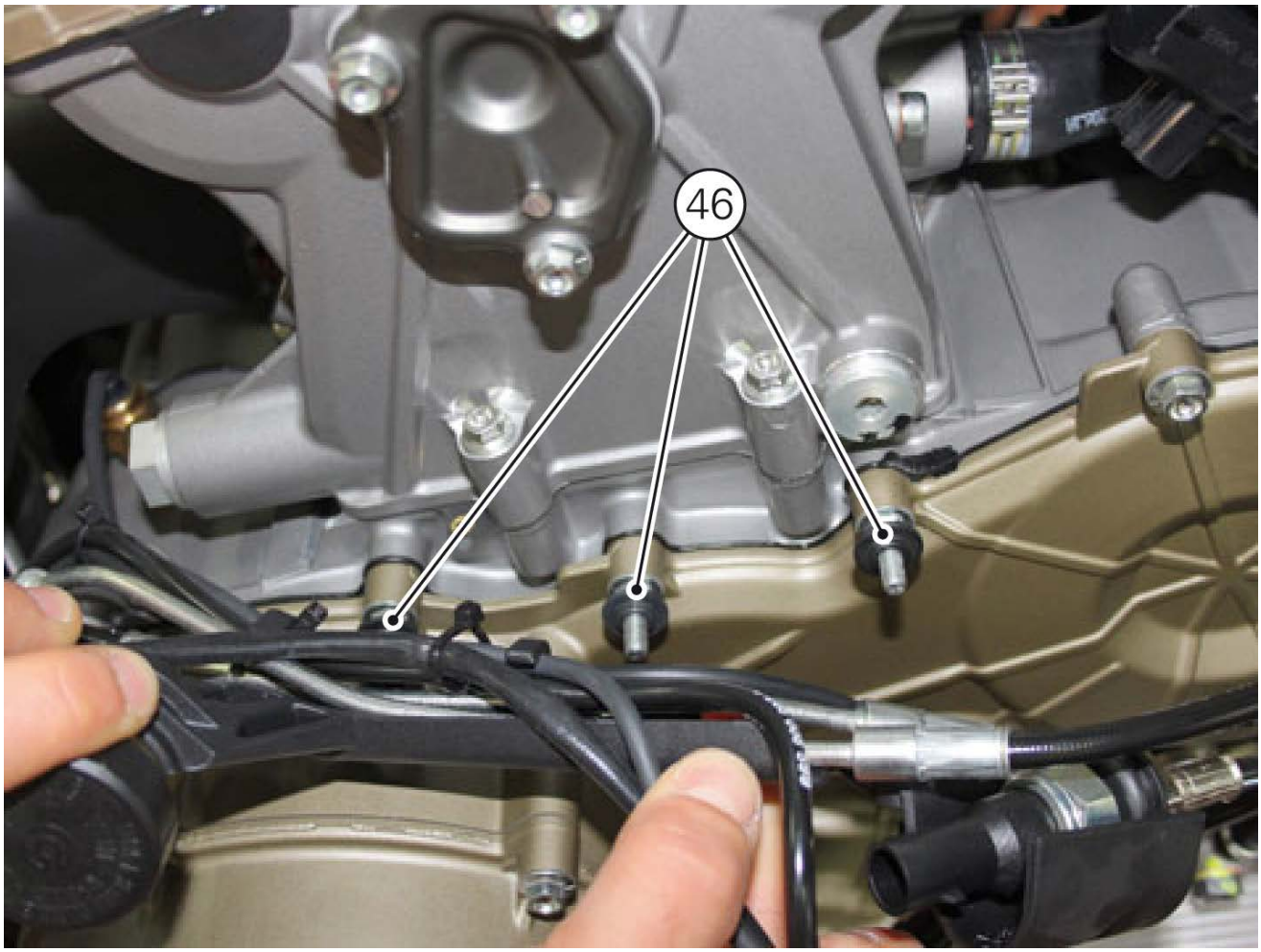
Position the ABS system cables in the relevant seats on support (17).



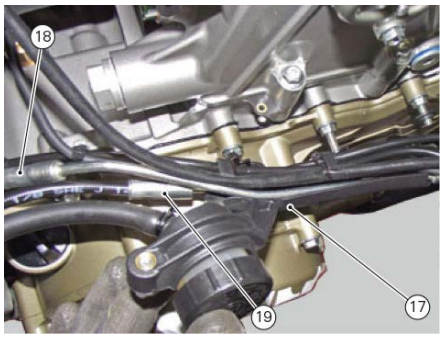




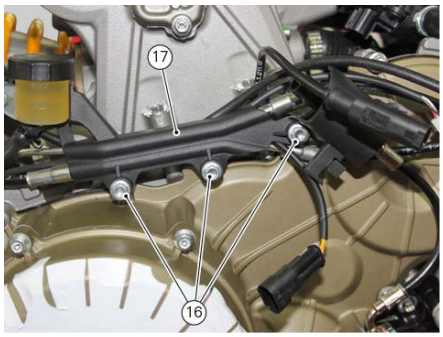
Refit the three seals (46).



Move support (17) near the crankcase with the ABS control unit hose - rear brake calliper hose (18) and ABS control unit hose - rear brake master cylinder hose (19).



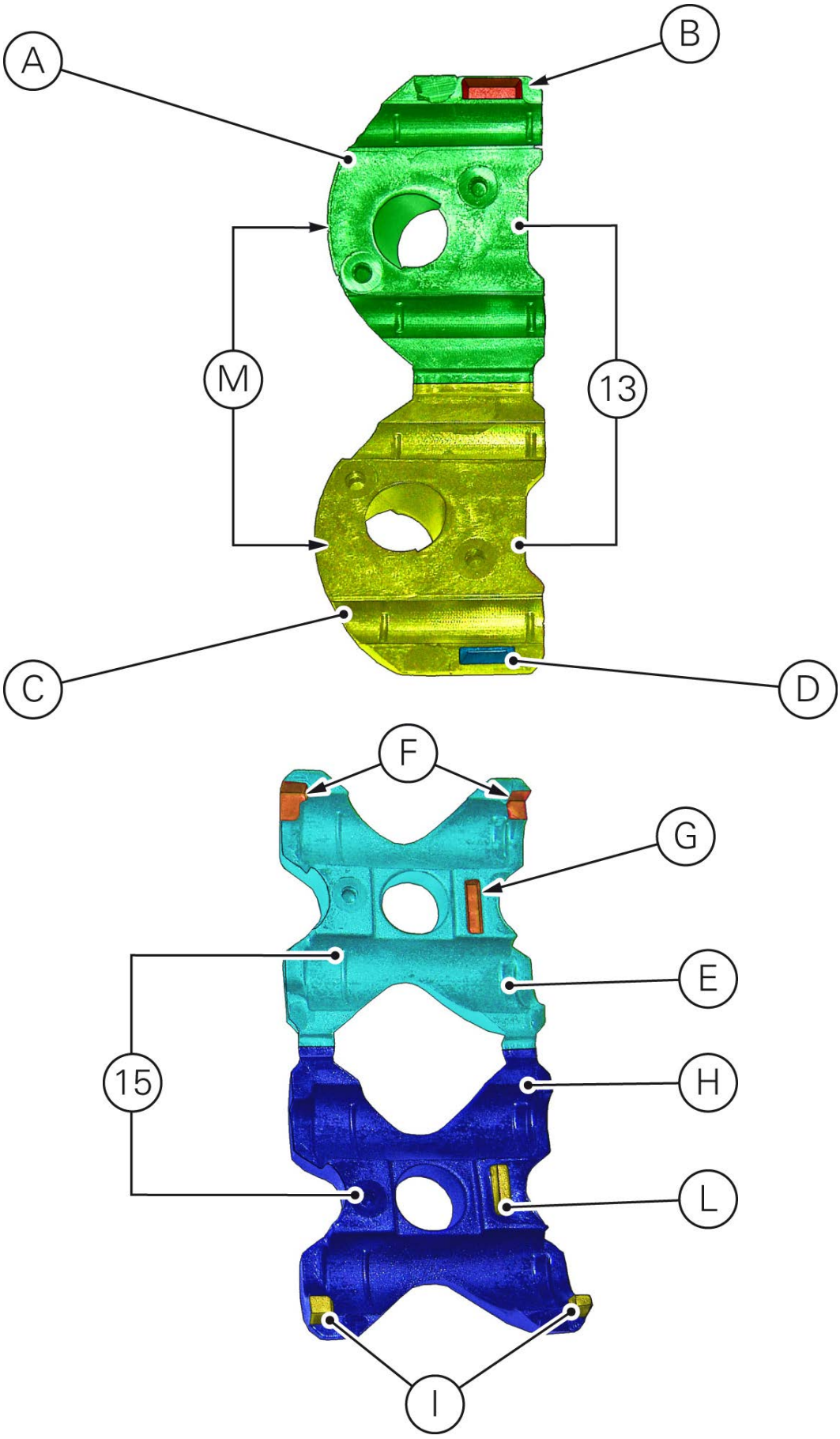
Start the special nuts (16) that secure support (17).
Tighten nuts (16) to a torque of 5 Nm ± 10%.

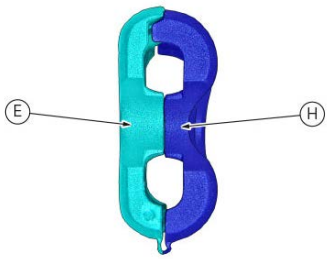


Position the rear ABS hose clip (13) as indicated below:
the rounded side must be facing towards the vehicle rear side;
shell (A) featuring recess (B) must be facing towards the frame, whereas shell (C) featuring tab (D) must be facing outwards (rounded side (M));
shells (A) and (C) junction point must be facing downwards, with fitted hose clip.

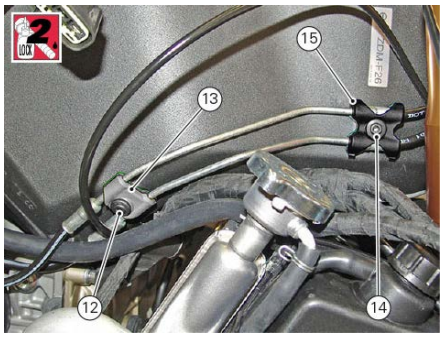
Position the front ABS hose clip (15) as indicated below:
shell (E) featuring recesses (F) and (G) must be facing towards the frame, whereas shell (H) featuring tabs (I) and (L) must be facing outwards;
shells (E) and (H) junction point must be facing downwards, with fitted hose clip.

Note
Shell (E) features an outer "flat" surface, whereas shell (H) features an outer "undulated" surface, as shown.


A
B
M
13
C
D
F
G
15
E
H
L
I

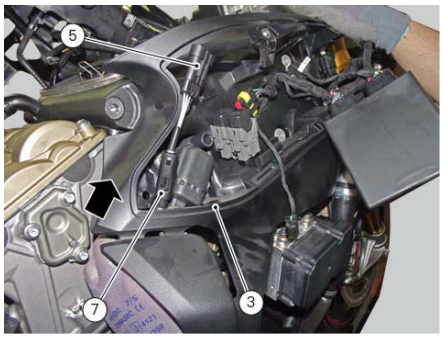


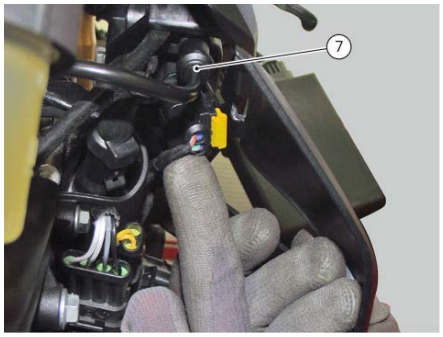
Apply the specified threadlocker to screws (12) and (14).
Start screws (12) and (14) that retain hose clips (13) and (15), respectively.
Tighten the screws to a torque of 5 Nm ± 10%.



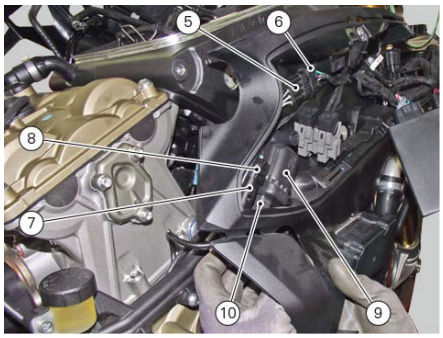
Remove the temporary fastener of support (3) to the RH handlebar (11).
Move support (3) near the frame, paying attention to the connected wiring.

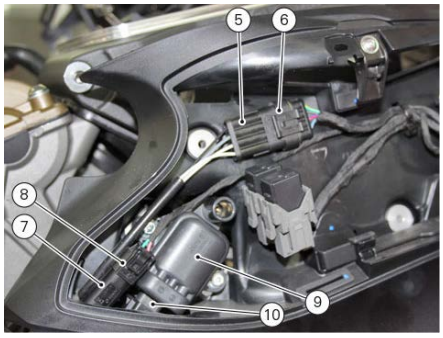
Insert connector pin (7) in the support seat (3).
Insert connector cable (5) in the opening on support (3) from the frame side.



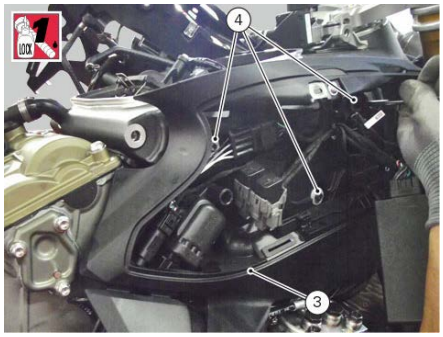


Connect the vertical cylinder coil (9) to the main wiring connector (10).
Connect rear speed sensor connector (7) to connector (8) of the main wiring harness.
Connect vertical lambda sensor connector (5) to connector (6) of the main wiring harness.

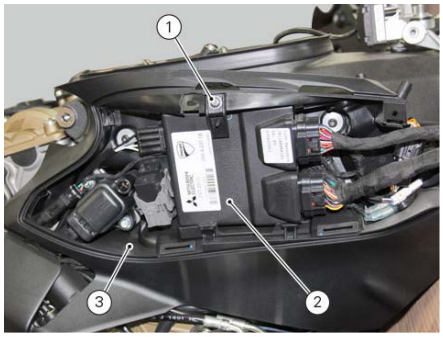




Apply the recommended threadlocker to the screws (4).
Start the three screws (4) securing the RH support (3).
Tighten screws (4) to a torque of 5 Nm ± 10%.



Reposition control unit (2), connected to the wiring, on support (3).
Start screw (1) that retains control unit (2) to the RH support (3) of the electric components.
Tighten the screw (1) to a torque of 3 Nm ± 10%.



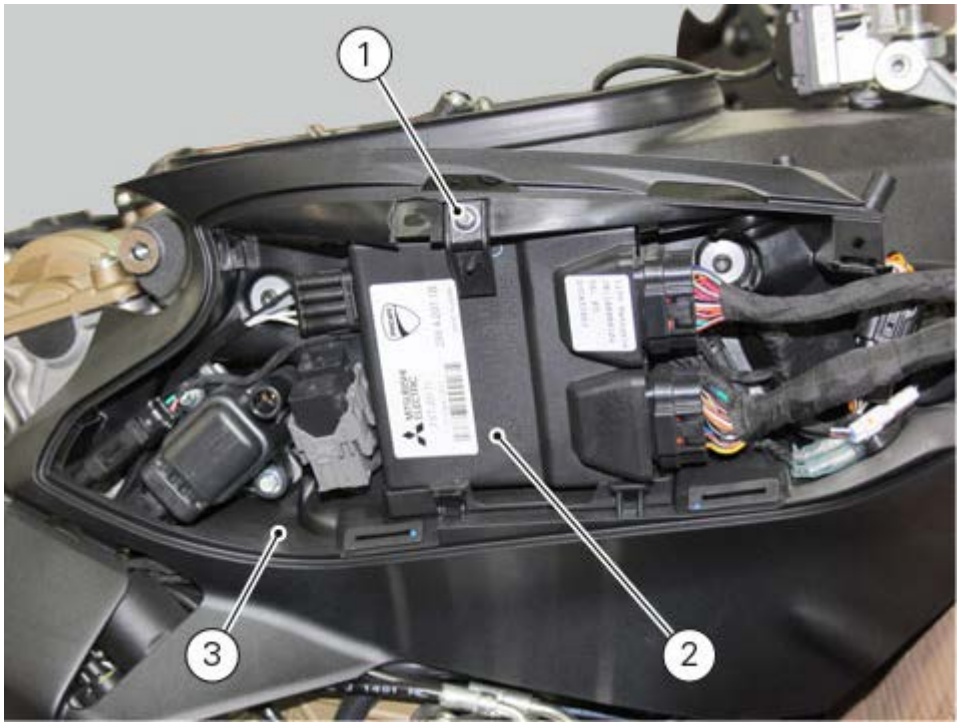
Refit the rear mudguard (Refitting the rear mudguard).
Refit the right-hand fairing (Refitting the side fairings).
Filling the front and rear braking system.
To fill the braking system follow the instructions to replace the master cylinder or calliper fluid connected to hose of the front and rear braking system (Changing the front brake system fluid - Changing the rear brake system fluid).

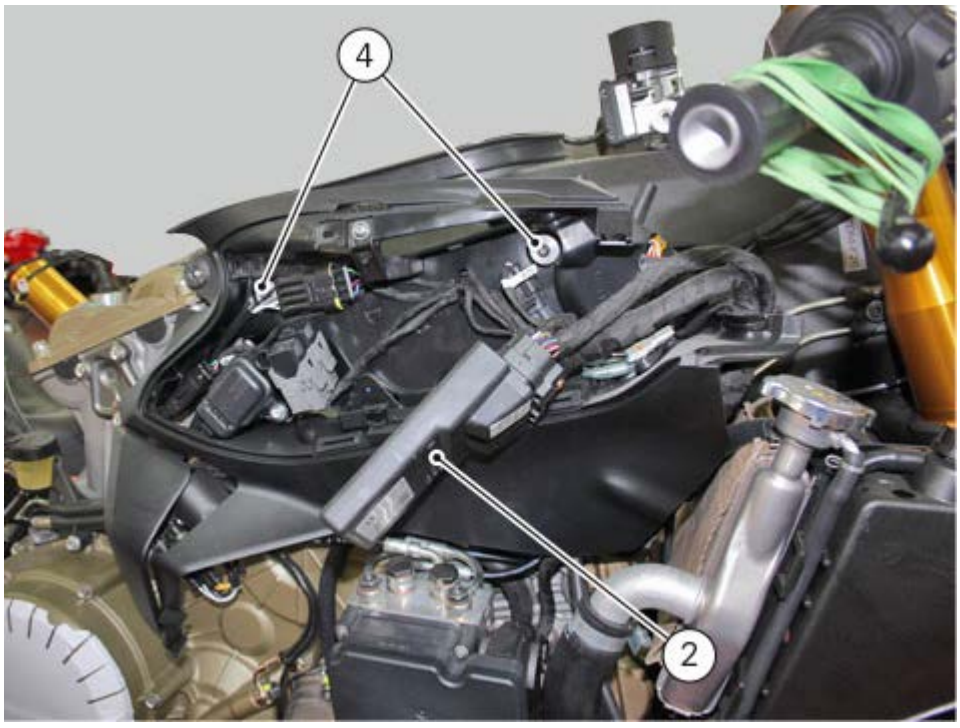
Important
In case of ABS control unit replacement, it is provided with the secondary circuit already full of fluid; the control unit must be fitted and the system filled and drained as a traditional system.

Removing the ABS control unit

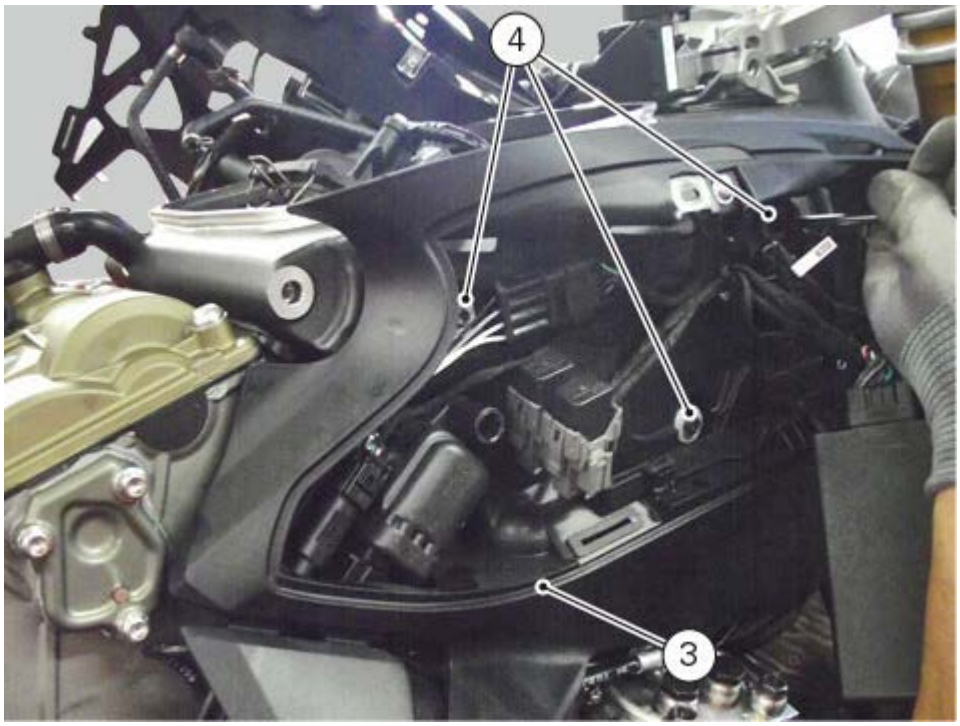
Drain the fluid from the front and rear brake system hoses, (Changing the front brake system fluid) and (Changing the rear brake system fluid).
Remove the right-hand side fairing (Removing the side fairings).
Remove the rear mudguard (Removing the rear mudguard).

Loosen screw (1) that retains control unit (2) to the RH support (3) of the electric components.
Remove control unit (2) from the support without disconnecting its wiring.

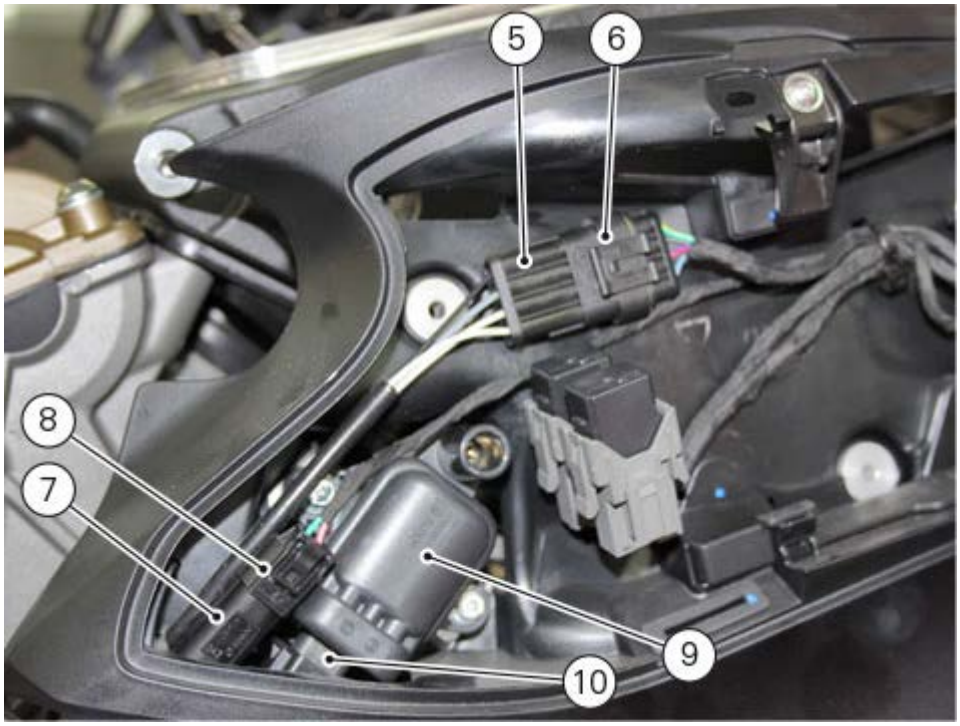




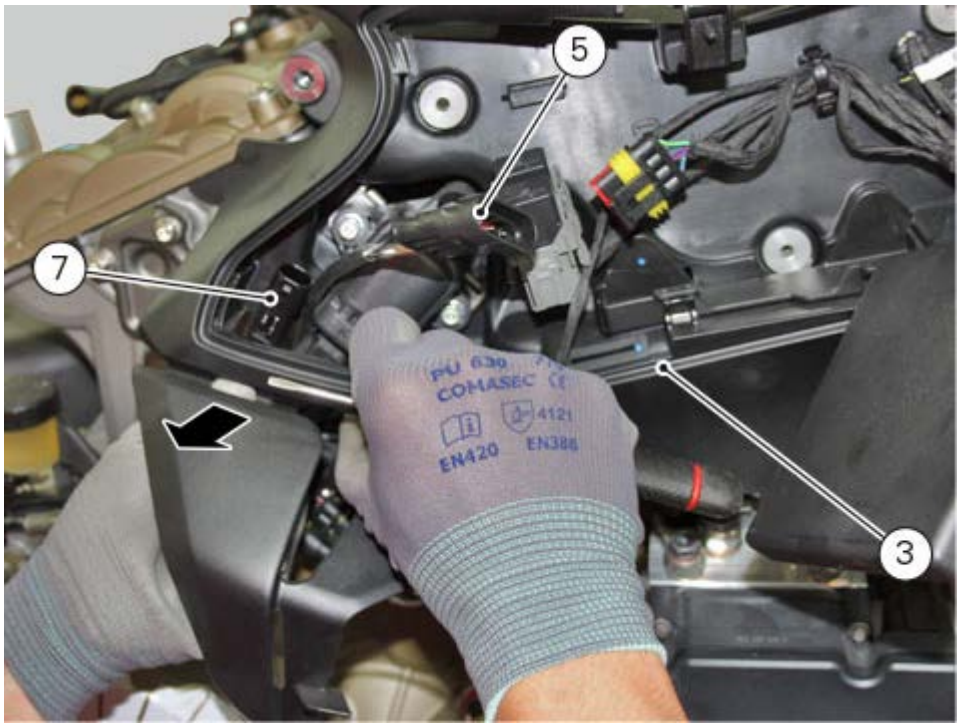
Loosen the three screws (4) securing the RH support (3).



Disconnect vertical lambda sensor connector (5) from connector (6) of the main wiring harness.
Disconnect rear speed sensor connector (7) from connector (8) of the main wiring harness.
Disconnect the vertical cylinder coil (9) from the main wiring connector (10).



Slide connector cable (5) out of the opening on support (3) from the frame side. Remove the connector pin (7) from the support seat.

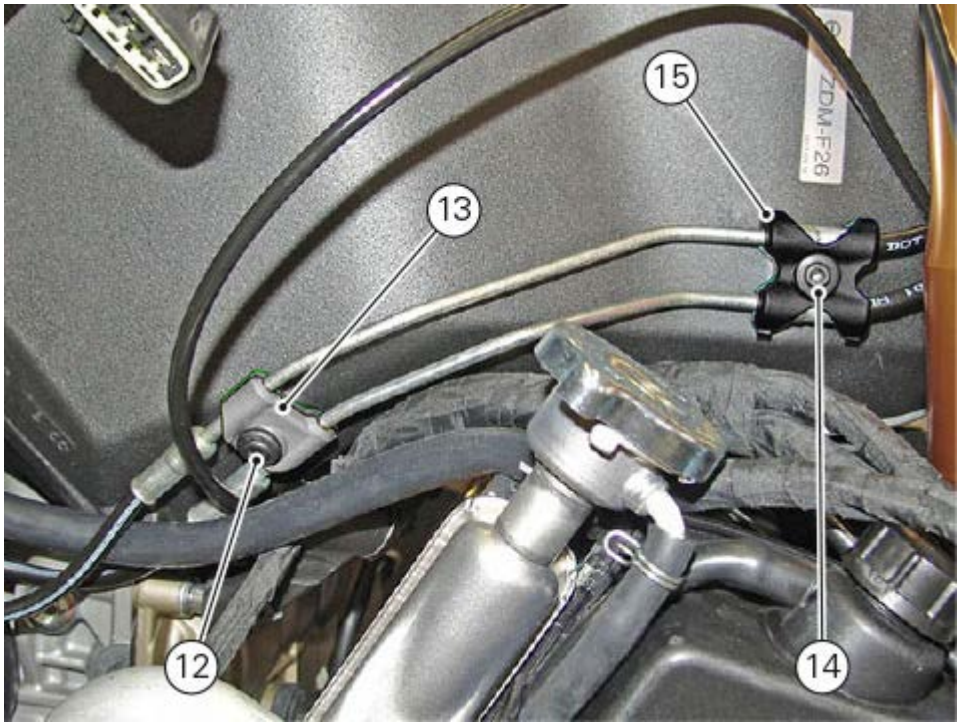


Move support (3) towards the RH handlebar (11) paying attention not to damage the connected wiring. Fix support (3) to the RH handlebar (11).

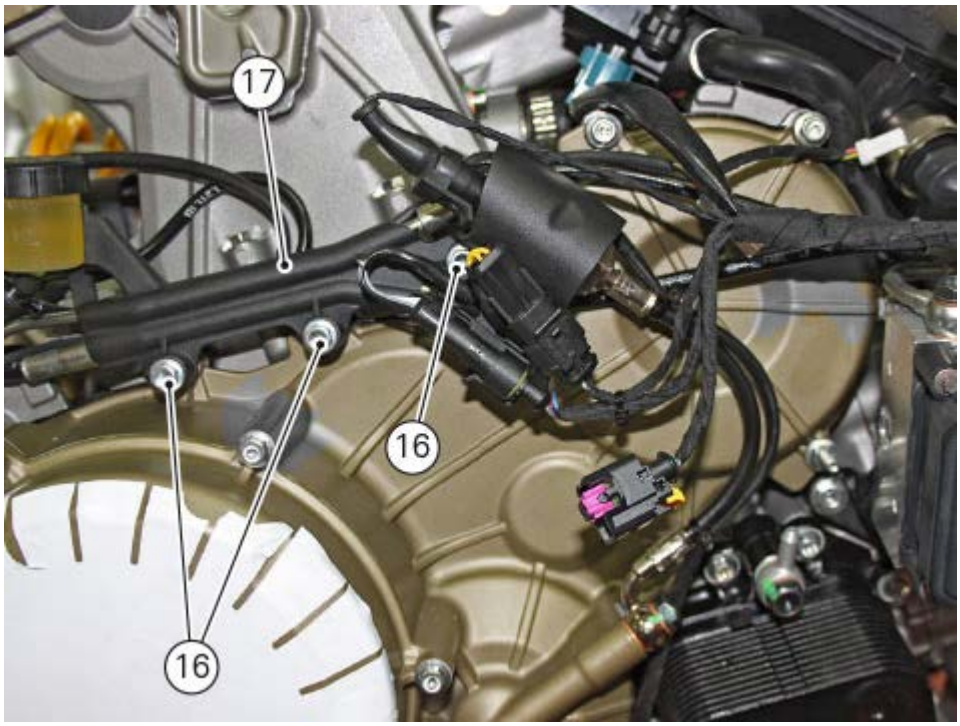
Warning

Place a suitable protection on support (3) to avoid damaging the handlebar.

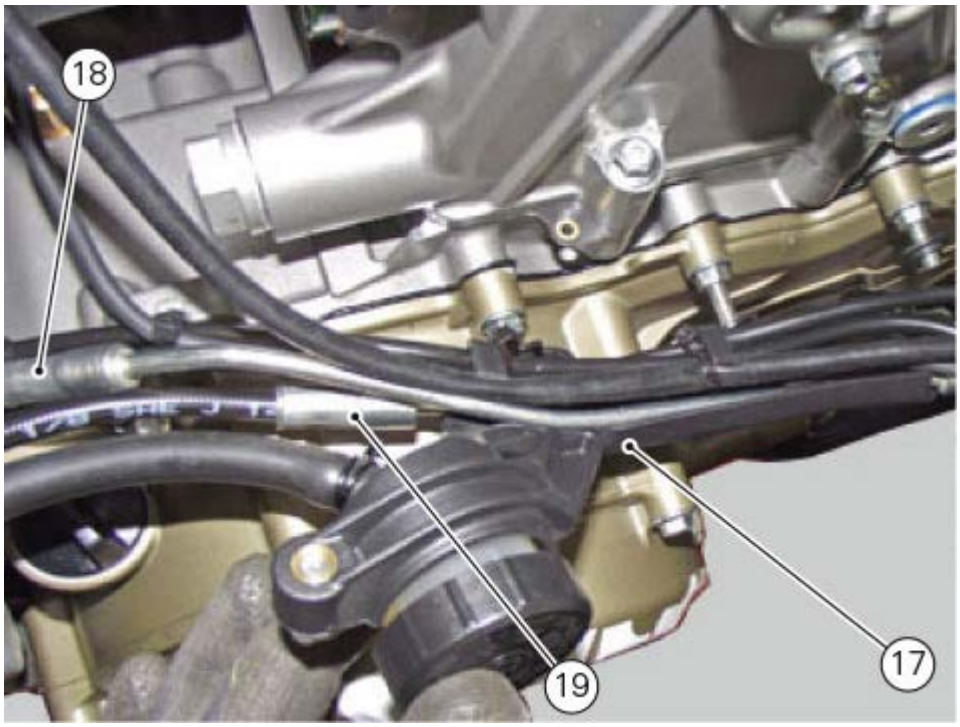
Loosen screw (12) to remove hose clip (13) and loosen screw (14) to remove hose clip (15).



Loosen nuts (16) that secure the cable support (17).



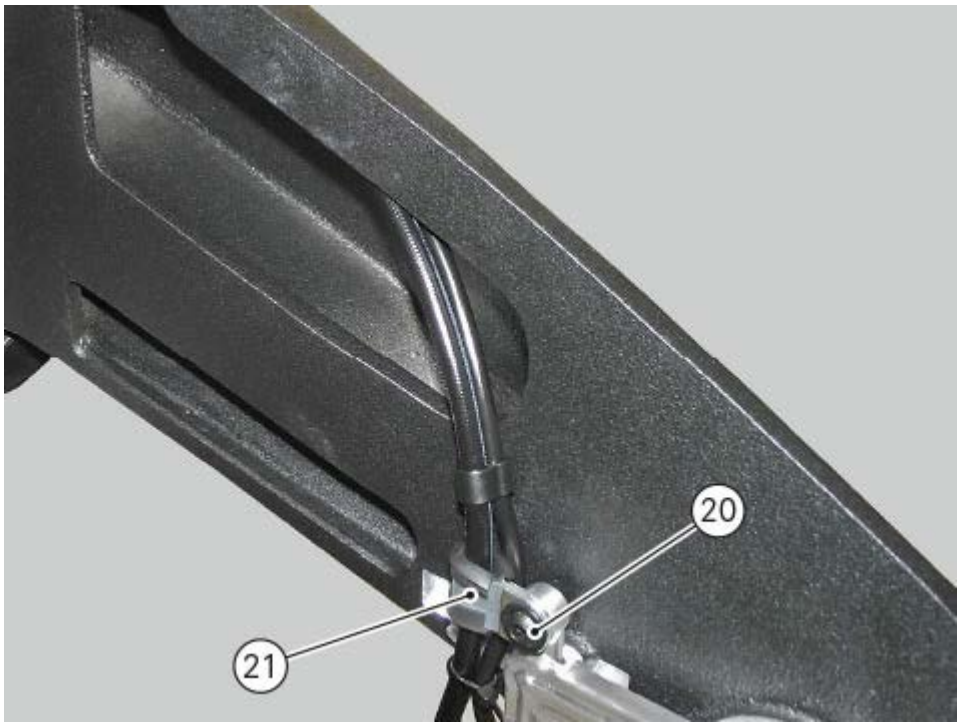
Move support (17) to the outside and free the ABS control unit hose - rear brake calliper (18) and ABS control unit hose - rear brake pump (19) from support (17).



Note

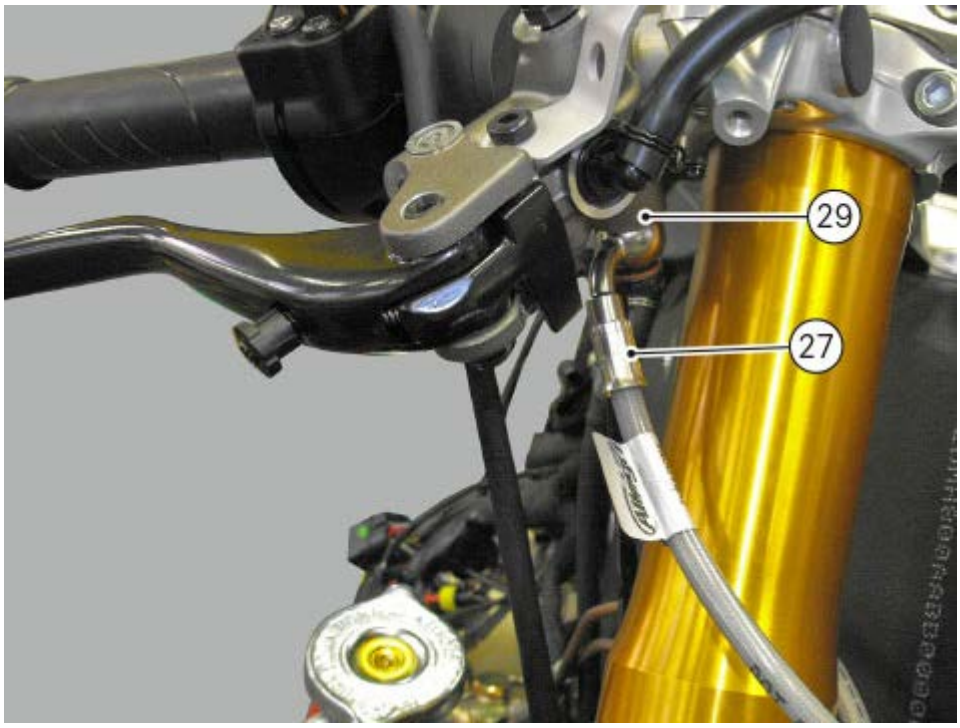
The pictures show the motorcycle without rear wheel. Nevertheless, to perform the operations described below it is not necessary to remove it.

Loosen screw (20) of cable ring (21).

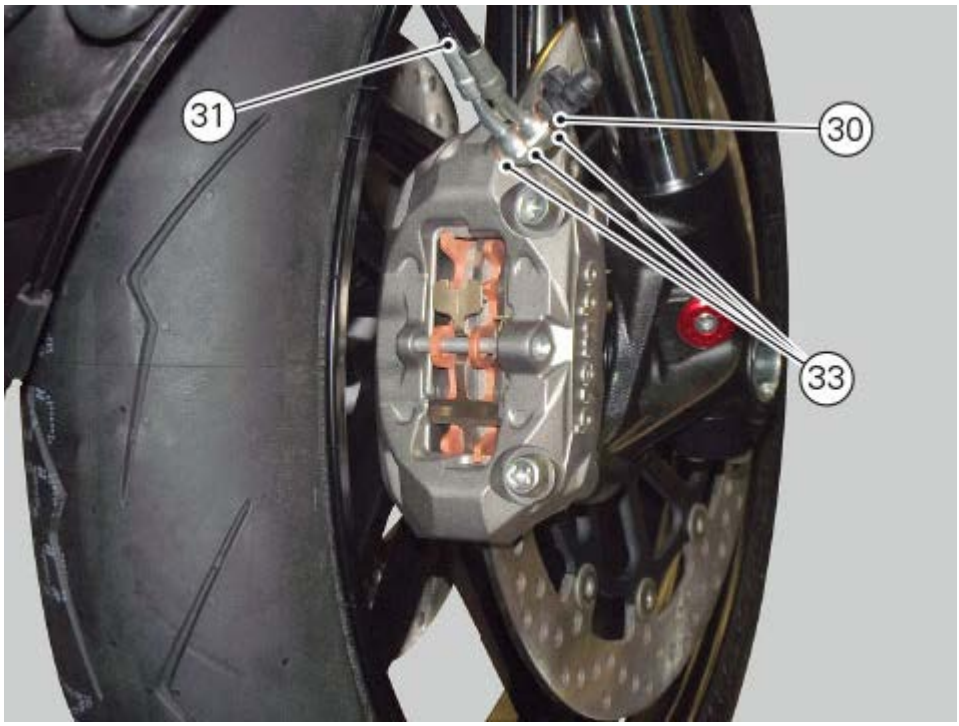


Loosen the special screw (25) that retains ABS control unit hose - rear brake master cylinder (19) to the master cylinder.

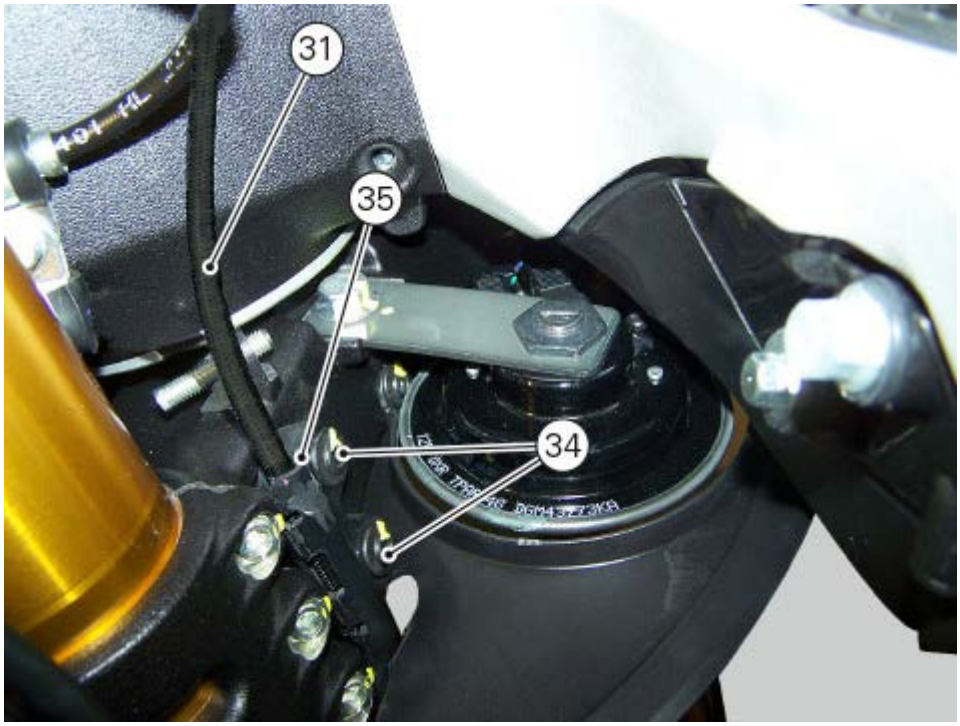
Loosen the special screw (26) that retains ABS control unit (27) - front brake master cylinder to the brake master cylinder (29).
Collect the two washers (28).



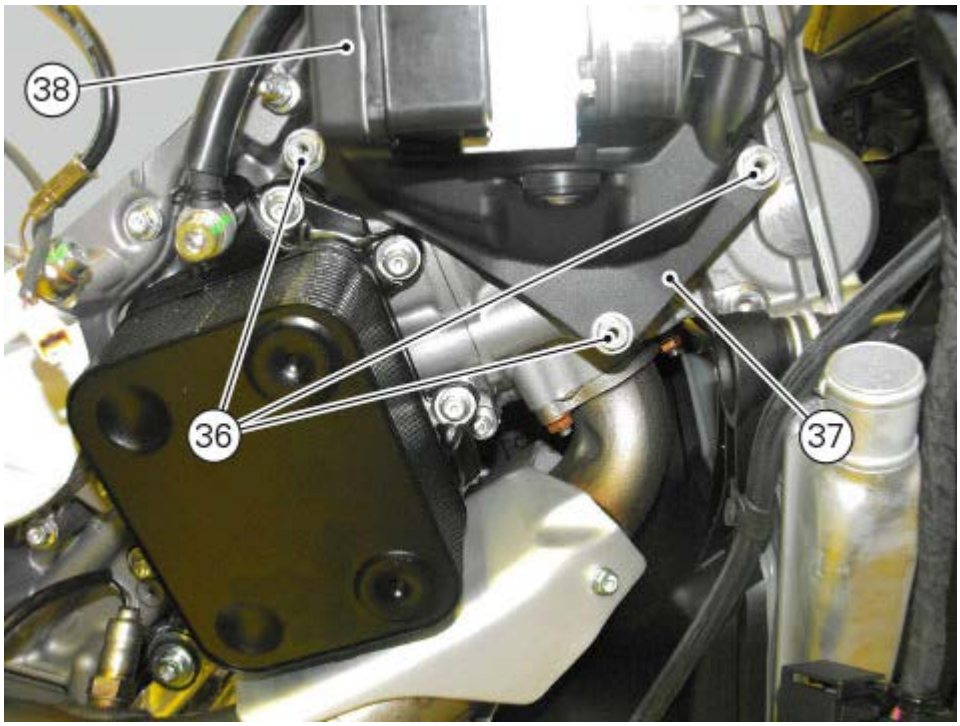
Loosen the special screw (30) that retains ABS control unit (31) - front brake master cylinder to the brake master cylinder (32).
Collect the washers (33).



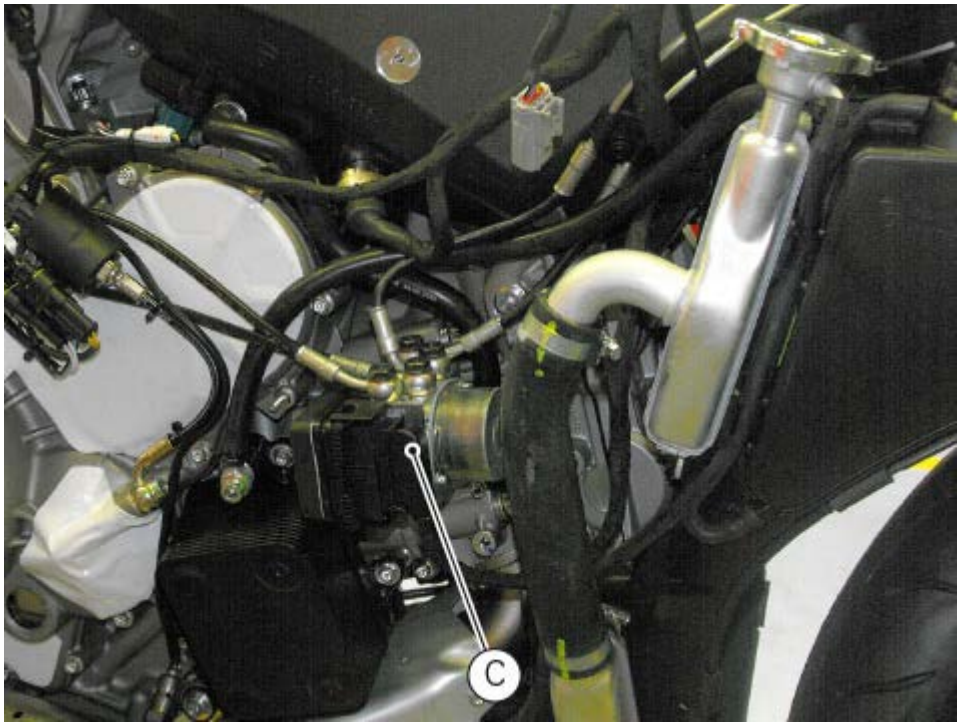
Loosen screws (34) of cable ring (35) of hose (31).



Loosen screws (36) that retain support (37) of the ABS control unit (38) to the horizontal head.



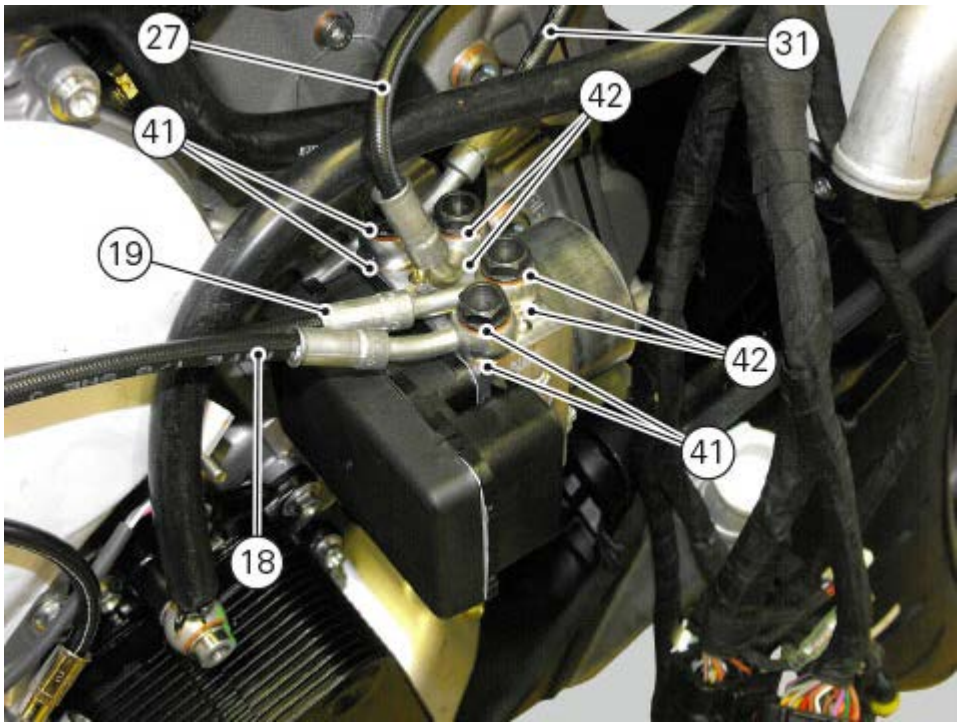
Disconnect wiring (C) from the ABS control unit.



Loosen screws (39) and (40) securing the hoses indicated below to the ABS control unit:
ABS control unit hose to rear brake calliper (18);
ABS control unit hose to rear brake master cylinder (19);
ABS control unit hose to front brake master cylinder (27);
ABS control unit hose to front brake calliper (31).

Collect washers (41) and (42).

Warning
Any time the washers are removed, they must be replaced with new ones.

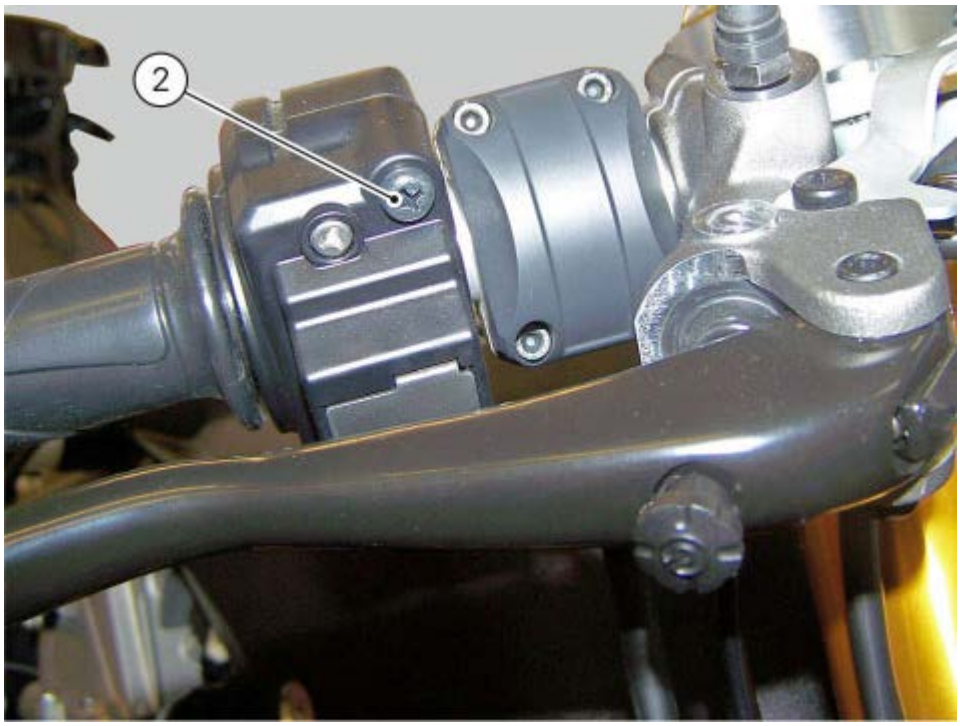


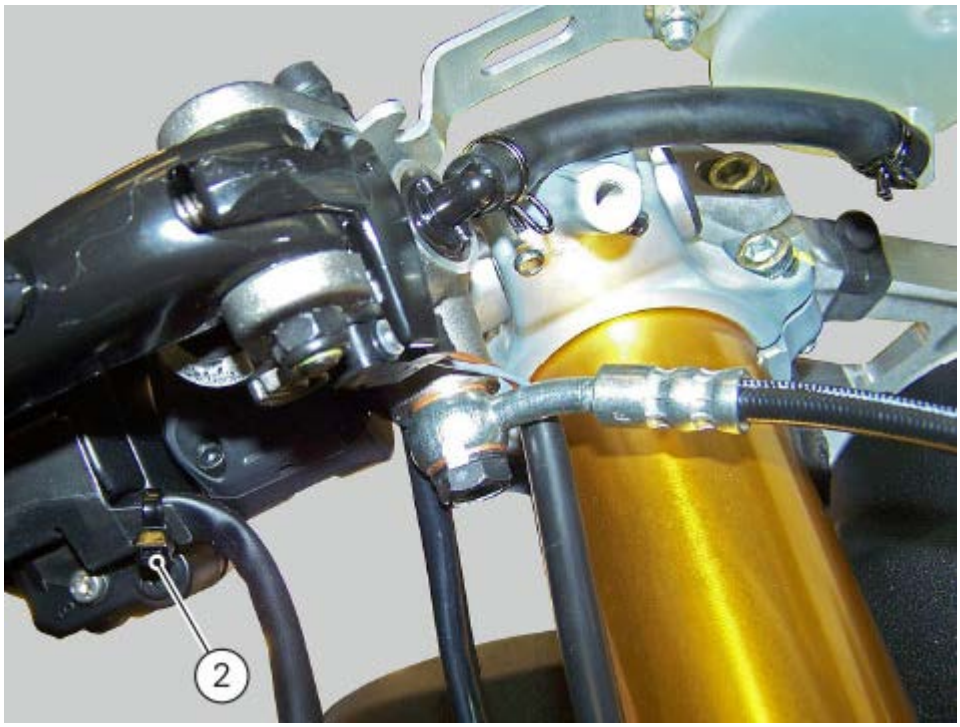
Important

Do not open the ABS control unit: in case of faults, replace it.

Refitting the throttle control

Position the throttle components on the handlebar by inserting the reference pin in the relevant seat.
Assemble the two parts of the throttle control.
Tighten screws (2) to a torque of 1.5 Nm ± 10 %.





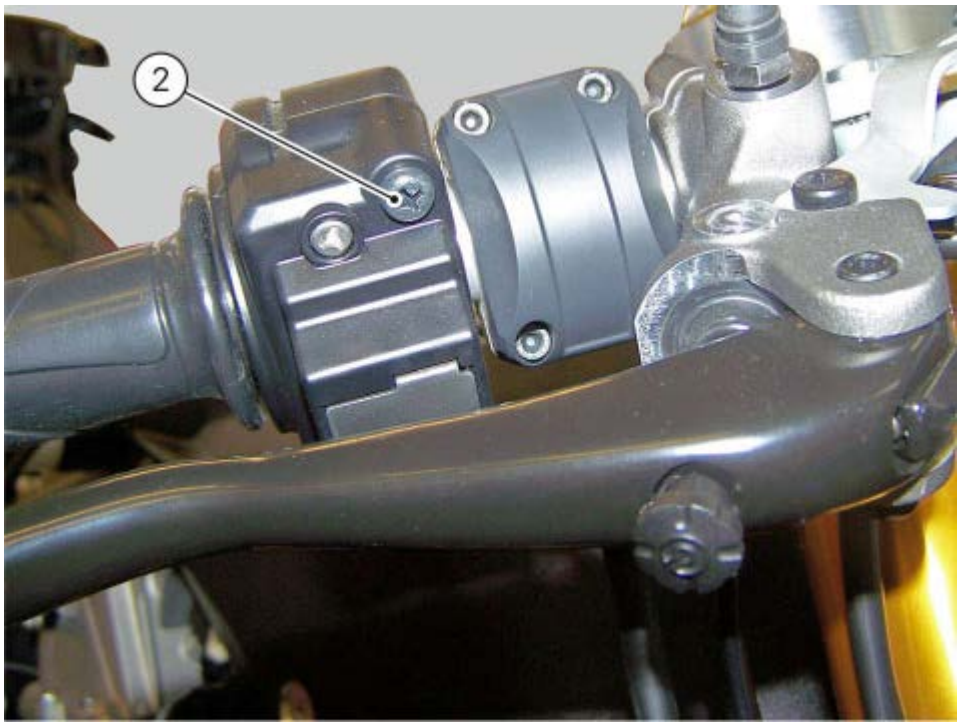
Connect the throttle control cable (1) from the main wiring harness.

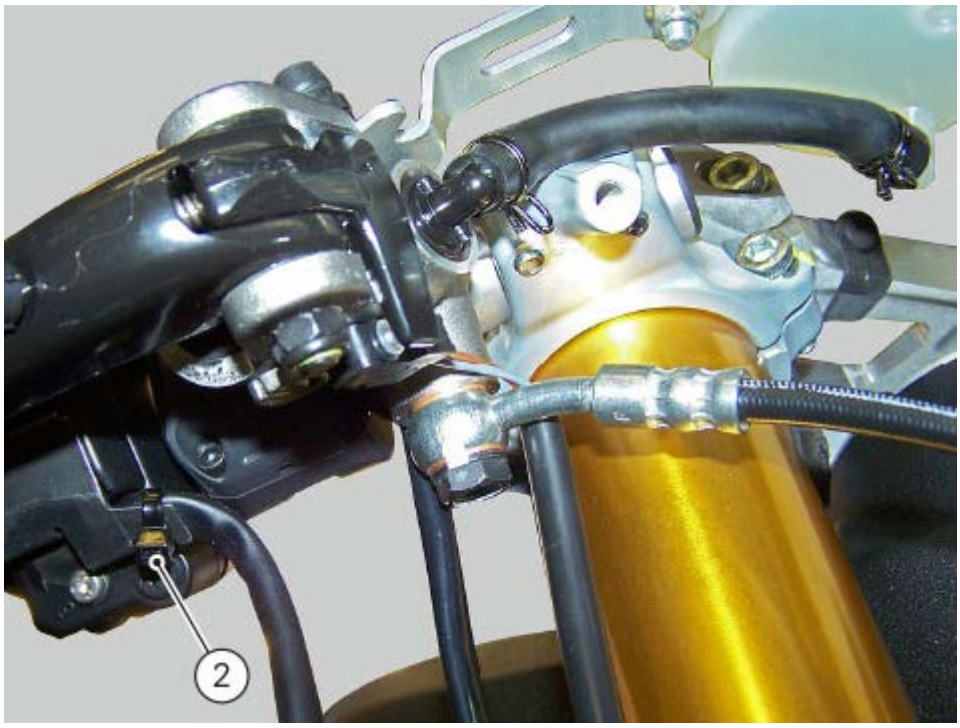
Refit the RH side fairing (Refitting the side fairings).

Removing the throttle control

Remove the RH side fairing (Removing the side fairings).
Disconnect the throttle control cable (1) from the main wiring harness.

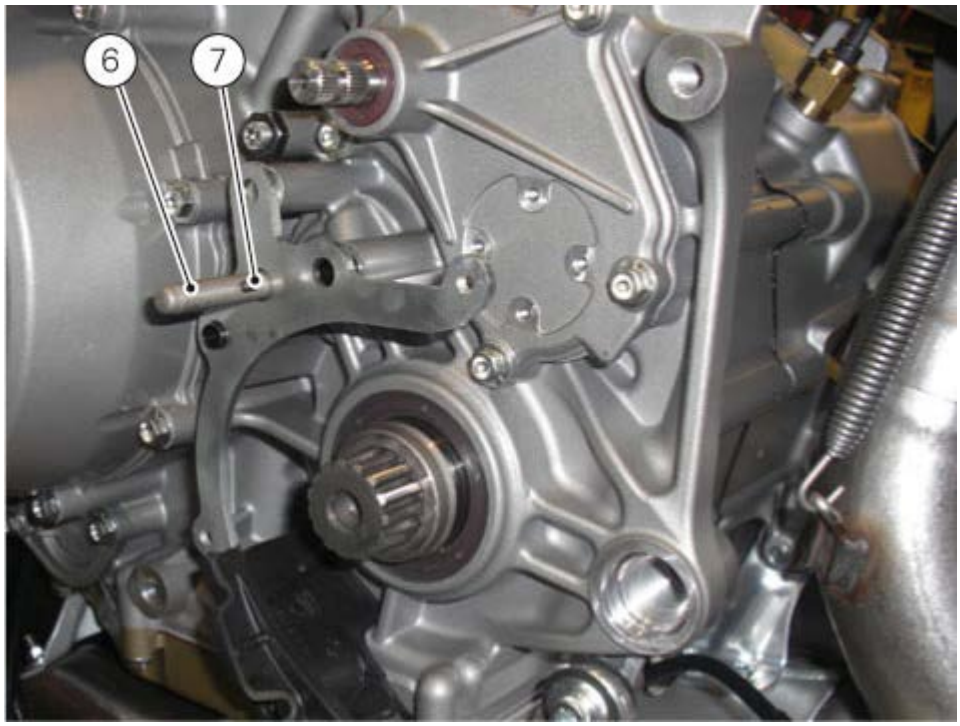
Loosen the screws (2), separate the two parts of the control and slide them out of the handlebar.


2

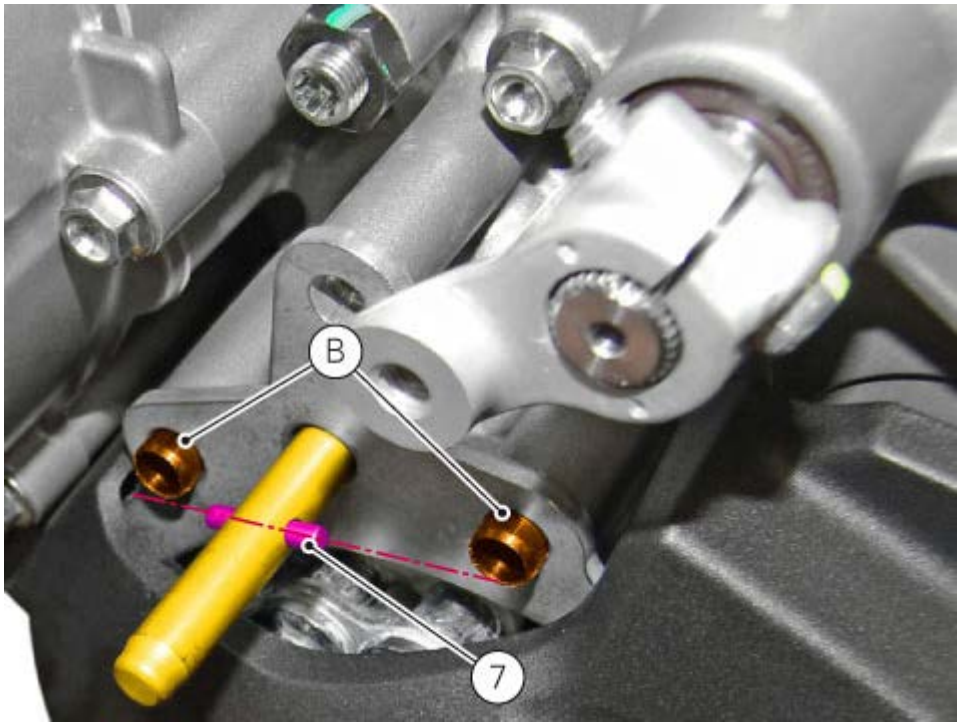

2

Refitting the clutch slave cylinder

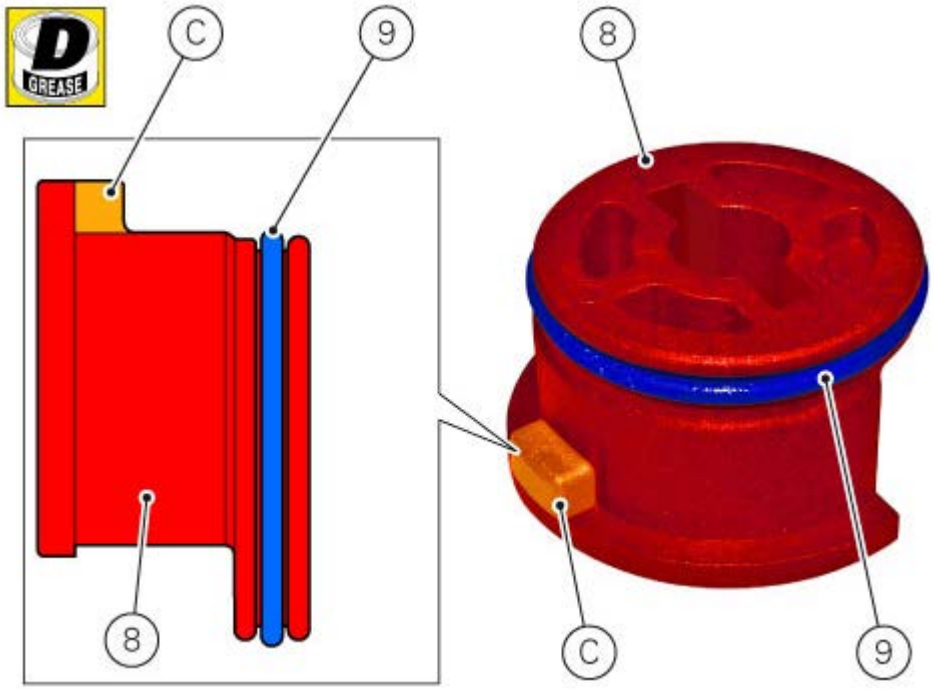
Make sure the anti-rotation pin (7) is fitted on the clutch pushrod (6).

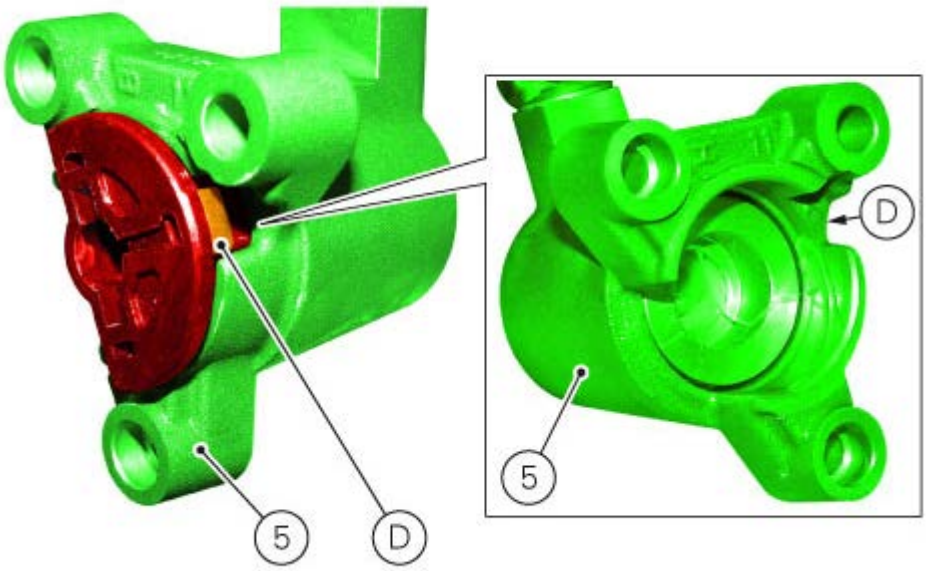


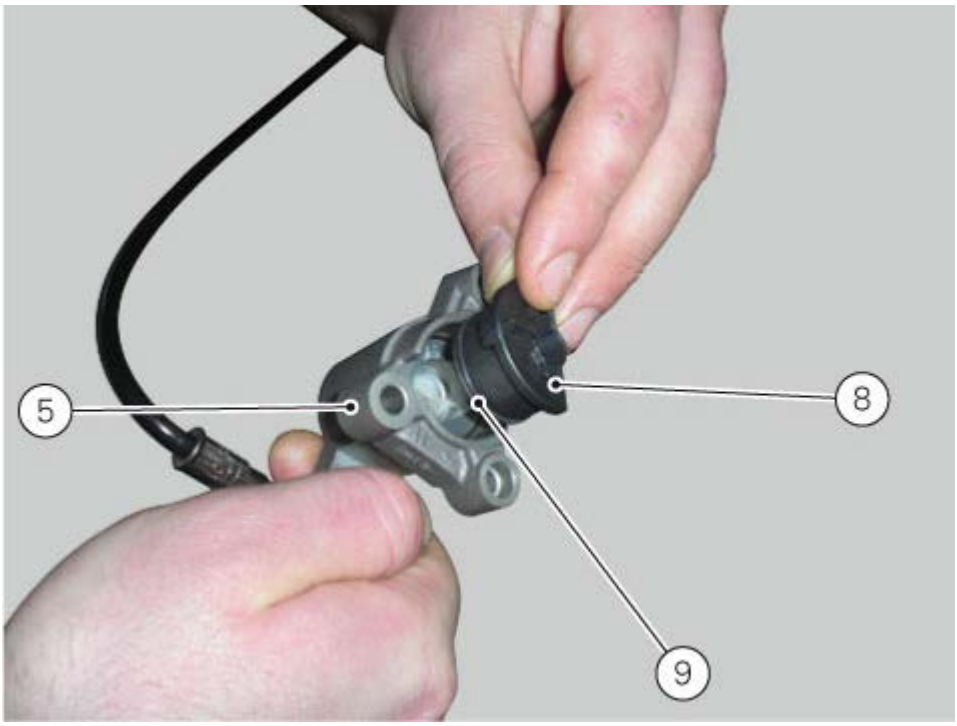
Fit the anti-rotation pin (7) in line with pins (B) on clutch-side casing, as shown in the figure.



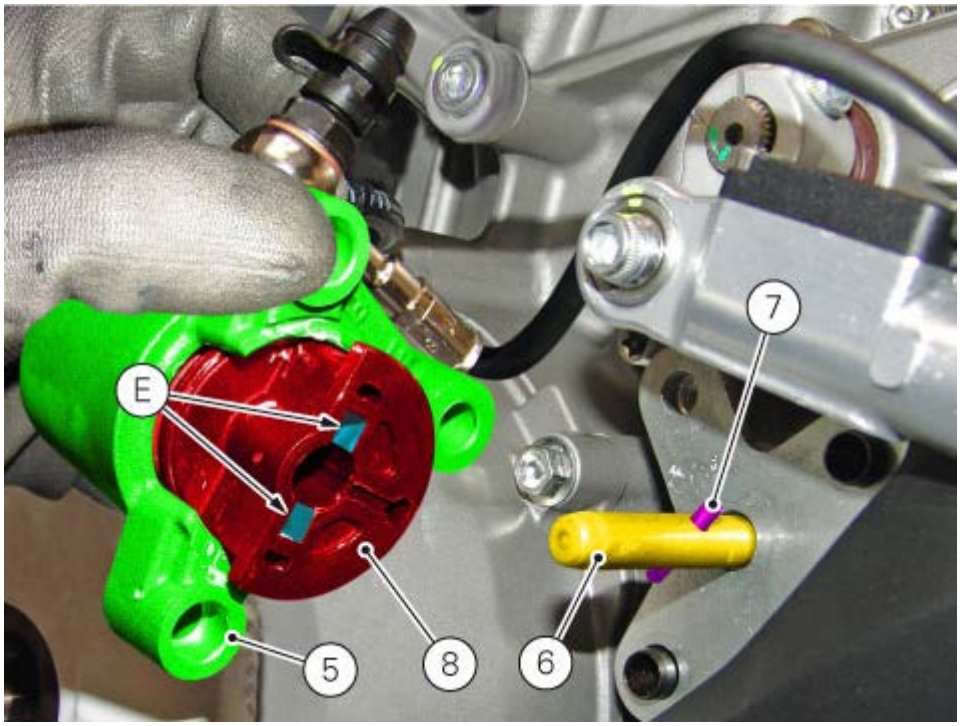
Fit seal (9) on anti-rotation insert (8).
Apply the recommended grease to the seal (9).
Insert the anti-rotation insert (8) into clutch slave cylinder (5), making sure to match tab (C) on insert (8) with slot (D) on cylinder unit.


D
GREASE
C
9
8
8
C
9


D
5
5
D



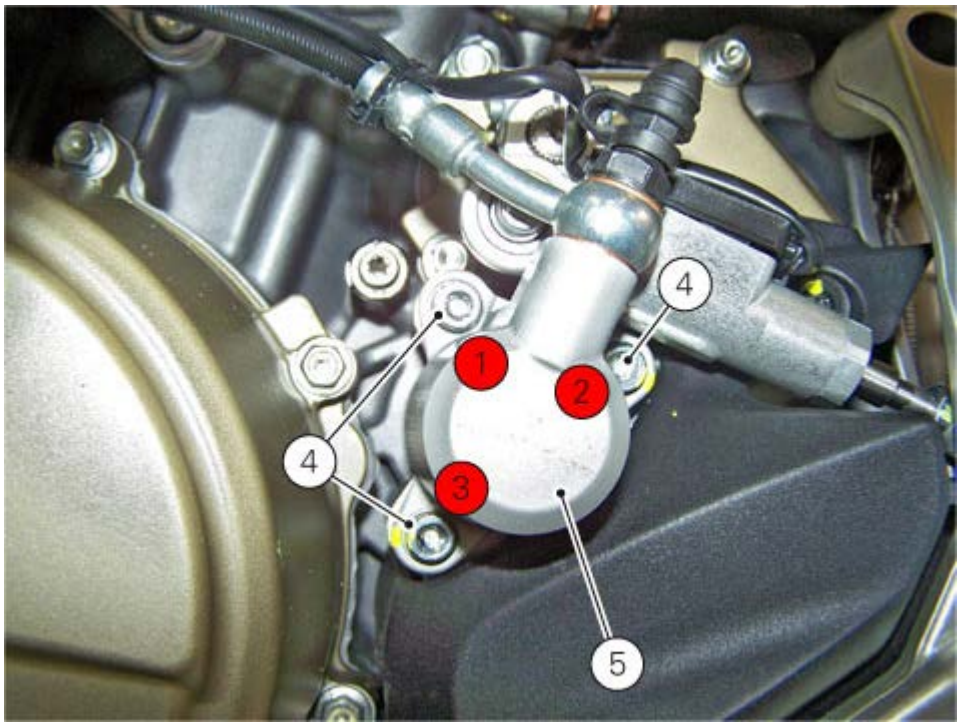
Insert clutch slave cylinder (5), including anti-rotation insert (8), on clutch pushrod (6) already positioned.
The anti-rotation pin (7) must engage into the corresponding slots (E) on anti-rotation insert (8).



Fix the clutch slave cylinder (5) by starting the screws (4).

Note
To bring the clutch slave cylinder (5) internal surface near the casing cover as evenly as possible, screw and tighten the screws (4) alternatively in steps.

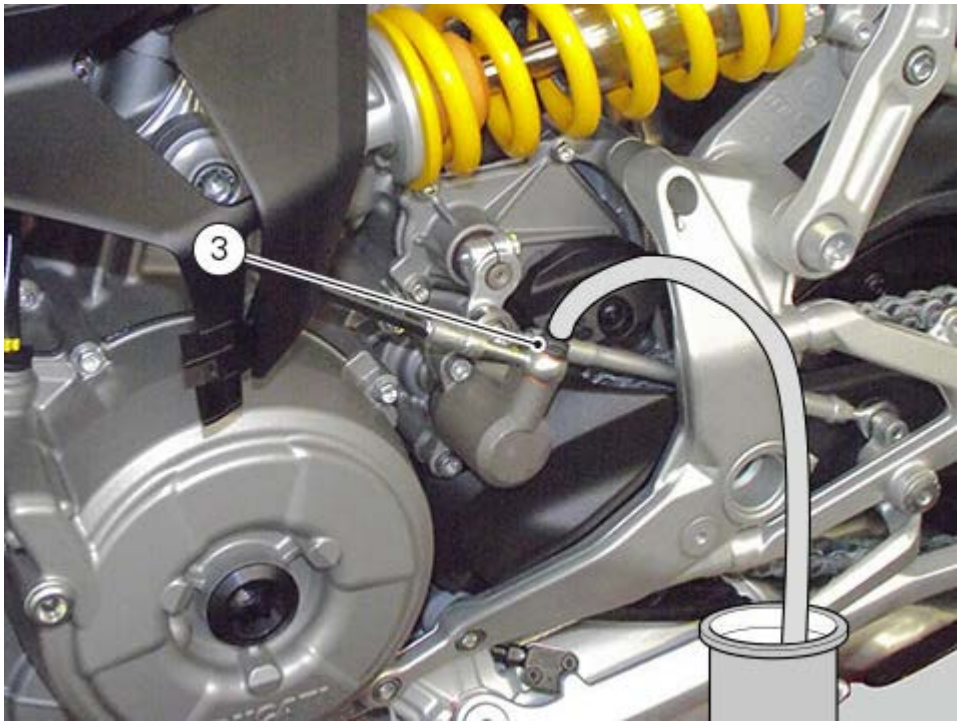
Tighten the screws (4) to a torque of 10 Nm ±10%, in the sequence 1 - 2 - 3 - 1.



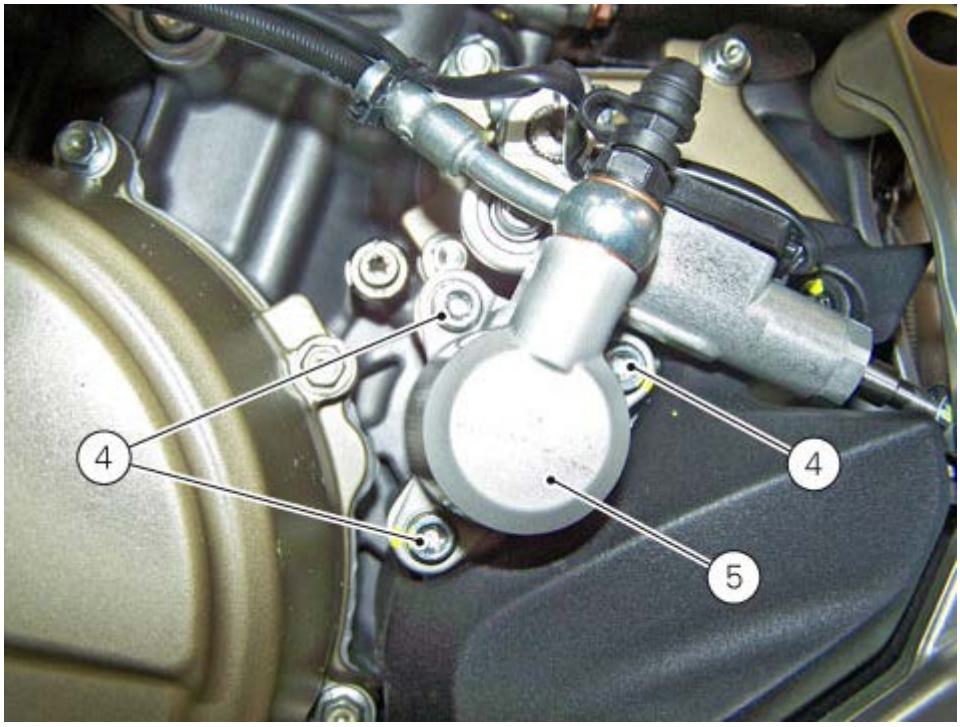
Fill the system (Filling the clutch system circuit).

Removing the clutch slave cylinder

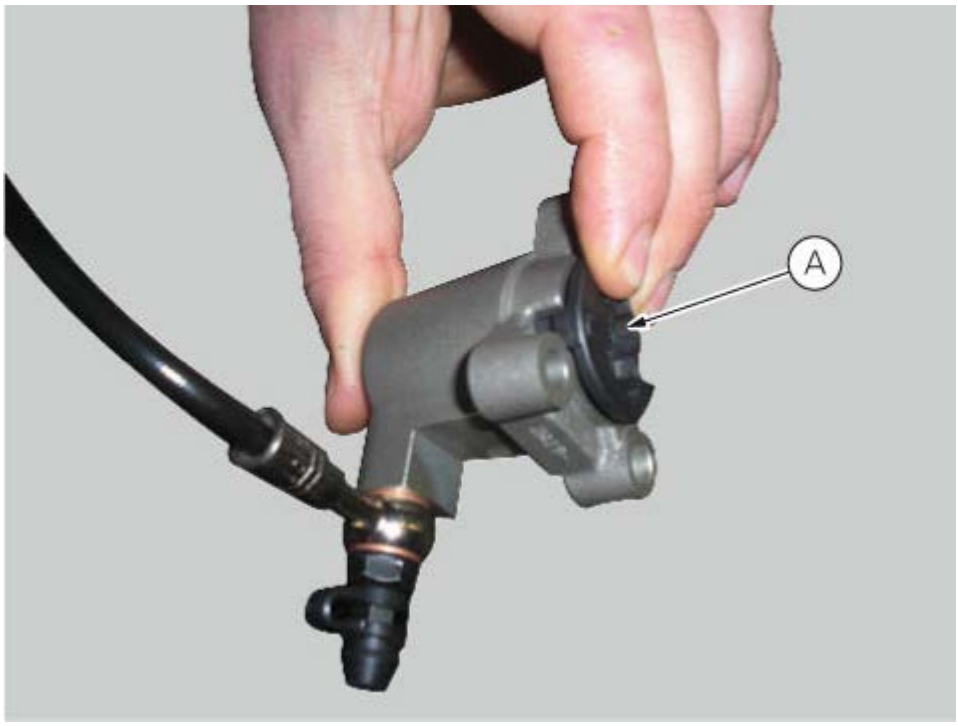
Drain the clutch system (Draining the clutch system).



Undo the screws (4) and slide out the clutch slave cylinder (5).



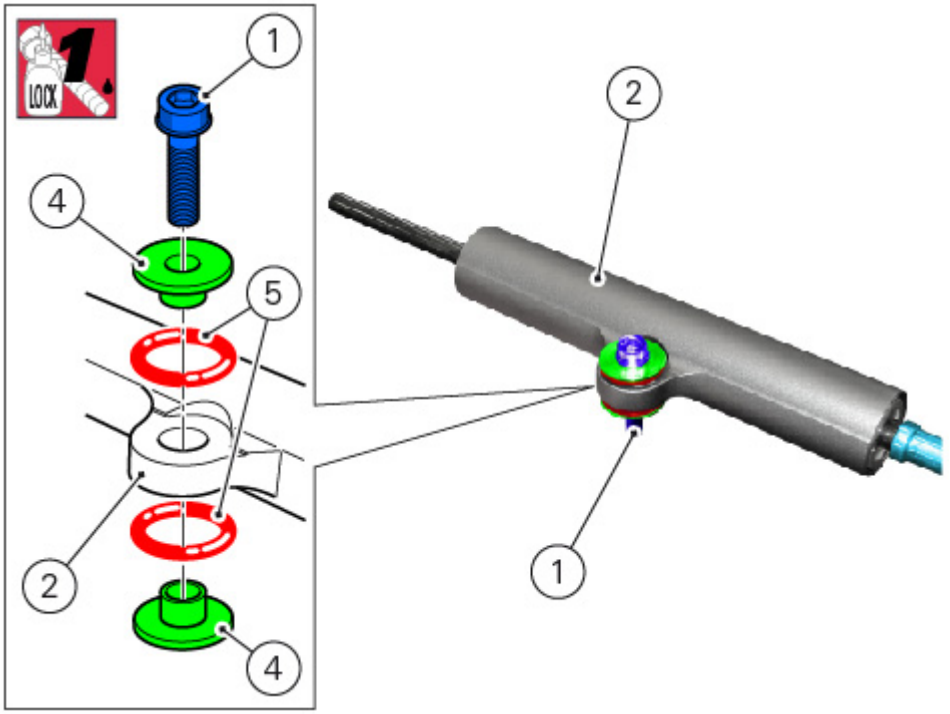
Push the internal piston (A) to force out all the fluid from inside the unit.

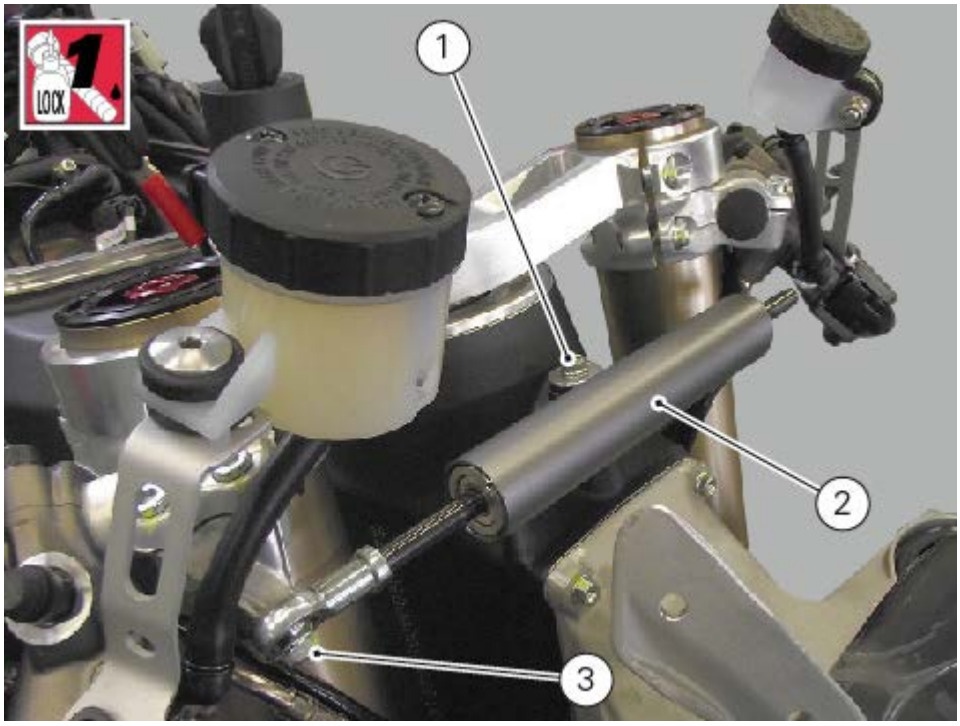

A

Smear the screw (1) with specified threadlocker.
Fit the spacer with collar (4), set as shown, and O-ring (5) on screw (1).
Insert screw (1) in the hole on steering damper body (2), from the side shown.
Fit the O-ring (5) and spacer with collar (4) on screw (1) bottom end, and set the spacer with collar as shown.
Apply specified threadlocker on screw (3) at the ball joint of steering damper rod (2).
Montare l'ammortizzatore di sterzo (2) impuntando la vite (3) sul semimanubrio (6) destro e la vite (1) sul telaio.

Warning
Make sure that the front brake fluid reservoir (A) is above the steering damper end (B).

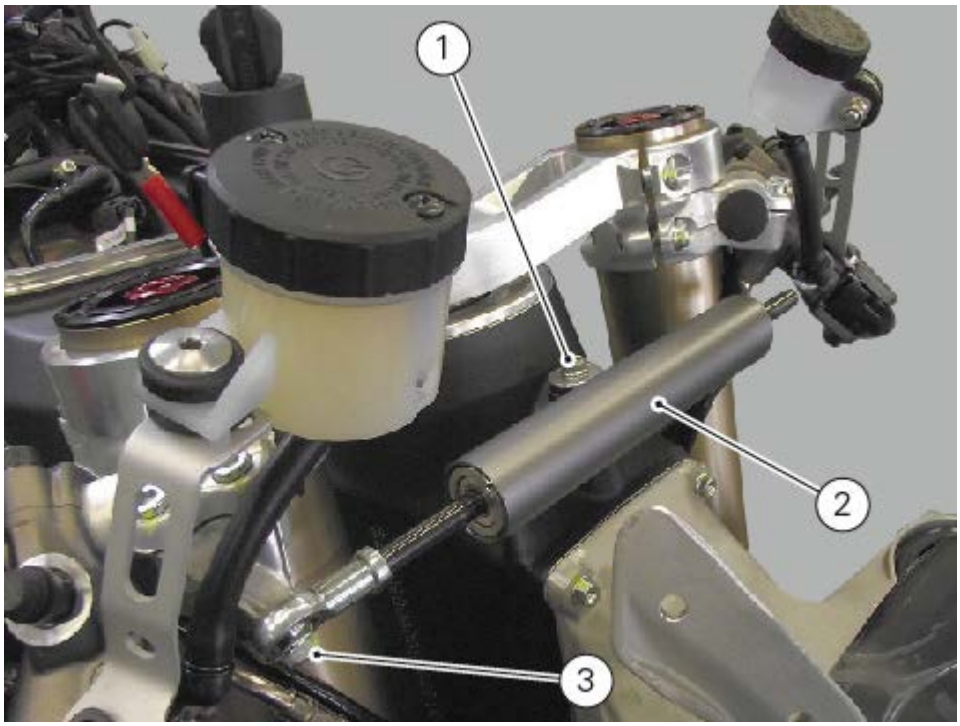
Tighten the screws (1) and (3) to a torque of 10 Nm ± 10%.





Removal of the steering damper

Loosen the central retaining screw (1) on steering damper (2).
Loosen the side retaining screw (3) on steering damper (2).
Remove the steering damper.

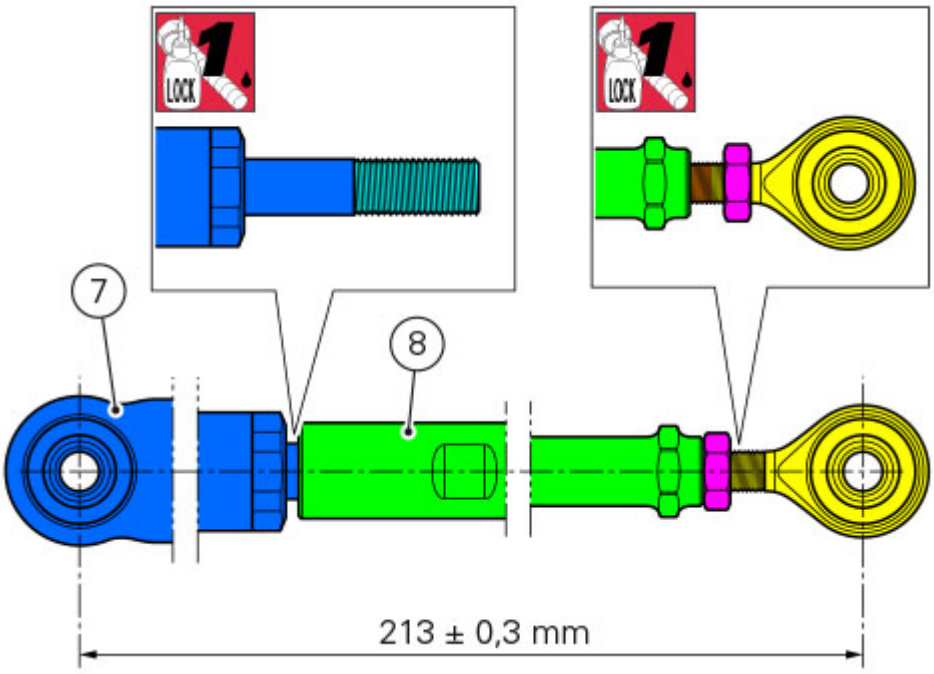


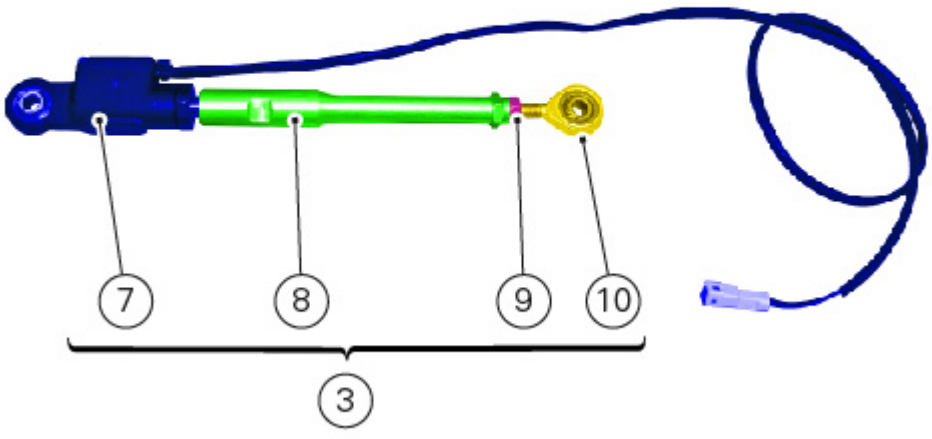
Refitting the gear shift

If the Quick Shift pin unit (3) has been disassembled, follow the instructions below.
Apply specified threadlocker on the threaded pin of the Quick Shift (7). Screw the gearbox pushrod (8) on the threaded pin of the Quick Shift (7). Tighten the gearbox pushrod (8) to 15 Nm ± 10% while counter-holding the Quick Shift (7).
Fully screw, without tightening, nut (9) on the uniball threaded pin (10).
Screw uniball (10) on the gearbox pushrod (8), until reaching the value indicated in the figure.

Note
Quick Shift and uniball must be aligned on the same surface, as indicated.

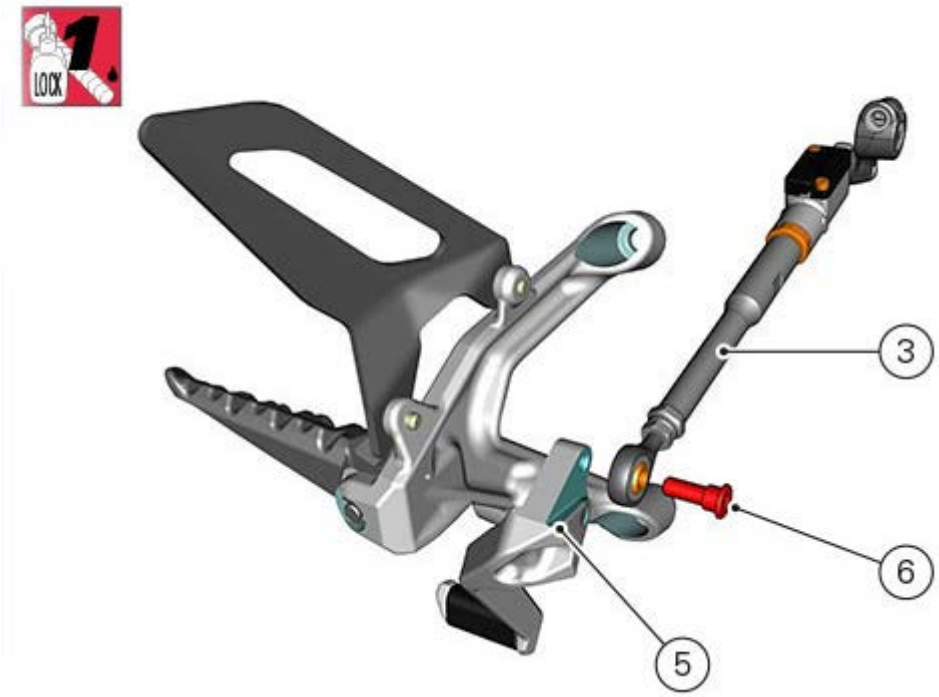
Apply specified threadlocker on the part of thread of uniball (10) near the gearbox pushrod (8), where nut (9) will be positioned once tightened.
Screw nut (9) fully home on the gearbox pushrod (8). Tighten nut (9) to a torque of 5 Nm ± 10 %.

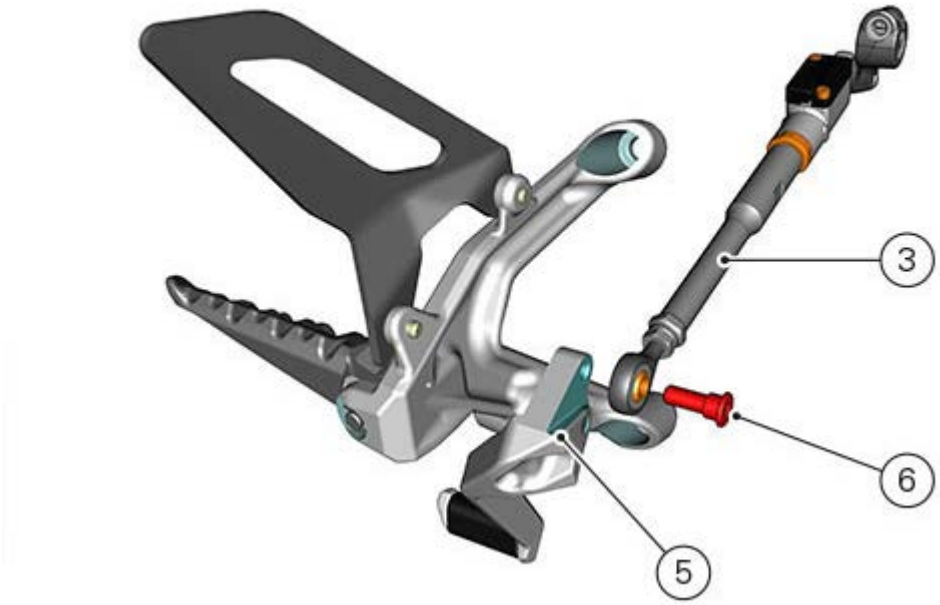




Apply the recommended threadlocker to the screw (6).
Start screw (6) to move the gearbox unit (3) on the gearchange lever (5).

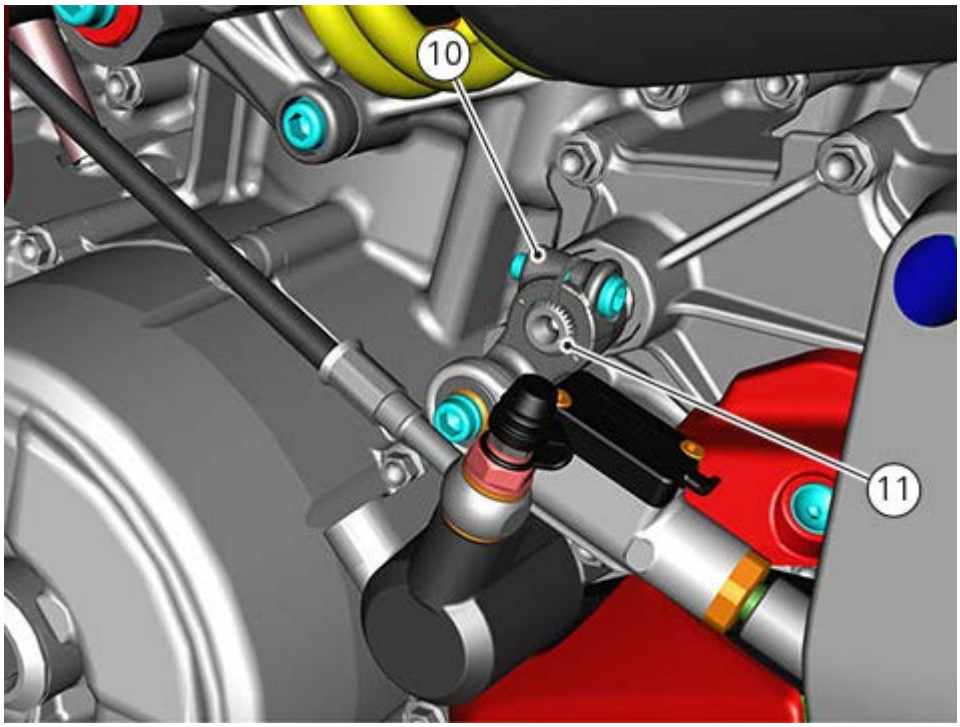
Tighten the screw (6) to a torque of 10 Nm ± 10%.

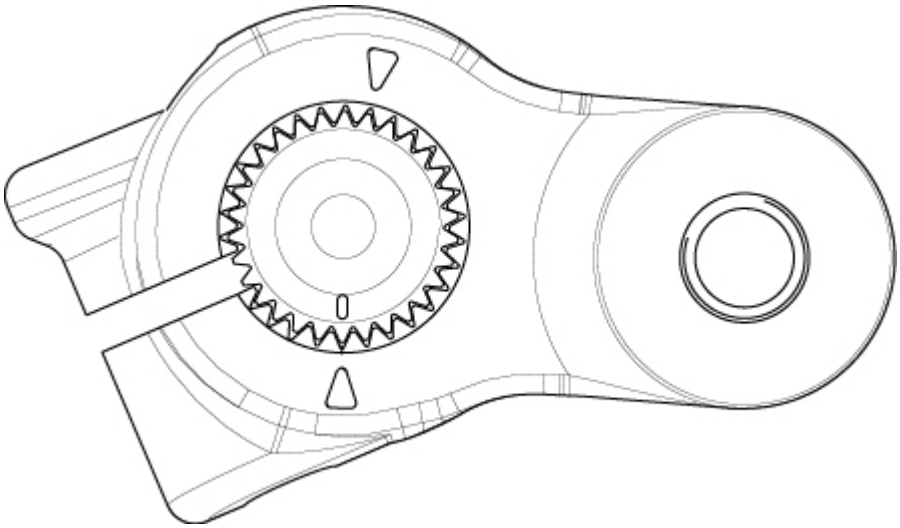




Reposition the gearchange lever (5) together with the gearbox unit (3), by starting screws (4) that retain the gearchange lever (5) to LH footpeg.
Tighten the screw (4) to a torque of 10 Nm ± 10%.

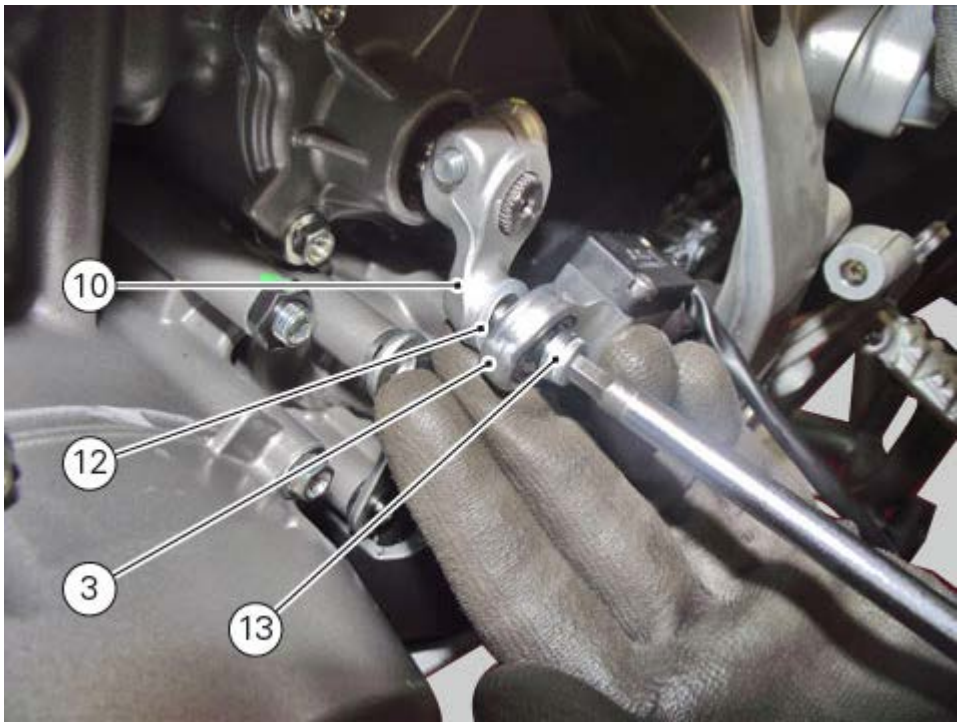
Position lever (10) of the gearbox unit on shaft (11), by matching the engraved point on the lever with that on the shaft.





Start screw (2) that retains gearchange unit (3) to the shaft.
Tighten the screw (2) to a torque of 10 Nm ± 10%.

If the complete gearbox unit (3) has been removed from lever (10), position a new Teflon washer (12) in the indicated position and tighten screw (13) to 10 Nm ± 10%.



Connect the Quick Shift pin sensor (1) to main wiring harness.

Refit the complete LH side fairing (Refitting the side fairings).

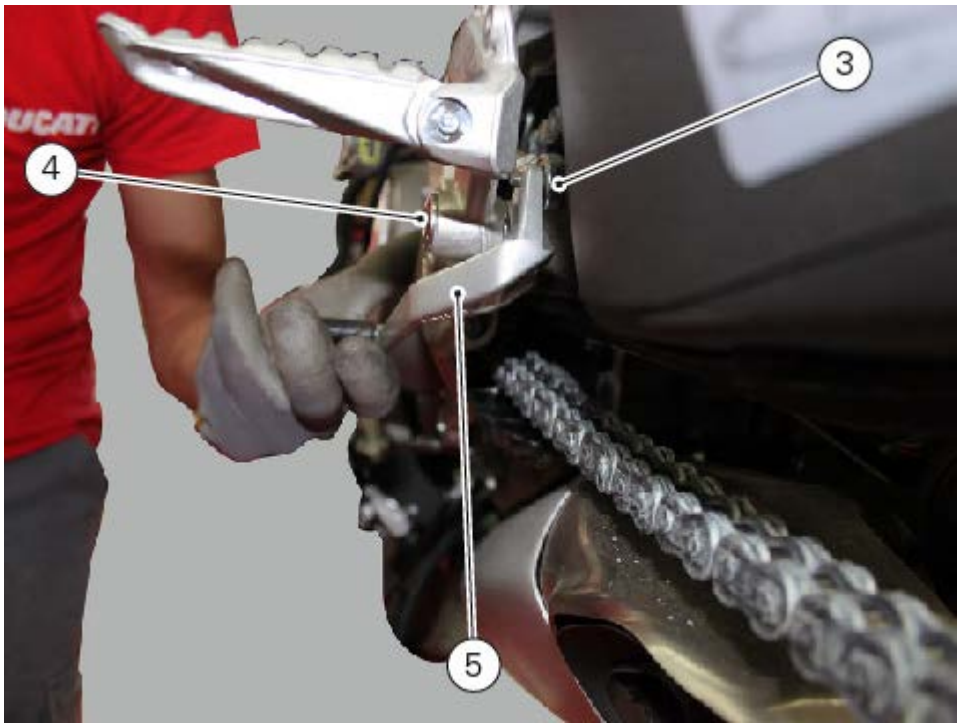
Removing the gear shift

Remove the complete LH side fairing (Removing the side fairings).

Disconnect the Quick Shift pin sensor (1) from main wiring harness.

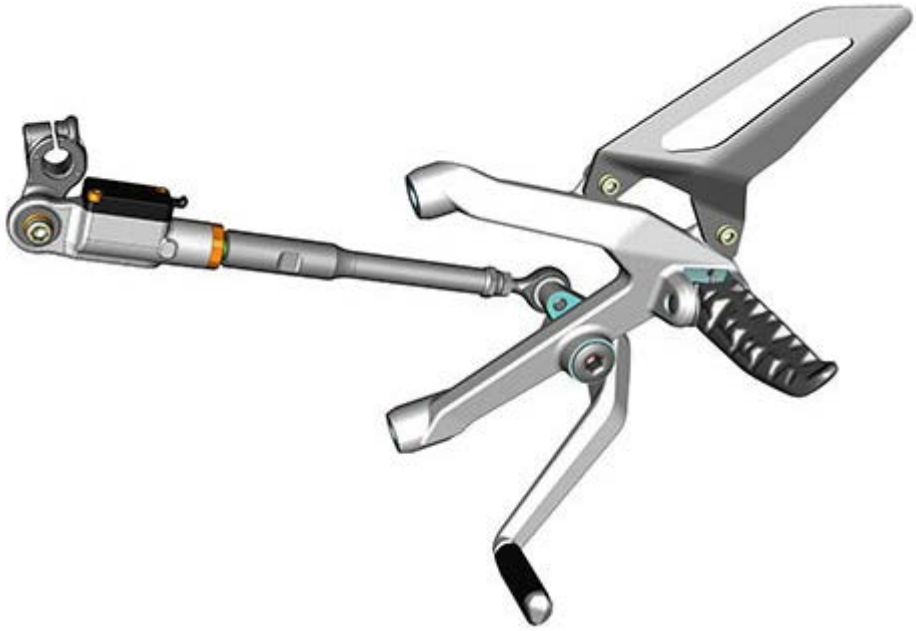
Loosen screw (2) that retains gearchange unit (3) to the shaft.

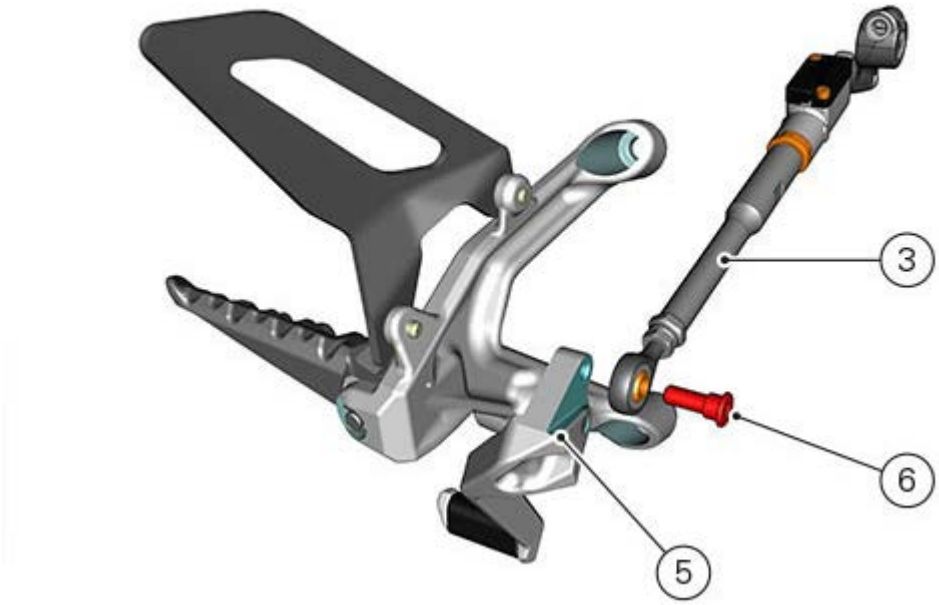
Loosen screw (4) that retains gearchange lever (5) to the LH footpeg.
Remove the gearchange lever (5) together with the gearbox unit (3).



Loosen screw (6) to separate the gearbox unit (3) from the gearchange lever (5).


3
5
6




3
6
5

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.

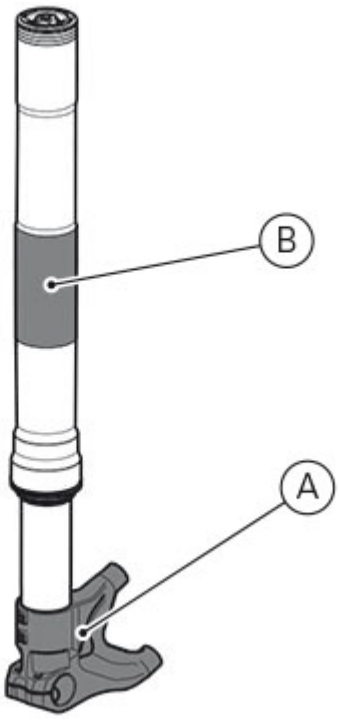
Do not modify the fork components.

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.

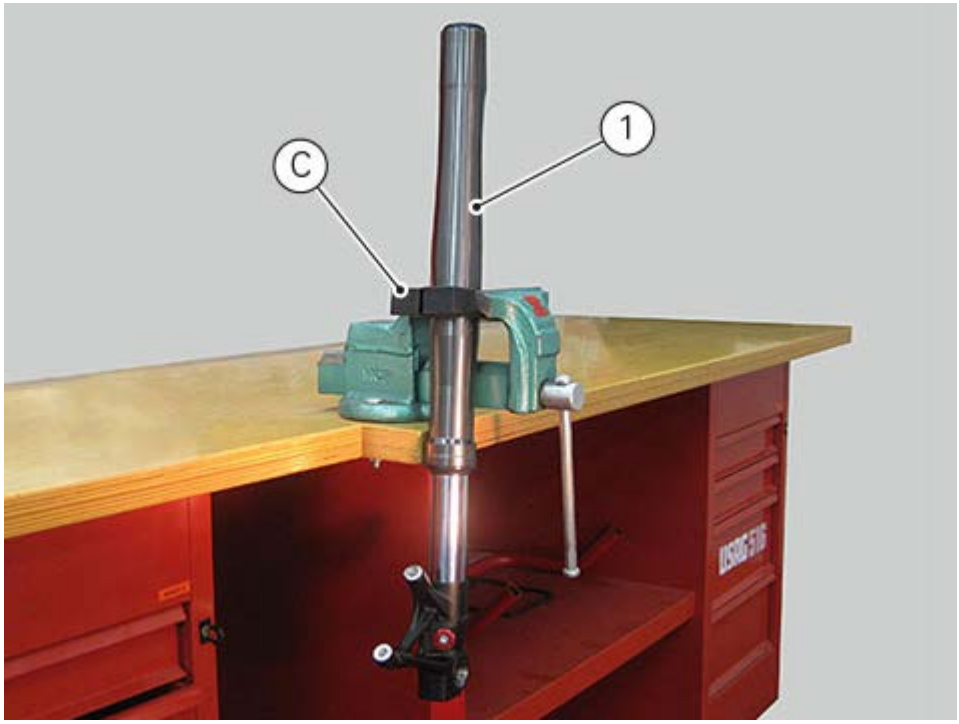


Remove the front wheel (Removing the front wheel).

Measure and note the value corresponding to the fork upper profile removal height with respect to steering head upper profile.
Remove the forks (Removing the front fork).

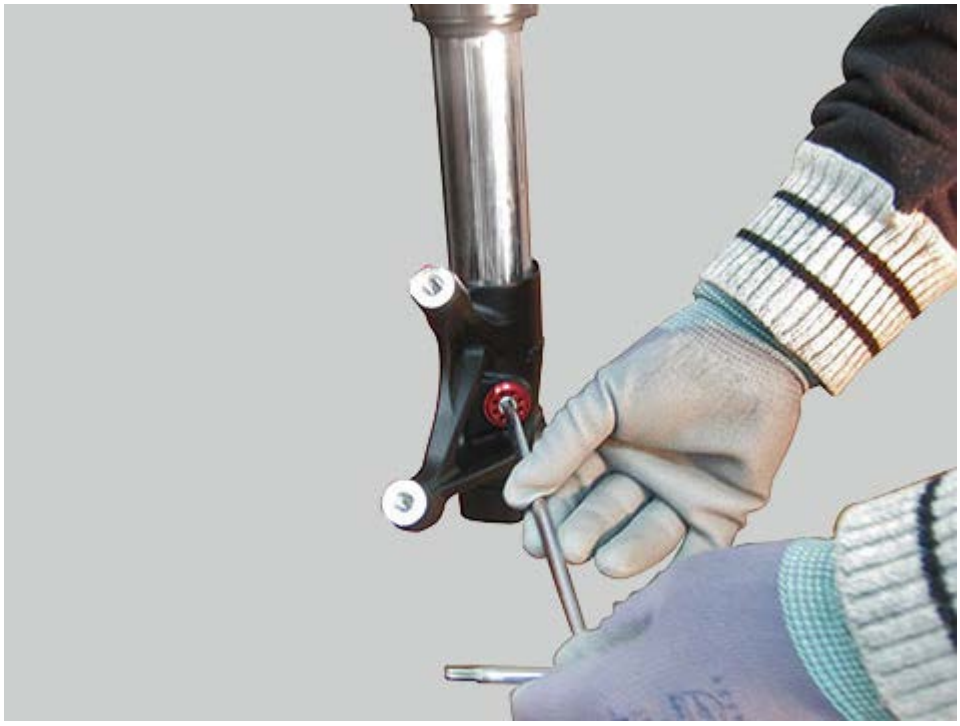
Disassembling the fork leg

Lock the fork leg on outer sleeve (1) using tool **C** part no.**887134302**.

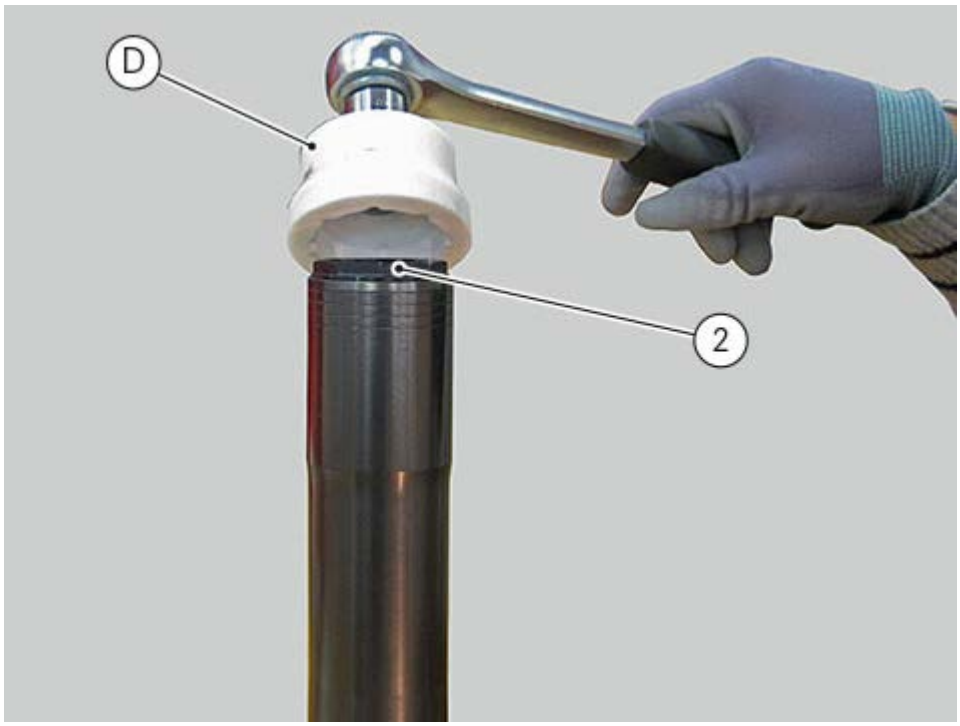


Loosen counter clockwise all spring preload on the fork leg bottom end.

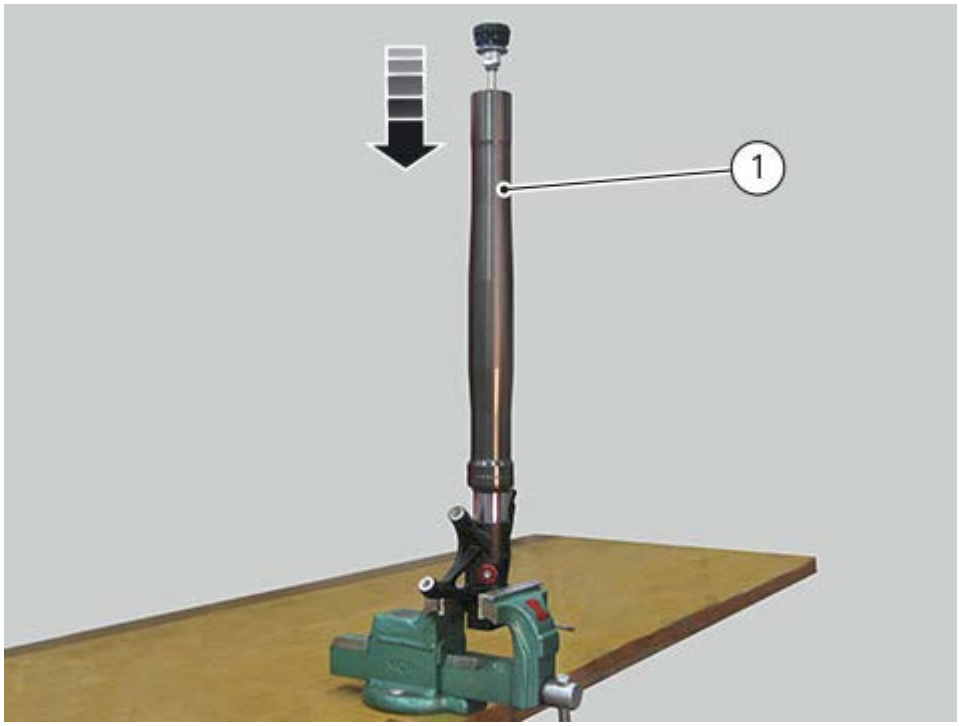
Note
Note the preload turn number.



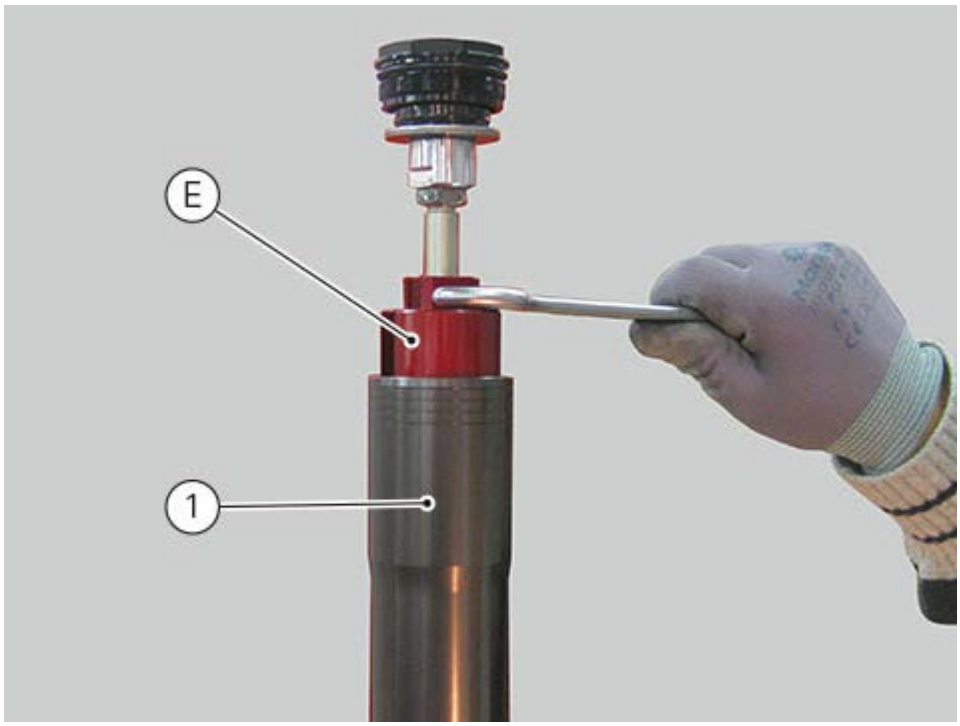
Loosen the top plug (2) from the fork sleeve using tool **D** part no.**887134487**.



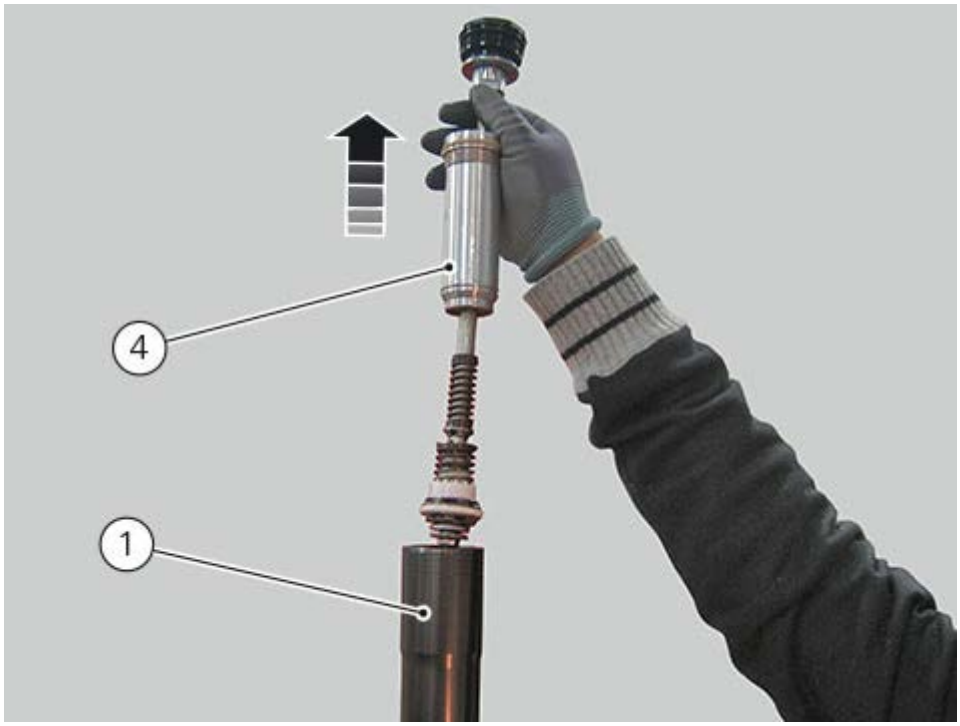
Take the outer sleeve (1) down.



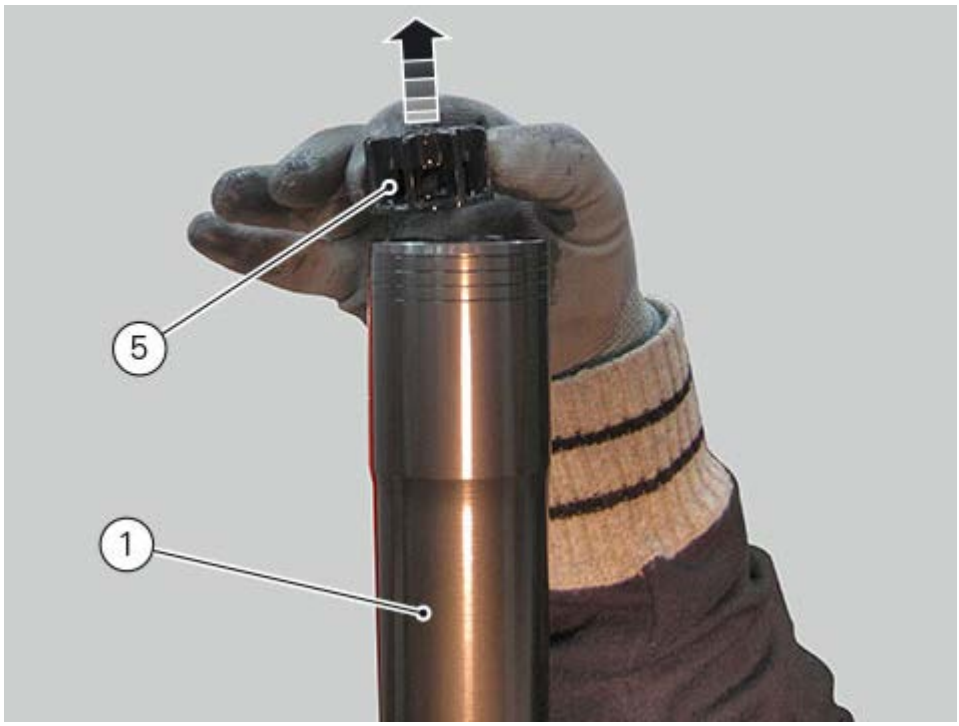
Loosen the damper rod unit fastening spacer using tool **E** part no.**887134485**.



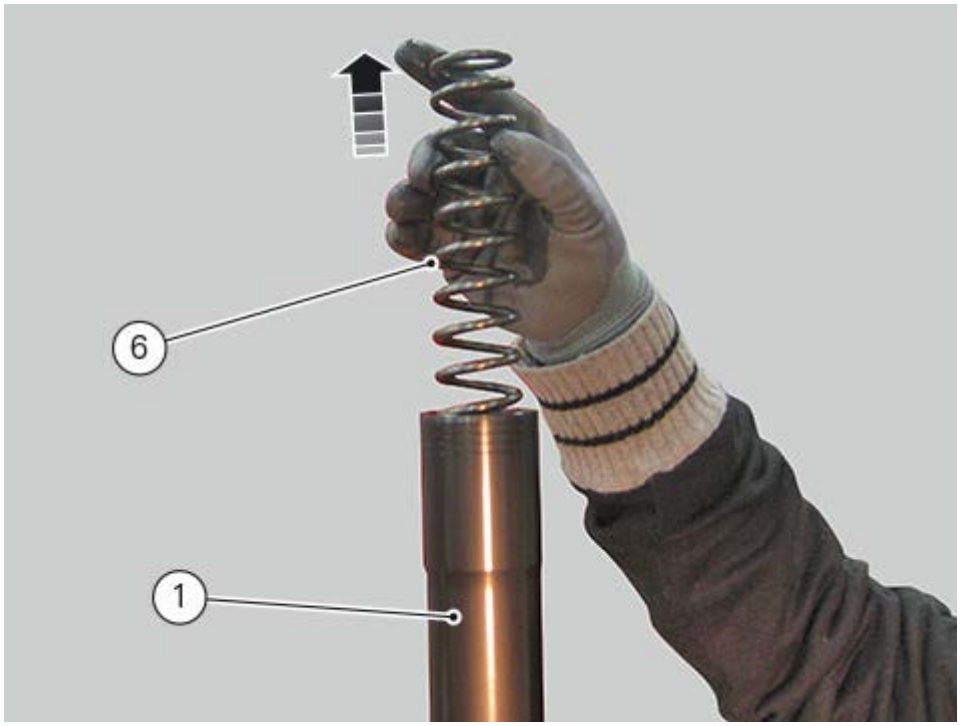
Slide out damper rod unit (4) from outer sleeve (1).



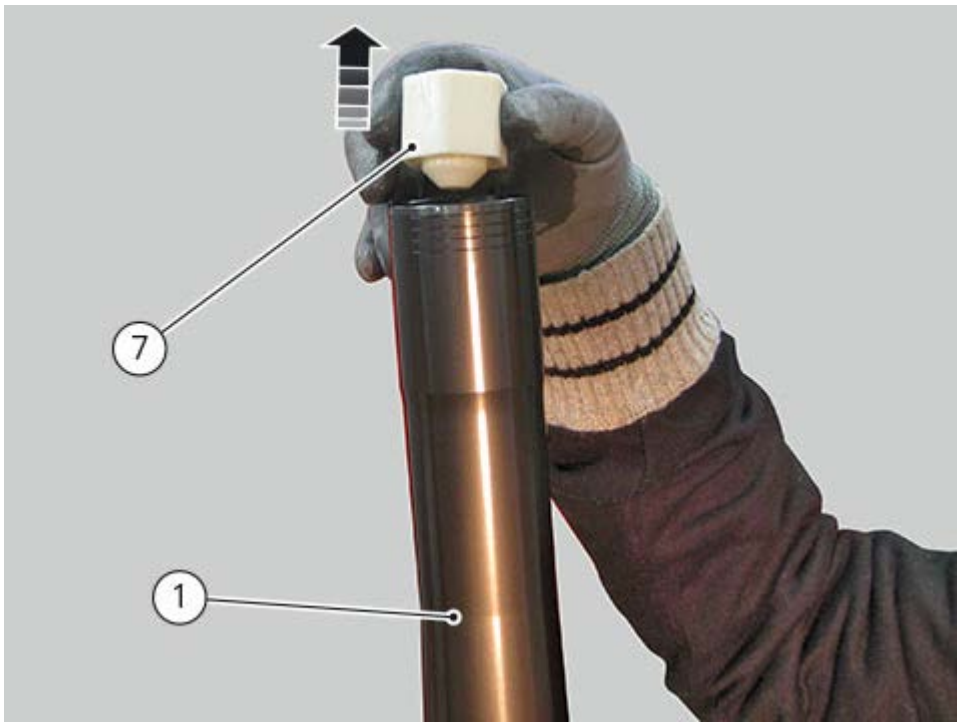
Slide out upper spring spacer (5) from outer sleeve (1).



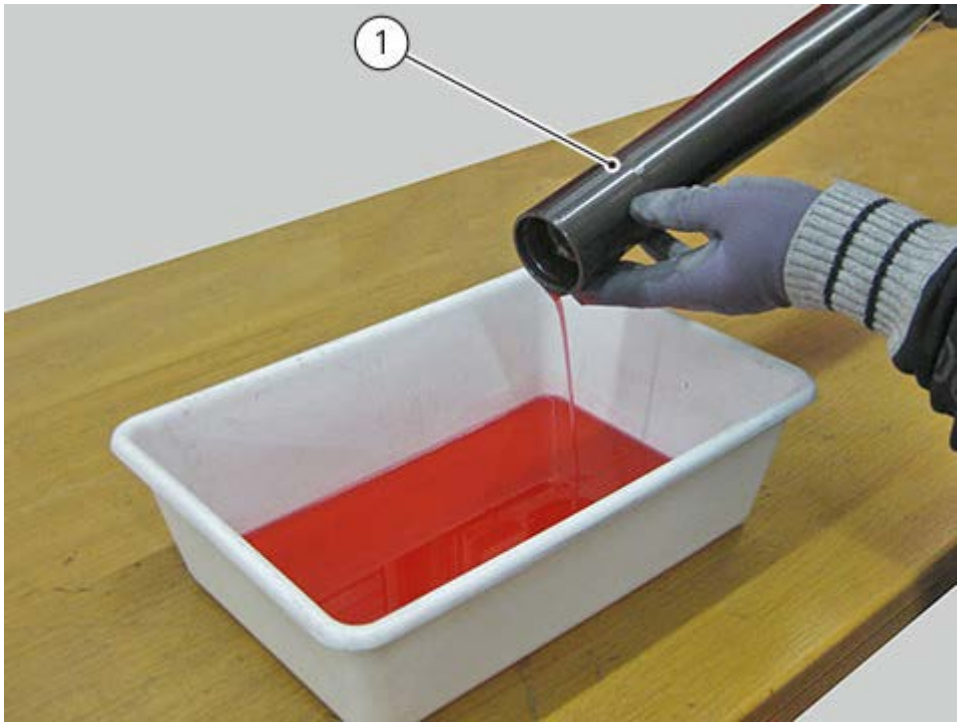
Slide out spring (6) from outer sleeve (1).



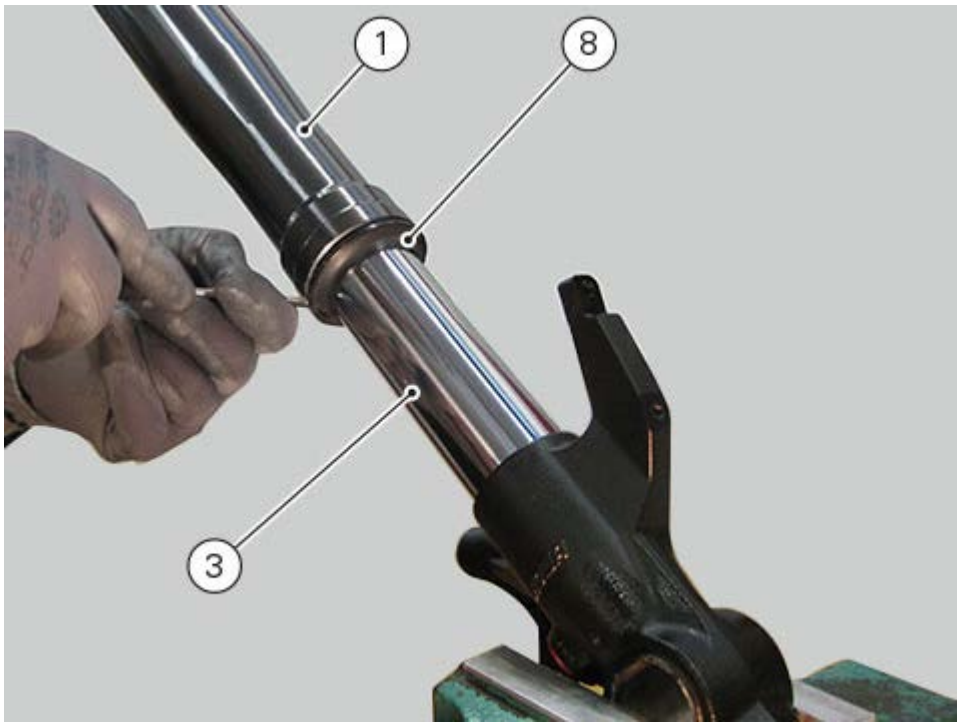
Slide out lower spring spacer (7) from outer sleeve (1).



Drain the fluid from sleeve (1).



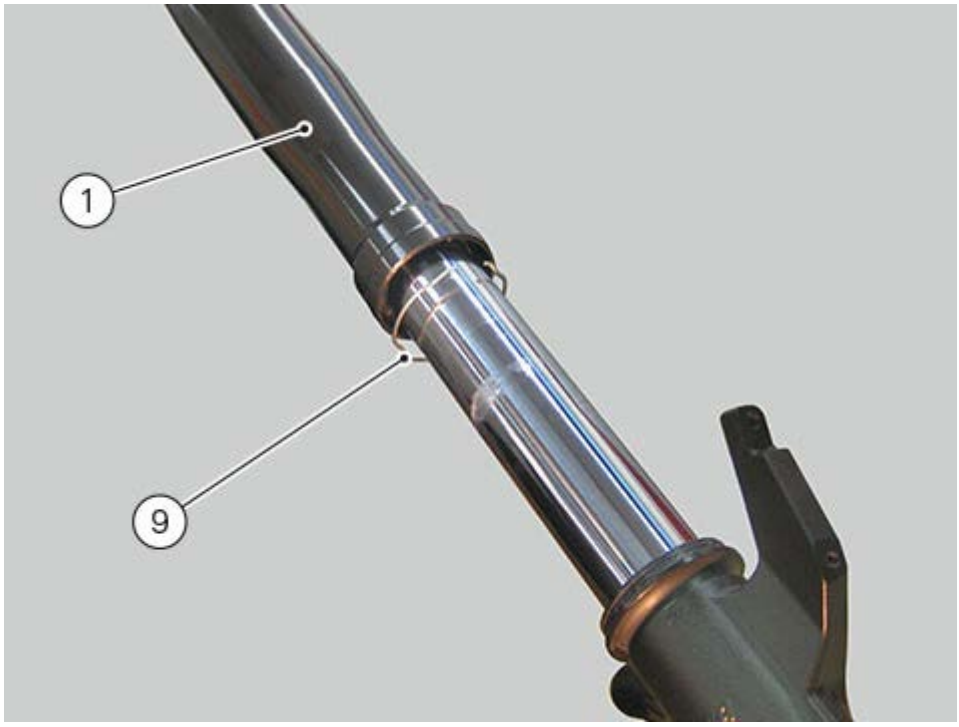
Vice fork leg (3) on the bottom end.
Remove dust gasket (8) from outer sleeve (1).



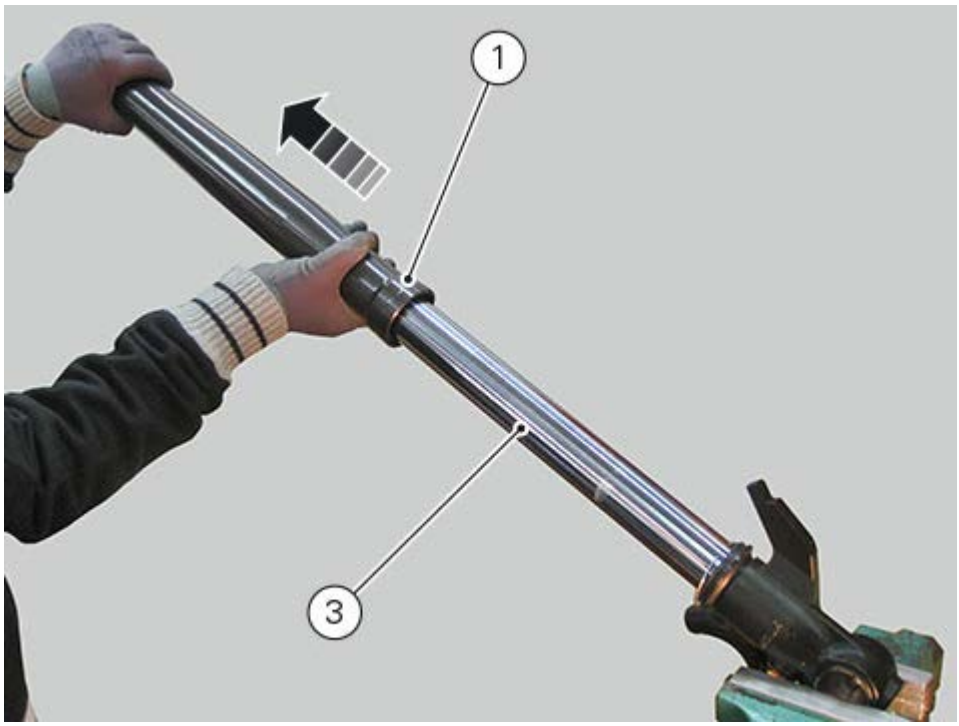
Remove snap ring (9) from outer sleeve (1).

Important

Make sure not to damage the leg surface treatment and the snap ring seat on the outer sleeve.

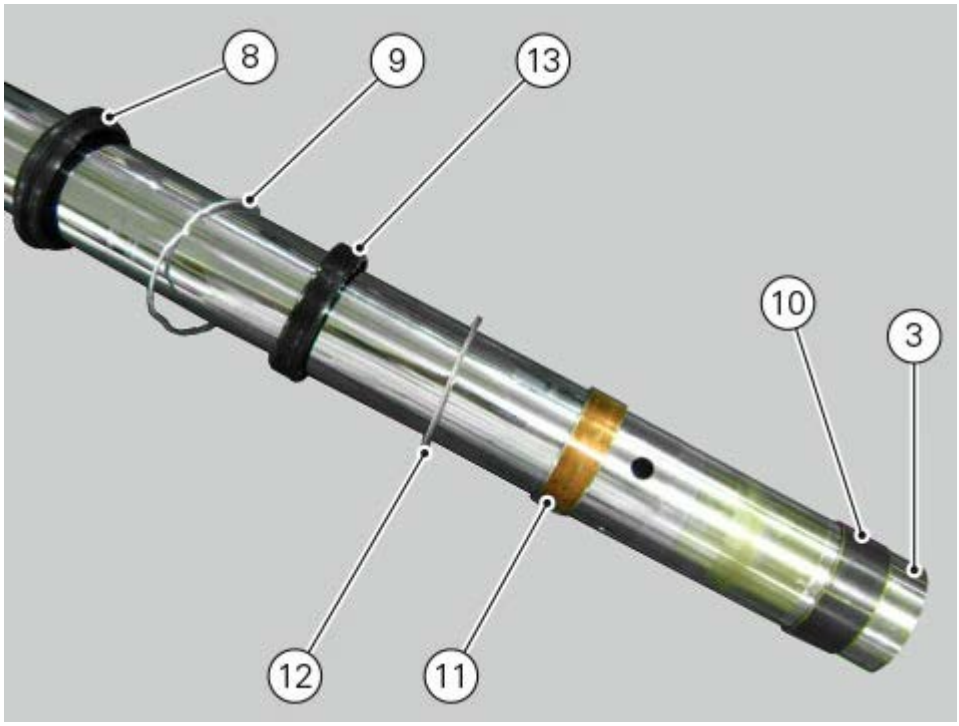


Slide out outer sleeve (1) from fork leg (3) by quickly hitting several times to counter-hold the lower sliding bushing resistance.



Remove the following parts from fork leg (3):

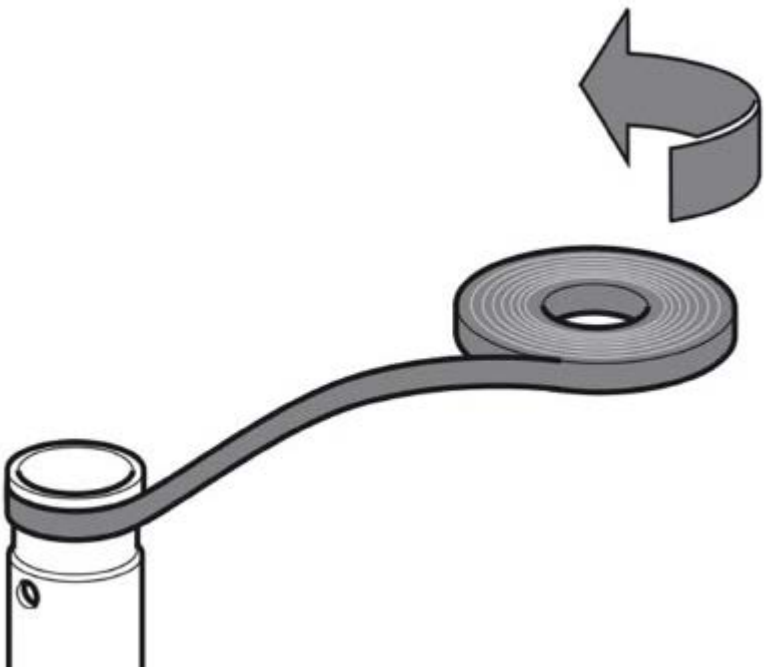
- Upper sliding bushing (10).
- Lower sliding bushing (11).
- Oil seal stop ring (12).
- Oil seal (13).
- Snap ring (9).
- Dust seal (8).



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 fork leg.

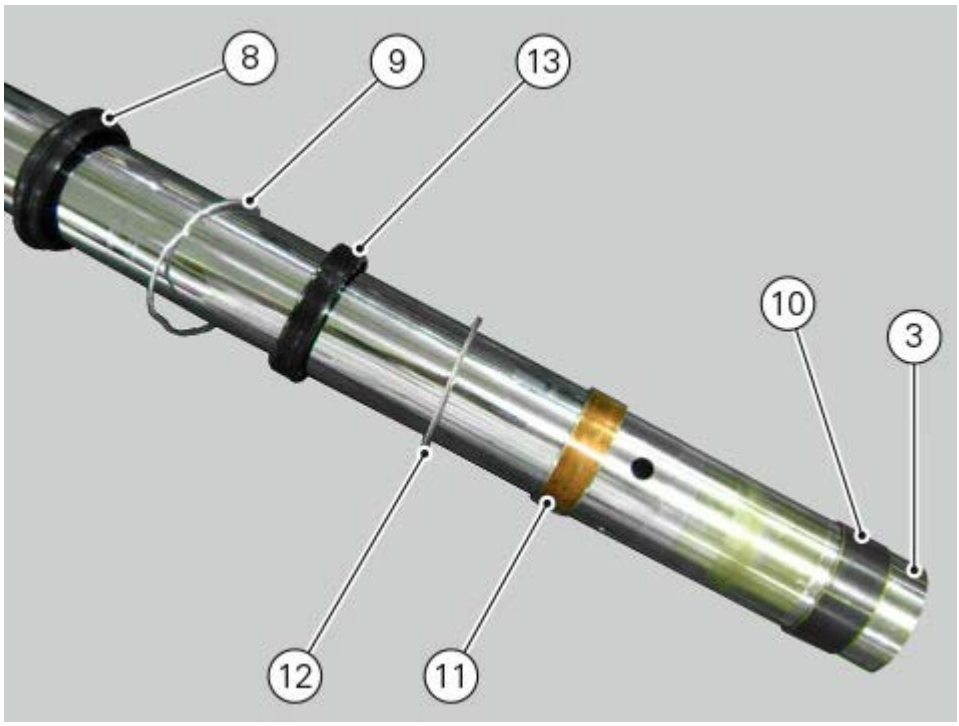
Vice the fork leg at the bottom end.
Protect tube edge and fork leg upper bushing seat with some adhesive tape.



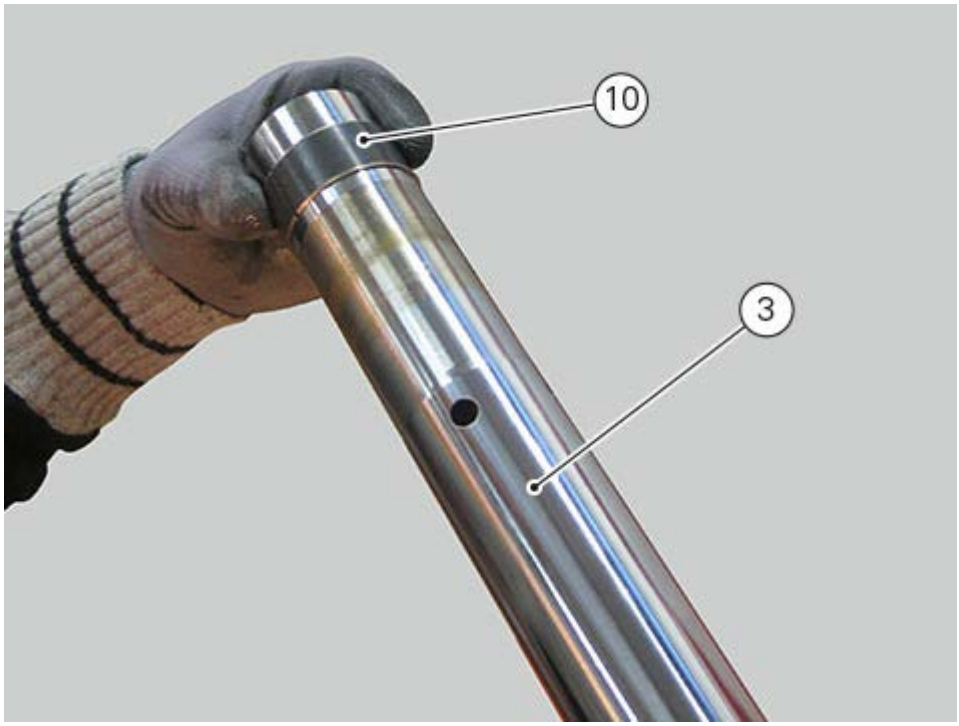
Fit the following parts in sequence in fork leg (3):

- Dust seal (8).
- Snap ring (9).
- Oil seal (13).
- Oil seal stop ring (12).
- Lower sliding bushing (11).
- Upper sliding bushing (10).

Note
Before fitting the dust and oil seals, lubricate the sliding edges with fork fluid or seal grease.



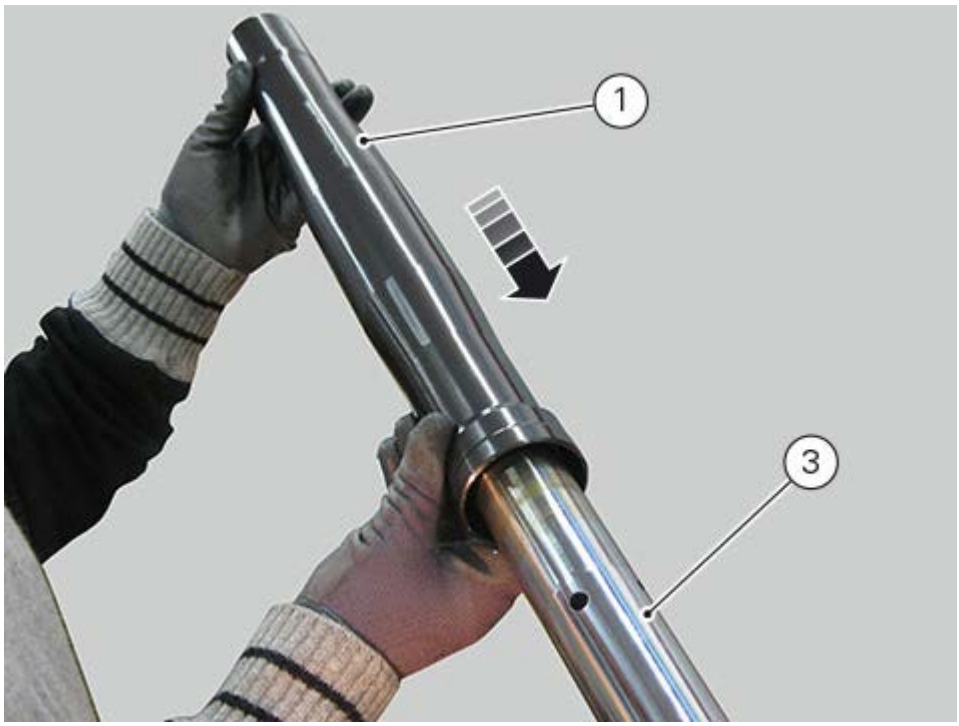
Remove the tape and fit upper sliding bushing (11) into the fork leg seat (8).



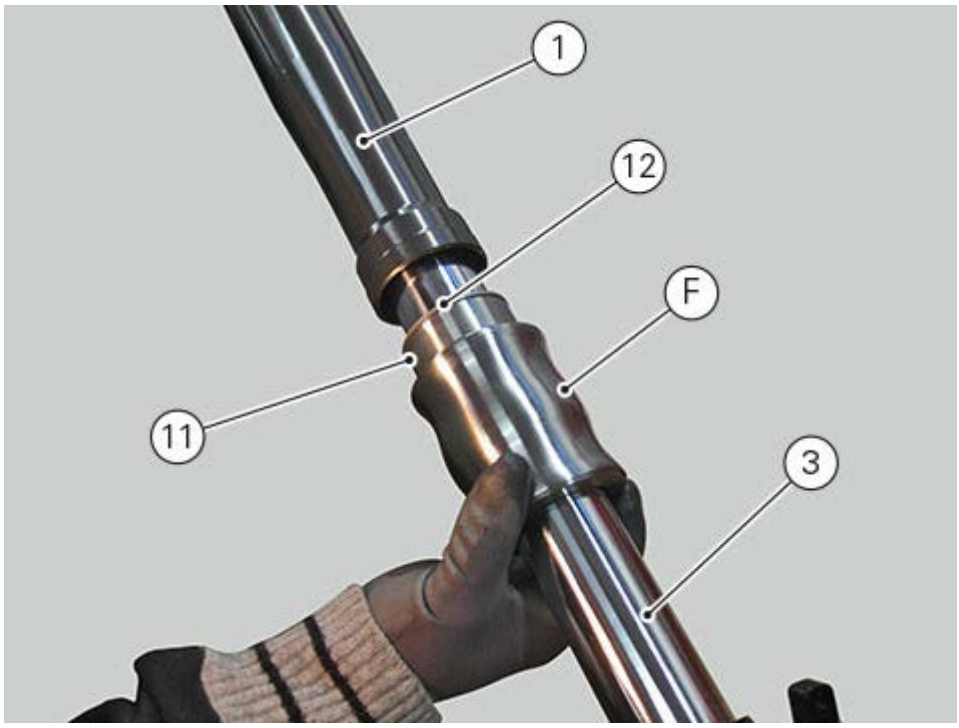
Fit fork leg (3) into outer sleeve (1).

Note

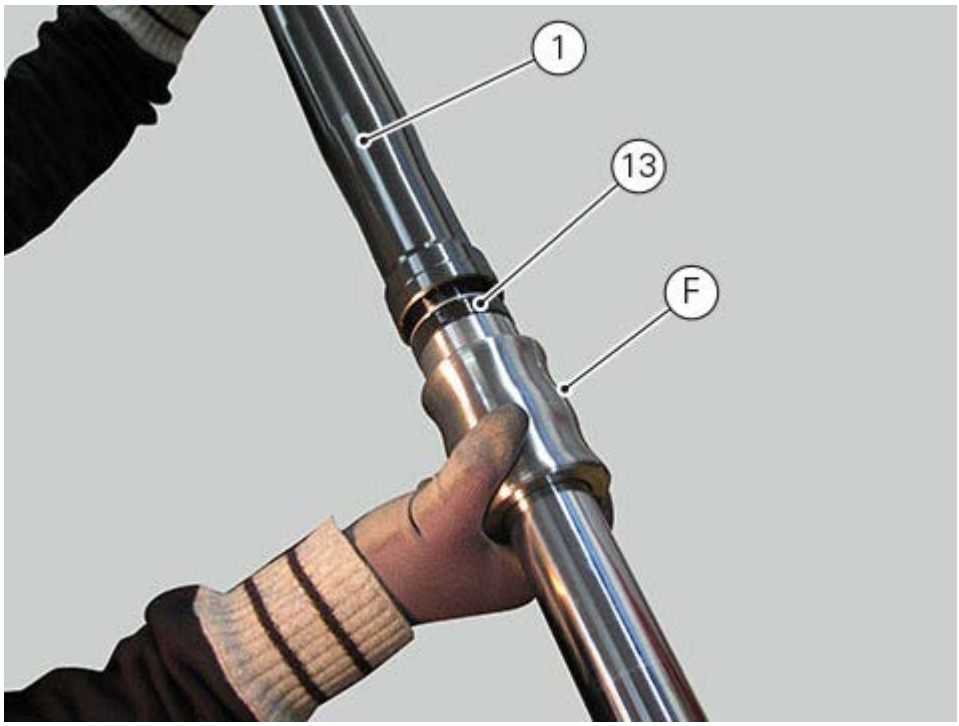
Smear the bushing sliding surfaces with some fork fluid before fitting the outer sleeve on the fork leg.



Position lower sliding bushing (11) and oil seal stop ring (12) fully home on outer sleeve (1) using tool **F** part no.**887134484**.

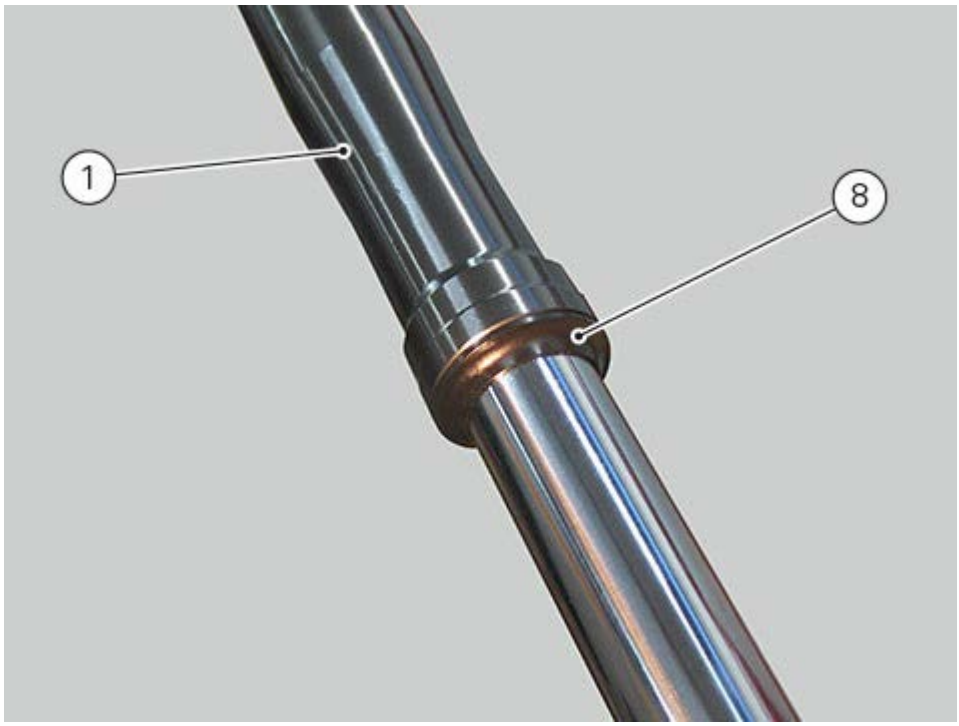


Position oil seal (13) fully home on outer sleeve (1) using tool **F** part no.**887134484**.

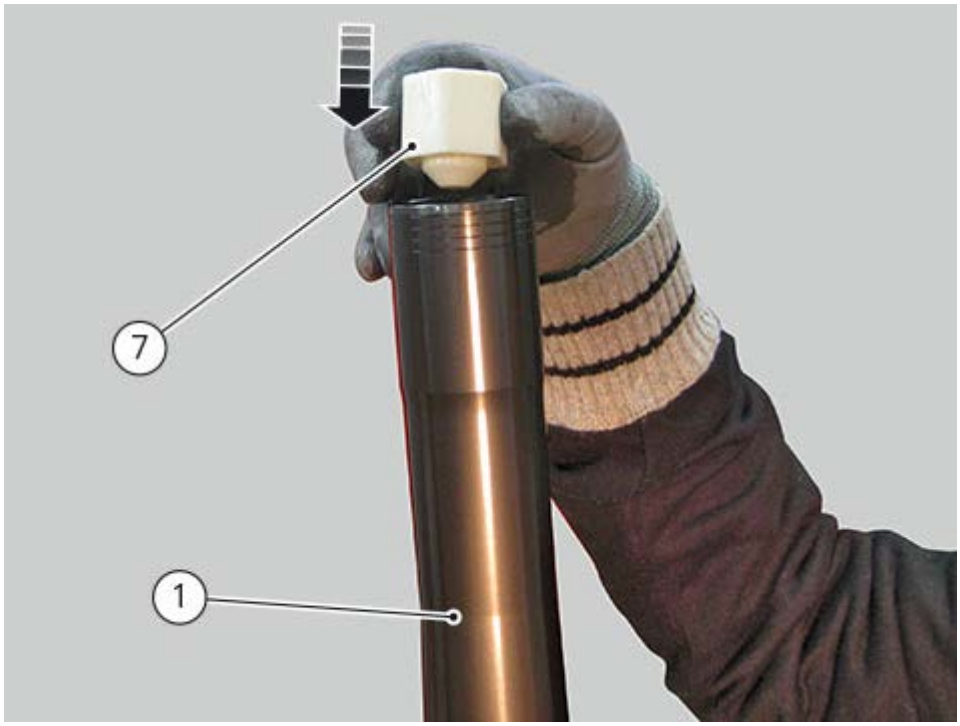


Position snap ring (9) into the outer sleeve seat.

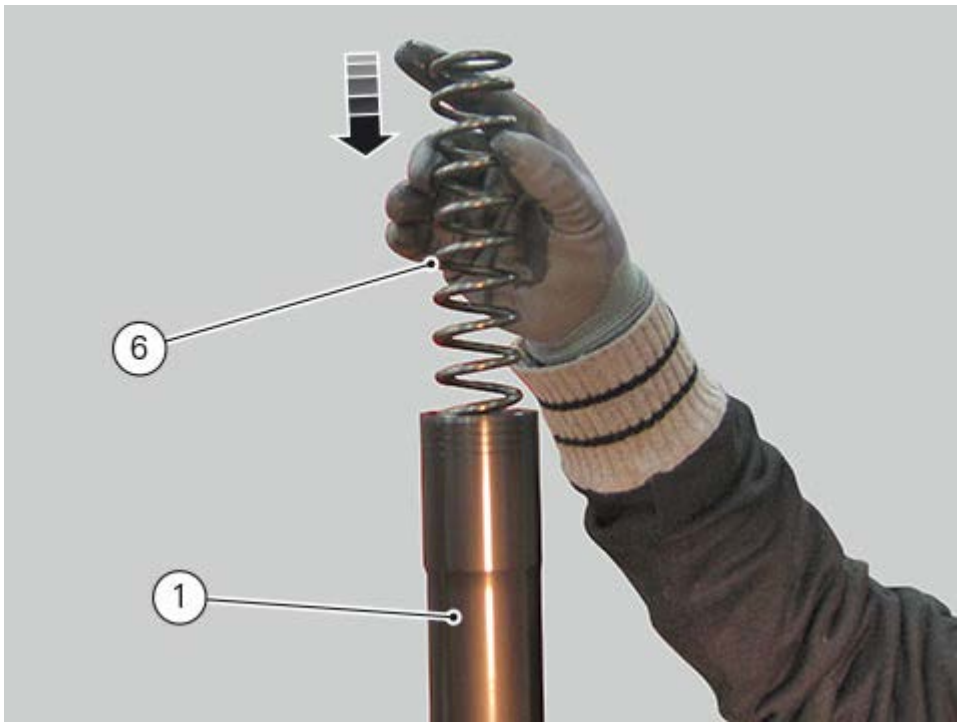
Position dust seal (8) fully home of outer sleeve (1).



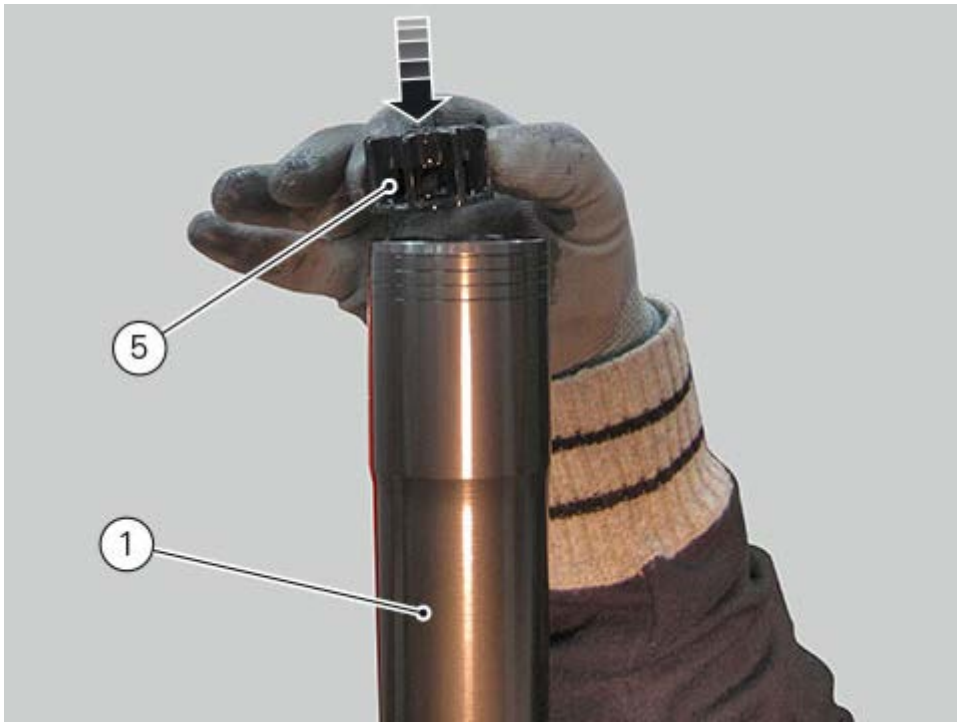
Fit lower spring spacer (7) into the outer sleeve (1).



Fit spring (6) into the outer sleeve (1).



Fit upper spring spacer (5) in the outer sleeve (1).



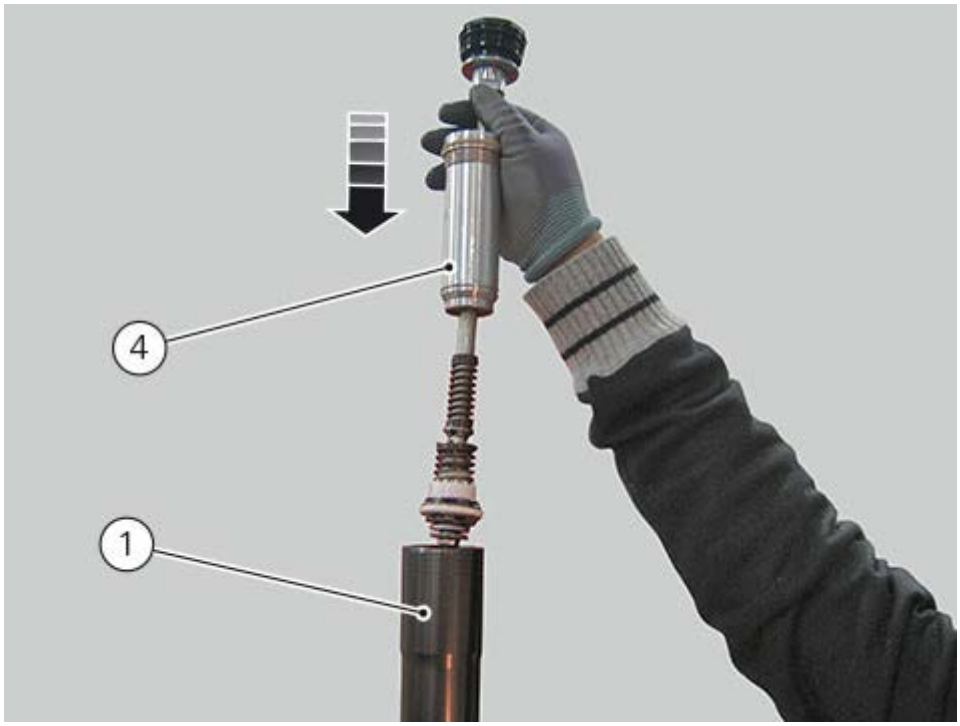
Fill with 563 cc of recommended product.

Important

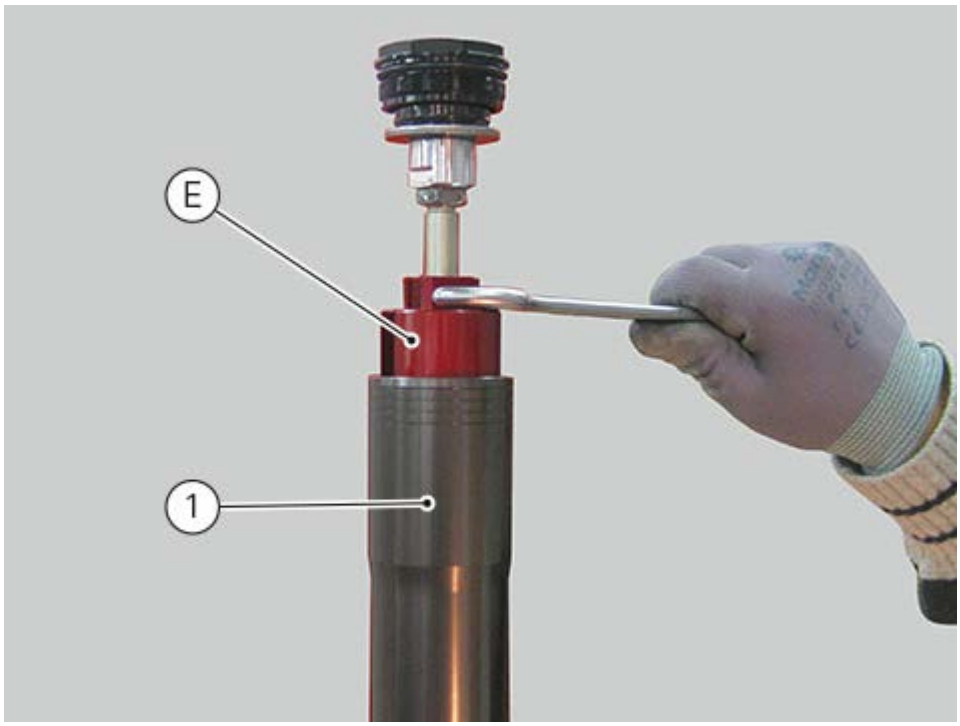
When you measure the level, position the leg vertically. Check that the level is the same in both legs.

With the fork leg on the bottom end, move the outer sleeve (1) downwards a few times by manually closing the sleeve upper surface and reopening it when the sleeve is moved up again.
In this way, any air bubbles produced during filling are removed.

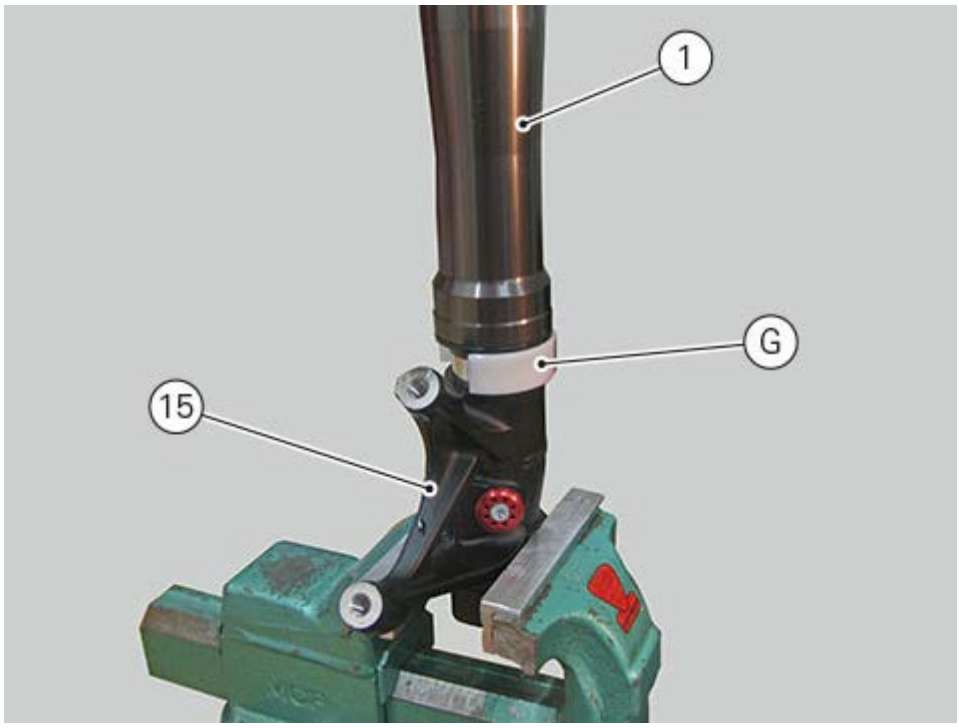
Fit damper rod unit (4) into the fork leg (3).



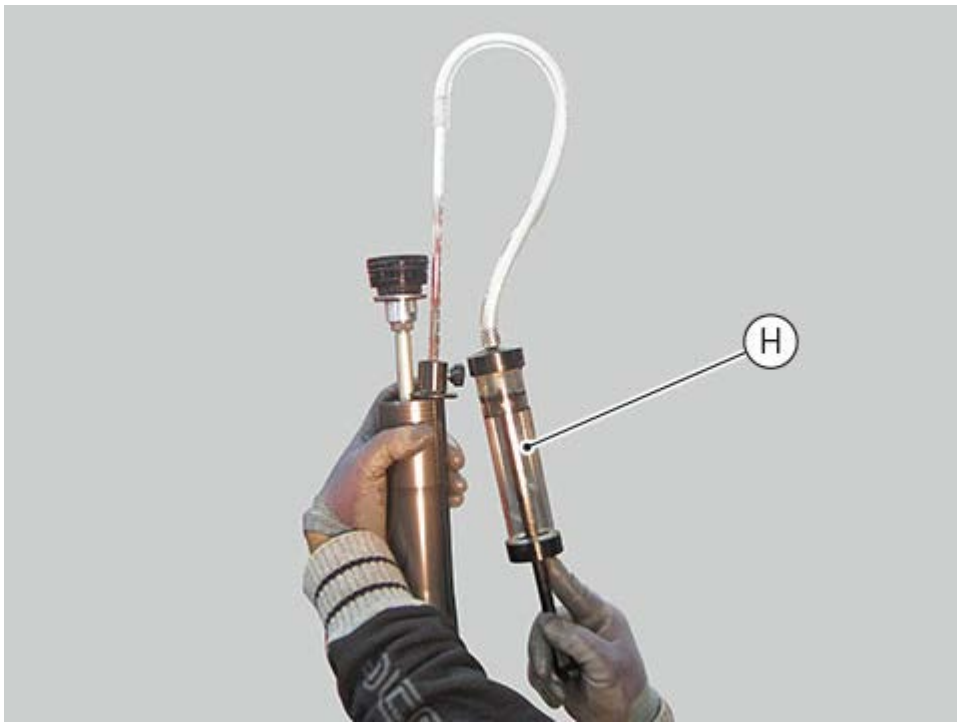
Tighten the damper rod spacer using tool **E** part no.**887134485** to a torque of 90 Nm ± 10%.

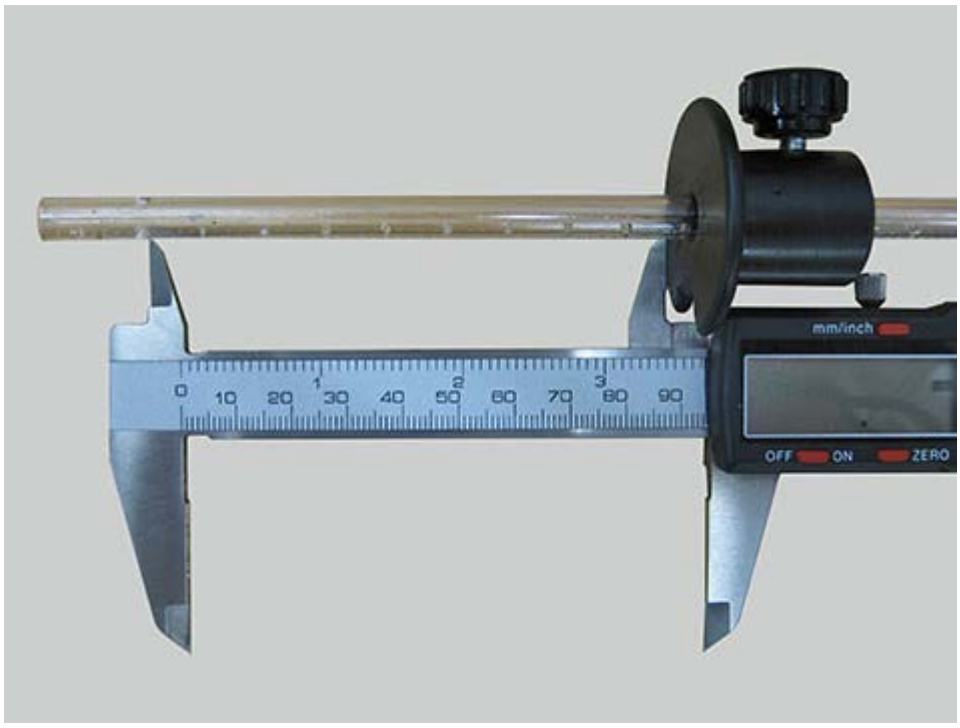


Fit tool **G** part no.**887134486** on the fork leg and push it fully home between fork leg bottom end (15) and outer sleeve (1).

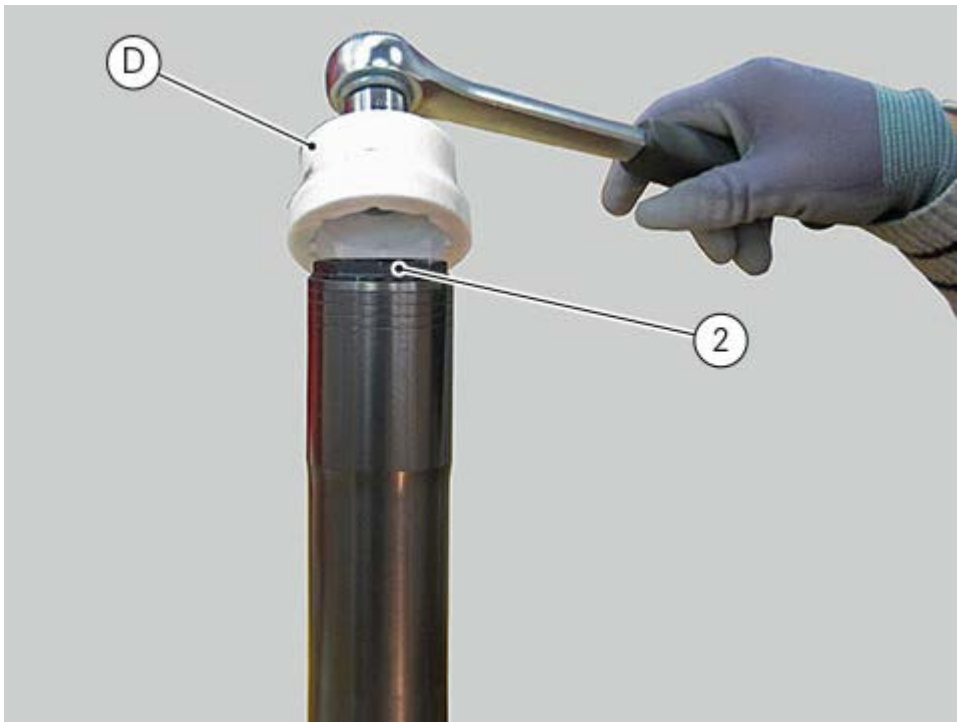


Operate the damper rod unit many times, so as to remove any air bubbles produced during fitting and top up with some cc of fluid in both legs.
Restore the correct oil level value by siphoning the oil excess with tool **H** part no.**887134486**until you reach an air column value of 95 mm.

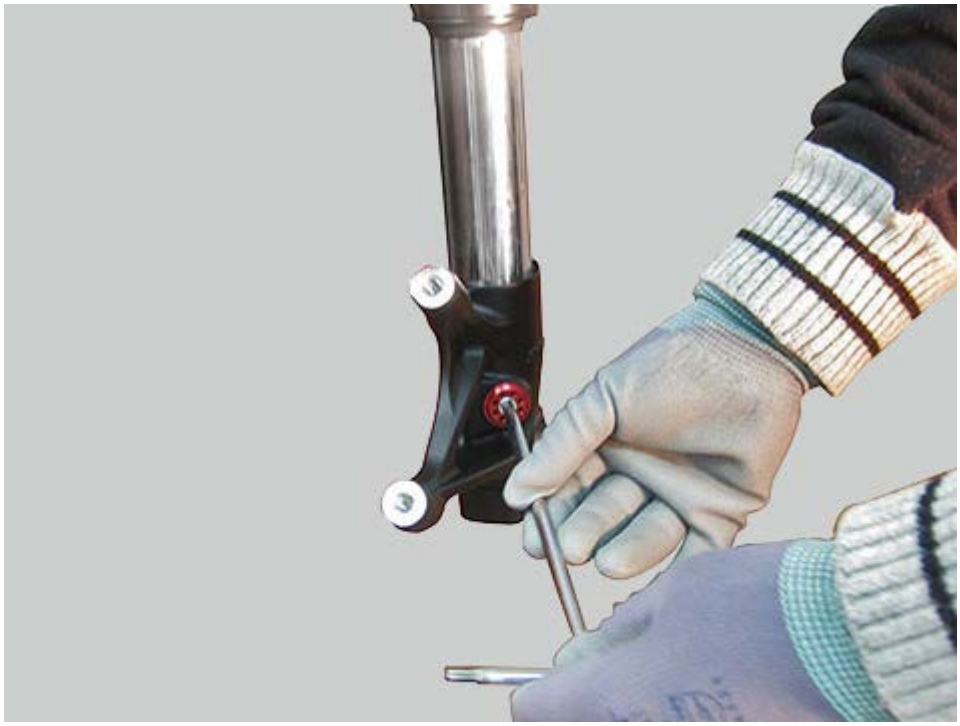




Tighten fork outer plug (2), using tool **D** part no. **887134487** to a torque of 35 Nm ± 10%.



Restore the preload value, previously measured.



Fit the fork legs in the plates.
Refit the forks on the vehicle (Refitting the front fork).

Changing the fork fluid

To change the fork fluid, refer to "Scheduled maintenance chart" and read the procedure under "Overhauling the front fork".

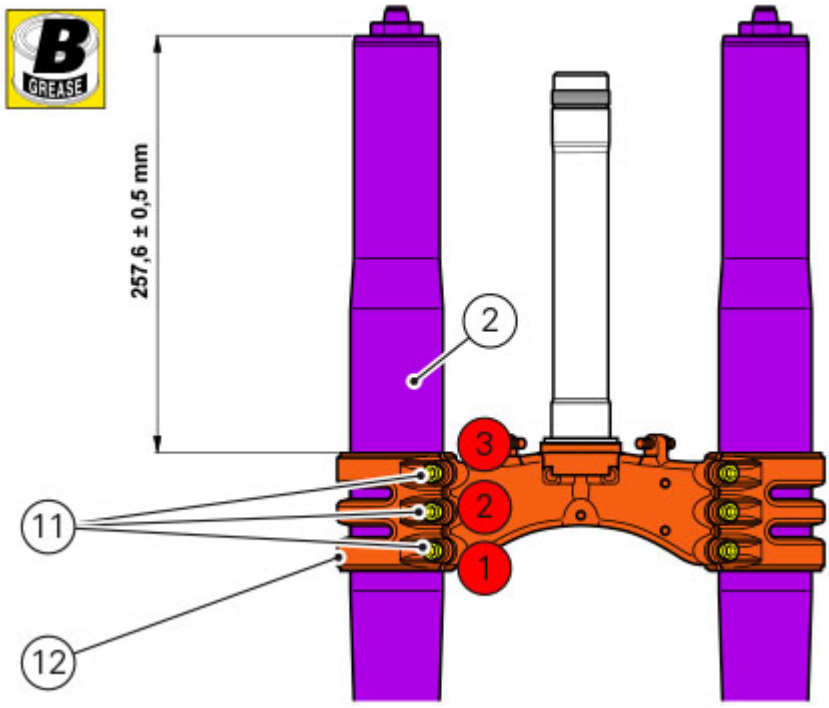
Refitting the front fork

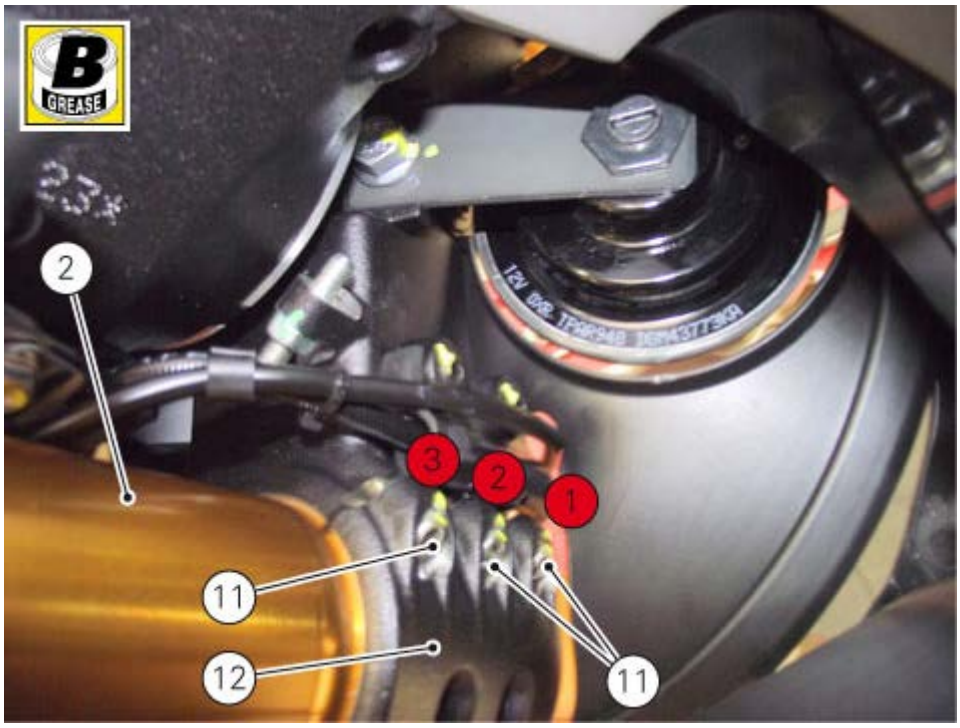
Refit the fork legs (2), positioning them at the height shown in the figure relative to the surface of the bottom yoke (12).

Warning
The difference in height between the two fork legs must be no greater than 0.1 mm.

Note
For a correct refitting, the writings on the fork sleeve caps must be facing as shown in the figure.

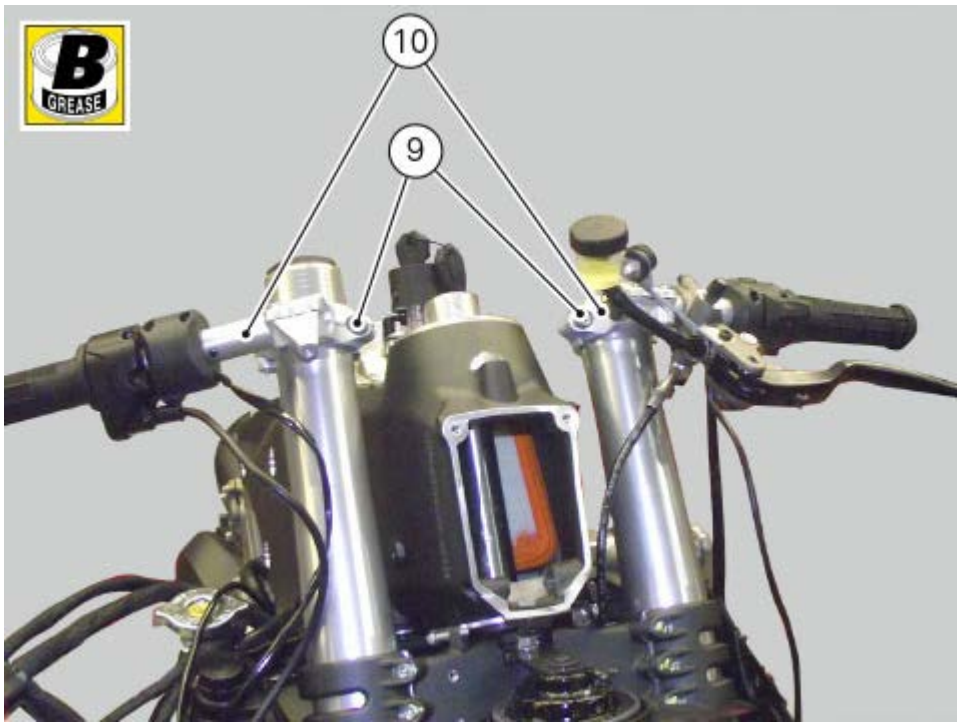
Smear screws (11) with specified grease.
Fasten the fork legs (11) by tightening the screws to 8 Nm ± 5%, following a 1-2-3 sequence.



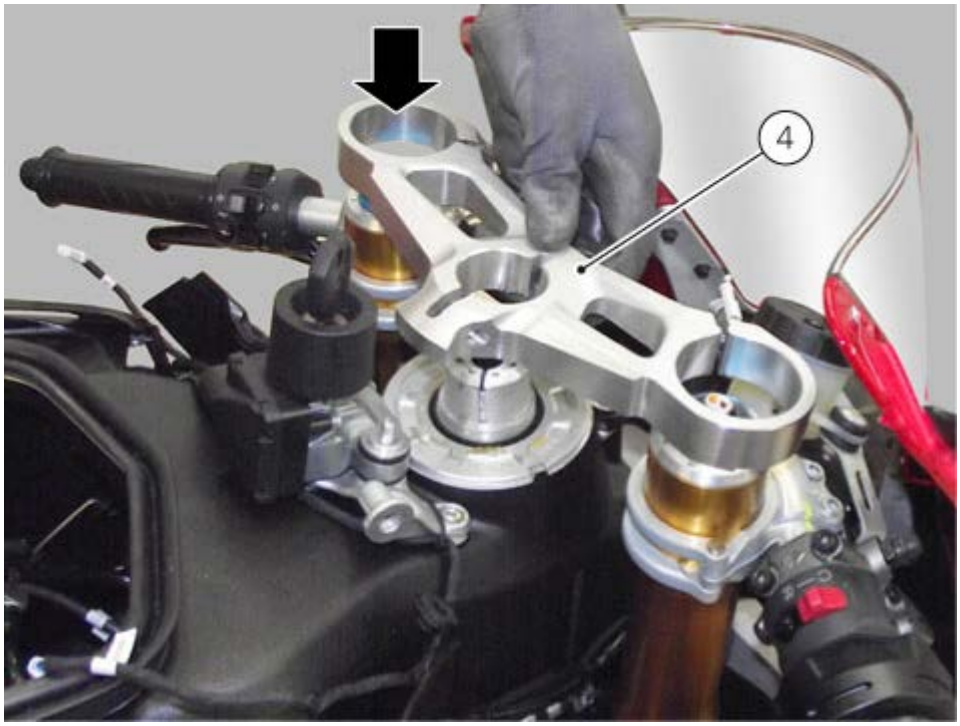


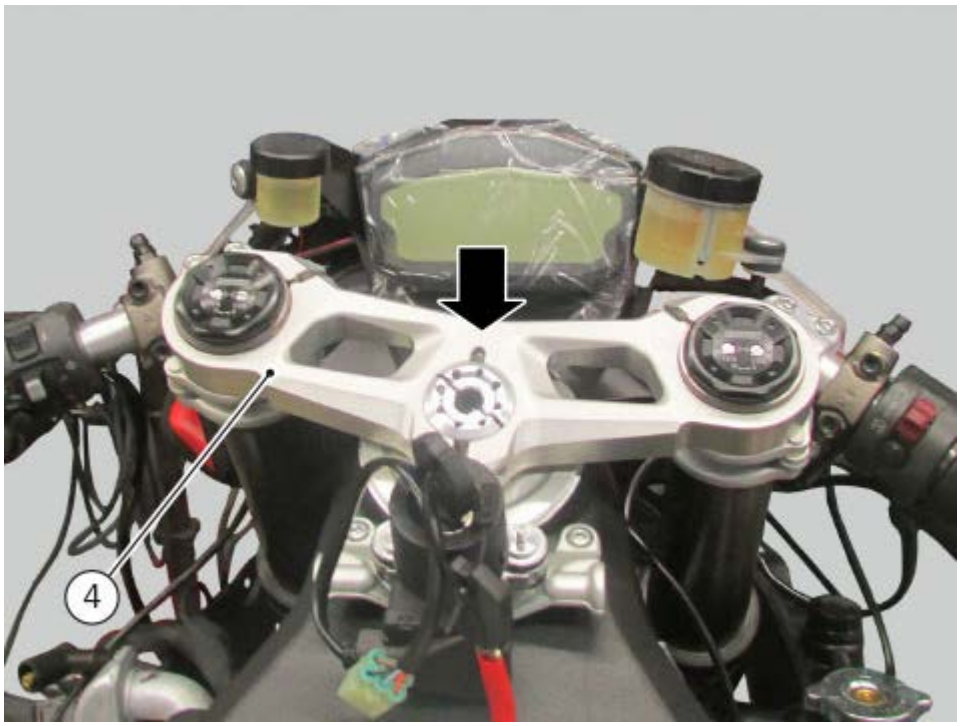
Set the handlebars onto the fork legs.

Smear screws (9) with specified grease.
Tighten the screws (9) to a torque of 22 Nm ± 5% to fasten handlebars (10).

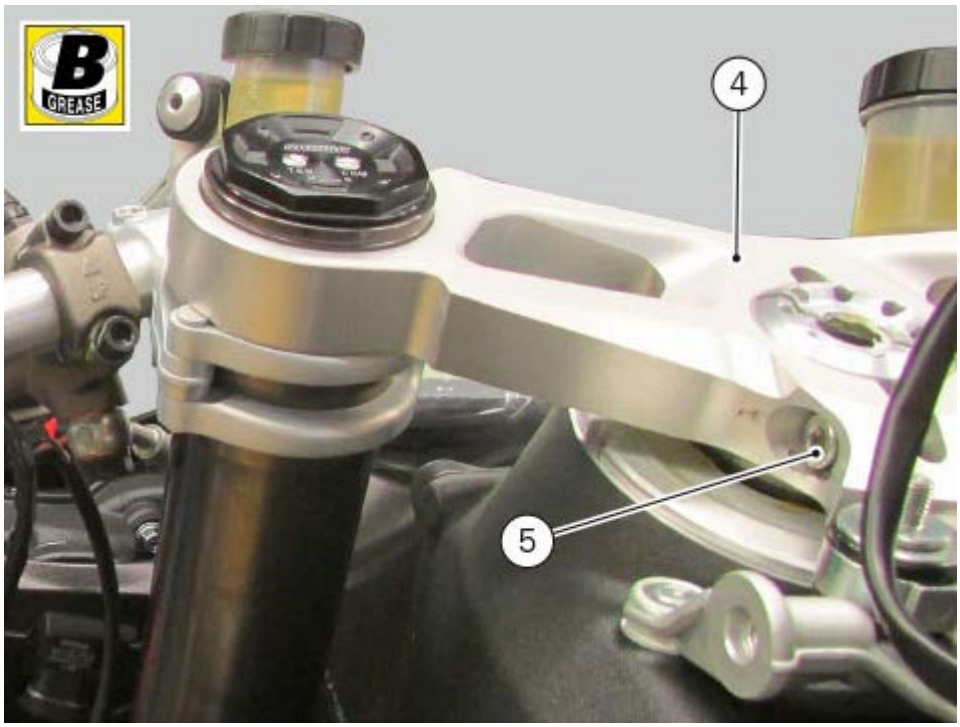


Fit the steering head (4) on the motorcycle.

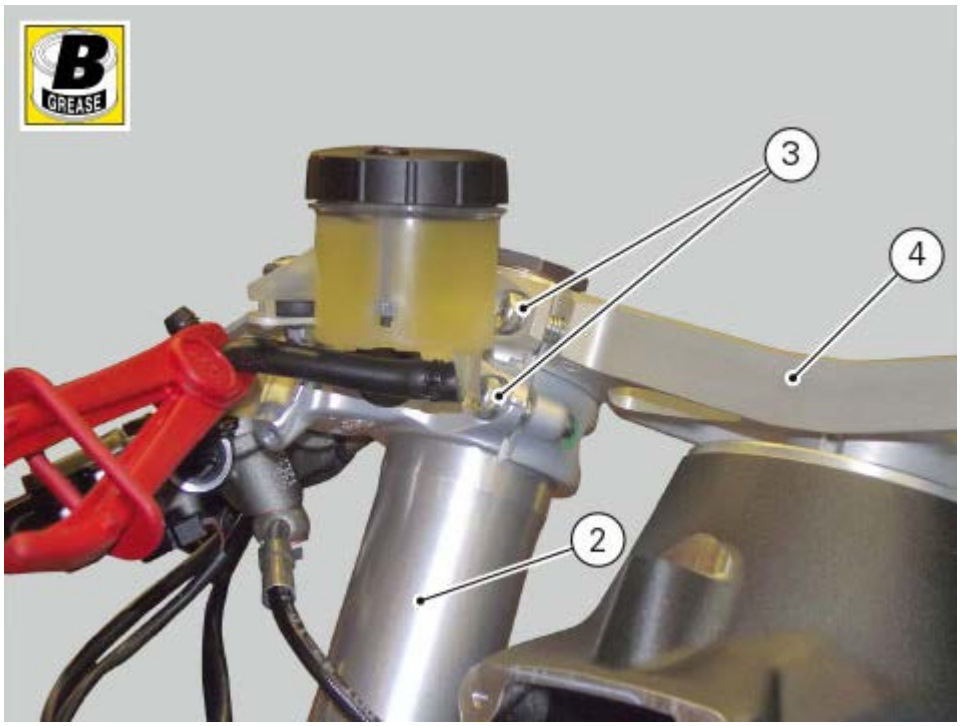


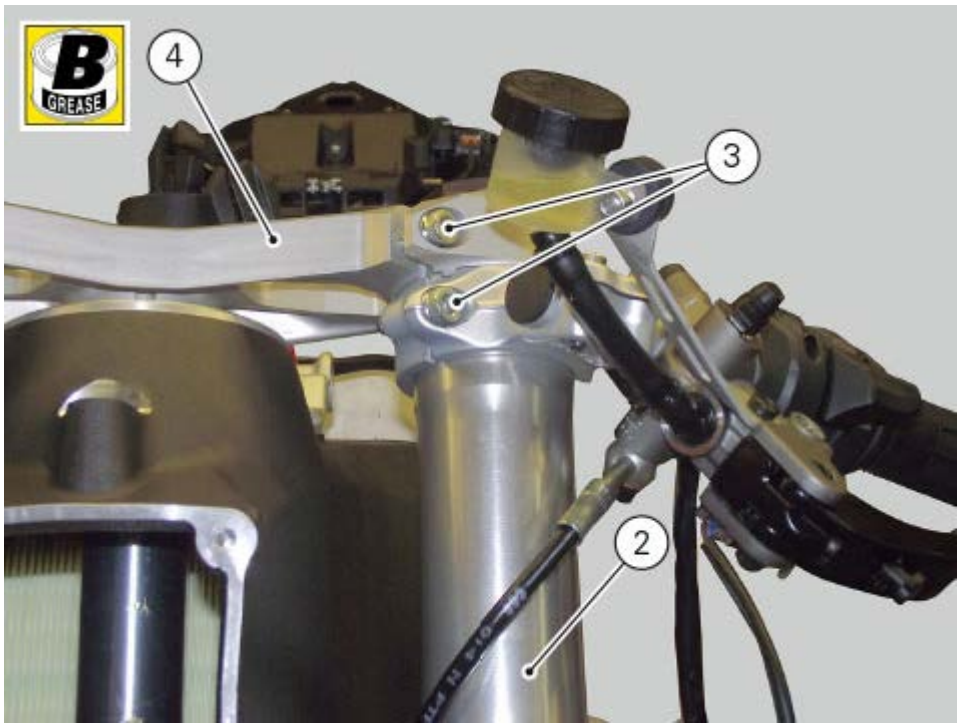


Apply recommended grease to the screw (5).
Start screw (5) retaining steering head (4) and tighten it to 22 Nm ± 5%.



Smear screws (3) with specified grease.
Start the screws (3) holding the steering head (4) to the fork legs (2). Tighten screws (3) to a torque of 22 Nm ± 5%.



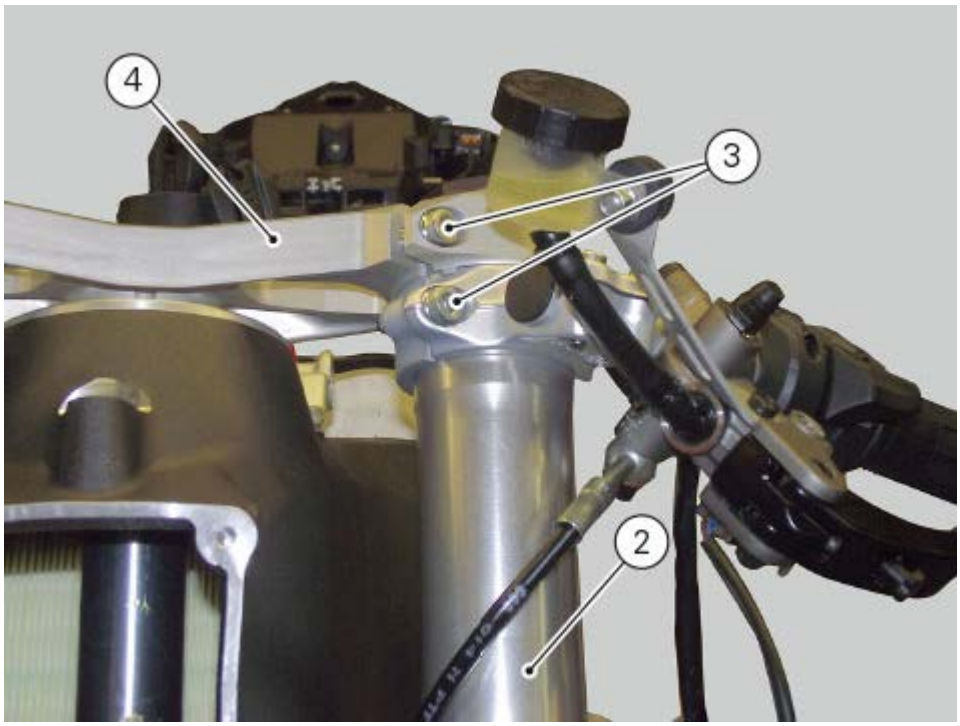


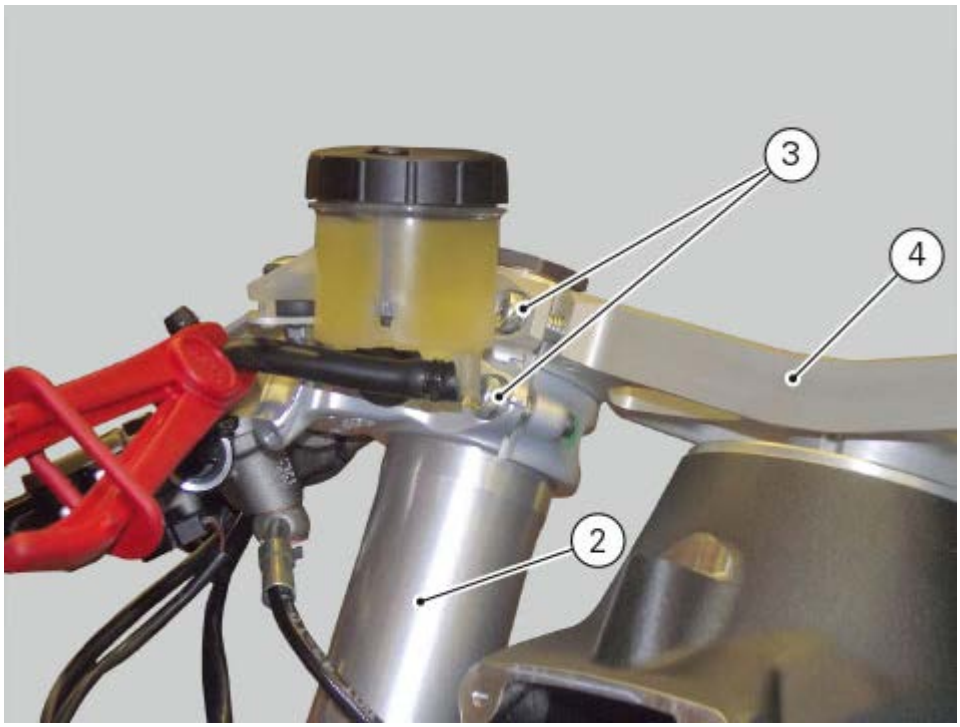
Refit the front wheel (Refitting the front wheel).
Refit the front mudguard (Refitting the front mudguard).
Refit the front brake callipers (Refitting the front brake system).

Removing the front fork

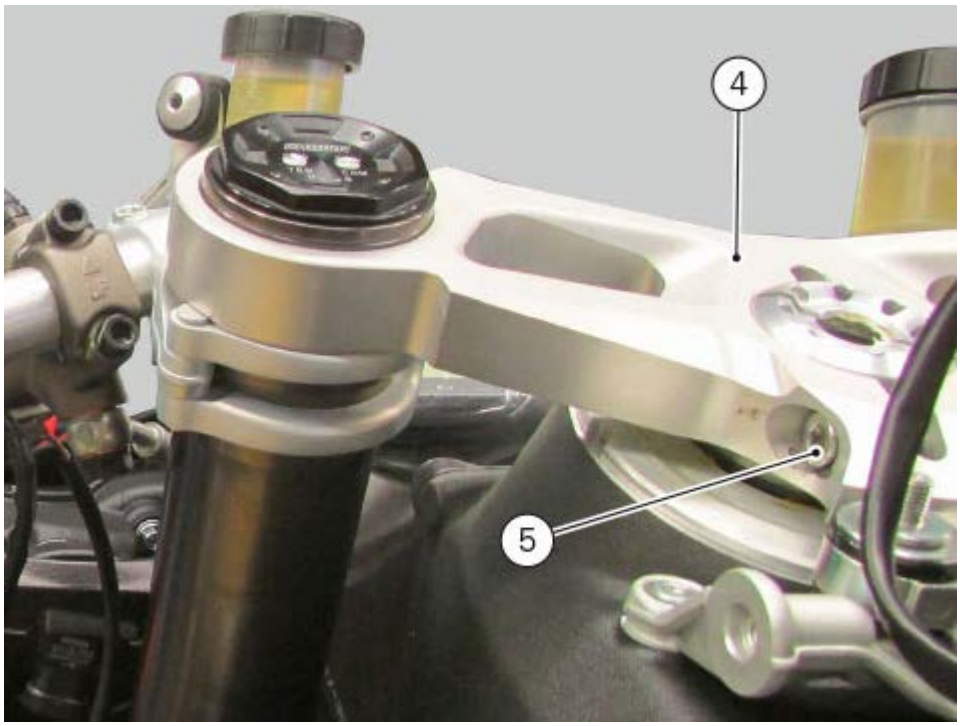
Remove the front brake callipers (Removing the front brake system).
Remove the front mudguard (Removing the front mudguard).
Remove the front wheel (Removing the front wheel).

Loosen the screws (3) holding the fork legs (2) to the steering head (4).

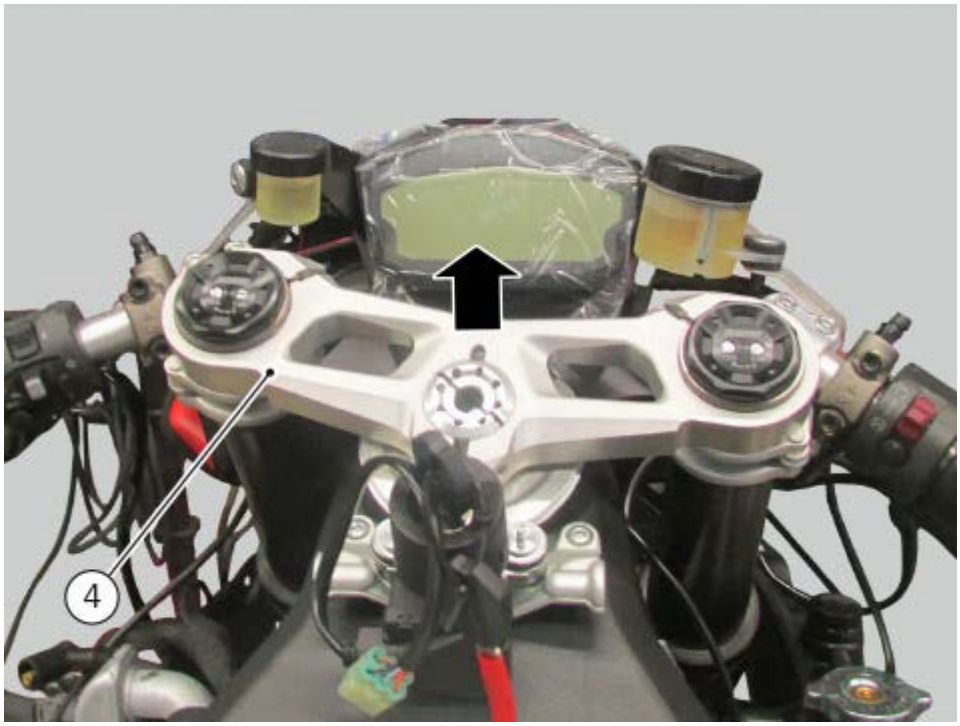




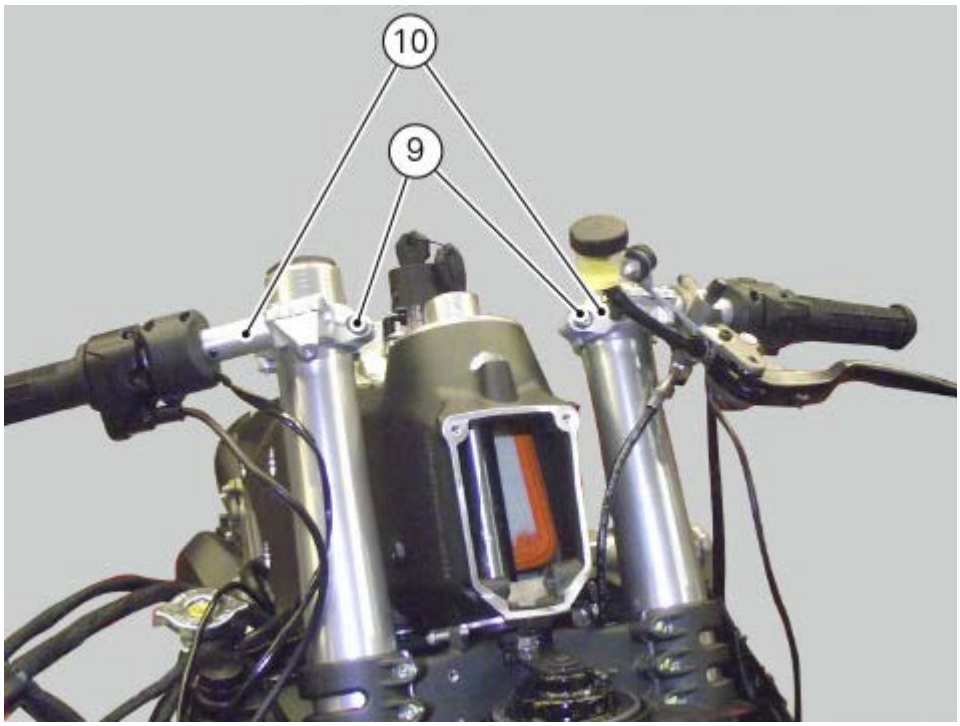
Loosen screw (5) retaining the steering head (4) to the steering tube.



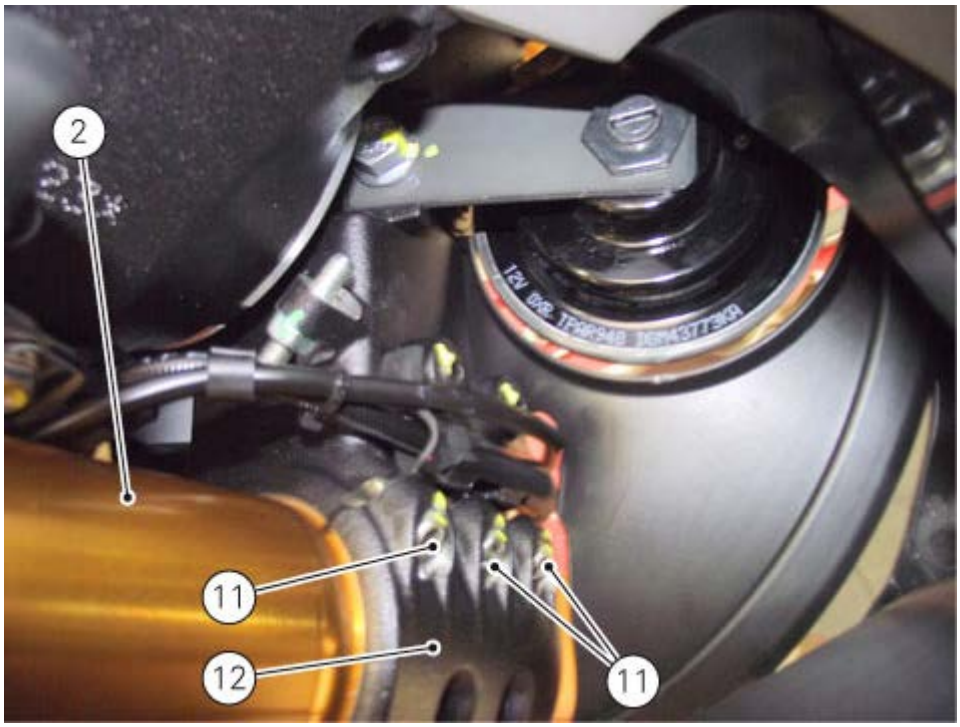
Remove the steering head (4) by pulling up.

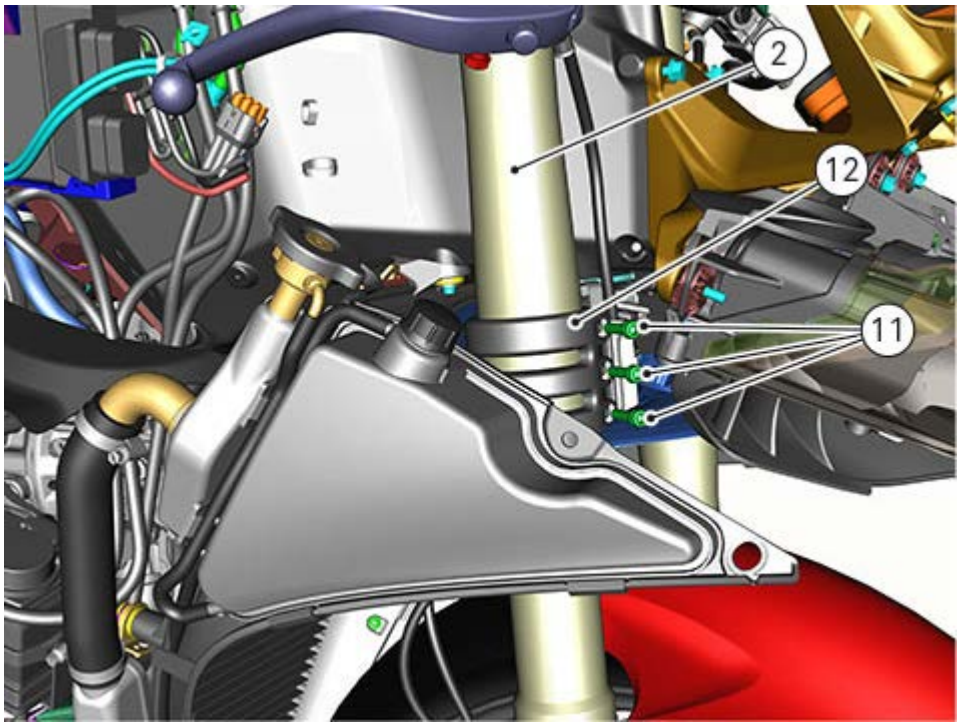


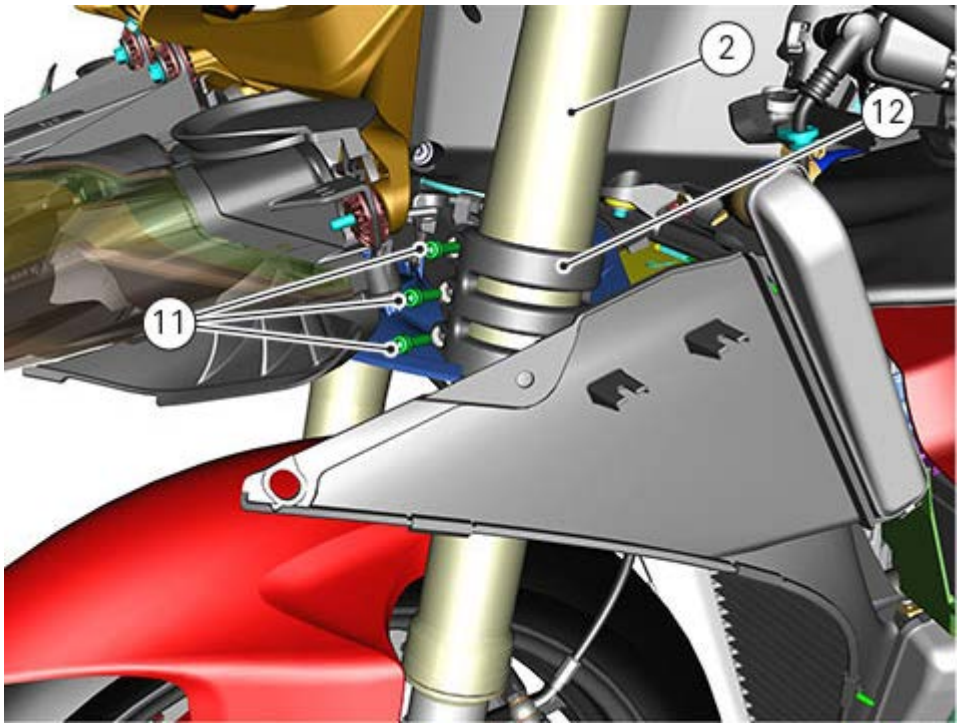
Loosen screws (9) retaining handlebars (10).
Remove handlebars (10) from the forks, without disconnecting the handlebar components from the system.



Loosen the six screws (11) retaining the fork legs (2) to bottom yoke (12): there are three screws (11) per leg.







Important

Be careful when loosening the lower screws since forks could fall down.

Slide the fork legs downwards to carry out to all the necessary overhaul operations.

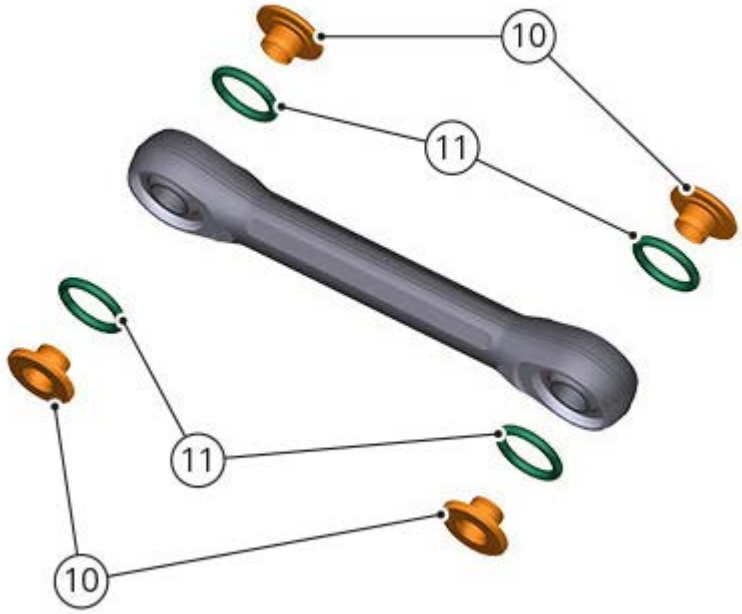
Changing the fork fluid

To change the fork fluid, refer to "Scheduled maintenance chart" and read the procedure under "Overhauling the front fork".

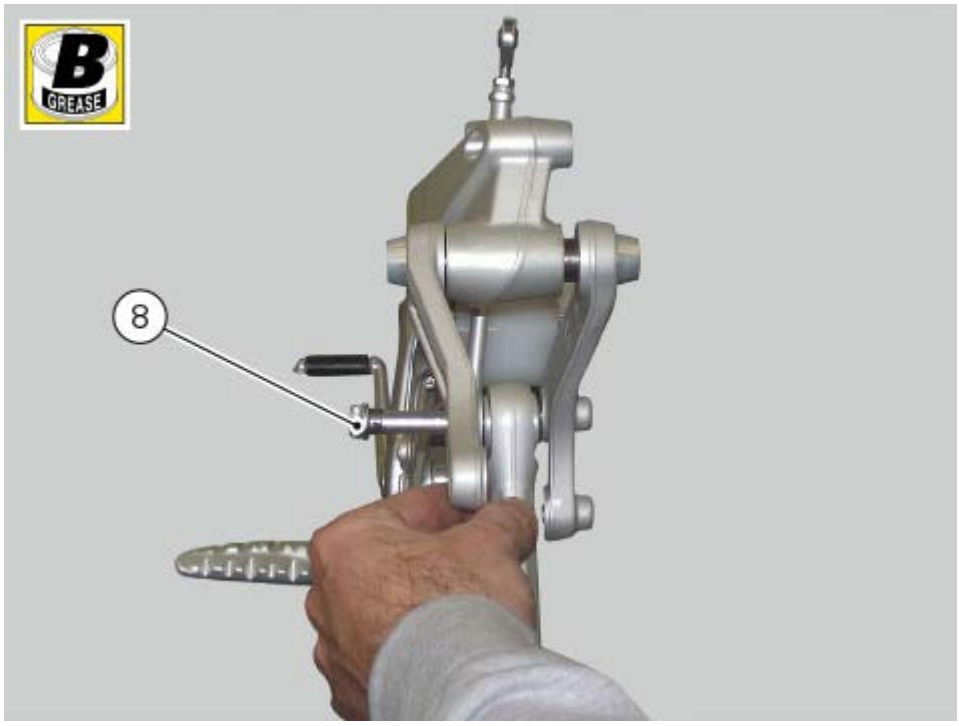
Refitting the rocker arms-linkage

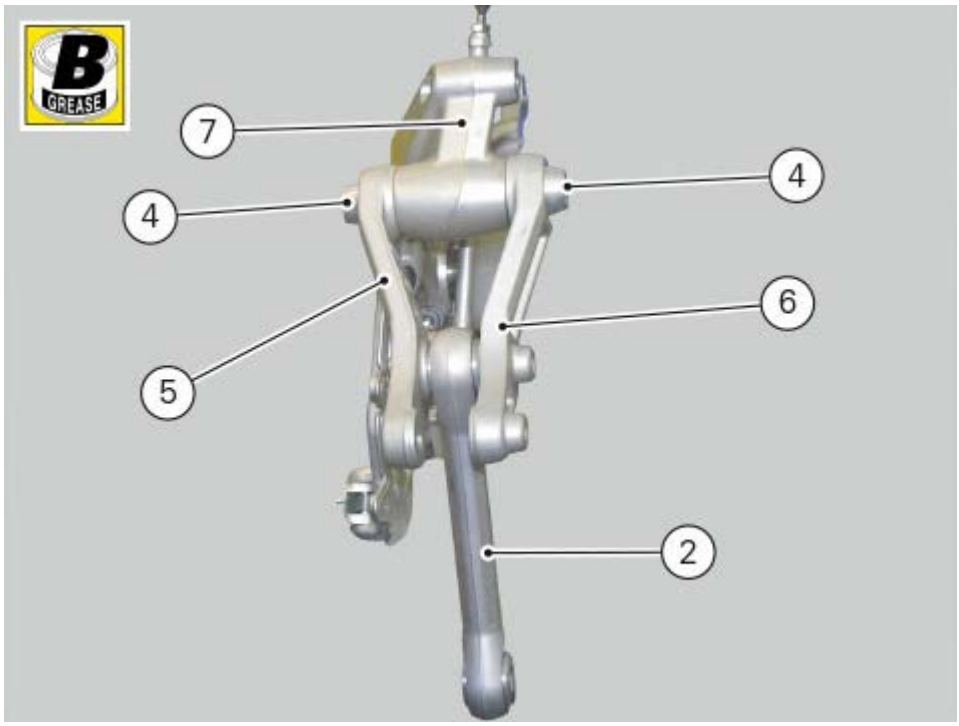
If linkage (2) was disassembled, fit the spacers with collar (10) fully home, on linkage (2), setting O-rings (11) between spacers and linkage.

Warning
While driving the spacers (10), make sure that O-rings (11) are not pinched or damaged.



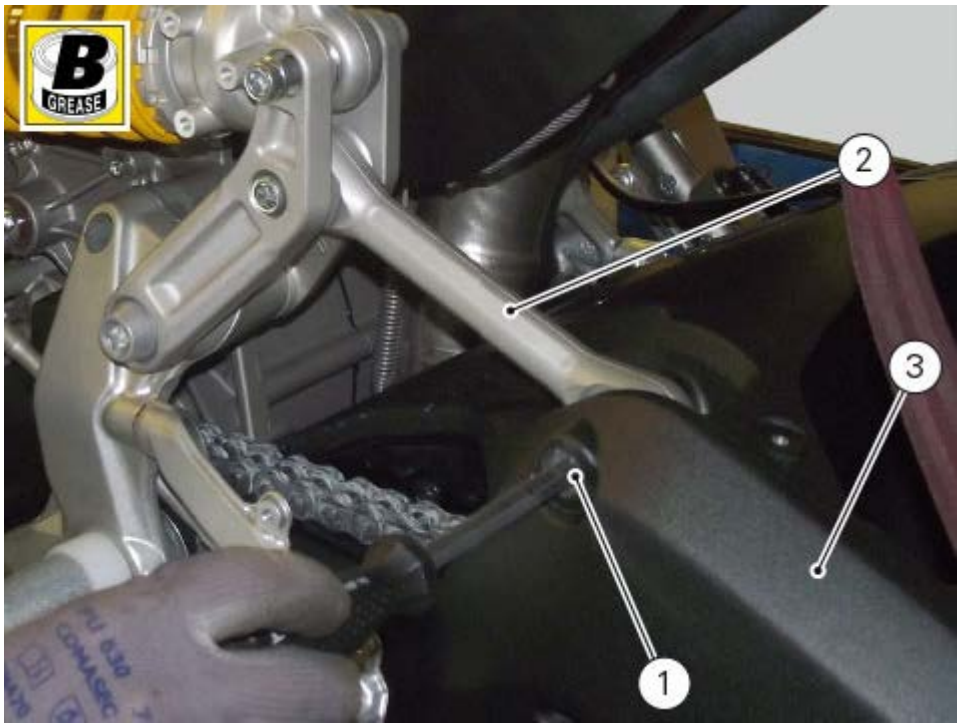
Fit linkage (2) to the rocker arm halves (5) and (6). Apply recommended grease to the screw thread (8). Tighten the screw (8) to a torque of 45 Nm ± 5%.





Set rocker arm halves (5) and (6) with linkage (2) on the left-hand footpeg assembly (7) and on swinging arm (3).
Apply the recommended grease to the screws (4). Start the screws (4) retaining the rocker arm to left-hand footpeg assembly (7).

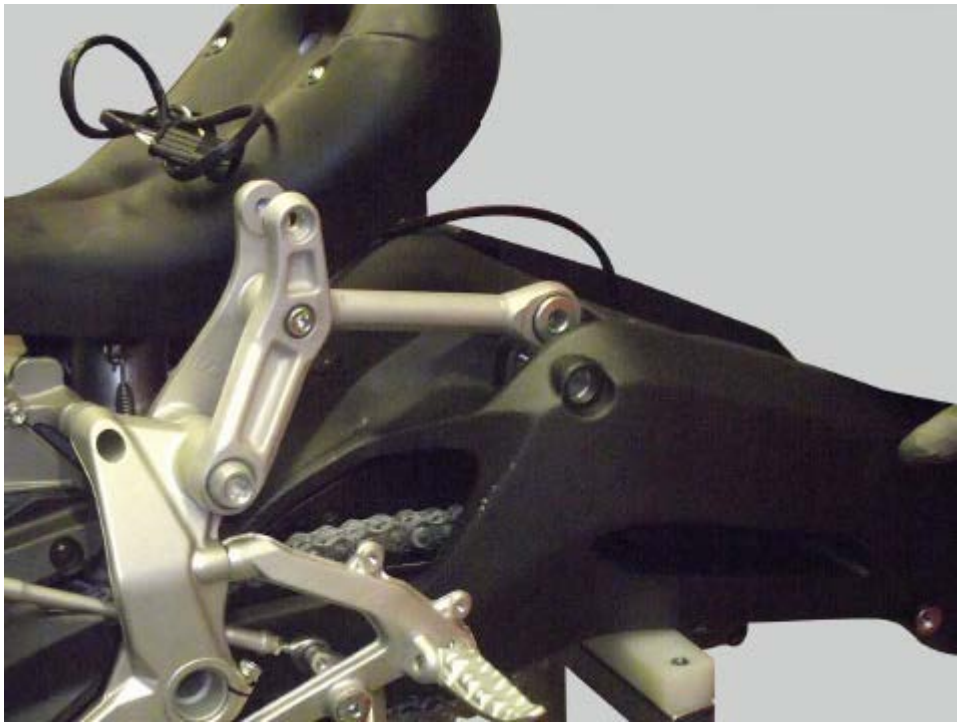
Tighten screws (4) to a torque of 60 Nm ± 5%.
Tighten the screw (1) to a torque of 45 Nm ± 5%.



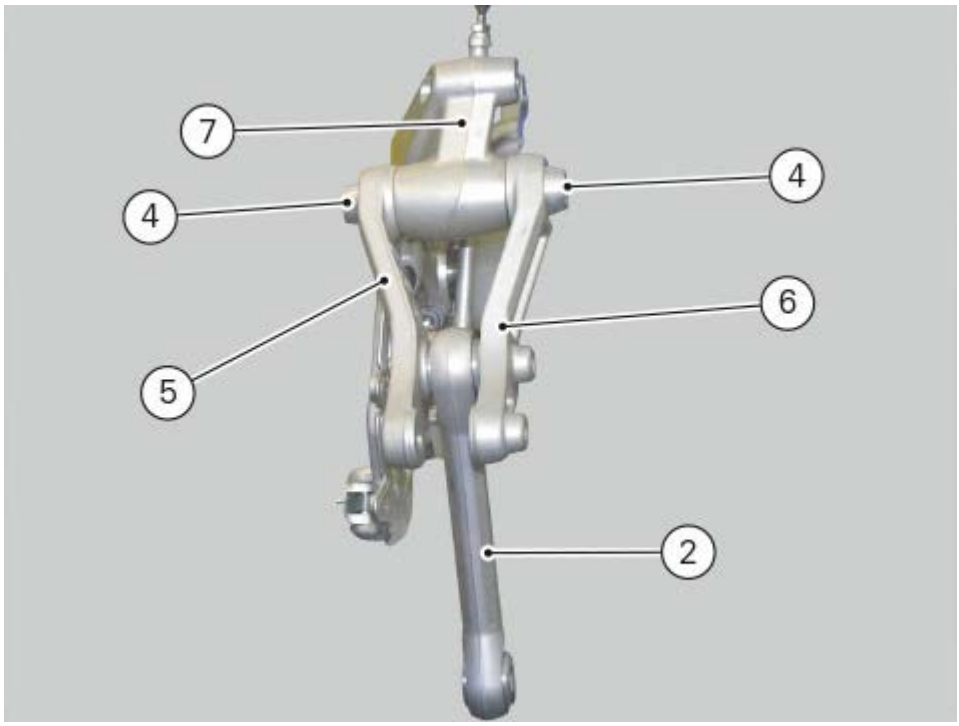
Refit the rear shock absorber (Refitting the rear suspension).
Remove the supports for the rear subframe and the swinging arm.
Refit the fairings (Refitting the side fairings).

Removing the rocker arms-linkage

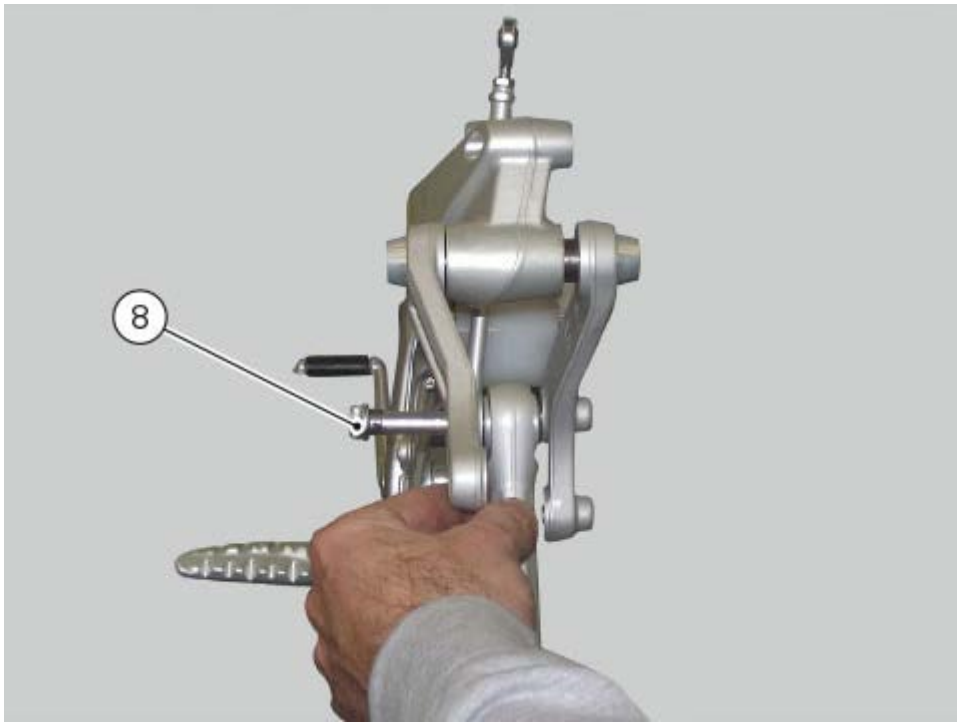
Remove the fairings (Removing the side fairings).
Duly support the rear subframe and the swinging arm.
The assembly made of shock absorber-rocker arms-linkage supports the whole rear end.
Remove the rear shock absorber (Removing the rear shock absorber).
Loosen screw (1) securing linkage (2) to swinging arm (3).

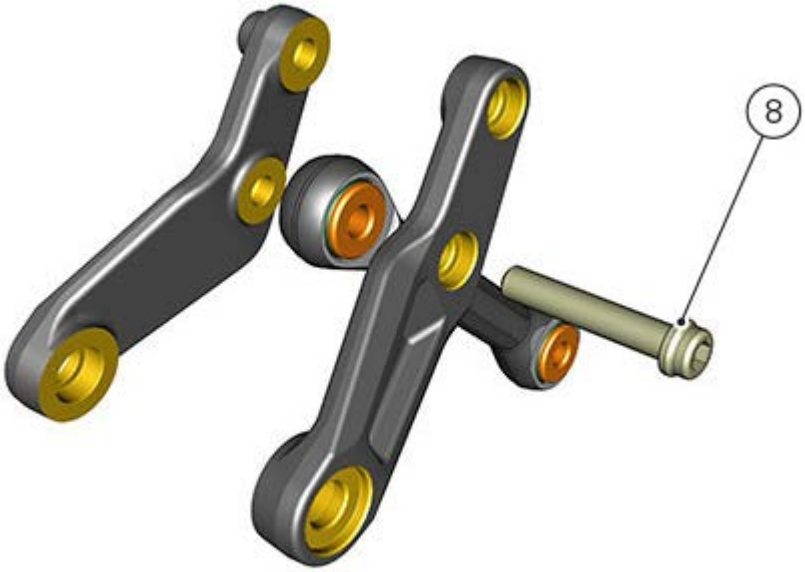


Loosen the screws (4) fastening the left (5) and right (6) rocker arm halves to the left-hand side footpeg assembly (7).
Remove the rocker arm halves (5) and (6), and linkage (2).



Loosen retaining screw (8) to disassemble left (5) and right (6) rocker arm halves from linkage (2).

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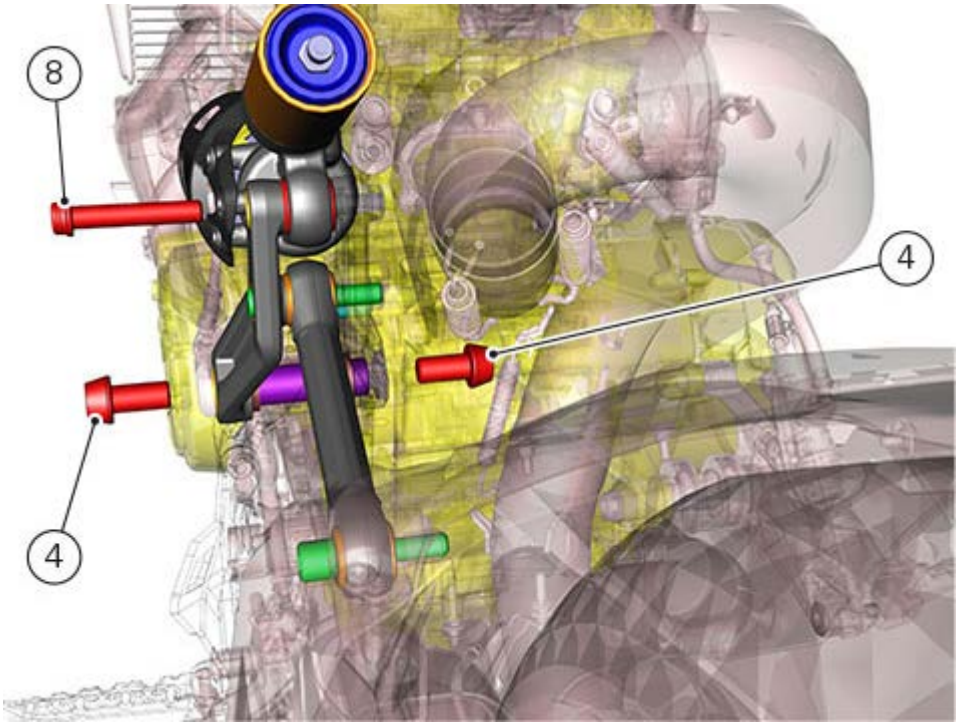

8
4
4

Refitting the rear shock absorber

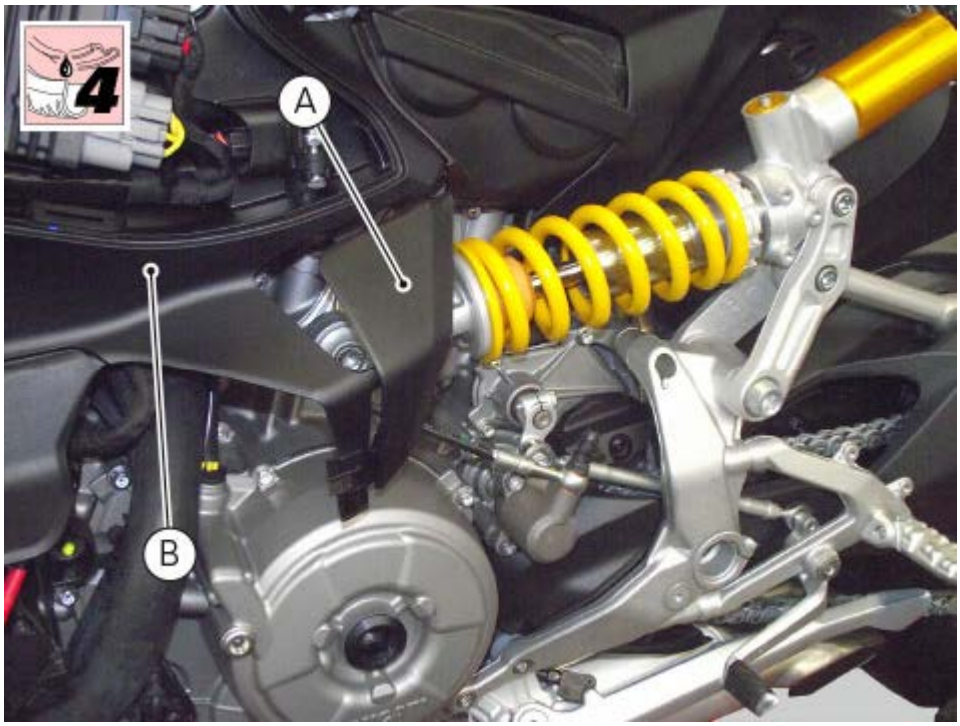
Fit the rear shock absorber on the rocker arm.
Smear recommended grease on screw (2) retaining shock absorber to rocker arm and start screw (2).

Smear recommended grease on screw (1) retaining rear shock absorber to crankcase and start screw (1).

Tighten screws (1) and (2) to a torque of ± 45 Nm 5%.

Fit the shock absorber cover (A) and first insert tab in vibration damper on electric component left-hand support (B). Then move cover down, fully home. Fit cover (A) pins in vibration dampers on electric component left-hand support (B).

Note
In case of problems when fitting the tab and pins on the vibration dampers, it is recommended to use specified lubricant, and apply some on the tab and pins.

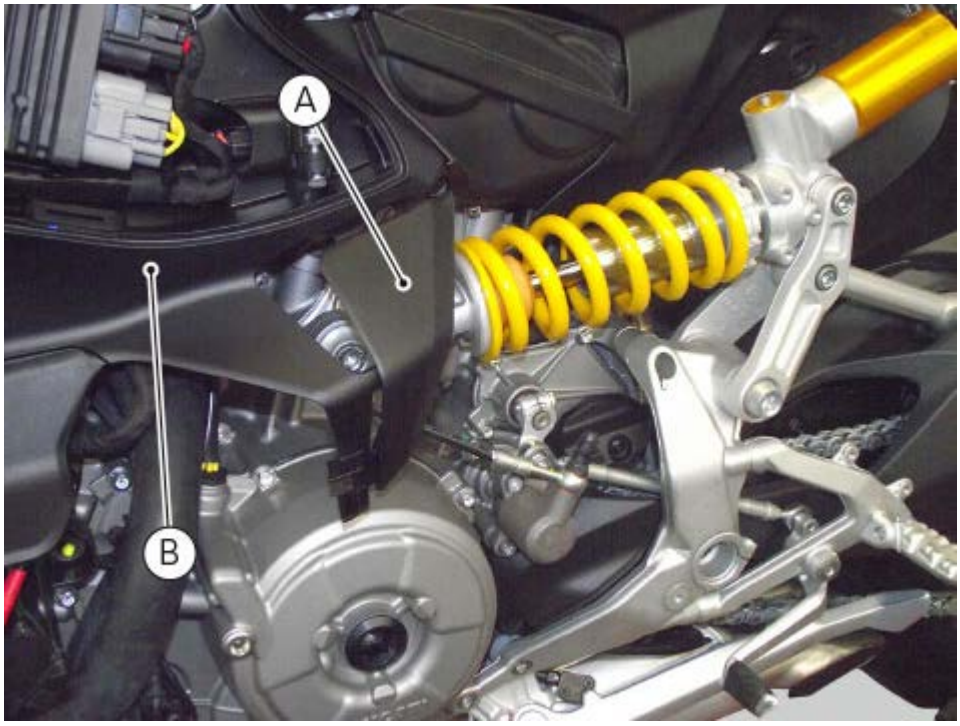


Remove the rear subframe and swinging arm supports.
Refit the fairings (Refitting the side fairings).

Removing the rear shock absorber

Remove the fairings (Removing the side fairings).

Duly support the rear subframe and the swinging arm.
The assembly made of shock absorber and linkage supports the whole rear end.
Remove cover (A) to reach the shock absorber, after releasing its top end from the electric component left-hand support (B) and sliding it down.



Remove the rear shock absorber by loosening screw (1) retaining it to crankcase.

Loosen screw (2) retaining shock absorber to rocker arm.

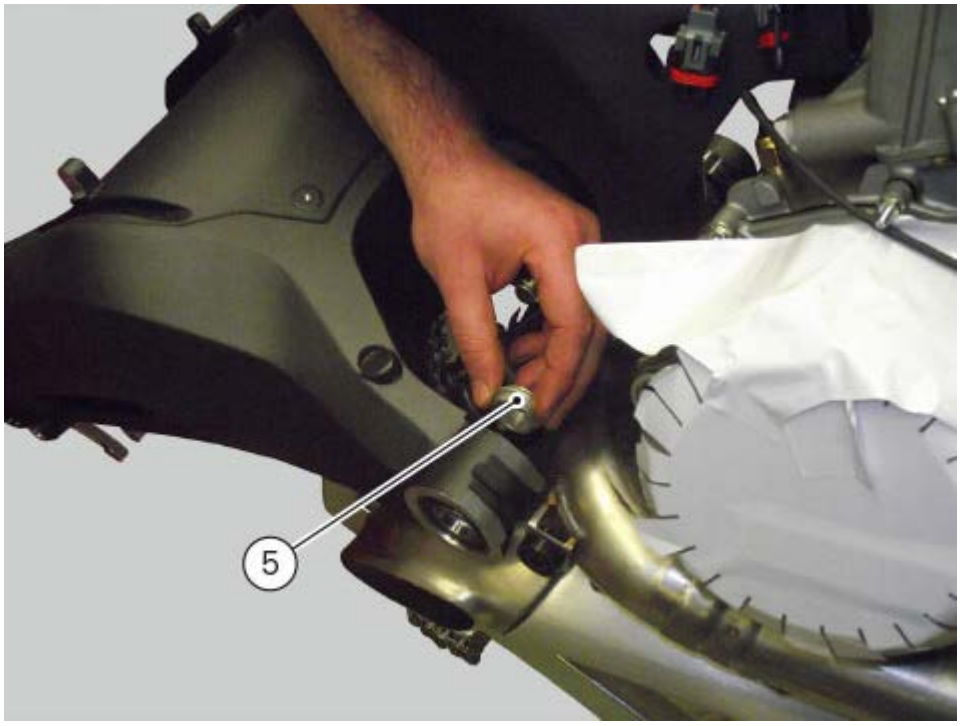

2

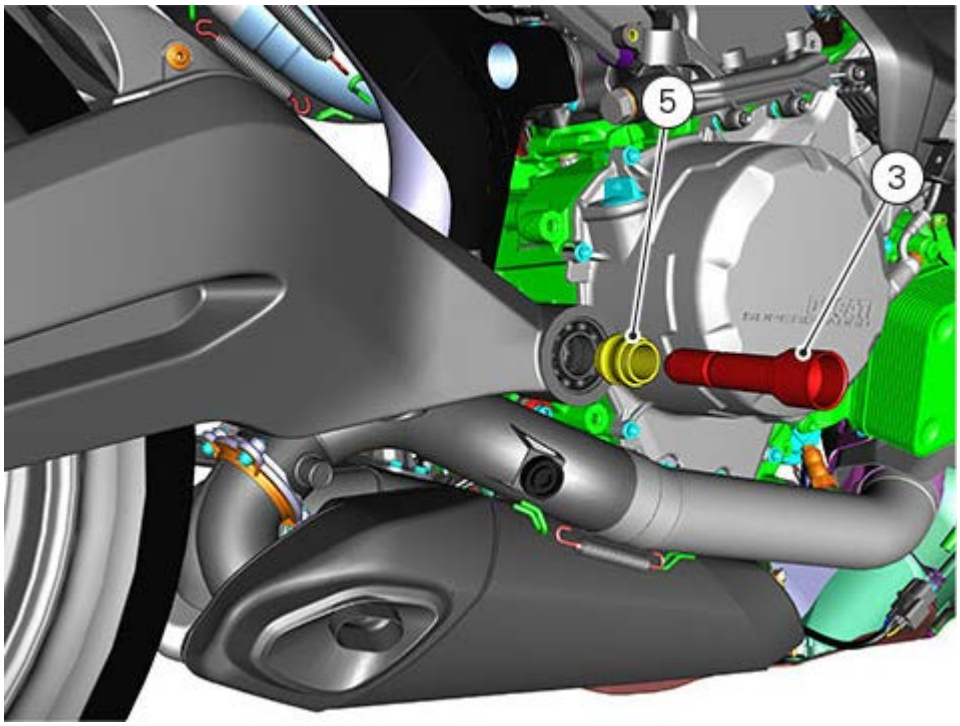
Refitting the swinging arm

Check that the swinging arm is complete with bearings.

Set the swinging arm onto engine block.

Smear recommended grease on right (3) and left (4) swinging arm shafts. Start pins on the swinging arm sides positioning spacer (5) as shown in the figure.
Tighten to a torque of 100 Nm ± 5%.

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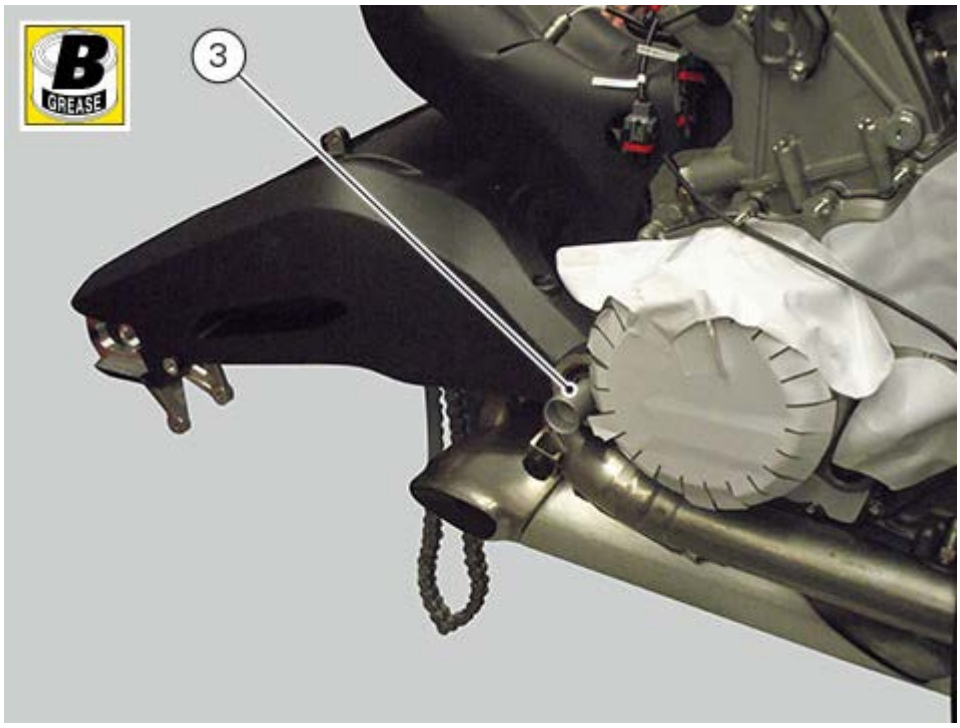
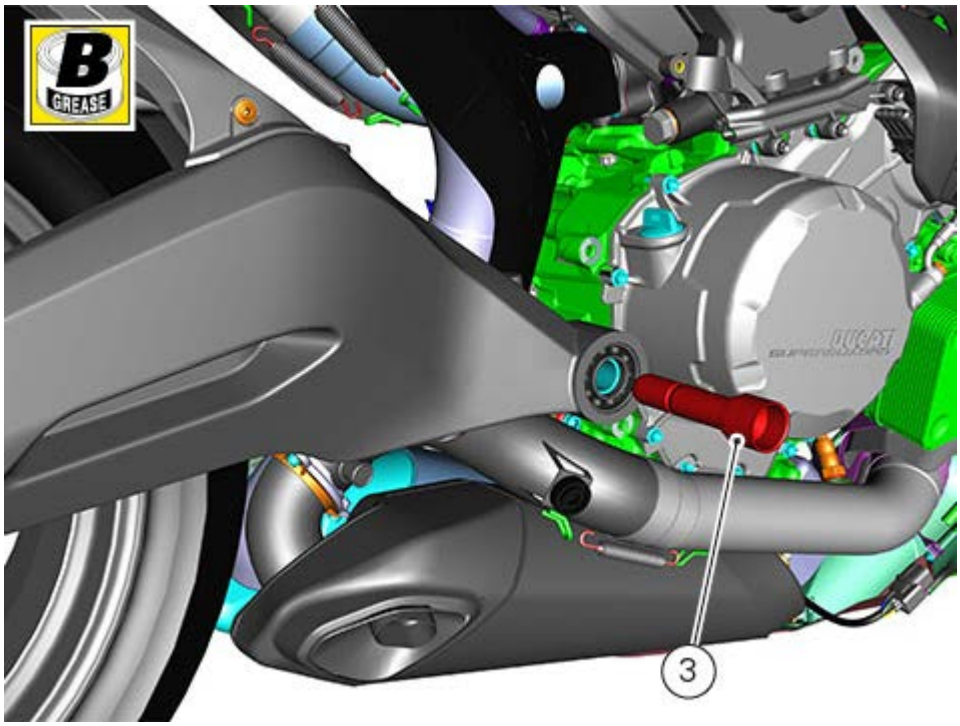
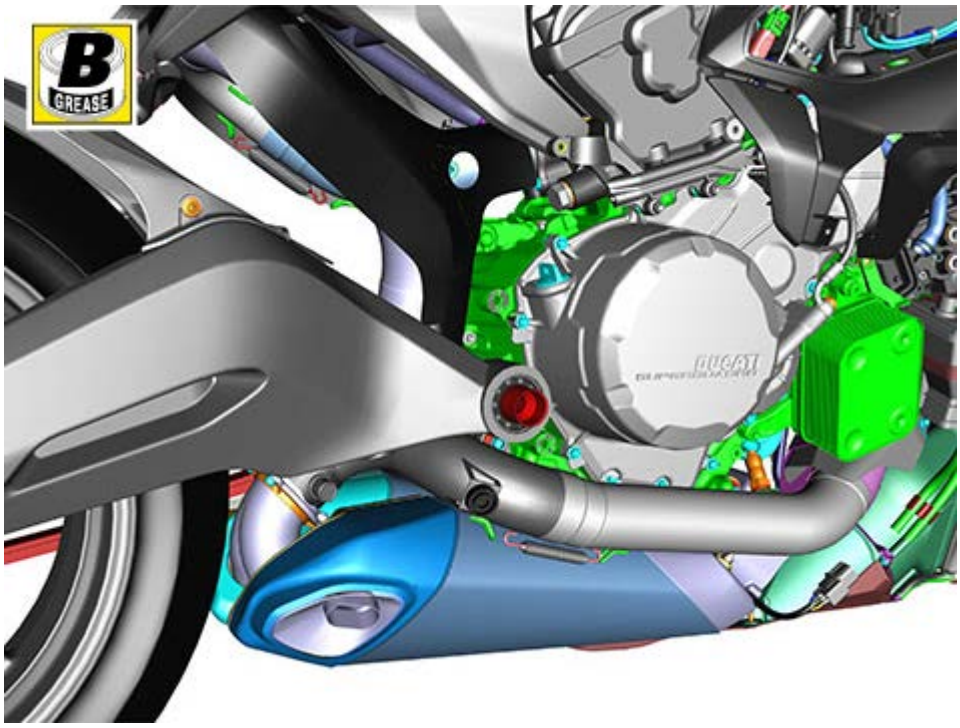

B
GREASE
3


B
GREASE
3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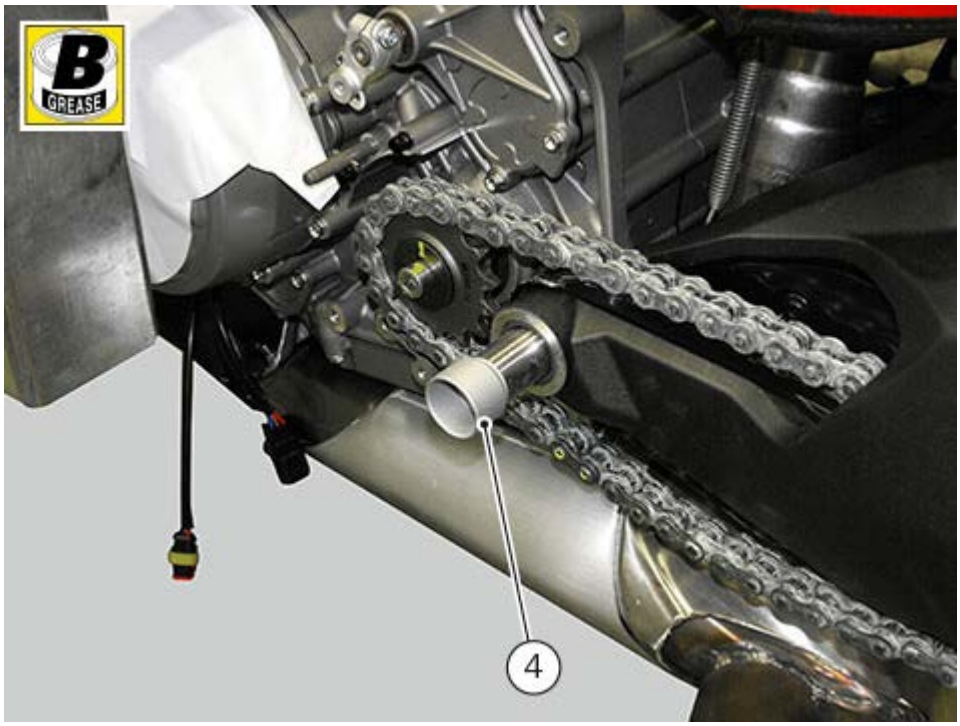
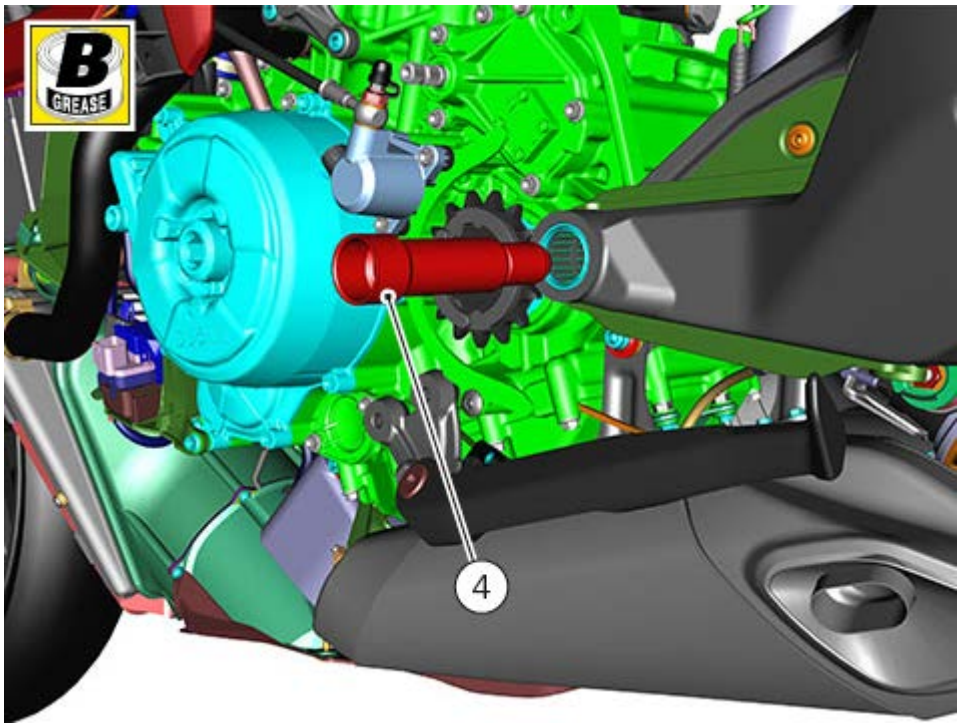
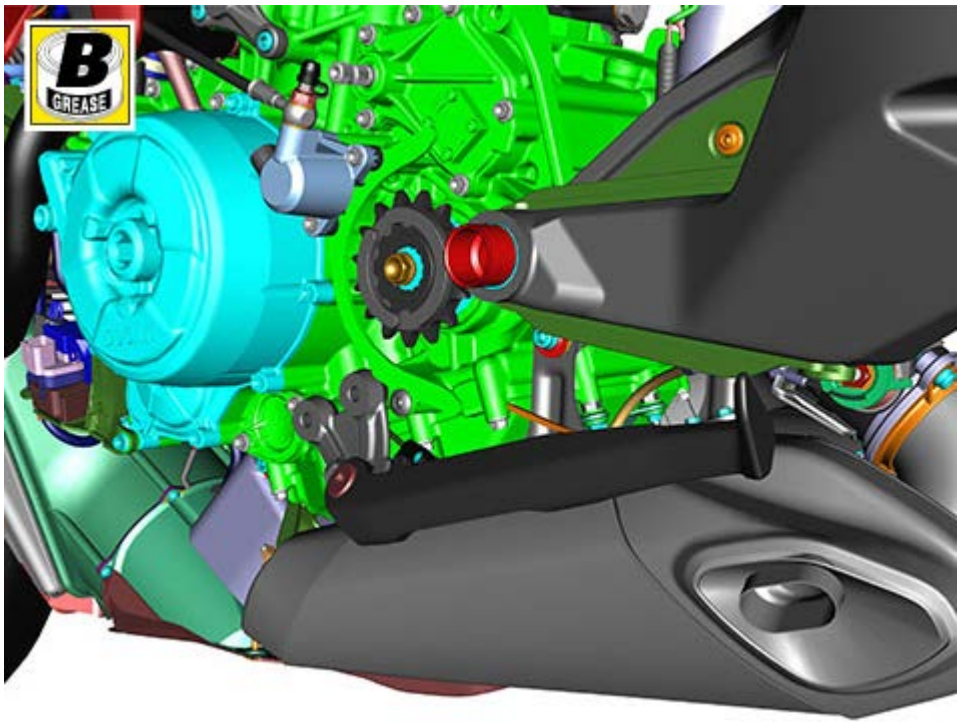
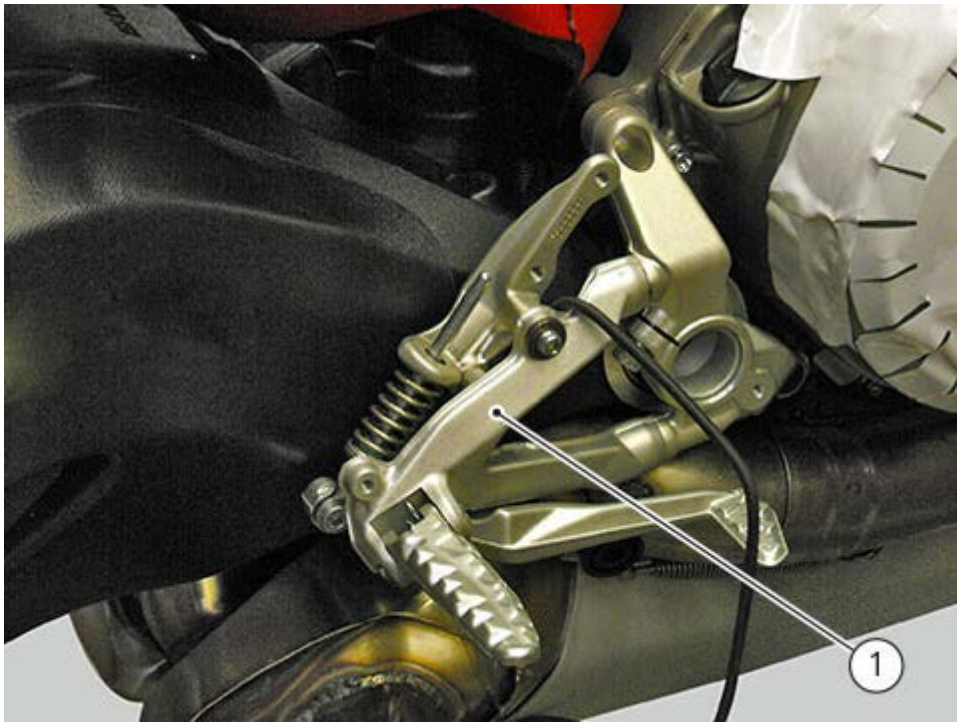
GREASE

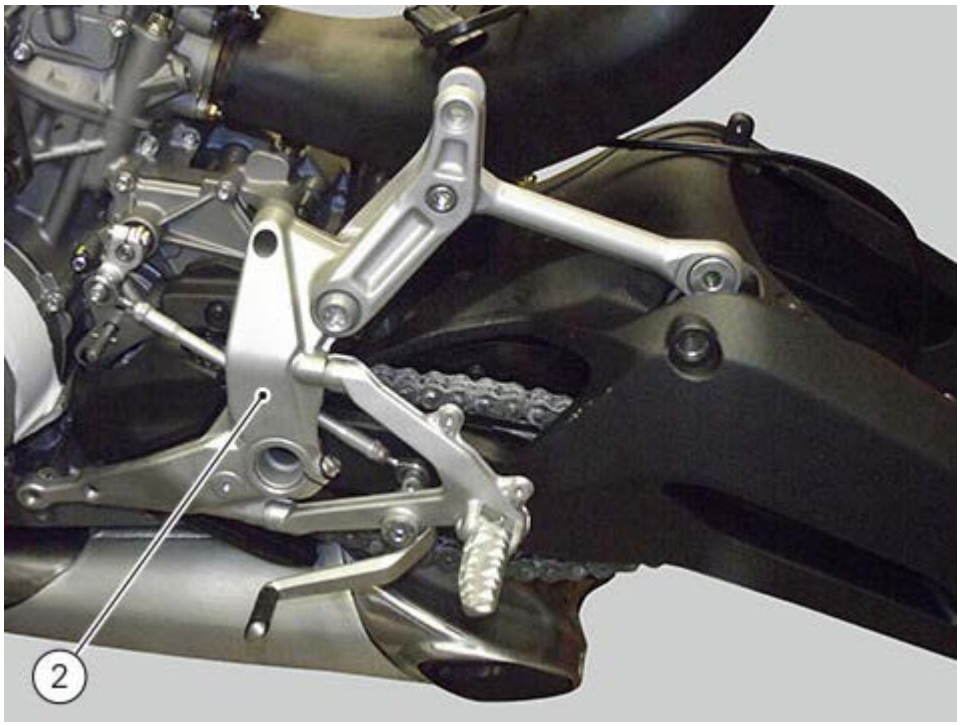

B
GREASE
4


B
GREASE
4



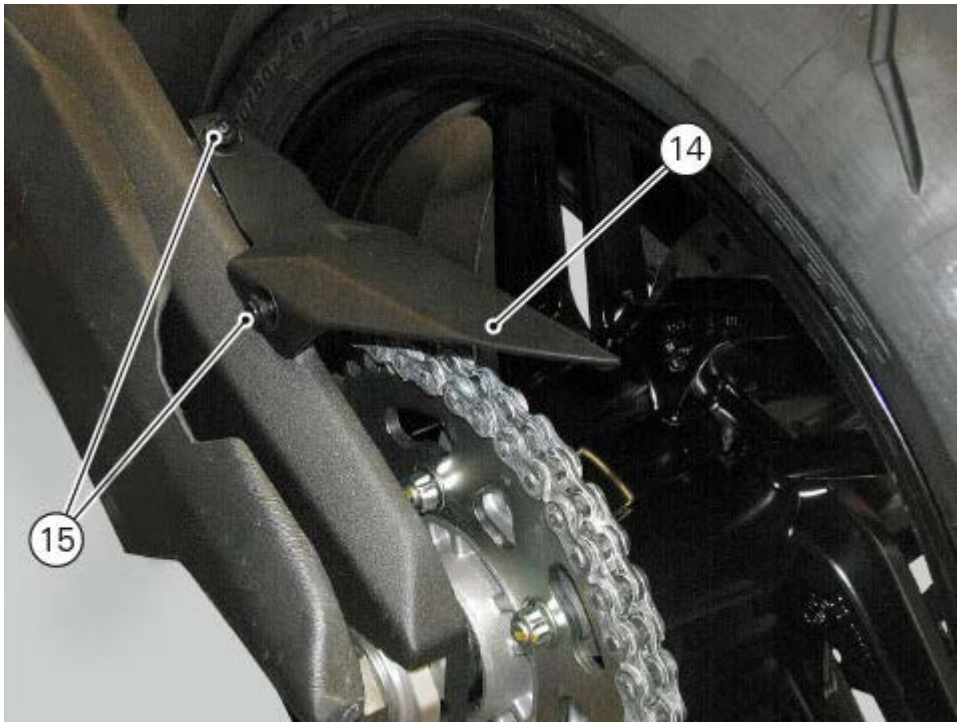
Refit right-hand footpeg holder plate (1) and left-hand footpeg holder plate (2) (Refitting the front footpeg plates).

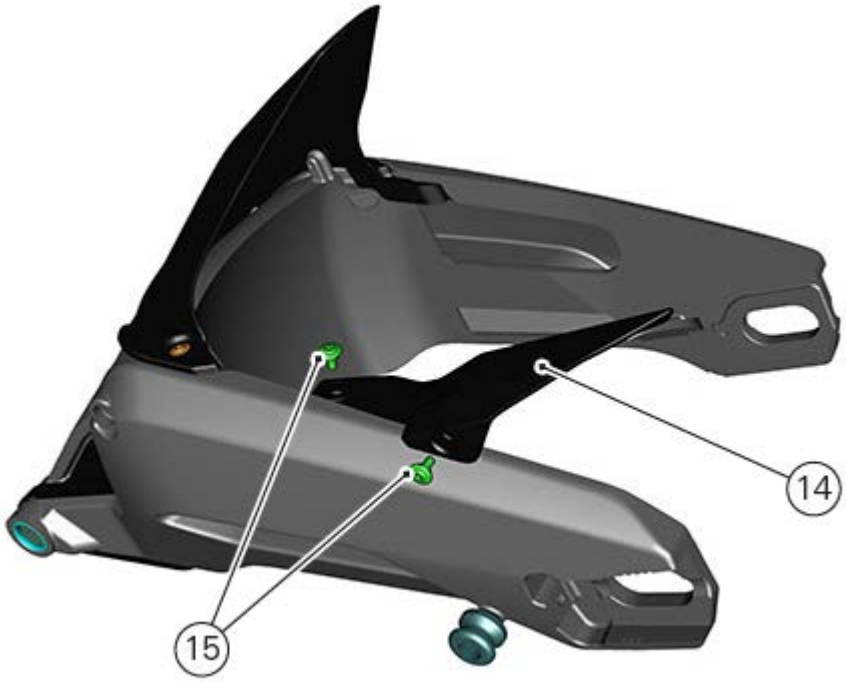




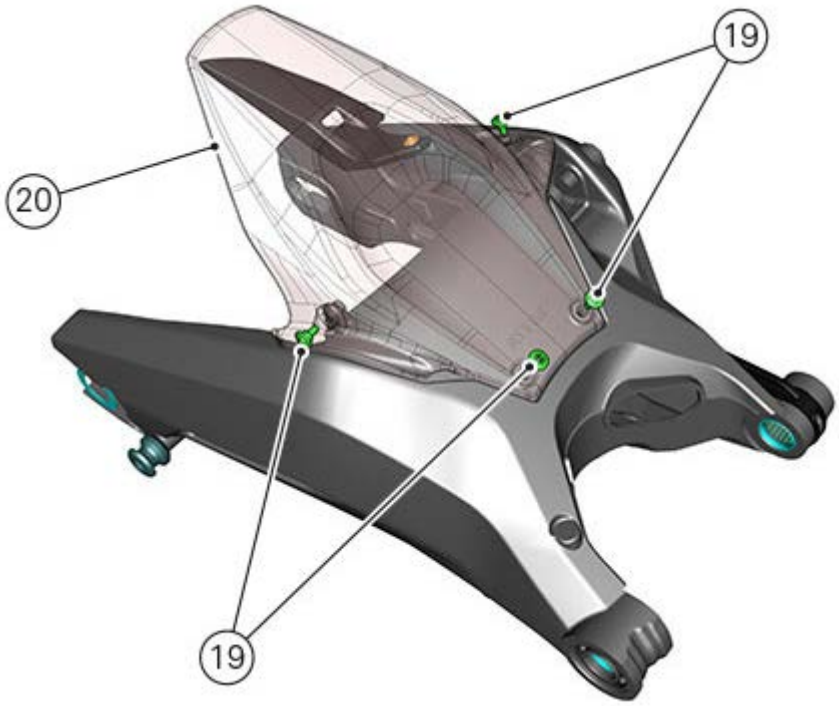
Refit the rear wheel (Refitting the rear wheel).
Refit rear sprocket and chain (Refitting the rear sprocket).
Refit the lower half-fairings (Refitting the side fairings).

Tighten screws (15) with specified threadlocker to a torque of 5 Nm ± 10% to fasten splash guard (14).





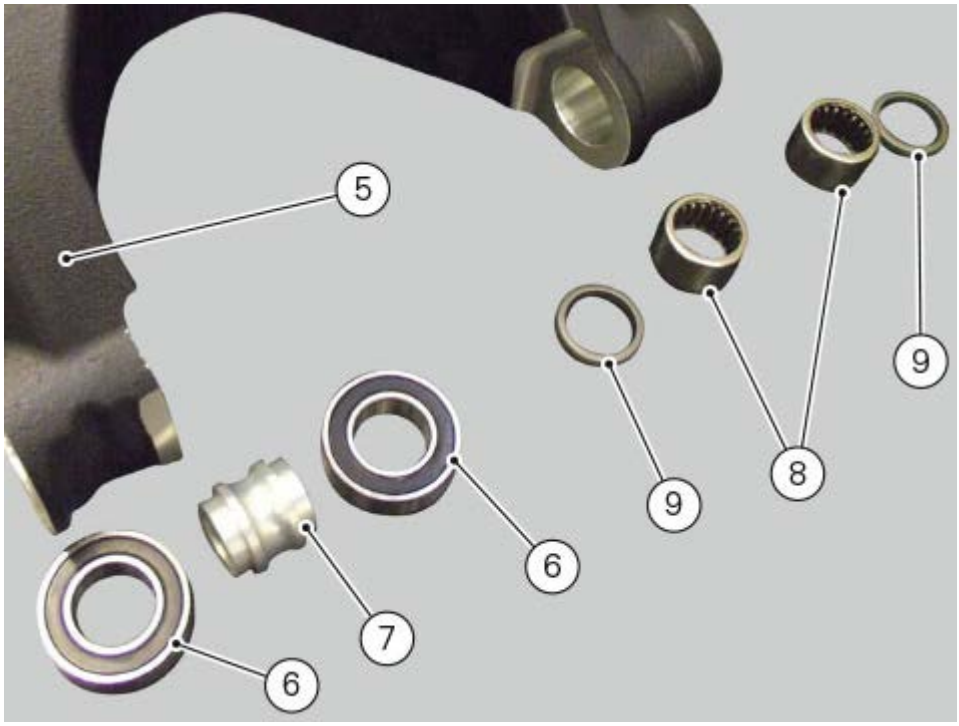
Tighten screws (19) to a torque of 5 Nm ± 10% to fasten the rear mudguard (20).

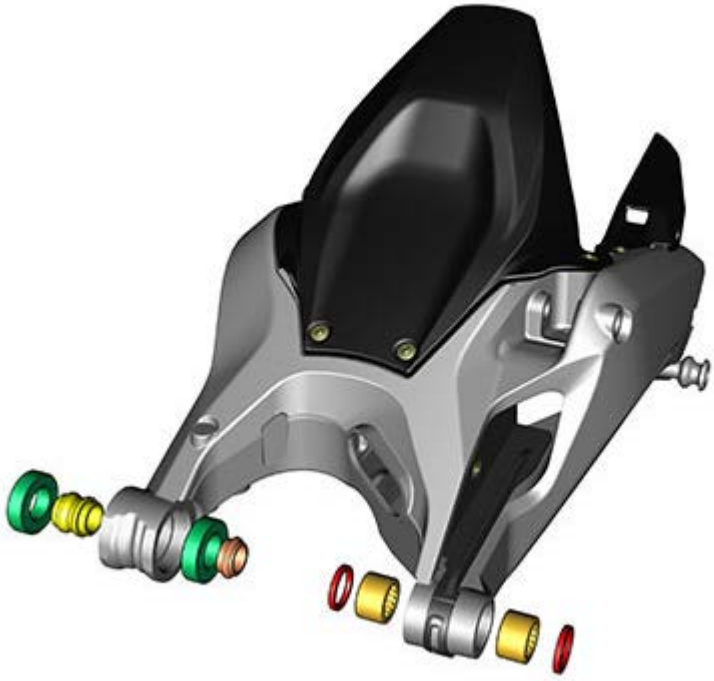


Overhaul of the swinging arm

Remove the swinging arm (Removing the rear swinging arm).

Two ball bearings (6) and an internal spacer (7) are present on the right-hand side and two needle roller bearings (8), with sealing rings (9), are present on the left-hand side inside the swinging arm, at the pivot point on the frame.





Remove the ball bearings (6), sealing rings (9) and needle roller bearings (8), using a suitable punch and a press. Duly support the swinging arm and pay utmost attention to avoid damaging the seats during removal.

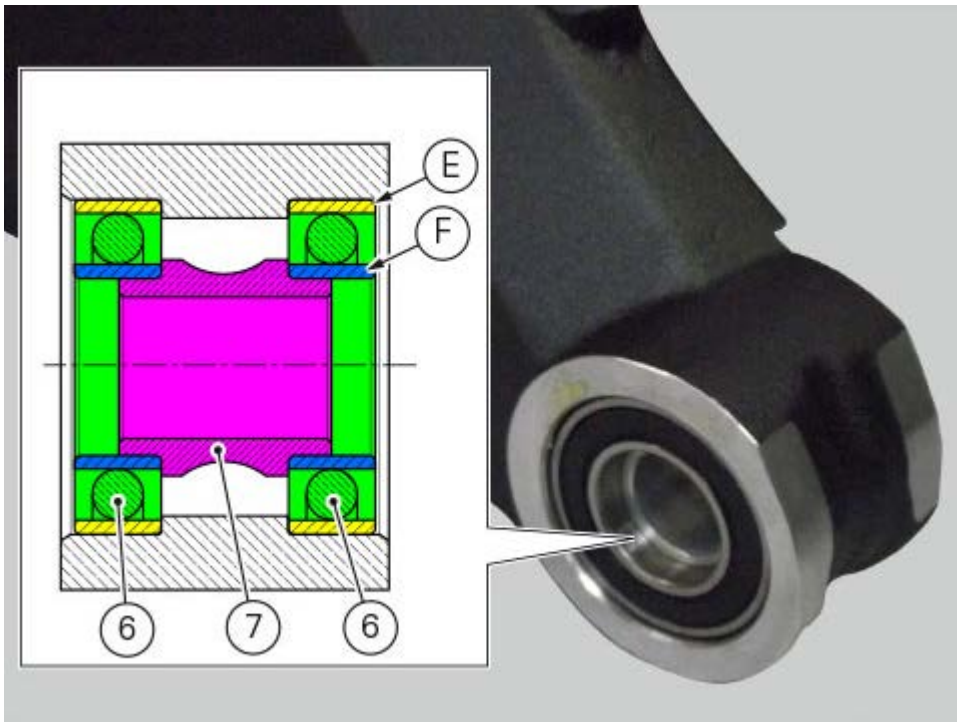
Important
Once removed, the used bearings, sealing rings and needle roller bearings must not be refitted.

To reassemble, evenly heat up the swinging arm at 150 °C and duly support it. Apply specified grease in the two seats of the swinging arm. Fit bearings (6) and internal spacer (7) into the RH seat and fit the roller bearings (8) and sealing rings (9) in the LH seat.

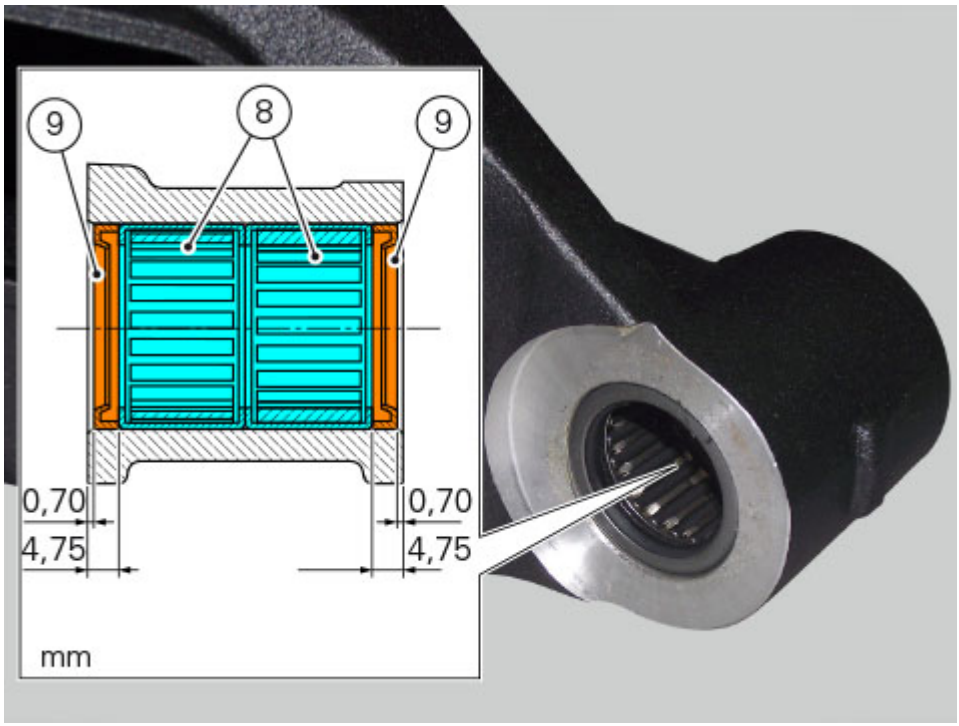
Important
Bearings and roller bearings must be set in such a way that the side with "marks" is facing outwards. The sealing rings must be set so that the "flat" side is facing outwards.

Drive the internal bearing (6) working on the outer ring (E) and not on the internal one (F) and bring it fully home onto the swinging arm. Fit the spacer (7), taking it fully home on bearing inner ring (6). Fit the external bearing (6), taking it fully home on spacer (7).

Important
The bearings must be installed by applying pressure on the outer ring rather than on the inner ring.

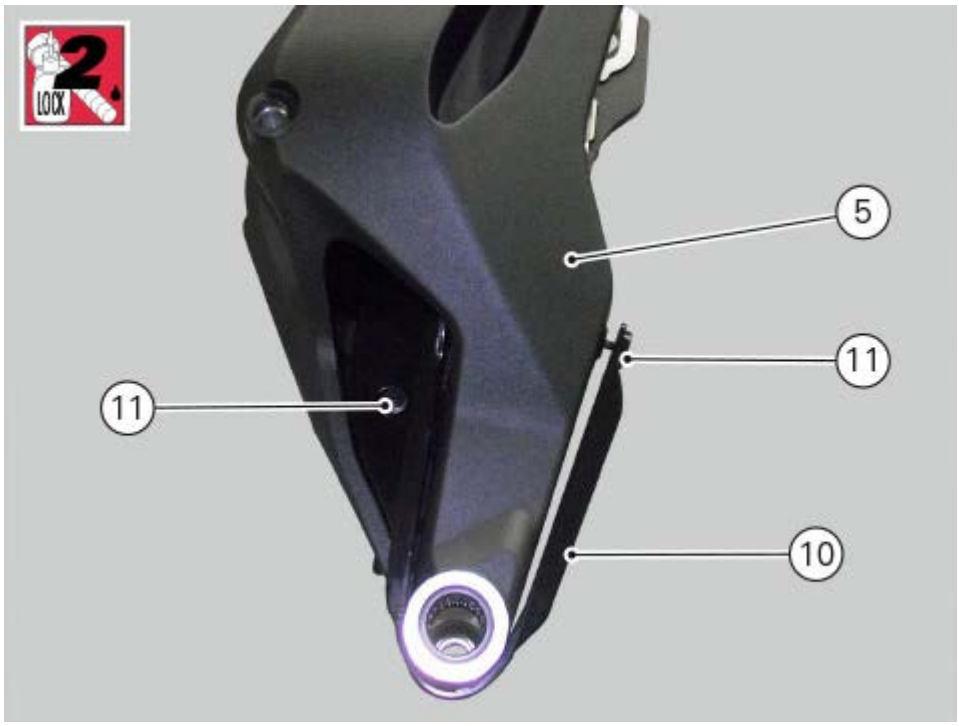


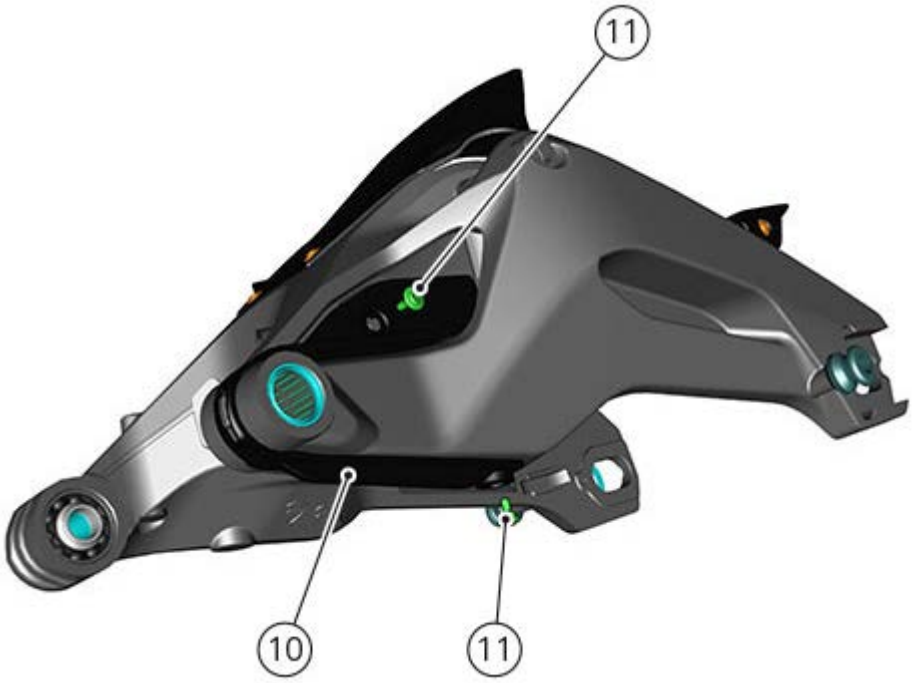
Fit the roller bearings (8) onto the swinging arm, complying with the indicated values.
Fit sealing rings (9), complying with the indicated values.



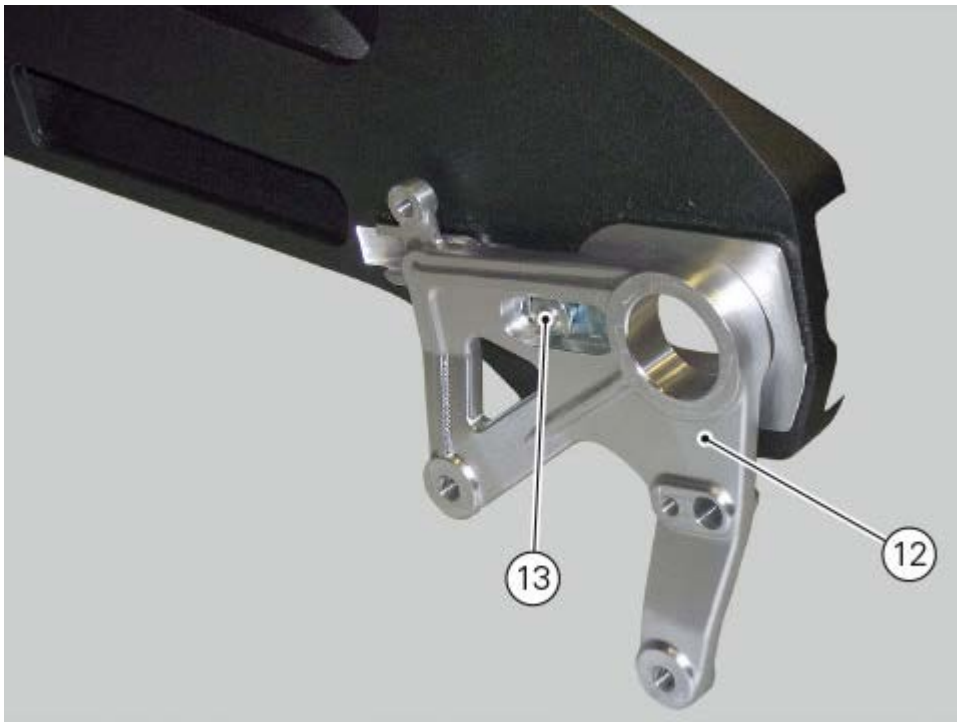
Warning
After assembly, make sure that spacer (7) has no axial play.

If it was removed, insert the chain sliding shoe (10) in swinging arm (5) and take it in position.
Fasten chain sliding shoe (10) by starting screws (11). If these screws are not new, first smear thread with specified threadlocker.





If previously removed, refit the calliper holder plate (12) by starting screw (13), with specified threadlocker, to a torque of 13 Nm ± 10%.



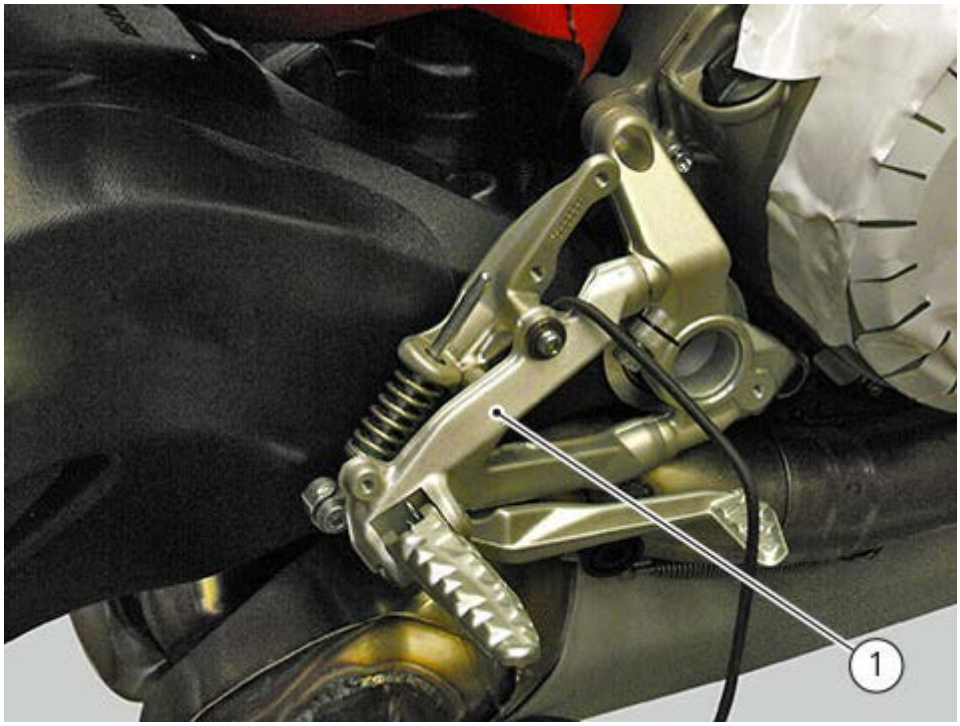
If previously removed, refit the rubber cap (16). Smear specified sealant on surface (K) all around the cap. Position so that arrow (Y) is facing upwards.

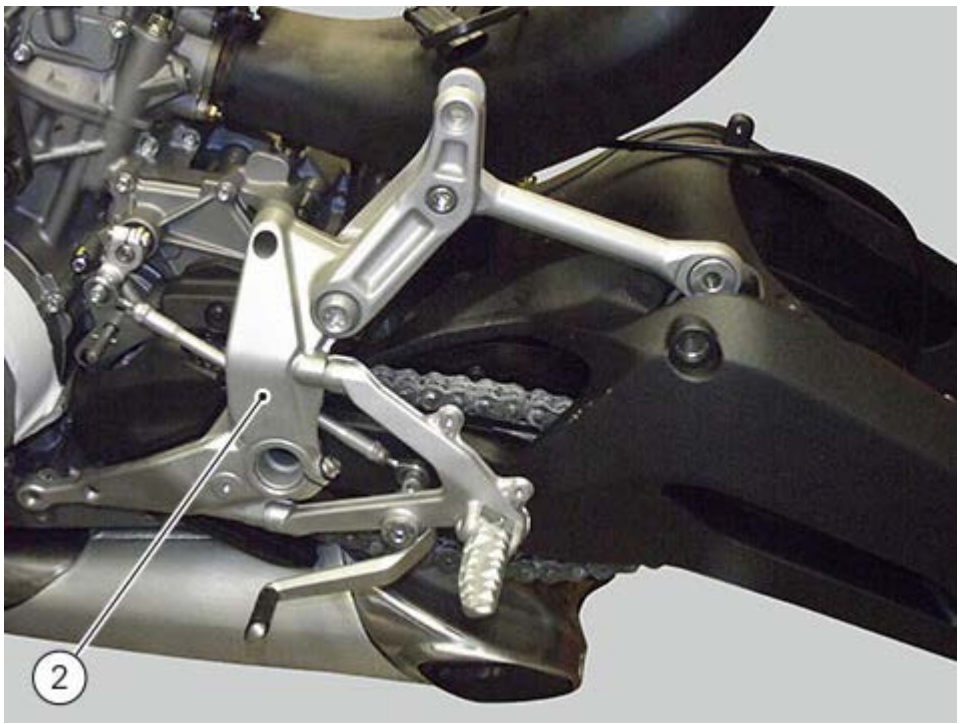
Removing the swinging arm

Remove the lower half-fairings (Removing the side fairings).
Duly support the engine block.
Remove the rear wheel (Removing the rear wheel).
Remove the rear shock absorber with rocker arms (Removing the rear shock absorber).

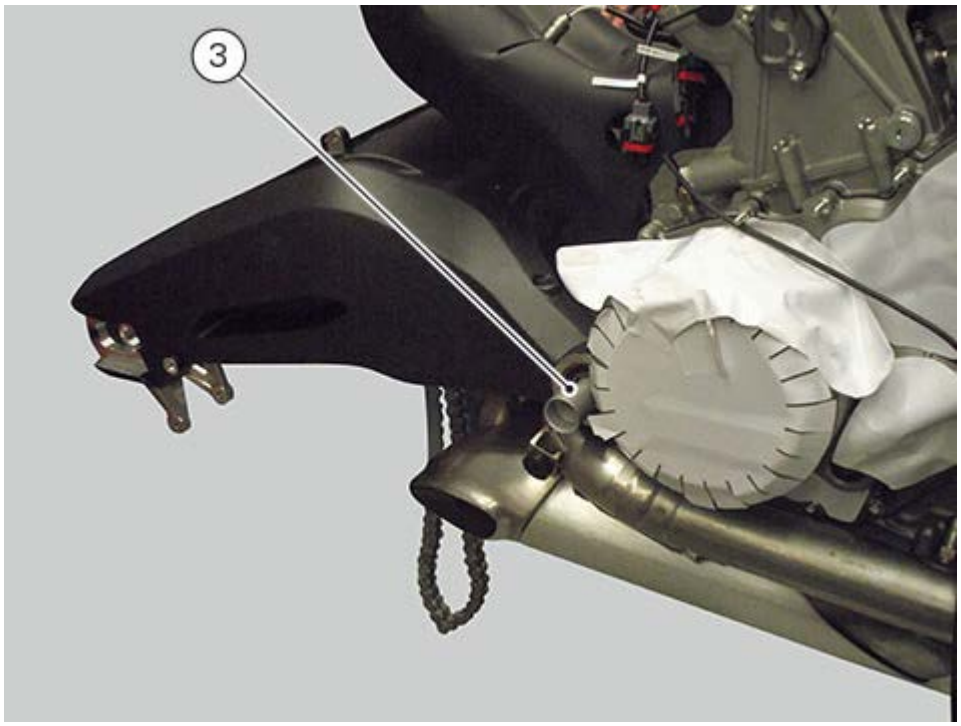
Remove rear sprocket and chain (Replacement of the rear sprocket).

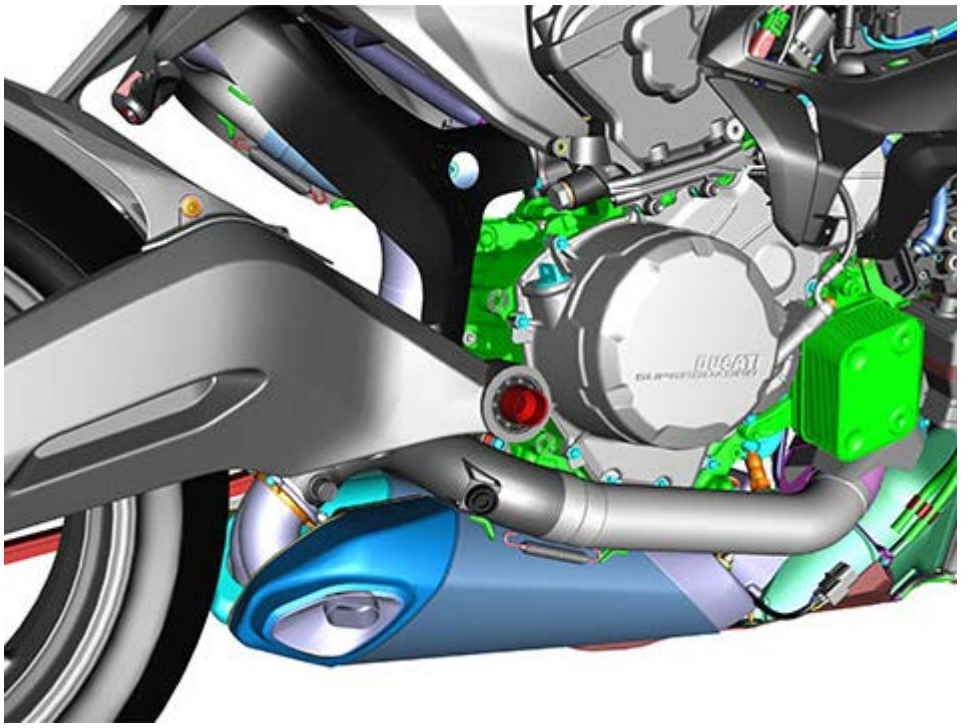
Remove right-hand footpeg holder plate (1) and left-hand footpeg holder plate (2) (Removing the front footpeg plates).

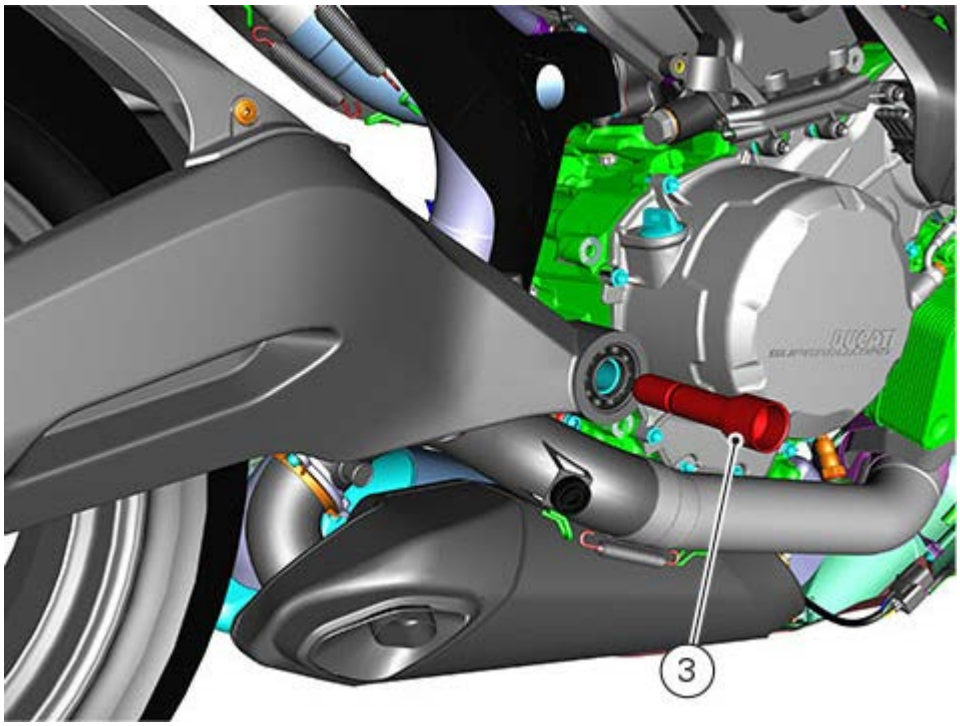




Loosen the RH swinging arm shaft (3). Loosen the LH swinging arm shaft (4). Slide out shafts from outside.


3

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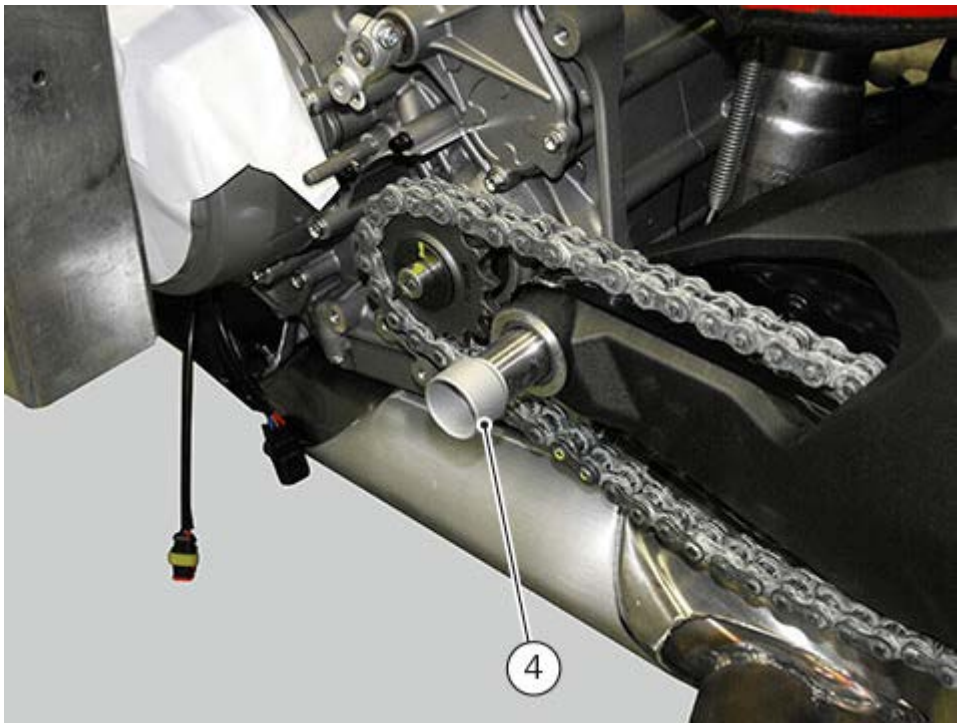
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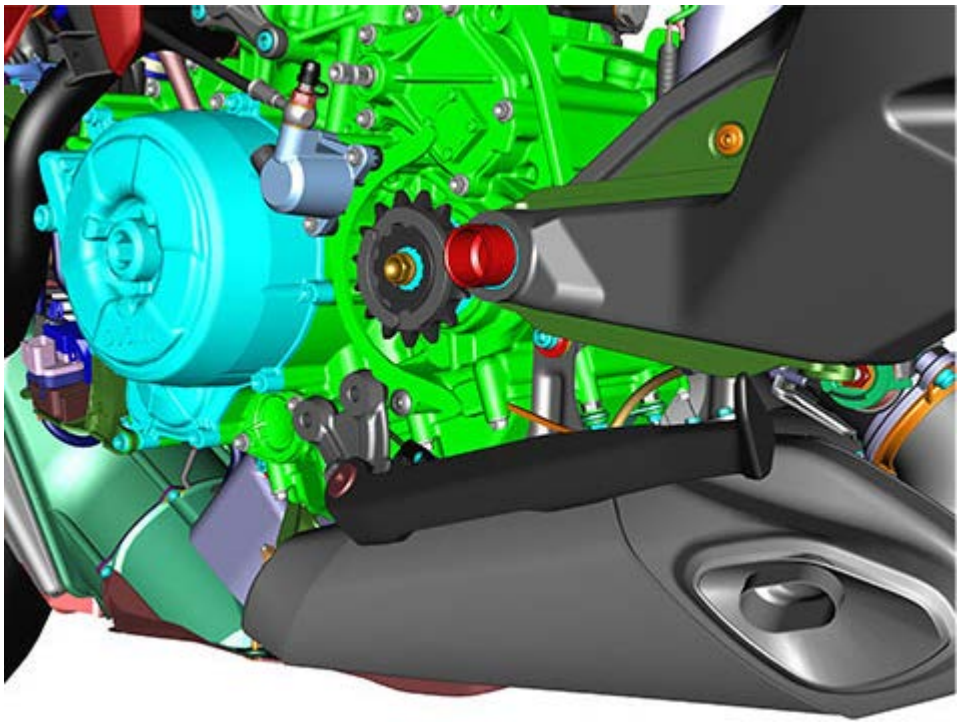
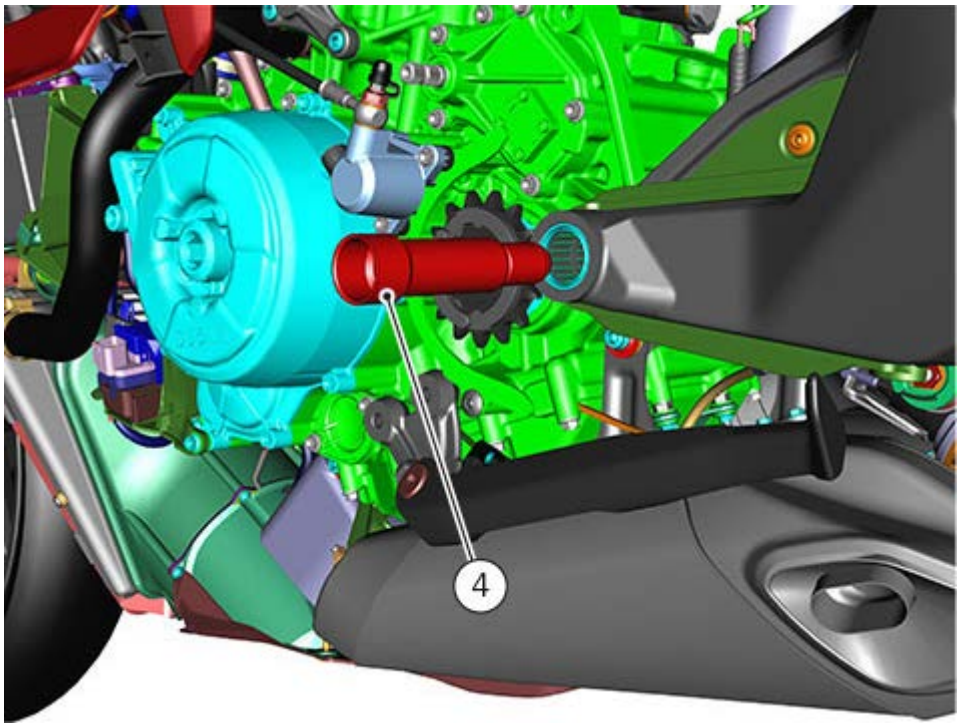
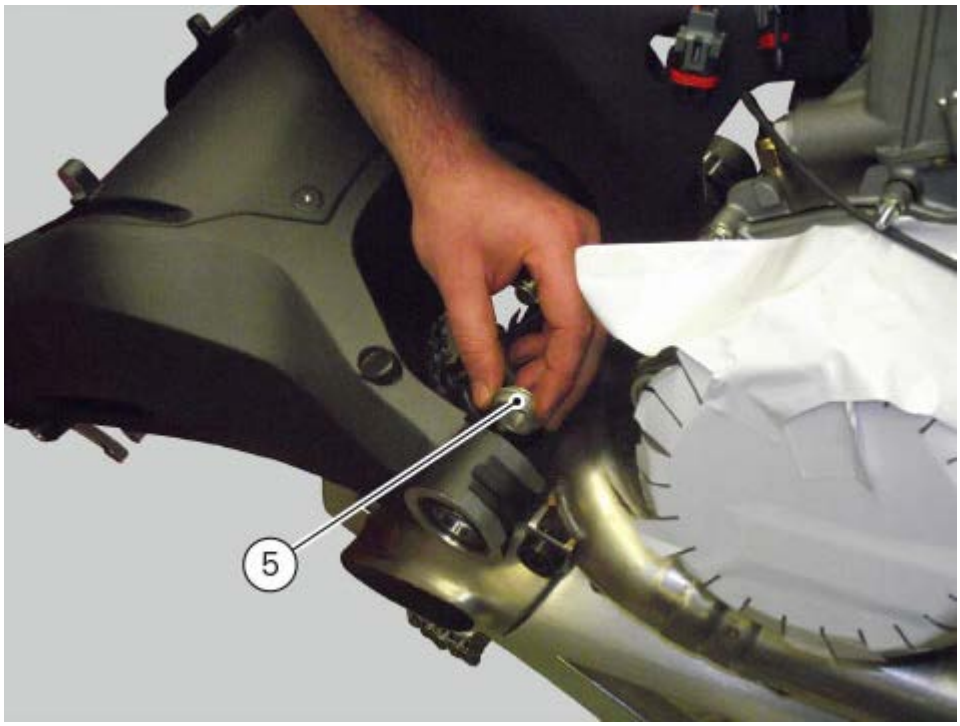
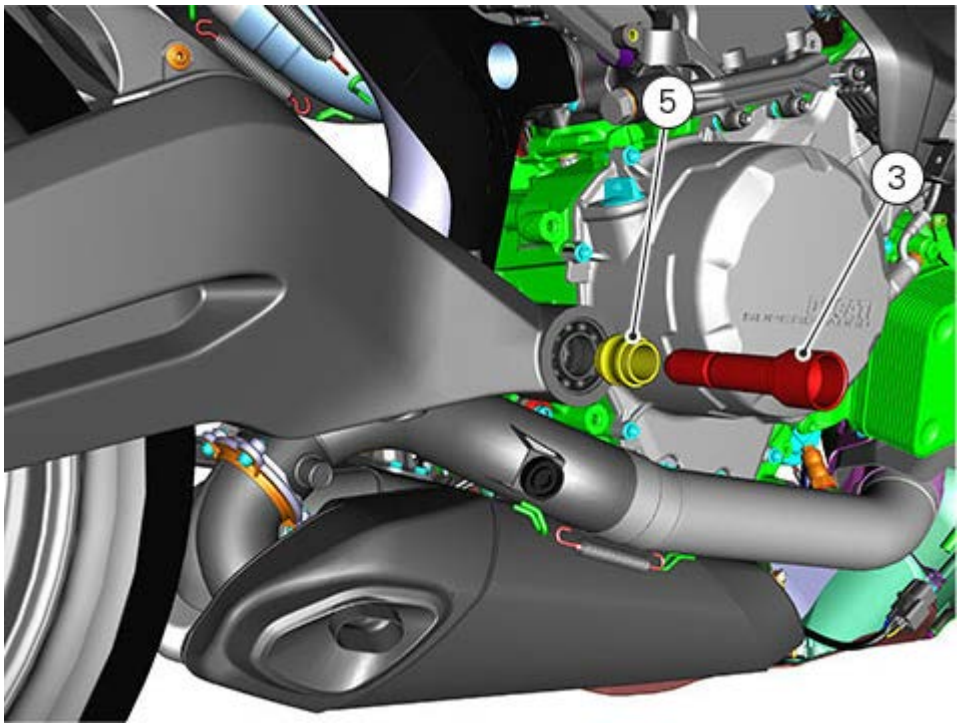


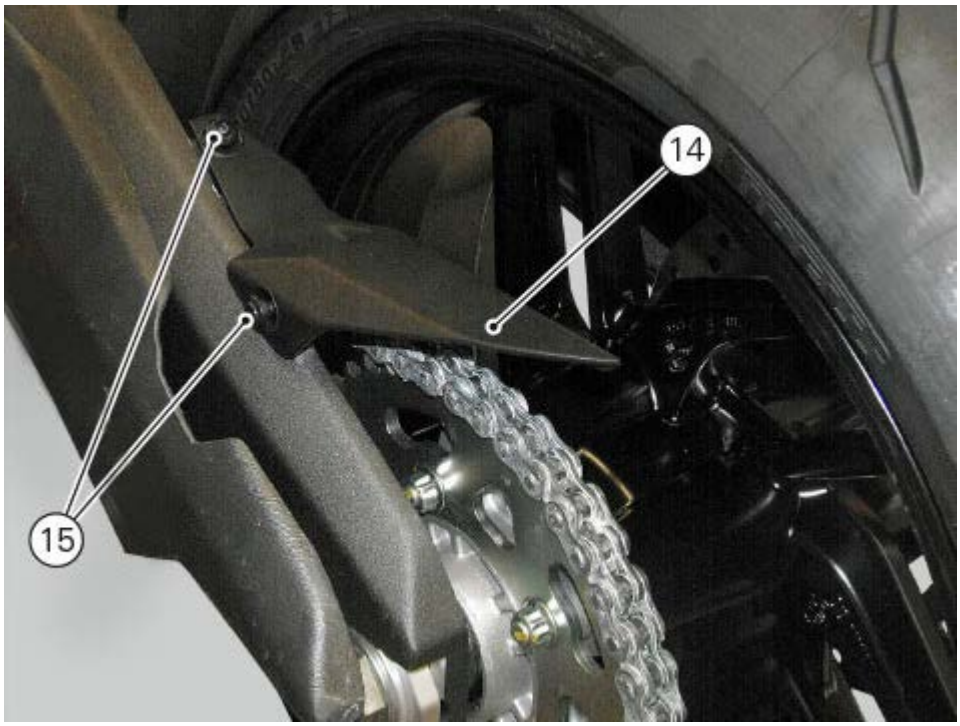


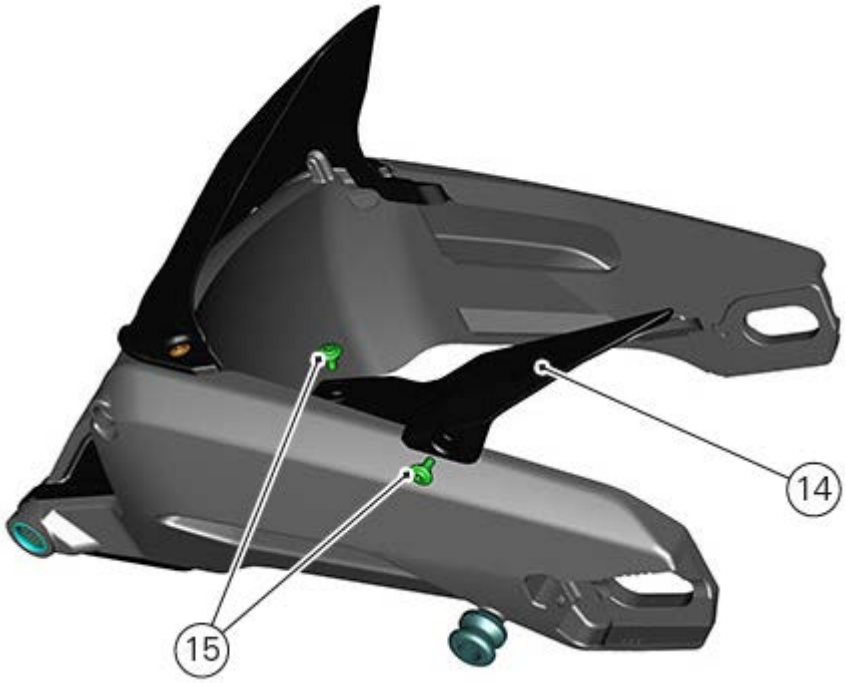
Collect spacer (5) on the RH side.
Remove the swinging arm from engine block.



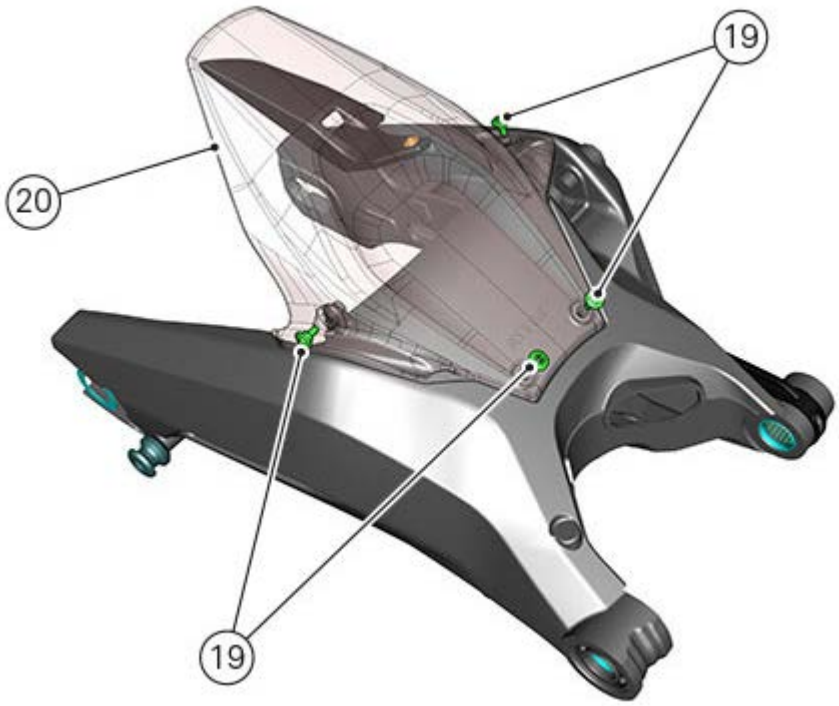


Remove splash guard (14) by loosening the two screws (15).





Undo screws (19) and remove the rear mudguard (20).


19
20
19

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.

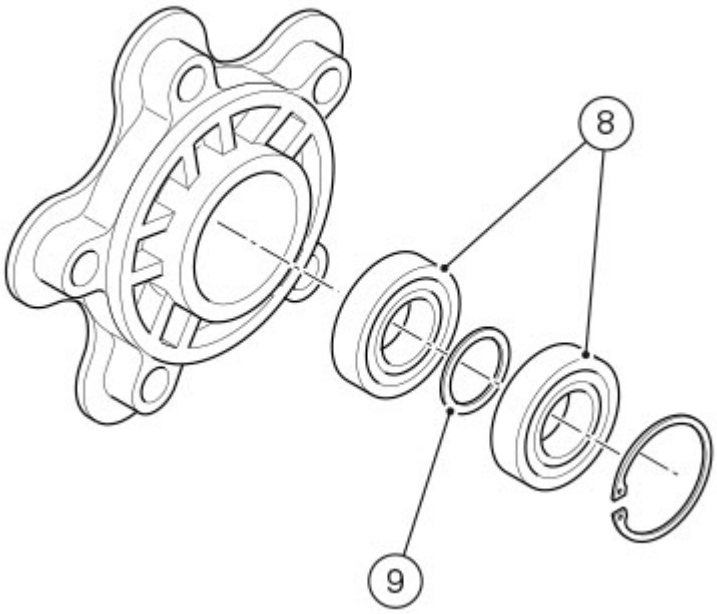
Using a brush, apply a thin protective layer of high-density gearbox oil along the entire length of the chain both inside and outside (Fluids and lubricants).

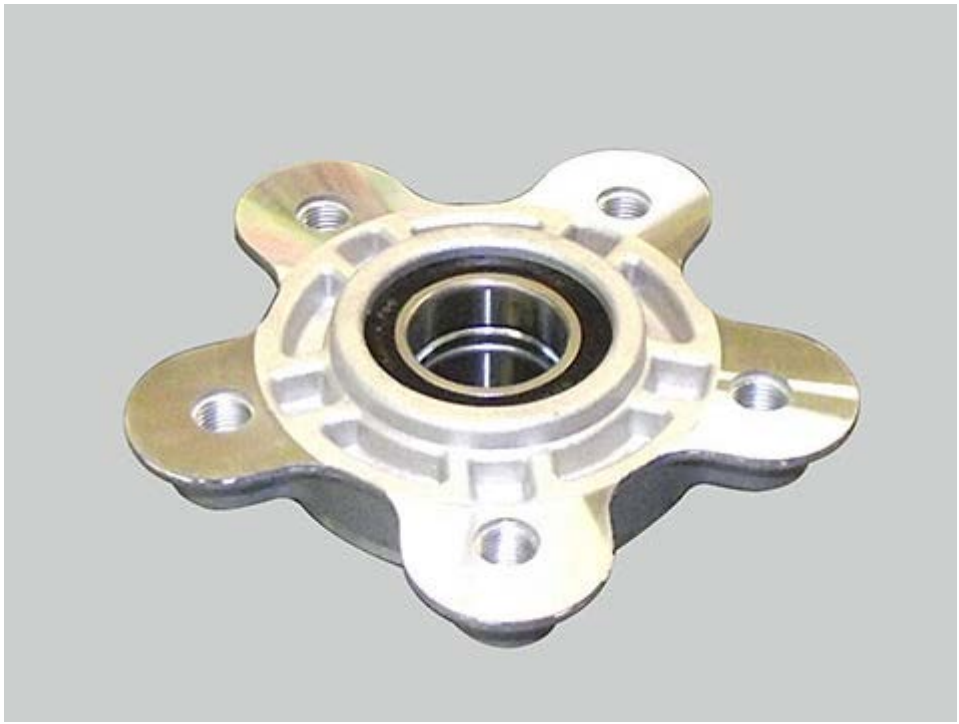
Washing the chain

Chains with O-rings must be washed in oil, diesel fuel or paraffin (kerosene).
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 flange

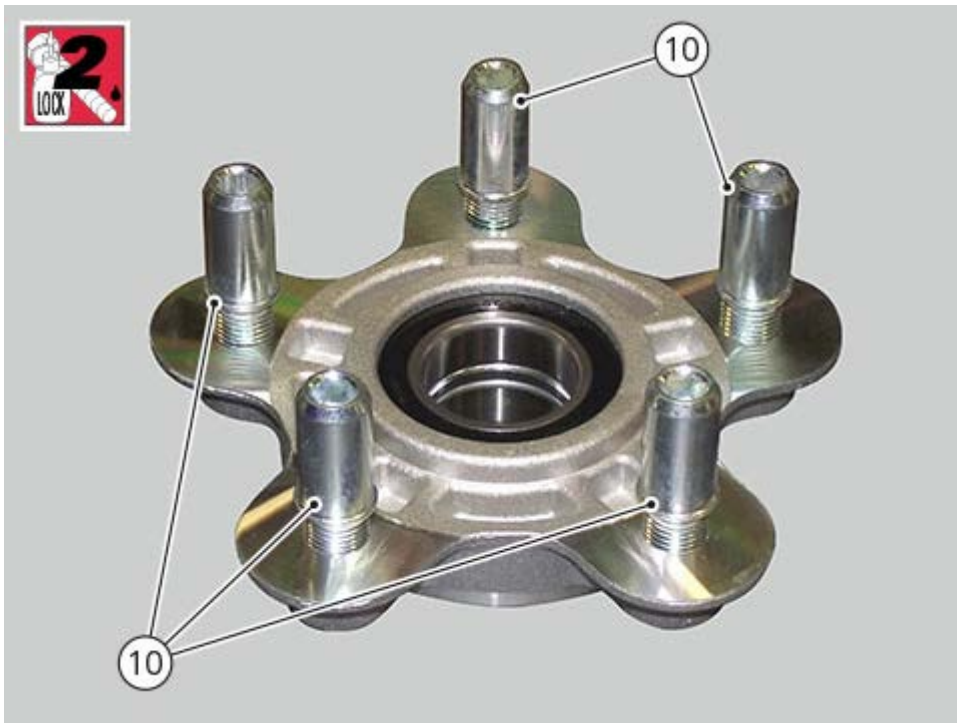
Position the two bearings (8) and spacer (9) in the rear sprocket flange respecting the order shown in the figure.





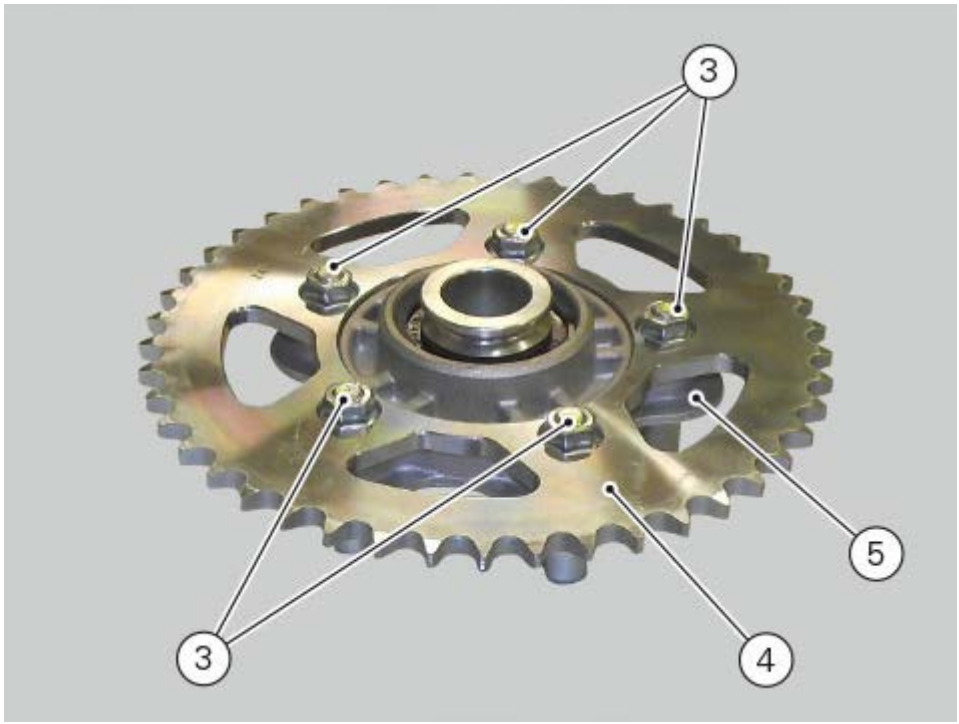
Fix the bearing pack with circlip (7).

If previously removed, fit stud-bolts (10) with specified threadlocker and tighten them to the specified torque of 44 Nm ± 10%.



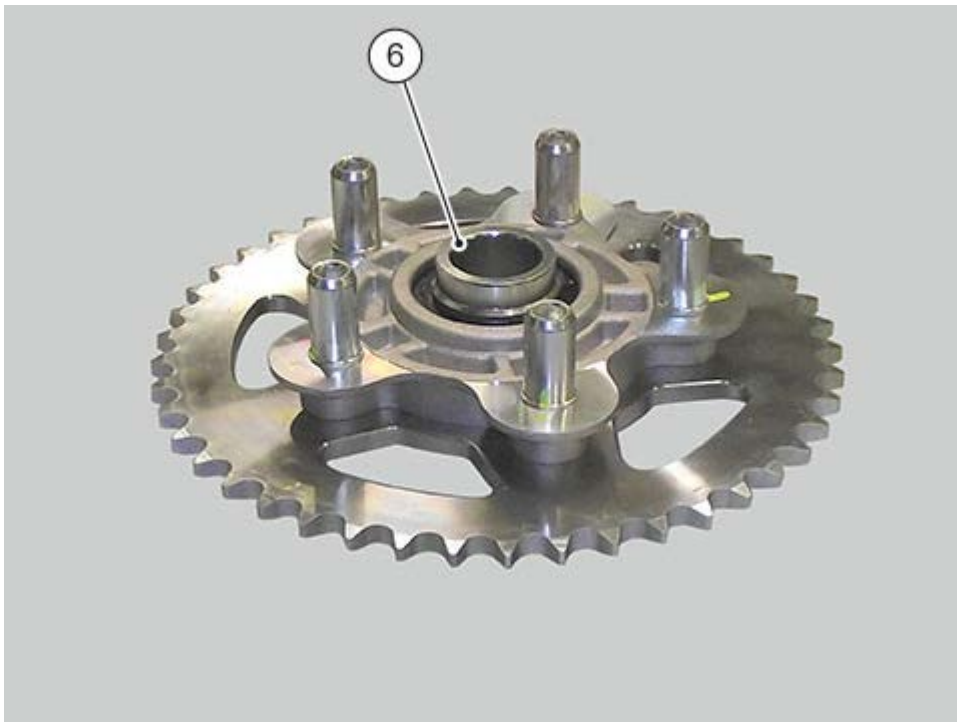
Fit the rear sprocket (4) on flange (5).

Tighten nuts (3) with specified threadlocker to a torque of 44 Nm ± 10% to fasten rear sprocket (5).

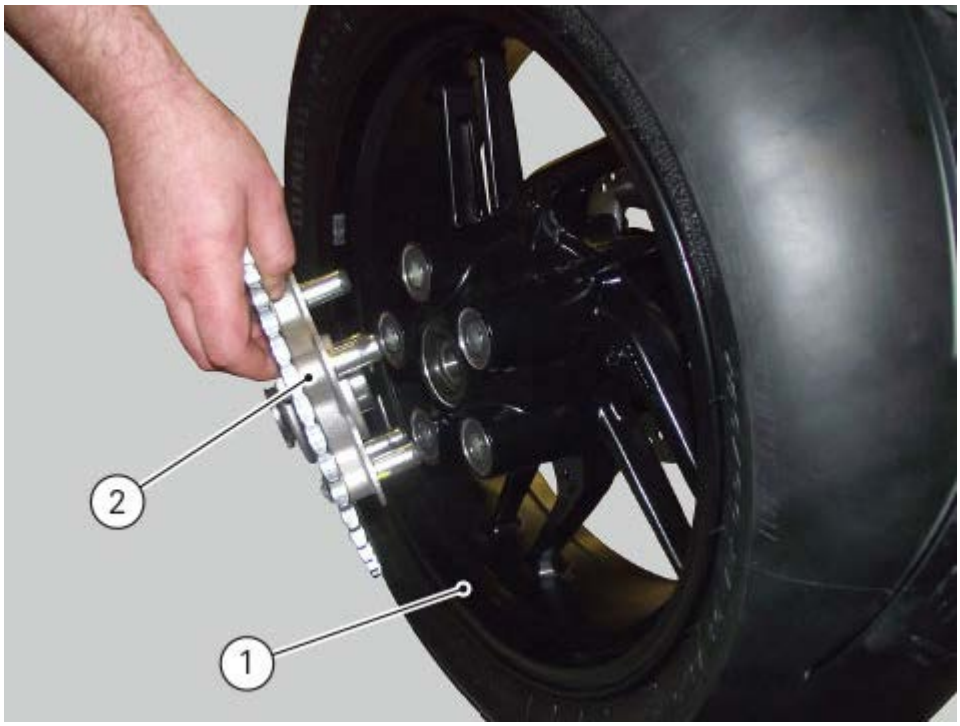


Refitting the rear sprocket

Fit spacer (6).



Apply specified grease to the stud-bolts of the rear sprocket flange. Check the silent block wear. Insert the rear sprocket flange (2) in the rear wheel (1).

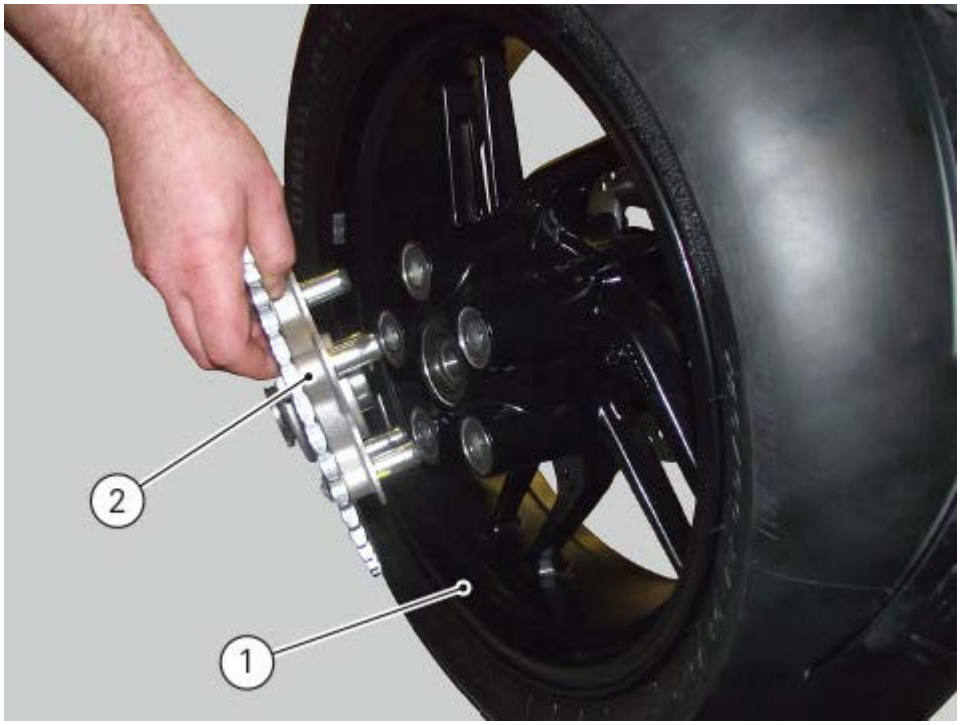


Refit the rear wheel (Refitting the rear wheel).
Tension the chain as described under “Adjusting the chain tension”.

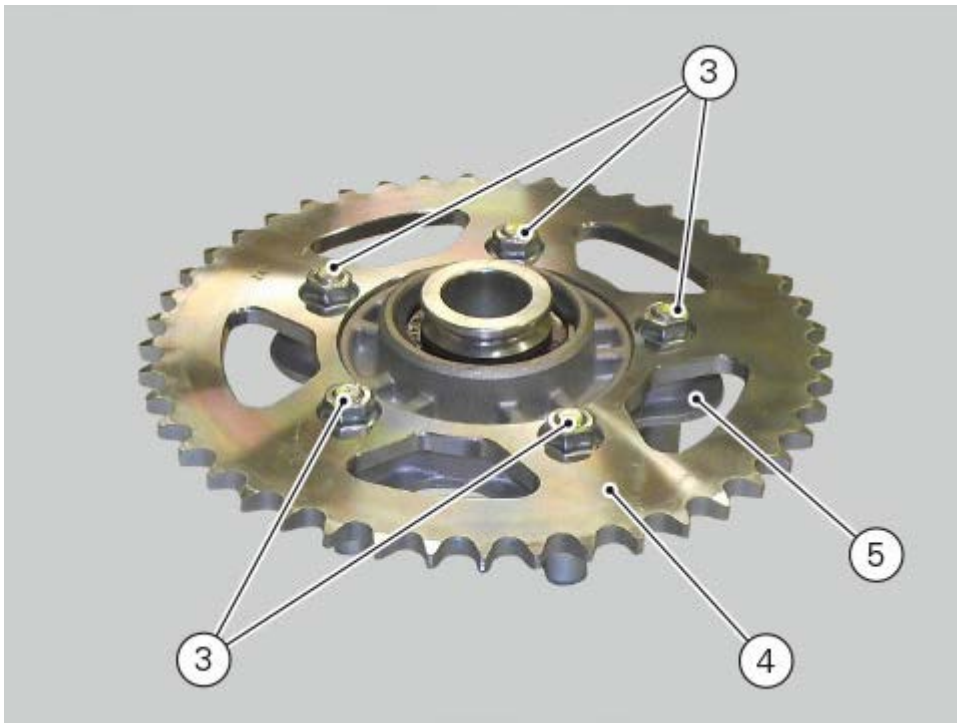
Removing the rear sprocket

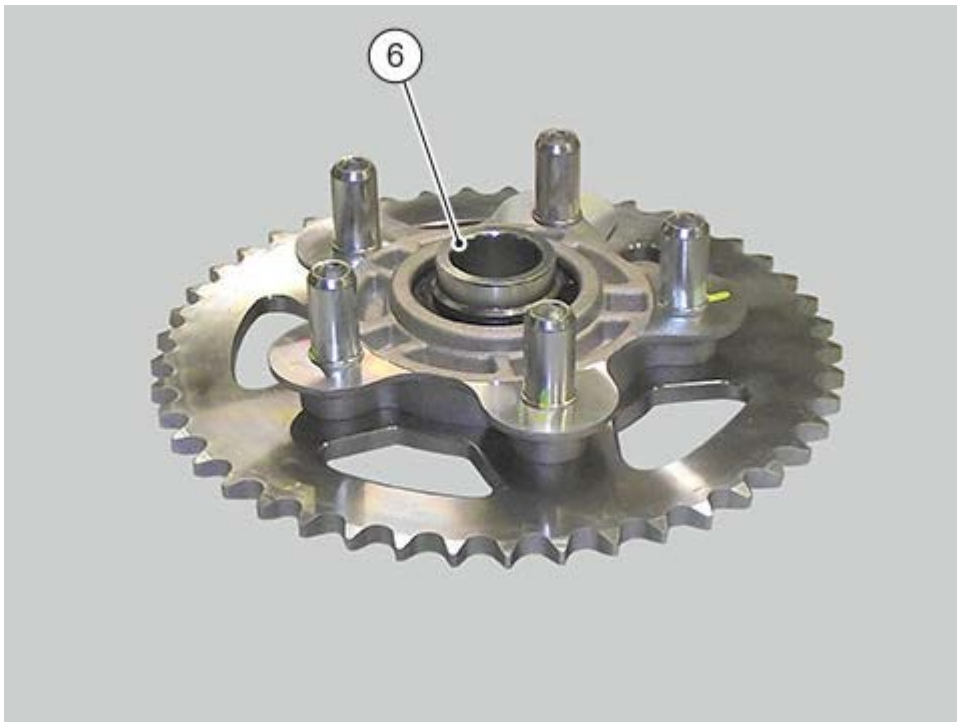
Remove the rear wheel following the procedure described under "Removing the rear wheel".

Separate the rear sprocket flange (2) from the rear wheel rim (1).



Loosen nuts (3), separate rear sprocket (4) from flange (5) and collect spacer (6).

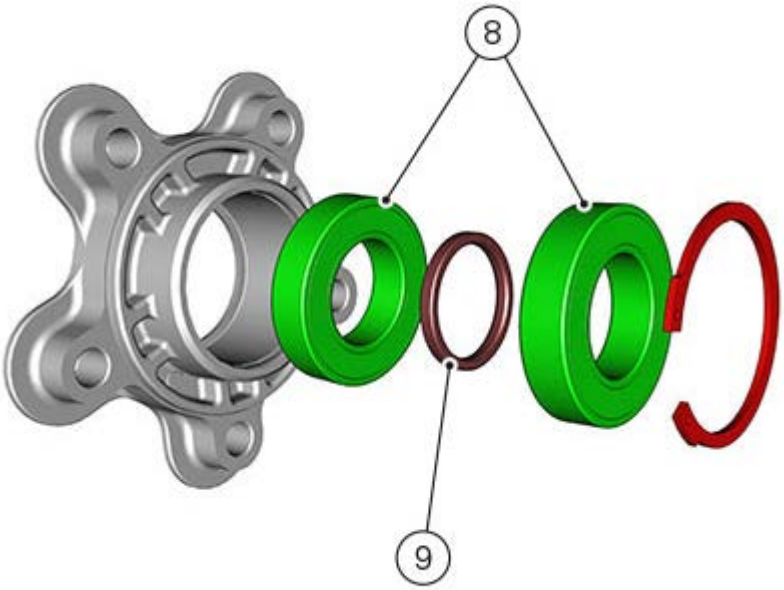




Removing the rear sprocket flange

Remove circlip (7).

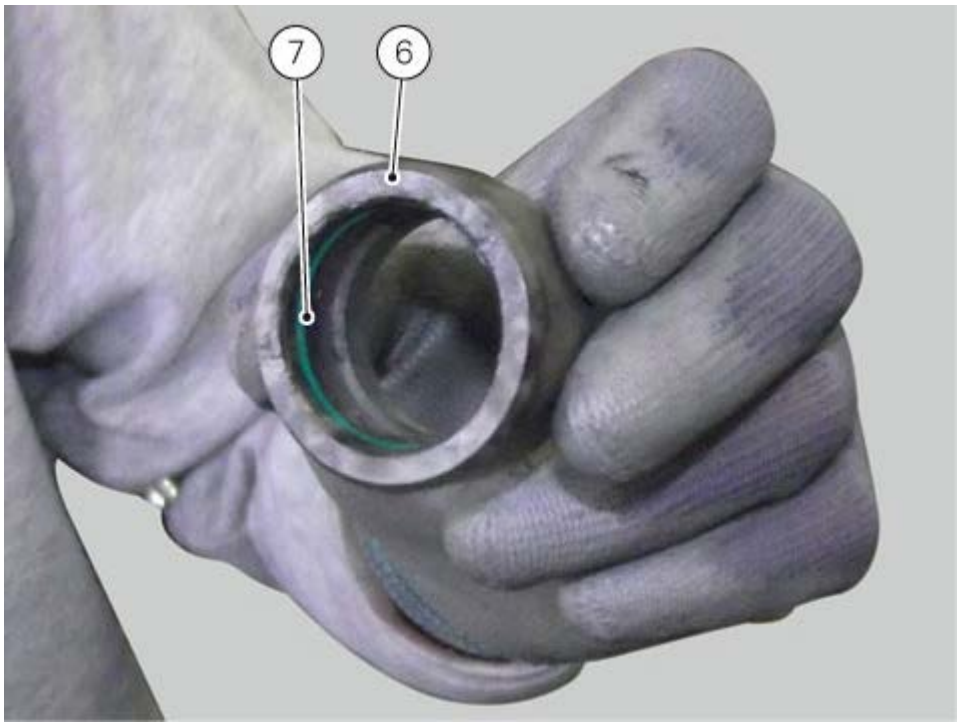
Remove bearings (8) and spacers (9).


8
9

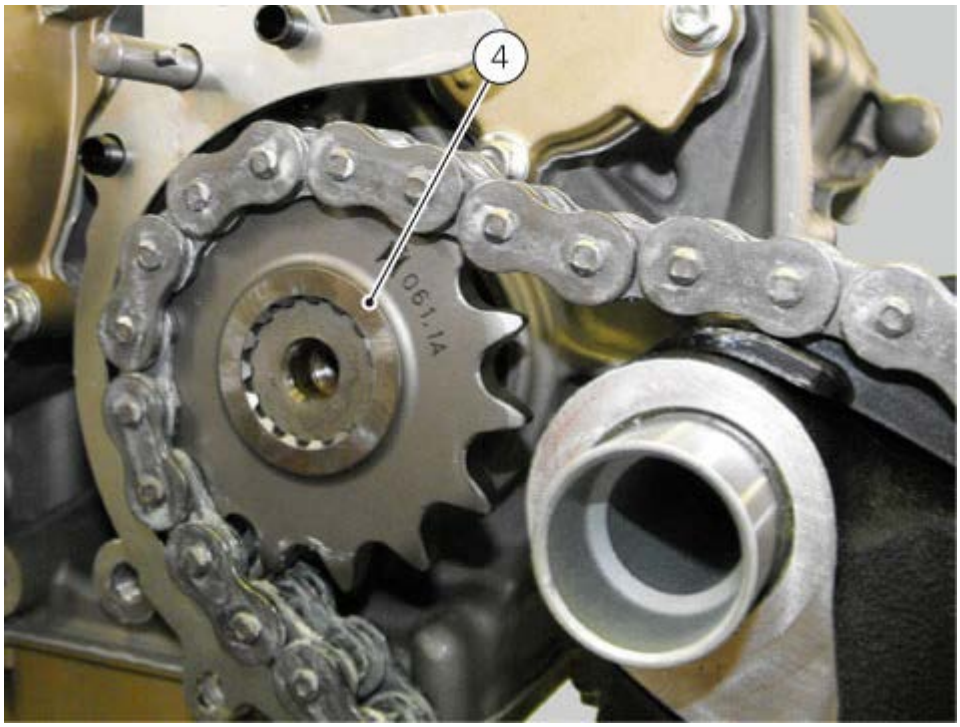
Refitting the front sprocket

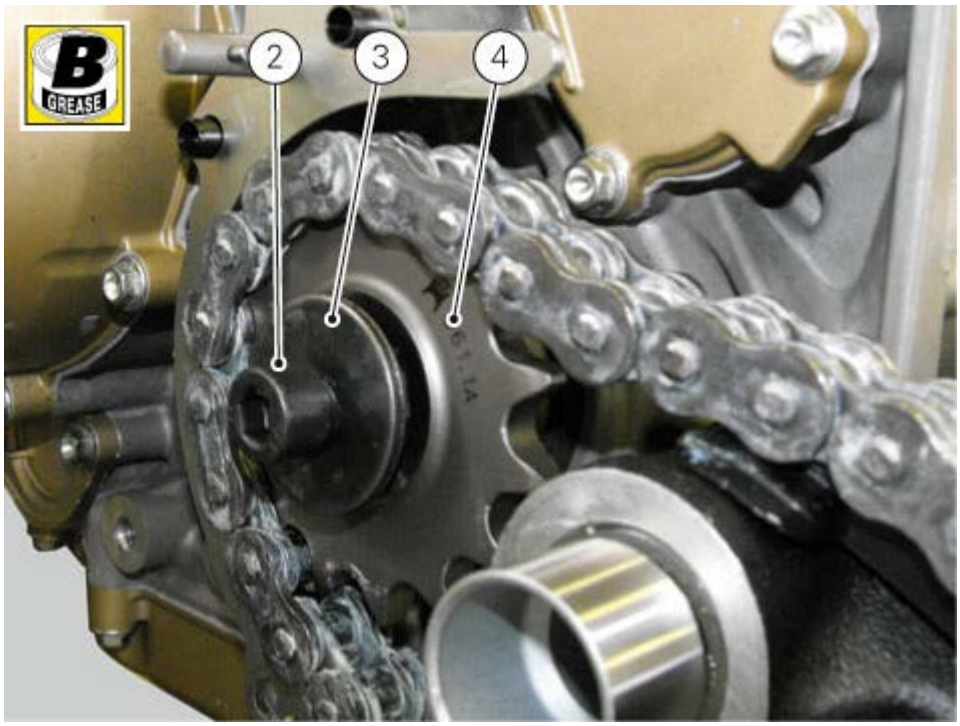
If it was removed, fit O-ring (7) onto spacer (6).
Fit the spacer (6), from the O-ring side, on the secondary shaft (5) and drive it fully home against the inner ring of the bearing.

Important
The O-ring (7) must be renewed upon removal.

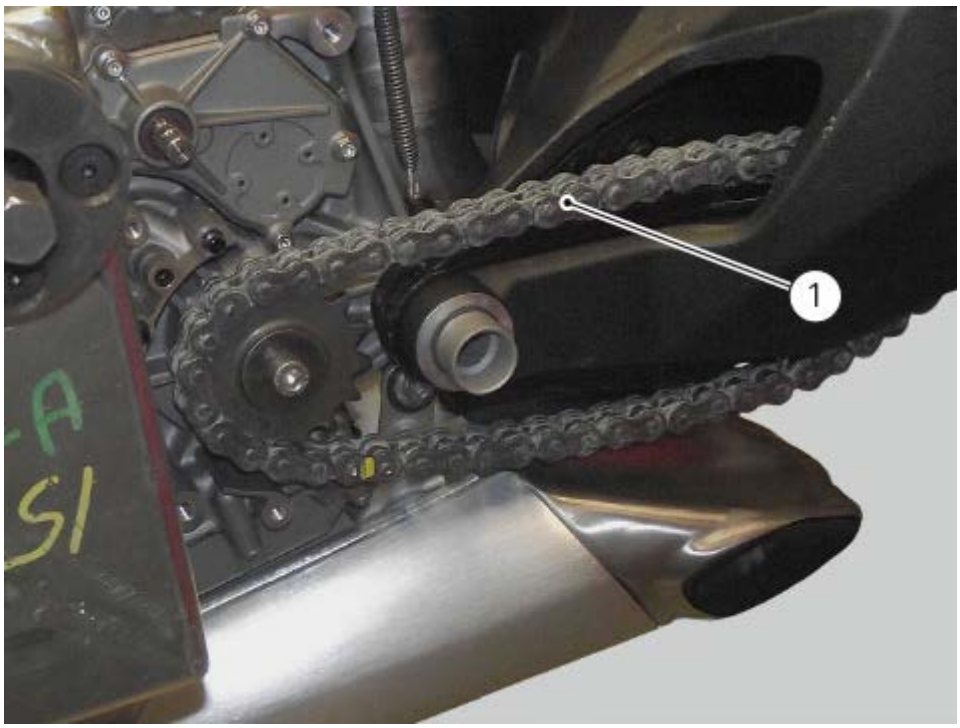


Make sure that the splines of the gearbox secondary shaft (5) and the sprocket (4) are in perfect condition.
Fit the front sprocket (4) with chain (1) and fit the lock washer (3).
Smear screw (2) with recommended grease, start and tighten it to a torque of 55 Nm ± 10%.

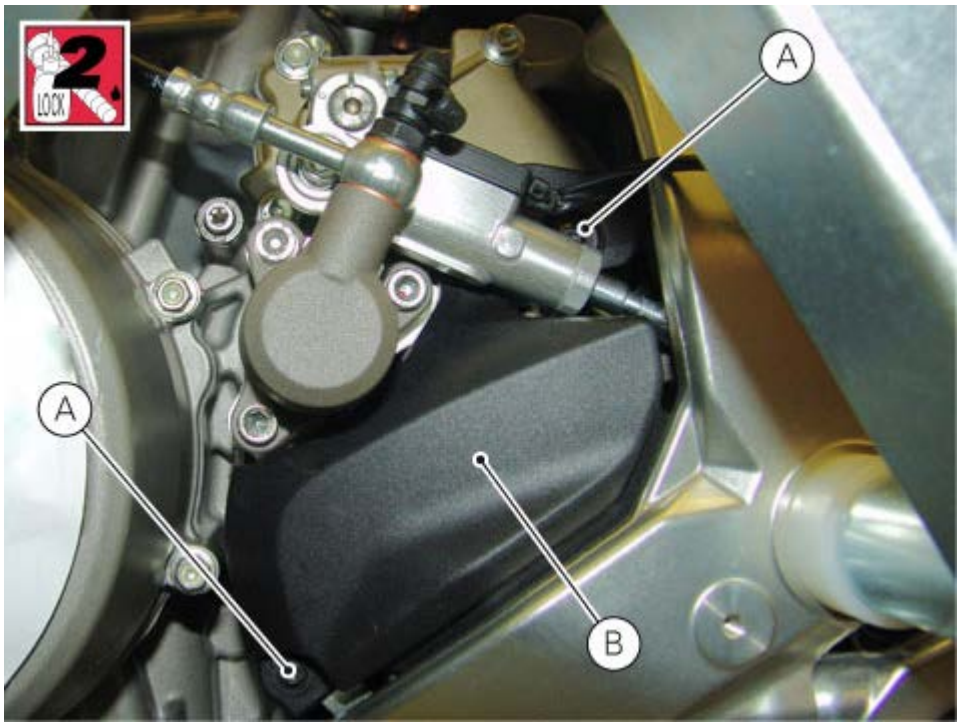




Tension chain (1), as described under “Adjustment of chain tension”.



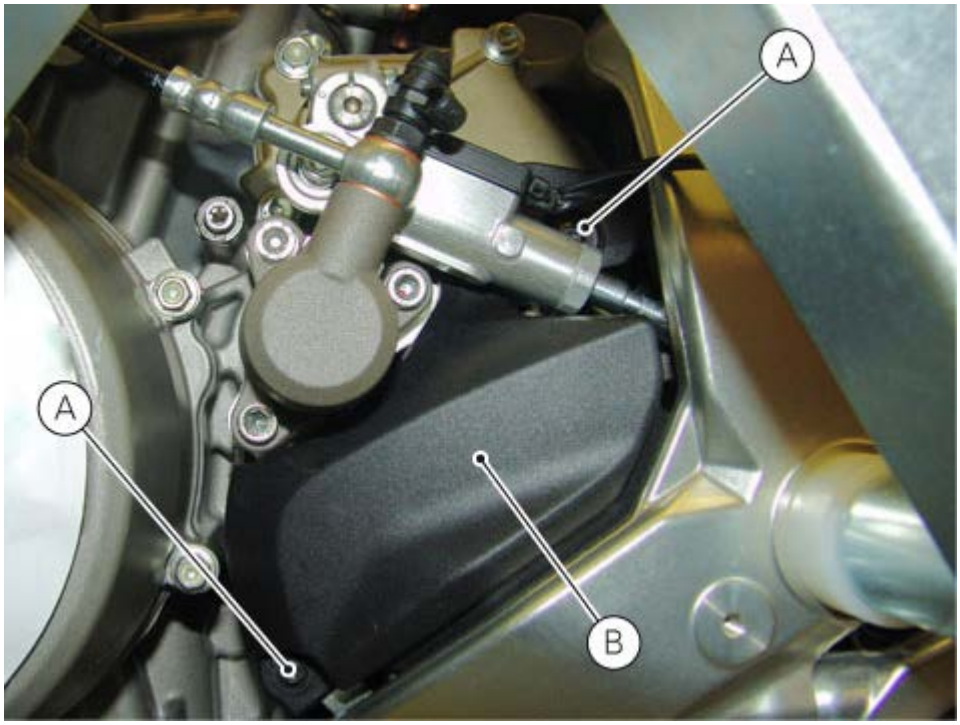
Refit the sprocket cover (B). Apply specified threadlocker to screws (A). Start and tighten screws (A) to a torque of 4 Nm ± 10%.



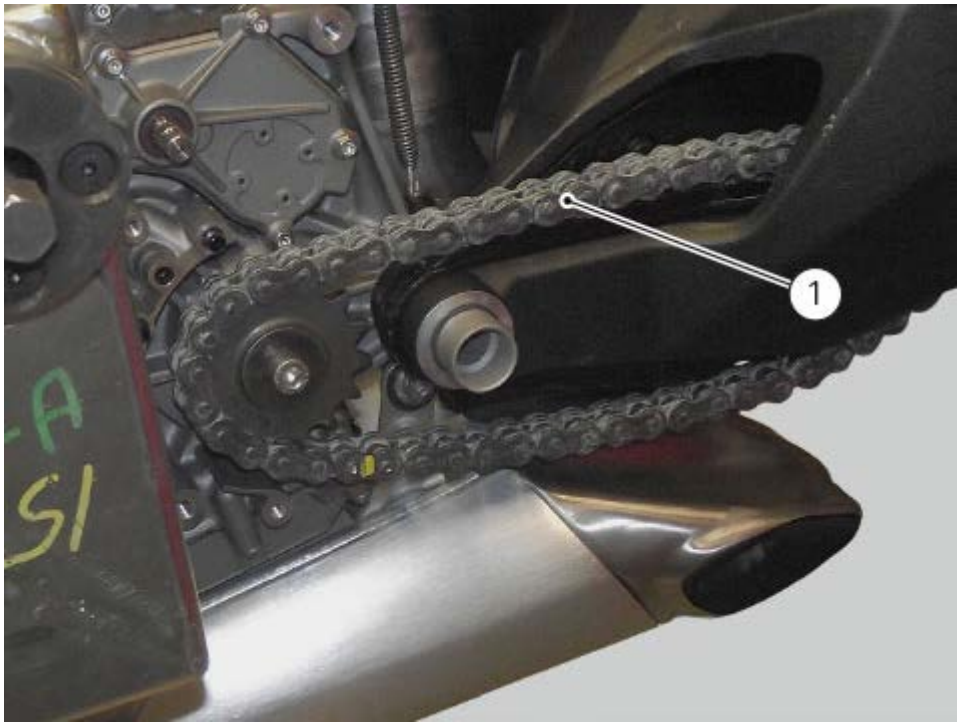
Refit the left-hand footpeg holder plate unit (Refitting the front footpeg plates).
Refit the left-hand side lower half-fairing (Refitting the side fairings).

Removing the front sprocket

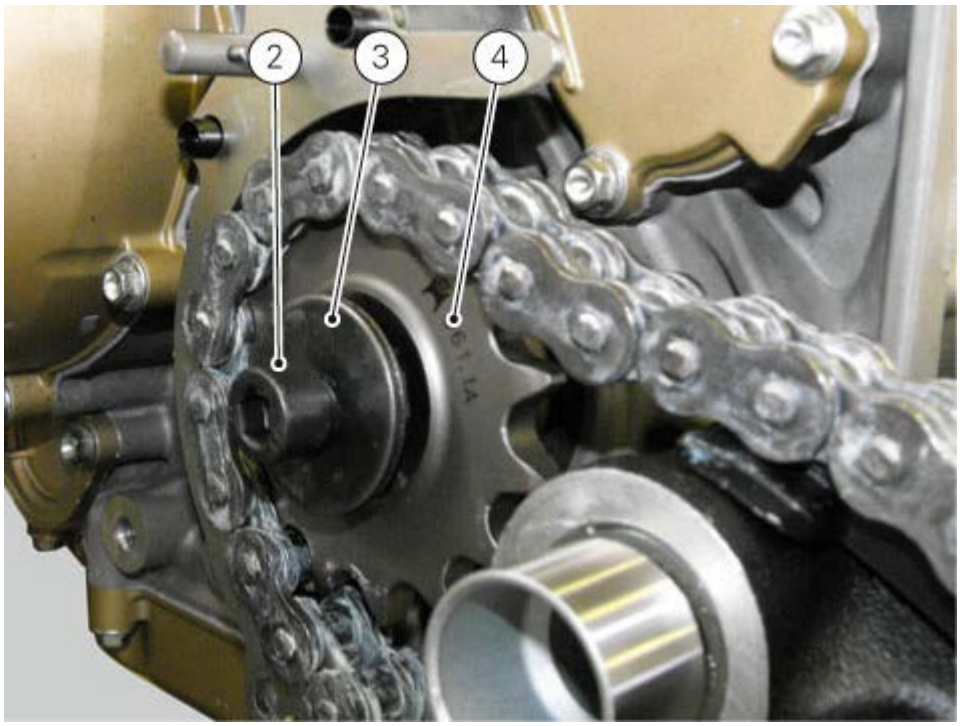
Remove the left-hand side lower half-fairing (Removing the side fairings).
Remove the left-hand footpeg holder plate unit (Removing the front footpeg plates).
Unscrew the screws (A) and remove the sprocket cover (B).



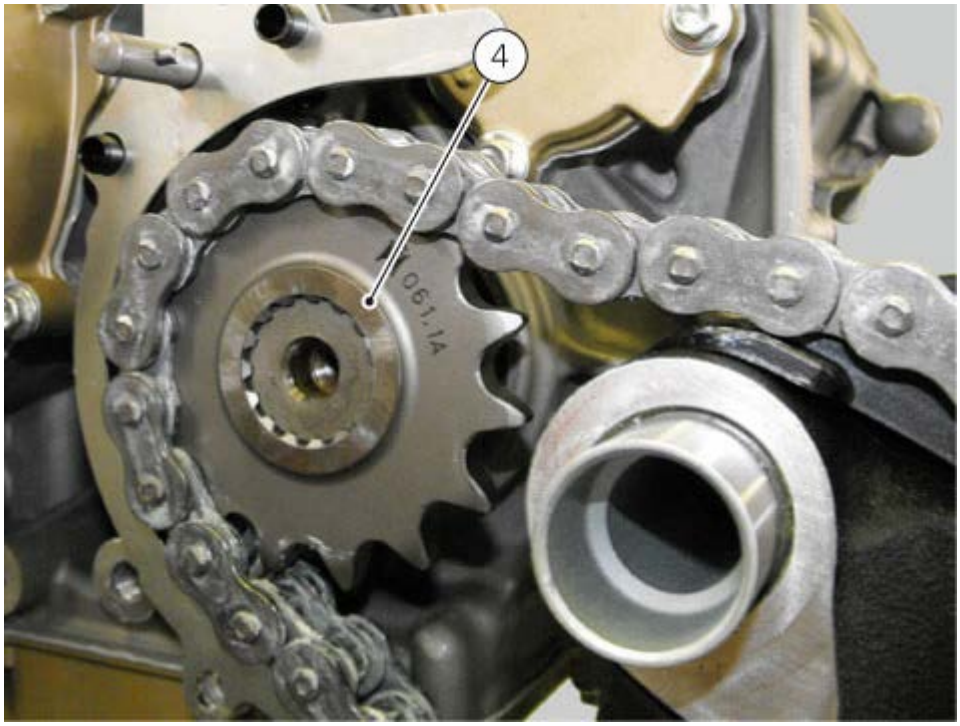
Slacken chain (1), as described under “Adjustment of chain tension”.

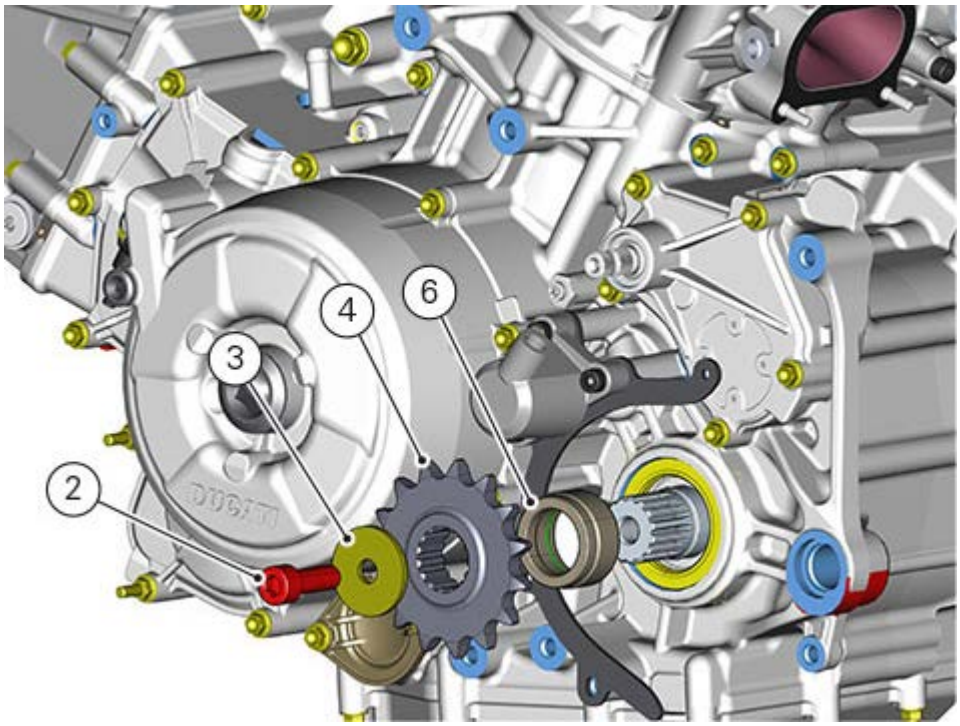


Engage a low gear and loosen screw (2).
Remove the lock washer (3) from front sprocket (4).



Remove the front sprocket (4) with chain from the gearbox secondary shaft.

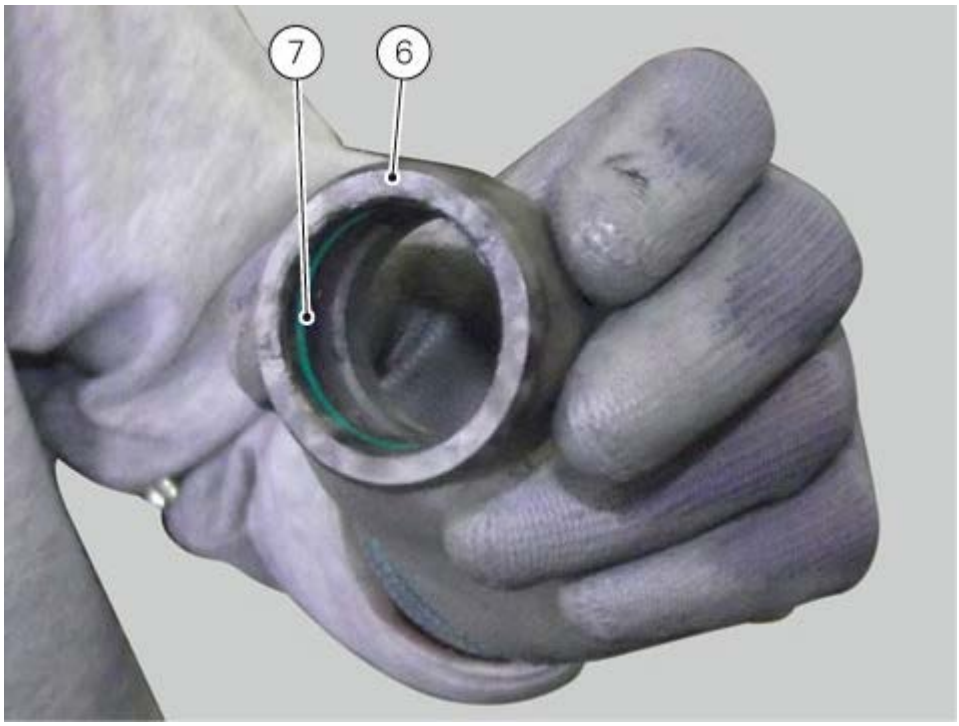




Remove the spacer (6) with O-ring (7) from the gearbox secondary shaft (5).

Important

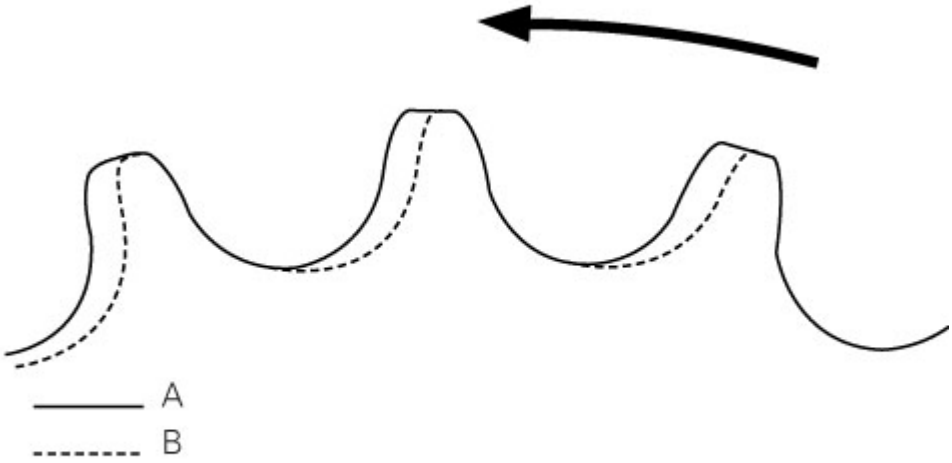
The O-ring (7) must be renewed upon removal.

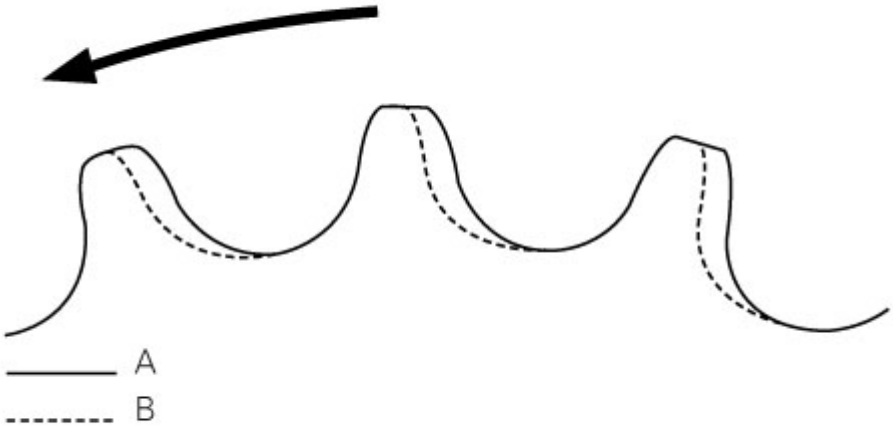

7
6


5

Inspecting the final drive

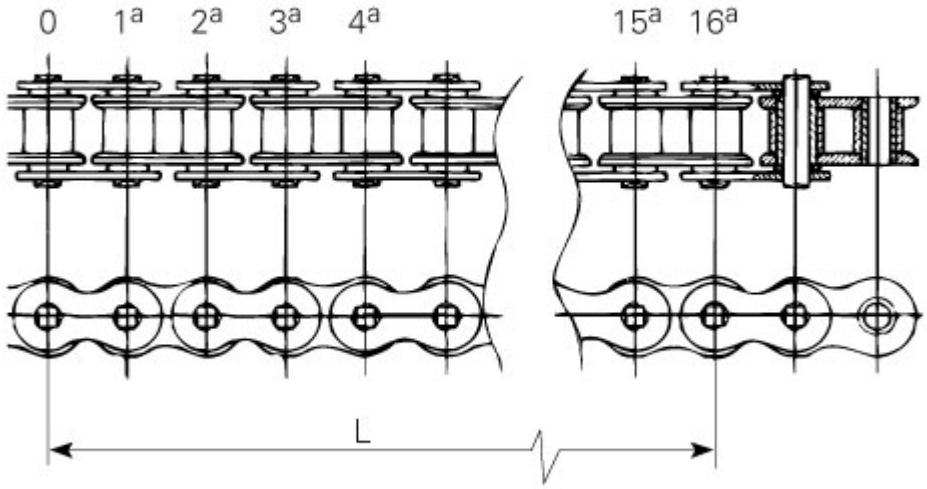
Check the final drive for wear by visually inspecting the front and rear sprockets.
The figure shows "Normal" sprocket profile with line (A) and "Worn" sprocket profile with broken line (B).
If the teeth are found to be worn as shown in the figure (broken line - B), the sprocket must be renewed.





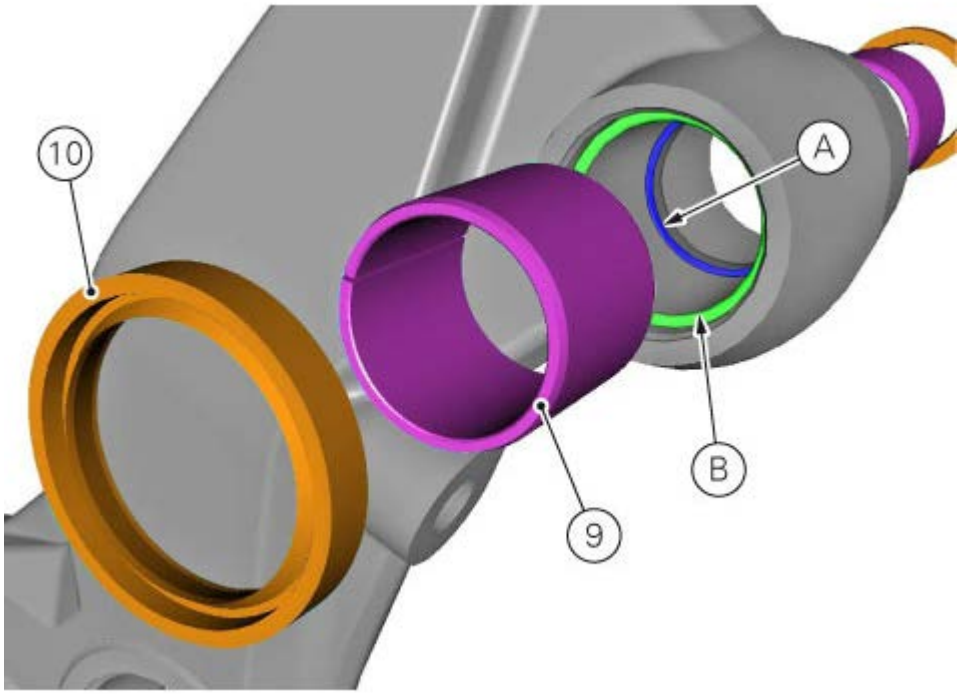
To check the chain, keep the chain taut and measure 16 links.
If the length (L) is greater than 256.5 mm, the chain should be replaced.

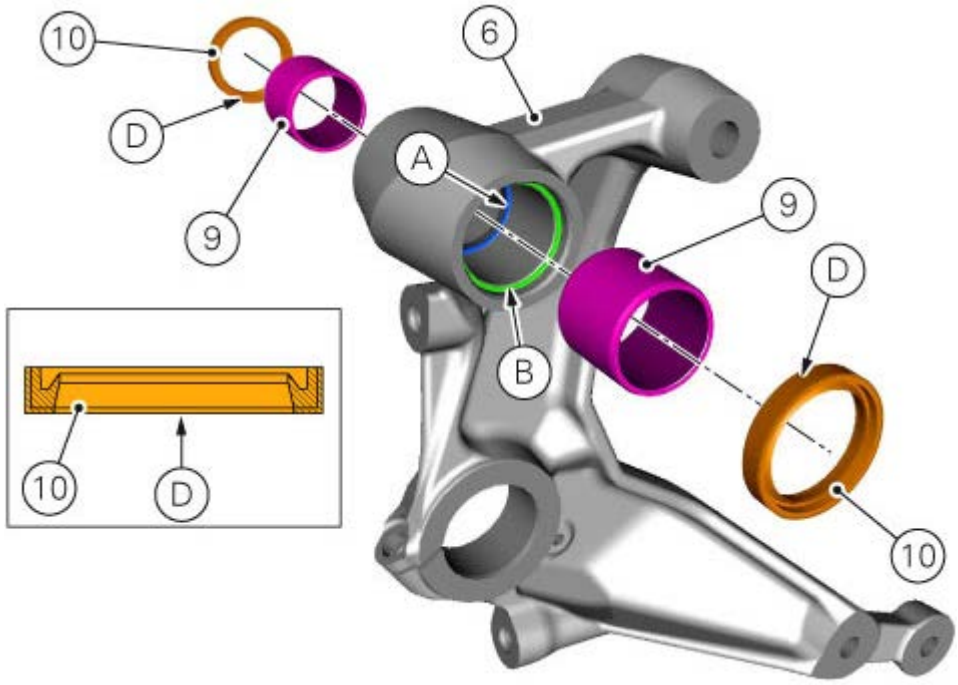
Important
The front and rear sprockets and chain must all be replaced together as a set.


0
1ª
2ª
3ª
4ª
15ª
16ª
L

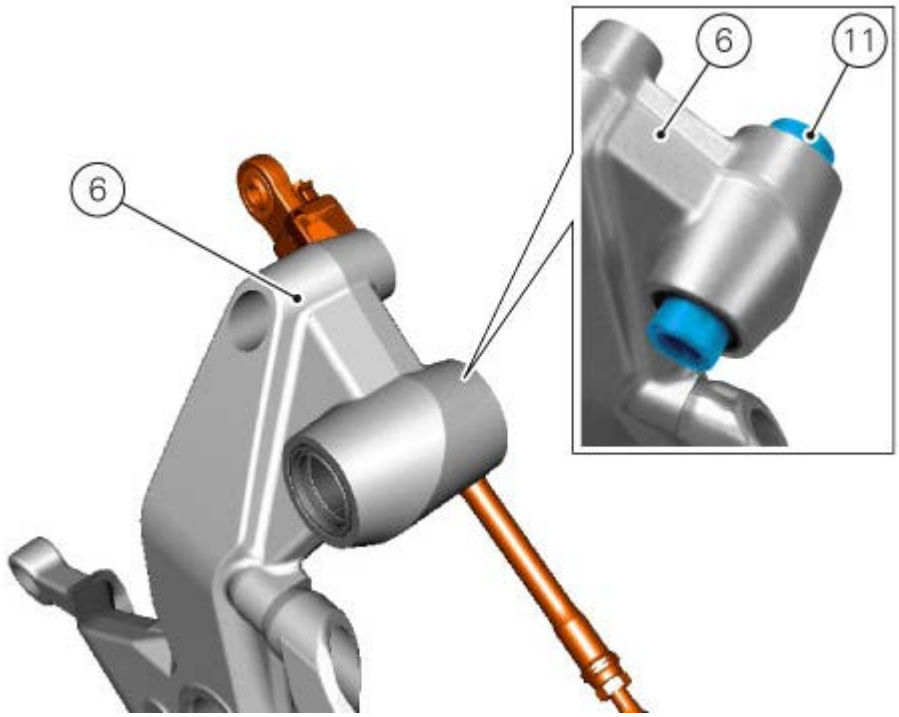
Refitting the front footpeg holder plates

If removed, drive bushes (9) in the indicated hole on support attached to left-hand footpeg holder plate (6), and take them fully home onto step (A). Fit dust seals (10) in their seats, fully home onto step (B) and positioned so that the flat side is facing inside.

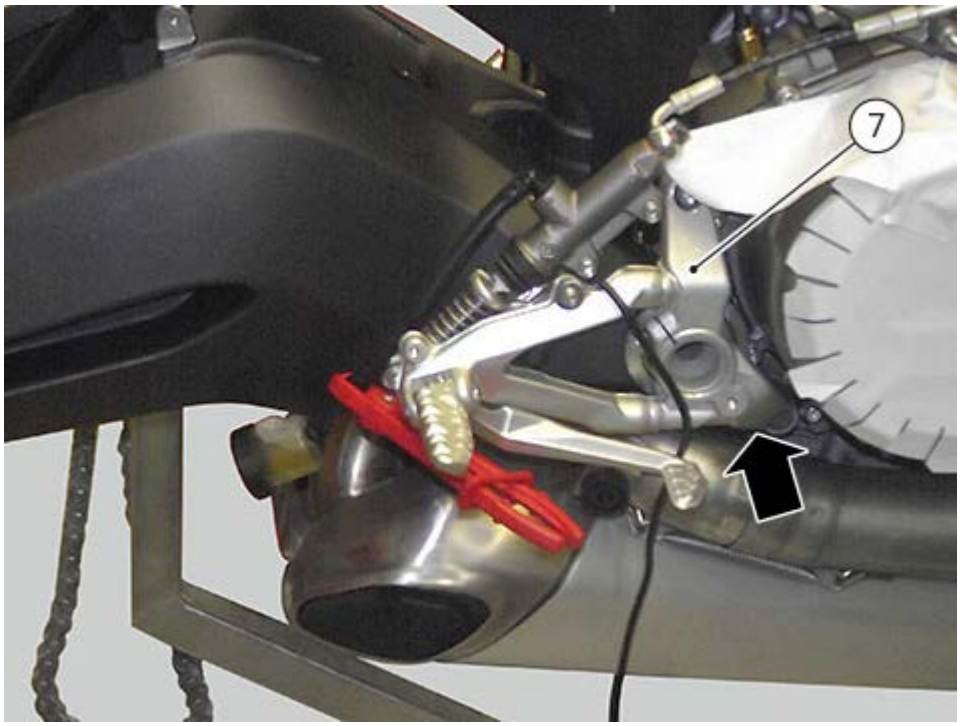




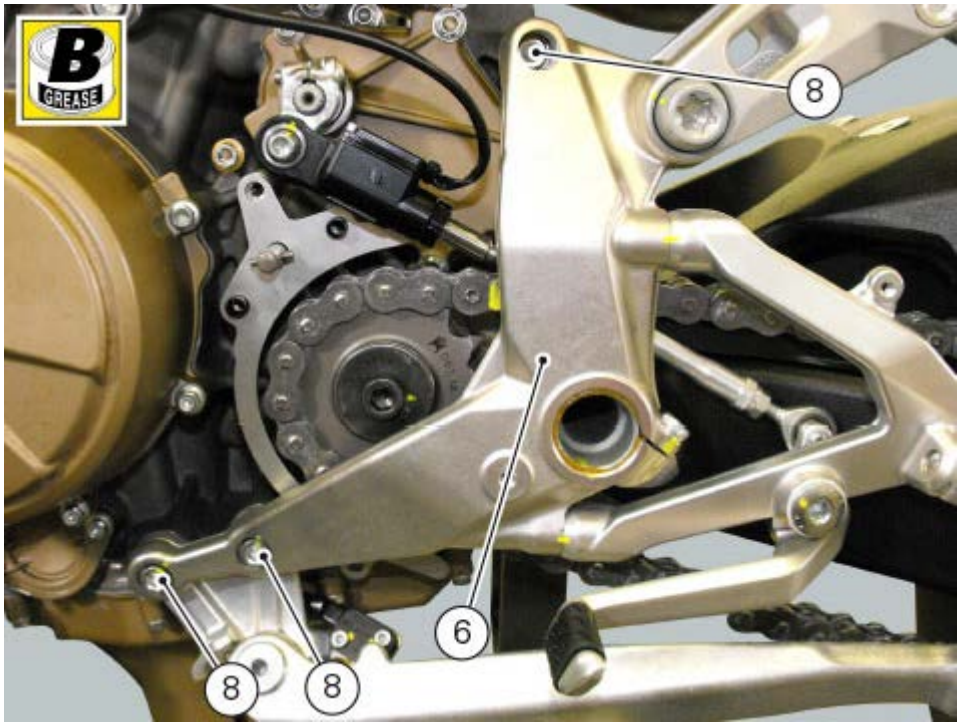
Make sure the bushing (11) is present inside the indicated hole on left-hand support (6).

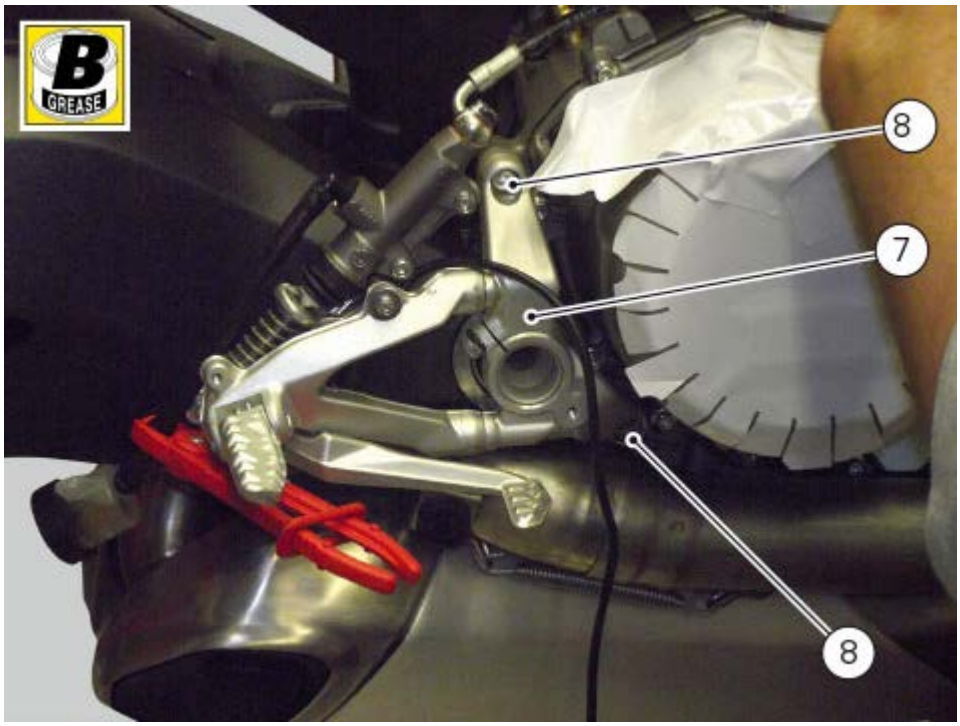


Set the left-hand support (6) and right-hand support (7) onto swinging arm shafts.

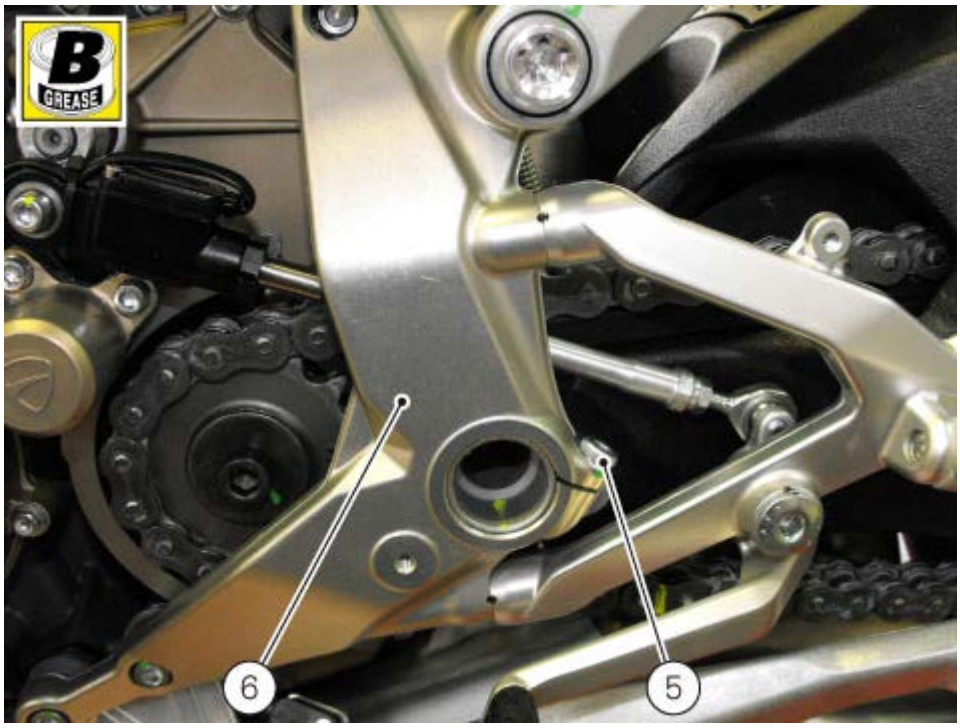


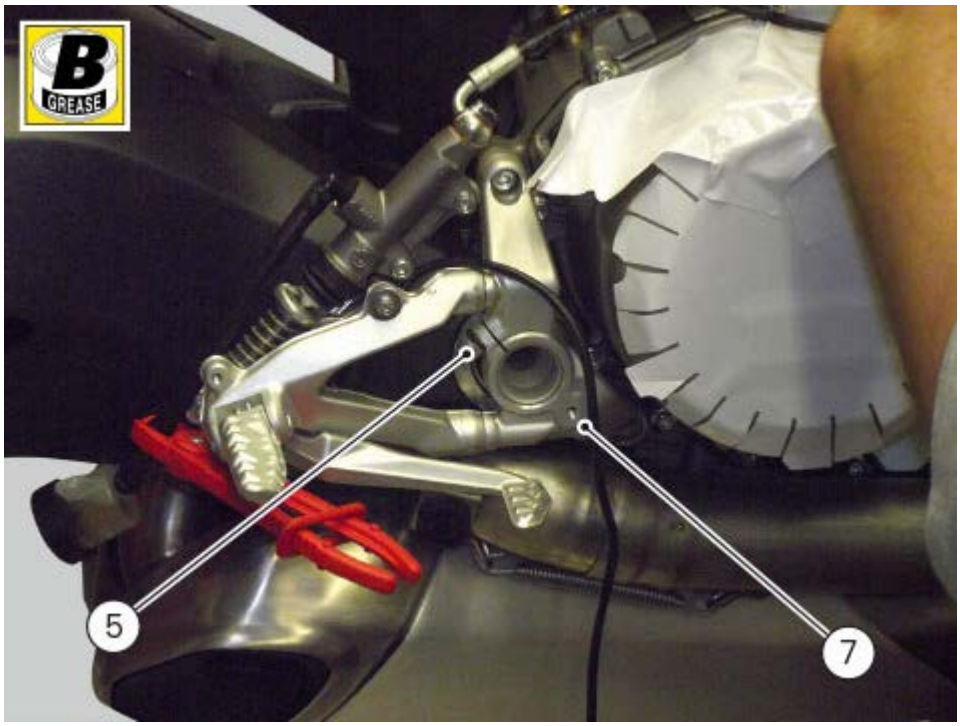
Smear screws (8) with specified grease.
Start the screws (8) securing the left-hand support (6) and right-hand support (7) to engine block.
Tighten screws (8) to a torque of 25 Nm ± 5%.



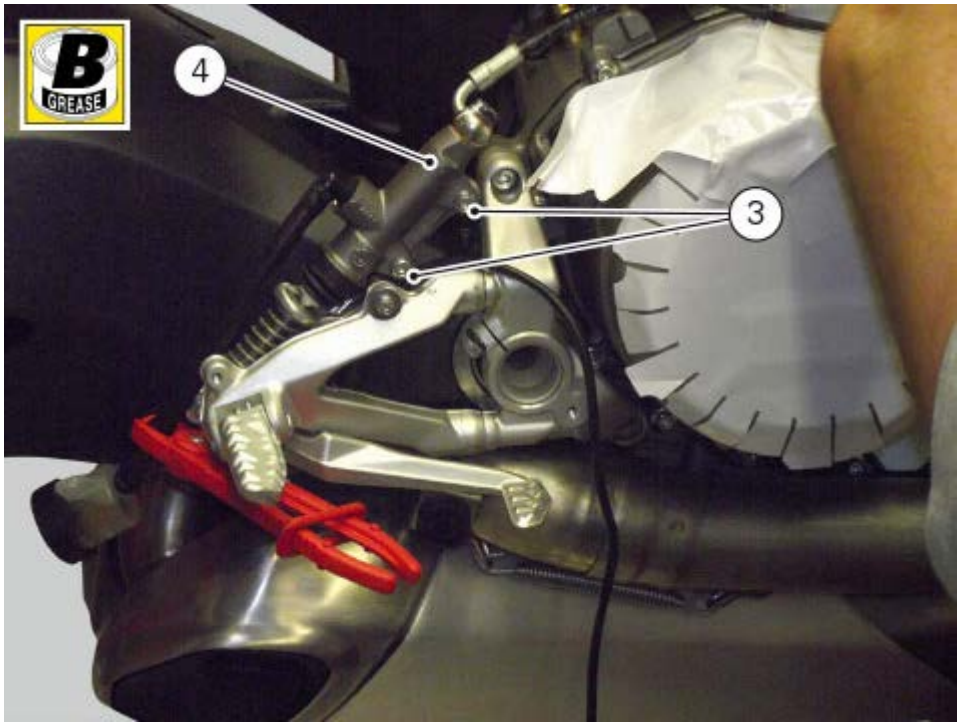


Smear screws (5) with specified grease.
Do screws (5) on swinging arm shaft clamps of left-hand support (6) and right-hand support (7) finger tight.
Tighten screws (5) to a torque of 8 Nm ± 5%.

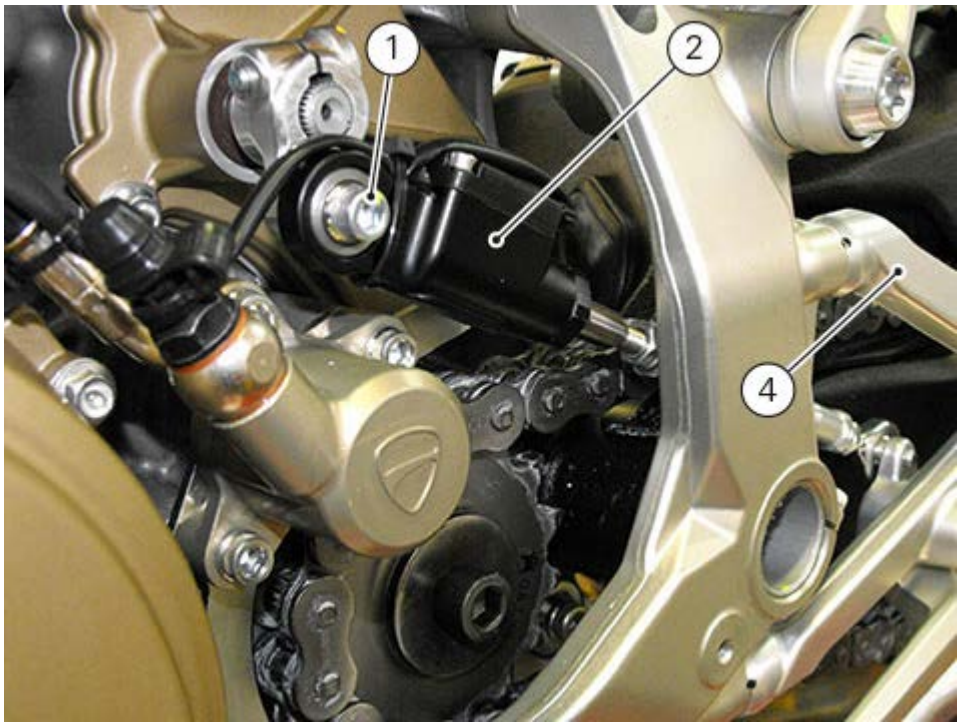




If footpeg holder plate units have already been fitted to the supports, start screws (3) retaining the rear brake master cylinder (4) to right-hand support (7). Tighten the screws (3) to a torque of 8 Nm 10%. Connect the rear brake sensor cable to the main wiring harness.



If footpeg holder plate units have already been fitted to the supports, start screw (1) retaining the gearchange rod (2). Tighten screw (1) to a torque of 10 Nm 10%.

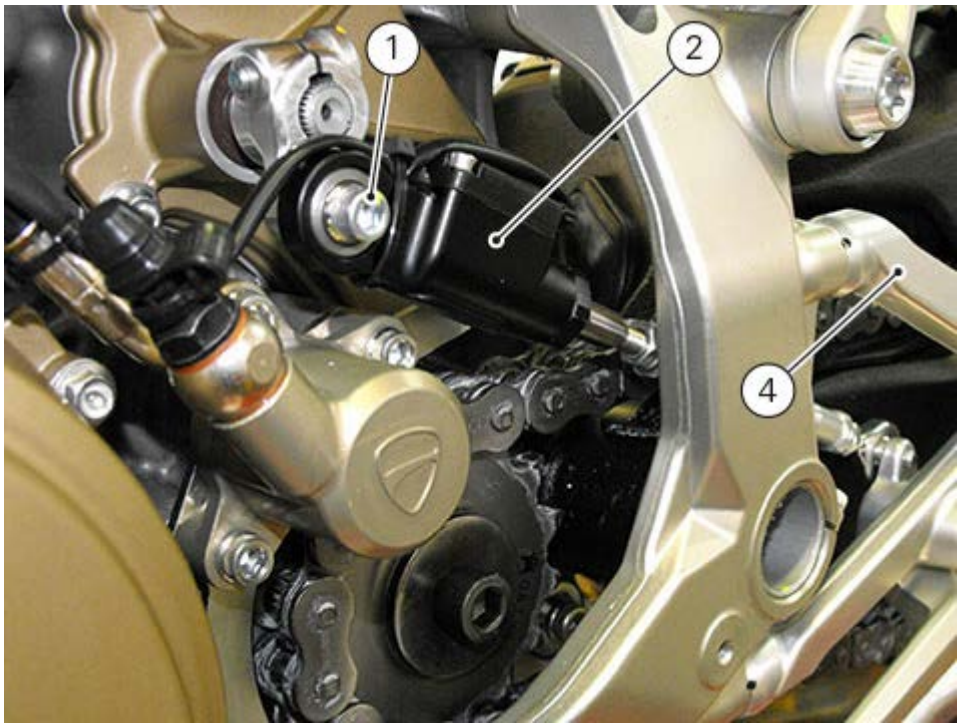


If necessary, refit the footpeg holder plate unit to supports (Refitting the front footpegs).
Refit the rocker arm-shock absorber assembly (Refitting the shock absorber support).
Refit the lower half-fairings (Refitting the side fairings).

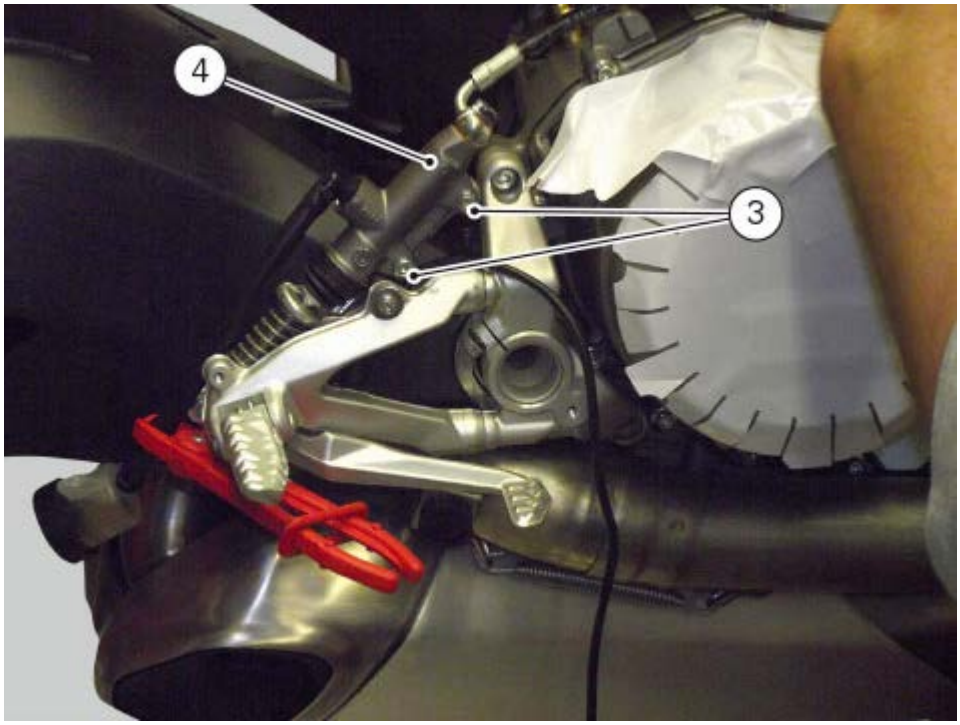
Removing he front footpeg holder plates

Remove the lower half-fairings (Removing the side fairings).
Remove the rocker arm-shock absorber assembly (Removing the shock absorber support).

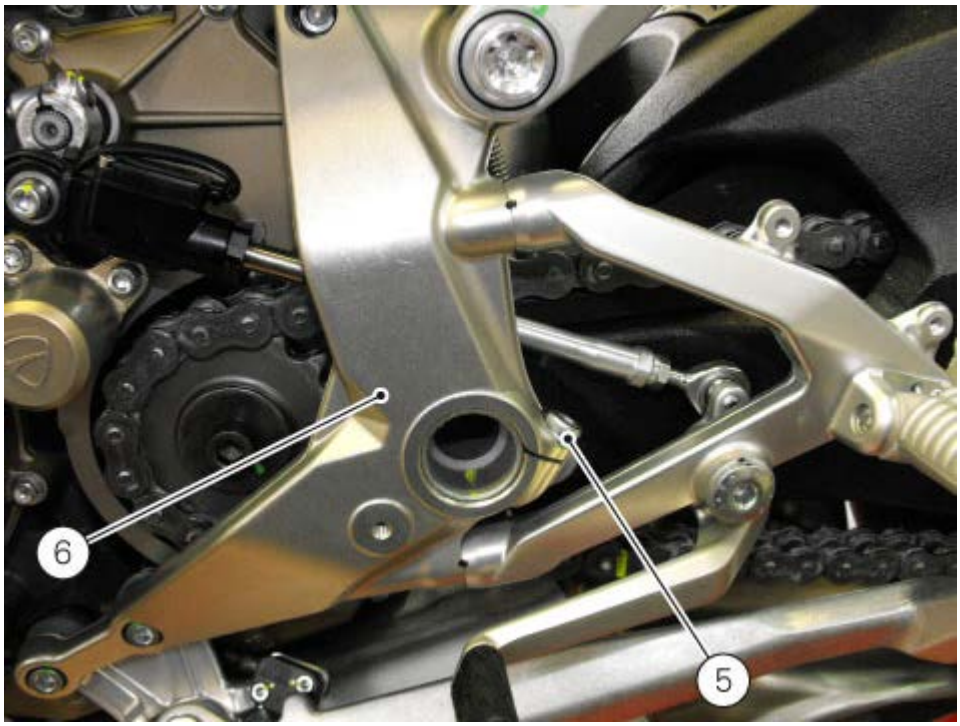
Remove the footpeg holder plate unit: it is possible to leave the footpeg holder plate unit assembled to the swinging arm shaft supports.
If these supports are removed with attached footpeg holder plate units, loosen screw (1) retaining the gearchange assembly (2).

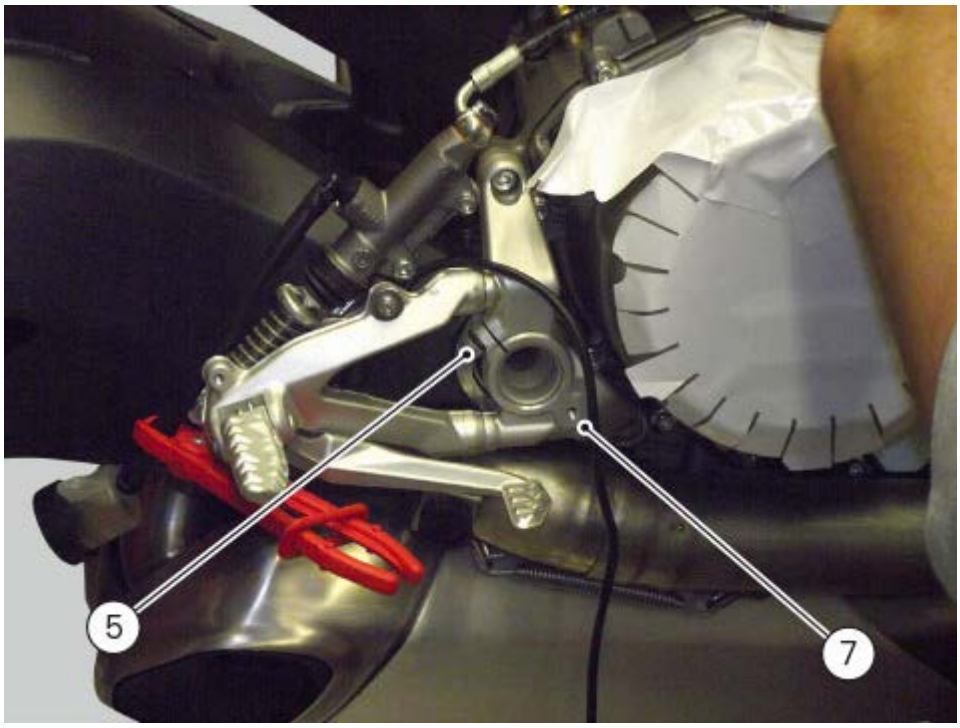


If these supports are removed with attached footpeg holder plate units, loosen screws (3) retaining the rear brake master cylinder (4) and disconnect the rear brake sensor cable from the main wiring harness.

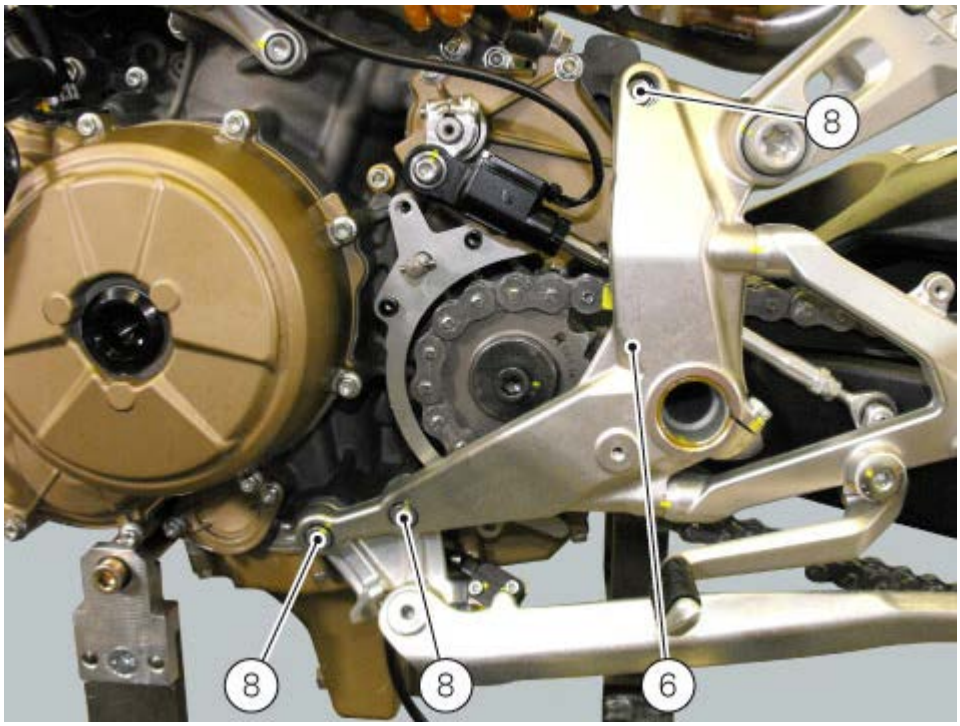


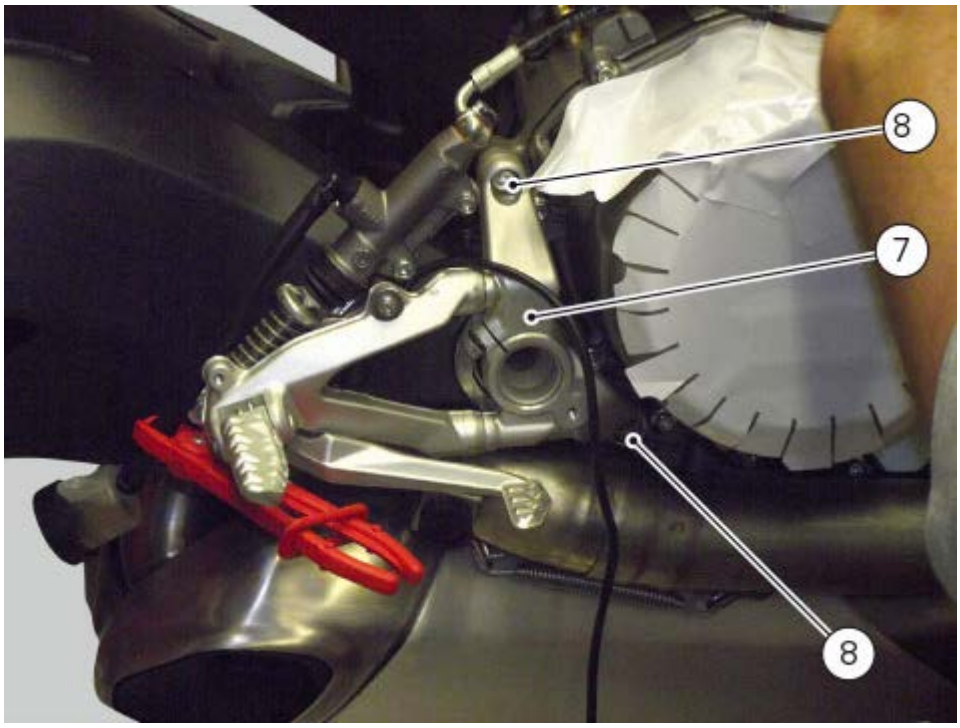
Loosen screws (5) from swinging arm shaft clamps of left-hand support (6) and right-hand support (7).





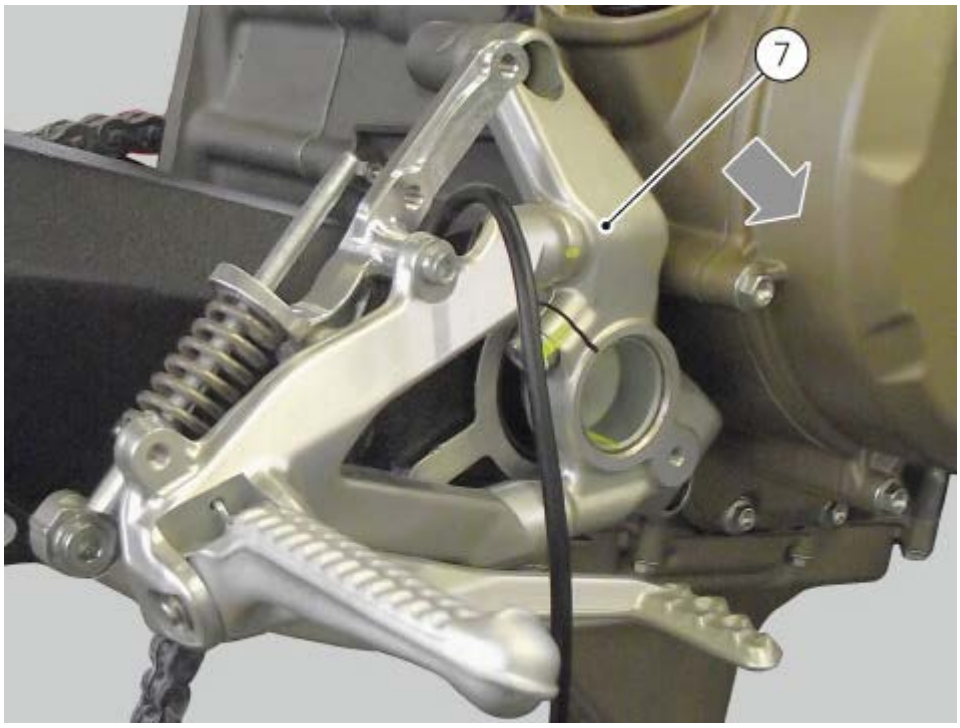
Unscrew the screws (8) securing the left-hand support (6) and right-hand support (7) to engine block.





Slide out the left-hand support (6) and right-hand support (7) from swinging arm shafts.


6


7

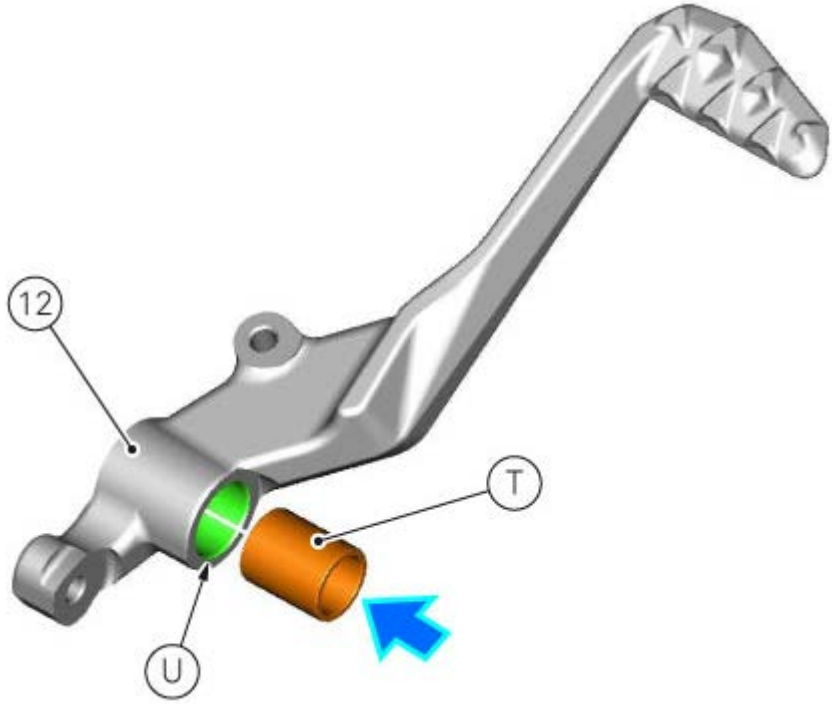
Refitting the footpeg assembly

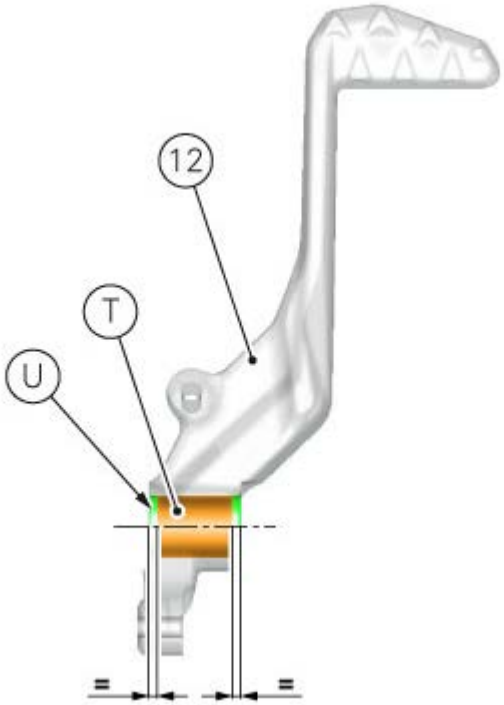
Reassembly of the right-hand footpeg holder plate unit

Make sure that bushing (T) is set in the relevant seat (U) on rear brake lever (12).

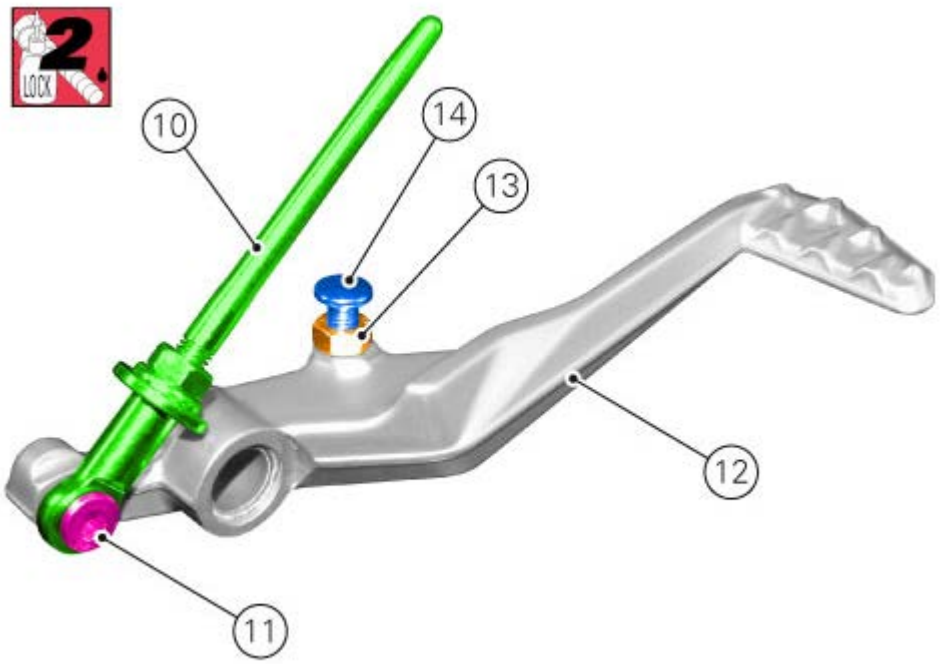
Important

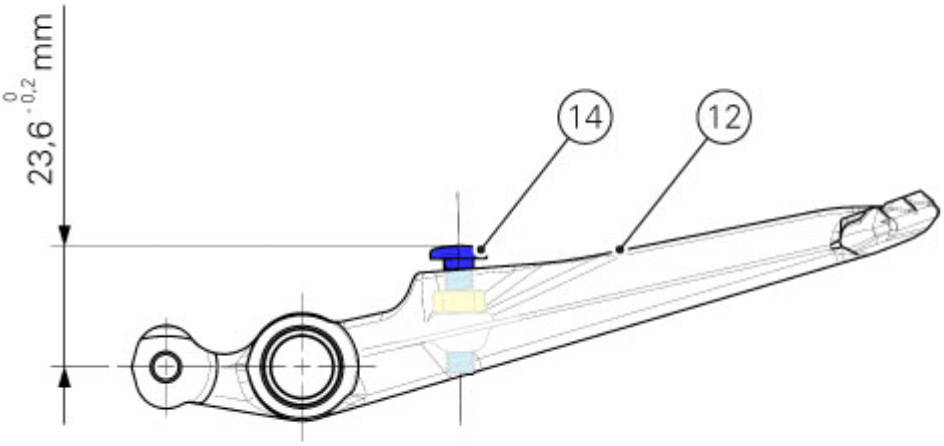
Bushing (T) must be at the same distance from the external edges of seat (A), as shown.



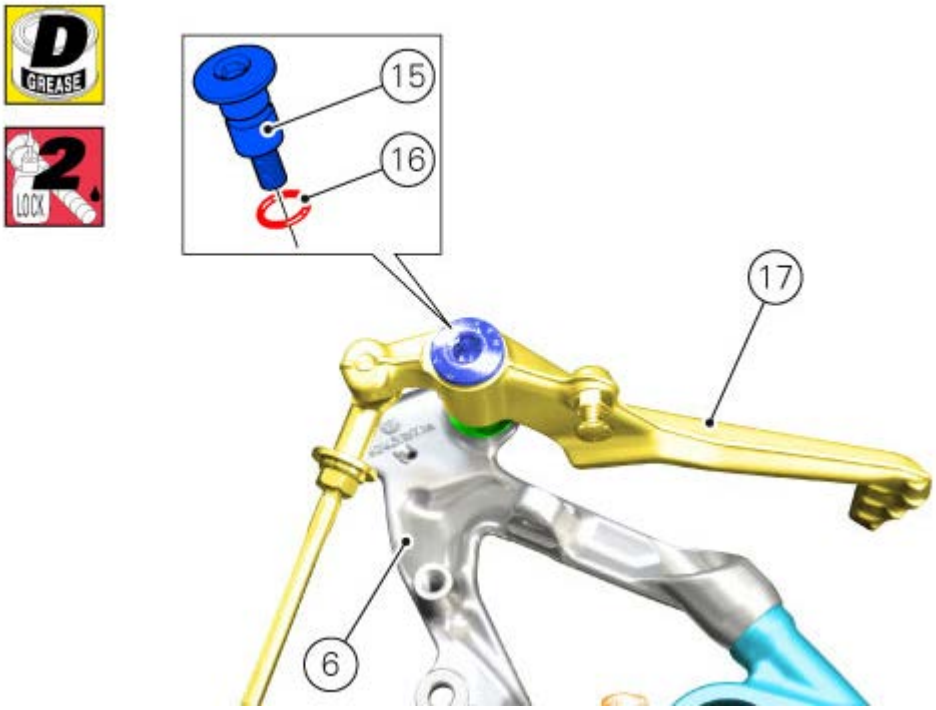


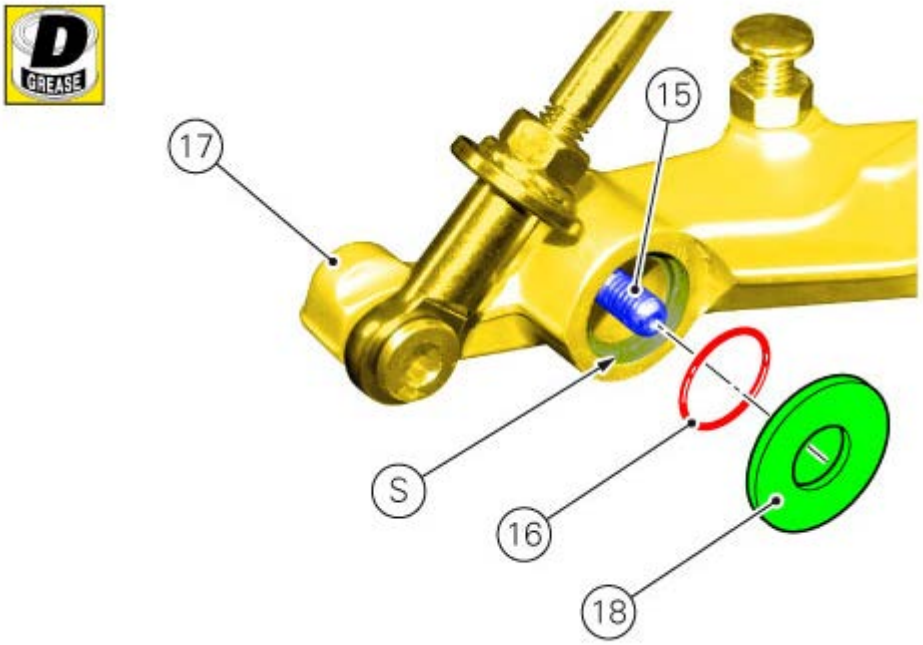
Fit the rear brake master cylinder rod (10) onto screw (11).
Apply the recommended threadlocker on the thread in view of screw (11).
Fit the rear brake master cylinder rod (10) onto brake lever (12) and start screw (11). Tighten the screw (11) to a torque of 10 Nm ± 10%.
Tighten nut (13) on adjuster (14). Tighten adjuster (14) on brake lever, until obtaining the indicated position.
Hold adjuster (14) and tighten nut (13) to 8 Nm ± 10% onto the surface of brake lever (12).



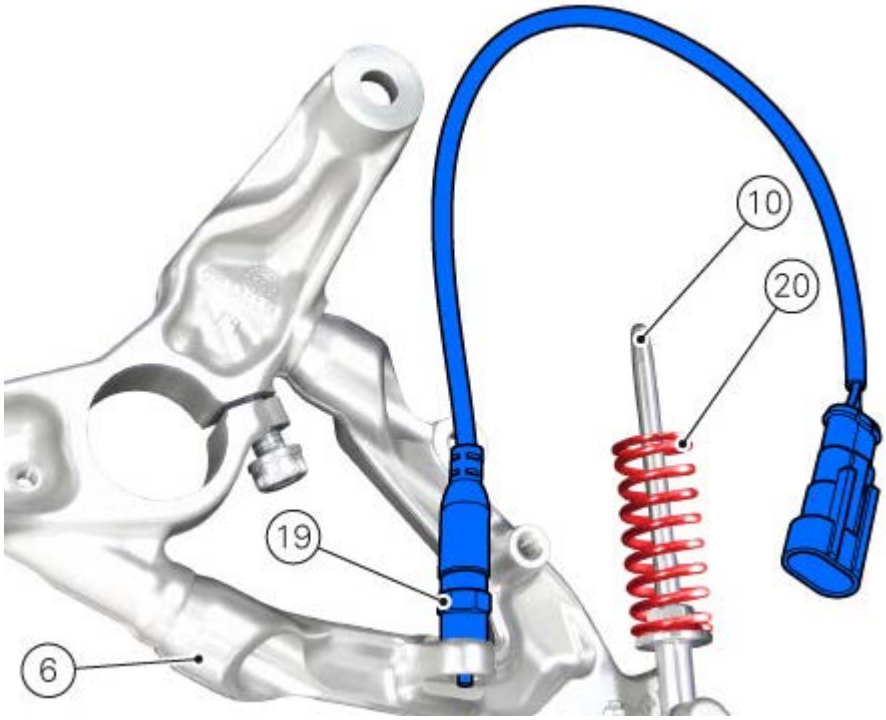


Apply recommended grease in the O-ring seat onto screw (15), insert the first O-ring (16) on screw (15).
Apply the recommended threadlocker to the screw thread (15).
Insert screw (15) in the indicated hole on brake lever assembly (17).
Apply recommended grease in the O-ring seat (S) onto brake lever assembly (17), insert the second O-ring (16) on screw (15).
Fit the washer (18) on screw (15).
Fit the brake lever assembly (17), positioning it as shown, on the front right-hand footpeg holder plate (6) and start screw (15).
Tighten the screw (15) to a torque of 25 Nm ± 10%.

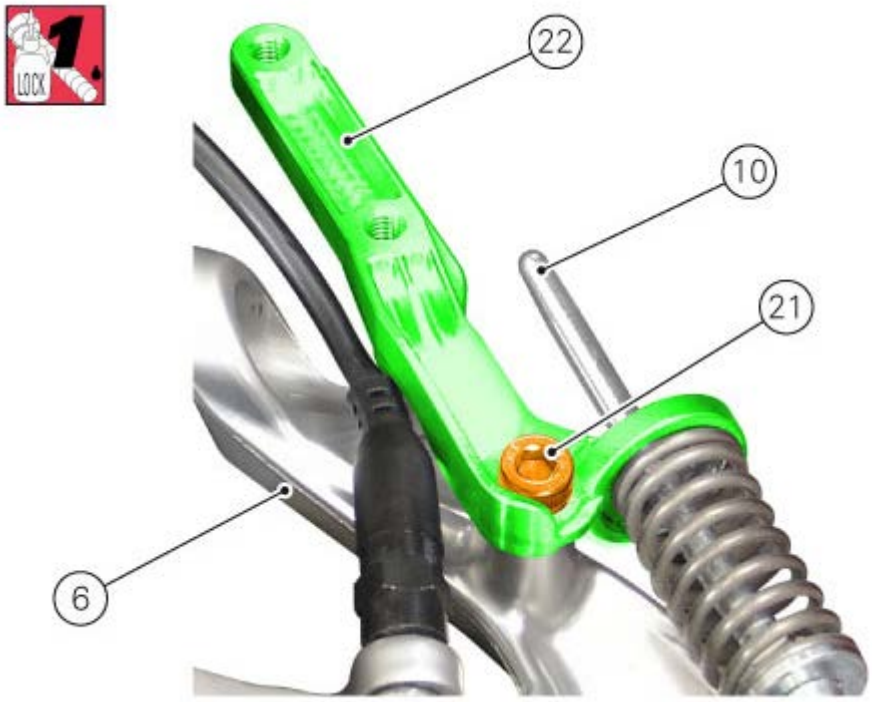


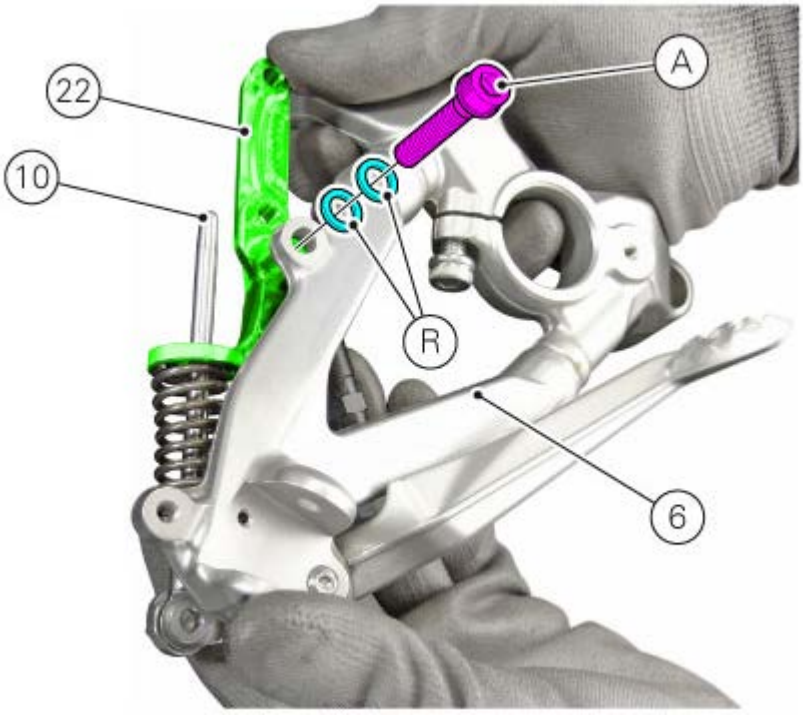


Fit the rear brake sensor cable (19), do it finger tight onto front right-hand footpeg holder plate (6). Tighten rear brake sensor cable (19) to a torque of 5 Nm ± 10%. Fit the spring (20) onto rear brake master cylinder rod (10).

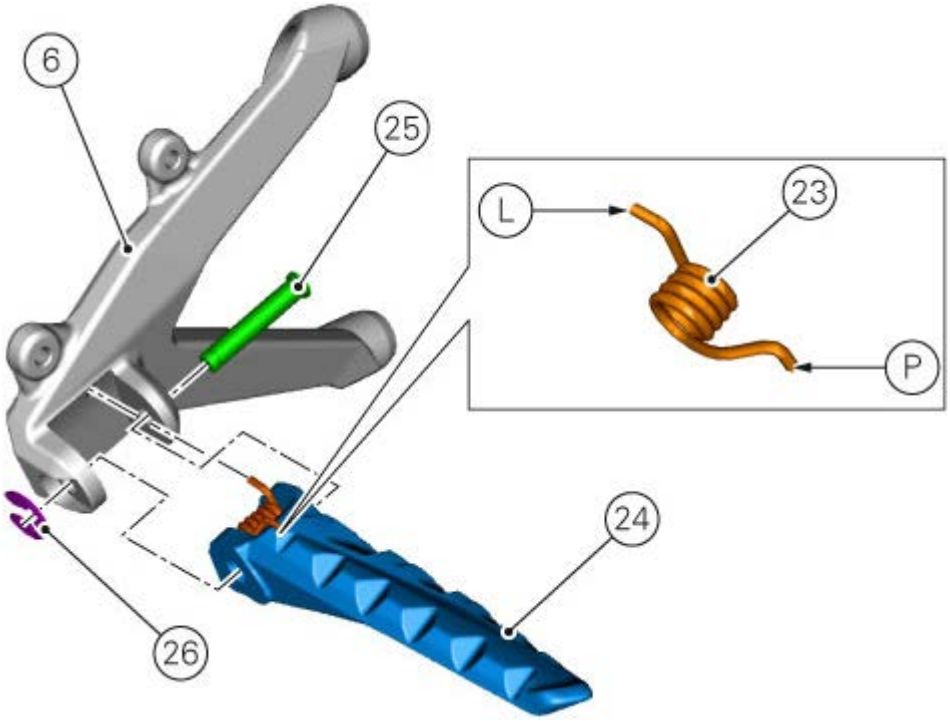


Apply specified threadlocker on the screw thread (21). Fit spring compression plate (22) onto rear brake master cylinder rod (10) and fasten it inside front right-hand footpeg holder plate (15) by starting screw (21).
Fit two service washers (R) onto screw (A): screw (A) will be used later, to fasten the right-hand heel guard. Every service washer (R) must be 5 mm x 15 mm (diameter) x 1.5 mm (thickness). On the outside, start screw (A) with washers (R).
Tighten the screw (21) to a torque of 10 Nm ± 10%.
Tighten screw (A) to a torque of 6 Nm ± 10%.





Position spring (23) as shown onto front right-hand footpeg (24): set the end (P) of spring (23) onto footpeg, while end (L), i.e. the one on footpeg holder plate side, must be inserted into the hole on front right-hand footpeg holder plate (6). Fit shaft (25) from the indicated side. Lock shaft using circlip (26).

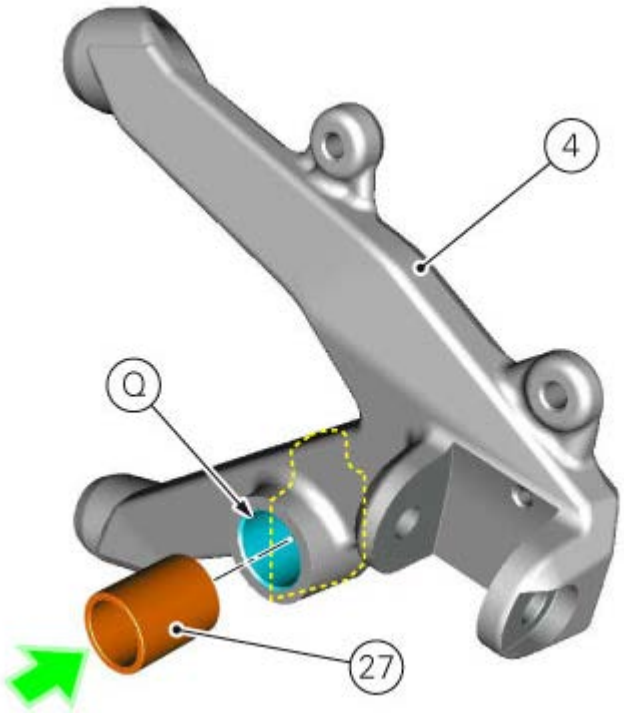


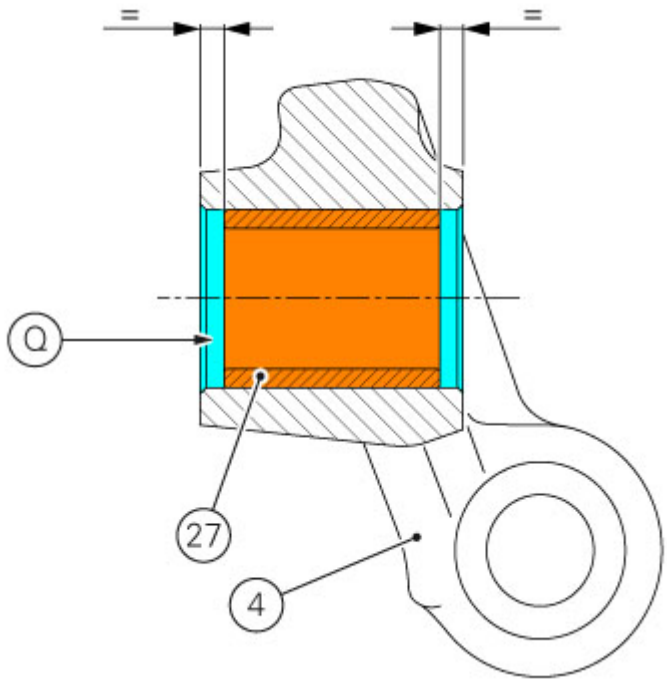
Reassembly of the left-hand footpeg holder plate unit

If removed, drive bushing (27) in the relevant seat (8) on front left-hand footpeg holder plate (4).

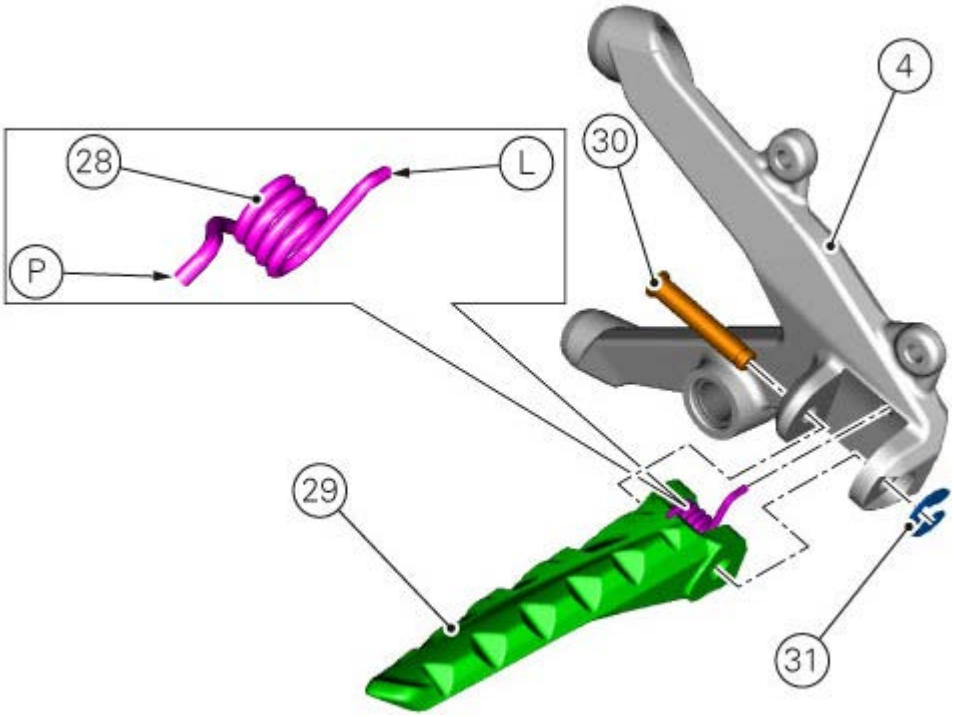
Important

After assembly, bushing (27) must be at the same distance from the external edges of seat (Q), as shown.

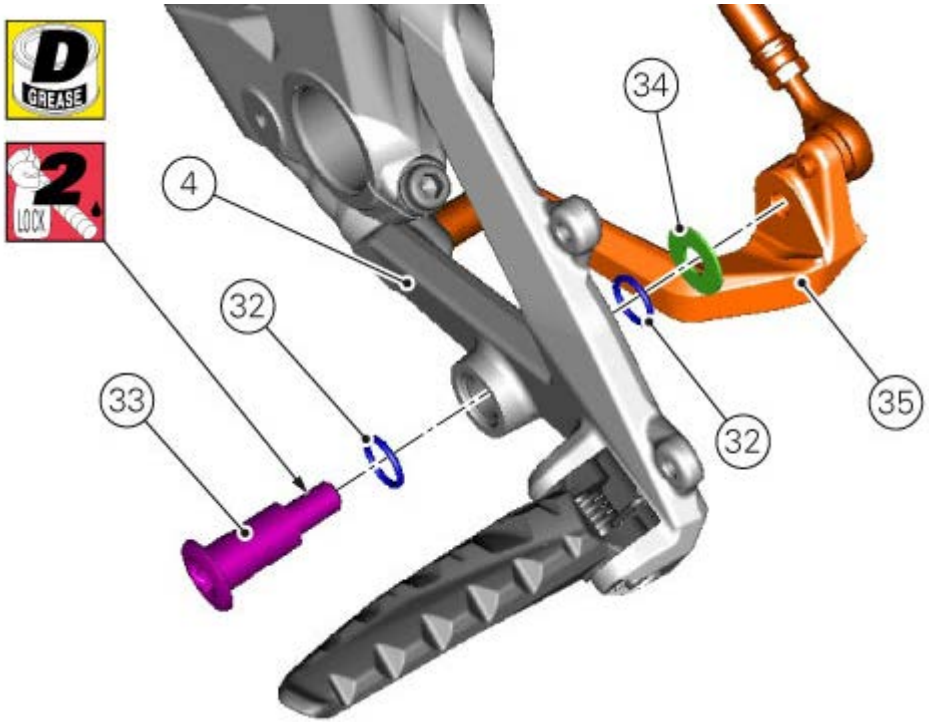


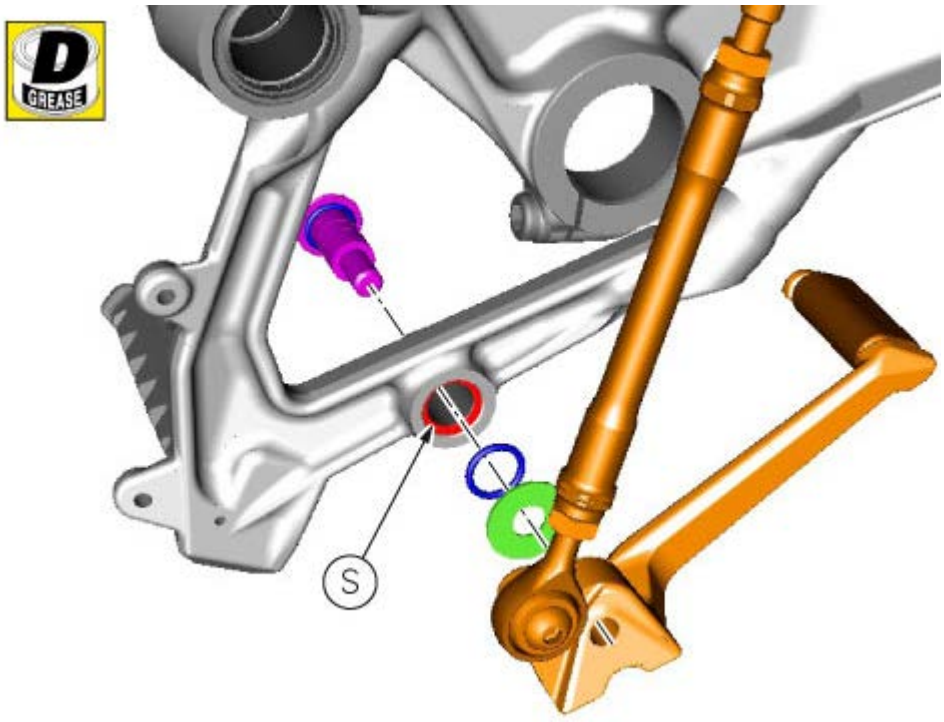


Position spring (28) as shown onto front left-hand footpeg (29): set the end (P) of spring (28) onto footpeg, while end (L), i.e. the one on footpeg holder plate side, must be inserted into the hole on front left-hand footpeg holder plate (4). Fit shaft (30) from the indicated side and lock it using circlip (31).



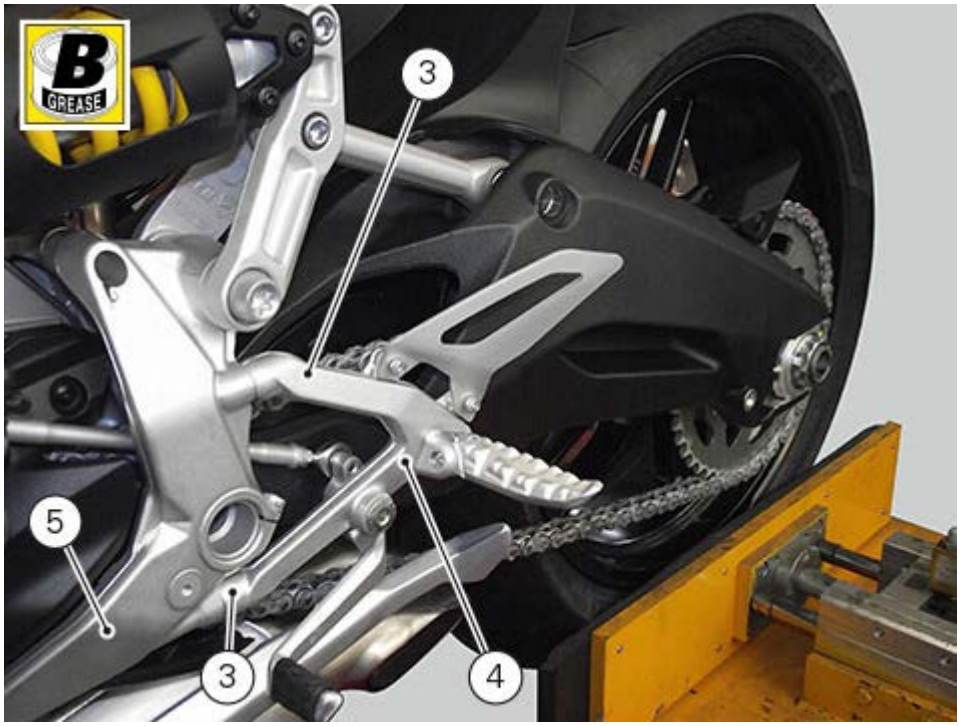
Fit the first O-ring (32) on screw (33) after applying recommended threadlocker on thread.
Apply recommended grease on the screw collar (33), avoiding to grease the thread.
Insert screw (33) in the indicated hole on front left-hand footpeg holder plate (4).
Apply recommended grease in the O-ring seat (S) onto front left-hand footpeg holder plate (4), insert the second O-ring (32) on screw (33). Fit the washer (34) on screw (33).
Fit the gearchange lever assembly (35), in the position shown, onto front left-hand footpeg holder plate (4). Start screw (33); tighten screw (33) to 25 Nm ± 10%.

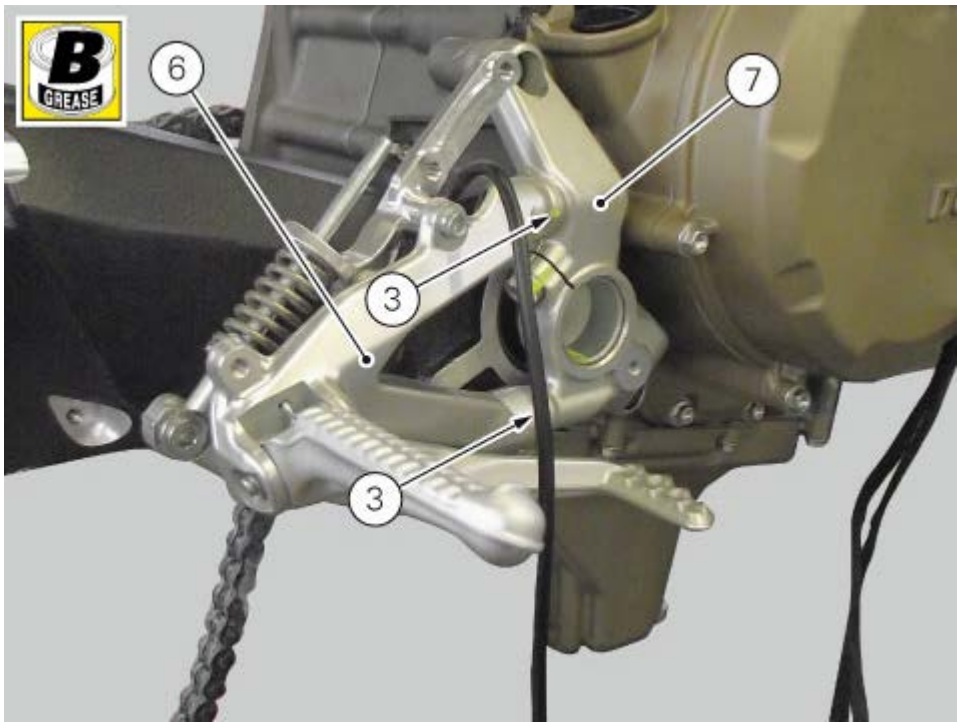




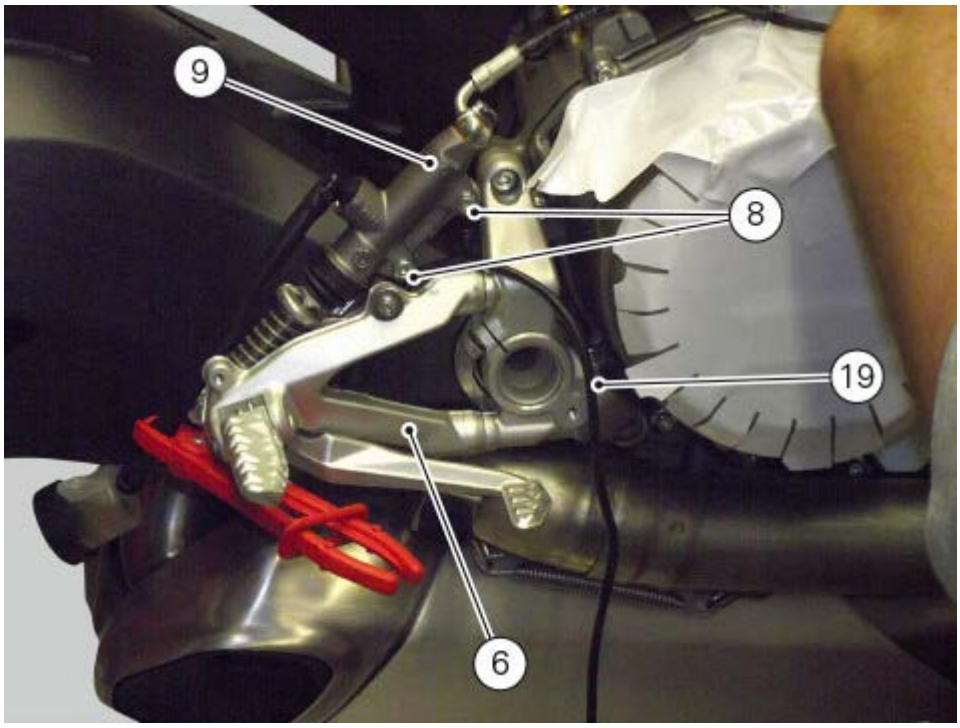
Refitting the footpeg holder plate assembly

Set the front left-hand footpeg holder plate (4) and right-hand one (6) on the relevant left (5) and right (7) swinging arm shaft supports.
Smear screws (3) with specified grease. Start the screws (3) and tighten them to a torque of 25 Nm ± 5%.

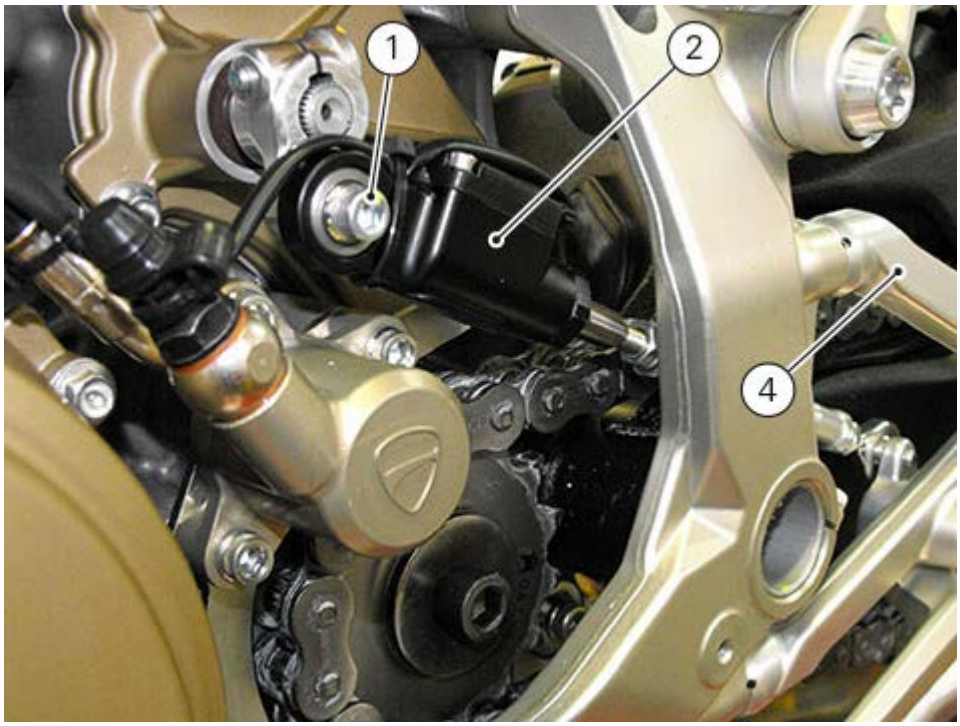




Position the rear brake master cylinder (9) onto the right-hand footpeg holder plate (6) and tighten screws (8) to 8 Nm ± 10%. Connect the rear brake sensor cable (19) to the main wiring harness.



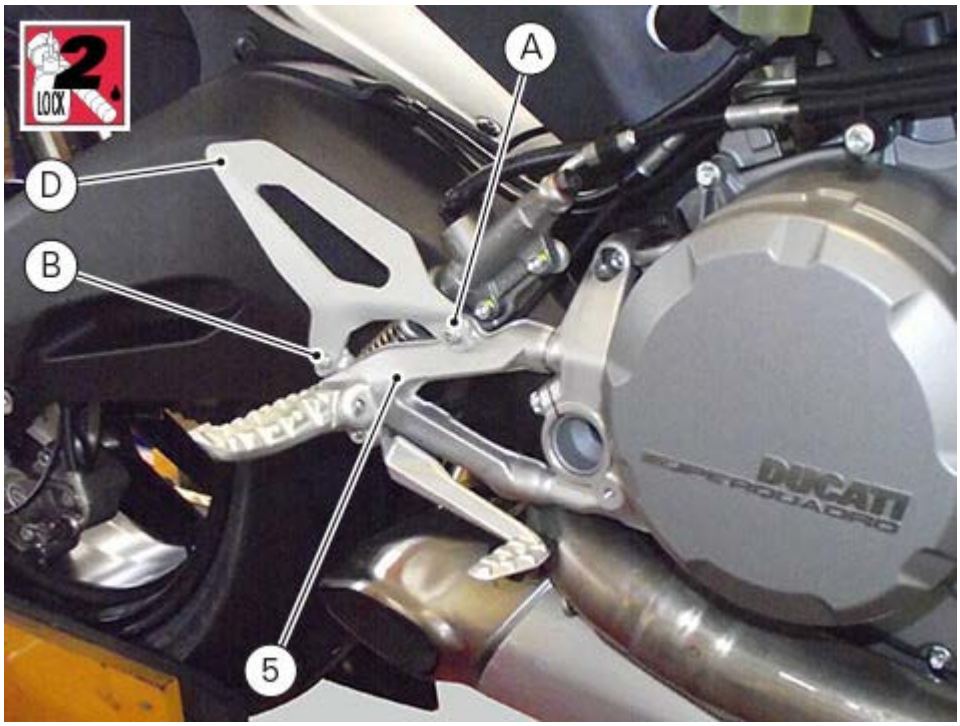
For left-hand footpeg holder plate (4), set gearchange assembly (2) onto gearchange lever and start the screw (1). Tighten the screw (1) to a torque of 10 Nm ± 10%.

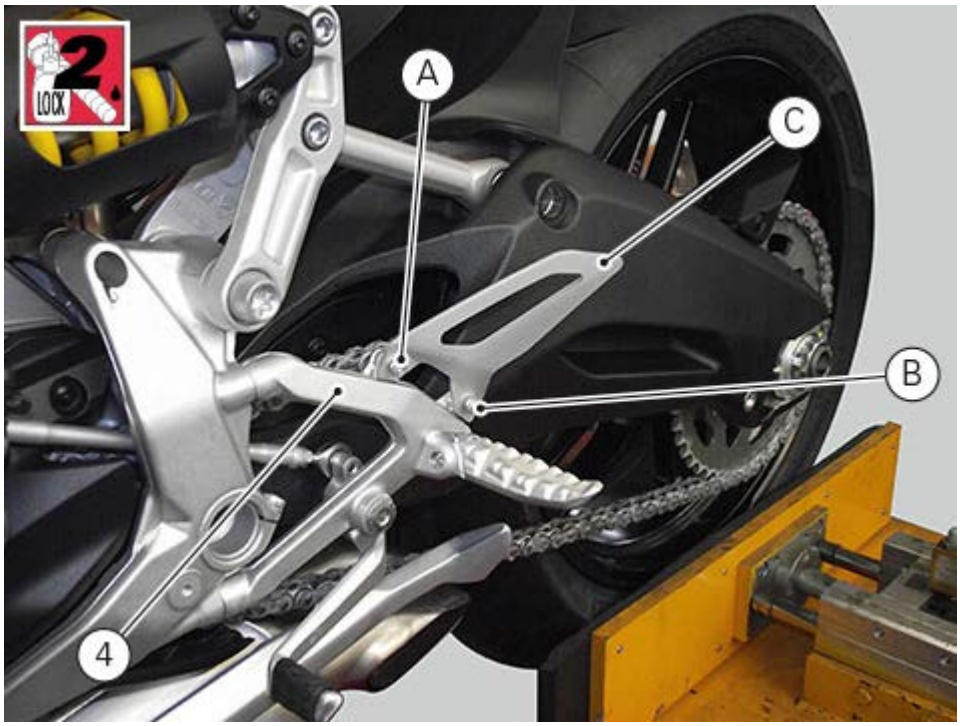


Refit the left (C) and right heel guards (D) respectively onto left-hand (4) and right-hand footpeg holder plates (6).
Loosen the previously used screw (A) from heel guard (D) and remove it together with the service washers used.
Smear screws (A) and (B) with recommended threadlocker, and start them.

Warning
Screw (A) on heel guard (D) also fastens rear brake master cylinder support onto footpeg holder plate.

Tighten the screws (A) and (B) to a torque of 6 Nm ± 10%.



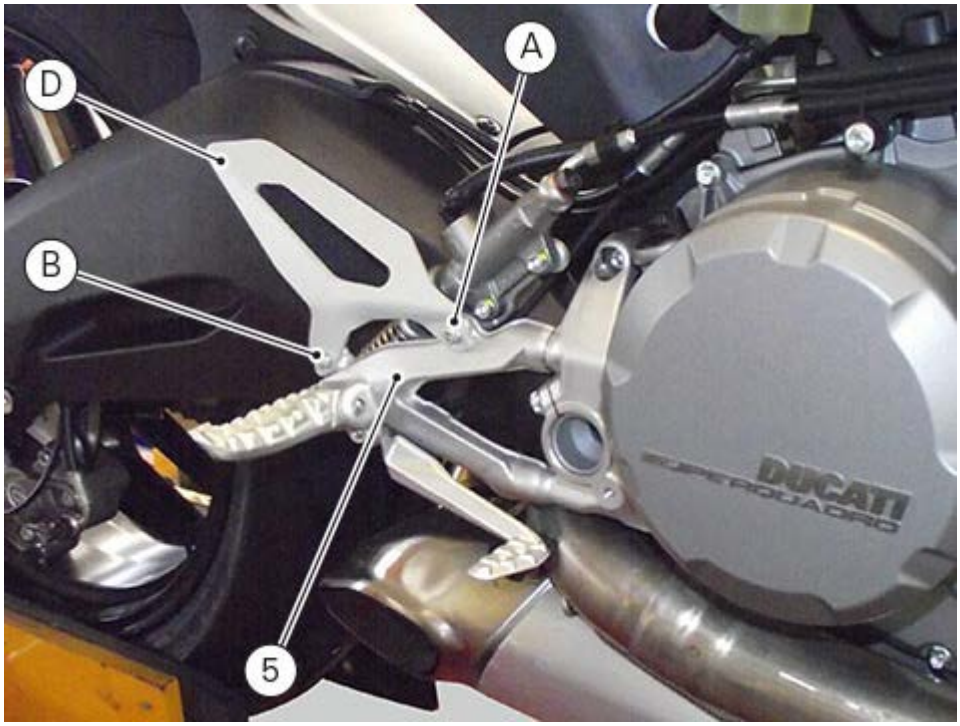


Refit the lower half-fairings (Refitting the side fairings).

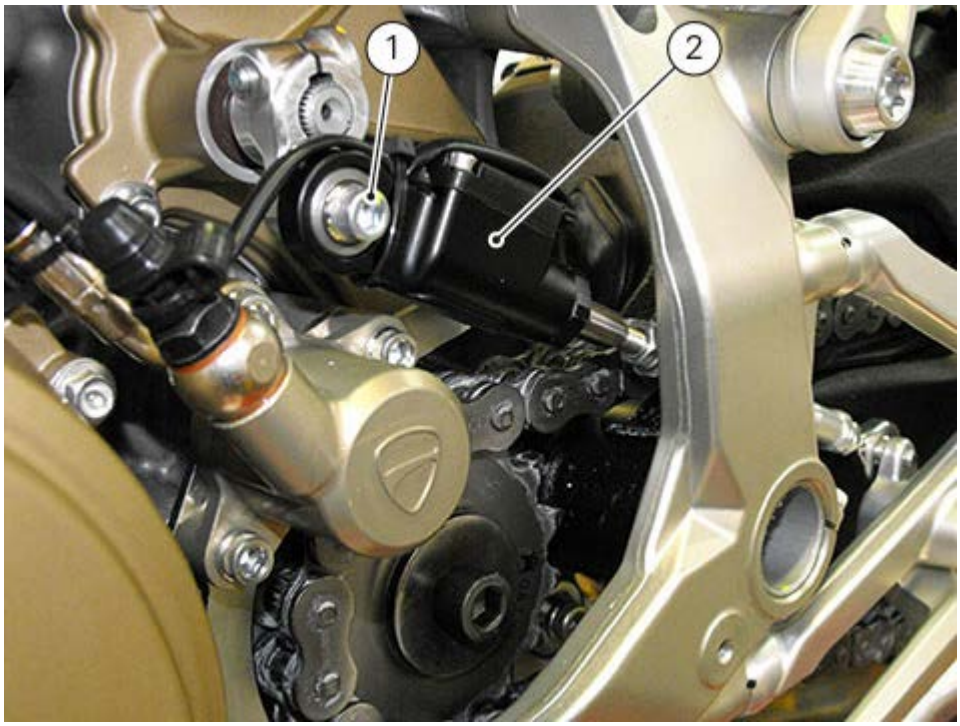
Removing the footpeg assembly

Remove the lower half-fairings (Removing the side fairings).

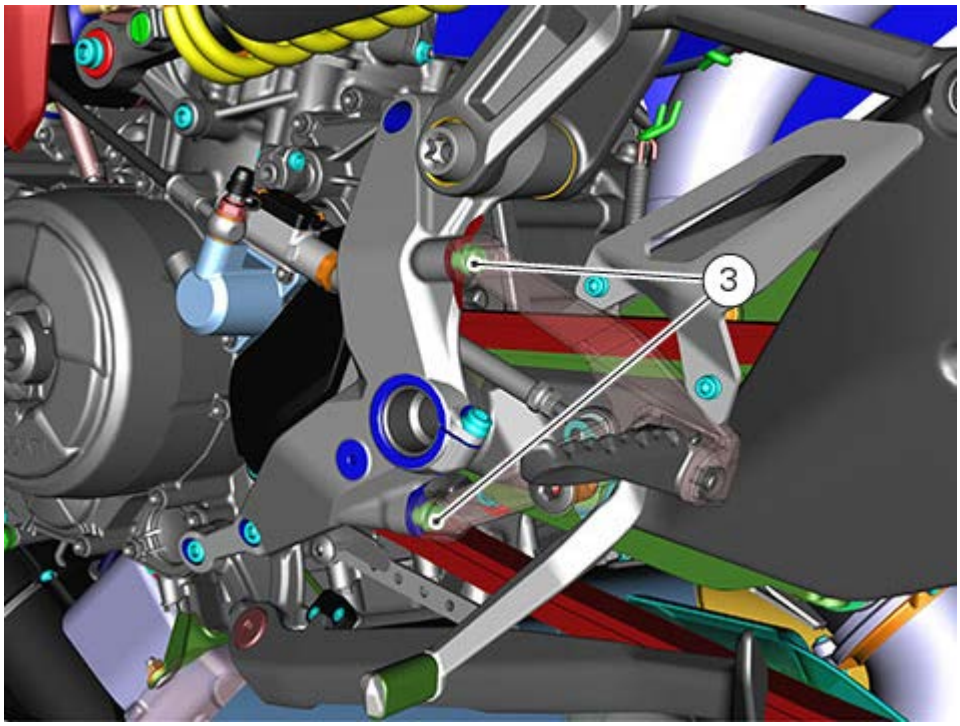
Loosen screws (A) and (B) to remove the LH (C) and RH (D) heel guards.



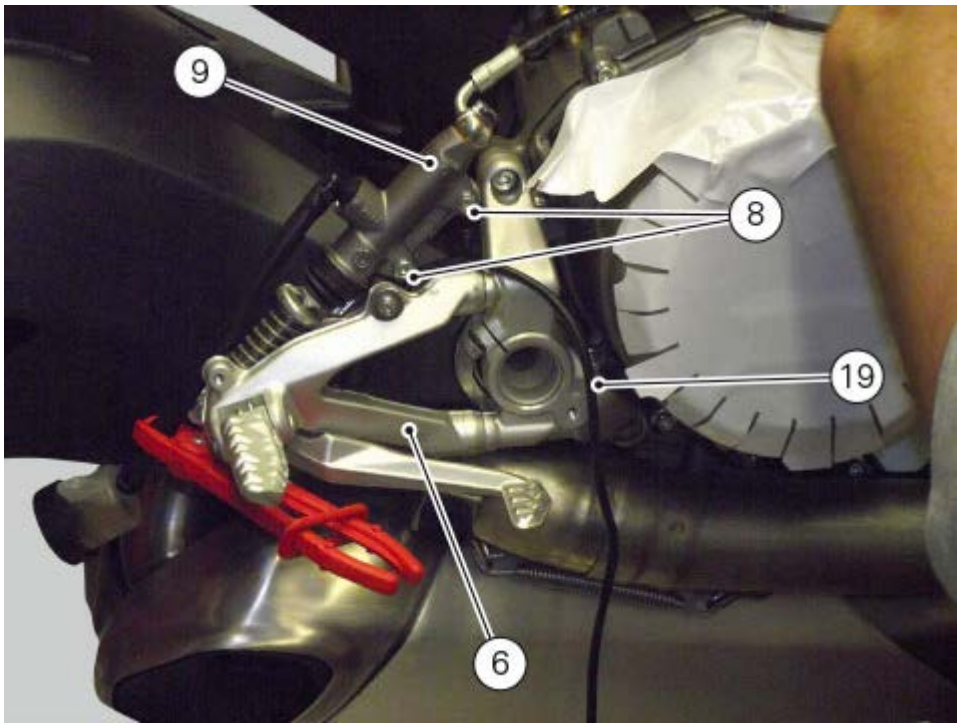
Loosen gearchange unit (2) screw (1).



Loosen the two screws (3) retaining the left-hand footpeg holder plate (4) to the left-hand swinging arm shaft support (5).
It is now possible to remove the left-hand footpeg holder plate (4) from the left-hand swinging arm shaft support (5).

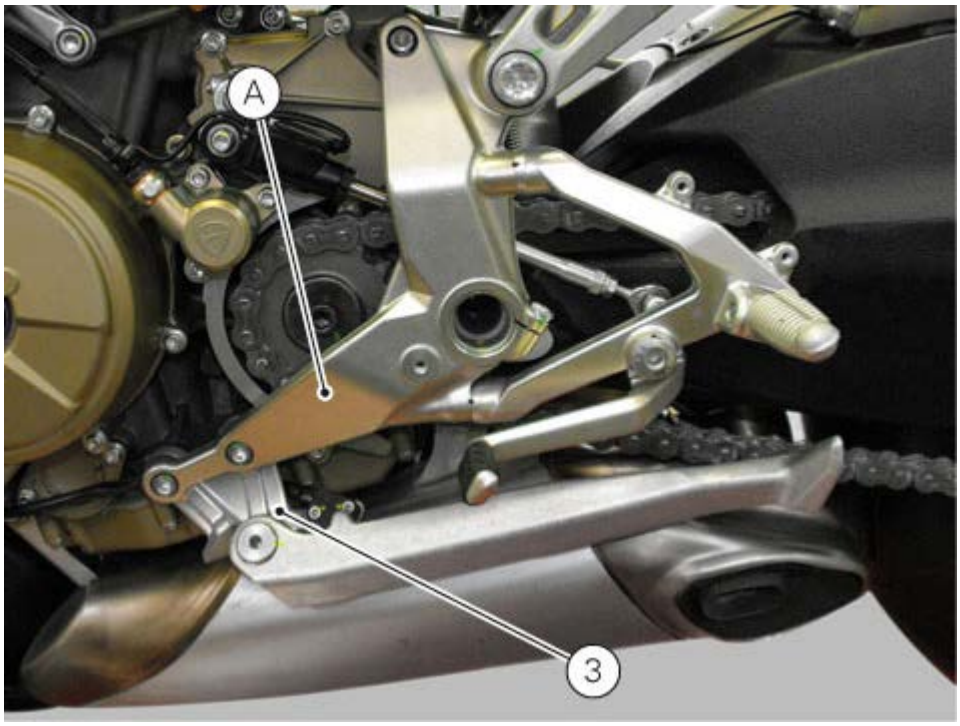


To remove the right-hand footpeg holder plate (6) from the right-hand swinging arm shaft support (7), loosen screws (8) retaining the rear brake master cylinder (9), disconnect the rear brake sensor (19) from the main wiring harness and proceed in the same way in order to remove the left-hand footpeg holder plate.

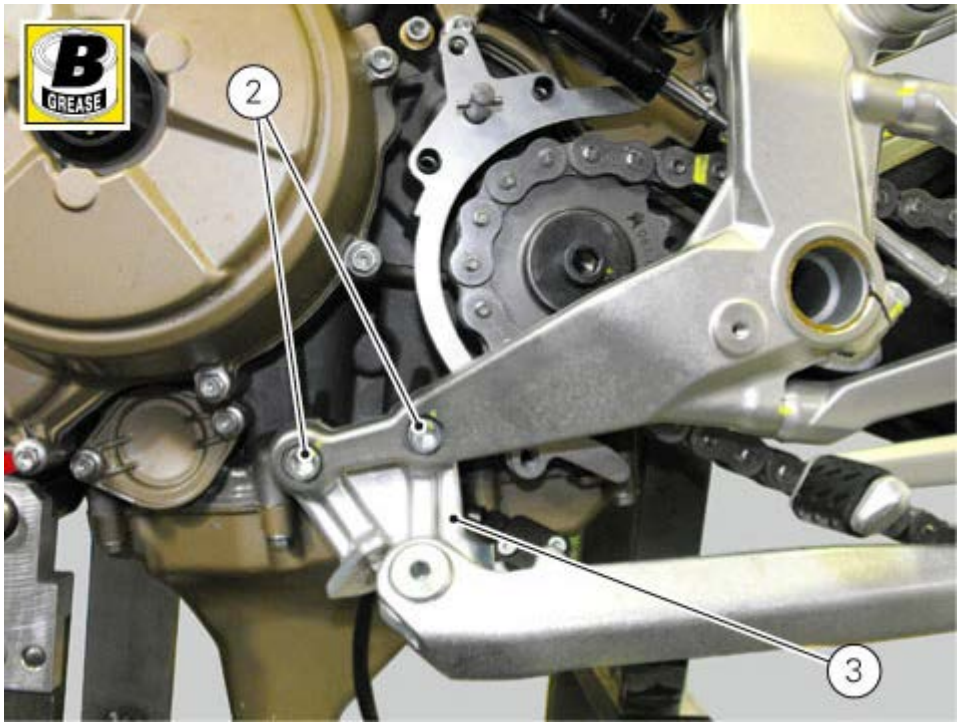


Refitting the side stand

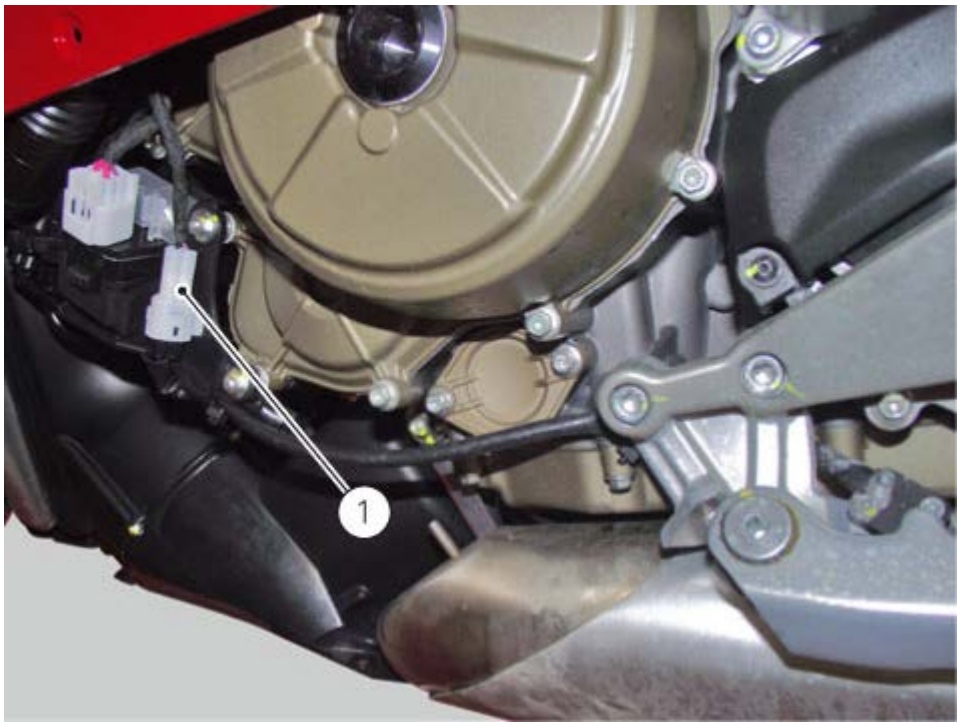
Fit the side stand assembly (3) under the LH swinging arm shaft support (4).



Smear screws (2) with specified grease.
Start the side stand assembly (3) retaining screws (2).
Tighten the screws to a torque of 25 Nm ± 5%.



Connect the side stand sensor to main wiring harness.

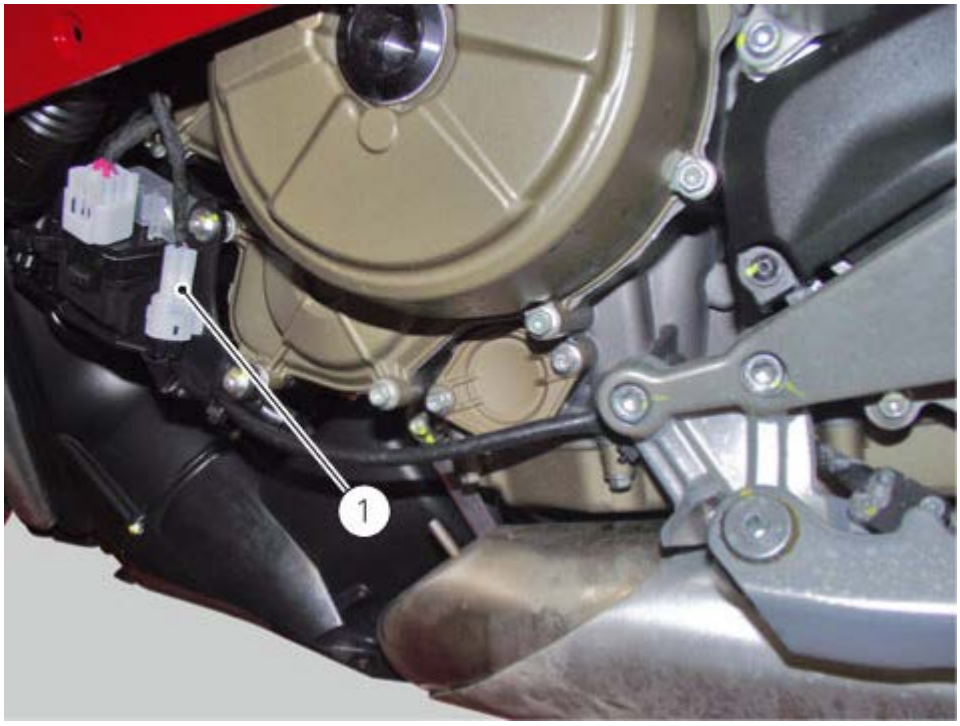


Refit the LH fairing (Refitting the side fairings).
Refit the rider seat (Refitting the rider seat).

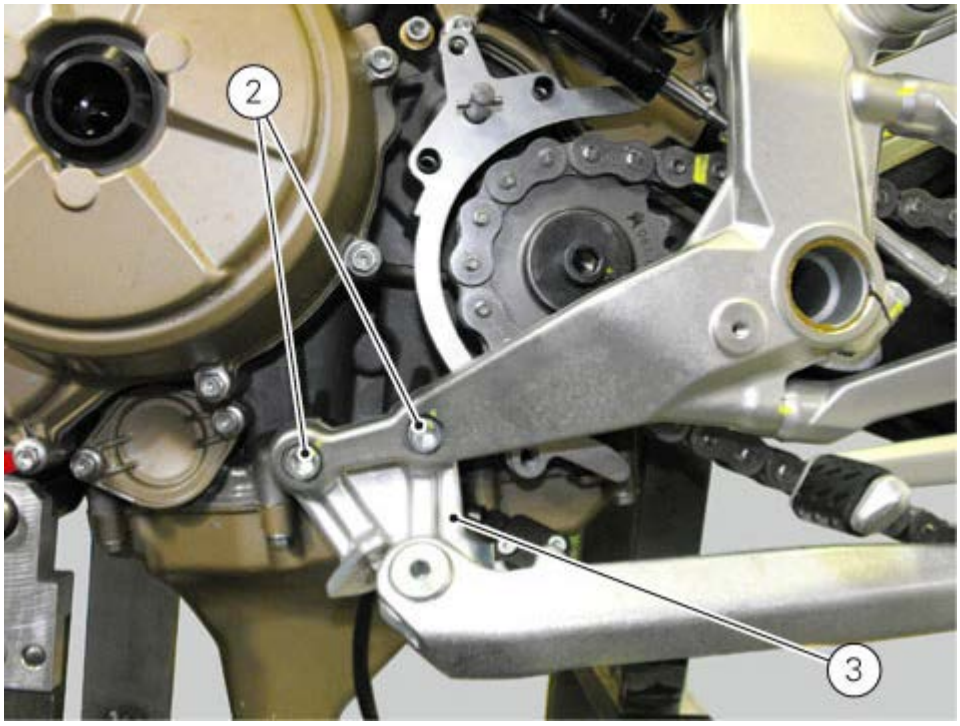
Disassembly of the side stand

Remove the rider seat (Removing the rider seat).
Remove the LH fairing (Removing the side fairings).

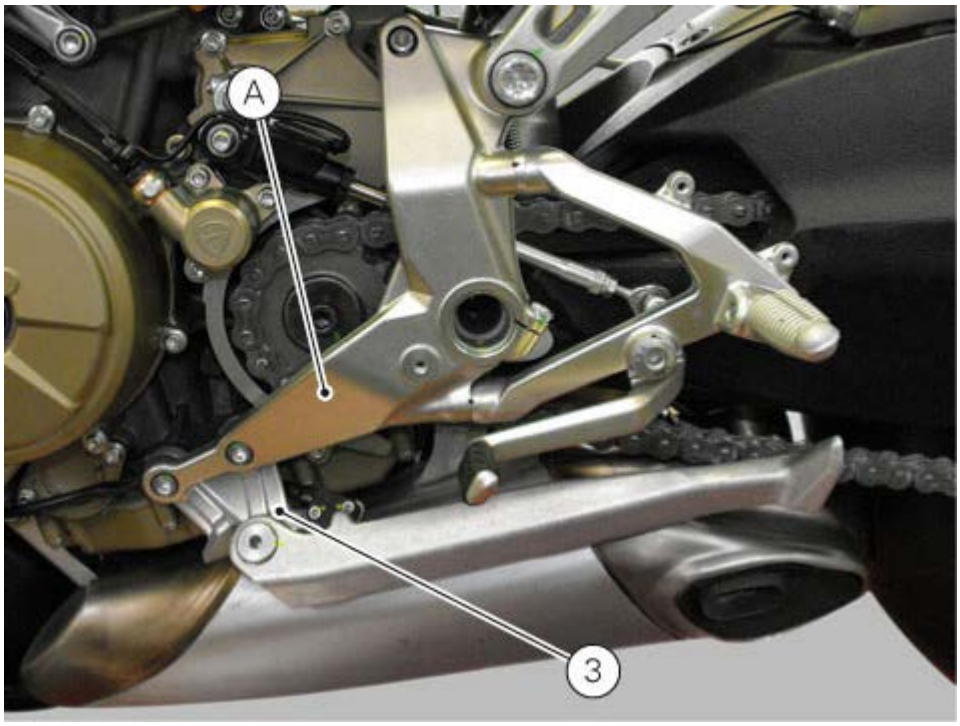
Disconnect the side stand sensor (1) from main wiring harness.



Loosen the two retaining screws (2) on the side stand assembly (3).



Remove the side stand assembly (3) from the LH swinging arm shaft support (4).

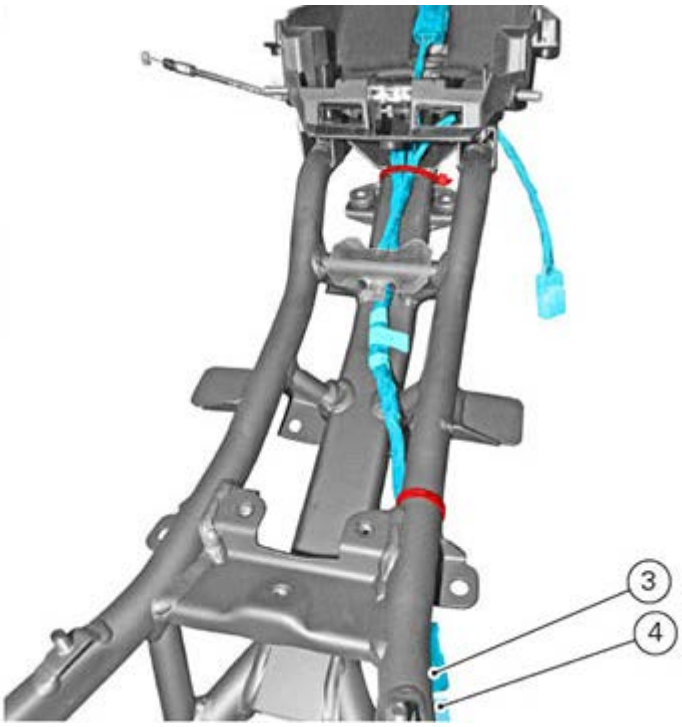

A
3

Refitting the rear subframe

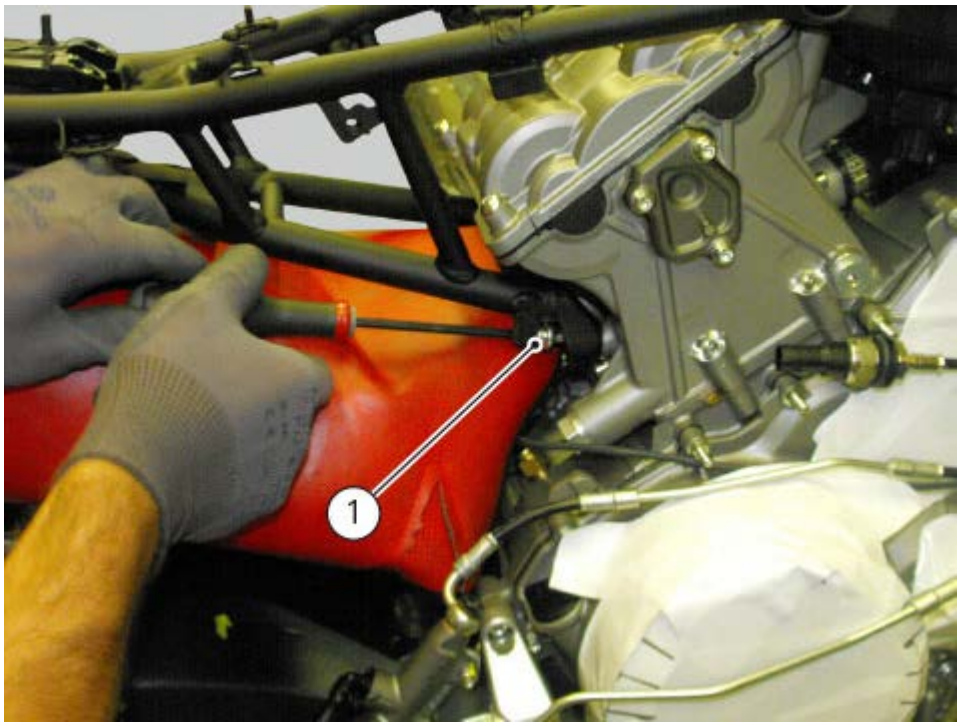
Refit the complete rear subframe on the motorcycle.

Connect main wiring harness (6) to black box (5).

Connect the rear wiring (3) to the main wiring connector (4).



Apply the recommended grease to the screws (1) and (2).
Start the screws (1) and (2) to secure the rear subframe in place.
Tighten screws (1) to a torque of 28 Nm ± 5%.
Tighten screws (2) to a torque of 22 Nm ± 5%.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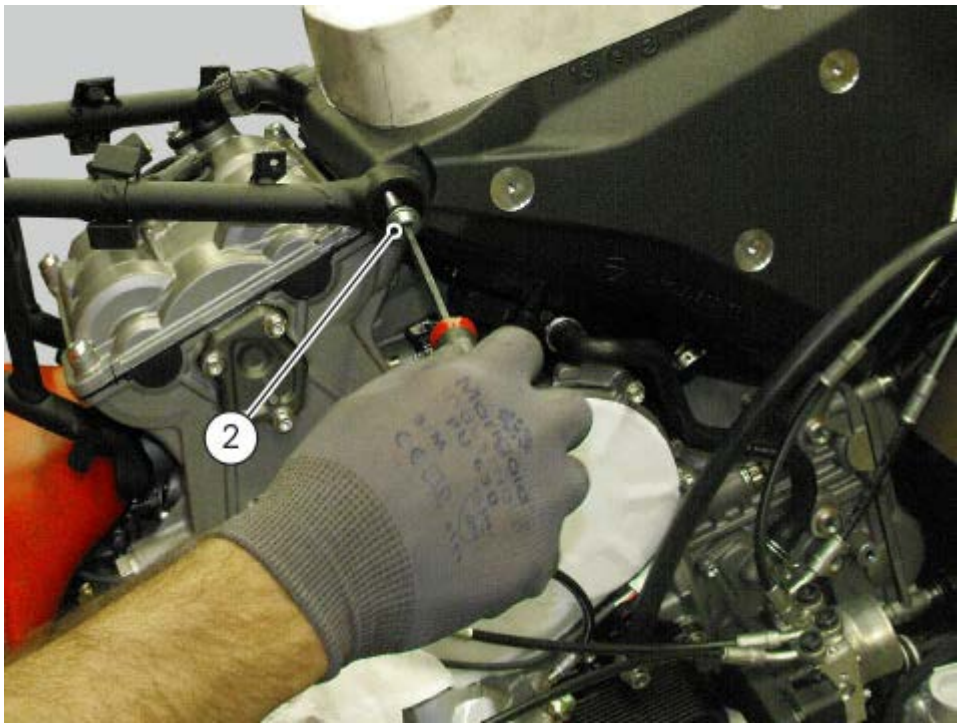
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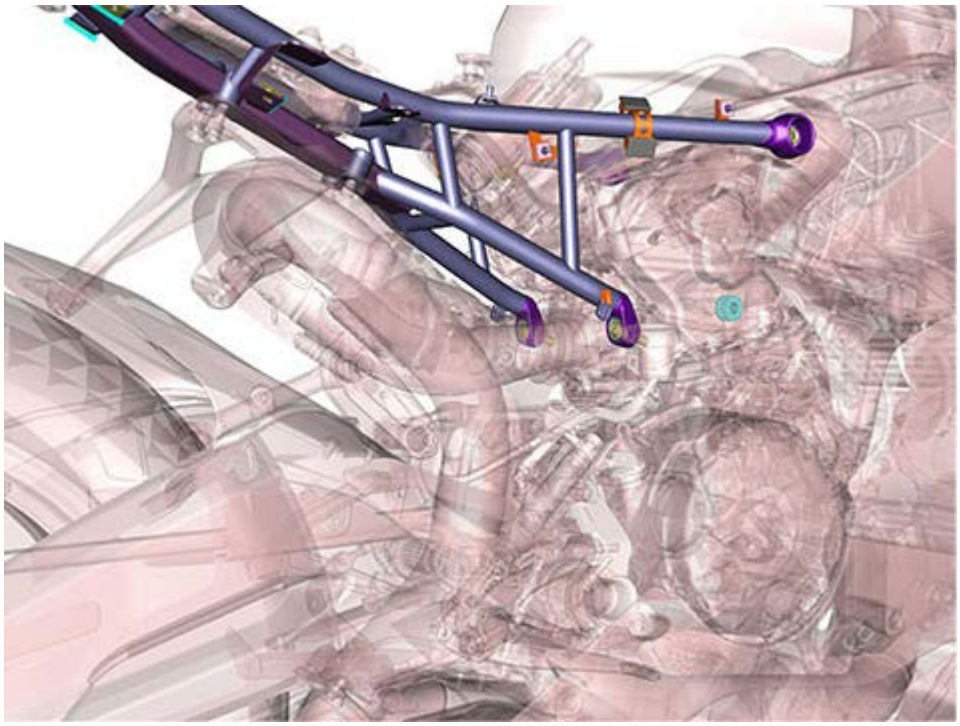
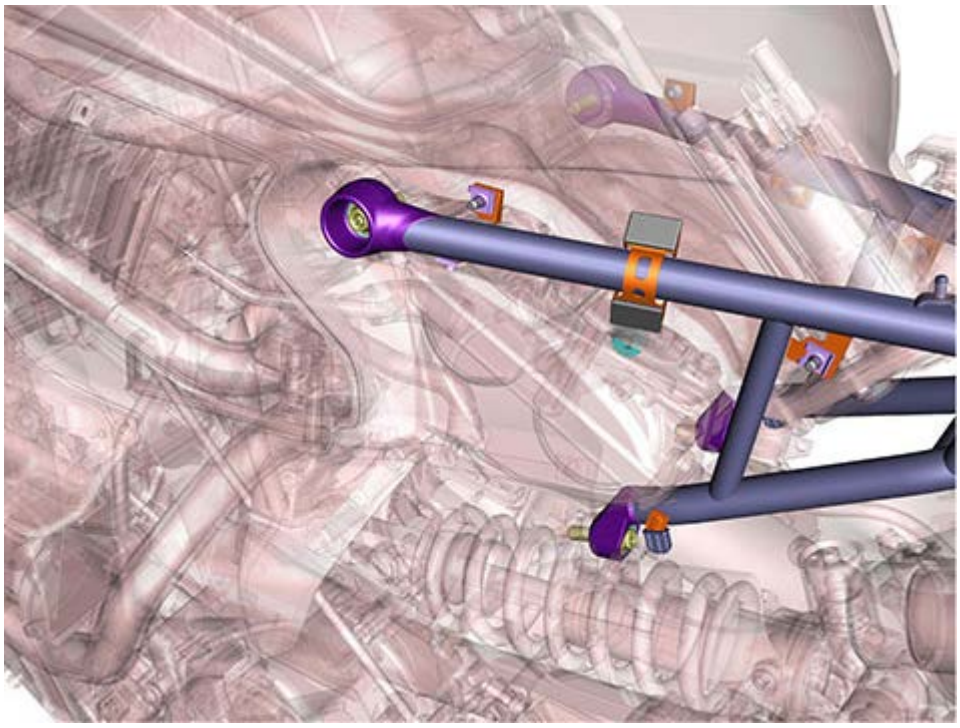
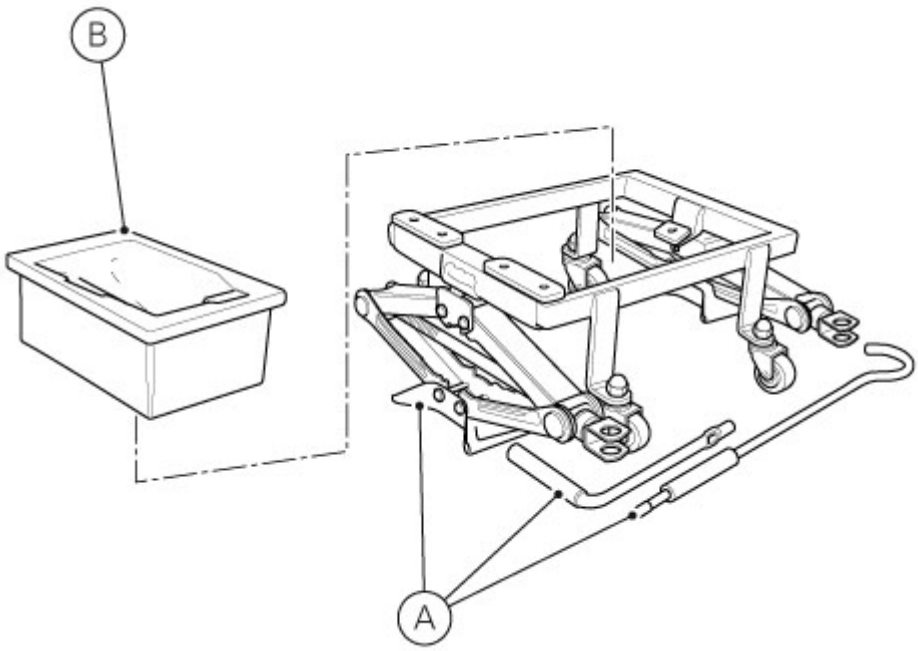




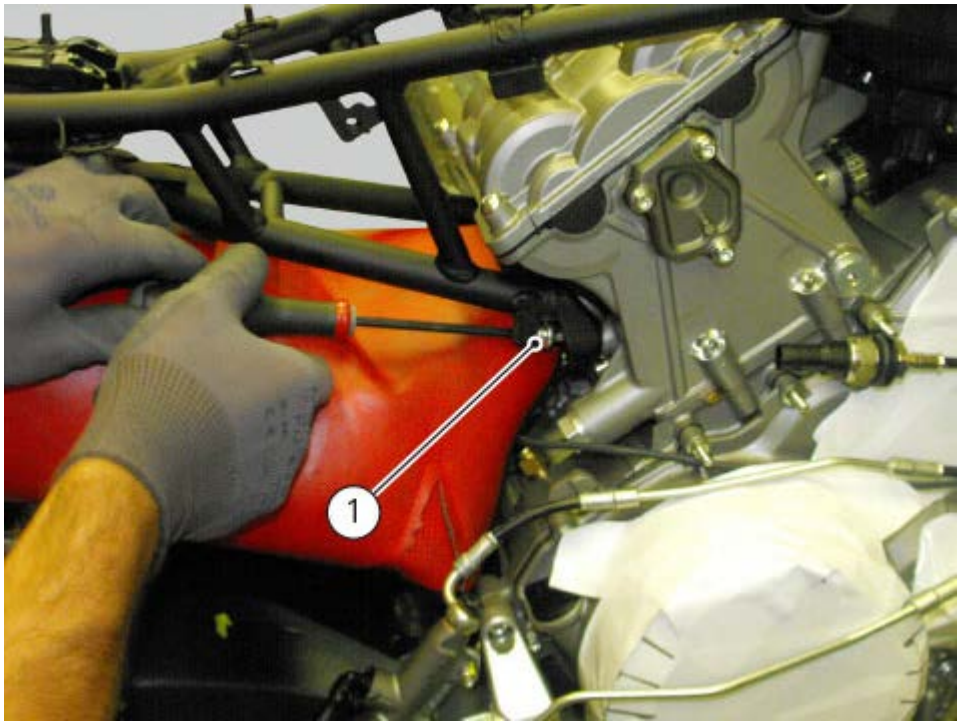
Remove the supporting tool.
Refit the tank (Refitting the fuel tank).
Refit the fairings (Refitting the side fairings).
Refit the seat (Refitting the rider seat).

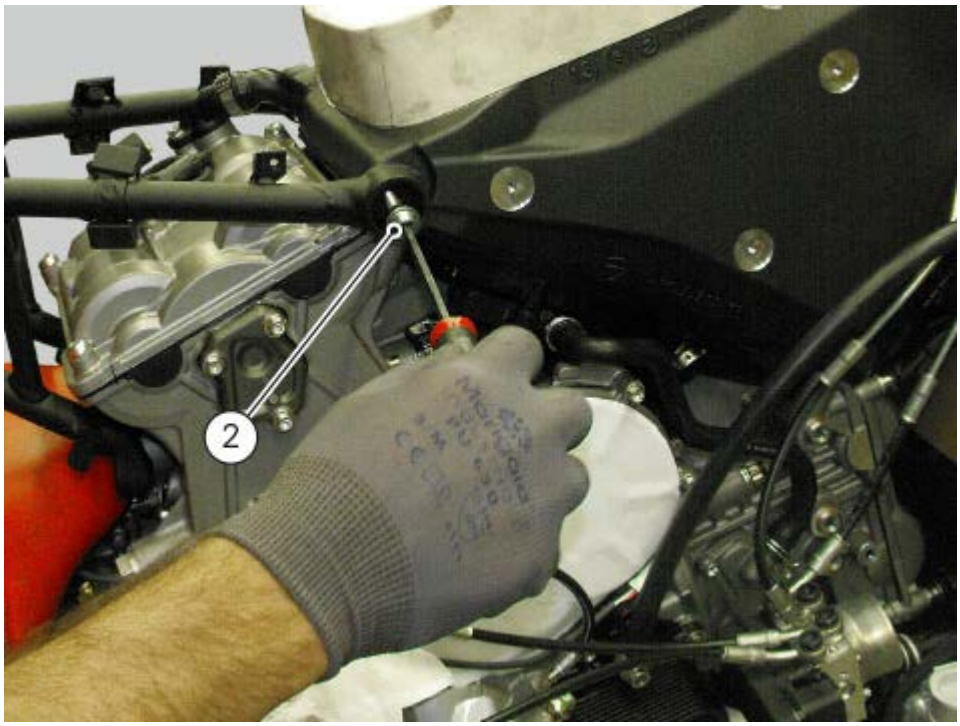
Removing the rear subframe

The engine block of this vehicle is a load-bearing part. To work on the parts supported by the engine block, such as the rear subframe, engine block shall be duly supported, as described here below.
Remove the seat (Removing the rider seat).
Remove the fairings (Removing the side fairings).
Remove the tank (Removing the fuel tank).
Position tools **88713.3092** - engine repair work bench (A) and **88713.3927** - engine support (B) under the engine block to duly support it.



To remove the rear subframe, loosen the retaining screws (1) and (2) repeating the operation performed on the other side.

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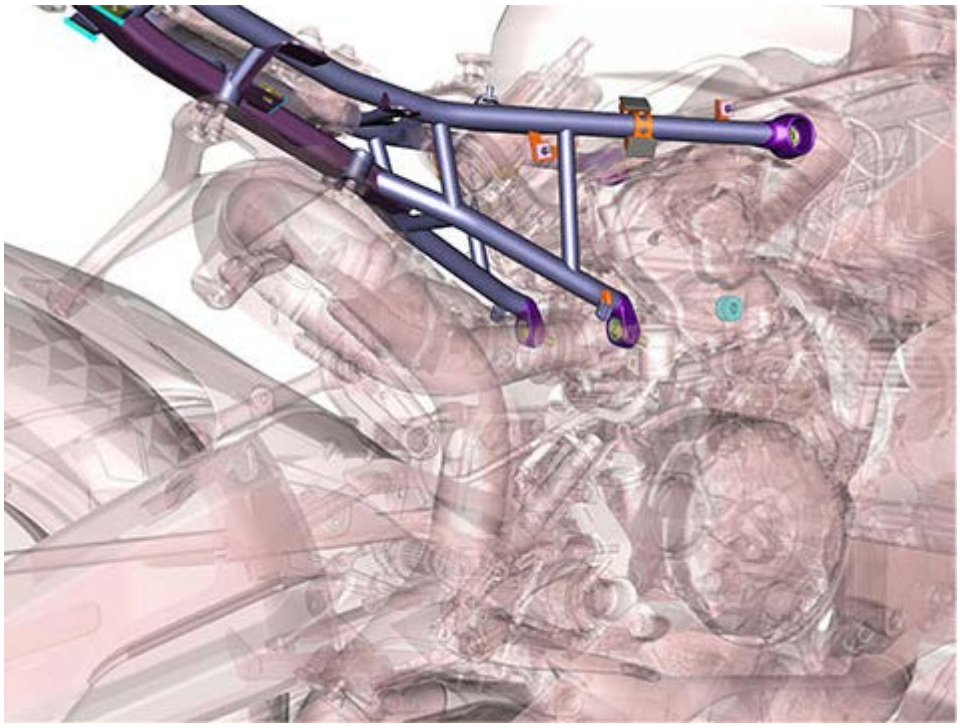
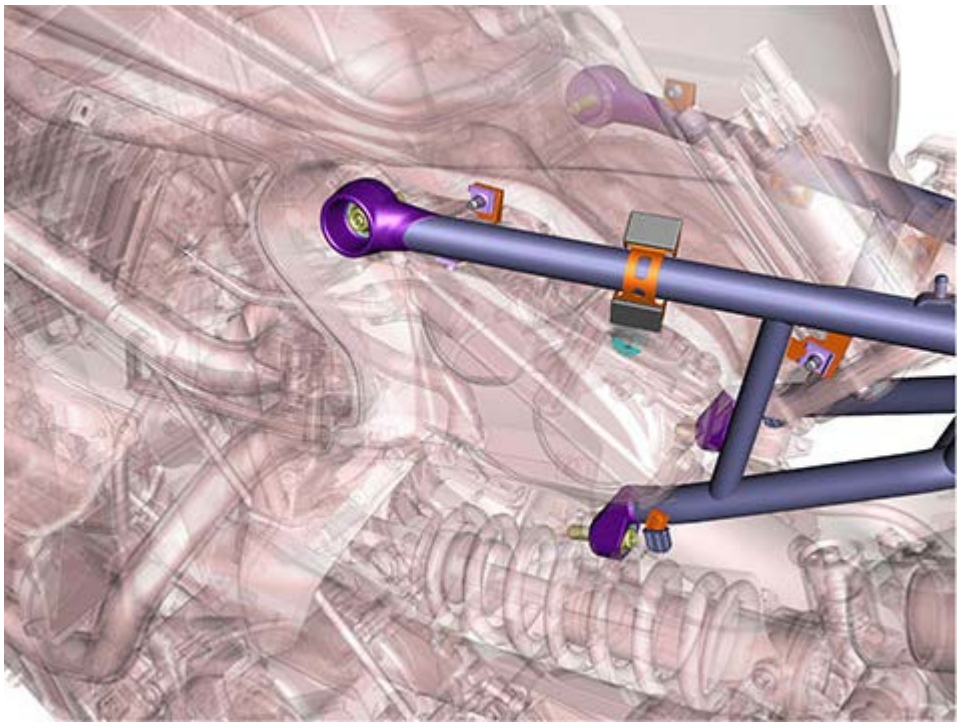
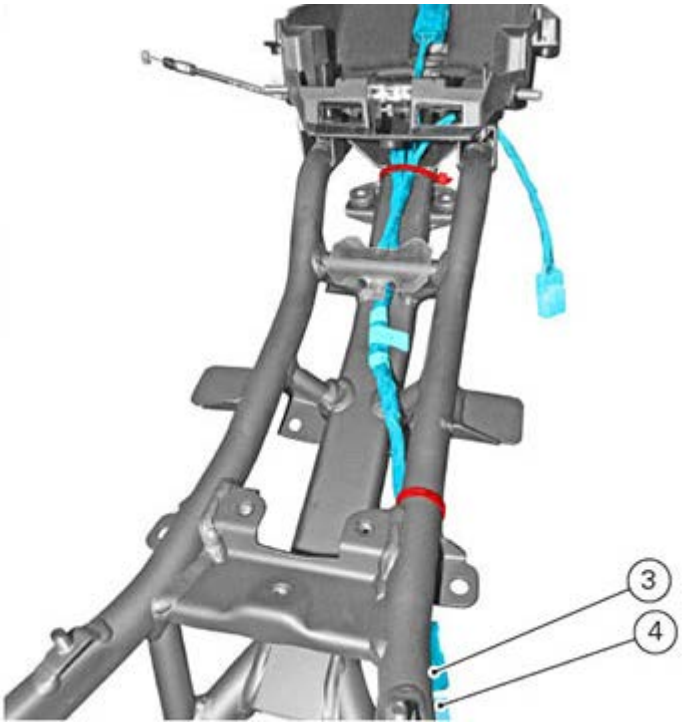




Disconnect the rear wiring (3) from the main wiring connector (4).



Disconnect main wiring connector (6) from black box (5).

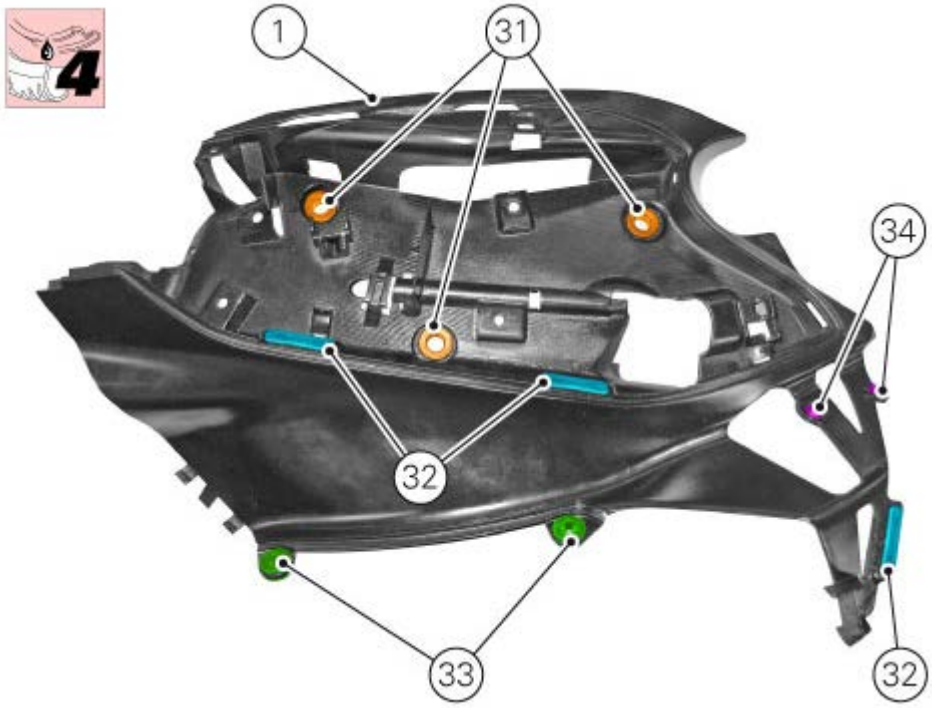
Remove the rear subframe from the motorcycle.

Refitting the electric system supports

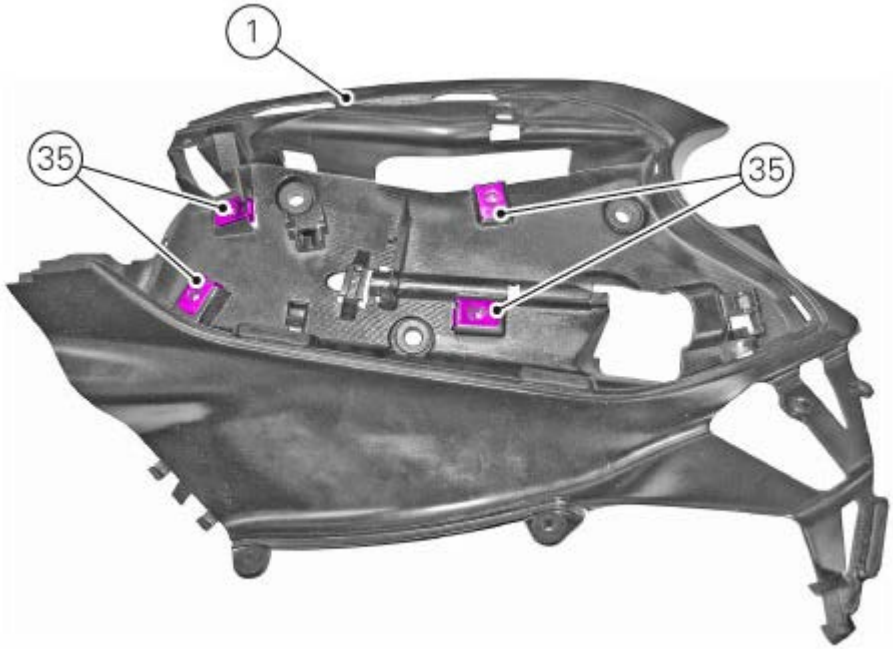
Refitting the LH electric system support

If the components assembled on the LH electric system support were removed, proceed as follows. Make sure that the vibration dampers (31), (32) (33) and (34) are present on the LH electric system support (1), in the positions shown in the figure.

Note
Should vibration dampers prove hard to assemble, smear them with recommended lubricant.

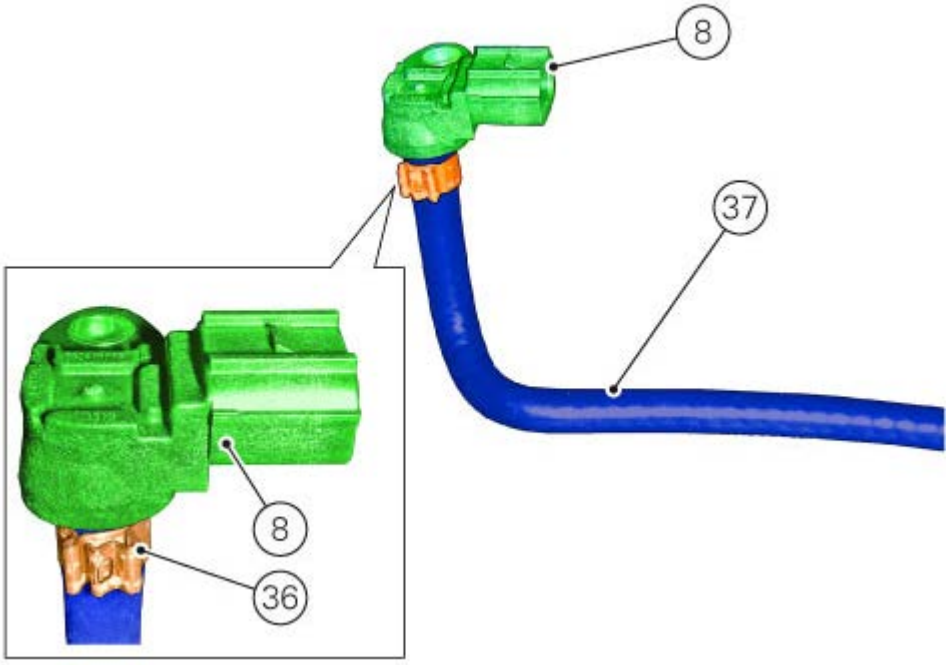


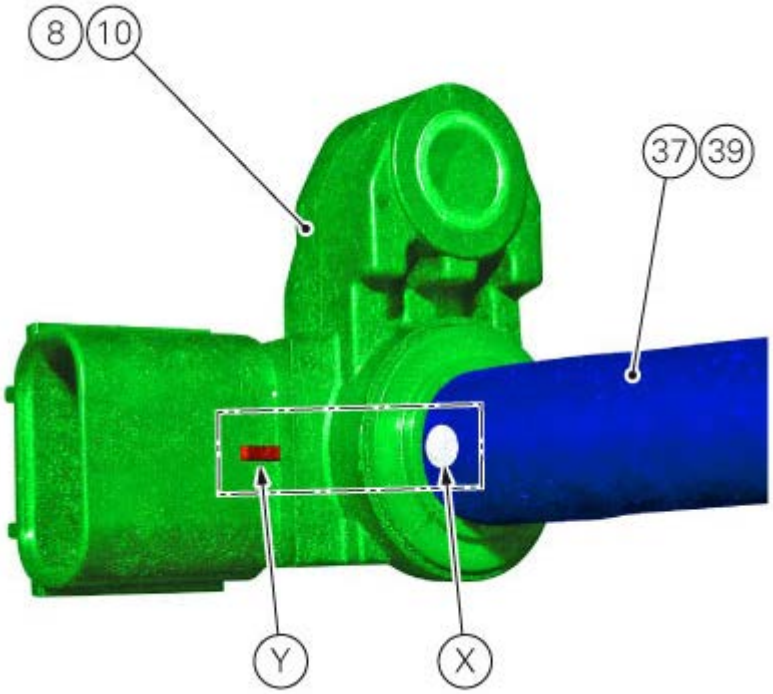
Make sure that the clips (35) are present in the indicated areas of the support (1).

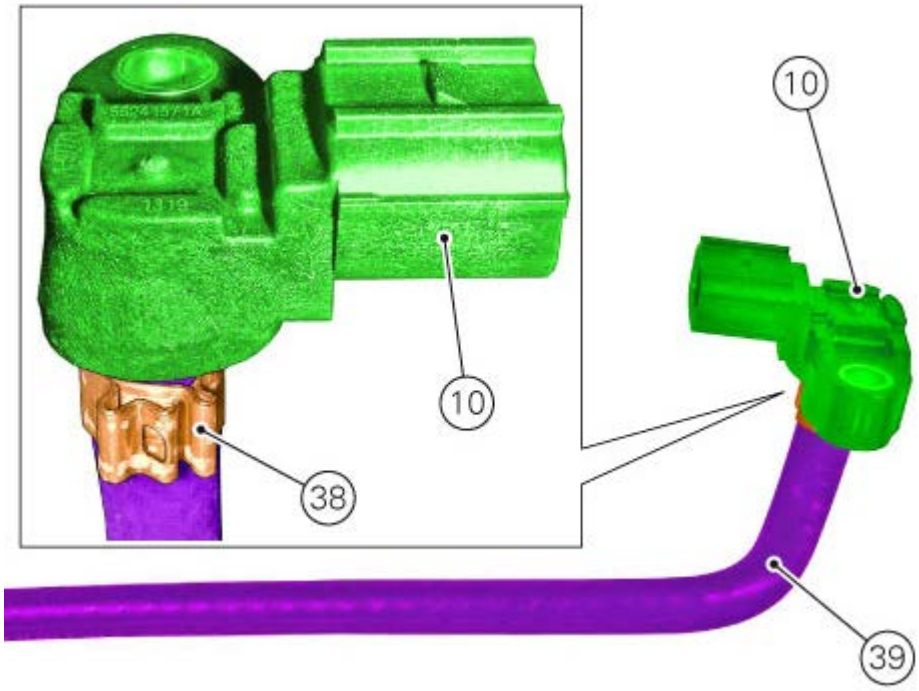


Fit the clamp (36) on the horizontal hose (37). Insert the horizontal hose (37) on the map sensor (8), aiming it so that the hose mark (X) is aligned with the map sensor notch (Y), as shown in the figure. Block the hose (37) by means of the clamp (36), aiming it as shown. Fit the clamp (38) on the vertical hose (39). Insert the vertical hose (39) on the map sensor (10), aiming it so that the hose mark (X) is aligned with the map sensor notch (Y), as shown in the figure.

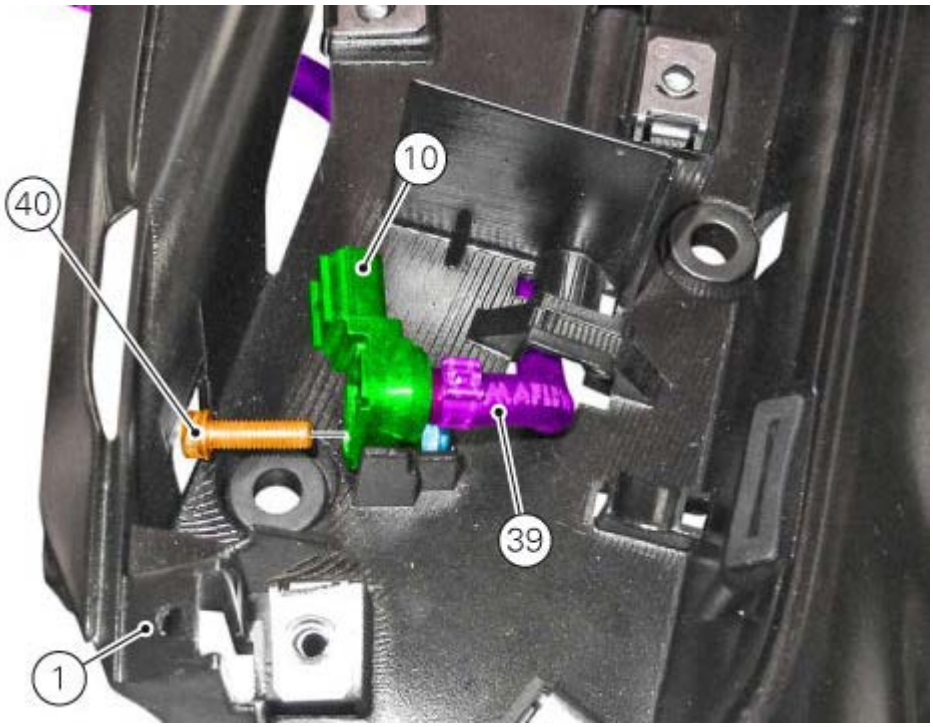
Block the hose (39) by means of the clamp (38), aiming it as shown.

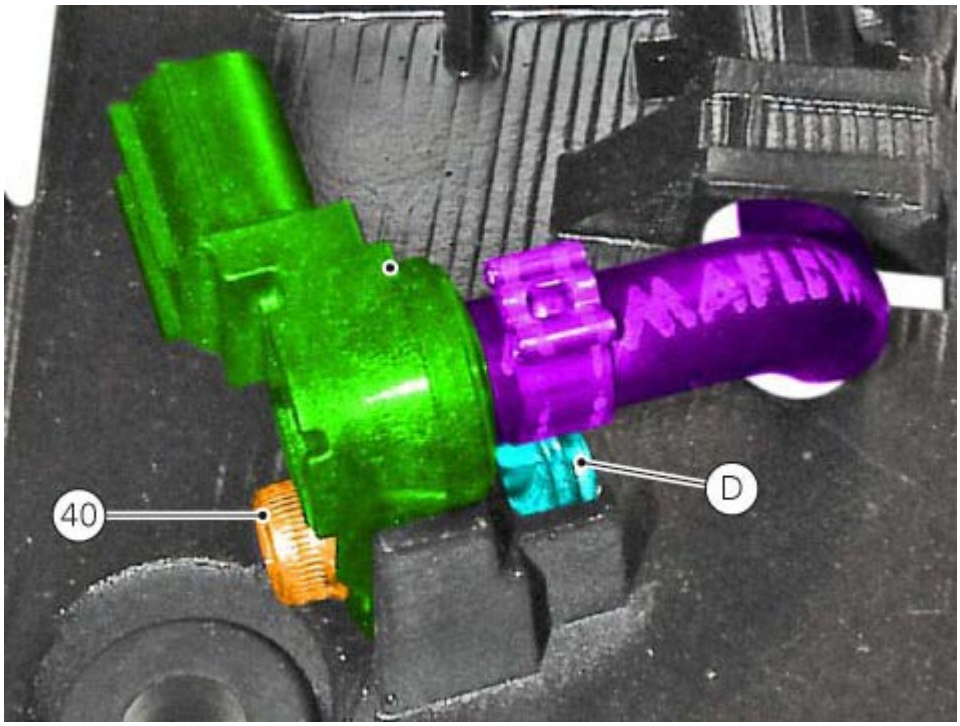


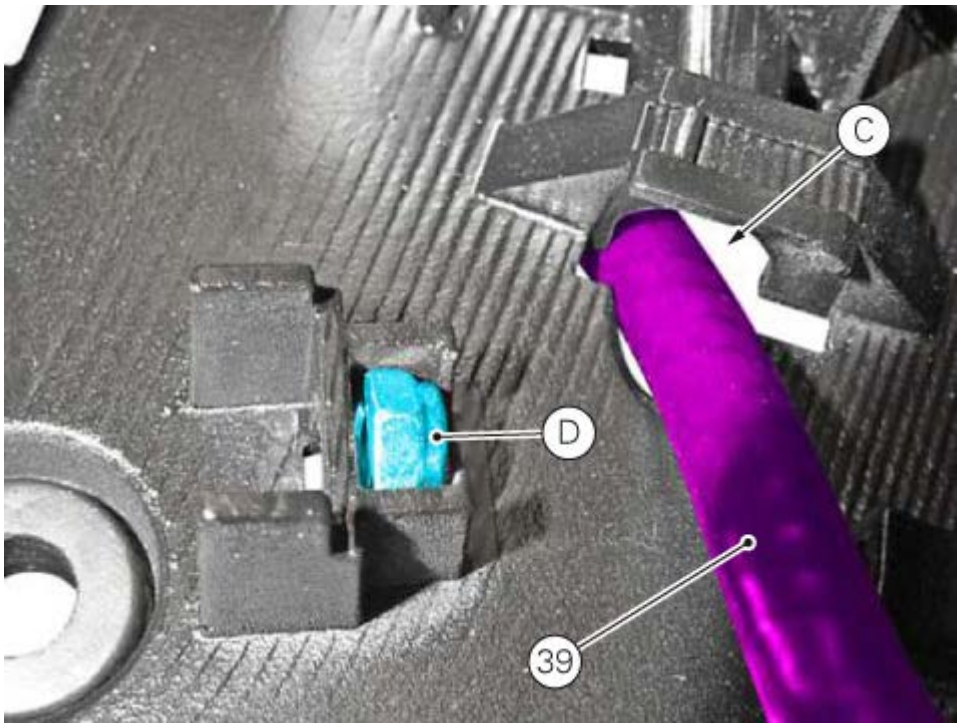




Insert the vertical hose (39) inside the LH electric system support (1) opening (C), and fit the map sensor (10) inside its seat, aiming it as shown in the figure.
To secure the map sensor (10) in place, start the screw (40) on support (1) nut (D).
Tighten the screw (40) to a torque of 2 Nm ± 10%.

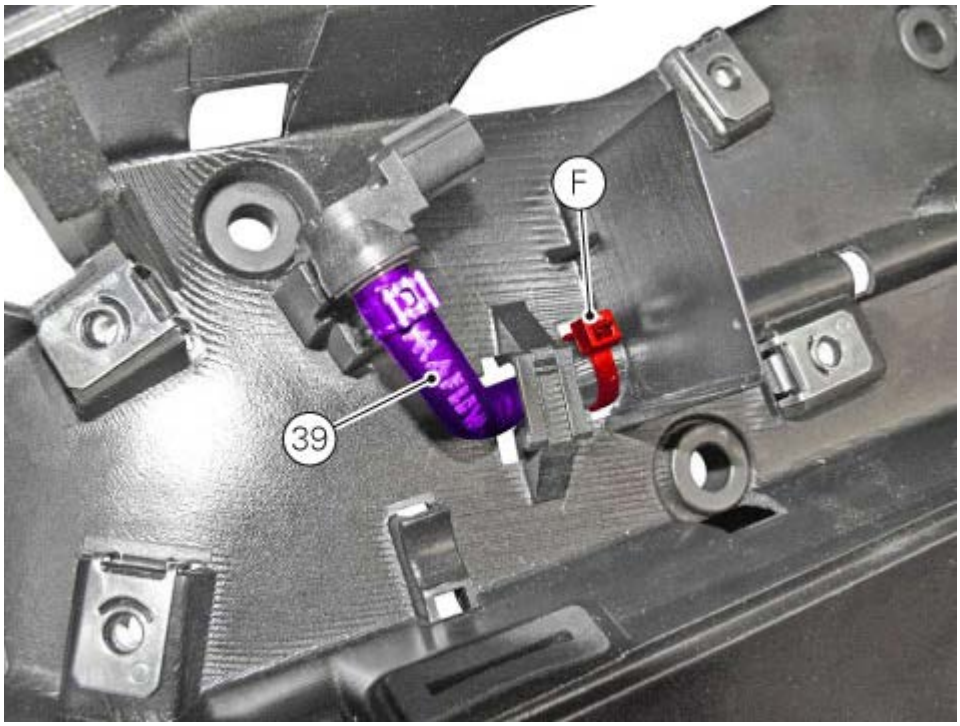


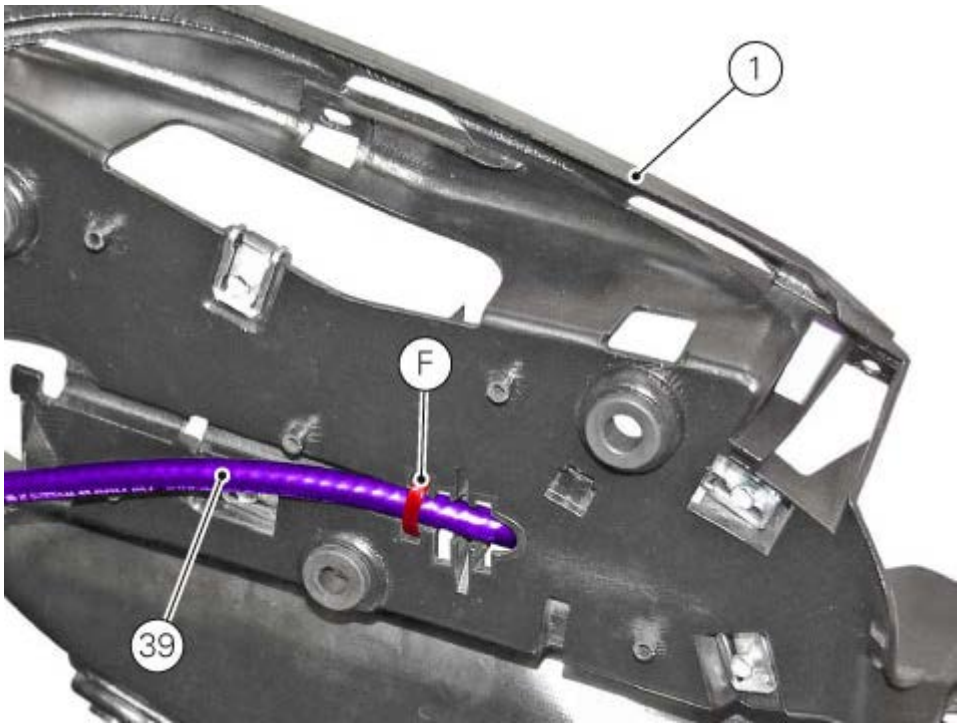




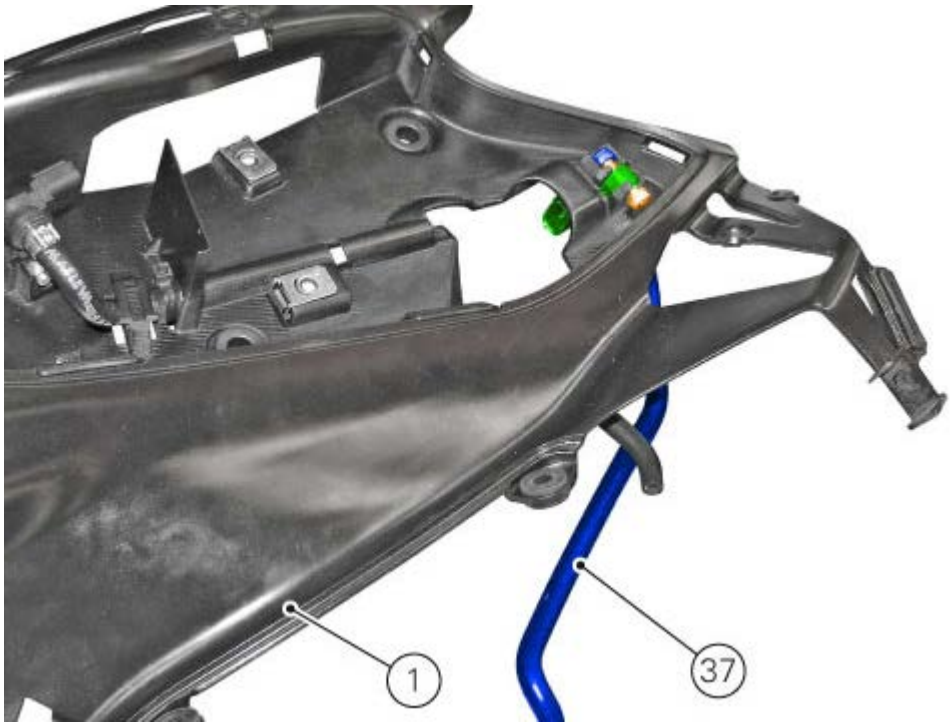
Secure the vertical hose (39) to the LH electric system support (1) using a large tie (F), as shown in the figure.

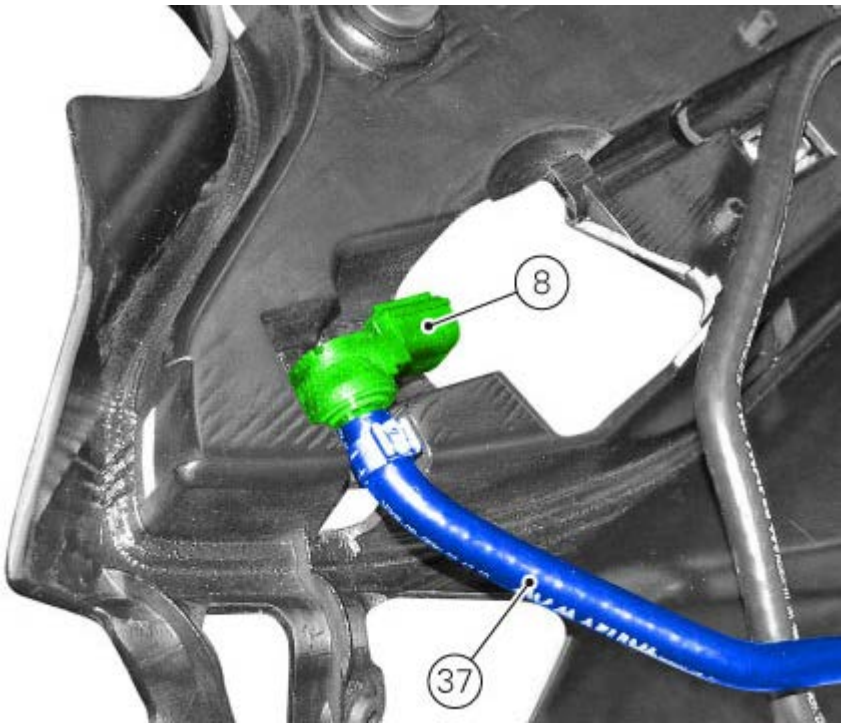
Note
Do not fasten tie (F) too much so as to prevent pipe (39) kinking.

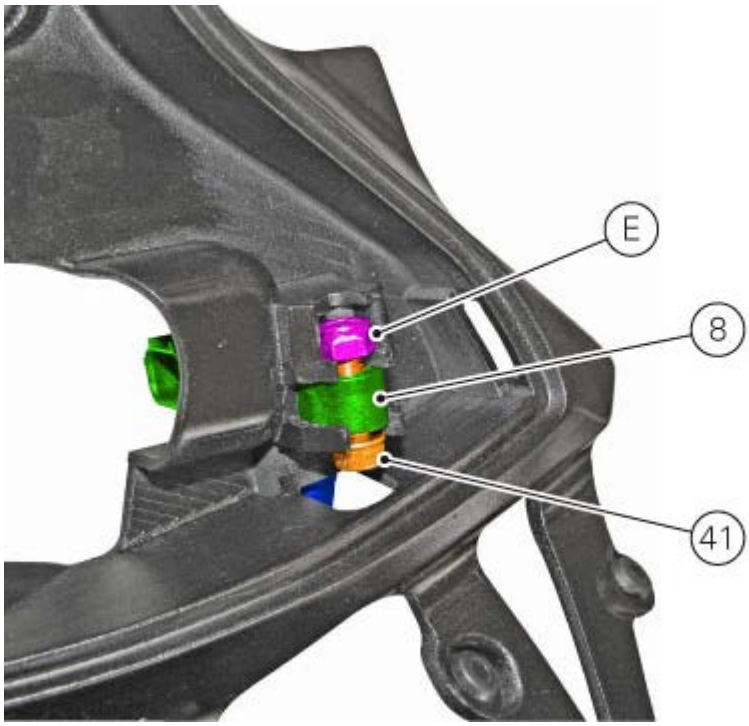




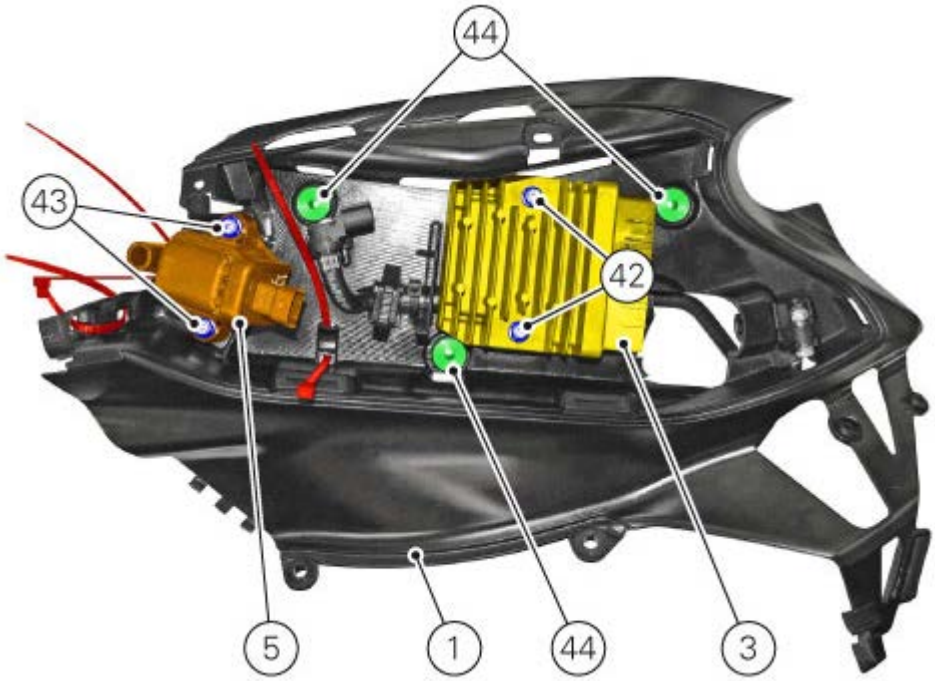
Position the map sensor (8), aiming it as shown in the figure, inside its housing on the LH electrical system support (1), and slide horizontal hose (37) out of the support.
To secure the map sensor (8) in place, start the screw (41) on support (1) nut (E).
Tighten the screw (41) to a torque of 2 Nm ± 10%.


1
37

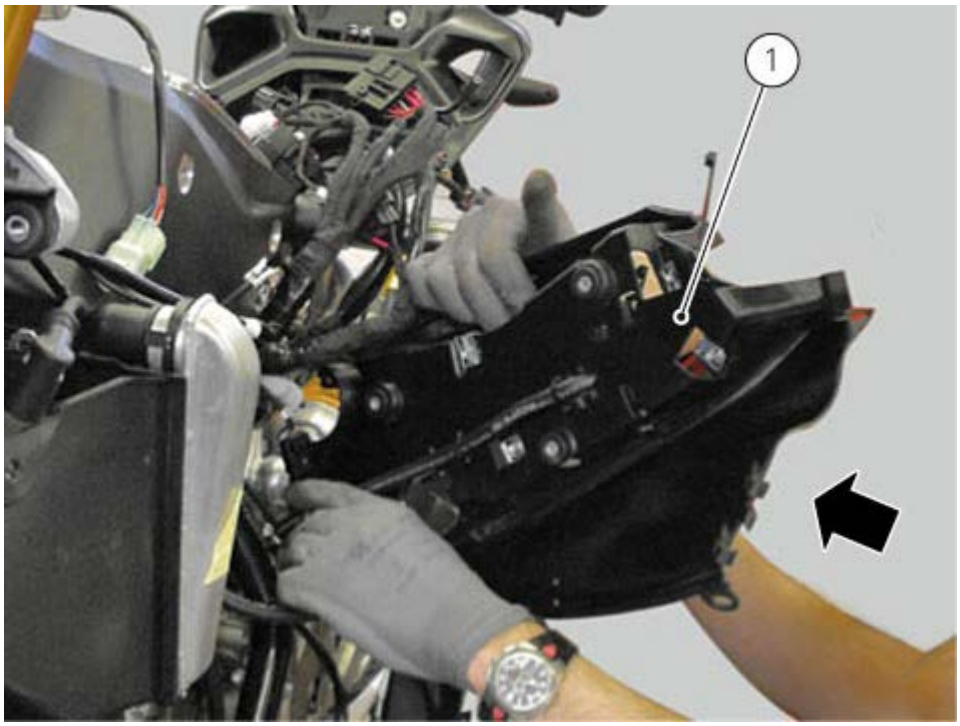

8
37



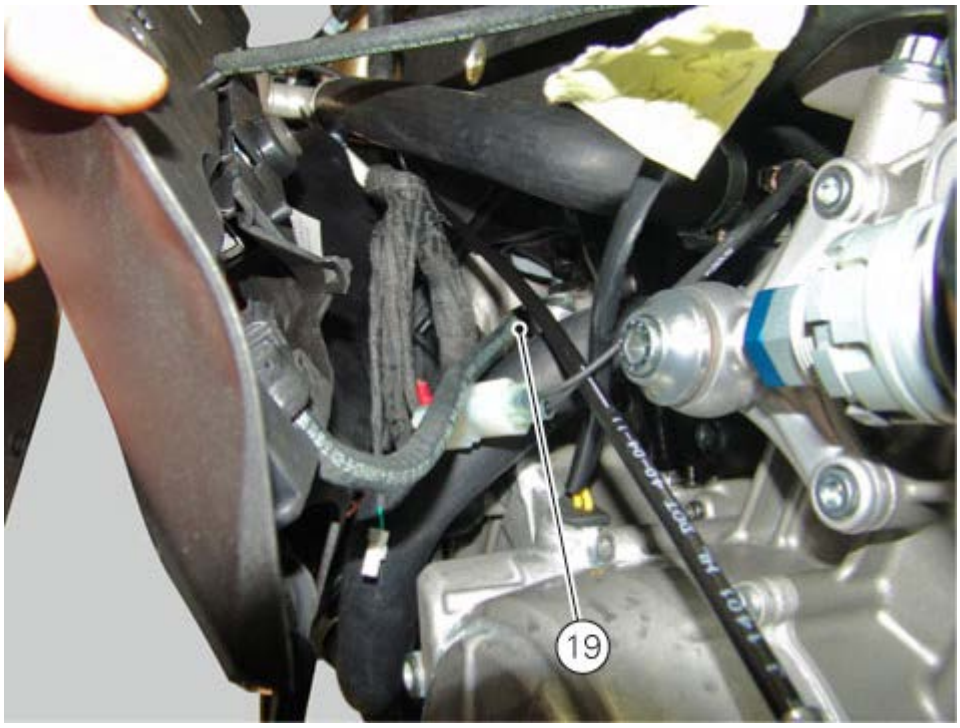
Fit the voltage rectifier (3), aiming it as shown in the figure, on the LH electric system support (1), and secure it in place with screws (42).
Tighten screws (42) to a torque of 8 Nm ± 10%.
Fit the horizontal coil (5), aiming it as shown in the figure, on the LH electric system support (1), and secure it in place with screws (43).
Tighten screws (43) to a torque of 8 Nm ± 10%.
Insert the spacers with collar (44) inside vibration dampers on support (1), as shown in the figure.



Refit the LH electrical system support (1).

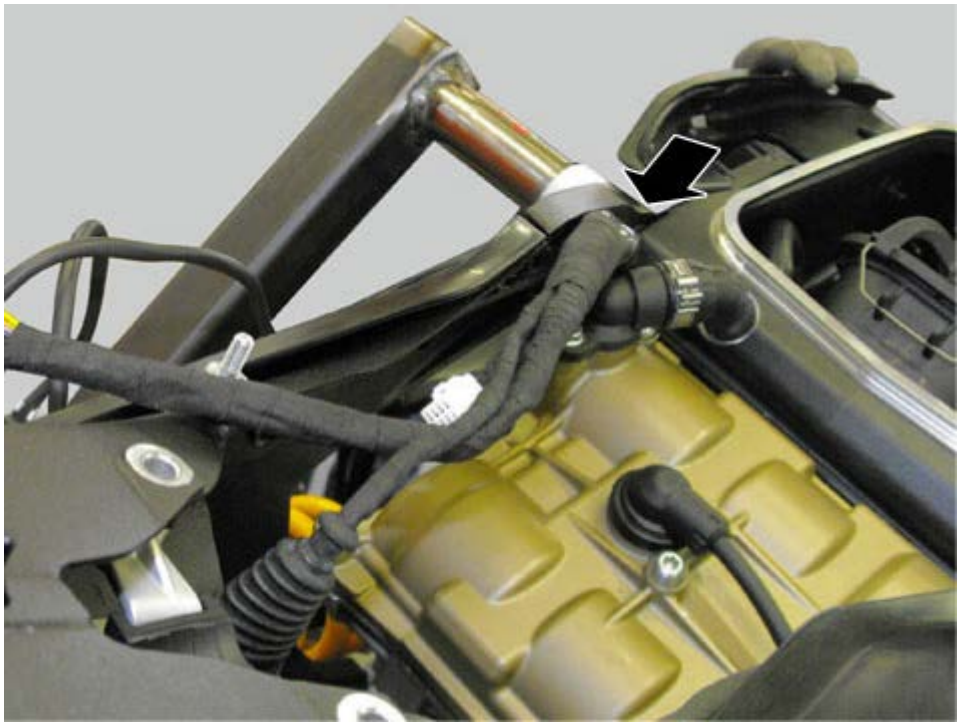


Connect the horizontal MAP sensor hose (19) to the horizontal head, and the vertical MAP sensor hose (20) to the vertical head.

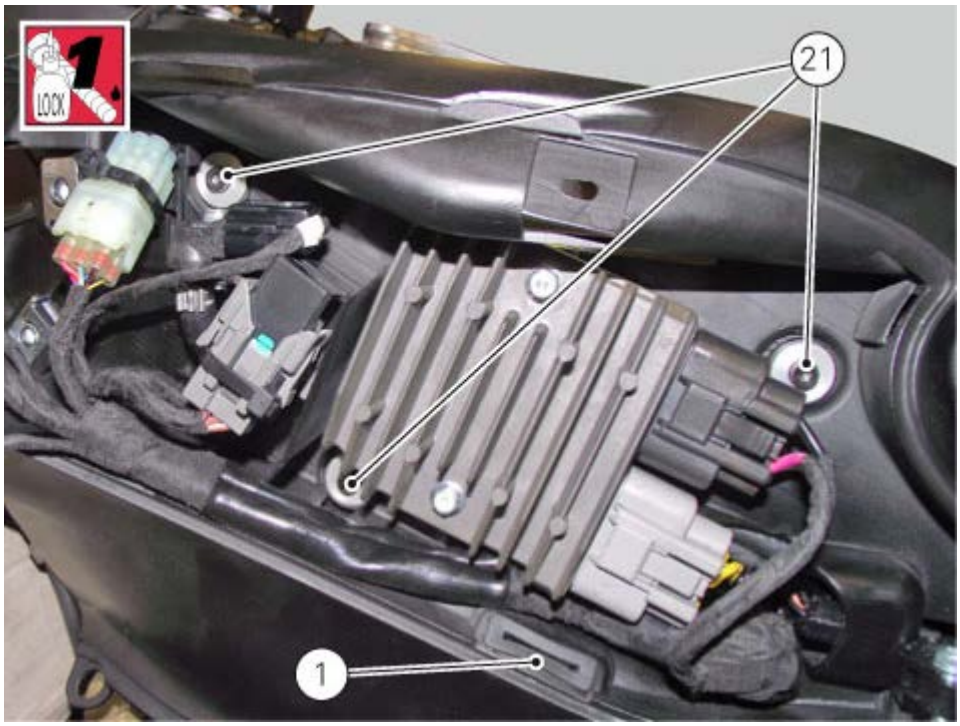


Bring the LH support (1) near the frame, laying wiring branch (G) as shown in the figure.

Slide the main wiring cable towards vehicle rear end so as to connect it to the rear wiring branch.



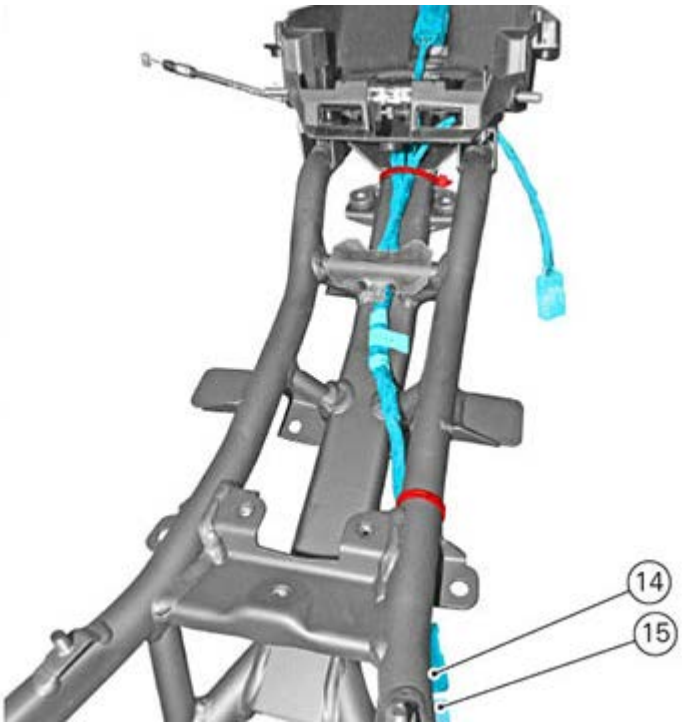
Smear the three screws (21) with recommended threadlocker, start the screws securing the support (1) to the frame, and tighten to a torque of 5 Nm ± 10 %.



Connect the rear shock absorber adjustment cables (18) to the main wiring harness.

Connect the main wiring harness (16) to the black box connector (17).

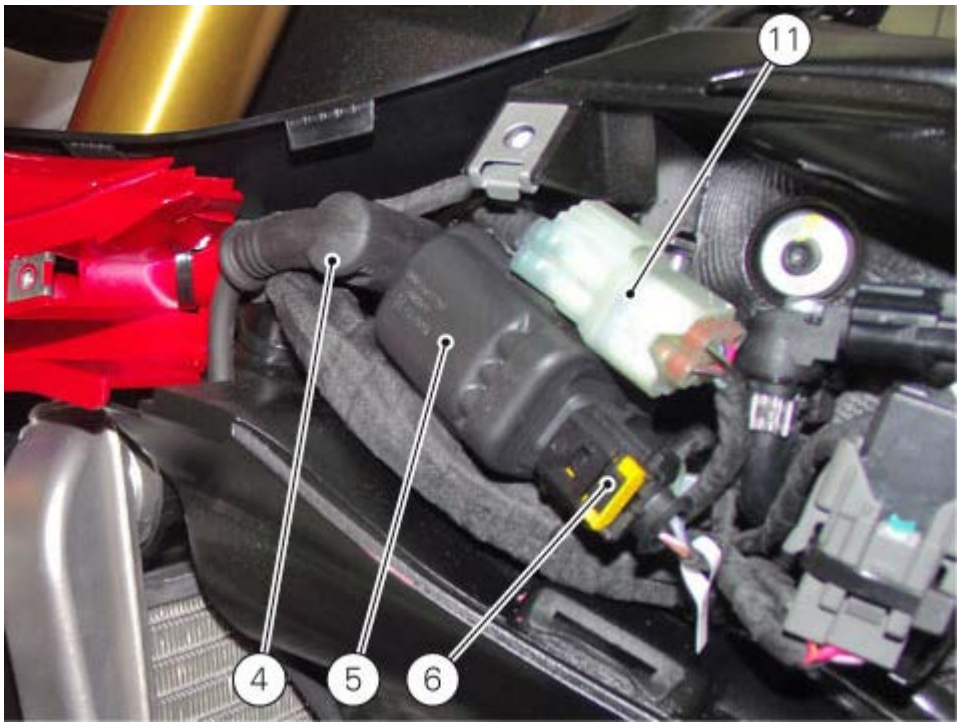
Connect the rear wiring (14) to the main wiring connector (15).

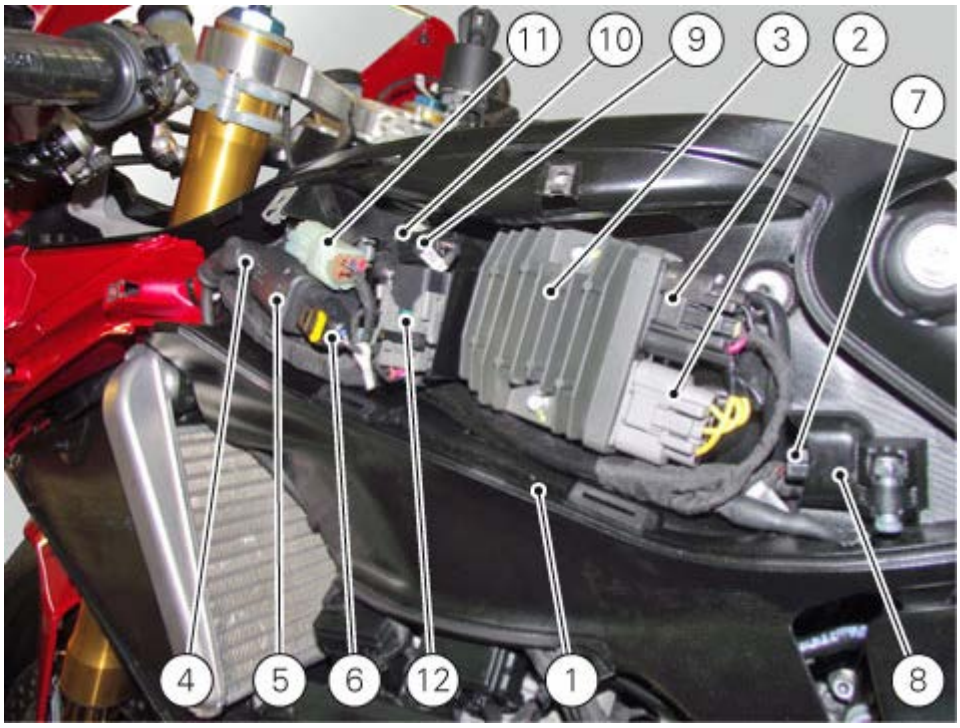


Position the fuse box cover (13).

Position the injection and e-lock relays (12) inside their seats on the LH support.
Connect the components positioned on LH electric system support (1). In particular:

- the connectors (2) between the voltage rectifier (3) and the main wiring harness and the generator;
- the horizontal cylinder coil (5) cap (4);
- the connector (6) between the horizontal cylinder coil (5) and the main wiring harness;
- the connector (7) between the horizontal MAP sensor (8) and the main wiring harness;
- the connector (9) between the vertical MAP sensor (10) and the main wiring harness;
- the connector (11) between the ignition switch and the main wiring harness.

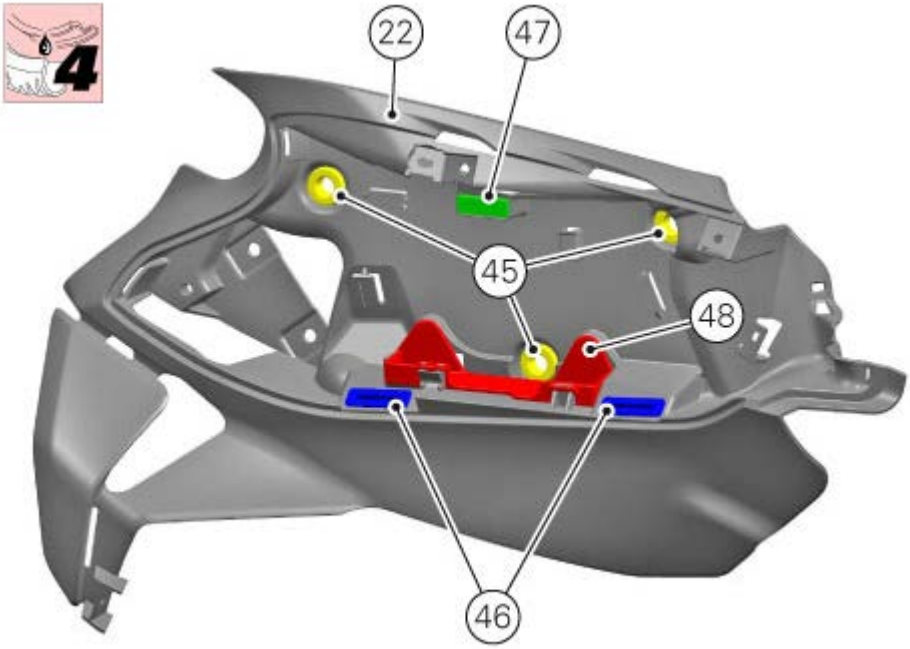


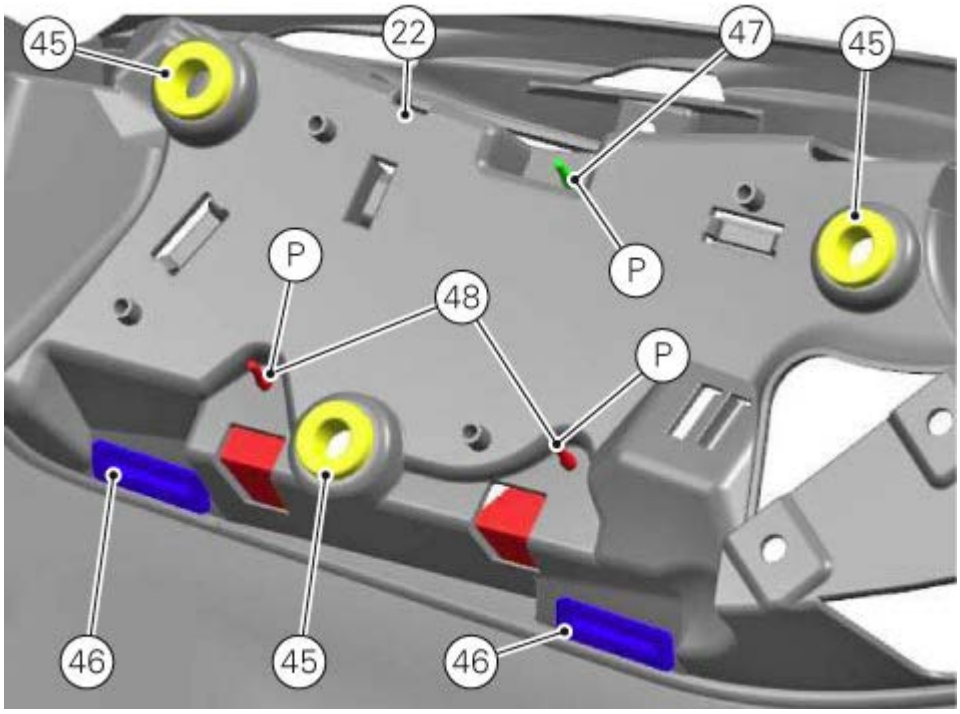


Refitting the RH electric system support

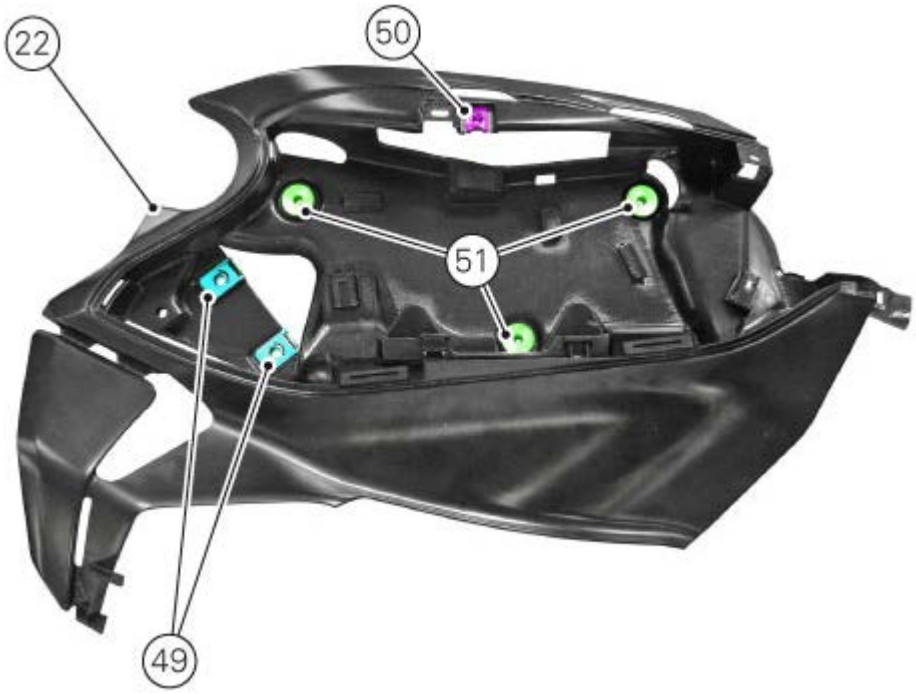
If the components assembled on the RH electric system support were removed, proceed as follows. Make sure that the rubber seals (45) and (46), the rubber drift (47) and the control unit vibration damper (48) are present on the electric system support (22). Drift (47) and vibration damper (48) pins (P) shall be positioned on the side opposite to the insertion one, as shown in the figure.

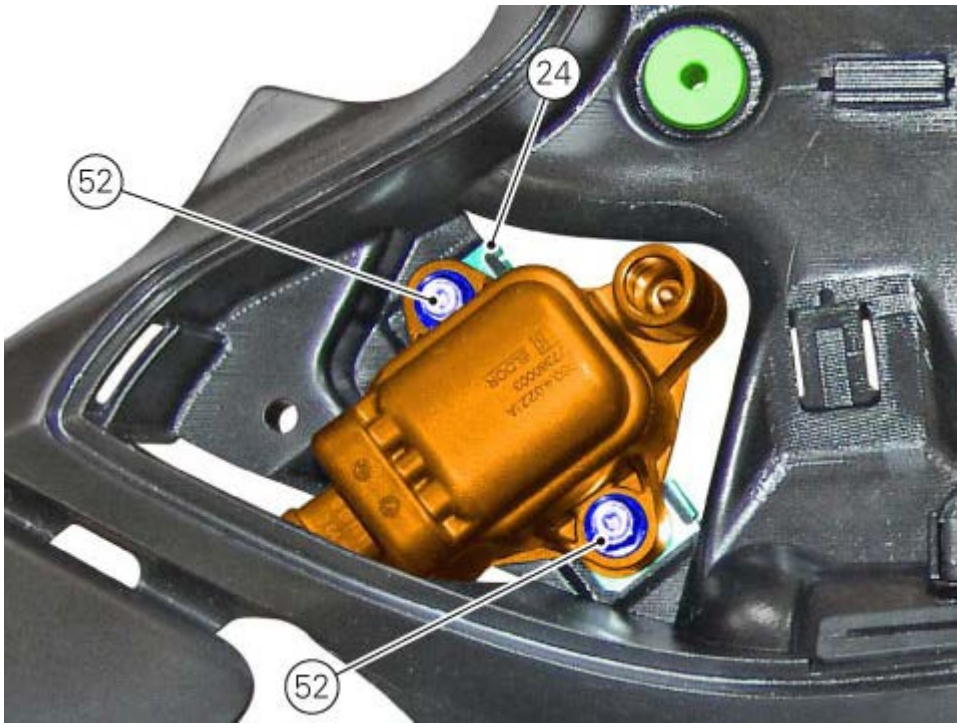
Note
Should the rubber parts prove hard to assemble, smear them with recommended lubricant.



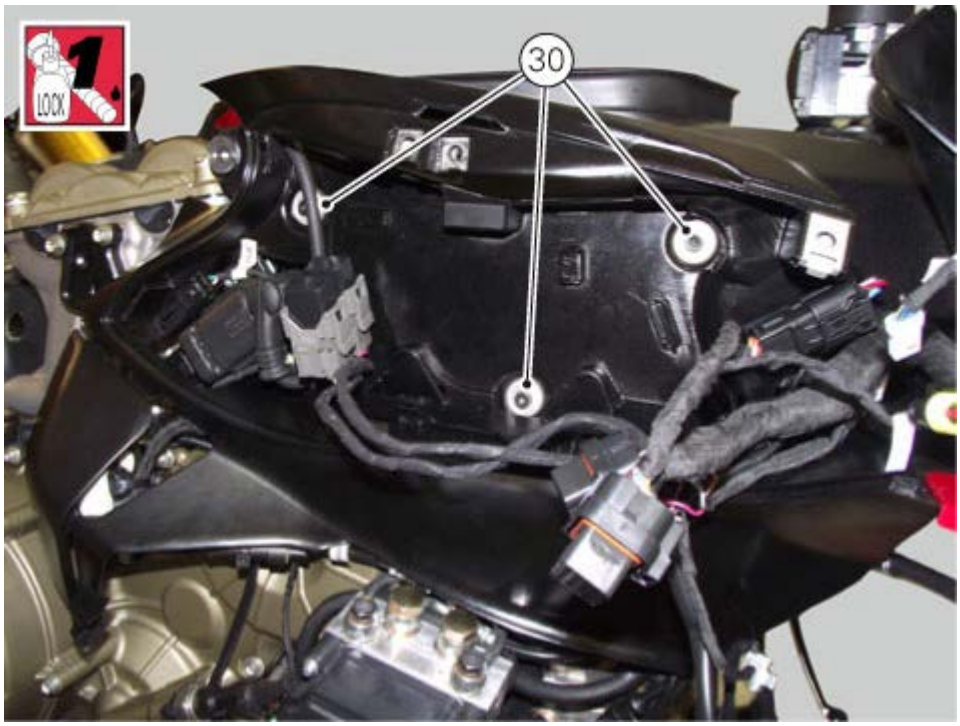


If removed, fit the clips (49) and (50) in the areas of the RH electric system support (22) indicated in the figure, and aiming them as shown. Insert the spacers with collar (51) inside vibration dampers on support (22), as shown in the figure. Fit the vertical coil (24), aiming it as shown in the figure, on the support (22), and secure it in place with the screws (52), close to the clips (49).
Tighten screws (52) to a torque of 8 Nm ± 10%.

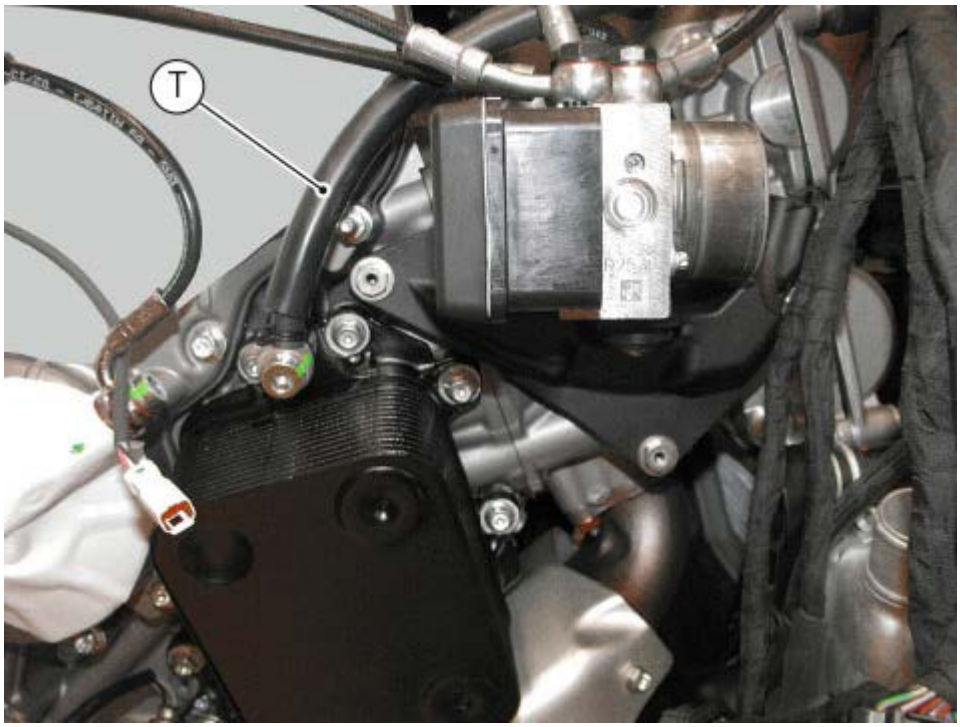




Refit the RH electric system support (22) on the frame.
Smear the three screws (30) with recommended threadlocker, start the screws securing the support (22) to the frame, and tighten to a torque of 5 Nm ± 10 %.

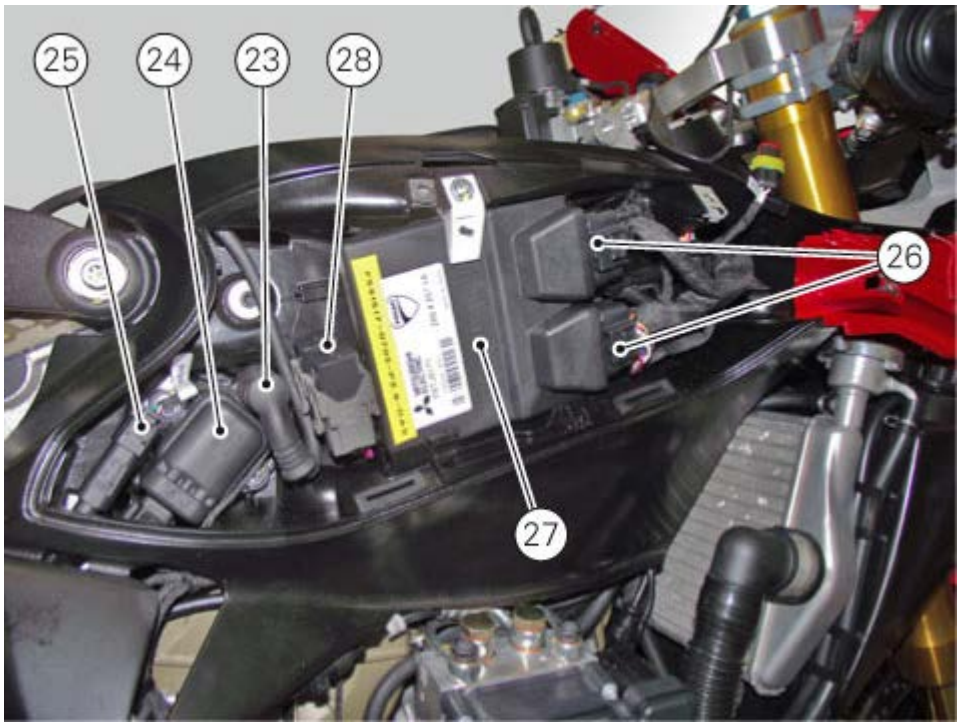


Note
During this operation, take special care to position the hose (T) coming out of the heat exchanger as shown in the figure.



Refit the relays (28) into their seats on the LH support.
Connect the components positioned on RH electric system support (22). In particular:

- the vertical cylinder coil (24) cap (23);
- the connector (25) between the vertical cylinder coil (24) and the main wiring harness;
- the connectors (26) between the ECU (27) and the main wiring harness.



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

Removal of the electric system supports

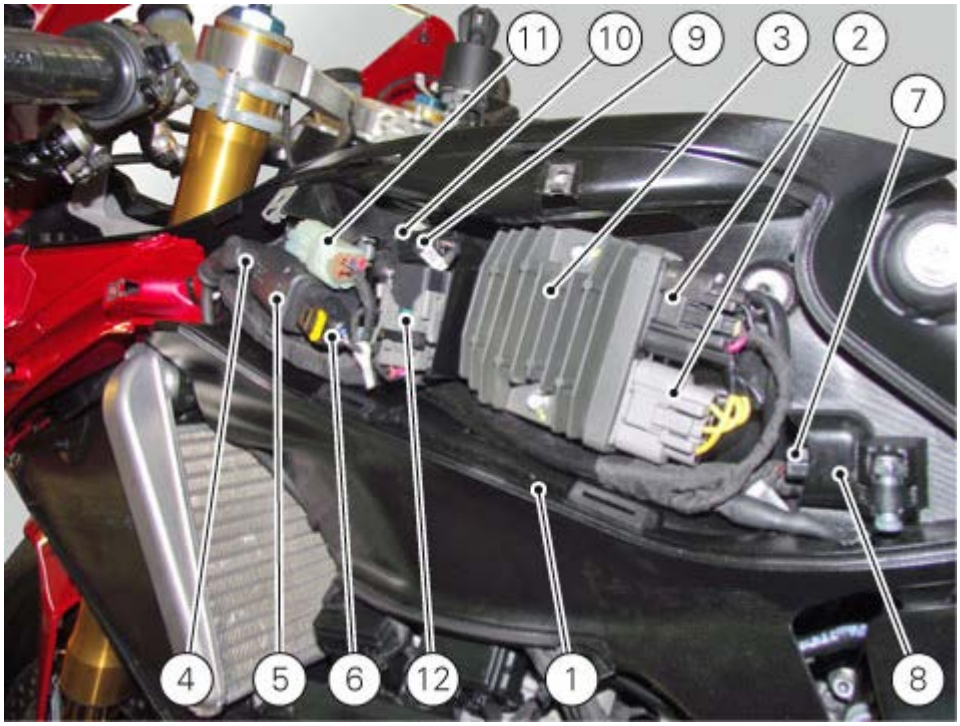
Removing the LH electric system support

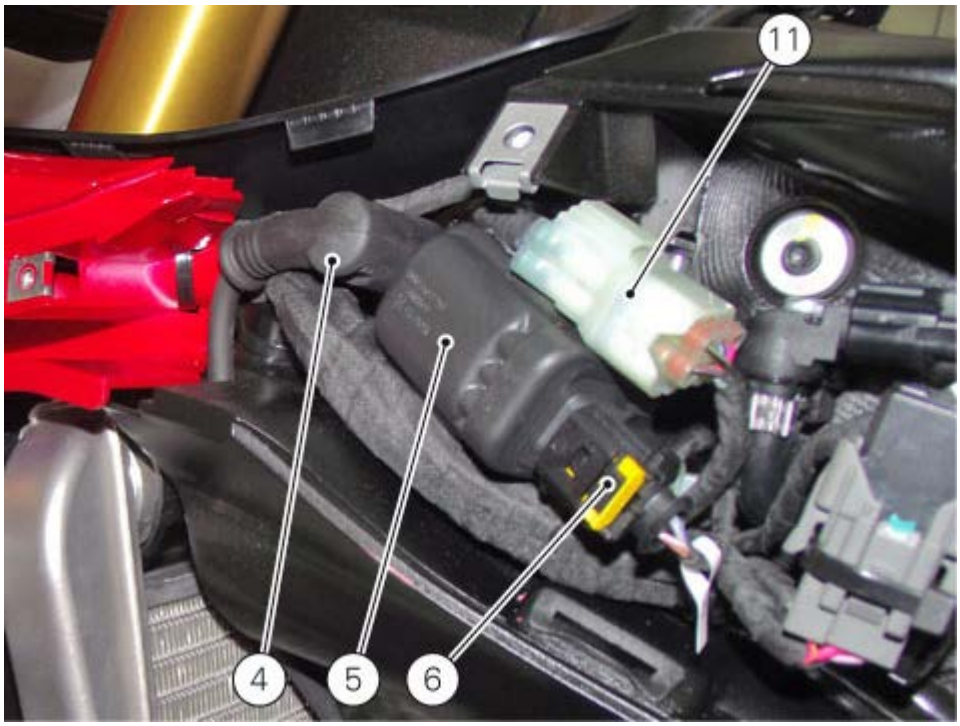
Remove the seat (Removing the rider seat).
Remove the fairings (Removing the side fairings).
Remove the tank (Removing the fuel tank).

Disconnect the components positioned on the LH electric system support (1). In particular:

- the connectors (2) between the voltage rectifier (3) and the main wiring harness and the generator;
- the horizontal cylinder coil (5) cap (4);
- the connector (6) between the horizontal cylinder coil (5) and the main wiring harness;
- the connector (7) between the horizontal MAP sensor (8) and the main wiring harness;
- the connector (9) between the vertical MAP sensor (10) and the main wiring harness;
- the connector (11) between the ignition switch and the main wiring harness.

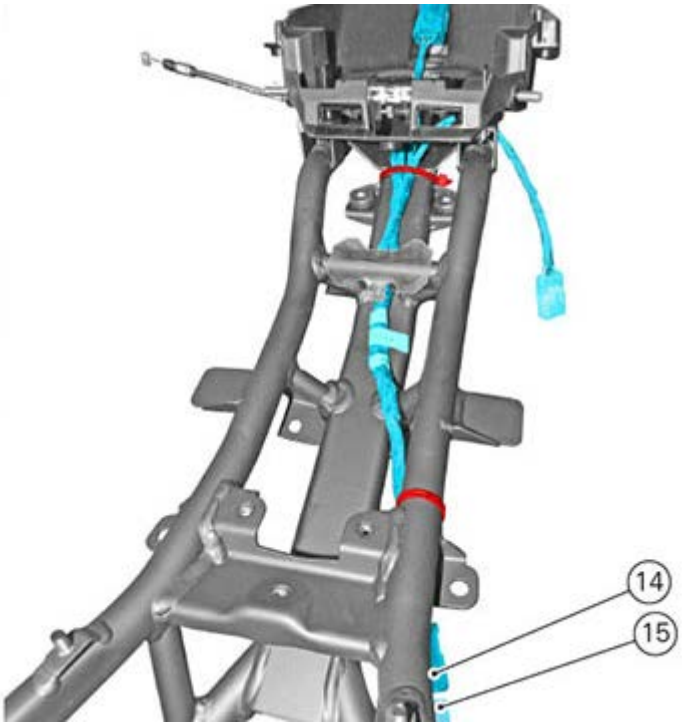
Remove the injection and e-lock relays (12) from their seats on the LH support.





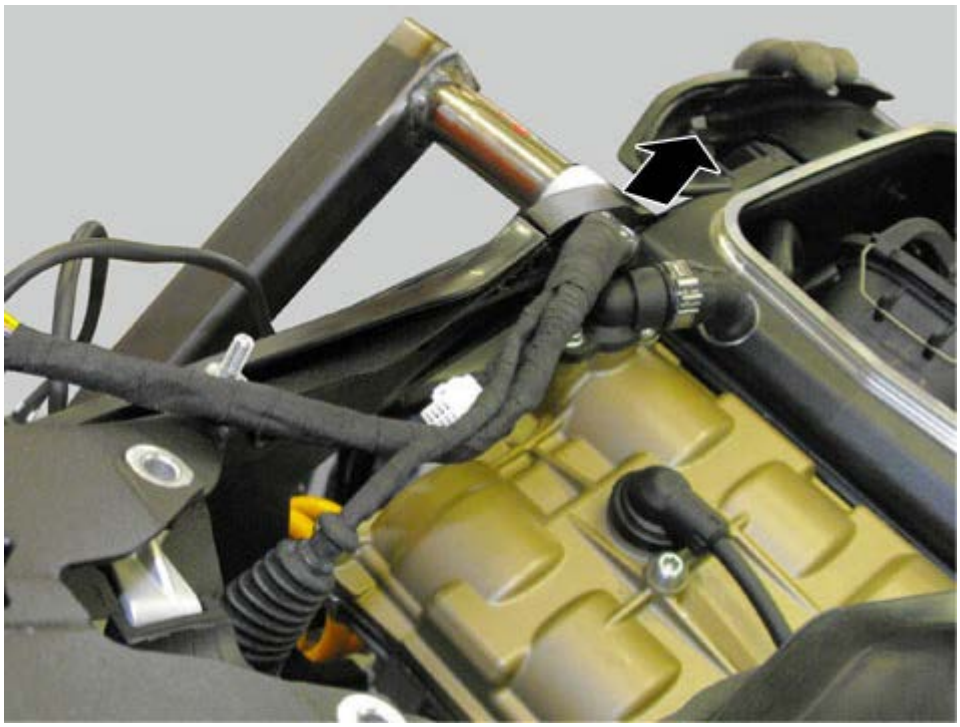
Remove the fuse box cover (13).

Disconnect the rear wiring (14) from the main wiring connector (15).

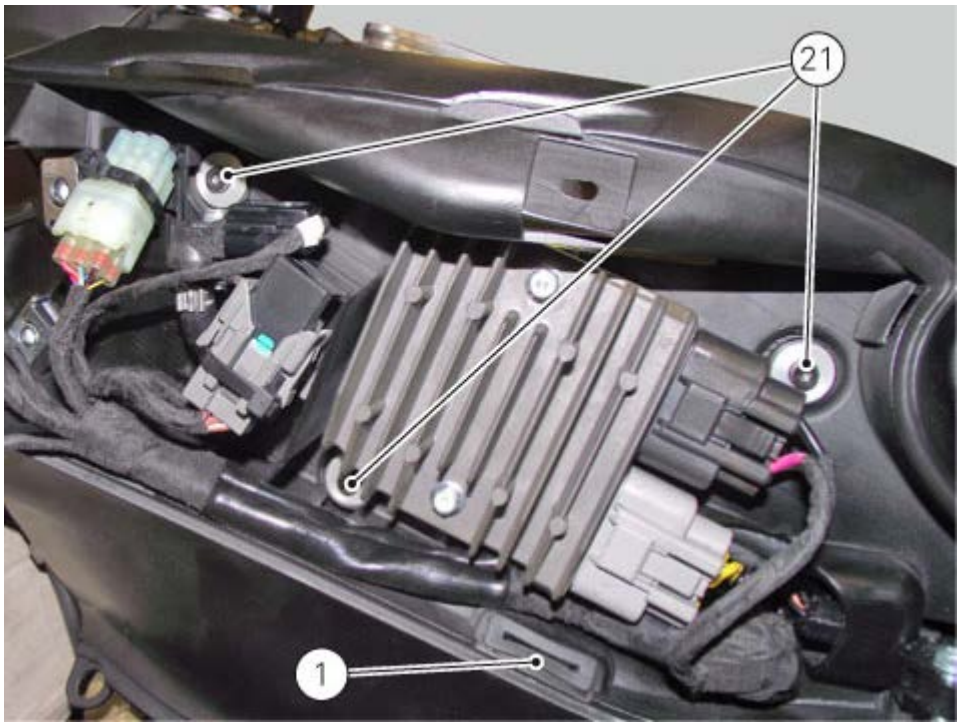


Disconnect the black box wiring (16) from the main wiring connector (17).

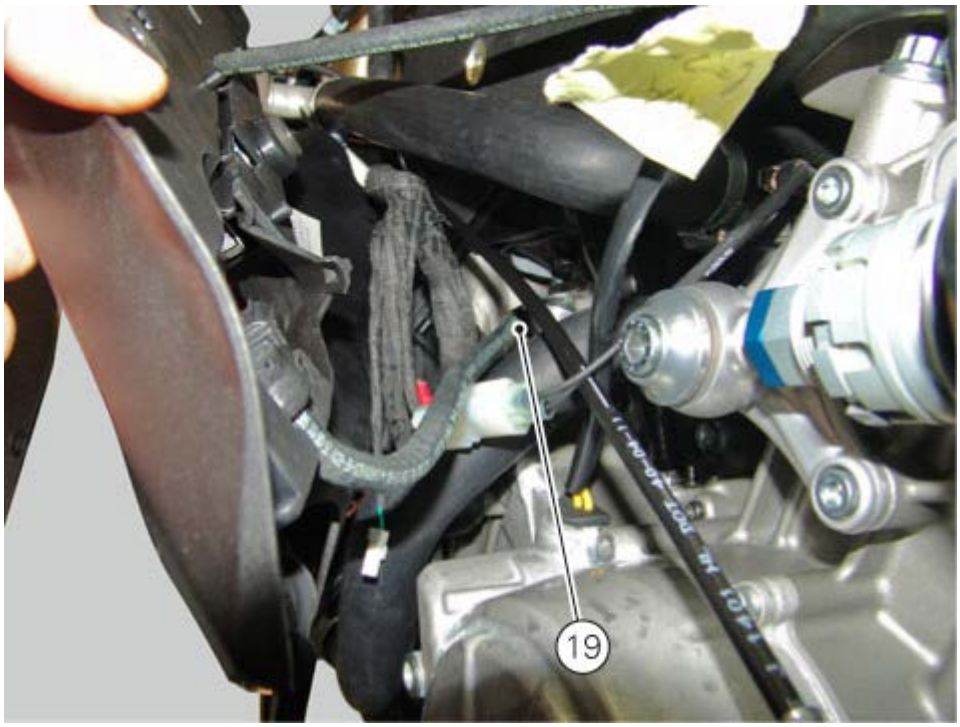
Remove main wiring cable, sliding it out towards bike front end, so as to release the LH support from the cable.



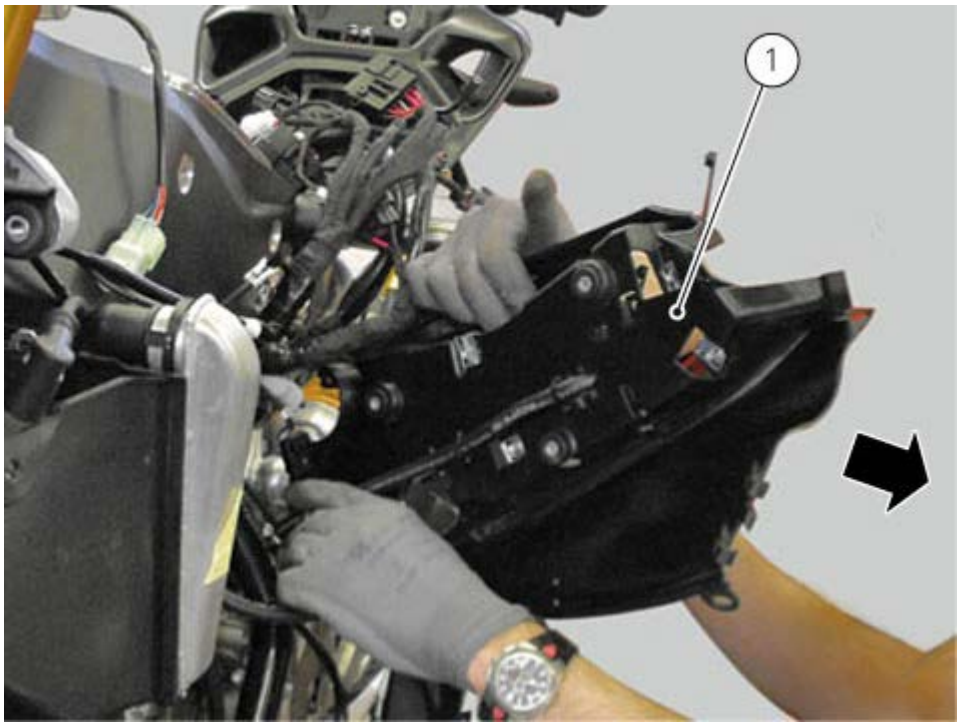
Loosen the three screws (21) securing support (1) to frame.

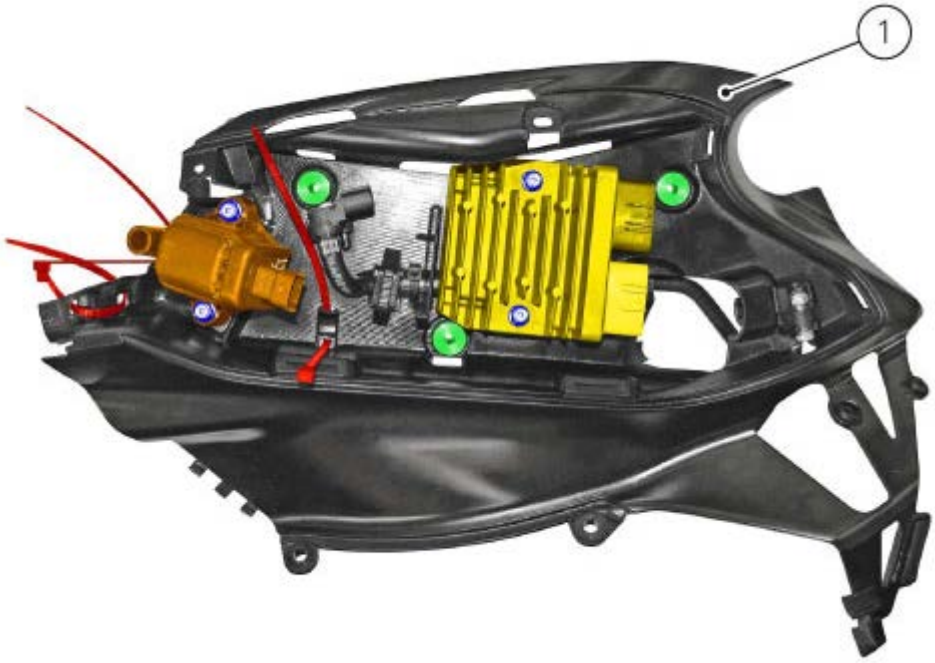


Slightly move the LH support outwards, and disconnect the horizontal MAP sensor hose (19) from the horizontal head, and the vertical MAP sensor hose (20) from the vertical head.



Remove the LH electrical system support (1).



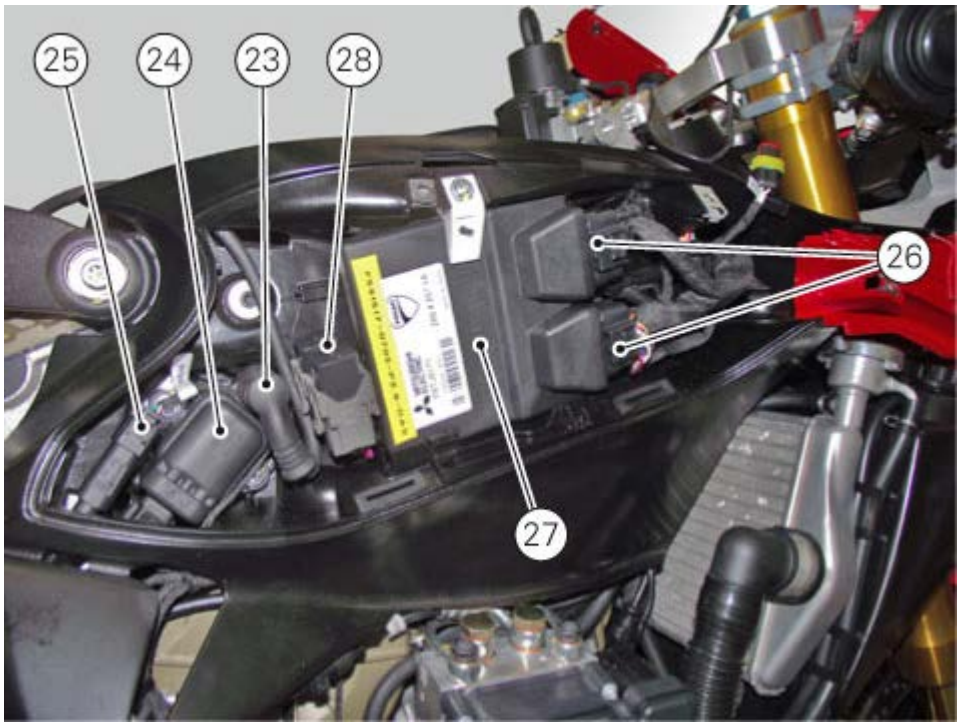


Removing the RH electric system support.

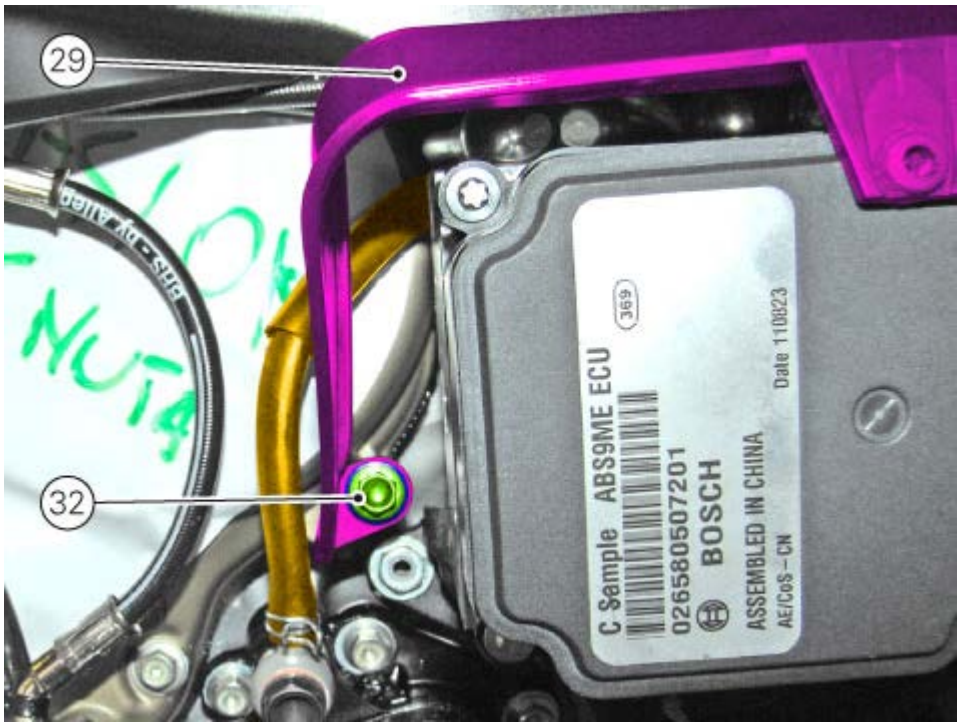
Disconnect the components positioned on RH electric system support (22). In particular:

- the vertical cylinder coil (24) cap (23);
- the connector (25) between the vertical cylinder coil (24) and the main wiring harness;
- the connectors (26) between the ECU (27) and the main wiring harness.

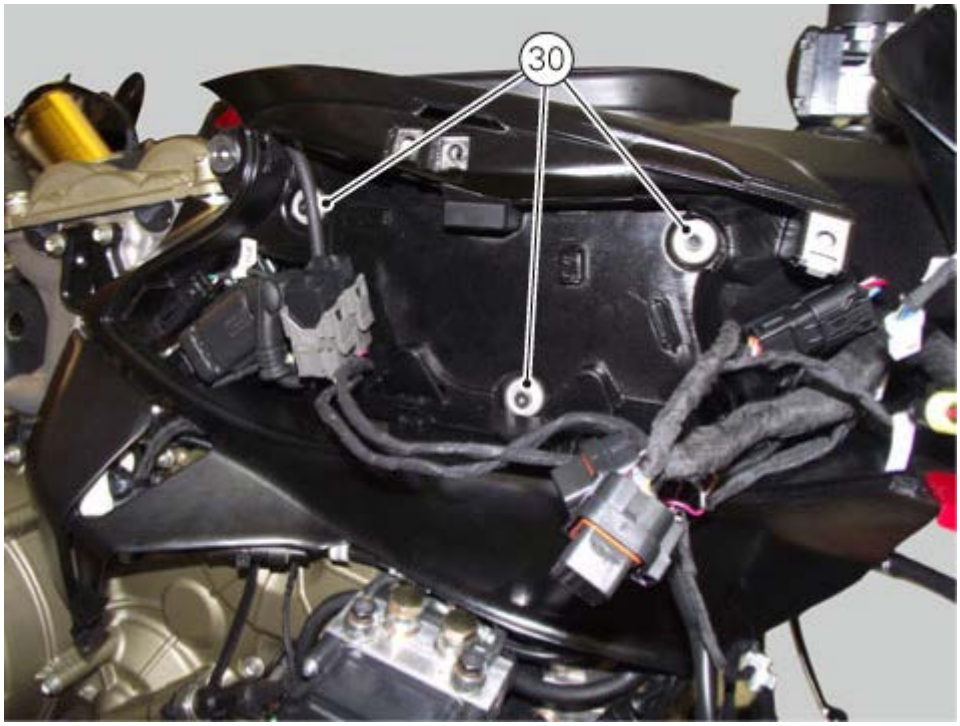
Remove the relays (28) from their seats on the LH support.



To remove the ABS control unit cover support (29), loosen screw (31) and nut (32).



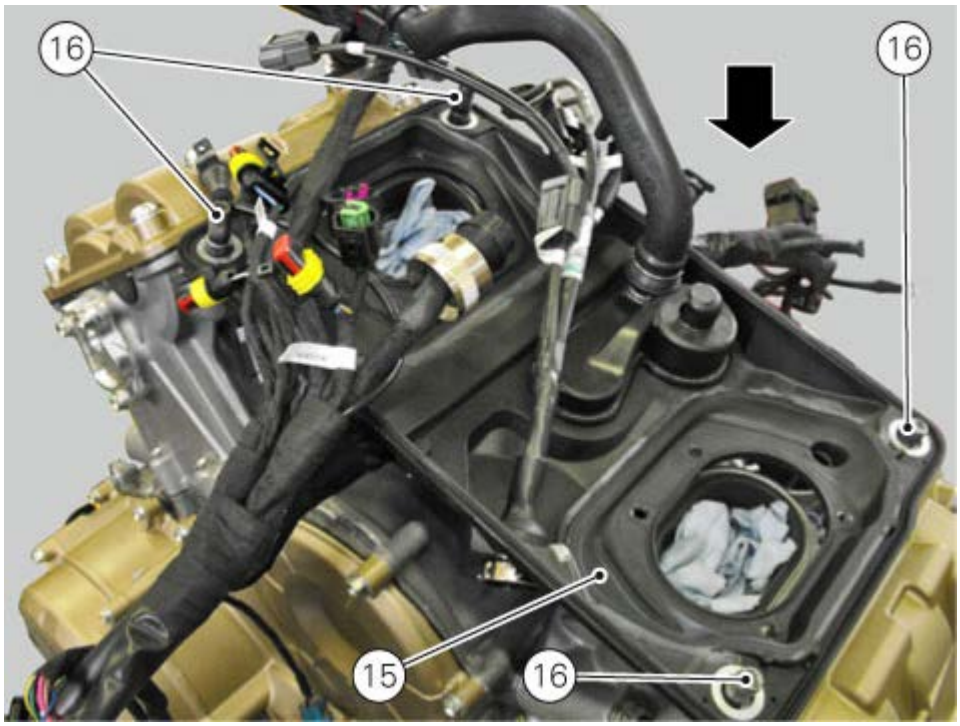
Loosen the three screws (30) securing the RH support (22) to the frame.



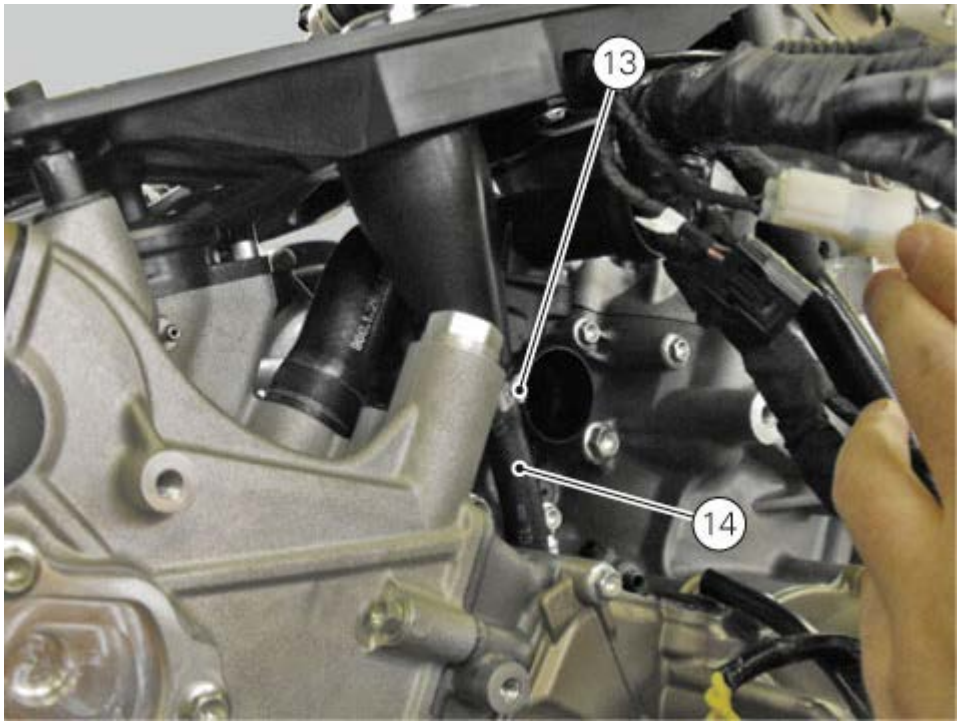
Refitting the structural parts and frame.

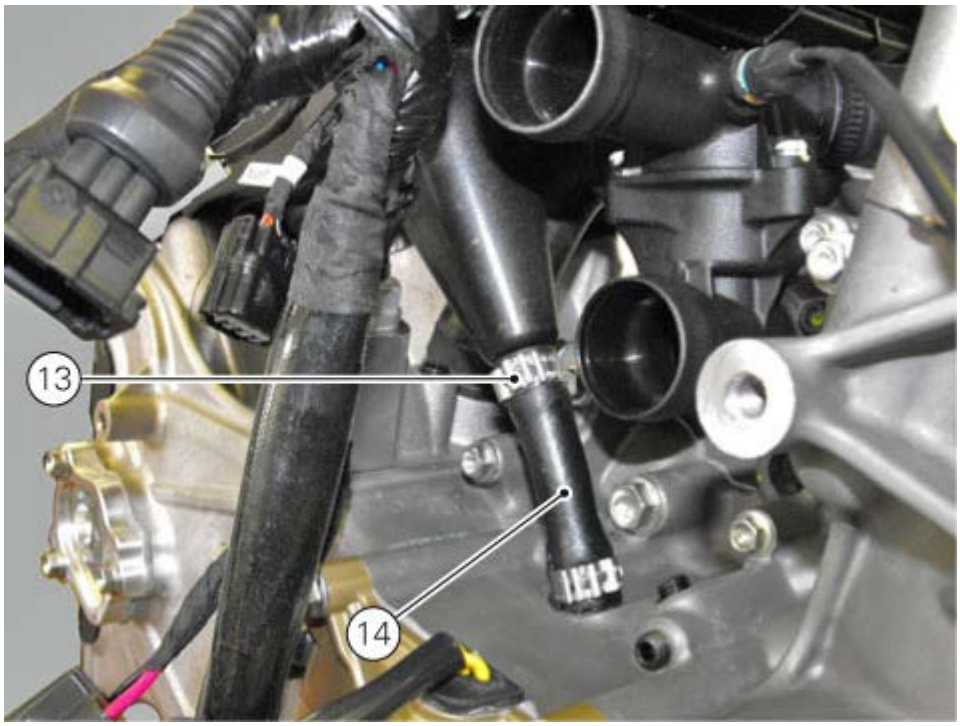
Refitting the airbox compartment

Position the complete airbox compartment (15) (Inspection of the frame) onto the engine head stud bolts (16).

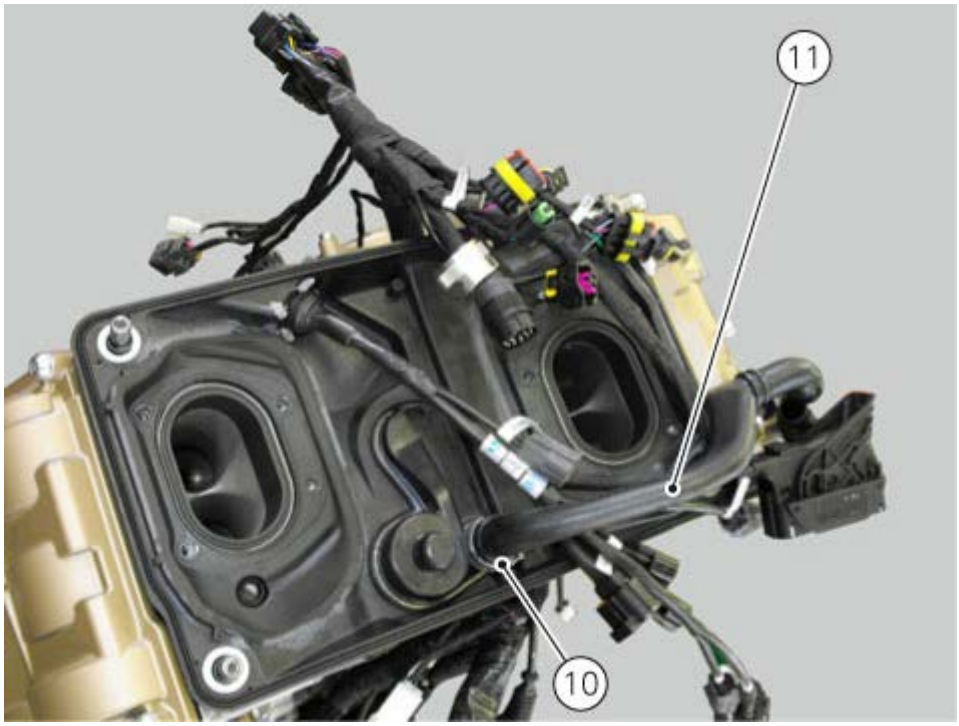


Secure hose (14) with clamp (13).





Position the breather hose (11) and lock it with clip (10).

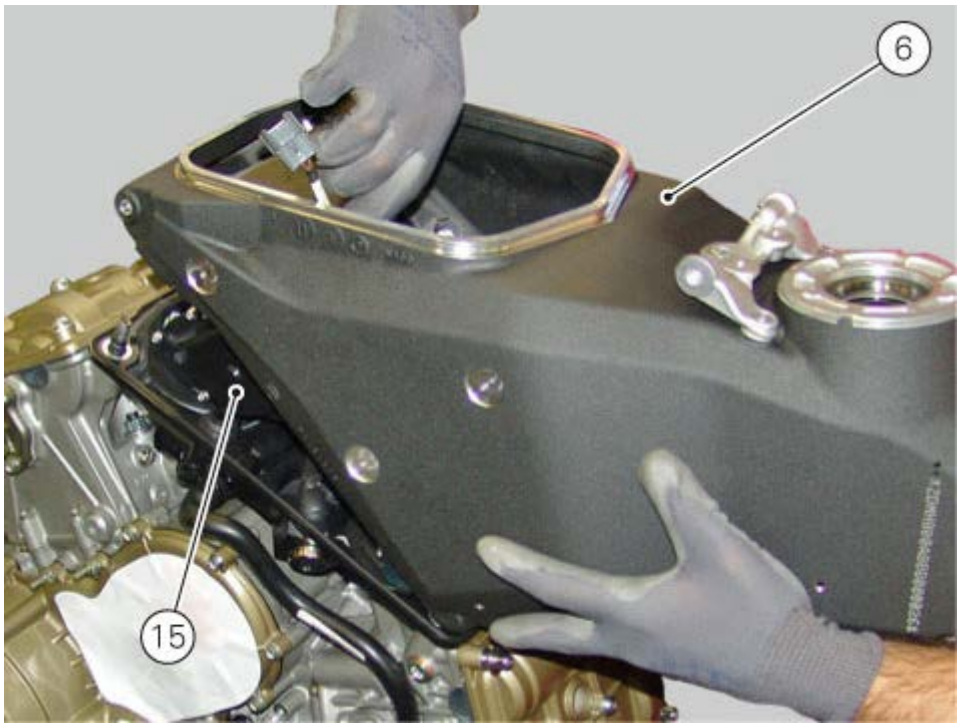


Refit the intake funnels and the throttle bodies (Refitting airbox and throttle body).
Refit the frame assembly as follows.

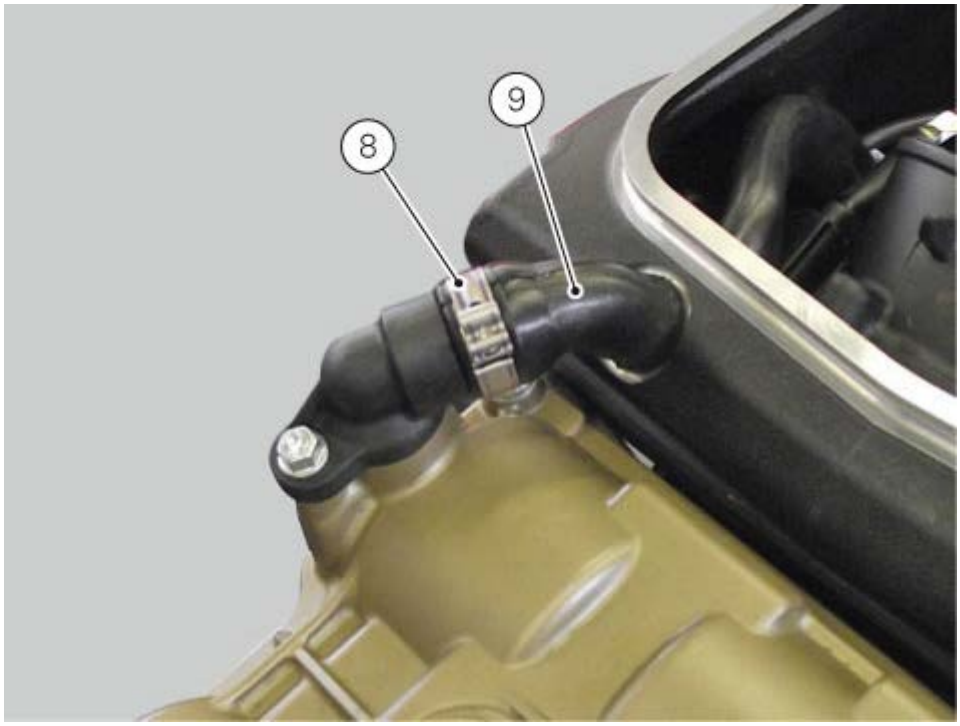
Refitting frame and steering system components

Position the complete frame (6) (Inspection of the frame) on the airbox compartment (15).

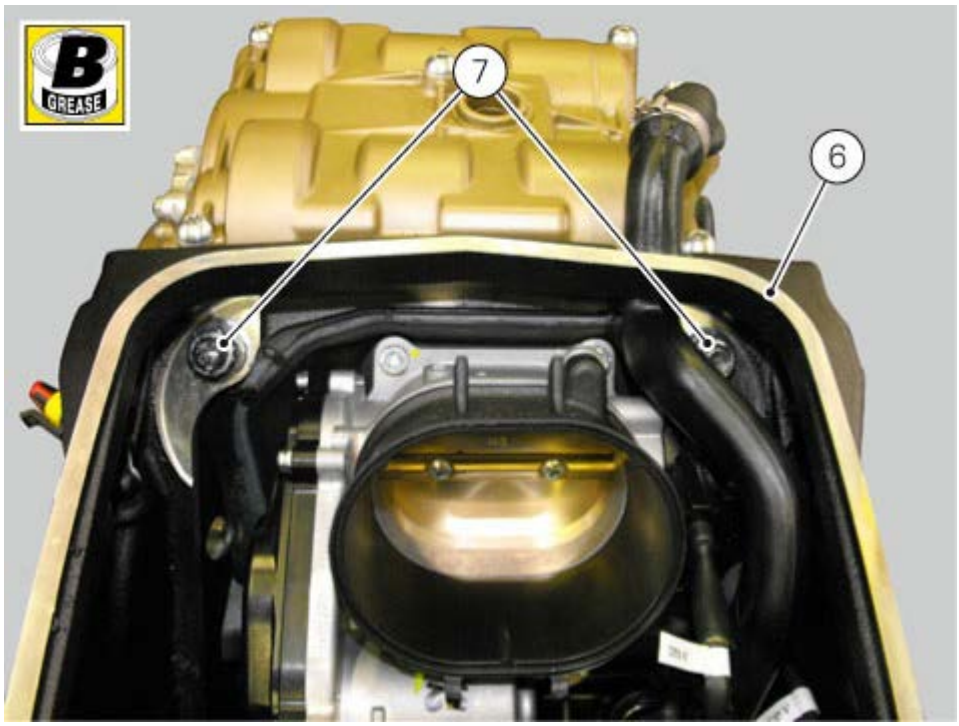

6

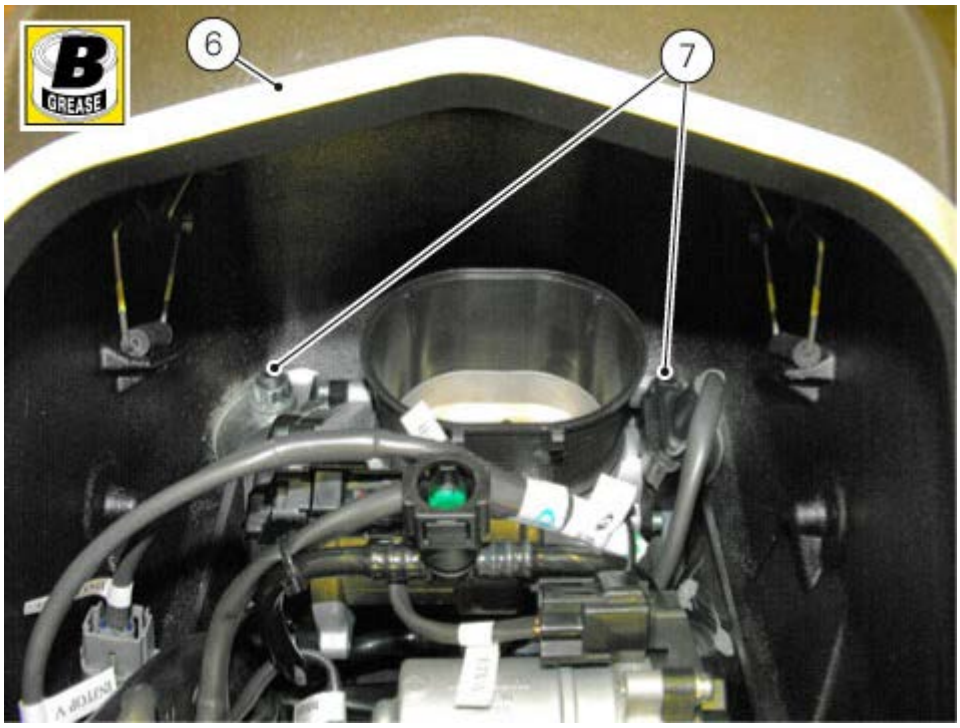

6
15

Position the hose (9) and lock it with clamp (8).



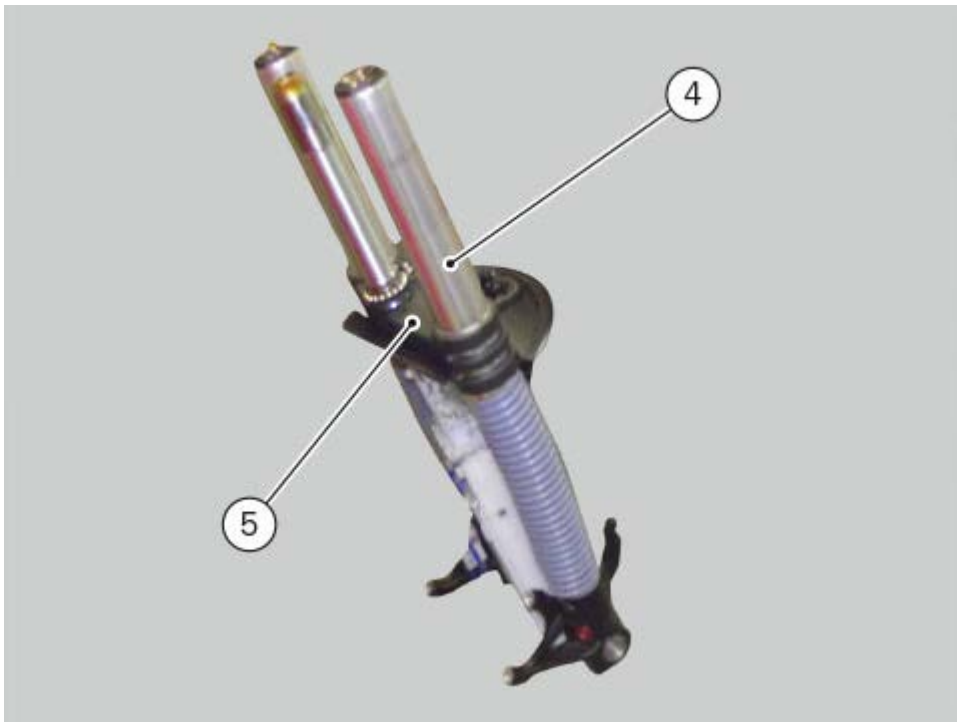
Smear screws (7) with specified grease.
Start the retaining screws (7) securing the frame-airbox assembly (6) to the engine block. Tighten screws (7) to a torque of 45 Nm ± 5%.

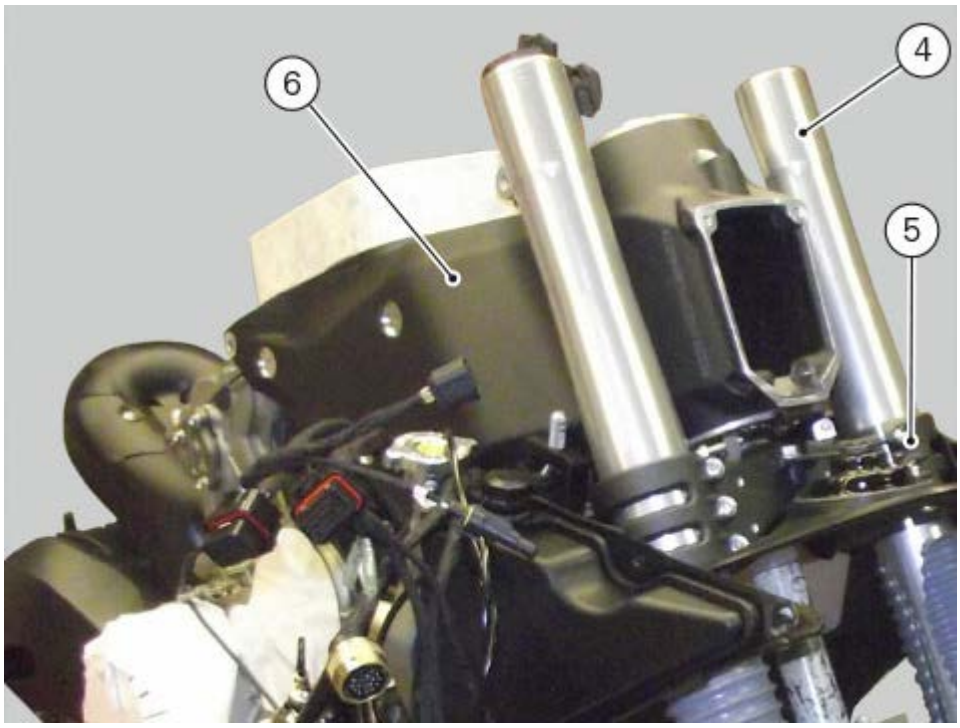




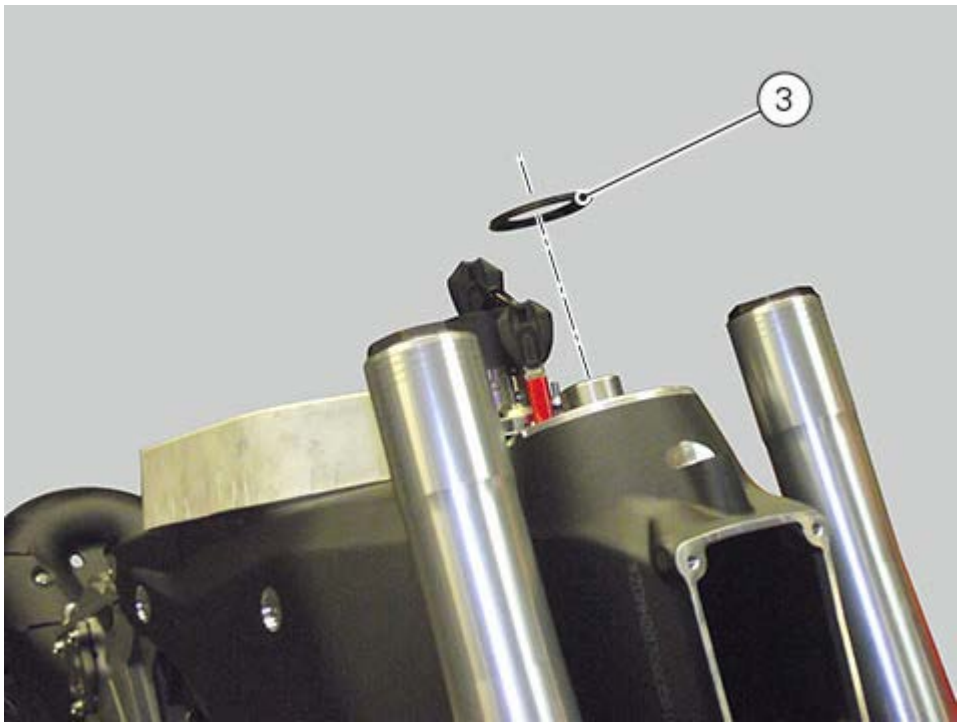
Make sure that the upper bearing is fitted on the frame.

Insert the fork assembly (4) with steering shaft and bottom yoke (5) inside frame (6): shaft, with bearing (41), shall be refitted into its seat on the frame, close to frame upper flange (19).

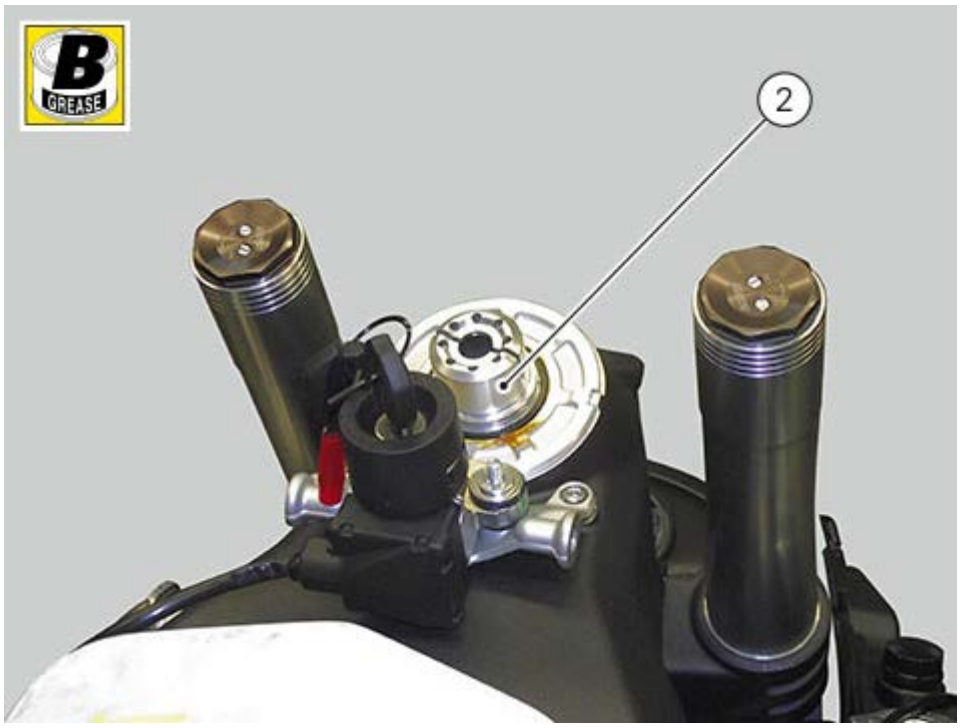




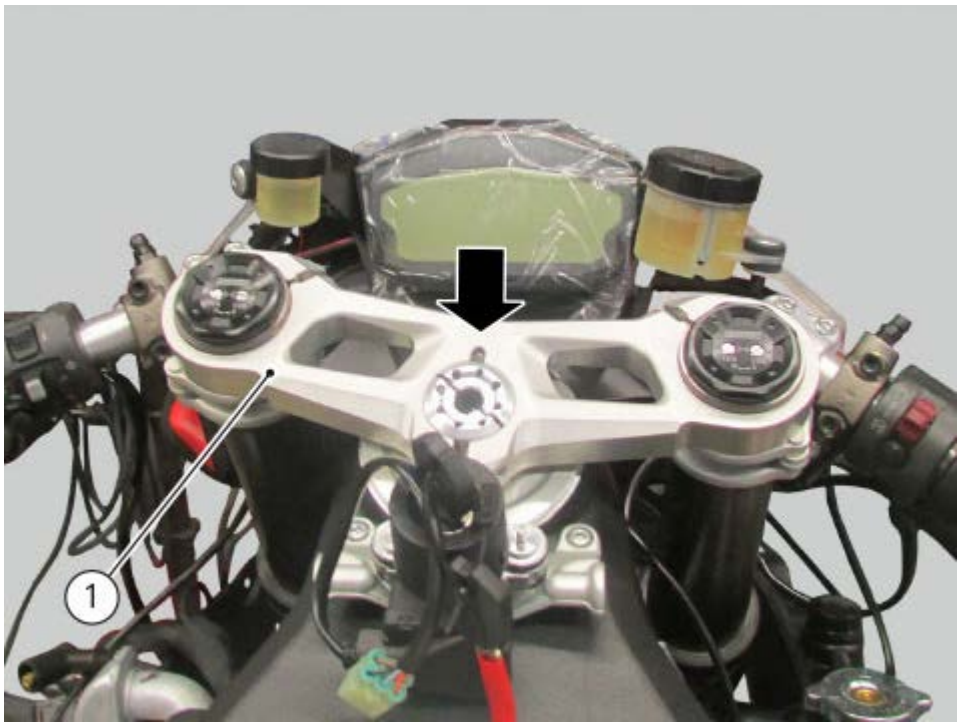
Fir the sealing ring (3).



Smear the ring nut (2) with specified grease.
Start the ring nut (2) and tighten it to a torque of 25 Nm ± 5%.



Fit handlebars onto forks and steering head (1).



Refit the headlight assembly (Replacement of the headlight).
Refit the LH and RH electric system supports (Refitting the electric system supports).
Refit the rear subframe(Refitting the rear subframe).
Remove the supporting tool.
Refit the exhaust system (Refitting the exhaust system).
Refit the radiator assembly support (Refitting the water radiator).
Refit the front wheel (Refitting the front wheel).
Refit the tank (Refitting the fuel tank).
Refit the seat (Refitting the rider seat).
Refit the fairings (Refitting the side fairings).

Inspecting the frame

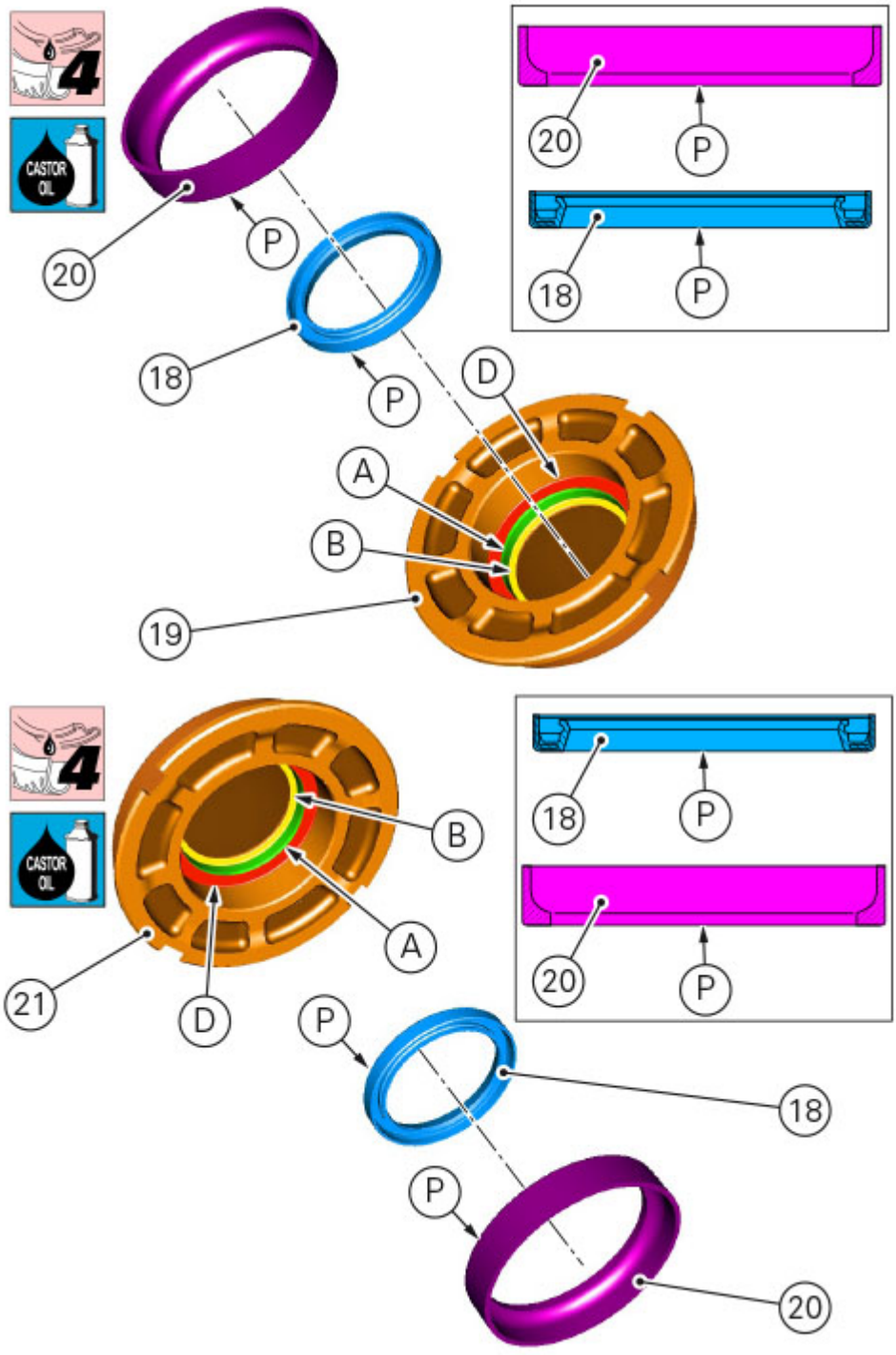
Reassembly of the frame

If flanges (19) and (21) were removed, before refitting them apply a thin layer of recommended lubricant inside the dust seals (18) seats (A) on the flanges (19) and (21).
Insert the dust seals (18) inside seats (A), driving them fully home on the flange (19) and (21) surfaces (B).

Note
Dust seals (18) shall be fitted with the "flat" side (E) facing inwards.

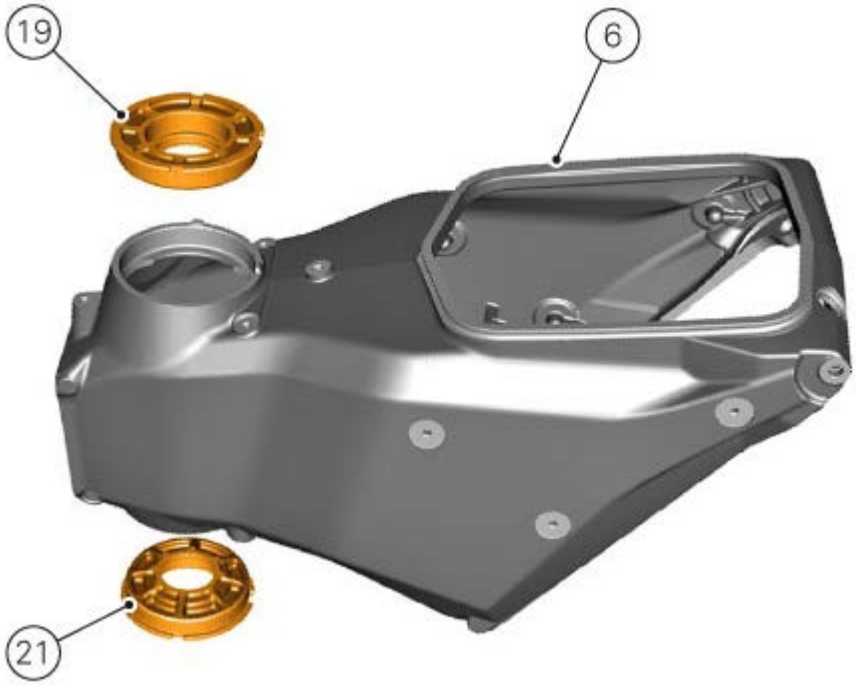
Apply a thin layer of recommended lubricant on the outer mating surfaces of the inner rings (20)
Fit the inner rings (20), driving them fully home inside the special seats (D) of flanges (19) and (21).

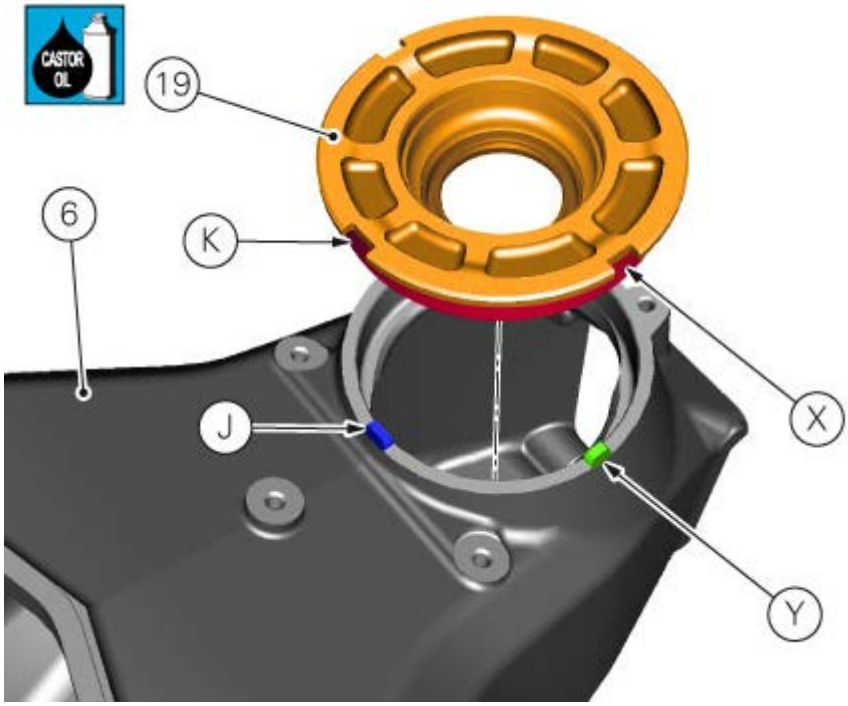
Note
Inner rings (20) shall be fitted with the "flat" side (E) facing inwards.

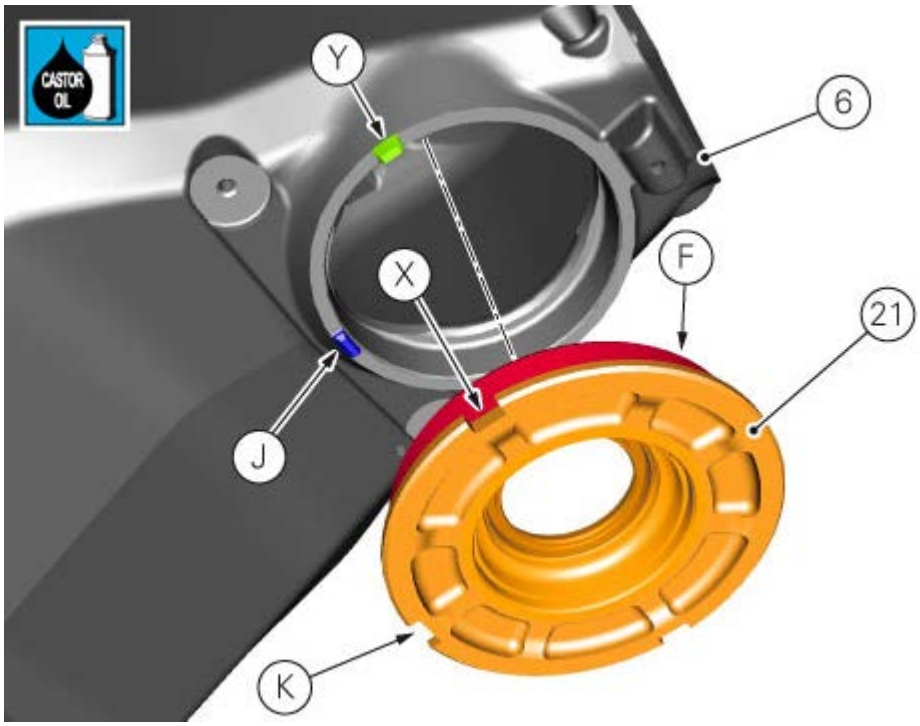


Apply a thin layer of recommended lubricant on the surface (F) of flanges (19) and (21).
Force flanges (19) and (21) inside frame seats (6), driving them fully home.

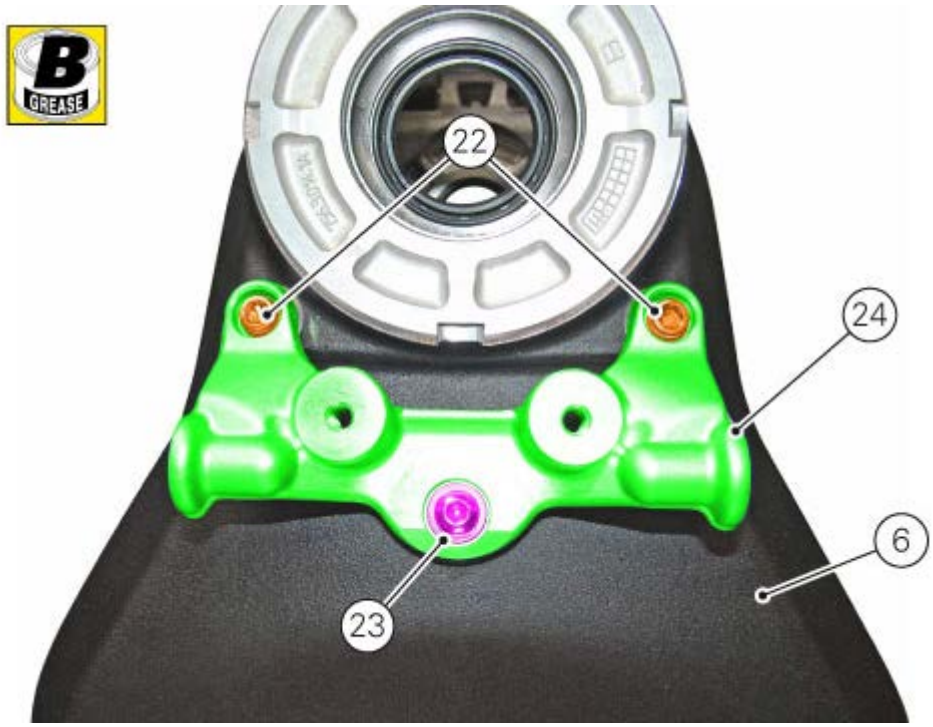
Note
Aim the flanges (19) and (21) so that the larger slots (K) match with the bigger teeth (J) on the frame and that the smaller slots (X) match with the smaller teeth (Y).







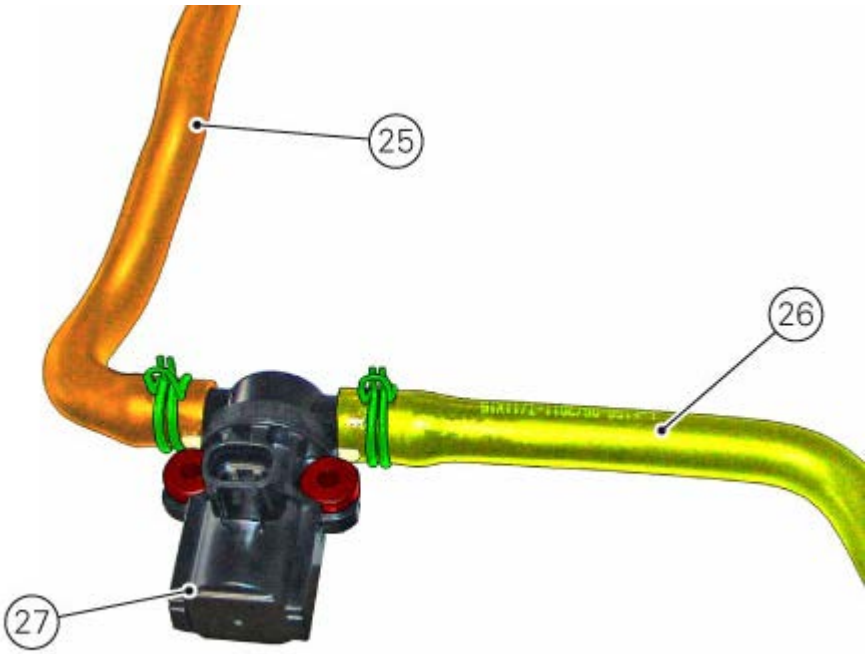
If the ignition switch support (24) was removed, before refitting it, apply recommended grease on the thread and underside of the screws (22) and (23). Position the ignition switch support (24) onto frame (6), and secure it in place with the screws (22) and (23). Tighten screws (22) and (23) to a torque of ± 10 Nm 10%.

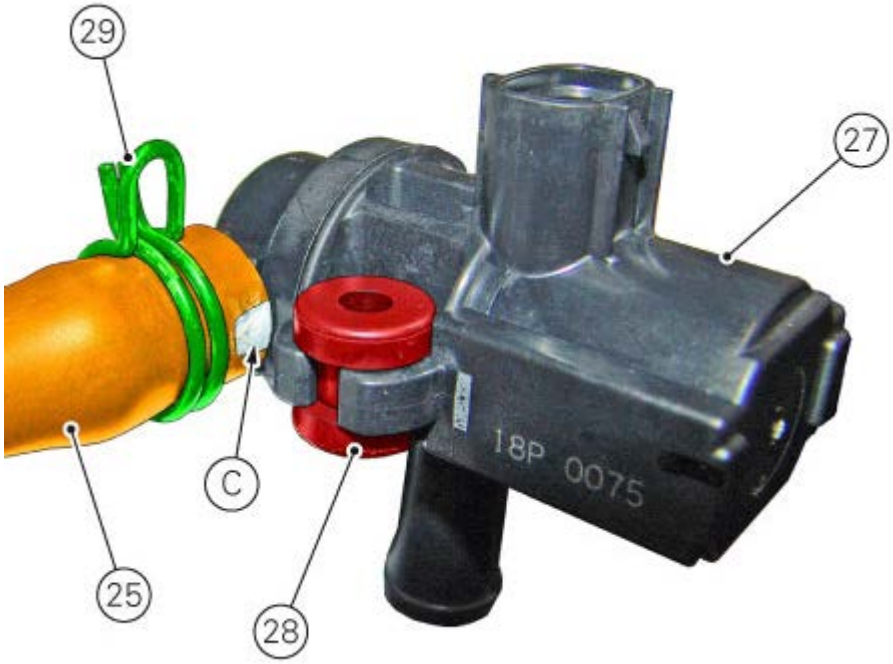


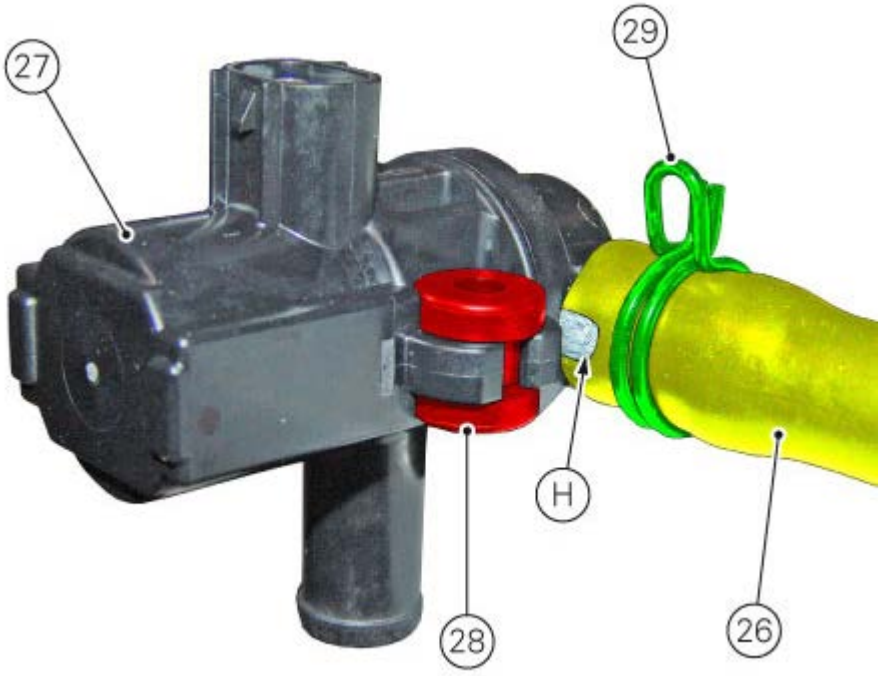
Reassembly of the airbox compartment

If the airbox compartment components were removed, refit them as indicated. Fit the horizontal head actuator secondary air hose (25) and the vertical head actuator secondary air hose (26) on the special secondary air actuator unions (27), aiming them so that the hose marks (C) and (H) are aligned with the actuator vibration dampers (28).
Secure hose (25) and hose (26) in place using the spring clips (29), in the positions shown in the figure.

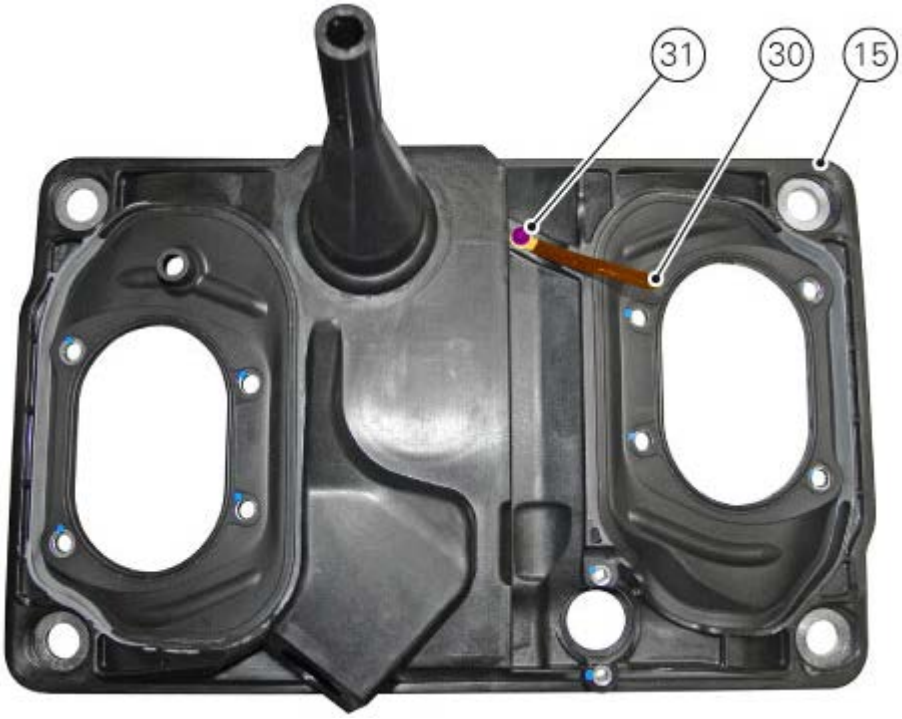
Note
Aim spring clips (29) as shown in the figure.

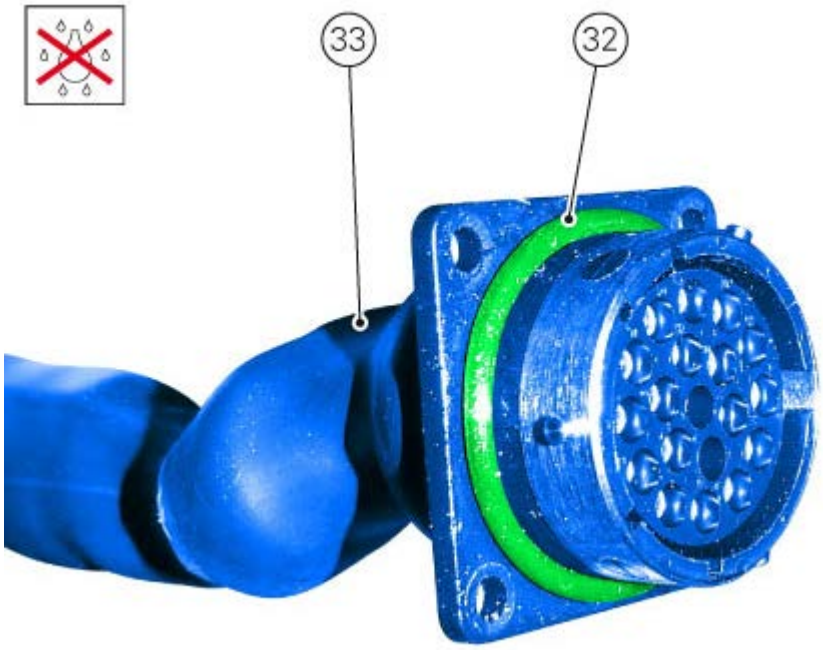

25
26
27


29
27
18P 0075
C
25
28

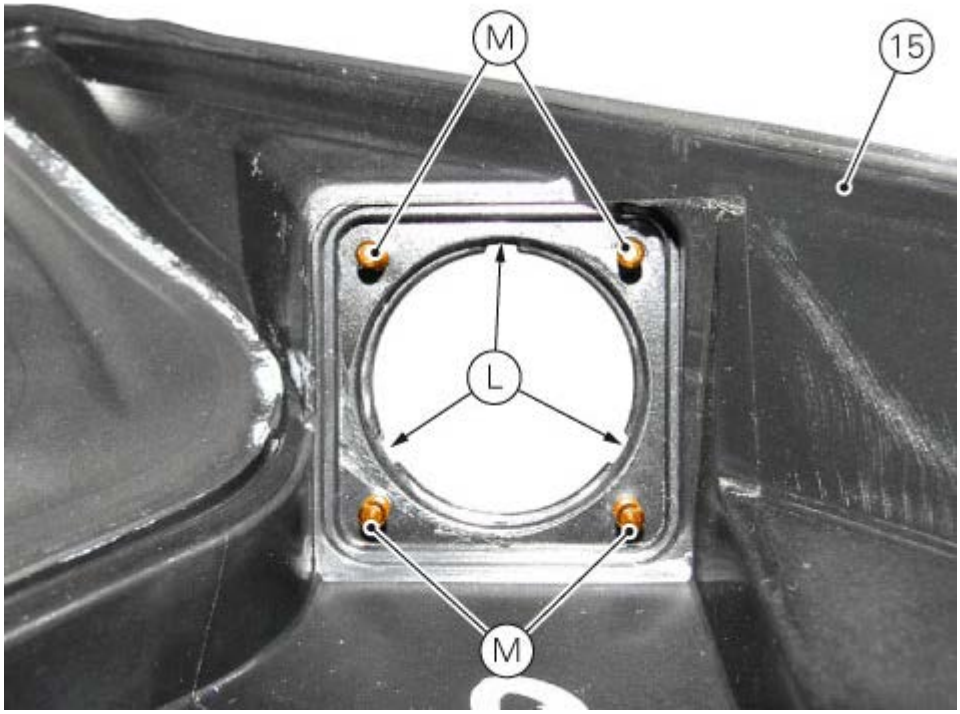


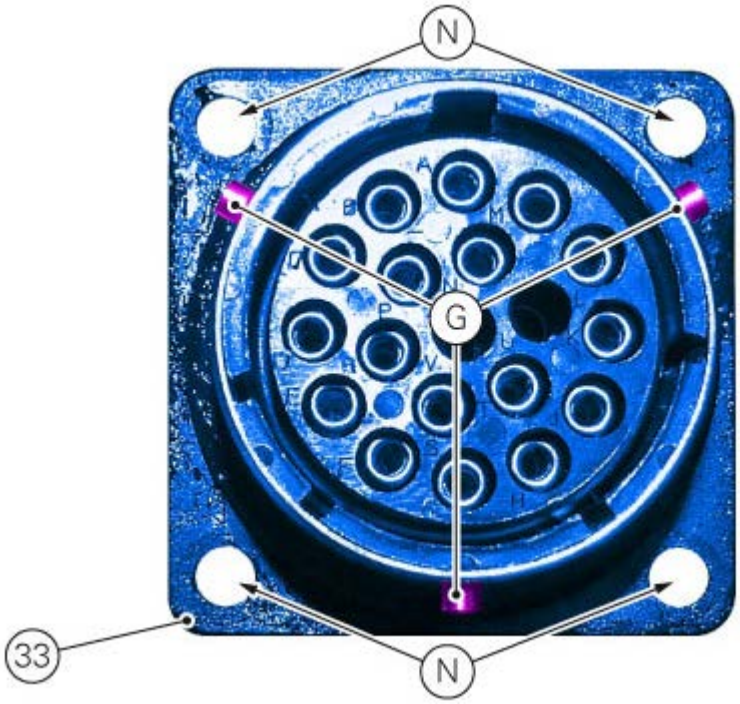
Fit the key (30), aiming it as shown in the figure, in the indicated airbox compartment area (15), then tighten the screw (31) to a torque of 1 Nm ± 10%.
Insert the O-ring (32) fully home on the wiring connector (33).
Apply recommended protective grease to the O-ring (32).



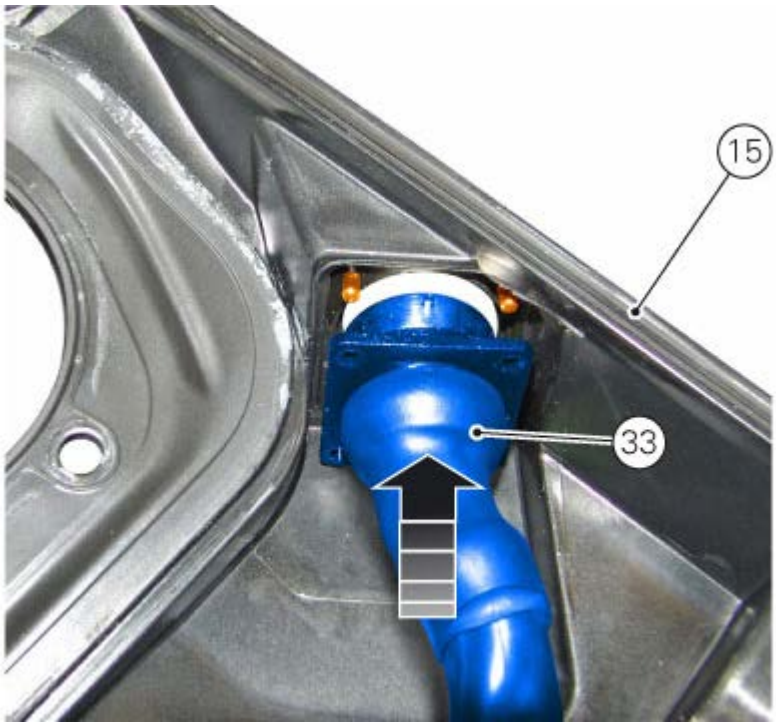


Insert the wiring connector (33) inside the special hole on the airbox compartment (15), so that connector pins (G) match with airbox compartment slots (L) and that airbox compartment pins (M) match with the connector holes (N).

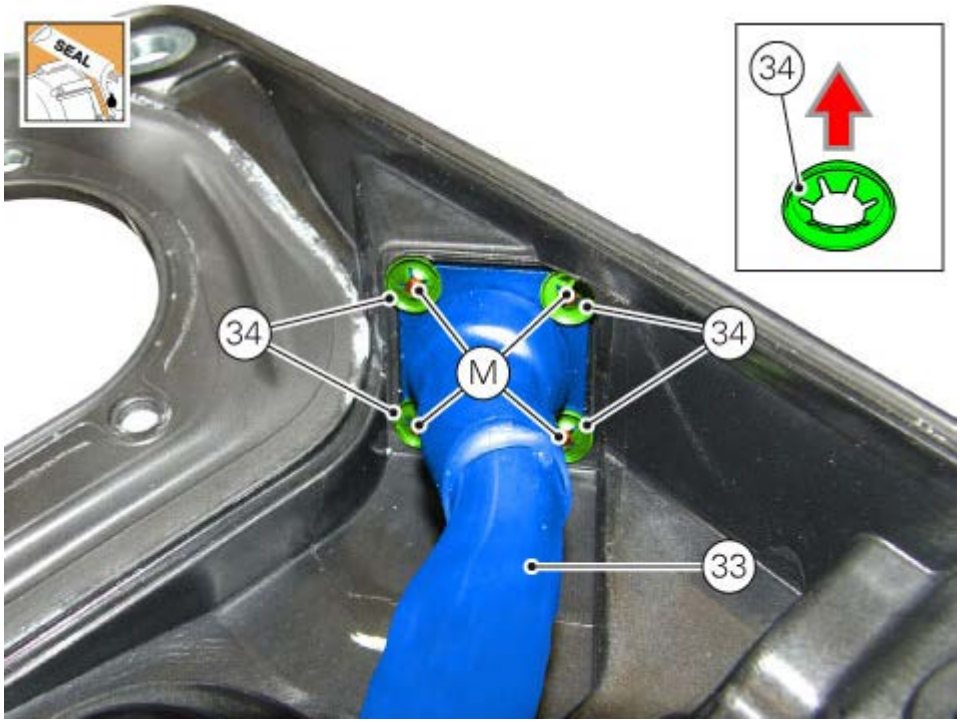


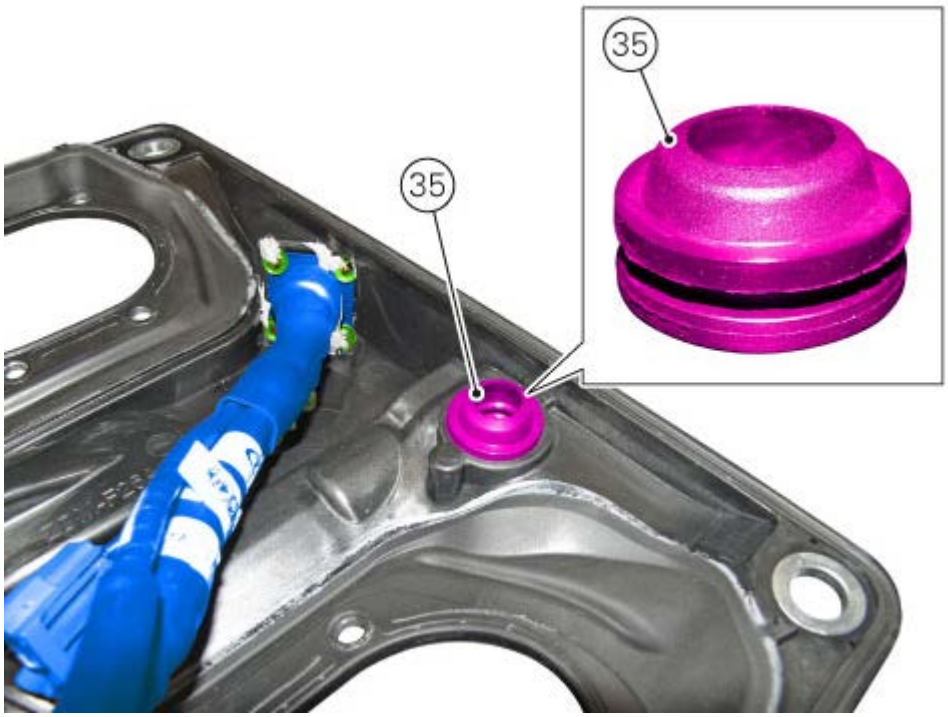

N
G
33
N


15
33

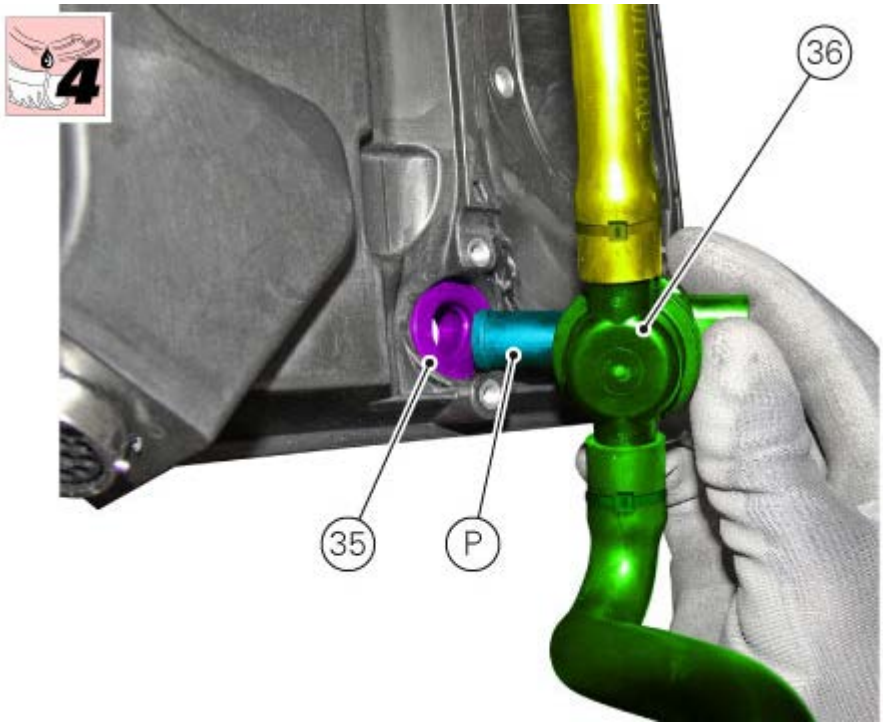


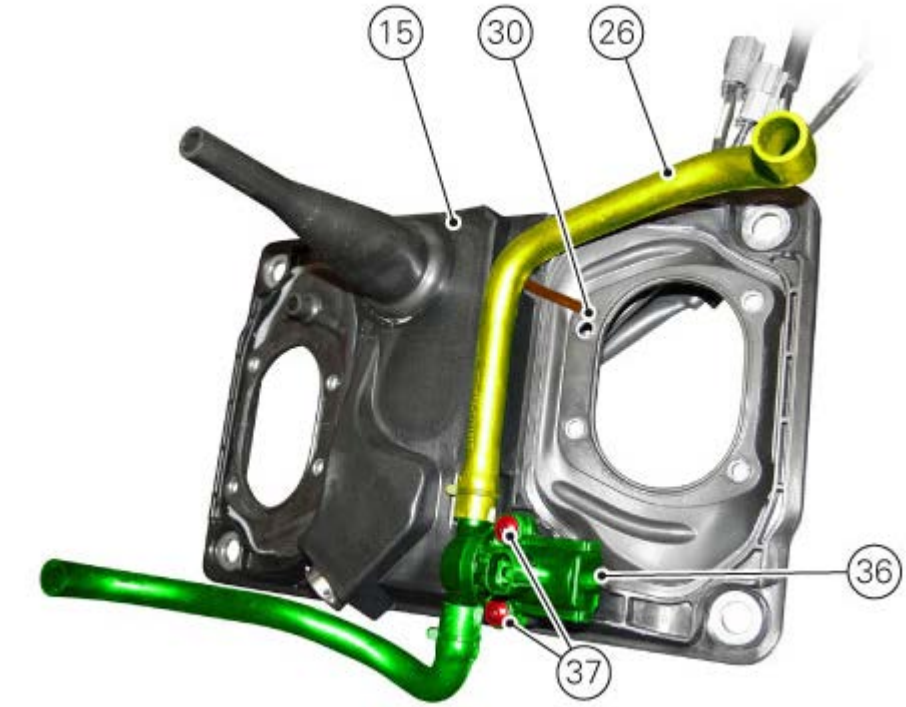
To secure the wiring connector (33), insert the fasteners (34) inside pins (M), aiming them as shown in the figure. Apply recommended threadlocker to the fasteners (34).
Fit the vibration damper (35), aiming it as shown.

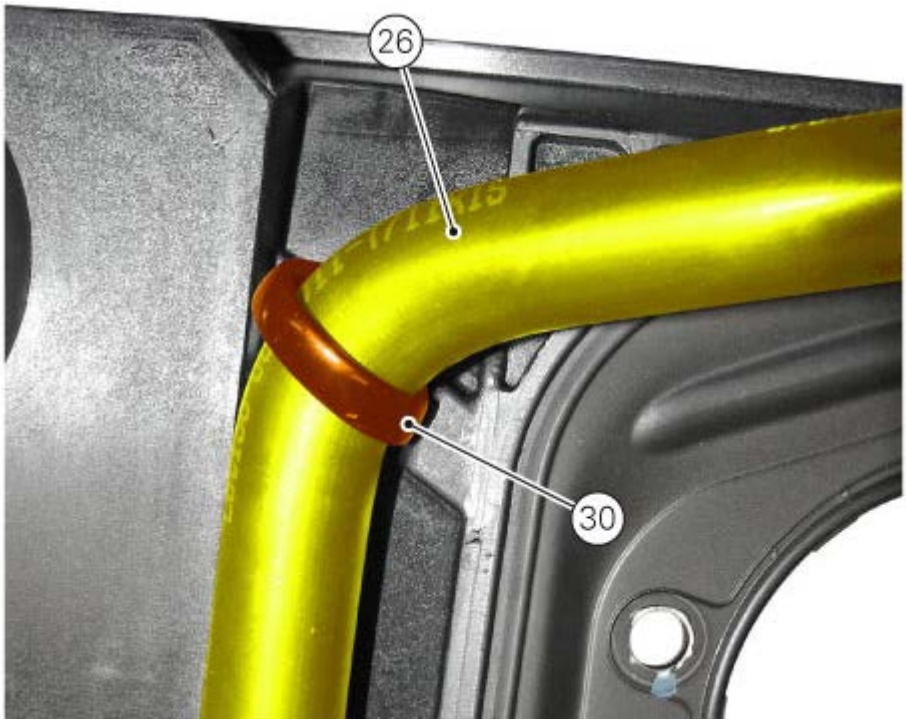




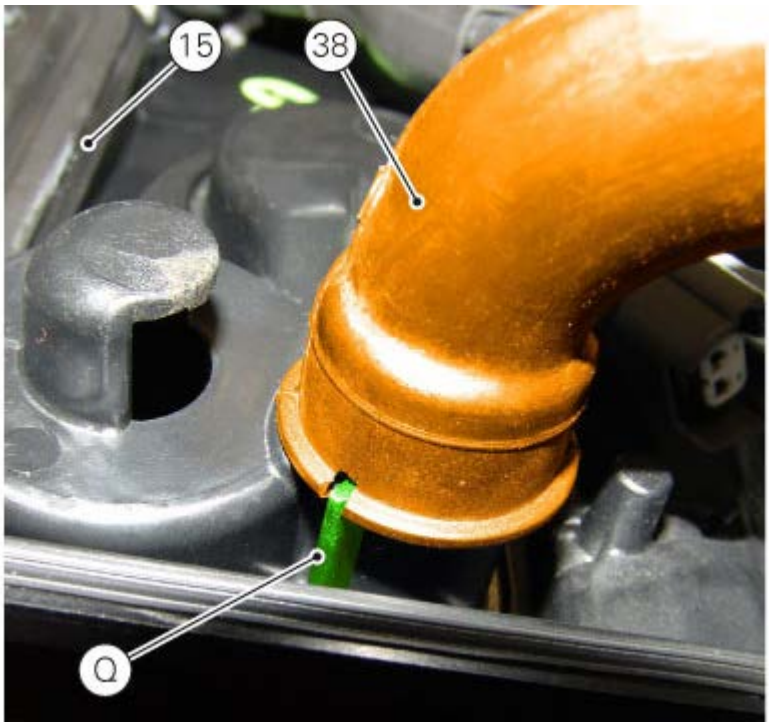
Turn the airbox compartment (15) upside down.
Apply a thin layer of lubricant on the vibration damper (35) you had previously assembled.
Insert union (P) inside seal (35), and position the secondary air actuator assembly (36), aiming it as shown in the figure. Fix the secondary air actuator assembly (36) by starting the screws (37).
Tighten screws (34) to a torque of 4 Nm ± 10%.
To secure the vertical head actuator secondary air hose (26) in place, fold tab (30), as shown. Take care not to kink the hose (26).

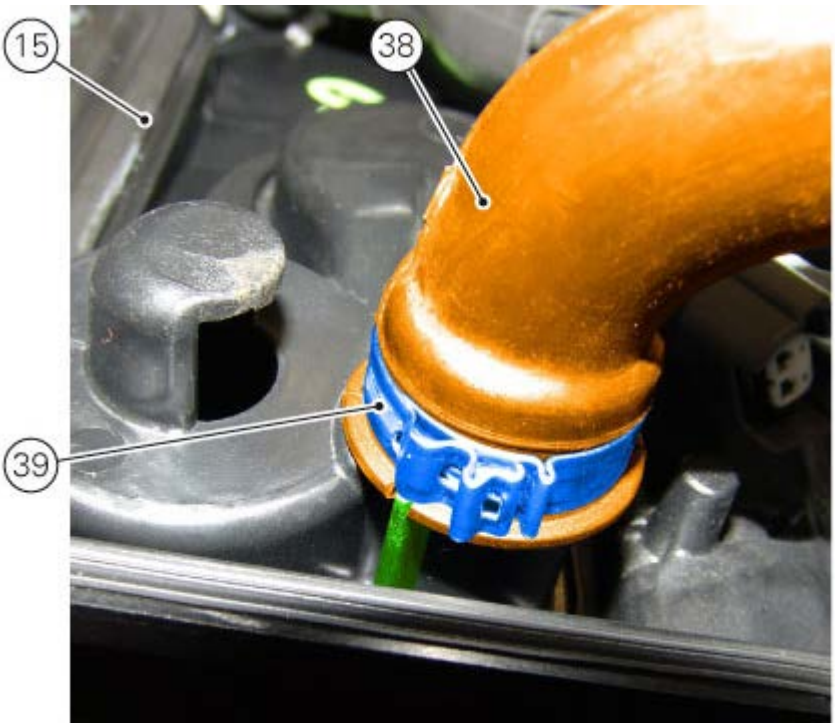






Fit the blow-by hose (38), aiming it so that the hose slot engages with the airbox compartment (15) tab (Q), as shown in the figure.
Insert clamp (39) on the blow-by hose (38), aiming it as shown in the figure. Then tighten clip.


15
38
Q

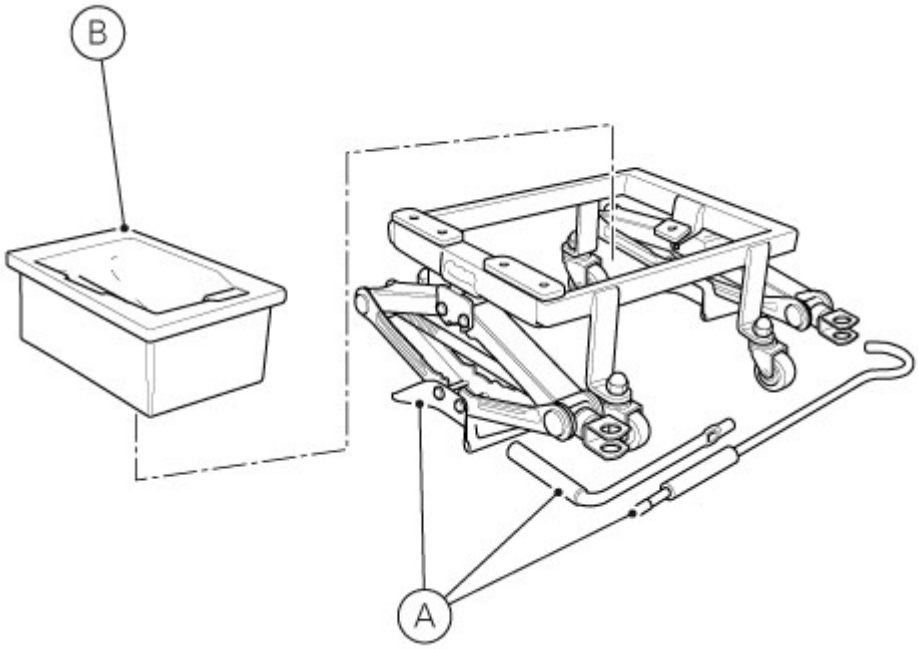

15
38
39

Removing structural components and frame

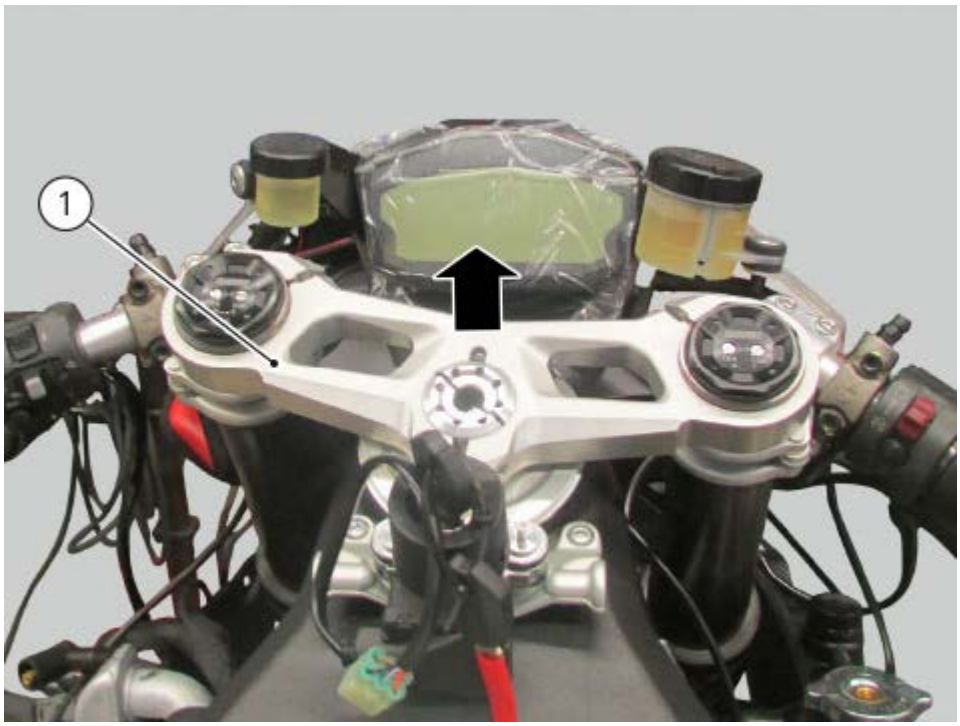
Removing frame and steering system components

The engine block of this vehicle is a load-bearing part. To work on the parts supported by the engine block, such as frame, the engine block shall be duly supported, as described herebelow.
Remove the fairings (Removing the side fairings).
Remove the seat (Removing the rider seat).
Remove the tank (Removing the fuel tank).
Remove the front wheel (Removing the front wheel).
Remove the radiator assembly support (Removing the water radiator).
Remove the exhaust system (Removing the exhaust system).

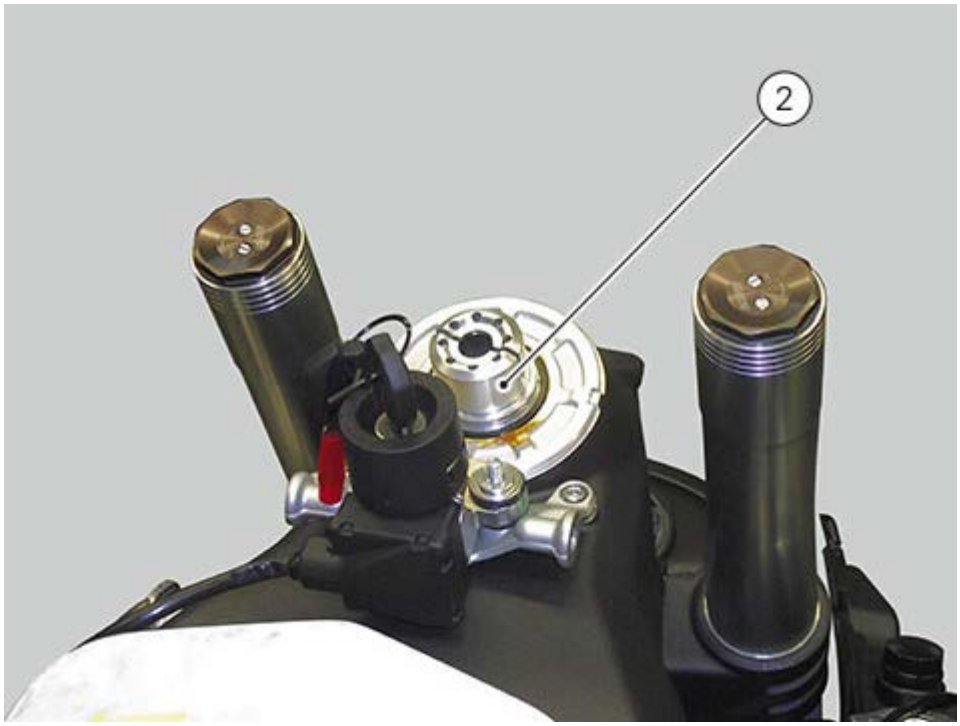
Position the tools **88713.3092** - engine repair work bench (A) and **88713.3927** engine support (B) under the engine block to duly support it.



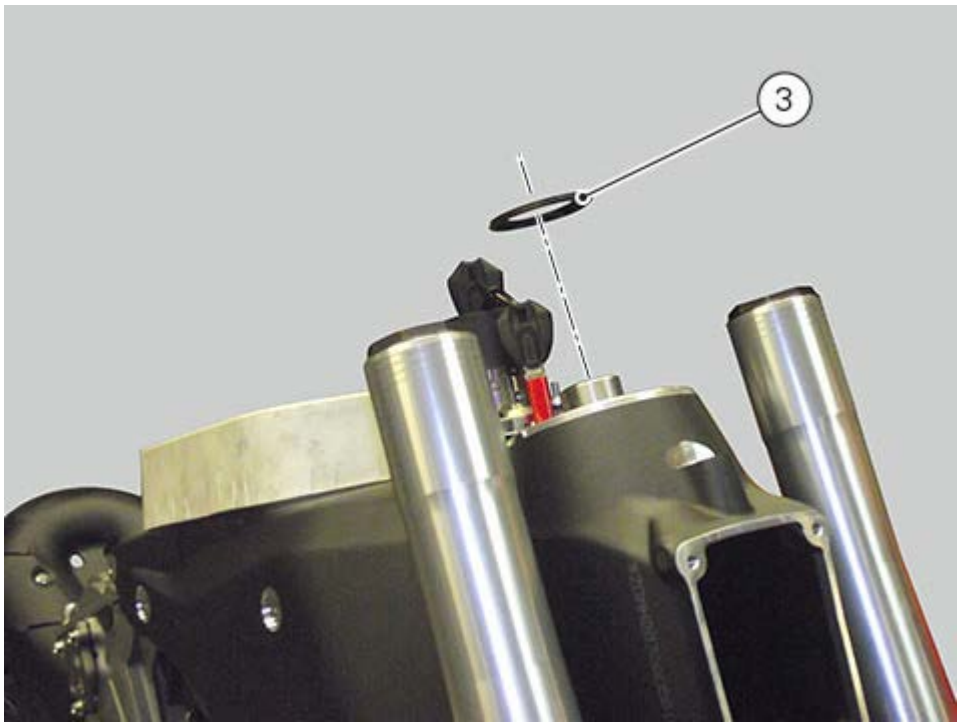
Remove the rear subframe (Removing the rear subframe).
Remove the LH and RH electric system supports (Removing the electric system supports).
Remove the headlight assembly (Replacement of the headlight).
Remove the steering head (1) and the handlebars from forks (Removing the front fork).



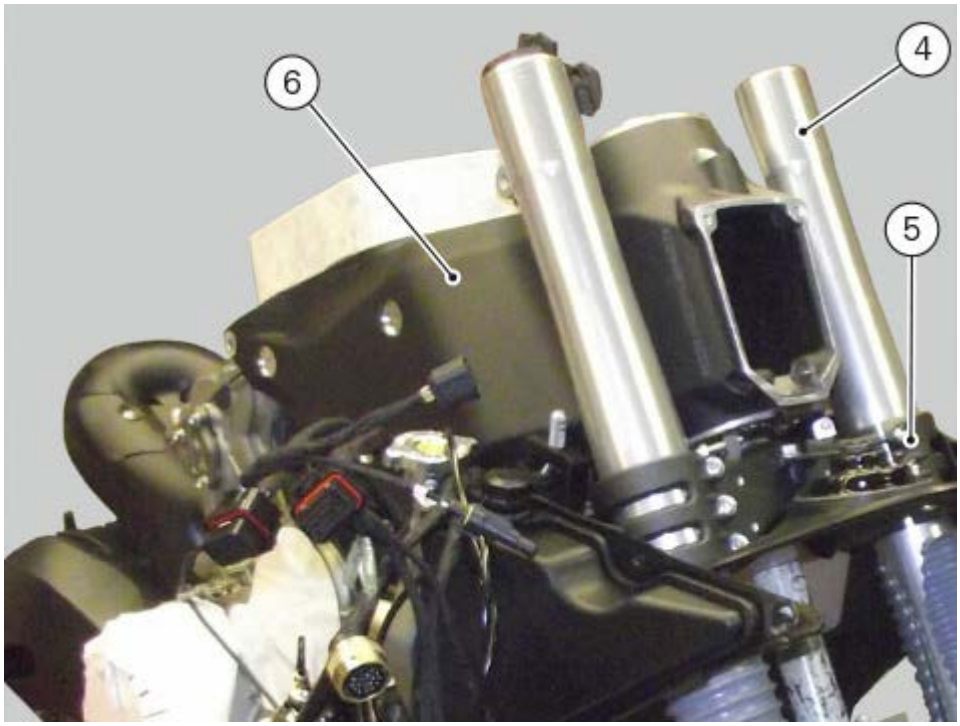
Loosen the ring nut (2).

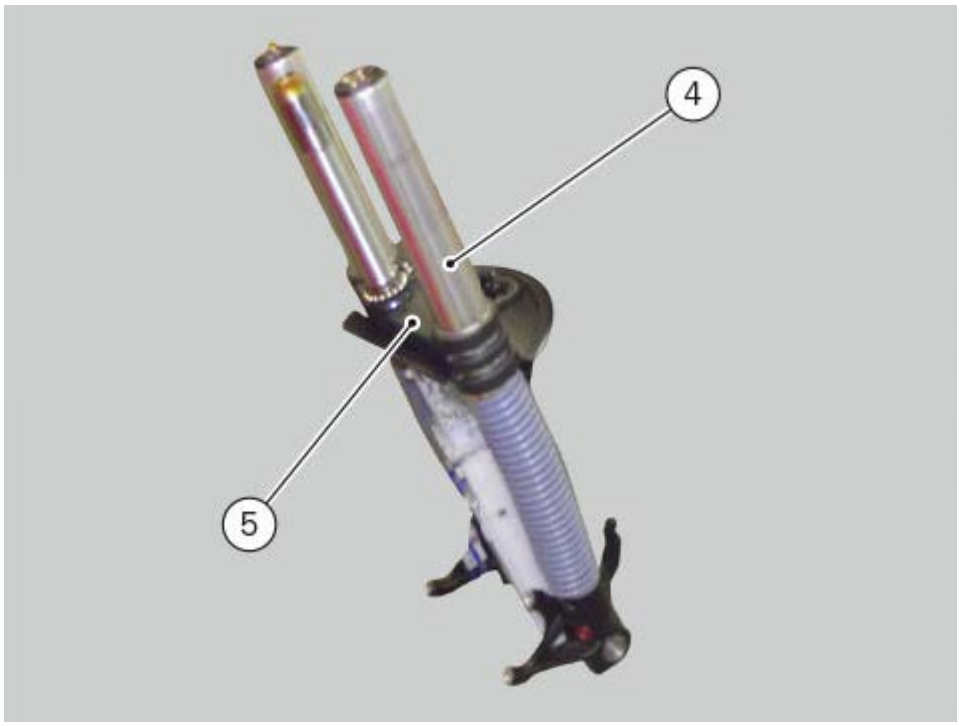


Remove the sealing ring (3).

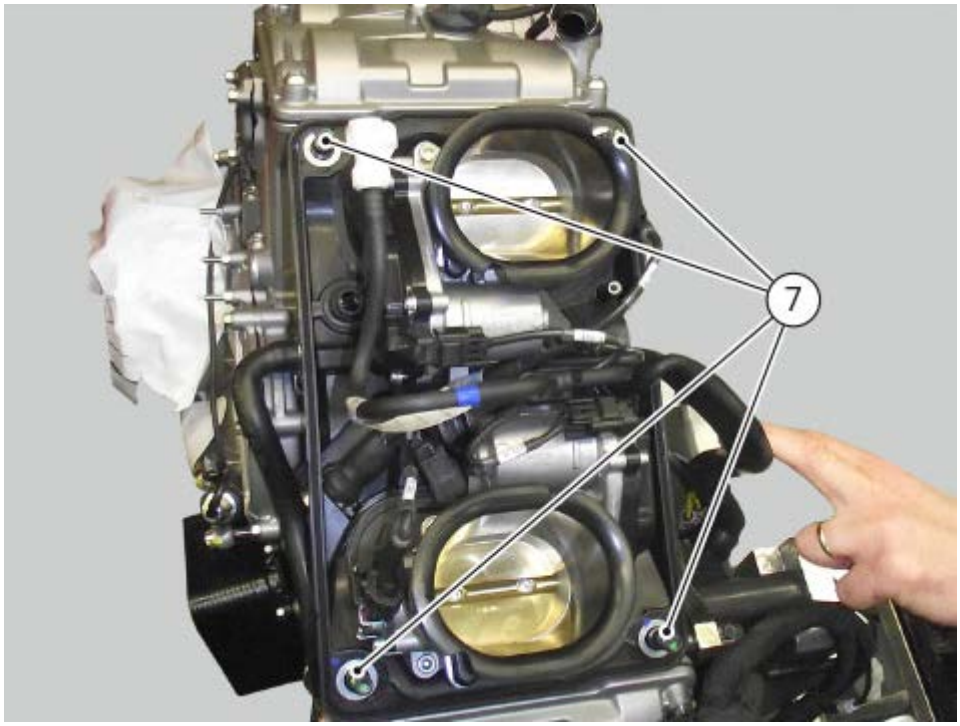


Remove the fork assembly (4) with steering shaft and bottom yoke (5) from frame (6).

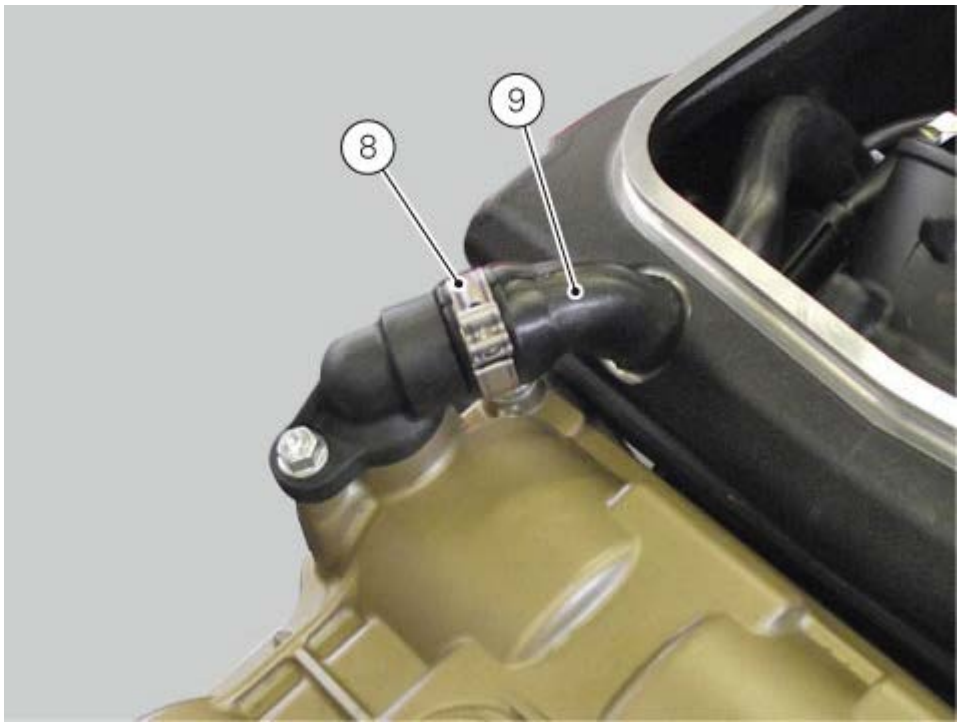




Loosen the retaining screws (7) securing the frame-airbox assembly (6) to the engine block.



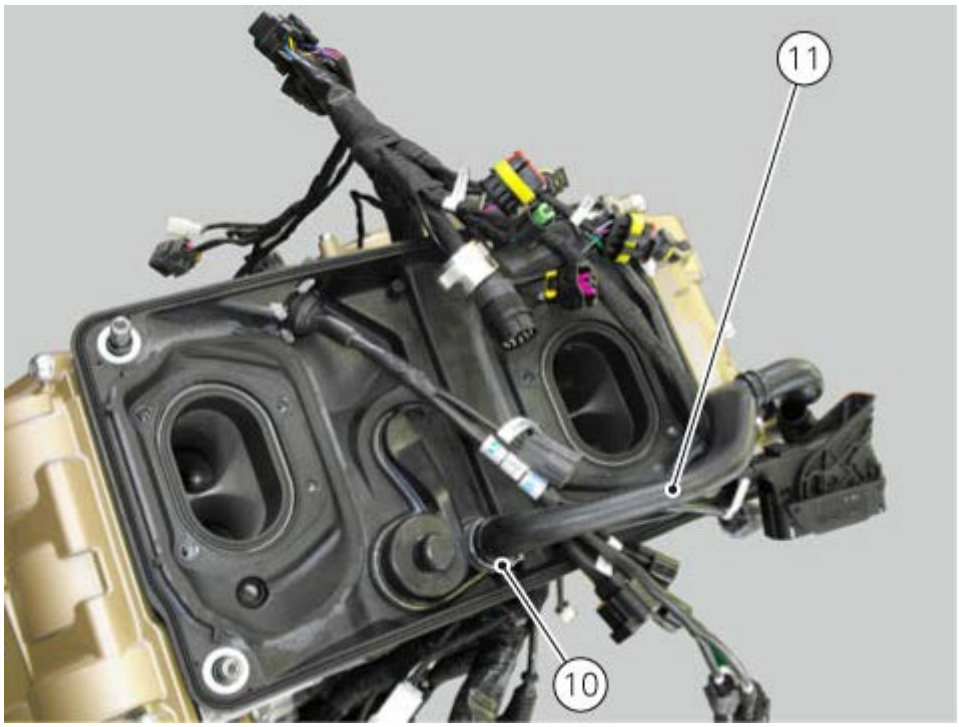
Loosen hose (9) clamp (8).



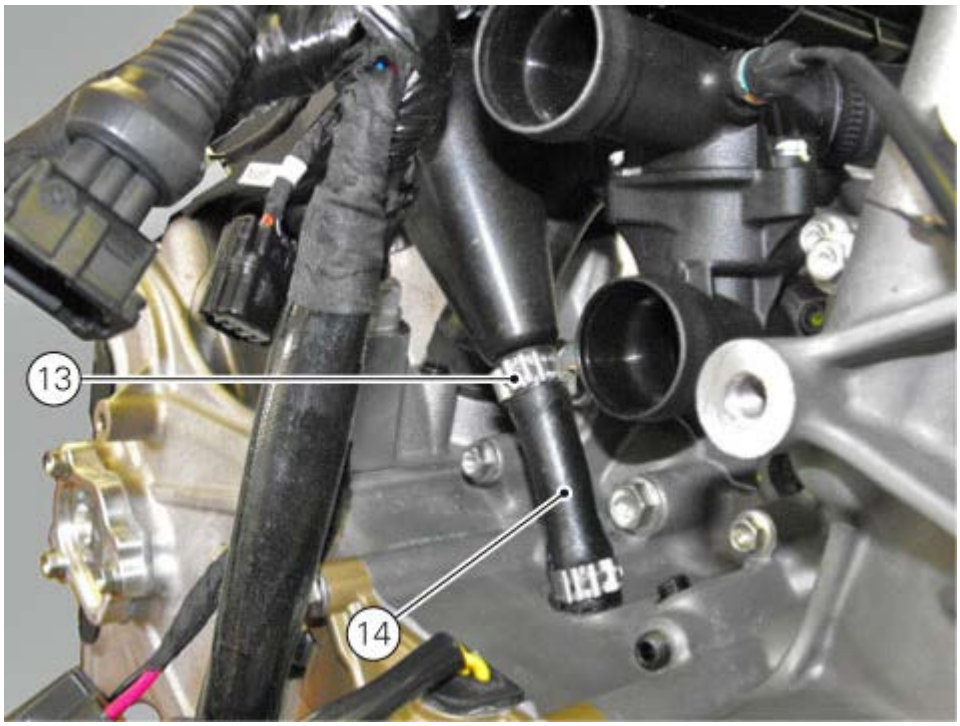
Remove the frame assembly (6).

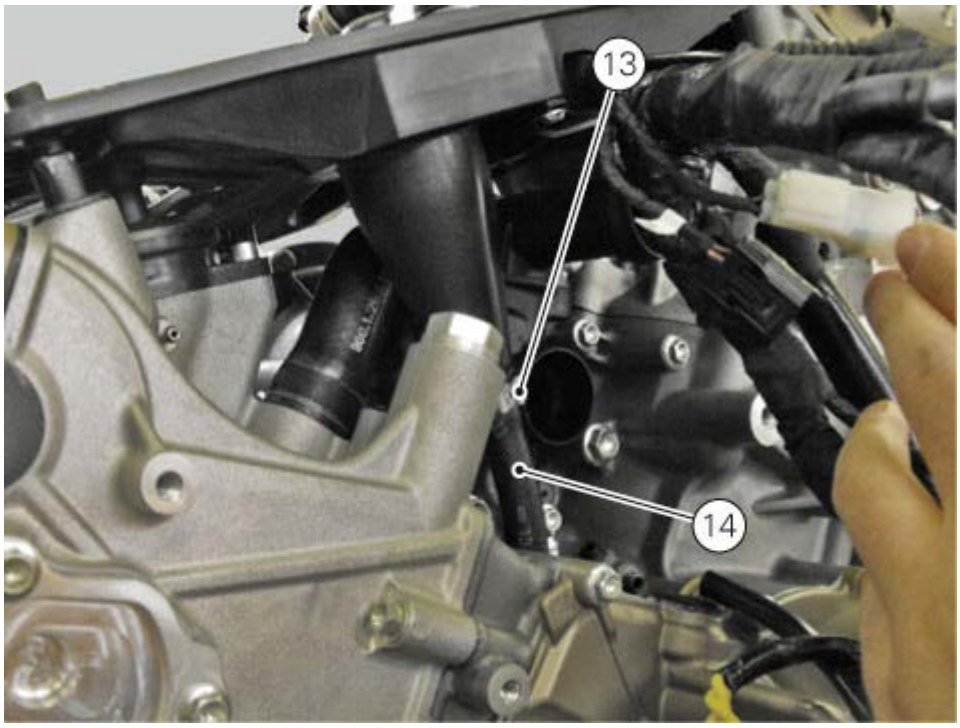
Removing the airbox compartment.

Remove the frame assembly, as described in the previous paragraph.
Remove the throttle bodies and the intake funnels (Removing the airbox and of the throttle body).
Loosen clamp (10) and remove the breather hose (11).

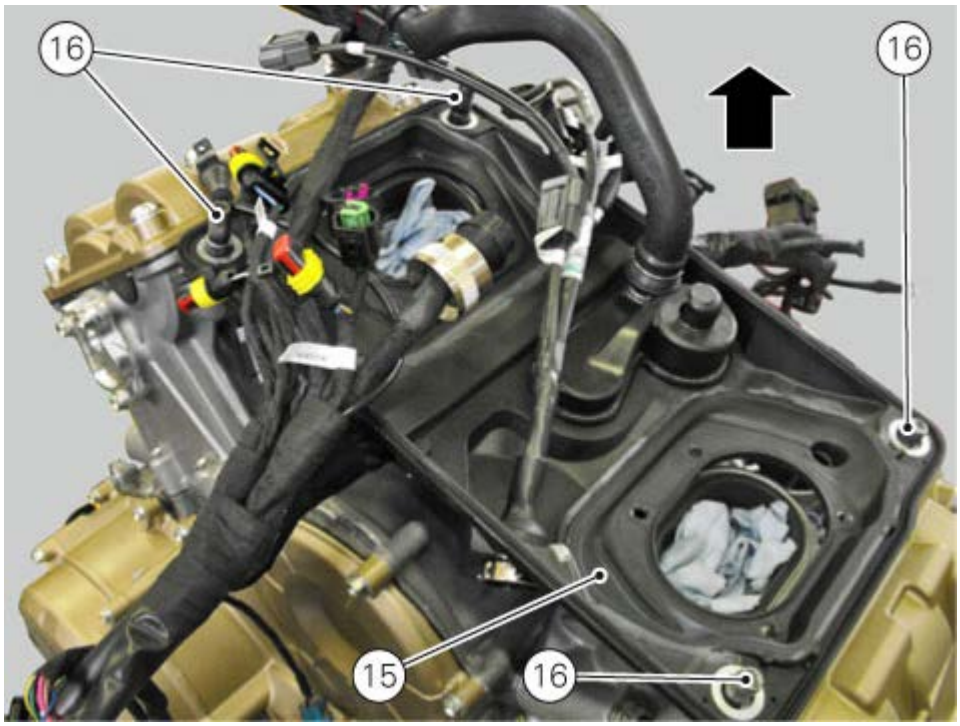


Loosen hose (14) clamp (13).



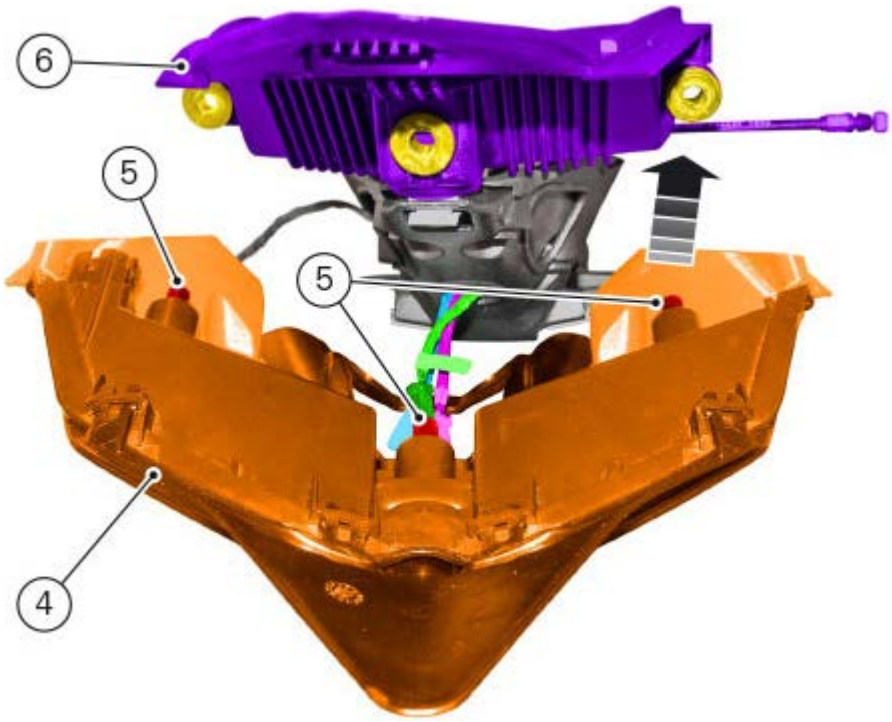


Lift the airbox compartment (15) and remove it from the stud bolts (16).

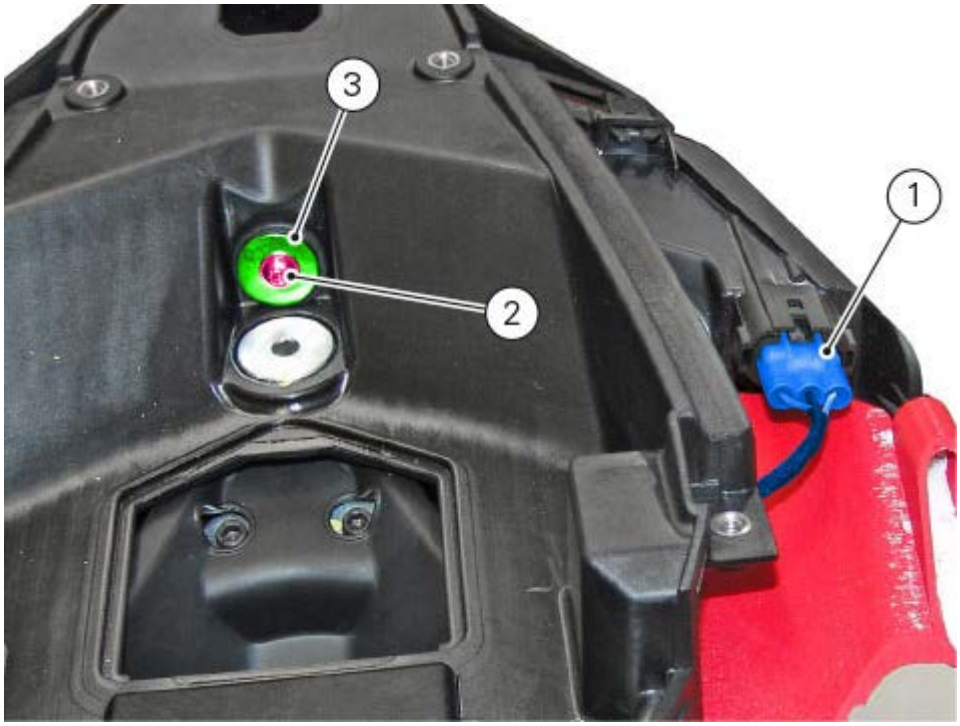

16
16
15
16

Refitting the tail light

Fit tail light unit (4) by inserting the three pins (5) in the three vibration damping pads of glove compartment (6).

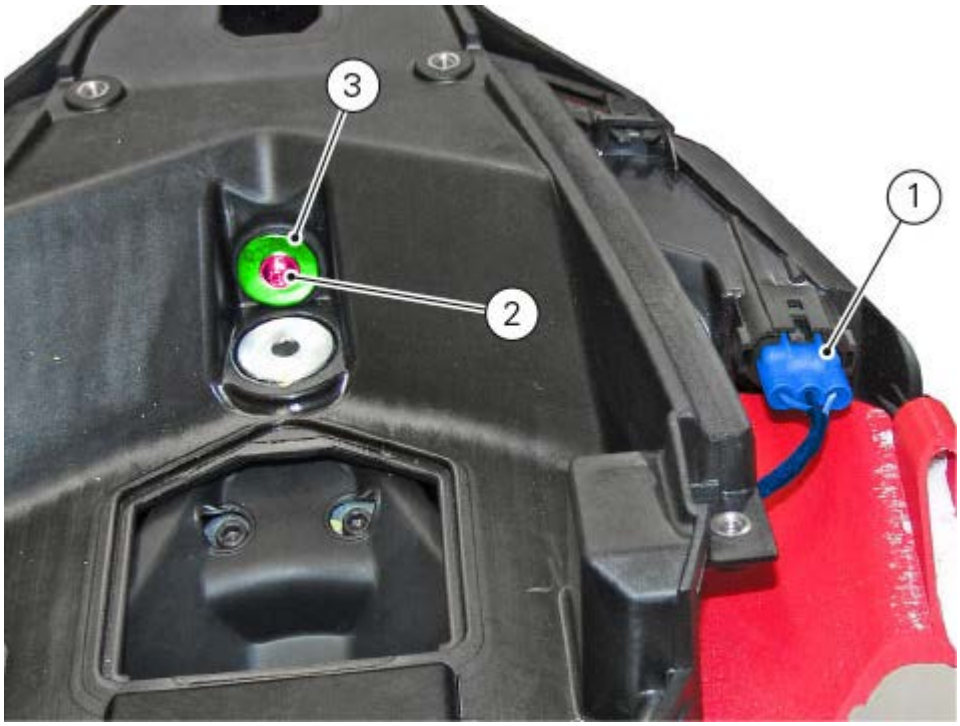


Tighten screw (2) with washer (3) to the specified torque of 3 Nm ± 10%.
Connect the tail light connector (1).

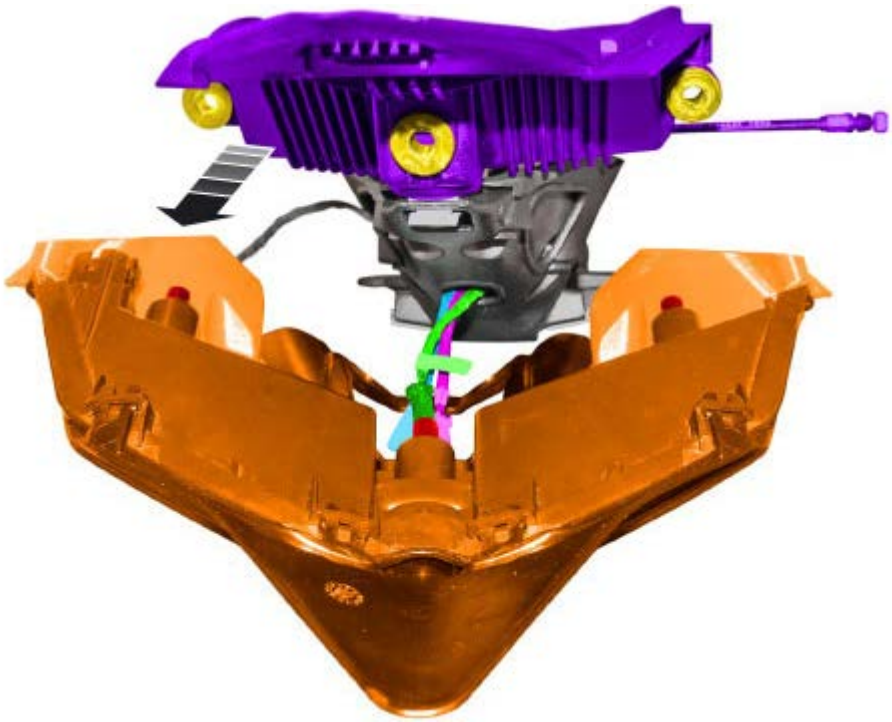


Removing the tail light

Disconnect light connector (1), loosen retaining screw (2) and collect washer (3).

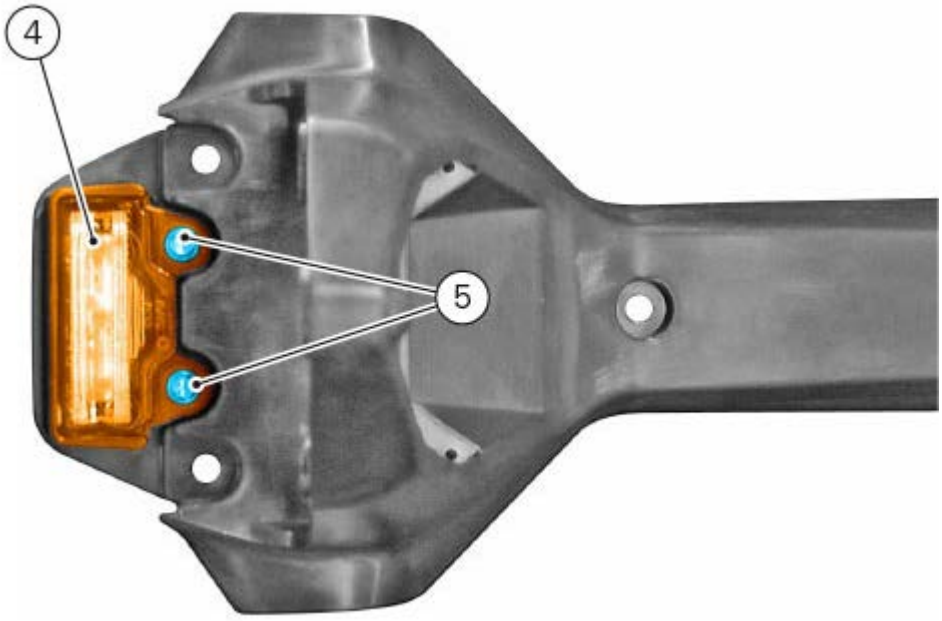


Disconnect the light unit by pulling it outwards to disengage it from the glove compartment.

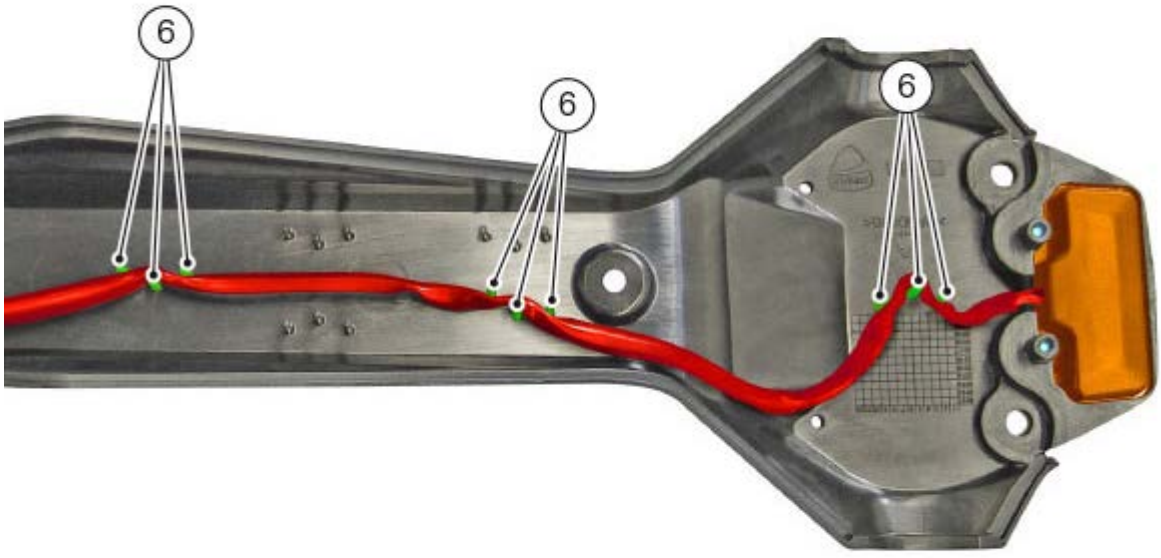


Refitting the number plate holder

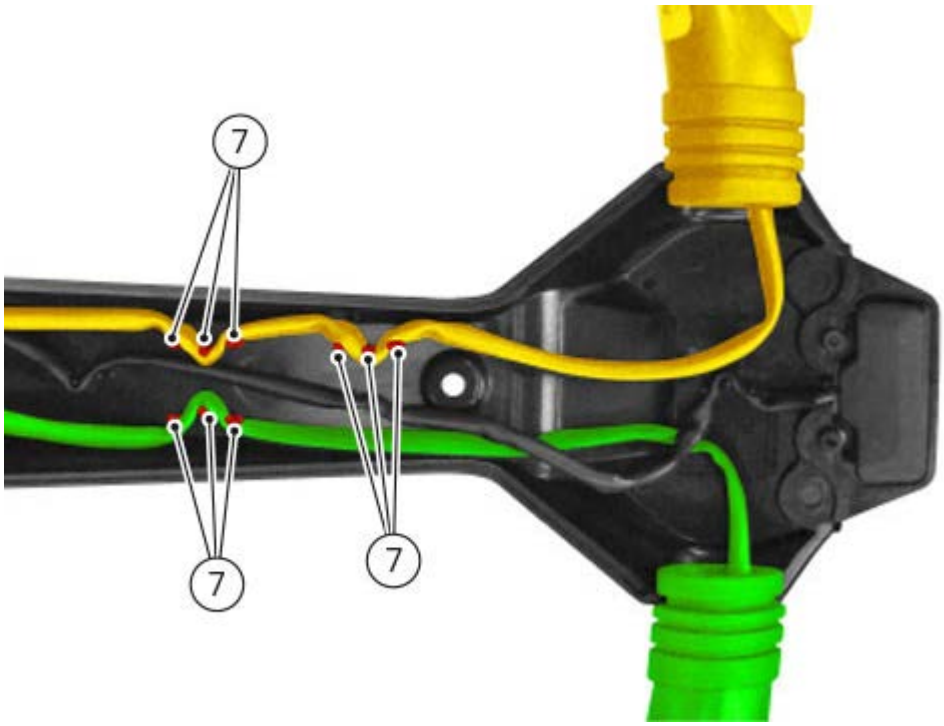
If previously disassembled, follow the procedure below to reassemble it.
Position number plate light (4) and fix it by tightening screws (5) to the specified torque of 0.7 Nm.



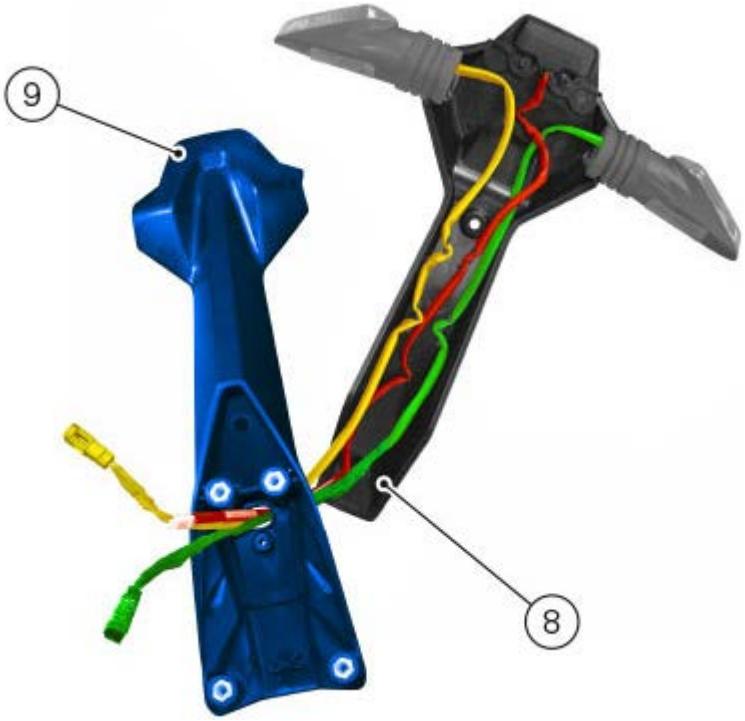
Position the wiring as shown in the figure by inserting it in pins (6).



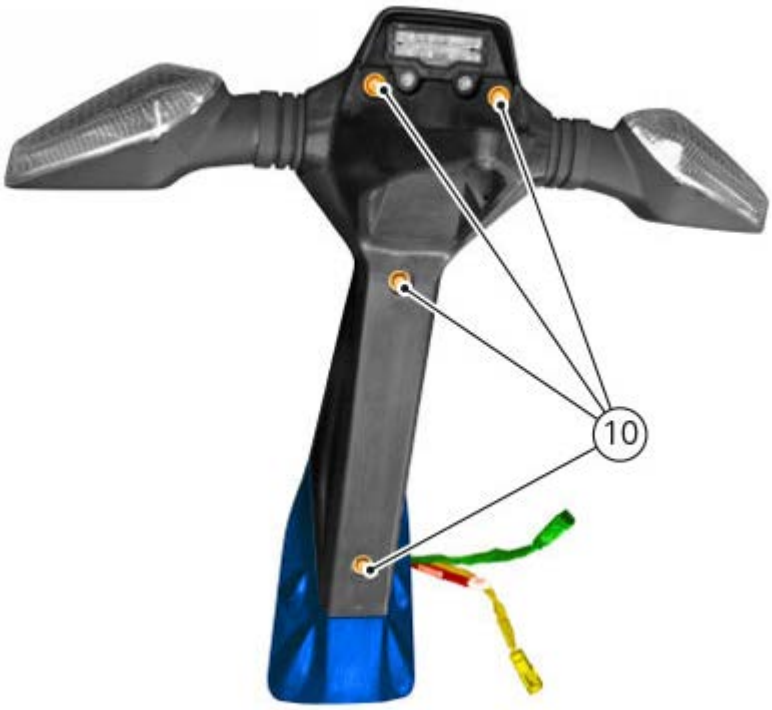
Position the two turn indicators in the relevant seats of the number plate support.
Position the wiring as shown in the figure block it in pins (7).



Assemble the lower number plate support (8) with the upper one (9) by routing the wiring as shown.



Tighten screws (10) to a torque of 5 Nm ± 10% to fasten the two parts.

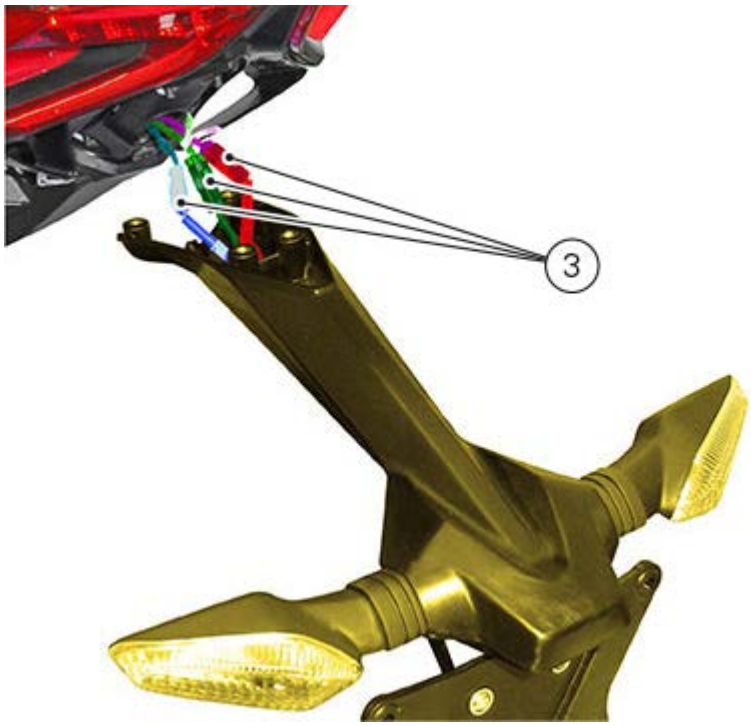


Tighten screws (1) to a torque of 6 Nm ± 10% to fasten the number plate holder to the rear subframe.

Removing the number plate holder

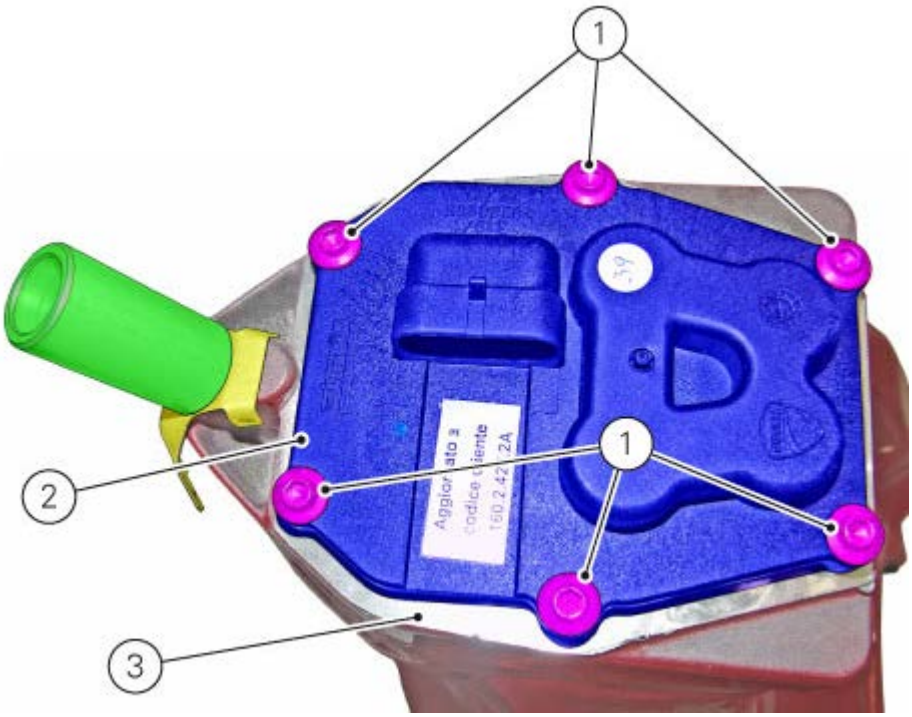
Remove the rear seat cover.
Support number plate holder (2) and loosen retaining screws (1).

Disconnect the three connectors (3) shown in the figure.


3

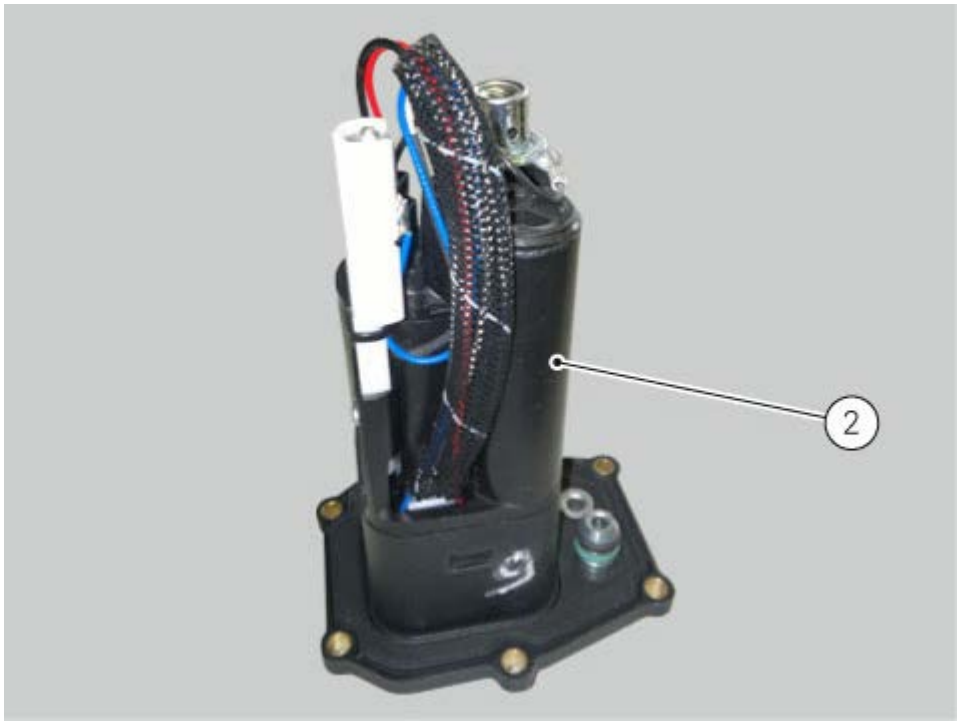
Removing the tank flange and the fuel level sensor

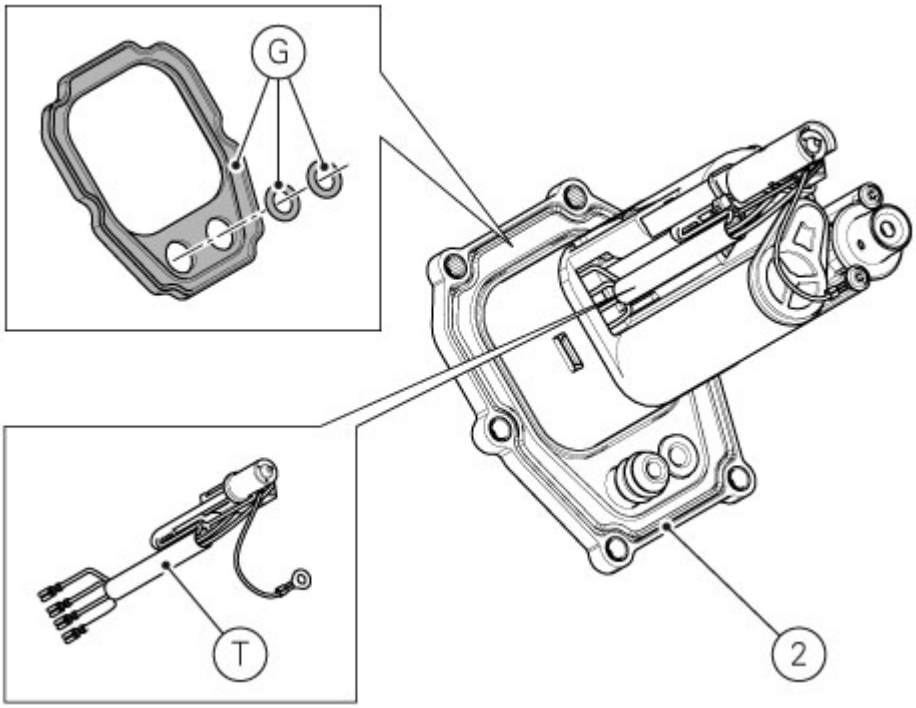
Remove the tank (Removing the fuel tank).
Loosen screws (1) that retain flange (2) of tank (3).



Remove the complete flange (2) from the tank.

Note
The flange is supplied as a spare part complete with the fuel pump and pressure regulator: the entire flange assembly must be replaced in the event of malfunction. Seals (G) and thermistor (T) are provided as spare parts.

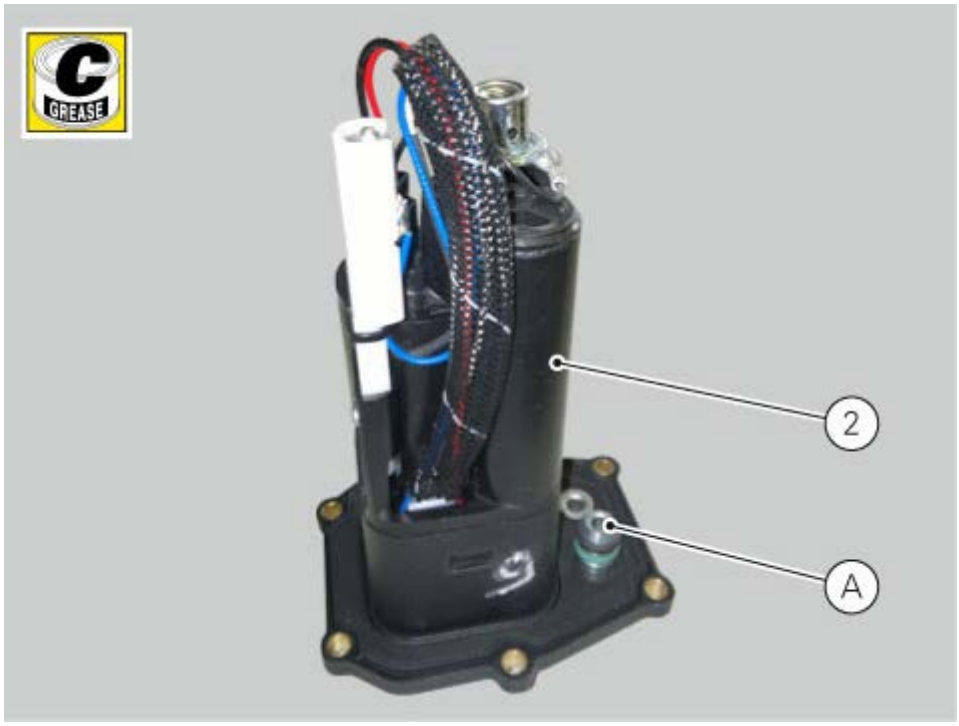




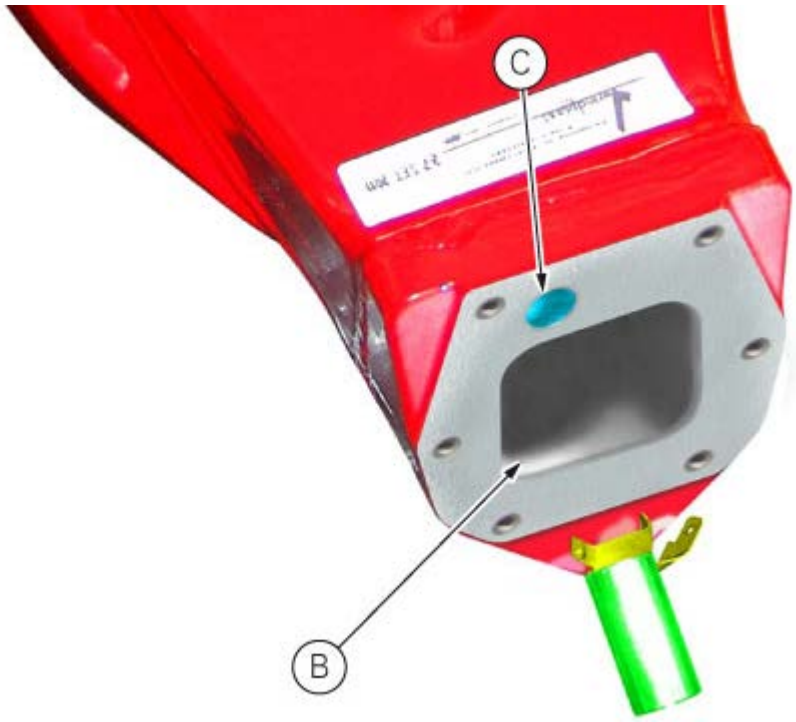
Fitting the tank flange and the fuel level sensor

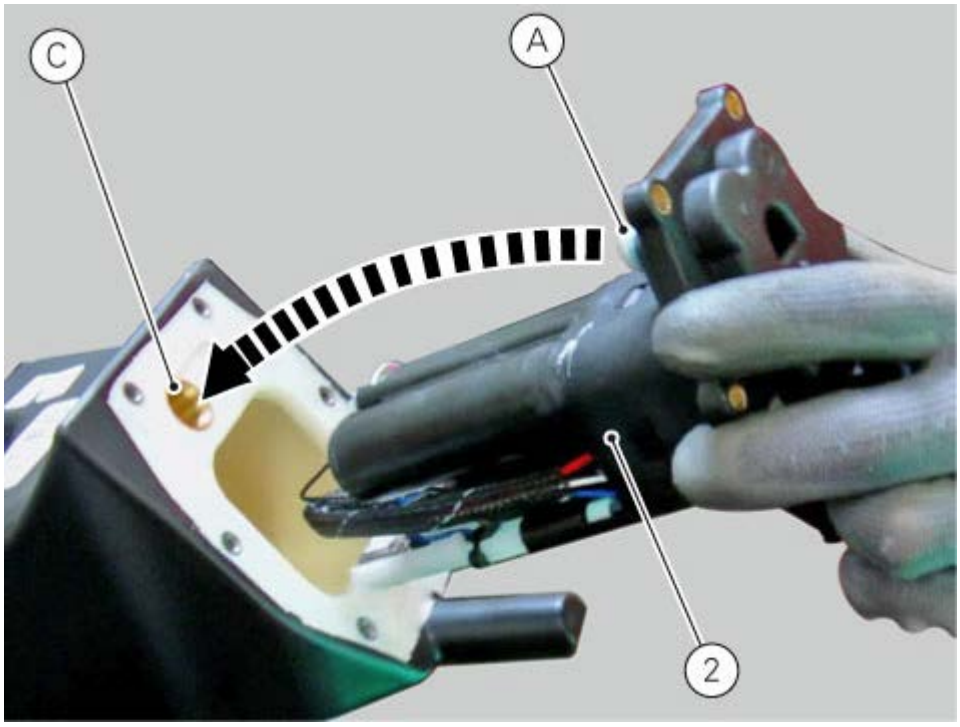
Apply specified grease on pin (A) of the fuel pump flange (2).

Note
The grease must be applied in a suitable quantity, i.e. not excessively to avoid friction upon next insertion of pin (A).

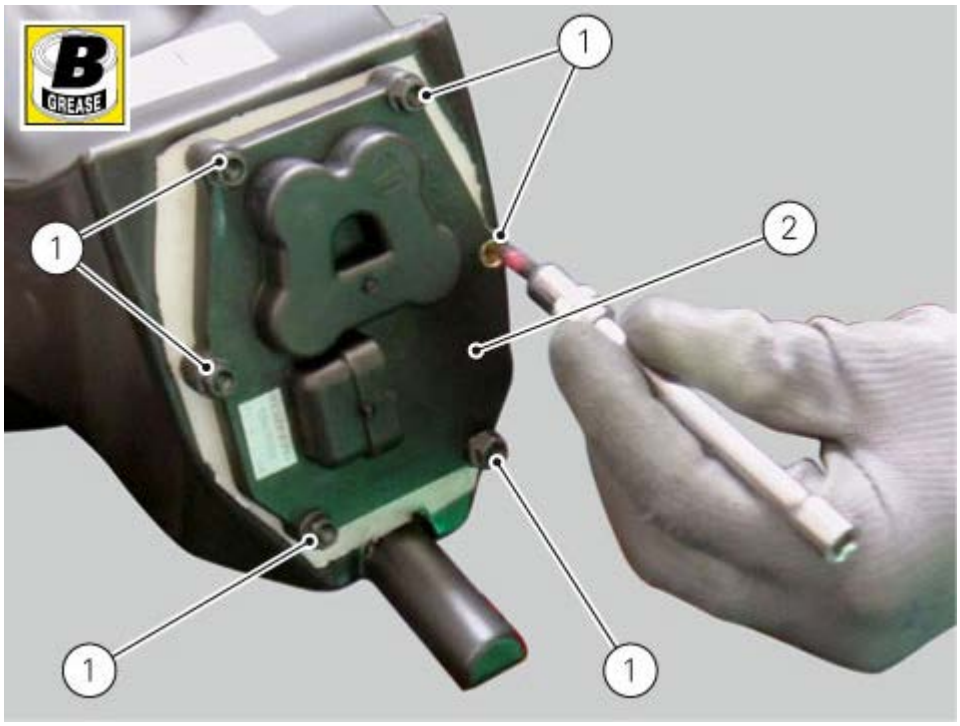


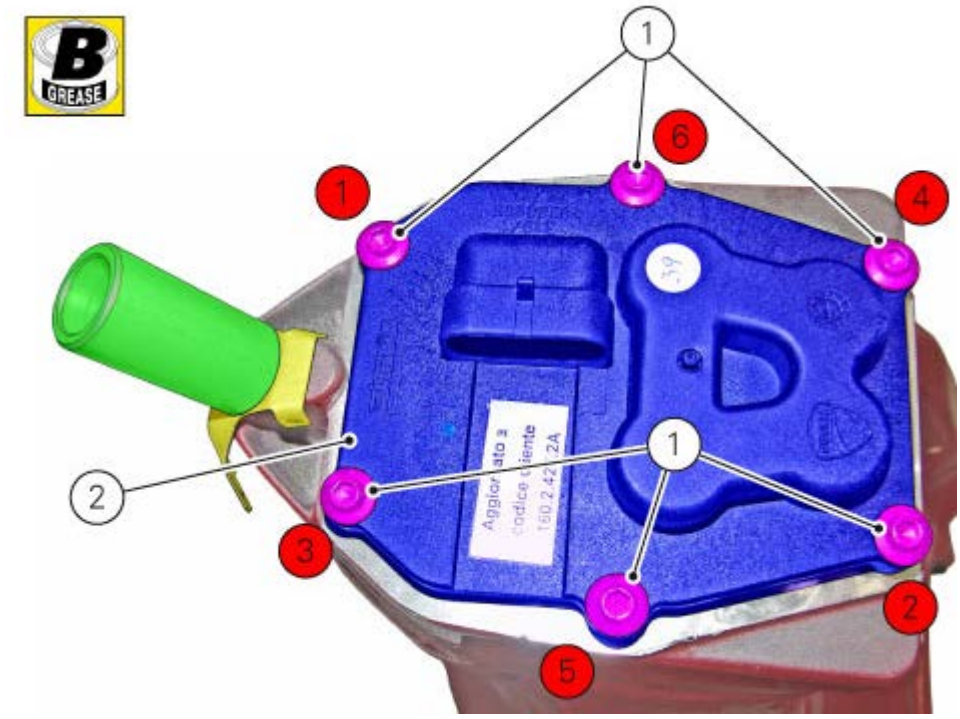
Insert fuel pump flange (2) inside the relevant seat (B) of fuel tank (3), by inserting pin (A) of the fuel pump flange in hole (C) of the fuel tank.





Apply the recommended grease on the threads and underside of the screws (1).
Fix the fuel pump flange (2) by starting screws (1), then tighten them to 6 Nm ± 10%, respecting the sequence 1 - 2 - 3 - 4 - 5 - 6.

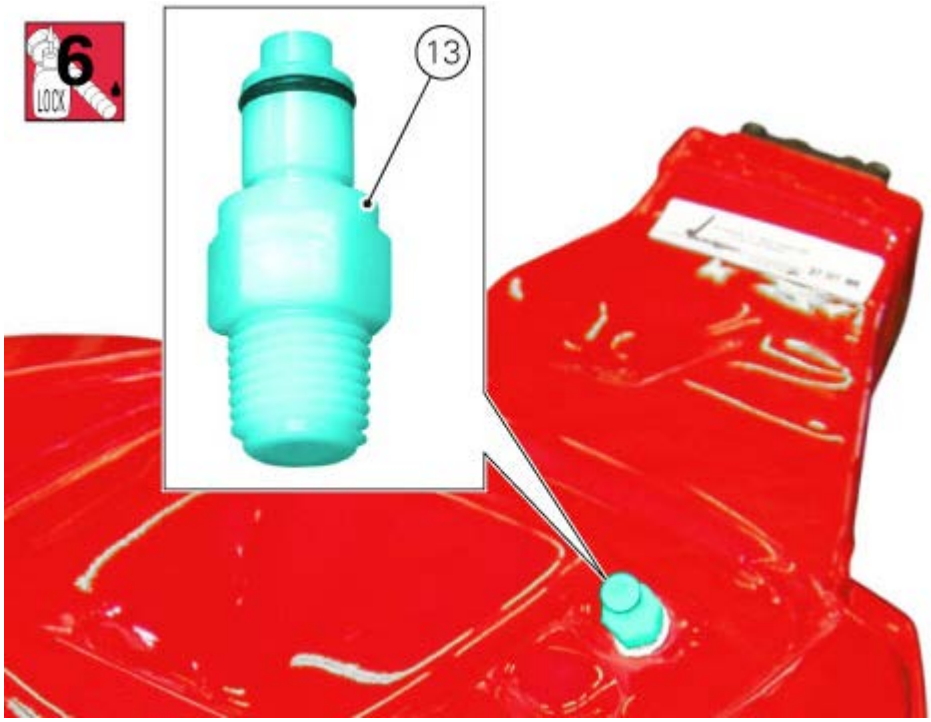




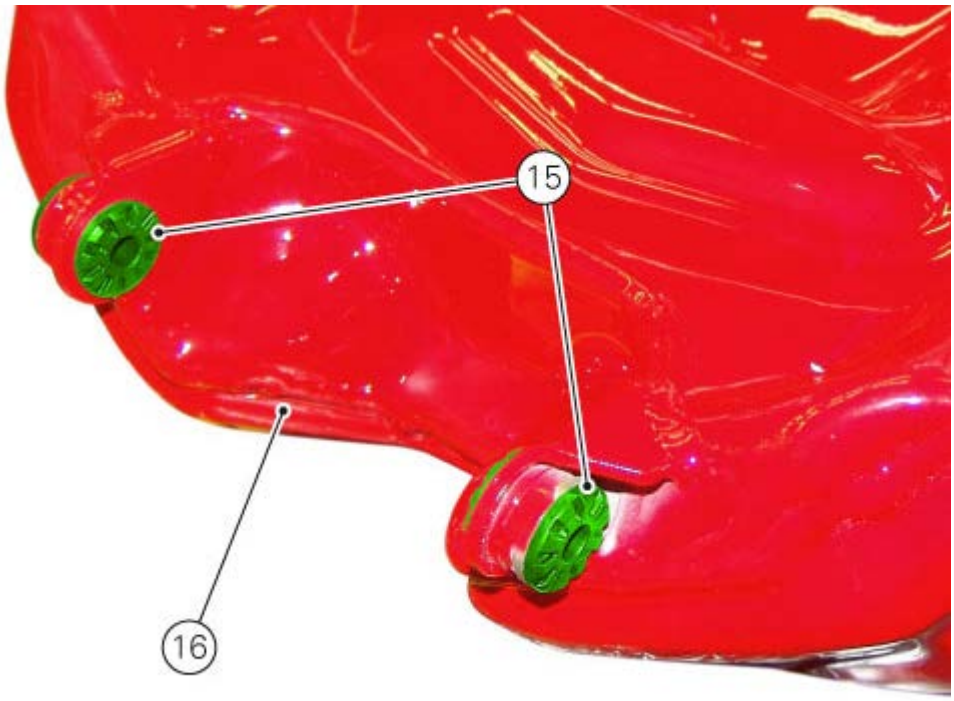
Refit the tank (Refitting the fuel tank).

Refitting the fuel tank

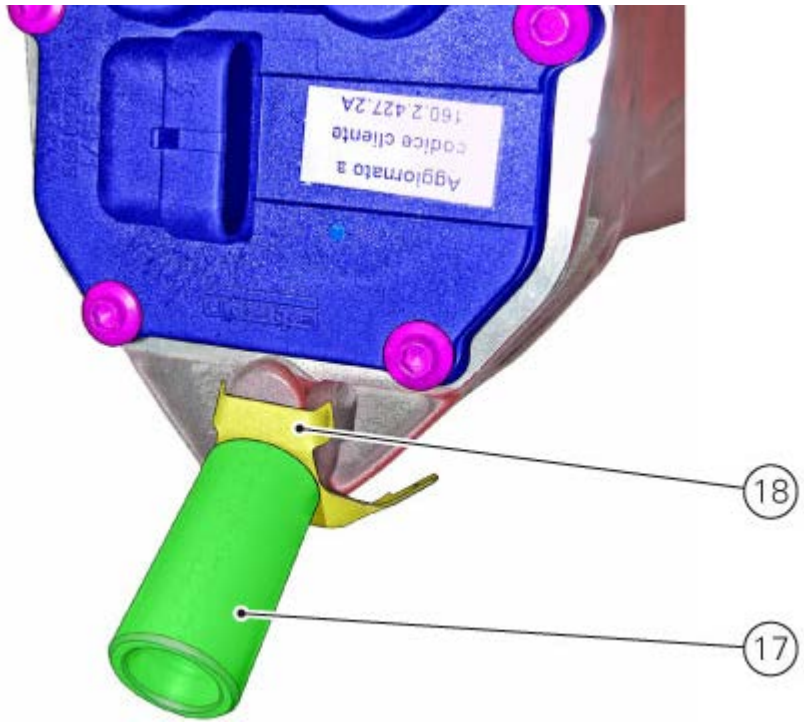
If previously removed, smear specified threadlocker on quick-release coupling (13), screw it by hand fully home on the tank, then further screw it by two complete turns (360° ÷ 360°).



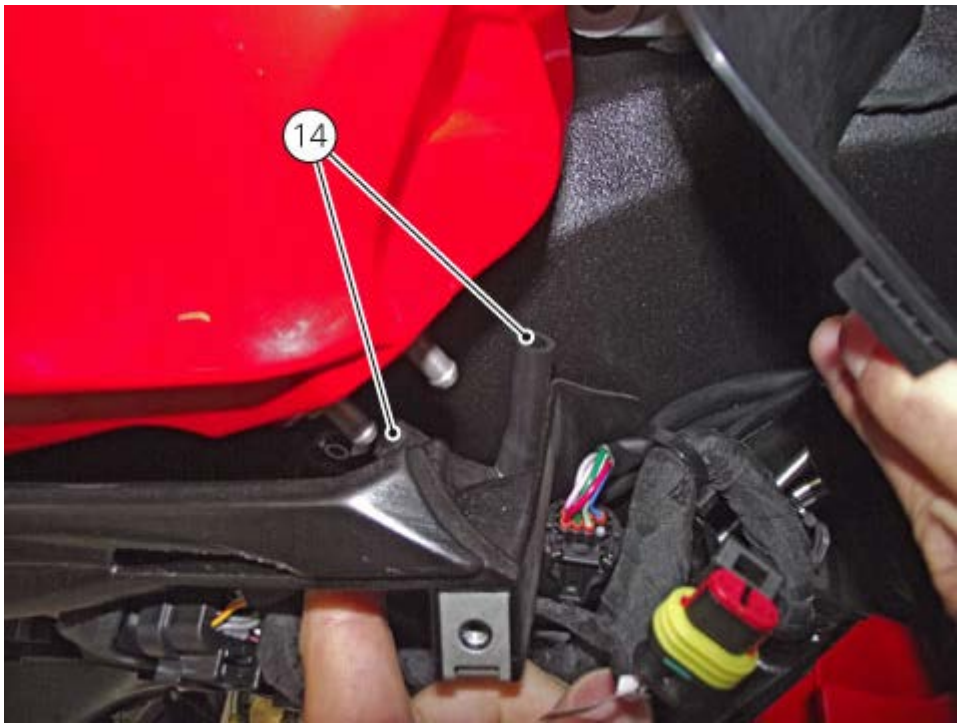
Check the presence of vibration damping pads (15) on tank (16).



If previously removed, start pin (17) in the indicated area of the fuel tank, placing plate (18) between pin and tank. Tighten shaft (17) to a torque of 18 Nm ± 10%.

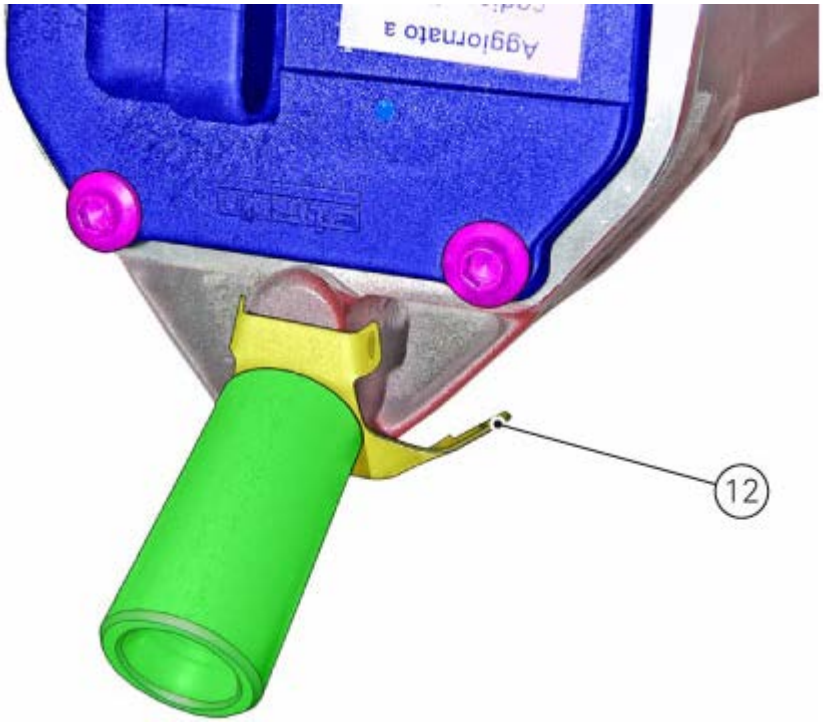


Refit the tank with flange and plug.
Connect the breather pipes (14) to the tank (16).

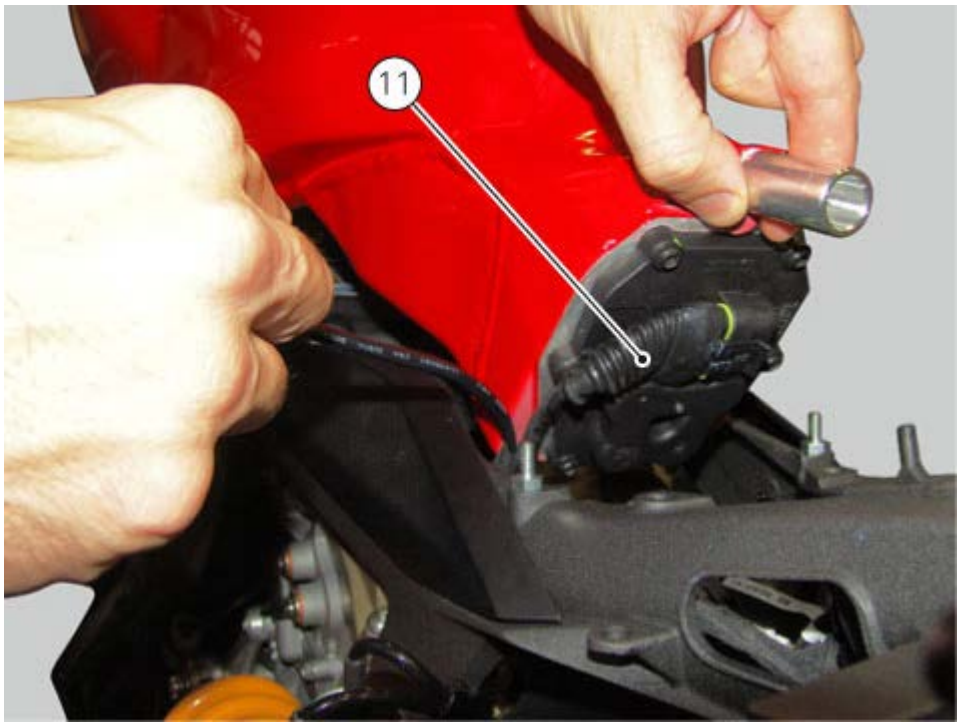


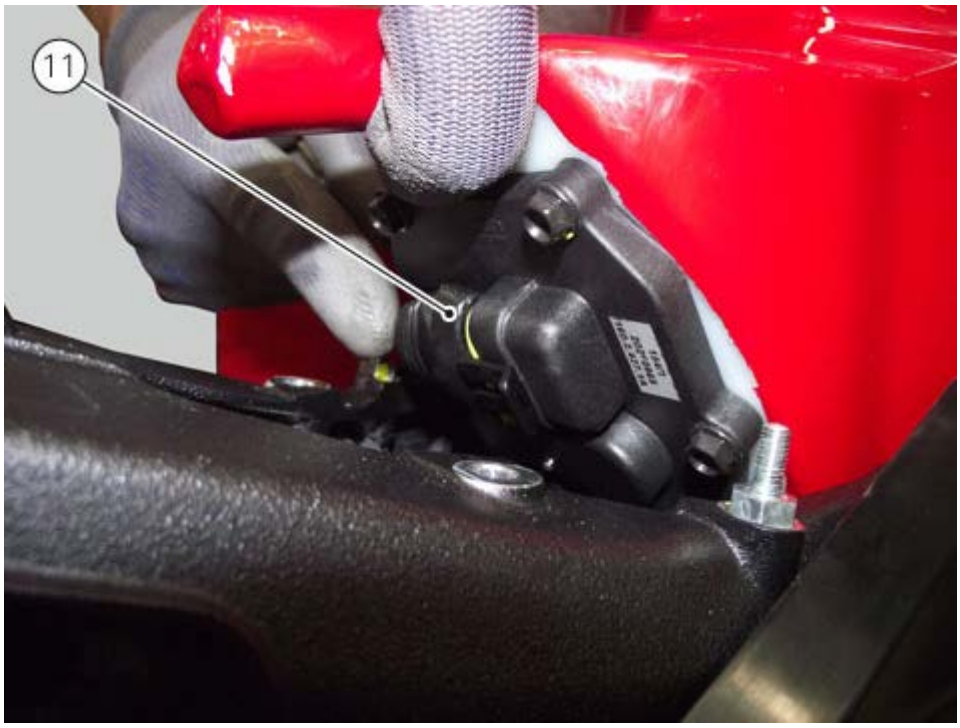
Connect the fuel pipe union to the quick-release coupling (13).

Connect the wiring connector of the tank earthing point to faston (12).



Connect the wiring connector of the fuel pump (11).



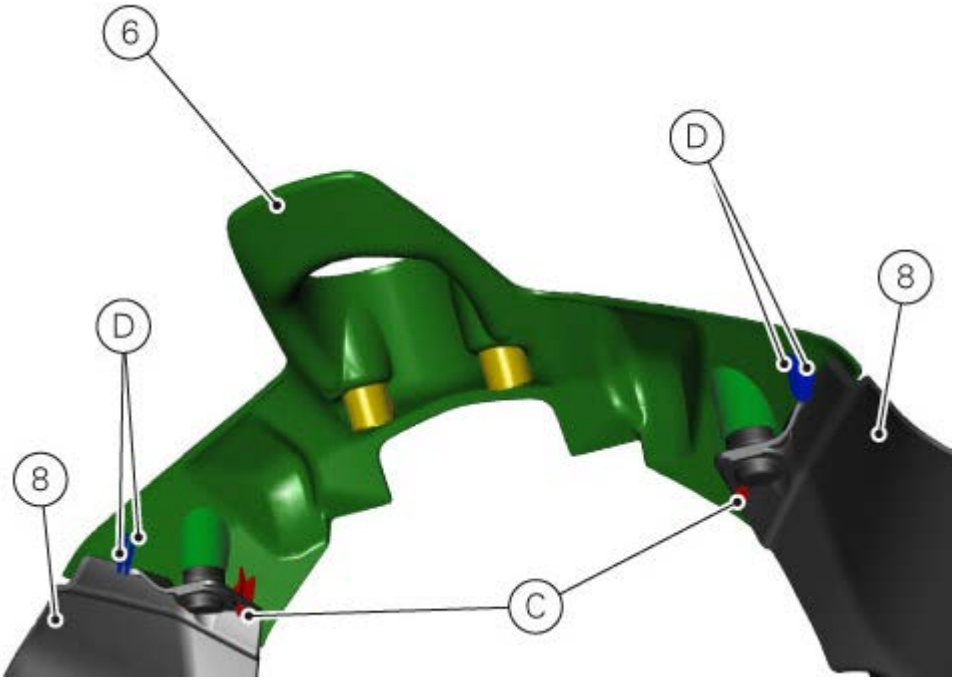


Apply specified grease to the thread of screws (8), start the screws with spacers (9) and tighten to a torque of 10 Nm ± 10 %.

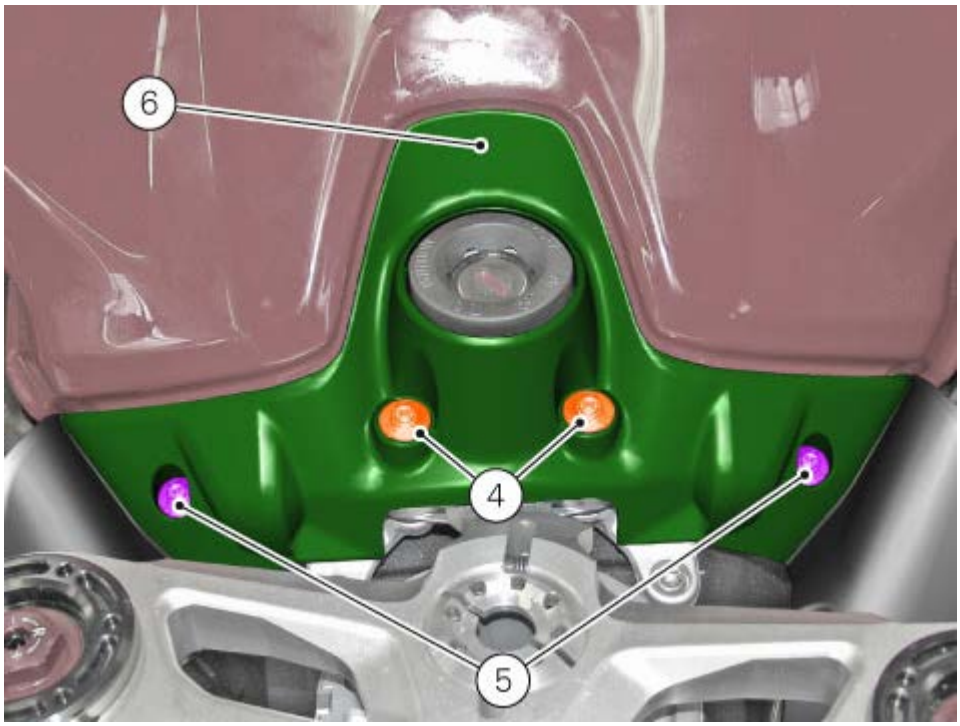
Fit the ignition switch cover (6) by inserting the threaded stud-bolts (7) in the holes of poppets (A).

Note

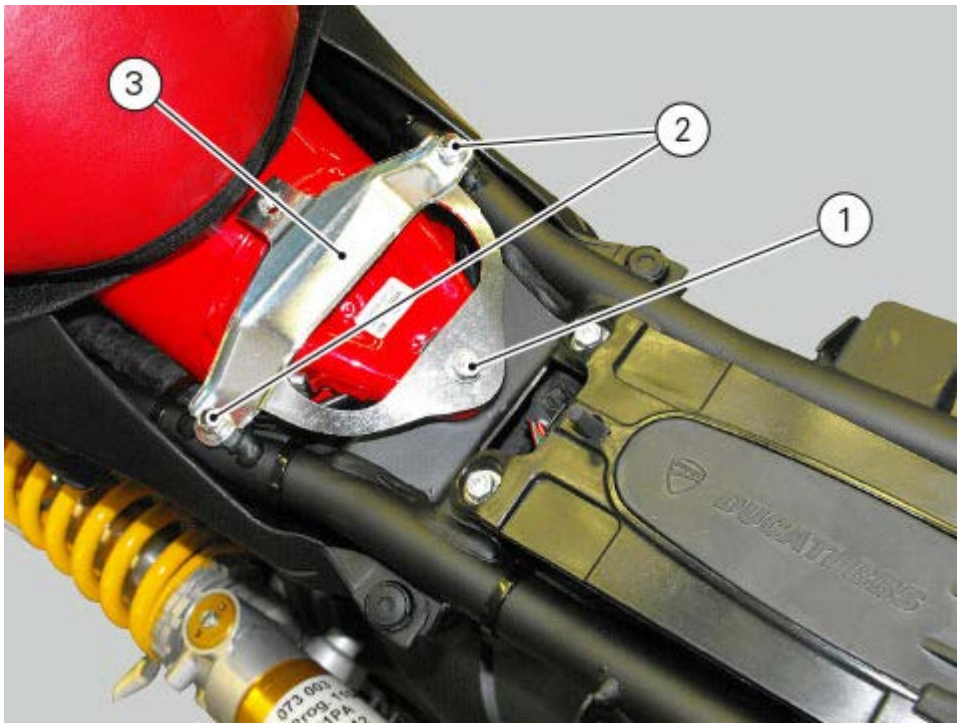
For a correct fitting, pins (C) must be inserted in the holes on the air conveyor covers (8) and tabs (D) must be positioned on the upper profiles of the same air conveyor covers.



Place switch cover (6) and start the special nuts (4) and screws (5).
Tighten the special nuts (4) to a torque of 8 Nm ± 10% and screws (5) to a torque of 2.5 Nm ± 10%.



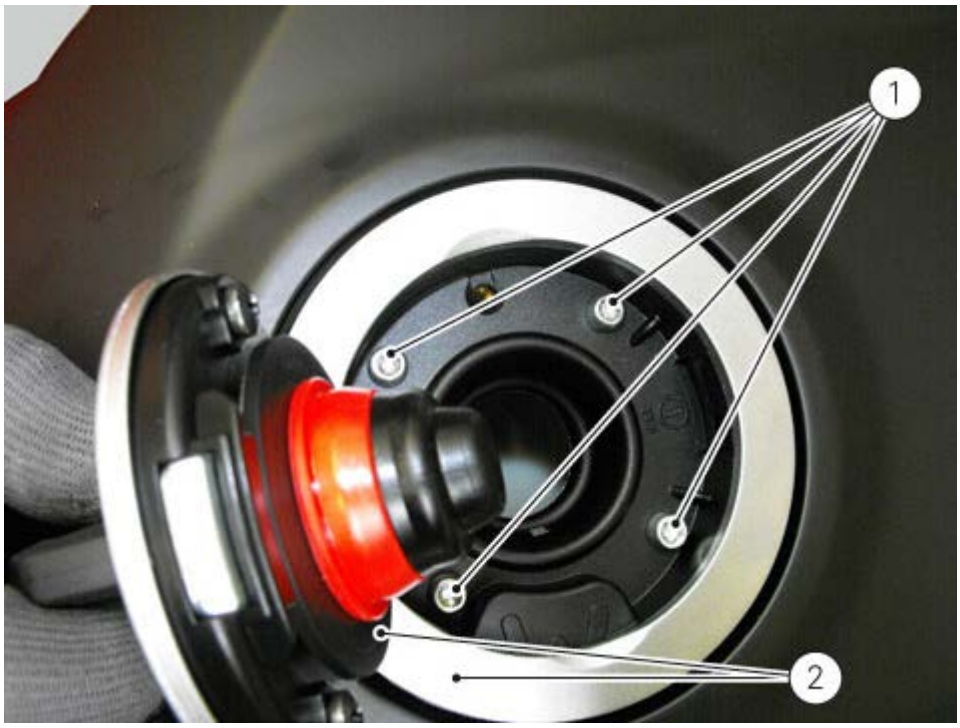
Place bracket (3) on the subframe.
Smear screws (1) with specified grease.
Start retaining nuts (2) and screws (1).
Tighten nuts (2) to a torque of 6 Nm ± 10% and screws (1) to a torque of 10 Nm ± 10%.



Refit the seat (Refitting the rider seat).

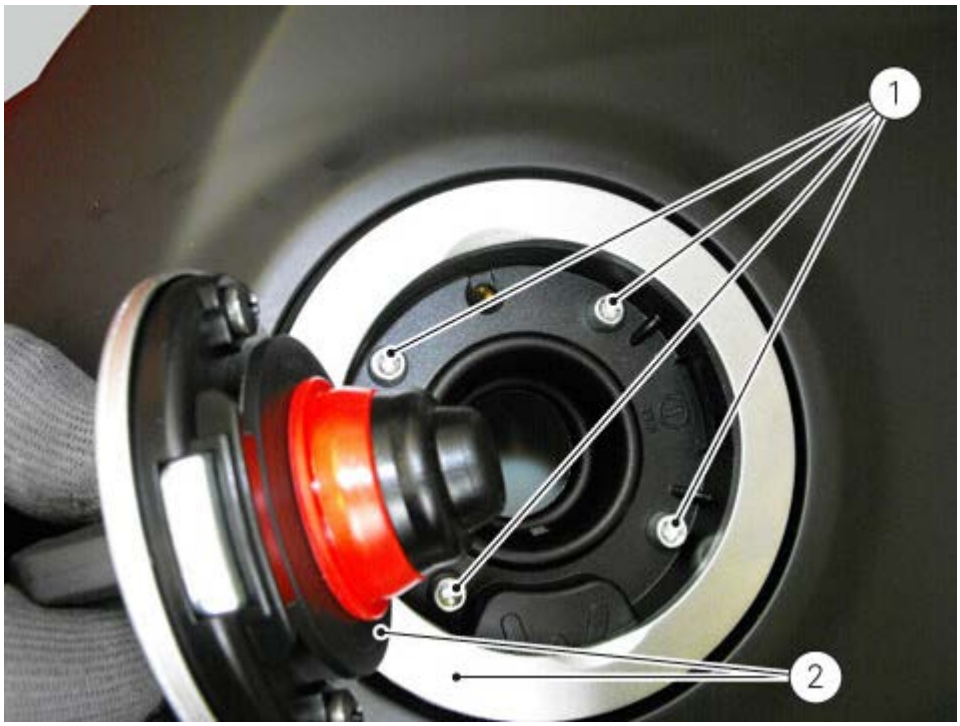
Installation of the fuel filler plug

If previously removed, fit the seal in fuel filler plug.
Fit the filler plug in seat (A) on tank.
Tighten the four outer screws (1) fastening the plug frame to the filler to a torque of 4 Nm ± 10%.



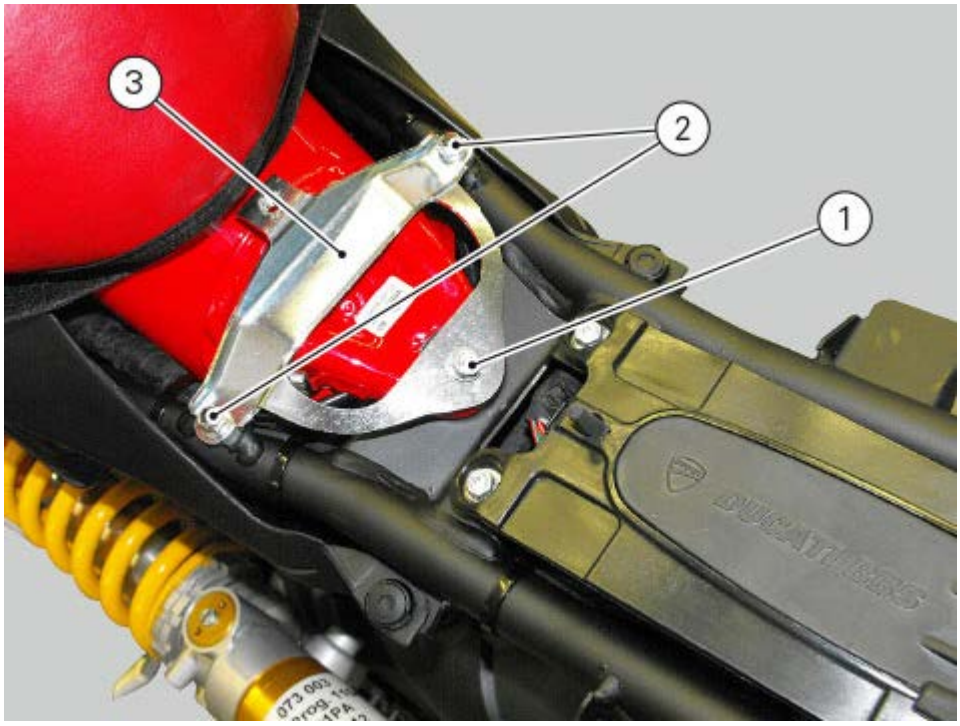
Removal of the fuel filler plug

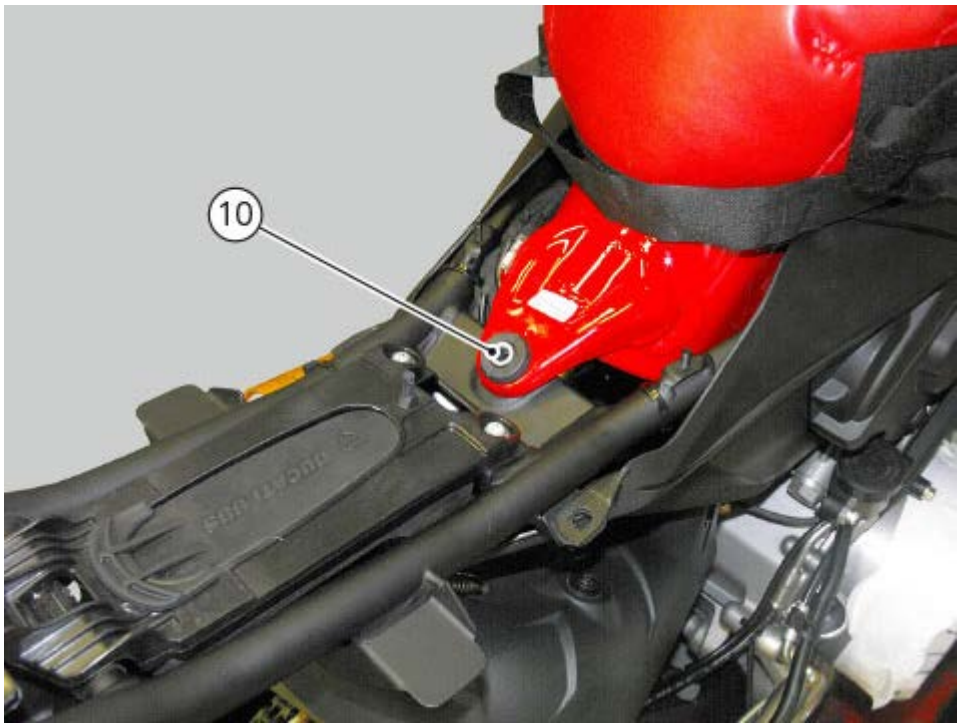
Open the filler plug.
Loosen the four outer screws (1) retaining the plug frame to the filler and remove the complete filler plug (2).



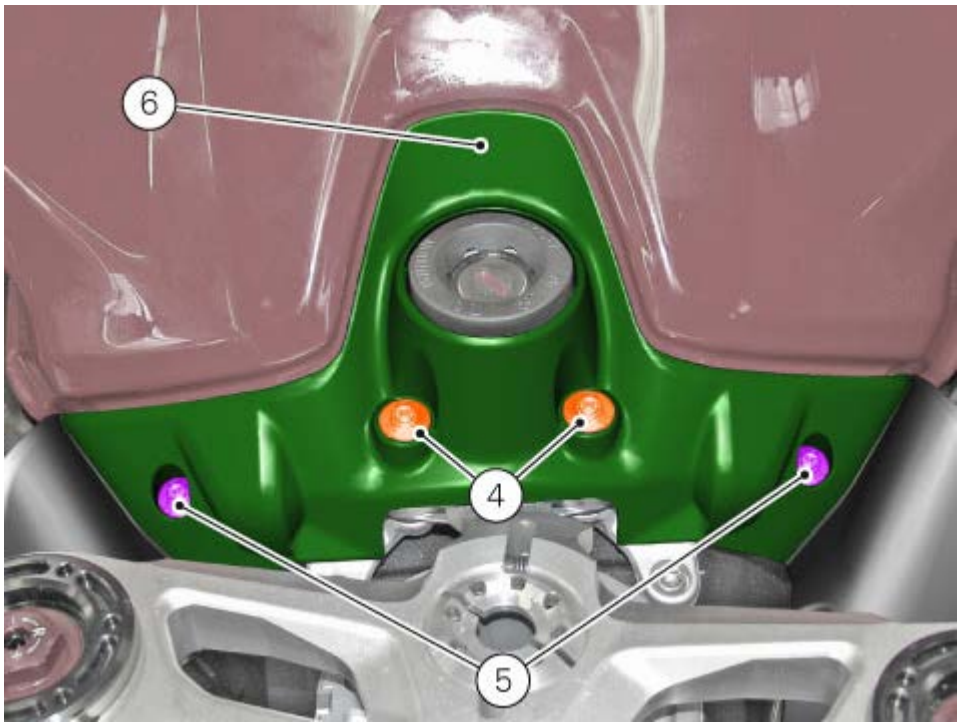
Removing the fuel tank

Remove the seat (Removing the rider seat).
Loosen screw (1) and nuts (2) that retain bracket (3) to the subframe.
Collect spacer (10).

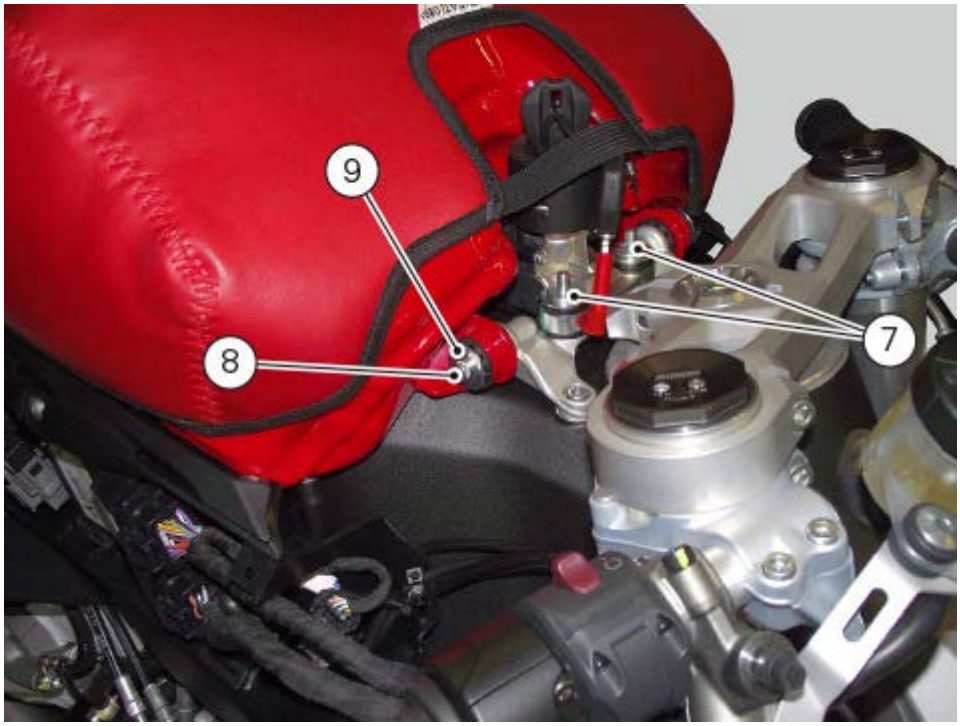


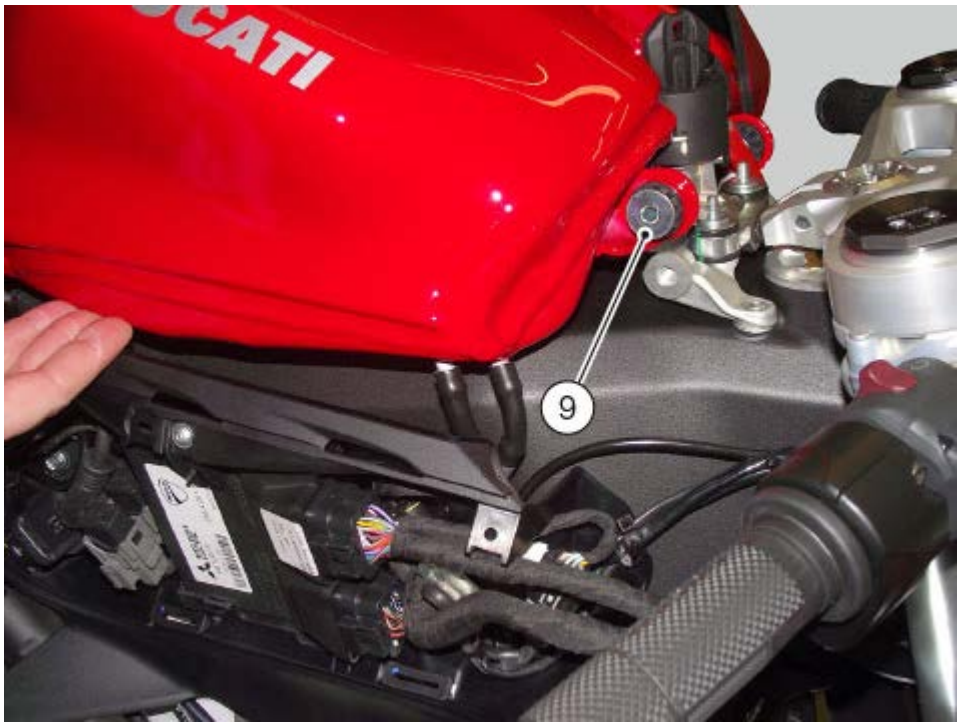


Loosen special nuts (4) and screws (5) of switch cover (6) and lift it to release it from stud-bolts (7) and air conveyor covers (8).

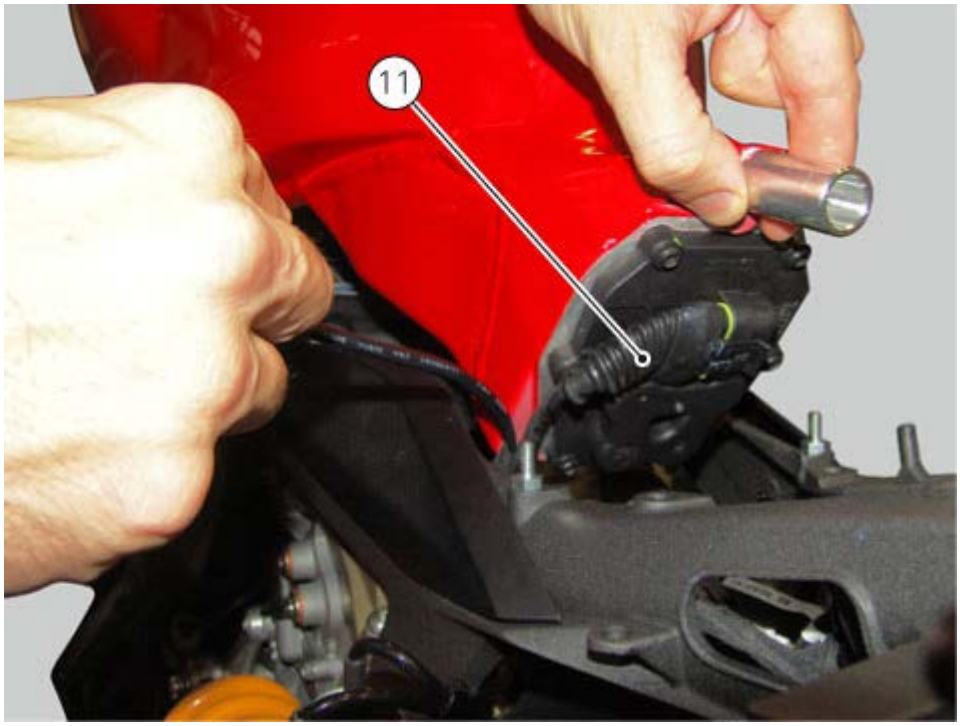


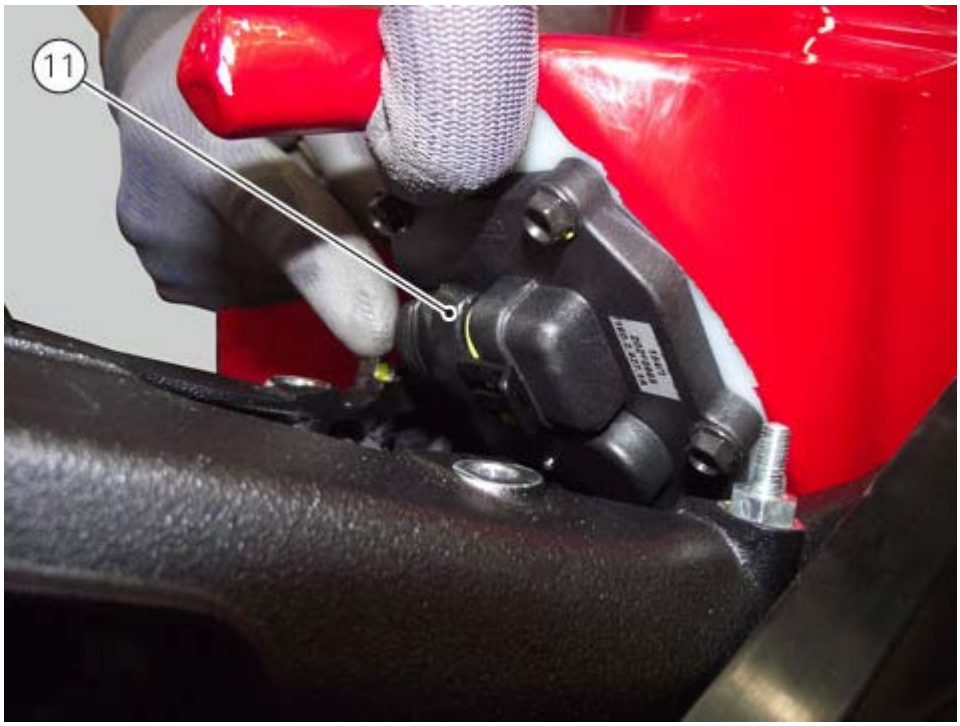
Working on both sides, loosen the two screws (8) that retain the tank front side and collect spacers (9).



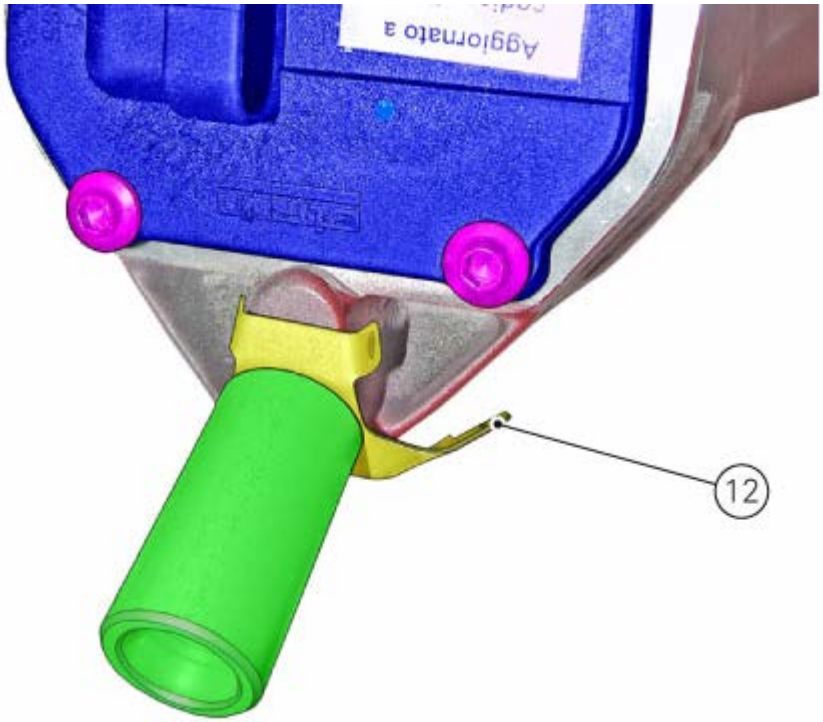


Disconnect the wiring connector of the fuel pump (11).



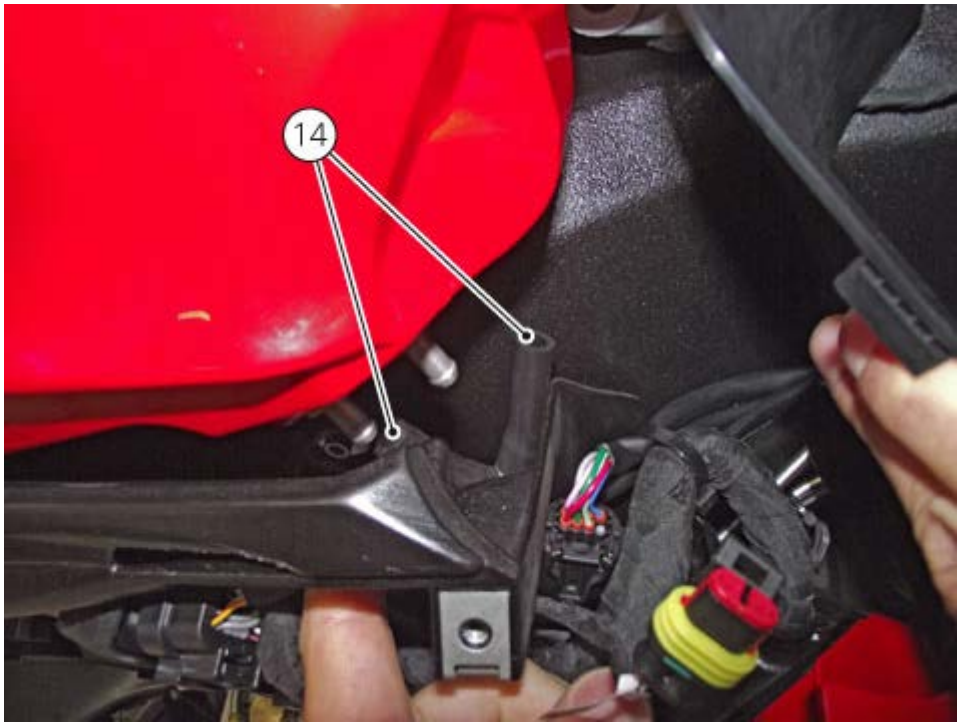


Disconnect the wiring connector of the tank earthing point from faston (12).



Disconnect the fuel pipe union from the quick-release coupling (13).

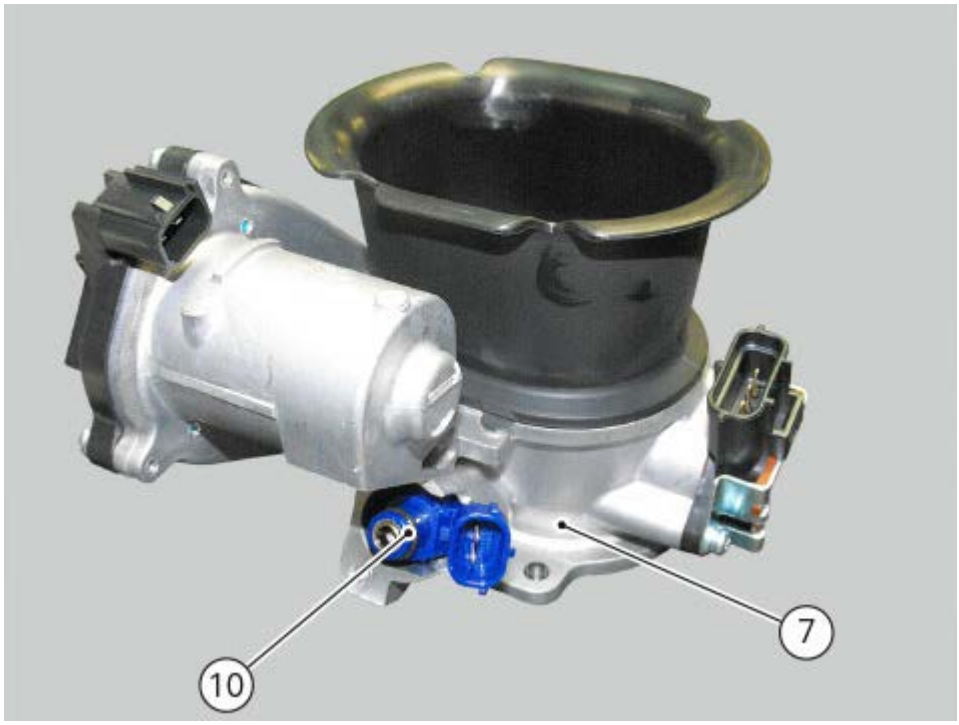
Slide out breather pipes (14) and disconnect them from the tank.

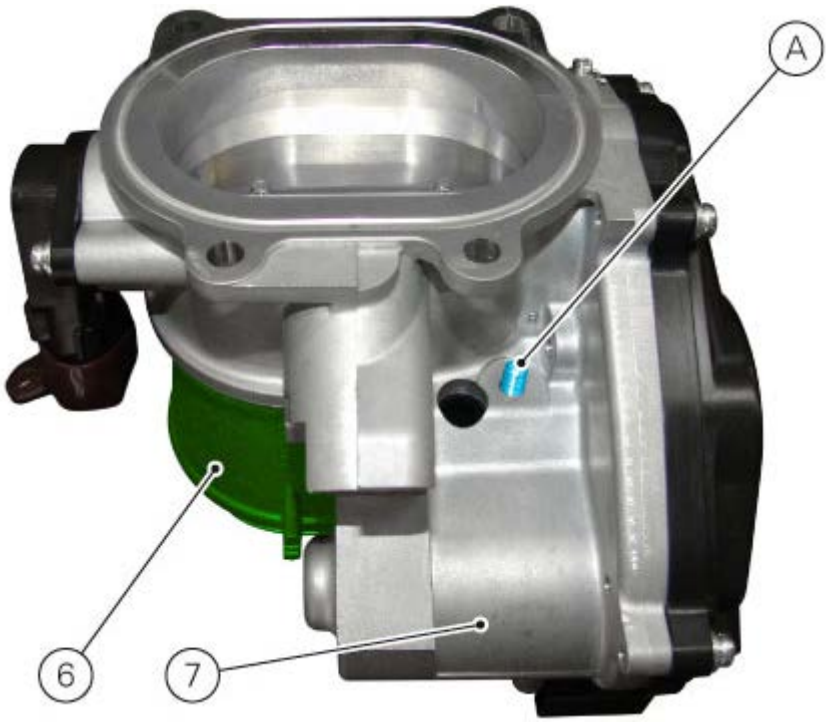


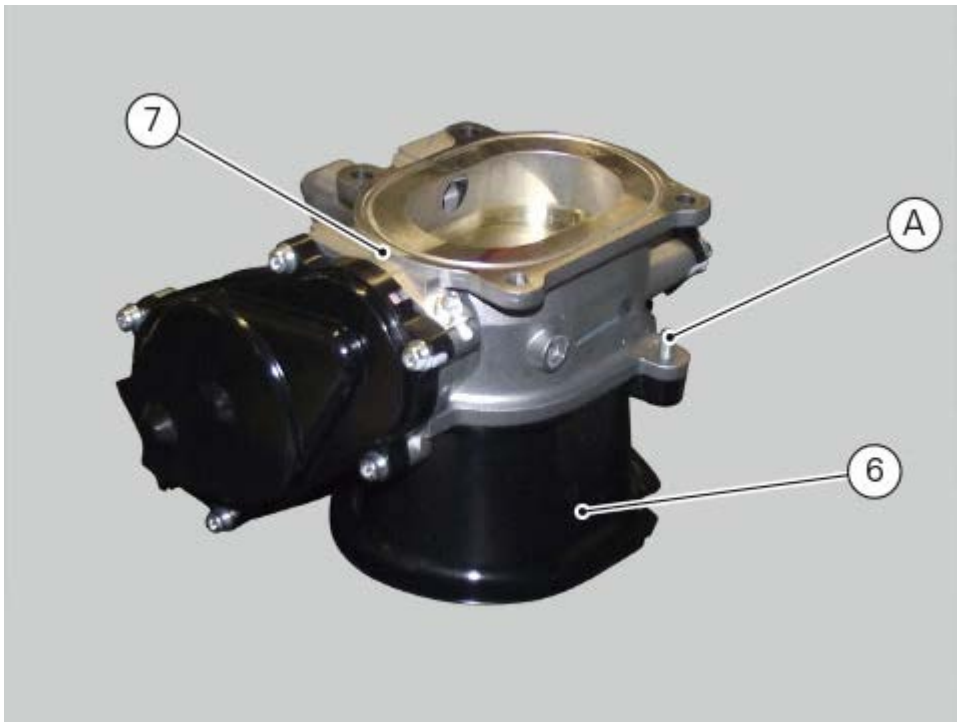
Remove the tank from the vehicle.

Overhauling the throttle body

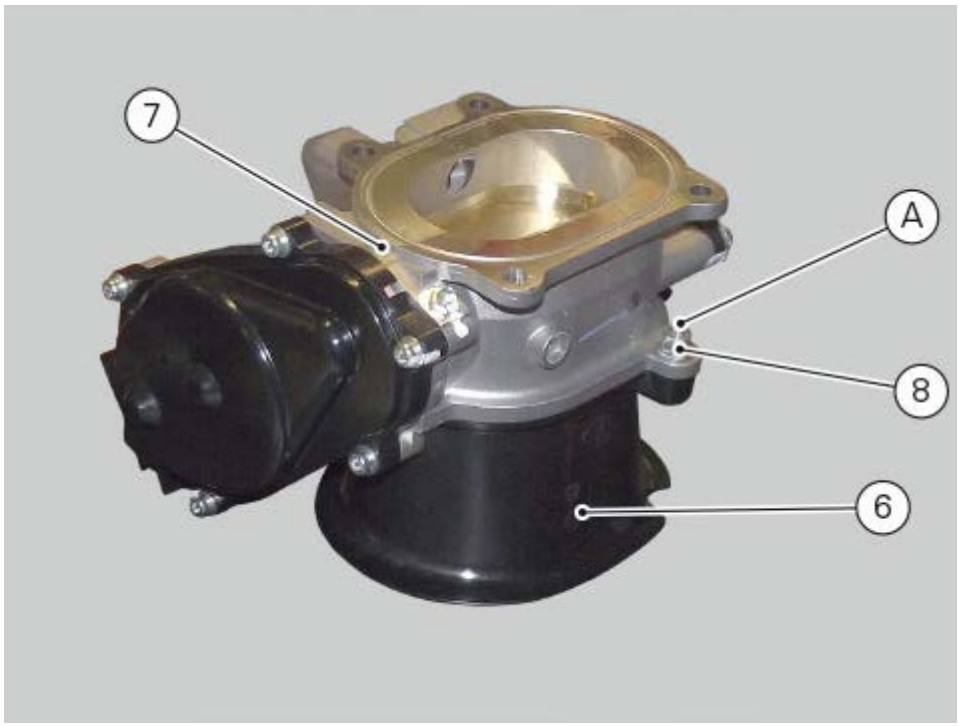
Place the intake funnel (6) on the throttle body (2) as shown in the figure by inserting threaded pins (A) in the relevant holes on the throttle body.

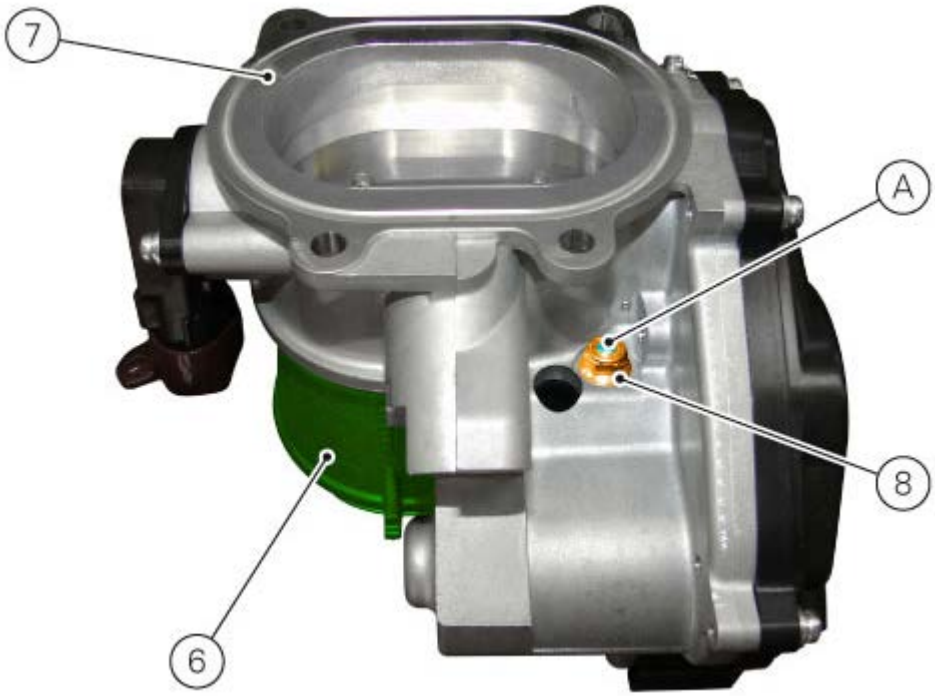




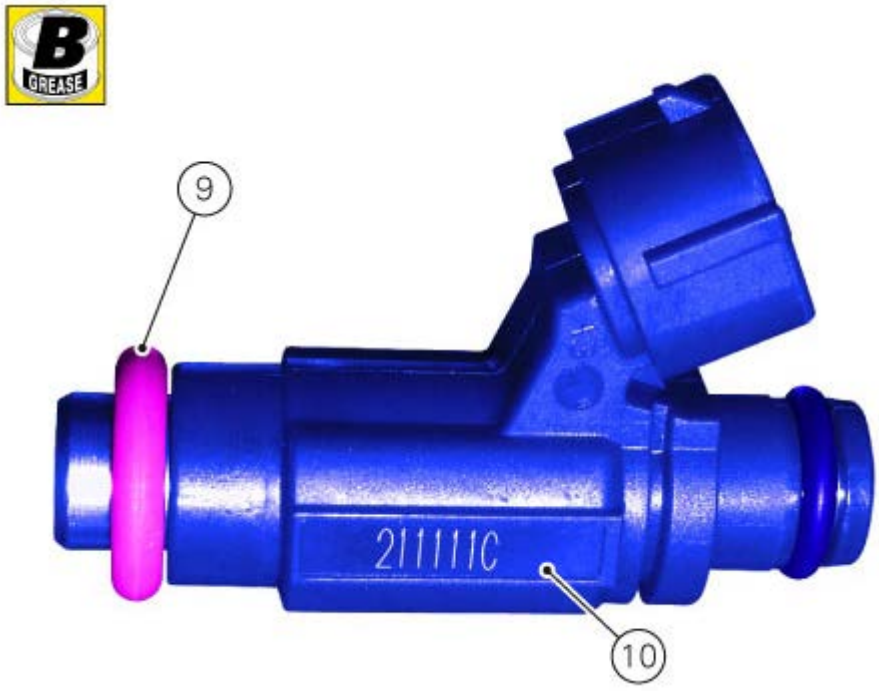


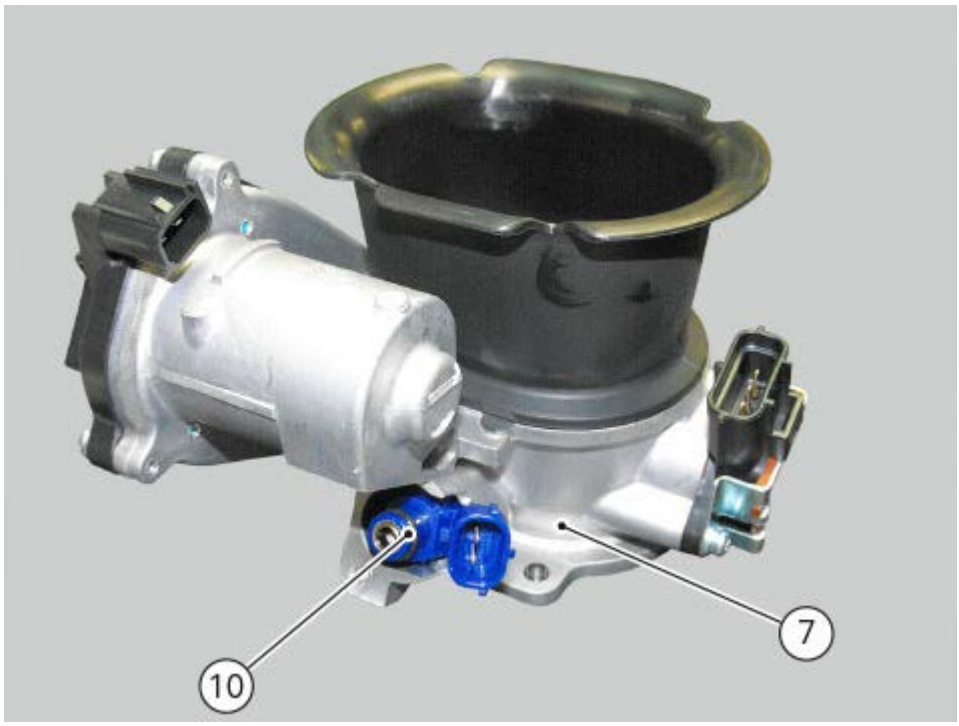
Fasten the intake funnel (6) on the throttle body (7) starting nuts (8) on threaded pins (A). Tighten nuts (8) to a torque of 6 Nm ± 10%.



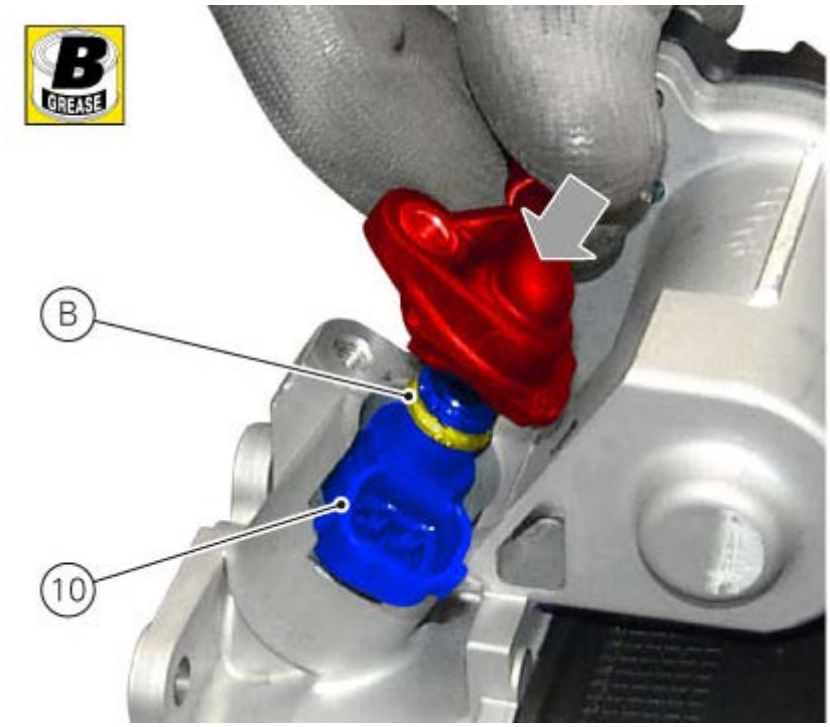


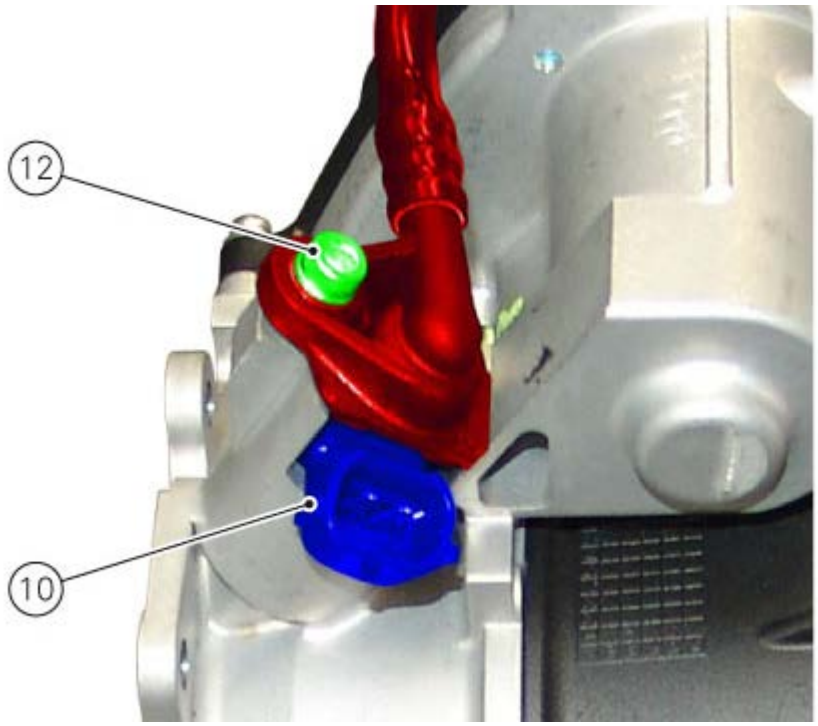
Fit O-ring (9) on injector (10).
Apply specified grease to the O-ring (9).
Insert injector (10) in the relevant seat on the throttle body (7).
Perform the same operations previously described for the other throttle body.

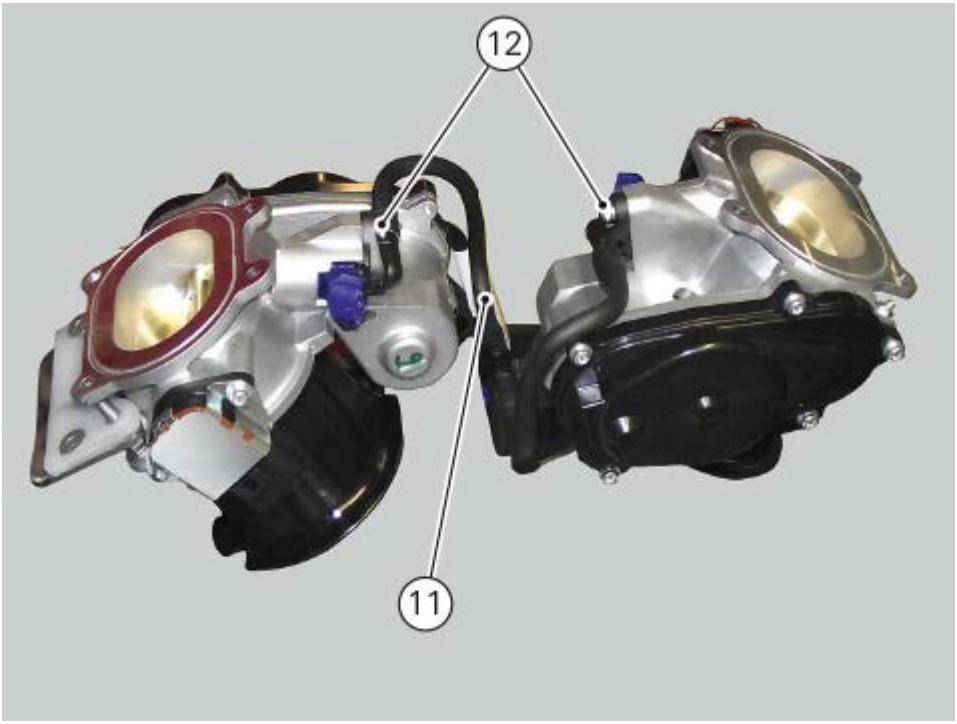




Apply specified grease on O-rings (B) on both injectors (10).
Insert the unions of the throttle body fuel pipe set (11) in injectors (10) and fix them by starting screws (12).
Tighten screws (12) to a torque of 5 Nm ± 10%.



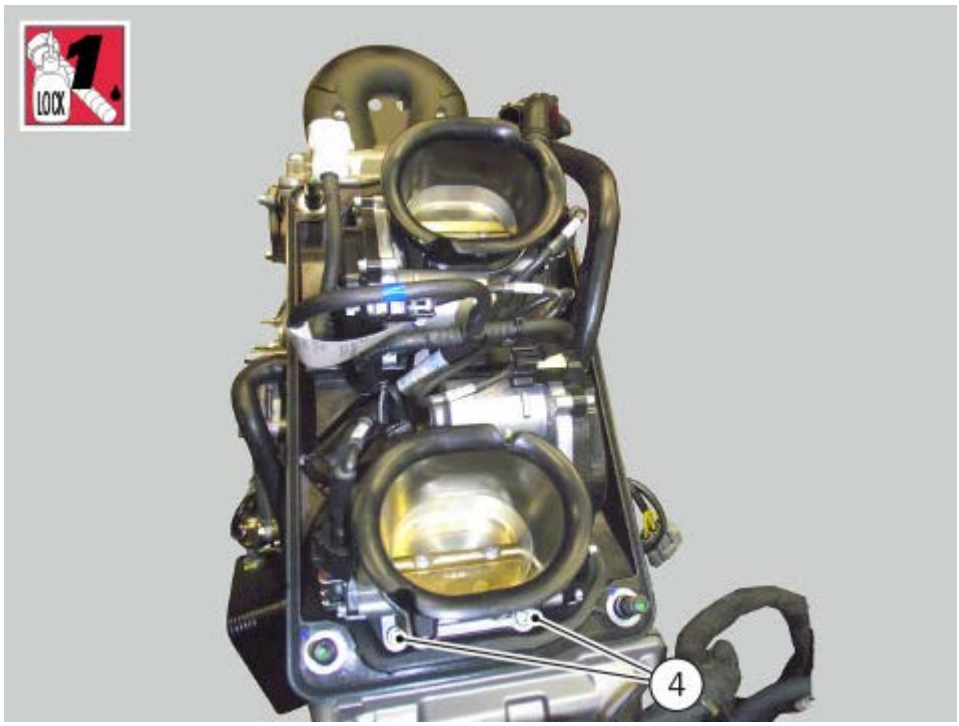




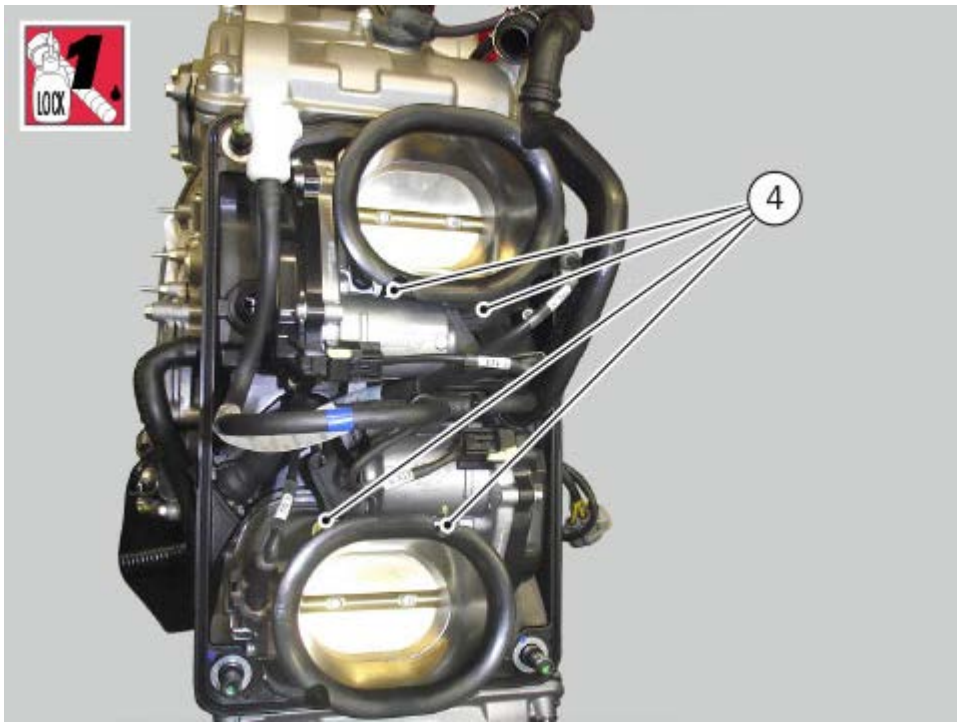
Fitting the throttle body

Refit the complete throttle body unit (5) inside the frame on the lower airbox.

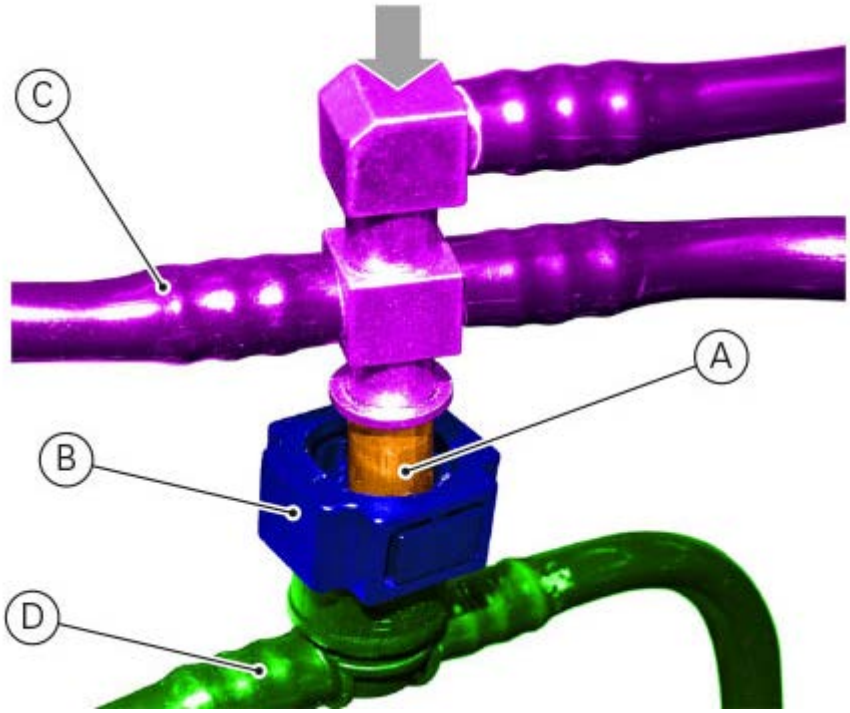
Apply specified threadlocker on the eight screws (4) and start them to fix the throttle body to the lower airbox.
Tighten screws (4) to a torque of 10 Nm ± 10%.


LOCK
4

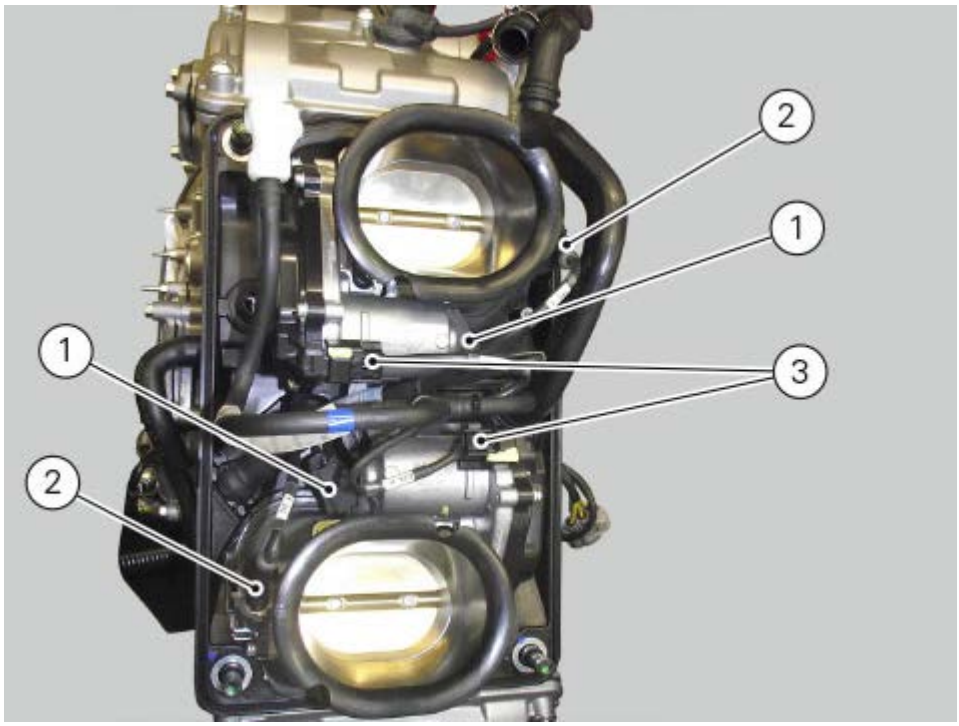

LOCK
4



Assemble the shower units (C) to the throttle body unit (D) by inserting pin (A) of the shower unit (D) in throttle body unit (C).



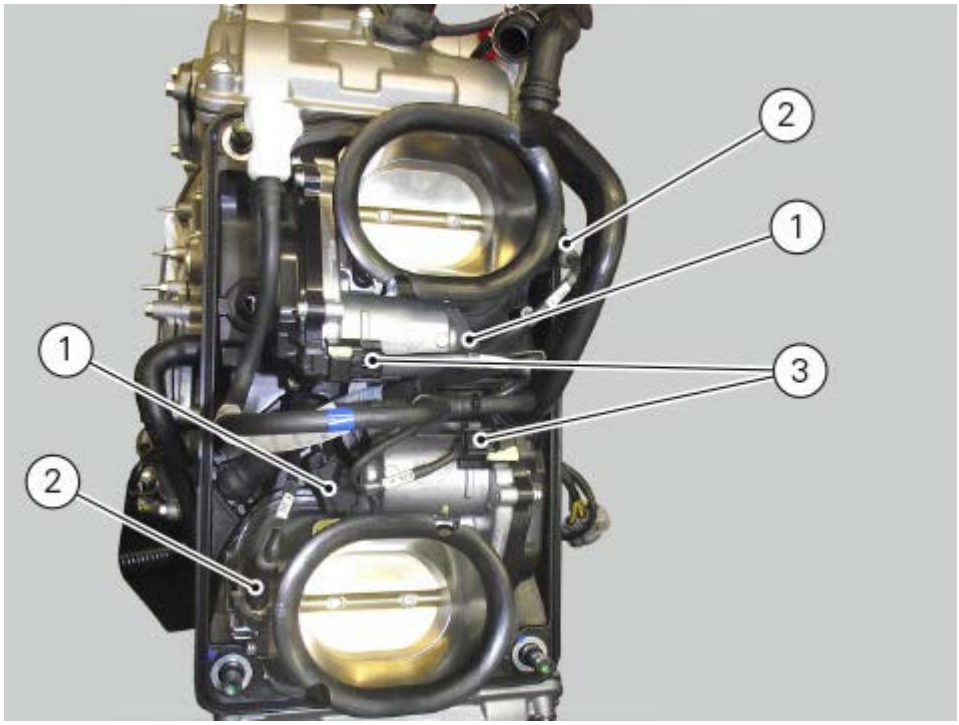
Connect the wiring of injectors (1), TPS (2) and motor-driven valves (3).



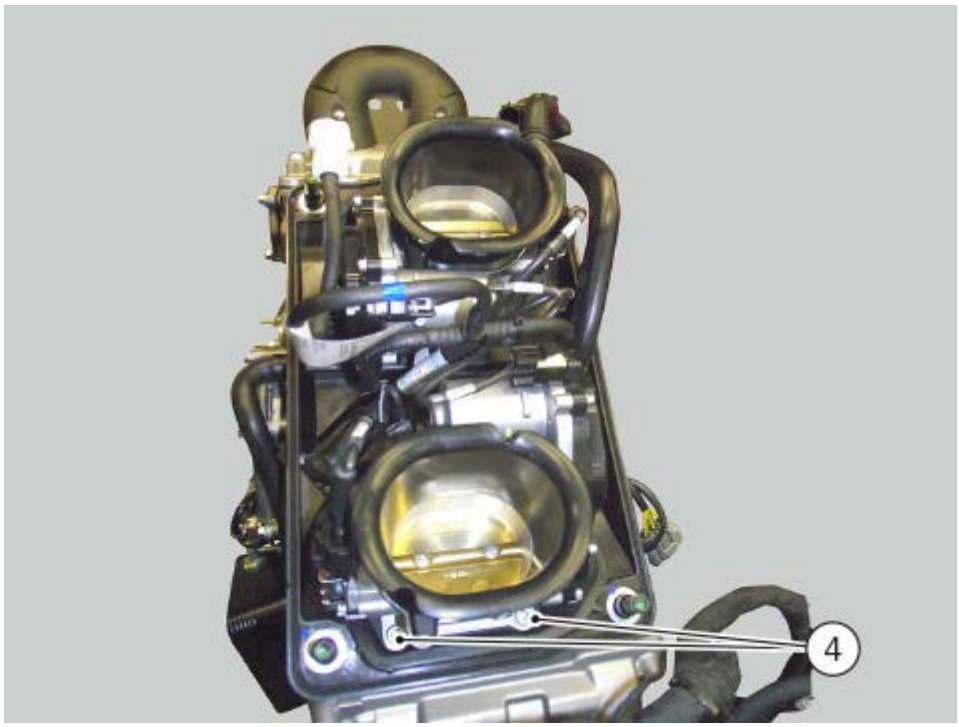
Refit the tank (Refitting the fuel tank).
Refit the seat (Refitting the rider seat).

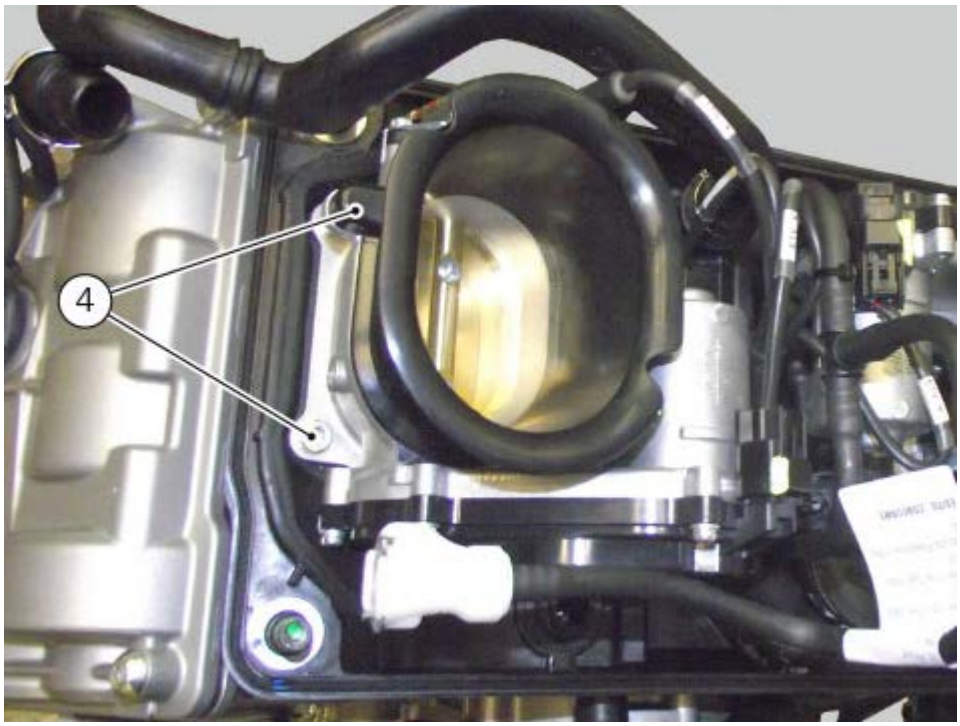
Removing the throttle body

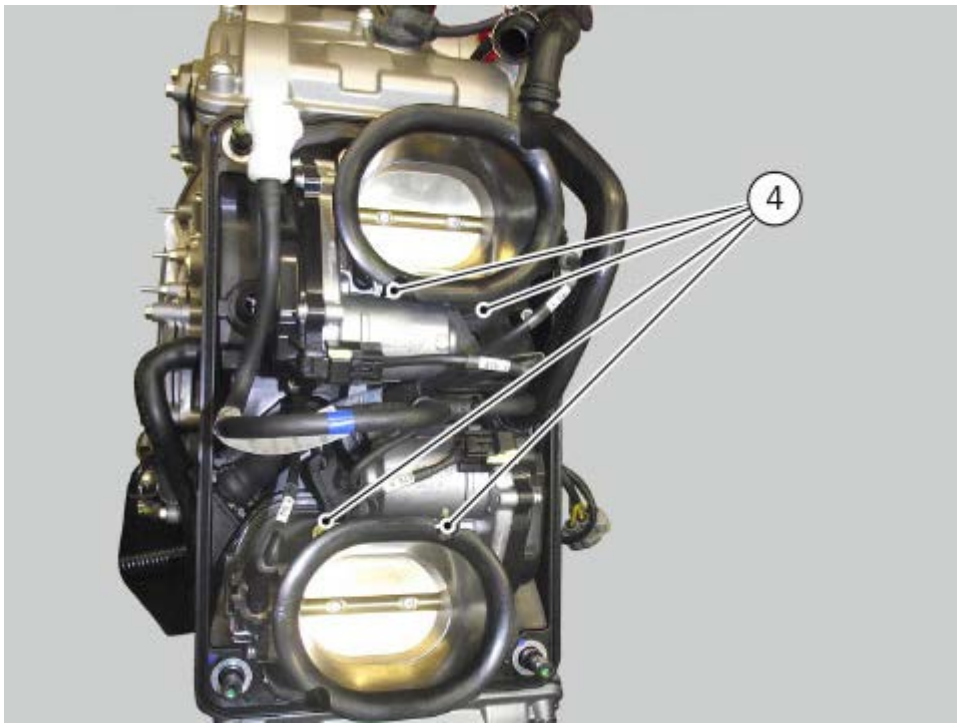
Remove the seat (Removing the rider seat).
Remove the tank (Removing the fuel tank).
Disconnect the wiring of injectors (1), TPS (2) and motor-driven valves (3).



Loosen the eight screws (4) that retain the funnels of the throttle body unit to the lower airbox.





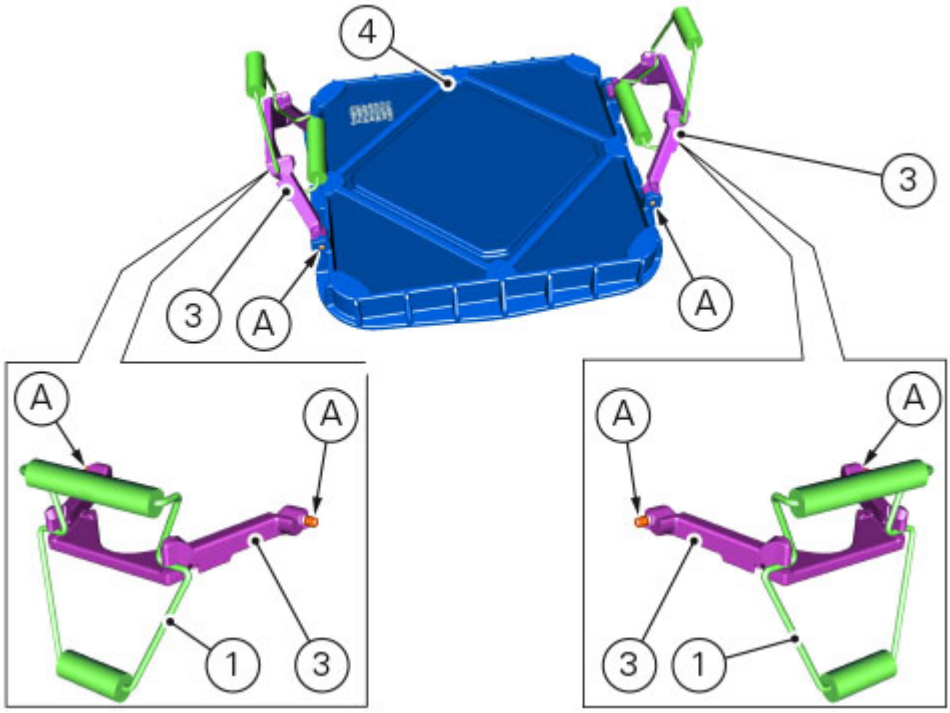


Remove the complete throttle body unit (5).

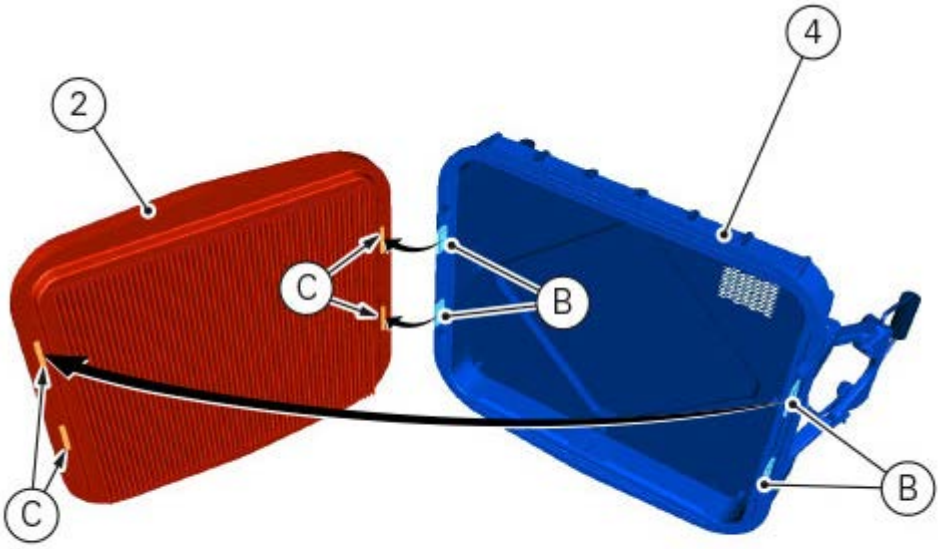

5

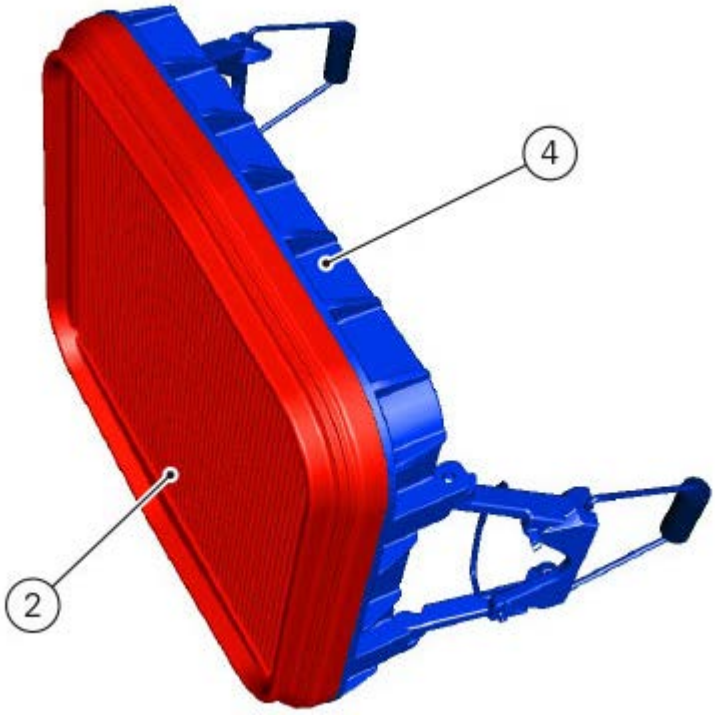
Refitting the air filter

If the filtering element unit (2) has been disassembled, refit spring clips (1) in the relevant seat of the blocking devices (3). Fit blocking devices (3) on the air filter support (4) by inserting pins (A) in the holes on the air filter support.



Fit air filter (2) on the support (4) by inserting tabs (B) of support (4) in openings (C) of the air filter (2) fully home.

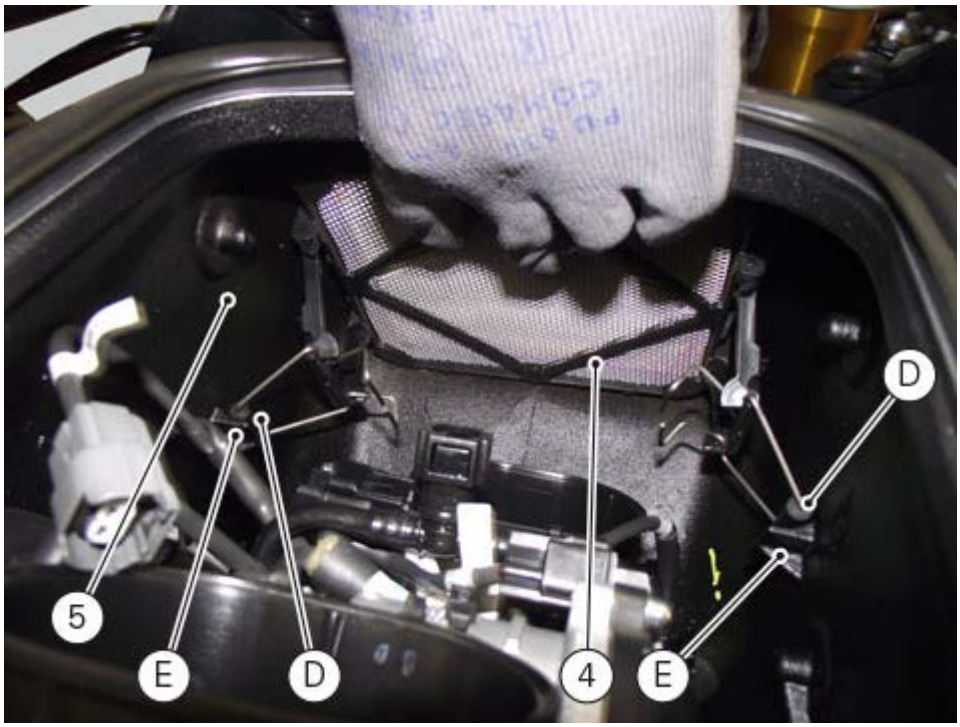




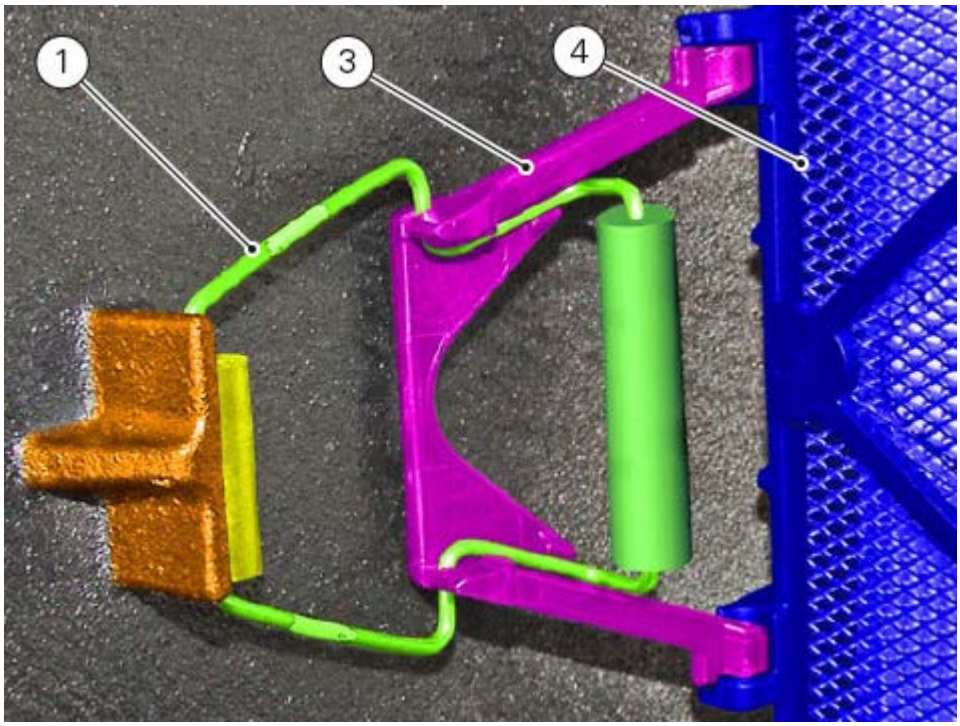
Place air filter support (4) in the relevant housing on frame (5).

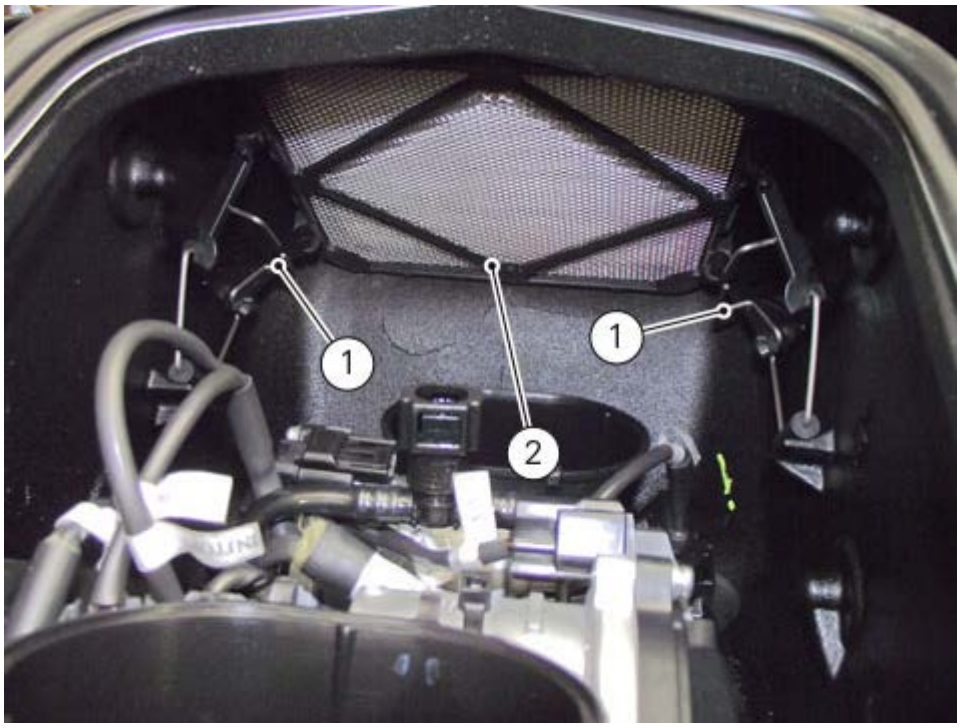
Note

For a correct fitting it is necessary to first bring pads (D) of clips (1) on plates (E) of frame (5).



Block the air filter support (4) working on spring clips (1), until they are in their relevant seats of the blocking devices (3).



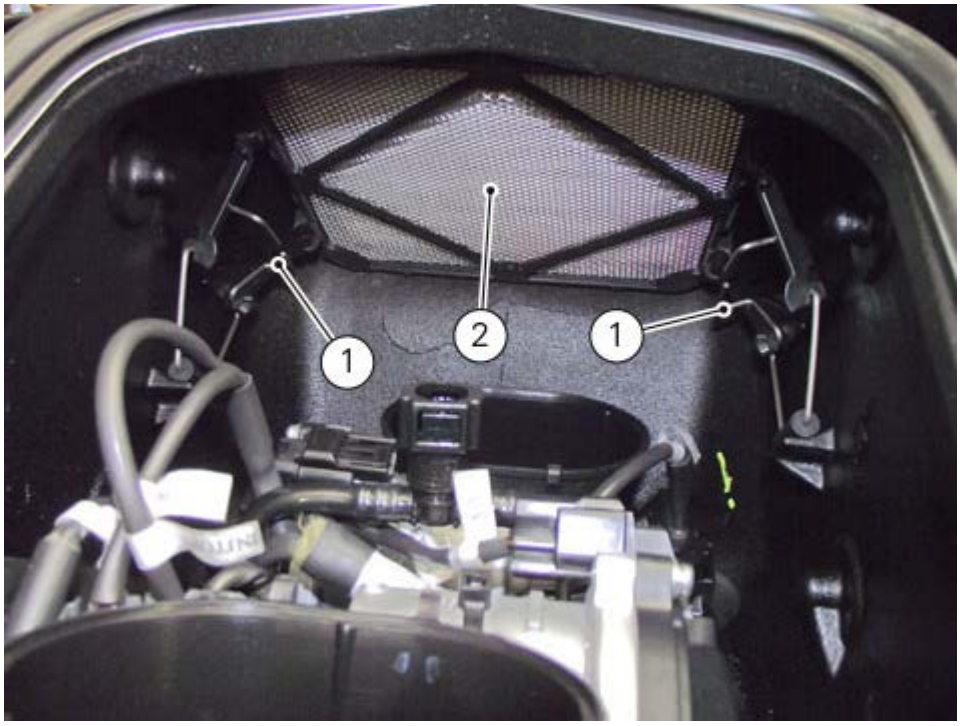


Refit the tank (Refitting the fuel tank).
Refit the seat (Refitting the rider seat).

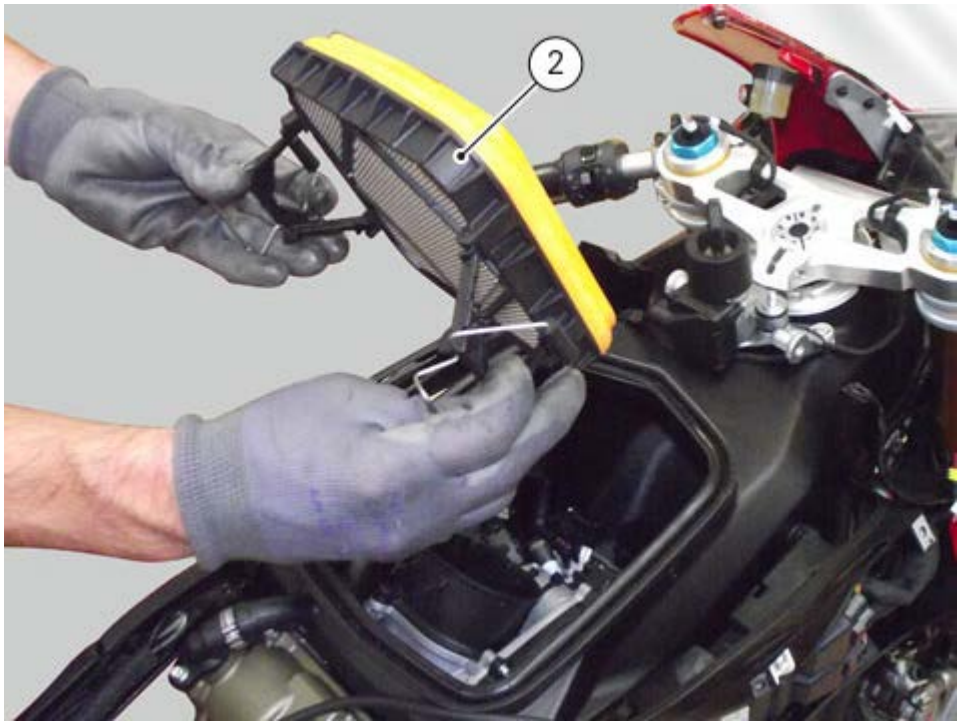
Removing the air filter

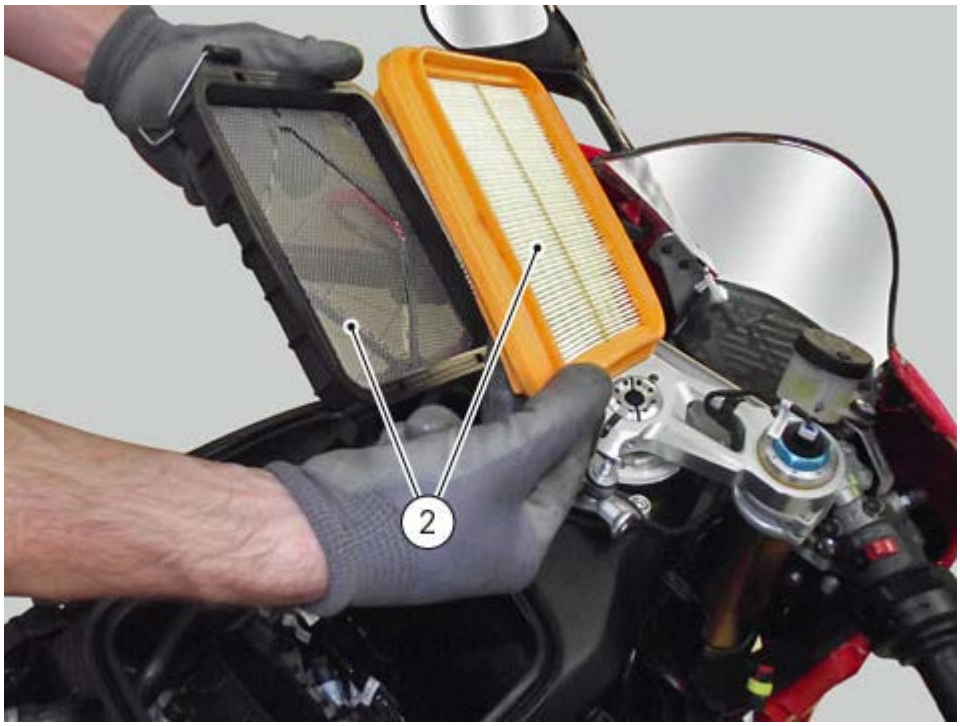
Remove the seat (Removing the rider seat).
Remove the tank (Removing the fuel tank).

Open the spring clips (1) that retain the filtering element unit (2).



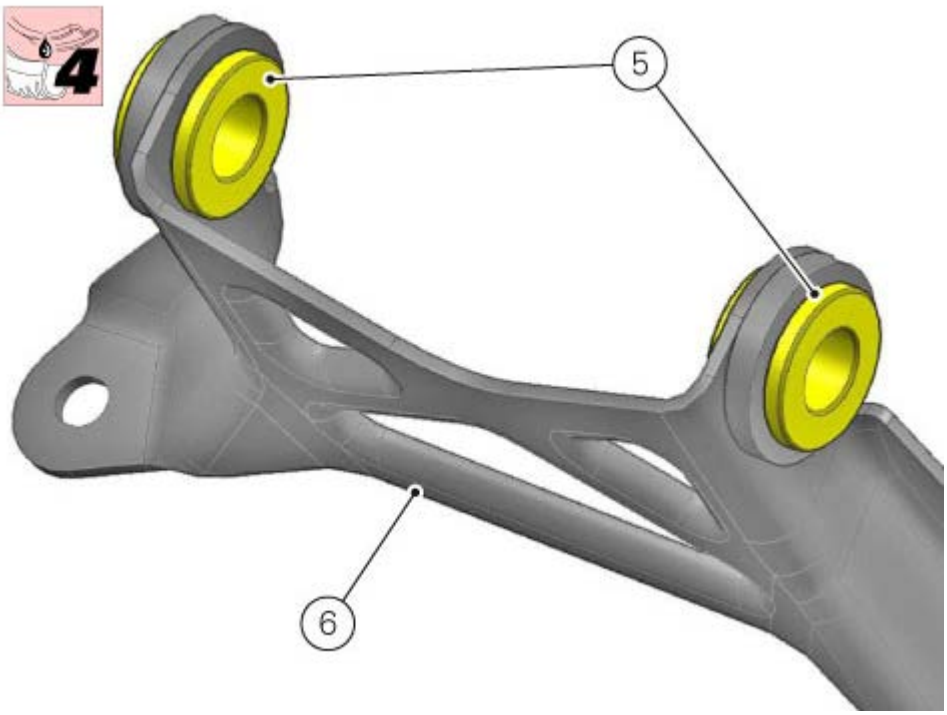
Slide out the filtering element unit (2) from the seat on the frame.




2

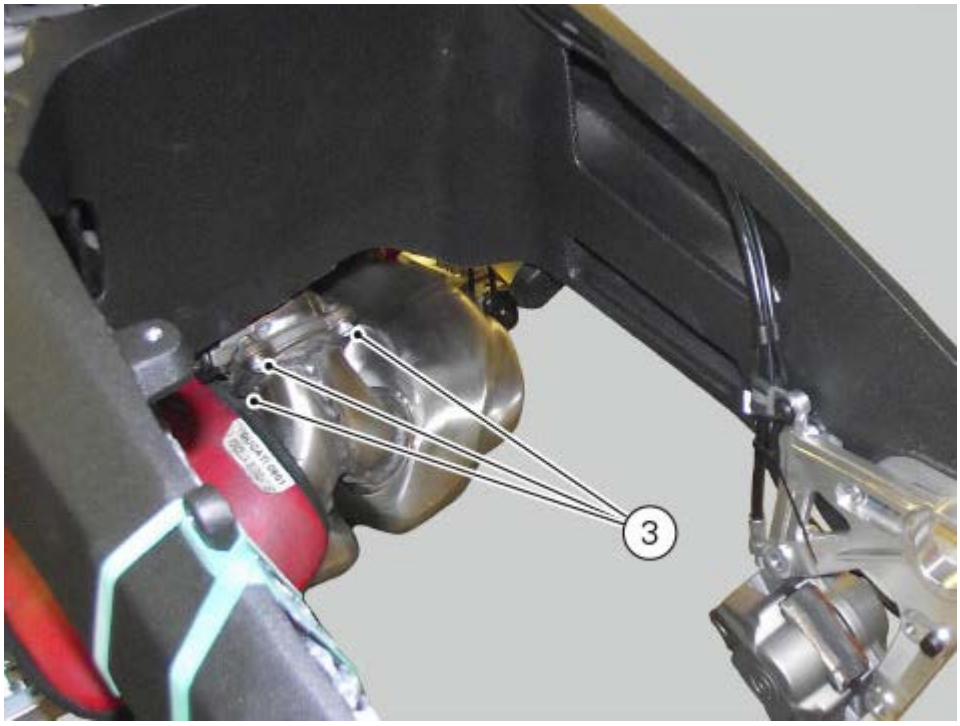
Refitting the silencer

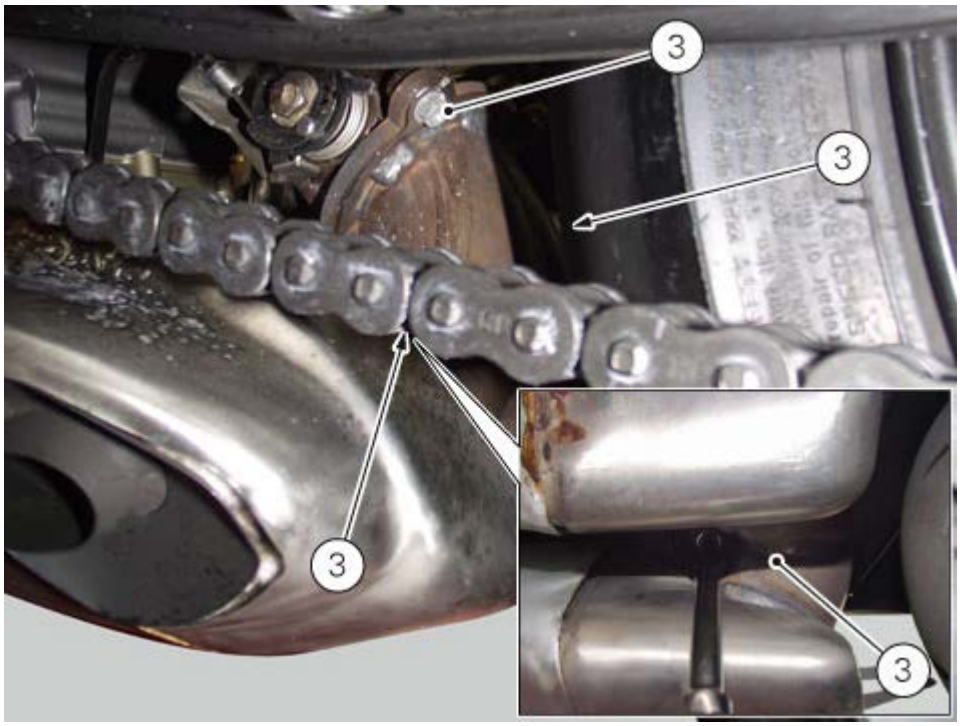
Check for the presence of rubber elements (5) of silencer front supporting bracket (6).
Should it be necessary to fit vibration dampers but they prove hard to assemble, smear them with recommended lubricant for rubber.



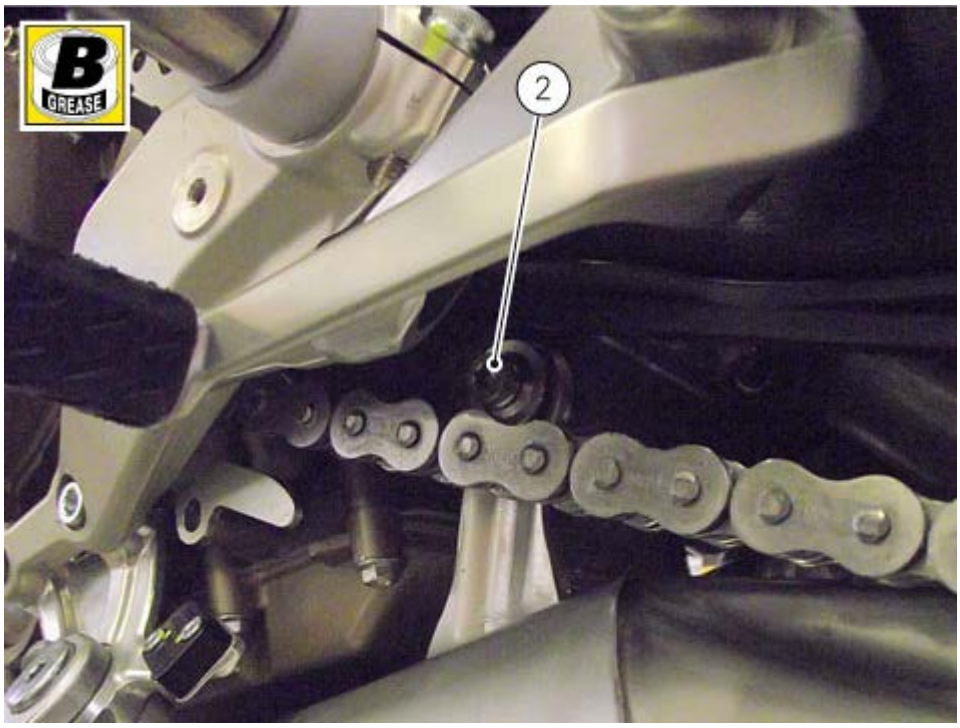
Position the silencer on the central exhaust pipe with the relevant seal.

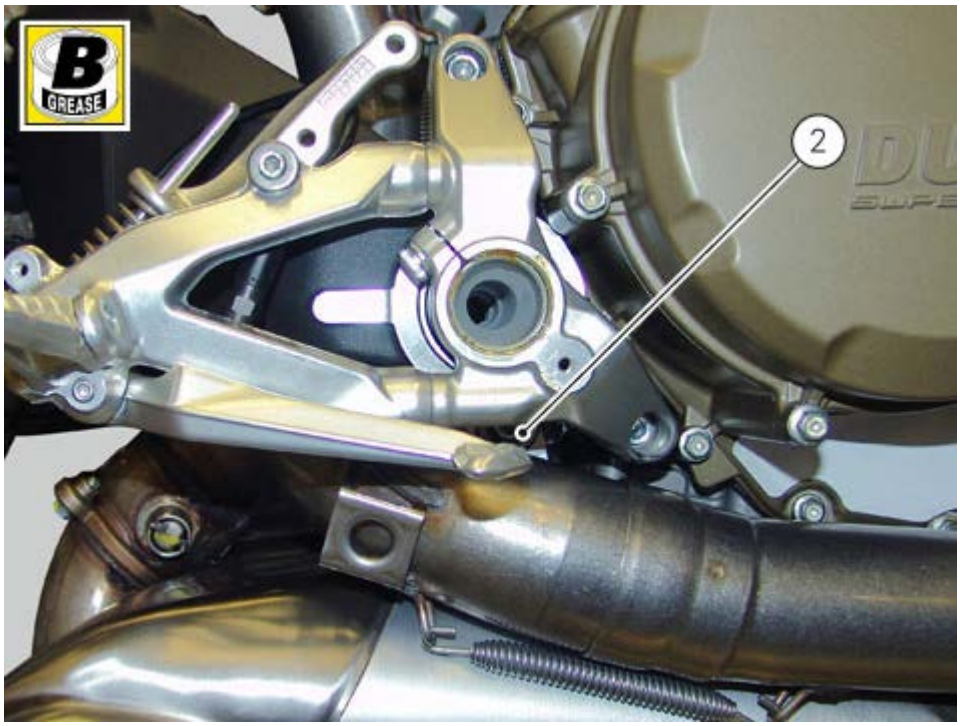
Start the three screws (3) that retain the silencer to the central exhaust pipe.



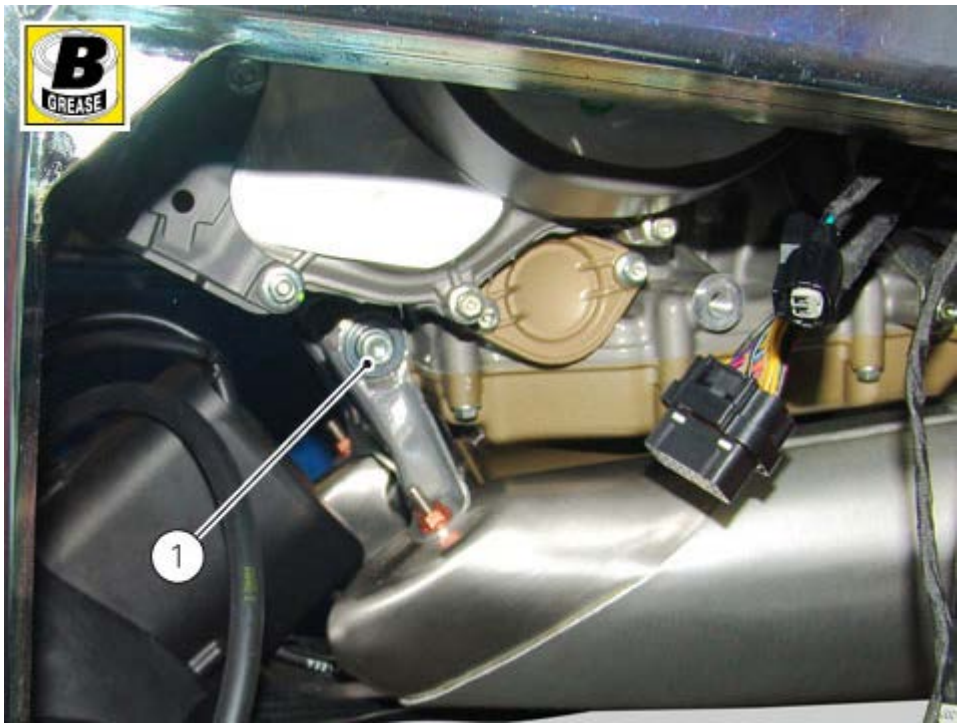


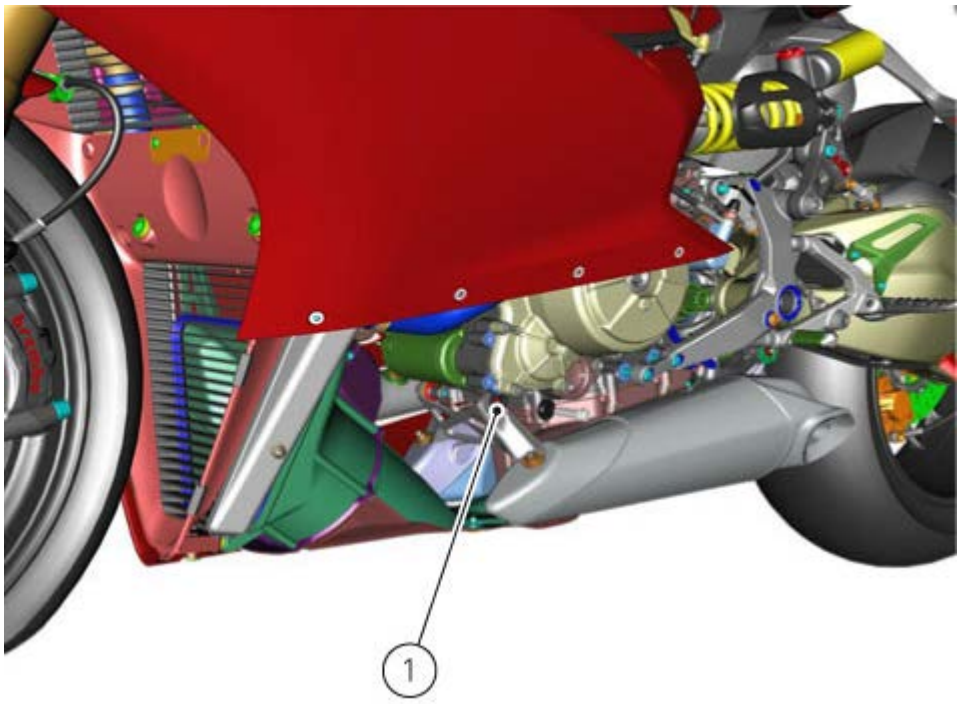
Apply specified grease and start the two screws (2) that retain the silencer rear side to the engine block.

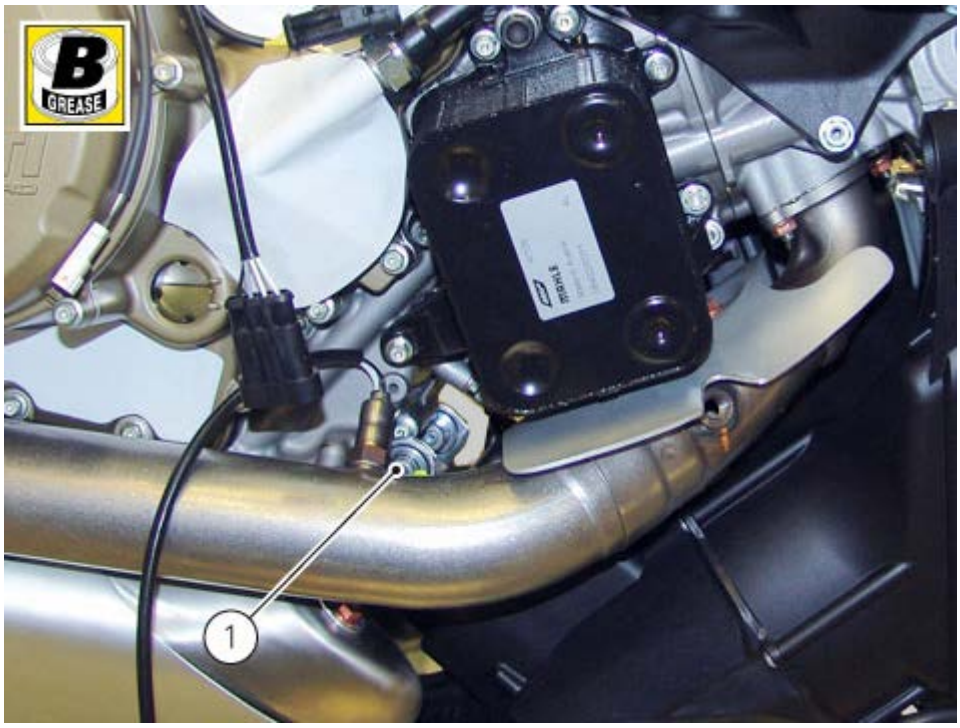


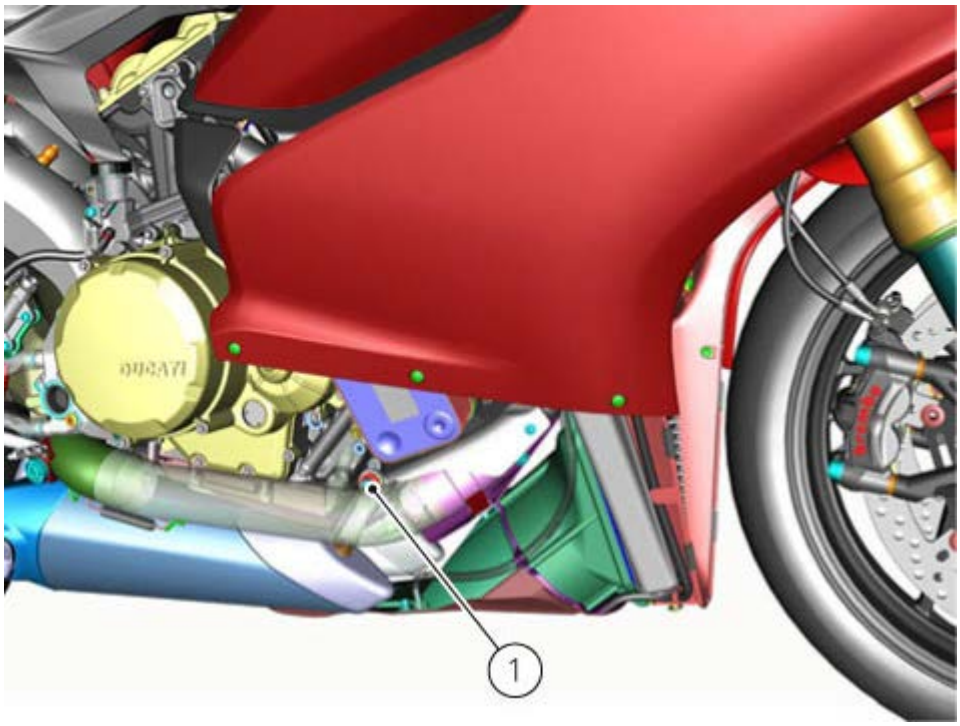


Apply specified grease and start the two screws (1) that retain the silencer front side to the engine block.




1


B
GREASE
1



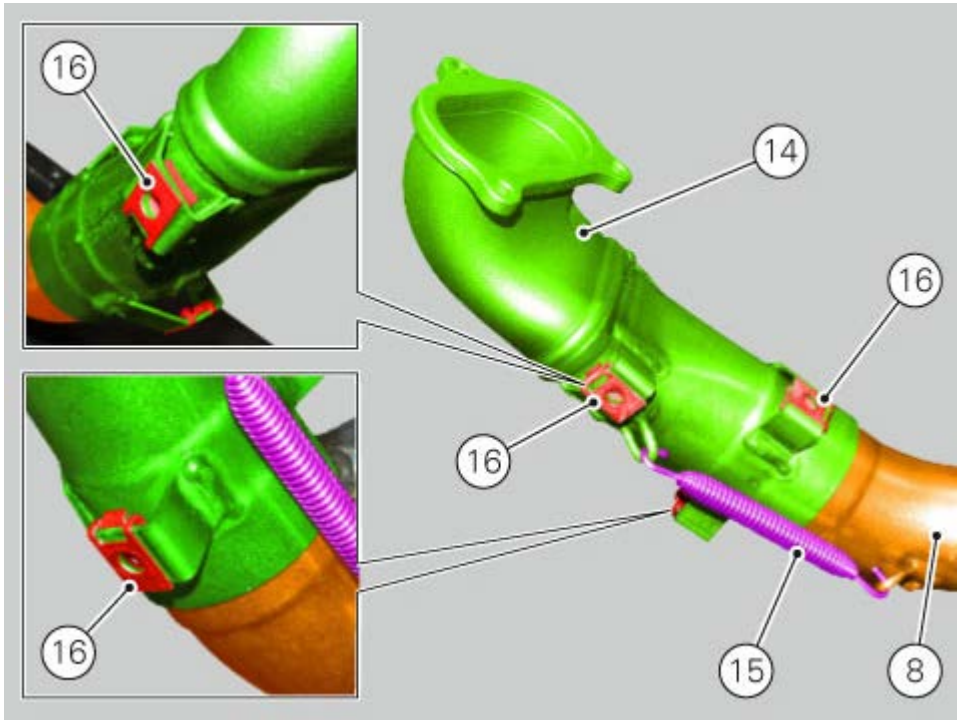
Then, tighten in the following sequence:

- screws (3) to a torque of 10 Nm ± 10%;
- screws (2) to a torque of 25 Nm ± 10%;
- screws (1) to a torque of 25 Nm ± 10%.

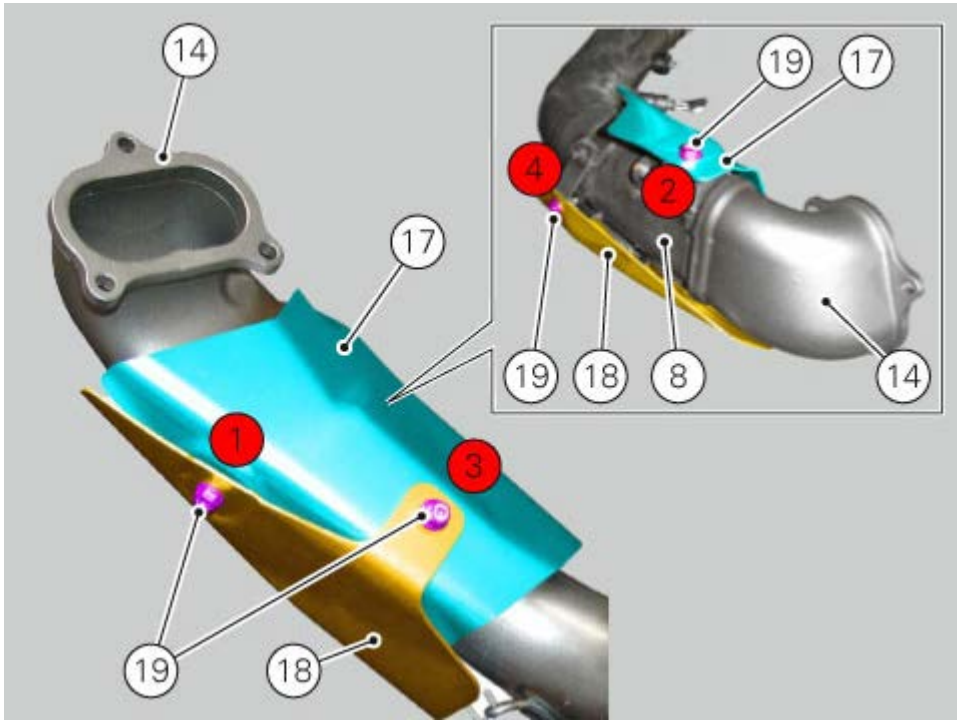
Refit the lower fairings (Refitting the side fairings).

Refitting the exhaust system

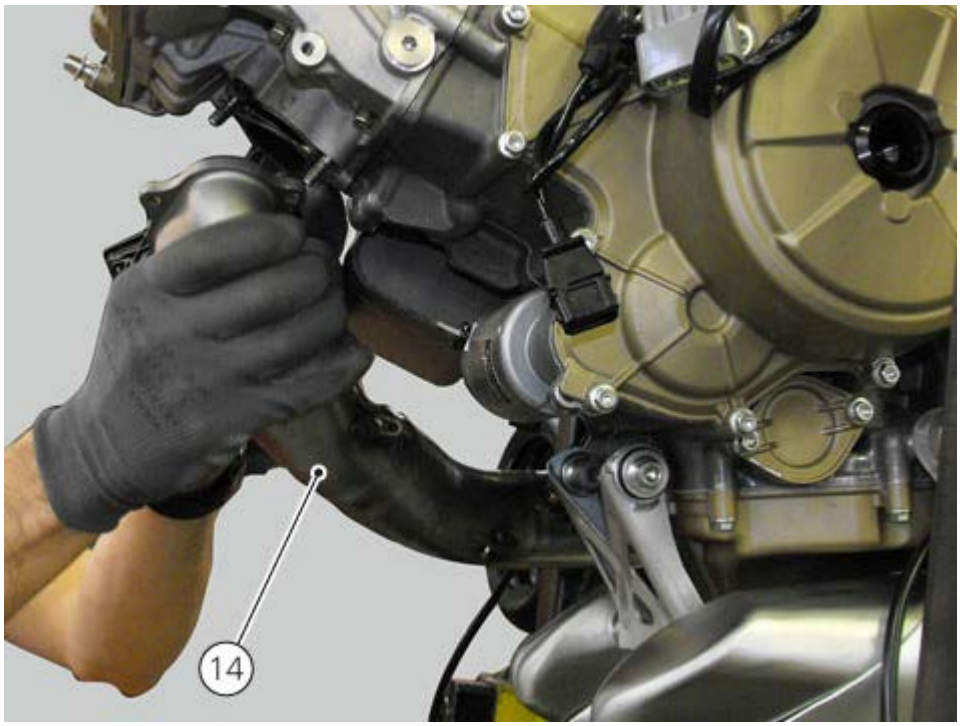
If the horizontal cylinder exhaust manifold (14) and horizontal cylinder exhaust pipe (8) unit has been disassembled:
position the horizontal exhaust pipe (14) on the horizontal cylinder exhaust pipe (8) and fix them by means of spring (15) as shown in the figure.
Check for the presence of the four clips (16) in the indicated areas of the central exhaust (1) of the horizontal cylinder exhaust pipe (8).

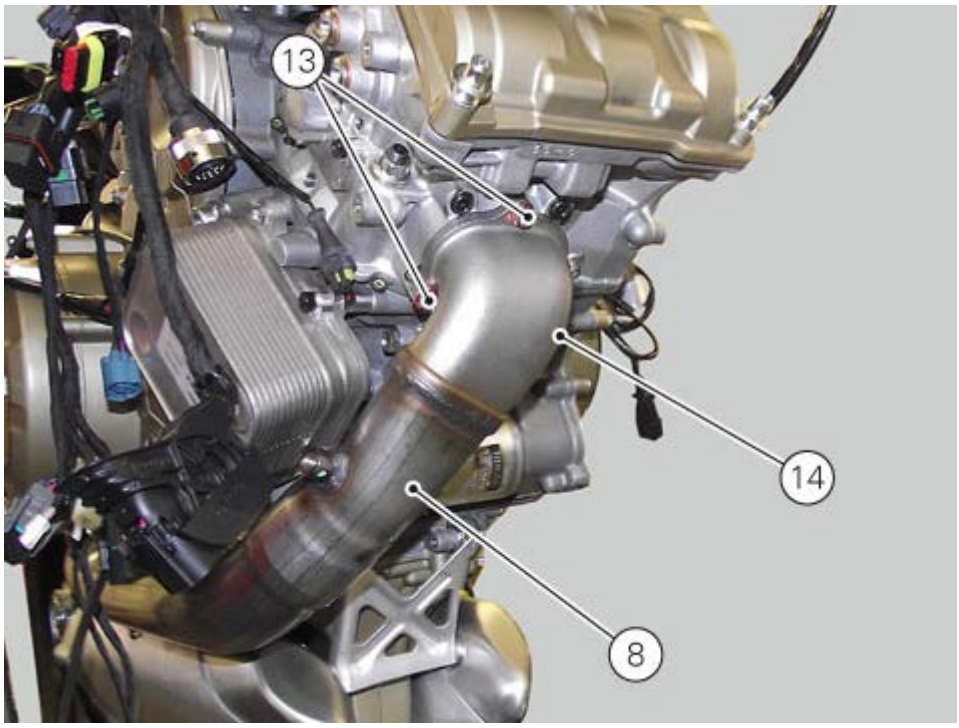


Position the upper heat (17) and then the lower (18) heat guard as shown in the figure.
Fix heat guards (17) and (18) by starting screws (19). Tighten the four screws (19) to 5 Nm ± 10%, following a 1-2-3-4 sequence.



Position the horizontal cylinder exhaust manifold (14) and the horizontal cylinder exhaust pipe (8) with the relevant gasket and start nuts (13) on the horizontal head thru bolts.


14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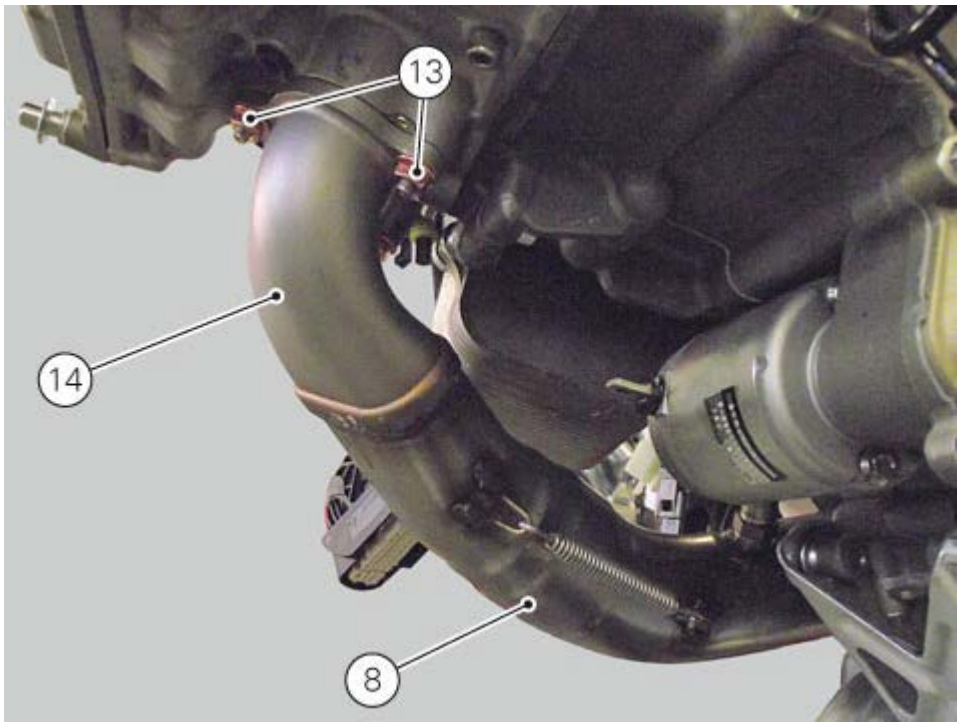
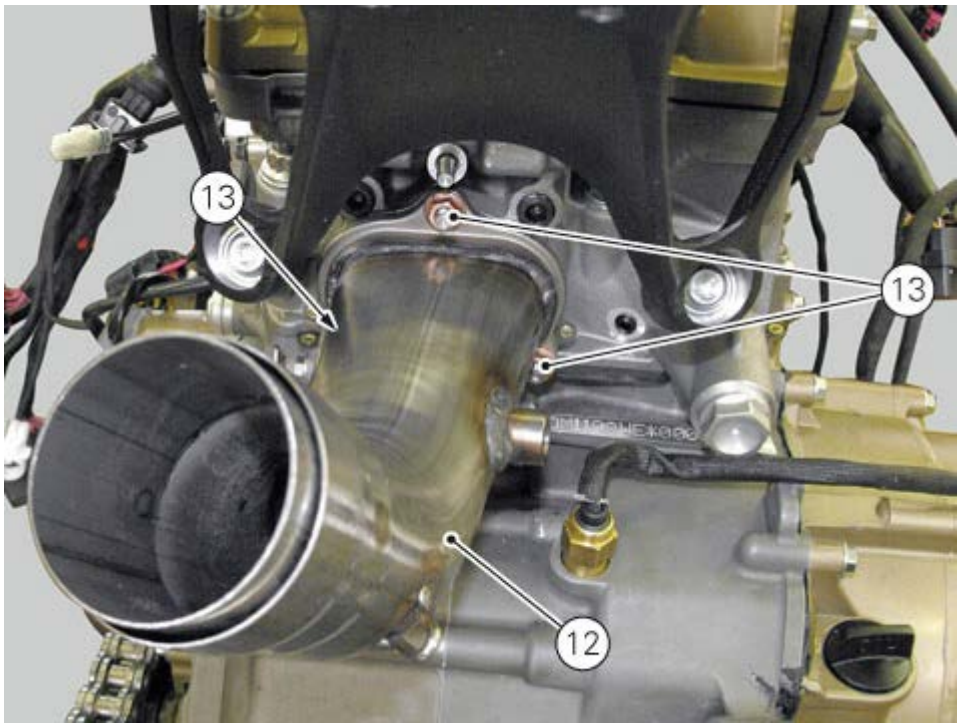
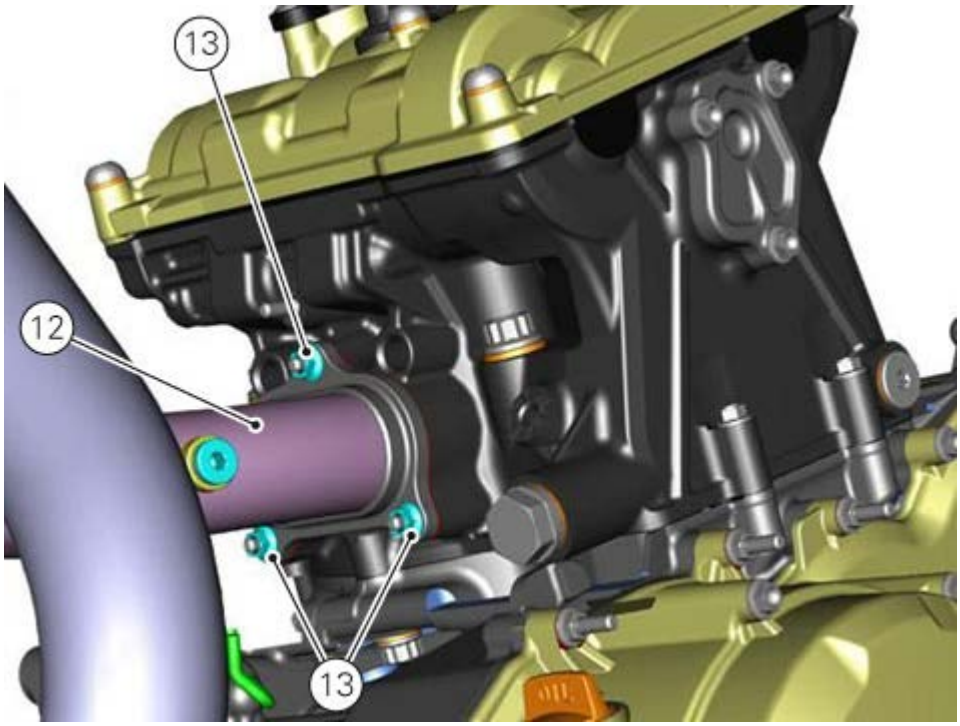
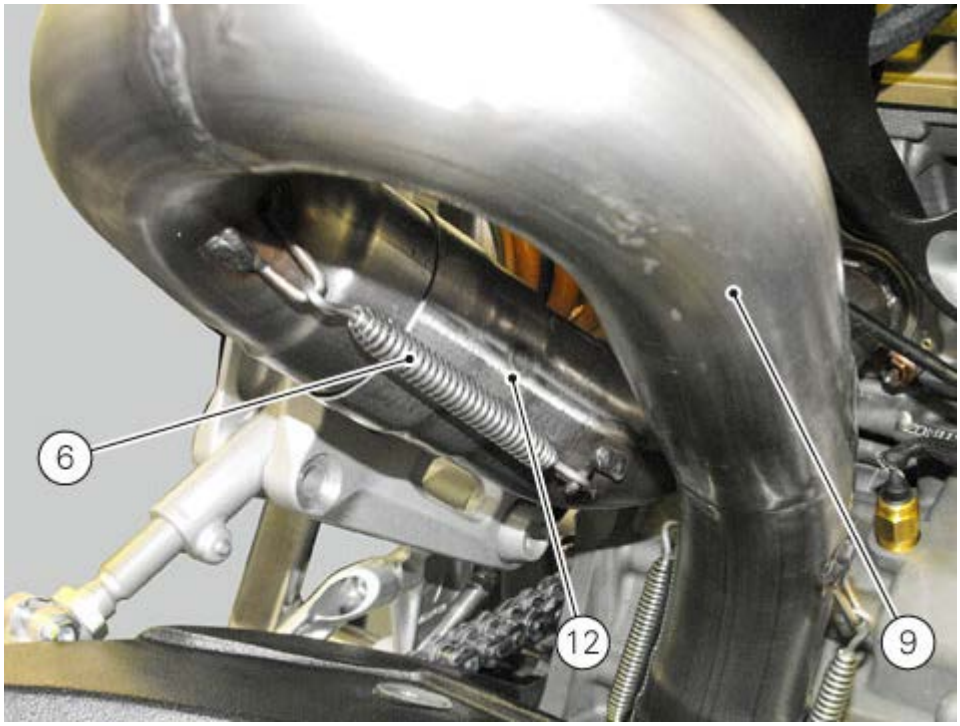


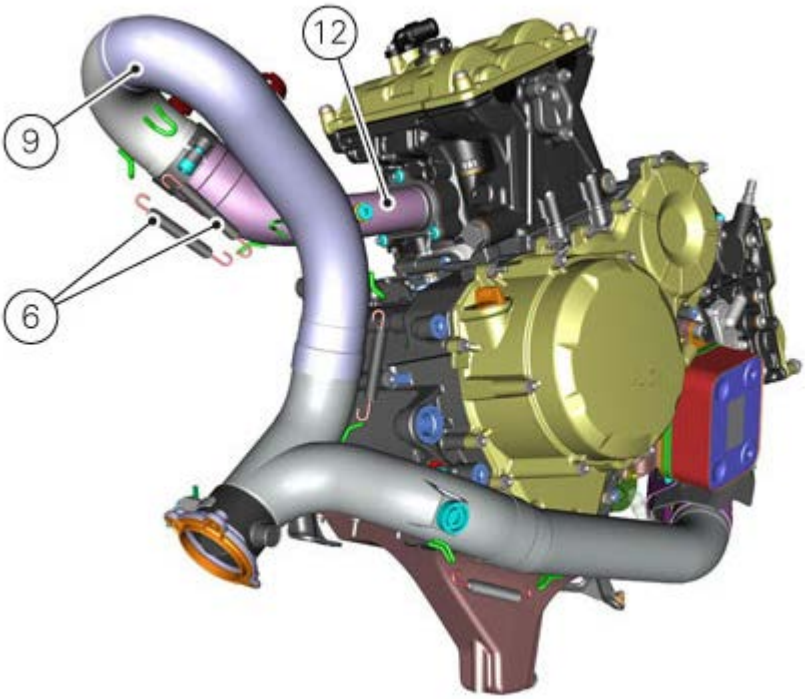
Position vertical cylinder exhaust manifold (12) with the relevant gasket and start nuts (13) on the vertical head thru bolts.



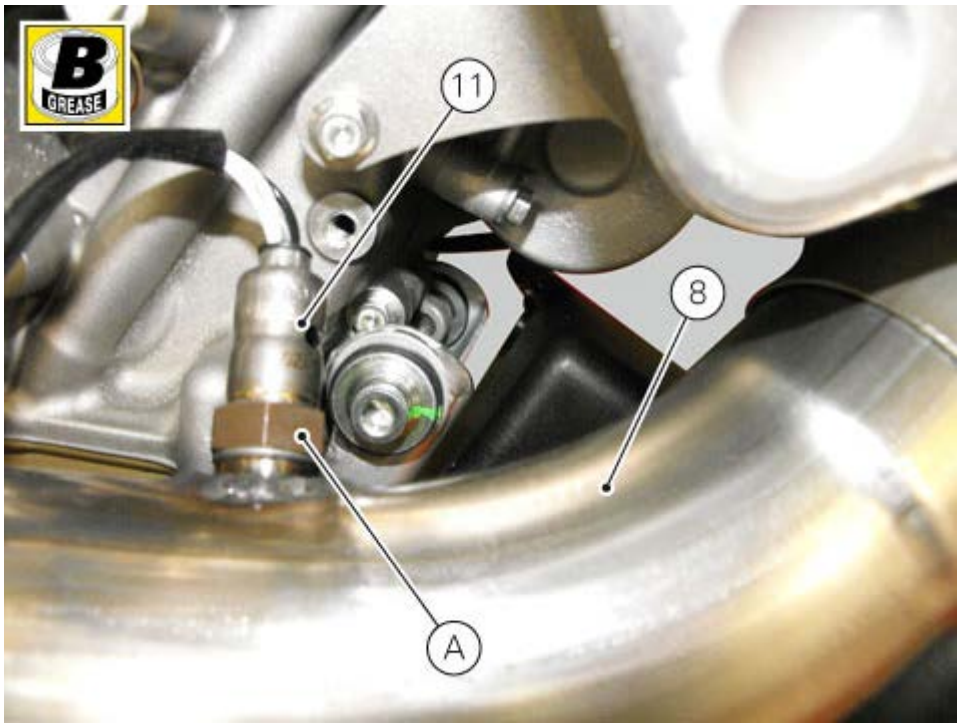


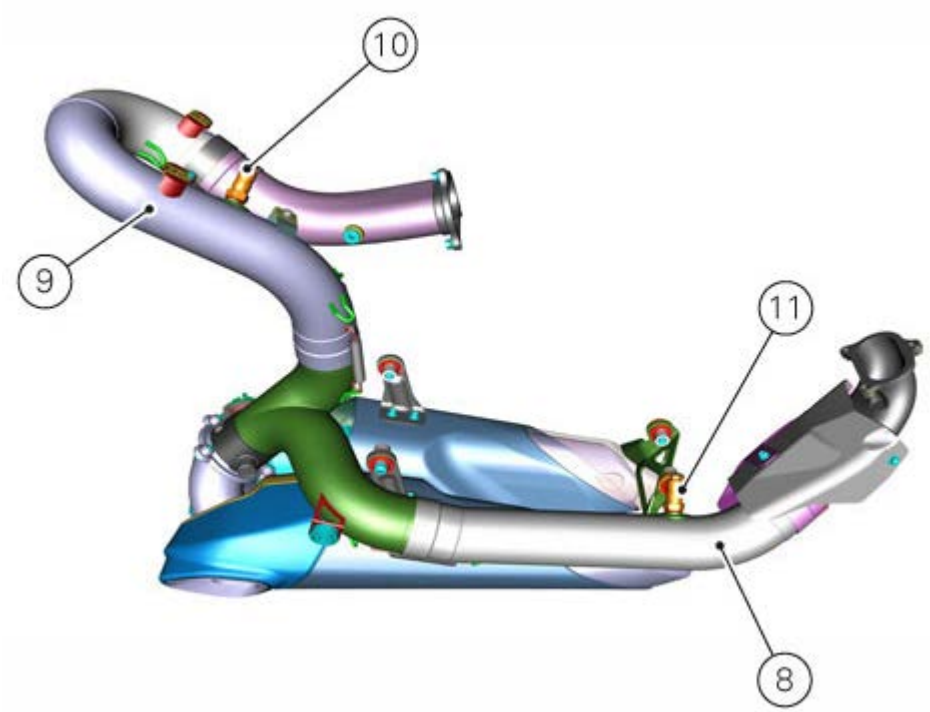
Insert the vertical cylinder exhaust pipe (9) in the vertical cylinder exhaust manifold (12).
Position springs (6) that retain the vertical cylinder exhaust pipe (9) to the vertical cylinder exhaust manifold (12).



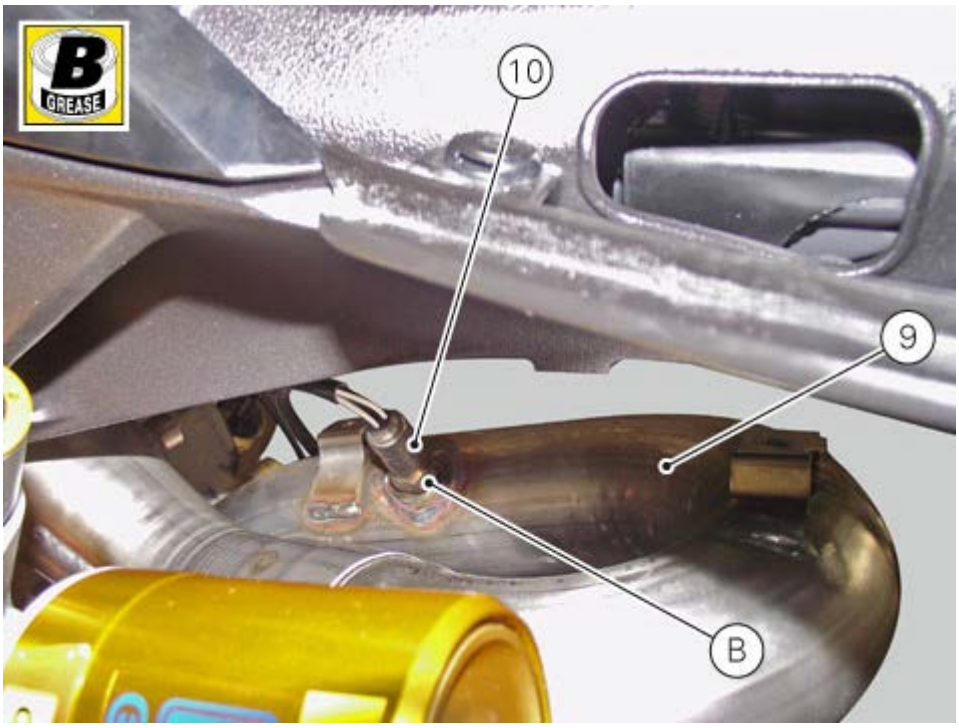


Apply specified grease on the lambda sensor thread (11).
Start lambda sensor (11), tighten ring nut (A) to the horizontal cylinder exhaust pipe (8).

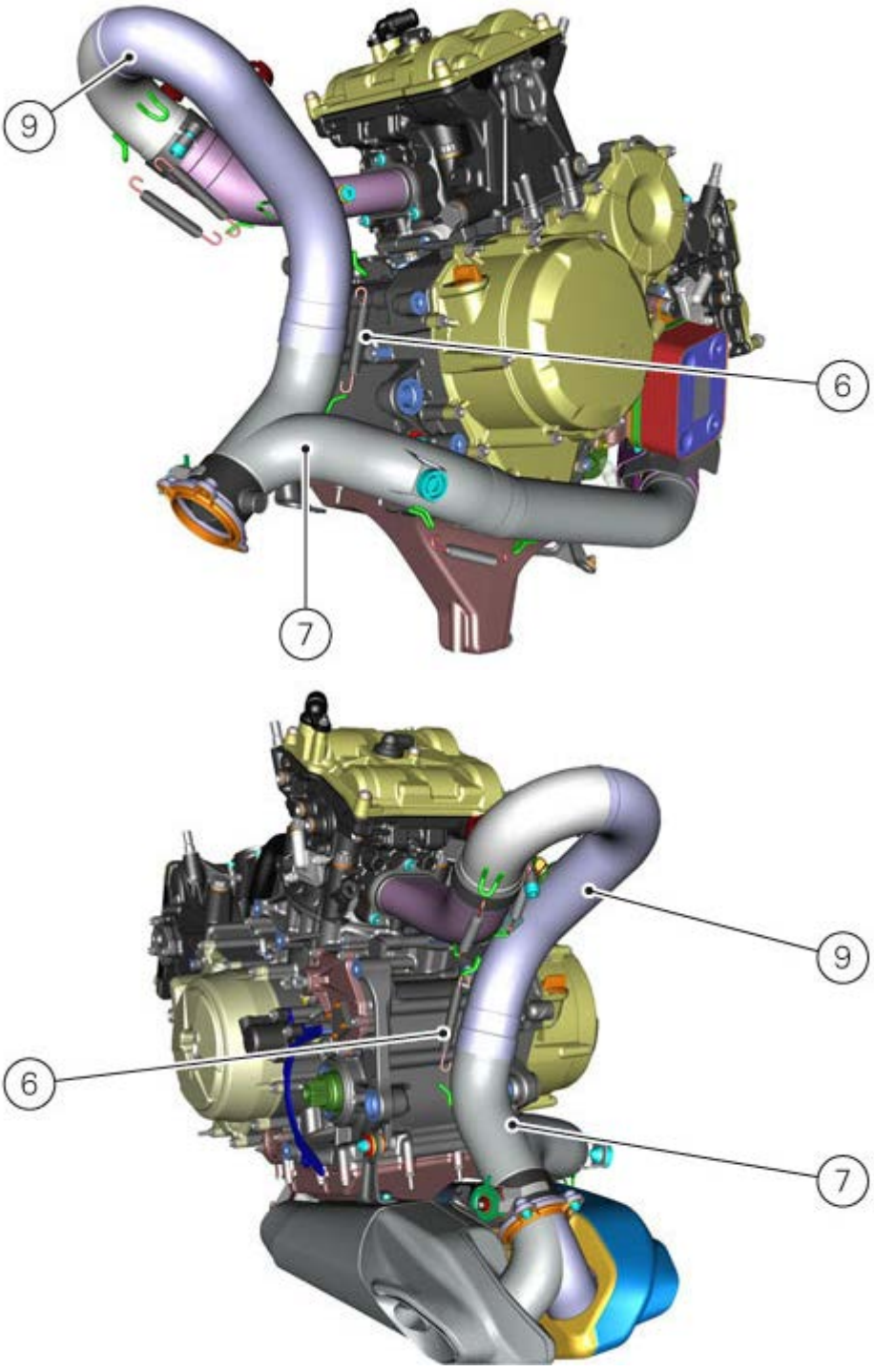




Apply specified grease on the lambda sensor thread (10).
Start lambda sensor (10), tighten ring nut (B) to the vertical cylinder exhaust pipe (9).



Insert the central exhaust pipe (7) in the vertical cylinder exhaust pipe (9).
Fit springs (6) that retain the central exhaust pipe (7) to the vertical cylinder head exhaust pipe (9).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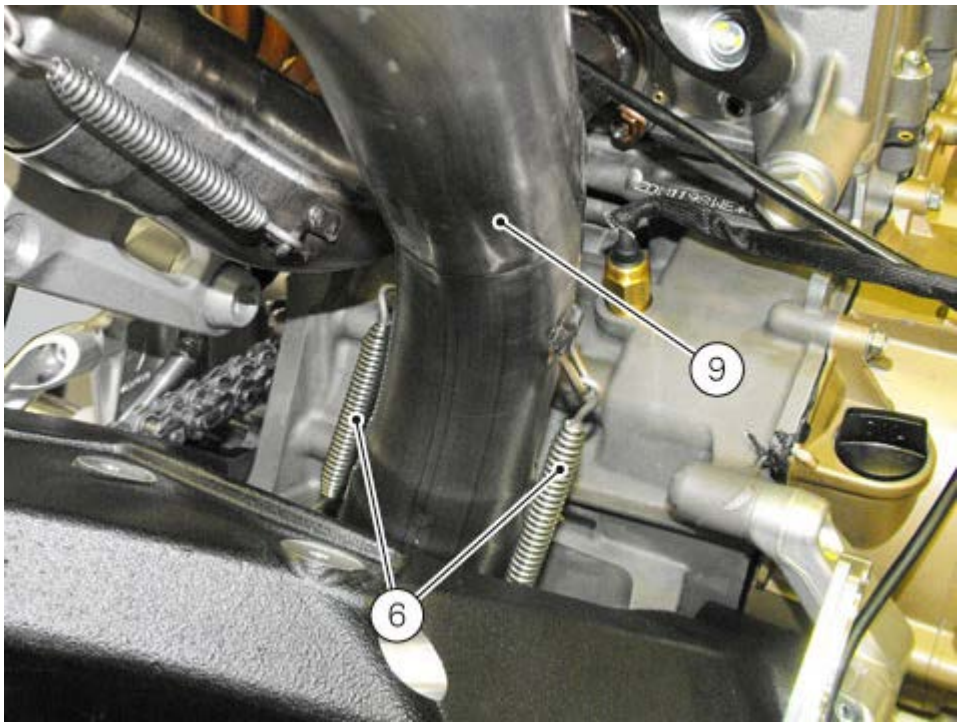
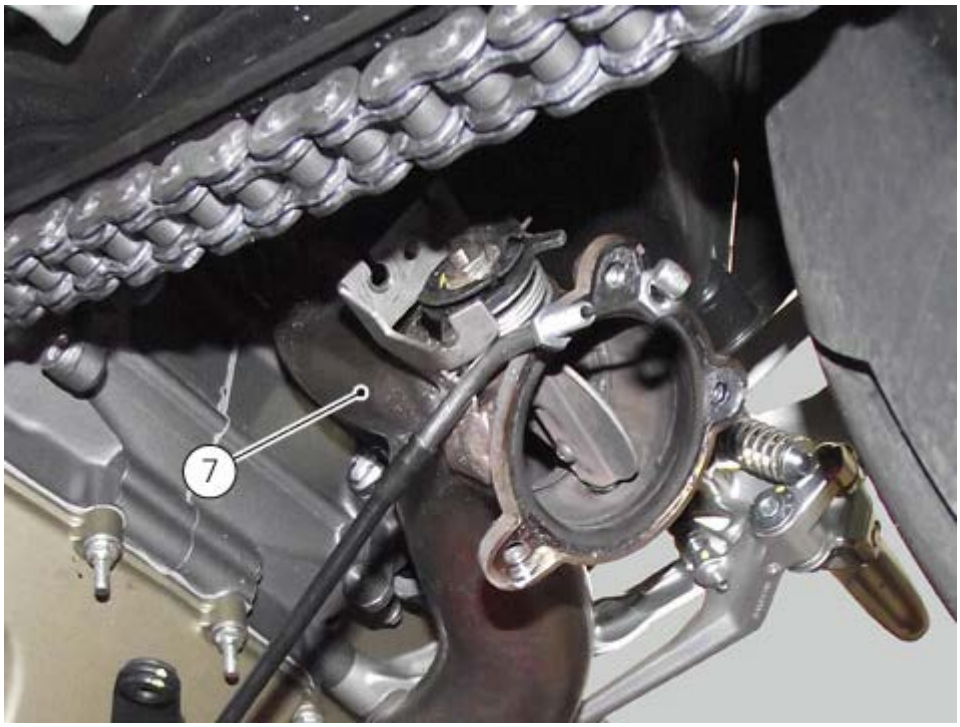
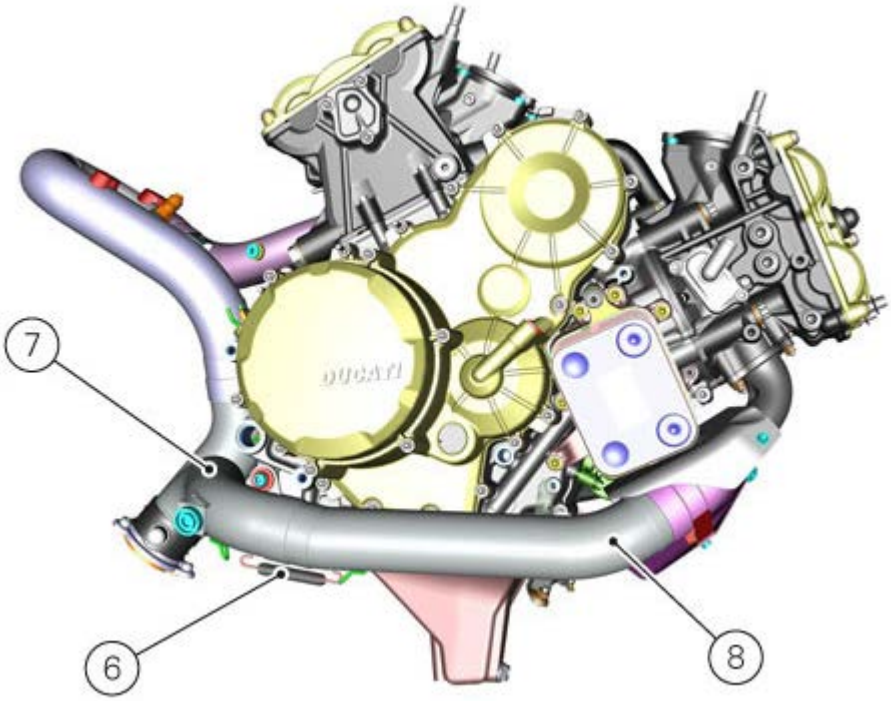
6
9
7





Insert the central exhaust pipe (7) in the horizontal cylinder exhaust pipe (8).
Fit the spring (6) that retains the central exhaust pipe (7) to the horizontal cylinder head exhaust pipe (8).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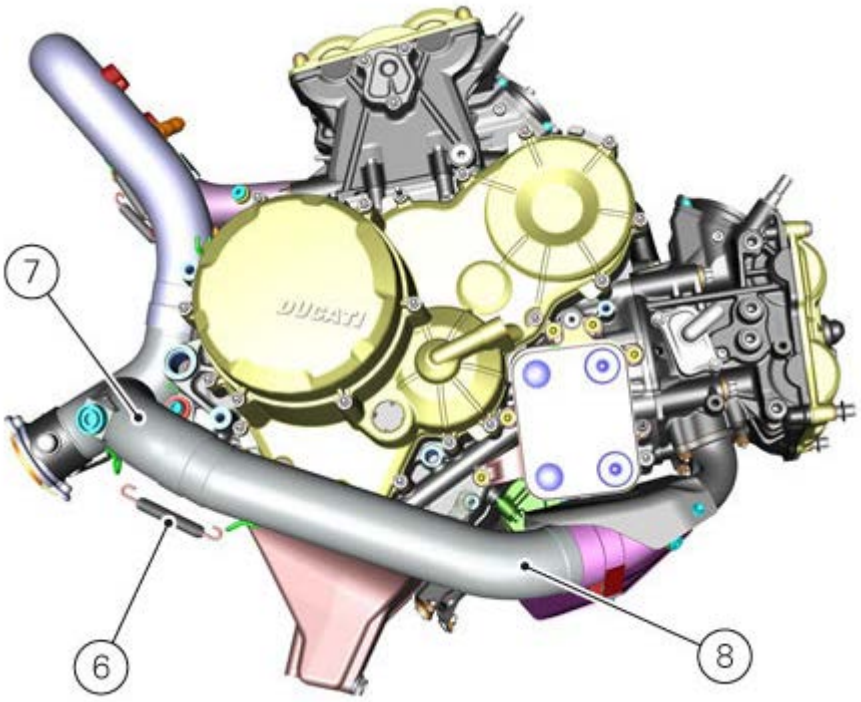
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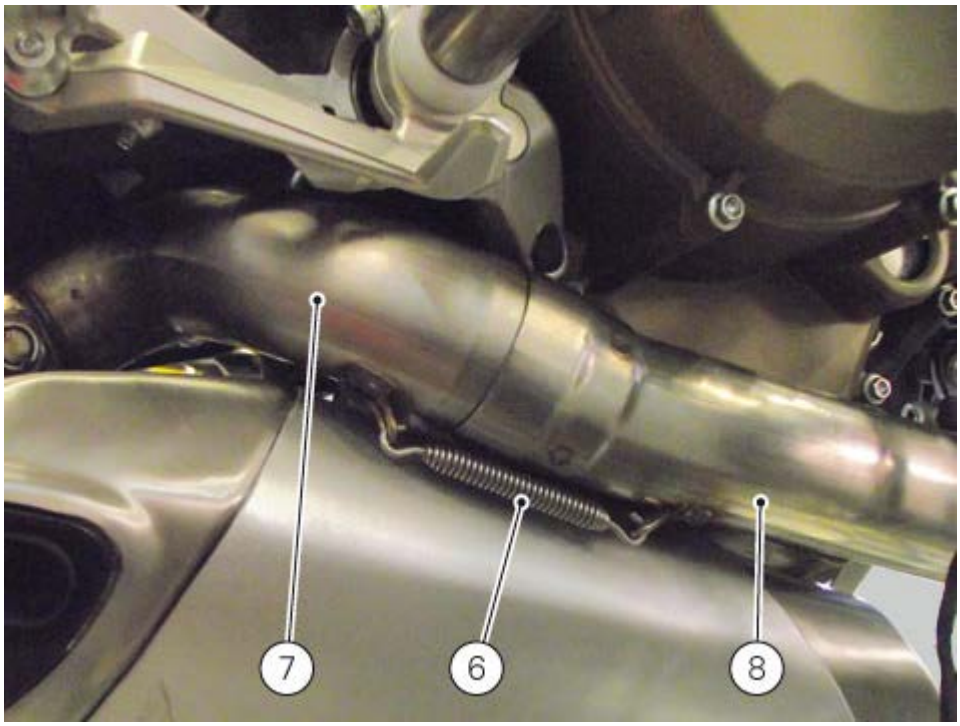
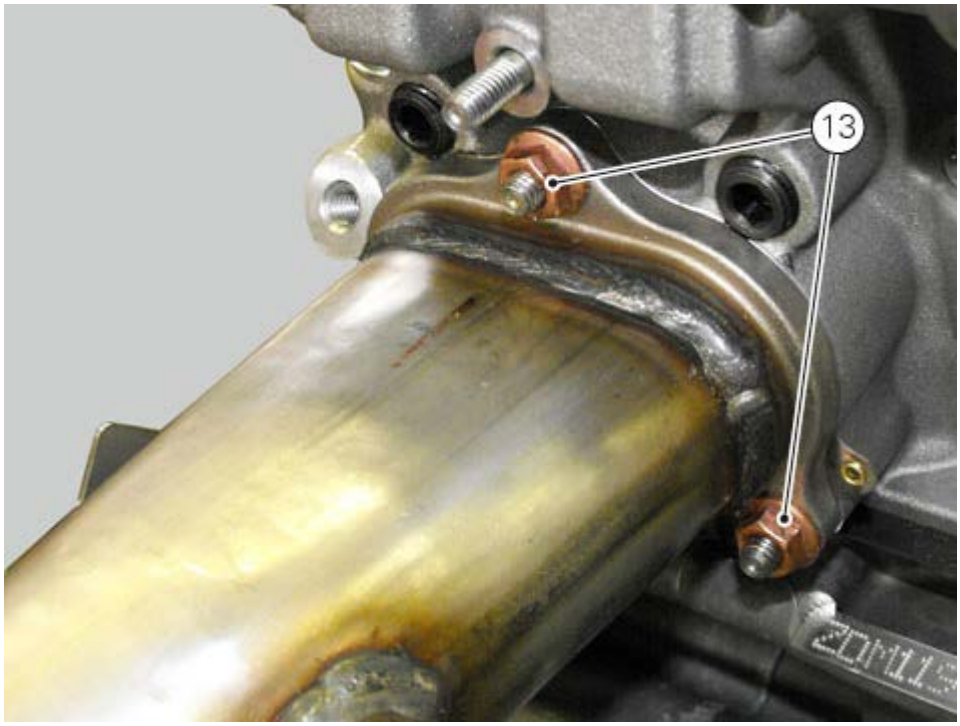
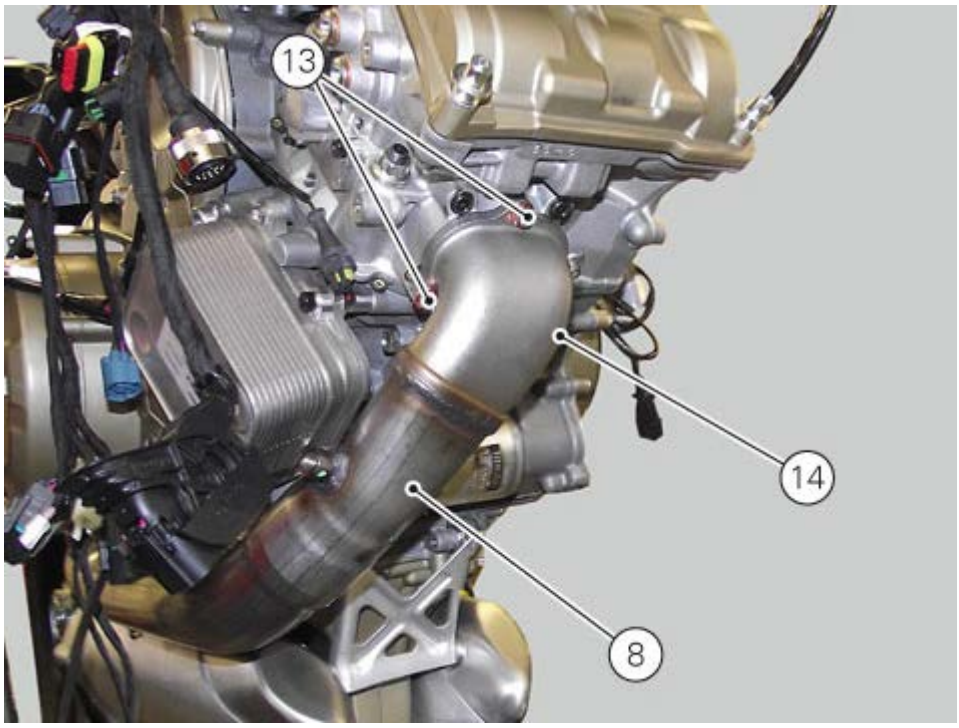


Tighten nuts (13), that retain the exhaust manifolds to the heads, to a torque of 10 Nm ± 10%.




13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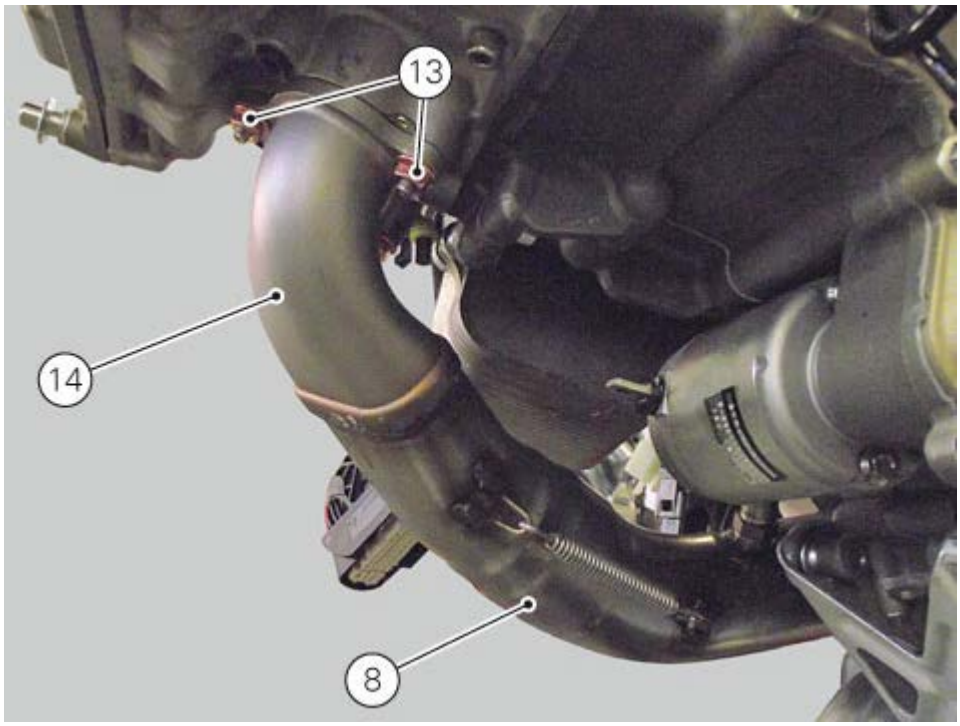
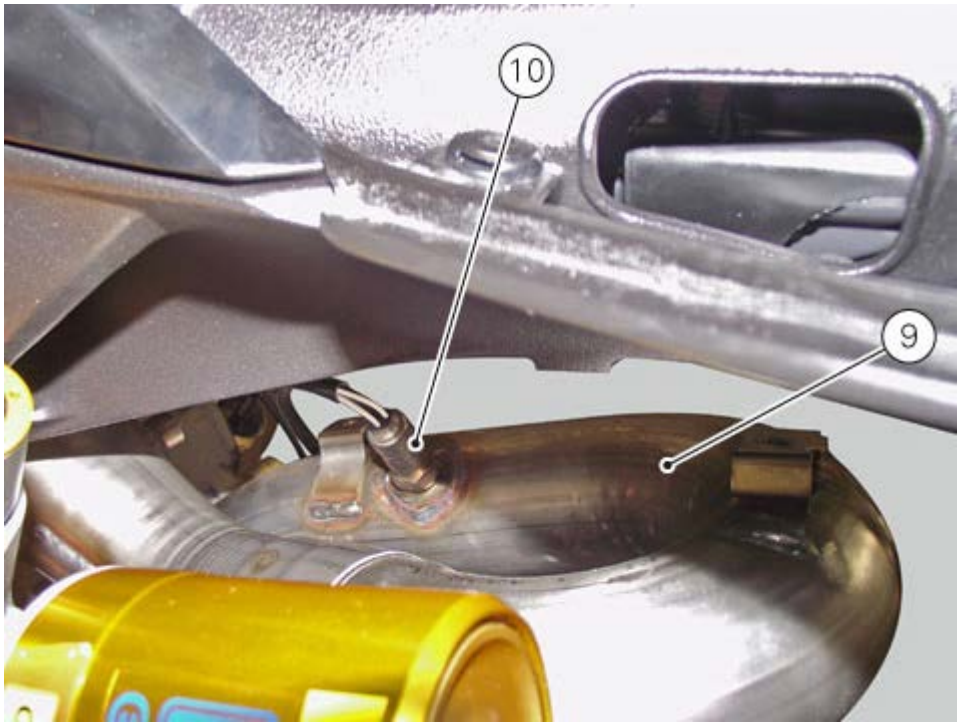
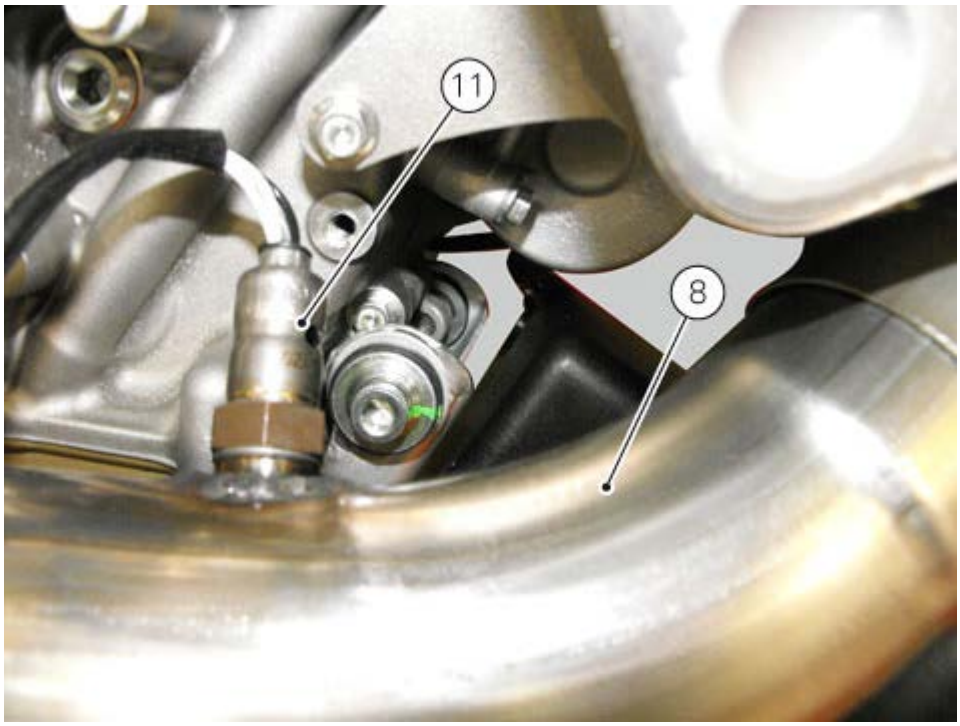
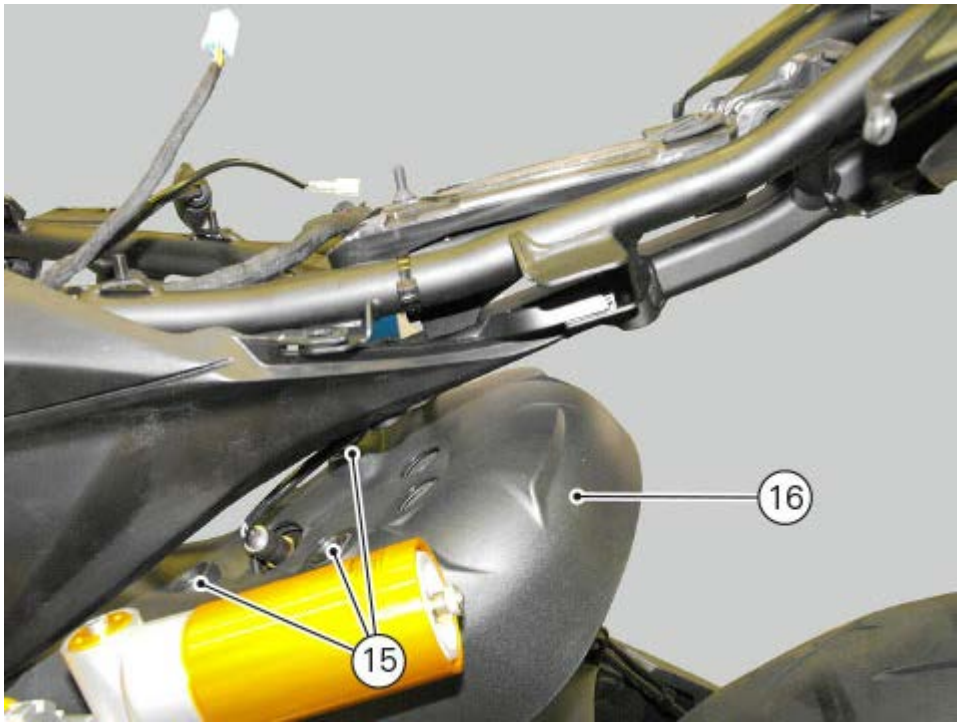


Tighten lambda sensors (10) and (11) to a torque of ± 25 Nm 10%.

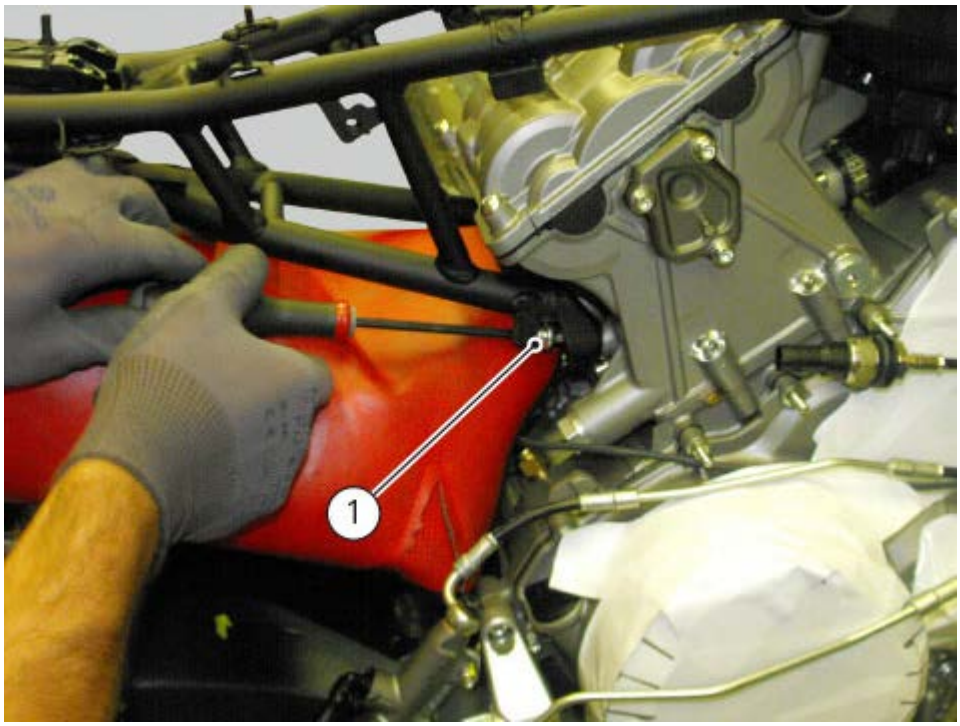


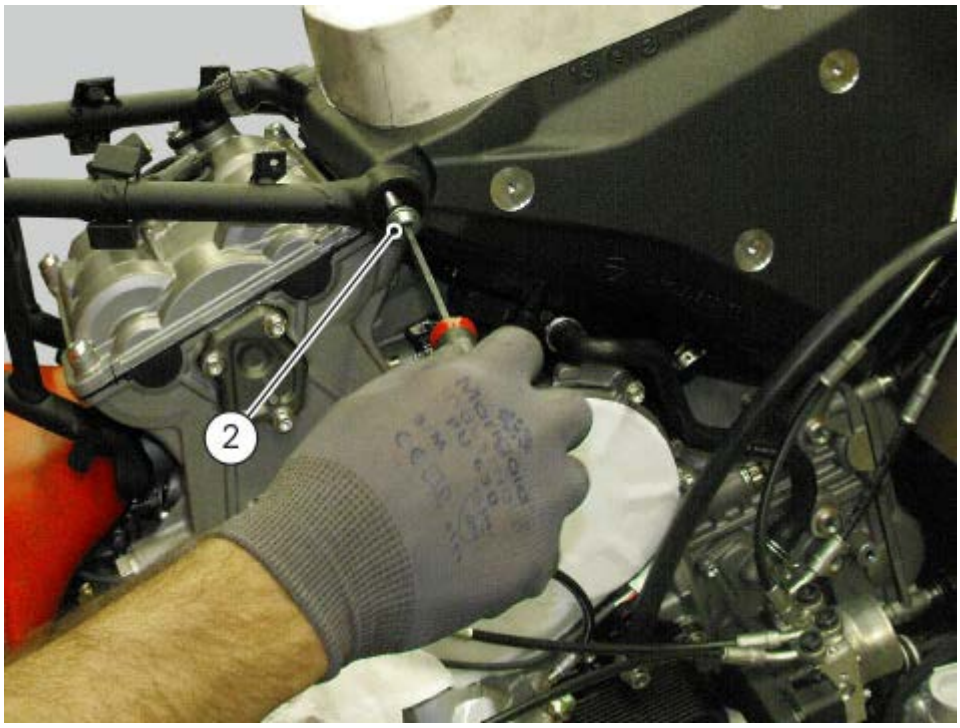


Position the heat guard (16) on the pipe. Tighten screws (15) to a torque of 5 Nm ± 10%.



Lower the rear subframe and tighten screws (1) and (2) that retain the rear subframe as described under “Refitting the structural parts and frame”.



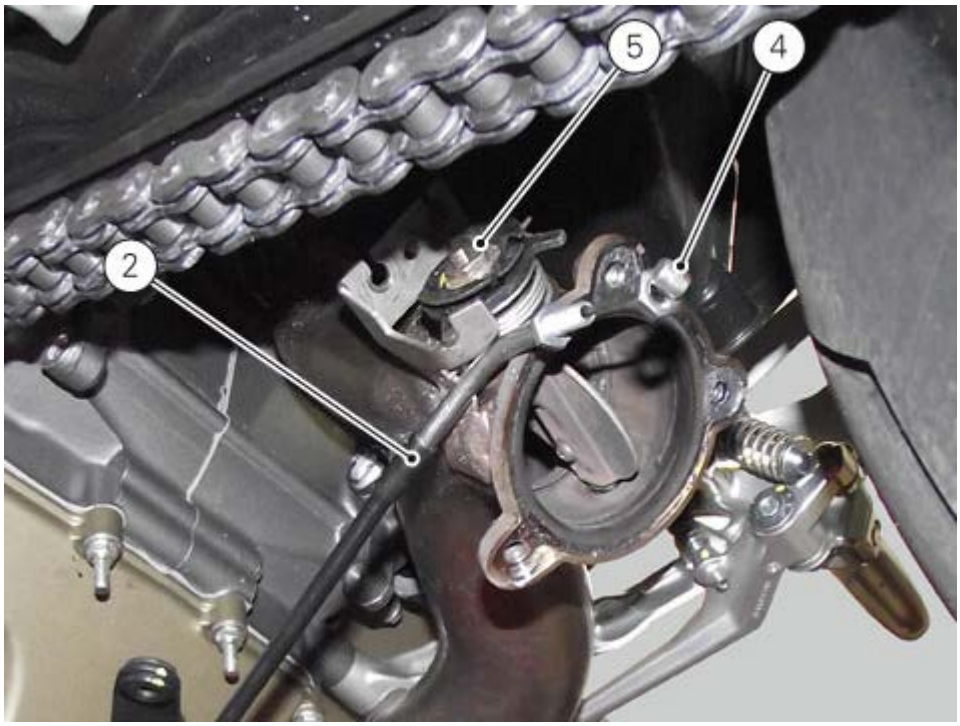


Position control cable (2) in plate (3). Insert nipple (4) onto exhaust valve (5) and block it by tightening nut (1) fully home on plate (3).

Warning

Make sure nipple (4) at the end of the cable is perfectly inserted on the pulley of the exhaust valve.

After assembly, the cable (22) on exhaust valve and the relevant motor is adjusted automatically by the instrument panel software, that causes the valve to open fully at the first key-on, and then to go back to rest position with the valve fully closed.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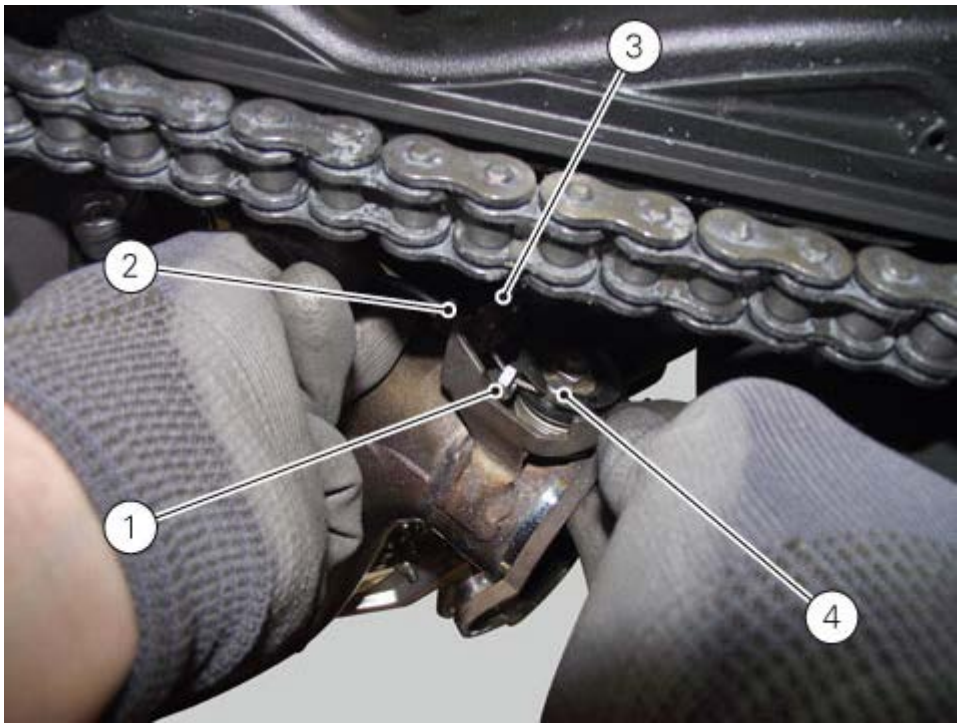
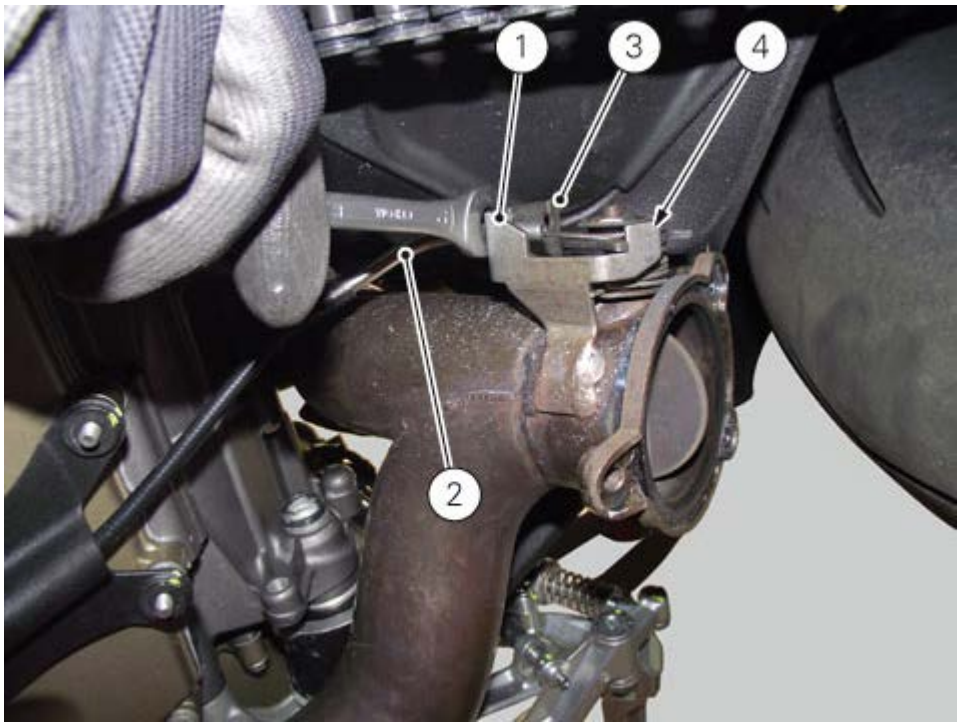
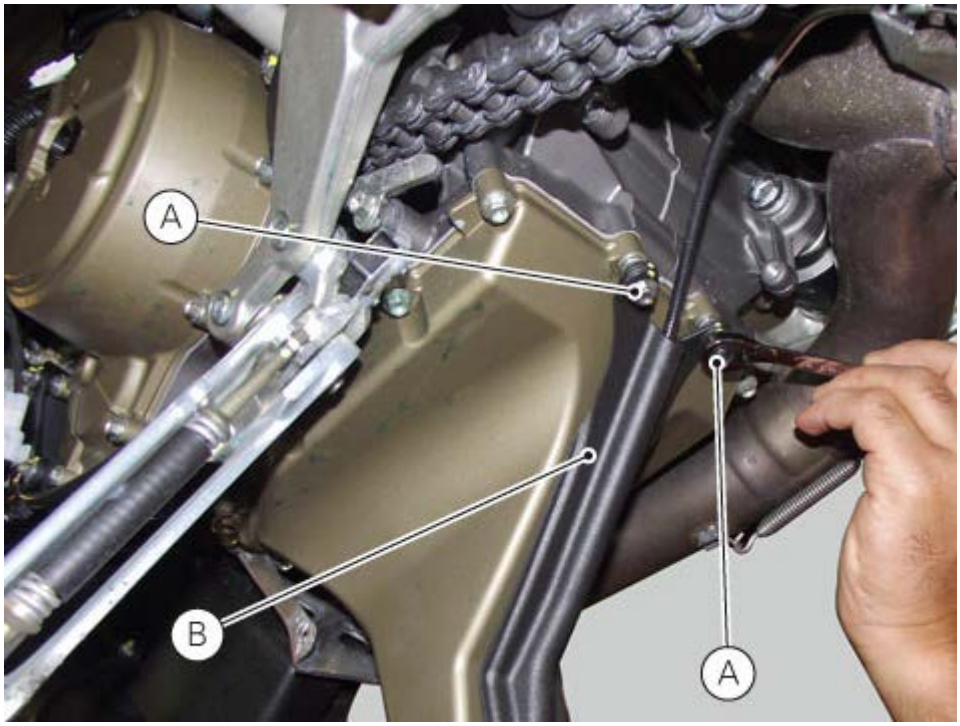

3
2
1
4



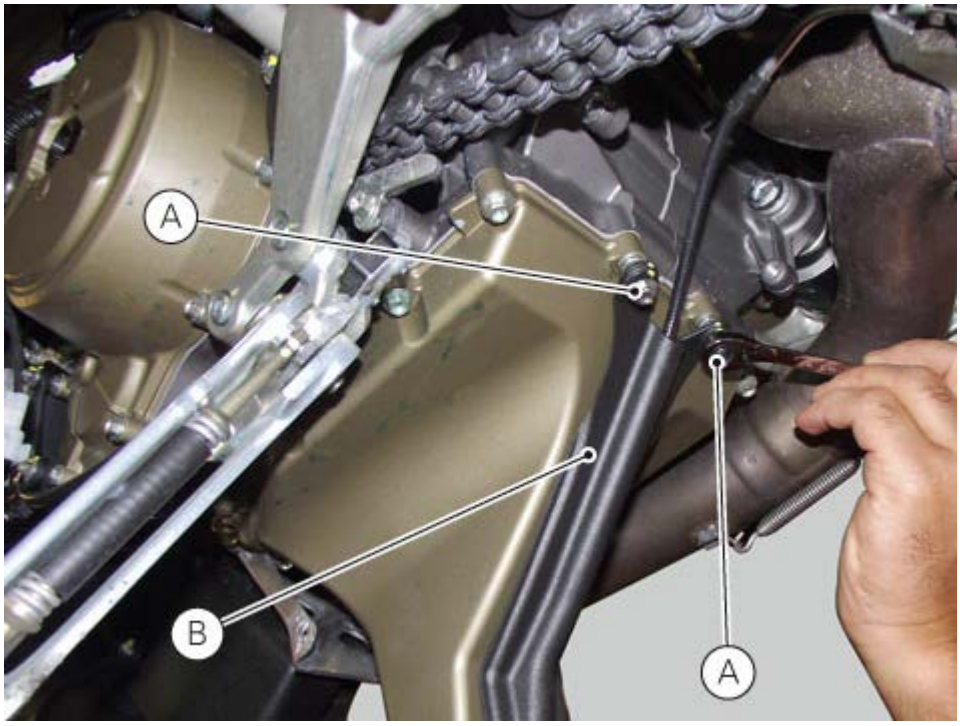
Reposition plate (B) and tighten nuts (A) to a torque of 6 Nm ± 10%.



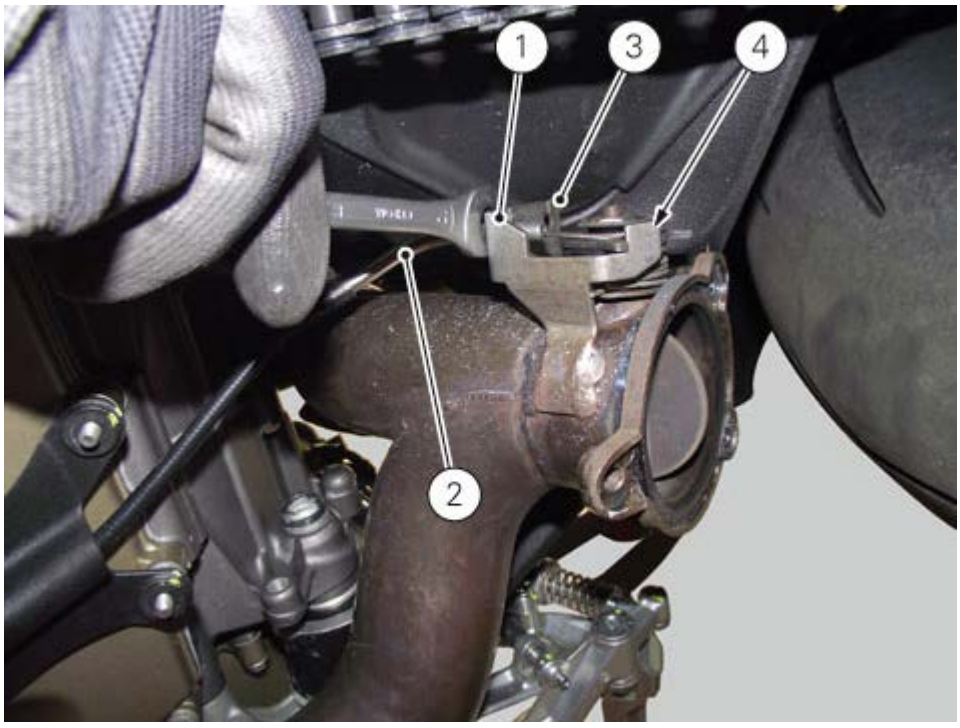
Refit the radiator support unit (Refitting the water radiators).
Refit the silencer (Refitting the silencer).
Refit the fairings (Refitting the side fairings).

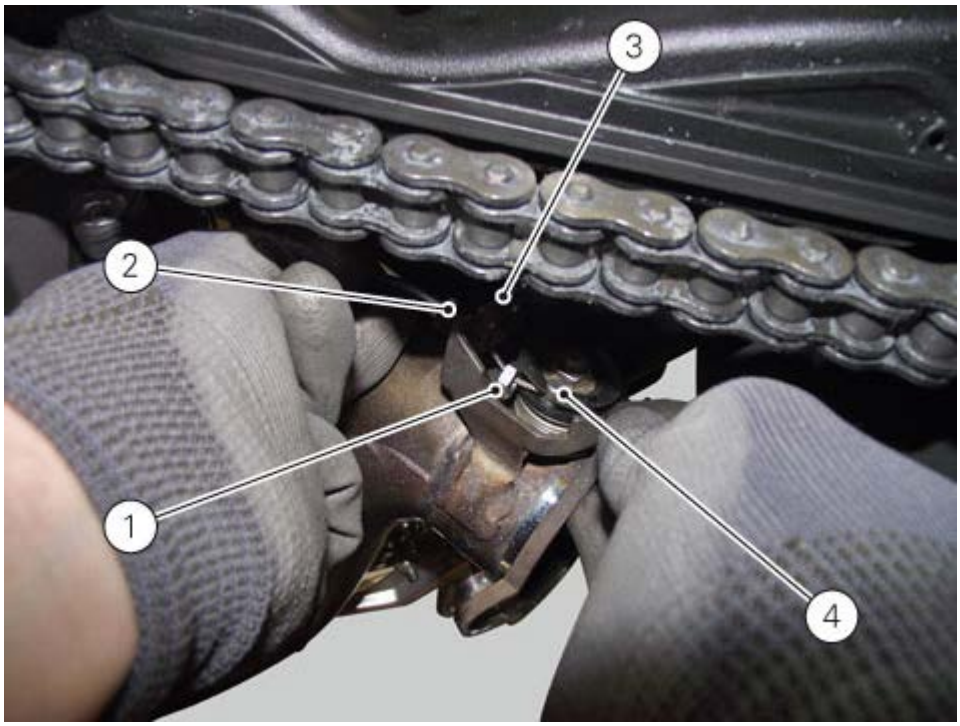
Removing the exhaust system

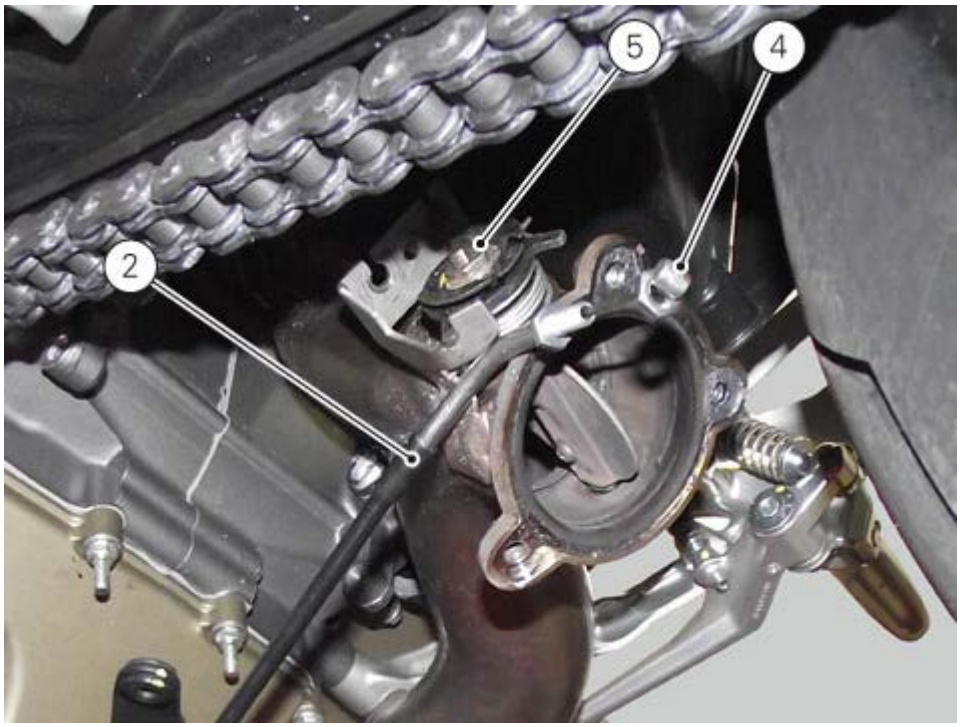
Remove the fairings (Removing the side fairings).
Remove the silencer (Removing the silencer).
Remove the radiator support unit (Removing the water radiator).
Loosen nuts (A) that retain plate (B) and remove the exhaust valve cable heat guard.



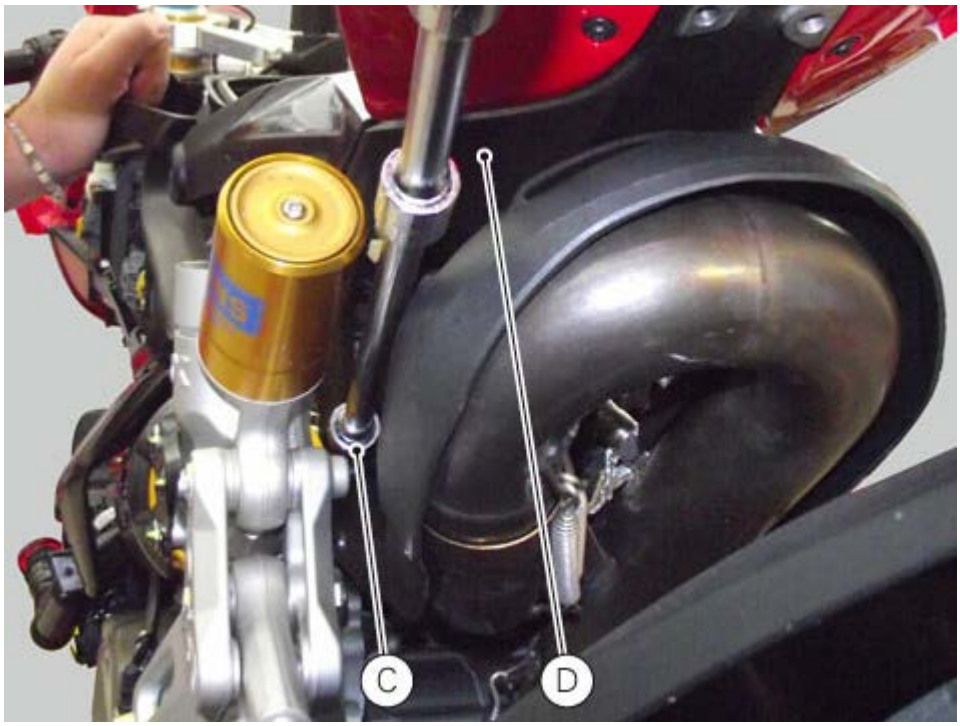
Loosen the adjuster nut (1) and separate control cable (2) from plate (3).
Release nipple (4) of cable (2) from the exhaust valve (5) and remove cable (2) of valve (5).

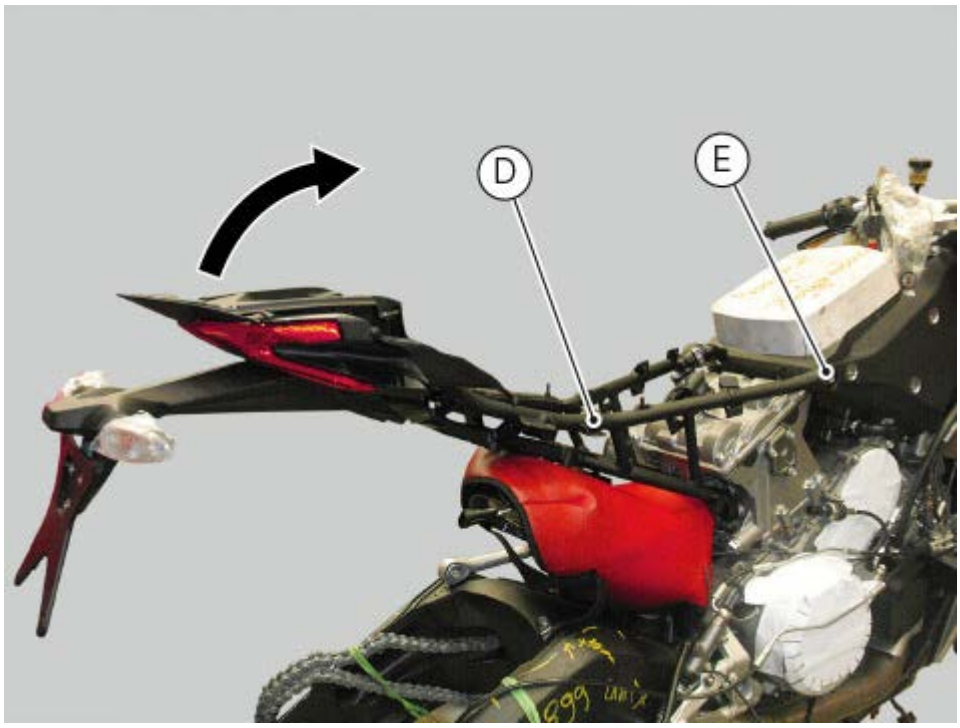




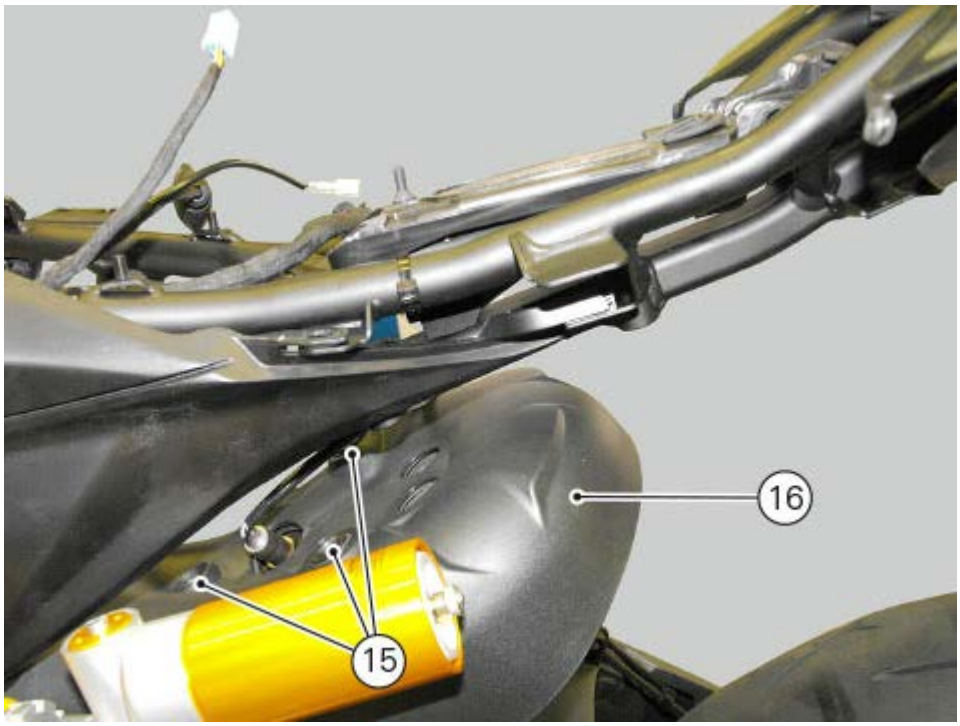


Loosen the two screws (C) that retain the rear subframe (D) and loosen the two screws (E) to lift the subframe.

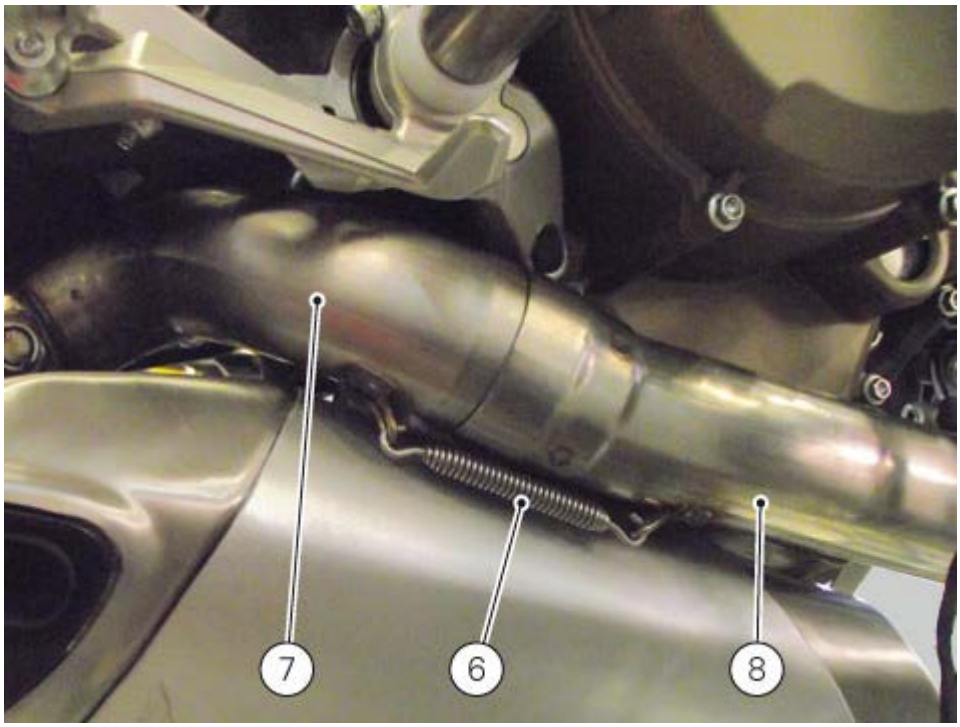


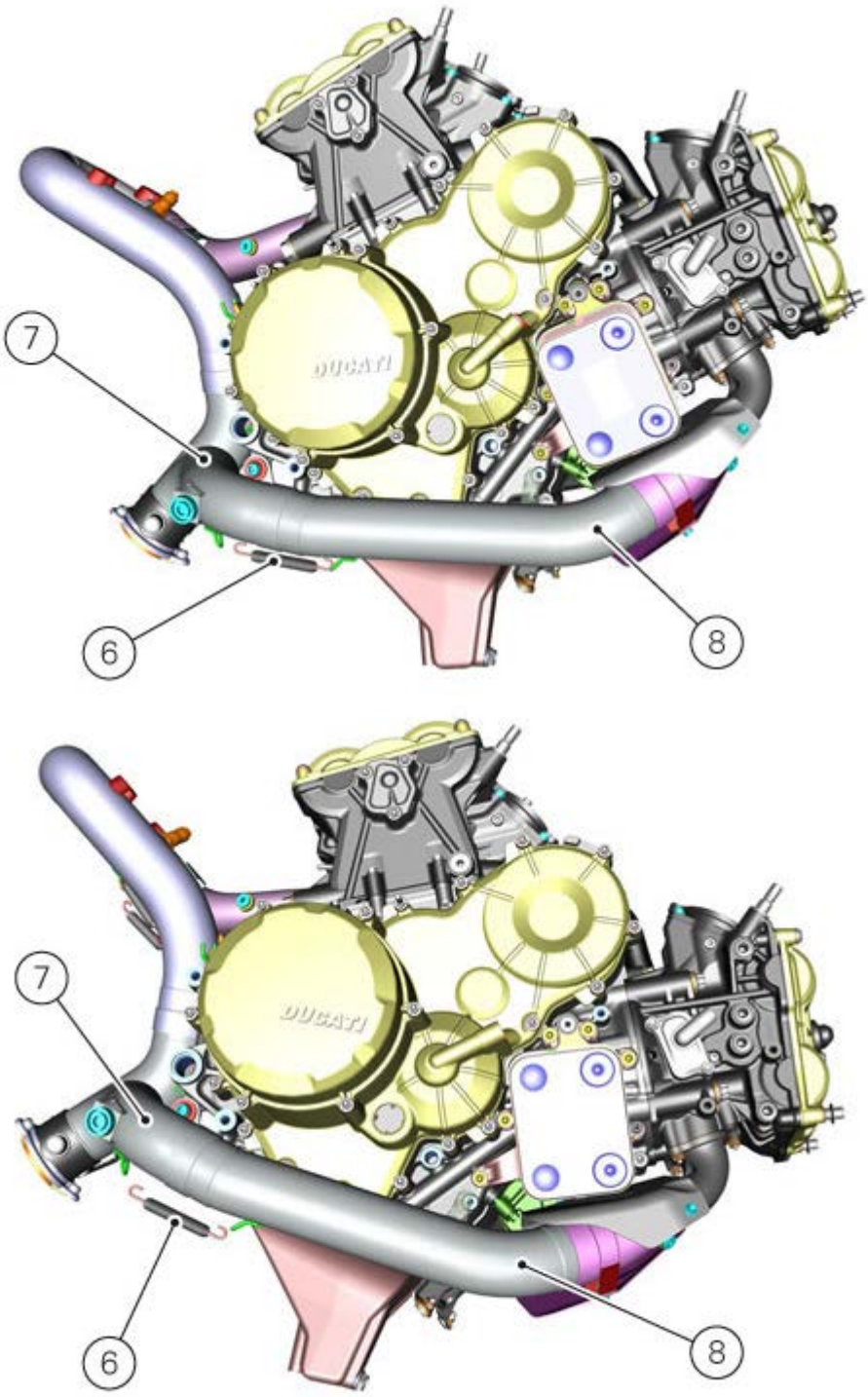


Undo screws (15) and remove heat guard (16).

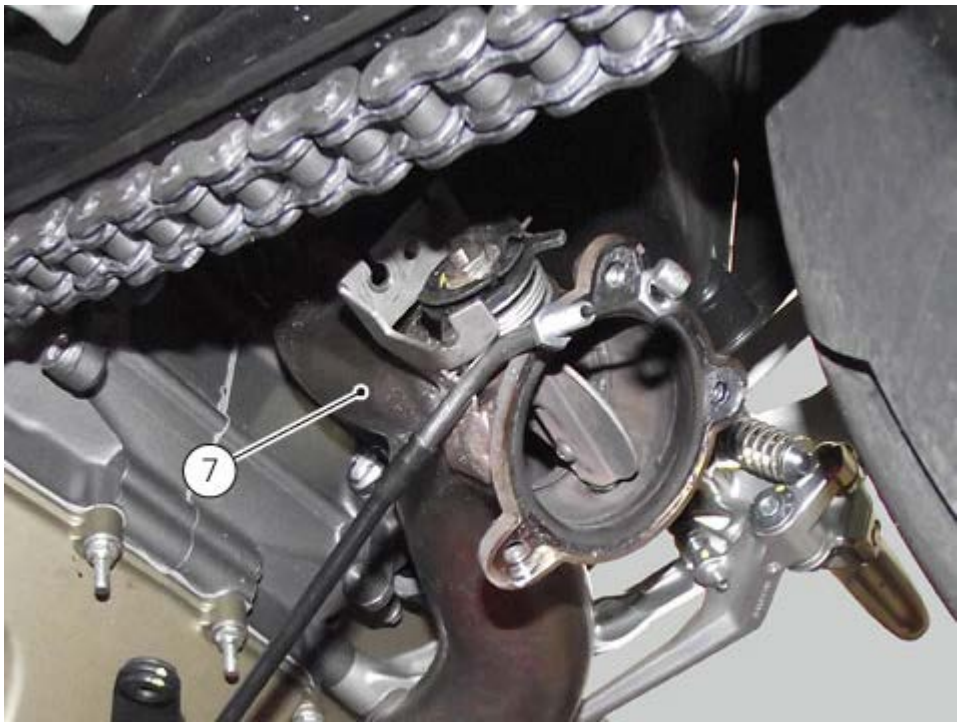


Remove the spring (6) that retains the central exhaust pipe (7) to the horizontal cylinder head exhaust pipe (8).





Remove springs (6) that retain the central exhaust pipe (7) to the vertical cylinder head exhaust pipe (9).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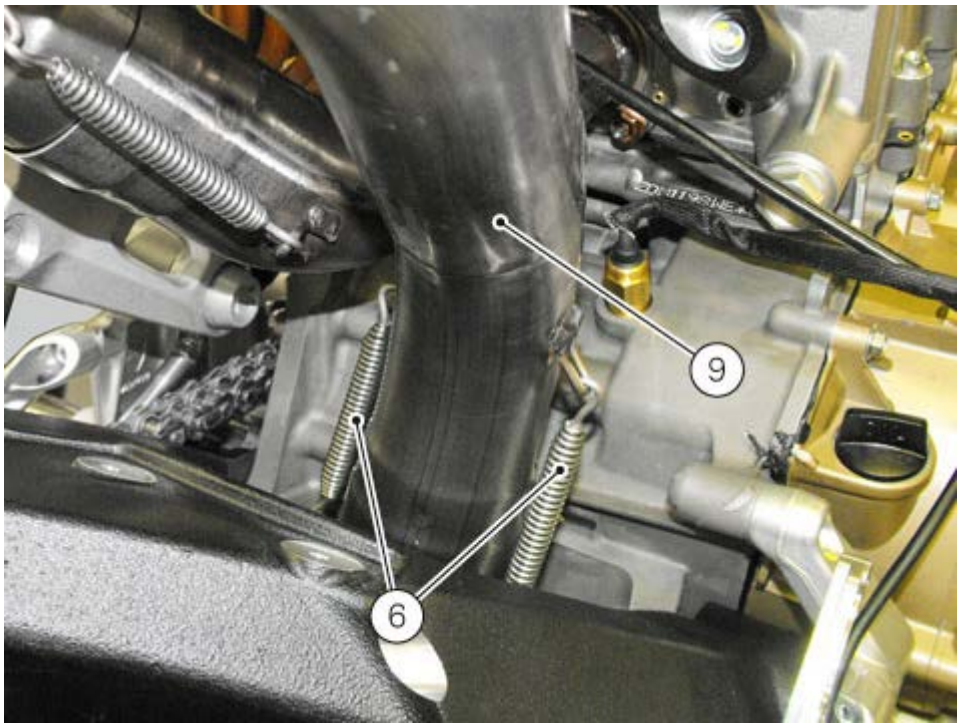
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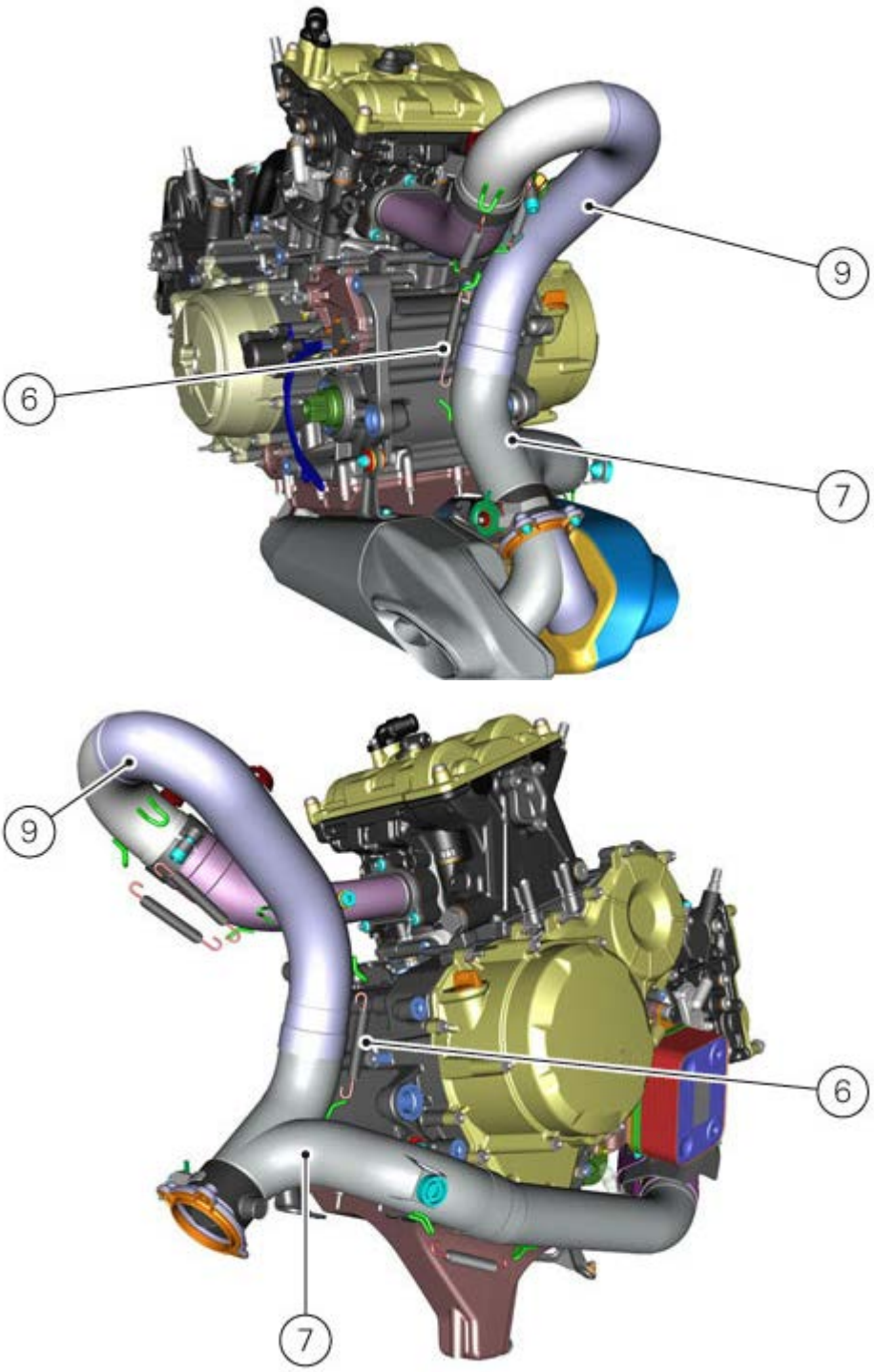
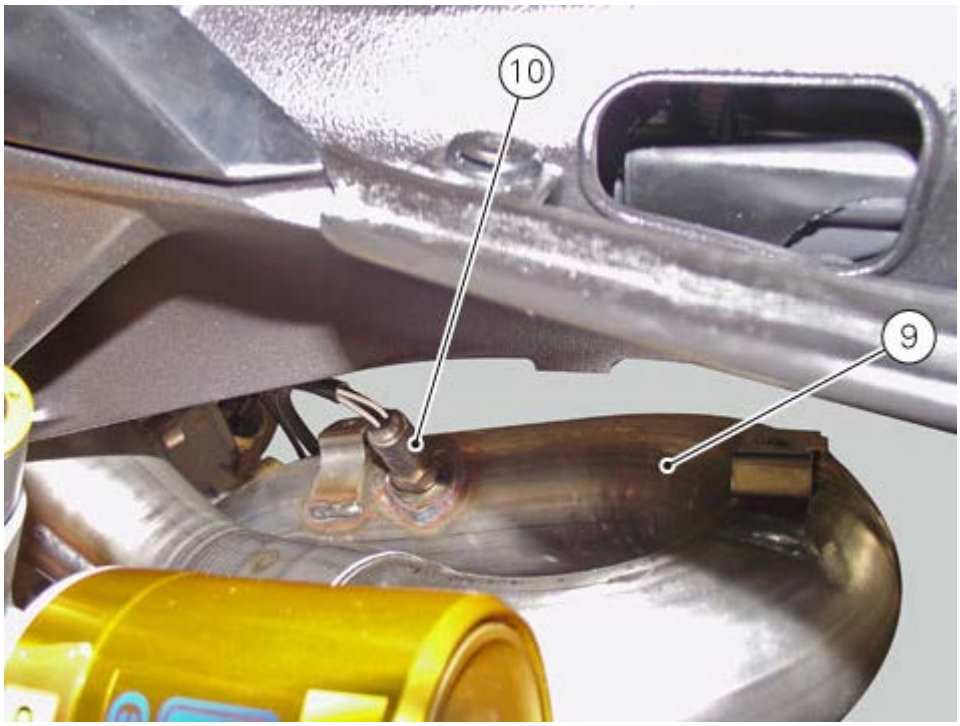
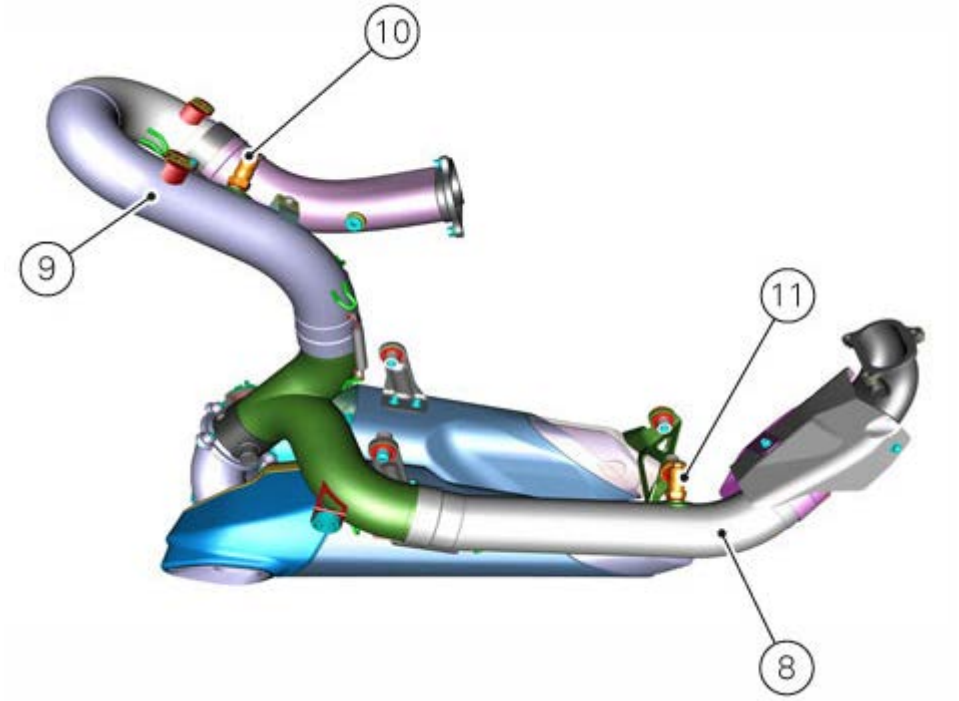
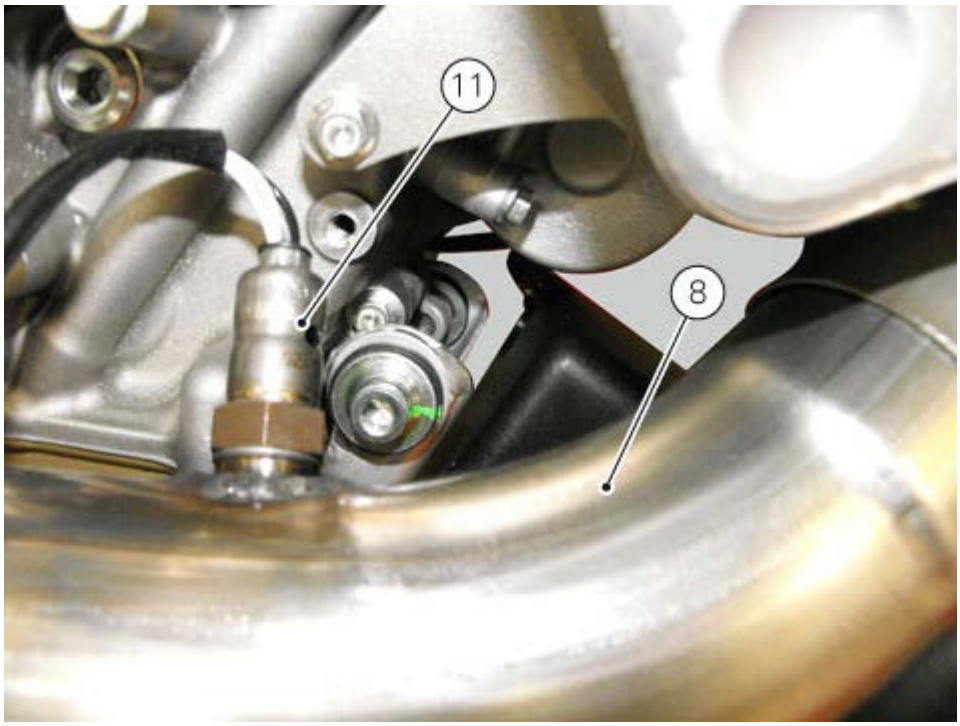


Loosen and remove lambda sensor (10) of the vertical cylinder exhaust pipe (9).

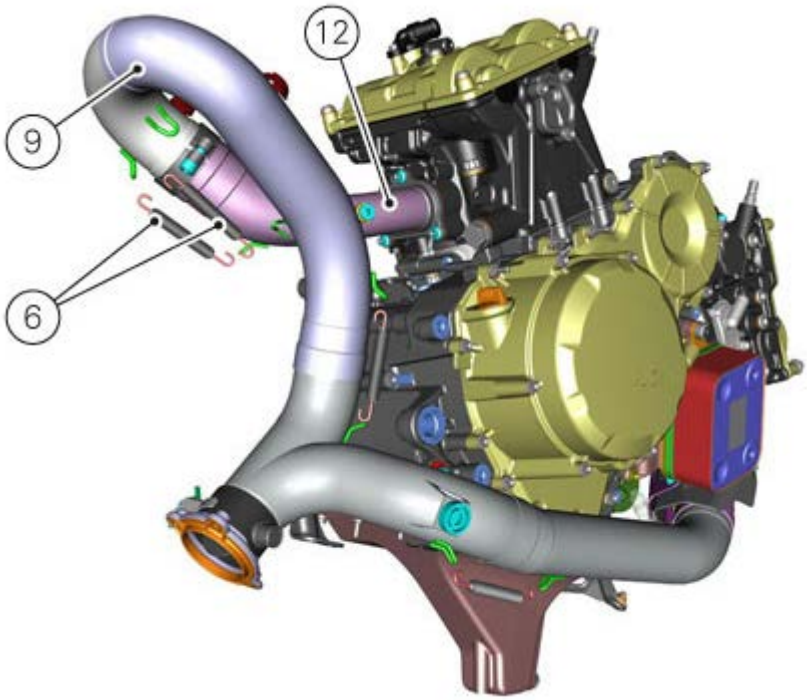


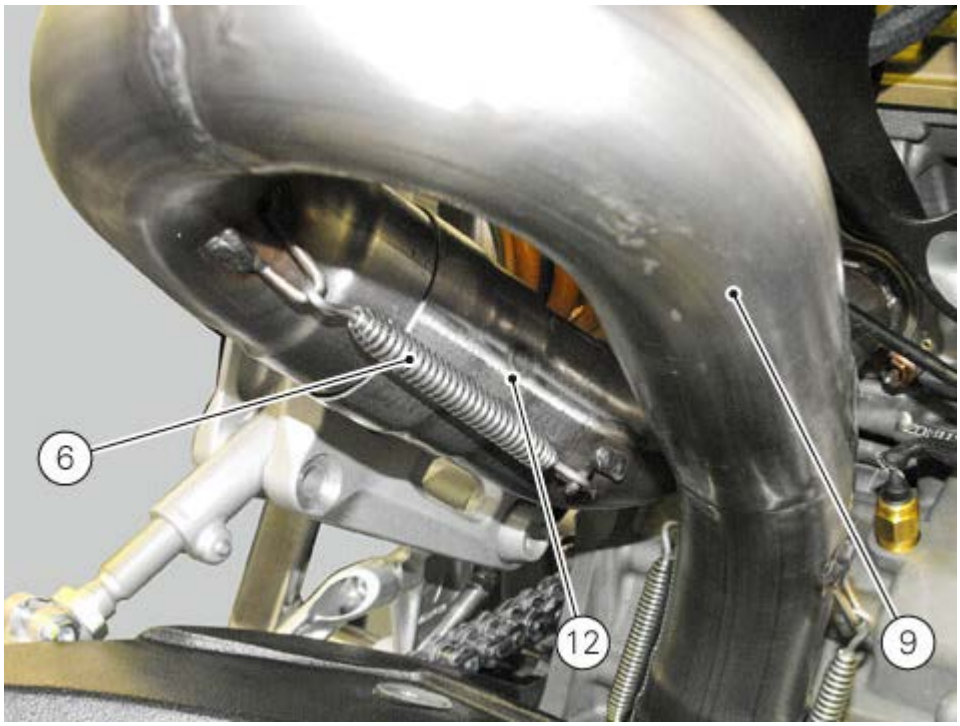


Loosen and remove lambda sensor (11) of the horizontal cylinder exhaust pipe (8).

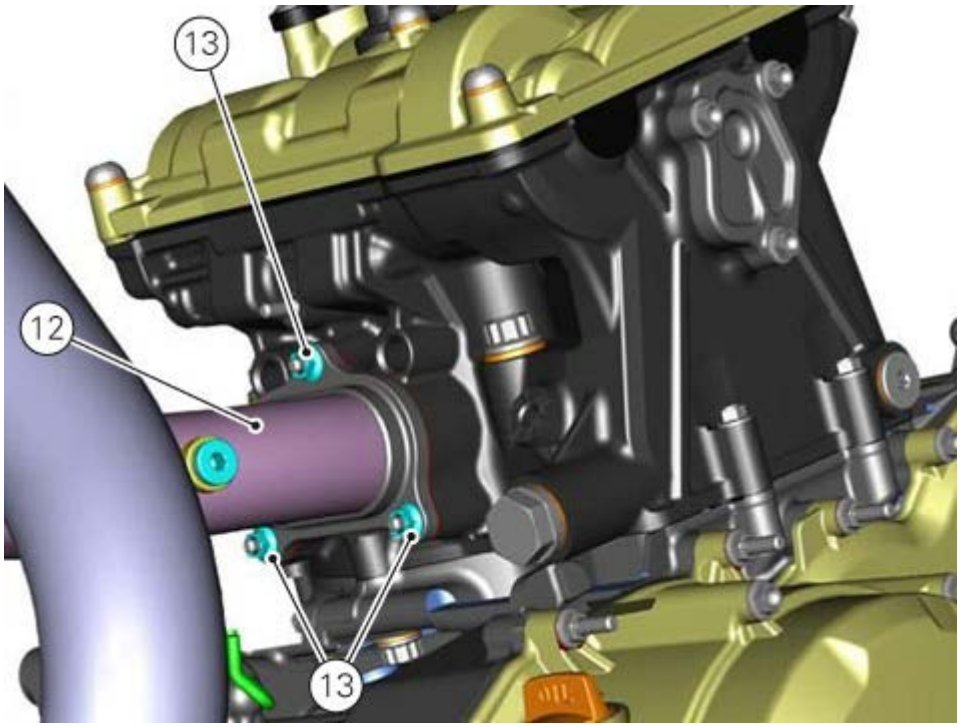


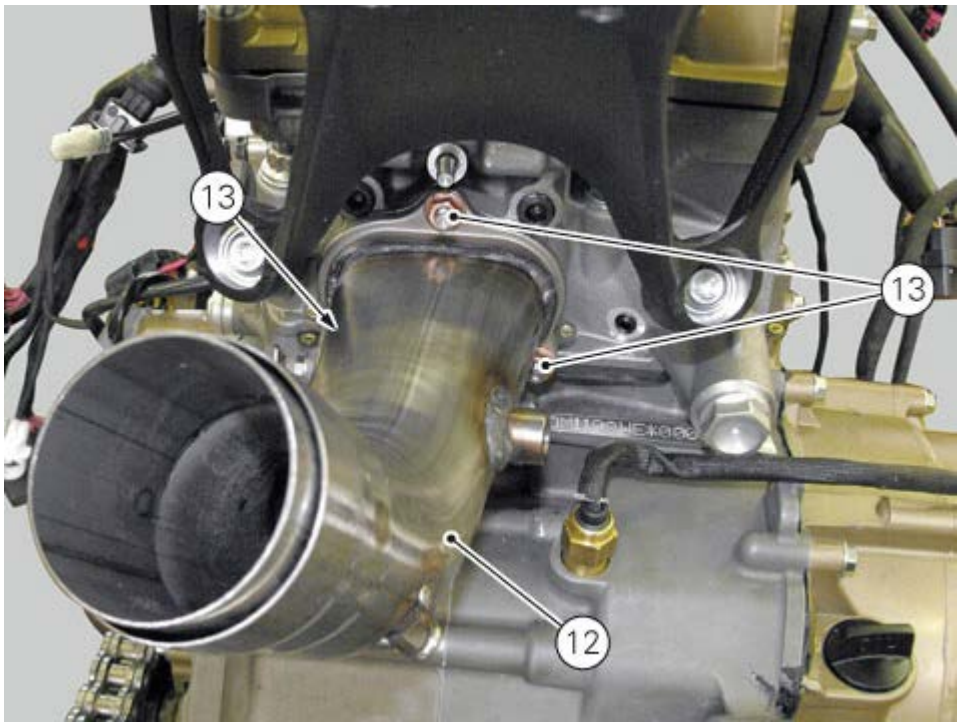
Remove springs (6) that retain the vertical cylinder exhaust pipe (9) to the vertical cylinder exhaust manifold (12).



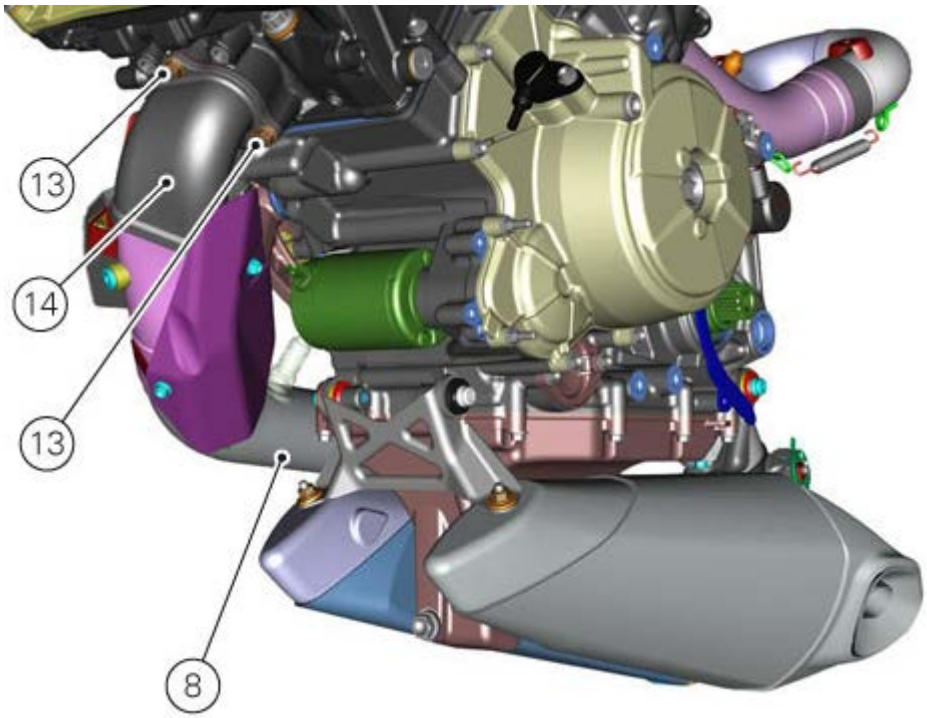


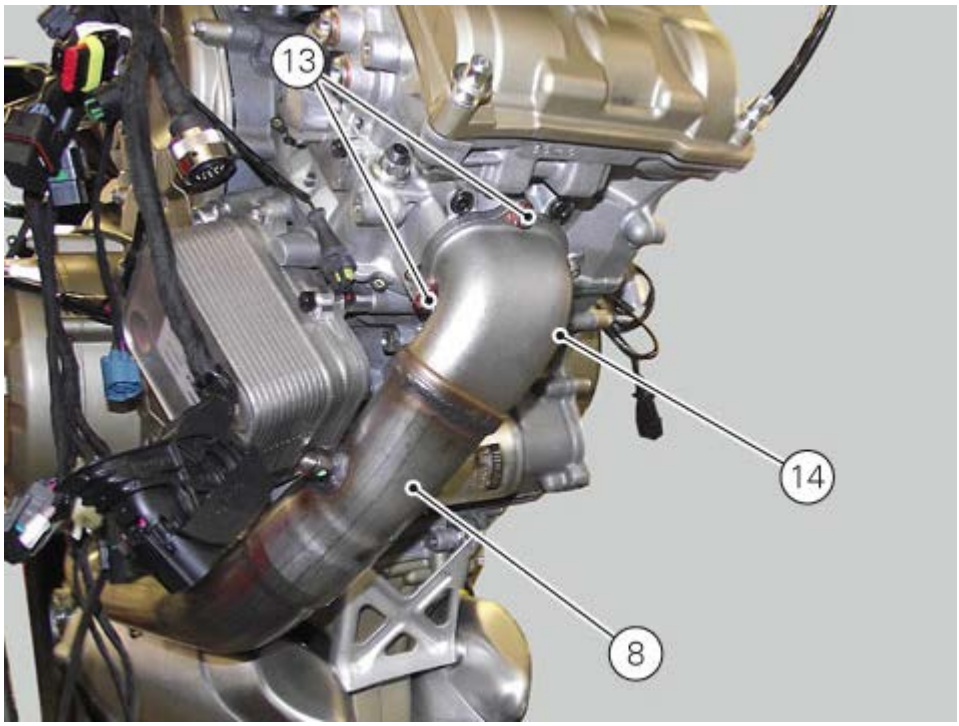
Loosen nuts (13) that retain the vertical cylinder exhaust manifold (12) and remove the manifold with the relevant gasket.





Loosen nuts (13) that retain the horizontal cylinder exhaust manifold (14) and the horizontal cylinder exhaust pipe (8) and the manifold with the relevant gasket.




13
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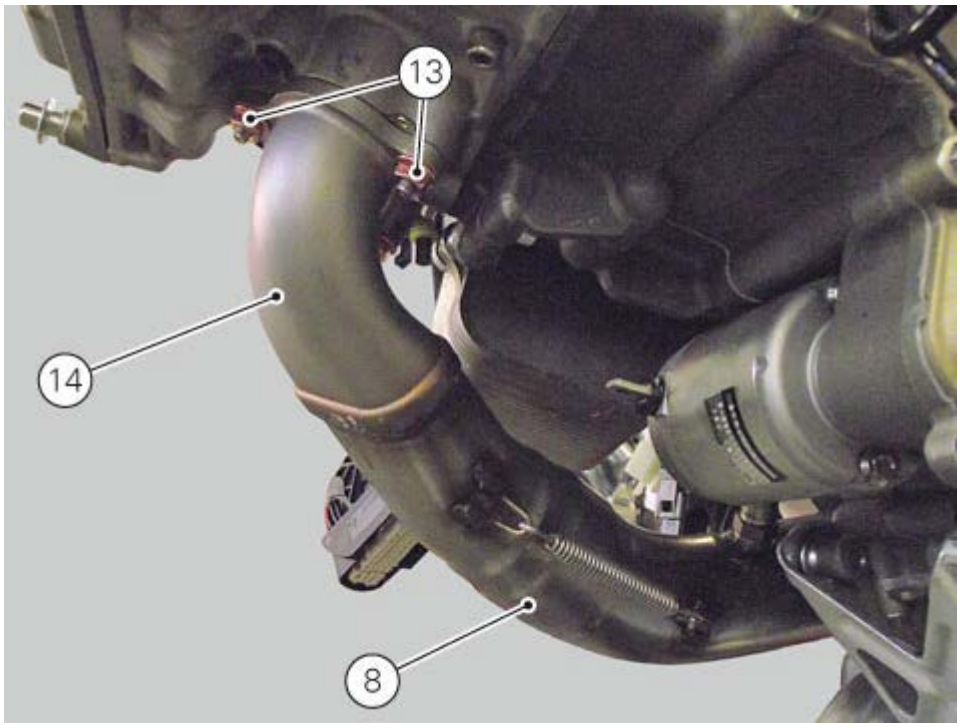
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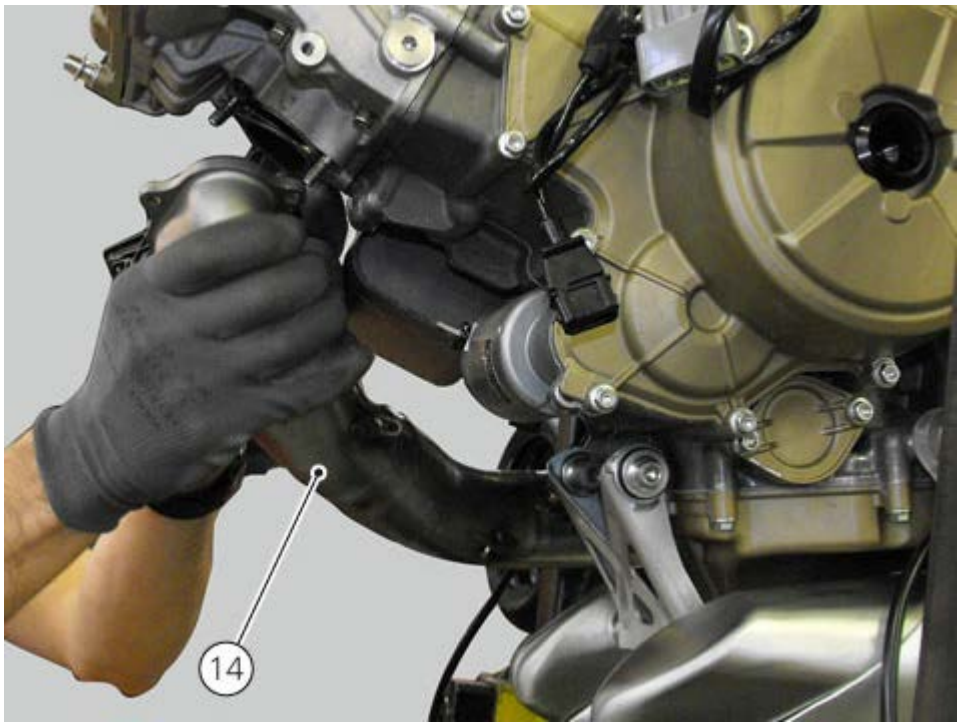
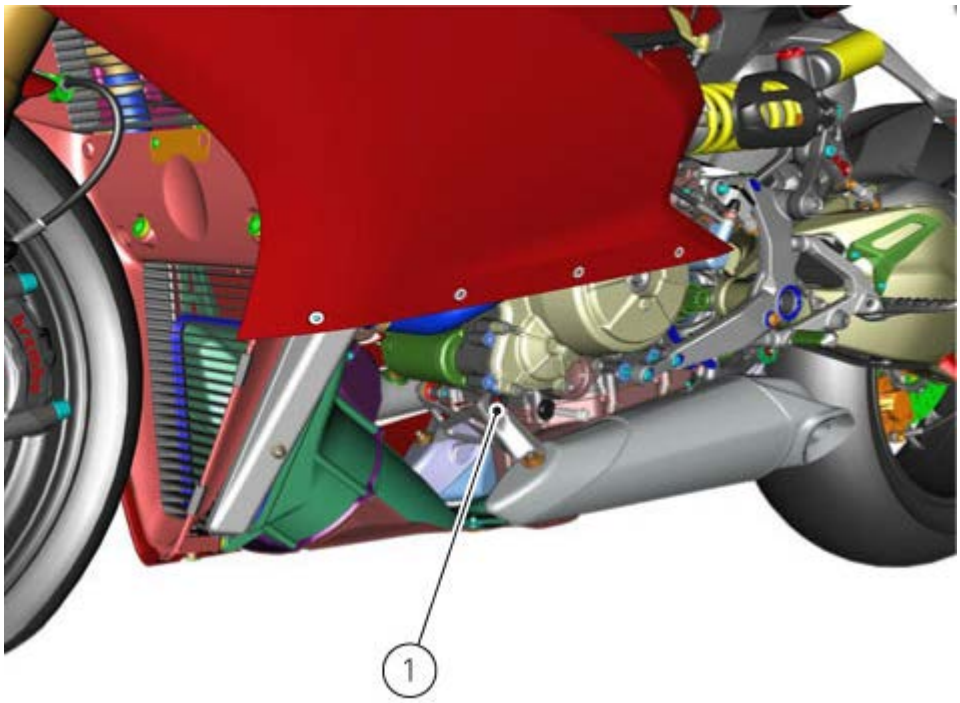
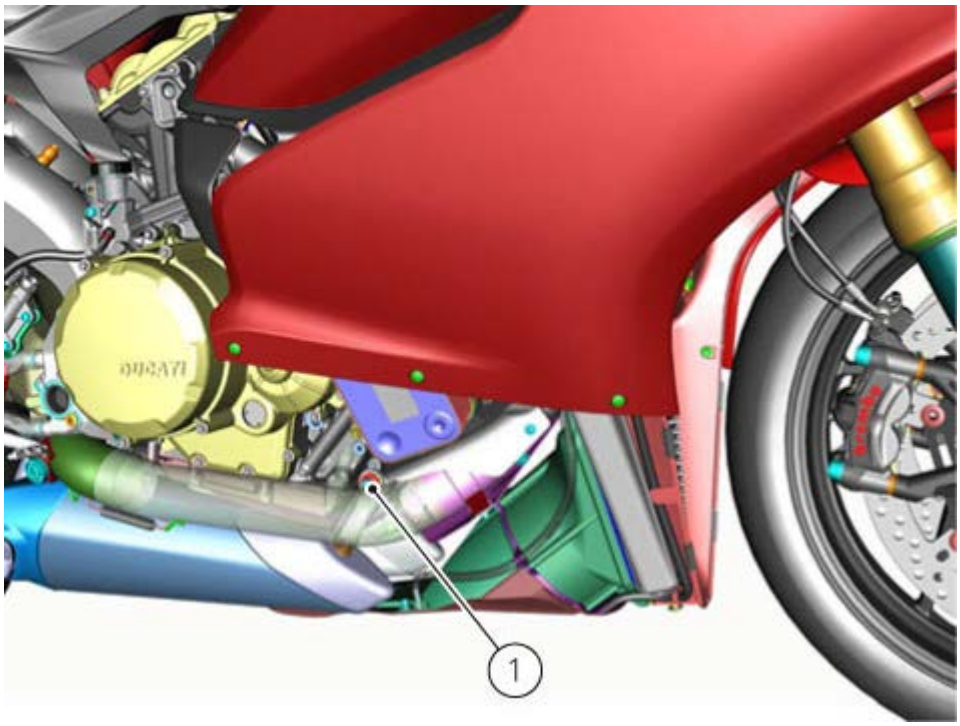
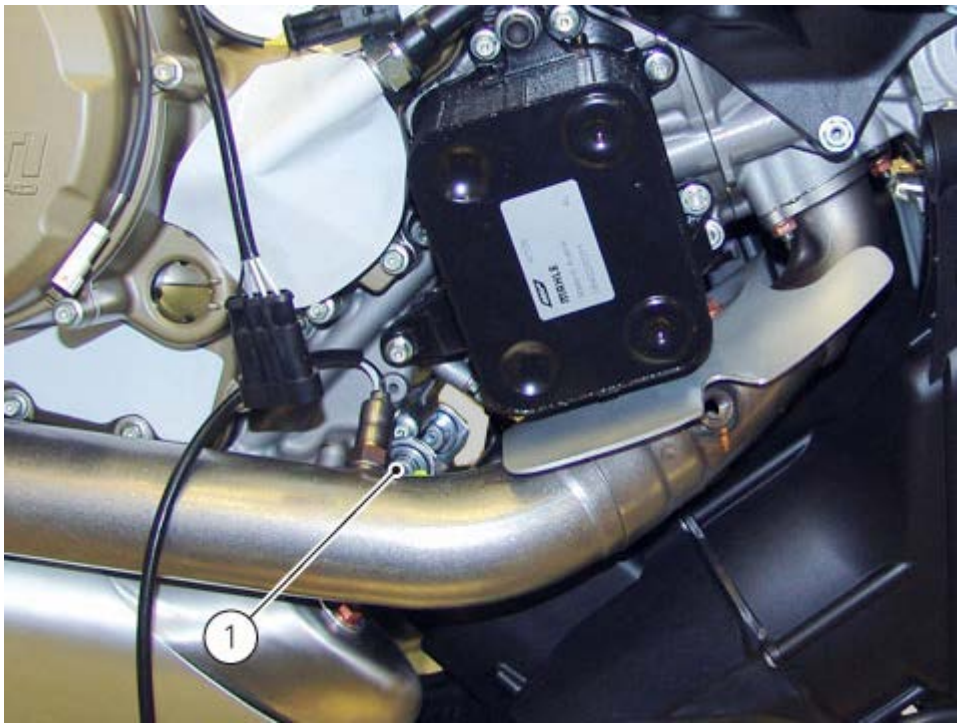

14

Removing the silencer

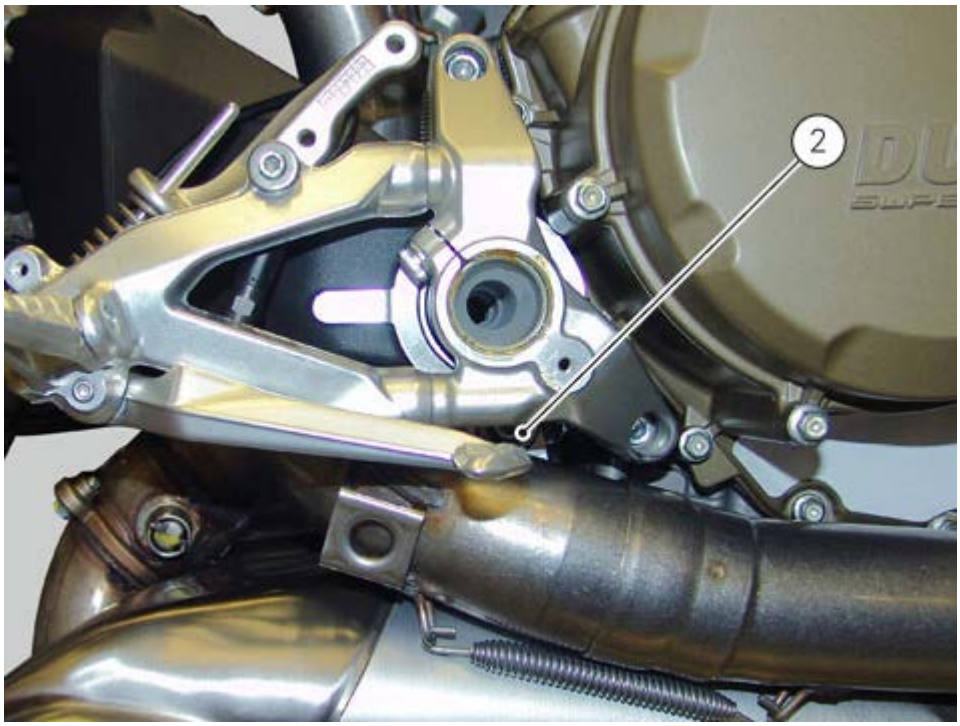
Remove the lower fairings (Removing the side fairings).
Loosen the two screws (1) that retain the silencer front side to the engine block.

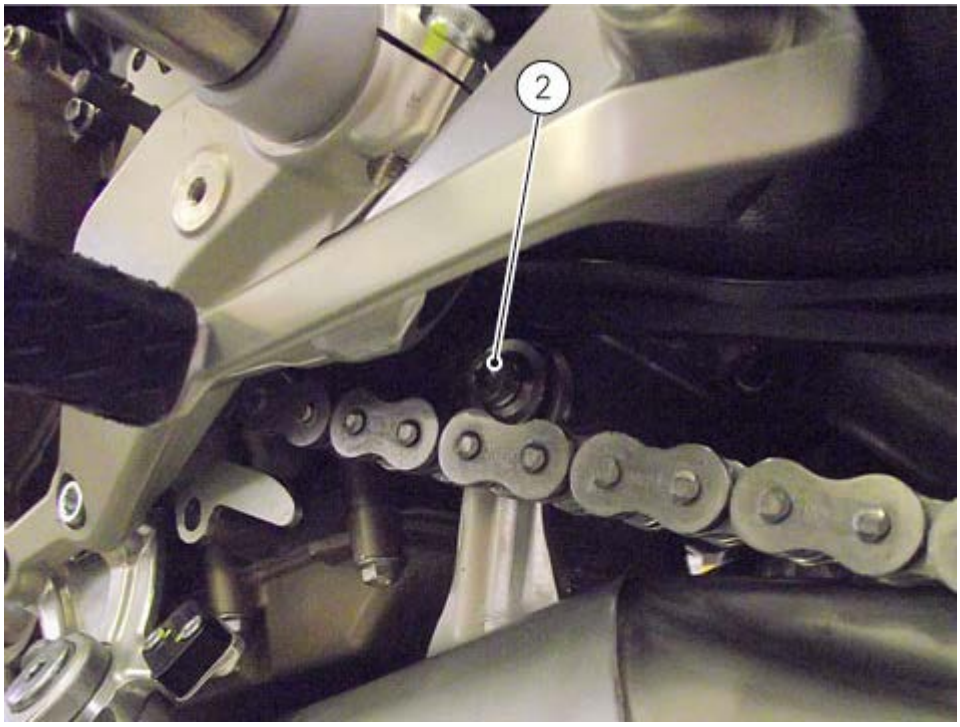




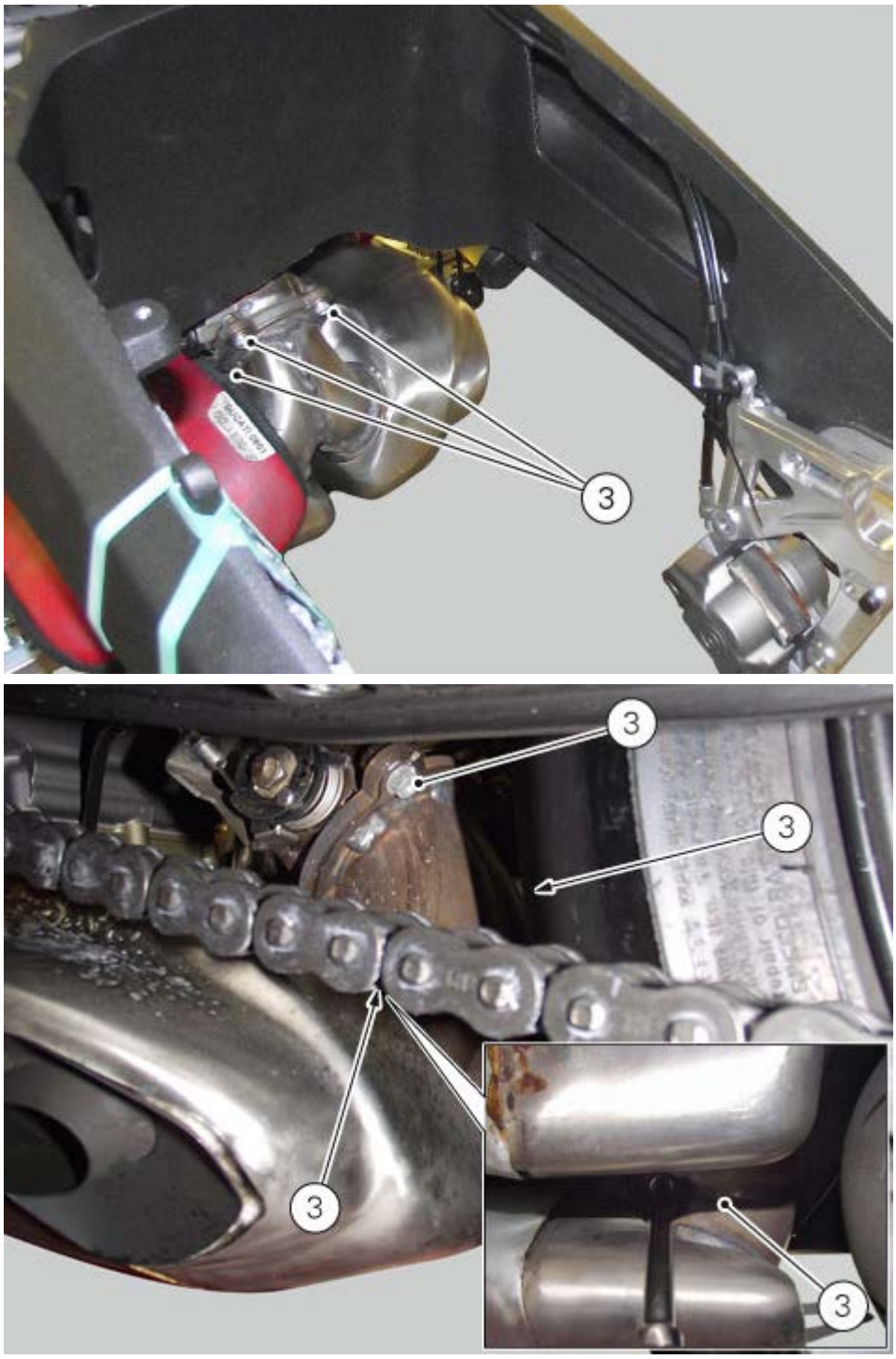


Loosen the two screws (2) that retain the silencer rear side to the engine block.





Loosen the three screws (3) that retain the silencer to the central exhaust pipe.

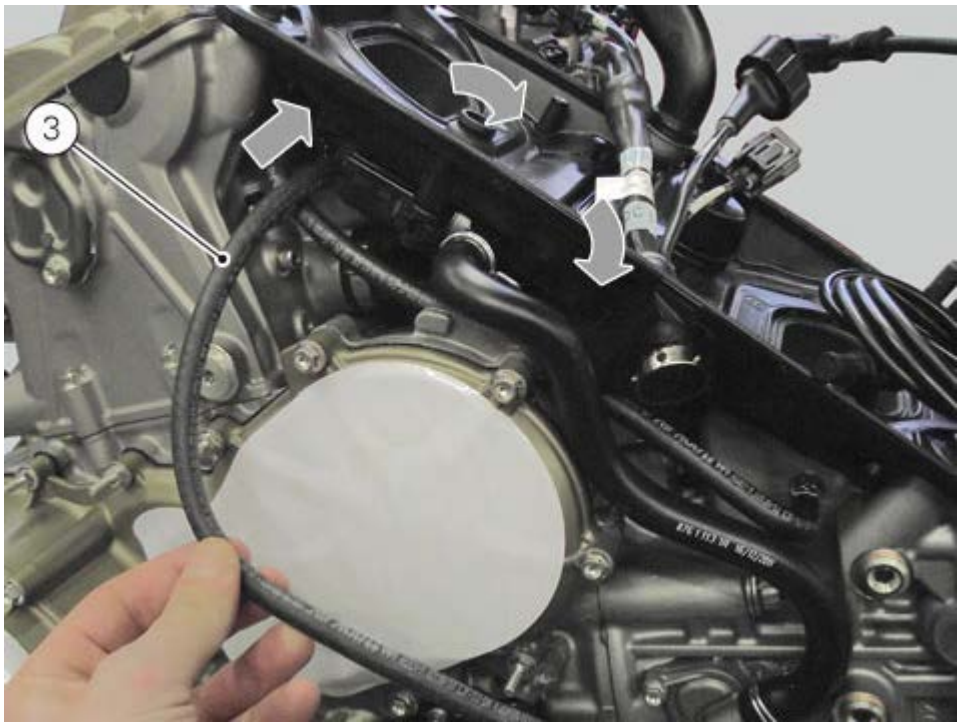


Separate silencer (4) from the central exhaust pipe (A) and collect the gasket.

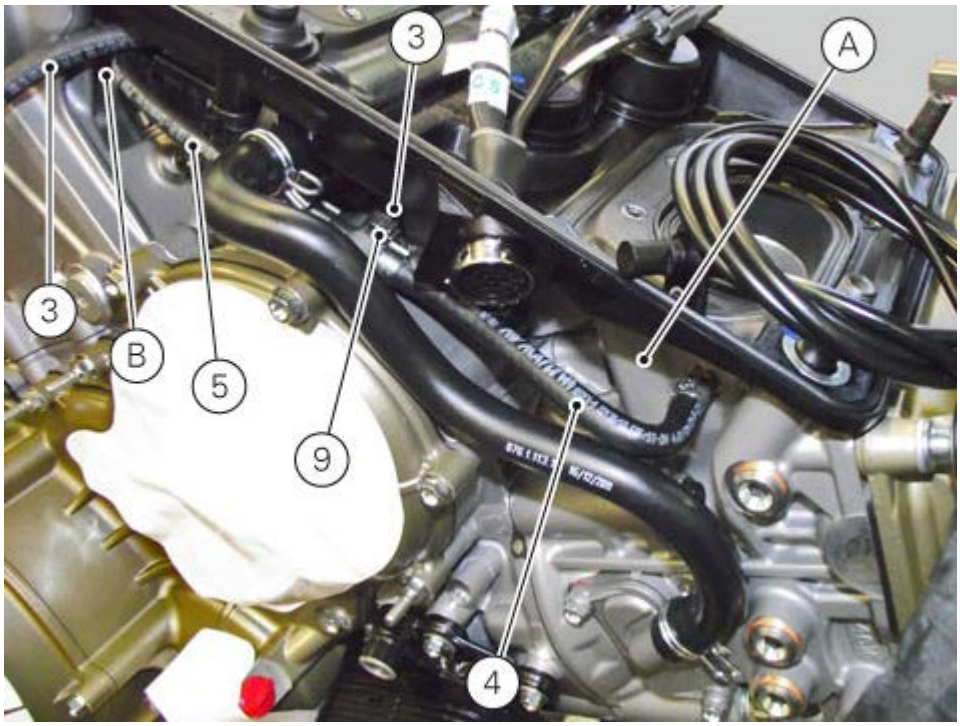

A
4

Refitting the canister filter breather pipes

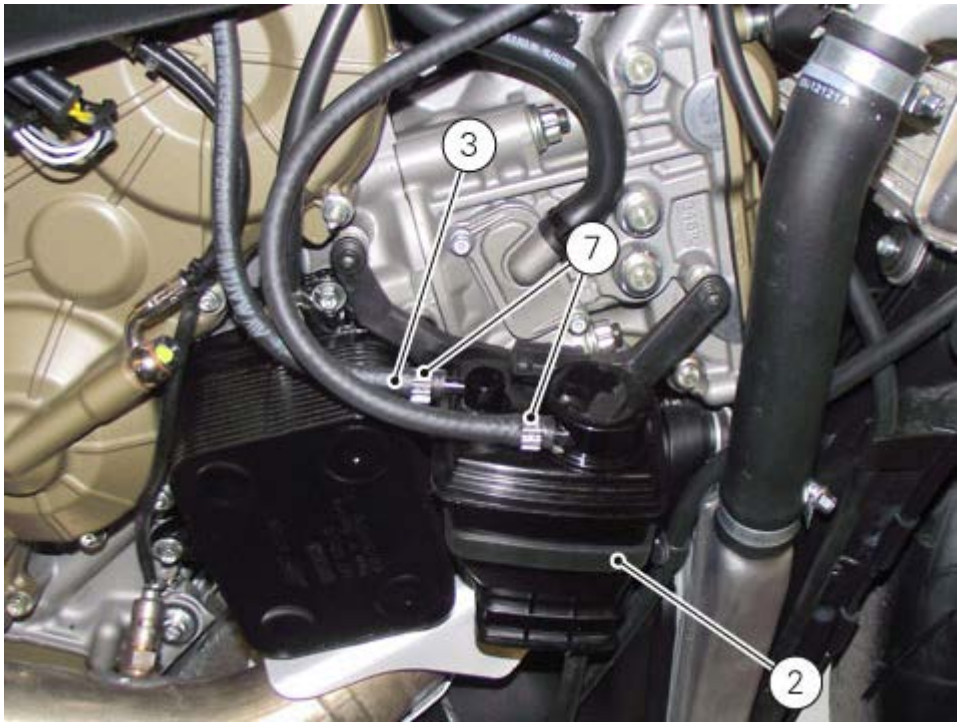
Insert pipe (3) from the vertical head side (B).



Connect hose (3) to hoses (4) and (5) of the horizontal head (A) and vertical head (B) respectively, by tightening clamp (9).



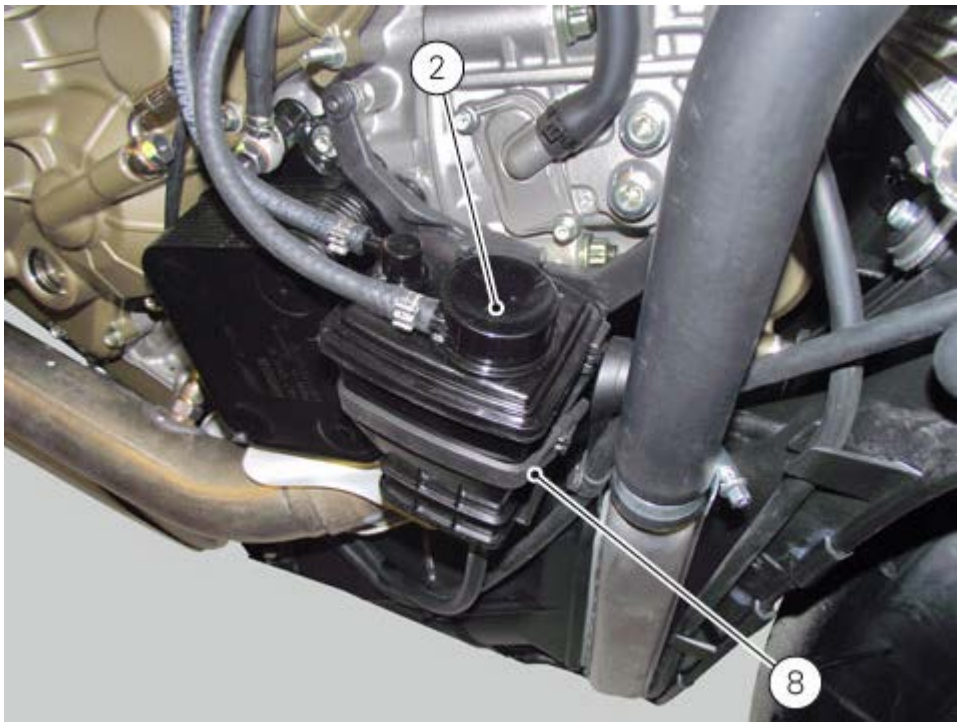
Connect hose (3) to the canister filler (2) by tightening clamp (7).



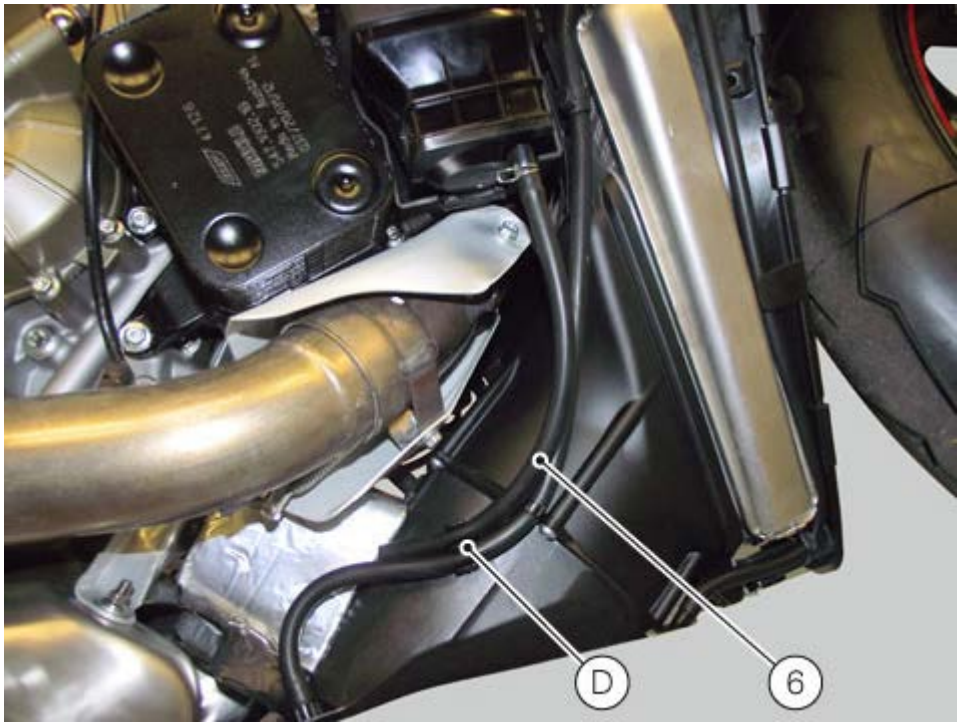
Refit the RH electric component support (Refitting the structural components and frame).
Refit the right-hand fairing (Refitting the side fairings).

Refitting the canister filter

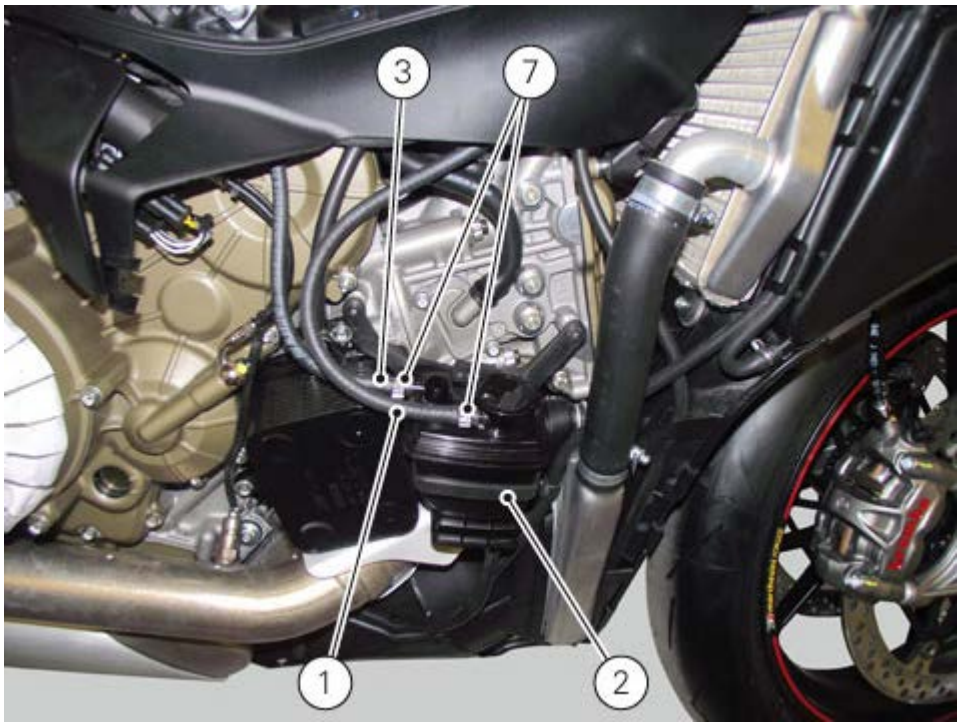
Position the canister filter (2) on its support and lock it with clamp (8).



Position hose (6) in seat (D) of the radiator support unit.



Connect pipes (1) and (3) to canister (2) using the clamps (7).

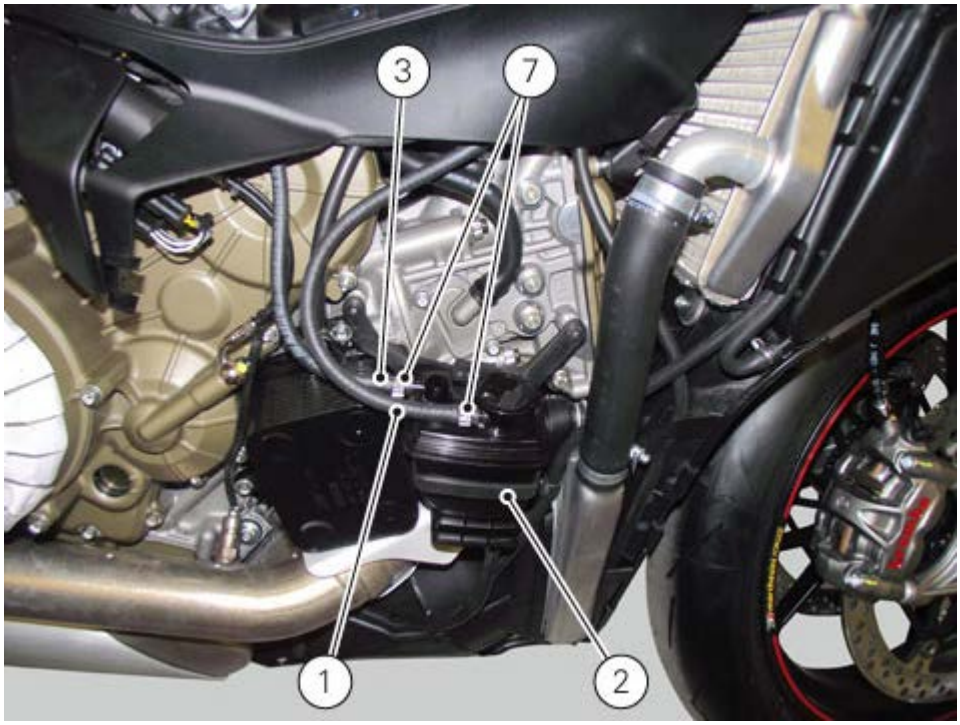


Refit the right-hand fairing (Refitting the side fairings).

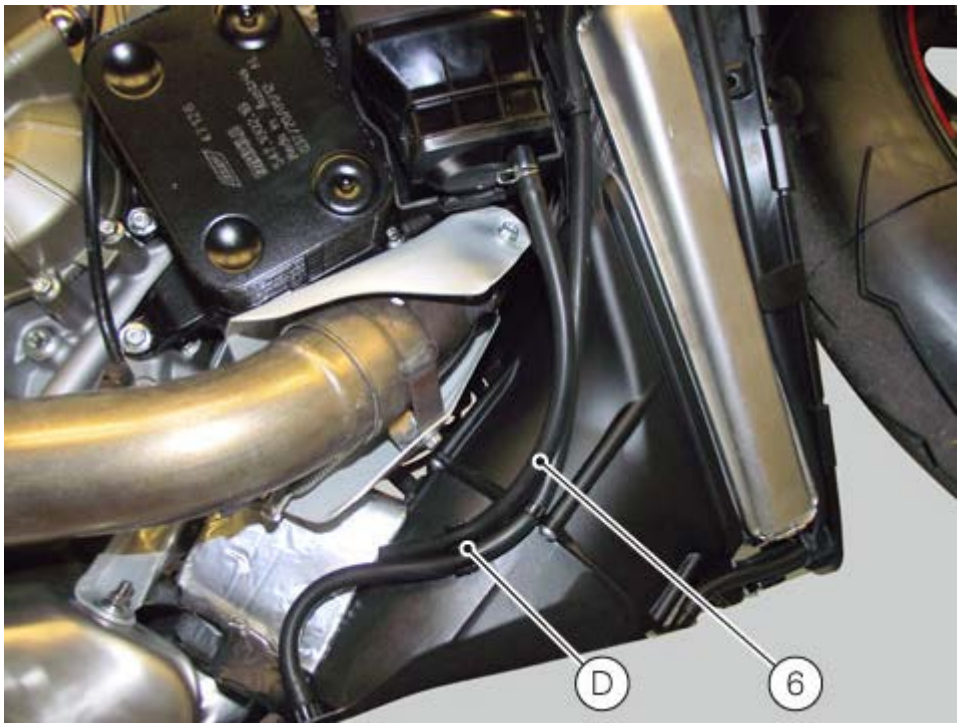
Removing the canister filter

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

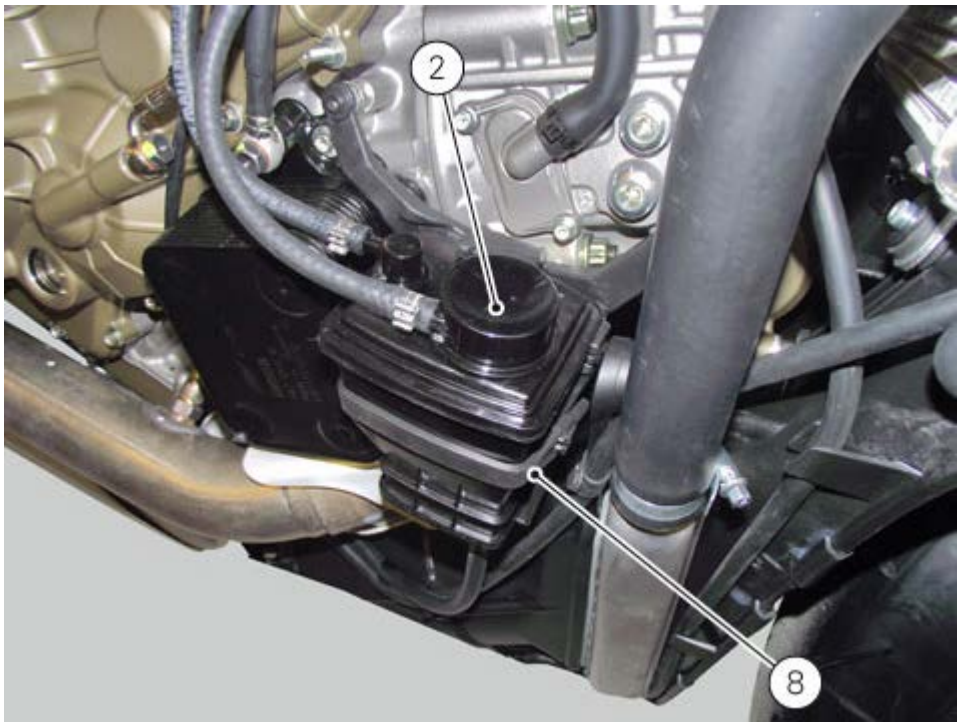
Remove clamps (7) retaining pipes (1) and (3) to canister filter (2).



Release pipe (6) from seat (D).



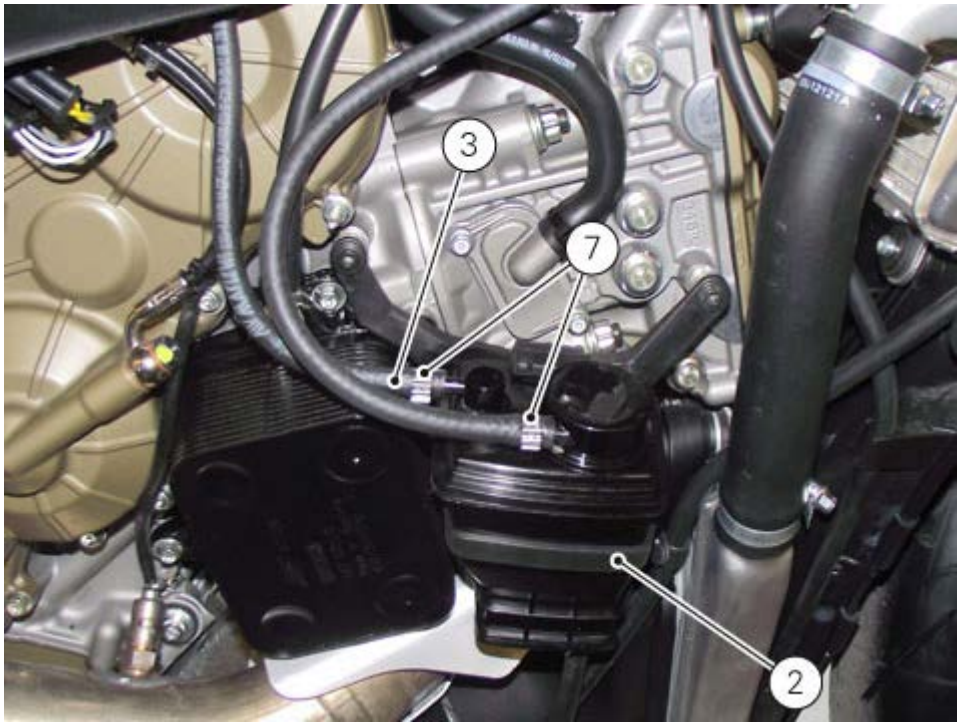
Release the retaining clamp (8) and remove the canister filter (2).



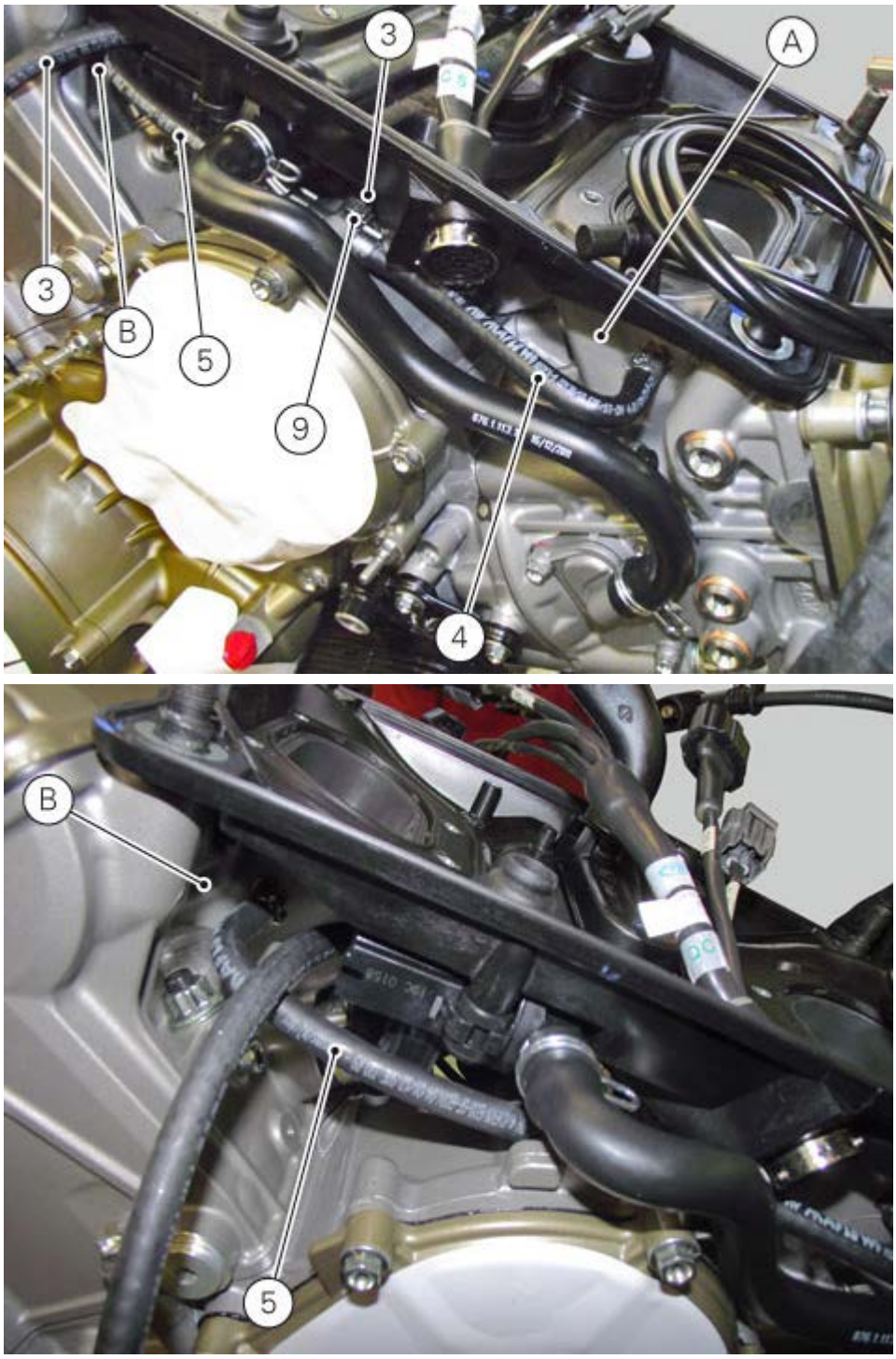
Removing the canister filter breather pipes

Remove the right-hand side fairing (Removing the side fairings).
Remove the RH electric component support (Removing the structural components and frame).

Remove clamp (7) retaining pipe (3) to canister filter (2).



Loosen clamp (9) that retain canister pipe (3) to pipes (4) and (5) of the horizontal (A) and vertical (B) head, respectively.

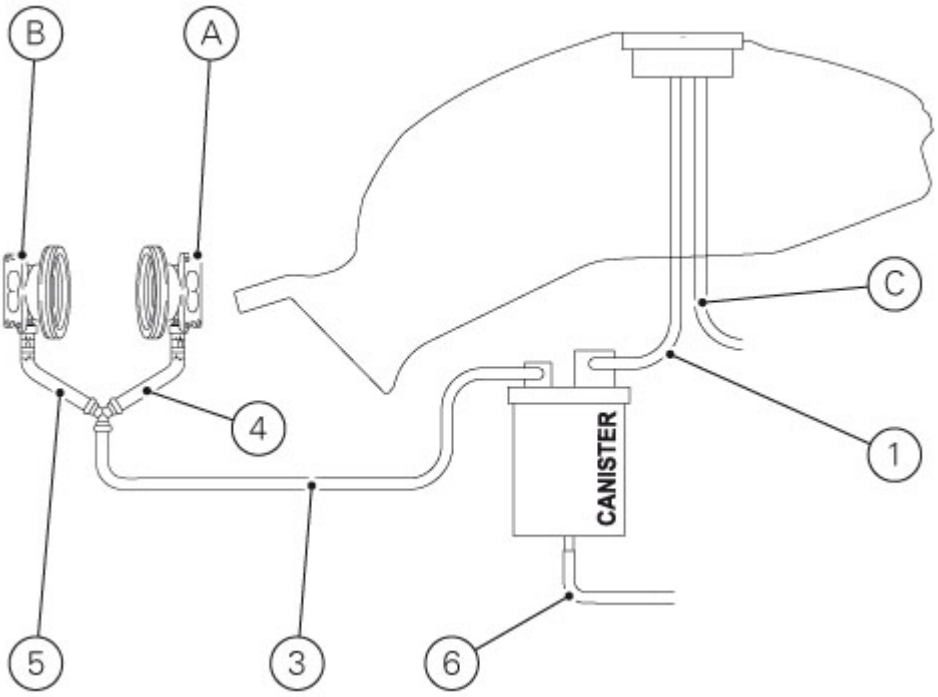


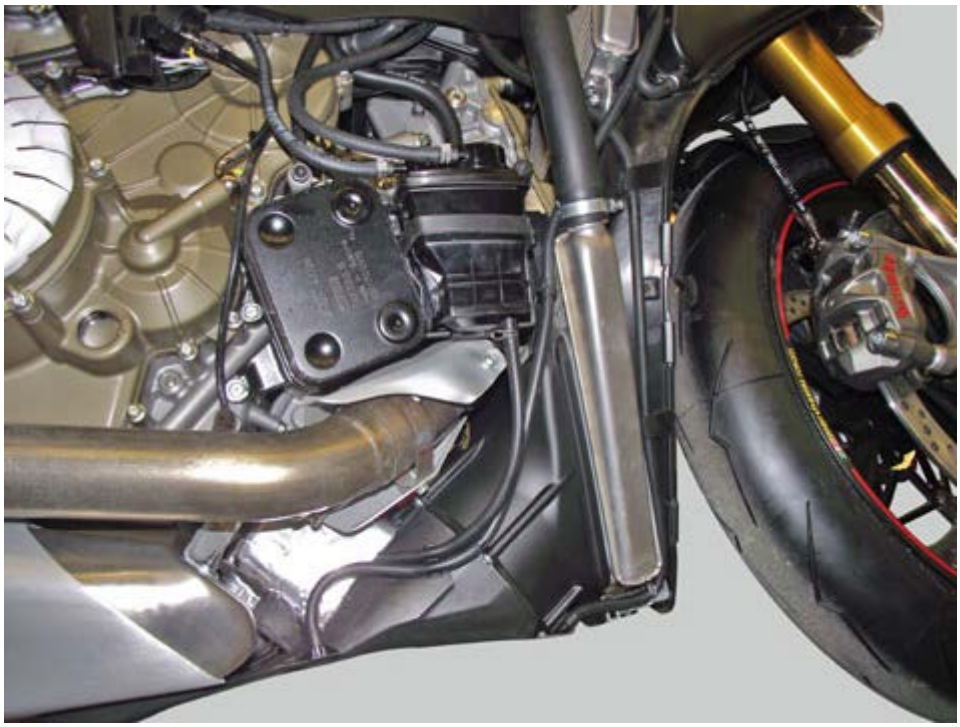
Slide pipe (3) outwards.


3

Canister filter system description

USA models are equipped with an additional system provided with Canister filter. This filter avoids the fuel vapour emission in the atmosphere.
Tank breather hose (1) is connected to Canister filter (2) which, after having filtered the fuel drain, sends it back directly to horizontal head (A), by means of hose (3), and to vertical head (B), by means of hoses (4) and (5). Tank draining hose (C) and Canister hose (6) discharge vapours to the ground.

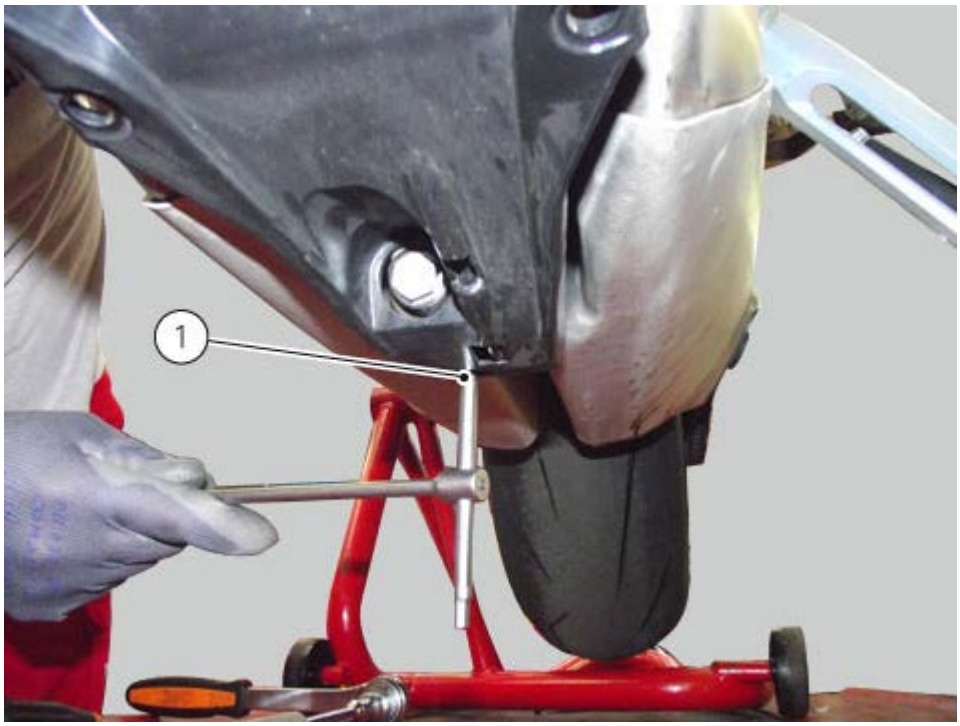




Removing the radiator

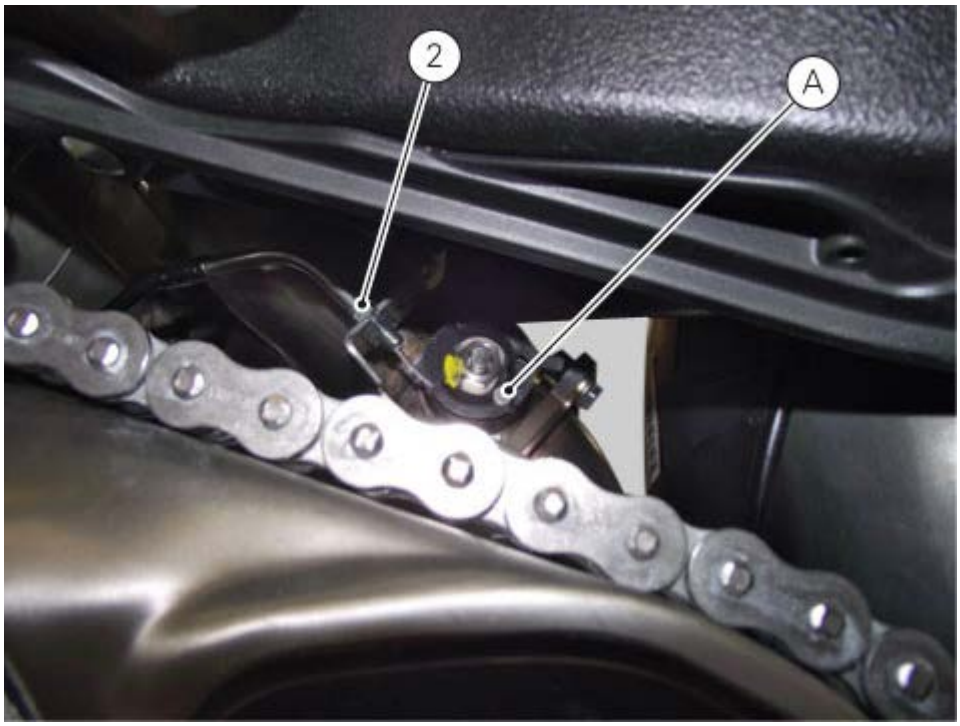
Remove the fairings (Removing the side fairings).
Drain the coolant (Changing the coolant).
Remove the cooling system hoses (Removing cooling system hoses and unions).

Loosen radiator mount bottom screw (1).

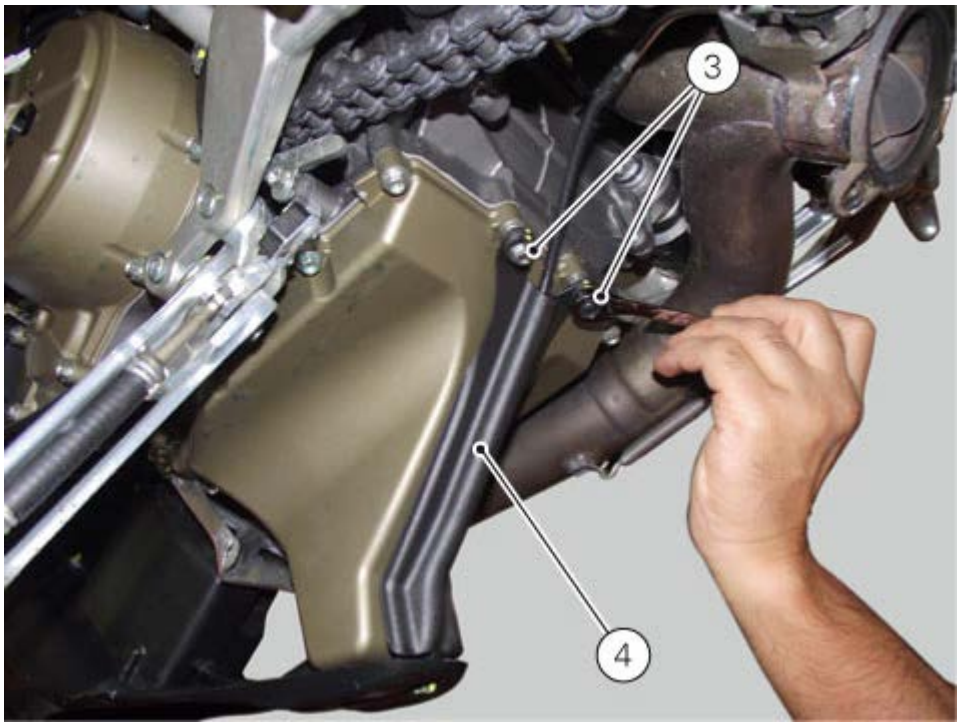


Remove the silencer (Removing the silencer).

Loosen nut (2), release pawl (A) and remove cable from exhaust valve.

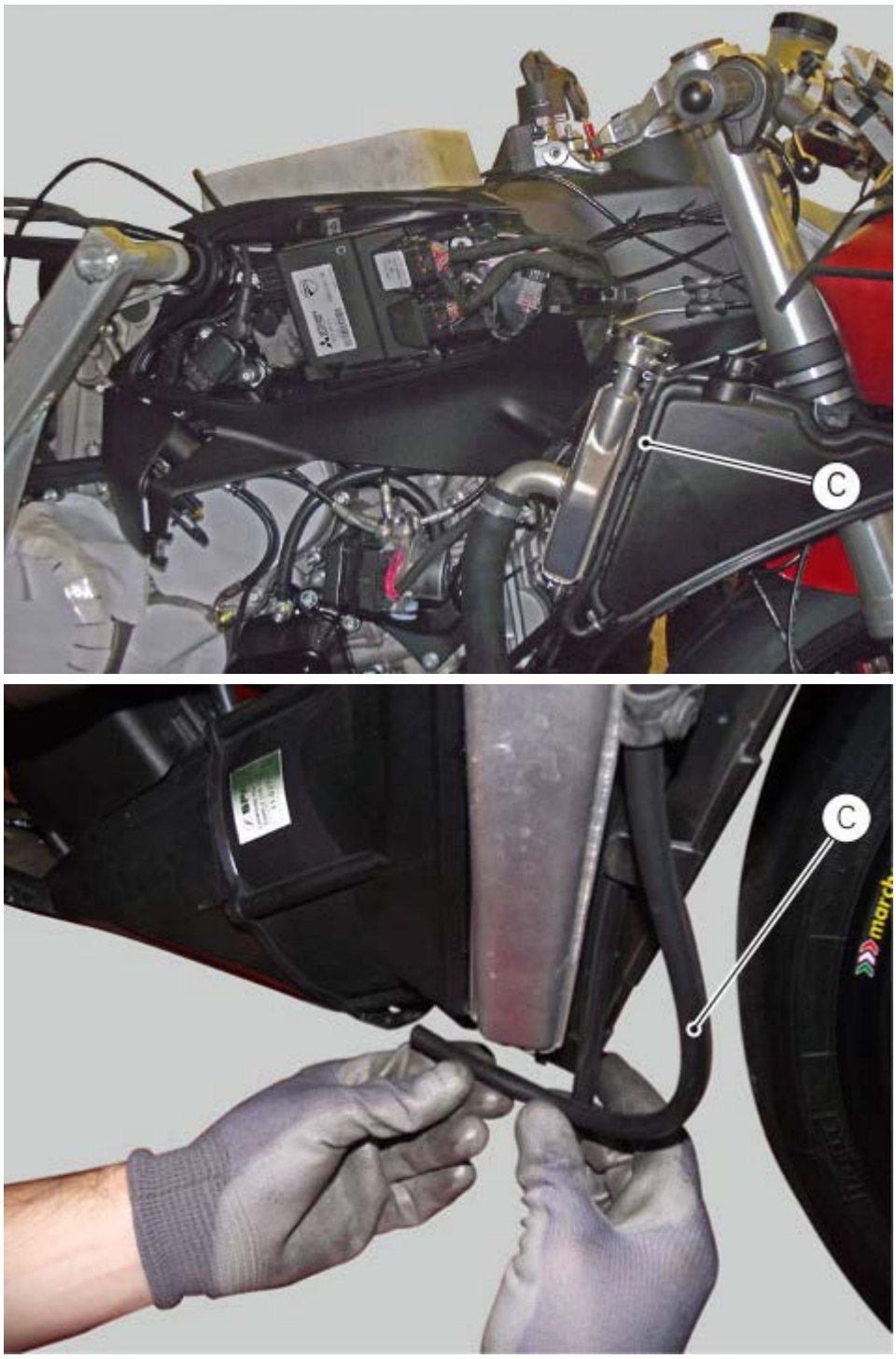


Loosen nuts (3) and remove sheath (4).

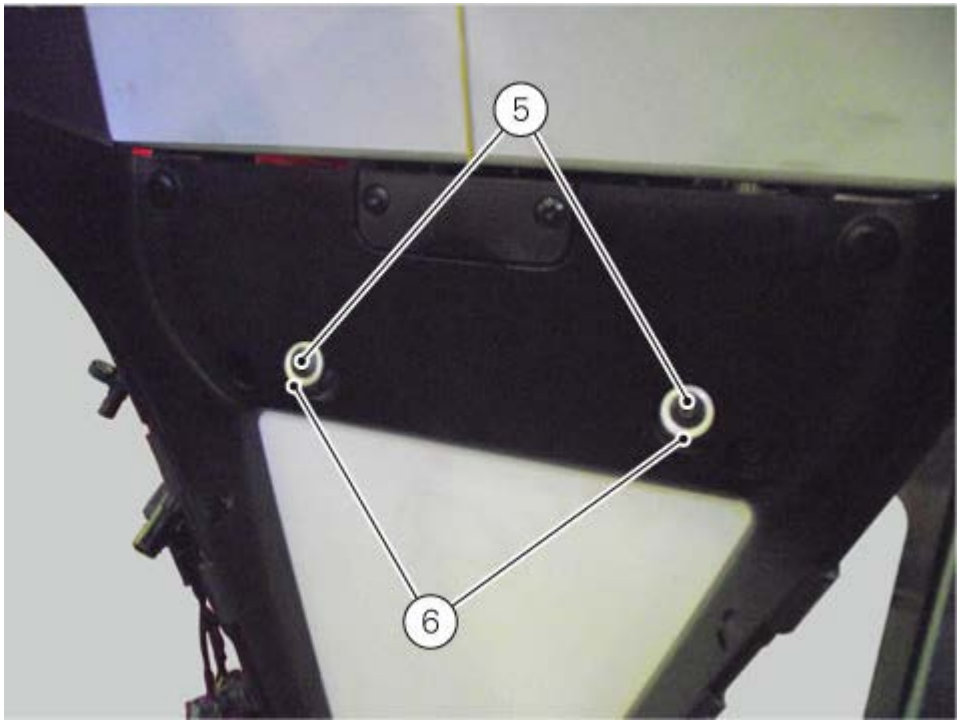


Loosen clip (B) and slide out the breather hose from the top radiator.

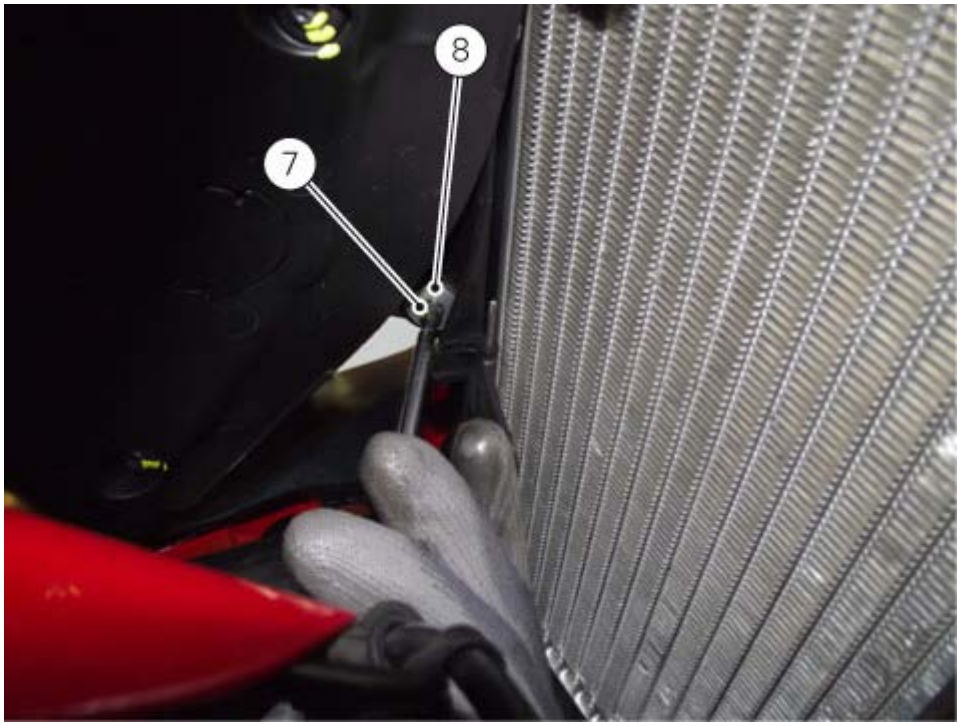
Detach breather hose (C) from radiator mounts.

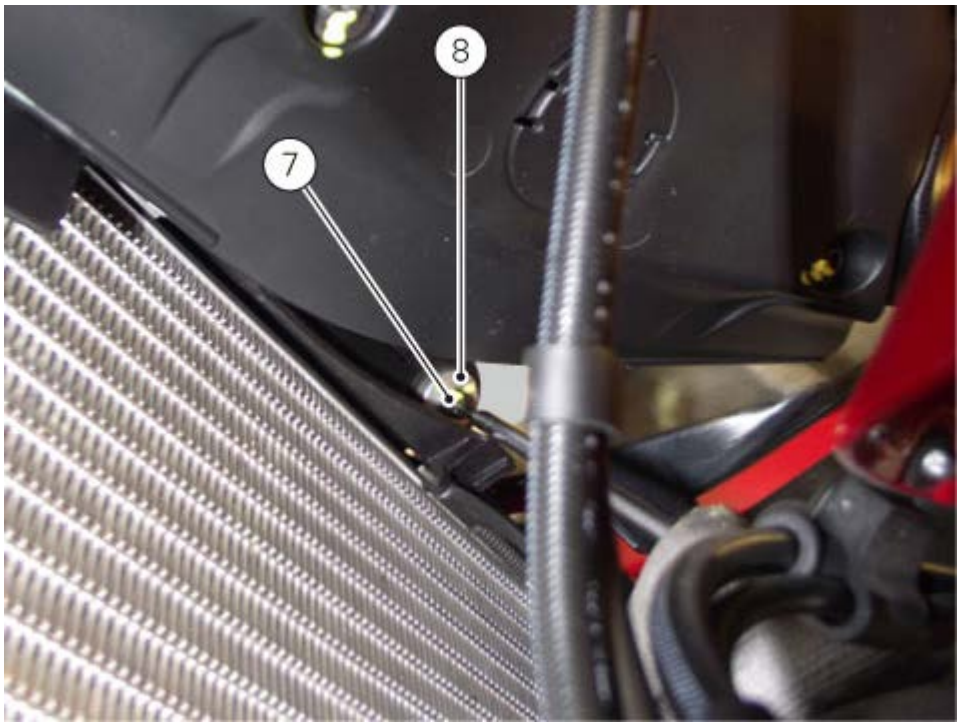


Loosen and remove central screw (5) from radiator mounts; keep spacers (6).

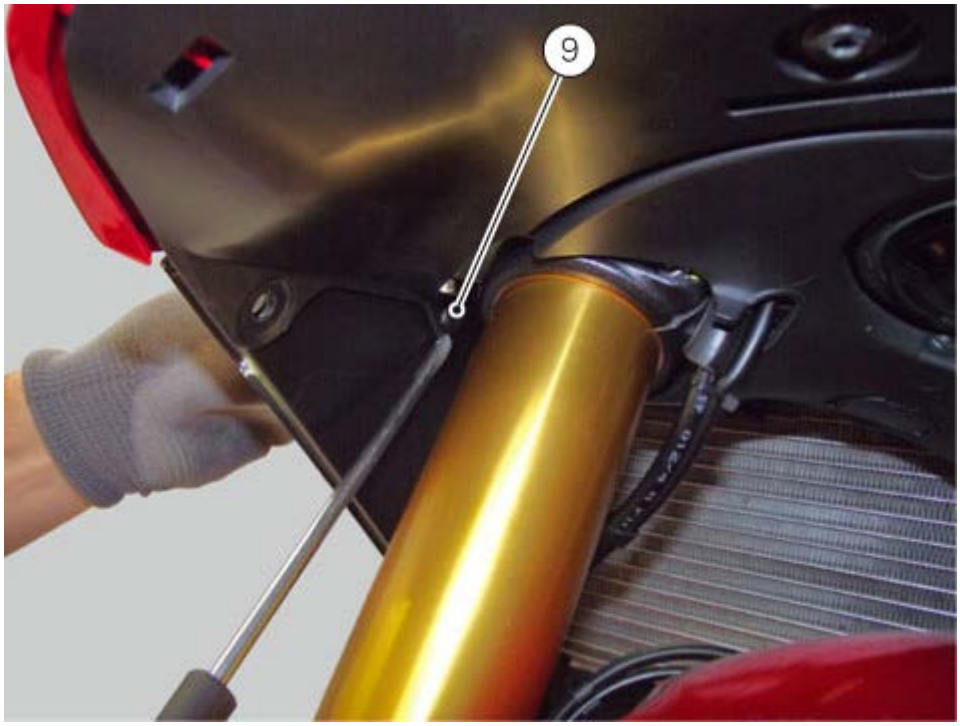


Loosen and remove top screw (7) from radiator mounts; keep spacers (8).



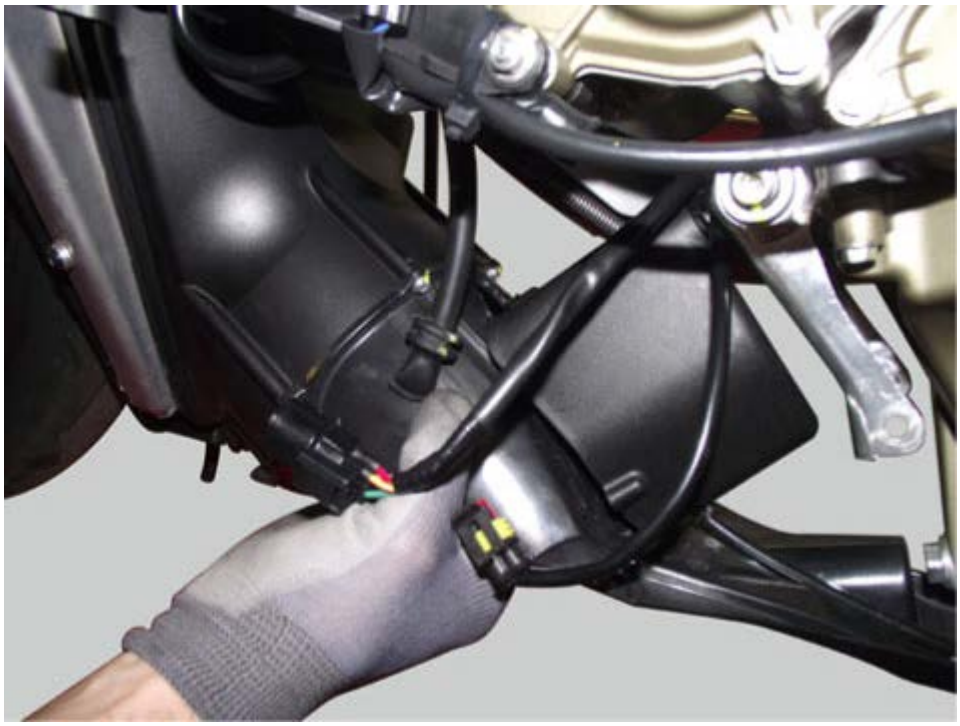


Open quick-coupling (9) to release the radiator mounts from the headlight fairing.

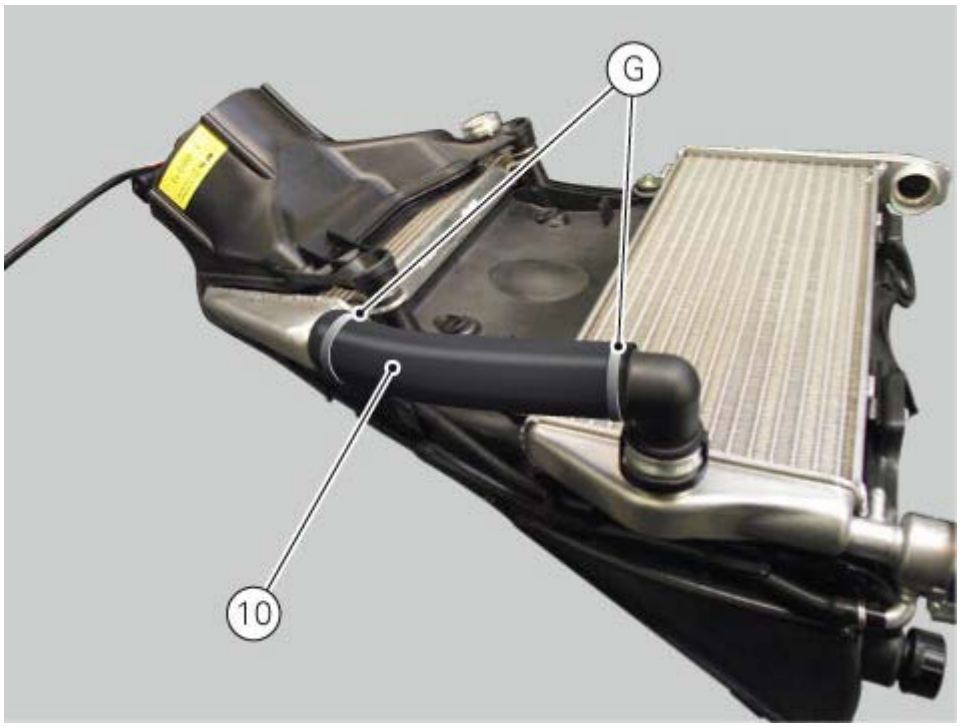


Remove the tie and disconnect fan connector (D) and exhaust valve drive motor connector (E).

Remove the airbox draining hose (F) from air conveyor and remove the complete radiator mounts from the vehicle.



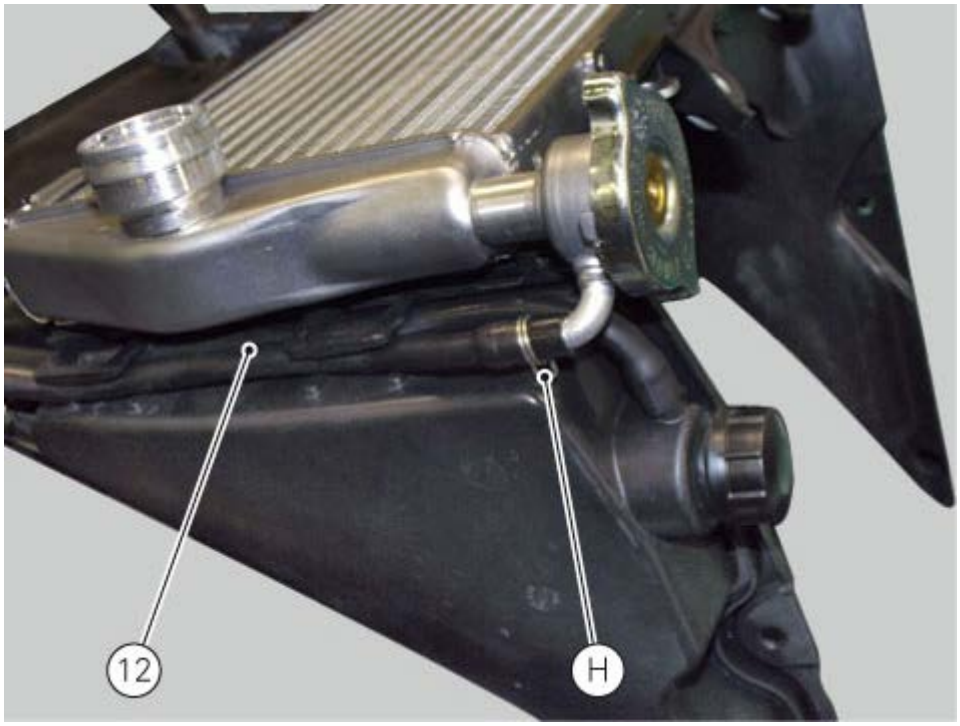
Slacken ties (G) fastening hose (10) which connects the top radiator to the bottom one and remove the hose.



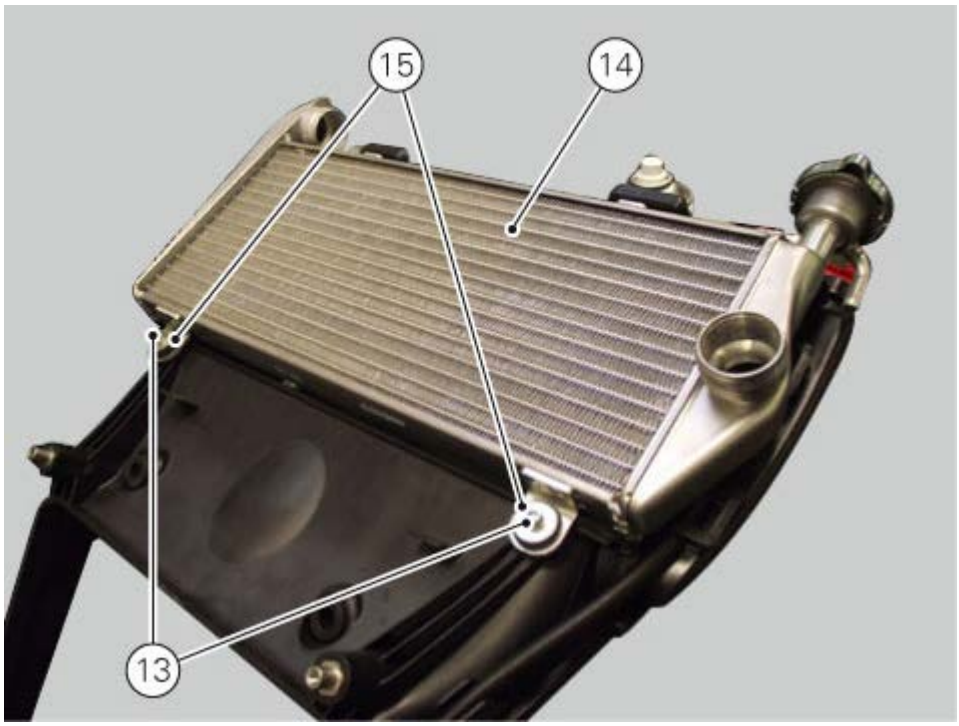
Remove the fan (Renewal of the cooling fan).

Slide out the bottom radiator (11) from the mount.

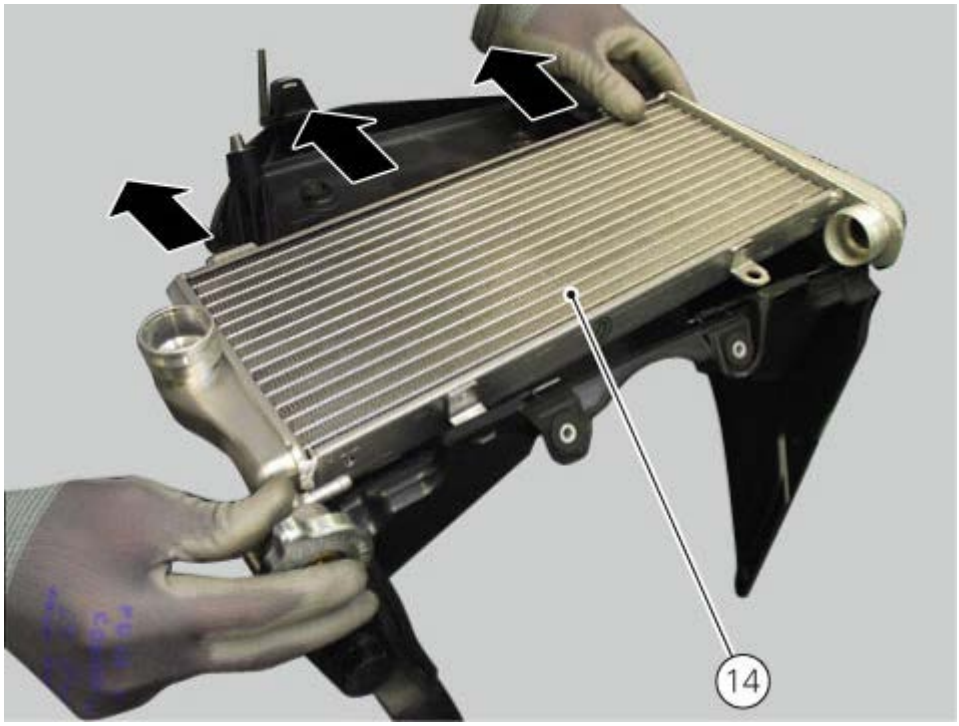
Remove clamp (H) fastening hose (12) which connects expansion tank to top radiator.



Loosen screws (13) fastening top radiator (14); keep washers (15).



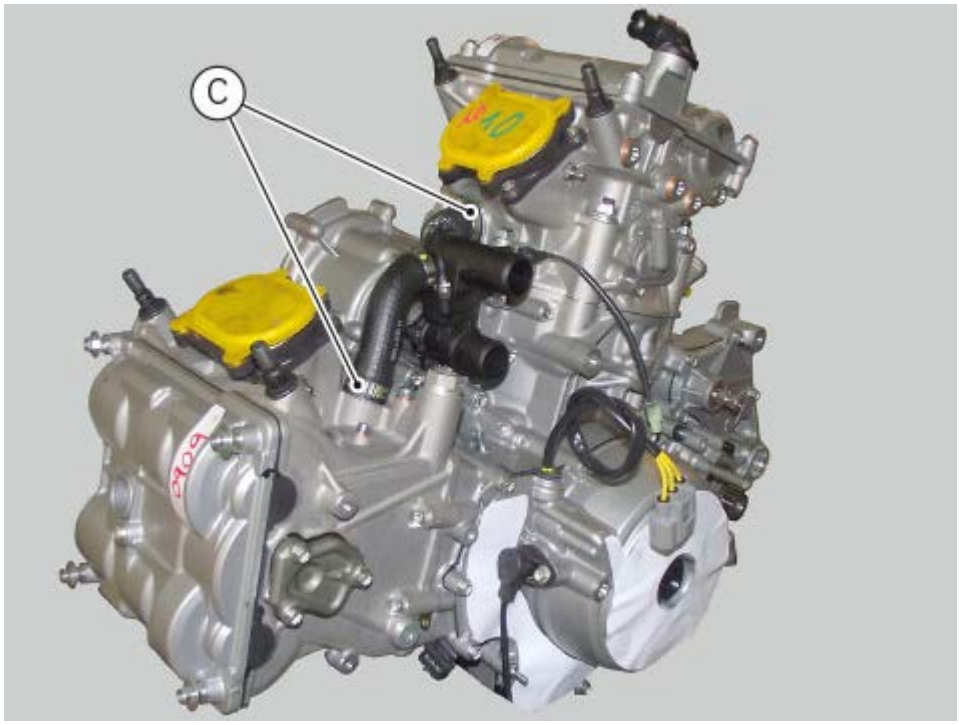
Slide down the top radiator (14) and disengage it from the mount.



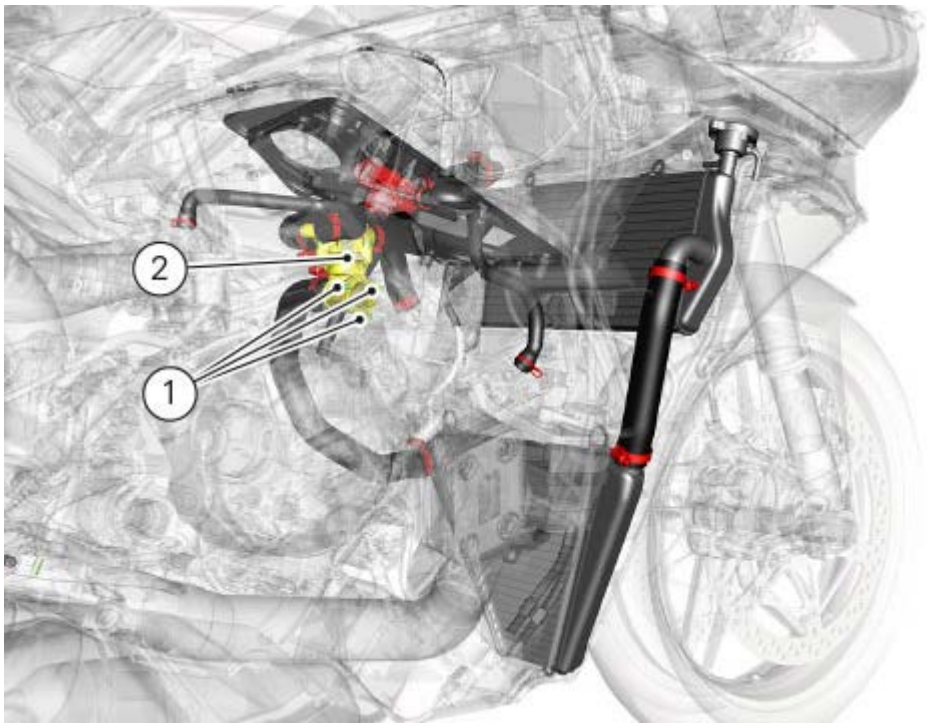
Refitting the cooling system hoses and unions

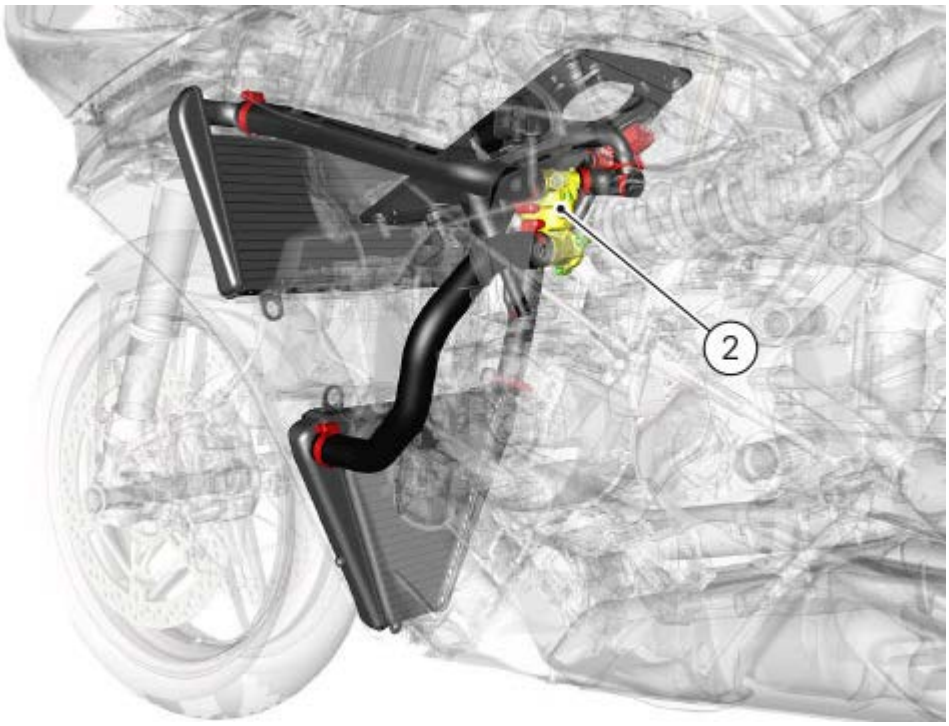
Note
For clarity, the figures show the engine removed from the frame.

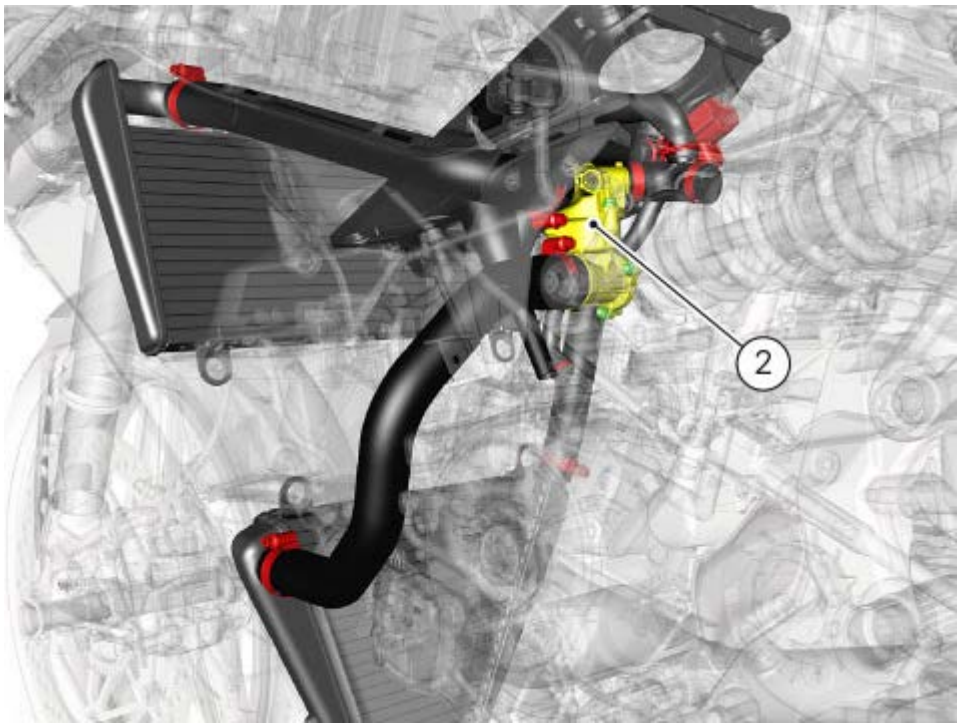
Set the thermostat on engine block, secure it with clamps (C) and tighten them to 2.5 Nm ± 10%.



Fasten thermostat (2) to engine by tightening the screws (1) to a torque of 6 Nm (Min. 5 Nm - Max. 7 Nm).





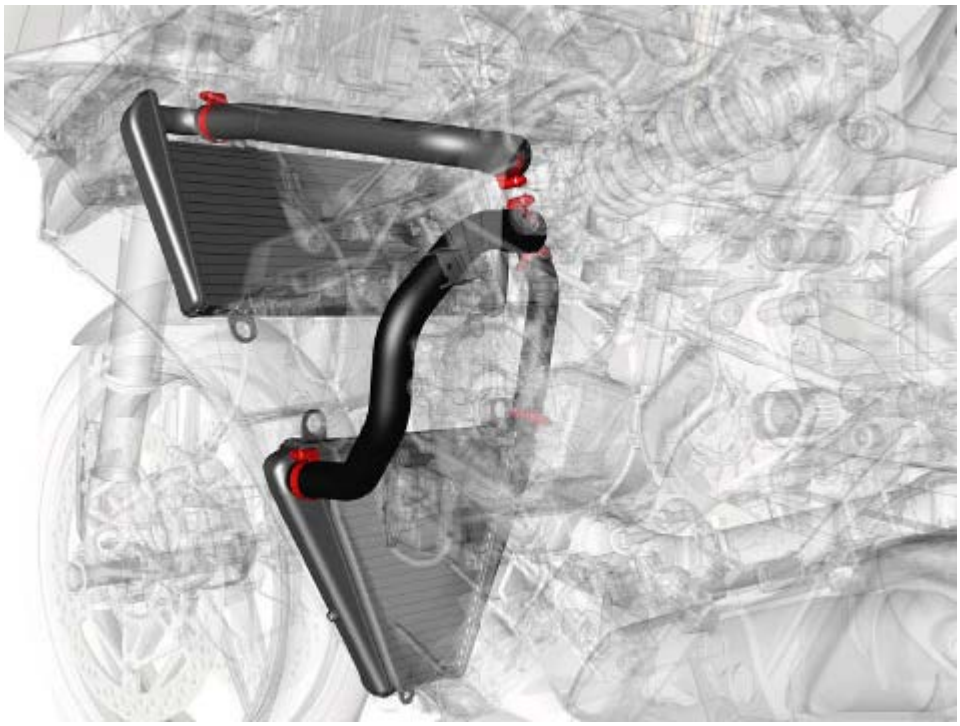


Connect the hoses to water distributor and tighten clamps (B) to 2.5 Nm ± 10%.

Connect the hoses to top and bottom radiator and tighten clamps (A) to 2.5 Nm ± 10%.

Removing the cooling system hoses and unions

Loosen clamps (A) and disconnect hoses from top and bottom radiator.

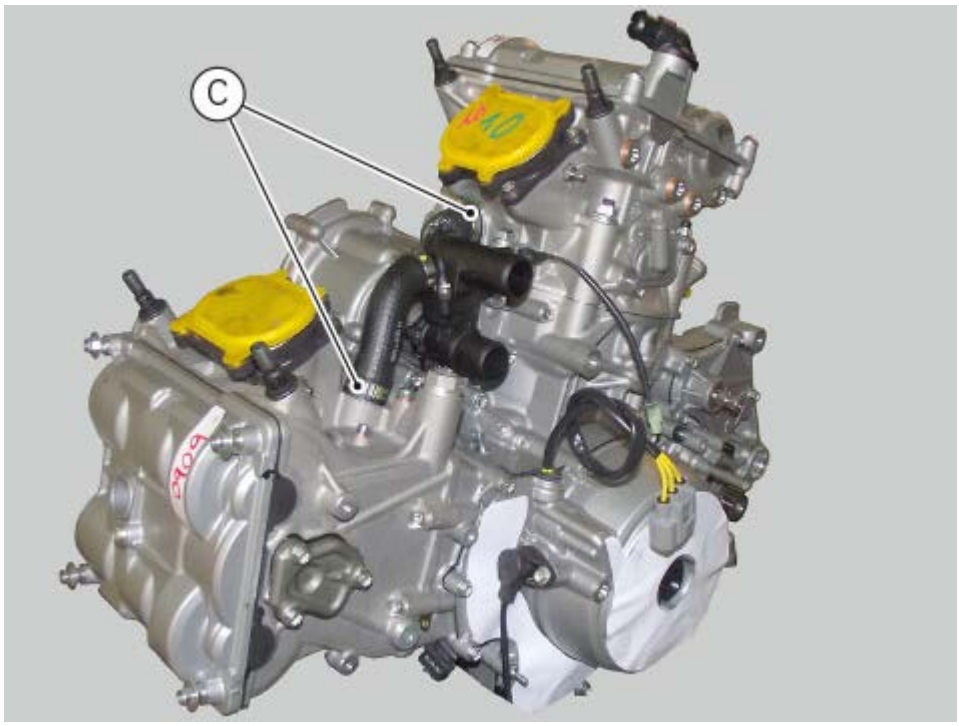


Loosen clamps (B) and disconnect the hoses from water distributor.

Note

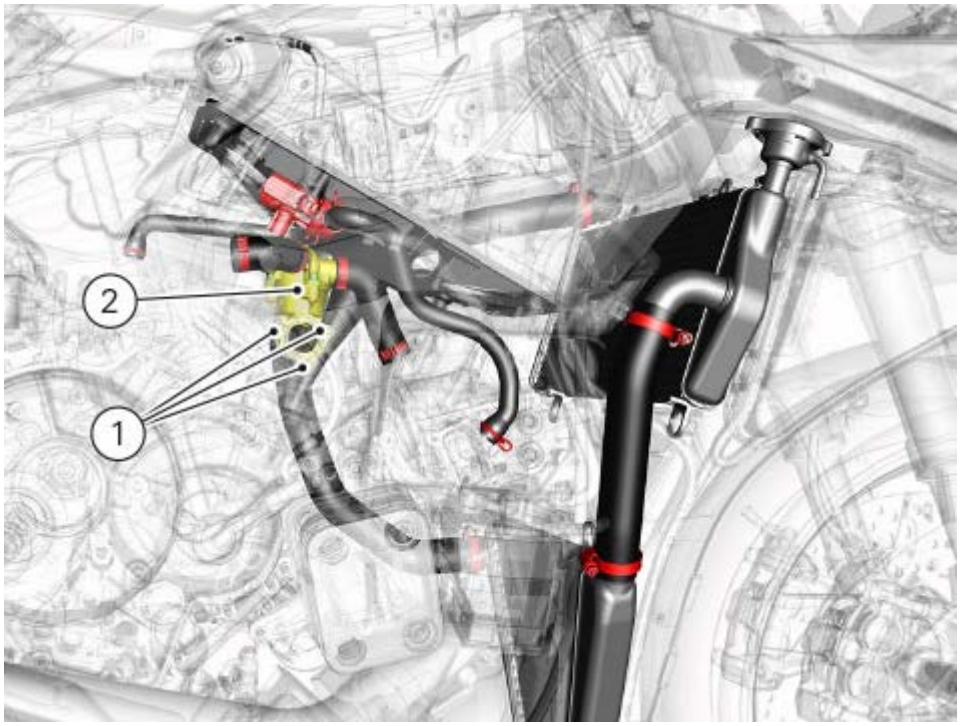
For clarity, the figures show the engine removed from the frame.

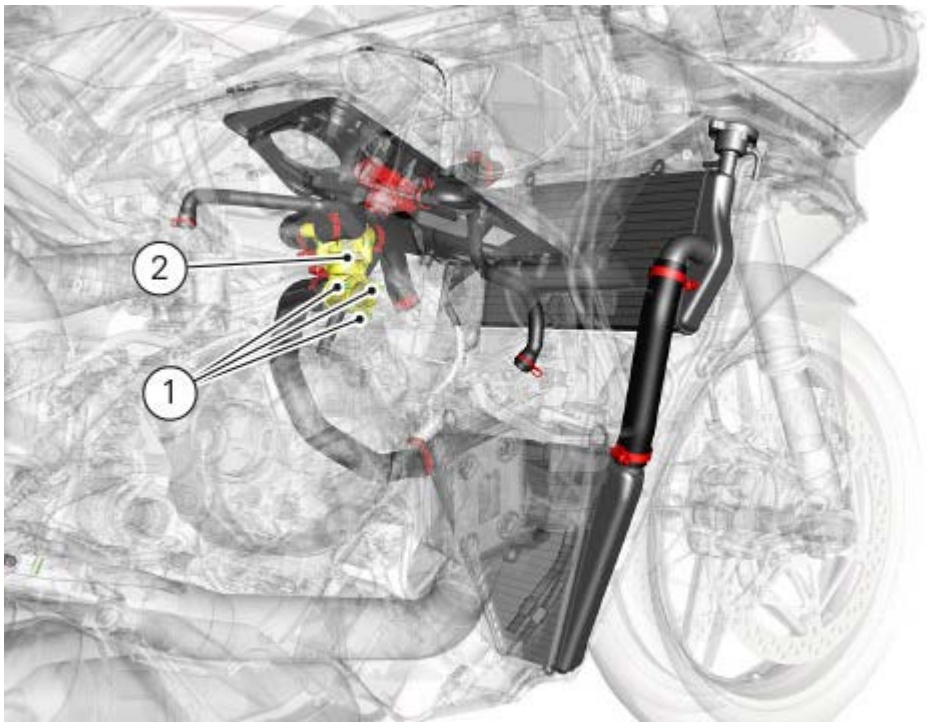
Loosen ties (C) and disconnect the thermostat hoses from the cylinder heads.

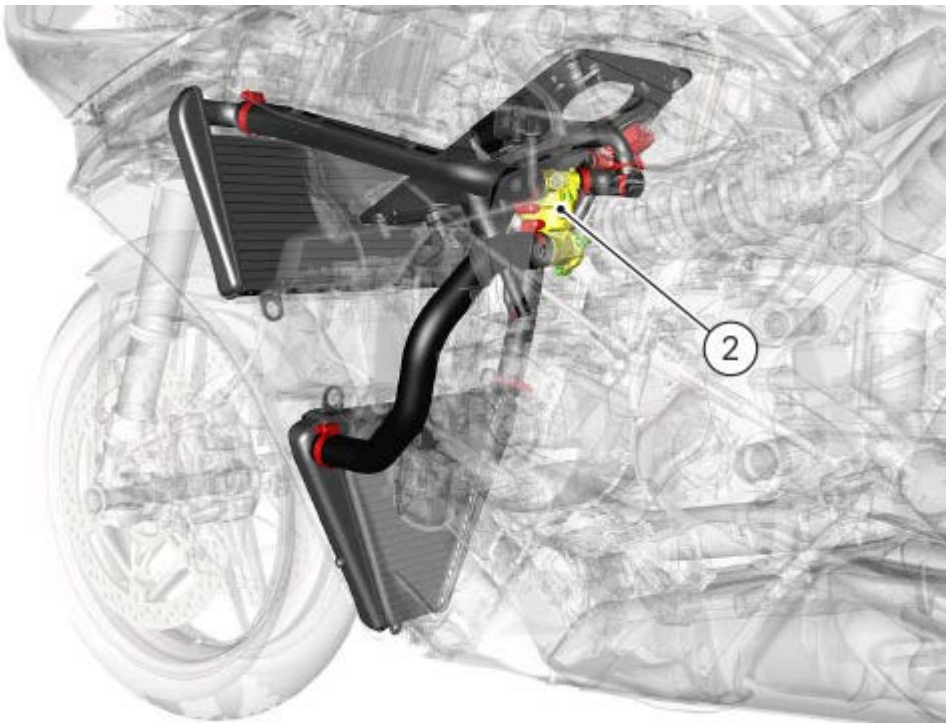

C

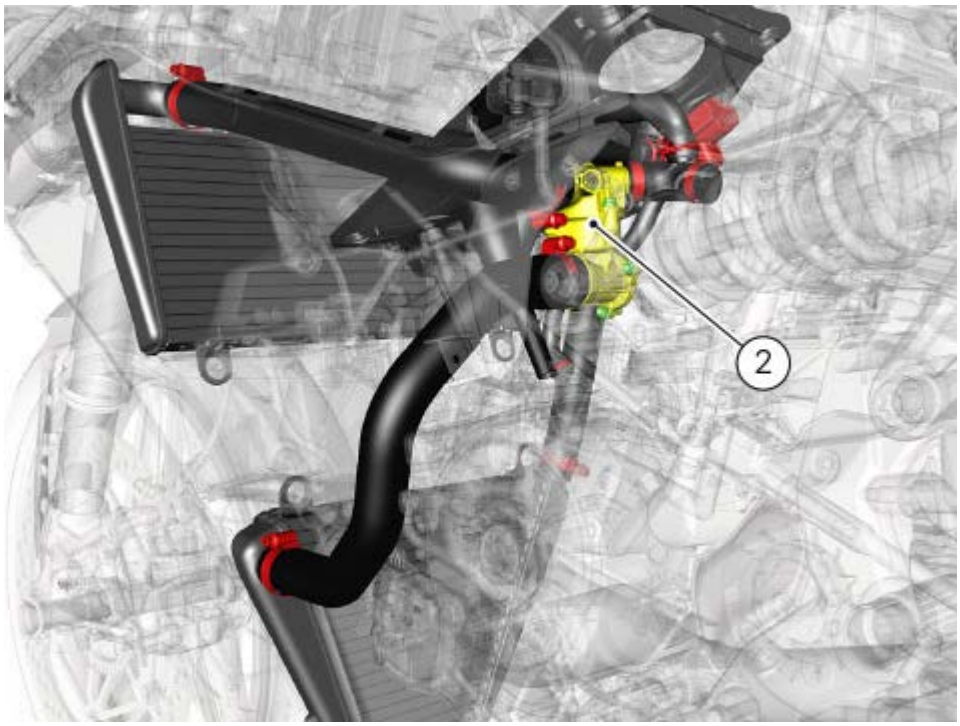

C

Unscrew the screws (1) and remove the thermostat (2).



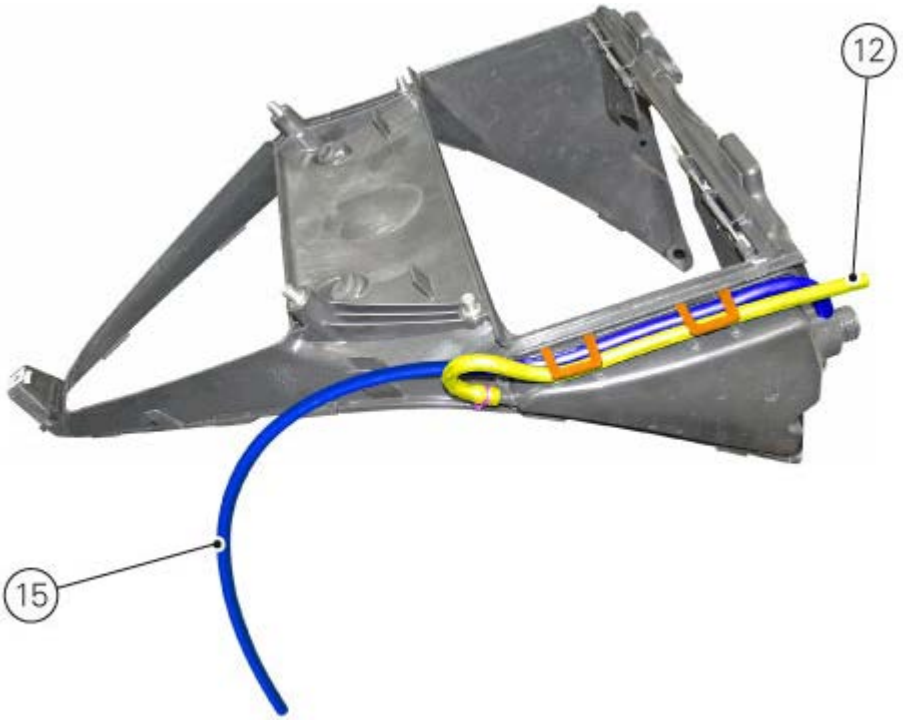

2
1


2

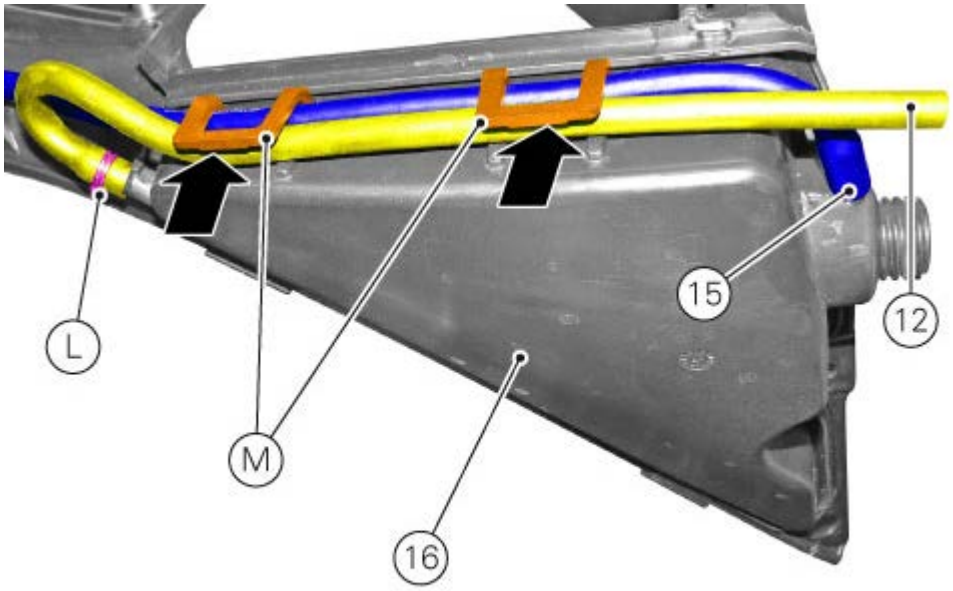

2

Fitting the radiator

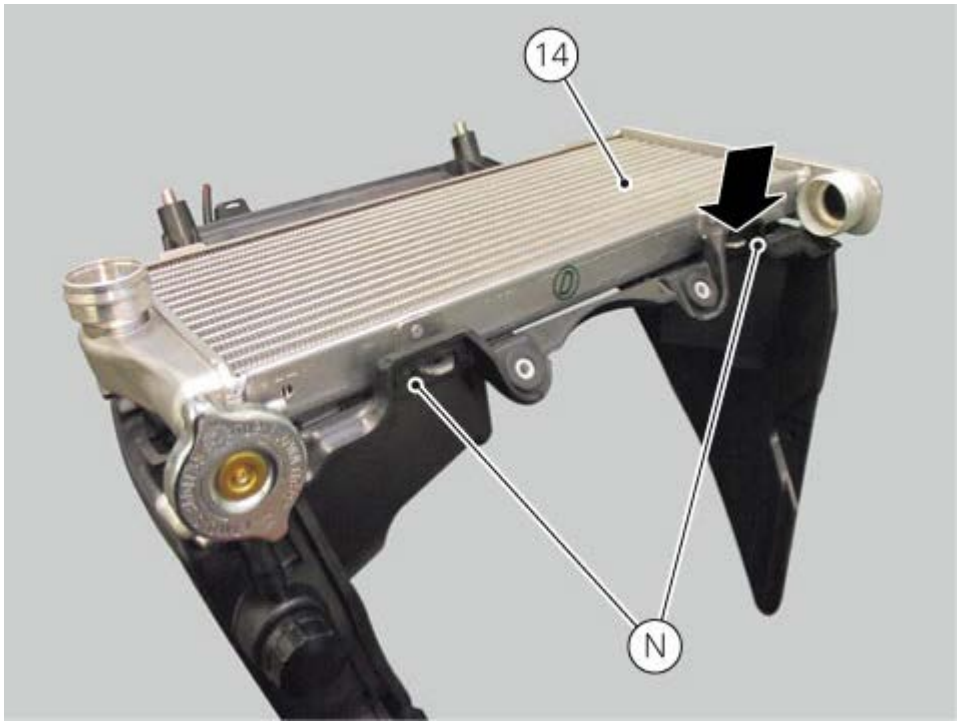
Ensure that hoses (12) and (15) are fitted on radiator mounts.

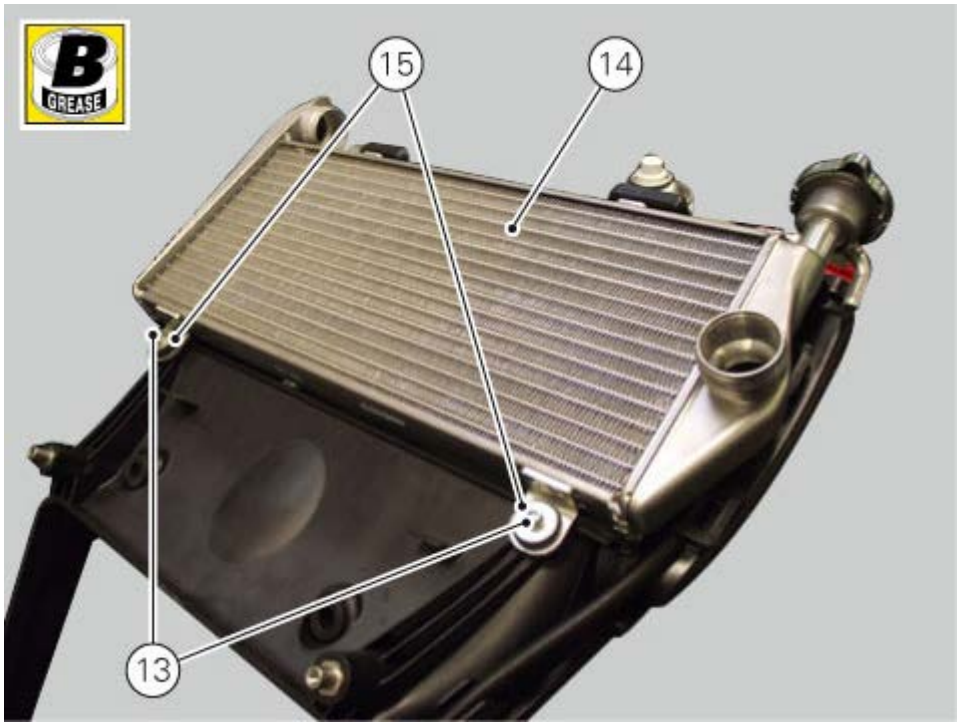


If previously removed, refit them as follows.
Fit the expansion reservoir draining hose (15) on the "upper" union of the expansion reservoir (16) located on the radiator support.
Fit the expansion reservoir / radiator hose (12) on the "lower" union of the expansion reservoir (16) and fix it with spring clip (L).
Position the drain hose (15) and the expansion reservoir / upper radiator hose (12) inside clips (M), respecting the position shown in the figure.

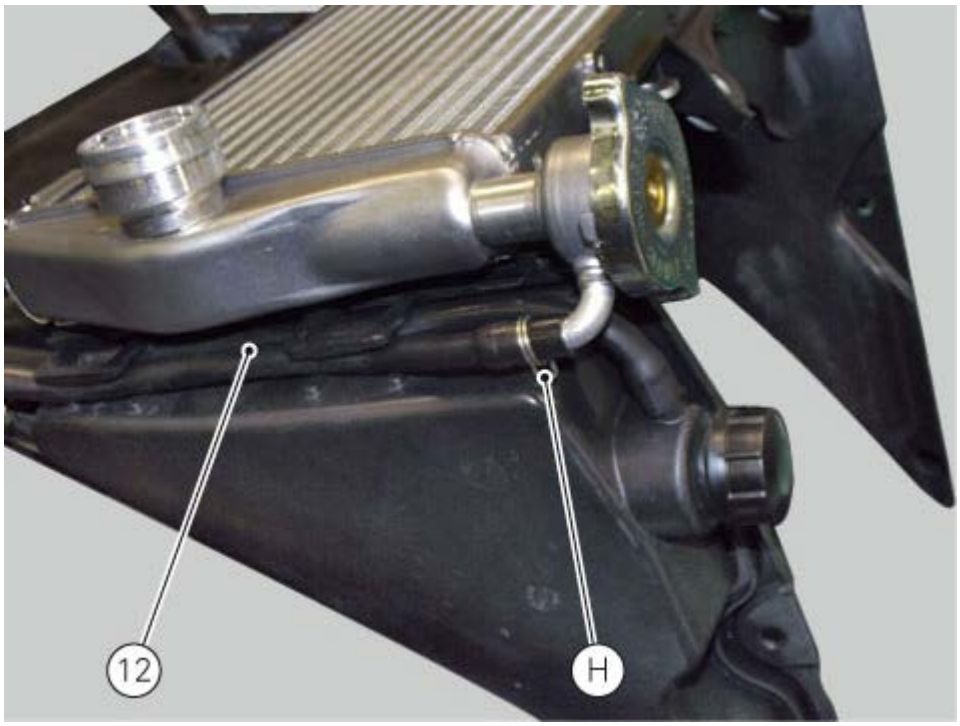


Position the upper radiator (14) on the relevant support by inserting first the LH bracket and then the RH bracket in the vibration damping pads (N).
Complete fitting of the upper radiator (14) inserting the vibration dampers fully home on stud bolts, as shown.
Apply the recommended grease on the threads and underside of the screws (13) and insert washers (15).
Tighten the screws (13) of the upper radiator (14) to a torque of 5 Nm ± 10%.

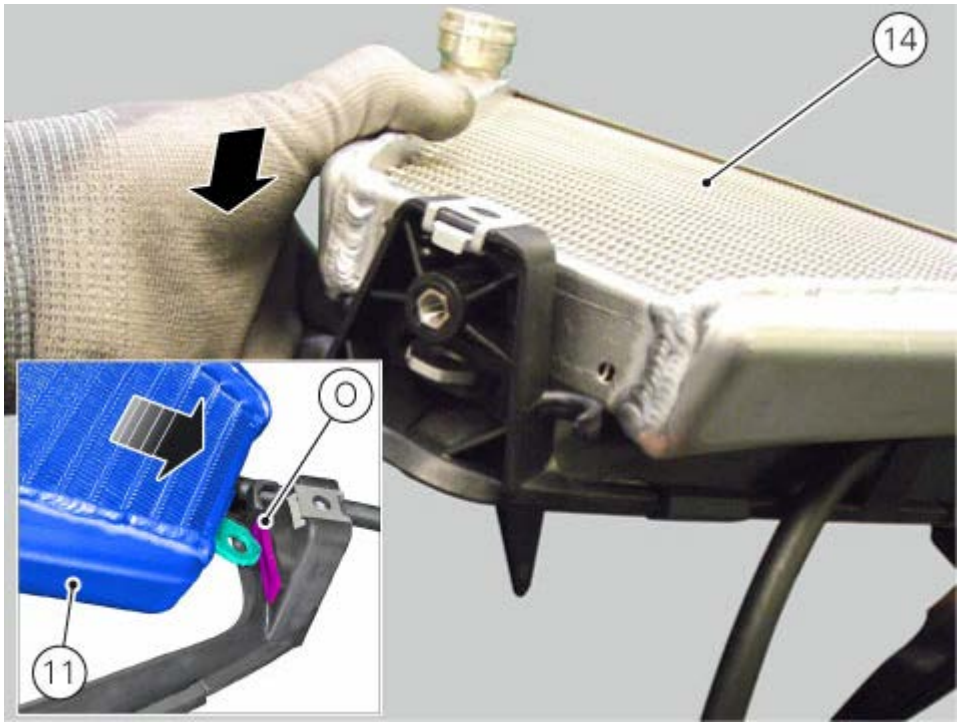




Fit expansion tank-top radiator hose (12) to the fitting and fasten it using clamp (H).



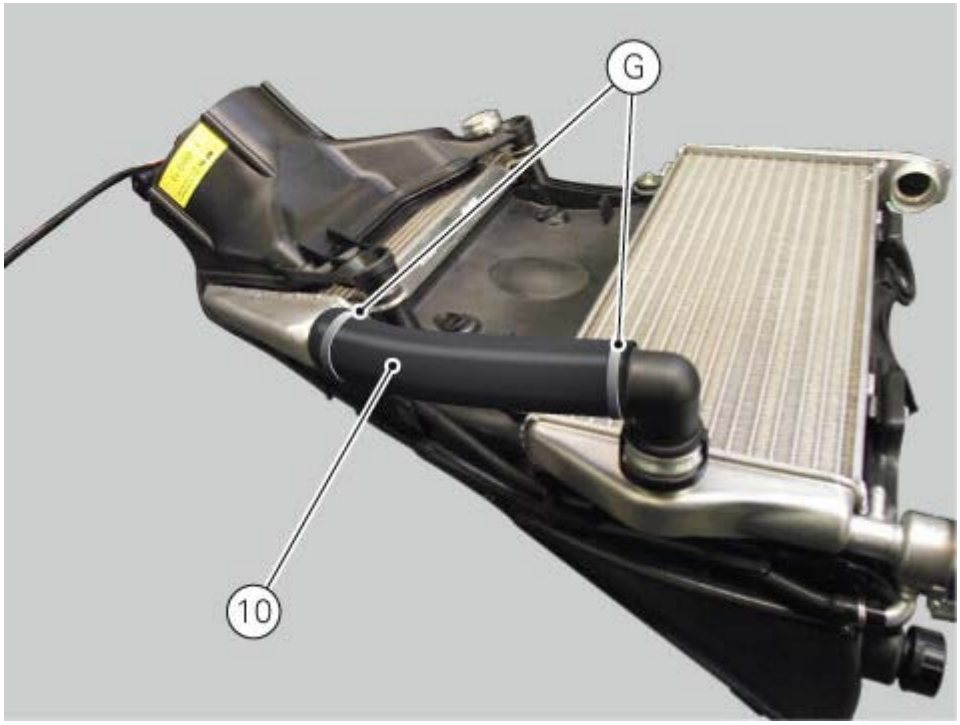
Position the bottom radiator (11) on radiator mounts by fitting the bracket in the vibration damper (O).



Complete fitting of the bottom radiator (11) inserting the vibration dampers fully home on stud bolts, as shown.

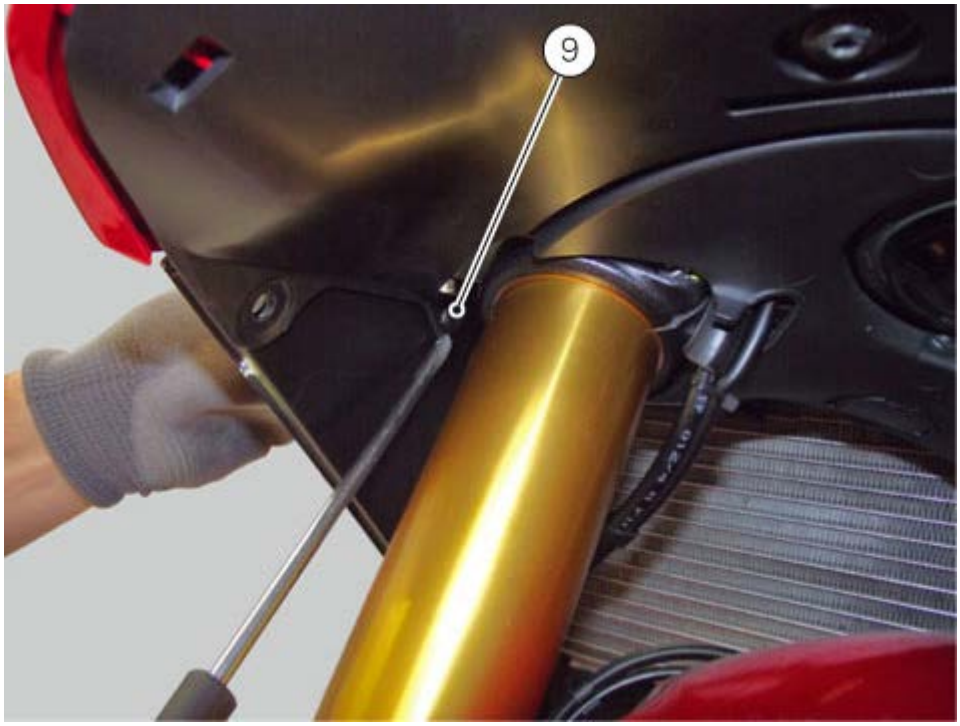
Refit fan on bottom radiator (11) (Renewal of the fan).

Refit hose (10) which connects the top radiator to the bottom one and tighten ties (G) to 2.5 Nm ± 10%.



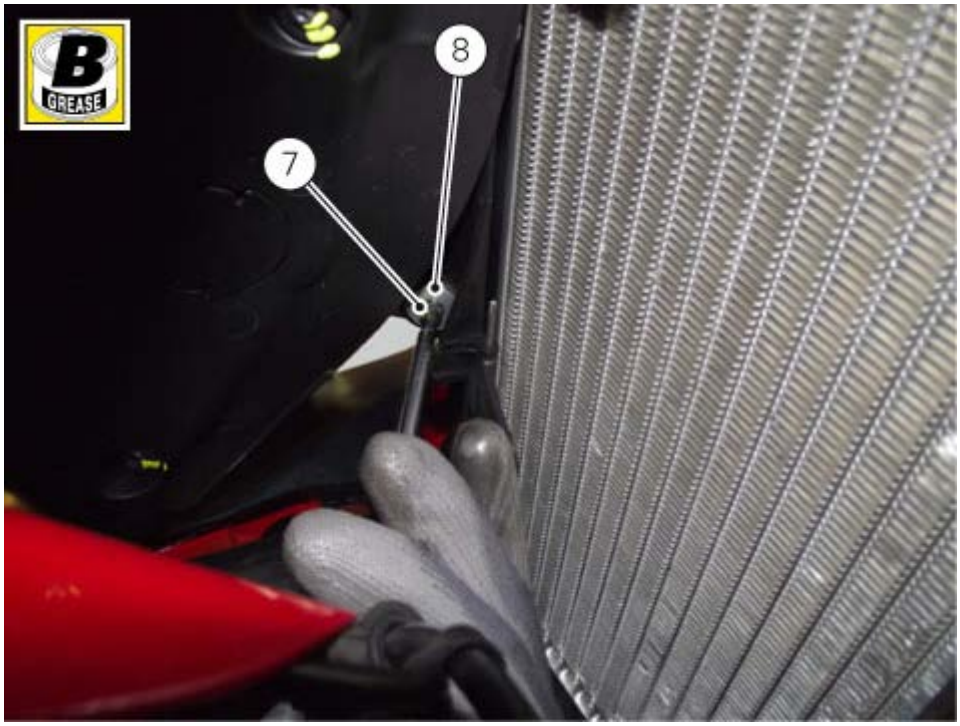
Fit the airbox draining hose (F) to air conveyor and refit the complete radiator assembly to the vehicle.

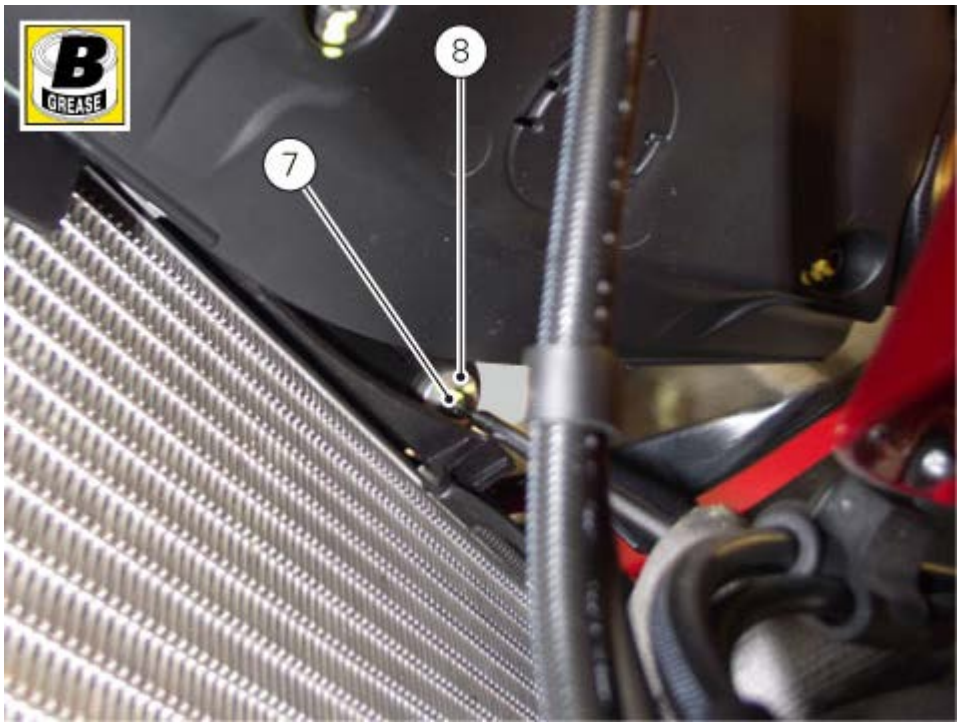
Secure the complete radiator mounts to the headlight fairing using quick-coupling (9).



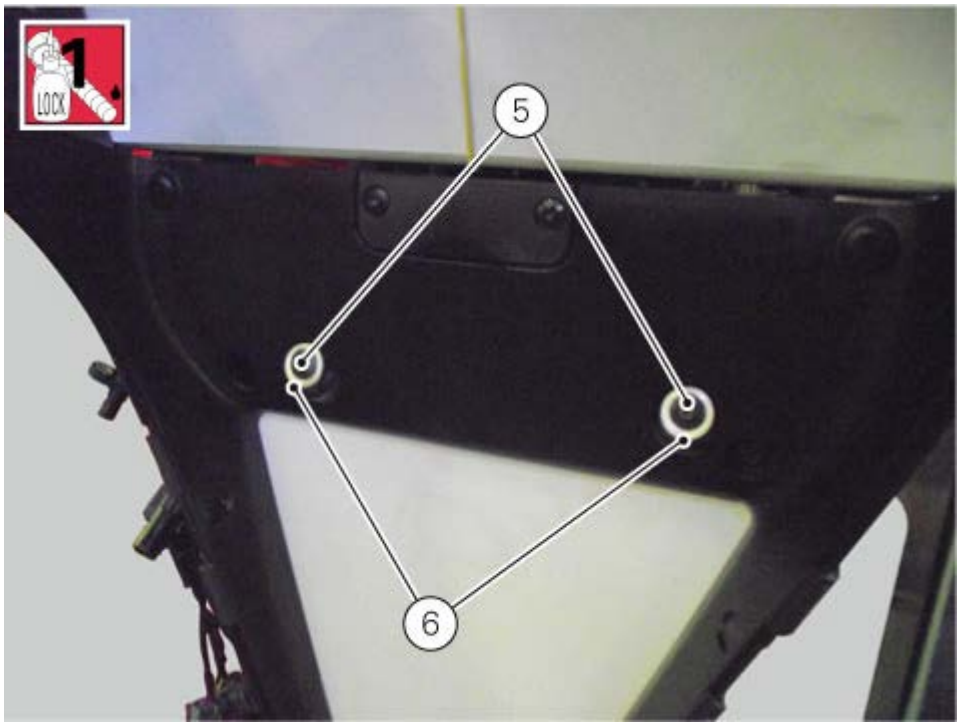
Connect fan connector (D) and exhaust valve drive motor connector (E) and fasten them using a tie.

Apply the recommended grease to the screws (7).
Fit the complete radiator unit on the frame by starting screws (7) with spacers (8).
Tighten screws (7) to a torque of 6 Nm ± 10%.



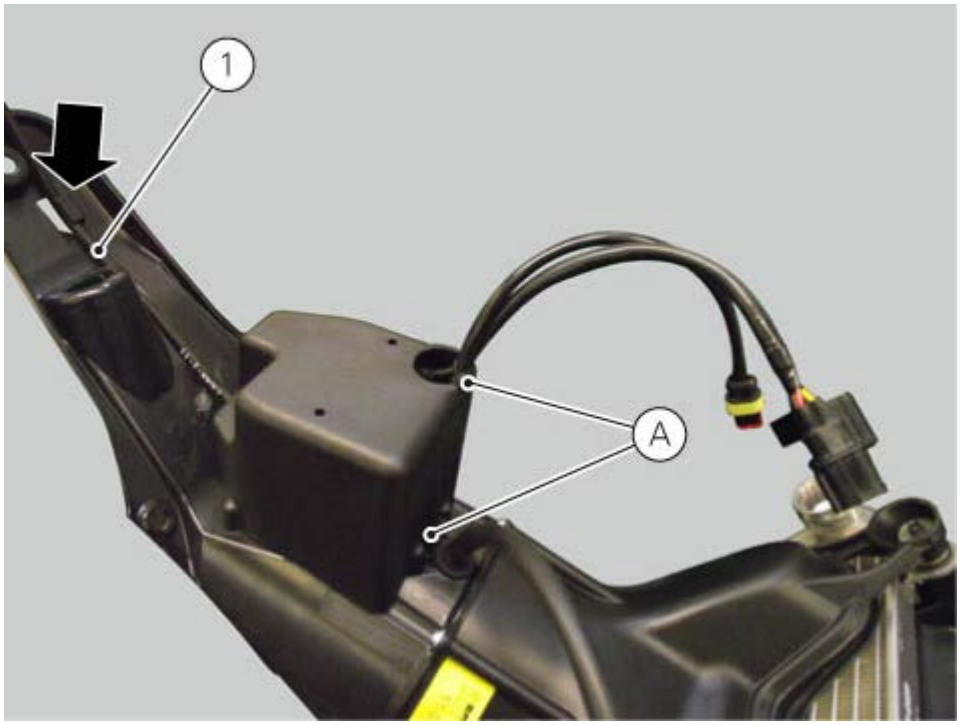


Apply the specified threadlocker on screws (5).
Fit the complete radiator unit on the horizontal head by starting screws (5) with spacers (6).
Tighten screws (5) to a torque of 4 Nm ± 10%.

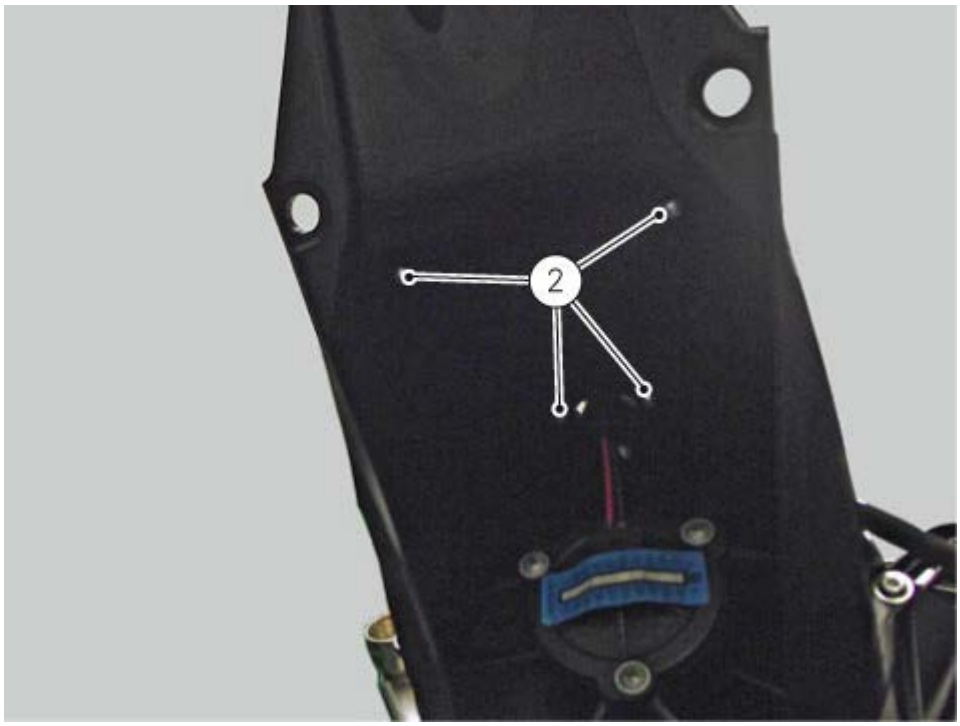


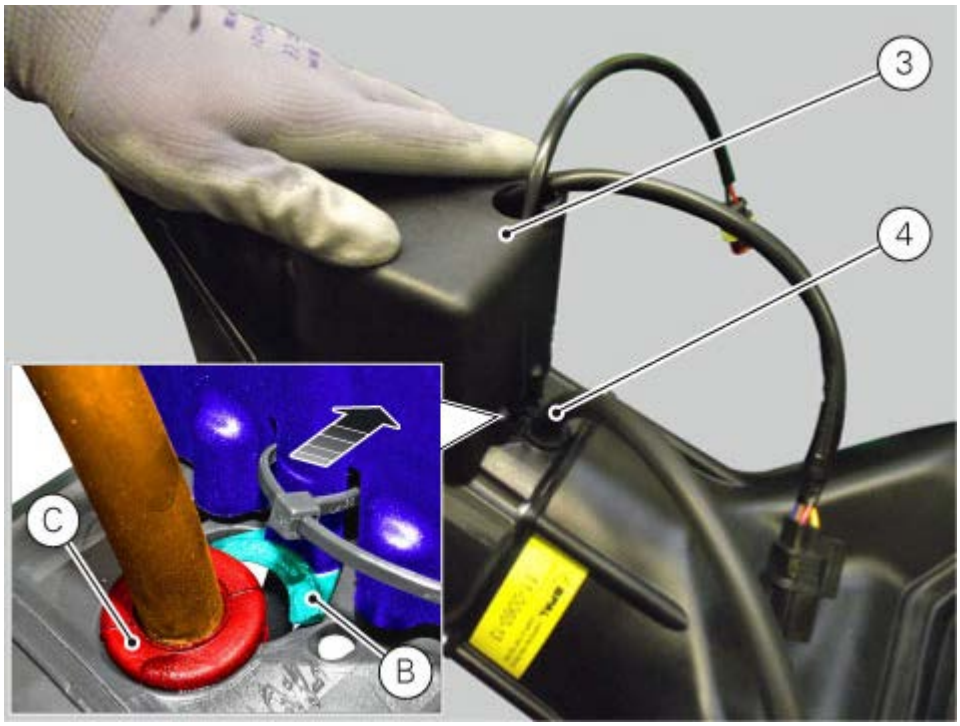
Renewal of the cooling fan

Release the exhaust valve drive motor cable (1) from the clip on air conveyor.
Remove clamp (A) and release the fan cable and exhaust valve drive motor cable.

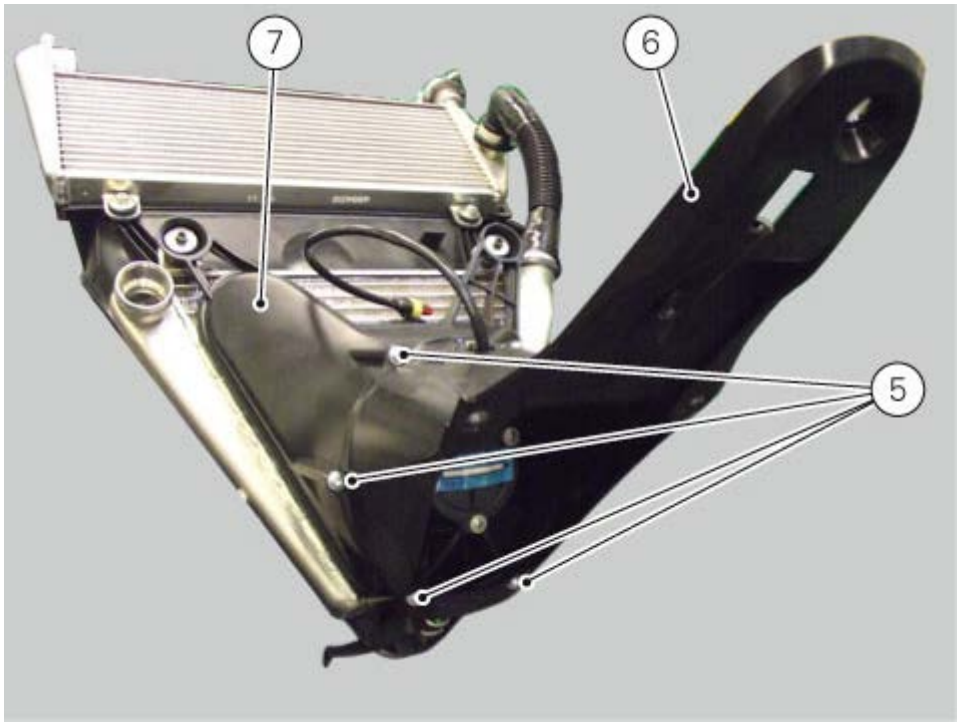


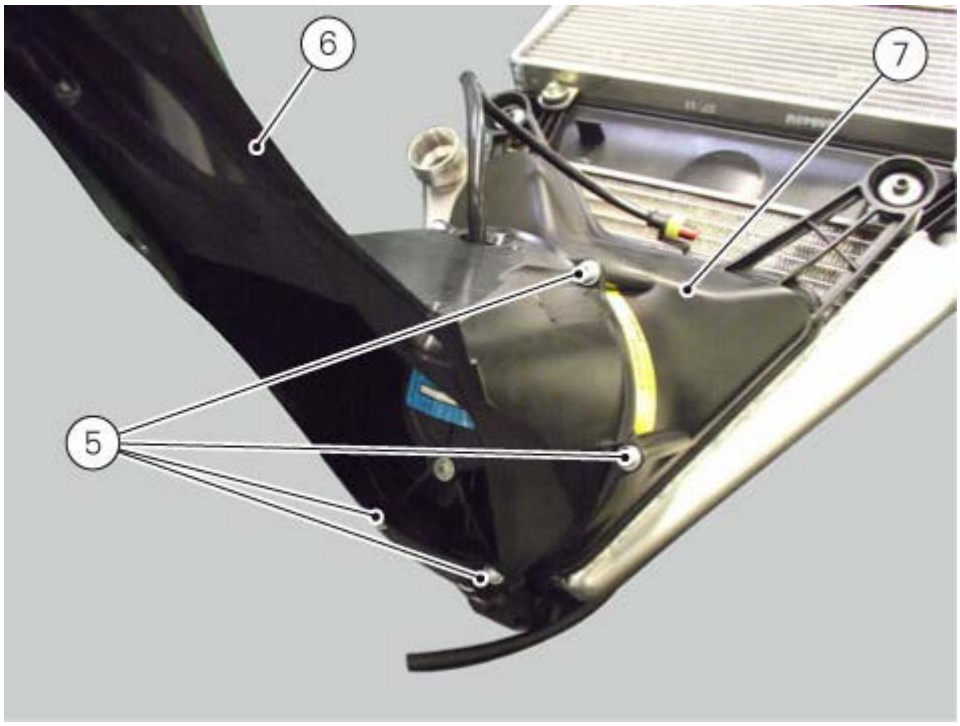
Loosen screws (2) retaining the exhaust valve drive motor (3).
Separate the exhaust valve drive motor (3) from the airbox draining hose (4), disengaging it from fork clip (B) in rubber block (C).
Remove the exhaust valve drive motor (3) from air conveyor.



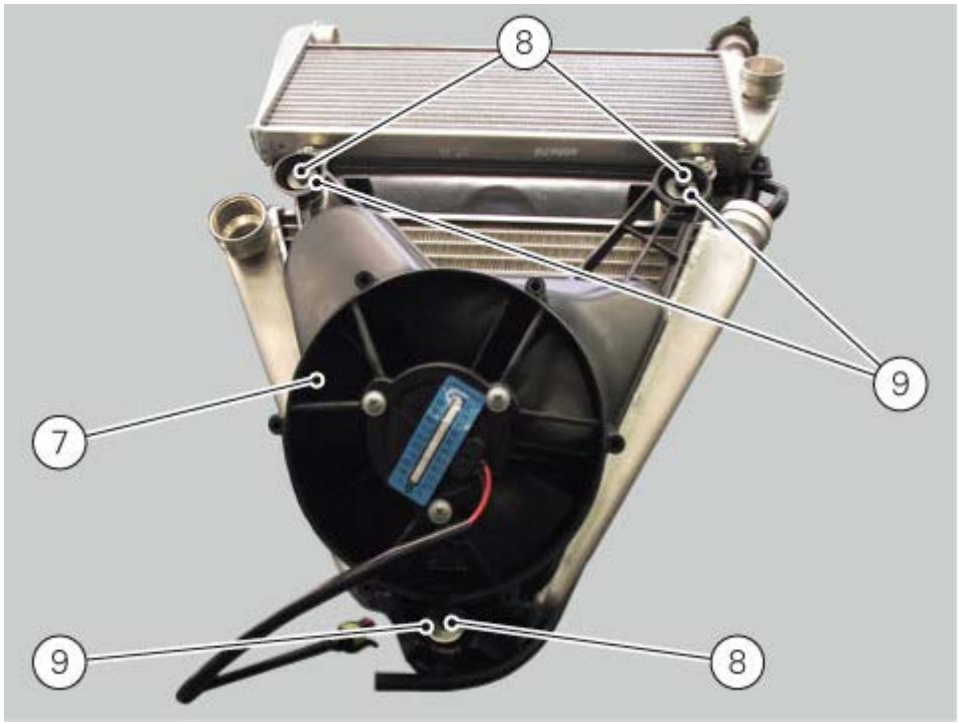


Loosen screws (5) and separate air conveyor (6) from fan (7).



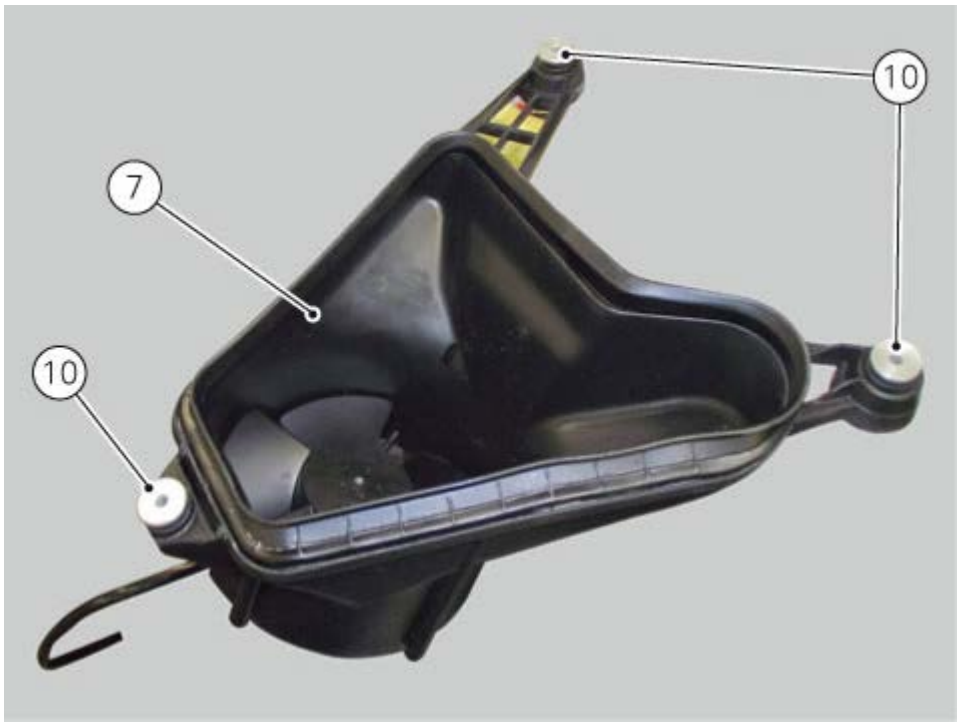


Remove fan (7) from bottom radiator by loosening screws (8); keep washers (9).

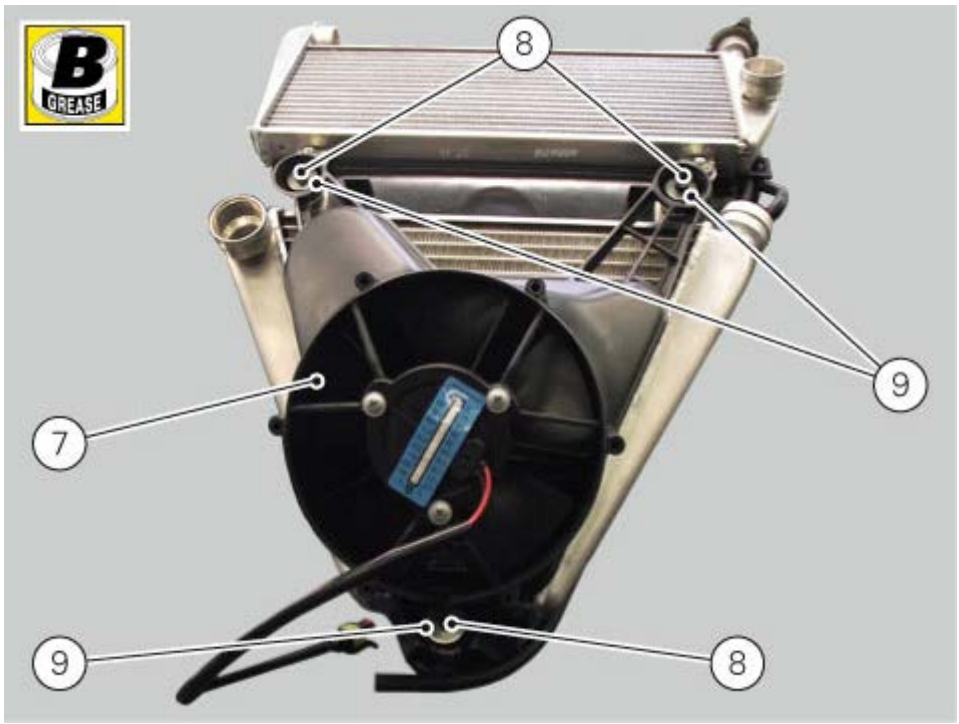


Installation of the cooling fan

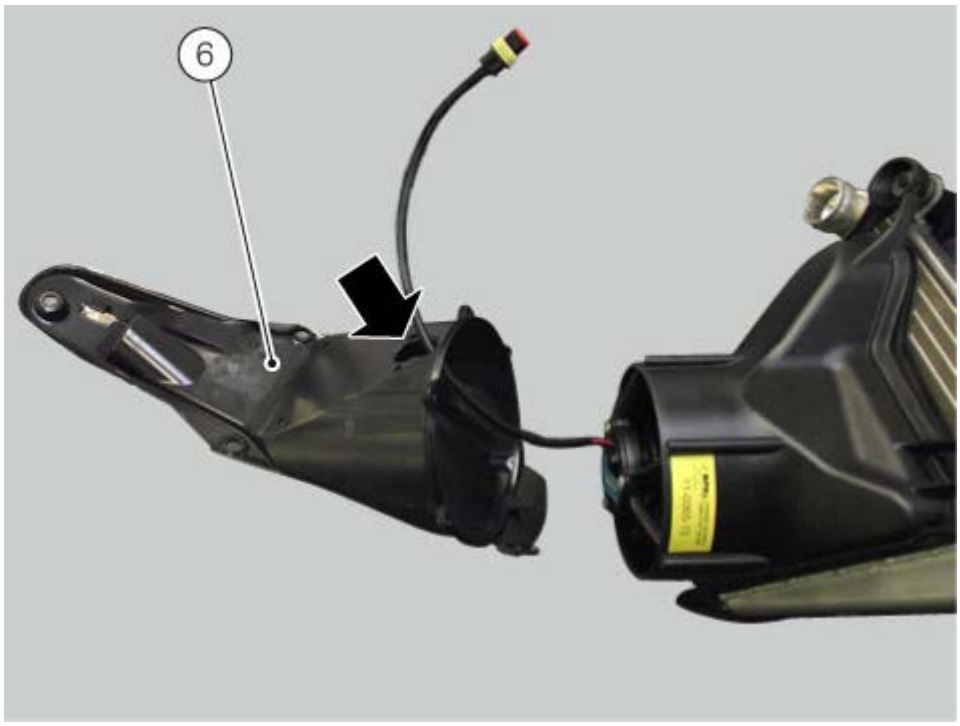
Ensure that fan (7) is fitted with hat-shaped spacers (10) inside vibration dampers, or fit them on fan side as shown in the figure.



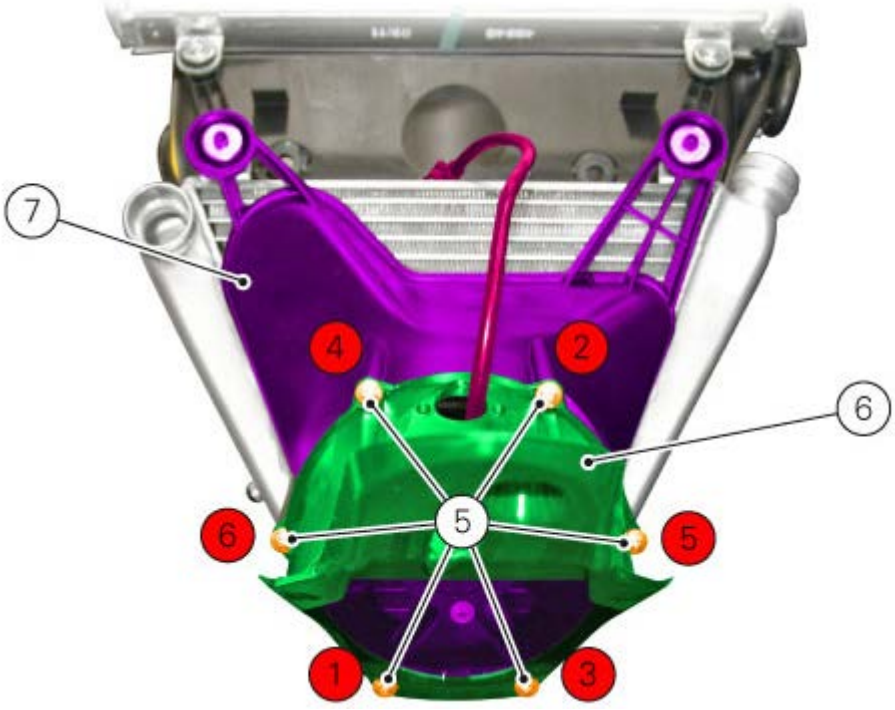
Smear recommended grease on thread and underside of screws (8).
Fit washers (9) onto screws (8).
Position fan (7) on bottom radiator, setting it as shown, and fasten it by starting screws (9)
Tighten screws (8) to 5 Nm ± 10%.



Let fan wiring slide inside the hole on air conveyor (6).

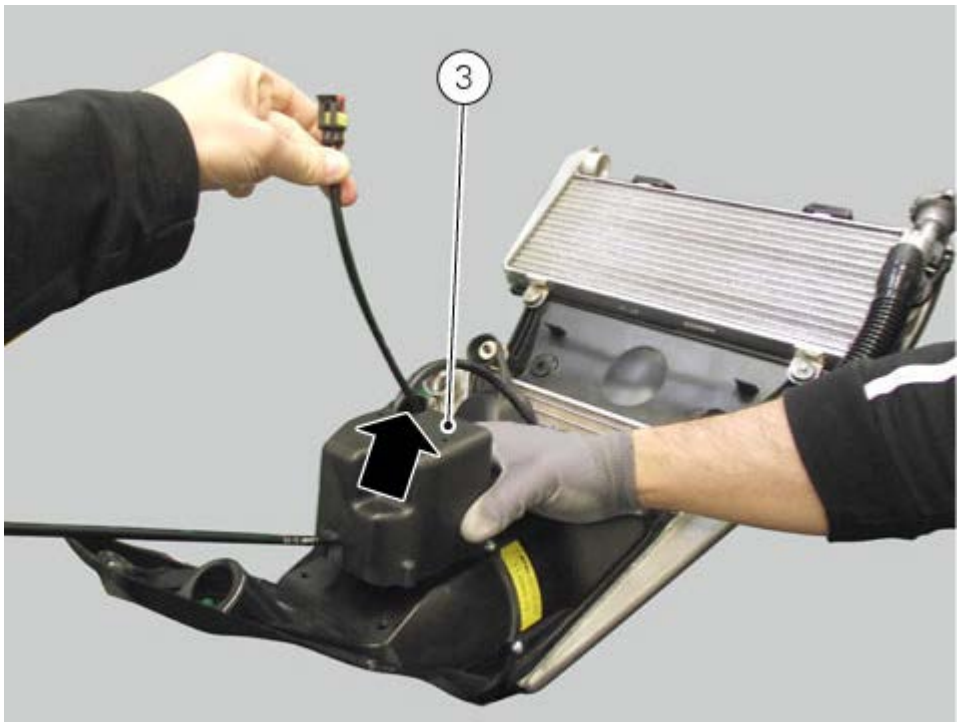


Position the air conveyor (6) on fan (7), set as shown in the figure, and fasten it by starting screws (5).
Tighten screws (5) to 5 Nm ± 10%, following a 1 - 2 - 3 - 4 - 5 - 6 sequence, as shown in the figure.

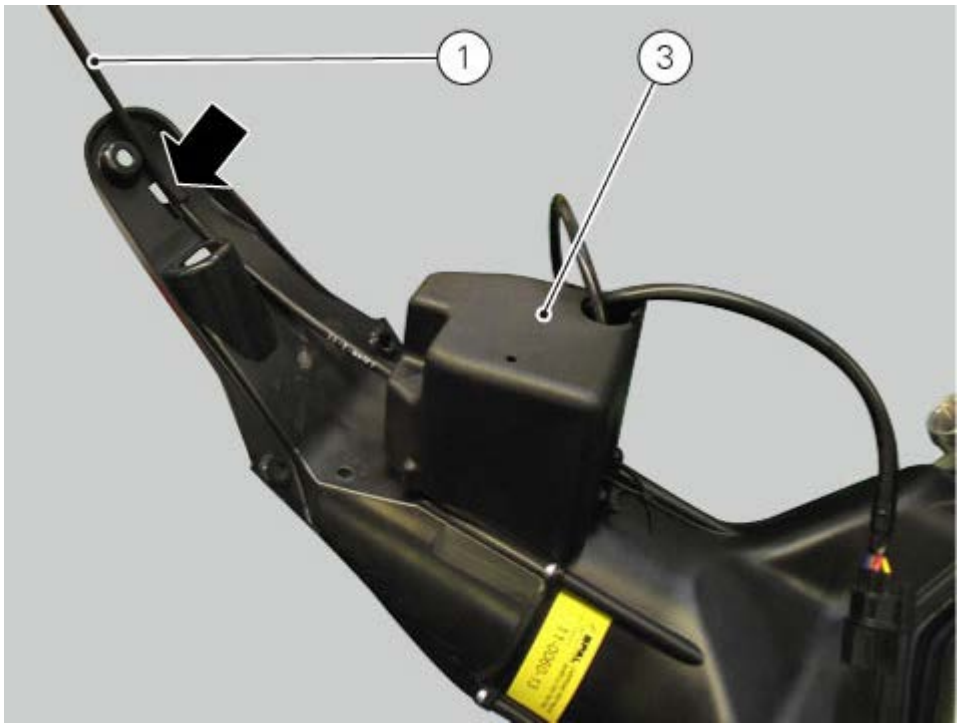


If the exhaust valve drive motor was disassembled, reassemble it as explained under "Reassembly of the exhaust valve drive motor".

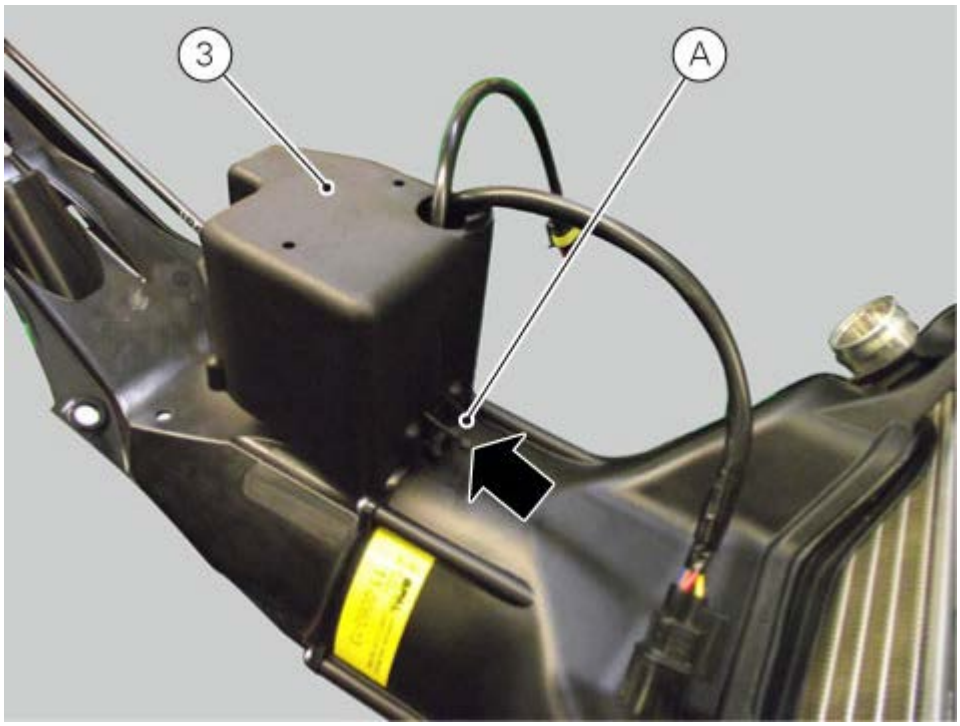
Set the exhaust valve drive motor (3) on air conveyor.
Let fan wiring slide inside the hole on exhaust valve drive motor (3).



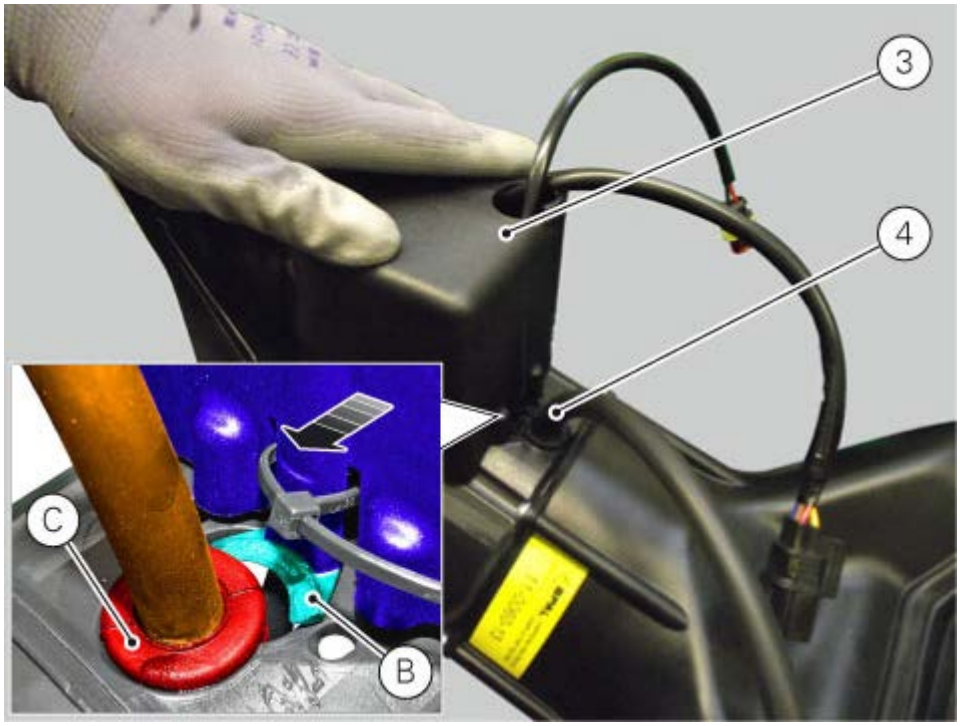
Engage the exhaust valve drive motor (3) inside clip, as shown.
Tie the fan wiring and the exhaust valve drive motor wiring using a tie (A), located in the position shown, without fastening it completely, so that fan wiring and exhaust valve drive motor wiring can freely slide inside it.

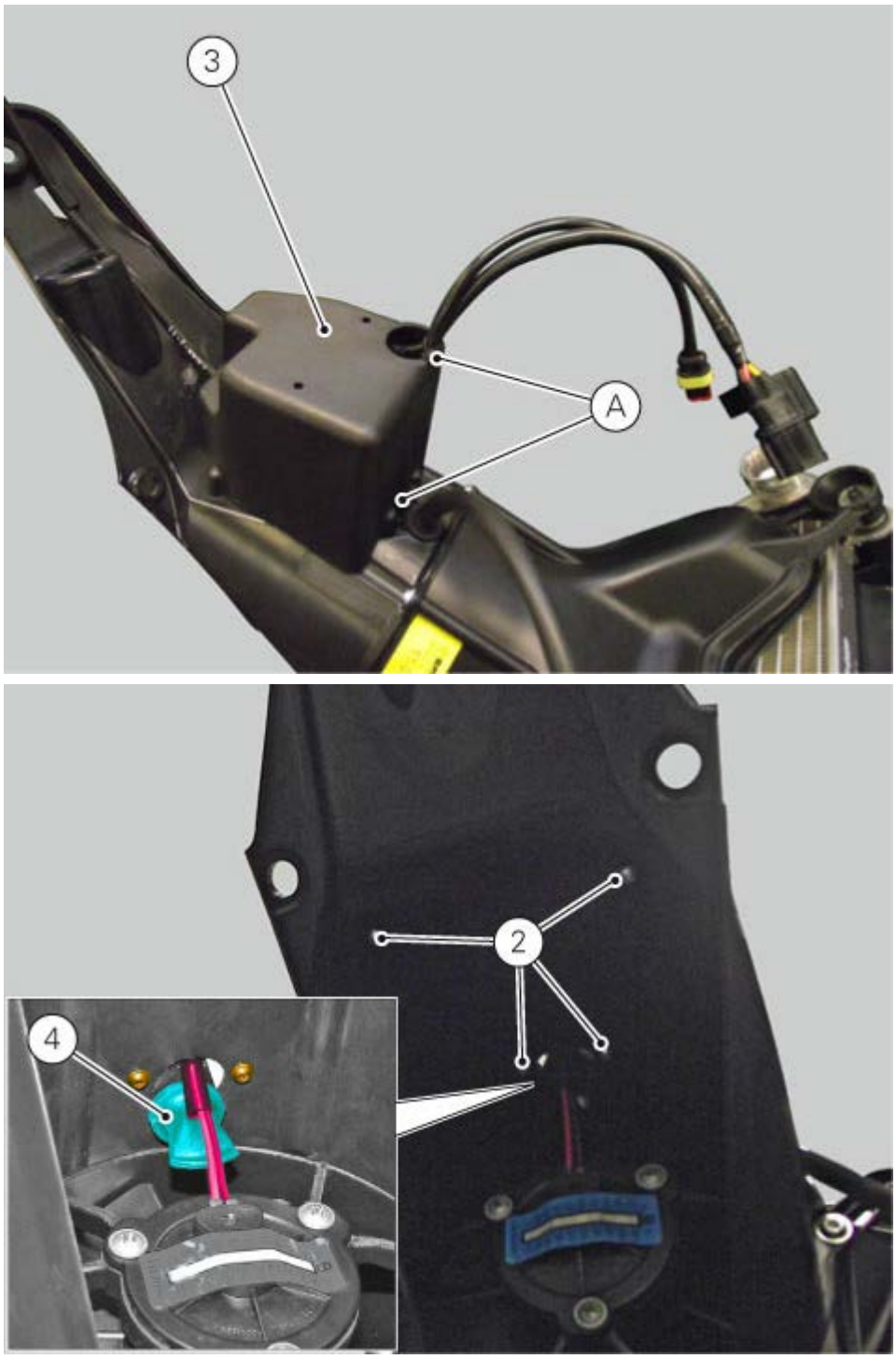


Install the airbox draining hose (4) fitting rubber block (C) in its seat on air conveyor (3), as shown in the figure.
Move the exhaust valve drive motor assembly (4) to airbox draining hose (4) and fit fork clip (B) in rubber block (C).



Fasten the exhaust valve drive motor (3) to air conveyor by starting screws (2) on conveyor bottom part.
Tighten screws (2) to 5 Nm ± 10%.
Slightly pull up with your hands to tension the fan wiring and exhaust valve drive motor wiring and fasten the small tie (1) you previously left loose.
Tie the fan wiring and the exhaust valve drive motor wiring to exhaust valve drive motor (3) using another tie (1), fitted in the position shown.
Position the draining hose (4) so as to prevent it from interfering with the fan wiring, as shown.



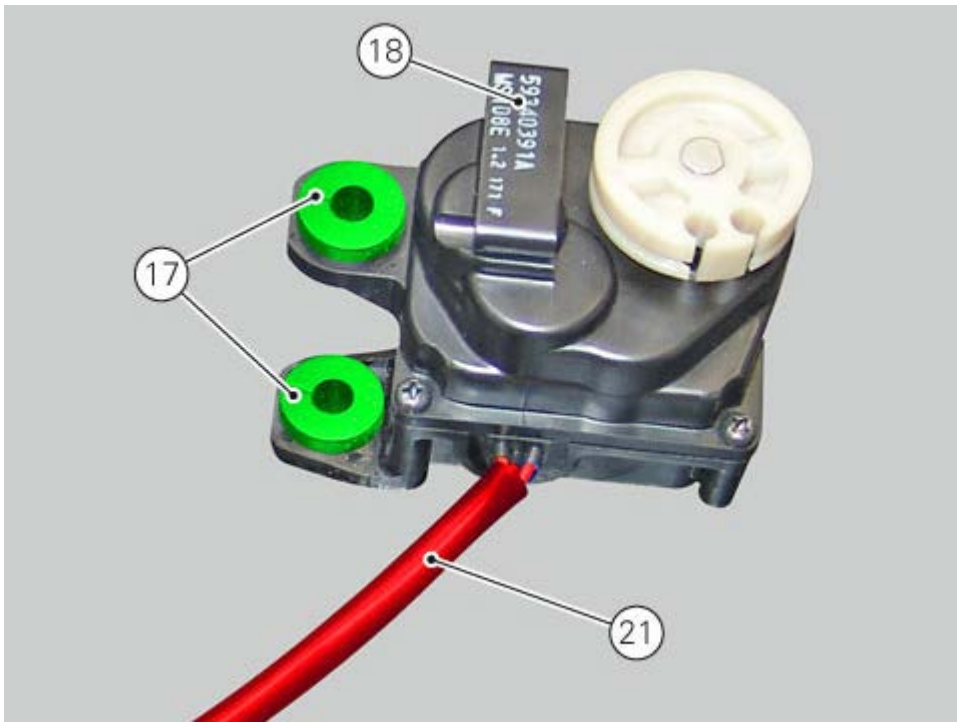


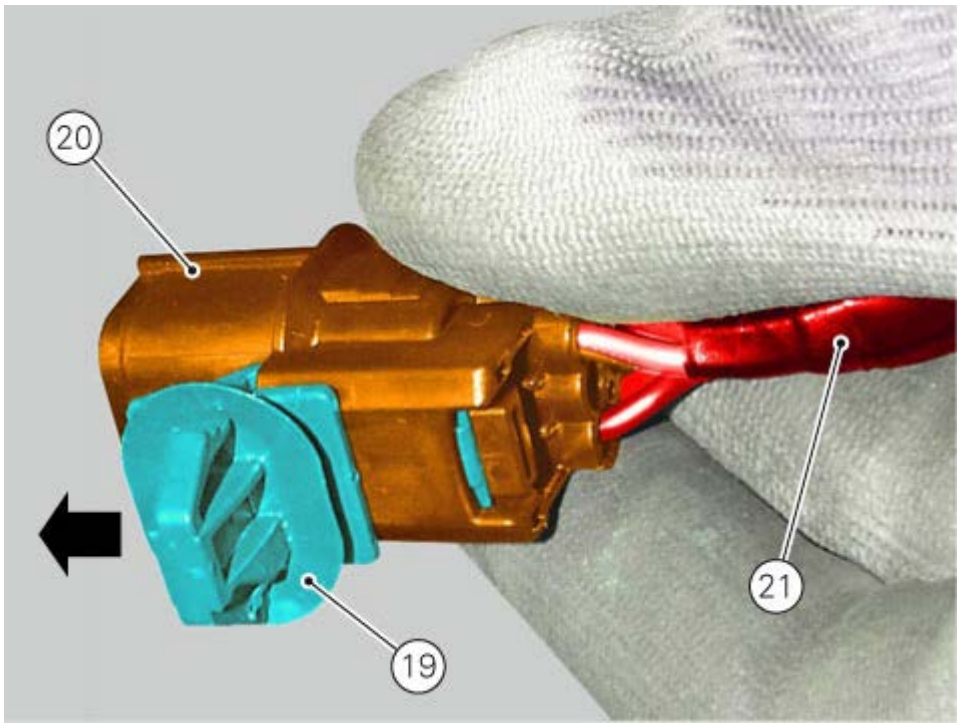
Reassembly of the exhaust valve drive motor

Fit the vibration damper mounts (17) in the relevant holes of the exhaust valve drive motor (18).

Note
In case of problems when fitting the vibration dampers (17), it is recommended to use KLÜBERPLUS S 06/100, and apply some on the vibration dampers.

Detach the quick-fitting (19) available on connector (20) of exhaust valve drive motor (21).



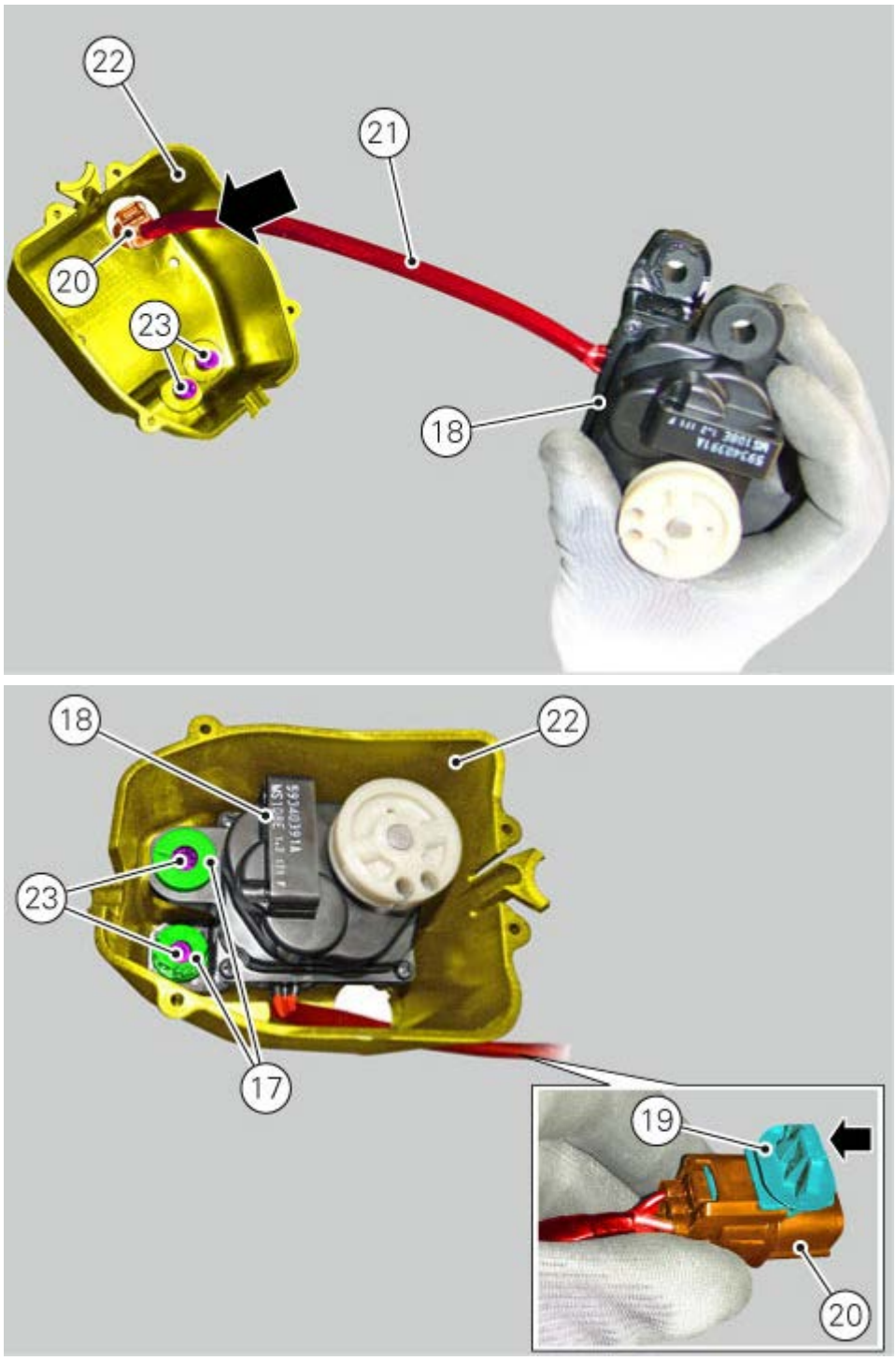


Install the exhaust valve drive motor (18) on cover (22), taking the vibration dampers (17) fully home on stud bolts (23).

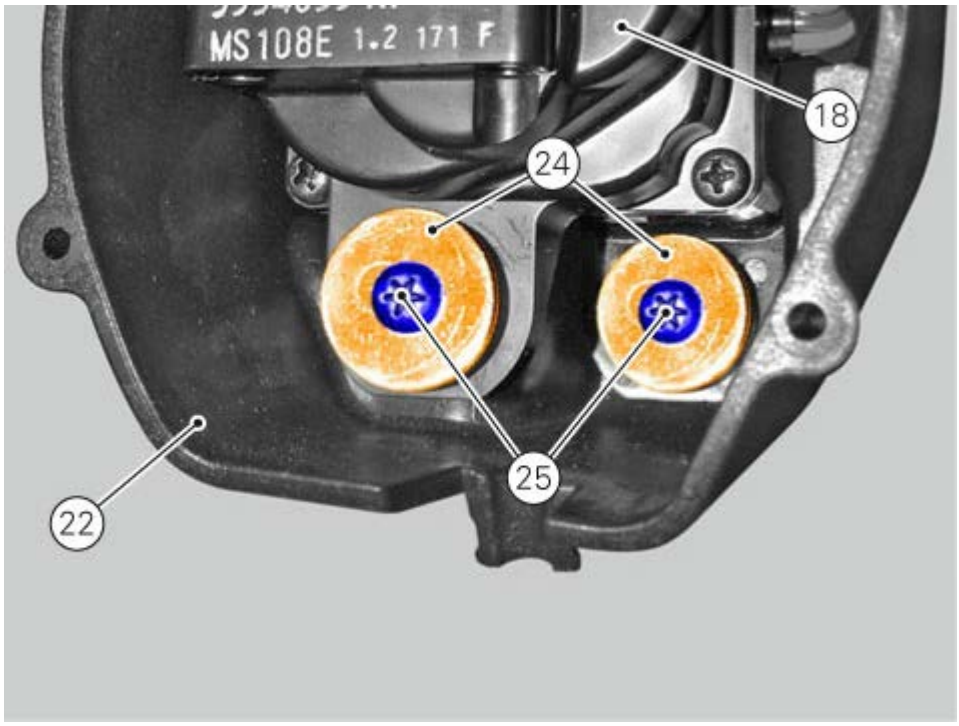
Note

In case of problems when fitting the vibration dampers (17), it is recommended to use KLÜBERPLUS S 06/100, and apply some on the vibration dampers.

Route exhaust valve drive motor wiring (21) connector (20) inside the hole on cover (22), as shown. Refit the quick-fitting (19) to exhaust valve drive motor wiring (21) connector (20).



Fit washers (24) on screws (25).
Fasten the exhaust valve drive motor (18) to cover (22) starting screws (25) on the vibration dampers installed previously.
Tighten screws (25) to 2 Nm±10%.

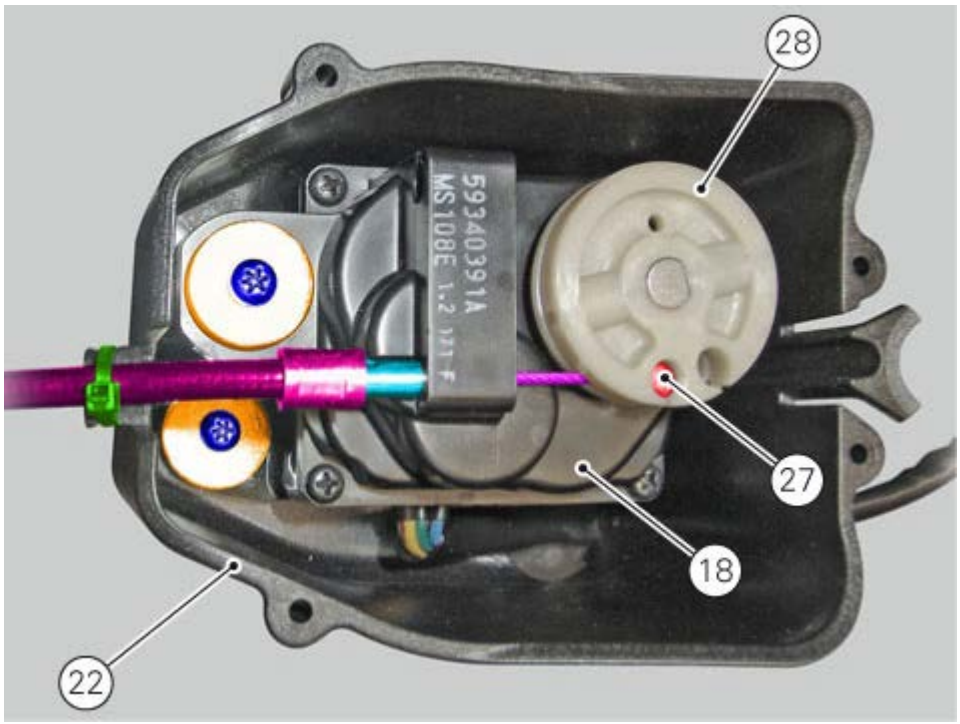


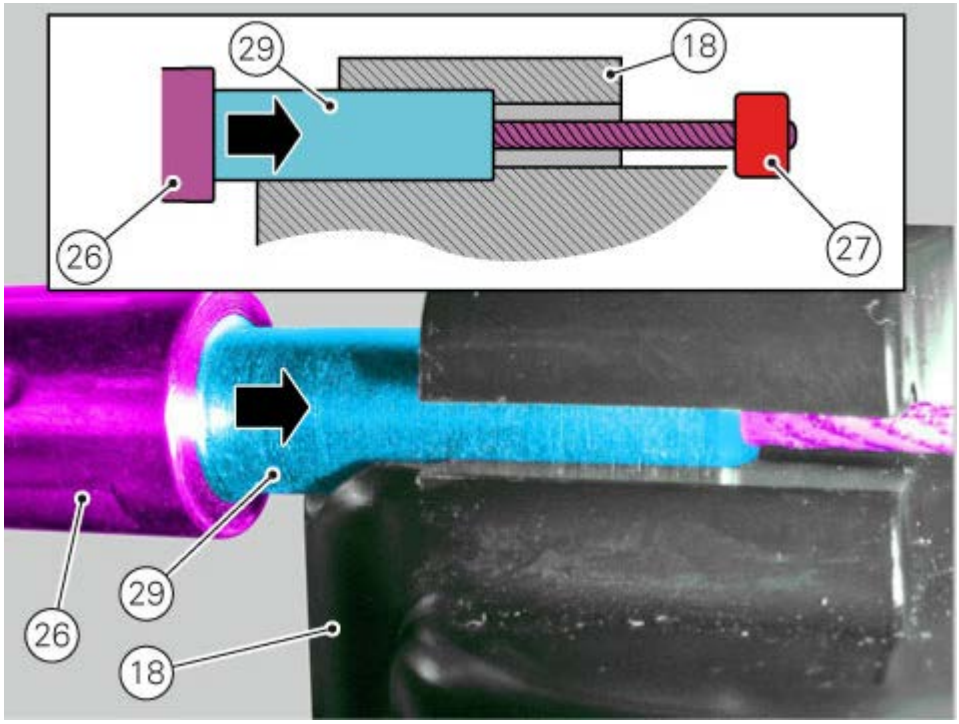
Install the exhaust valve drive motor cable (26) and engage pawl (27) in the relevant hole on pulley (28).

Note
The exhaust valve drive motor cable (26) must be positioned as indicated.

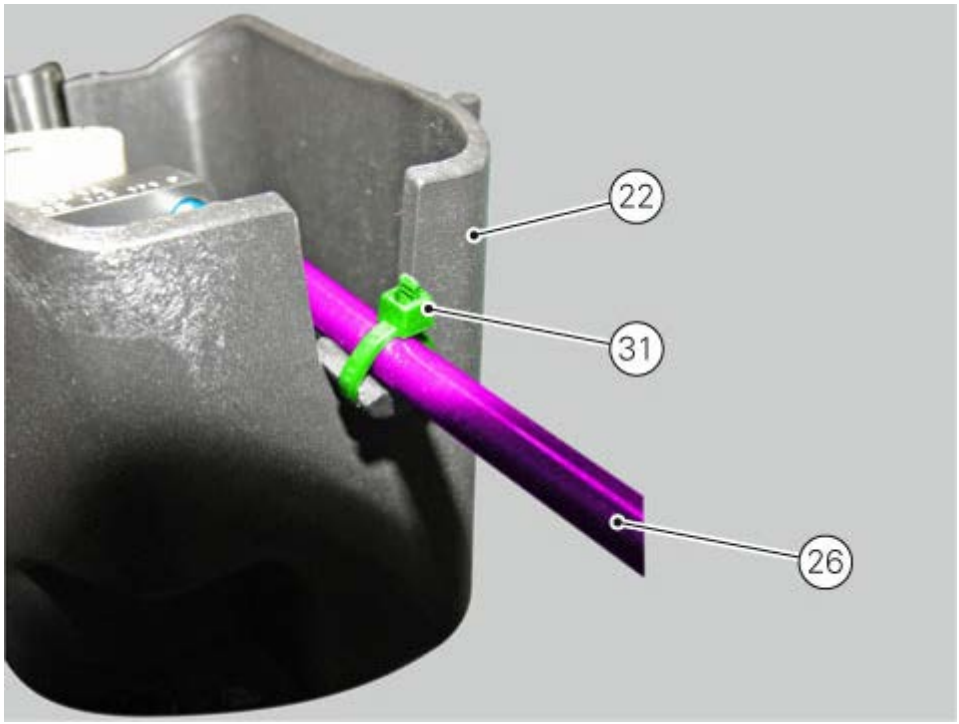
Fit the cylindrical end (29) in the relevant seat on exhaust valve drive motor (18), ensure to take it fully home as shown in the figure (30).

Attention
In case of problems when fitting the terminal (29) fully home, it is recommended to use RUBBER-SPECIFIC LUBRICANT (KLÜBERPLUS S 06/100), and apply some on the terminal.



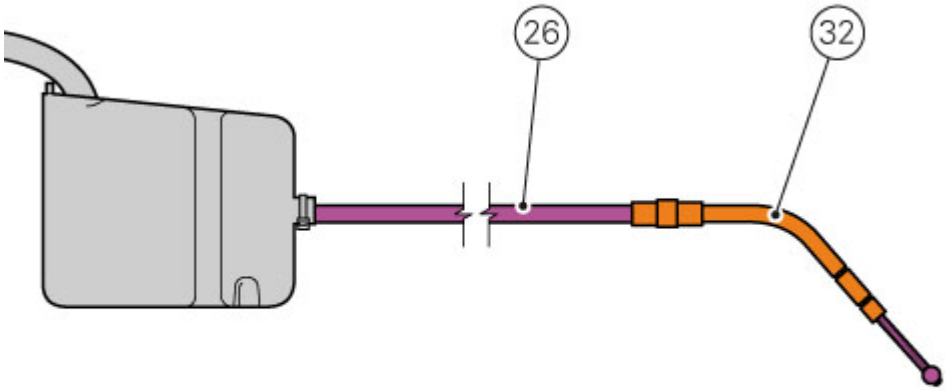


Tie the exhaust valve drive motor (26), using a small tie (31), in the indicated cover area (22).



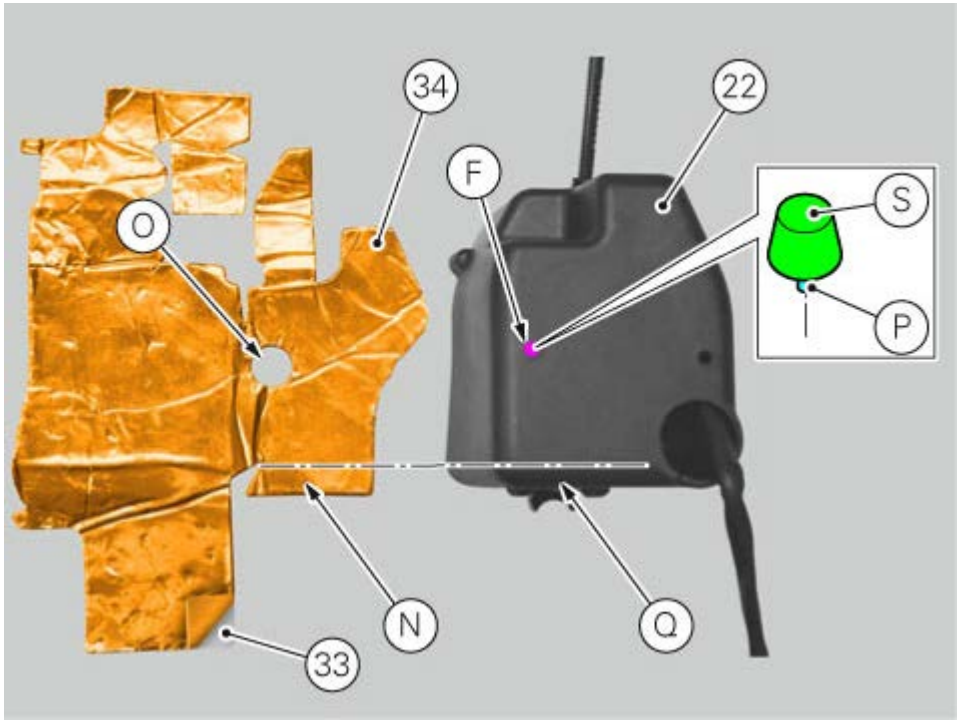
Important

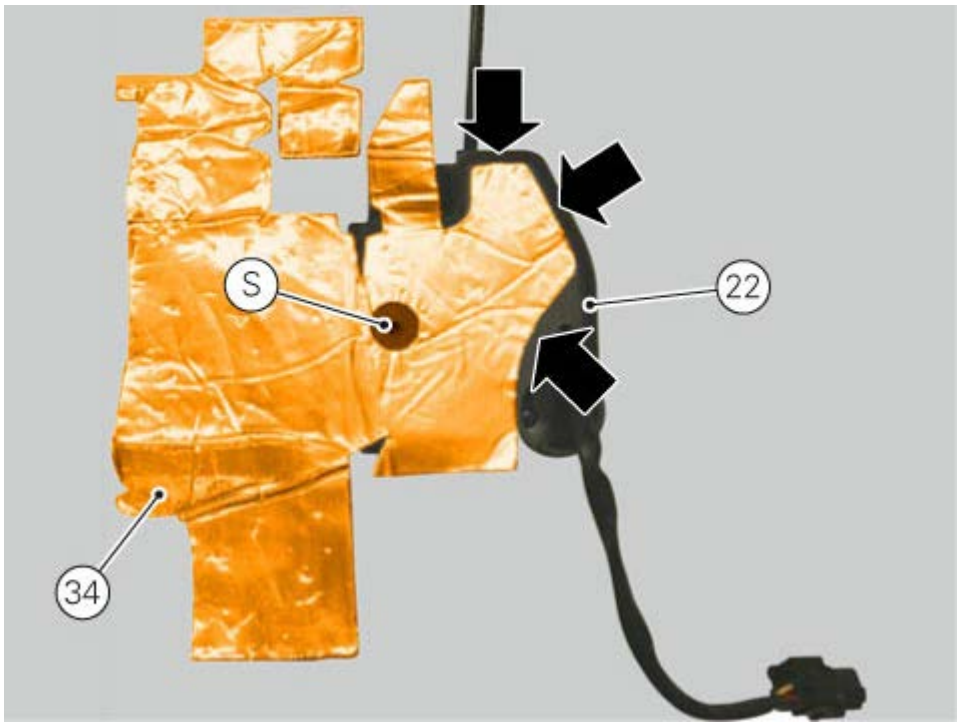
Once assembled, the exhaust valve drive motor cable (26) must be positioned with bent terminal (32) downward.



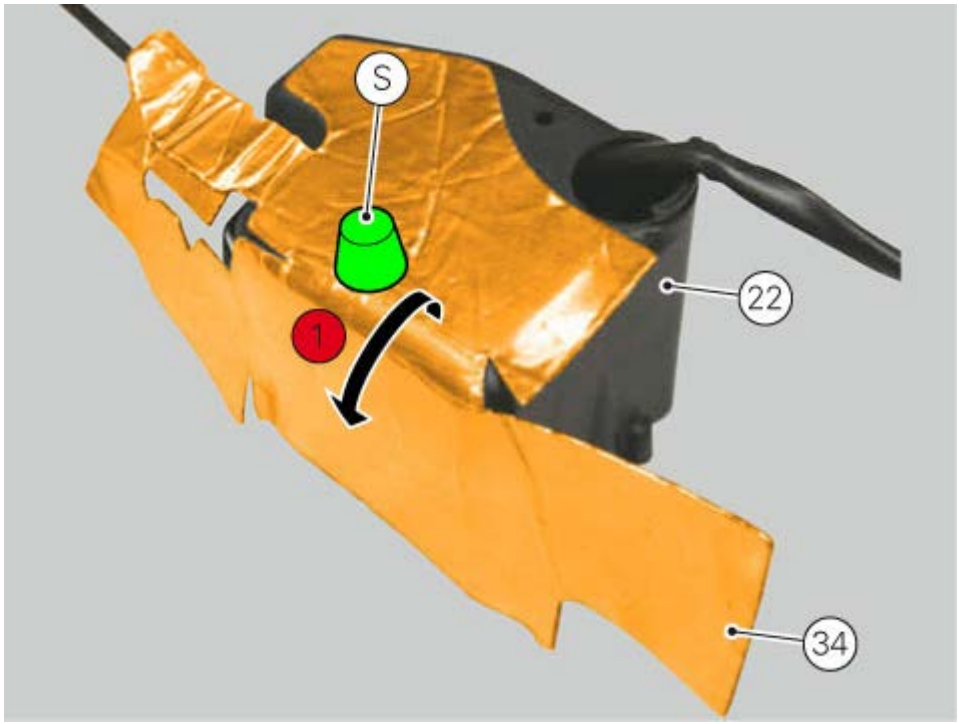
Install a service taper pin (S) and fit pin (P) in hole (F) on cover (22).
Remove the protective film (33) at the back of the heat reflective material (34).
Position the heat reflective material (34) on cover (22) top part, as follows:

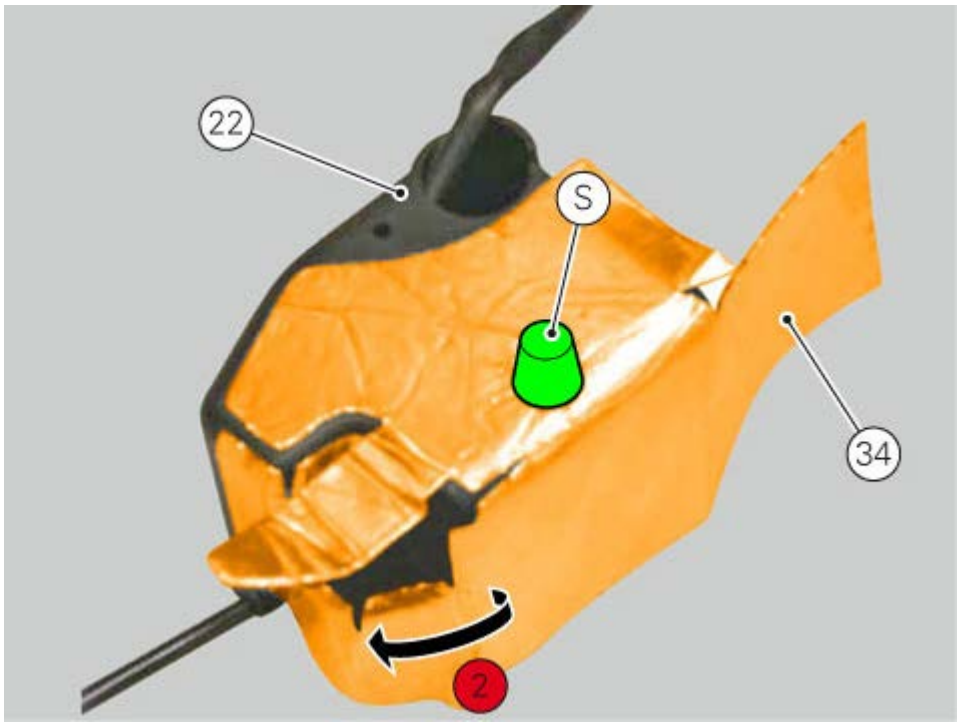
- Centre hole (O) of heat reflective material (34) on taper pin (S);
- Align heat reflective material (34) bend (P) with the internal profile (Q) of cover (22) chamfer;
- Make heat reflective material (34) perfectly adhere especially in the areas indicated by the blue arrows.

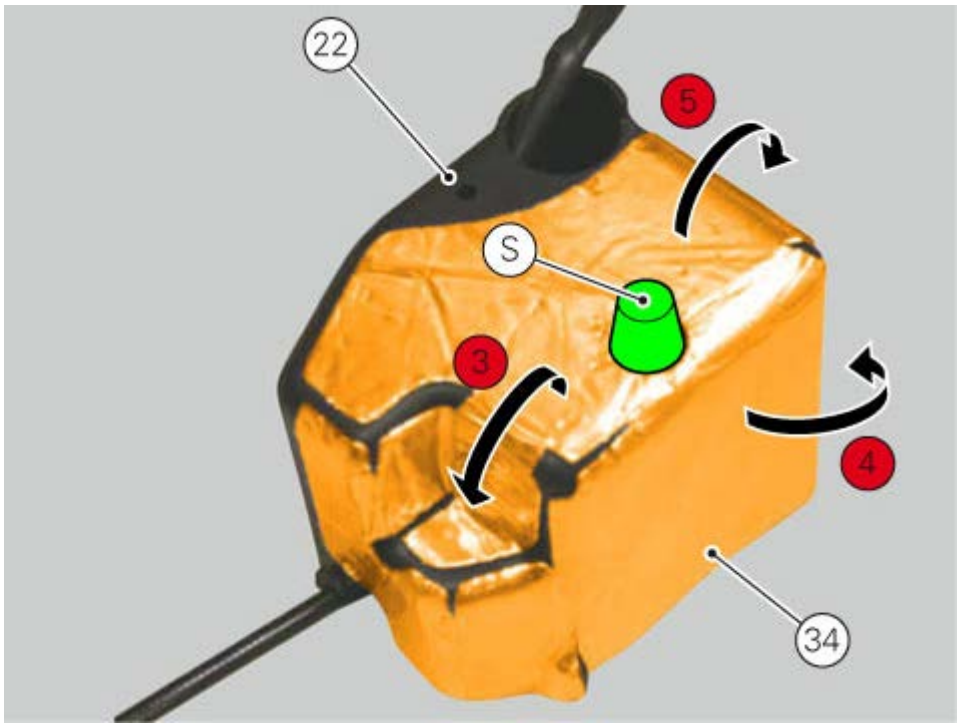




Apply the remaining parts of heat reflective material (34) on cover (22), strictly following the 1-2-3-4-5 sequence.
Remove the service taper pin (S).

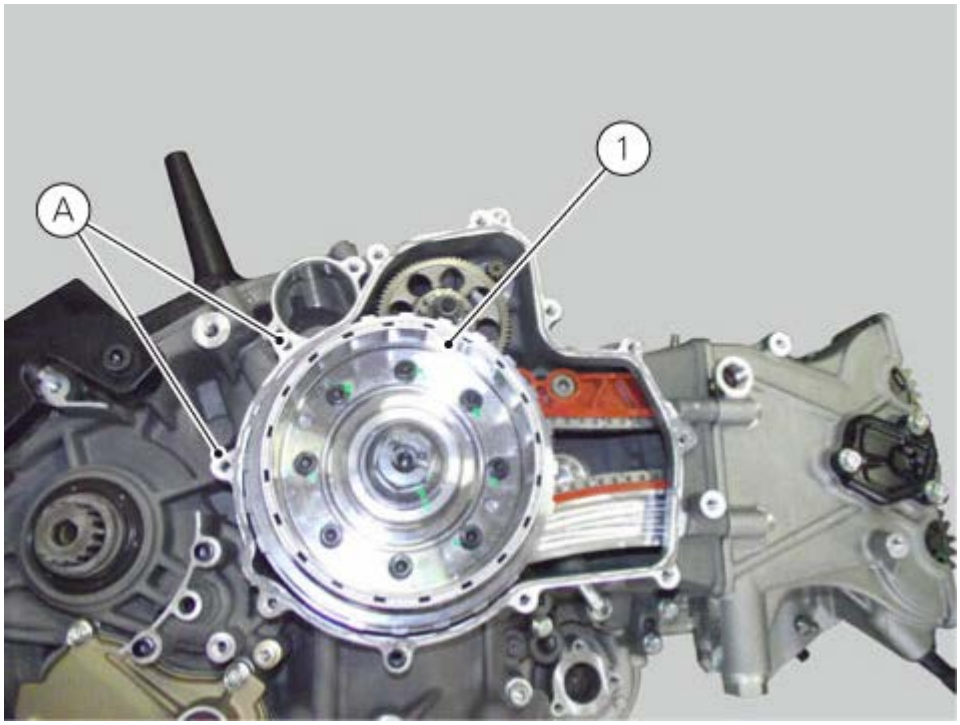


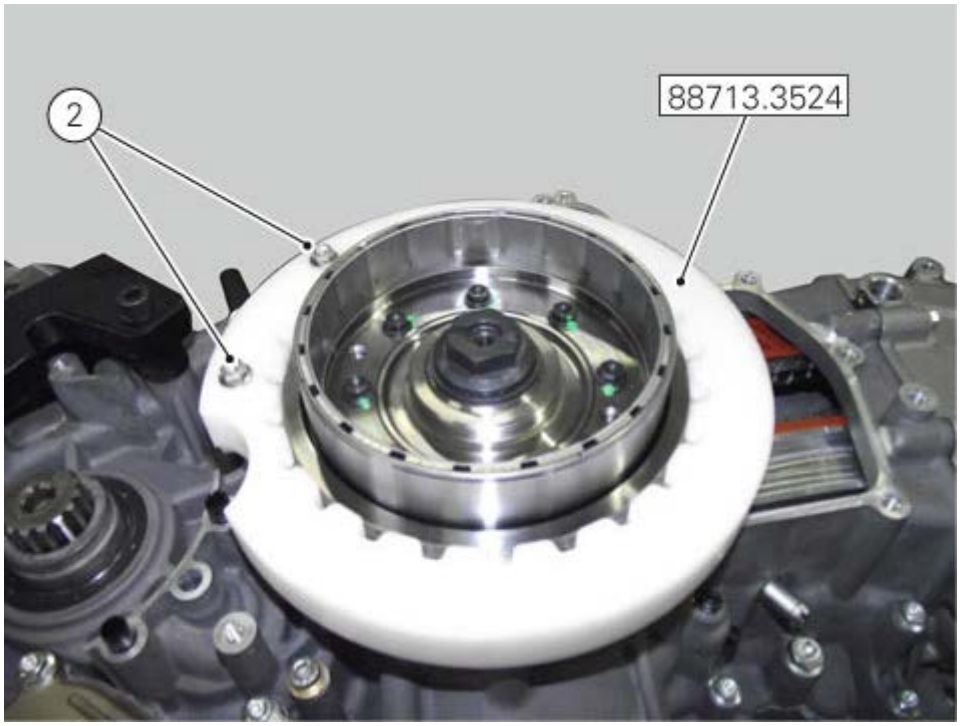

22
S
34
2


22
5
S
3
4
34

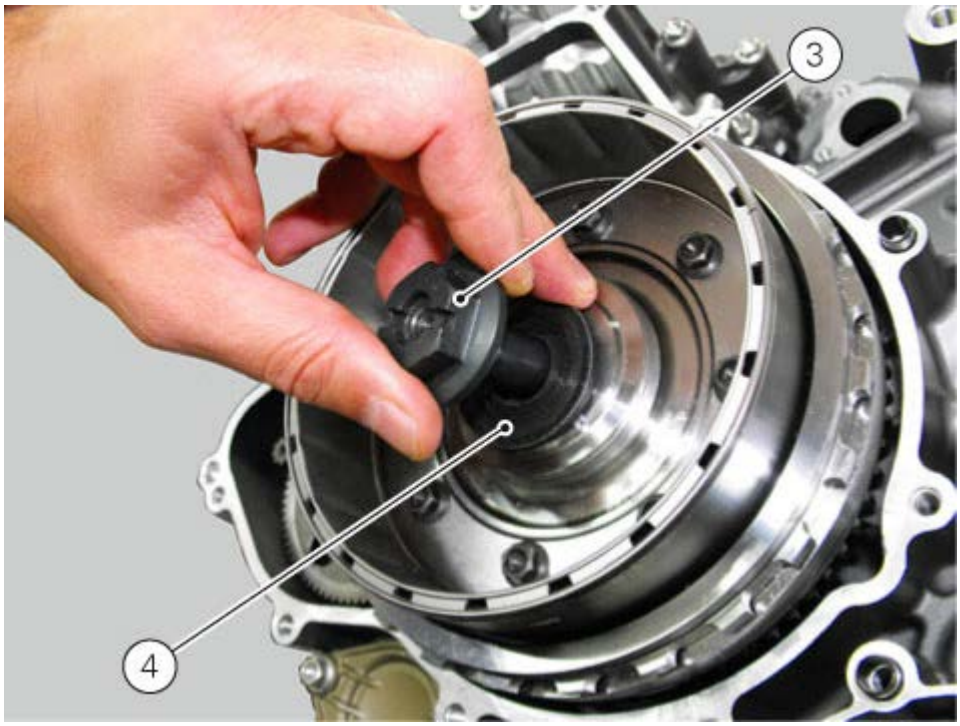
Removal of the flywheel/generator assembly

Hold the flywheel assembly (1) installing tool part no. **88713.3524** and securing it in place by means of screws (2) in holes (A).

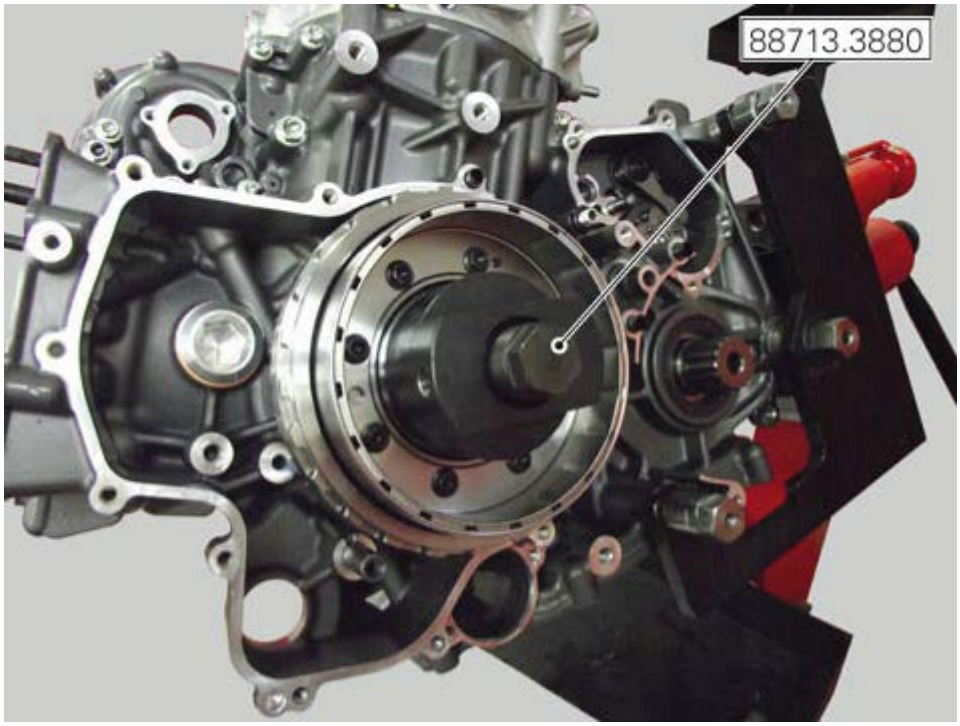




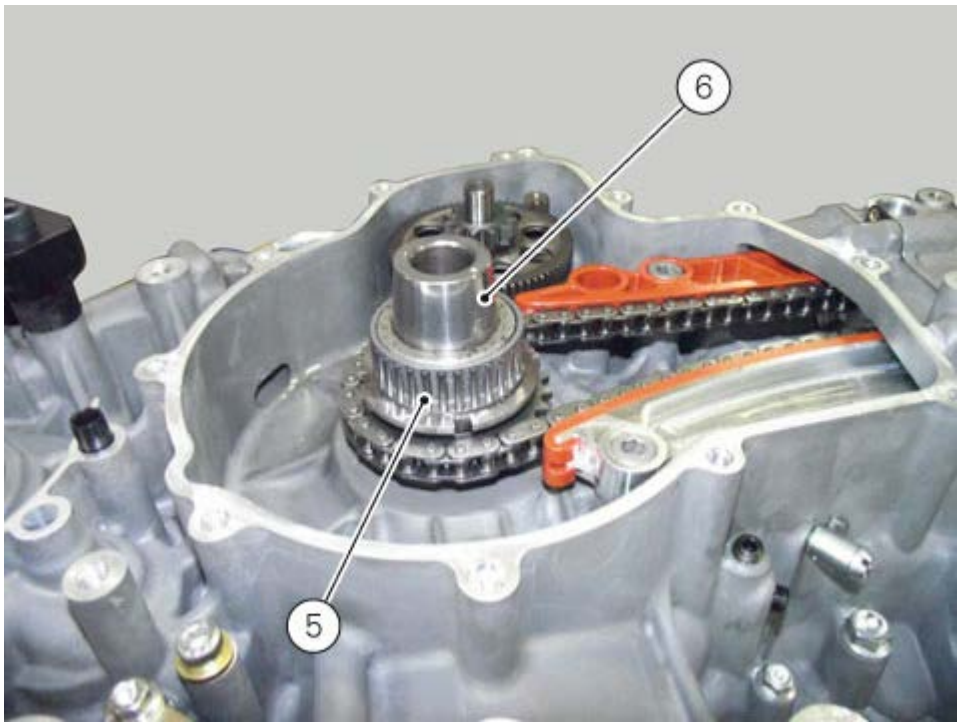
Loosen flywheel screw (3).
Remove screw (3) and washer (4).



Using tool part no. **88713.3880**, remove the flywheel assembly and driven gear from crankshaft.



Remove the roller bearing (5) and key (6).

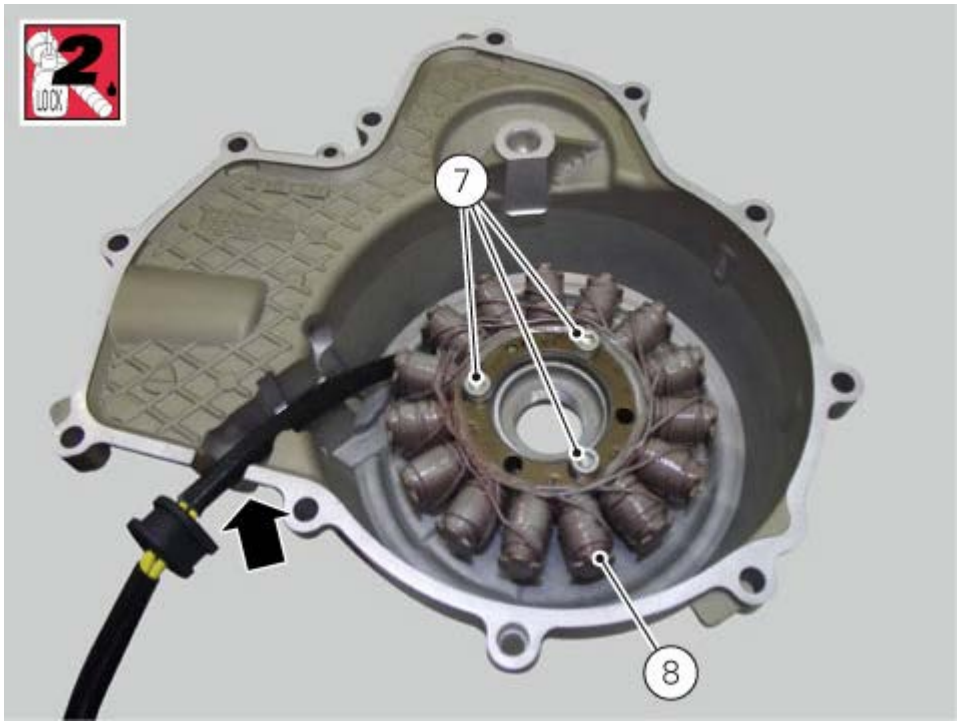


Important

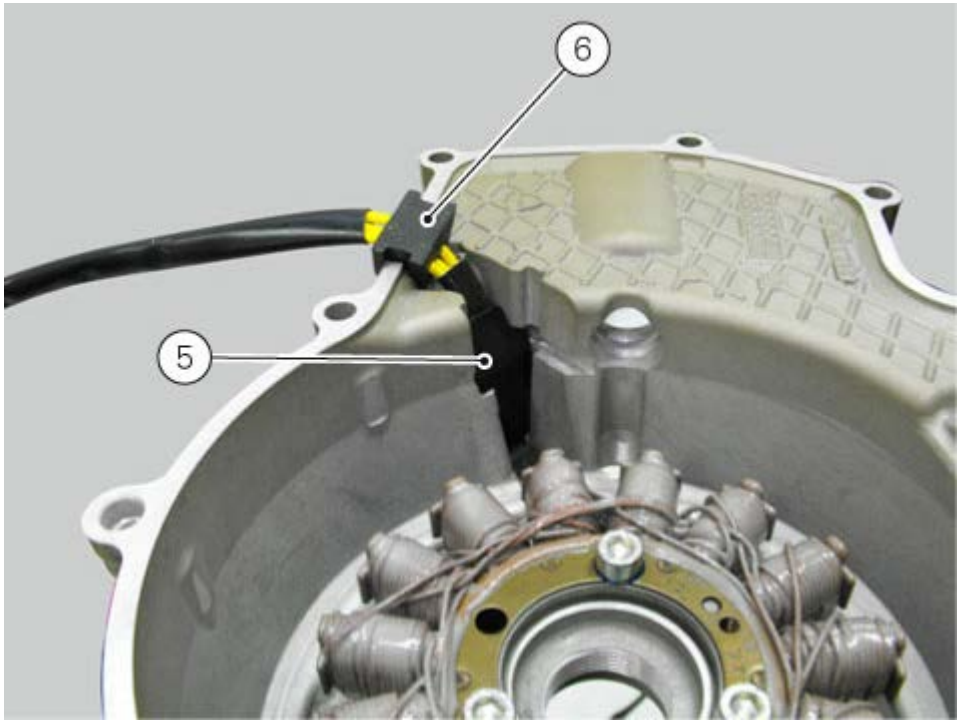
Check roller bearing for wear. Change it if worn out.

Fitting the generator cover

Fit stator (8) inside the generator cover, so that the cable exit point faces downwards and towards the recess.
Insert rubber element (6) in the generator cover recess and block the cable by inserting plate (5).
Thoroughly clean the retaining screws (7) and the relevant threaded holes.
Apply the specified threadlocker on screws (7).
Match the stator retaining holes with the generator cover threaded holes, start screws (7) and tighten them to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).

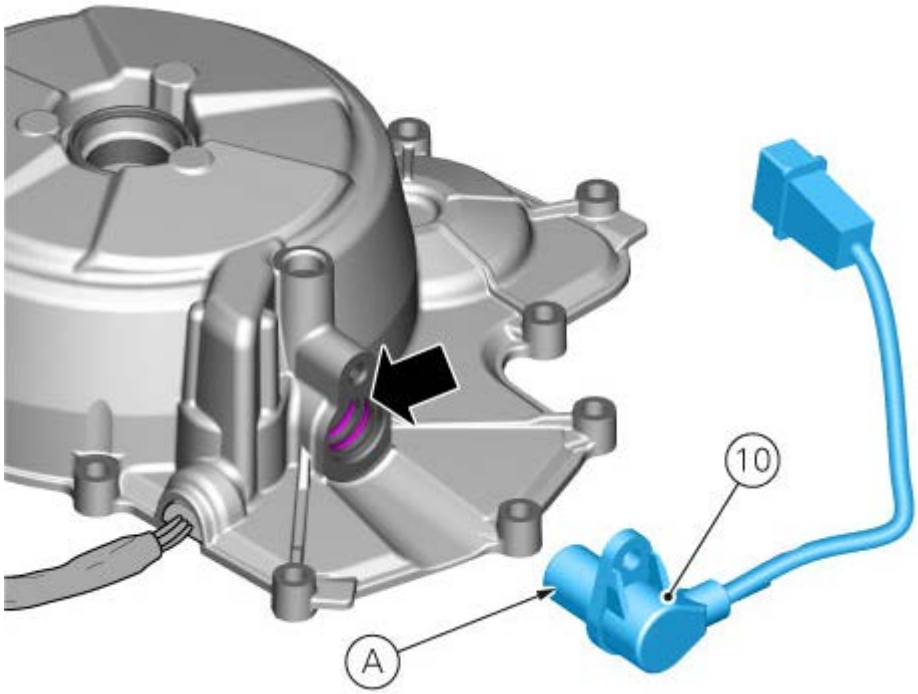


Check that rubber element (6) is correctly inserted in the relevant seat on the generator cover.
Insert the lower tabs of plate (5) in the generator cover grooves.
Push plate (5) downwards along the guides having care that the stator cable is correctly positioned under the plate until the upper tabs reach the grooves.

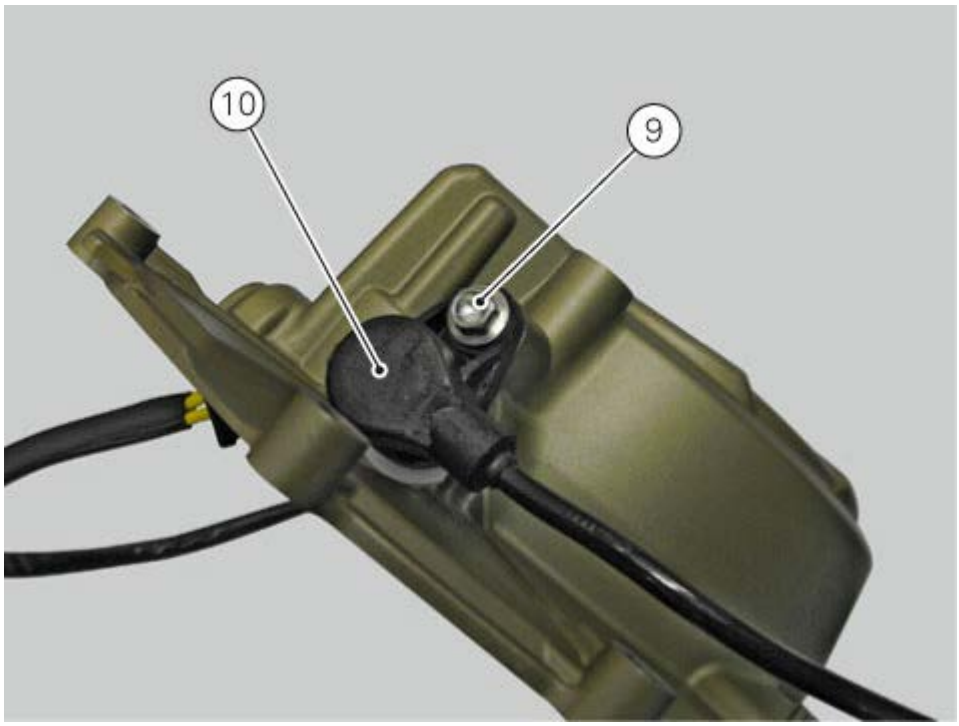


If pick-up sensor was removed, when refitting make sure that the O-rings are duly inserted in the relevant seats on generator cover.

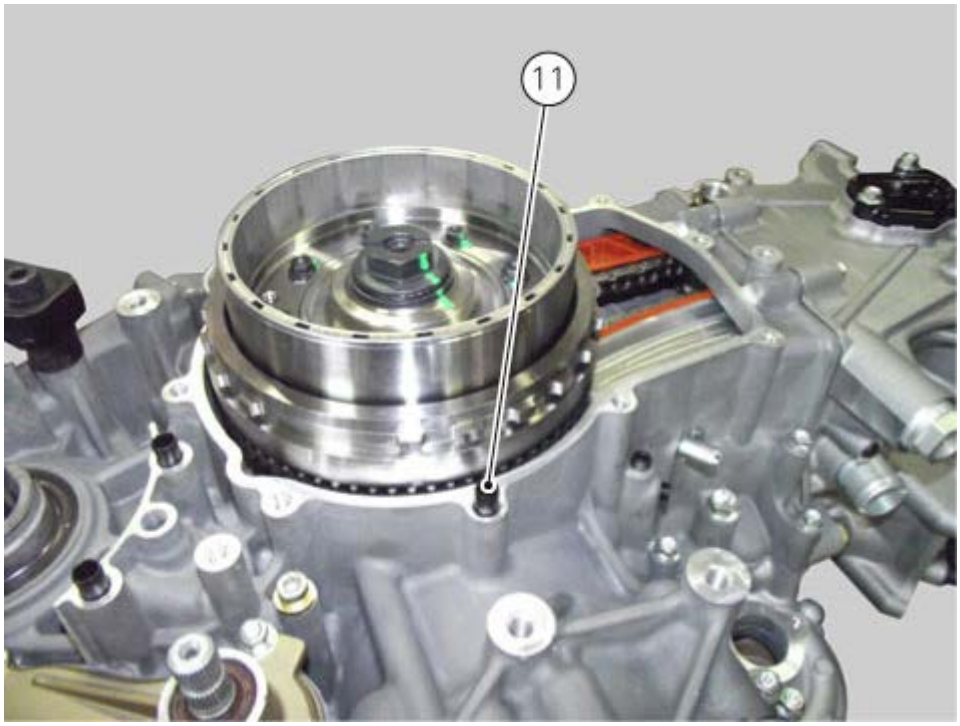
Smear “Grease” on surface (A) of pick-up sensor (10).



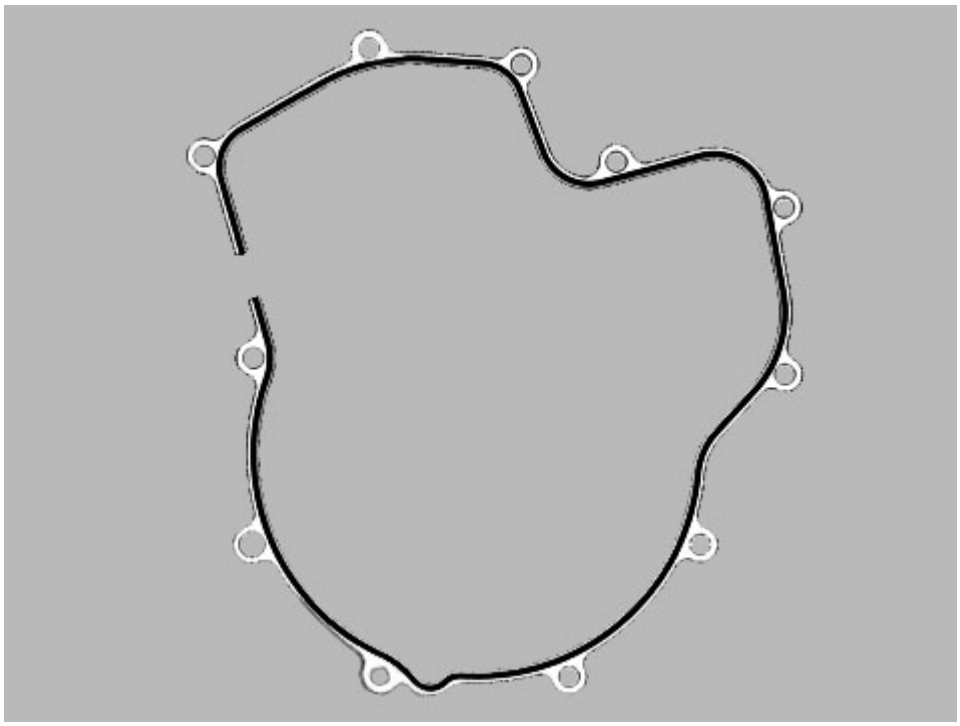
Fit the pick-up sensor (10) with elastic washer on the generator cover by starting screw (9).
Tighten screw (9) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).



Remove any scale and grease from the mating surfaces of the left-hand crankcase half and the generator cover.
Fit the reference bushing (11).



Apply a uniform bead of DUCATI sealing paste on the crankcase, avoiding holes for screws and pilot bushings.

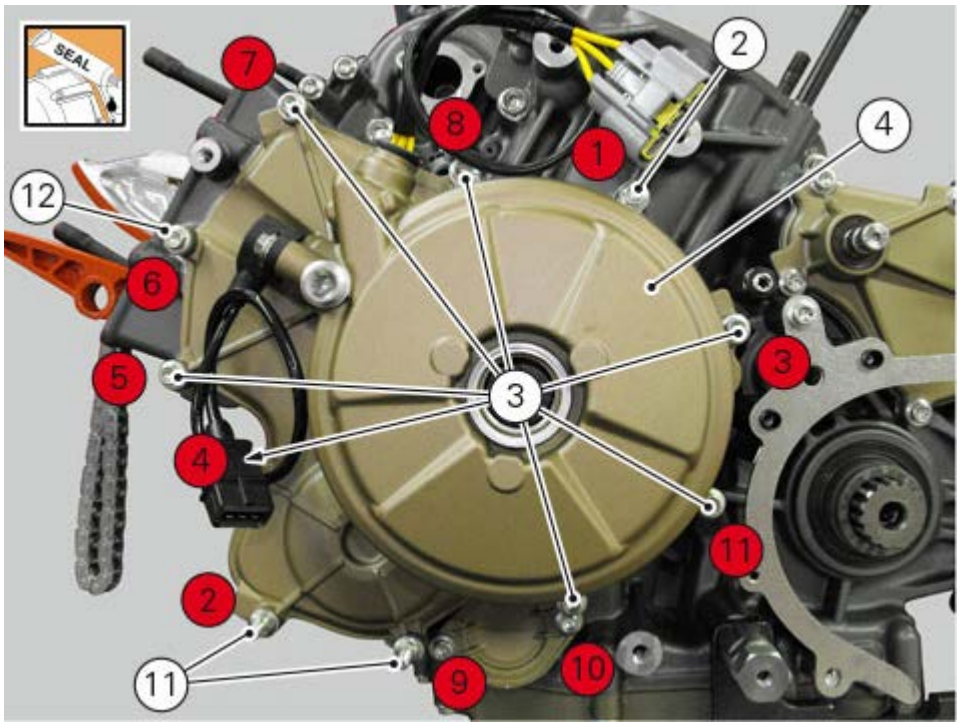


Position cover (4) and start the screws following the specifications in the table.

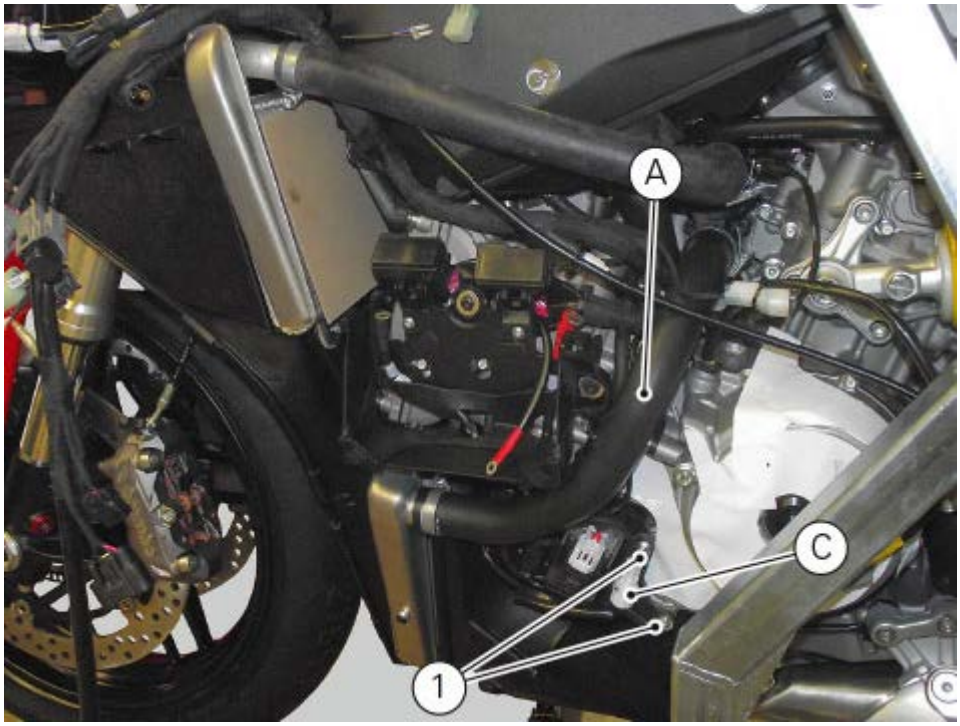
Warning
The rotor magnet strongly attracts the cover, be careful when refitting it and avoid touching the surface smeared with Ducati sealant.

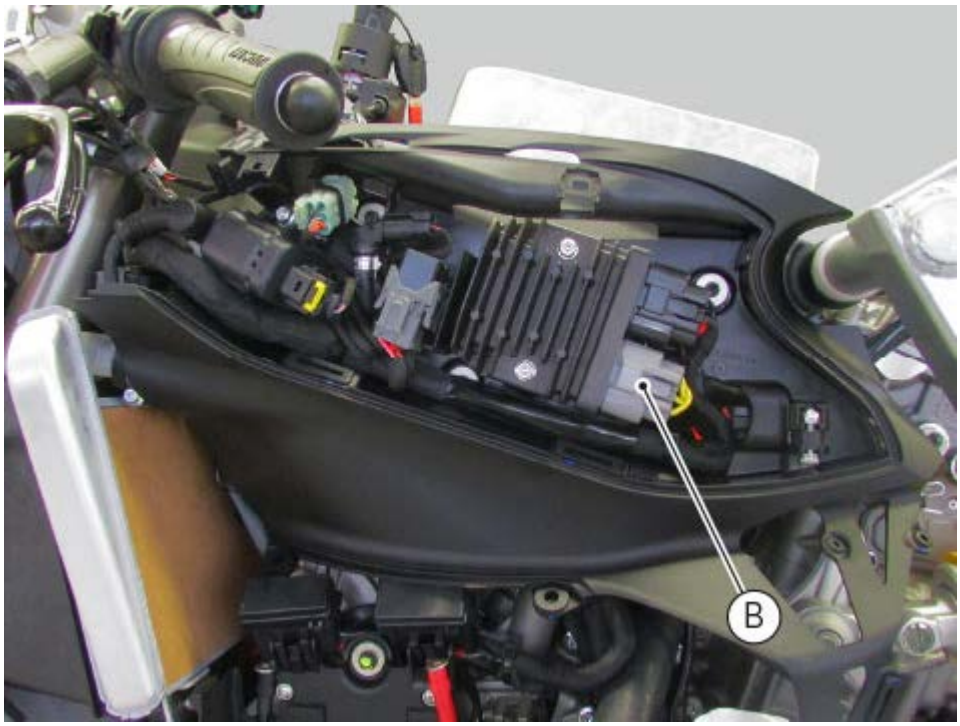
Apply the recommended sealant to screw (12).
Tighten the screws (2), (3), (11) and (12) to a torque of 13 Nm (Min. 12 Nm - Max. 13 Nm), respecting the indicated sequence.

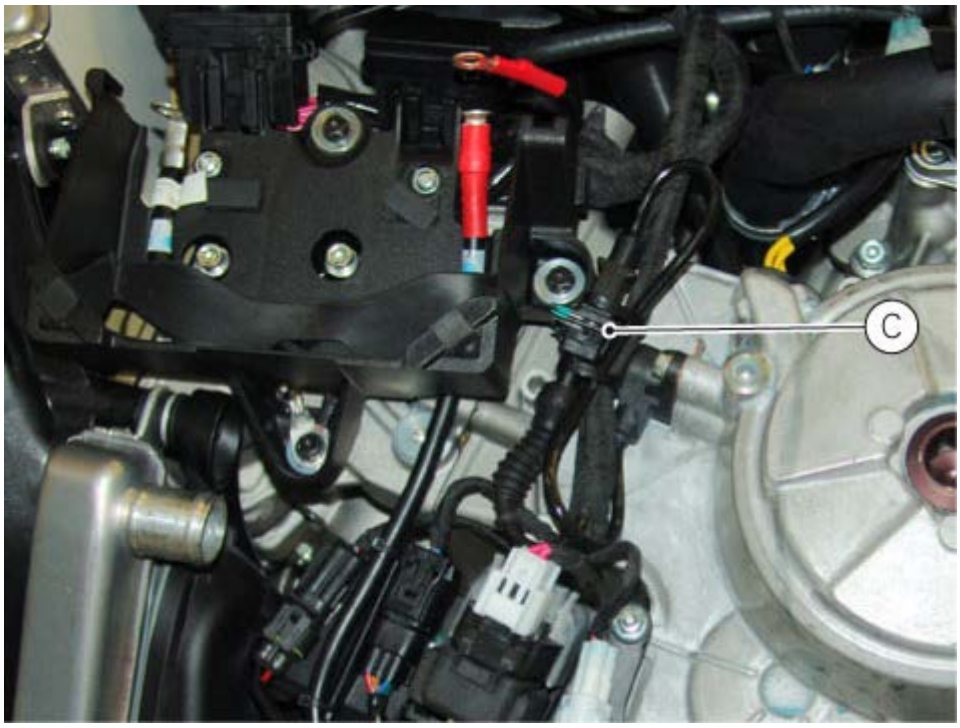
Ref.	Q.ty	Description
3 - 12	7+1	M6X25 Screws
2	1	M6X30 Screws
11	2	M6X25 special screws



Fix the solenoid starter support by tightening nuts (1).
Connect connector (B) to the generator cable and connector (C) of the pick-up sensor cable.
Connect lower radiator hose (A) to the vertical head.



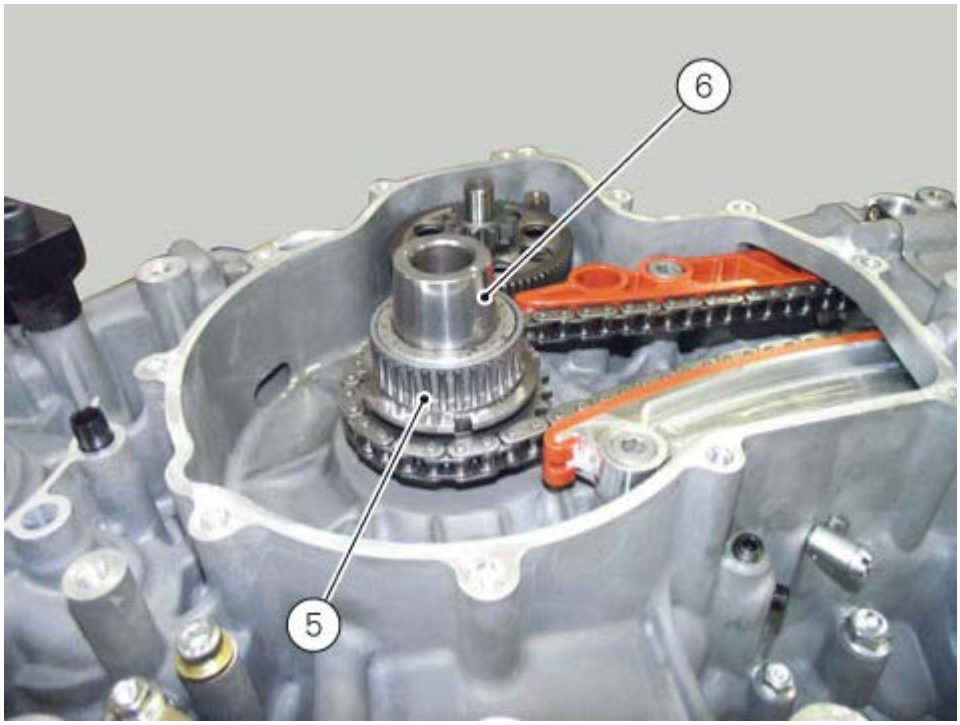


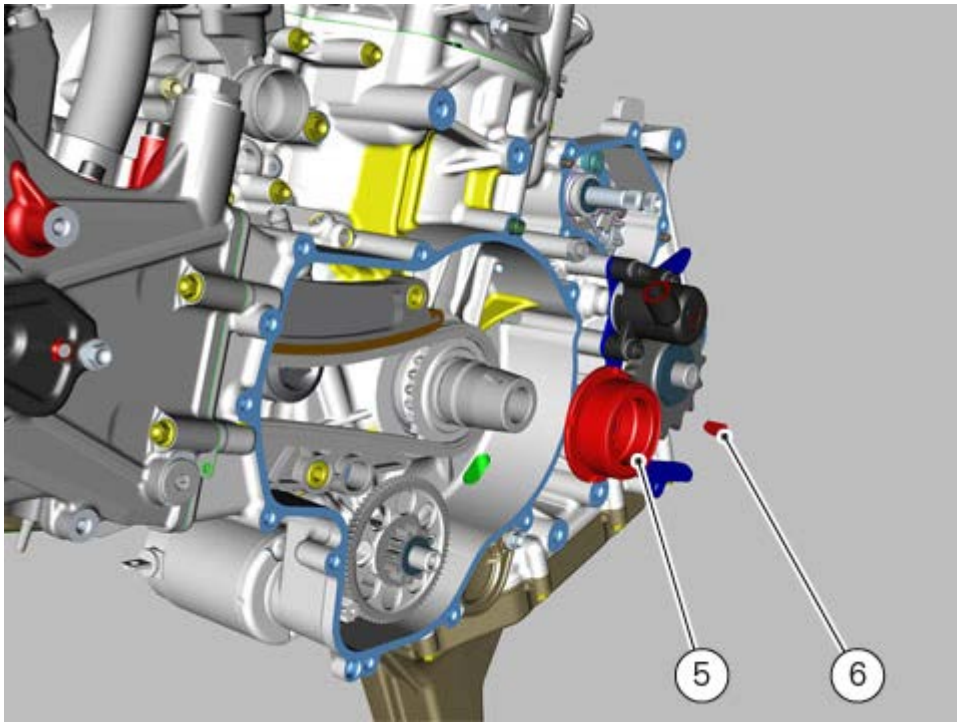


Refit the clutch slave cylinder (Refitting the clutch slave cylinder).
Refit the battery support (Battery).
Fill with engine oil (Changing the engine oil and filter cartridge).
Refit the LH fairing (Refitting the side fairings).

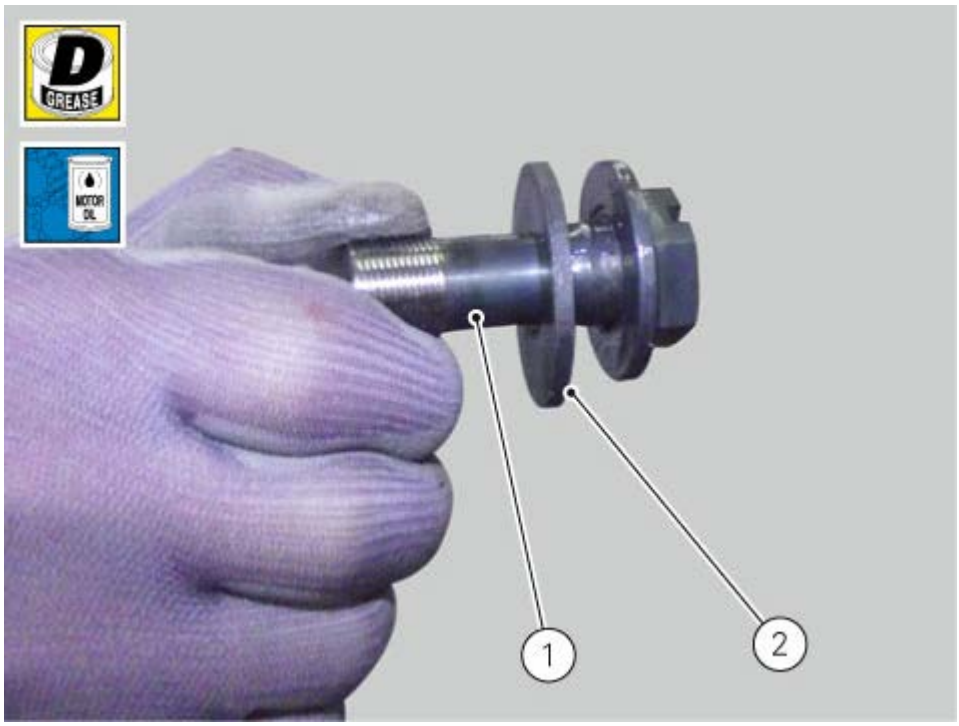
Fitting the flywheel/generator assembly

Carefully clean the crankshaft taper coupling.
Position the key (6) in its seat on crankshaft and position the roller bearing (5), after lubricating it.

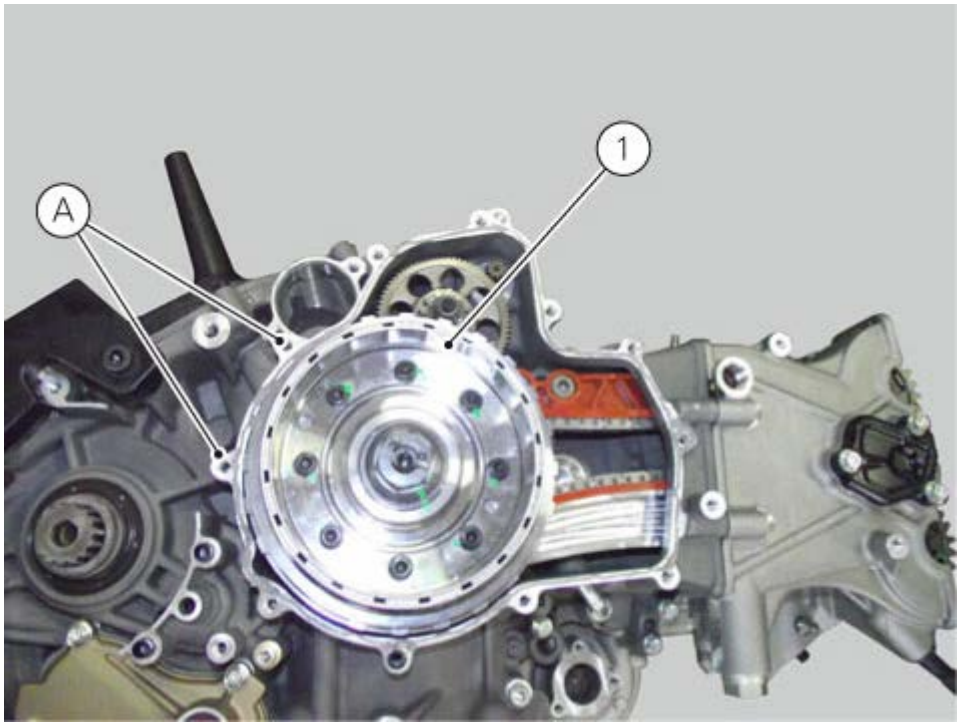


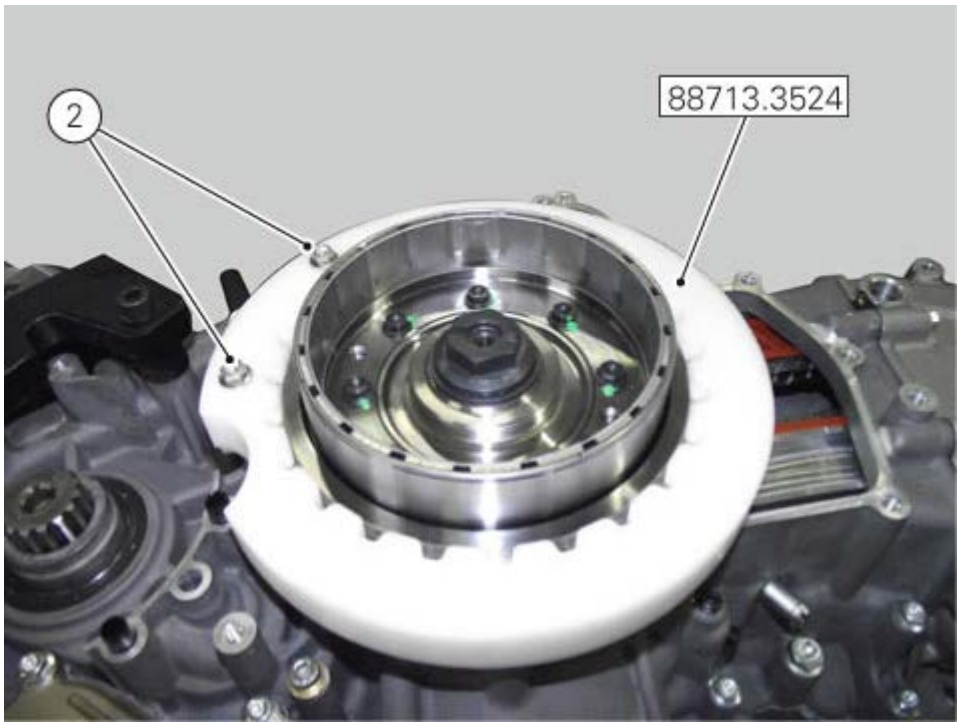


Clean the internal part of the flywheel and insert in the crankshaft by rotation the idle gear.
Apply the recommended grease on the underside of the screw (1) and insert washer (2).
Use engine oil to lubricate the screw thread (1).

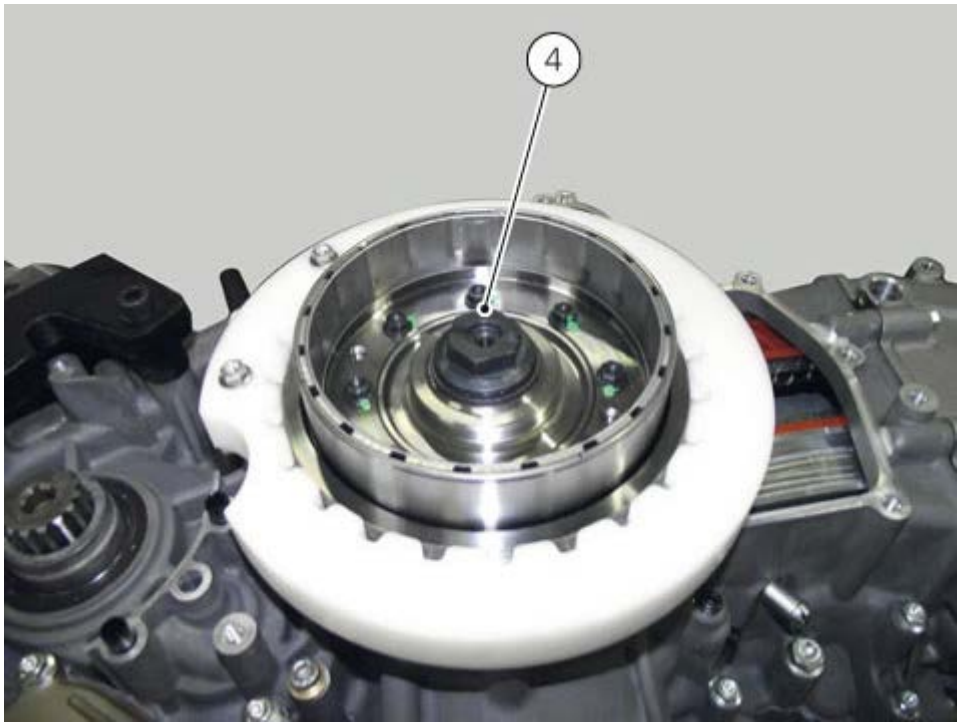


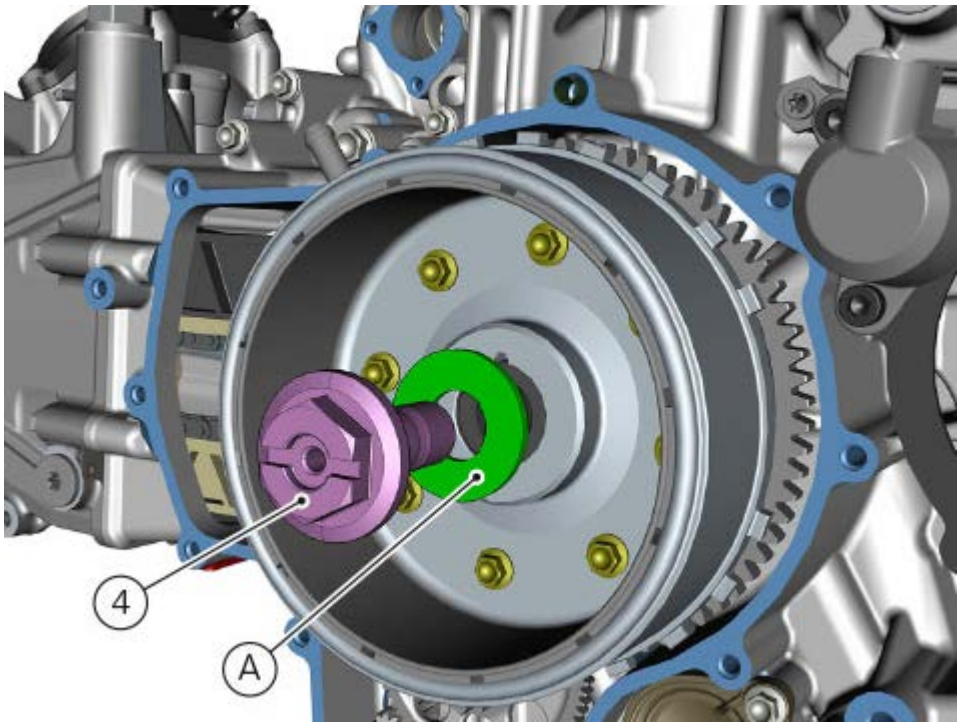
Block the flywheel unit (1) using tool no. **88713.3524** and fix it with screws (2) in holes (A).





Start and tighten the screw (4) with washer (A) to a torque of 190 Nm (Min. 180 Nm - Max. 200 Nm).




4
A

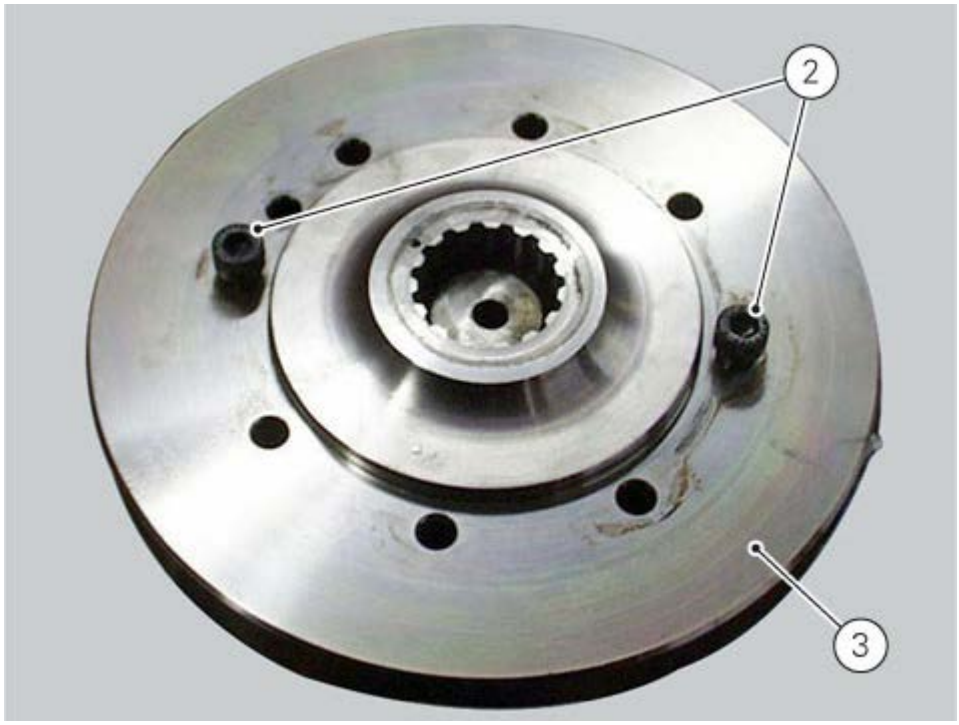
Overhauling the flywheel/generator assembly

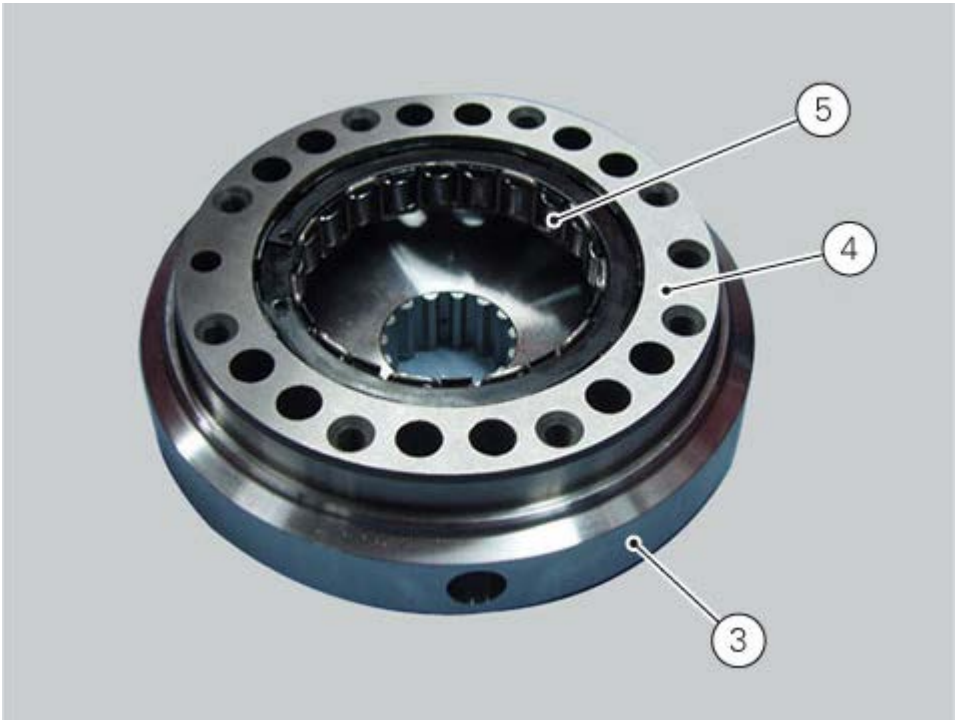
Examine the inner part of generator rotor (1) for signs of damage.
Check that the starter clutch is working properly and that the roller races do not show signs of wear or damage of any kind. Disassemble the unit if you find faulty operation.

Disassembling the generator flywheel

Unscrew the screws (2) and remove the generator rotor (1) from the flywheel.

Insert two of the screws (2) just removed from the rotor in order to remove the flange (4) and the starter clutch (5) from the flywheel (3).
The starter clutch is a slight interference fit on the flange. Use a suitable drift to remove it.



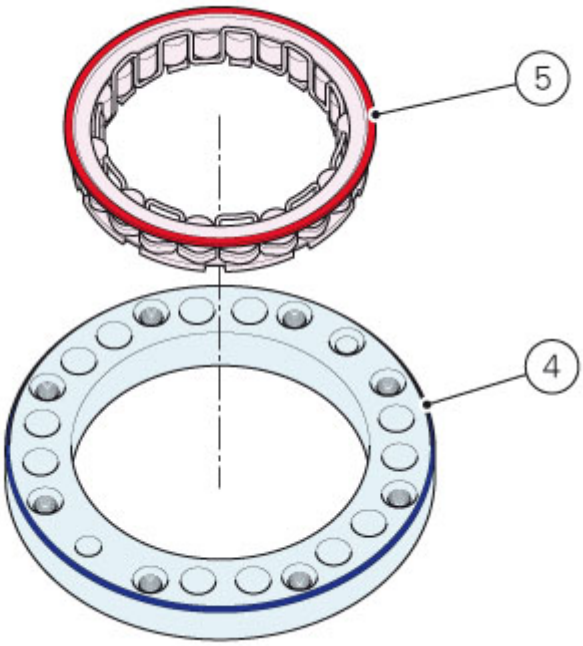


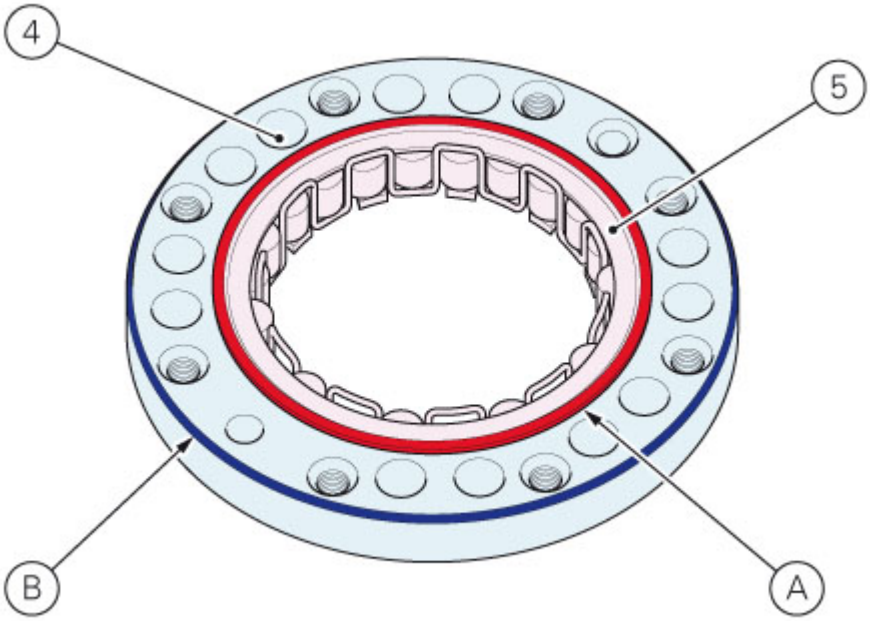
Reassembling the flywheel/generator assembly

Fit starter clutch (5) on flange (4) taking starter clutch edge (A) fully home on flange.

Important

Assemble the components (starter clutch and flange) so that the edge (A) of the starter clutch is positioned on side of the flange with the bevelled edge (B).

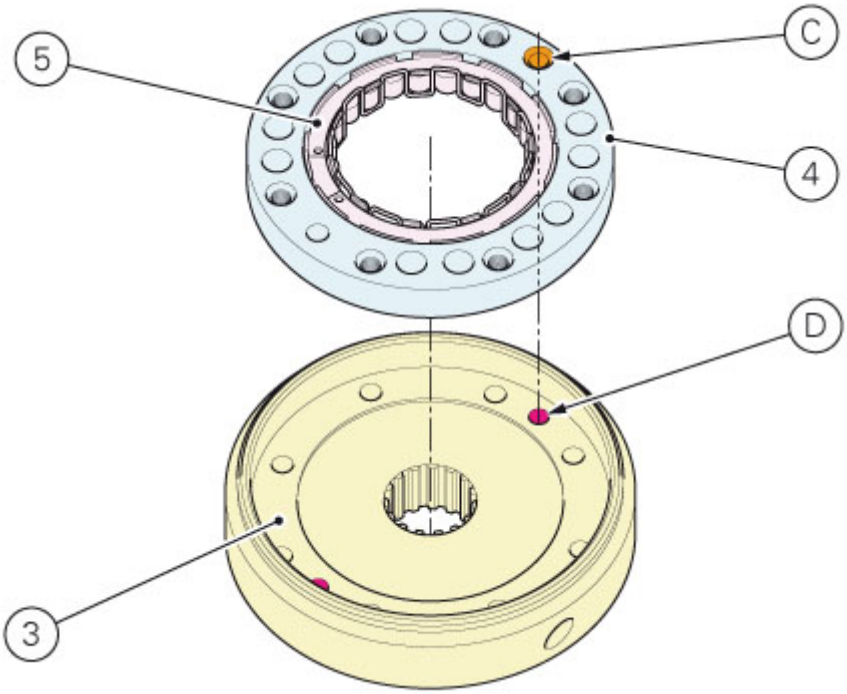


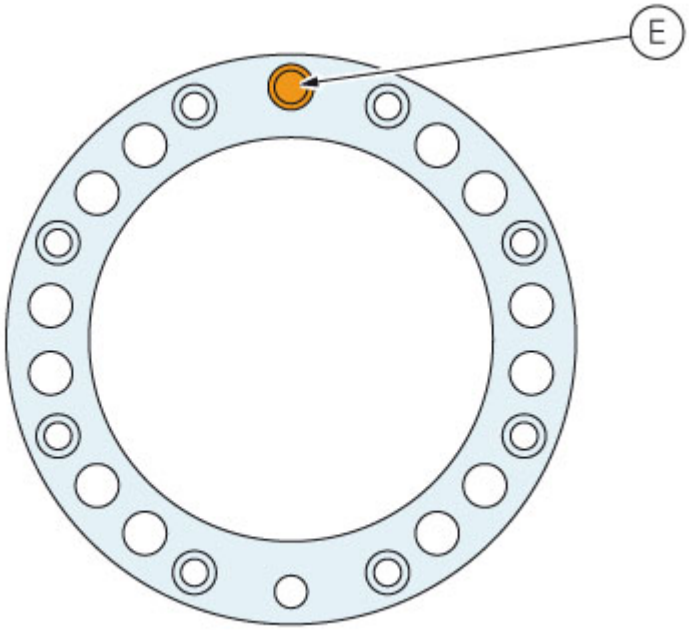


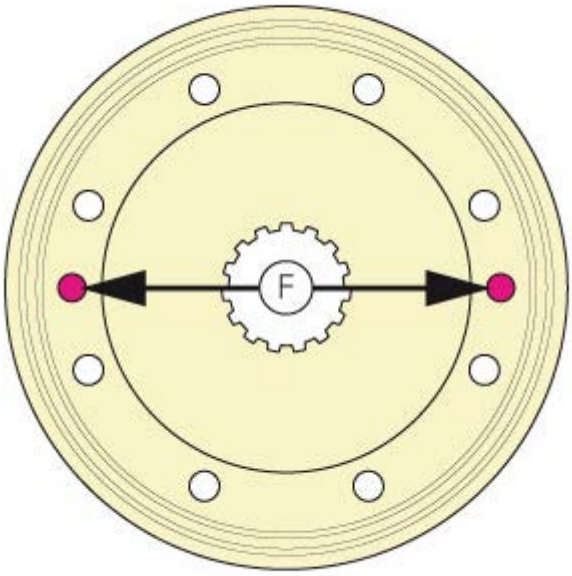
Fit the flange (4) with starter clutch (5) fully home into the flywheel (3), ensuring the centring hole (C) on flange matches the flywheel centring hole (D).

Note

The flange centring hole (C) is the hole with the countersunk lead-in (E).
The centring hole (D) of the flywheel can be either one of the two holes (F).
Use suitable tools to align the centring holes.

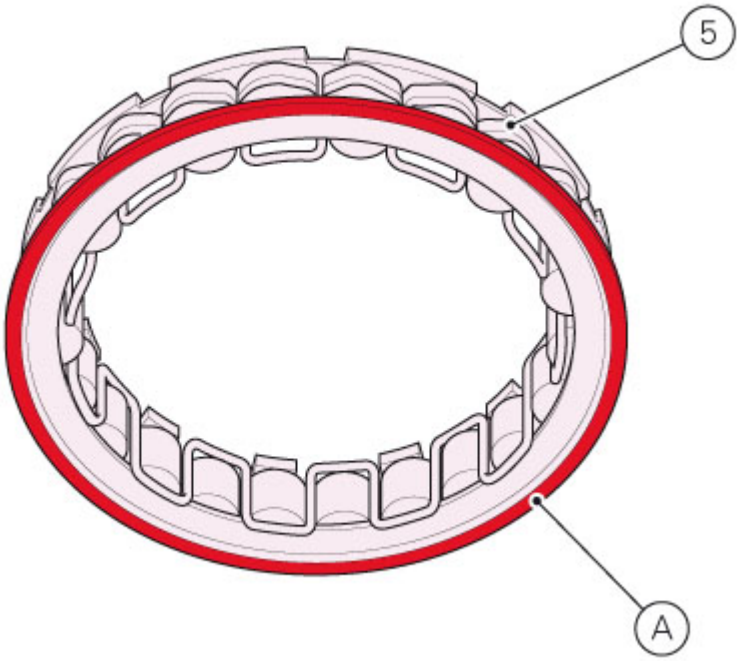






Important

Assemble the components (flange and flywheel) so that edge (A) of the starter clutch is enclosed between the flange and flywheel.

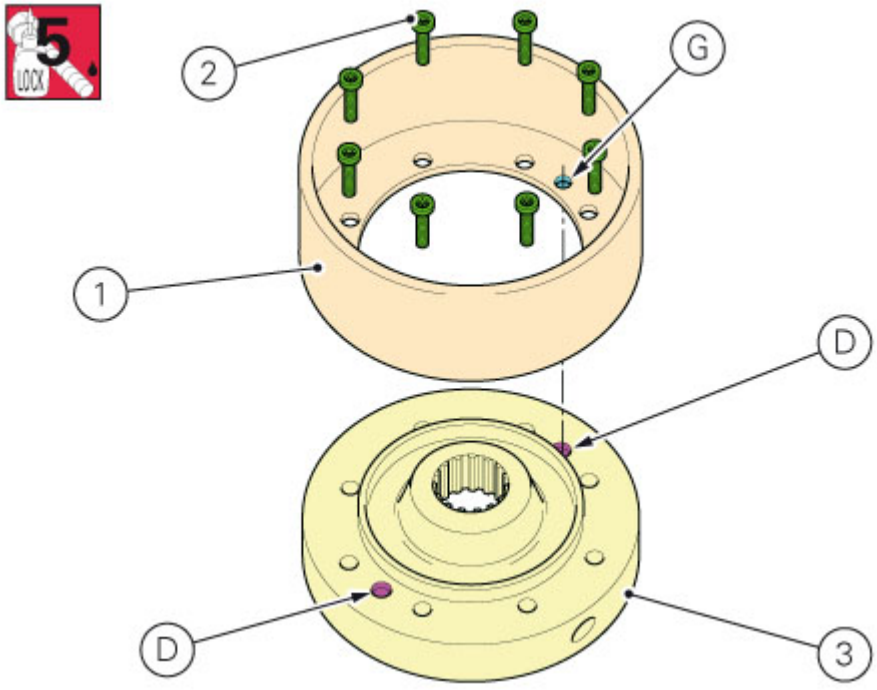


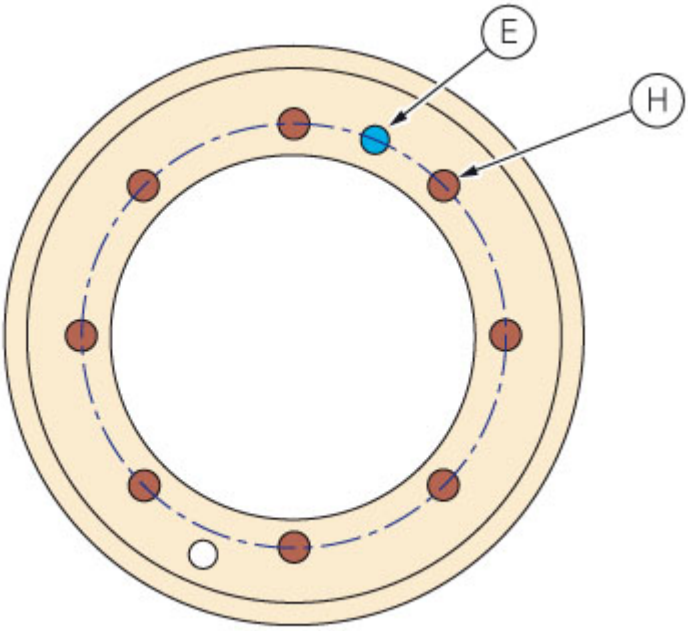
Fit rotor (1) on flywheel (3), matching one of the two flywheel centring holes (D) with the rotor centring hole (G).

Note
The rotor centring hole (G) is the one positioned on the same diameter as the fixing holes (H).

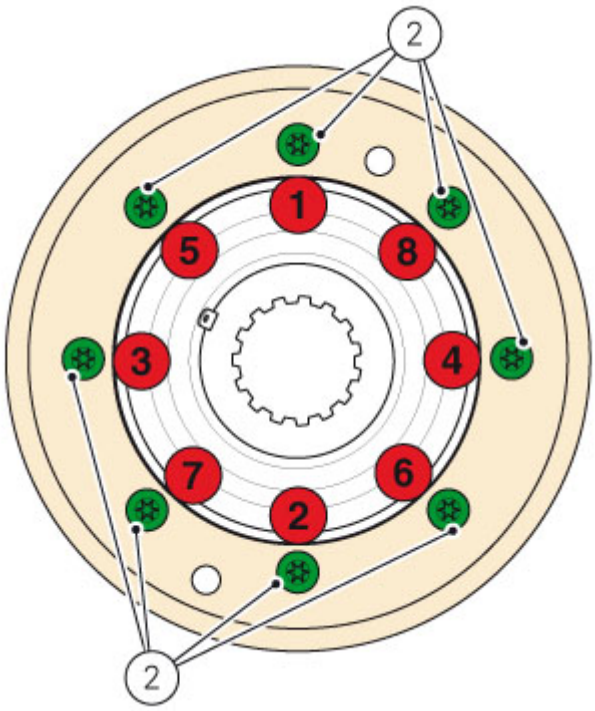
Note
Use suitable tools to align the centring holes.

Smear some threadlocker on the rotor/flywheel retaining screws (2) and start them in their holes.





Tighten the screws (2) to a torque of 13 Nm (Min. 11 Nm - Max. 15 Nm), respecting the indicated sequence.

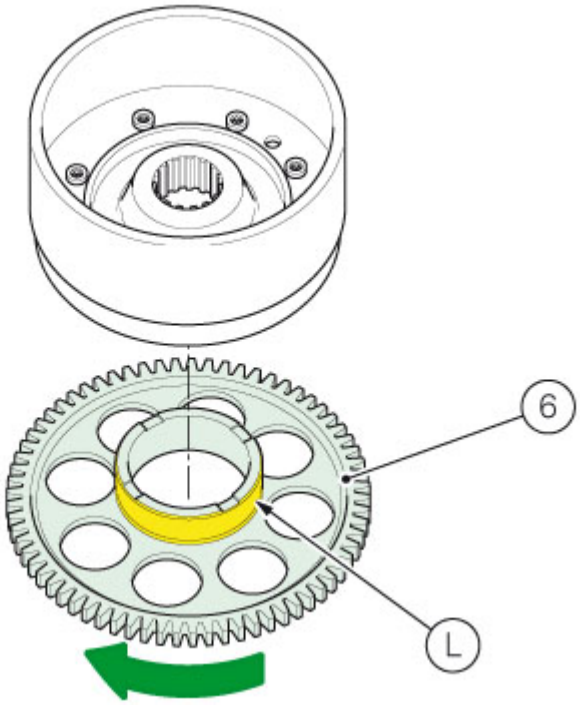


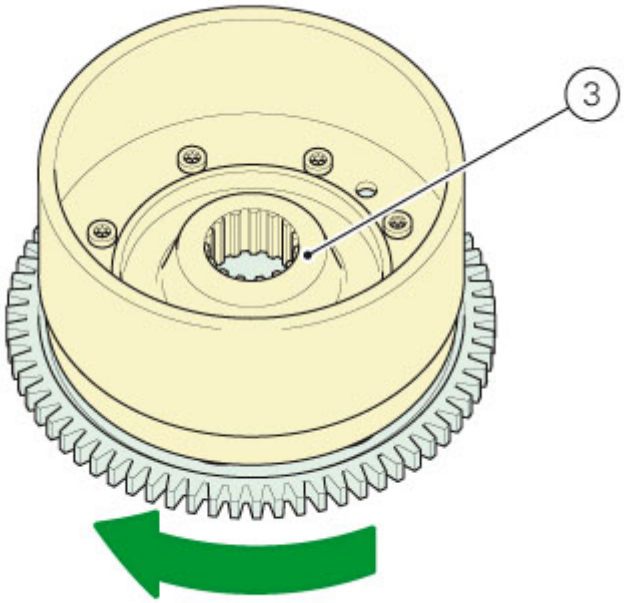
Lubricate the race (L) of the driven gear (6) with engine oil.
Fit the driven gear on the starter clutch, ensuring it is properly seated.

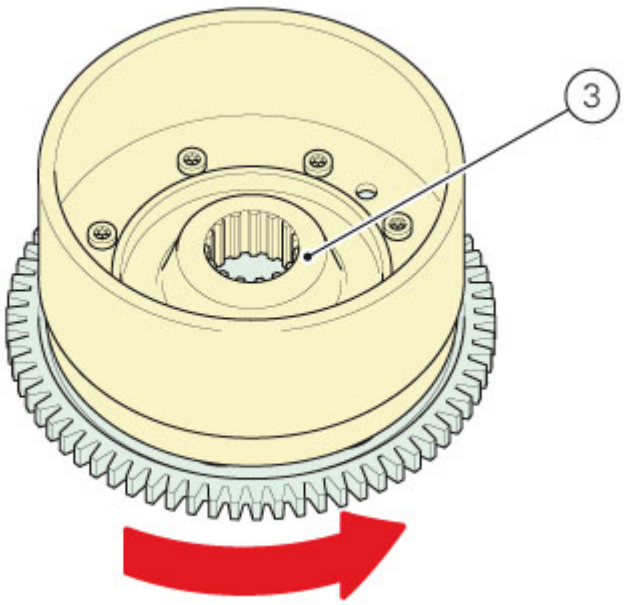
Note
To help insertion, turn the driven gear in the direction indicated by the green arrow.

Hold the flywheel (3) with one hand and check that the driven gear (6) 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 fitted correctly.


MOTOR
OIL

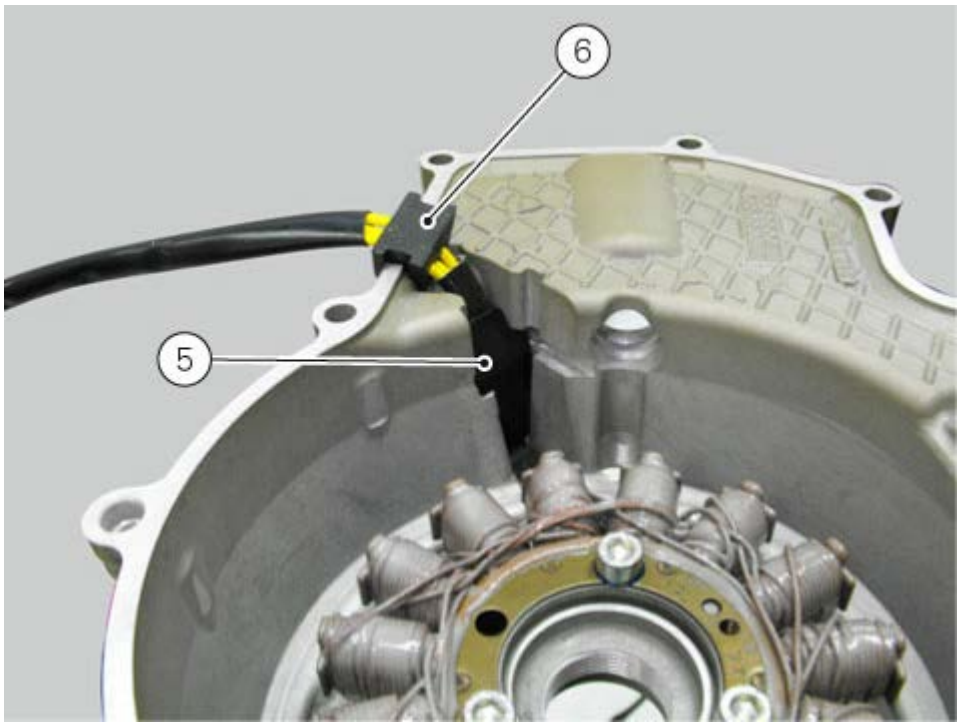

6
L

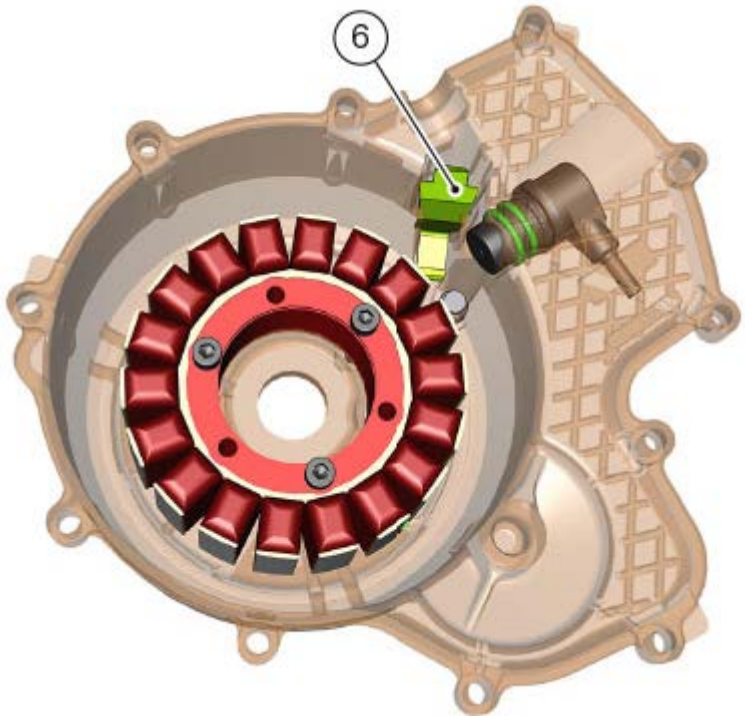

3


3

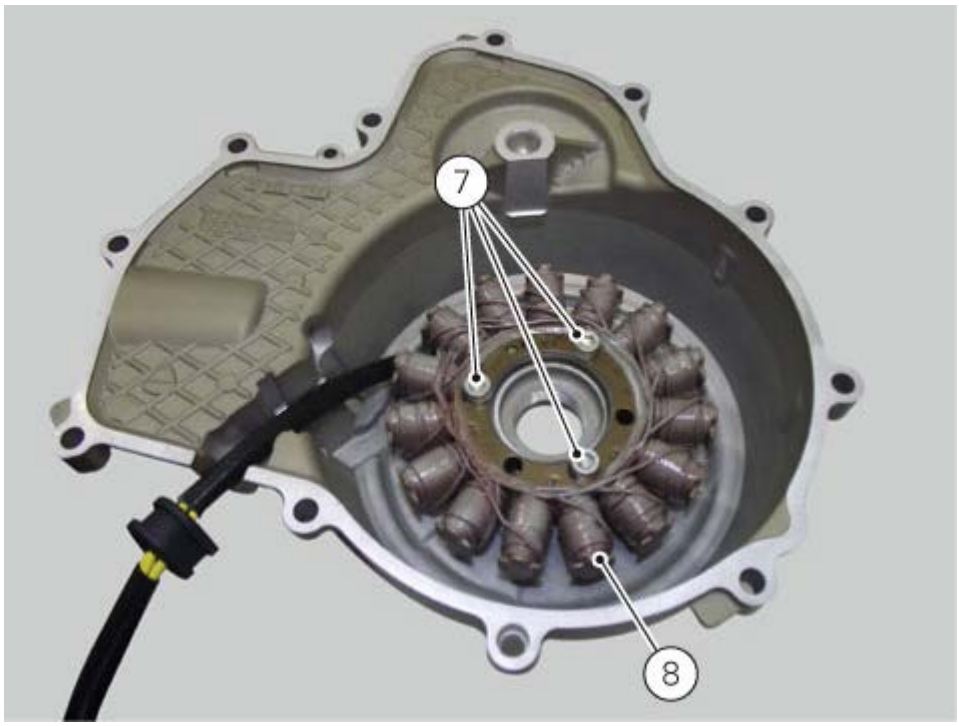
Disassembling the generator cover

Remove the cable retainer (5) sliding it up and remove rubber block (6).

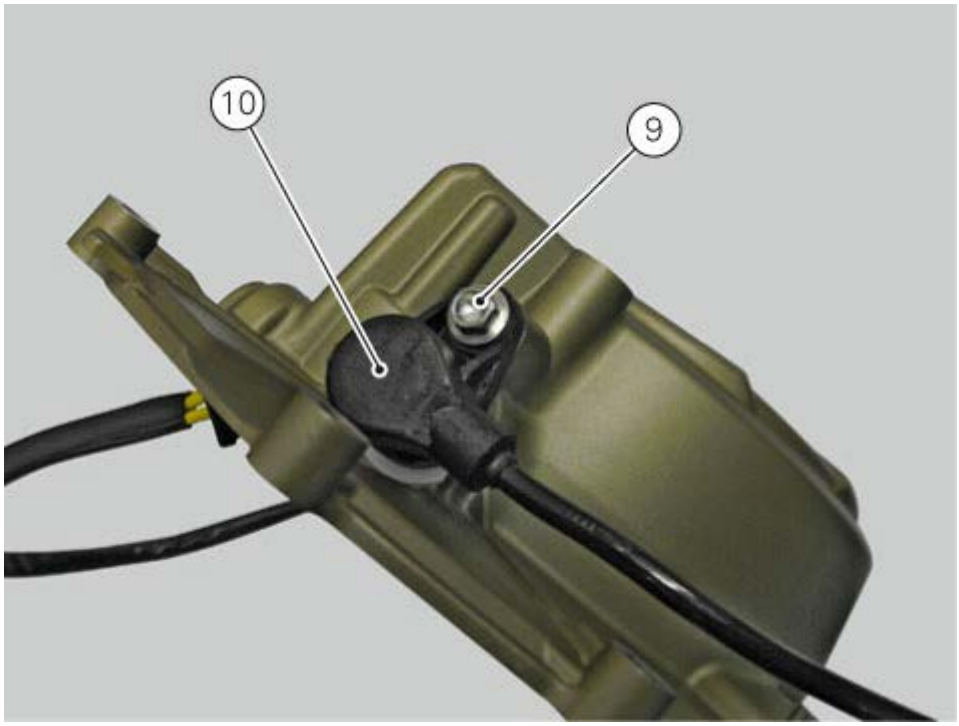




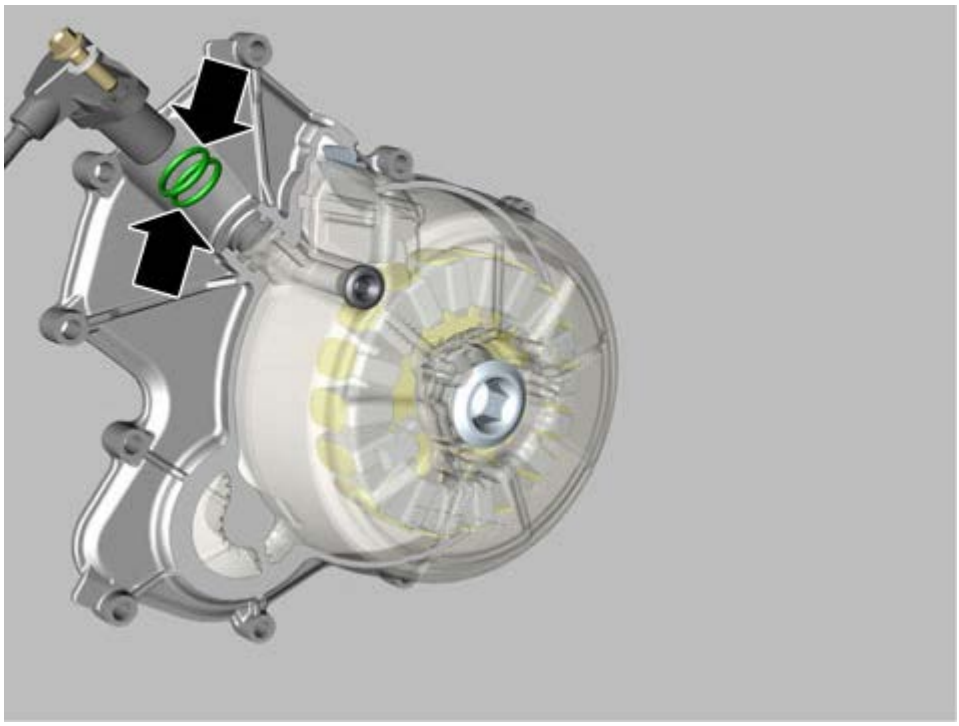
Unscrew the screws (7) and remove the stator (8).



Undo the screw (9) and remove the pick-up sensor (10), keeping the washer.



Check the two O-rings inside the pick-up seat and renew them, if necessary.

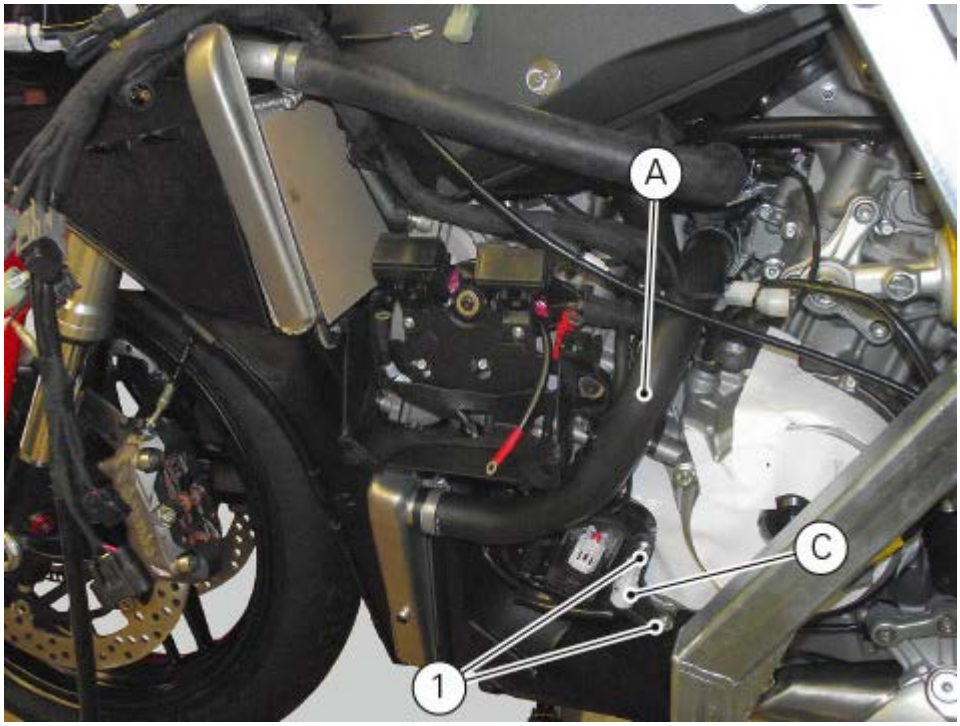


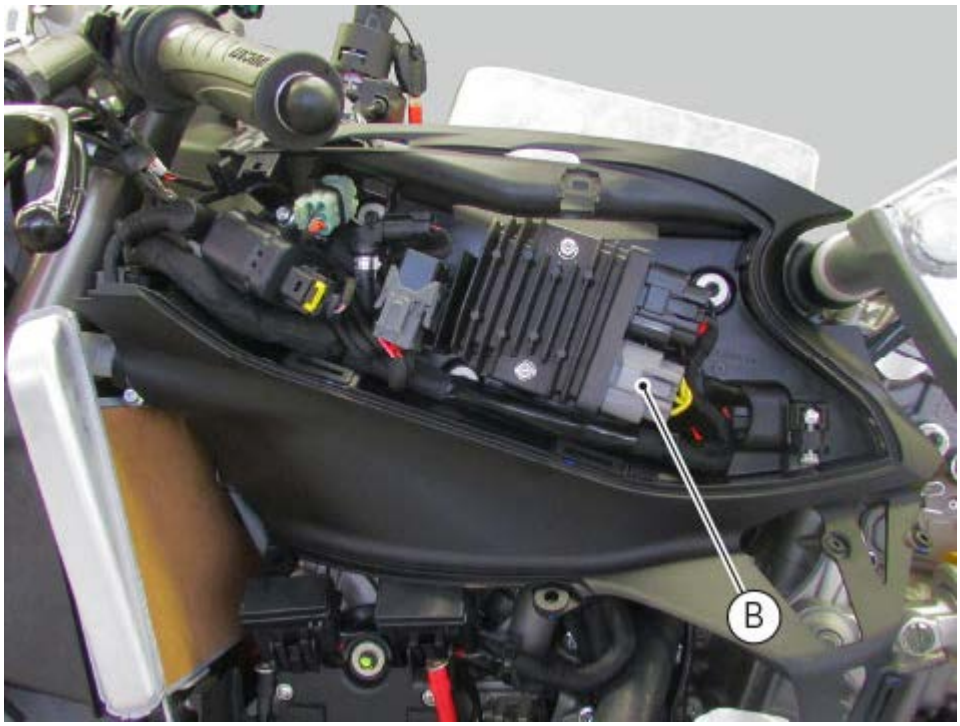
Removing the generator cover

Remove the LH fairing (Removing the side fairings).
Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the battery support (Battery).
Remove the clutch slave cylinder (Removing the clutch slave cylinder).

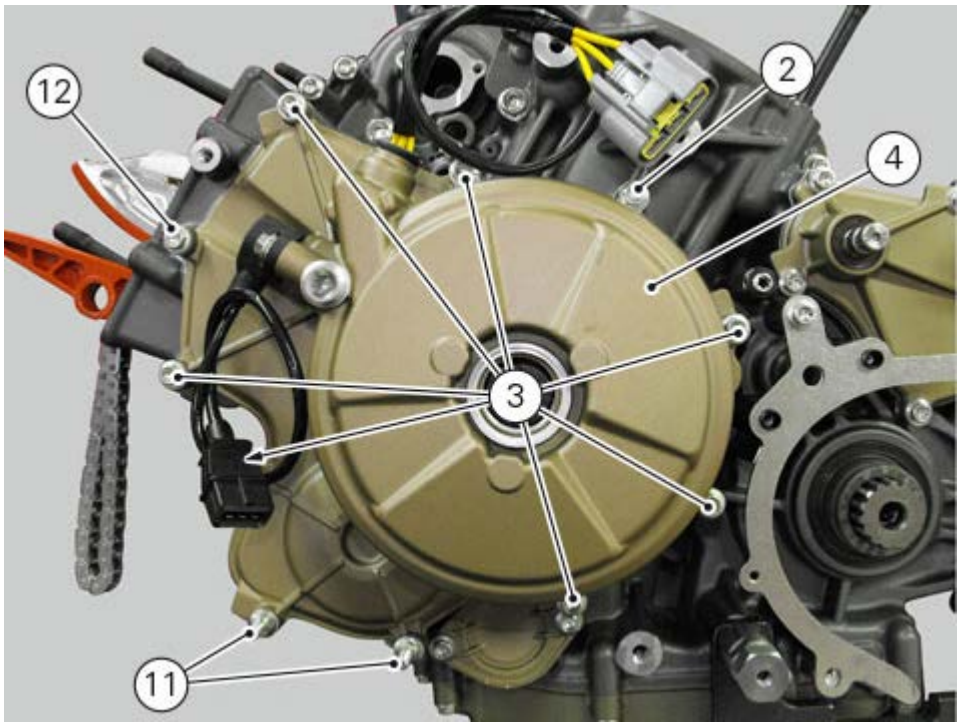
Note
For clarity, the figures show the engine removed from the frame.

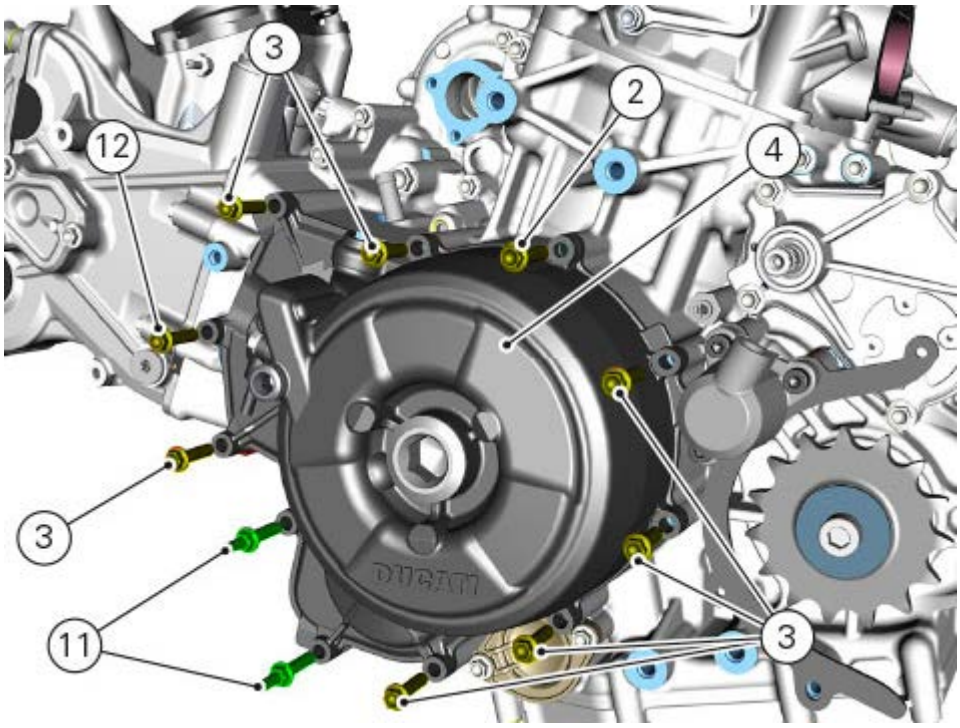
Disconnect lower radiator hose (A) from the vertical head.
Disconnect connector (B) from the generator cable and connector (C) of the pick-up sensor cable.
Loosen nuts (1) that secure the solenoid starter support.

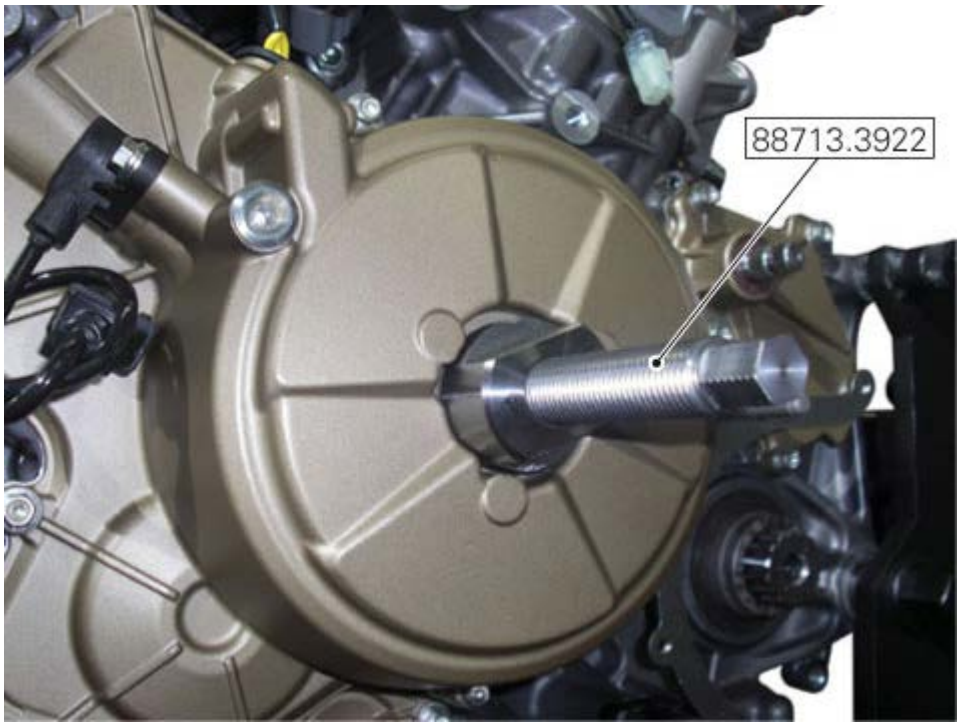




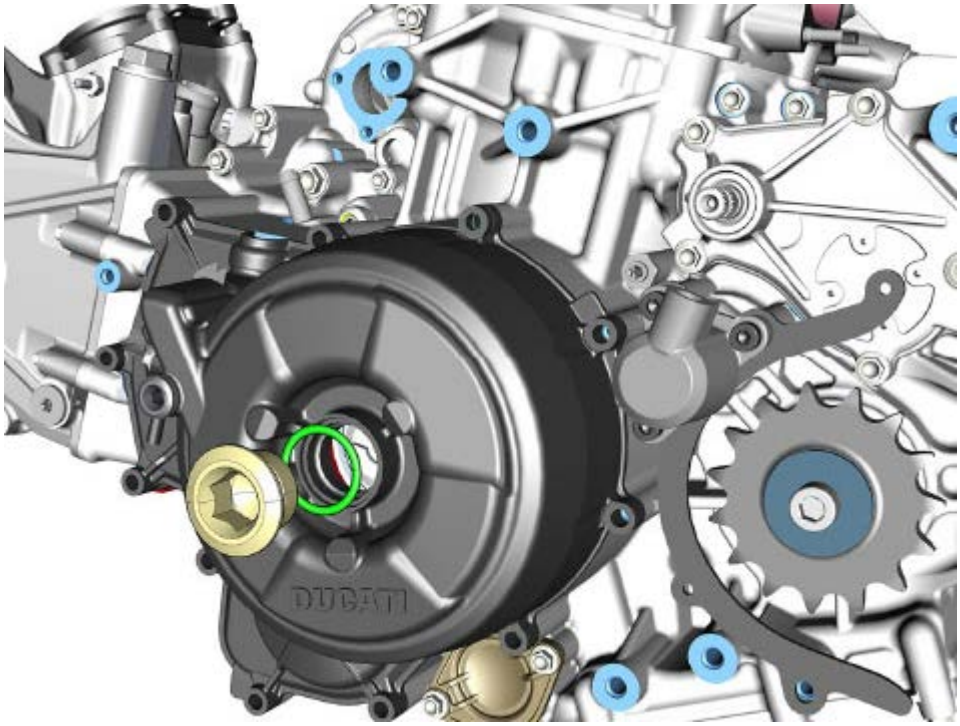
Loosen the special screws (11), the screws (2), (3) and (12) and remove the generator cover (4) using the suitable tool part no. **88713.3922**.


12
2
4
3
11


3
2
12
4
3
11
3



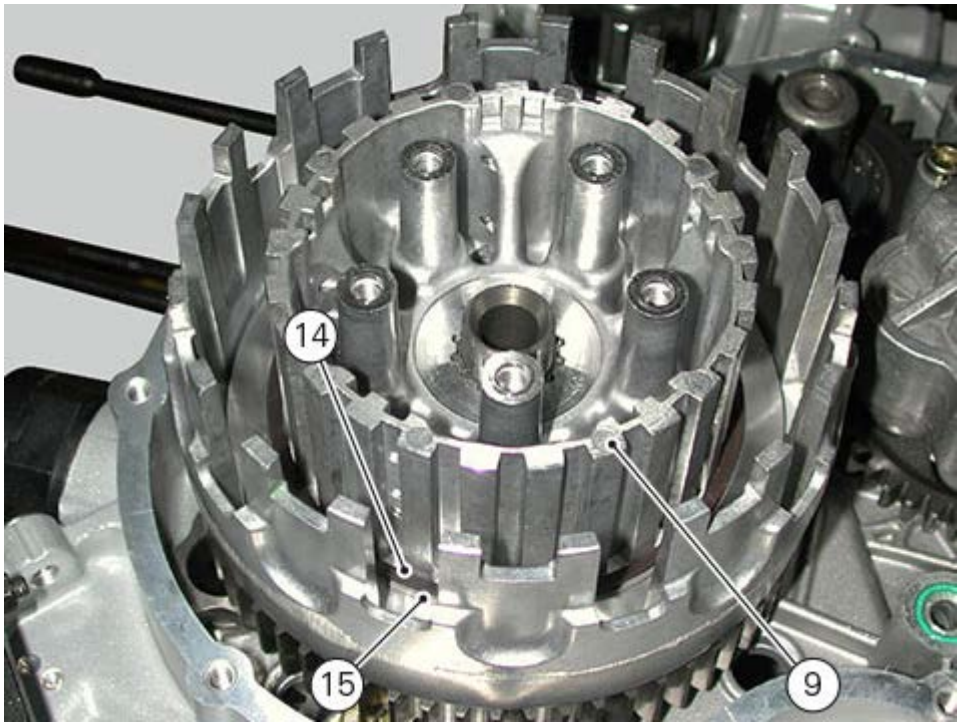
Upon removal, check the conditions of the O-ring shown in the figure.



Refitting the clutch

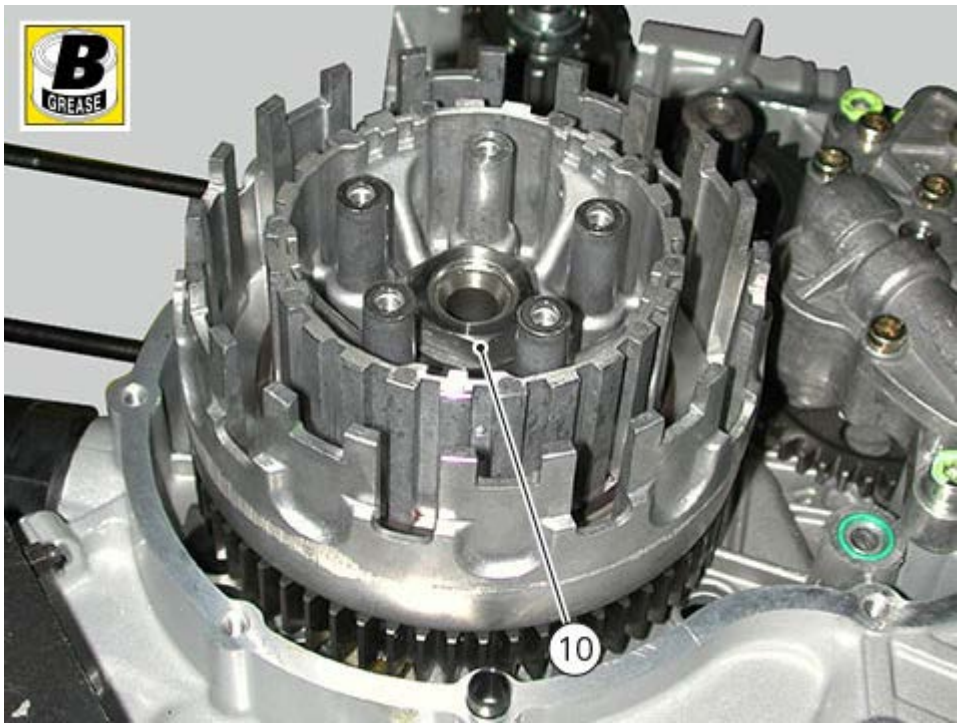
Fit the spacer (11) on the primary shaft: the spacer (11) shall be centred on the gearbox primary shaft axis.

Fit the flat ring (15) and the Belleville washer (14) on the clutch drum (9), so that the convex side faces the clutch drum.

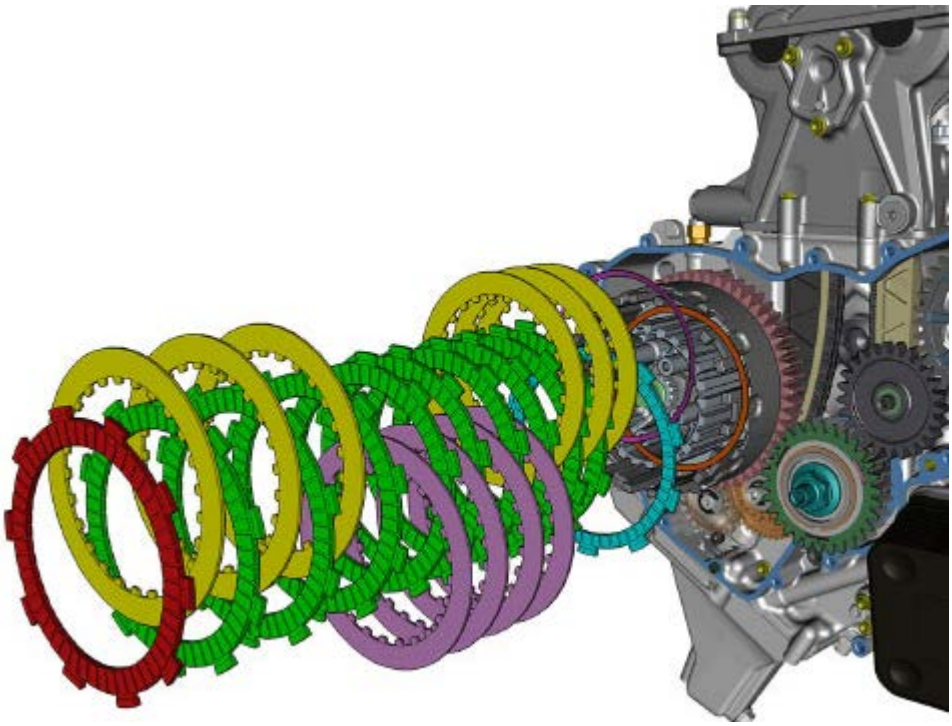


Locate the Belleville washer (11).

Apply the prescribed grease to the thread of the gearbox primary shaft and the mating surface of nut (10), and fit it over the Belleville washer.
Block the clutch drum using tool no. **88713.2651**, insert the bushing and tighten the retaining nut (10) to the specified torque.

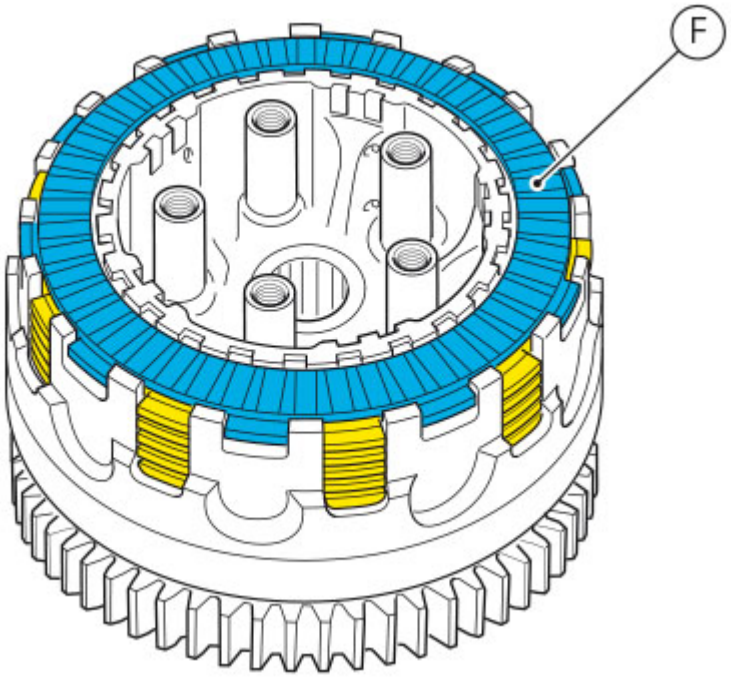


Ft the clutch plates (12) in the following order:

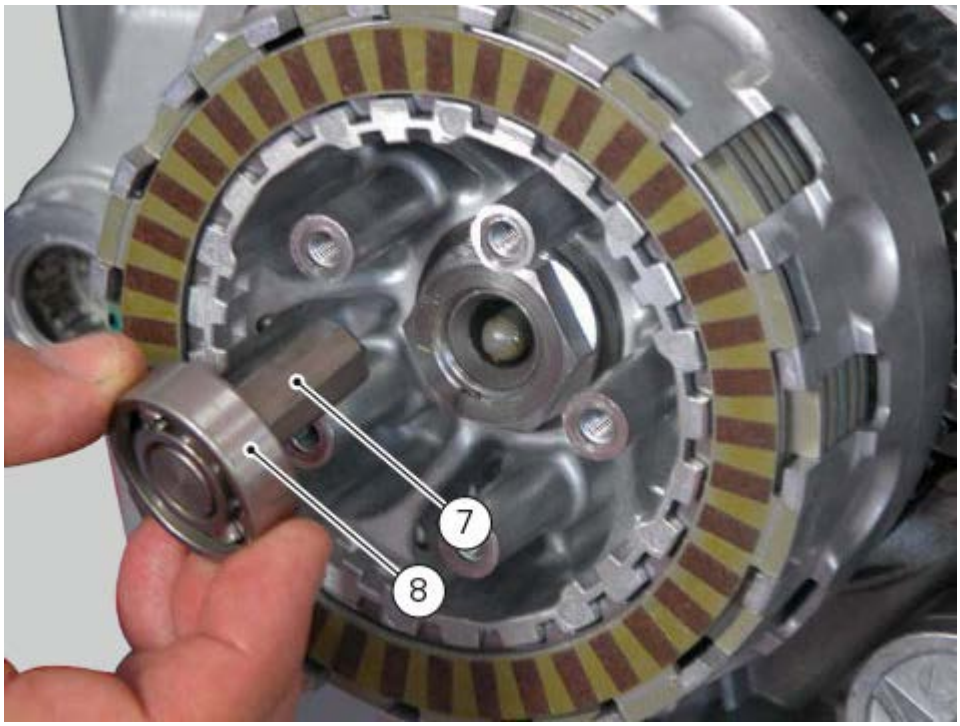


- Plate (RED) (F) quantity 1. Driving plate (external) thickness **3** mm.
- Plate (YELLOW) quantity 6. Driven plate thickness **1.6** mm.
- Plate (GREEN) quantity 9. Driving plate thickness **3** mm.
- Plate (PURPLE) quantity 4. Driven plate thickness **2** mm.
- Plate (LIGHT BLUE) quantity 1. Driven plate (internal) thickness **3** mm.
- Plate (DARK PURPLE) quantity 1. Belleville washer.
- Plate (ORANGE) quantity 1. Shimming plate.

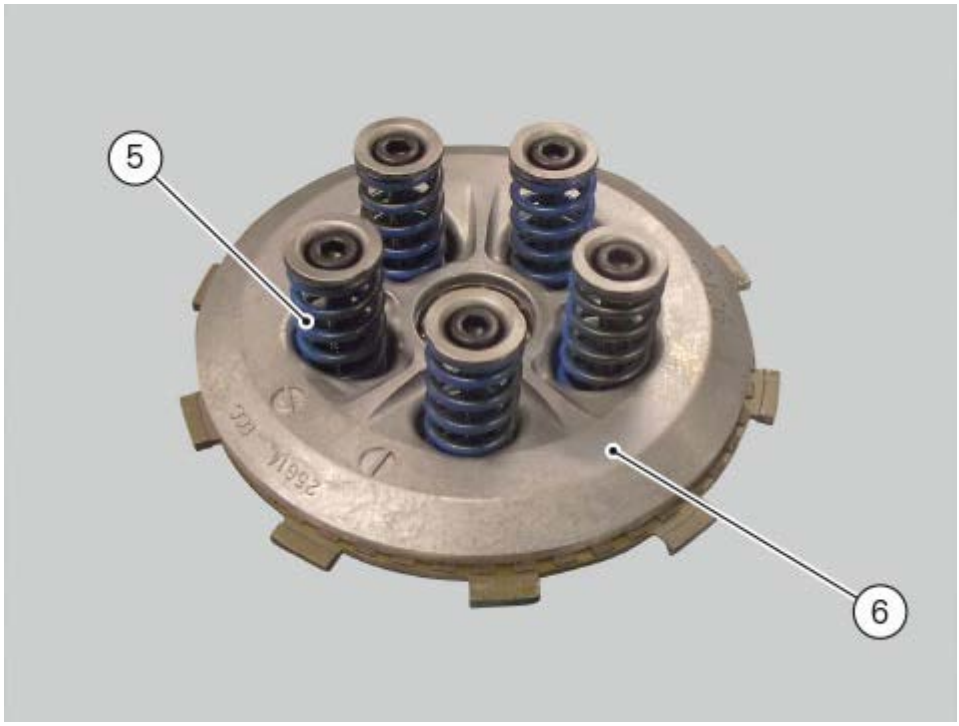
Note
The last clutch plate shall be positioned with a different direction compared to the previous ones, as shown in the figure.



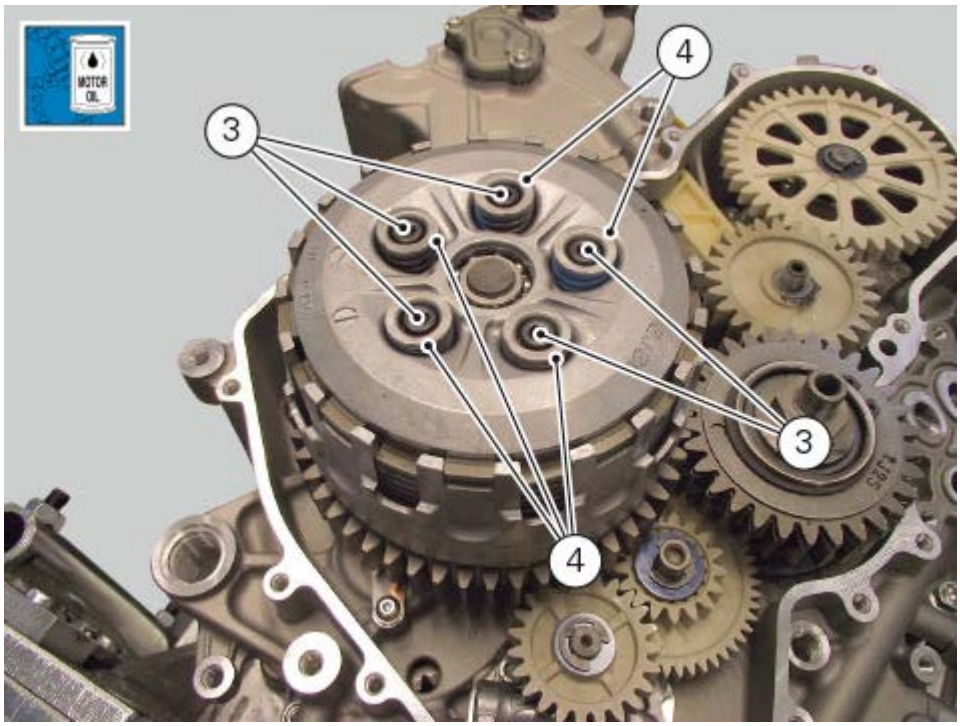
Lubricate primary shaft inner hole with engine oil.
Insert the control pin (7) in the bearing (8) and the latter in the gearbox primary shaft.

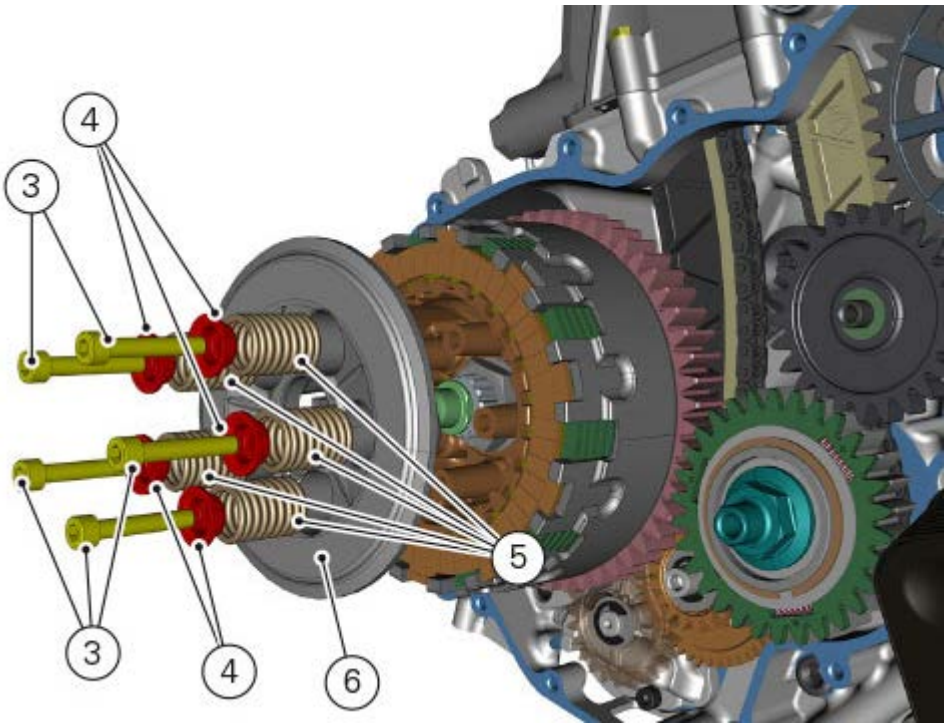


Fit the pressure plate (6).
In each cavity, fit a spring (5) and a collar (4).
Lubricate the thread of the screws (3) with oil.



Tighten the screws (3) to the specified torque in a crossed-pattern sequence.



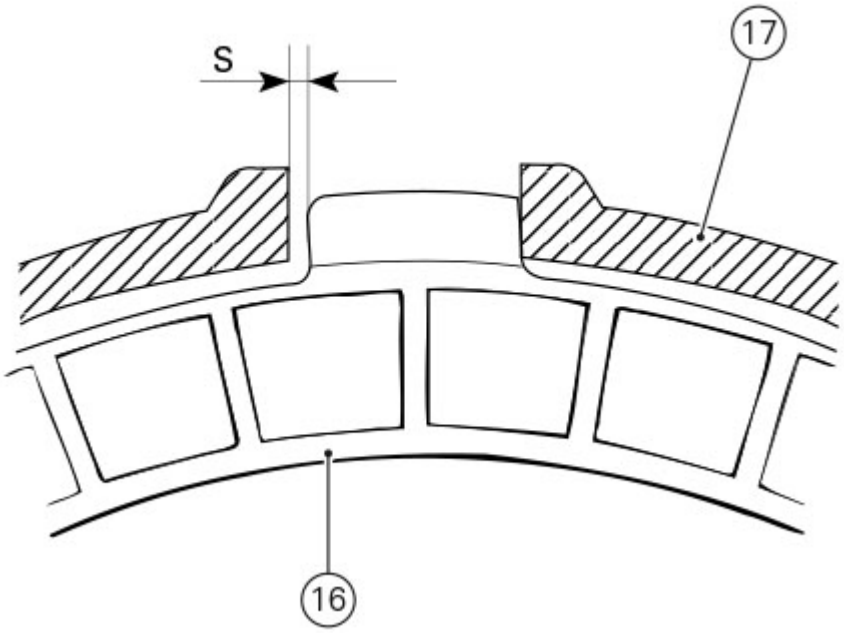


Fill the engine with oil (Changing the engine oil and filter cartridge).
Refit the right-hand fairing (Refitting the side fairings).

Checking and overhauling the components

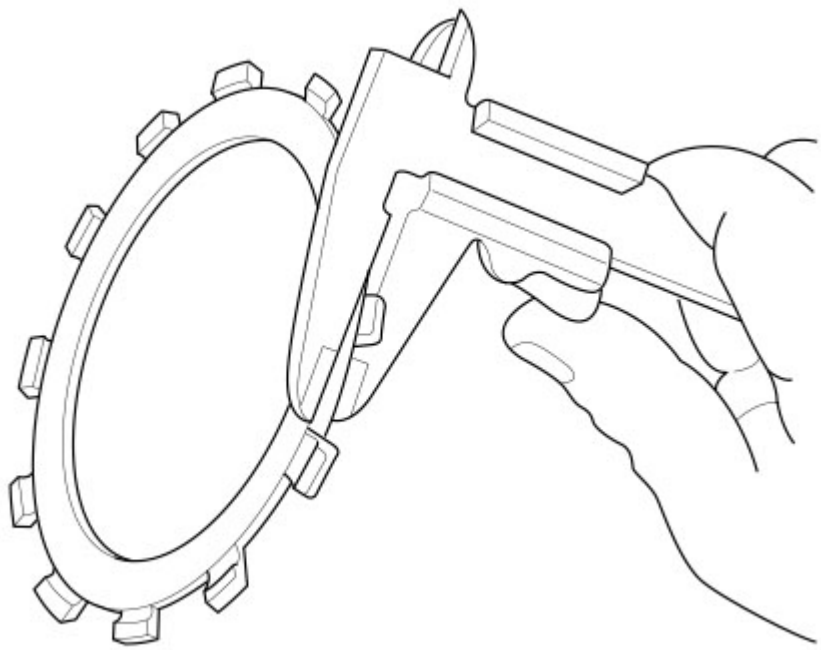
Clearance between the clutch housing and friction plates

Insert a friction plate (16) in the clutch housing (17) and measure the clearance (S) with a feeler gauge.
Clearance “S” must not exceed **0.6** mm.
If it does, replace the plates and, if necessary, the clutch housing.



Overhauling the clutch plates

The clutch plates must not show any signs of blackening, grooves or deformation.
Measure the thickness of the friction plates; it should not be less than **2.6** mm.

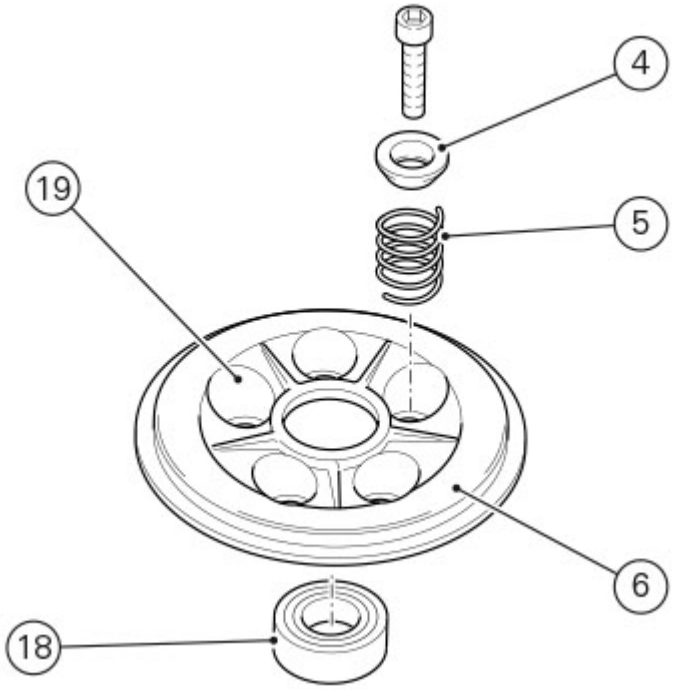


Important
The total thickness of the plates pack must not be less than 46.1 mm.

Place the plate on a flat surface and check the amount of deformation with a feeler gauge.
Max. flatness error: **0.2** mm.

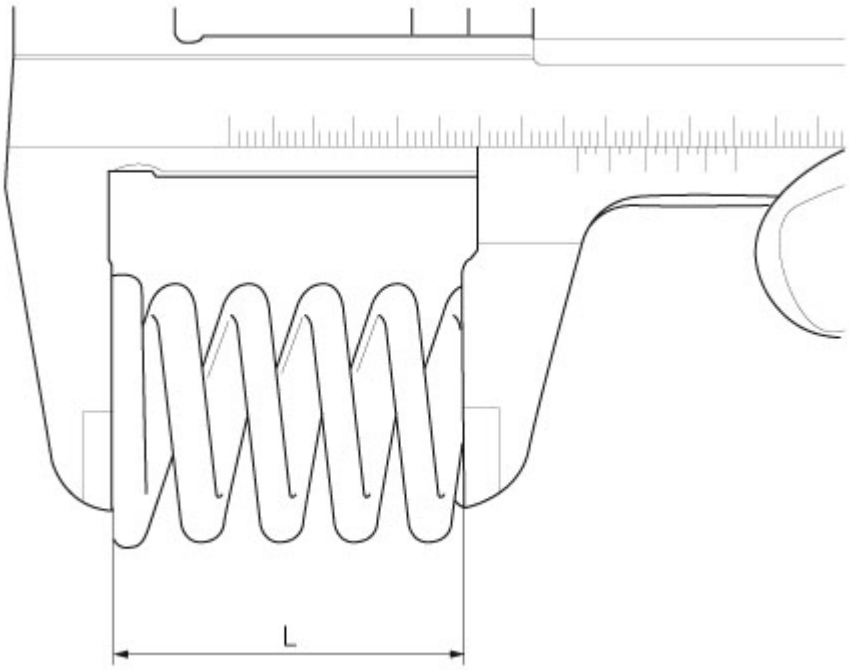
Overhauling the pressure plate

Check bearing (18) conditions: replace the bearing if the play is excessive.
Check the contact surfaces of the last friction plate; if extremely scored, polish it in the same manner as described previously for the cylinder head surface.
Check the condition of the spring guide seats (19) of the pressure plate (6) and always replace the spring retainer collars (4) at each overhaul.



Overhauling the pusher plate springs

Measure the length “L” of each spring (5).
Minimum length: **41** mm.
Replace any springs that are shorter than the above limit value.

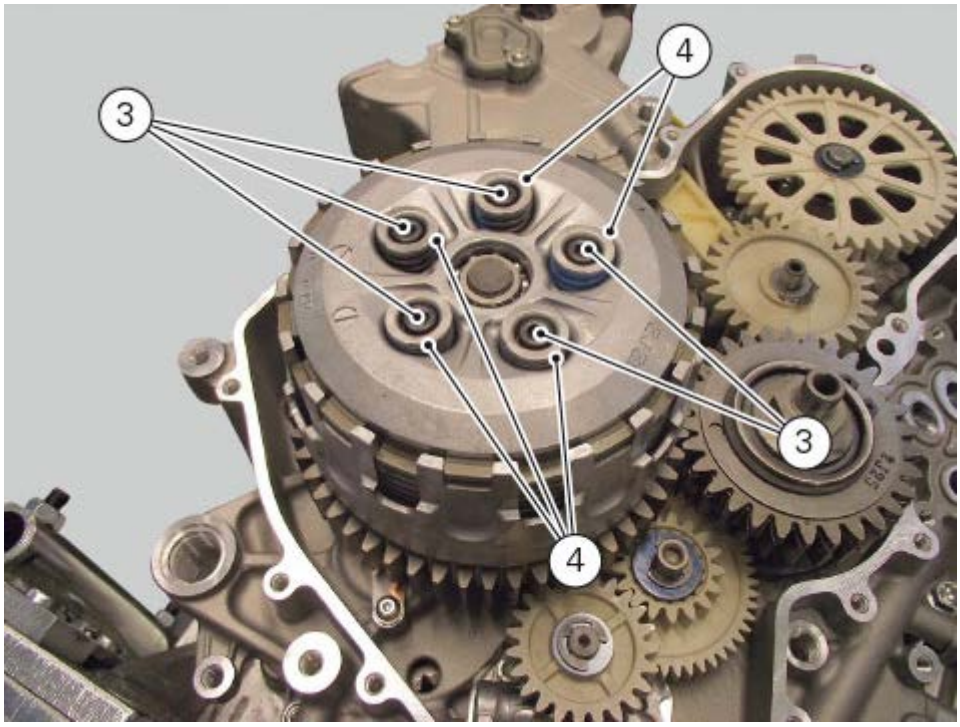

L

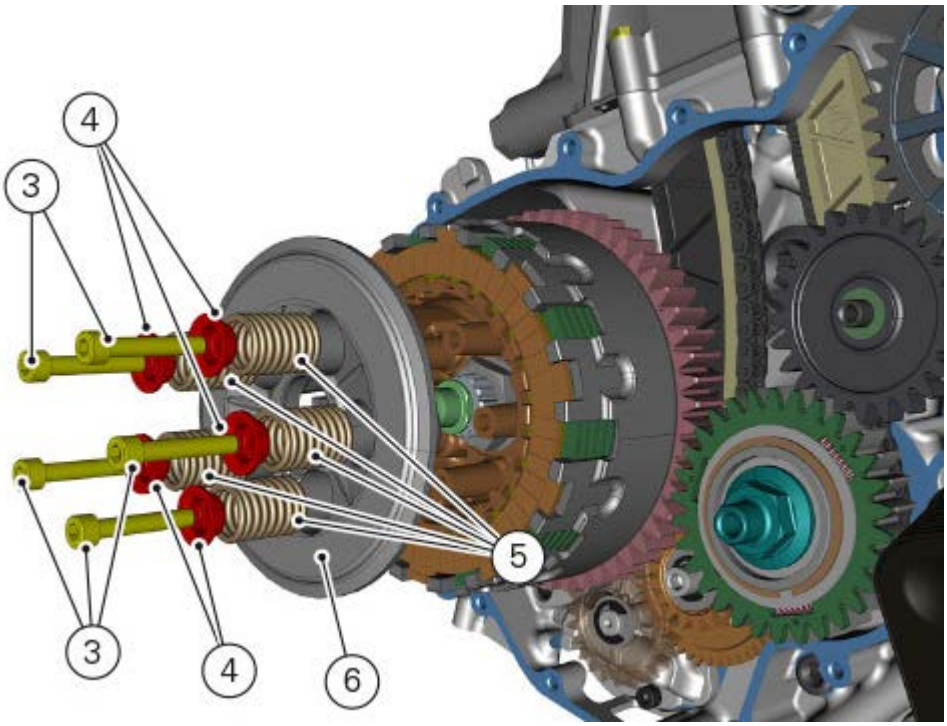
Removing the clutch

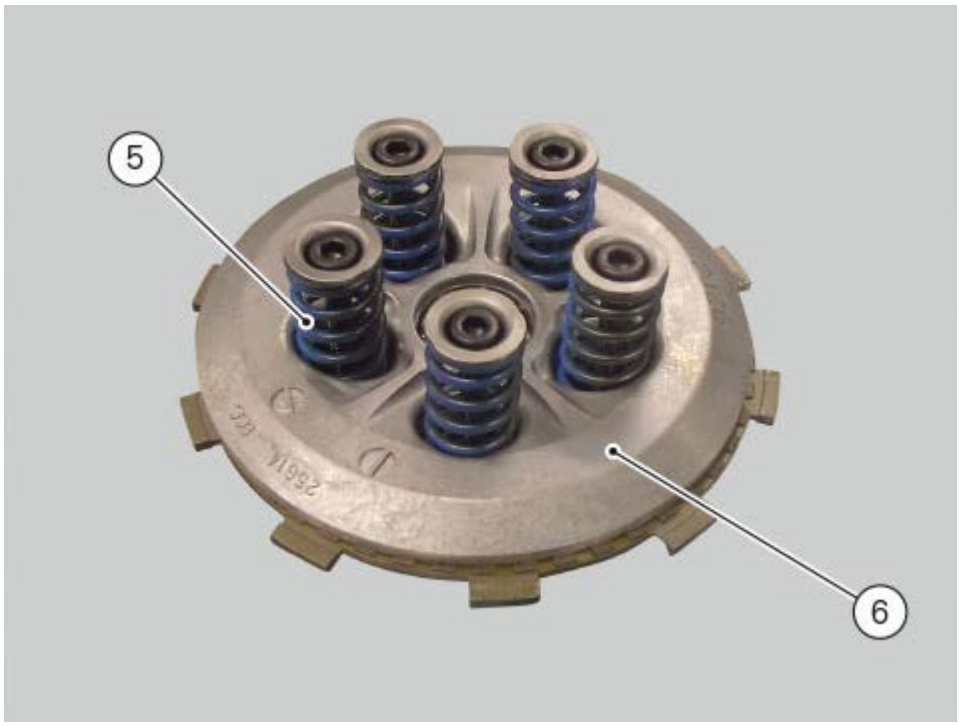
Remove the right-hand side fairing (Removing the side fairings).
Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the clutch cover (Removing the clutch cover).

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

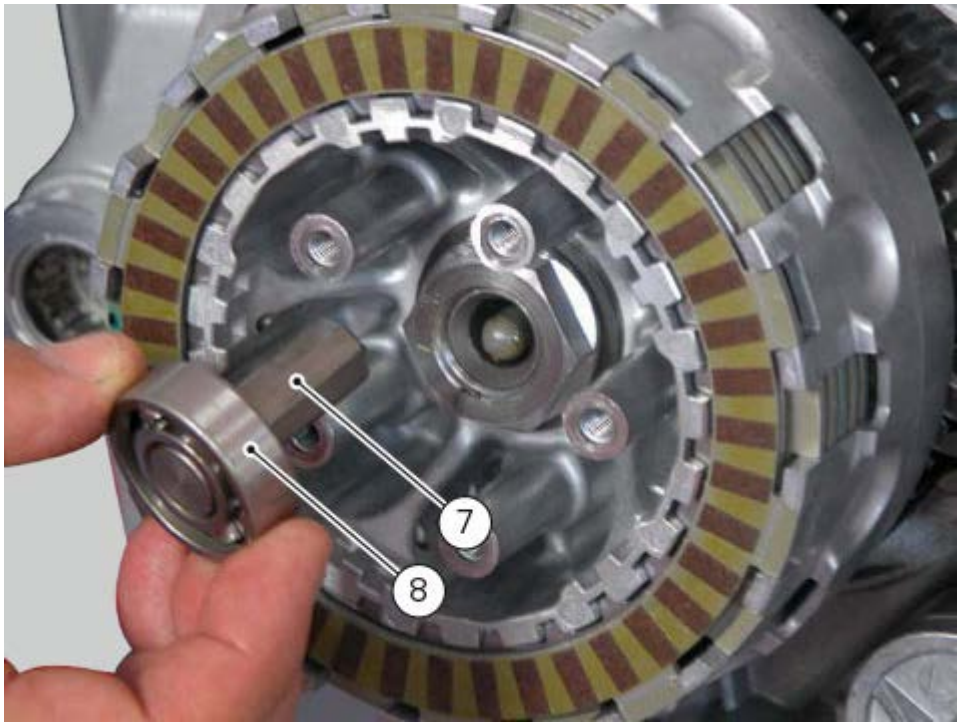
Undo the fixing screws (3) and remove the collars (4) and the springs (5) from the pressure plate (6).



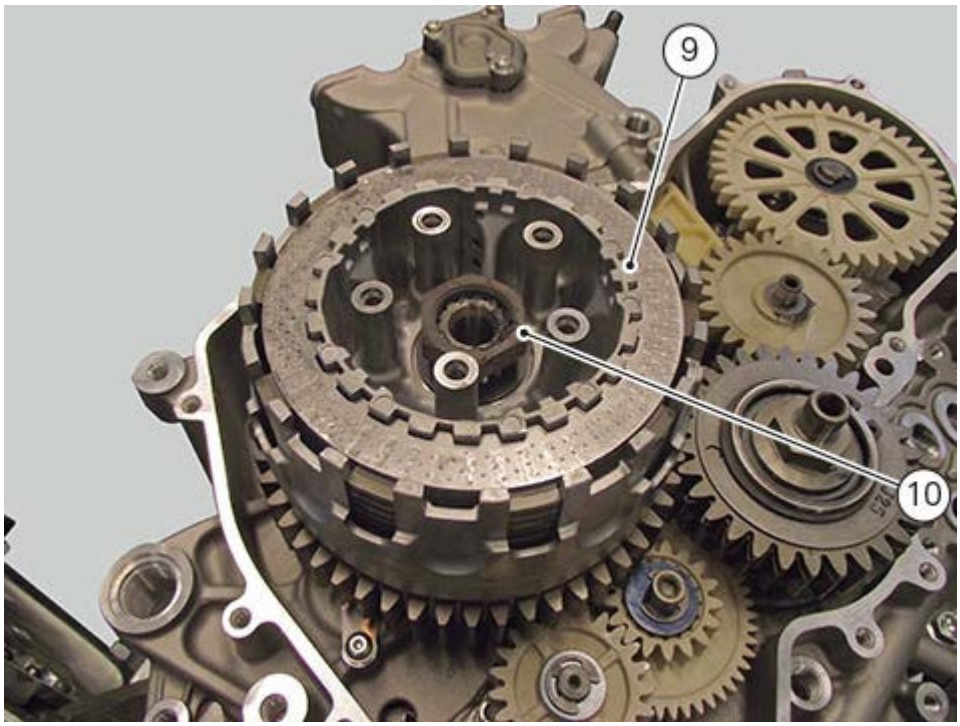




Remove the clutch control pin (7) and bearing (8).

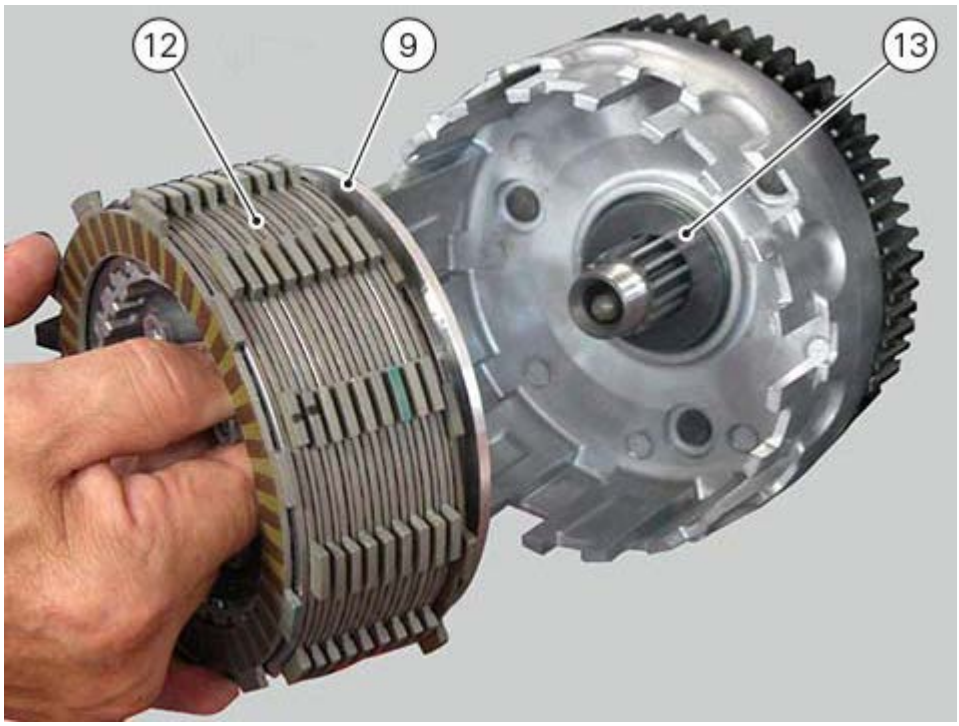


Block the clutch drum (9) using tool A: **88713.2651** and loosen retaining nut (10).

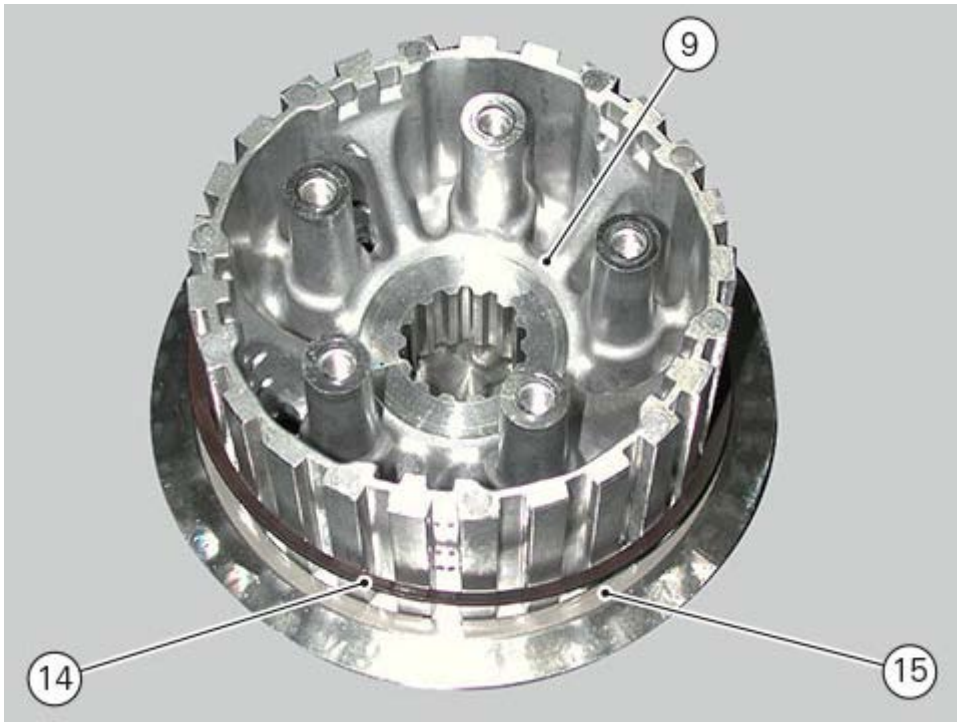


Remove nut (10) and Belleville washer (11), slide clutch drum (9) and remove the clutch plates from the clutch housing.

Remove the clutch plates (12) from the clutch drum (9). When removing the clutch plates, keep them together in pairs in the correct order and set them aside, tying them together, if necessary.
Remove the spacer (13) from the primary shaft.

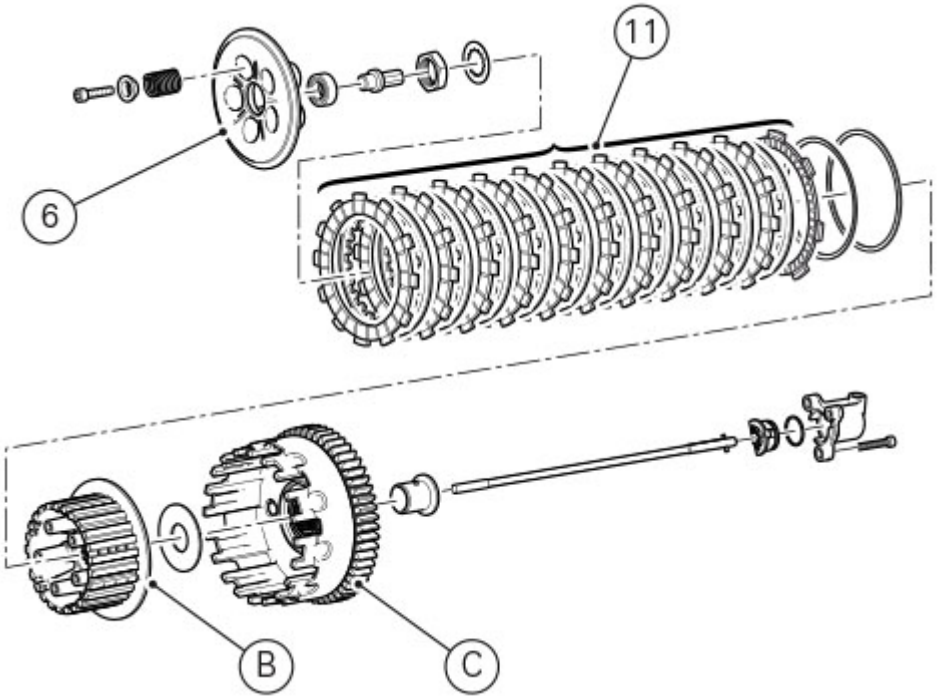


Withdraw the Belleville washer (14) and flat ring (15) from the clutch drum (9).



Description of the clutch assembly

The clutch is disengaged by a drive unit consisting of a thrust piston (A) accommodated inside a small cap mounted to the generator cover. This piston (A) pushes a pushrod (B), which runs through gearbox primary shaft and operates the pressure plate (6) located on top of the clutch plate pack (11).
Drive is transmitted from the crankshaft to the gearbox primary shaft by a gear integrated with the clutch housing/primary drive gear pair (C).
Accommodated in the clutch housing is a set of driving and driven plate pack (11). When the clutch is operated, the driven plates push away a drum (9) 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:

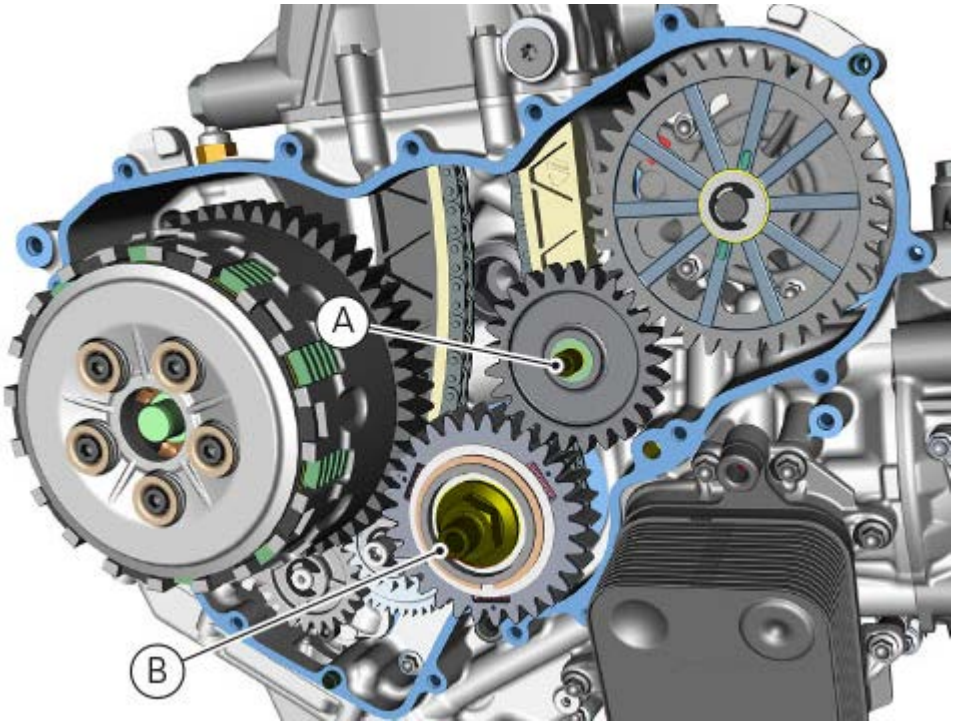
- no backlash of the control lever;
- worn clutch plates;
- weakened springs;
- faulty clutch release mechanism;
- excessive wear of the hub or clutch housing.

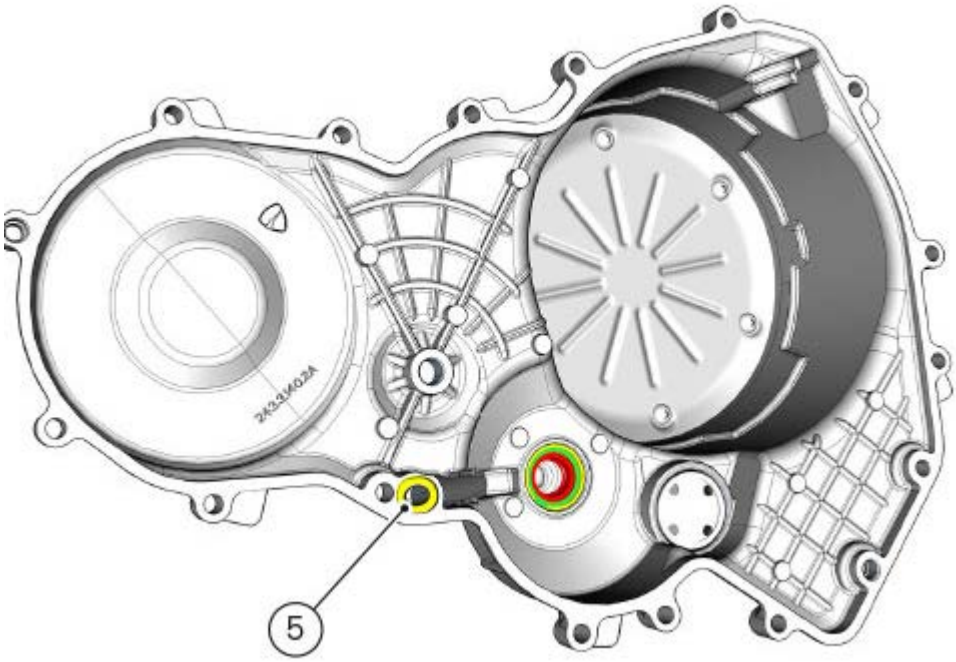
A noisy clutch may be caused by:

- excessive backlash between the primary drive gears;
- damaged primary drive gear teeth;
- excessive housing between friction plate tabs and the clutch housing;
- worn gear/clutch housing bearings;
- the presence of metal particles (filings) on the gear teeth.

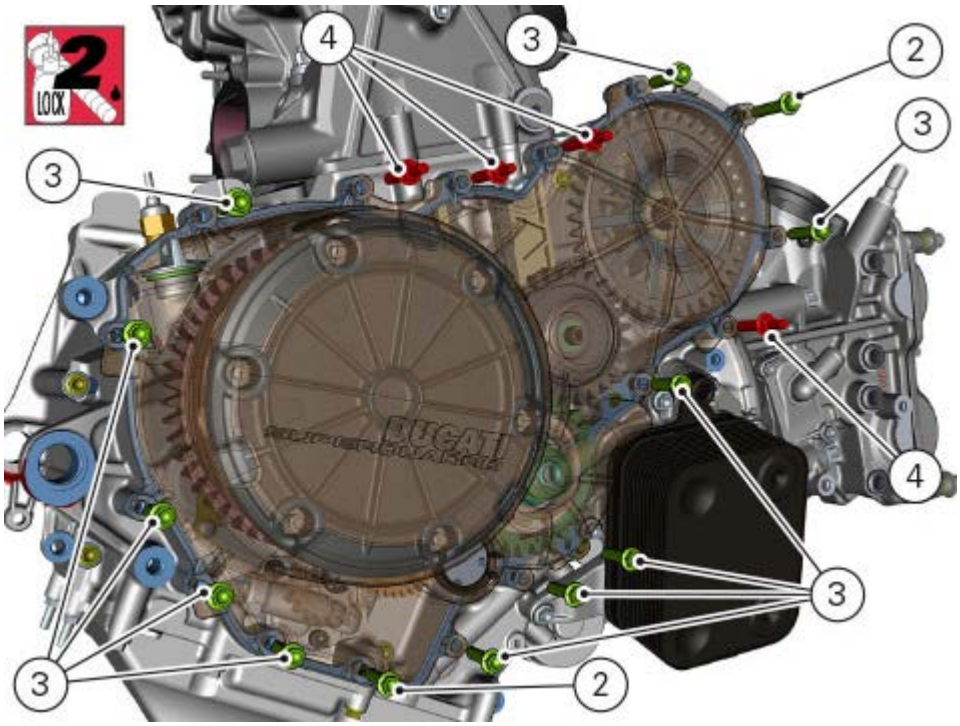
Refitting the clutch cover

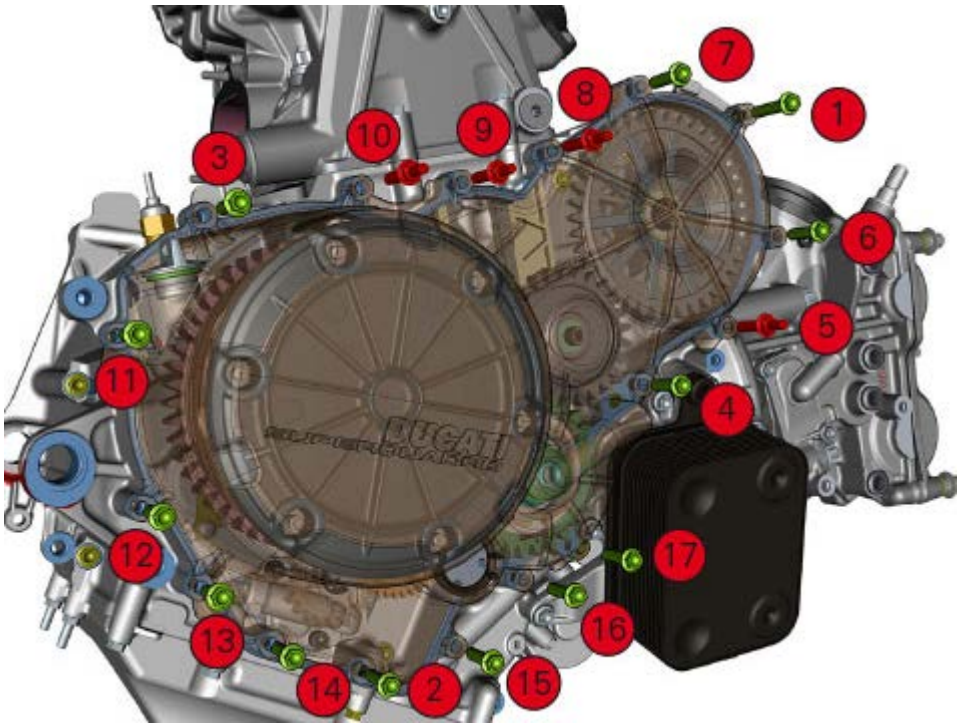
Clean and degrease mating surfaces on cover and crankcase half, and ensure that centring bushing and the O-ring (5), located in correspondence with the oil way, are fitted on the crankcase.
Apply an even, regular bead of DUCATI sealing compound on the mating surface of the crankcase half and around all holes.
Lubricate with engine oil reference pins (A) and (B) for positioning clutch cover (4).
Fit clutch cover (4) by centring it with respect to the bushings, pins (A) and (B) and bring it perfectly home on the casing.





Apply recommended threadlocker on the special screws (4) and tighten them on clutch cover; tighten the remaining short screws (3) and long screws (2).
Tighten screws (2), (3) and (4) to a torque of 13 Nm (Min. 12 Nm – Max. 14 Nm) respecting the indicated sequence as shown in the figure.



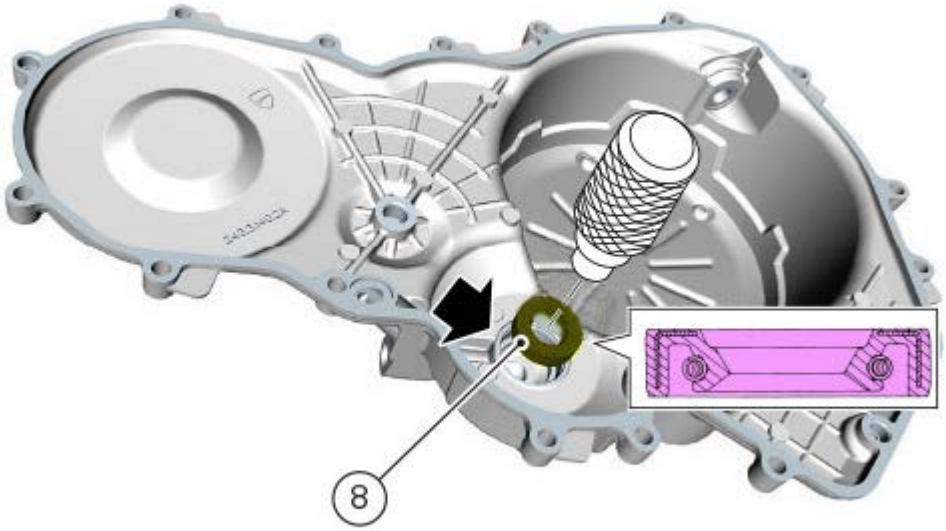


Retaining screws table		
Reference	Type	Quantity
2	socket cap M6x30	1
3	socket cap M6x25	12
4	socket cap M6x25	4

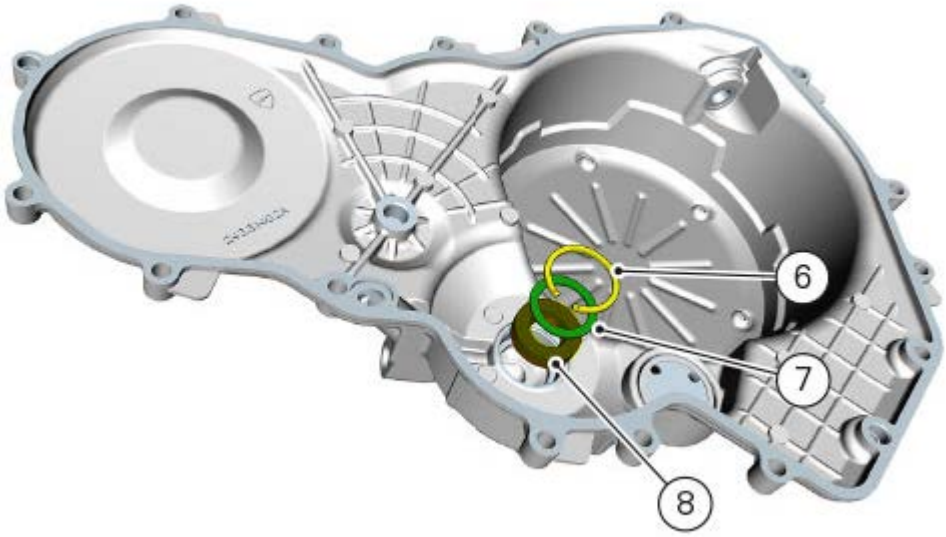
Refit the oil heat exchanger (Refitting the heat exchanger).
Fill with engine oil (Changing the engine oil and filter cartridge).
Refit the side fairings (Refitting the side fairings).

Reassembling the clutch cover

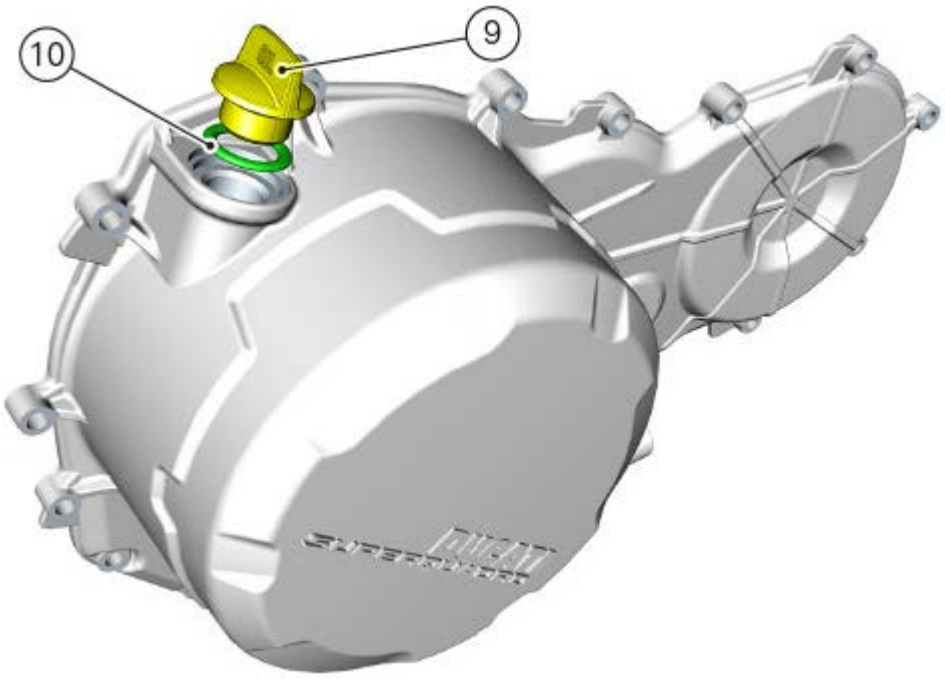
If the sealing ring (8) needs replacing, refit the new seal in the clutch cover using the relevant tool, setting it as shown in the figure, until the circlip (6) groove is exposed.



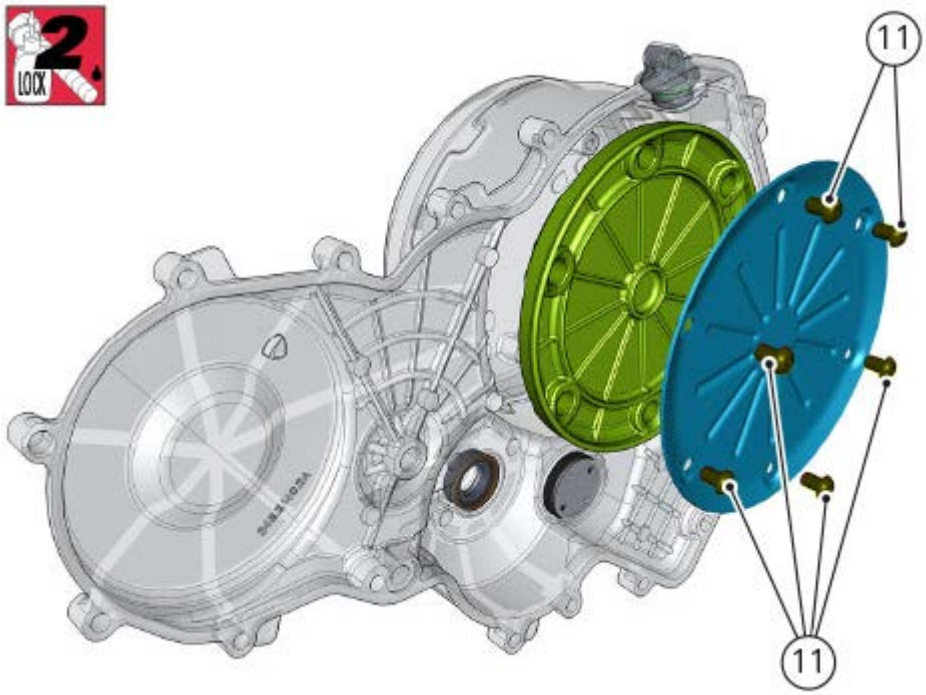
Before fitting, check that the edges of the circlip groove show no sign of burrs which might otherwise damage the sealing ring.
Then fit the shim (7) and the circlip (6).
Make sure circlip (6) is completely inside the seat of the clutch cover.



Make sure that the oil filler cap (9) has O-ring (10).
Fit cap (9) by bringing it fully home by hand on the clutch cover.

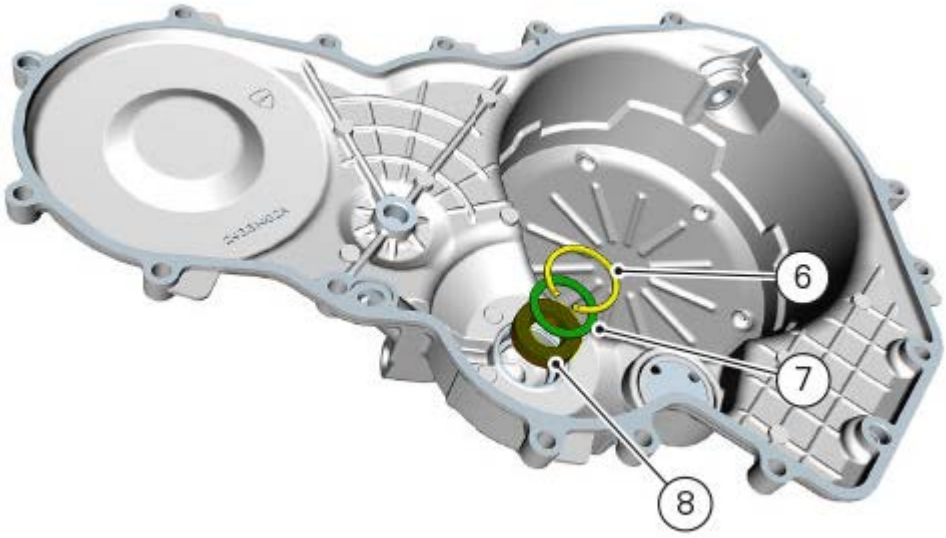


Fix the noise dampening sheet (12) to clutch cover (1) by starting the retaining screws (11). Apply specified threadlocker and tighten to a torque of 10 Nm (min. 9 Nm - max. 11 Nm).

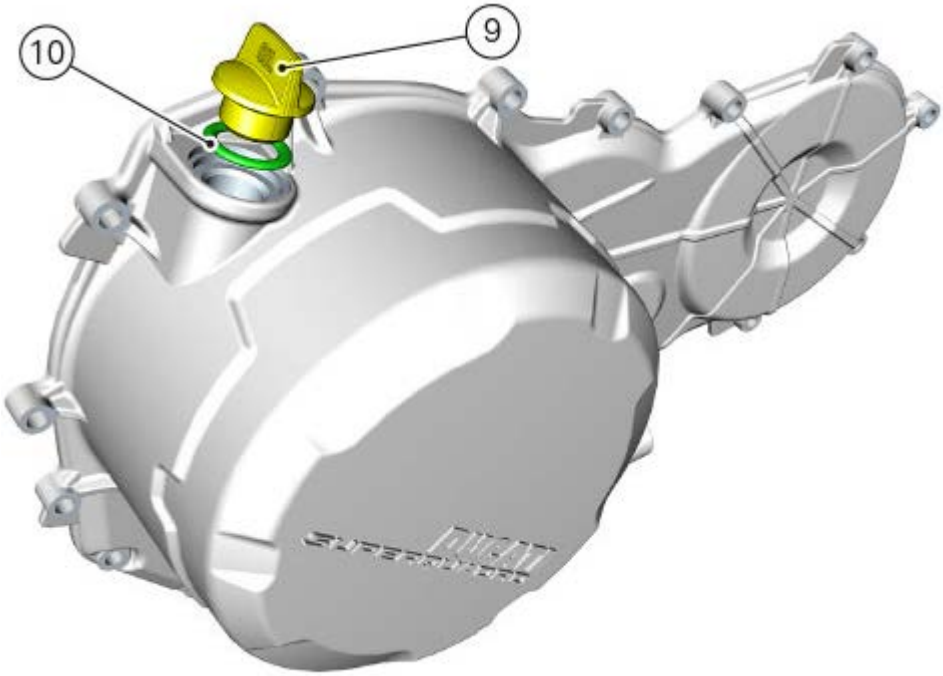


Disassembling the clutch cover

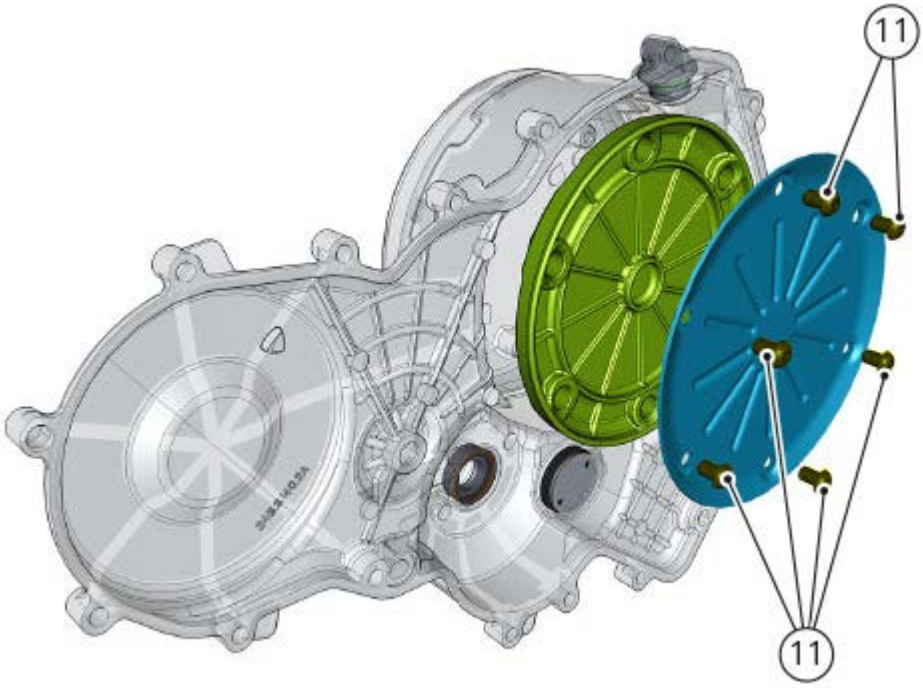
Remove the circlip (6) and withdraw the shim (7) and the sealing ring (8).
Visually inspect the sealing ring (8) and replace it if necessary.



Remove the plug (9) with its O-ring (10) from cover.



Loosen and remove the six retaining screws (11) and remove the noise dampening sheet (12).

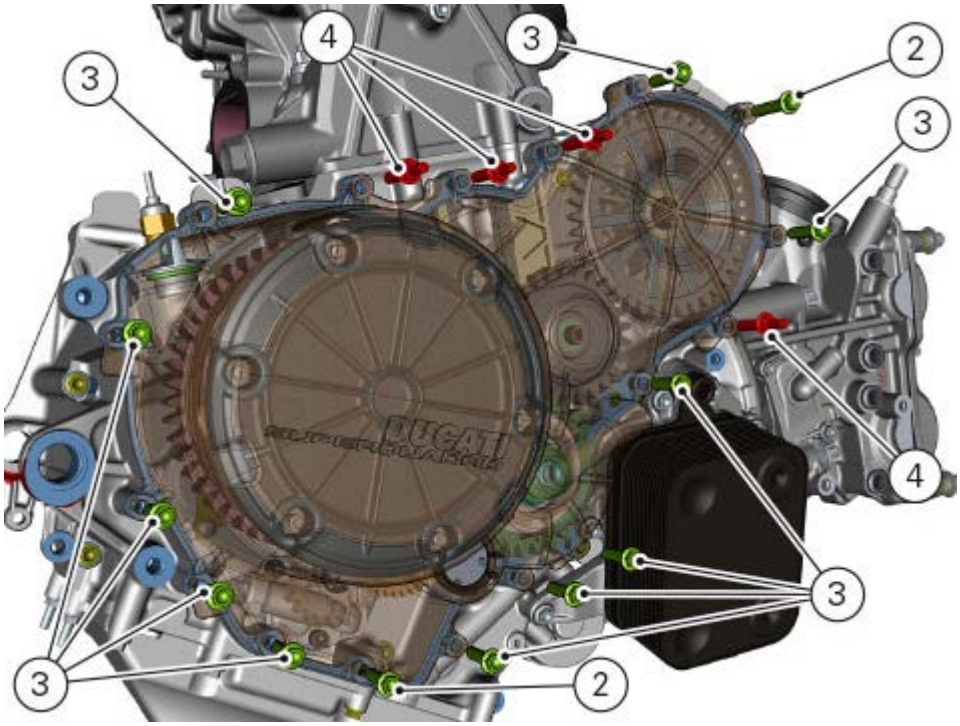

11
11

Removing the clutch cover

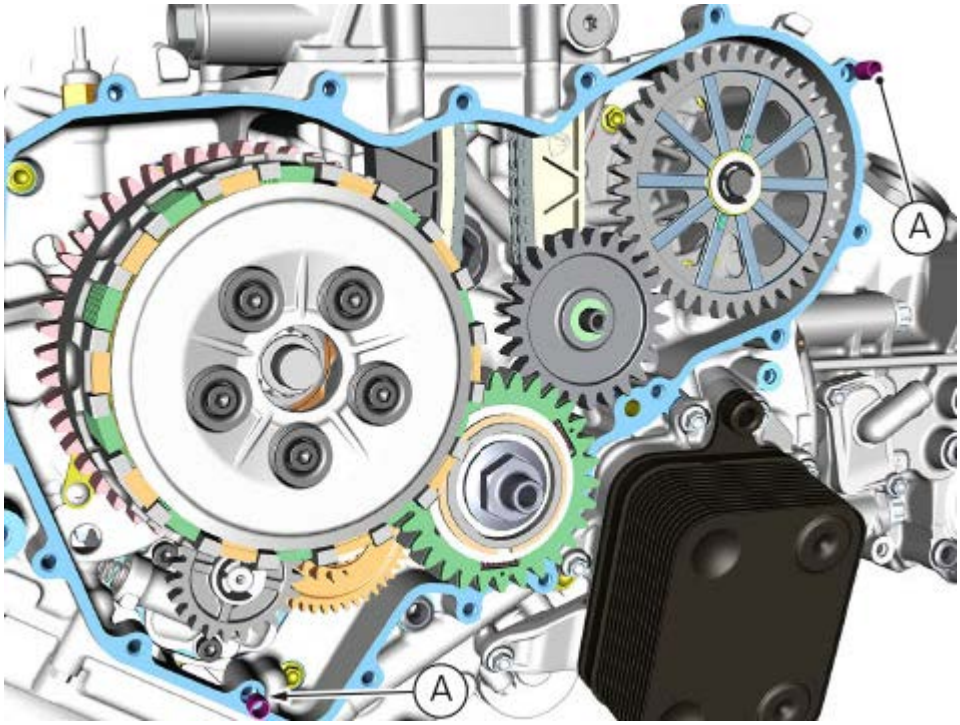
Remove the side fairings (Removing the side fairings).
Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the heat exchanger (Removing the oil heat exchanger).

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

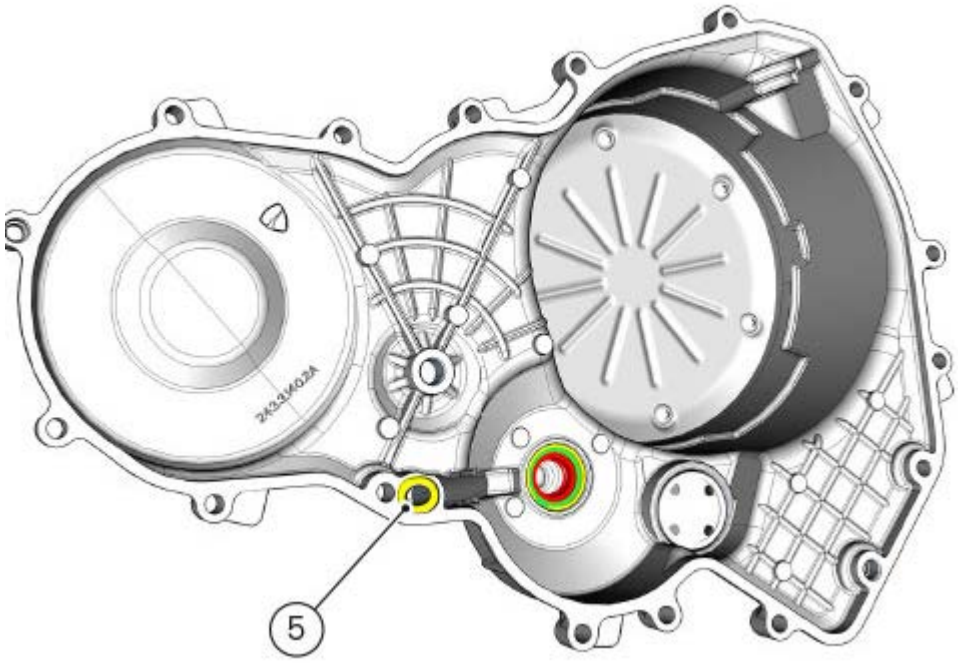
Loosen and remove the long screws (2), the short ones (3) and the special ones (4) retaining the clutch cover (1).



Using a plastic mallet, tap at several positions all along the cover edge to help separation from the crankcase.
Remove the clutch cover from the crankcase, paying attention not to let the centring bushings (A) fall.

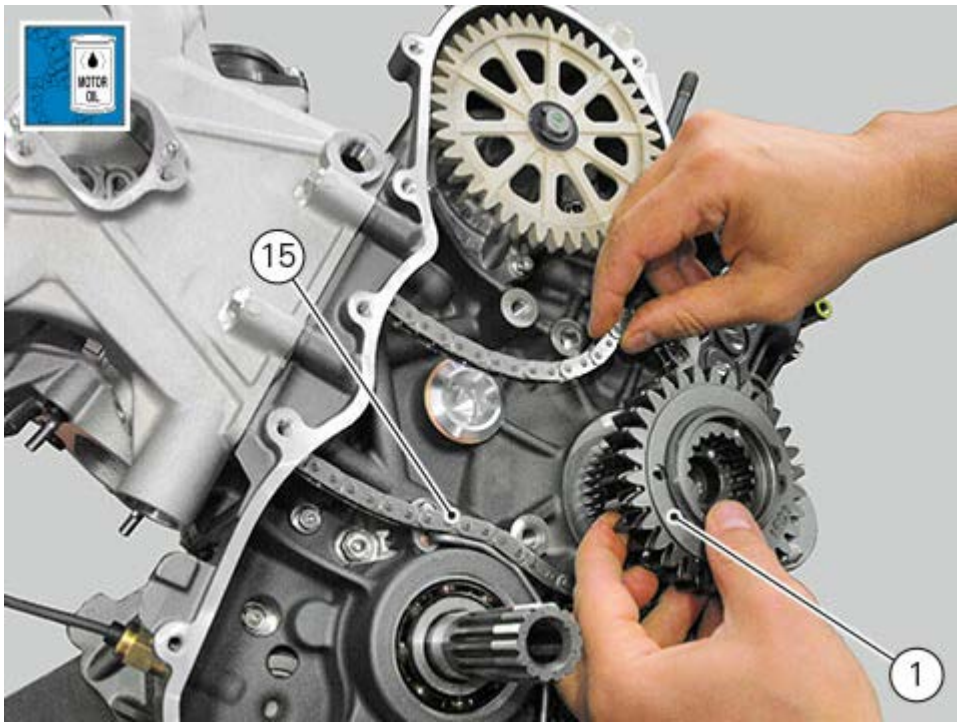


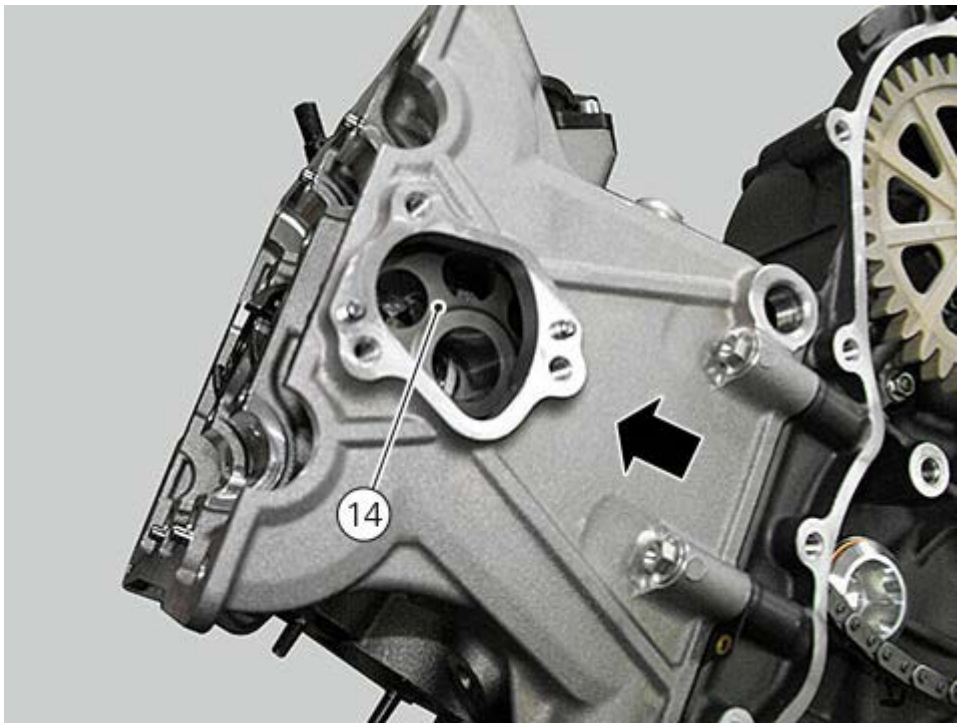
Remove the O-ring (5) at the oilway from crankcase.


5

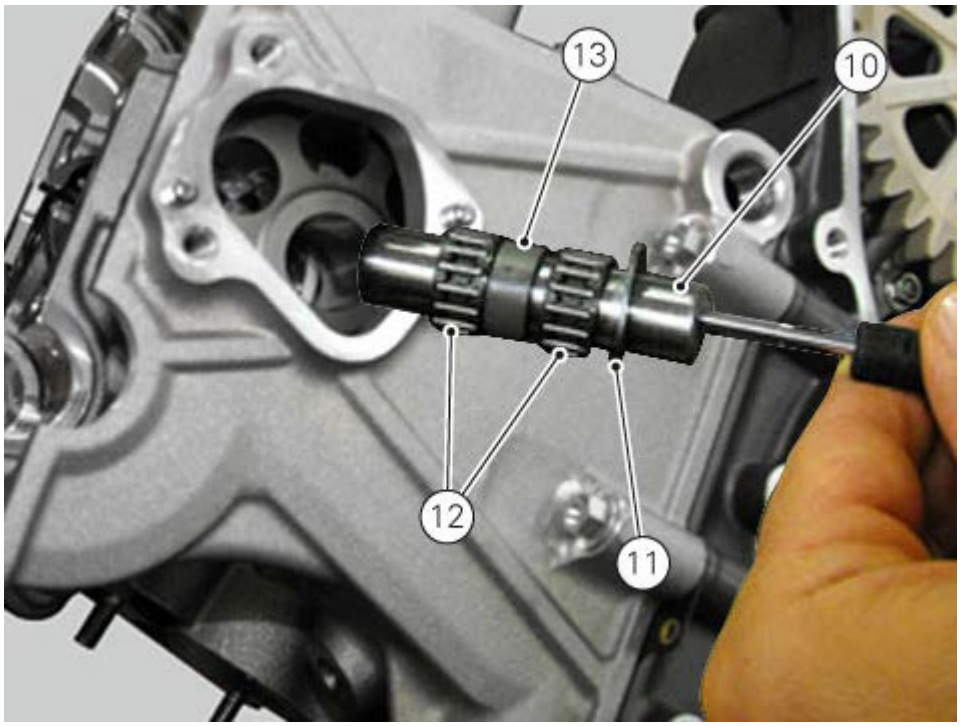
Refitting the primary drive gears and checking backlash

Apply specified lubricant on the thread of the primary sprocket (1).
Insert the sprocket on the crankshaft and place chain (15) on the primary sprocket.
Reposition gear (14) with chain (15) on the vertical head.

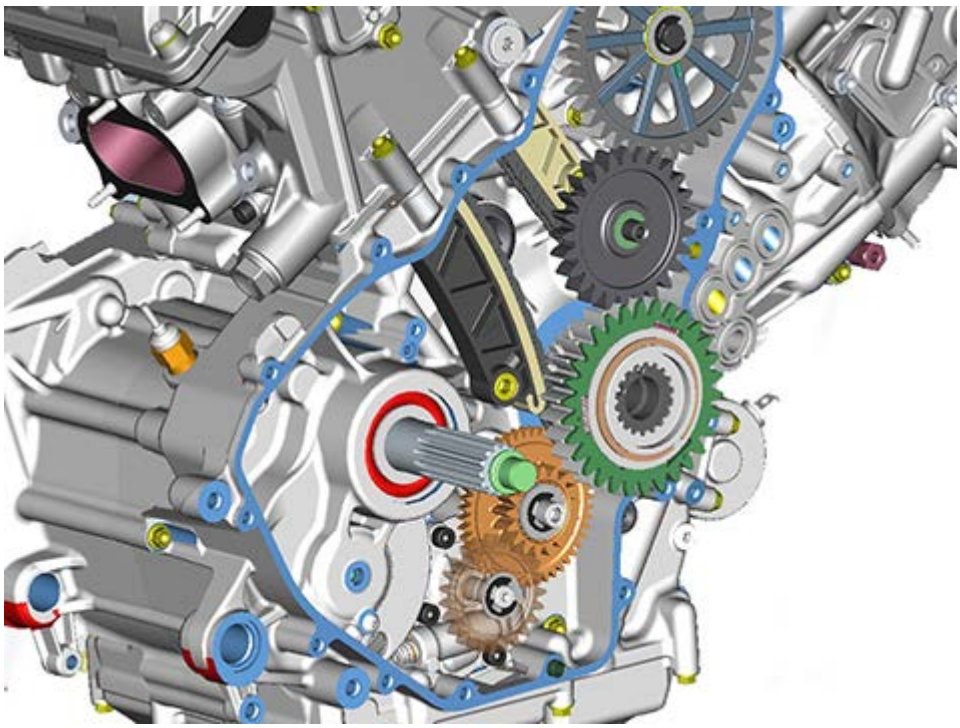




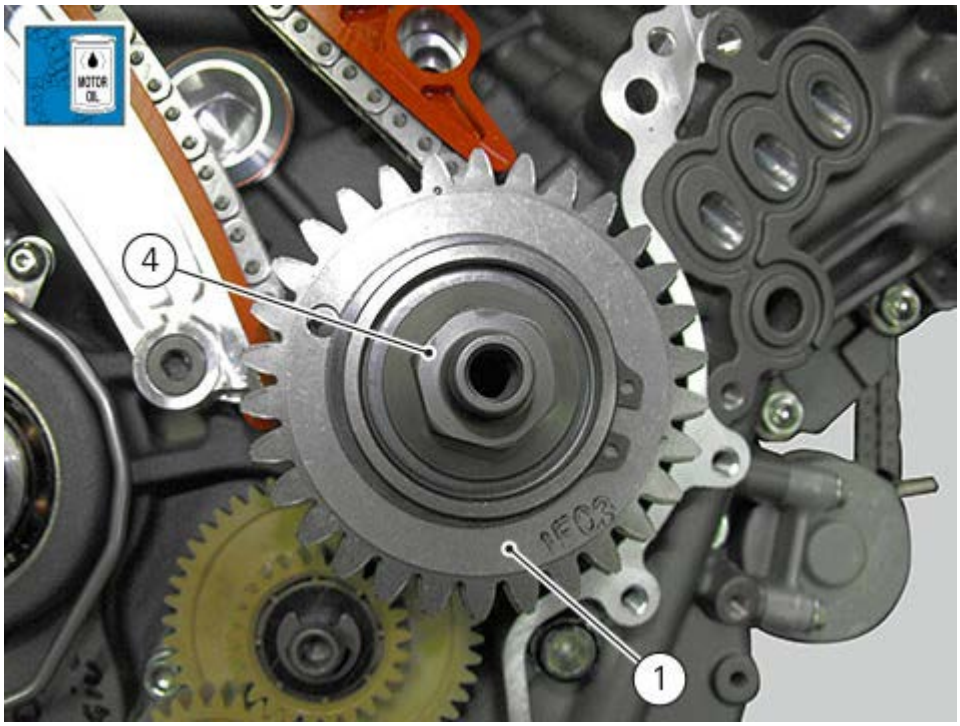
Insert pin (10) with bearing (12), a spacer (13) and another bearing (12) on the head.
Fit shim (11).



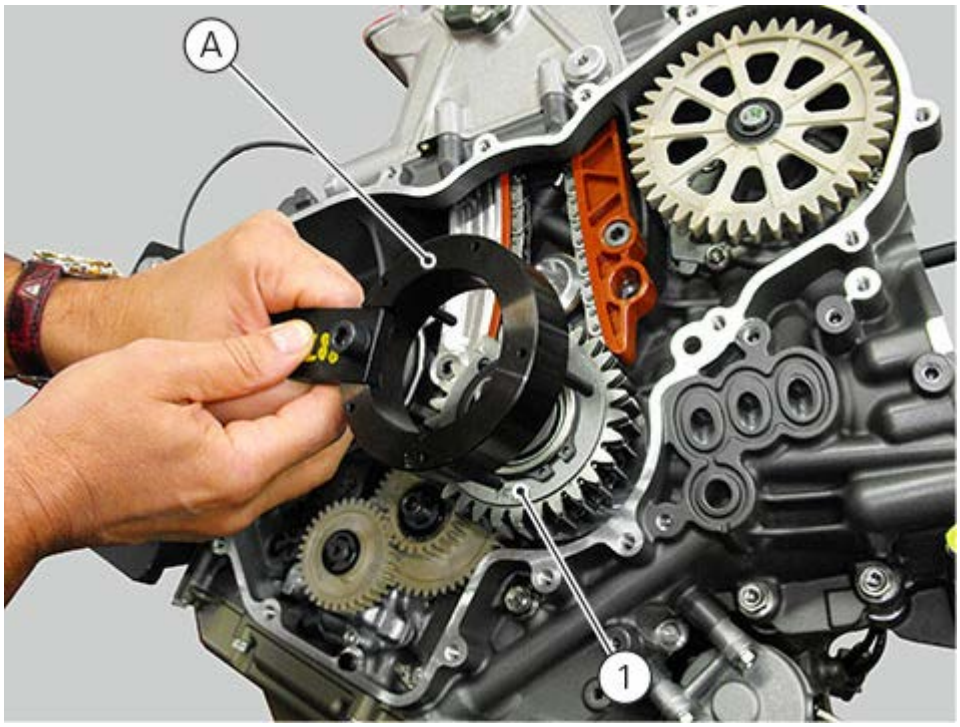
Follow the instructions under "Refitting the chain" to correctly fit the vertical head chain.

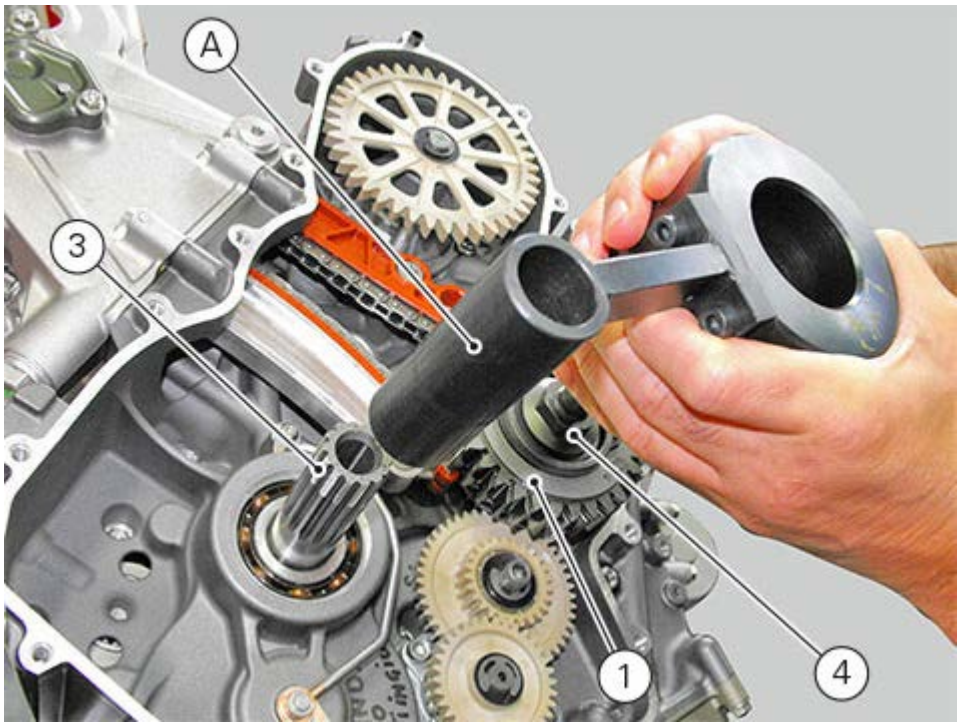


Apply engine oil on screw (4) that secures the primary sprocket and start it.

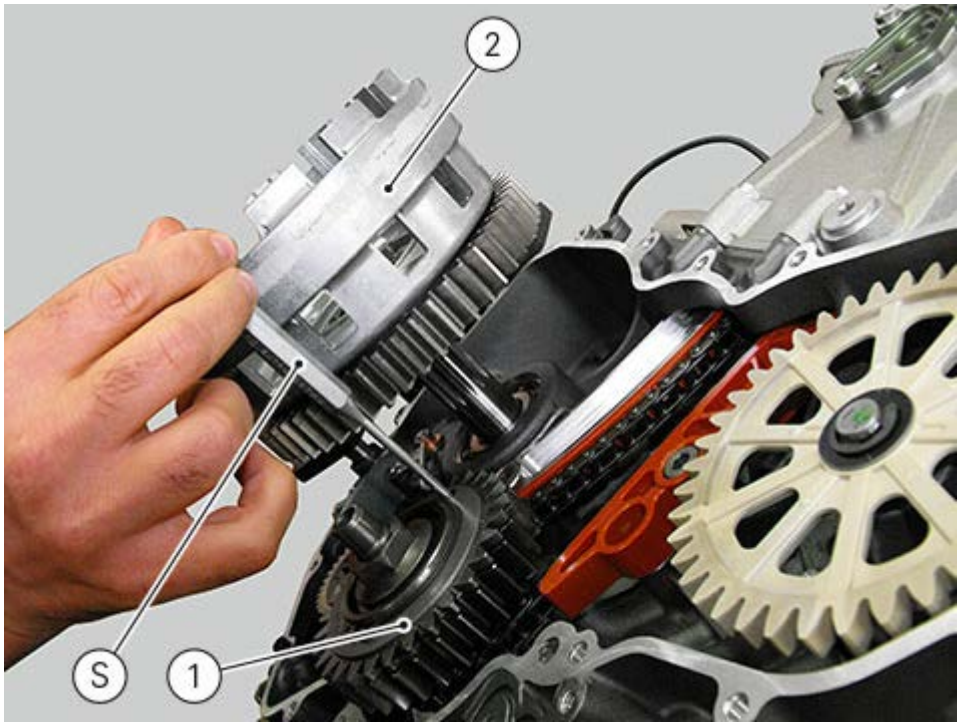


Position tool (A) **88713.3925** on the gearbox primary shaft (3) and on the primary sprocket (1) to tighten screw (4) to a torque of 150 Nm (Min. 140 Nm - Max. 160 Nm).





Insert one service pin (S) in the hole of the primary sprocket (1) and insert the clutch housing (2).

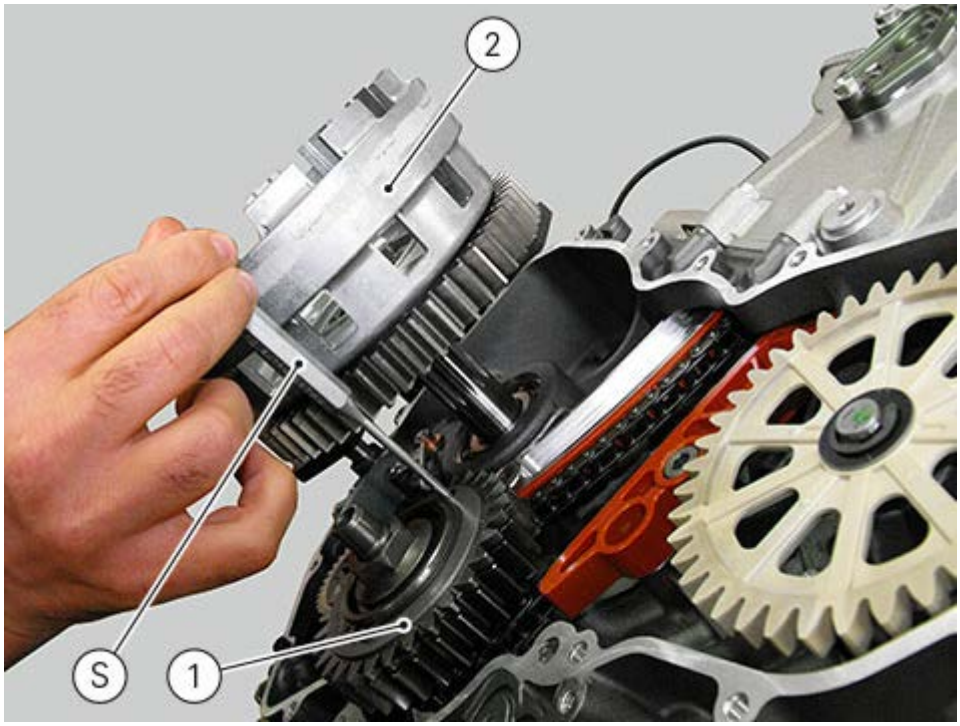


Refit the water pump idle gear (Refitting the water pump).
Refit the clutch unit (Refitting the clutch).
Refit the clutch cover (Refitting the clutch cover).
Refit the heat exchanger (Refitting the oil heat exchanger).
Fill with engine oil (Changing the engine oil and filter cartridge).
Refit the side fairings (Refitting the side fairings).

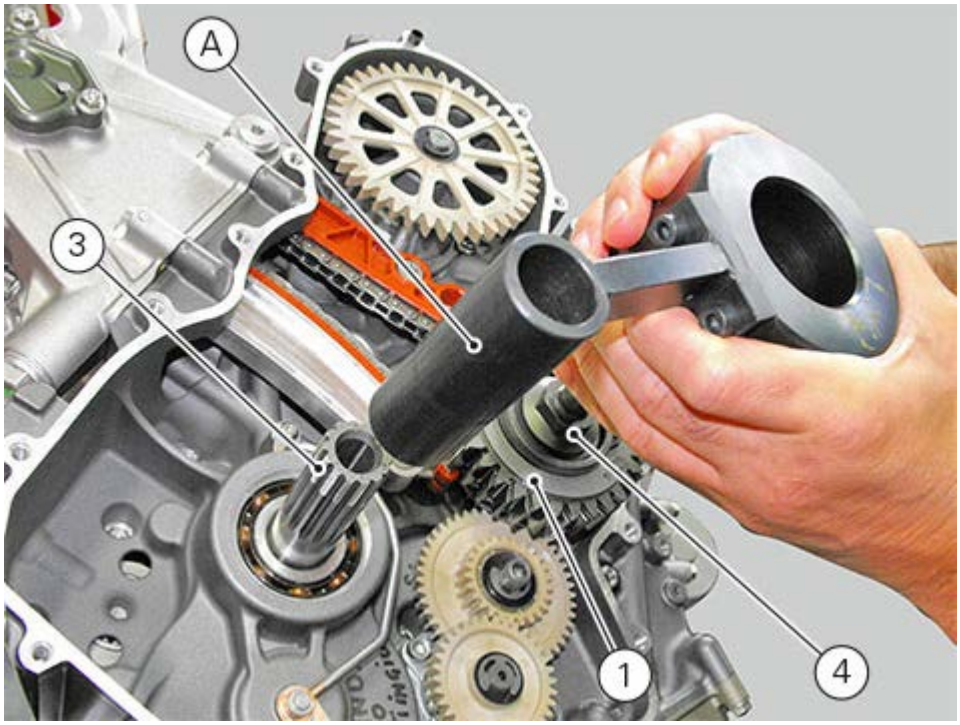
Removing the primary drive gears

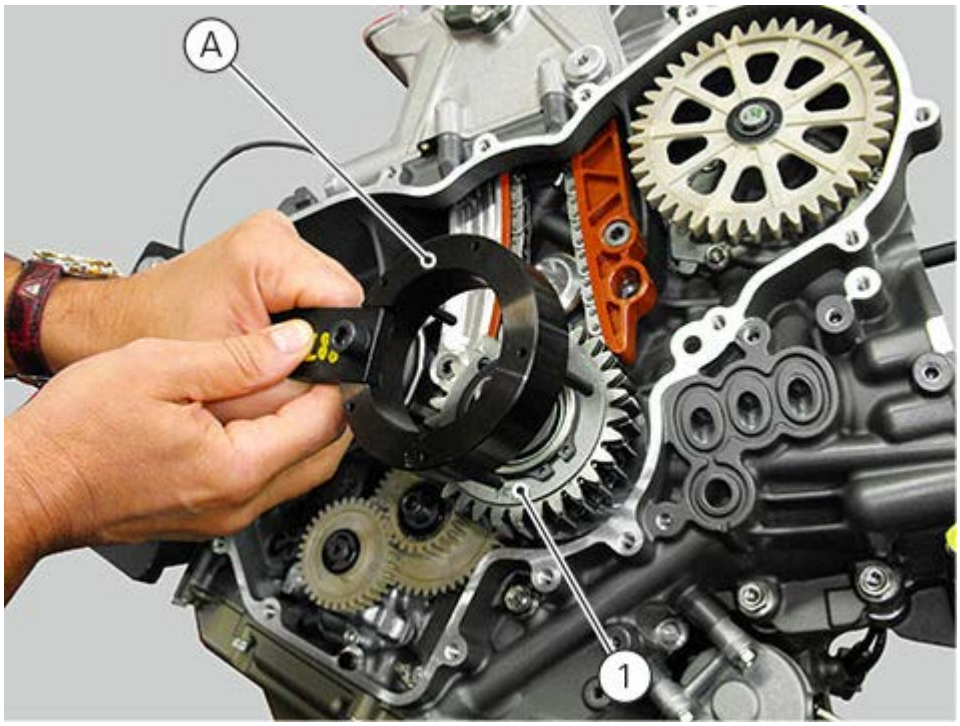
Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the heat exchanger (Removing the oil heat exchanger).
Remove the clutch cover (Removing the clutch cover).
Remove the complete clutch (Removing the clutch).
Remove the water pump idle gear (Removing the water pump).

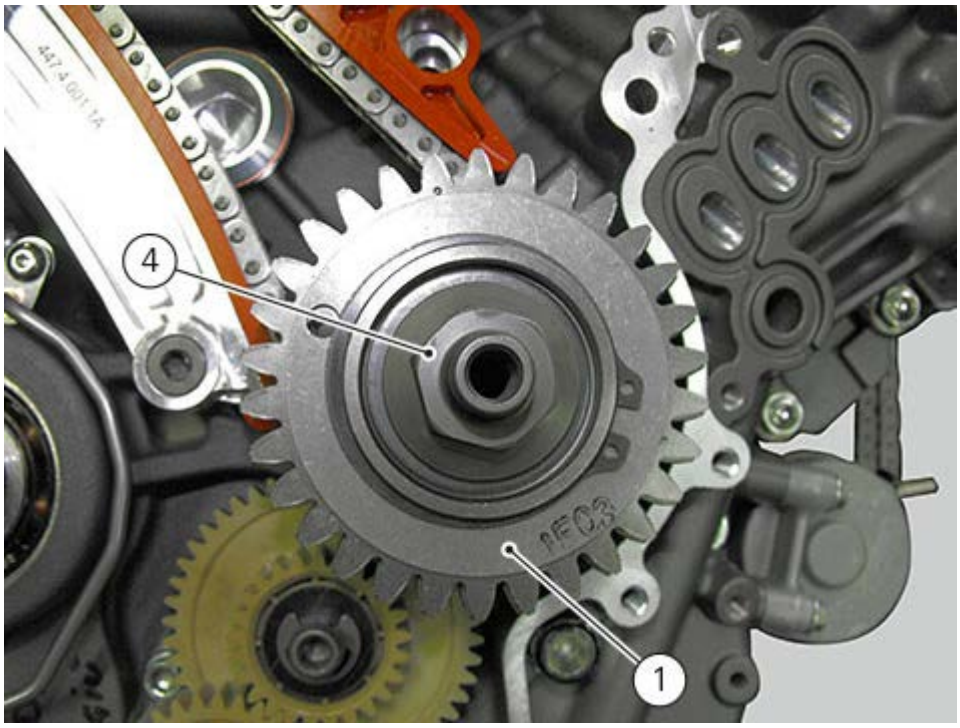
Insert one service pin (S) in the hole of the primary sprocket (1) and slide out clutch housing (2).



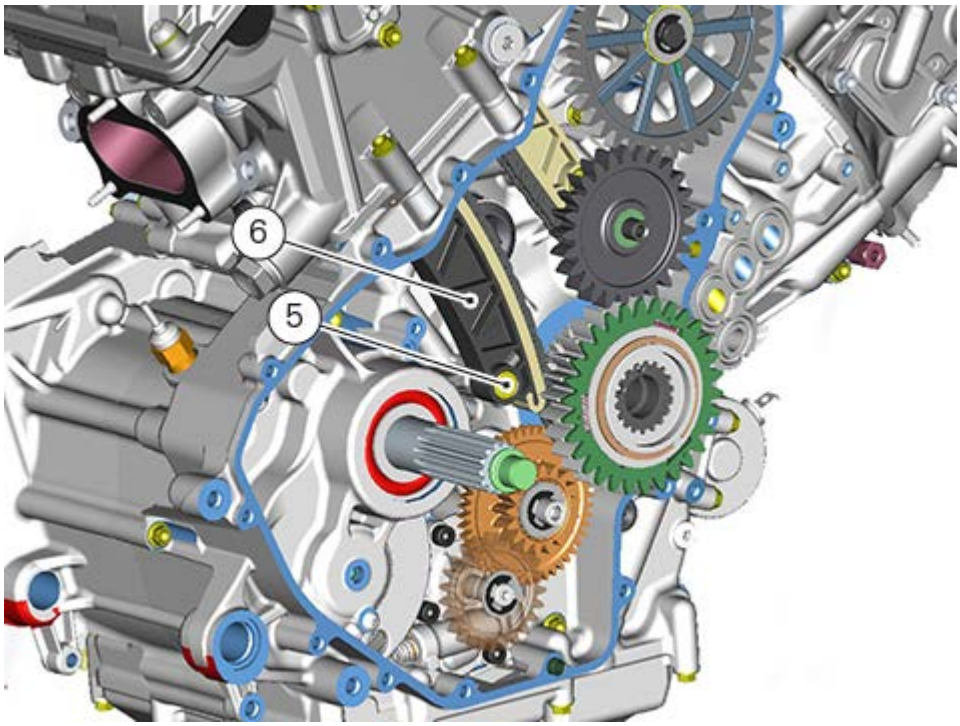
Position tool (A) **88713.3925** on the gearbox primary shaft (3) and on the primary sprocket (1) to loosen the special screw (4).



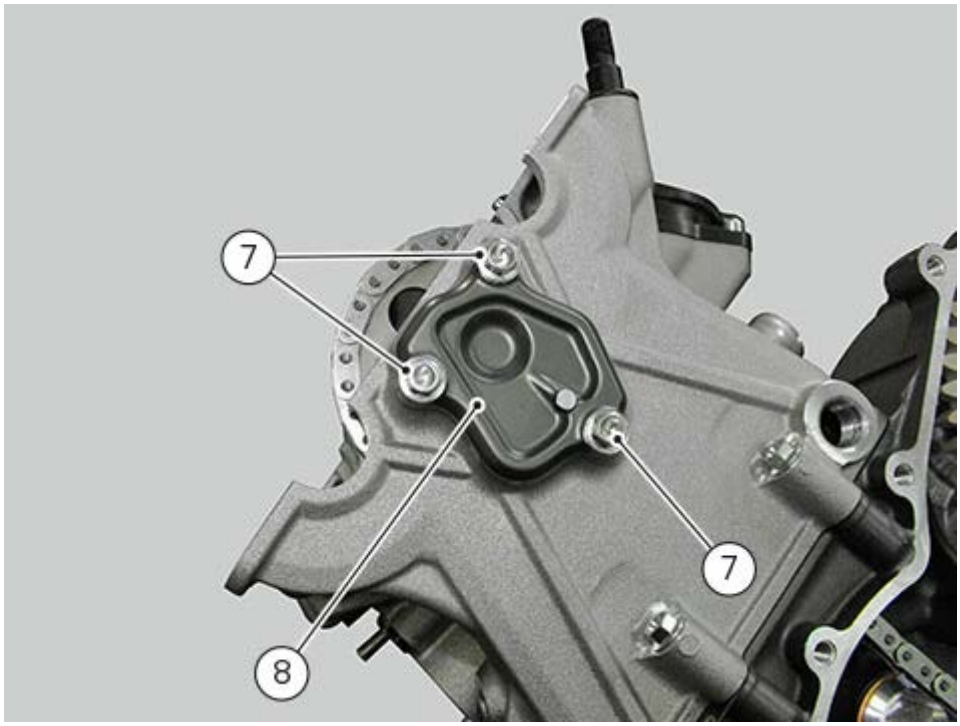




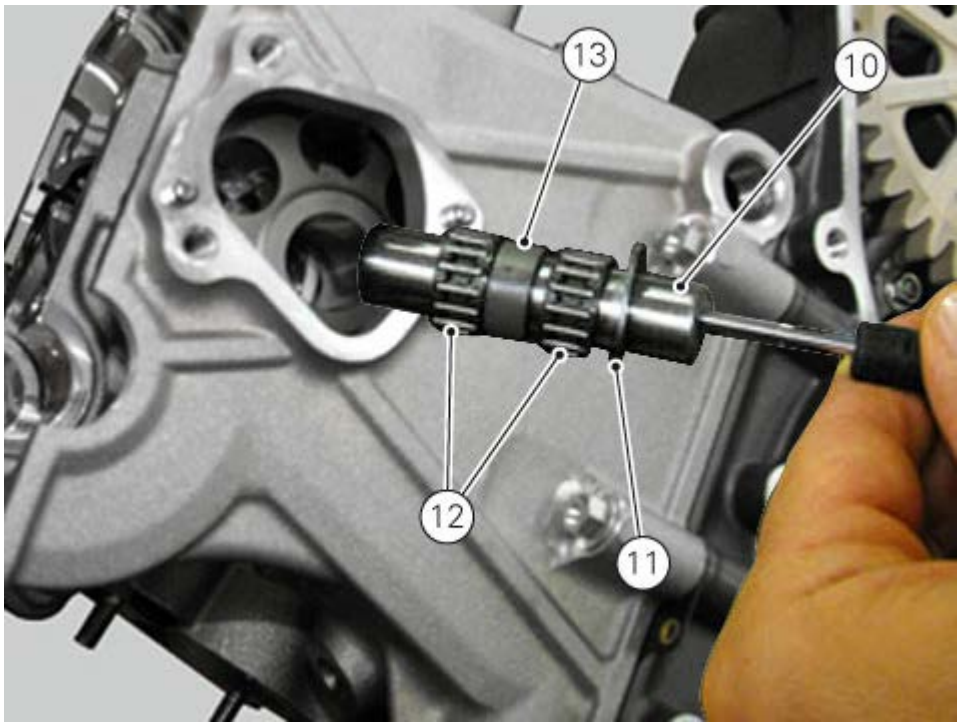
Undo the screws (5) and remove the mobile tensioner (6).



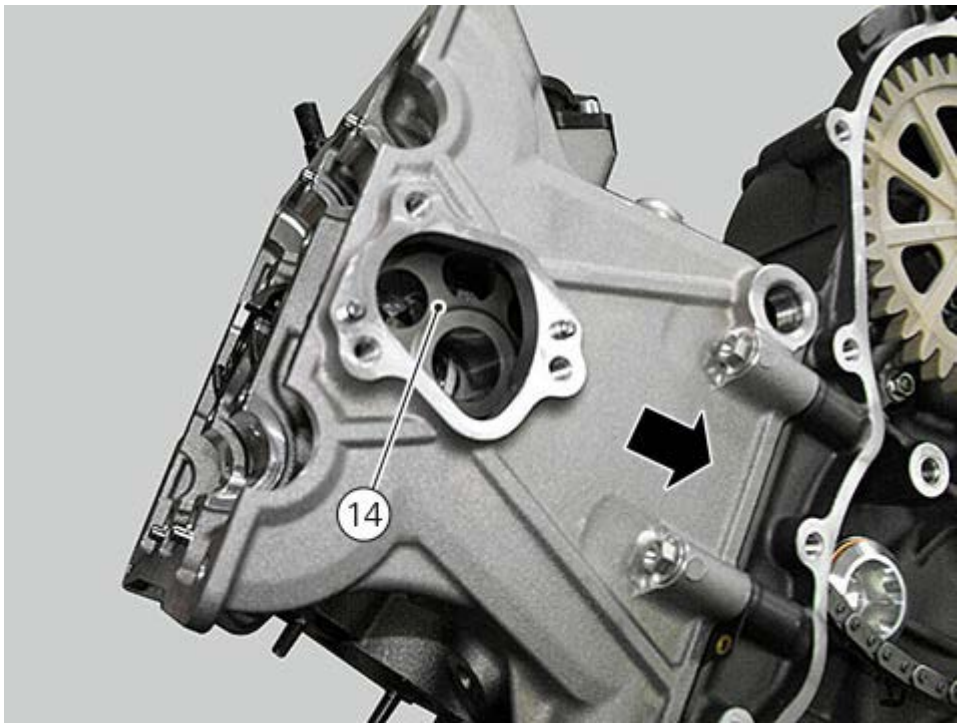
Remove the valve cover from the vertical head and the camshafts (Removing the camshafts). Undo screws (7) and remove cover (8).

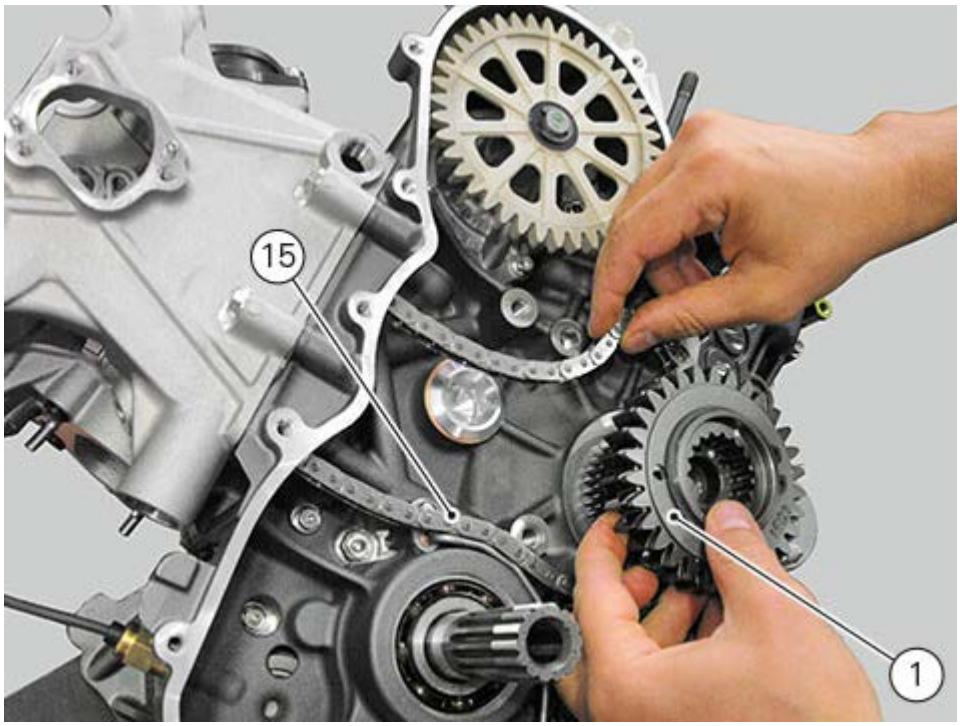


Remove shim (11), pin (10), bearings (12) and spacer (13) from the camshaft gear.



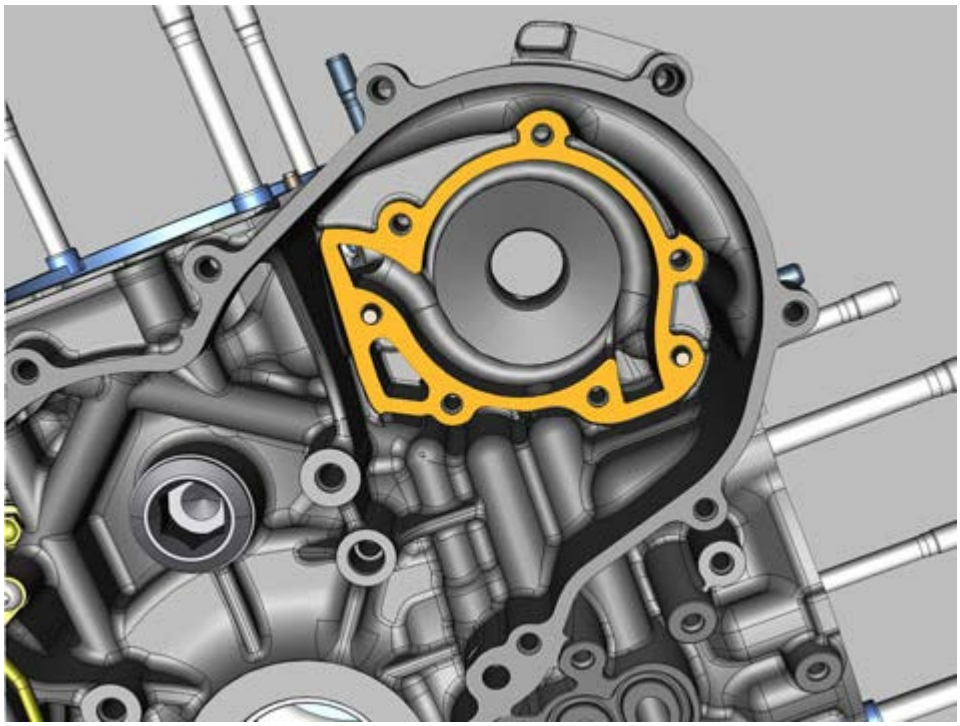
Slide gear (14) with chain (15) towards the crankshaft.
Release the primary sprocket (1) from the chain and slide out the crankshaft sprocket.



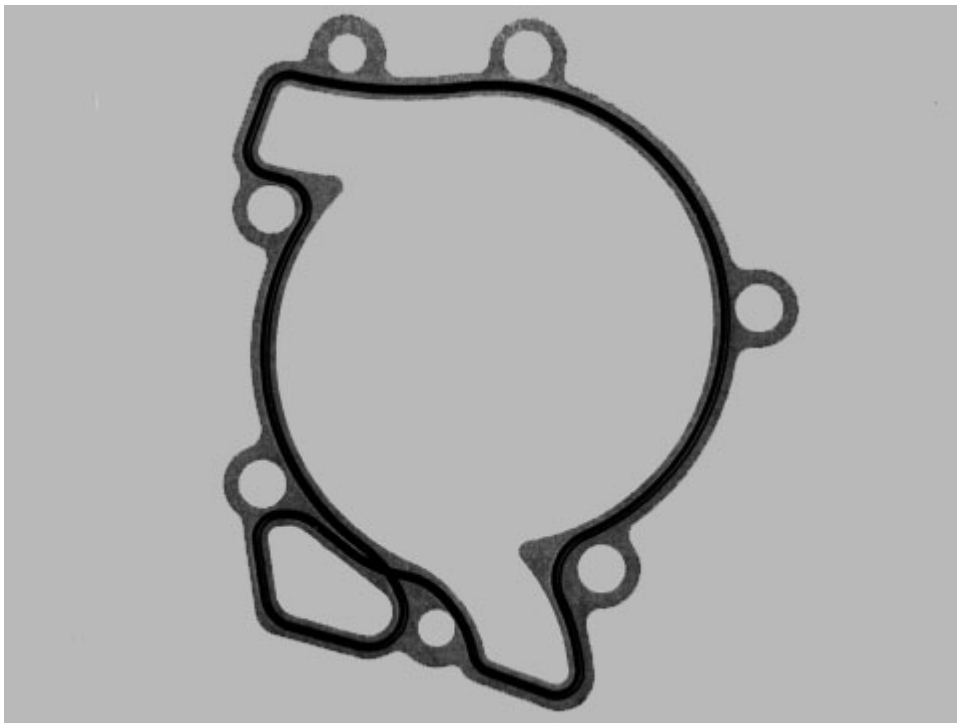

15
1

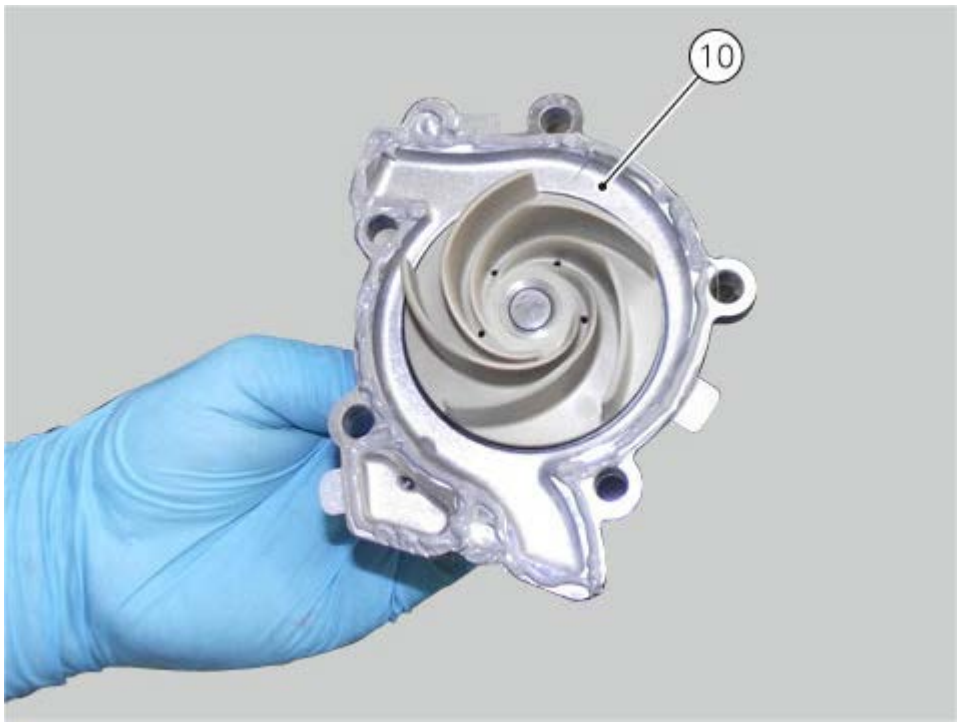
Installation of the water pump

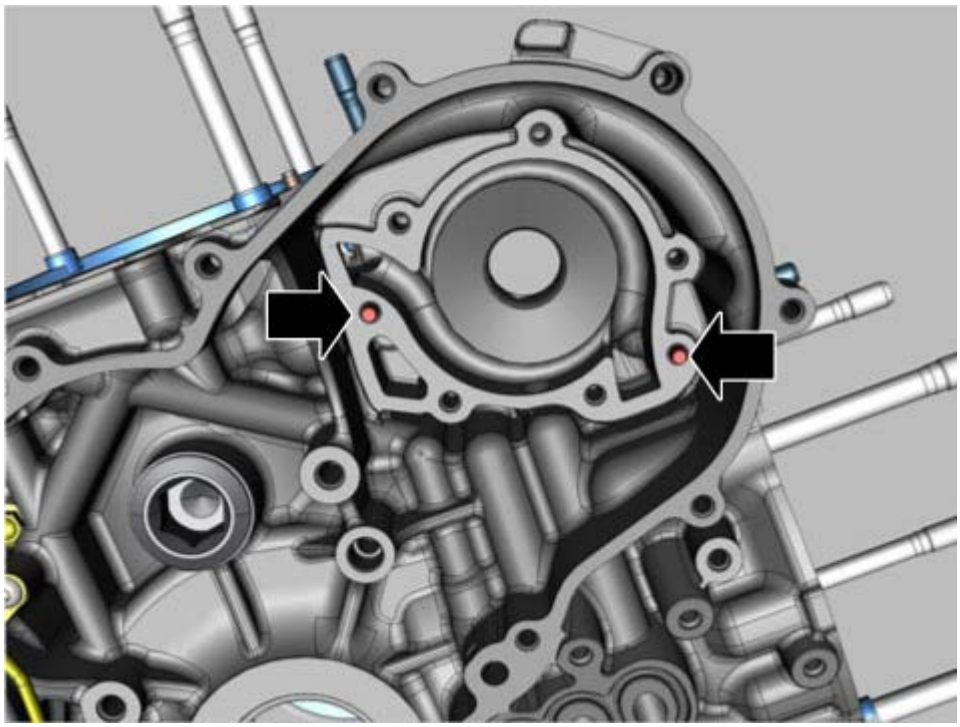
Clean the water pump (10) mating surface using a degreasing agent.



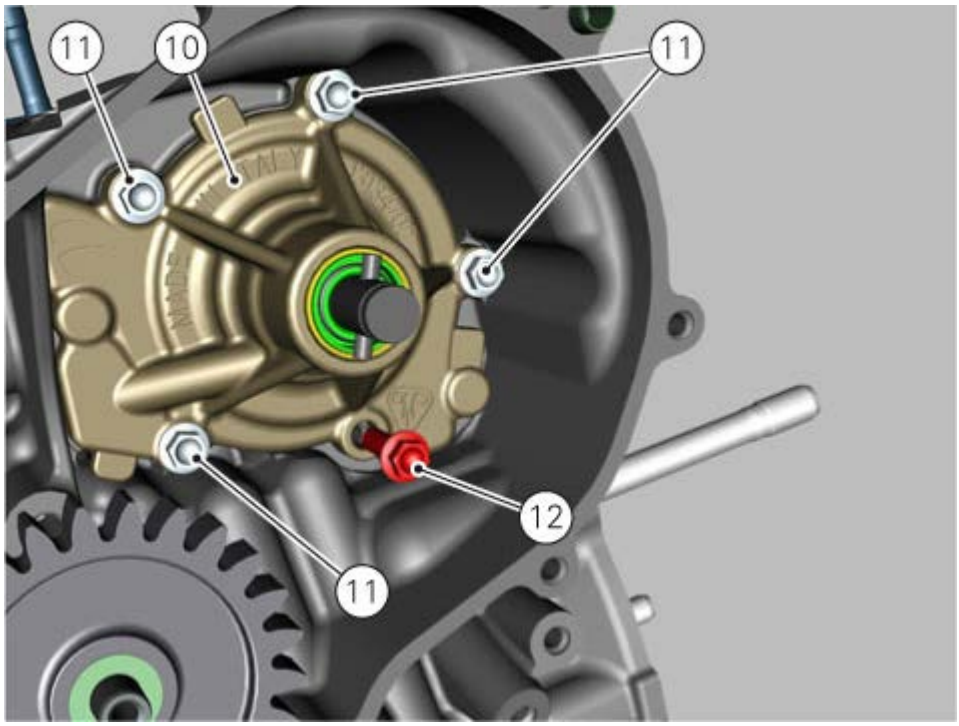
Ensure the surface is dry and apply a uniform bead of sealant on the water pump (10).
install water pump (10) on clutch-side crankcase, centring it on the pins and taking it fully home.







Fasten water pump (10) by starting screw (12) and screws (11). Tighten the screws (11) and (12) to a torque of 13 Nm (Min. 12 Nm - Max. 14 Nm), following the specified sequence.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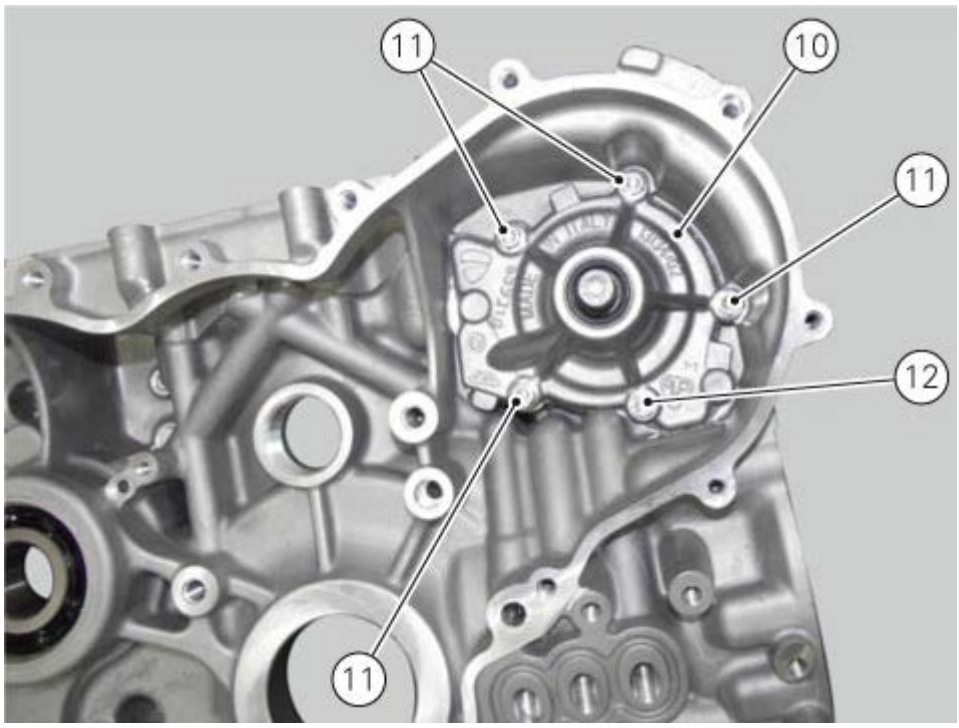
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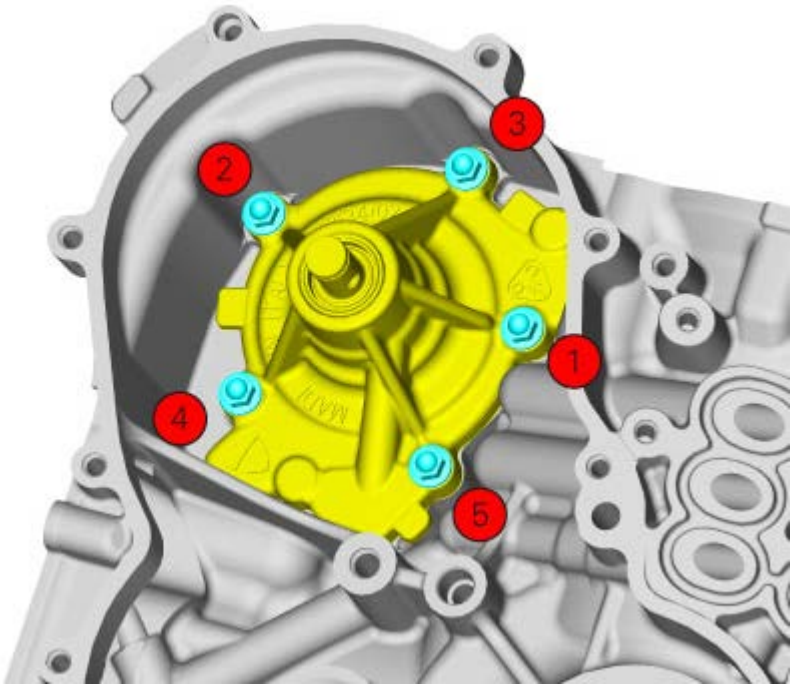
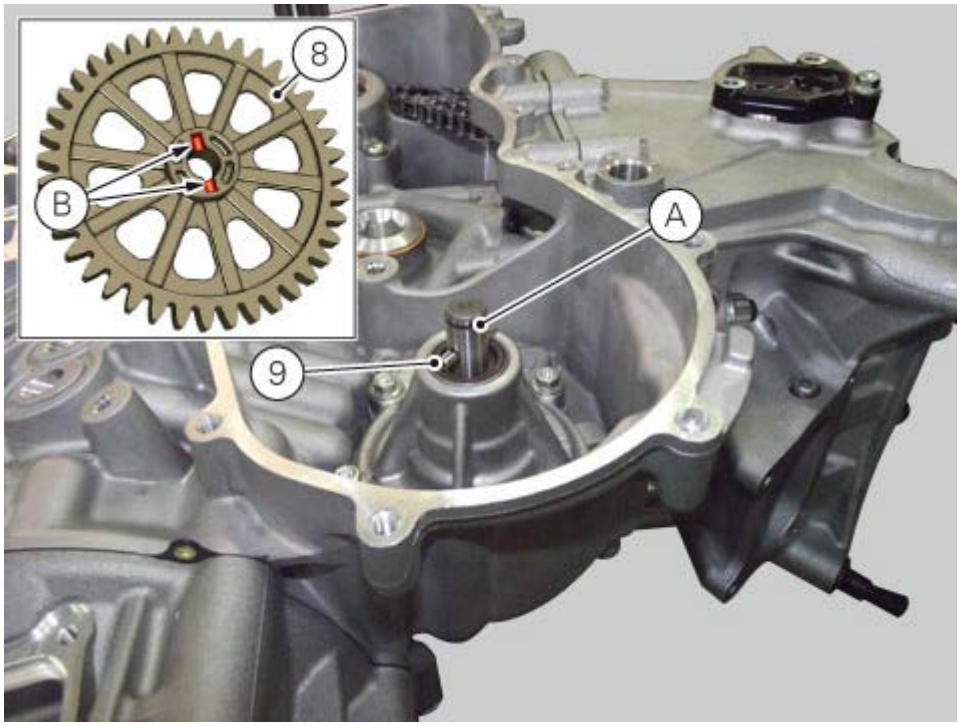
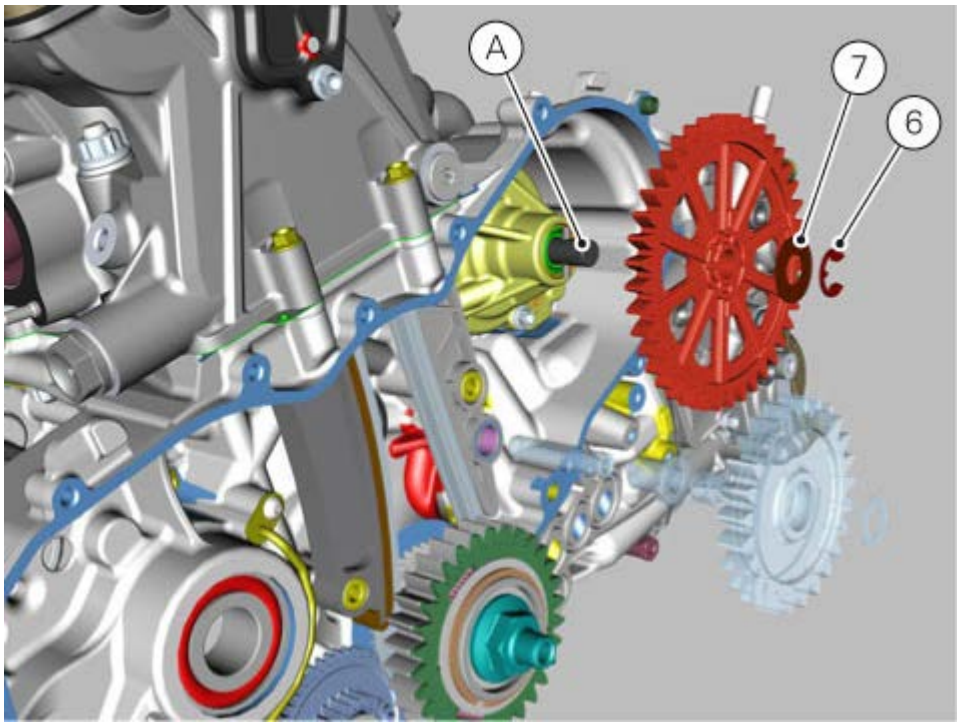


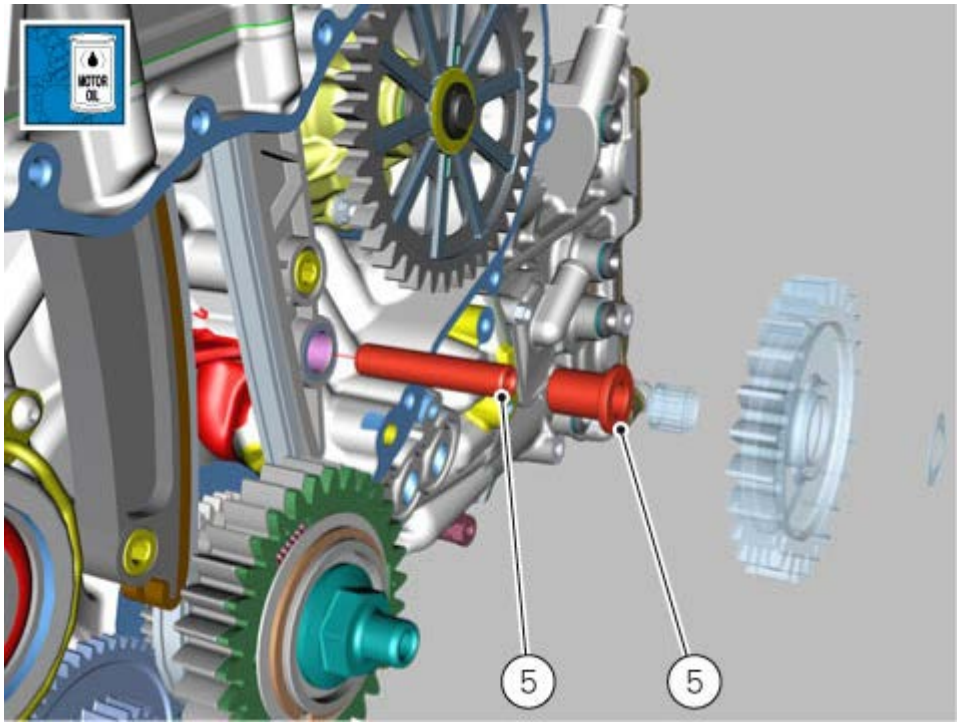
Ensure that the pump shaft (A) can turn freely, with no friction or hard spots.
Fit pin (9) in the relevant hole on water pump shaft (A).
Install the water pump drive gear (8) to shaft (A), fully home, centring pin (9) on groove (B).

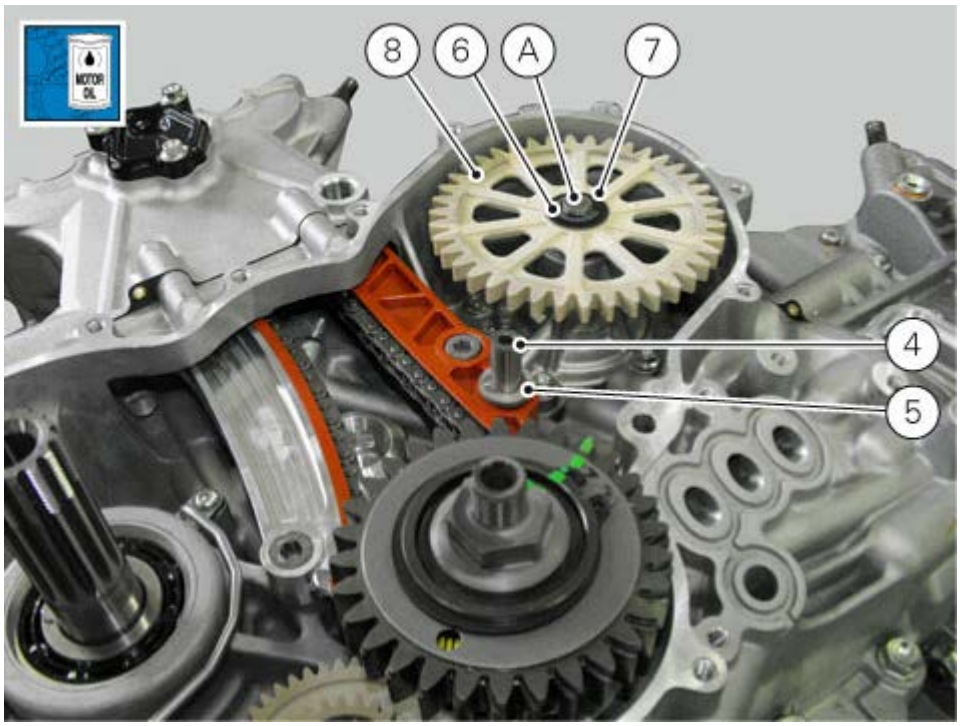


Fit spacer (7) in water pump drive shaft (A), fully home on gear. Fit the circlip (6) in its seat on water pump drive shaft (A).

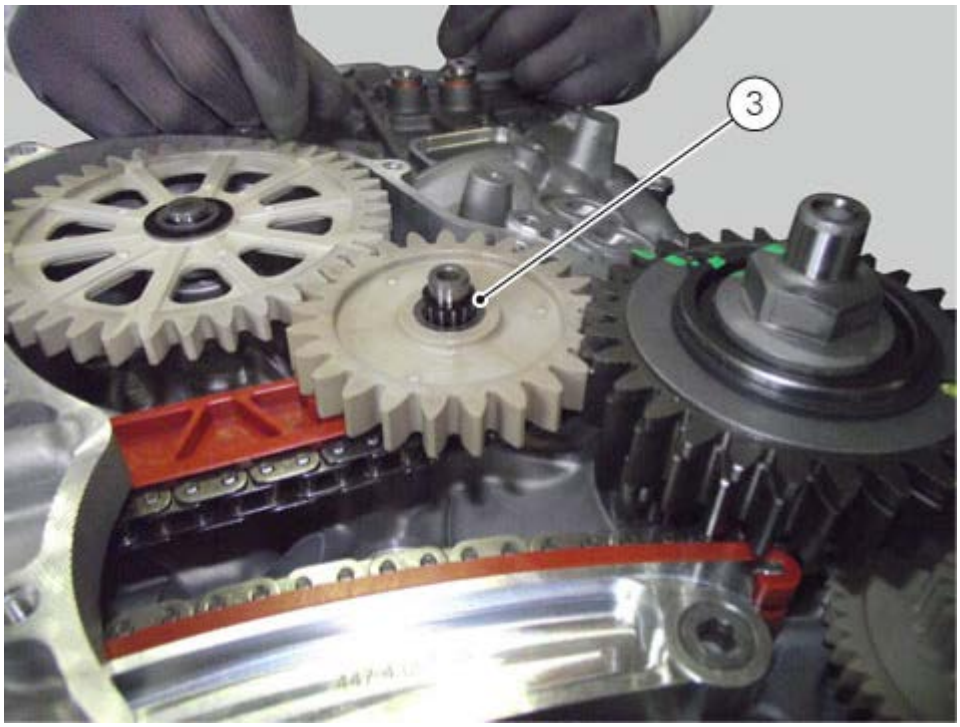


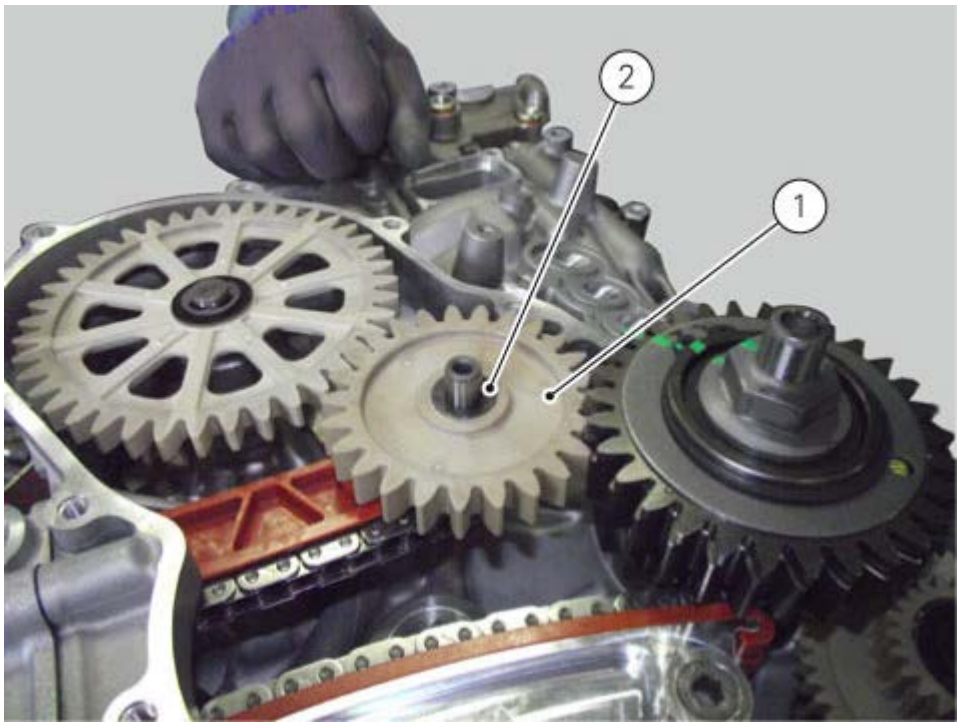
Ensure that the gear can turn freely.
Fit bushing (5) to vertical fixed slider.
Lubricate pin (4) with engine oil and fit it to bushing (5), fully home onto crankcase.





Install water pump idle gear (1) onto shaft (4), first mesh it with crankshaft sprocket and then with water pump drive gear (1).
Fit roller cage (3) onto shaft (4) and take it fully home onto gear (1).
Fit washer (2) to shaft (4) and take it fully home onto gear (1).

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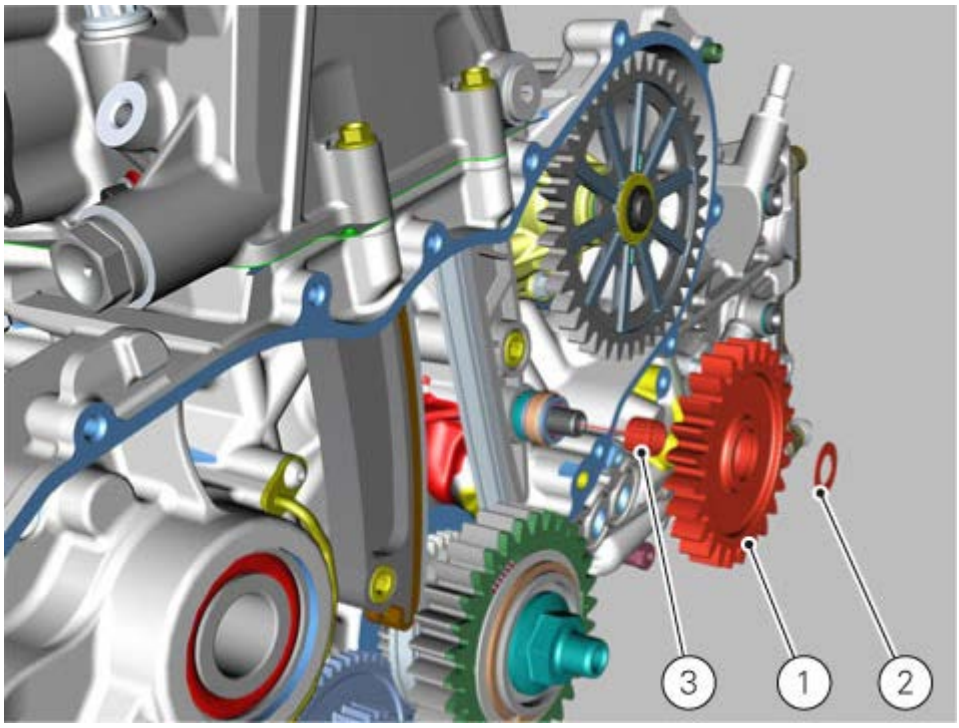
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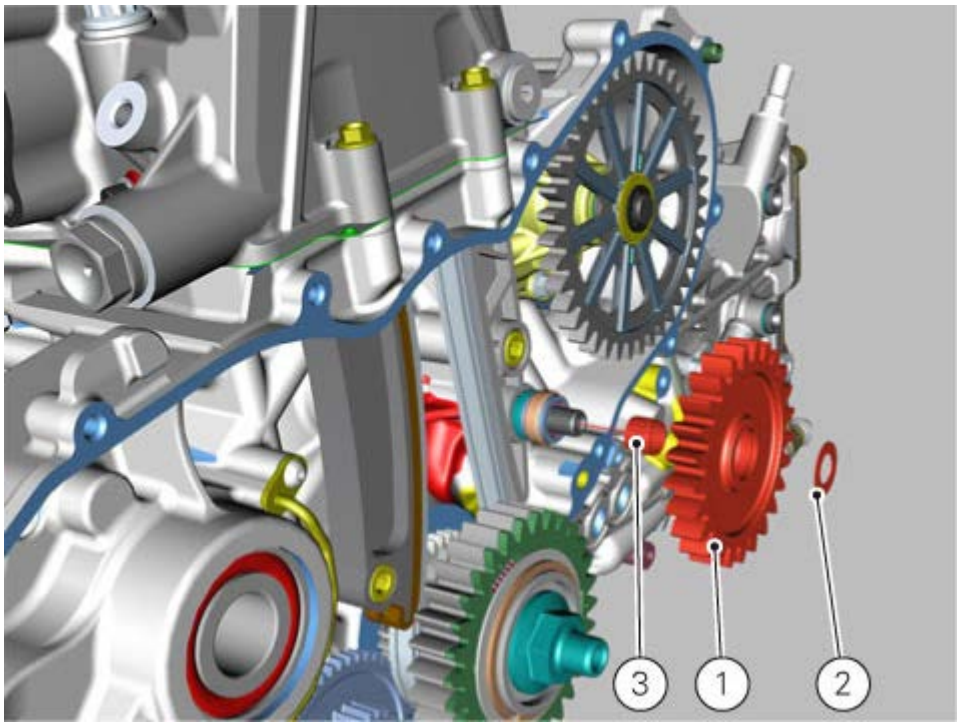
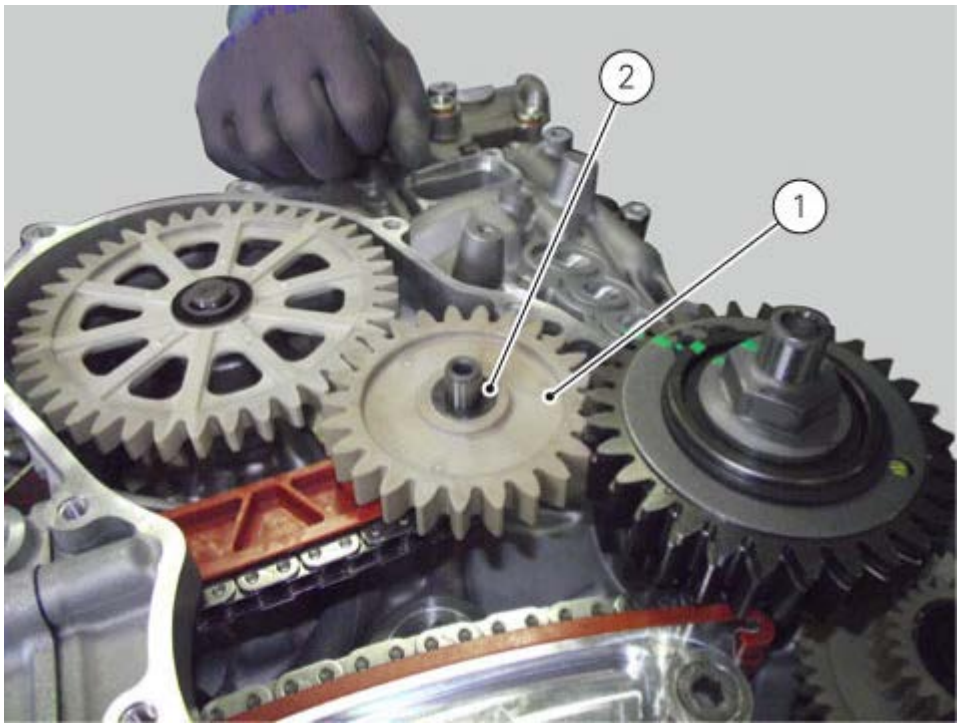
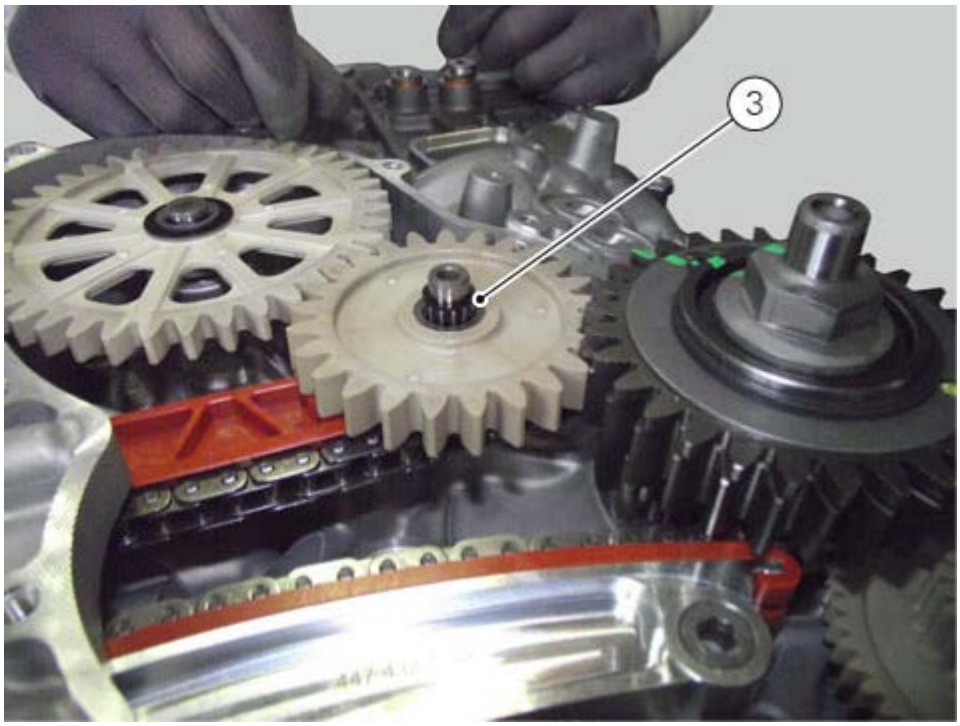
Removal of the water pump

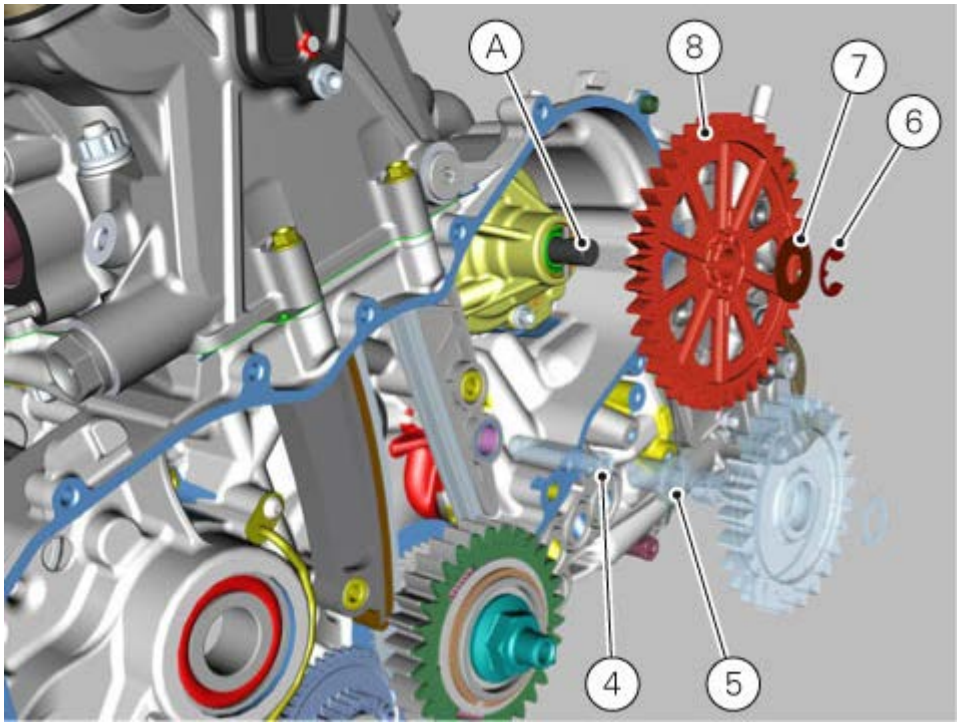
Remove the water pump idle gear (1) sliding out washer (2) and needle roller cage (3).

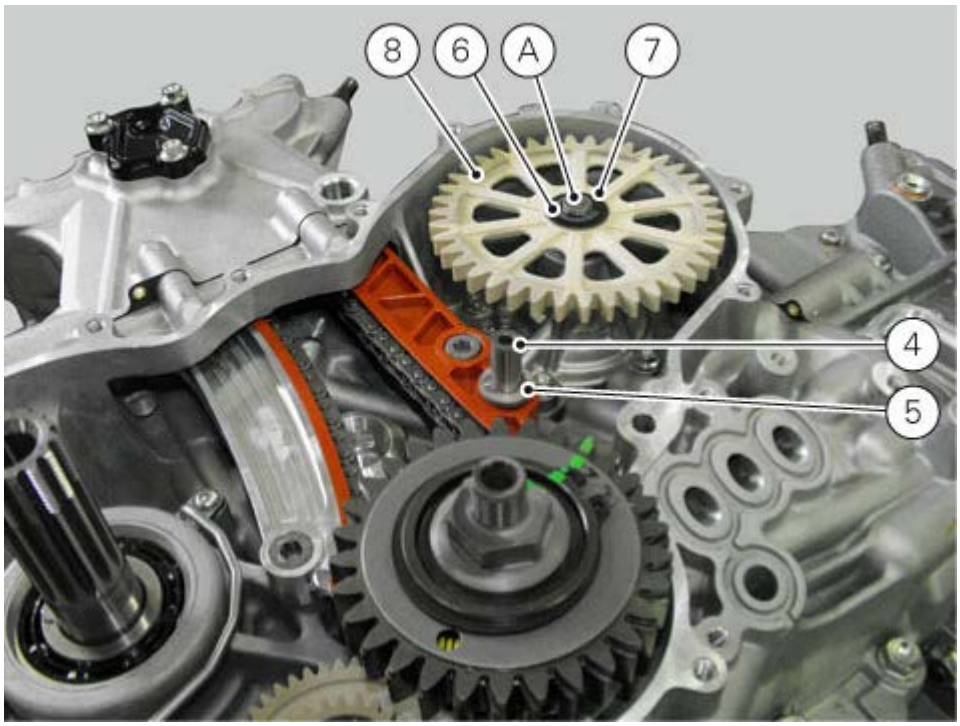




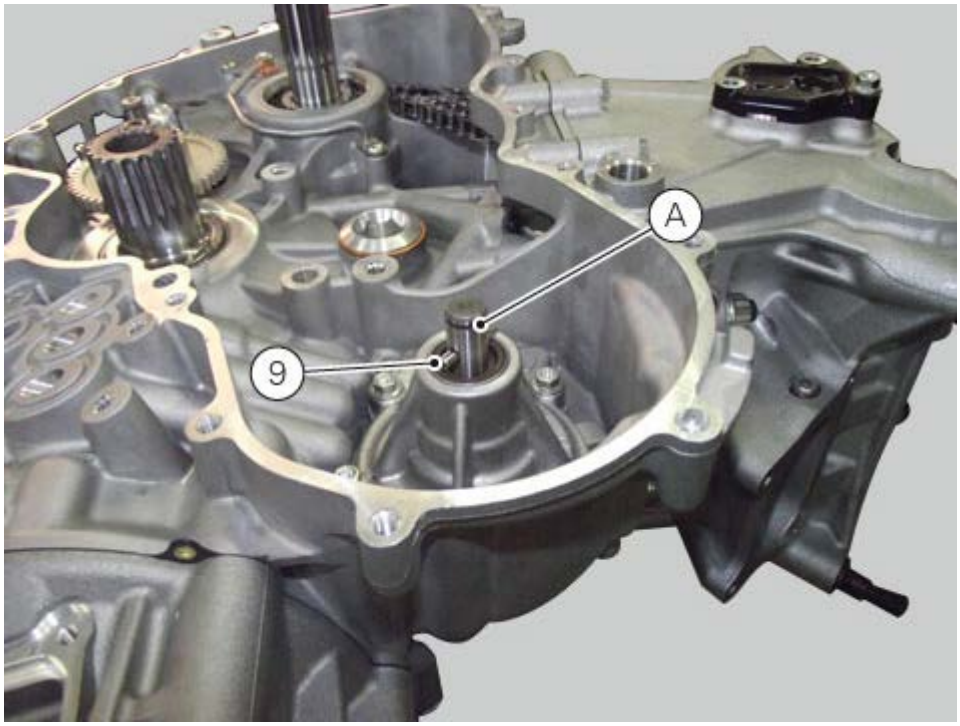


Remove pin (4) and slide out bushing (5) from fixed slider.
Remove the circlip (6) from the seat on water pump drive shaft (A).
Remove spacer (7) and water pump drive gear (8) from drive shaft (A).

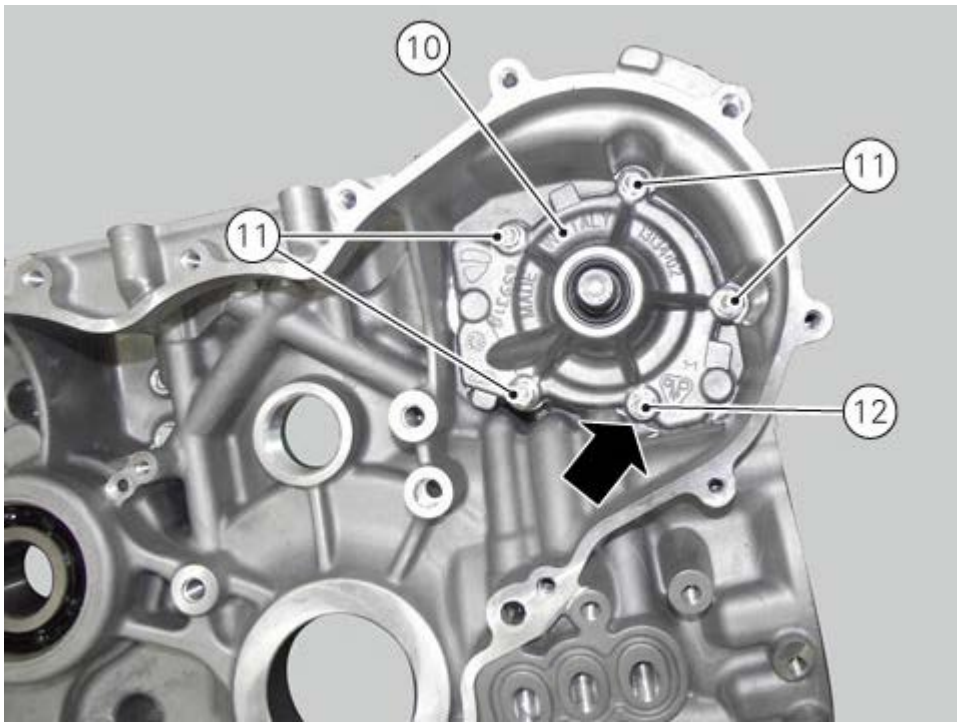




Remove pin (9) from the relevant hole on water pump shaft (A).



Remove the water pump (10) by loosening screws (11) and (12).
Remove the washer on screw (12).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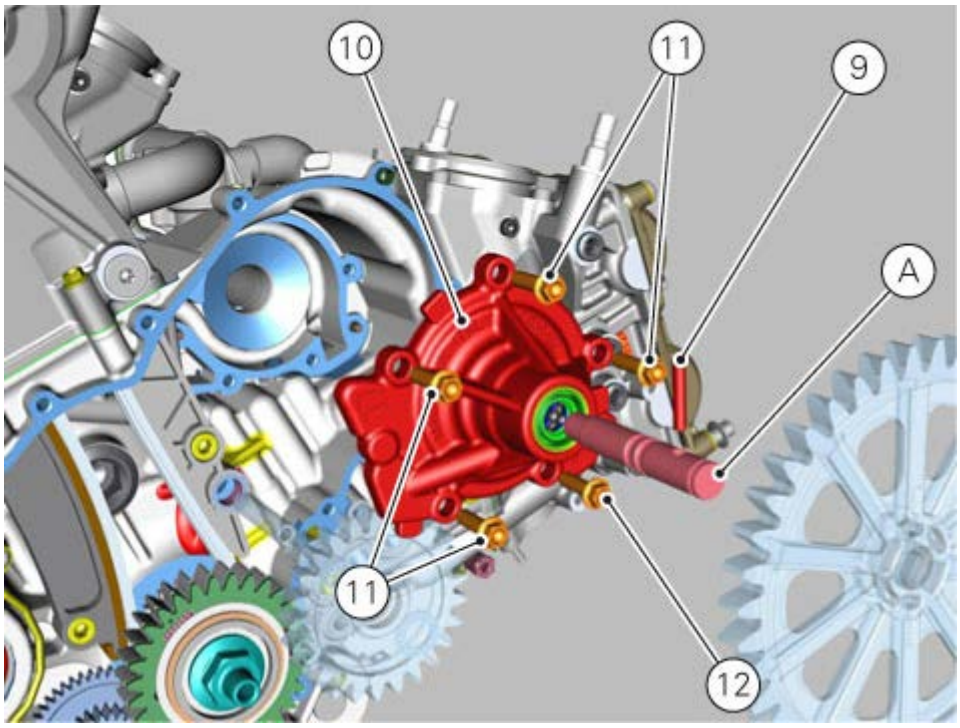
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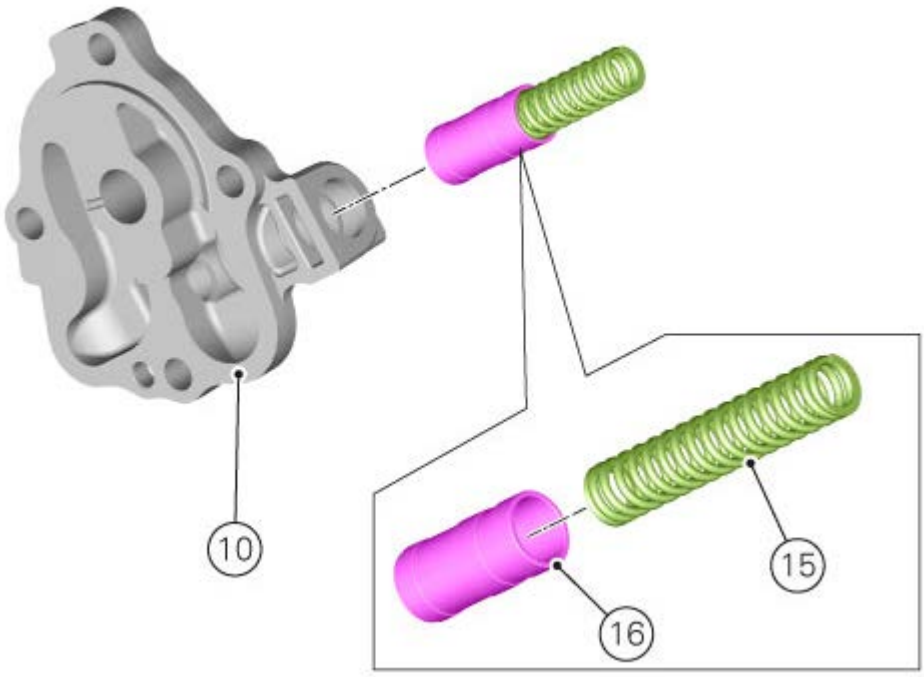
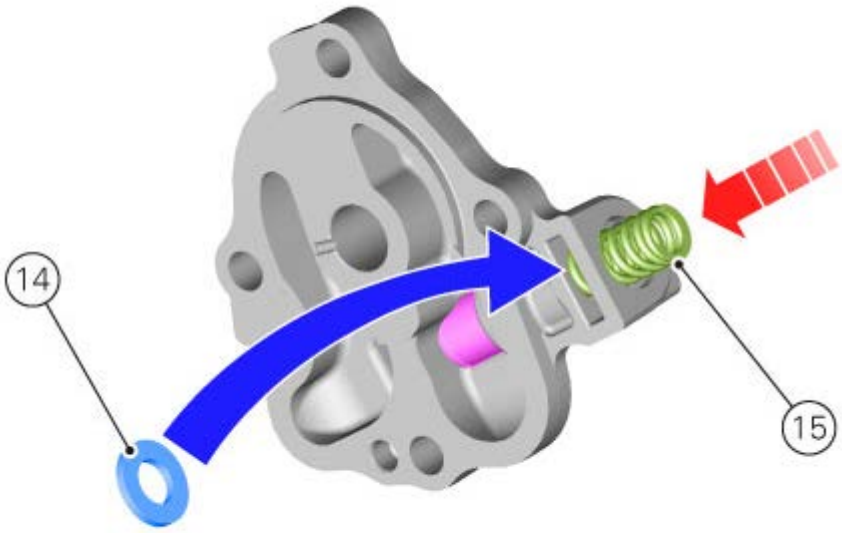
Installation of the oil pressure pump cover

Fit the spring (15) fully home inside piston (16).
Fit the spring (15) and piston (16) assembly fully home on oil pump cover (10).

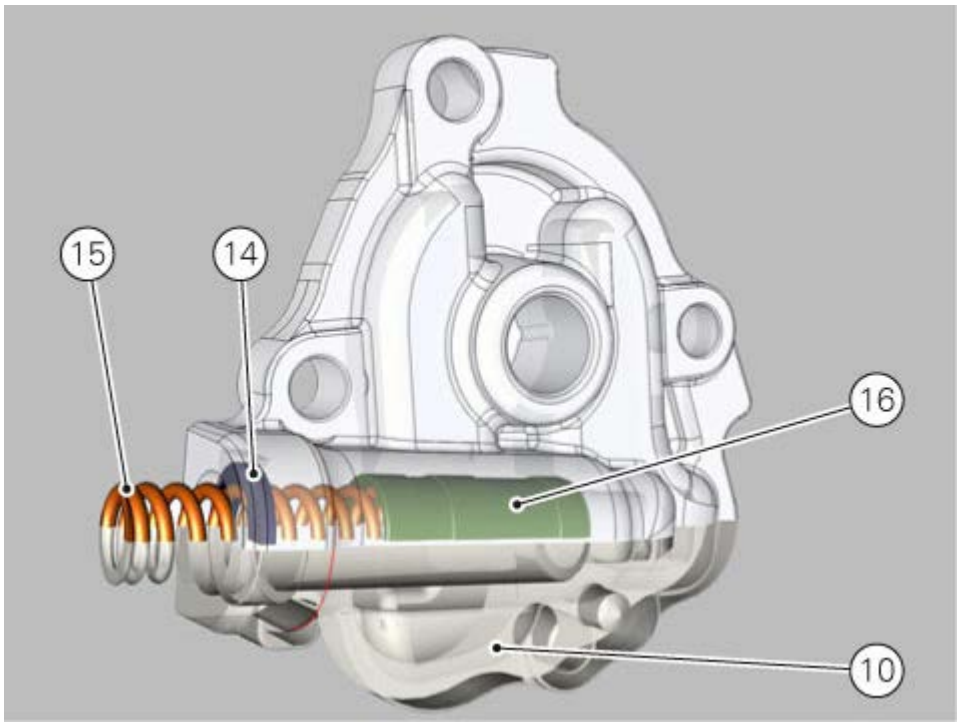


Press spring (15) inside the cover and put washer (14) fully home.
make sure that washer is in place, fully inside pump cover.

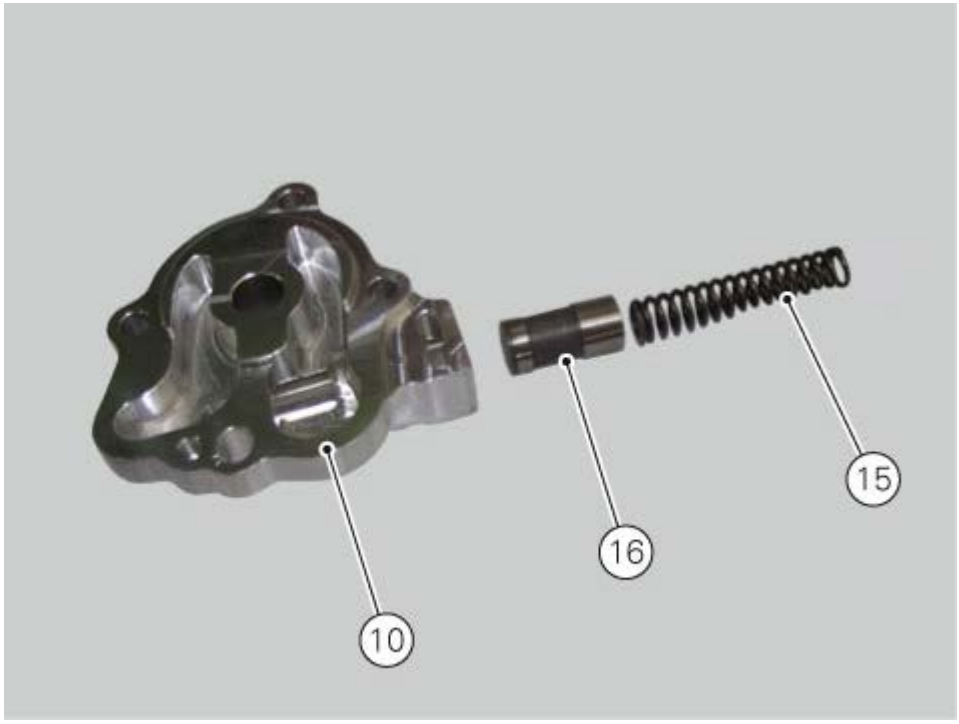


Removal of the oil pressure pump cover

Remove the washer (14) from its seat.

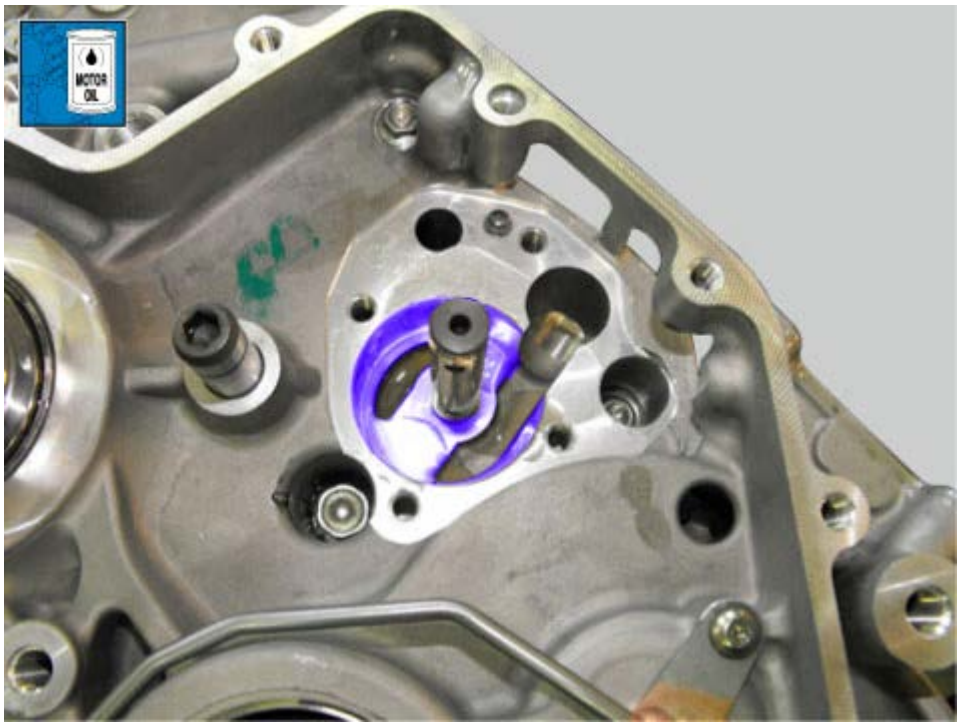


Remove the spring (15) and by-pass piston (16) from cover (10).

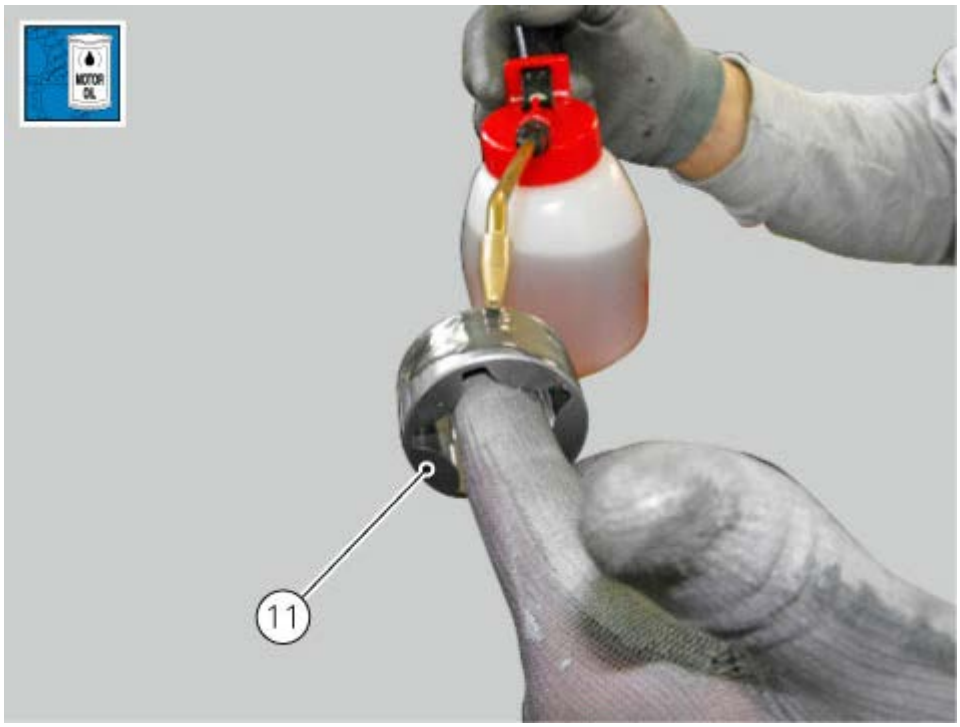

15
16
10

Refitting the oil pressure pump

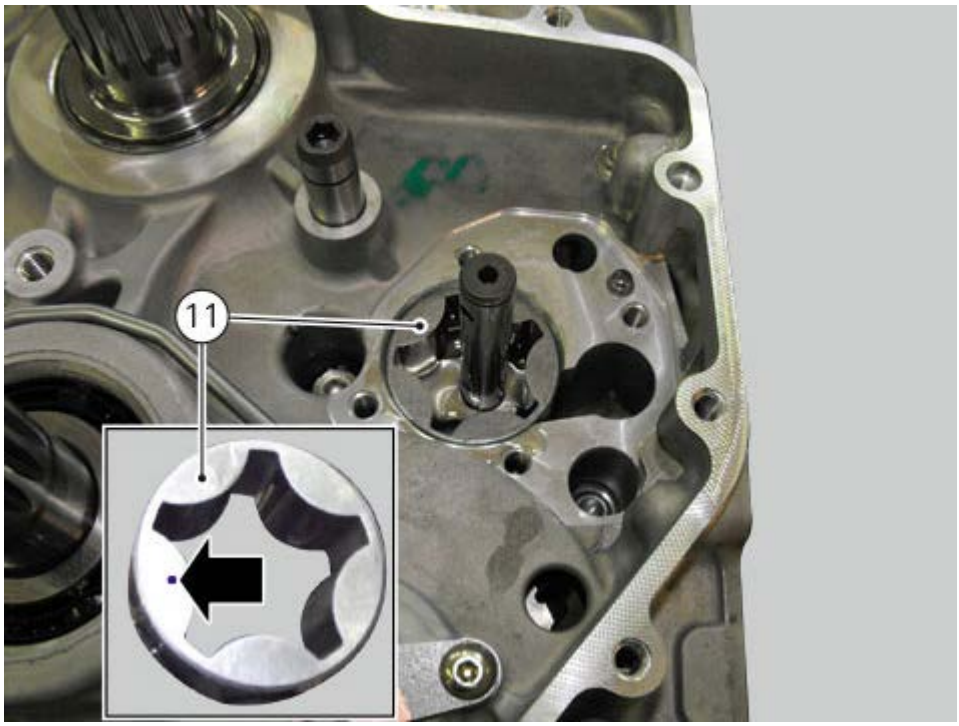
Lubricate pump seat with engine oil.



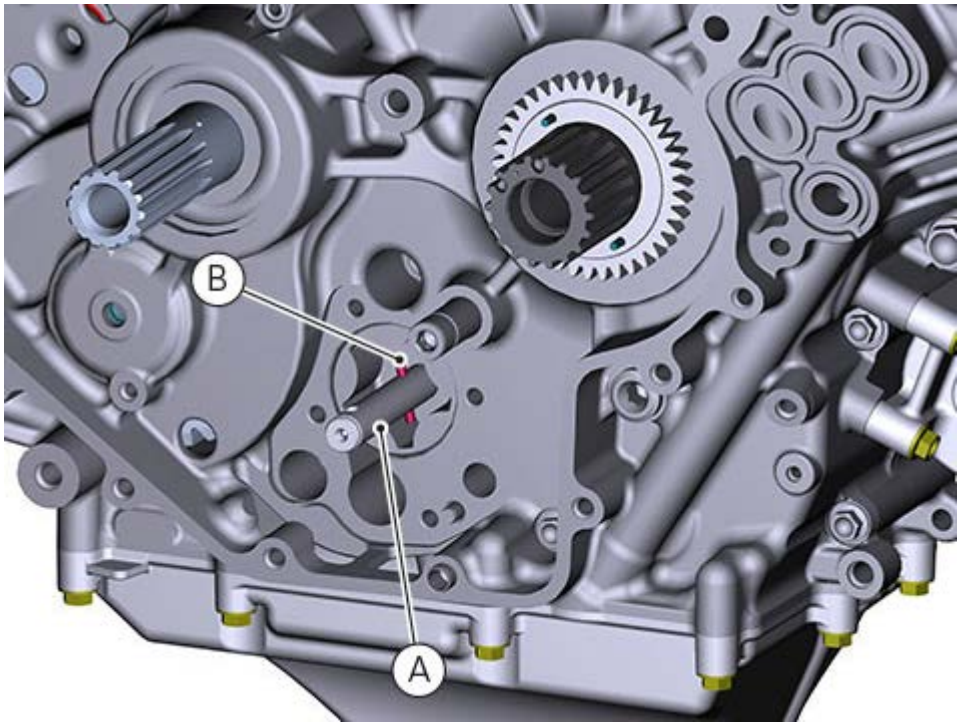
Lubricate with engine oil the outside and inside of external rotor (11) and position the latter in its seat in the casing.



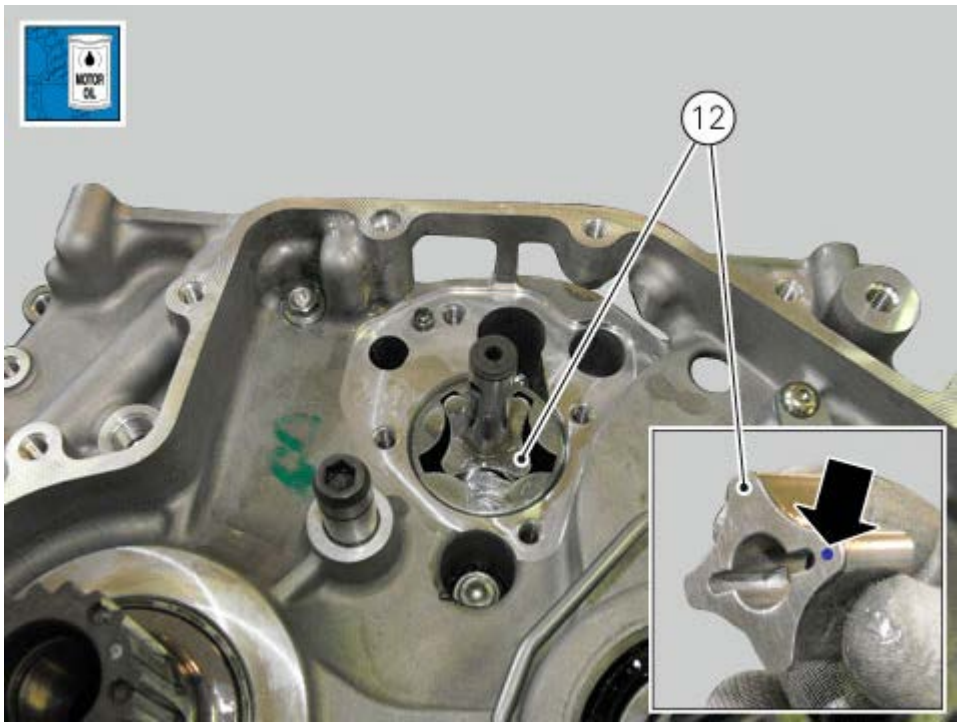
Pay attention to fitting direction: the surface with reference must be facing the inside of the casing.



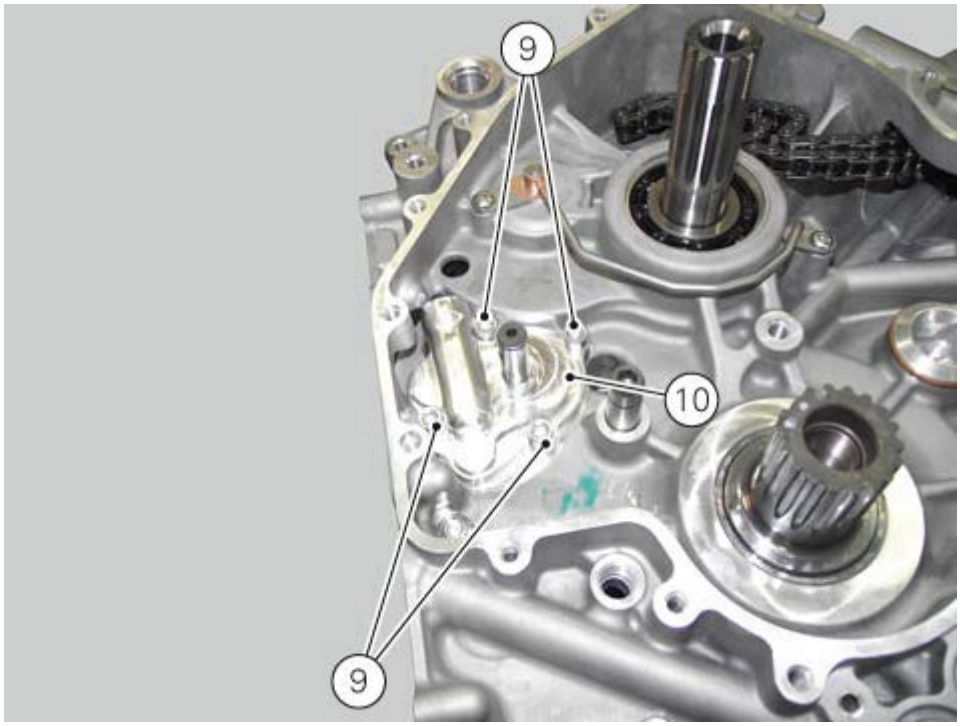
Fit the centring pin (B) in shaft (A).



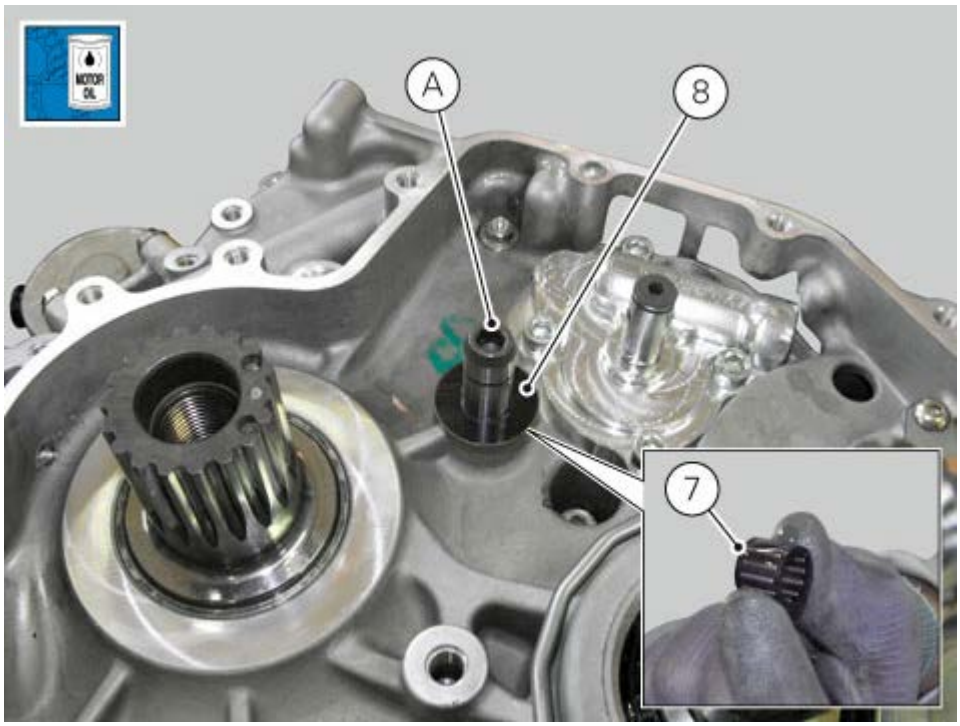
Lubricate the internal rotor (12) with engine oil and position it in its seat. The surface with the reference mark must be facing inwards.
The rotor groove must match with the centring pin (13) previously positioned in the oil pump drive shaft.

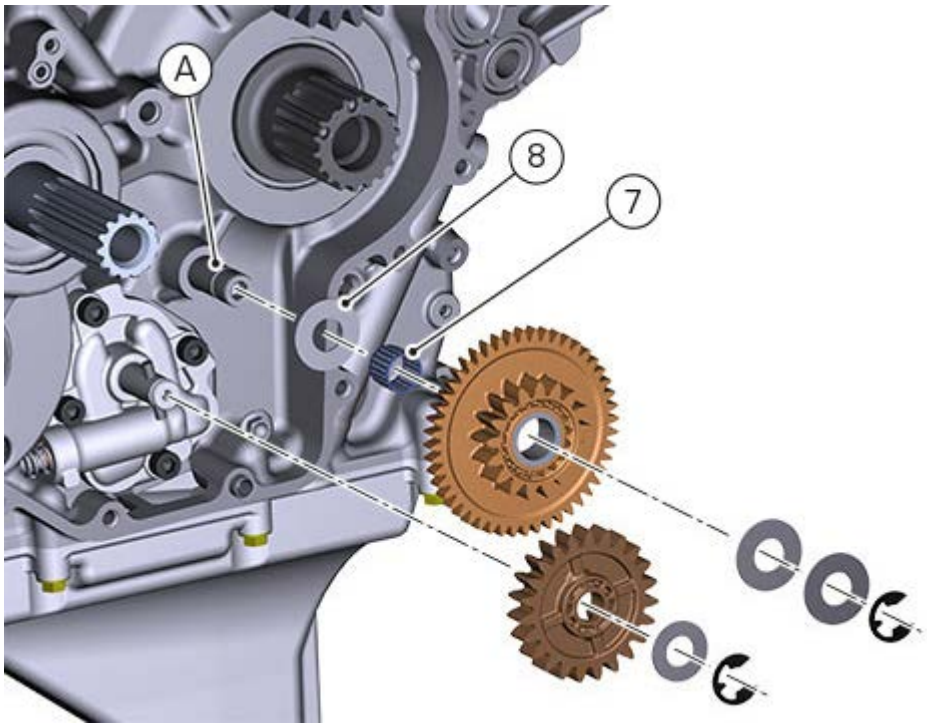


Place oil pump cover (10), start the four screws (9) and tighten them to 10 Nm (Min. 9 Nm – Max. 10 Nm).
Turn the oil pump drive shaft and make sure it turns freely.

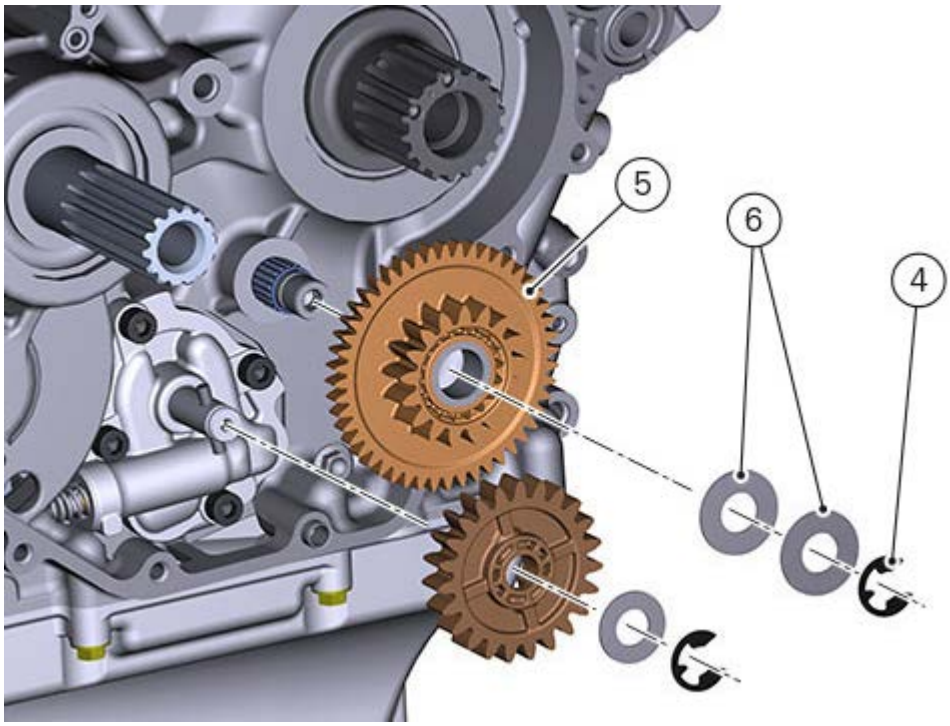


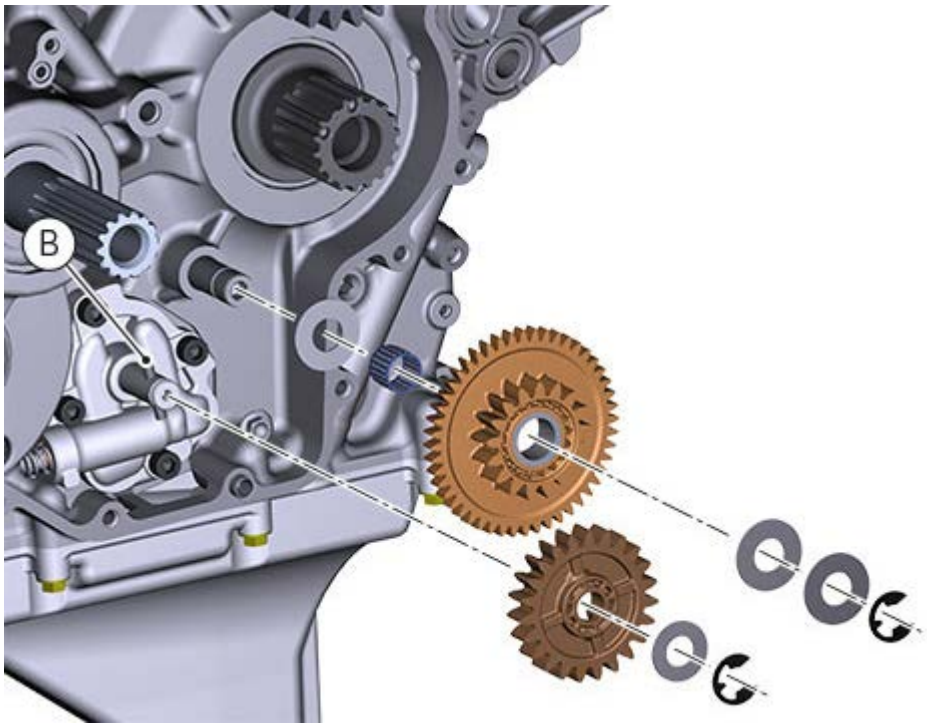
Position shim (8) and roller bearing (7) on the driving shaft (A).
Use engine oil to lubricate the roller bearing and the driving shaft.

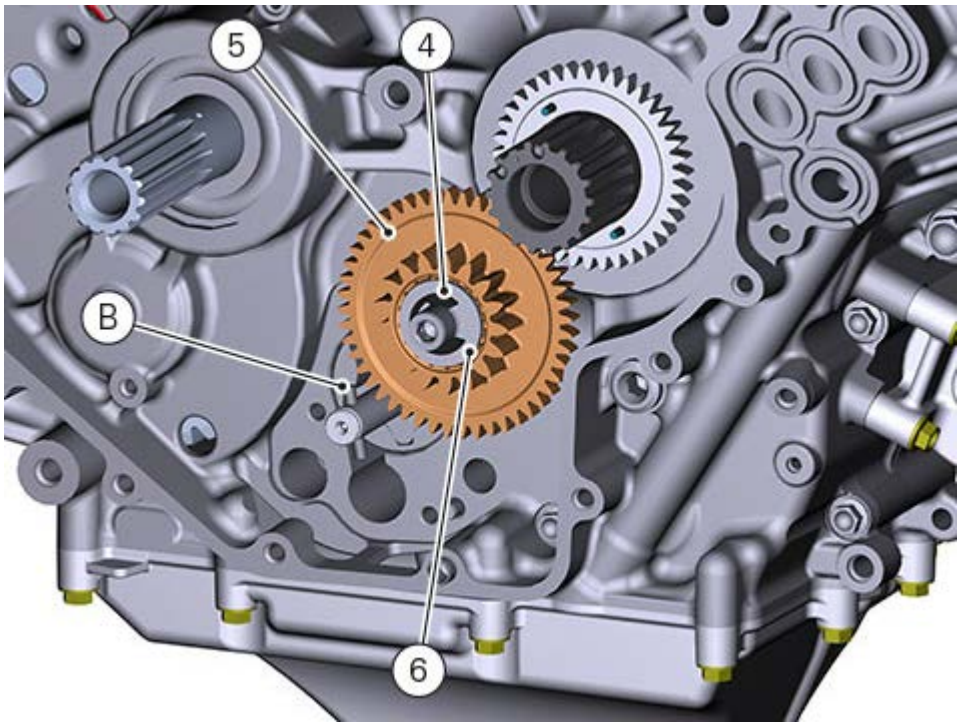




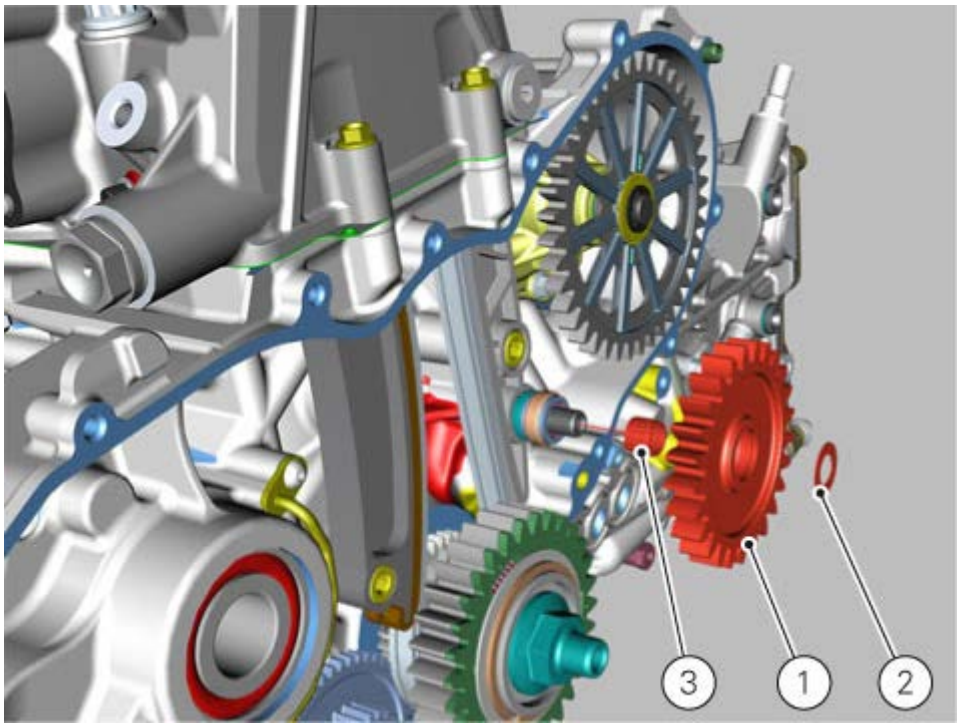
Fit the upper shim (6) and fit the oil pump idle gear (5) locking it in place with its circlip (4).
Fit pin (B) on oil pump shaft.

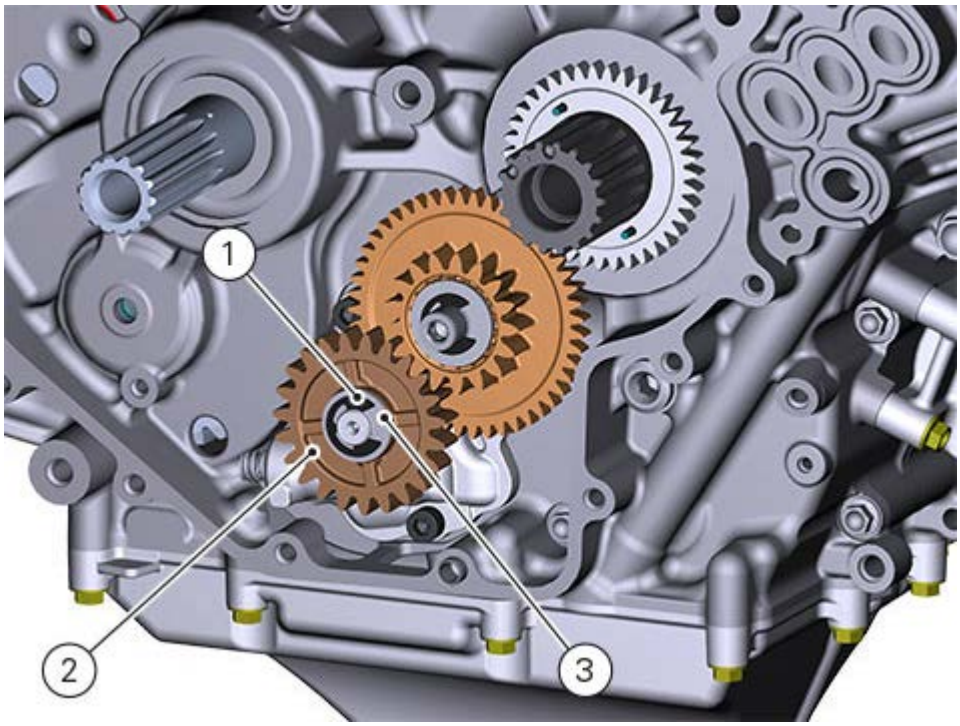

5
6
4


B



Fit the oil pump drive gear (2), fit the upper shim (3) and secure in place with circlip (1). Test pump rotation.





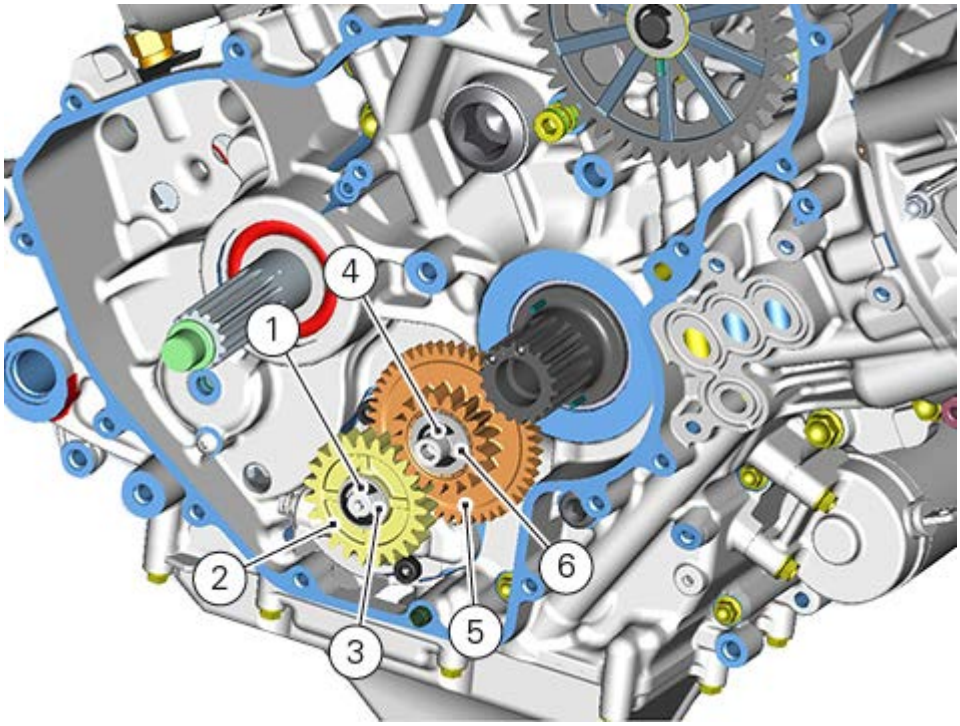
Refit the primary drive gear (Refitting the primary drive gear and checking backlash).
Refitting the clutch (Refitting the clutch).
Refit the clutch cover (Refitting the clutch cover).
Fill the engine with oil (Changing the engine oil and filter cartridge).

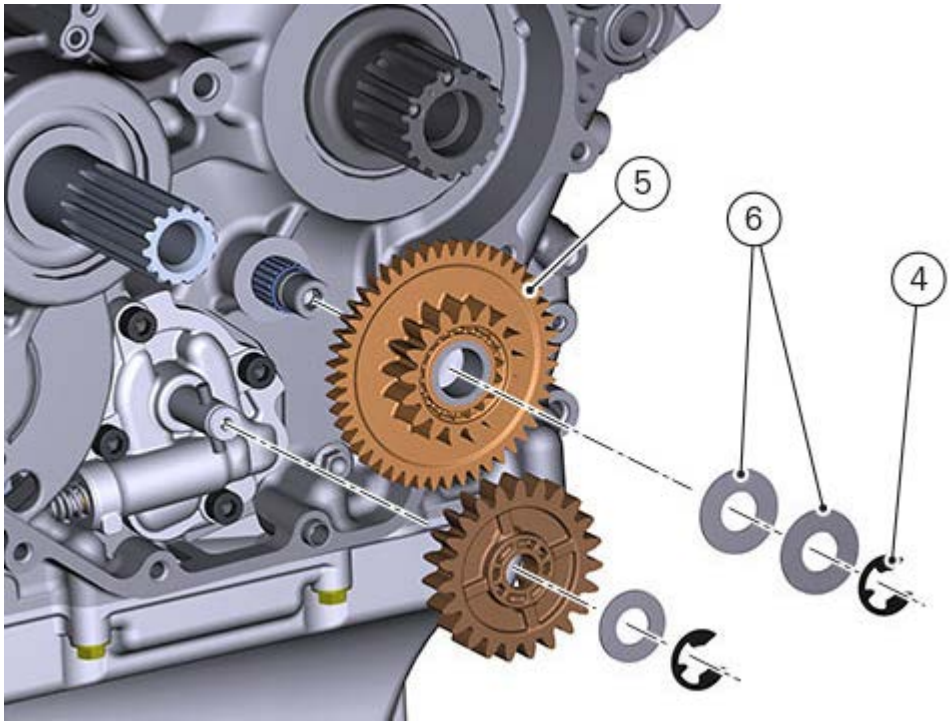
Removing the oil pressure pump

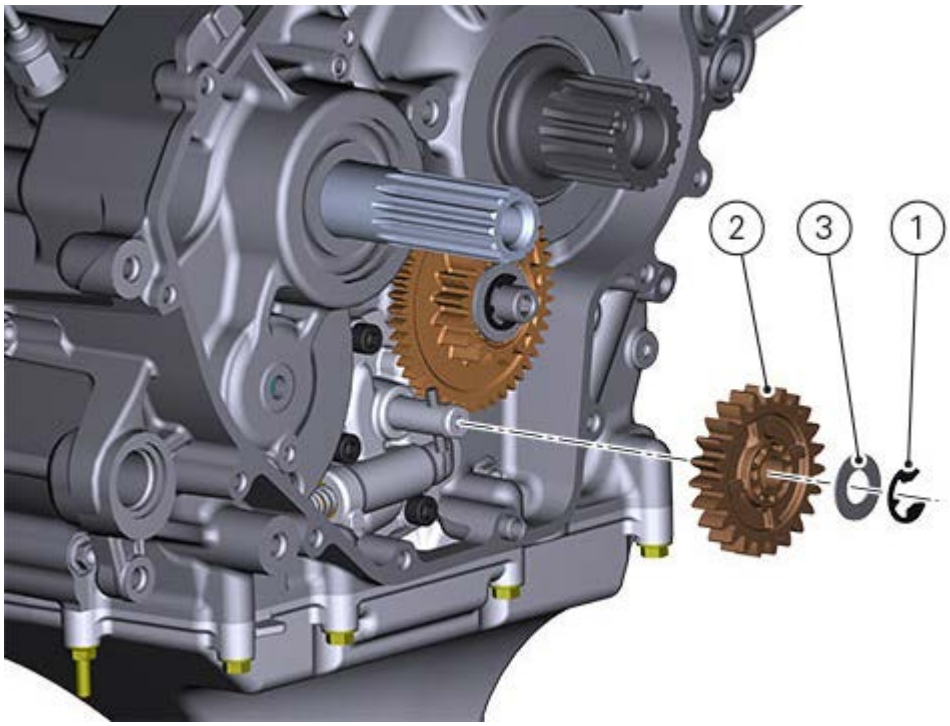
Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the clutch cover (Removing the clutch cover).
Removing the clutch (Removing the clutch).
Remove the primary drive gear (Removing the primary drive gear)

Remove circlip (1) and slide out oil pump (2) drive gear and collect washer (3).
Remove circlip (4) and slide out oil pump (5) idle gear and collect washer (6).

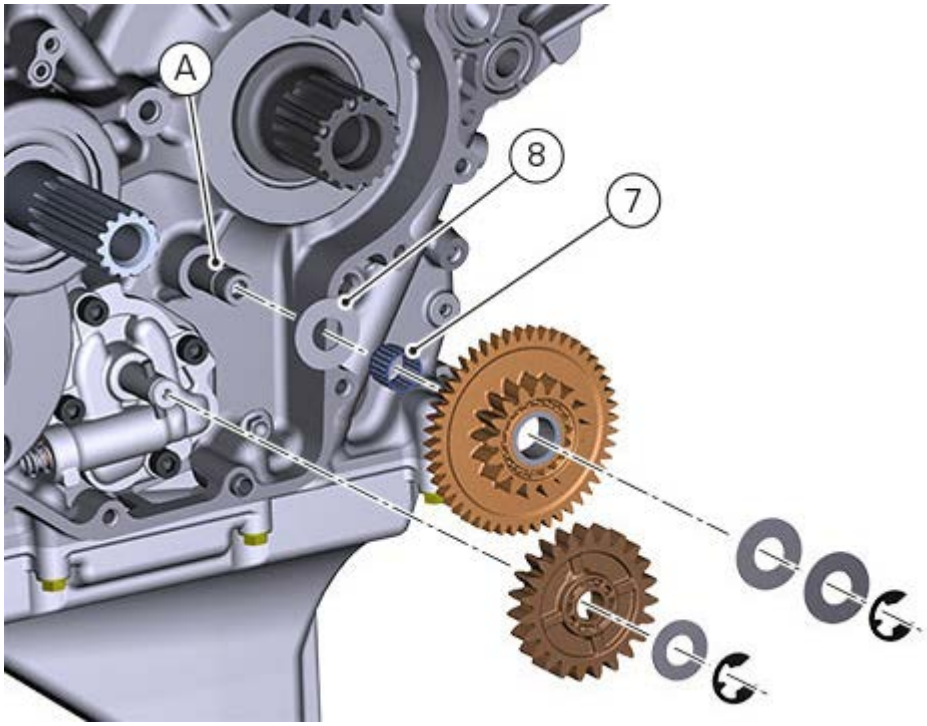
Note
It is not necessary to remove the primary gear sprocket in order to work only on the oil pump. Loosen the shaft (LH thread), and slide out the oil pump idle gear from the side.



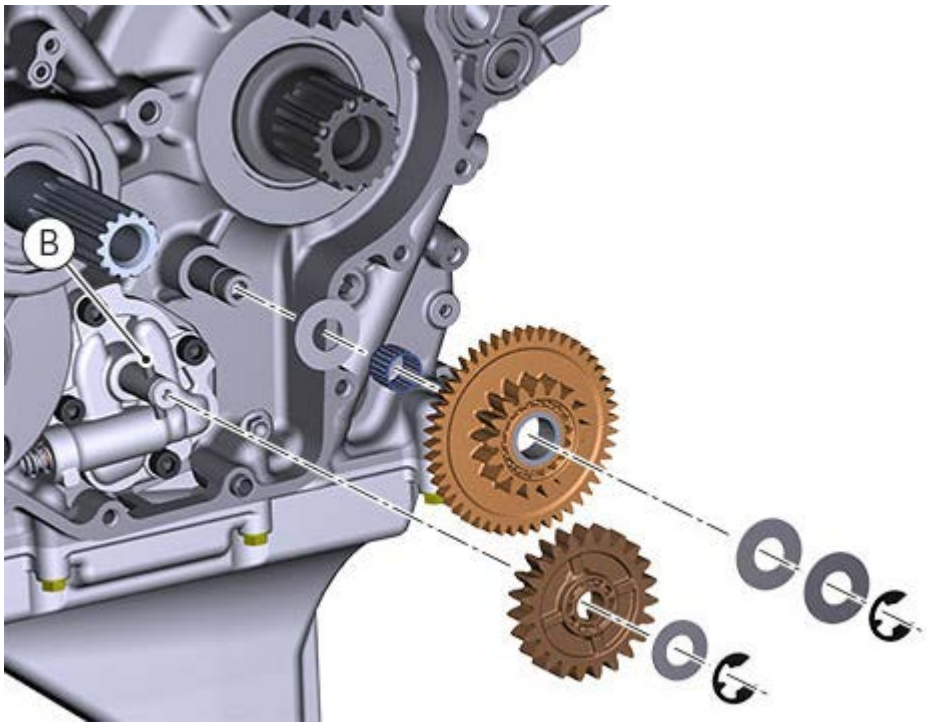




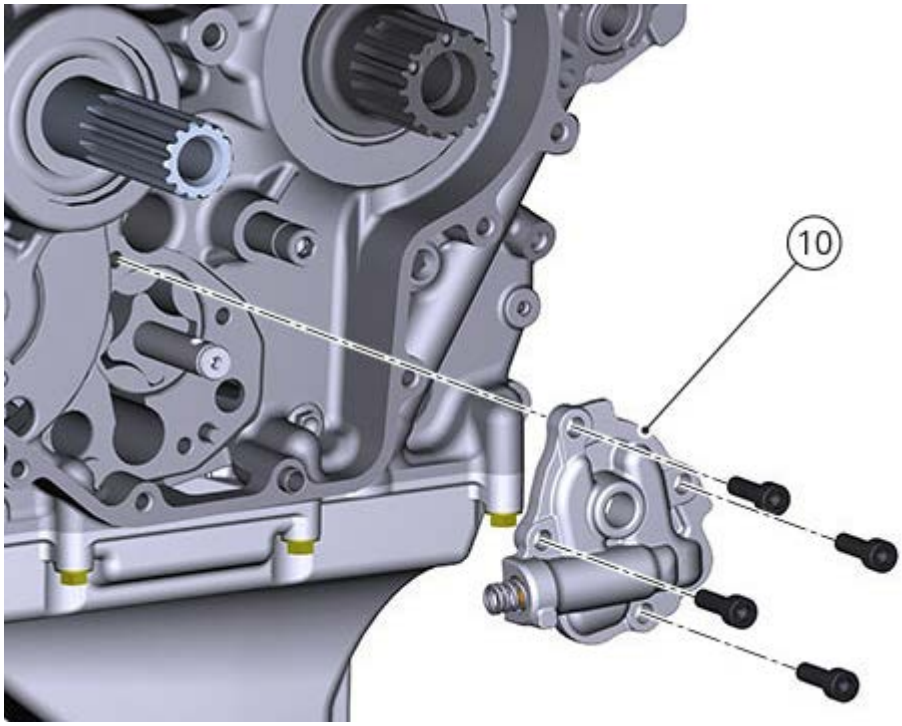
Remove the needle roller bearing (7) and washer (8) from shaft (A).

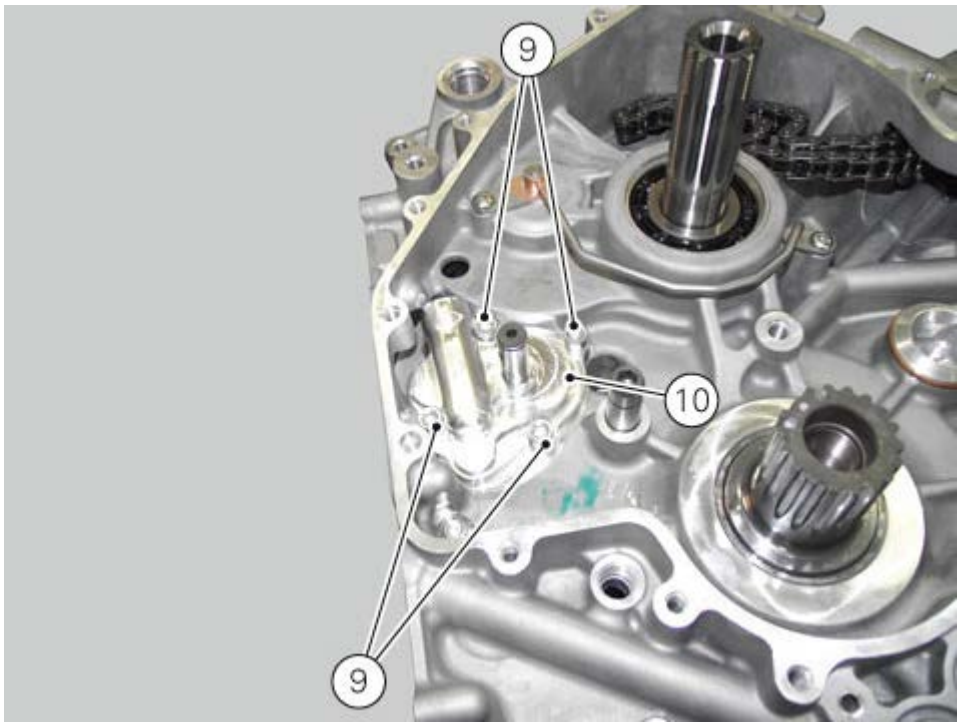


Remove pin (B).

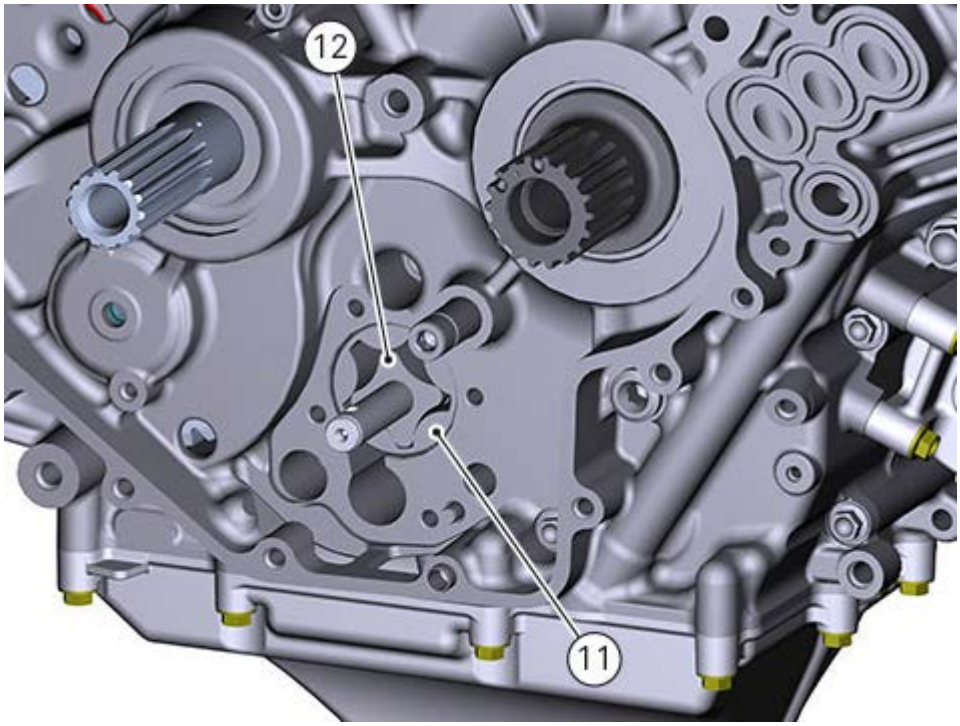


Unscrew the screws (9) and remove the oil pump cover (10).



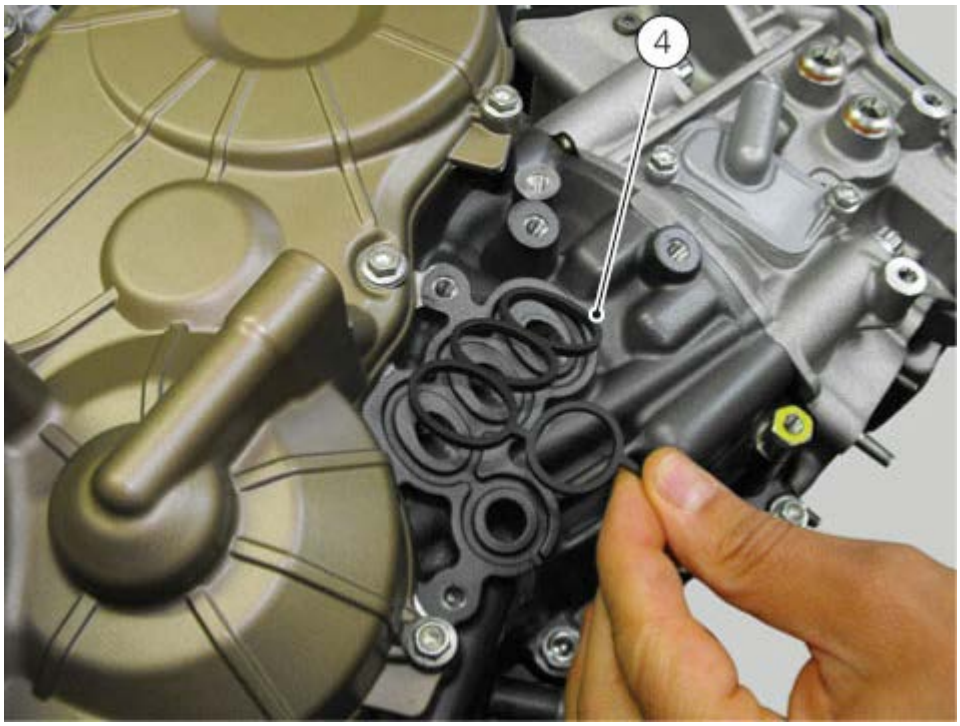


Remove the oil pump internal rotor (12) and external rotor (11).

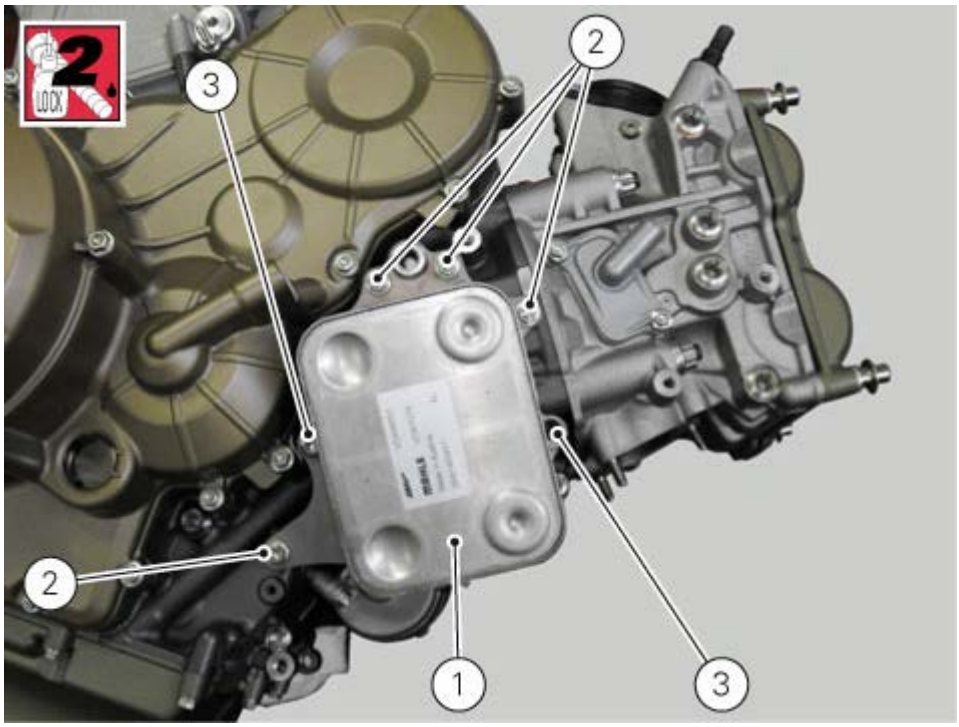


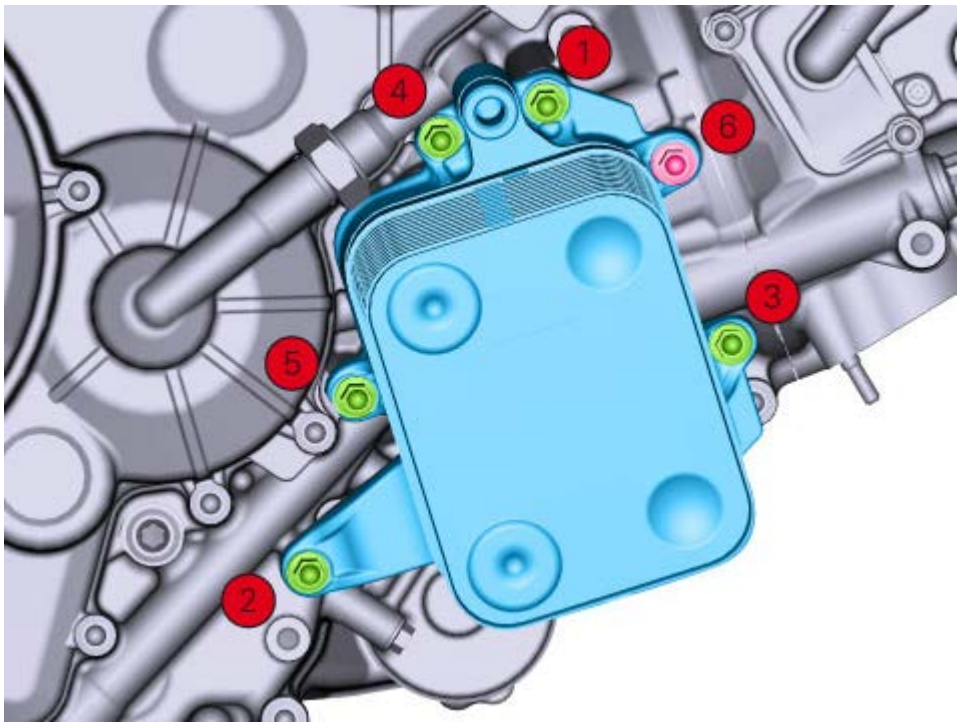
Refitting the oil heat exchanger

Fit seal (4) in its seat on the crankcase.



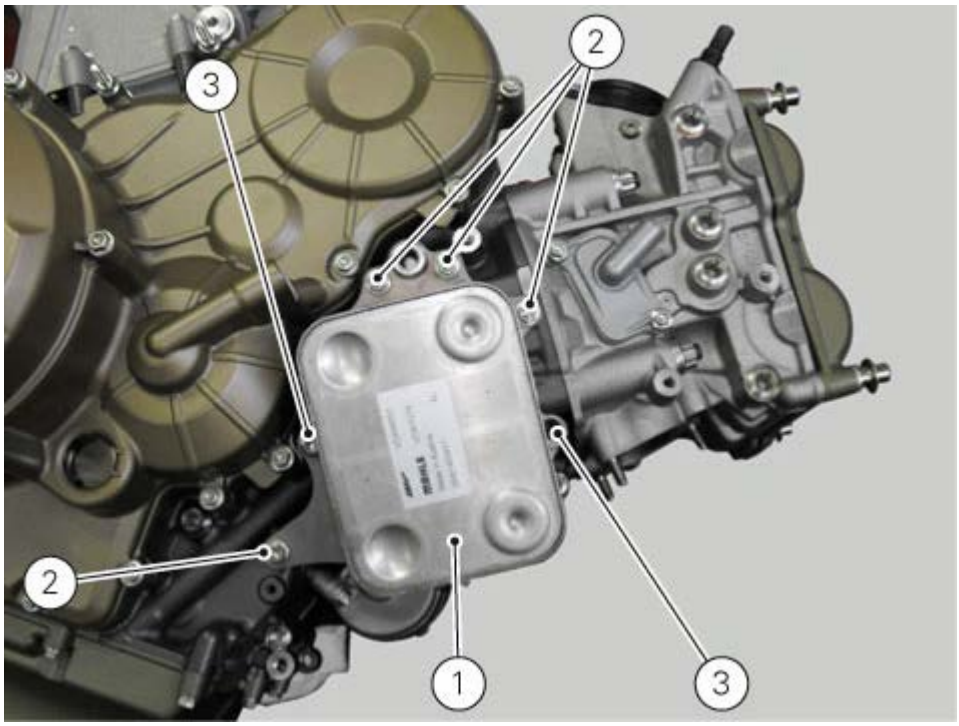
Apply the specified threadlocker on screws (2).
Fit the heat exchanger (1) on the casing by starting screws (2) and (3).
Tighten the screws (2) and (3) to a torque of 13 Nm (Min. 12 Nm – Max. 14 Nm), respecting the indicated sequence.



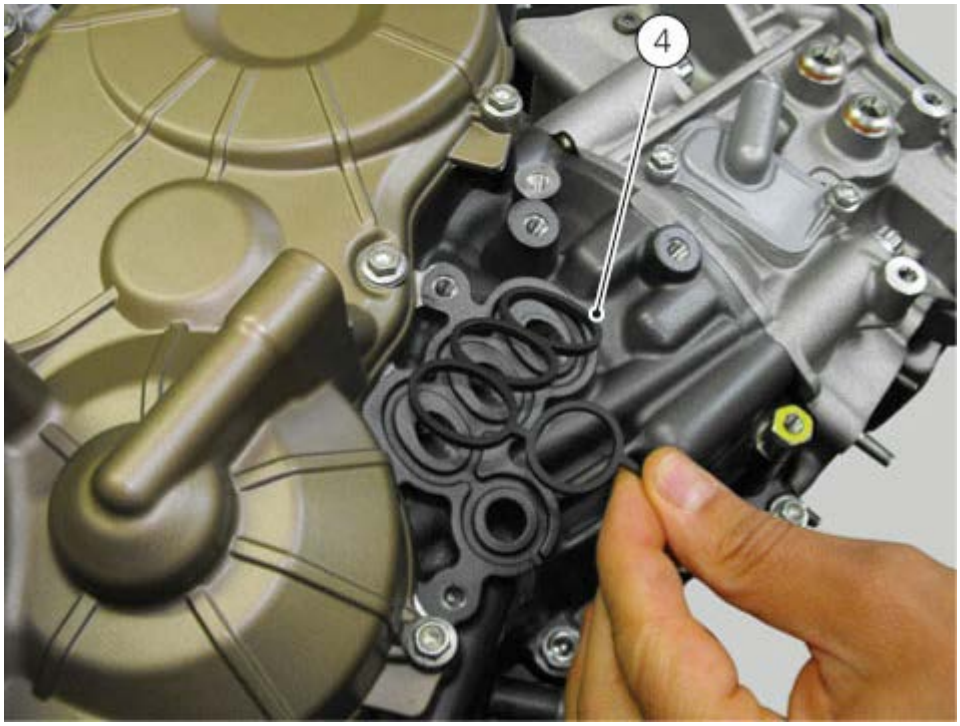

1
4
6
3
5
2

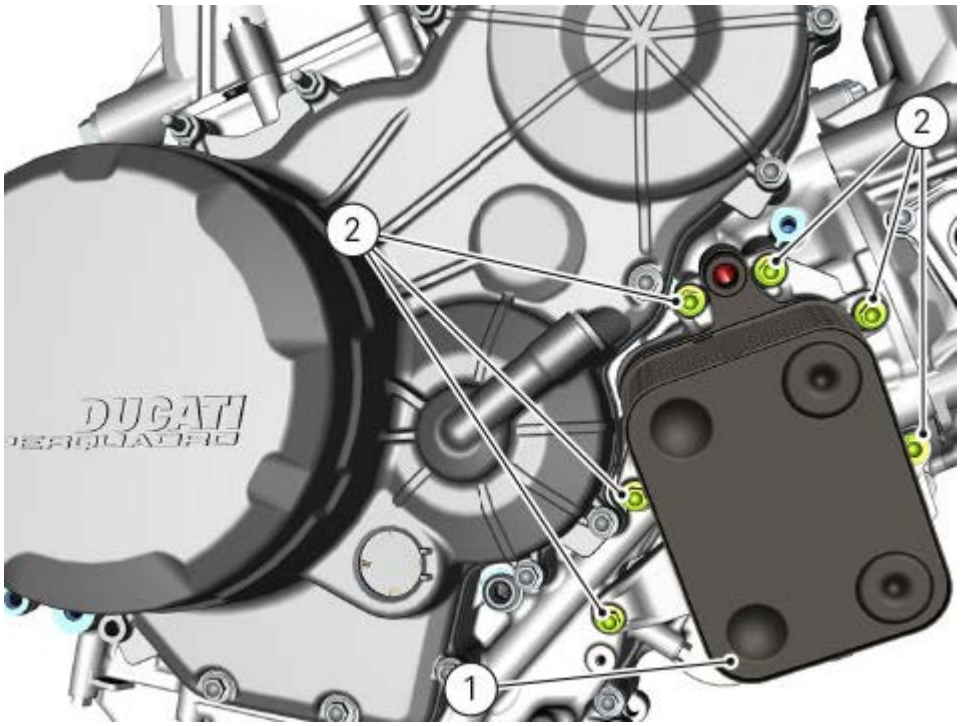
Removing the oil heat exchanger

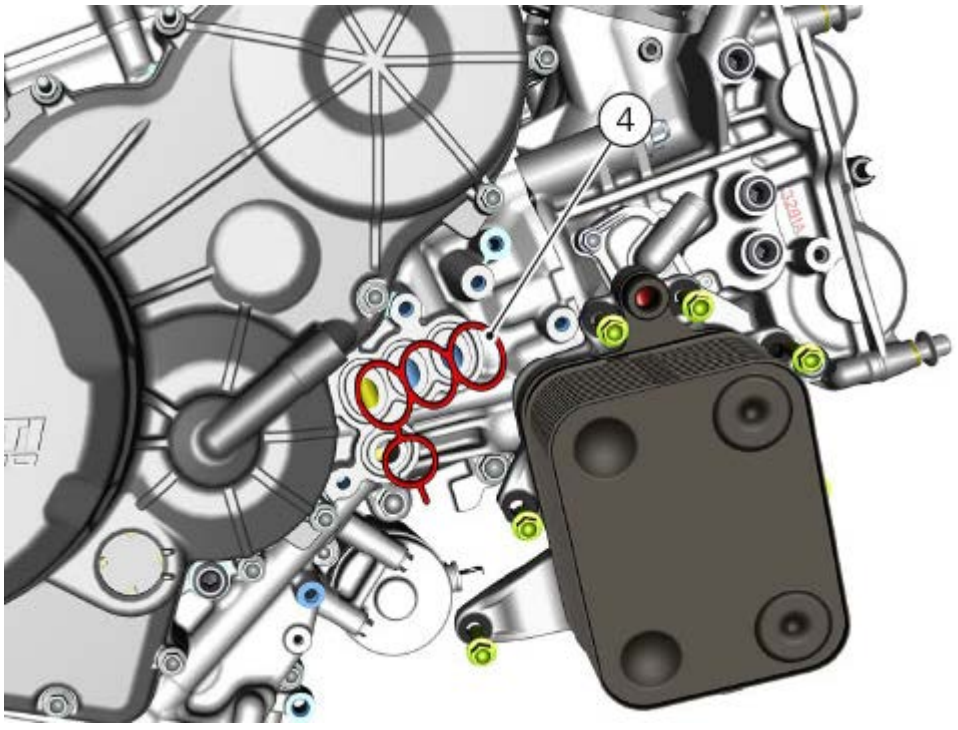
Remove the heat exchanger (1) by loosening the screws (2) and (3).



Remove seal (4) from the crankcase.



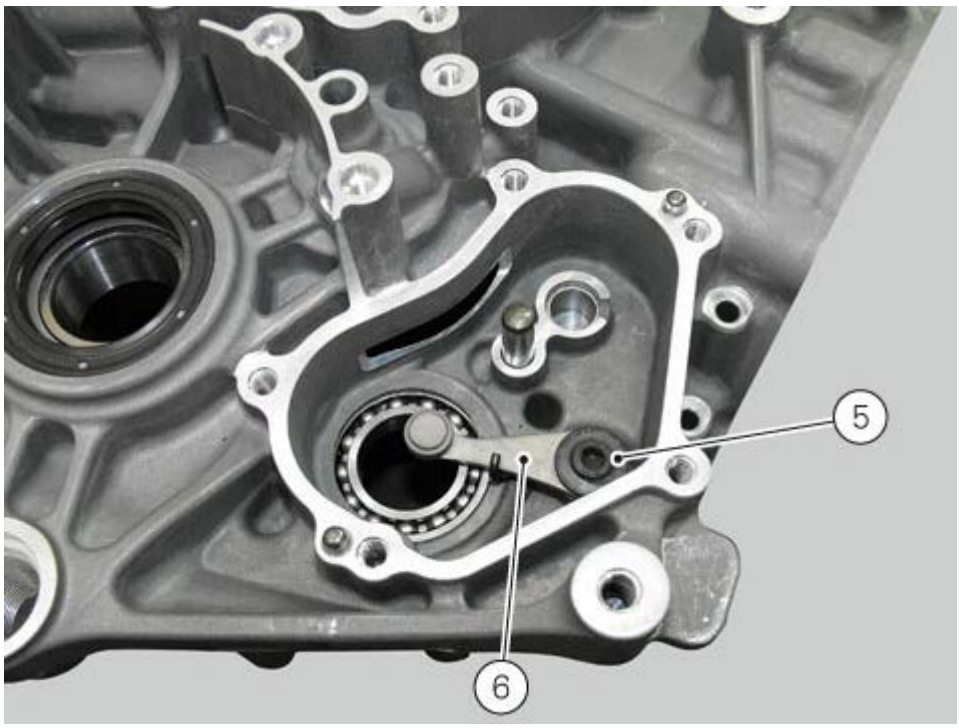

2
2
1

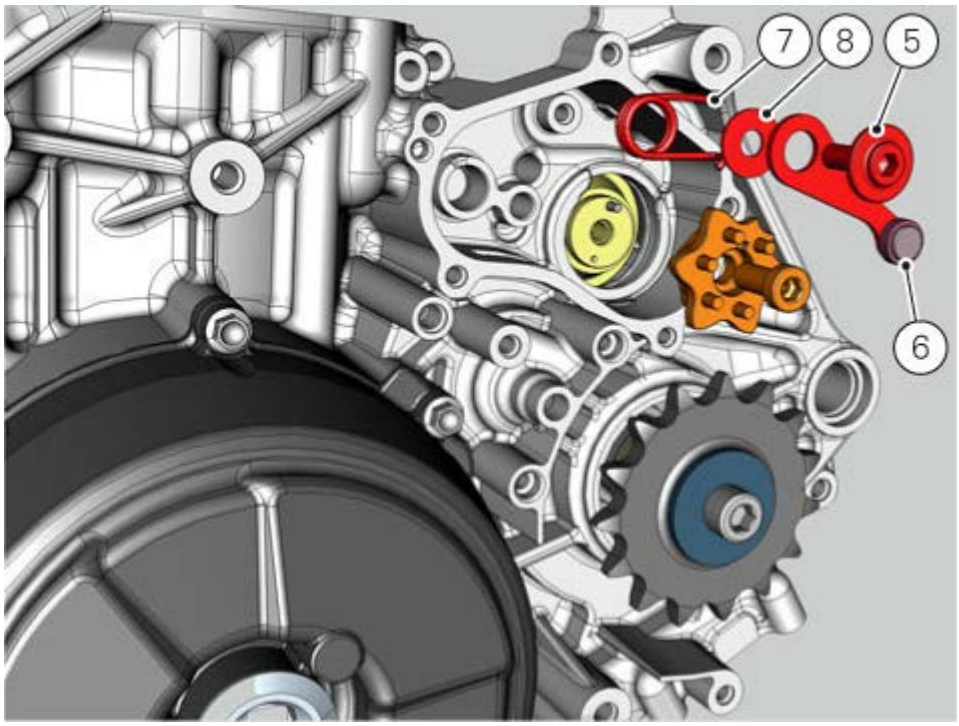

4

Installation of the gear selector lever

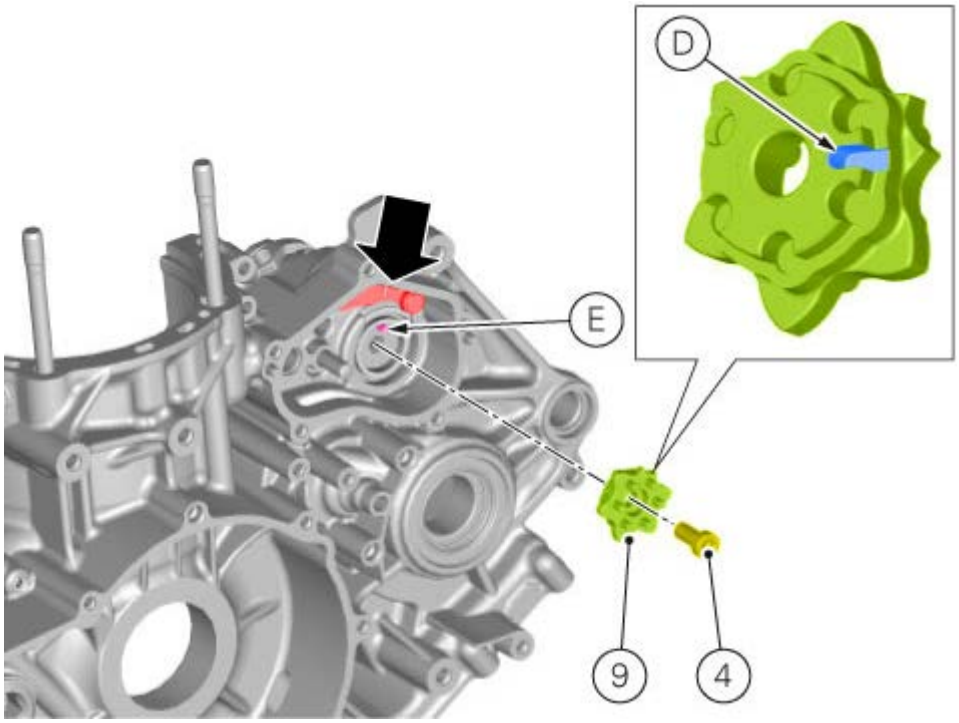
Fit the spring to gear stopper (7).

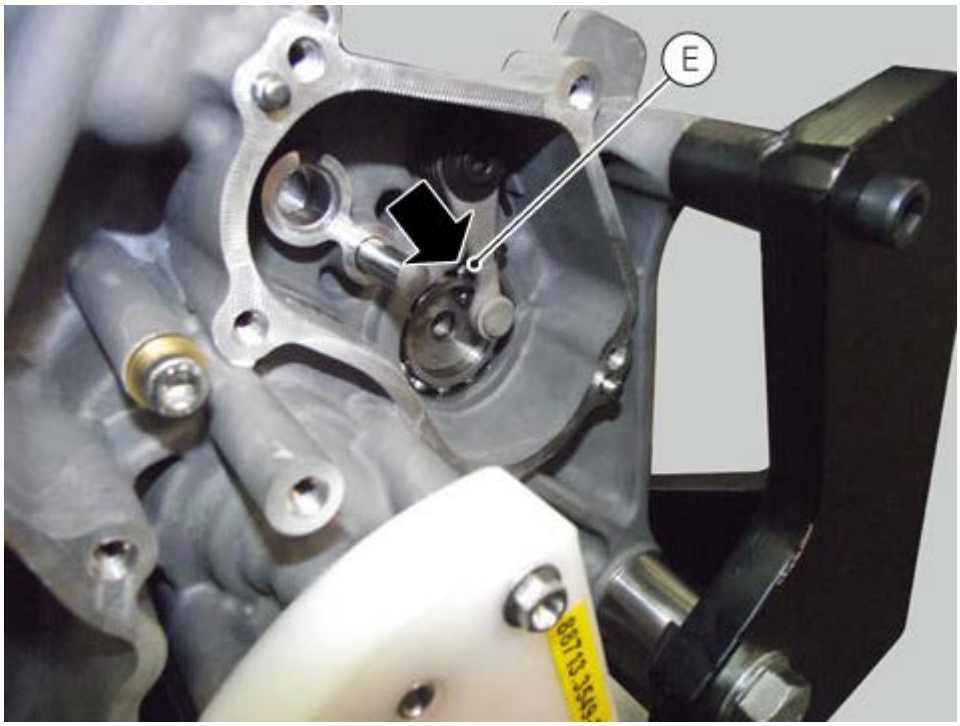
Lubricate screw (5) with engine oil.
Set the gear stopper (6) starting screw (5) with washer (8).
Tighten screw (5) to 10 Nm (Min. 9 Nm - Max. 11 Nm).



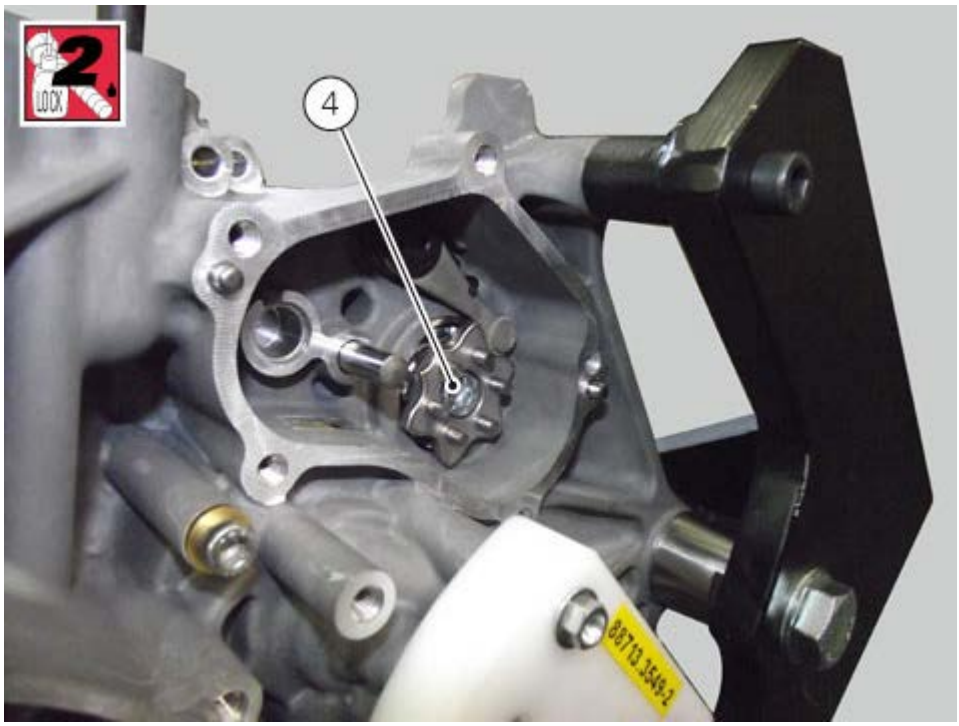


Push the gear ratchet toward the casing edge, fit the shift star (9) on selector drum by centring the slot (D) on pin (E) and release the ratchet that sets against shift star (9).
Fit tool part no. **88713.3853** on pin (F) and on shift star pins.
Apply specified threadlocker on screw (4), start it and tighten to 25 Nm (Min. 23 Nm - Max. 27 Nm) using the relevant tool part no. **88713.3853**.

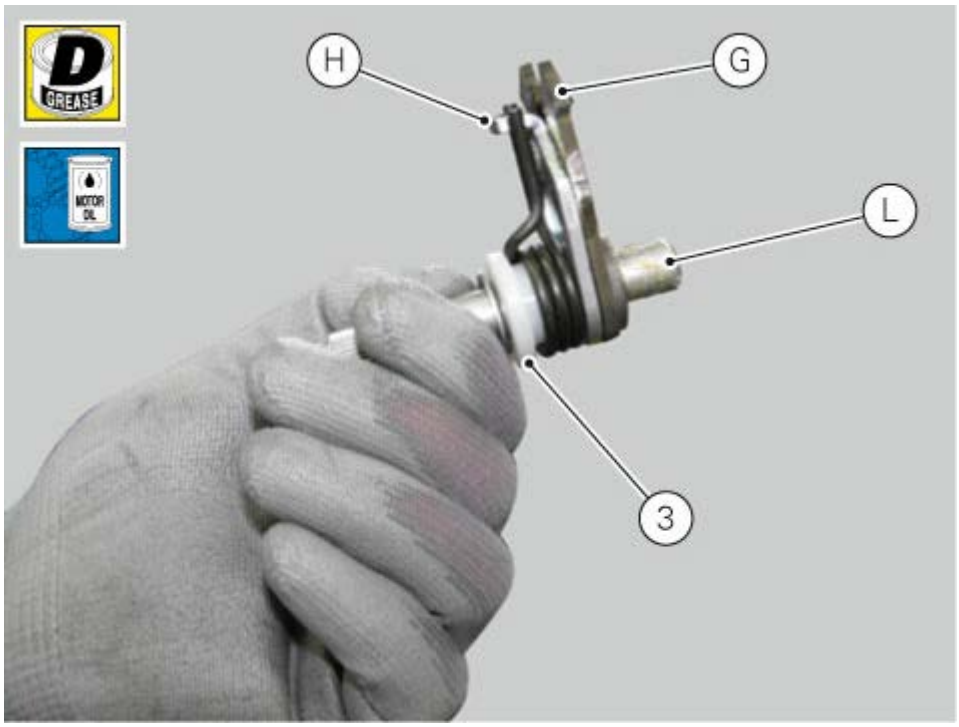



E

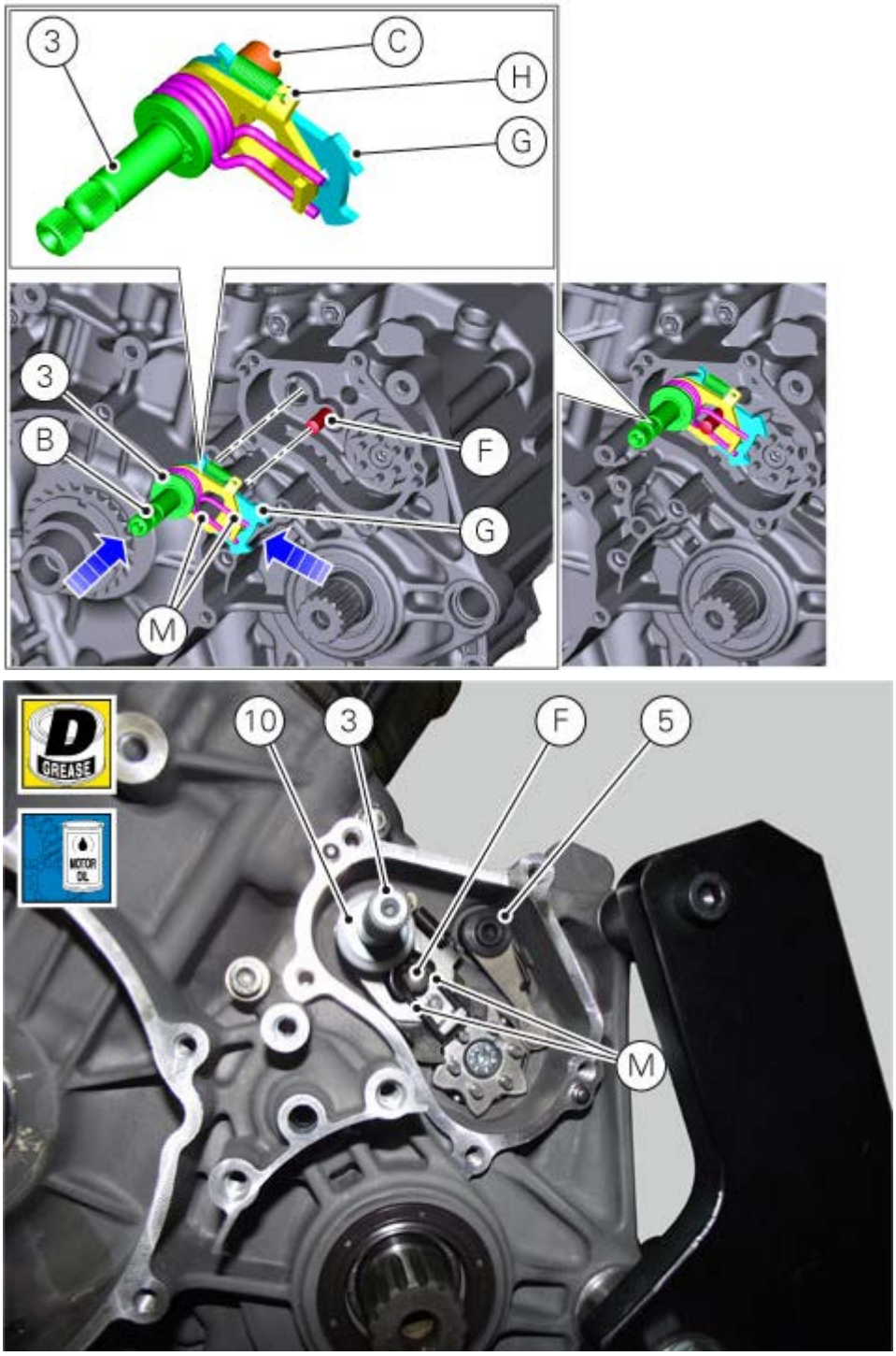

2.
LOCK
F
88713.3853
4



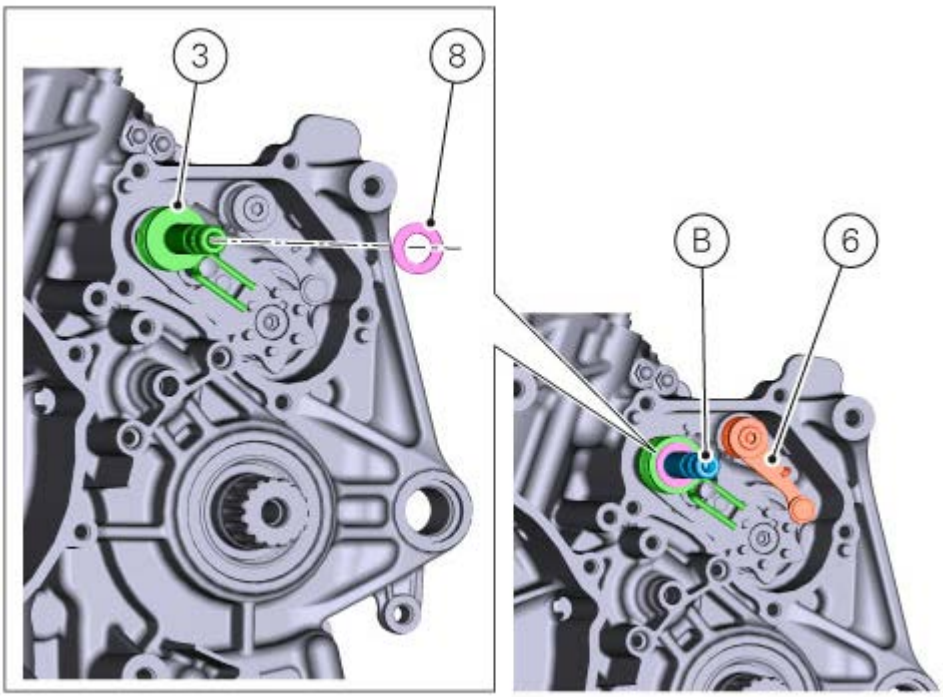
Lubricate with engine oil the sliding surface between pawl (G) and plate (H) of gear selector (3).
Smear grease on pin (L) of gear selector (3).



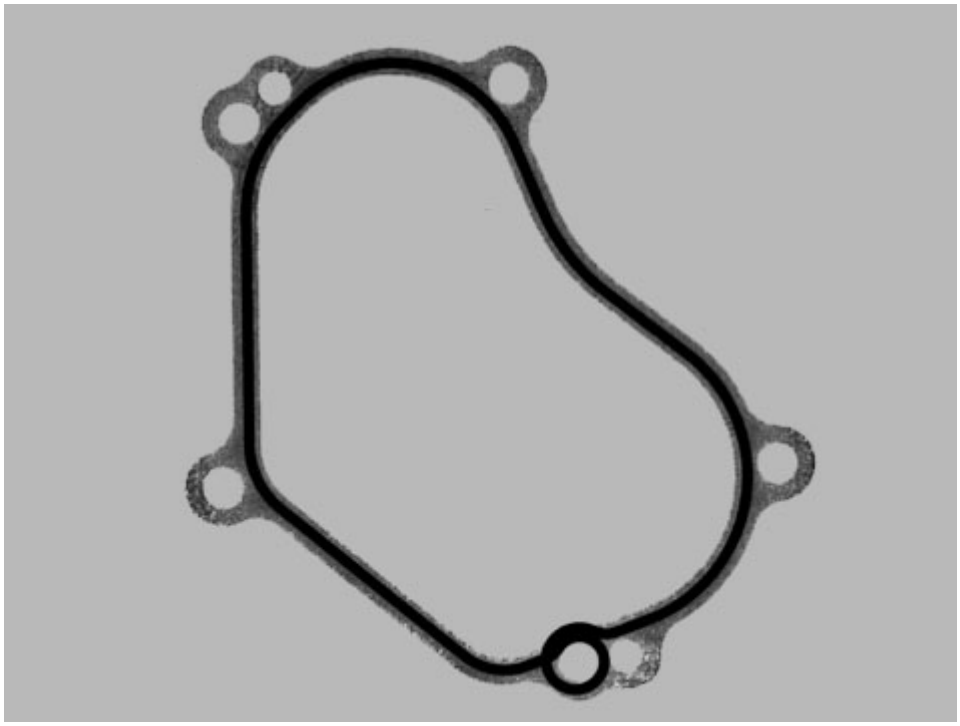
Install gear selector (3) ensuring that pin (F) engages between spring ends (M).
Fit washer (10) on gear selector (3) splined coupling.
Smear grease on gear selector (3) splined coupling and engine oil on gear stopper (M).
Start screw (5) and tighten it to 10 Nm (Min. 9 Nm - Max. 11 Nm).



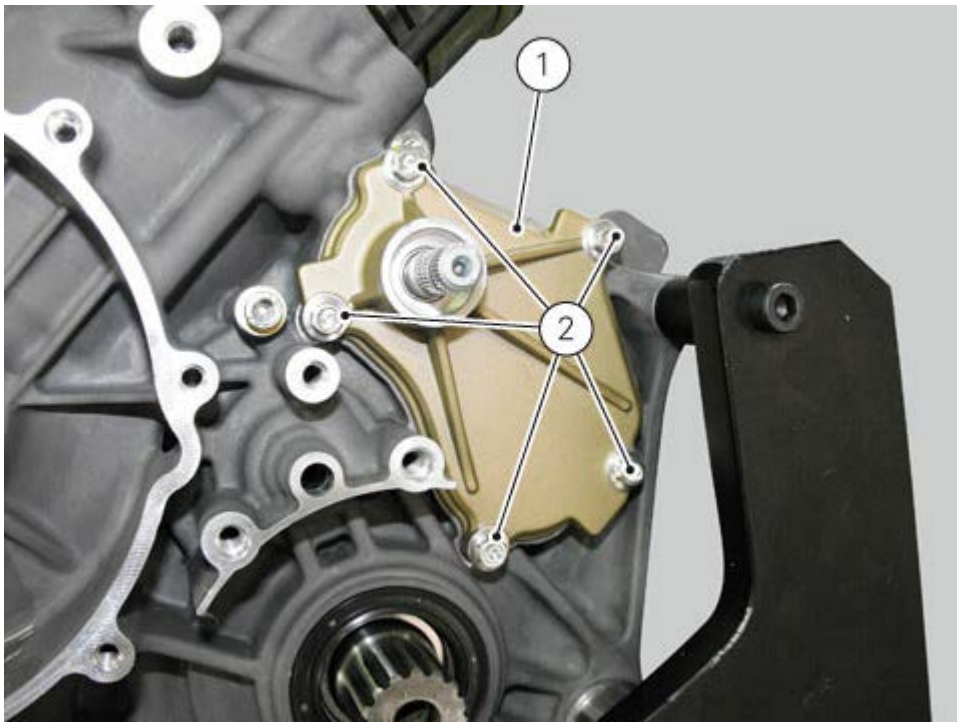
Fit washer (8) on gear selector (3) splined coupling.
Smear grease on gear selector (3) splined coupling (B) and lubricate lever (6) with engine oil.



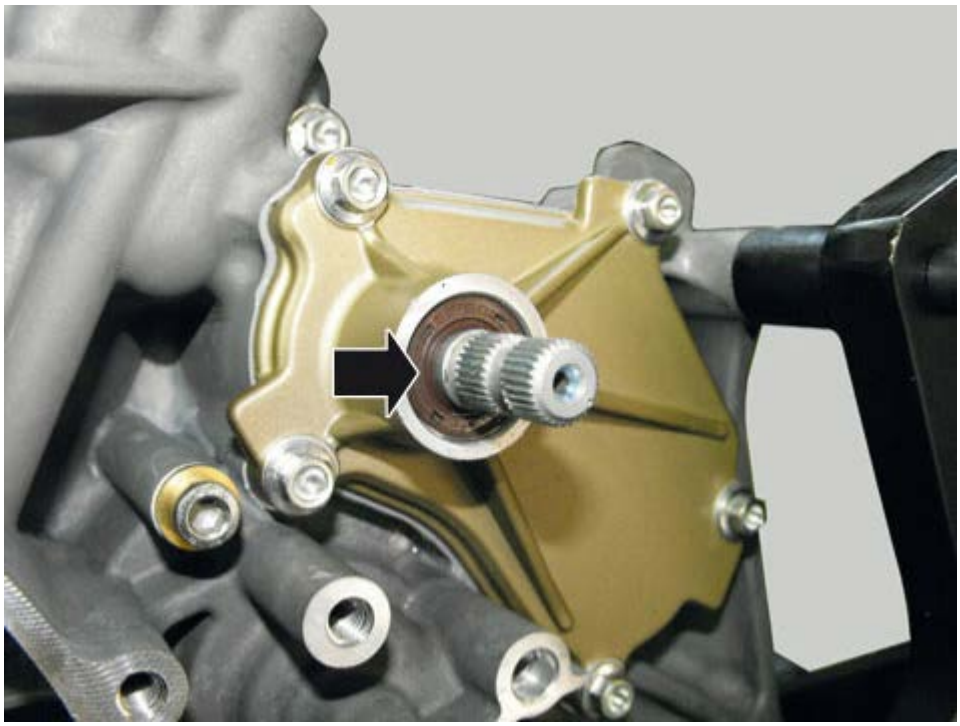
Carefully clean the surface that will mate with cover and the cover itself.
Apply Ducati sealing compound on cover (1) and position the cover on the casing relying on the pilot pins for centring.

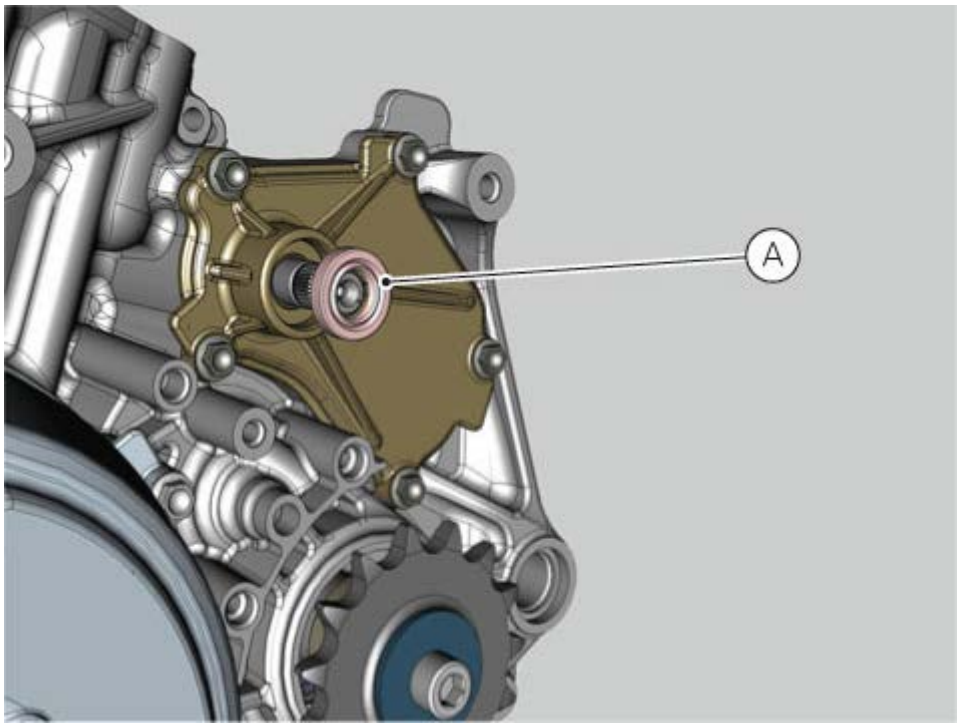


Tighten the screws (2) to 13 Nm (Min.12 Nm – Max.14 Nm) in a cross pattern.



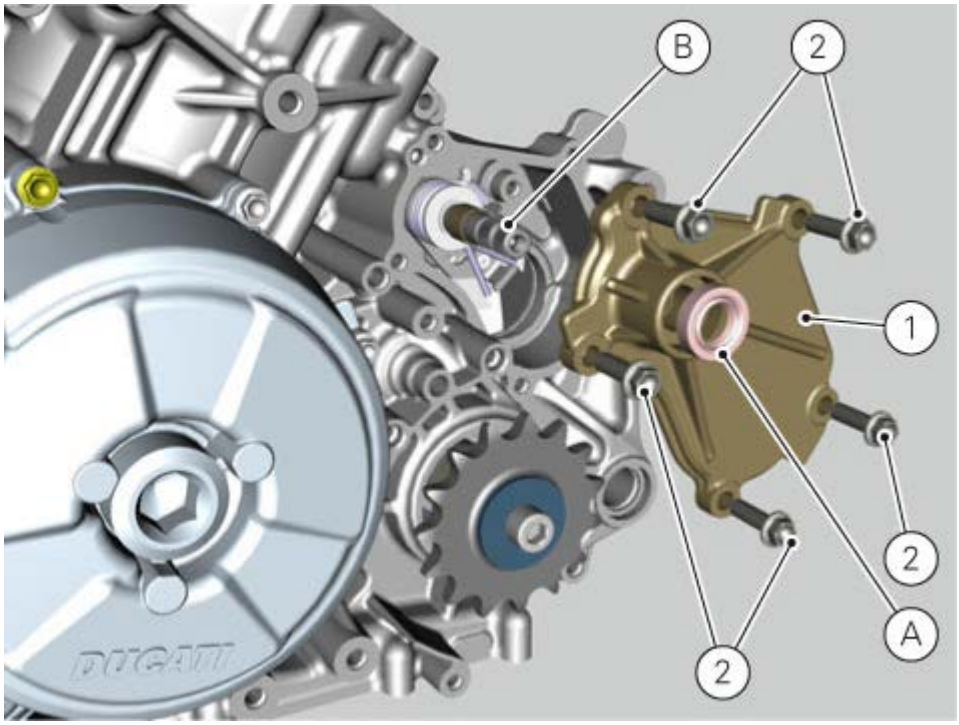
Fit oil seal (A) using the relevant tool part no. **88713.3507**.

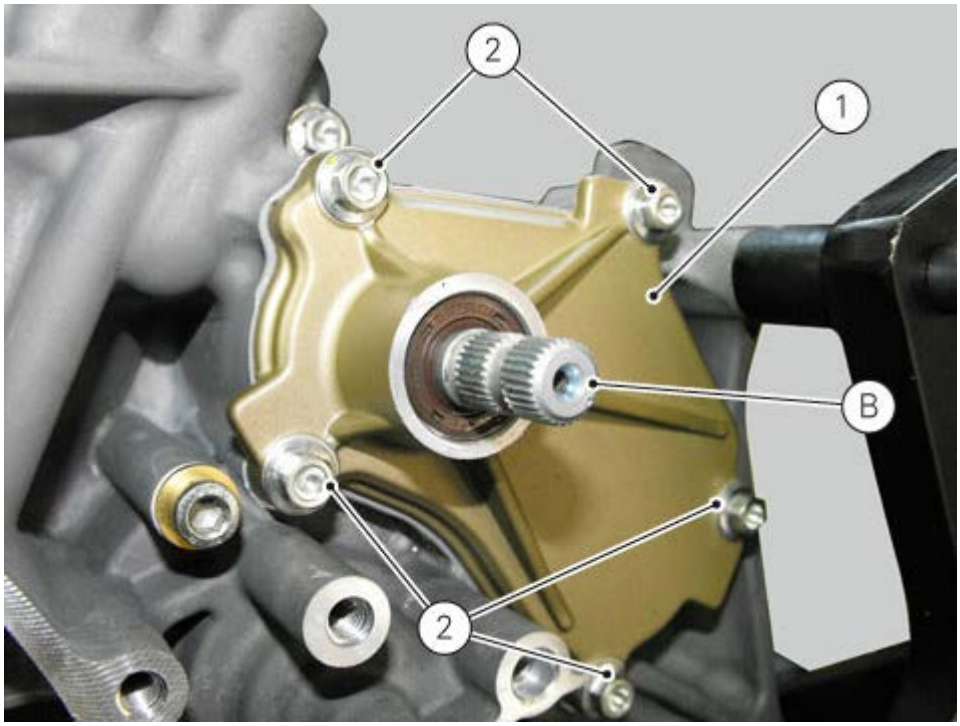



A

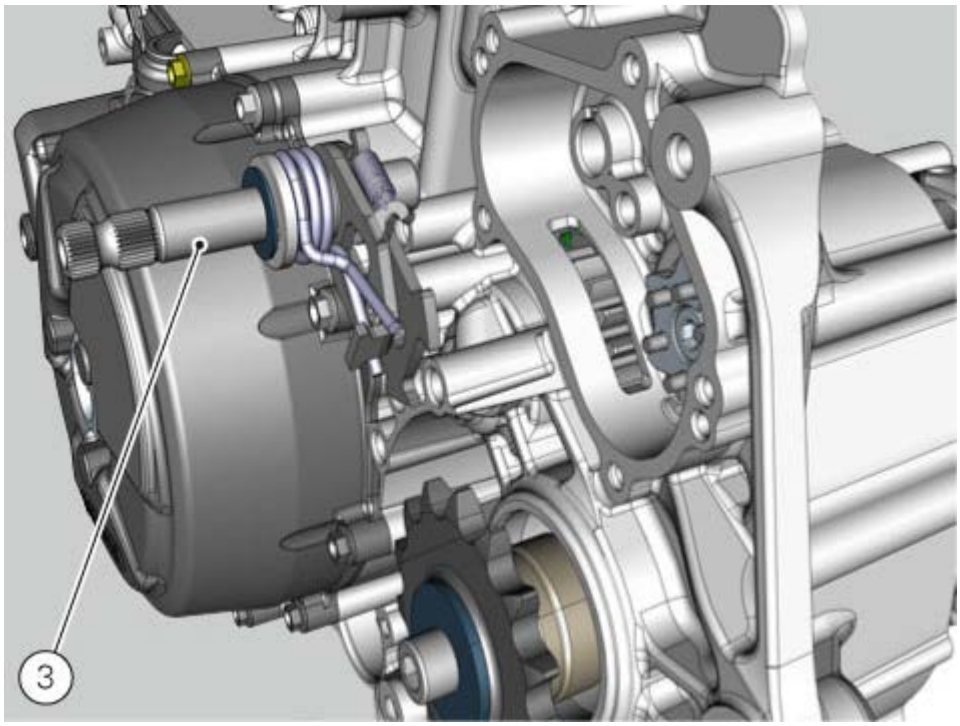
Removal of the gear selector lever

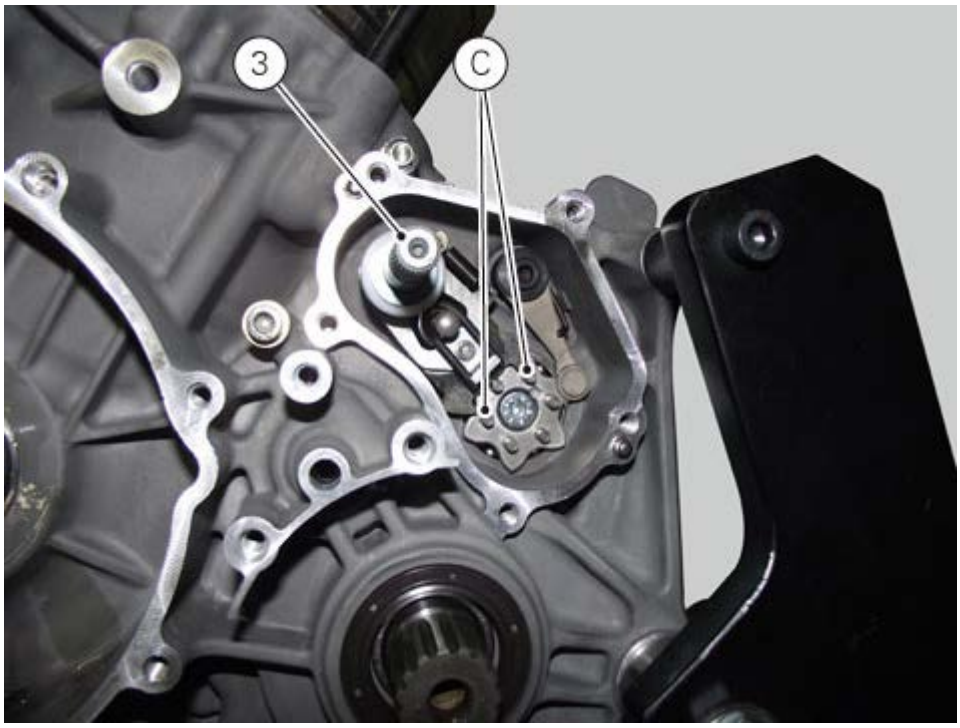
Remove the gear control cover (1) by loosening screws (2), avoiding to let oil seal (A) touch the splined coupling of the gear selector.



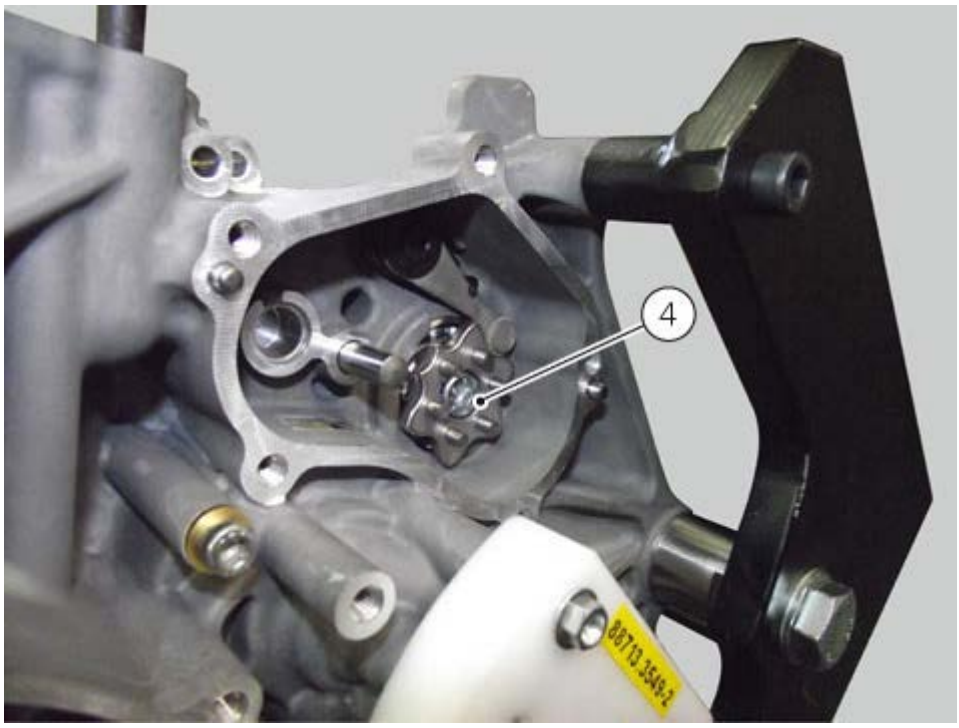


Take selector out (3).
During removal, be careful not to damage the pins (C) of shift star assembly.

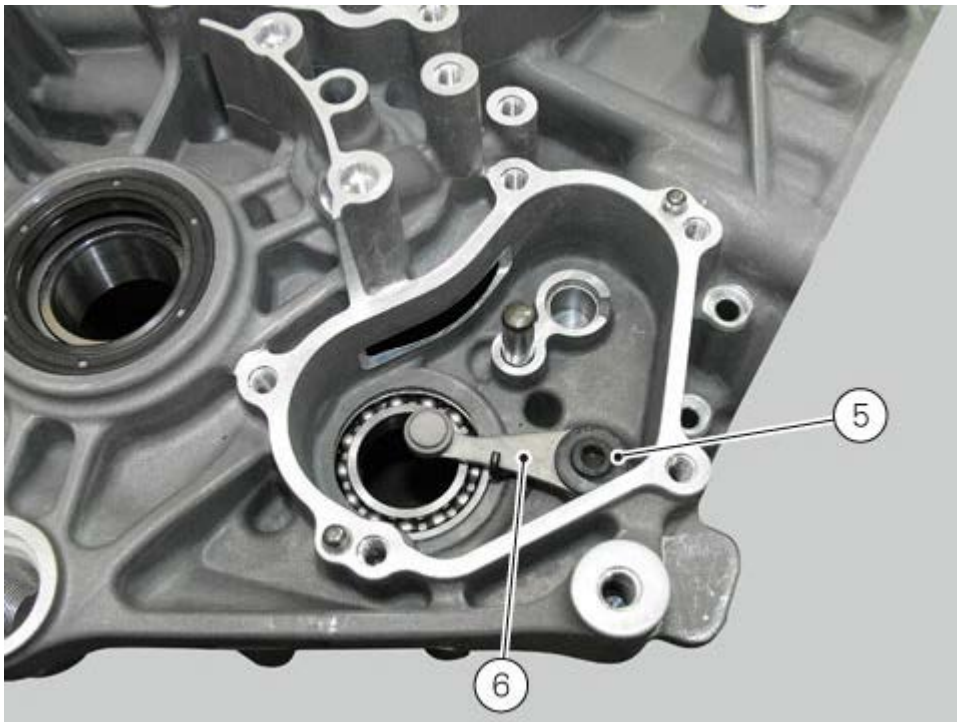




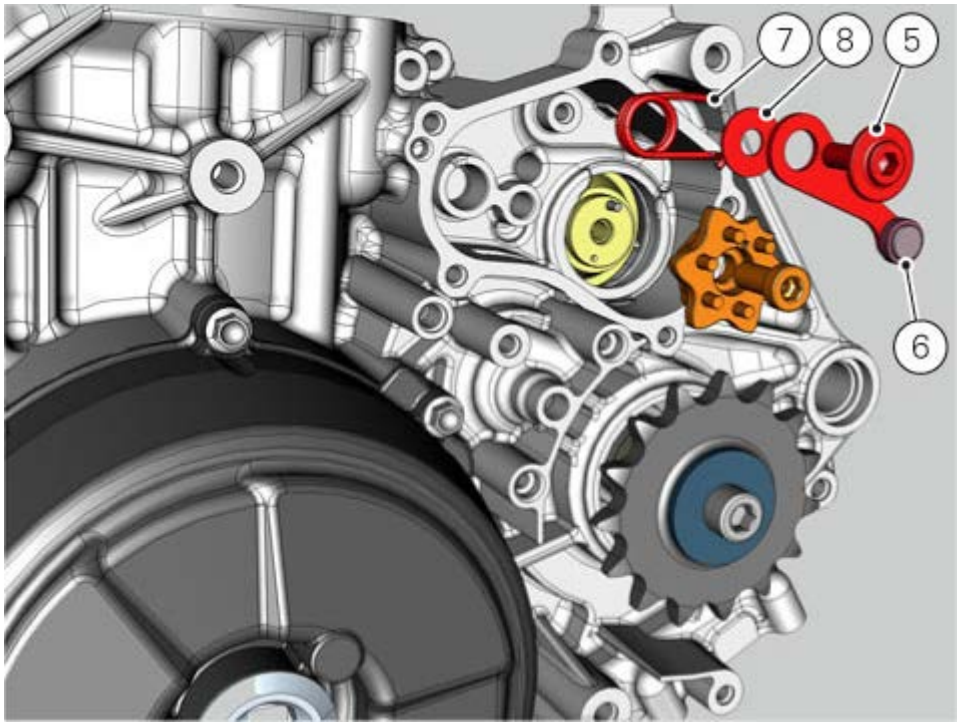
Remove the shift star by loosening and removing screw (4), with the relevant tool part no. **88713.3853**.



Undo the screw (5) and remove the gear stopper (6).



Ensure to keep the washer (8) and spring (7).



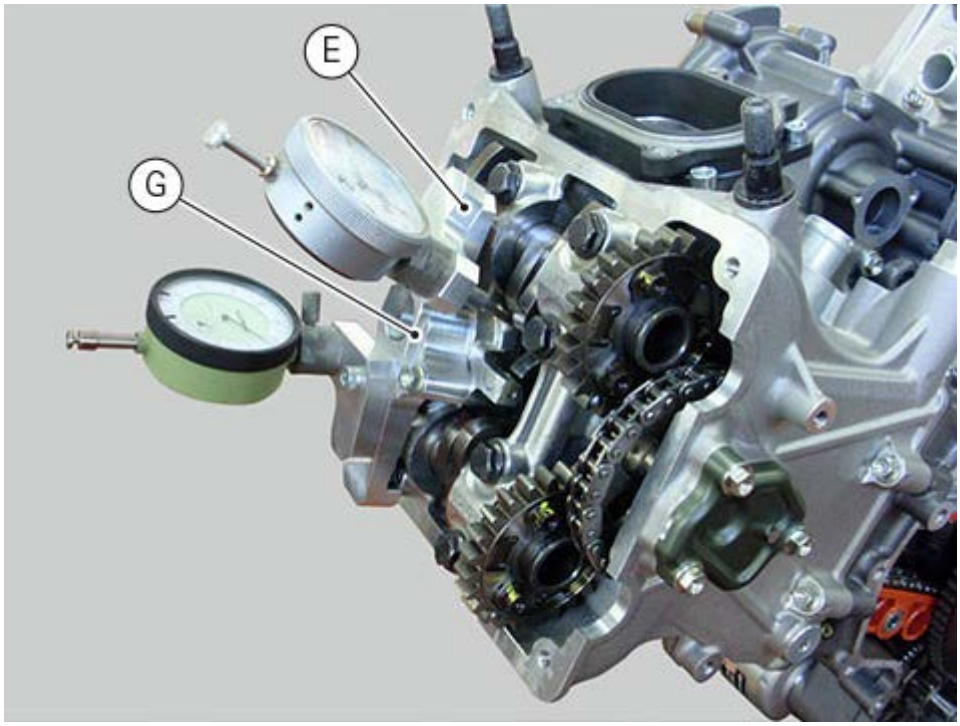

7

Checking the engine timing

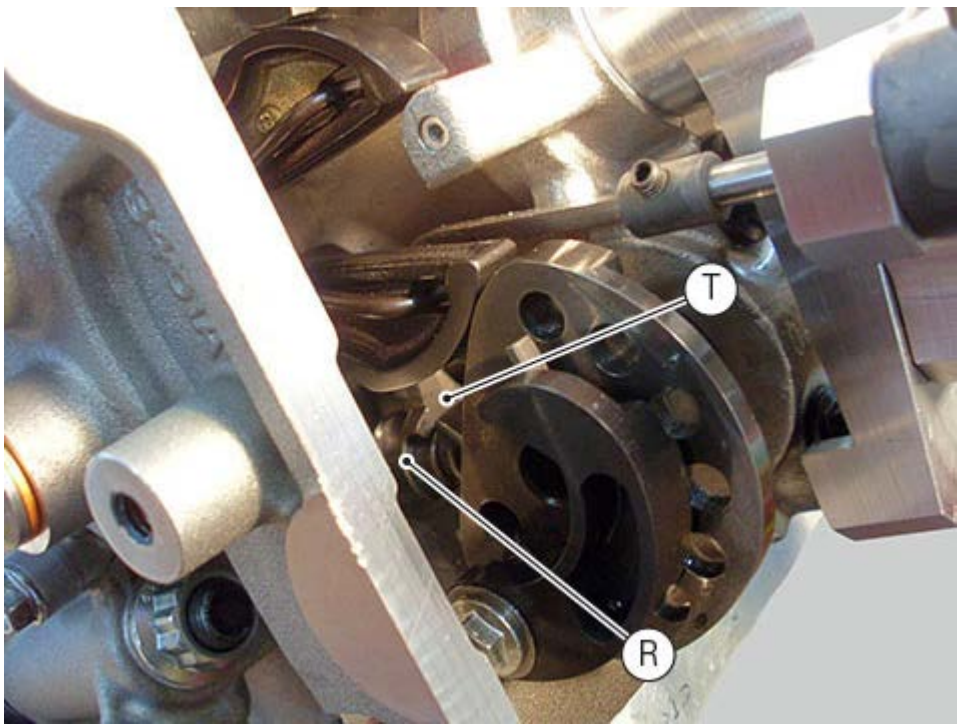
Set the engine to the condition described for the operation under "Checking and adjusting the valve clearance", indicated before.
Position tool (G) **88765.1632** on the head.
The tool consists of:

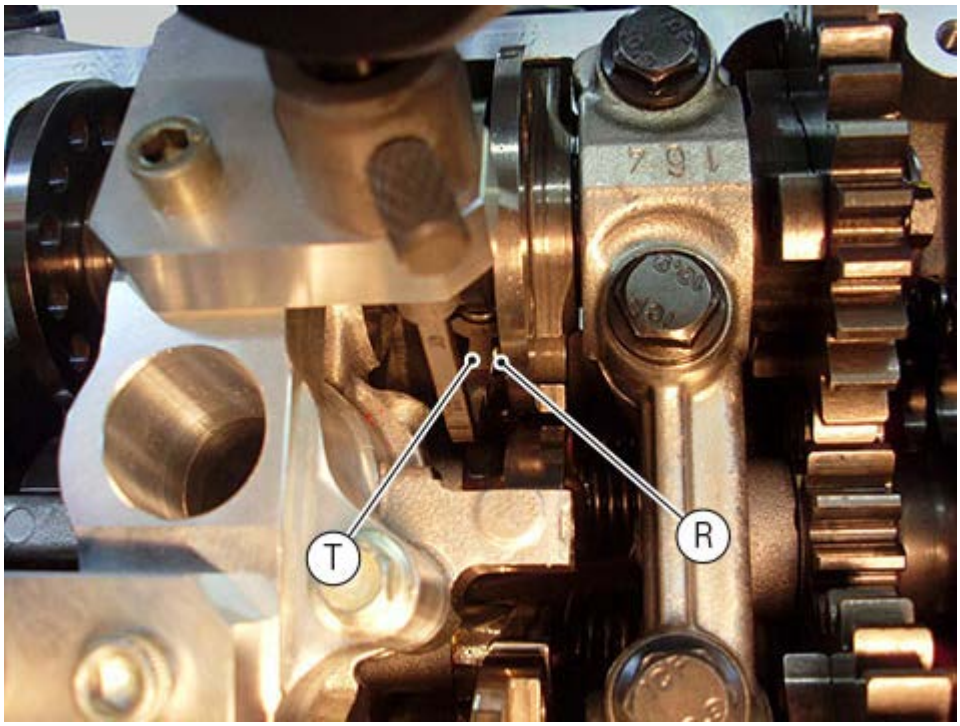
- dial gauge bushing support (E) **887651702**;
- small rod for intake side dial gauge (T) **887651703**;
- big rod for exhaust side dial gauge (T) **887651704**.

Position part (E) from the intake side and the other part from the exhaust side.

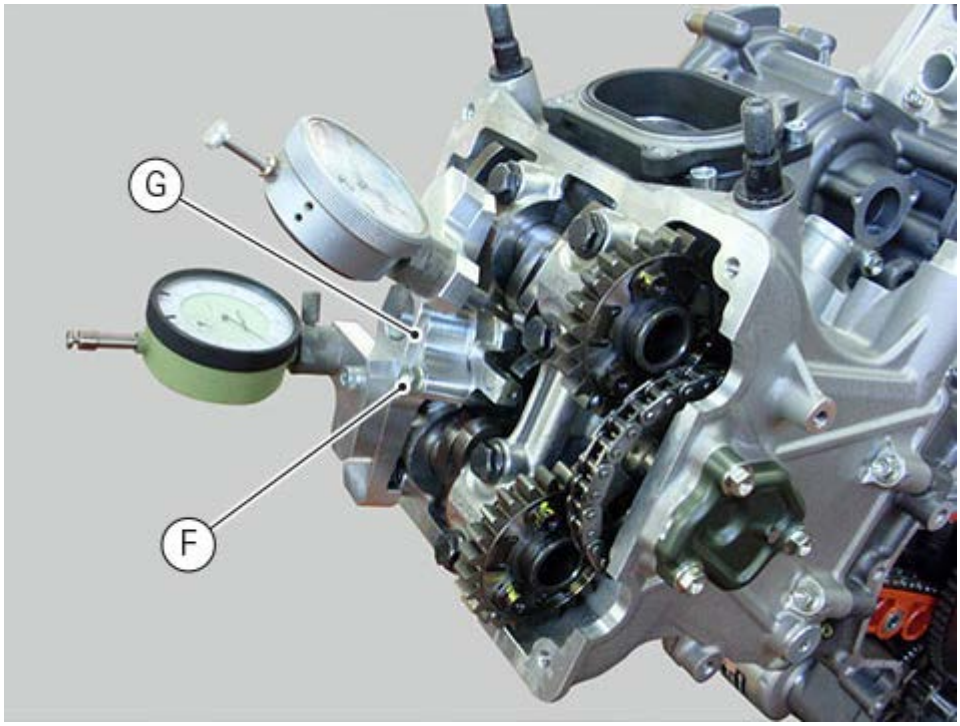


Position tool fork probe (T) against the closing shim (R) surface.

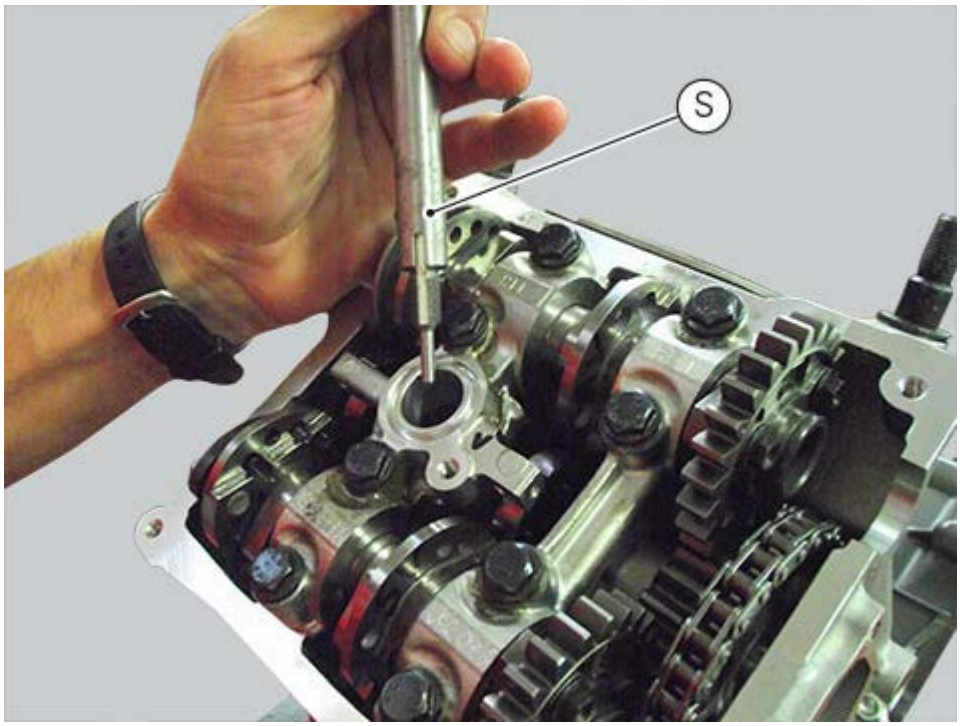


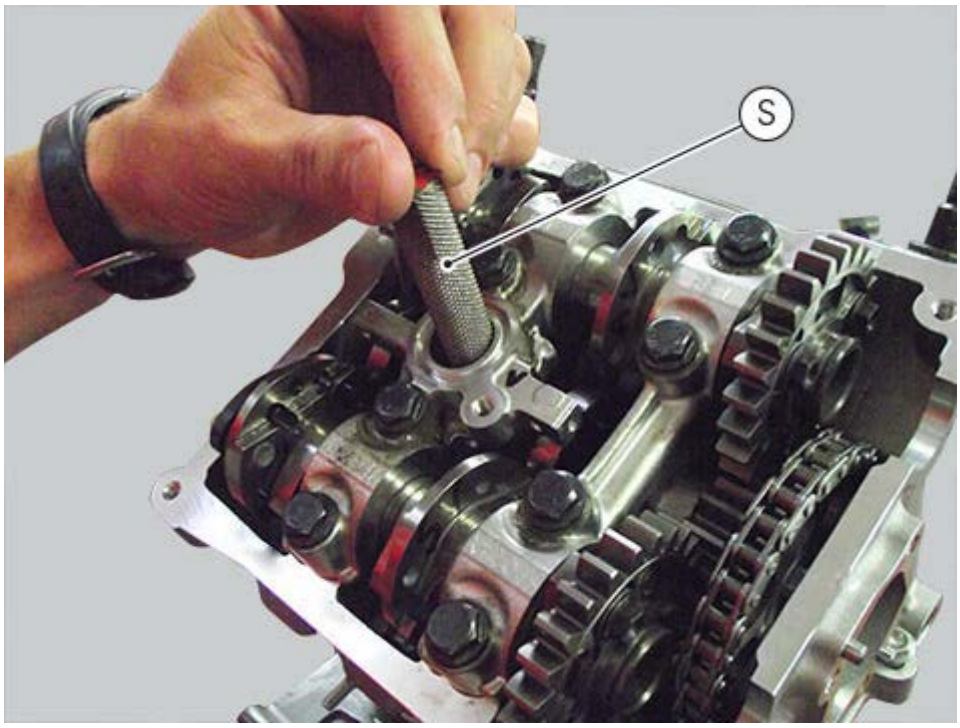


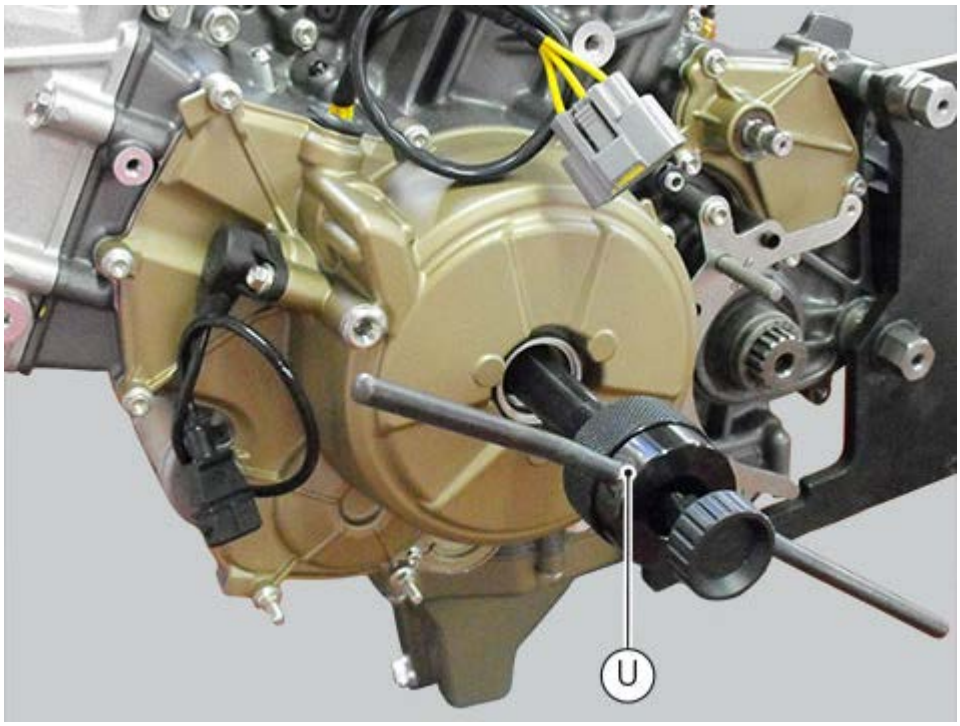
Bring the central plate of tool (G) fully home and tighten screw (F).



Fit the TDC checking tool **88713.2574** (S) and the tool with partition for checking the timing part **88713 3824** (U).


S


S



Set the opening valve clearance to zero when the camshafts are in rest position by fitting a feeler gauge between the upper rocker arm and the opening shim on which you are taking the measurements.
In this condition, at TDC with completely closed valves, reset the dial gauge on the closed valve position.
Turn the engine in its operation sense until the gauge dial (H), on the exhaust side, shows a lift of 1 mm.
Check that the value of the angular displacement read on the degree wheel (L) is the specified one.
Continue to rotate in the same direction until you obtain a lift of 1 mm on the intake side.
Complete the checking operation.
Repeat the procedure on both cylinders.
A tolerance of ±3° is allowed in the values detected with the described procedure compared to the specified ones.

Refit the components by carrying out the same operations indicated in paragraph "Checking and adjusting the valve clearance", previously described.
Refit the components removed in the procedure.

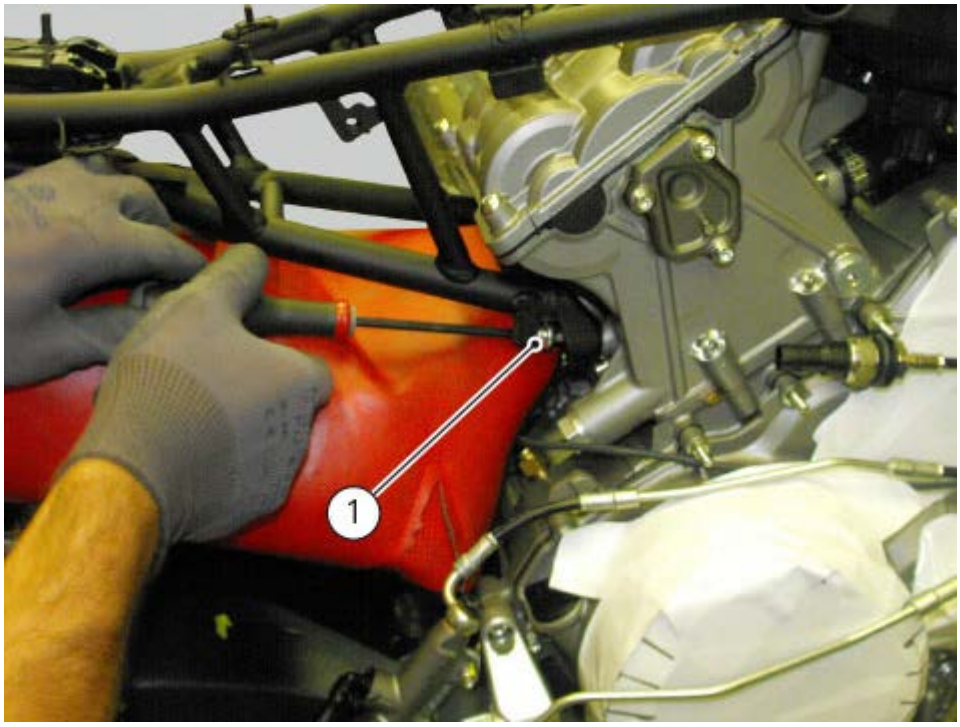
Refit the radiator unit (Refitting the water radiator).
Refit the fuel tank (Refitting the fuel tank).
Refit both fairings (Refitting the side fairings).
Refit the rider seat (Refitting the rider seat).

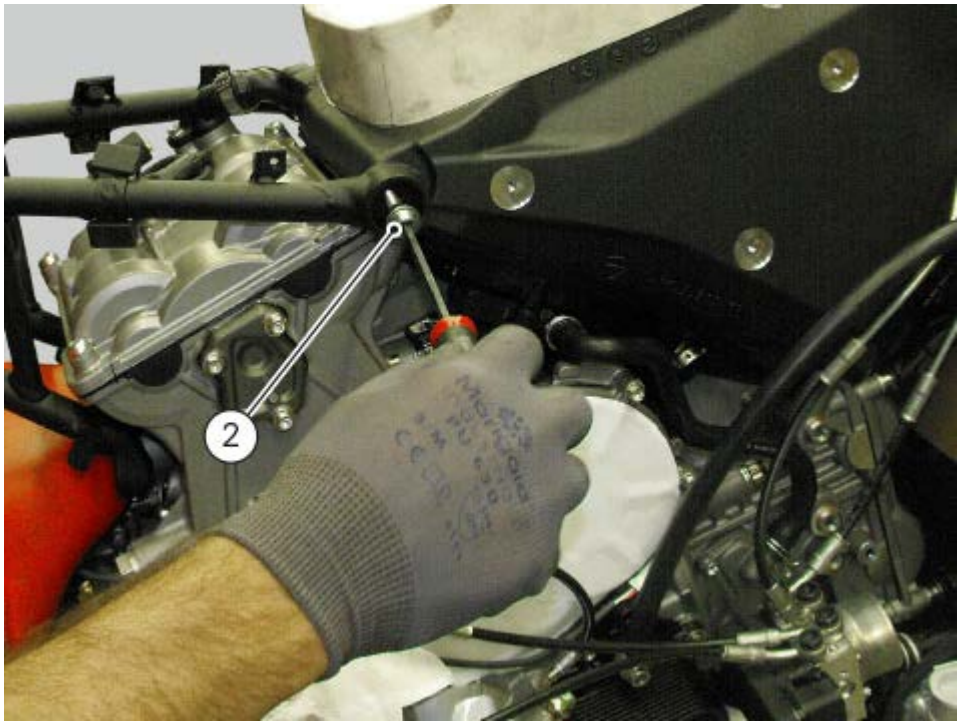
Checking and adjusting the valve clearance

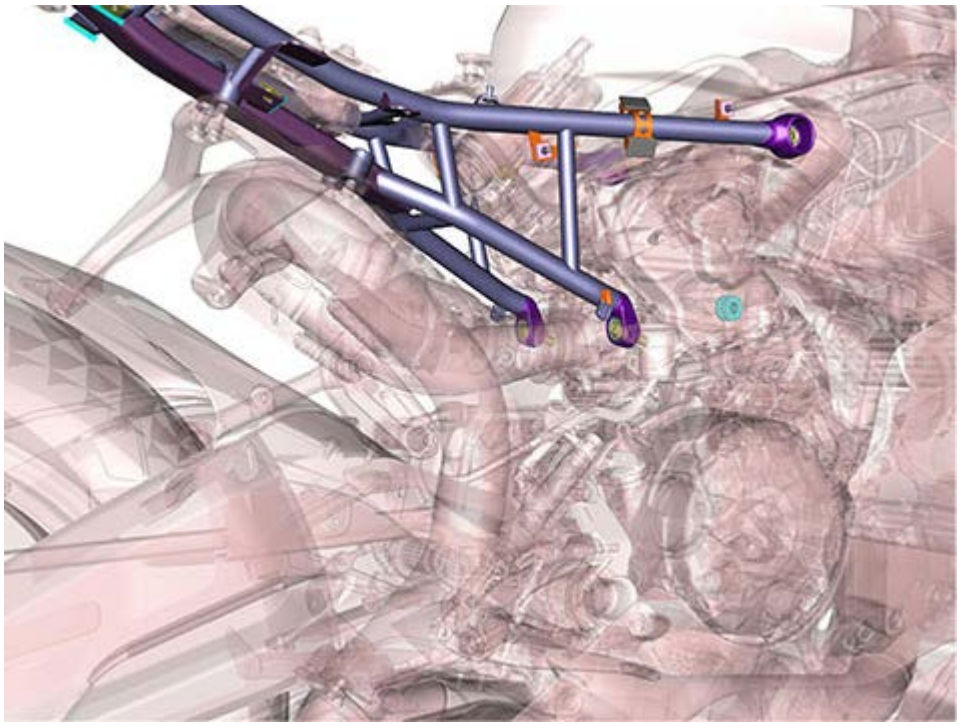
To check valve clearance, it is necessary to have access to the cylinder head covers and then remove the components listed below.

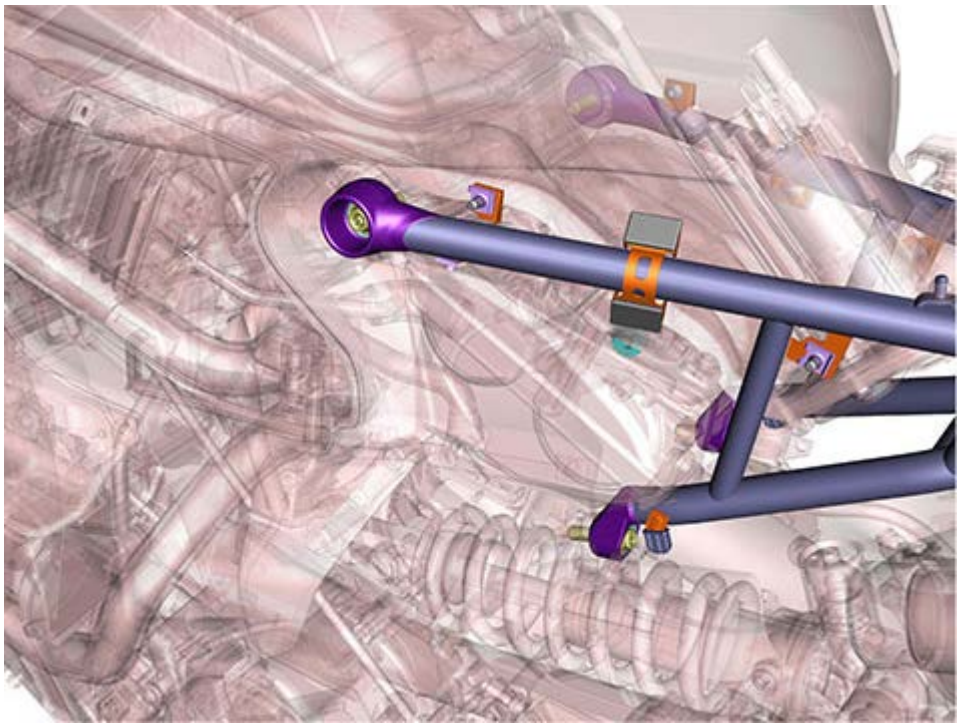
Remove the rider seat (Removing the rider seat).
Remove both fairings (Removing the side fairings).
Remove the fuel tank (Removing the fuel tank).
Remove the radiator unit (Removing the water radiator).

Working on both sides, lift the rear subframe by loosening lower screws (1) and upper screws (2).

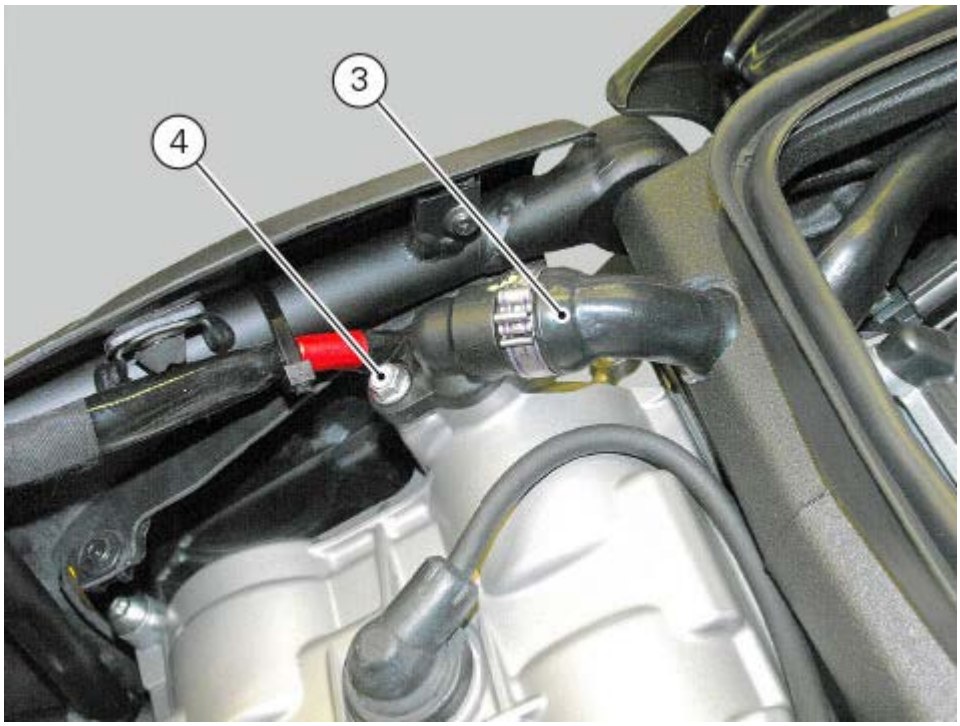






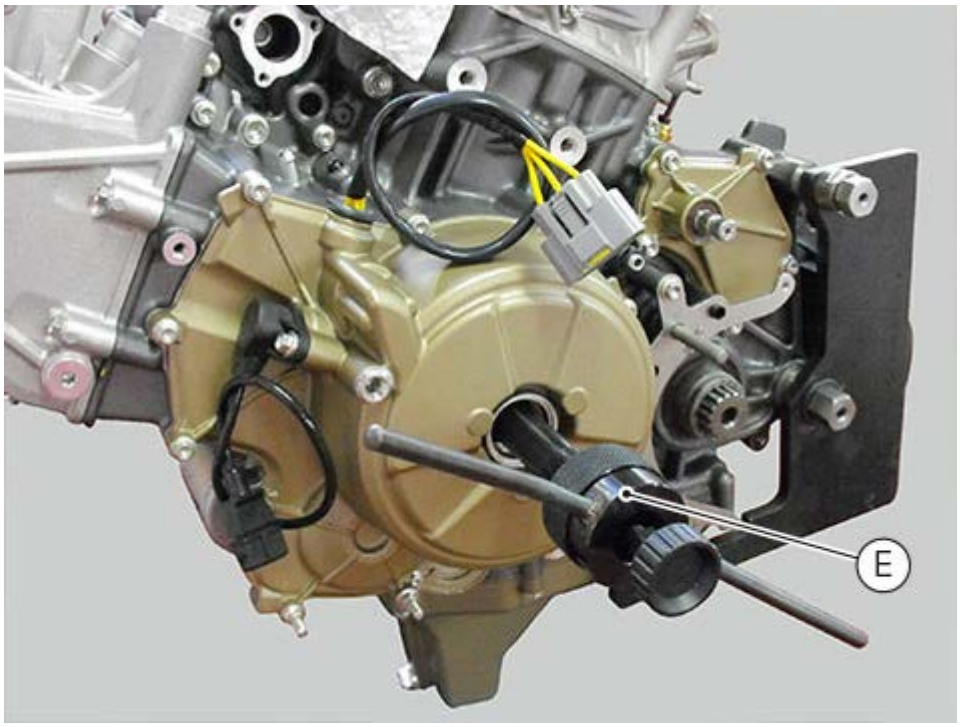


Loosen screw (4) to remove blow-by outlet fitting (3) from vertical head cover.



Remove the lateral protections of the vertical head and the relevant covers as described in paragraph "Removing the camshafts".

Using handle of tool no. **88713.3824** (E) turn the crankshaft so that the valve to be inspected is in rest position.



With the valve in the rest position, slide a feeler gauge between rocker arm liner (A) and the lowest side of the cam (B) to measure the clearance.

Important

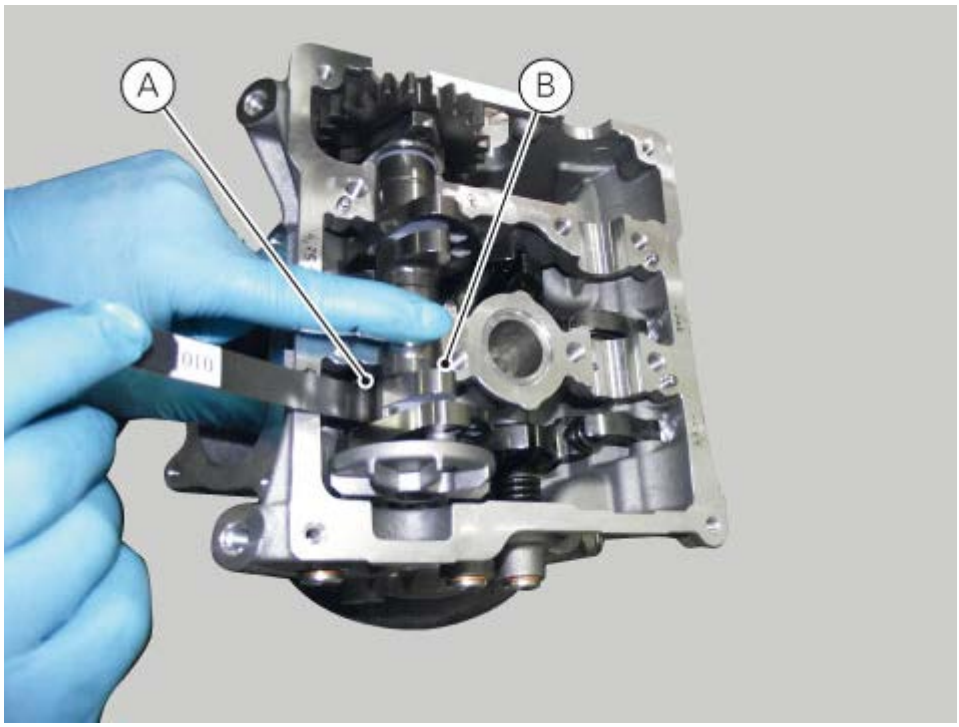
Hold the feeler gauge at a distance of at least 4-5 cm from the point of measurement between cam and rocker arm, as shown in the figure.

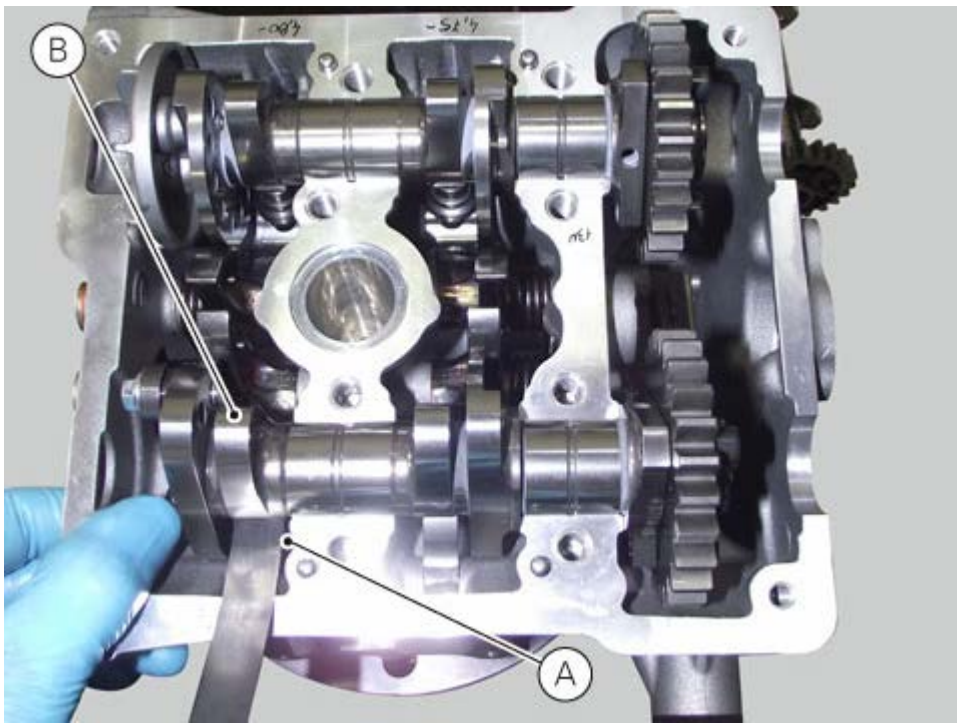
The clearance must be within the specified limits:

Opening rocker arm

INTAKE:	
Operation	0.15÷0.20 mm
Inspection	0.10÷0.25 mm
EXHAUST:	
Operation	0.15÷0.20 mm
Inspection	0.10÷0.25 mm

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



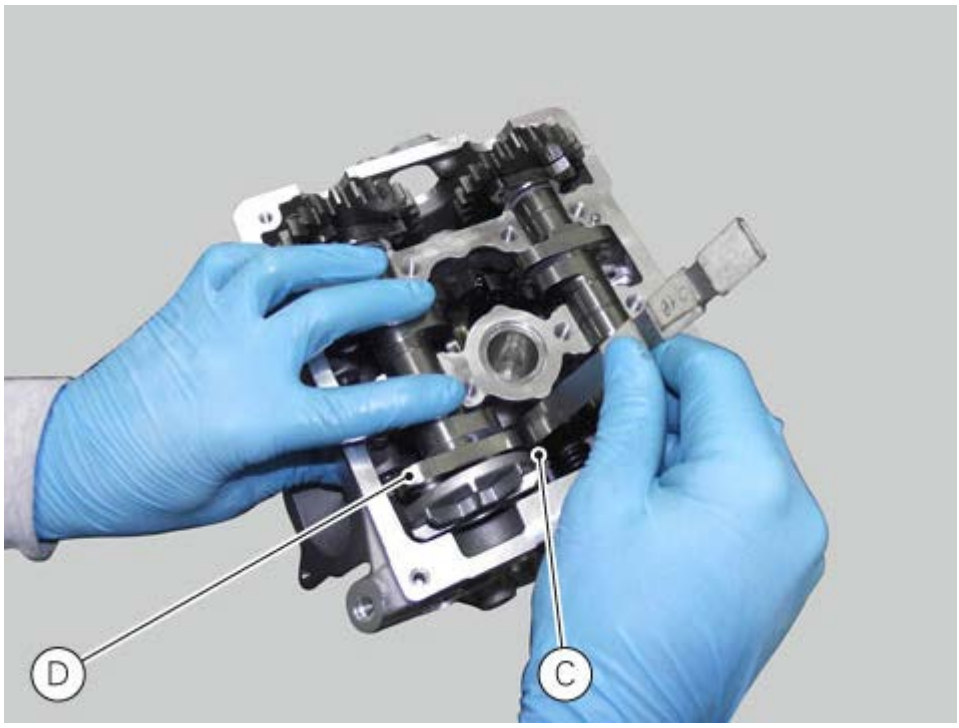


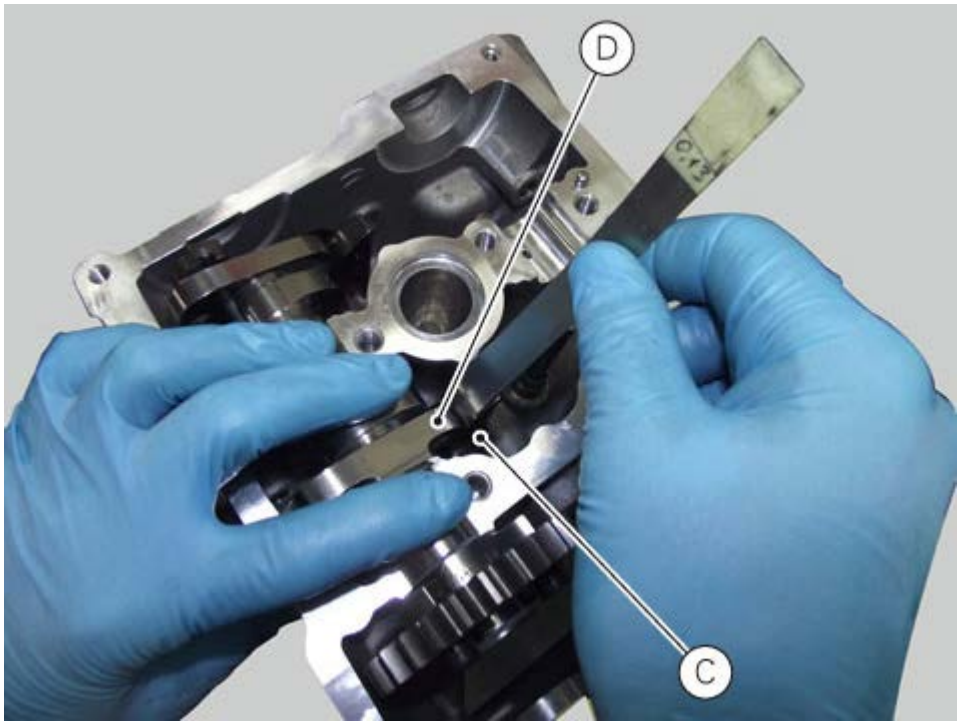
With the valve in the rest position, slide a feeler gauge between closing rocker arm liner (C) and the highest side of the cam (D) to measure the clearance.

Closing rocker arm	
INTAKE:	
Operation	0.08÷0.13 mm
Inspection	0.08÷0.25 mm
EXHAUST:	
Operation	0.08÷0.13 mm
Inspection	0.08÷0.25 mm

Note

For clarity, the figures show the engine removed from the vehicle.





If detected values exceed the specified limits, replace opening and/or closing shim, as described in paragraph “Removing the valves”, with one featuring an adequate thickness to obtain the specified clearance.

Note
The charts below indicate the available spare opening and closing shims: each part is marked with the size.

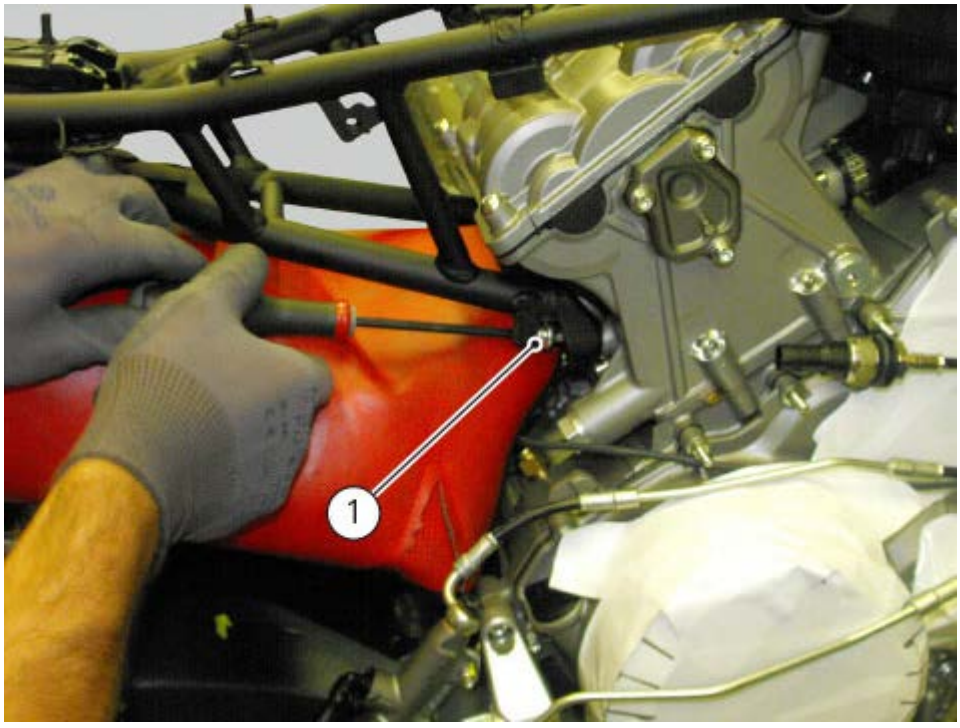
840.2.001.2A Opening rocker shim		
840.1.031.2A - 1.8	840.1.012.2A - 2.55	840.1.027.2A - 3.3
840.1.032.2A - 1.85	840.1.013.2A - 2.6	840.1.028.2A - 3.35
840.1.033.2A - 1.9	840.1.014.2A - 2.65	840.1.029.2A - 3.4
840.1.034.2A - 1.95	840.1.015.2A - 2.7	840.1.030.2A - 3.45
840.1.001.2A - 2.0	840.1.016.2A - 2.75	840.1.072.2A - 3.6
840.1.002.2A - 2.05	840.1.017.2A - 2.8	840.1.073.2A - 3.8
840.1.003.2A - 2.1	840.1.018.2A - 2.85	840.1.108.2A - 3.5
840.1.004.2A - 2.15	840.1.019.2A - 2.9	840.1.109.2A - 3.55
840.1.005.2A - 2.2	840.1.020.2A - 2.95	840.1.110.2A - 3.65
840.1.006.2A - 2.25	840.1.021.2A - 3.0	840.1.111.2A - 3.7
840.1.007.2A - 2.3	840.1.022.2A - 3.05	840.1.112.2A - 3.75
840.1.008.2A - 2.35	840.1.023.2A - 3.1	840.1.113.2A - 3.85
840.1.009.2A - 2.4	840.1.024.2A - 3.15	840.1.114.2A - 3.9
840.1.010.2A - 2.45	840.1.025.2A - 3.2	
840.1.011.2A - 2.5	840.1.026.2A - 3.25	

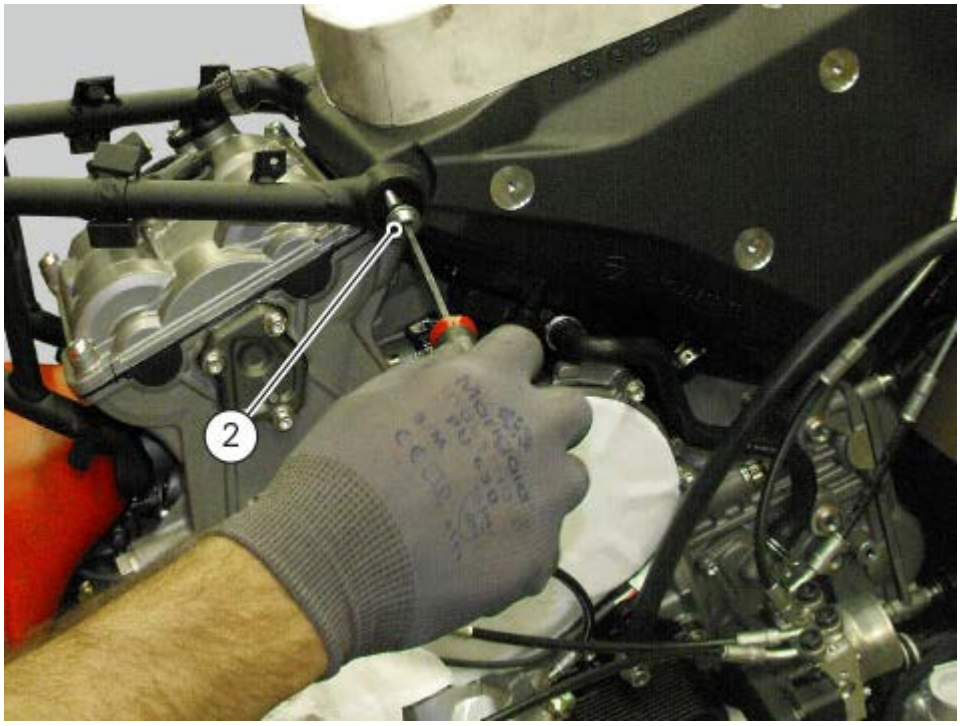
840.2.002.2B Closing rocker shim (split rings)		
840.1.041.2B - 2.2	840.1.057.2B - 3.0	840.1.073.2B - 3.8
840.1.042.2B - 2.25	840.1.058.2B - 3.05	840.1.074.2B - 3.85
840.1.043.2B - 2.3	840.1.059.2B - 3.1	840.1.075.2B - 3.9
840.1.044.2B - 2.35	840.1.060.2B - 3.15	840.1.076.2B - 3.95
840.1.045.2B - 2.4	840.1.061.2B - 3.2	840.1.077.2B - 4.0
840.1.046.2B - 2.45	840.1.062.2B - 3.25	840.1.078.2B - 4.05
840.1.047.2B - 2.5	840.1.063.2B - 3.3	840.1.079.2B - 4.1
840.1.048.2B - 2.55	840.1.064.2B - 3.35	840.1.080.2B - 4.15
840.1.049.2B - 2.6	840.1.065.2B - 3.4	840.1.081.2B - 4.2
840.1.050.2B - 2.65	840.1.066.2B - 3.45	840.1.082.2B - 4.25

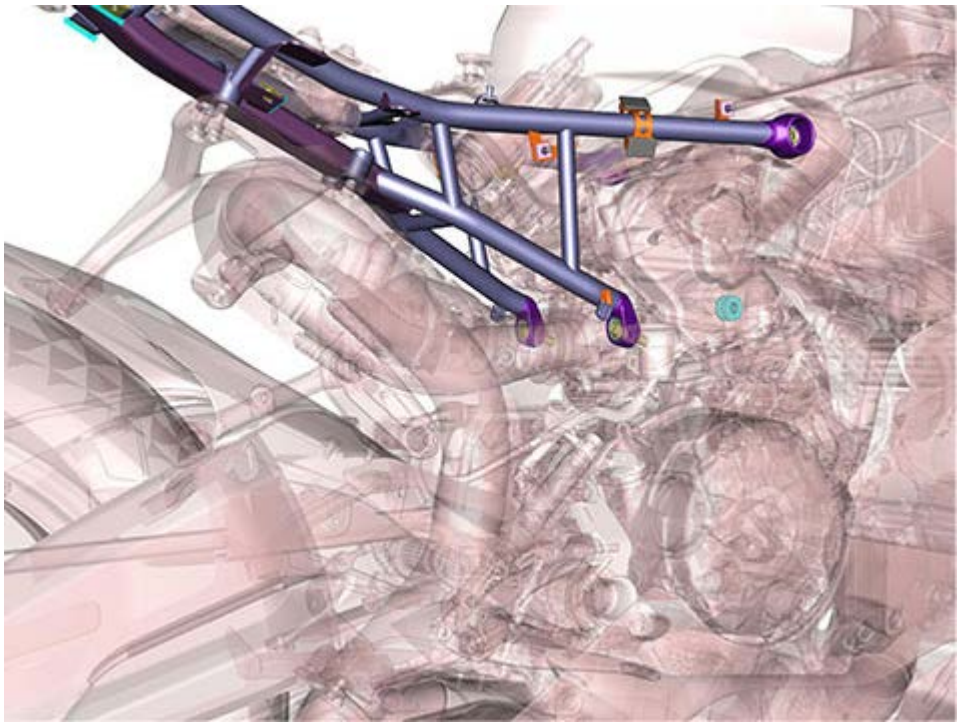
840.1.051.2B - 2.7	840.1.067.2B - 3.5	840.1.083.2B - 4.3
840.1.052.2B - 2.75	840.1.068.2B - 3.55	840.1.084.2B - 4.35
840.1.053.2B - 2.8	840.1.069.2B - 3.6	840.1.085.2B - 4.4
840.1.054.2B - 2.85	840.1.070.2B - 3.65	840.1.086.2B - 4.45
840.1.055.2B - 2.9	840.1.071.2B - 3.7	840.1.087.2B - 4.5
840.1.056.2B - 2.95	840.1.072.2B - 3.75	

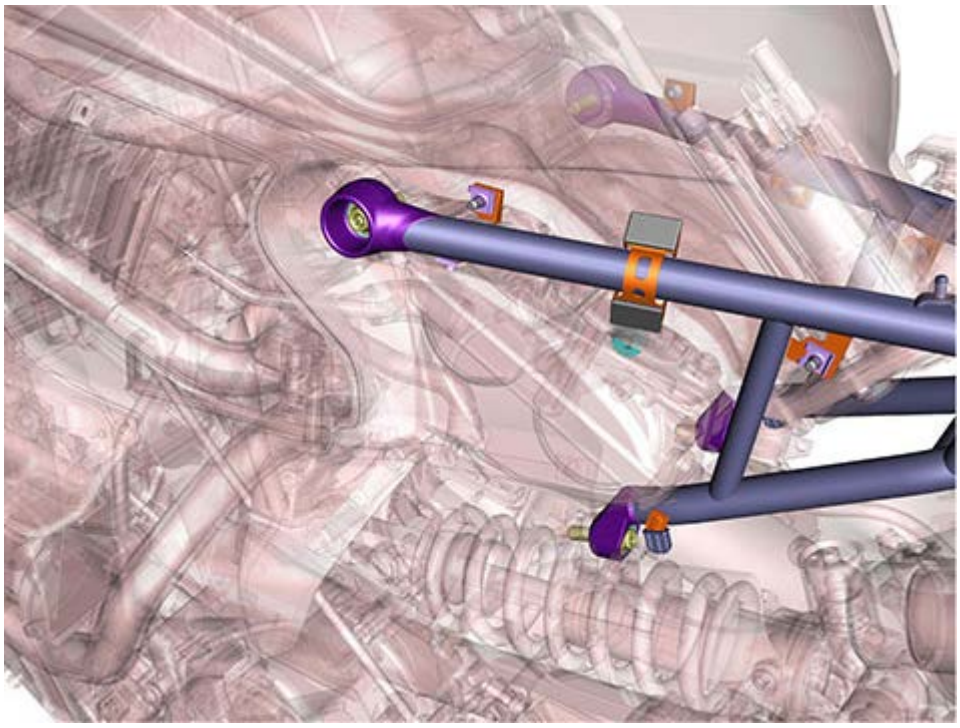
Refit head covers and lateral protections as explained under "Refitting the camshafts".

Apply the recommended grease to the screws (1) and (2).
Lower the rear subframe, and fasten it by starting the lower screws.
Tighten screws (1) to a torque of 22 Nm and screws (2) to a torque of 28 Nm.







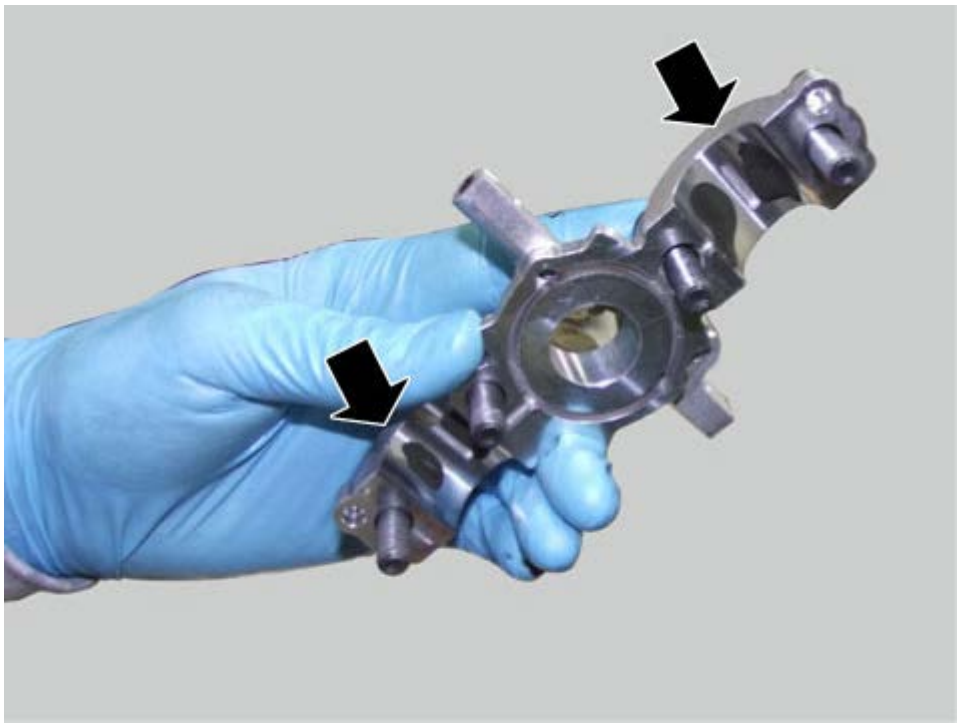


Refit the radiator unit (Refitting the water radiator).
Refit the fuel tank (Refitting the fuel tank).
Refit both fairings (Refitting the side fairings).
Refit the rider seat (Refitting the rider seat).

Check of the camshafts and supports

Ensure that the cam working surfaces are free from scoring, grooves and steps.
Worn cams often cause wrong timing resulting in poor engine performance.
Set camshaft between centres and use two dial gauges to check for any deviation in the indicated areas.
Service limit: **0.1** mm.

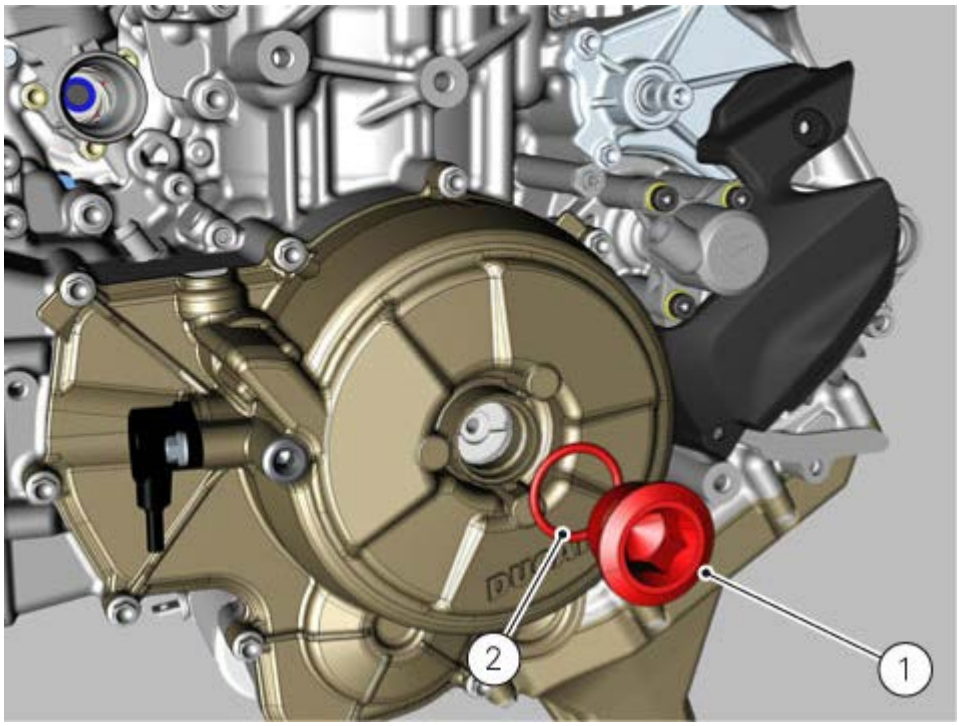
Visually inspect the camshaft tracks for scoring and abnormal wear.
If any of the above defects are found, the camshaft should be renewed. If you find scoring or excessive wear, check the operation of the engine lubrication circuit.



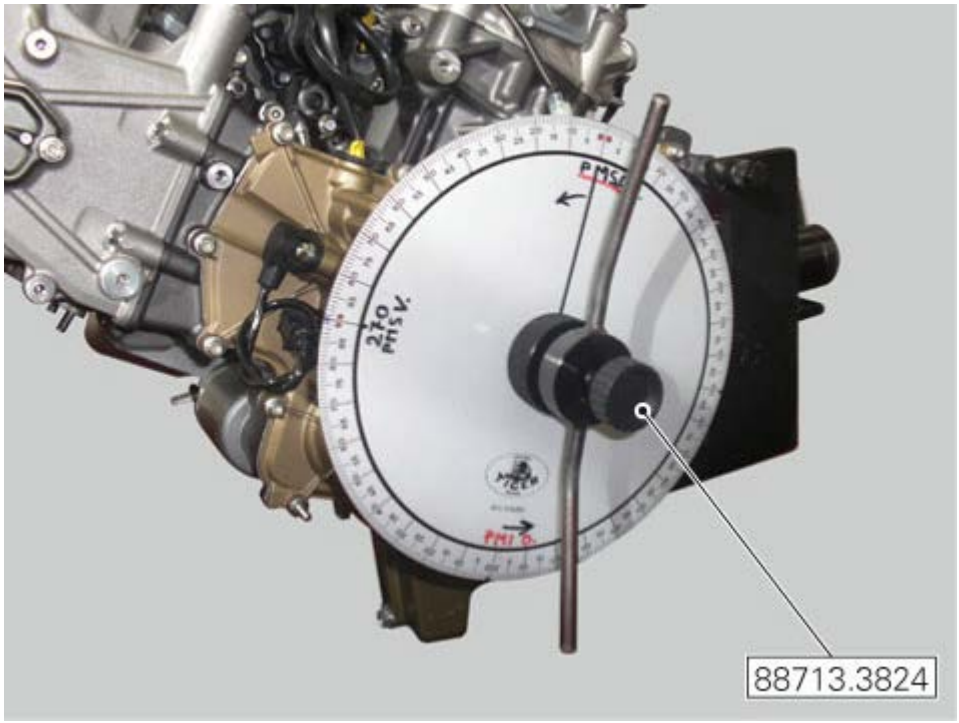
Crankshaft positioning at TDC in the combustion stage

Remove the head covers as described under Removing the camshafts.

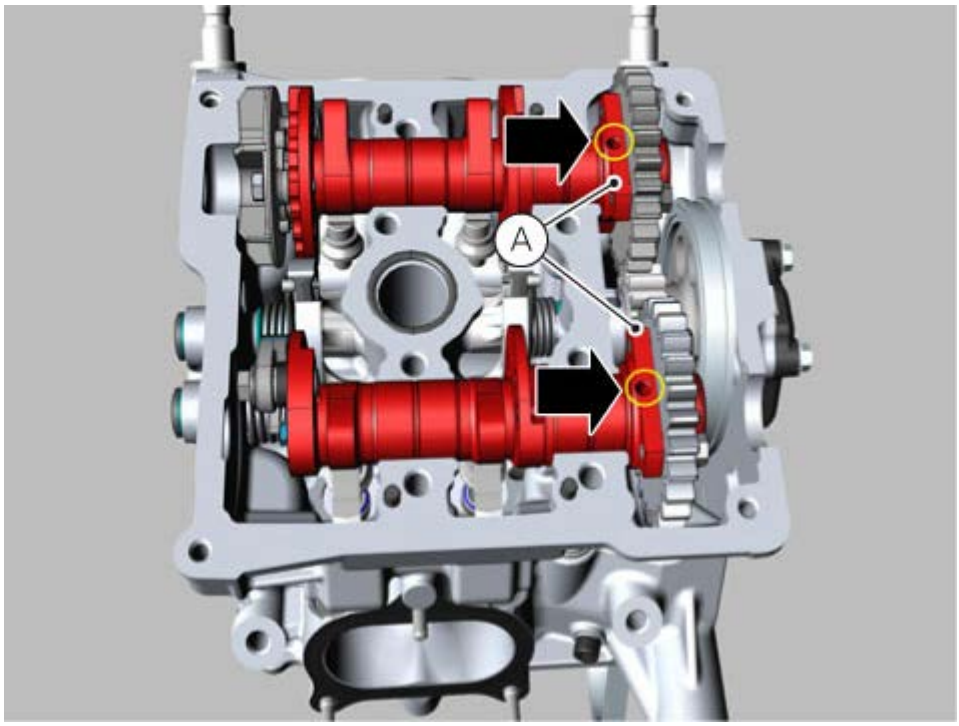
Remove the timing inspection cover (1), with seal (2), from generator cover, paying attention since a small quantity of oil could spill out (and must be topped up).

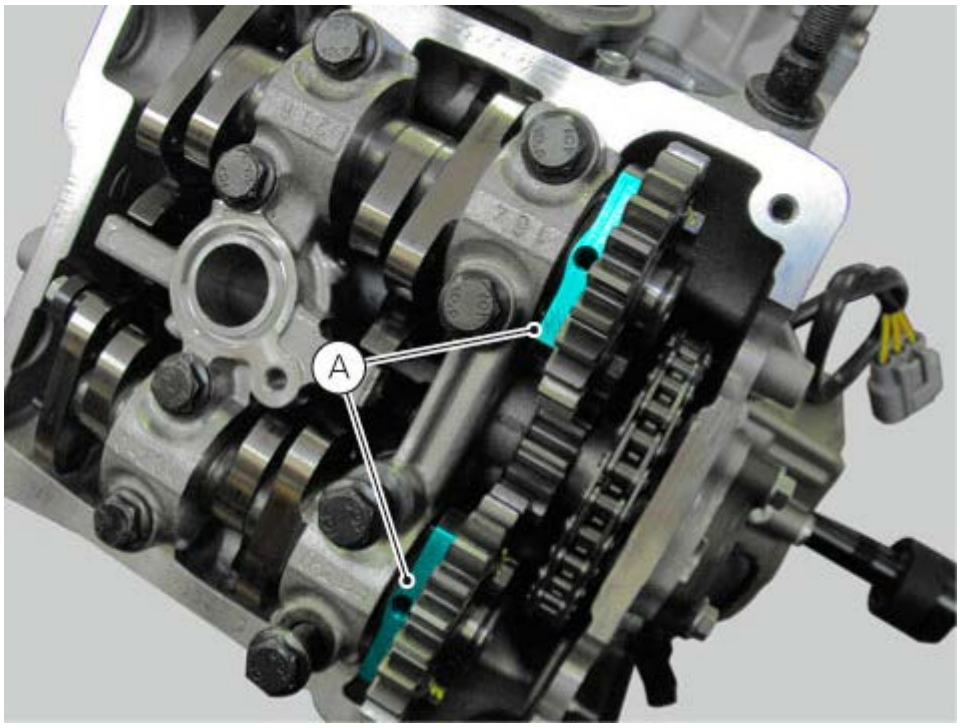


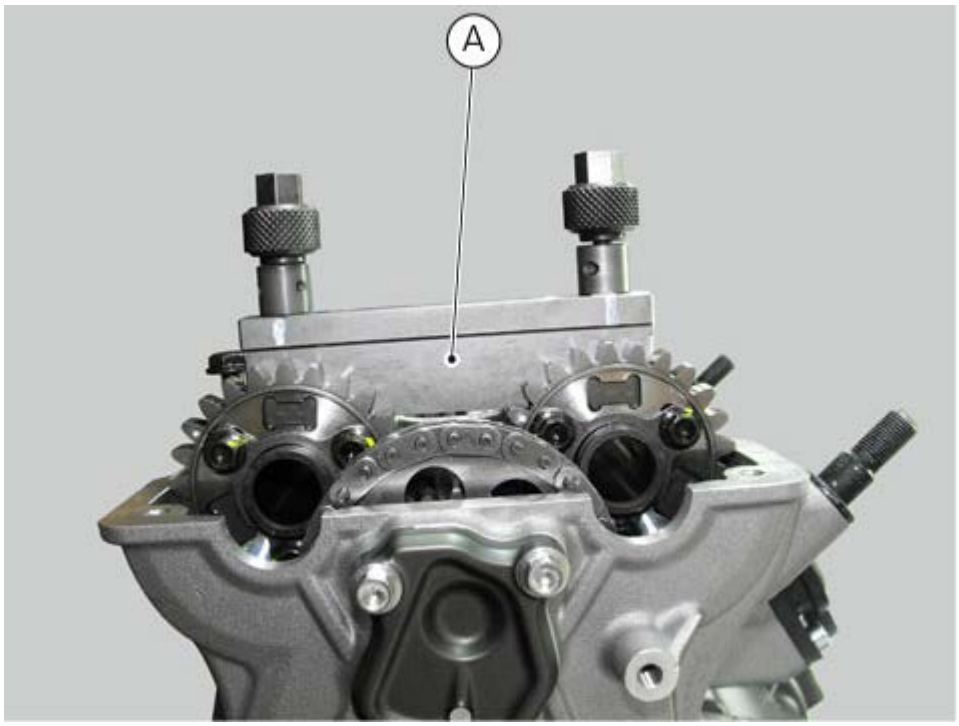
Fit the tool with partition for checking the timing part no. **88713.3824**.



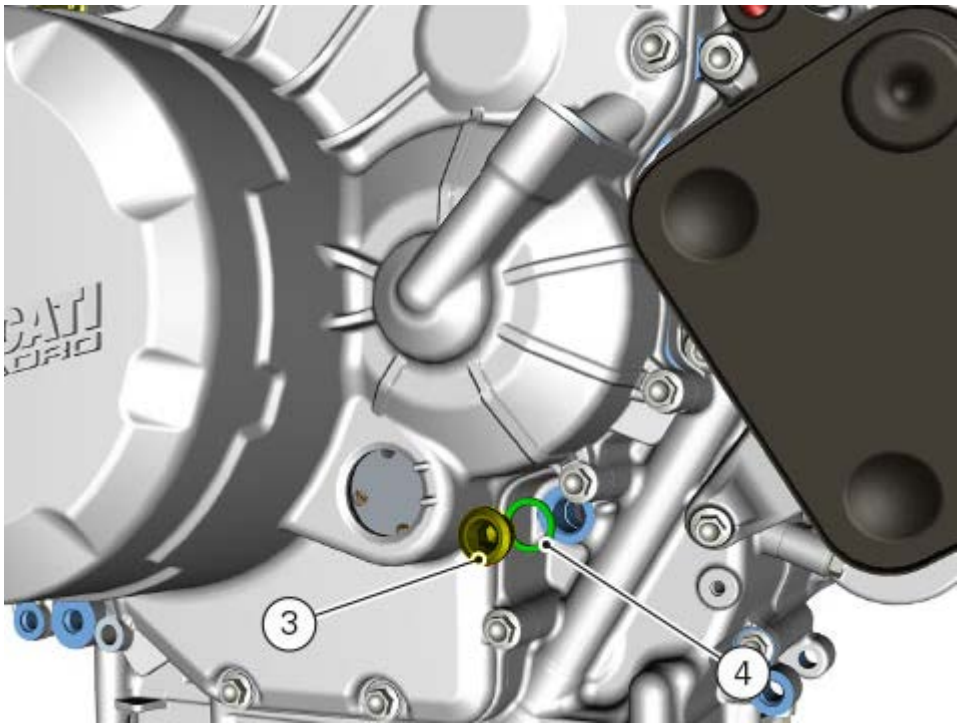
Turn the crankshaft in the engine rotation sense until the valves are in rest position (reference surfaces (A) on camshafts are not aligned).
Fit the cam blocking tool A: **88765.1622** by screwing and tightening the knobs in the camshaft holes.

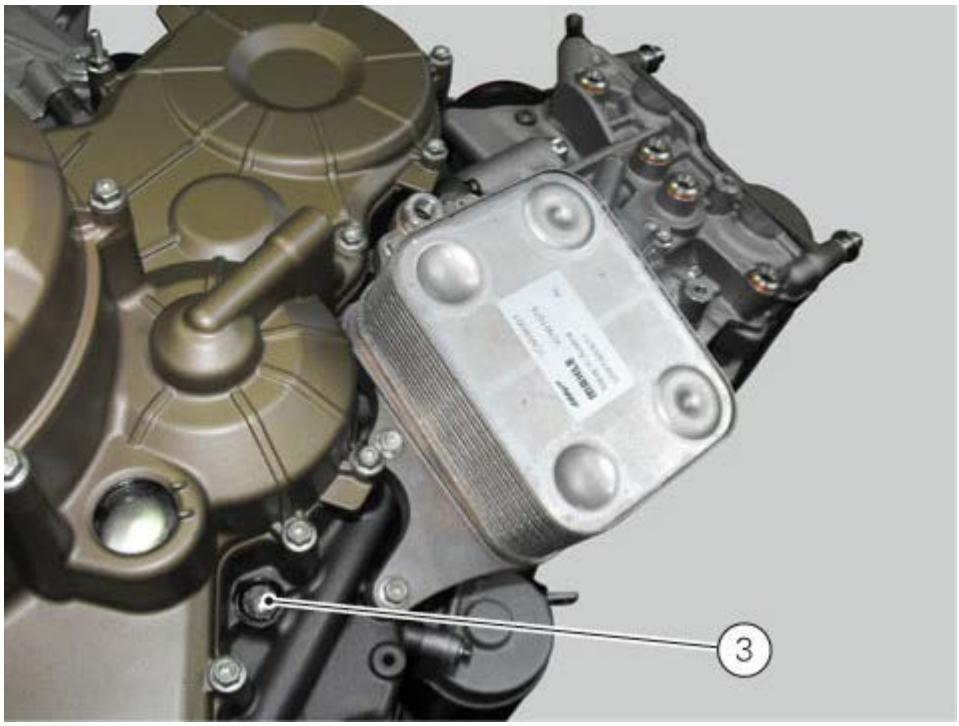

A


A

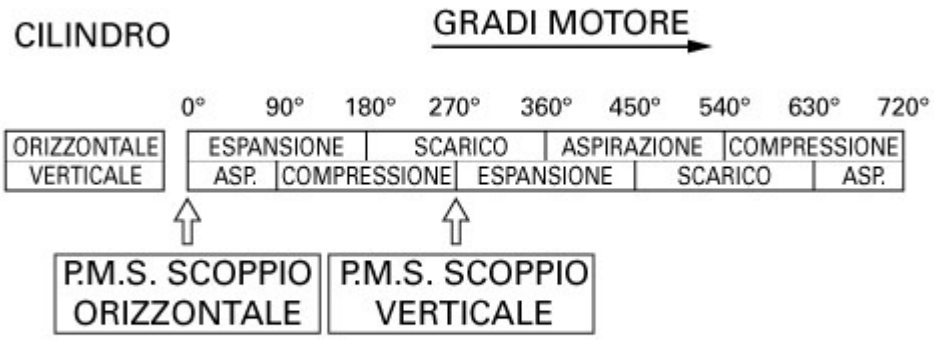


On clutch side, undo screw (3), with washer (4), used as a reference to lock crankshaft and then lock crankshaft with tool part no. **88713.3500**.





The chart below represents the sequence of engine stages.

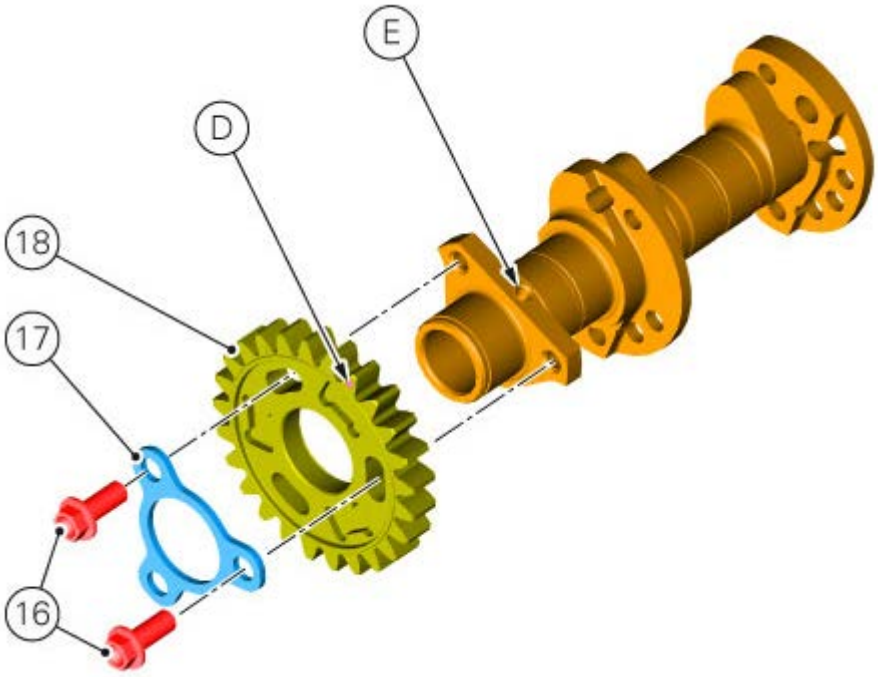

CILINDRO
GRADI MOTORE
0°
90°
180°
270°
360°
450°
540°
630°
720°
ORIZZONTALE
VERTICALE
ESPANSIONE
SCARICO
ASPIRAZIONE
COMPRESSIONE
ASP.
COMPRESSIONE
ESPANSIONE
SCARICO
ASP.
P.M.S. SCOPPIO ORIZZONTALE
P.M.S. SCOPPIO VERTICALE

Refitting the camshafts

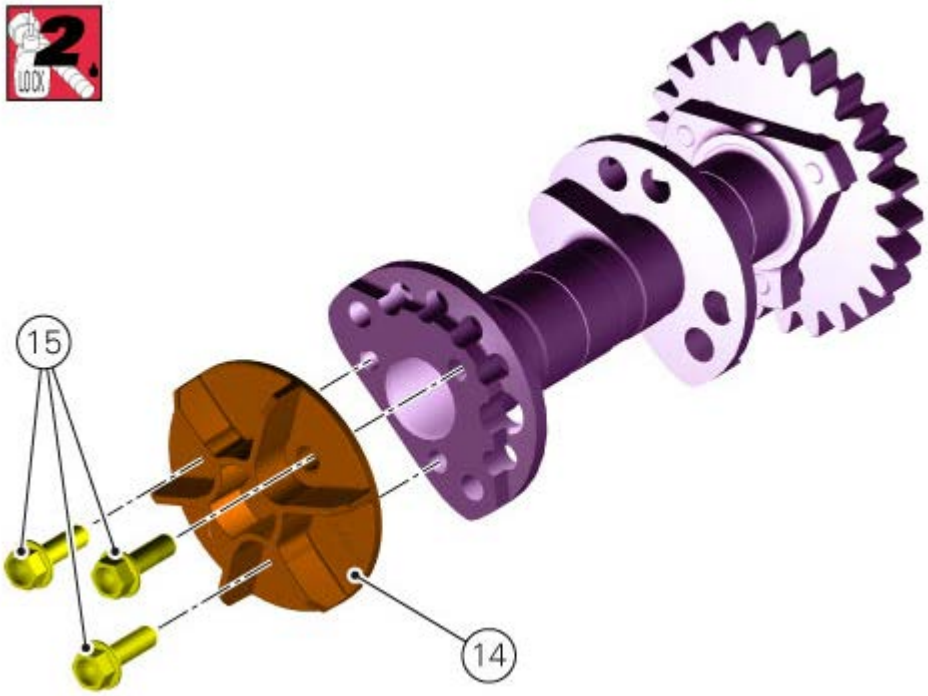
The removal procedure of camshafts from cylinder heads can be carried out even with engine on the vehicle.

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

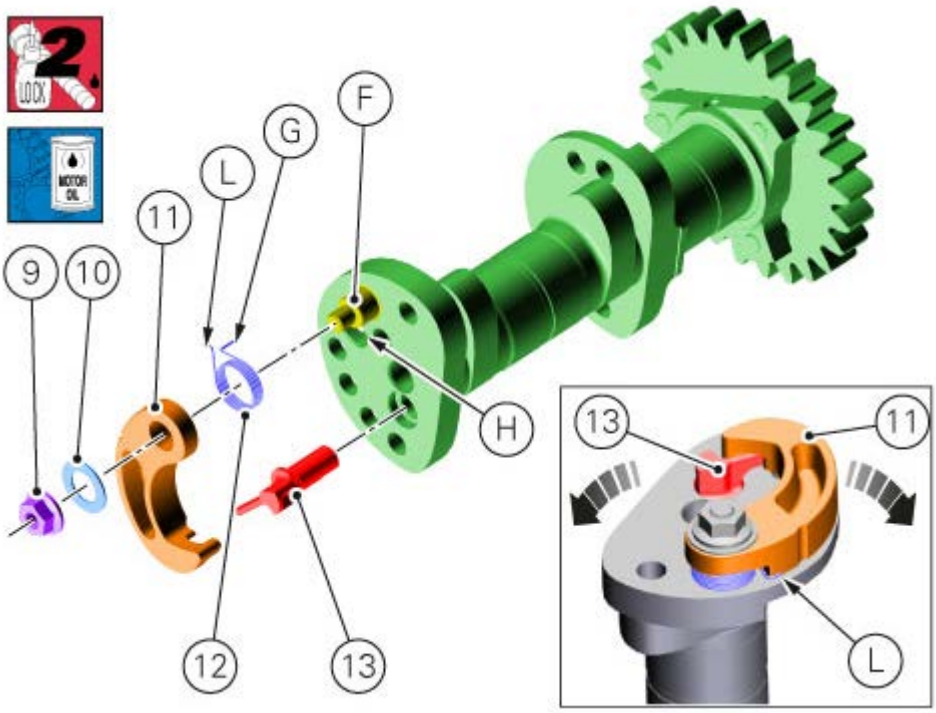
Fit gears (18) with engraved point (D) facing outwards and near surface (E) of the camshaft.
Fit plate (17) by starting screws (16) fully home.
Loosen screws (16) by approximately 90°.



The camshaft of the intake side vertical head features impeller (14).
Apply specified threadlocker on the screw thread (15).
Fit impeller (14) on the camshaft.
Start screws (15) to a torque of 8 Nm (Min. 7 Nm – Max. 9 Nm).
After tightening, remove any excess of threadlocker.

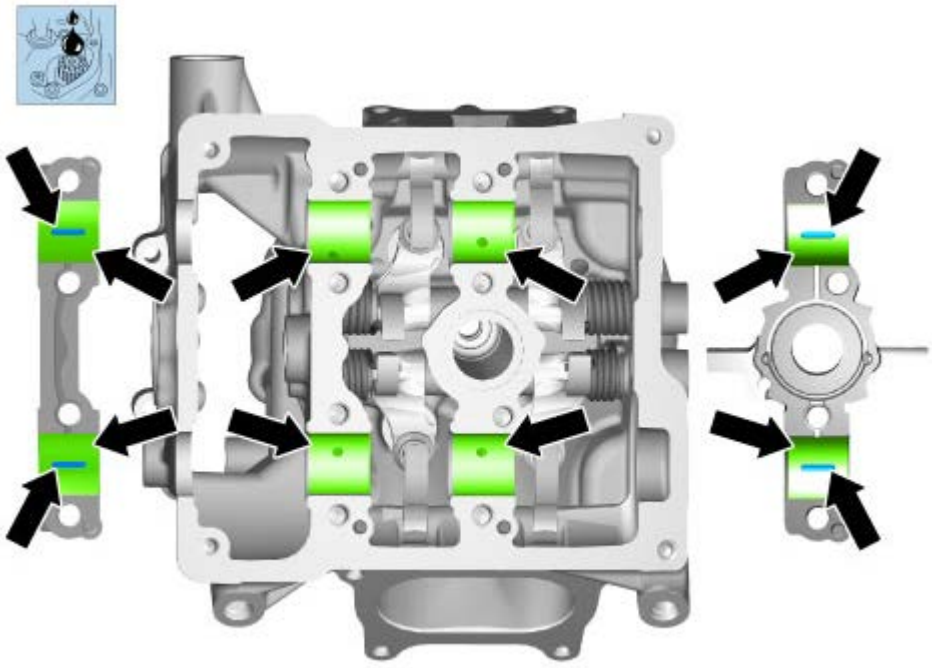


The shafts of both heads on the exhaust side feature de-compressor system (11).
Apply specified threadlocker on the pin thread (F).
Tighten the pin on the shaft to 8 Nm (Min. 7 Nm – Max. 9 Nm).
After tightening, remove any excess of threadlocker.
Use engine oil to lubricate the de-compressor system roller (13) and insert on the camshaft.
Fit spring (12) in pin (F) by inserting tooth (G) in camshaft hole (H).
Use engine oil to lubricate the de-compressor system groove (11).
Insert de-compressor system (11) on pin (F) by pre-loading spring (12) so that the other tooth (L) of the spring is against the outer surface of the de-compressor system (11).
Fit washer (10) on pin (F) and fix the de-compressor system (11) by fitting nut (9) on the pin with specified threadlocker.
Perform the operation test of the de-compressor system (11) that must slide freely on the de-compressor system roller (13) in both directions.



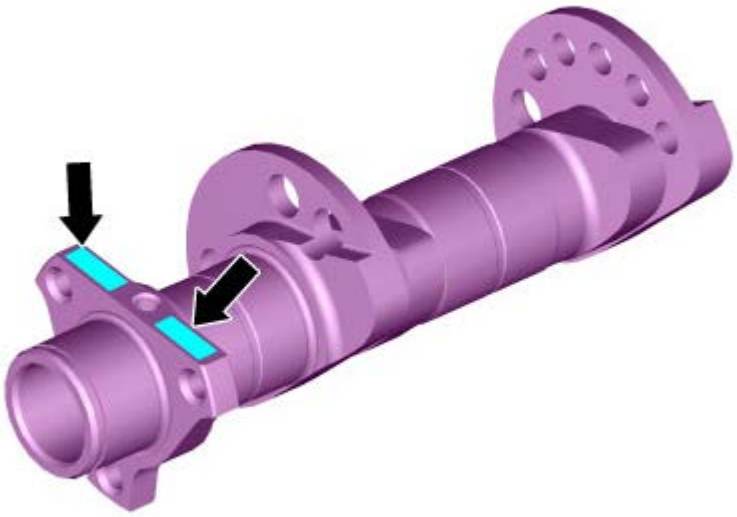
The described operations refer to a vertical head. These operations also apply to the horizontal head.

Lubricate the shaft seats on heads and cam caps as well as the oilways on cam caps with specified lubricant.

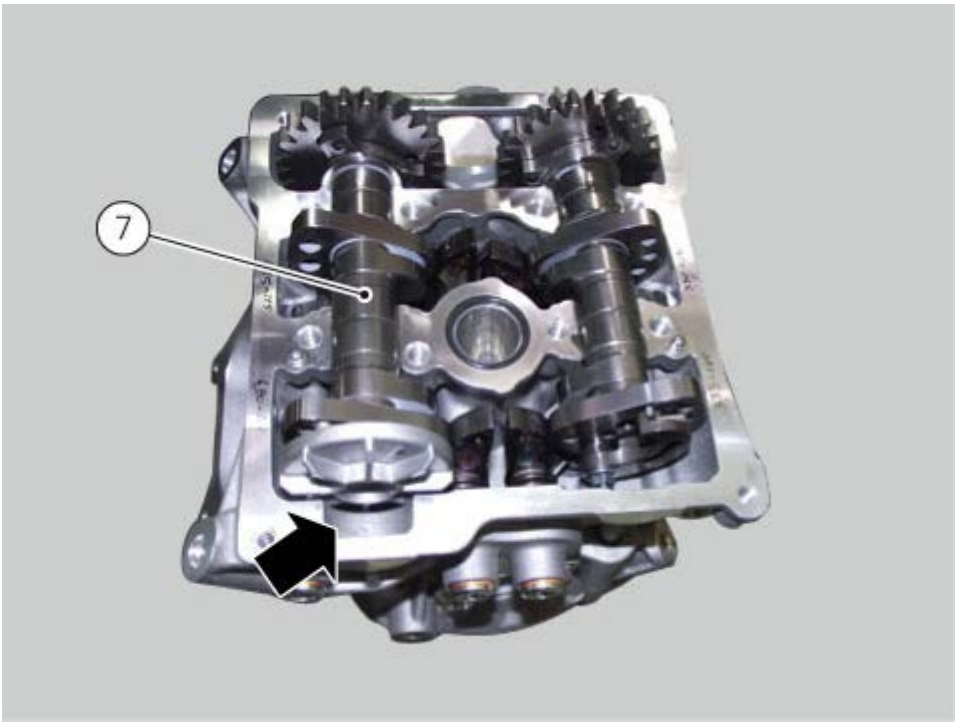


When positioning the camshafts on the heads, pay attention to the following aspects.

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 camshafts and support surfaces, working on a flat surface.

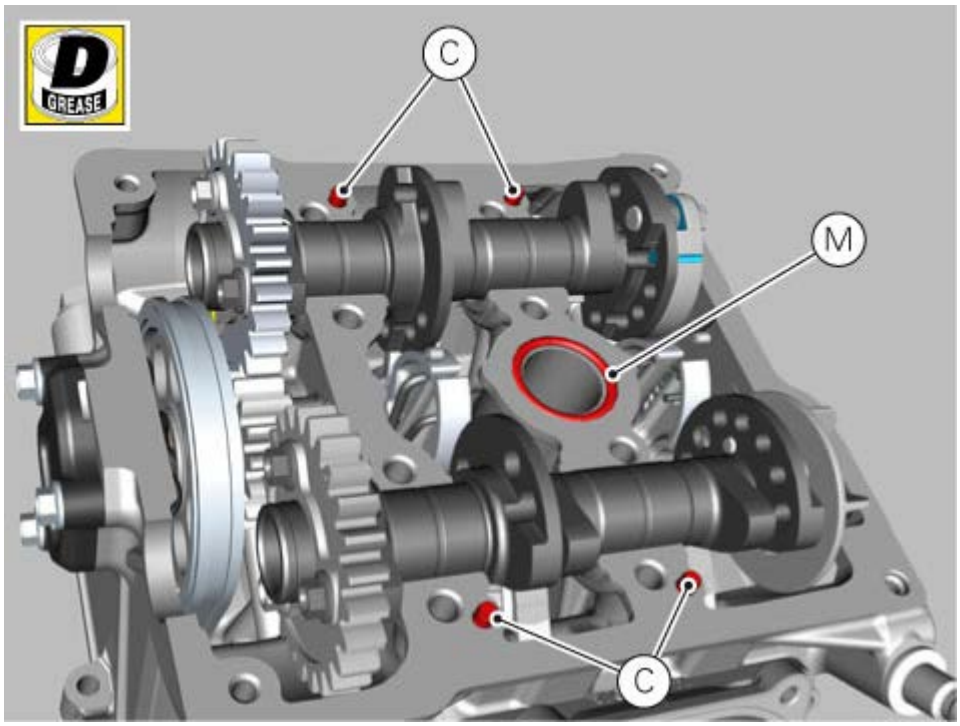


Camshaft (7) with impeller is positioned only on the exhaust side vertical head.
Position it with impeller facing towards the recess on the head.

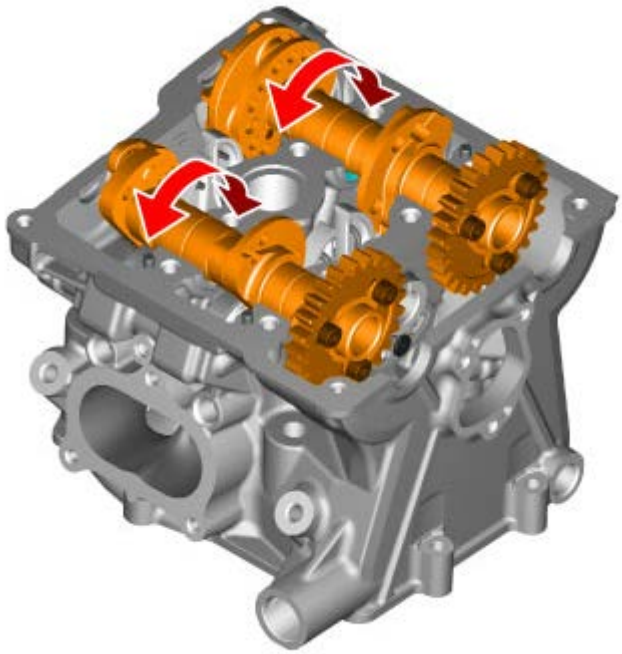


Both heads, on the exhaust side, the camshafts are fitted with decompressor.

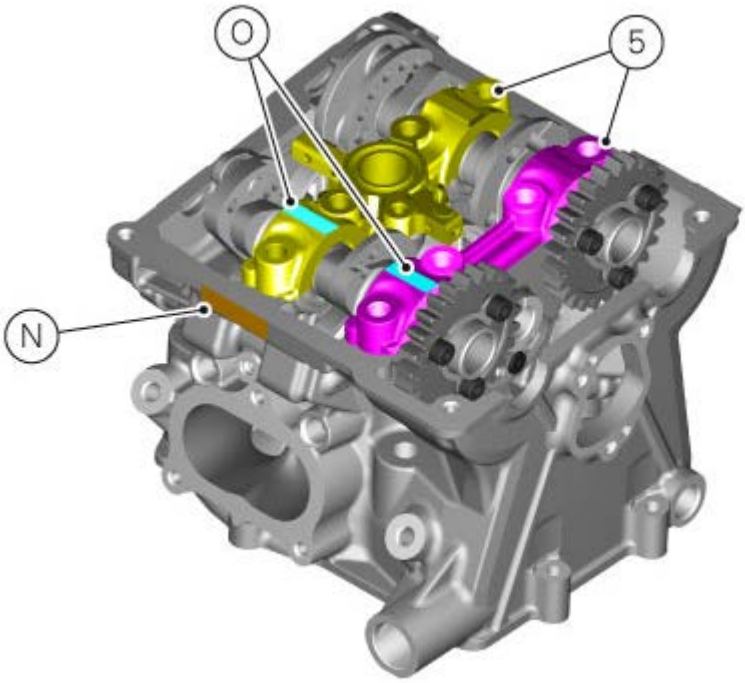
Check that the centring dowels (C) are present.
Slightly lubricate O-ring (M) with specified grease and fit it in its seat on the head.



Fit camshafts on the head and turn them to evenly lubricate all mating surfaces.

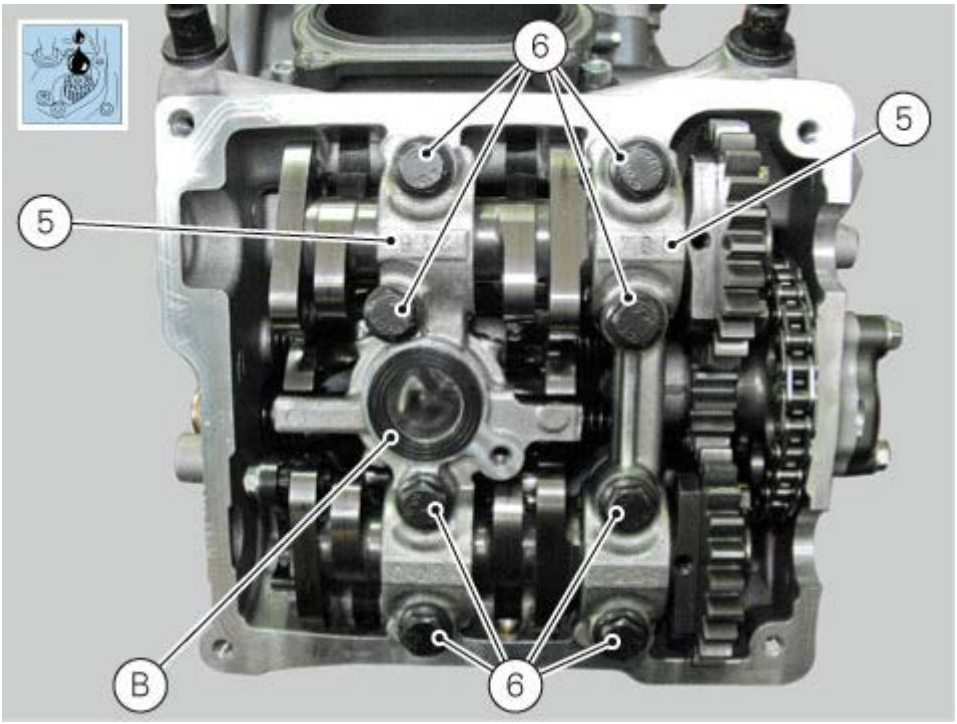


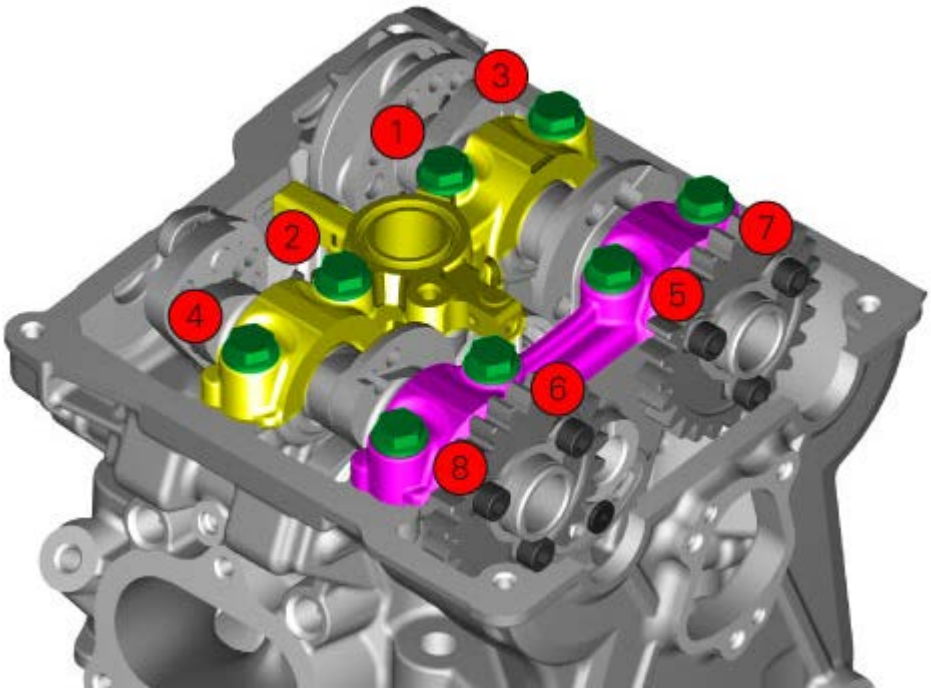
Insert camshaft supports (5) perfectly home on the head.
Check that the progressive number stamped on area (N) of the head matches with that on area (O) of camshaft supports (5).
Settle the caps.



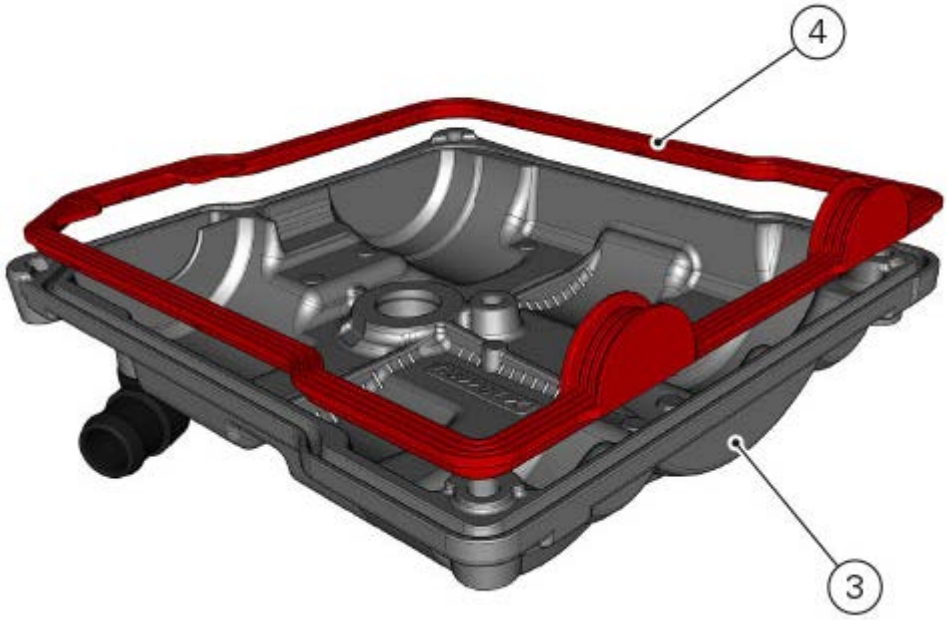
Lubricate screws (6) with MOLYCOTE M55 PLUS.

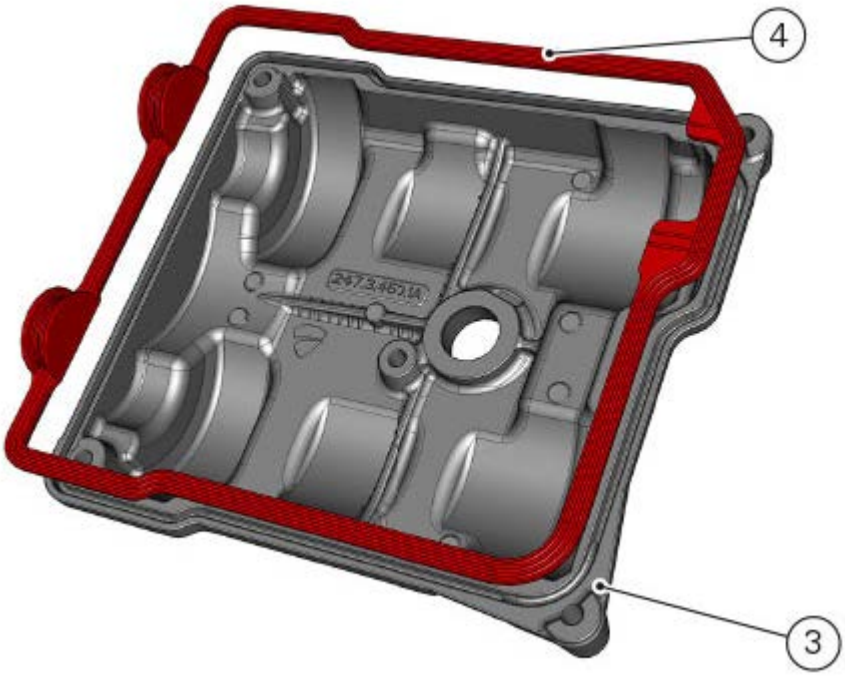
Refit seal (B) on the spark plug recess.
Pre-tighten screws (6) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm), following the sequence indicated in the figure.
Then tighten screws (6) to a torque of 22.5 Nm (Min. 21 Nm - Max. 25 Nm), following the sequence indicated in the figure.
Turn the camshafts by hand to check that they rotate freely.





Fit seals (4) on head covers (3) laying it inside the groove on the cover.
Make sure seals (4) are fully home inside the covers (3) and there is no section outside the groove.



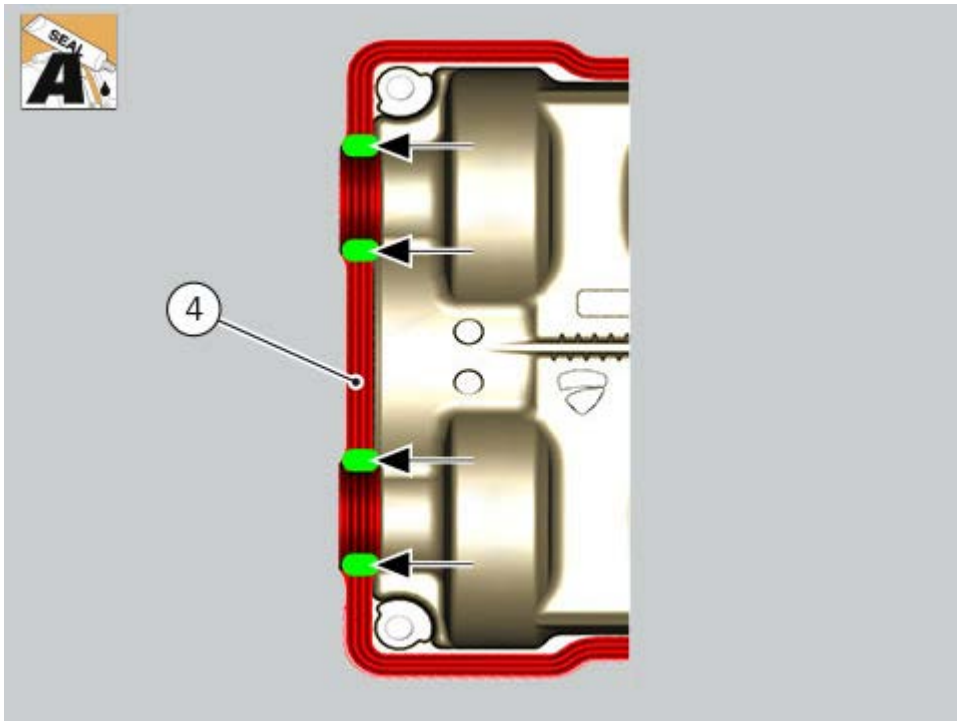


Apply specified sealant on the indicated points of the head cover seals (4)

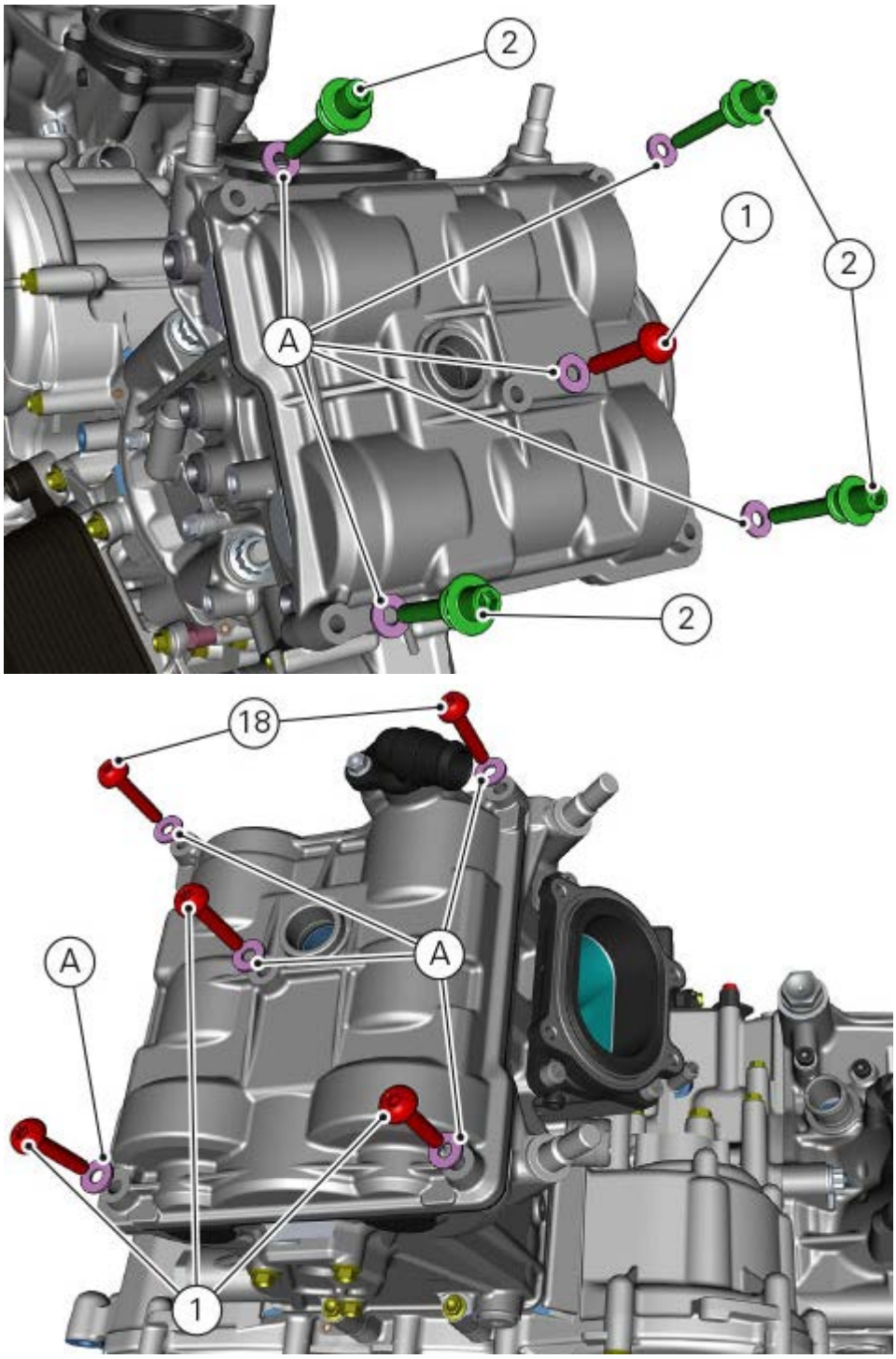
Note
The sealant bead must indicatively have a thickness of 1.5 mm.

Warning
An excessive quantity of sealant may cause the internal components of the valve cover to block.

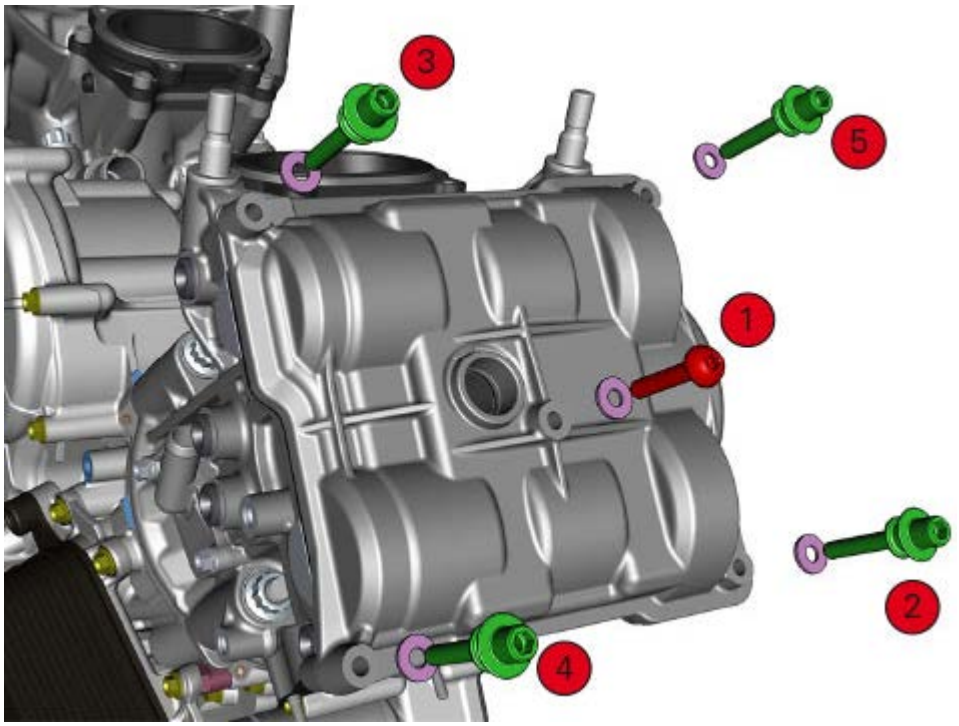
Important
Fit valve covers within 5 minutes form sealant application.

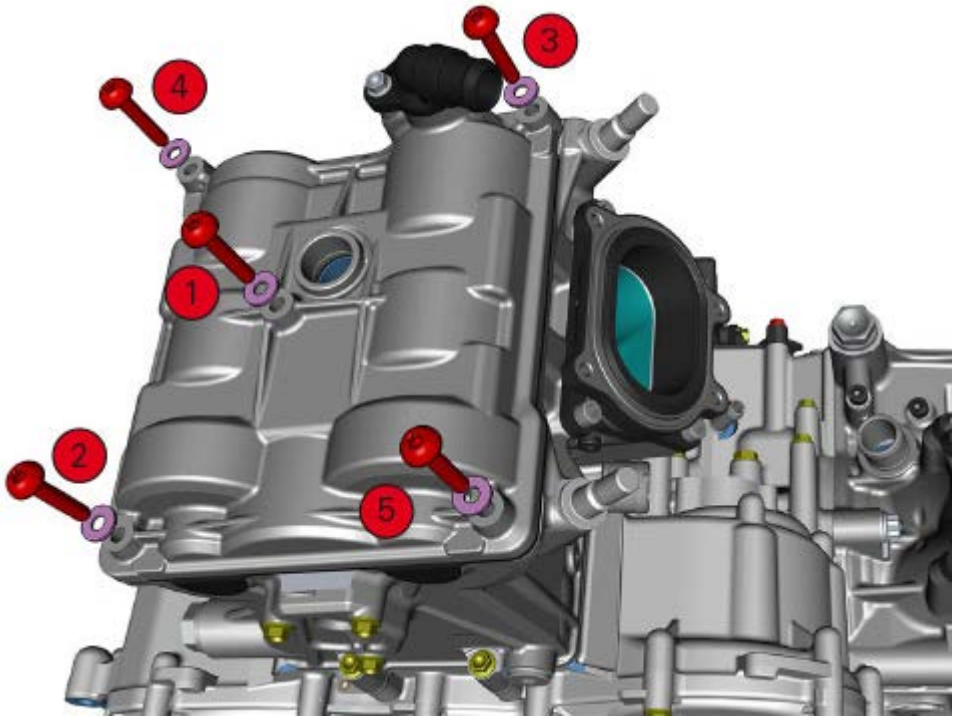


Place head covers (3) fit seals (4) on the heads making sure they are perfectly in seat.
Apply specified threadlocker on special screws (2) of the horizontal head cover.
Start screws (1), (2) and (18) with the relevant washers (A) to fix the head covers.
Start special screws (2) on the vertical head exhaust side.



Tighten the screws (1), (2) and (18) to a torque of 10 Nm (Min. 9 Nm – Max. 11 Nm), respecting the indicated sequence.





Refit the spark plugs (Replacing the spark plugs).
Refit the water radiator unit (Refitting the water radiators).
Refit the tank (Refitting the fuel tank).
Refit the rider seat (Refitting the rider seat).

Removing the camshafts

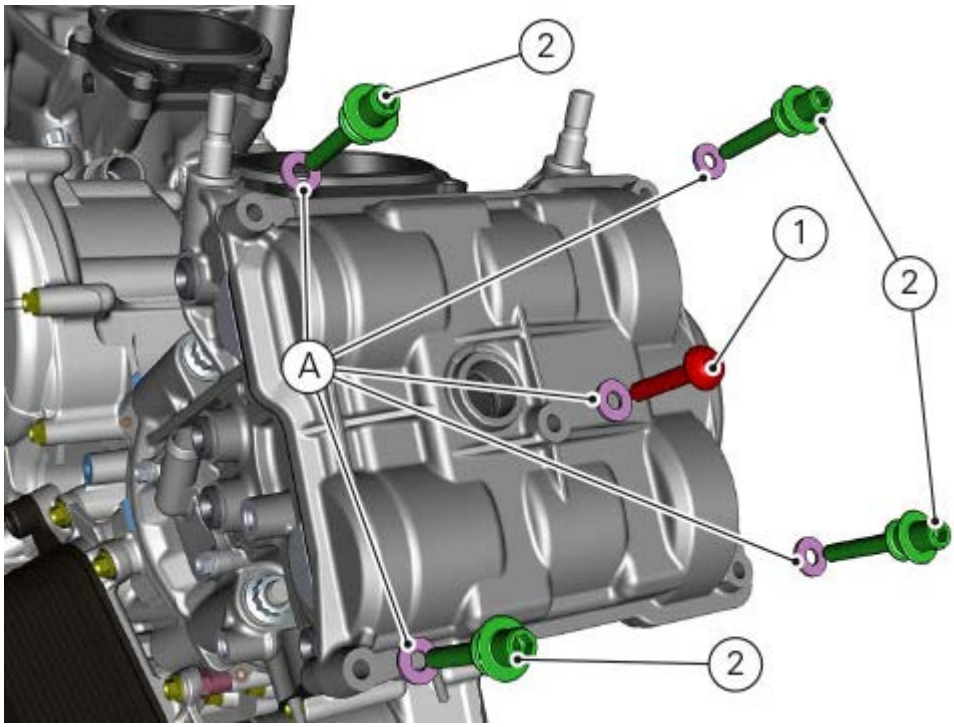
The removal procedure of camshafts from cylinder heads can be carried out even with engine on the vehicle.

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

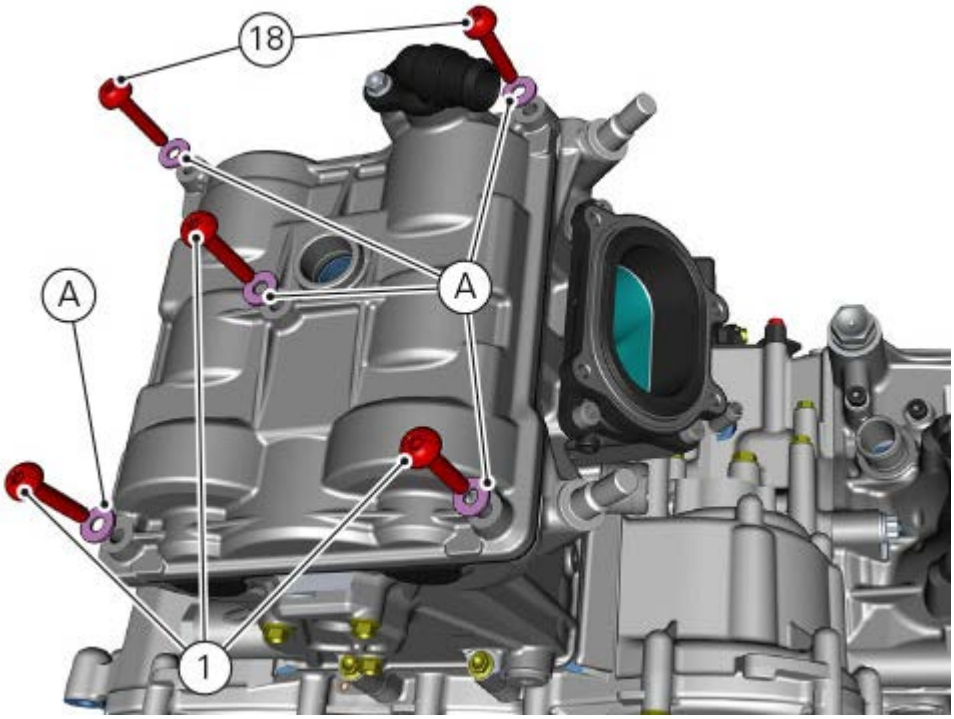
Remove the following parts to reach the vertical head:
Remove the rider seat (Removing the rider seat).
Remove the fuel tank (Removing the fuel tank).
Remove the spark plug (Replacing the spark plugs).

Remove the following parts to reach the horizontal head:
Remove the water radiator unit (Removing the water radiator).

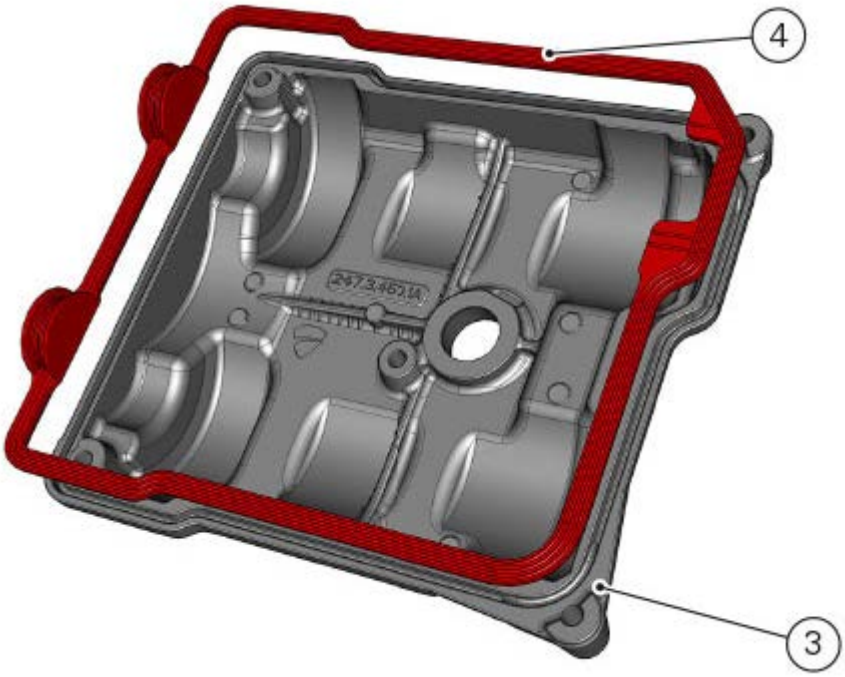
For the horizontal head, loosen the special screws (2) and screw (1) that fix the cover.
Collect washers (A).

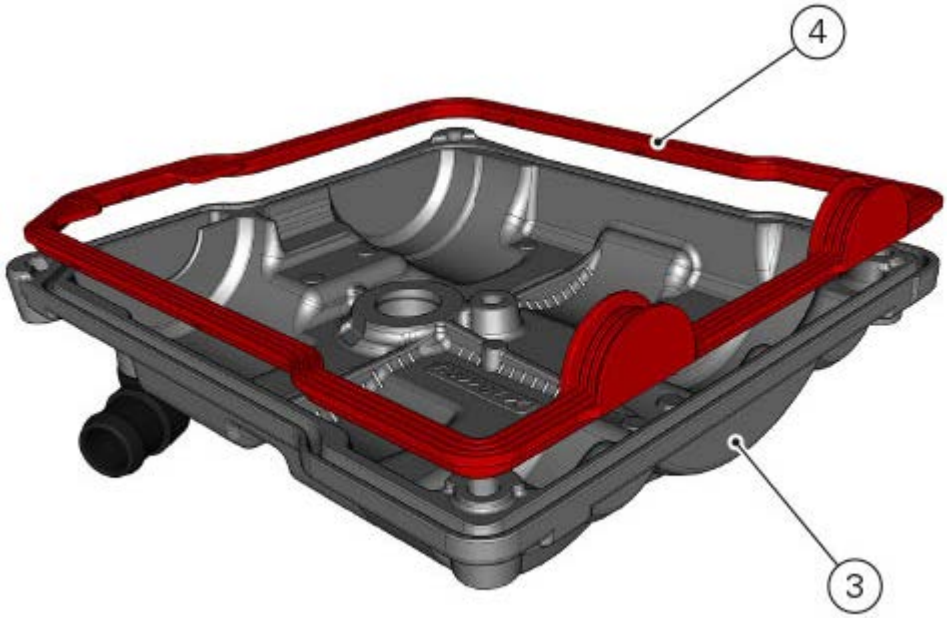


For the vertical head, loosen screws (1) and special screws (18) and collect seals (A).

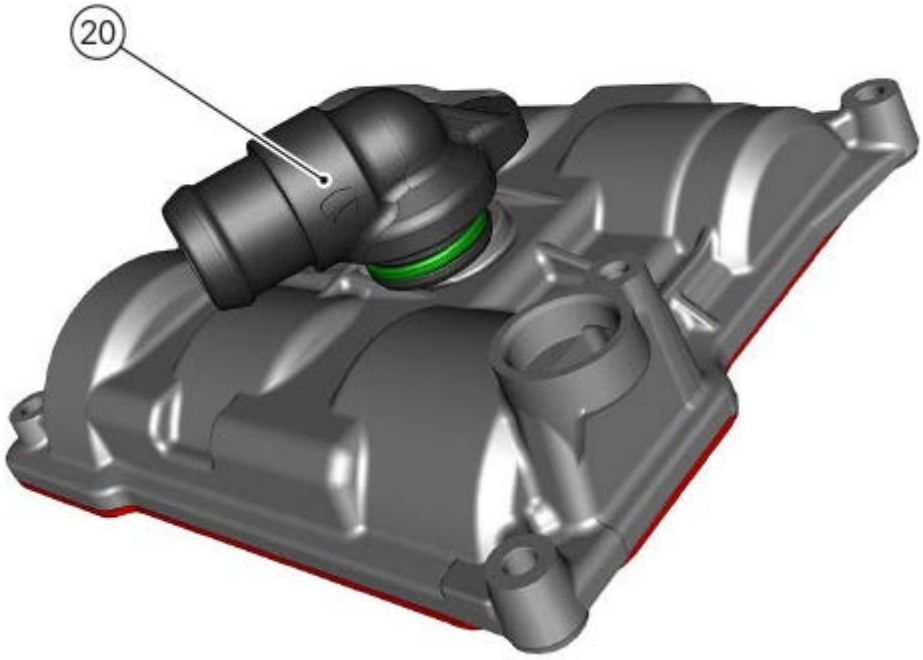


Remove the head covers (3) and collect seals (4).



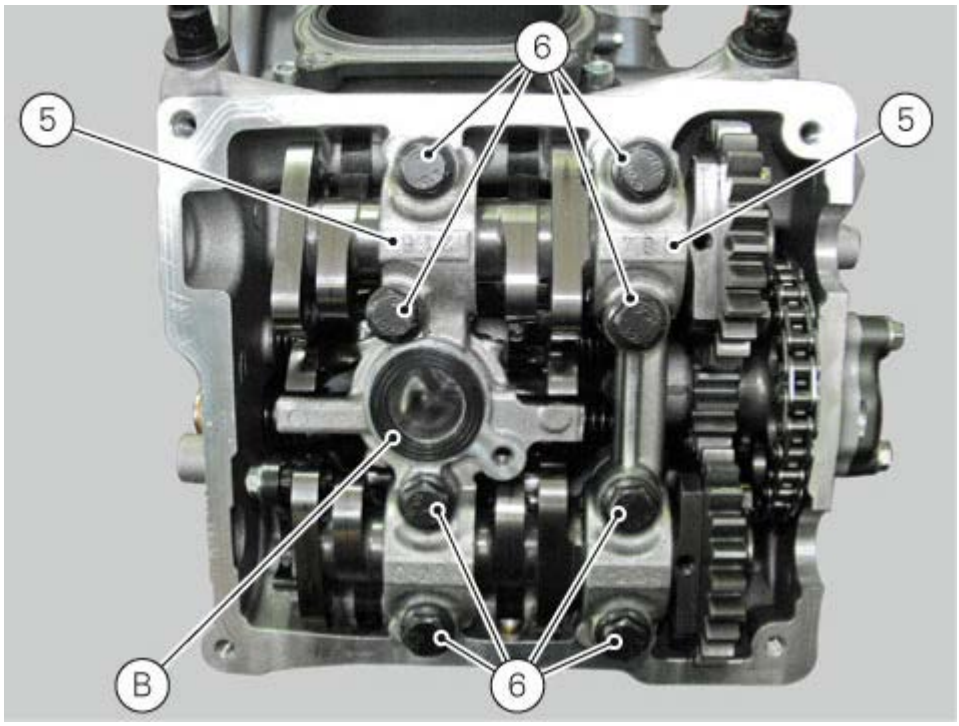


Collect Blow-by union (20).



Set the crankshaft at TDC in the combustion stage (Crankshaft positioning at TDC in the combustion stage).

Remove seal (B) on the spark plug recess.
Undo the screws (6) securing the camshaft supports.
Withdraw the camshaft supports (5) straight out from the cylinder head, taking care not to damage the machined faces and centring dowels (C).
Remove the vertical intake camshaft (7) and vertical exhaust camshaft (8) from the head.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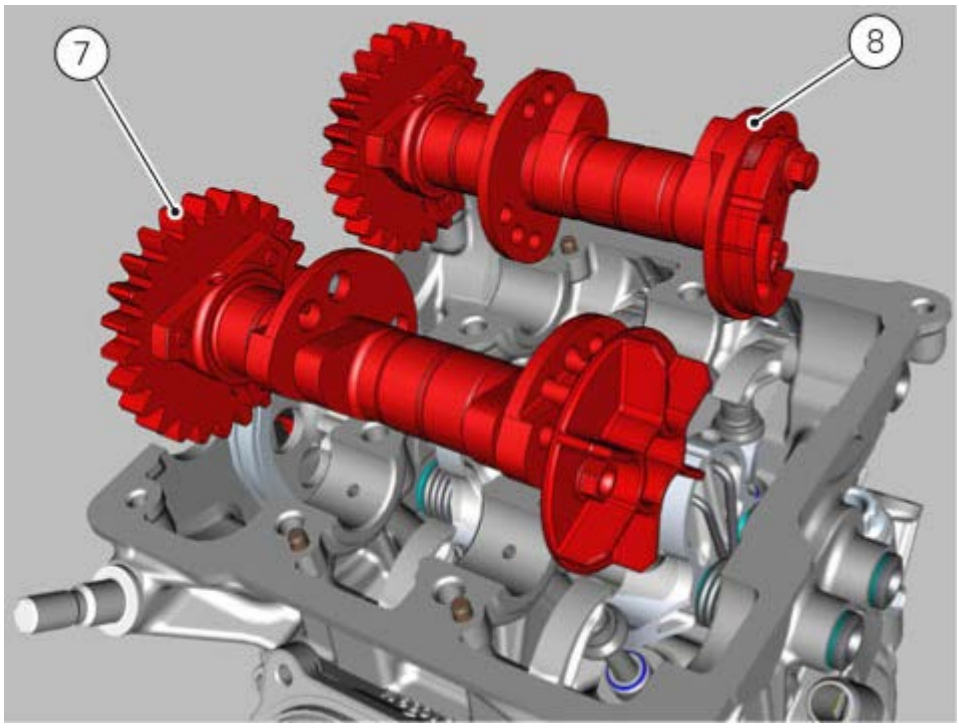
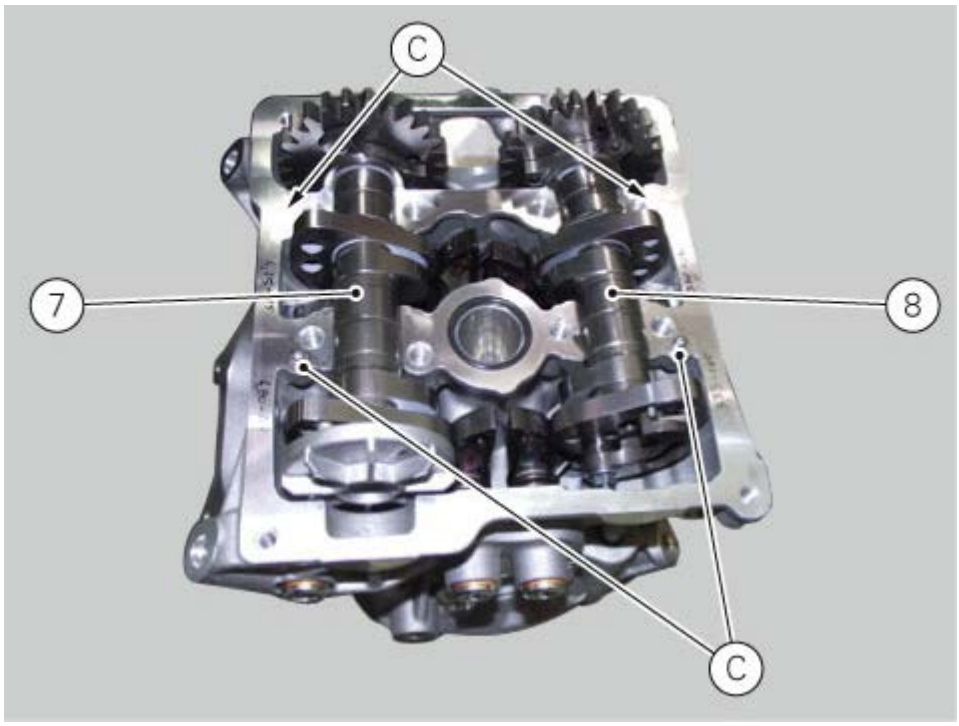
5
5
B
6

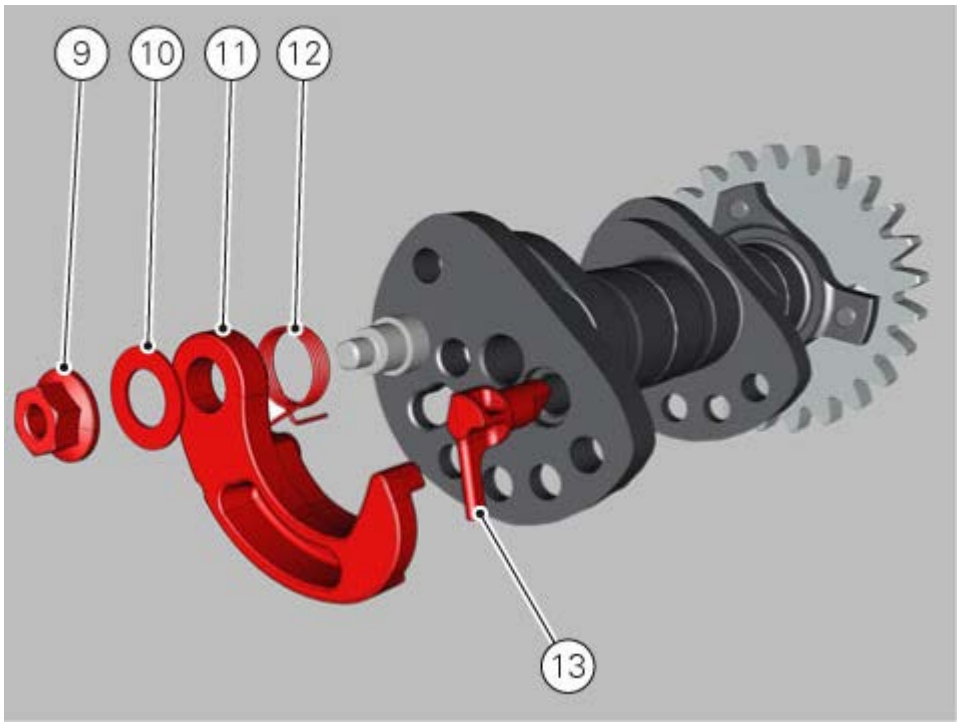

7
8



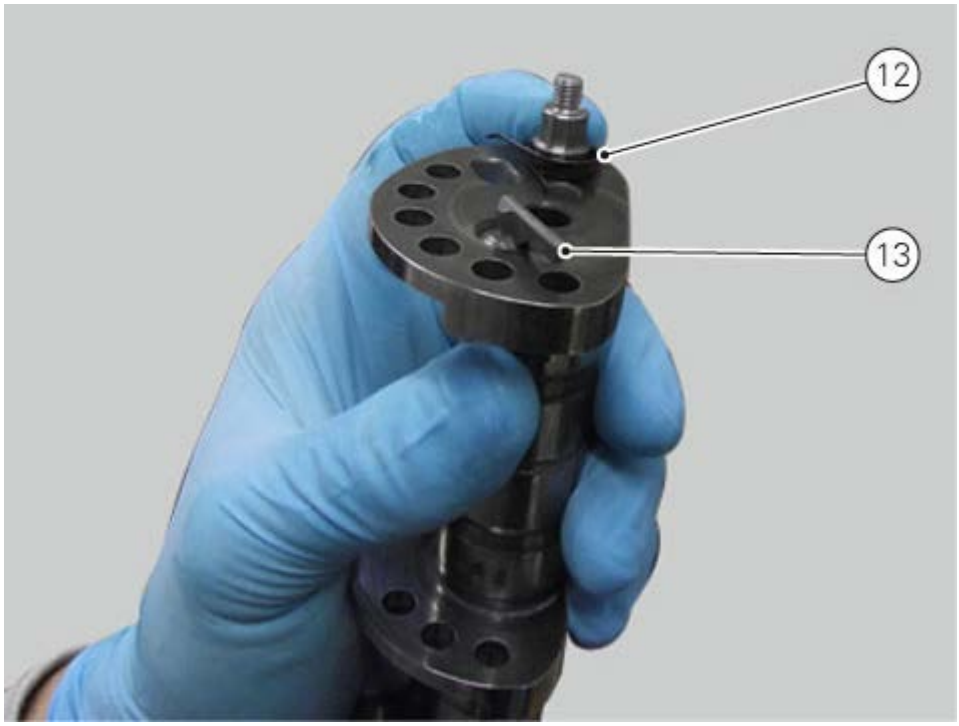
Warning
The opening shims are no longer retained and could fall inside the engine.

Repeat the same procedure for the other cylinder head.

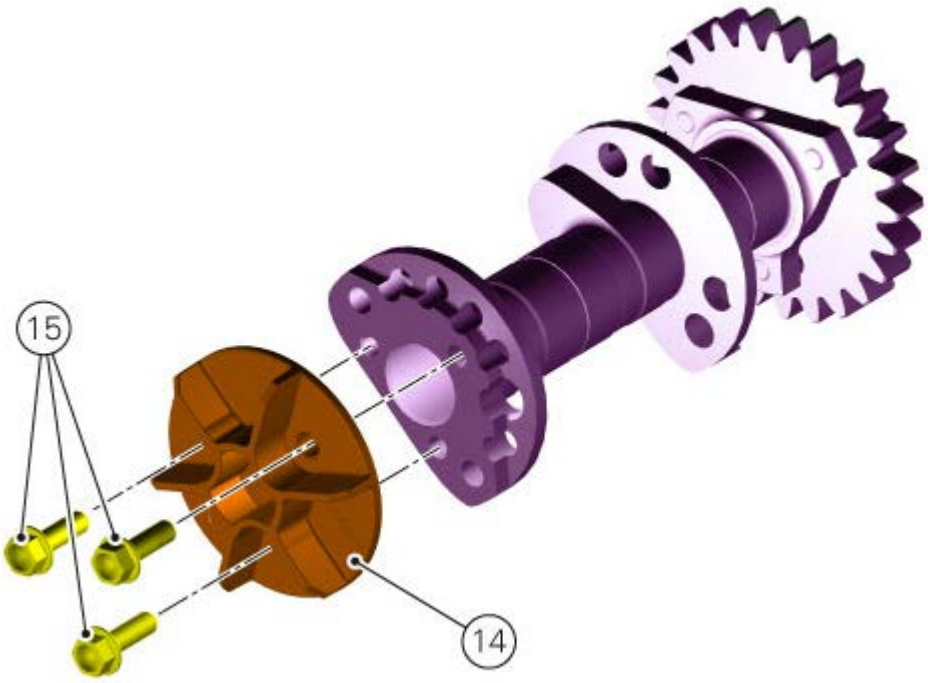
The camshafts of both heads, on exhaust side, feature a decompressor (11). To remove it, proceed as follows.
Loosen nut (9), remove washer (10).



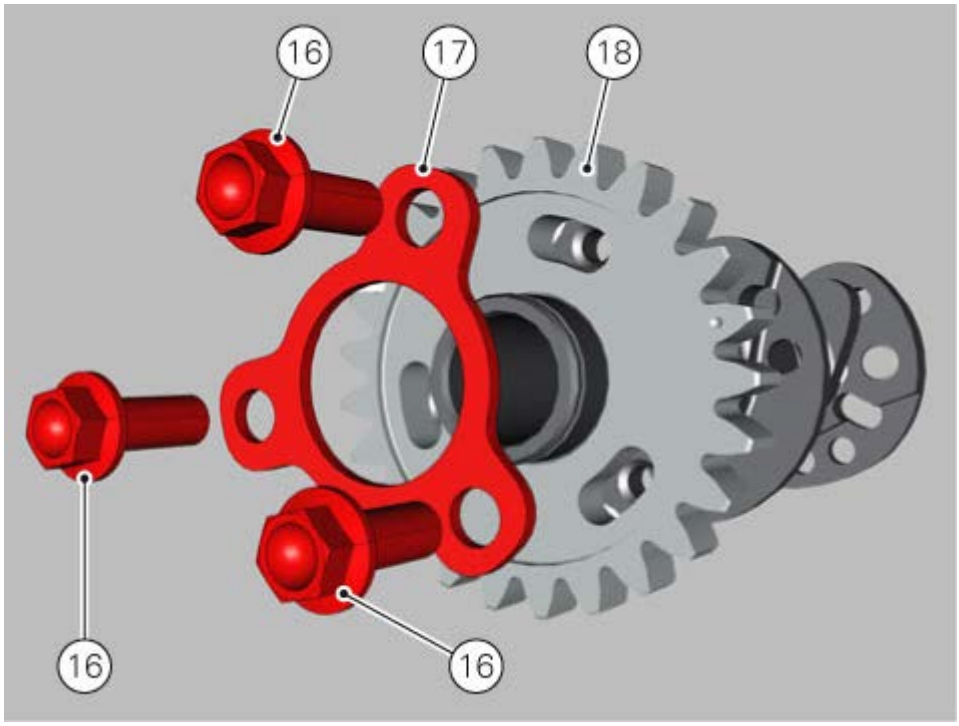
If necessary, remove spring (12) and compressor roller (13).



The camshaft of the intake side vertical head features impeller (14).
To remove it from the camshaft, loosen screws (15).



Loosen screws (16) to separate the shaft from gear (18) and plate (17).



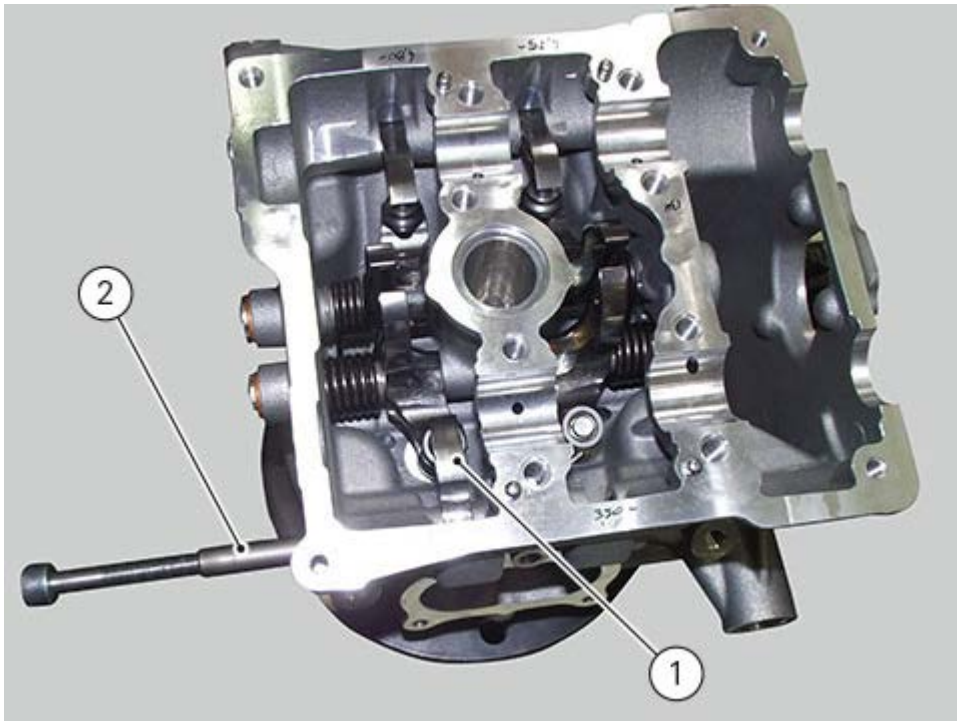
Smontaggio bilancieri

La procedura di smontaggio dei bilancieri è possibile anche con il motore montato su veicolo.
Rimuovere il coperchio testa e gli alberi distribuzione (Smontaggio alberi distribuzione teste)
Sulle teste dal lato aspirazione e scarico si trovano i semianelli.
Sollevare i bilancieri di apertura e rimuovere i registri di apertura.

Note
Upon reassembly, make sure to refit the opening rocker arms in their original position.

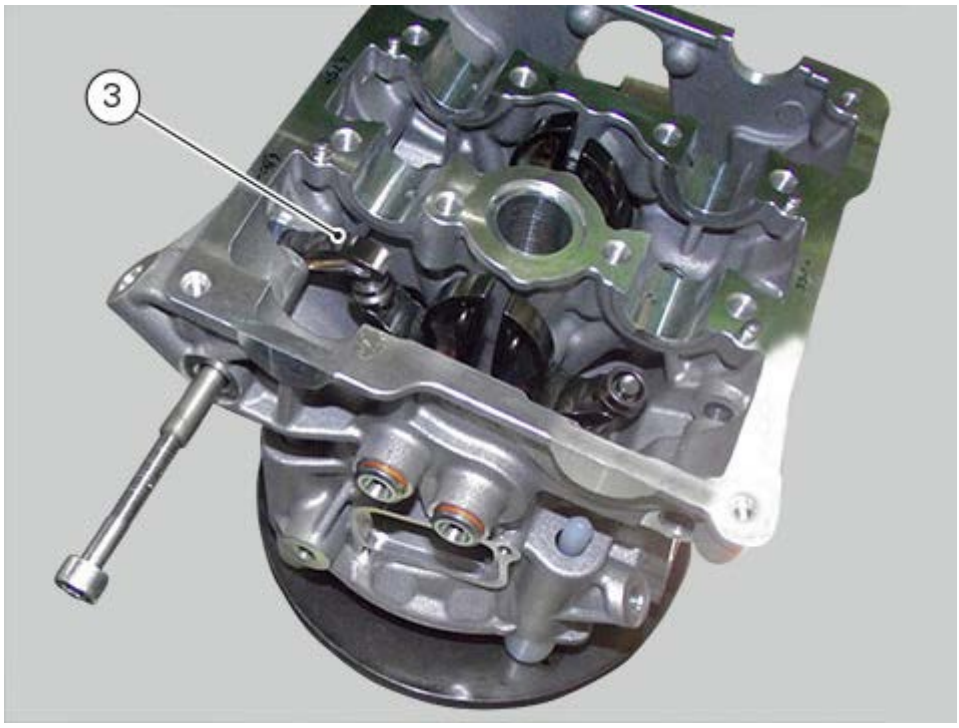
Svitare i tappi (1) dei perni bilancieri apertura con le relative guarnizioni.

Con l'attrezzo **88713.2994** sfilare i perni (2) dei bilancieri apertura lato scarico e aspirazione: fare attenzione alla possibile caduta dei registri.
Il perno bilancere apertura lato aspirazione ha una lunghezza di 106,5 mm.
Il perno bilancere apertura lato scarico ha una lunghezza di 84,6 mm



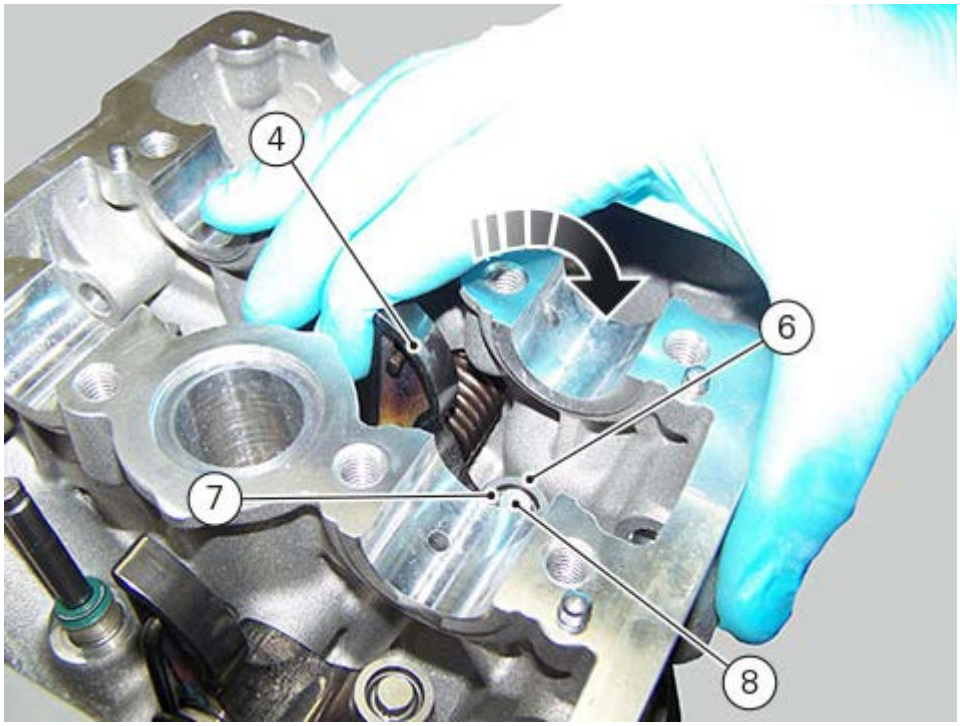
Dal lato scarico, una volta rimosso il tappo, rimuovere il perno (2).

Rimuovere successivamente il bilanciere di apertura (3).

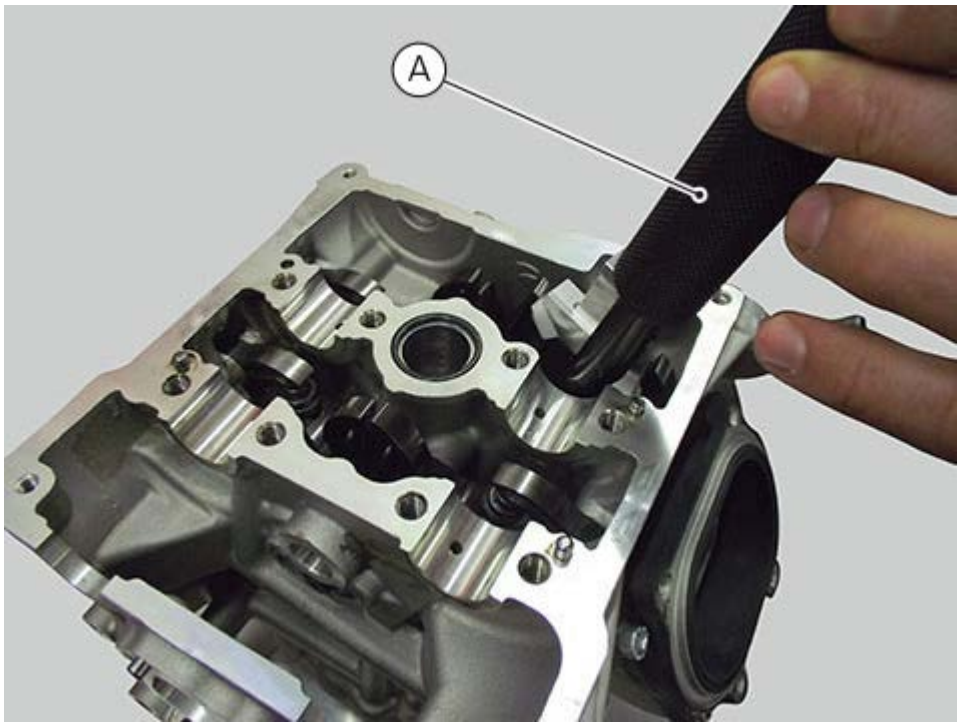


Per smontare i bilancieri chiusura procedere nel seguente modo.
Rimuovere il tenditore mobile.
Liberare il bilanciere di chiusura (4) dalla molla (5).

Spingere verso il basso i bilancieri di chiusura (4) e il registro di chiusura (6).
Rimuovere i semianelli (7) sulle valvole di scarico (8) usando un cacciavite calamitato. Sfilare i registri di chiusura dalla valvola.

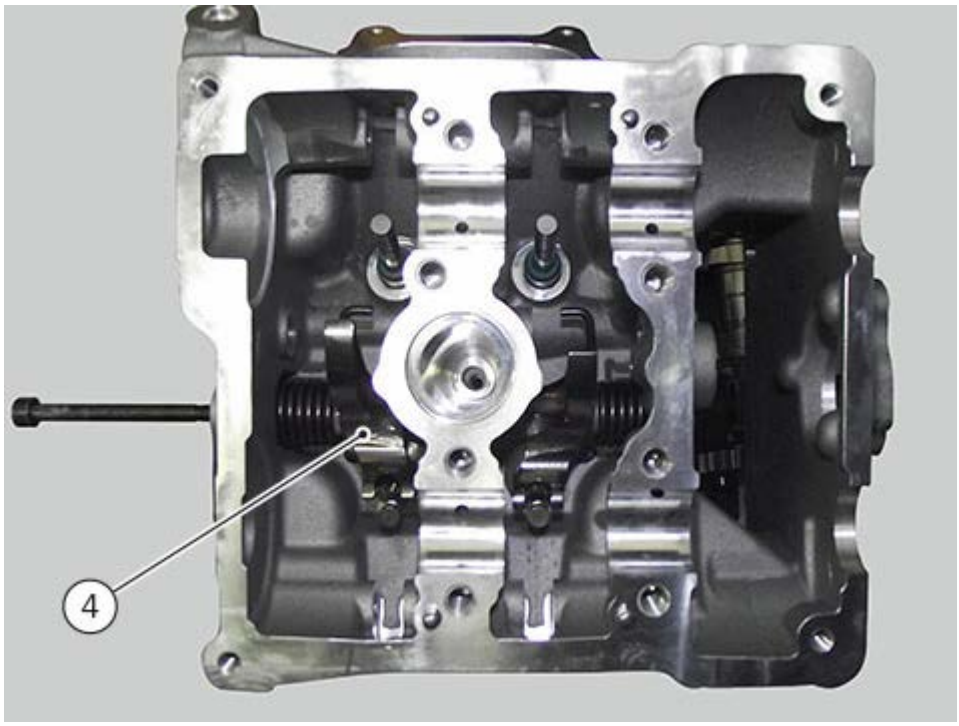


Ripetere l'operazione sulle valvole di aspirazione.

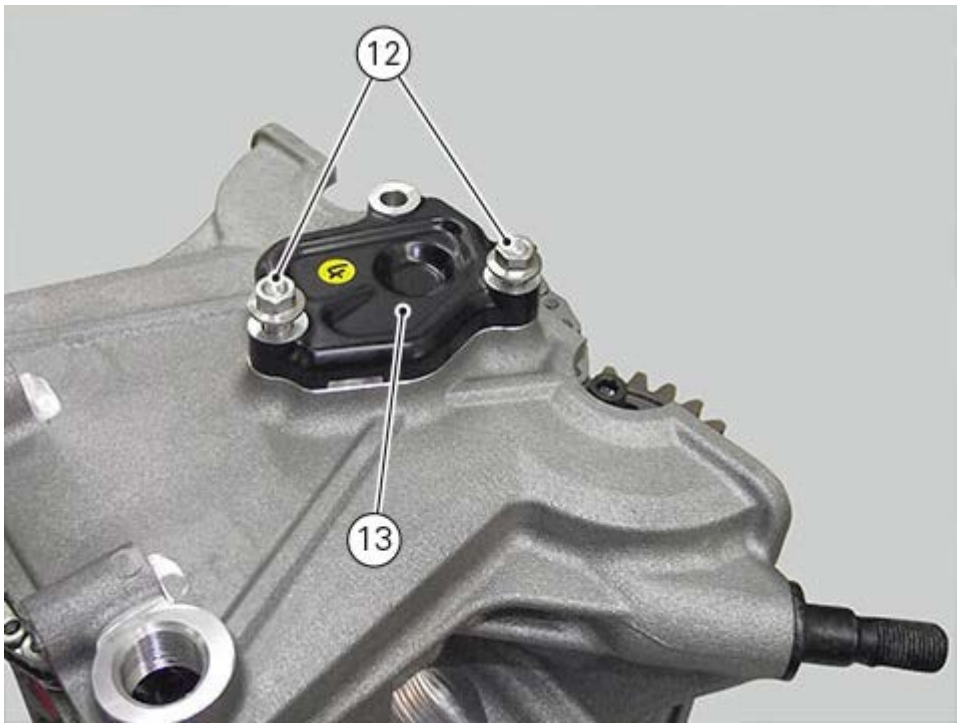


Svitare i tappi (11) dei perni bilancieri chiusura lato opposto distribuzione e rimuoverli con le relative guarnizioni.

Rimuovere i bilancieri di chiusura (4) lato opposto distribuzione.

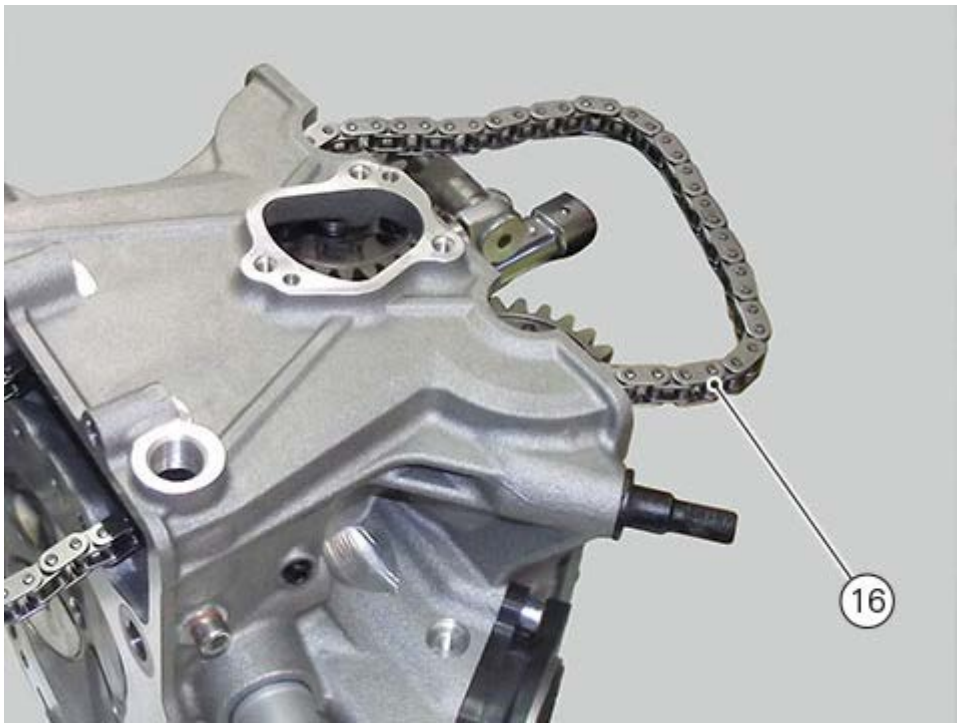


Svitare le viti di fissaggio (12) e rimuovere il coperchietto (13), facendo attenzione a non trascinare le parti mobili.

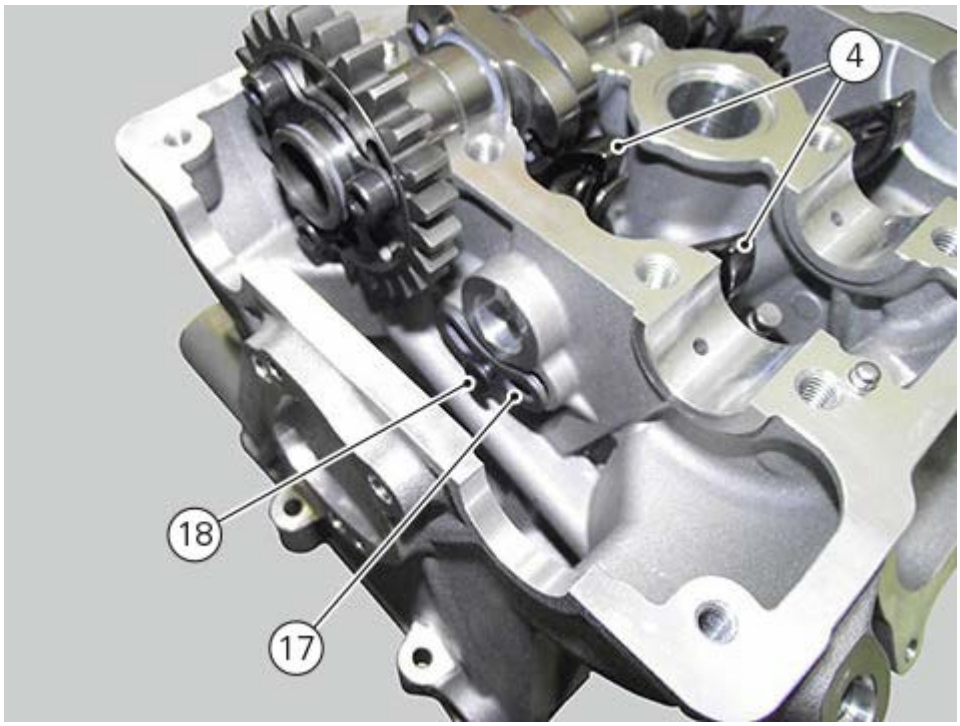


Rimuovere rasamento, perno (14) e distanziale (15) dal rinvio distribuzione.

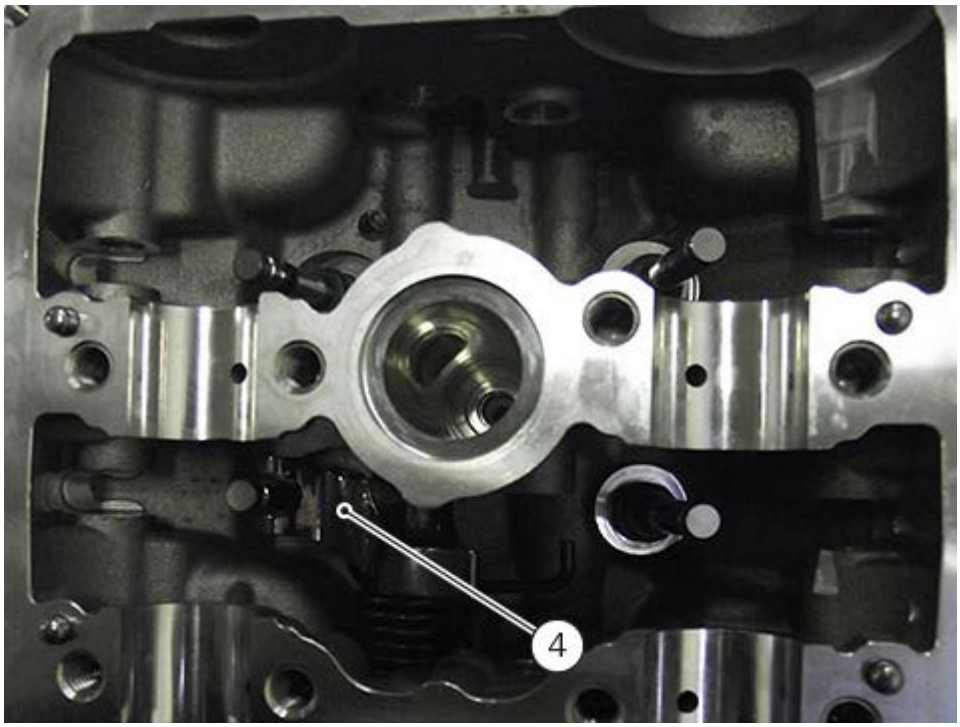
Scalzare la catena (16) dall'ingranaggio con catena facendo attenzione che la catena non cada all'interno del vano distribuzione.

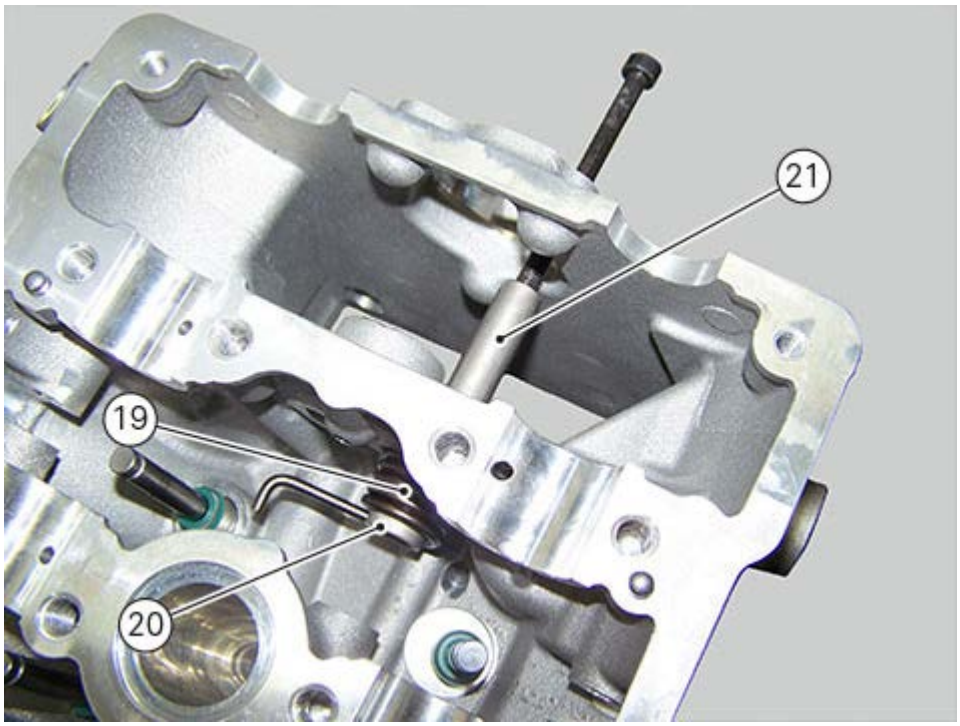


Smontare il piastrino (17) ritegno perni rinvio distribuzione, svitando le viti (18).



Con l'attrezzo **88713.2994** sfilare i bilancieri chiusura, le molle (19) con i distanziali (20) ed i perni bilancieri (21).




21
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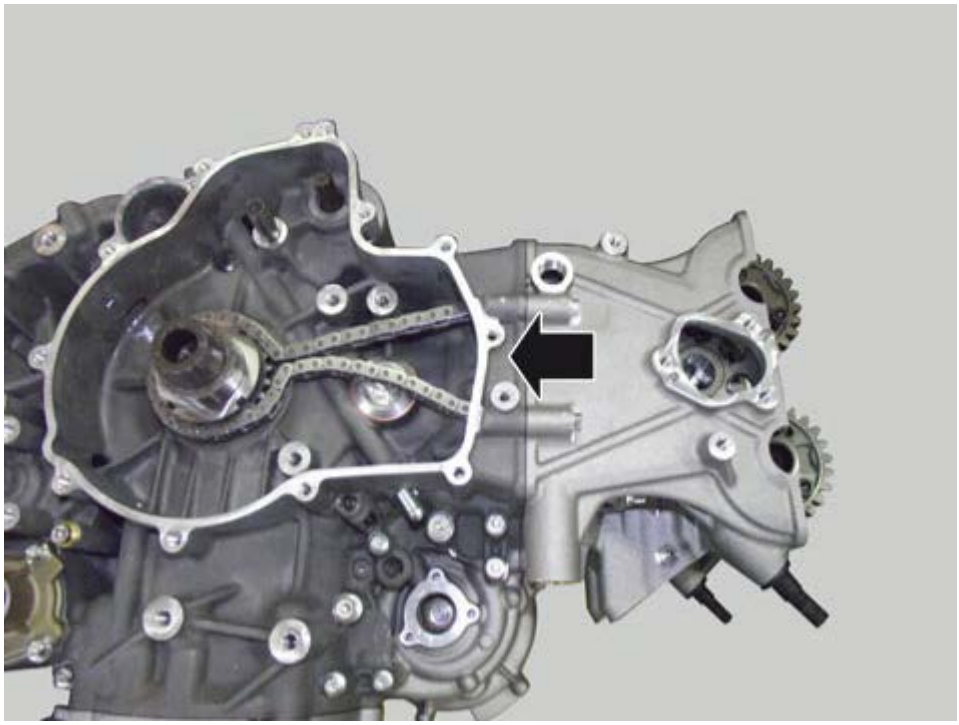
20

Refit the heads (from "Removing the heads and timing chain").

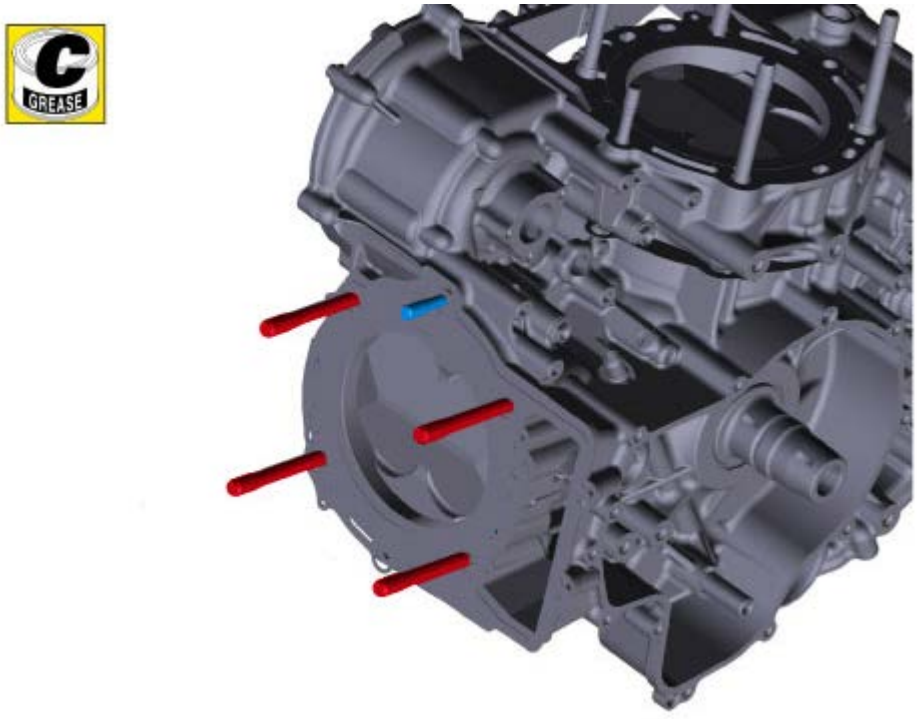
Insert the chain with the split gear in the timing system compartment.
Fit the chain on the crankshaft timing gear on the flywheel side.

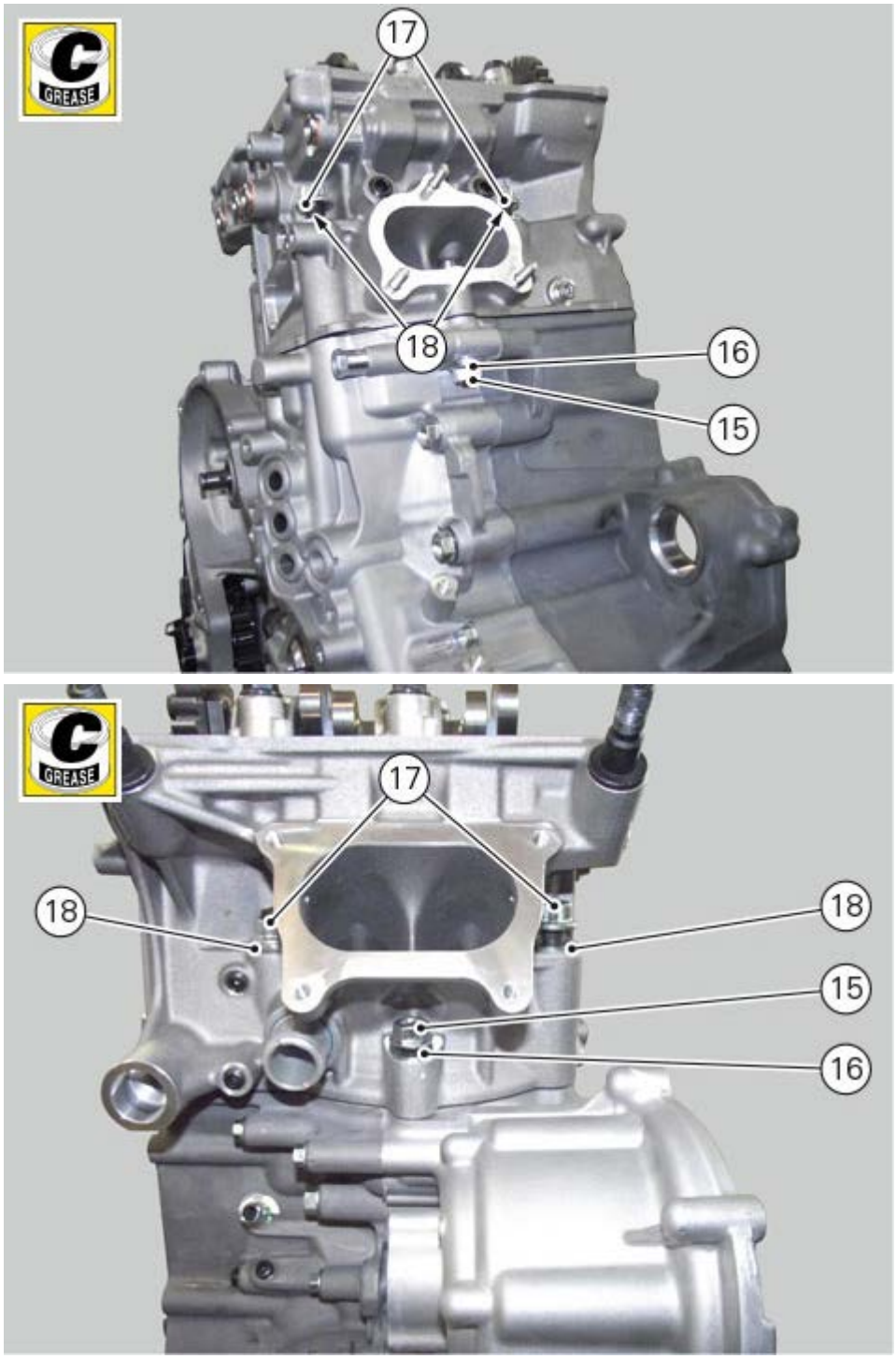


Note
Make sure the cylinder-head gasket, centring pins on the case surface and the bushing for oil passage to the heads are in the correct position.

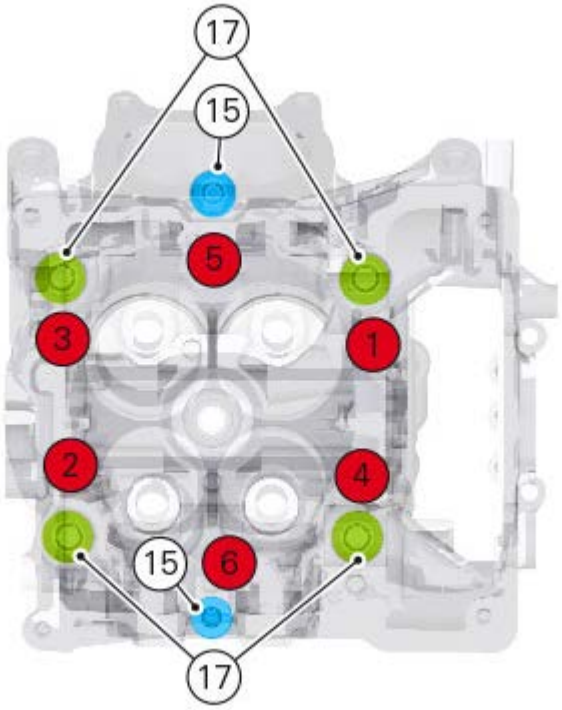
The operations indicated in this procedure refer to the fitting of a horizontal head. These operations also apply to the vertical head.
Fit chain on the split gear hub between the two teeth.

Fit the head on the thru bolts.
Apply specified grease on the underhead of nuts (15) and (17) and on the thru bolt thread.
Fit washers (16) and (18) on the thru bolts.
Start the head retaining nuts on the thru bolts following a cross pattern using tool no. **88713.2676** for nuts (15) and tool no. **88713.3926** for nuts (17), using a torque wrench.

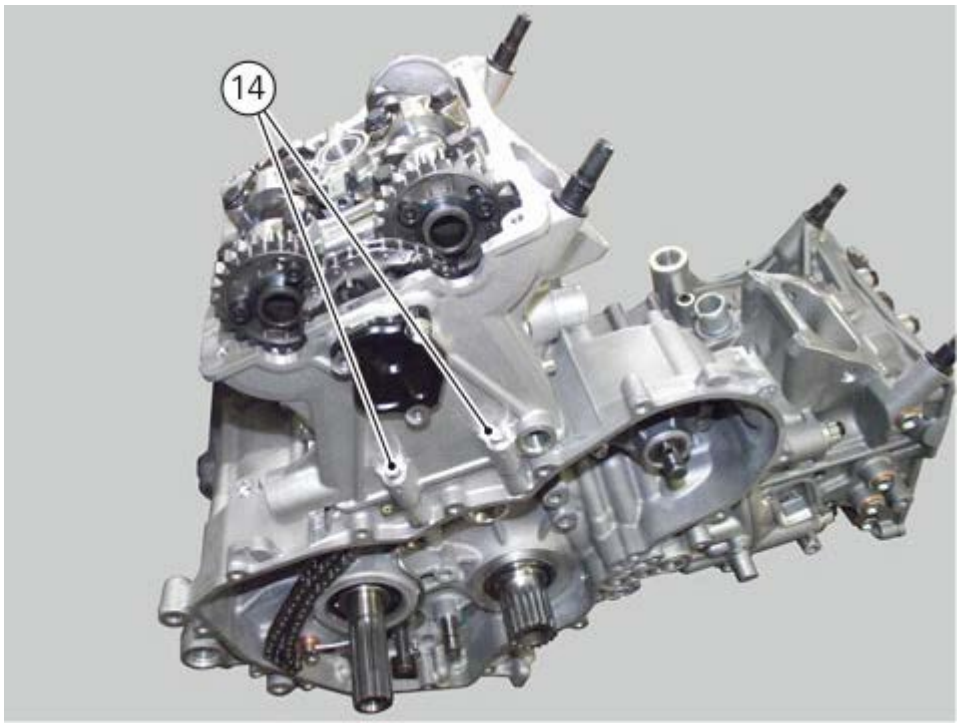




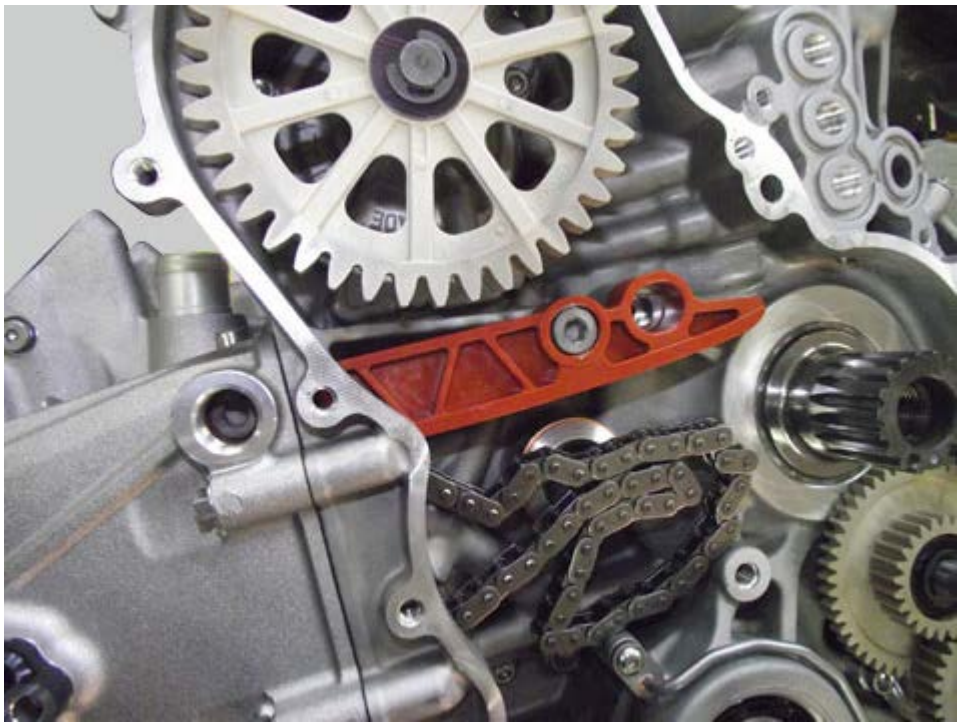
Apply a snug torque of 20 Nm to nuts (17) in the following sequence: 1-2-3-4.
Pre-tighten nuts (17) to a torque of 40 Nm (Min. 38 Nm – Max. 42 Nm) following the sequence: 1-2-3-4.
Tighten nuts (17) to a torque of 67 Nm (Min. 64 Nm – Max. 70 Nm) following the sequence: 1-2-3-4.
Start nuts (15) in the following sequence: 5-6.
Tighten nuts (15) to a torque of 28.5 Nm (Min. 27 Nm – Max. 30 Nm) following the sequence: 5-6.



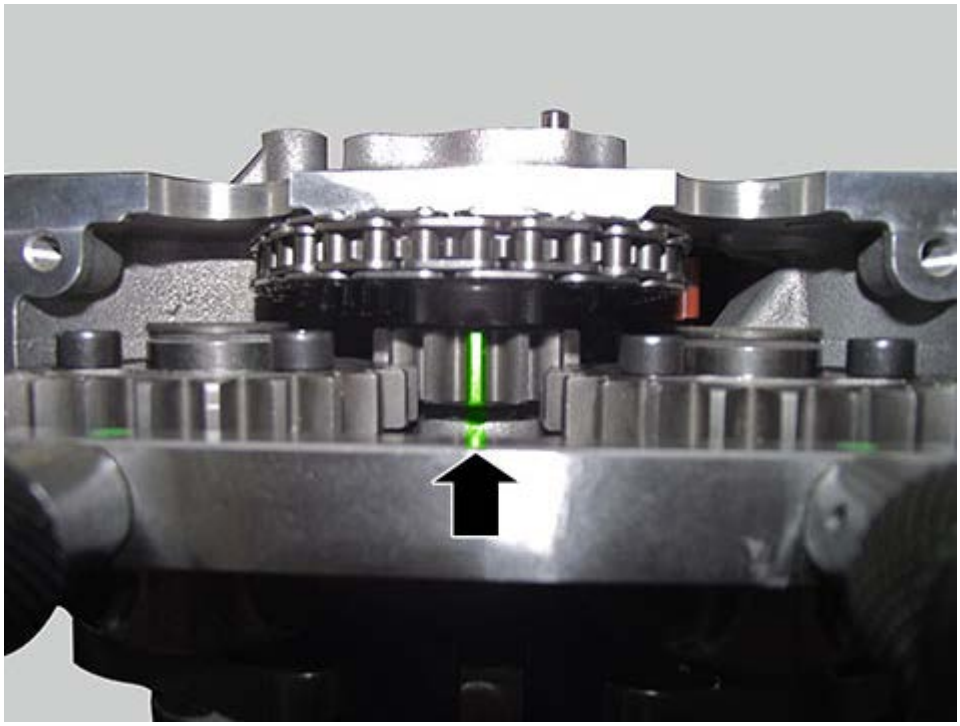
Start the screws (14) that retain the timing side heads and tighten them to a torque of 13 Nm (Min. 12 Nm – Max. 14 Nm).



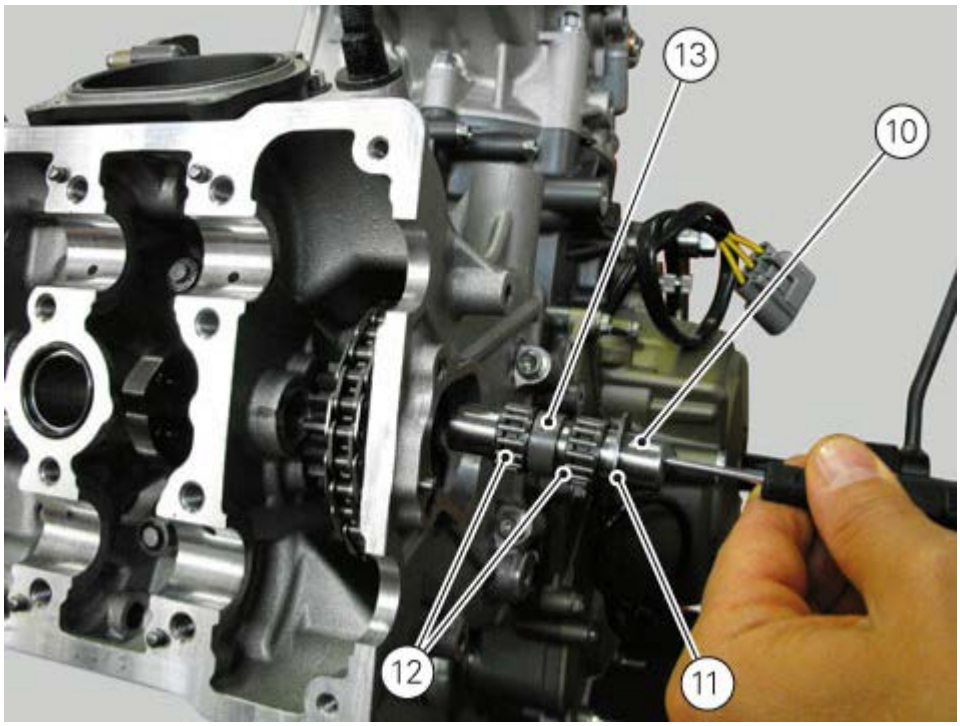
Check that the crankshaft is at the horizontal cylinder TDC in the combustion stage (Positioning of the crankshaft at TDC in the combustion stage).
If the vertical cylinder timing system has already been refitted, turn the shaft by 450° in the engine rotation sense.
Keep the chain against the fixed shoe.



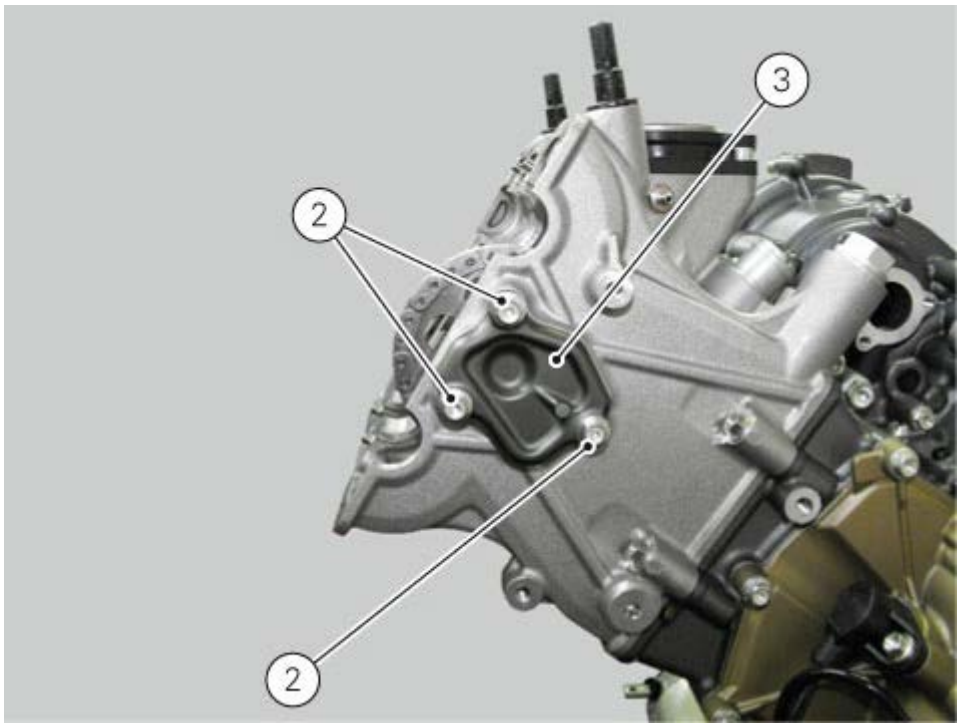
Make sure that one tooth of the split gear is on the head reference as shown in the figure.



Insert pin (10) with a bearing (12), a spacer (13) and another bearing (12) on the head. Fit shim (11).

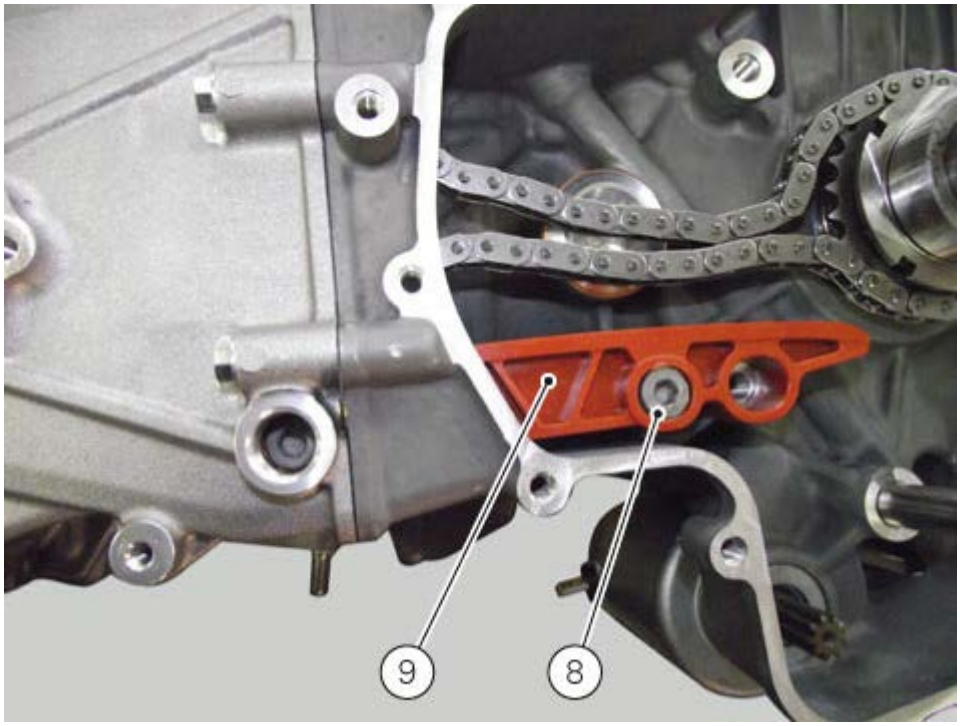


Apply Ducati sealing compound on the transmission pins according to the drawing.
Position cover (3) and tighten the screws (2) to a torque of 10 Nm (Min. 9 Nm – Max. 11 Nm).

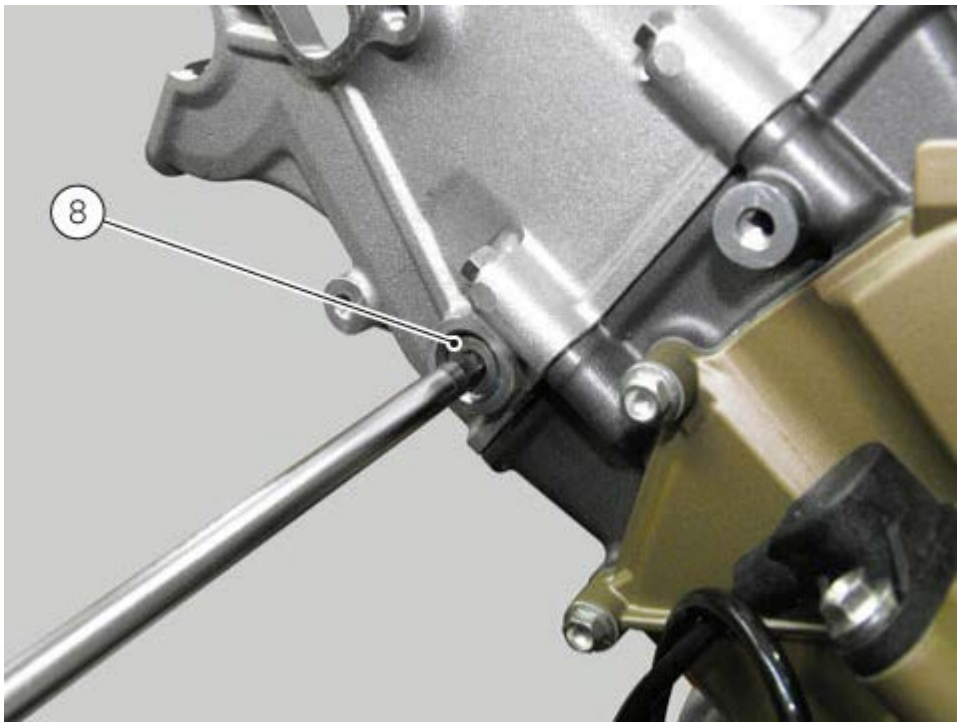


Position mobile shoe (5) and tighten retaining pin (6) to a torque of 20 Nm (Min. 18 Nm – Max. 22 Nm).

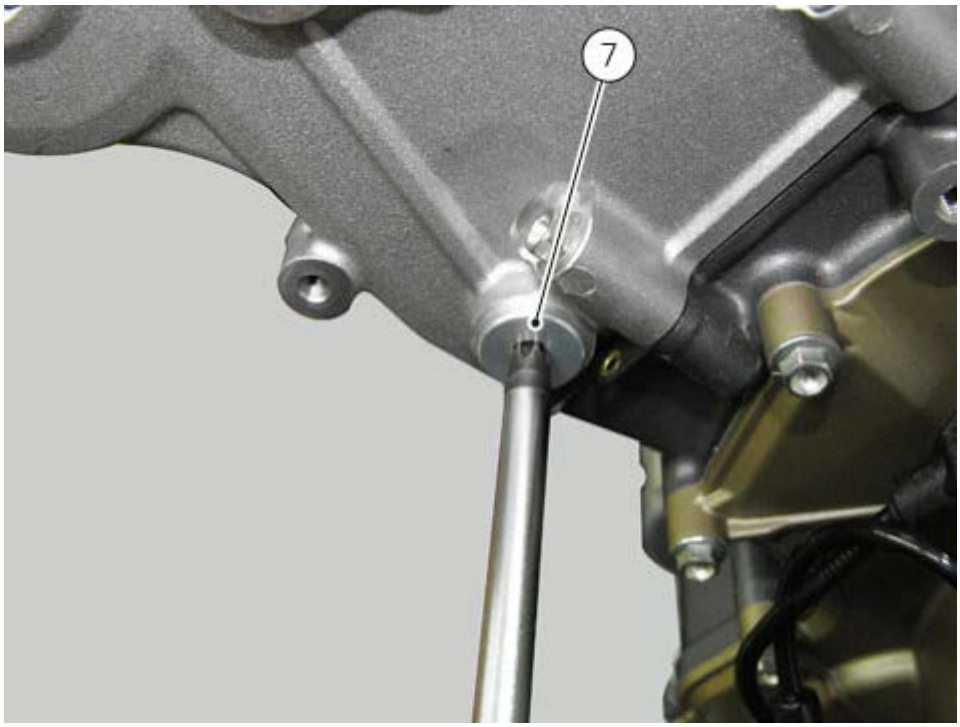
Position fixed shoe (9) and tighten retaining pin (8) to a torque of 20 Nm (Min. 18 Nm – Max. 22 Nm).



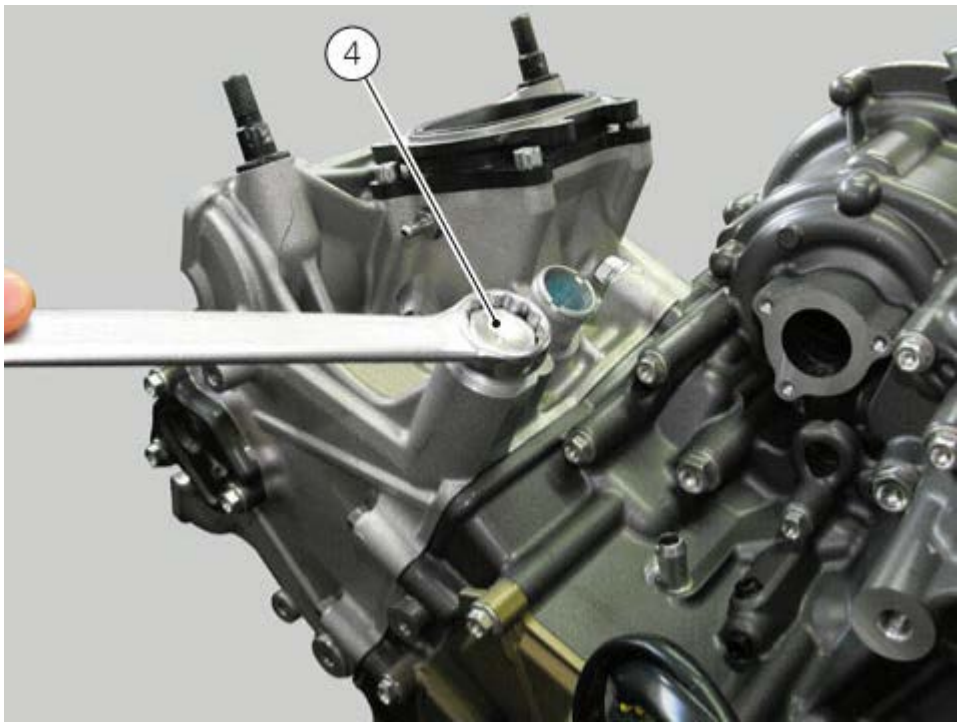
Fit fixed shoe pin (8) located on the head base and tighten it to 20 Nm (Min. 18 Nm – Max. 22 Nm).



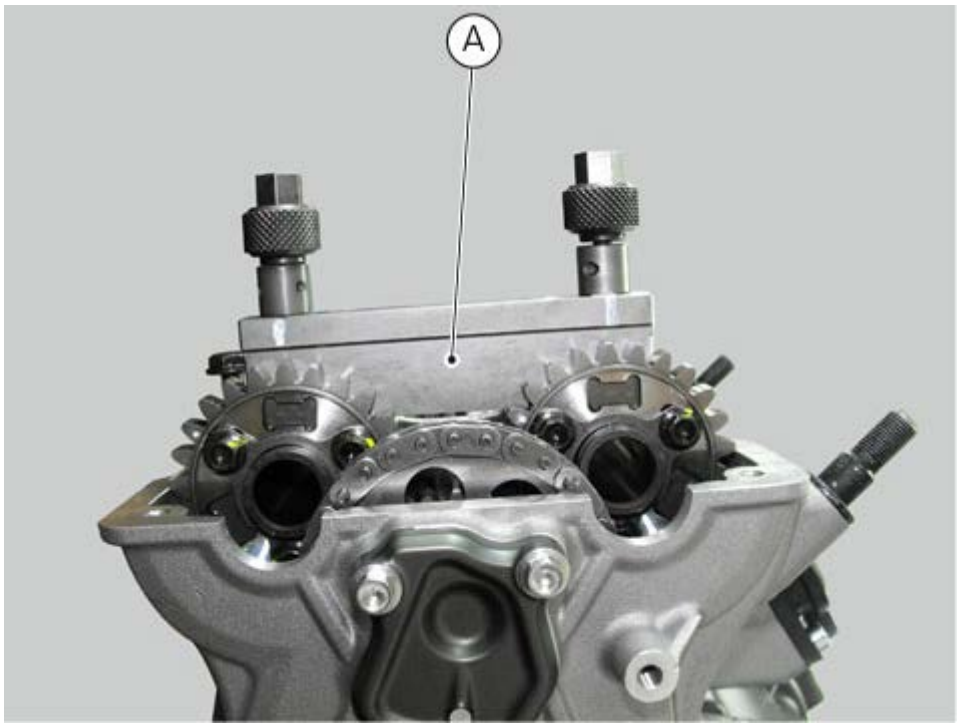
Fit cap (7) for access to the fixed show pin located on head base and tighten it to 17 Nm (Min. 16 Nm – Max. 18 Nm).



Position tensioner (4) and tighten it to a torque of 25 Nm (Min. 23 Nm – Max. 27 Nm) and make sure that the chain is centred on the pins.

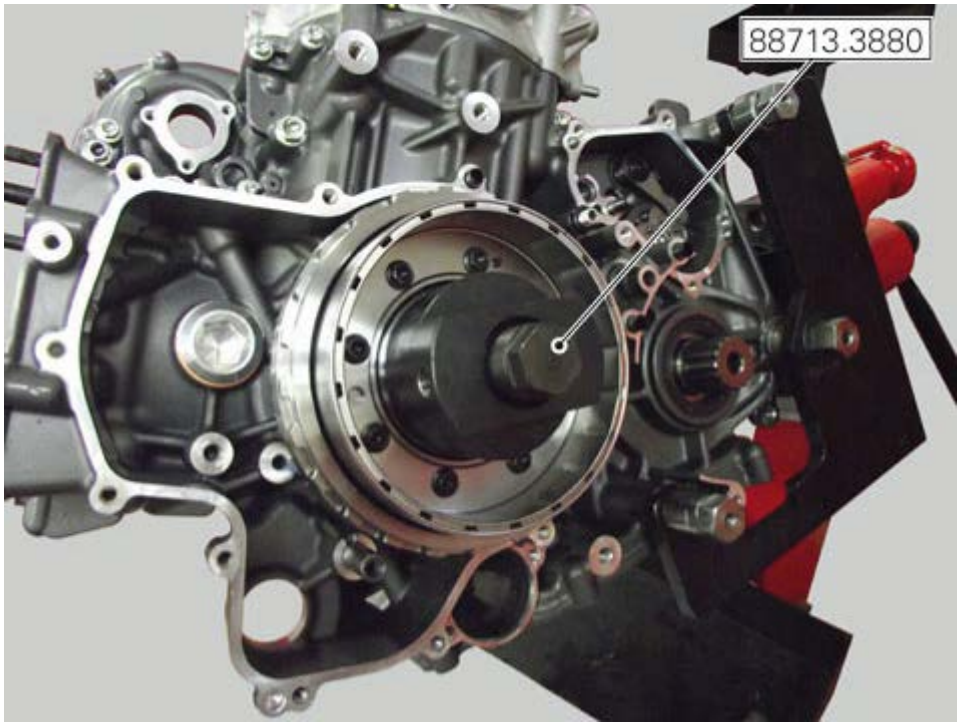


Place the camshafts on the head with the reference surfaces aligned and fit the timing tool A, no. **88765.1622**.



Completely loosen the two screws (one each camshaft), apply threadlocker as specified in the table and tighten to 19 Nm (Min. 18 Nm – Max. 20 Nm).
Remove tool no. **88765.1622** and tool no. **88713.3500**.
Turn the engine in its rotation sense until uncovering two other screws (A) (one each camshaft).
Completely loosen the two uncovered screws (A), apply threadlocker as specified in the table and tighten to the specified torque.

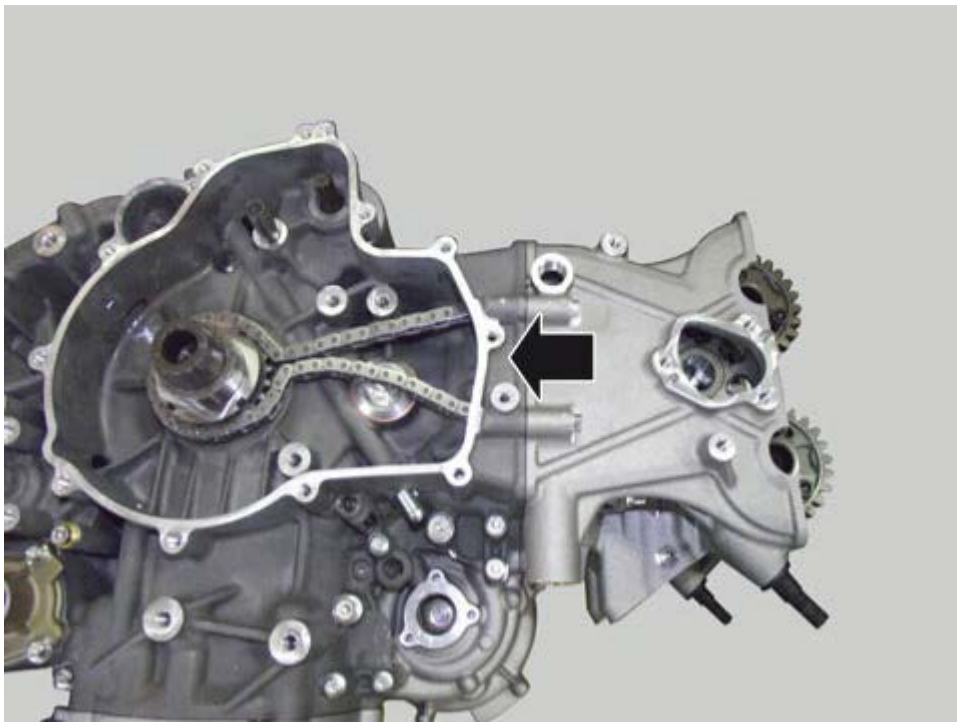
Refit the flywheel using the relevant tool no. **88713.3880**.



Refit the camshafts (Refitting the camshafts).
Refit both spark plugs (Replacing the spark plugs).
Refit the engine in the vehicle (Refitting the engine).

Refitting the vertical head chain

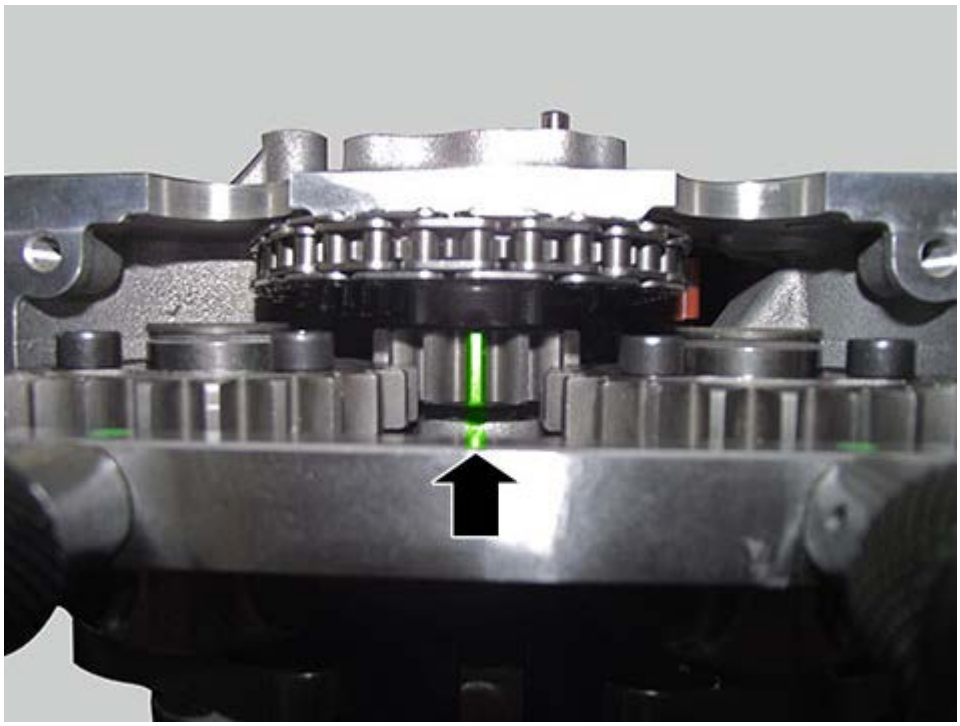
Insert the chain with the split gear in the timing system compartment.
Fit the chain on the crankshaft timing gear on the flywheel side.



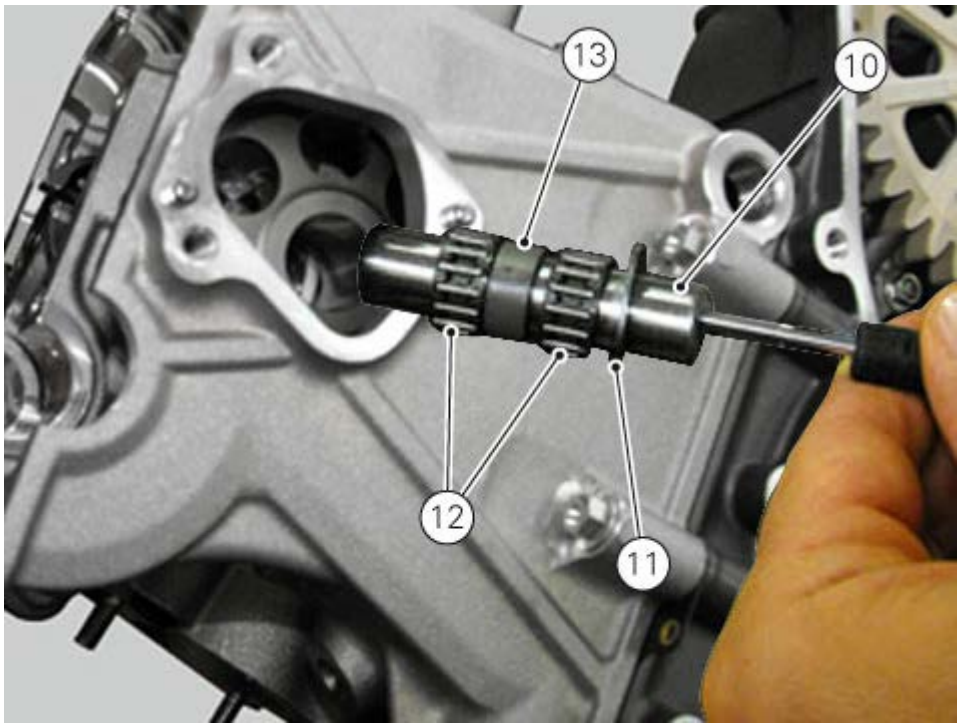
Repeat the head retaining operation already described for the horizontal head.

Check that the crankshaft is at the horizontal cylinder TDC in the combustion stage (Positioning of the crankshaft at TDC in the combustion stage).
If the vertical cylinder timing system has already been refitted, turn the shaft by 270° in the engine rotation sense.
Insert the primary sprocket making sure to engage the two pins of the oil pump drive gear in the front sprocket holes.
Keep the chain against the fixed shoe.

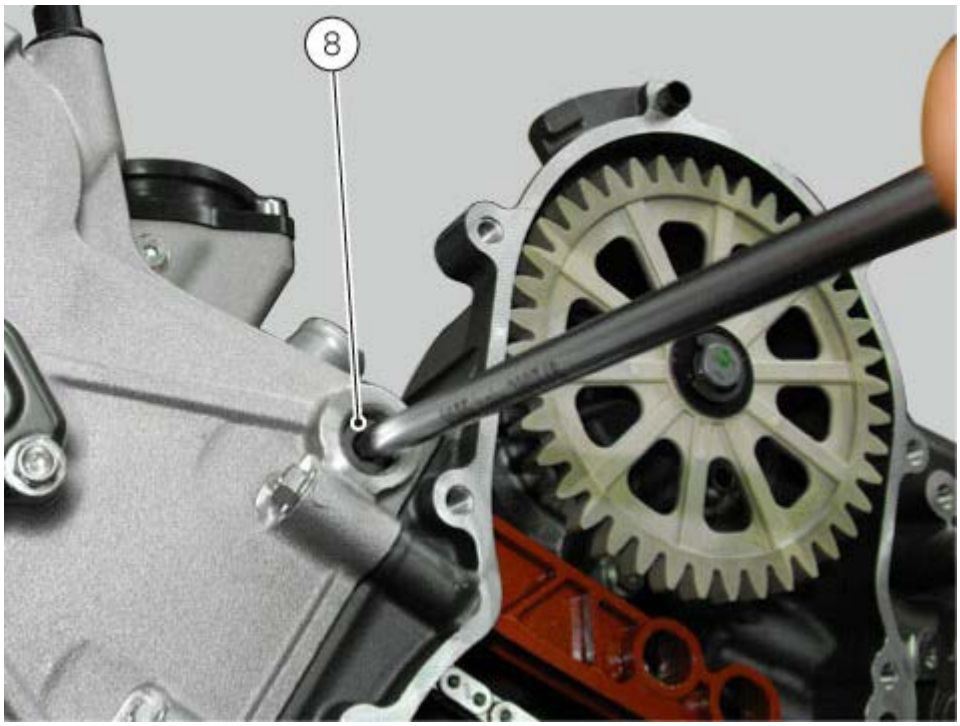
Make sure that one tooth of the split gear is on the head reference as shown in the figure.

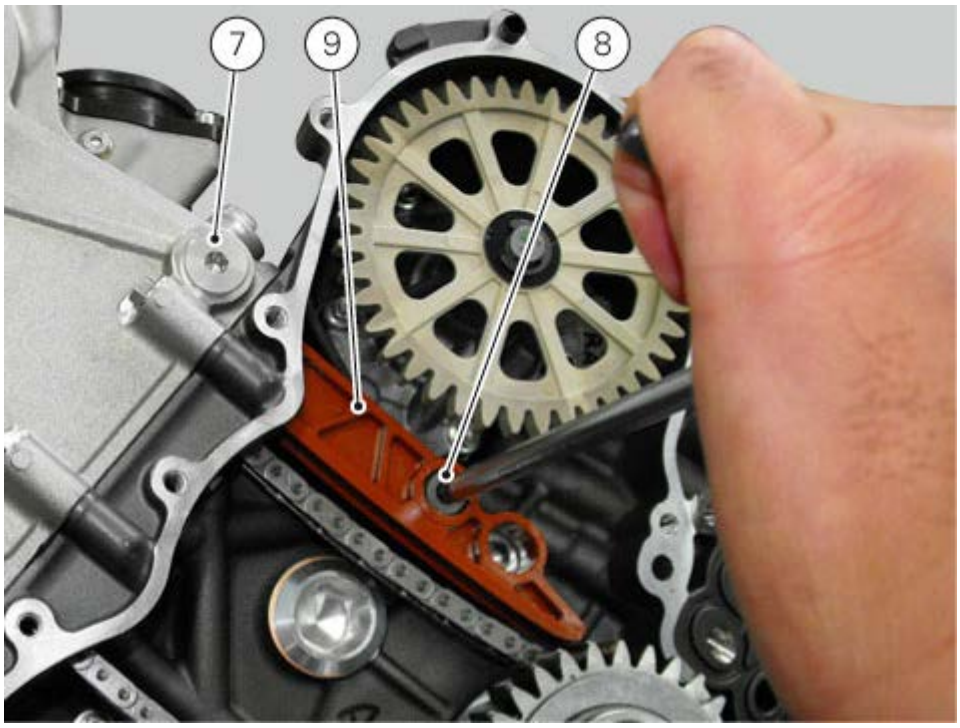


Insert pin (10) with a bearing (12), a spacer (13) and another bearing (12) on the head.
Fit shim (11).

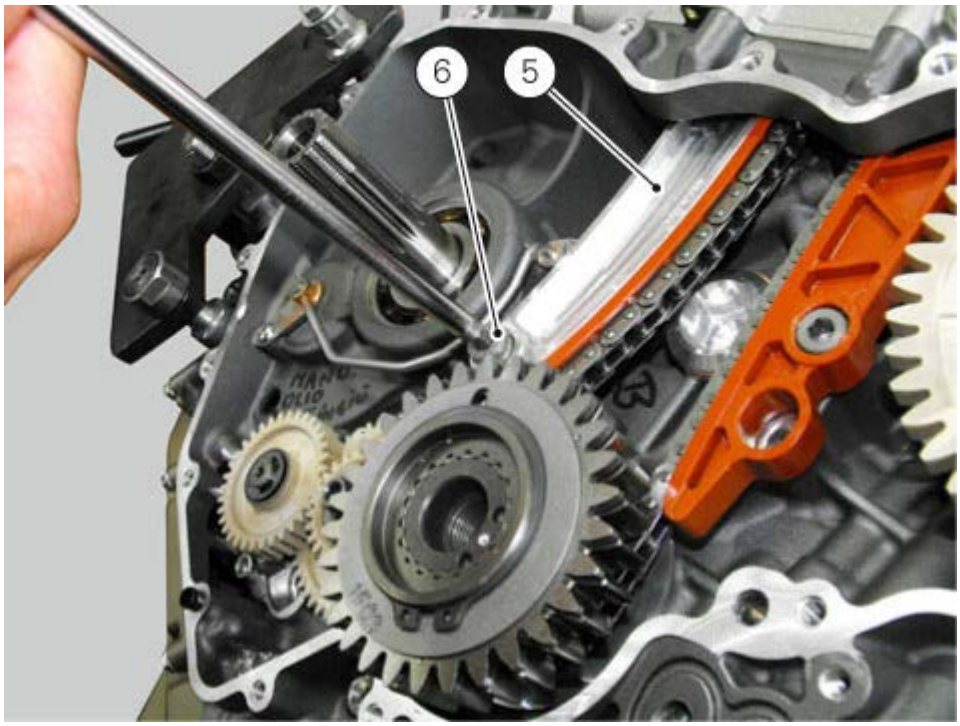


Fit fixed shoe pin (8) located on the head base.
Fit cap (7) for access to the fixed show pin located on head base and tighten it to 17 Nm (Min. 16 Nm – Max. 18 Nm).

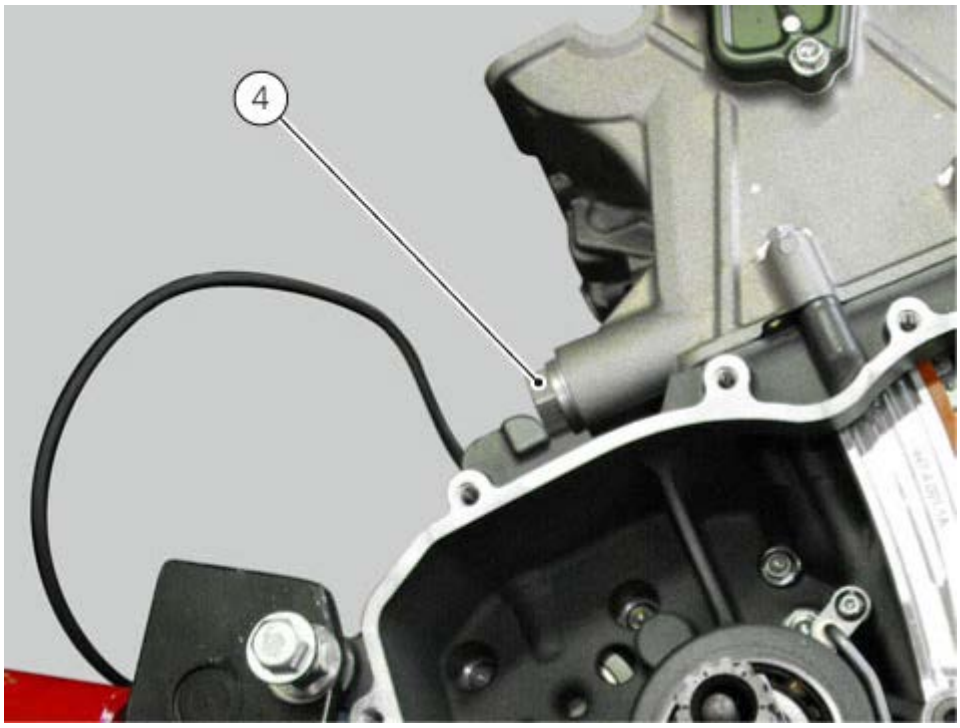




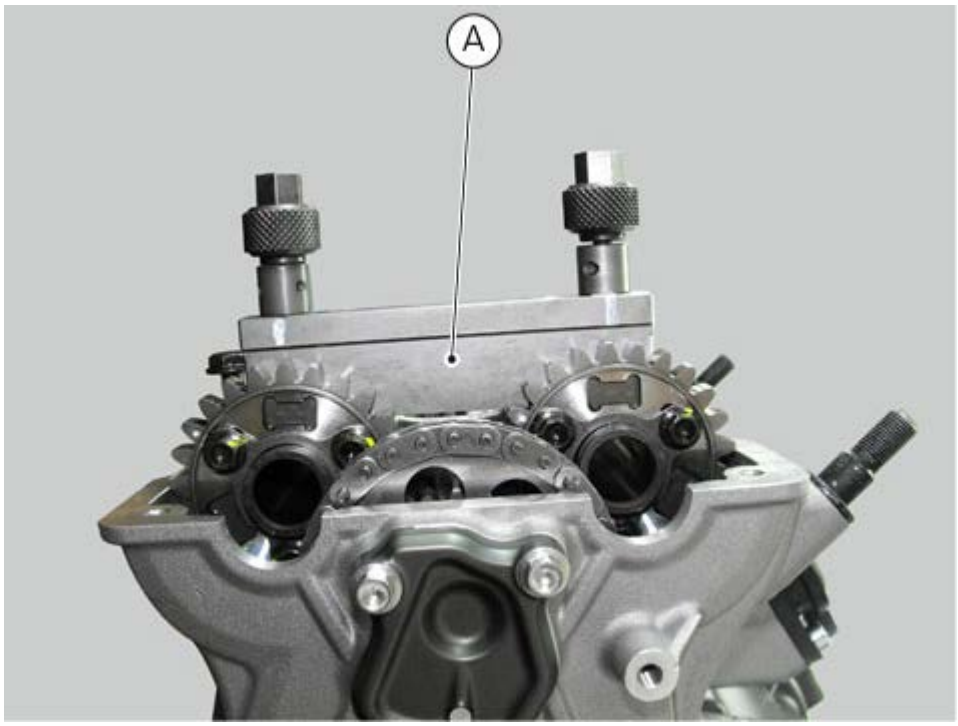
Position mobile shoe (5) and tighten retaining pin (6) to a torque of 20 Nm (Min. 18 Nm – Max. 22 Nm).



Position tensioner (4) and tighten it to a torque of 25 Nm (Min. 23 Nm – Max. 27 Nm) and make sure that the chain is centred on the pins.



Place the camshafts on the head with the reference surfaces aligned and fit the timing tool A, no. **88765.1622**.



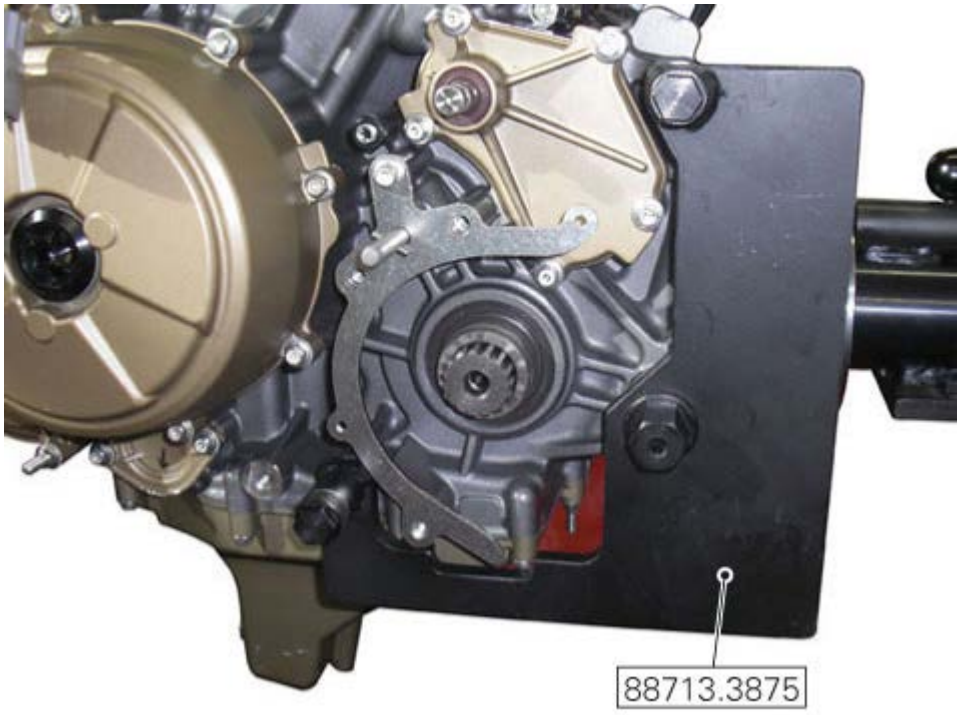
Completely loosen the two screws (one each camshaft), apply threadlocker as specified in the table and tighten to 19 Nm (Min. 18 Nm – Max. 20 Nm).
Remove tool no. **88765.1622** and tool no. **88713.3500**.
Turn the engine in its rotation sense until uncovering two other screws (A) (one each camshaft).
Completely loosen the two uncovered screws (A), apply threadlocker as specified in the table and tighten to the specified torque.

Refit the camshafts (Refitting the camshafts).
Refit both spark plugs (Replacing the spark plugs).
Refit the engine in the vehicle (Refitting the engine).

Removing the heads and timing chain

Remove the engine from the vehicle (Removing the engine).

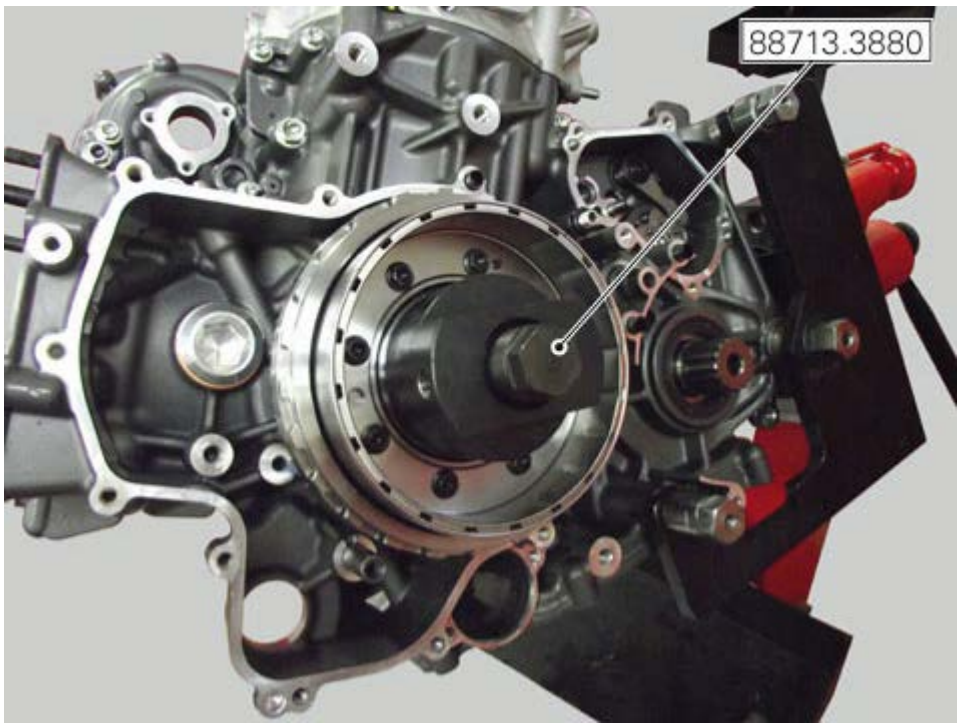
Fit the engine block using the suitable tool no. **88713.3875**.



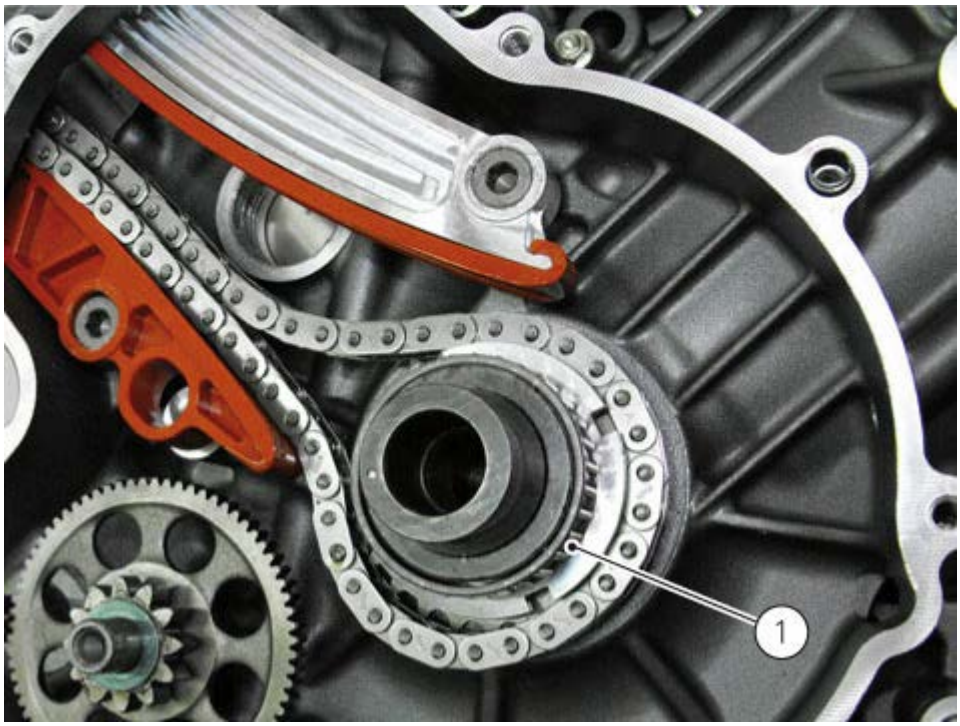
The operations indicated in this procedure refer to the removal of a horizontal head. These operations also apply to the vertical head.

Remove both spark plugs (Replacing the spark plugs).
Set the crankshaft at TDC in the combustion stage (Crankshaft positioning at TDC in the combustion stage).
Remove the camshafts (Removing the camshafts).

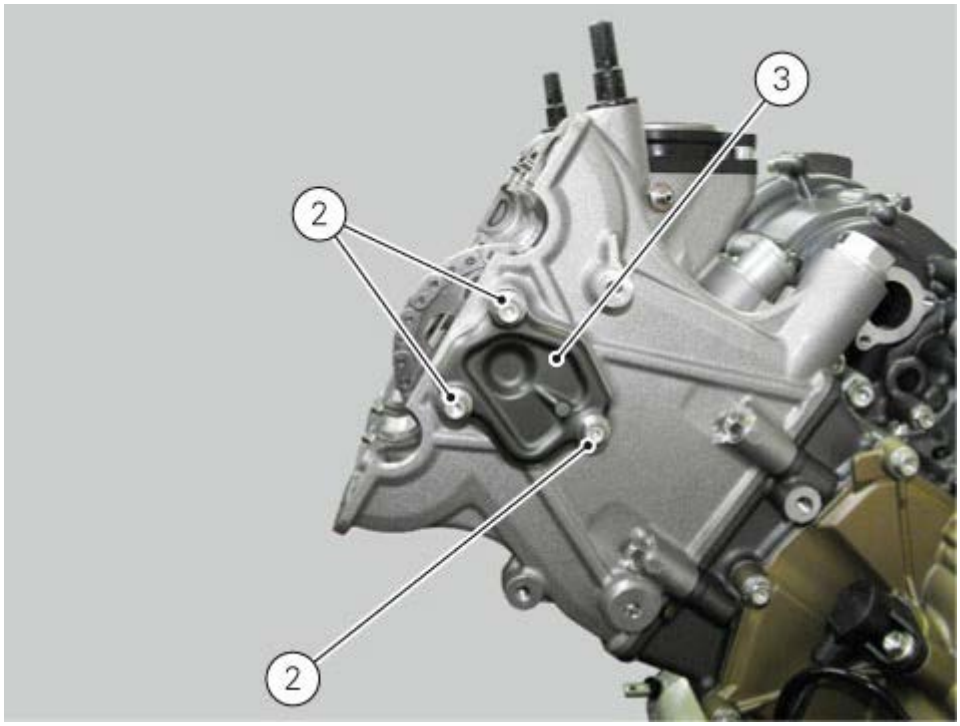
Fit the flywheel using the puller no. **88713.3880**.



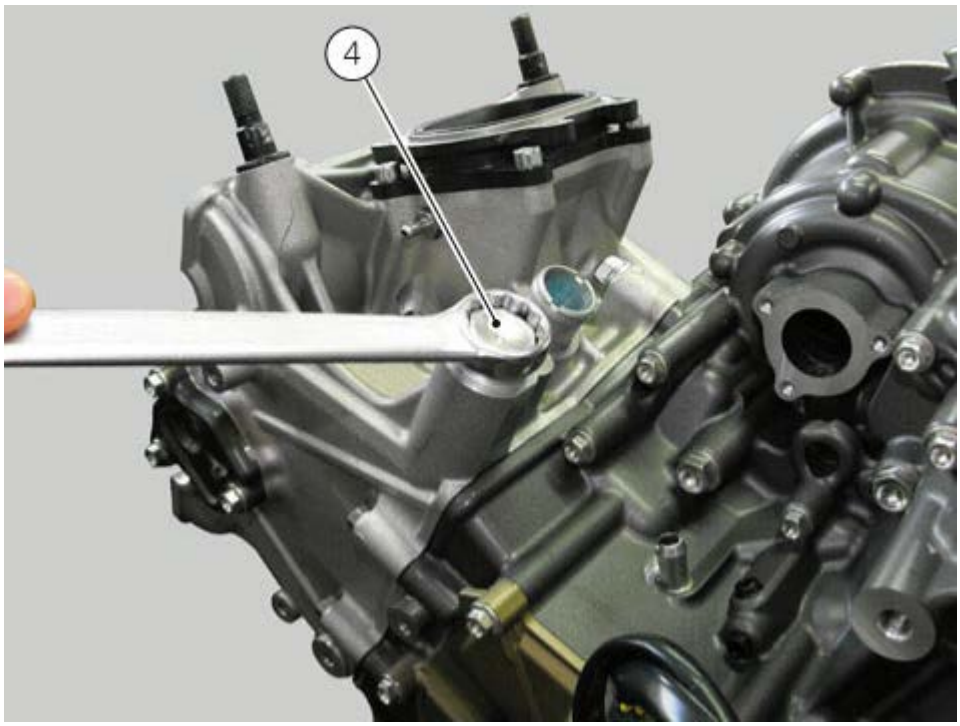
Slide out the roller bearing (1).



Loosen retaining screws (2) and remove cover (3), having care not to damage the mobile parts.

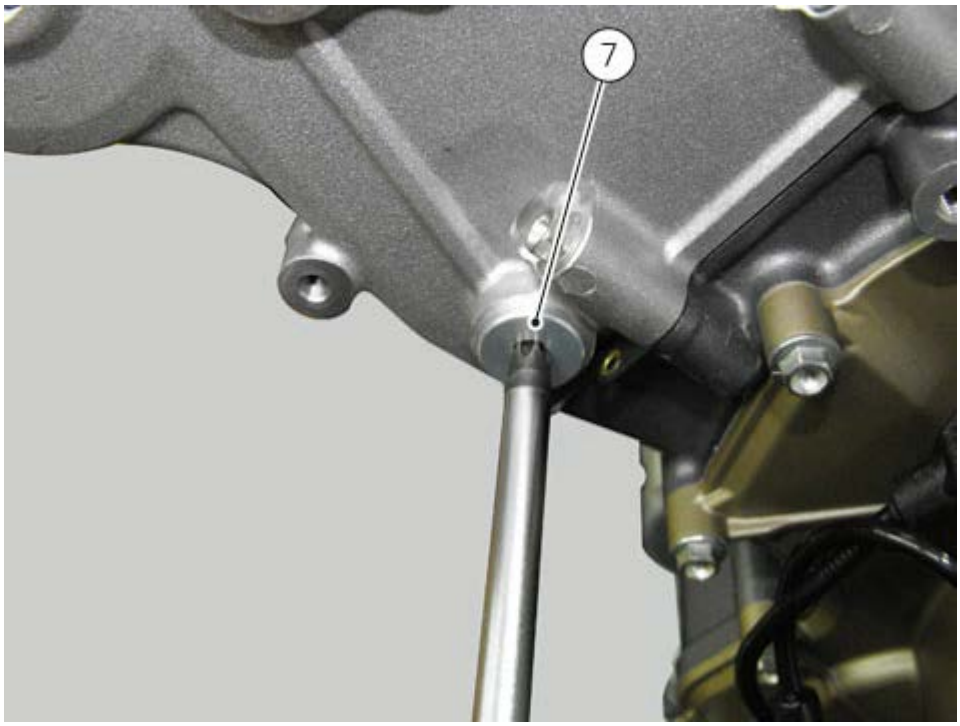


Loosen tensioner (4) and remove it.



Undo pin (6) and remove the mobile sliding shoe (5).

We recommend removing the fixed sliding shoe (9) by loosening the retaining pins (8).
Remove plug (7) located on the head base to access the fixed sliding shoe pin.
Remove the fixed sliding shoe pin (8).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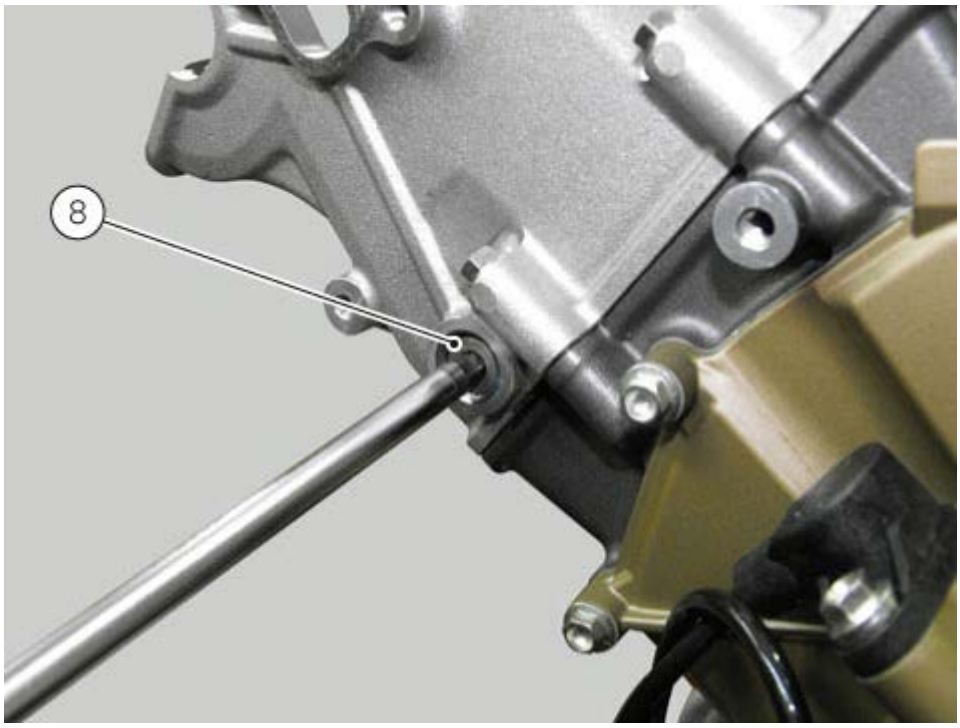
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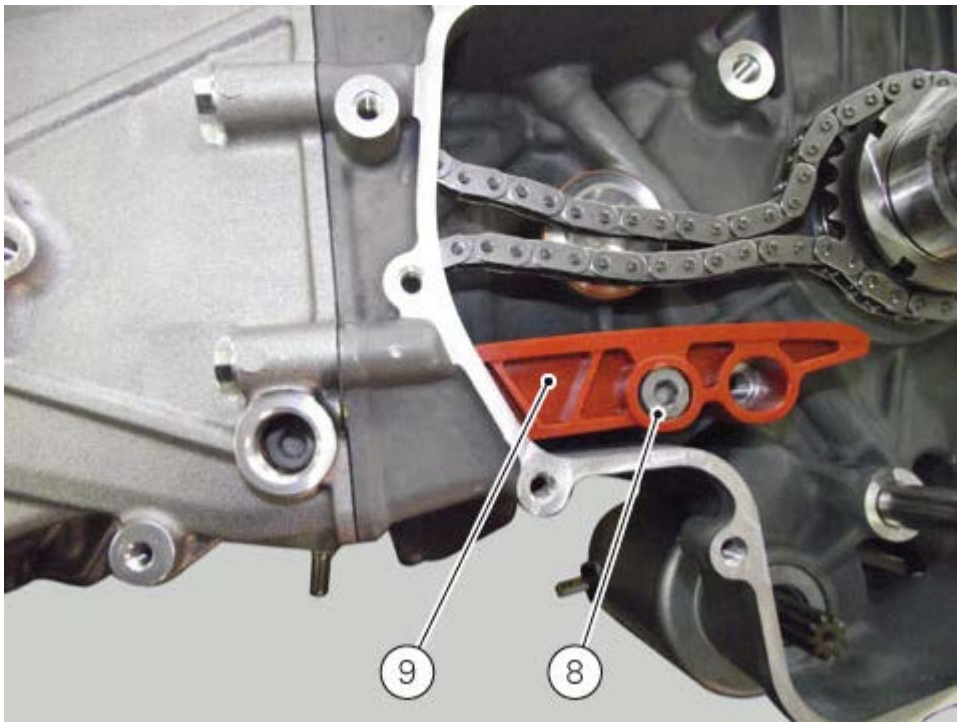
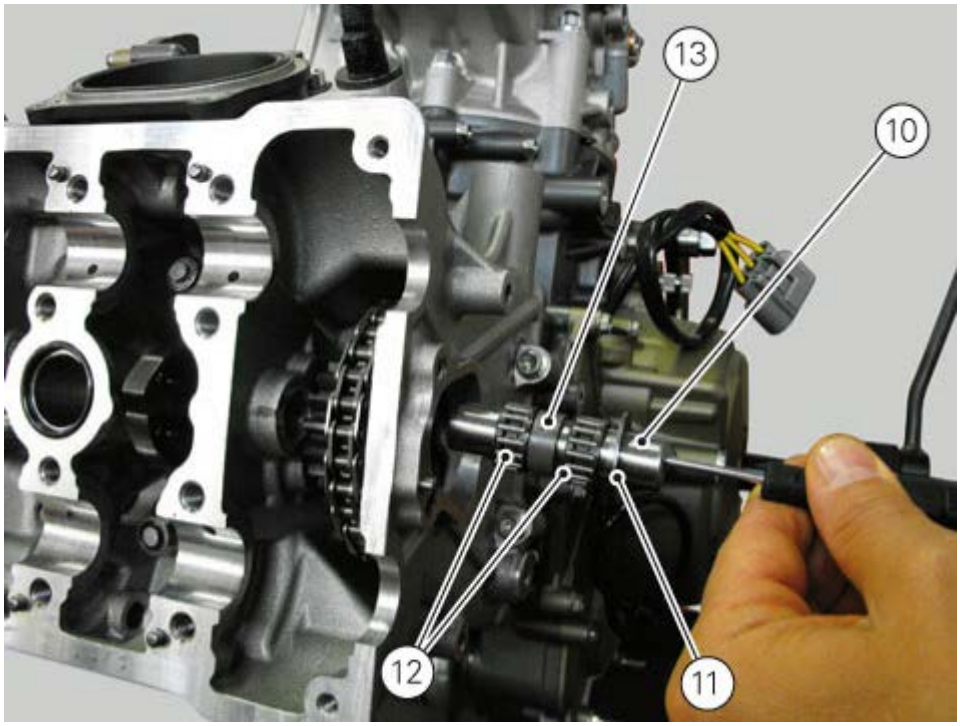
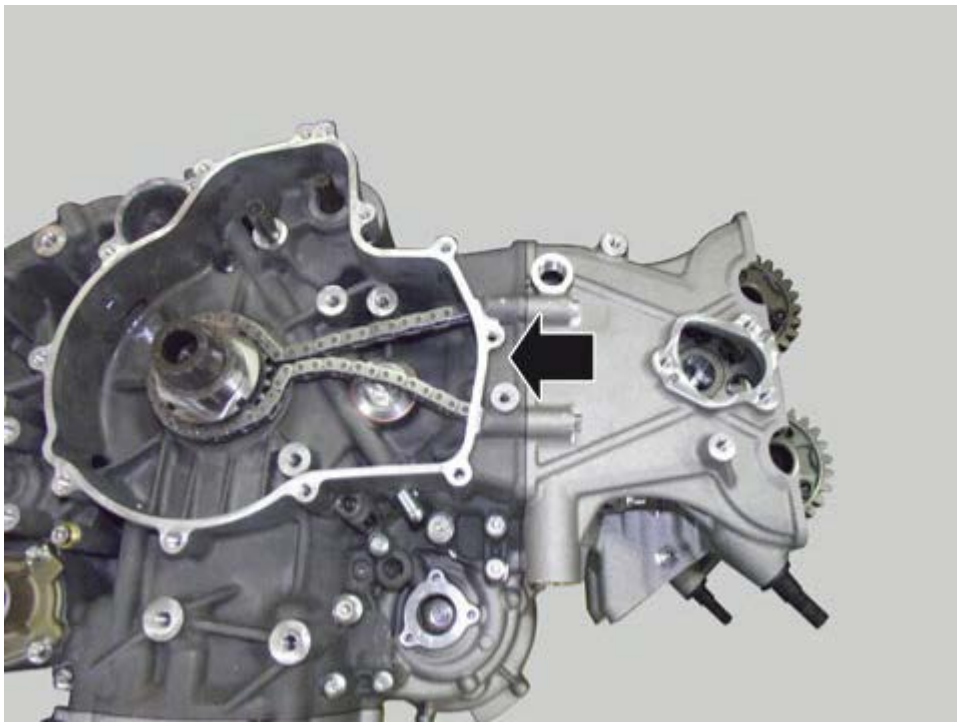


Remove shim (11), pin (10), bearings (12) and spacer (13) from the camshaft gear.

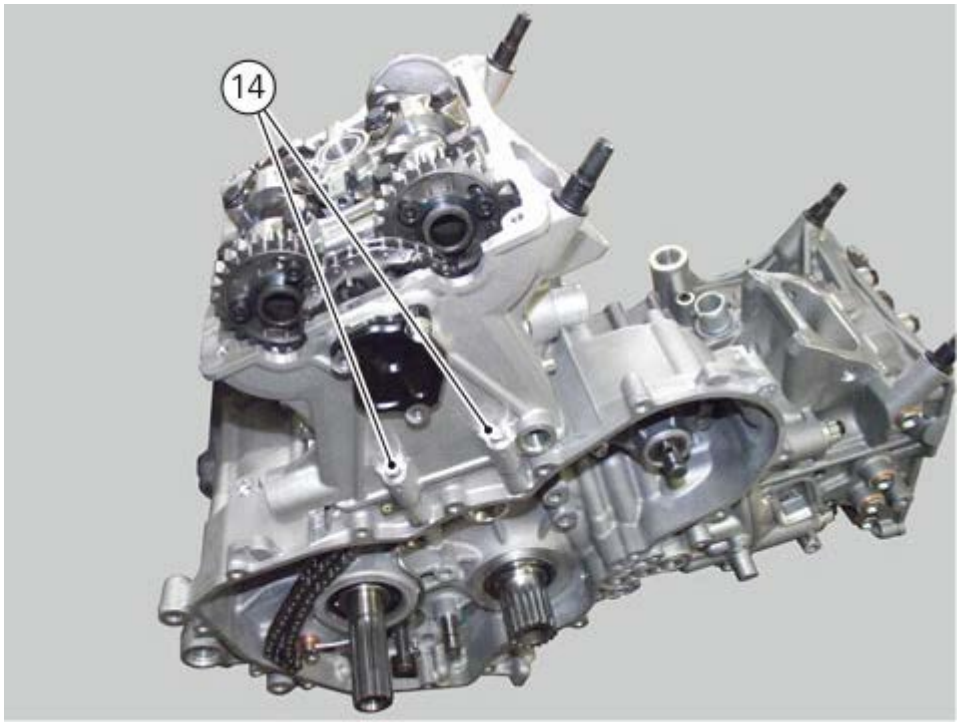


Slide the gear with chain towards the crankshaft.
Remove the chain from the crankshaft.
Now the chain is free.



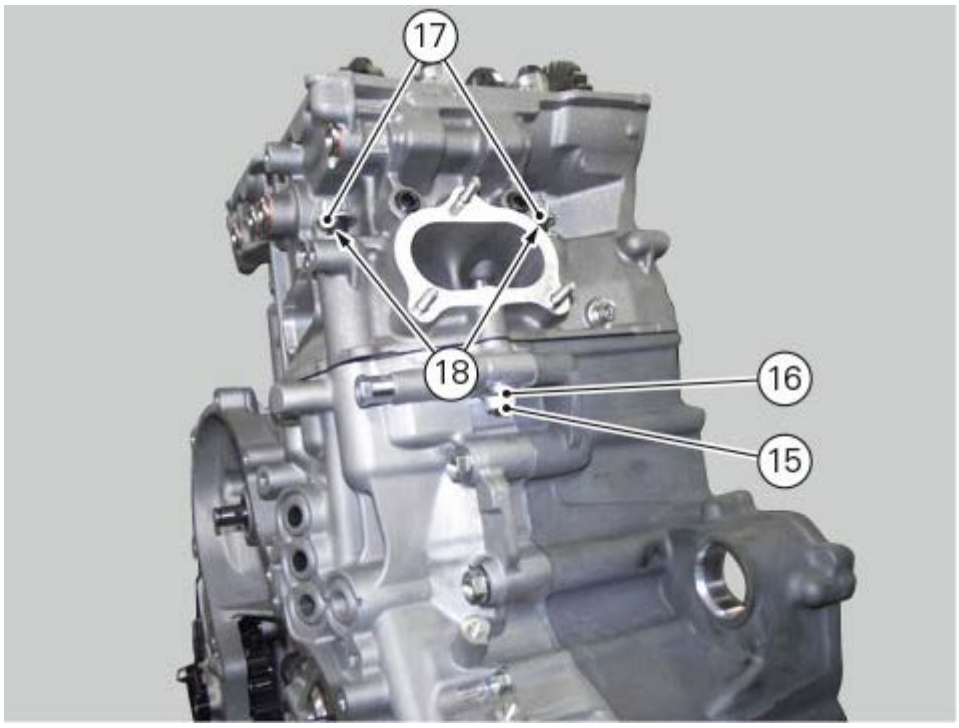
Reposition the split gear with chain in its original position using only the pin, and reposition the cover to move the head together with the chain.

Loosen the screws (14) securing the timing side heads.



Using tool no. **88713.2676**, undo 8 mm-diameter nuts (15) on the cylinder head stud bolts.
Remove nuts (15) and collect the special washers (16) located between nut and head.
Using tool no. **88713.3926**, undo 10 mm-diameter nuts (17) on the cylinder head stud bolts.
Remove nuts (17) and collect the special washers (18) located between nut and head.


88713.3926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18
16
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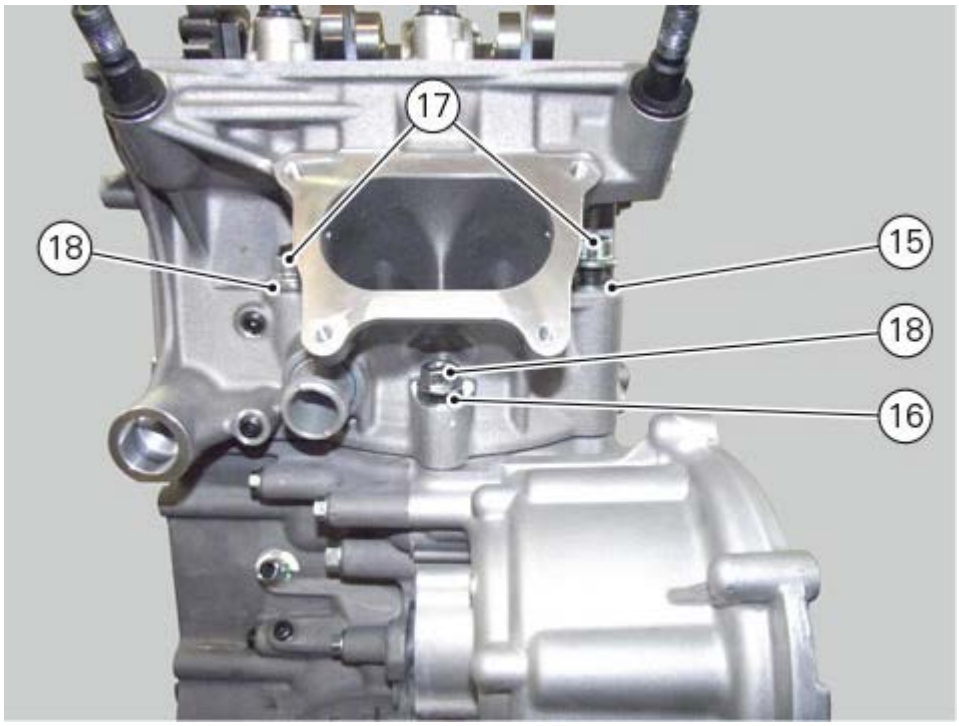


Removing the vertical head

Remove both spark plugs (Replacing the spark plugs).
Set the crankshaft at TDC in the combustion stage (Crankshaft positioning at TDC in the combustion stage).
Remove the clutch inspection cover (Removing the clutch cover).
Remove the water pump idle gear paying attention to the free parts (Removing the water pump).
Remove the clutch unit (Removing the clutch).

Loosen retaining screws (2) and remove cover (3), having care not to damage the mobile parts.

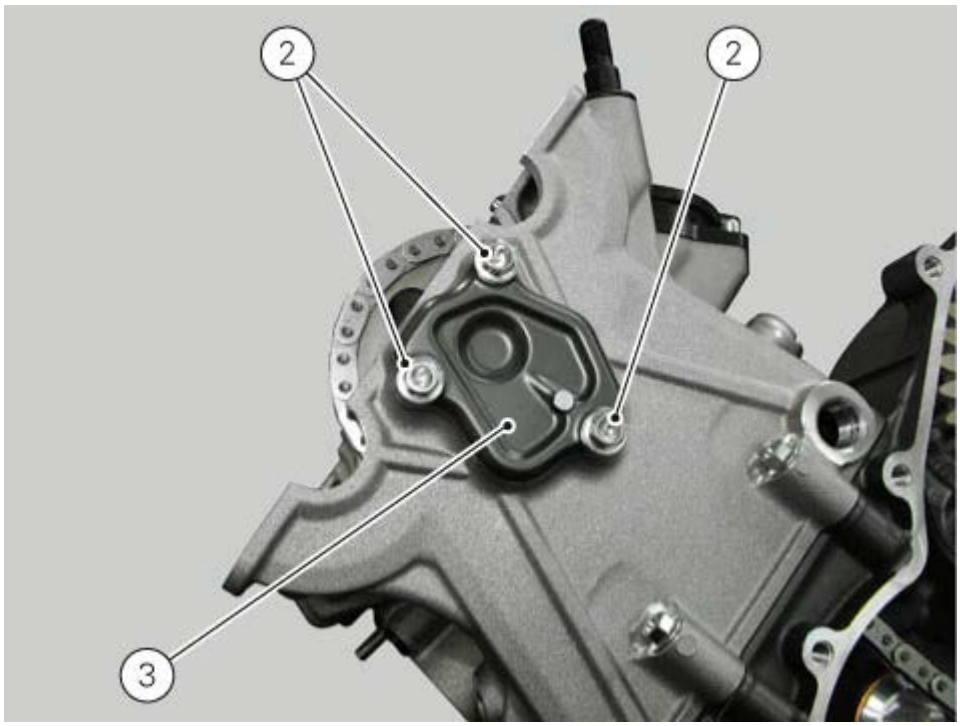
Loosen tensioner (4) and remove it.

Undo pin (6) and remove the mobile sliding shoe (5).

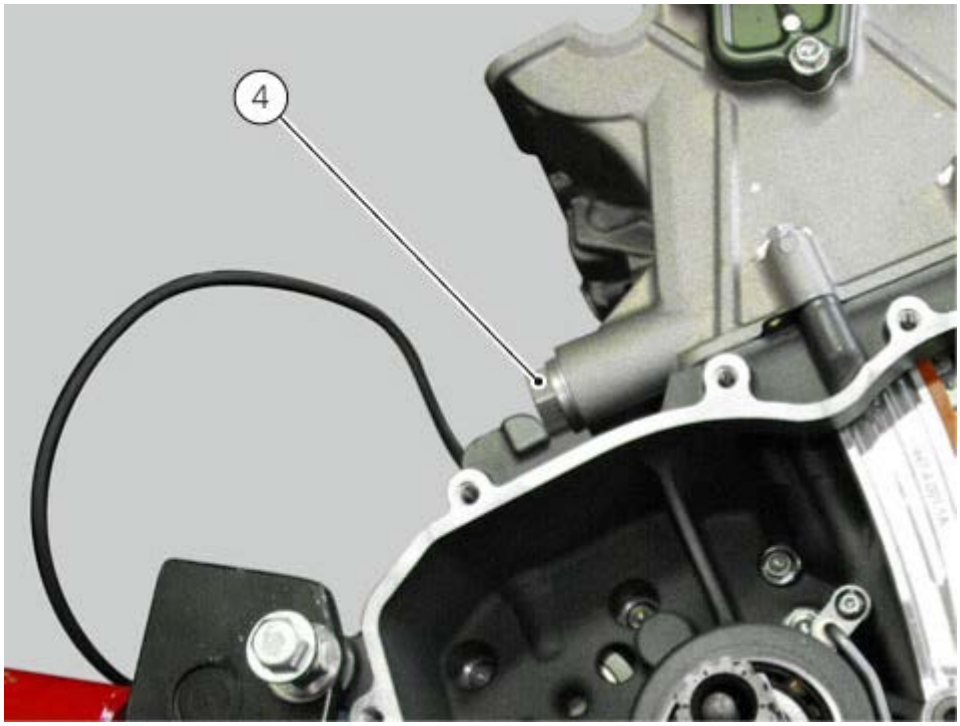
We recommend removing the fixed sliding shoe (9) by loosening the retaining pins (8).
Remove plug (7) located on the head base to access the fixed sliding shoe pin.
Remove the fixed sliding shoe pin (8).

Remove shim (11), pin (10), bearings (12) and spacer (13) from the camshaft gear.

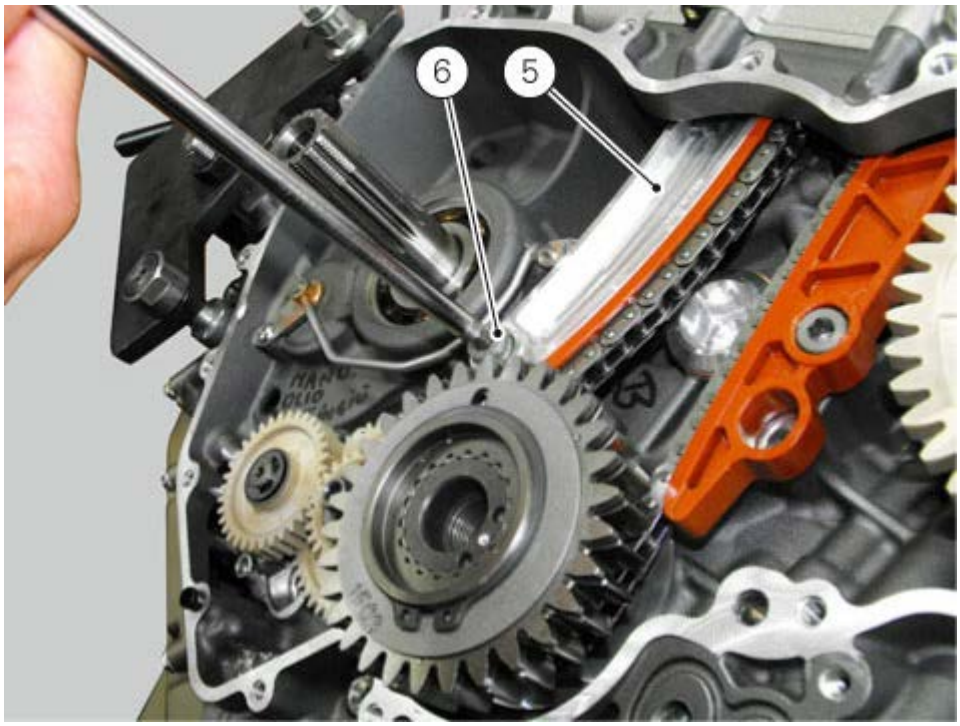
Loosen retaining screws (2) and remove cover (3), having care not to damage the mobile parts.



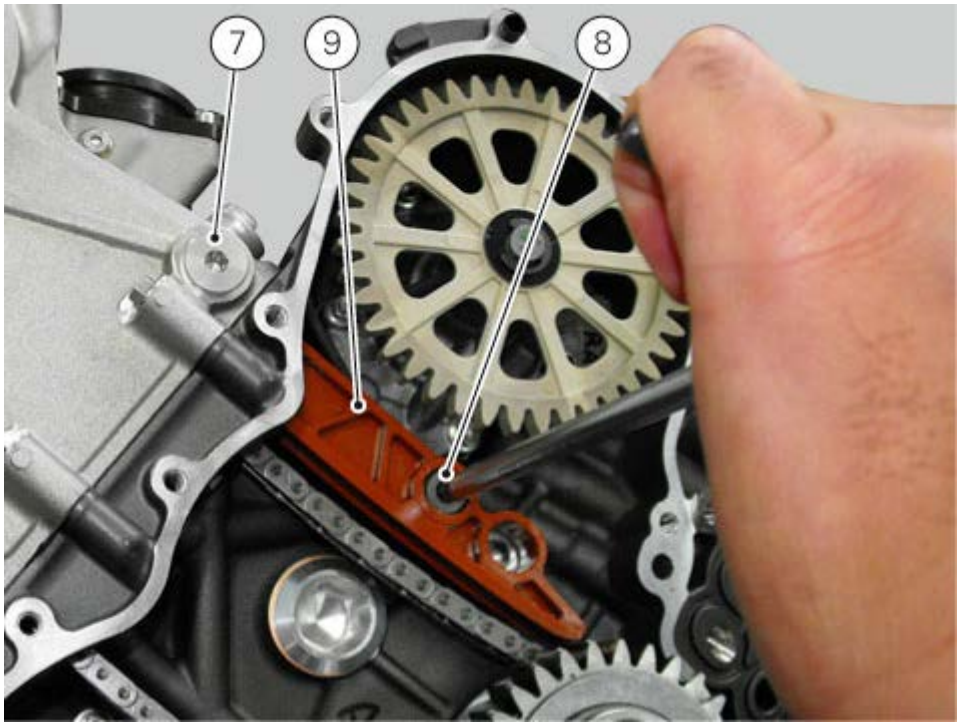
Loosen tensioner (4) and remove it.

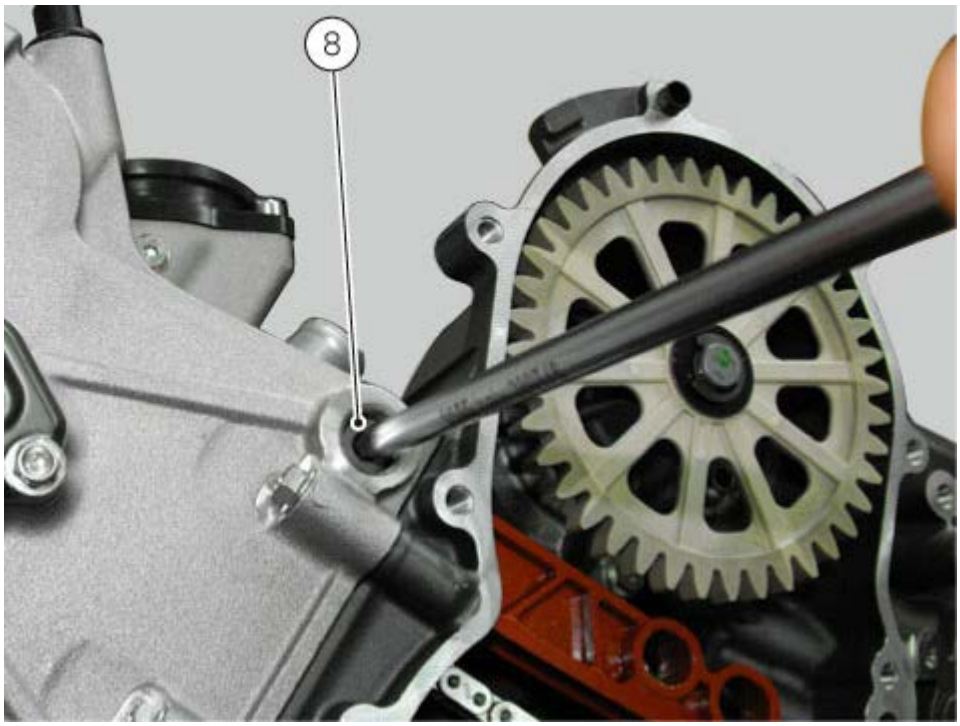


Undo pin (6) and remove the mobile sliding shoe (5).

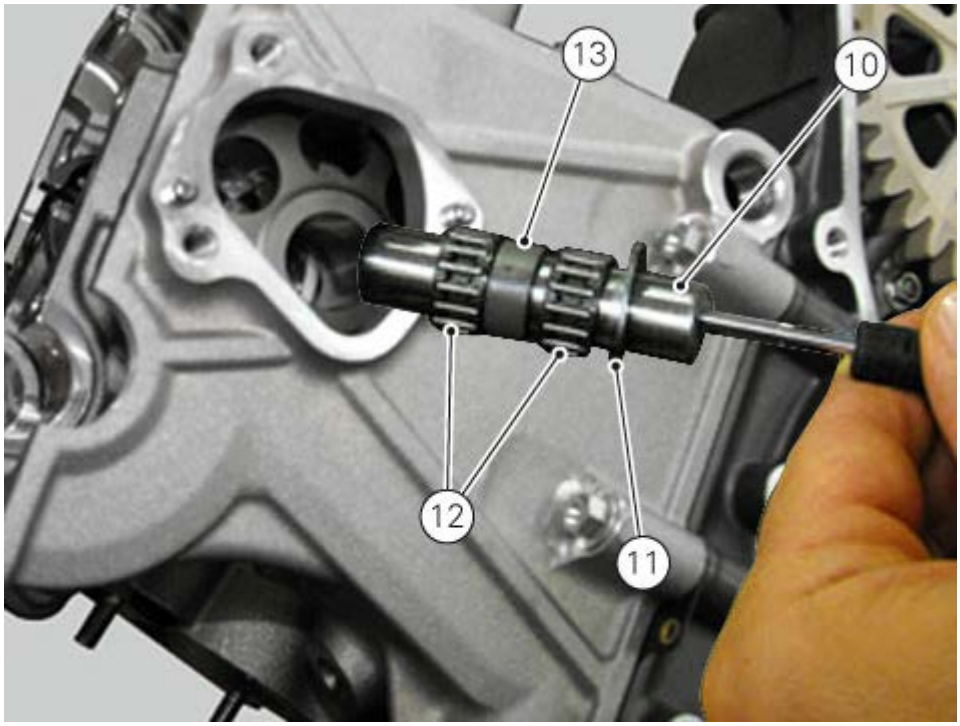


We recommend removing the fixed sliding shoe (9) by loosening the retaining pins (8).
Remove plug (7) located on the head base to access the fixed sliding shoe pin.
Remove the fixed sliding shoe pin (8).

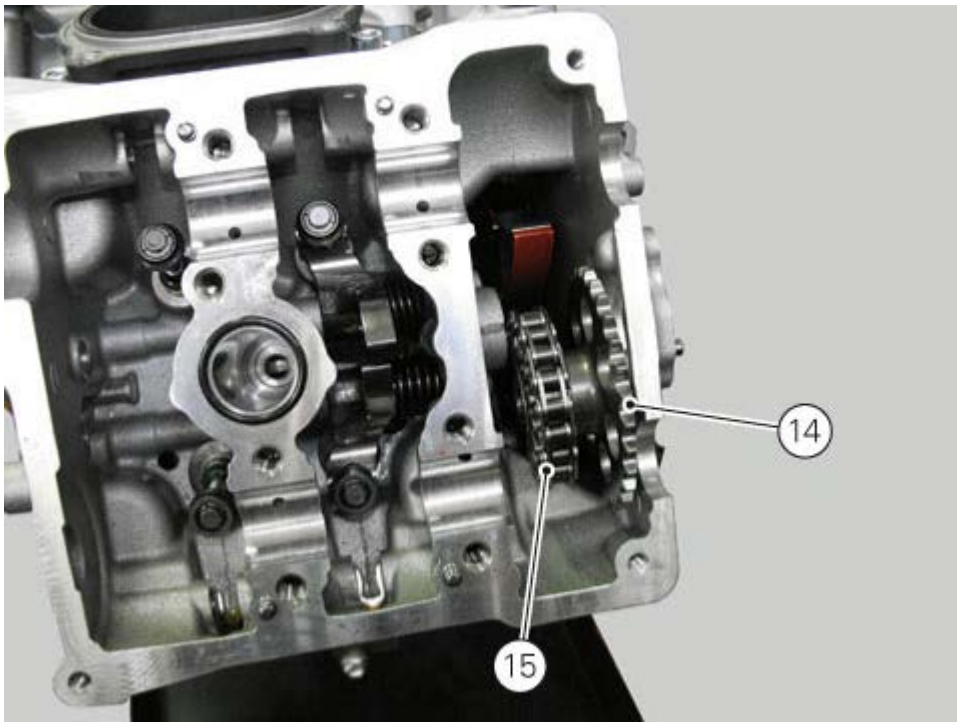




Remove shim (11), pin (10), bearings (12) and spacer (13) from the camshaft gear.



Slide gear (14) with chain towards the crankshaft.
Now the chain (15) is free.

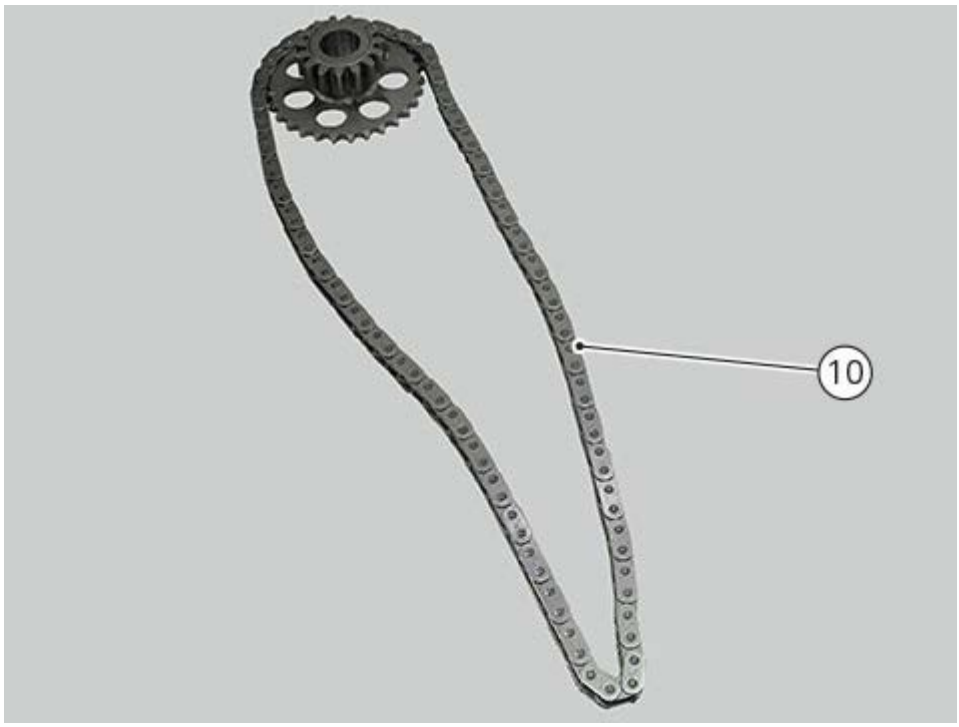


Reposition the gear with chain in its original position using only the pin, and reposition the cover to move the head together with the chain.
Repeat the loosening operation of the head screws and thru bolts as already described for the horizontal head.

Refit the head (from "Removing the heads without timing chain removal").

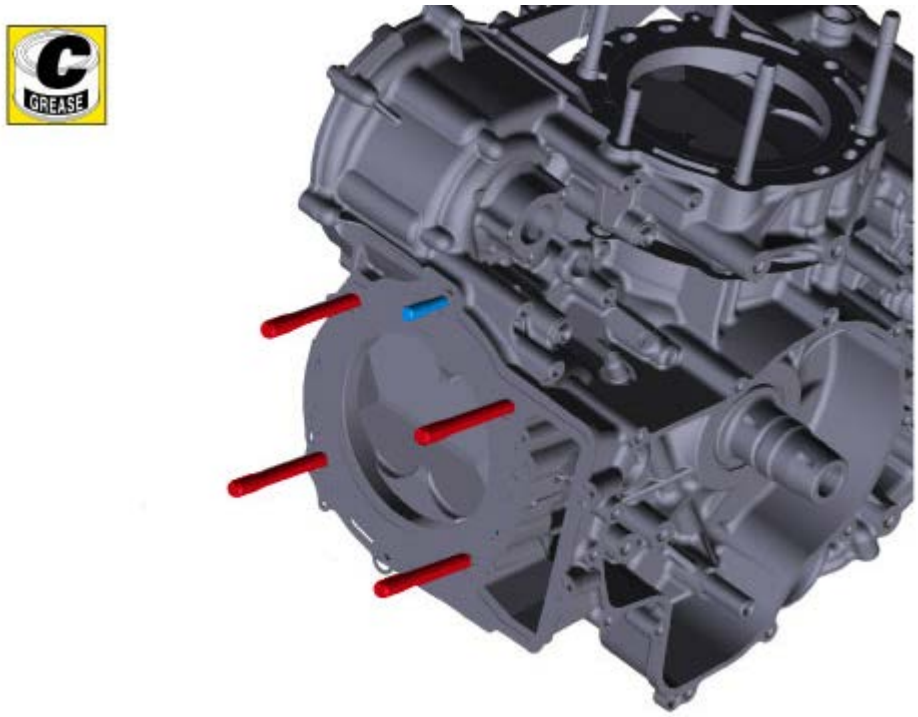
Note
Make sure the cylinder-head gasket, centring pins on the case surface and the bushing for oil passage to the heads are in the correct position.

The operations indicated in this procedure refer to the fitting of a horizontal head. These operations also apply to the vertical head.
Fit chain (10) on the split gear hub between the two teeth.



Insert the split gear with chain from the lower part of the head timing system compartment.
Take the split gear with chain from the upper part of the timing system compartment.

Fit the head on the thru bolts.
Apply specified grease on the underhead of nuts (12) and (14) and on the thru bolt thread.
Fit washers (13) and (15) on the thru bolts.
Start the head retaining nuts on the thru bolts following a cross pattern using tool no. **88713.2676** for nuts (12) and tool no. **88713.3926** for nuts (14), using a torque wrench.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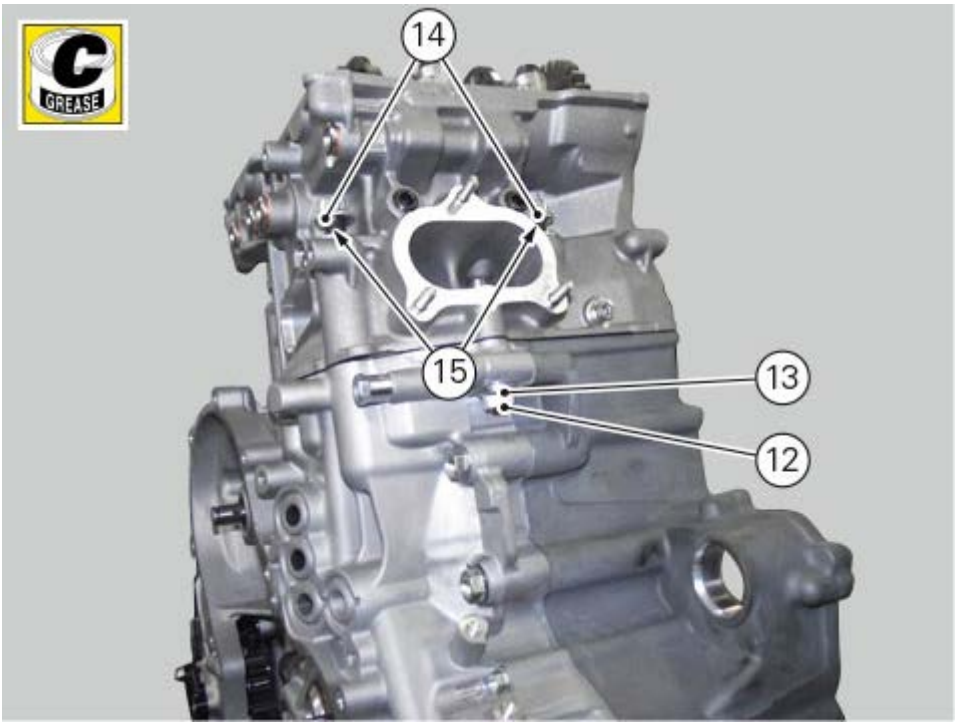
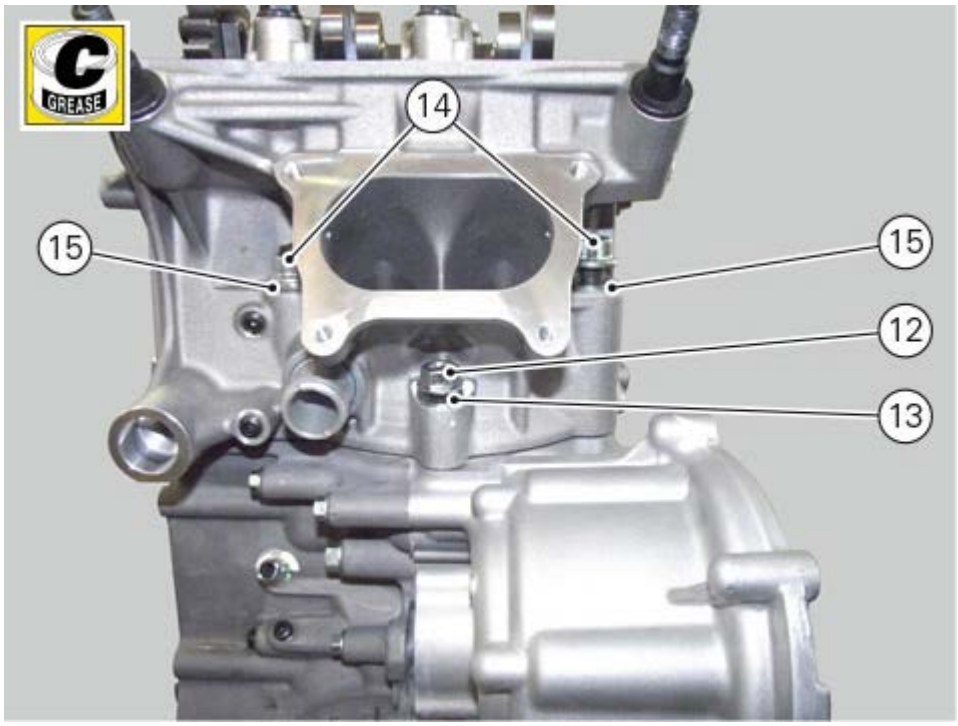
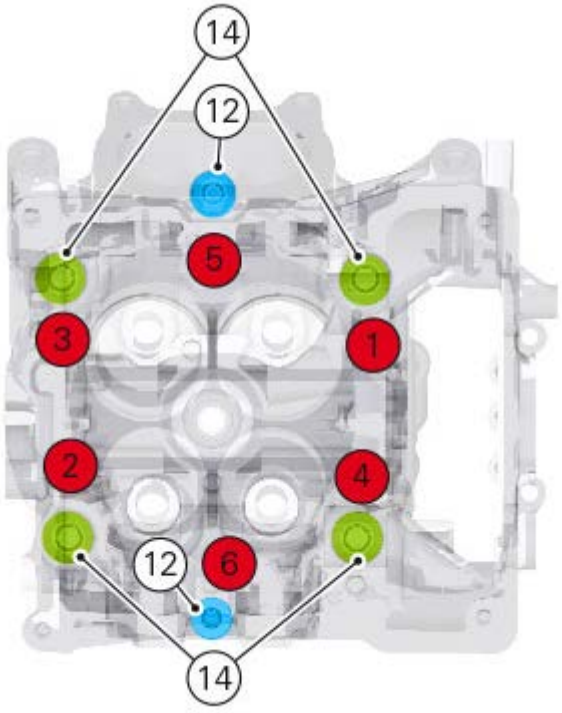
GREASE

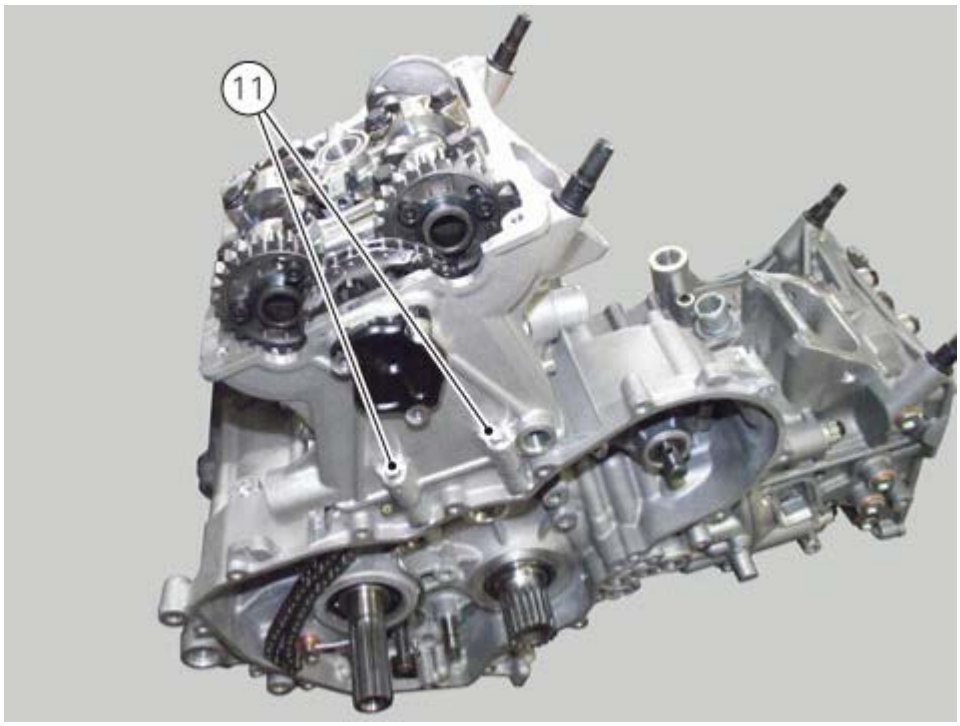

C
GREASE
14
15
13
12



Apply a snug torque of 20 Nm to nuts (14) in the following sequence: 1-2-3-4.
Pre-tighten nuts (14) to a torque of 40 Nm (Min. 38 Nm – Max. 42 Nm) following the sequence: 1-2-3-4.
Tighten nuts (14) to a torque of 67 Nm (Min. 64 Nm – Max. 70 Nm) following the sequence: 1-2-3-4.
Start nuts (12) in the following sequence: 5-6.
Tighten nuts (12) to a torque of 28.5 Nm (Min. 27 Nm – Max. 30 Nm) following the sequence: 5-6.



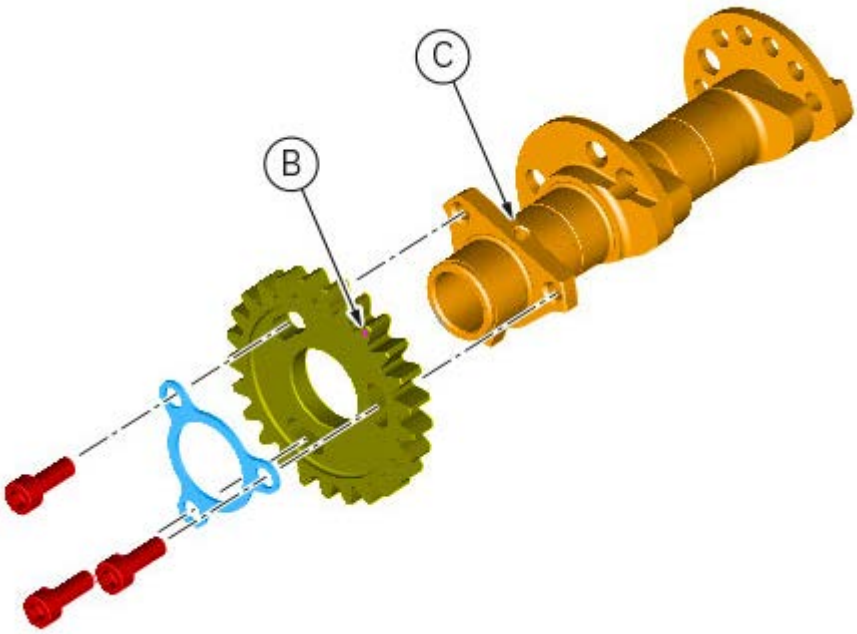
Start the screws (11) that retain the timing side heads and tighten them to a torque of 13 Nm (Min. 12 Nm – Max. 14 Nm).



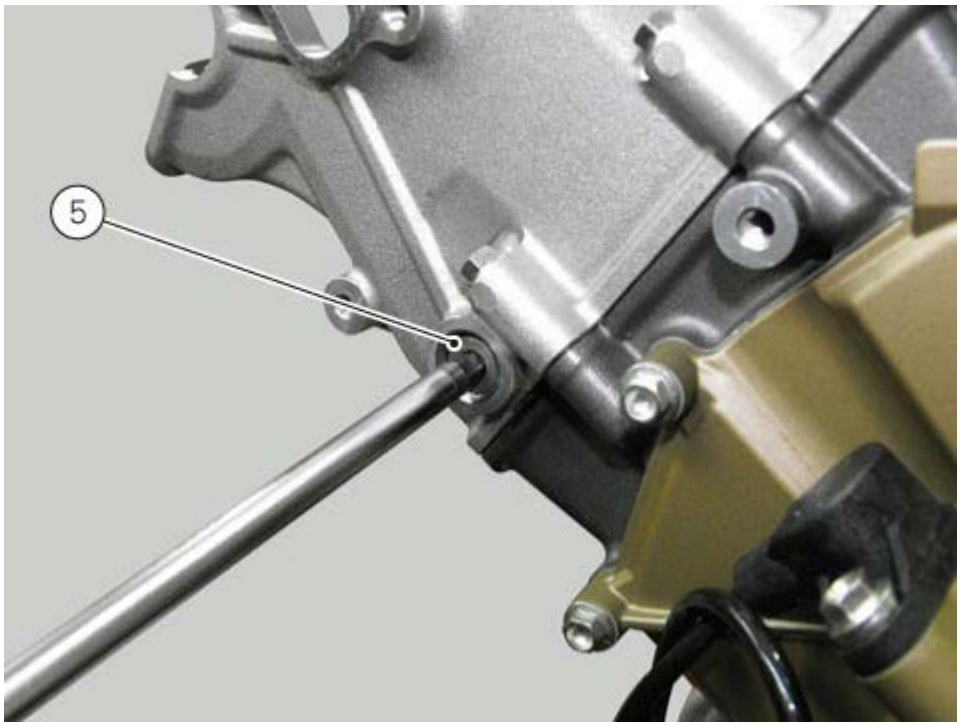
Use tool no. **88713.3500** to block the crankshaft.

Loosen and remove screws (A) of the camshaft gears and remove any threadlocker residue. Reposition screws (A) without tightening.

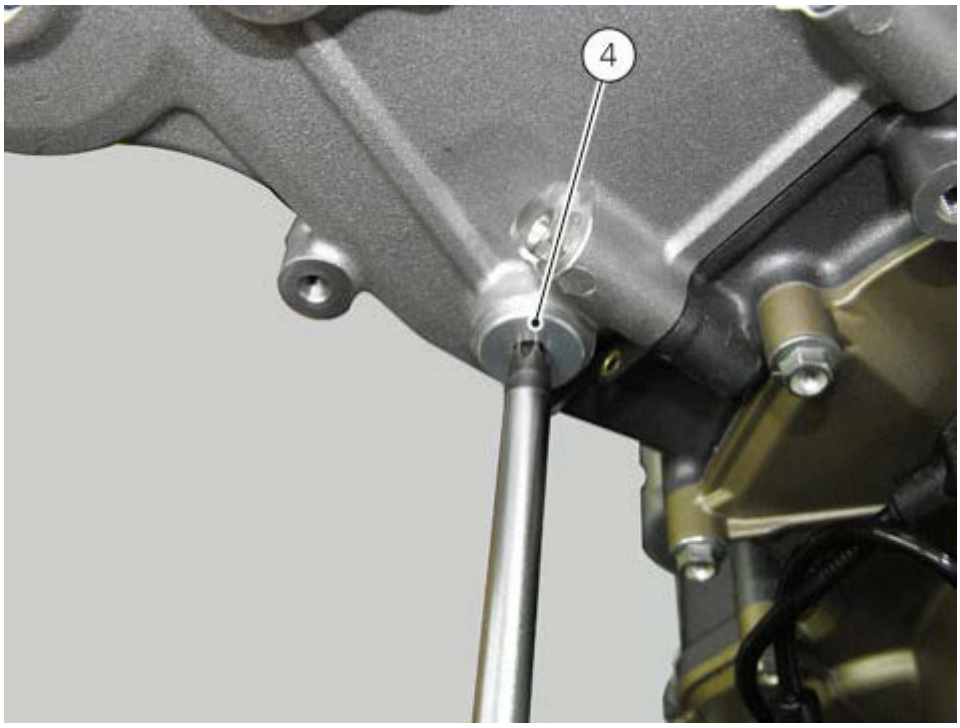
Check that timing engraved point (B) of the camshaft gear is near hole (C) of the camshaft reference surface.



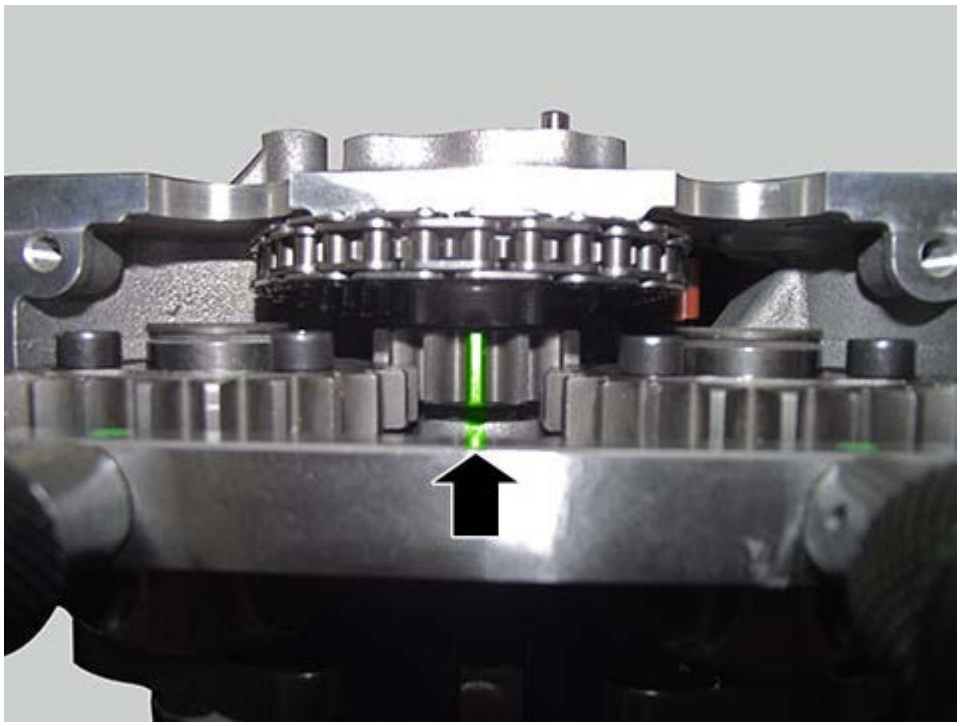
Fit fixed shoe pin (5) located on the head base.



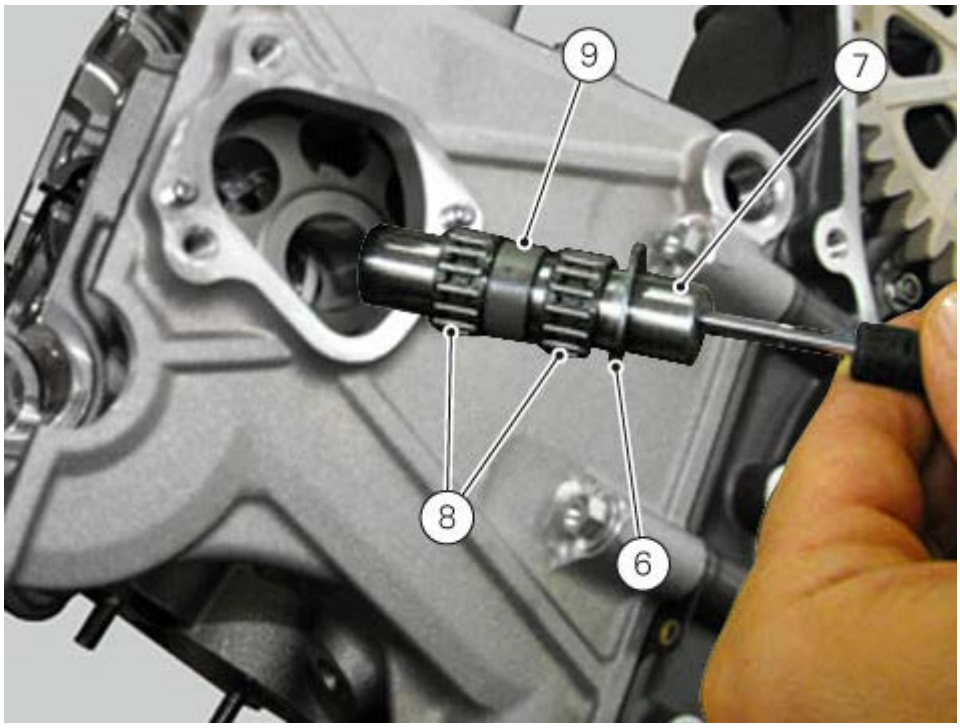
Fit cap (4) for access to the fixed show pin located on head base and tighten it to 17 Nm (Min. 16 Nm – Max. 18 Nm).



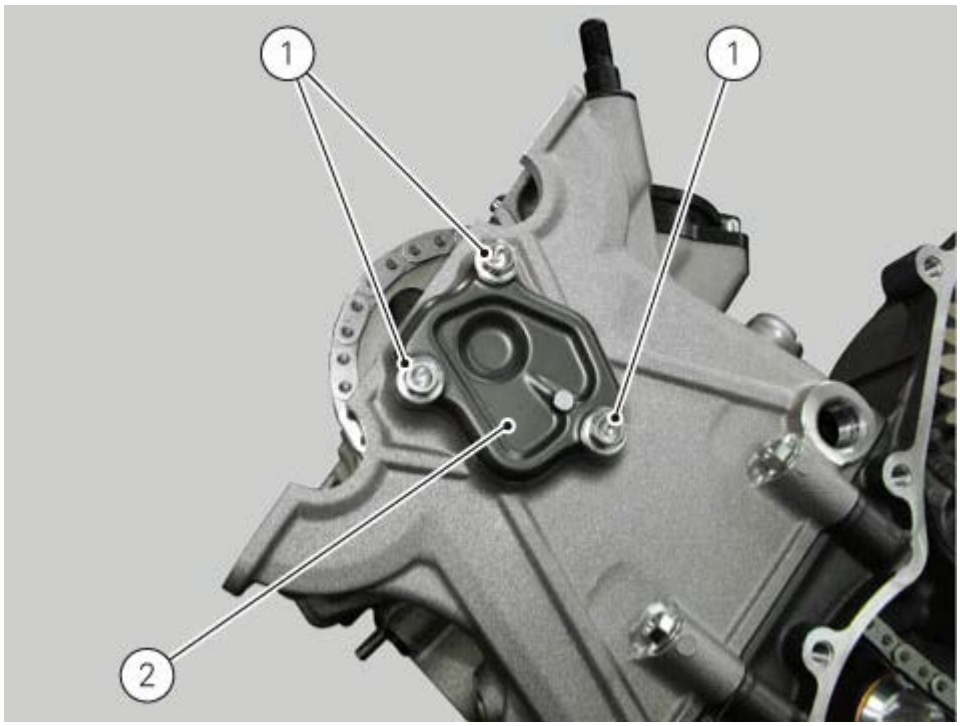
Keep the chain against the fixed shoe.
Make sure that one tooth of the split gear is on the head reference.



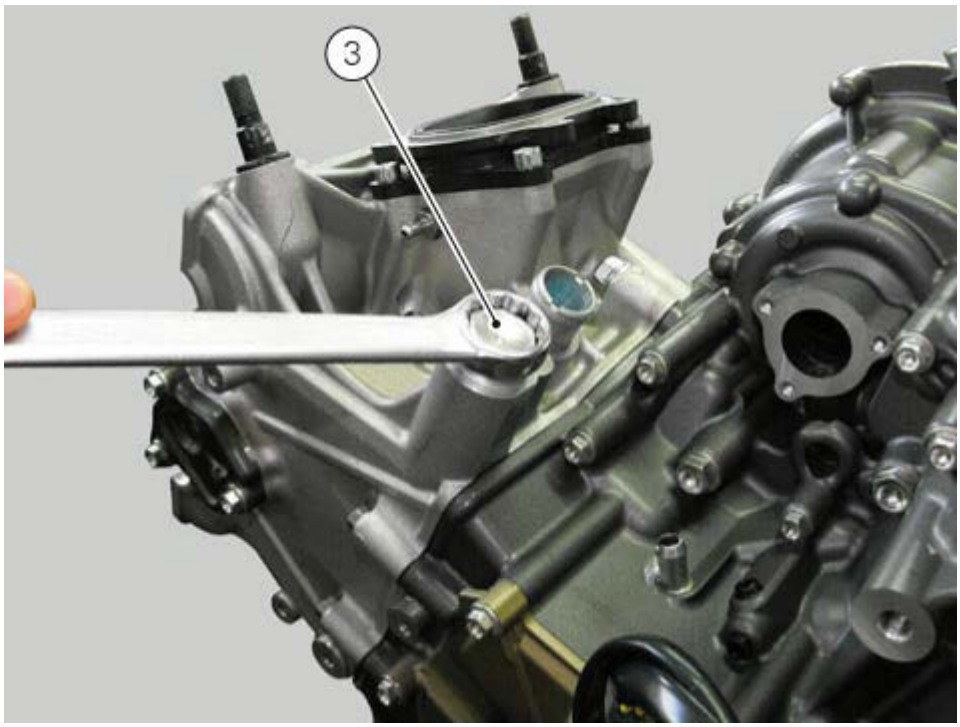
Insert pin (7) with a bearing (8), a spacer (9) and another bearing (8) on the head.
Fit shim (6).



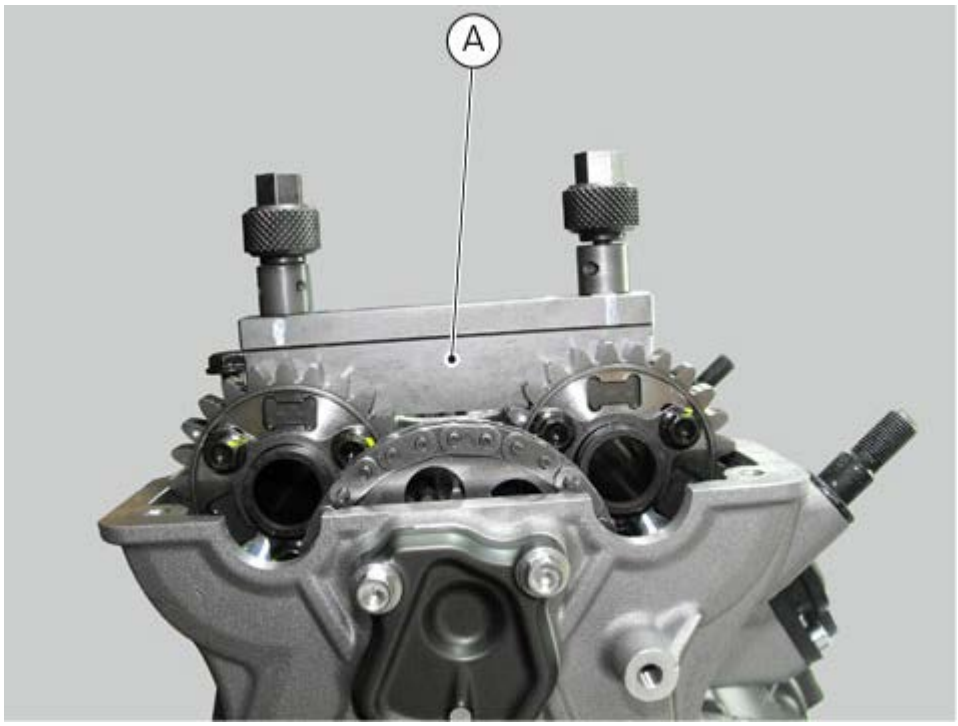
Apply Ducati sealing compound to cover (2) of the transmission pin.
Position the cover and tighten the screws (1) to a torque of 10 Nm (Min. 9 Nm – Max. 11 Nm).



Position tensioner (3) and tighten it to a torque of 25 Nm (Min. 23 Nm – Max. 27 Nm) and make sure that the chain is centred on the pins.



Place the camshafts on the head with the reference surfaces aligned and fit the timing tool A, no.: **88765.1622**.



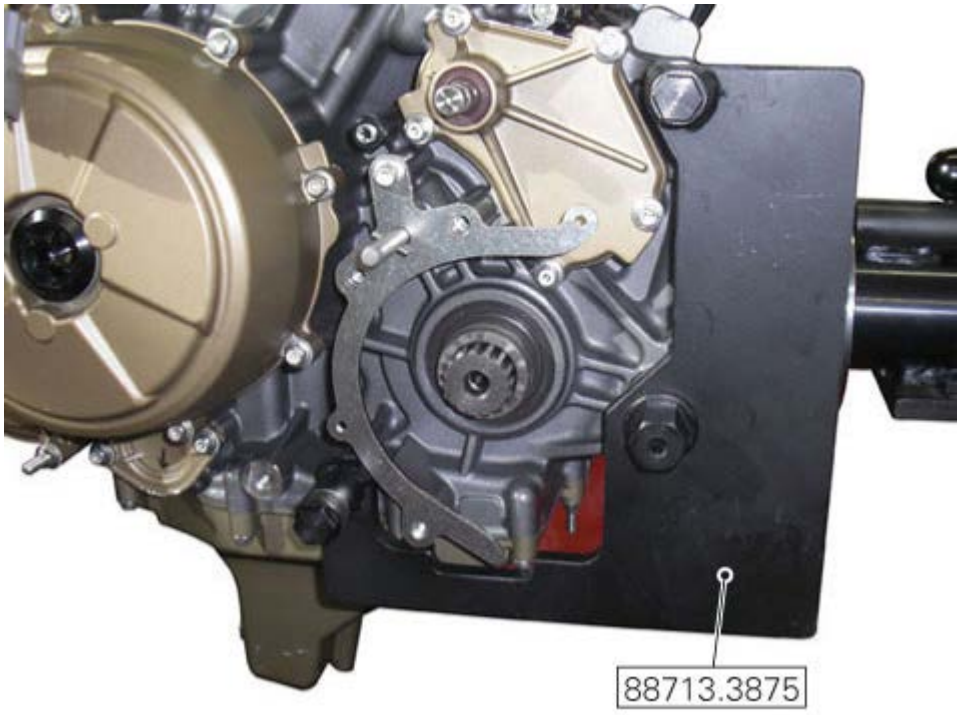
Completely loosen the two screws (one each camshaft), apply threadlocker as specified in the table and tighten to 19 Nm (Min. 18 Nm – Max. 20 Nm).
Remove tool no. **88765.1622** and tool no. **88713.3500**.
Turn the engine in its rotation sense until uncovering two other screws (A) (one each camshaft).
Completely loosen the two uncovered screws (A), apply threadlocker as specified in the table and tighten to the specified torque.

Refit both spark plugs (Replacing the spark plugs).
Refit the engine in the vehicle (Refitting the engine).

Removing the heads without timing chain removal

Remove the engine from the vehicle (Removing the engine).

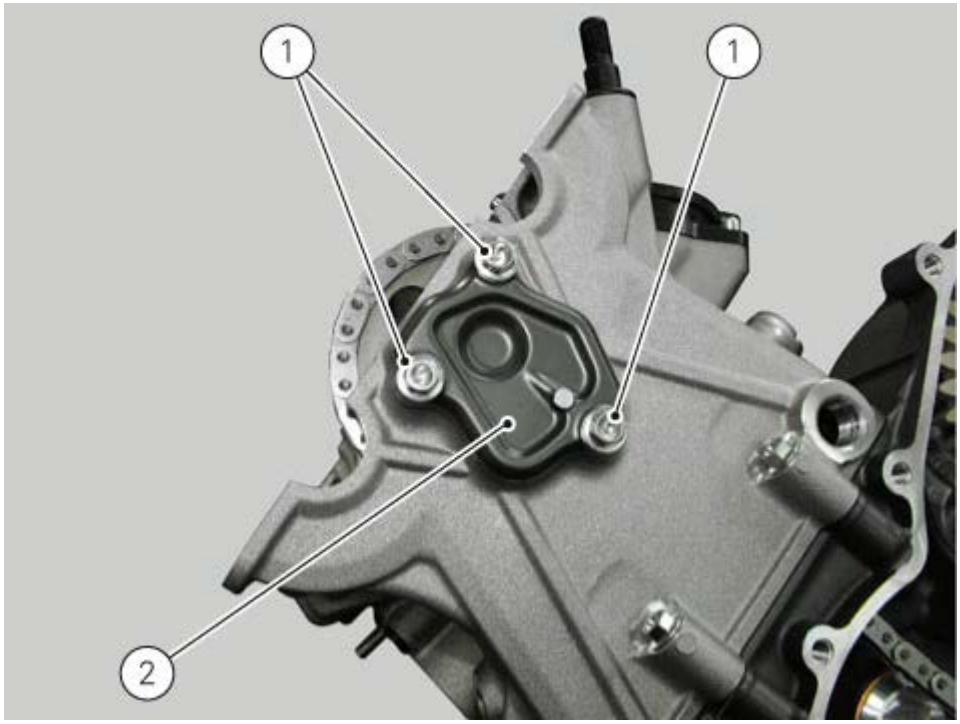
Fit the engine block using the suitable tool no. **88713.3875**.



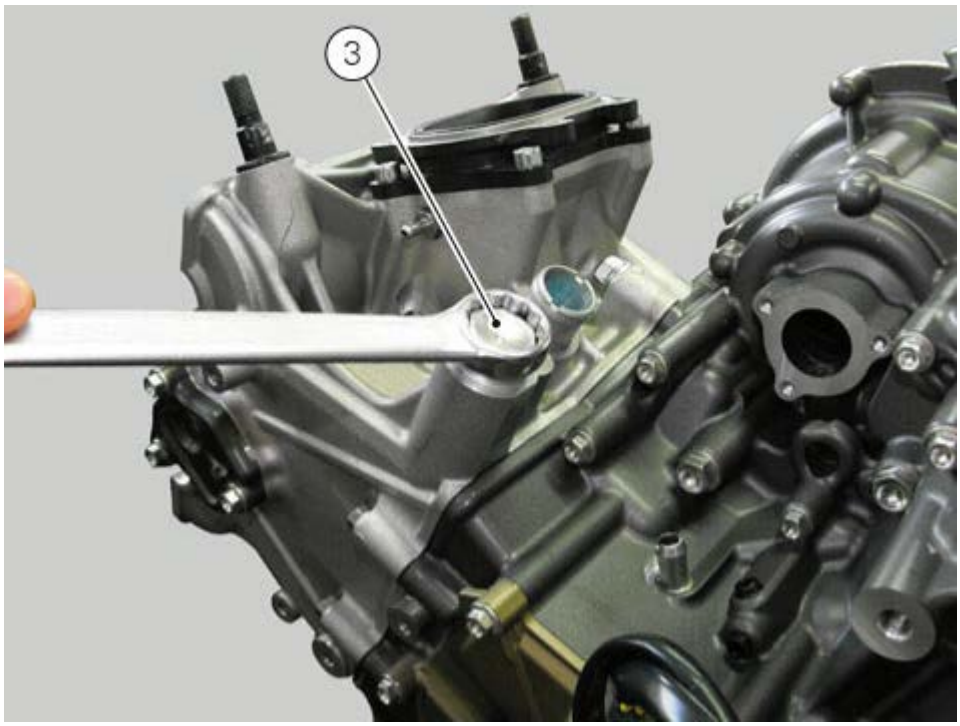
The operations indicated in this procedure refer to the removal of a horizontal head. These operations also apply to the vertical head.

Remove both spark plugs (Replacing the spark plugs).
Set the crankshaft at TDC in the combustion stage (Crankshaft positioning at TDC in the combustion stage).
Remove the camshafts (Removing the camshafts).

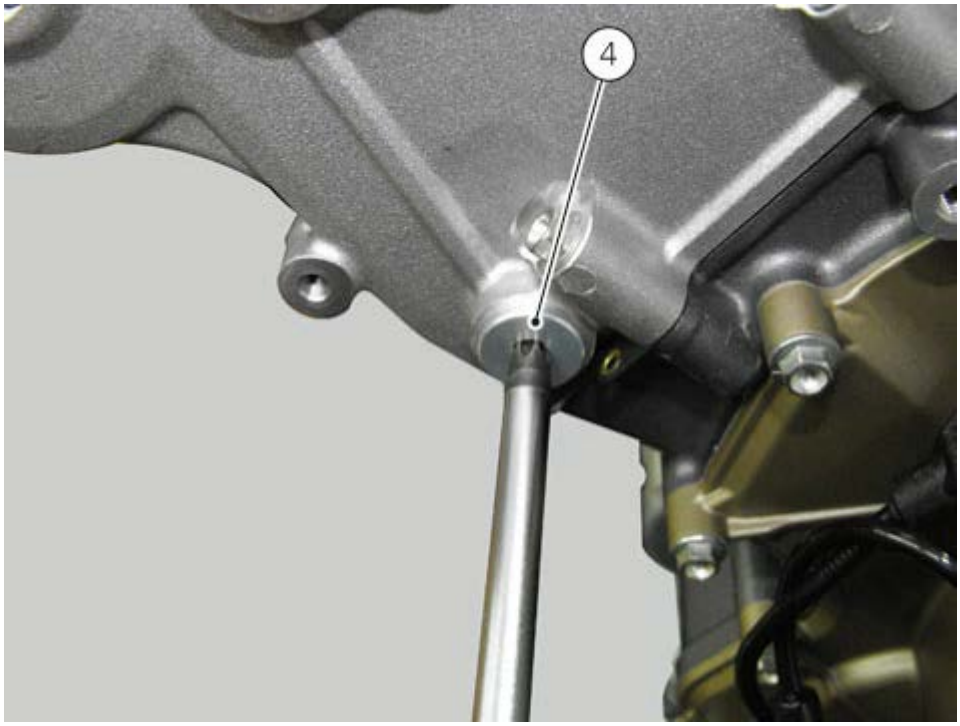
Loosen retaining screws (1) and remove cover (2), having care not to damage the mobile parts.



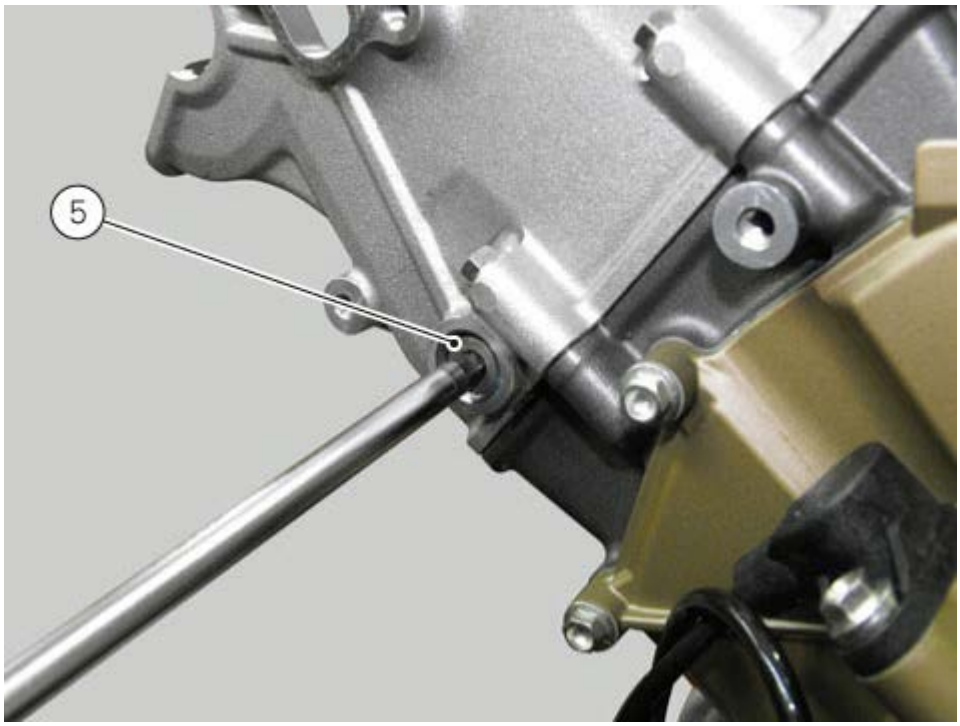
Loosen tensioner (3) and remove it.



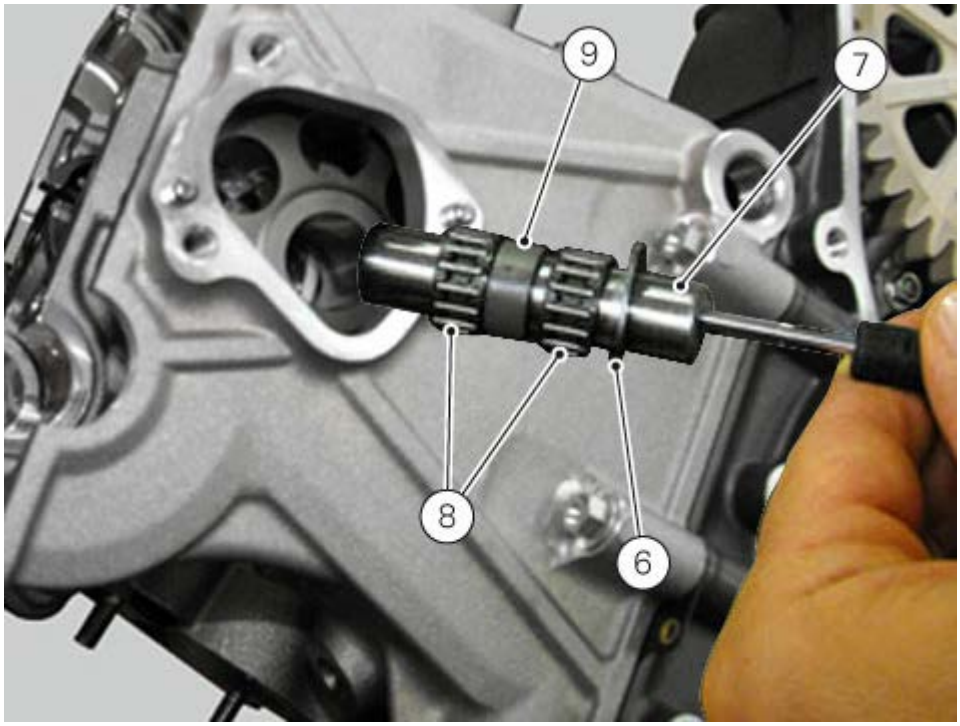
Remove plug (4) located on the head base to access the fixed sliding shoe pin.



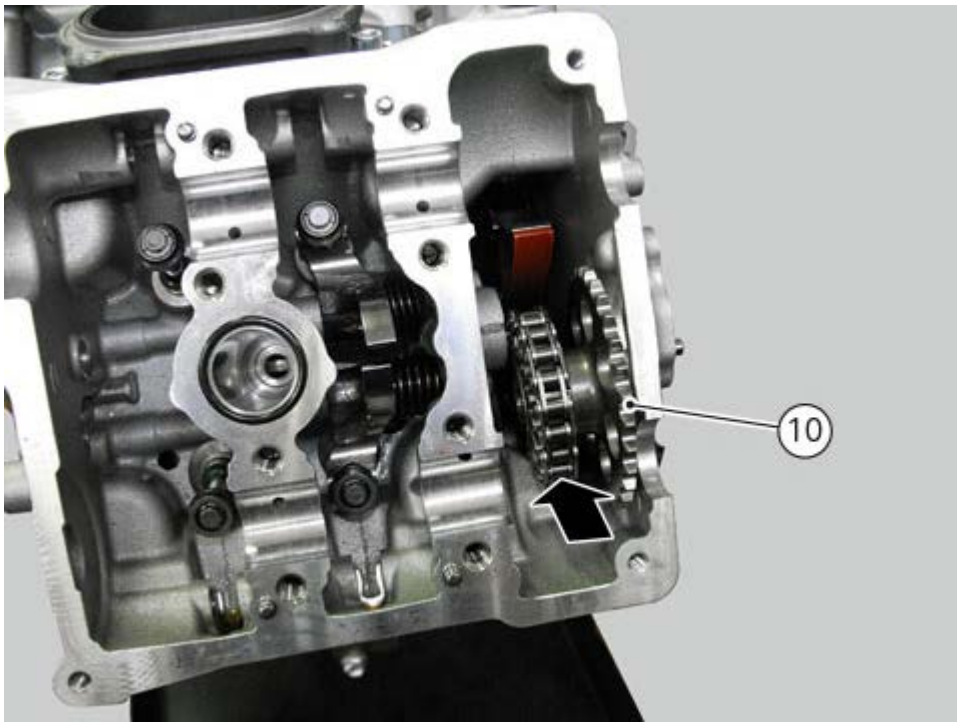
Remove fixed shoe pin (5) located on the head base.



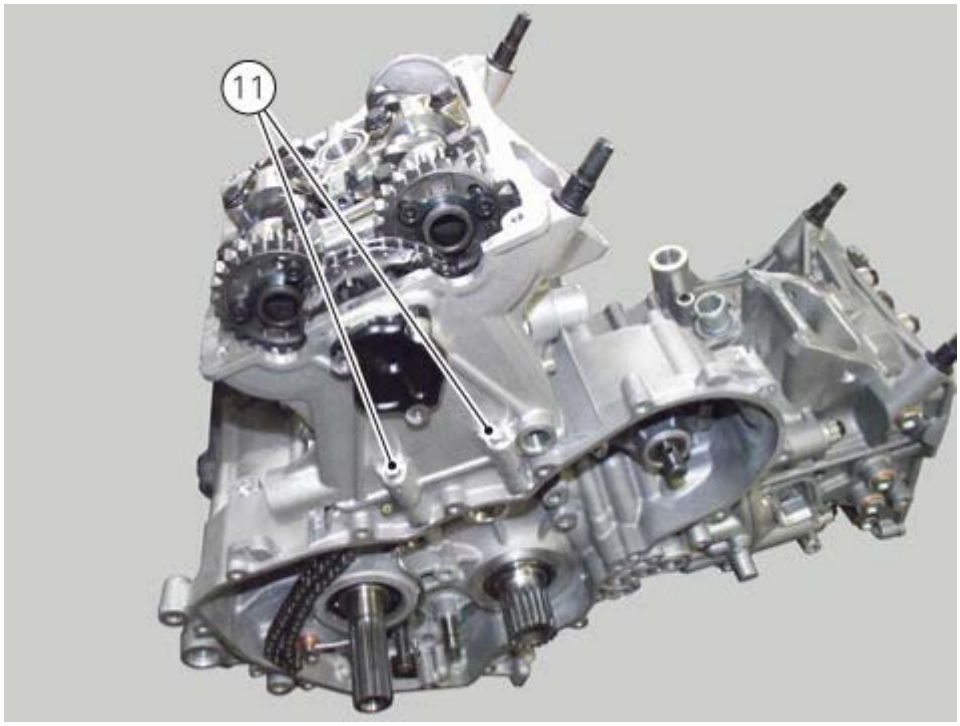
Remove shim (6), pin (7), bearings (8) and spacer (9) from the camshaft gear.



Remove the chain from gear (10) paying attention that the chain does not fall inside the timing system compartment.

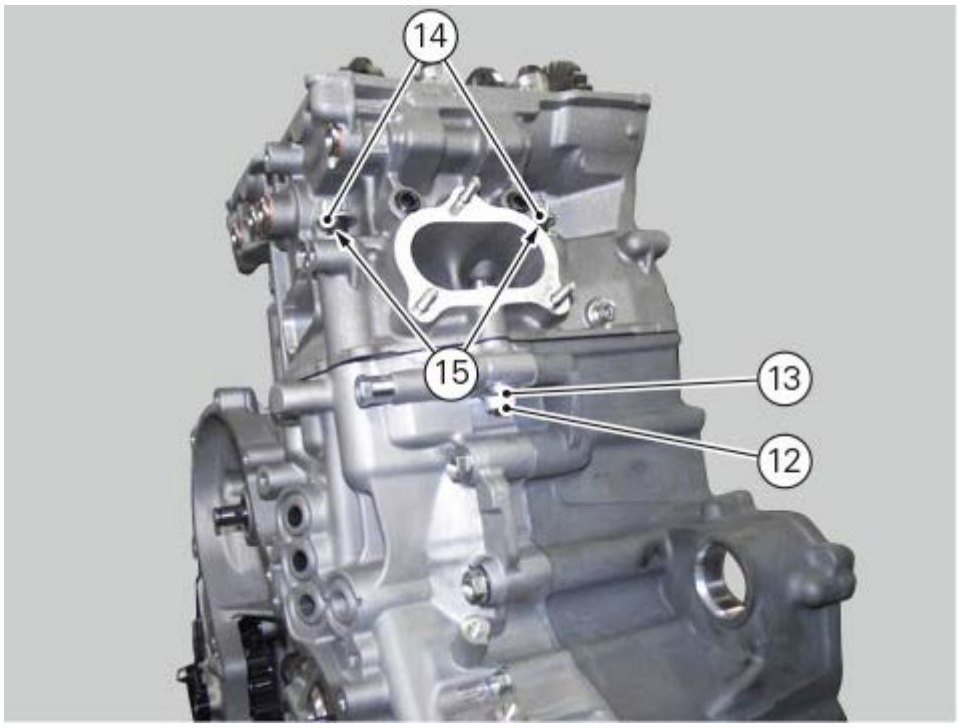


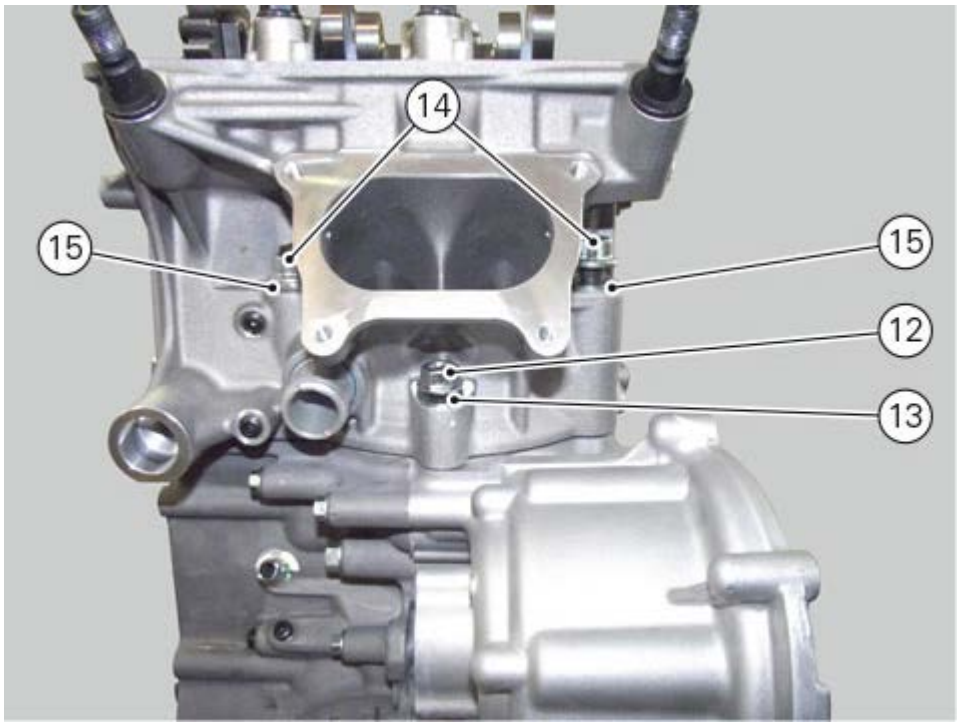
Loosen the screws (11) securing the timing side heads.

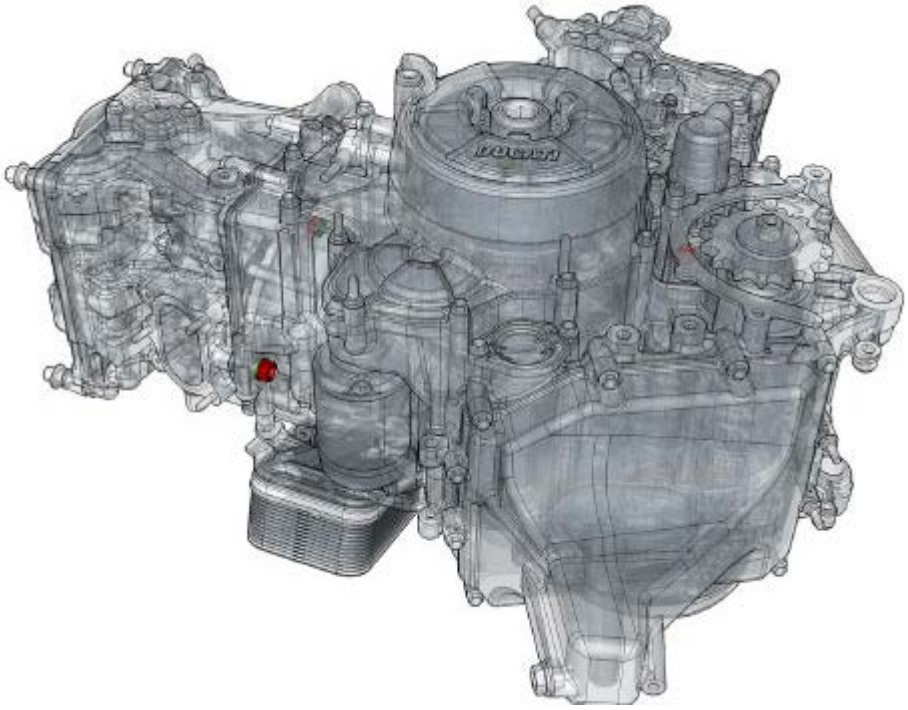


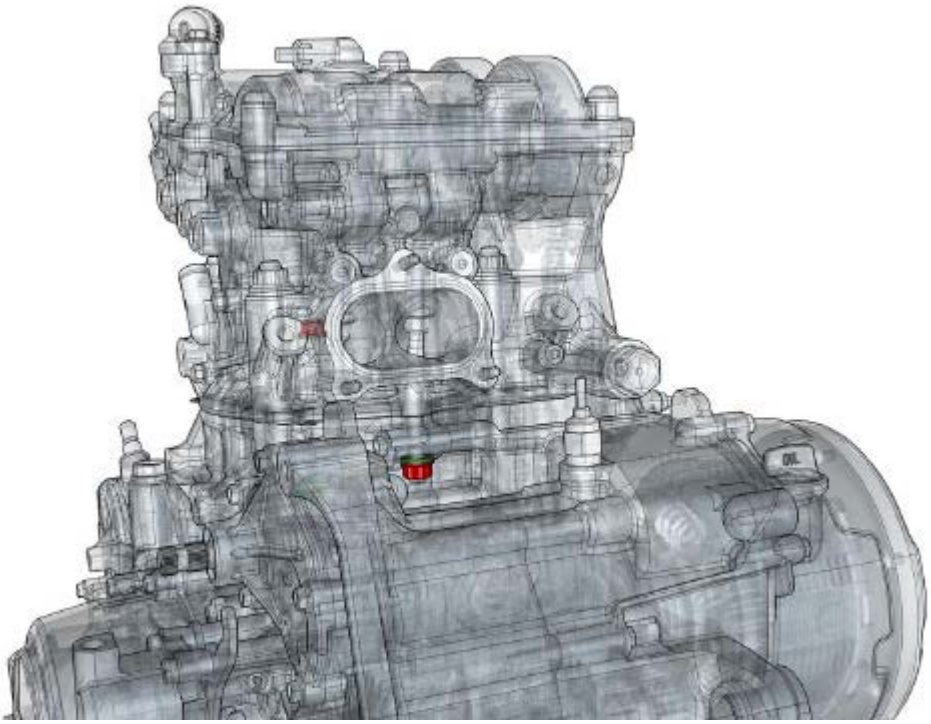
Using tool no. **88713.2676**, undo 8 mm-diameter nuts (12) on the cylinder head stud bolts.
Remove nuts (12) and collect the special washers (13) located between nut and head.
Using tool no. **88713.3926**, undo 10 mm-diameter nuts (14) on the cylinder head stud bolts.
Remove nuts (14) and collect the special washers (15) located between nut and head.

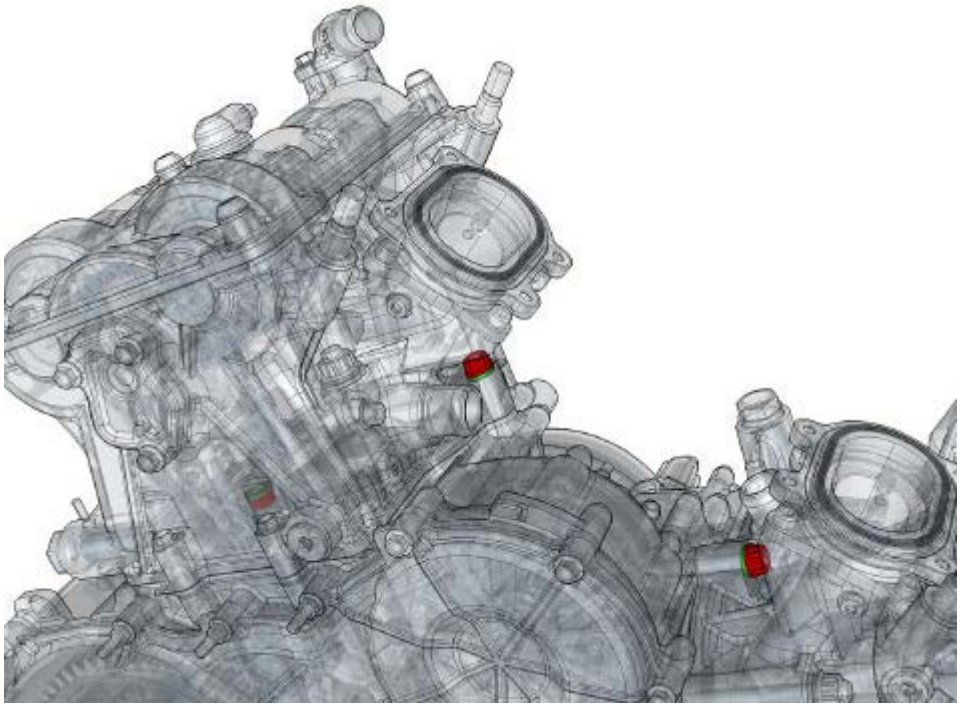

88713.3926

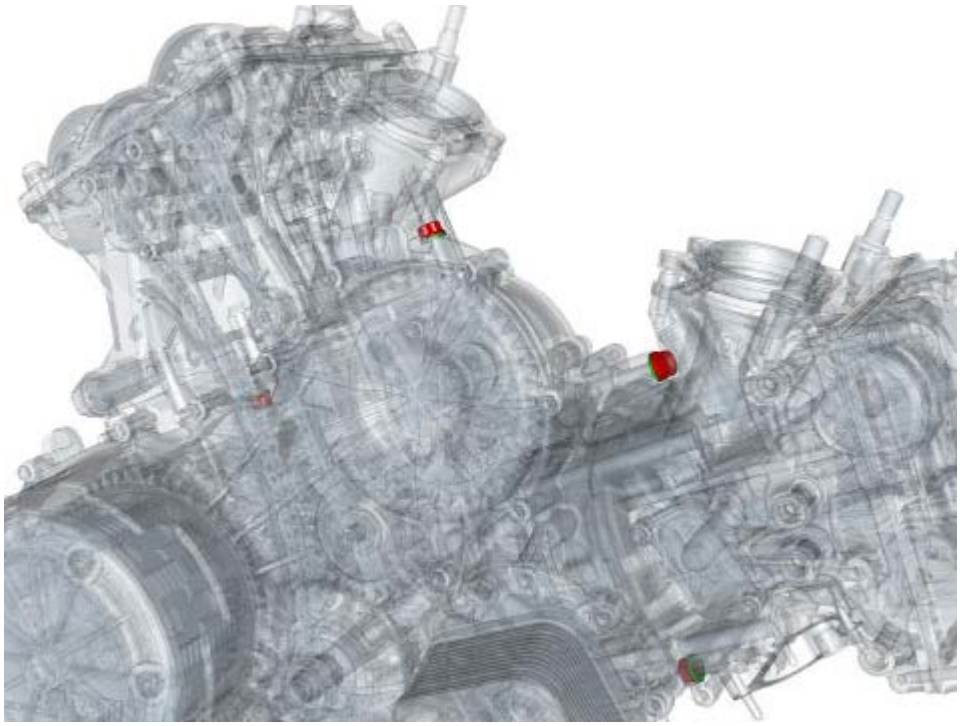

14
15
13
12

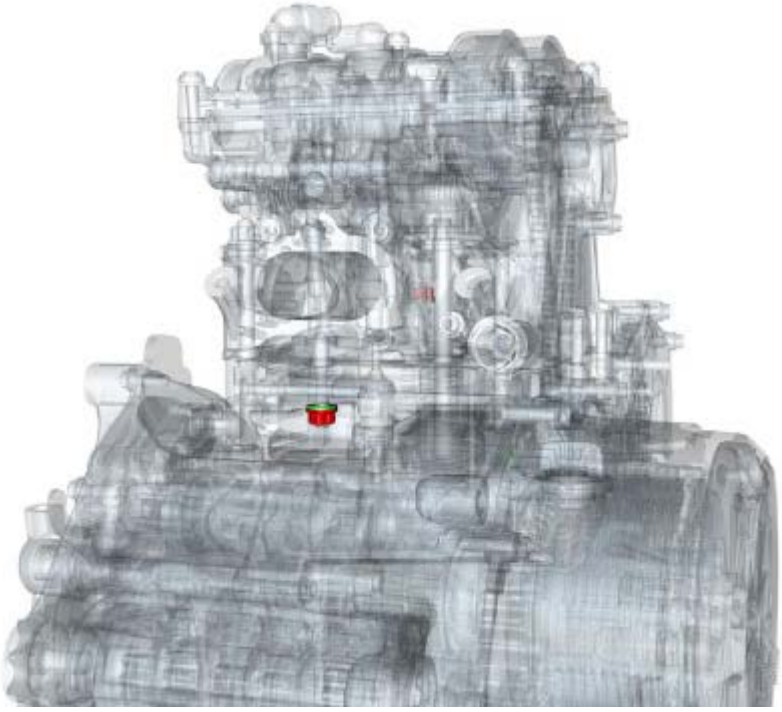

14
15
15
12
13

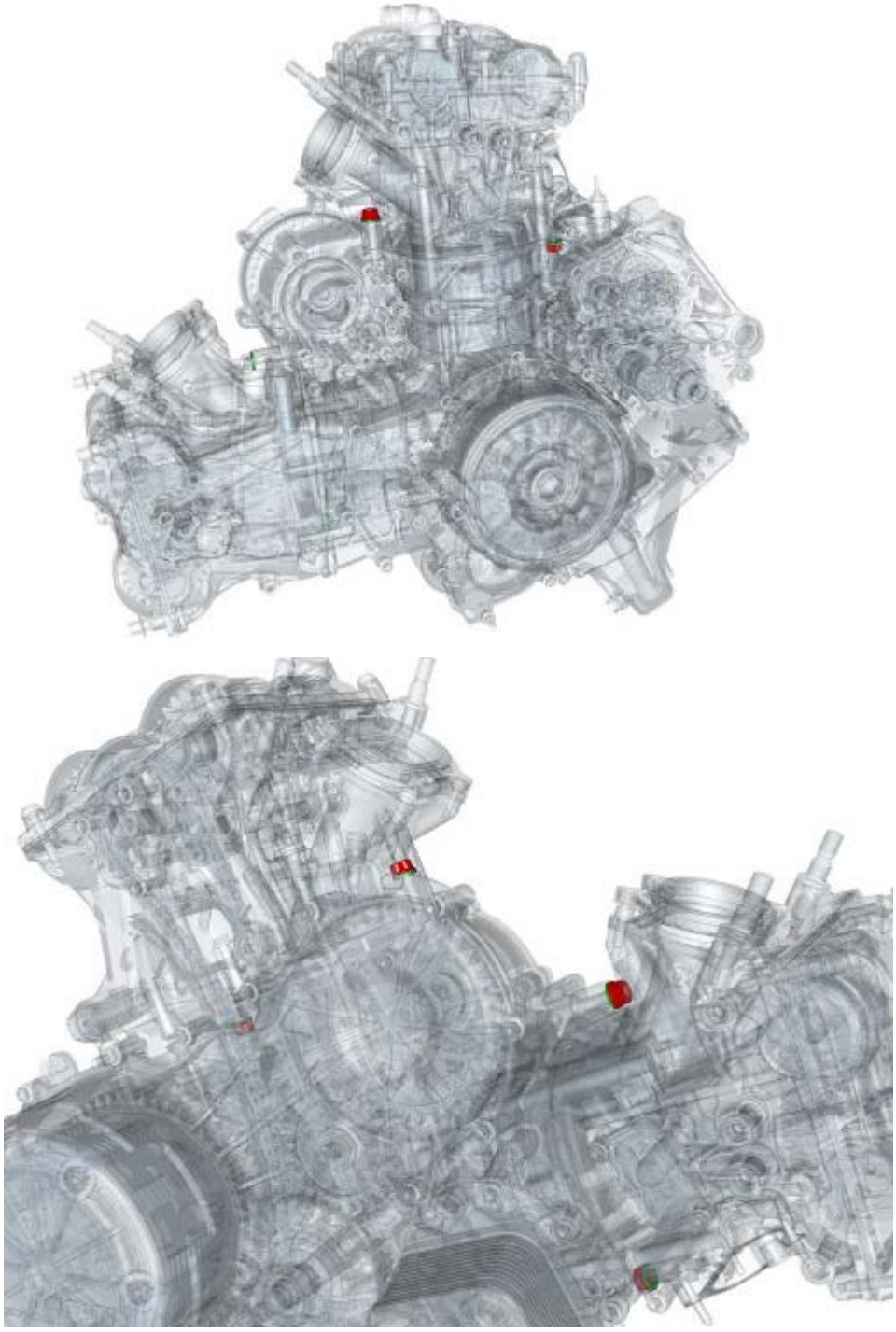








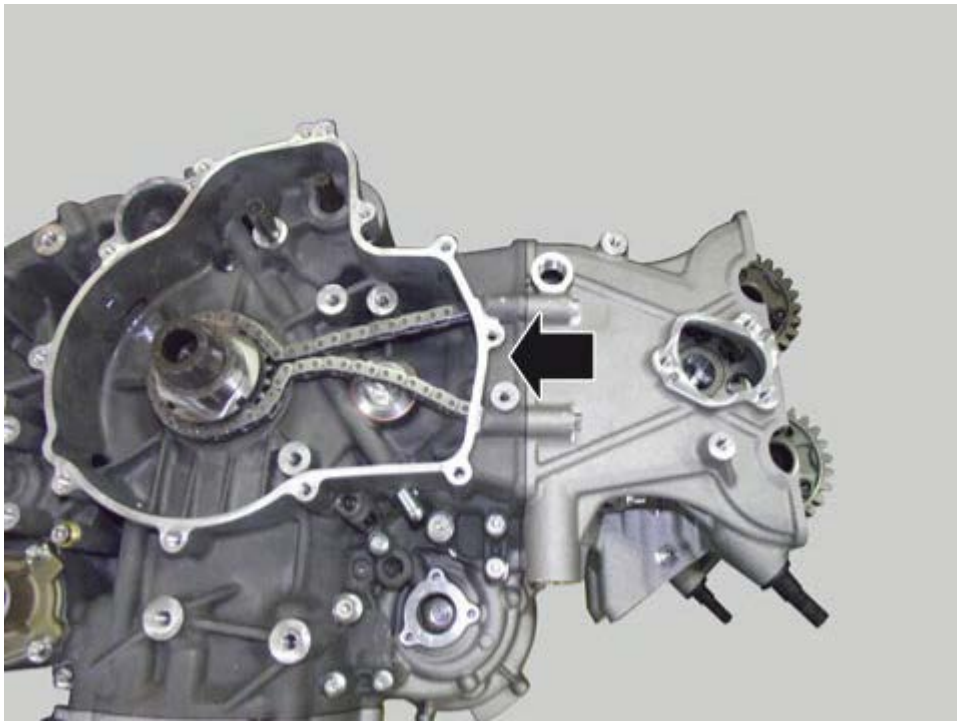




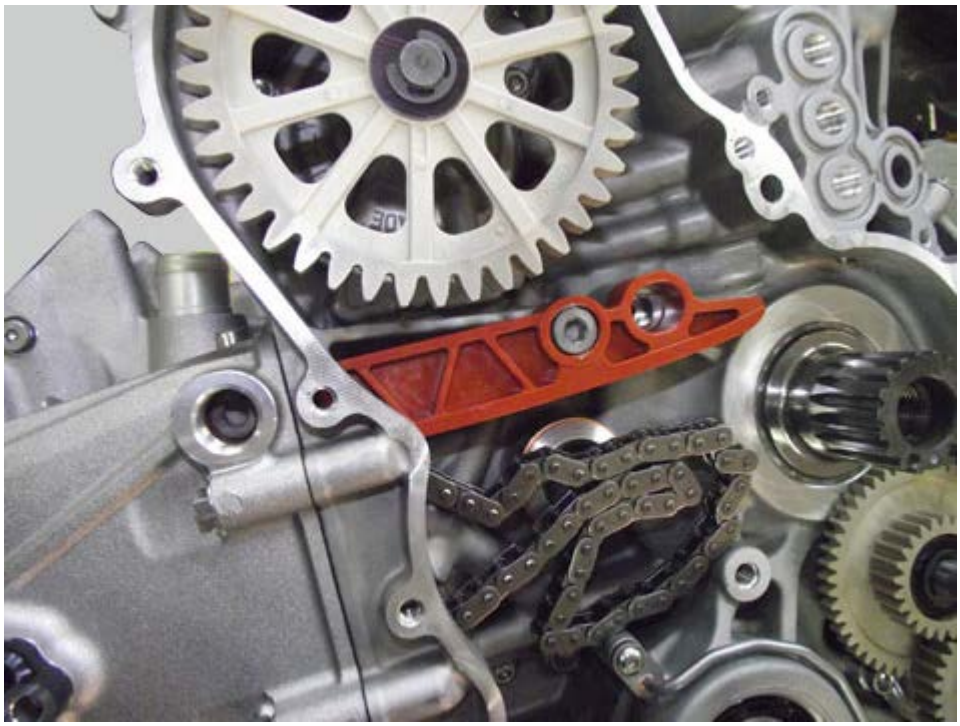
Slide out the head by keeping the chain against the sliding shoes.

Refitting the horizontal head chain

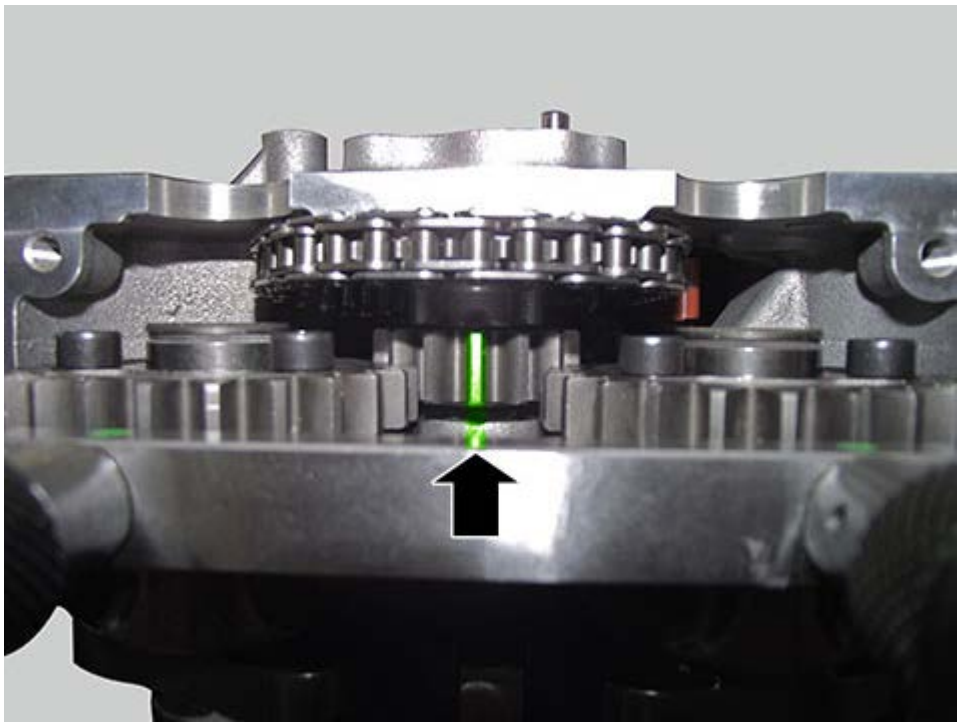
Insert the chain with the split gear in the timing system compartment.
Fit the chain on the crankshaft timing gear on the flywheel side.



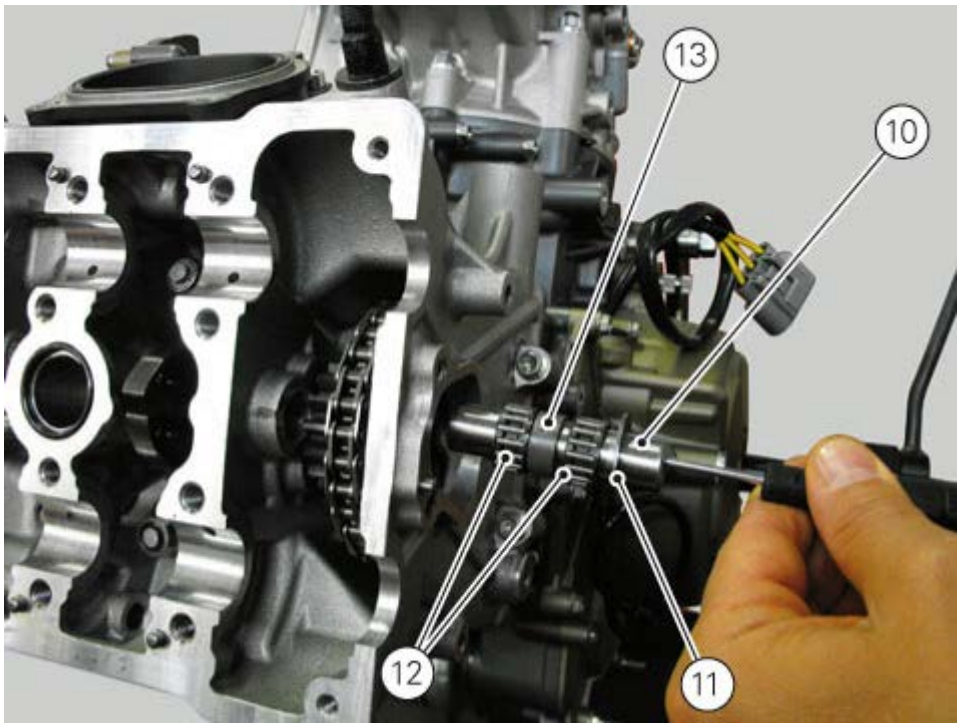
Check that the crankshaft is at the horizontal cylinder TDC in the combustion stage (Positioning of the crankshaft at TDC in the combustion stage).
If the vertical cylinder timing system has already been refitted, turn the shaft by 450° in the engine rotation sense.
Keep the chain against the fixed shoe.



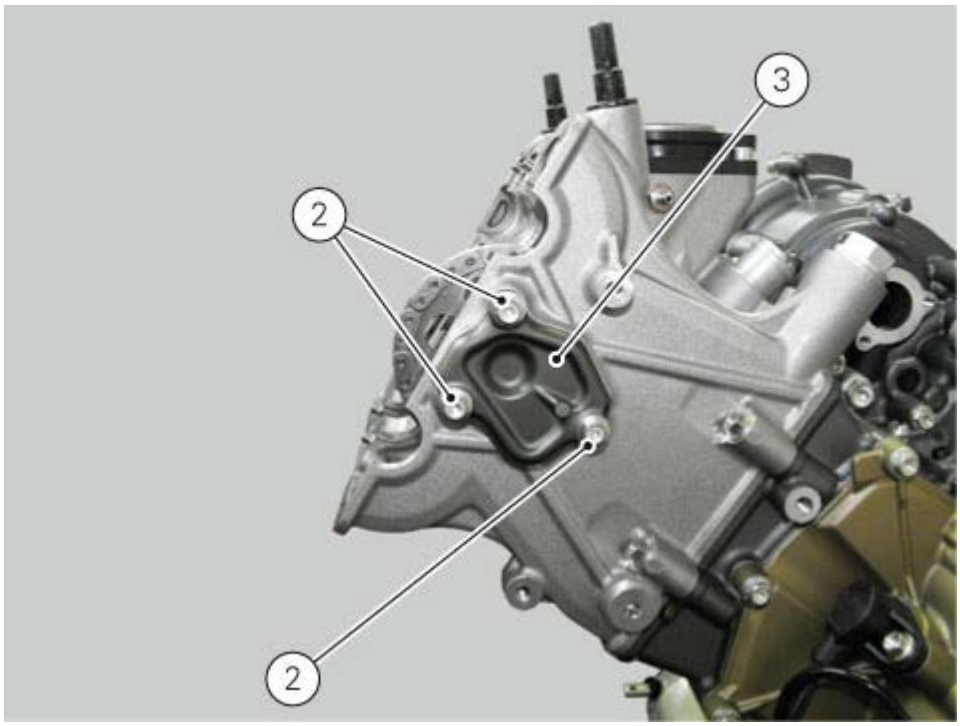
Make sure that one tooth of the split gear is on the head reference as shown in the figure.



Insert pin (10) with a bearing (12), a spacer (13) and another bearing (12) on the head.
Fit shim (11).

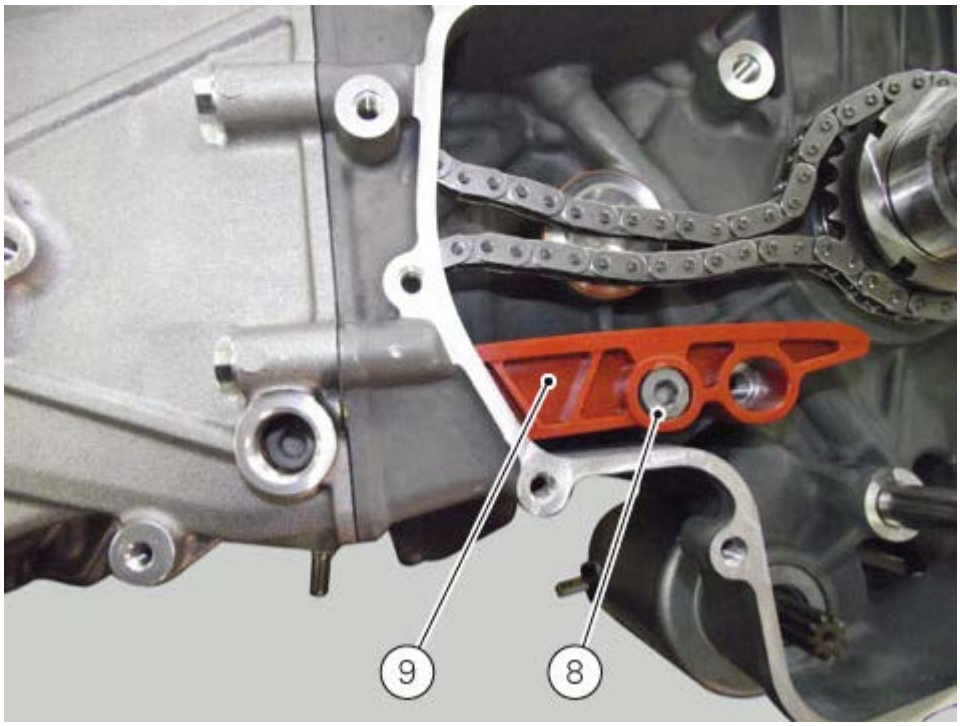


Apply Ducati sealing compound on the transmission pins according to the drawing.
Position cover (3) and tighten the screws (2) to a torque of 10 Nm (Min. 9 Nm – Max. 11 Nm).

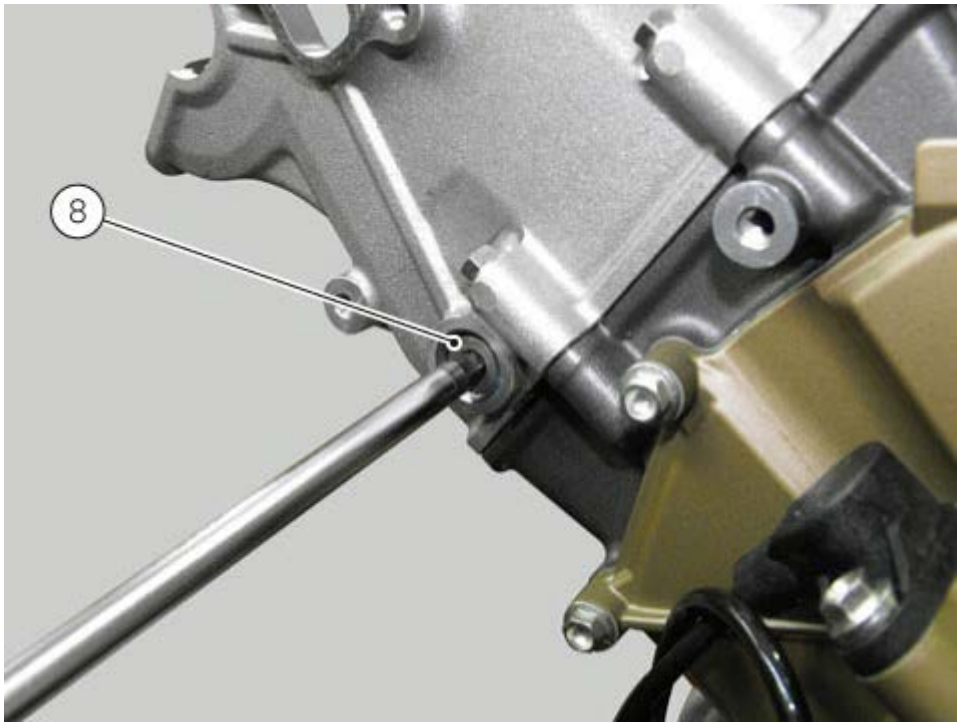


Position mobile shoe (5) and tighten retaining pin (6) to a torque of 20 Nm (Min. 18 Nm – Max. 22 Nm).

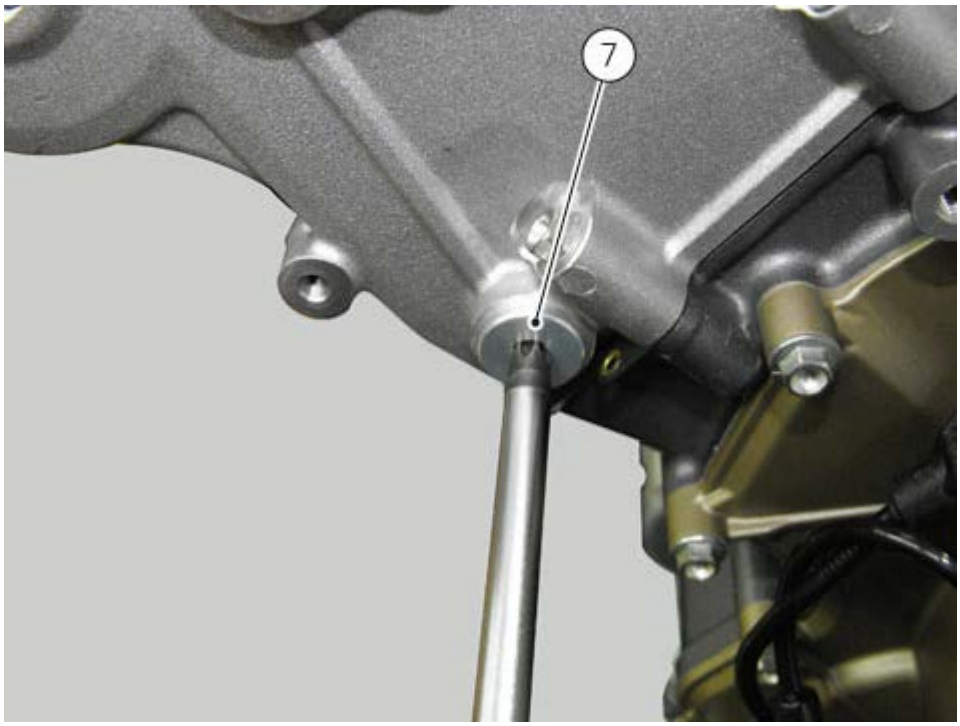
Position fixed shoe (9) and tighten retaining pin (8) to a torque of 20 Nm (Min. 18 Nm – Max. 22 Nm).



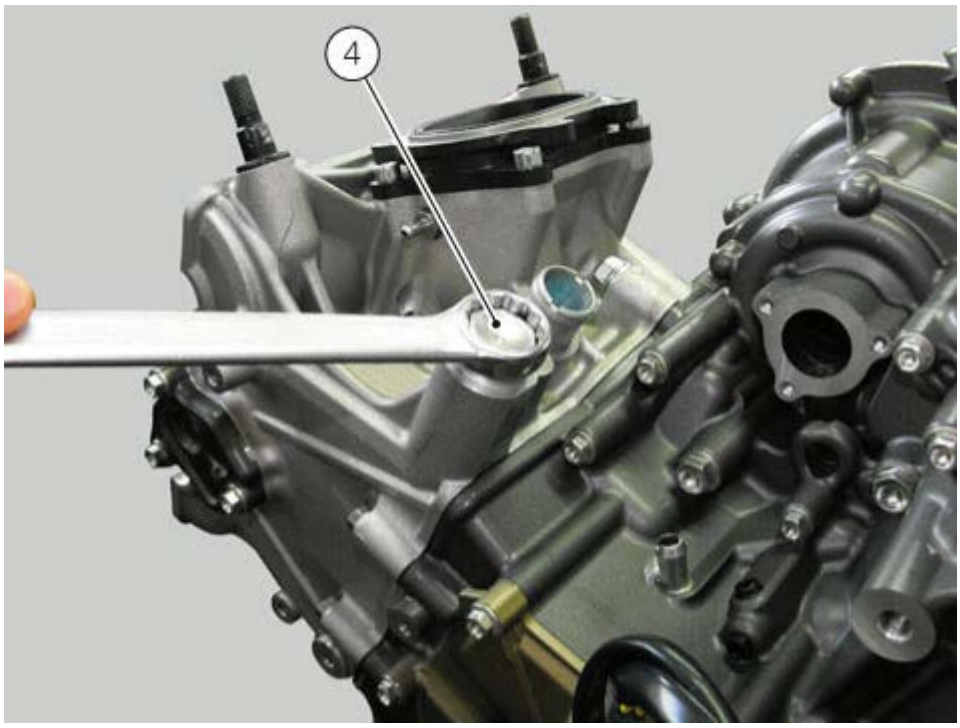
Fit fixed shoe pin (8) located on the head base and tighten it to 20 Nm (Min. 18 Nm – Max. 22 Nm).



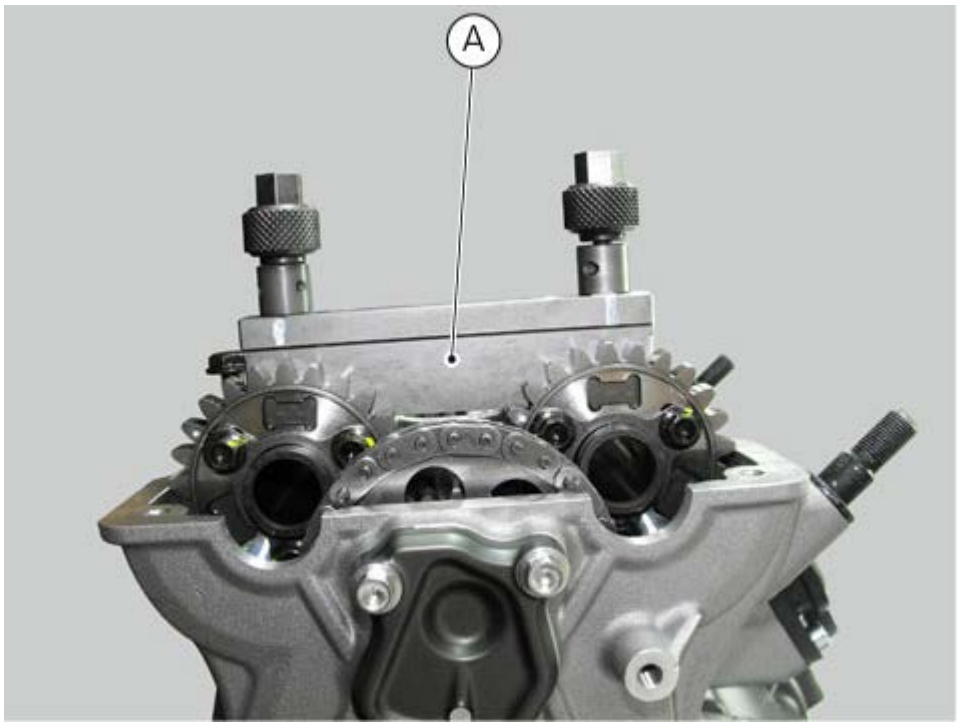
Fit cap (7) for access to the fixed show pin located on head base and tighten it to 17 Nm (Min. 16 Nm – Max. 18 Nm).



Position tensioner (4) and tighten it to a torque of 25 Nm (Min. 23 Nm – Max. 27 Nm) and make sure that the chain is centred on the pins.



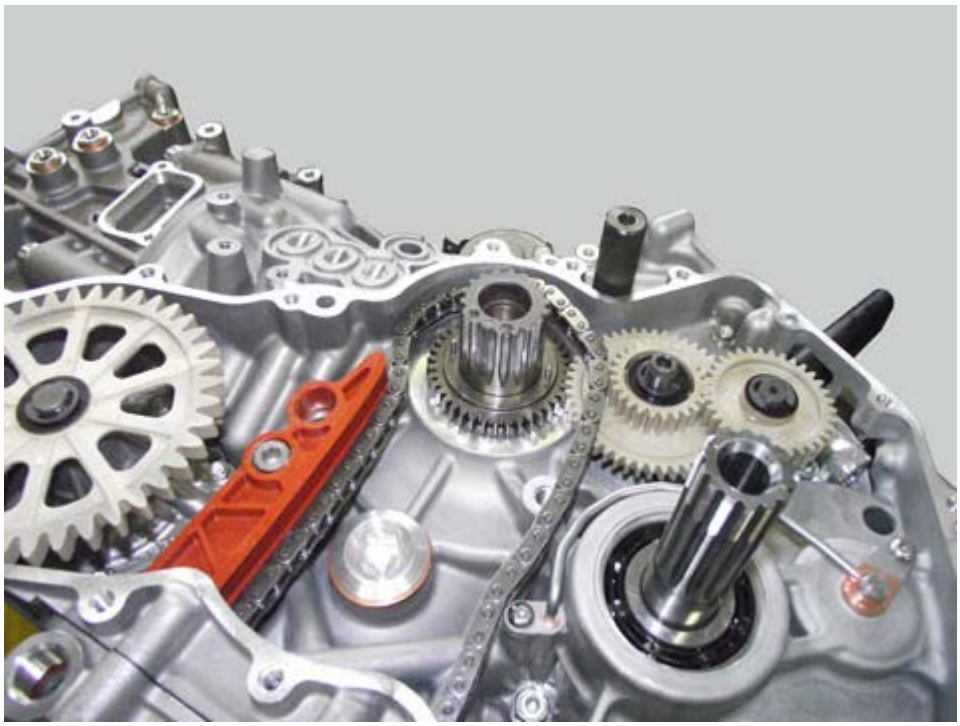
Place the camshafts on the head with the reference surfaces aligned and fit the timing tool A, no.: **88765.1622**.



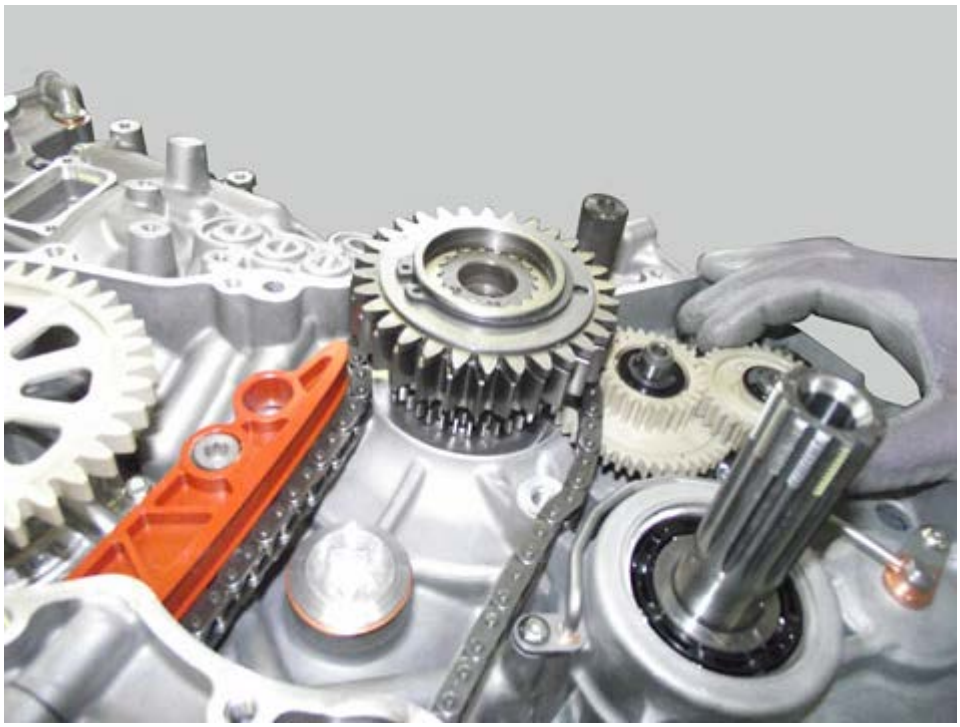
Completely loosen the two screws (one each camshaft), apply threadlocker as specified in the table and tighten to 19 Nm (Min. 18 Nm – Max. 20 Nm).
Remove tool no. **88765.1622** and tool no. **88713.3500**.
Turn the engine in its rotation sense until uncovering two other screws (A) (one each camshaft).
Completely loosen the two uncovered screws (A), apply threadlocker as specified in the table and tighten to the specified torque.

Refitting the vertical head chain

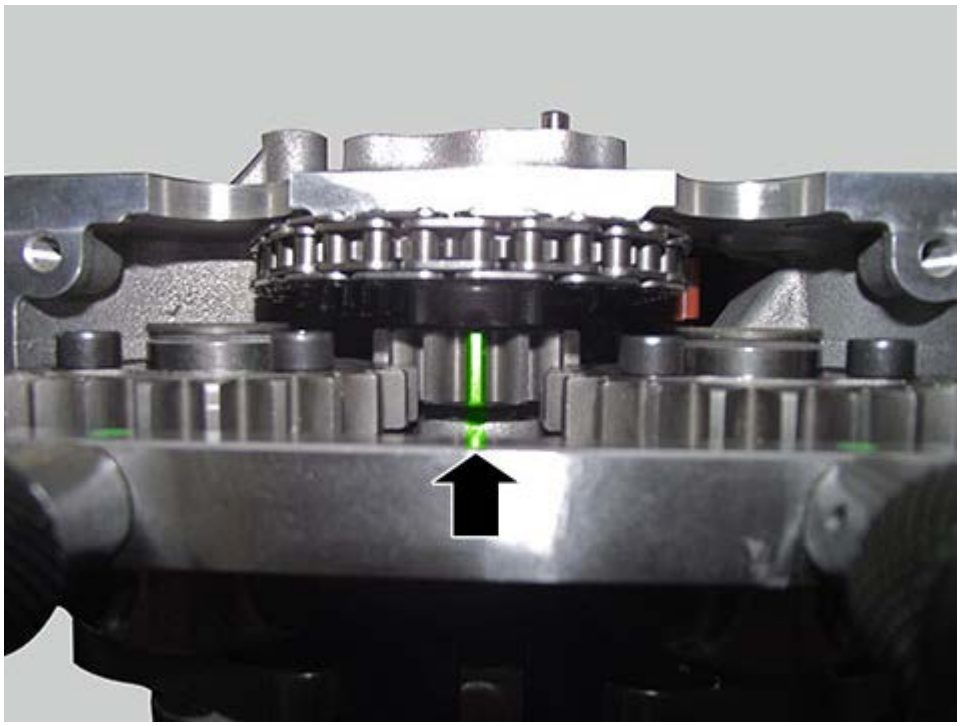
Insert the chain with the split gear in the timing system compartment.
Fit the chain on the crankshaft.



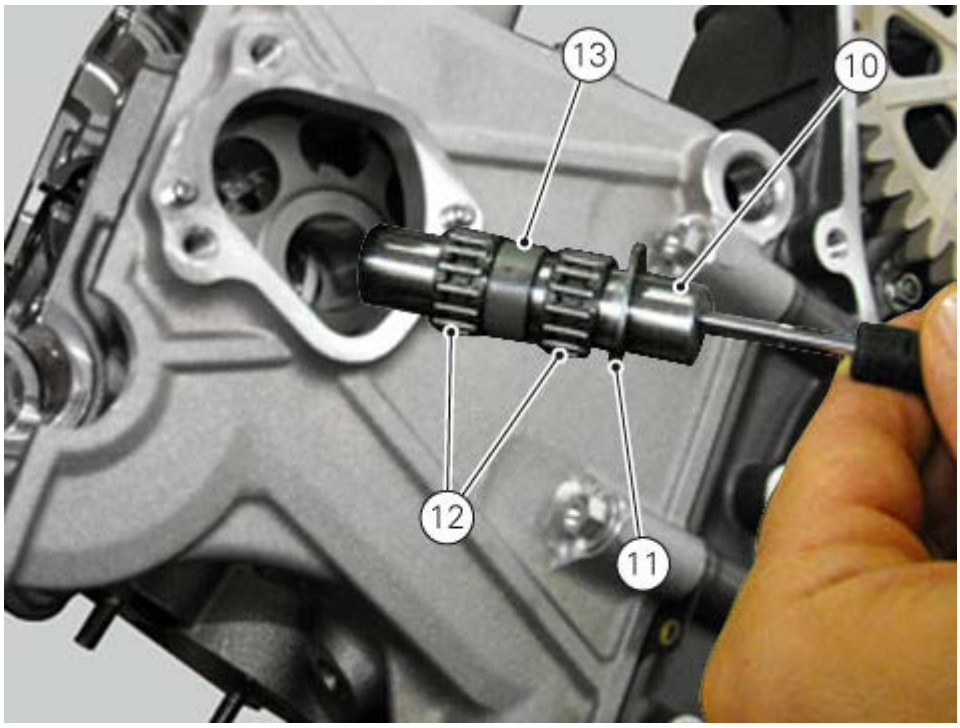
Check that the crankshaft is at the vertical cylinder TDC in the combustion stage (Positioning of the crankshaft at TDC in the combustion stage).
If the horizontal cylinder timing system has already been refitted, turn the shaft by 270° in the engine rotation sense.
Insert the primary sprocket making sure to engage the two pins of the oil pump drive gear in the front sprocket holes.
Keep the chain against the fixed shoe.



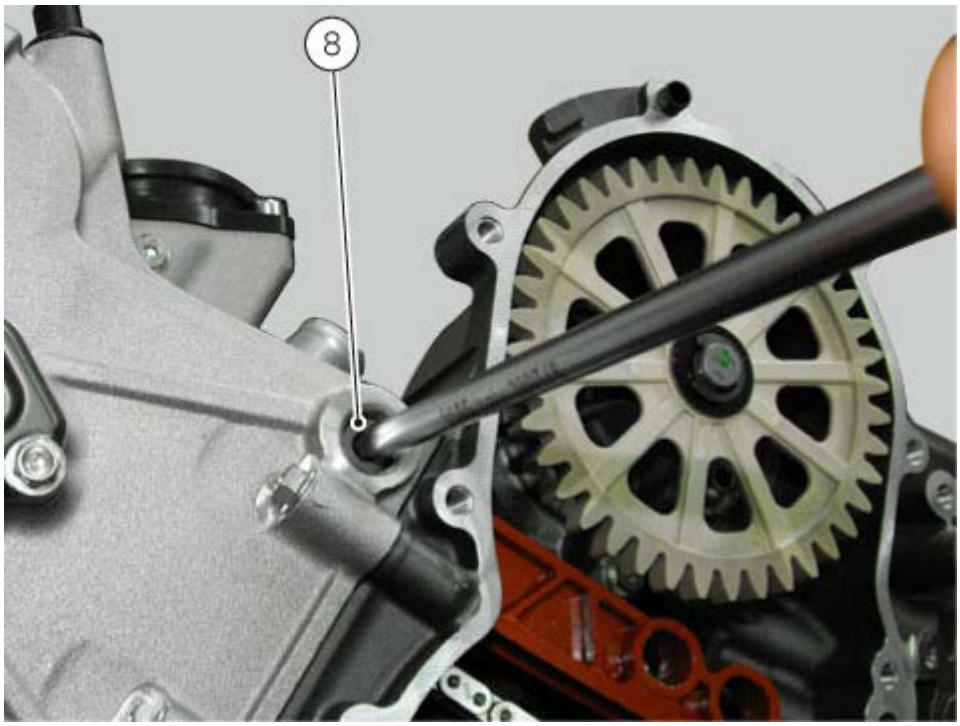
Make sure that one tooth of the split gear is on the head reference as shown in the figure.

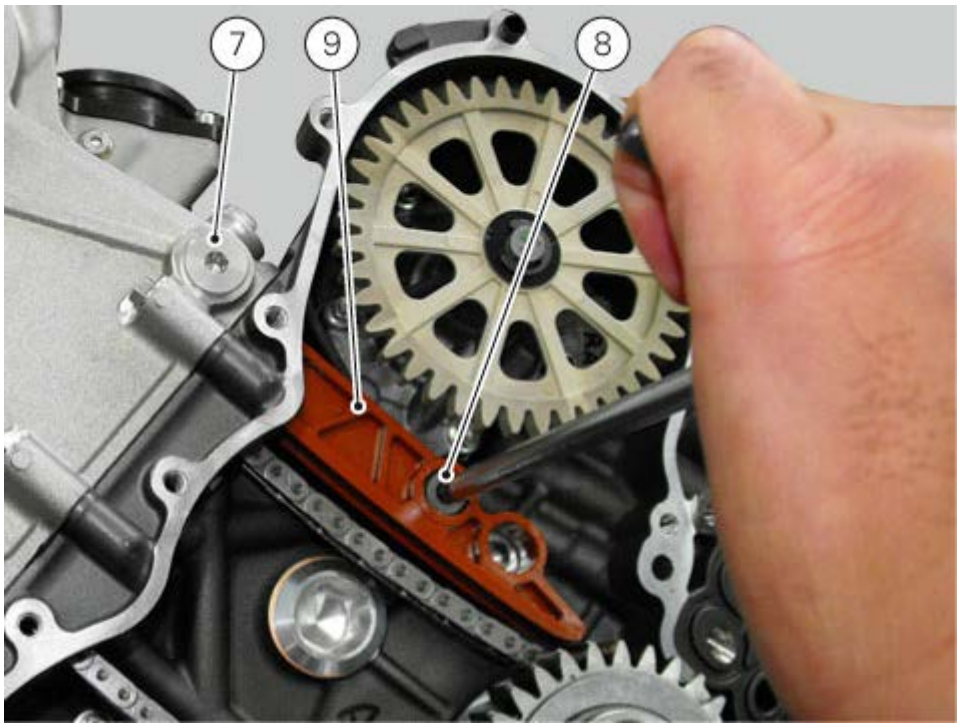


Insert pin (10) with a bearing (12), a spacer (13) and another bearing (12) on the head.
Fit shim (11).

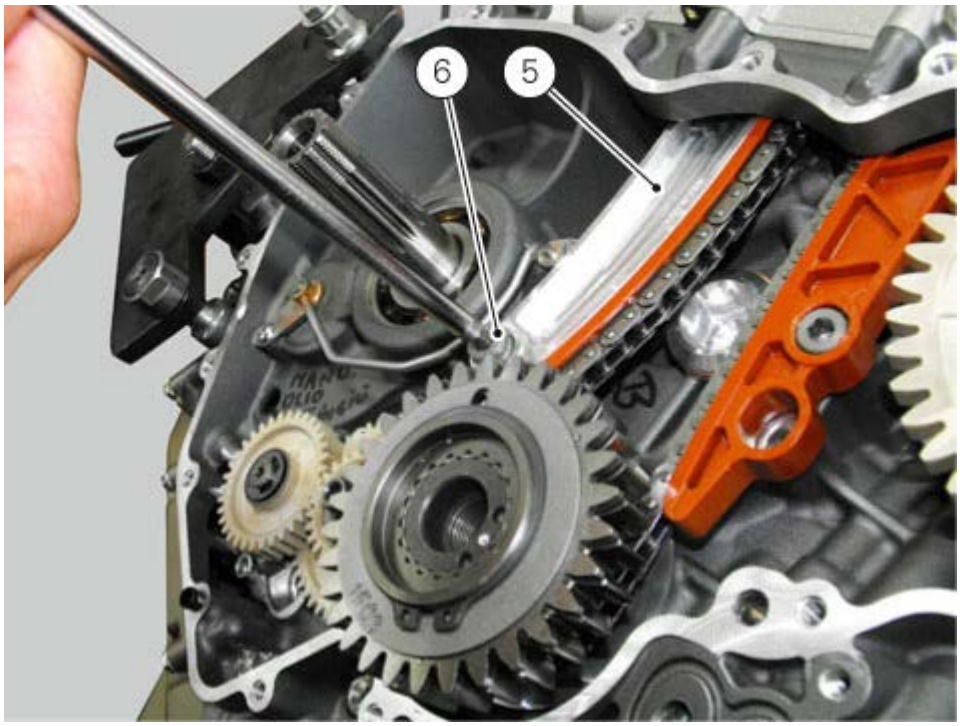


Fit fixed shoe pin (8) located on the head base.
Fit cap (7) for access to the fixed show pin located on head base and tighten it to 17 Nm (Min. 16 Nm – Max. 18 Nm).

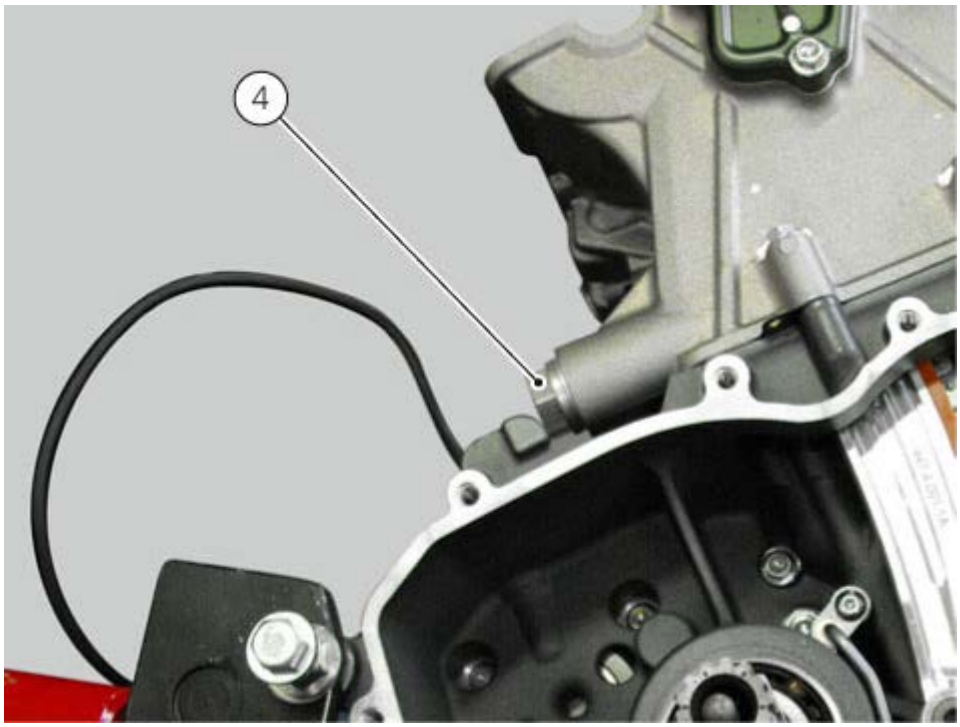


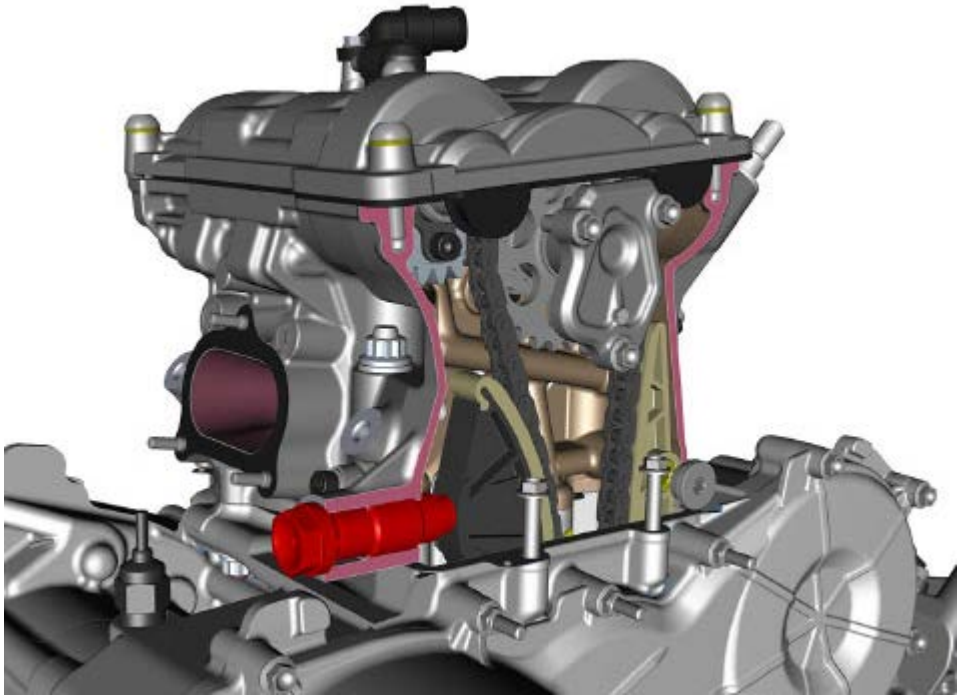


Position mobile shoe (5) and tighten retaining pin (6) to a torque of 20 Nm (Min. 18 Nm – Max. 22 Nm).

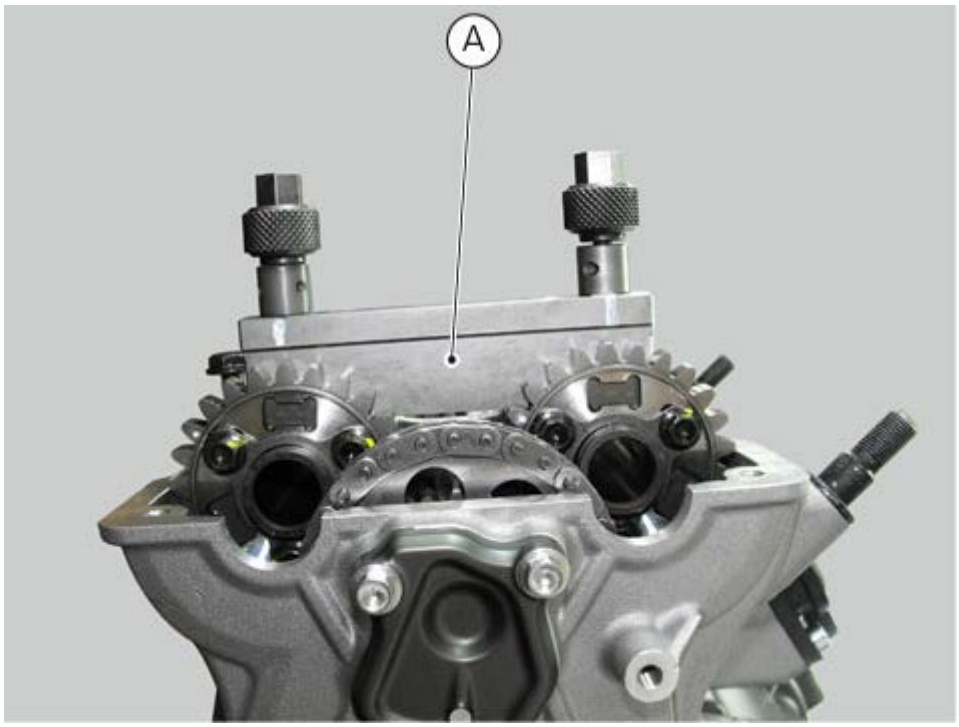


Position tensioner (4) and tighten it to a torque of 25 Nm (Min. 23 Nm – Max. 27 Nm) and make sure that the chain is centred on the pins.





Place the camshafts on the head with the reference surfaces aligned and fit the timing tool A, no.: **88765.1622**.



Completely loosen the two screws (one each camshaft), apply threadlocker as specified in the table and tighten to 19 Nm (Min. 18 Nm – Max. 20 Nm).
Remove tool no. **88765.1622** and tool no. **88713.3500**.
Turn the engine in its rotation sense until uncovering two other screws (A) (one each camshaft).
Completely loosen the two uncovered screws (A), apply threadlocker as specified in the table and tighten to the specified torque.

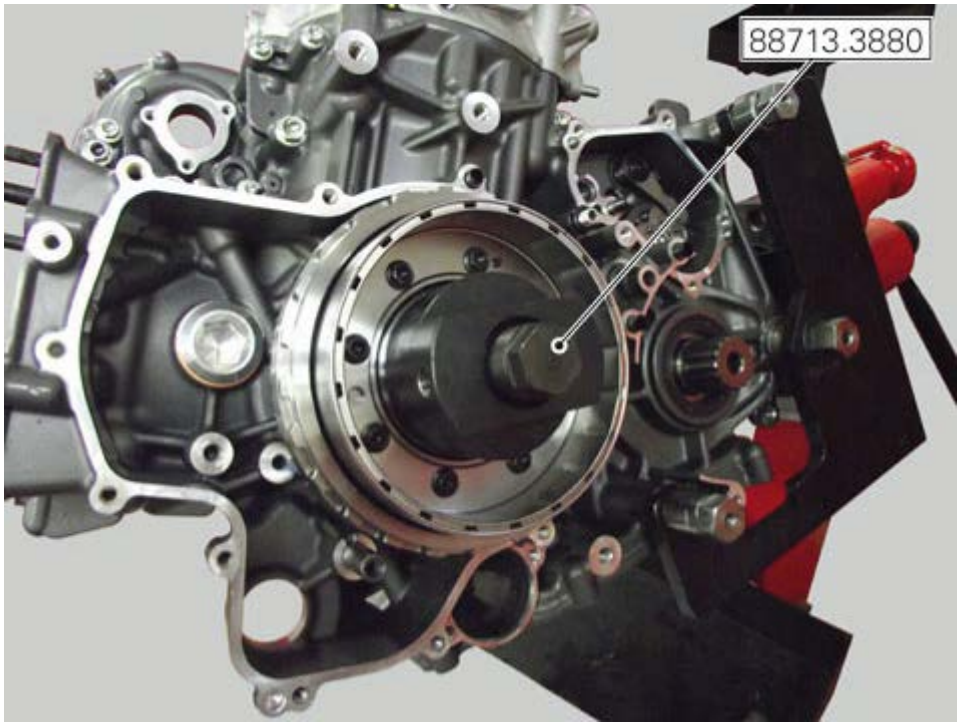
Refit the clutch cover (Refitting the clutch cover).
Refit both spark plugs (Replacing the spark plugs).

Removing the horizontal head chain

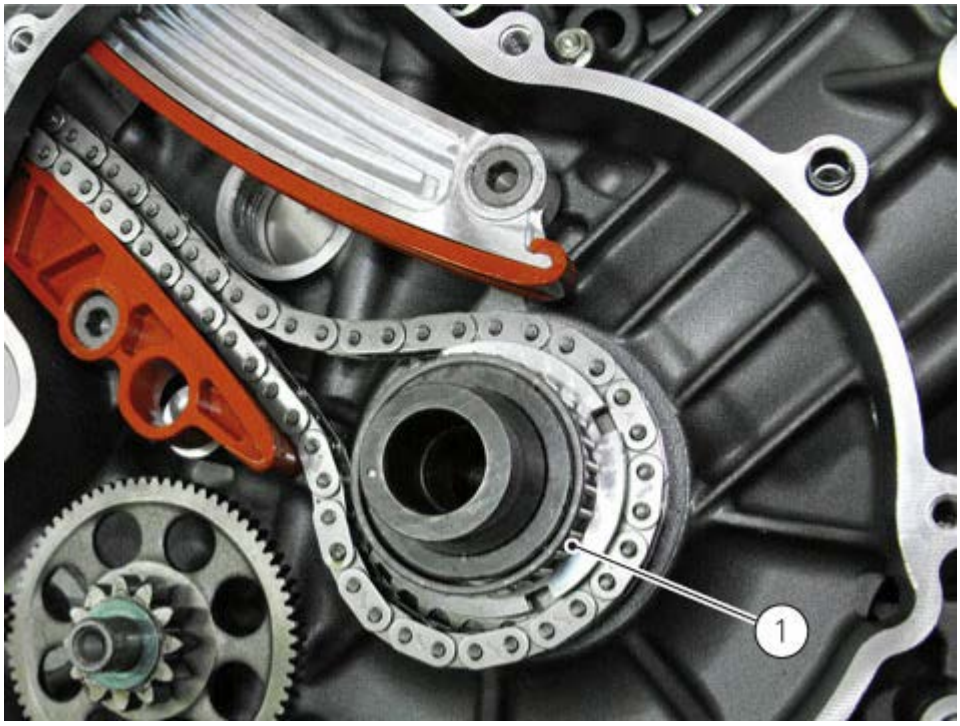
This operation can be performed with the engine fitted on the vehicle.
The two timing chains are located on both sides of the casing: to remove them, operate only on the side of the chain to be removed.
Removing the generator side chain (horizontal head)

Remove both spark plugs (Replacing the spark plugs).
Remove the generator cover (Removing the generator cover).
Loosen the flywheel retaining screw (do not release the flywheel).
Set the crankshaft at TDC in the combustion stage (Crankshaft positioning at TDC in the combustion stage).
Remove the camshafts (Removing the camshafts).

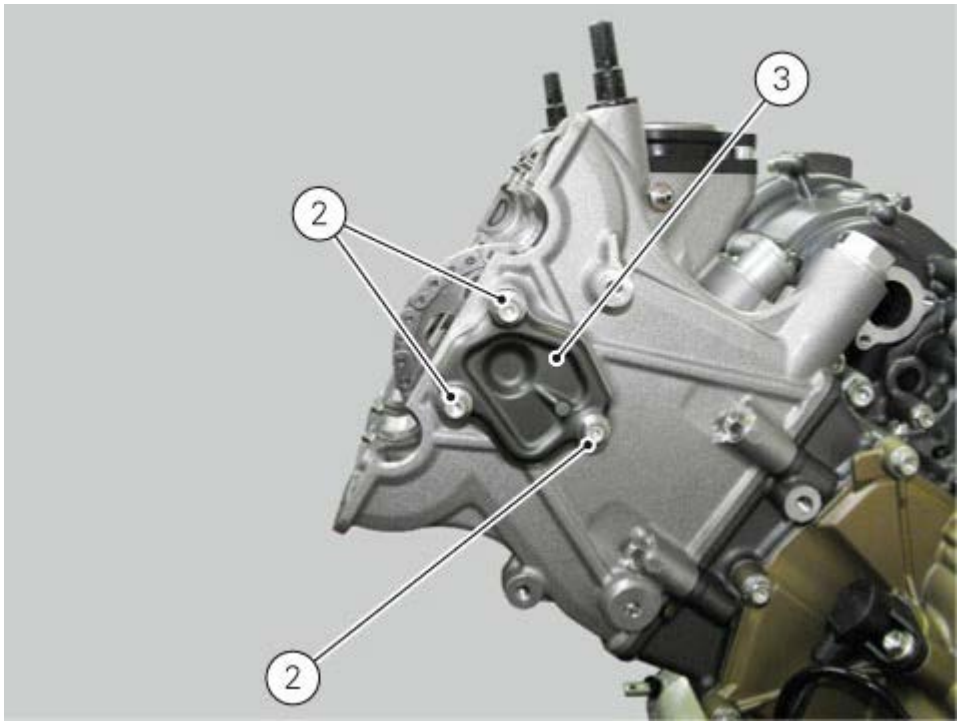
Fit the flywheel using the puller no. **88713.3880**.



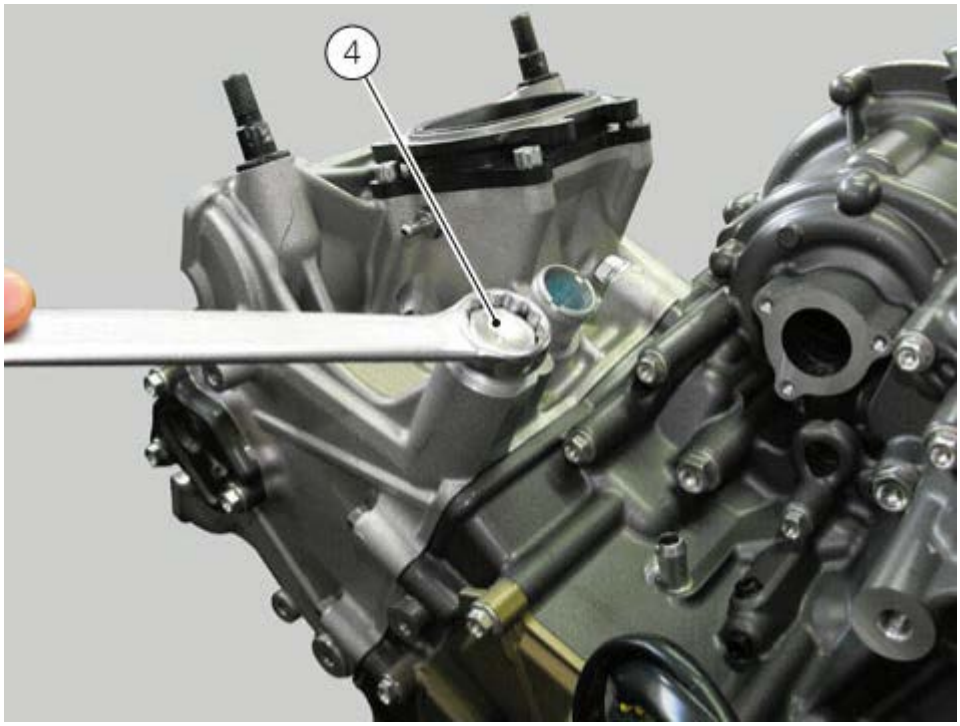
Slide out the roller bearing (1).



Loosen retaining screws (2) and remove cover (3), having care not to damage the mobile parts.

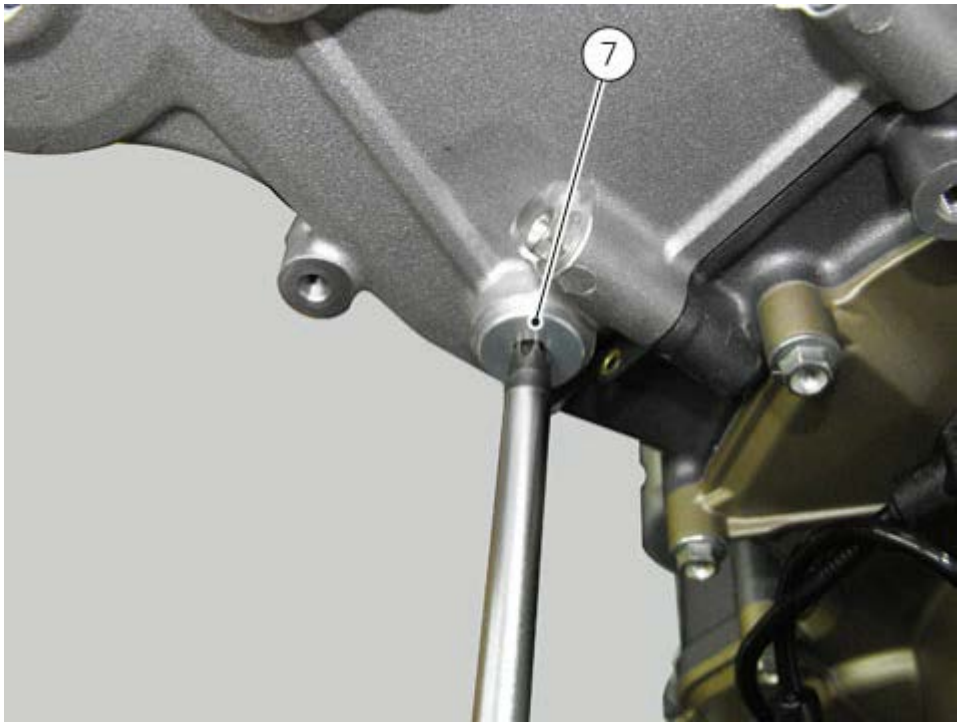


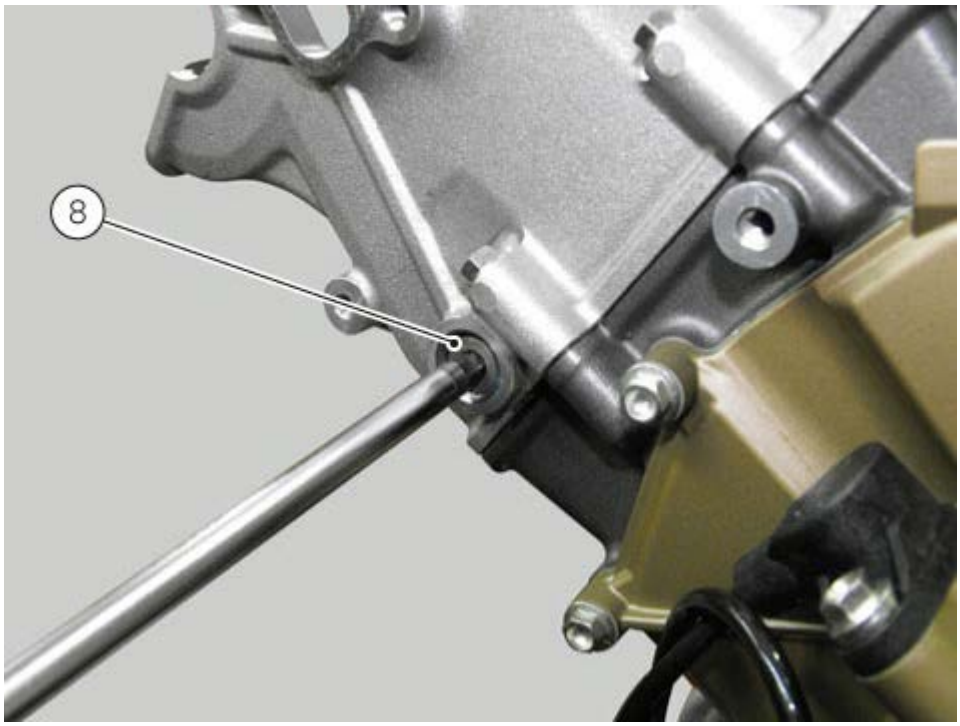
Loosen tensioner (4) and remove it.

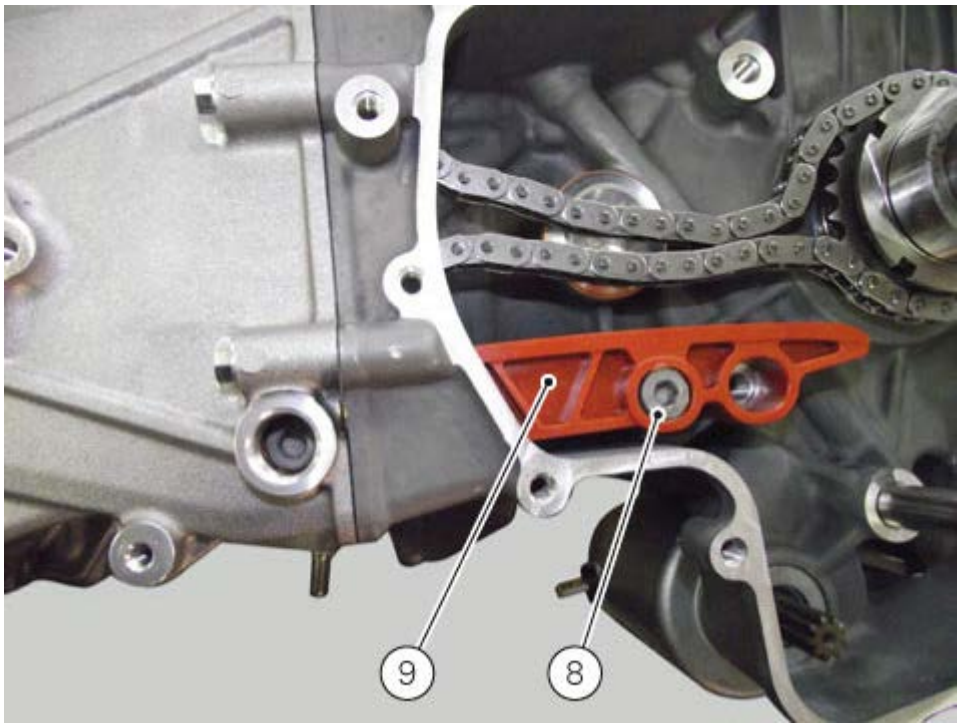


Undo pin (6) and remove the mobile sliding shoe (5).

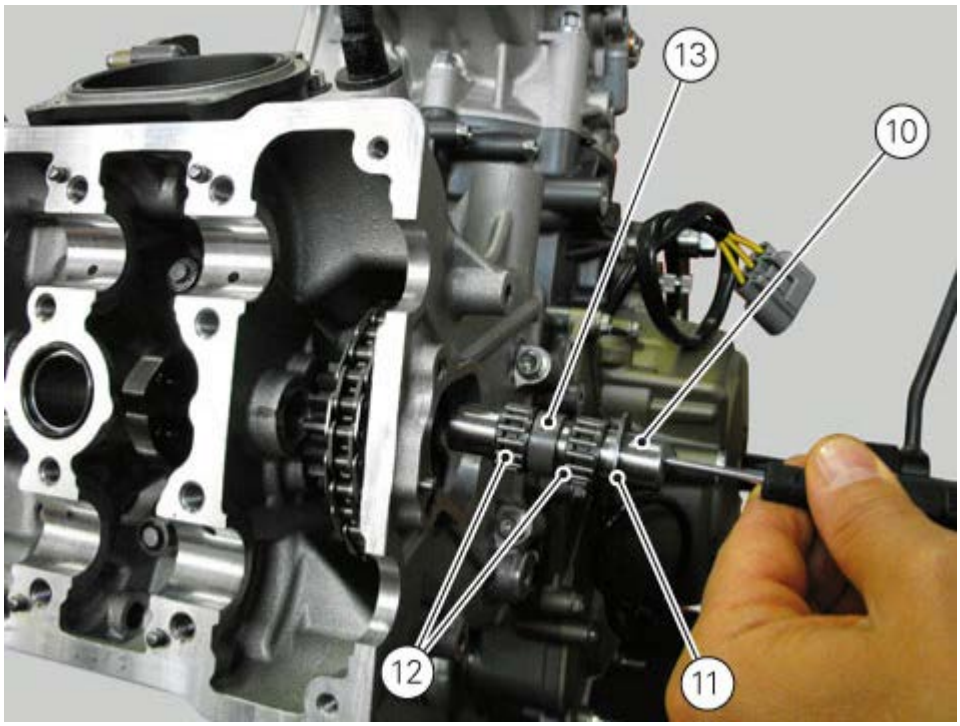
We recommend removing the fixed sliding shoe (9) by loosening the retaining pins (8).
Remove plug (7) located on the head base to access the fixed sliding shoe pin.
Remove the fixed sliding shoe pin (8).



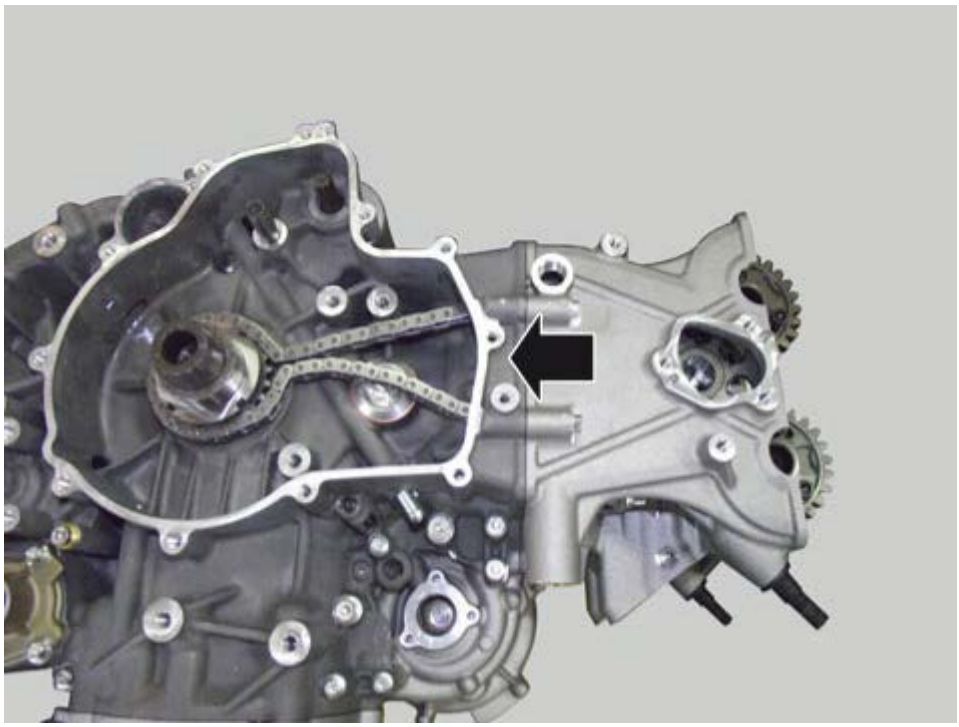




Remove shim (11), pin (10), bearings (12) and spacer (13) from the camshaft gear.



Slide the gear with chain towards the crankshaft.
Now the chain is free.

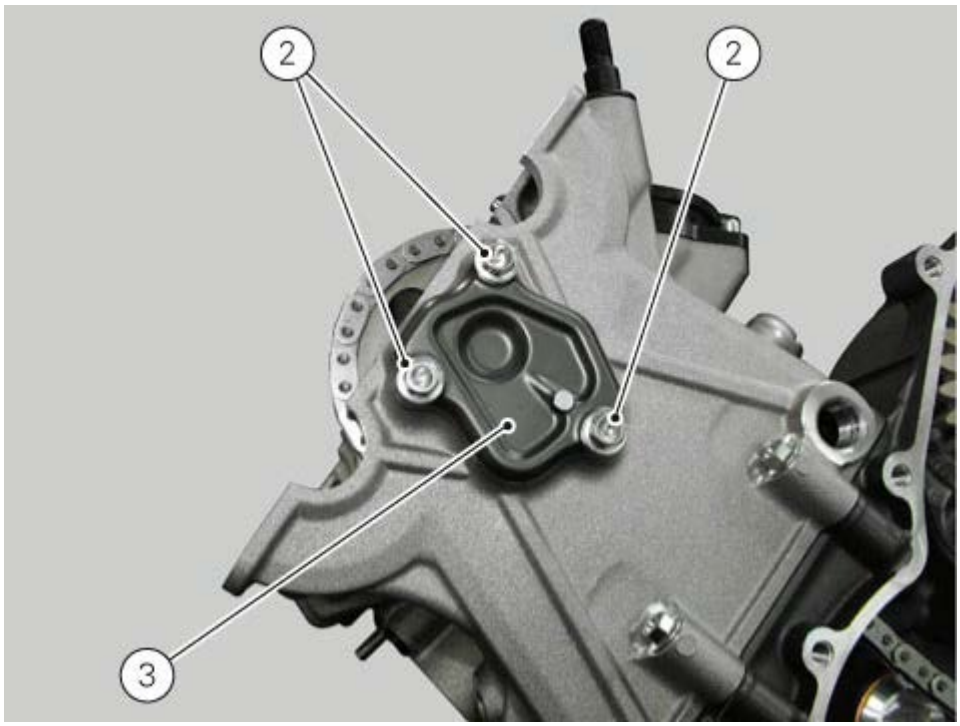


Slide out the split gear and the chain from the timing system compartment.

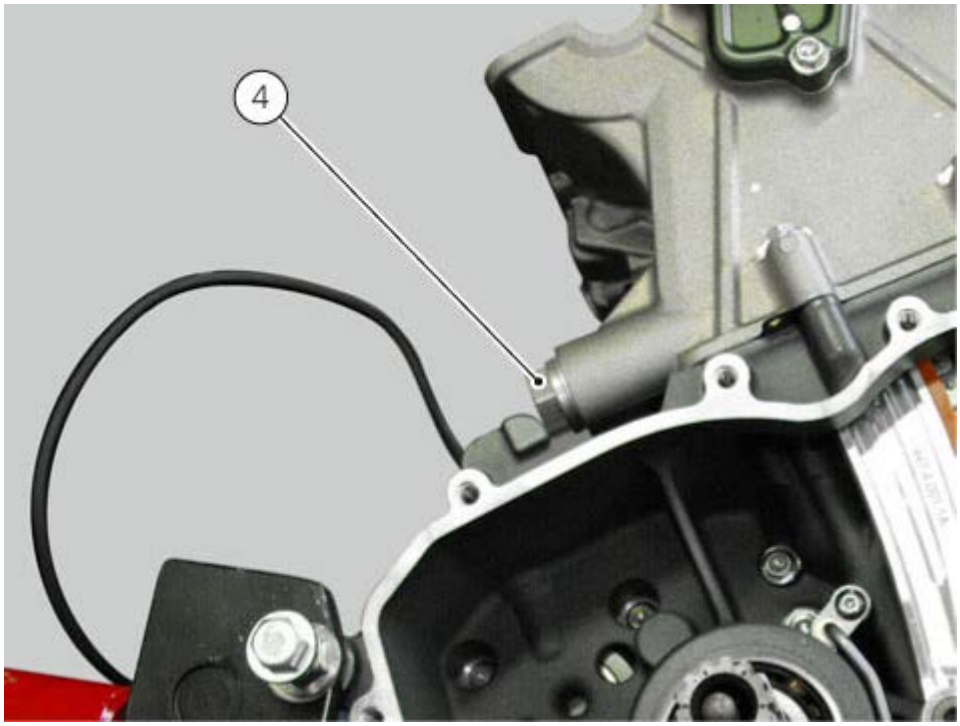
Removing the clutch side chain (vertical head)

Remove both spark plugs (Replacing the spark plugs).
Remove the camshafts (Removing the camshafts).
Remove the clutch cover (Removing the clutch cover).
Remove the water pump idle gear (Removing the water pump) paying attention to the free parts.
Remove the clutch unit (Removing the clutch).
Set the crankshaft at TDC in the combustion stage (Crankshaft positioning at TDC in the combustion stage).
Remove the primary drive gear (Removing the primary drive gear)

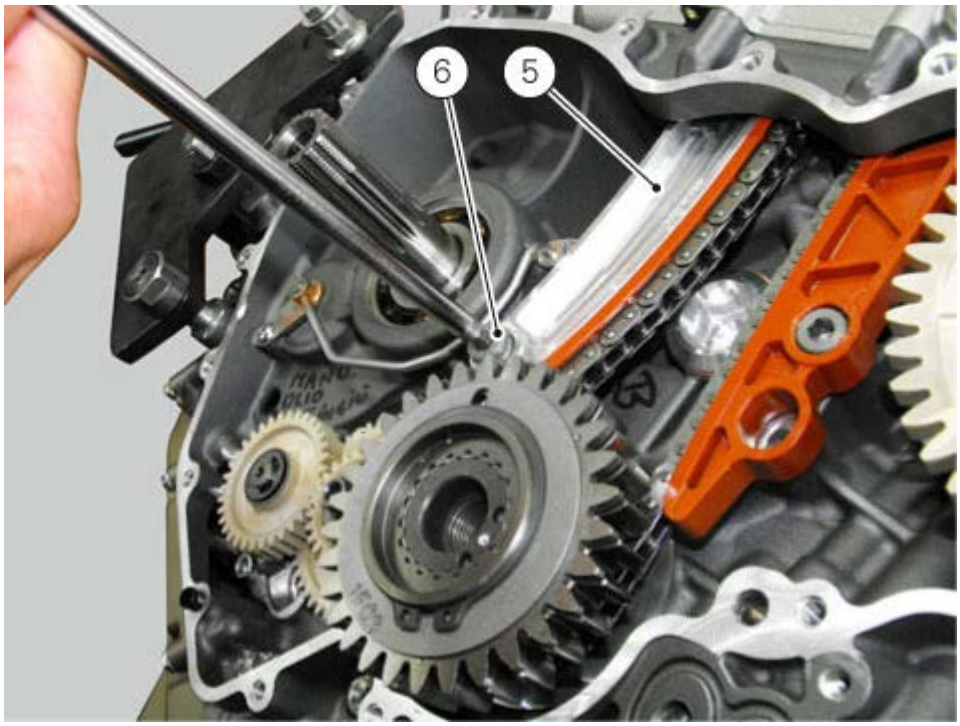
Loosen retaining screws (2) and remove cover (3), having care not to damage the mobile parts.



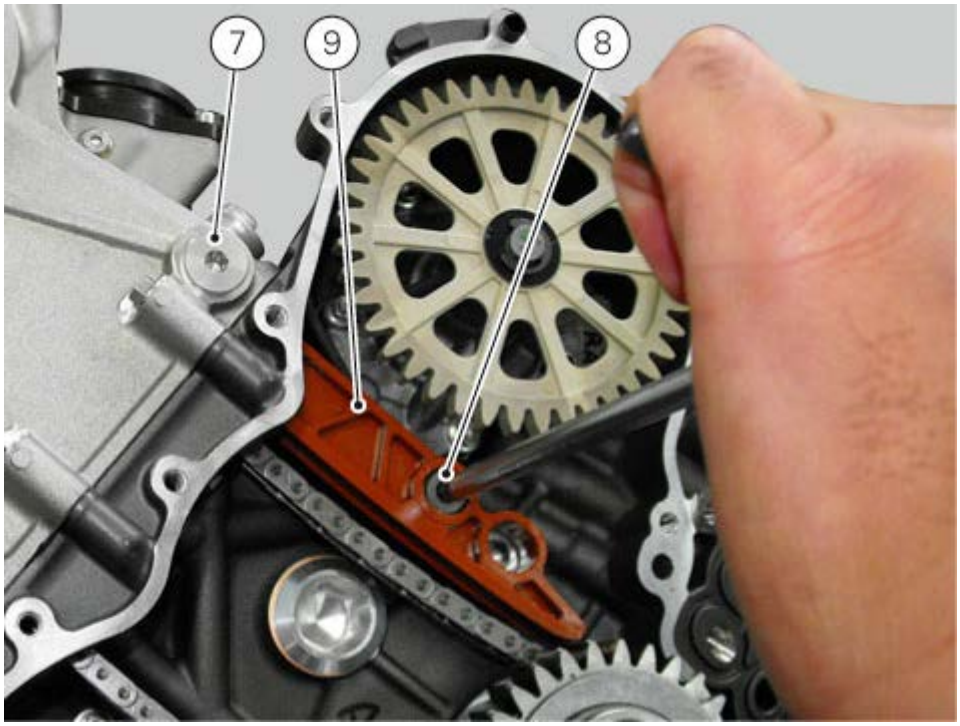
Loosen tensioner (4) and remove it.

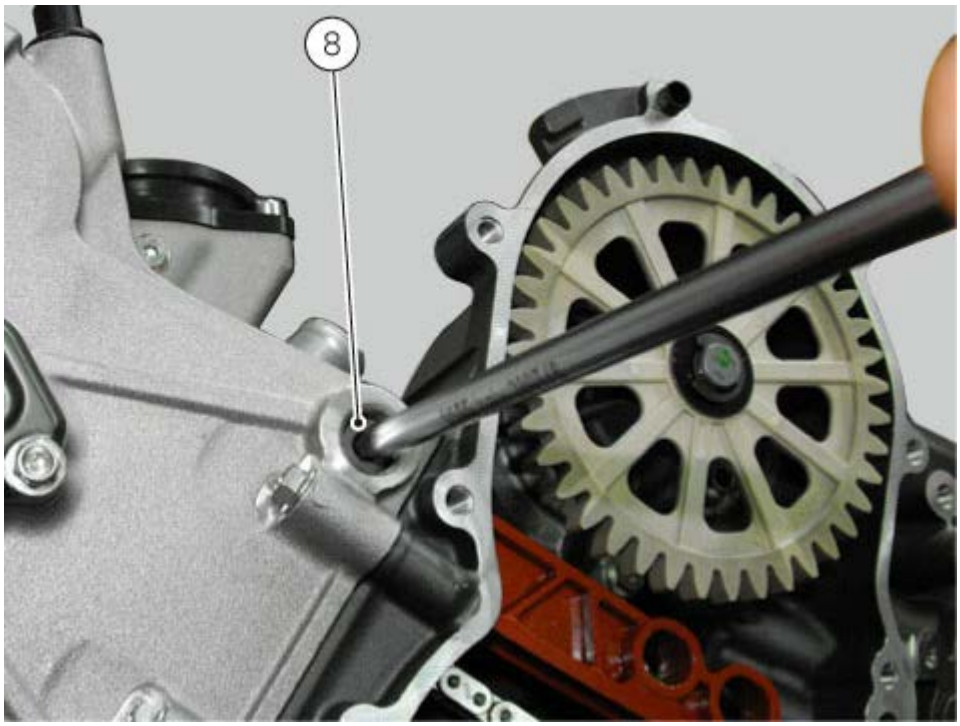


Undo pin (6) and remove the mobile sliding shoe (5).

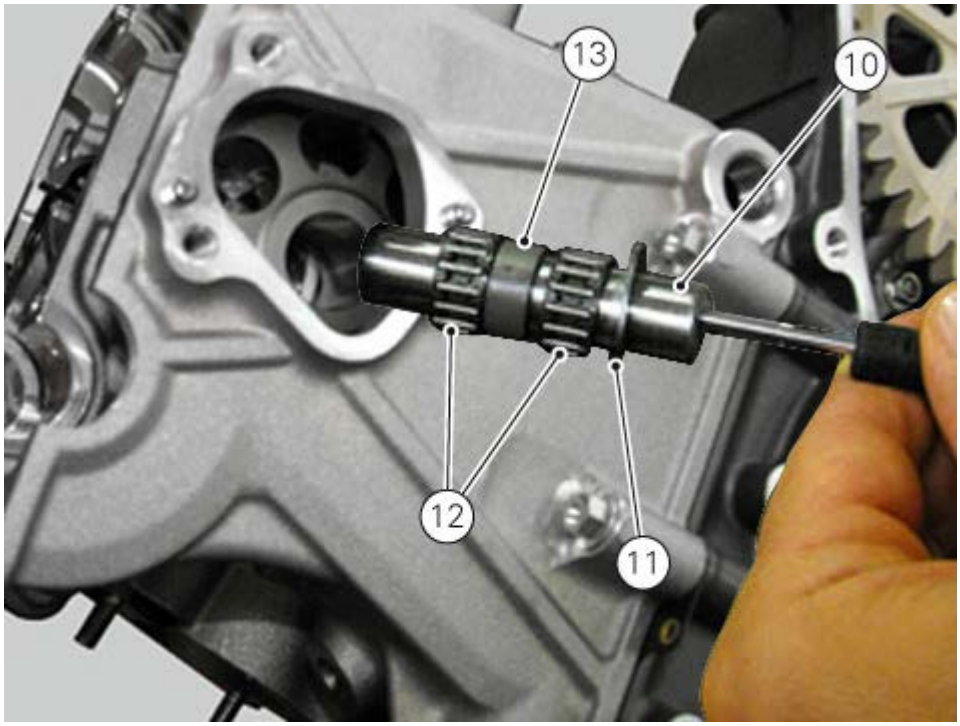


We recommend removing the fixed sliding shoe (9) by loosening the retaining pins (8).
Remove plug (7) located on the head base to access the fixed sliding shoe pin.
Remove the fixed sliding shoe pin (8).

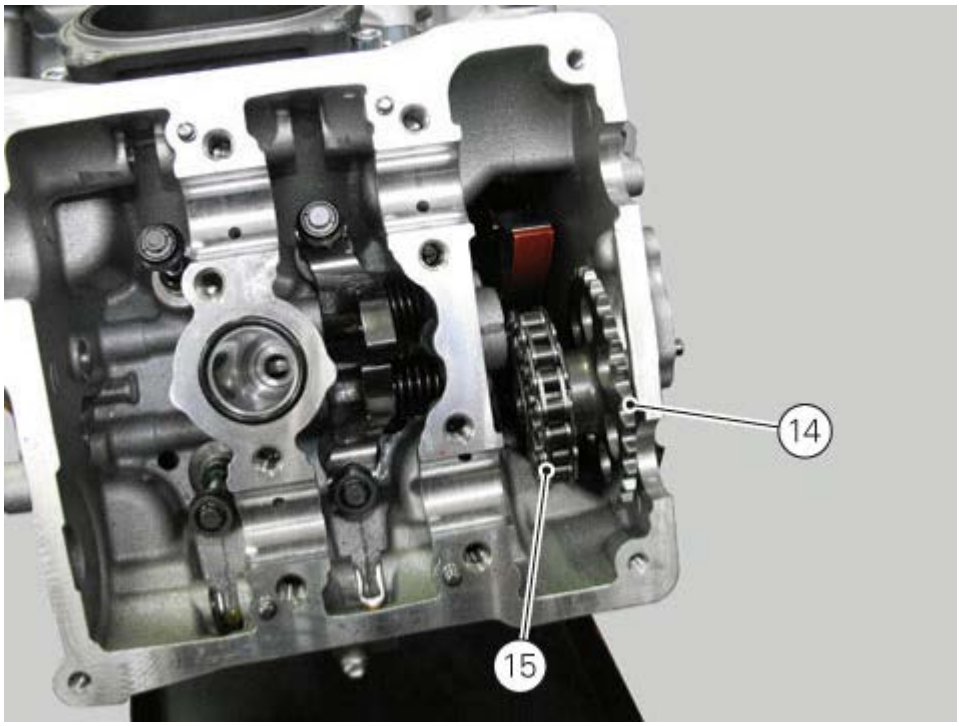




Remove shim (11), pin (10), bearings (12) and spacer (13) from the camshaft gear.



Slide gear (14) with chain towards the crankshaft.
Now the chain (15) is free.
Slide out the split gear (14) and the chain from the timing system compartment.


14
15

Refitting the valves

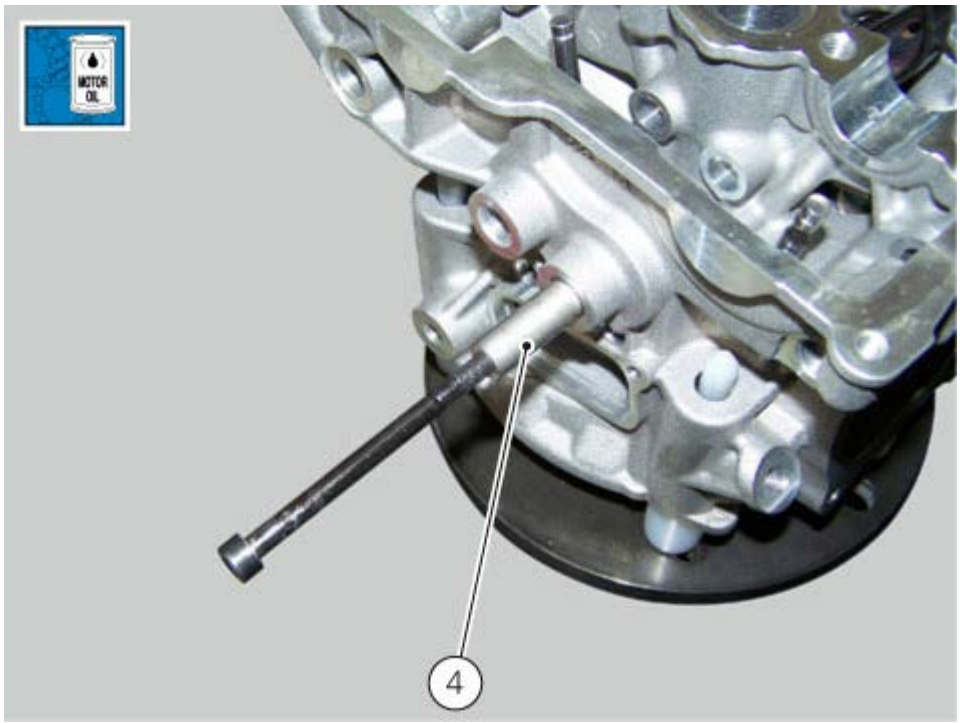
Thoroughly clean the intake and exhaust valve seats.
Use engine oil to lubricate the central part of the two intake valve and of the two exhaust valve stems.

Fit the valves in their seats on cylinder head, fully home.

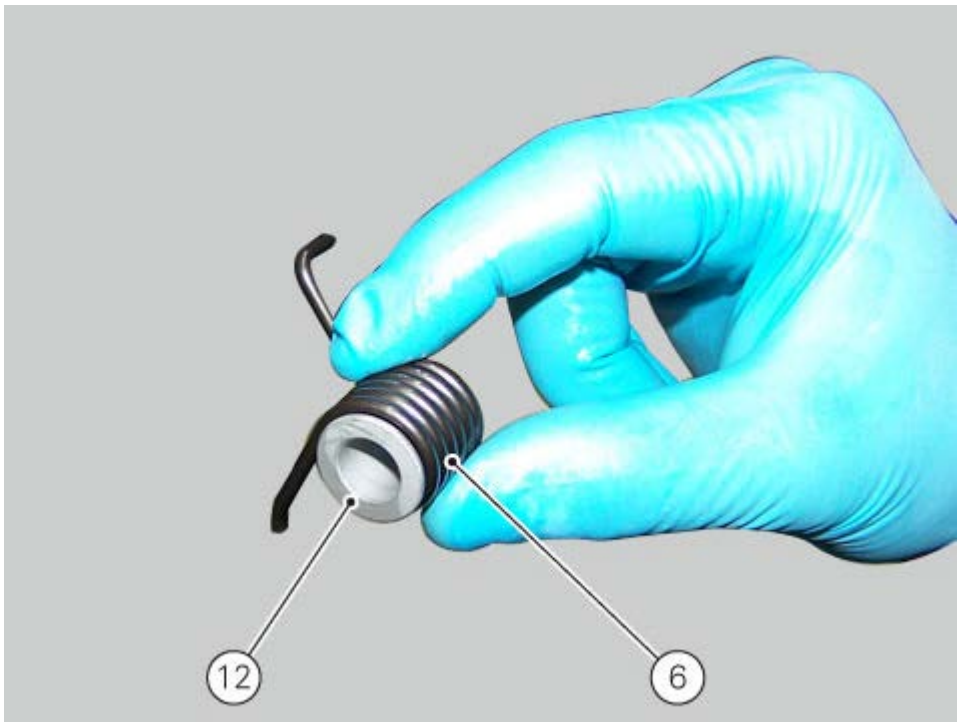
Take the head you are going to work on and set it onto tool part no. **88713.3422** so that the valves can rest onto the mating Teflon surface.

Check that the rocker arms are not scored or show signs of breakage in the area of contact with the camshaft and shim.
Screw a service screw on the closing rocker arm shaft (4) on the side with the threaded hole.
Use engine oil to lubricate the closing rocker arm shaft (4).
Insert shaft (4) in the relevant hole on the head sliding it to spread the engine oil all over the shaft surface and inside the relevant hole on the head.

Note
Once shaft is fitted to the head, the threaded side must be facing outwards.



Fit a spacer (12) to closing rocker arm shaft (4). Then fit return spring (6) on spacer, setting its end (C) in the corresponding recess on the head.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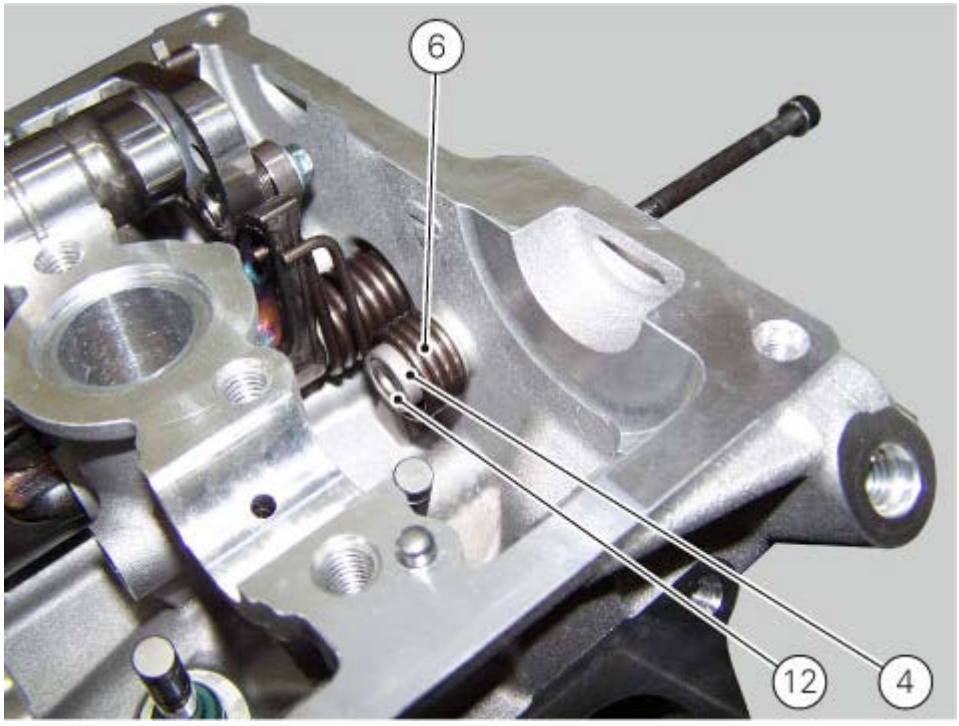
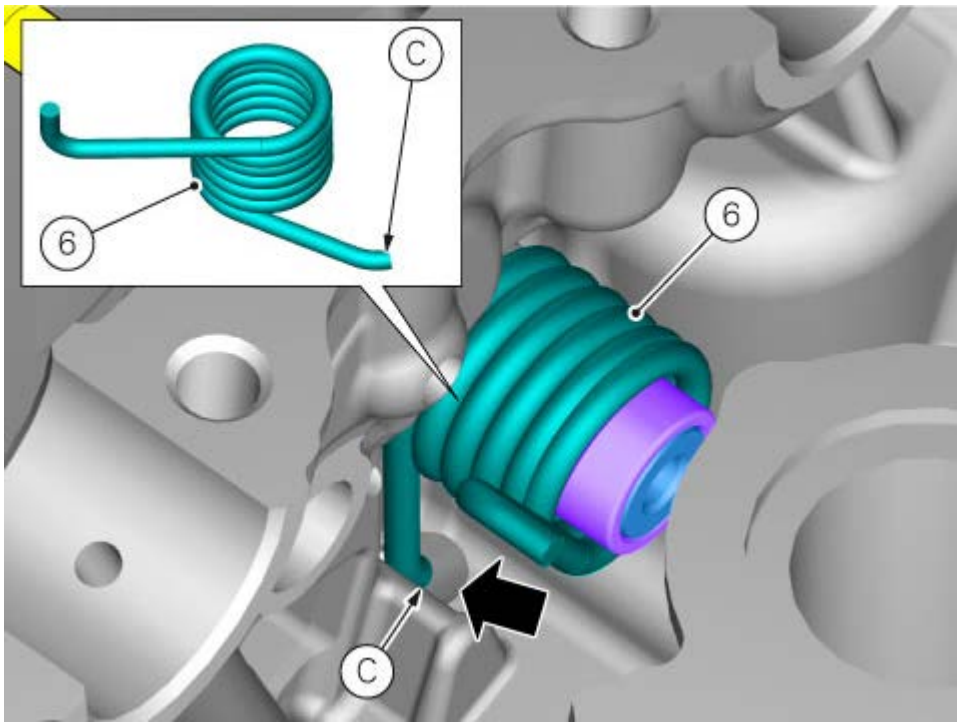
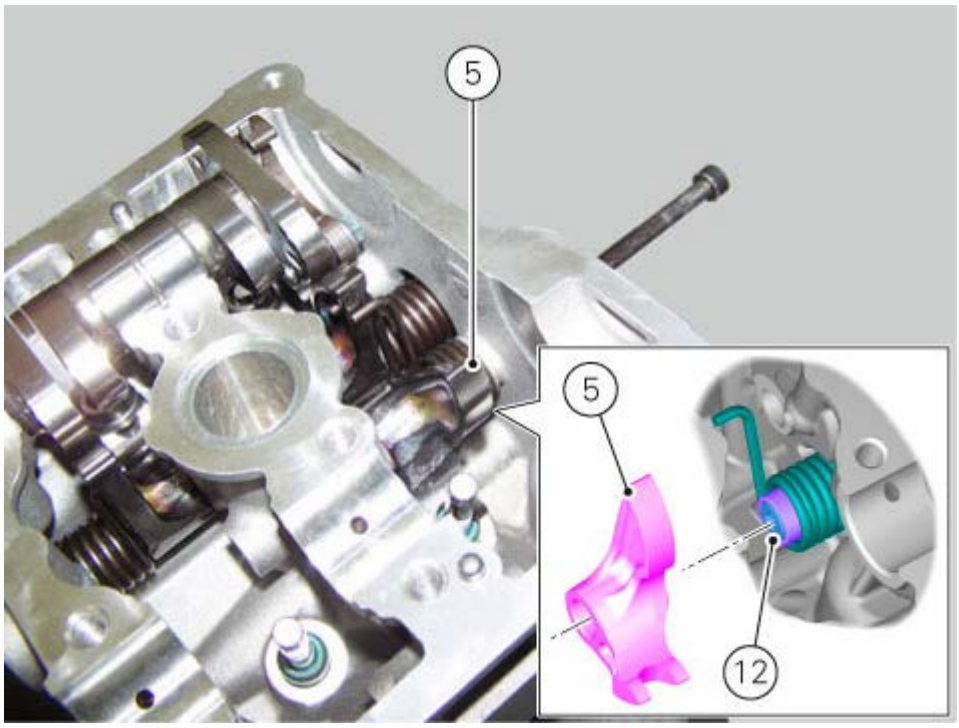
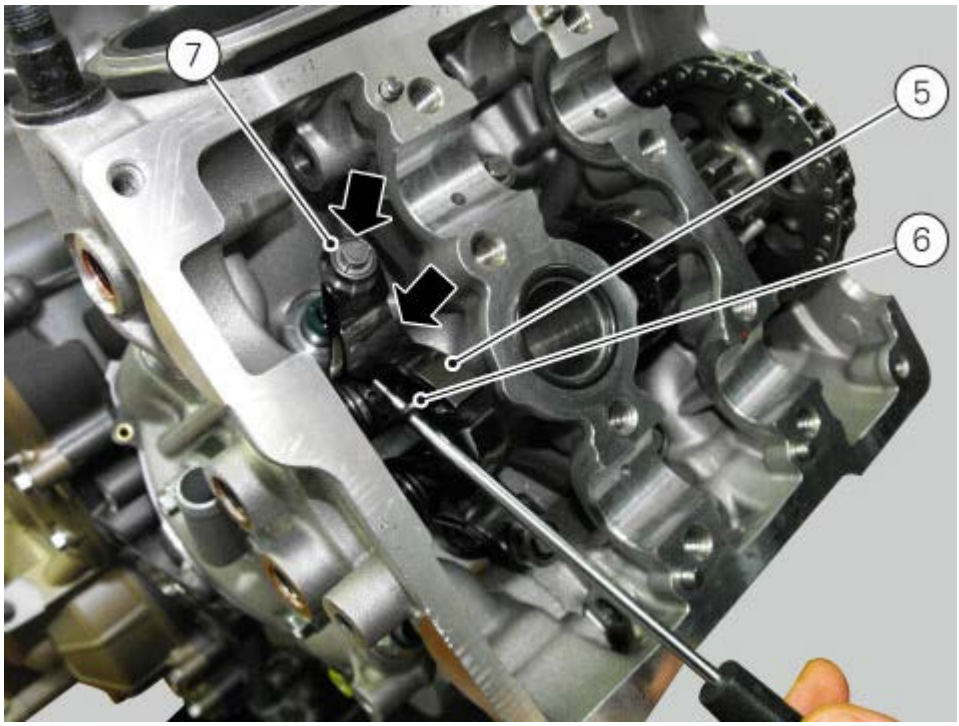

6
12
4



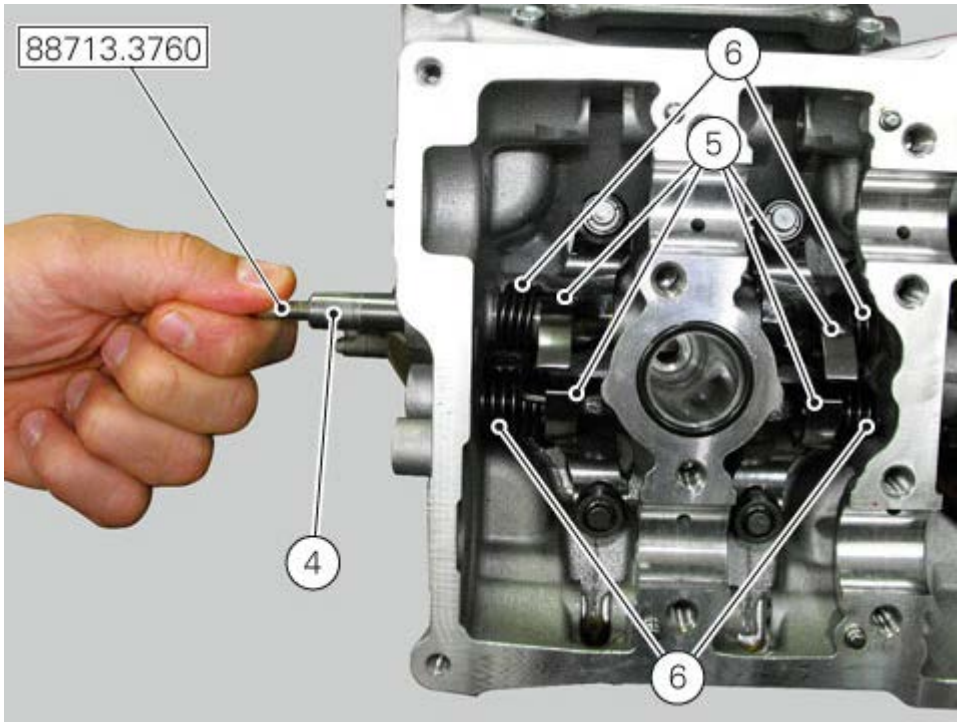
Fit the closing rocker arm (5) in its seat, making sure that the through hole is in line with the closing rocker arm shaft (12).
Push the service screw inside until taking the closing rocker arm shaft (12) fully home.
Loosen and remove the service screw from the closing rocker arm shaft.



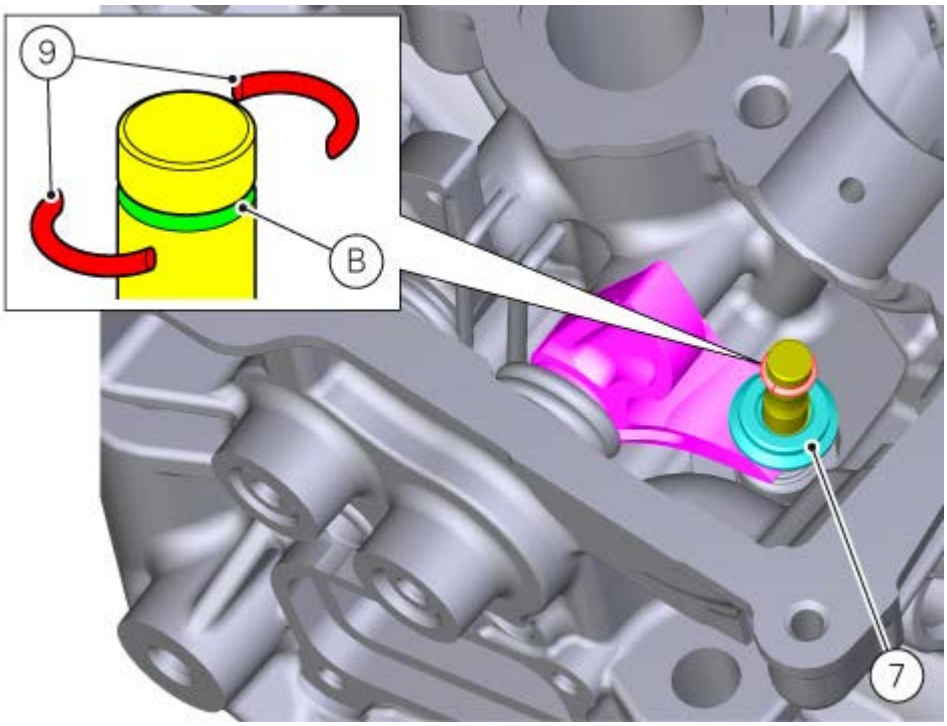
Hold the closing rocker arm (5) pushed downwards and fit the closing shim (7) on the valve stem up to reach the rocker arm.
If using the old cylinder head, start by refitting the original shim.



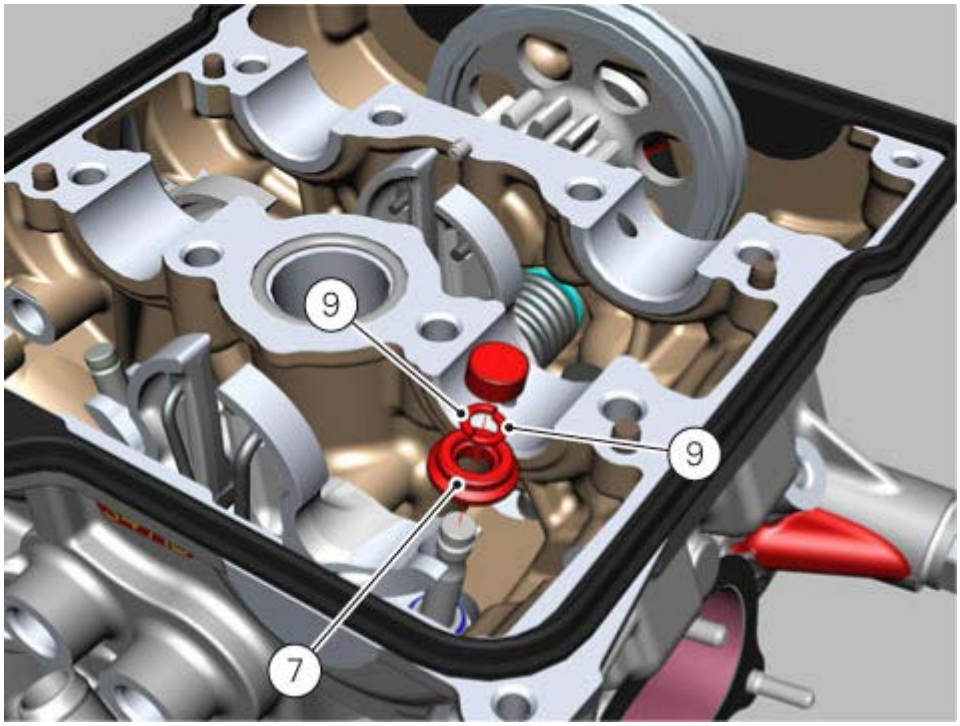
Work in the same way to fit the shafts (5), springs (6) and shafts (4) on exhaust side.



On the exhaust side, fit split rings (9) as follows: fit the new rings in groove (B) on valve stem and release the rocker arm to obtain proper split ring positioning inside the shim.



Turn the closing rocker arm, and compress the spring as much as possible while holding valve, shim (7) and split rings (9) in the valve closed position.
Release the rocker arm with a quick movement, so that the split rings (9) in the shim.
Repeat the procedure with the other valves 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 rings (9) fitting procedure.



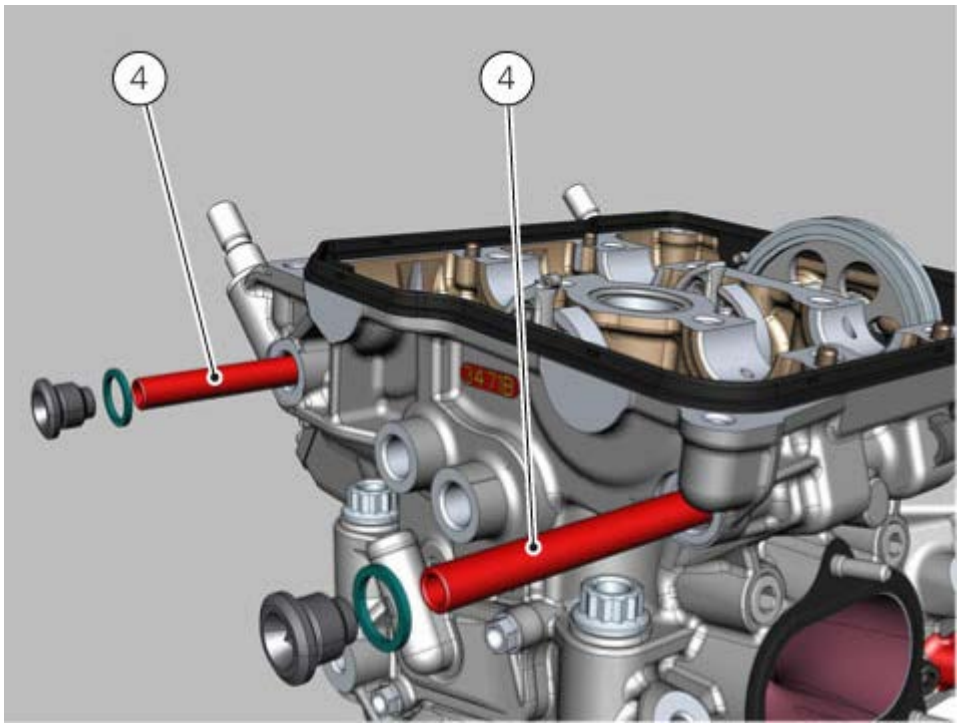
Temporarily position the camshafts and check closing valve clearance (Check valve clearance).

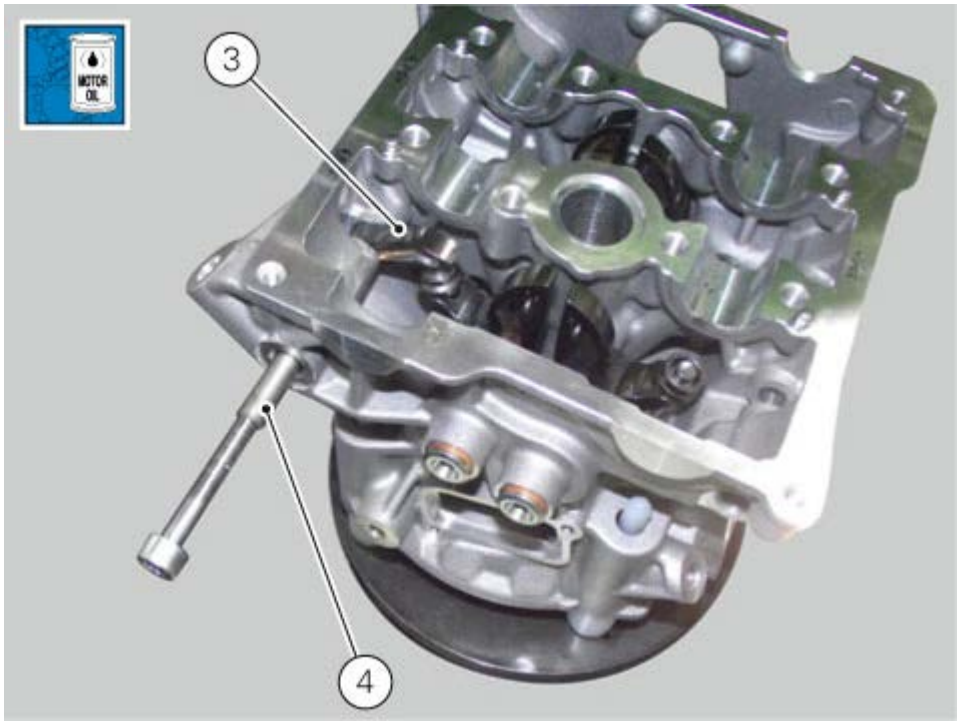
Closing rocker arm	
INTAKE:	
Operation	0.08÷0.13 mm
Inspection	0.08÷0.25 mm
EXHAUST:	

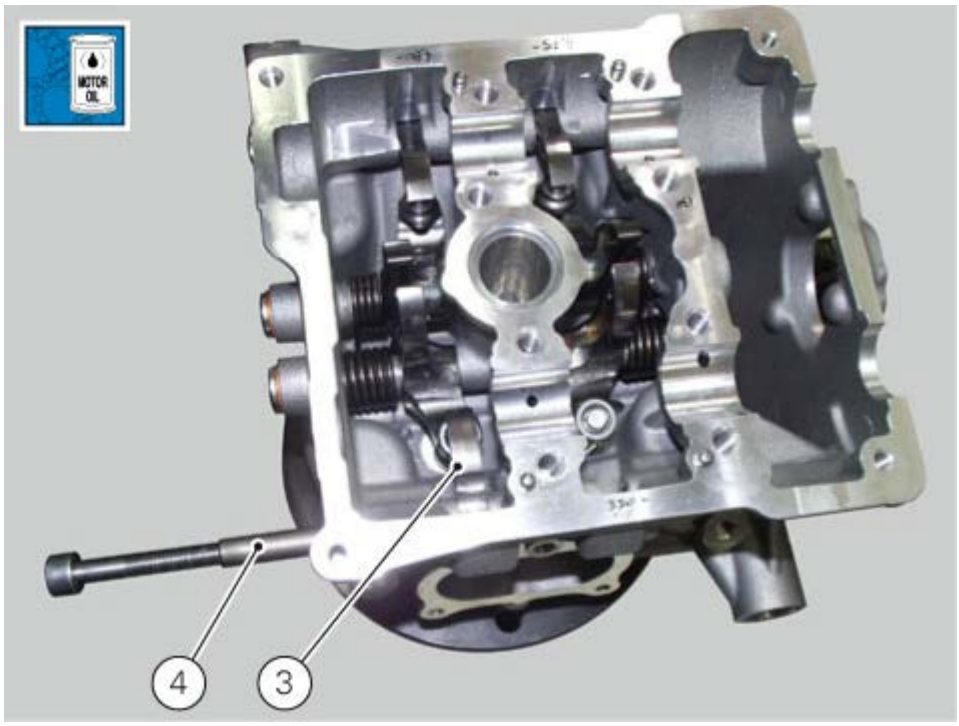
Operation	0.08÷0.13 mm
Inspection	0.08÷0.25 mm

Remove the camshafts.

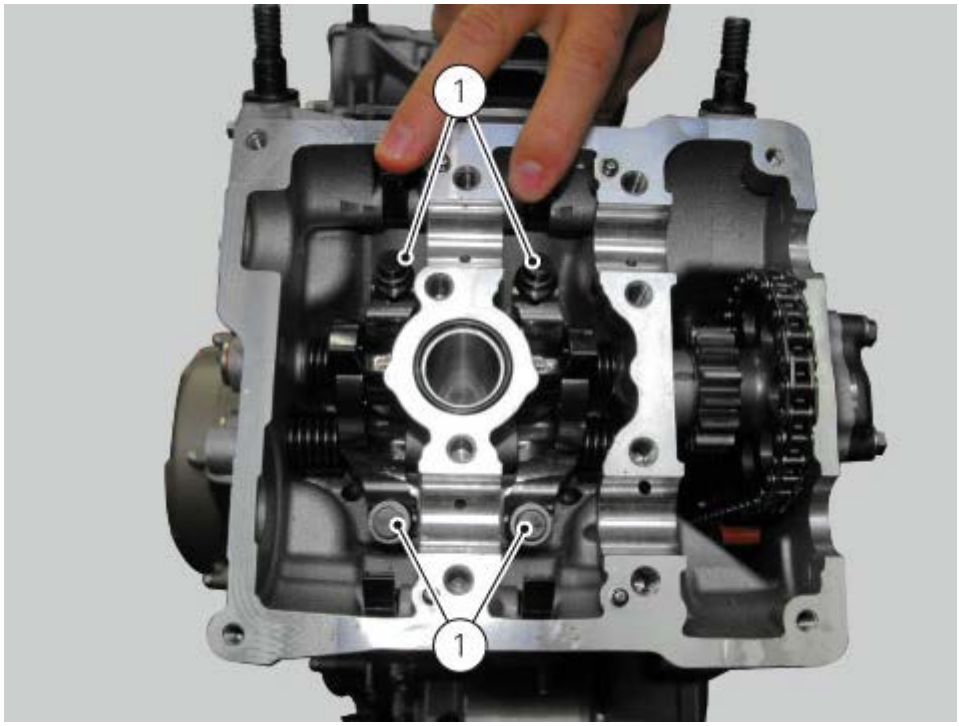
Screw a service screw on the opening rocker arm shaft (4) on the side with the threaded hole.
Use engine oil to lubricate the closing rocker arm shaft (4).
Insert shaft (4) in the relevant hole on the head sliding it to spread the engine oil all over the shaft surface and inside the relevant hole on the head.
Locate the opening rocker arm (3) in its seat and drive the shaft (4) home.
Loosen and remove the service screw from the opening rocker arm shaft (4).







Lift the opening rocker arm and refit the opening shim (1) on the valves.
Release the rocker arm so that it rests against the shim.
Ensure that shim (1) is correctly seated by lightly tapping the rocker arm shoe with a nylon mallet.



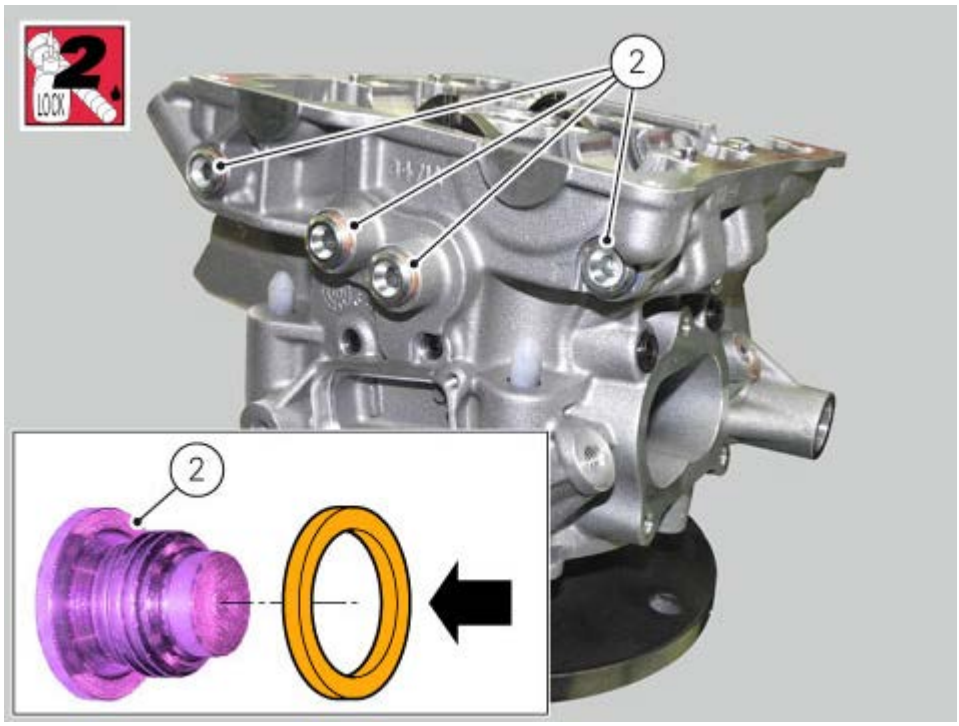
Temporarily position the camshafts and check opening valve clearance (Check valve clearance).

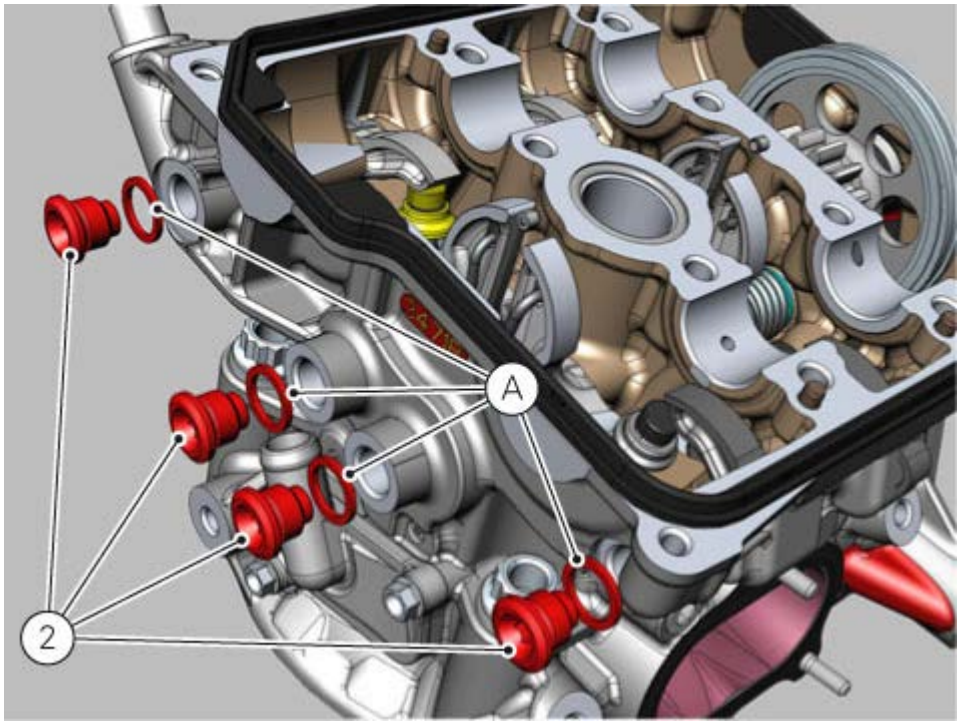
Opening rocker arm	
INTAKE:	
Operation	0.15÷0.20 mm
Inspection	0.10÷0.25 mm
EXHAUST:	
Operation	0.15÷0.20 mm

Inspection	0.10÷0.25 mm

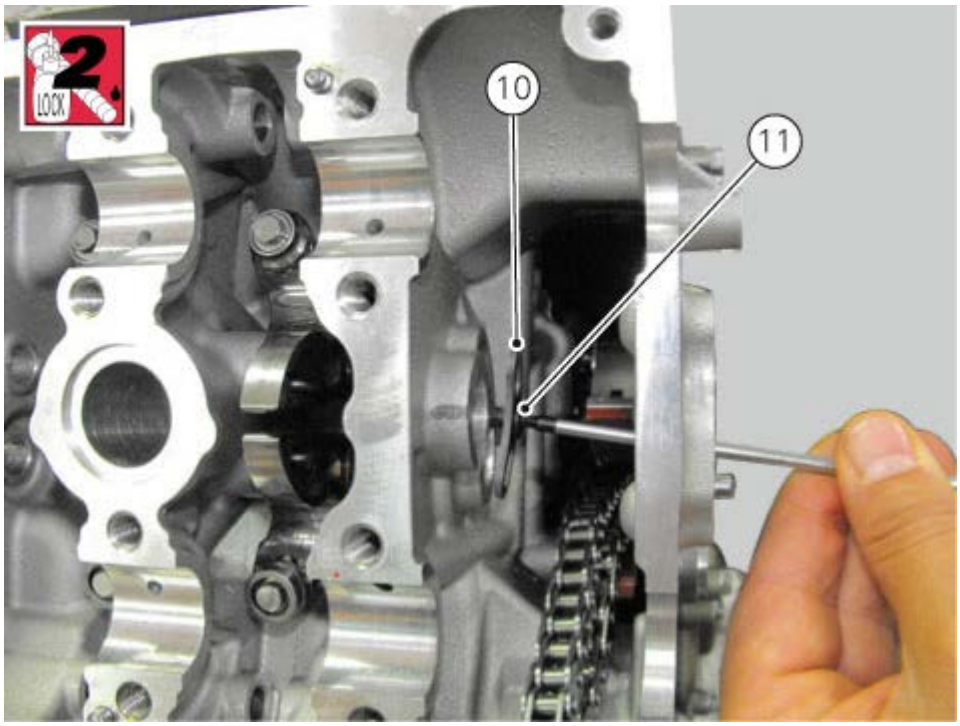
Remove the camshafts.

Insert the gaskets (B) on plugs (2), orienting them (preferably) with the square edge side facing the cylinder head.
Apply the recommended threadlocker on the plug 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).





Apply the recommended threadlocker on screw (11).
Refit plate (10) blanking timing transmission pins and tighten screw (11) to 10 Nm (Min. 9 Nm - Max. 11 Nm).



Repeat the same procedure for the other cylinder head.

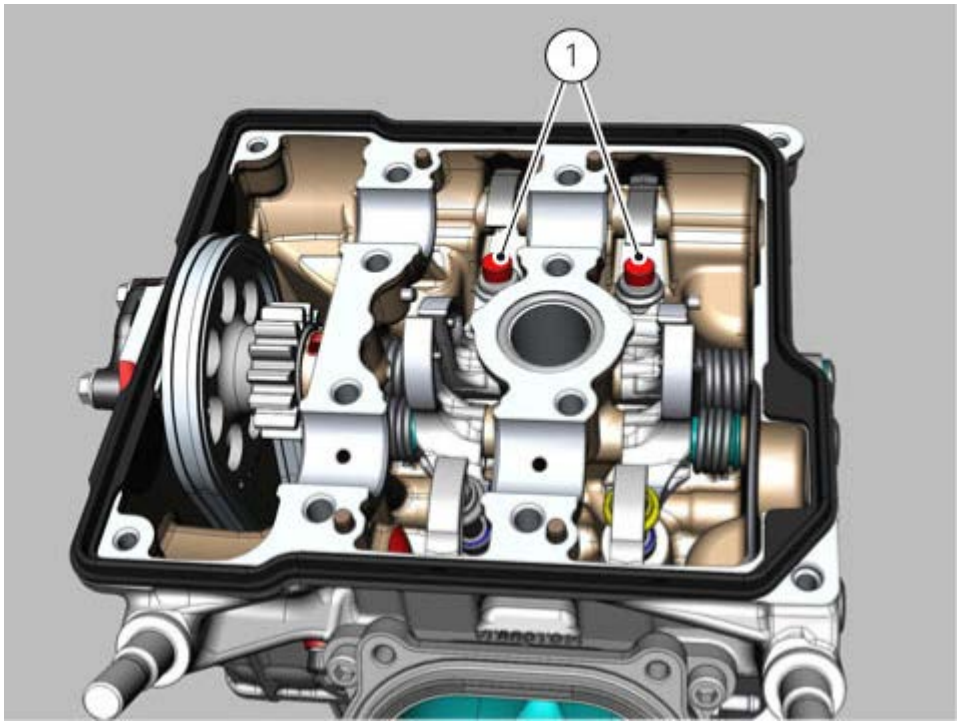
Refit the camshafts (Refitting the camshafts).
Refit the head on the vehicle (Refitting the heads (reverse procedure of "Removing the heads and timing chain")).

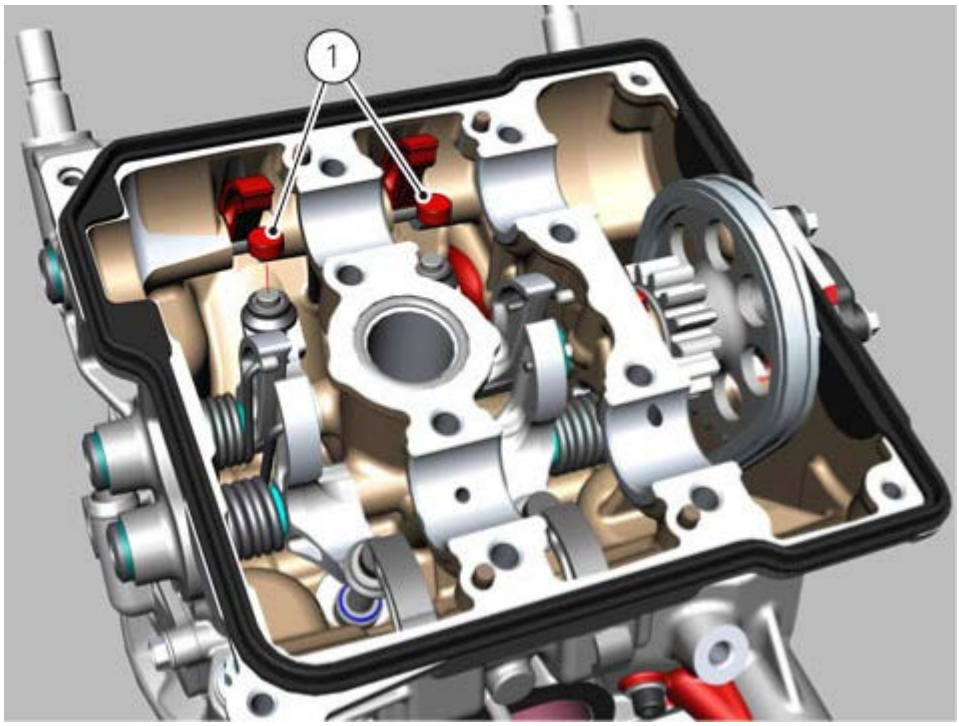
Removing the valves

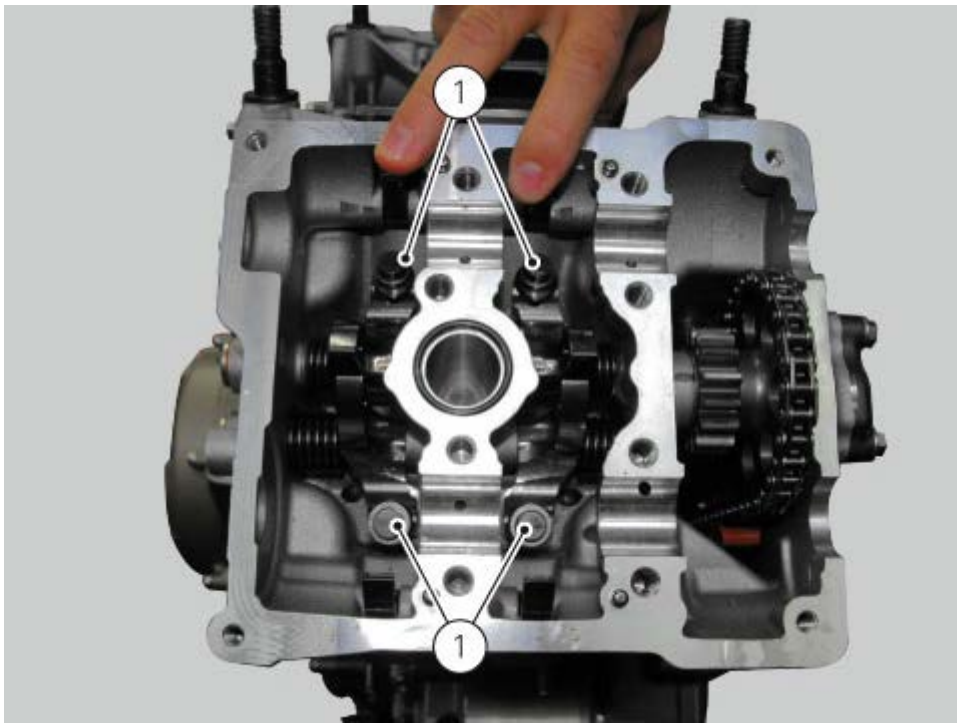
Remove the complete head from the engine with the timing chain (Removing the heads and timing chain).
Take the head you are going to work on and set it onto tool part no. **88713.3422** so that the valves can rest onto the mating Teflon surface.
Remove the camshafts (Removing the camshafts).

Lift the opening rocker arms and remove the opening shims (1).

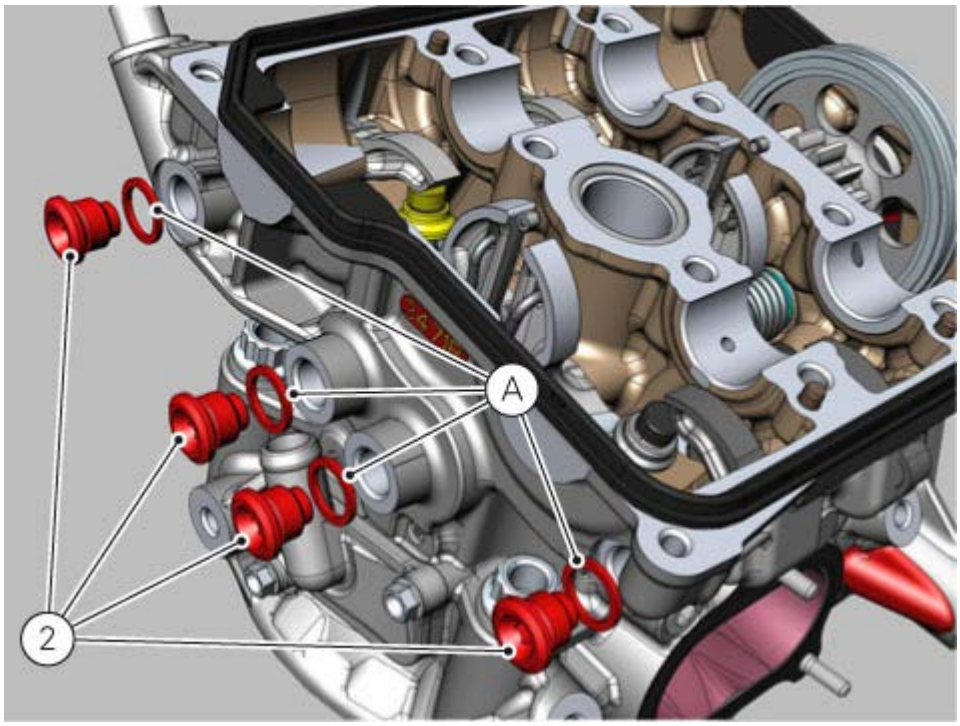
Note
Upon refitting, make sure to refit the opening rocker arms in their original position.



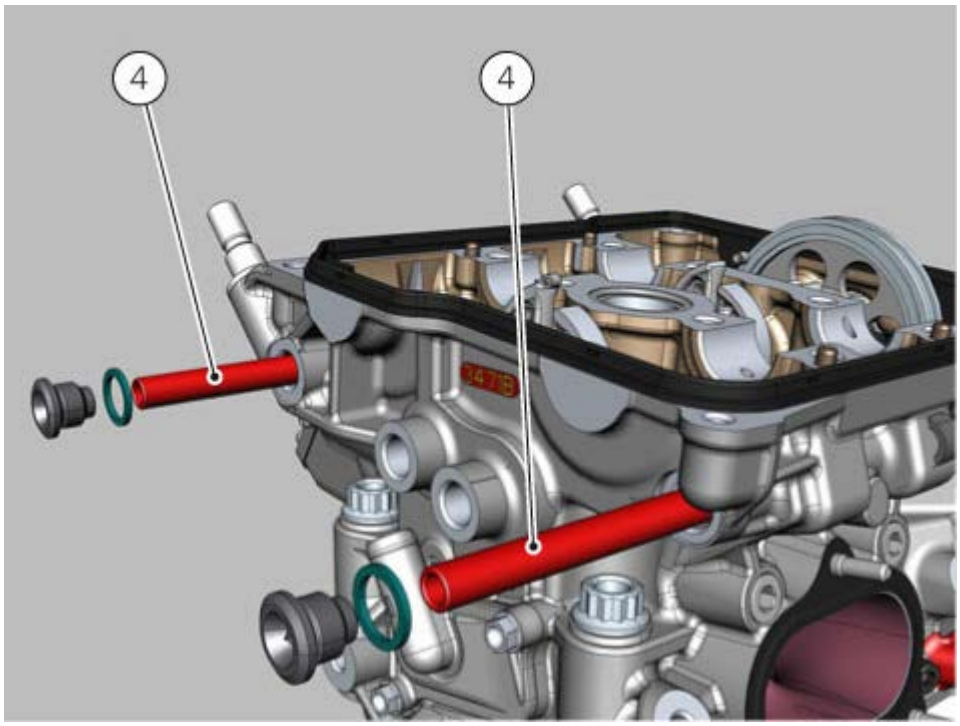




Loosen and remove the plugs (2) for reaching the opening rocker arm shafts, with their washers (A).



Using tool part no. **88713.3943** slide out the shafts (4) of exhaust and intake side opening rocker arms (3); make sure shims do not fall down.
Remove the opening rocker arms (3).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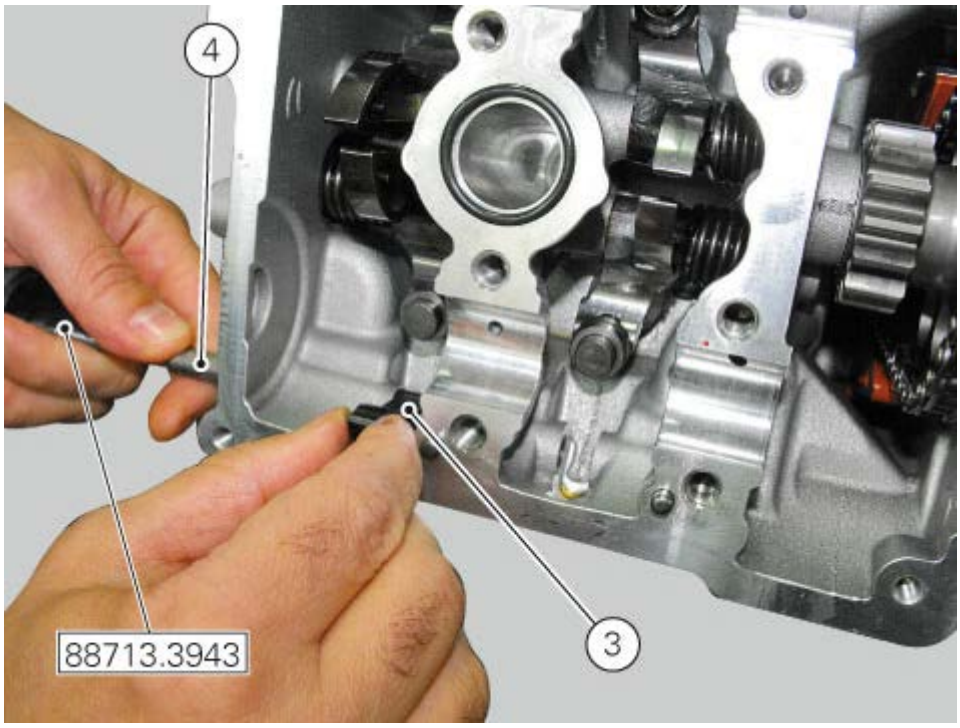
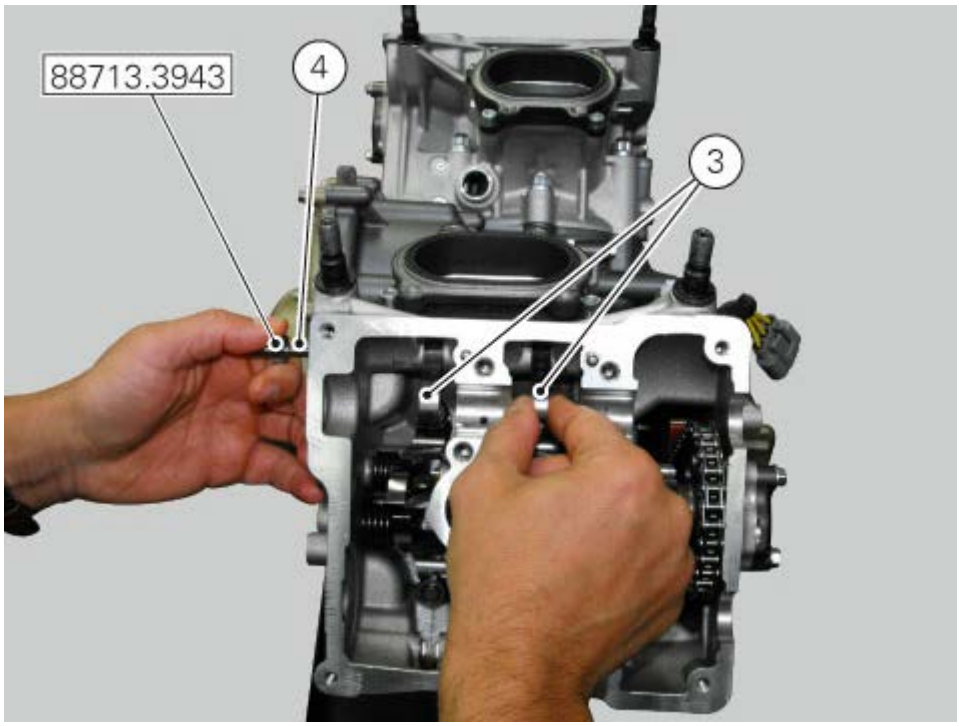
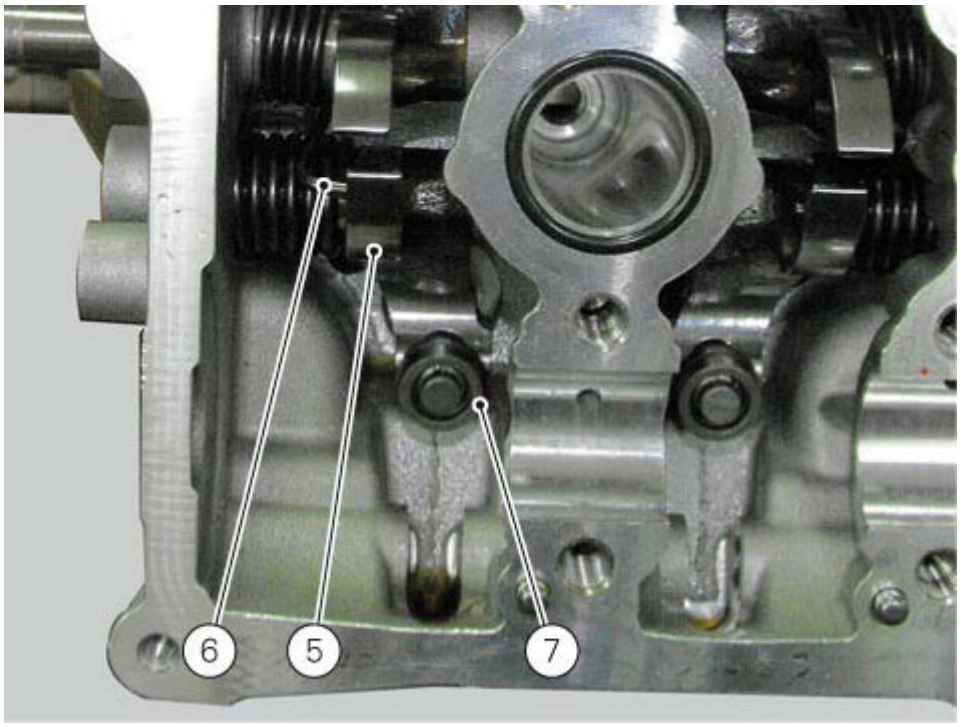
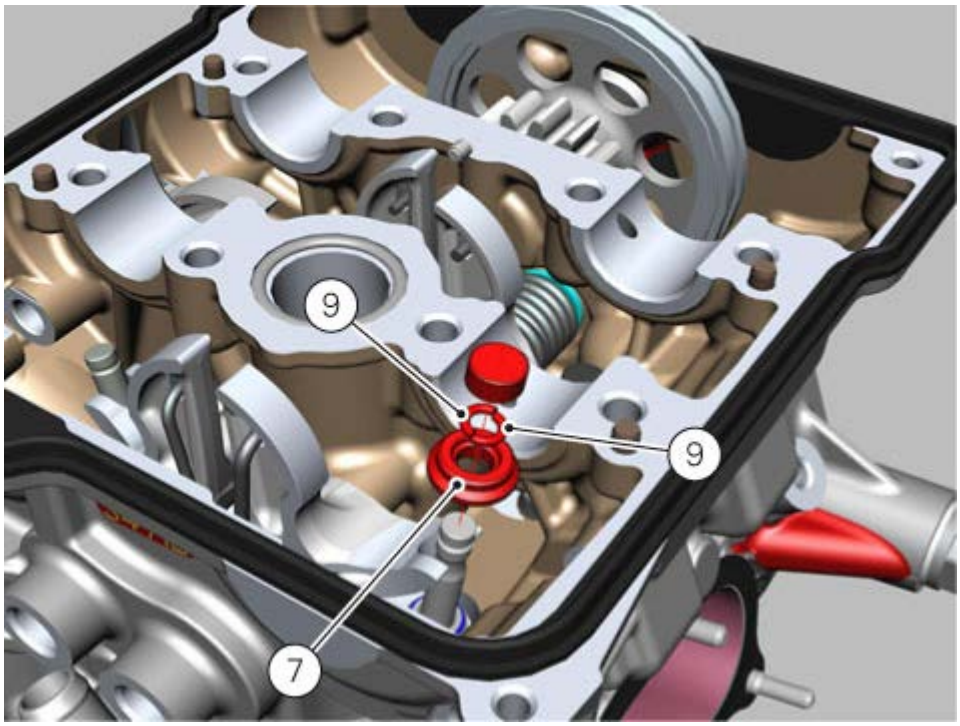

4
88713.3943
3

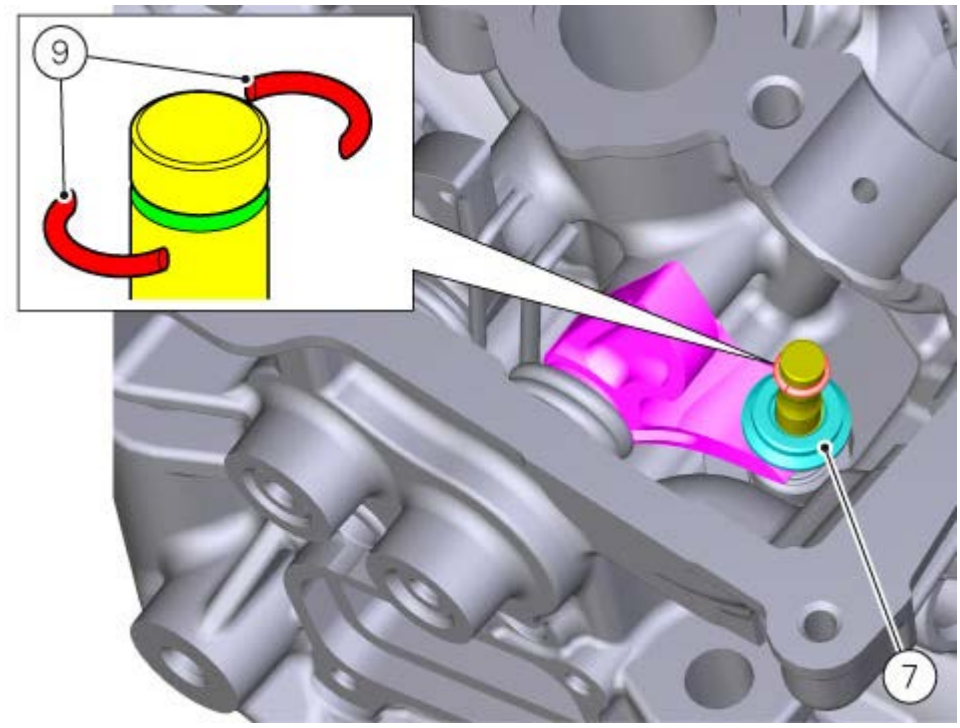


Release closing rocker arm (5) from spring (6).
Push down closing rocker arms (5) and the relevant shim (7).

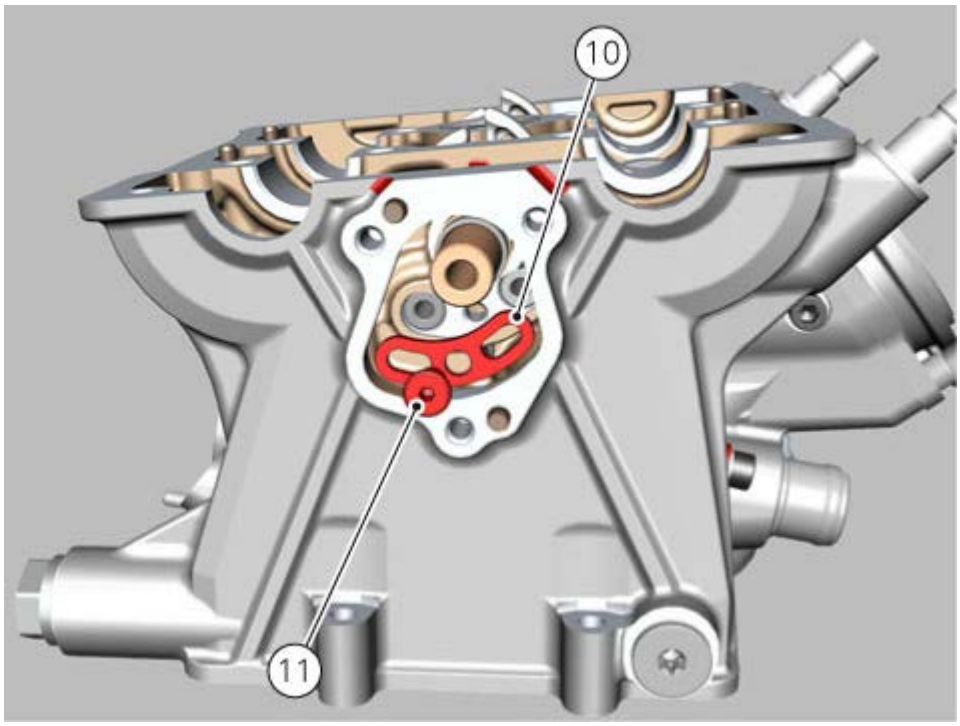


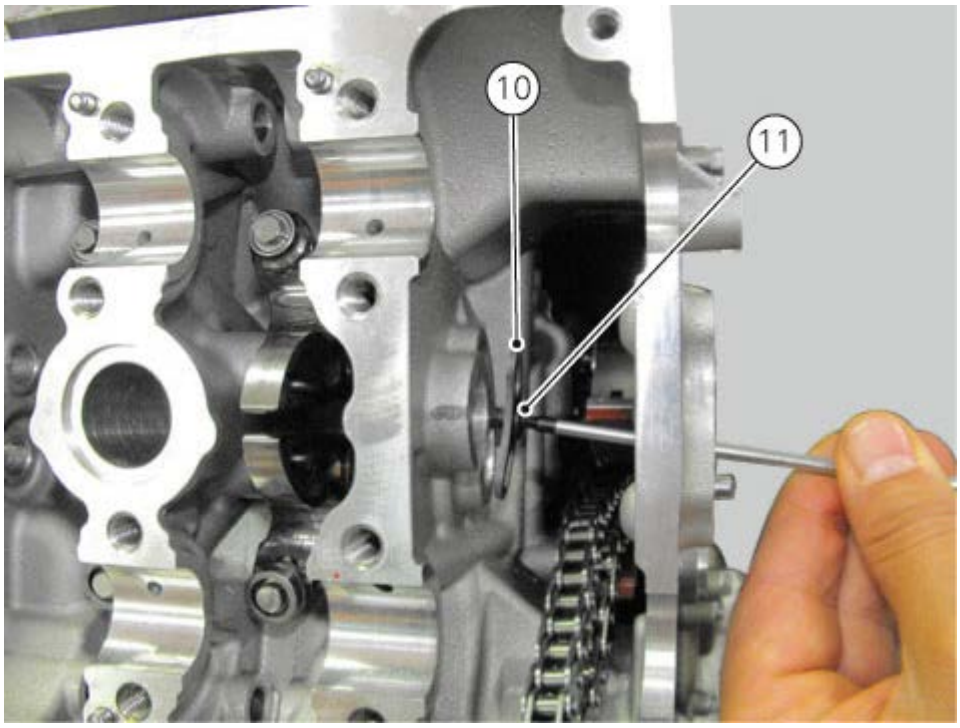
Remove the split rings (9) from the valves with a magnetic screwdriver.
Slide out closing shims (7) from the valve.



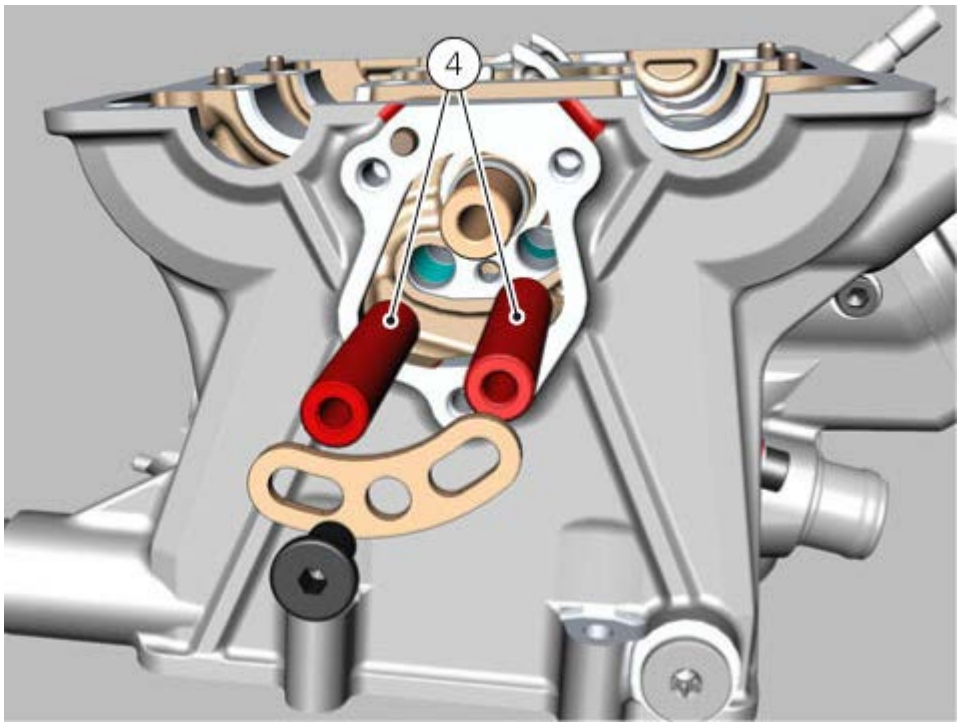


Remove plate (10) blanking timing transmission pins by loosening screw (11).





Use tool **88713.3760** to slide out the closing rocker arm shaft (4) from the intake and exhaust side. Recover springs (6) with spacers (12) and rocker arms (5).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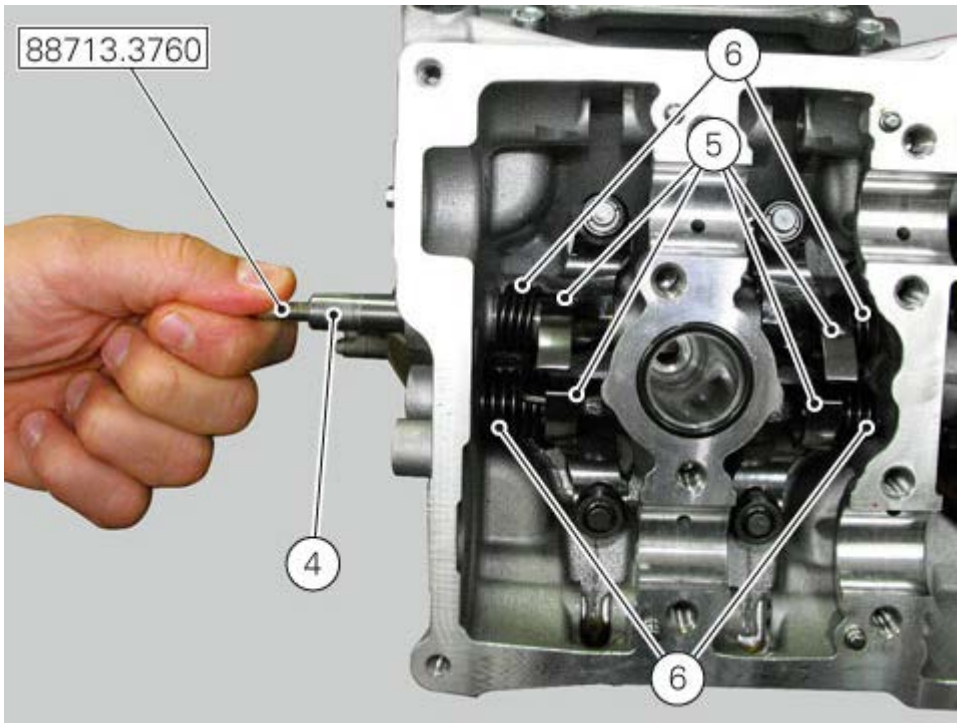
88713.3760
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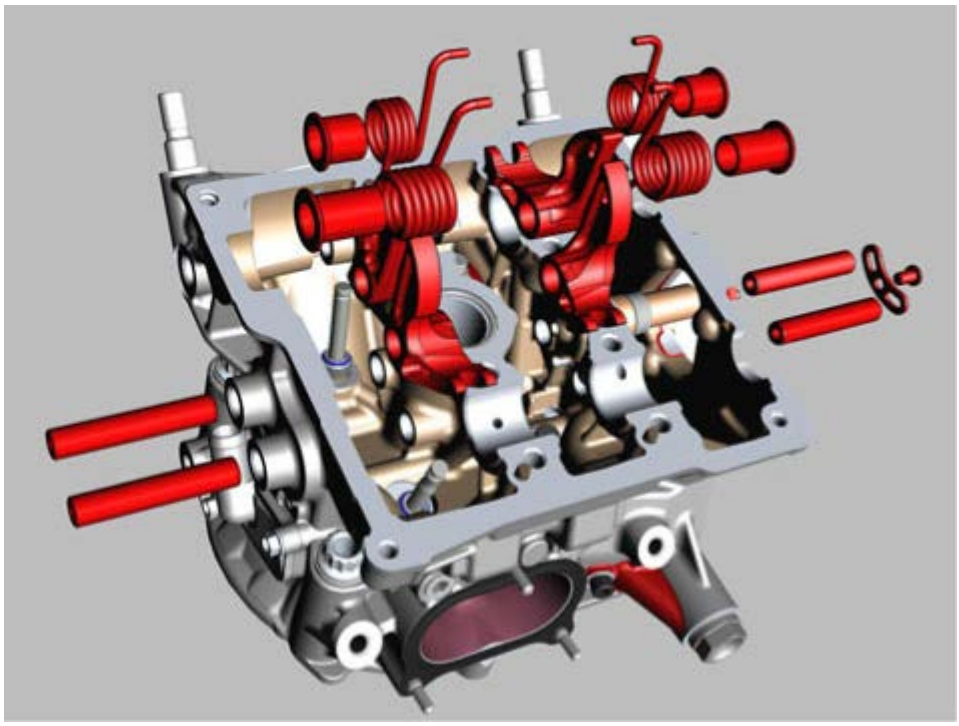
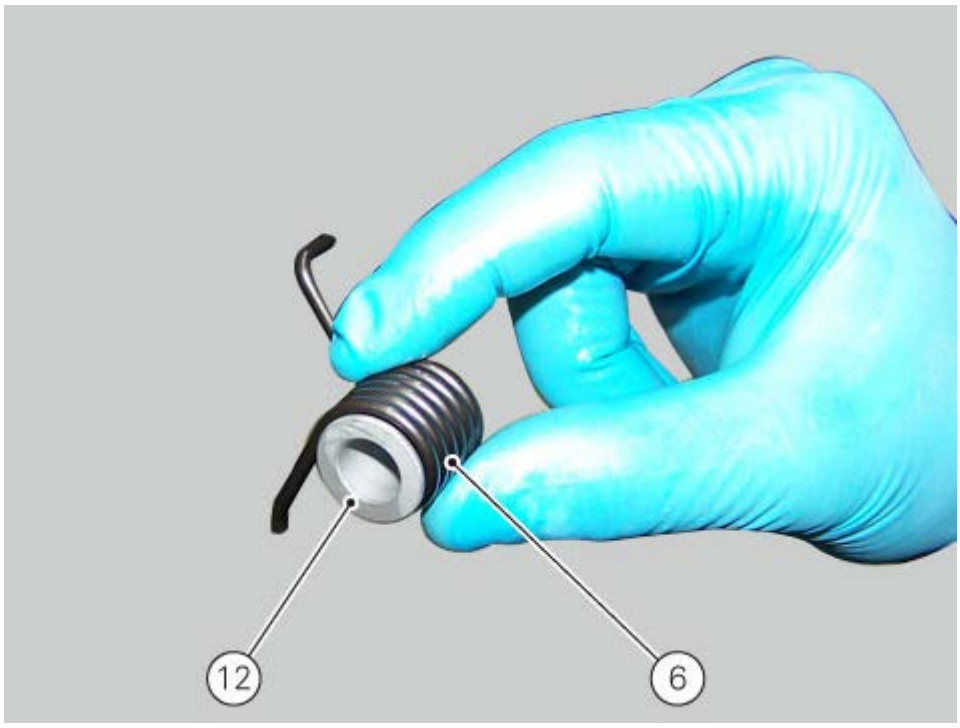
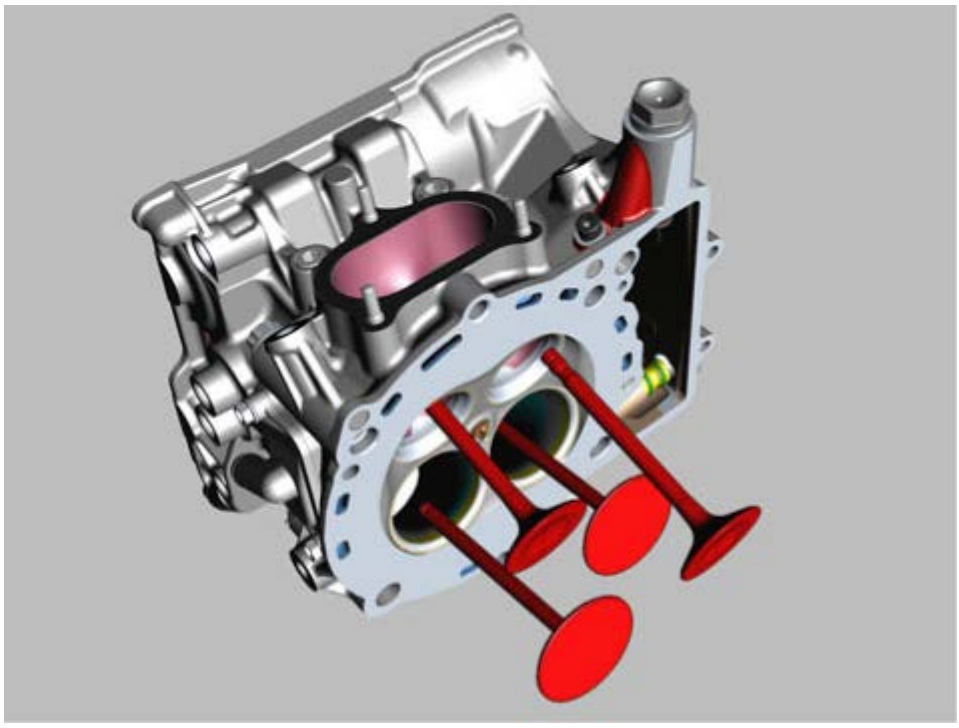
6





Remove head from tool part no. **88713.3422** and take out the valves from below the head.


88713.3422



Repeat the same procedure for the other cylinder head.

Overhauling the piston liner components

Overhauling the piston liner

Check that the walls of the cylinder are perfectly smooth. Take the measurement of the piston liner diameter and determine the relevant size class according to the specified values. Refer to the measured values to ensure that the taper and ovality comply with the relevant specifications.
The liner diameter measurement to determine the size class must be taken in the following three axial positions: 10 mm – 40 mm – 80 mm from the upper edge.

In the event of damage or excessive wear the liner must be replaced as it has a silicon carbide coating (which provides the liner walls with excellent anti-friction and anti-wear properties) and therefore cannot be ground.
The liners are marked with a letter that indicates the relevant size class. Such letter is stamped on the external lower diameter of the liner and on the opposite side of the timing pin seat.
Always match piston with liner from the same size class.

	Piston selection	
Marking	Piston measurement	Liner measurement
A	99.935 ÷ 99.945	100.000 ÷ 100.010
B	99.945 ÷ 99.955	100.010 ÷ 100.020
C	99.955 ÷ 99.965	100.020 ÷ 100.030
	Coupling clearance:	0.055 ± 0.075

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 8 mm up from the bottom of the skirt and in perpendicular direction to the gudgeon pin axis.

Checking the piston-liner clearance

The pistons are marked with a letter (punched into the piston crown) that indicates the size class to which they belong.
Always match piston with liner from the same size class.
For the correct values, see previous section.

Overhauling the gudgeon pins

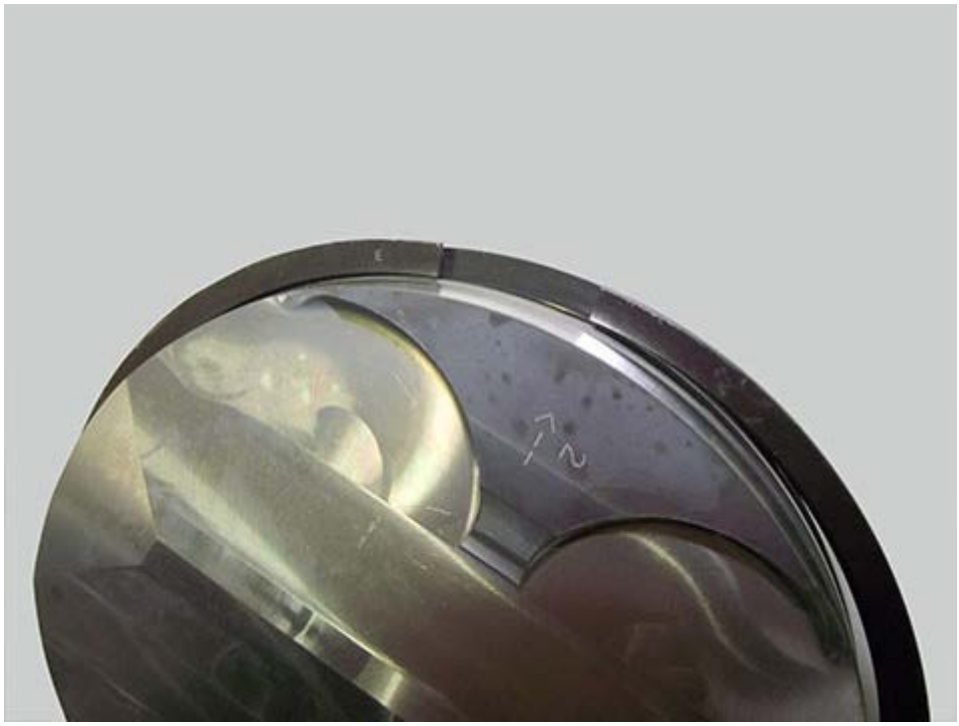
Gudgeon pins must be perfectly smooth without signs of scoring or steps.
The well-lubricated gudgeon pin must slide smoothly inside the piston without stiffness.
For the coupling clearance values with the piston and the connecting rod, see section "Cylinder/Piston".

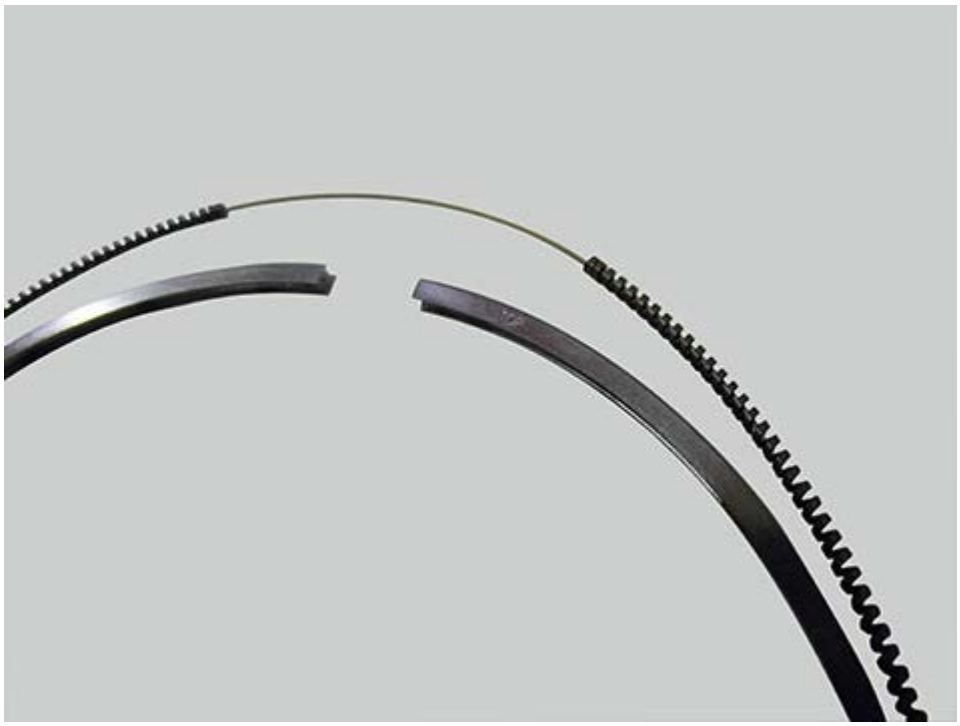
Overhauling the piston rings

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

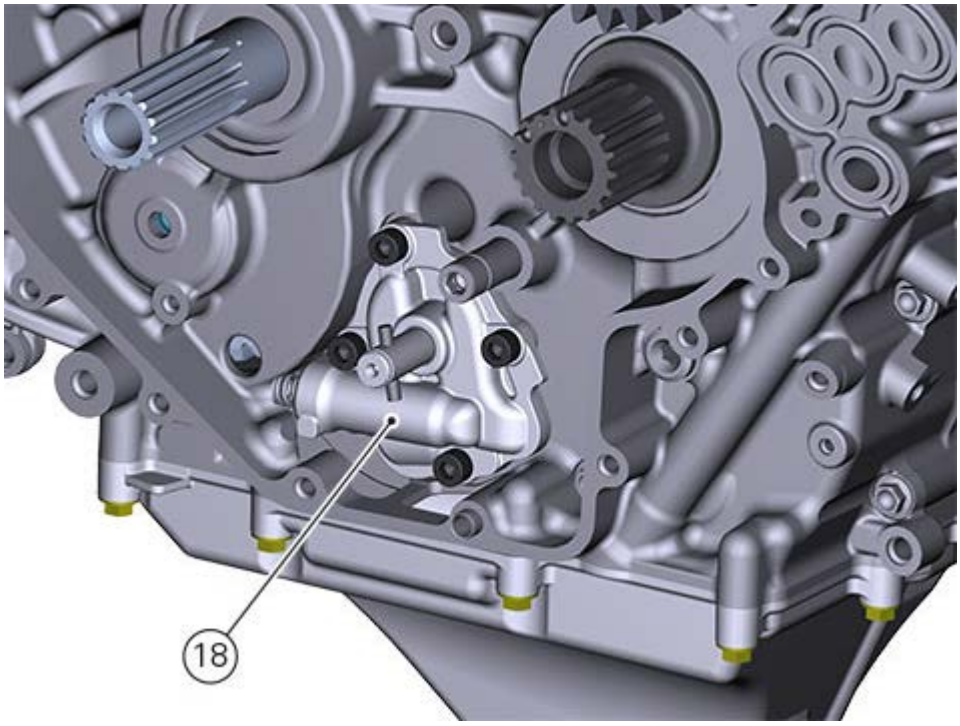
The piston rings must always be fitted with markings facing upwards.



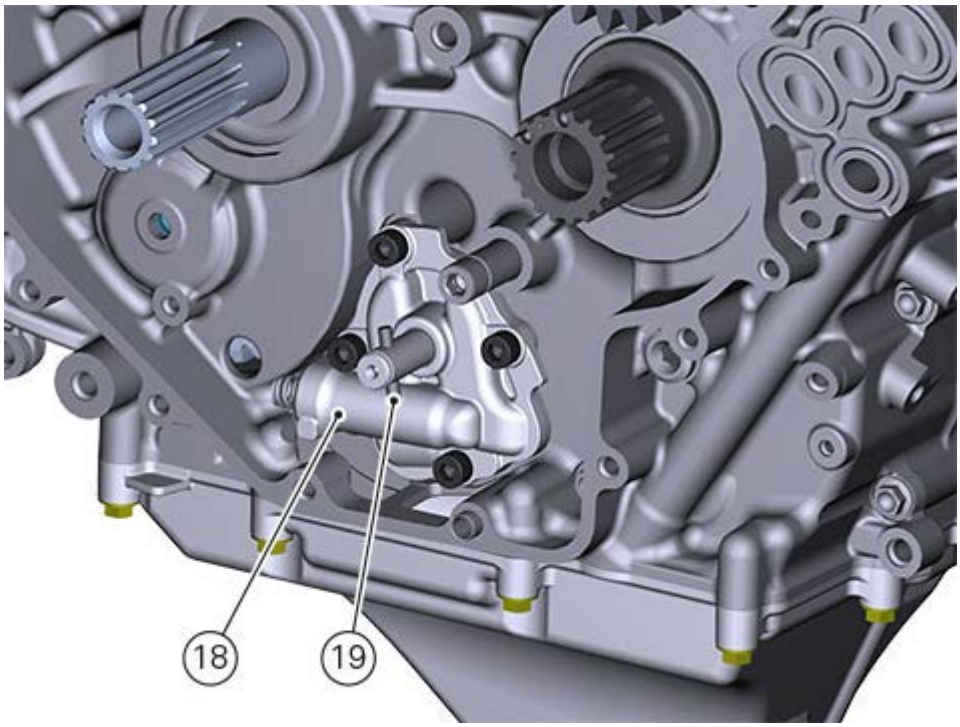


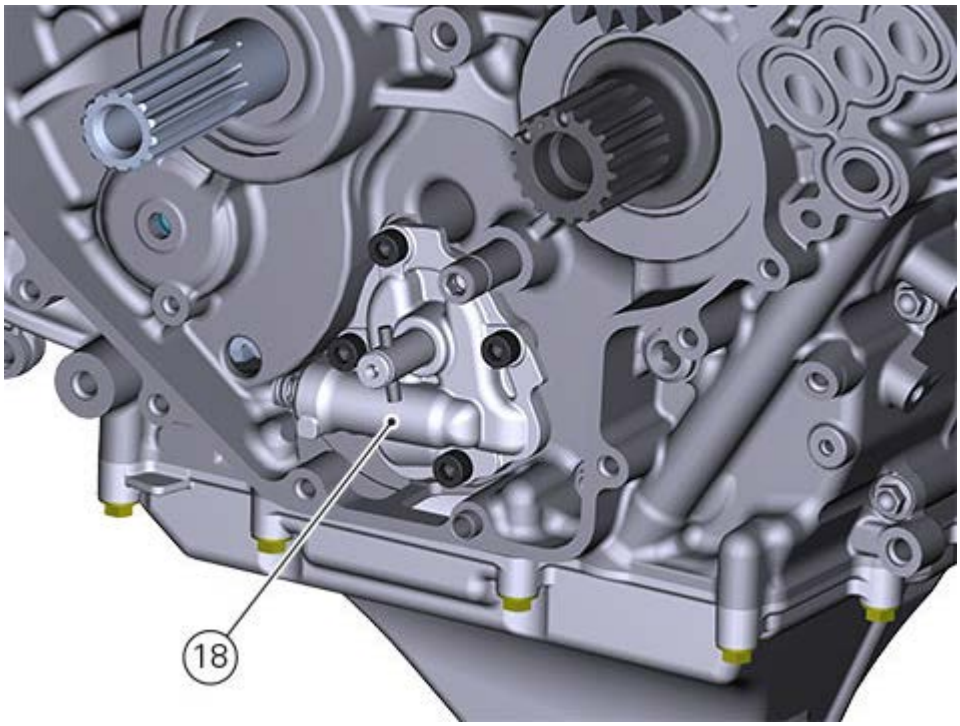
Refitting the external components

Refit the oil delivery pump (18) (Refitting the oil delivery pump).

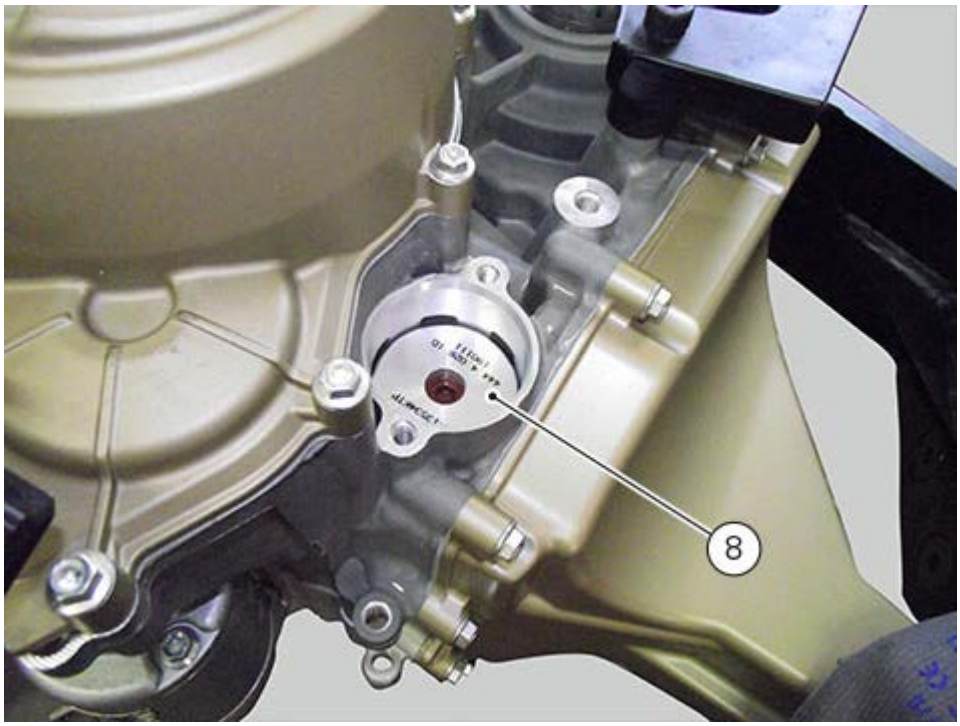


Position the oil pump split gear (17) paying attention to the mobile parts.
Check for the presence of pin (19) on the oil pump shaft (18) (Refitting the oil delivery pump).
Fit the oil pump driving gear (16).





Refit the oil filter (15) and the relevant cover (13) with the relevant O-ring (14).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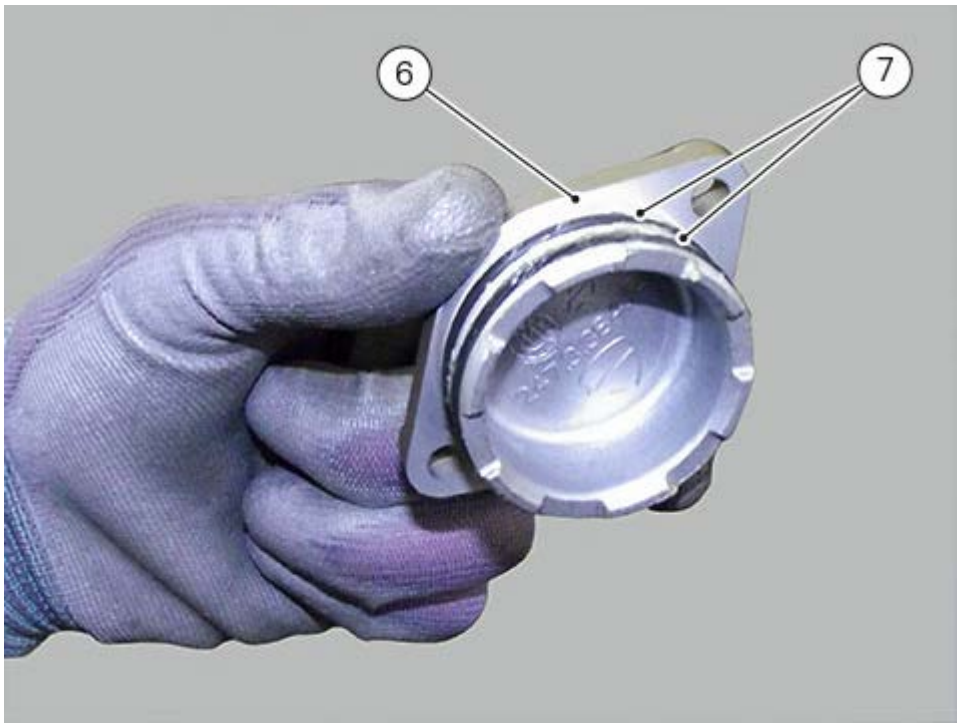
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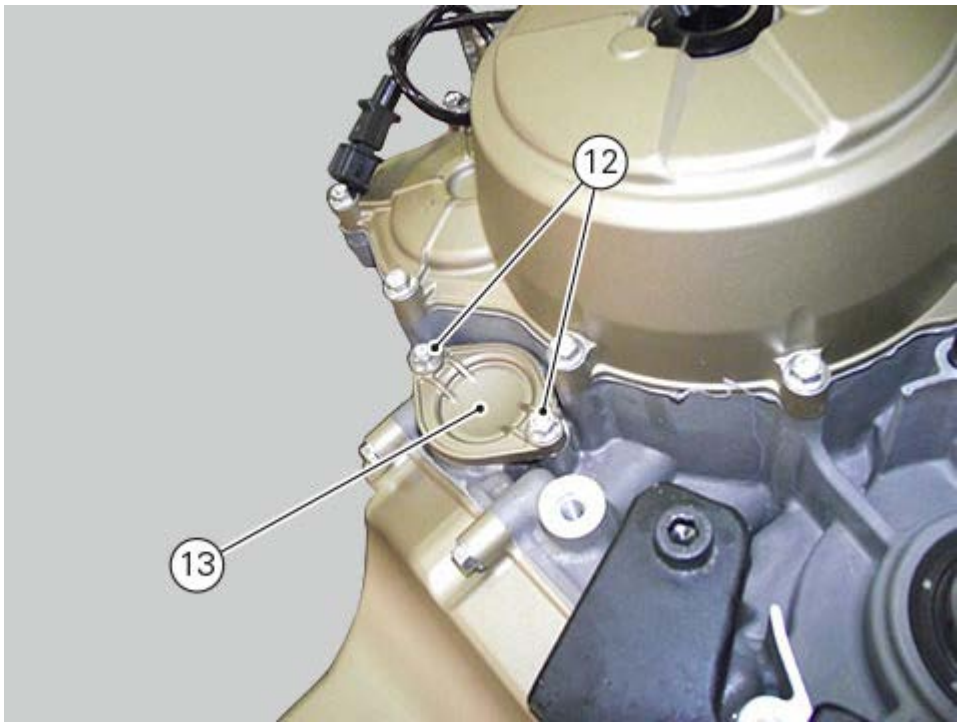
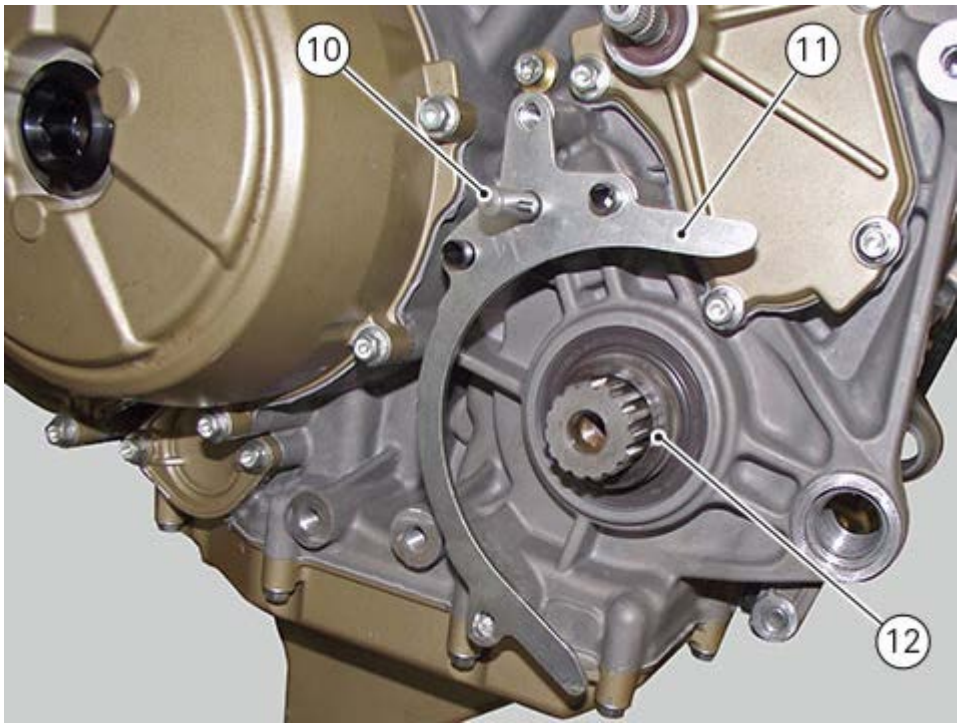
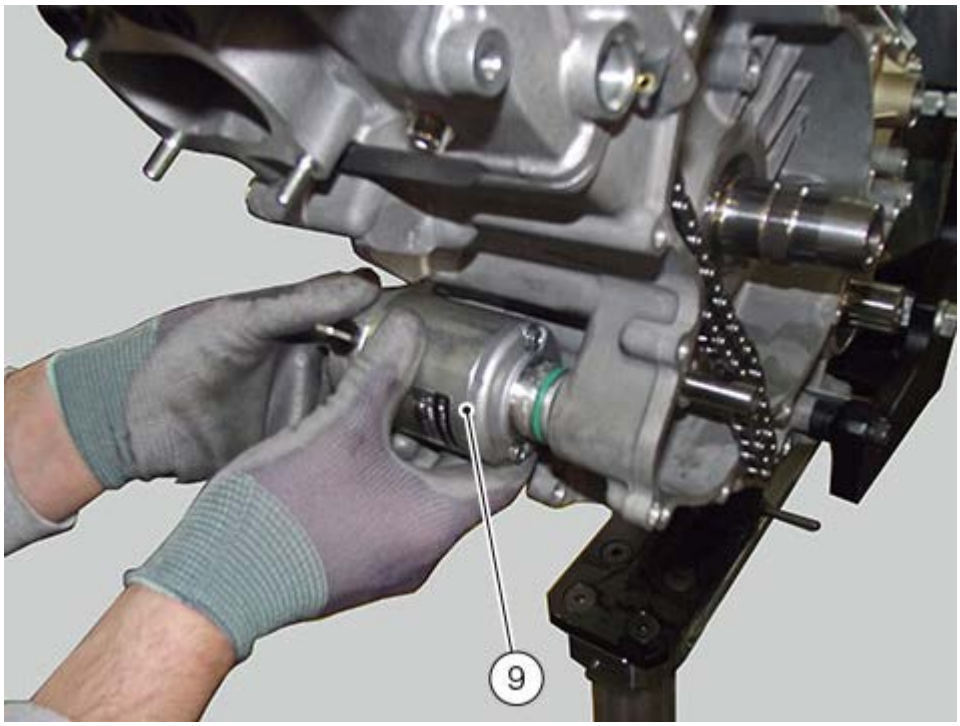
7

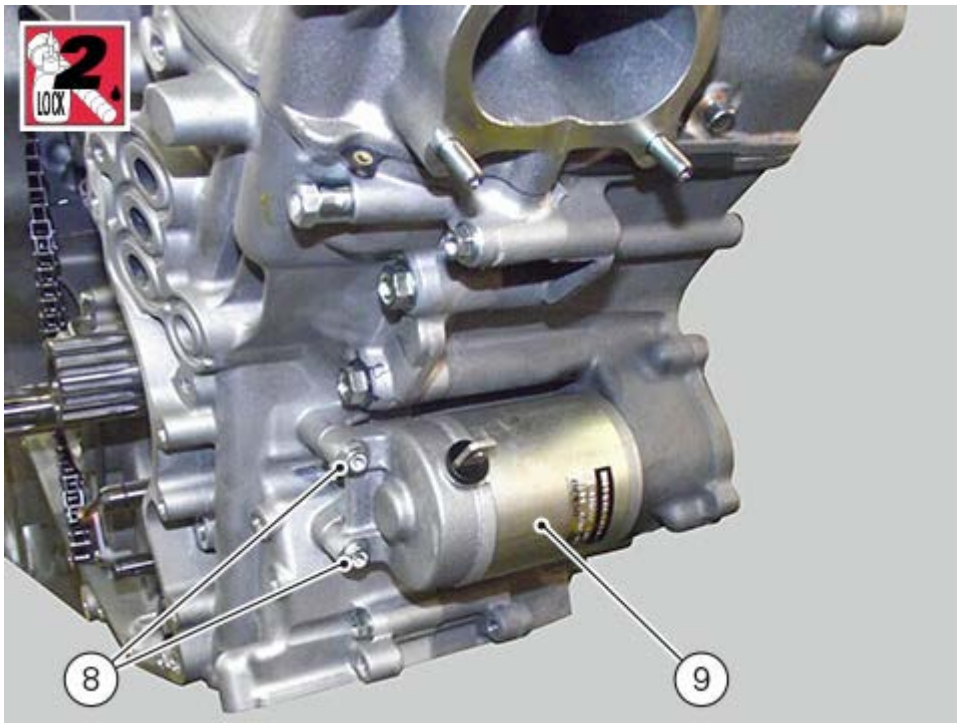


Refit front sprocket spacer (12) and the chain show (11).
Refit the clutch pushrod (10).

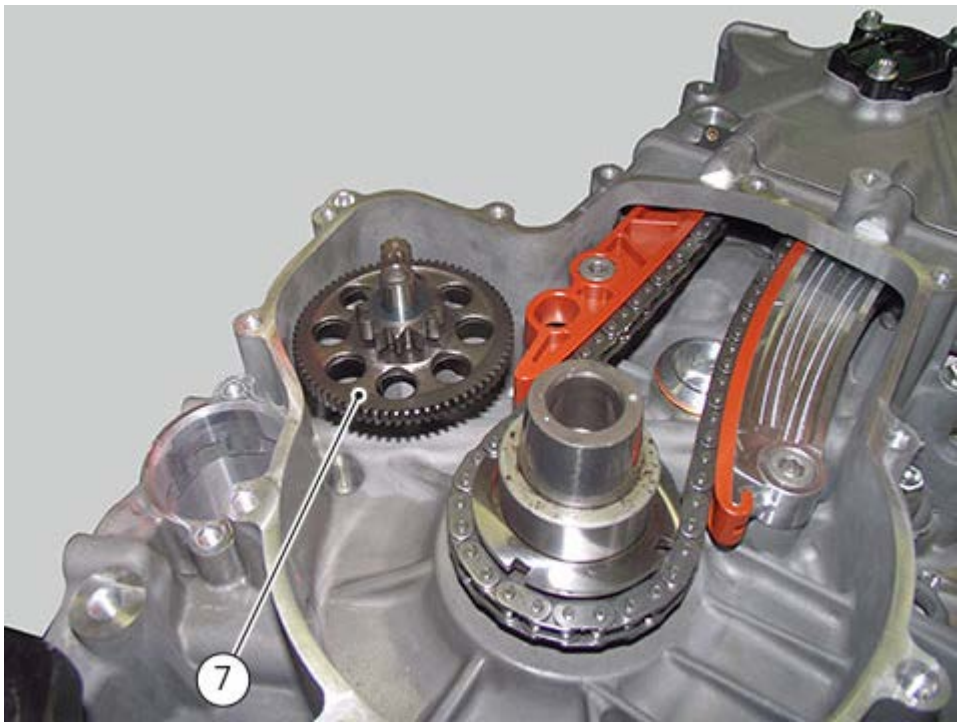


Apply the recommended threadlocker to the screws (8).
Refit the electric starter (9) by tightening to a torque of 13 Nm (Min. 12 Nm - Max. 14 Nm) the retaining screws (8).

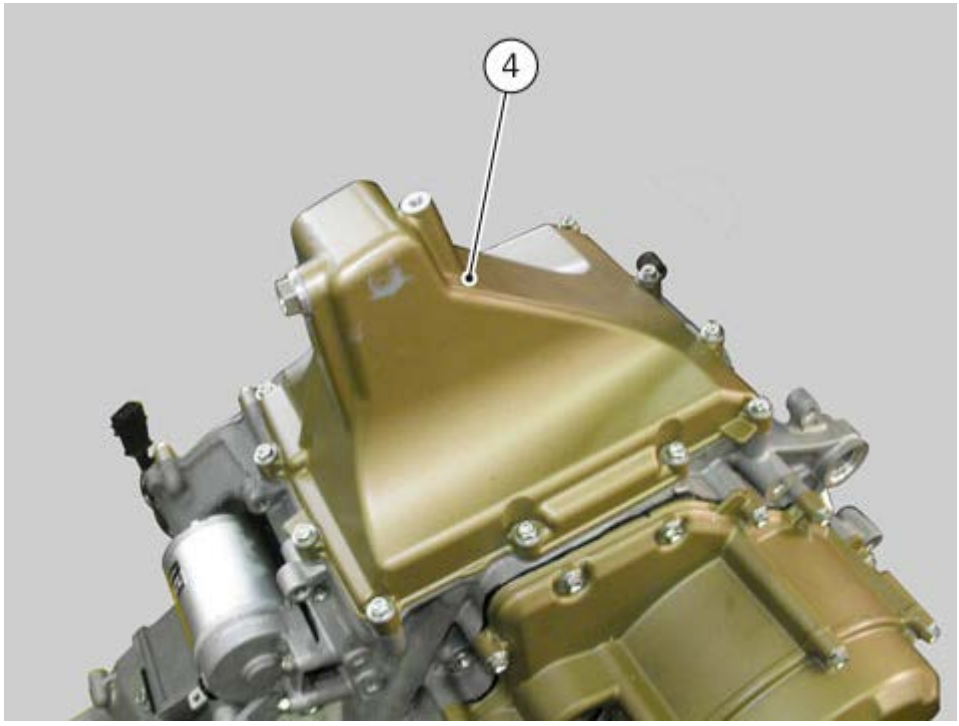




Position the electric starter gear (7) and the relevant shim.

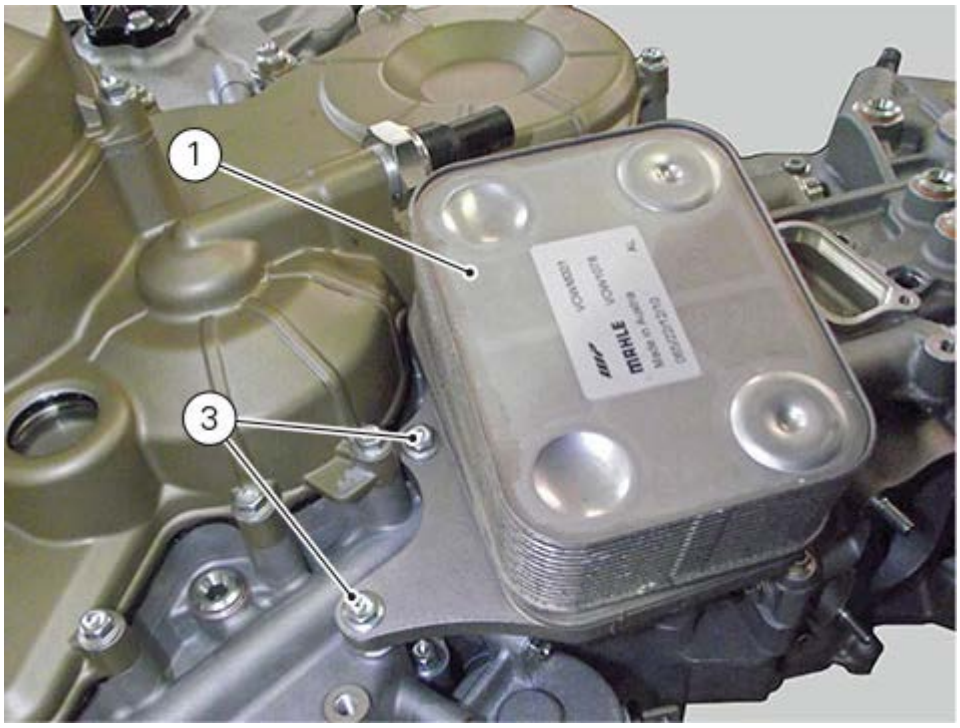


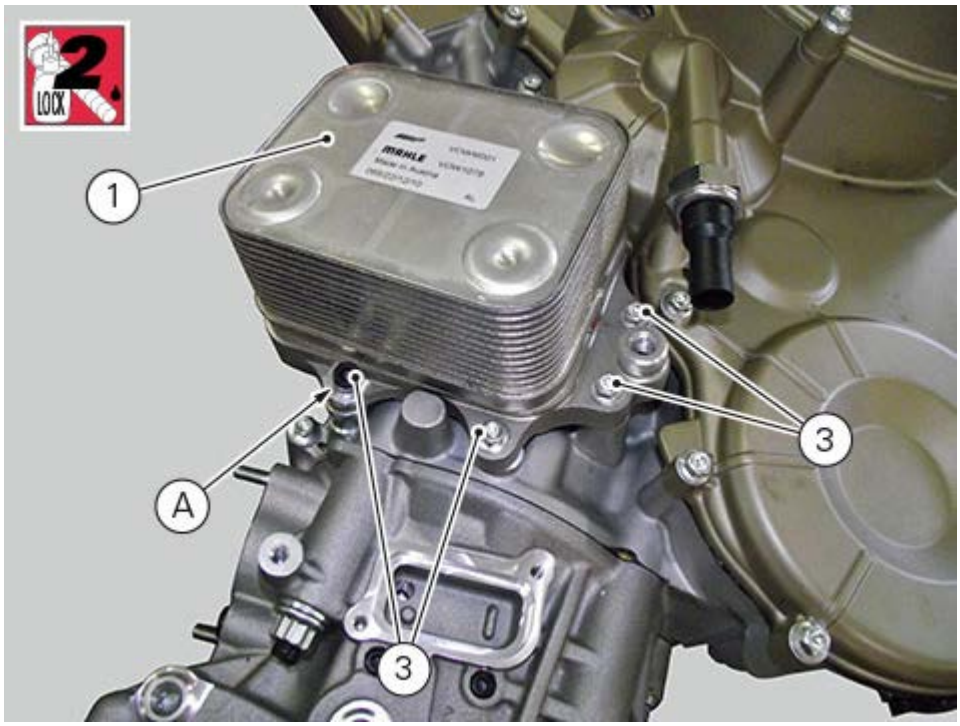
Refit the oil sump (4) (Changing the engine oil and filter cartridge).



Apply specified threadlocker on screws (3) except screw (A).
Refit the heat exchanger (1) and the relevant seal (2) by tightening to a torque of 13 Nm (Min. 12 Nm - Max. 14 Nm) the retaining screws (3).


2

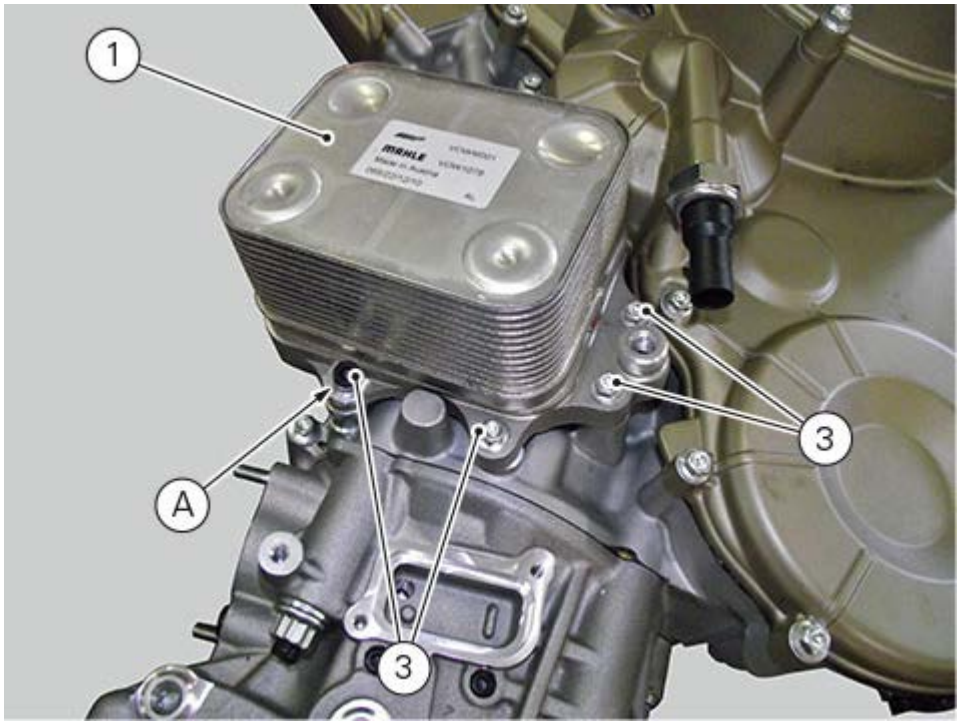

1
3
MAHLE

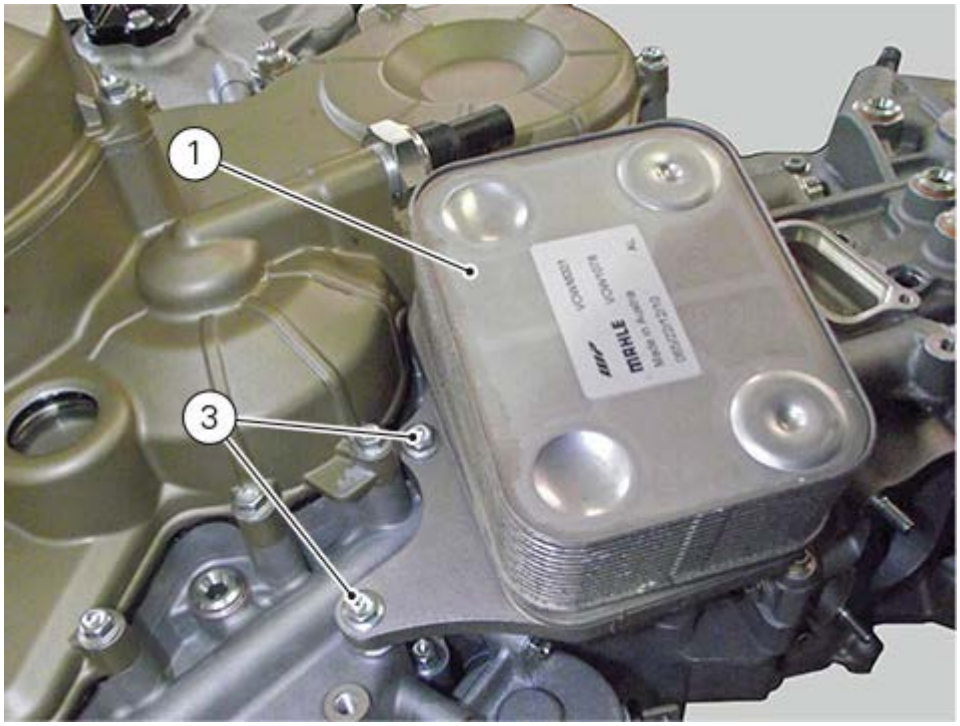

2.
LOCK
1
A
3
3

Removing outer components

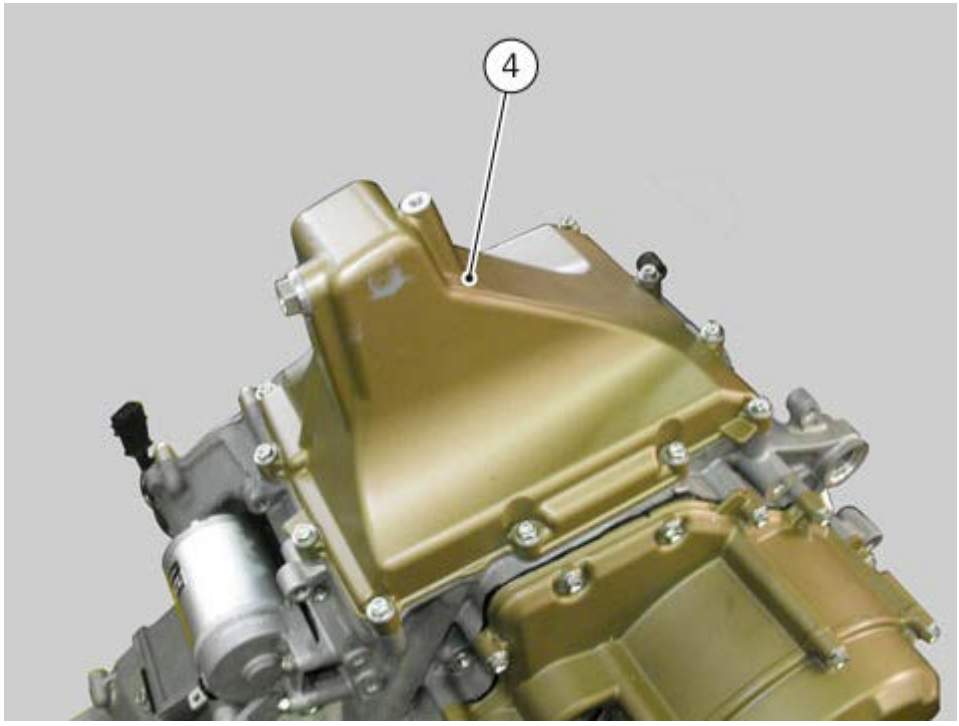
Remove heat exchanger (1) and seal (2) by loosening the retaining screws (3).

Warning
After the removal, some coolant and engine oil could leak out.

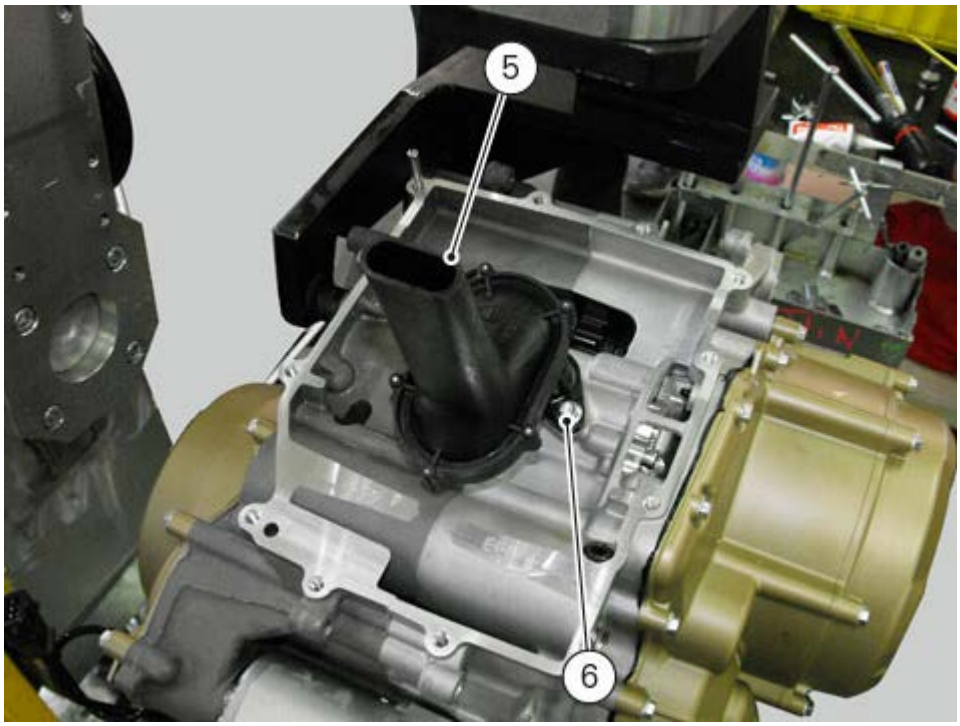




Remove the oil sump (4) (Changing the engine oil and filter cartridge).



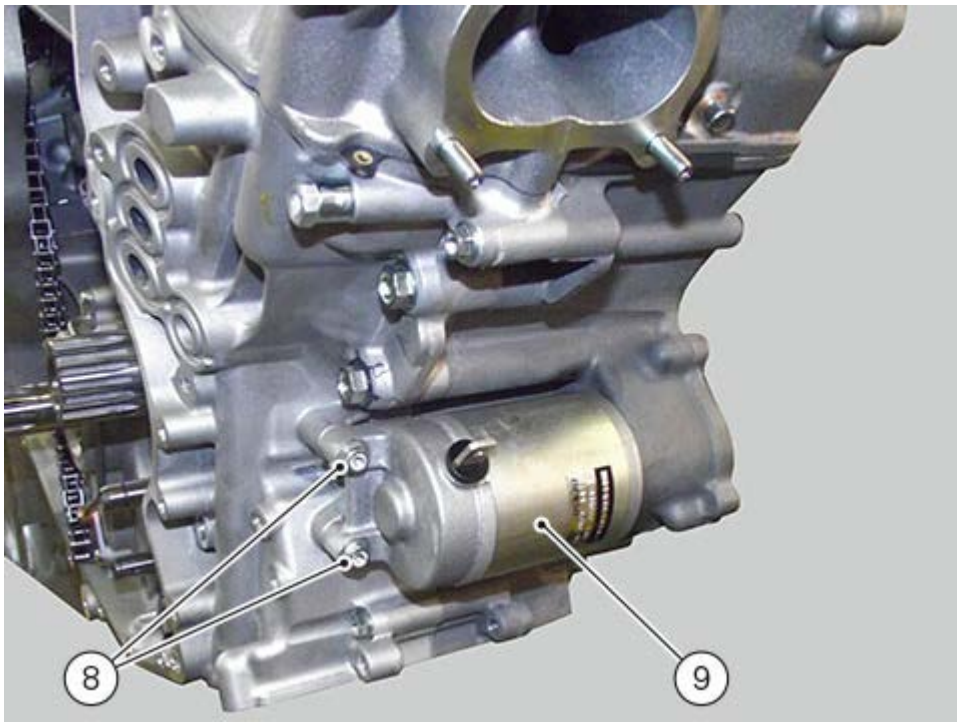
Loosen screw (6) to remove the oil intake filter (5).

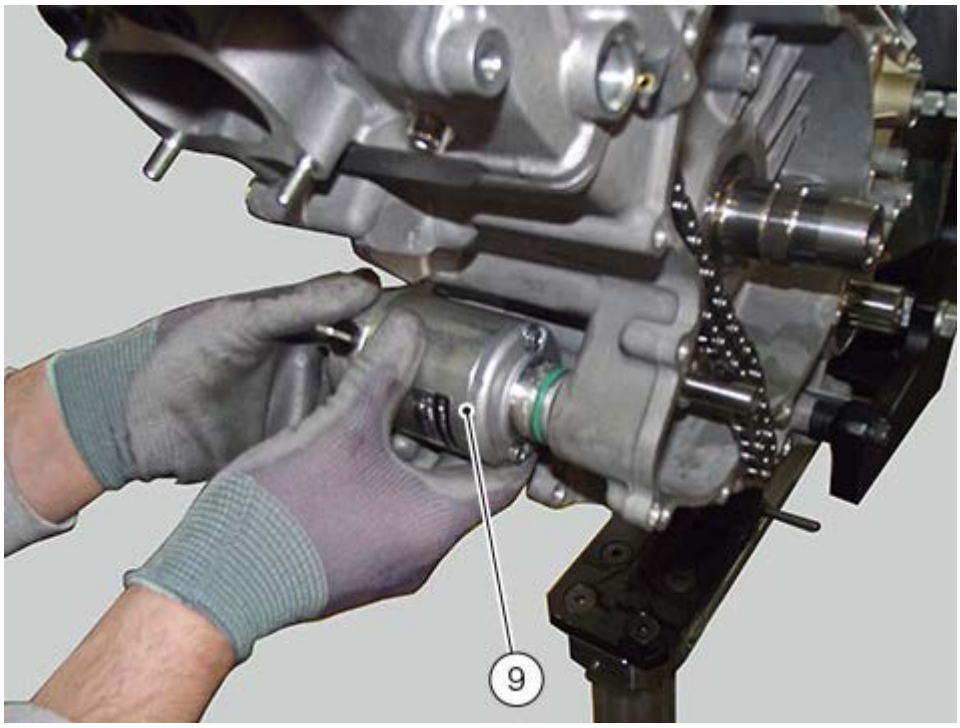


Remove the generator cover (Removing the generator cover).
Remove the flywheel/generator assembly (Removing the flywheel/generator assembly).

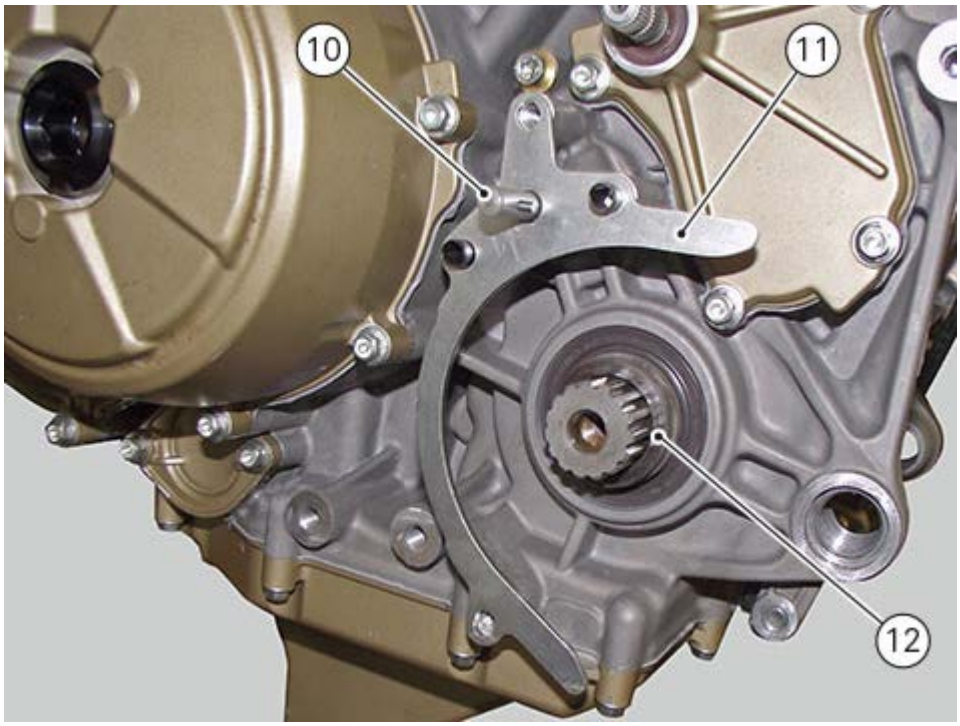
Slide out the electric starter split gear (7).

Loosen screws (8) of the electric starter (9), and remove it from the casing.

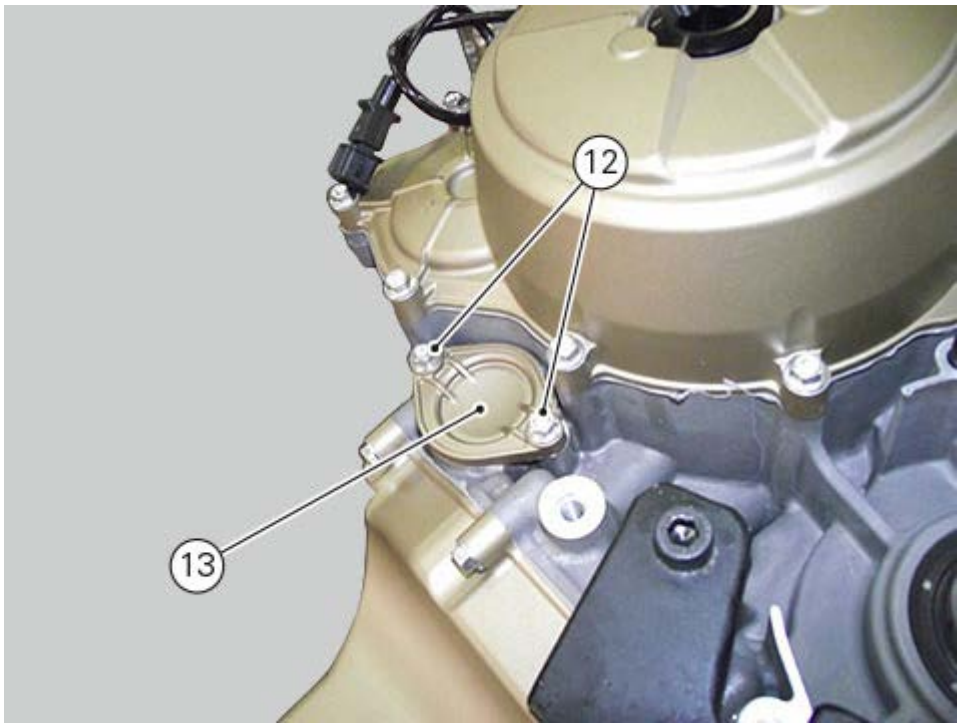


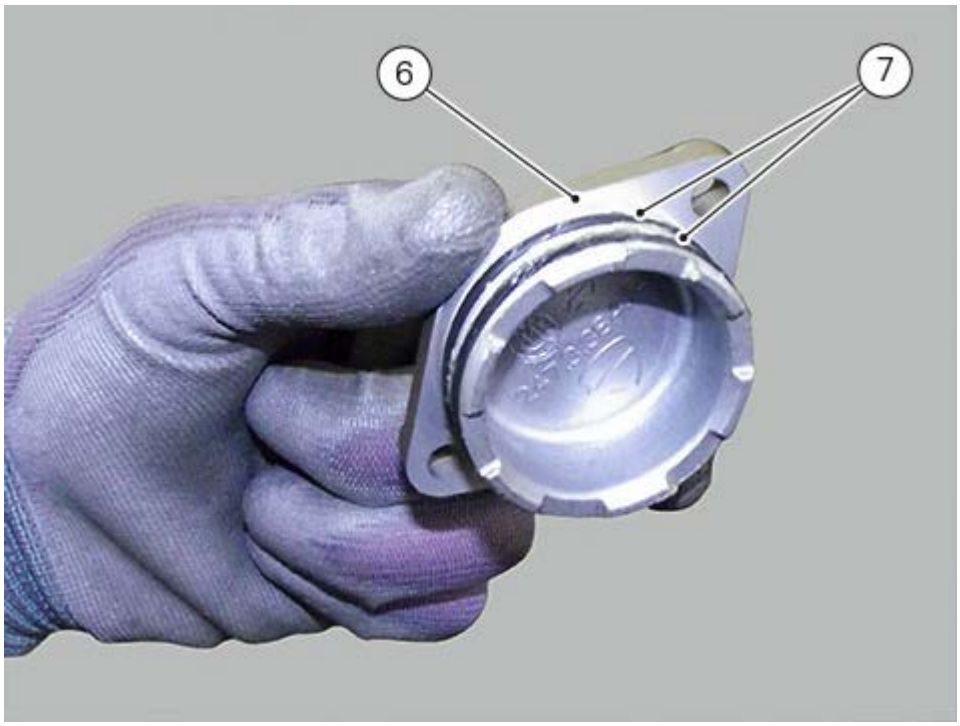


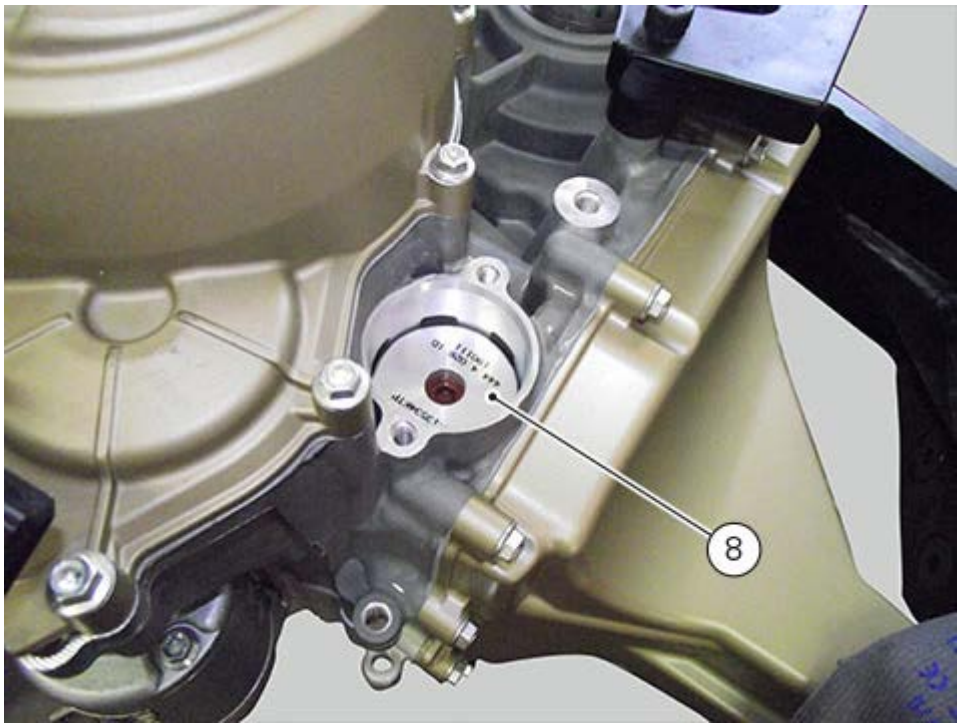
Slide out the clutch pushrod (10).
Remove the chain shoe (11) and the front sprocket spacer (12).



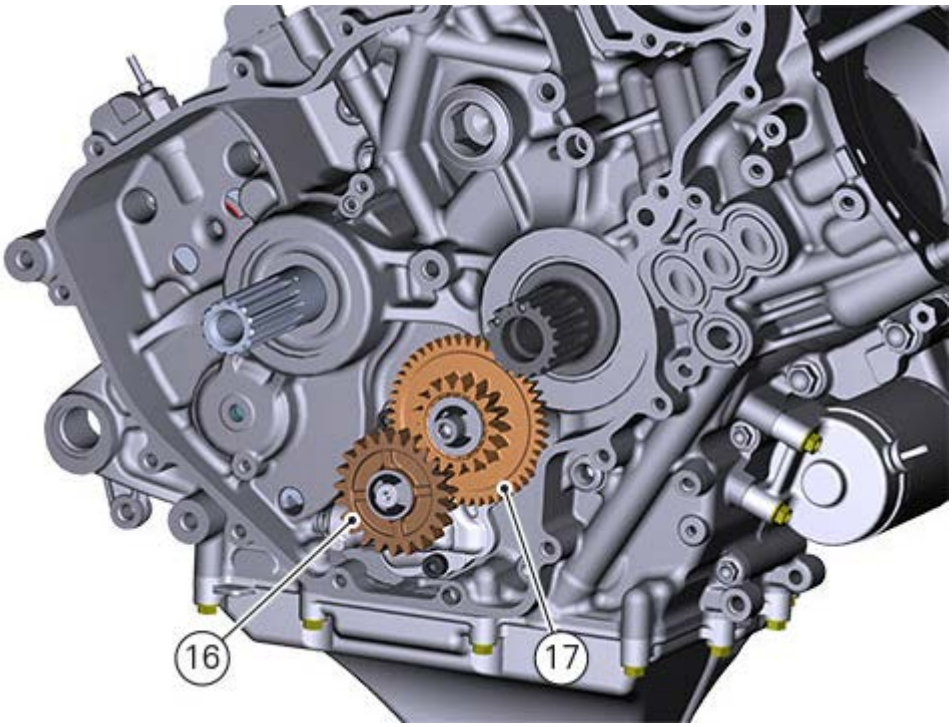
Loosen the screws (12).
Remove the oil filter cover (13) with the relevant O-ring (14) and oil filter (15).



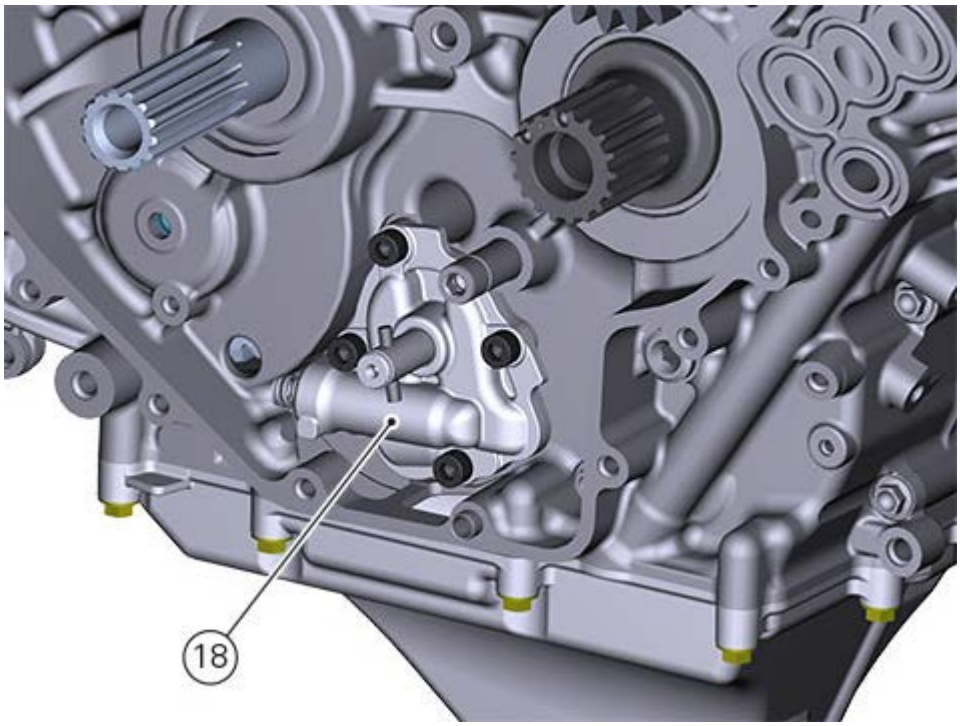

6
7


8

Remove the oil pump driving gear (16).
Remove the oil pump split gear (17) paying attention to the mobile parts.

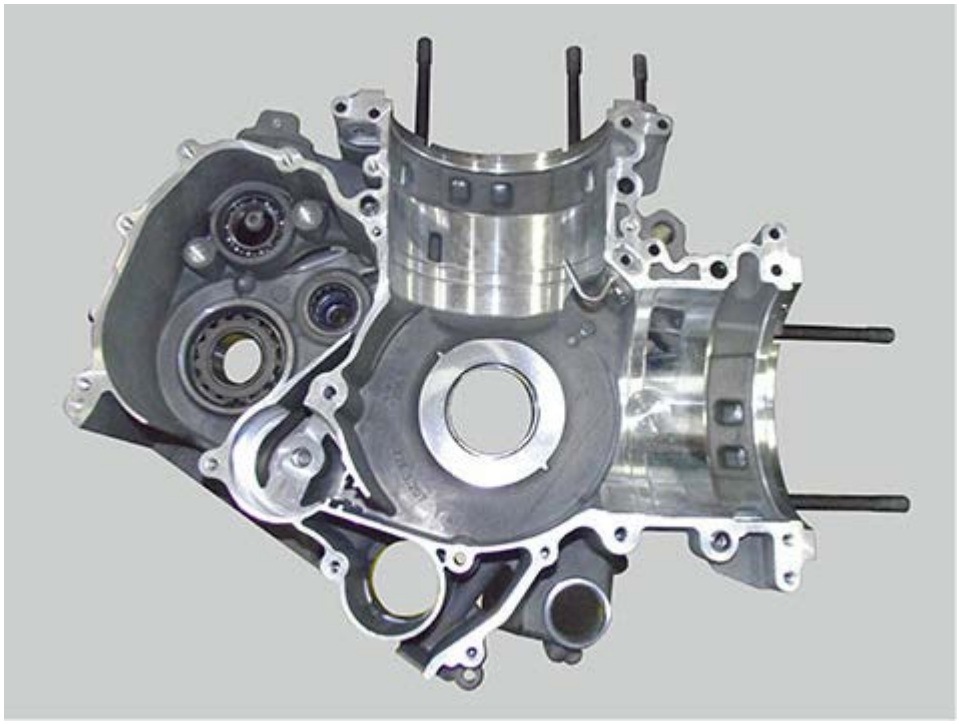


Remove the oil delivery pump (18) (Removing the oil delivery pump).

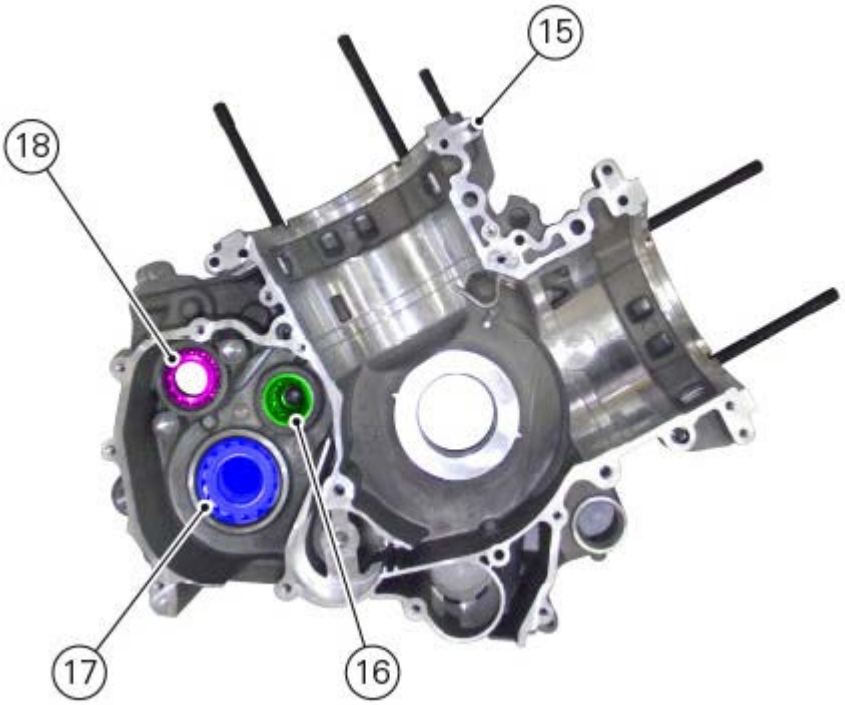

18

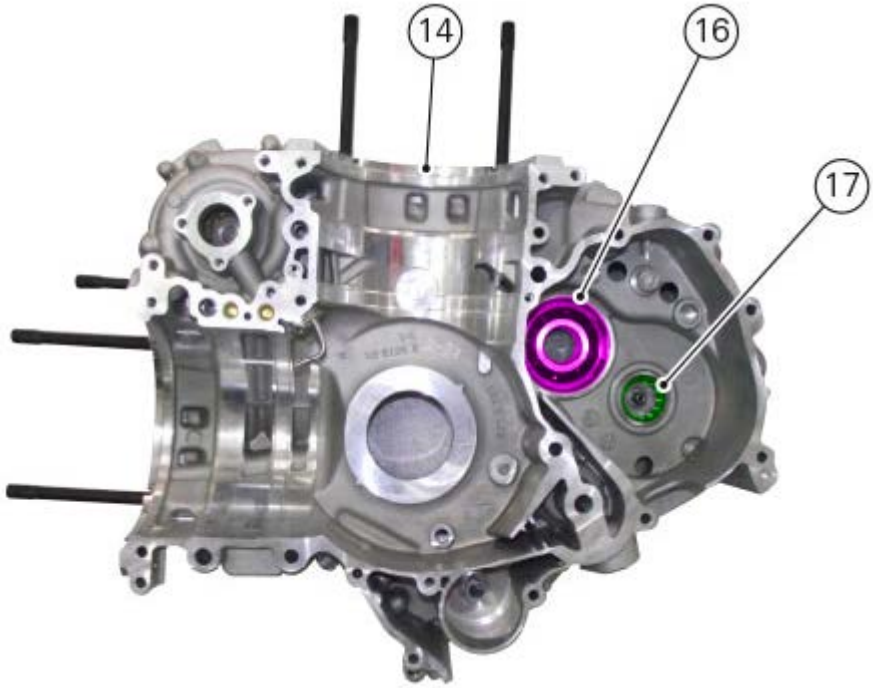
Overhauling the crankcase halves

Visually inspect the engine crankcase halves.
Check that the surfaces of the crankcase halves are perfectly flat using a reference surface.
Check that the main bearing shells are in perfect conditions.
If main bearing shells need replacing, they must be changed both as a set.



Bearings (16) and (17) support the gearbox shafts and are located both on chain-side casing (15) and on clutch-side casing (14).
Bearing (18) supports the gear selector drum and is located only on chain-side casing (15).





Should it be necessary to change gearbox shaft and gear selector drum bearings, proceed as follows.

Warm up clutch-side casing (14) and chain-side casing (15) to a temperature ranging from min. 95 °C to max. 110 °C, for the time necessary to obtain an even temperature over the whole casing surface. Immediately after warming the chain-side casing (15) up, drive the following parts fully home in the casing inner side:

- The gearbox secondary shaft bearing (17), positioning it so that the side with markings (N) faces upwards.
- The gearbox primary shaft roller bearing (16), positioning it so that the side with markings (N) faces upwards.
- The gear selector drum bearing (18), positioning it so that the side with markings (N) faces upwards.

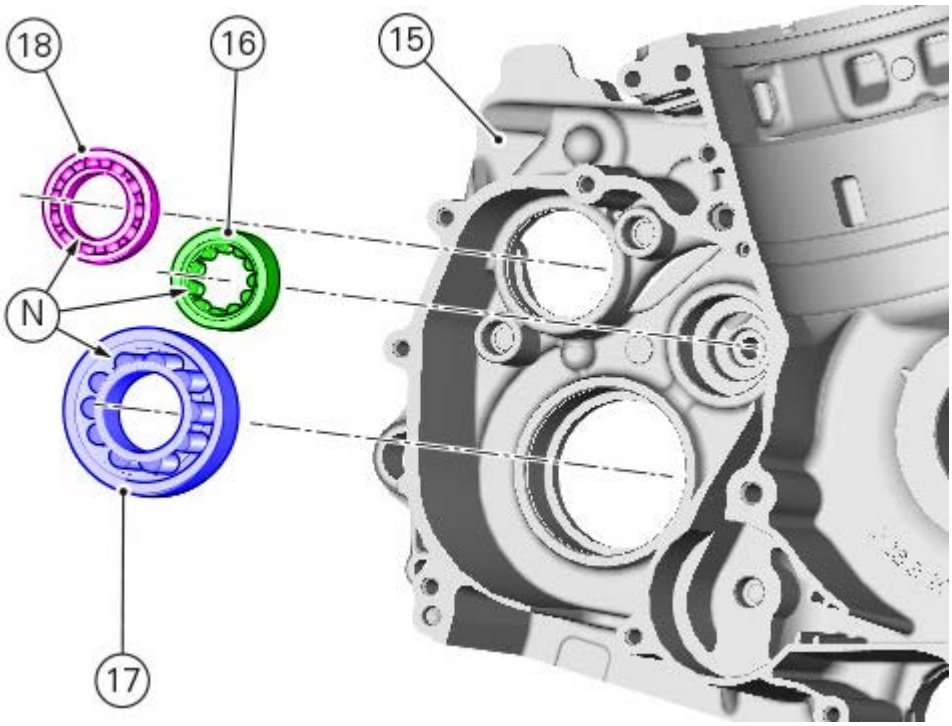
Immediately after warming the clutch-side casing (14) up, drive the following parts fully home in the casing inner side:

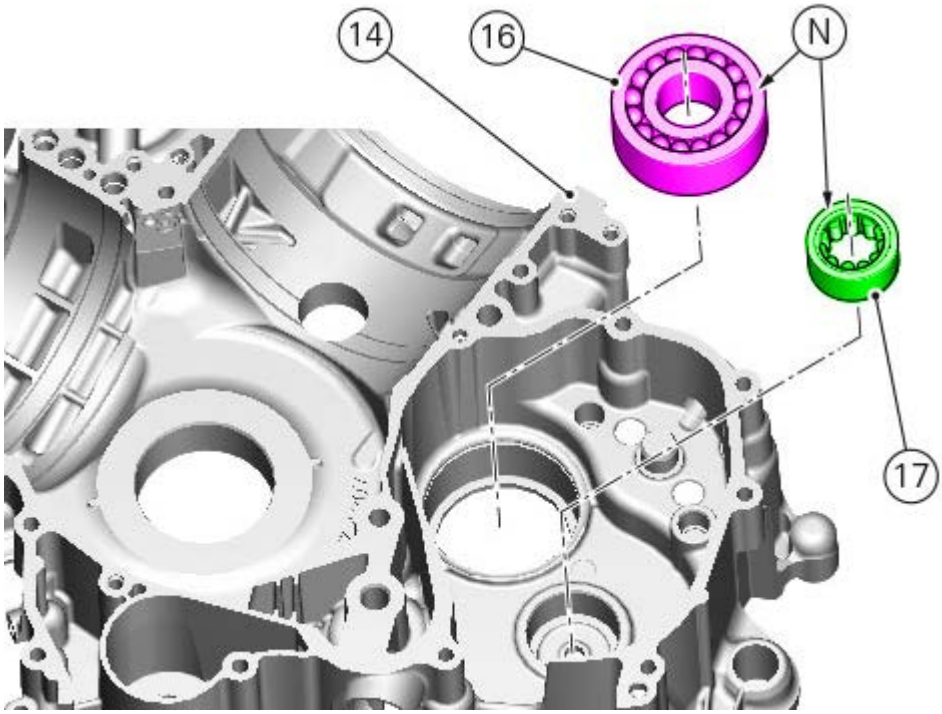
- The gearbox primary shaft bearing (16), positioning it so that the side with markings (N) faces upwards.
- The gearbox secondary shaft roller bearing (17), positioning it so that the side with markings (N)

faces upwards.

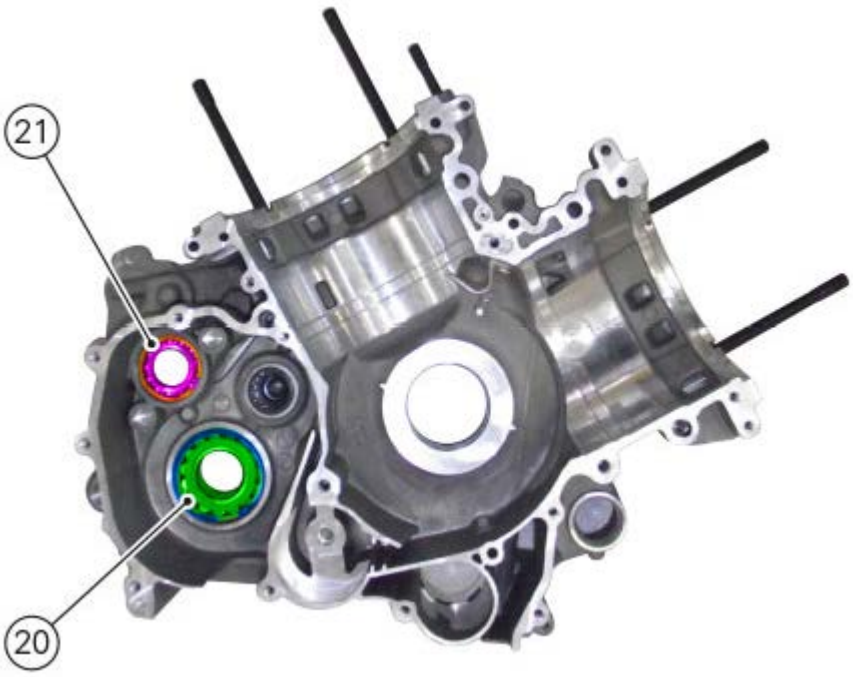
Warning

During casing cooling, the above mentioned parts may shift from their fully home position. It is therefore important to keep the parts fully home for the time required to ensure that the casing has sufficiently cooled down and that the bearings are locked into their fully home position.



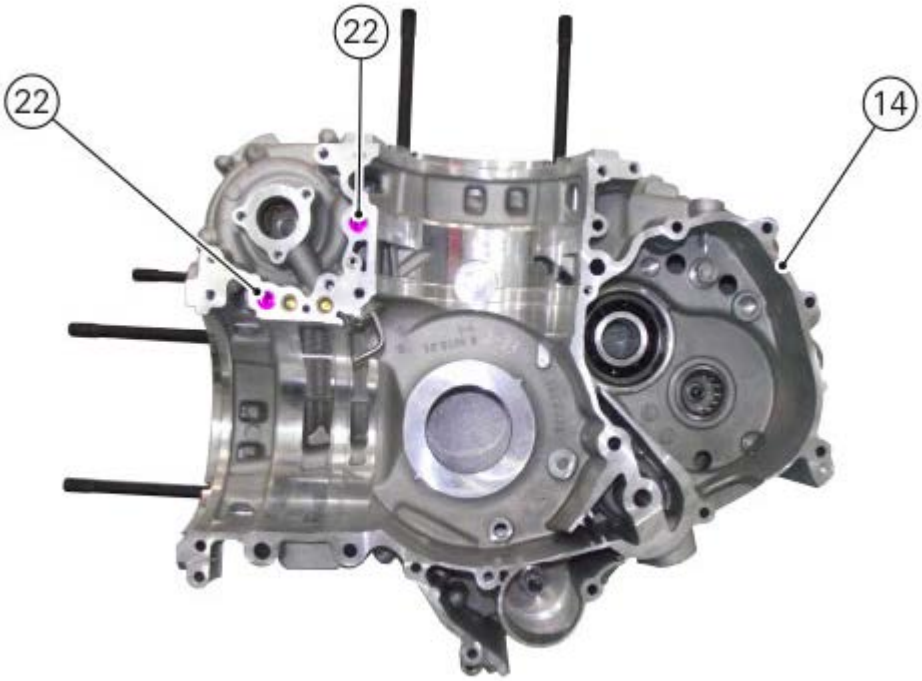


At each replacement it is recommended to replace also the snap rings (19), (20) and (21) on the outside of bearings.

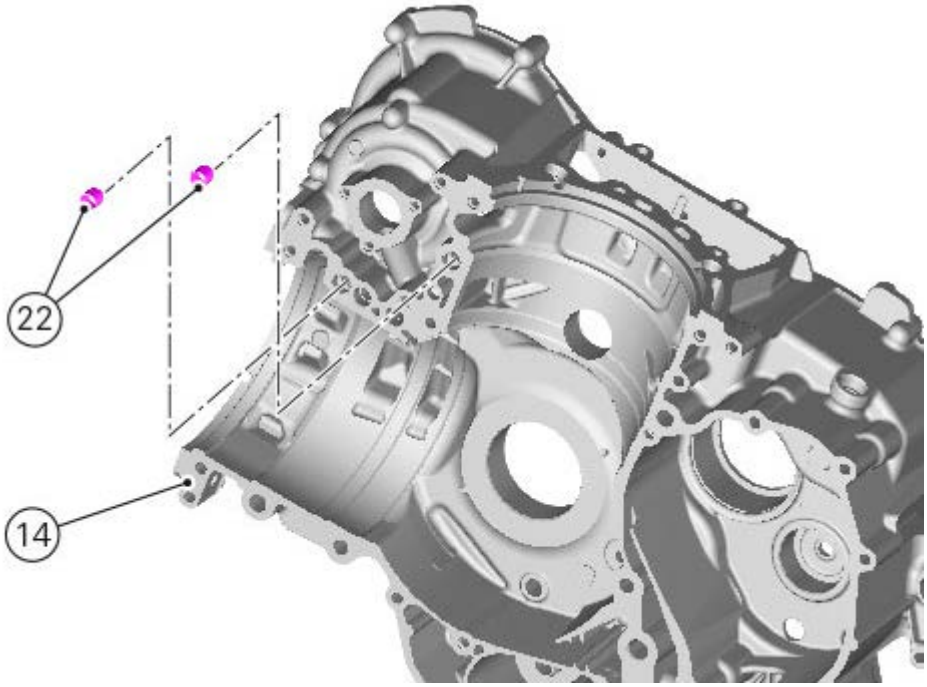


Check that the oilways are free of restrictions or clogging.
Check the condition of locating bushes (22) on casing (14). If apparently distorted or loose in their seats, change them using proper tools.
When the centring bushes (22) are hard to remove from casing, use a left-hand tap to force bushes out.

Important
The bushes must always be replaced when they have been removed using the above procedure.



If it was necessary to remove the bushes, it is now necessary to warm up casing (14) in order to refit them, in the same way as described above for installing the bearings.
When casing is warm, fit centring bushes (22) fully home in their housings.



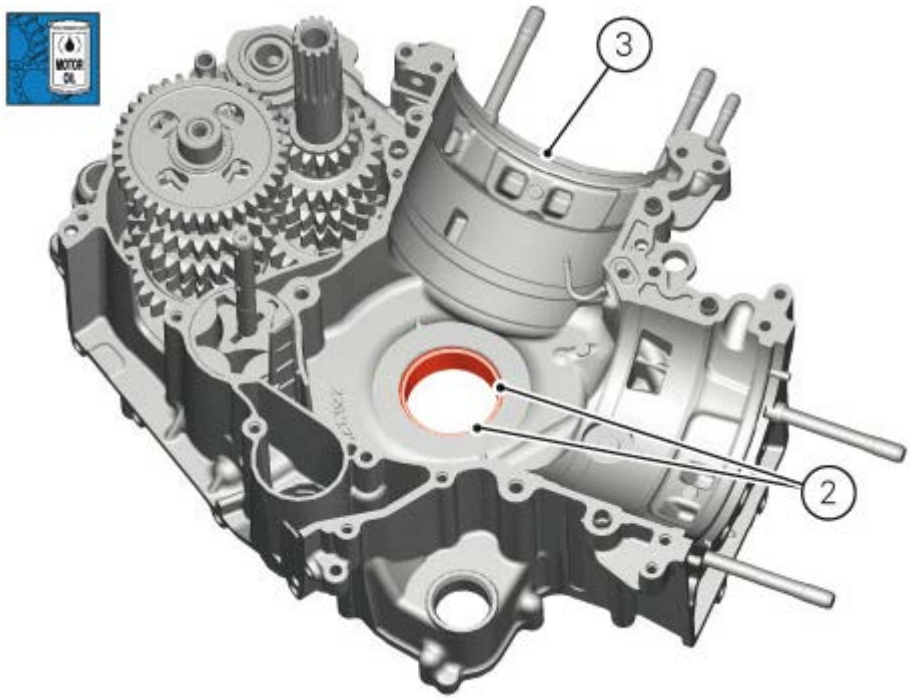
Closing the crankcase

Check for the presence of the centring bushings on the casings and all external and internal elements.
Thoroughly clean the coupling surfaces on the casing closing one.

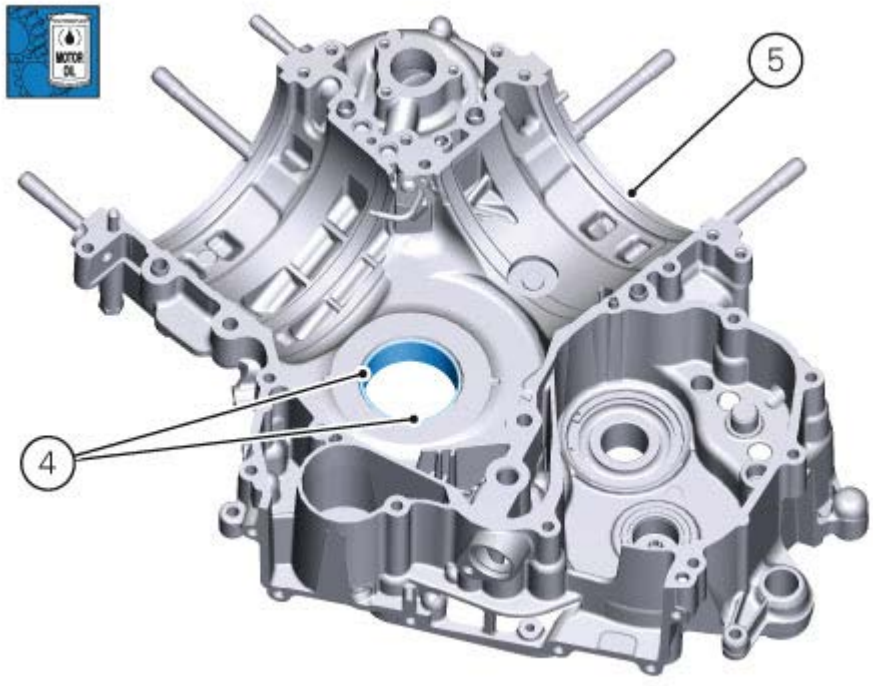
Note
Ensure that the timing marks of both rotors are in view.

Lubricate the main bearing shells (2) on chain-side casing (3) and main bearing shells (4) on clutch-side casing (5) with engine oil.
Also lubricate liner O-rings.

FLYWHEEL SIDE

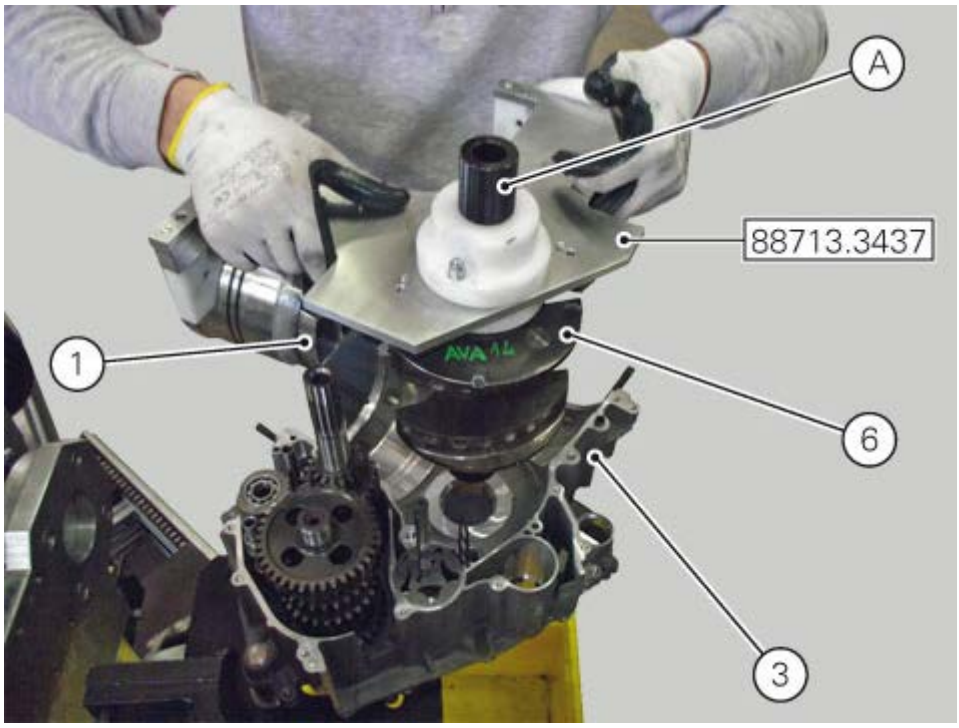


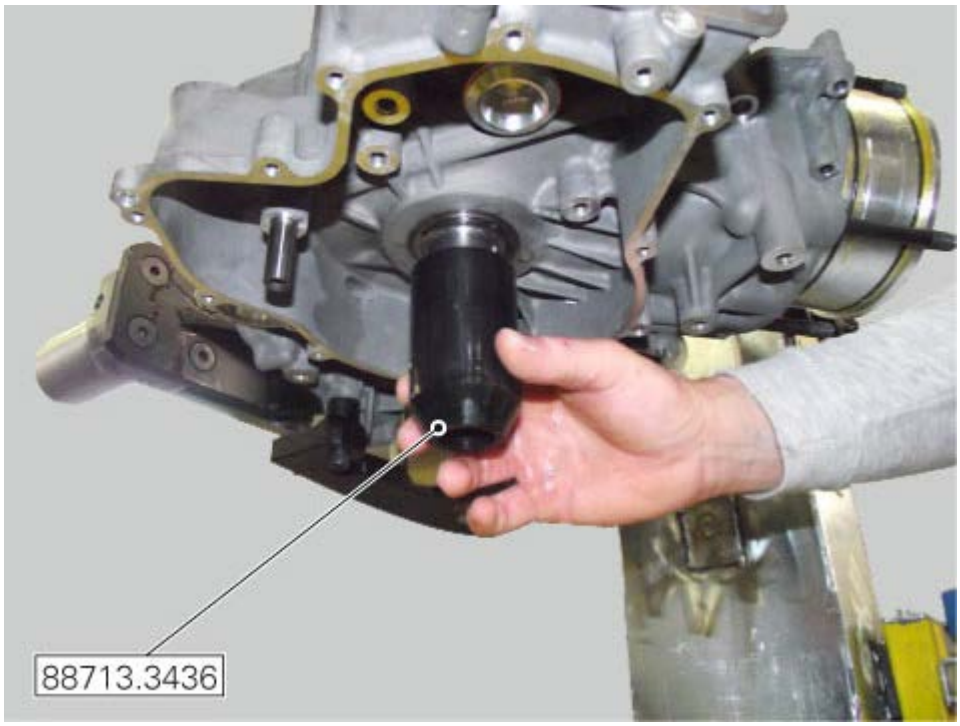
CLUTCH SIDE



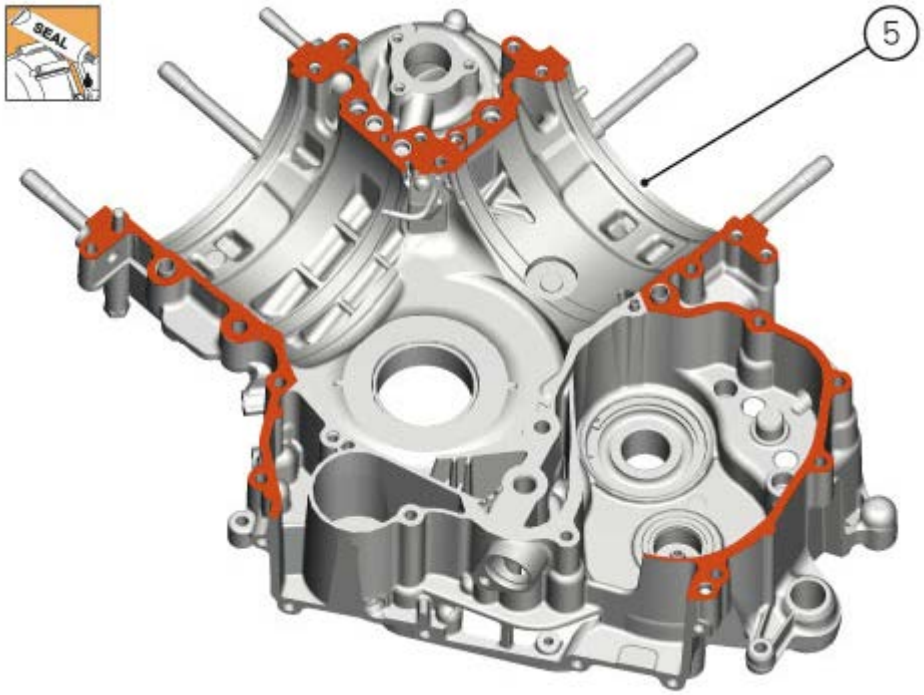
Position the centring tool for gearbox secondary shaft part no. **88713.3549**.

Place tool part no. **88713.3437** on the con-rod assembly (1) and fix it by screwing bushing (A).
Fit on crankshaft (6) the tool for main bearing shell protection no. **88713.3436**.
Collect the con-rod assembly (1) by lifting it with tool no. **88713.3437**.
Fit the con-rod assembly (1) in the main bearing shells on the flywheel side casing (3) fully home.
Slide out tool no. **88713.3436** from the crankshaft and reposition it on the clutch side shaft.
Loosen retaining bushing (A) of the con-rod assembly (1) to tool no. **88713.3437**.
Remove tool part no. **88713.3437** from the con-rod assembly (1).

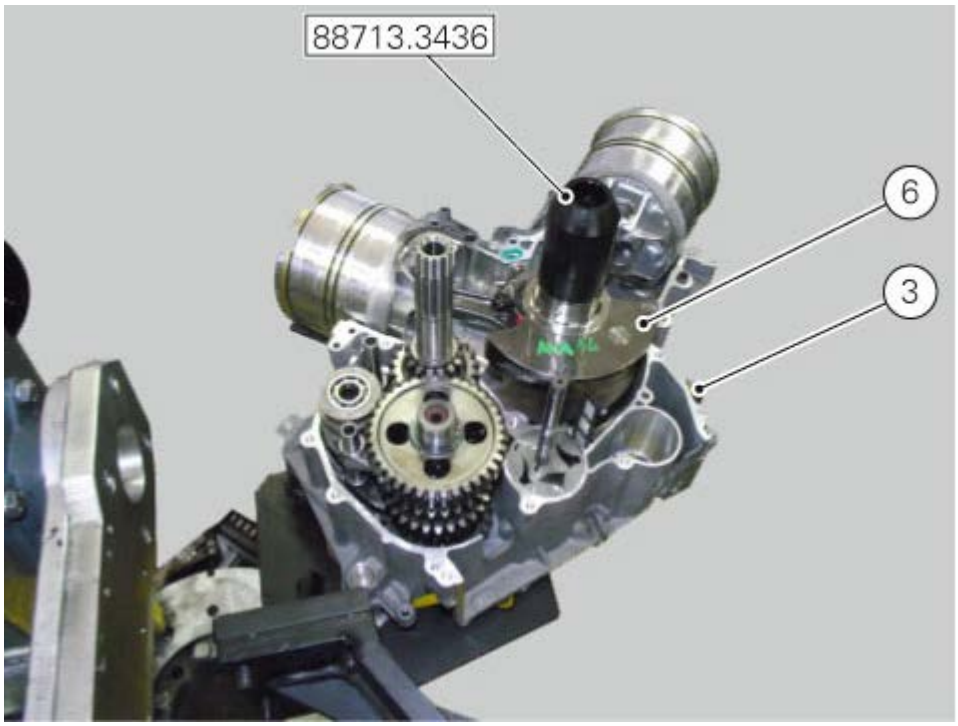




Apply a uniform bead of DUCATI sealing compound on clutch-side casing (5) along the whole mating surface, avoiding all holes, as shown.



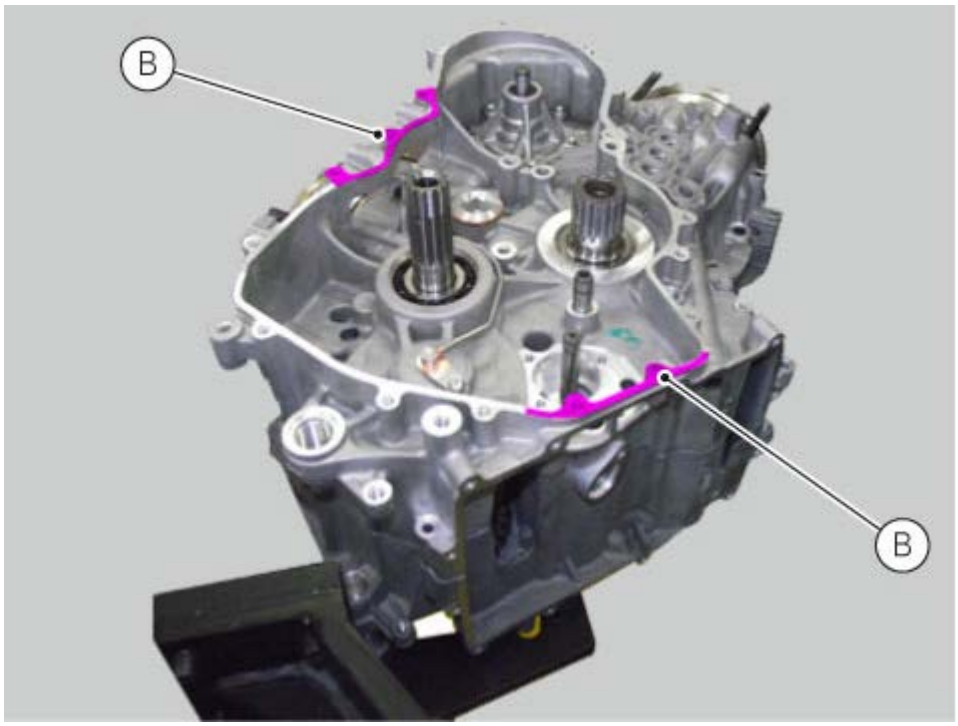
Fit the insertion tool part no. **88713.3436** to crankshaft (6).
Close the crankcase by fitting the clutch-side casing (5) on chain-side casing (3) while centring tool part no. **88713.3436** and hence the primary shaft (7) and oil pump shaft (8).



Take casings fully home against one another, lightly hitting with a nylon mallet alternately on opposite points to settle casings and ensure perfect coupling.

Important

Do not hit surfaces (B) that have cutouts underneath since this could result in serious damage.

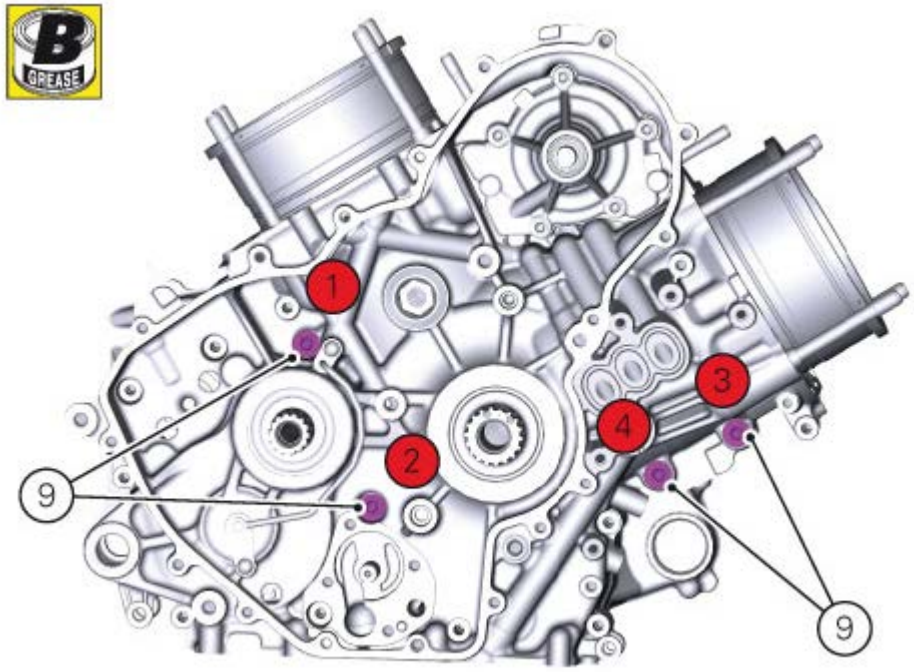


Prepare the fastening screws smearing them with specified grease, and start them on crankcase, paying attention to the different lengths, starting from the larger ones (M8) and following the specified sequence.

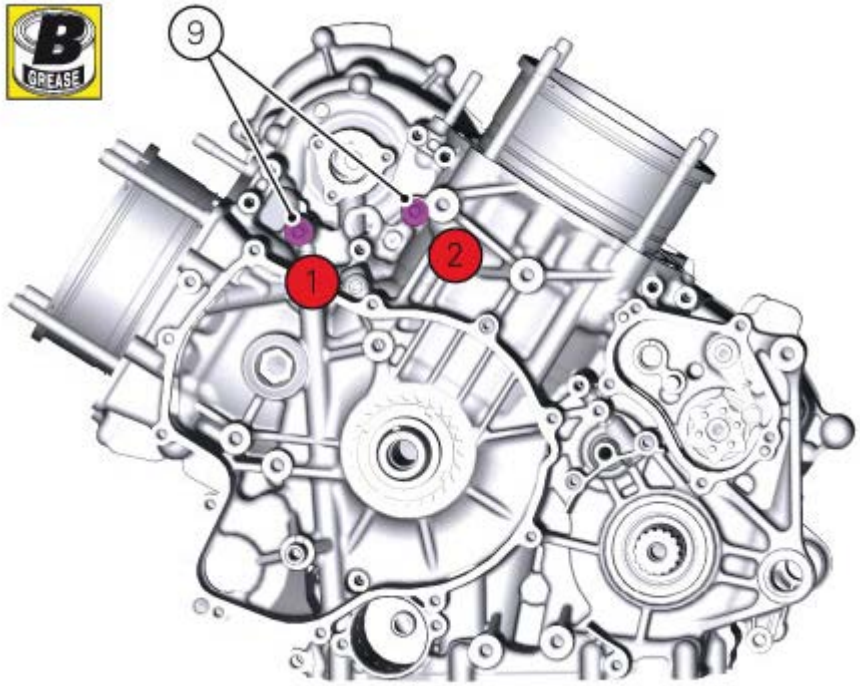
Ref.	Description
CLUTCH SIDE	
9	M8x50 Screws
10	Special screw
11	M6x45 Screw
12	M6x75 Screw
CHAIN SIDE	
9	M8x50 Screws
11	M6x45 Screw
12	M6x75 Screw

Start and tighten the screws (9) to a first torque of 25 Nm (Min. 24 Nm - Max. 26 Nm), following the sequence specified in the figure.

CLUTCH SIDE

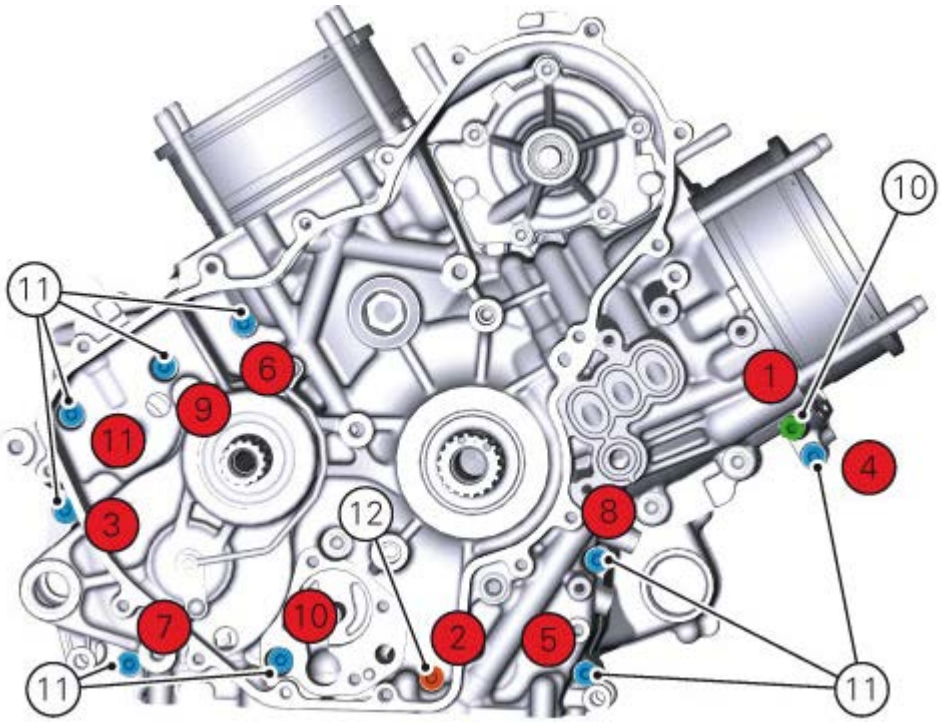


FLYWHEEL SIDE

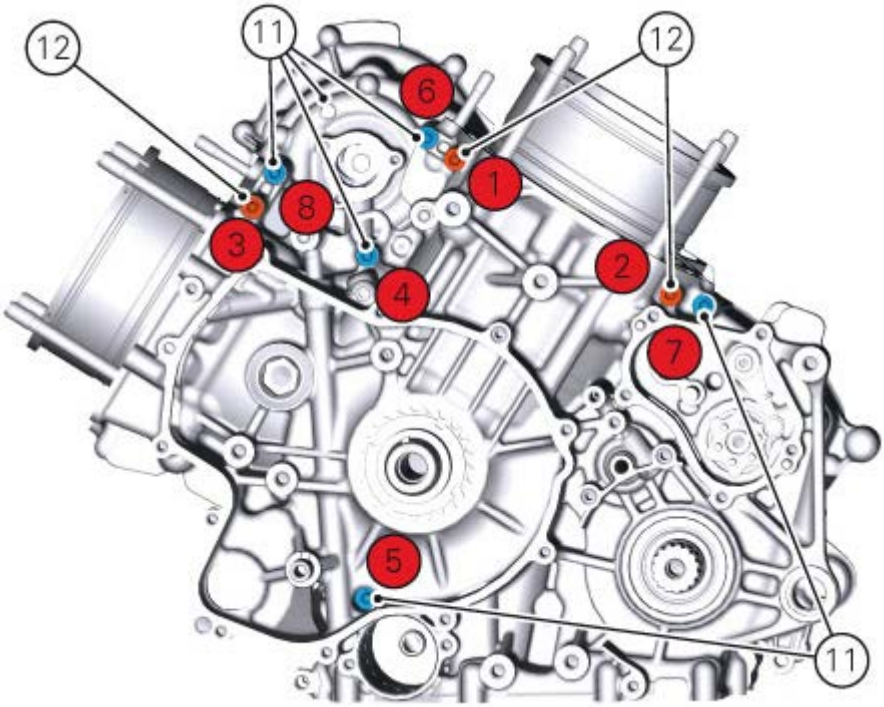


Start and tighten the screws (10), (11), (12) to a torque of 13 Nm (Min. 12 Nm - Max. 14 Nm), following the sequence specified in the figure.

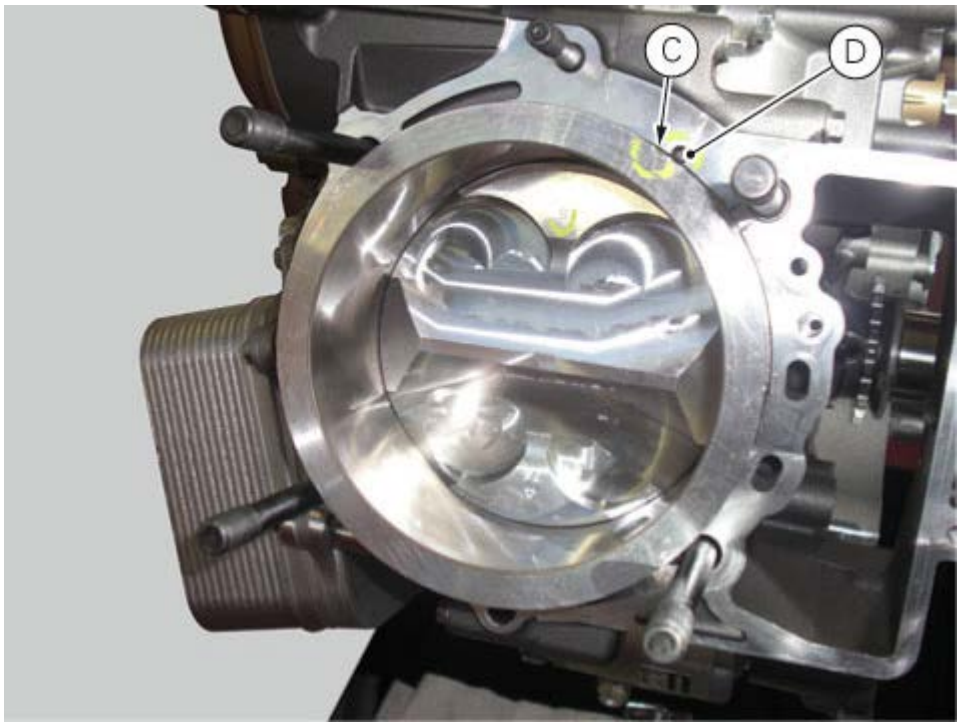
CLUTCH SIDE



FLYWHEEL SIDE

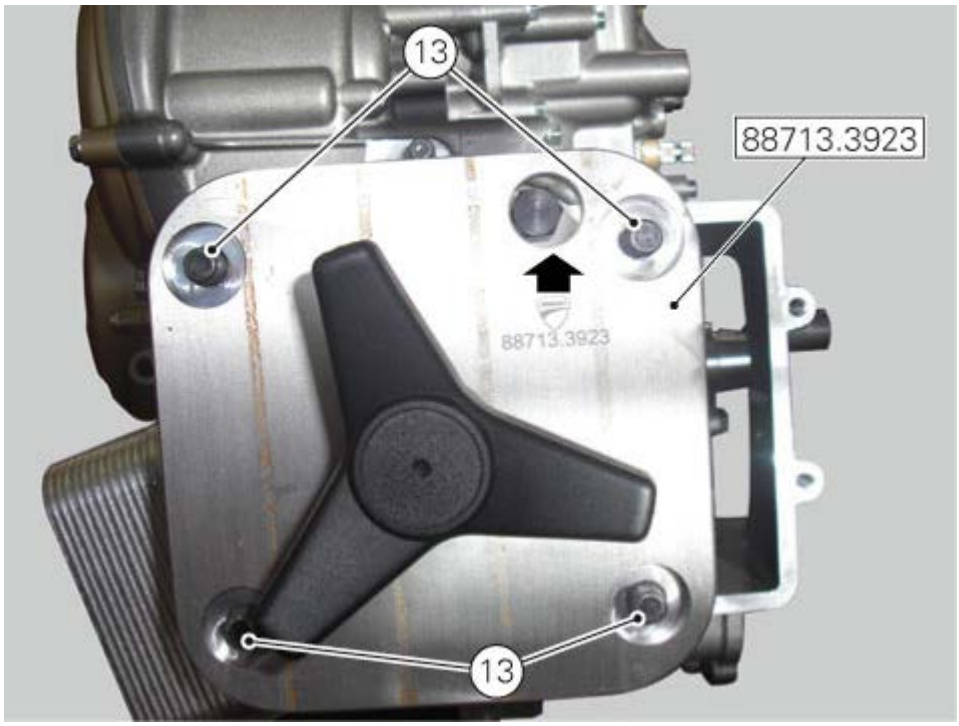


Set liner down on crankcase and make sure that notch (C) matches pin (D).

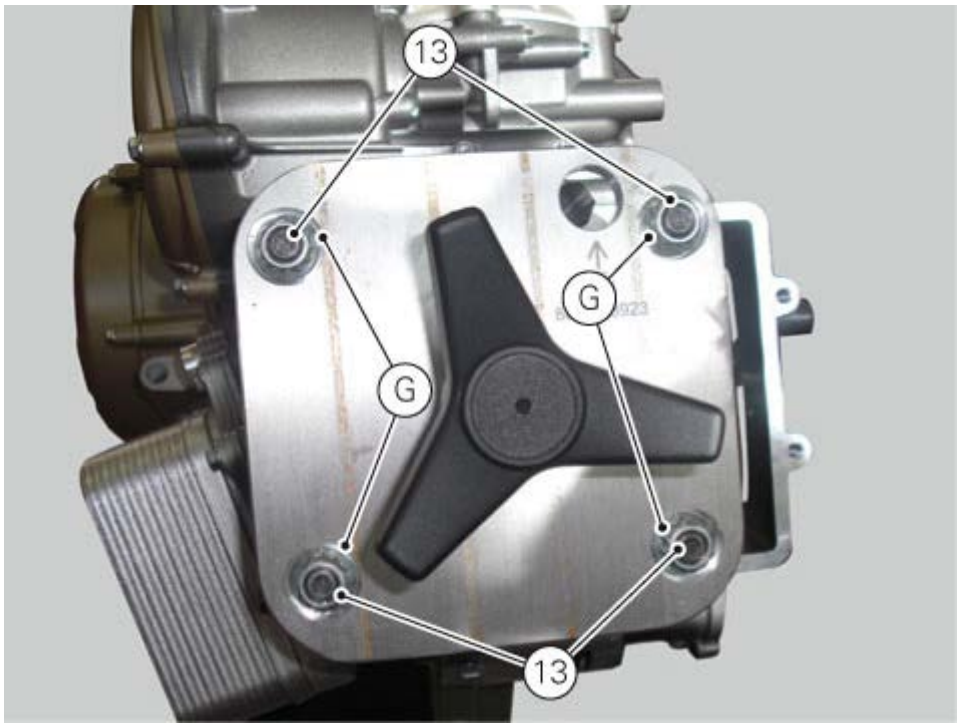


Fit guide (E) to liner and fasten it by tightening pin (F).

Fit insertion tool part no. **88713.3923** on the stud bolts (13) ensuring that the arrow is facing up.



Position the head retaining screws (G) on thru bolts (13).
Screw the tool fully home and check that the liner is fully inserted.
Remove the insertion tool no. **88713.3923** and make sure that the liner surface mating with the head is perfectly flush with the crankcase surface mating with the head.



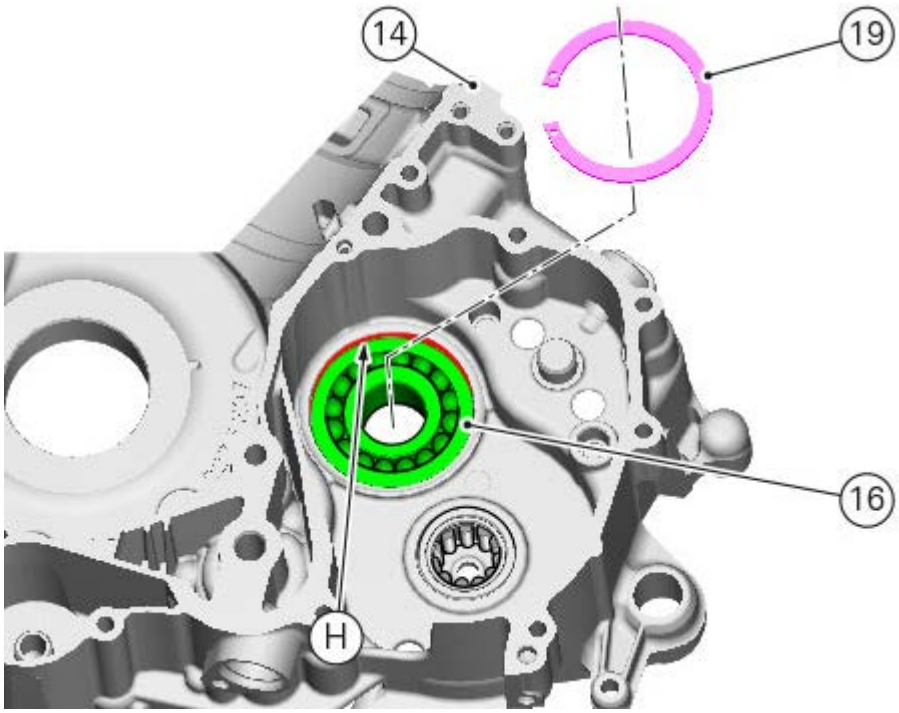
Refit the flywheel/generator assembly (Refitting the flywheel/generator assembly).
Refit the generator cover (Fitting the generator cover).
Refit the complete clutch (Refitting the clutch).
Refit the clutch cover (Refitting the clutch cover).
Refit the oil sump (Changing the engine oil and filter cartridge).
Refit the heat exchanger (Refitting the oil heat exchanger).
Refit the heads (Refitting the heads (reverse procedure of "Removing the heads and timing chain")).
Refit the engine block on the vehicle (Refitting the engine).

Refitting 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.

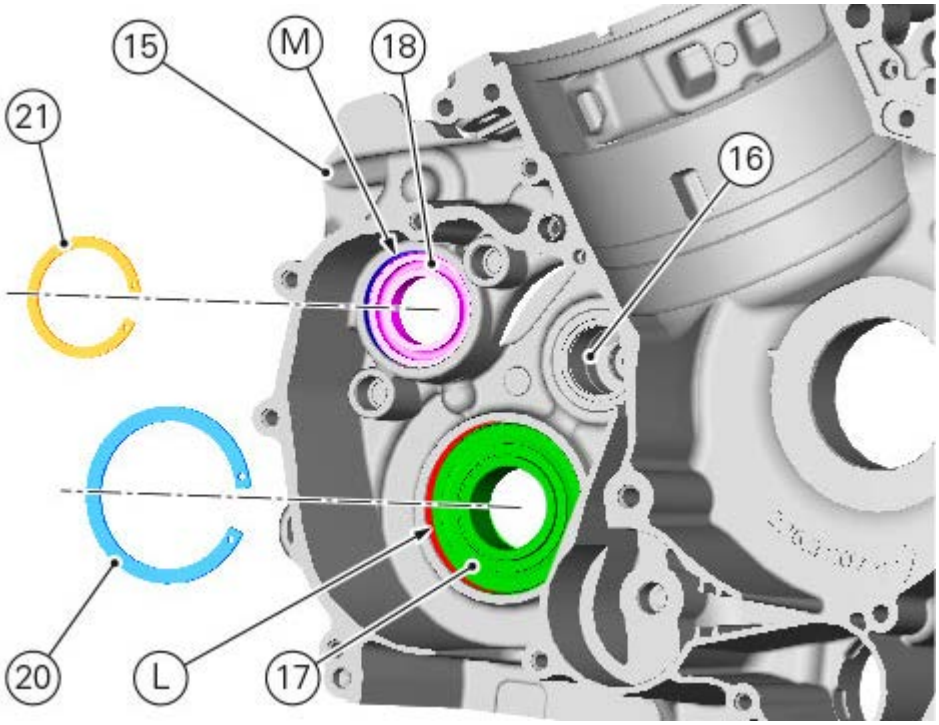
Reassembling the clutch side crankcase half

The bearing for the secondary shaft (17) and the bearing for the gearbox drum (18) must be located on the internal side of the clutch side crankcase half (14), whereas snap rings (20) and (21) must be positioned on the crankcase half external side, respectively near bearing (17) and bearing (18). The crankcase half internal side must feature also the bearing of the gearbox primary shaft (16).



Reassembling the generator side crankcase half

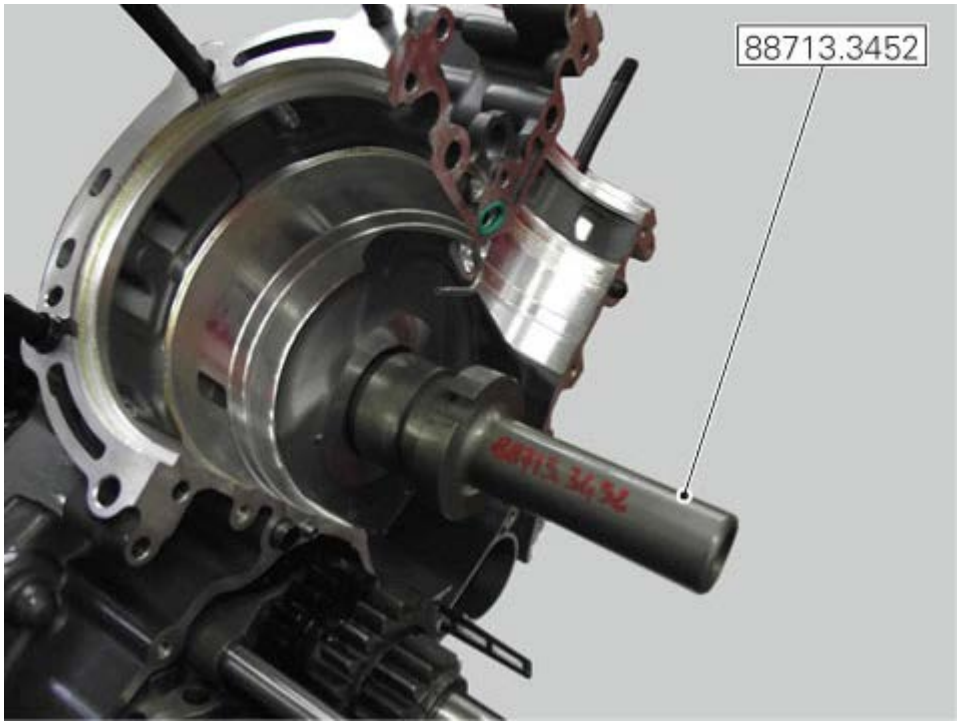
The bearing for the secondary shaft (17) and the bearing for the gearbox drum (18) must be located on the internal side of the chain side crankcase half (15), whereas snap rings (20) and (21) must be positioned on the crankcase half external side, respectively near bearing (17) and bearing (18).

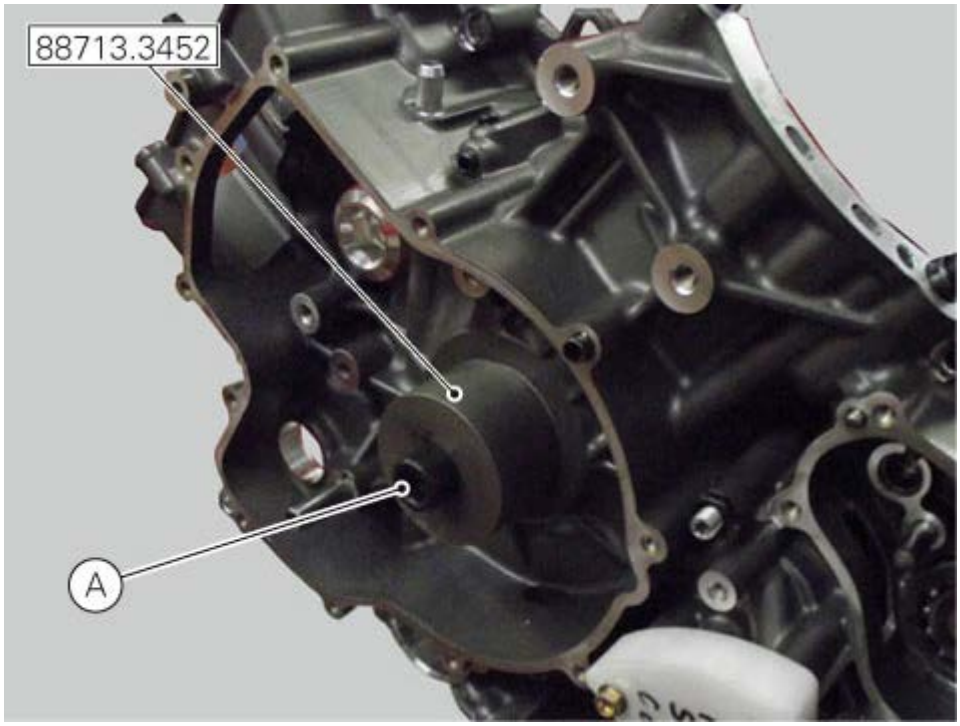


Main bearing shells

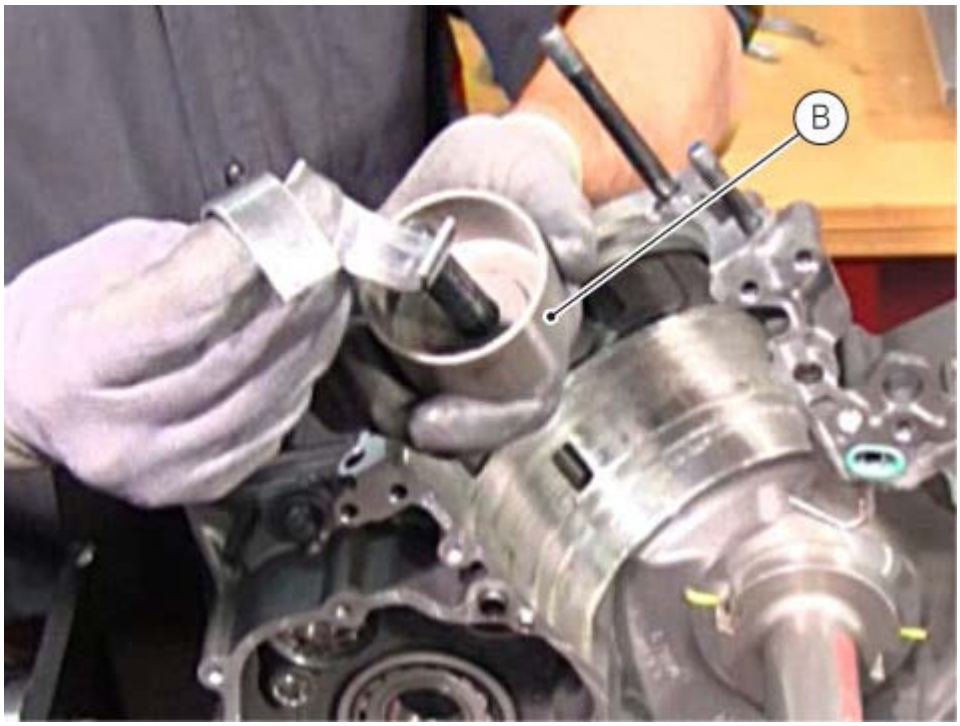
Renewal of crankshaft bearings.

Remove the crankshaft bearing shells using tool part no. **88713.3452**, set drift inside the casing and the cap on the outside.
Tighten screw (A) fully home.



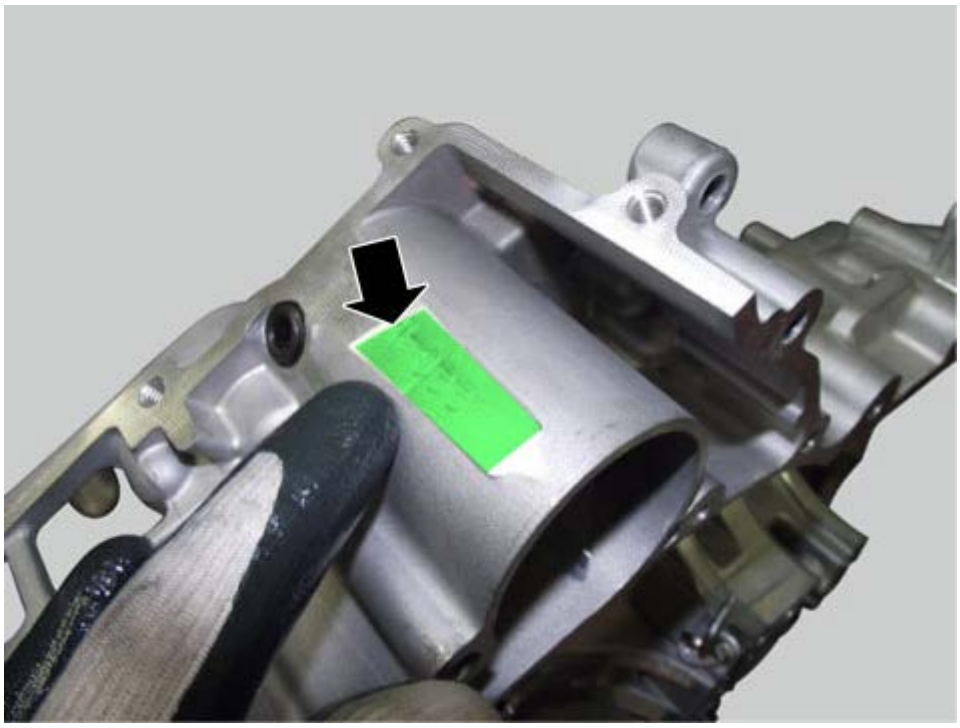


Loosen screw (A) and remove the shells from cap (B).



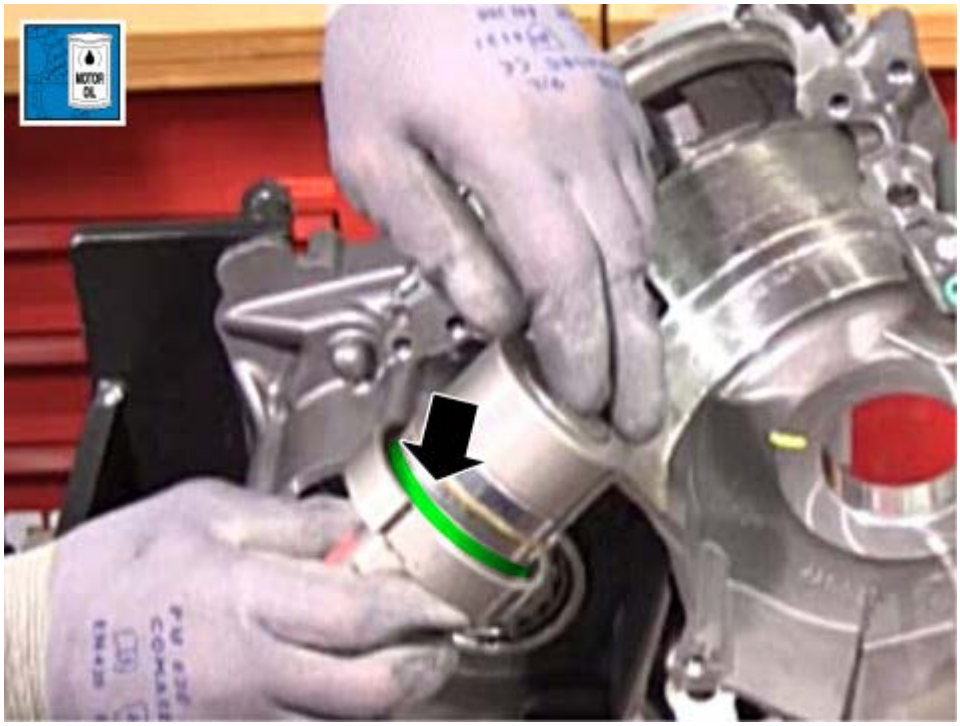
Select the main bearing shells according to crankshaft and crankcase punching, as follows:

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 50.000	A	55.000 to 55.0094	BLUE	2.501 to 2.506
A	49.992 to 50.000	B	55.0095 to 55.0190	YELLOW	2.505 to 2.510
B	49.984 to 49.992	A	55.000 to 55.0094	YELLOW	2.505 to 2.510
B	49.984 to 49.992	B	55.0095 to 55.0190	BLACK	2.509 to 2.514
C	49.976 to 49.984	A	55.000 to 55.0094	BLACK	2.509 to 2.514
C	49.976 to 49.984	B	55.0095 to 55.0190	GREEN	2.513 to 2.518
COUPLING CLEARANCE **0.043 to 0.072**					

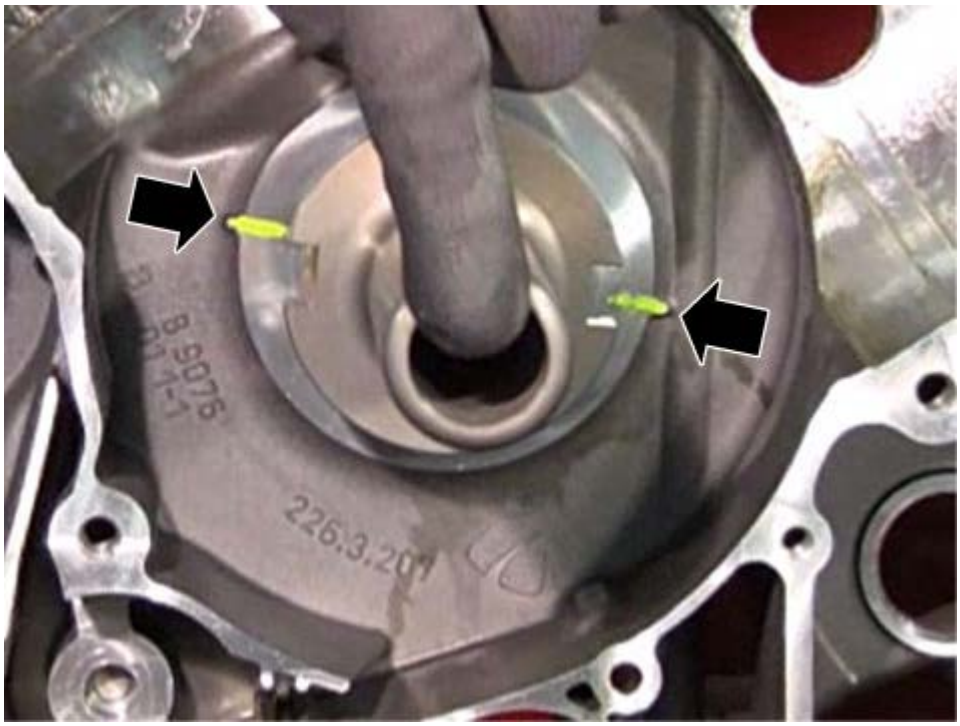


Set the new shells in tool drift part no. **88713.3452** and set bushing (C) fully home.

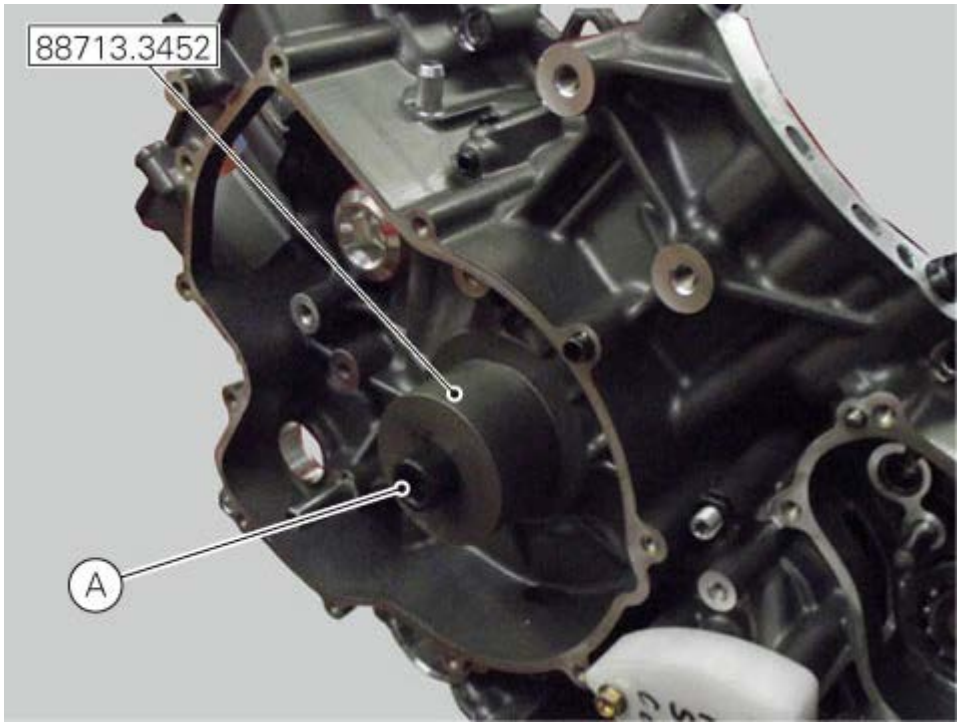
Smear tool part no. **88713.3452** with engine oil.



Fit the main bearing shells using the tool drift part no. **88713.3452** and positioning the shell parting line at a right angle to cylinder centreline, as shown.



Tighten screw (A) fully home.



Remove tool part no. **88713.3452** and make sure that the shells have been fitted correctly.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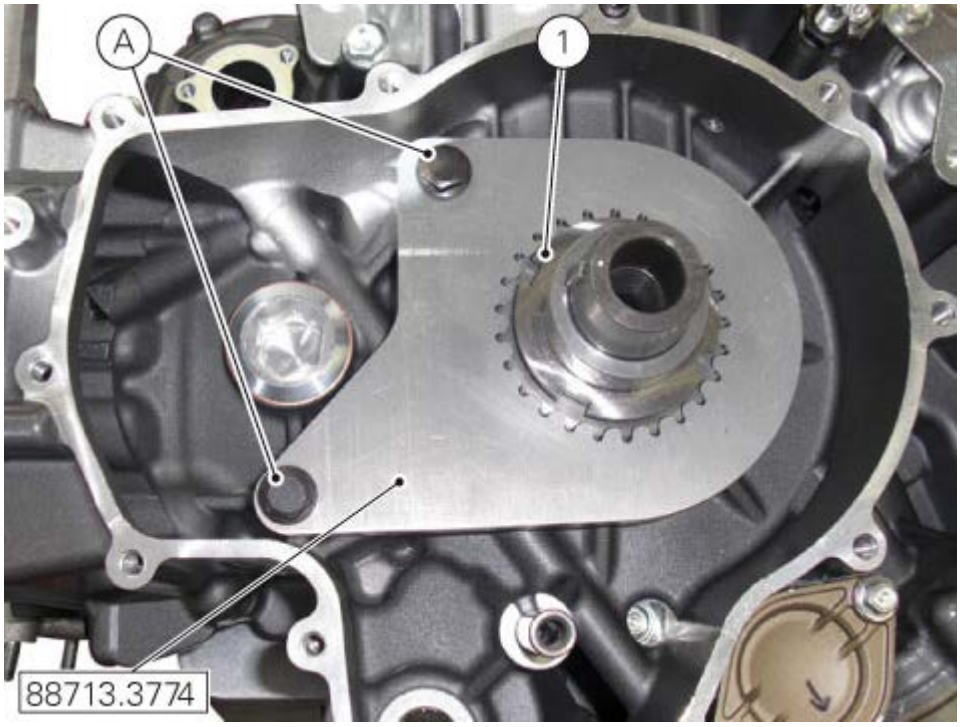
Opening the crankcase

Remove the engine block from the vehicle (Removing the engine).
Remove the heads (from "Removing the heads and timing chain").
Remove the heat exchanger (Removing the oil heat exchanger).
Remove the clutch cover (Removing the clutch cover).
Remove the complete clutch (Removing the clutch).
Remove the generator cover (Removing the generator cover).
Remove the flywheel/generator assembly (Removing the flywheel/generator assembly).

Place on ring nut (1) that retains the timing gear, the blocking tool no. **88713.3774** and fix it to the casing by starting screws (A) fully home.
Use tightening tool no. **88713.3773** to remove ring nut (1) that retains the timing gear.
Remove both tools.

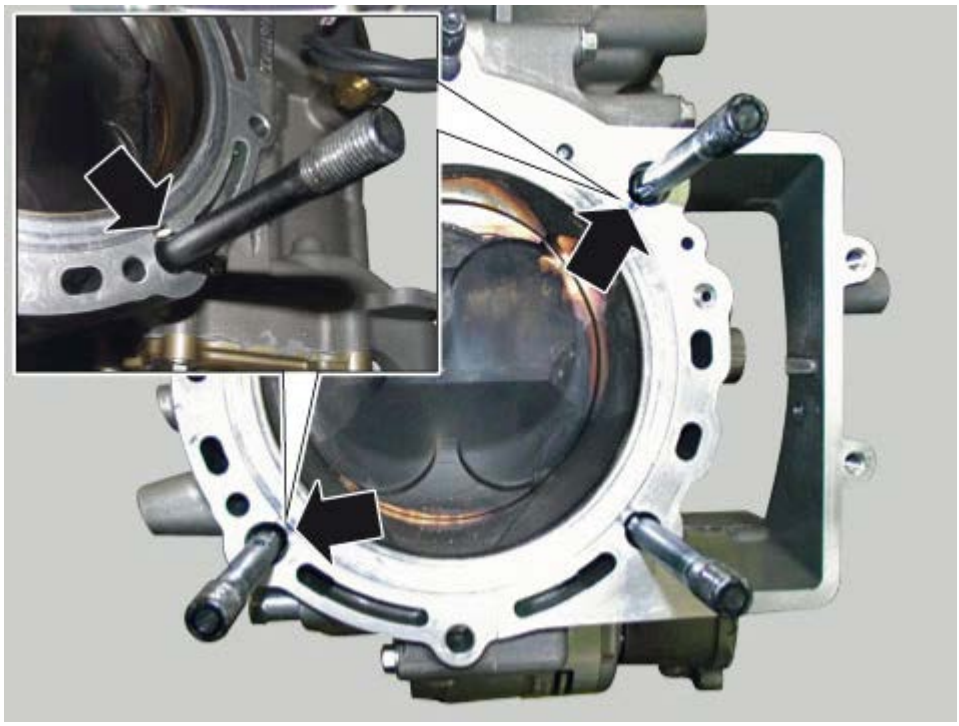


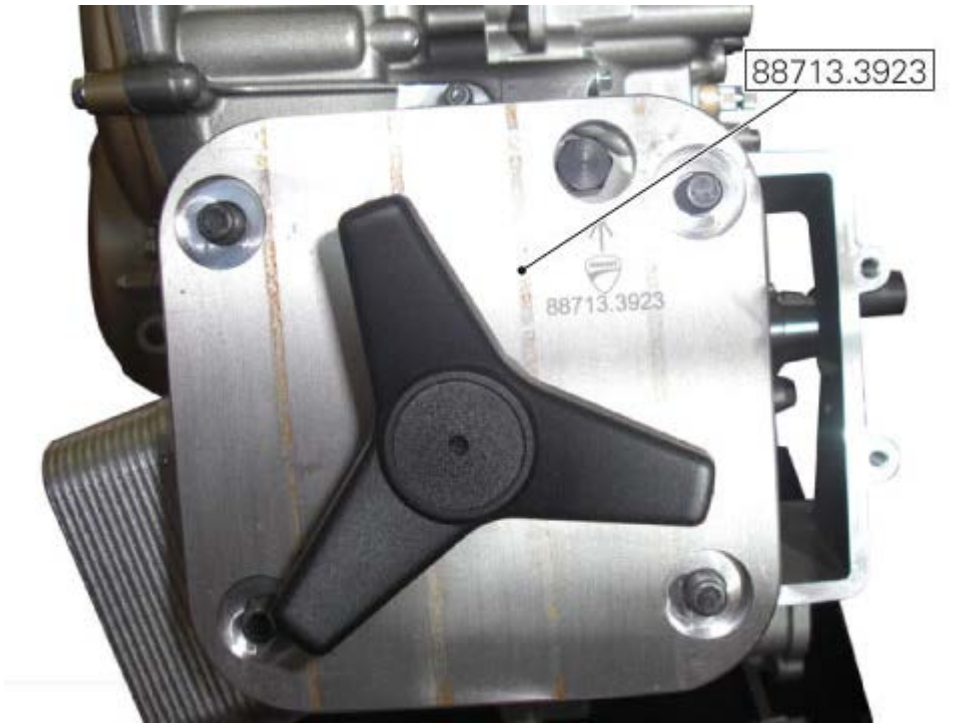
Set crankshaft with both pistons at mid-stroke.

Place tool no. **88713.3923** with teeth in the piston liner slots. The tool consists of:

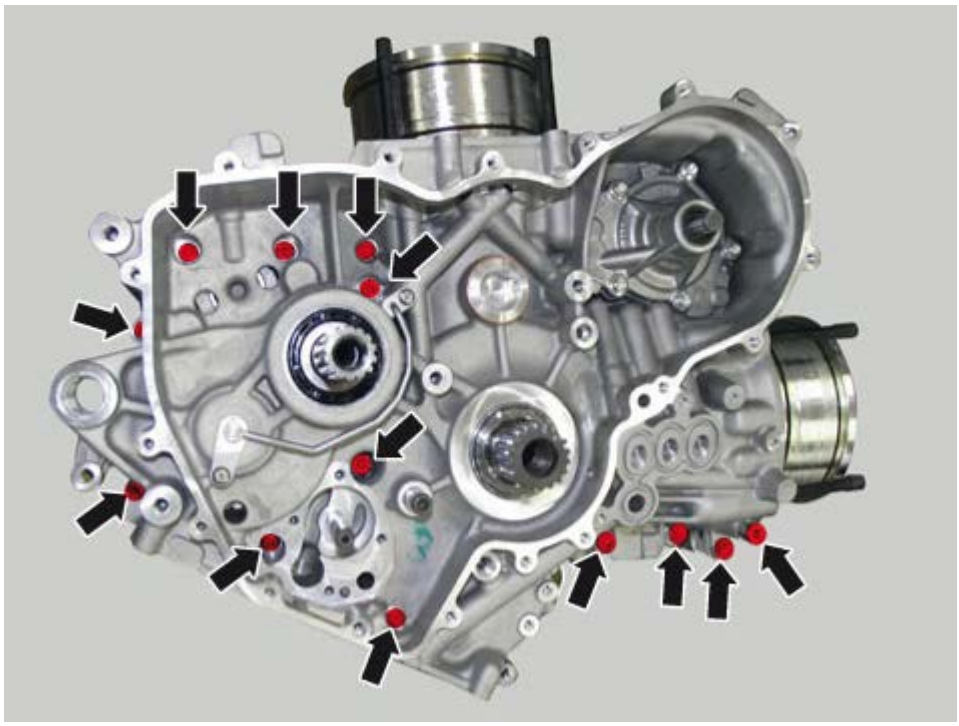
- Teflon plate no. **887134136**;
- removal hook opening spring no. **887134135**;
- liner removal hook no. **887134134**.

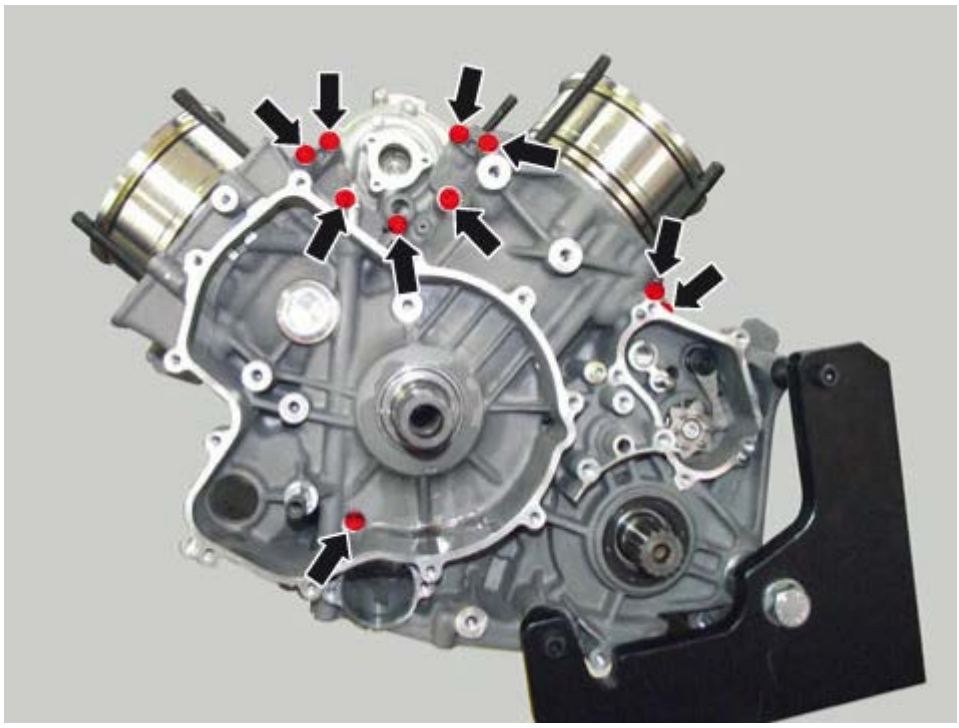
Screw tool no. **88713.3923** to slide out the horizontal liner by approximately 60 mm without removing it completely.





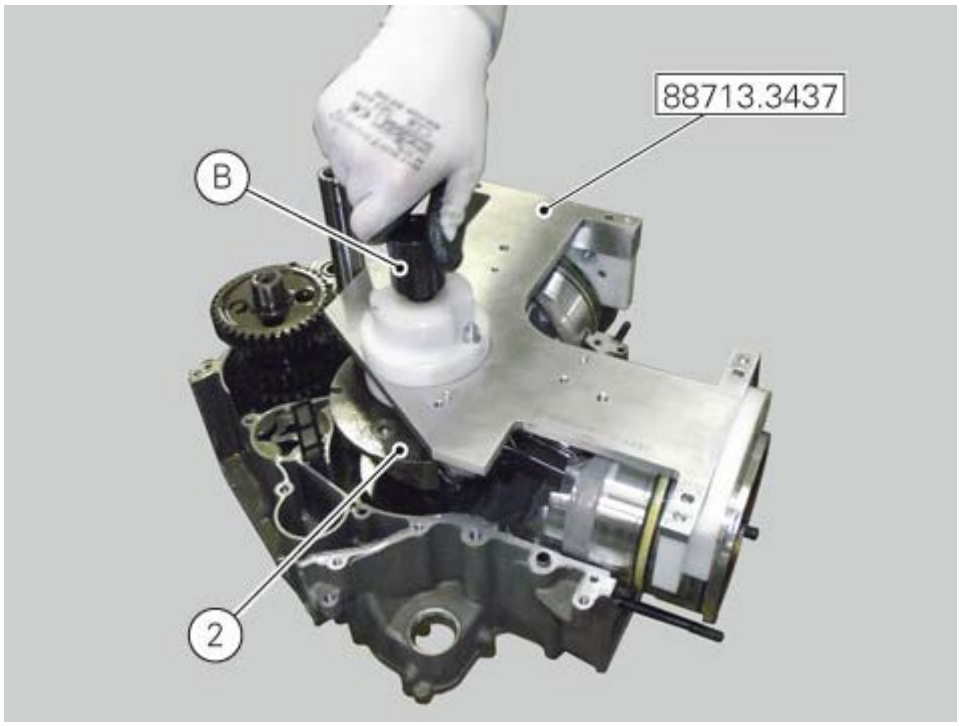
Once you slide out the horizontal liner, loosen the crankcase jointing screws on clutch side and flywheel side.





Split the casings.

Follow the procedure described for the horizontal liner to remove the vertical one.
Place tool no. **88713.3437** on the con-rod assembly (2) and fix it by screwing bushing (B).
Remove the con-rod assembly (2) by lifting it with tool no. **88713.3437**.


88713.3437
B
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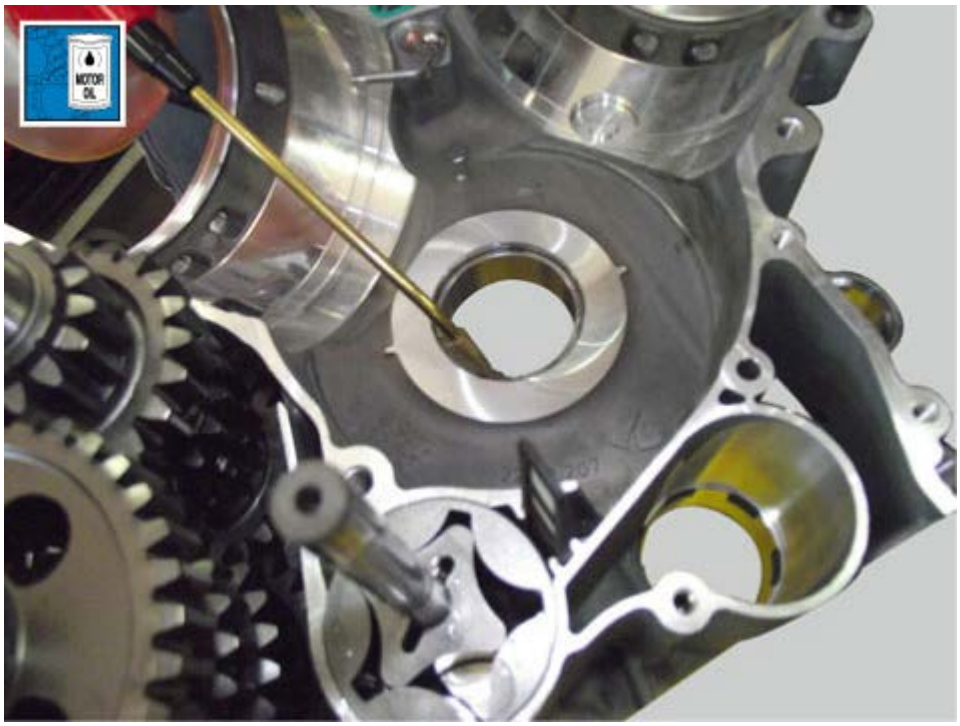
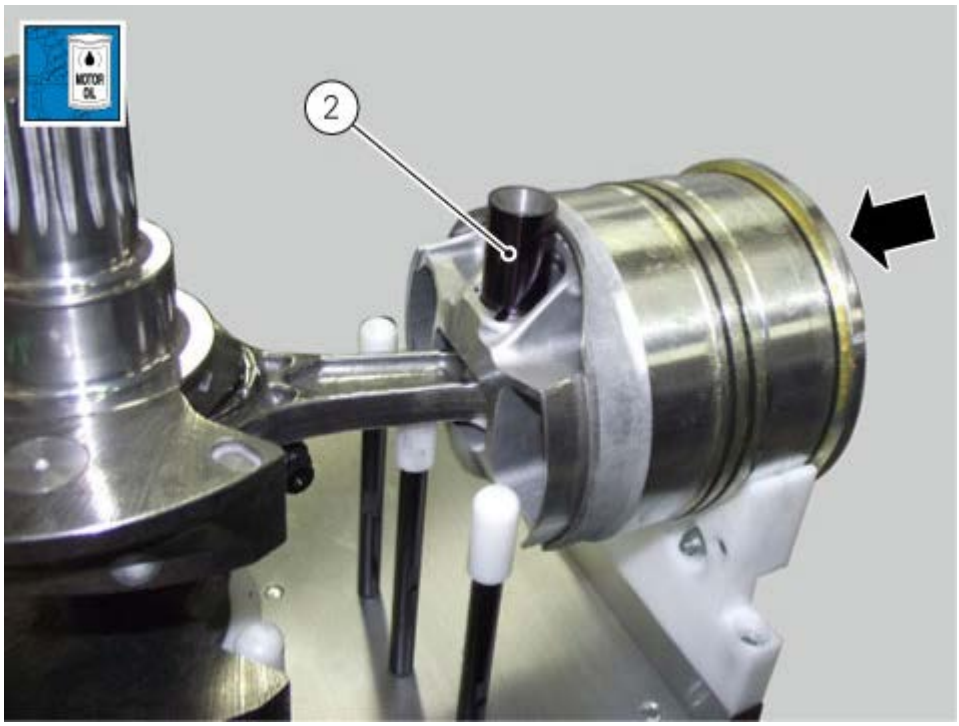
Refitting the connecting rod assembly

Lubricate the main bearing shells with engine oil.

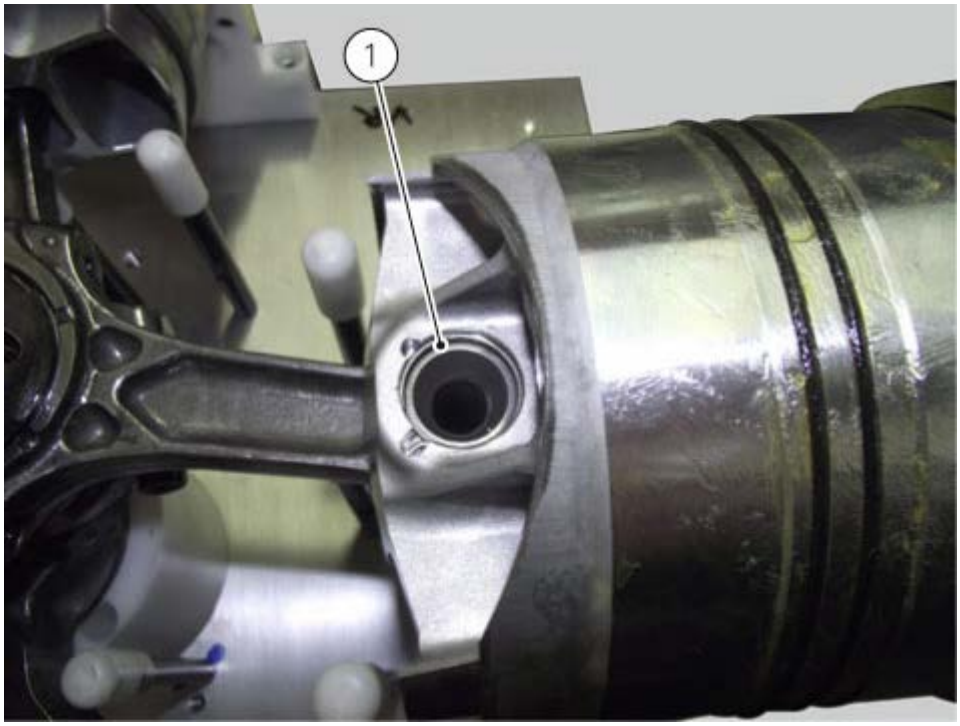


Duly support the connecting rod assembly on tool part no. **88713.3440** in order to fit the liner-piston assembly to the con-rod.

Fit the con-rod in the piston base.
Lubricate gudgeon pin (2) with engine oil and fit it inside piston a con-rod.



Refit circlip (1) to gudgeon pin (2) on each connecting rod using tool part no. **88713.3517**



Fit the connecting rod assembly together with liners and pistons and close the crankcase (Closing the crankcase).

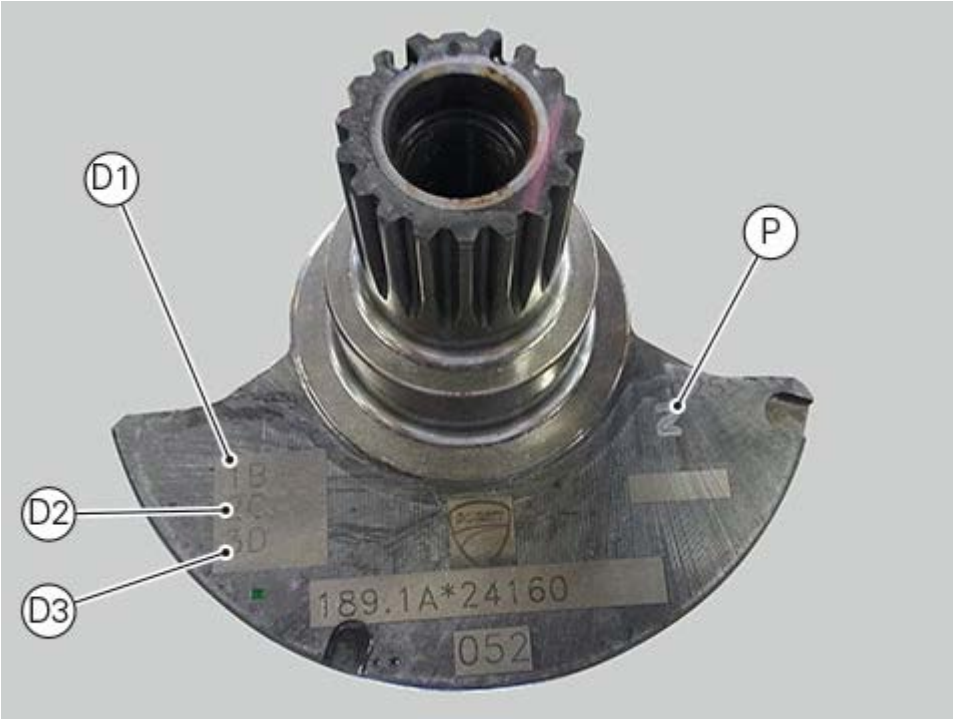
Reassembling the connecting rod assembly

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 on the crankshaft.

If the crankshaft, one or both con-rods need replacing, you must match crankshaft and con-rods according to their weight, as described in the table below:
It is furthermore necessary to match the crankshaft with two con-rods of the same weight class, e.g. X1, X2, X3, X4 or Y1, Y2, Y3, Y4

Punching on con-rod	Con-rod weight	Punching on crankshaft (A)
1	452 g - 456.99 g	1
2	457 g - 461.99 g	2
3	462 g - 466.99 g	3
4	467 g - 472 g	4

For a correct identification of the markings on the crankshaft, refer to the following figure:
(D1) Journal size class 1
(D2) Journal size class 2
(D3) Journal size class 3
(P) Weight class



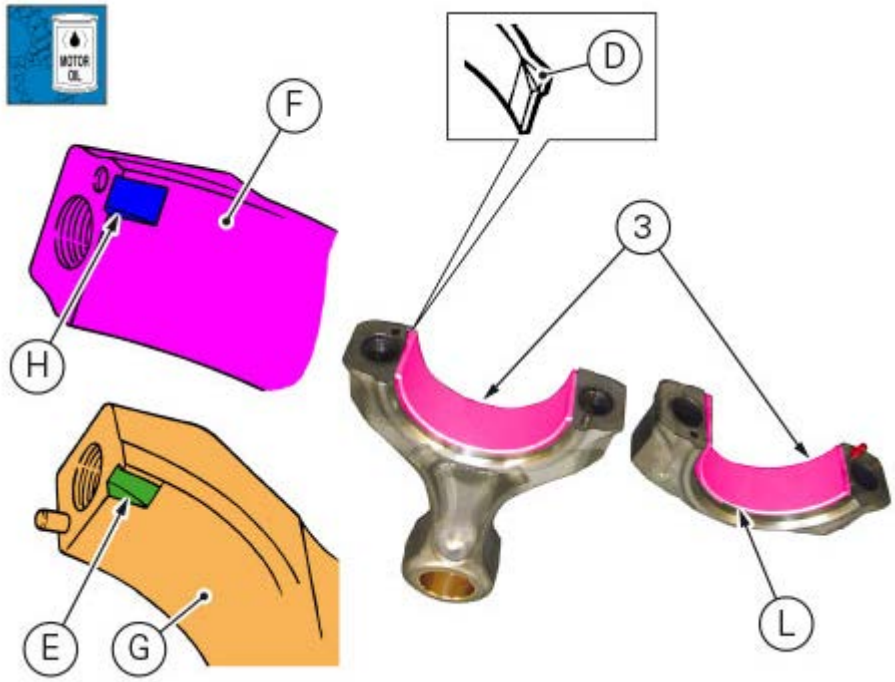
Take the con-rods previously matched to the crankshaft.

Take the bearings (3) necessary to shaft/connecting rod coupling, following the indications specified in the table.

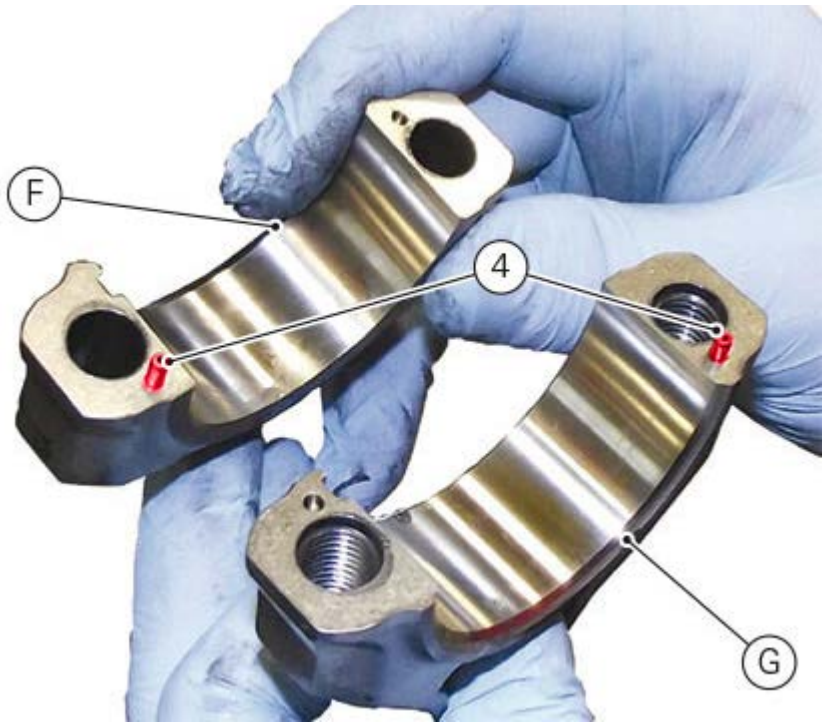
Crankshaft class	Class	Colour of bearing shell on connecting rod shank	Colour of bearing shell on connecting rod cap
A	X	BLUE	BLUE
A	Y	BLUE	YELLOW

B	X	BLUE	YELLOW
B	Y	YELLOW	YELLOW
C	X	YELLOW	YELLOW
C	Y	YELLOW	BLACK

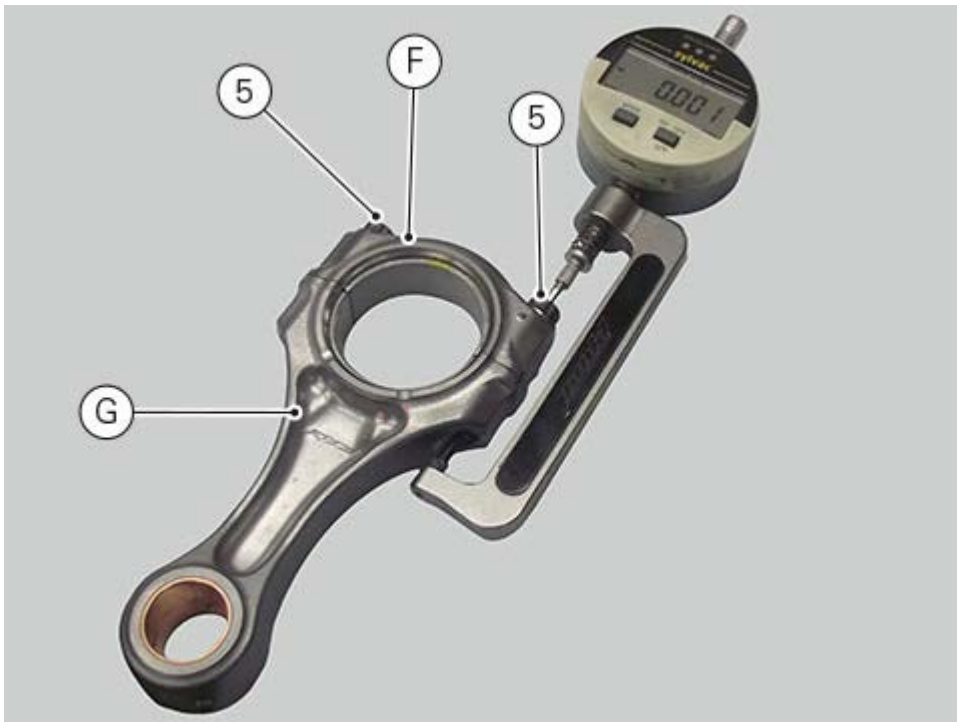
Insert the shells (3) in the connecting rod seats matching the tooth (D) of the shells with the corresponding marks (E) on the connecting rod cap (F) and on the shank (G).
It is essential that the tooth (D) adheres perfectly with its own mark (H).



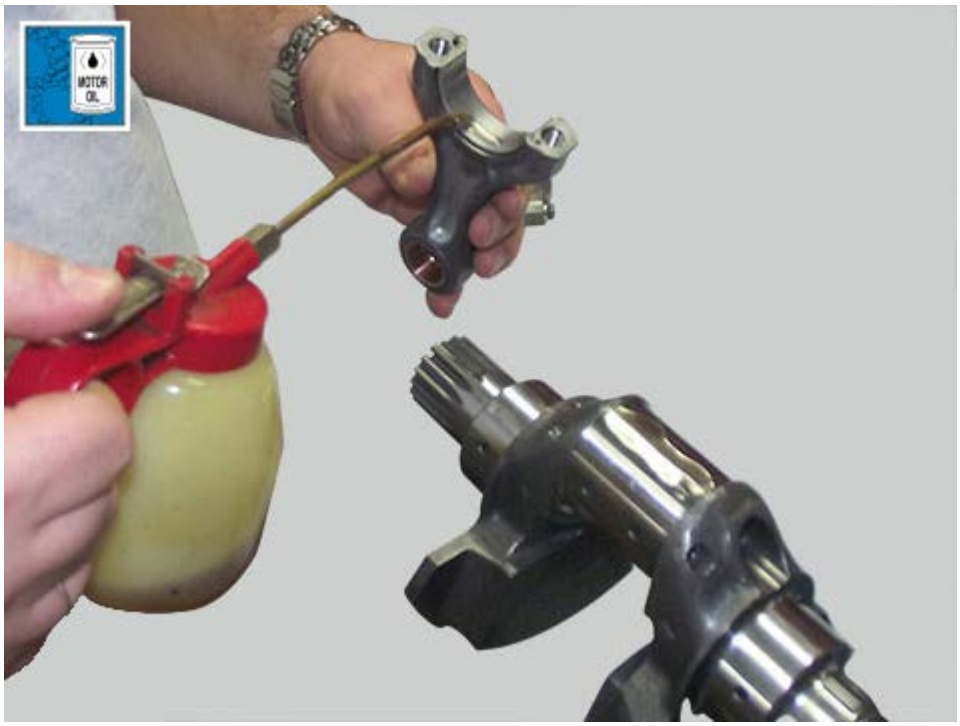
Check that each connecting rod is fitted with its centring pins (4) between cap (F) and the relevant shank (G).



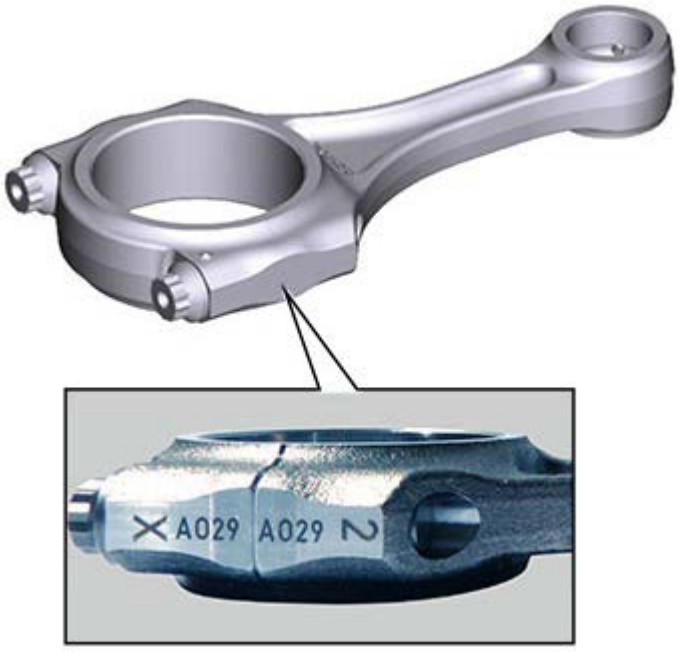
Join con-rod cap (F) with shank (G) using the screws (5) and measure the screw elongation.
After measuring, loosen screws (5) and disassemble the con-rod.

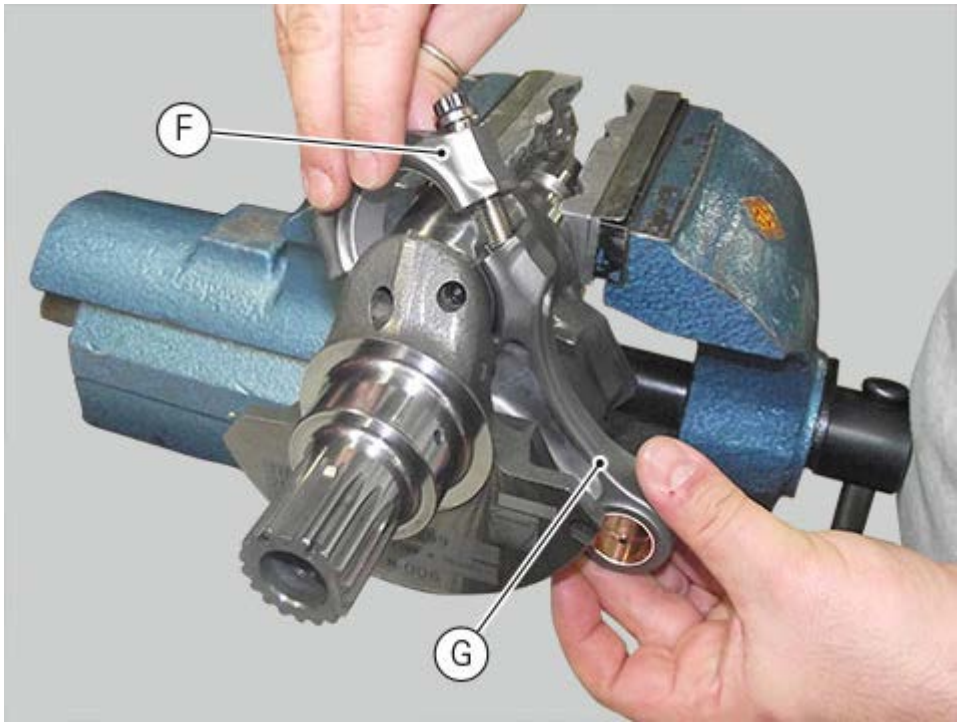


Use engine oil to lubricate the crank pin and the shells on the shank.



Wash the pins and dry them with compressed air.
Fit the connecting rod on the crankshaft, in the same position in which it was removed.
Insert the connecting rods in the crankshaft, so that the engraved point (R) and the chamfered part (S) face the internal side.
Join the connecting rod cap (F) with the corresponding shank (G), ensuring that the progressive number stamped on the two pieces is the same, as shown in the figure.





Use the specified grease to lubricate the thread and underside of the new screws (5).

Warning
The grease utilised is irritant in contact with the skin; wear protective gloves.

Important
Lubrication of con-rod screws 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 screw by hand until the head seats against the connecting rod.

Fit the spacer of tool no. **88713.3510** (R) between the connecting rods and take up residual axial clearance with the fork feeler gauge of the tool no. **88713.3510** which is available in the following thickness values:

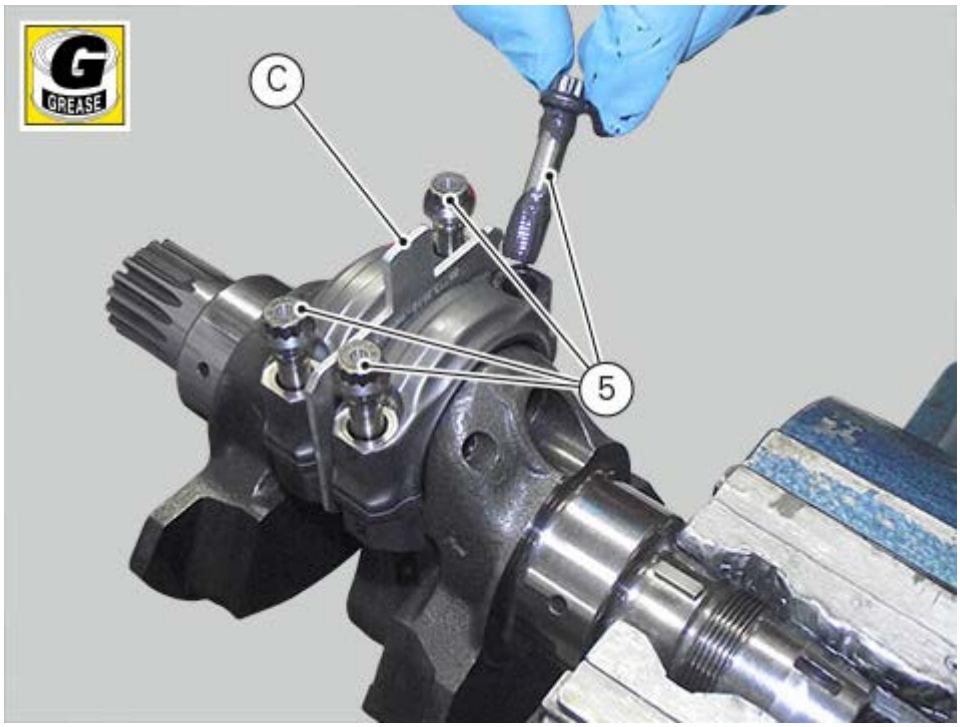
- 0.1 mm;

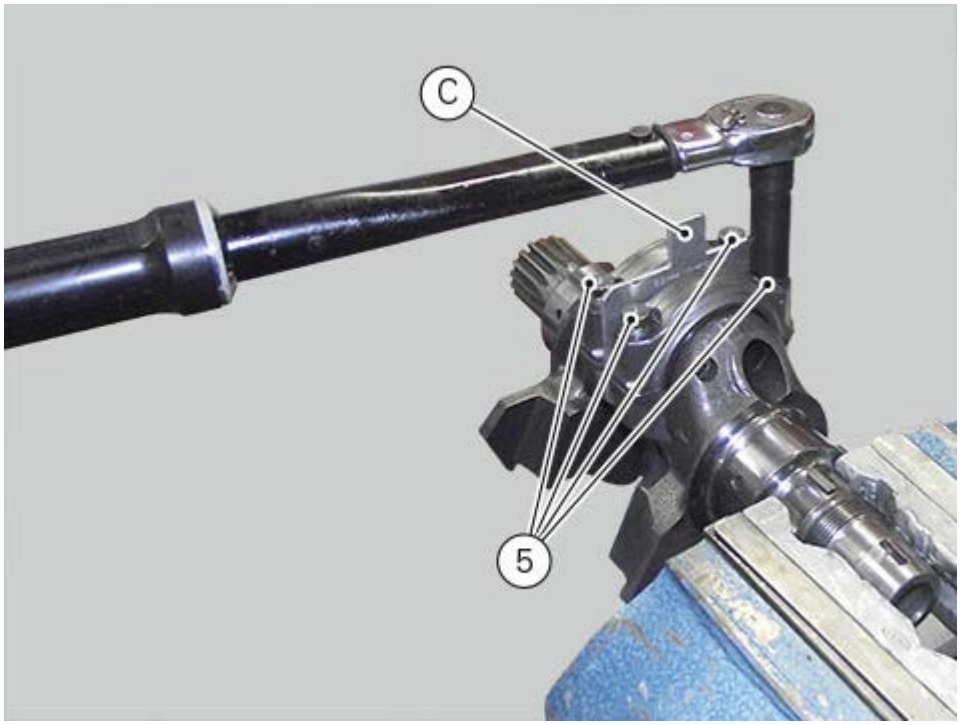
- 0.2 mm;
- 0.3 mm.

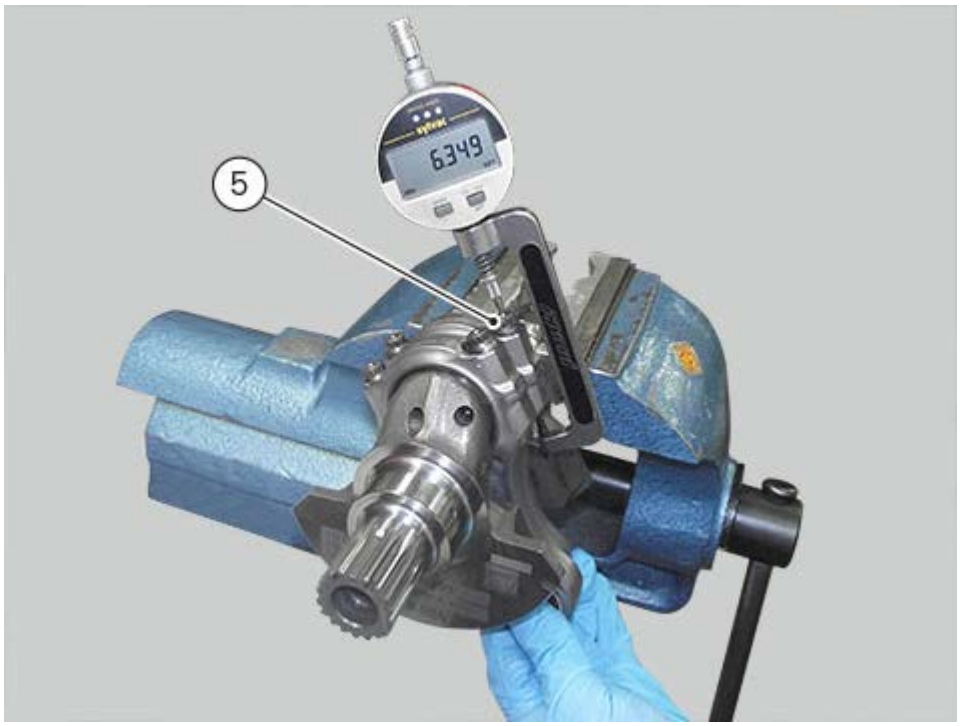
Temporarily fit the gudgeon pin to align the connecting rods, and then tighten the screws.

Tighten the screws (5), with torque wrench and degree wheel, as described below:

1 tighten the screws to a torque of 35 Nm;
2 loosen screws (5), remove them and apply specified grease on the thread and underhead of the screws (5);
3 tighten screws (5) to a torque of 35 Nm;
4 tighten with a rotation of 80° ± 2°;
5 torque check: 70 - 100 Nm;
6 elongation check with dial gauge: 0.205 ÷ 0.245 mm.



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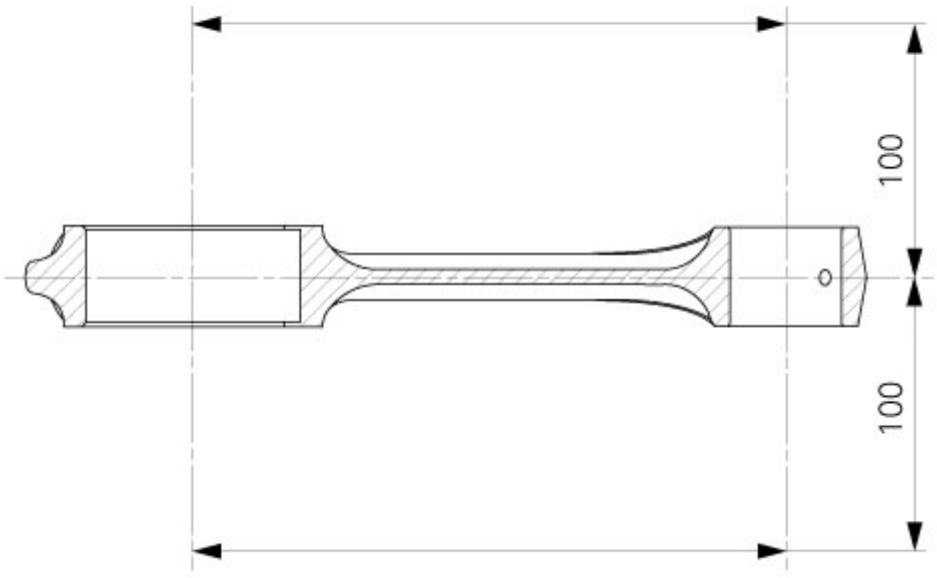
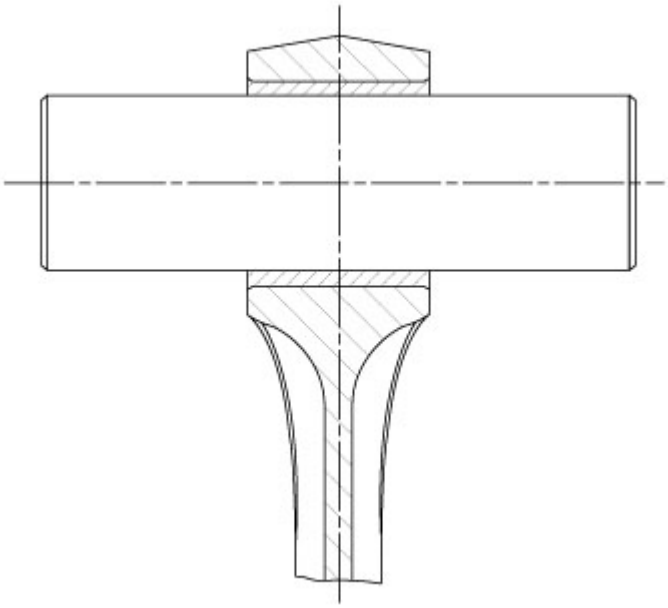
Overhauling the connecting rod assembly

Make the following dimensional checks on the connecting rods (Crankshaft):

- clearance with gudgeon pin upon fitting.

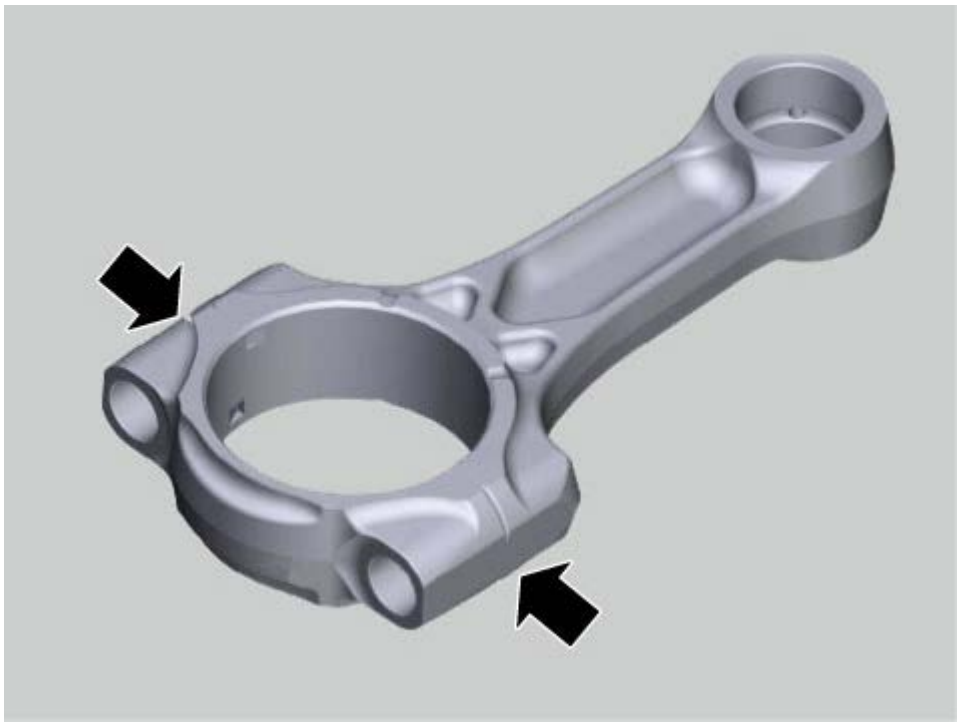
In case of excessive wear replace the con-rod (Crankshaft).
Check for parallelism error measured at 100 mm from the connecting rod longitudinal axis: it must be (H-h) lower than 0.02 mm; change the con-rod if it is not so.





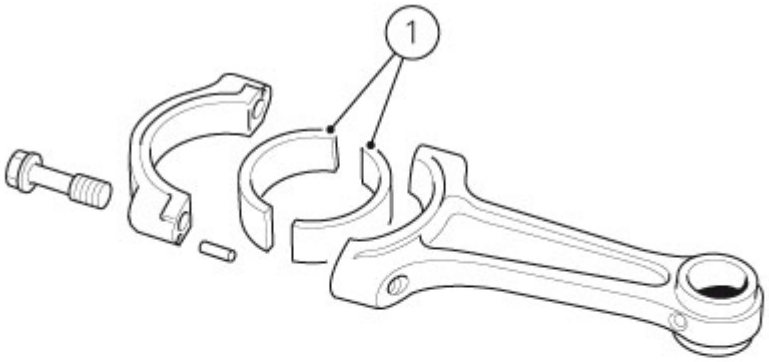
Important
If the con-rod weight indication is no longer readable, refer to that indicated on the crankshaft.

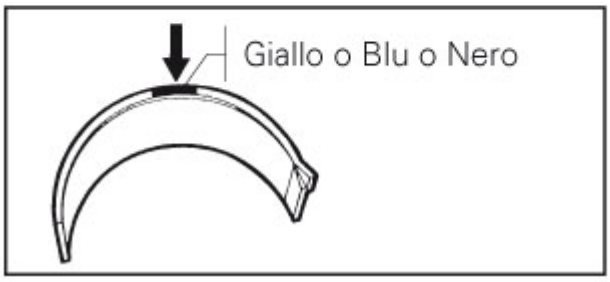
The connecting rod is supplied in two size classes A and B relative to the big end diameter (Crankshaft) as punch marked on the side of the cap.



Connecting rod big end bearings

It is good practice to replace the bearings (1) each time the engine is overhauled.
Replacement bearings are supplied ready for fitting and they must not be reworked with scrapers or emery cloth.
The bearings may belong to three different size classes, each identified by a specific colour (YELLOW, BLUE and BLACK).
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 and connecting rod.

SIZE CLASS OF BIG-END BEARINGS					
Crankshaft class	Crank pin size (mm)	Con-rod class	Con-rod big end size (mm)	Bearing shell colour	Bearing shell thickness (mm)
A	44.987 to 44.992	X	49.000 to 49.006	BLUE	1.985 to 1.990
A	44.987 to 44.992	Y	49.006 to 49.012	BLUE/YELLOW	1.985 to 1.990/1.990 to 1.995
B	44.982 to 44.987	X	49.000 to 49.006	BLUE/YELLOW	1.985 to 1.990/1.990 to 1.995
B	44.982 to 44.987	Y	49.006 to 49.012	YELLOW	1.990 to 1.995
C	44.976 to 44.982	X	49.000 to 49.006	YELLOW	1.990 to 1.995
C	44.976 to 44.982	Y	49.006 to 49.012	YELLOW/BLACK	1.990 to 1.995/1.995 to 2.000
COUPLING CLEARANCE **0.053 to 0.075**					

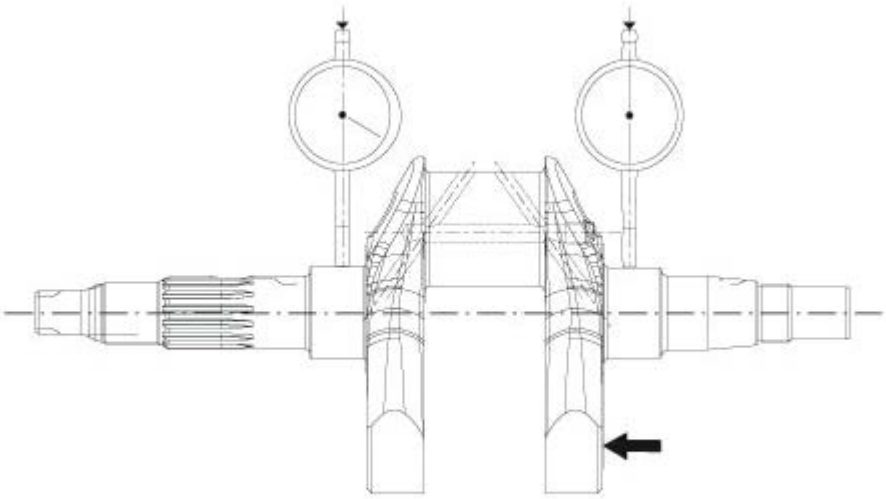
Note
The layout of the journal size marking is a follows:
number = journal identification

1 = clutch side journal for main bearing (splined side Ø35).
2 = generator side journal for main bearing (taper side).
3 = crank pin.
Letter = diameter selection identification.

Crankshaft

The main bearing and big end journals 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.

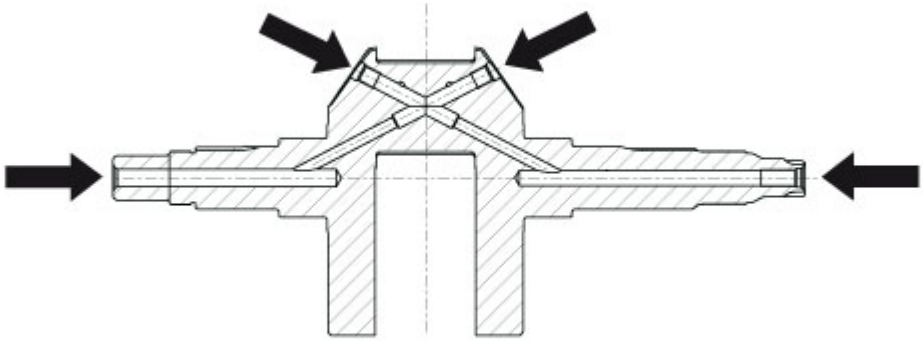
Use a micrometer to measure ovality and taper of the crank pin. Measure oval and taper in several different directions.
Use a dial gauge to measure the alignment of the main journals by positioning the crankshaft between two opposing centres.
At each overhaul, it is advisable to clean the crankshaft internal oilways.
The specified values are indicated in chapter Crankshaft.
The crankshaft is supplied in three size classes of the crank pin (A, B and C) and two size classes for the main journals (A and B) punched on the side of the crank web, sprocket side.



For a correct identification of the markings on the crankshaft, refer to the following figure:

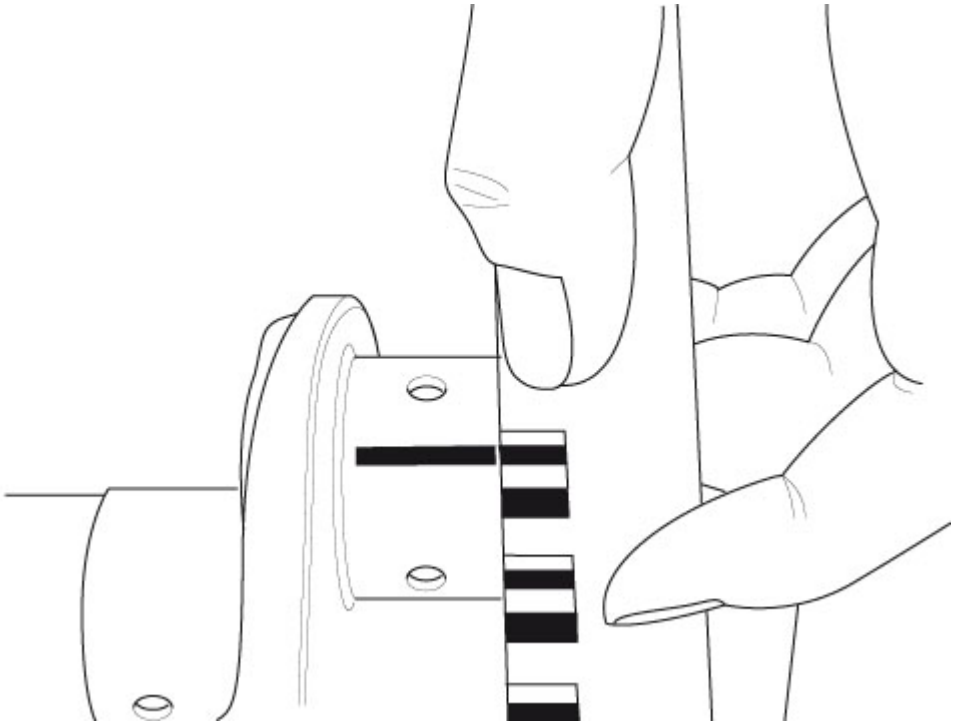
Loosen the two dowels of the crankshaft, heating the latter, if necessary, to remove the sealant applied upon assembly.

Clean all the oilways using suitable diameter metal brushes and then blow with compressed air to remove any residues that have accumulated and are restricting the oil flow.
Apply specified threadlocker on the dowel threading and refit them.
Tighten the dowels to a torque of 14 Nm (Min. 12 Nm - Max. 16 Nm).



Big-end bearing-crank pin clearance

To check the assembly clearance between the bearing shells and crankshaft use a strip of GREEN "Plastigage PG-1" on the journal.
Fit the connecting rod with the original bearings and tighten the screws according to the tightening procedure.
Remove the connecting rod and compare the thickness of the strip to the scale.
If the width measured corresponding to the existing clearance is not within the prescribed limit (Crankshaft), either the bearing shells or the crankshaft must be replaced.

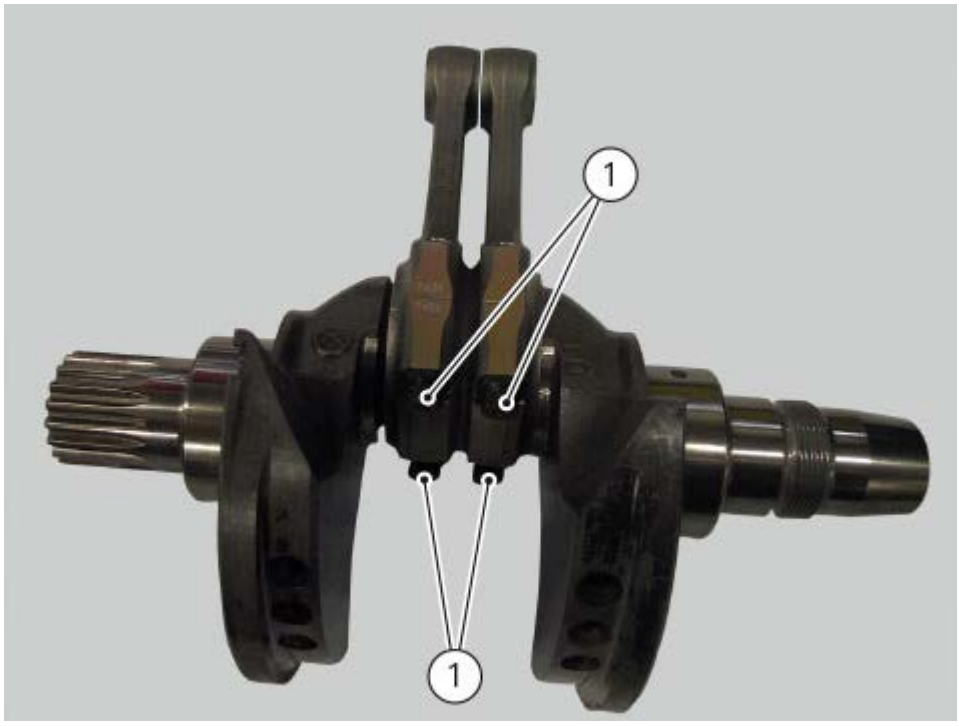


Disassembling the connecting rod assembly

Loosen the screws (1) and separate the connecting rods from the crankshaft.

Important

Take care not to mix up components of different connecting rods and maintain the original orientation.

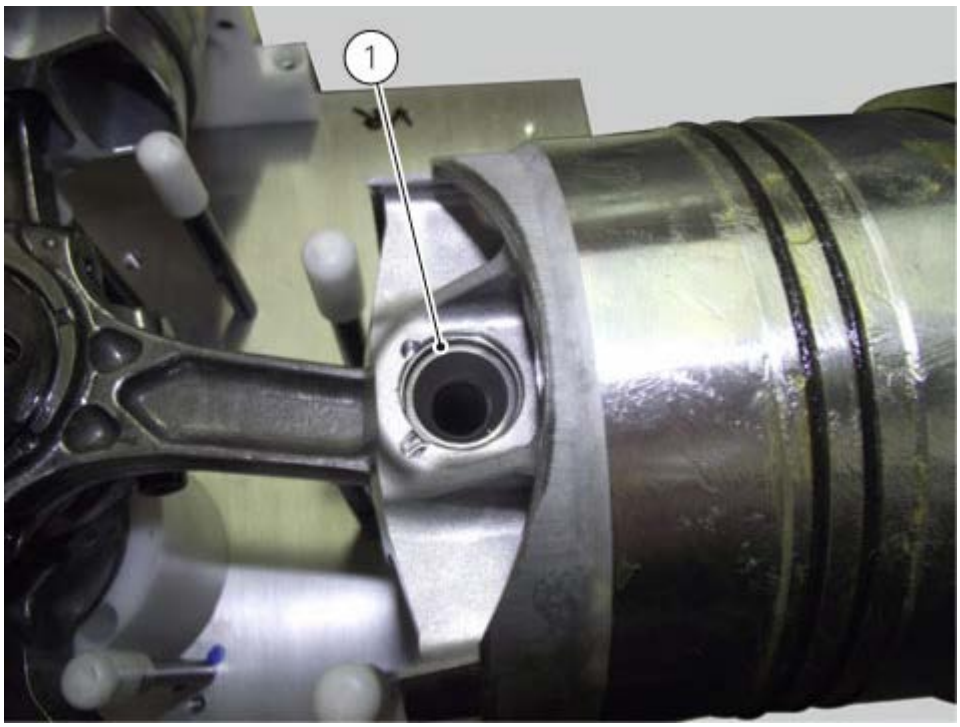


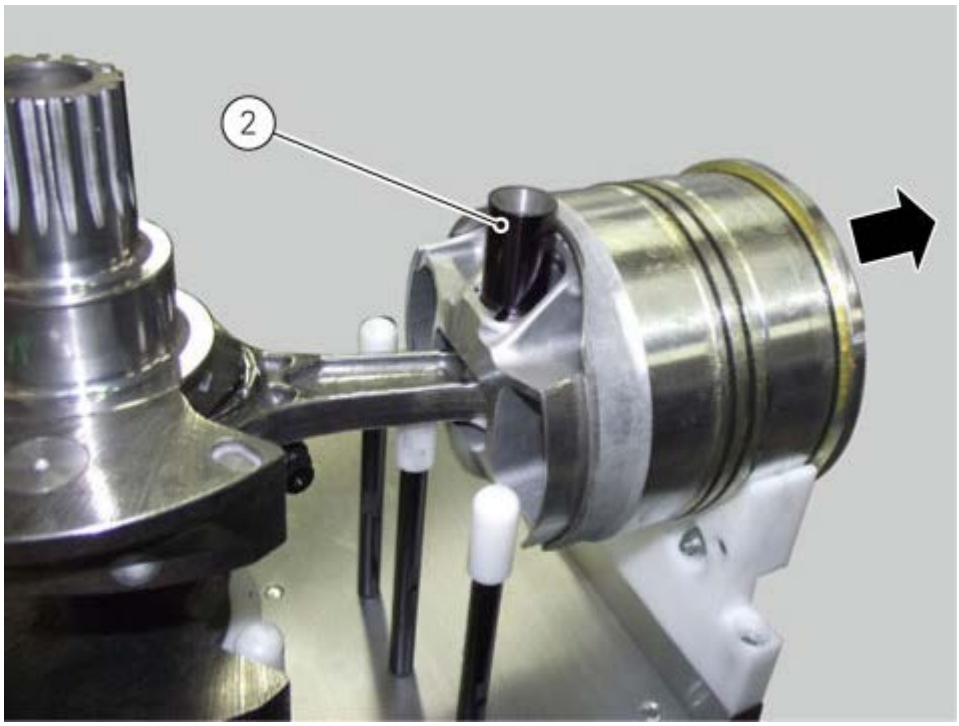
Removing the connecting rod assembly

Split the crankcase and remove the connecting rod assembly together with liners and pistons (Opening the crankcase).

Set the connecting rod assembly on tool part no. **88713.3440**.

Slide liners out until piston pin is in view, making sure that the oil scraper ring remains in its seat. Remove circlip (1) and pin (2) of each con-rod using the suitable tool no. **88713.3517** and then remove the liner-piston assembly from con-rod small end.

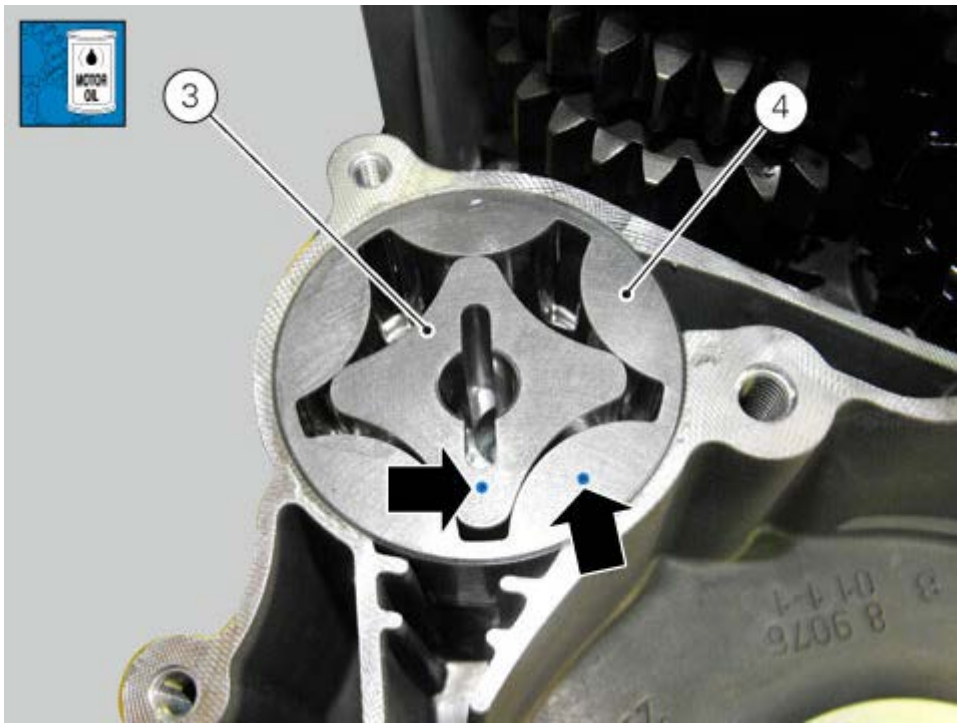



2

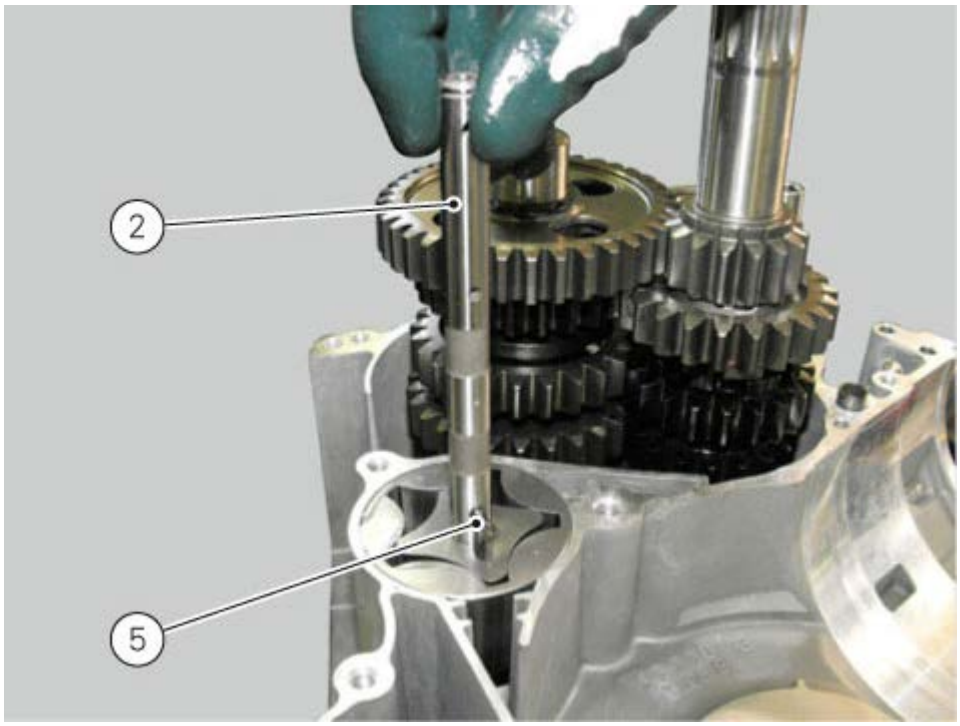
Installation of the oil scavenge pump

Carefully clean the scavenge pump seat and smear with engine oil.

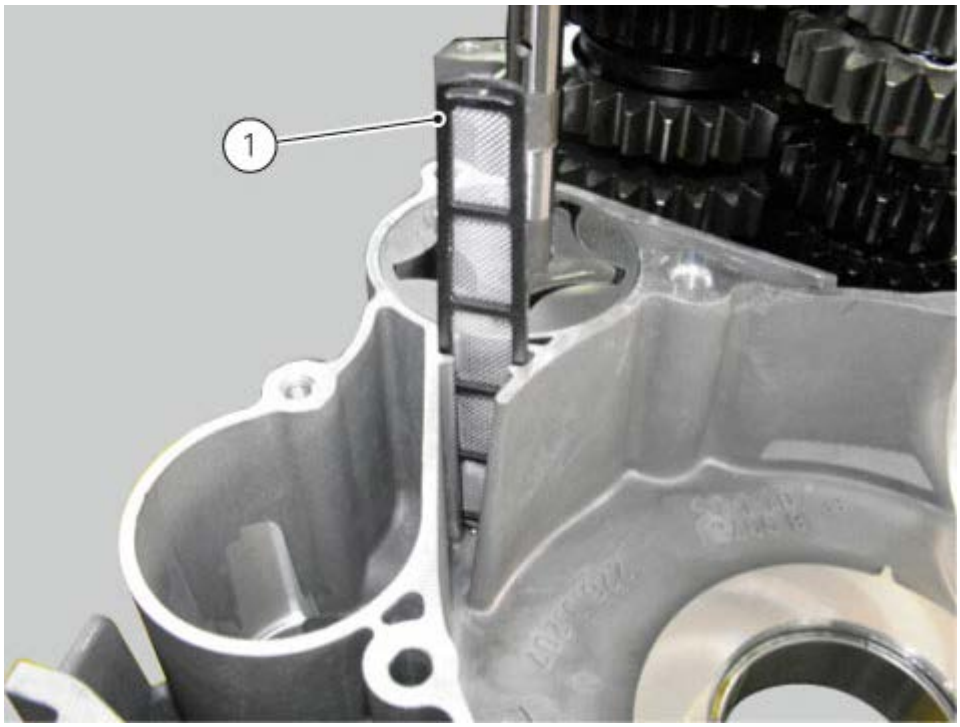
Lubricate the external and internal surface of the external rotor (4) and fit it in its seat with reference mark upward.
Lubricate the external surface of internal rotor (3) and fit it in the external rotor with reference mark upward.



Fit pin (5) in the hole on oil pump drive shaft (2).
Fit the oil pump drive shaft (2) in the internal rotor ensuring that pin (5) engages and gets fully home in the relevant groove.
Test pump rotation

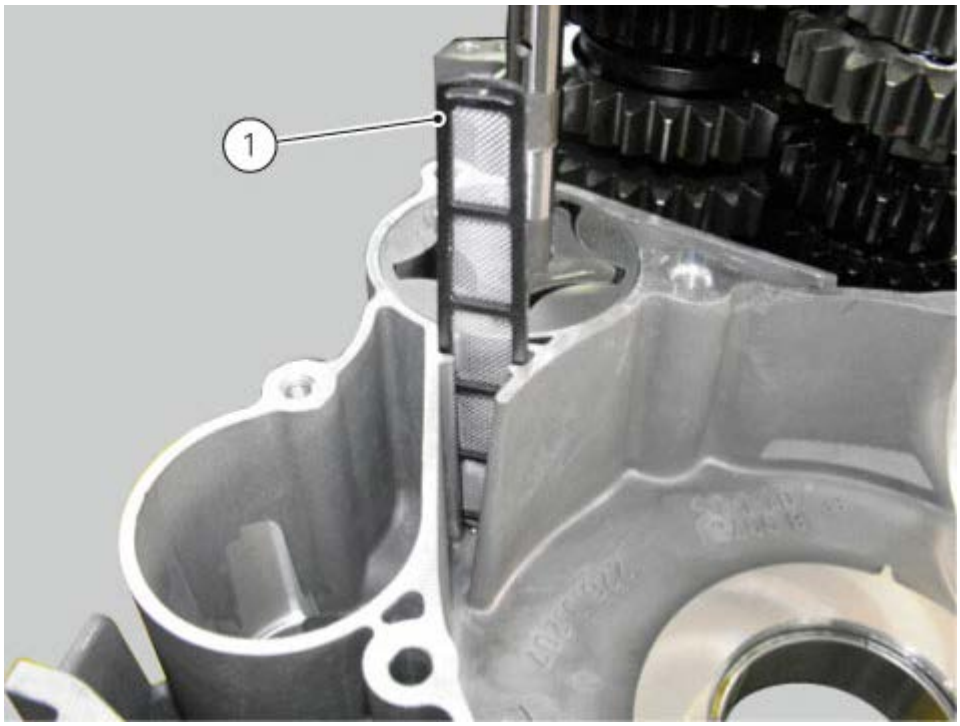


Carefully clean the scavenge pump mesh filter (1).
Fit the scavenge pump mesh filter (1) fully home in its seat on chain-side casing.

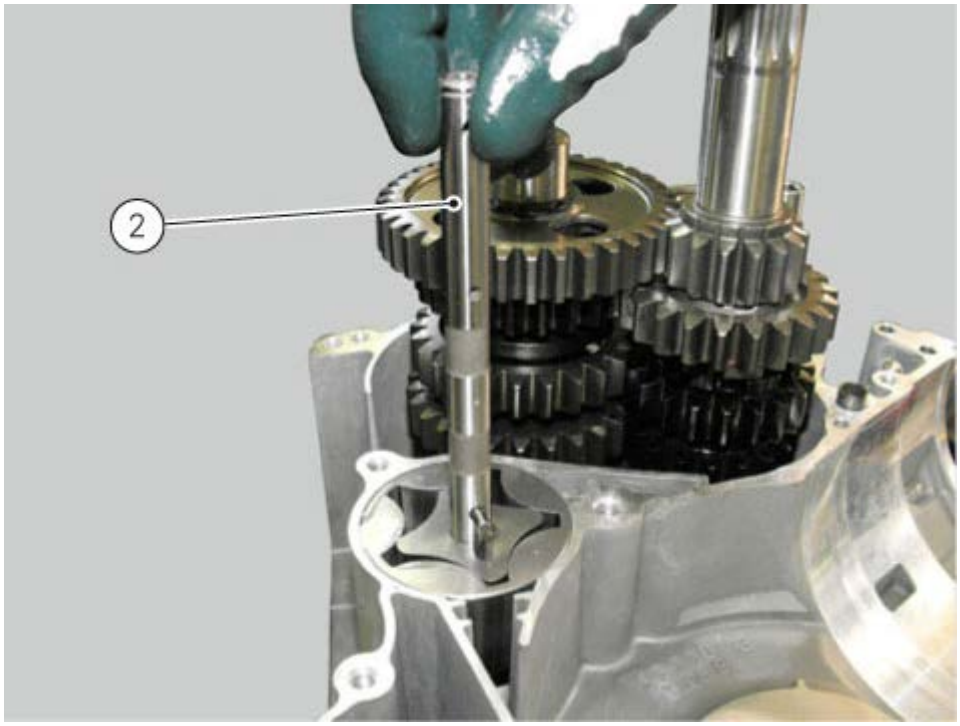


Removal of the oil scavenge pump

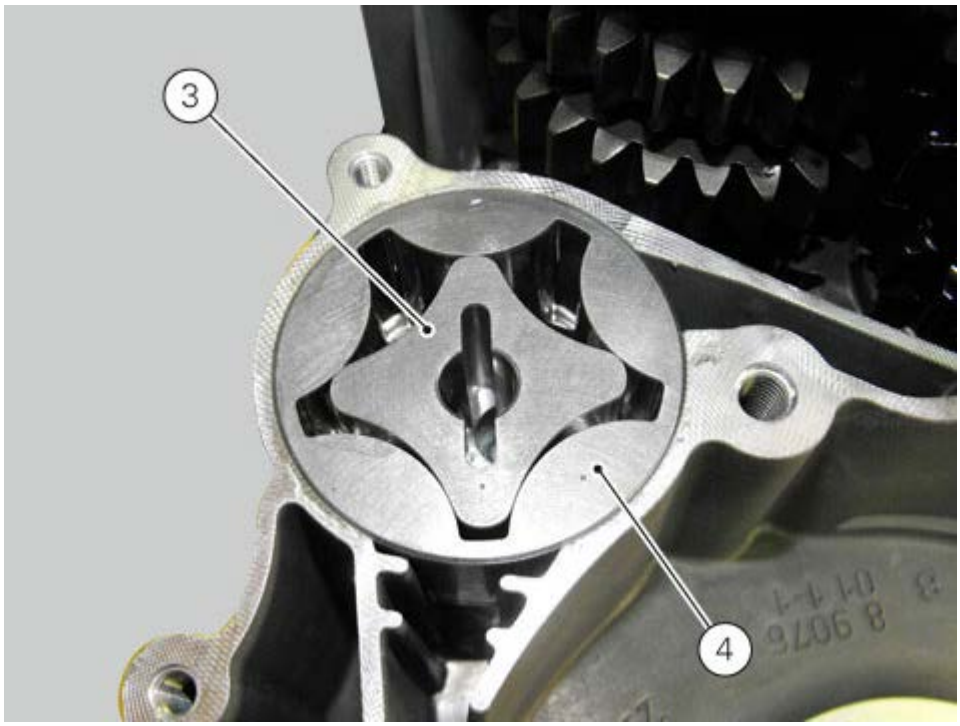
Remove scavenge pump filter (1) by pulling it up.



Remove the oil pump drive shaft (2).



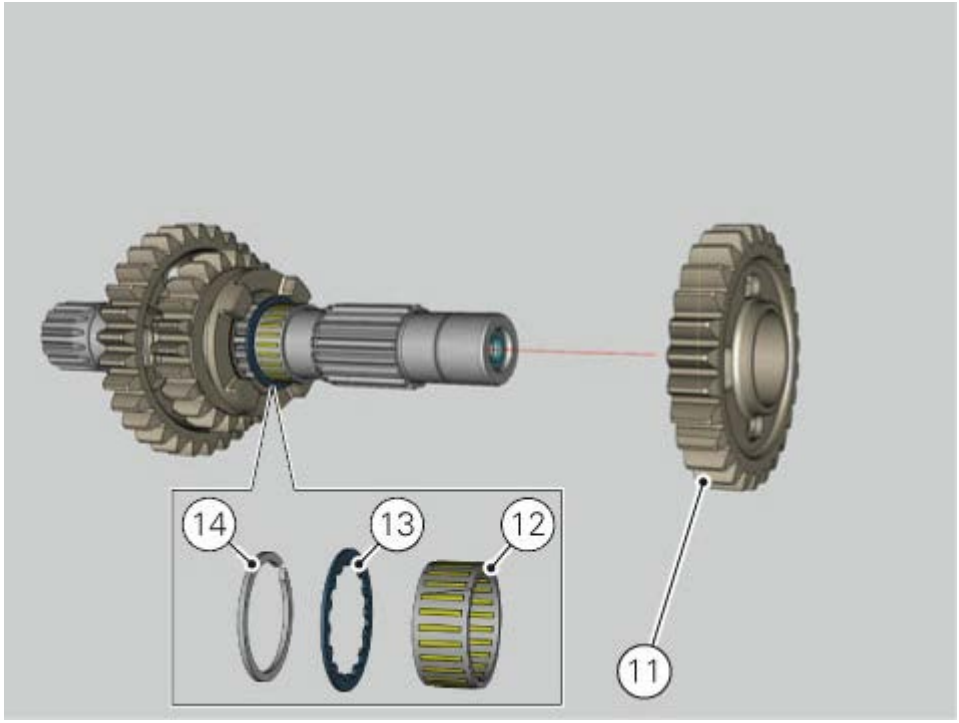
Remove the internal rotor (3) and the external rotor (4).


3
4

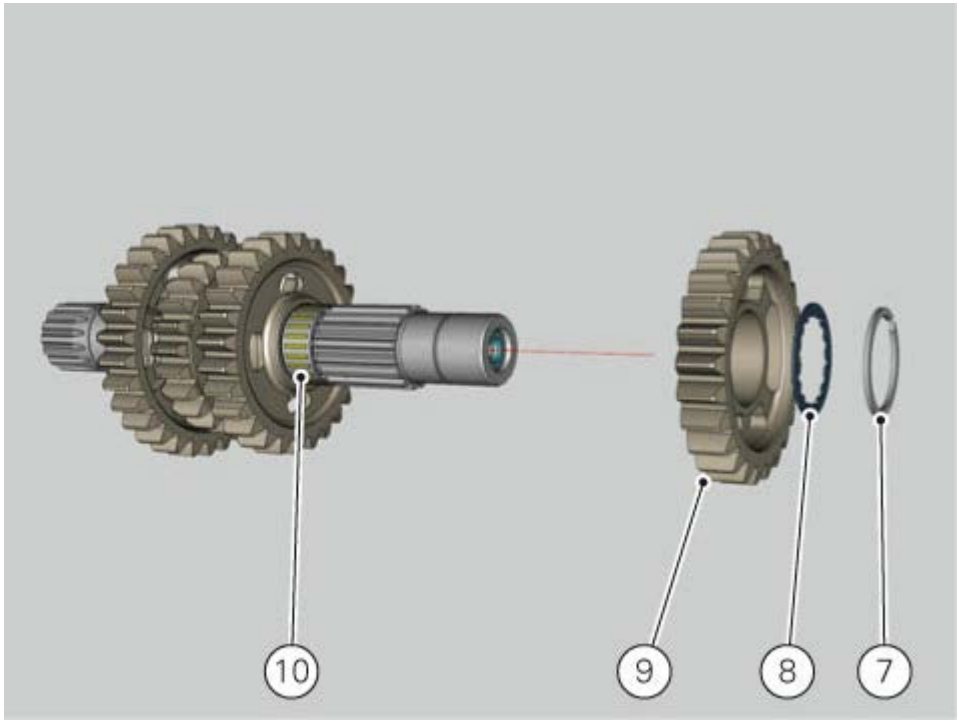
Reassembly of the gearbox shafts

Reassemble the gears on the gearbox shafts by reversing the disassembly procedure (Disassembly of the gearbox shafts).
Take particular care when installing the idler gears. 3rd and 4th speed gears and the relevant fixing components on the secondary shaft are given as an example.
Fit the circlip (14), checking that it is fully inserted into its groove on the shaft. Push the circlip into position with a suitable size tubular drift.
Slide the splined washer (13) over the shaft until it locates against the circlip you have just fitted.

To fit the needle roller cage (12) onto the shaft, first lubricate it with plenty of grease (of recommended type) and then open it slightly to make it easier to slide on to the shaft.
Fit the 3rd speed gear (11).



Fit another needle roller cage (10) using the method already described. Fit the 4th speed gear (9).
Fit a splined washer (8) and another circlip (7) into the shaft Push it inside its seat using the previously used pad.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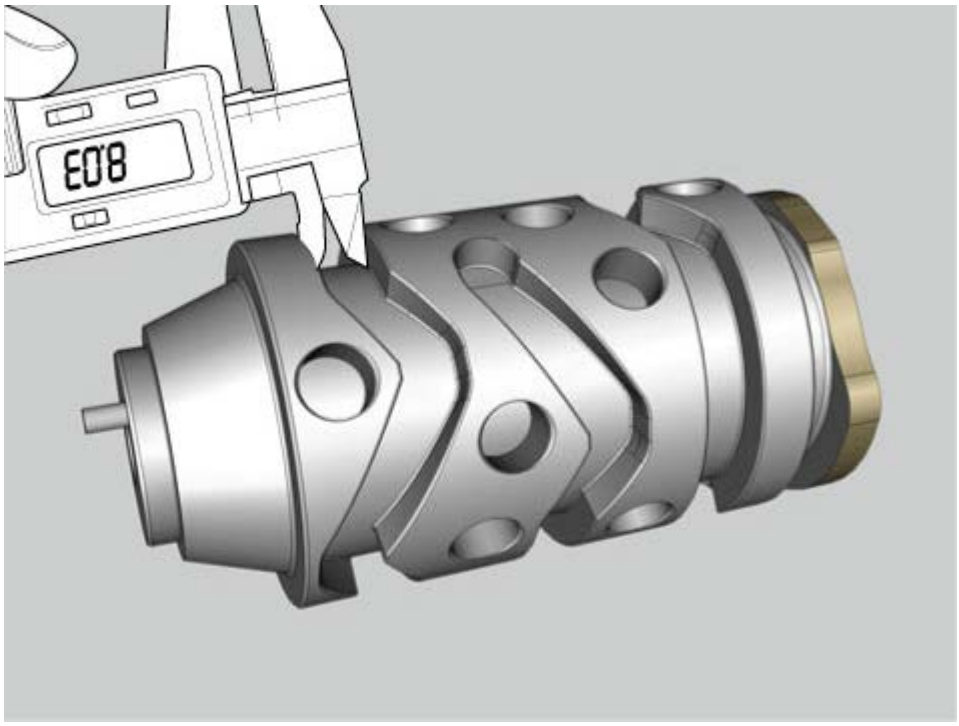
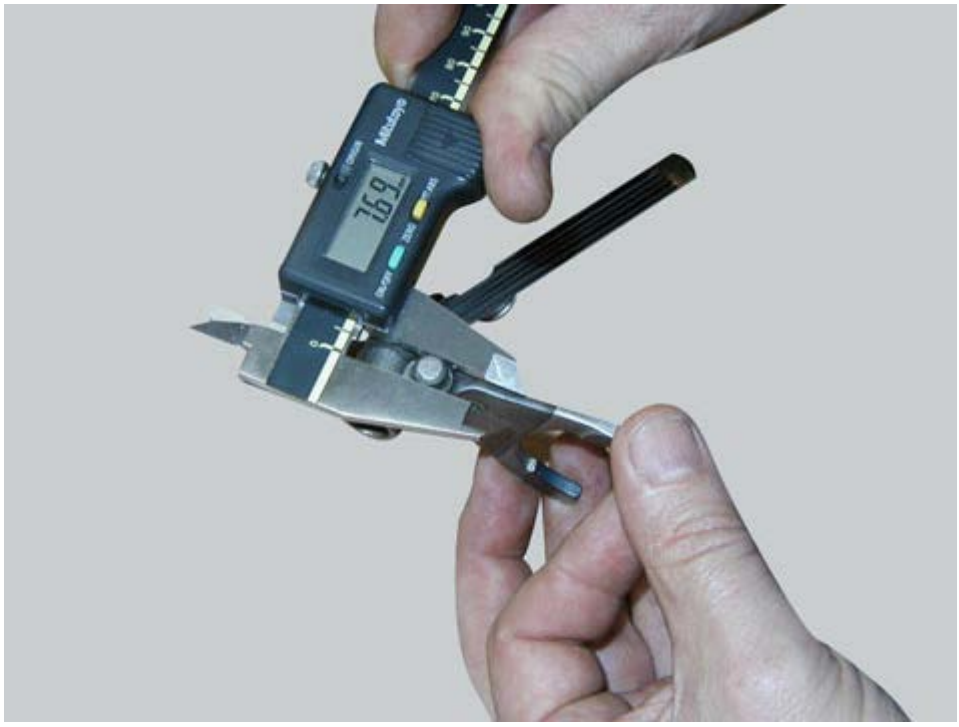
Inspection of the gear selector drum

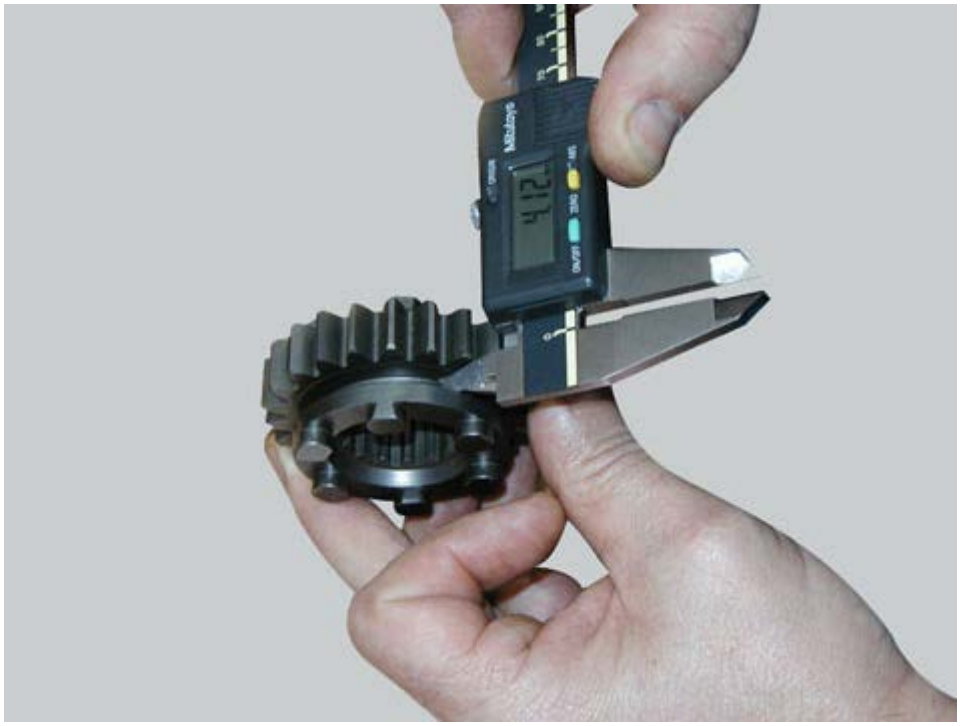
Use a gauge to measure the clearance between fork pin and the slot on the selector drum.
If the service limit is exceeded, determine which part must be replaced by comparing these dimensions with those of new components. Refer to the technical specifications table (Gearbox).
Also check the desmodromic drum support bearings for wear.

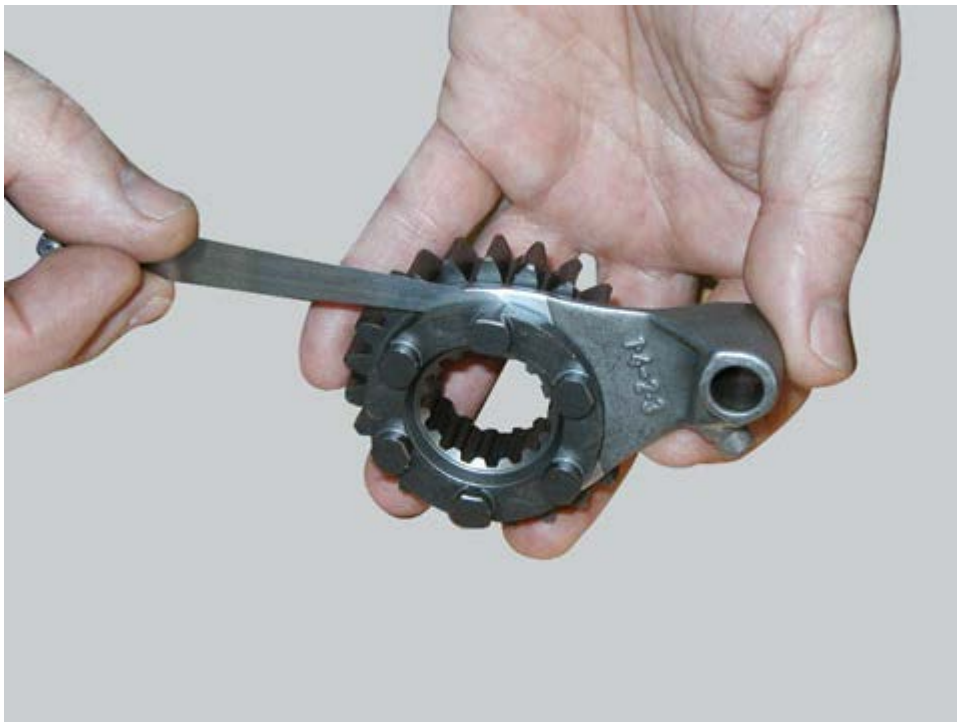




Inspection of the gear selector forks

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 limits specified for each part, as specified in paragraph "Gearbox".





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).
For the total gearbox shaft and selector drum end clearance values, refer to paragraph"Gearbox".

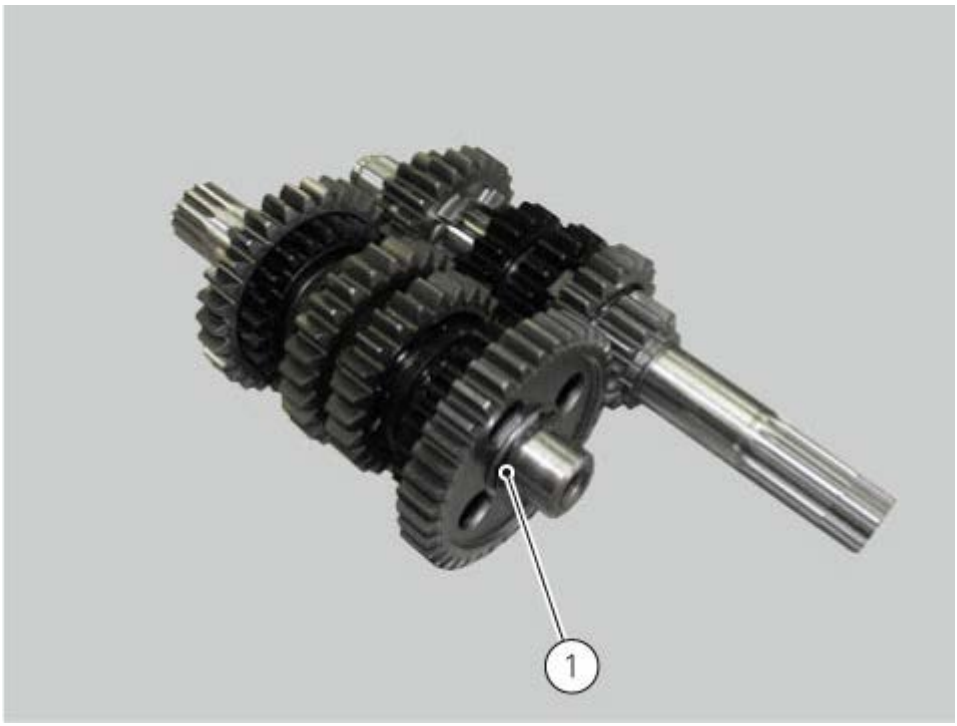
Disassembly of the gearbox shafts

Place the shaft in a vice in such a way as to facilitate the disassembly operations.

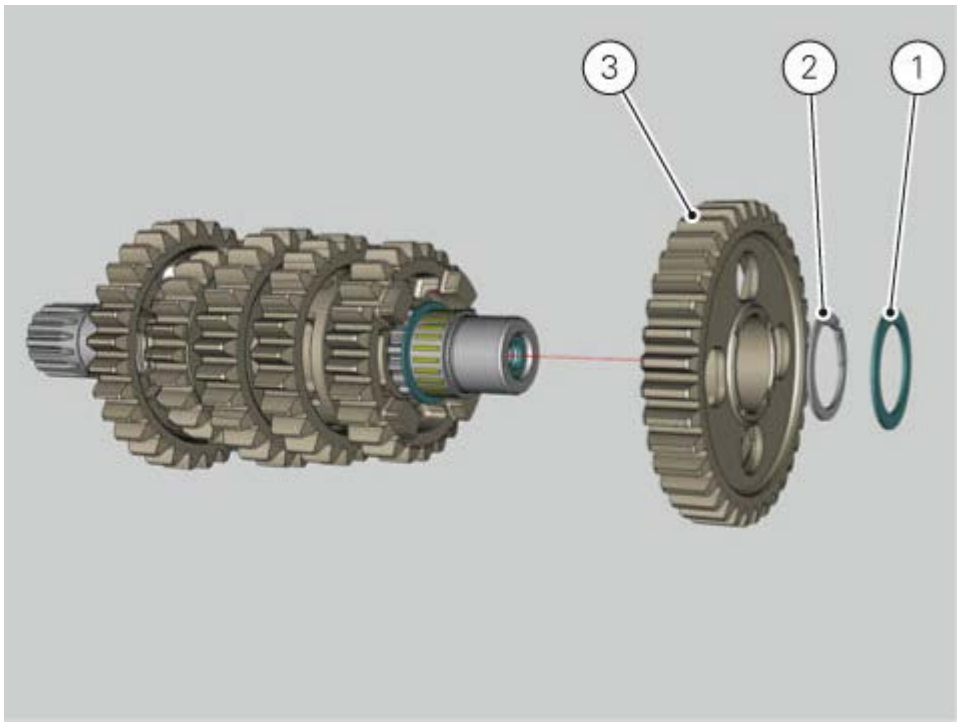
Important
Take care not to invert the shim position upon reassembly: this would potentially lead to jamming when using the gear selector control, making it necessary to reopen the crankcase.

Disassembly of the gearbox secondary shaft

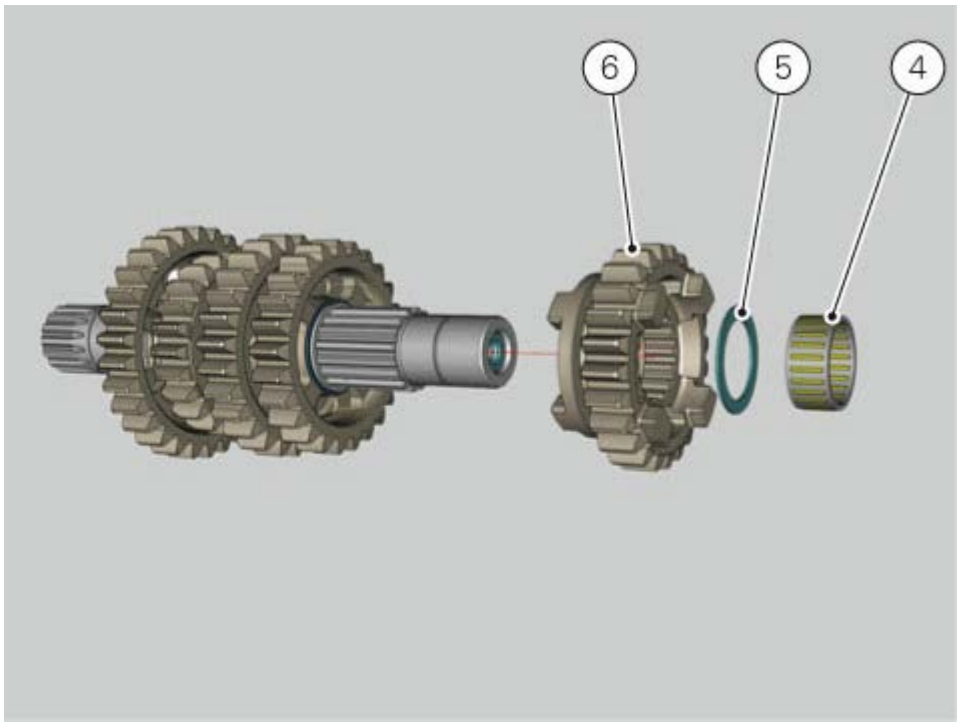
Remove the chain-side shim washer and the clutch-side shim washer (1) from the secondary shaft.



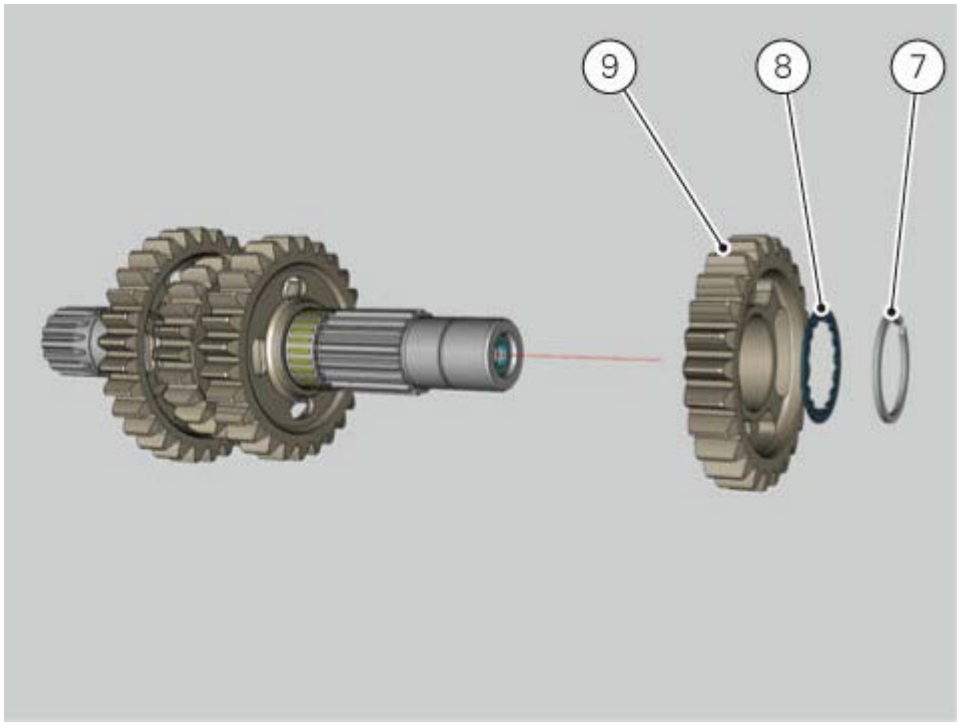
Remove the circlip (2) and slide the first speed driven gear out (3).



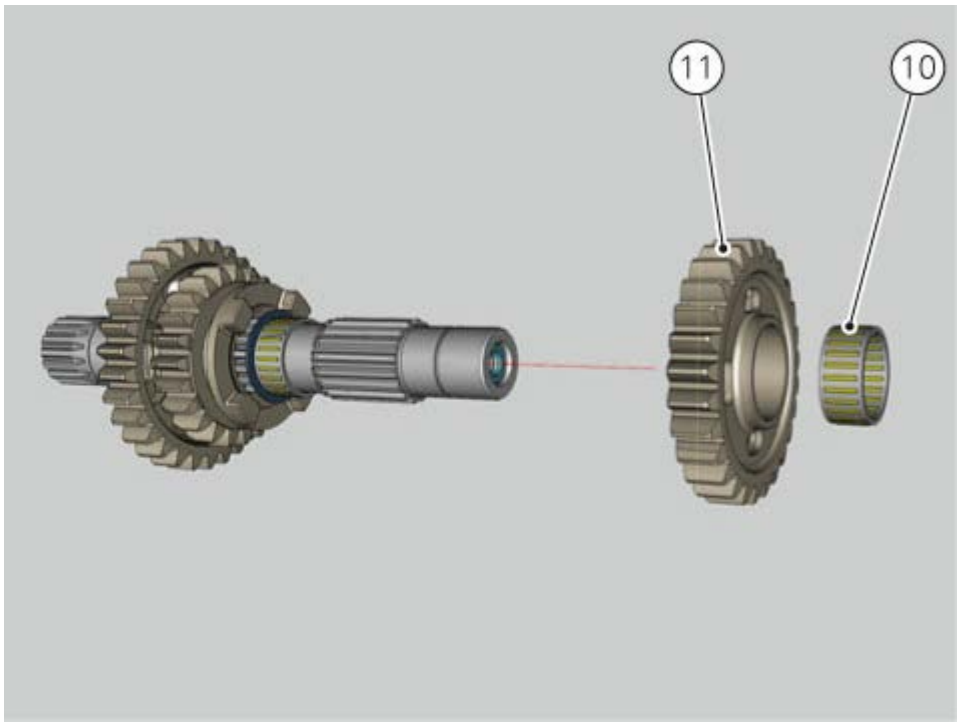
Remove the needle roller cage (4) and the shim (5).
Remove the fifth speed driven gear (6).



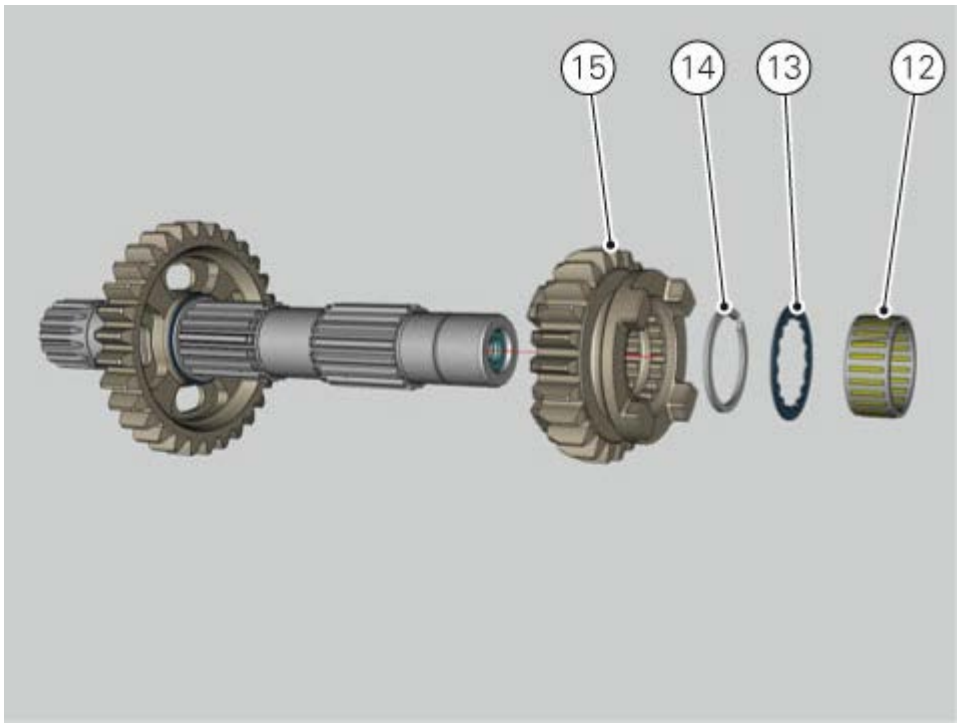
Use two flat blade screwdrivers to remove the circlip (7) from its sear, taking care not to damage the shaft surface.
Remove the circlip (7), the splined washer (8), and the fourth speed driven gear (9).



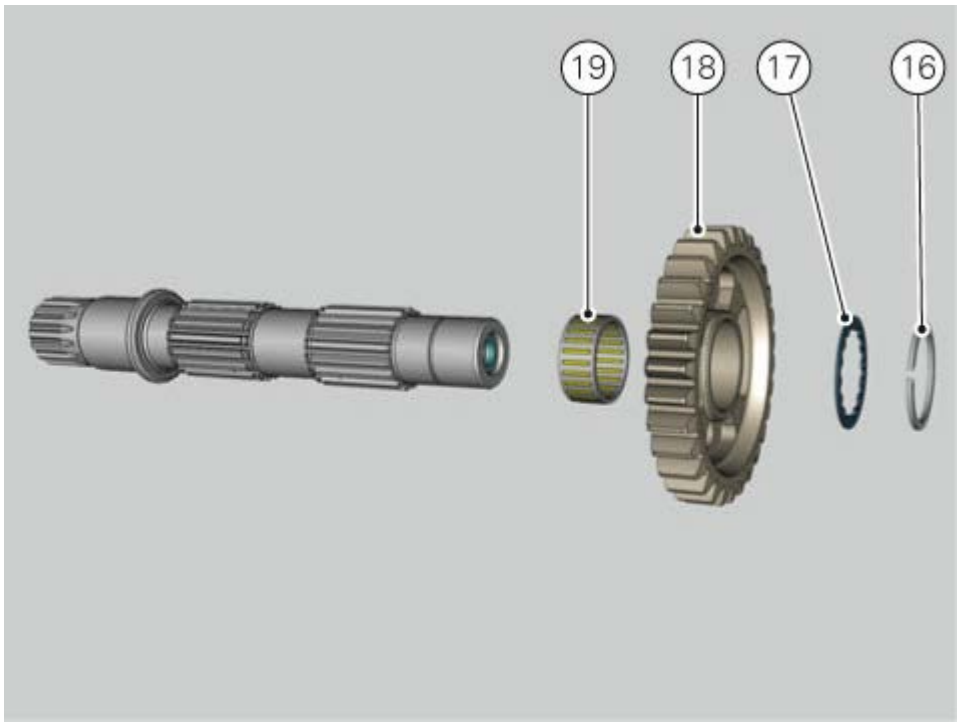
Remove the needle roller cage (10), and remove the third speed driven gear (11).

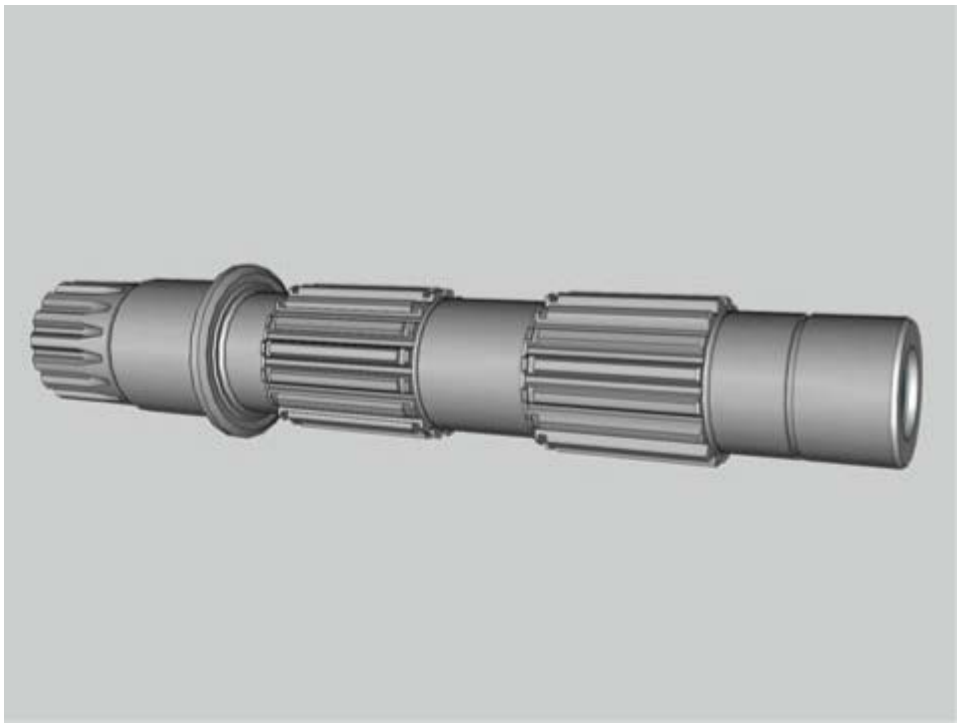


Remove the needle roller cage (12).
Remove the splined washer (13), the circlip (14), and slide the sixth speed driven gear out (15).



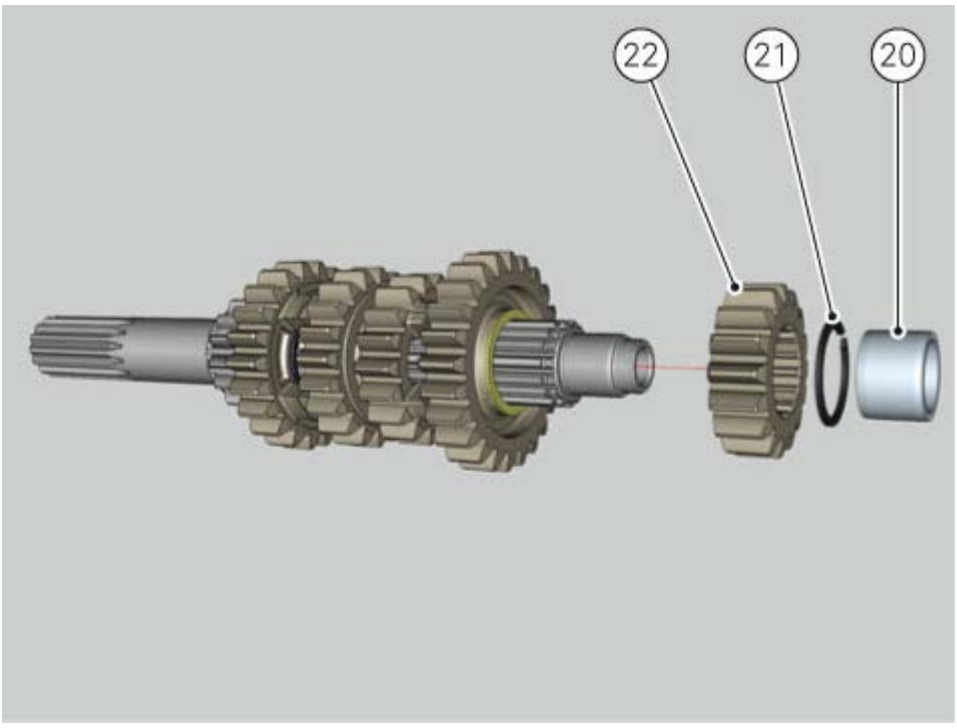
Remove the circlip (16), the splined washer (17), and the second speed driven gear (18).
Keep the needle roller cage (19): all the components have now been removed from gearbox secondary shaft .



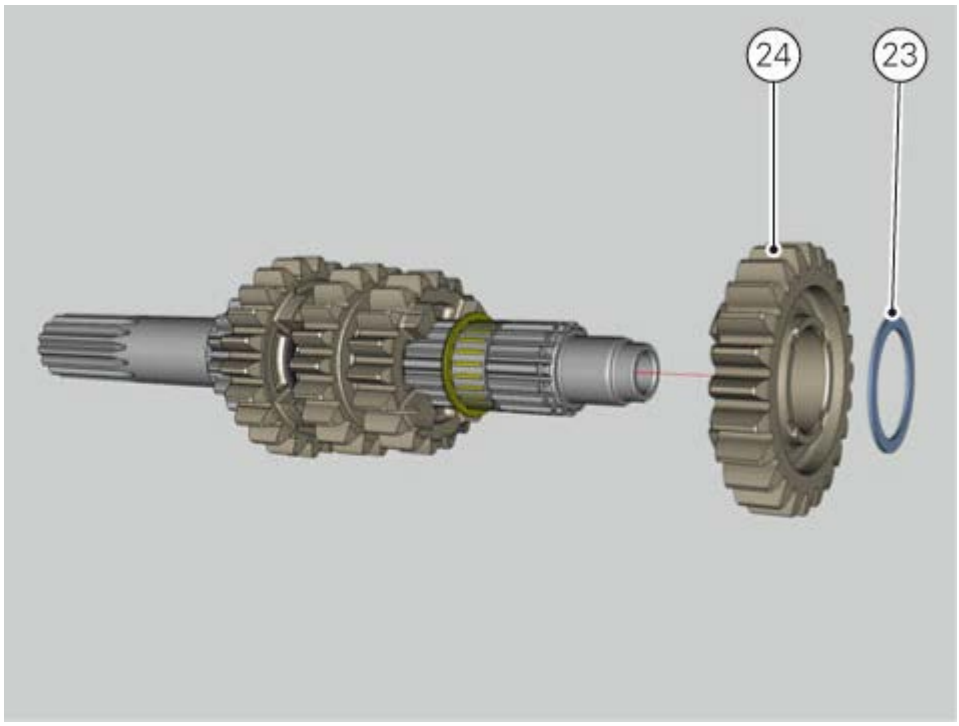


Disassembly of the gearbox primary shaft

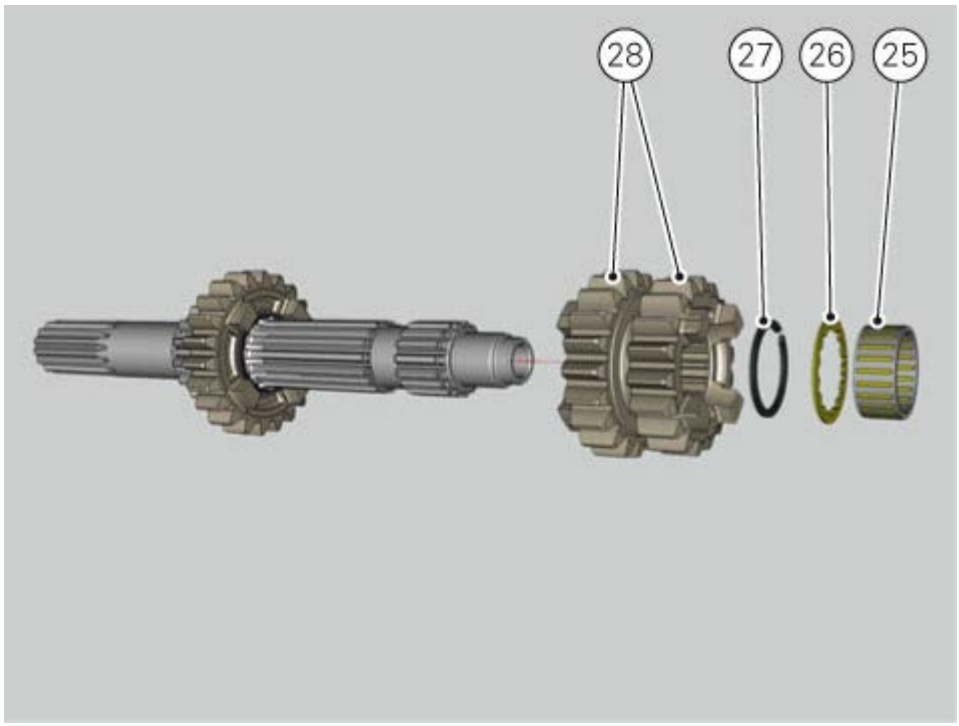
Remove the inner ring (20), the chain-side shim washer (21) and the clutch-side shim washer from the primary shaft.
Remove the second speed driving gear (22).



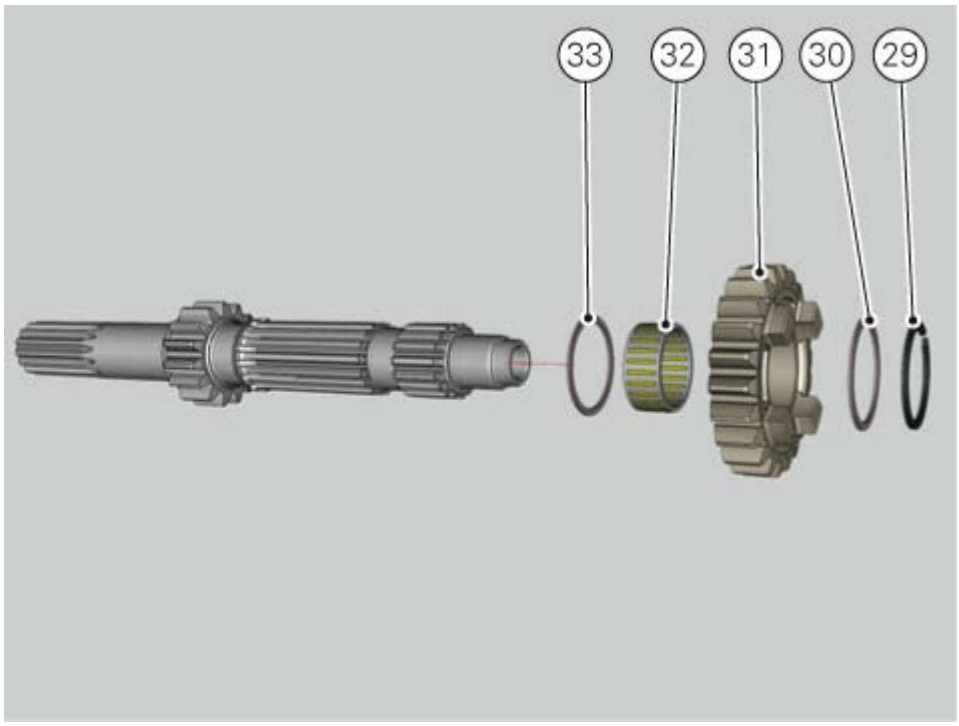
Use two screwdrivers to prise the circlip out (23).
Take care to avoid damaging the surface of the shaft while removing circlip (23).
Remove the sixth speed driving gear (24).



Remove the needle roller cage (25), then the splined washer (26), and the circlip (27).
Remove the third and fourth speed driving gear (28).



Remove the circlip (29) and the splined washer (30).
Remove the fifth speed driving gear (31) complete with the roller cage (32).
Slide the shim (33) off the primary shaft.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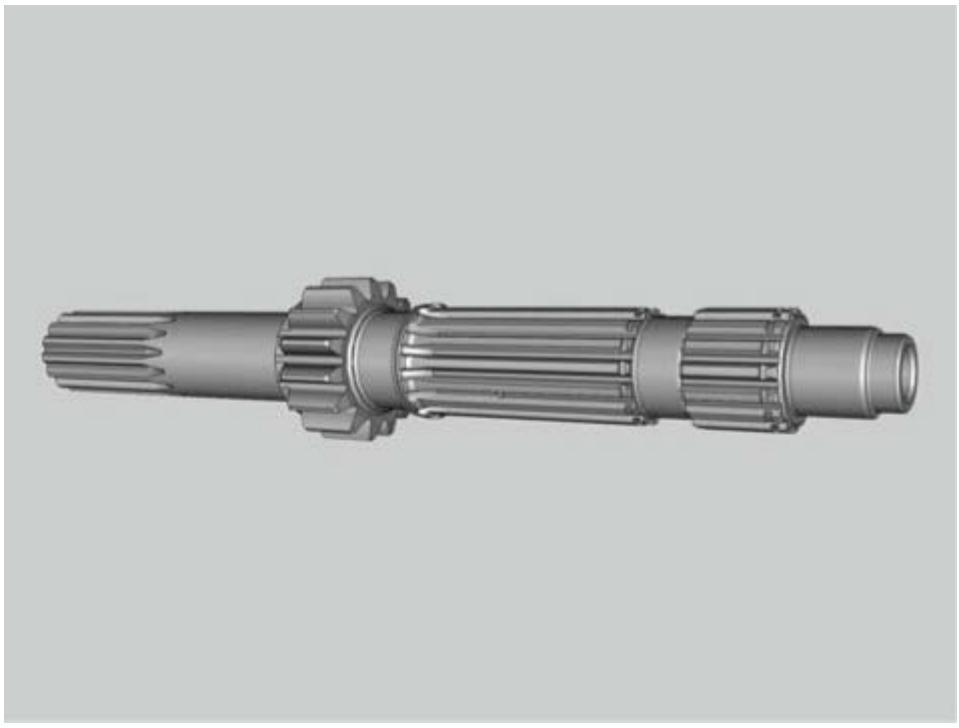
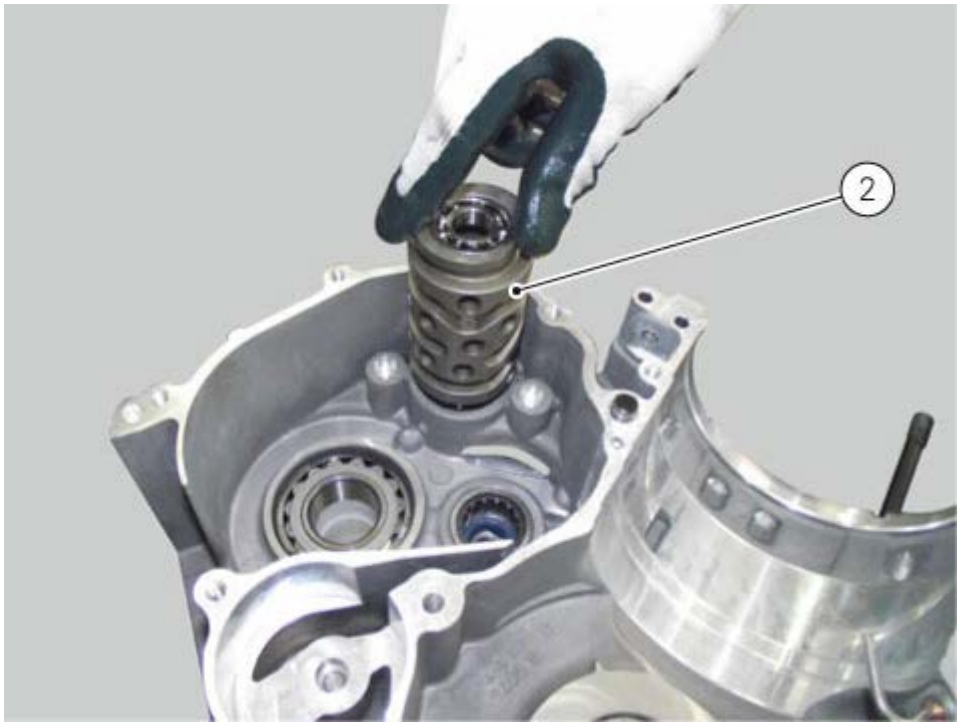


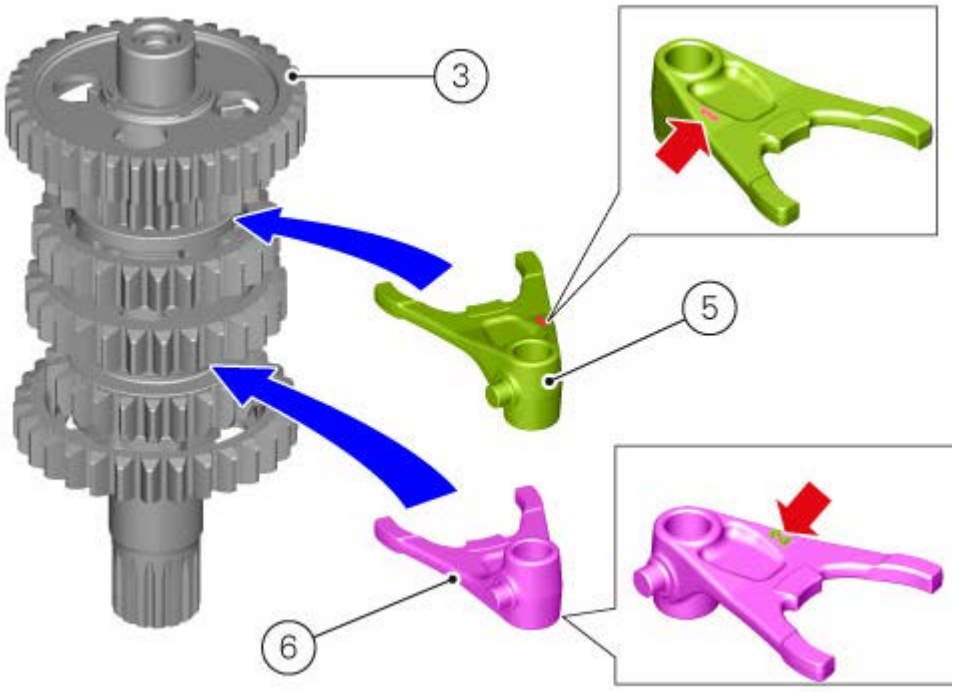
Reassembling the gearbox assembly

Use engine oil to lubricate the desmodromic drum, secondary and primary shaft bearings.

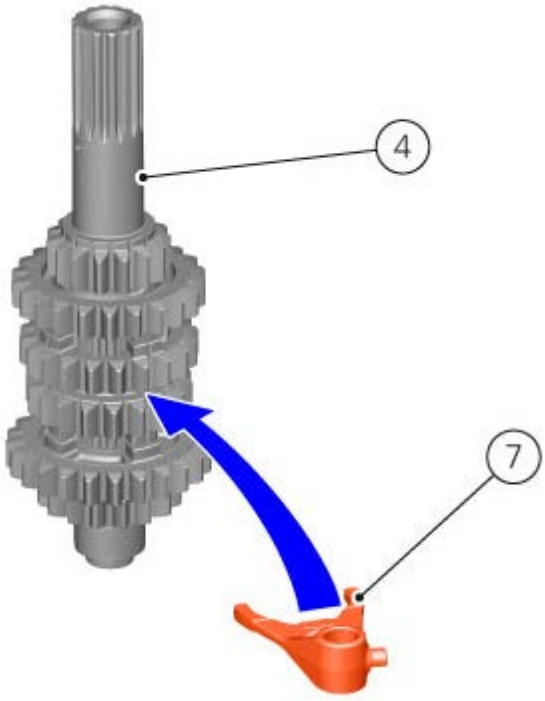
Insert the gearbox desmodromic drum (2) and fit the unit of the gearshift as indicated in paragraph "Refitting the gearchange mechanism".



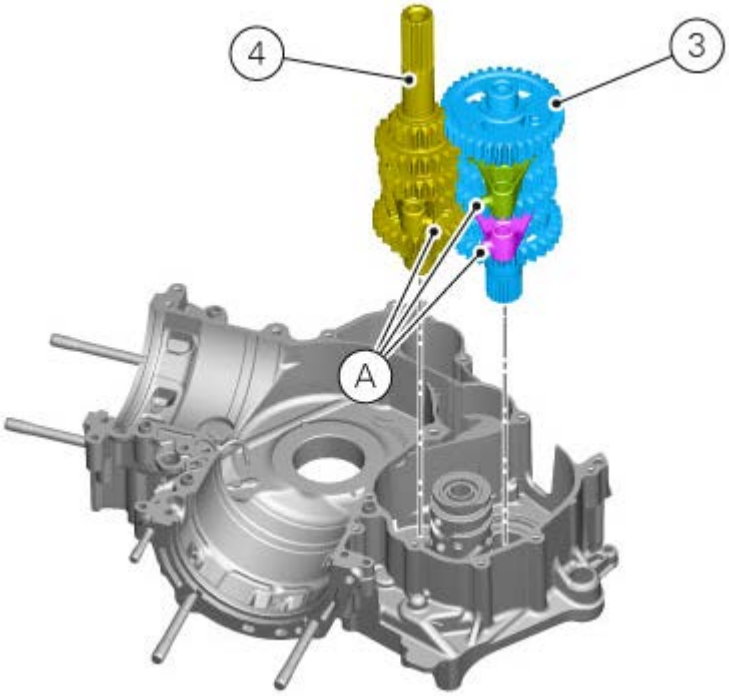
Insert the gearbox fork (5) marked with the stamped reference "1" on the 5th gear of the secondary shaft (3).
Insert the gearbox fork (6) marked with the stamped reference "2" on the 6th gear of the secondary shaft (3).



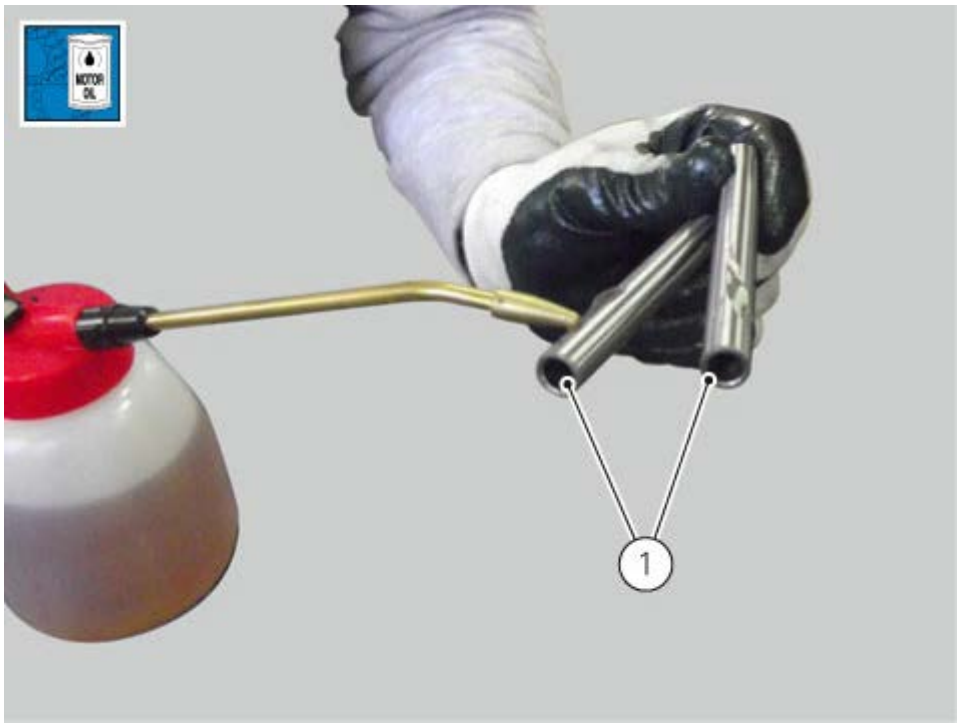
Insert the gearbox fork (7) without reference stamped on the 3rd / 4th gear of the primary shaft (4).



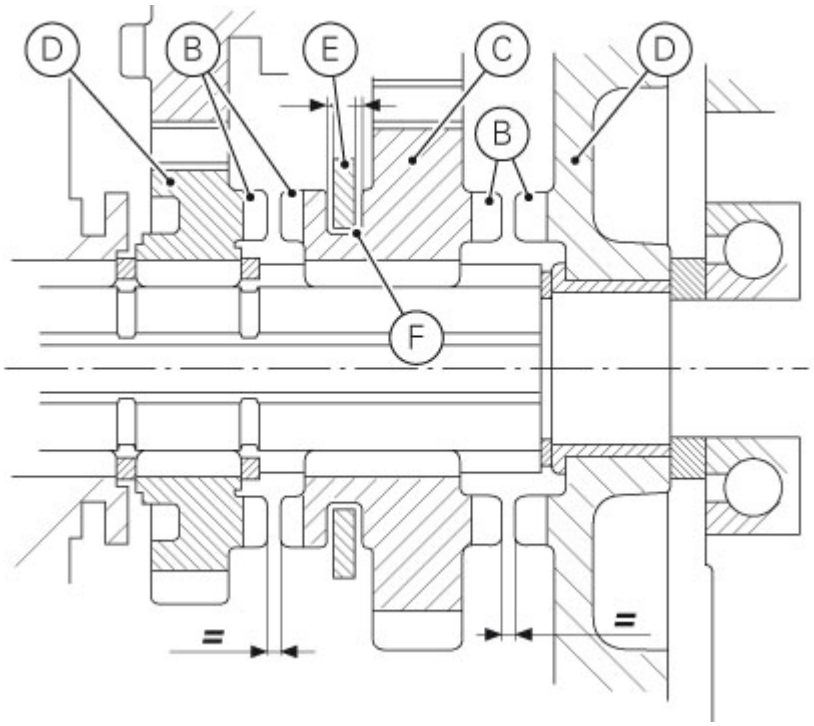
Couple the gears of the primary (4) and secondary shaft (3) and insert them in the relevant seats in the chain side casing.
Make sure the shafts are fully home and that they slide freely.
Insert pins (A) of the gearbox forks in the drum seats.



Use engine oil to lubricate pins (1) and insert in the gearbox forks.
Rotate the drum to facilitate the operation (leaving the 2nd gear engaged).



As a final practical test, ensure that with the gearbox in neutral the front coupling dogs (B) of sliding gears (C) are equidistant on both sides with respect to the corresponding coupling dogs on the fixed gears (D).
Check also that there is always a small amount of clearance between fork (E) and relative groove (F) on sliding gear (C) when engaging the gears.


D
B
E
C
D
B
F
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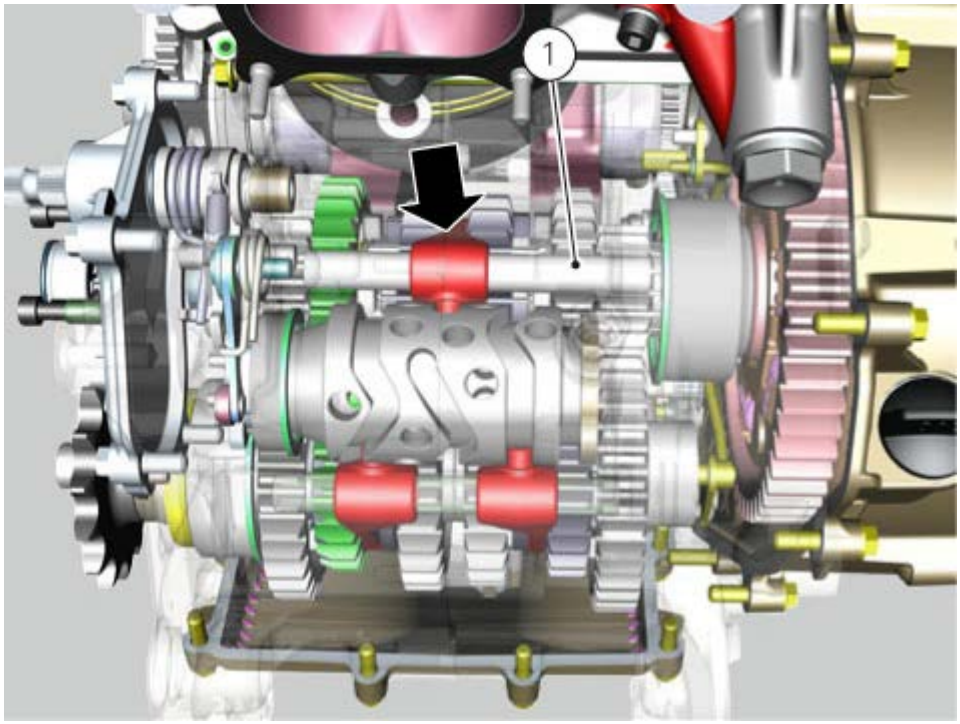
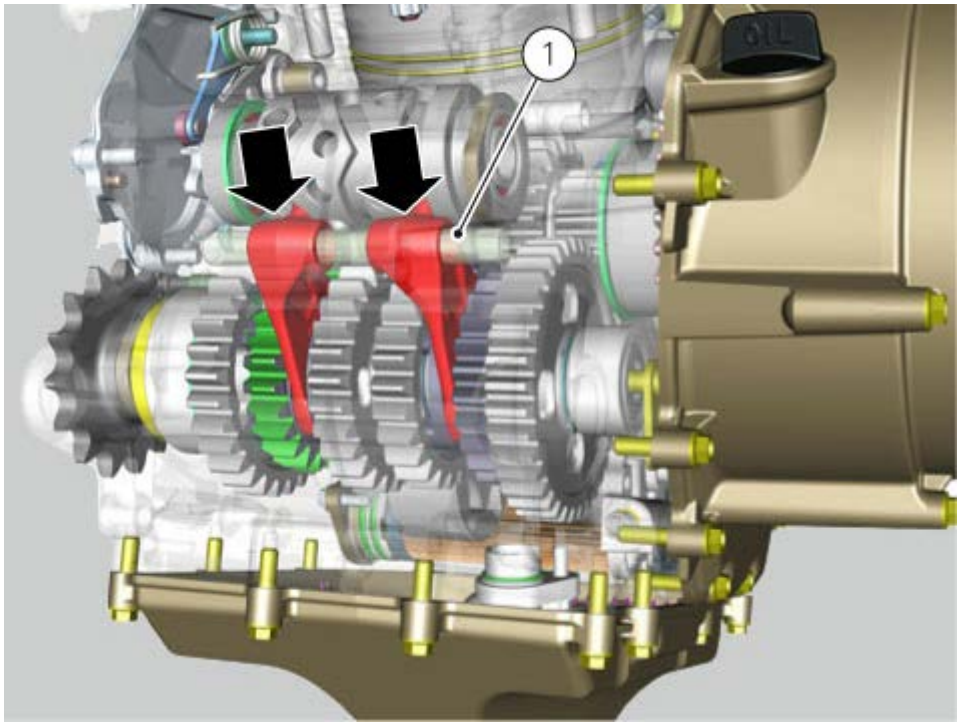
=

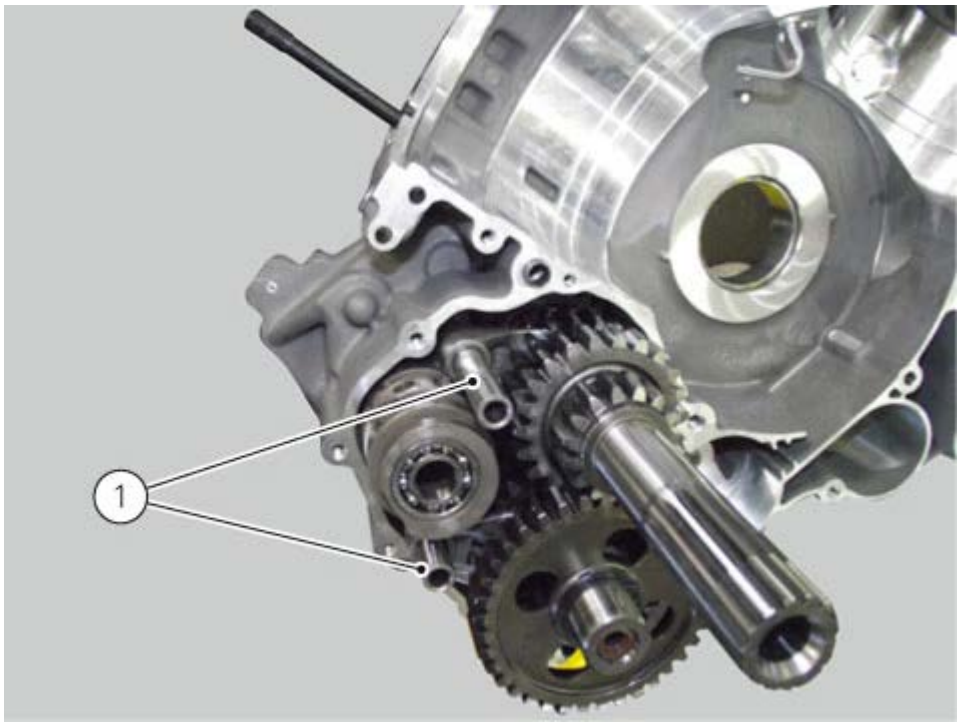
Removing the gearbox assembly

Remove the engine from the frame (Removing the engine).
Separate the crankcase halves (Separating the crankcase halves).

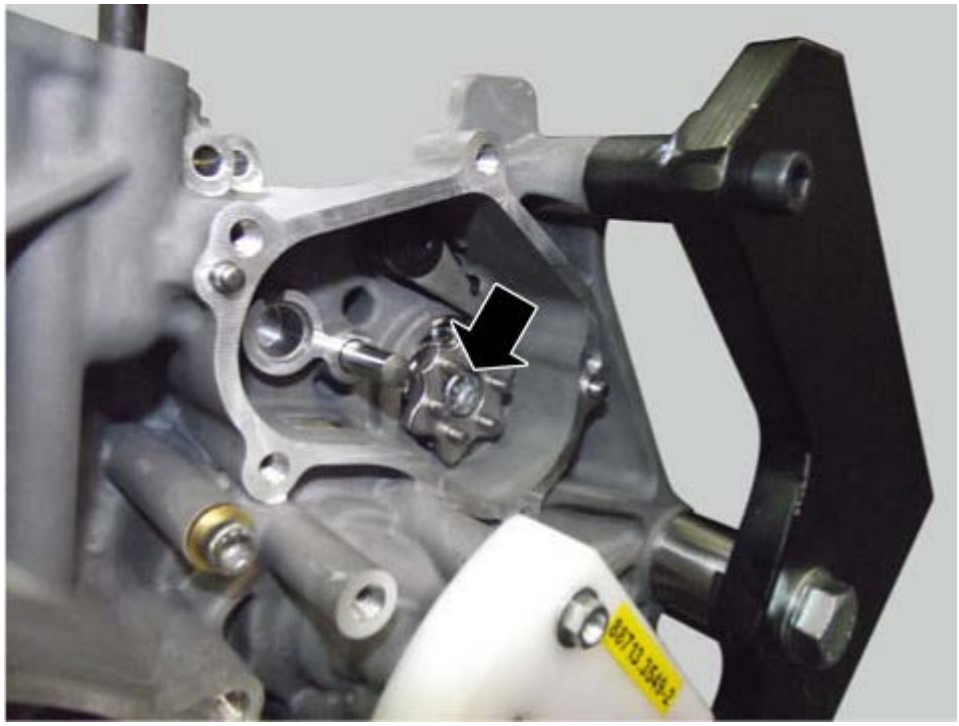
Remove pins (1) of the gear engagement forks.
Move the gear selector forks away from the gearbox desmodromic drum.
Remove the forks from the grooves of the relevant gears.

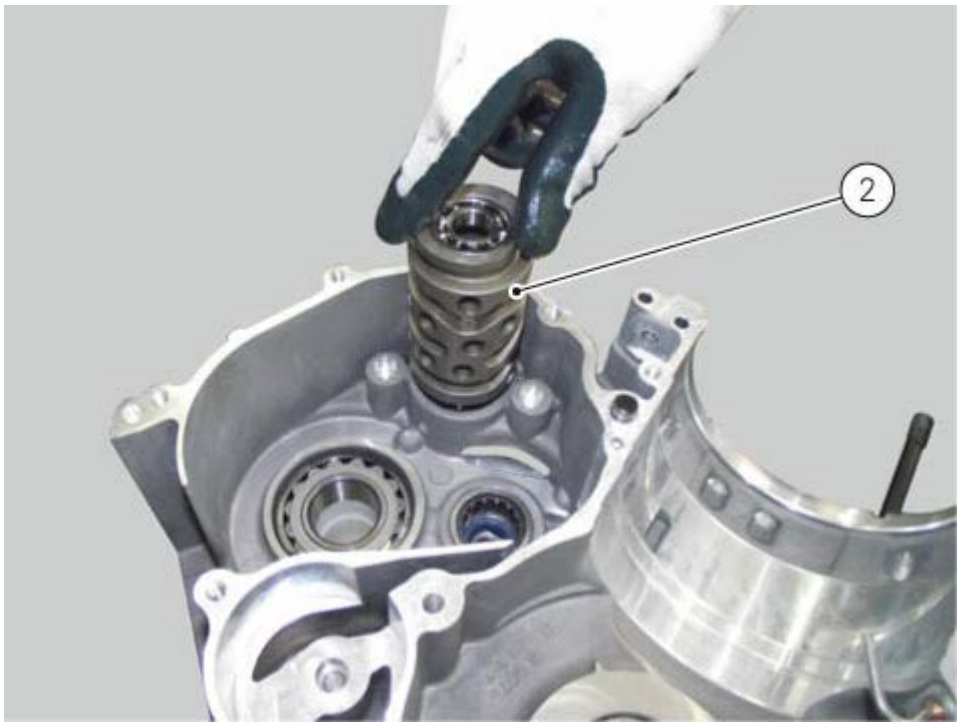


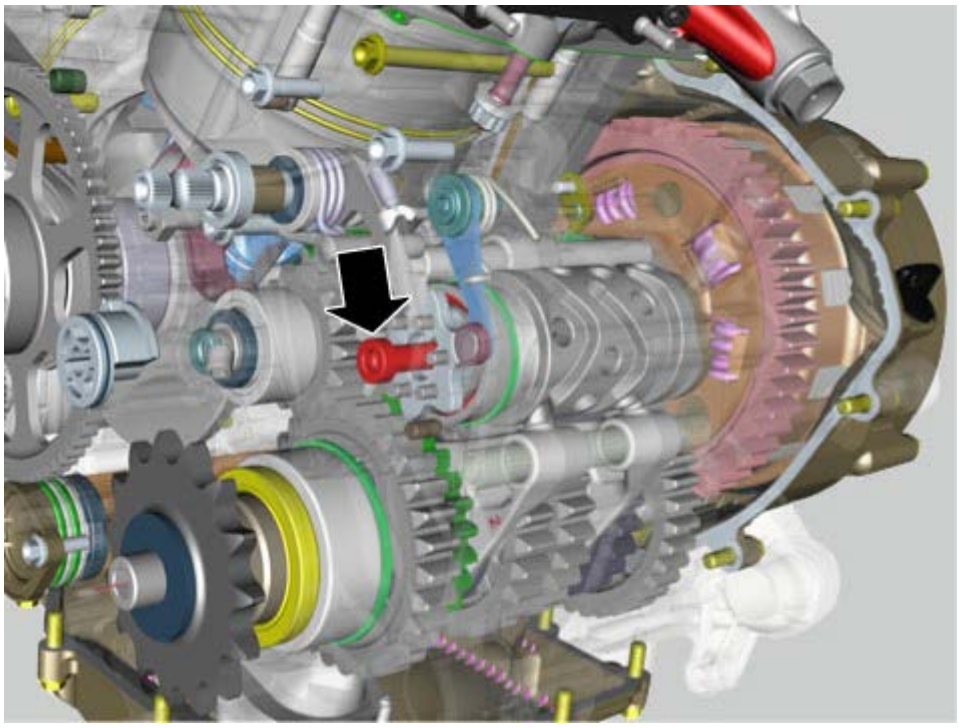




Remove the gearbox desmodromic drum (2) by loosening the screw of the gearbox shift star as indicated in section "Removing the gearchange mechanism".







Remove the gear pack.