2015 DUCATI MULTISTRADA 1200 ABS Workshop Manual

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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.

Smaltimento
This symbol supplies information on the disposal of a substance/material.

Product specifications

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

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

	GREASE C	Bearing/joint grease for parts subject to prolonged mechanical stress. Temperature range: -10 to 110 °C.	SHELL Retinax LX2
	GREASE D	Protective grease, with anti-corrosive and waterproofing properties.	SHELL Retinax HD2
	GREASE E	Grease	PANKL - PLB 05
	GREASE F	Grease	OPTIMOL - PASTE WHITE T
	GREASE G	Grease	PANKL - PLB07
	GREASE H	Grease	KLÜBER STABURAGS NBU 30 PTM
	GREASE I	Copper grease	CUPRUM 320
	LOCK 1	Low-strength threadlocker.	Loctite 222
	LOCK 2	Medium-strength threadlocker, compatible with oil.	Loctite 243
	LOCK 3	High-strength threadlocker for threaded parts.	Loctite 270
	LOCK 4	Surface sealant resistant to high mechanical stress and solvents. Resists high temperatures (up to 200 °C) and pressures up to 350 bar; fills gaps up to 0.4 mm.	Loctite 510
	LOCK 5	Permanent adhesive for freely sliding cylindrical couplings or threaded couplings on mechanical parts. High resistance to mechanical stress and solvents. Temperature range: 55 to 175 °C.	Loctite 128455
	LOCK 6	Pipe sealant for pipes and medium to large fittings. For water and gases (except oxygen). Maximum filling capacity: 0.40 mm (diameter clearance).	Loctite 577
	LOCK 7	Instant adhesive for rubber and plastics with elastomer charged ethylic base.	Loctite 480

			
	LOCK 8	High-strength retaining compound for threaded parts, bearings, bushes, splines and keys. Operating temperature range: 55 to 150 °C.	Loctite 601
	LOCK 9	Medium-strength threadlocker.	Loctite 406
	LOCK 10	Product for metal parts to seal and lock freely sliding cylindrical couplings or threaded couplings. Resistant to high mechanical stress and high temperature, excellent resistance to solvents and chemical attack.	Loctite 128443
	LOCK 11	Medium-strength threadlocker.	Loctite 401
	LOCK 12	Instant adhesive gel offering tensile/shear strength.	Loctite 454 gel
		DUCATI sealing compound.	Three bond 1215 - Sealing compound
		Exhaust pipe sealing paste. Self-sealing paste hardens when heated and resists temperatures exceeding 1000 °C.	Holts Firegum
		Spray used to protect electric systems. Eliminates moisture and condensation and provides excellent corrosion resistance. Water repellent.	SHELL Advance Contact Cleaner
		Dry lubricant, polymerising on contact with air.	Molykote M55 Plus
		Emulsion for lubrication of rubber.	P 80
		Protection lubricant emulsion.	KLUBERPLUS S 06/100
		Lubricant for mechanical elements	Castor oil
		Degreasing agent	Deta Blu

Acronyms and abbreviations used in the Manual

ABS
Antilock Braking System
BBS
Black Box System
CAN
Controller Area Network
DDA
DUCATI Data Acquisition
DSS
DUCATI Skyhook Suspension
DSB
Dashboard
DTC
DUCATI Traction Control
HF
Hands Free
ECU
Engine Control Unit
LIN
Local Interconnect Network

Technological Dictionary

Riding Mode
The rider can choose from four different preset bike configurations (Riding Modes) and pick the one that best suits his/her riding style or ground conditions. The Riding Modes allow the user to instantly change the engine power delivery (ENGINE), the ABS settings, the DTC settings as well as, on "Sport" versions, the suspension settings (DSS).
Available Riding Modes: Sport, Touring, Urban and Enduro.
Within every Riding Mode, the rider can customise any settings.

DSS (Ducati SkyHook System)
Multistrada 1200 is equipped with the brand new suspension control system called DSS (Ducati Skyhook System): DSS is a dynamic suspension damping control system. By selecting a certain Riding Mode, the rider can establish the default suspension behaviour, suspension response and hence the motorcycle response. DSS default setting can be changed using the corresponding menu through the instrument panel. This menu allows the rider to increase or decrease the base damping settings characterising the operation of fork and 25 rear shock absorber for each Riding Mode.

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

Anti-lock Braking System (ABS)
The ABS 9.1ME system fitted to the Multistrada 1200 is a safety system preventing wheel lockup while riding with the motorcycle not leaning over. The Multistrada 1200 ABS also features a "cornering" function that widens ABS functionality to the conditions where the motorcycle is leaning over, thus preventing wheel lockup and slipping as much as possible, within the physical limits allowed by the vehicle and by the road conditions. The Multistrada 1200 ABS implements rear wheel lift-up control and combined braking (from front to rear) in order to ensure not only smaller stopping distance under braking, but also the best possible stability. The system features 3 levels, one associated to each Riding Mode. ABS can be disabled.

Hands Free (HF)
The Hands free system allows the rider to start the motorbike without actually using the ignition key. The key must simply be within a certain range from the motorbike, for instance in the rider's pocket.
The electric steering lock used by the Hands free system locks the handlebar on the right or on the left, making for a more versatile parking solution.
The Hands free system is connected to the other control units on the bike and to the instrument panel via the CAN

line.
The system can enable ignition (key present and recognised) or disable it (key not present or not recognised - immobilizer function) thanks to this line. The instrument panel displays any notice, such as the warnings concerning low key battery or key not present.

Inertial Measurement Unit (IMU)
The Multistrada 1200 is fitted with a Bosch inertial platform, equipped with inertial measurement unit (IMU). The IMU constantly monitors motorcycle incidence and lean angle, matching them with ABS and DWC signals, thereby optimising the efficiency of all these systems, regardless of motorcycle position.

Ducati Cruise Control
Multistrada 1200 features a system for maintaining the cruise speed, the Ducati Cruise Control. System can be enabled with engaged gear equal to or higher than the second gear and vehicle speed ranging between 50 Km/h and 200 Km/h.

Desmodromic Variable Timing (DVT)
Allows optimised timing setting according to engine load and speed, as well as to continuously advance or delay exhaust and intake valve timing through the rotation of the camshafts, thereby ensuring utmost efficiency throughout the rpm range and high performance at high speed, with an optimised torque curve at low rpm.

General maintenance instructions

Useful tips

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

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

General advice on repair work

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

General safety rules

Carbon monoxide

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

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

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

Fuel

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

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

Hot parts

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

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

Used engine oil

Warning
Wear suitable gloves to work with engine oil. Keep away from children.

Brake dust

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

Brake fluid

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

Coolant

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

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

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

Battery

 Warning

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

Identification data

Each Ducati motorcycle is identified by two numbers, one for the frame and one for the engine.

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

DATA STAMPED ON THE FRAME

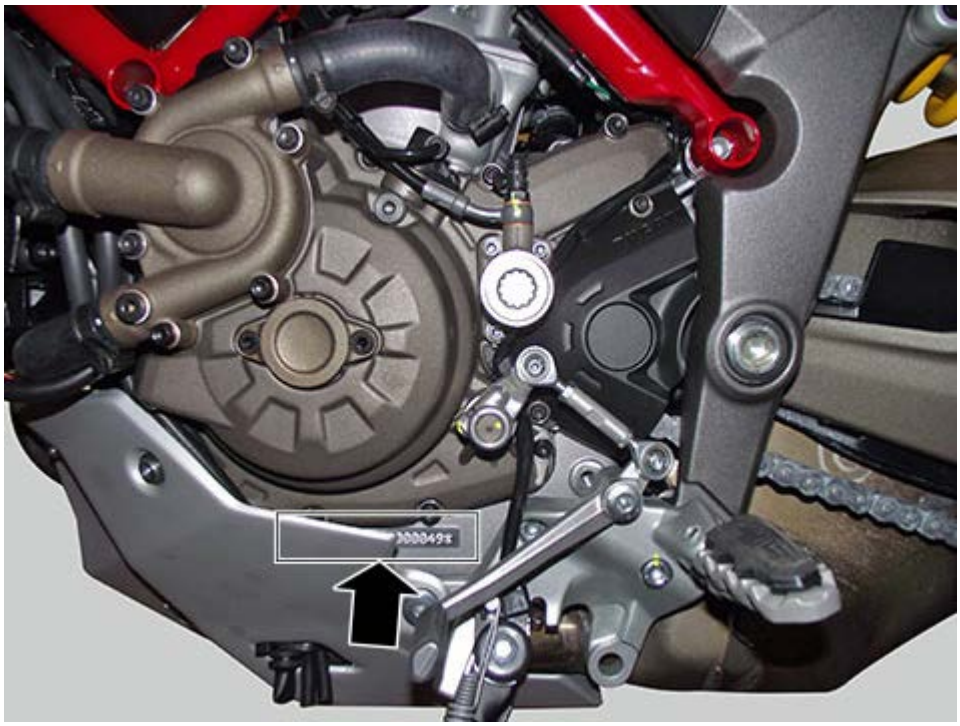
Example: ZDM 12 BWW? # B ?????

Following is the table with the frame part numbers.

VERSION	1	2	3	4	5	6
Frame	ZDM	12	BWWW	#	B	?????

1 Manufacturer: Ducati Motor Holding
2 Type - identical for all models
3 Variant
4 Model Year: F for 2015 models, G for 2016 models
5 Model Year:
(C=2012)
(D=2013)
6 Manufacturing facility
7 Progressive serial no.

DATA STAMPED ON ENGINE



Examples:
2BW # ??????

Following are the tables with the frame part numbers.

VERSION	**1**	**2**	**3**
Engine version	2BW	#	??????

1 Engine type
2 Model Year: F for 2015 models
3 Progressive production no.

Lights/Instrument panel

	Reference	Technical specifications
Headlight	low beam lamp type	No. 2 bulbs H11 12V-55W
	high beam lamp type	No. 2 bulbs H11 12V-55W
Parking light	Lamp type	LED
Tail and stop light	Lamp type	LED
Front turn indicators	Lamp type	LED (9.8 V - 2.2 W)
Rear turn indicators	Lamp type	RY10W amber (halogen) (12V-10W)
Number plate light	Lamp type	C5W (12 V - 5 W)

Fuse box (A) key		
Pos	El. item	Rat.
1	KEY EMS / ABS / IMU	5 A
2	KEY DSB / BBS	15 A
3	KEY Lights	5 A
4	-	-
5	KEY Accessories	10 A
6	+30 Hands Free	25 A
7	+30 Diagnosis / charge	7.5 A

Fuse box (B) key		
Pos	El. item	Rat.
1	+30 EMS LOAD RELAY	25 A
2	+30 FUEL PUMP RELAY	10 A
3	+30 Starter RELAY	7.5 A
4	+30 Instrument panel	20 A
5	+30 Black Box System (BBS)	10 A
6	+30 ABS UBMR	25 A
7	+30 ABS UBVR	15 A

Injection system

	Make	Type
Control unit	BOSCH	ME7921

Fuel system

Important

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

Warning

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

	Make	Type
	Throttle body	With oval cross-section, Ø 56 mm
	Injectors per cylinder	1
	Firing points per injector	10

Ignition system

	Reference	Technical specifications
Starting	Type	Electric starter motor 12 V - 0.7 kW
Spark plugs	Make and type	NGK MAR10A-J
	Electrode gap	0.8±0.1 mm

Charging system/generator

	Reference		Technical specifications
Battery	Voltage		12 V
	Charge		10 Ah
	Type		Sealed-type, maintenance-free
Generator	Denso Hi-Frequency		
	Capacity		12 V - 500 W
	1500 rpm		
	Active voltage	27.5 V	
	Minimum voltage	25.2 V	
	Maximum voltage	33 V	
	2500 rpm		
	Active voltage	45 V	
	Minimum voltage	41.1 V	
	Maximum voltage	54.1 V	

Hydraulic brakes

	Reference	Standard value	Service limit
FRONT			
Brake disc	Type	Semi-floating drilled dual disc	
	Braking surface material	Steel	
	Disc diameter	330 mm	
Brake calliper	Make	Brembo	
	Type	M4.32B	
	Calliper cylinder diameter	32	
	Pad friction material	BR M11E HH	
Master cylinder	Type	PR 16/19	
	Master cylinder diameter	16 mm	
REAR			
Brake disc	Type	Fixed drilled disc	
	Thickness	5 mm	4.5 mm (min.)
	Flange material	steel	
	Diameter	265 mm	
Brake calliper	Make	Brembo	
	Type	PF 2X28	
	Calliper cylinder diameter	34 mm	
	Pad friction material	TT 2181 FF	
Master cylinder	Type	PS13	
	Master cylinder diameter	13 mm	

Rear suspension

	Reference	Technical specifications
Type		SACHS: progressive with monoshock absorber with adjustable rebound, compression and spring preload.
Shock absorber	Stroke	59.5 mm
	Wheel travel	170 mm

Rear wheel

	Reference	Standard value	Service limit
Minimum tread depth	In the most worn part		2 mm
Tyre pressure	Cold	2.5 bar (rider only) 2.9 bar (with pillion rider and/or bags)	
Swinging arm shaft runout	On 100 mm		0.2 mm
Wheel rim runout	Radial	0.8 mm	2 mm
	Axial	0.5 mm	2 mm
Drive chain	Make	Regina	
	Type	136 ZRPB	
	Size	5/8" x 1/16"	
	No. of links	108	

Front suspension

	Reference	Technical specifications
Type		KAYABA: hydraulic upside-down fork with external adjusters for rebound, compression, and preload (for inner springs of fork legs).
	S Version	SACHS: upside-down fork completely adjustable in rebound and compression, electronic control.
	Travel on leg axis	170 mm
Fork	Oil quantity, per leg	556 cc (per leg)

Front wheel

	Reference	Standard value	Service limit
Minimum tread depth	In the most worn part		2 mm
Tyre pressure	Cold	2.5 bar (rider only) 2.5 bar (with pillion rider and/or bags)	
Wheel shaft runout	On 100 mm		0.2 mm
Wheel rim runout	Radial	0.8 mm	2 mm
	Axial	0.5 mm	2 mm

Cooling system

	Reference	Technical specifications
Type	Liquid-cooling with two closed-circuit radiators with twin bent radiator, twin fan and mixing thermostat.	
Coolant capacity		2.5 litres
Thermostat	Starts opening at	65 °C ±2 °C
	Electric fan enabling	103 °C
	Electric fan disabling	102 °C

Gearbox

	Reference	Standard value	Service limit
Gearbox shafts	End float		0.05÷0.20 mm
Selector drum	End float		0.10÷0.40 mm
Gear selector fork	Fork slider thickness	3.90÷4.00 mm	
	Fork–to-gear clearance	0.070÷0.285 mm	0.4 mm

Cylinder/piston

	Reference	Standard value	Service limit
	Cylinder nominal diameter	106 mm	
	Max. oval		0.010
	Max. taper		0.015
	Diameter Section A Section B Section C	106.000 mm ÷ 106.010 mm 106.010 mm ÷ 106.020 mm 106.020 mm ÷ 106.030 mm	
Piston-to-bore clearance		0.065 ÷ 0.085 mm	
Piston	Nominal diameter	106 mm	
	Diameter Section A Section B Section C	105.905 mm ÷ 105.915 mm 105.915 mm ÷ 105.925 mm 105.925 mm ÷ 105.935 mm	
Connecting rod	Connecting-rod big-end diameter	49 mm	
	Crankshaft class	Connecting rod class	Bearings colour
Big-end bearing pairings	A B A B	A A B B	Yellow + BLUE BLUE + BLUE YELLOW + YELLOW YELLOW + BLUE
Big-end bearing-to-crankpin clearance	Crankpin selection	Ø 42.014 mm/0÷0.016 mm	
Gudgeon pin–to-piston clearance		0.015 ÷ 0.024 mm	
	Nominal diameter	Ø 20 mm	
	Piston	Ø 20 mm / 0.020÷ 0.015	
	Gudgeon pin	Ø 20 mm / 0 ÷ 0.004	
Gudgeon pin-to-connecting rod clearance		0.035 ÷ 0.049 mm	

Crankshaft

	Reference	Standard value	Service limit
Crankshaft	Oval		0.005 mm
	Taper		0.005 mm
	Main journals alignment		0.01 mm on diameter

Timing system/valves

	Reference	With 1 mm valve clearance	With 5 mm valve clearance
Timing diagram			
	Intake	Opening - 22° ± 3° B.T.D.C. Closing 84° ± 3° A.T.D.C.	Opening - 59° ± 3° B.T.D.C. Closing 44° ± 3° A.T.D.C.
	Exhaust	Opening - 80° ± 3° B.B.D.C. Closing -15° ± 3° A.T.D.C.	Opening - 40° ± 3° B.B.D.C. Closing -59° ± 3° A.T.D.C.
	Intake valve diameter	43.5 mm	
	Exhaust valve diameter	34.5 mm	
Valve lift	With 0 mm valve clearance	Intake 12.2 mm Exhaust 11.2 mm	
	Opening rocker arm - intake	0.13÷0.18 mm	
	Opening rocker arm - exhaust	0.13÷0.18 mm	
	Closing rocker arm - intake	0.05÷0.10 mm	
	Closing rocker arm - exhaust	0.05÷0.10 mm	
	Reference	Assembly value (new belt)	Recovery value (used belt)
Cold belt tension adjustment	DDS		
	New belt	90 ± 5 Hz (horizontal) 90±5 Hz (vertical)	
	Used belt	80±5 Hz (horizontal) 80±5 Hz (vertical)	

Transmission

	Reference	Technical specifications
	Clutch	Wet type with multiple plates
	Clutch control	Hydraulic
	Gearbox	6 speed
	Primary drive	33/61
	Drive ratio	1.84
	Final drive	15/40
	Gearbox type	With constant mesh spur gears, operated by a lever on the left side of the motorcycle
Transmission	Gear ratios	
	1st	15/37
	2nd	17/30
	3rd	20/27
	4th	22/24
	5th	24/23
	6th	25/22

Colours

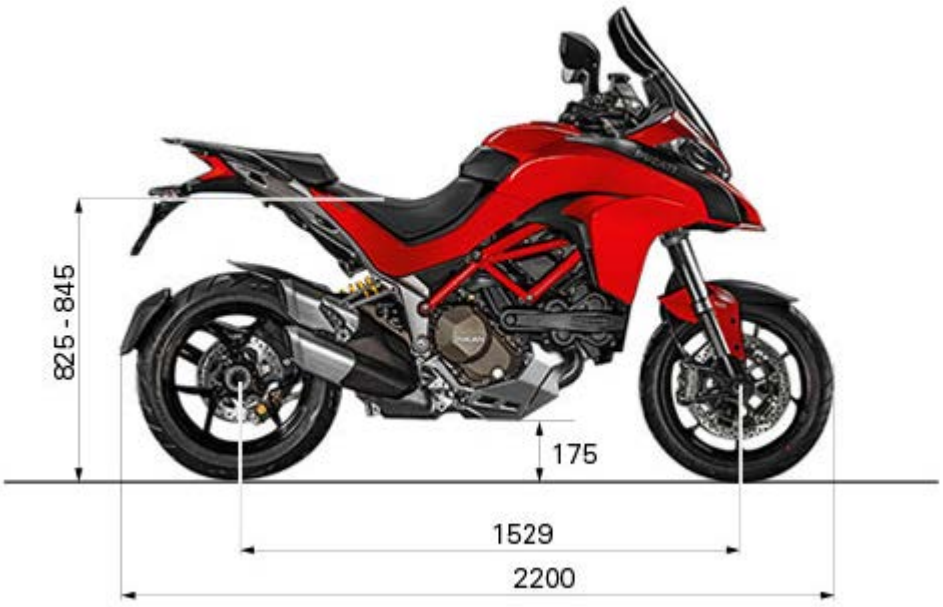
Ducati Anniversary Red Primer Acriflex White Varnish Acriplast Red Stoner SF Frame, Racing Black Subframe, Mercury Gray Rims, Glossy Black	— L0040652 (Lechler) LMC06017 (Lechler)

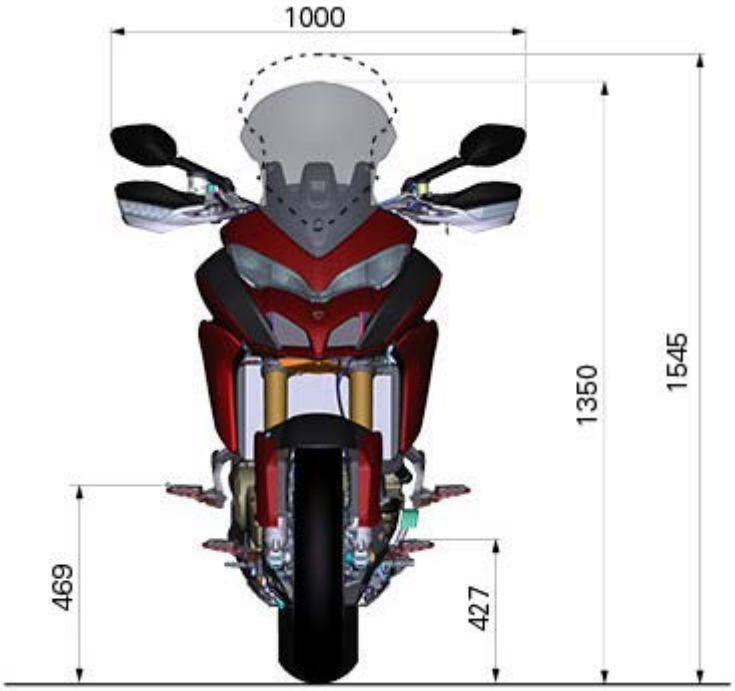
General

	Reference	Technical specifications
Motorcycle dimensions	Total length	2200 mm
	Total width	980 mm
	Max. width	1000 mm
	Total height	from 1350 mm (Plexiglas all down) to 1545 mm (Plexiglas all up)
	Seat height	825 - 845 mm
	Minimum ground clearance	175 mm
	Front footpeg height	427 mm
	Wheelbase	1529 mm
Frame	Type	ALS420 steel tubular trellis
Subframe	Type	Two aluminium gravity cast elements. Plus fibreglass-charged technopolymer bearing element.
	Steering head angle	24°
	Steering angle	40° RH/LH
	Trail	106 mm
	Front suspension	KAYABA: Hydraulic upside-down fork adjustable in compression, rebound and spring preload.
	Front wheel travel	170 mm
	Rear suspension	SACHS: Shock absorber adjustable in rebound, compression and with remote control of the spring preload. Pivoted on the top of the frame and on the bottom of the frame to a light alloy swinging arm that rotates around the pivot. Rear wheel travel: 170 mm
	Front wheel rim	Light alloy with three Y-shaped spokes
	Front wheel rim size	MT 3.50x17"
	Front tyre size	120/70 - ZR 17
	Rear wheel rim	Light alloy with three Y-shaped spokes
	Rear wheel	MT 6.00x17"

	rim size	
	Rear tyre size	190/55 - ZR 17
	Type of tyres	Radial tubeless tyres
	Front brake	Hydraulic, 2 callipers with ABS as a standard
	Rear brake	Hydraulic, 1 calliper with ABS as a standard
Engine	Type	Ducati Testastretta with DTV system, twin cylinder "L" type, 4 valves per cylinder.
	Bore	106 mm
	Stroke	67.9 mm
	Displacement	1198.4 cu.cm
	Compression ratio	12.5±0.5:1
	Timing system	Toothed belt type with two overhead camshafts, 4 valves per cylinder with DTV system
	Lubrication system	Forced lubrication by pump with two cooling radiators
	Oil pump type	Gear type, with bypass valve
	Cooling system	Liquid cooling with 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 and impair the performance of your motorcycle, and you may lose control of the motorcycle.

Fuel, lubricants and other fluids	Type	cu. dm(litres)
Fuel tank, including a reserve of 5 cu. dm(litres)	Unleaded fuel with 95 RON fuel octane rating (at least) For the US market, unleaded fuel with 90 (RON+MON)/2 fuel octane rating (at least).	20
Oil sump and filter	Ducati recommends you use Shell Advance 4T Ultra 15W-50 oil. As an alternative it is possible to use a motorcycle engine oil having the same degree SAE 15W-50 and meeting the following specifications JASO: MA2 and API: SM.	4.10
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	556 cc (per leg) (*)
Cooling circuit	ENI Agip Permanent Spezial antifreeze (do not dilute, use pure)	2.3

(*) Value refers to the air column between oil free surface and sleeve end, with sleeve in fully lowered position and without spring and preload tube inside fork leg.

Important

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

Warning

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

Engine oil

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

Recommendations concerning oil

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

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

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

Frame tightening torque values

Part	Thread (mm)	Nm ±10% Tolerance	Notes
ACCESSORIES AND OUTFIT			
Footpeg — pannier low. bracket retainer	M6x1	10	GREASE B
Heat guard to pannier retainer	M6x1	8	
D-Air accelerometer bracket retainer	M5x0.8	3	
D-Air accelerometer bracket to fork bottom end retainer	M5x0.8	5	
STAND			
Stand sensor retaining screw	M6x1	5	pre-applied threadlocker
Stand retaining screw	M8x1.5	18	GREASE B
Central stand retaining screw	M18x1.5	50	pre-applied threadlocker
Spring retainer pin	M6x1	10	LOCK 2
CHAIN - FRONT SPROCKET			
Sprocket retaining nut	M25x1.5	186 ± 5%	GREASE B
Sprocket cover retaining screw	M6x1	6	LOCK 2
LIGHTS			
Headlight to front subframe retainer	M5x0.8	5	LOCK 2
Tail light retaining screw	M5x0.8	5	
Rear turn indicator retaining screw	M5x0.8	3	LOCK 2
Left rear-view mirror retaining screw	M10x1.25	40	
Right rear-view mirror retaining screw with left threading	M10x1.25	40	
Front turn indicators on hand guards	AF 3.5	0.45	
Number plate light retaining screw		1.5	
INSTRUMENT PANEL			
Retainer on instrument panel	Silent Block M5	Manual	
Instrument panel retaining nut on panel	M5	3	
FRONT FORK			
Steering head clamp retaining screws	M6x1	10*	GREASE B - Sequence: 1-2-1
Screw retaining steering bearing ring nut on head	M8x1.25	18*	GREASE B

Screw securing handlebar stud bolt on head	M10x1.25	45*	LOCK 2
Bearing preload ring nut fastener	M35x1	30*	GREASE B - Sequence: 1-2-1
Steering stop adjuster lock nut fastener	M8x1.25	18	
Bottom yoke terminal screws	M8x1.25	16*	GREASE B - Sequence: 1-2-1
Handlebar U-bolt retaining screw	M8x1.25	25*	GREASE B - Sequence: 1-2-3-4-3
Screw securing front brake hose guide to bottom yoke	M6x1	10	
SACHS bottom end clamp retaining screws		10*	Sequence: 1-2-1
Screws retaining splash guard to bottom yoke	M5x0.8 special screw	3	pre-applied threadlocker
Hands free control pin retaining screw	M6x1	6	LOCK 2
Bottom yoke to accelerometer fastener	M5x0.8	5	
Accelerometer to bracket fastener	M5x0.8	5	
Accelerometer bracket to left fork bottom end fastener	M5x0.8	5	
Kahaba fork bottom end clamp retainer	M8x1.25	19*	GREASE B
LH accelerometer bracket to left fork bottom end fastener	M5x0.8	5	
ELECTRICAL - ELECTRONIC SYSTEM			
Hands-Free retainer	M6x1	shear screw	LOCK 2
Hands-Free antenna retainer	AF4	1	
Electrical components support front retaining screws	M6x1	10	
Rear vibration damping pads to compartment retaining nuts	M6x1	5	
Battery bracket retaining screw	M5x0.8	5	
Front screw retaining starter contactor bracket to compartment	AF5	2	
Screws retaining regulator bracket to compartment	M6x1	5	
Screws securing regulator to bracket	M6x1	10	
Bosch inertial platform on bracket retainer	M6x1	6	
Bosch inertial platform on compartment retainer	AF4	1	
Cable ring to compartment retainer	AF4	1	
Fuse support bracket fastener	AF5	2	
Seat lock cover to compartment bracket retainer	AF4	1	

Seat lock to glove compartment retaining nut	M22x1.5	3	
Retainer securing battery cables and starter motor to starter contactor	M6x1	4	
Central vertical coil to bracket fastener	M6x1	9	
Central vertical coil to RH frame retainer	M5x0.8	5	
Horizontal coils to bracket fastener	M6x1	9	
Central horizontal coils to RH frame retainer	M5x0.8	5	
LH vertical coil to support bracket fastener	M5x0.8	5	
Temperature sensor to airbox cover fastener	AF3	0.5	
Temperature sensor to central conveyor fastener	AF3	0.9	
Map sensor to lower airbox support retainer	AF5	2	
Retainer securing horn to support bracket	M8x1.25	22	
Horn bracket to horizontal cylinder retainer	M6x1	10	
Power socket to glove compartment retainer	M18x1	3	
Rear brake STOP switch to support	M8x1	5	
Power socket to headlight fairing retainer	M18x1	3	
Starter motor cable retainer	M6x1	5	GREASE D
Screw securing ground cable to crankcase	M6x1	10	
Knock sensor retaining screw	M8x1	25	
BRAKE SYSTEM: ABS			
ABS control unit bracket retaining screws	M6x1	5	
Front calliper retainer	M10x1.25	45*	GREASE B
Rear calliper fastener	M8x1.25	25*	GREASE B
Brake master cylinder and stop sensor bracket to footpeg holder plate retainer	M6x1	10	
Fluid reservoir to bracket fastener	M5x0.8	2	
Rear brake fluid reservoir support to subframe fastener	M5x0.8	2	
Front brake master cylinder clamp	M6x1	10	
Retainer securing front brake fluid reservoir to hand guard	M5x0.8	2	
Rear brake hose guide to swinging arm fastener	M6x1	5	
Retainer securing ABS control unit to bracket	M6x1	8	
Front ABS sensor retainer	M6x1	10	
Rear ABS sensor retainer	M6x1	10	

Filler plug on ABS control unit retainer	M12x1	32*	
Two front calliper bleed screws, one front brake and one rear brake	M6x1	5.5	
Front break plug screw retainer	M4x0.7	0.7	
Filler plug on control unit retainer	M10x1	24.5*	
Filler plug to front RH calliper Version S	M10x1	24.5*	
RH front calliper bleed retainer, base version	M10x1	24.5*	
Front LH calliper to union retainer	M10x1	24.5*	
Filler plug to front LH calliper Version S	M10x1	24.5*	
REAR SWINGING ARM			
Upper sliding shoe and chain guard retaining screw	M5x0.8	5	LOCK 2
Lower chain sliding shoe retaining screw	M5x0.8	5	LOCK 2
Eccentric hub screw	M12x1.25	35*	GREASE B - Sequence: 1-2-1
Swingarm shaft screw	M15x1.25	72*	GREASE B
Rear brake calliper holder plate locking pin	M12x1.25	33*	LOCK 8
Accelerometer to brake line protection fastener	AF5	2.5	
HANDLEBAR - CLUTCH CONTROL			
Clutch master cylinder retaining screws	M6x1	10	Sequence: 1(UP)-2-1
Screws retaining hand guard to master cylinder	M6x1	10	
Screws retaining hand guard to clamp	M5x0.8	5	
Screws retaining clutch slave cylinder to casing	M6x1	10	Sequence: 1-2-3-1
Throttle control retaining screws	M5x0.8	4.5	
Clutch fluid reservoir retaining screw	M5x0.8	2	
Handlebar counterweight fastener	M6x1	10	
Right-hand heated handgrip fastener	AF4	2.8	GREASE B
Lower to upper hand guard fastener	AF 3.5	0.45	
Filler plug to clutch slave cylinder retainer	M10x1	24.5*	
Clutch bleed on master cylinder retainer	M6x1	5.5	
REAR SUSPENSION			
Rear shock absorber upper retaining screw	M10x1.25	50*	GREASE B
Rear shock absorber lower retaining screw	M10x1.5	42*	GREASE B

Screw securing Sachs preload adjuster to support	M6x1	10	
Angular sensor con-rod to swinging arm support sensor retainer	M6x1	5	
Angular sensor to sensor plate retainer	M5x0.8	3	
Angular sensor plate to engine support retainer	AF5	2	
FRONT MUDGUARD			
Screw securing mudguard to fork	M6x1	5	
Screw securing hose guide to mudguard	M5x0.8	3	
LIQUID COOLING			
Radiator upper retaining screw	M6x1	10	
Screw securing cowling bracket on radiator on threaded pin head	M6x1	6	
Radiator lower retaining screw	M6x1	8	
Expansion reservoir retaining screw	M5x0.8	5	
Tie on water pump hose fastener	Ties/clamps	3	
Expansion reservoir hose tie on radiator fastener	Ties/clamps	1	
Expansion reservoir hose tie on reservoir fastener	Ties/clamps	1	
Water hose clamp on radiator fastener	Ties/clamps	3	
Horizontal cylinder bleed tie	Ties/clamps	1	
Water bleeder cap on left casing	Ties/clamps	15	
FOOTPEGS AND LEVERS			
Brake lever and gearbox on frame plate retaining screws	M8x1.25	23	pre-applied threadlocker
Brake lever spacer retaining screw	M6x1	10	
Screw securing gearbox lever on shaft	M6x1	10	LOCK 1
Gearchange transmission rod joint retaining screws	M6x1	10	
Passenger footpeg holder retaining screws	M8x1.25	24	pre-applied threadlocker
Brake lever rear lug pivot screw	M6x1	5	LOCK 2
Brake lever adjuster screw nut	M6x1	5	
Brake master cylinder control rod nut	M6x1	7.5	
RH and LH footpeg holder plates to subframe retainer	M10x1.5	42	
LH footpeg holder plate to engine retainer	M10x1.5	42	
REAR MUDGUARD			
Screw securing mudguard to swinging arm right side	M5x0.8	5	

Screw securing mudguard to swinging arm+brake hose guide	M5x0.8	5	
Screw securing carbon mudguard to swinging arm+hose guide (PP)	M5x0.8	5	
Screw securing carbon mudguard to swinging arm right side (PP)	M5x0.8	5	
Screw securing splash guard to swinging arm	M6x1	10	pre-applied threadlocker
FRONT WHEEL			
Screw securing brake discs and phonic wheel to wheel rim	M8x1.25	30*	LOCK 2
Wheel shaft retaining nut	M25x1.25	63*	GREASE B underhead and Pin thread
Front wheel (angle) valve retaining nut	M8x1.25	9	LOCK 2
REAR WHEEL			
Screw securing phonic wheel to disc	M5x0.8	5	pre-applied threadlocker
Brake disc retaining screw	M8x1	27	pre-applied threadlocker
Right and left rear wheel retaining screw		230	
Silentblock retaining nut	M10x1	44	LOCK 2
Rear wheel valve retaining hexagon nut	M8x1.25	9	
FUEL TANK			
Fuel tank plug retaining screw	M5x0.8	4	
Front block retaining screws	M6x1	10	
RH and LH plates to tank support retainer	M6x1	5	
Fuel sensor ring nut retainer		8	
GAC retaining nuts	M5x0.8	6	
Tank support to engine special screw/nut retainer	M6x1	5	
Bracket to canister support retainer with blind nuts	M6x1	5	
Canister support to engine fastener	M5x0.8	5	
EXHAUST			
Right and left con-rod to pre-silencer fastener	M6x1	10	
Right and left con-rod to footpeg holder fastener	M6x1	10	
CO plug	G 1/8	25	
Pre-silencer to vertical pipe retainer		18	
Lambda sensor fastener	M18x1.5	24.5	

Motor support to subframe plate retainer	M5x0.8	5	
Retainer securing valve motor to support	AF4	2	
Bowden cable adjuster to exhaust retaining nut	M6x1	2.5	
Nut securing exhaust to vertical head	M6x1	10	
Nut securing exhaust to horizontal head	M6x1	10	
Heat guard nut tightening	M6x1	5	
Plastic heat guard to glove compartment retainer	M5x0.8	5	
Plastic heat guard to glove compartment retainer	AF4	2	
Silencer central cover to split tail pipe silencer retainer	M5x0.8	5	
Upper and lower cover to silencer fastener	M5x0.8	5	
Split tail pipe clamp retainer	M8x1.25	22	GREASE B
Secondary air system actuator to airbox fastener	AF5	2	
RH silencer con-rod to subframe plate retainer	M6x1	10	
SEAT			
High seat RH and LH aesthetic support retaining screws	M5x0.8	4	
High seat support retaining screws	M5x0.8	4	
Rider seat adjustment eccentric retaining screw	M5x0.8	2	
Passenger rider seat spacer retaining screw	M5x0.8	2	
Seat latch special retaining screw	M6x1	8	
FRAME			
Frame-plate adjuster retaining screws	M10x1.5	50*	GREASE B
Frame to engine front retaining screw with special nut	M12x1.5	60*	GREASE B
Frame to engine rear retaining screw with special nut	M2x1.5	60*	GREASE B
Adjuster retainer	M 20x1	80*	GREASE B
Rear subframe RH and LH to crankcase lower retainer	10x1.25	42*	LOCK 8
Rear junction plate retainer	M6x1	10	LOCK 2
Side pannier plate to rear subframe retainer	M6x1	10	
RH and LH side panels to RH and LH rear subframe special retaining screws	M5x0.8	5	
Subframe junction upper plate retainer	M8x1.25	25*	GREASE B
Glove compartment to rear subframe retainer	M8x1.25	18	
RH and LH retainer to rear subframe	M5x0.8	2	

Screw retaining front subframe to frame on steering tube	M8x1.25	25	
Adjuster pre-tightening	M20x1	0.6	
Swinging arm pivot plug retainer	M22x1.5	50	
RH and LH heat guard to rear subframe plate retainer	AF4	1	
OIL COOLER			
Fastener securing union to oil cooler	M14x1.5	23	LOCK 1
Pipe to radiator union retainer	M16x1.5	18*	Lubricate with engine oil
Radiator upper retainer	M6x1	5	
Fastener securing pipe plate on casing	M6x1	10	LOCK 2
Pressure switch fastener	M14x1.5	19*	Lubricate with engine oil
Temperature sensor fastener	M8x1.25	9	
AIR INLET/OIL BREATHER			
Throttle body assembly to airbox fastener	M5x0.8	5	
Blow-by to airbox retainer	AF5	3	
Wiring cover to airbox fastener	AF5	3	
Upper to lower airbox retainer	AF5	3	
Airbox filter cover retainer	AF5	3	
Blow-by pipe clamp		2	
Connector bracket fastener	AF5	2	
FUEL SYSTEM			
Retainer securing funnels to throttle bodies	M5x0.8	5	
Bosch injector cap retainer	M5x0.8	5	
Airbox to intake manifolds retaining clamps		2.5	
FAIRINGS			
Headlight fairing to headlight retainer	M5x0.8	3	
Central conveyor to cover retainer	AF5	2	
Conveyor lower panel to upper cover retainer	M5x0.8	2	
Tank cover assembly to upper cover retainer	M5x0.8	2	
Tank cover to RH and LH conveyor retainer	M5x0.8	2	
Tank cover assembly to tank retainer	M5x0.8	4	
RH and LH panels to rear subframes retainer	M5x0.8	5	

RH and LH cowling structure retainer	M5x0.8	2	
Right and left cowling to radiator bracket fasteners	M5x0.8	5	
Right and left cowling bracket to radiator fastener	M6x1	6	
Screw securing thermoformed windscreen to support	M5x0.8	3	
Windscreen support block retainer	AF 4.5	2	
Sump guard RH bracket to crankcase fastener	M6x1	10	
Sump guard LH bracket to crankcase fastener	M6x1	10	
LH and central RH sump guard retainer	M5x0.8	5	
Right and left sump guard to brackets fastener	M5x0.8	5	
Sump guard to footpeg holder plate RH and LH retainers	M8x1.25	20	
Sump guard on lower vibration damping pad fastener	M8x1.25	24	
Panel support to front subframe retainer	M6x1	3	
Front subframe to panel fixed support retainer	M6x1	3	
Rod to windscreen support fastener	M10x1	2	LOCK 2
Windscreen support release retainer	M5x0.8	3	LOCL 1

Engine tightening torque values

Description	Thread length	Thread pitch	Torque (Nm)			Notes
Head						
VVT blanket plug		M22x1	20	18	22	
Fixed and mobile tensioner pin		M20x1	50	45	55	LOCK 2 or TB1324
OCV oil filter plug		M16x1	20	22.5	25	Motor Oil
Temperature sensor on water union		M12x1.5	20	23	26	LOCK 4 - Hold insert while tightening
Rocker arm shaft blanking plug		M12x1.5	15	14	16	LOCK 2
Timing variator securing screw		M11x1				
Snug torque			20 Nm			
Angular backlash manual check						
Tightening			90 Nm			
Angular backlash manual check						
Nut for head/cylinder stud bolt		M10x1.5				
Snug torque			20			GREASE C on nut underhead and on stud bolt thread
Preload torque			40	38	42	
Tightening torque			60	57	63	
Camshaft cap retaining screw		M8x1.25				Apply engine oil
Preload torque			10	9	11	
Tightening torque			22.5	21	25	
Knock sensor		M8x1.25	25	22.5	27.5	
Exhaust manifold stud bolt		M6x1	10	9	11	LOCK 5
OCV retainer		M6x1	13.5	12.5	14.5	
Horizontal head air breather union		M6x1	2.5	2	3	LOCK 2
Secondary air cover retaining screw		M5x0.8	6	5	7	
Head cover retaining special stud bolt screw		M6x1	10	9	11	
Head cover retaining stud bolt special nut		M6x1	10	9	11	
Head cover retaining screw		M6x1	10	9	11	

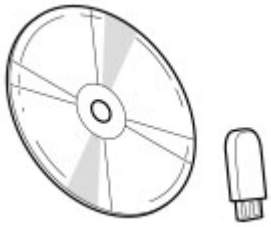
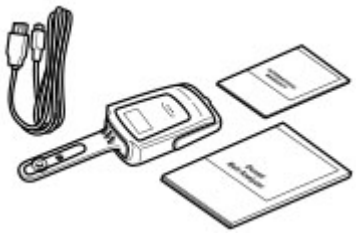
Pick-up sensors to head cover retaining screw		M6x1	8	7	9	
Screw securing water unions to head		M5x1	6	5	7	Pre-applied threadlocker on new part - LOCK 2 for reuse
MAP sensor special screw		M6x1	5	4	6	
Vertical head air breather screw with washer		M6x1	8	7	9	LOCK 2
Union for canister		M6x1	5	4	6	
Covers						
Water intake union		M30x1.5	25	23	27	LOCK 5
Water delivery union		M22x1.5	25	23	27	LOCK 5
Wet clutch fluid filler cap		M20x2.5	5	4.5	5.5	
Pick-up inspection screw		M12x1	15	13	17	LOCK 2
Water pump cover plug		M10x1	15	13.5	16.5	
Clutch recess blanking plug + washer		M10x1	11	10	12	
Water pump bearing retaining screw		M6x1	10	9	11	
Timing inspection cover screw		M6x1	5	4.5	5.5	
Alternator cover closing screw		M6x1	13	12.5	14.5	
Water pump cover closing screw		M6x1	13	12.5	14.5	
Water pump closing screw (blind hole)		M6x1	13	12.5	14.5	
Generator stator retaining screw		M6x1	10	9	11	LOCK 2
Clutch cover closing screw		M6x1	13	12.5	14.5	
Radial pick-up retaining screw		M6x1	10	9	11	
Soundproofing panel retaining screw		M6x1	12	10	14	
Casing						
Oil cartridge		M16x1.5	11	10	12	Engine oil on seal
Nipple for oil cartridge		M16x1.5	42	38	46	LOCK 2 or TB1324
Oil intake service hole plug		M16x1.5	24	21	27	LOCK 5
Oil drain plug with magnet		M12x1.5	20	18	22	TB1215
Clutch casing oil delivery channel blanking plug		M10x1.5	15	13	17	LOCK 5
Clutch oil channel tapered plug		M10x1	20	18	22	LOCK 5

Clutch casing inner oil channel grub screw		M10x1.5	15	13	17	LOCK 5
Roller bearing bush hole blanking tapered plug		M10x1.5	20	18	22	LOCK 2 or TB1324
Cylinder/head stud bolt		M10x1.5	30	28	32	LOCK 2 or TB1324
Casing jointing screw in cylinder area		M10x1.5				
Preload torque			19	17	21	GREASE B on thread
Tightening torque			25	22	28	
Casing central jointing screw + swinging arm shaft		M8x1.25				
Preload torque			19	17	21	GREASE B on thread
Tightening torque			25	22	28	
Gear stopper lever retaining screw		M8x1.25	18	16	20	LOCK 2 or TB1324
Special dowel for roller bearing bush		M8x1.25	16	15	17	LOCK 2 or TB1324
Blow-by valve retaining screw		M6x1	10	9	11	
Secondary bearing (chain side) stopper screw		M6x1	10	9	11	LOCK 2 or TB1324
Primary bearing (clutch side) stopper screw		M6x1	10	9	11	LOCK 2 or TB1324
Casing jointing screw in idle gear shaft area		M6x1	10	9	11	
Casing outer jointing screw		M6x1	10	9	11	
Mesh filter cover TSPEI - TEF screws		M6x1	9	8	10	
Radial pick-up inspection screw		M6x1	10	9	11	
Oil channel service hole screw on chain casing		M6x1	5	4	6	
Blow-by valve upper shell screw		M3x0.5	1.2	1	1.4	LOCK 5
Nut retaining oil adjustment screw to clutch		M8x1	10	9	11	
Oil squirter under piston retaining screw		M5x0.8	8	7	9	LOCK 2 or TB1324
Electric starter						
Starter motor inner retaining TCEI - TCEIF screw		M6x1	10	9	11	Pre-applied threadlocker on new part - LOCK2 for reuse
Starter motor outer retaining screw		M6x1	10	9	11	
						Pre-applied threadlocker on new

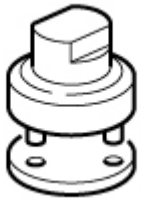
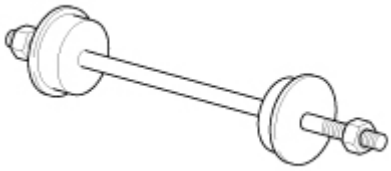
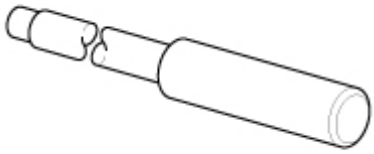
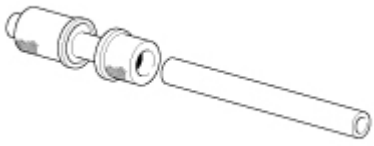
Starter motor rear retaining screw		M6x1	10	9	11	part - LOCK2 for reuse
Idle gear shaft retaining screw		M6x1	10	9	11	LOCK 2 or TB1324
Connecting rods						
Flywheel retaining nut		M28x1.5				
Tightening to torque			150 Nm			
Loosen the nut						LOCK 5
Tightening to torque			330 Nm			
Primary sprocket retaining ring nut		M24x1	190	171	209	GREASE B
Balancing plug		M12x1.25	28	26	30	
Connecting rod						
Apply grease to the screws						GREASE B
Tightening			35 Nm to 50 rpm			
Pause and loosening by 360°			2 sec.			
Snug torque			20 Nm to 30 rpm			
Snug torque			35 Nm to 10 rpm			
Tightening			65° ± 1° at 14 rpm			
Torque check			70 ± 113 Nm			
Gear selector control						
Gearbox drum positioning screw		M16x1.5	30	27	33	
Gearbox pawl screw		M8x1.25	36	34	38	LOCK 2 or TB1324
Pawl positioner retaining nut		M6x1	10	9	11	
Gearbox pawl screw		M6x1	16	15	17	LOCK 2 or TB1324
Gear sensor		M12x1.25	12	11	13	
Timing system						
Timing layshaft belt roller ring nut		M15x1	71	64	78	GREASE A
Camshaft gear nut		M14x1	55	50	60	GREASE A
Fixed and mobile tensioner retaining nut		M8x1.25	25	22	28	GREASE A
Plastic cover retaining screw		M6x1	10	9	11	Pre-applied threadlocker on new part - LOCK2 for reuse

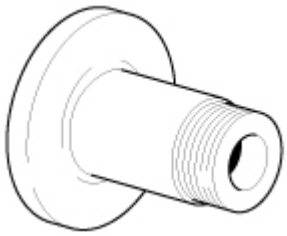
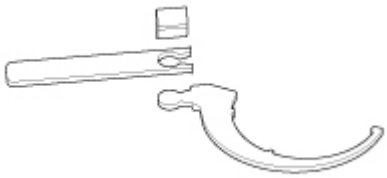
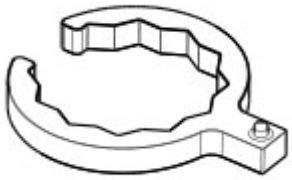
Gearbox and clutch						
FCC clutch drum nut		M25x1.5	190	180	200	GREASE B
FCC wet clutch spring screw		M6x1	10	9	11	
Ignition						
Spark plug		M10x1	12	11	13	
Rotor to flywheel retaining screw		M5x0.8	13	11	15	Pre-applied threadlocker on new part - LOCK2 for reuse
Oil pump						
Oil pump retaining screw		M8x1.25	26	23	29	
Oil pump assembling screw		M6x1	10	9	11	
Oil pump retaining screw		M6x1	10	9	11	
Cylinders						
Water delivery union		M22x1.5	25	23	27	LOCK 5
Cooling circuit						
Water circuit ties			2.5	2	3	

Diagnosis special tools

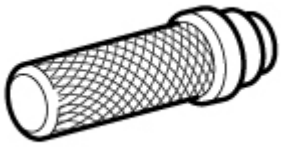
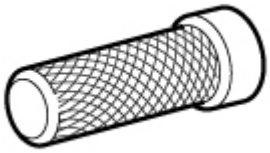
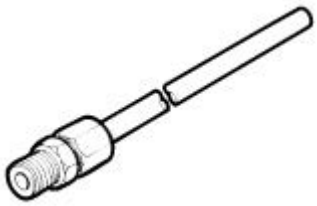
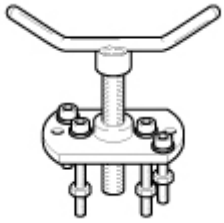
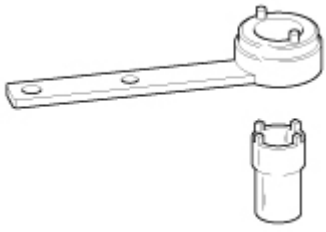
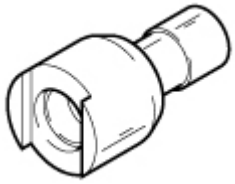
PART NO.	DESCRIPTION	IMAGE
28620441A	"PC HASP DDS2.0" wrench	
979000252	DDS 2 (Ducati Diagnosis System 2.0)	
979000253	Belt tensioning	
979000254	Diagnosis and power supply cable	
979000255	Diagnosis and power supply cable (CAN)	
979000256	Power supply cable from DDS battery	

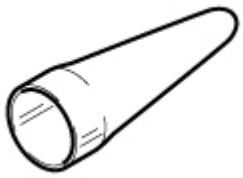
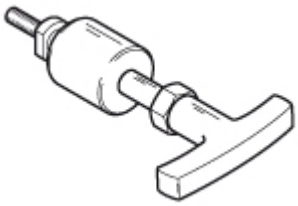
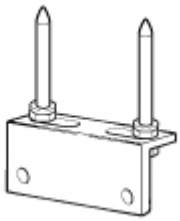
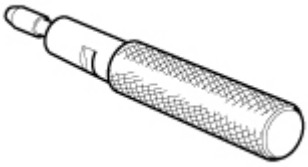
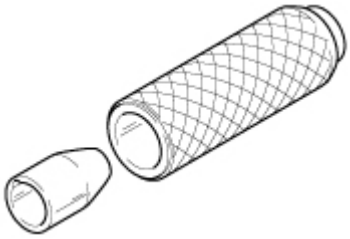
Frame special tools

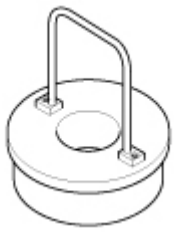
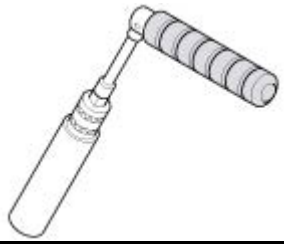
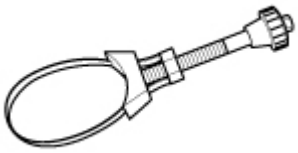
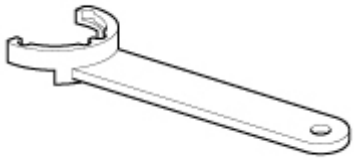
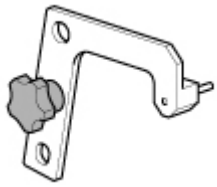
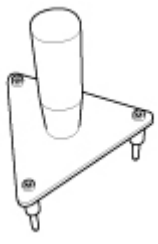
PART NO.	DESCRIPTION	IMAGE
80007.0139	Front wheel shaft wrench	
88713.1058	Wrench to fit steering tube plug	
88713.1062	Steering tube bearing installation tool	
88713.1074	Swingarm shaft removal tool	
88713.1515	Frame/engine support	
88713.2409	Ball bearing installation tool	
88713.2951	Rear wheel balancing tool	

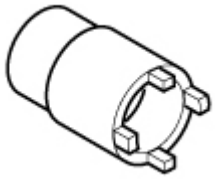
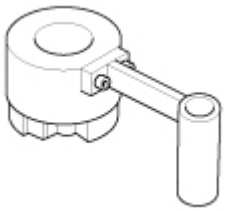
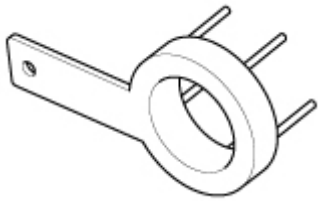
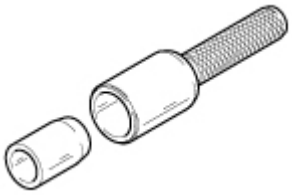
		
88713.3211	Eccentric hub adjusting wrench	
88713.3396	Engine repair work bench	
88713.3501	Tank level sensor plug tightening wrench	
88713.3526	Frame ring nut wrench	

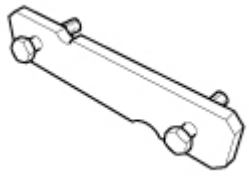
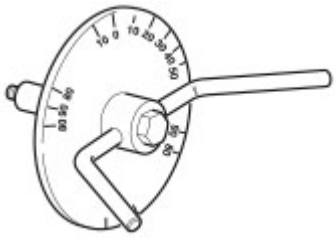
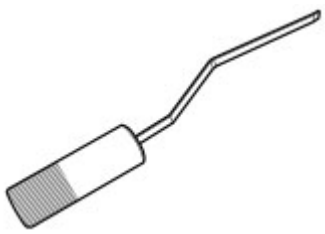
Engine special tools

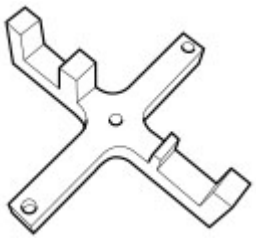
PART NO.	DESCRIPTION	IMAGE
88713.0869	Water pump front seal installation tool	
88713.0870	Water pump front seal counter-washer installation tool	
88713.1010	Exhaust gas suction fitting	
88713.1749	Puller for driving pulley and cover	
88713.1805	Driving pulley tightening tool	
88713.1821	Tensioner pin wrench	
88713.1832	Engine repair work bench	

88713.1920	Tool to install O-rings on engine block stud bolts	
88713.1994	Rocker arm shaft puller	
88713.2011	Tool to block crankshaft at Top Dead Centre (TDC)	
88713.2103	Bearing surface for head installation	
88713.2442	Tool to install seal ring on valve guide	
88713.2834	Snap ring installation tool	
88713.2861	Seal installation tool	
88713.2870	Con-rod guiding tool	

		
88713.2877	Spark plug wrench	
88713.2906	Oil cartridge wrench	
88713.3219	Reaction tool for pulley tightening	
88713.3334	Selector fork positioning plate	
88713.3352	Clutch plate positioning tool	
88713.3367	Flywheel wrench	

88713.3406	Primary sprocket ring nut wrench	
88713.3407	Bushing (gear sensor)	
88713.3408	"F clutch housing reaction tool	
88713.3417	Reaction wrench	
88713.3497	Wrench to tension the belt mobile tensioner	
88713.3521	Seal ring installation tool	
88765.1000 88765.1005 88765.1006	Fork feeler gauges	
88765.1298	Valve lower shim check spacer	

		
88765.1623	Timing pulley positioning tool	
88765.1657	Degree wheel holder tool	
88713.4964	Cylinder head nut tightening tool	
88713.4965	Camshaft O-ring installation tool	
88713.4966	Pressure control nozzles	
88713.4967	Lever to release the RH and LH switch block	

88713.5009	TDC control tool	
8876.1737	Camshaft locking tool	

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 Install the handlebar and the controls (where applicable)
6 Assemble rear view mirror
7 Assemble windscreen
8 Battery start-up and fitting on the vehicle
9 Check correct final drive tensioning
10 Tyre pressure check:
- Front: 2.5 bar (rider only) - 2.5 bar (with passenger and/or bags)
- Rear: 2.5 bar (rider only) - 2.9 bar (with passenger and/or bags)
11 Check brake and clutch fluid and coolant level (top up, if necessary)
12 Check engine oil level (top up, if necessary).
13 Lights, turn indicators, horn and controls check. Headlight beam height adjustment check. Check handlebar free movement and possible interference
14 Check active key and passive key operation: check steering lock correct operation both on the right and on the left
15 Time and date setting and check of correct unit setting according to the country version.
16 Check front and rear wheel shaft tightening
17 Check the brake calliper retaining screws tightening
18 Fuel filling up until the reserve warning light turns off (approx. 5 litres)
19 Check engine stop switch, side stand switch and clutch lever operation.
20 Check the presence of any technical updates and recall campaigns on DCS
21 Check of Software version updates on control unit (use the Global Scan function) and reading of fault memory with the DDS 2.0
22 Install any Ducati Performance accessories required by Customer's order and check their operation.
23 Final inspection and road test (safety devices, electric fan, cruise control and heated handgrips correct operation check)
24 Softly clean the motorcycle
25 Motorcycle warranty activation and on-board documentation filling in (General warranty conditions).
26 Show the Customer the maintenance plan, the bike operation (see bike delivery Check List) and the rider seat height setting
27 Turn in to Customer the kit documentation and the Service Booklet (appropriately filled in).

Bike pre-delivery

- Check of bike conformity with the purchase agreement (version, model, no aesthetics flaws)
- Check of accessory presence and their operation (if any according to the contract)
- Removal of the protective films from the instrument panel and reminding the Customer that the lens could be stained if in contact with oils/fuel
- Hands Free system: use of the keys (active black and passive red) and battery replacement procedure, Key-ON and Key-OFF, starting and stopping the engine, engaging and releasing the steering lock
- Pin Code: entering the personal code and emergency starting using the Pin Code (without keys)
- Buttons on the LH switch: high-beam flasher, high beam activation, turn indicator activation and deactivation, horn activation, Hazard button (simultaneous flashing of the 4 turn indicators) and relevant warning lights on the instrument panel
- FULL LED cornering headlight operation (S version only)
- Supplementary LED lights: operation and relevant warning light on the instrument panel (if present)
- Heated handgrips: operation and relevant warning light on the instrument panel (if present)
- Riding mode (Sport-Touring-Urban-Enduro): operation and parameters connected to each Riding Mode
- Cruise Control: operation, enabling/disabling and relevant warning light on the instrument panel
- DTC (Ducati Traction Control): operation, setting to 8 levels + off customisable per each Riding Mode and relevant warning light on the instrument panel
- ABS (Antilock Braking System) with cornering function: operation, setting to 3 levels + off customisable per each Riding Mode and relevant warning light on the instrument panel
- DWC (Ducati Wheelie Control): operation, setting to 8 levels + off customisable per each Riding Mode and relevant warning light on the instrument panel
- DSS (Ducati Skyhook Suspension): operation, setting and variation per each Riding mode. Preload adjustment of the rear monoshock in accordance to vehicle load (S version only)
- DMS (Ducati Multimedia System): operation, pairing of the Bluetooth systems (smartphone, navigator, rider and passenger earphones), indication on the instrument panel of the missed calls, incoming calls, text messages/emails and player function
- Adjustment of the windscreen height

- Showing the passenger seat opening location, removal of seats and adjustment of rider seat height
- Showing the location of the tool compartment with the relevant accessories, tyre repair kit and e pannier nipple kit (if not installed as accessories)
- Showing the power sockets (front and rear) and USB socket (compartment under the seat)
- Check of the presence and operation of the battery charge and maintainer socket
- Show the correct procedure of assembly/disassembly of side panniers and top-case, their opening and closing (if present)
- Maintenance schedule (OIL SERVICE 1000, ANNUAL SERVICE/OILSERVICE and additional DESMO SERVICE operations) with relevant indications on instrument panel and importance of running-in period for the first 1000 km
- Presentation of the Service Manager with delivery of the business card and entry to the Service structure
- Give the Customer the 2 keys, the log-book, the supplied documents (Service Booklet, bike Use and Maintenance, Emergency Road Service) and the bike standard equipment (seat supports, front mudguard extension, components removed to install the accessories, accessory catalogue and advertising material)

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

List of operations and type of intervention [set mileage (km/mi) or time interval*]	km. x1000	1
	mi. x1,000	0.6
	Months	6
Check engine oil level		•
Check brake and clutch fluid level		•
Check tyre pressure and wear		•
Check the drive chain tension and lubrication If necessary, contact dealer for adjustment		•
Check brake pads. If necessary, contact your dealer to replace pads		•

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

Operations to be carried out by the dealer

Warning

This scheduled maintenance chart is designed for a road use of the Multistrada. 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	
Read 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				•		•	-
Change timing belts				•		•	60
Change the spark plug				•		•	-
Change air filter				•		•	-
Clean air filter			•			•	-
Clean plugs with metal mesh filters on heads				•		•	-
Check brake and clutch fluid level		•	•	•	•	•	12
Change brake and clutch fluid							36
Check pad wear and brake discs. Change, if necessary		•	•	•	•	•	12
Check tightening of the safety components (brake disc flange screws, brake calliper screws, front/rear wheel nuts, sprocket and final drive sprocket nuts)		•	•	•	•	•	12
Check and lubricate the front and rear wheel shaft		•	•	•	•	•	12
Check wheel hub bearings				•		•	-
Check the drive chain tension and lubrication.		•	•	•	•	•	12
Check final drive wear (chain, front and rear sprockets) and chain sliding shoes			•	•	•	•	12
Check the cush drive damper on rear sprocket				•		•	-
Check steering bearings and lubricate, if necessary				•		•	-
Visually check the front fork and rear shock absorber seals		•	•	•	•	•	12
Change the front fork fluid				•		•	-
Visually check the fuel lines			•	•	•	•	12
Check the freedom of movement and tightening of the side and central stand (if any)		•	•	•	•	•	12

Check rubbing points, clearance, freedom of movement and positioning of hoses and electric wiring in view	•	•	•	•	•	12
Lubricate the levers at the handlebar and pedal controls		•	•	•	•	12
Check coolant level	•	•	•	•	•	12
Change coolant						48
Check electric fan operation	•	•	•	•	•	12
Check tyre pressure and wear	•	•	•	•	•	12
Check the battery charge level	•	•	•	•	•	12
Check idling	•	•	•	•	•	12
Check the operation of the safety electrical devices (side stand sensor, front and rear brake switches, engine stop switch, gear/neutral sensor)	•	•	•	•	•	12
Check the indicators and lighting	•	•	•	•	•	12
Reset the Service indication through the DDS 2.0	•	•	•	•	•	-
Road test of the motorcycle, testing the safety devices (ex. ABS and DTC)	•	•	•	•	•	12
Softly clean the motorcycle	•	•	•	•	•	12
Fill out the part dedicated to the Service, once carried out, in the Warranty Certificate	•	•	•	•	•	12

Warning

This scheduled maintenance chart is designed for a road use of the Multistrada. 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.

Filling the clutch hydraulic circuit

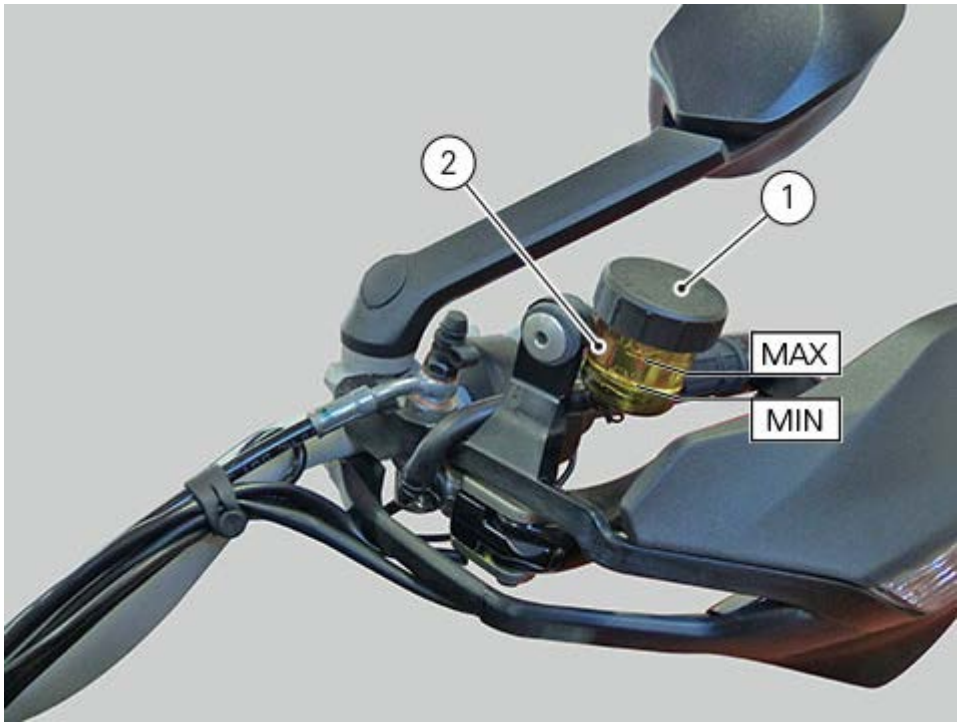
Warning

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

Fill the reservoir with specified fluid taken from an intact container.

Important

During the operation, fluid level must remain at a suitable level at all times. The end of the transparent plastic hose 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.

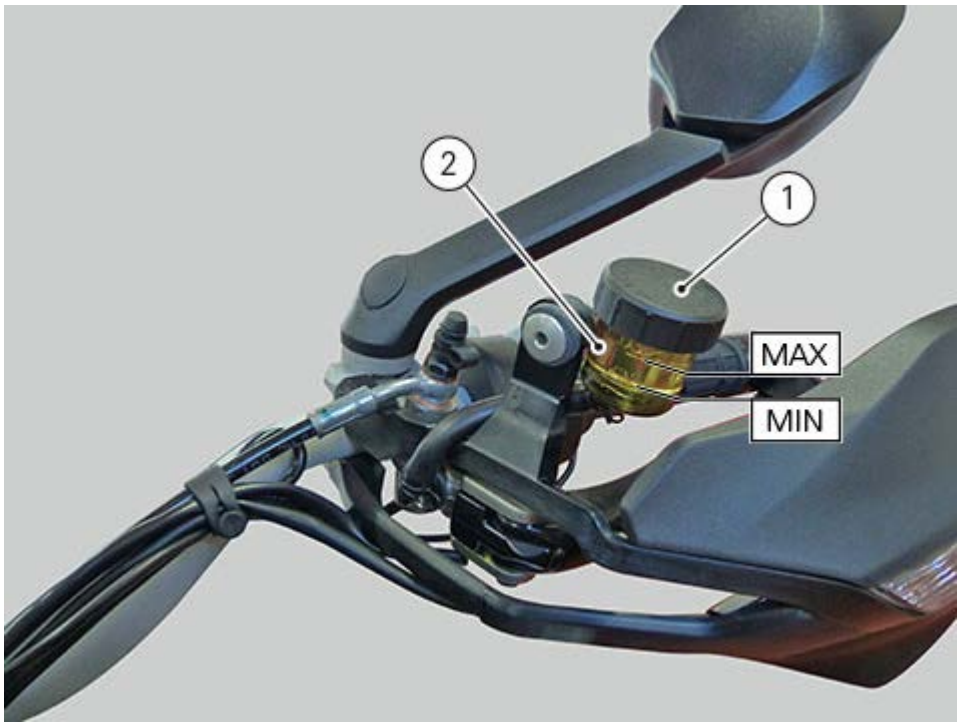
Pump with the bleeding tool and open the bleed valve (3) making sure that the level does not fall below the MIN mark.
Repeat the last operation until the fluid flowing from the tube is completely free of air bubbles.
If you do not have a bleeding tool available, connect a transparent plastic tubing to 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 brake 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.
Block to a torque of 10 Nm ± 10% (Min. 9 Nm - Max. 11 Nm) the bleed valve (3) and install the protection cap.
Top up the fluid level to approximately 3 mm above the MIN mark of the reservoir.
Refit cover with membrane (1).


2
1
MAX
MIN

Draining the clutch hydraulic circuit

Warning

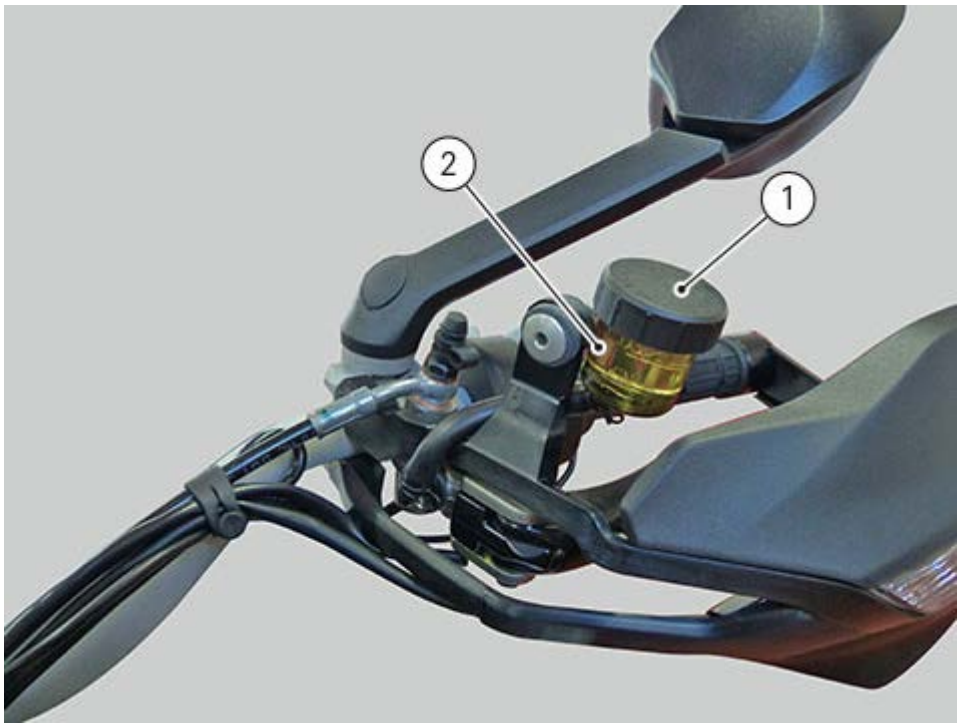
Clutch fluid is corrosive and will damage paint. Avoid contact with eyes and skin. In case of accidental contact, wash thoroughly with water.

Remove the 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.

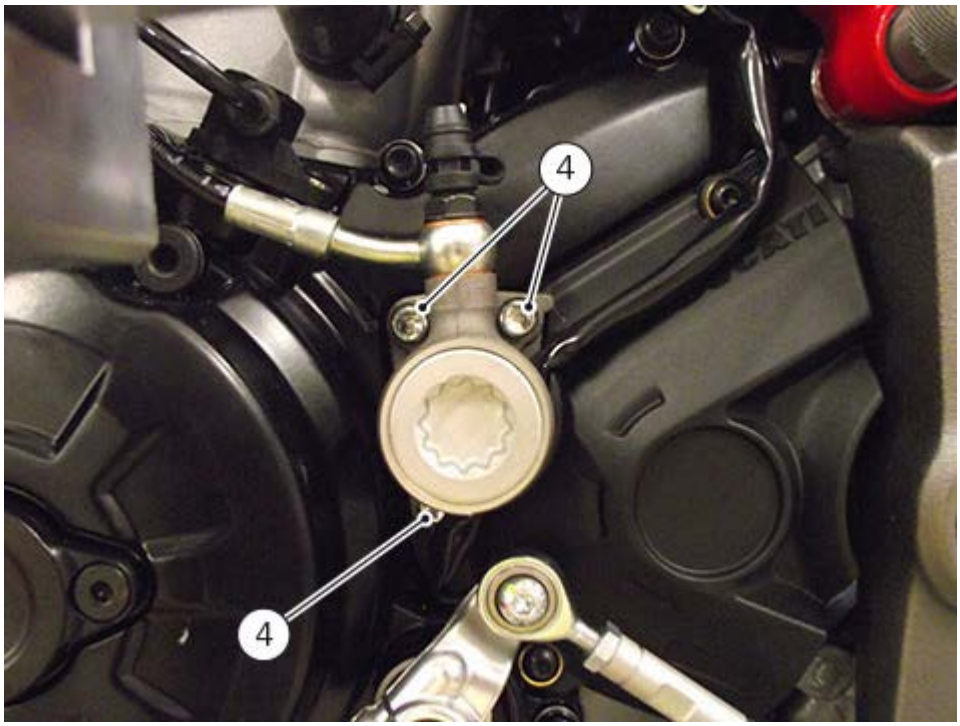
Remove the cover (1) with the membrane from the clutch fluid reservoir (2).



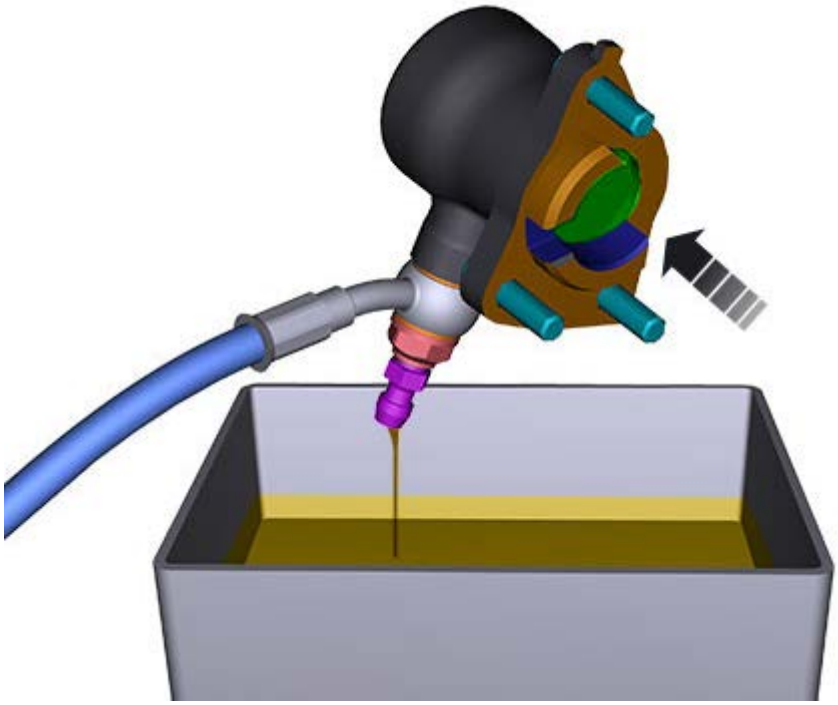
Open the bleed valve and pump with the bleeding tool until no more fluid flows out.
If you do not have a bleeding tool available, attach a transparent plastic tubing to the bleed valve (3) and insert the other end of the tubing in a container for old clutch fluid placed on the floor.

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 to force out all the fluid from inside the cap.



Reassemble as described in chapter "Refitting clutch slave cylinder".

Changing the clutch fluid

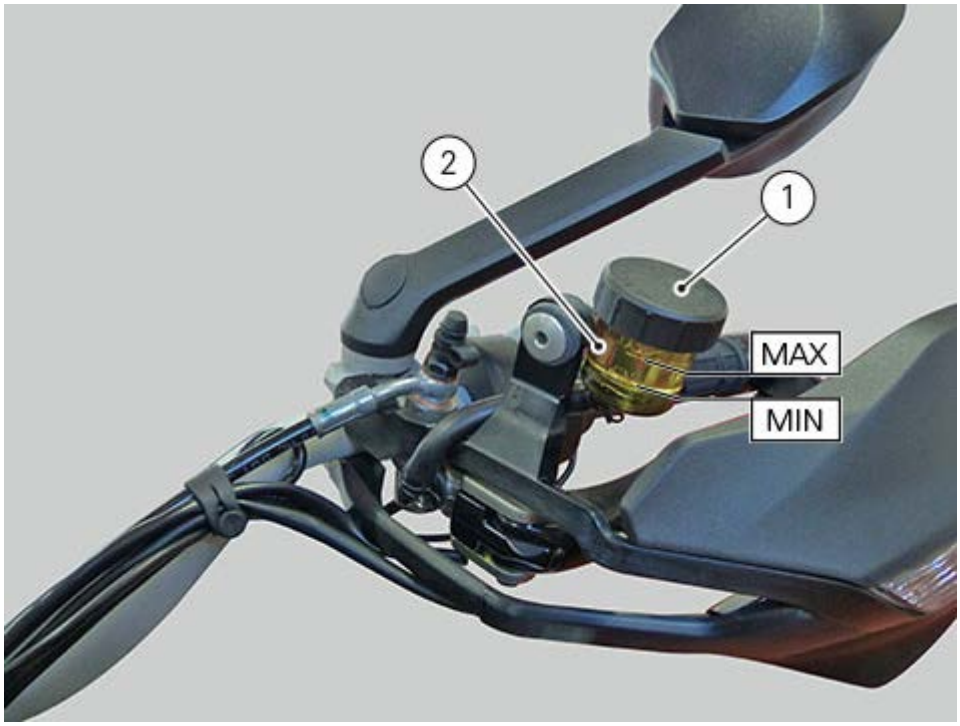
Warning
Clutch fluid is corrosive and will damage paint. Avoid contact with eyes and skin. In case of accidental contact, wash thoroughly with water.

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.

Warning
Do not dispose of exhausted oil into the environment

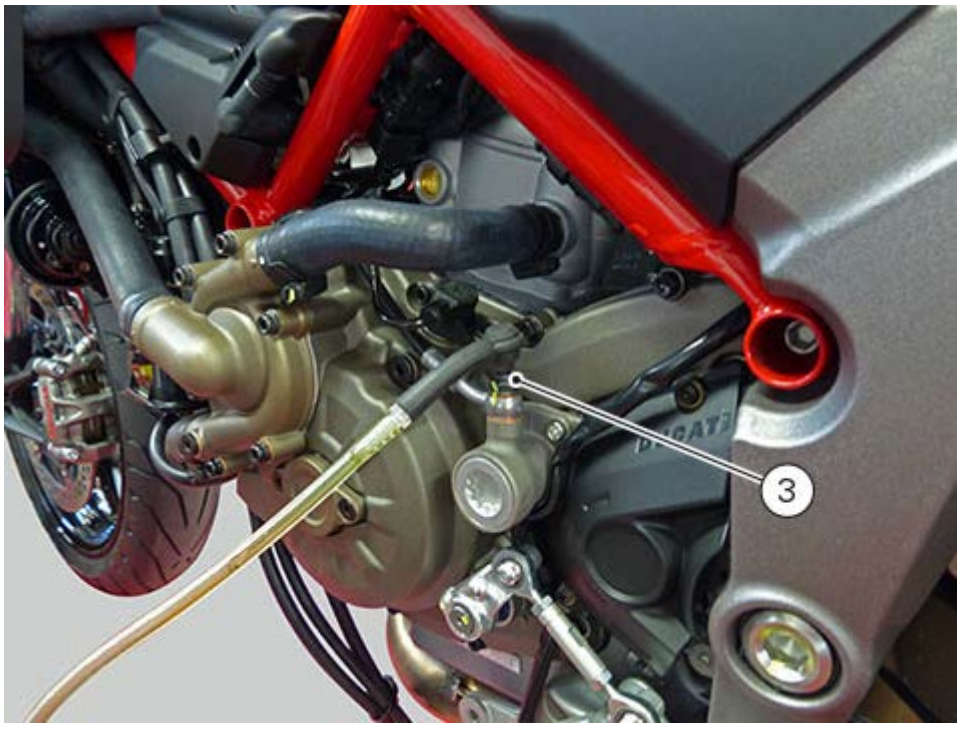
Smaltimento
Do not dispose of the exhausted fluid into the environment; do not pour the product, either new or exhausted, inside drains, water courses or the soil. Collect and deliver waste to authorized collecting centres. Dispose of waste in compliance with the prevailing local and national standards.
European Waste Catalogue Codes recommended for waste disposal as indicated by Decision No 2001/118/EC: CER 13 02 05* (Mineral-based non-chlorinated engine, gear and lubricating oils waste).

Note
It should be noted that the above-mentioned CER code is a general and non-binding provision, provided based on product original composition and intended use. The user is thus responsible for selecting the CER code most suitable to the concerned product, based on product real use and taking into account any alterations and/or contaminations of the product, as well as any amendments to the prevailing standard on waste disposal.



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.



Warning
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.
Screw bleed valve (3) again, and tighten it to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) and restore fluid correct level inside reservoir.

Adjusting the rear shock absorber

The rear shock absorber used on this motorcycle has rebound (return), compression and spring preload adjustment.

This adjustment is done using the outer screw adjusters:

2. compression damping;
3. rebound damping;
4. spring preload.

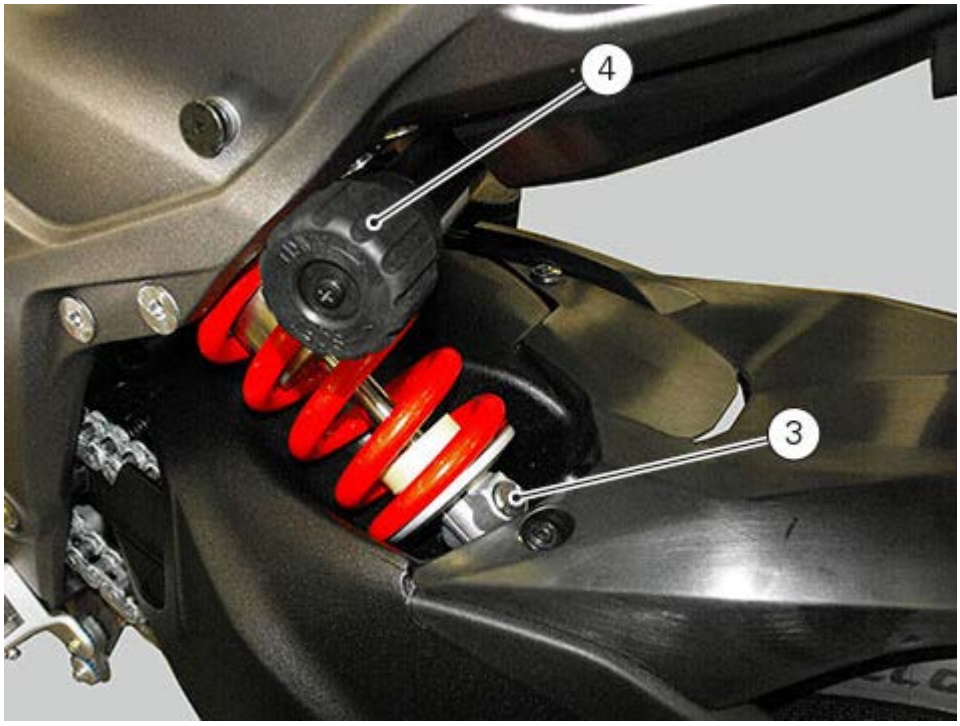
COMPRESSION

To reach the compression adjuster (2) remove the rider seat and cover (1).

Rotate clockwise (HARD) to increase the hydraulic damping or counter clockwise (SOFT) to decrease it.

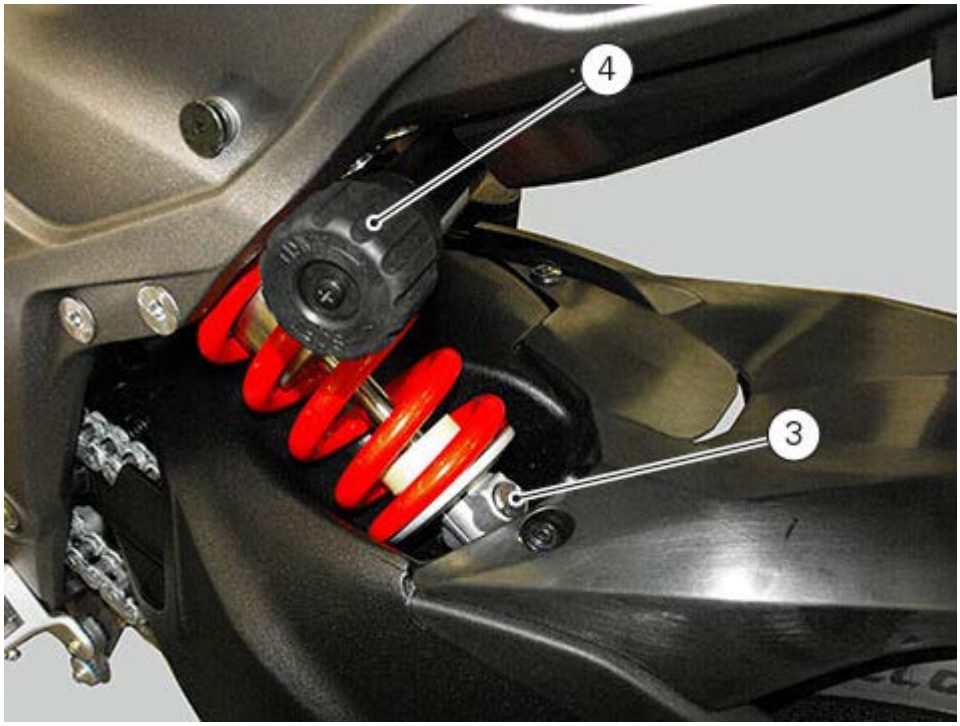
REBOUND

Put the motorcycle on the side stand and make sure it is stable.
Use a slit screwdriver to rotate the adjuster (3).
Rotate clockwise (HARD) to increase the hydraulic damping or counter clockwise (SOFT) to decrease it.



PRELOAD

To modify the spring preload work on the hexagon head knob (4).
Turn clockwise (HARD) to increase the spring preload, or turn counter clockwise (SOFT) to decrease it.



STANDARD SETTING

Compression: 1.5 clicks;
Rebound: 9 clicks;
Preload: 18 mm.

Front fork adjustment

The front fork used on this motorcycle has rebound, compression and spring preload adjustment.

This adjustment is done using the outer screw adjusters:

1 For rebound adjustment (both legs);
2 for internal spring preload adjustment (on both legs);
3 For compression adjustment (both legs).

REBOUND

Put the motorcycle on the side stand and make sure it is stable.
Use a slit screwdriver to rotate the adjuster (1).
Rotate clockwise (H) to increase the hydraulic damping or counter clockwise (S) to decrease it.

Important
The forks must be adjusted in the same way. Each setting on the right leg must be performed also on the left one and vice versa.

COMPRESSION

Put the motorcycle on the side stand and make sure it is stable.
Use a slit screwdriver to rotate the adjuster (2).
Rotate clockwise (H) to increase the hydraulic damping or counter clockwise (S) to decrease it.

PRELOAD

To modify the spring preload work on the hexagon head adjuster (3).
Rotate clockwise to increase the spring preload or counter clockwise to decrease it.

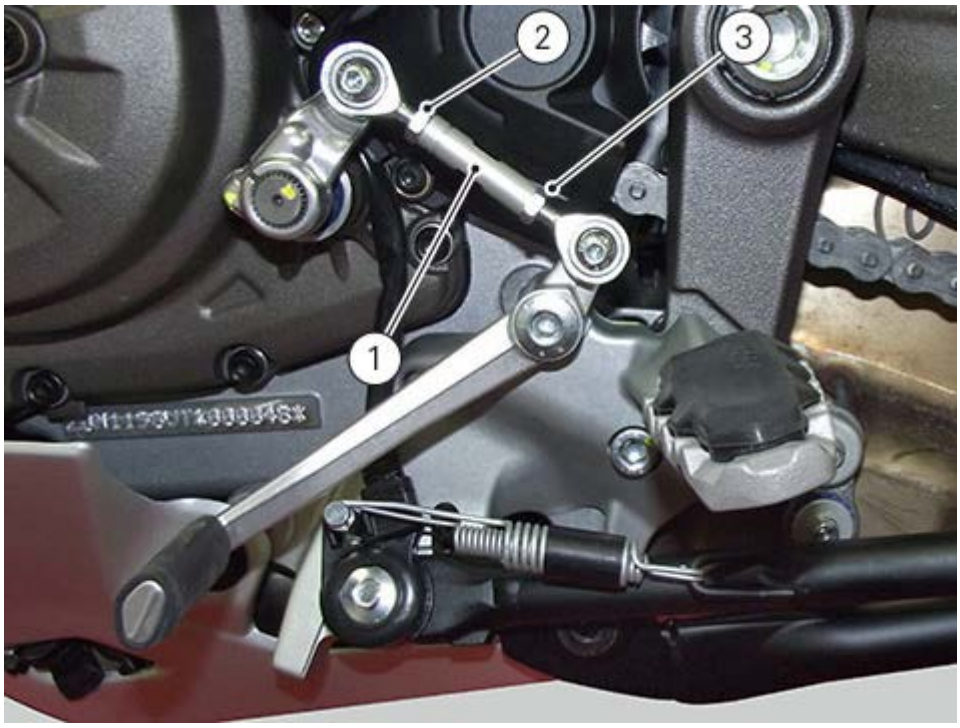
STANDARD ADJUSTMENTS

Compression: 1 and a half turns;
Rebound: 2 turns;
Spring preload: Fully open (counter clockwise).

Adjusting the position of the gearchange pedal and rear brake pedal

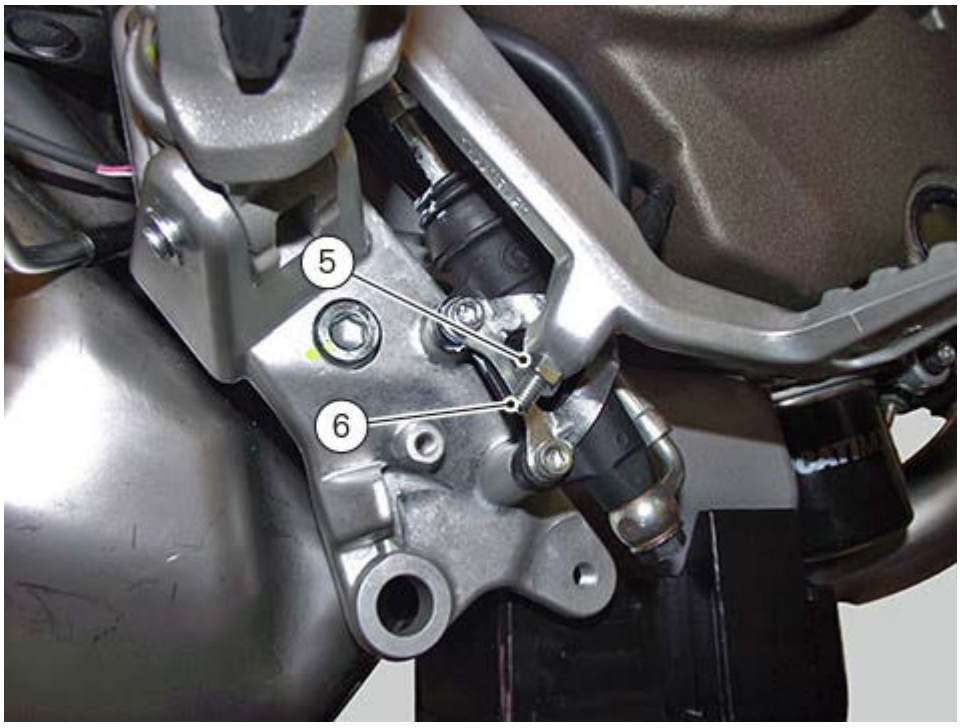
The position of the gear change and rear brake pedals in relation to the footpeg can be adjusted to suit the preferred riding position.
To adjust the position of the gearchange pedal, proceed as follows:

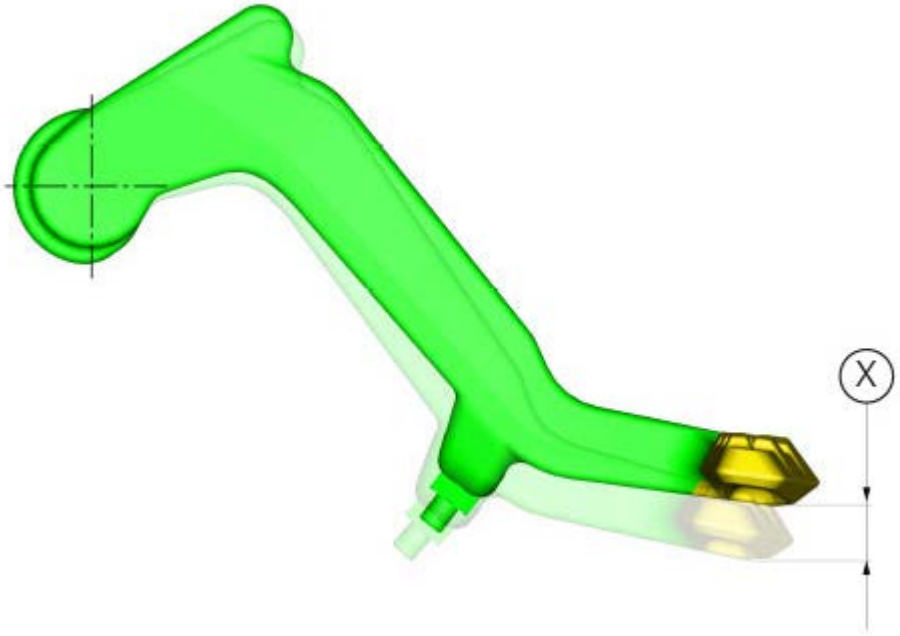
hold the linkage (1) and slacken the lock nuts (2) and (3).
Fit an open-end wrench to hexagonal element of linkage (1) and rotate until setting pedal in the desired position.
Tighten both lock nuts onto linkage.



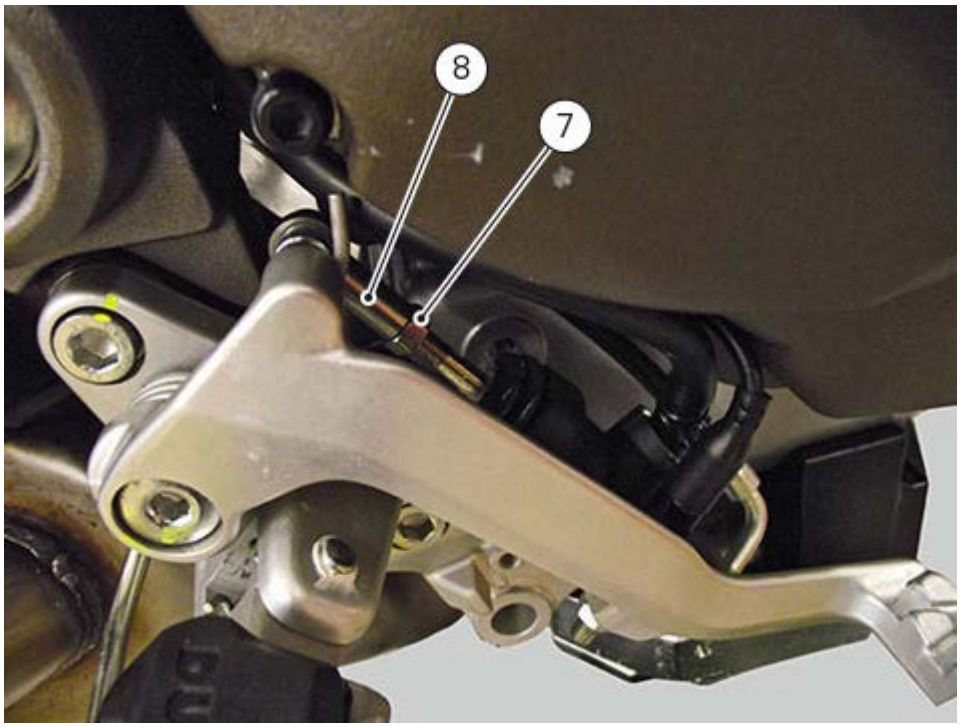
To adjust the position of the rear brake pedal, proceed as follows.
Loosen lock nut (5).
Turn pedal stroke adjusting screw (6) until pedal is in the desired position.

Tighten lock nut (5) to a torque of 5 Nm ± 10%.
Operate the pedal by hand to check that there is 1.5 to 2 mm of free play before the brake bites.





If not, modify the length of the cylinder push-rod in the following mode.
Slacken off the check nut (7) on the cylinder pushrod.
Screw the rod into the fork (8) to increase play, or unscrew it to reduce play.
Tighten the check nut (7) to a torque of 2.5 Nm ±10%, and check play again.



Adjusting the front brake control lever and clutch lever

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 same adjustment can be made also for front brake control (3).

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

Checking rear brake pad wear and replacing brake pads

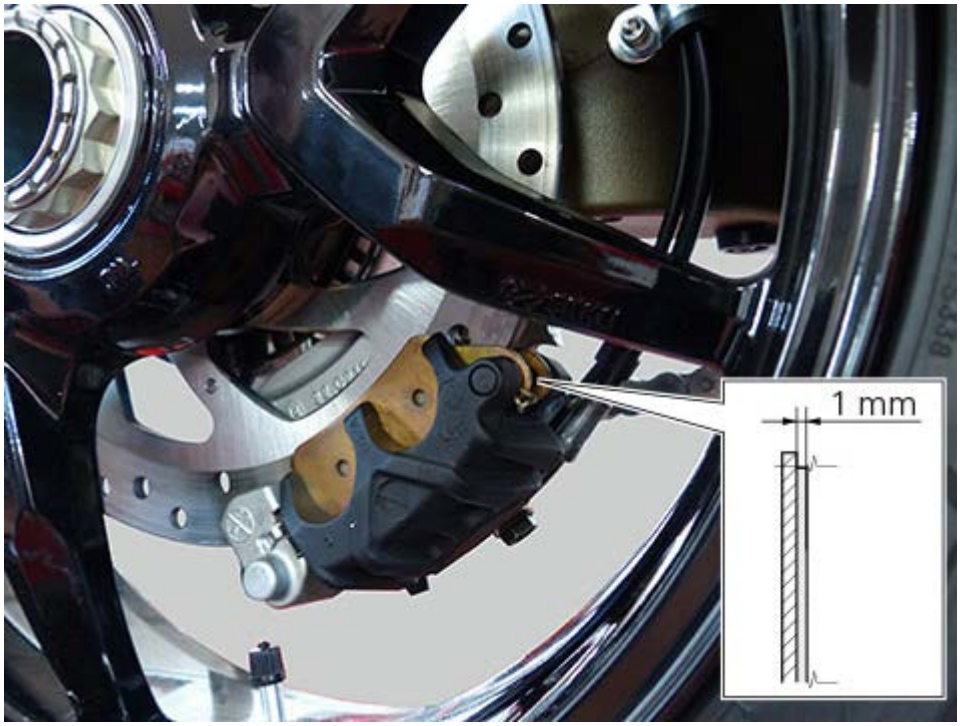
Warning

The following procedure applies to both vehicle versions.

Check through the slot between the two calliper halves, and make sure that at least 1 mm of the friction material on pads is visible.

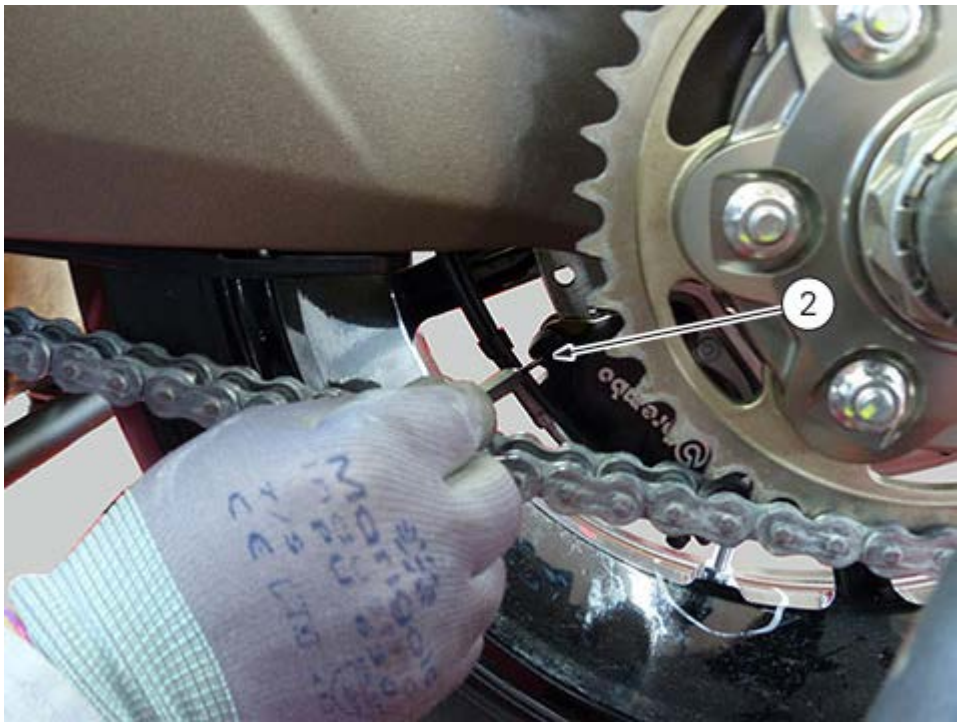
Important

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

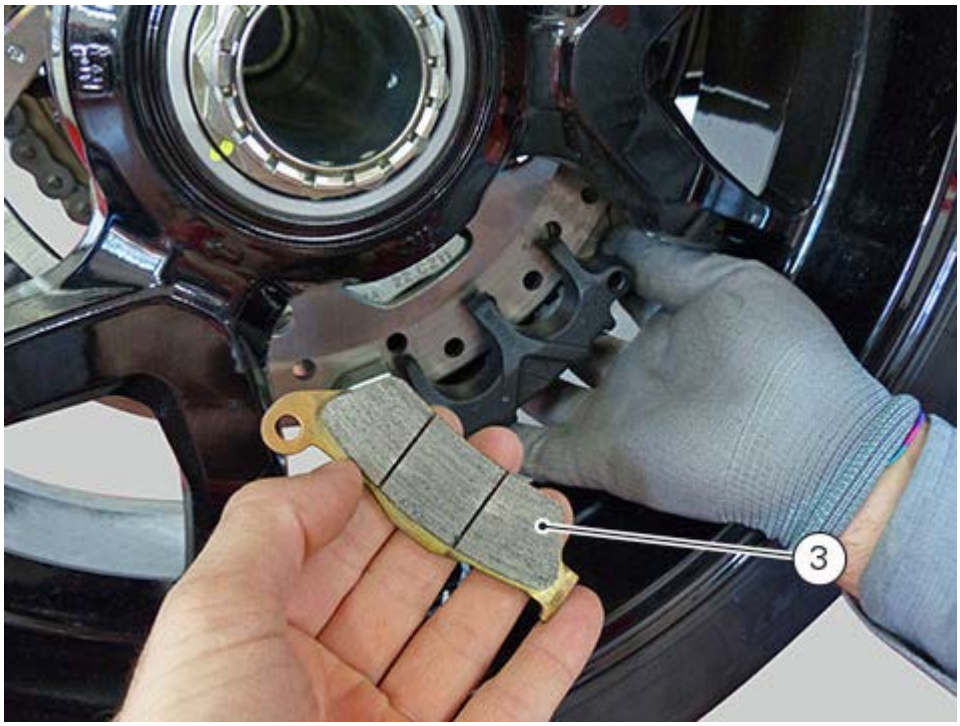


Remove the safety split pin (1).

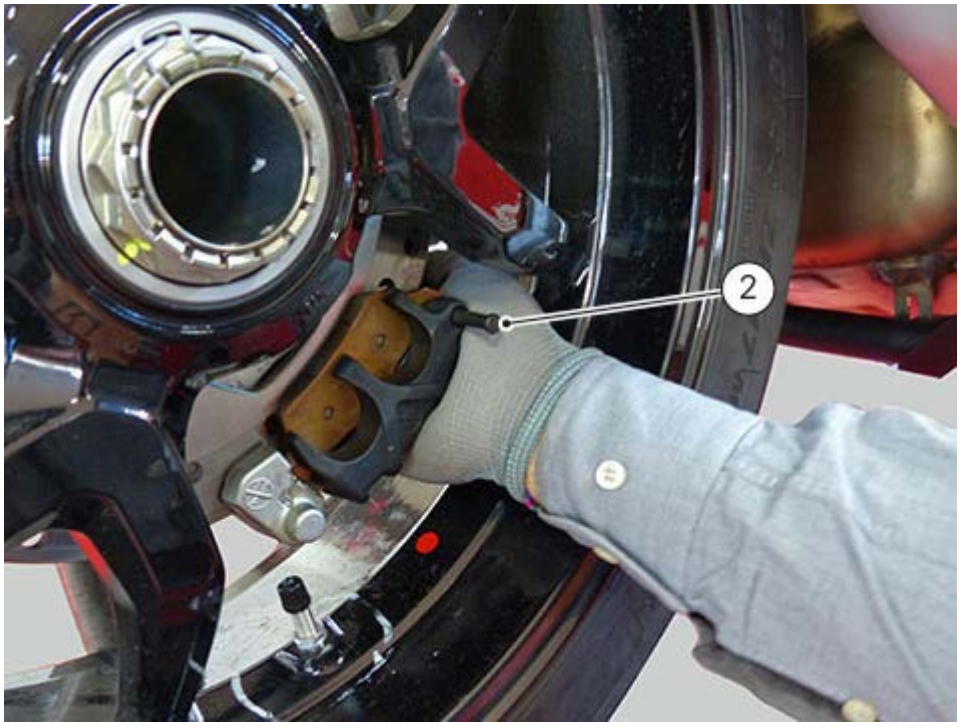
Working on the LH side, push the retaining pin (2) until it comes out completely.



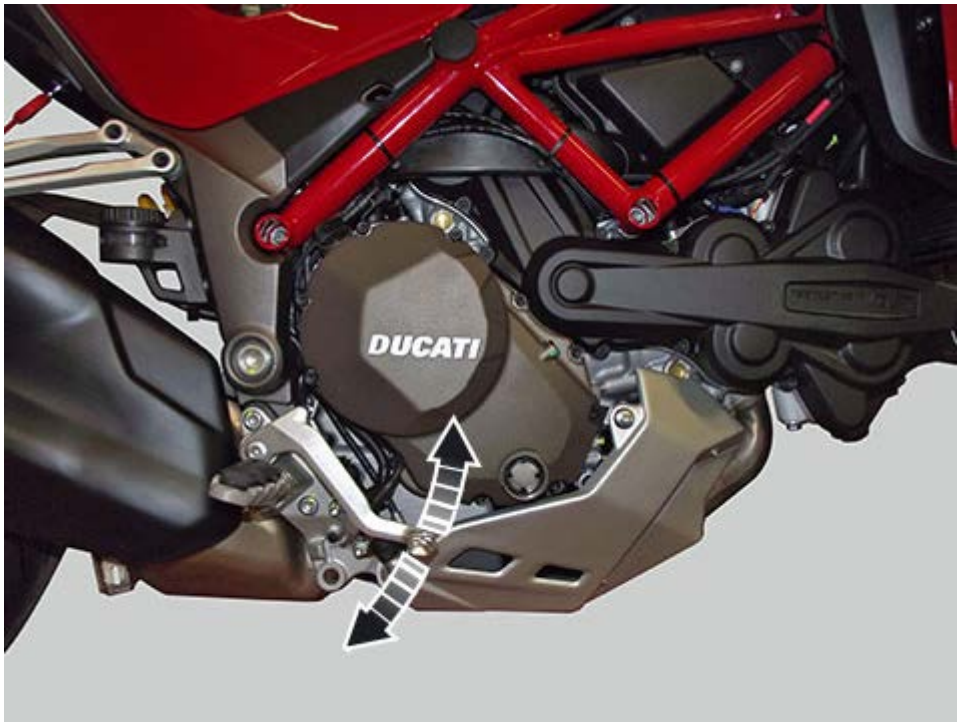
Remove the brake pads (3) by pushing the calliper pistons fully inside their seats.



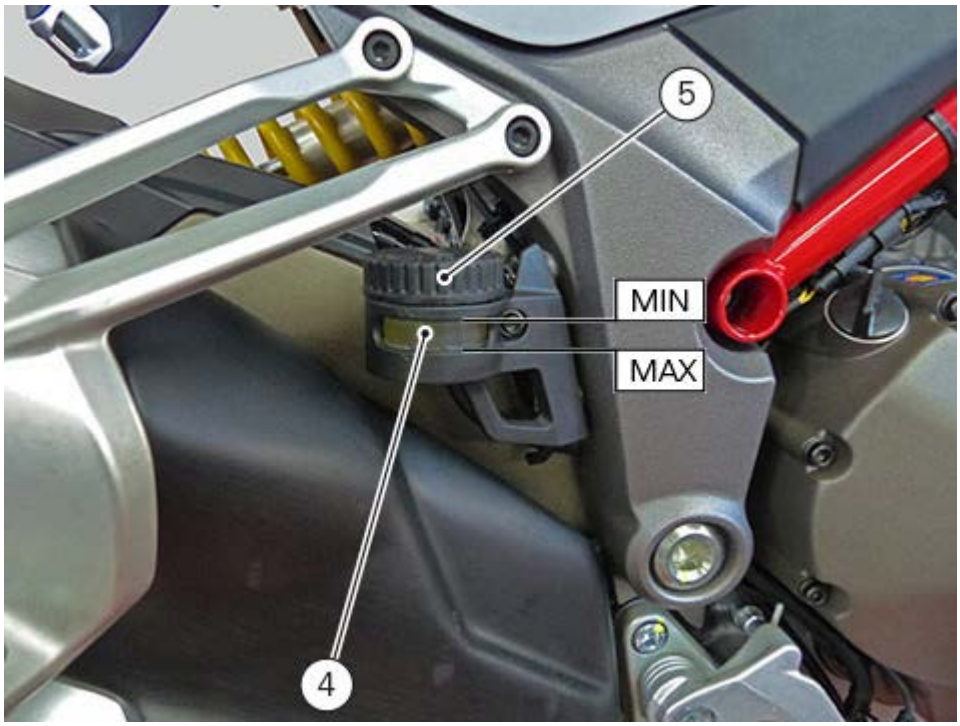
Fit the new pads.
Insert pin (2) and fix it by means of the safety split pin (1).



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 (4) is between the MIN and MAX marks.
If this is not the case, unscrew the plug (5) of reservoir cover (4) and top up.



Warning

Do not dispose of brake pads into the environment.

Smaltimento

Do not dispose of waste into the environment. Collect and deliver waste to authorized collecting centres. Dispose of waste in compliance with the prevailing local and national standards. European Waste Catalogue Codes recommended for waste disposal as indicated by Decision No 2001/118/EC: CER 16 01 12 (Brake pads, other than those mentioned under item 16 01 11).

Note

It should be noted that the above-mentioned CER code is a general and non-binding provision, provided based on product original composition and intended use. The user is thus responsible for selecting the CER code most suitable to the concerned product, based on product real use and taking into account any alterations and/or contaminations of the product, as well as any amendments to the prevailing standard on waste disposal.

Checking front brake pad wear and replacing brake pads

Warning

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

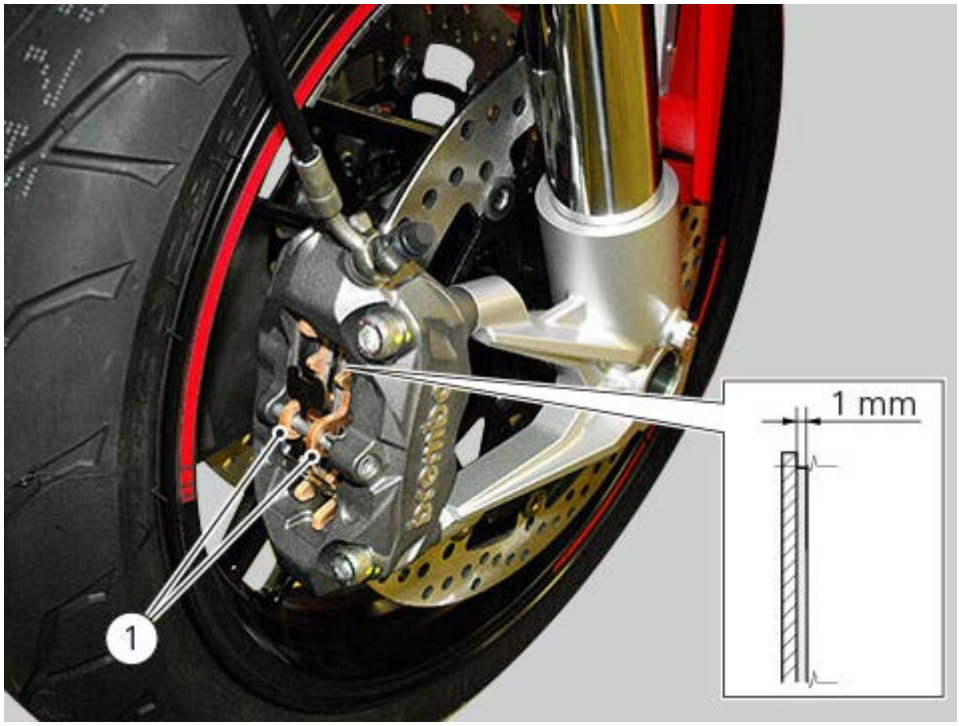
Important

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

Check through the calliper slot and make sure that the friction material on pads (1) is visible.

Important

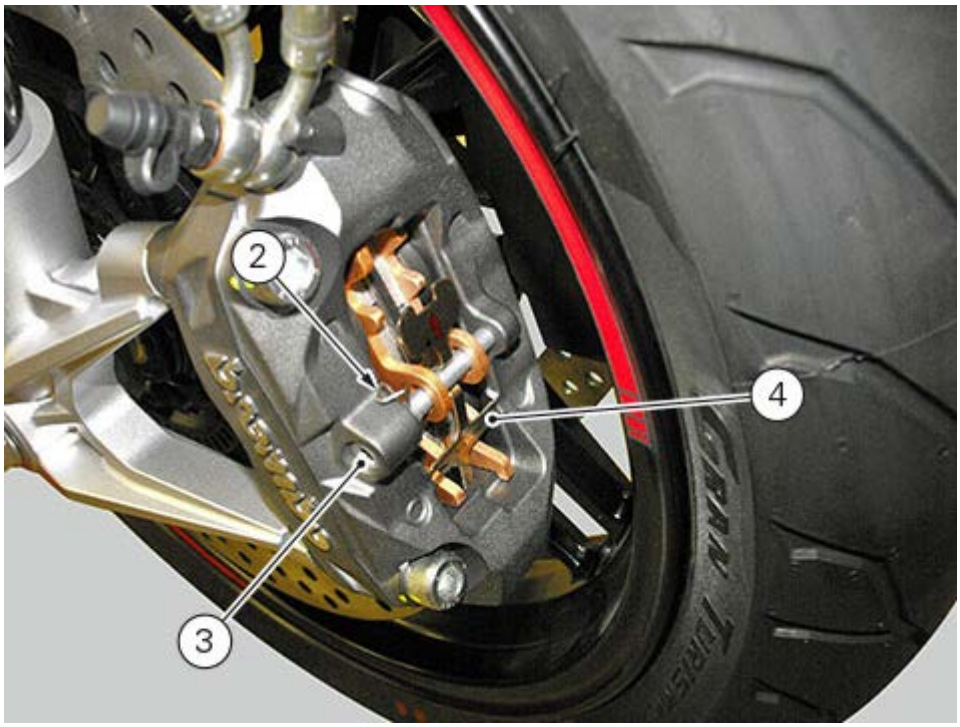
Change both pads even if just one of them is worn.



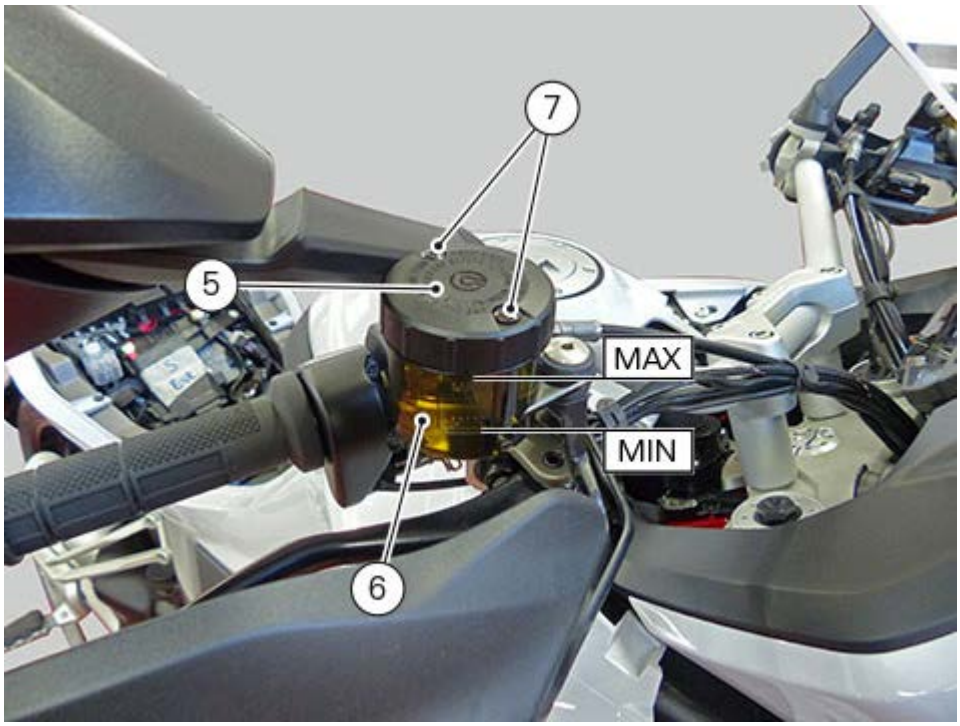
Slide out the safety split pin (2) and pin (3).
Force the calliper pistons back into their seats by forcing the old brake pads apart.
Remove the pads (1).

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

Fit the new pads with their clip (4), positioning it with the arrow pointing up.
Insert and screw shaft (3).
Fit lockwasher (2).



Operate the brake lever repeatedly so that the pads firmly bed in against the disc thanks to the brake fluid pressure.
Check that the level in the master cylinder tank is not below the MIN mark.
If necessary, top up as follows.
Turn the handlebar so that the reservoir is levelled.
Remove the cover (5) with membrane from the front brake fluid reservoir (6) by loosening the screws (7).
Top-up with specified fluid until reaching the Max. mark.



Warning

Do not dispose of brake pads into the environment.

Smaltimento

Do not dispose of waste into the environment. Collect and deliver waste to authorized collecting centres. Dispose of waste in compliance with the prevailing local and national standards. European Waste Catalogue Codes recommended for waste disposal as indicated by Decision No 2001/118/EC: CER 16 01 12 (Brake pads, other than those mentioned under item 16 01 11).

Note

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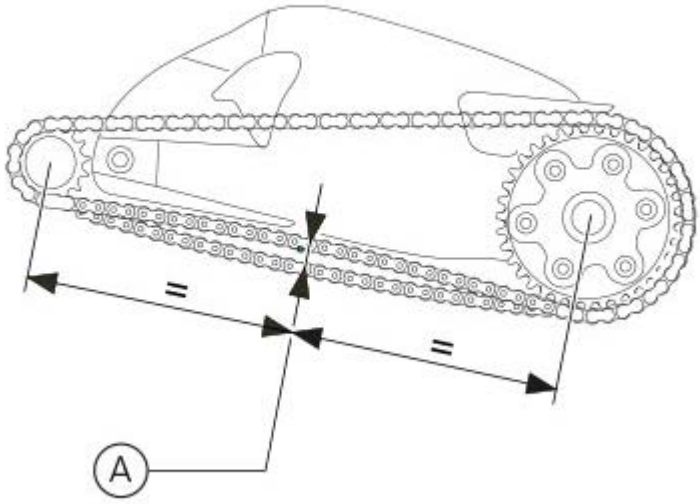
Adjusting the chain tension

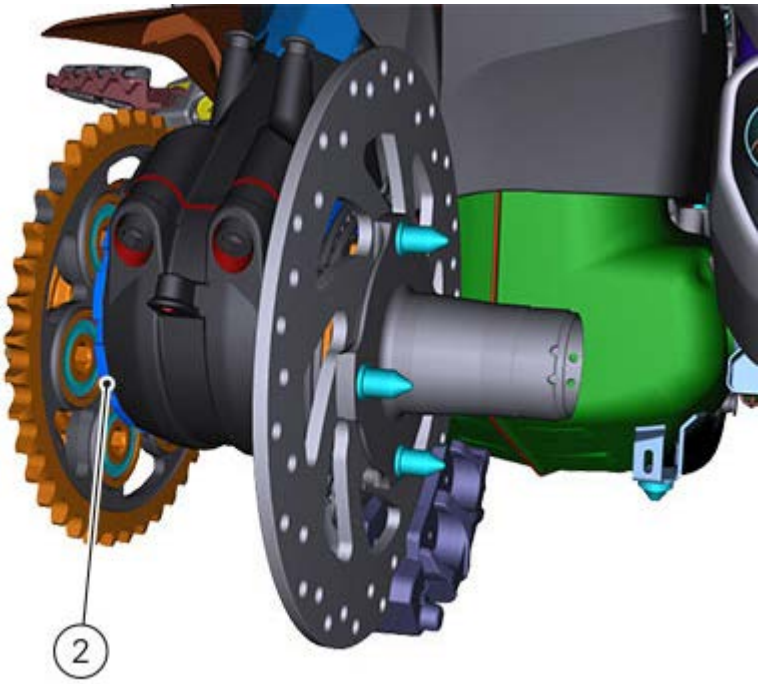
Move the bike slowly so as to find the position where chain upper section is more tensioned.
Set the motorcycle on the side stand.
Measure chain tension at the centre of the lower section, with the motorcycle on the side stand: lower the chain by pressing down on it only with your finger, release it and measure the distance between the centre of the chain pins and the aluminium section of the swingarm.
It must be: A = 38 ÷ 40 mm.

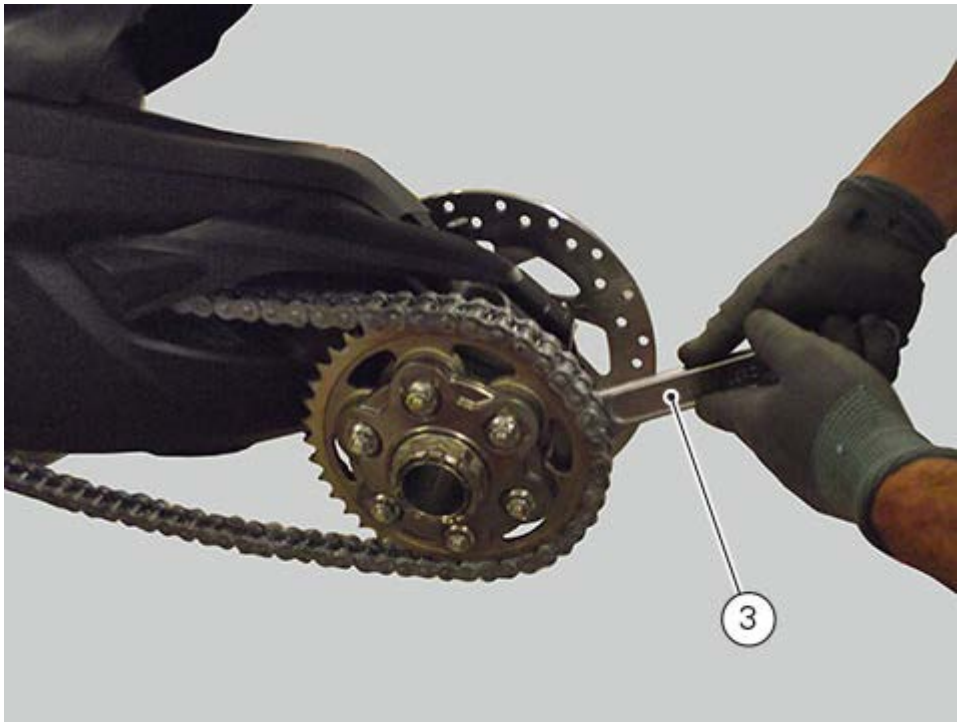


To adjust the tension remove the rear splash guard (Removing the splash guard).
Slacken off the two screws (1) that secure the rear wheel hub to the swinging arm.

Note
To make the procedure clearer the rear wheel has been removed.

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





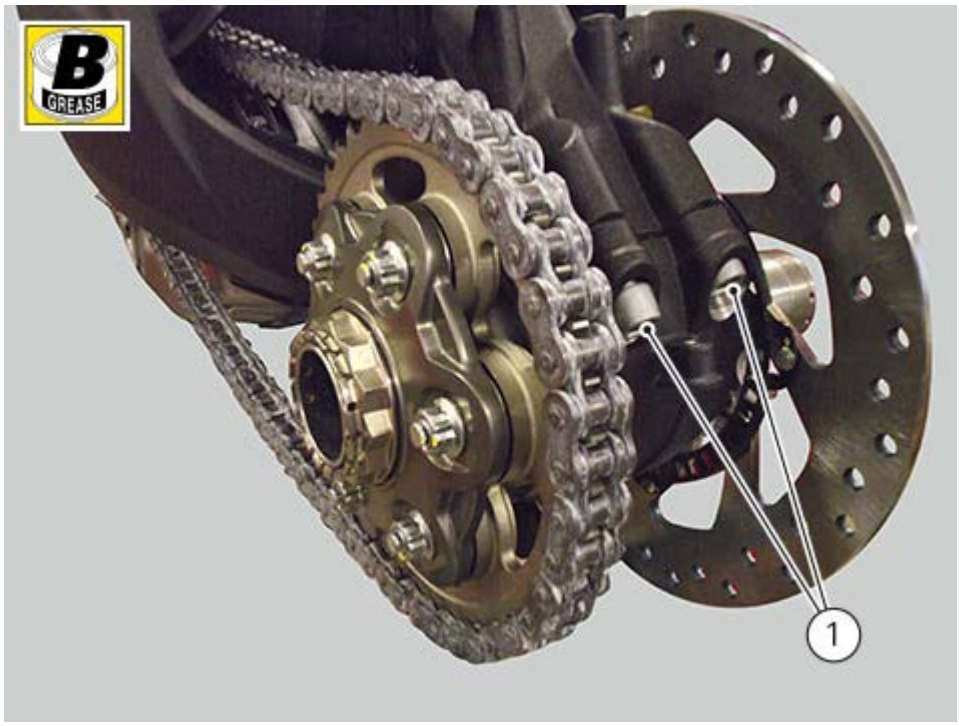
Important

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

If the screws (1) are removed, lubricate with specified grease underside and thread, then tighten the screws (1) to a torque of 35 Nm ± 5% proceeding with sequence 1-2-1.

Warning

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

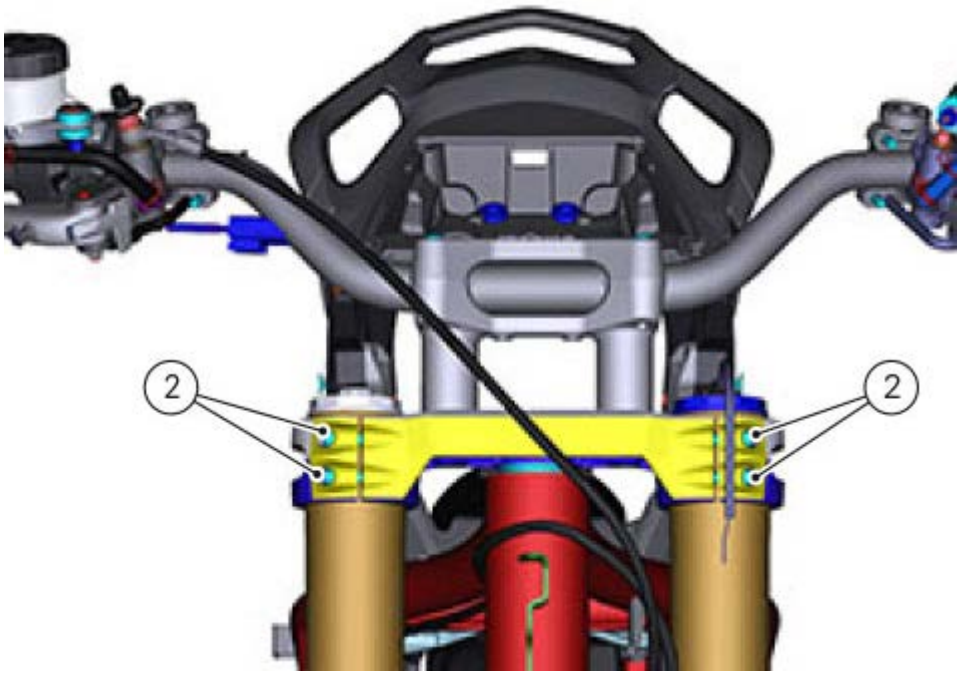


Refit the rear splash guard (Refitting the splash guard).

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 (A) part no. **88713.1058** lock the ring nut (3) to a torque of 30 Nm ±5%.
Push the steering head against the ring nut (3) and tighten the screw (1) to a torque of 18 Nm ±5% and screws (2) following a (1-2-3) sequence to a torque of 10 Nm ±5%.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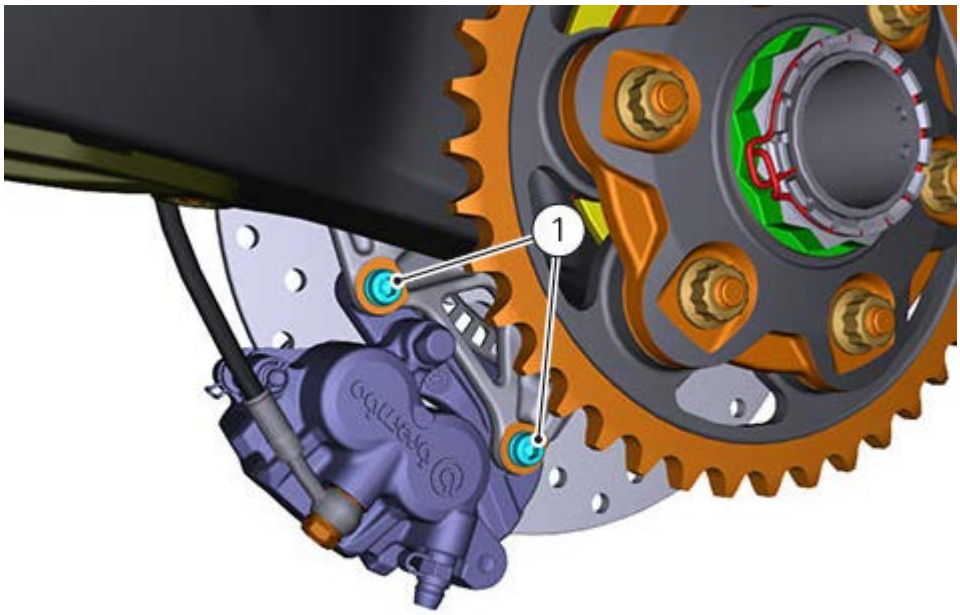
1

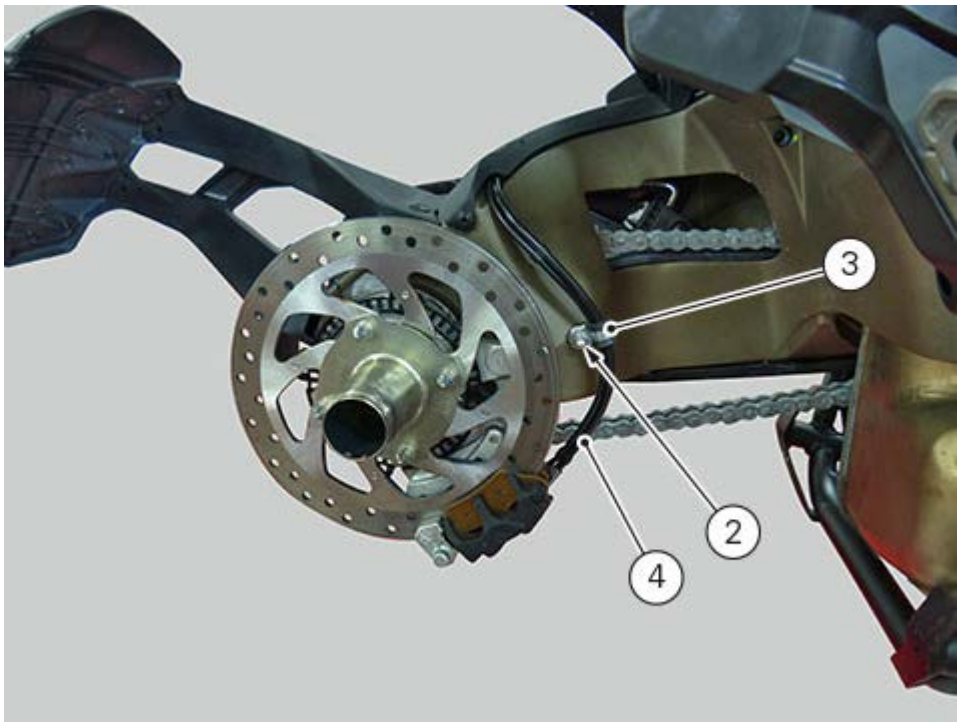
Changing the fluid in the rear brake system

Remove the rear wheel (Removing the rear wheel).

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

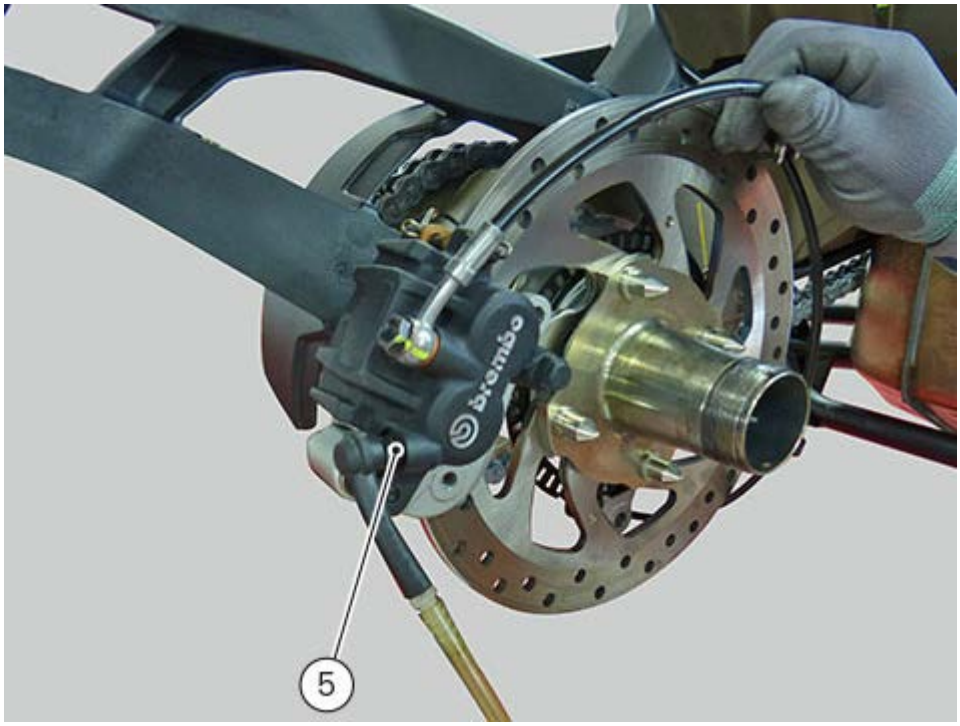


Undo the screws (2) and remove the hose cover (3).
Release hose (4).

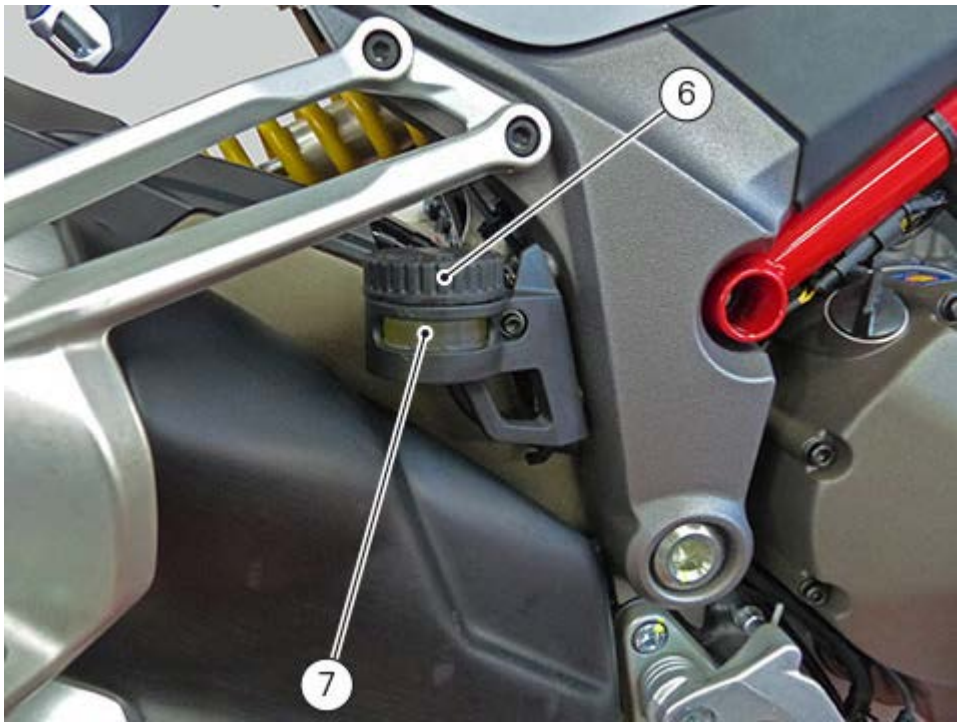


Bring the rear calliper in the position shown in the figure.

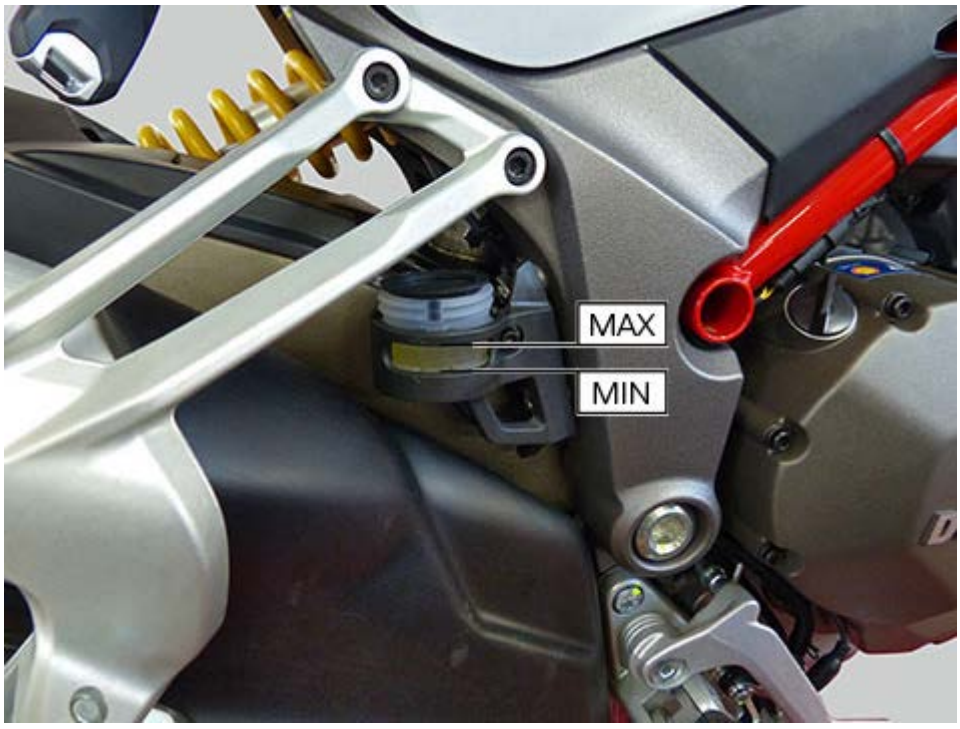
Attach a transparent plastic tubing to the rear calliper bleed valve (5) and insert the other end of the tubing in a container placed on the floor.



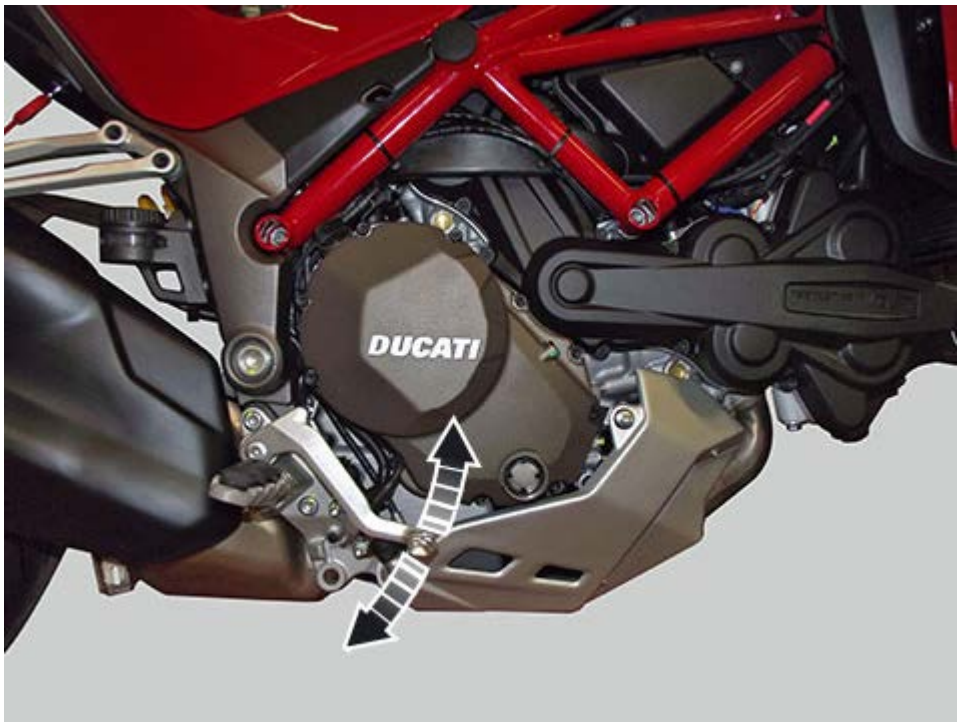
Unscrew the cover (6) of the rear brake fluid reservoir (7).



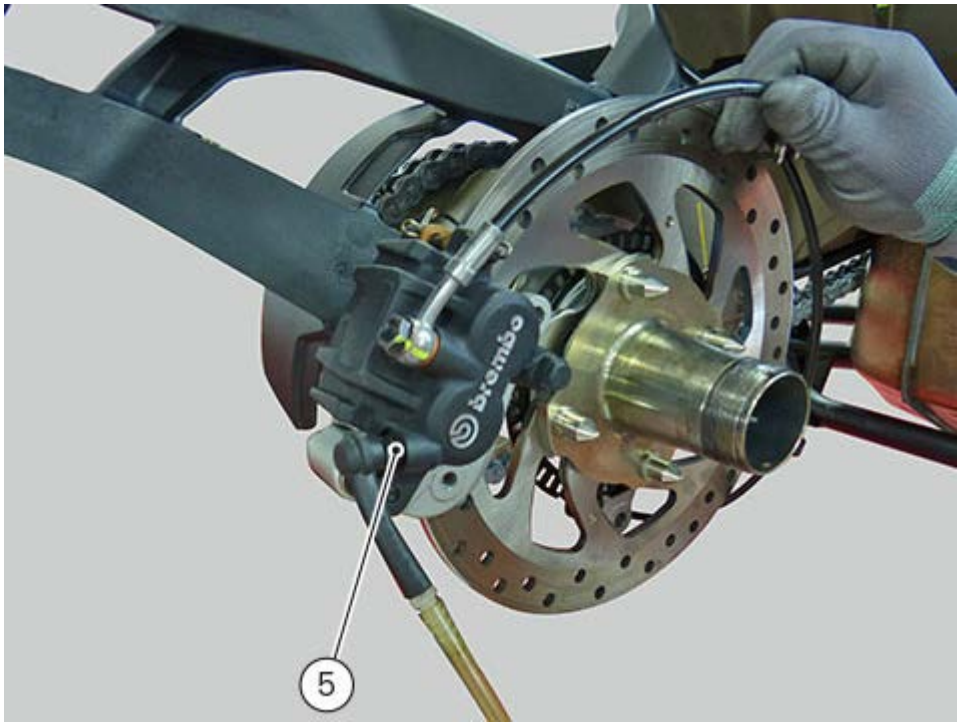
Fill the reservoir (7) with new oil up to the MAX mark.
Refit the membrane (without the plug) on the reservoir to avoid brake fluid splashes during the following operations.



Operate the brake pedal to pressurise the circuit.
Keep pedal pushed down.



Loosen bleed valve (5) by 1/4 of a turn so as to drain all fluid and push fully until pedal stops.
Tighten the bleed valve (5).



Warning

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

Note

If bleeding tool is not available, move back calliper pistons as well.

Repeat the above operations until finishing all the fluid contained inside package (approx. 250 cc).

Make sure that, with bleed valves duly closed, pressure is correctly developed through brake pedal.
Tighten bleed valves (10) to a torque of 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.

 Warning

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

 Smaltimento

Do not dispose of the exhausted fluid into the environment; do not pour the product, either new or exhausted, inside drains, water courses or the soil. Collect and deliver waste to authorized collecting centres. Dispose of waste in compliance with the prevailing local and national standards.
European Waste Catalogue Codes recommended for waste disposal as indicated by Decision No 2001/118/EC: CER 13 02 05* (Mineral-based non-chlorinated engine, gear and lubricating oils waste).

 Note

It should be noted that the above-mentioned CER code is a general and non-binding provision, provided based on product original composition and intended use. The user is thus responsible for selecting the CER code most suitable to the concerned product, based on product real use and taking into account any alterations and/or contaminations of the product, as well as any amendments to the prevailing standard on waste disposal.

Refit the rear calliper (Refitting the rear calliper).

Changing the fluid in the front brake system

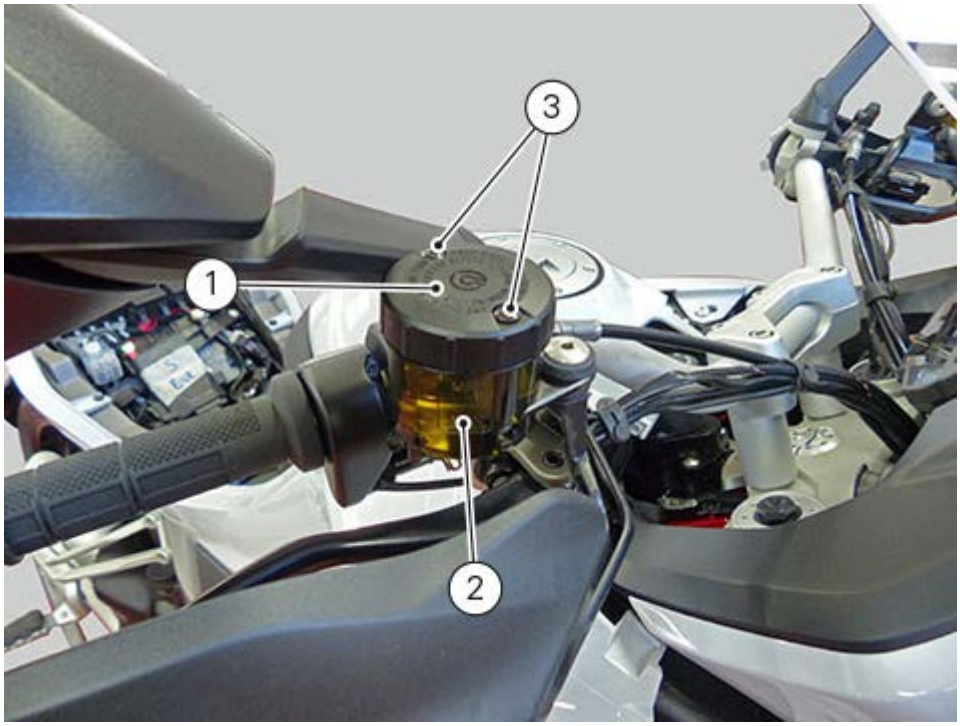
Warning

The following procedure applies to both vehicle versions.

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).

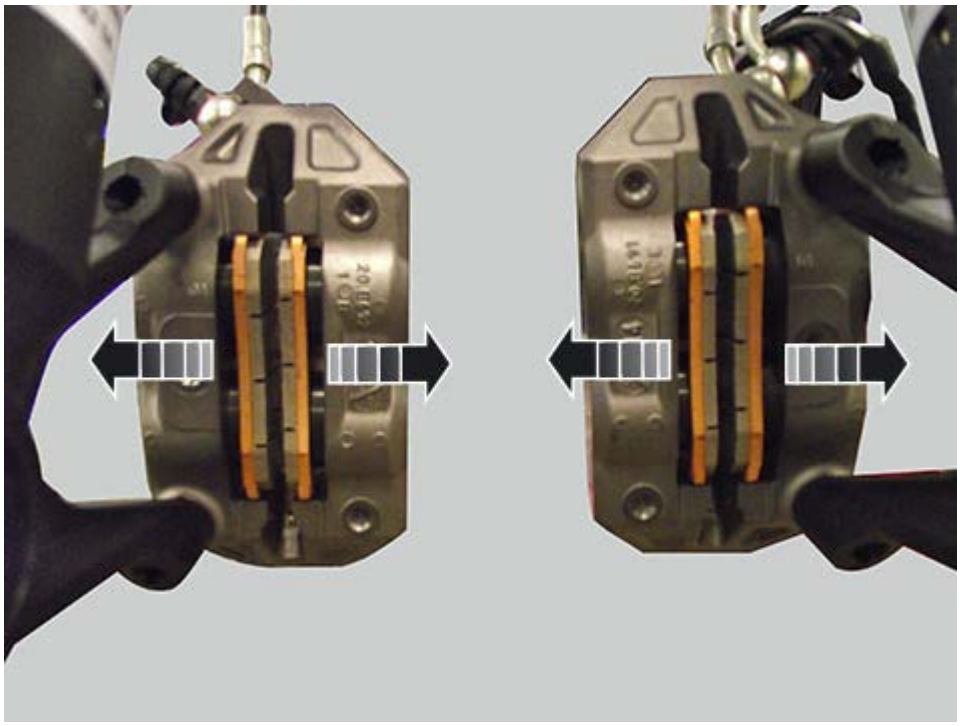


Important

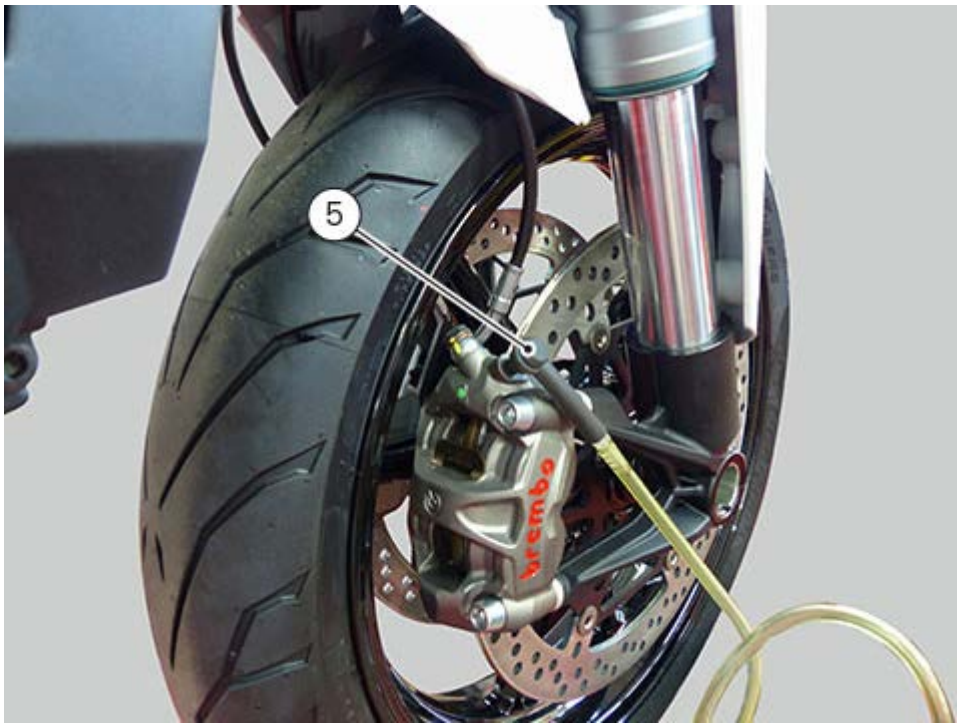
Refit the membrane (without the plug) on the reservoir to avoid brake fluid splashes during the following operations.

Move the brake calliper pistons back: to do so, loosen screws (4) that retain the callipers on the fork bottom ends.

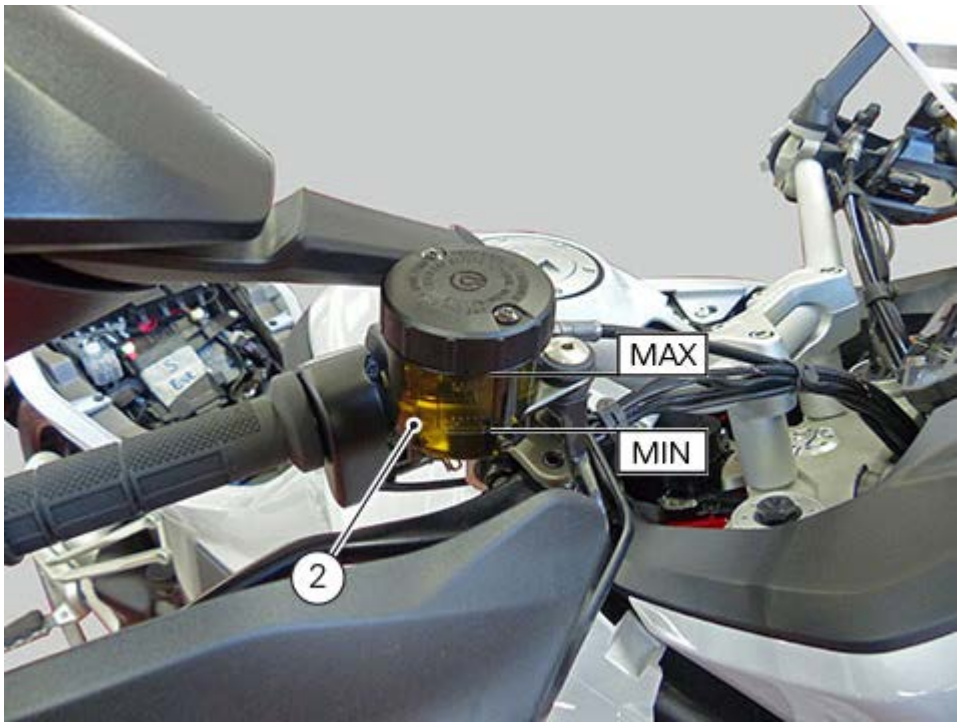
Take calliper pads apart and during this operation be careful with the fluid level, which must always be sucked out each time it flows back in the reservoir.



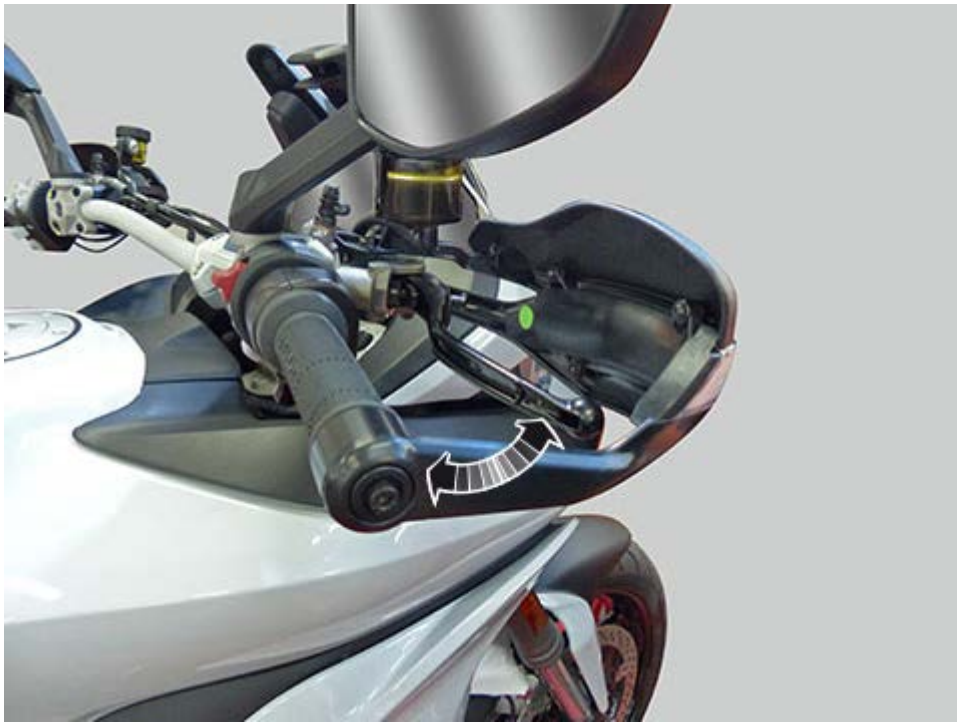
Once all pistons of both callipers are fully moved back and all the fluid in the reservoir has been sucked out, connect a transparent tube to the RH calliper bleed valve (5) and set the other end in a container placed on the floor.



Fill the front brake fluid reservoir with new fluid up to the MAX mark.



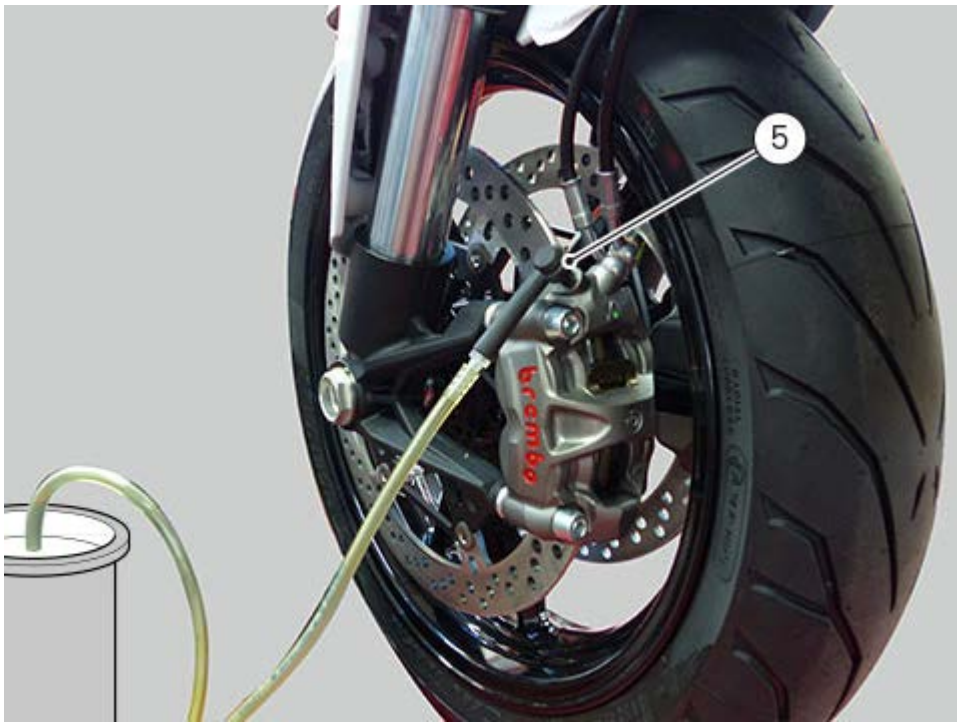
Pull the lever to make a 20 - 30 mm stroke and keep the lever in this position using a non-elastic clamp until clear brake fluid (new) flows out.



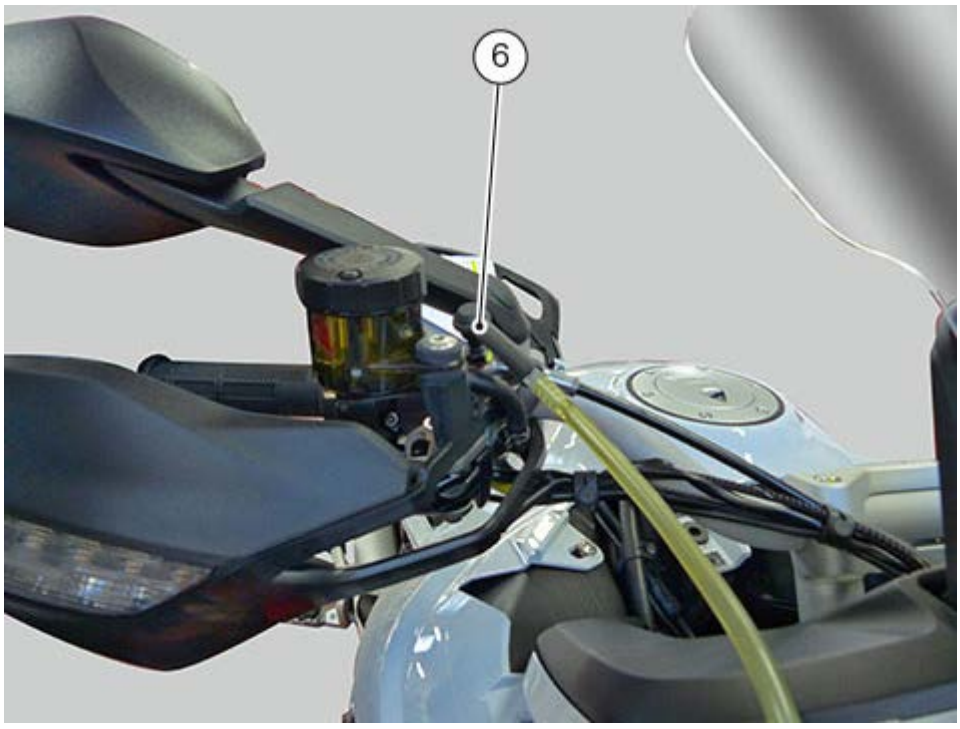
Tighten screw (5) of the RH calliper bleed valve to a torque of 12 Nm ± 10%.
Use a piece of paper towel and clean the hole of bleeder cap to remove any residues of fluid and then refit the rubber cap.

Loosen the bleed valve of the LH calliper 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) to a torque of 12 Nm ± 10% and then release the lever.
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.



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.

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

Smaltimento
Do not dispose of the exhausted fluid into the environment; do not pour the product, either new or exhausted, inside drains, water courses or the soil. Collect and deliver waste to authorized collecting centres. Dispose of waste

in compliance with the prevailing local and national standards.
European Waste Catalogue Codes recommended for waste disposal as indicated by Decision No 2001/118/EC: CER 13 02 05* (Mineral-based non-chlorinated engine, gear and lubricating oils waste).

Note
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To complete the ABS system bleeding, after performing the standard bleeding of the just-described front braking system and after changing the rear brake circuit fluid, perform the procedure described in "Bleeding of the ABS hydraulic system".

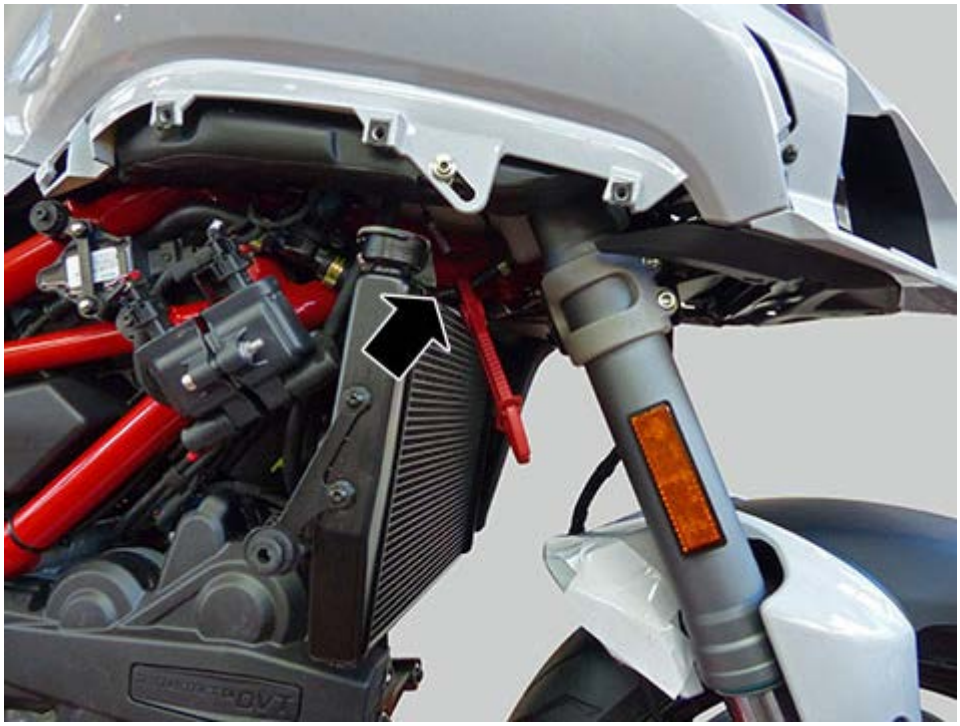
Change coolant

Warning

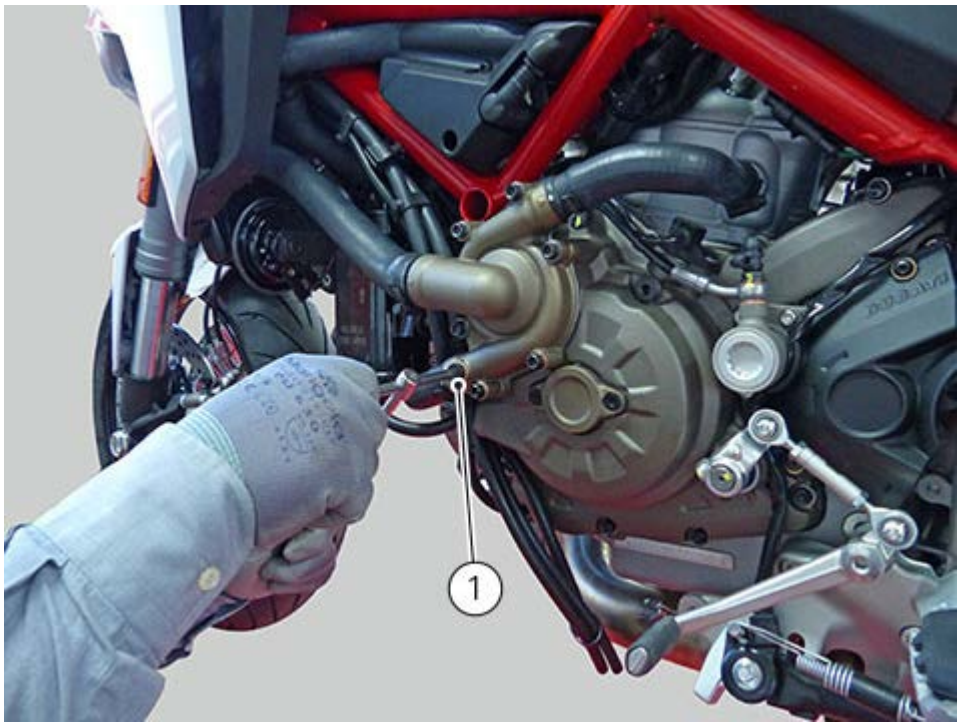
Make sure the engine is cold before proceeding. Attempting to change the coolant with the engine hot could lead to burns from hot coolant or scalding steam.

Remove the LH and RH panel (Removing the panel).
Remove the front half-casing (Removing the front half-casing).

Place a container under the engine and set the motorcycle on its side stand.
Remove the water radiator plug.
Connect a clamp to the expansion reservoir/water radiator pipe.
This is to isolate the expansion reservoir preventing water from flowing out.



Loosen fluid drain plug (1) located on the pump cover.
Allow the coolant to drain off completely.
Screw plug (1) with a new gasket.
Tighten plug (1) to a torque of 19 Nm ± 10%.



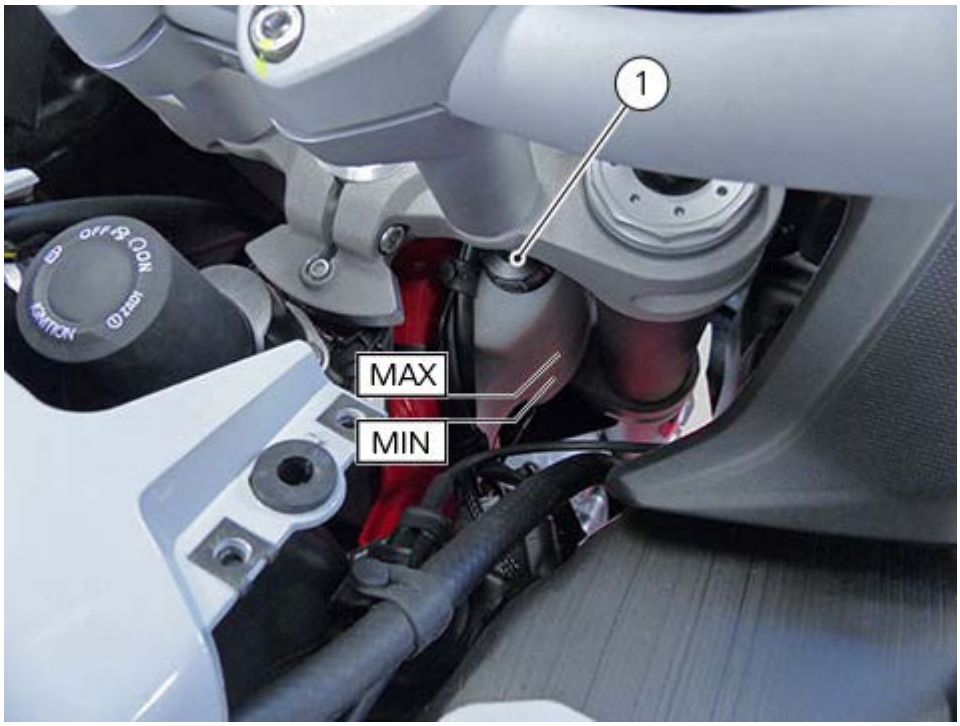
Fill the circuit with new coolant through the water radiator plug.
Remove the clamp from the expansion reservoir/radiator pipe.

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.

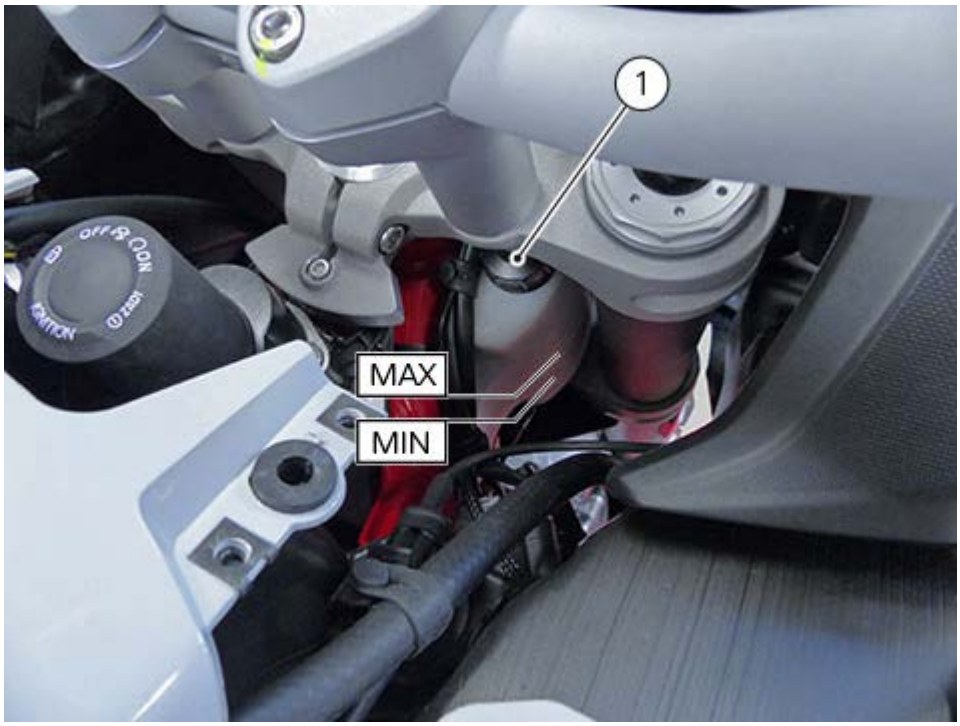


Refit the front half-casing (Refitting the front half-casing).

Refit the LH and RH panel (Refitting the panel).

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 "Scheduled maintenance chart".
The correct 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 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.

Warning
Do not dispose of coolant into the environment.

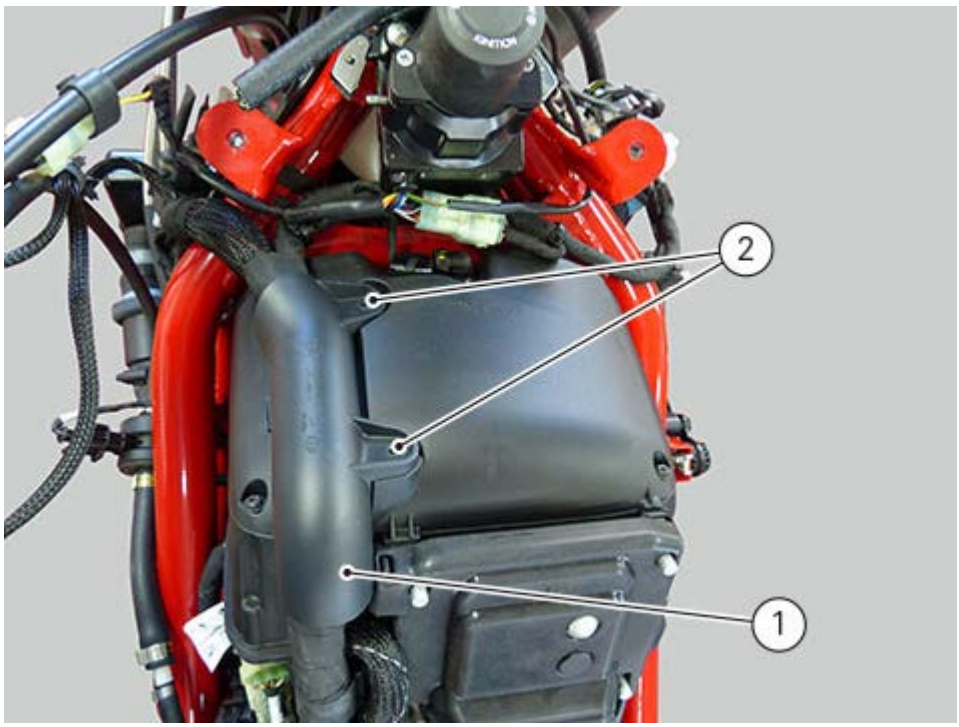
Smaltimento
Do not dispose of the waste into the environment; do not pour the product, either new or exhausted, inside drains, water courses or the soil. Collect and deliver waste to authorized collecting centres.
Dispose of waste in compliance with the prevailing local and national standards.
European Waste Catalogue Codes recommended for waste disposal as indicated by Decision No 2001/118/EC: CER 16 01 14* (Antifreeze fluids containing dangerous substances).

Note
It should be noted that the above-mentioned CER code is a general and non-binding provision, provided based on product original composition and intended use. The user is thus responsible for selecting the CER code most suitable to the concerned product, based on product real use and taking into account any alterations and/or contaminations of the product, as well as any amendments to the prevailing standard on waste disposal.

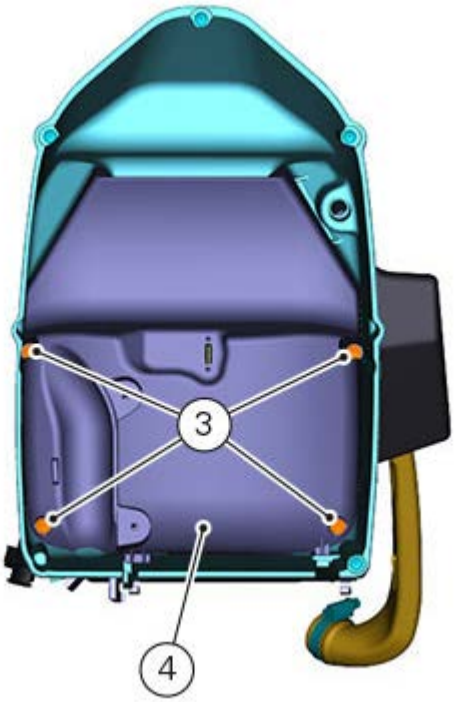
Changing and cleaning the air filters

Remove the fuel tank (Removing the fuel tank).

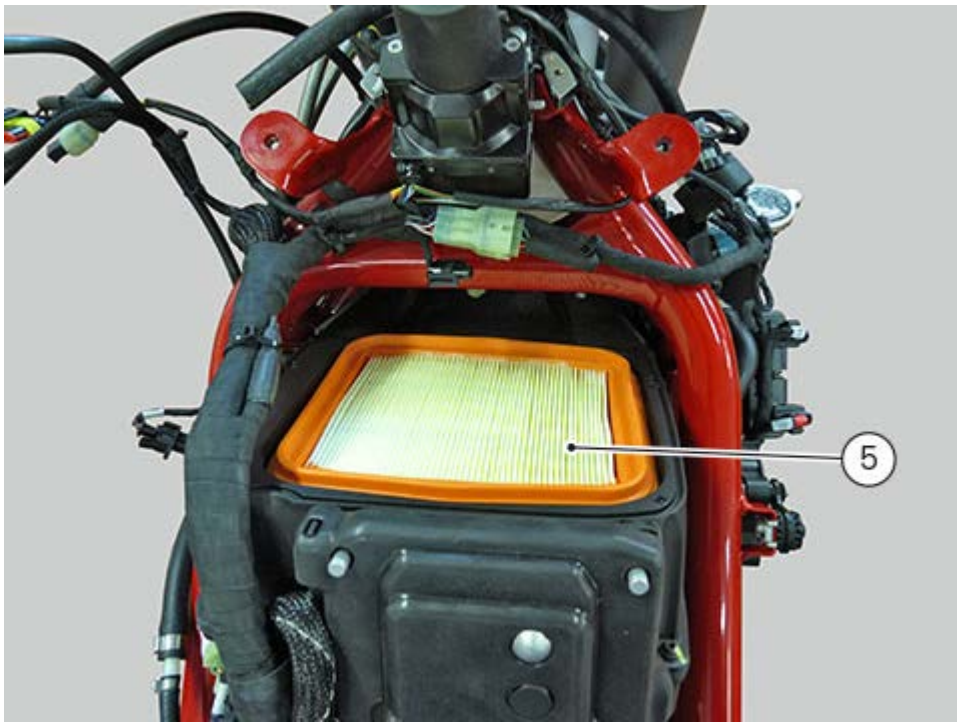
Remove the wiring cover (1) by loosening the two retaining screws (2).
Release the wiring from the airbox.



Loosen the four retaining screws (3) and remove cover (4).



Remove the filter (5).



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.

Note

Do not dispose of replaced filters into the environment.

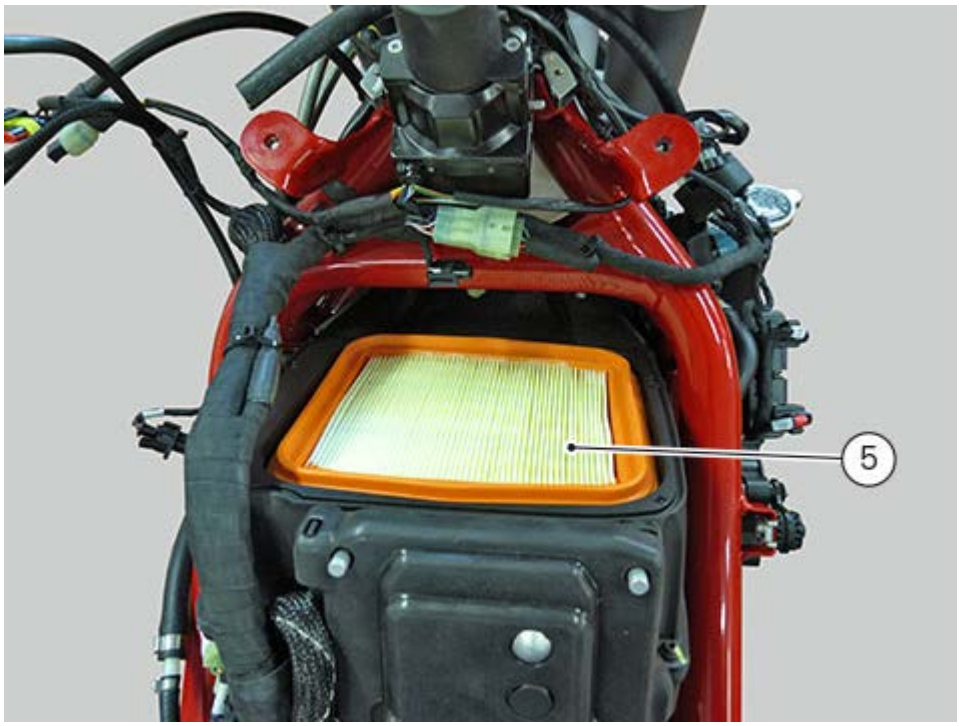
Smaltimento

If filtering element is replaced, do not dispose of waste into the environment. Collect and deliver waste to authorized collecting centres. Dispose of waste in compliance with the prevailing local and national standards. European Waste Catalogue Codes recommended for waste disposal as indicated by Decision No 2001/118/EC: CER 15 02 02* (Absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances).

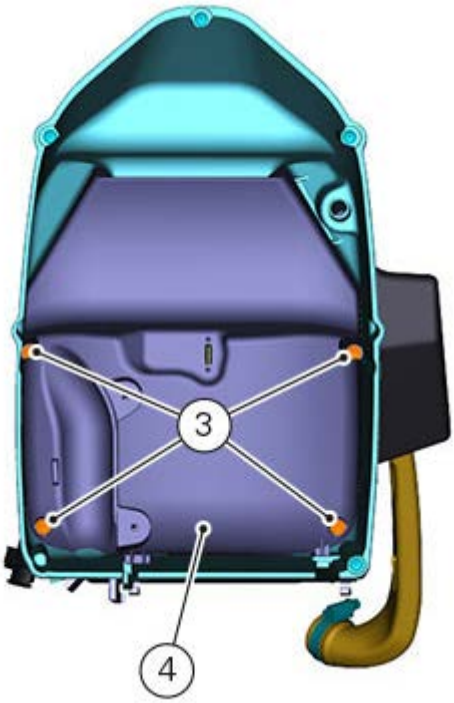
Note

It should be noted that the above-mentioned CER code is a general and non-binding provision, provided based on product original composition and intended use. The user is thus responsible for selecting the CER code most suitable to the concerned product, based on product real use and taking into account any alterations and/or contaminations of the product, as well as any amendments to the prevailing standard on waste disposal.

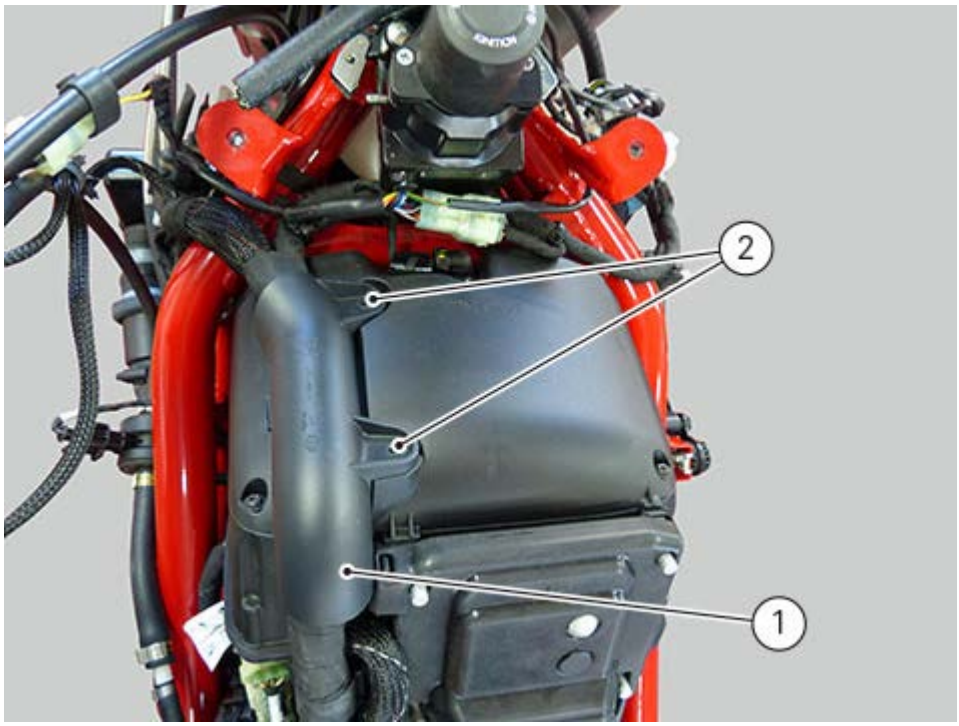
Correctly install the cartridge (5) in the airbox seat.



Position cover (4) and tighten the four retaining screws (3) to a torque of 3 Nm ± 10%.



Position the main wiring on the airbox.
Position wiring cover (1) and tighten the two retaining screws (2) to a torque of 3 Nm ± 10%.

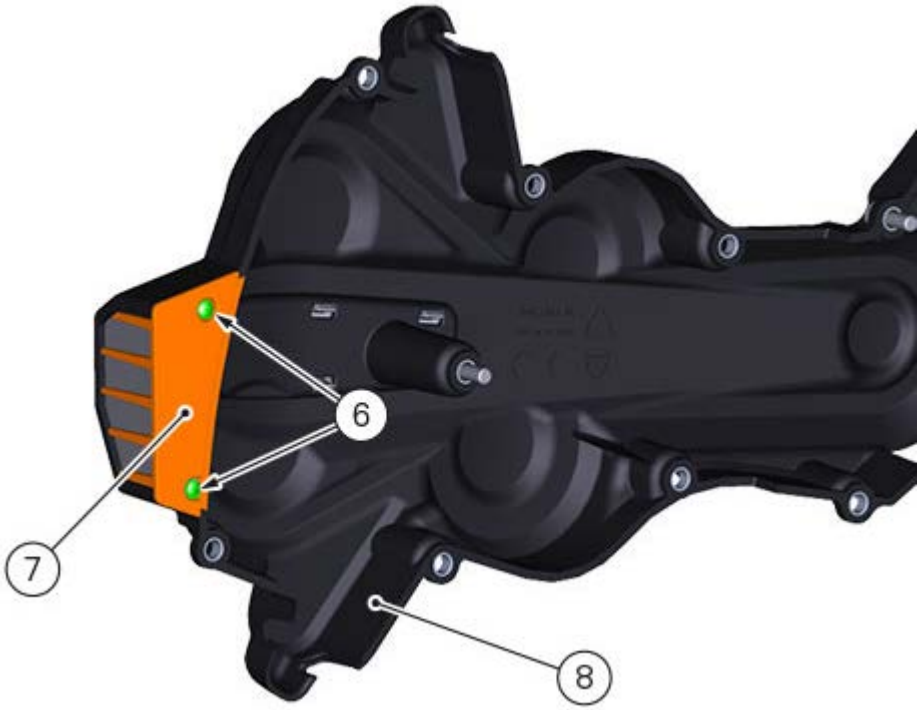


Important

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

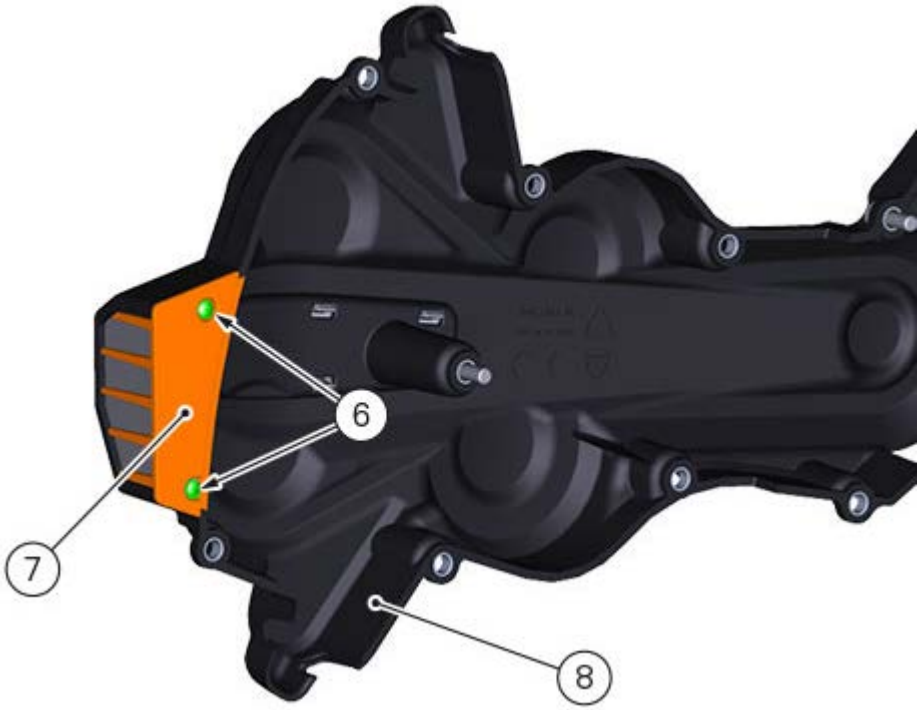
Remove the external timing belt covers (Removing the timing belt external covers).

Loosen the screws (6) and remove the filter (7).
Check the air filter (7) in the horizontal timing belt cover (8).



Once the check has been carried out, refit filter (7), start (without tightening) screws (6), and refit the horizontal timing belt cover (8) on the horizontal piston-cylinder assembly.

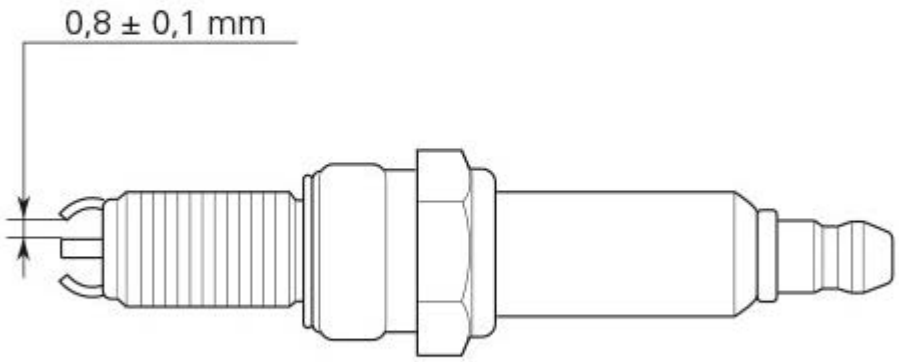
Tighten screws (6).



Refit the fuel tank (Refitting the fuel tank).

Change spark plugs

Check the colour of the ceramic insulation around the central electrode: an even, light brown colour indicates the engine is in good condition and running at the right temperature.
Inspect the centre electrode for wear and check spark plug gap, which should be: 0.8 ÷ 0.1 mm.



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.

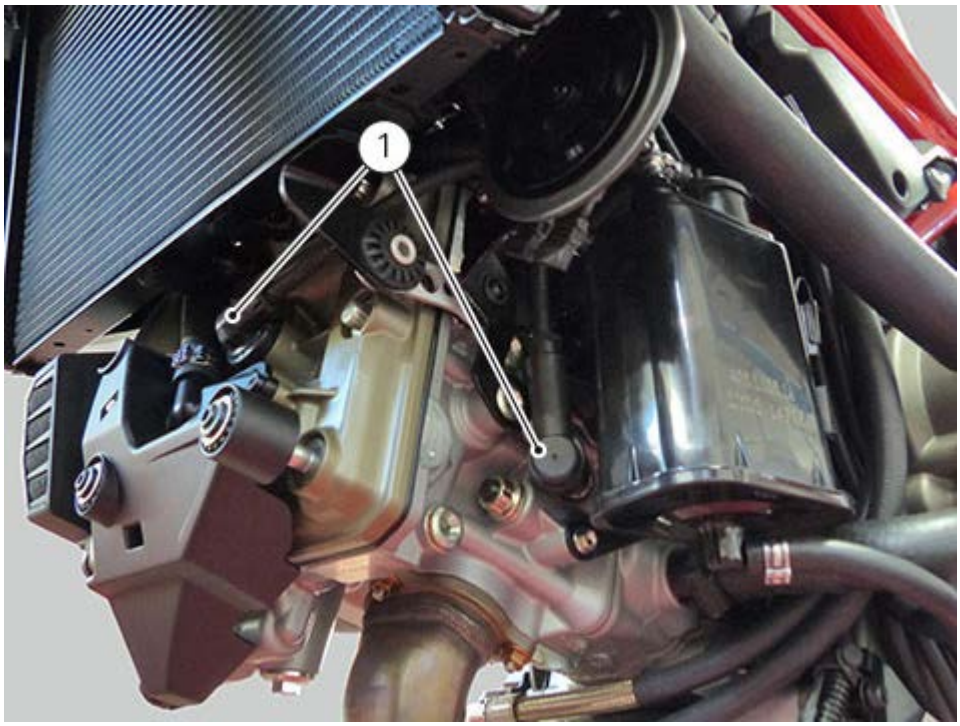
Warning

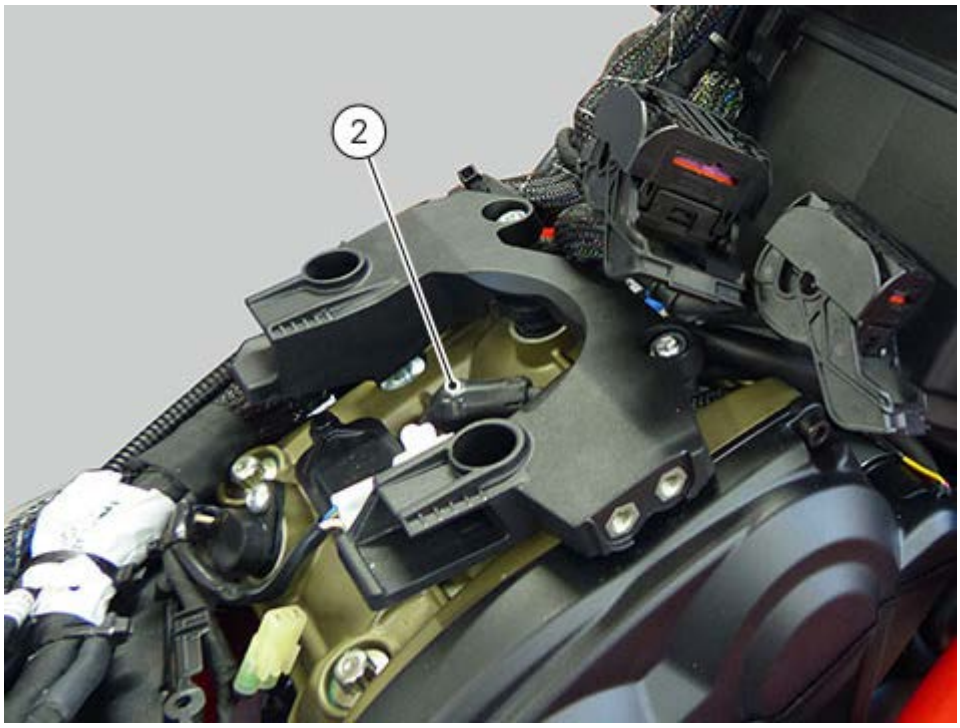
Do not use spark plugs with inadequate heat rating or incorrect thread length.
The spark plug must be securely installed.
If a spark plug is loose, it can overheat and damage the engine.

Spark plug type
Make: NGK
Type: MAR10A-J

Remove the fuel tank (Removing the tank).

Slide out caps (1) of the horizontal head and cap (2) of the vertical head using tool no. **88713.2877**.
Replace the spark plugs with new ones and tighten them to a torque of 12 Nm (Min. 11 Nm - Max. 13 Nm).


1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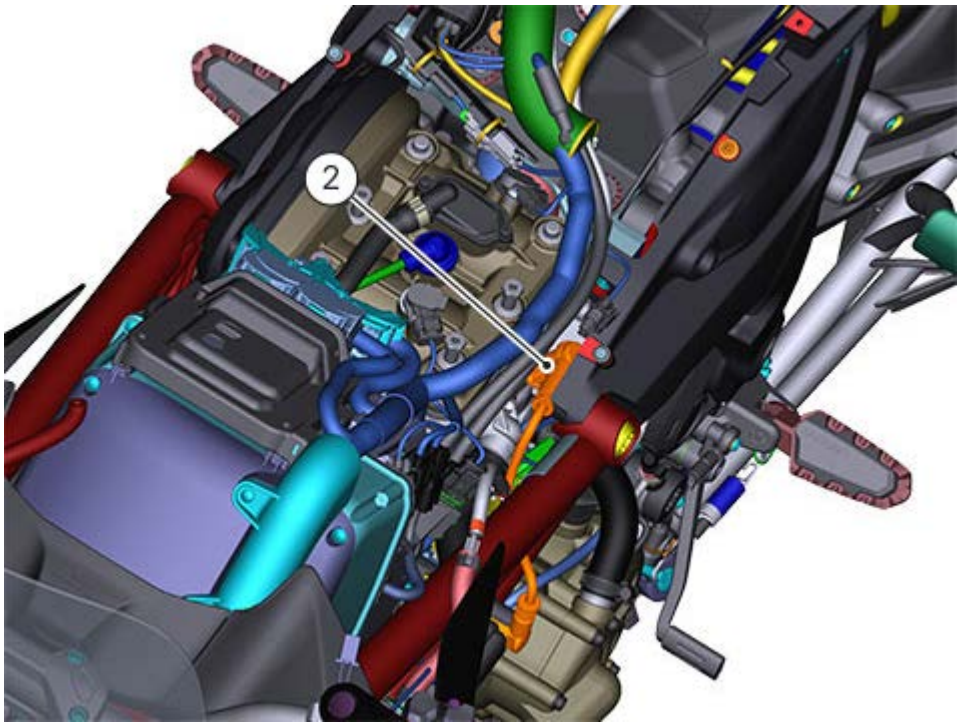

Warning

Do not dispose of waste components into the environment.

Smaltimento

Do not dispose of waste into the environment. Collect and deliver waste to authorized collecting centres. Dispose of waste in compliance with the prevailing local and national standards. European Waste Catalogue Codes recommended for waste disposal as indicated by Decision No 2001/118/EC: CER 16 01 22 (components not otherwise specified).

Note

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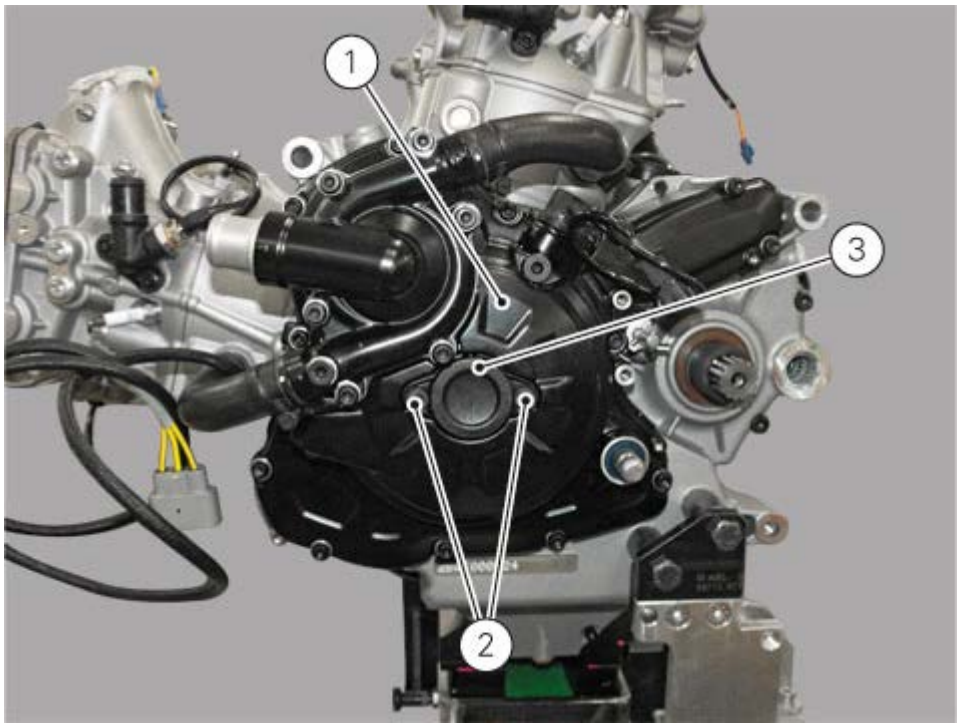
Refit the fuel tank (Refitting the fuel tank).

Change timing belts

Remove the external belt covers (Removing the timing belt external covers).
Remove the cylinder head covers (Removing the head covers).
Remove the timing belts (Removing the mobile tensioner/timing belt).

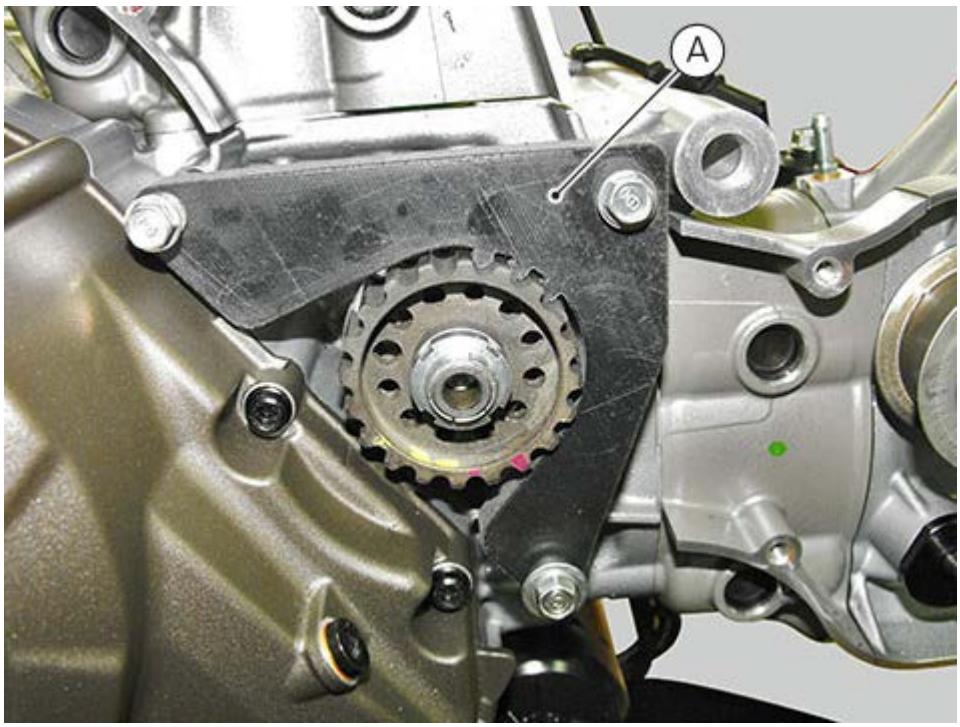
Working on the generator cover (1) loosen the screws (2) and remove cover (3).

For better clarity, some of the following figures show the engine removed from the frame.

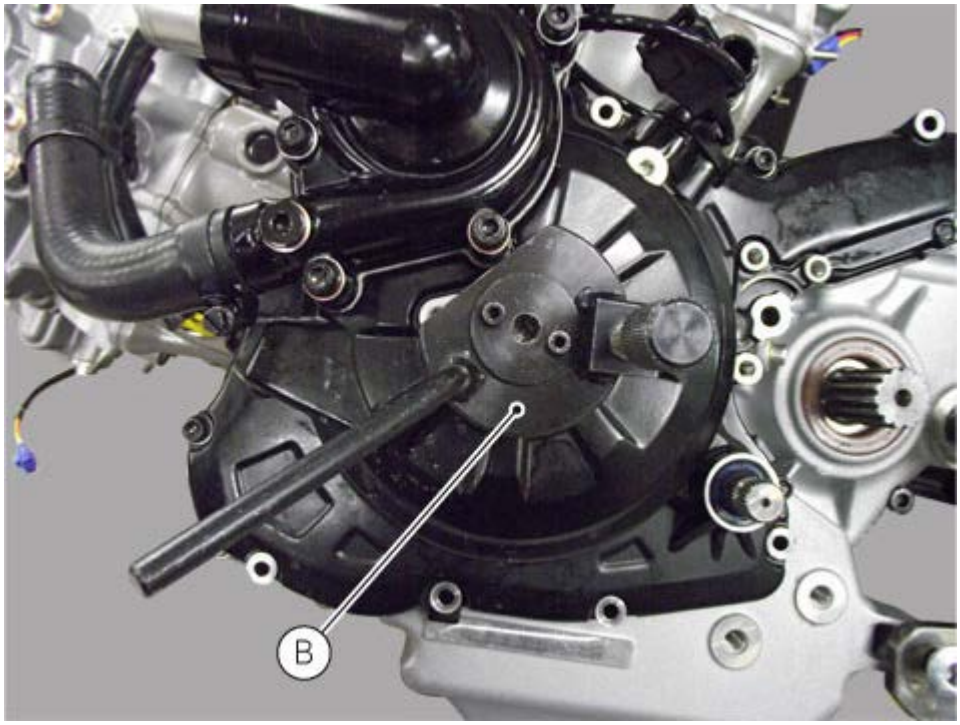


Use tool no. **88765.1523** to rotate the crankshaft in the vehicle direction of travel (by looking the tool from the front side, counter clockwise), to bring the horizontal cylinder piston to the TDC.

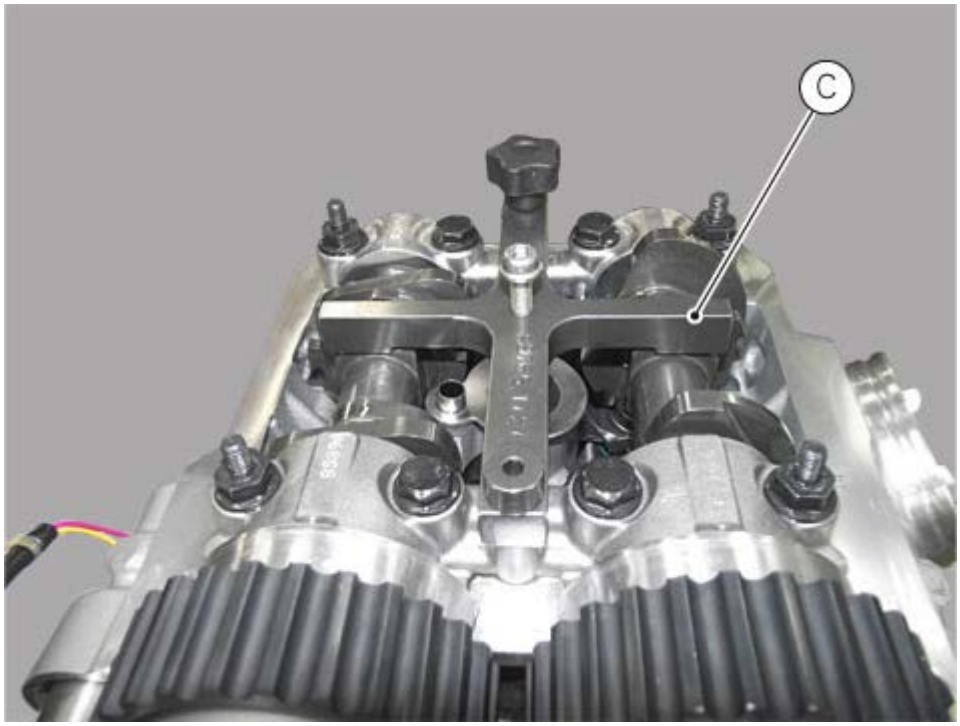
In this condition, the check tool (A) no. **88713.5009** fitted on the timing layshaft pulley must perfectly match with the crankcase holes.
If this is not the case, rotate the crankshaft until reaching the TDC again and try refitting the tool.
For this type of engine, there is just one TDC that allows performing a correct timing.



When the timing is correct, fit tool (B) no. **88713.2011** to block the crankshaft.

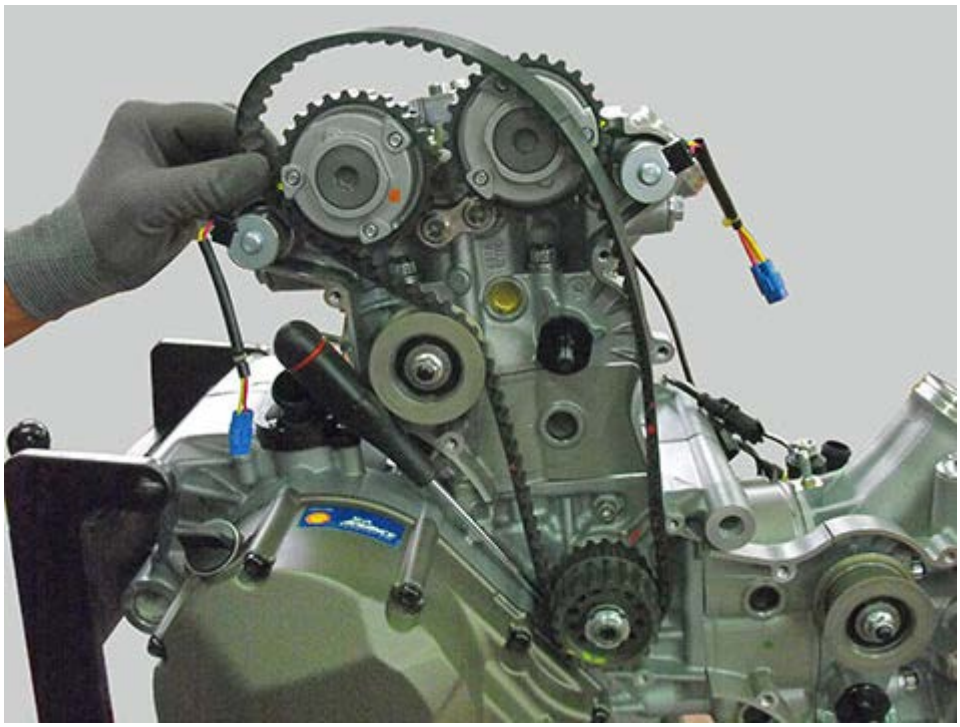


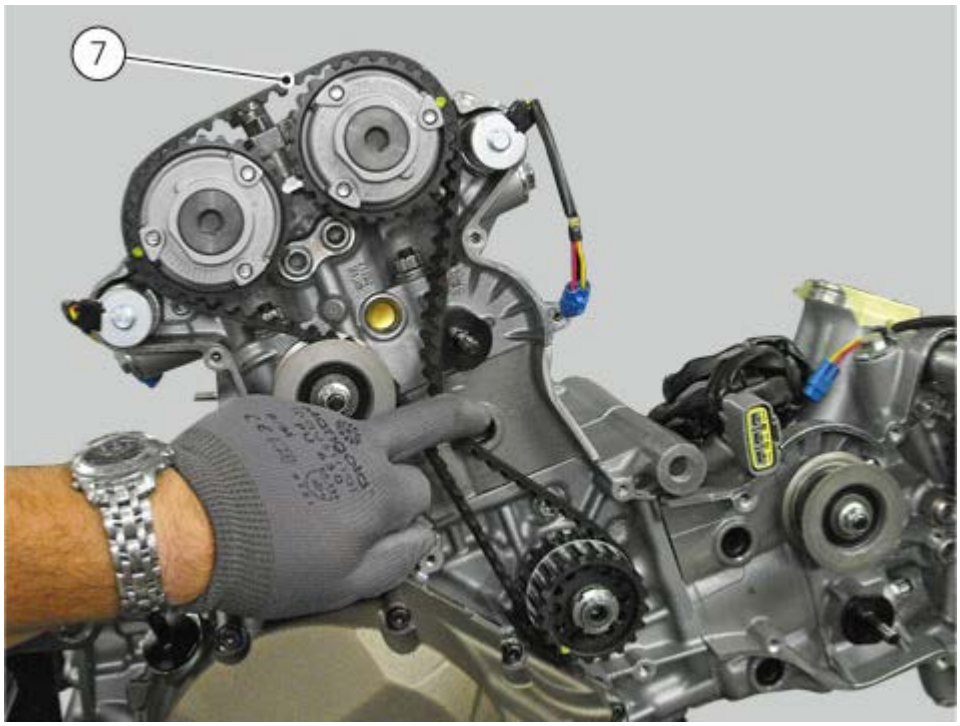
On the vertical head install tool (C) part no. **88765.1737**.



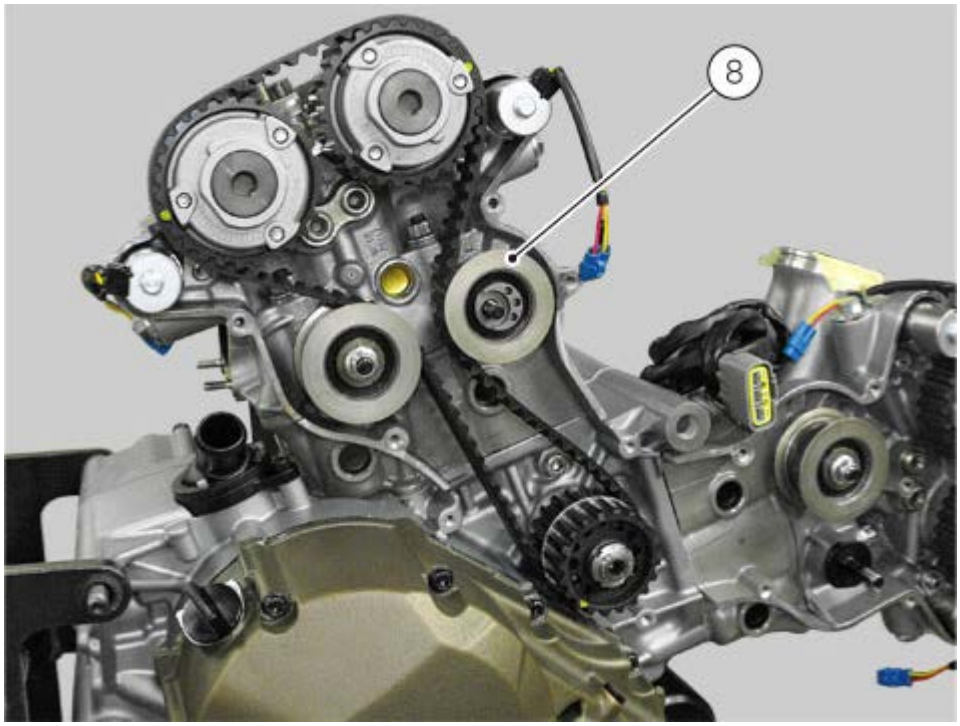
Check the variators alignment, i.e. they must be flush with the "head flat surface".

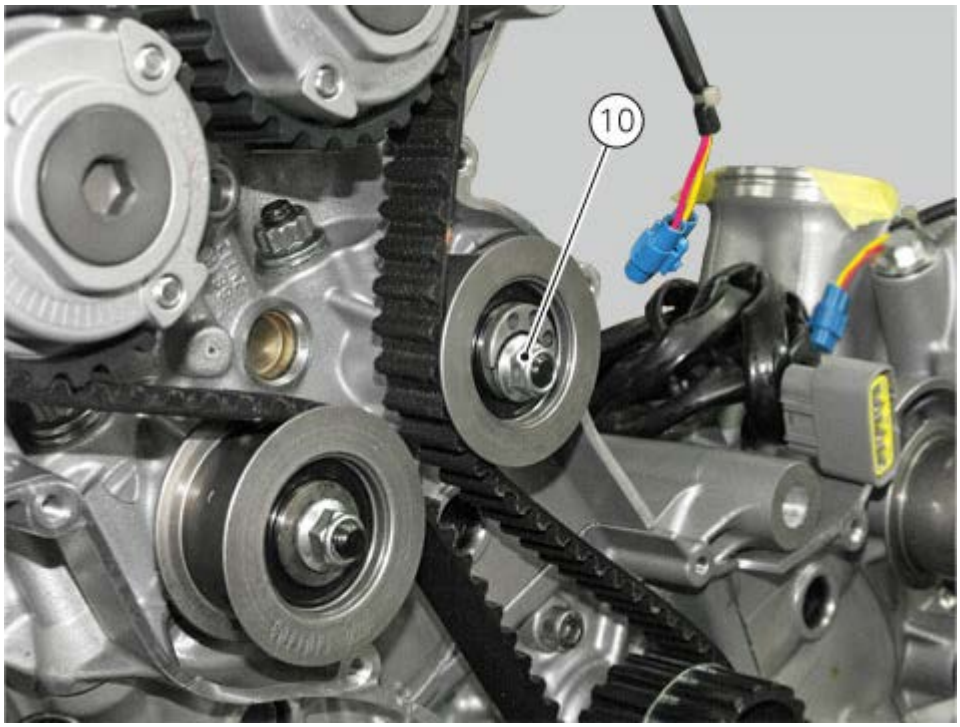
Fit the belt (7) as shown in the figure using a screwdriver to tension it.



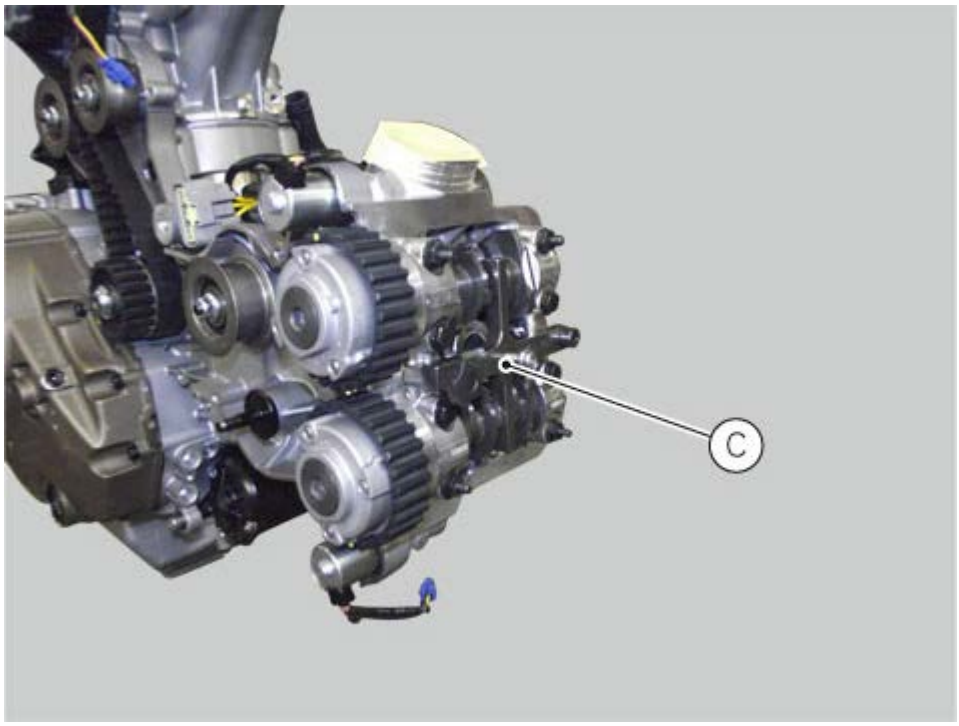


If previously removed, fit the chain tensioner (8), washer (9) and tighten it by means of nut (10). Do not tighten to torque.

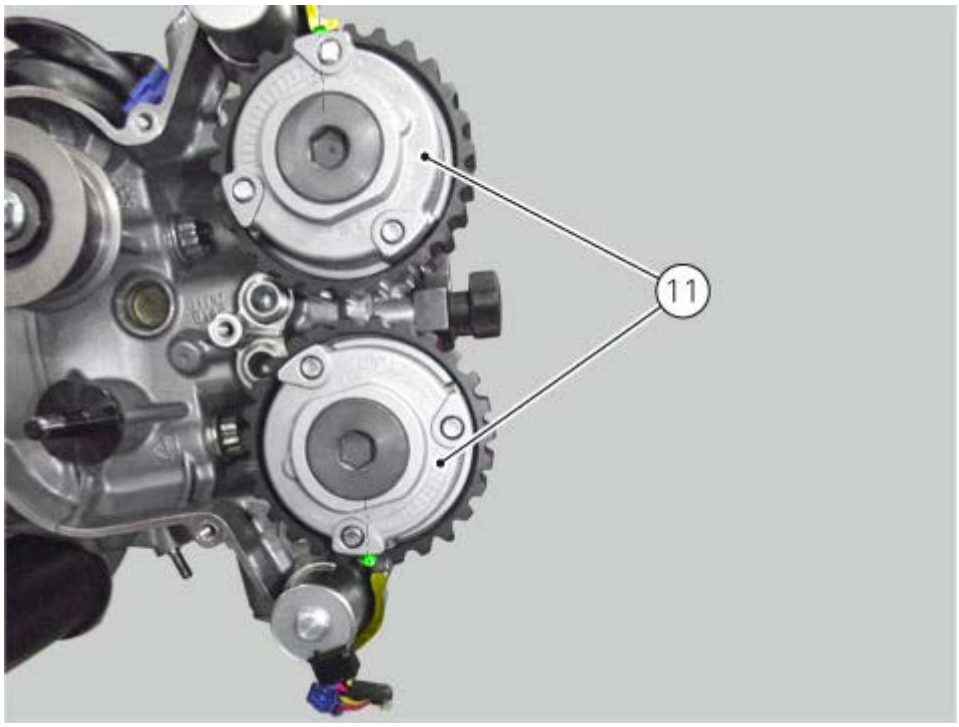




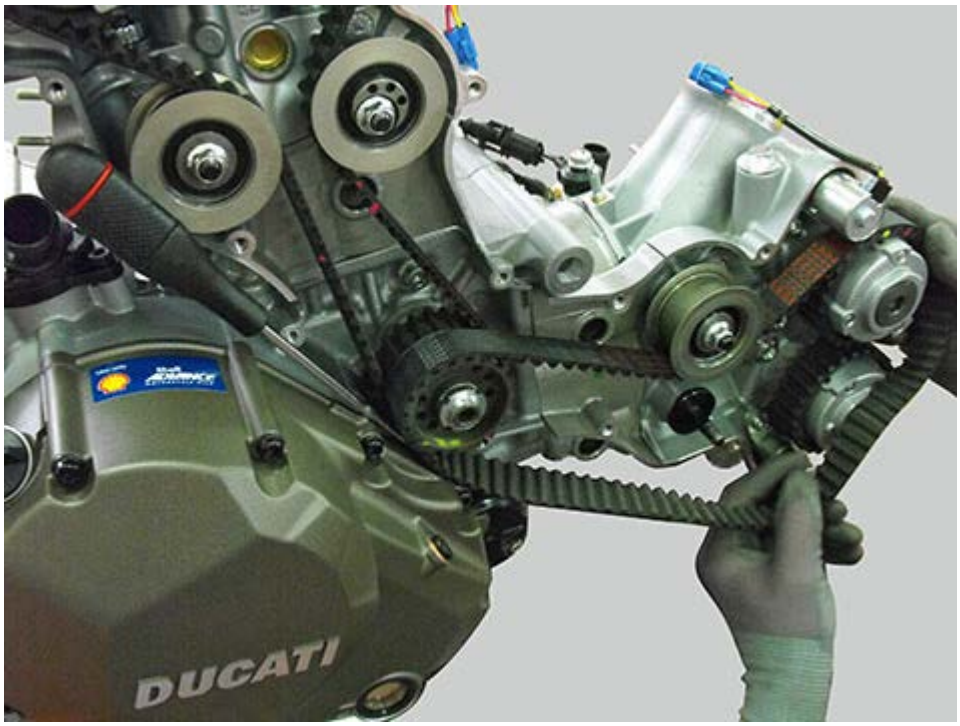
Remove tool (C) part no. **88765.1737** and fit it on the horizontal head.

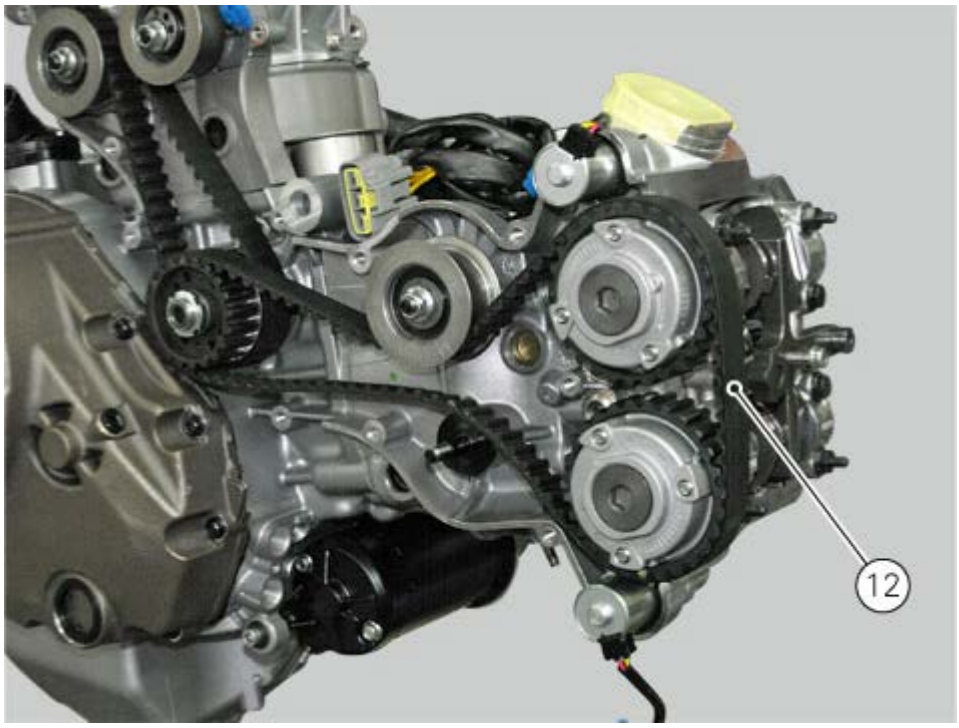


Check on the variators (11) that the references are aligned with the "head flat surface".

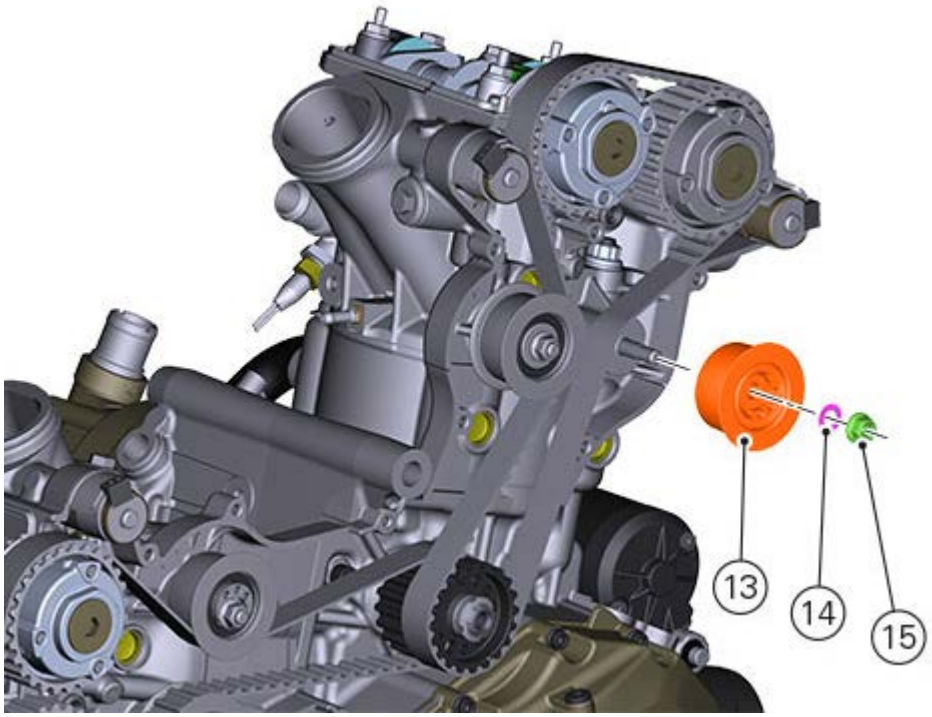


Fit the belt (12) in the horizontal head as shown in the figure using a screwdriver to tension it.



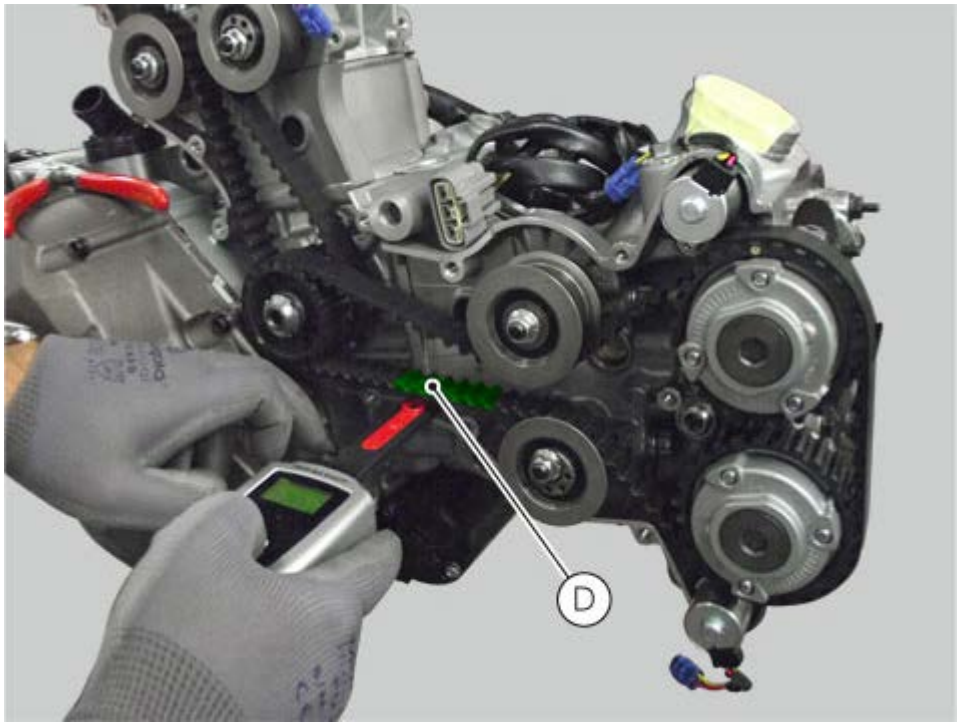


If previously removed, fit the chain tensioner (13), washer (14) and tighten it by means of nut (15).
Do not tighten to torque.



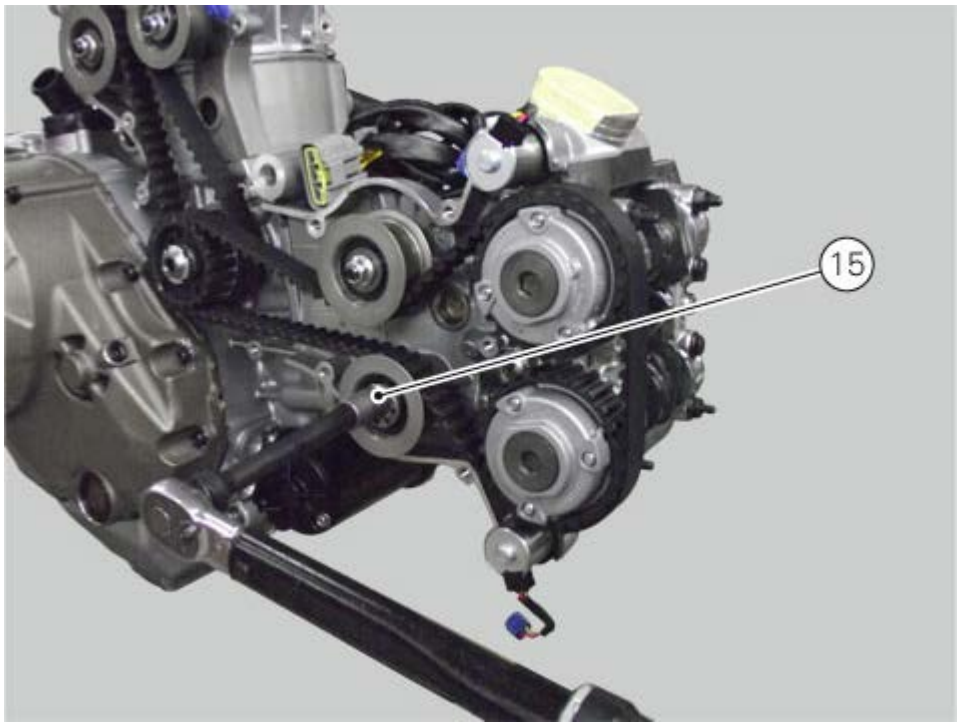
Remove the camshaft locking tool.

Check the horizontal head belt tension in the indicated point (D).
Tension the belt according to the values indicated in the table.



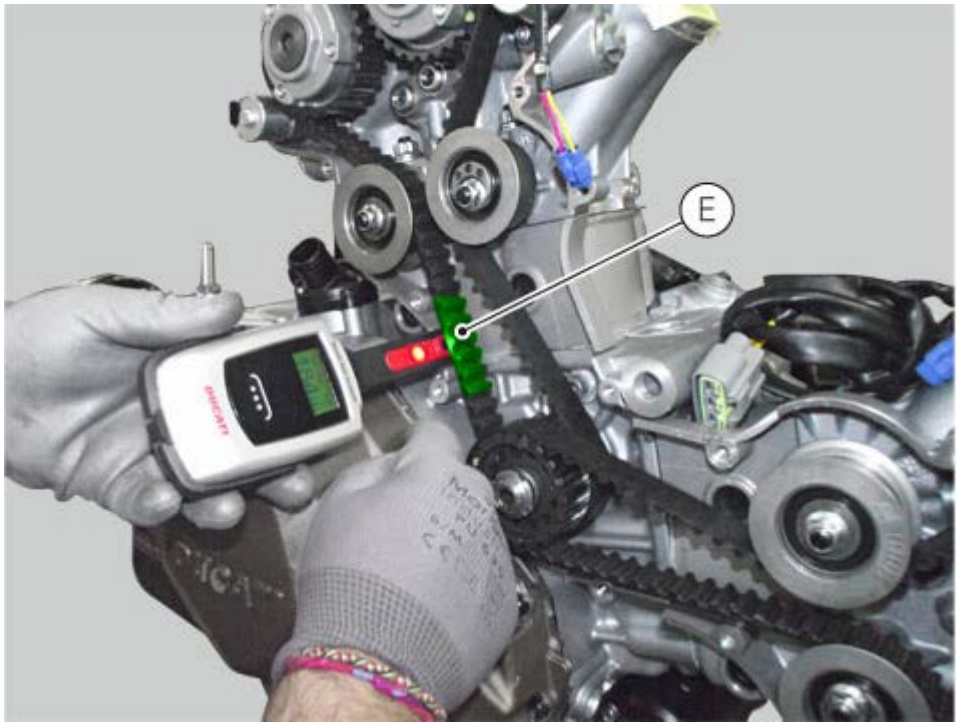
	Reference	**Assembly Value (new belt)**	**Assembly Value (used belt)**
Cold belt tension adjustment	DDS 2	90 ± 5 Hz (horizontal) 90 ± 5 Hz (vertical)	80 ± 5 Hz (horizontal) 80 ± 5 Hz (vertical)

Tighten nut (15) to a torque of 25 Nm (Min. 22 - Max. 28).



Rotate the crankshaft by 270° in its rotation sense so as to bring the vertical cylinder piston to the stroke TDC.

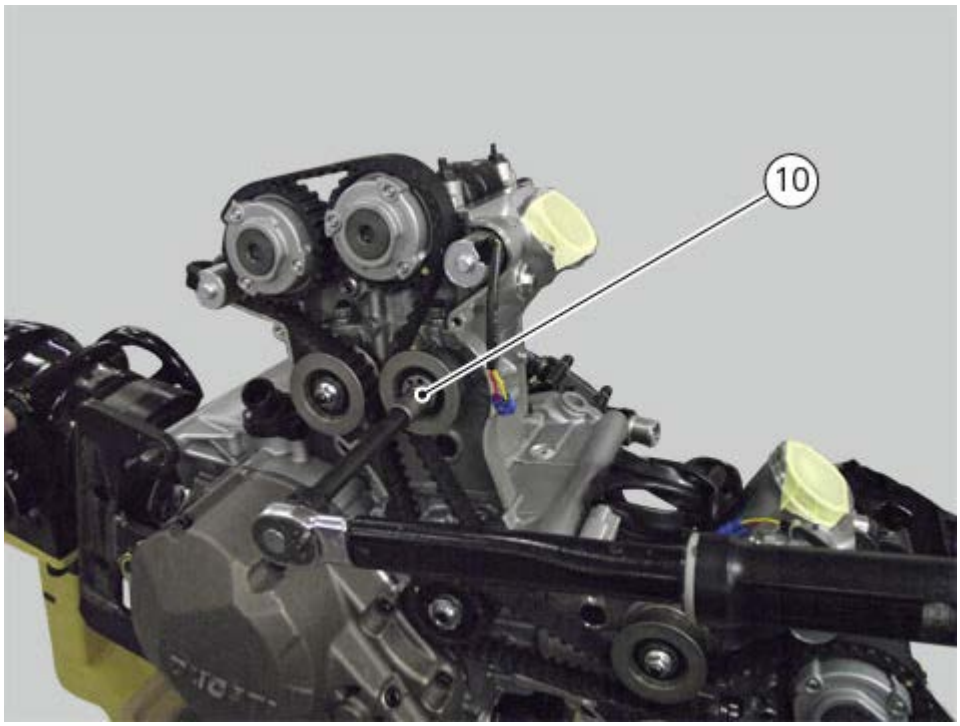
Check the vertical cylinder belt tension in the indicated point (E).
Tension the belt according to the values indicated in the table.



	Reference	**Assembly Value (new belt)**	**Assembly Value (used belt)**
Cold belt tension adjustment	DDS 2	90 ± 5 Hz (horizontal) 90 ± 5 Hz (vertical)	80 ± 5 Hz (horizontal) 80 ± 5 Hz (vertical)

Note
With used belt we mean after the first heating up of the engine.

Tighten nut (10) to a torque of 25 Nm (Min. 22 - Max. 28).



Remove all the previously installed tools.
Refit the cylinder head covers (Refitting the camshafts).
Refit the external timing belt covers (Refitting the timing belt external covers).

Checking valve clearance

Remove the seat (Removing the seat).
Remove the rear body panels (Removing the side body panels and the tail guard).
Remove the front half-fairings (Removing the front half-fairing).
Remove the fuel tank (Removing the fuel tank).
Remove the airbox (Removing the airbox and throttle body).
Loosen the timing belt covers (Removing the timing belt external covers).
Loosen the water radiator retaining screws by leaving the radiator connected to the cooling system (Removing the water radiator).
Disconnect the coil caps.
Disconnect the secondary air units of the head covers (Removing the secondary air system).
Remove the cylinder head cover (Removing the camshafts).

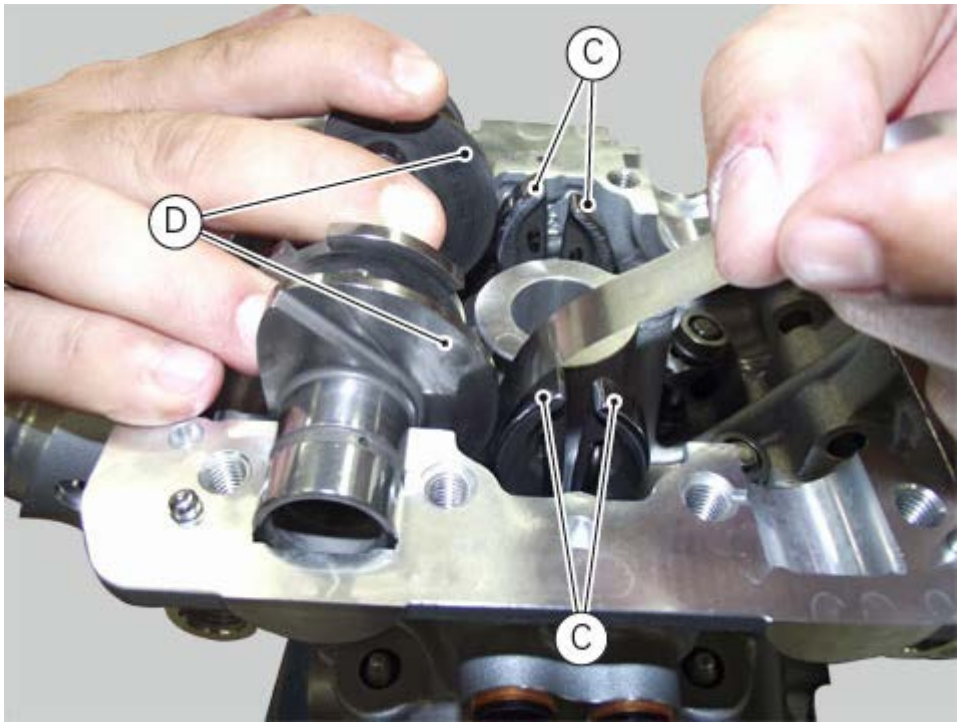
Note
For better clarity, some of the following figures show the engine removed from the frame.

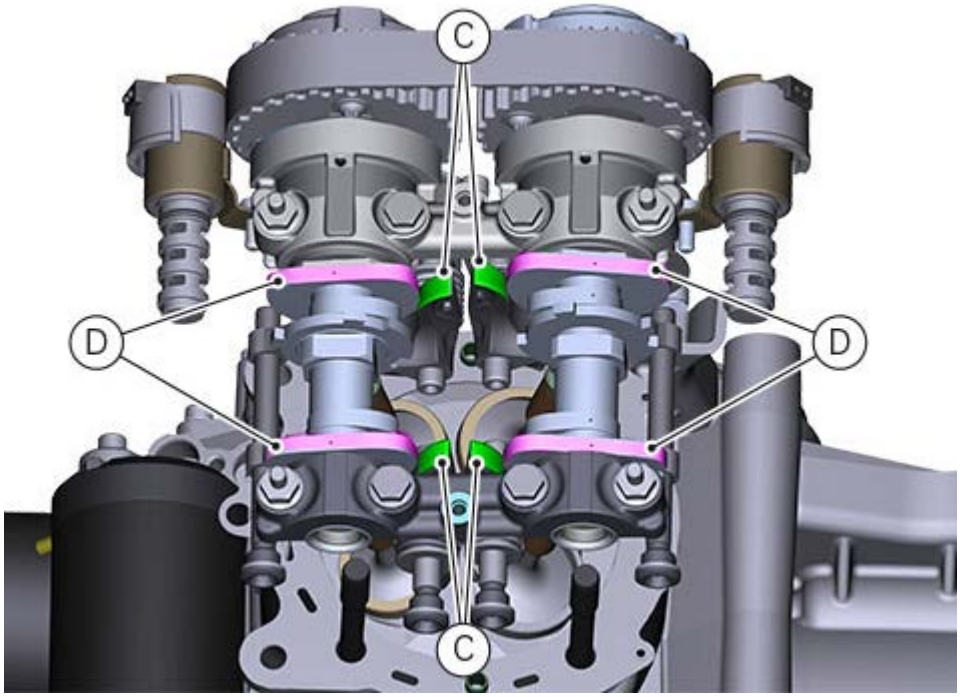
Bring the horizontal cylinder to the TDC and proceed as described in chapter "Timing"

Then, all valves are closed and the camshafts are in rest position, i.e. free to rotate.

Checking the closing clearance

Using a feeler gauge, check the clearance between the closing rocker arm (C) sliding shoe and the highest point of the camshaft lobe (D).

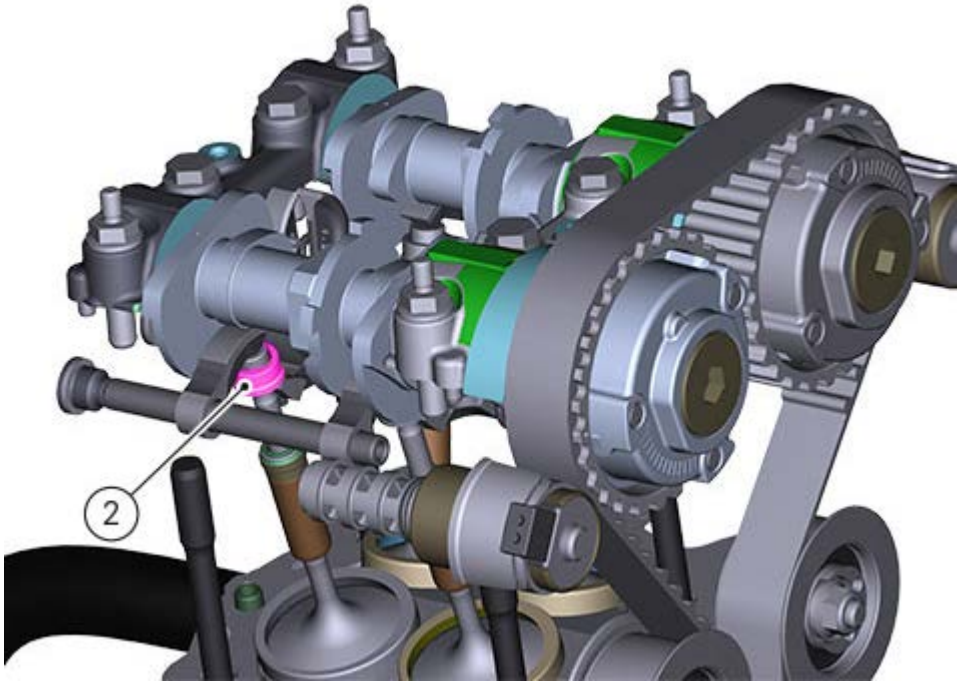




The value must be within the prescribed ones.

VALVES	CLOSING CLEARANCE (mm)
INTAKE	0.05 ÷ 0.10
EXHAUST	0.05 ÷ 0.10

If not, remove the closing shim (2), as described in paragraph "Removing the valves", and replace it with one of suitable height to obtain the prescribed clearance.



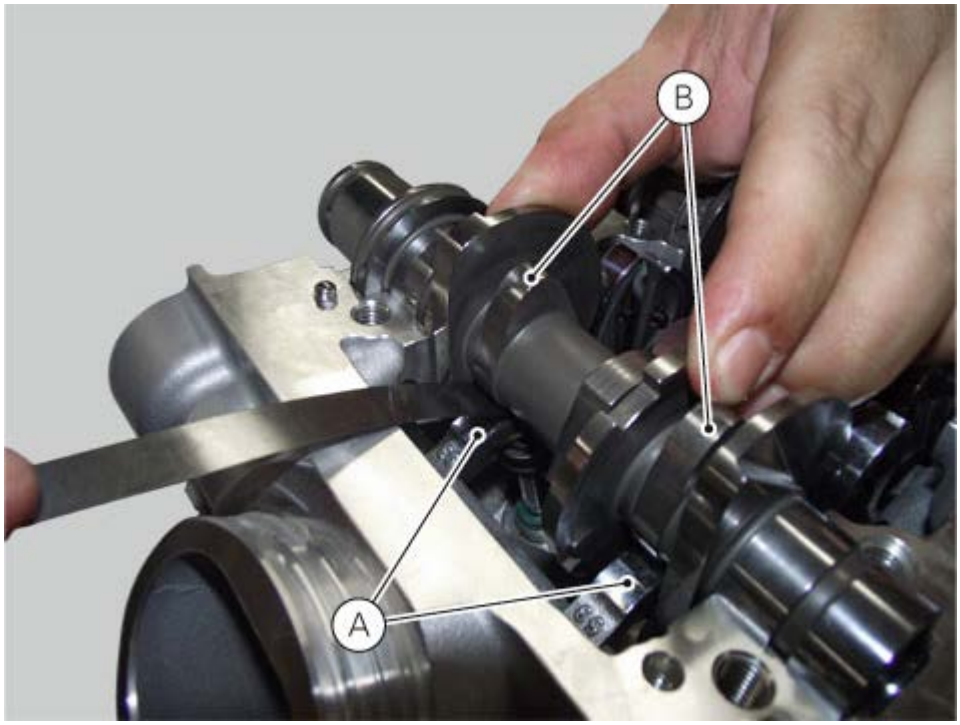
Note

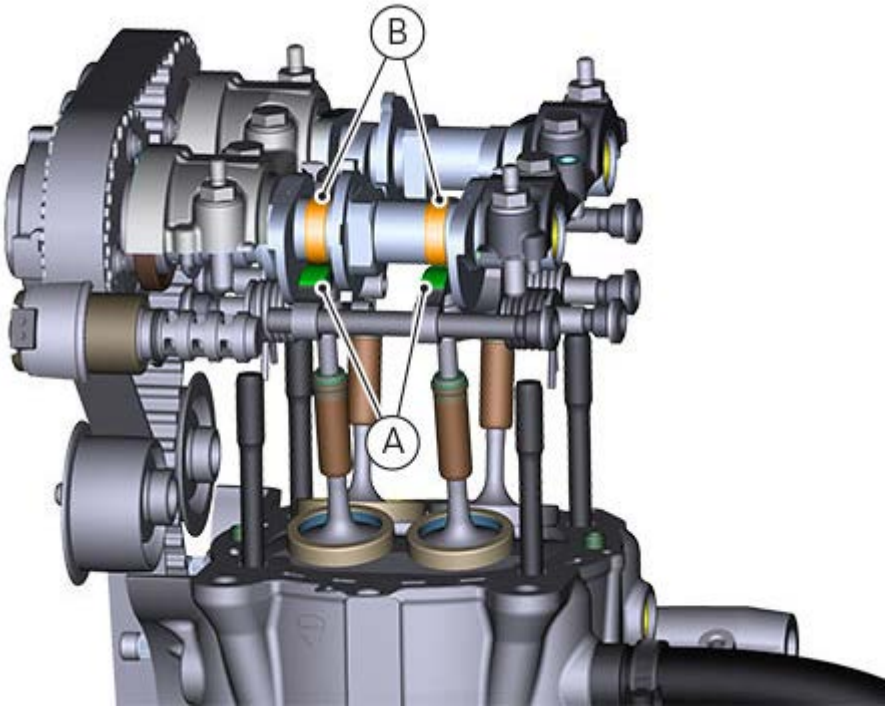
Opening rocker arm shims measuring 1.80 to 3.45 are available as spare parts: the size is punched on the shim.

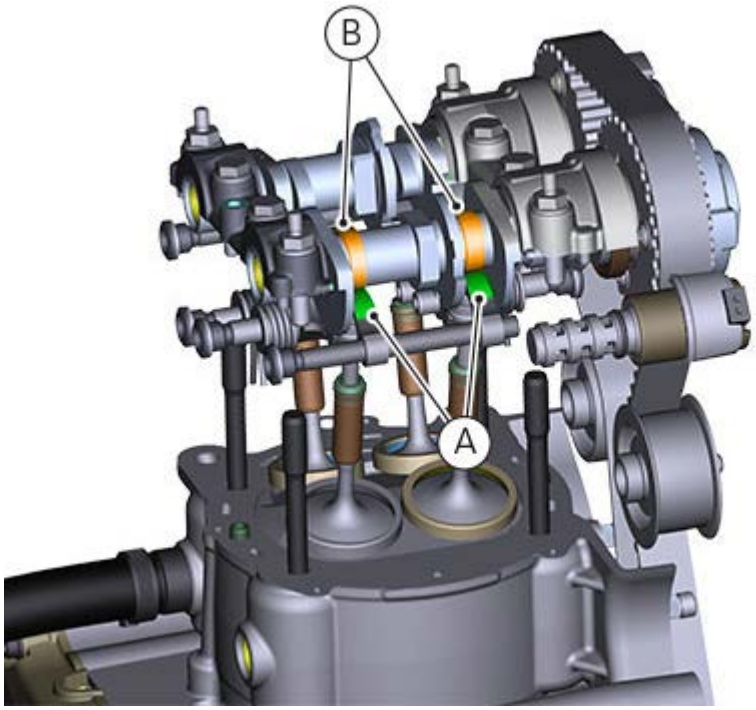
Checking the opening clearance

Using a feeler gauge, check the clearance between the opening rocker arm (A) and the lowest point of the

camshaft lobe (B).



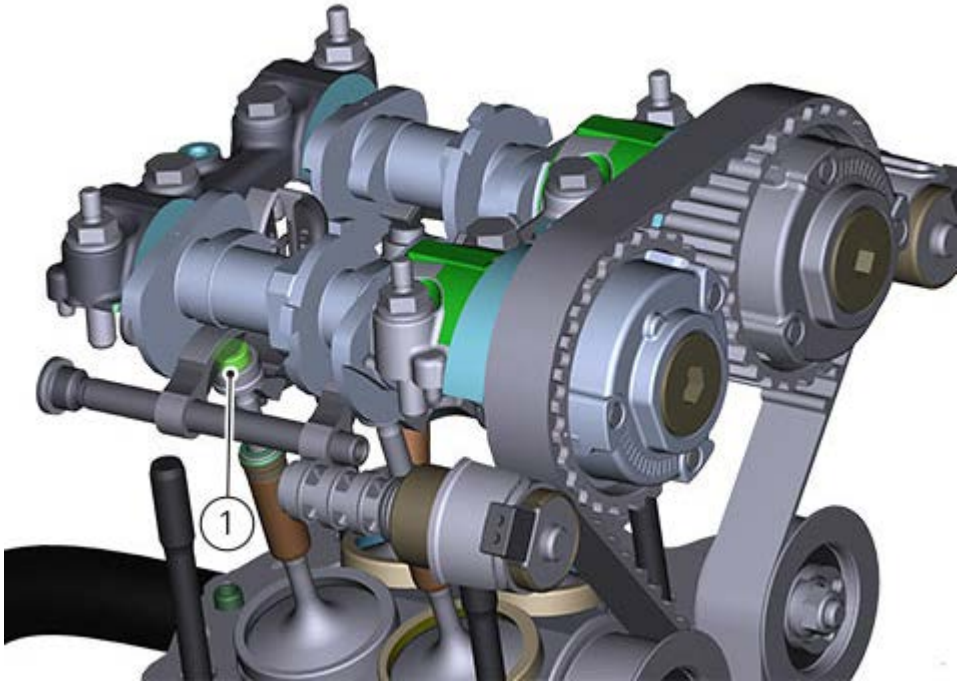




The value must be within the prescribed ones.

VALVES	CLOSING CLEARANCE (mm)
INTAKE	0.13 ÷ 0.18
EXHAUST	0.13 ÷ 0.18

If not, remove the opening shim (1), as described in paragraph "Removing the valves", and replace it with one of suitable height to obtain the prescribed clearance.



Note

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

Bring the vertical cylinder to the TDC. Repeat the operations performed on the vertical head for the horizontal head.

Changing the engine oil and filter cartridge

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

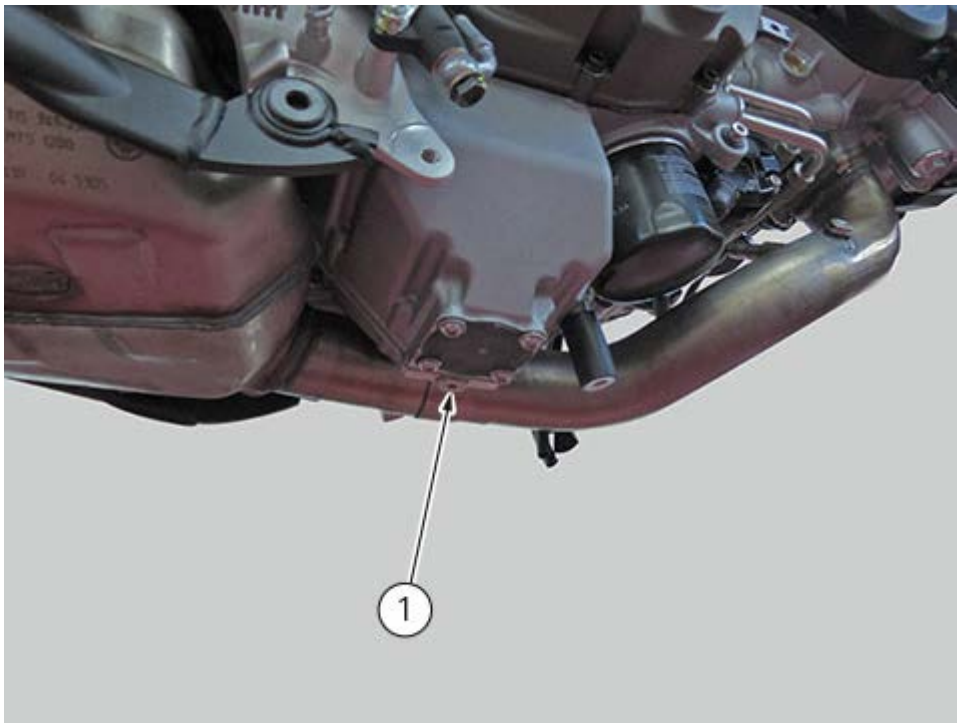
Remove the complete belly pan (Removing the belly pan).

CHANGING THE ENGINE OIL

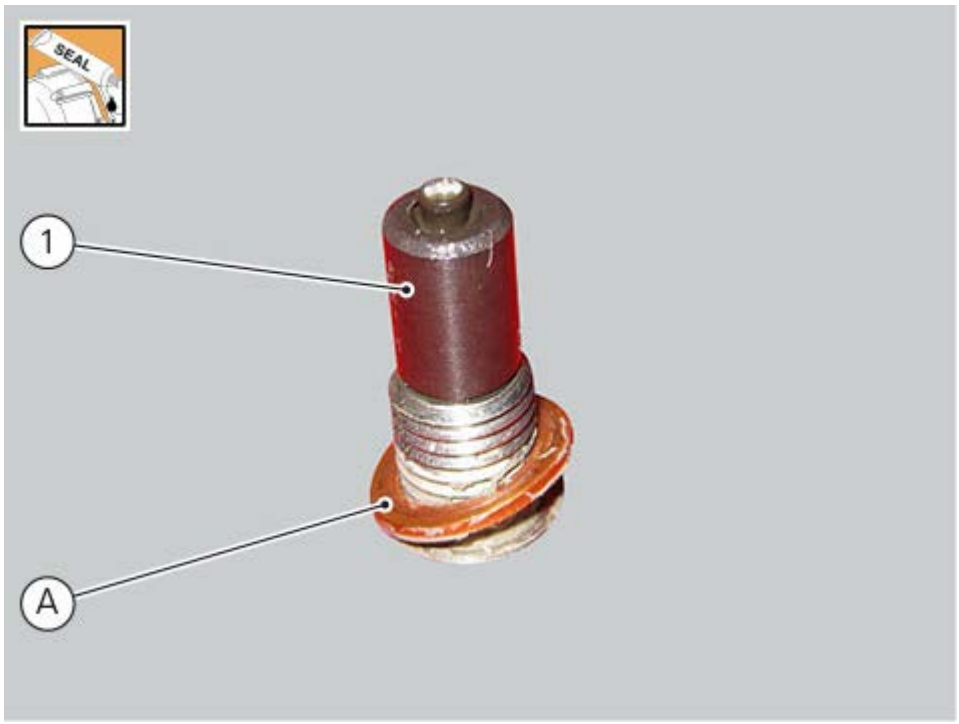
Warning
Dispose of oil and/or filter cartridges in compliance with environmental protection regulations.

Smaltimento
Do not dispose of the waste into the environment; do not pour the product, either new or exhausted, inside drains, water courses or the soil. Collect and deliver waste to authorized collecting centres. Dispose of waste in compliance with the prevailing local and national standards. European Waste Catalogue Codes recommended for waste disposal as indicated by Decision No 2001/118/EC: CER 13 02 05* (Mineral-based non-chlorinated engine, gear and lubricating oils): CER 16 01 07* (Oil filters).

Note
It should be noted that the above-mentioned CER code is a general and non-binding provision, provided based on product original composition and intended use. The user is thus responsible for selecting the CER code most suitable to the concerned product, based on product real use and taking into account any alterations and/or contaminations of the product, as well as any amendments to the prevailing standard on waste disposal.

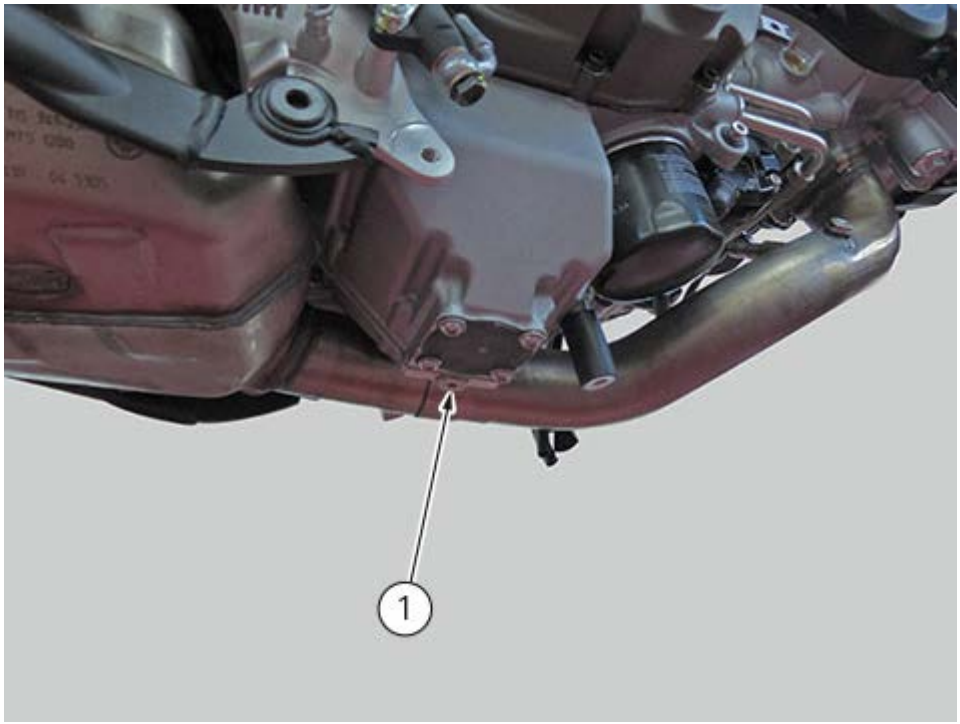


Remove any metal deposits from the end of the magnetic drain plug (1). Clean the thread of the drain plug and apply the indicated product. Refit the drain plug complete with gasket (A) to the sump.



Once the oil sump is completely empty, proceed as follows:

Tighten the drain plug (1) to a torque of 20 Nm (Min. 18 Nm - Max. 22 Nm).

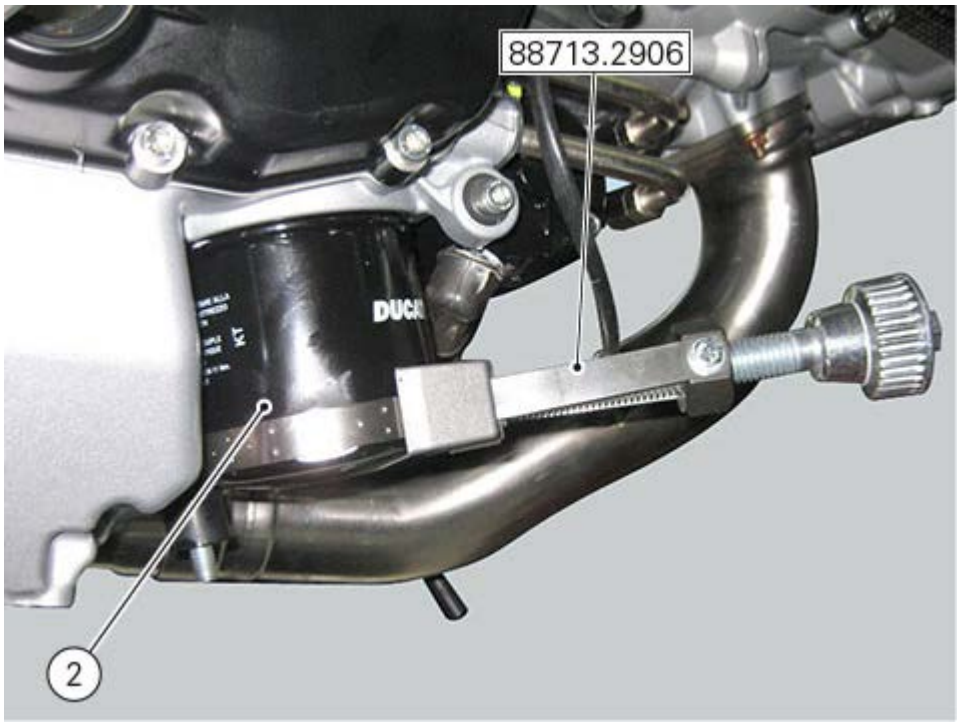


OIL CARTRIDGE FILTER

Remove the oil sump filter cartridge (2) using service tool part no. **88713.2906**.

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

Fit a new cartridge (2), using tool part no. **88713.2906** taking care to lubricate seal with engine oil.



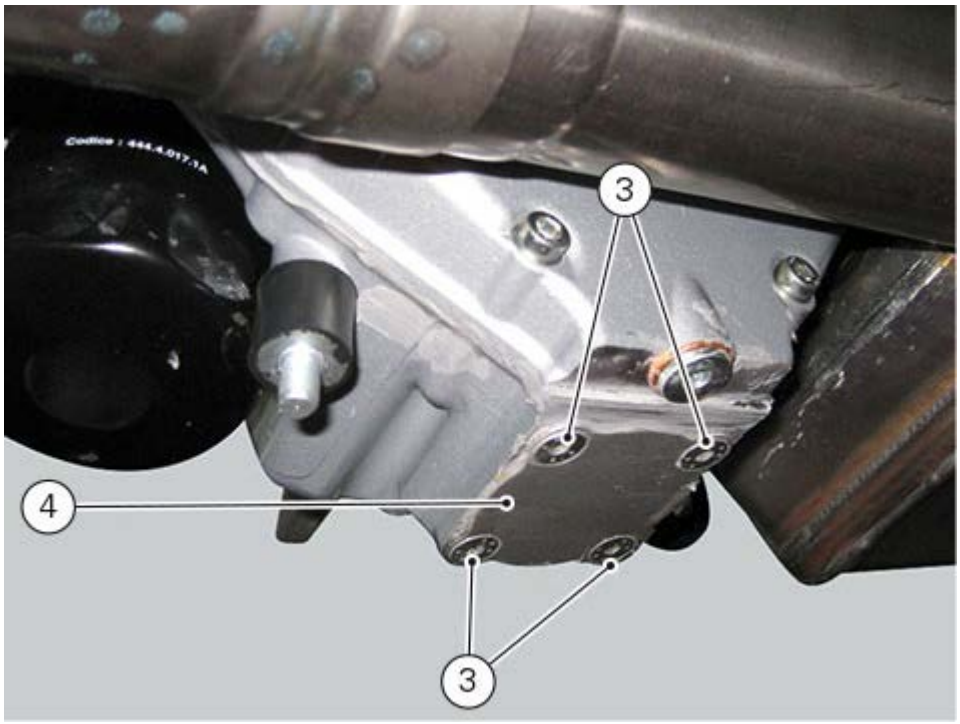
Note

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

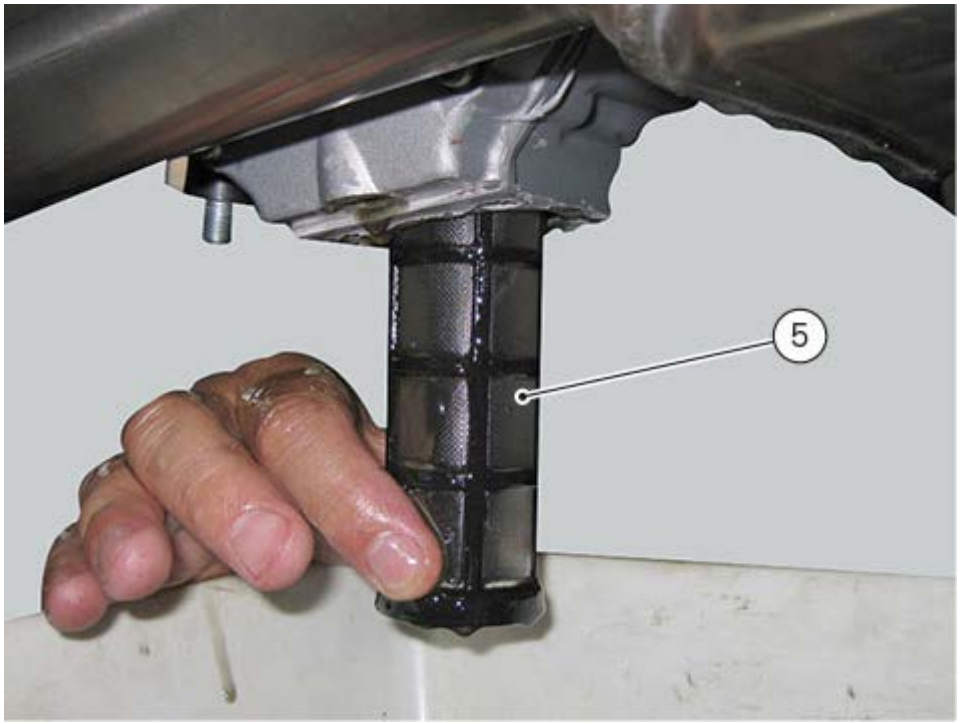
Screw it into seat and tighten it to 11 Nm (Min. 10 Nm - Max. 12 Nm).

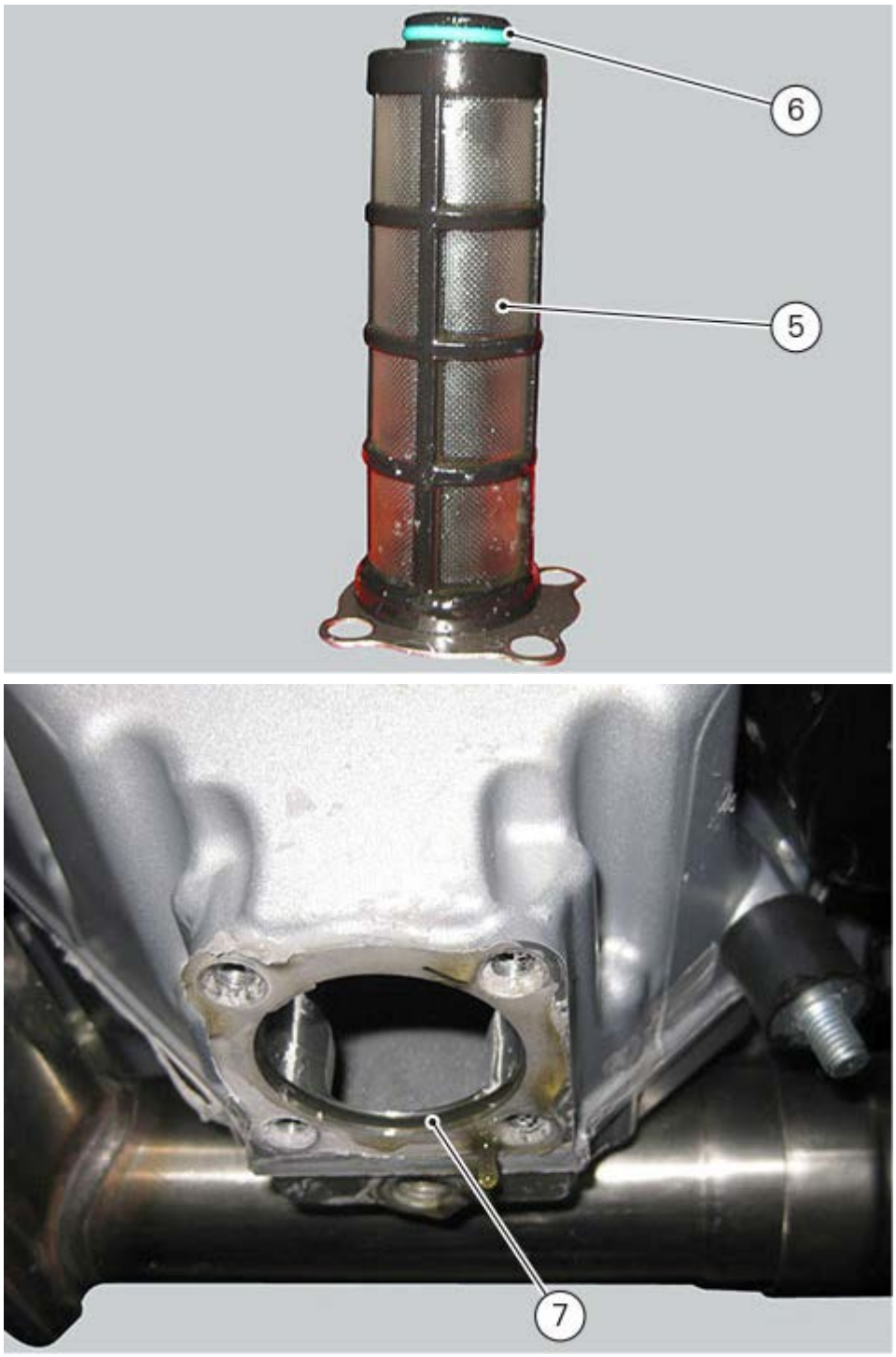
OIL MESH FILTER

Every two oil changes, clean the oil intake mesh filter.
Loosen the four screws (3) of the external cover (4) and remove it.

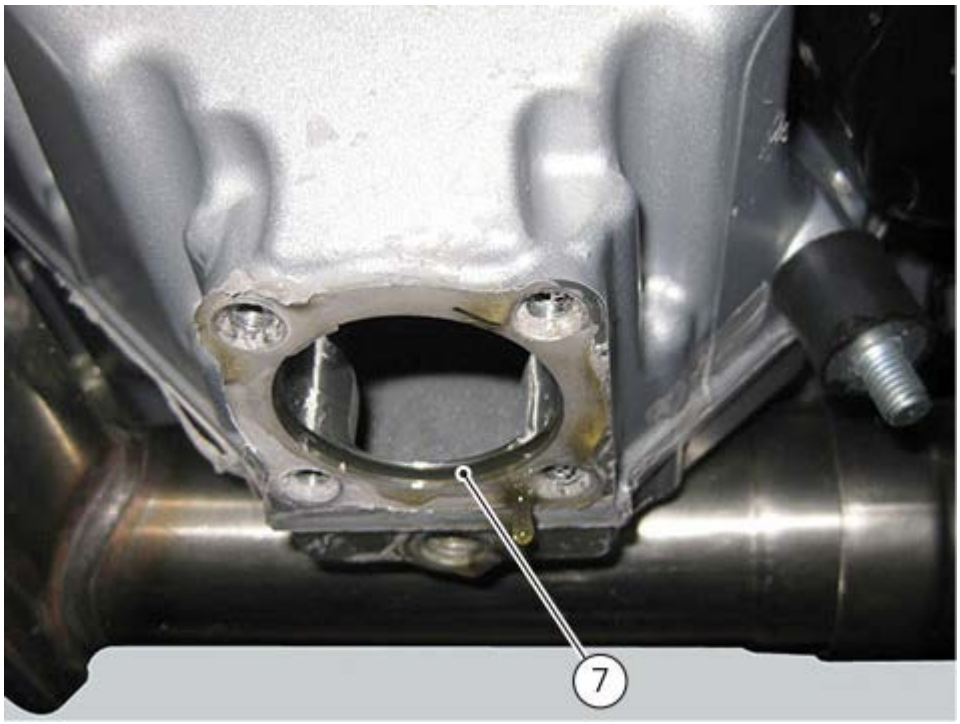


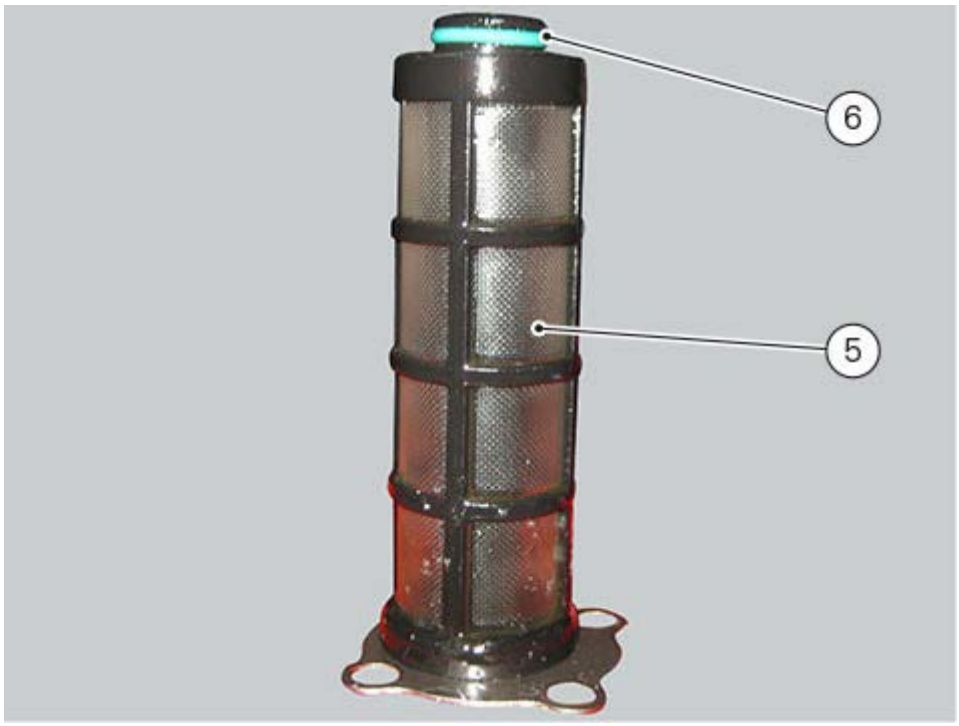
Remove the filtering element (5) and check the O-rings (6) and (7), and replace them if necessary. Clean the filter with fuel and compressed air. Take care not to damage the mesh.



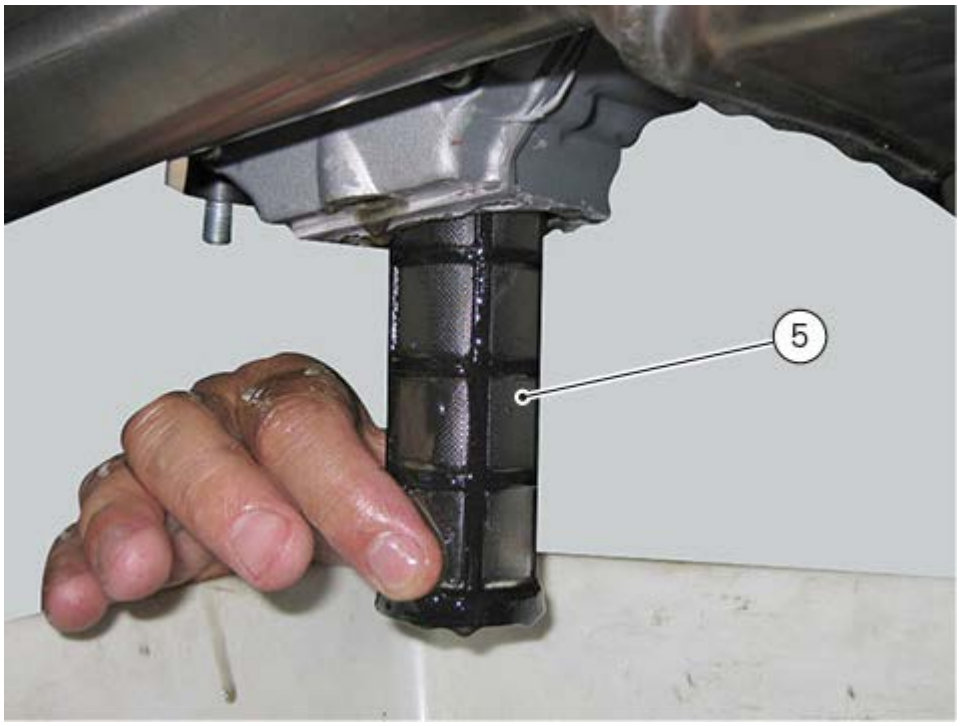


Position O-ring (7) on the crankcase and O-ring (6) on the mesh filter (5).

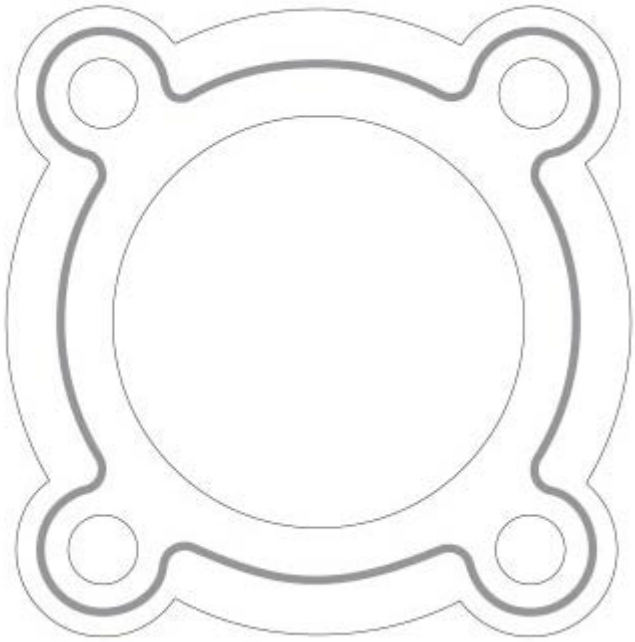


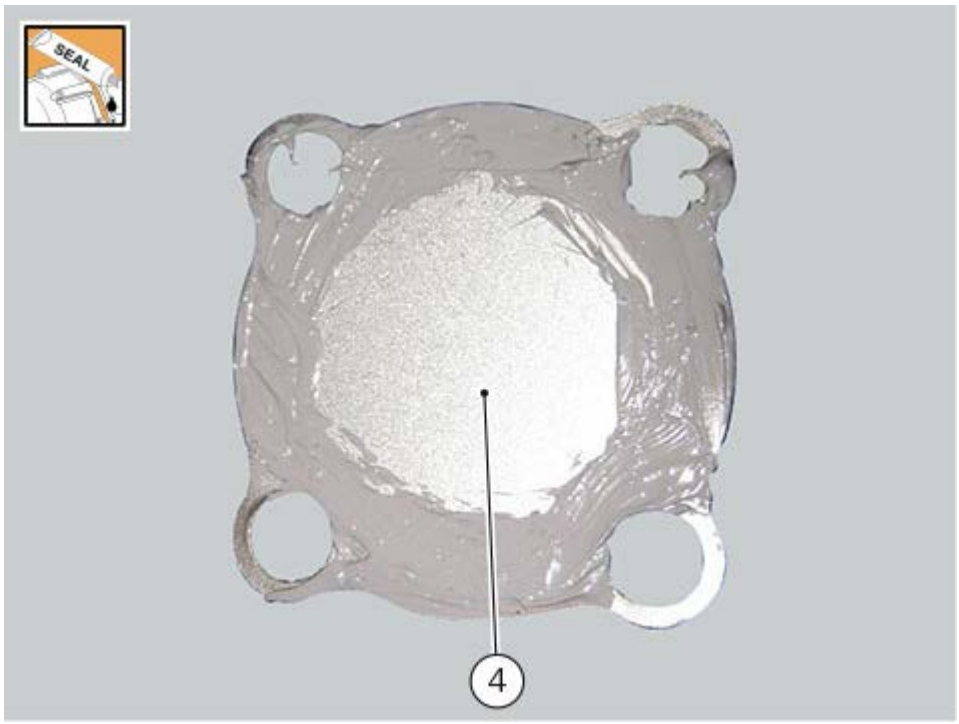


Refit the mesh filter (5).

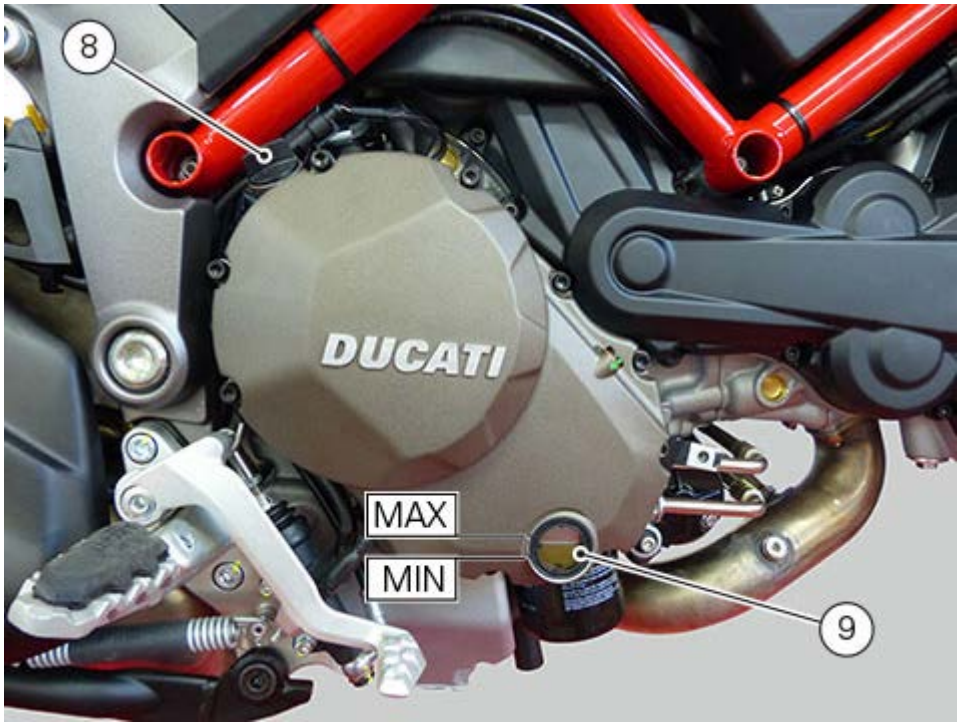


Apply a bead of sealing compound to cover (7) as shown in the figure.

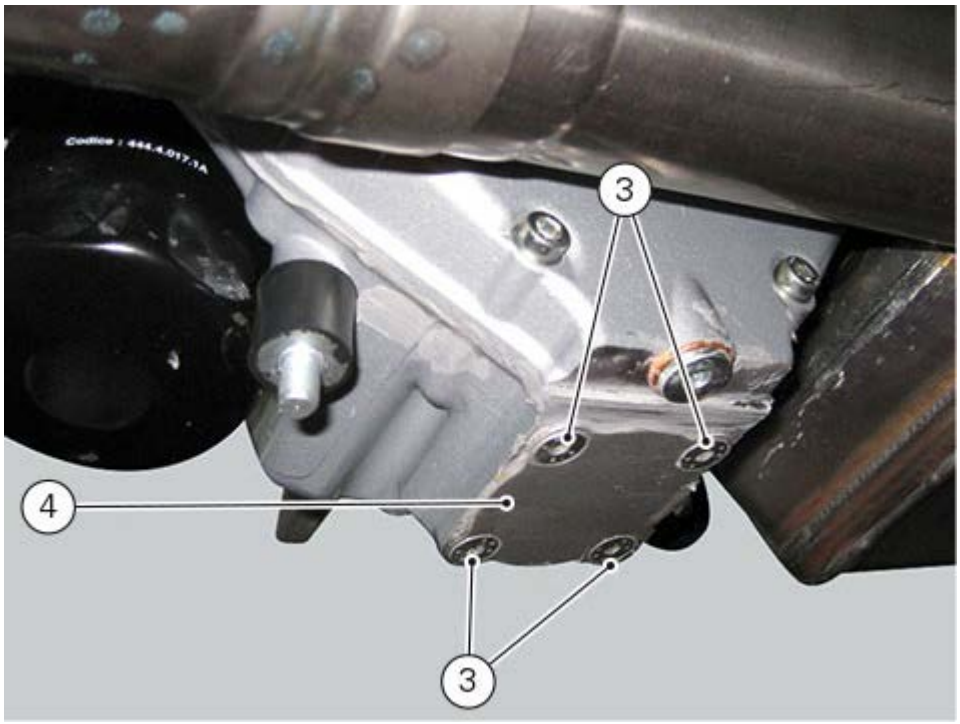




Remove the filler plug (8) and carry out refilling with the specified oil type up to reaching the notch that identifies the MAX level in the sight glass (9).
Ducati recommends you use Shell Advance 4T Ultra 15W-50 oil. As an alternative it is possible to use a motorcycle engine oil having the same degree SAE 15W-50 and meeting the following specifications JASO: MA2 and API: SM.
Refit the filler plug (8). Run the engine at idle speed for a few minutes.



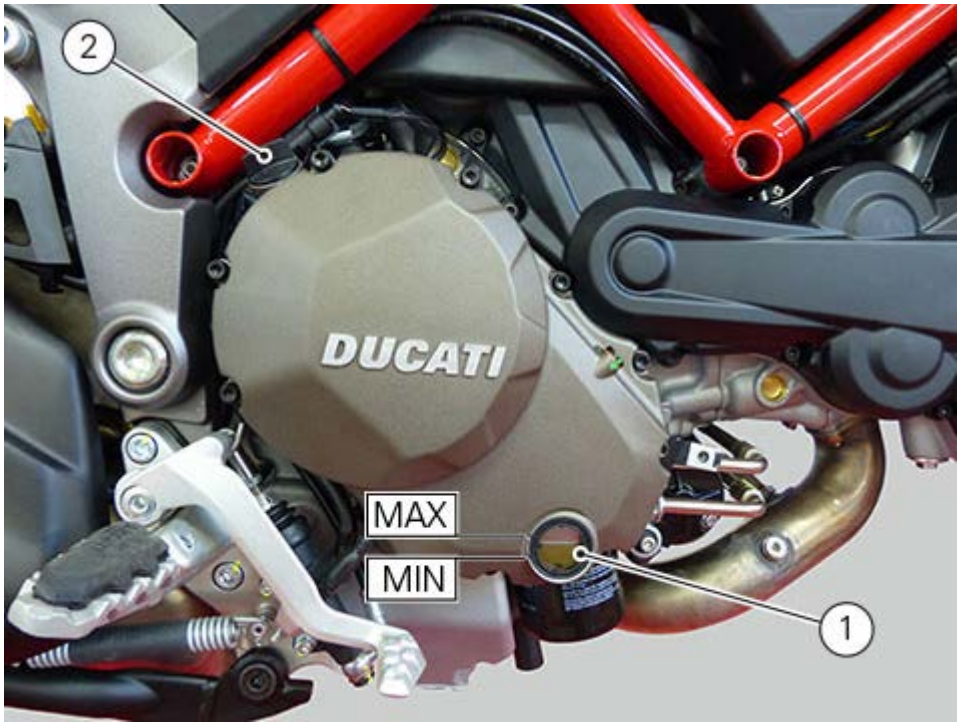
Check that there are no oil leaks and that the engine oil pressure warning light on the instrument panel switches off a few seconds after starting up the engine. If not, stop the engine and trace the fault.
After a few minutes, check that the oil level is the specified one; if necessary, restore the MAX. level.
Tighten screws (3) retaining external cover (4) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).



Refit the complete belly pan (Refitting the belly pan).

Check engine oil level

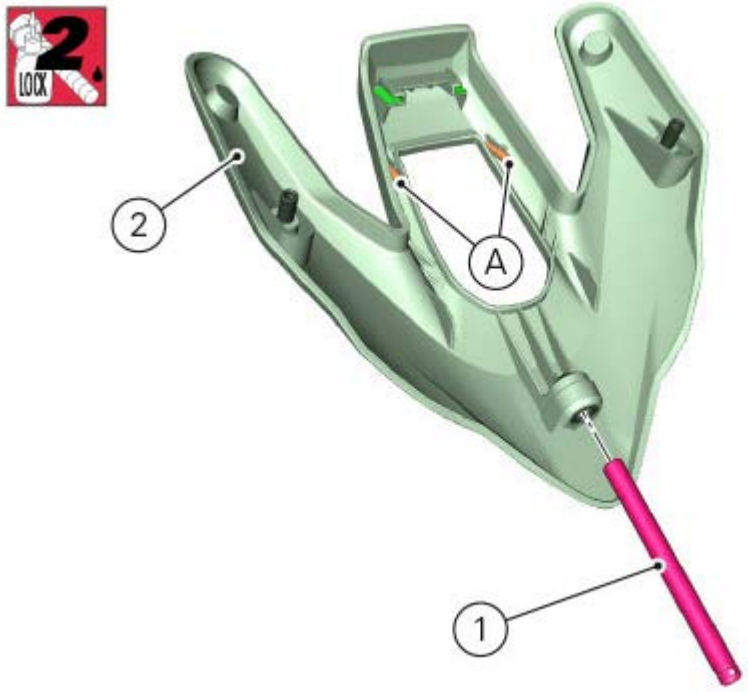
Check the engine oil level through the sight glass (1) on the right-hand side of the oil sump.
Stop the engine and allow a few minutes for the oil to settle to a steady level.
Oil level must be checked with the vehicle perfectly upright and the engine hot (but off).
Oil level must be between the MIN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



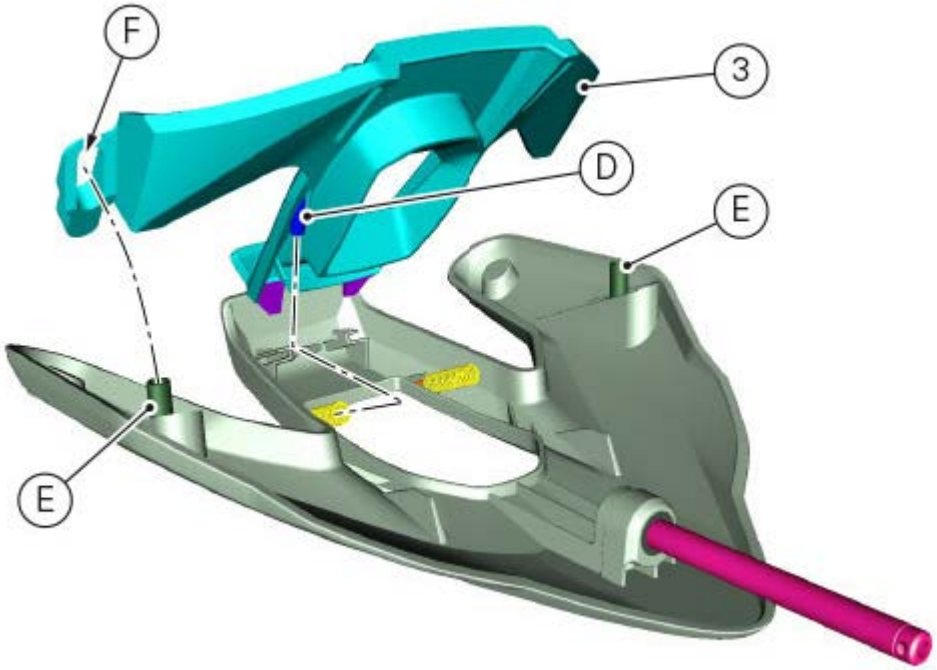
Refitting the headlight fairing

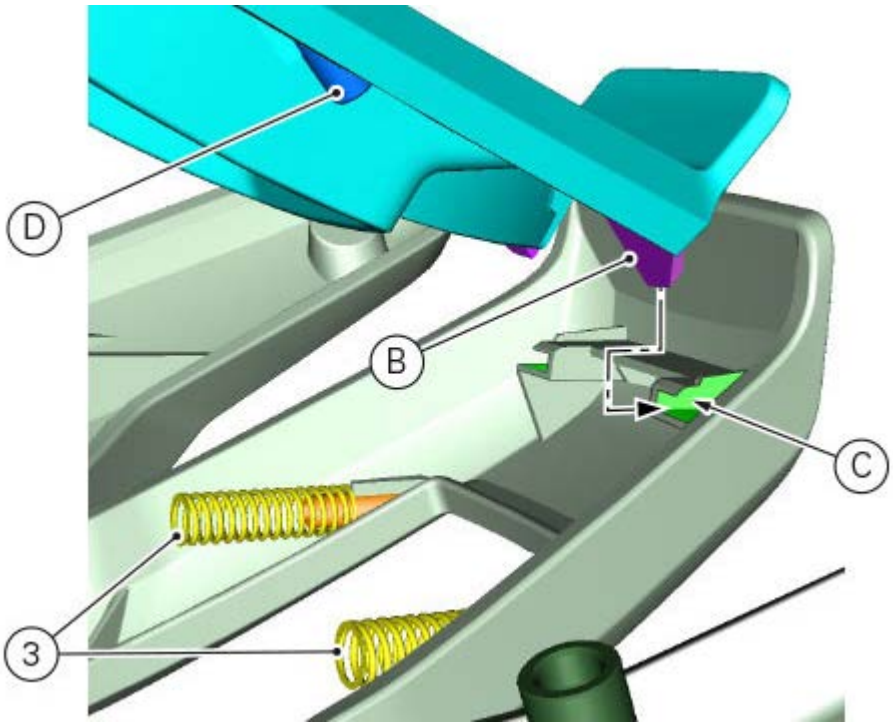
ASSEMBLING THE HEADLIGHT FAIRING

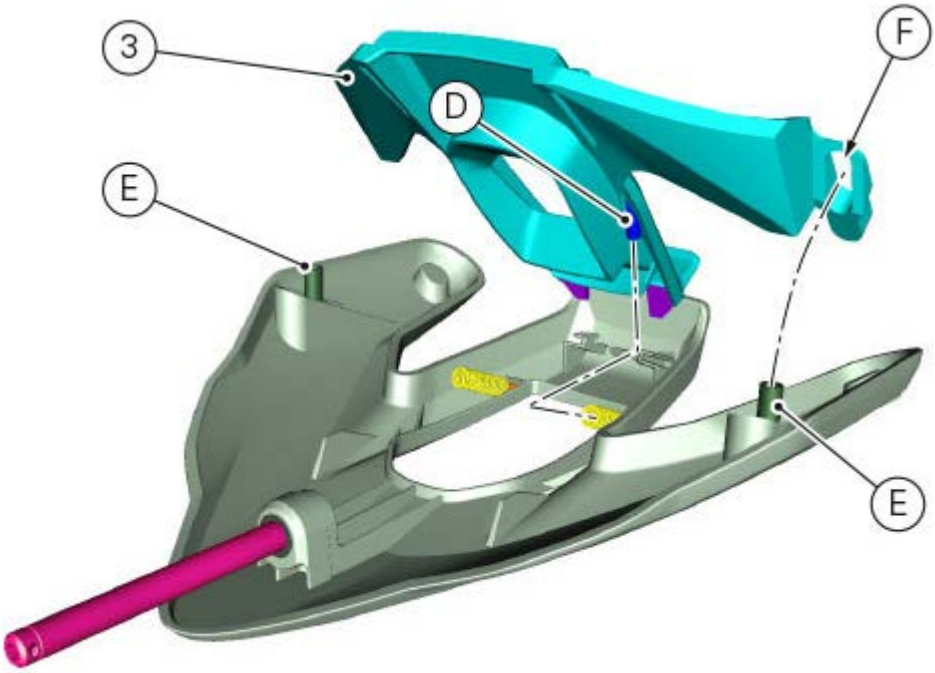
Apply specified threadlocker on rod (1) and start it on the windscreen support (2).
Tighten rod (1) to a torque of 2 Nm ± 10%.
Fit springs in stud-bolts (A).



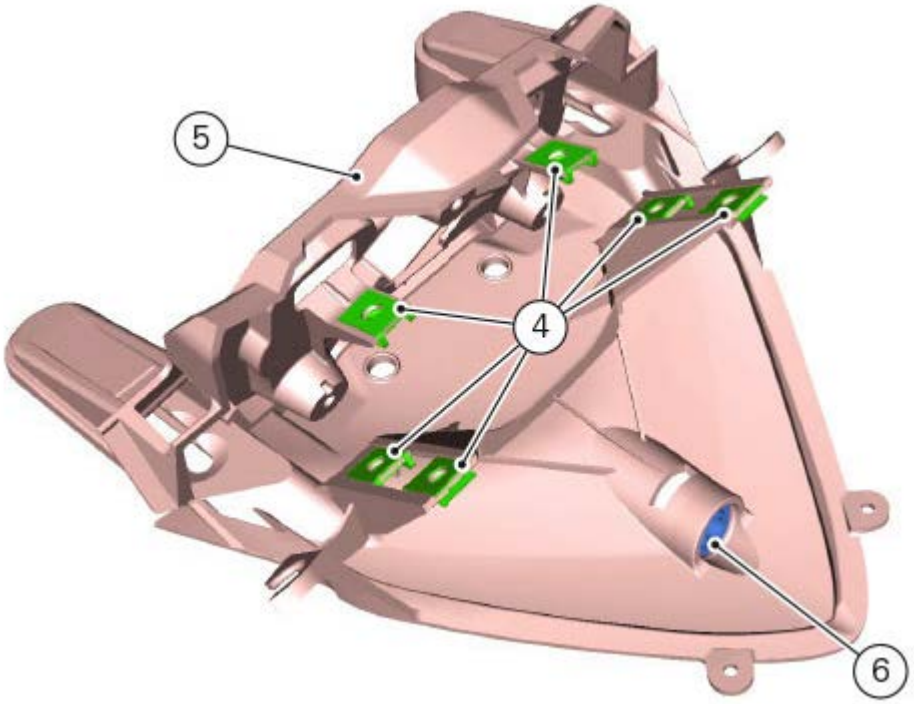
Fit block (3) on the windscreen support (2) by engaging:
- tabs (B) of the windscreen support block (3) in seats (C) of support (2);
- stud-bolts (D) in the springs inserted in support (2);
- stud-bolts (E) of support (2) in the slots (F) of the windscreen block (4).







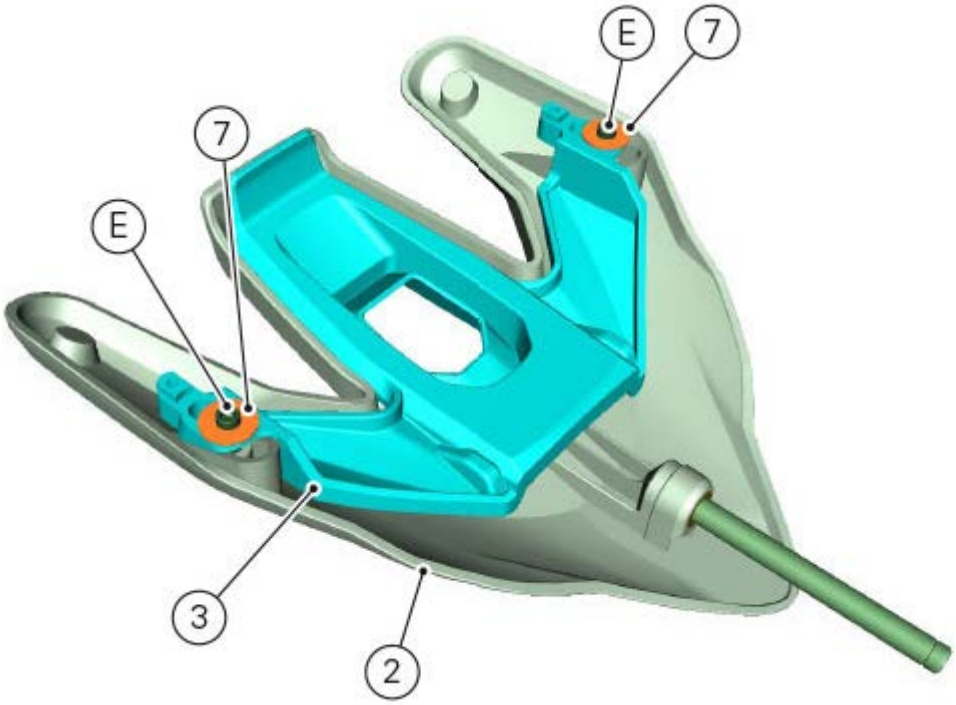
Fit clips (4) in the indicated areas of the central panel (5).
Force ball joint (6) into its seat.



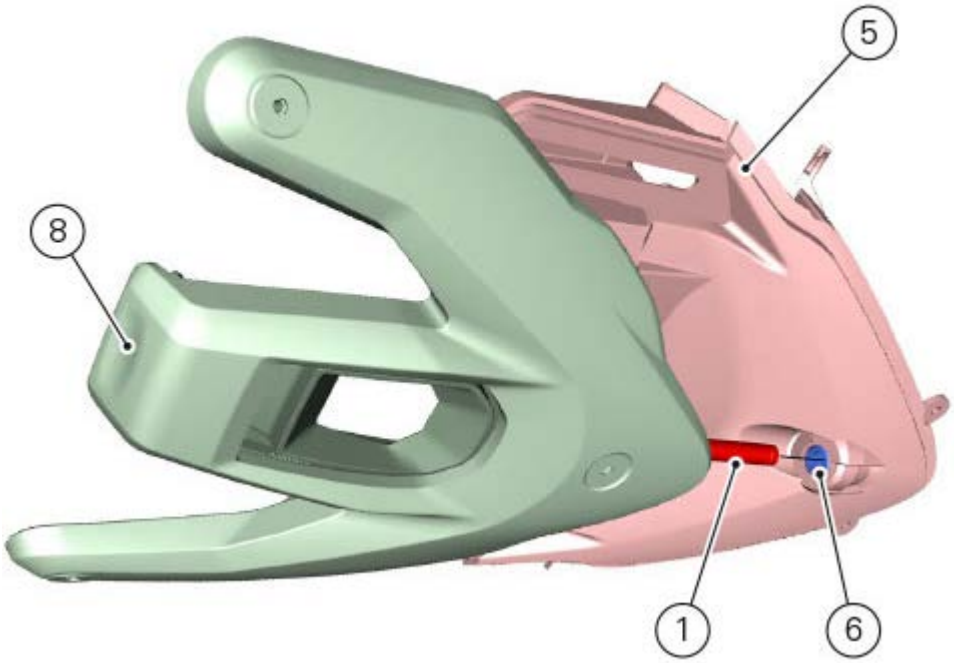
Fit washers (7) on stud-bolts (E) of the windscreen support (3).

Note

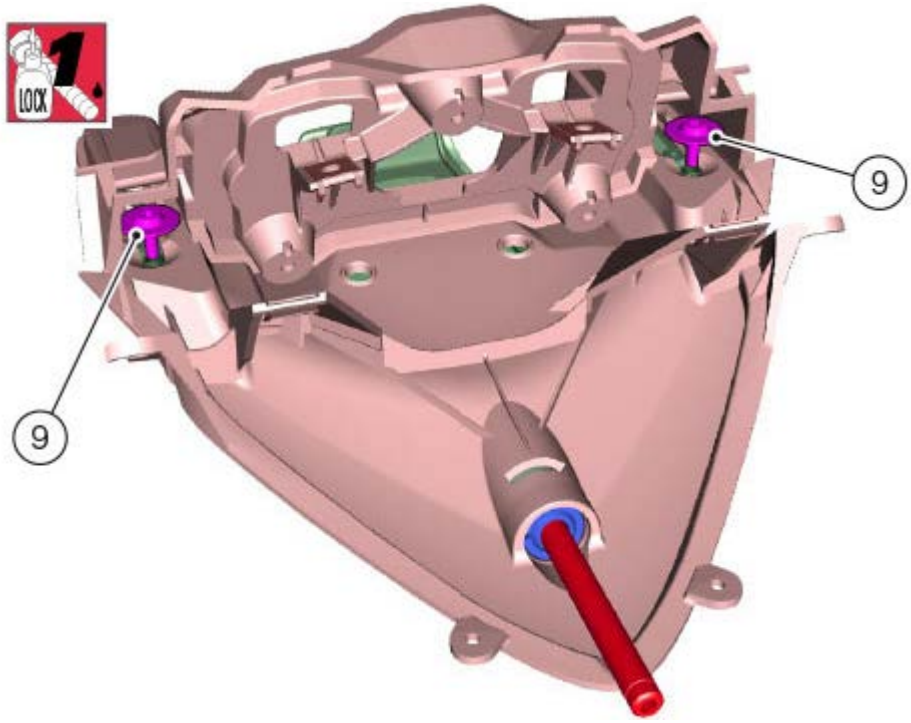
The washer sharp edge must be facing the windscreen support block.

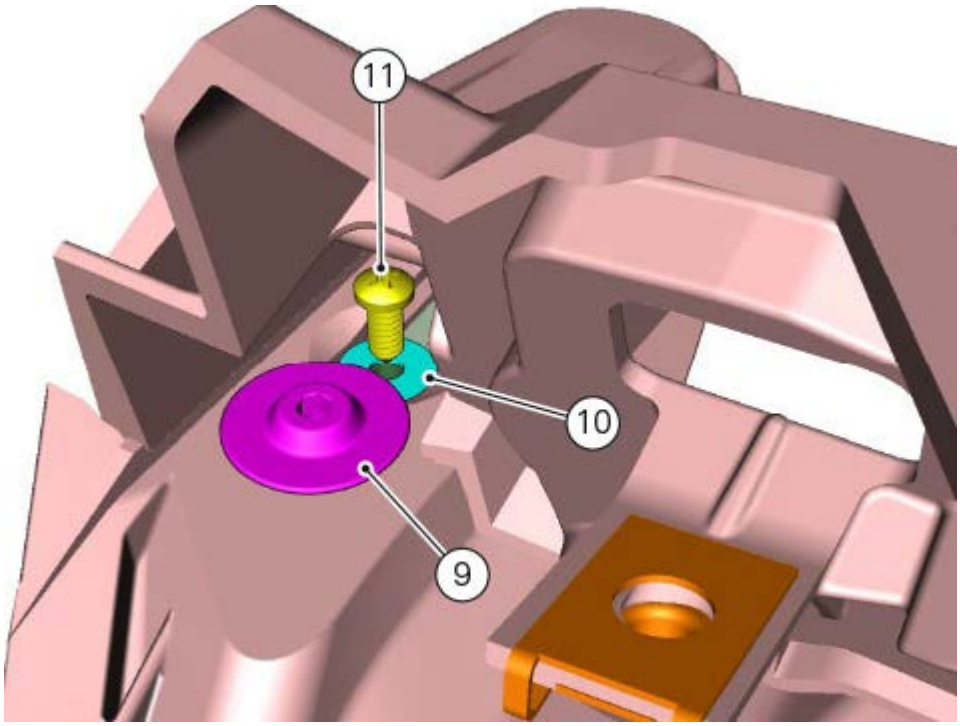


Couple the windscreen support assembly (8) with the central panel (5) by inserting rod (1) in ball joint (6).

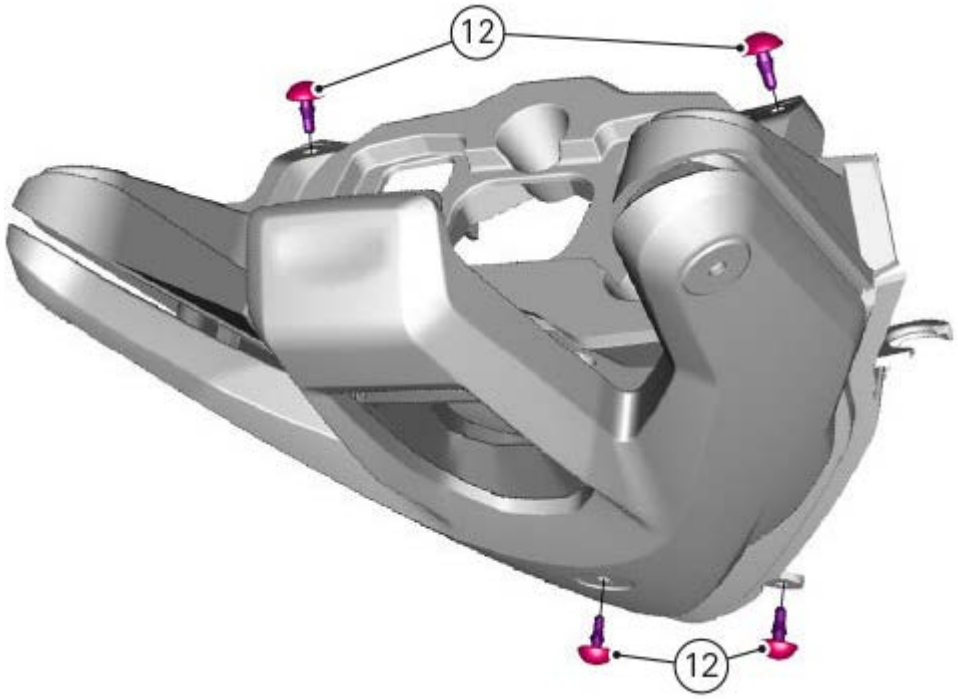


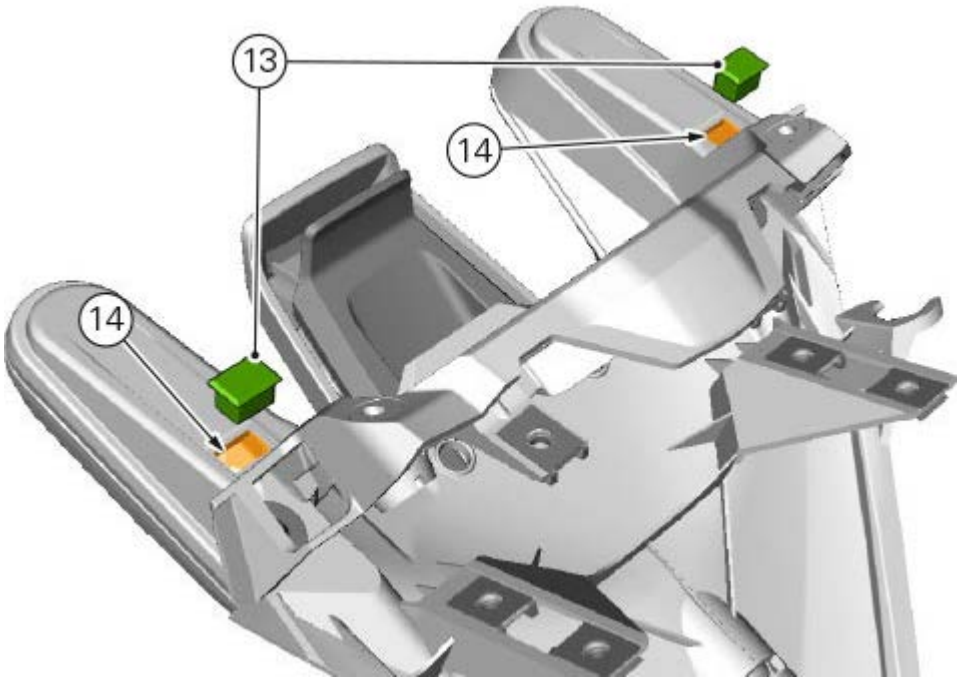
Apply the indicated threadlocker on the two screws (9).
Fit the windscreen support assembly (8) to the central panel (5) tightening screws (9) to a torque of 3 Nm ± 10%.
Fit washers (10) onto two screws (11).
Tighten the two screws (11) to a torque of 2 Nm ± 10%.



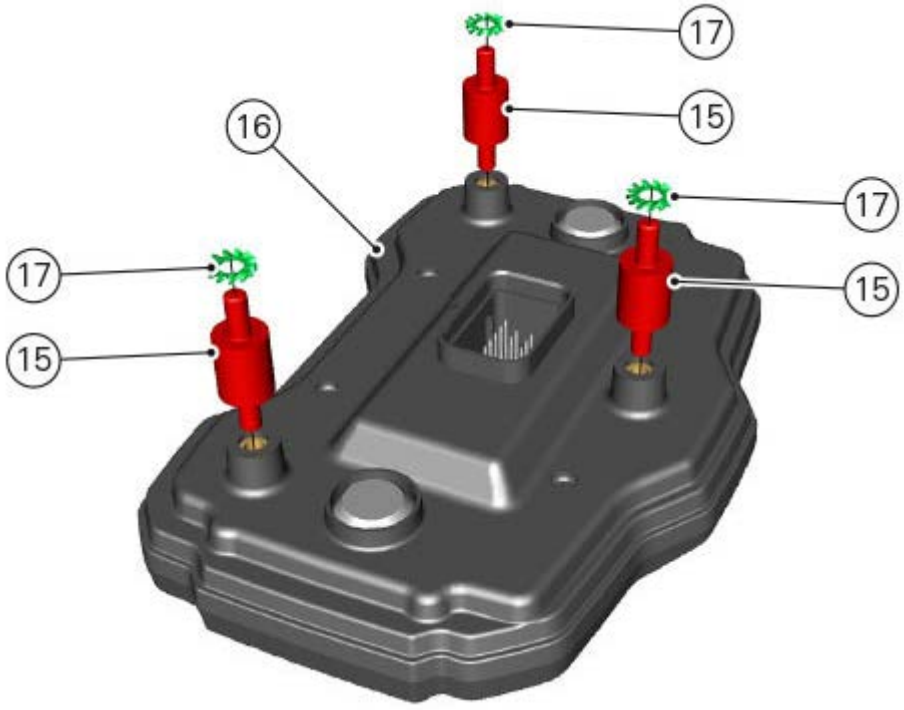


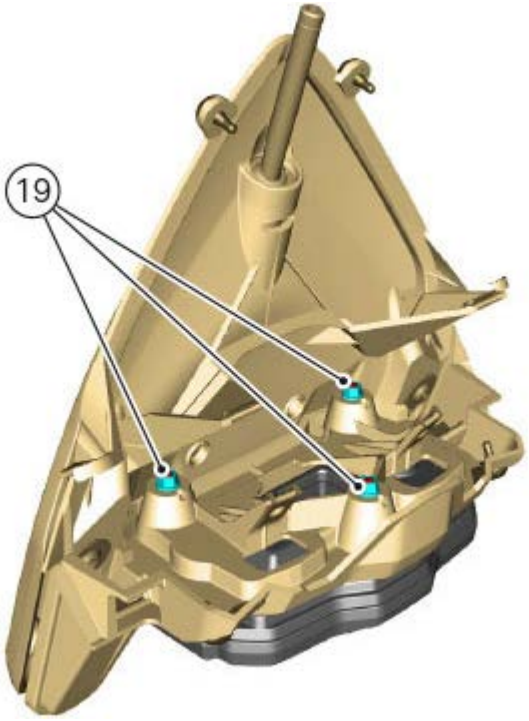
Fit two rubber plugs (12) in the indicated holes.
Insert plugs (13) in recesses (14).





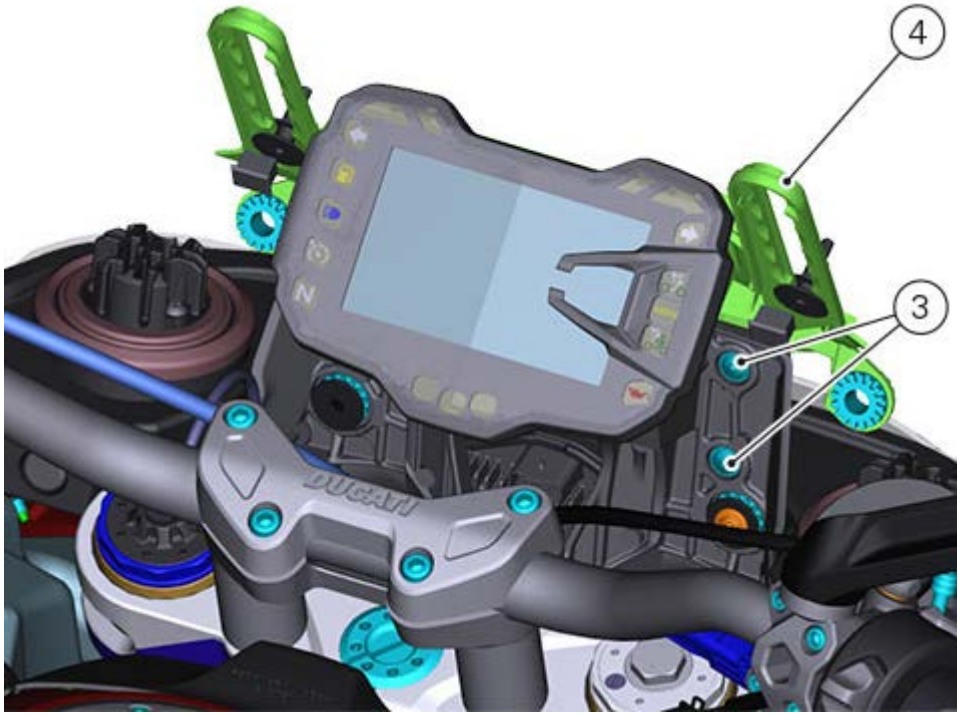
Completely screw silent blocks (15) on instrument panel (16).
Fit toothed washers (17) on silent block (15) threaded pins.
Fit cover (16) on the windscreen support assembly / central panel (18) by tightening nuts (19) to a torque of 3 Nm ± 10%.

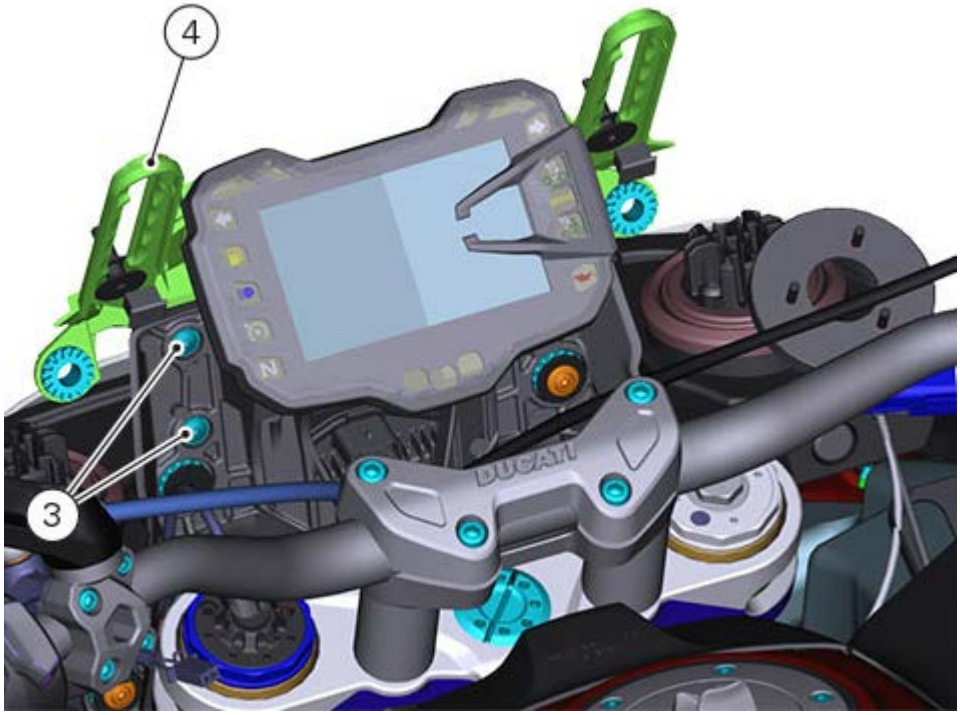




FITTING THE HEADLIGHT FAIRING

Position headlight fairing (4) on the front frame.
Start screws (3) and tighten them to a torque of 3 Nm ± 10%.





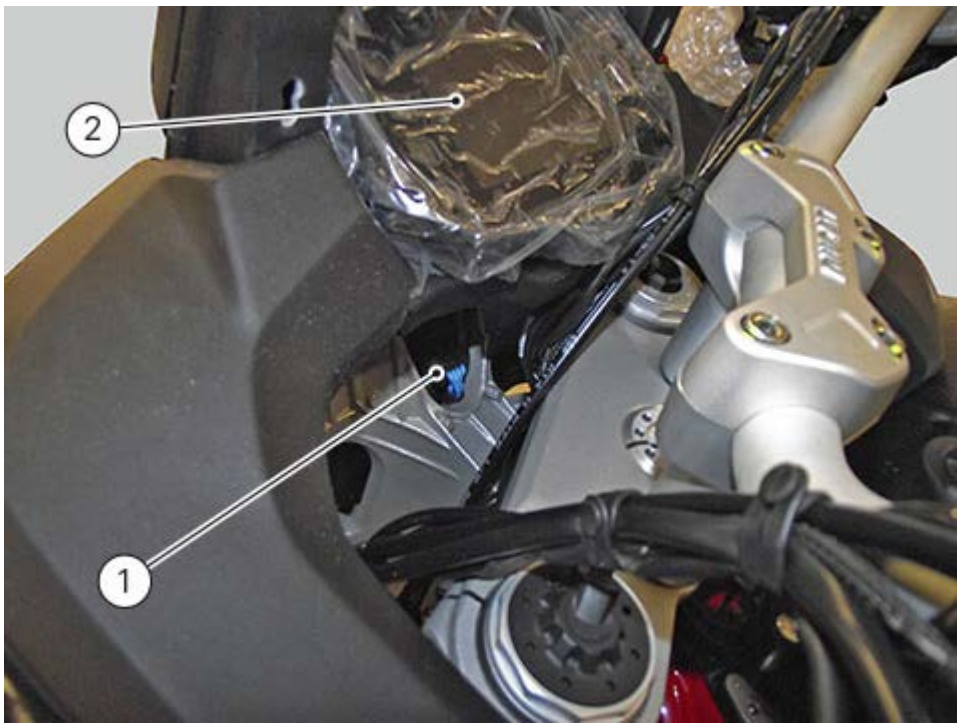
Connect connector (1) to instrument panel (2).

Refit the light assembly (Refitting the light assembly).
Refit the panel (Refitting the panel).

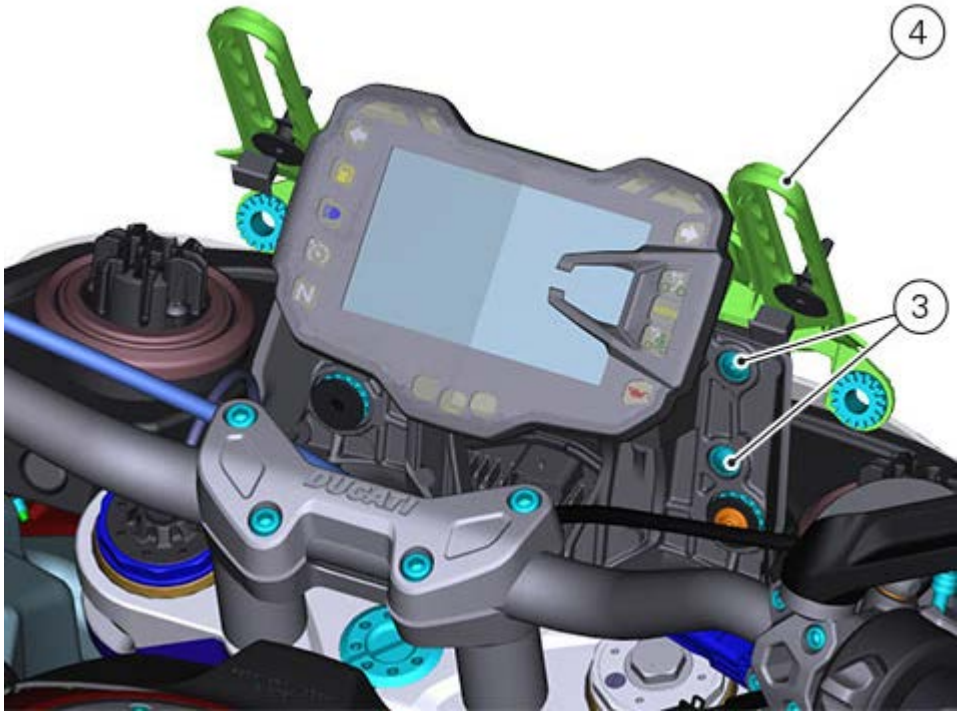
Removing the headlight fairing

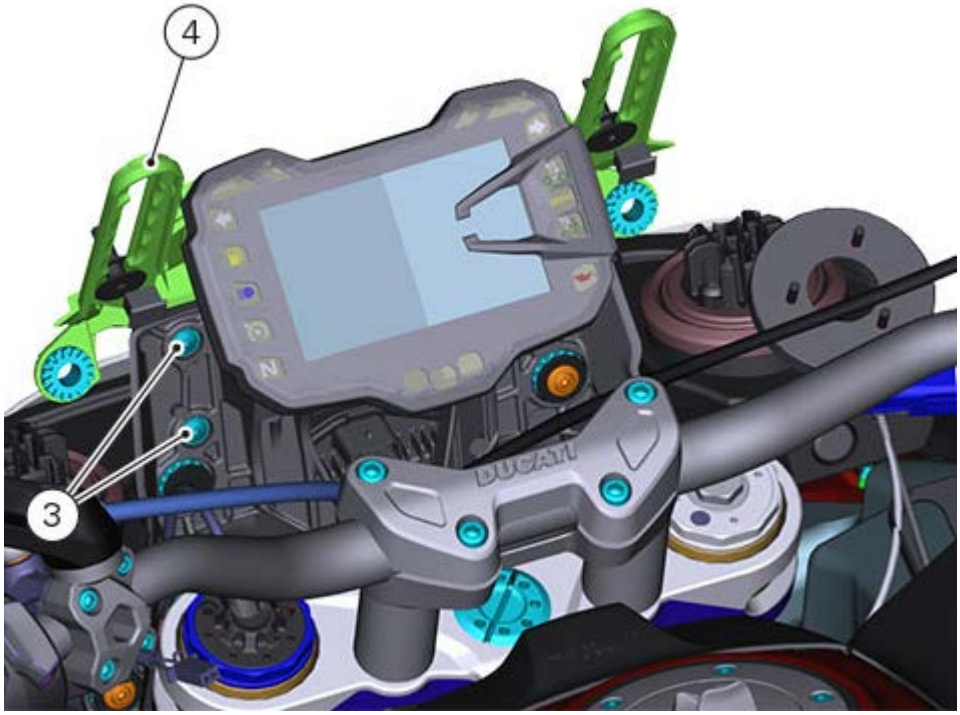
Remove the panel (Removing the panel).
Remove the light assembly (Removing the light assembly).

Disconnect connector (1) of instrument panel (2).



Working on both sides of the headlight fairing, loosen screws (3).
Remove headlight fairing (4).



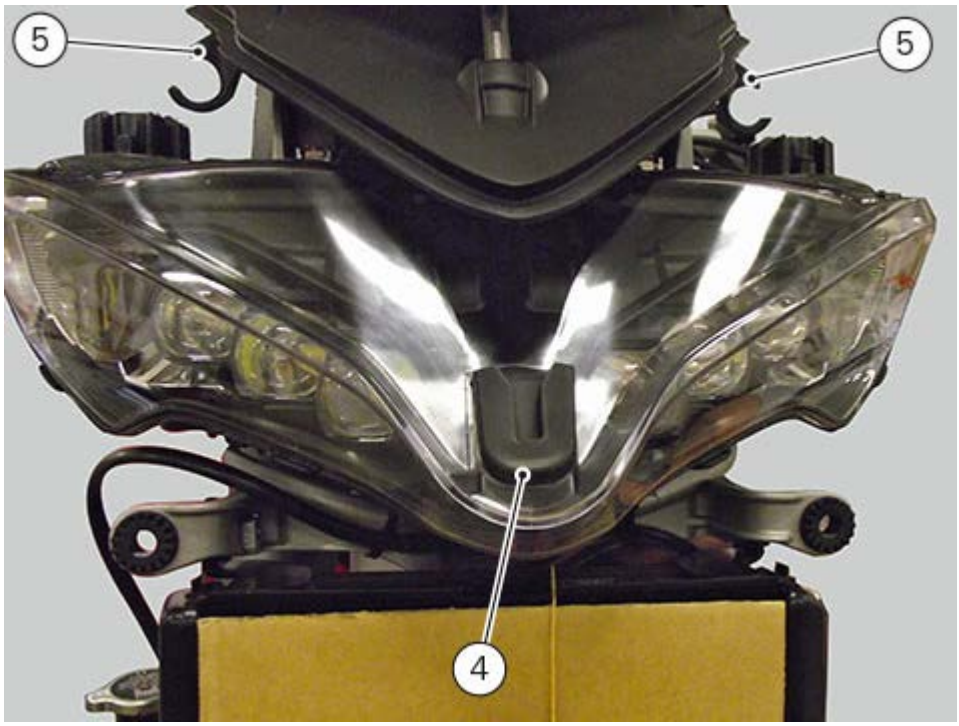

4
3
DUCATI

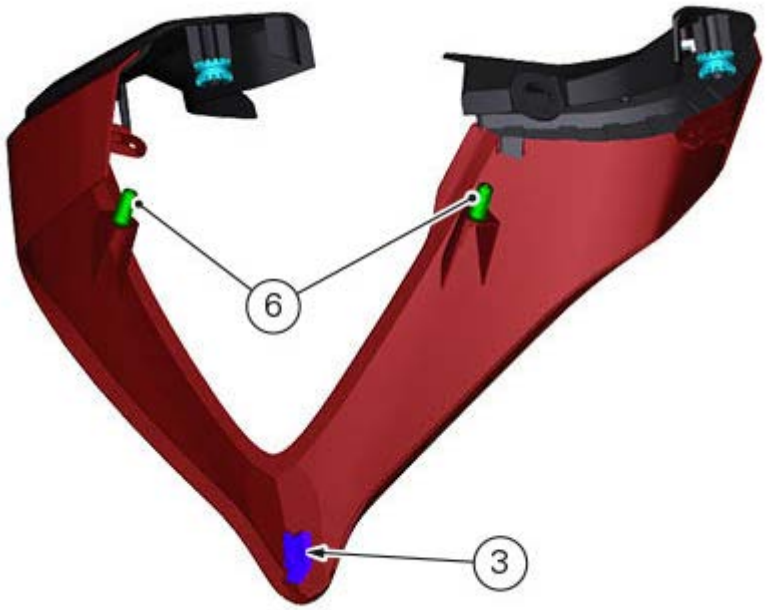
Refitting the panel

If previously removed, refit Plexiglas (9) by starting three screws (8).
Tighten screws (8) to a torque of 3 Nm ± 10%.

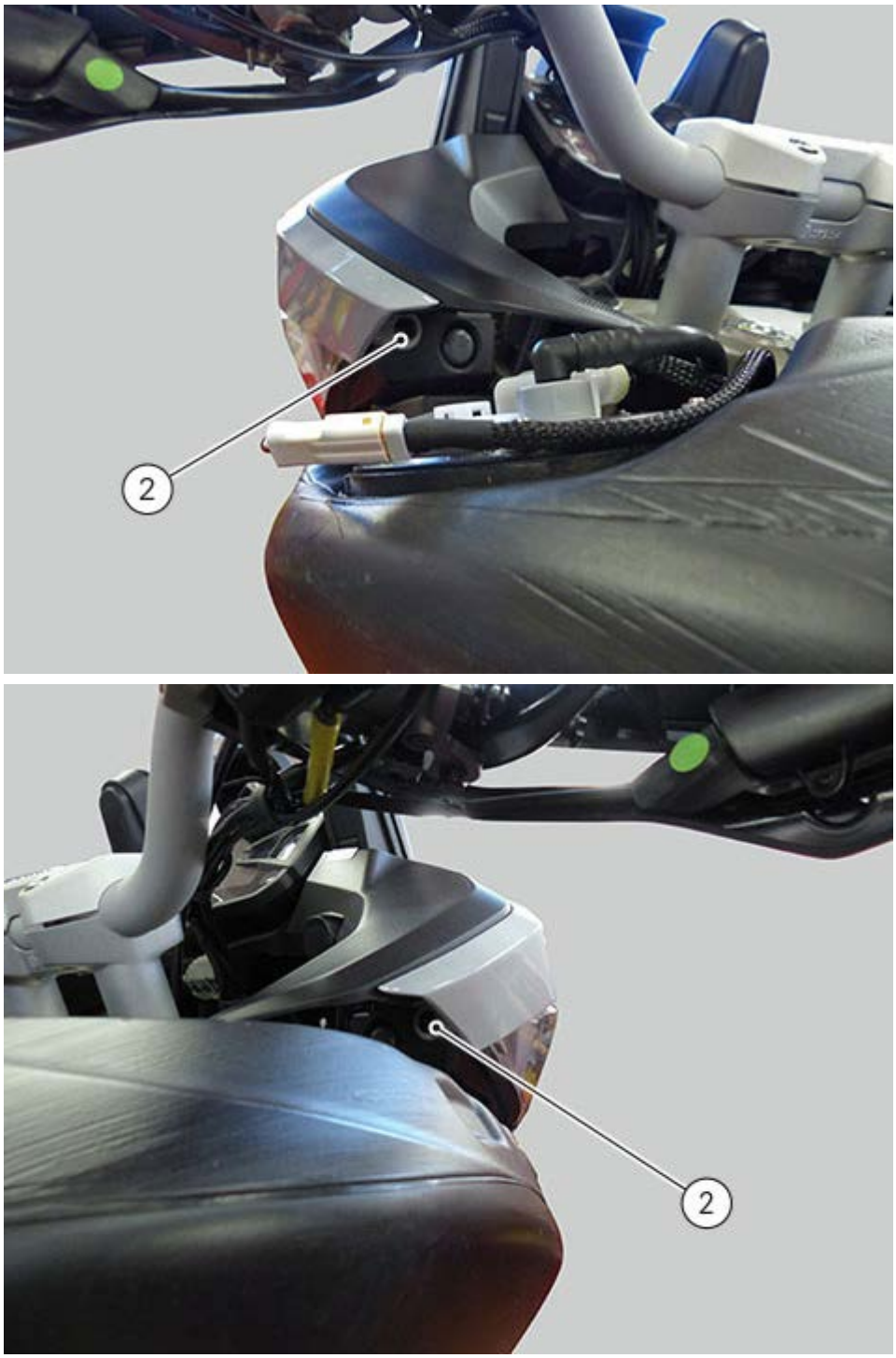
Connect power socket (7).

Fit the panel so as to engage retainer (3) in hook (4) on the headlight.
Engage pins (6) in seats (5).





Fix the headlight fairing to the headlight by means of two screws (2).
Tighten them to a torque of 3 Nm ± 10%.



Connect the immobilizer antenna by means of connector (1).

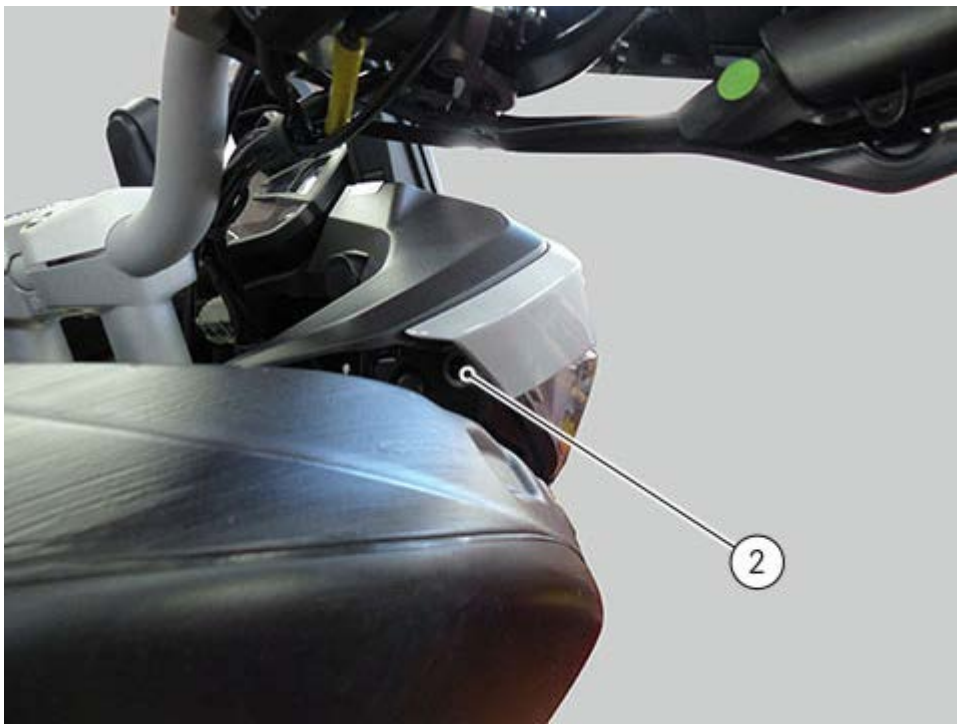

1

Removing the panel

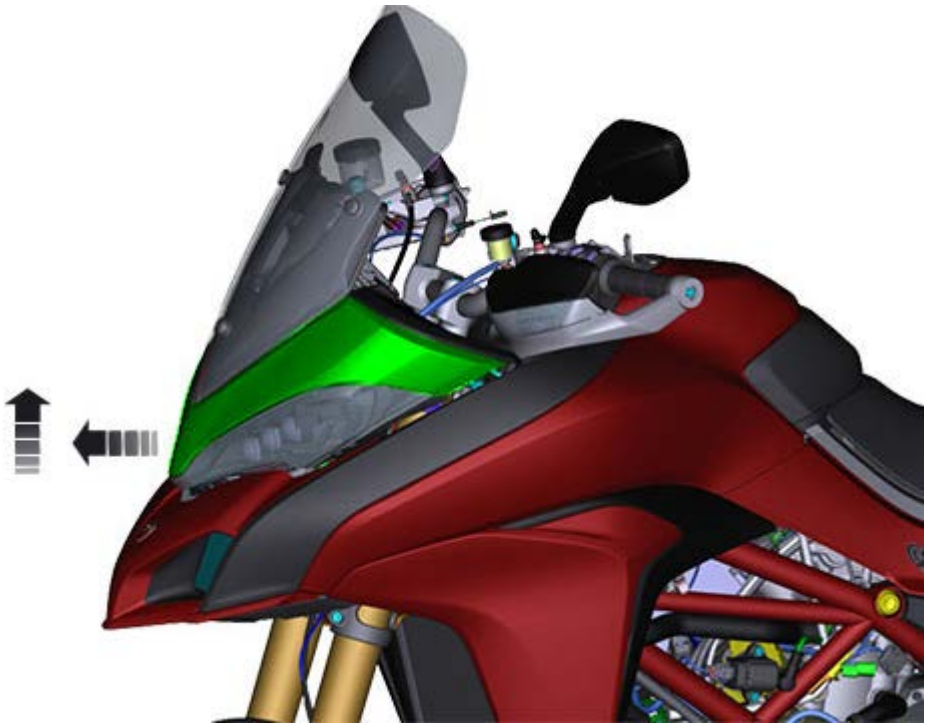
Remove the tank cover (Removing the tank cover).

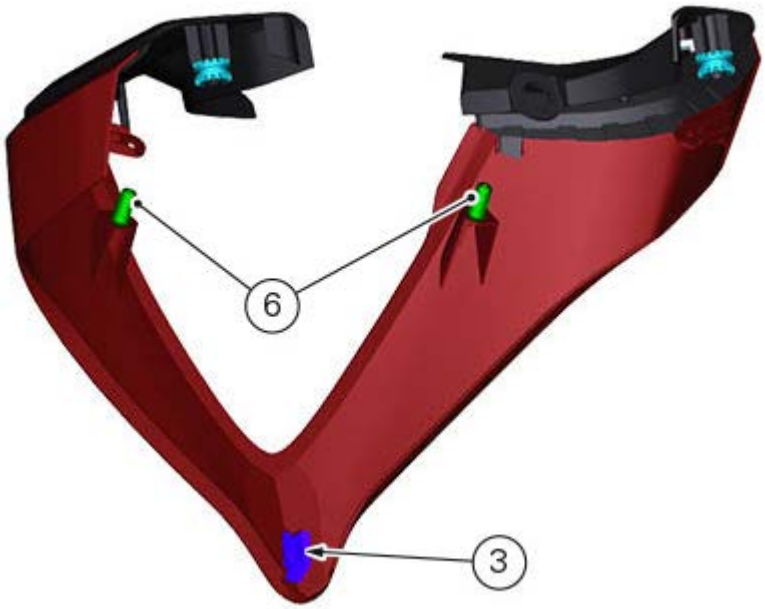
Disconnect connector (1) from the immobilizer antenna.

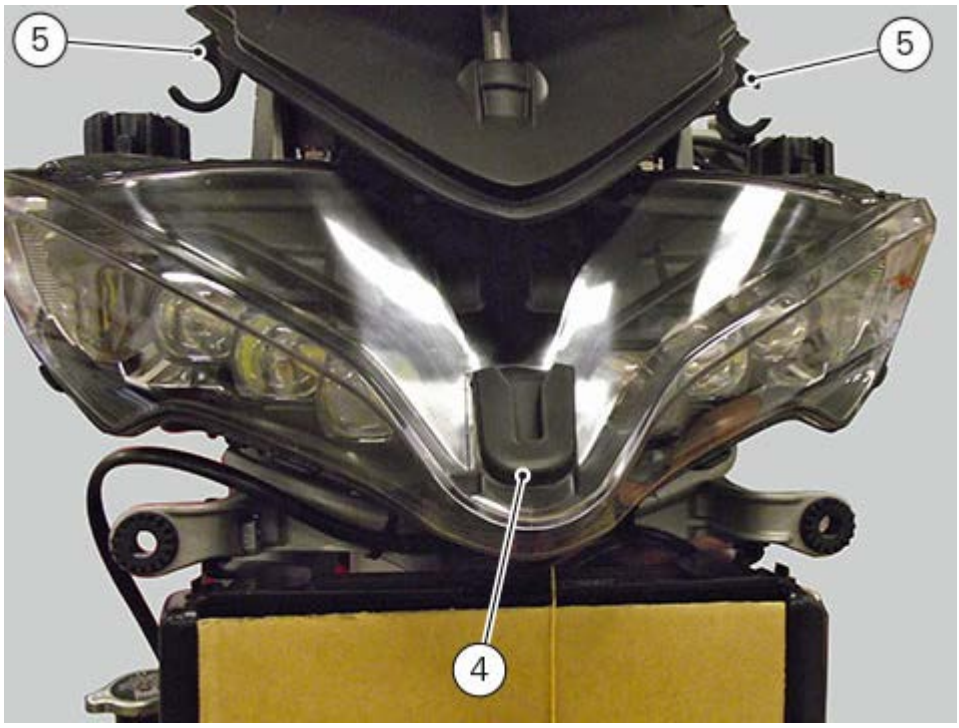
Remove the retaining screws (2).



Remove the panel by pulling the top part outwards and the tip downwards at the same time, as shown in the picture.
In this way, retainer (3) will be released from hook (4)
and pins (6) from seats (5).







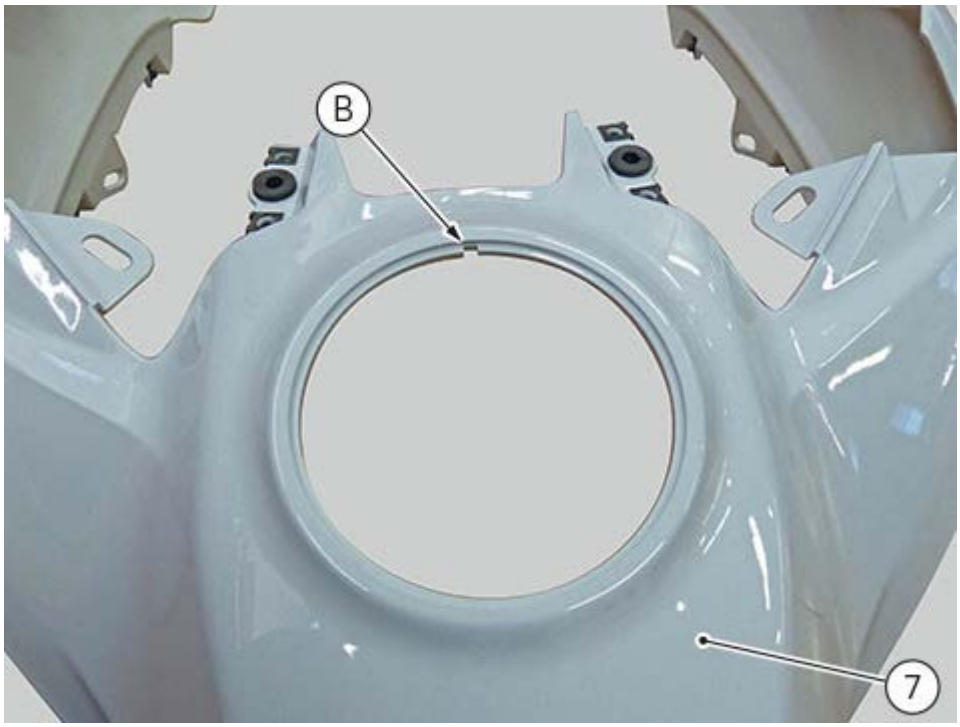
Disconnect the power socket (7) and remove the panel.

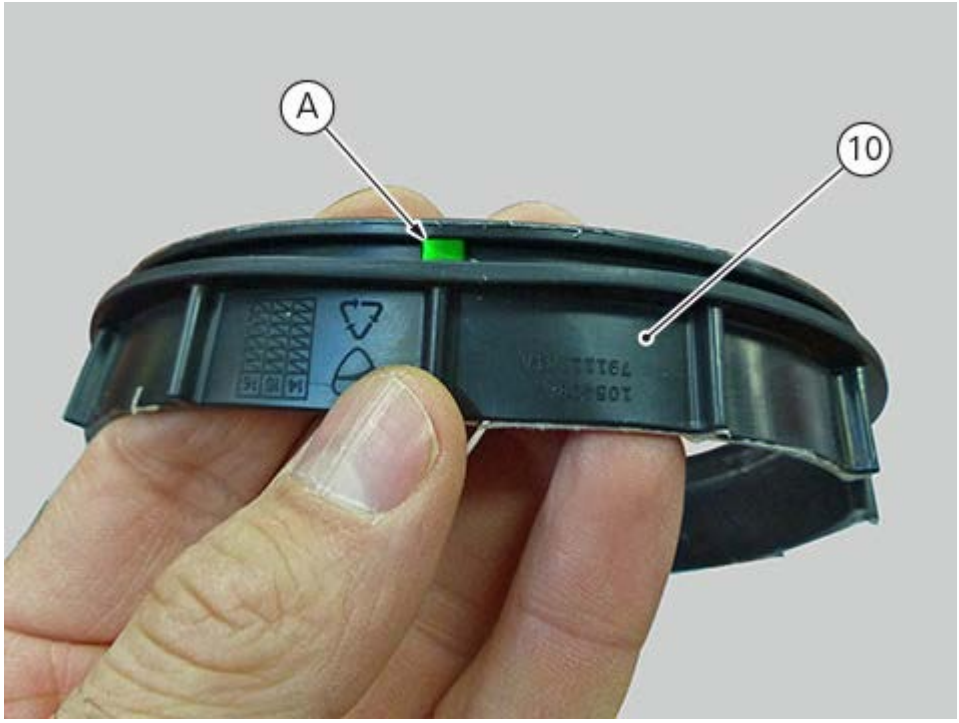
If necessary, remove the Plexiglas as indicated below:
remove Plexiglas (9) by loosening the three screws (8).

Refitting the tank fairings

Check that the two vibration damping pads (8) and the four clips (9) are present on the tank cover (7).

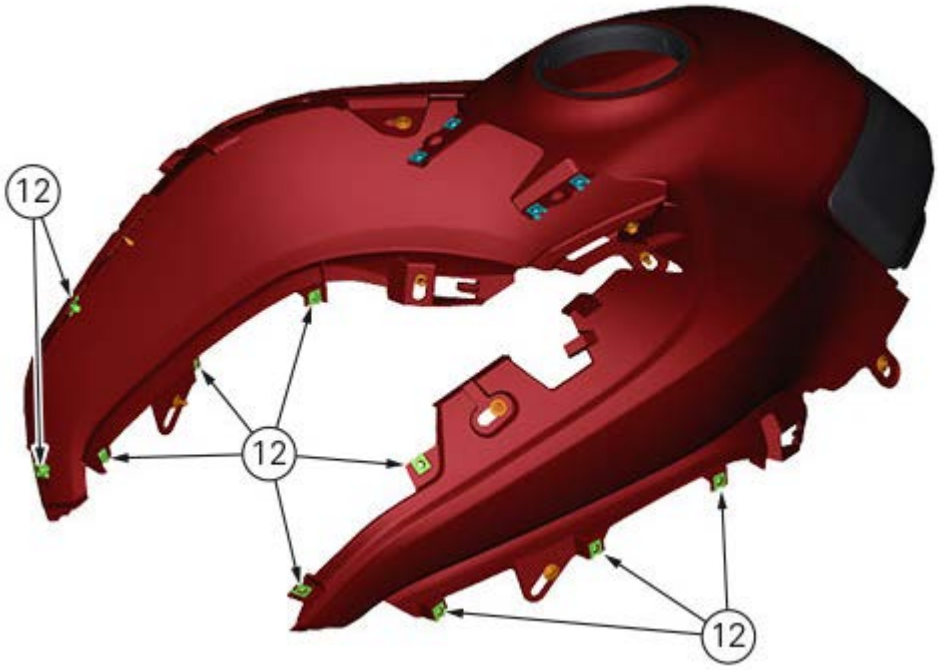
Fit gasket (10) on cover (7) so that ridge (A) engages in recess (B).



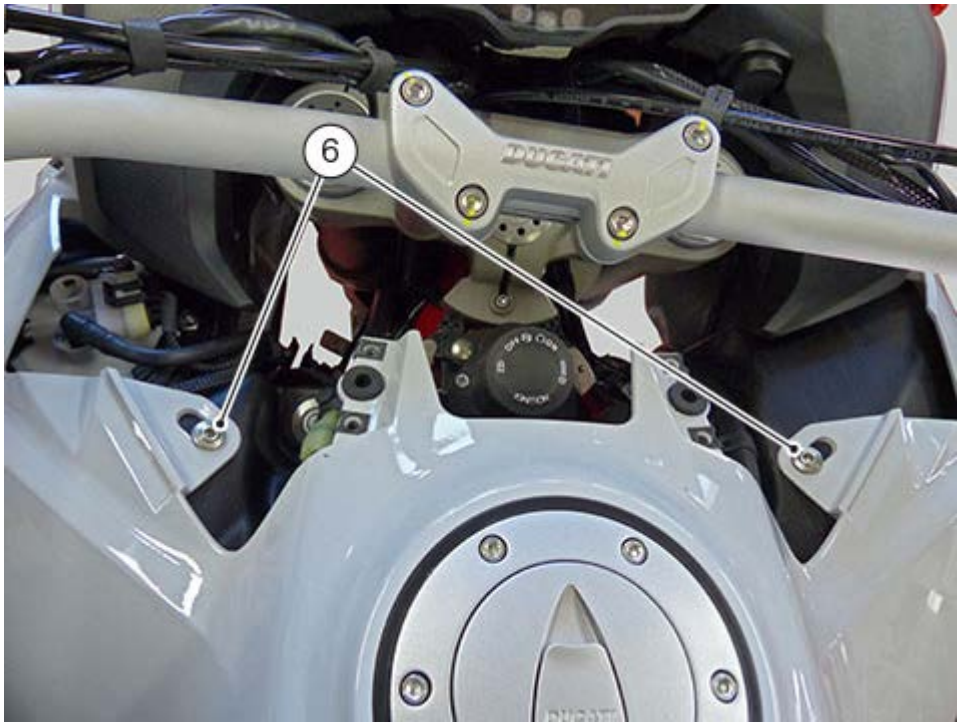


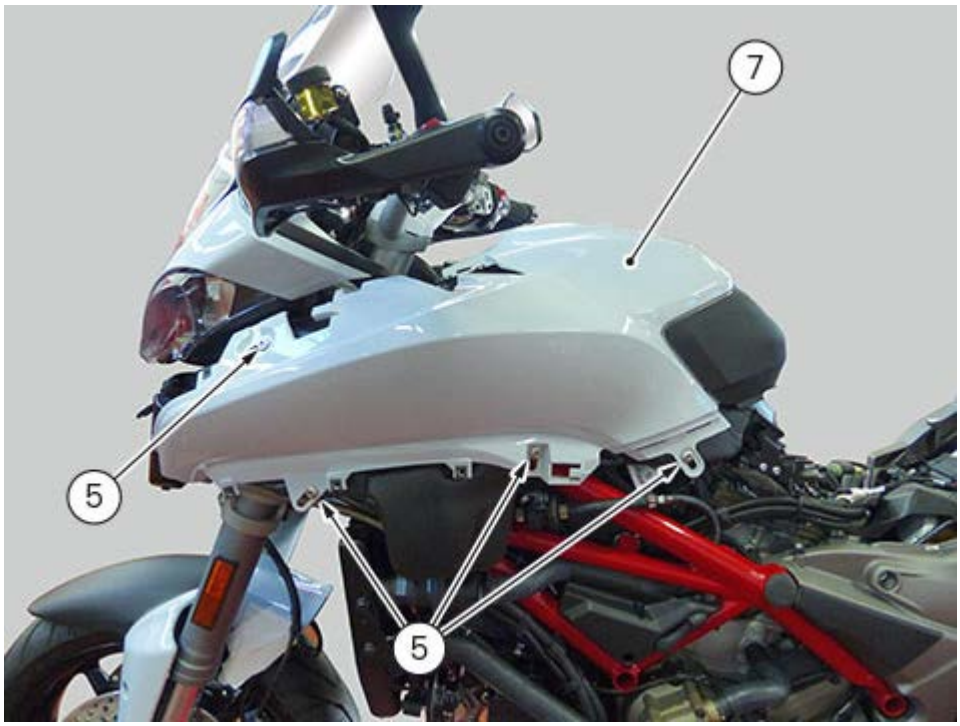
Apply the indicated lubricant on the gasket surface (10) in contact with the tank plug (11).
Fit the tank cover on the tank.

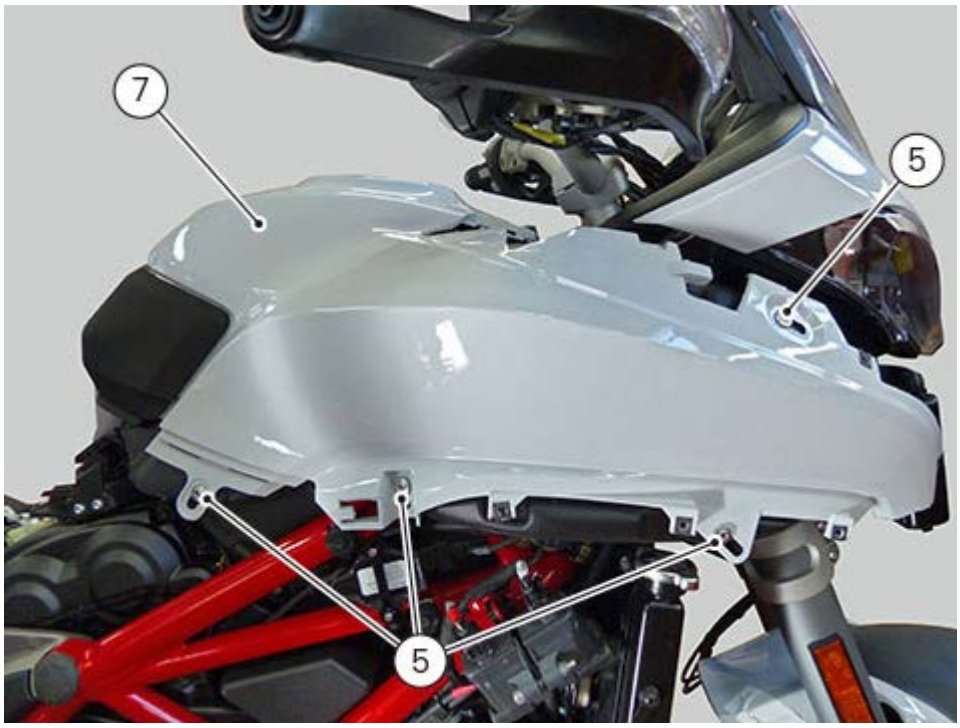
Fit the ten clips (12) in the points indicated in the figure.



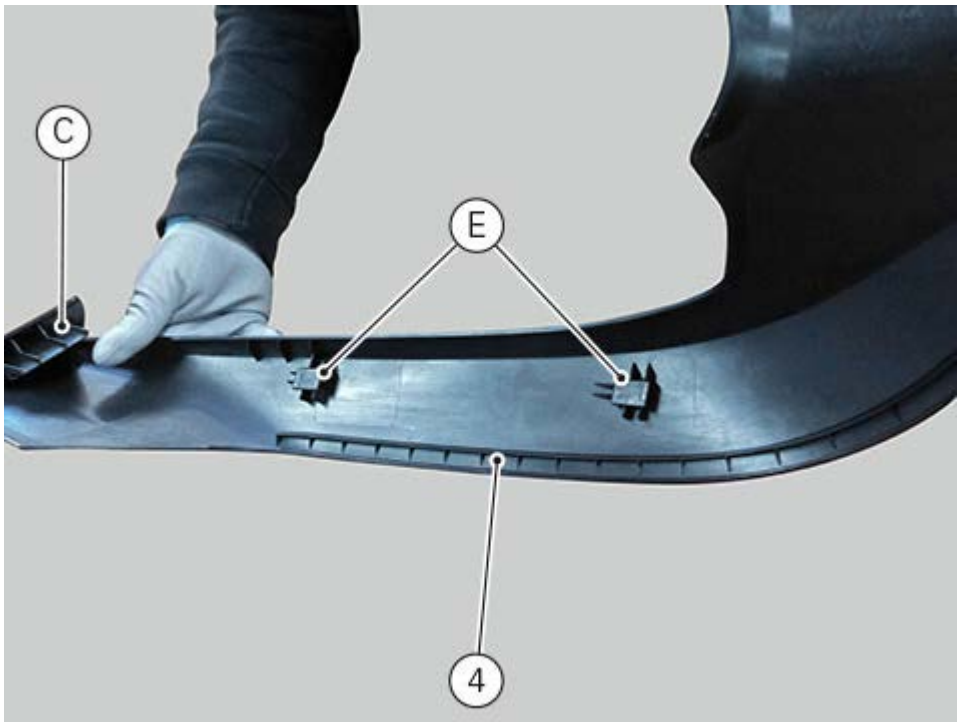
Fix the tank cover by means of the upper screws (6) and lateral screws (5) with Nylon washer. Tighten the screws to a torque of 4 Nm ± 10%.



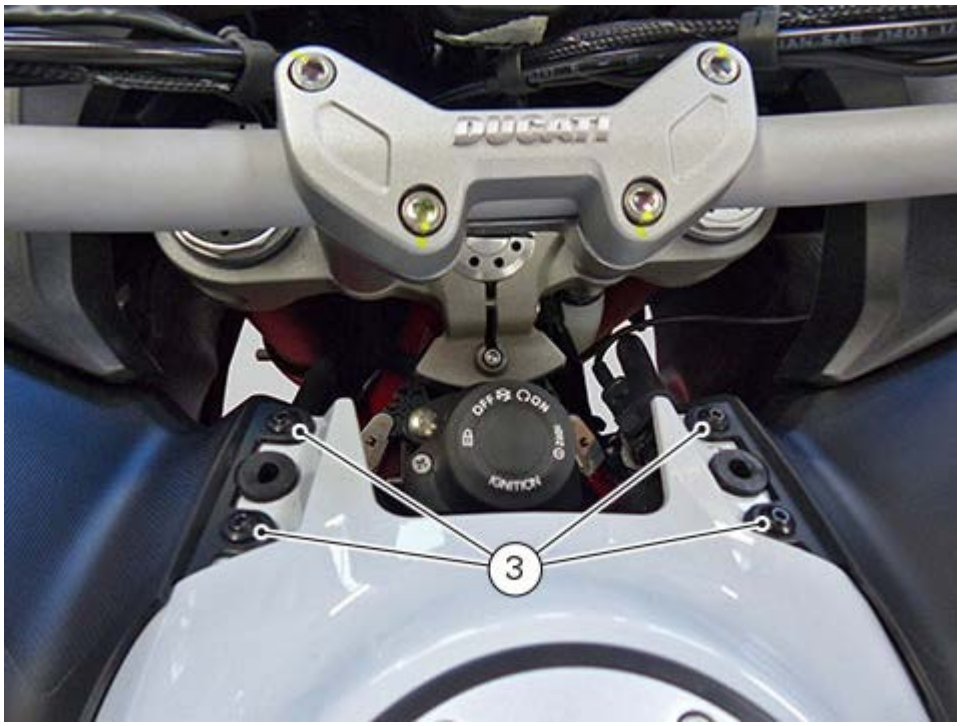




Fit the side conveyor (4) by sliding it first forwards and then backwards so that tab (C) engages in slot (D) and U-bolts (E) in tabs (F).



Fix the side conveyor (4) by tightening screws (3) to a torque of 2 Nm ± 10%.



Fit the Hands free cover (1) by inserting the cover pins in the tank vibration damping pads and press on tabs (2) until they engage into seat.

U.S.A. VERSION


2

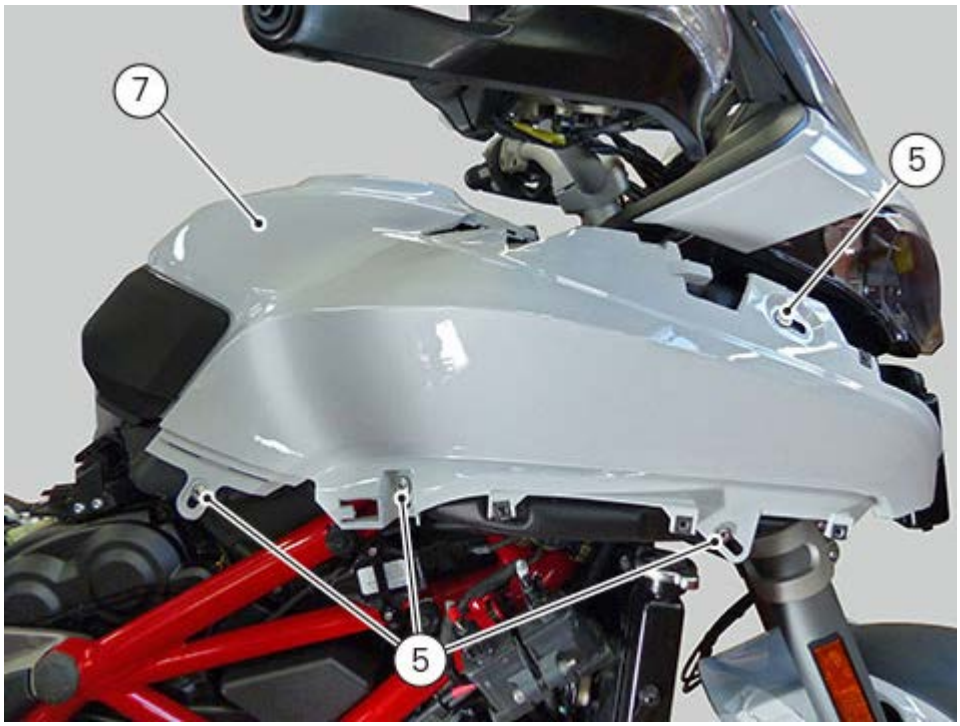
Removing the tank fairings

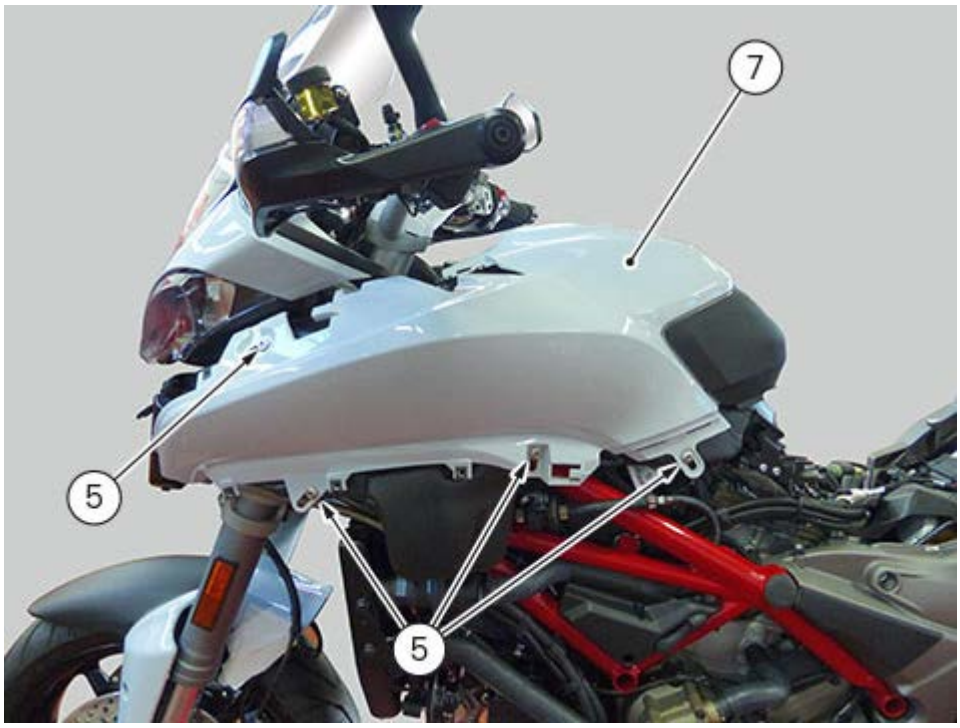
Remove the Hands Free cover (1) by pulling it upwards to release teeth (2).

U.S.A. VERSION

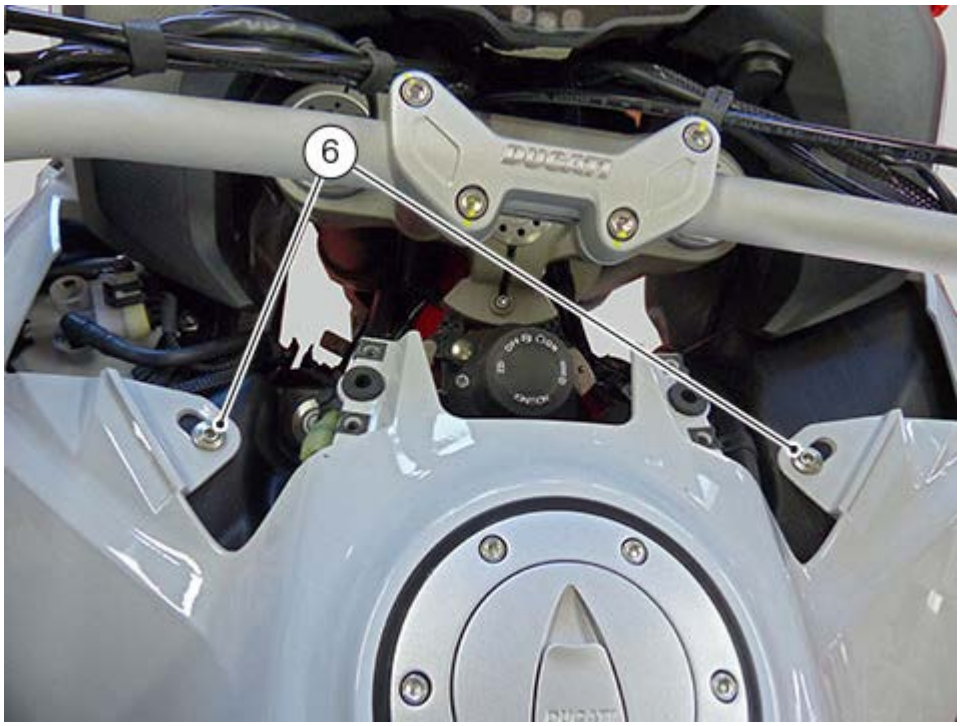
Loosen screws (3) and remove conveyor (4).
Repeat this operation on the other conveyor.

Loosen screws (5) from both sides of the tank cover (7).





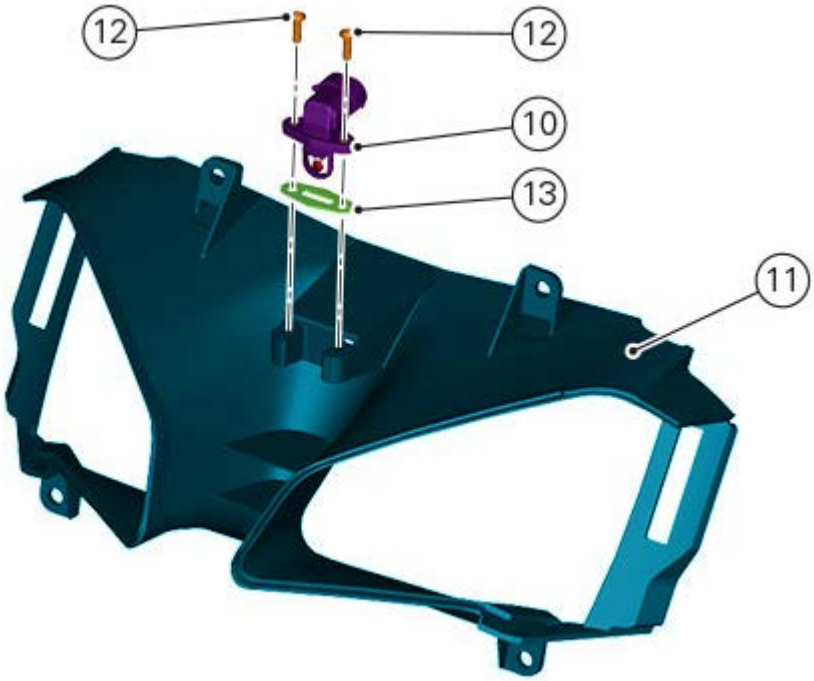
Loosen the two upper screws (6).
Remove the tank cover (7) by sliding it upwards.


6

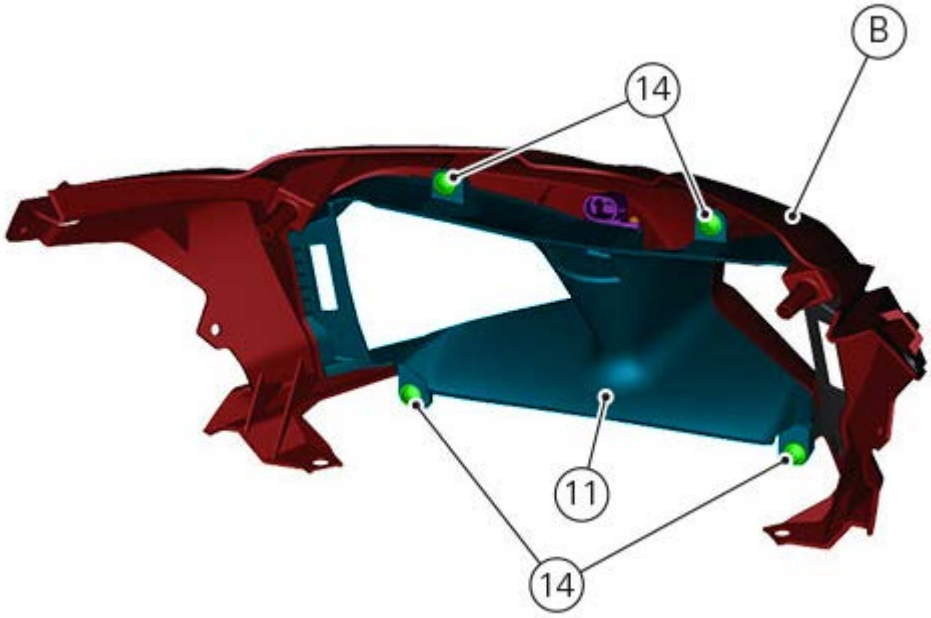
Refitting the front half-fairing

Conveyor upper cover

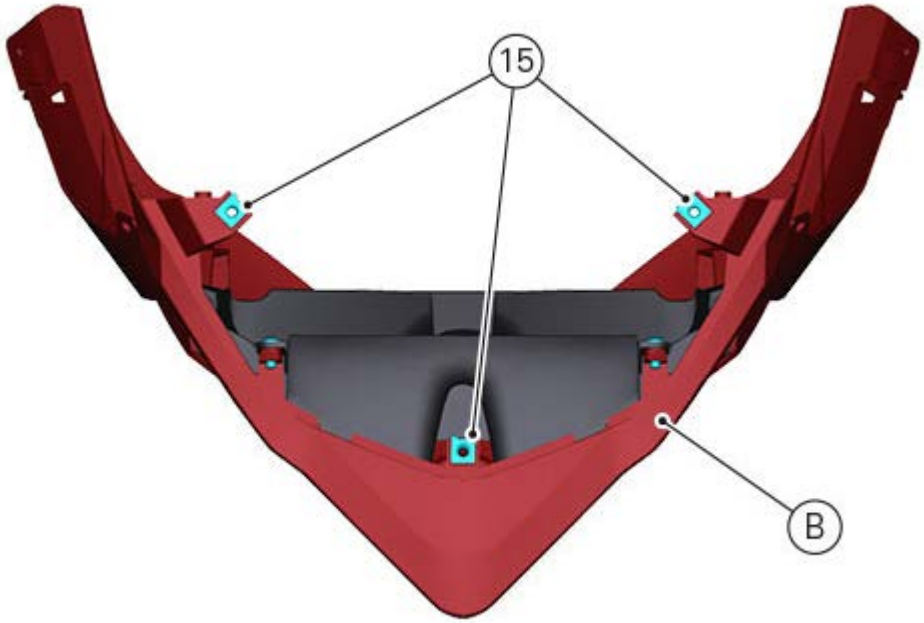
If previously removed, refit the conveyor upper cover as follows:
fix the temperature sensor (10) to the central conveyor (11) by means of two screws (12) with gasket (13).
Tighten the two screws (11) to a torque of 0.9 Nm ± 10%.



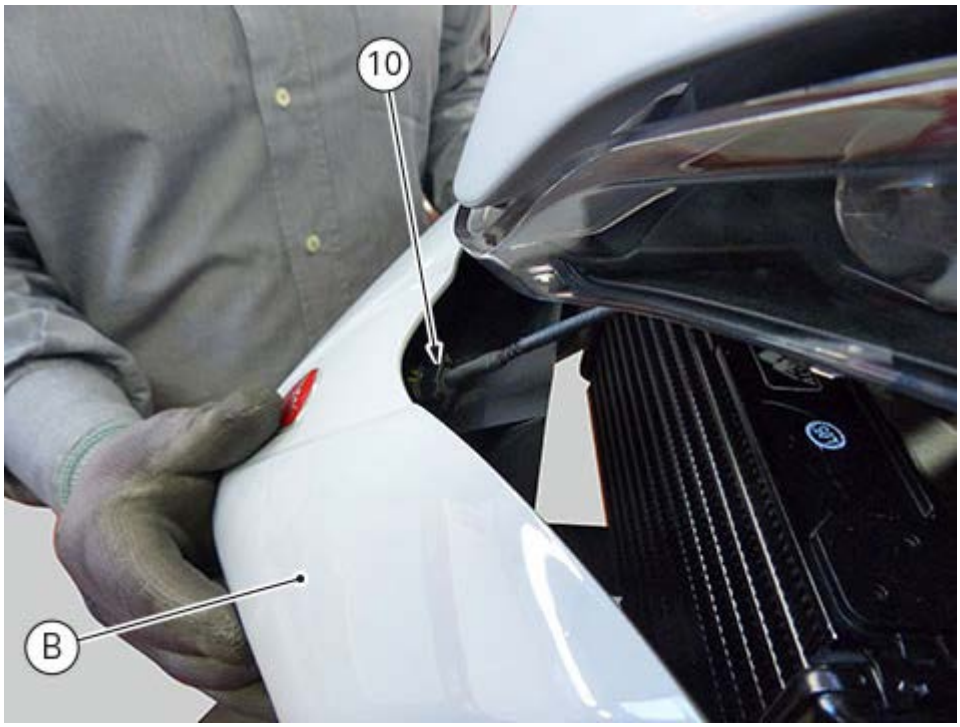
Position the central conveyor (11) inside the conveyor upper cover (B).
Fix it by tightening the four screws (14) to a torque of 2 Nm ± 10%.



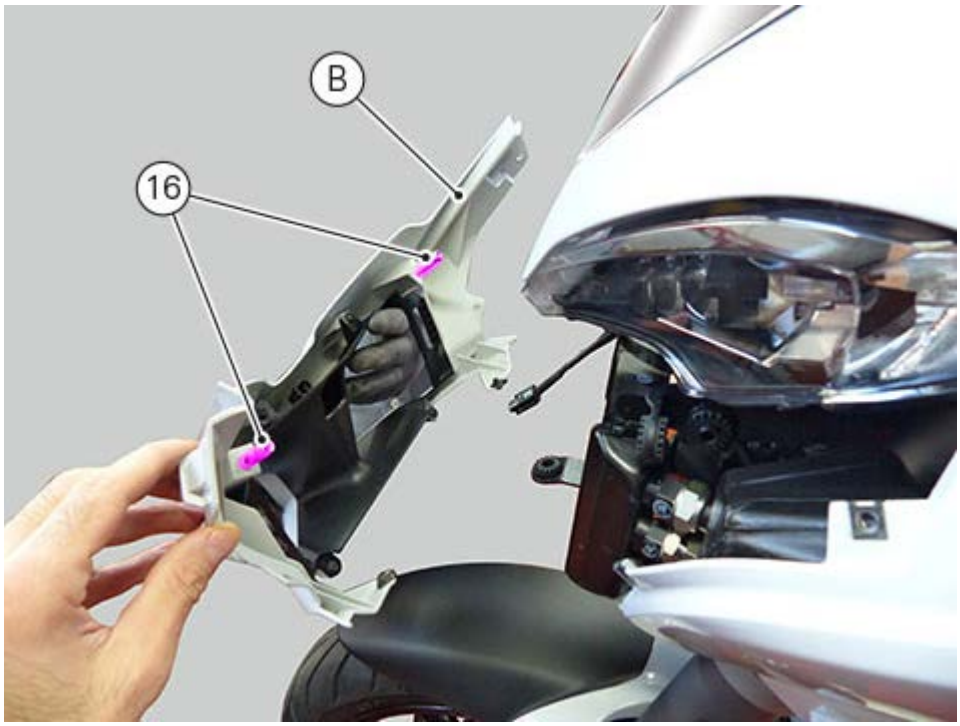
Position the three clips (15) on the conveyor upper cover (B).

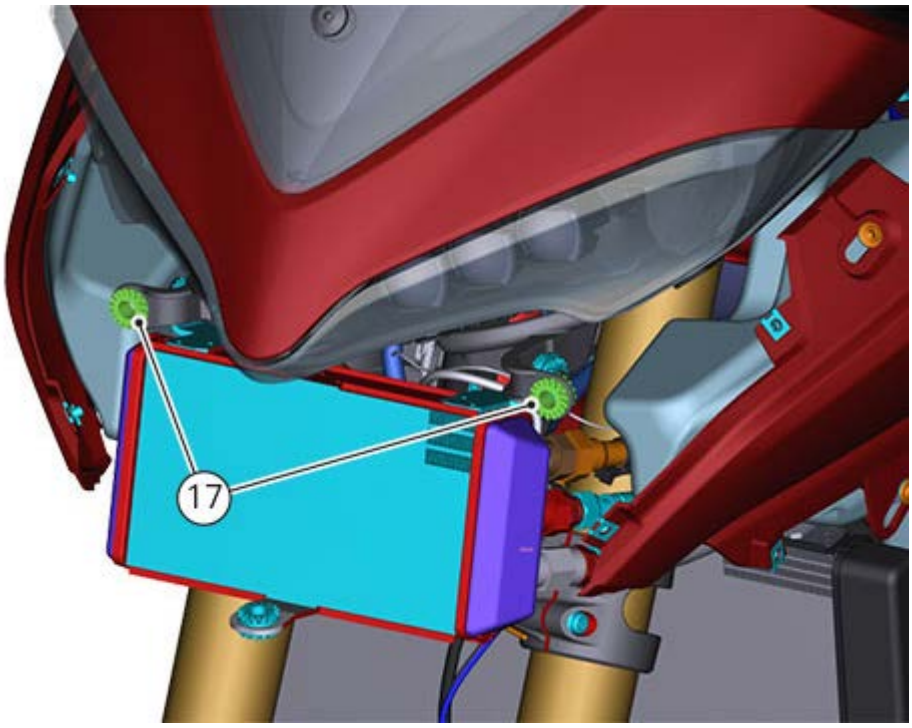


Connect the temperature sensor (10).



Position the conveyor upper cover (B) by inserting the two pins (16) in rubber elements (17).



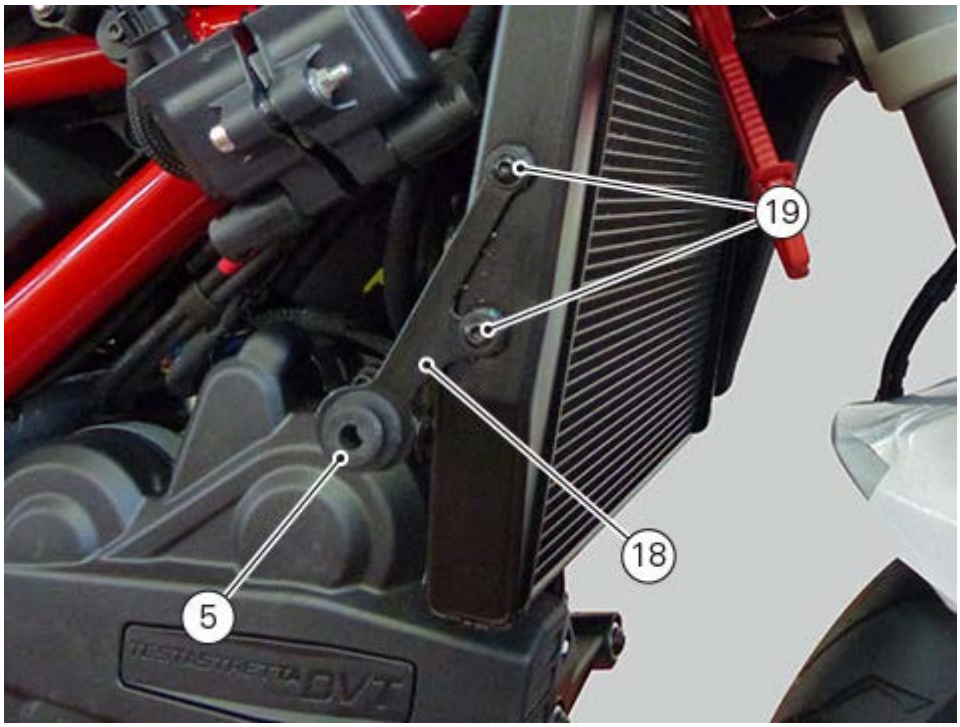


Fix the conveyor upper cover (B) to the tank cover by means of screws (9) by fitting a plastic washer between the screw and the cover.
Tighten them to a torque of 2 Nm ± 10%.

Insert the lower panel (8) of conveyor (B) and fix it with screws (7).
Tighten screws (7) to a torque of 2 Nm ± 10%.

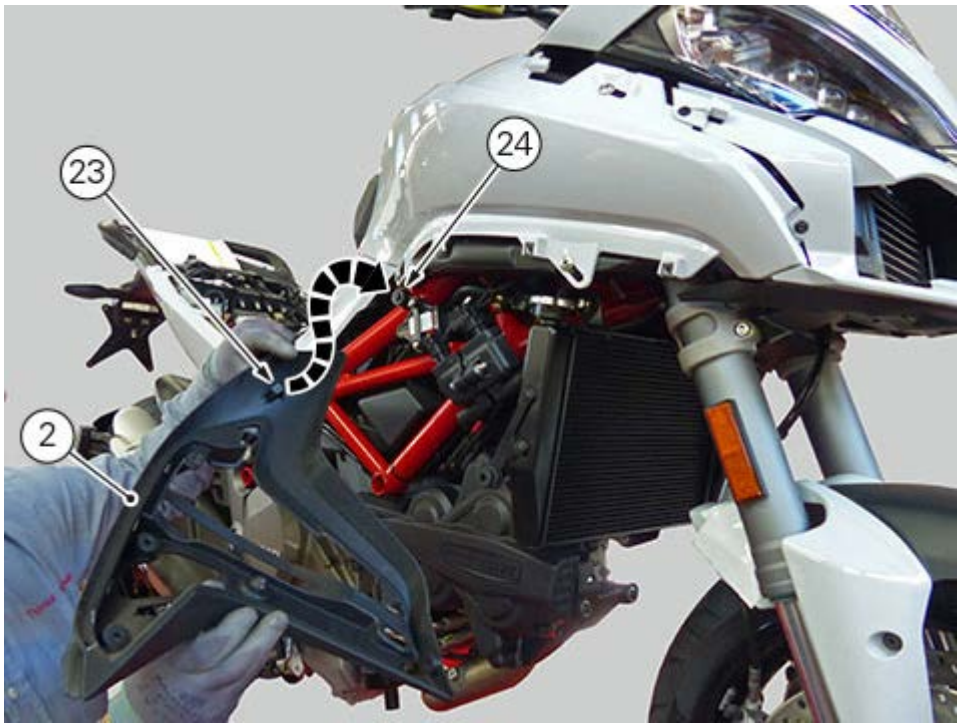
Side panels

Check the presence on the water radiator of the retaining brackets (18).
If not present, fix them by tightening screws (19) to a torque of 6 Nm ± 10%.
Fit the vibration damper (5).

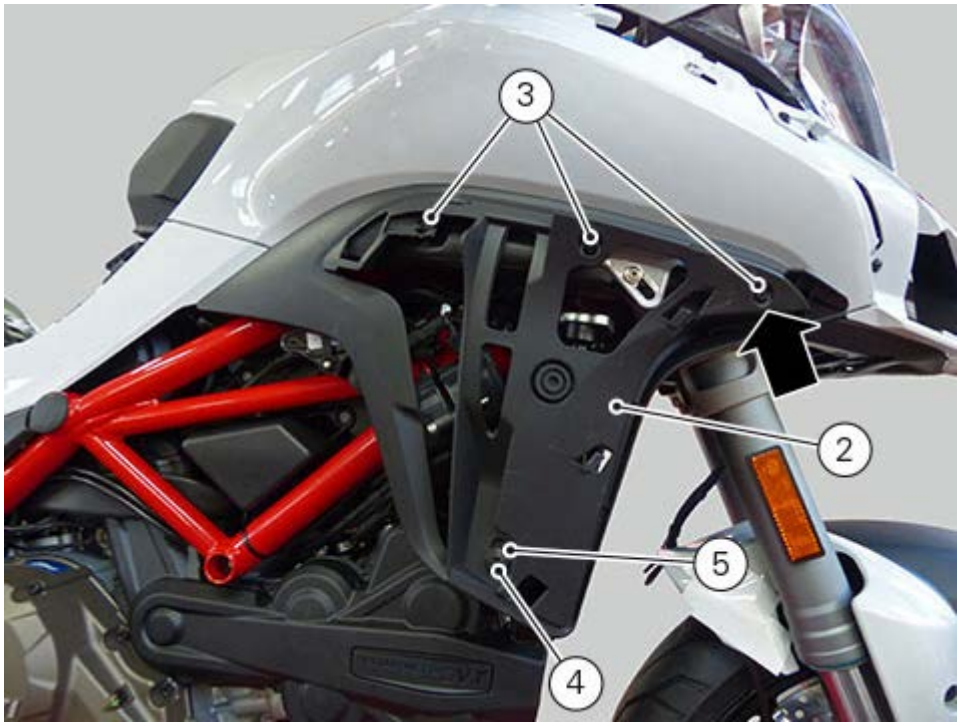


Check that the damper is on support (2).
If not, lubricate with indicated product the hole (22) and fit the damper.

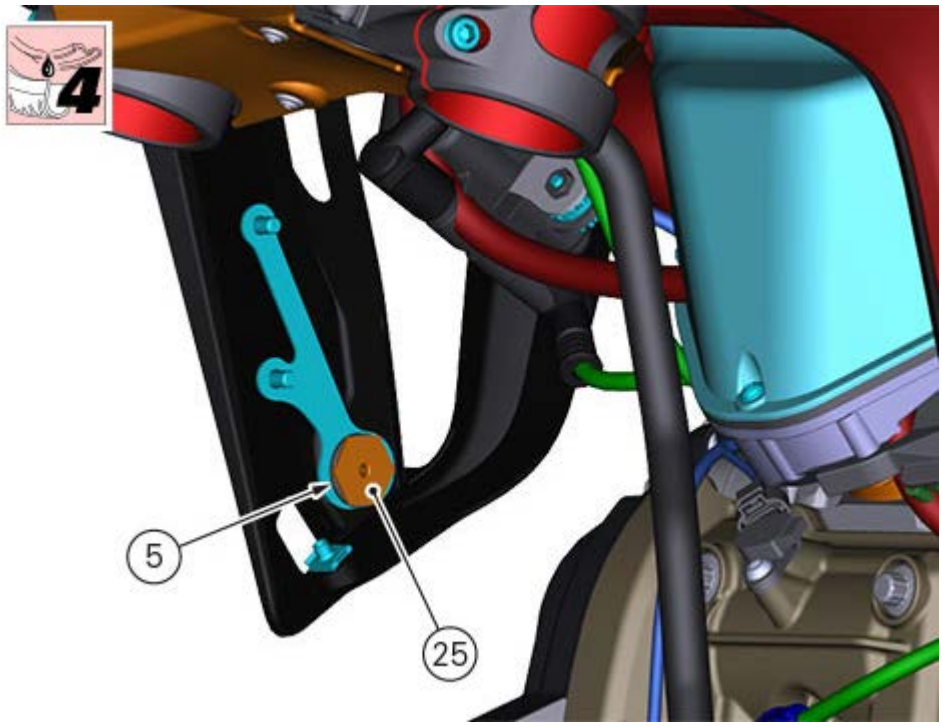
Position support (2) by inserting U-bolt (23) in tooth (24) of the tank cover on the upper side.



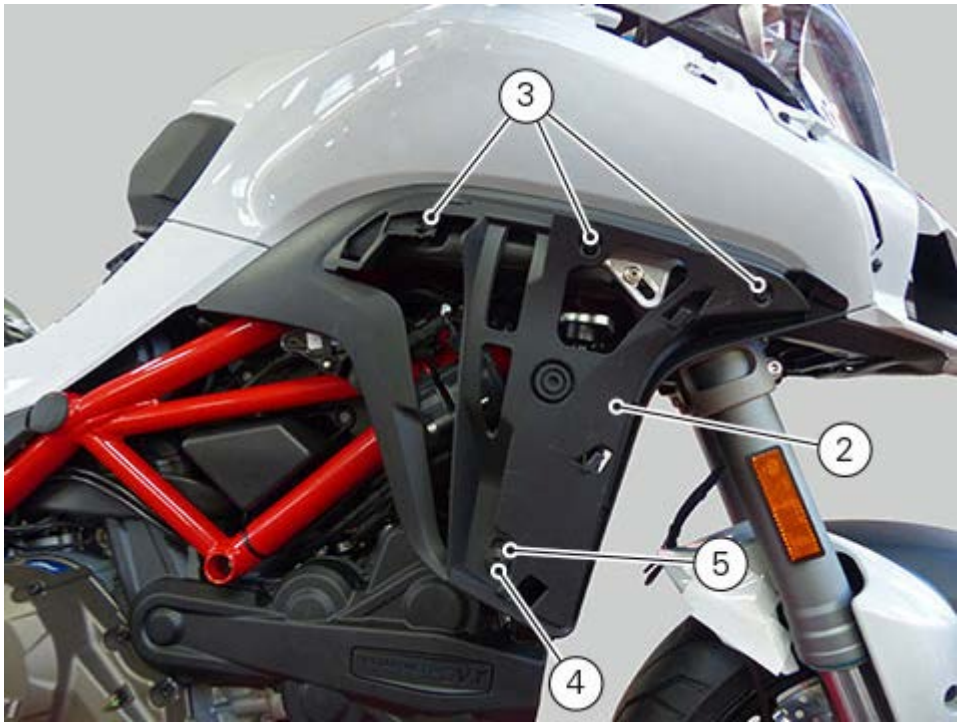
Fix support (2) by starting screw (3) highlighted in the figure.
Tighten the screw (3) to a torque of 2 Nm ± 10%.



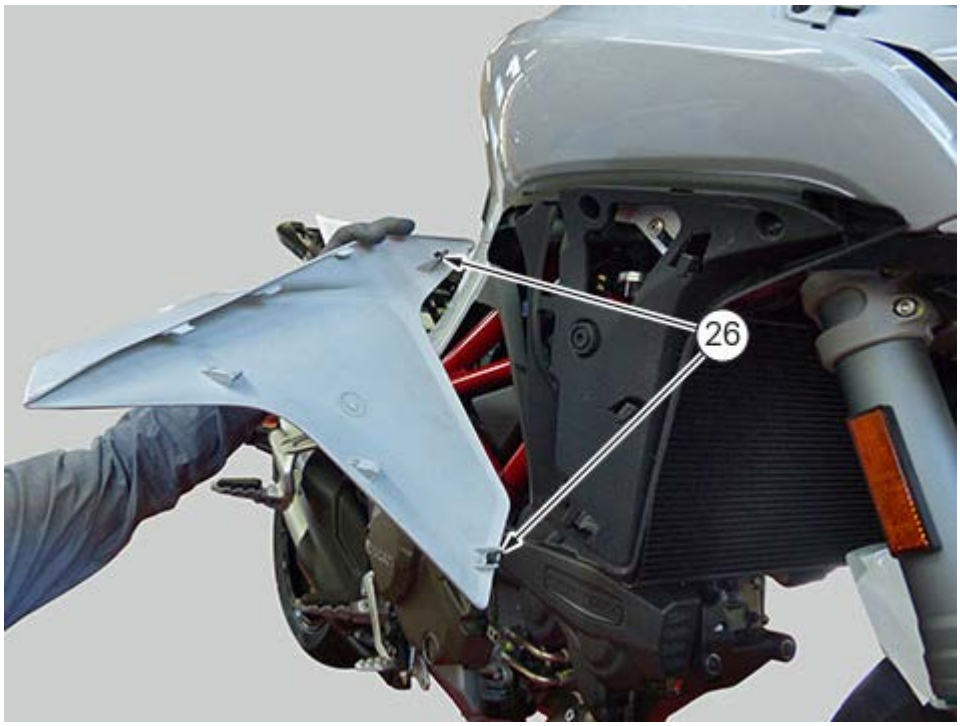
Insert the threaded bushing (25) in the rear hole of the vibration damper (5).
Use the indicated product to lubricate the surface that will be against screw (4).



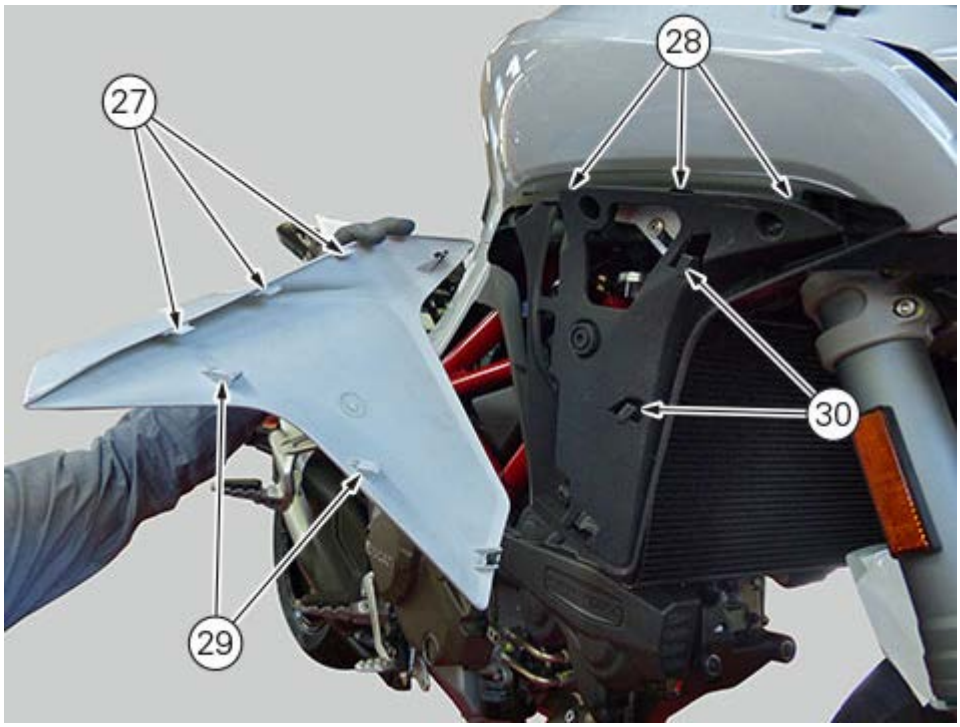
Tighten the screw (4) to a torque of 5 Nm ± 10%.
Start the remaining screws (3) and tighten them to a torque of 2 Nm ± 10%.



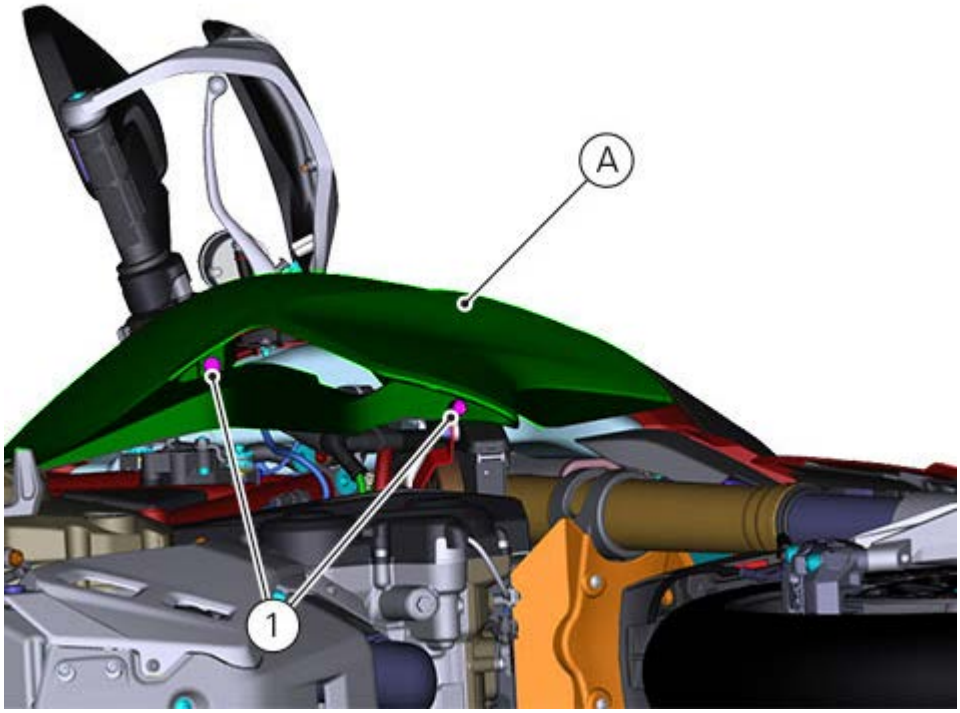
Check that on the panel there are two clips (26).



Position the panel on its support: upper part tabs (27) in slots (28) and U-bolts (29) in tabs (30).

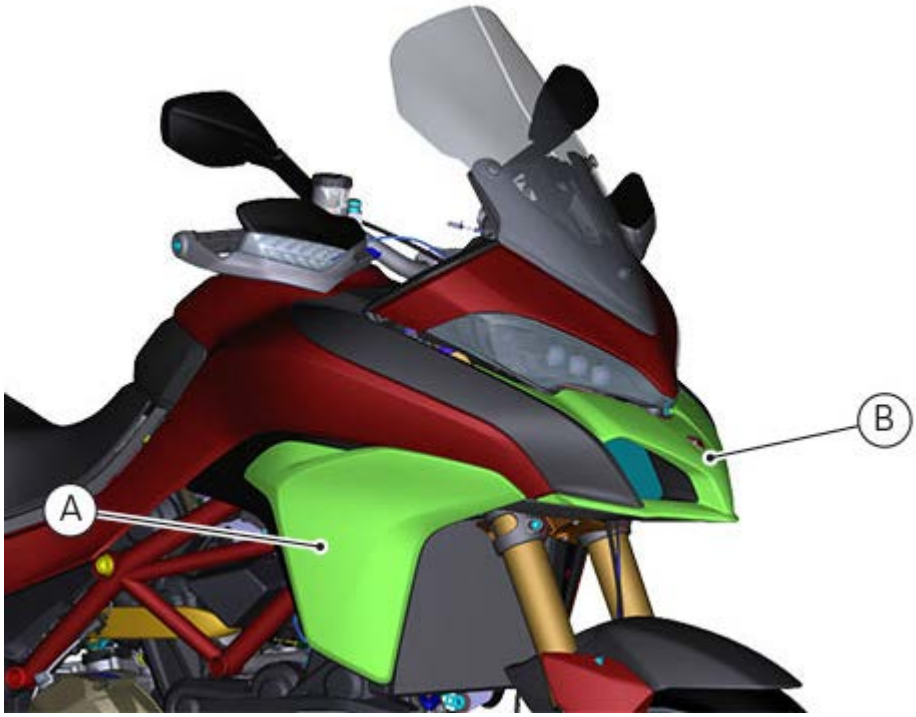


Fix panel (A) by tightening screws (1) to a torque of 2 Nm ± 10%.


A
1

Removing the front half-fairing

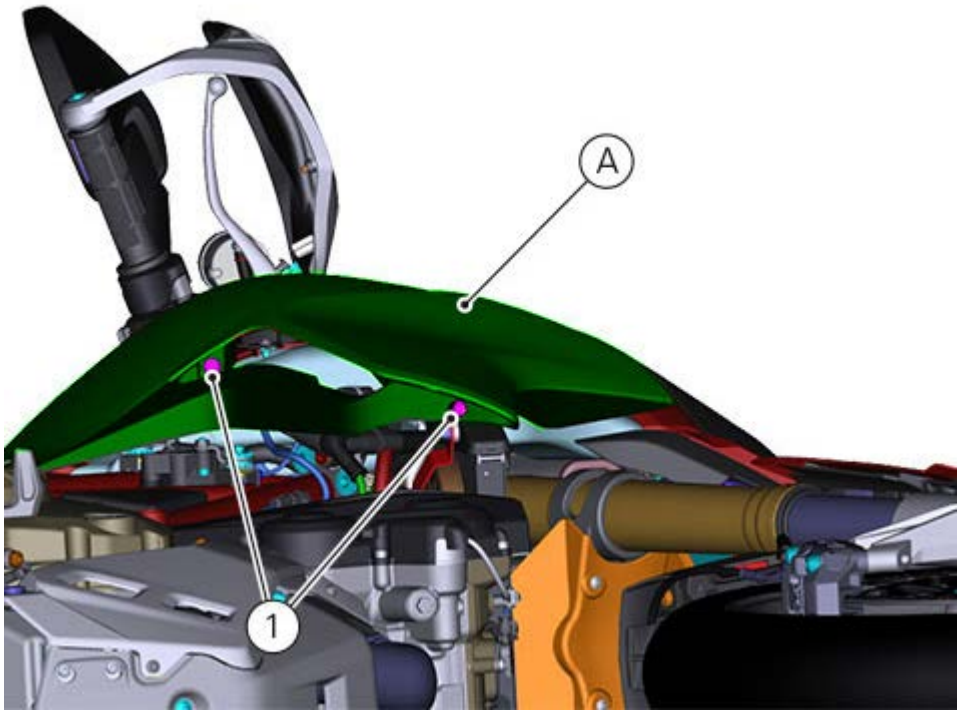
The front half-fairing consists of two parts:
A) side panels;
B) conveyor upper cover.



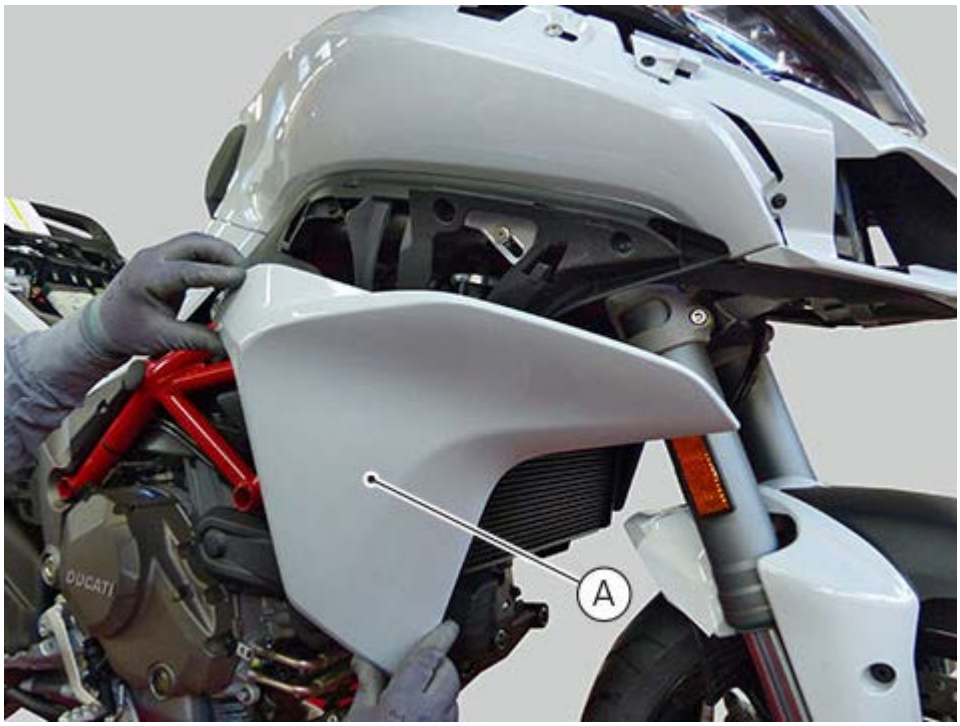
Side panels

The procedure below describes how to remove one side panel but it applies to both tabs.

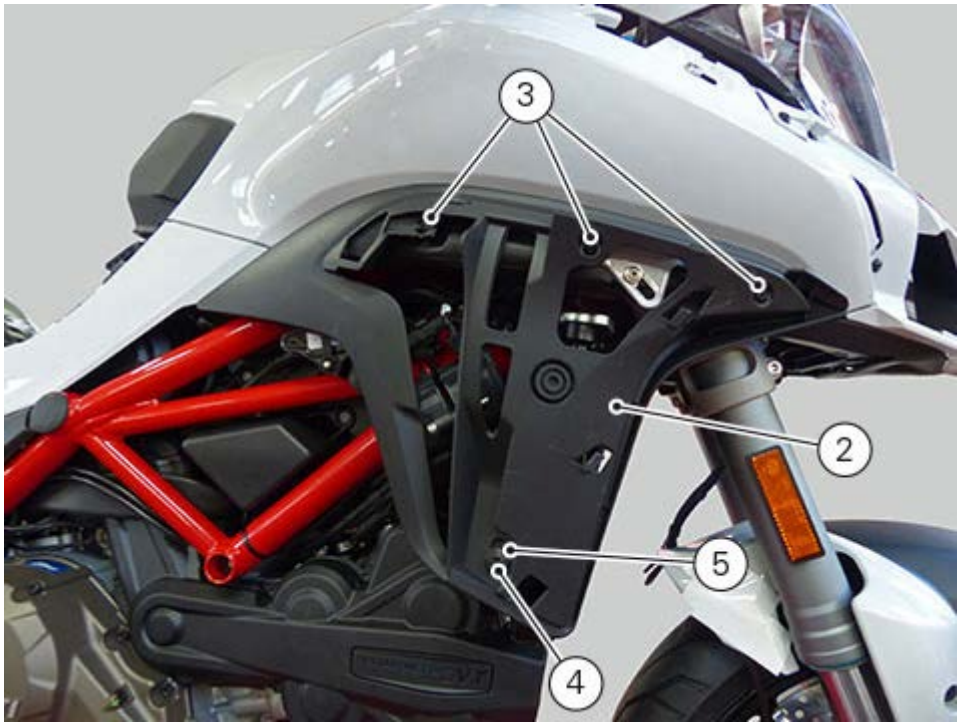
Remove the two screws (1) securing the side panel (A).



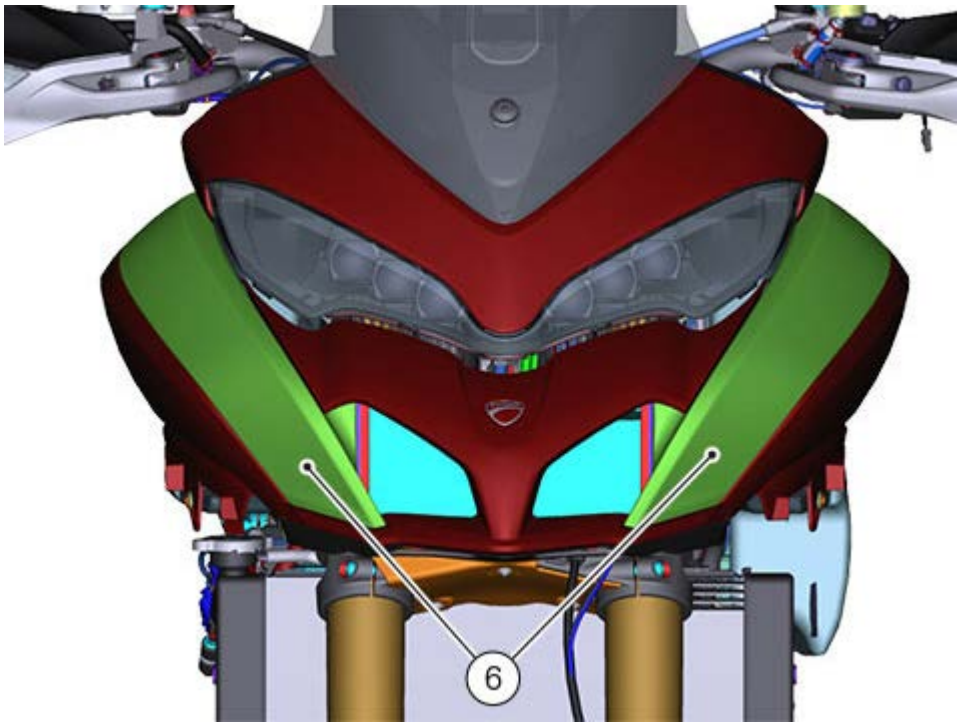
Remove the side panel (A).



To remove support (2), loosen the three screws (3).
Loosen the retaining screw (4) of rubber element (5).
Remove support (2) from rubber element (5).



Remove the two conveyors (6) "Removing the tank cover".



Conveyor upper cover

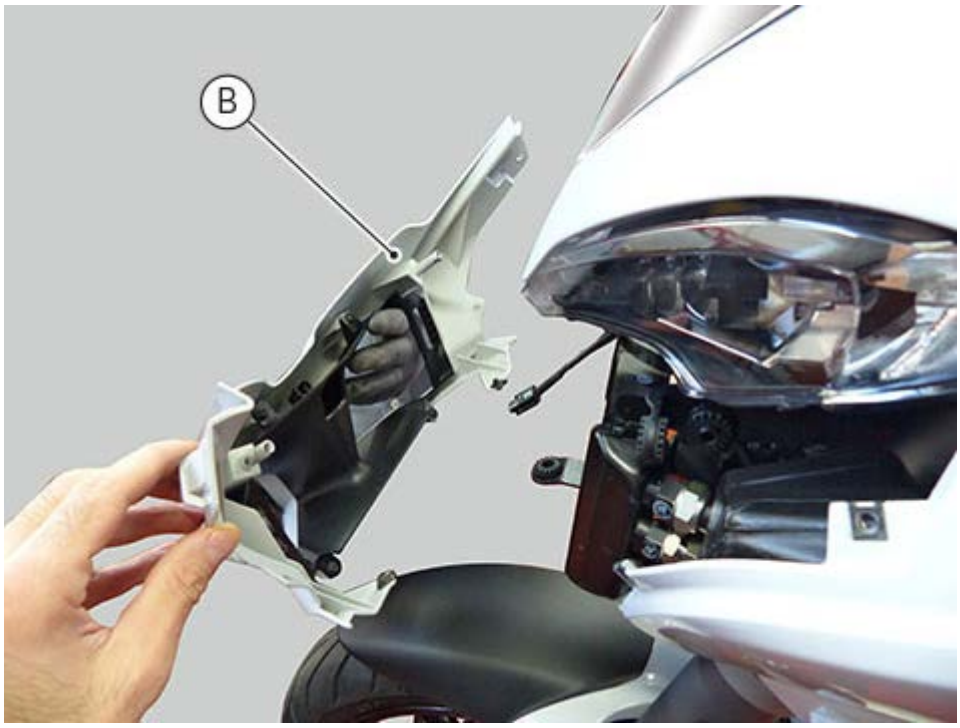
Loosen the three screws (7) securing the conveyor (B) lower panel (8).

Remove the lower panel (8).

Remove from both sides the retaining screws (9) of conveyor (B).

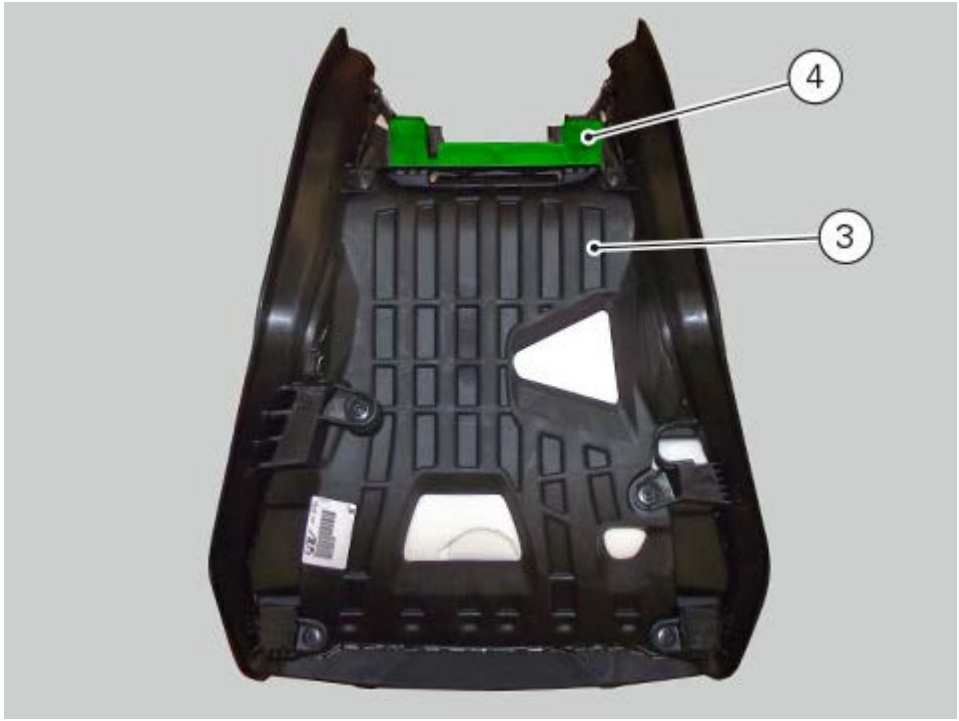
Pull conveyor (B) forwards by releasing its retainers.
During this operation, pay attention not to damage the temperature sensor cable (10).
Disconnect the temperature sensor (10).

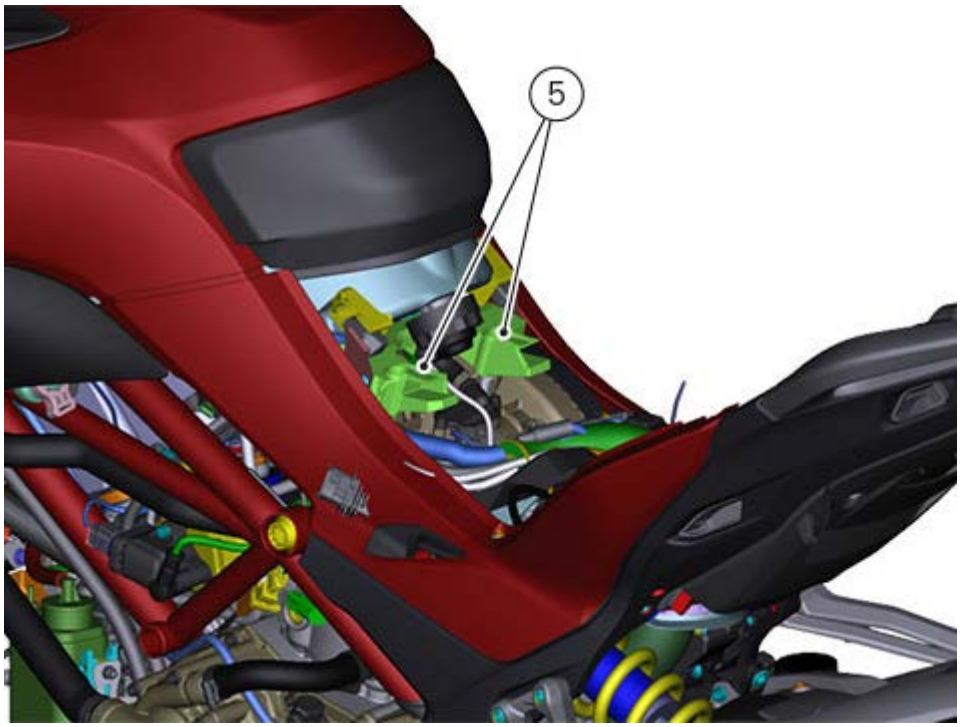

10
B


B

Refitting the seat

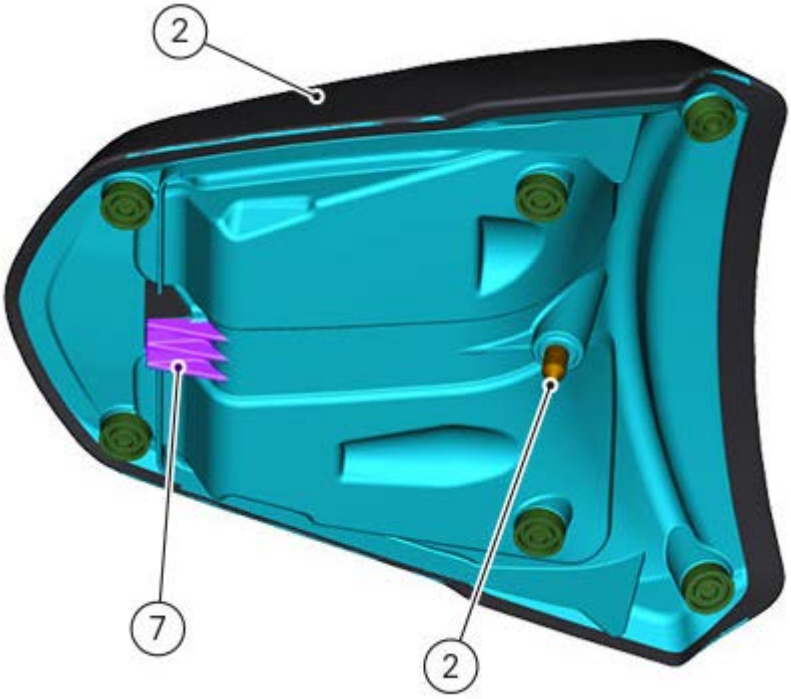
Fit the two pins (4) of seat (3) in the relevant housings (5) on vehicle frame.
Press seat (3) towards vehicle front and lock it.





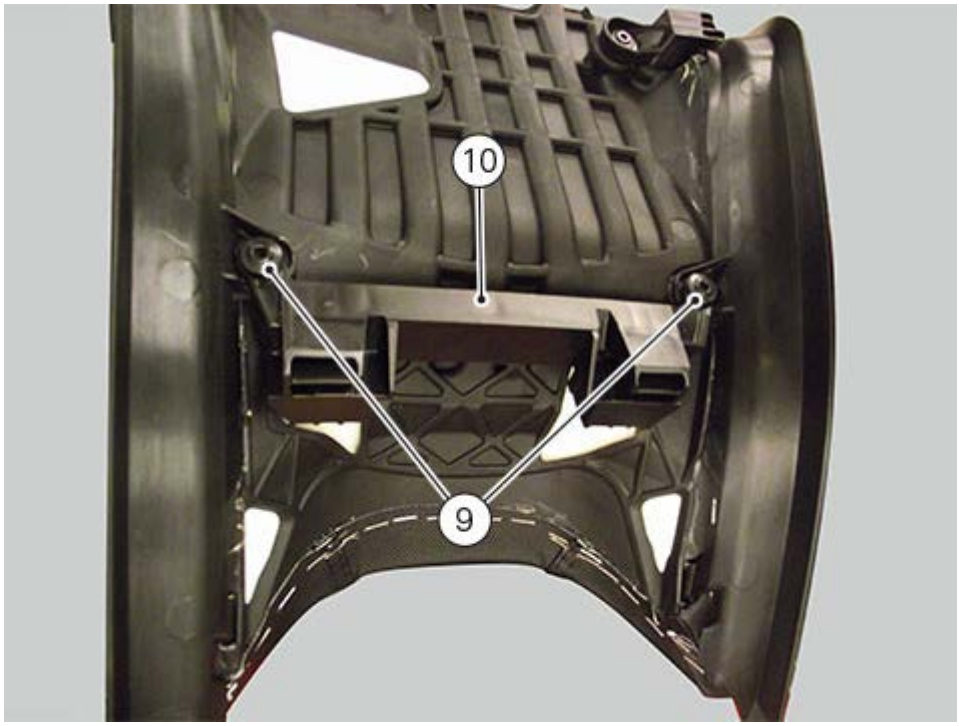
Lubricate rear seat (2) pin (6) housing with indicated product. Fit rear seat (2) pin (7) in housing (8) on frame.
Push seat (2) down to lock pin (6) in seat lock.


D
GREASE

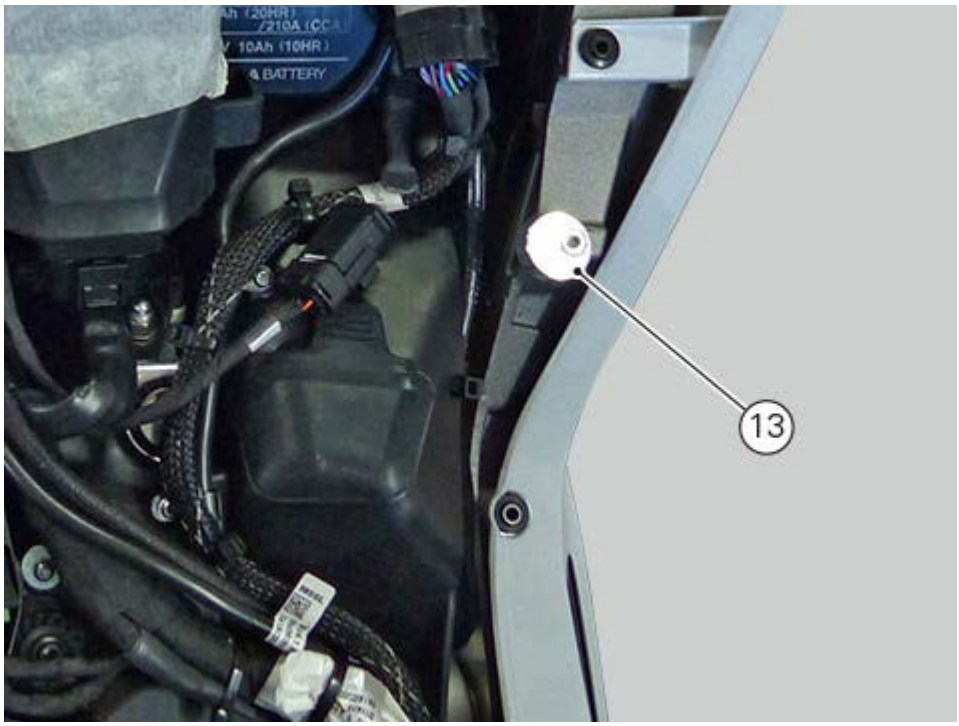

2
7
2

Seat components and height adjustment

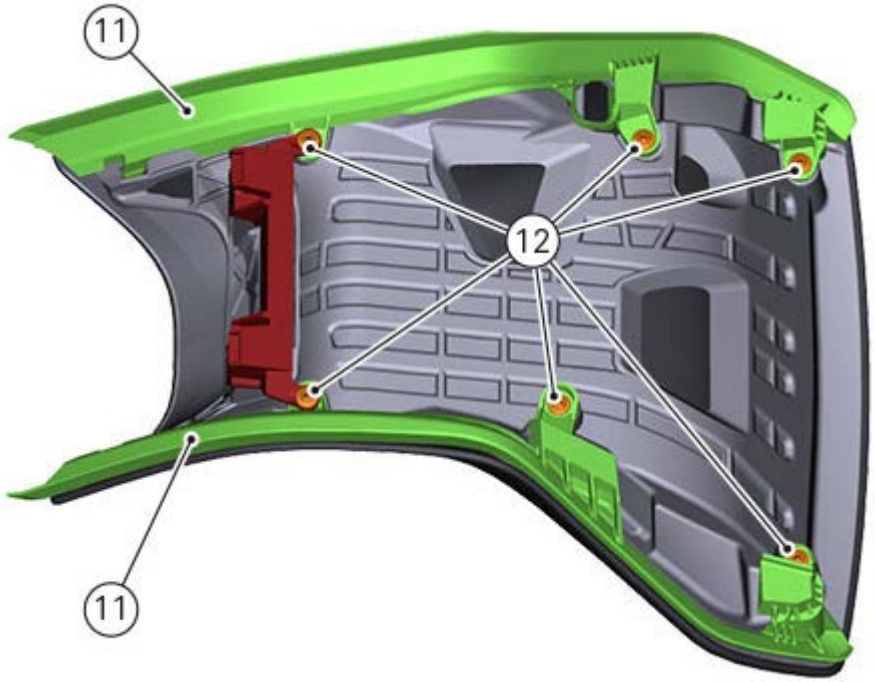
If previously removed, fit seat support (10) and tighten screws (9) to a torque of 4 Nm ± 10%.



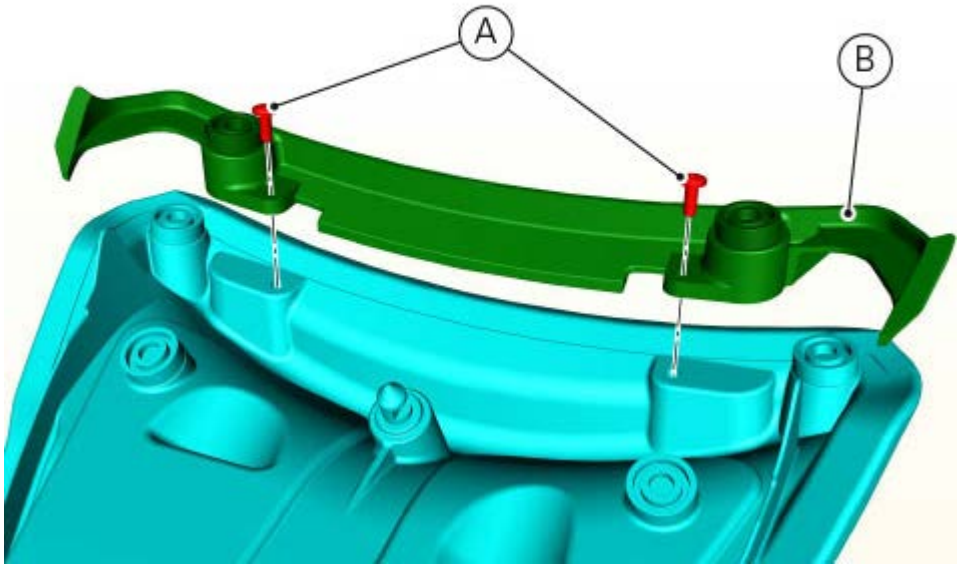
Check for eccentric (13) presence, if it needs to be fitted, tighten screw (14) to a torque of 2 Nm ± 10%.

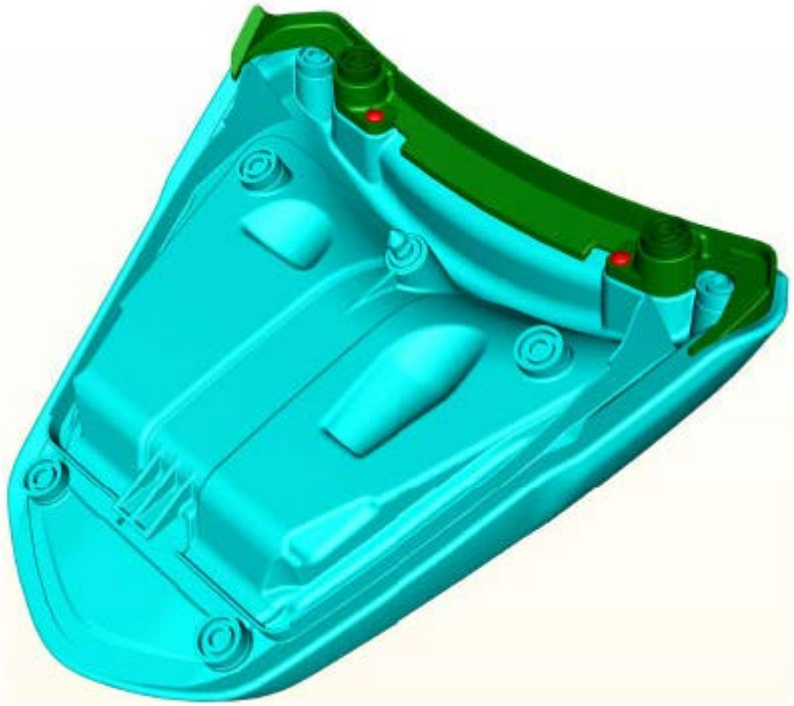


If seat height needs to be changed, it is possible to increase it by positioning the two shims (11). After positioning them, fix them by tightening screws (12) to a torque of 4 Nm ± 10%.



In case of "lowered seat" configuration, spacer (B) must be installed on passenger seat.
Tighten the screws (A) to a torque of 2 Nm ± 10%.

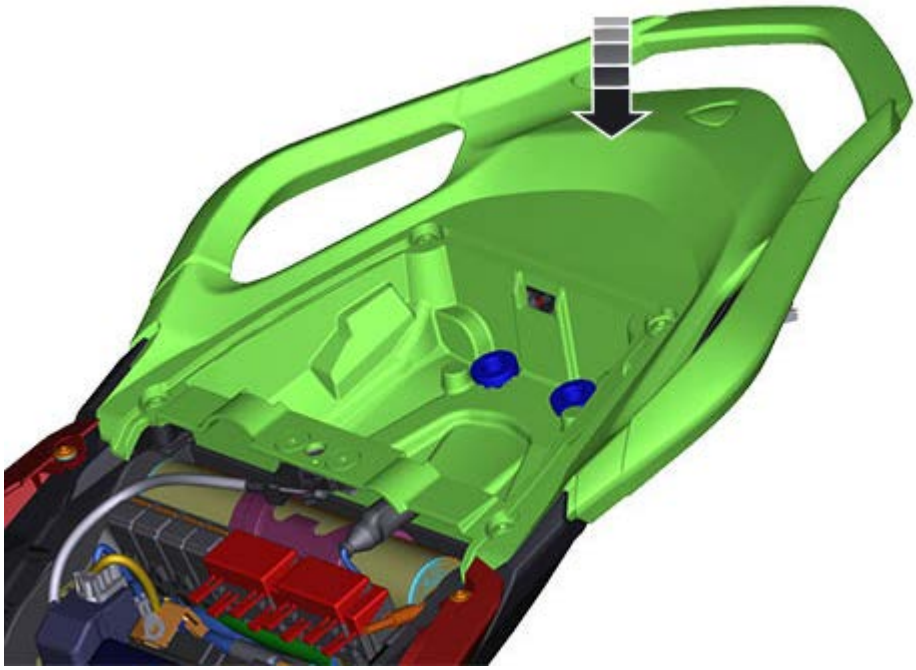

A
B



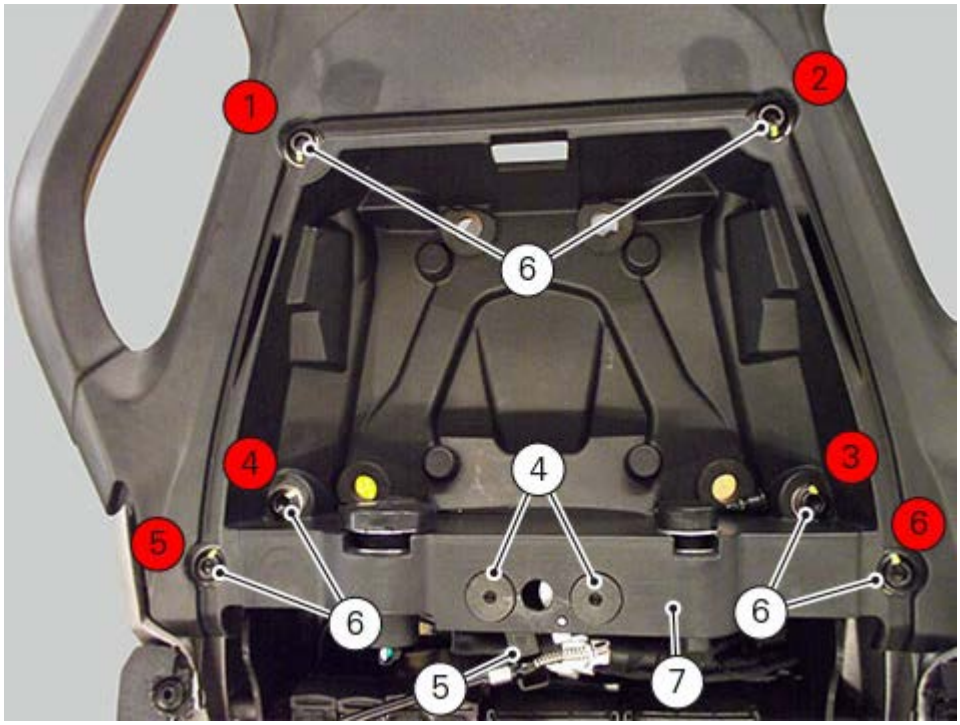
Refitting side body panel and tail guard

Tail guard

Reposition the tail guard (7) inside the rear subframe.

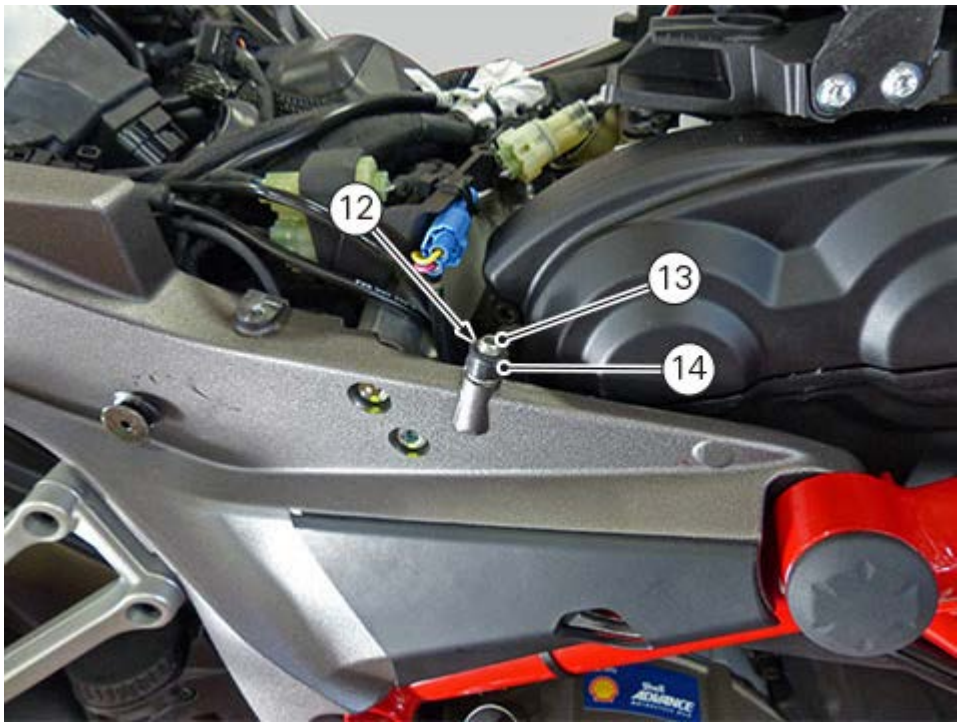


Insert the retaining screws (6) and tighten them to 18 Nm ± 10% following the indicated sequence and applying the specified threadlocker.
Insert the lock block (5) and fix it with screws (4).



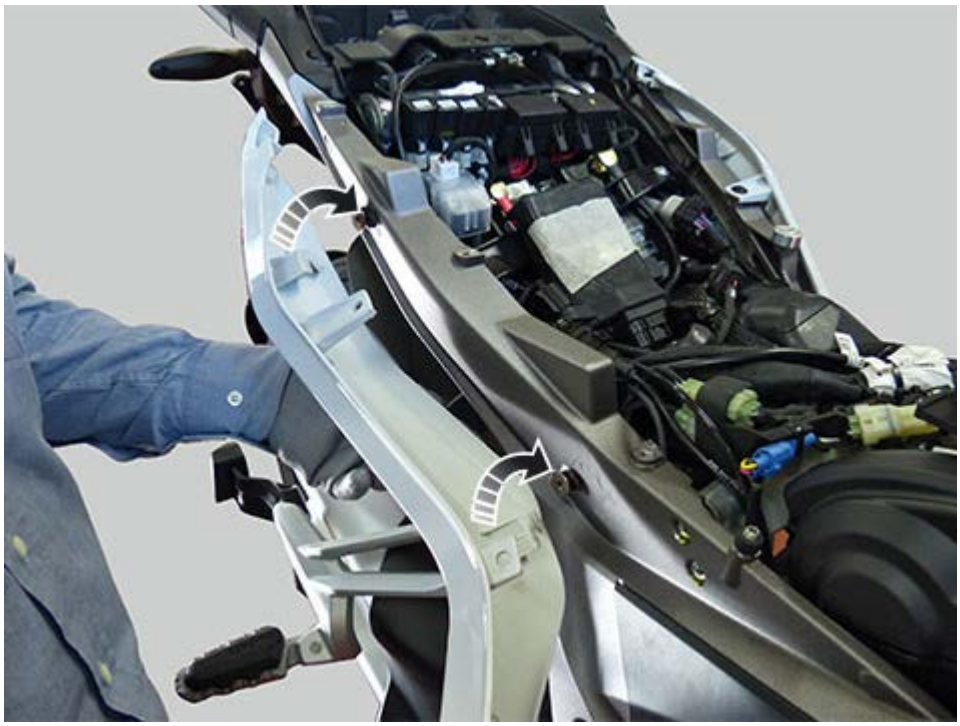
Side body panels

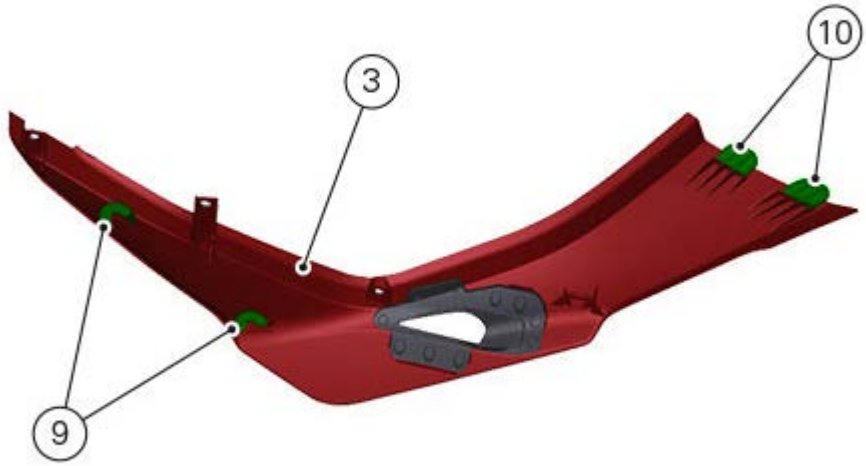
Make sure that pin (12) is present on the half-subframe; if not, insert screw (13) in rubber element (14) and tighten it to 2 Nm ± 10%.



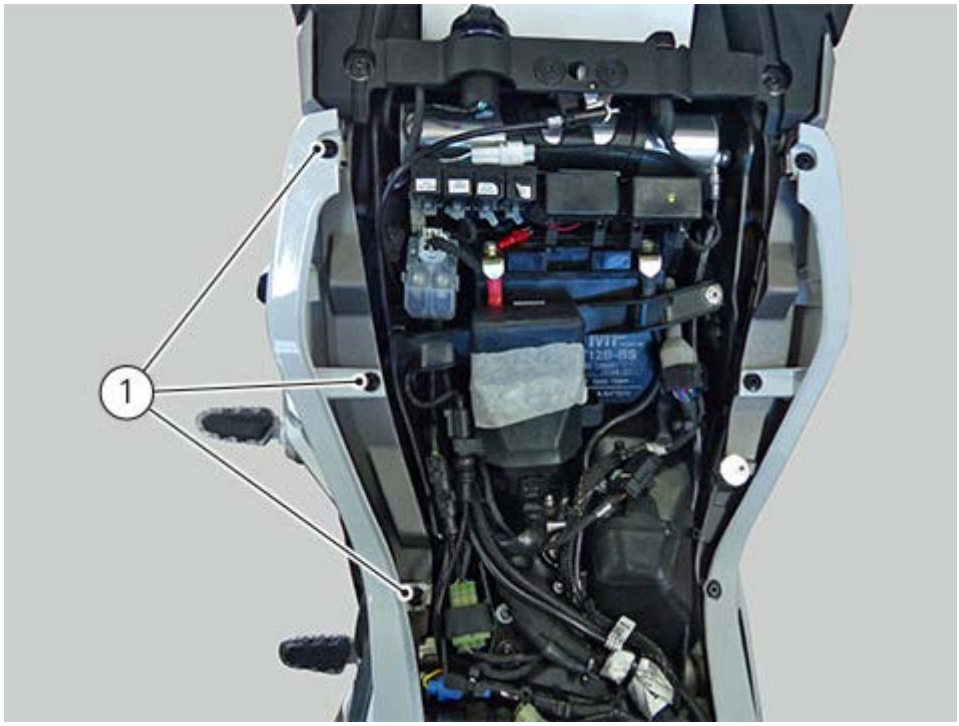
Fit the two special screws (15) and tighten them to a torque of 5 Nm ± 10%.

Position the side body panel (3) so that the two tabs (9) engage in the frame hooks (8).
At the same time, the two tabs (10) must engage under the tank cover (11).





Start screws (1) with the relevant washer (2) and tighten them to a torque of 5 Nm ± 10%.

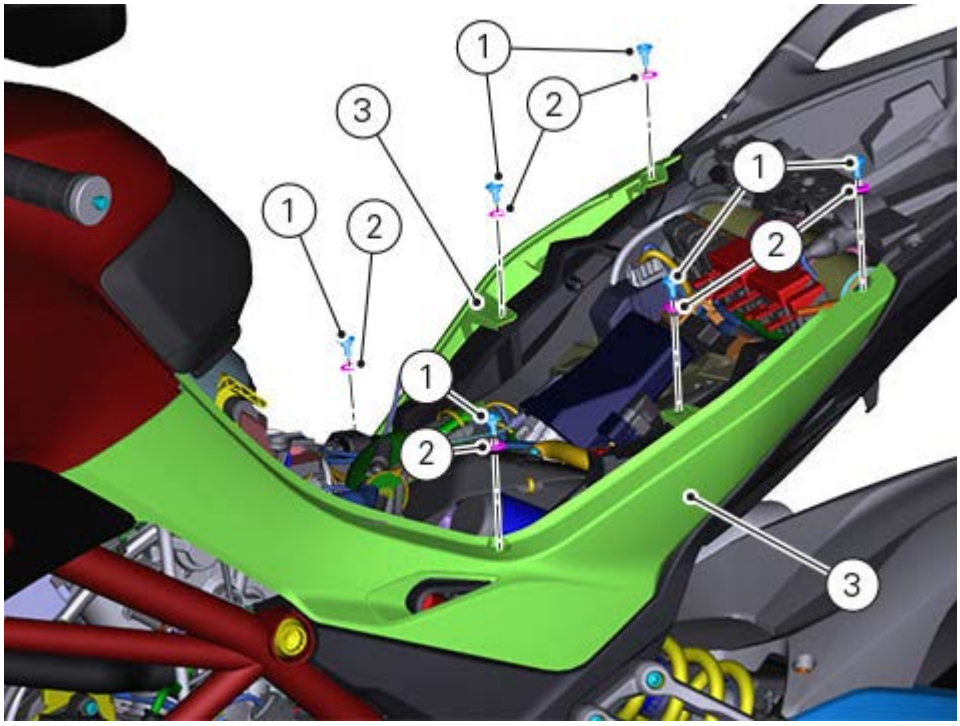


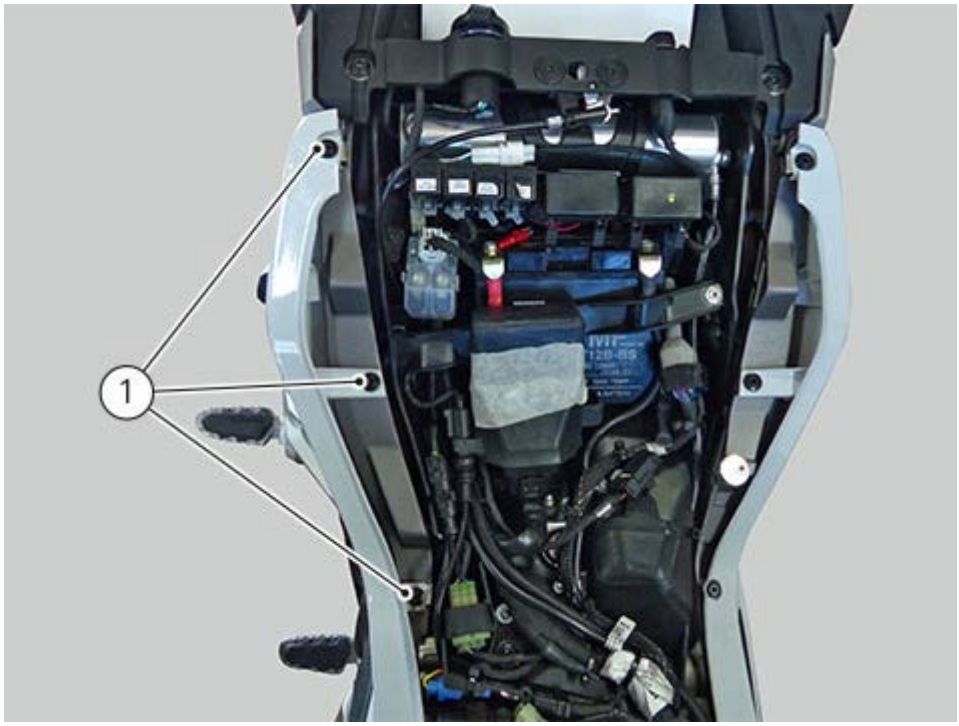
Removing the side body panels and the tail guard

Side body panels

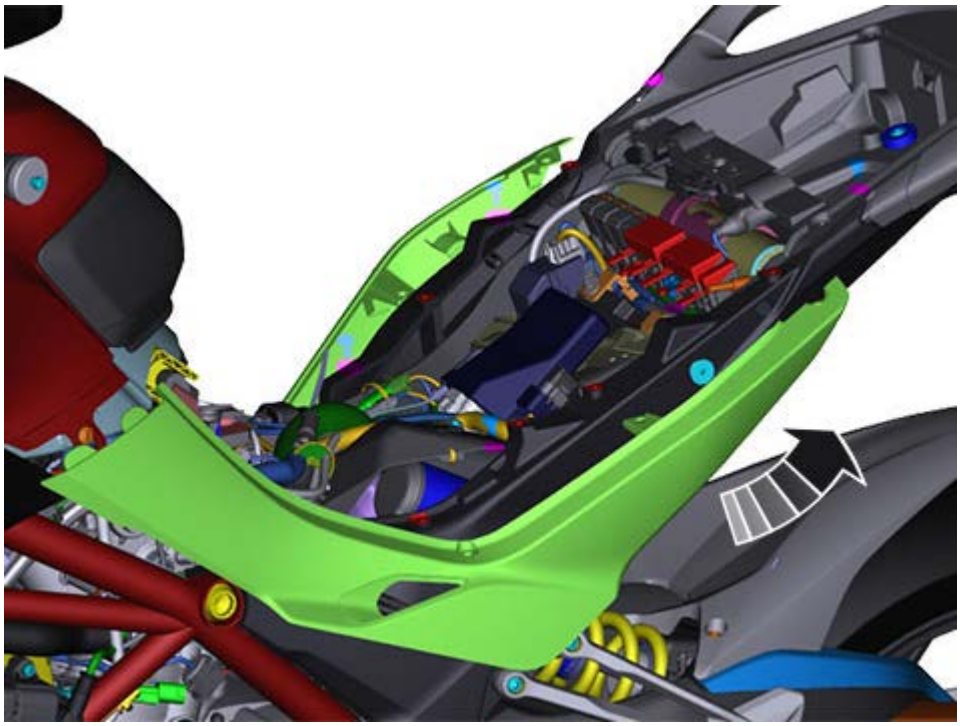
Remove the seat (Removing the seat).

Loosen screws (1) securing side body panel (3) to the rear subframe, collecting washers (2).



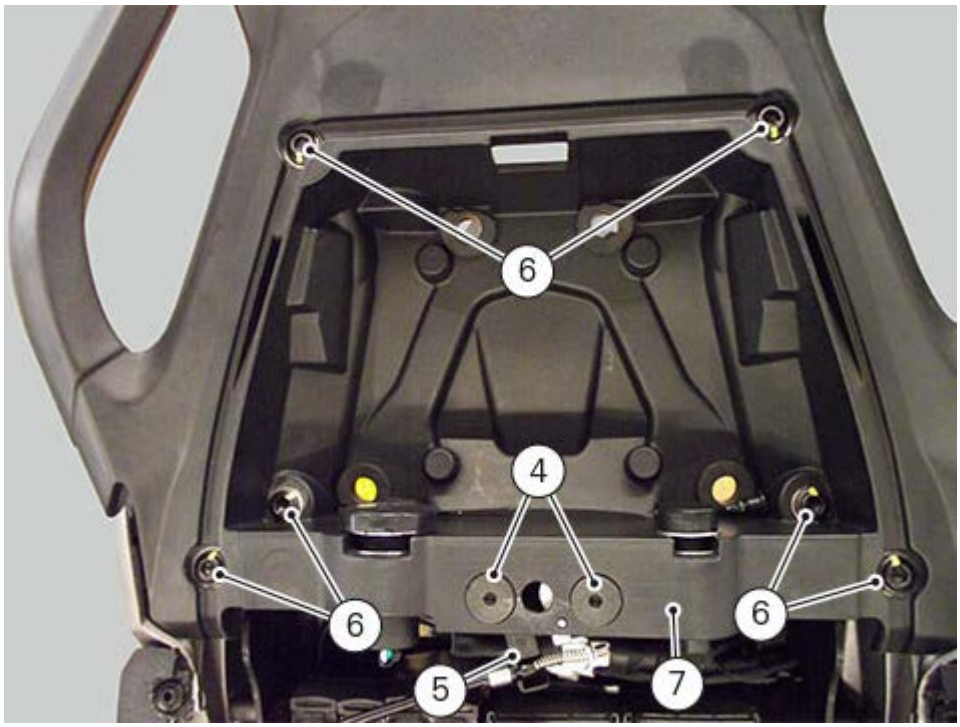


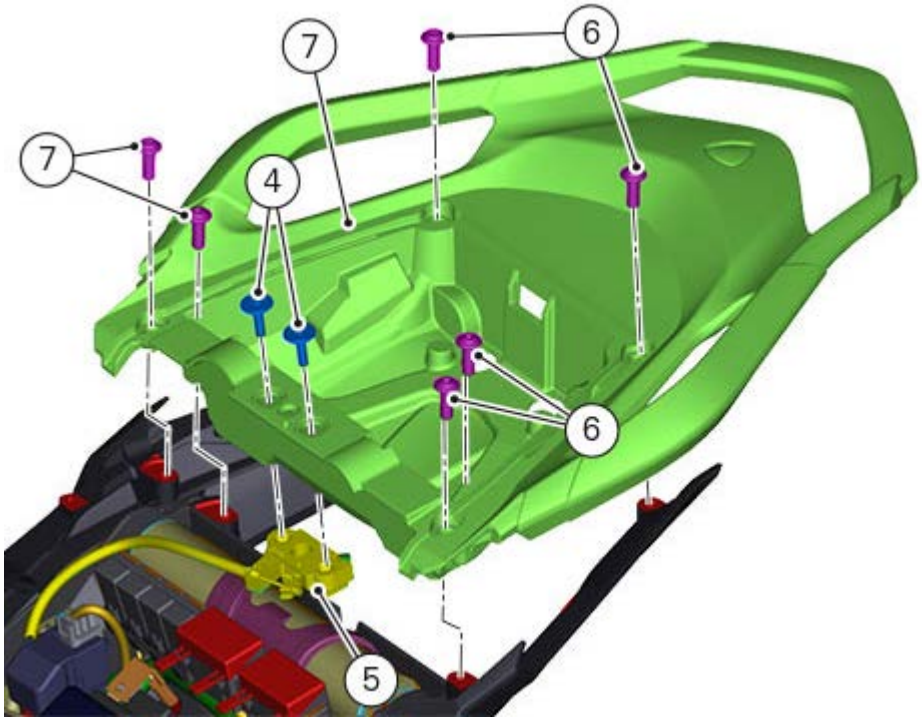
Remove the side body panel by sliding it towards the vehicle rear side.



Tail guard

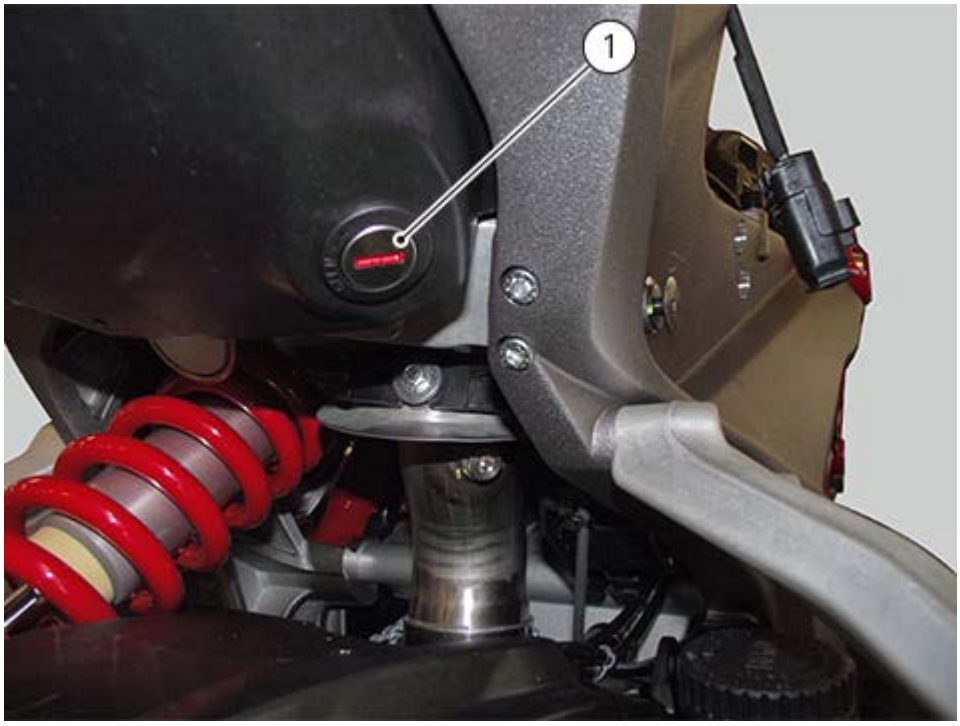
Undo the screws (4) and remove the seat lock block (5).
Loosen screws (6) that retain the tail guard.
Remove the tail guard (7) by prying in the indicated point.




7
6
7
4
6
5

Removing the seat

Insert key inside seat lock (1), and turn it clockwise until hook clicks.



To slide passenger seat (2) out of the front retainer, push it forward, lift it, and remove it.

To remove rider seat (3) from vehicle, pull it back, and lift it.

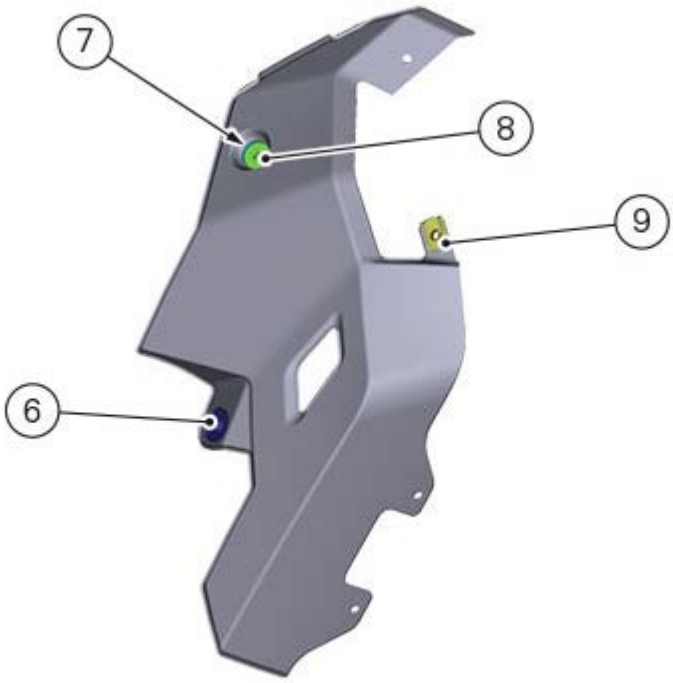

3

Refitting the belly pan

From disassembled sump guard

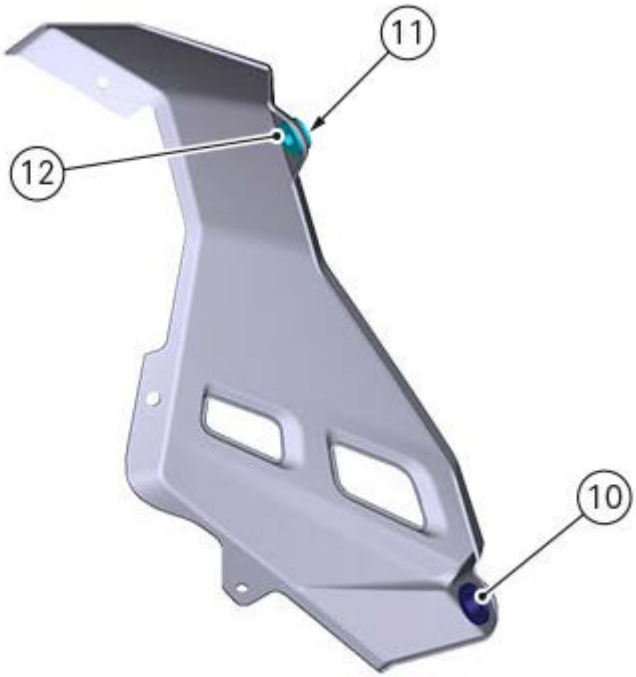
LEFT SIDE SUMP GUARD

Fit the vibration dampers (6) and (7) with spacer (8).
Fit clip (9).



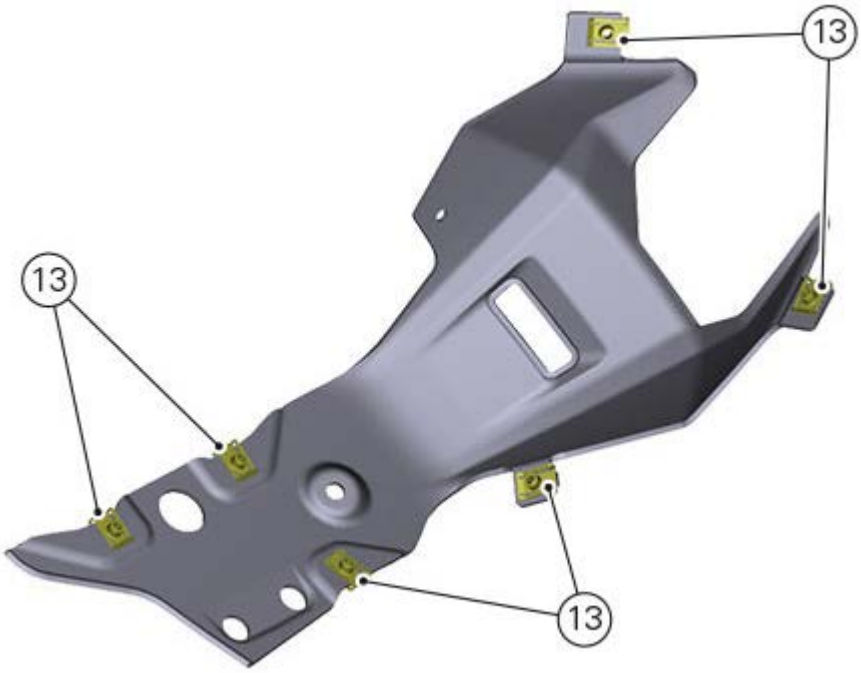
RIGHT SIDE SUMP GUARD

Fit the vibration dampers (10) and (11) with spacer (12).

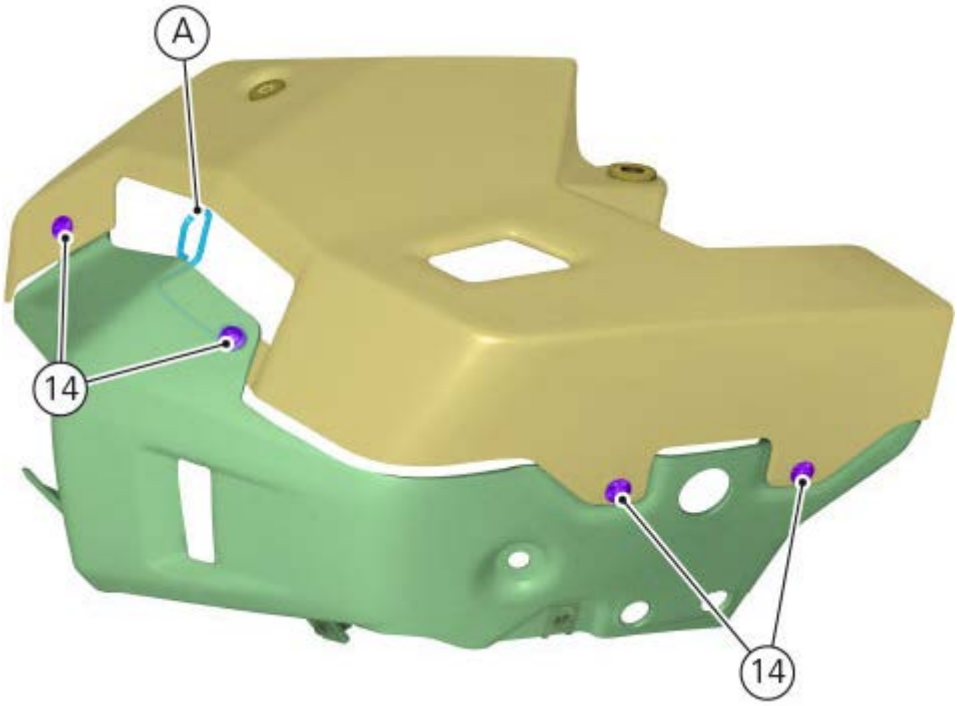


CENTRAL SUMP GUARD

Fit clips (13).

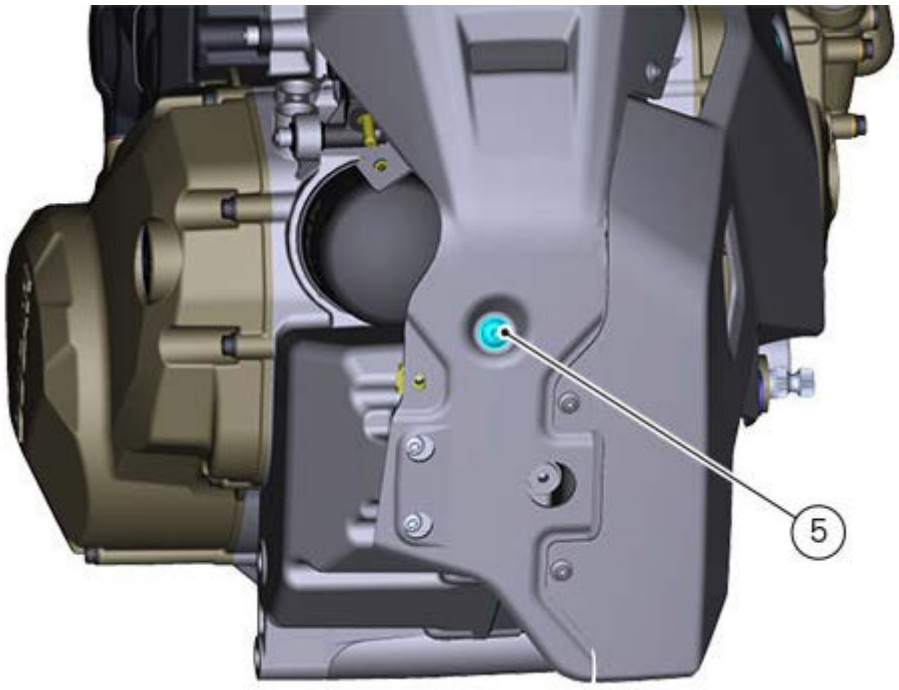


Match the LH sump guard to central sump guard, inserting hose guide (A) in-between.
Start screws (14).
Do not tighten to torque.

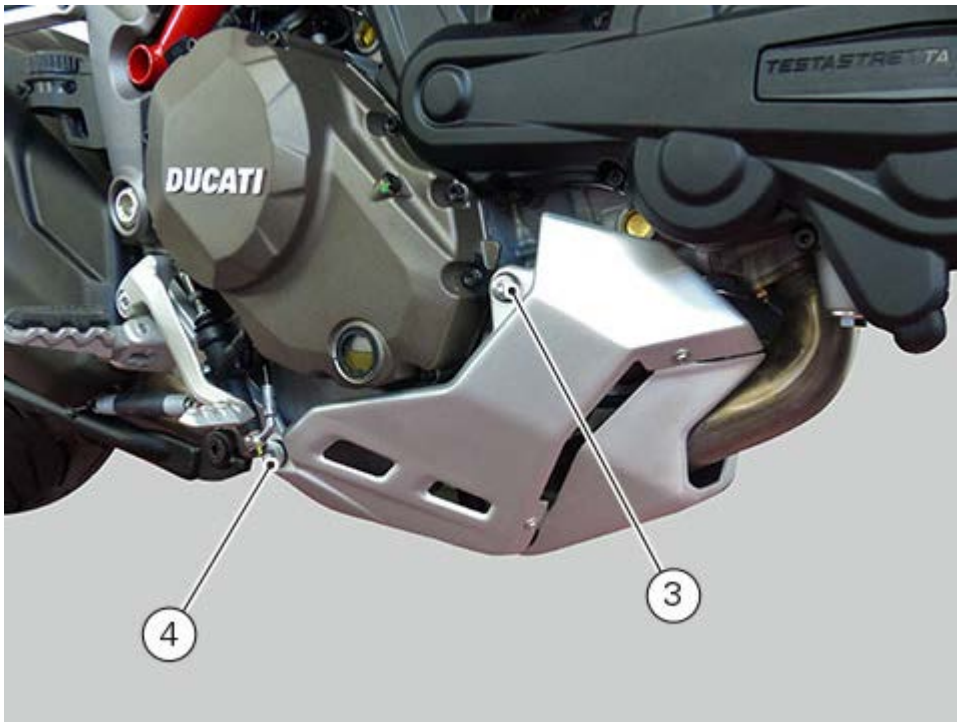


Position the just assembled assembly and fix it by starting screw (2) on the lower LH footpeg holder plate and screw (1) on the LH sump guard support plate.

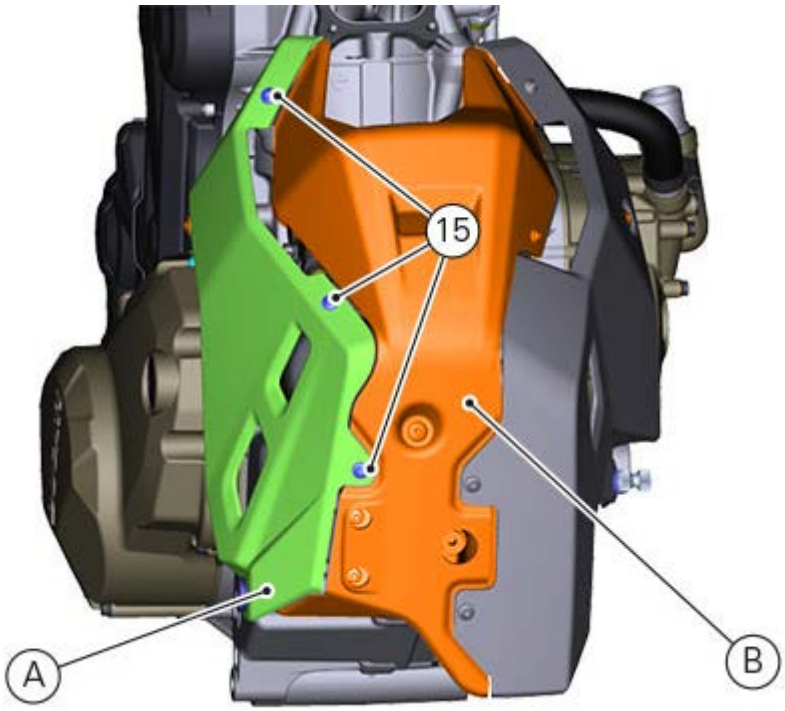
Start screw (5) on the silent block.



Fit the RH sump guard by starting screw (4) on the lower RH footpeg holder plate and screw (3) on the RH sump guard support plate.

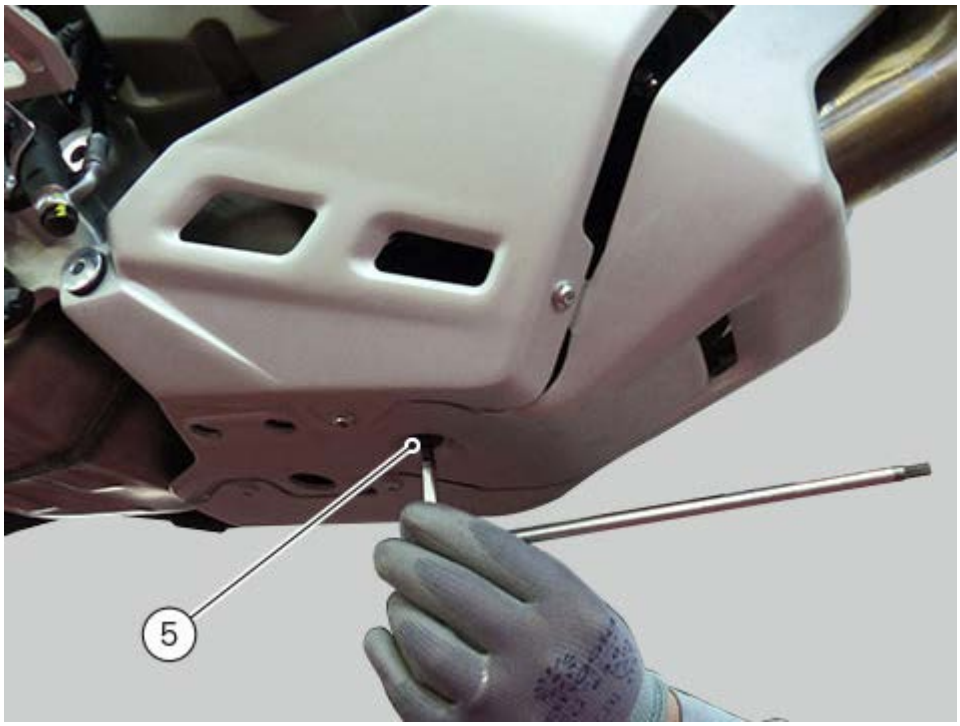


Fix the RH sump guard (A) to the central sump guard (B) by starting screws (15).

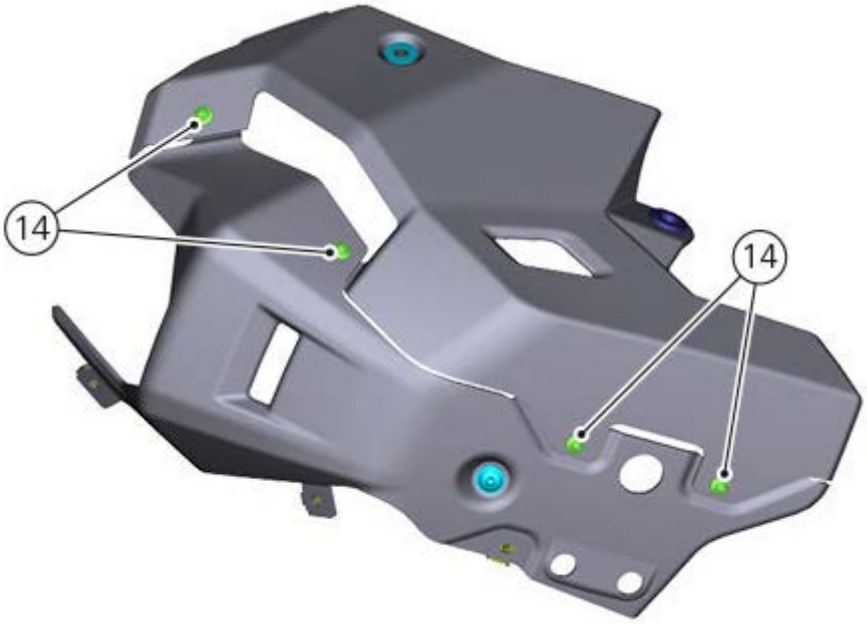


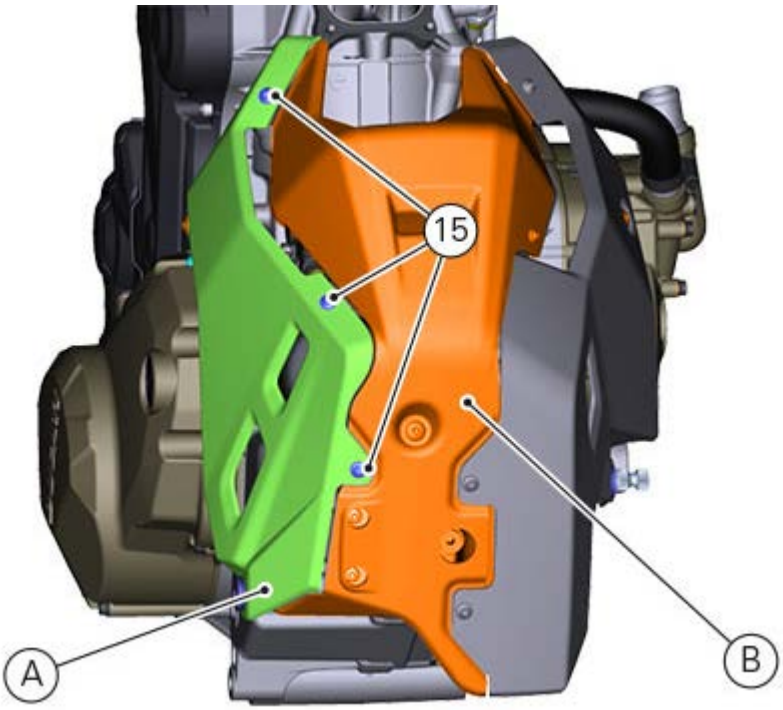
Tighten screws (4) and (2) to a torque of ± 20 Nm 10%.
Tighten screws (3) and (1) to a torque of ± 5 Nm 10%.

Tighten the screw (5) to a torque of 24 Nm ± 10%.



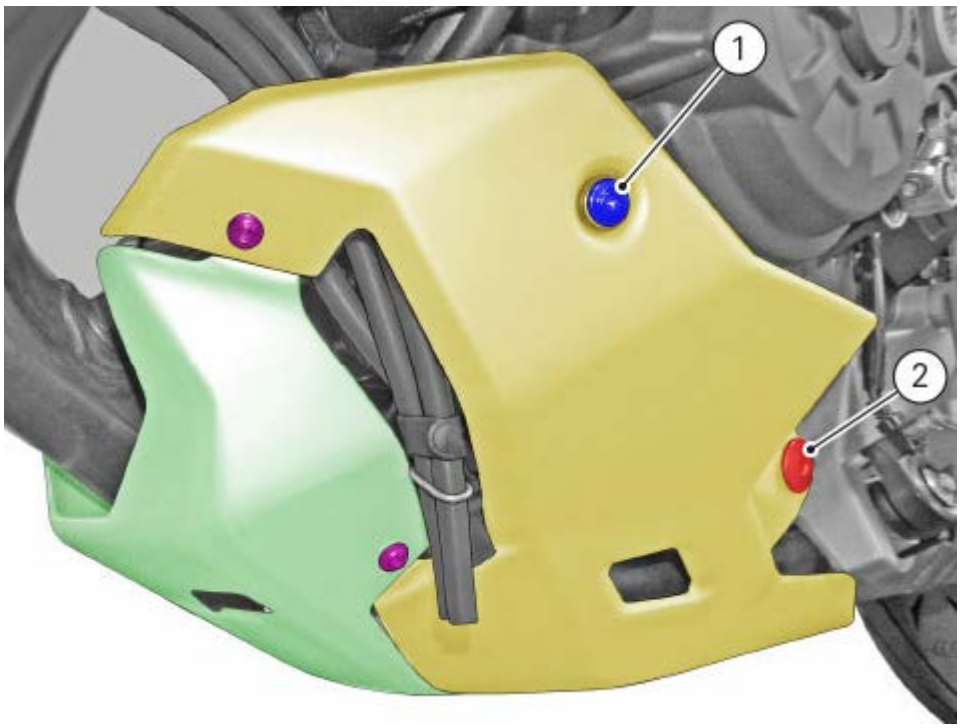
Tighten screws (14) and (15) to a torque of 5 Nm ± 10%.

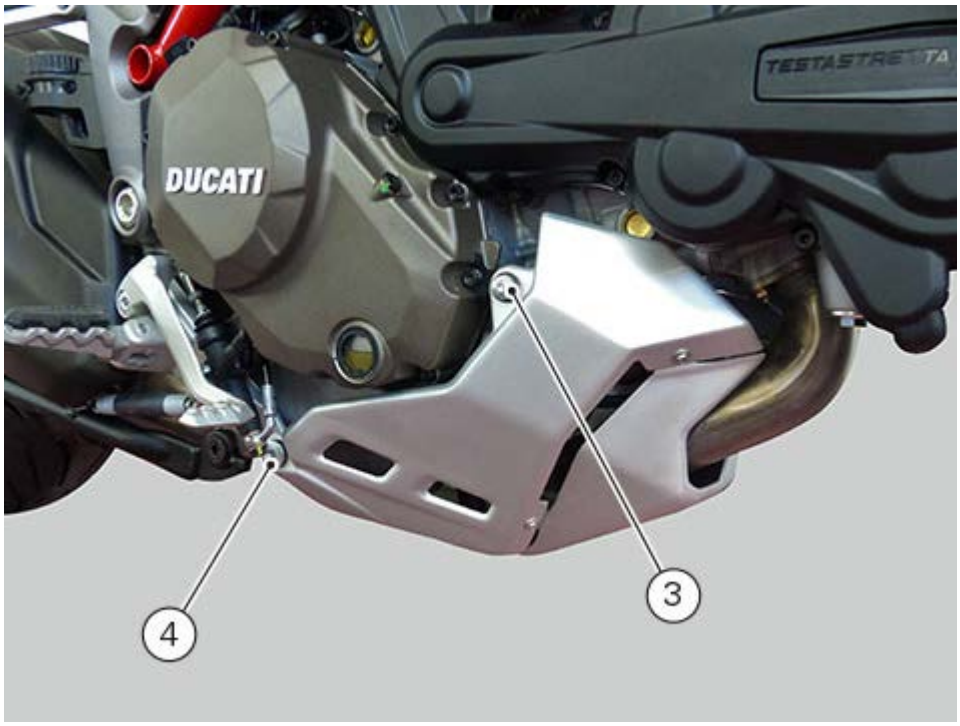




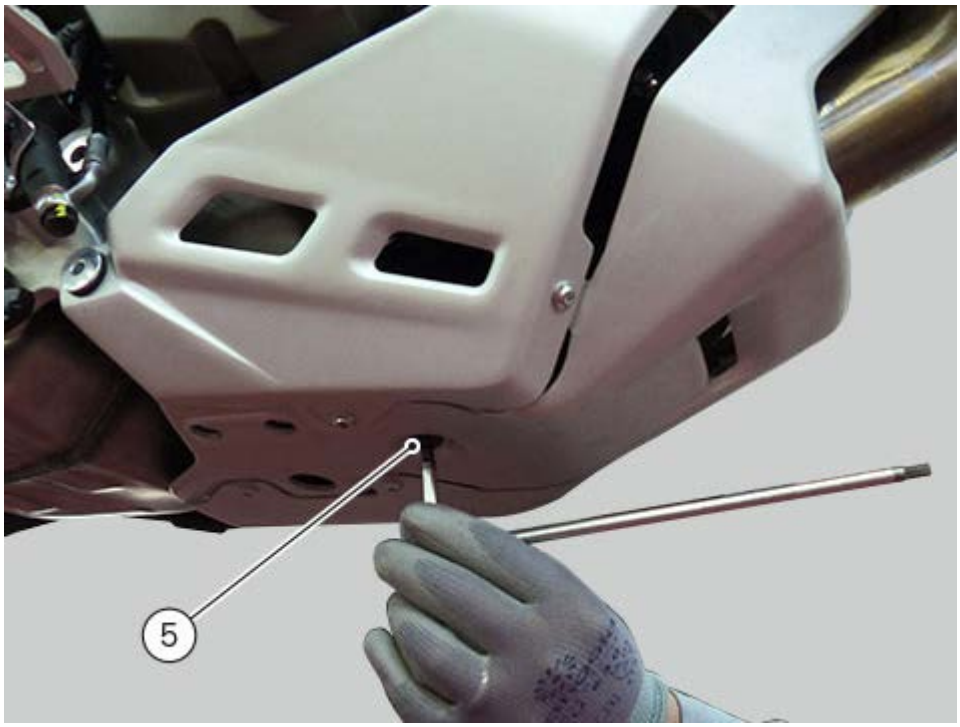
From assembled sump guard

Position the assembled sump guard and start screws (1) (2) (3) (4) and (5).
Tighten the screws to the following torque values:
Screws (4) and (2) to a torque of ± 20 Nm 10%;
Screws (3) and (1) to a torque of ± 5 Nm 10%;





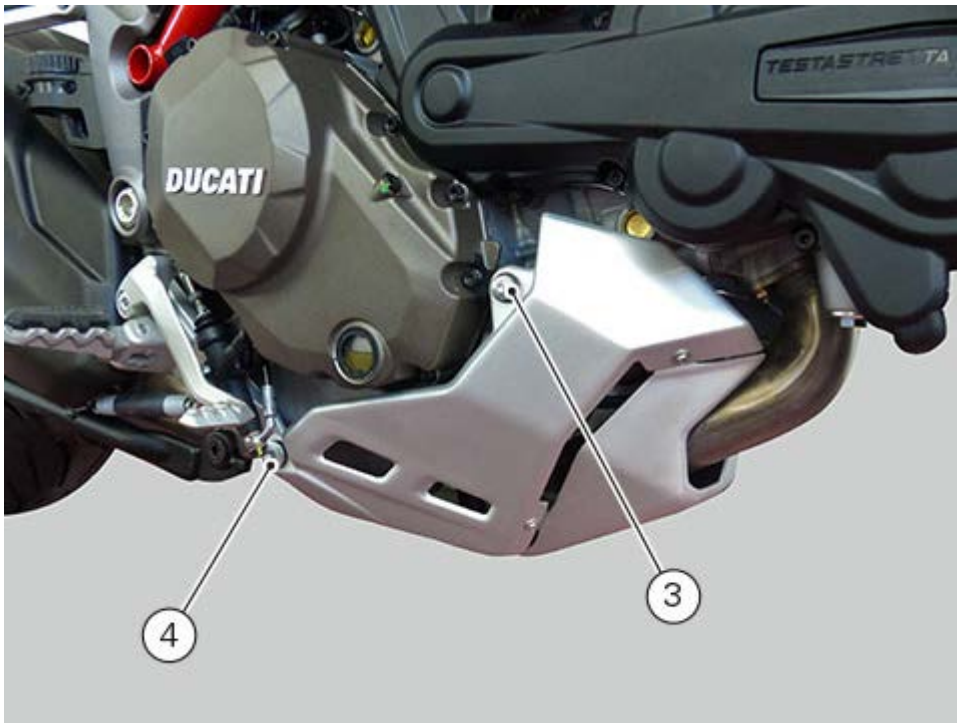
Tighten the screw (5) to a torque of 24 Nm ± 10%.



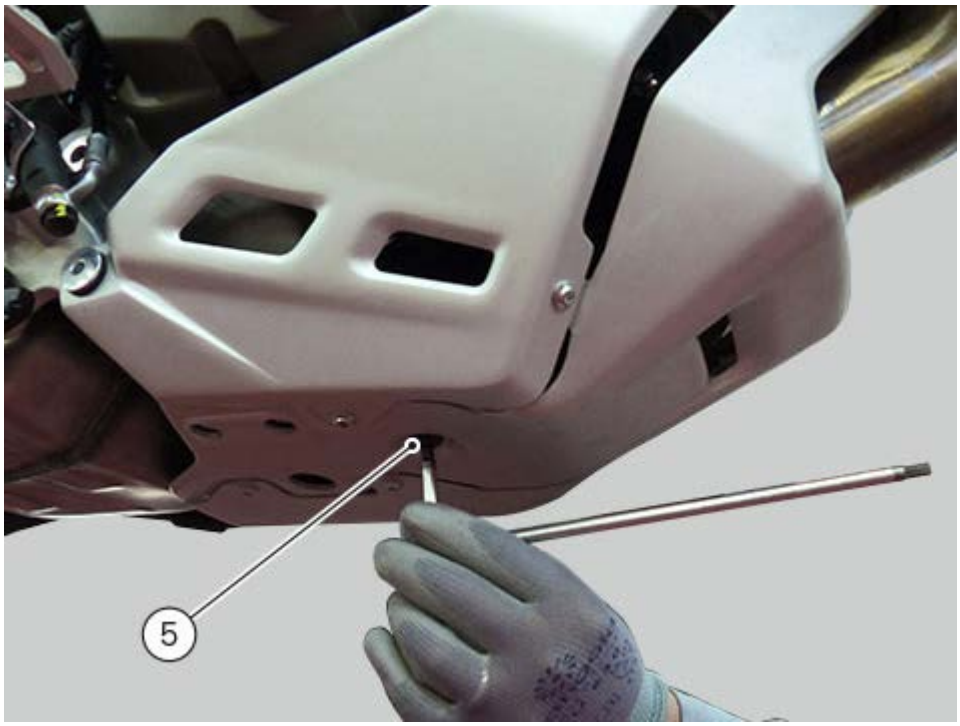
Removing the belly pan

Loosen the two screws (1) and (2) on the vehicle left side.

Working on the vehicle lower side, loosen screws (3) and (4).



Undo the lower screw (5) and remove the belly pan.


5

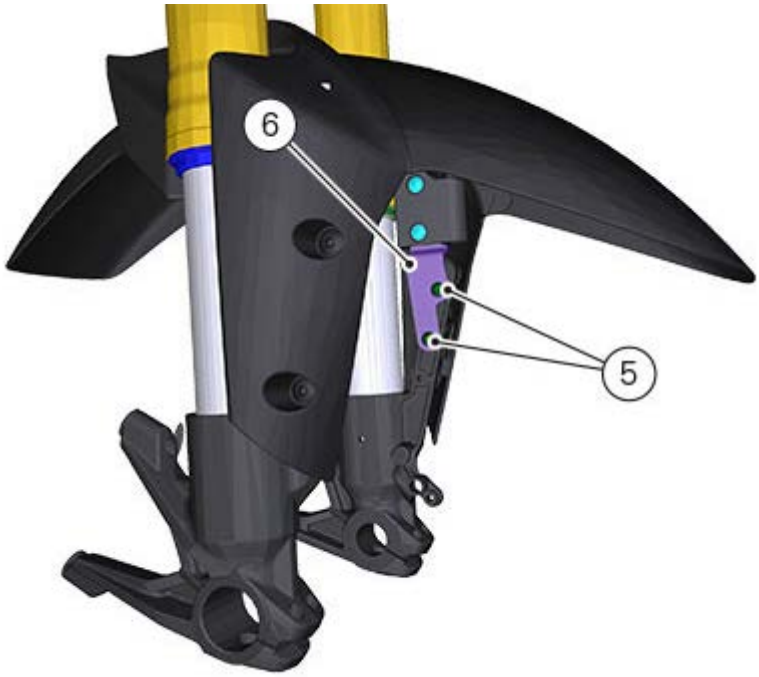
Refitting the front mudguard

Warning

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

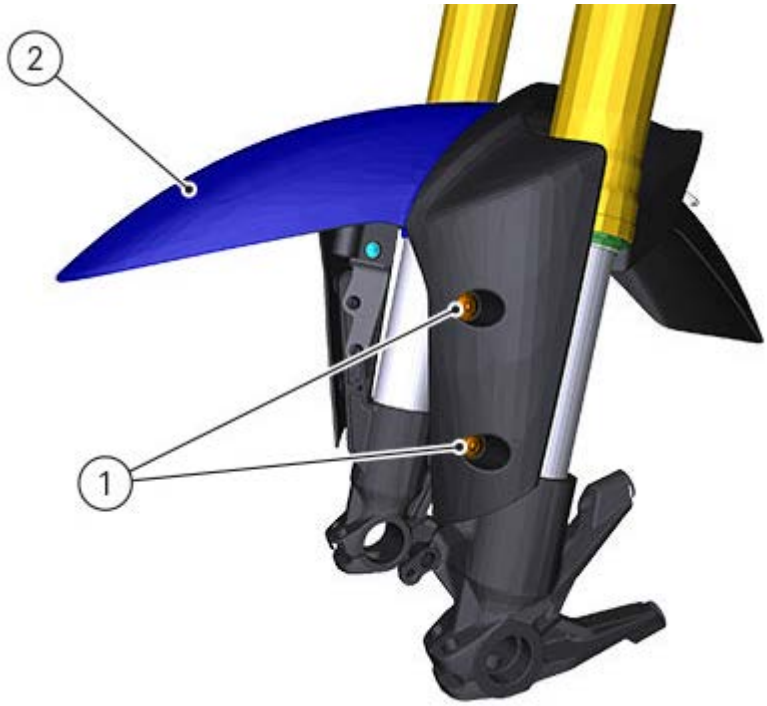
Refit sensors.

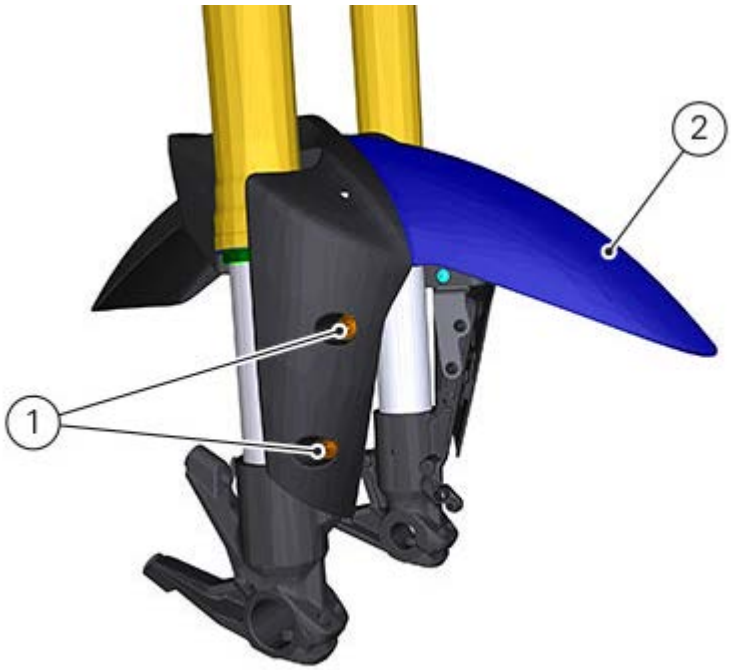
Refit sensor brackets (6) and secure them in place by tightening screws (5) to a torque of 5 Nm ± 10%.



Tighten speed sensor (3) screw (4) to a torque of 10 Nm ± 10%

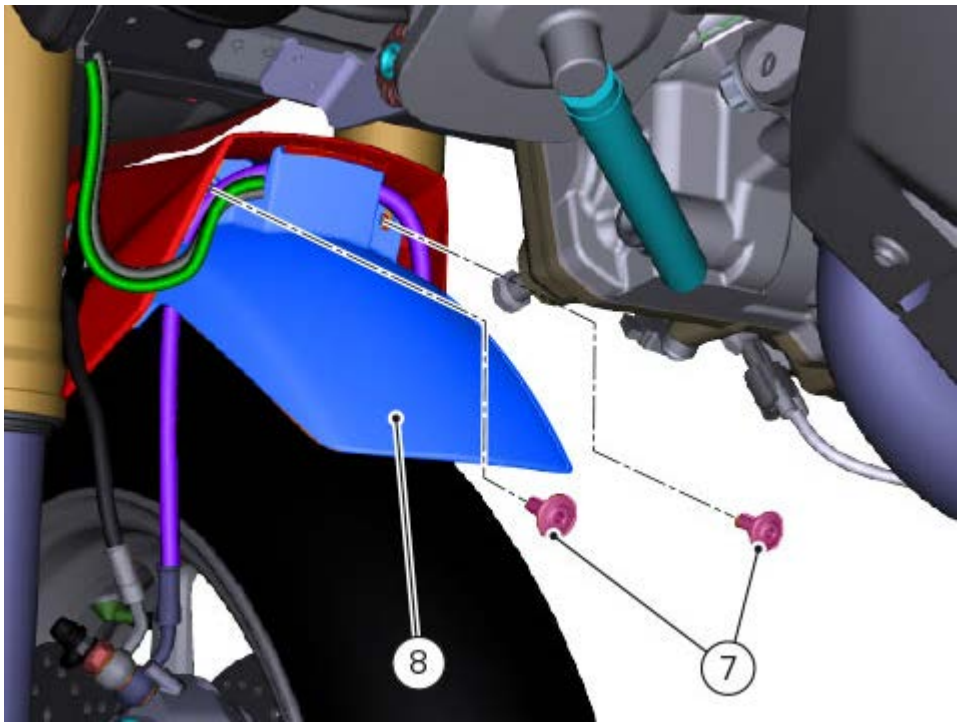
Fit mudguard (2) by starting screws (1) with spacers.
Tighten the screws (1) to a torque of 3.5 Nm ± 10%.



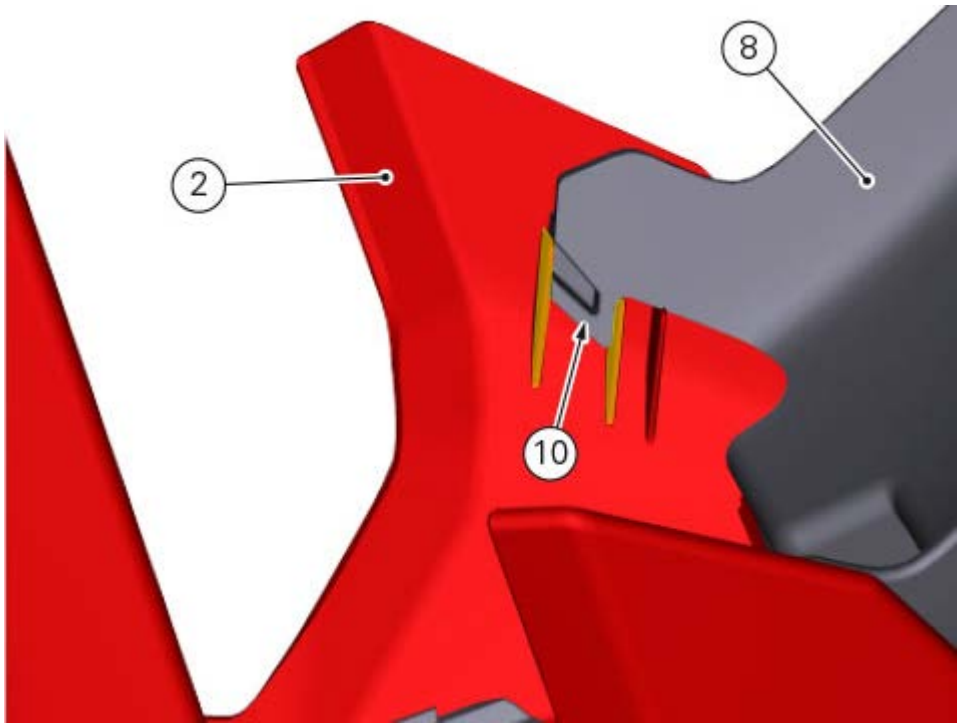


FRONT MUDGUARD HALF KIT

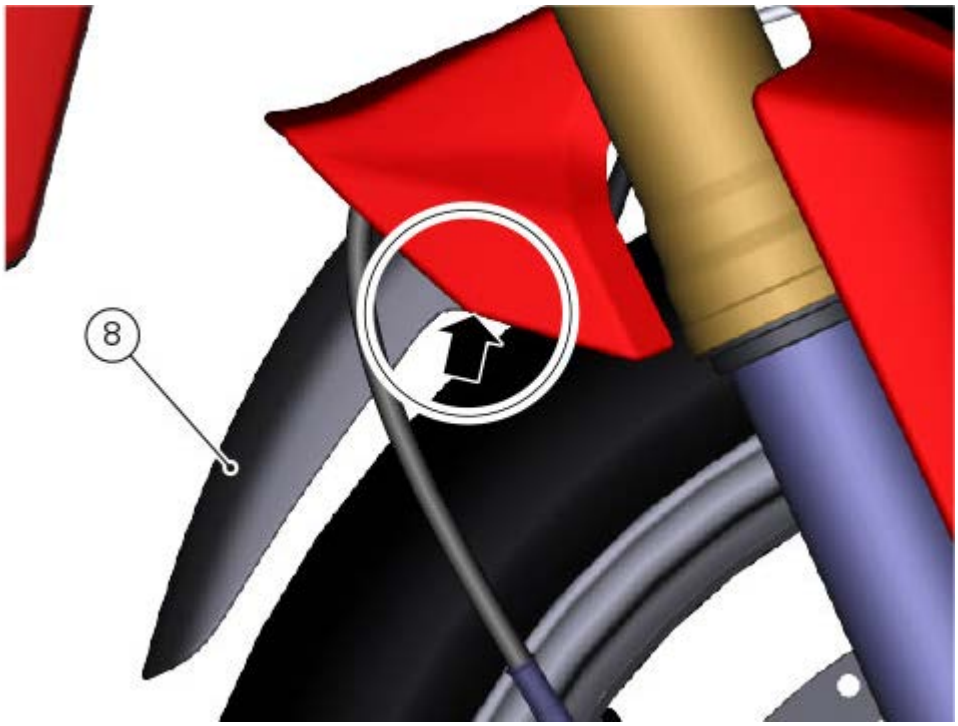
Refit half mudguard (8) by tightening screws (7) to a torque of 3.5 Nm ± 10%.



During assembly, insert tabs (10) in the housing on front mudguard (2).

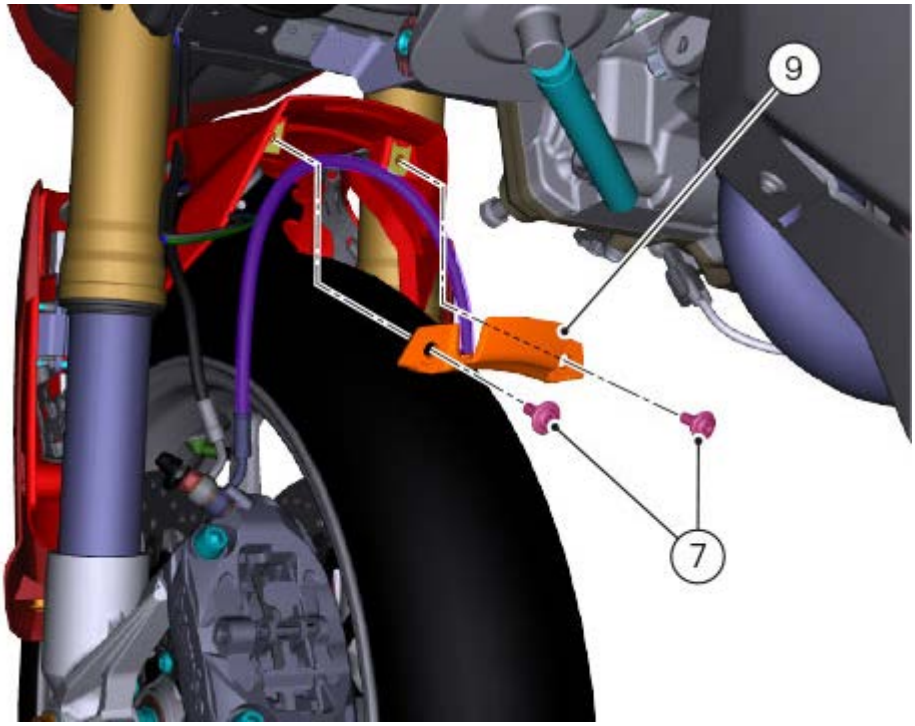


Make sure that semi-mudguard (8) profiles are aligned as shown in the figure.



NO FRONT MUDGUARD HALF KIT

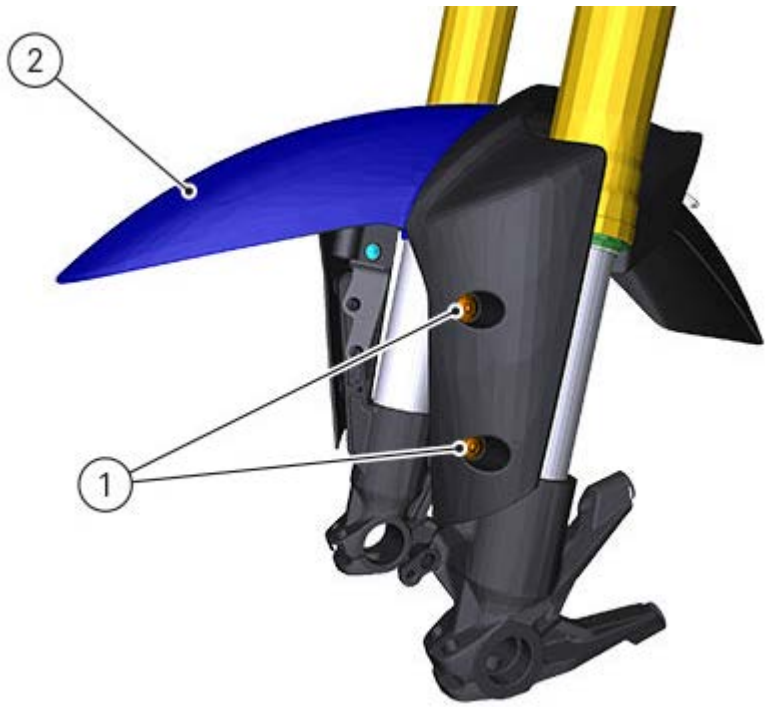
Fit bracket (9) and fasten it by tightening screws (7) to a torque of 3.5 Nm ± 10%.

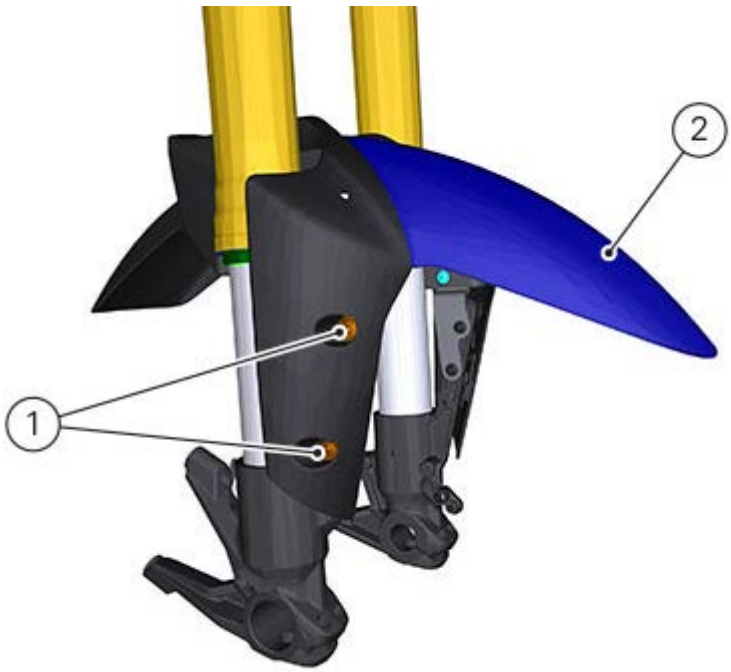


Removing the front mudguard

Remove the front wheel (Removing the front wheel)

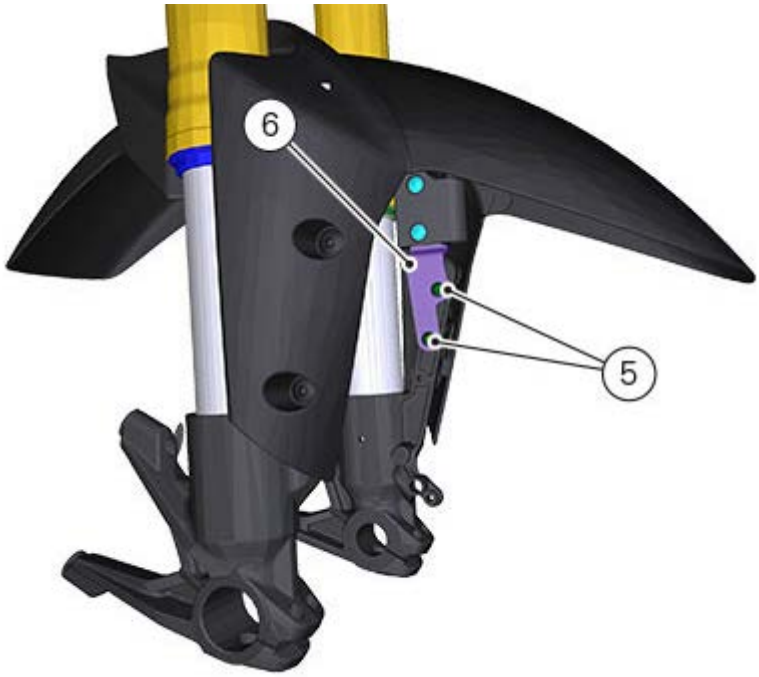
The following pictures show the front mudguard with installed mudguard half.
Loosen front mudguard (2) retaining screws (1), keeping the relevant nylon washers.



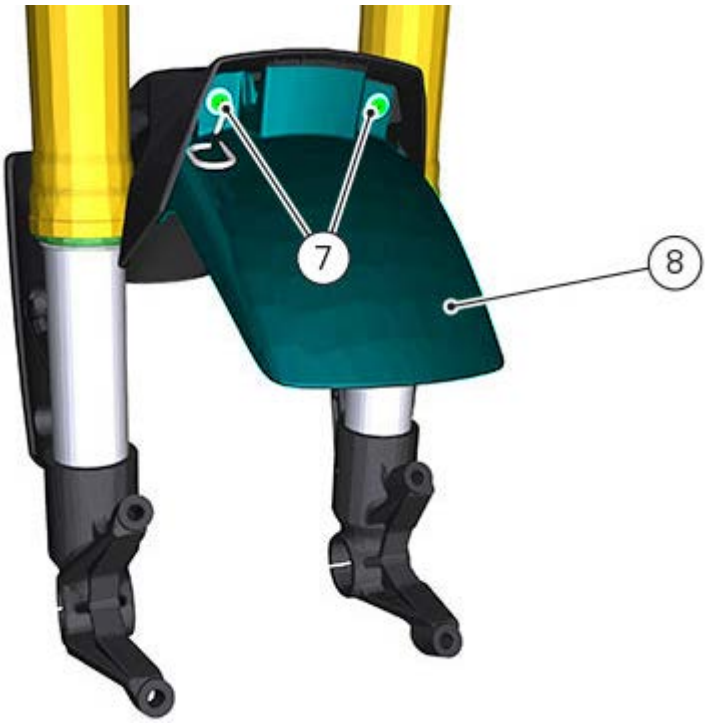


Loosen screw (4), and remove the speed sensor (3).

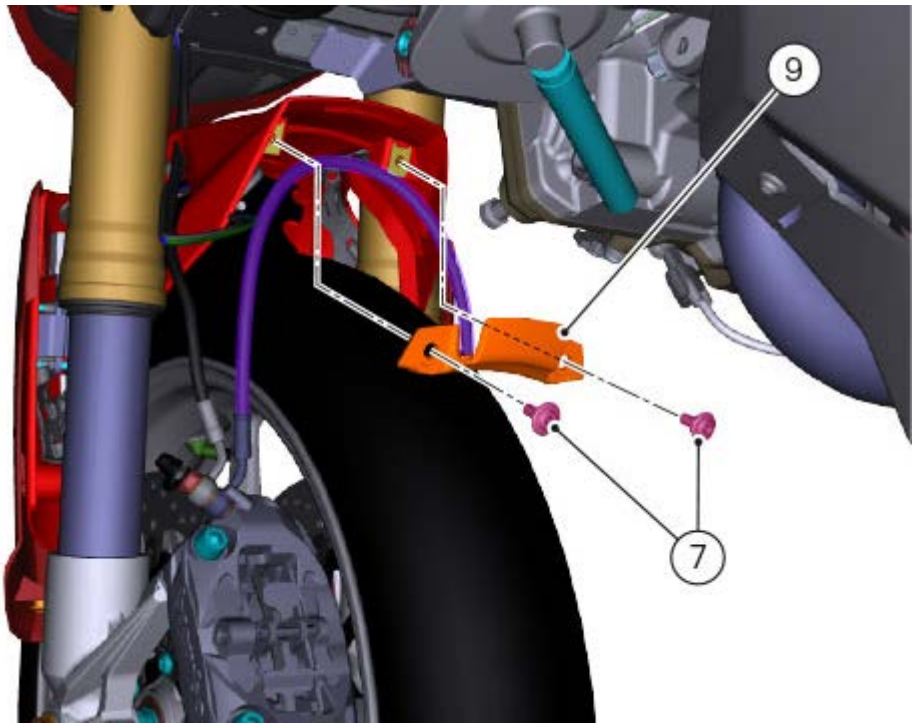
Loosen the two retaining screws (5) of left accelerometer holder bracket (6).
Repeat the same procedure on right bracket.

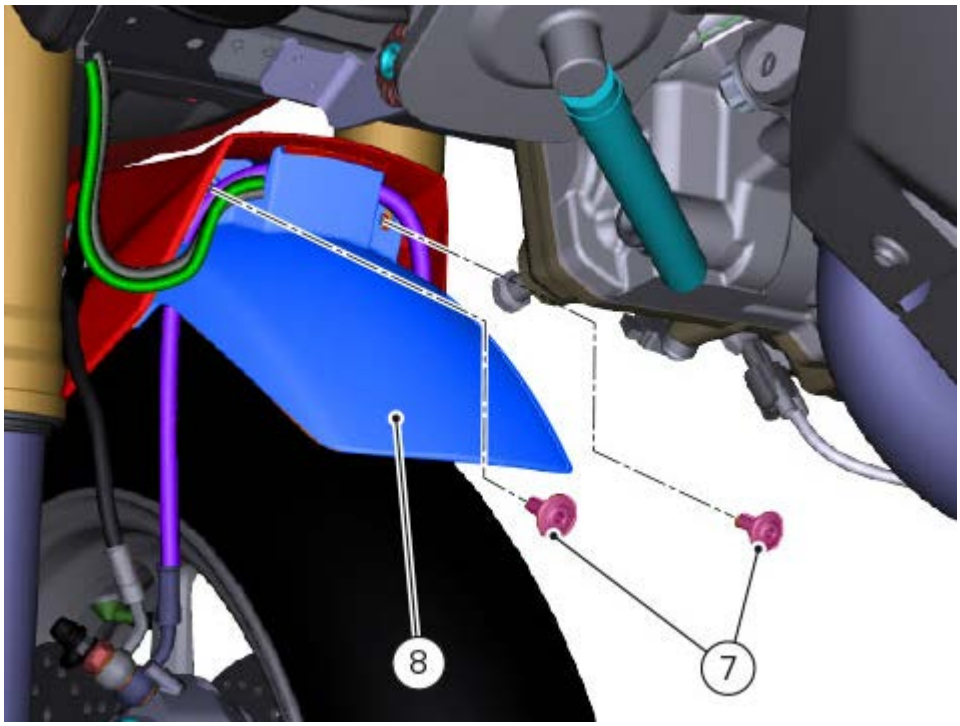


Loosen the two screws (7) and remove the half mudguard (8).



If mudguard half (8) has not been installed, remove bracket (9) by loosening screws (7).




8
7

Refitting the splash guard

If previously disassembled, reassemble the chain guard (4) with rear splash guard (1) as shown in the figure.

Position the splash guard (1) with chain guard (4) on the swinging arm.
Apply the specified threadlocker to screws (2) and (3).
Start and tighten the retaining screws (2) and (3) to a torque of 10 Nm ± 10%.


2.
LOCK
3

Removing the splash guard

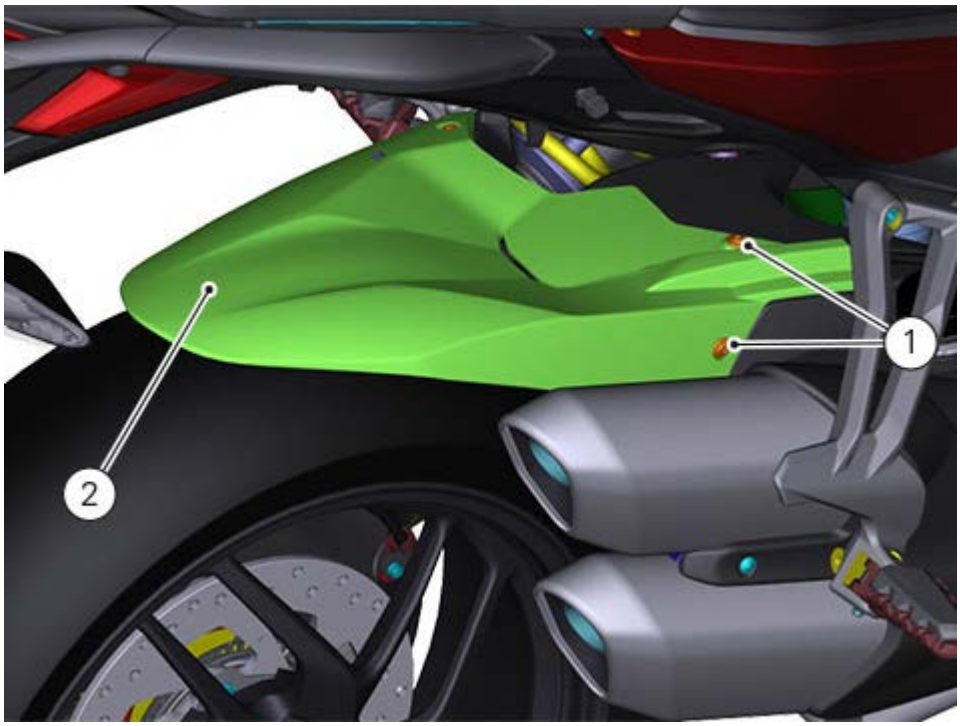
Remove the splash guard (1) with chain guard from the rear swinging arm by loosening screws (2) and (3).

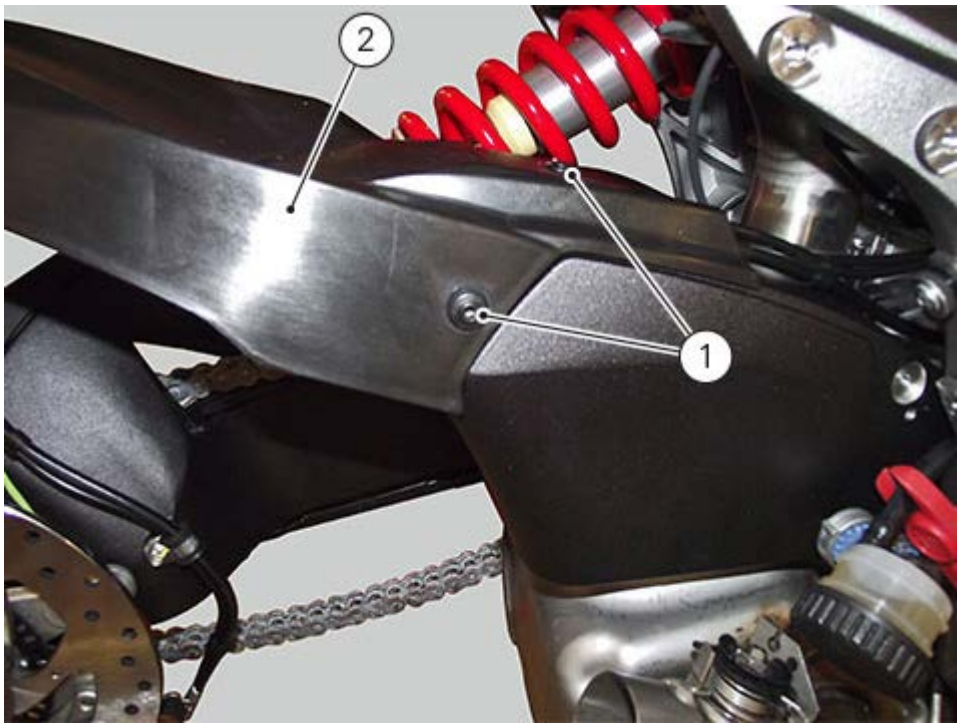
Remove splash guard (1) from chain guard (4).

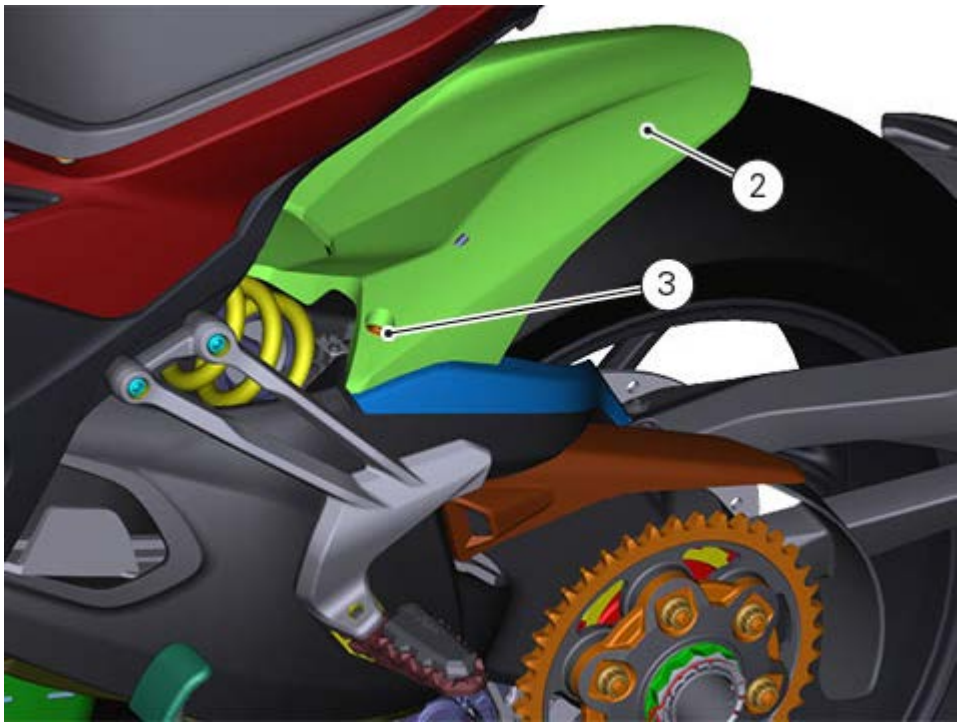

4
1

Refitting the rear mudguard

Fit rear mudguard (2) on swinging arm and start screws (1), (3) and (4).
Tighten screws (1), (3) and (4) to a torque of 5 Nm ± 10%.



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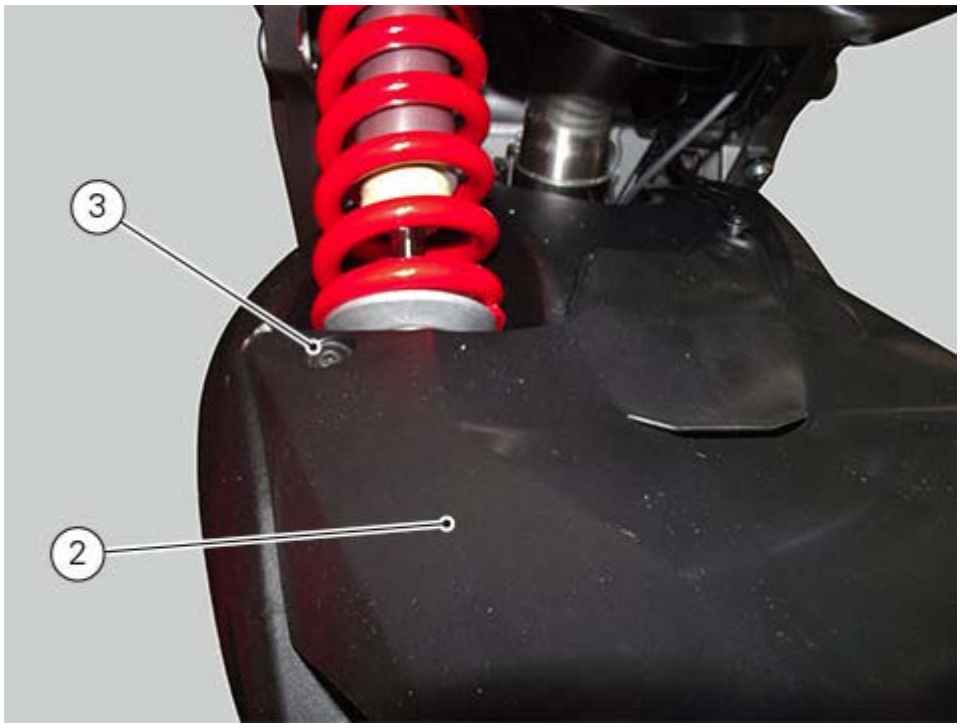
3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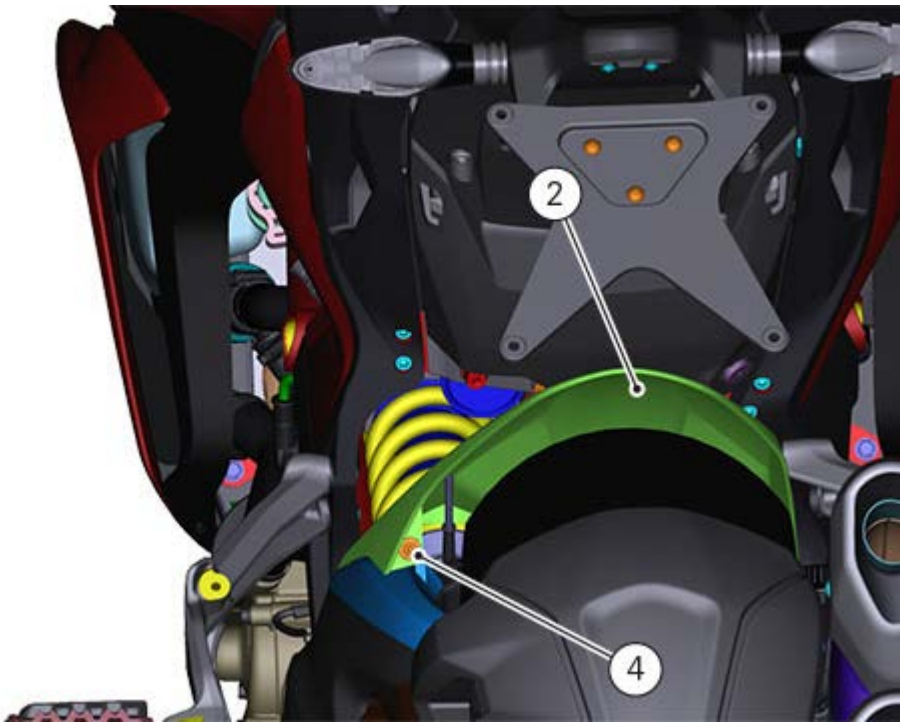
2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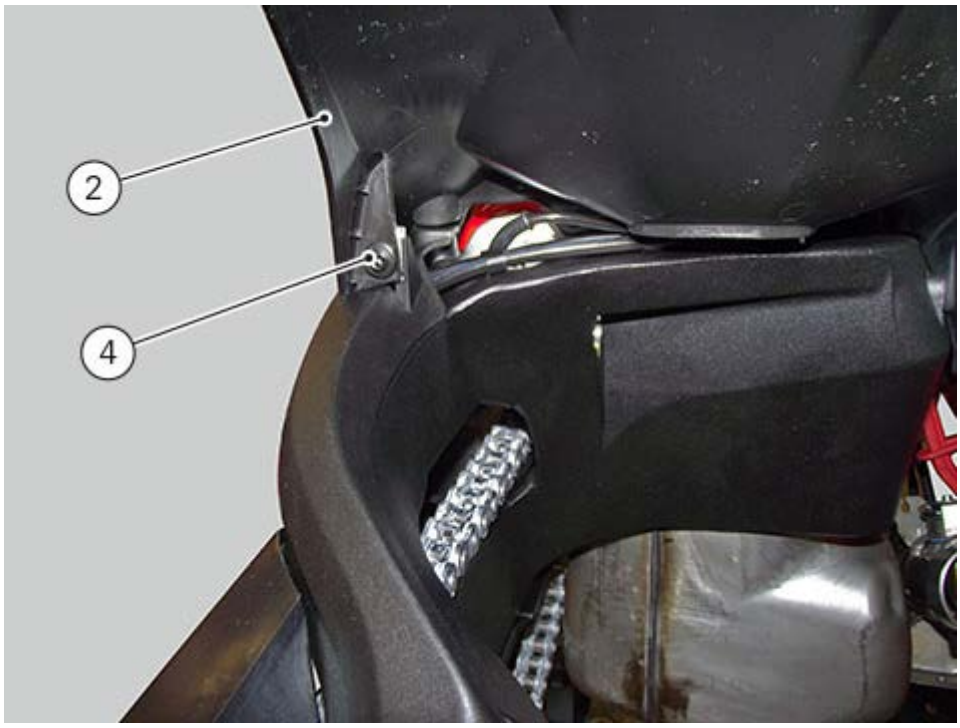
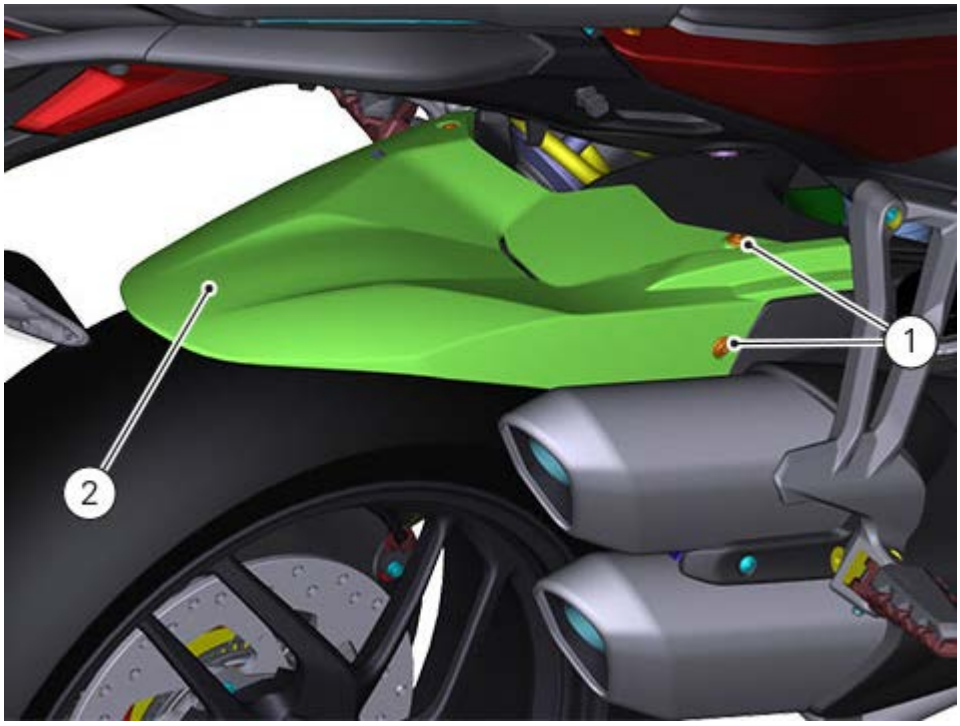
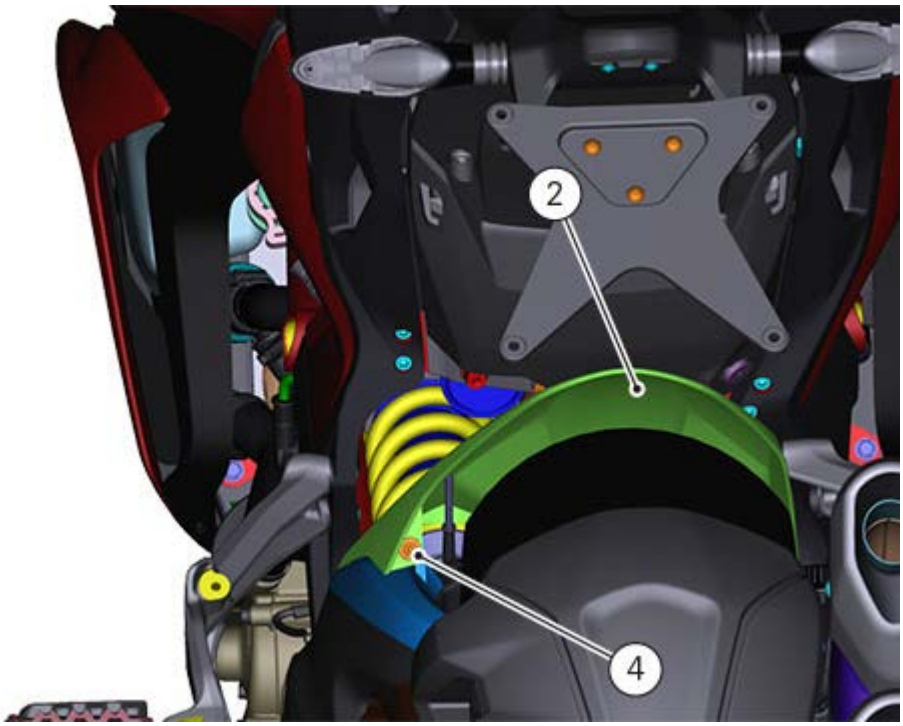

2
4

Removing the rear mudguard

Working on the vehicle RH side, loosen the screws (1) that retain the rear mudguard (2) to the swinging arm.



From the vehicle LH side, loosen screws (3) and (4) on the rear side.

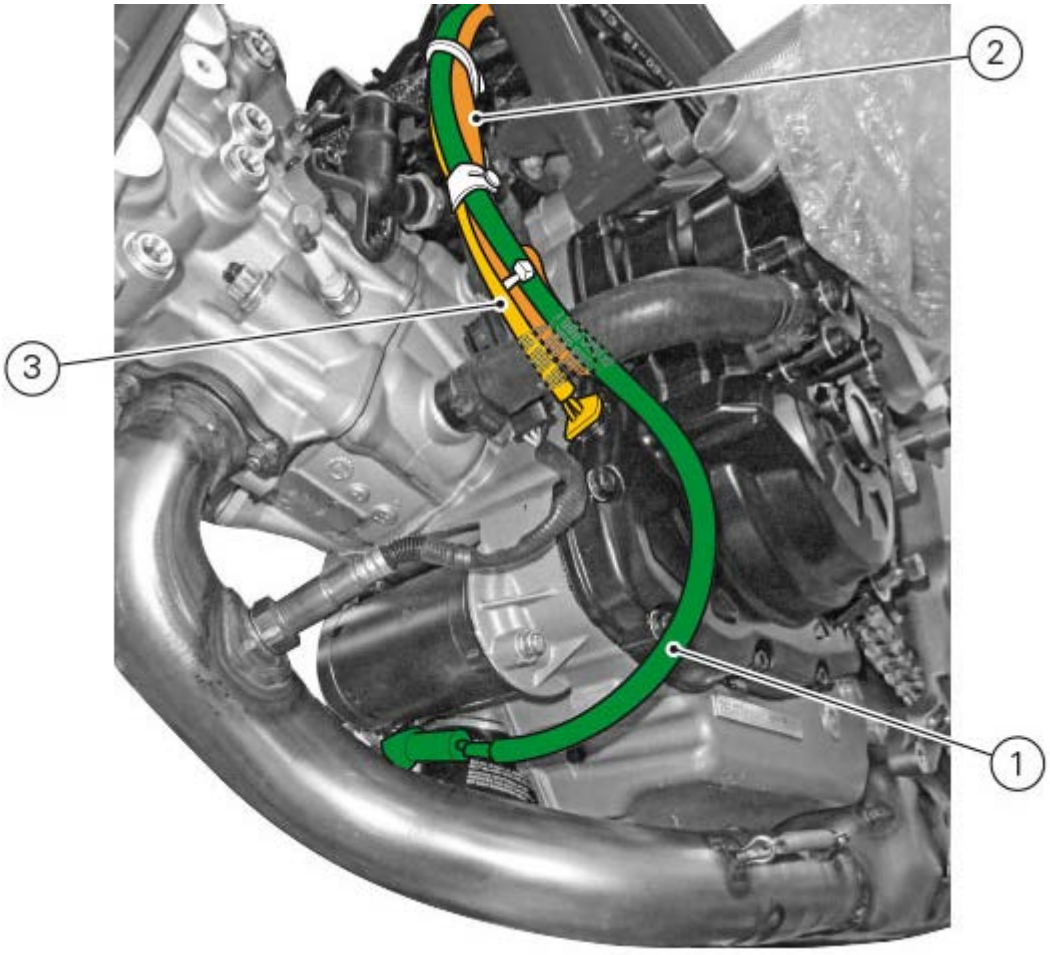

2
4

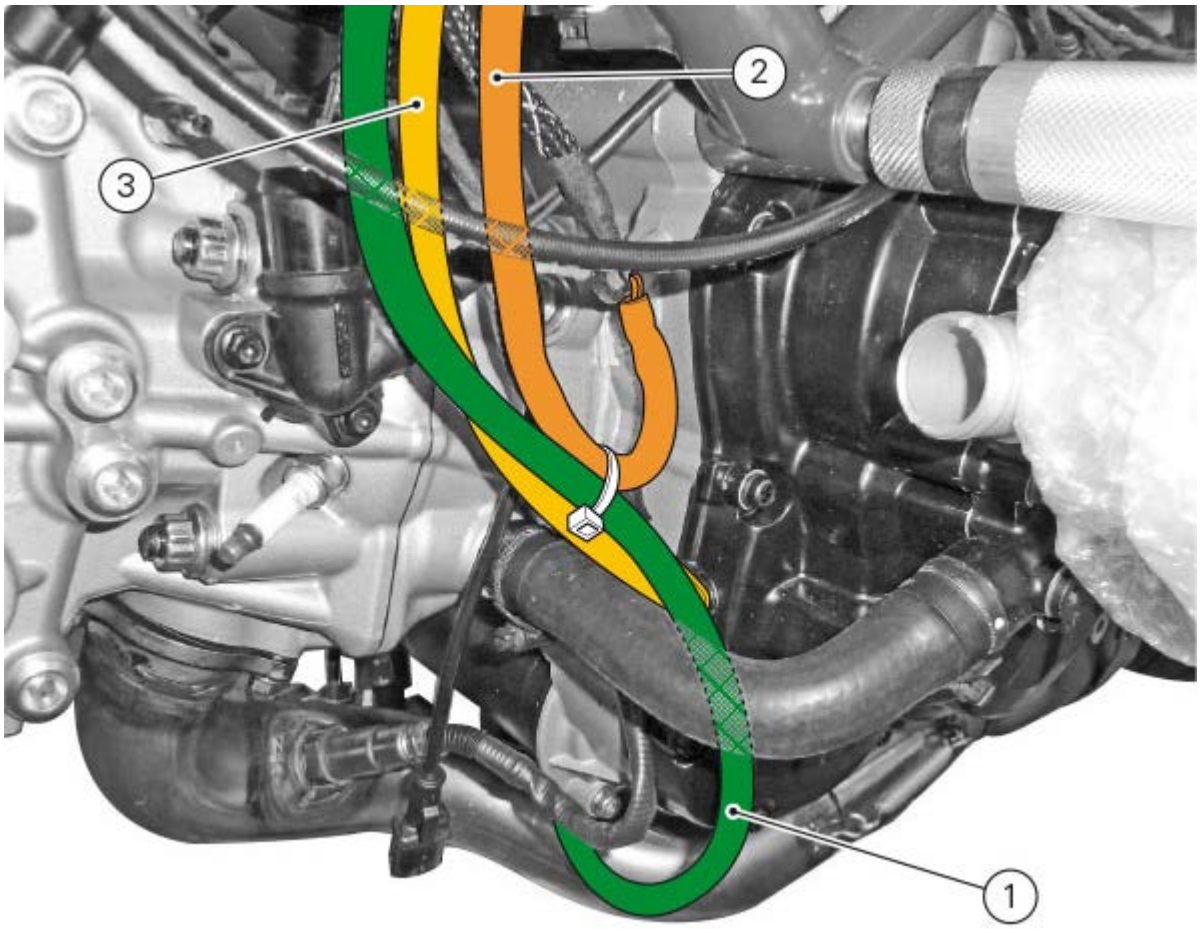
Branch 10

Cables not inserted inside main wiring.

Table 10A

POS.	DESCRIPTION
1	Starter motor cable
2	Battery negative cable
3	Generator cable

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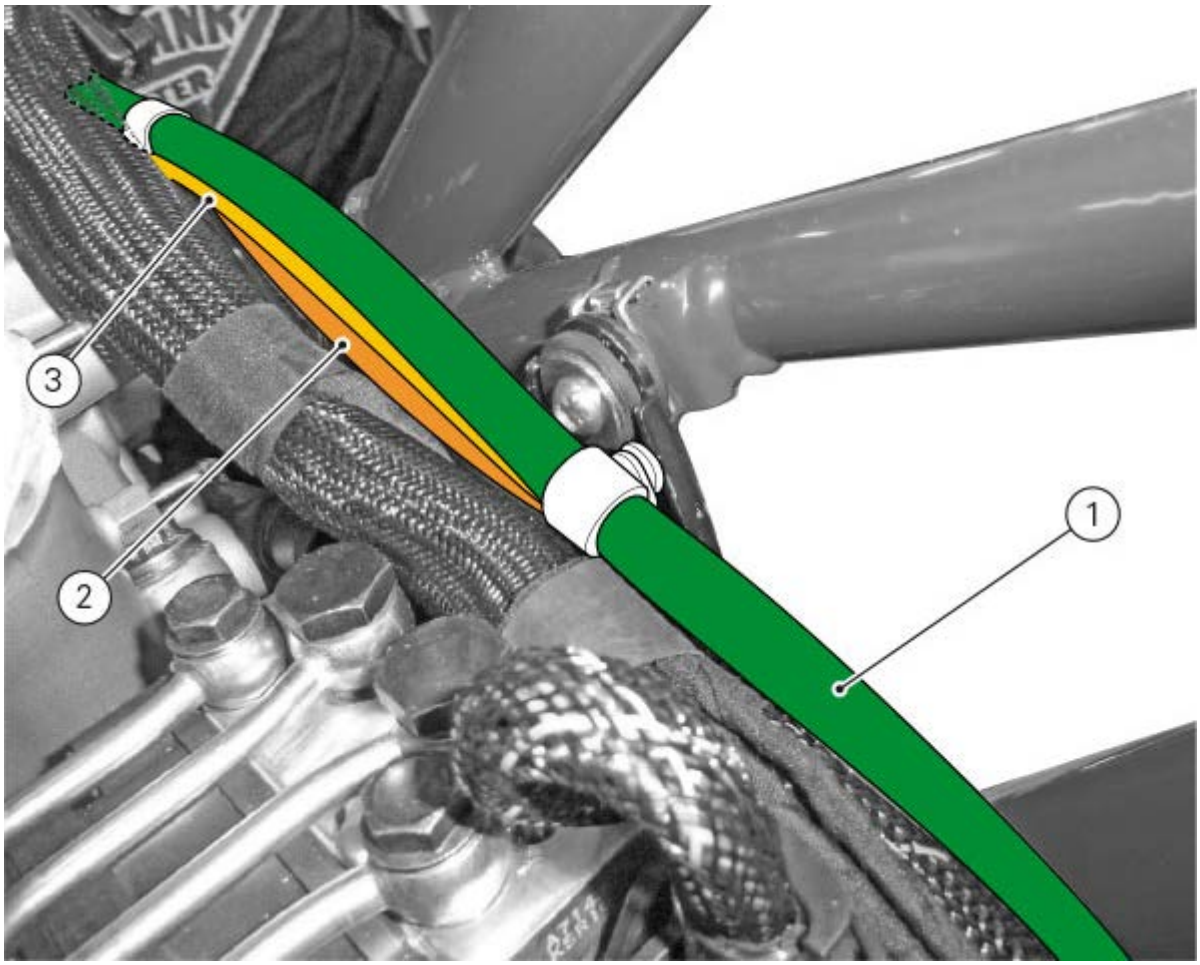
3
1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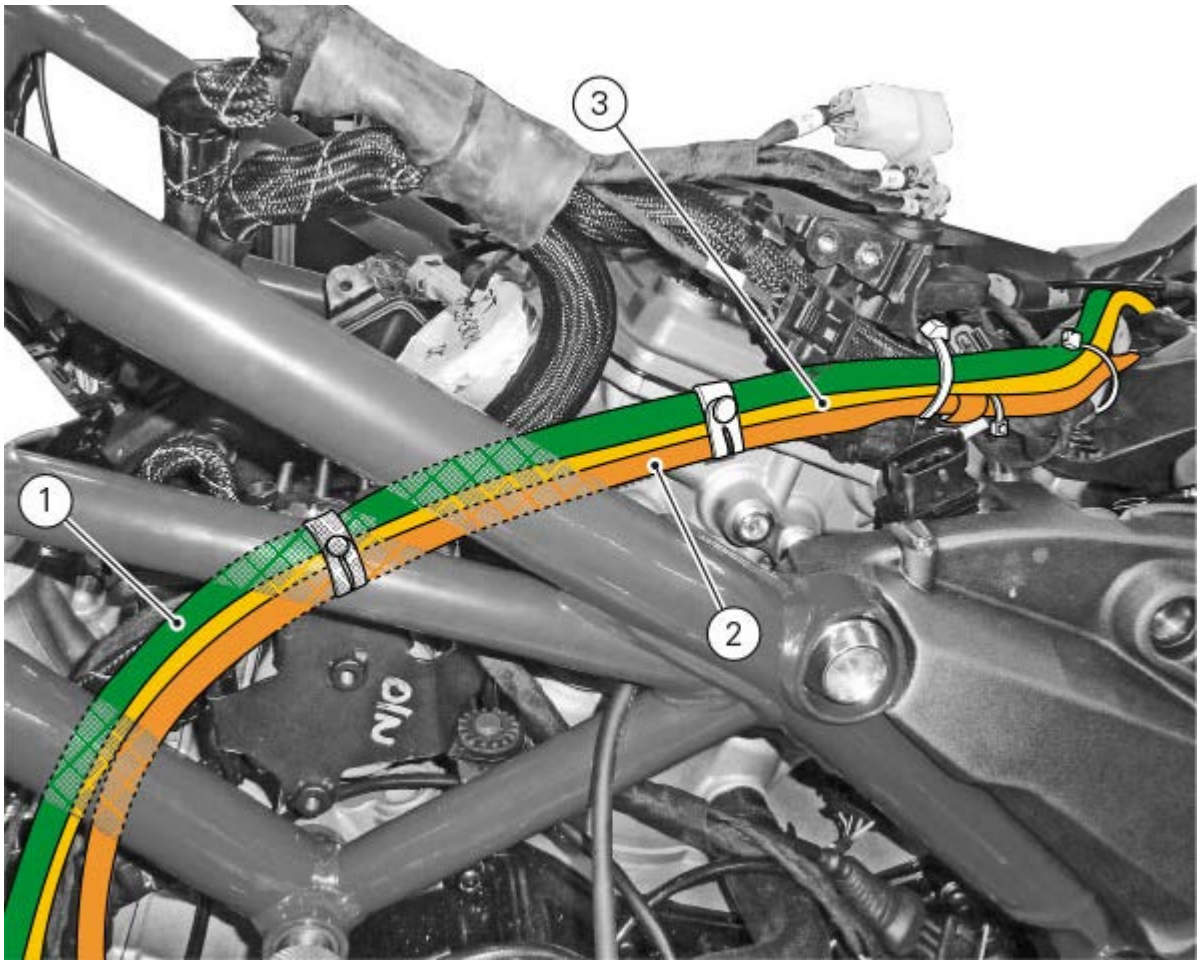
2
1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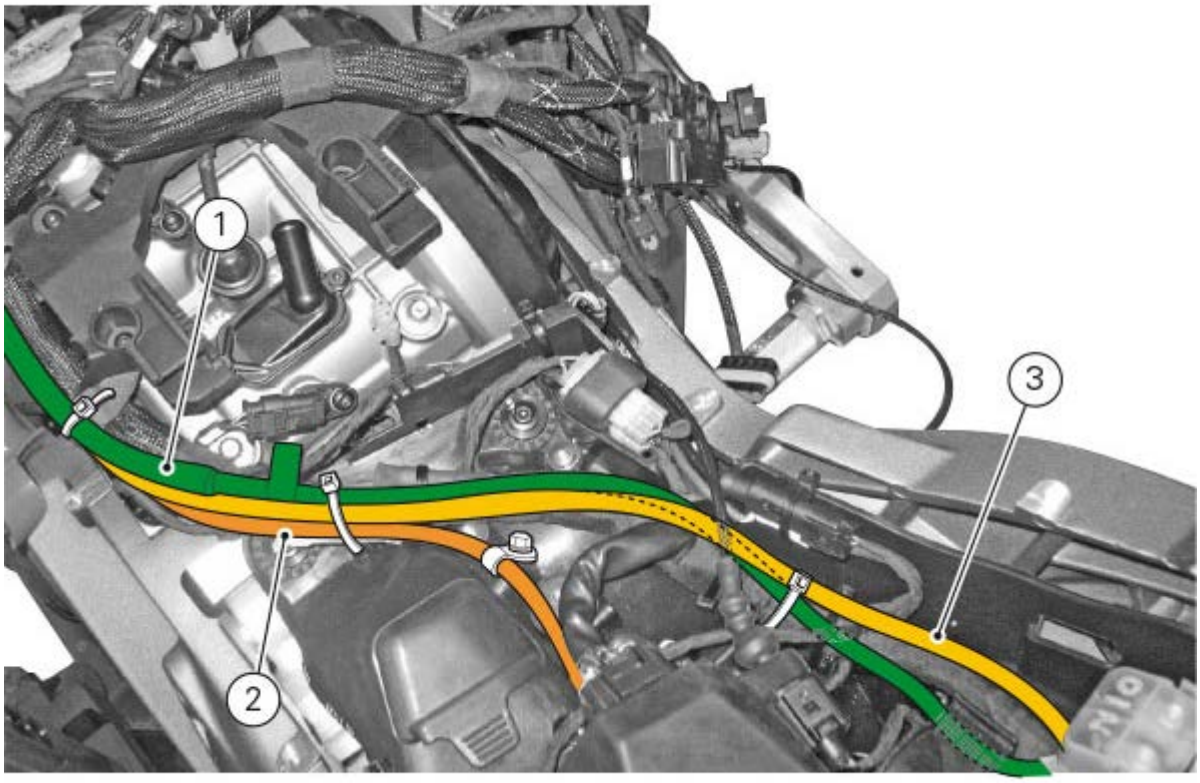
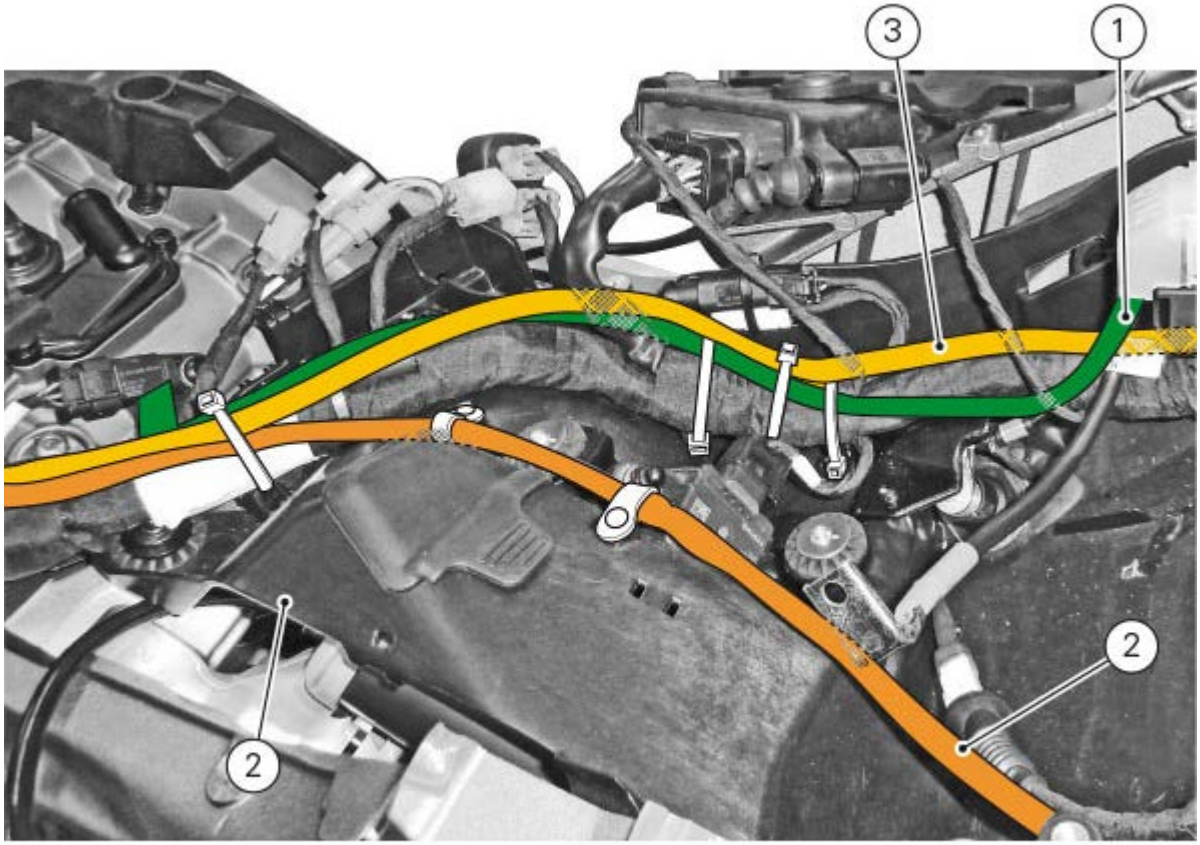
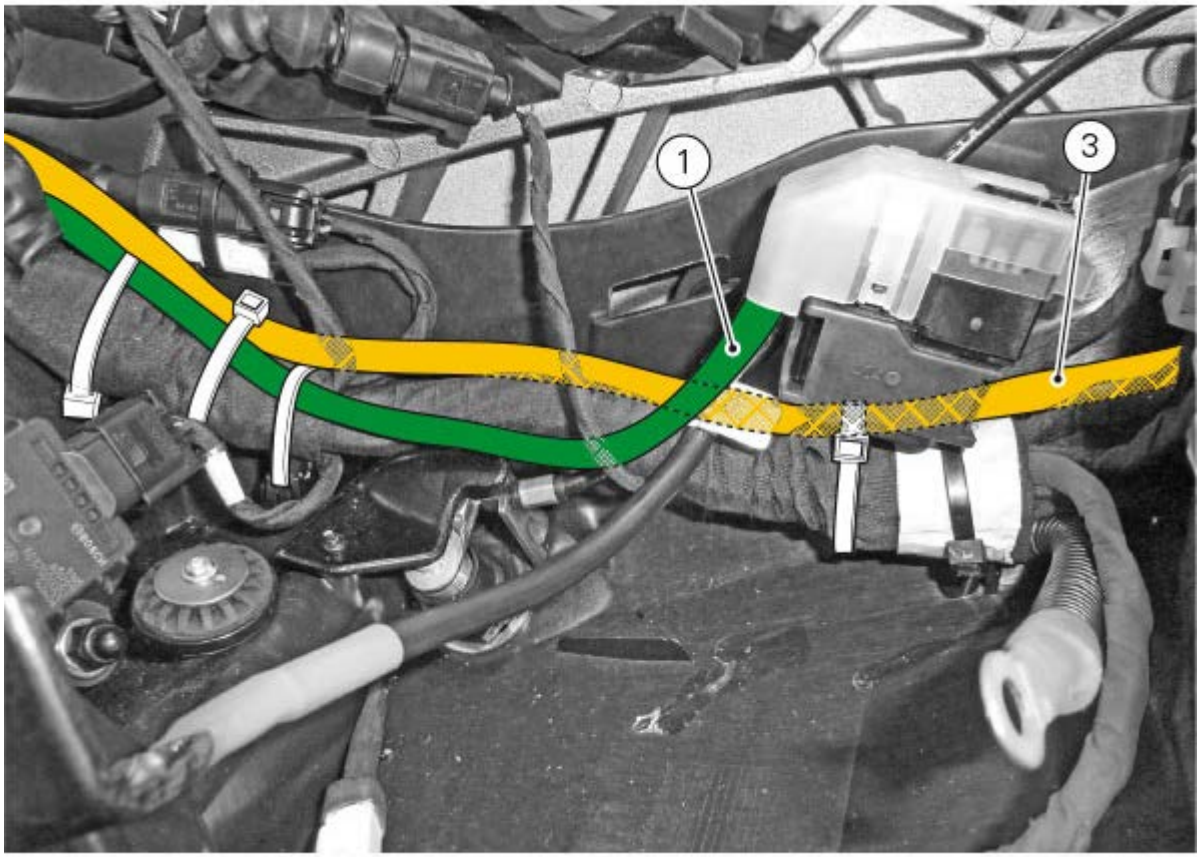
1
2


1
3
2


3
1
2
2


1
3

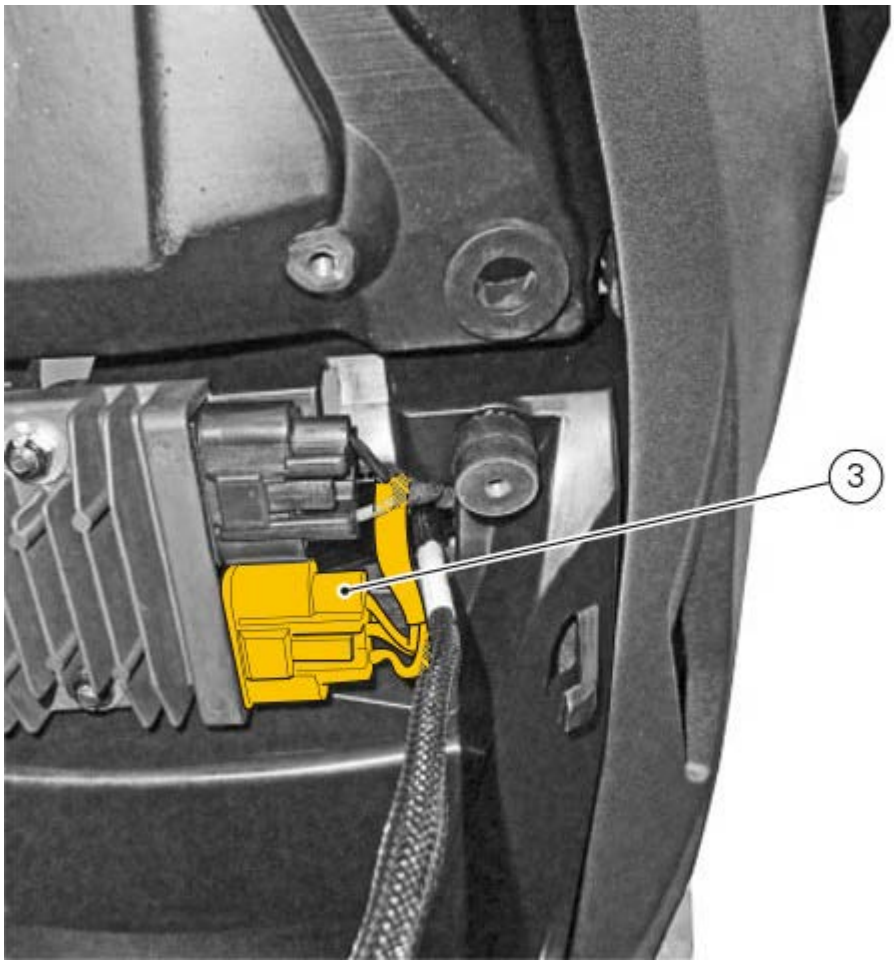
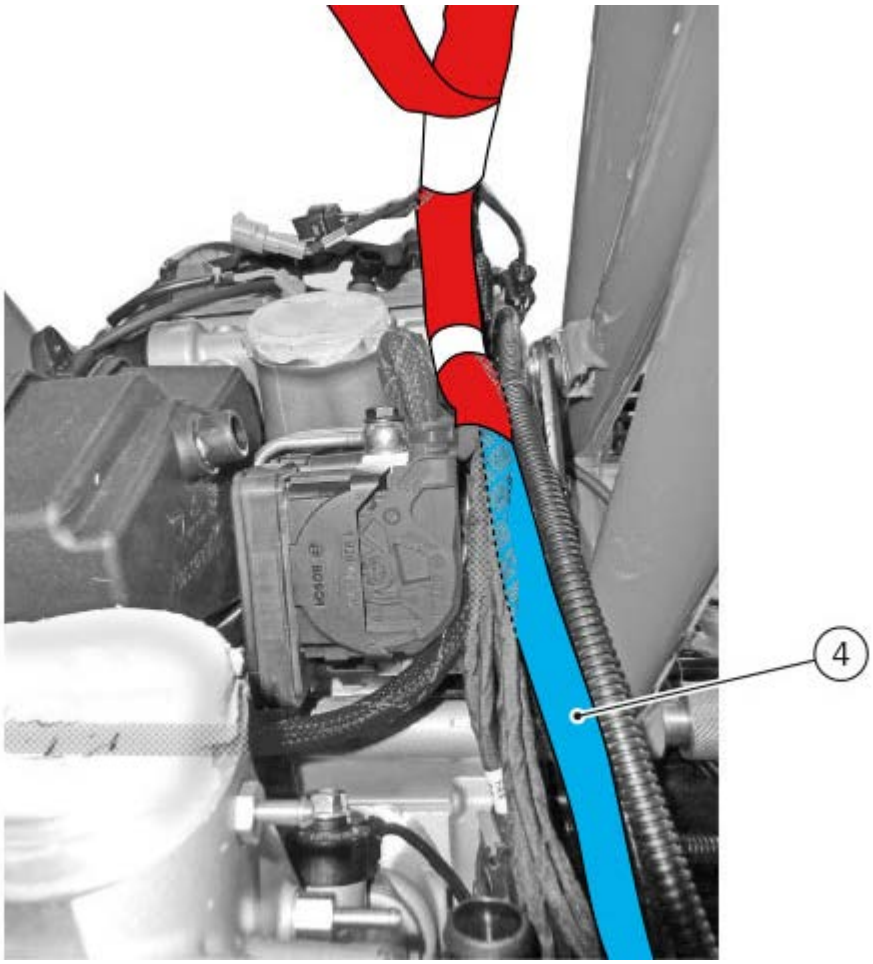


Table 10B

POS.	DESCRIPTION
4	Ground cable



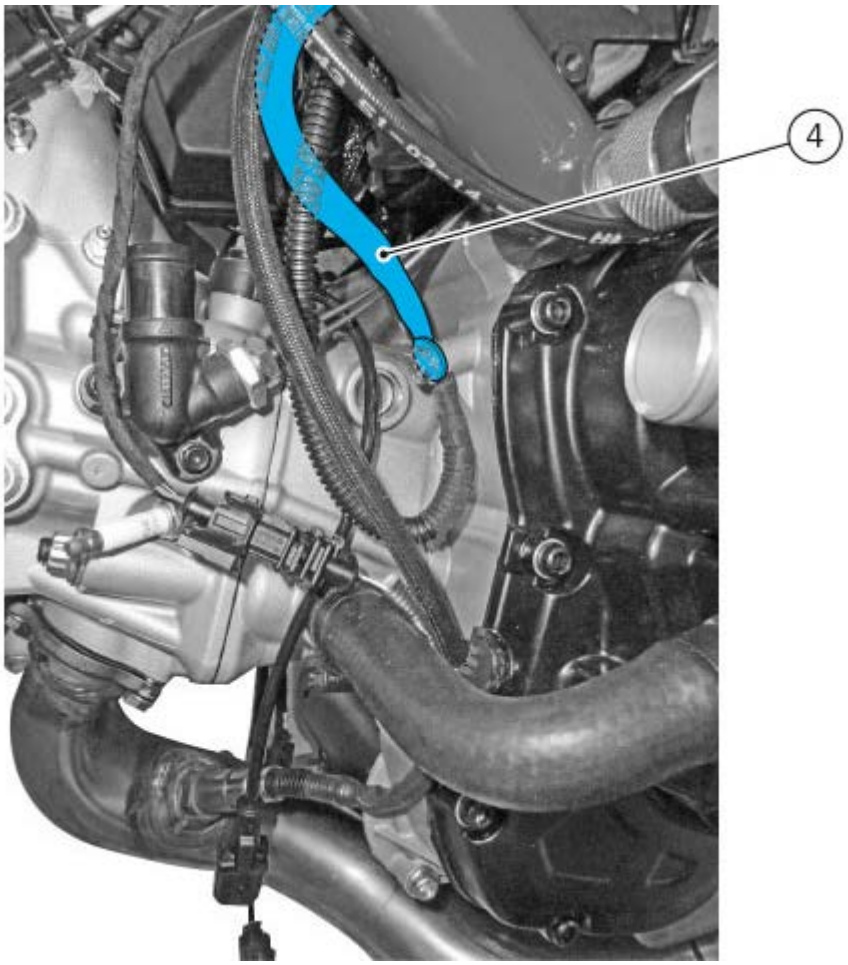
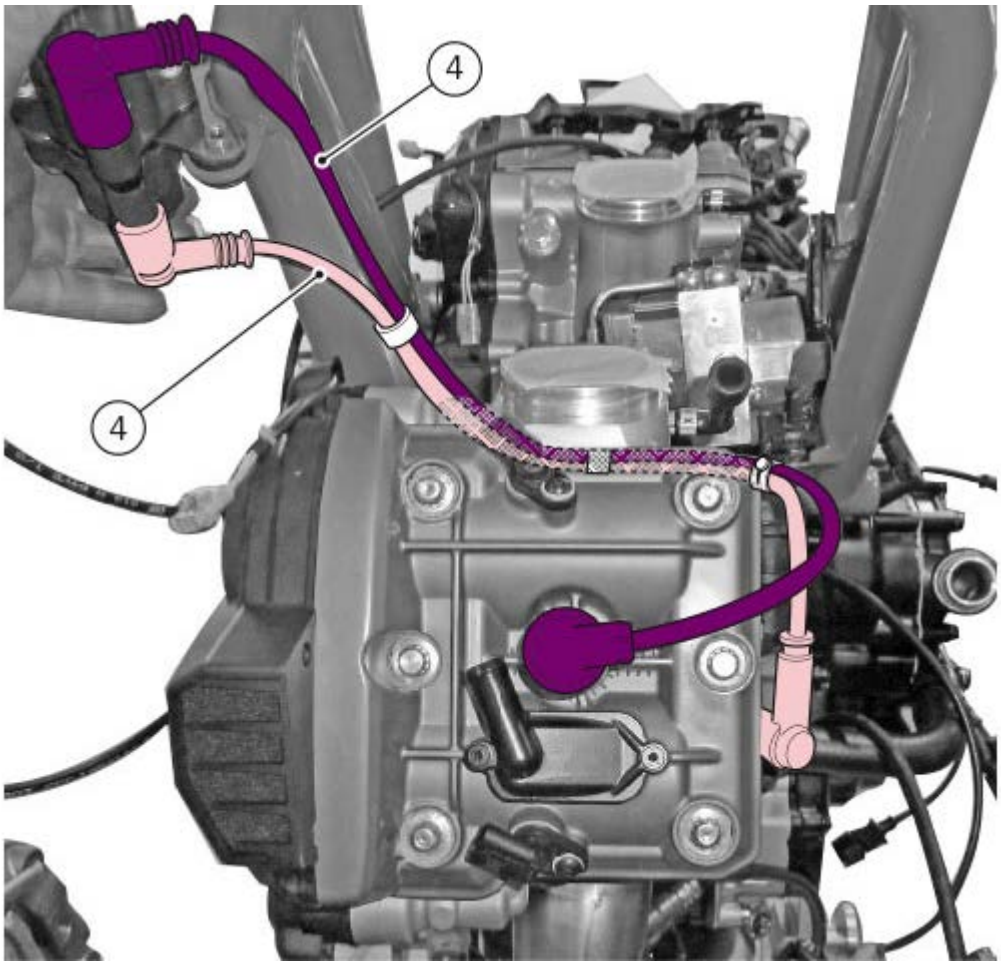


Table 10C

POS.	DESCRIPTION

4	Horizontal head spark plug
5	Horizontal head coils



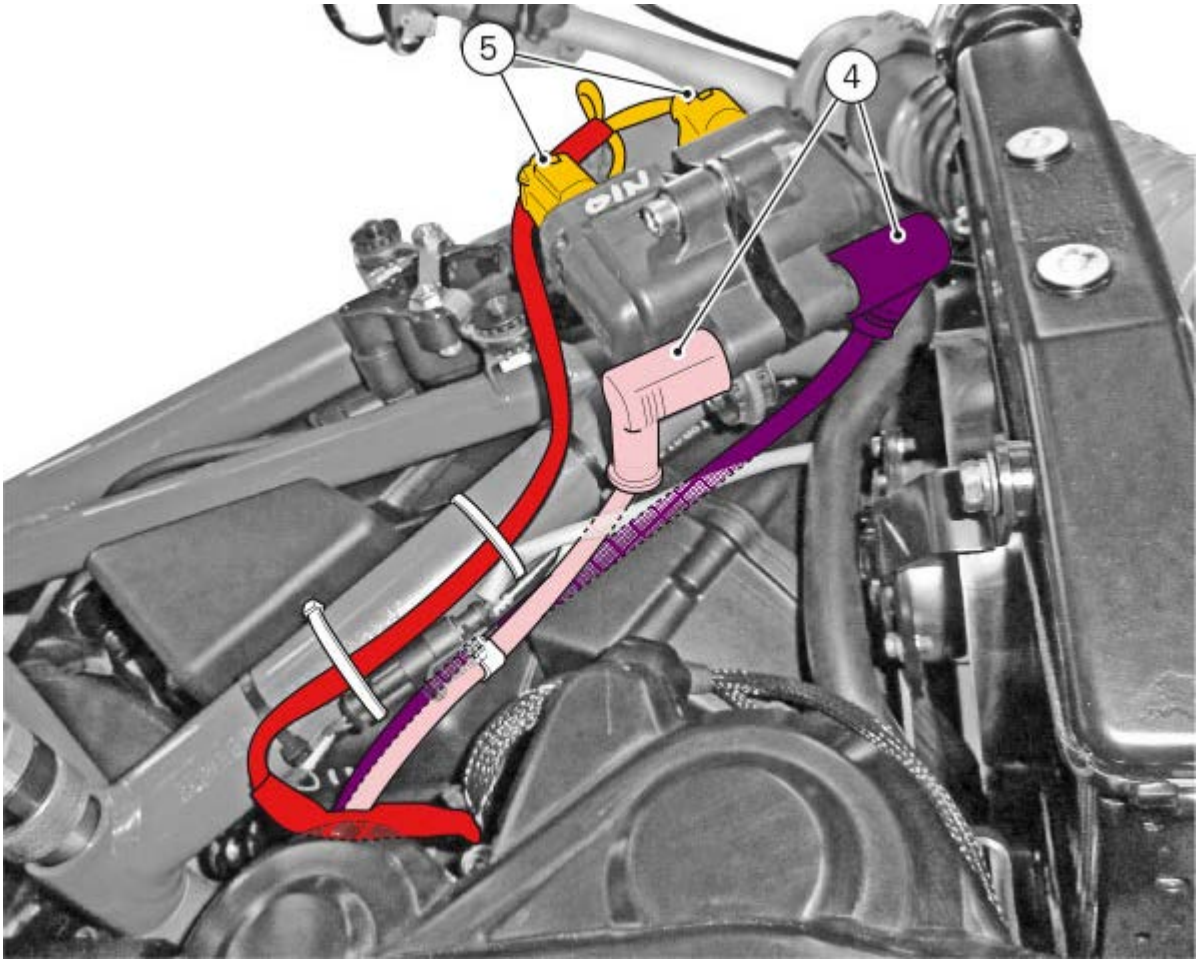
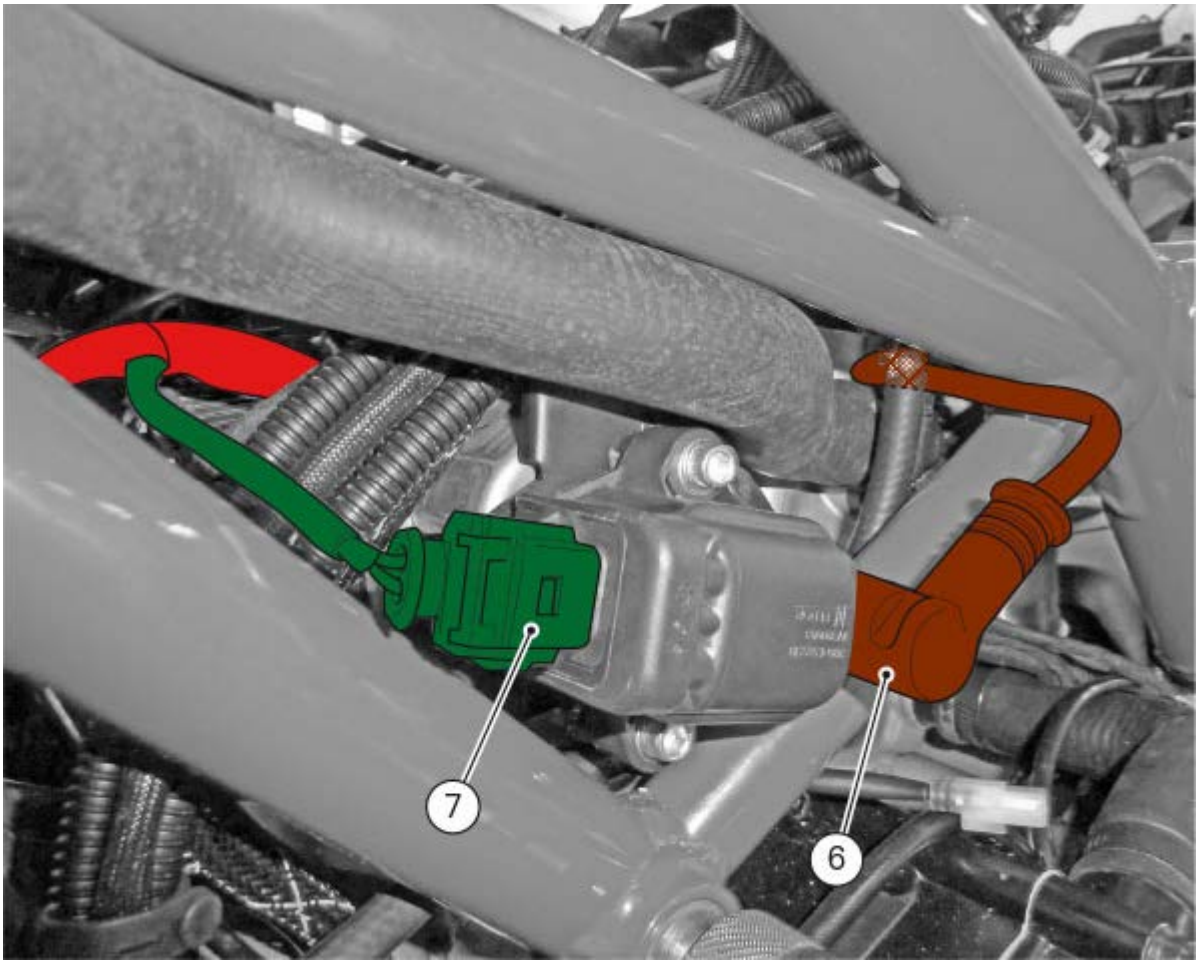
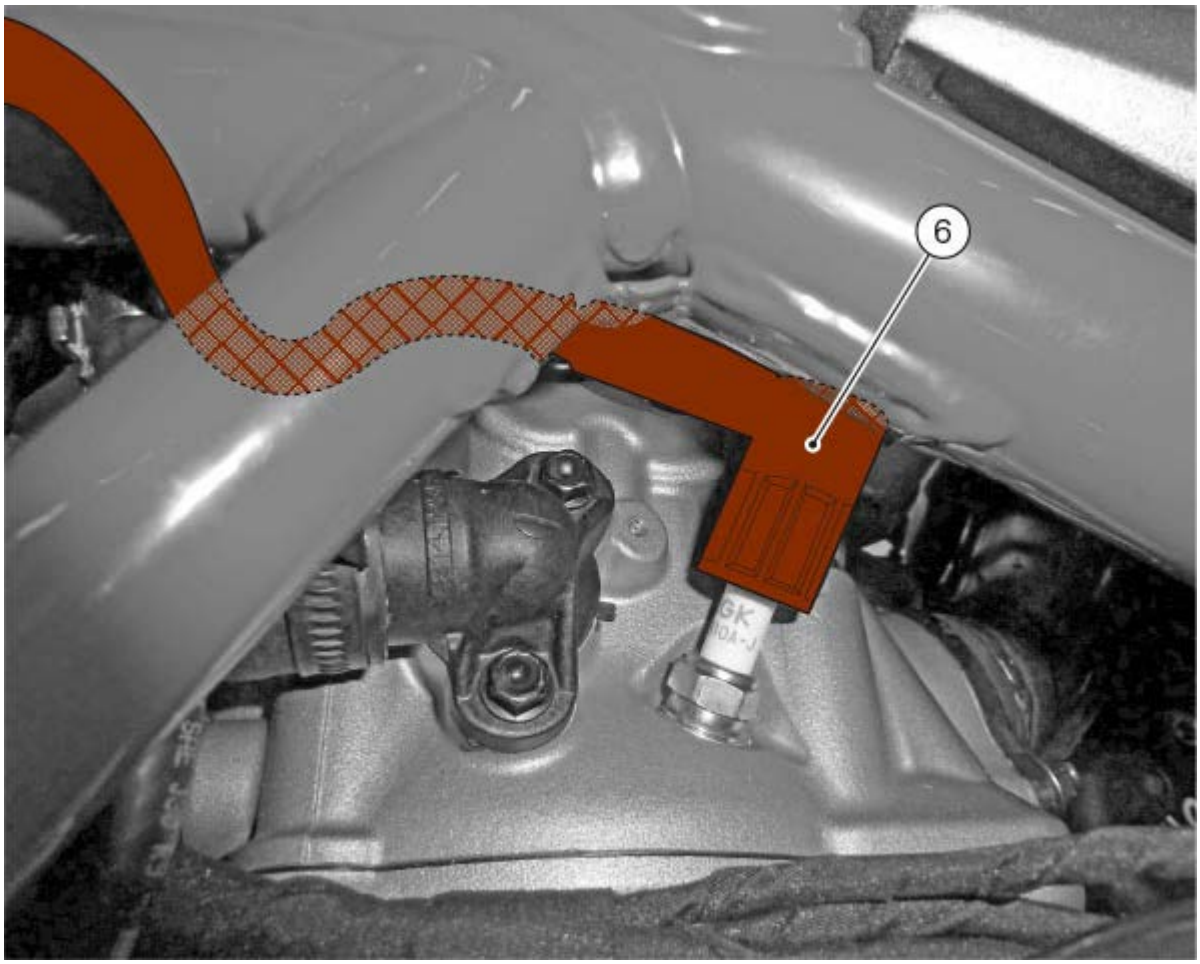


Table 10D

POS.	DESCRIPTION
6	Vertical head spark plug
7	Vertical head coils

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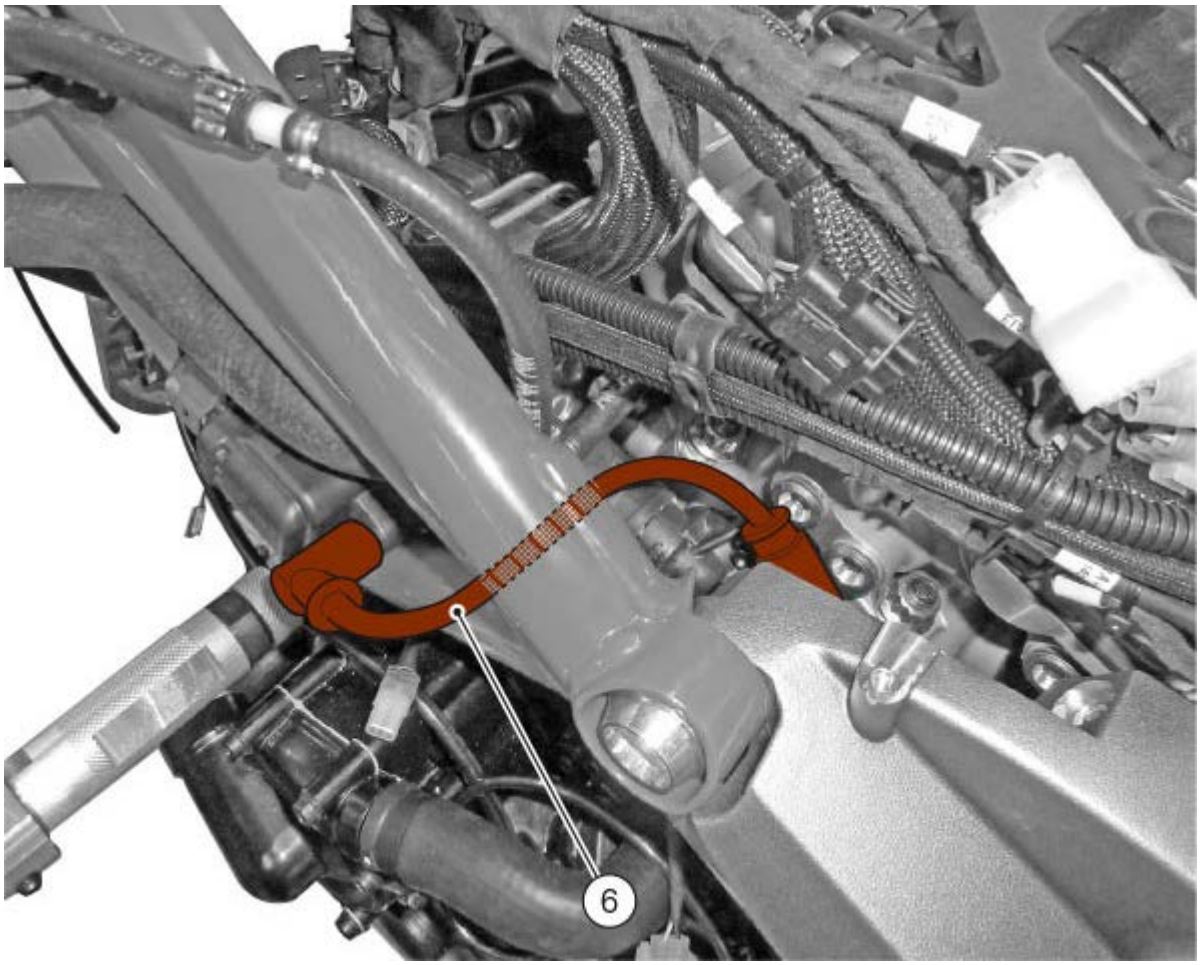
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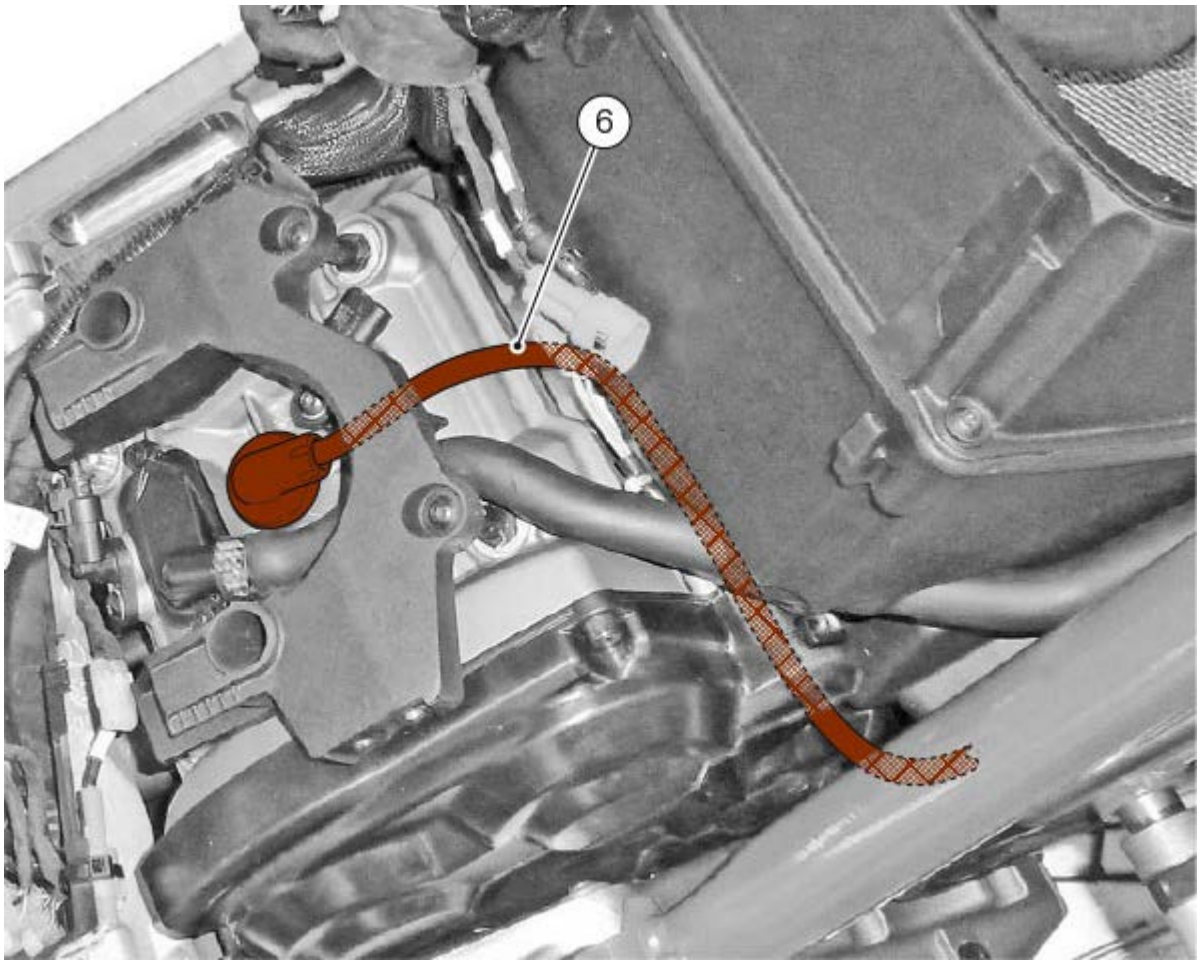
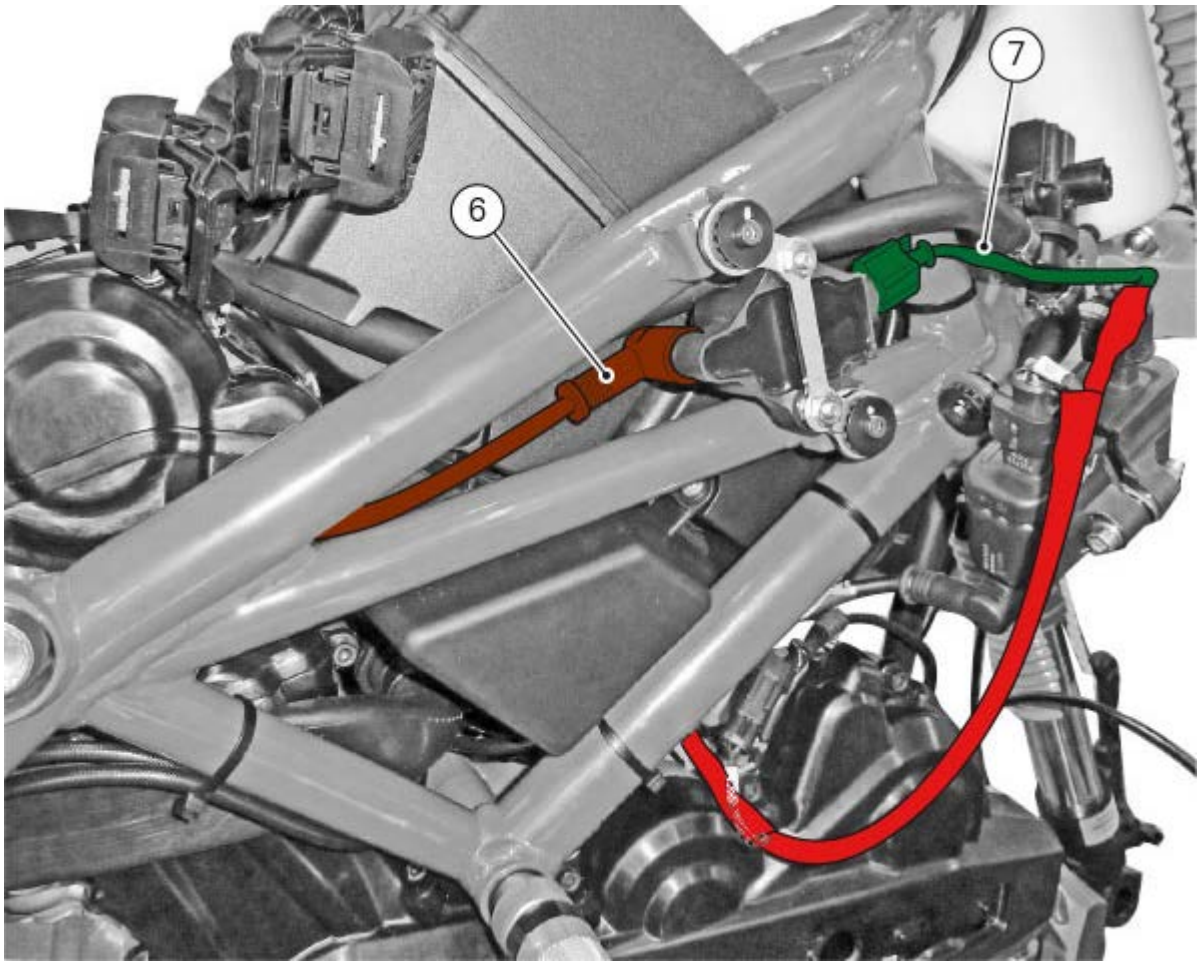




"ROUTING OF WIRING ON FRAME"

Branch 9

Table 9A

POS.	DESCRIPTION
1	USB cable
2	Alarm presetting cable
3	12V power outlet
4	Solenoid starter cable

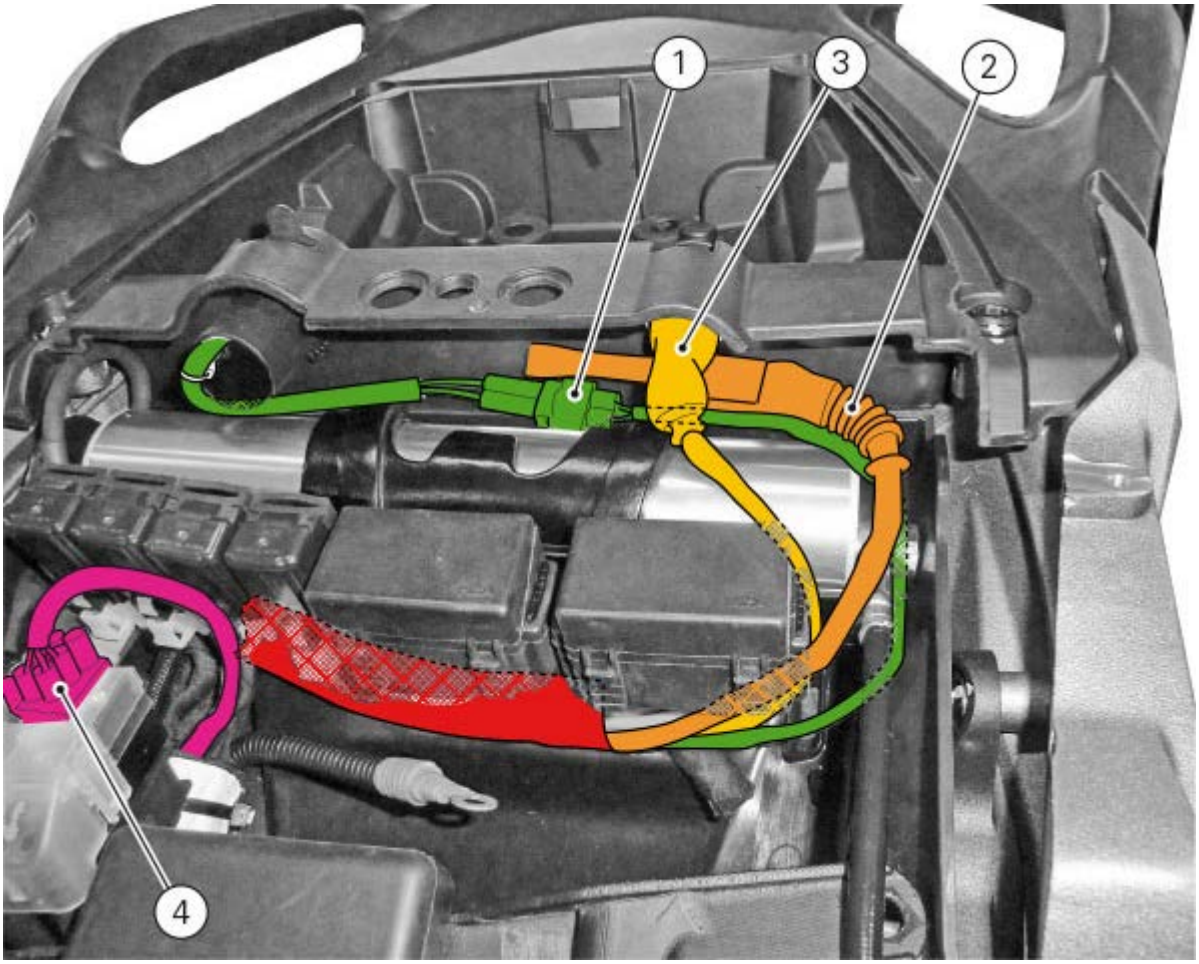
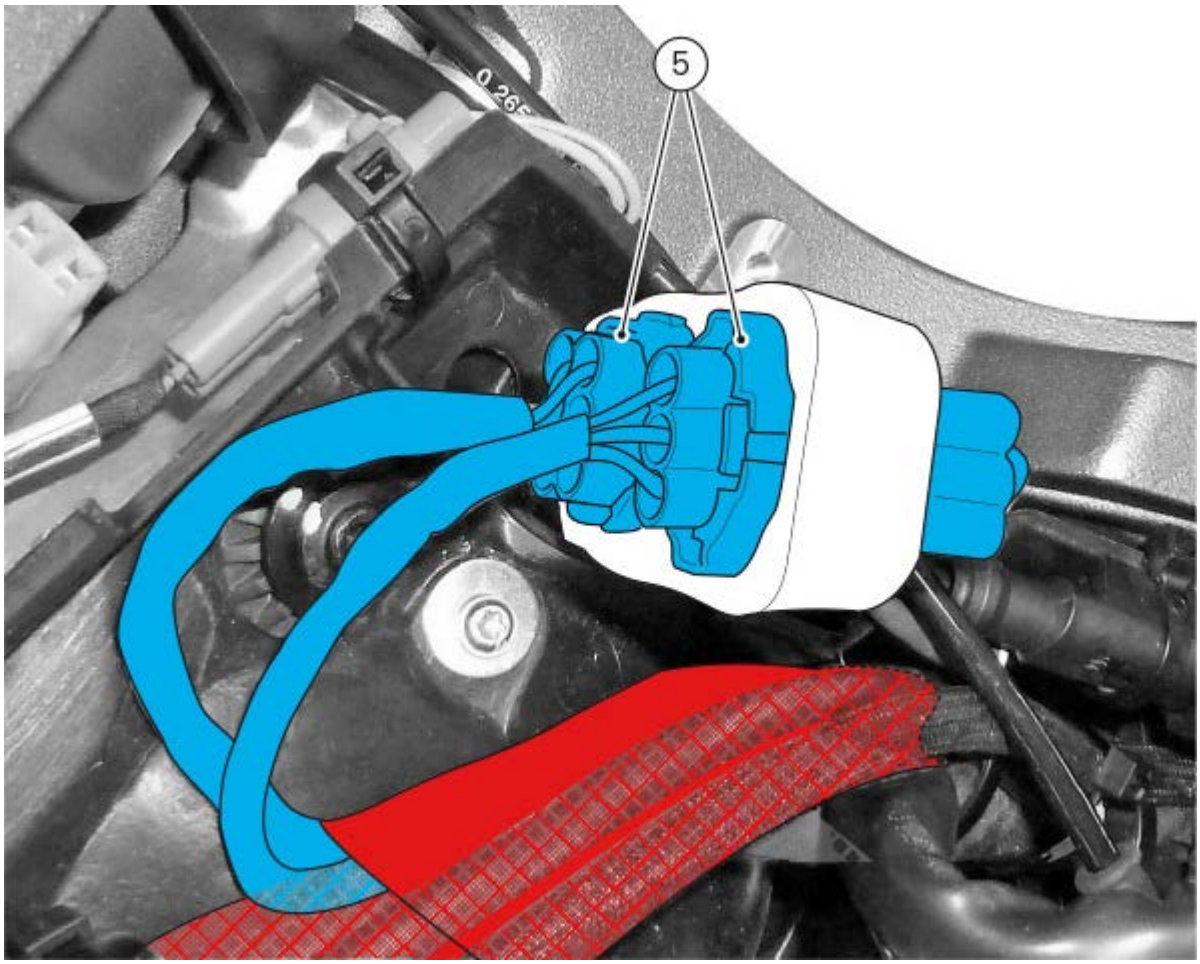


Table 9B

POS.	DESCRIPTION
5	Exhaust valve motor + rear accelerometer cable (FOR S VERSION, ONLY)



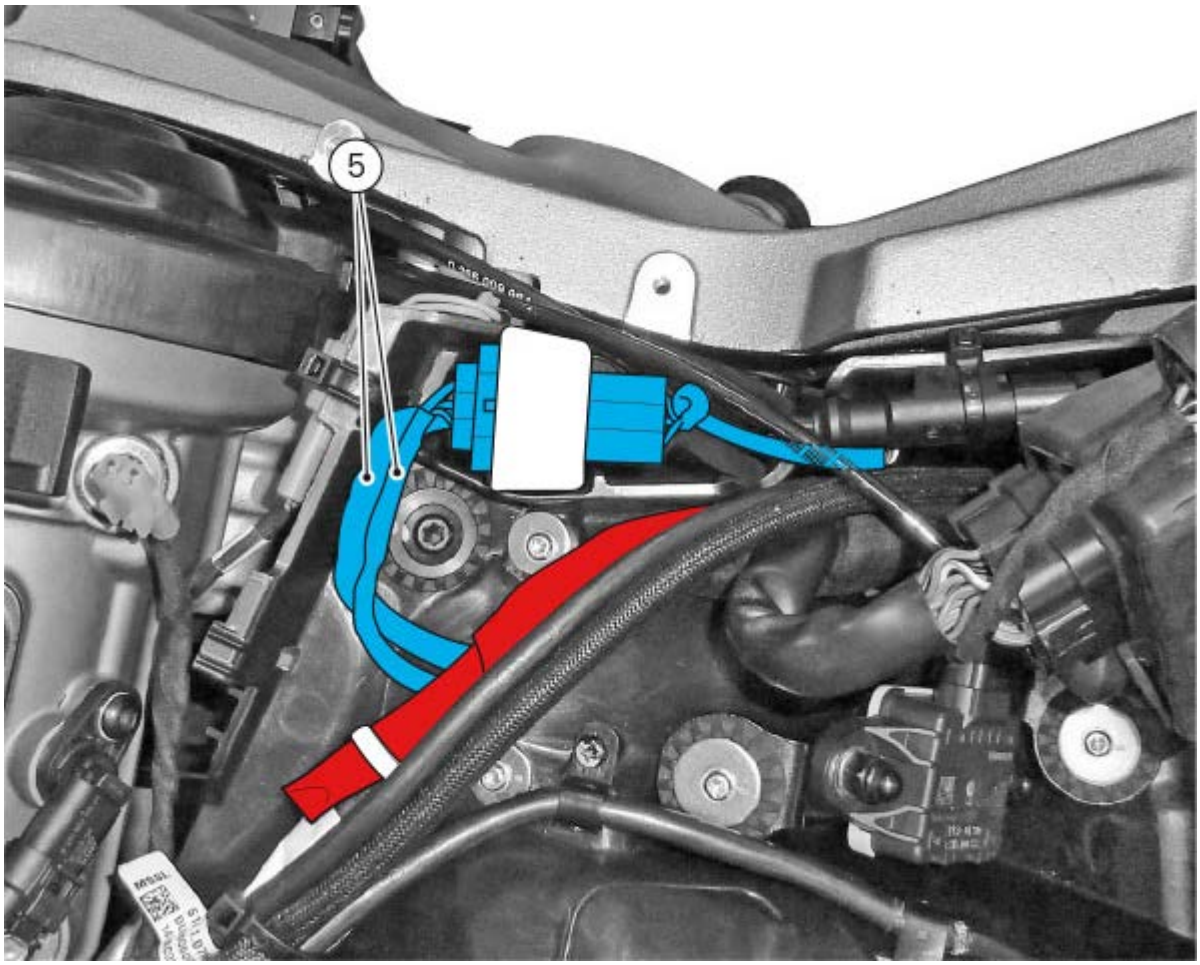


Table 9C

POS.	DESCRIPTION

6	Rear shock absorber preload cable (FOR S VERSION, ONLY)

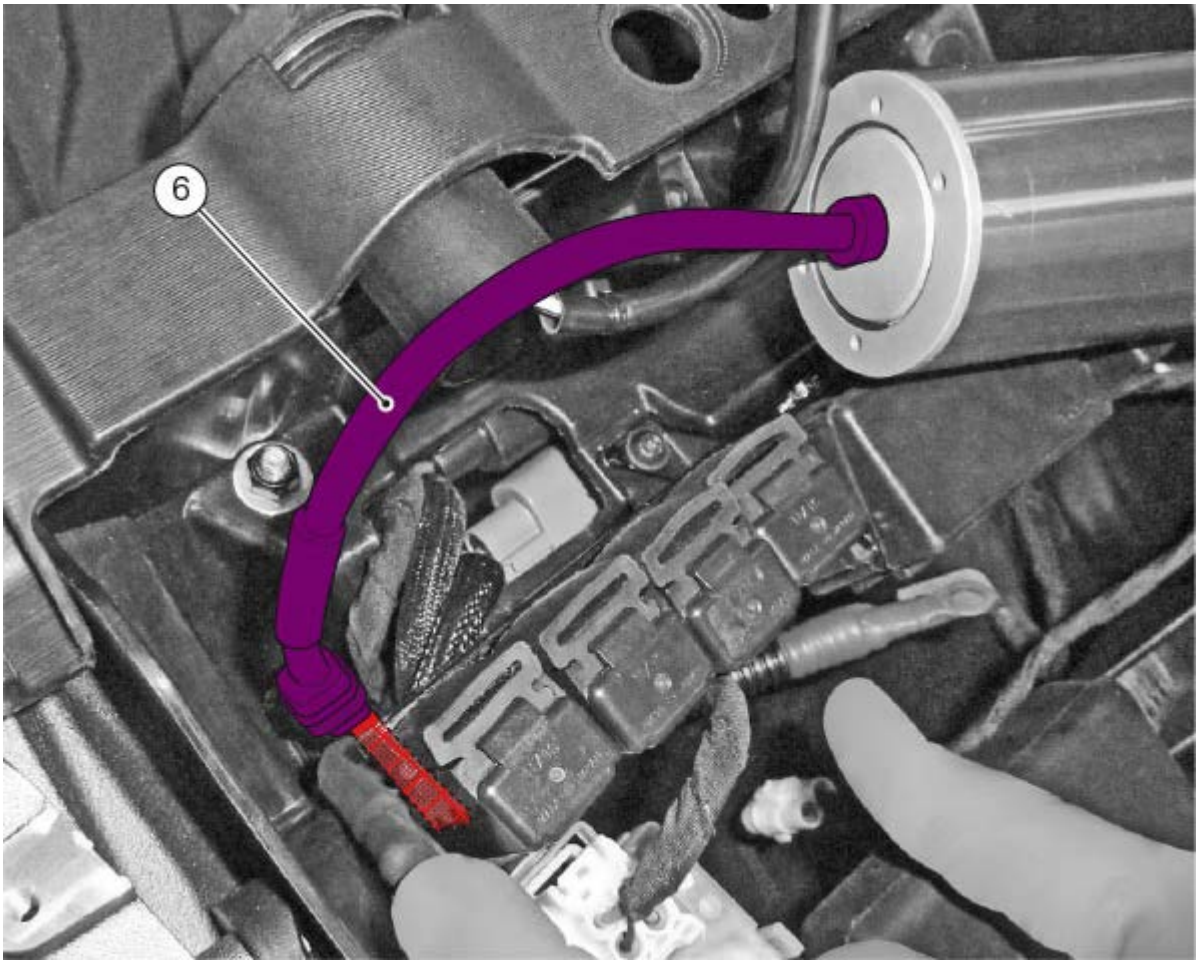
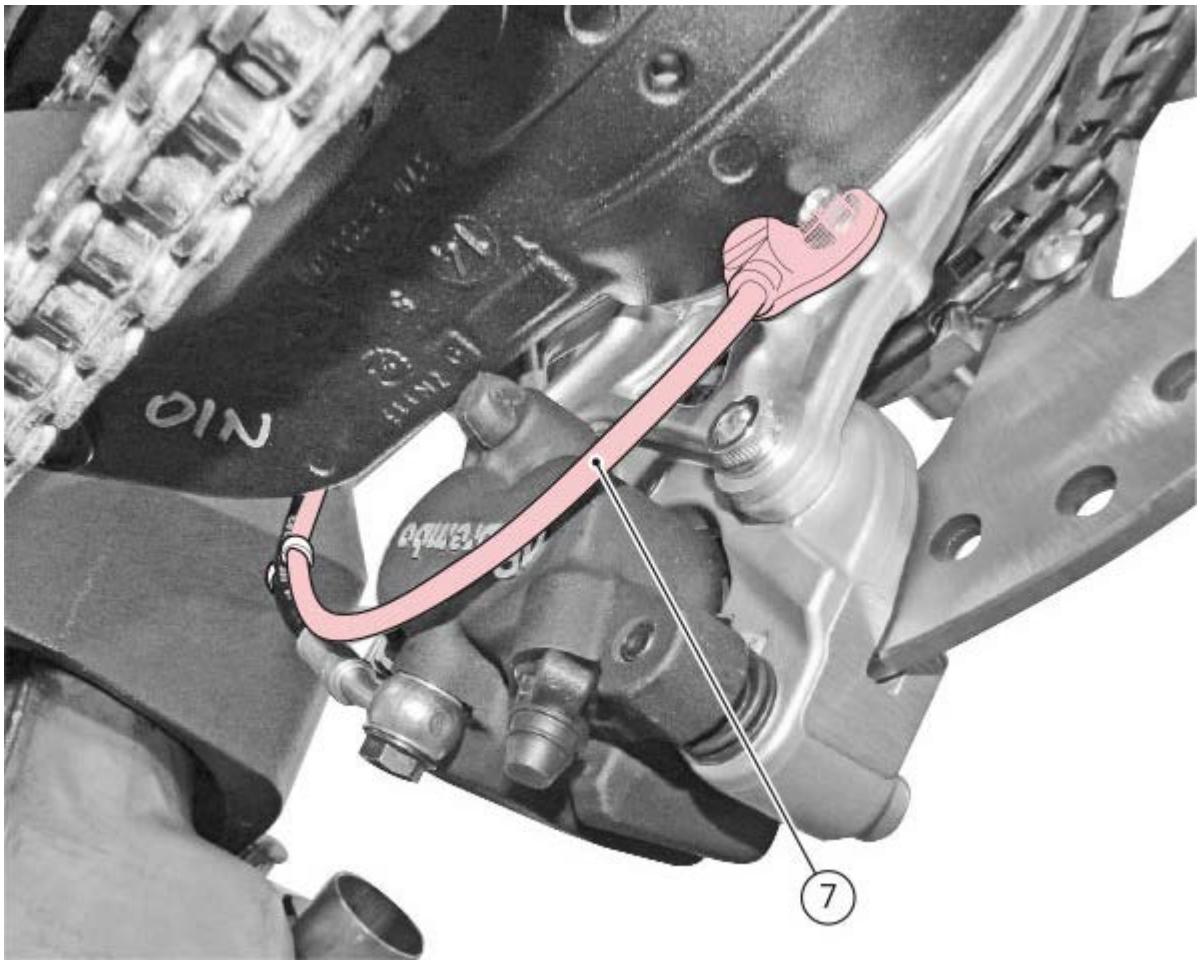
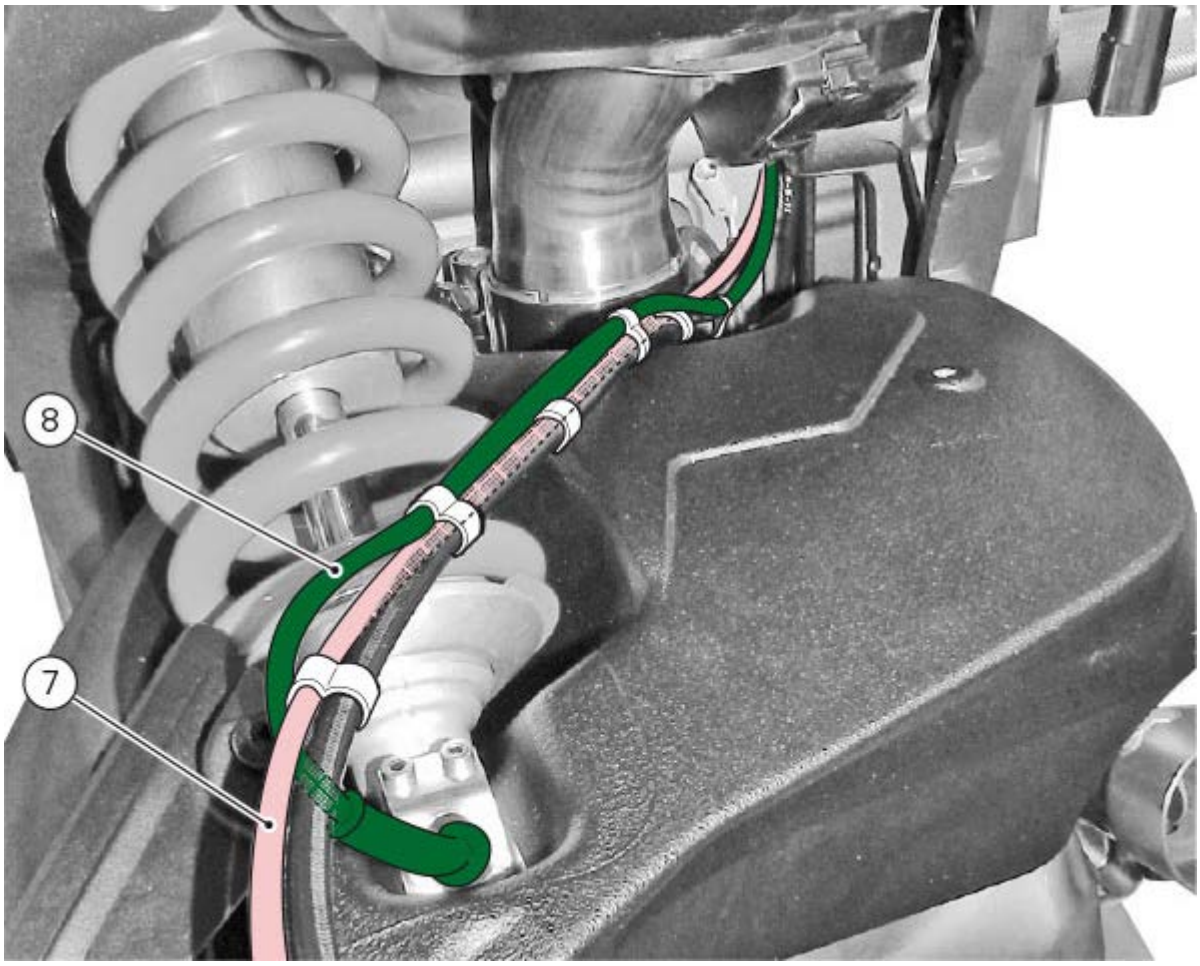
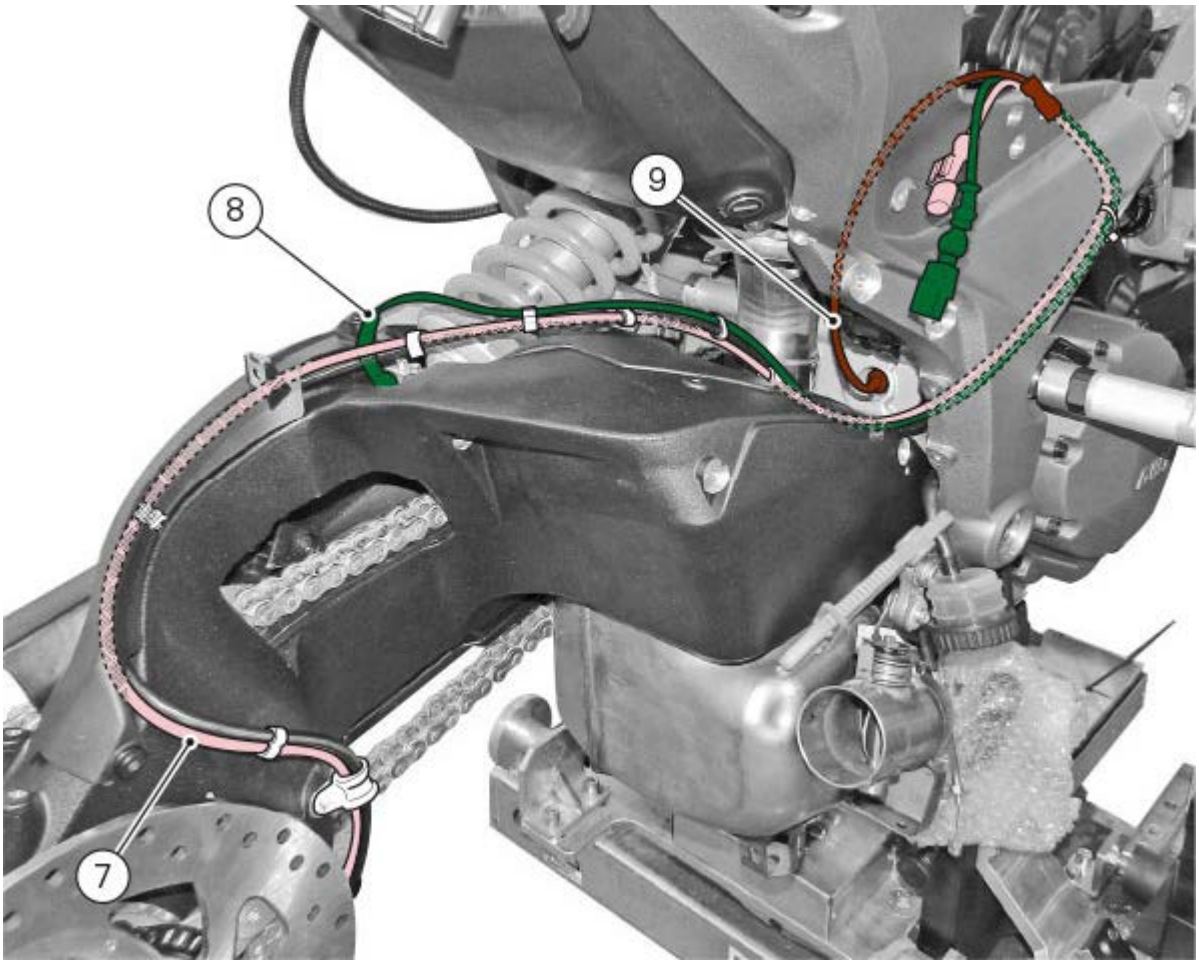


Table 9D

POS.	DESCRIPTION
7	Rear speed sensor cable
8	Rear shock absorber regulator cable (FOR S VERSION, ONLY)
9	Gear sensor cable


7


8
7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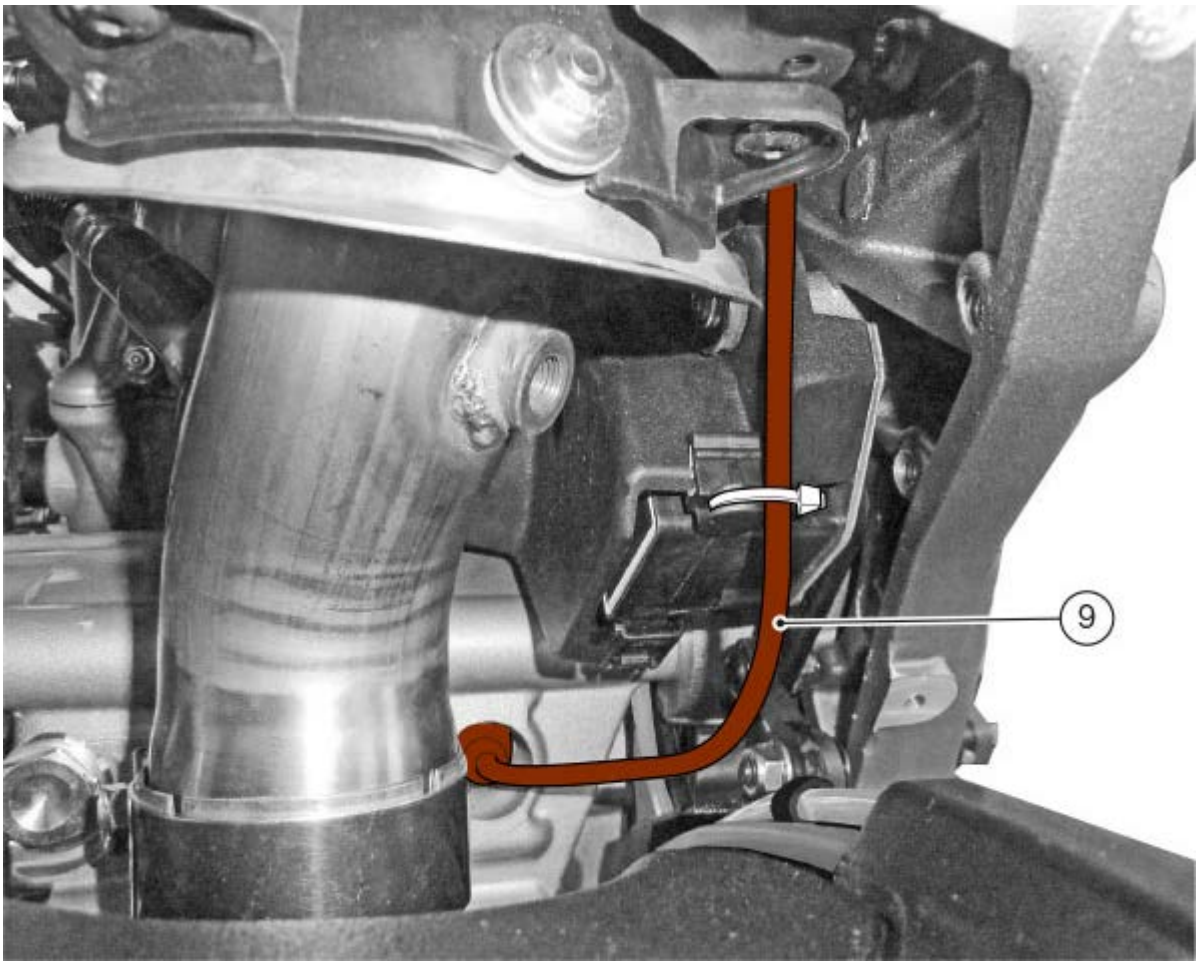
9
7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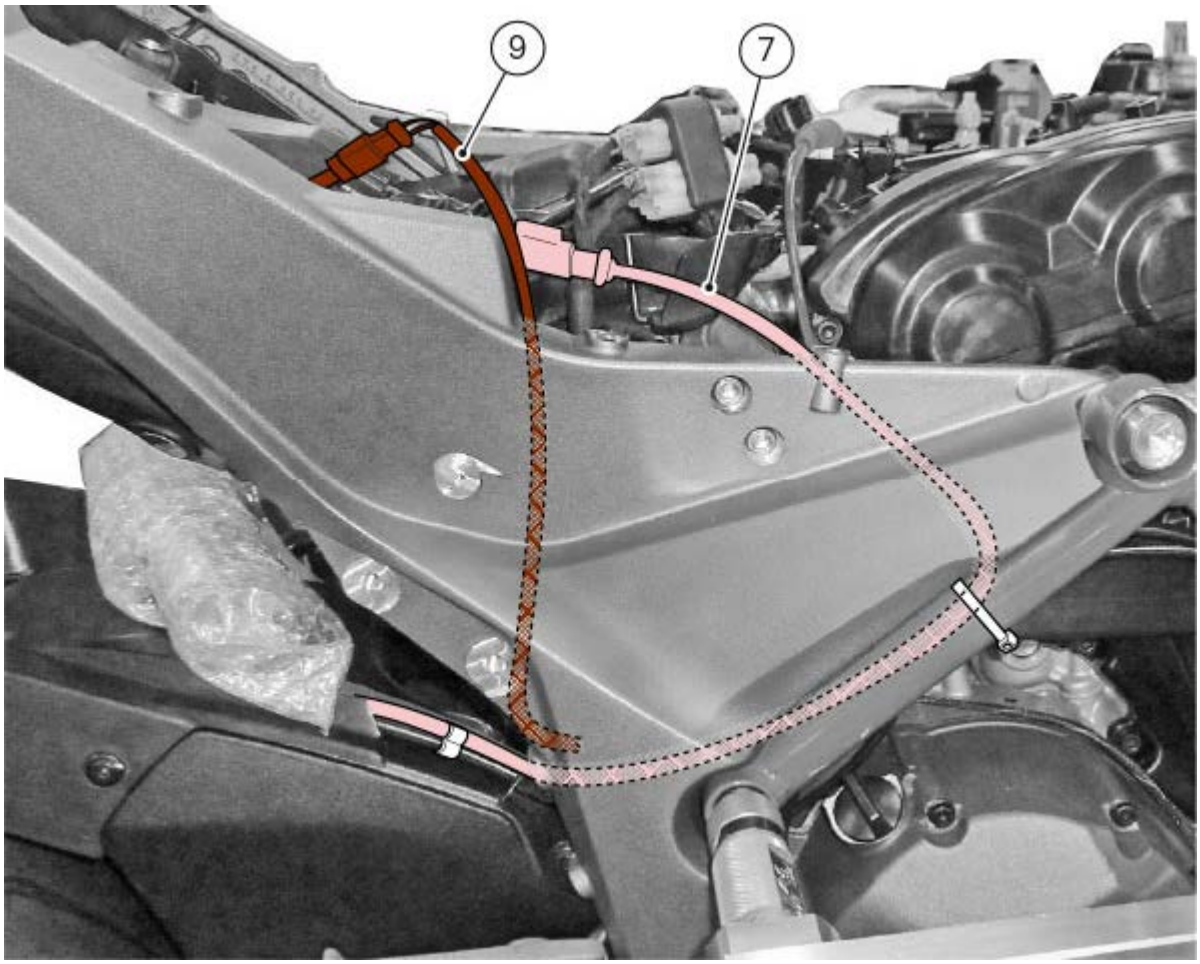
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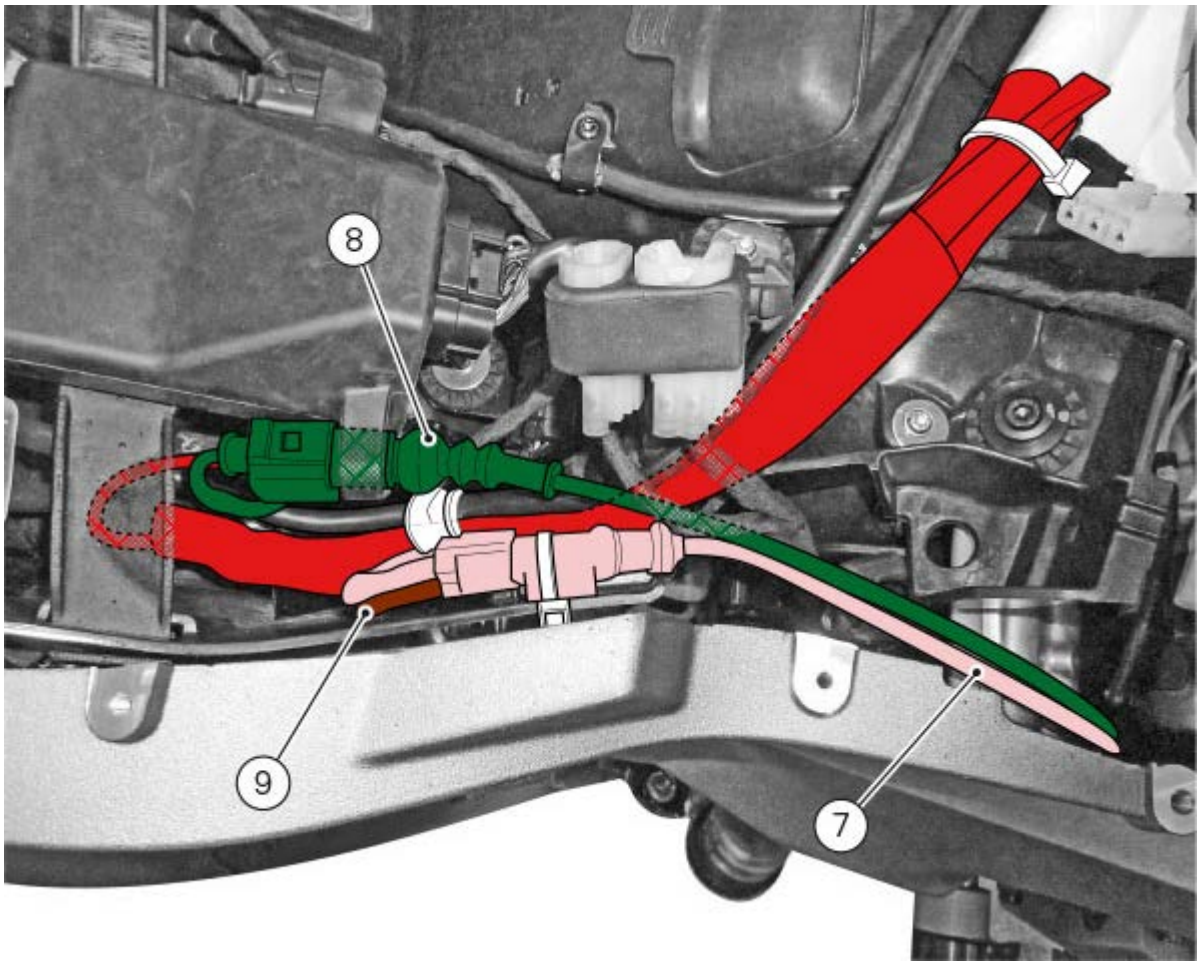

8
9
7

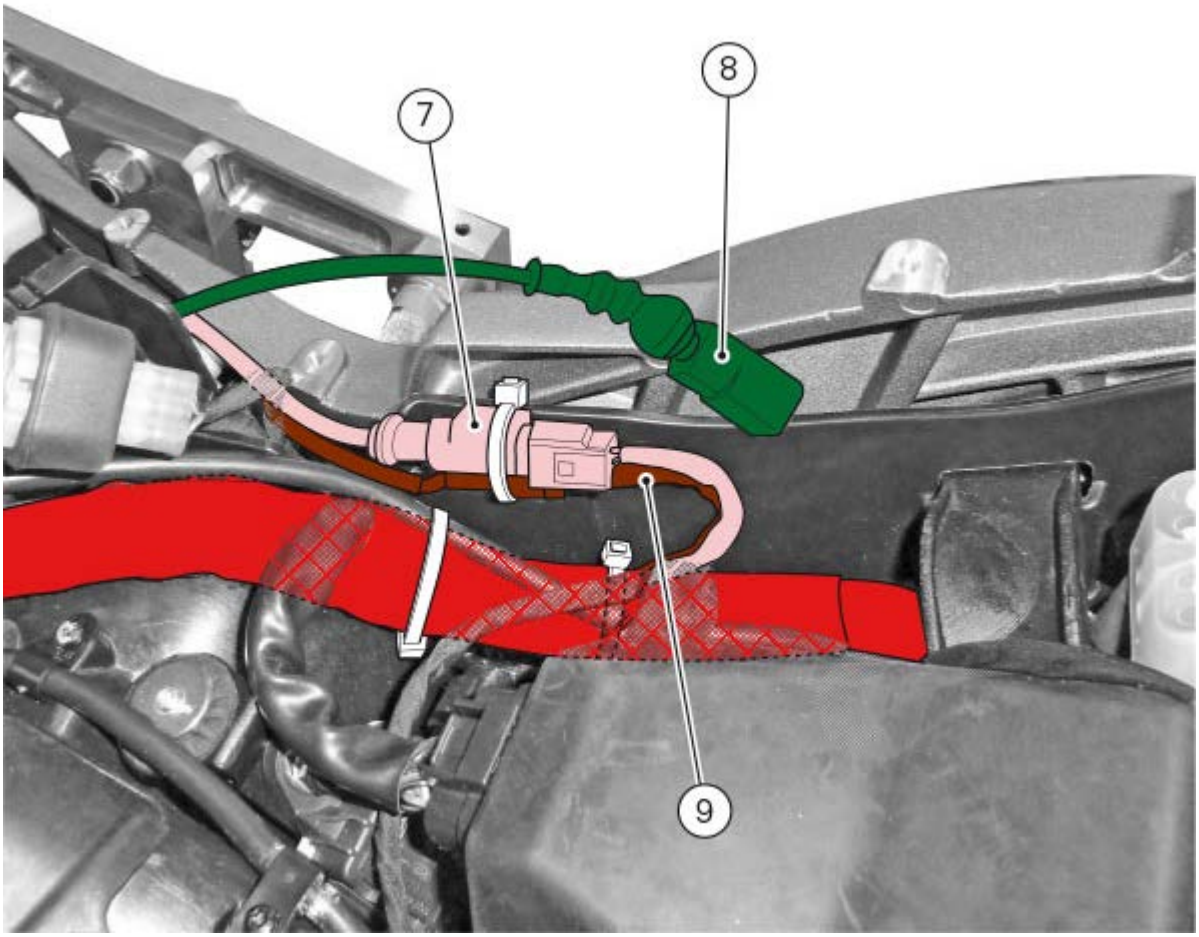
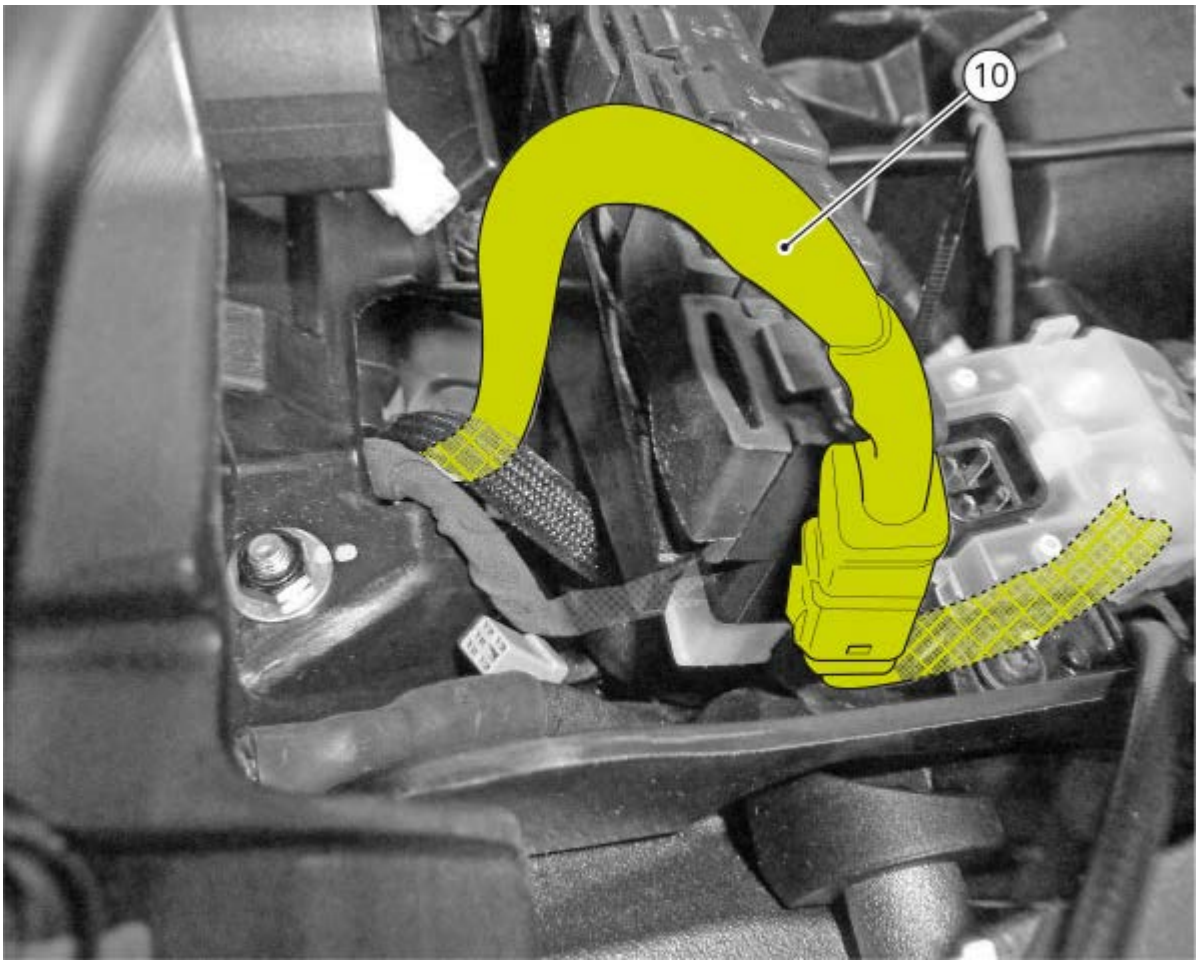
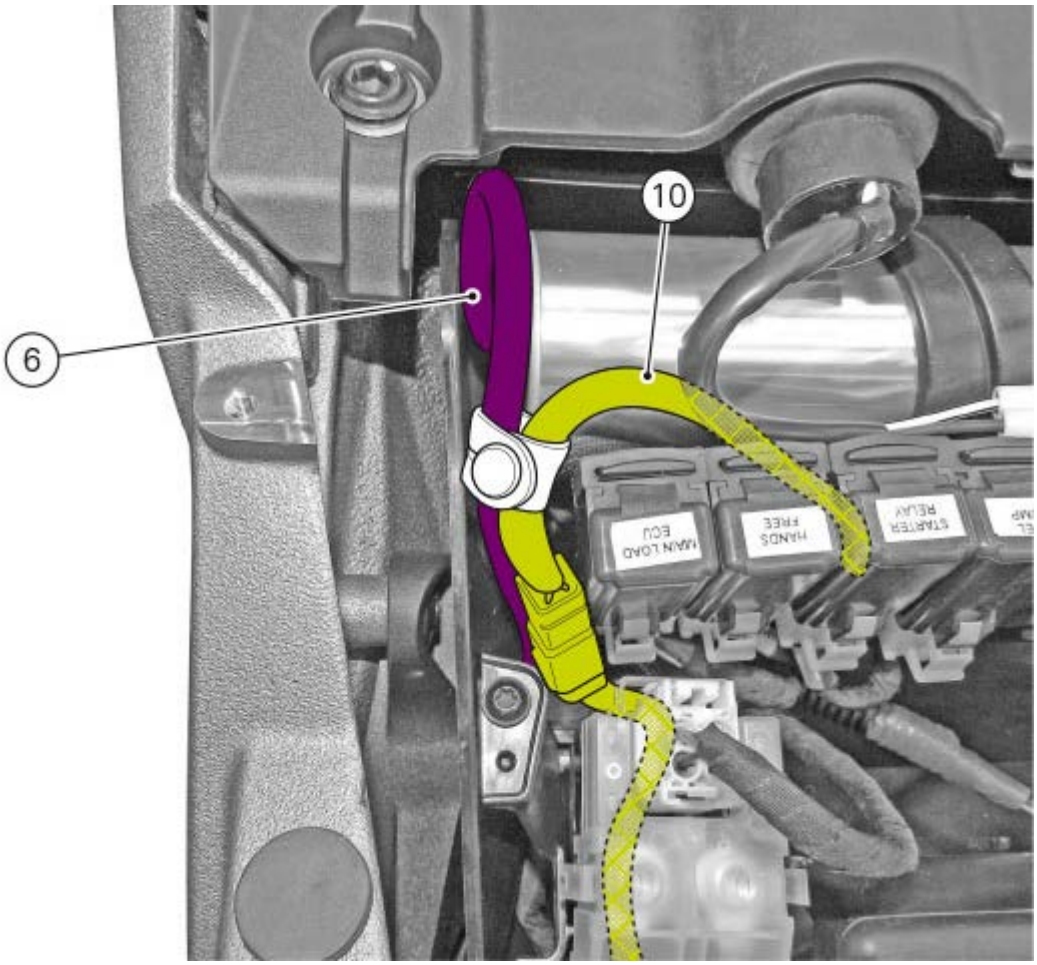


Table 9E

POS.	DESCRIPTION
6	Rear shock absorber preload cable (FOR S VERSION, ONLY)
10	Tail light cable



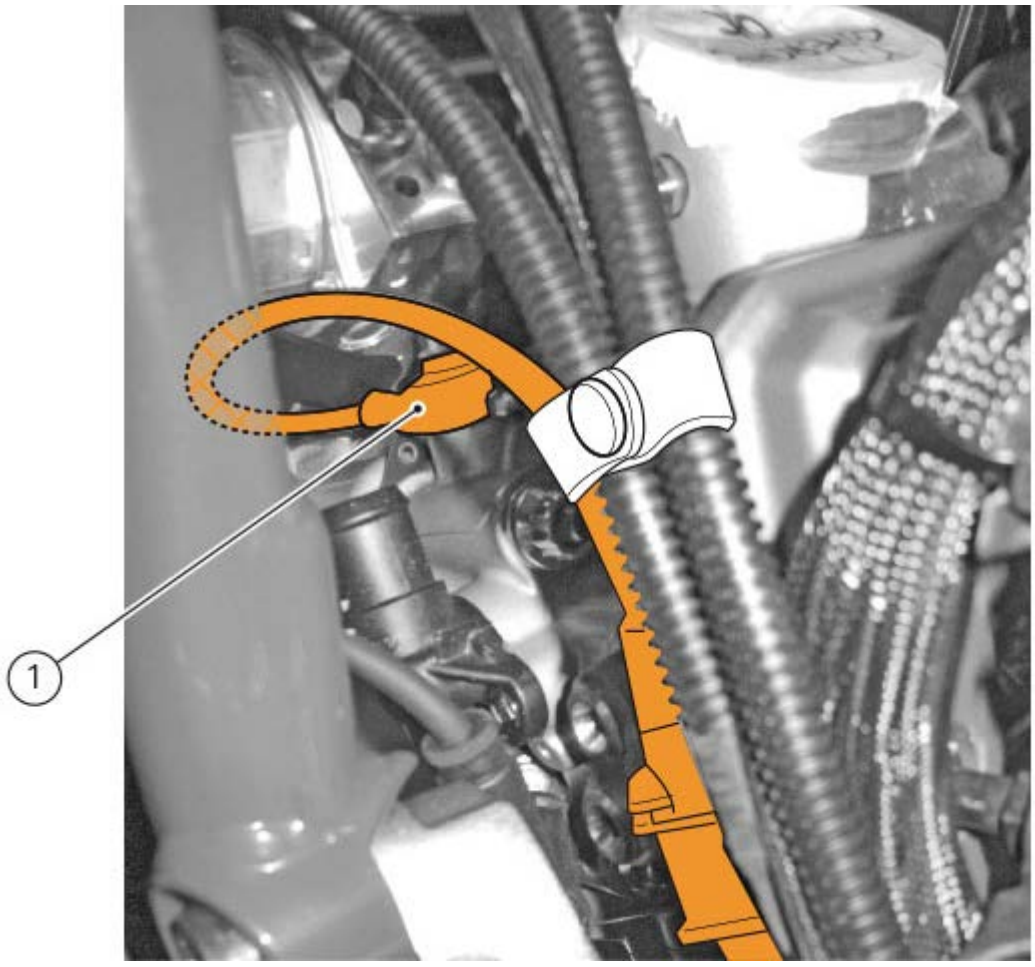


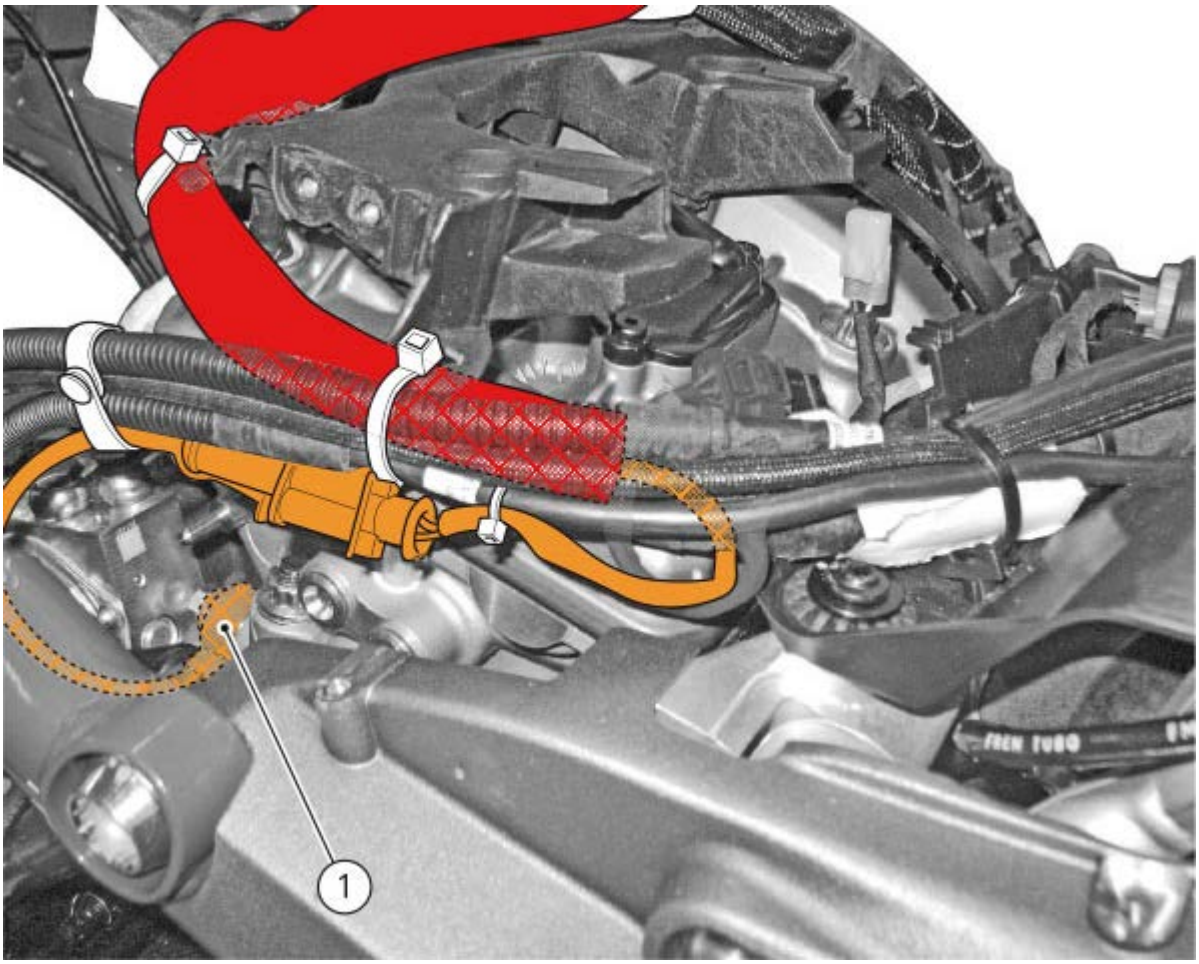
"ROUTING OF WIRING ON FRAME"

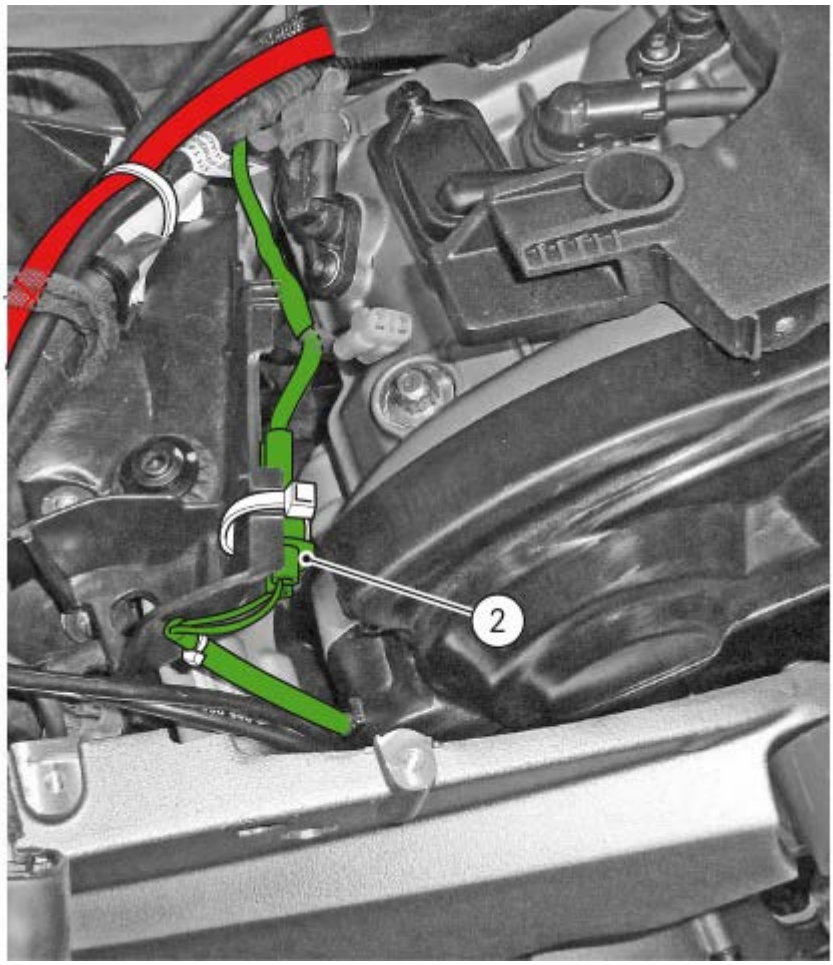
Branch 8

Table 8A

POS.	DESCRIPTION
1	Vertical head knock sensor cable
2	Exhaust side vertical head timing regulator cable







"ROUTING OF WIRING ON FRAME"

Branch 7

Table 7A

POS.	DESCRIPTION
1	ECU 1 cable
2	ECU 2 cable

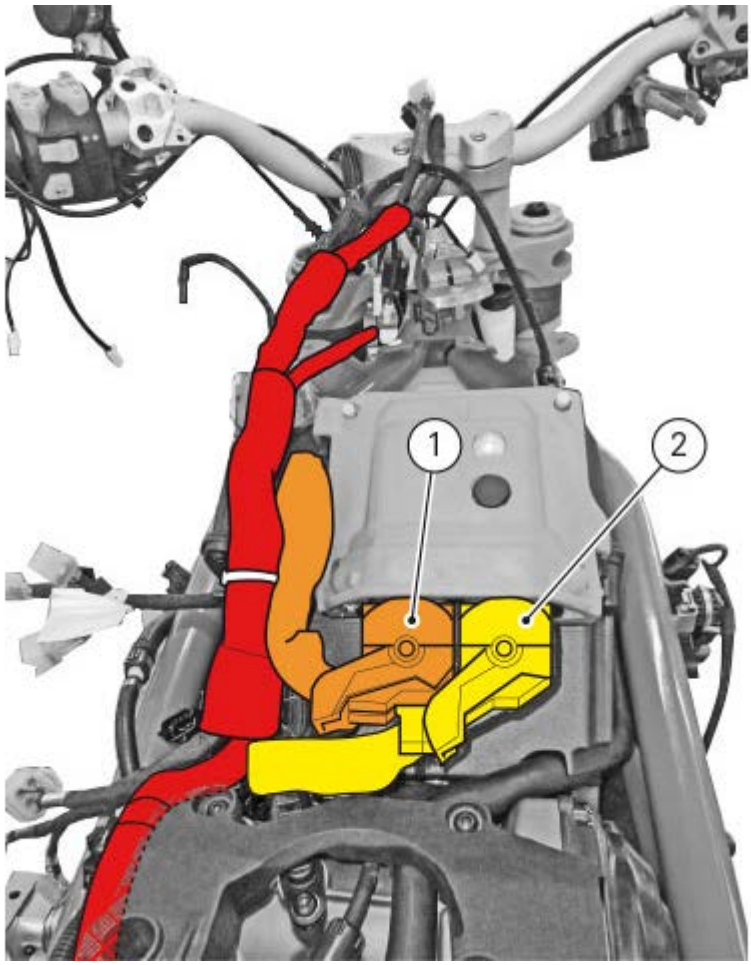


Table 7B

POS.	DESCRIPTION
3	Injector wiring cable
4	Horizontal solenoid valve cable
5	Vertical solenoid valve cable
6	Vertical head map sensor cable

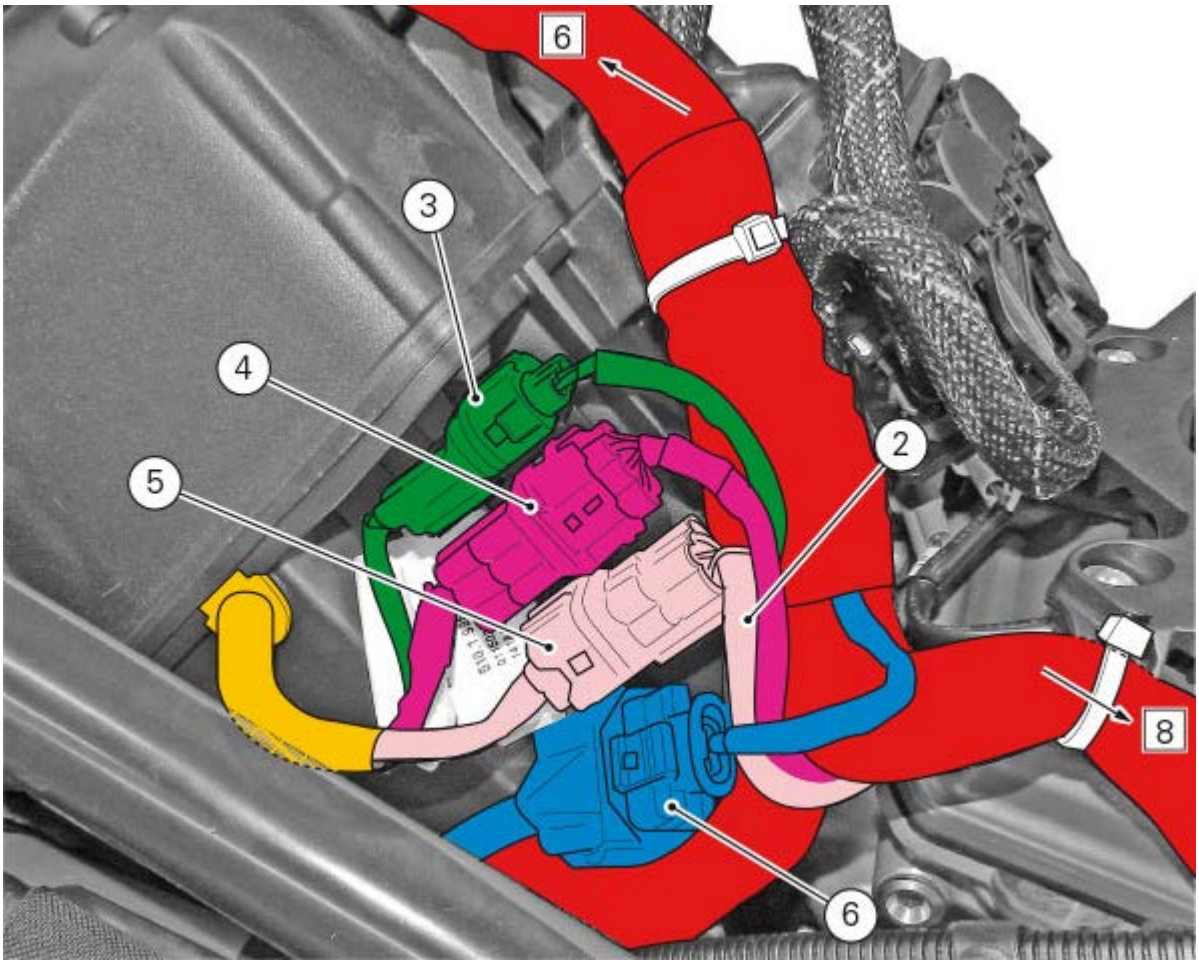
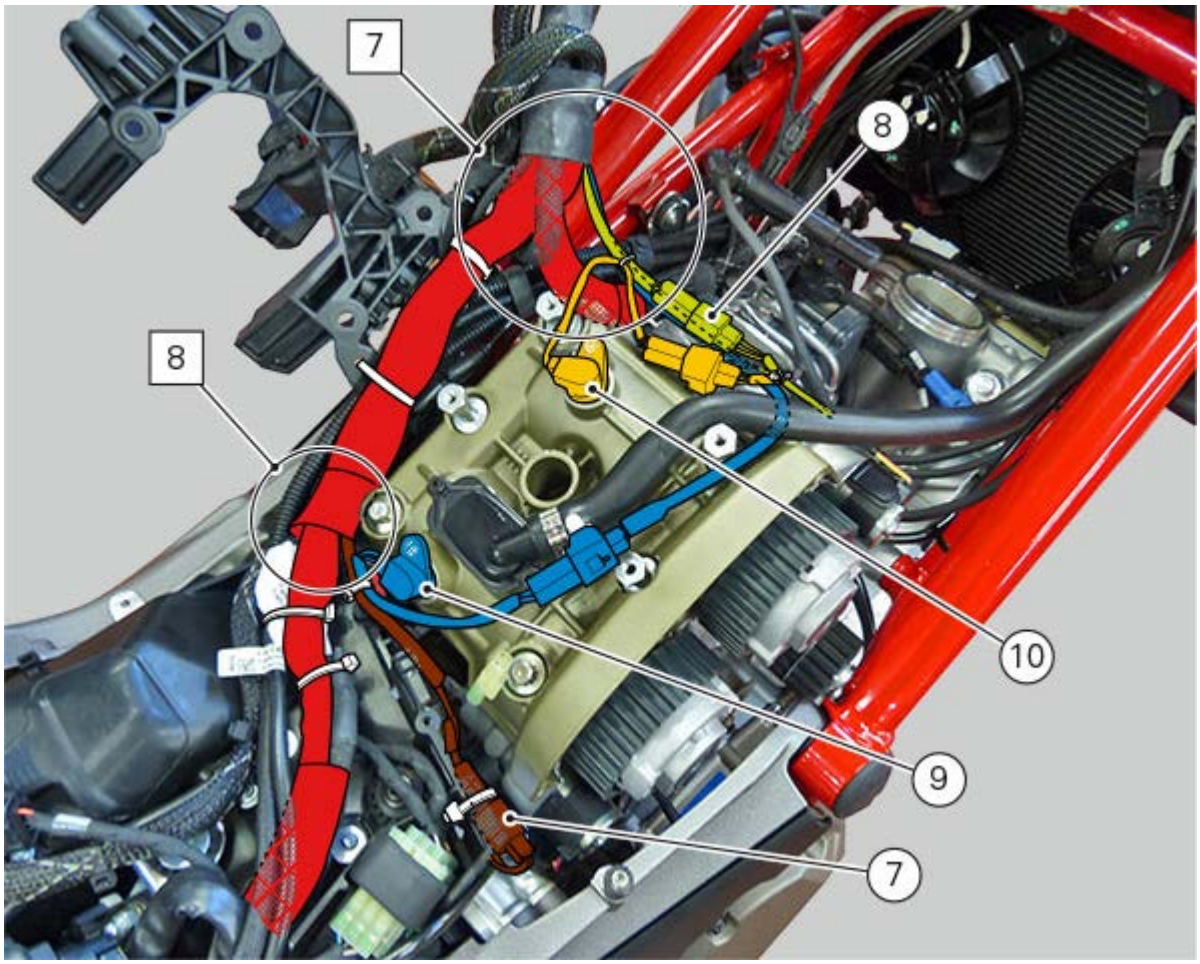
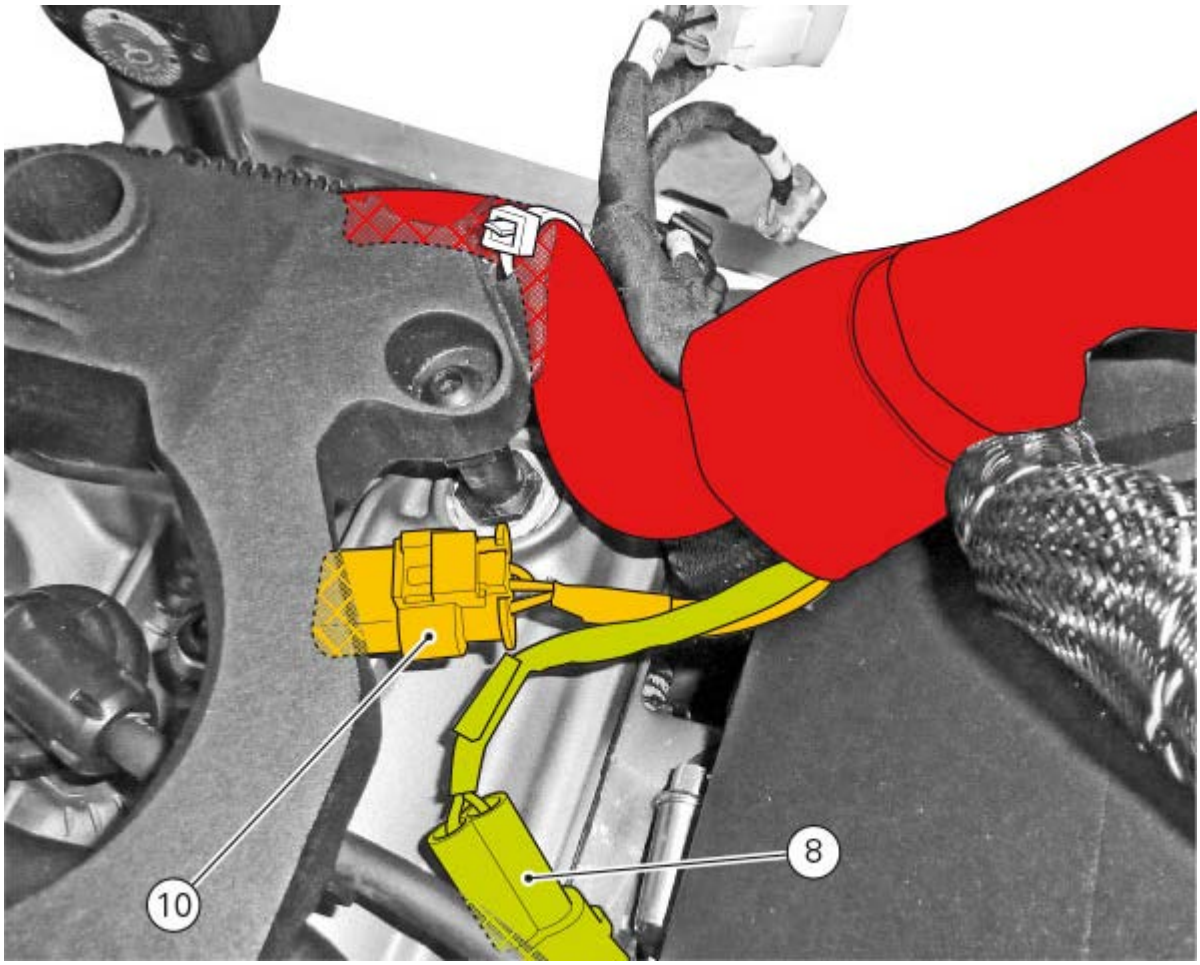


Table 7C

POS.	DESCRIPTION
7	Exhaust side vertical head timing regulator cable
8	Intake side vertical head timing regulator cable
9	Exhaust side vertical head timing check cable
10	Intake side vertical head timing check cable



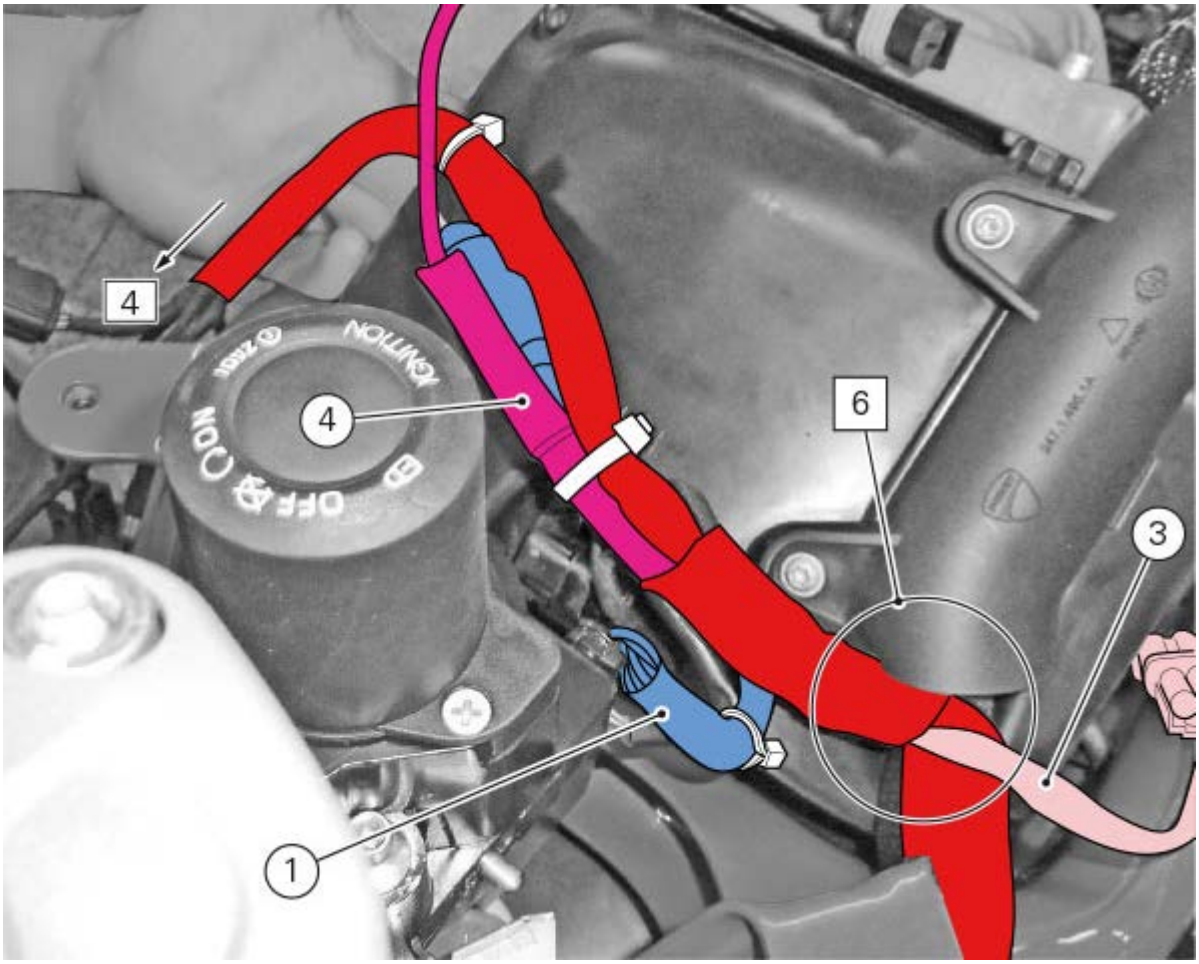


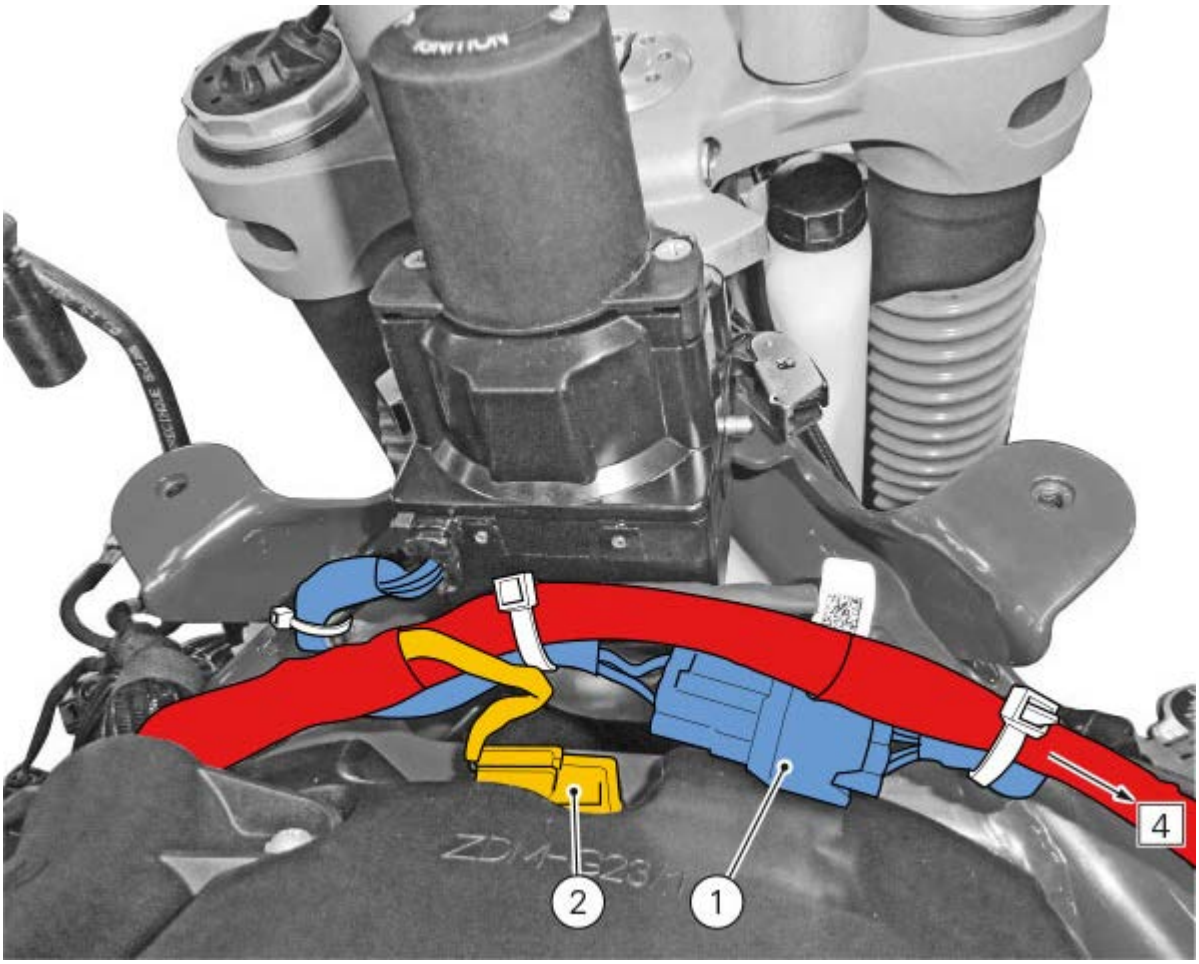
"ROUTING OF WIRING ON FRAME"

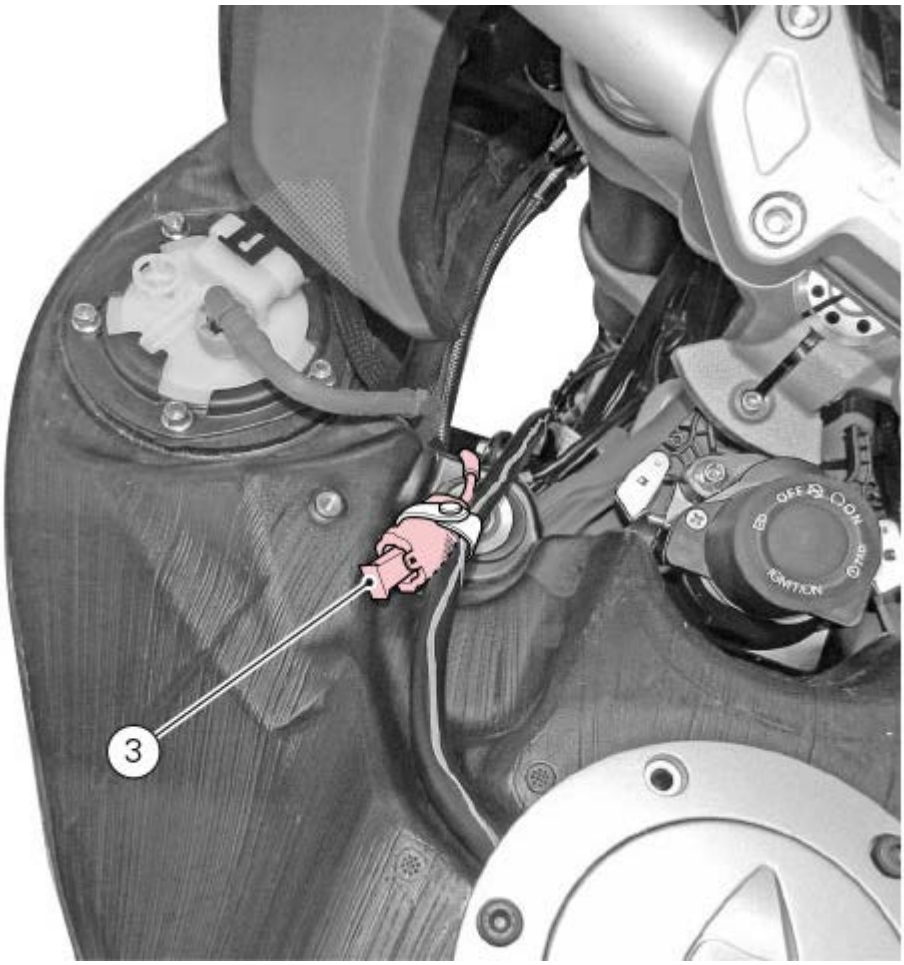
Branch 6

Table 6A

POS.	DESCRIPTION
1	Hands free cable
2	Airbox cable
3	Tank plug presetting cable
4	Ground jointing




4
2
1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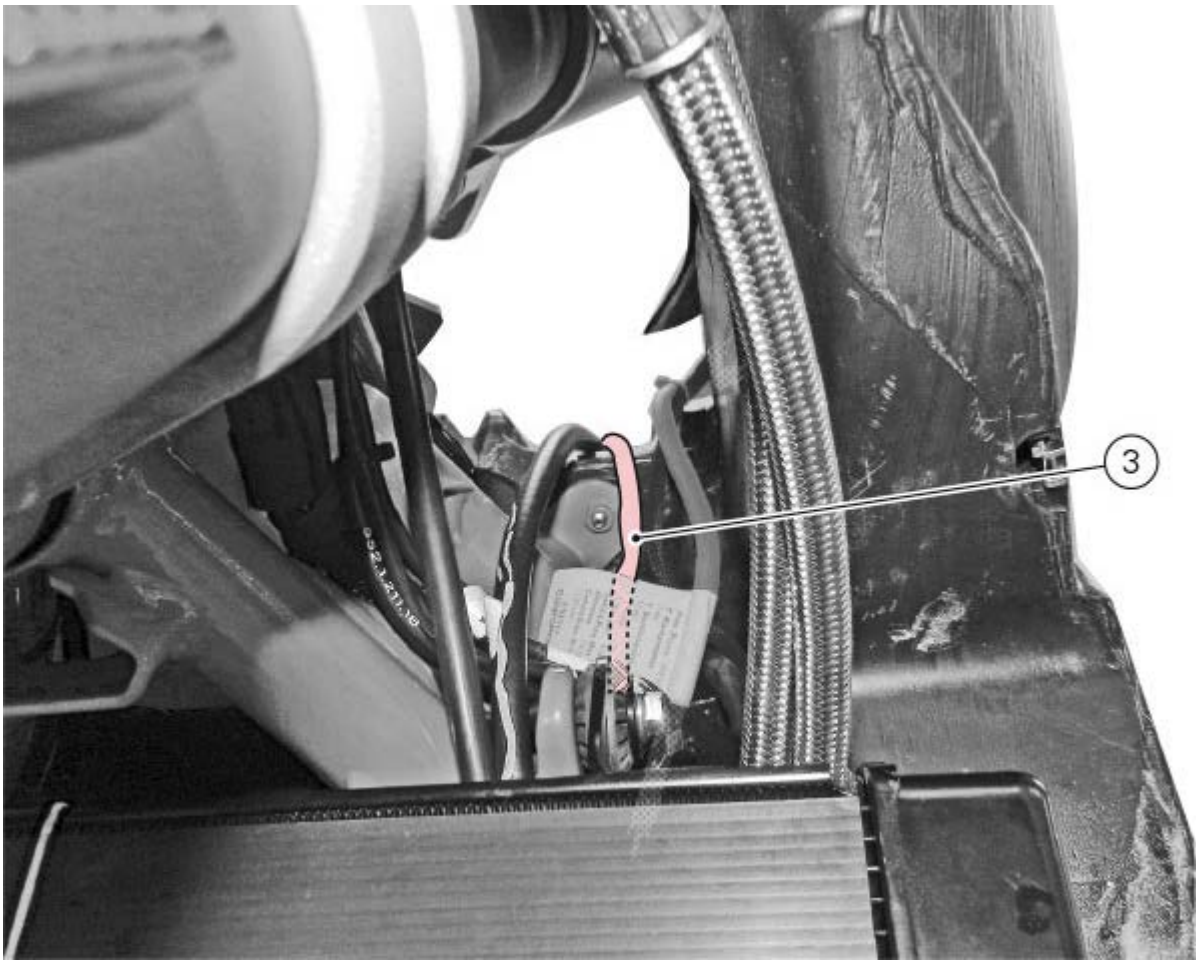
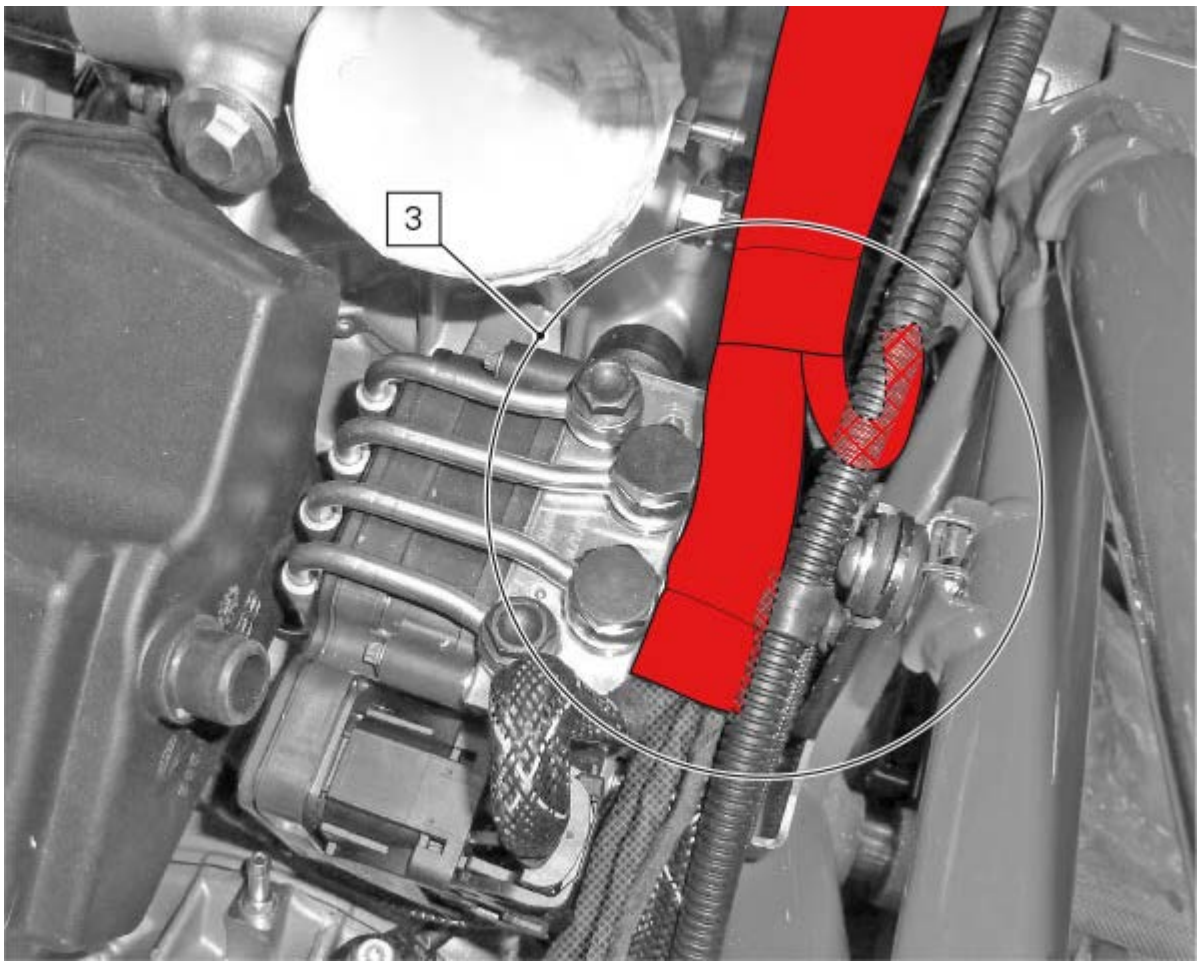
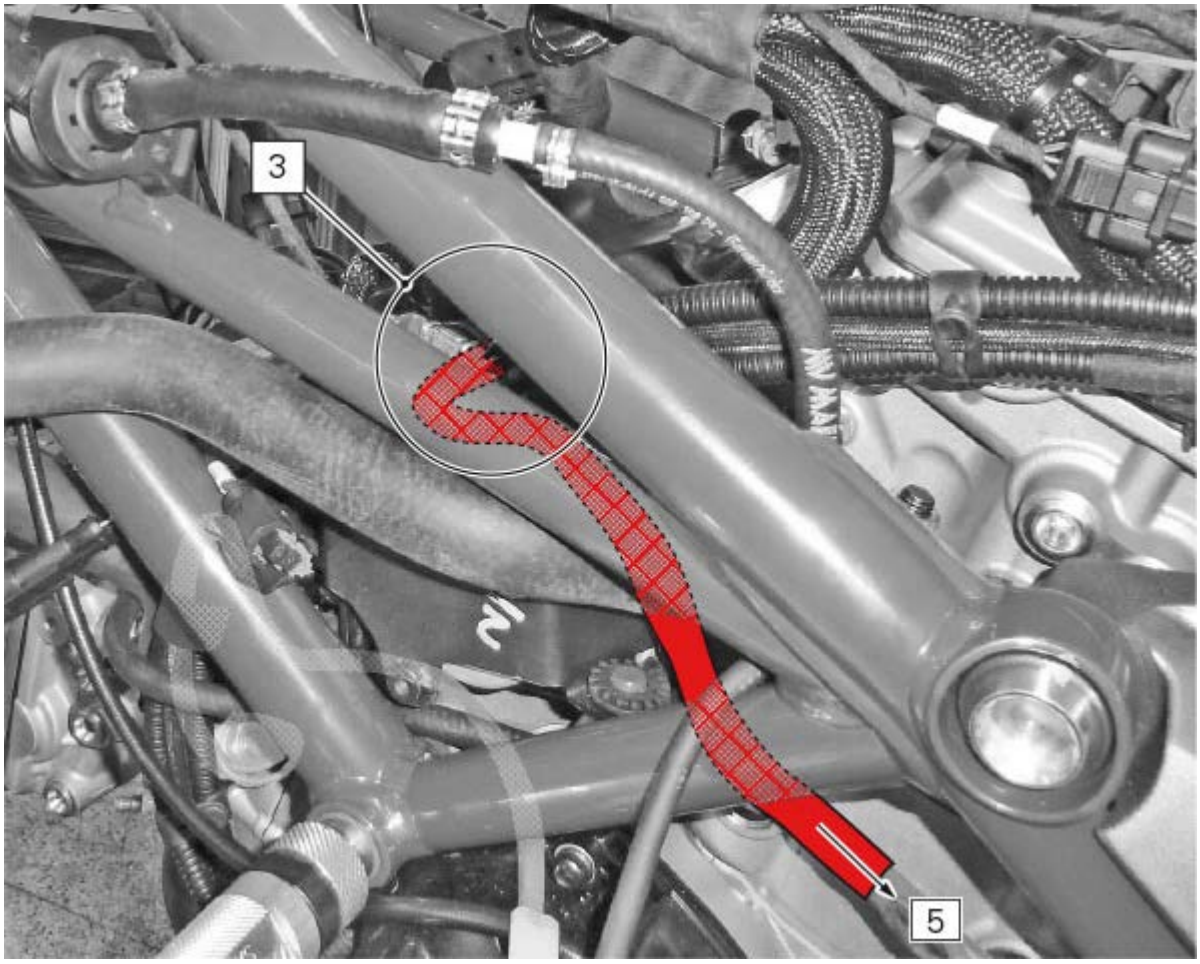


"ROUTING OF WIRING ON FRAME"

Branch 5





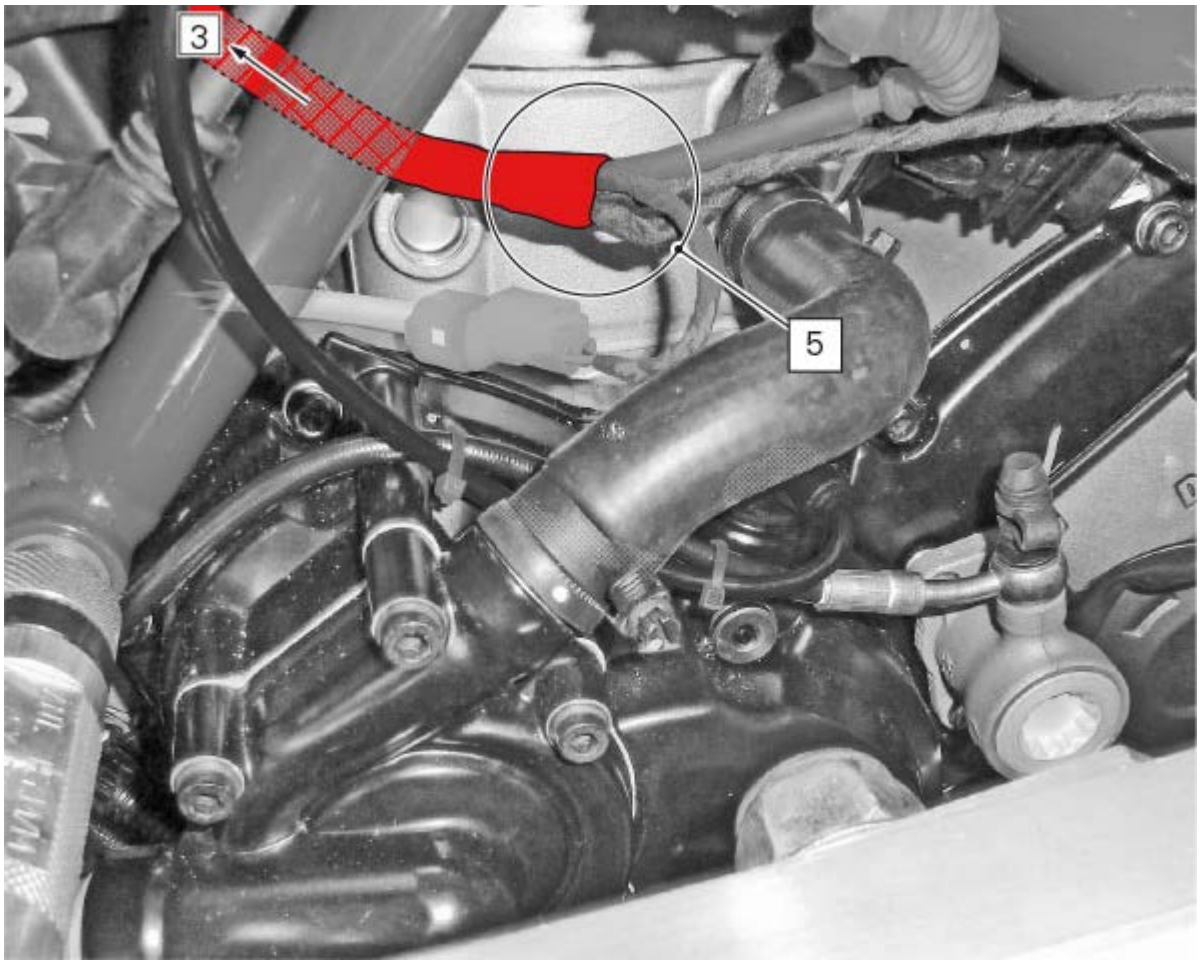
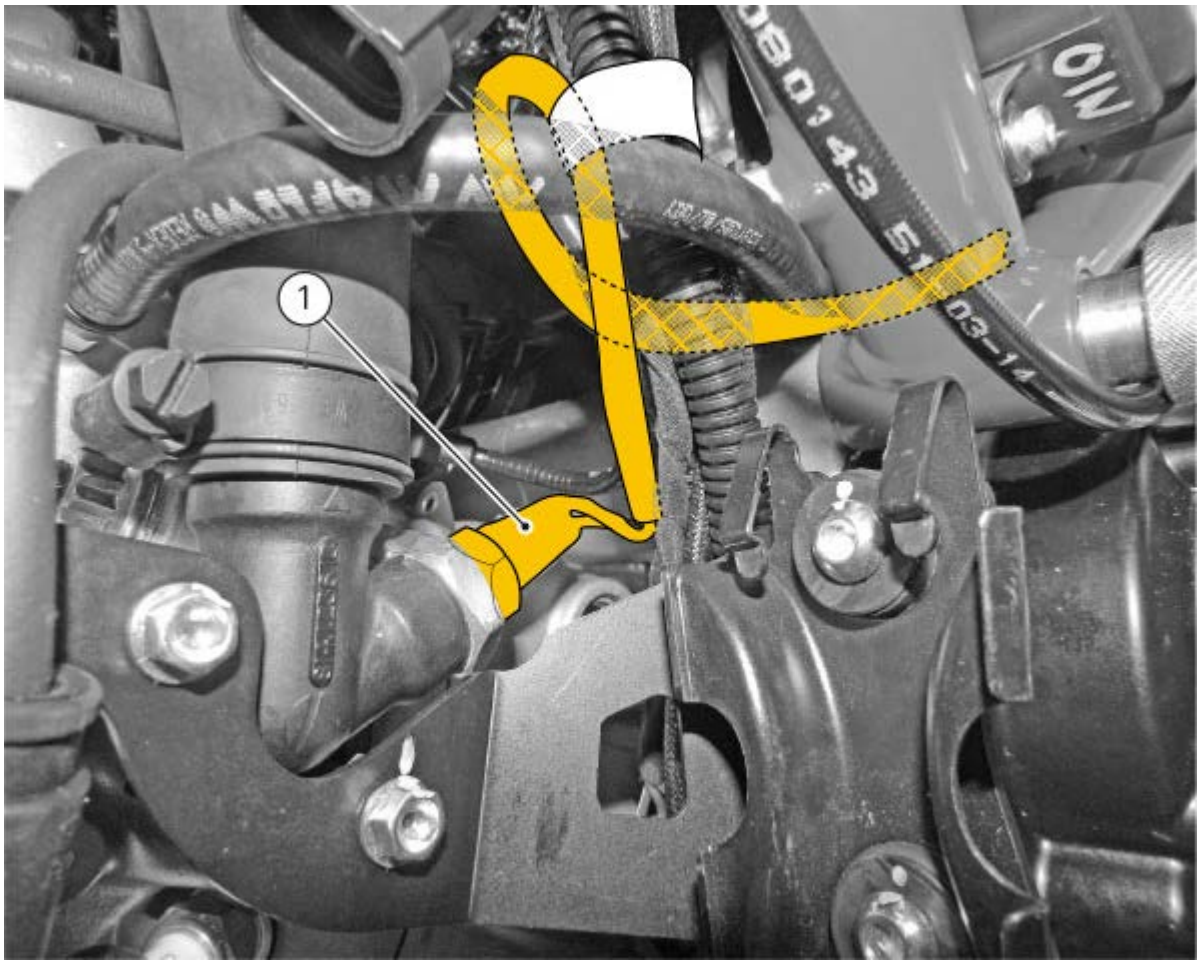
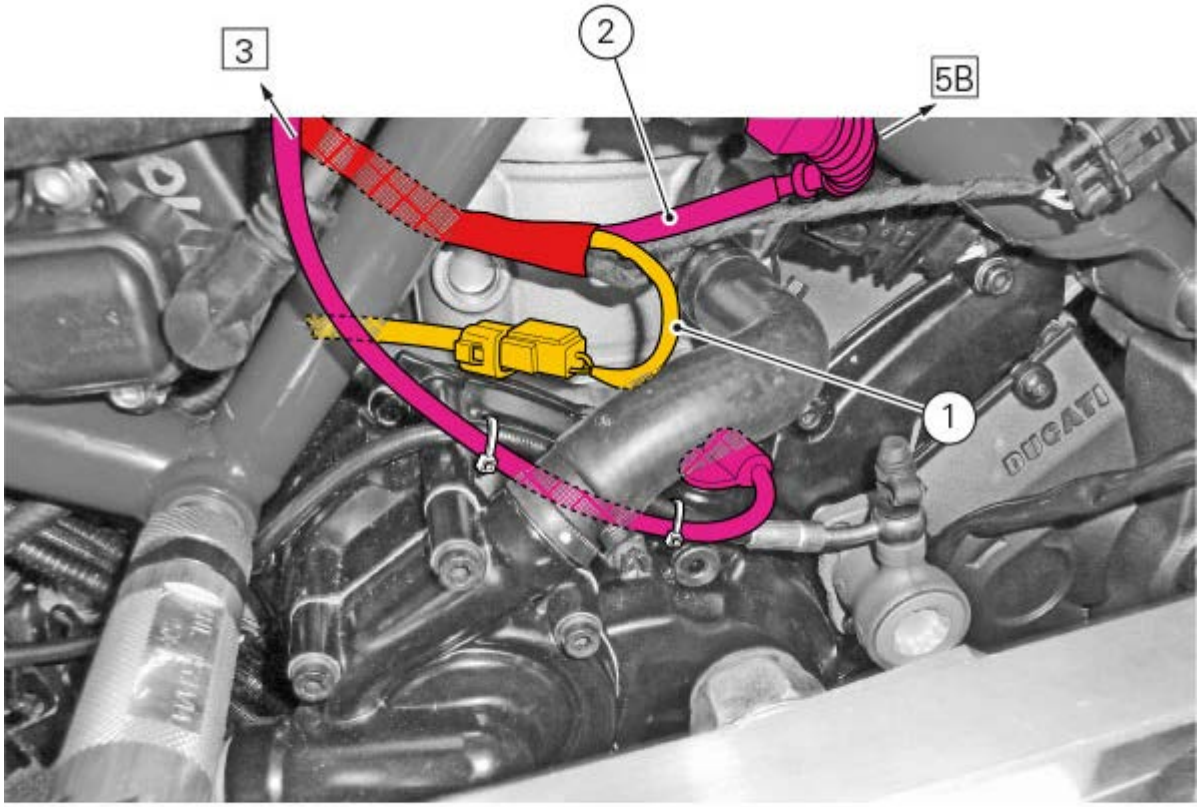


Table 5A

POS.	DESCRIPTION
1	Water temperature sensor cable
2	Pick-up cable


1


3
2
5B
1
DUCATI

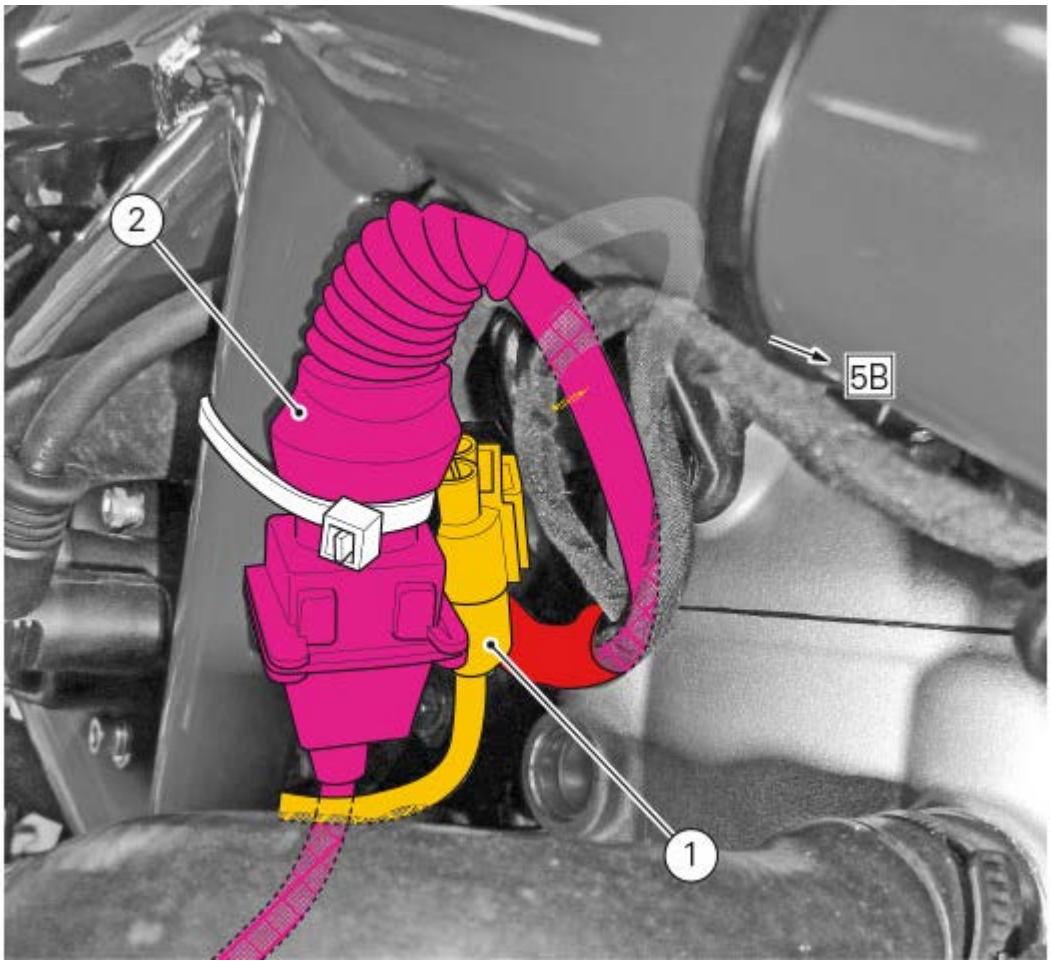
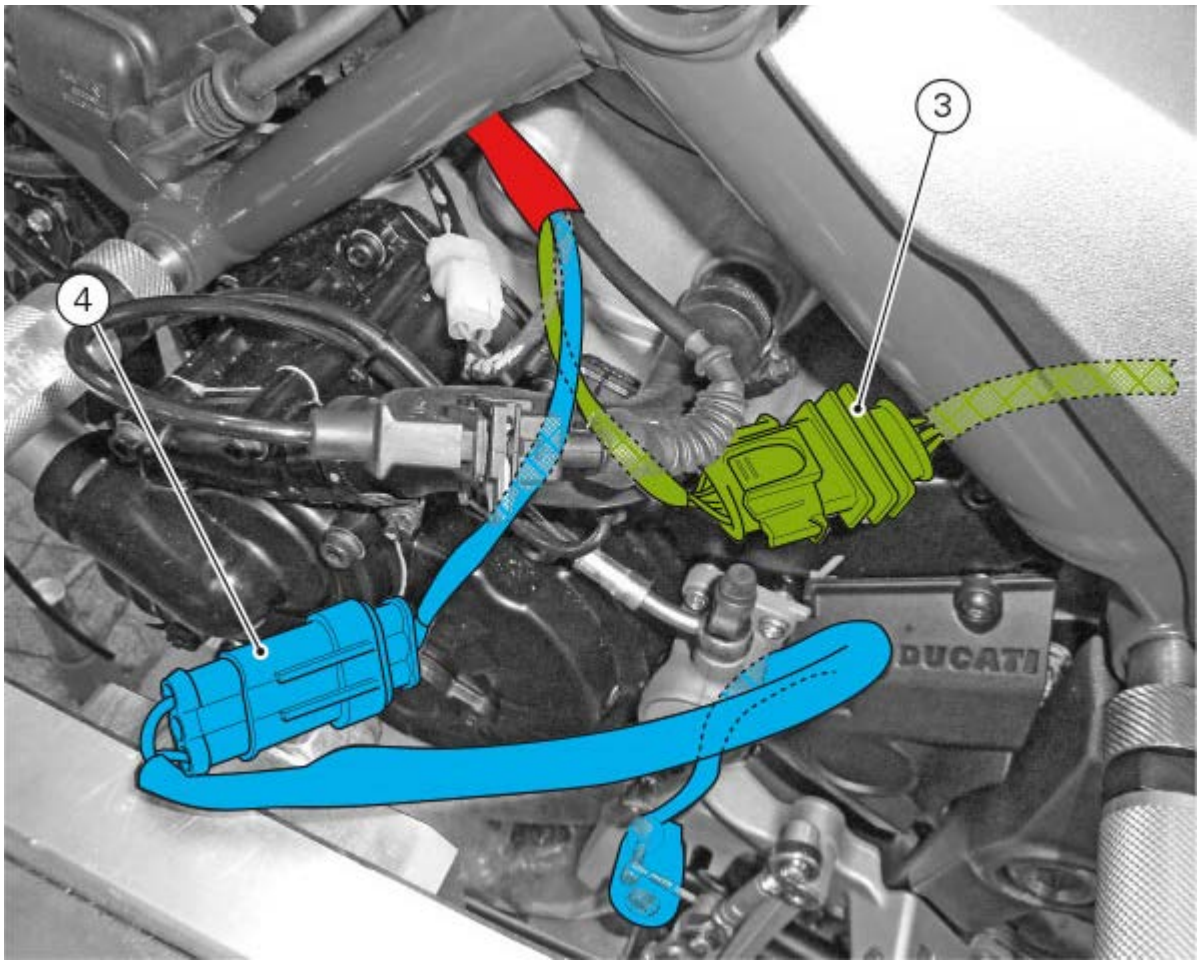
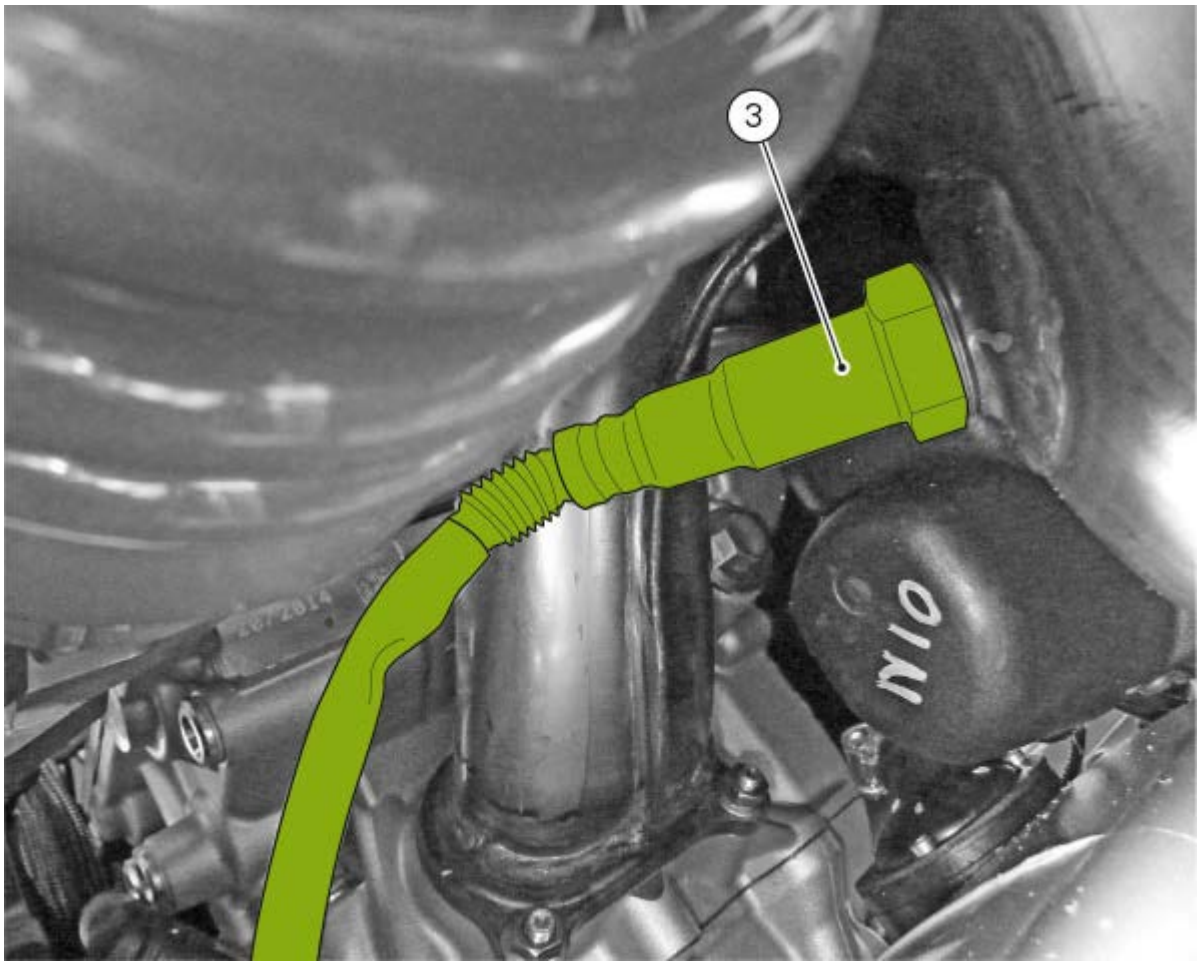
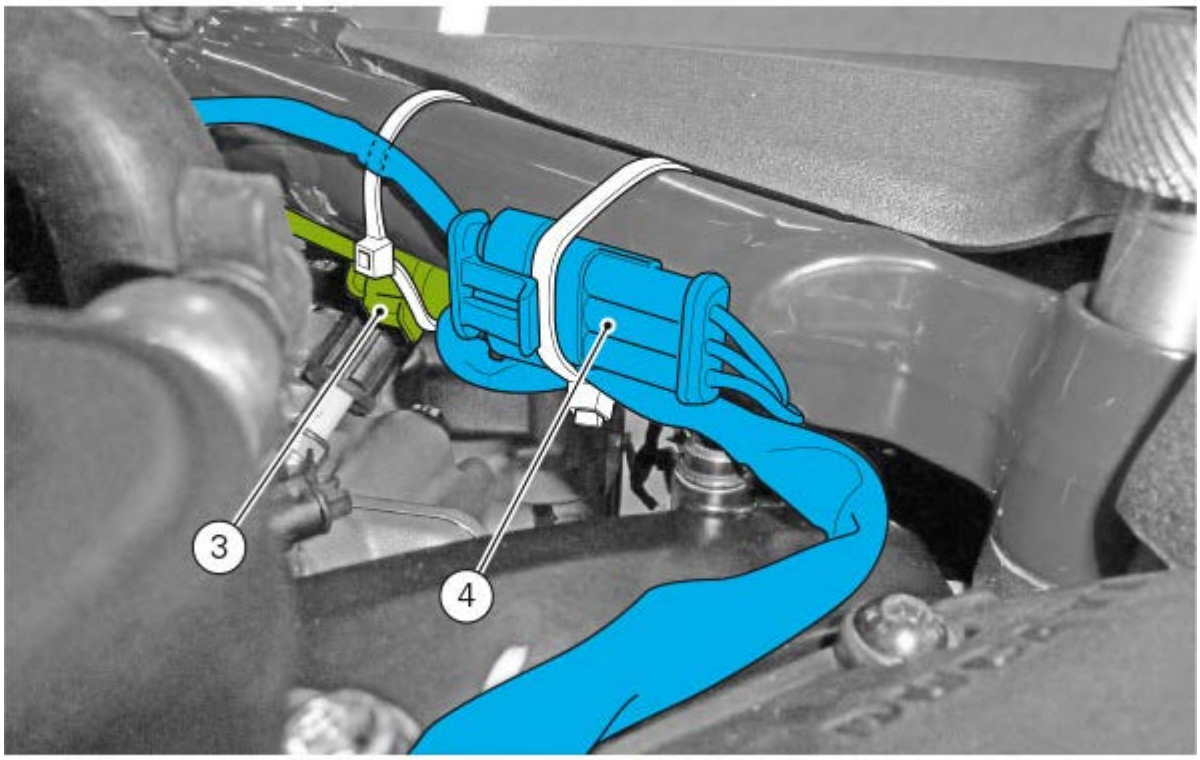


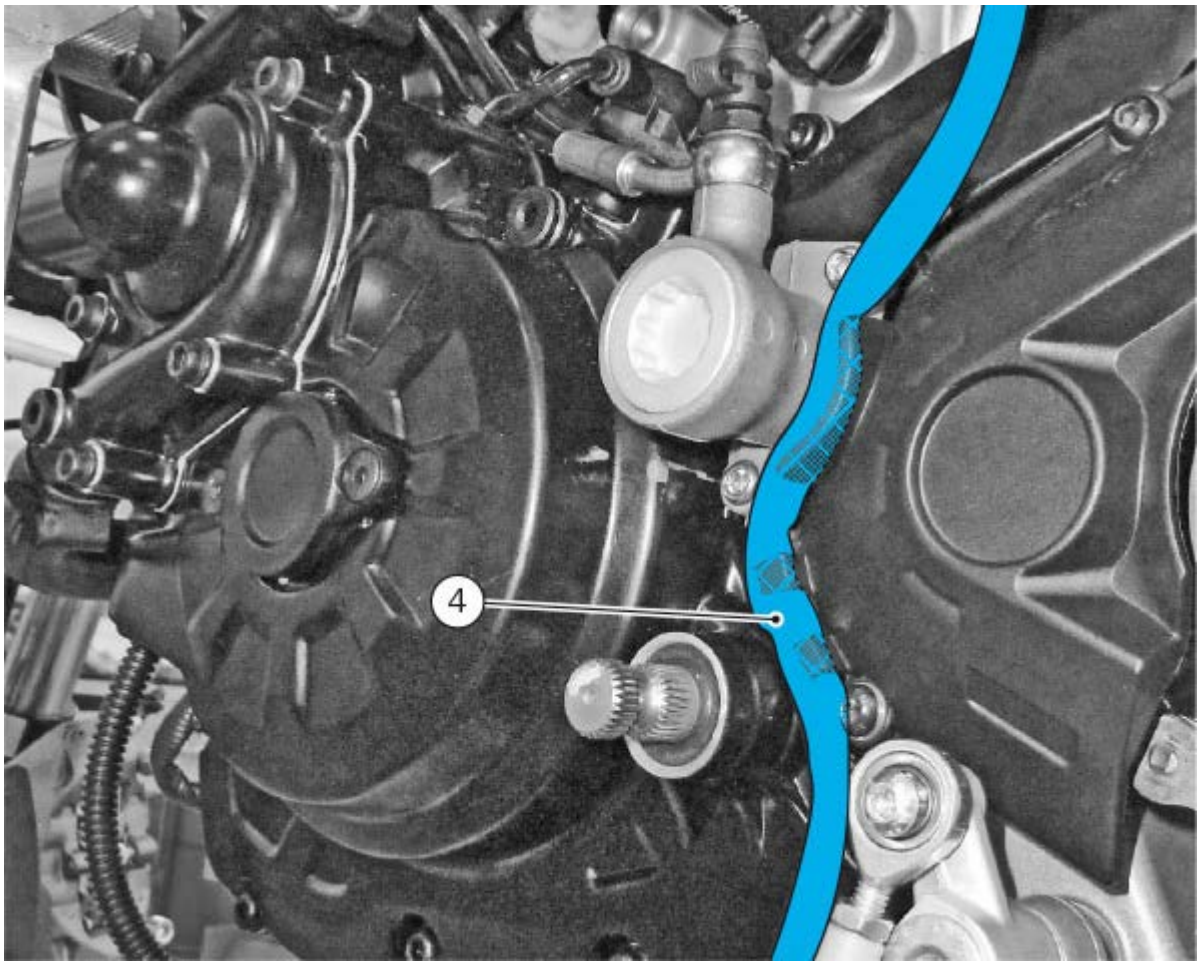
Table 5B

POS.	DESCRIPTION
3	Vertical oxygen sensor cable
4	Side stand cable


3
4
DUCATI


3
OIL



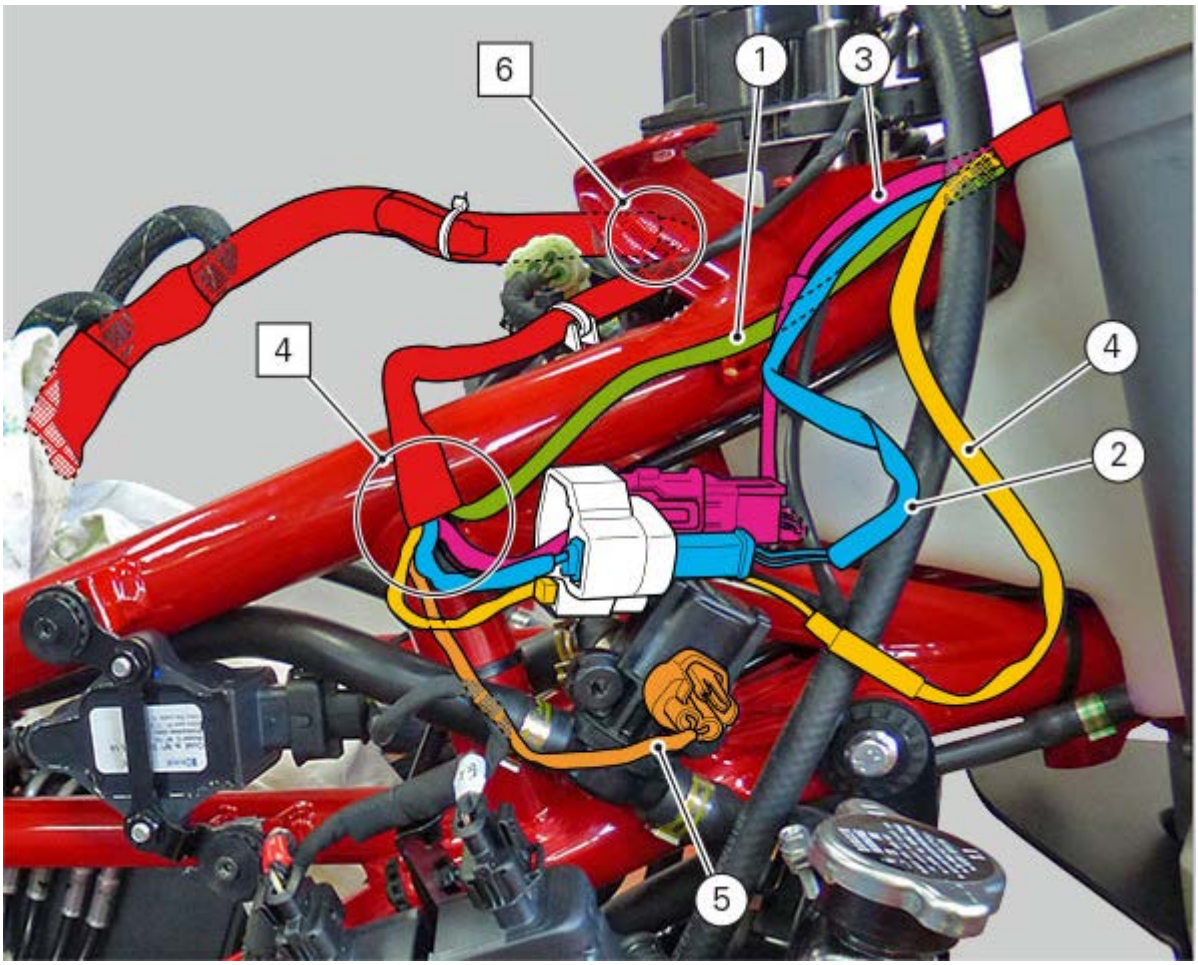


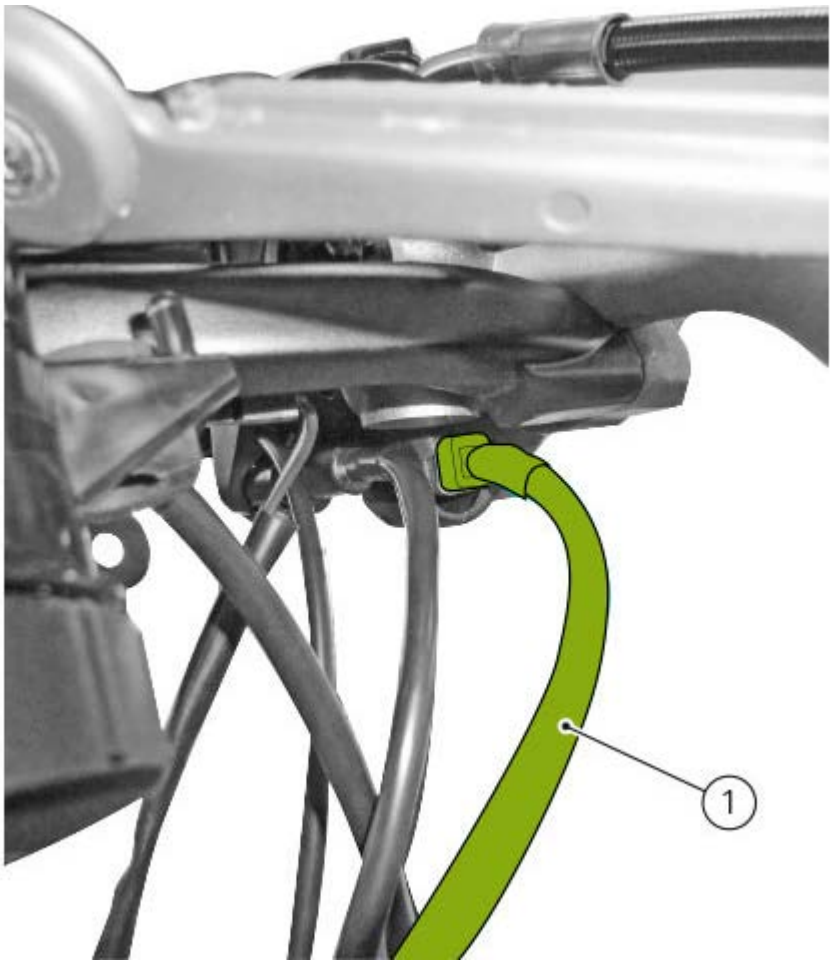
"ROUTING OF WIRING ON FRAME"

Branch 4

TABLE 4A

POS.	DESCRIPTION
1	RH switch cable
2	Front brake switch cable
3	Throttle control cable
4	Heated handgrip cable (IF ENABLED, ONLY)
5	Secondary air system valve cable





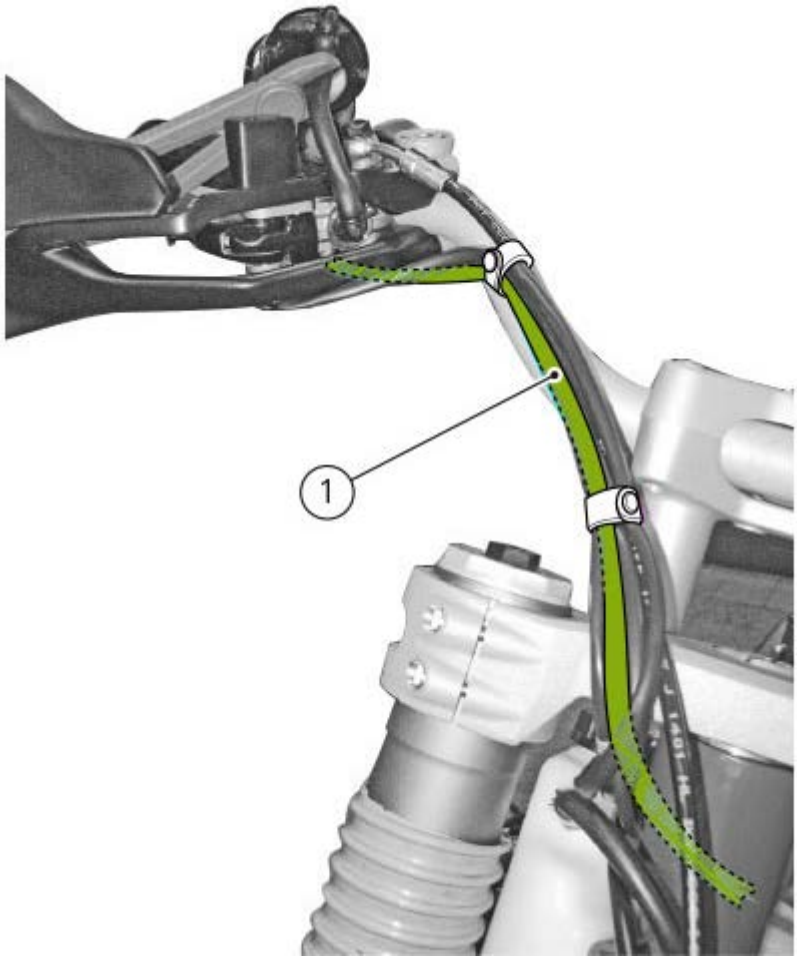
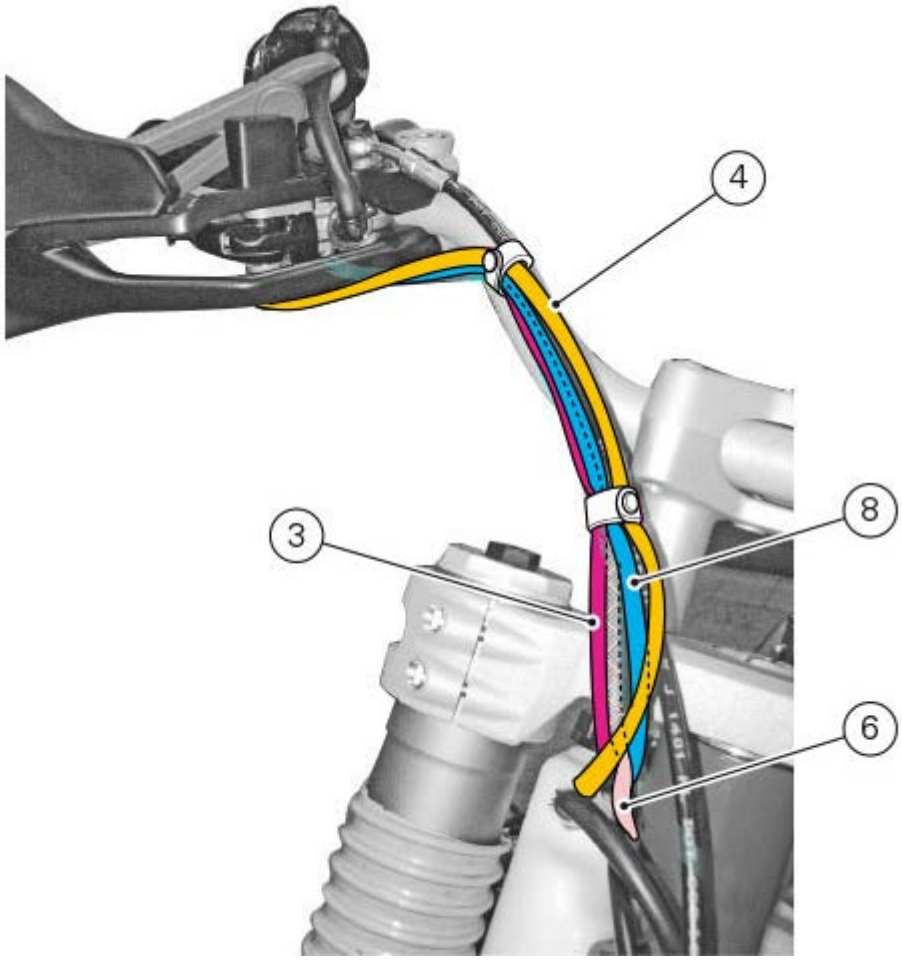
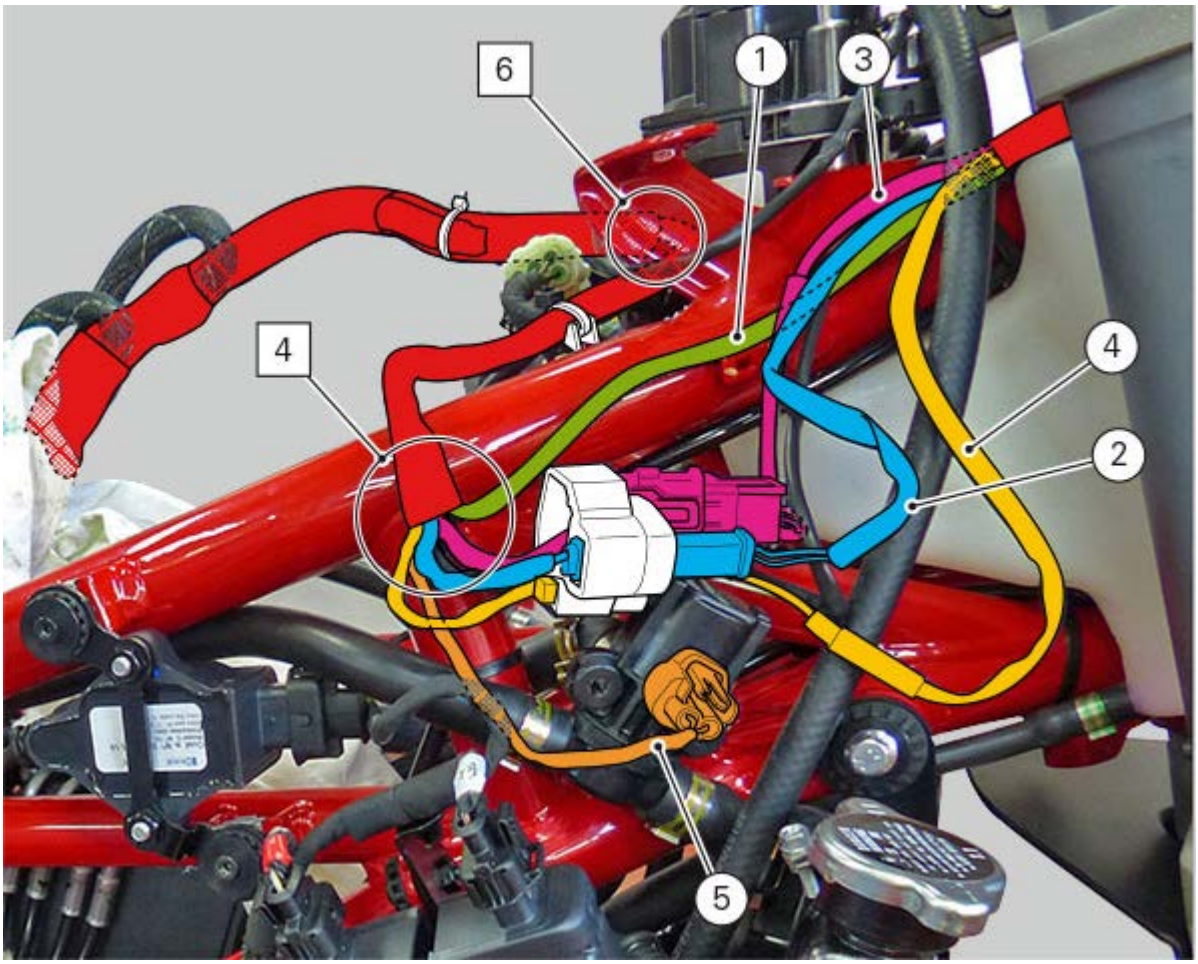


TABLE 4B

POS.	DESCRIPTION

2	Front brake switch cable
3	Throttle control cable
4	Heated handgrip cable (IF ENABLED, ONLY)
6	Right turn indicator cable



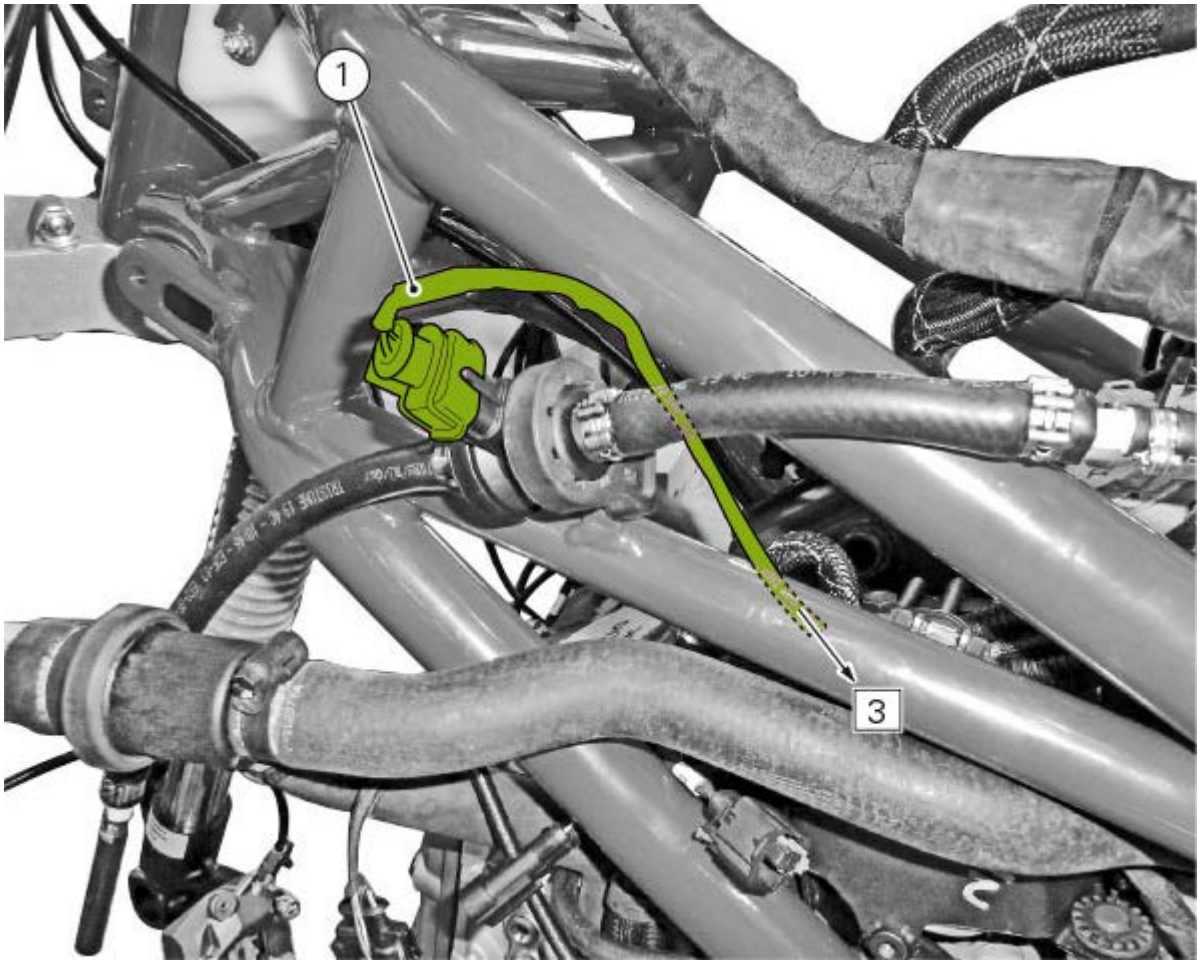


"ROUTING OF WIRING ON FRAME"

Branch 3

Table 3A

POS.	DESCRIPTION
1	Purge valve cable



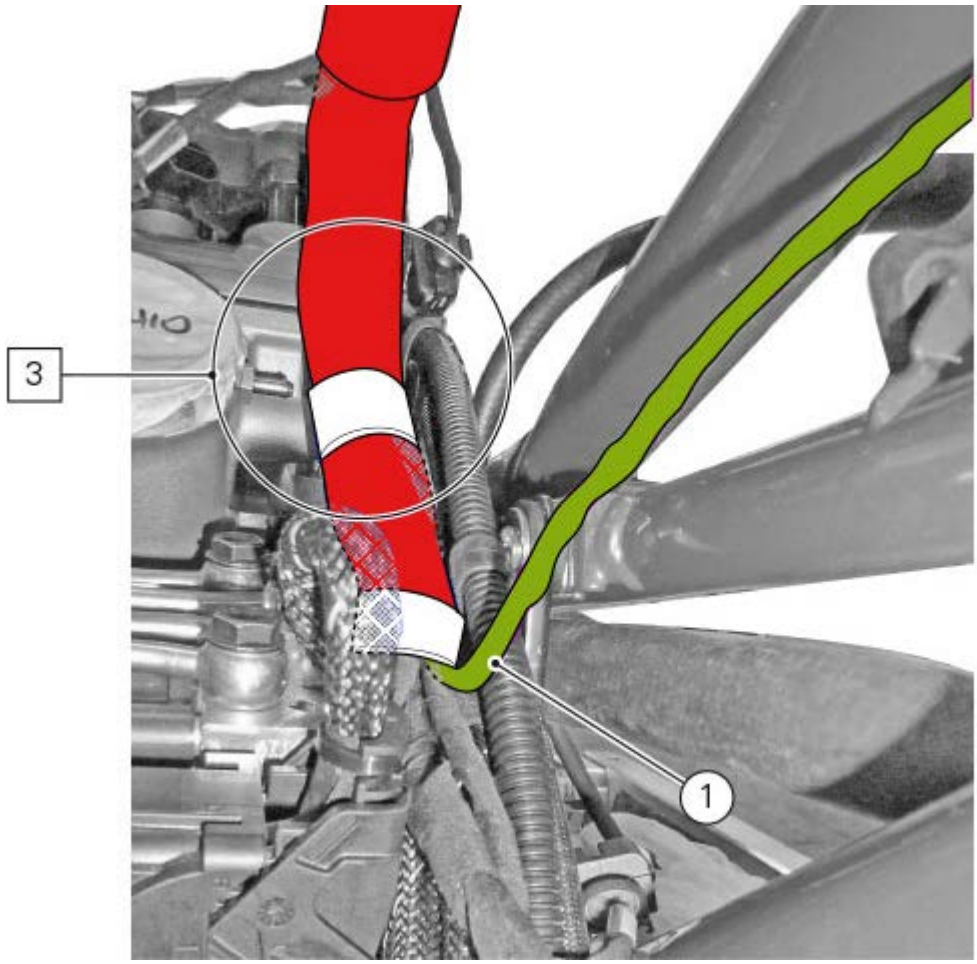
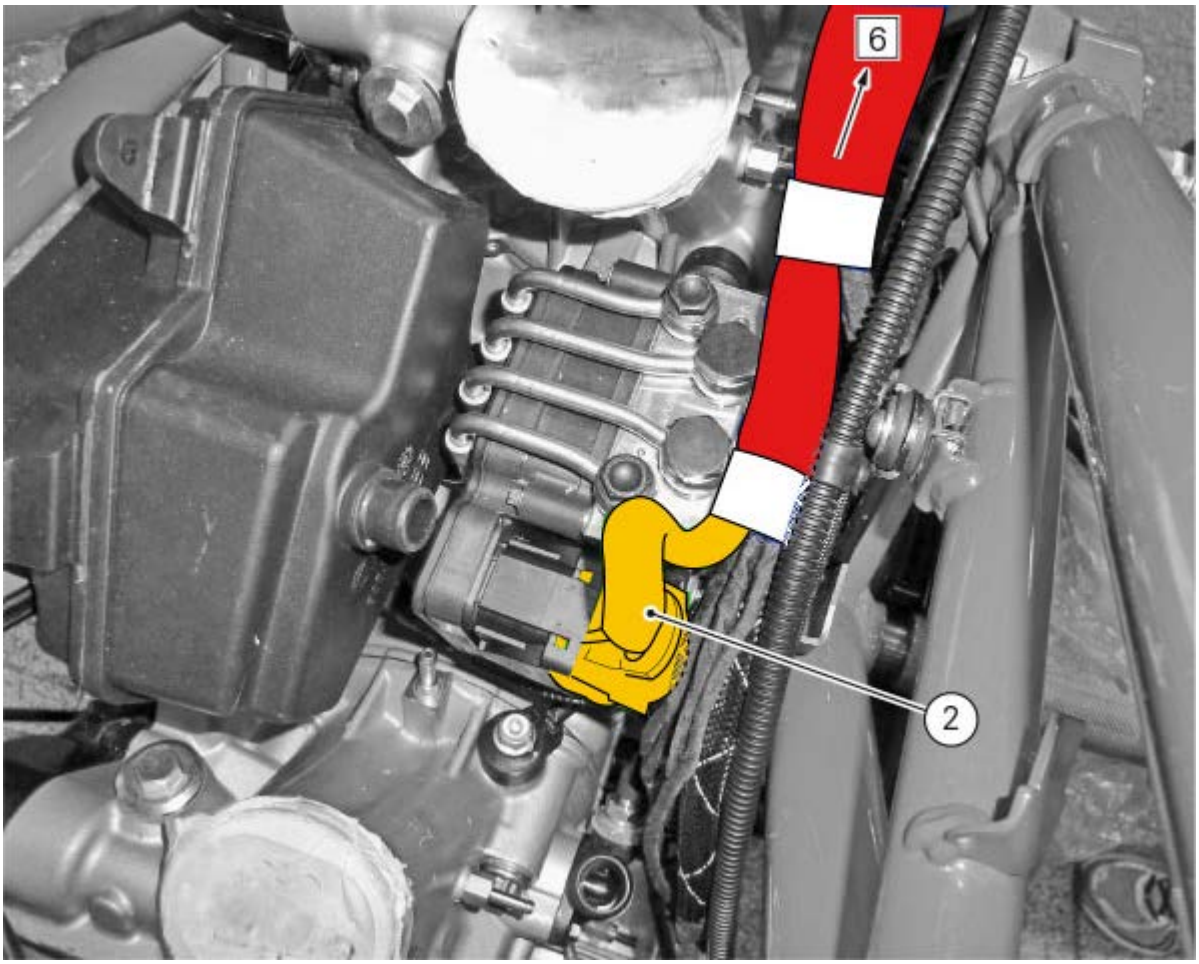


Table 3B

POS.	DESCRIPTION
2	ABS control unit cable



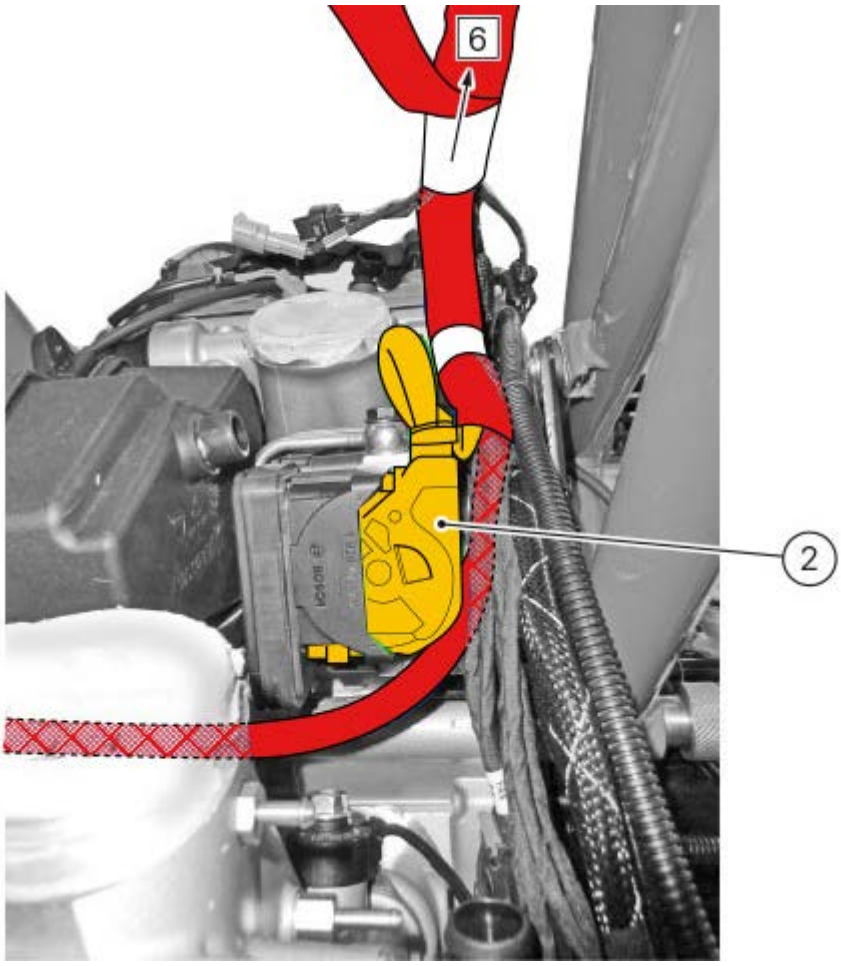
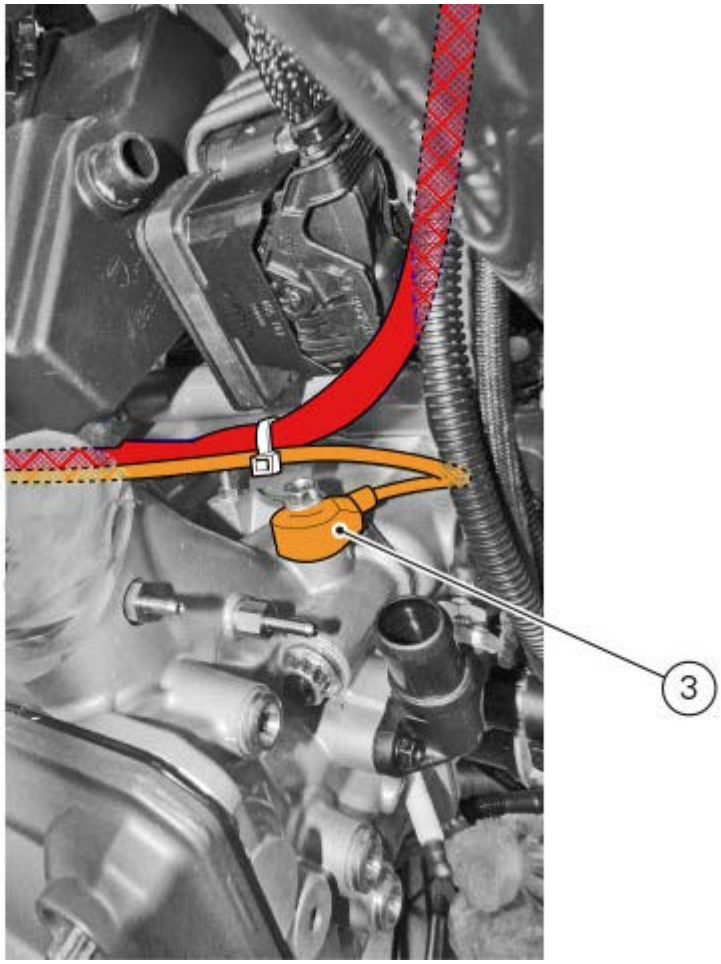
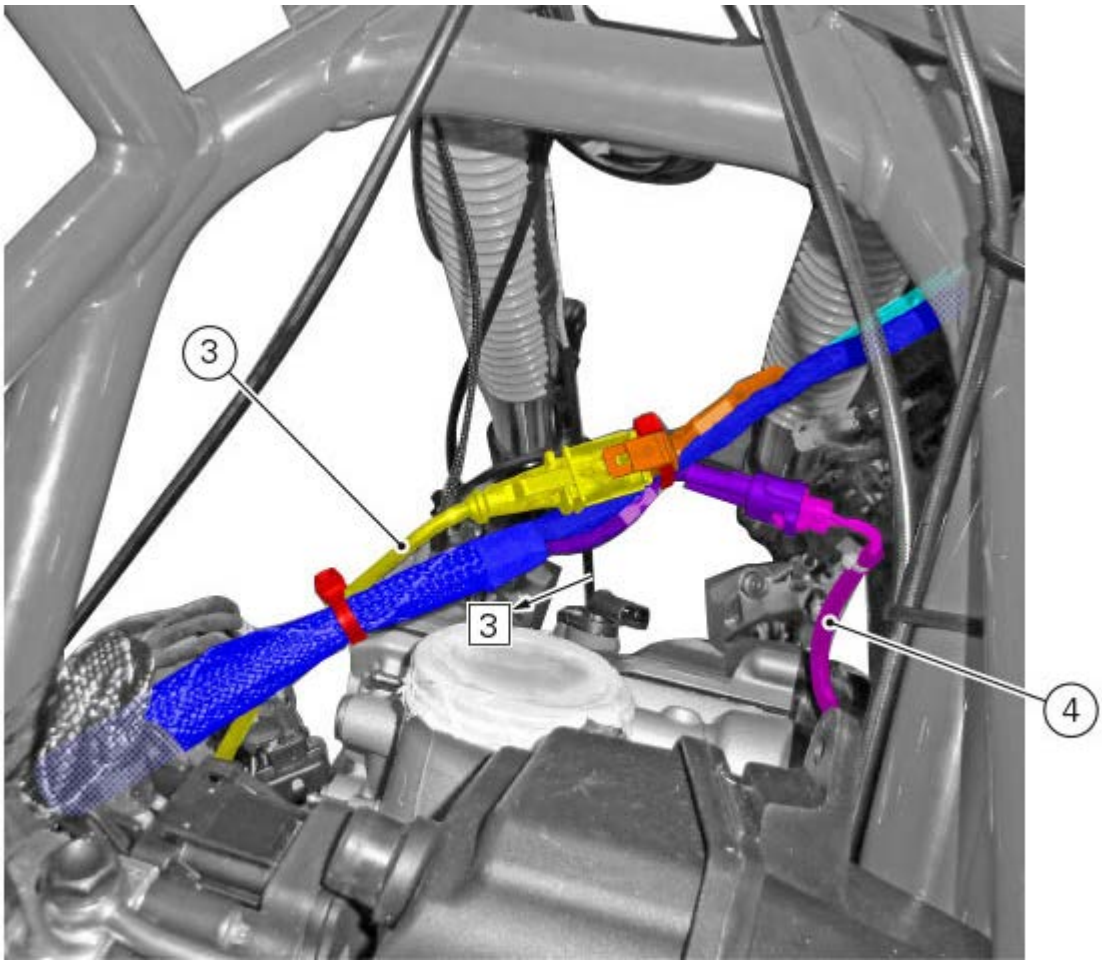


Table 3C

POS.	DESCRIPTION

3	Horizontal head knock sensor cable
4	Intake side horizontal head timing regulator cable
5	Intake side horizontal head timing check cable





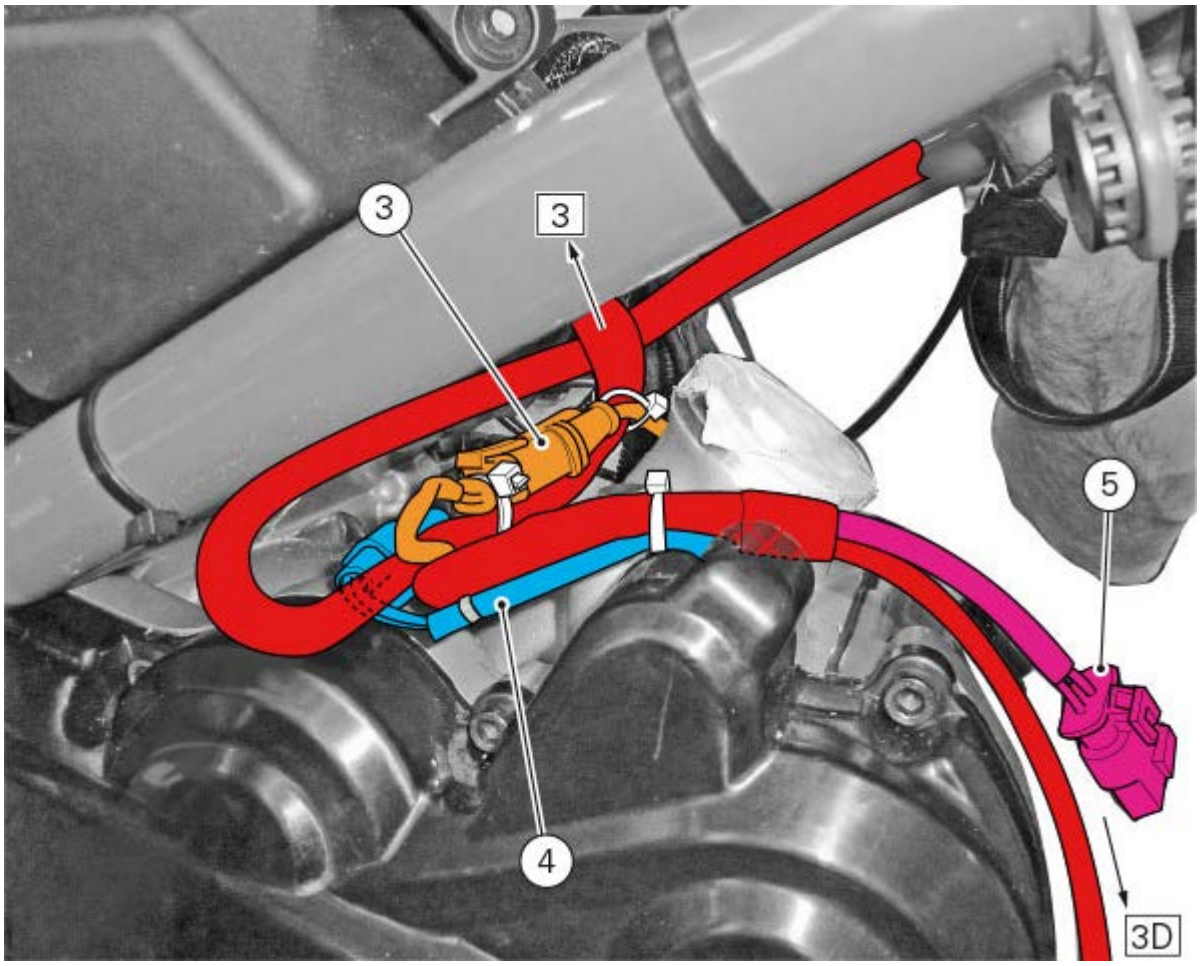
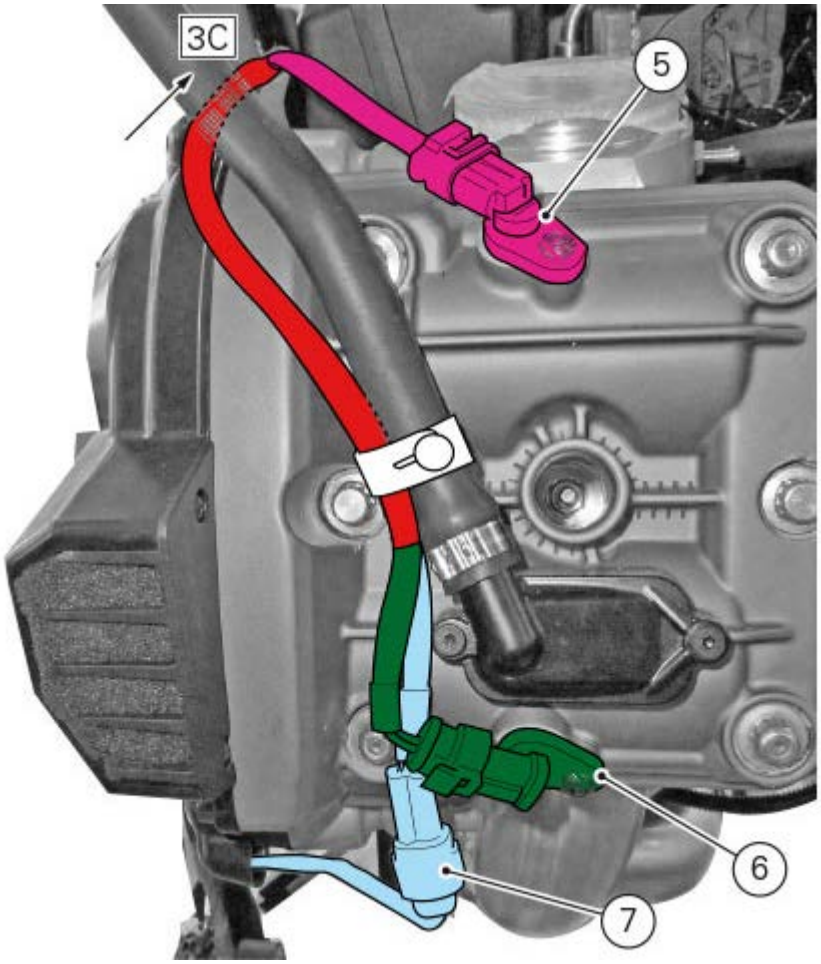


Table 3D

POS.	DESCRIPTION

5	Intake side horizontal head timing check cable
6	Exhaust side horizontal head timing check cable
7	Exhaust side horizontal head timing regulator cable



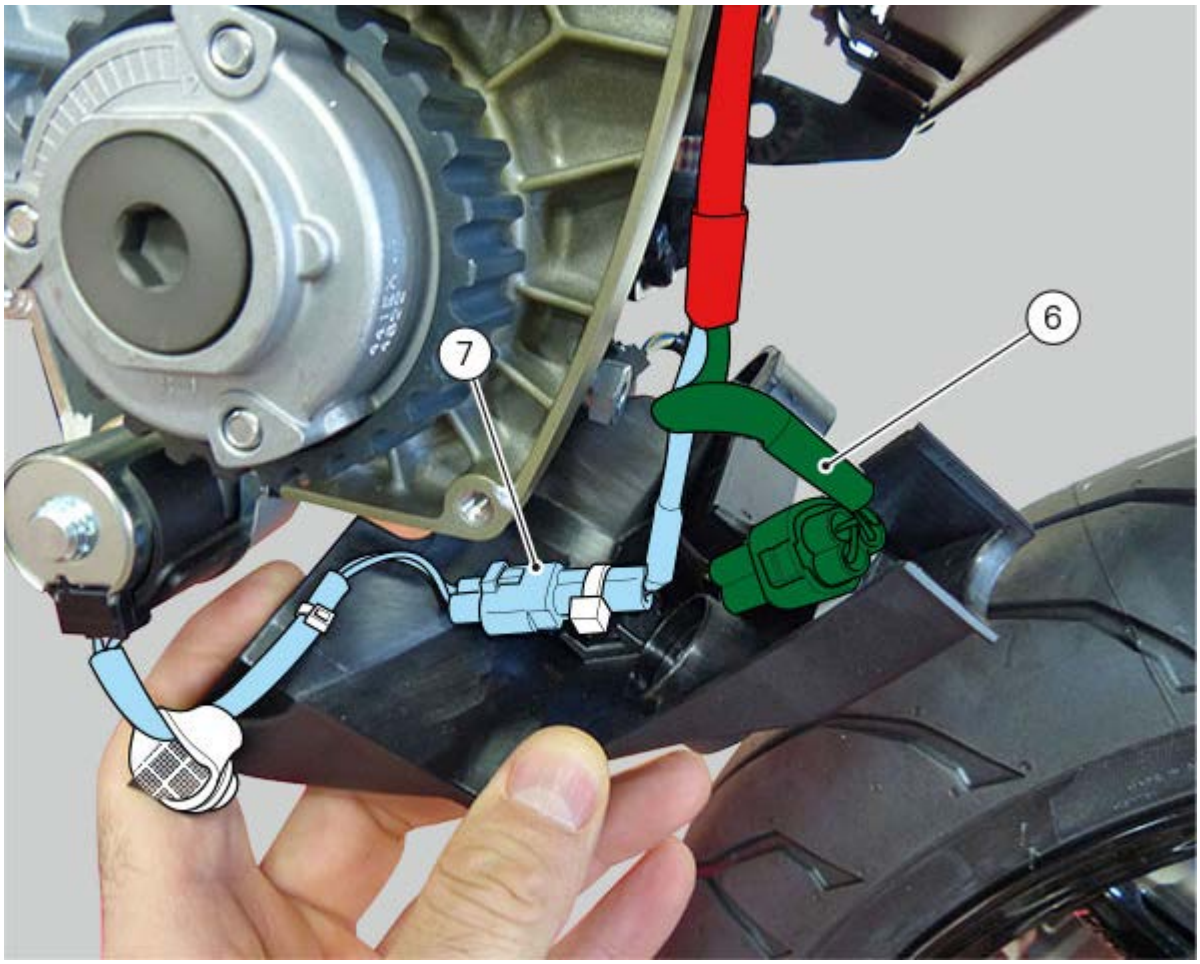
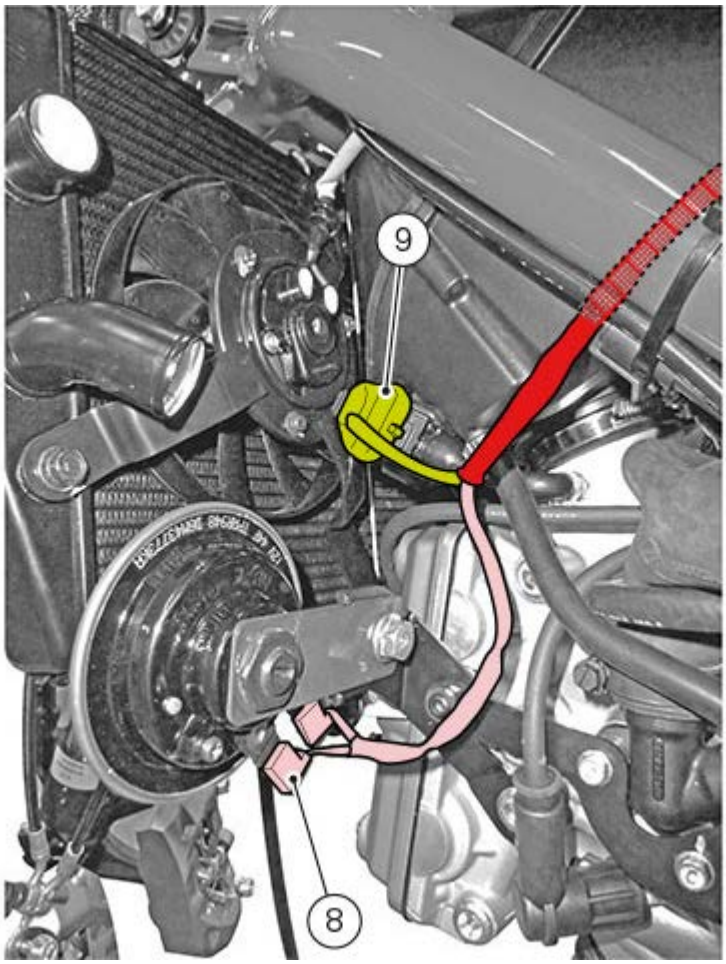


Table 3E

POS.	DESCRIPTION
8	Horn cable
9	Horizontal map sensor cable



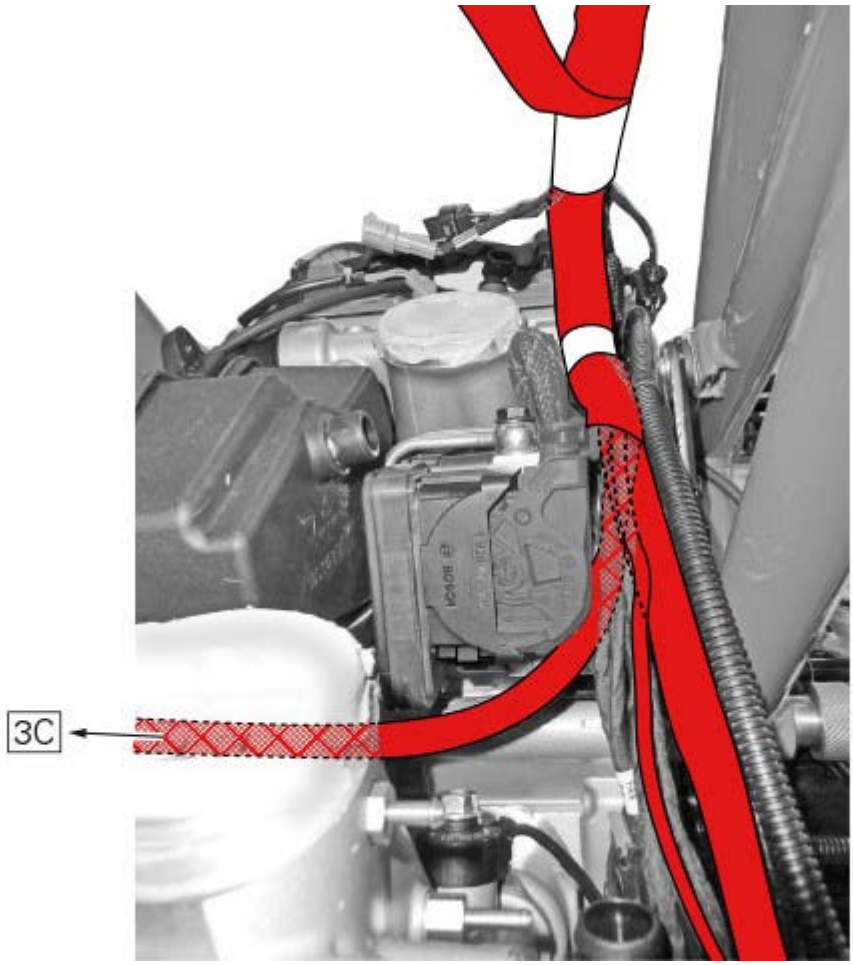
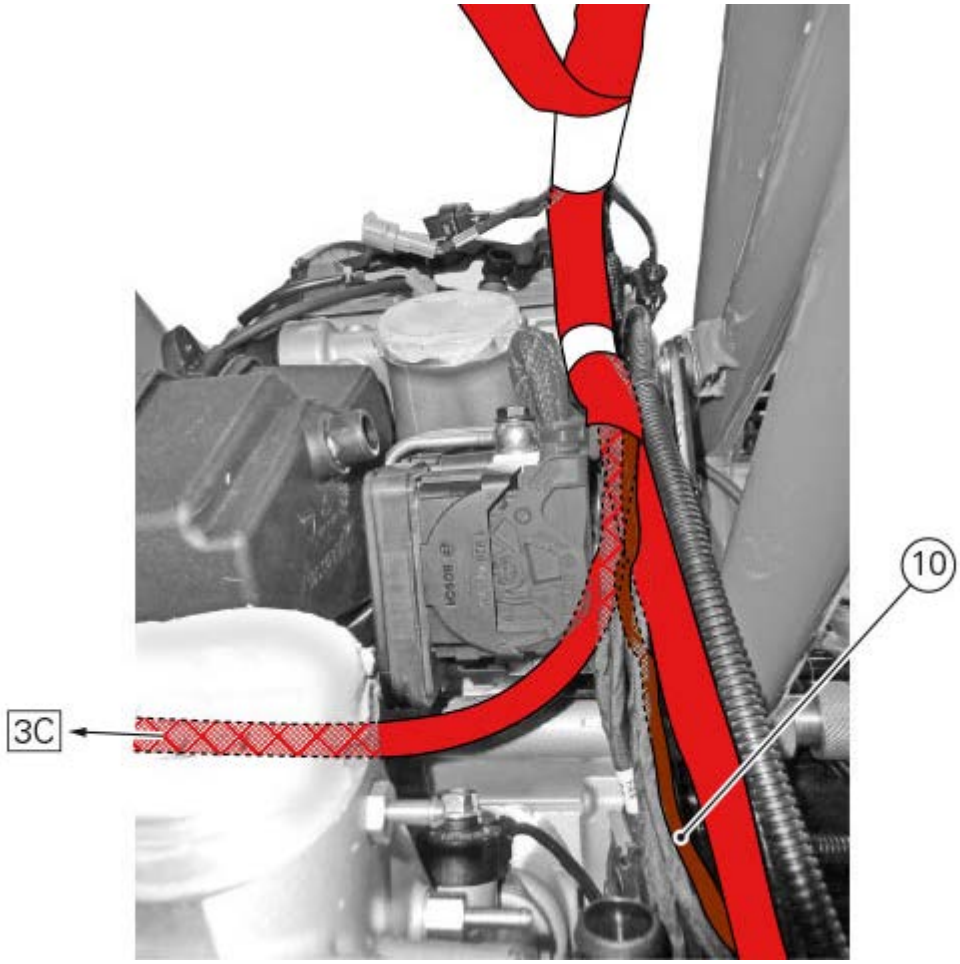
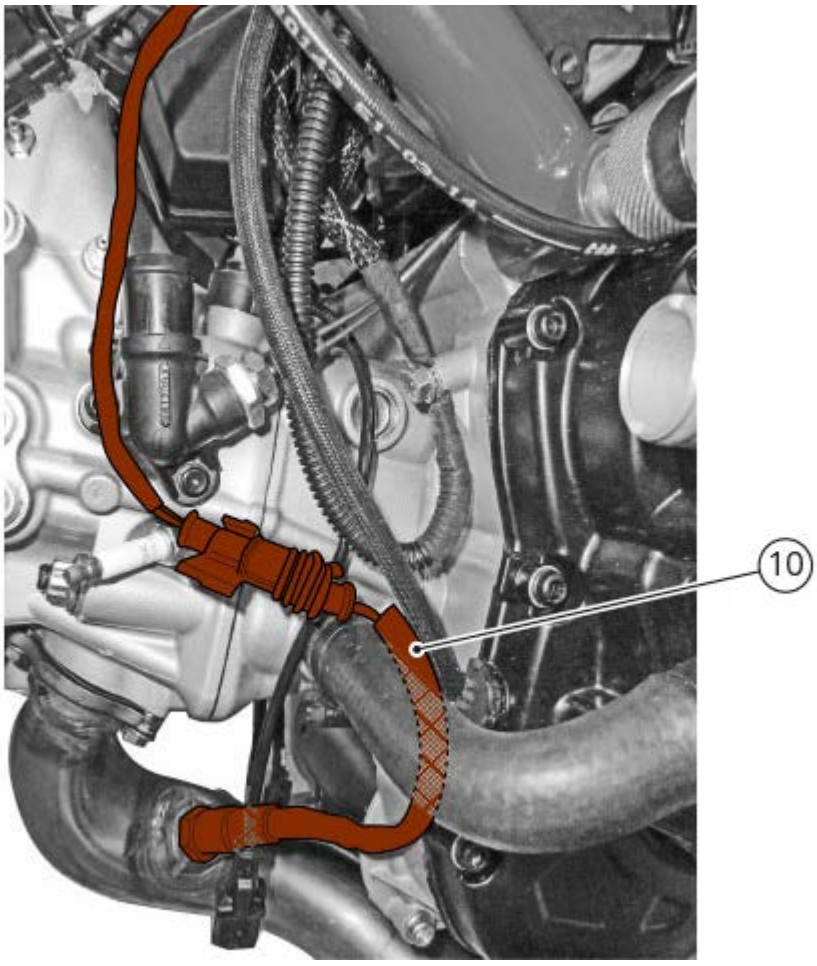


Table 3F

POS.	DESCRIPTION

10	Horizontal oxygen sensor cable





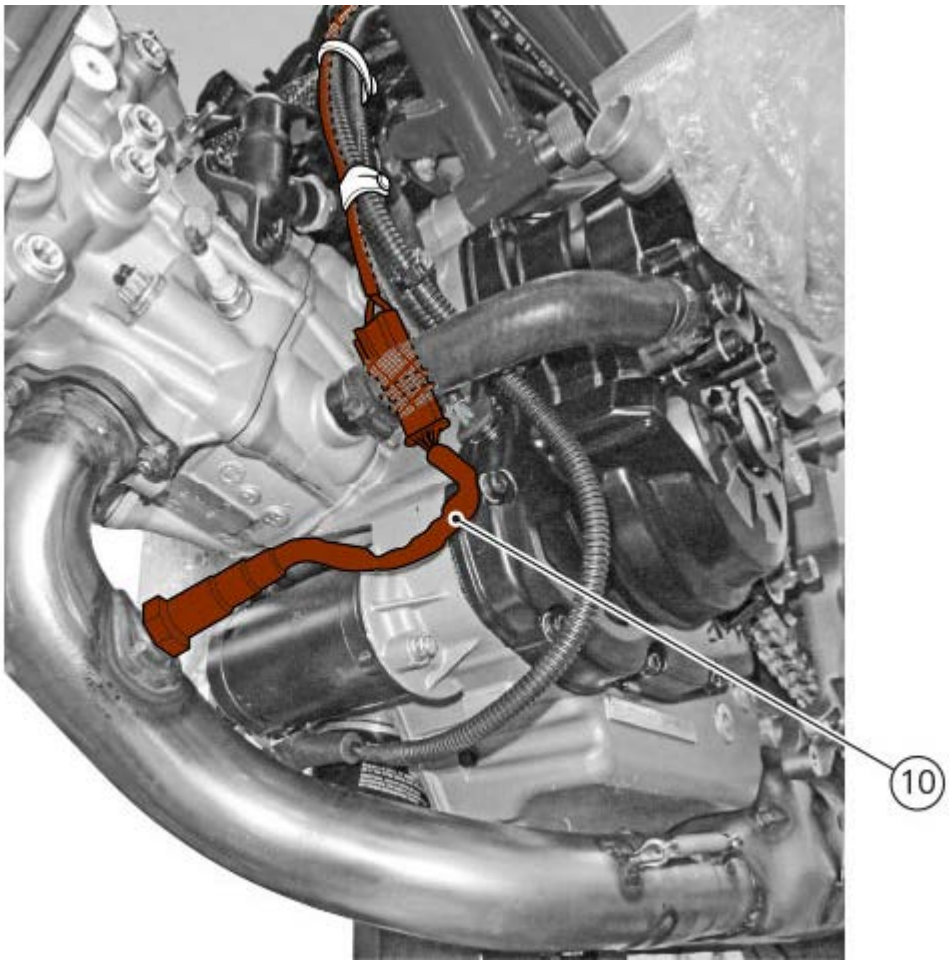
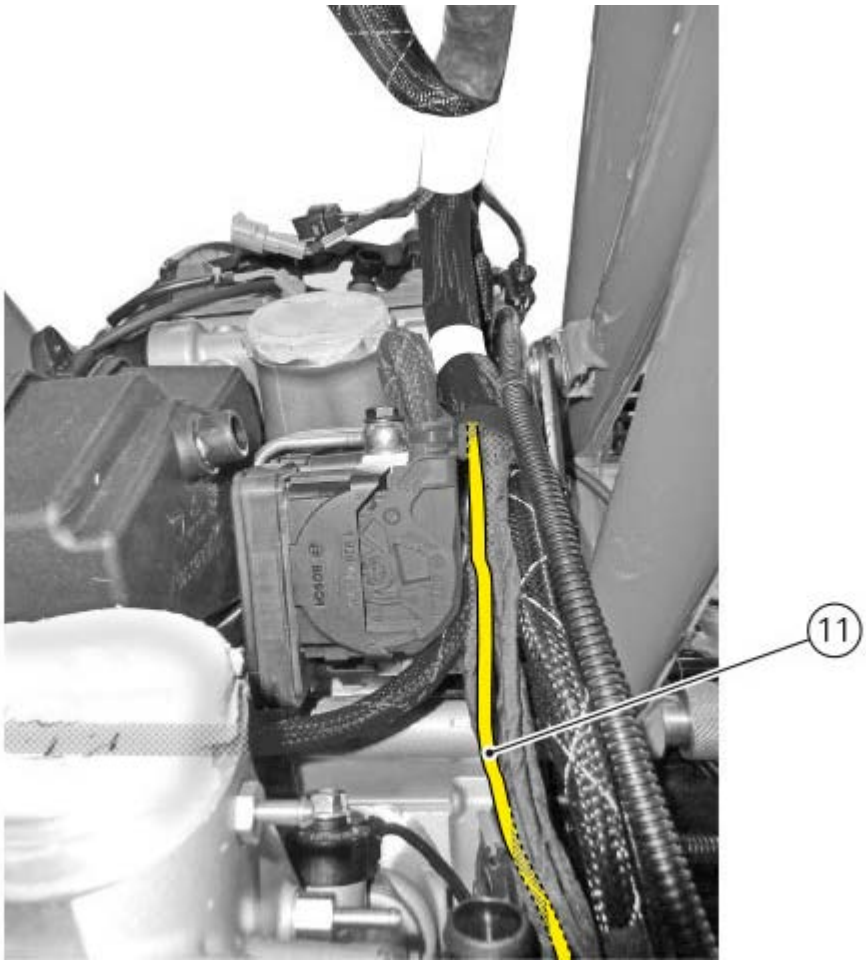


Table 3G

POS.	DESCRIPTION
11	LH fan cable



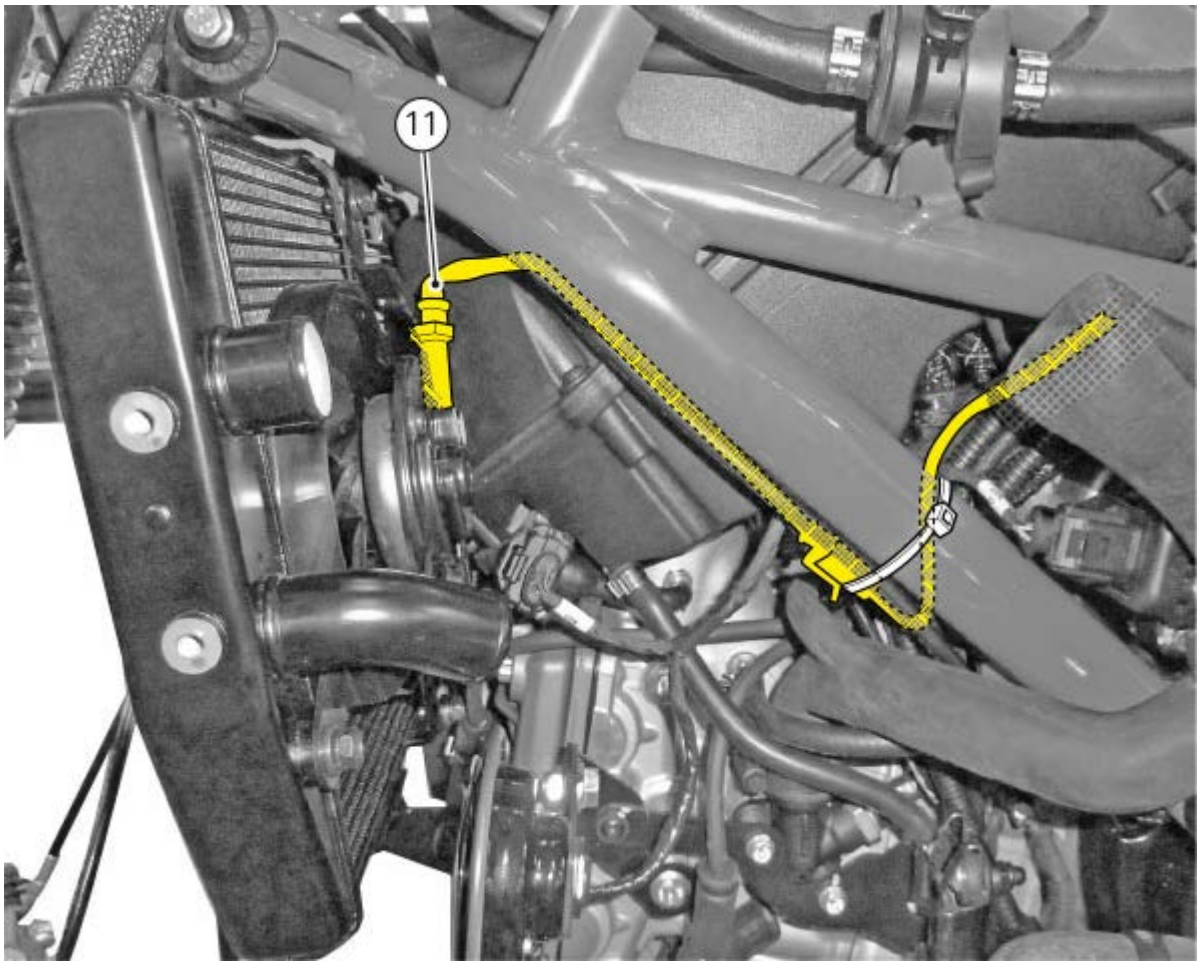
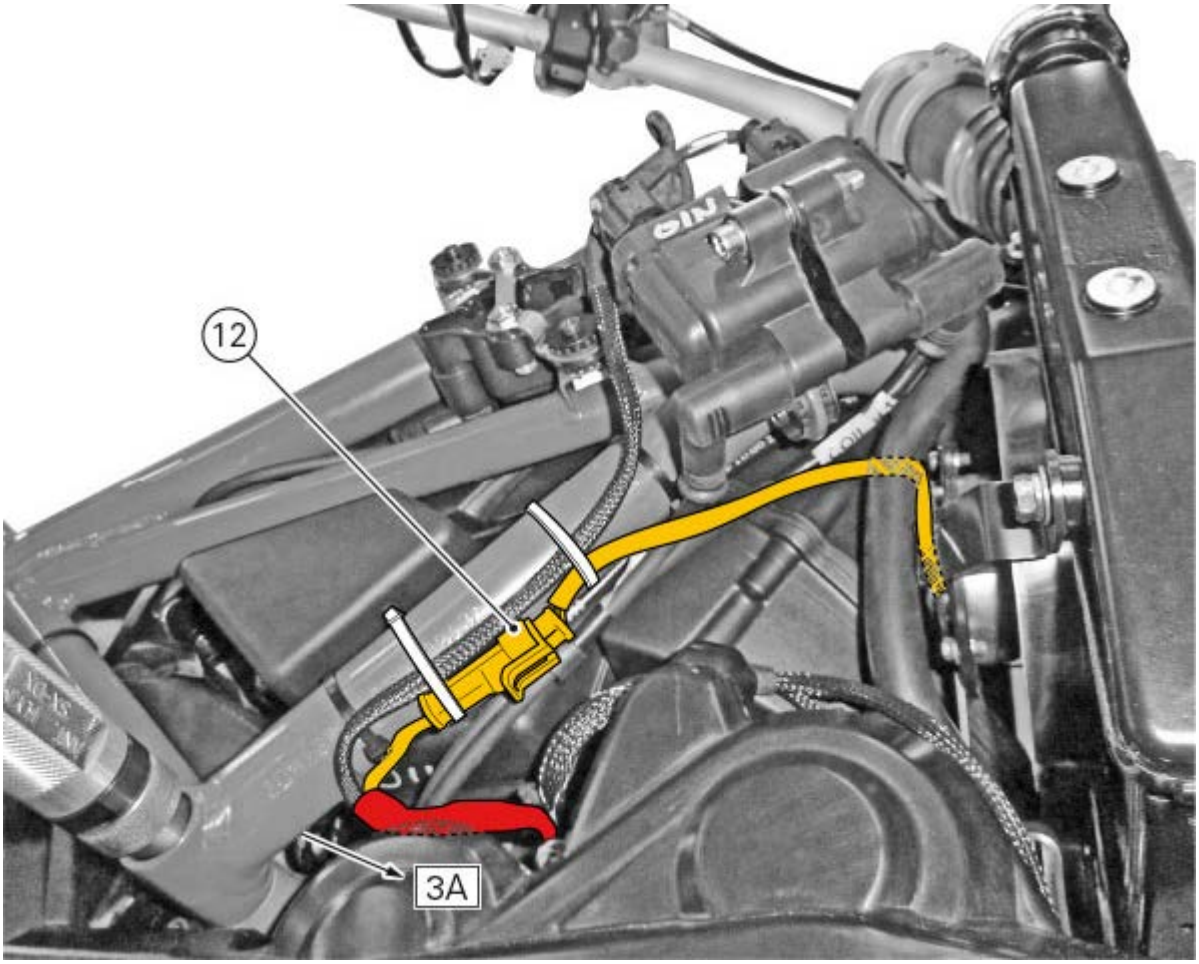


Table 3H

POS.	DESCRIPTION

12	RH fan cable

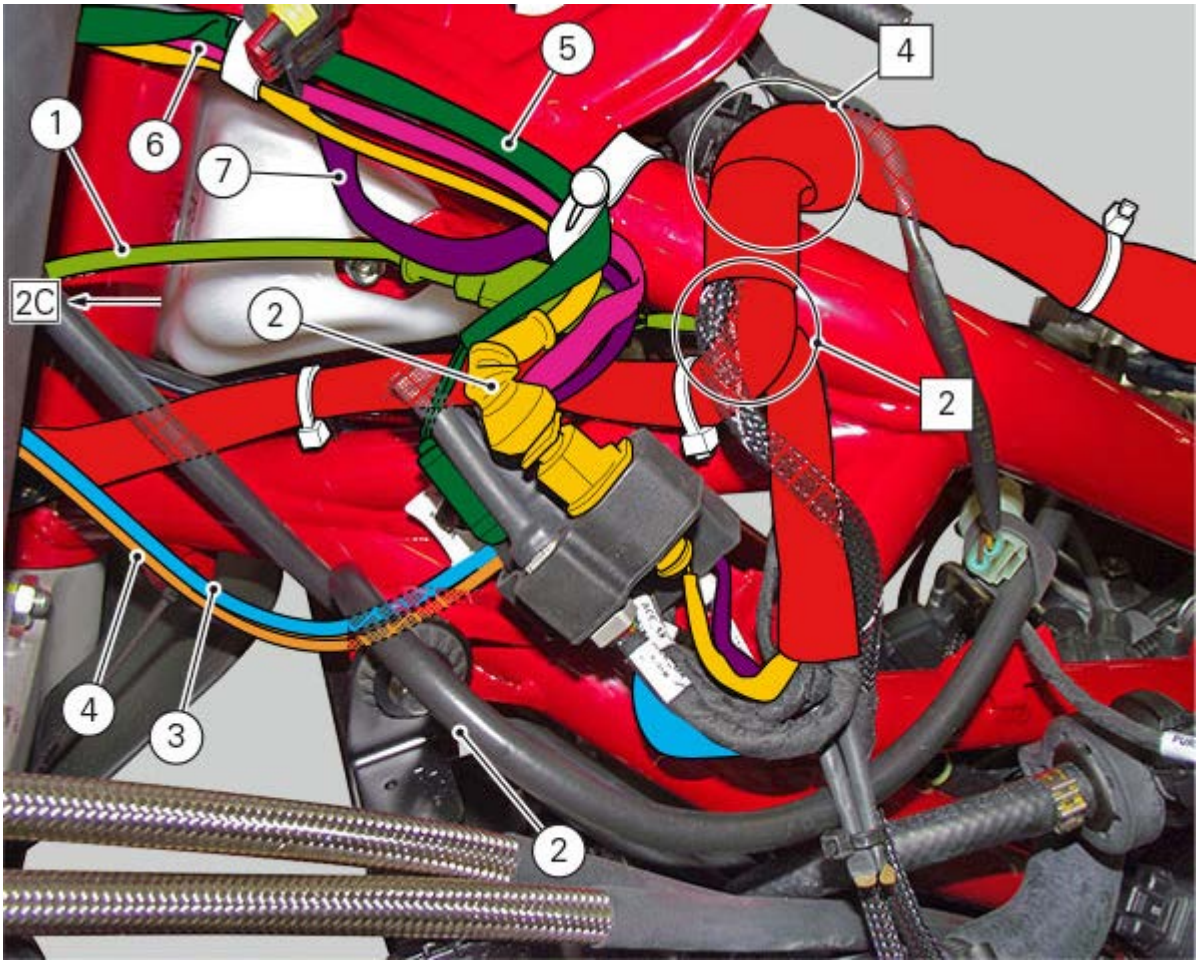


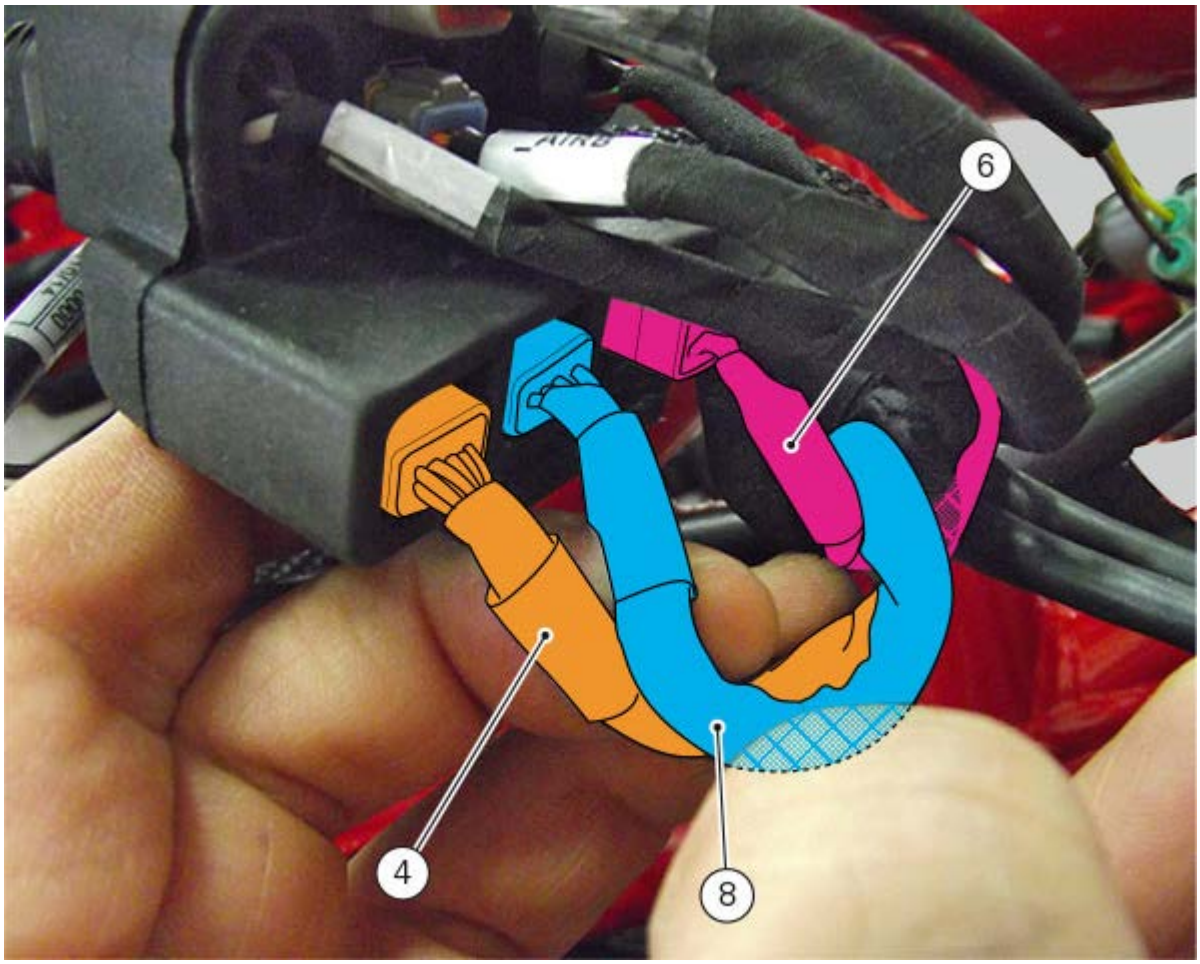
"ROUTING OF WIRING ON FRAME"

Branch 2

Table 2A

POS.	DESCRIPTION
1	Front speed sensor cable
2	Front suspension cable (FOR S VERSION, ONLY)
3	Front wheel accelerometer cable (FOR S VERSION, ONLY)
4	Frame accelerometer cable (FOR S VERSION, ONLY)
5	Clutch switch cable
6	Heated handgrip cable (IF ENABLED, ONLY)
7	Turn indicator cable





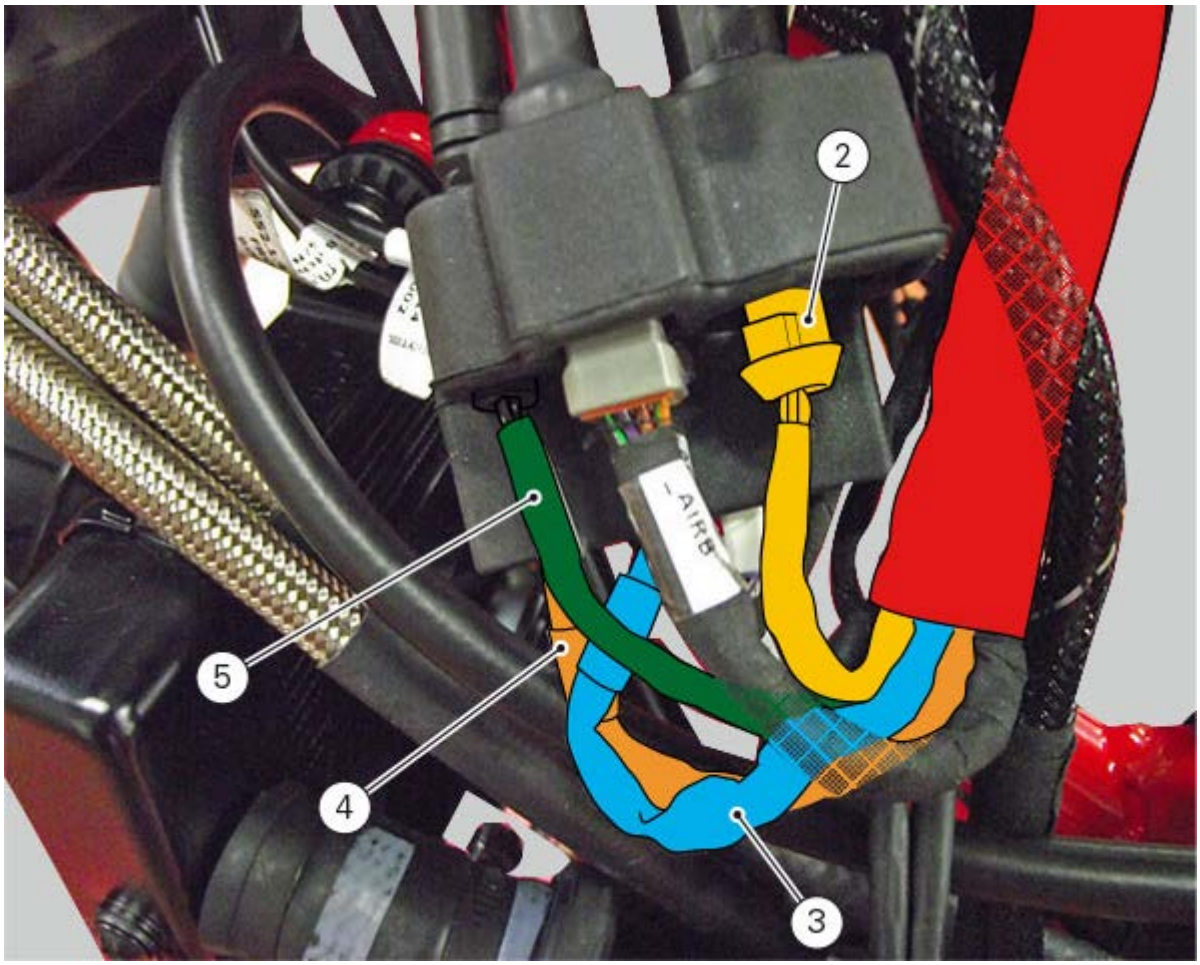
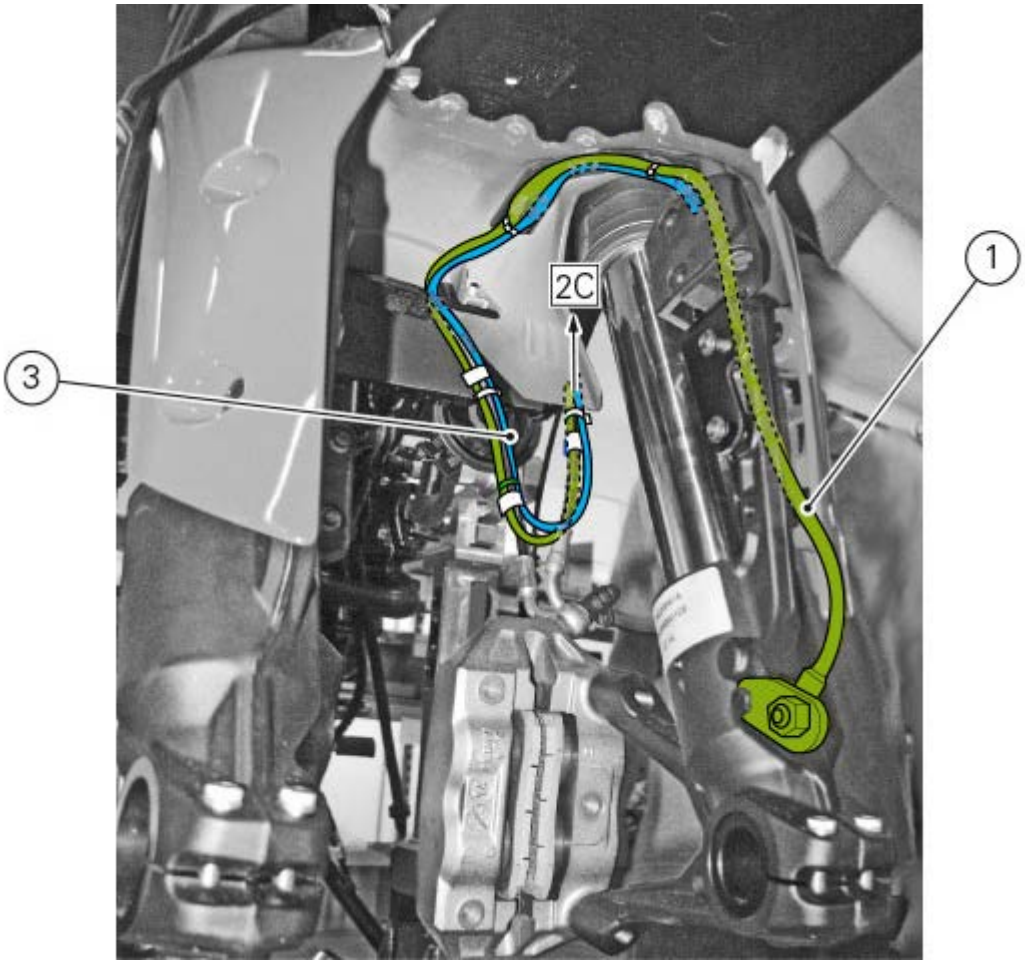
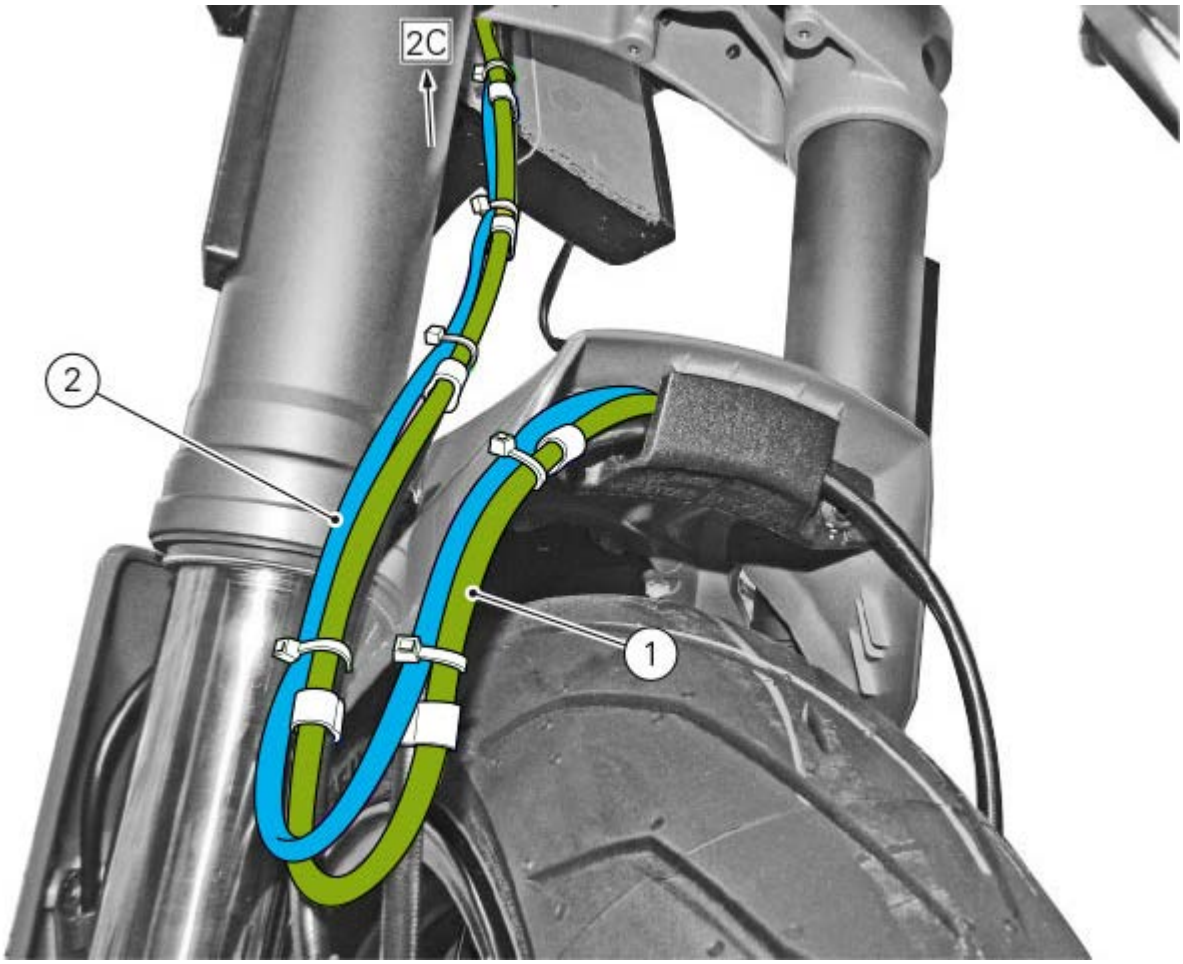


Table 2B

POS.	DESCRIPTION

1	Front speed sensor cable
3	Front wheel accelerometer cable (FOR S VERSION, ONLY)
4	Frame accelerometer cable (FOR S VERSION, ONLY)





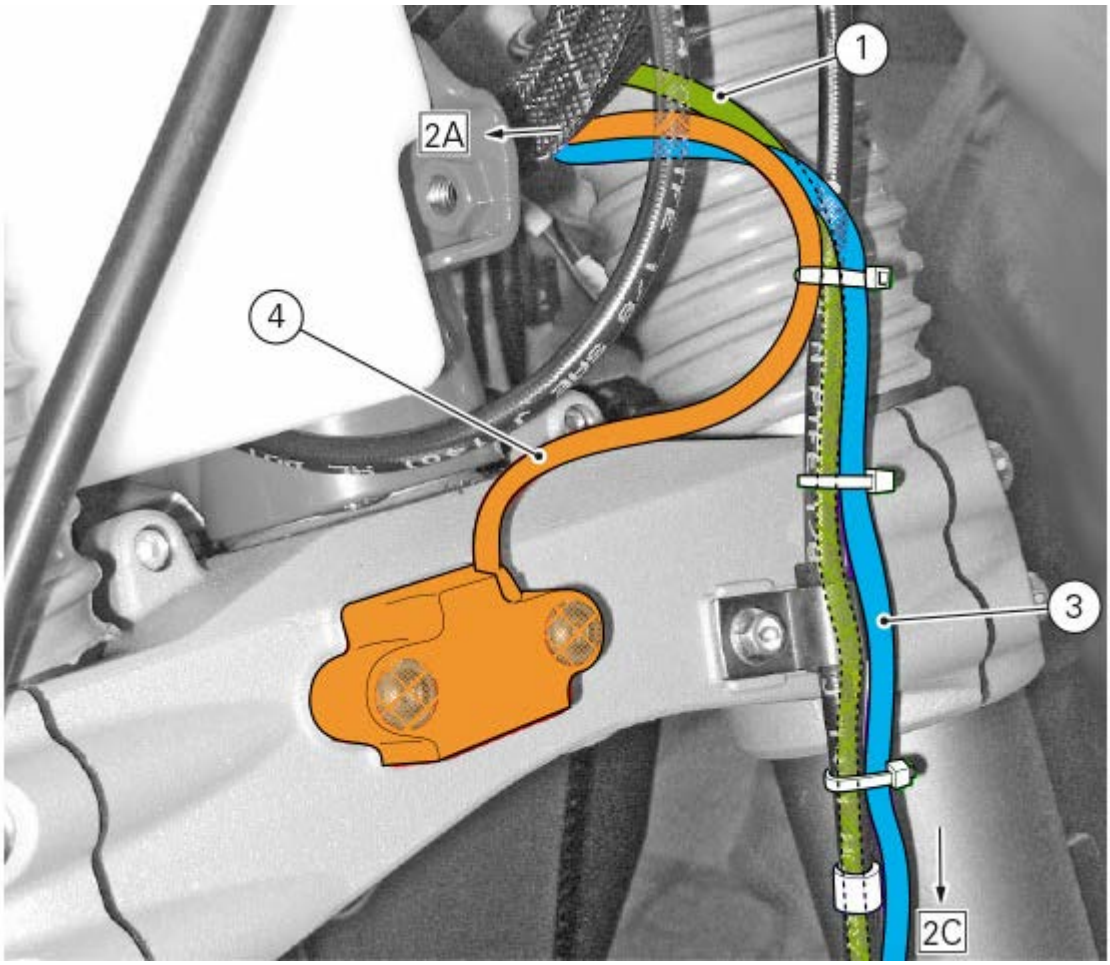
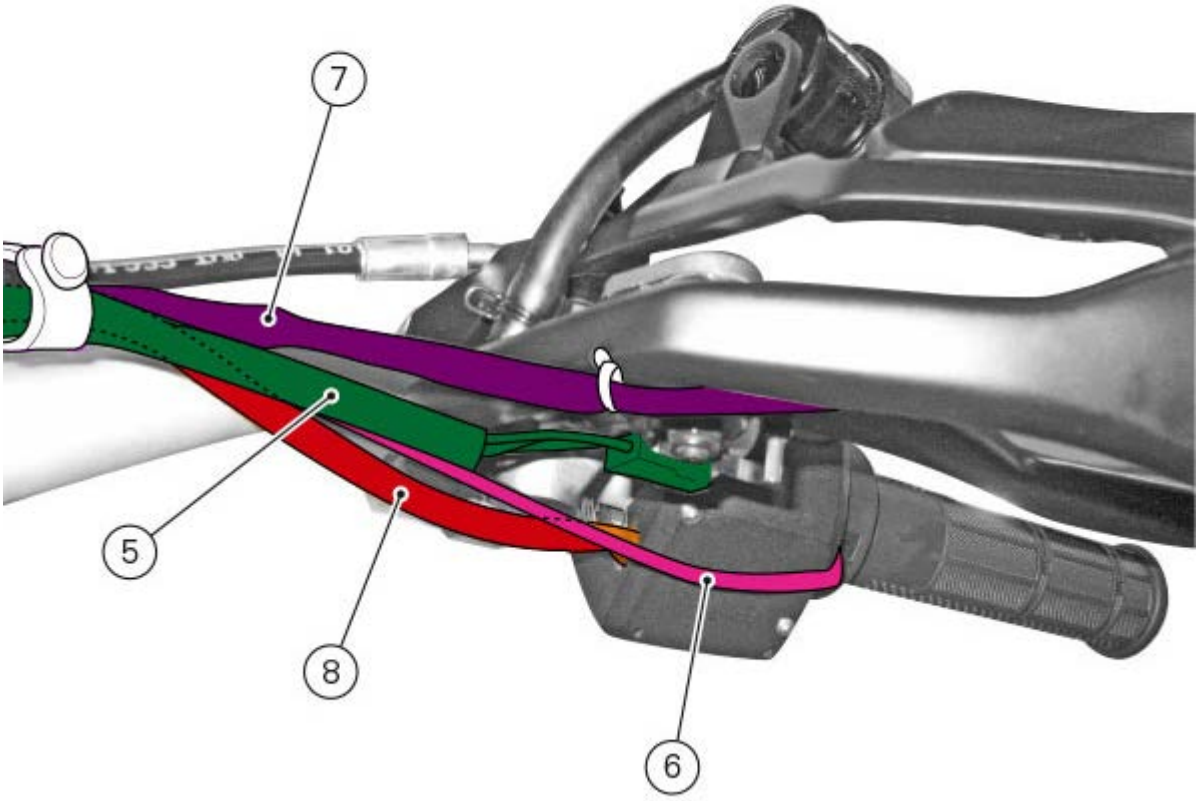


Table 2C

POS.	DESCRIPTION

2	Front suspension cable (FOR S VERSION, ONLY)
5	Clutch switch cable
6	Heated handgrip cable (IF ENABLED, ONLY)
7	Turn indicator cable
8	LH switch cable



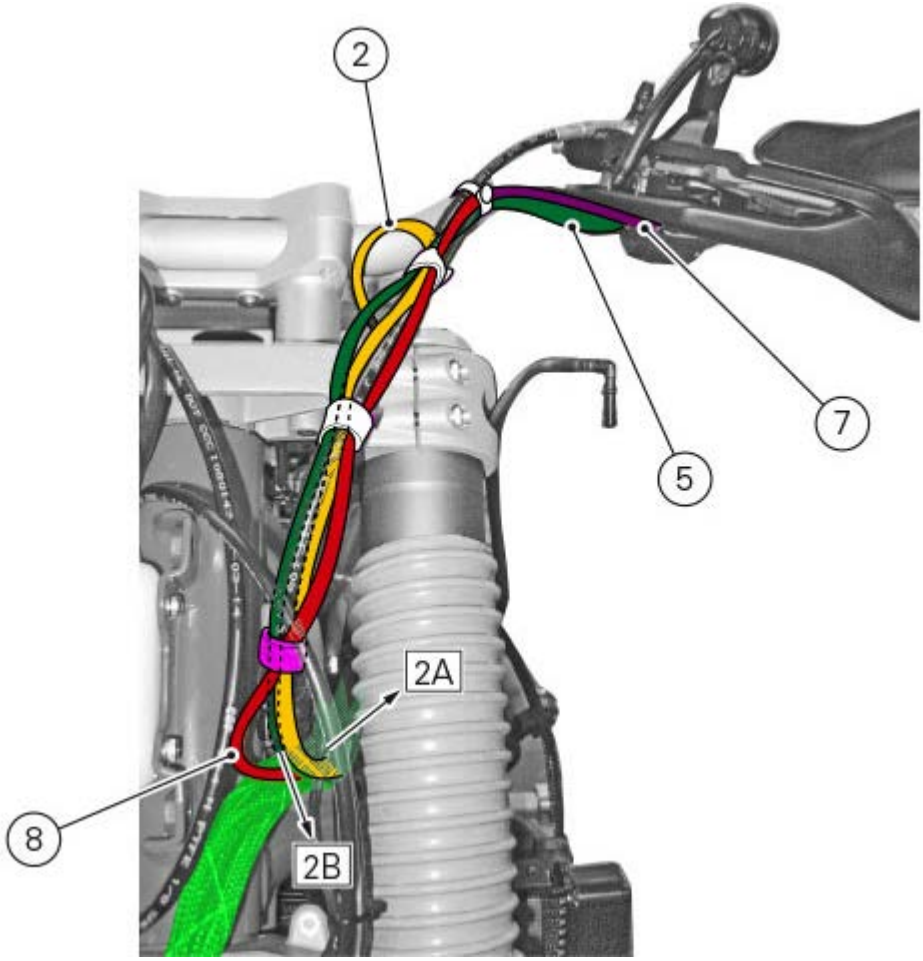
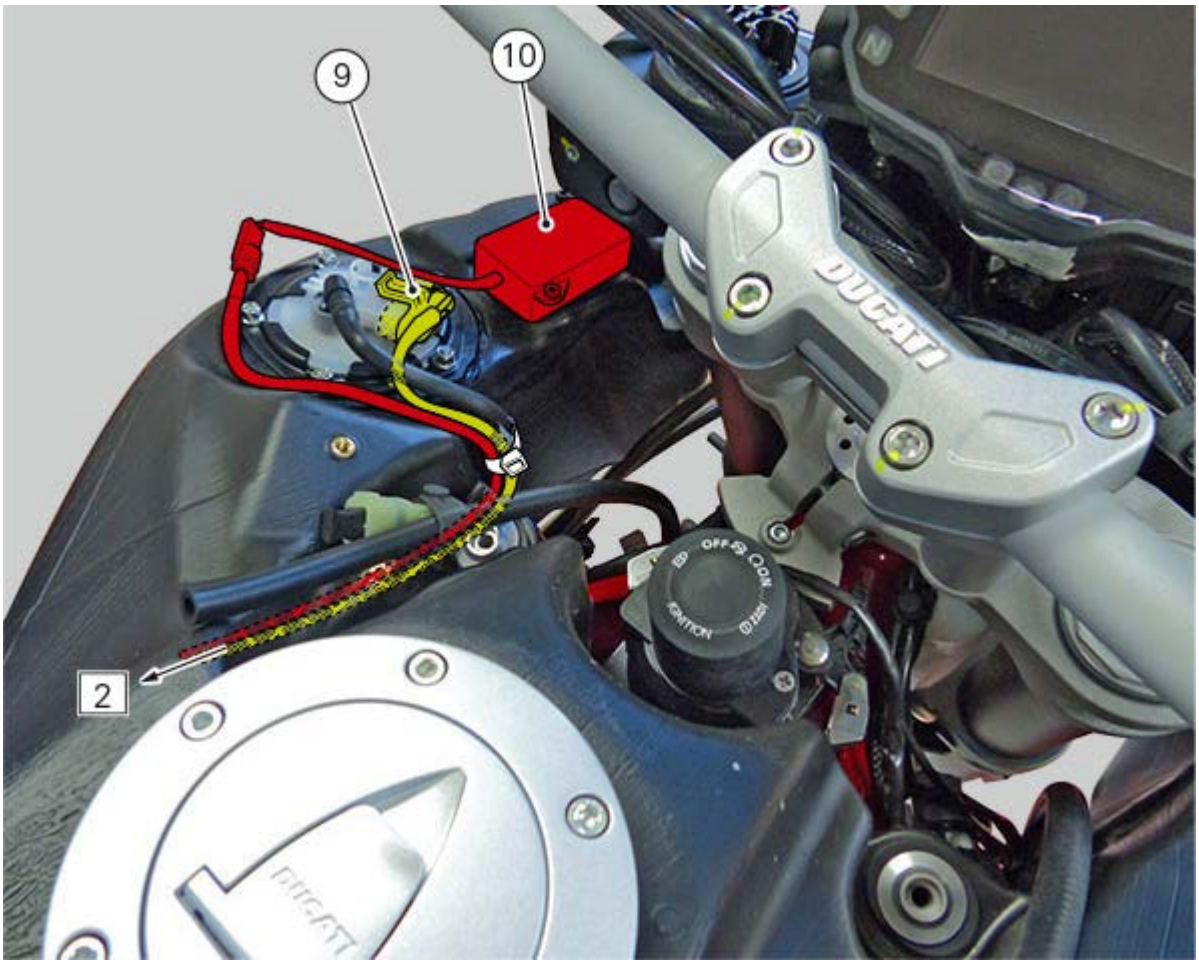


Table 2D

POS.	DESCRIPTION
9	Fuel pump cable
10	Bluetooth cable (IF ENABLED, ONLY)



"ROUTING OF WIRING ON FRAME"

Branch 1

TABLE 1A

POS.	DESCRIPTION
1	Instrument panel

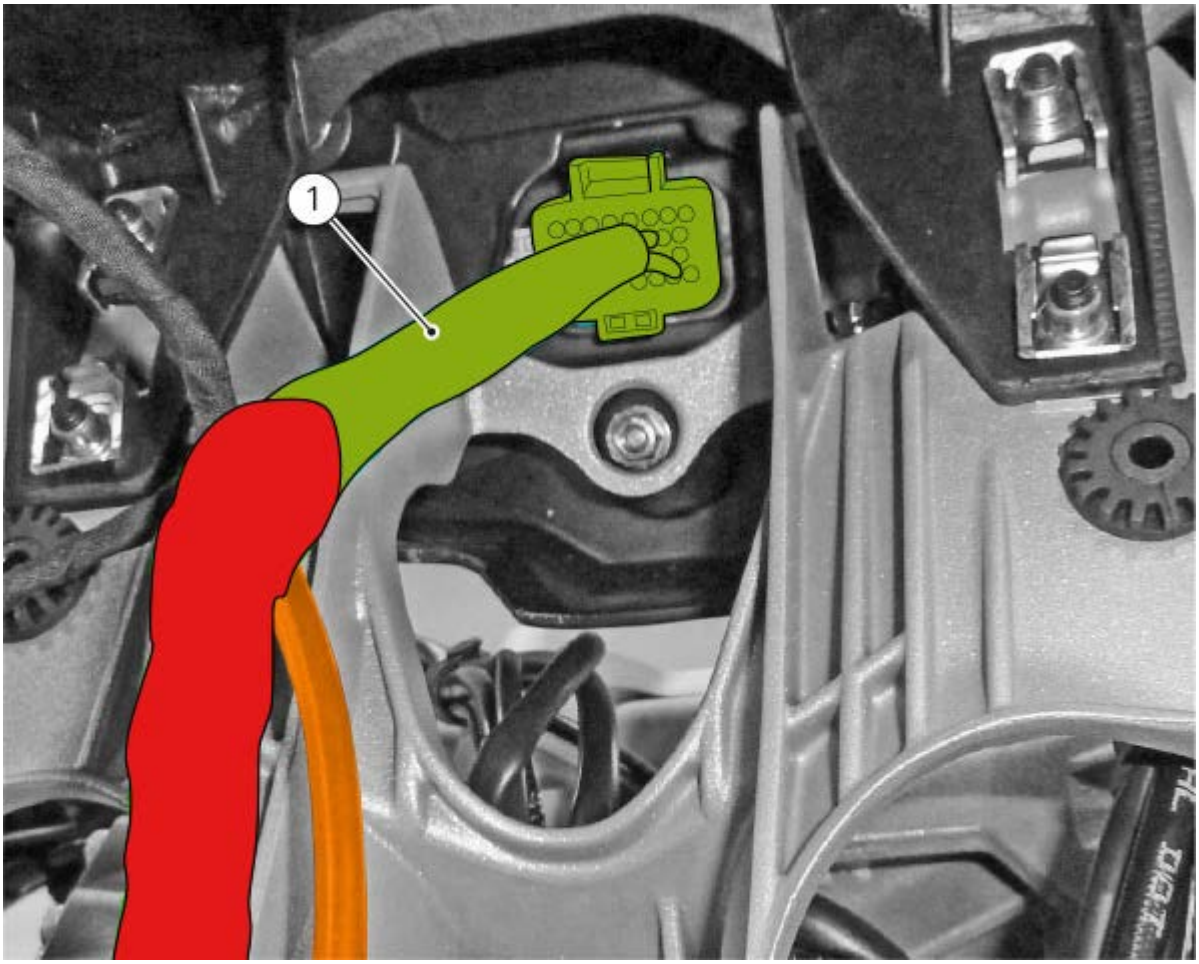


TABLE 1B

POS.	DESCRIPTION
1	Instrument panel
2	Oil temperature sensor cable
3	Oil pressure switch cable
4	GPS presetting cable
5	Air temperature sensor cable
6	12V power outlet

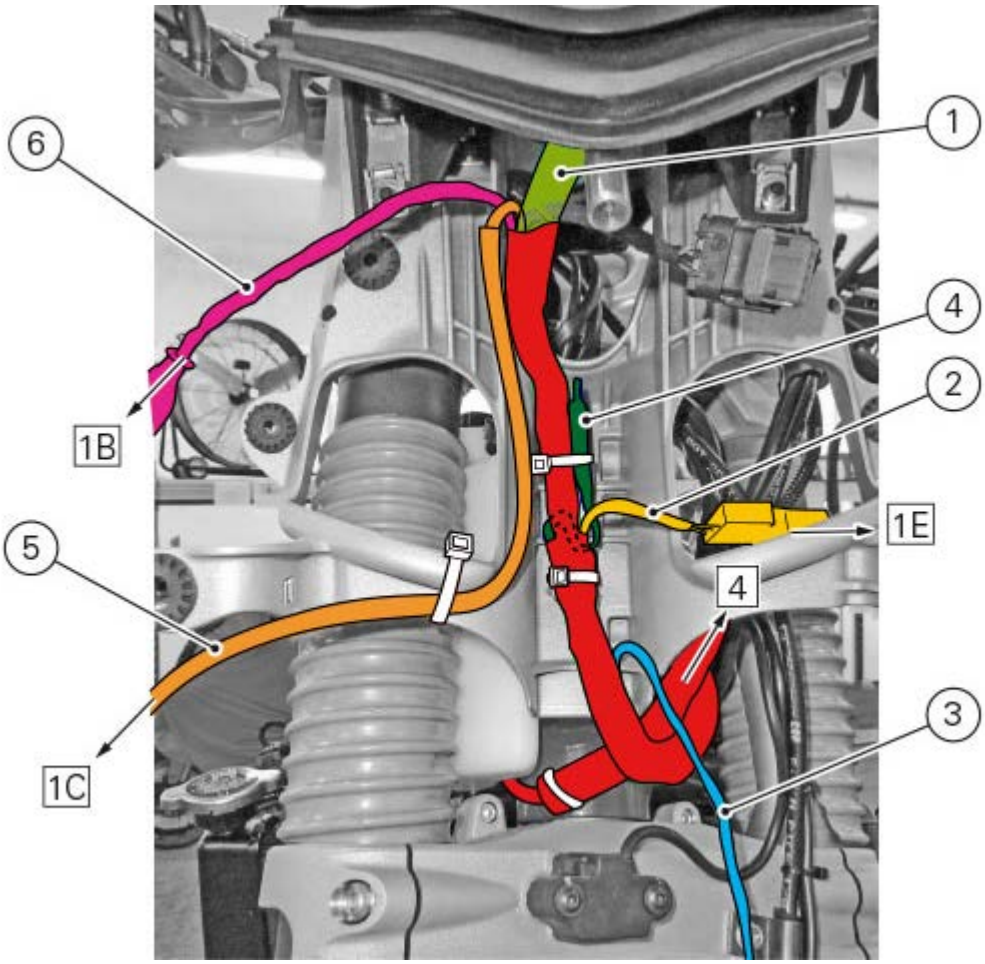


TABLE 1C

POS.	DESCRIPTION
5	Air temperature sensor cable

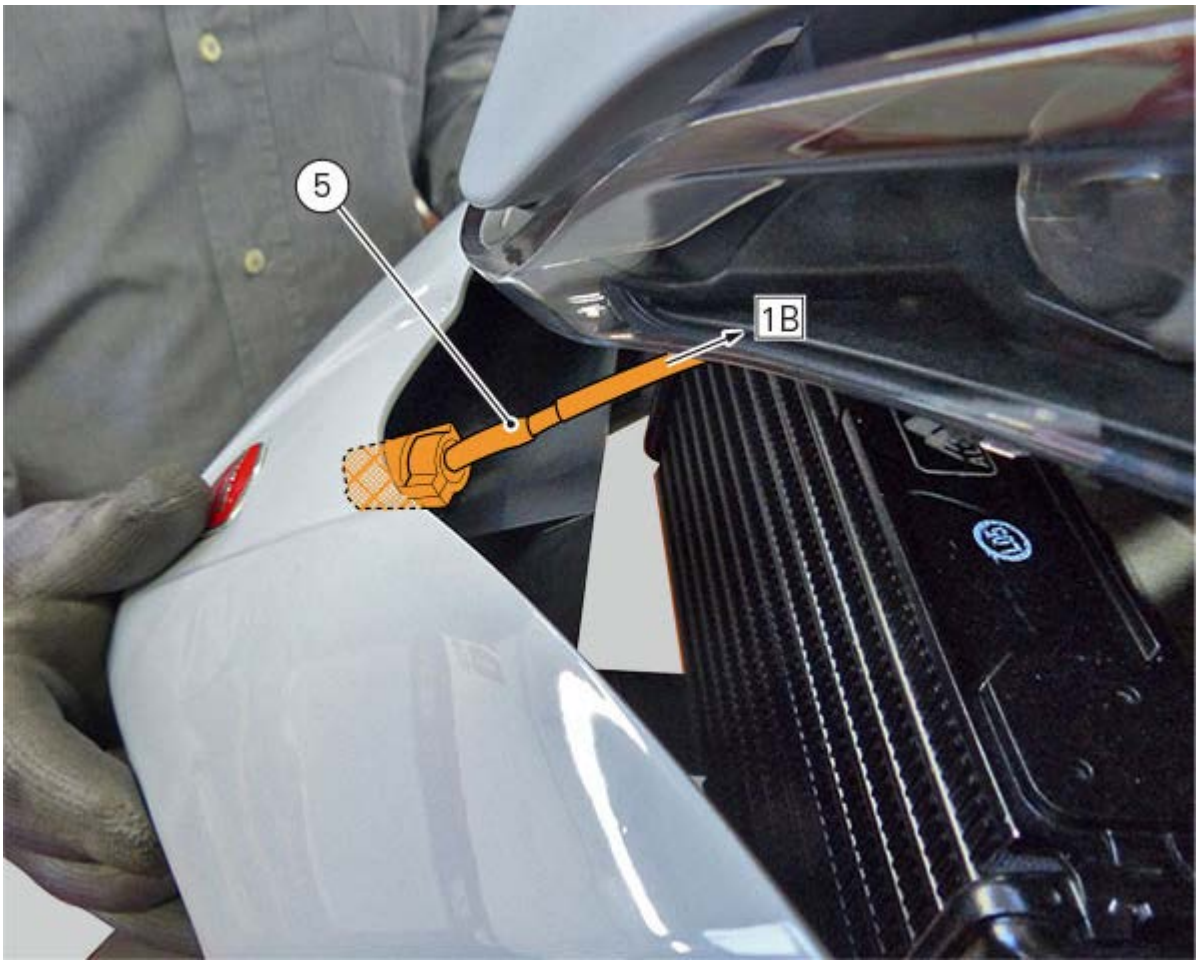


TABLE 1D

POS.	DESCRIPTION
6	12V power outlet

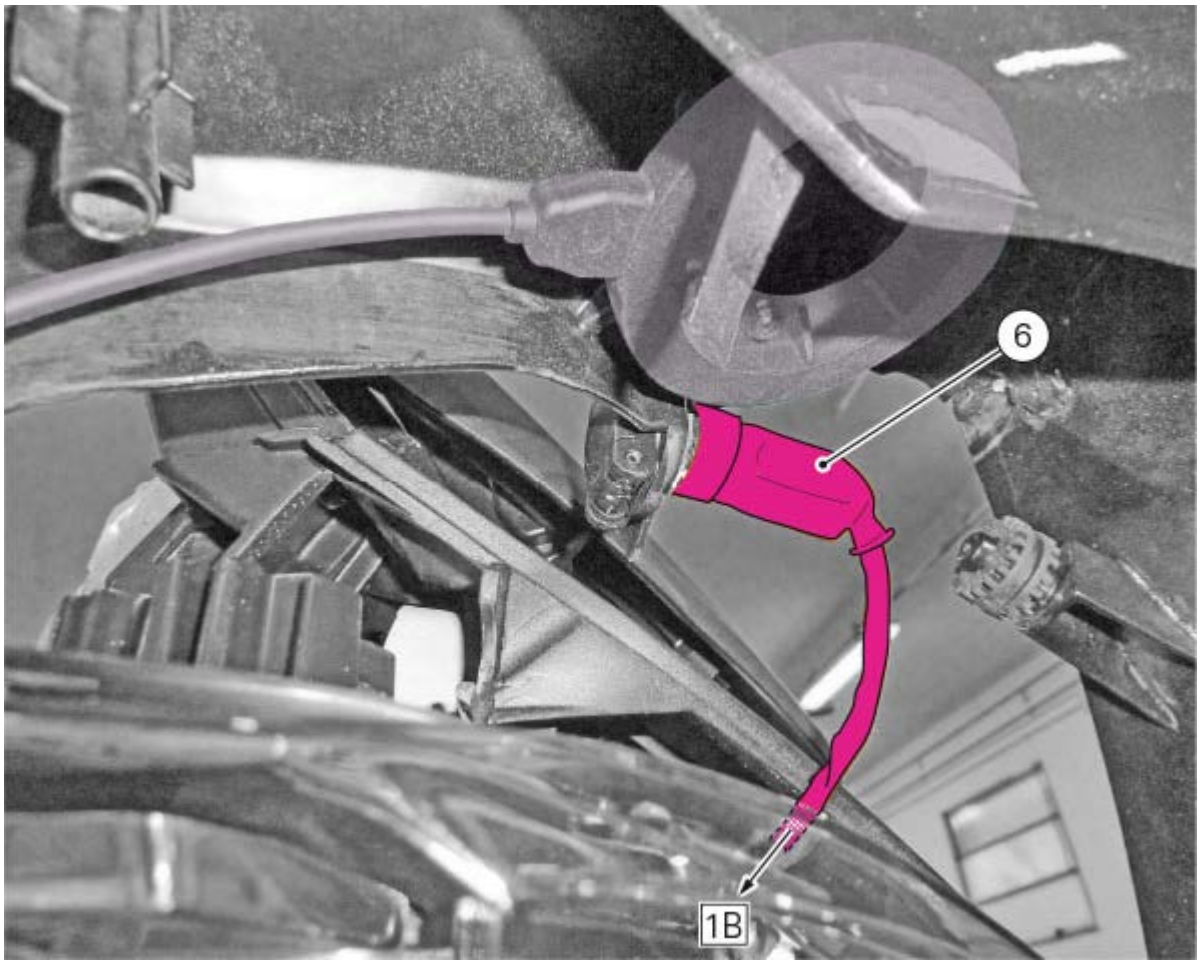
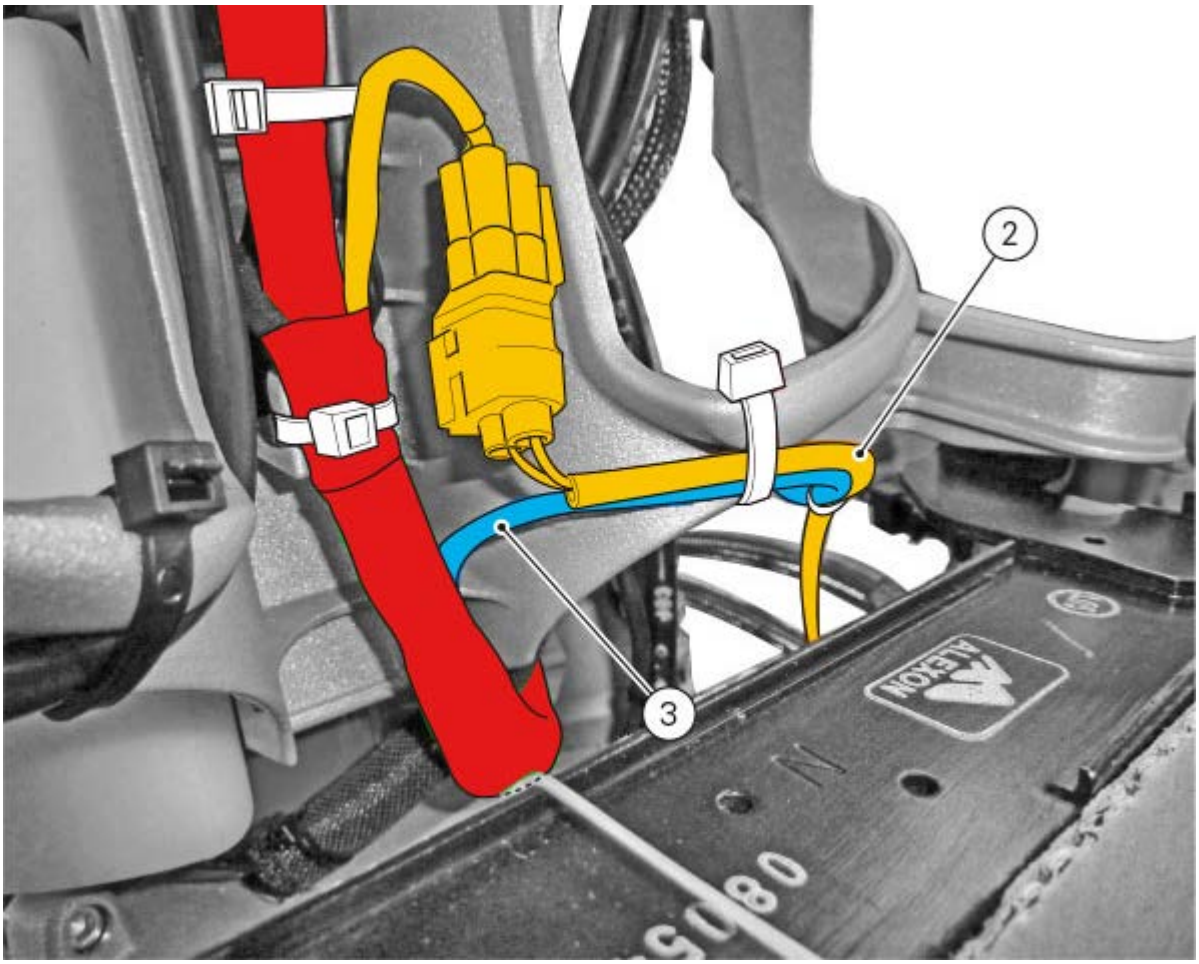
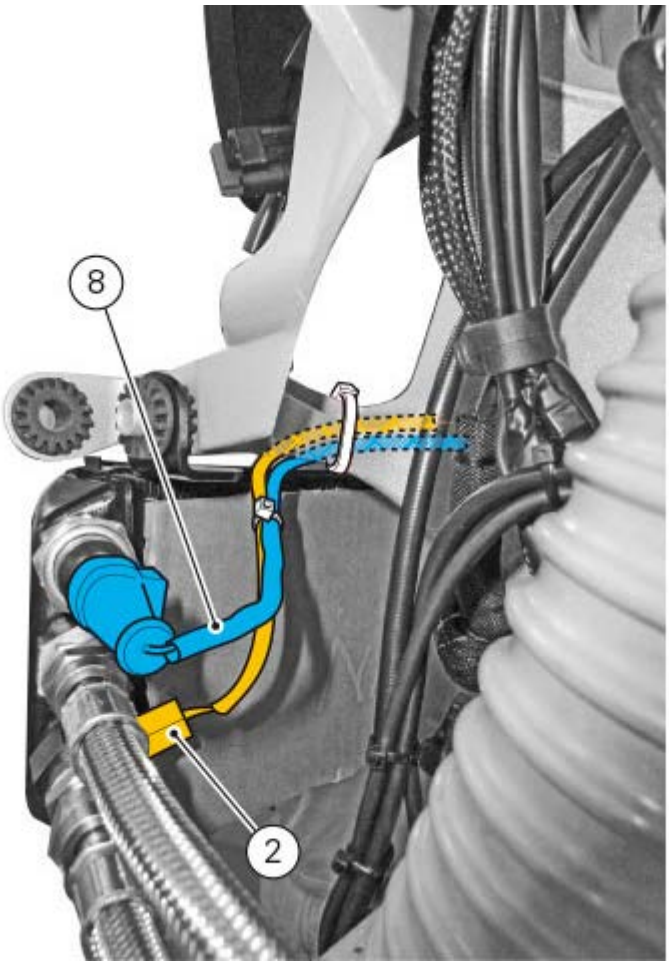


TABLE 1E

POS.	DESCRIPTION
2	Oil temperature sensor cable
3	Oil pressure switch cable

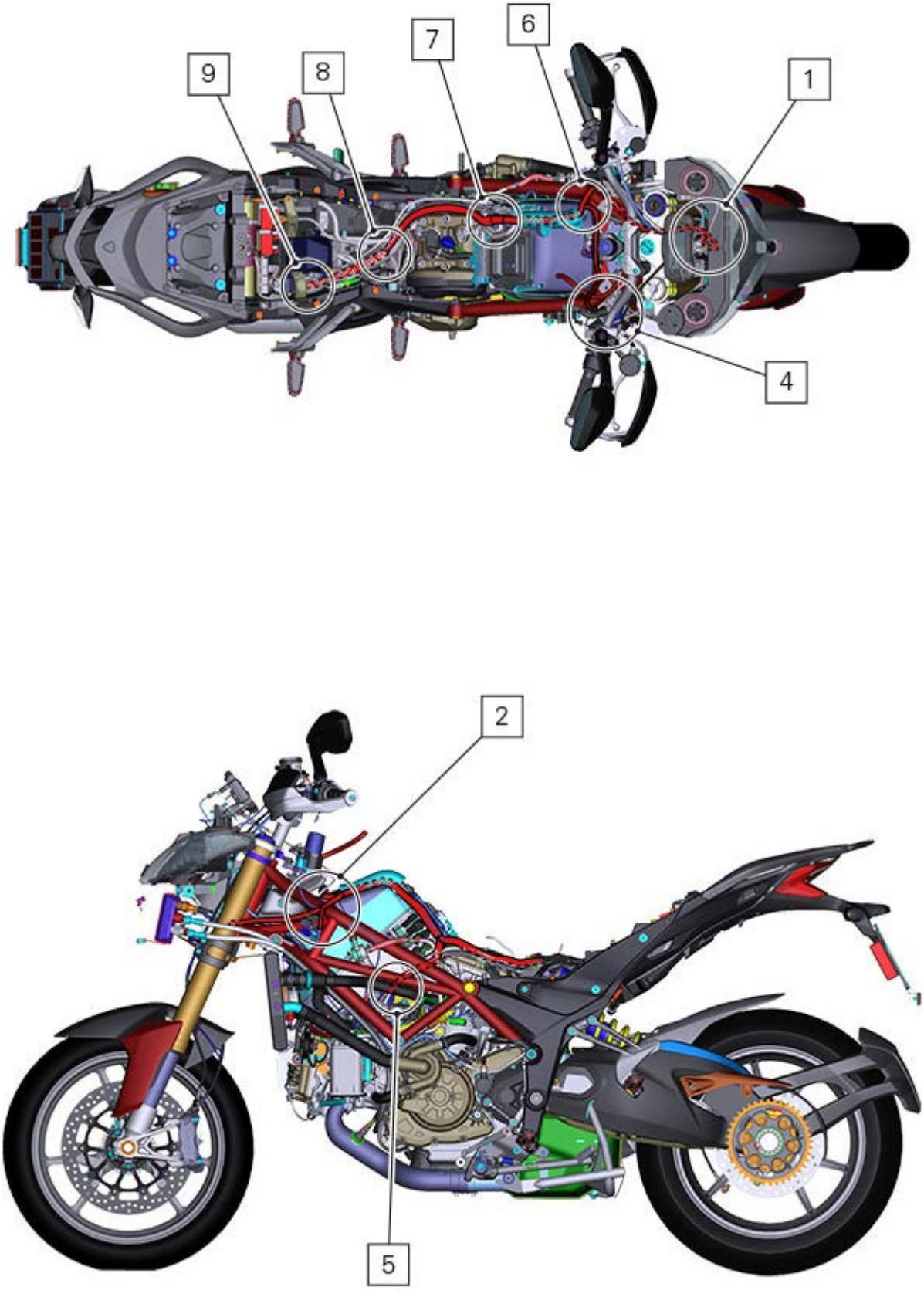


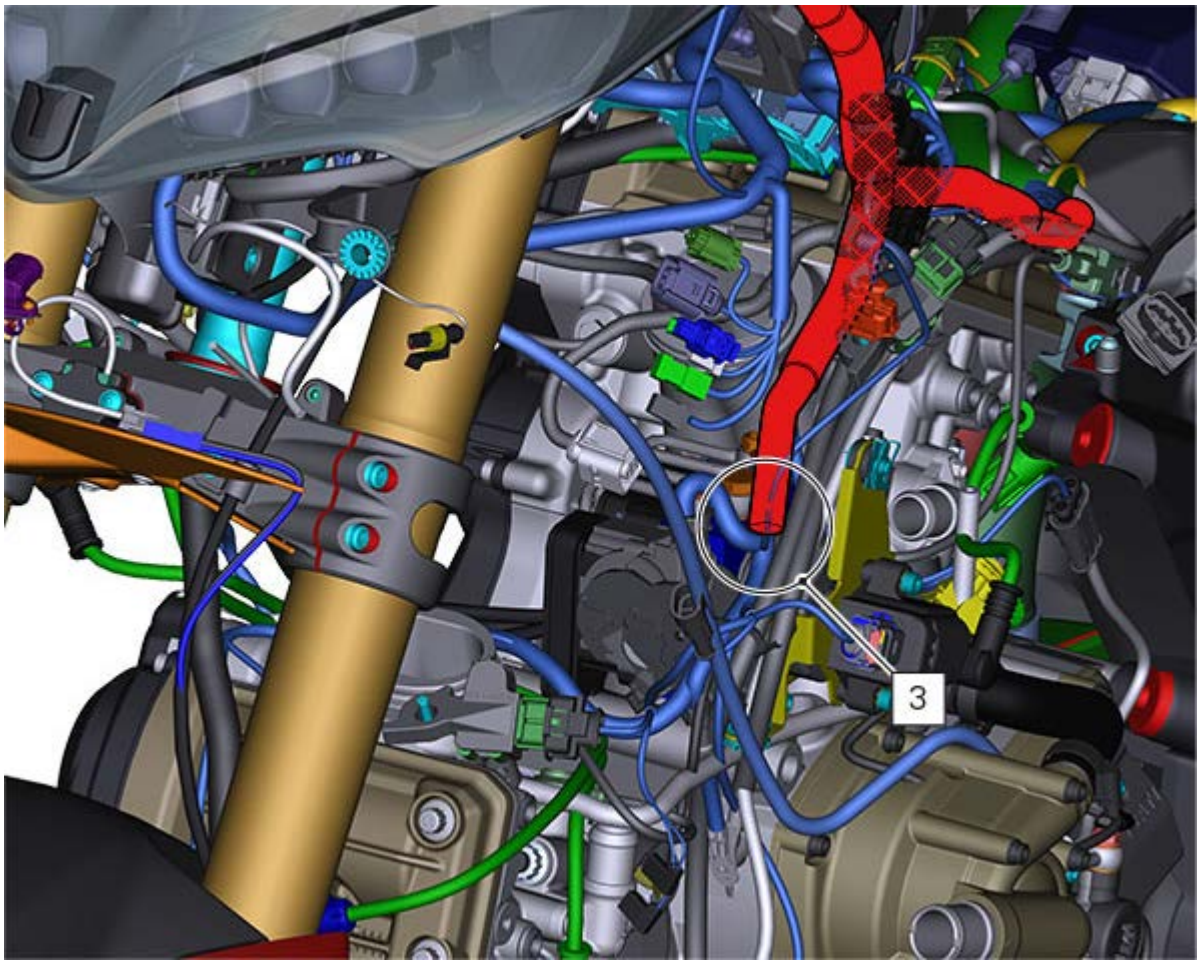


"ROUTING OF WIRING ON FRAME"

ROUTING OF WIRING ON FRAME

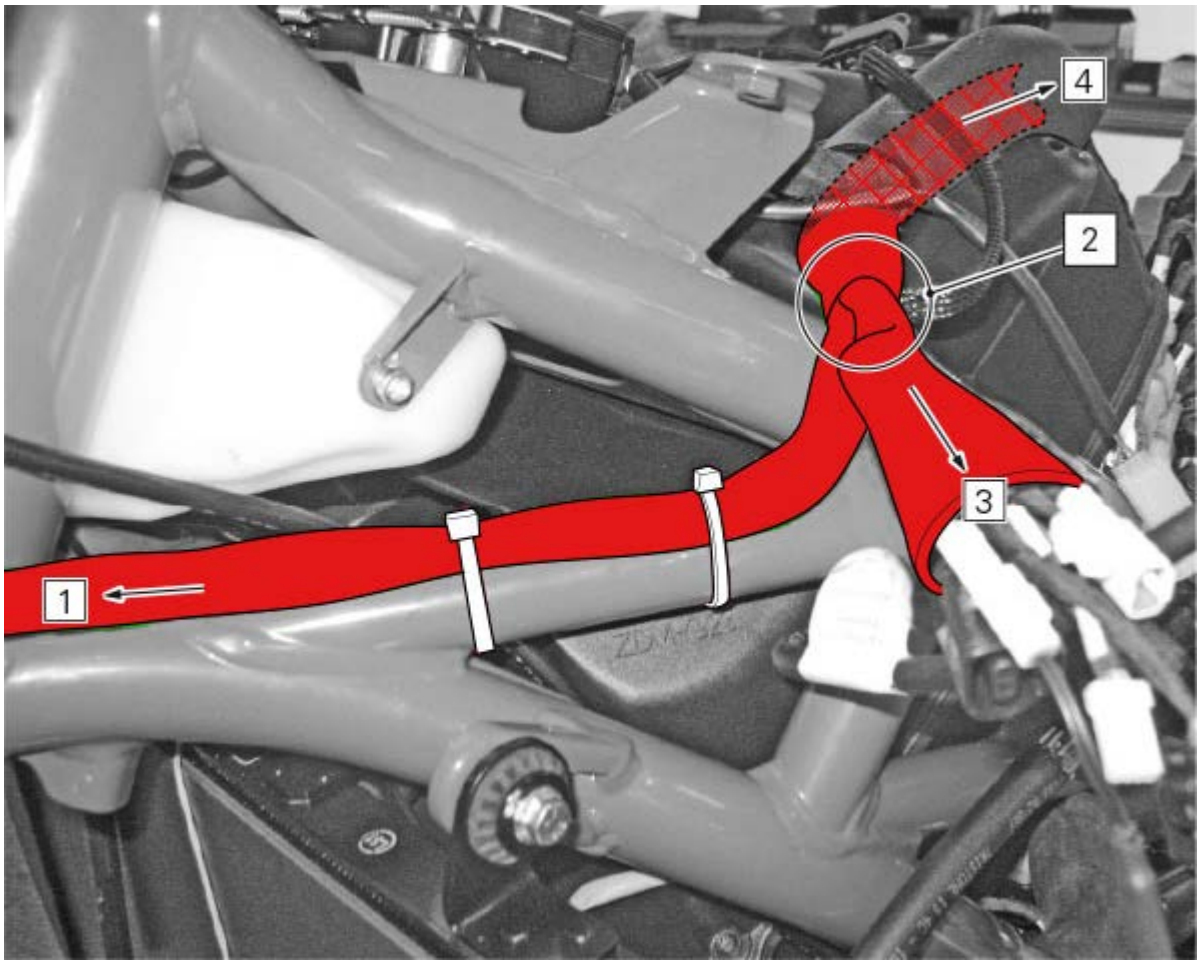
MAIN BRANCHES

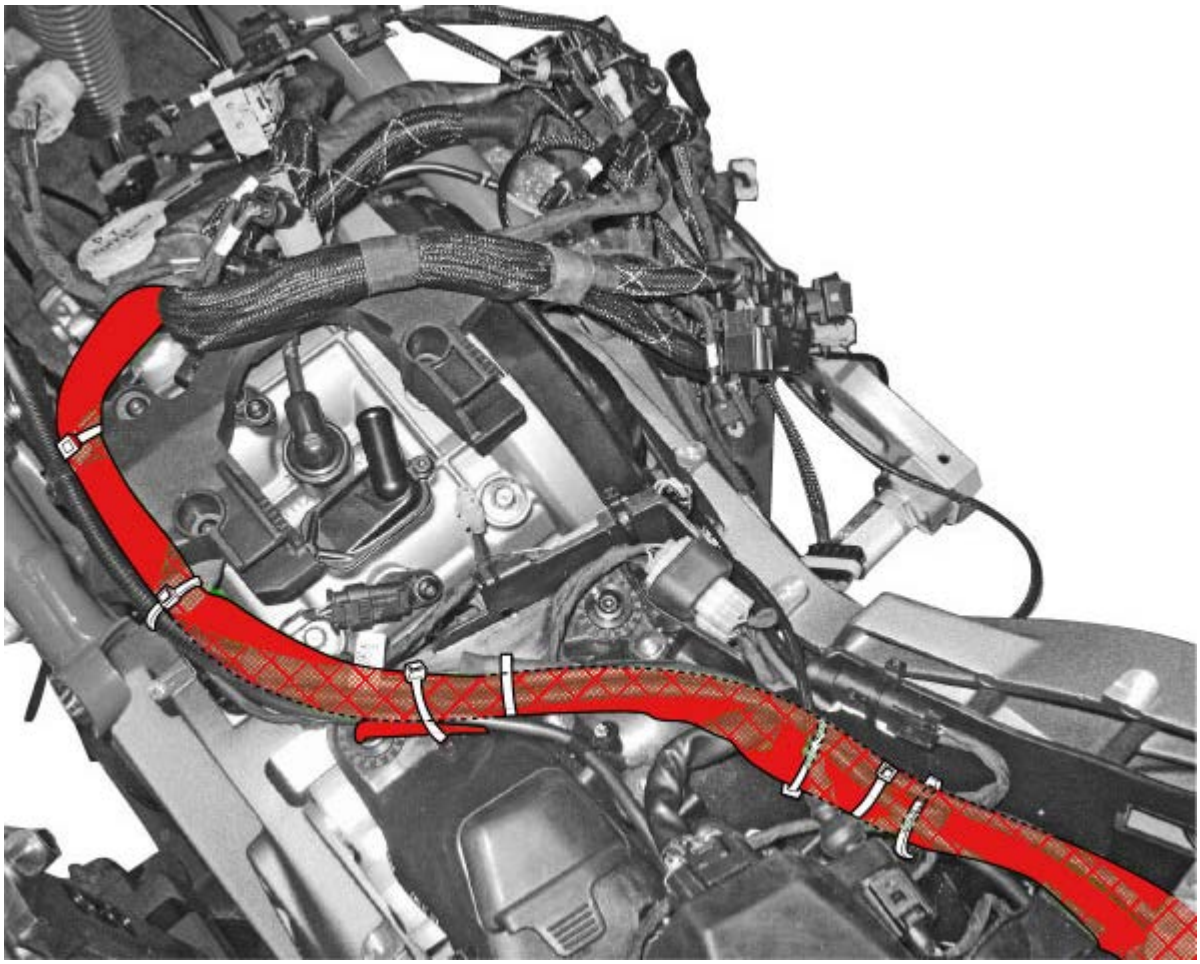


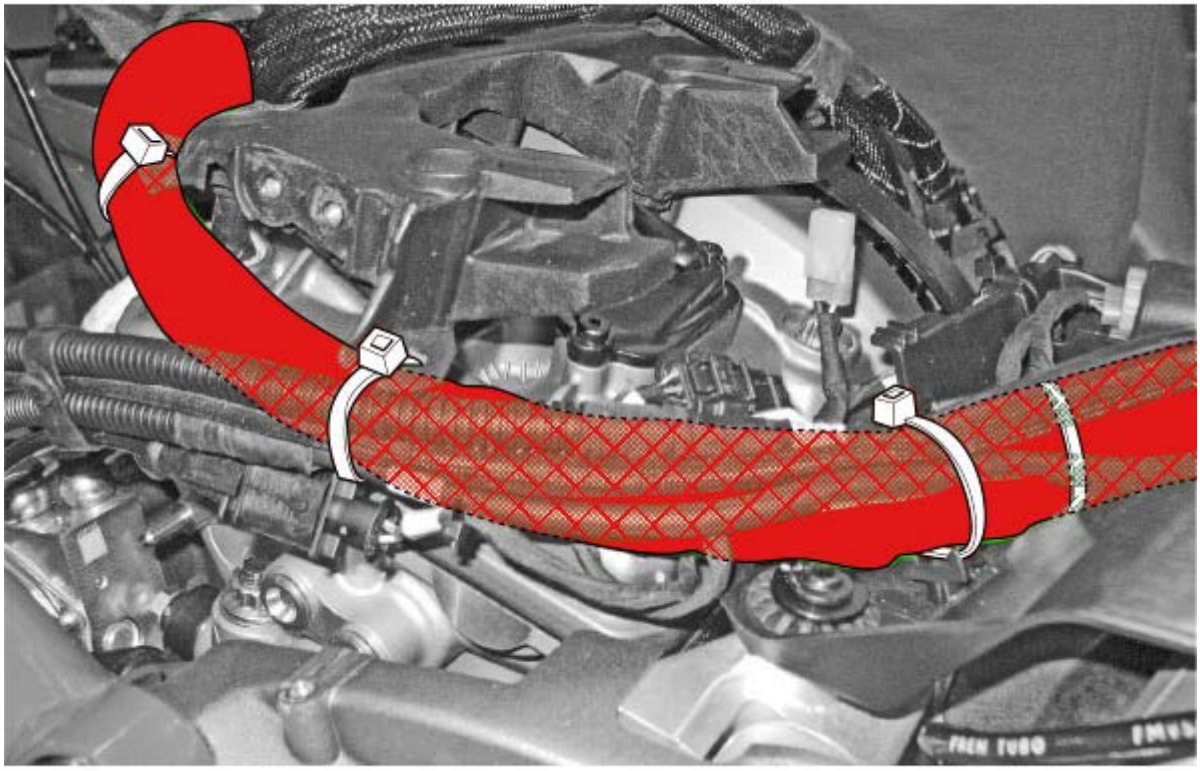


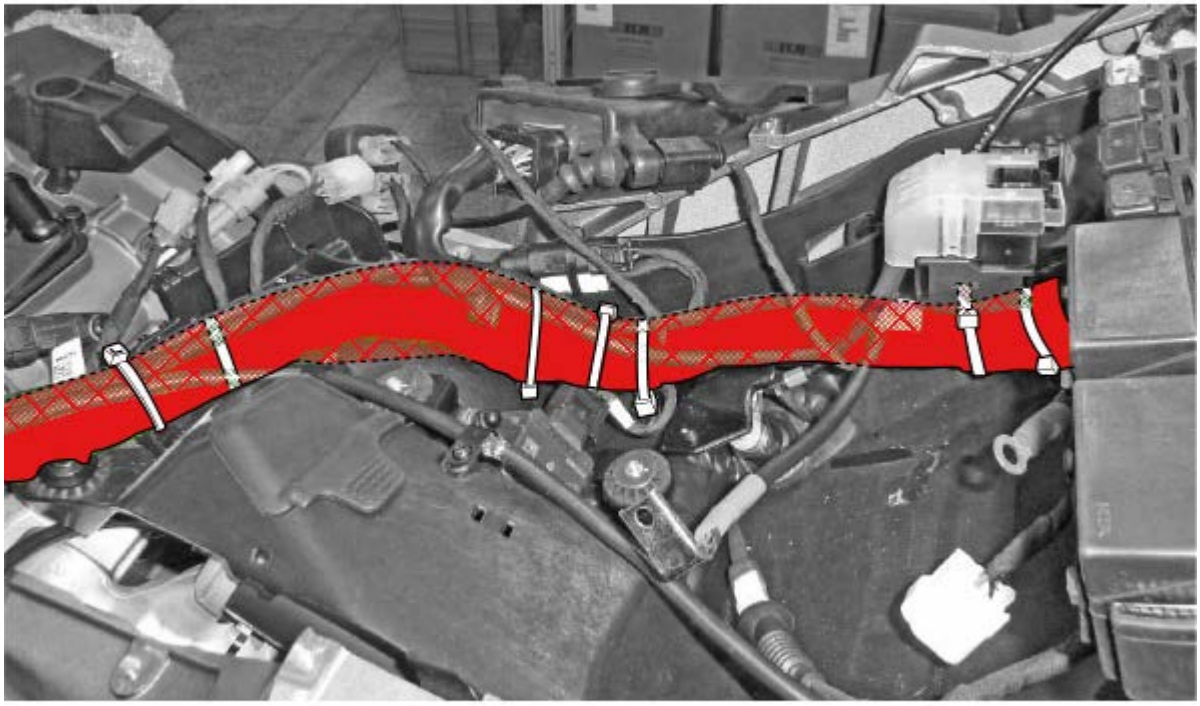
MAIN WIRING POSITIONING

Position main wiring as shown in the figure.









BRANCH KEY

BRANCHES	DESCRIPTION
Branch 1	Instrument panel
	Oil temperature sensor cable
	Oil pressure switch cable
	GPS presetting cable
	Air temperature sensor cable
	12V power outlet
Branch 2	Front speed sensor cable
	Front suspension cable (FOR S VERSION, ONLY)
	Front wheel accelerometer cable (FOR S VERSION, ONLY) Frame accelerometer cable (FOR S VERSION, ONLY)
	Clutch switch cable
	Heated handgrip cable (IF ENABLED, ONLY)
	Turn indicator cable
	Turn indicator cable
	LH switch cable

	Fuel pump cable
	Bluetooth cable (IF ENABLED, ONLY)
Branch 3	Intake side purge valve cable
	ABS control unit cable
	Horizontal head knock sensor cable
	Horizontal head timing regulator cable
	Intake side horizontal head timing check cable
	Exhaust side horizontal head timing check cable
	Exhaust side horizontal head timing regulator cable
	Horn cable
	Horizontal map sensor cable
	Horizontal oxygen sensor cable
	LH fan cable
	RH fan cable
Branch 4	RH switch cable
	Front brake switch cable
	Throttle control cable
	Heated handgrip cable (IF ENABLED, ONLY)
	Secondary air system valve cable
	Right turn indicator cable
Branch 5	Vertical water temperature sensor cable
	Pick-up cable
	Oxygen sensor cable
	Side stand cable
Branch 6	Hands free cable
	Airbox cable
	Tank plug presetting cable
	Ground jointing
Branch 7	ECU 1 cable
	ECU 2 cable
	Injector wiring cable

	Horizontal solenoid valve cable
	Vertical solenoid valve cable
	Vertical head map sensor cable
	Exhaust side vertical head timing regulator cable
	Intake side vertical head timing regulator cable
	Exhaust side vertical head timing check cable
	Intake side vertical head timing check cable
Branch 8	Vertical head knock sensor cable
	Exhaust side vertical head timing regulator cable
Branch 9	USB cable
	Alarm presetting cable
	12V power outlet
	Solenoid starter cable
	Exhaust valve motor + rear accelerometer cable (FOR S VERSION, ONLY)
	Rear shock absorber preload cable (FOR S VERSION, ONLY)
	Rear speed sensor cable
	Rear shock absorber regulator cable (FOR S VERSION, ONLY)
	Gear sensor cable
	Tail light cable
Branch 10	Starter motor cable
	Battery negative cable
	Generator cable
	Ground cable
	Horizontal head spark plug
	Horizontal head coils
	Vertical head spark plug
	Vertical head coils

Key to wiring diagram

1 Front 12V power socket
2 GPS navigation system
3 Bluetooth
4 Right-hand switch
5 Right-hand switch
6 Inertial sensor
7 Immobilizer
8 Hands free
9 Hands Free Relay
10 Battery
11 Wiring ground
12 Fused solenoid
13 LH fan
14 RH fan
15 Generator
16 Rectifier
17 USB socket
18 Rear 12V power outlet
19 Data Acquisition / Diagnosis
20 Anti-theft system alarm
21 Tail light
22 Rear right turn indicator
23 Rear left turn indicator
24 Rear wiring
25 Number plate light
26 Temperature sensor
27 LH heated handgrip connector (optional)
28 RH heated handgrip connector (optional)
29 Exhaust valve motor
30 Rear stop light
31 Vehicle control unit (BBS)
32 Fuel level
33 Rear suspension adjustment (preload)
34 Fuse box (2)
35 Fuse box (1)
36 ABS
37 Rear speed sensor
38 Front speed sensor
39 Fuel pump
40 Main control unit relay
41 Fuel pump relay
42 Starter relay
43 Injection control unit connector A (EMS)
44 Injection control unit connector B (EMS)
45 Gear sensor
46 Throttle twistgrip position sensor (APS)
47 Vertical ETV
48 Horizontal ETV
49 Main vertical injector
50 Main horizontal injector
51 Vertical lambda sensor
52 Horizontal lambda sensor
53 Timing/rpm sensor
54 Vertical cylinder secondary coil
55 Vertical cylinder main coil
56 Horizontal cylinder secondary coil
57 Horizontal cylinder main coil
58 Oil pressure sensor
59 Purge valve
60 Oil temperature
61 Brake switch
62 Clutch switch

63 Side stand switch
64 Engine temperature sensor
65 Air temperature sensor
66 Vertical MAP sensor
67 Horizontal MAP sensor
68 Vertical cylinder knock sensor
69 Horizontal cylinder knock sensor
70 Secondary air sensor
71 Vertical cylinder EX timing sensor
72 Vertical cylinder IN timing sensor
73 Horizontal cylinder EX timing sensor
74 Horizontal cylinder IN timing sensor
75 Vertical cylinder EX timing connector
76 Vertical cylinder IN timing connector
77 Horizontal cylinder EX timing connector
78 Horizontal cylinder IN timing connector
79 Front left turn indicator
80 Instrument panel
81 Front right turn indicator
82 Right high beam
83 Left high beam
84 Right low beam
85 Left low beam
86 Front parking light
87 Horn
88 Fog lights (option)

Technological Dictionary

Riding Mode

The rider can choose from 4 different preset bike configurations (Riding Modes) and pick the one that best suits his/her riding style or ground conditions. The Riding Modes allow the user to instantly change the engine power delivery (Power Mode) and the ABS, DTC and DWC settings.
Available Riding Modes: Sport, Touring, Urban and Enduro. Within every Riding Mode, the rider can customise any settings.

Power Mode

The Power Modes are the different engine maps the rider can select to change power level and delivery to suit his/her own riding style and surface conditions.
There are three Power Modes, one for each Riding Mode:

- LOW, with 'soft' power delivery;
- MED, with 'soft' power delivery;
- HIGH, with 'instant' power delivery.

Ride by Wire (RbW)

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

Ducati Traction Control (DTC)

The Ducati Traction Control system (DTC) supervises the rear wheel slipping control and settings vary through eight different levels that are calibrated to offer a different tolerance level to rear wheel slipping. Each Riding Mode features a pre-set intervention level. Level 8 indicates system intervention whenever a slight slipping is detected, while level 1 is for off-road use and very expert riders because it is less sensitive to slipping and intervention is hence softer.

Anti-lock Braking System (ABS) 9.1ME

The ABS 9.1ME system fitted to the Multistrada 1200 is a safety system preventing wheel lockup while riding with the motorcycle not leaning over. The Multistrada 1200 ABS also features a "cornering" function that widens ABS functionality to the conditions where the motorcycle is leaning over, thus preventing wheel lockup and slipping as much as possible, within the physical limits allowed by the vehicle and by the road conditions. The Multistrada 1200 ABS implements rear wheel lift-up control and combined braking (from front to rear) in order to ensure not only smaller stopping distance under braking, but also the best possible stability.
The system features 3 levels, one associated to each Riding Mode. ABS can be disabled.

Ducati Wheelie Control (DWC)

The Ducati Wheelie Control system (DWC) supervises control of wheelie movement and settings vary through eight different levels that are calibrated to offer a different prevention and reaction to wheelies. Each Riding Mode features a pre-set intervention level. Level eight indicates a setting that minimises motorcycle tendency to shift up in a wheelie and maximises reaction to the same, if it occurs. While level one is for expert riders and features a lower wheelie control in terms of prevention and less strong reaction to the same, if it occurs.

Inertial Measurement Unit (IMU)

The Multistrada 1200 is fitted with a Bosch inertial platform, equipped with inertial measurement unit (IMU). The IMU constantly monitors motorcycle incidence and lean angle, matching them with ABS and DWC signals, thereby optimising the efficiency of all these systems, regardless of motorcycle position.

Ducati Cruise Control

Multistrada 1200 features a system for maintaining the cruise speed, the Ducati Cruise Control. System can be enabled with engaged gear equal to or higher than the second gear and vehicle speed ranging between 50 Km/h and 200 Km/h.

Desmodromic Variable Timing (DVT)

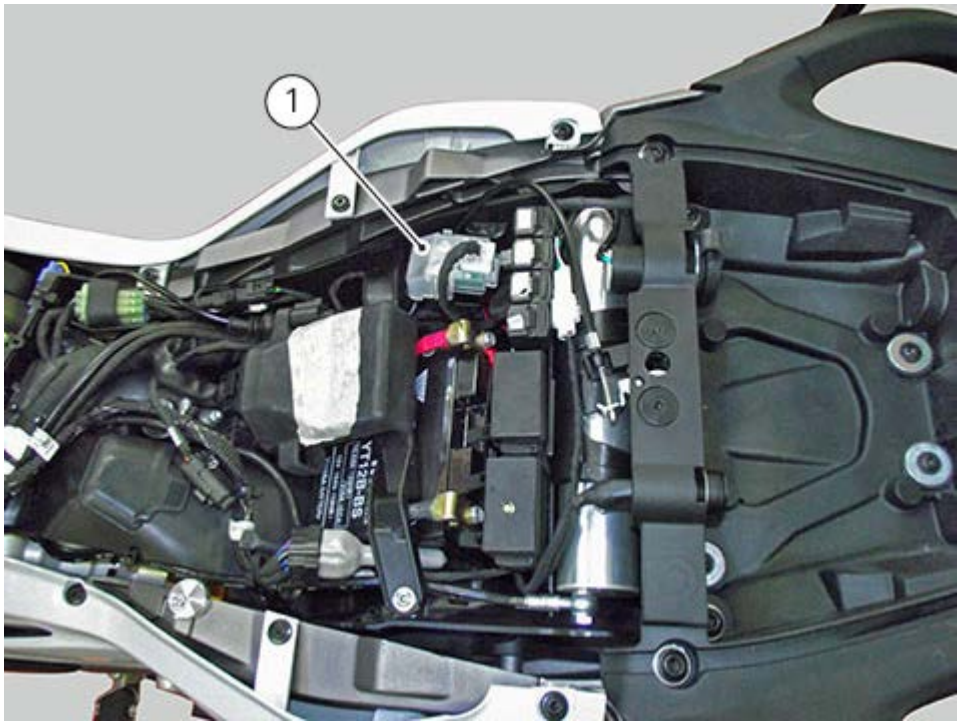
The DVT system allows optimised timing setting according to engine load and speed, as well as to continuously advance or delay exhaust and intake valve timing through the rotation of the camshafts, thereby ensuring utmost efficiency throughout the rpm range and high performance at high speed, with an optimised torque curve at low rpm.

Acronyms and abbreviations used in the manual

ABS
Antilock Braking System
BBS
Black Box System
CAN
Controller Area Network
LIN
Local Interconnect Network
DSB
Dashboard
DTC
DUCATI Traction Control
DWC
DUCATI Wheelie Control
ECU
Engine Control Unit

Rectifier-regulator

The regulator (1) is located inside the electrical component compartment.



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.

Important

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

Removing the regulator

To remove the regulator, see the procedure explained in chapter "Removing the electric components compartment".

Important

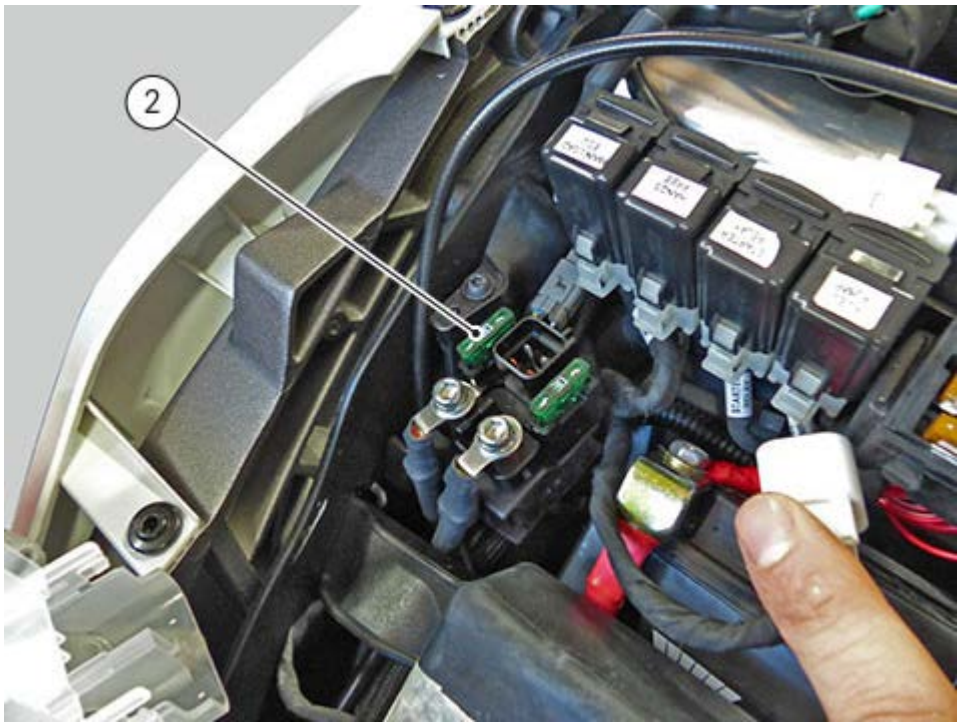
Do not disconnect the battery cables when engine is running because this would cause irreparable damage to the regulator.

Refitting the regulator

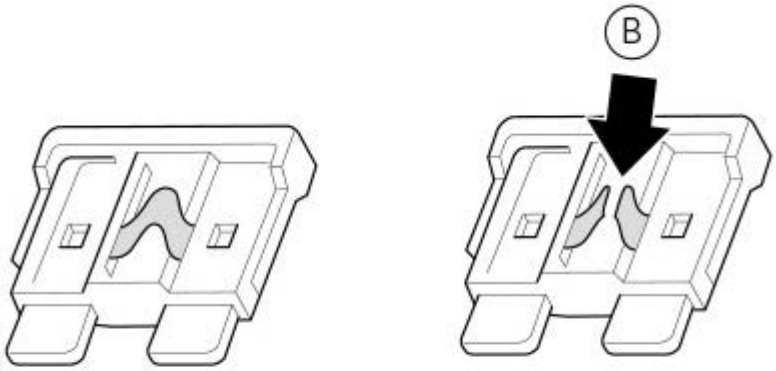
To install the regulator on the vehicle, see the procedure explained in chapter "Refitting the electric components compartment".

Regulator fuse

The 30 A regulator fuse (2) is located inside solenoid starter (1), in the battery compartment, and protects the electronic regulator.



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



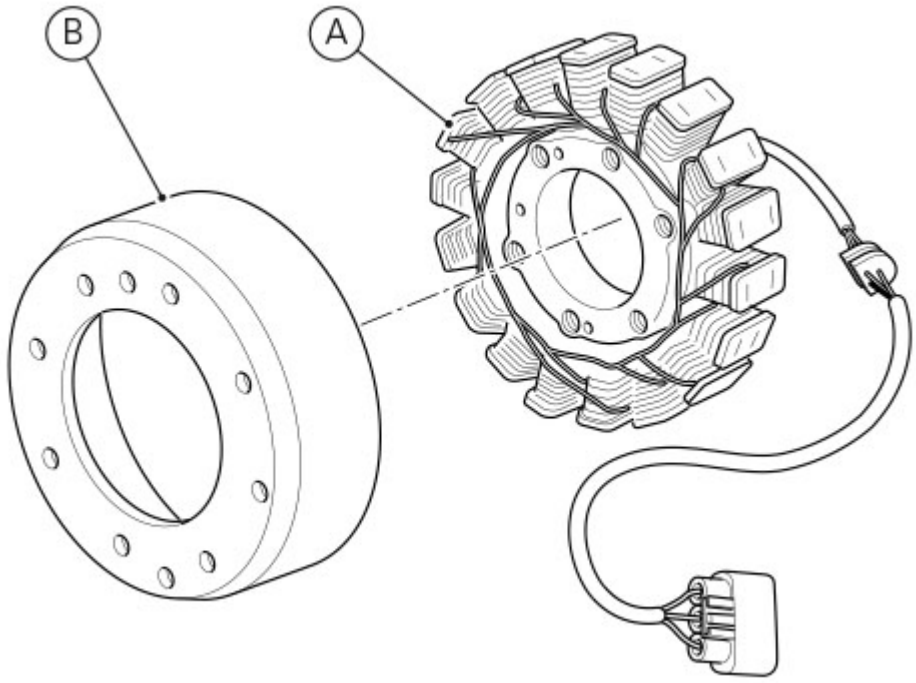
Important
Switch the ignition key to OFF before replacing the fuse to avoid possible short-circuits.

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.

To access the regulator fuse, see paragraph "Solenoid starter".

Alternator / Generator

The generator used on the Multistrada 1200 has a rated power of 490W at 14V and consists of a fixed element (stator/generator, A), located in the generator cover and a mobile element (rotor/flywheel, B) fastened to the crankshaft.



Rotor (B) is manufactured with strong permanent magnets and features a lot of pin pairs for each stator phase. This allows generating alternate voltage at a higher frequency compared to a standard generator. The result: at low rpm it is possible to generate higher current.

Important

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

To check the generator, measure the voltage at each end of the generator cable and check if it is compliant with the value indicated in the table (ambient temperature: 20 °C).

Attention

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

Rpm	Active voltage	Minimum voltage	Maximum voltage
1500 rpm	27.5 V	25.2 V	33 V
2500 rpm	45 V	41.1 V	54.1 V

Values significantly lower than those indicated above can be due to:
- partially demagnetised rotor;
- short-circuited windings.

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

Removing the generator

Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the front sprocket cover (Removing the front sprocket cover).
Slide out the gearchange mechanism (Removing the gear shift).
Drain the cooling system and release the case from the pipes (Removing the cooling system hoses and unions).

Remove the generator cover (Removing the generator cover), the stator (A) (Disassembling the generator cover) and the rotor (B) (Removing the flywheel/generator assembly).

Refitting the generator

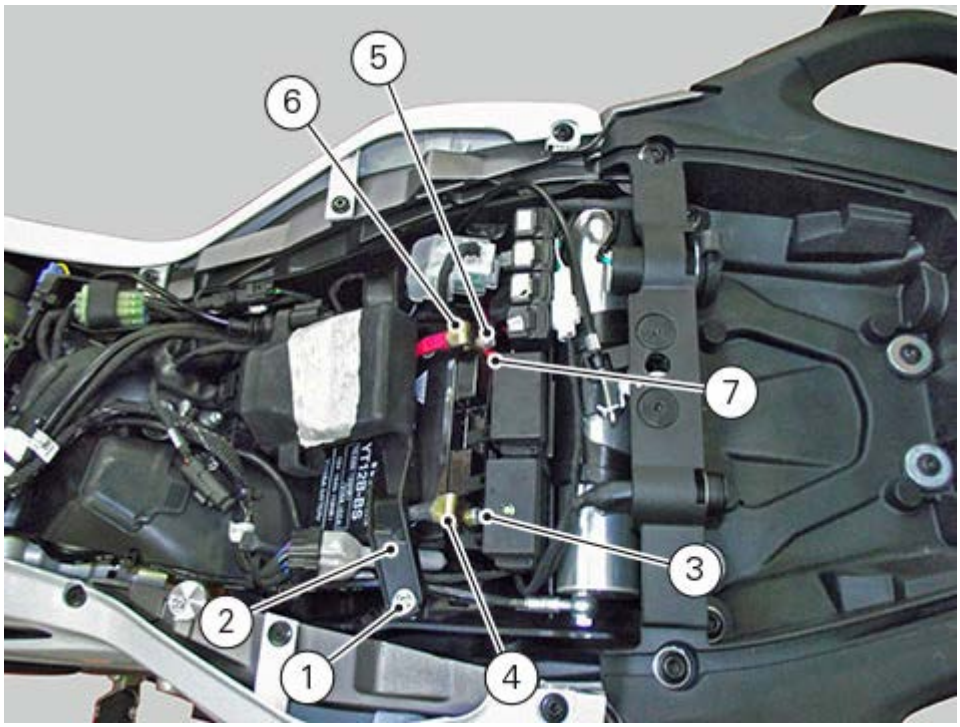
Fit the rotor (B), the stator (A) (Refitting the flywheel/generator assembly) and the generator cover (Refitting the generator cover).
Refit the cooling system pipes (Refitting the cooling system hoses and unions) and restore the fluid level.
Refit the gearchange mechanism in its seat (Refitting the gear shift).
Refit the front sprocket cover (Refitting the front sprocket cover).
Restore the engine oil level (Changing the engine oil and filter cartridge).

Refitting the battery

Position ABS positive (7) and battery/solenoid starter (6) wiring.
Tighten the screw (5) to a torque of 10 Nm ± 10%.

Position ground cable (4) and tighten screw (3) to a torque of 10 Nm ± 10%.

Secure battery mounting bracket (2) with screw (1).
Tighten the screw (1) to a torque of 5 Nm ± 10%.



Removing the battery

Battery safety rules

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

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

Important
Never try to open the battery as it is sealed, it does not require maintenance operations or to be filled in with acid or other types of liquids. Consequently, it does not need any operation upon its installation on the vehicle.

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.

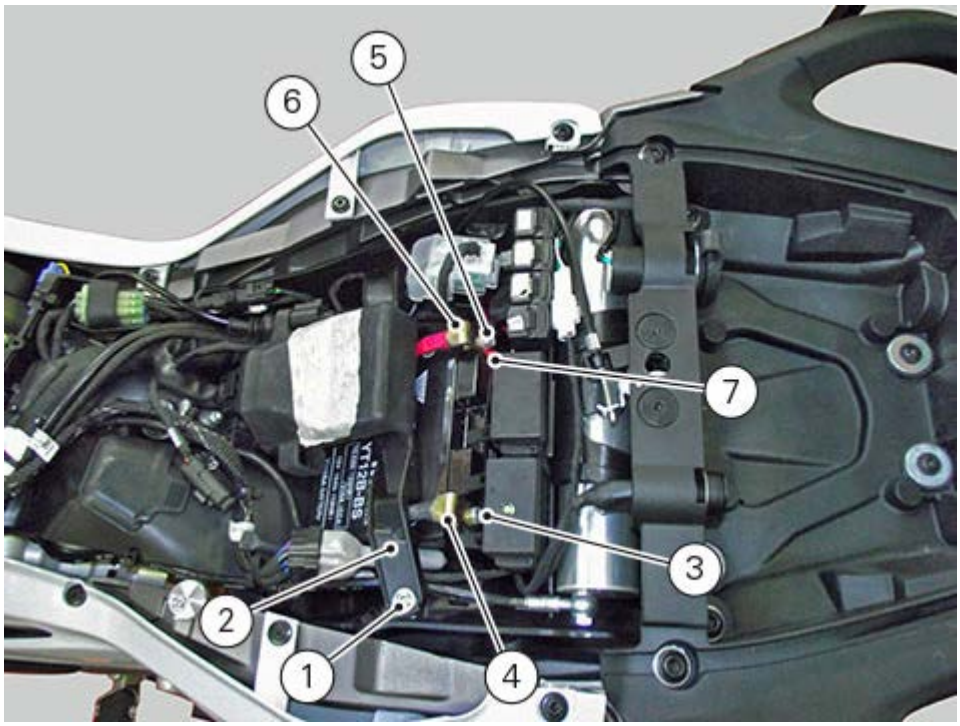
Important
If the motorcycle is left unused for more than 30 days, remove the battery and store it in a safe, cool place.

Warning
The battery gives off explosive gases; never cause sparks or allow naked flames and cigarettes near the battery. Check that during the battery charge, the area ventilation is adequate and that the ambient temperature is lower than 40 °C (104 °F). Do not try to open the battery: it does not require to be filled with acid or other types of fluids.

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

Warning
Insulate the ground cable ends you just removed to prevent them from touching the motorcycle.

Loosen screw (1) and remove Black Box and battery support (2).
Undo the screw (3) and disconnect the ground cable (4).
Loosen screw (5) and remove battery/solenoid starter (6) and ABS positive (7) cable.


5
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Topping up the electrolyte

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

Warning

Do not dispose of exhausted battery into the environment.

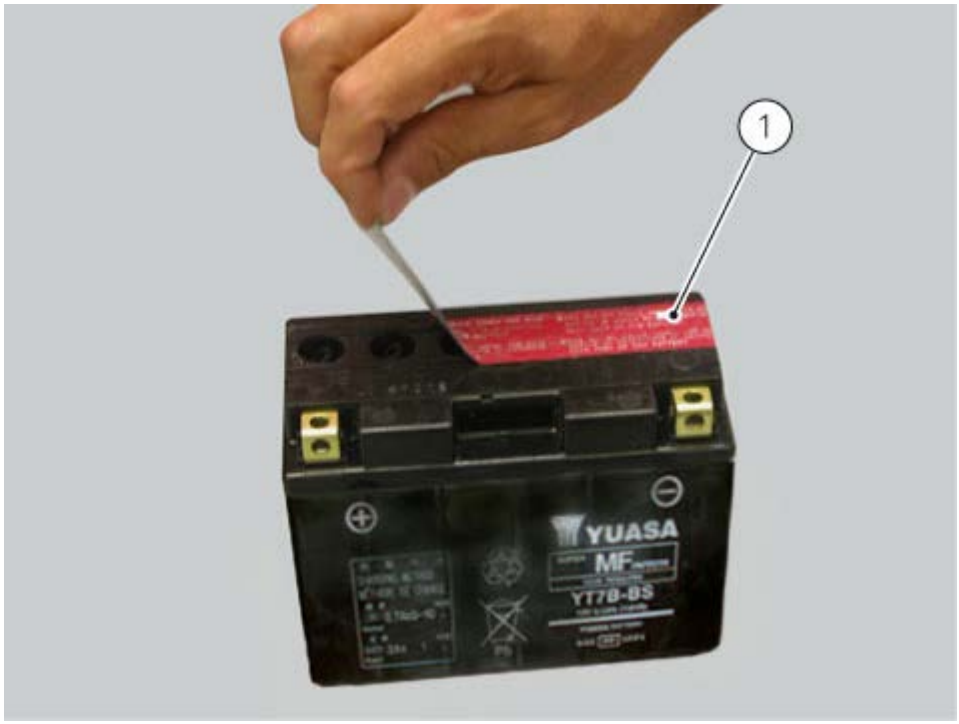
Smaltimento

Do not dispose of waste into the environment. Collect and deliver waste to authorized collecting centres. Dispose of waste in compliance with the prevailing local and national standards. European Waste Catalogue Codes recommended for waste disposal as indicated by Decision No 2001/118/EC: CER 16 06 01* (Lead batteries).

Note

It should be noted that the above-mentioned CER code is a general and non-binding provision, provided based on product original composition and intended use. The user is thus responsible for selecting the CER code most suitable to the concerned product, based on product real use and taking into account any alterations and/or contaminations of the product, as well as any amendments to the prevailing standard on waste disposal.

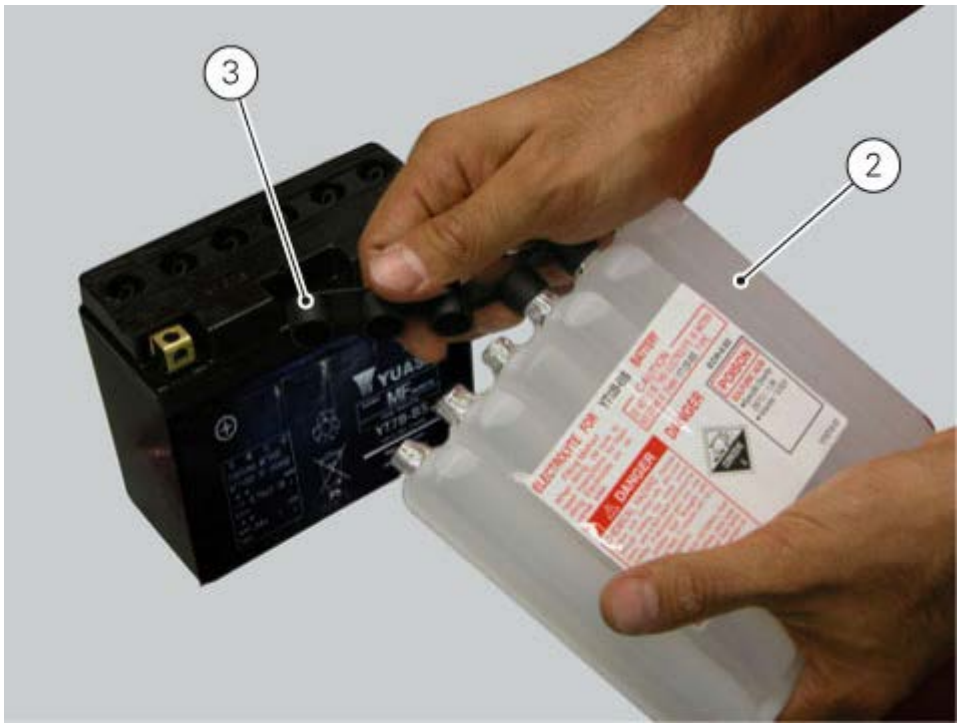
Place the battery on a flat surface. Remove the protective film (1).



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).



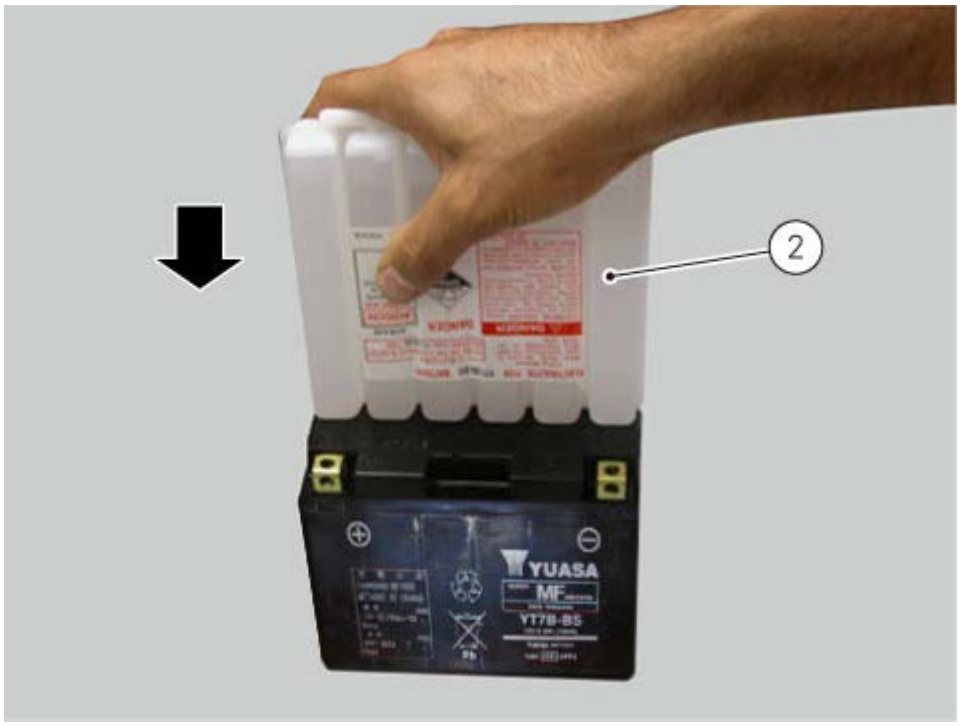
Important

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 fluid to flow out.



Note

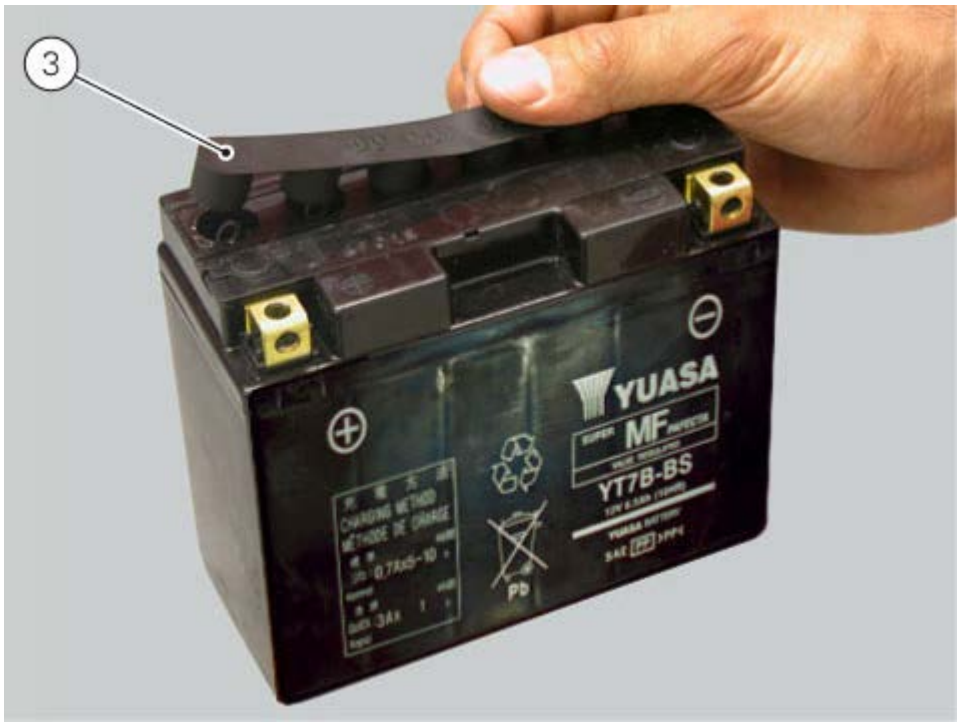
Do not tilt the electrolyte container as this could interrupt the flow temporarily or even permanently.

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

Important

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

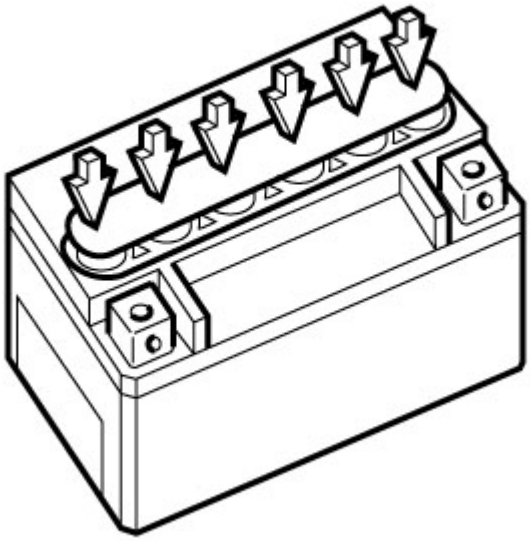
Make sure that all the electrolyte has flowed out. Carefully extract the container (2) from the battery.
Fit the cap strip (3) previously removed from the electrolyte container (2) to the battery, and ensure the caps plug off all filler holes.



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

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

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



Warning
Do not dispose of the electrolyte container into the environment.

Smaltimento
Do not dispose of waste into the environment. Collect and deliver waste to authorized collecting centres. Dispose

of waste in compliance with the prevailing local and national standards. European Waste Catalogue Codes recommended for waste disposal as indicated by Decision No 2001/118/EC: CER 15 01 10* (Packaging containing residues of or contaminated by dangerous substances).

 Note

It should be noted that the above-mentioned CER code is a general and non-binding provision, provided based on product original composition and intended use. The user is thus responsible for selecting the CER code most suitable to the concerned product, based on product real use and taking into account any alterations and/or contaminations of the product, as well as any amendments to the prevailing standard on waste disposal.

Recharging the battery

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

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

Warning

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

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

Type of charging	Volt	Ampere (A)	Time (Hours)
Normal	12	1.2	5-10

Use fast charging in emergencies only.

Storing the battery

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

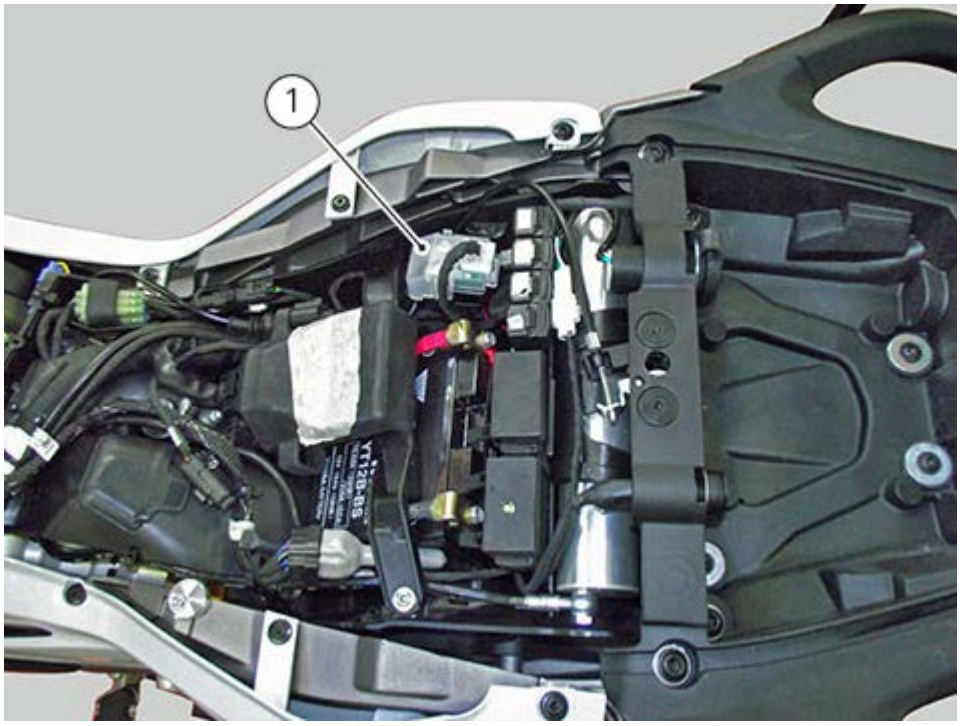
Checking the battery charging system

Perform checks on the system as indicated in the following paragraphs:

- Recharging the battery
- Topping up the electrolyte
- Generator
- Rectifier-regulator

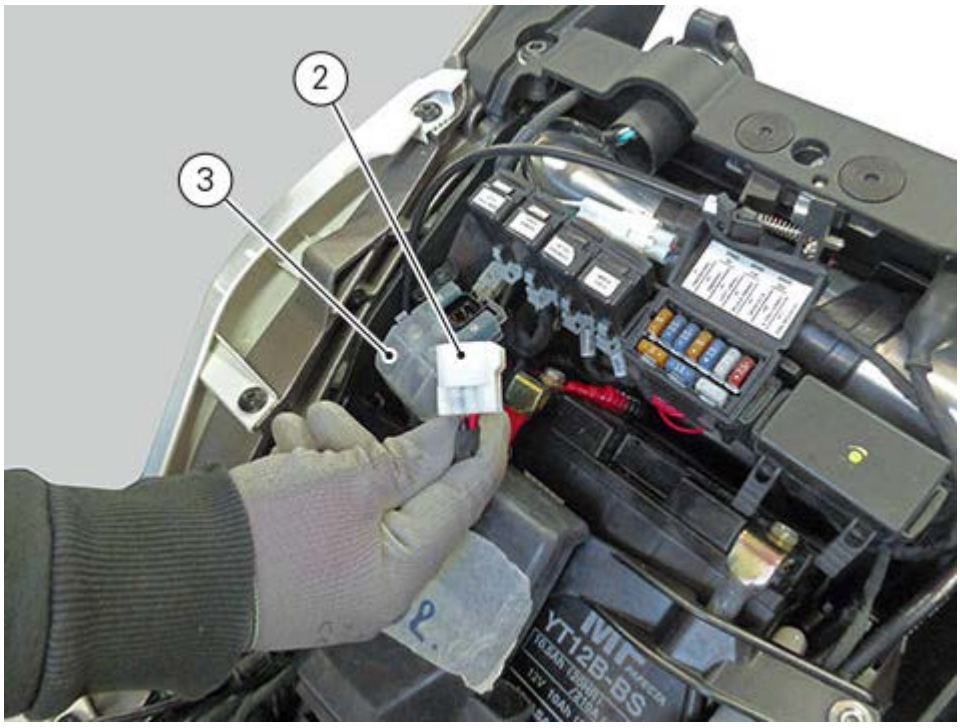
Solenoid starter

The solenoid starter (1) is located inside the electrical component compartment.

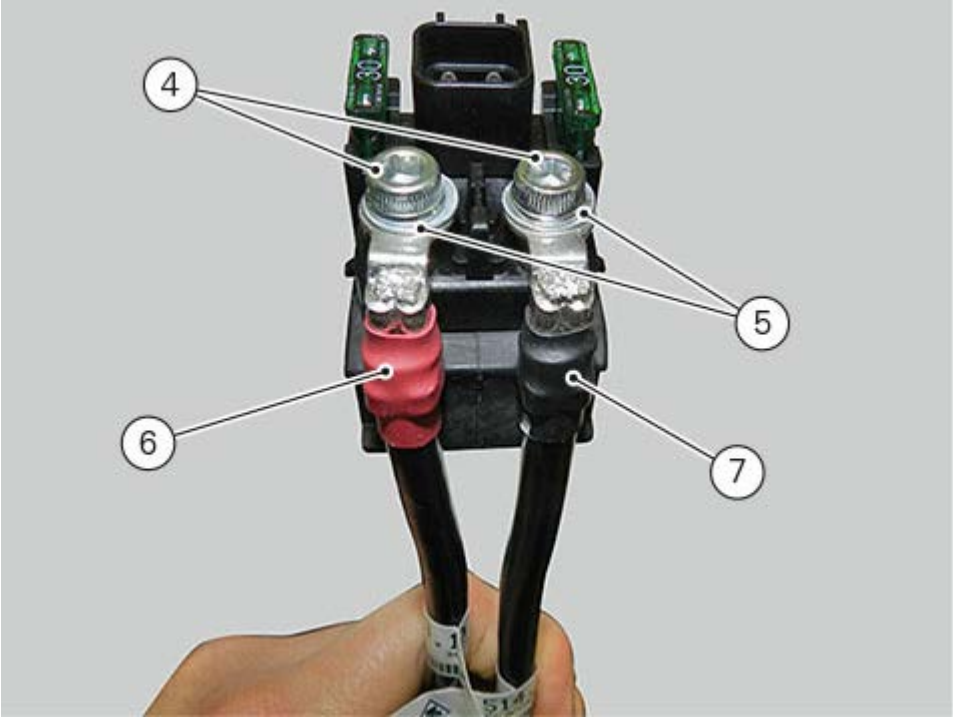


Removal procedure

Disconnect the solenoid starter connector (2) from the wiring.
Slide out solenoid starter from its seat.
Remove protection (3).

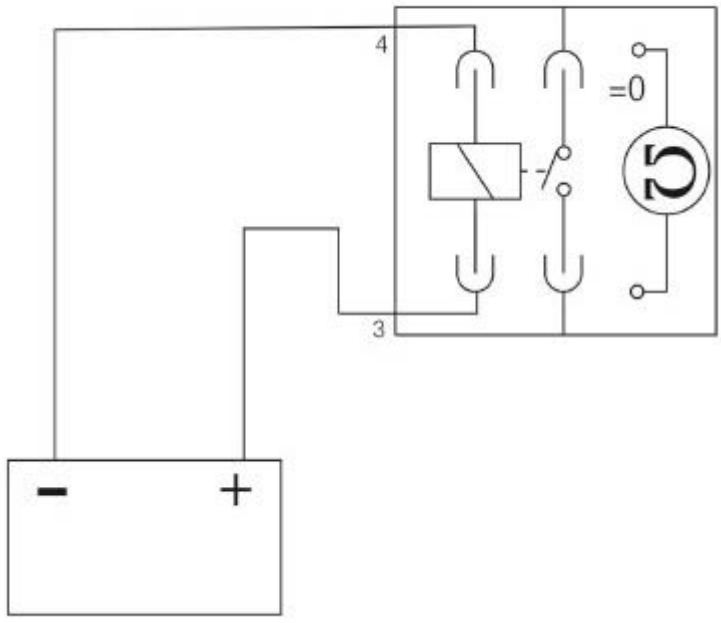


Undo the screws (4), taking care to collect the spring washers (5).
Remove the starter motor-solenoid starter cable (6) and the solenoid starter-battery cable (7).



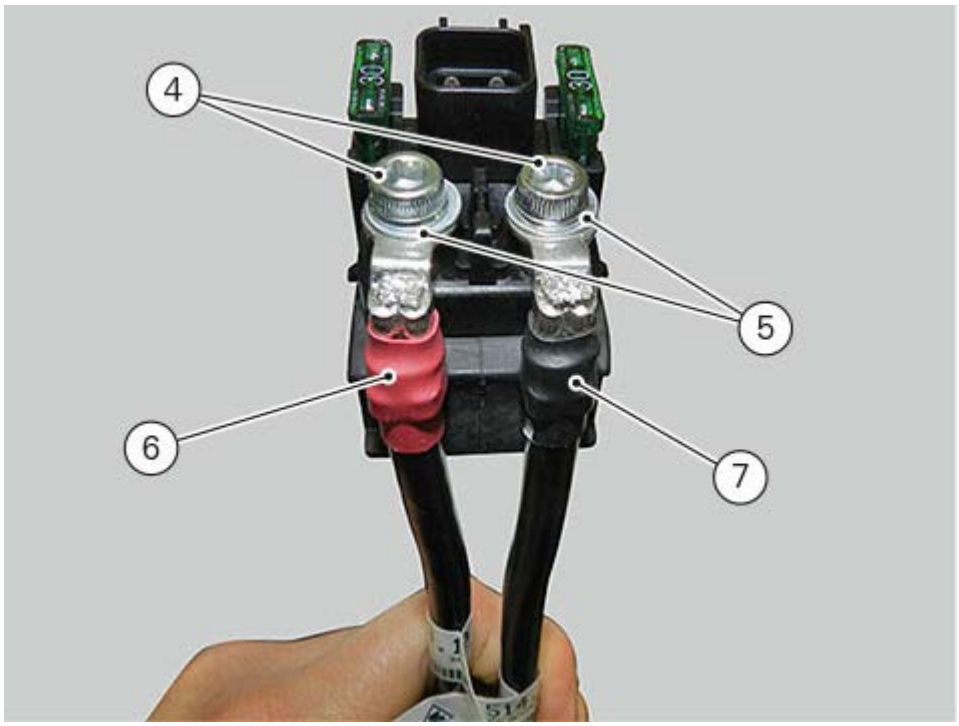
Checking operation of the solenoid starter.

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.



Refitting procedure

Lay down the starter motor-solenoid starter cable (6) and the solenoid starter-battery cable (7).
Start screws (4) with washers (5). Tighten screws (4) to the specified torque of 10 Nm ± 10%.
Refit protection cap (3).
Secure the solenoid starter inside its seat and connect connector.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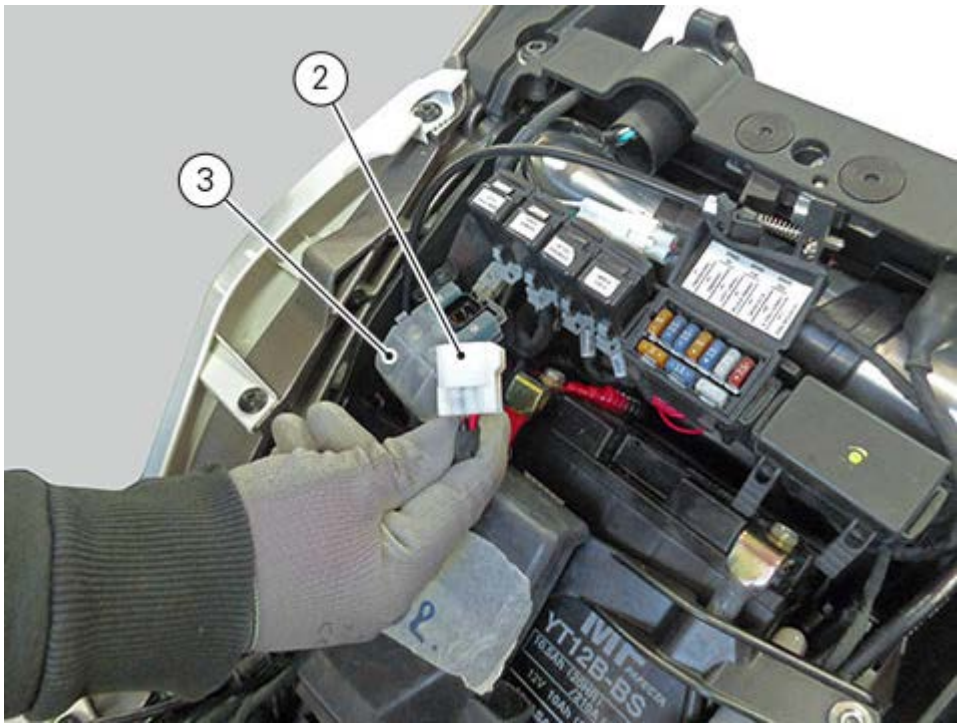

2
3

Starter motor

Electric features:
12 V / 0.7 kW

The starter motor is highly compact and reliable, therefore rarely raises any operating issue.
In case of faults:
- 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).

Warning
Secure the starter motor to a test bench, making sure not to damage the casing.

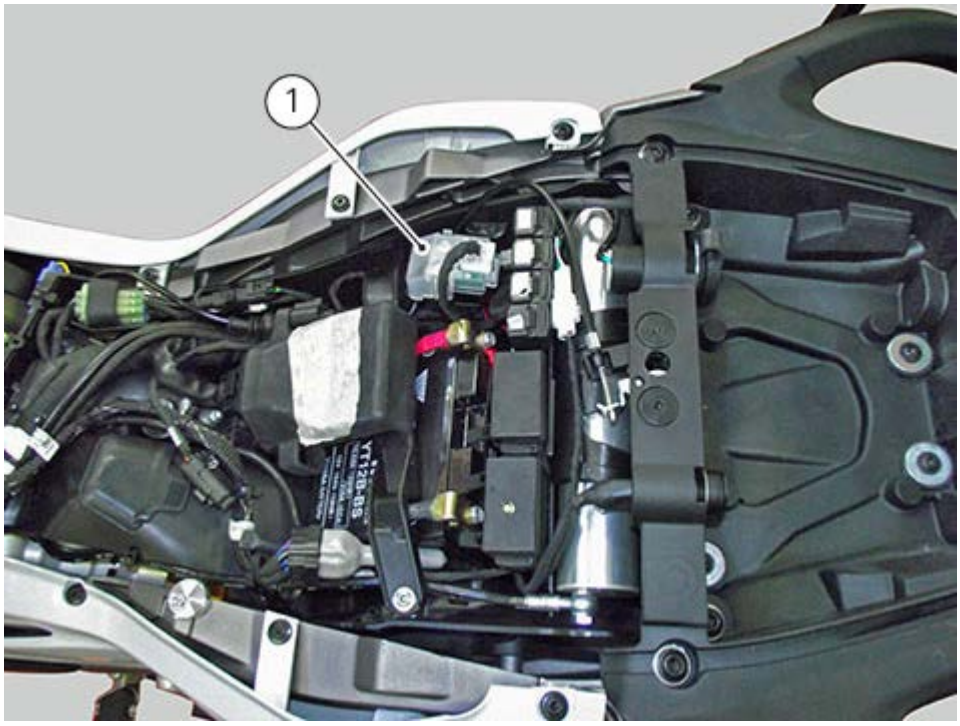
Warning
Use a fully charged 12 V battery for the test.

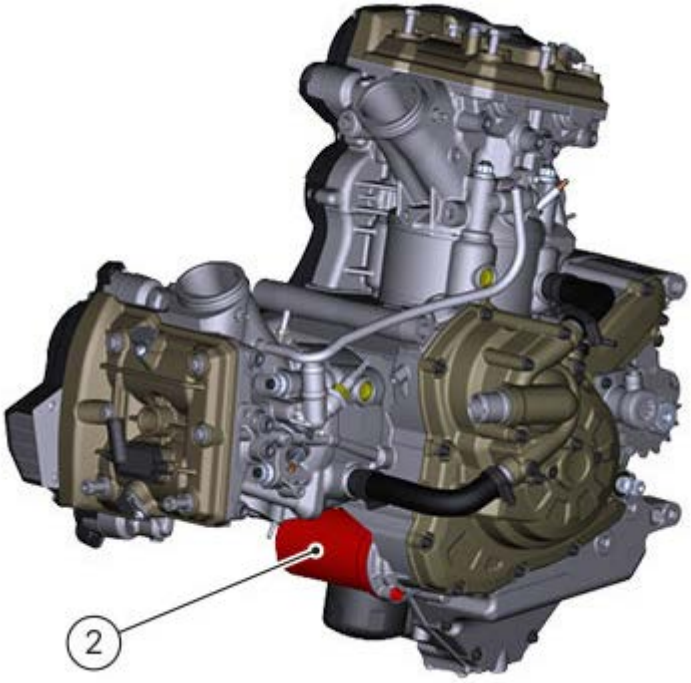
- Use battery-motor connection cables which are no longer than 70 cm and with the same cross-section as the cable on the vehicle itself;
- connect the negative terminal of the battery to an unpainted area of the starter motor casing and the positive terminal to its electrical terminal;
- the shaft of the starter motor should rotate freely and at a high speed.

Warning
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).





Replacing the tail light bulbs

The tail light (1) on this motorcycle is a LED light.
In case of malfunctions or breakage, it will be necessary to replace the entire tail light (1) (Removing the number plate holder).

Tail light

The tail light (1) on this motorcycle is a LED light.
In case of malfunctions or breakage, it will be necessary to replace the entire tail light (1) (Removing the number plate holder).

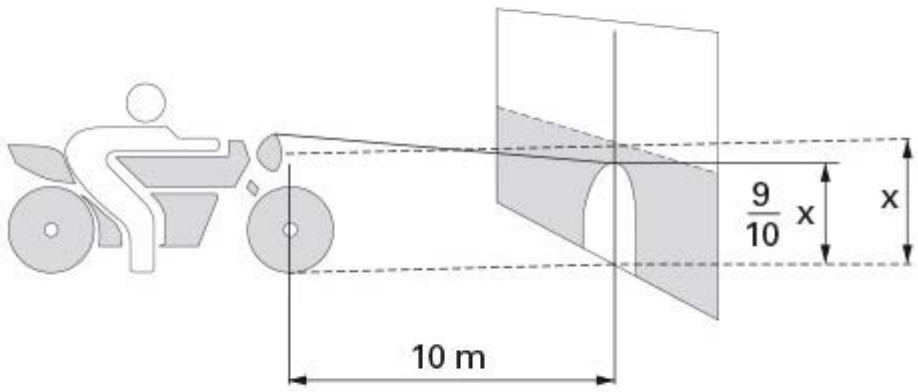
Aligning the headlight

Position the vehicle with tyres inflated at the indicated pressure (“Front wheel" and "Rear wheel”) and a person seating on the seat, perfectly perpendicular to his/her longitudinal axis.
Position the vehicle 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.

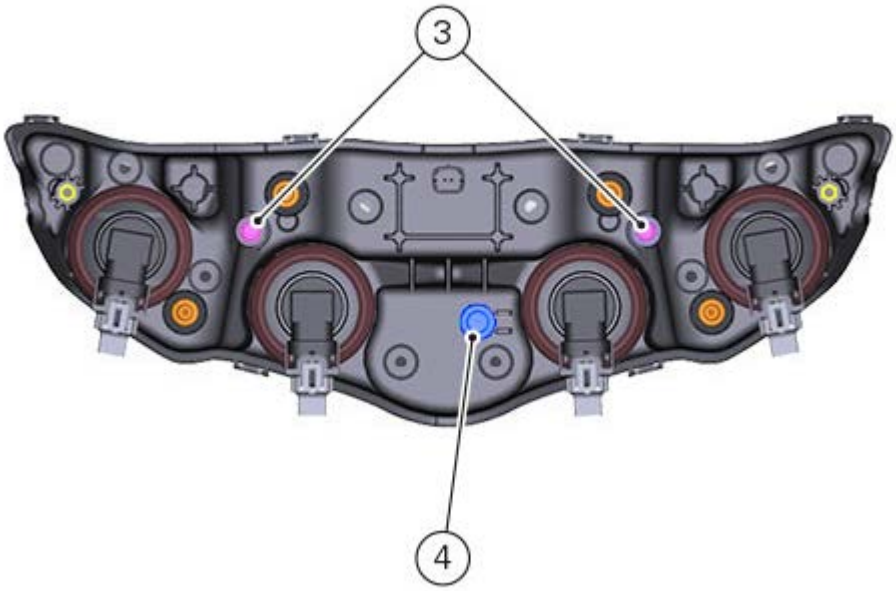
Switch on the low beam. The height of the upper limit between the dark area and the lit area must not be more than 9/10 of the height from the ground of the headlight centre.

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.



Switch low beam/high beam ON and completely cover one of the two.
Adjust uncovered low beam vertically by working the corresponding screw (3), i.e., the one on the same side.
Turn screw clockwise to move beam down, or counter clockwise to move beam up.
Once adjustment is completed, repeat the same procedure on the other headlight.

Adjust the high beam by working on screw (4).
Turn screw (4) clockwise to move beam down, or counter clockwise to move beam up.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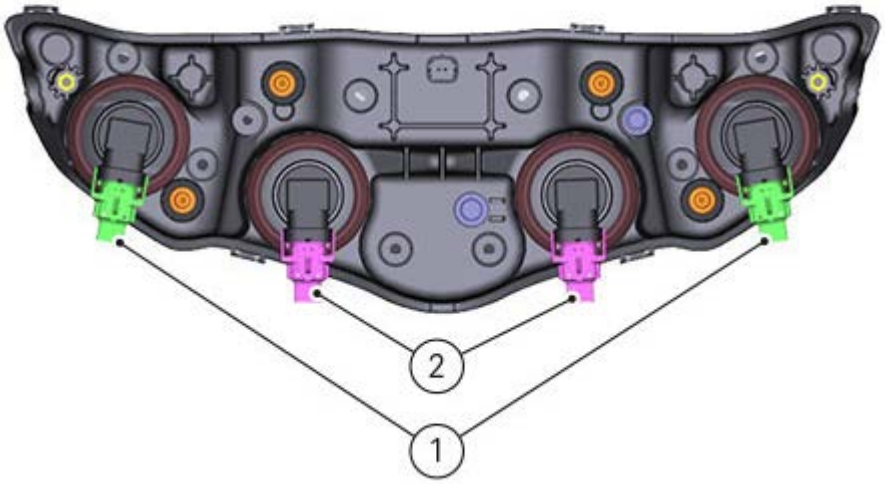
Replacing the headlight bulbs

To make bulb replacement procedure easier, it is recommended to remove the light assembly (Removing the light assembly).

Remove the connector of the bulb to be replaced:

1 high beam bulbs;
2 low beam bulbs.

Remove damaged bulb and replace it.



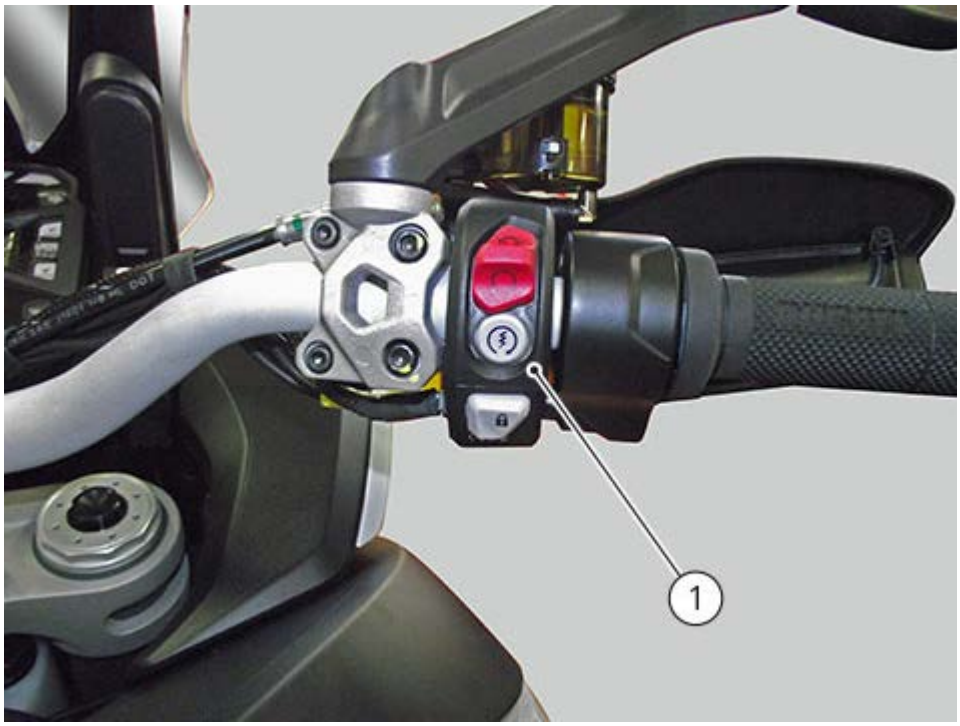
Headlight

This procedure applies to base version only, as S version features a LED headlight so, in case of malfunction of a bulb, the whole headlight must be replaced.

For removal, refer to the procedure explained in chapter "Removing the light assembly".

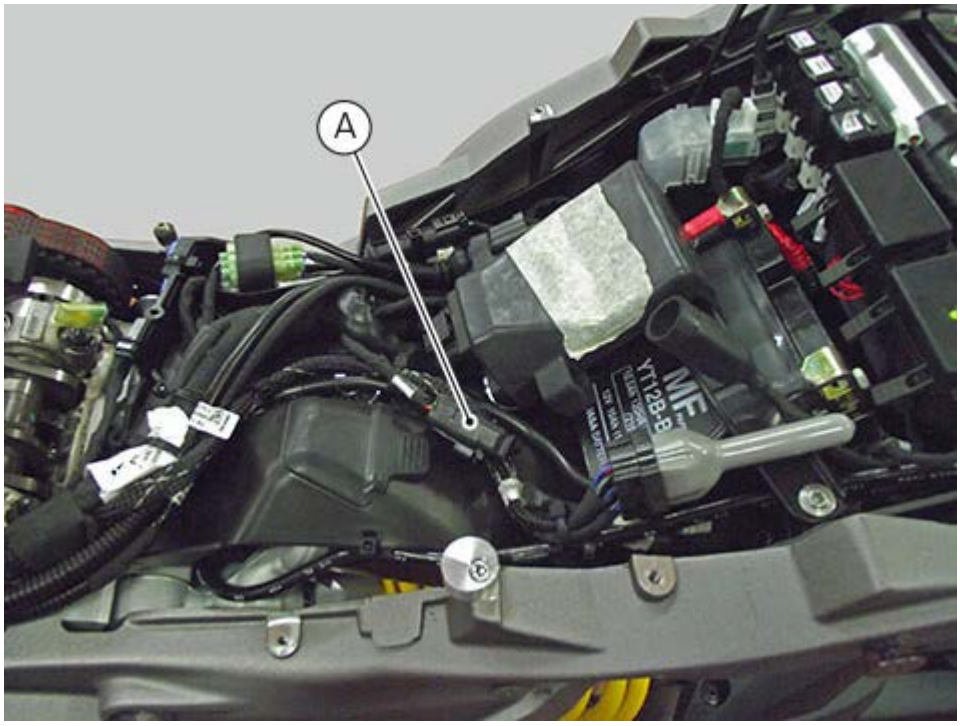
Right-hand switch

In case of malfunction, check for faulty parts in the system.
To disassemble and reassemble right-hand switch (1), see chapters "Removing the handlebar" and "Refitting the handlebar".



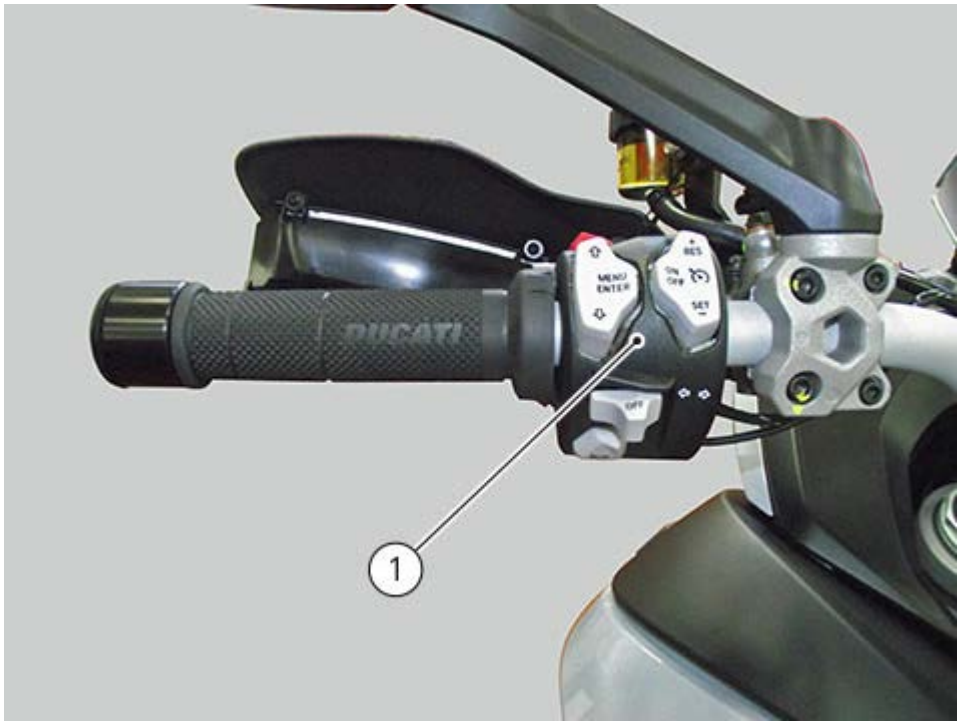
CONTROLS

Check control unit correct operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket (A), which is positioned inside electrical components compartment; to reach it, remove the seat.



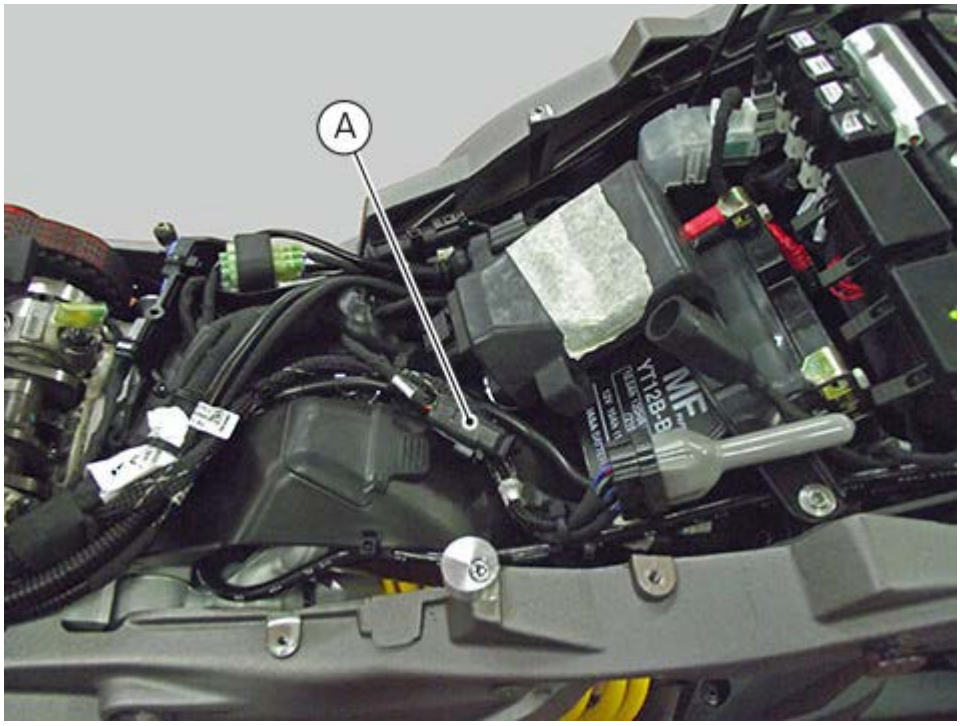
Left-hand switch

In case of malfunction, check for faulty parts in the system.
To disassemble and reassemble left-hand switch (1), see chapters "Removing the handlebar" and "Refitting the handlebar".



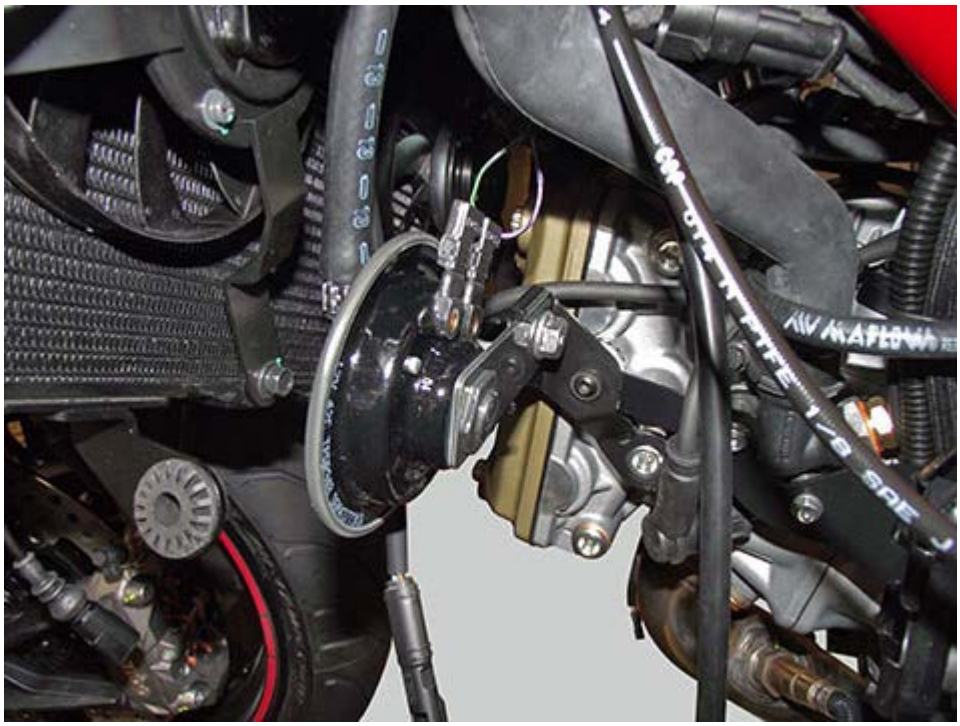
CONTROLS

Check control unit correct operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket (A), which is positioned inside electrical components compartment; to reach it, remove the seat.

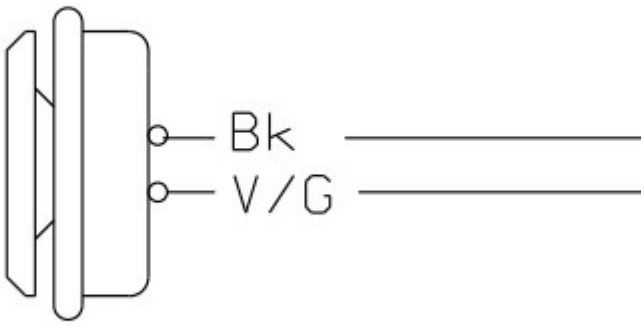


Horn

Supply 12 V (battery) to the two fastons.
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 horn if the malfunction persists.



ELECTRIC DIAGRAM



Checking the fuses

Electric components are protected by eleven fuses located in the two fuse boxes.
In each fuse box (A) and (B) there are three spare fuses.

FUSE BOXES (A) and (B)

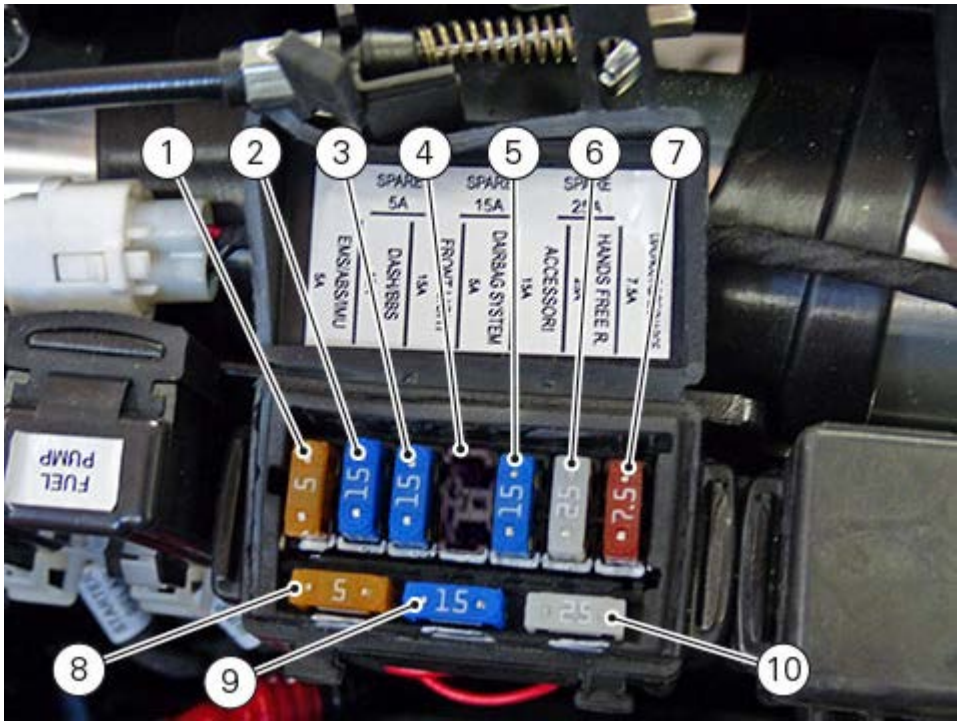
The fuse boxes (A) and (B) are located in the electrical components compartment, under the seat.
Remove seat as described in paragraph "Removing the seat".
To expose the fuses, lift the box protective covers. Mounting position and ampere capacity are marked on box cover.

Refer to the table below to identify the circuits protected by the various fuses and their ratings.

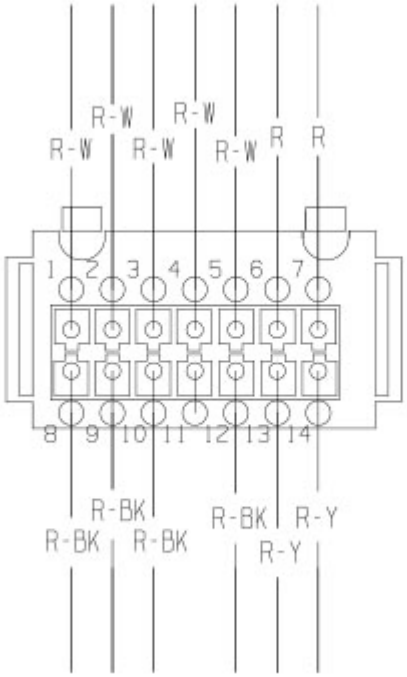
Fuse box (A)

Fuse box (A) key		
Pos	El. item	Rat.
1	KEY EMS / ABS / IMU	5 A
2	KEY DSB / BBS	15 A
3	KEY Lights	5 A
4	-	-
5	KEY Accessories	10 A
6	+30 Hands Free	25 A
7	+30 Diagnosis / charge	7.5 A

Fuses 8, 9, 10 are spare fuses



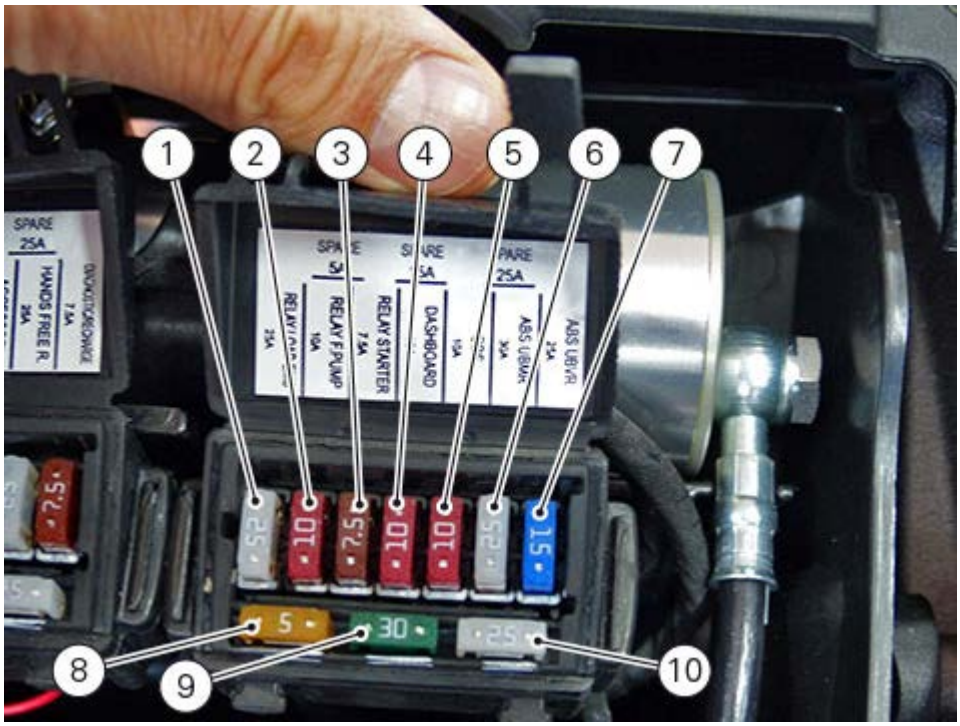
ELECTRIC DIAGRAM



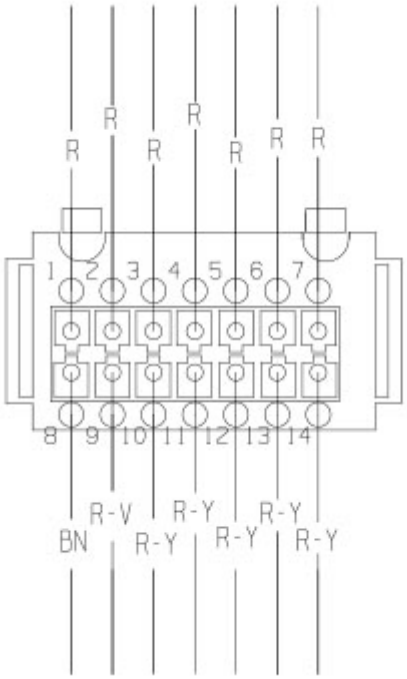
Fuse box (B)

Fuse box (B) key		
Pos	El. item	Rat.
1	+30 EMS LOAD RELAY	25 A
2	+30 FUEL PUMP RELAY	10 A
3	+30 Starter RELAY	7.5 A
4	+30 Instrument panel	20 A
5	+30 Black Box System (BBS)	10 A
6	+30 ABS UBMR	25 A
7	+30 ABS UBVR	15 A

Fuses 8, 9, 10 are spare fuses

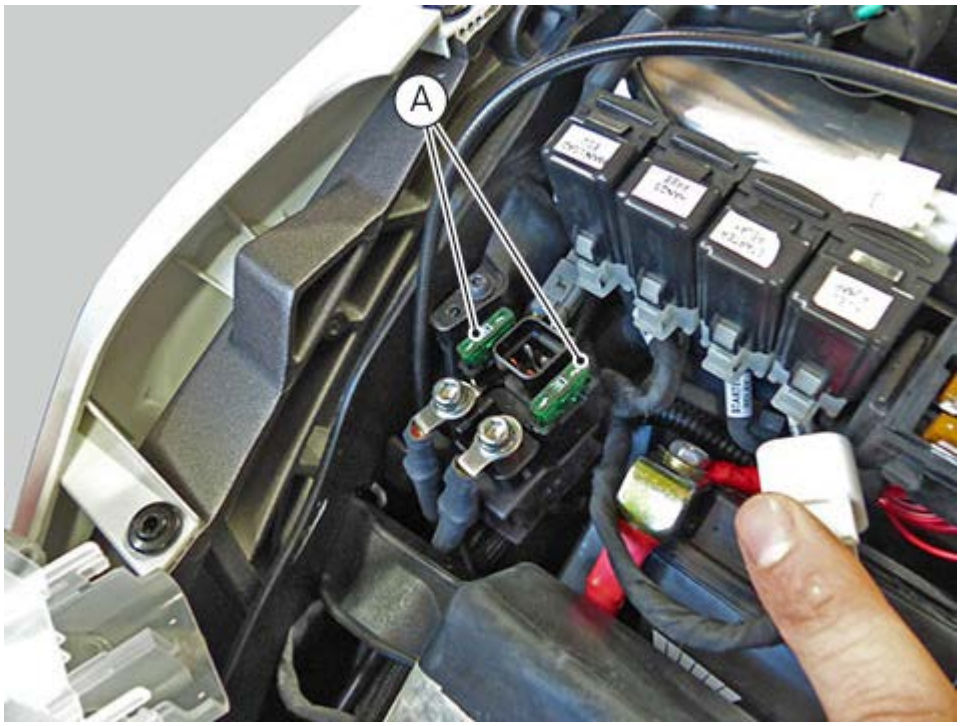


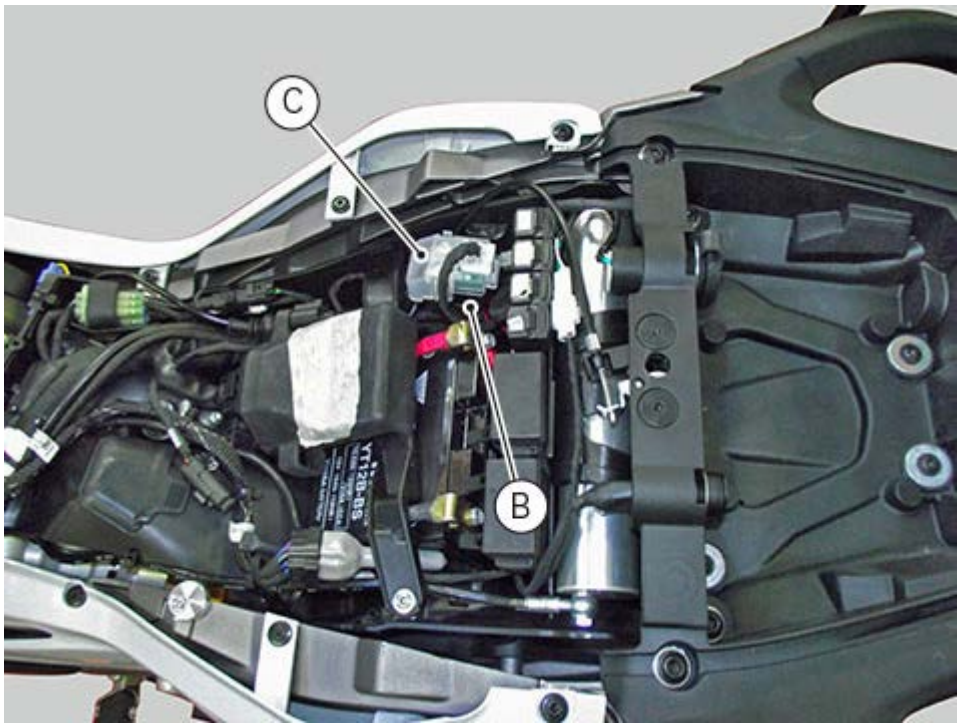
ELECTRIC DIAGRAM



MAIN FUSES

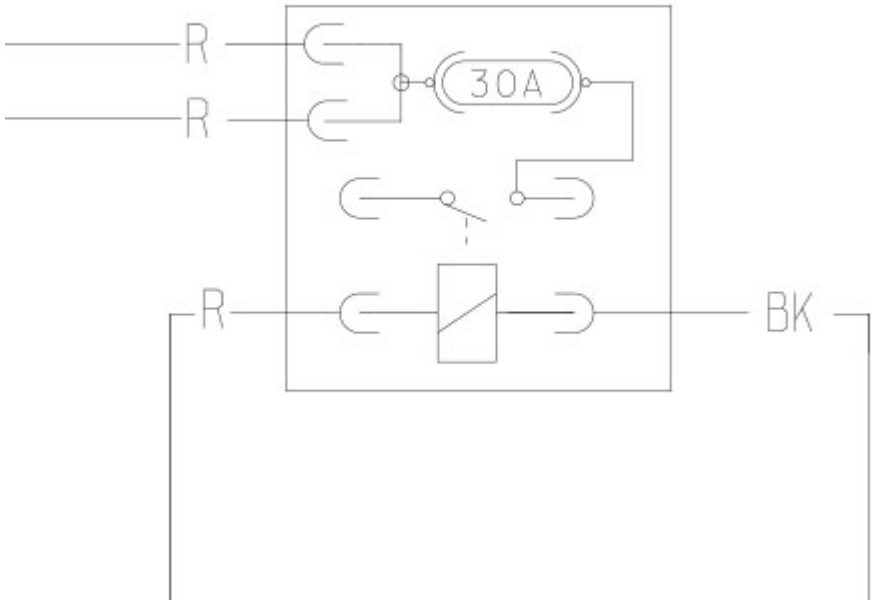
To reach the main fuses and the ABS fuses, remove the seat, as described in paragraph "Removing the seat".
The two main fuses (A) (one is the spare fuse) are located on solenoid starter (B).
Remove protection cap (C) of both fuses.





Main fuses key		
Pos	El. item	Rat.
A	Main fuse	30 A
A	Spare	30 A

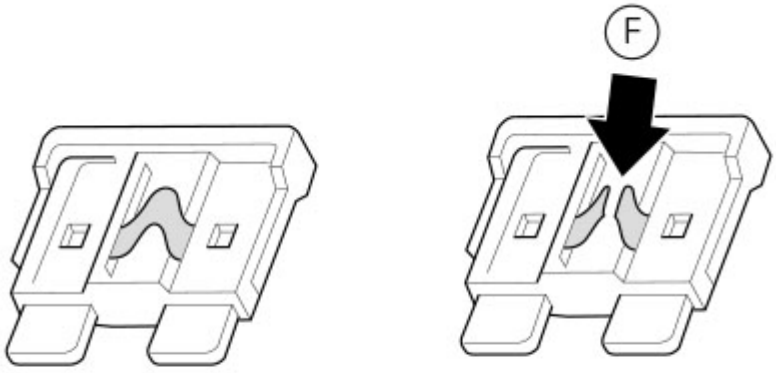
ELECTRIC DIAGRAM



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 (F).



Important

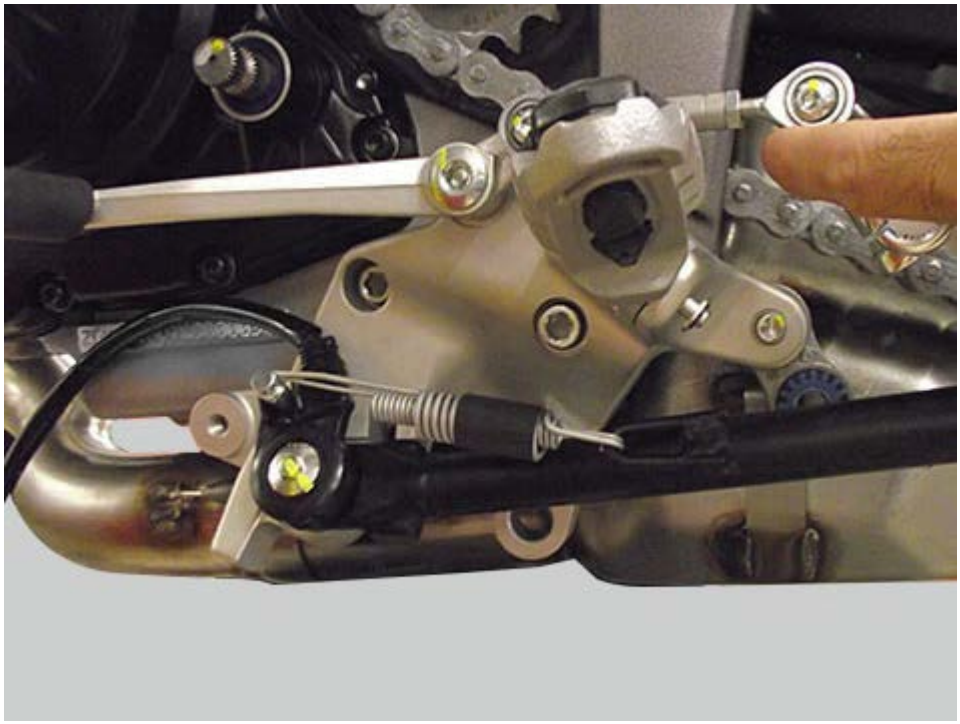
Switch the ignition key to OFF before replacing the fuse to avoid possible short-circuits.

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.

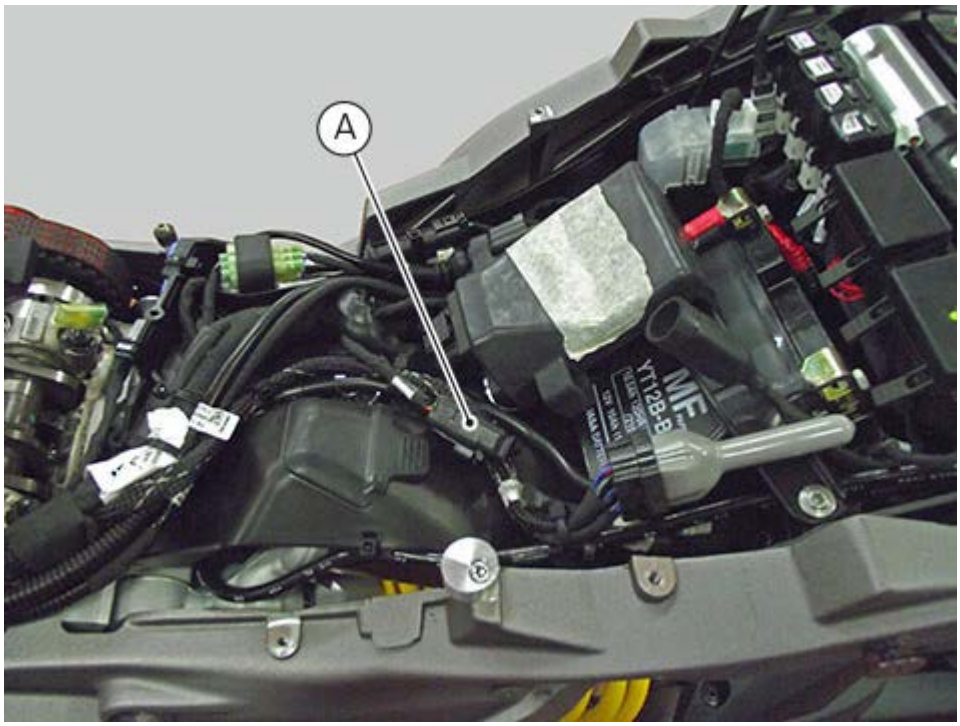
Side stand switch

The side stand switch is located on the side stand ball joint and provides the side stand position information to the control unit.
The detected signal is output to the control unit, which shares it with the instrument panel.



CONTROLS

Check control unit correct operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket (A), which is positioned inside electrical components compartment; to reach it, remove the seat.

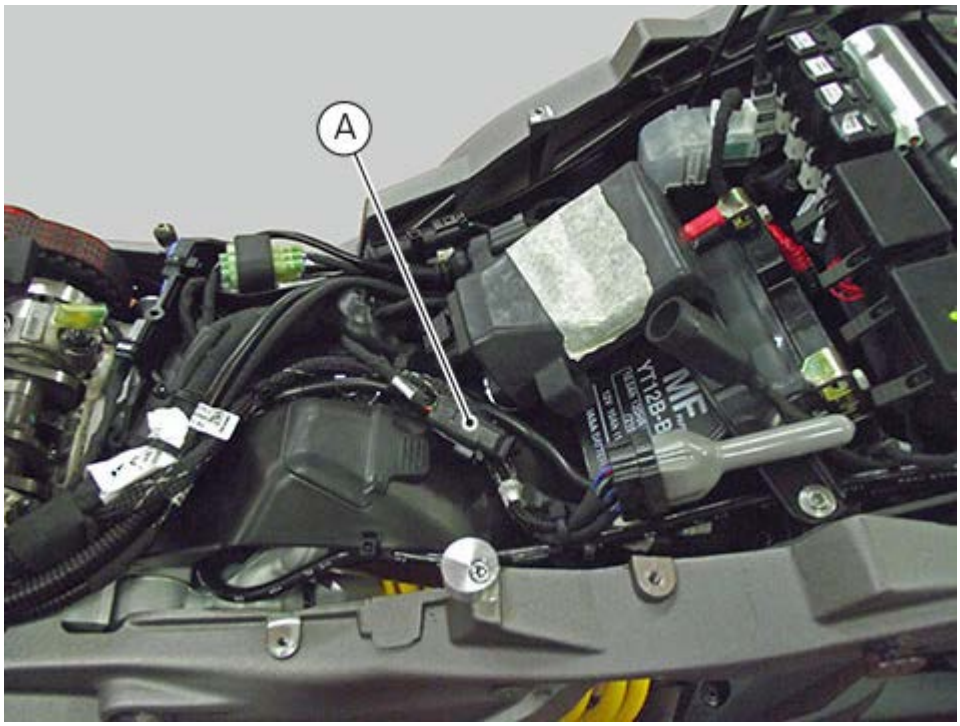


Air temperature sensor

The air temperature sensor (1), located on vehicle front part, detects the ambient temperature.
The detected signal is sent to the control unit, that shares it with the instrument panel; this allows performing map corrections if necessary.

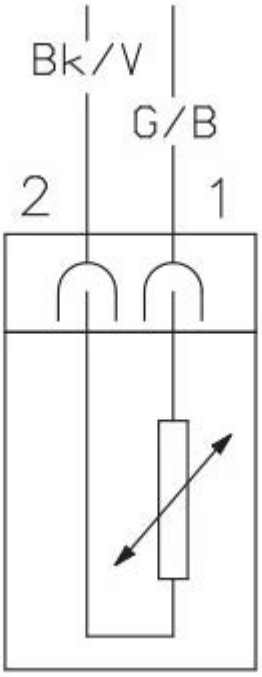
CONTROLS

Check control unit correct operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket (A), which is positioned inside electrical components compartment; to reach it, remove the seat.



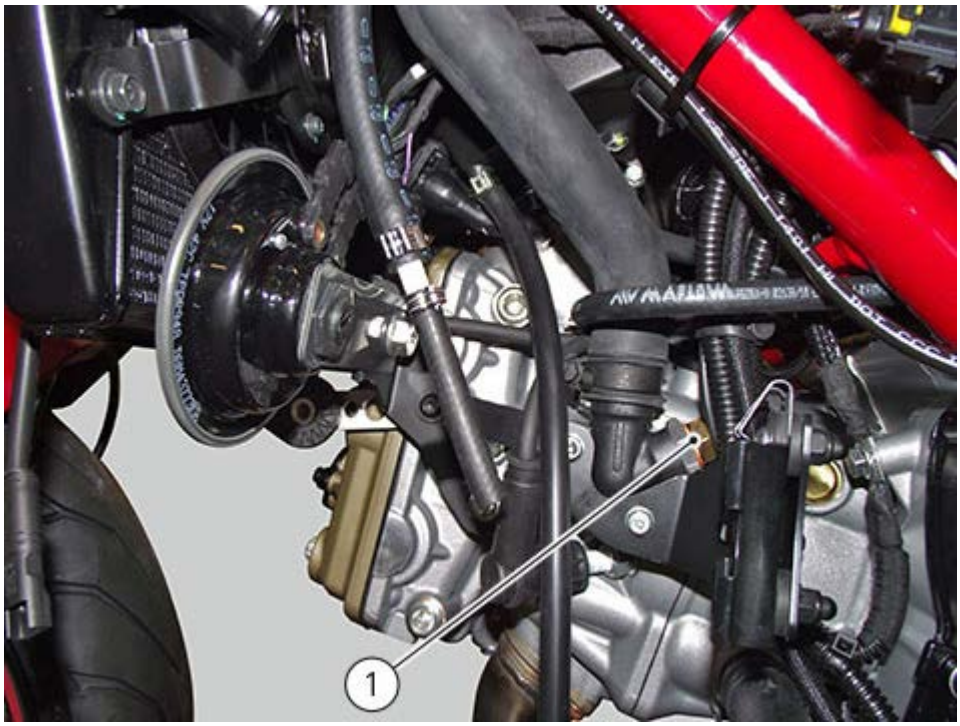
After selecting the proper items on the DDS 2 menu, read the external air temperature value among the different displayed parameters and compare it with the actual value.
Change the sensor if reading is incorrect.

ELECTRIC DIAGRAM


Bk/V
G/B
2
1

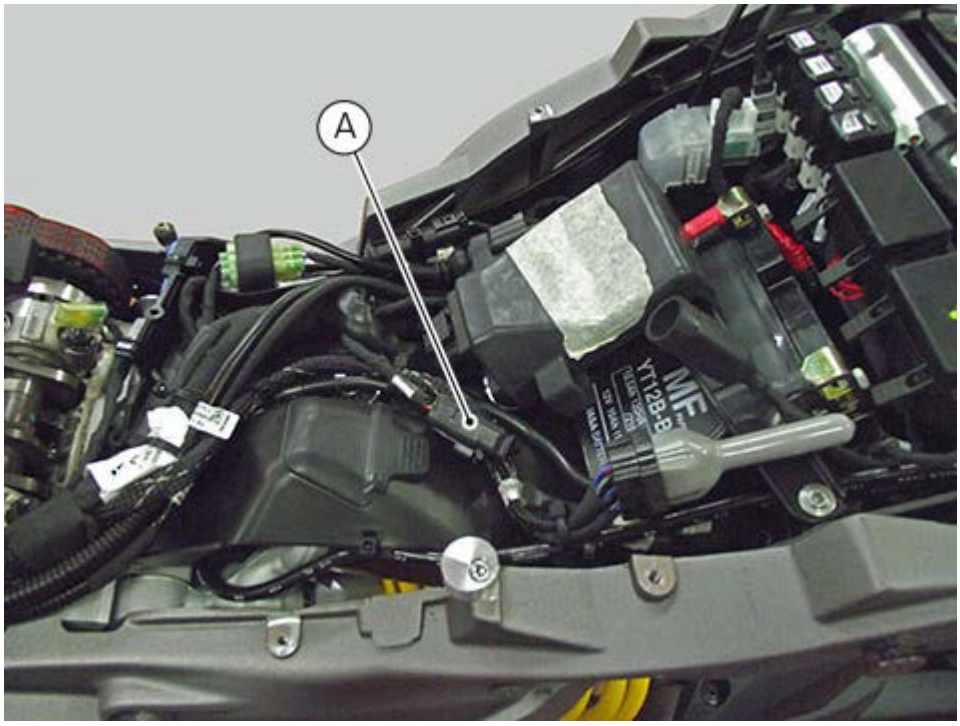
Engine temperature sensor

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.



CONTROLS

Check control unit correct operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket (A), which is positioned inside electrical components compartment; to reach it, remove the seat.



After selecting the proper items on the menu, read the engine coolant temperature value among the different displayed engine parameters:

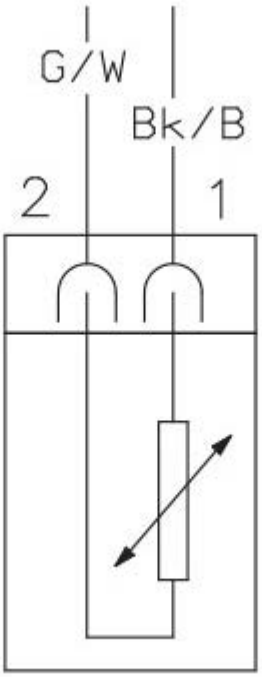
- with cold engine, the air temperature detected with the DDS 2 shall be similar to the coolant one;
- with hot engine and cooling fan just triggered, coolant temperature value shall be similar to the one required for activating the electric fan.

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.

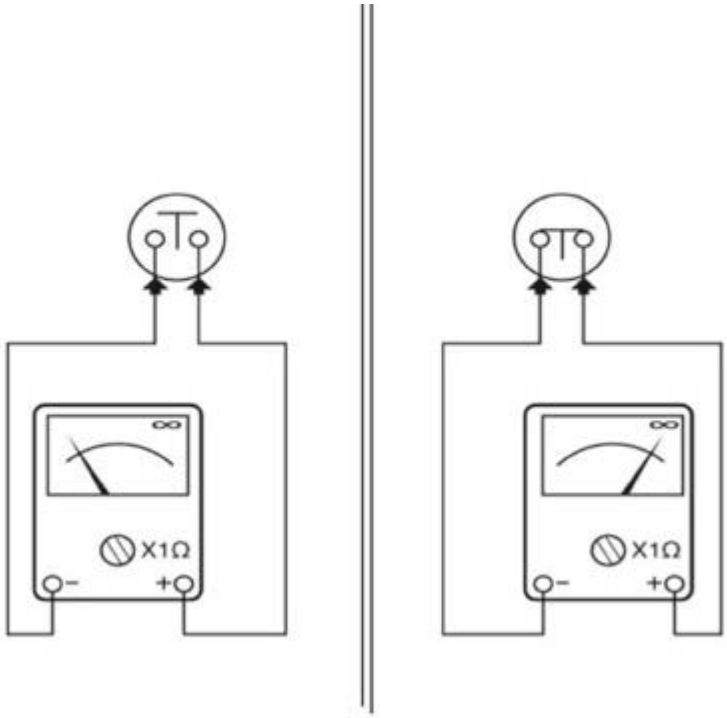
ELECTRIC DIAGRAM



Clutch switch

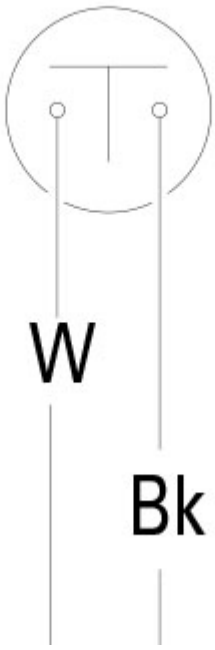
To check operation of the front (1) STOP switch, use a multimeter: when the front brake lever is operated, there must be electric continuity between the terminals of the corresponding switch.

No electric continuity should be available when brakes are not operated.



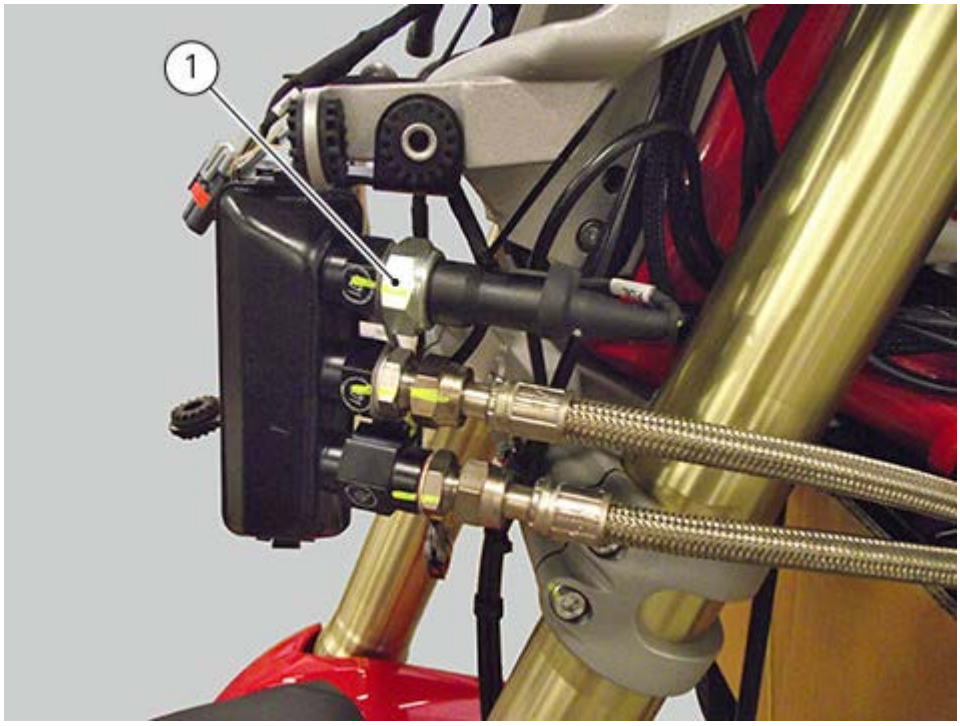
If these tests fail to produce positive results, the part in question must be replaced.

ELECTRIC DIAGRAM



Oil pressure sensor

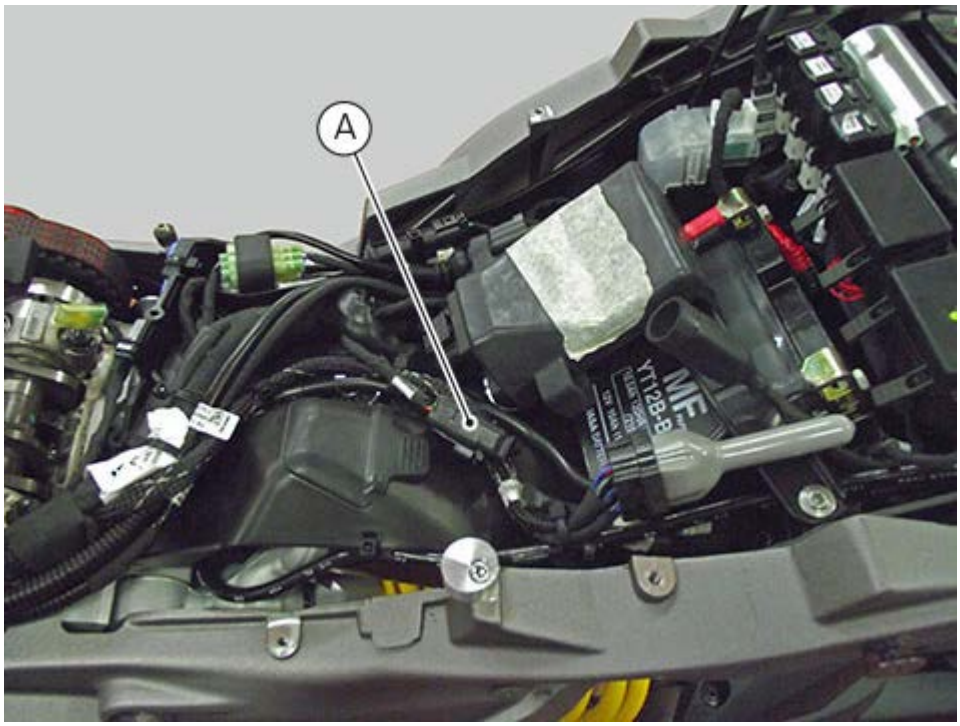
The oil pressure sensor (pressure switch) (1) is located in the front of the oil cooler.



To test the operation of the engine oil pressure sensor (1), proceed as follows.
Use the diagnosis instrument DDS 2 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 without starting the engine, disconnect the electrical terminal from the pressure sensor and connect it to ground:

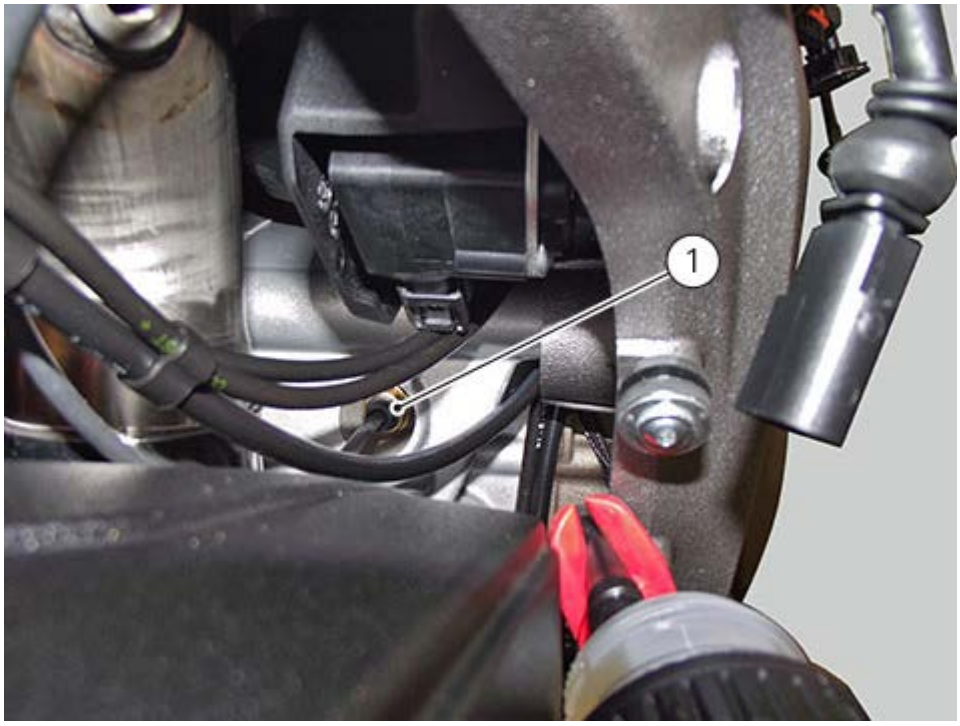
- if the warning light does not illuminate, this means the sensor is defective and must be replaced;
- if the warning light illuminates, start the engine;
- if the warning light does not turn off, check the DDS 2 system by connecting to connector (A) located in the electrical components compartment; to reach it, remove the seat.



ELECTRIC DIAGRAM

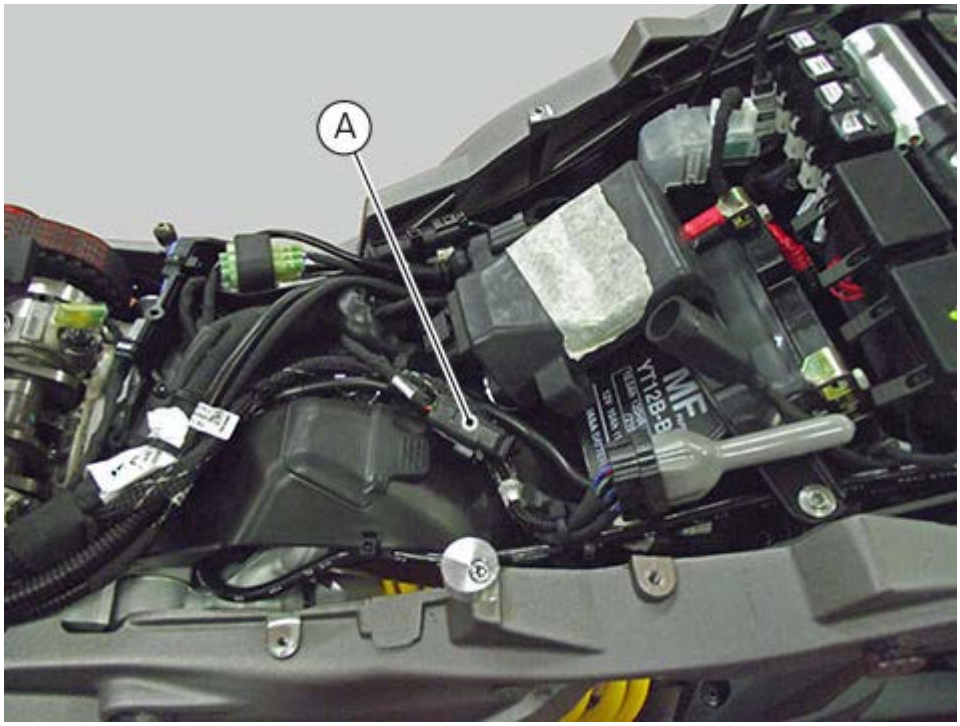
Gear/neutral sensor

The gear sensor (1) is positioned on the vehicle rear RH side.



CONTROLS

Check control unit correct operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket (A), which is positioned inside electrical components compartment; to reach it, remove the seat.



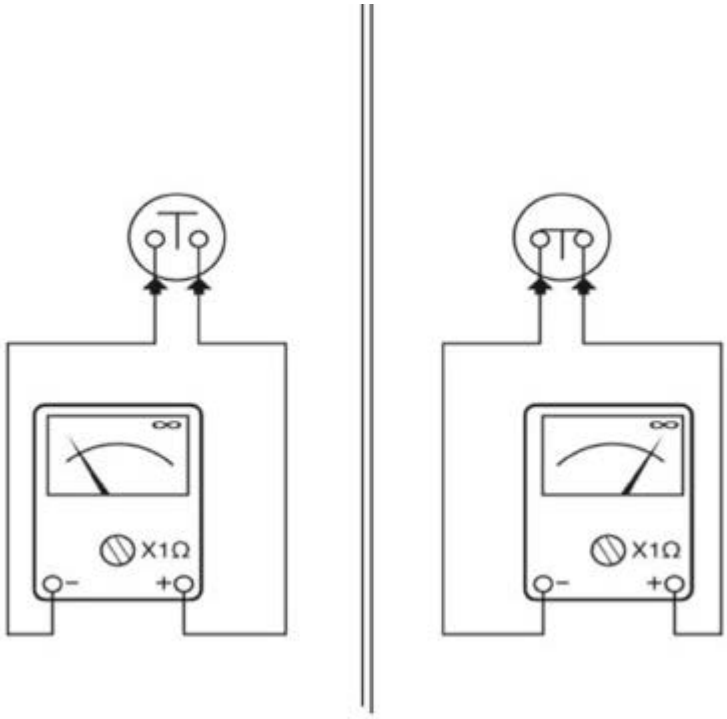
Rear stop switch

The rear STOP switch (1) is located inside the RH footpeg holder plate.

REAR STOP SWITCH CONTROL

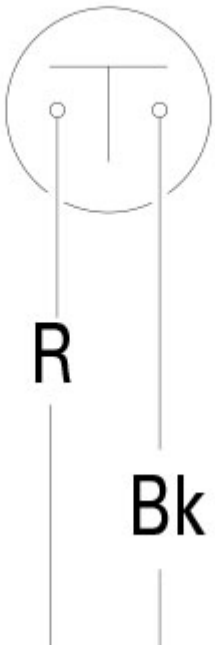
To check operation of the rear (1) STOP switch, use a multimeter: when the rear brake lever is operated, there must be electric continuity between the terminals of the corresponding switch.

No electric continuity should be available when brakes are not operated.



ELECTRIC DIAGRAM

If these tests fail to produce positive results, the part in question must be replaced.


R
Bk

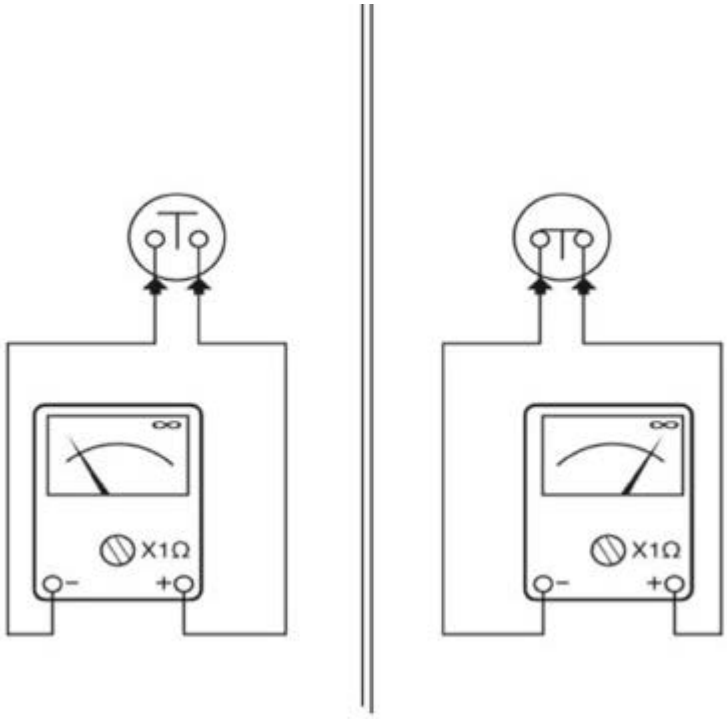
Front stop switch

The front STOP switch (1) is located on the front lever front side.

CONTROLS

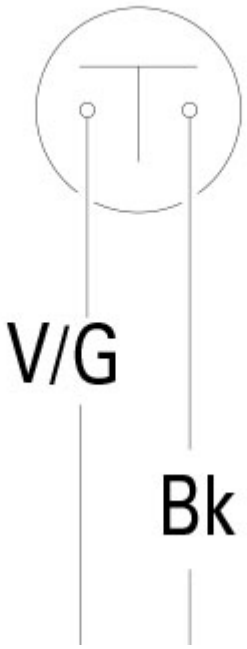
To check operation of the front (1) STOP switch, use a multimeter: when the front brake lever is operated, there must be electric continuity between the terminals of the corresponding switch.

No electric continuity should be available when brakes are not operated.



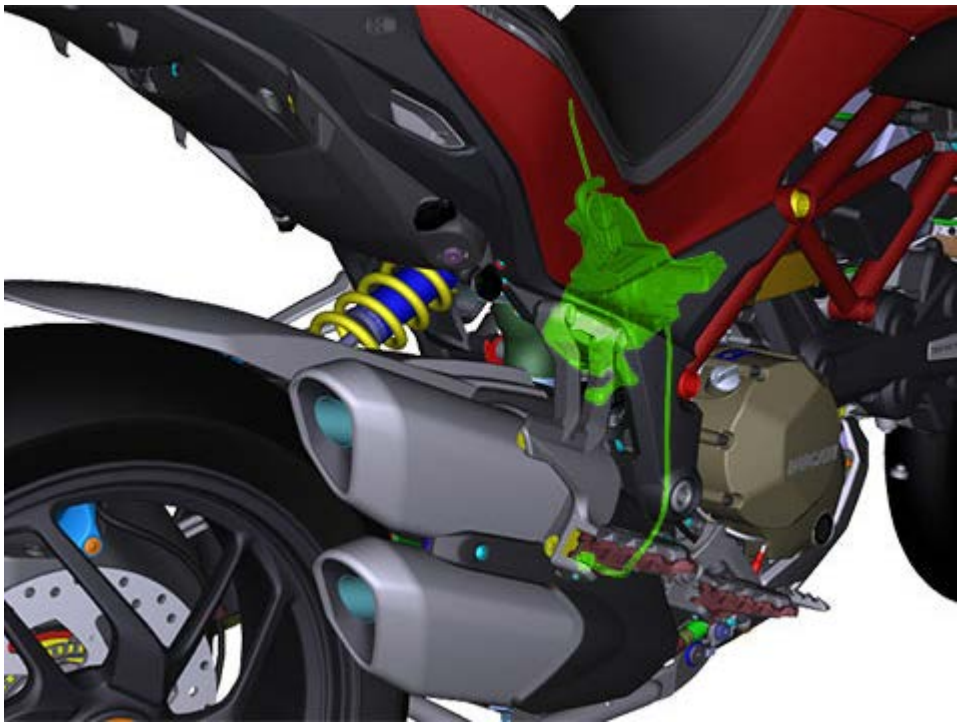
ELECTRIC DIAGRAM

If these tests fail to produce positive results, the part in question must be replaced.


V/G
Bk

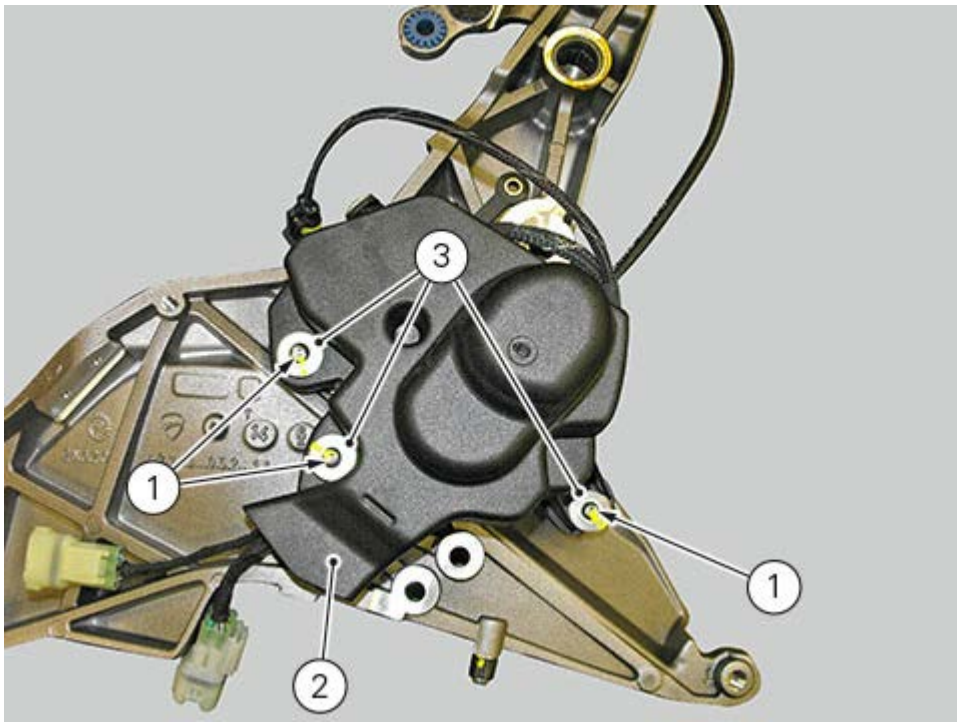
Exhaust valve motor

To reach the exhaust valve motor, remove the RH side plate as described in chapter "Removing the side panels".
Release exhaust valve motor cable as described in chapter "Removing the exhaust system".

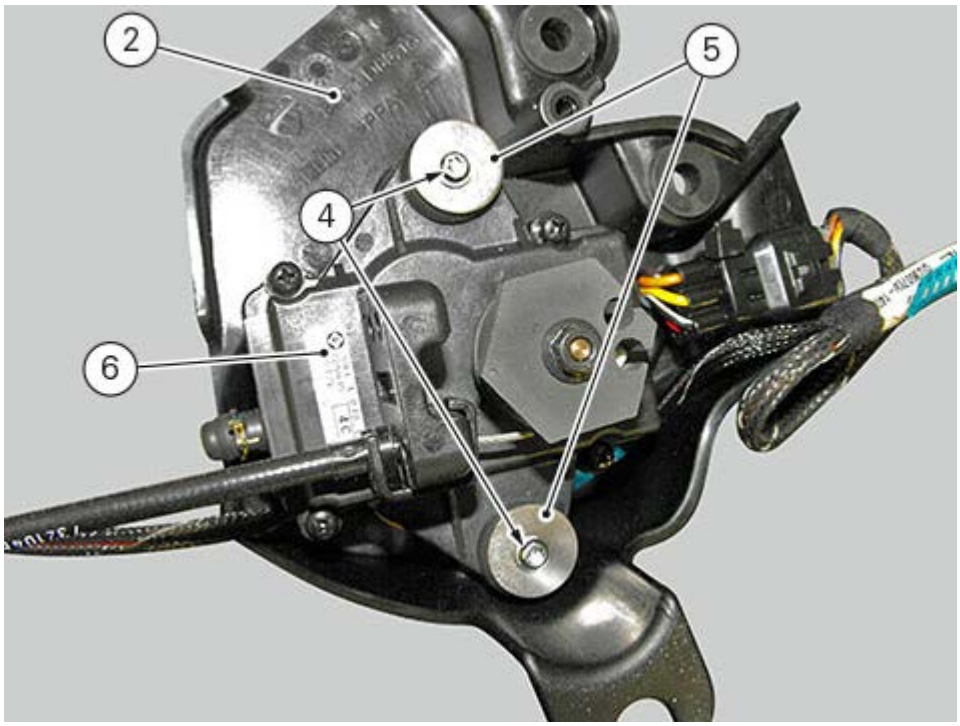


REMOVAL PROCEDURE

Remove the three screws (1) of exhaust valve motor support (2) collecting washers (3).

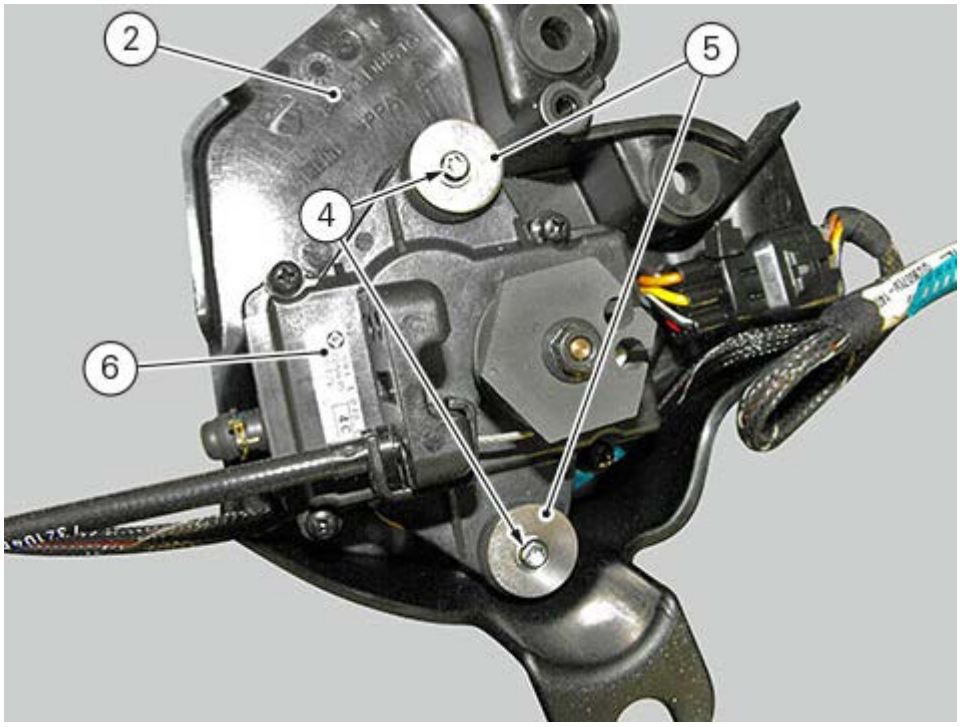


Remove the two screws (4) collecting washers (5).
Separate exhaust valve motor (6) from its support (2).

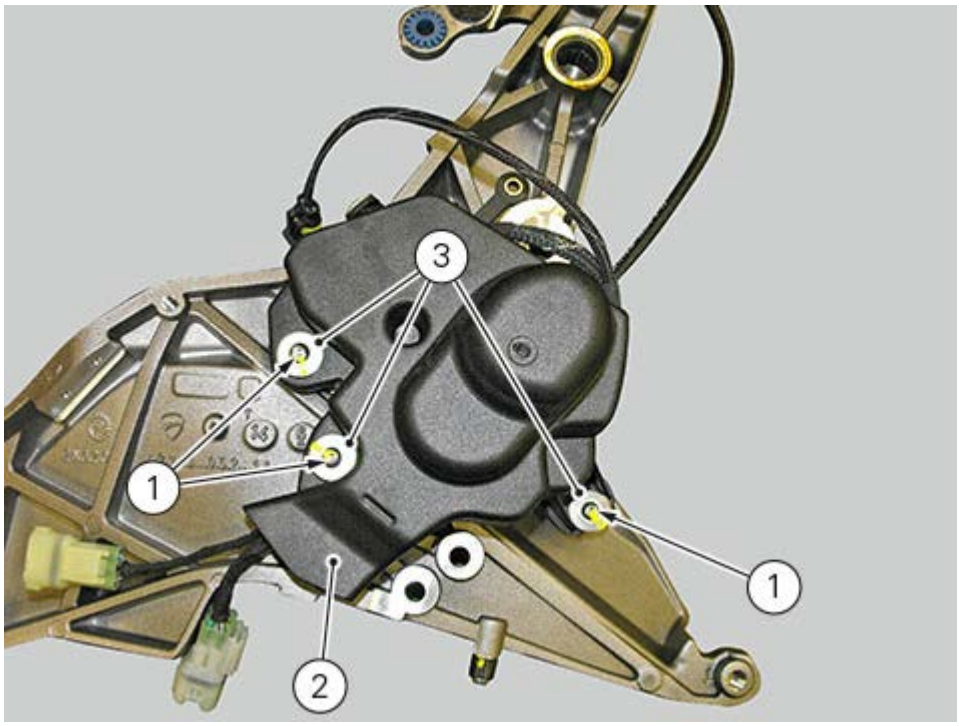


ASSEMBLY

Position exhaust valve motor (6) inside its support (2). Fasten exhaust valve motor (6) using the two screws (4) and positioning the two washers (5) in-between.
Tighten the two screws (4) to a torque of 2 Nm ± 10%.

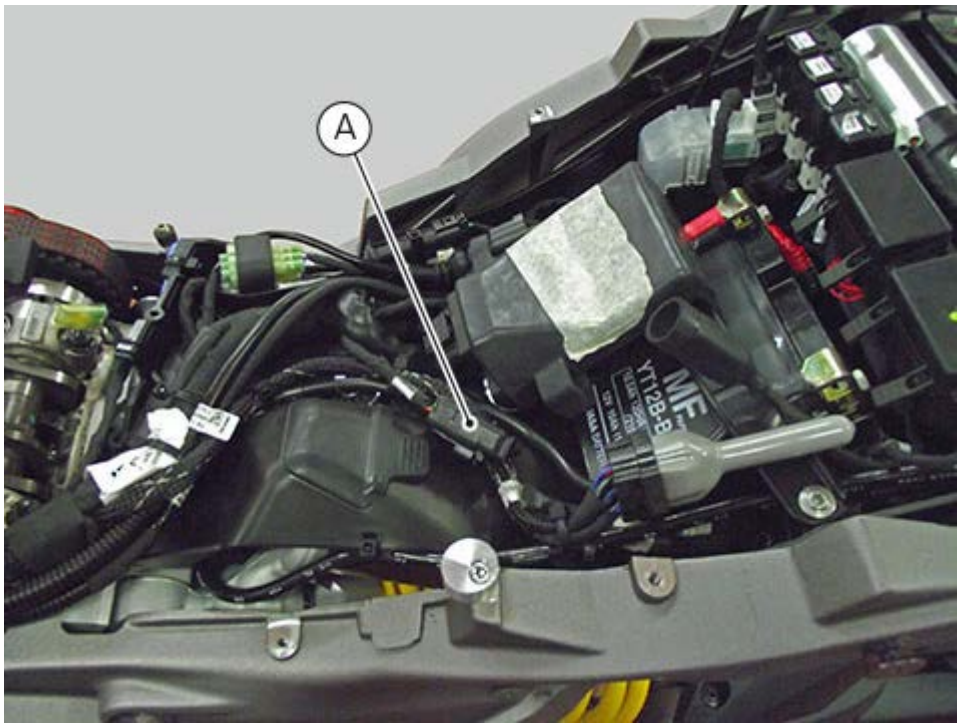


Fasten support (2) to the frame using the three screws (1) with washer (3).
Tighten the three screws to a torque of 5 Nm ± 10%.

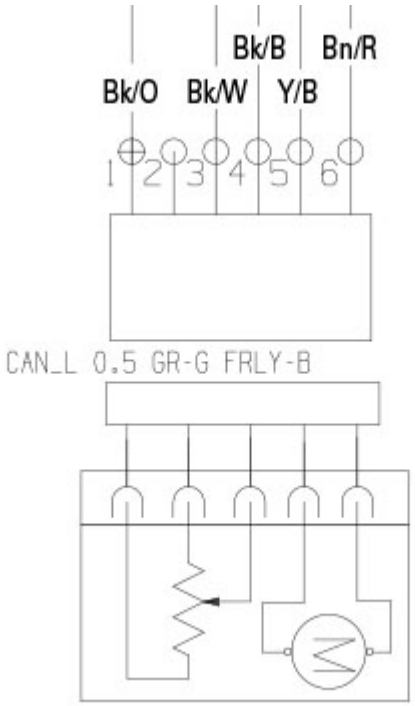


CONTROLS

Check control unit correct operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket (A), which is positioned inside electrical components compartment; to reach it, remove the seat.



ELECTRIC DIAGRAM


Bk/B
Bn/R
Bk/O
Bk/W
Y/B
1
2
3
4
5
6
CAN_L 0.5 GR-G FRLY-B

Solenoid valves

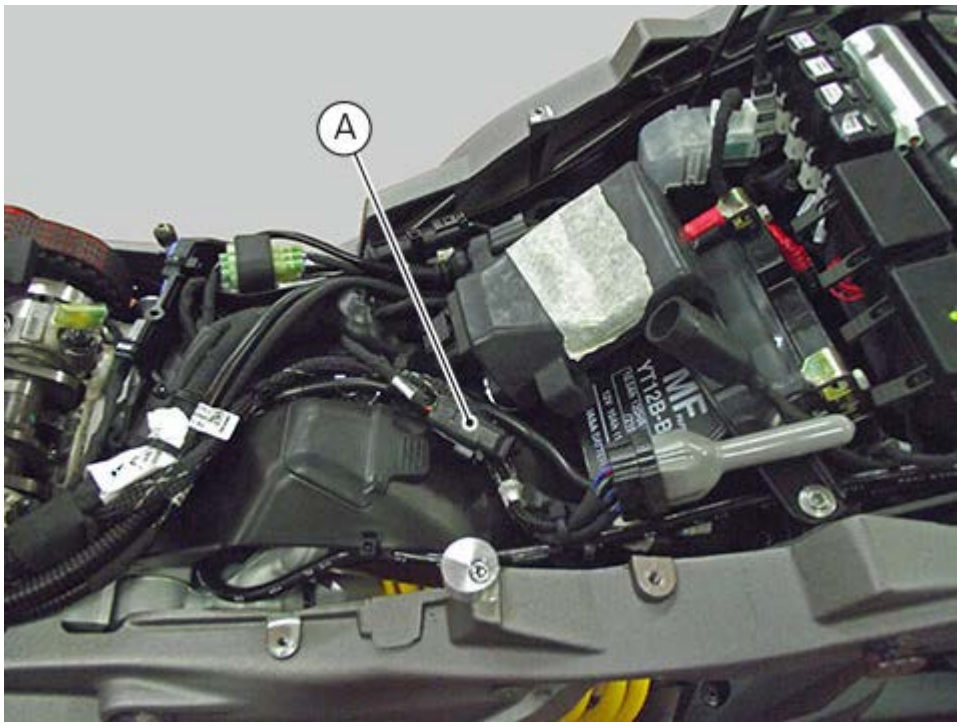
The LH and RH solenoid valves are located on the rear side of the radiator and improve the coolant cooling when the temperature is high.
The solenoid valve activation parameters are defined by the water temperature sensors and controlled by the thermostat.
The operating parameters are indicated in chapter "Cooling system".

REMOVAL / REASSEMBLY

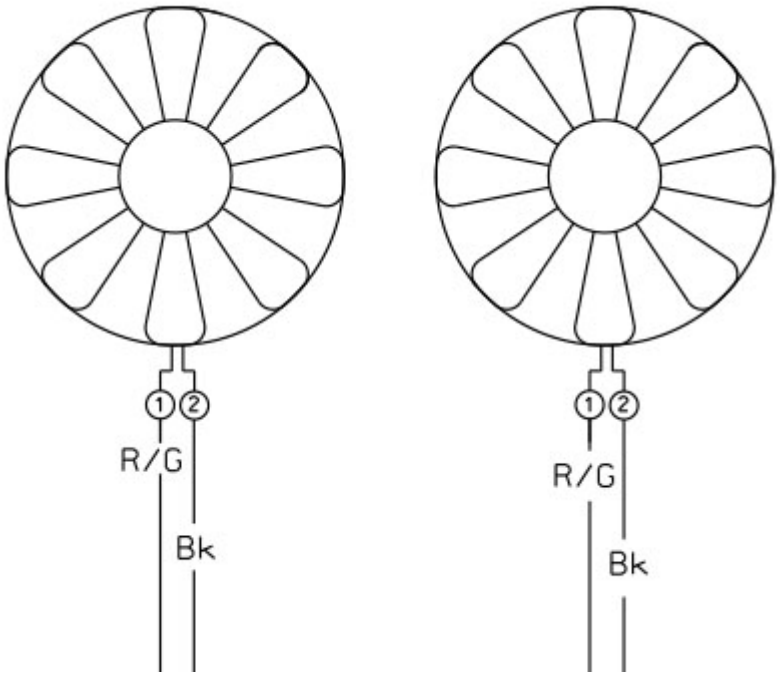
To work on the solenoid valves, move the radiator from the front side as described in chapters "Removing the radiator" and "Refitting the radiator".

CONTROLS

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 valve if the malfunction persists.



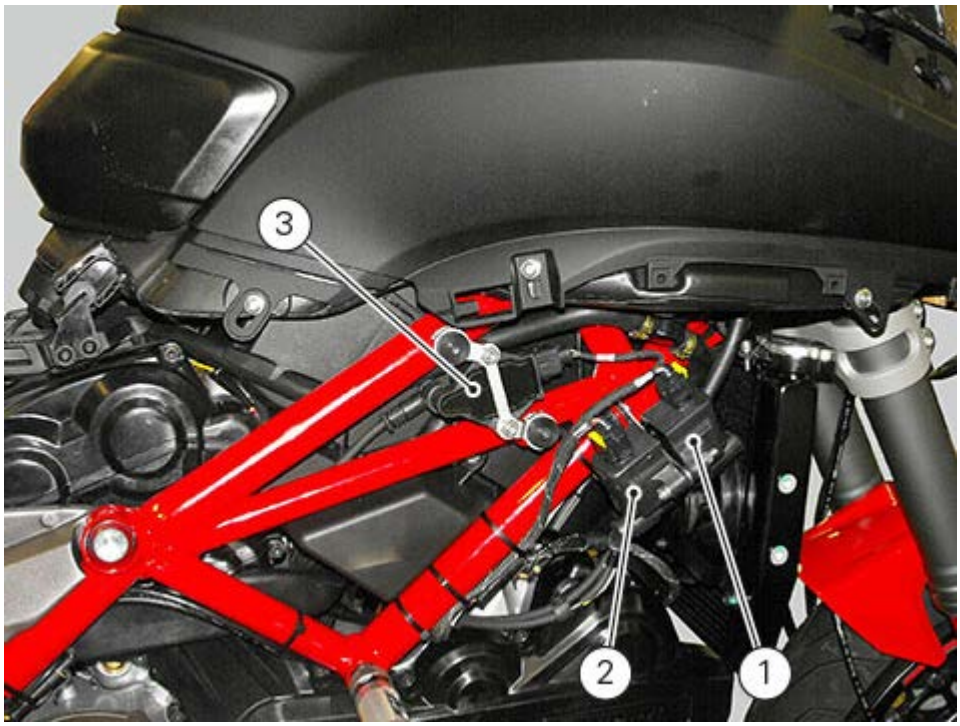
ELECTRIC DIAGRAM

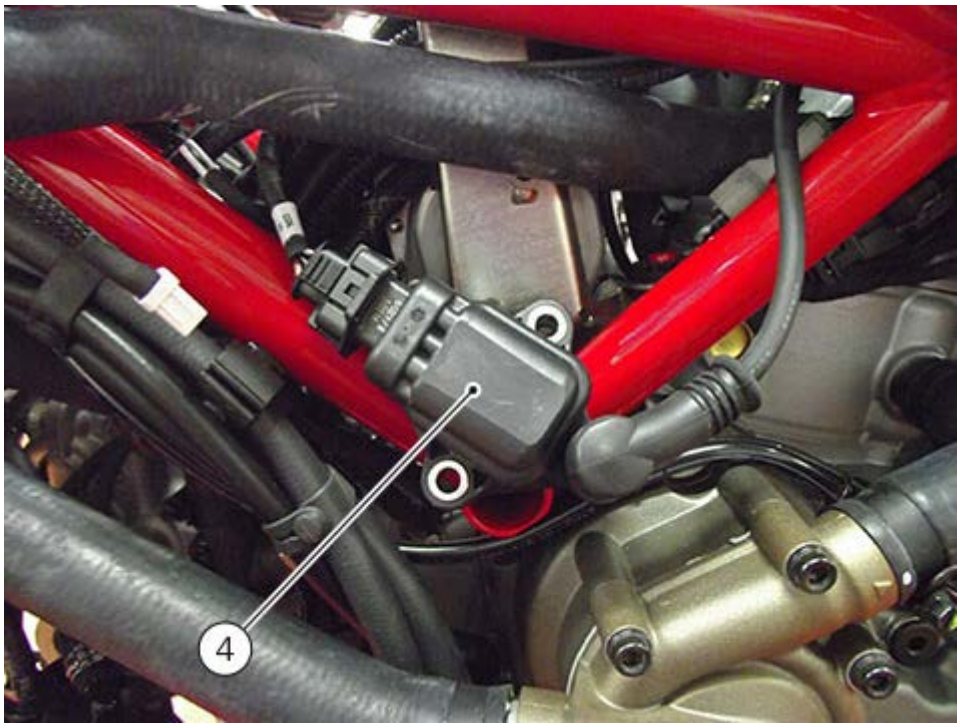


Coils

The ignition coil increases the input voltage of the current alternator and brings the voltage to a value that allows the spark creation in the spark plug.

Four coils are fitted on the vehicle, two for the horizontal cylinder (1) and (2) and two for the vertical cylinder (3) and (4).

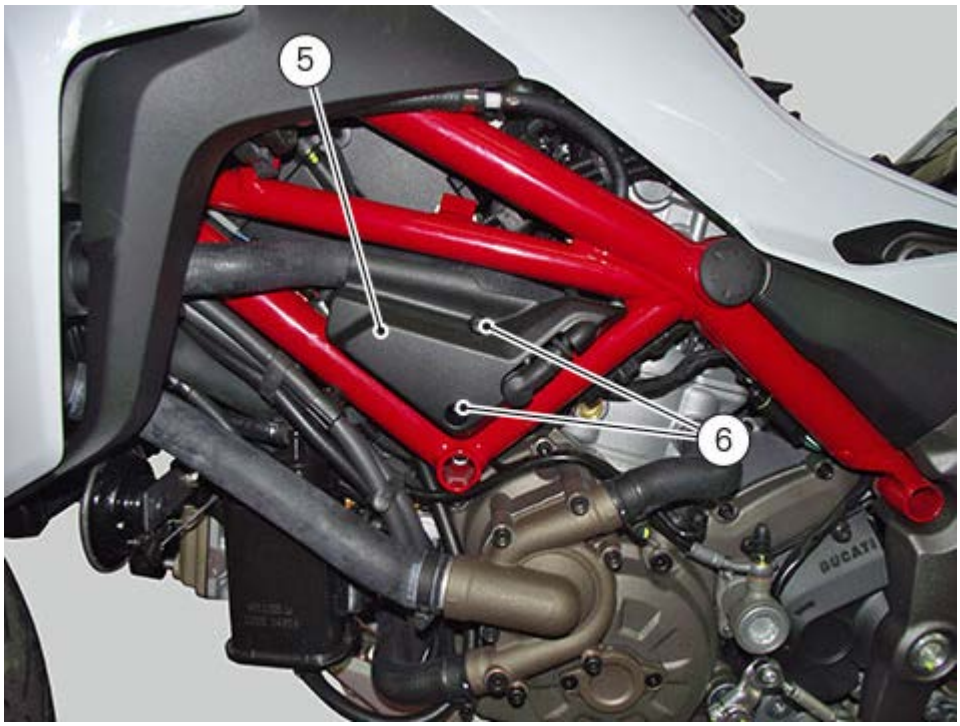




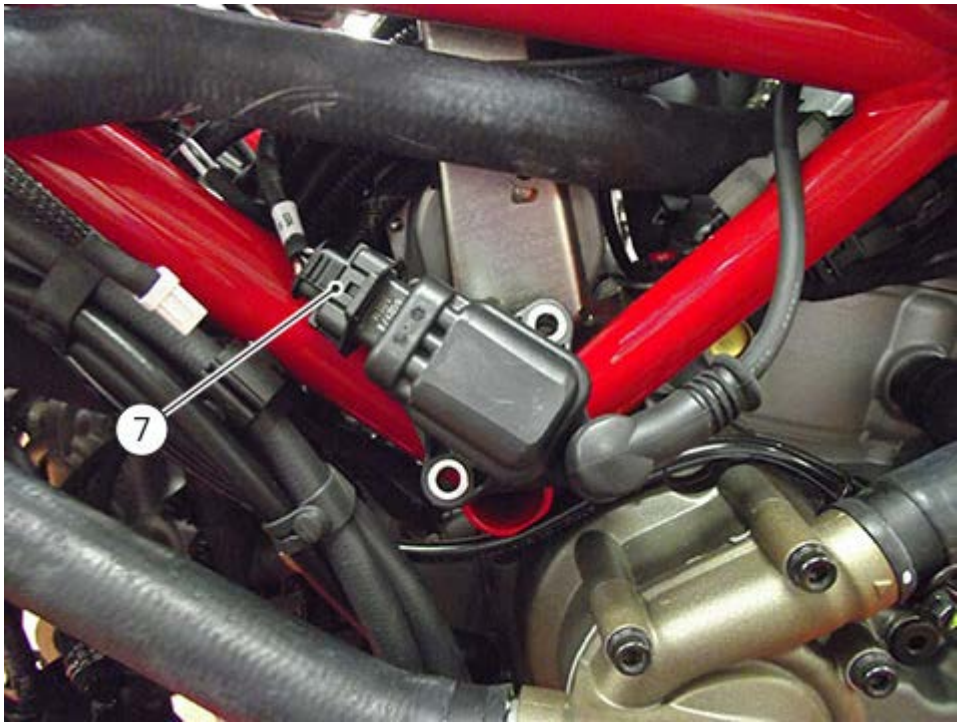
REMOVAL PROCEDURE

To reach the coils, remove front half-fairings "Removing the front half-fairing".

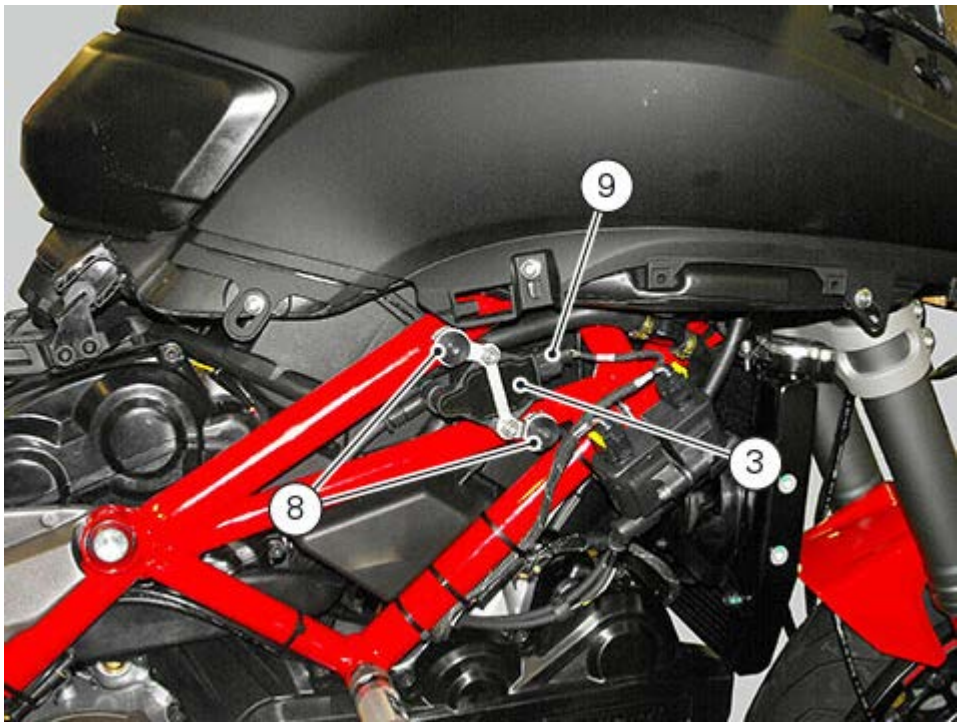
Remove the cover (5), loosening screws (6).



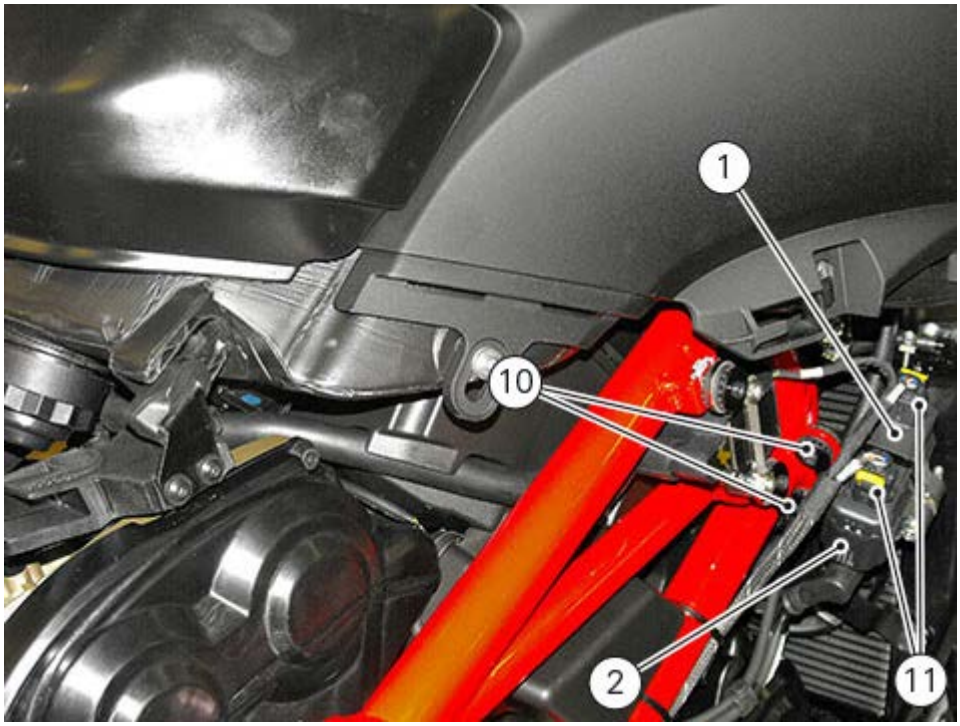
Disconnect the connector (7).
Disconnect caps as described in paragraph "Replacing the spark plugs".
Remove vertical cylinder coil (4).



Disconnect the connector (9).
Disconnect caps as described in paragraph "Replacing the spark plugs".
Loosen the two screws (10). Remove vertical cylinder coil (3).



Disconnect connectors (11).
Disconnect caps as described in paragraph "Replacing the spark plugs".
Remove the two screws (10). Remove coils (1) and (2).



ELECTRIC CHECKS

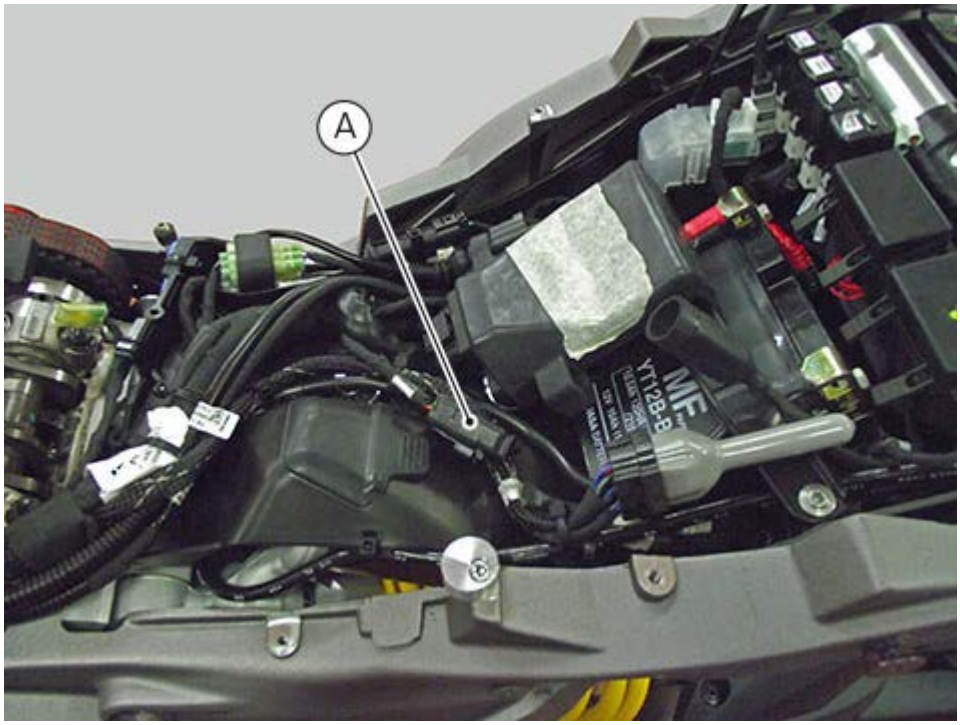
Primary winding resistance: 0.6 Ohm

PIN OUT	**Function**
PIN 1	Control signal to negative
PIN 2	Positive to battery

DIAGNOSIS CHECKS

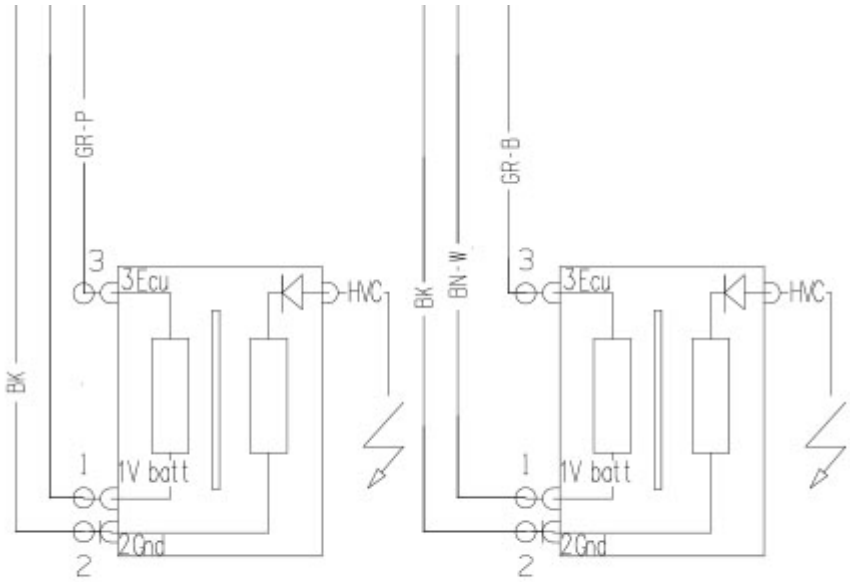
Check control unit correct operation with the DDS 2 diagnosis instrument connected to control unit diagnostic

socket (A), which is positioned inside electrical components compartment; to reach it, remove the seat.

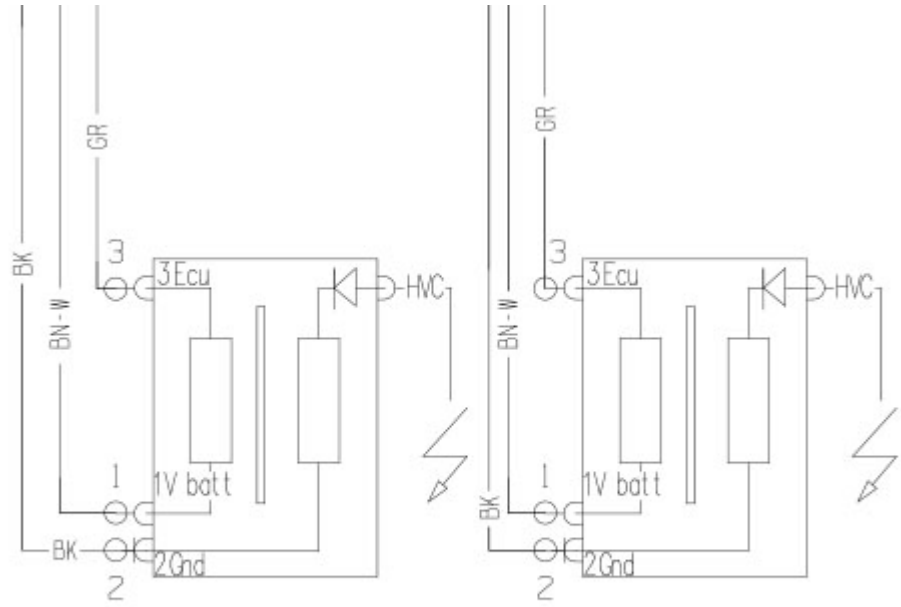


ELECTRIC DIAGRAM

Vertical cylinder coils



Horizontal cylinder coils


BK
BN-W
GR
3
3Ecu
HVC
1
1V batt
BK
2Gnd
2
BK
BN-W
GR
3
3Ecu
HVC
1
1V batt
2Gnd
2

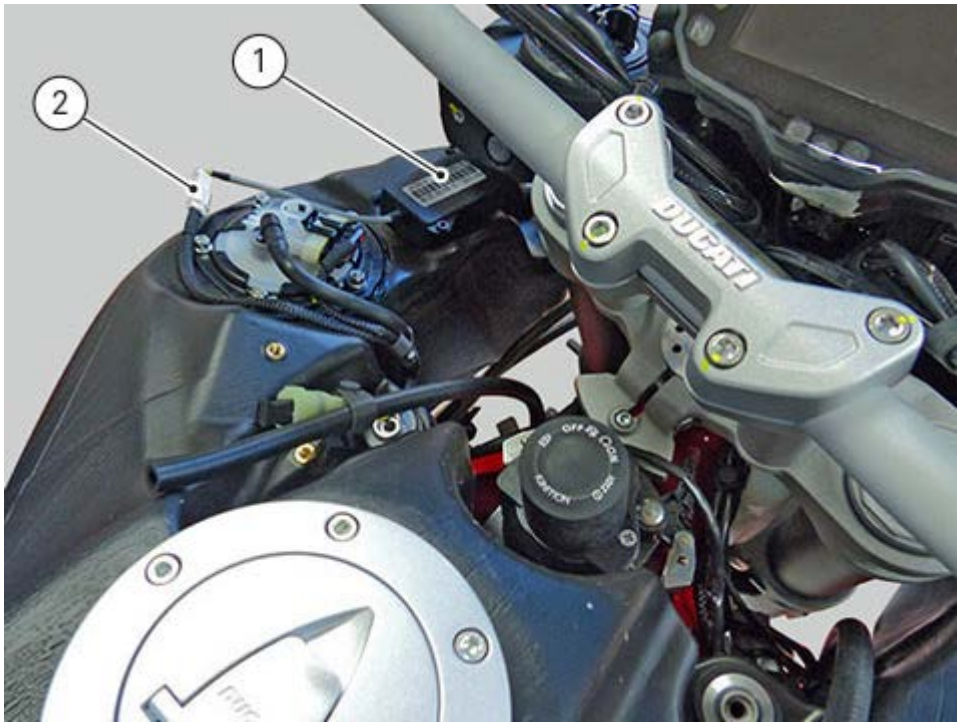
Bluetooth

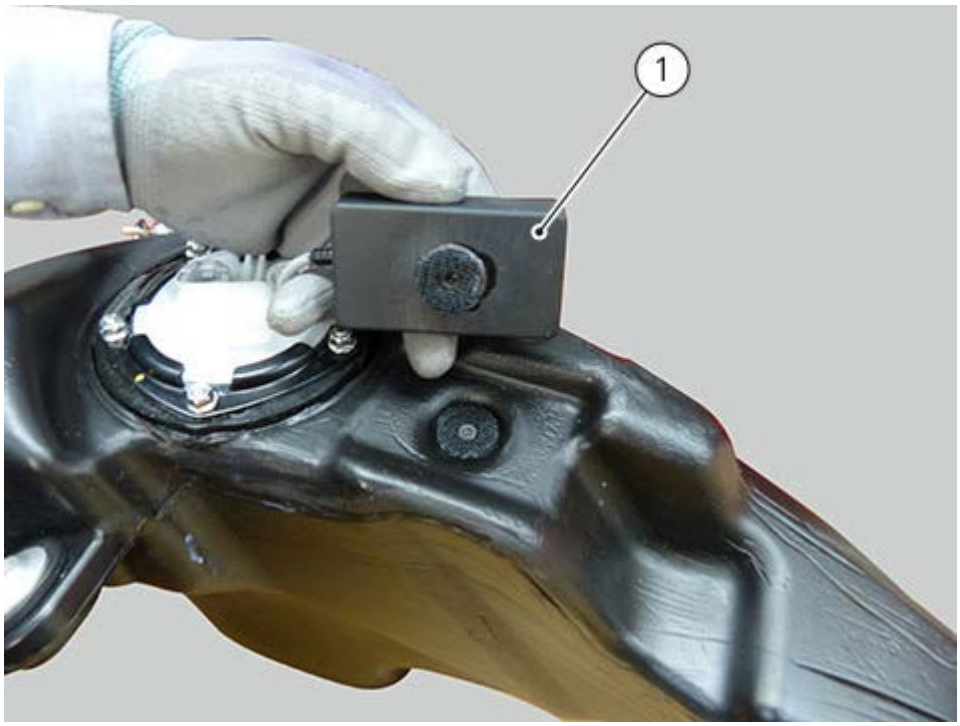
The Bluetooth control unit in the vehicle electric system works as a "bridge" among different electronic devices.

REMOVAL PROCEDURE

For Bluetooth control unit removal and refitting, remove the instrument panel first "Removing the panel" and "Refitting the panel".

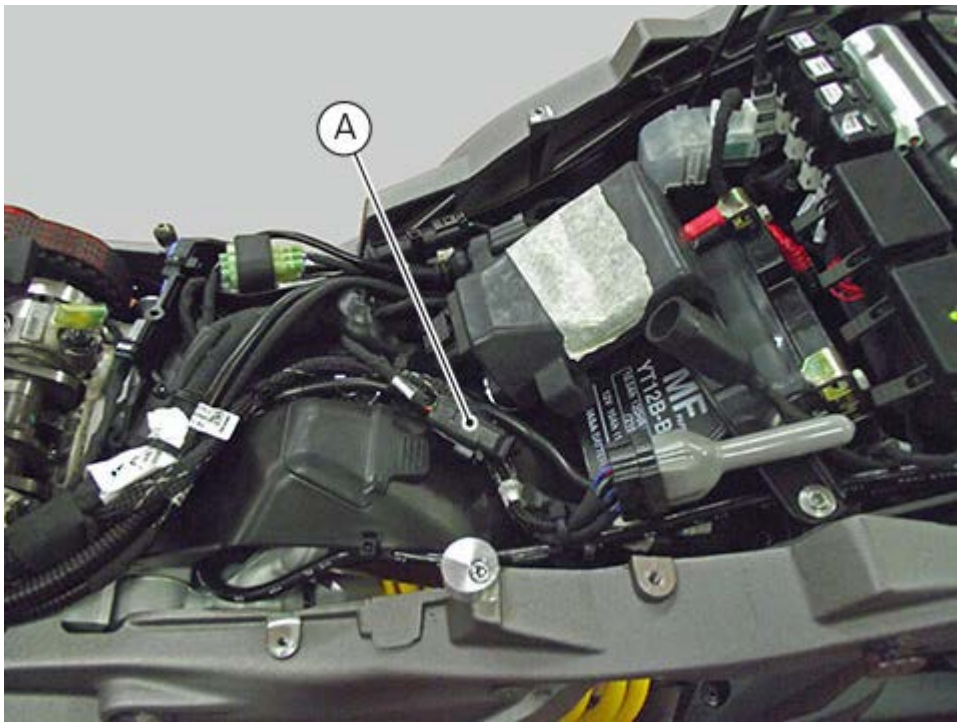
Remove the Bluetooth control unit (1) by sliding it upwards.
Disconnect the connector (2).



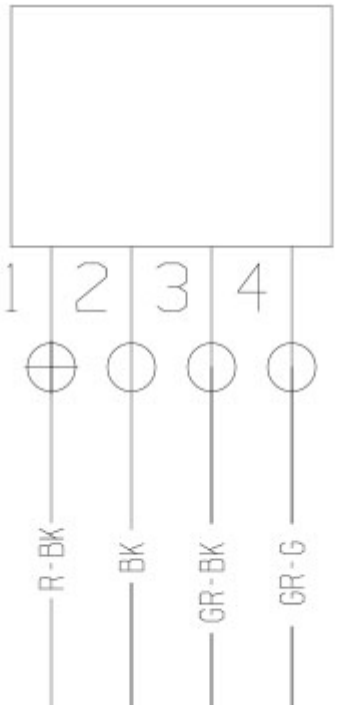


CONTROLS

Check control unit correct operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket (A), which is positioned inside electrical components compartment; to reach it, remove the seat.

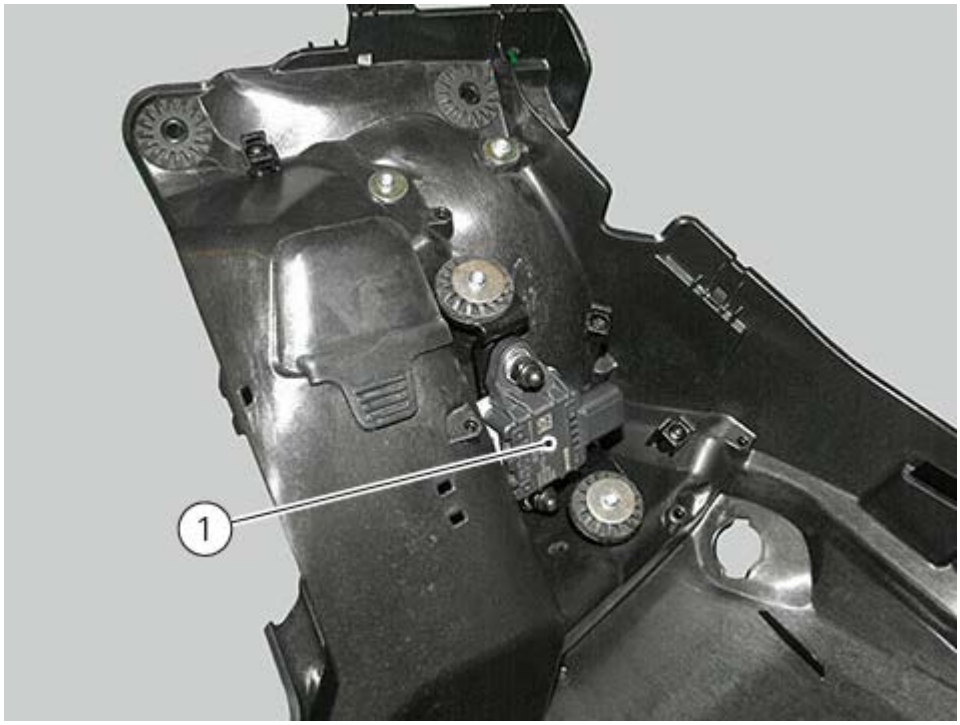


ELECTRIC DIAGRAM



Inertial Measurement Unit (IMU)

The inertial platform (1) is located in the electrical components compartment.
The anti-wheelie function is performed through two closed loops on the following signals:
- Longitudinal acceleration;
- Pitch angle



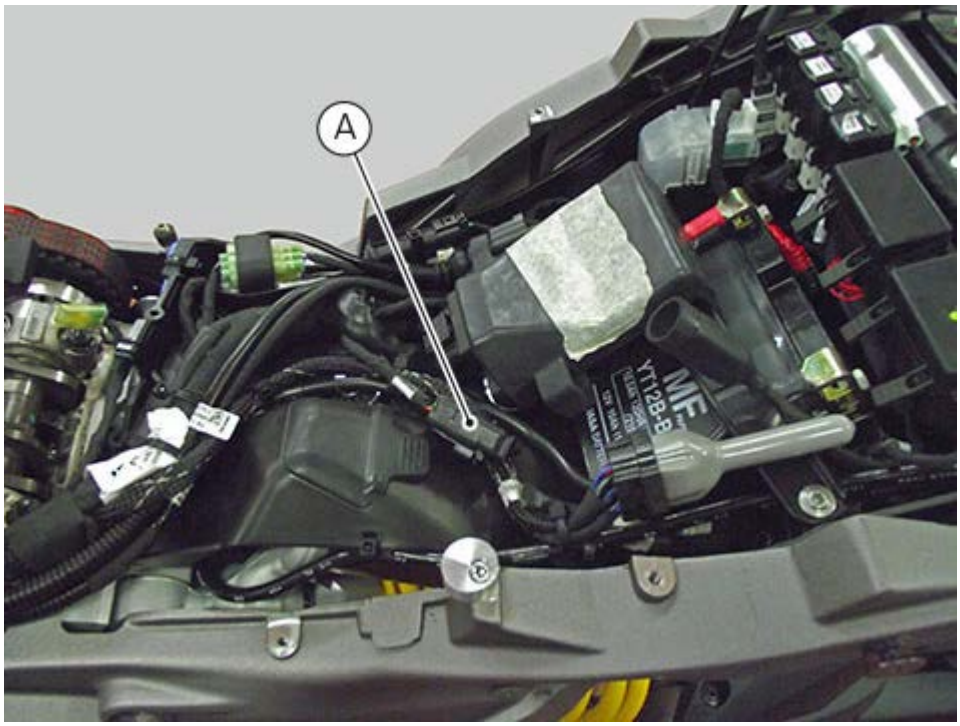
The signal is read by the ECU that will control the throttle valve consequently.

Warning
During the removal and refitting phase, do not turn the key on before the sensor is installed in its definitive position. This because upon Key-On the sensor checks the signal plausibility. If the sensor is not in its correct position, it will trigger a signal error that cannot be erased with the DDS 2.

For removal and refitting please refer to chapters "Removing the electric components compartment" and "Refitting the electric components compartment".

CONTROLS

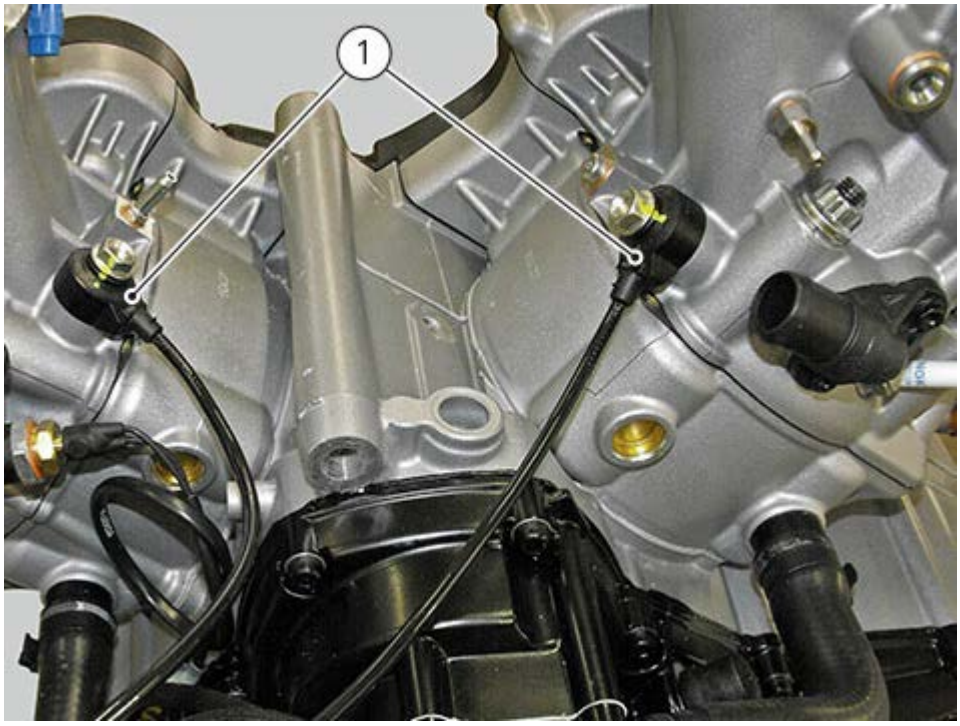
Check control unit correct operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket (A), which is positioned inside electrical components compartment; to reach it, remove the seat.


A

Knock Sensor

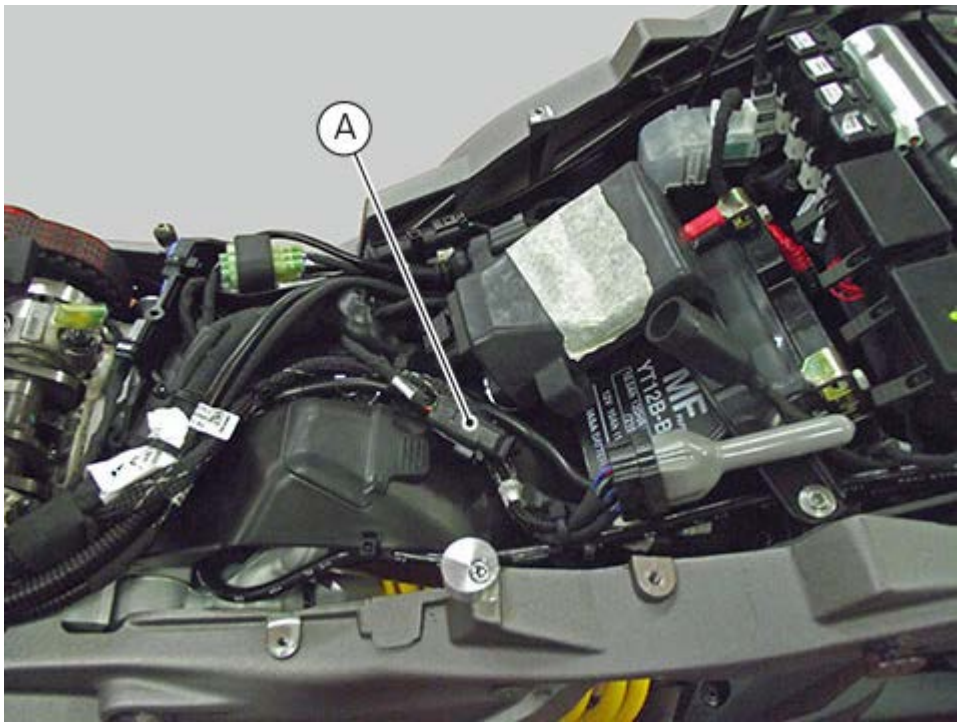
To measure faulty engine vibrations, caused by irregular combustion, the Multistrada uses two piezoelectric knock sensors (1).

In case of faulty combustion, the ignition advance is progressively reduced.



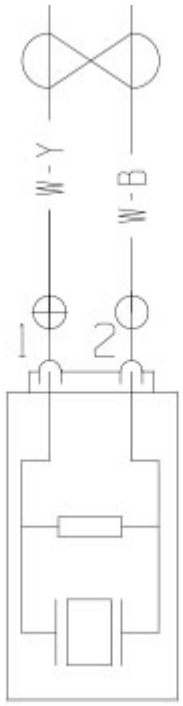
CONTROLS

Check control unit correct operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket (A), which is positioned inside electrical components compartment; to reach it, remove the seat.

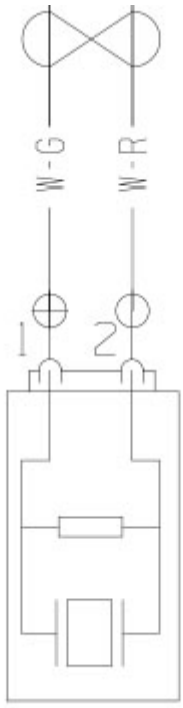


ELECTRIC DIAGRAM

Horizontal head



Vertical head



Accelerator Position System (APS)

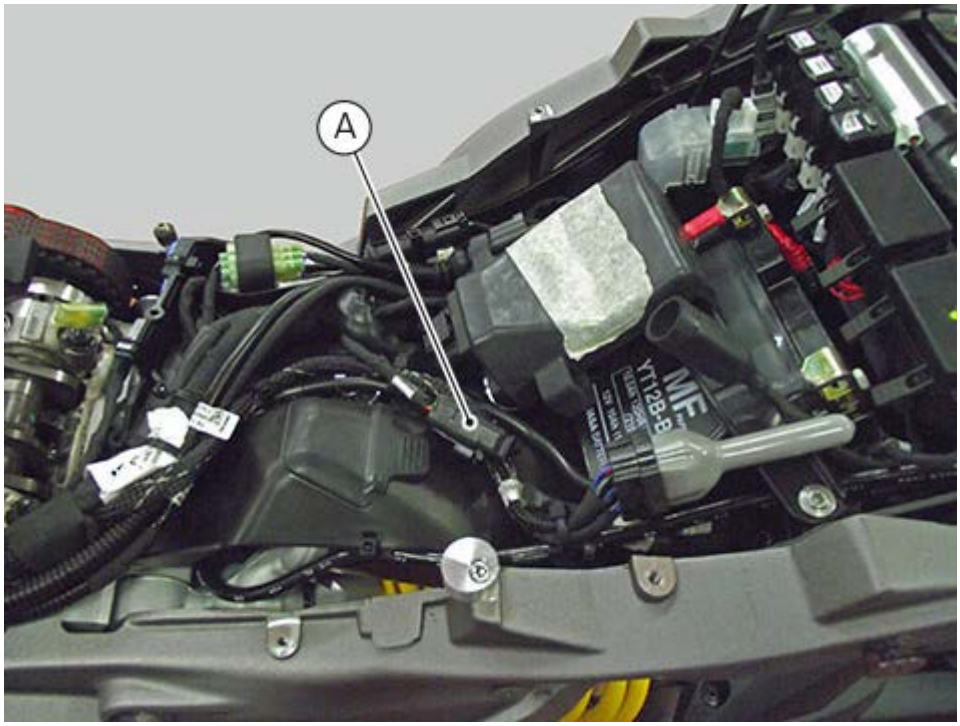
The Acceleration Position Sensor (APS) (1) or throttle twistgrip sensor, is a potentiometer that generates an electric input sent to the control unit which receives information on:

- throttle twistgrip position;
- activation dynamics

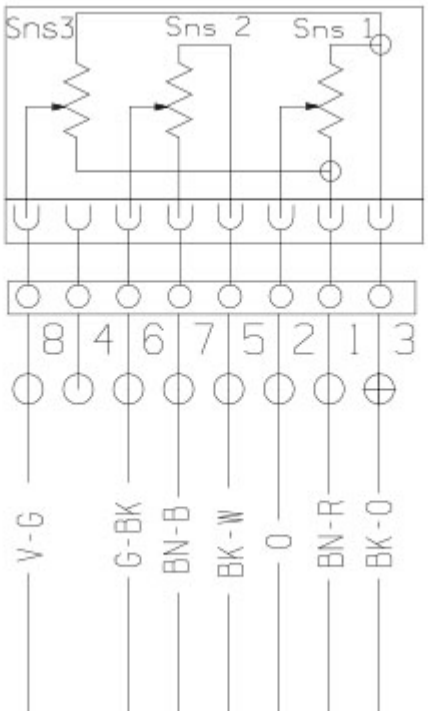
To remove the APS, follow the instructions in chapter "Removing the throttle control".

CONTROLS

Check control unit correct operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket (A), which is positioned inside electrical components compartment; to reach it, remove the seat.



ELECTRIC DIAGRAM

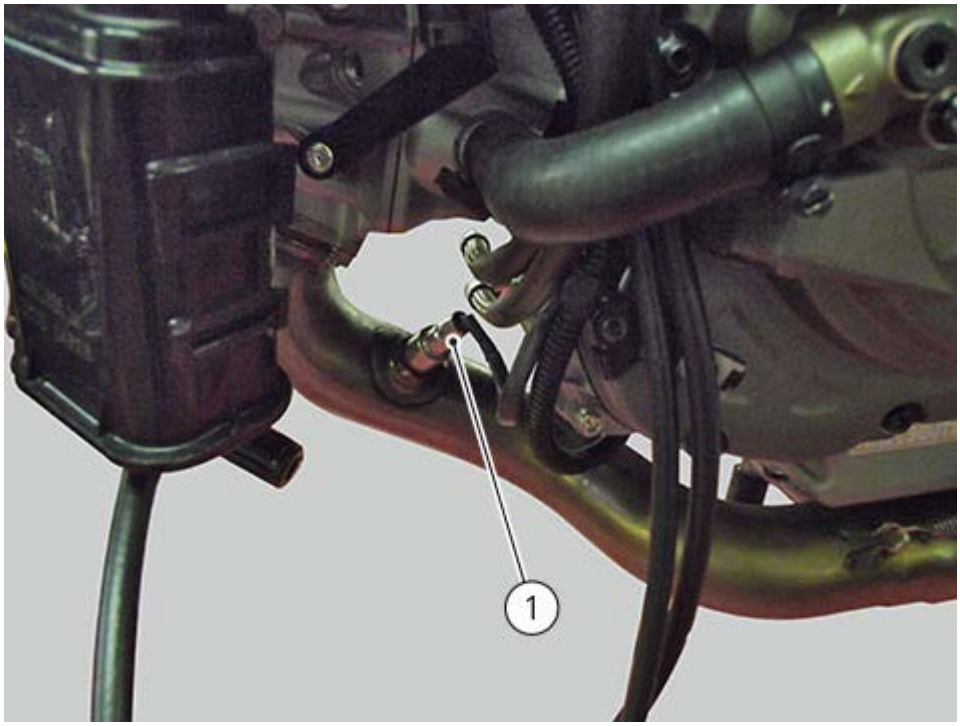


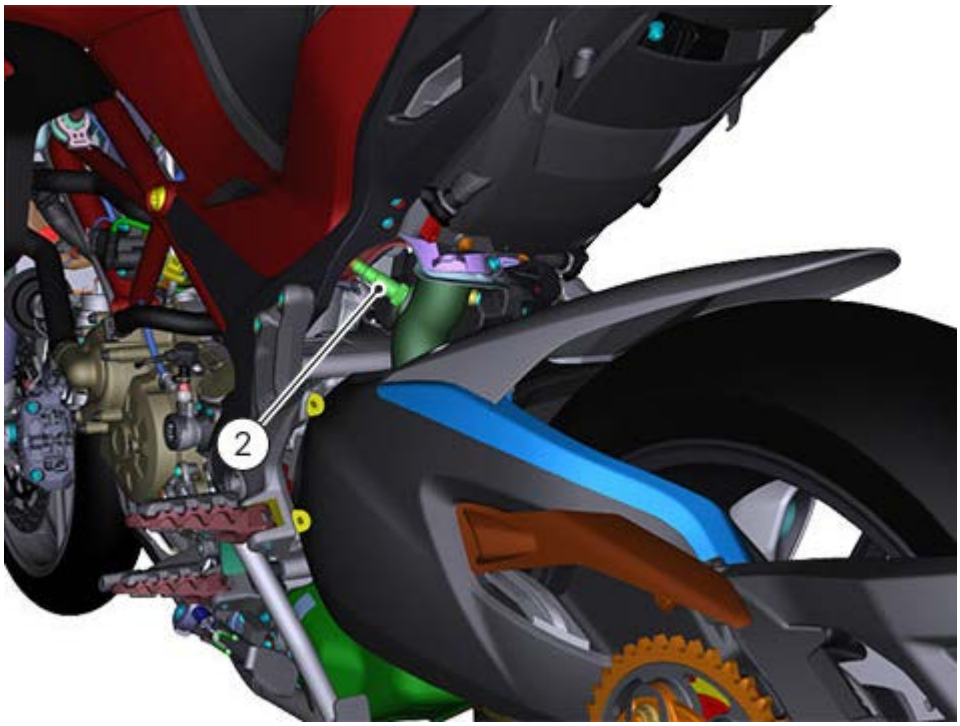
Oxygen sensors

The oxygen sensor detects the presence of unburned fuel in the exhaust gases, processes the information sent to the control unit and allows keeping the mixture ratio (air kg/fuel kg) within the best efficiency range for the catalytic converter.

The vehicle is provided with two lambda sensors, one per cylinder:

- oxygen sensor (1) for horizontal cylinder exhaust;
- oxygen sensor (2) for vertical cylinder exhaust.

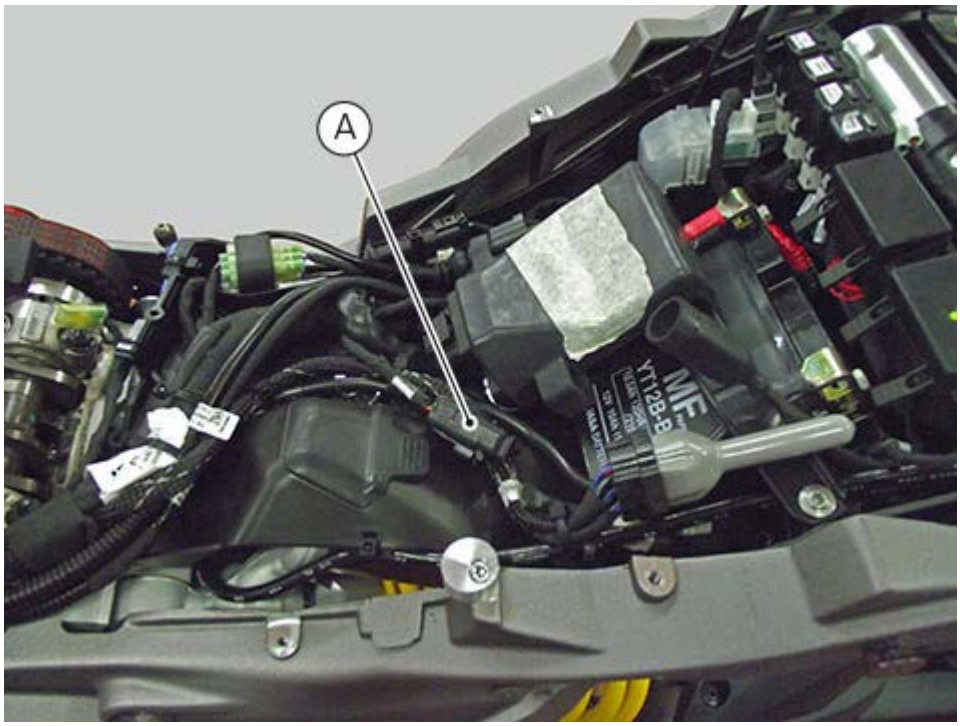




If necessary, reach the oxygen sensor connectors as described in chapter Routing of wiring on frame

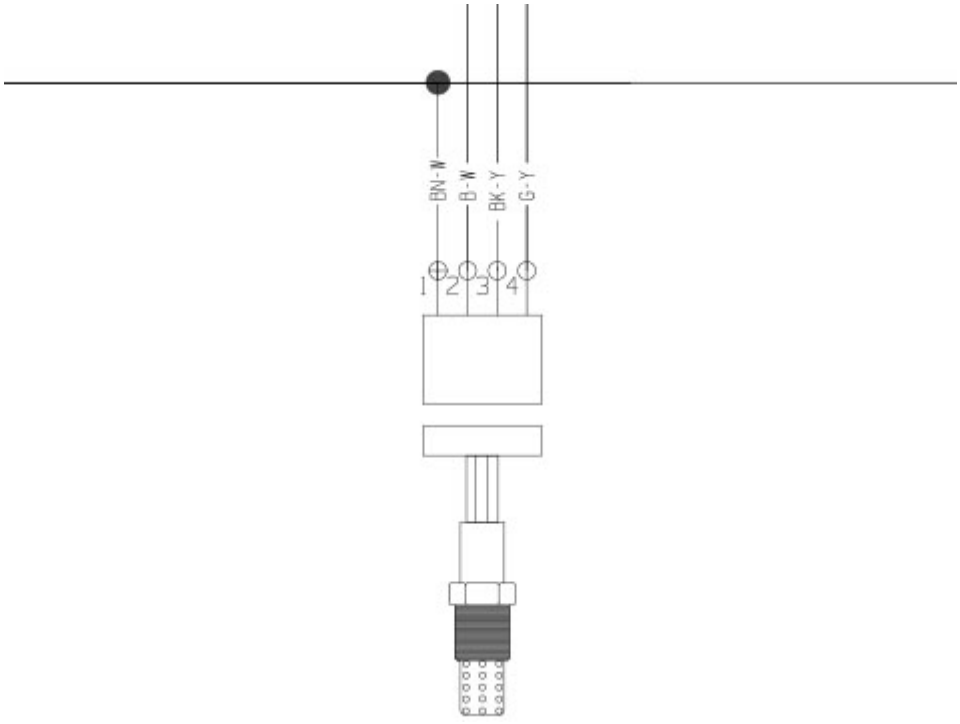
CONTROLS

Check control unit correct operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket (A), which is positioned inside electrical components compartment; to reach it, remove the seat.

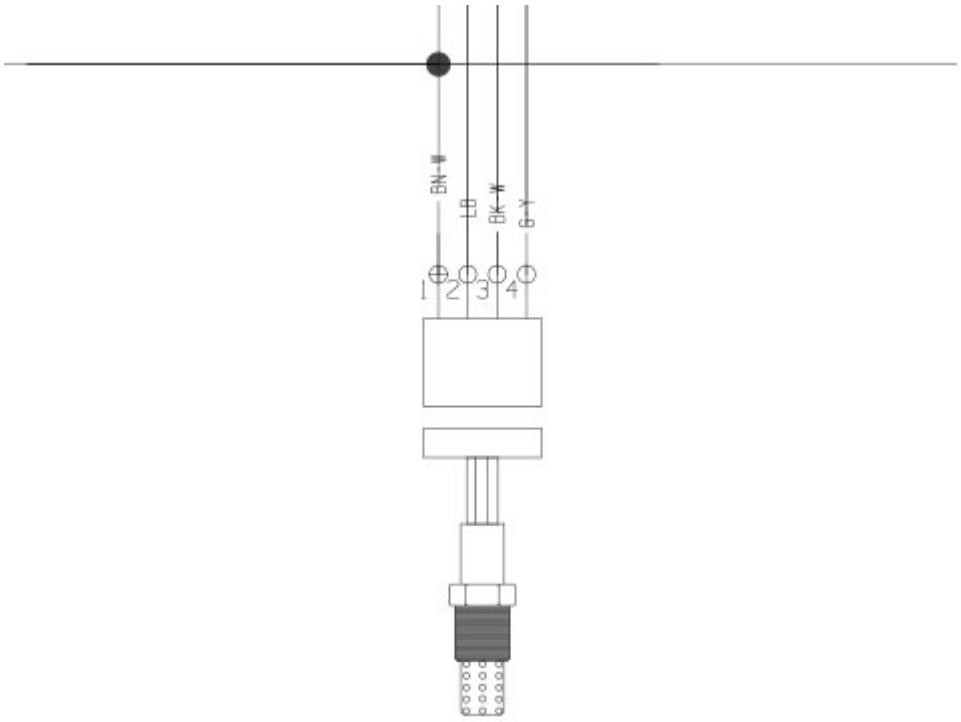


ELECTRIC DIAGRAM

Horizontal oxygen sensor



Vertical oxygen sensor


BN-W
LB
BK-W
G-Y
1
2
3
4

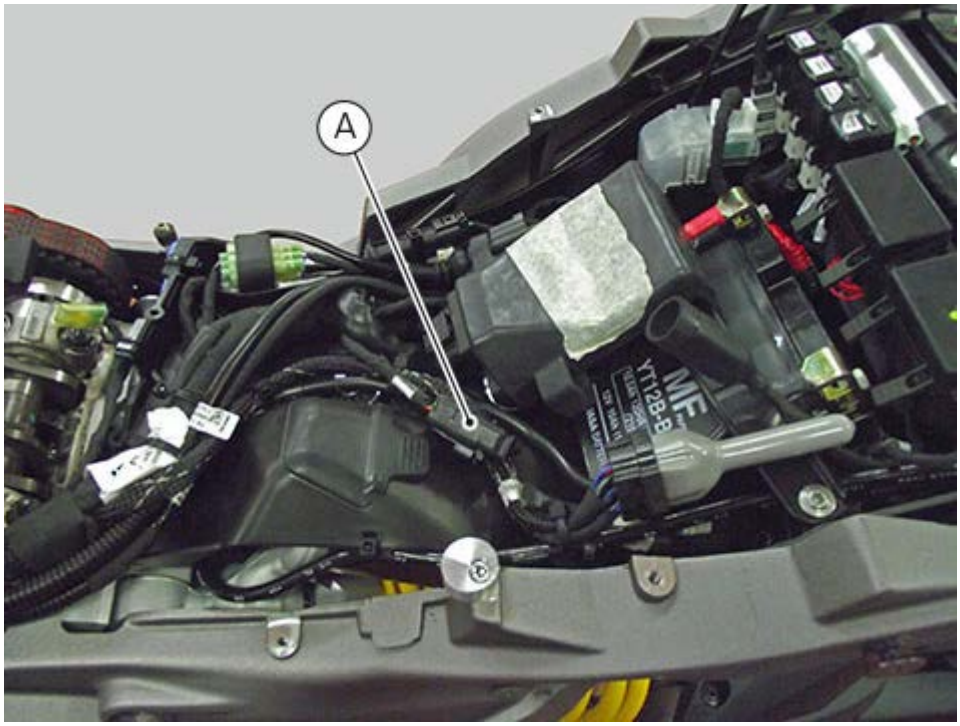
Local Interconnect Network (LIN)

It is a serial communication between left-hand switch and instrument panel to manage the cruise control.

For removal and refitting please refer to chapters "Removing the handlebar" and "Refitting the handlebar".

CONTROLS

Check control unit correct operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket (A), which is positioned inside electrical components compartment; to reach it, remove the seat.



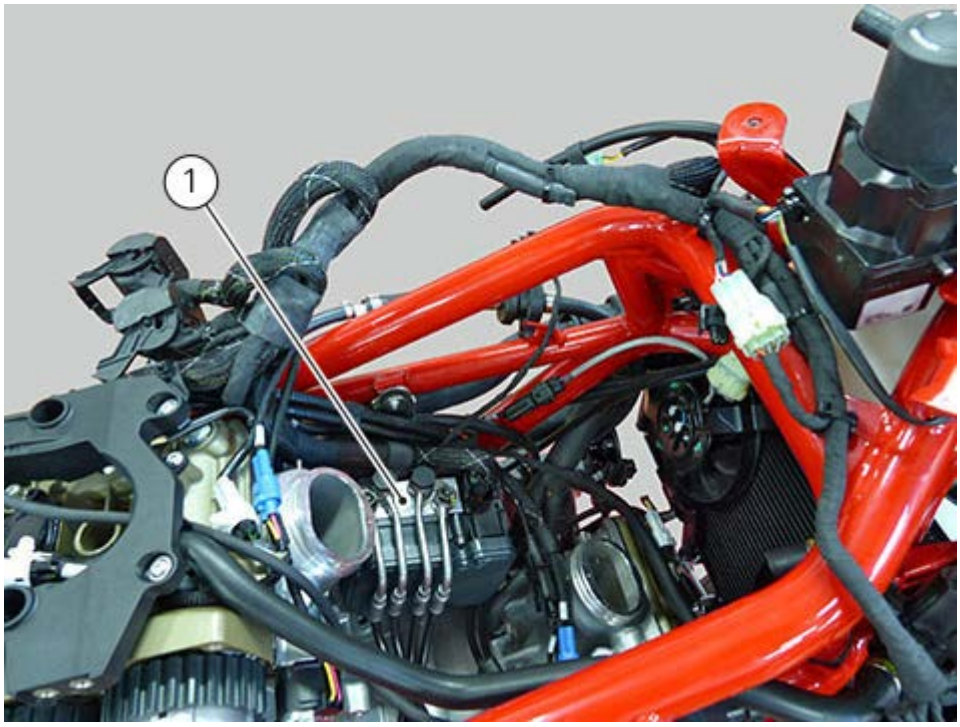
VIN CODE

The VIN code is an alphanumerical code with 17 characters that clearly identifies a vehicle (family, model, country, serial number, …).
This code can be stored in the instrument panel and read through the DDS 2 with suitable KWP2000 inputs.
When replacing one of the above control units, this information must be copied onto the new control unit using DDS 2.

Anti-lock Braking System (ABS)

The cornering function has been added to the new ABS control unit (1). This has been possible thanks to the interaction with the inertial platform (IMU).
The necessary signals for correct operation are:

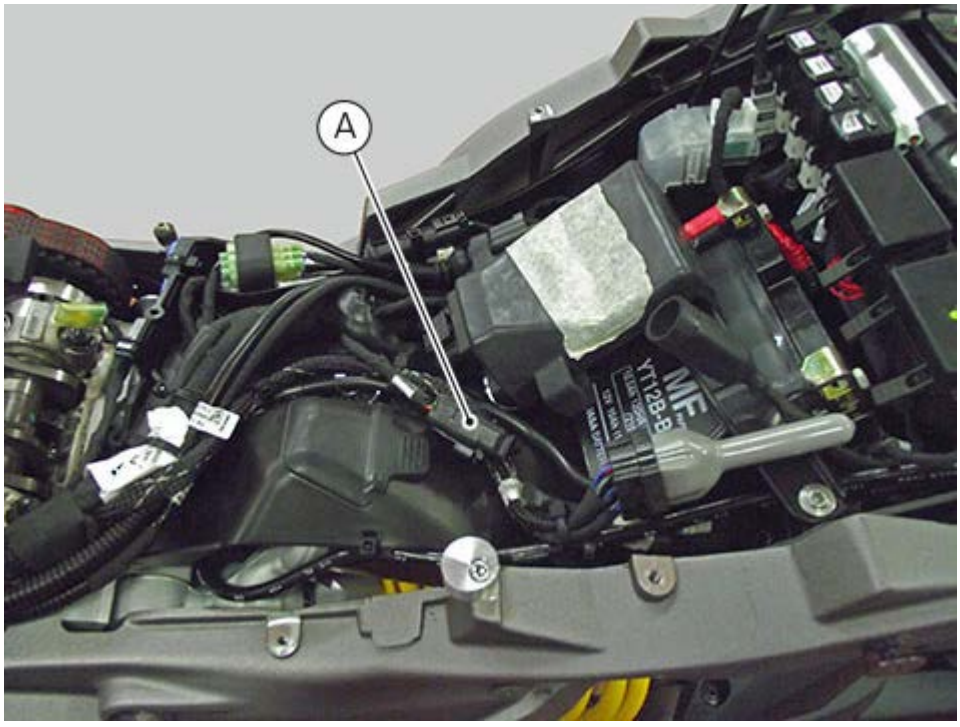
- Front wheel speed;
- Rear wheel speed;
- Inertial platform via CAN line.



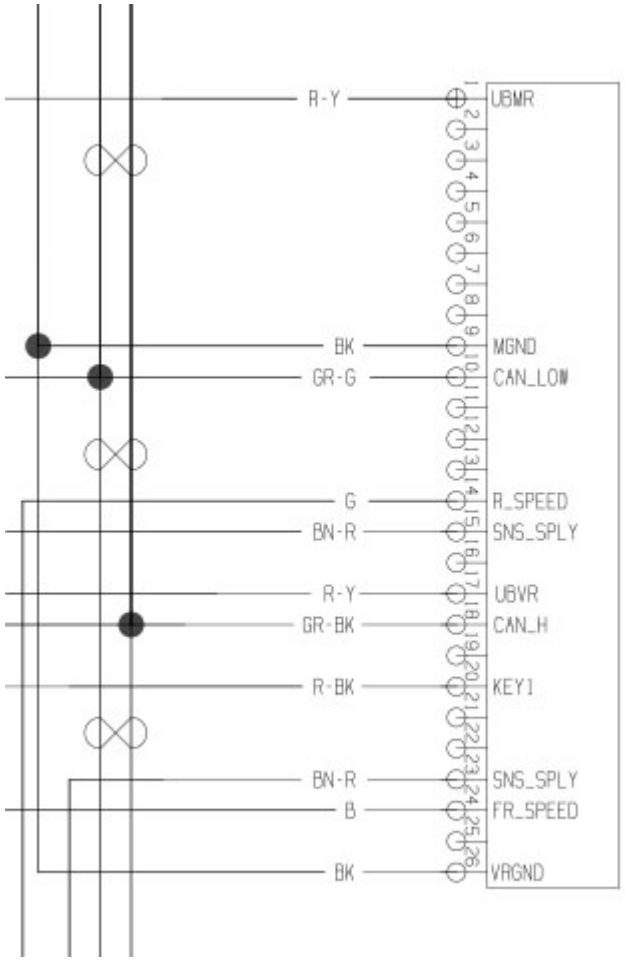
For removal and refitting please refer to chapters "Removing the ABS control unit" and "Refitting the ABS control unit".

CONTROLS

Check control unit correct operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket (A), which is positioned inside electrical components compartment; to reach it, remove the seat.



ELECTRIC DIAGRAM

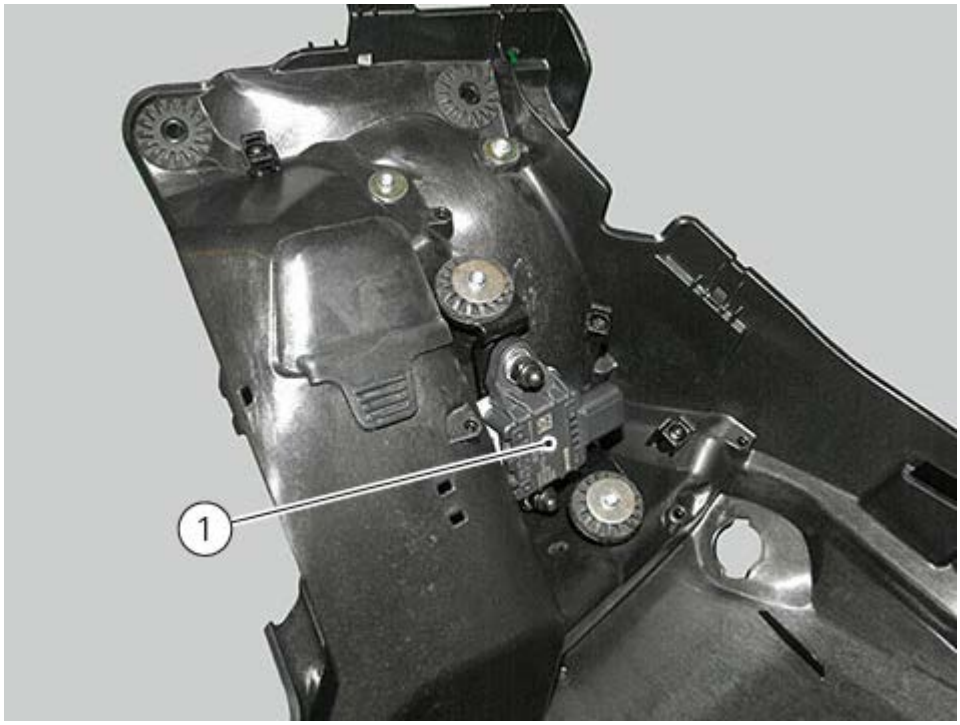

R-Y
BK
GR-G
G
BN-R
R-Y
GR-BK
R-BK
BN-R
B
BK
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
UBMR
MGND
CAN_LOW
R_SPEED
SNS_SPLY
UBVR
CAN_H
KEYI
SNS_SPLY
FR_SPEED
VRGND

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 line is connected to two nodes: the instrument panel and the 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.

Ducati Wheelie Control (DWC)

The inertial platform (1) is located in the electrical components compartment.
The anti-wheelie function is performed through two closed loops on the following signals:
- Longitudinal acceleration;
- Pitch angle



The signal is read by the ECU that will control the throttle valve consequently.

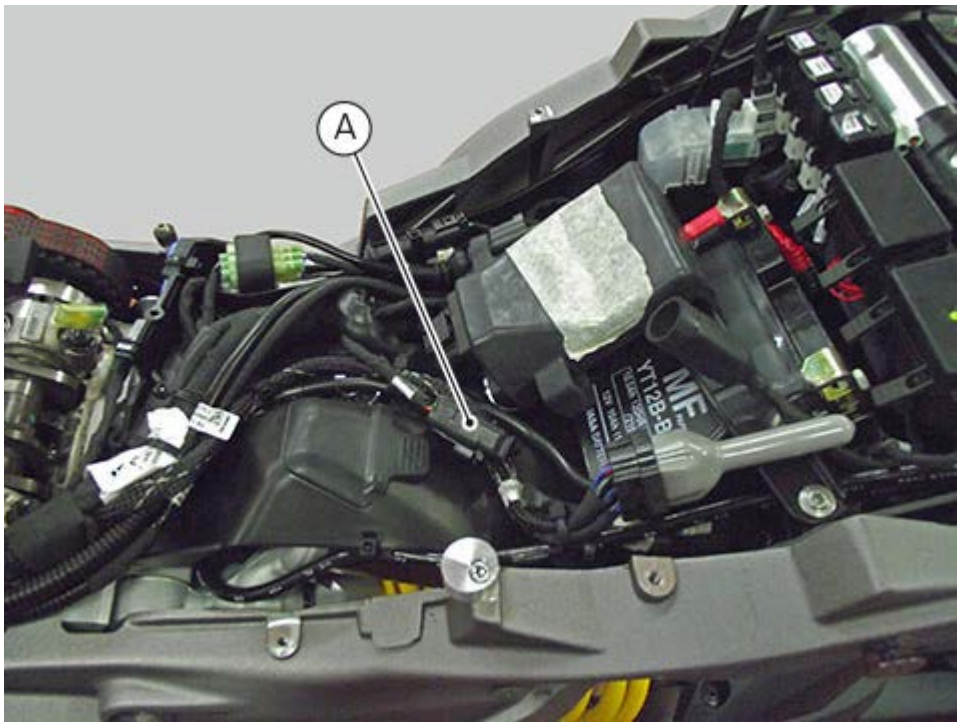
Warning

During the removal and refitting phase, do not turn the key on before the sensor is installed in its definitive position. This because upon Key-On the sensor checks the signal plausibility. If the sensor is not in its correct position, it will trigger a signal error that cannot be erased with the DDS 2.

For removal and refitting please refer to chapters "Removing the electric components compartment" and "Refitting the electric components compartment".

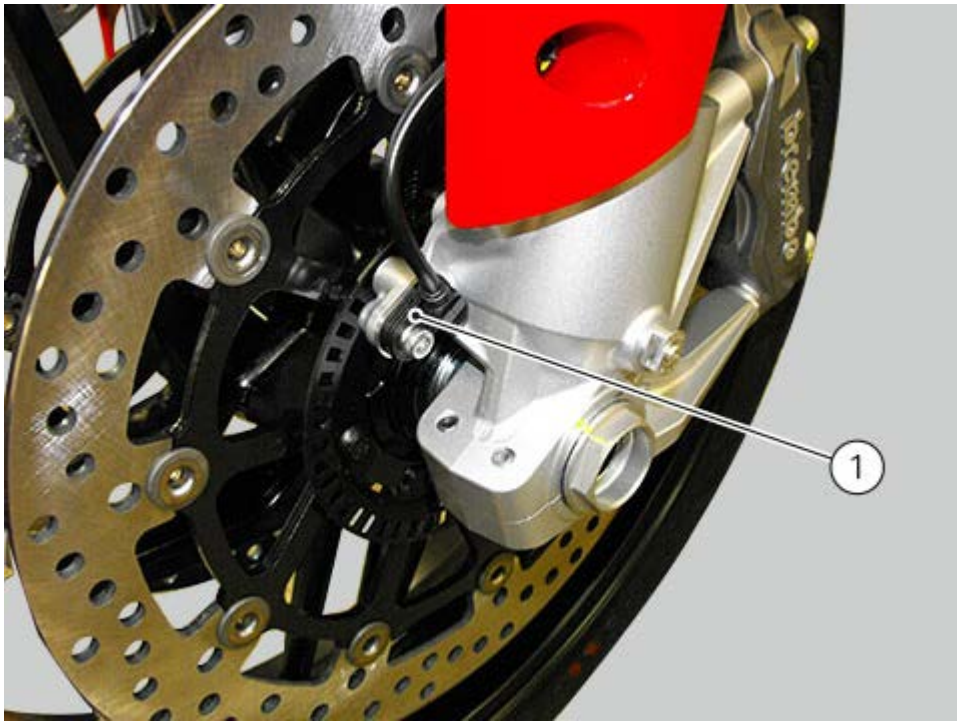
CONTROLS

Check control unit correct operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket (A), which is positioned inside electrical components compartment; to reach it, remove the seat.


A

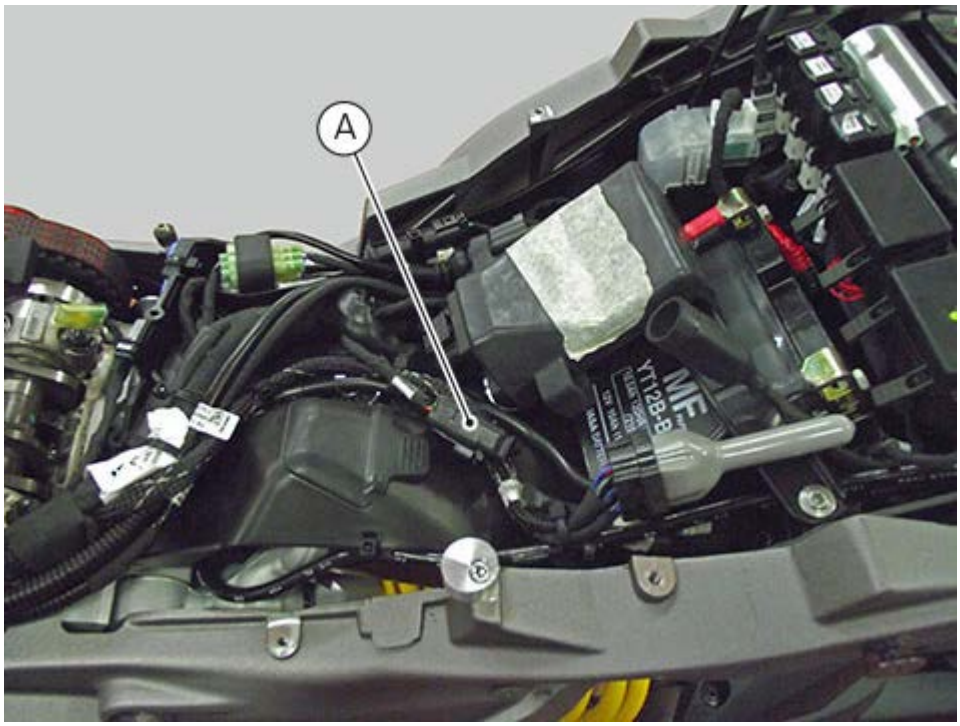
Ducati Traction Control (DTC)

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.



CONTROLS

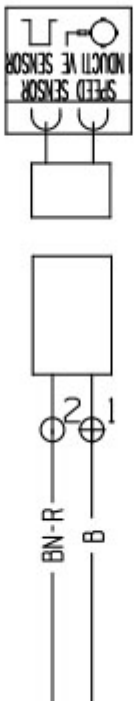
Check control unit correct operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket (A), which is positioned inside electrical components compartment; to reach it, remove the seat.



To remove and refit the speed sensors, refer to chapters "Replacing the front phonic wheel sensor" and "Replacing the rear phonic wheel sensor"

ELECTRIC DIAGRAM

Front sensor



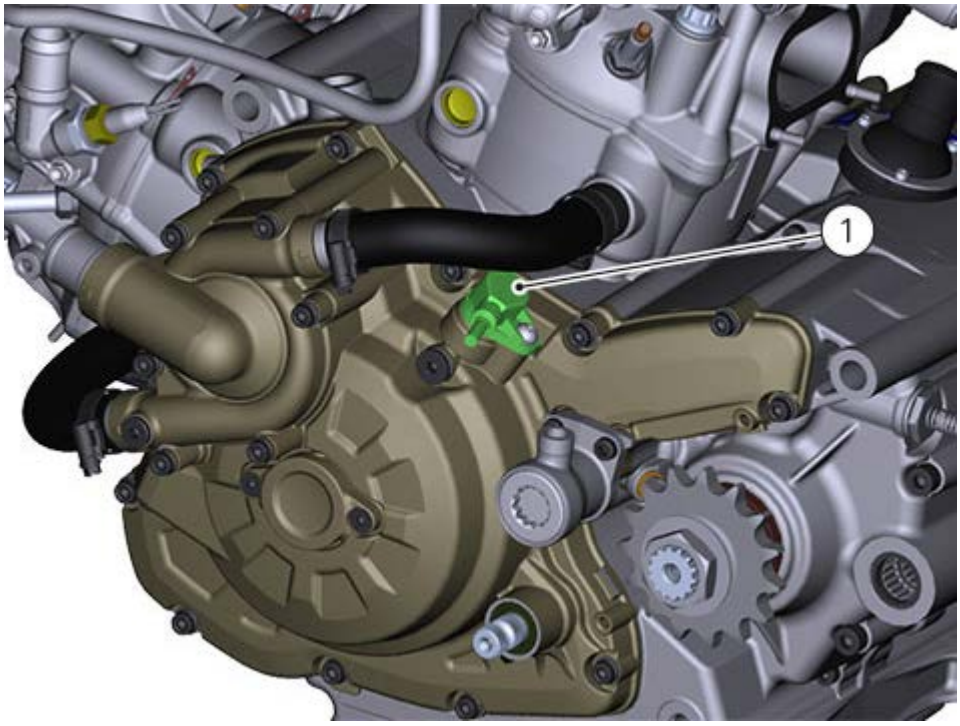
Rear sensor

SPEED SENSOR
INDUCTIVE SENSOR
2
1
BN-R
G

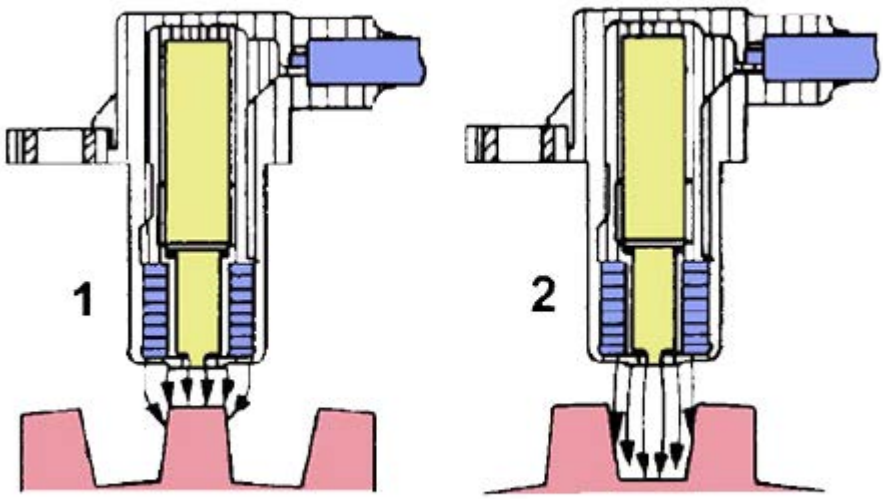
Rpm sensor (pick-up)

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.



Position 1: the pick-up sensor detects the "full area" (i.e. the tooth);
Position 2: the pick-up sensor detects the "empty area" (i.e. the gap between the teeth).

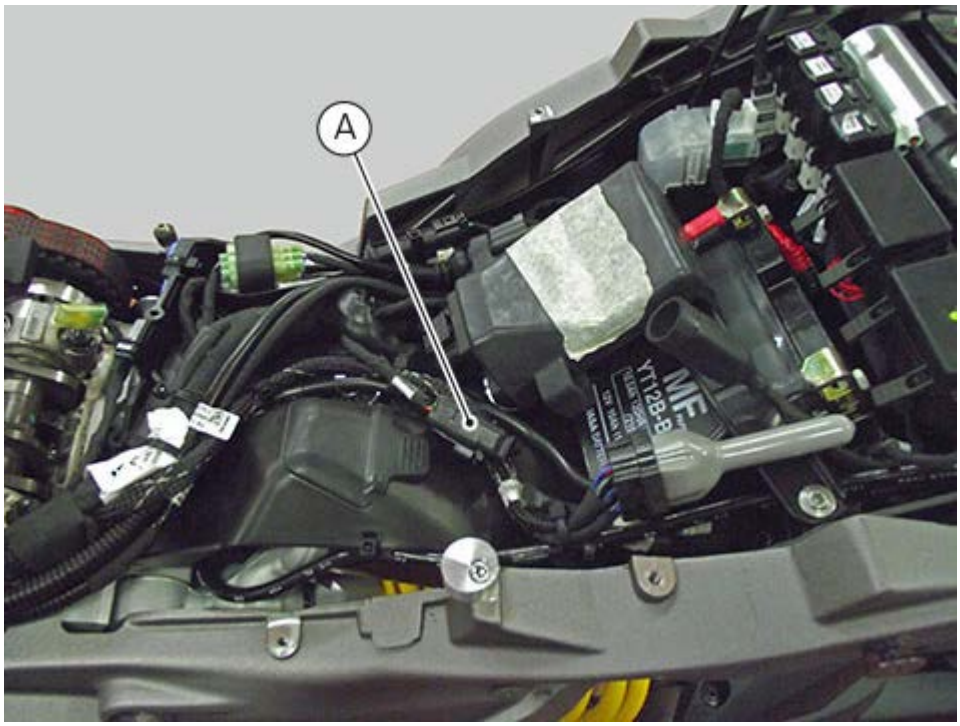


Note
Without rpm signal the engine does not start.

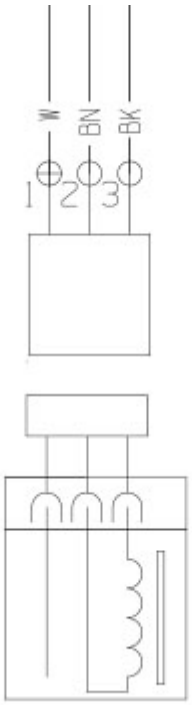
CONTROLS

The engine rpm sensor (pick-up sensor) is located on the engine right side, on the generator cover.
For removal, proceed as described in chapter "Removing the generator cover".

Check control unit correct operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket (A), which is positioned inside electrical components compartment; to reach it, remove the seat.



ELECTRIC DIAGRAM

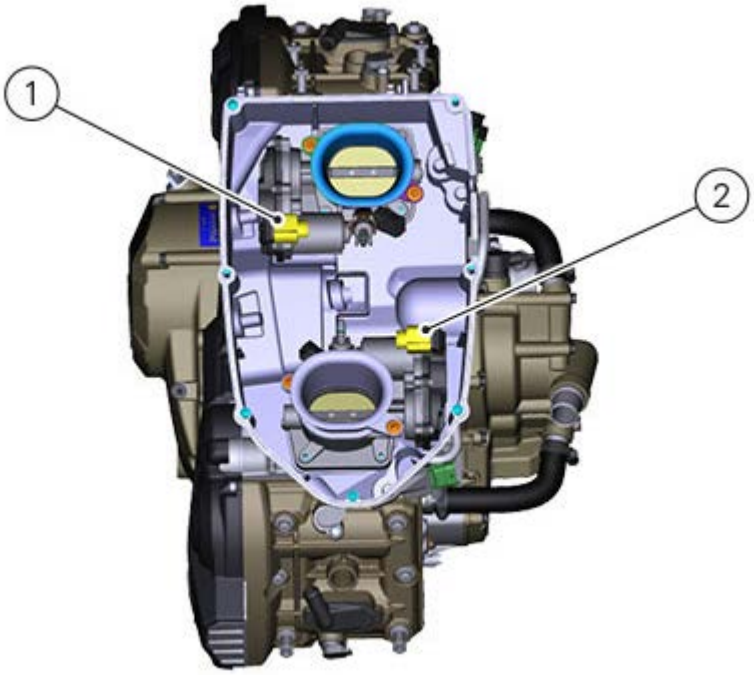


Throttle Position System (TPS)

In the Multistrada, the TPS is integrated in the ETV.

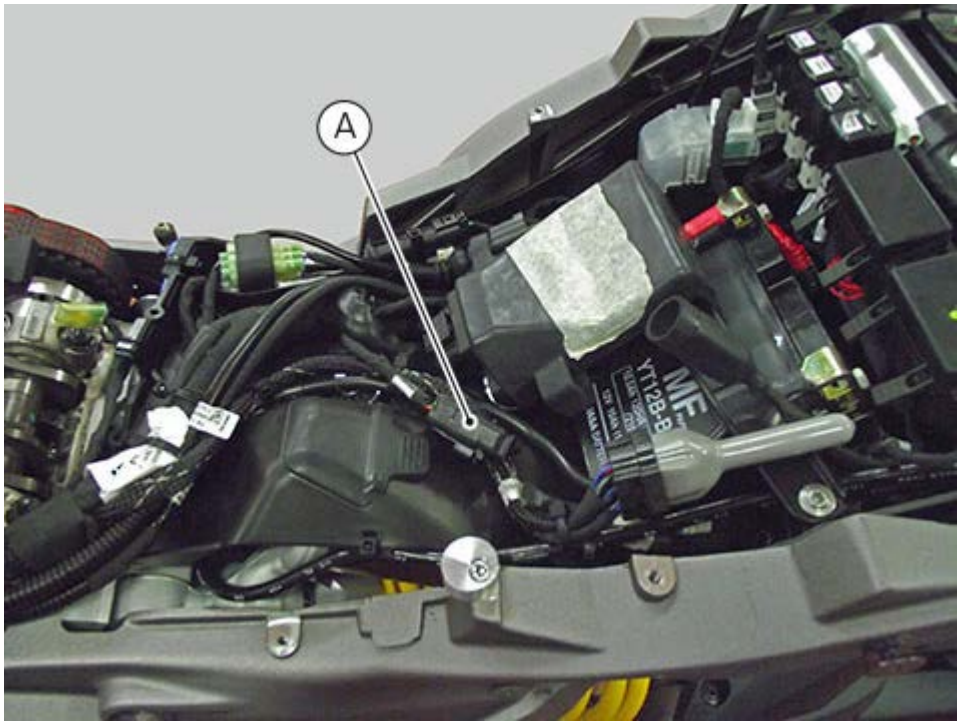
Electronic Throttle Valve (ETV)

The ETV (1) and (2) is the motor that controls throttle valve opening and closing and is located on the throttle body.
In case of failure it is not possible to replace only the ETV, but it is necessary to replace the complete throttle body.
Once replaced, reset the TPS as described in chapter "Throttle position potentiometer".

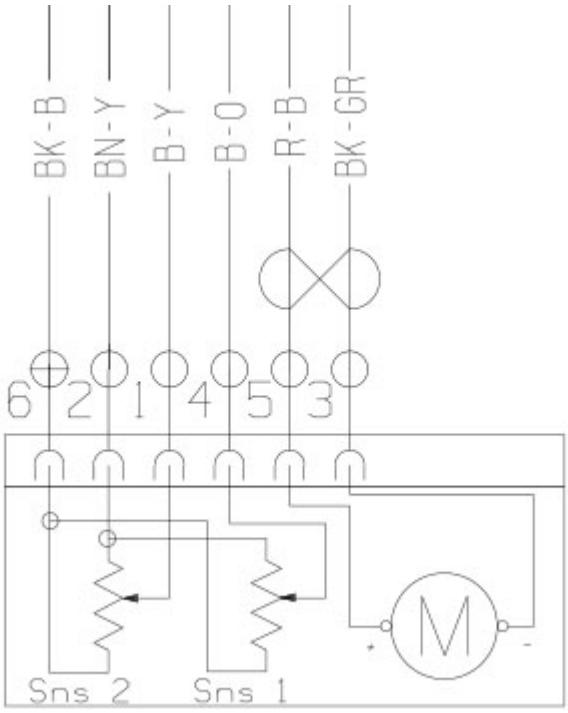


CONTROLS

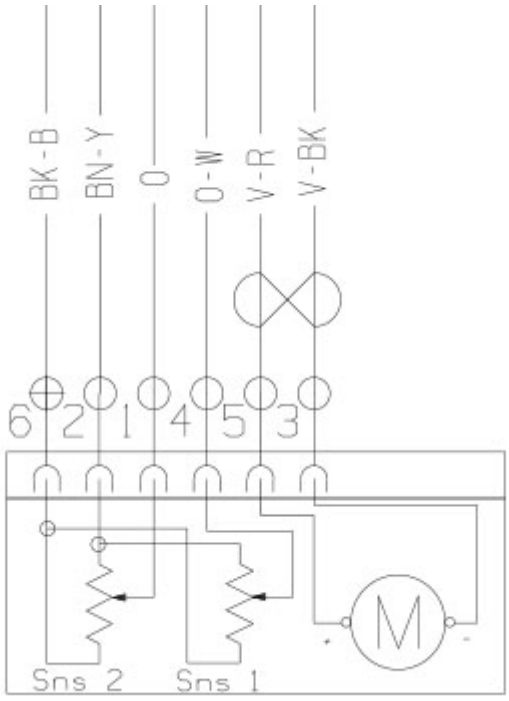
Check control unit correct operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket (A), which is positioned inside electrical components compartment; to reach it, remove the seat.



HORIZONTAL ETV WIRING DIAGRAM (2)



VERTICAL ETV WIRING DIAGRAM (1)

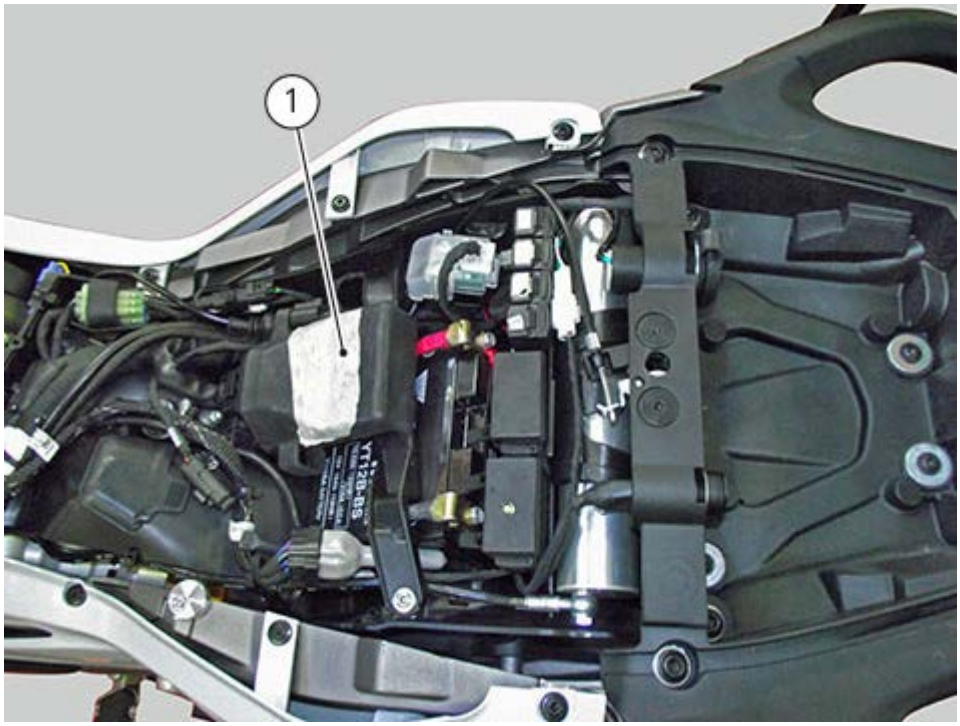


To remove and refit the ETV, refer to chapters "Removing the airbox and throttle body" and "Refitting the airbox and throttle body".

Black Box System (BBS)

BBS (1) is an electronic unit connected to the CAN line, having the following functions:

- DSS;
- DTC/DWC;
- Fog lights (if enabled);
- D|Air (if enabled);
- Handgrip heating (if enabled);
- Alarm (if enabled).

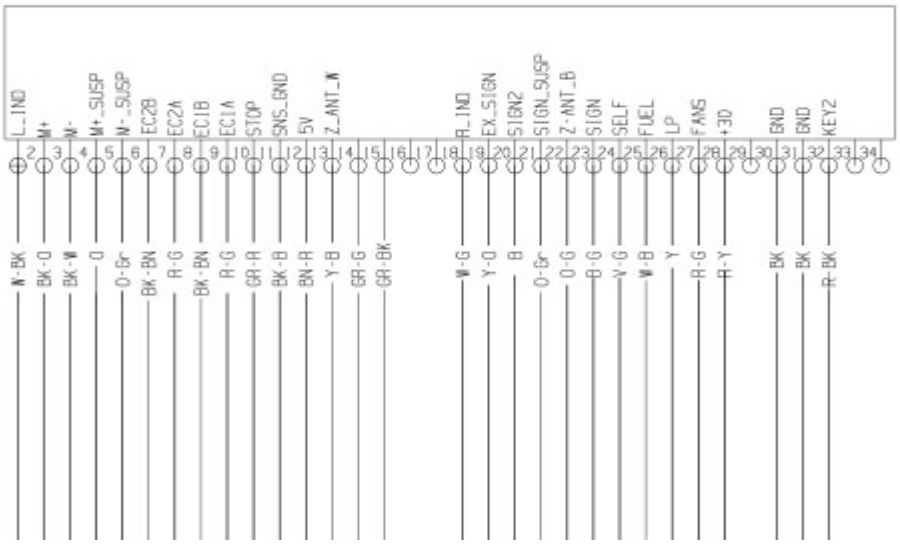


In Signals:

- Front wheel accelerometer;
- Bottom yoke accelerometer (if enabled);
- Level sensor;
- Preload position (if enabled);
- Shock absorber position sensor (if enabled);
- EXVL valve position
- Rear stop light.

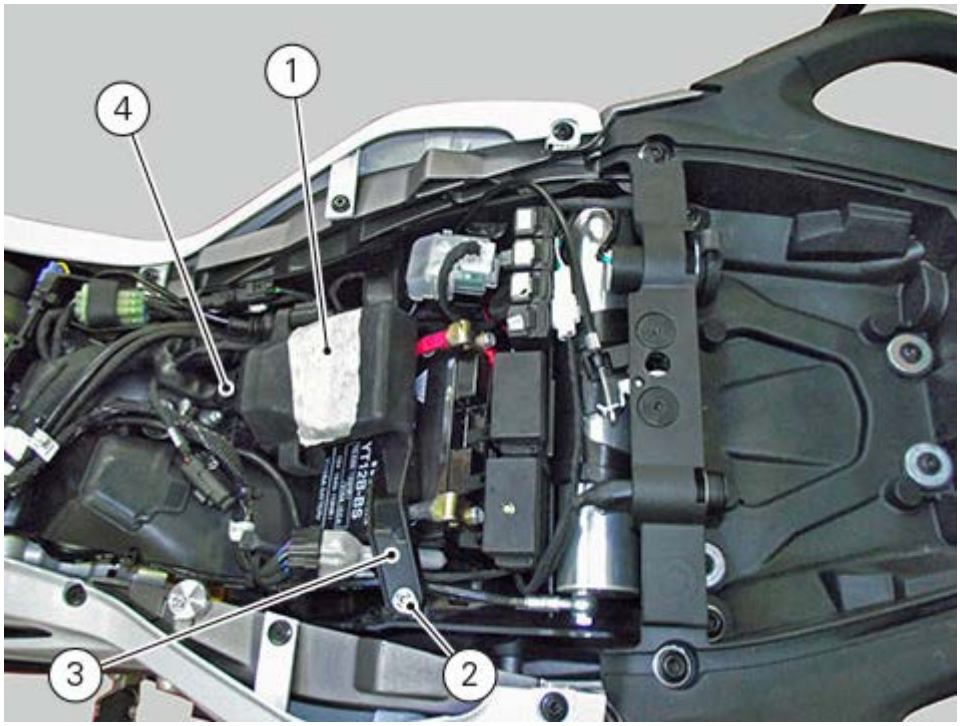
OUT Signals:

- Front suspension damping (if enabled);
- Rear suspension damping (if enabled);
- EXVL valve actuator;
- Preload actuator (if enabled);
- Tail light;
- Rear LH turn indicator;
- Rear RH turn indicator



REMOVAL PROCEDURE

To remove the BBS (1), remove the seat "Removing the seat", undo screw (2) and remove support (3). Disconnect the connector (4).

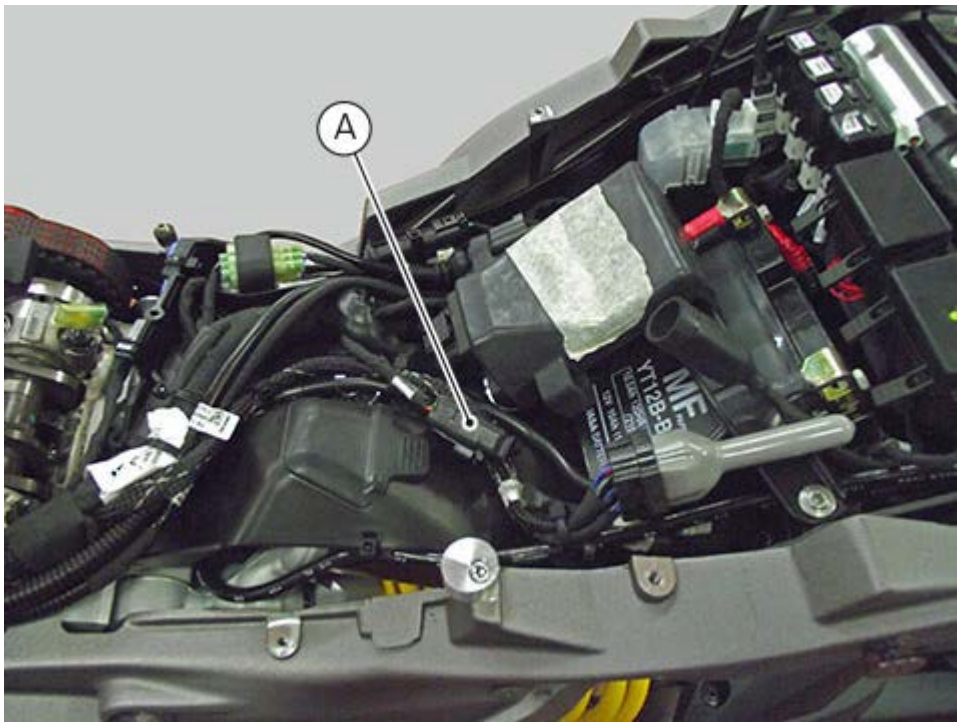


REFITTING PROCEDURE

Refitting is the reverse of removal.

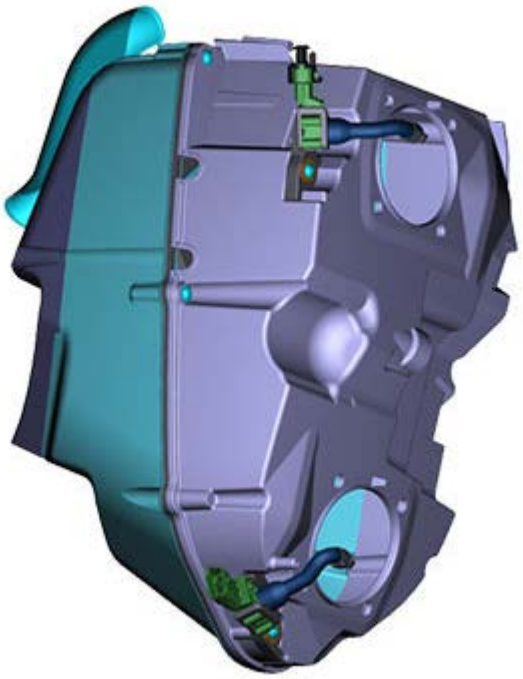
CONTROLS

Check control unit correct operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket (A), which is positioned inside electrical components compartment; to reach it, remove the seat.


A

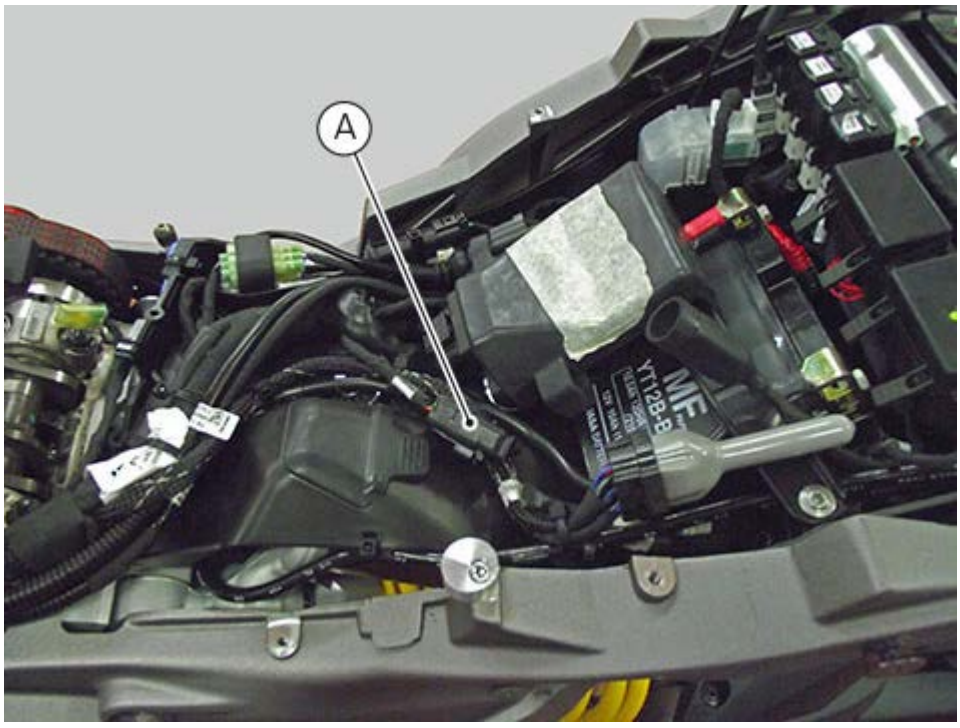
Map sensor

The Map sensor (Manifold Absolute Pressure) measures the air pressure to calculate the exact quantity of fuel to be injected.
The control unit processes the intake air pressure value and the external temperature value to calculate the quantity of intake air in the cylinders and, based on the preset stoichiometric ratio, determines the correct quantity of fuel to be delivered to the injectors.
The air/fuel ratio is therefore always excellent.



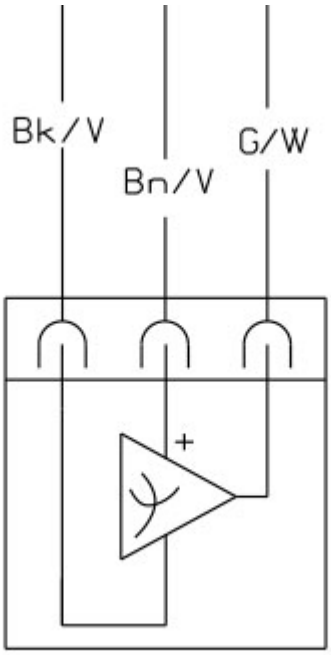
CONTROLS

Check control unit correct operation with the DDS 2 diagnosis instrument connected to control unit diagnostic socket (A), which is positioned inside electrical components compartment; to reach it, remove the seat.

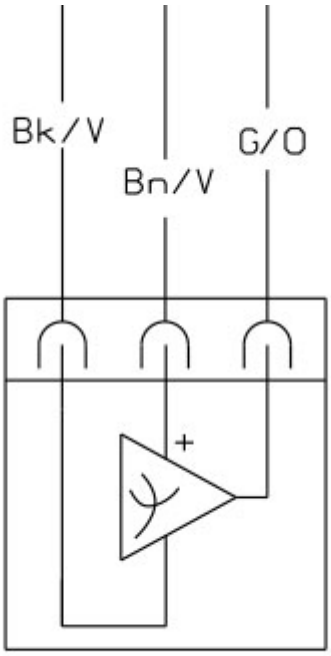


ELECTRIC DIAGRAM

H Map



V Map

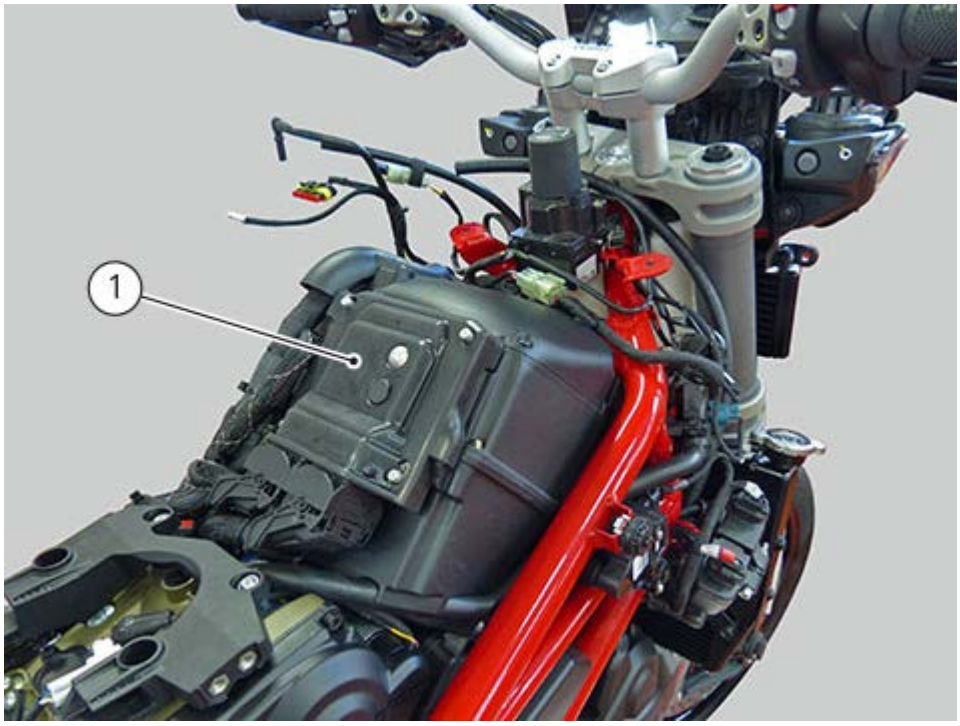


REMOVAL / REASSEMBLY

To remove and refit the MAP sensor, refer to chapters "Removing the airbox and throttle body" and "Refitting the airbox and throttle body".

Engine control unit (ECU)

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



The ECU (1) controls many components, among which:

- Vertical and horizontal injectors;
- Vertical and horizontal cylinder secondary coil;
- Vertical and horizontal cylinder main coil;
- Vertical and horizontal cylinder ETV DC Motor;
- Purge valve;
- Vertical and horizontal cylinder OCV Phase IN;
- Vertical and horizontal cylinder OCV Phase EX;
- AIS.

These components are controlled according to the engine operation status detected by a set of sensors listed below:

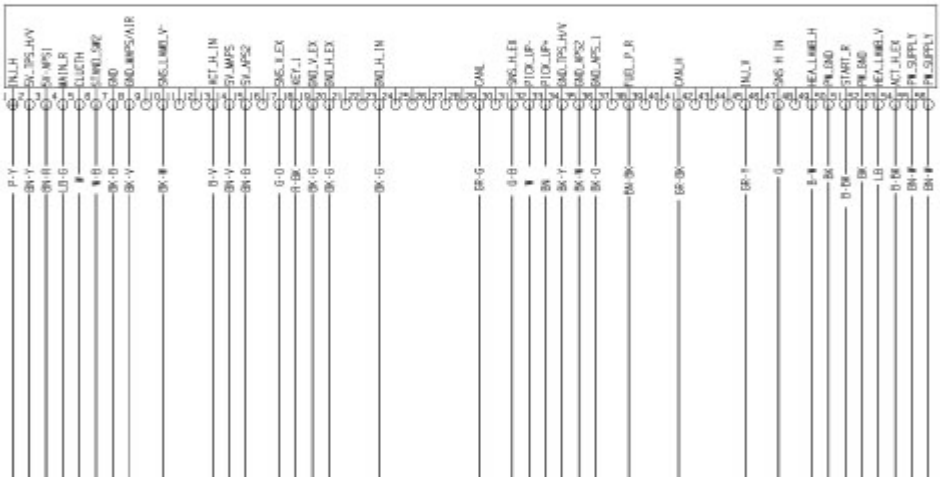
- APS;
- Gear sensor;
- Vertical and horizontal cylinder ETV;
- Vertical and horizontal cylinder lambda sensor;
- Pick-Up sensor;
- Vertical and horizontal cylinder Map Sensor;
- Vertical and horizontal cylinder knock sensor;
- Vertical and horizontal cylinder Timing sensor IN;
- Air T.;
- Engine T.;
- Side stand switch;
- Clutch switch;
- Brake switch;
- Oil T.

Important

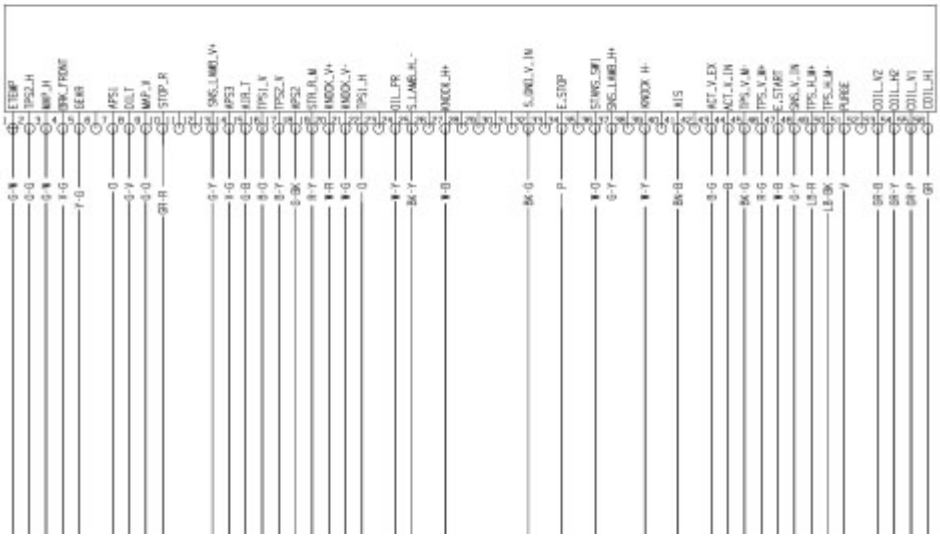
The maps, which include spark advance values, injection times, crankshaft angle for injector closing and all correction curves as a function of temperature and atmospheric pressure values, are stored in the Flash Eprom of the ECU. The above values are preset by the Manufacturer after testing the motorcycle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

ELECTRIC DIAGRAM

ECU 1 connector



ECU 2 connector



To remove and refit the ECU, see the procedure described in chapter "Removing the airbox"

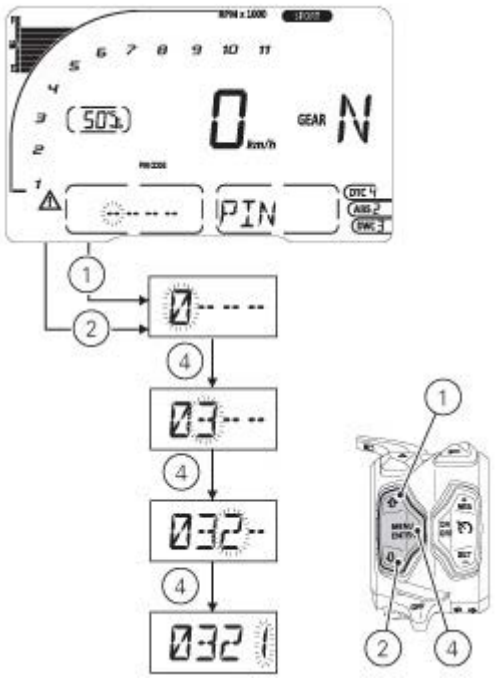
Restoring motorcycle operation via the PIN CODE

In case of key acknowledgement system or key malfunction, the instrument panel allows the user to enter his/her own PIN code to temporarily restore motorcycle operation.
If the PIN CODE function is active, the instrument panel enables in "Menu 1" the possibility to enter the PIN CODE.

Entering the code:

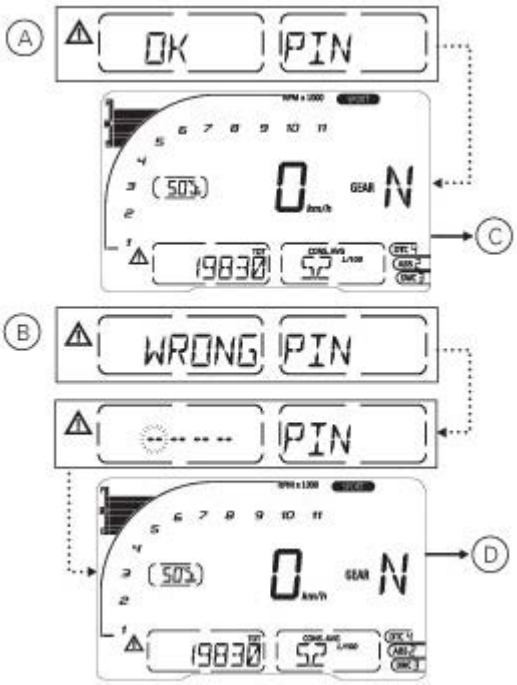
1 Press button (2) or (1), only one digit indicating "0" starts flashing;
2 Each time you press button (2) the displayed number increases by one (+ 1) up to "9" and then starts back from "0";
3 Each time you press the button (1) the displayed number decreases by one (- 1) up to "1" and then starts back from "0";
4 To confirm the number, press the button (4);

Repeat the procedures until you confirm all the digits of the PIN CODE.



When you press button (4) to confirm the fourth and last digit:

- if the PIN code (A) is correct, the instrument panel shows the message OK for 3 seconds followed by the "Standard screen" and enables the vehicle to start (C);
- if the PIN code (B) is not correct, the instrument panel displays WRONG for 3 seconds and then highlights the string of four dashes "- - - -" to allow you to try again. The number of possible attempts is unlimited and determined by a preset time-out of 2 minutes. After this time, the instrument panel shows the standard screen and does not allow the vehicle start (D).


A
OK
PIN
C
B
WRONG
PIN
PIN
D
GEAR
N

Key duplication

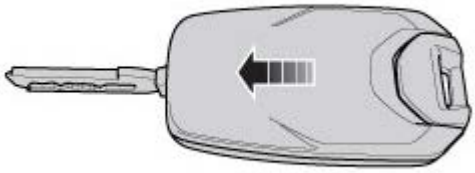
When a customer needs spare keys, he/she shall contact a Ducati authorised service centre and bring all keys he/she still has.
The Ducati authorised service centre will program all new and old keys.
The Ducati authorised service centre may ask to the customer to prove to be the motorcycle owner.
The codes of the keys missing during the programming procedure will be erased to ensure that any lost key can not start the engine.

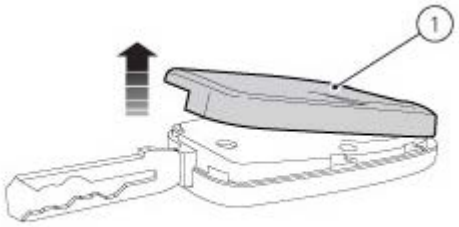
Replacing the battery in the active key

Note

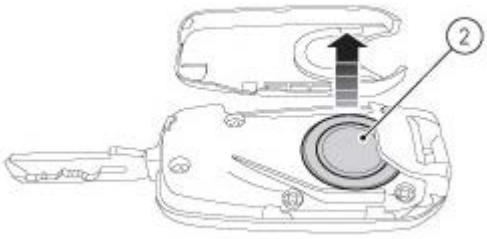
The keys do not need to be reprogrammed after replacing the battery.

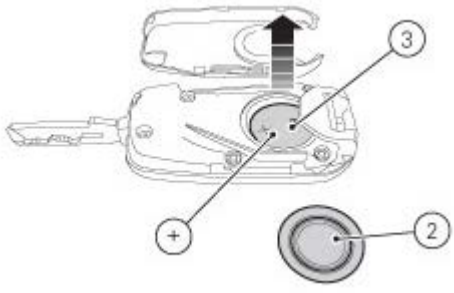
Remove the metal part of the battery.
Remove the rear plastic shell of the grip by pushing it forward and lifting it as shown in the figures.





After separating the plastic shells, remove the battery protection sheath (2).
Remove battery (3) and install a new one.



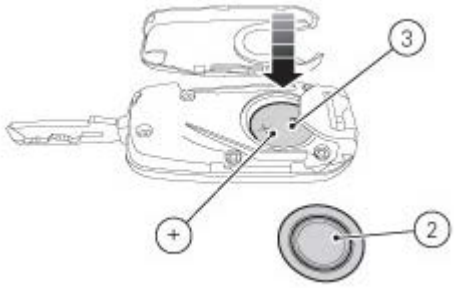


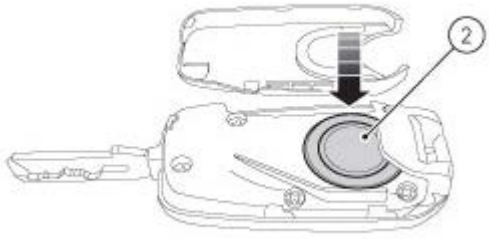
Install the battery in place, paying attention to respect polarity: positive pole (+) must be facing up.

Important

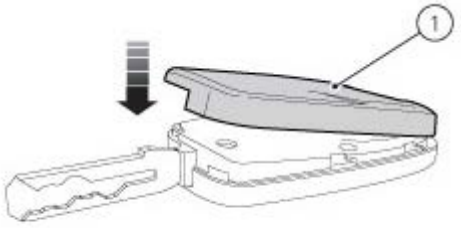
Only use the required type of battery.

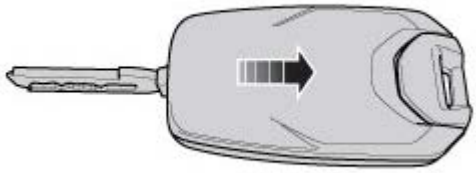
Refit protection sheath (2) on the battery.





Reinstall the rear plastic shell and push slightly as shown in the figure.
Make sure shells close properly and that the key is well closed.





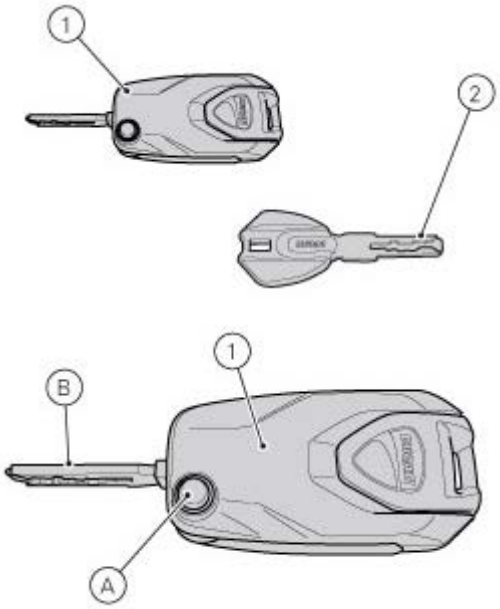
Keys

The Owner receives a set of keys comprising:

- 1 active key (1);
- 1 passive key (2).

They contain the code used by the "Hands free" system for the Key-On, in different modes.

The active key (1) is the one that is normally used and has a button (A) that, when pressed, makes the metal part exit (B).
The metal part returns inside the grip by pushing it in.



The active key contains a battery that must be replaced when the key and the battery symbols are displayed when the instrument panel is turned on.

Note
In this case, replace the battery as soon as possible.

When the charge level goes below a certain limit, the key can only work in passive mode, like the passive key: in this case, the instrument panel will not display any message.

Warning
Do not ride with the (active or passive) key inserted in the lock of the tank cap or in the seat lock as it could come out and represent a potential danger. Furthermore, if bumped, the key mechanism and the integrated circuit could be damaged.
Also riding in poor weather conditions with the key inserted could cause damage to its integrated circuit.
Do not leave the key on the motorcycle when washing it as it could be damaged, not being watertight.

Immobilizer system

To increase protection against theft, motorcycle features an electronic engine locking system (IMMOBILIZER) which is automatically enabled upon every Key-Off.
The grip of each ignition key contains an electronic device that modulates the output signal from a special antenna in the headlight fairing when the ignition is switched On. The modulated signal is the "password", different upon every Key-On, used by the control unit to acknowledge the key. Engine can be started only after key acknowledgement.

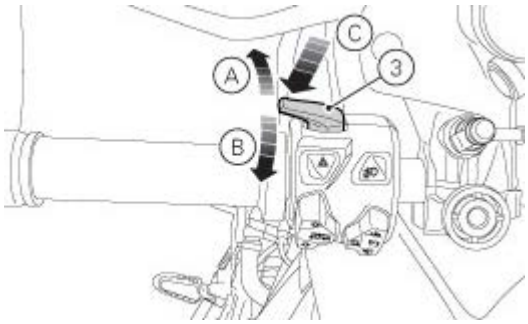
Light control

Low / High beam

This function allows you to reduce current consumption from the battery, by managing headlight switching-on and off.

At Key-On, the high beam and low beam lights are OFF, only the parking lights are turned on.

Once the engine is started, the low beam is turned on; with engine running the standard operation of the lights is restored: it is possible to switch the high beam on and off using button (3) in positions (A) and (B). If engine is not started upon key-on, it is anyway possible to switch high/low beams on by pushing button (3) position (C) on LH switch.



If engine is not started within 60 seconds since manual ignition, the low and/or high beam lights are turned OFF.

If the low beam and/or high beam was turned on before starting the engine (with the procedure described above), the headlight turns off automatically when starting the engine and will turn ON again when the engine has been completely started.

Turn indicators

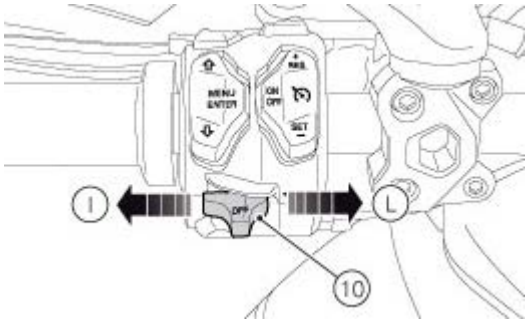
Turn indicators are automatically reset by the instrument panel.

To activate the left turn indicators, press button (10) in position (I); to activate the right turn indicators, press button (10) in position (L).

Turn indicators can be cancelled by pressing button (10) on LH switch.

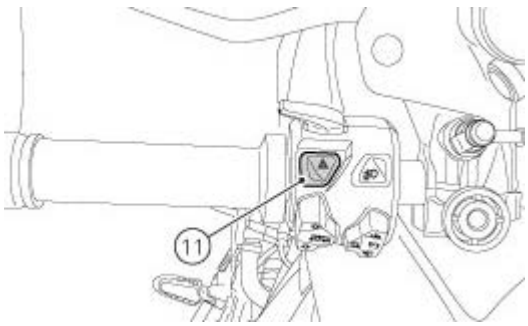
If the turn indicator is not reset manually, the instrument panel will automatically switch it off after the motorcycle has travelled 500 m (0.3 miles) from when the turn indicator was activated. The counter for the distance travelled for automatic deactivation is only activated at speeds below 80 km/h (50 mph).

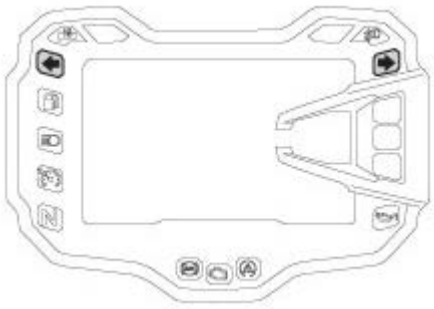
If the calculation of the distance for automatic deactivation is activated and then the motorcycle exceeds a speed of 80 km/h (50 mph), the calculation will be interrupted and will restart when the speed returns below the indicated threshold.



Hazard function (4 turn indicators)

The "Hazard" function turns all four turn indicators on at the same time to signal an emergency condition. Push button (11) to activate the "Hazard" function. It can only be activated when vehicle is turned on (Key-ON). When the "Hazard" function is active, all four turn indicators blink at the same time as well as warning lights on the instrument panel. The "Hazard" function can be manually turned off exclusively when vehicle is on (Key-ON), by pressing button (11).





Once the "Hazard" function is activated, if vehicle is turned off (key turned to "OFF"), the function stays active for two hours. After two hours, the turn indicators switch OFF automatically in order to save battery charge.

Note

If user performs a Key-ON while the "Hazard" function is still active, the function will remain ON (temporary turn indicator control interruption is allowed during the instrument panel initial check routine).

Note

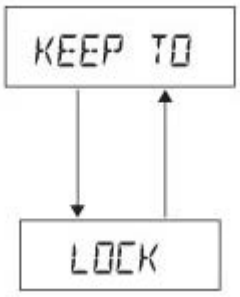
If there is a sudden interruption in the battery while the function is active, the instrument panel will disable the function when the voltage is restored.

Note

The "Hazard" function has higher priority compared to normal operation of the single turn indicators, this means that, as long as it is active, it will not be possible to activate the single right or left turn indicators.

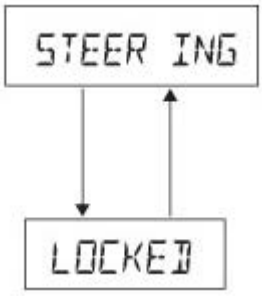
Warning reading "Keep pressed to lock" (upon Key-Off)

This warns that it is necessary to keep the button pressed to engage the steering lock.
The steering lock can be turned on during the first 60 seconds after turning off the vehicle by pressing the starter button.
Message "KEEP PRESSED TO LOCK" is displayed if the starter button is depressed for at least 1 second.



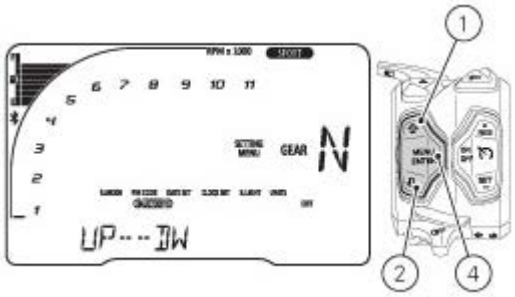
Warning reading "Steering locked" (upon Key-Off)

This warns that the steering lock was activated after Key-Off.
If the steering lock was activated correctly, the Instrument panel will display "STEERING LOCKED" indication for 6 seconds.



Bluetooth device setting

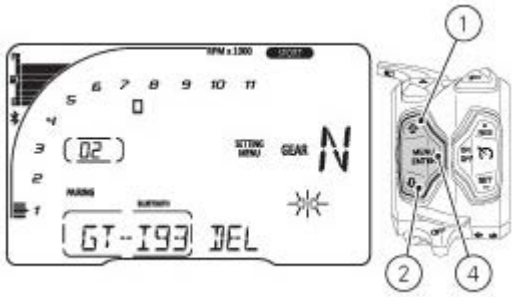
This function can be activated only if the Ducati Multimedia System (DMS) and the Bluetooth control unit are available: for this model the Bluetooth control unit can be purchased at a Ducati Dealer or Authorised Service Centre.
This function allows pairing and/or deleting any paired Bluetooth devices.
To do this, you must enter the Setting Menu.
Select "BLUETOOTH" option, by pressing button (1) or (2). Once function is highlighted, press button (4).
You enter the "BLUETOOTH" menu, which is active only if the Bluetooth function is active.
The BLUETOOTH menu is not available if the player is active or when there is an incoming call, a call is in progress or during recall.



To carry out the pairing procedure, refer to "Pairing of a new device".
To delete any paired devices, refer to "Deleting a paired device".
Following is the information contained in the Bluetooth Setting Menu:

- number of paired devices (from 0 to 5);
- number of devices detected during the pairing phase (from 0 to 20);
- Label Paring, Bluetooth, Exit, Setting Menu;
- name of the first paired device, if available (in Menu 1);
- Icon of the type of paired device shown in that moment;
- "DEL" indication (delete) in Menu 2, used to delete the device.

To quit the Bluetooth Setting Menu, use buttons (1) and (2) to select EXIT and then press button (4).



Pairing of a new device

This function allows user to associate (pair) one or several Bluetooth devices by running the "PAIRING" control.
Set the Bluetooth device to ensure it can be detected by the control unit, so turn device on and make it visible to other devices.
A Bluetooth device in visible mode transmits a wireless signal allowing it to be detected by other devices. This function is called pairing mode.
The motorcycle is equipped with a Bluetooth control unit that works as a hub between the various supported electronic devices relying on a Bluetooth communication interface.

Warning

Bluetooth Headset device manufacturers may incorporate certain changes within the standard protocols over the course of the lifecycle of the device (Smartphones and Earphones).

Warning

These changes are outside the control of Ducati and may result in Bluetooth Headset devices functionality becoming impaired (sharing Music, multimedia player, etc.) and may equally affect some types of Smartphones (depending on supported Bluetooth profiles). This is why Ducati cannot guarantee multimedia player proper

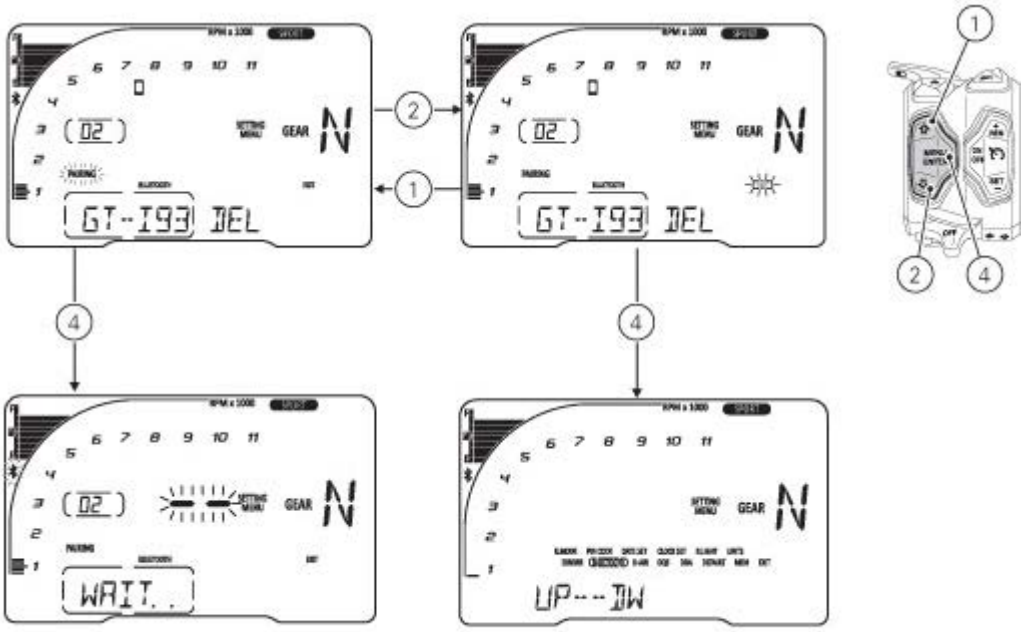
operation for:

- any earphones not coming with the "Ducati Kit part no. 981029498";
- any Smartphones not supporting the required Bluetooth profiles (even though paired to earphones coming with the "Ducati Kit part no. 981029498").

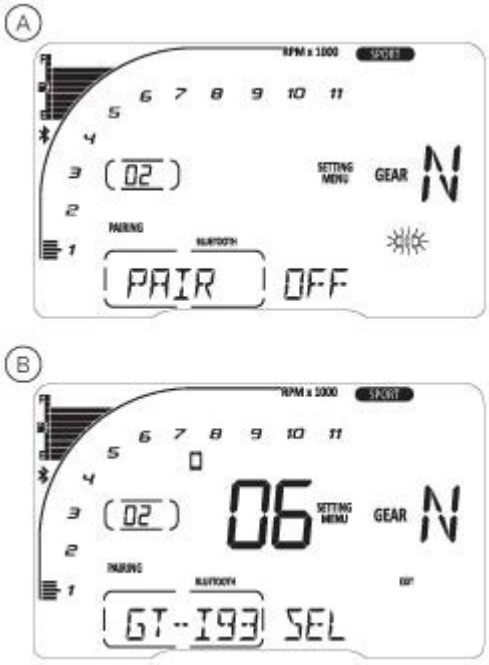
Warning

In case of interference or noise due to particular conditions of the external environment, the Ducati earphone kit no. 981029498 also allows sharing the music being played directly from rider helmet to passenger helmet (for further details please refer to the manual of the earphones coming with the Ducati kit part no. 981029498).

When opening the BLUETOOTH menu for the first time, the first label highlighted by default will be "PAIRING".
The Pairing function is activated by pressing button (4): this runs a search for all Bluetooth devices present within a certain range. Therefore, the "WAIT.." indication is displayed in Menu 1. During the search, besides the "WAIT.." indication in Menu 1 also two flashing dashes are displayed.
The pairing ends automatically when devices are detected within the range.
During the pairing it is possible to use only the EXIT: to quit the pairing in progress, use buttons (1) and (2) to select EXIT and press button (4).



At the end of the pairing, the number of the detected devices is displayed.
If the Pairing fails (A), the "PAIR" indication is displayed in Menu 1 and "OFF" in Menu 2. Now you can only quit the BLUETOOTH Setting Menu, and then go back in to run a new Pairing procedure.
If Pairing is successful (B), as soon as Bluetooth devices are detected, their name is displayed in a list: up to 20 devices can be displayed.



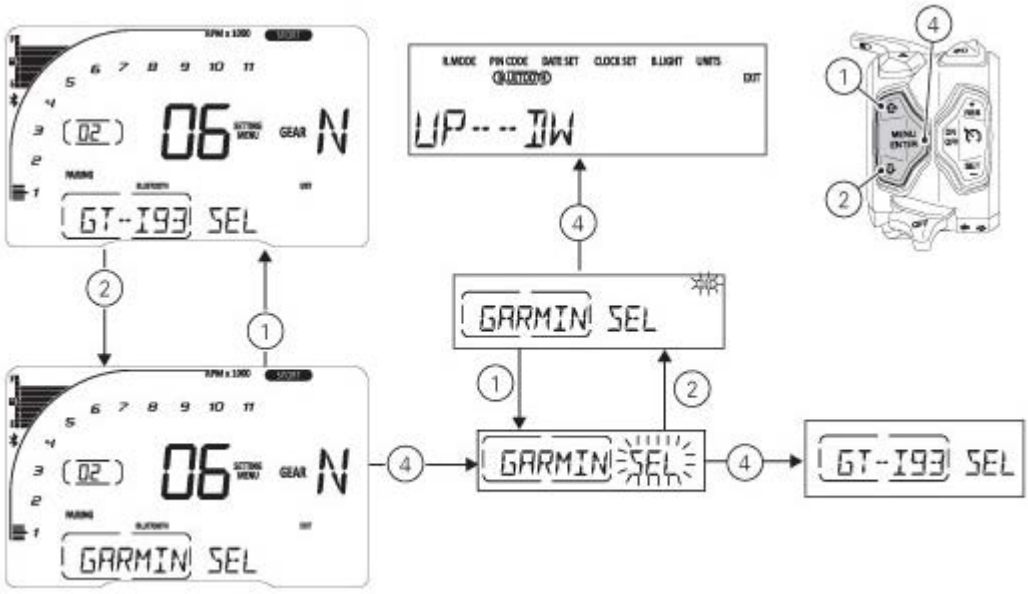
The list of devices found within the range during the Pairing stage does not include already paired devices, even if their Bluetooth connection is ON.
The name of the device is scrolled on the display.
To pass from one device to the other, press buttons (1) and (2).
Once the desired device is selected, press button (4) to confirm it: Menu 2 will show "SEL" flashing.
In this condition, it is possible to use buttons (1) and (2) to select the SEL or EXIT function:

- if you select SEL and press button (4), the indication will remain steady ON in Menu 2 whereas Menu 1 will show the first six characters of the selected device. Then, the selected device will be paired.
- If you select EXIT and press button (4), you quit the Pairing function and go back to the main setting menu.

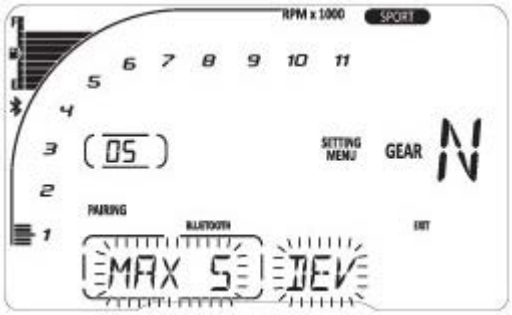
If two or more Bluetooth devices have the same name, the list of devices detected will include two or more labels with the same name.
If one of the devices detected has no name, it is not included in the list of devices detected.

It is possible to pair up to:

- two Smartphones;
- one rider helmet;
- one passenger helmet;
- one navigator.



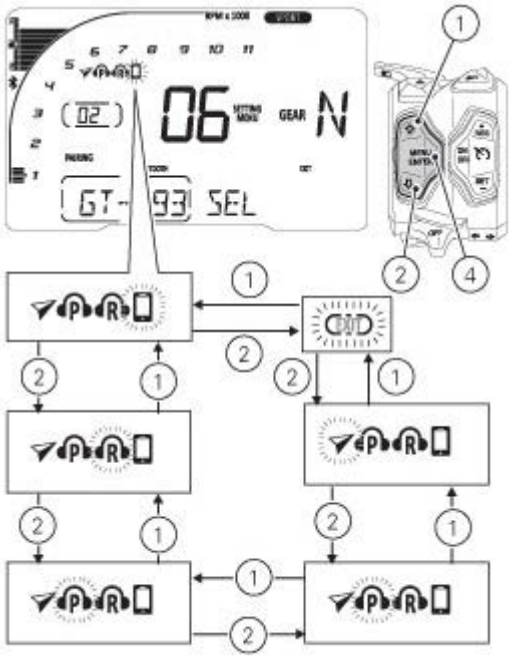
If at least 5 devices have already been paired and the user attempts to run the Pairing, the following message will be displayed: "MAX 5" in Menu 1 and "DEV" in Menu 2 for 3 seconds (flashing).
After 3 seconds, Menu 1 will show the name of the first paired device and Menu 2 will show DEL to allow deleting it: for the deletion procedure of one or more devices, refer to paragraph "Deleting associated devices".
To quit the Bluetooth Setting Menu select "EXIT" and press button (4).



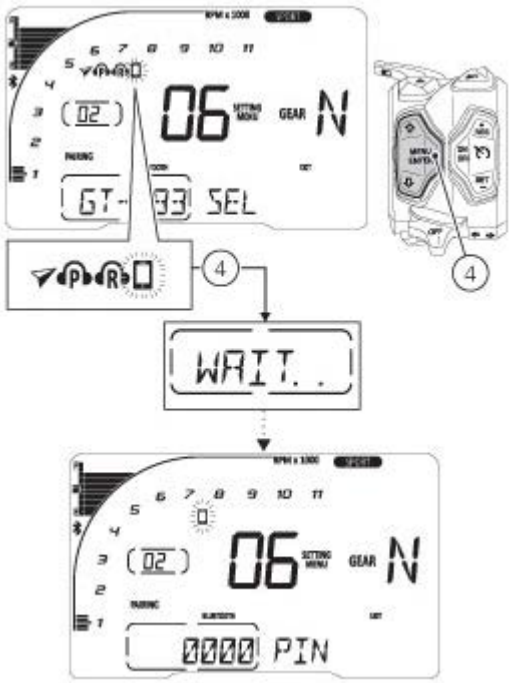
When device is selected, the user must indicate the type of connected using buttons (1), (2) and then button (4) to confirm. Types of devices can be:

- Smartphone;
- Rider helmet;
- Passenger helmet;
- GPS navigation system.

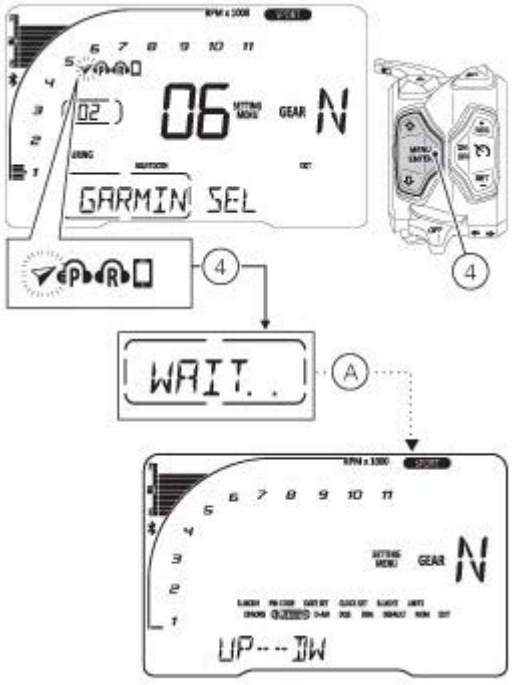
If necessary, to interrupt the pairing select EXIT and press button (4). This allows quitting the pairing procedure and going back to the Bluetooth Setting Menu main page.
If, on the other hand, you confirm a device pairing, the number of paired devices will be updated (from 0 to 5).
Pairing deactivation takes place when quitting the Bluetooth Setting Menu or when no more Bluetooth devices are present.



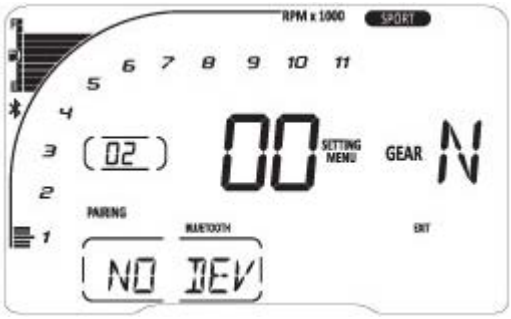
To pair a Smartphone, the pairing procedure with the Bluetooth control unit requires user to enter a code (0000), which is only necessary the first time the device is paired with the Bluetooth control unit.
In this case, the Instrument panel displays the PIN to be entered: "0000" in Menu 1, "PIN" in Menu 2 and the Smartphone icon flashing.
When the user enters the PIN code on the Smartphone, the display will automatically show the Bluetooth Setting Menu main page and the device will be paired.
If the user does not enter the PIN CODE on the Smartphone within 30 seconds, the instrument panel will automatically show the Bluetooth Setting Menu main page.
As soon as the pairing is finished, the indication WAIT is replaced by the name of the connected device: the complete name will be scrolled and then only the first characters will be displayed. Once the device is paired, the display will automatically show the Bluetooth Setting Menu main page.



If you wish to connect a Bluetooth Navigator, the connection procedure shall be completed on the navigator, by selecting the connection with the motorcycle Bluetooth control unit. In this case, during the pairing procedure, the Navigator icon will flash in the Bluetooth Setting Menu. When the Bluetooth control unit is connected to the device, the icon stops flashing and becomes steady ON.
If user does not complete the pairing procedure on the Navigator within 90 seconds, pairing screen on instrument panel will go out, and display will go back to Bluetooth Setting Menu main screen.
As soon as the pairing is finished, the indication WAIT is replaced by the name of the connected device: the complete name will be scrolled and then only the first characters will be displayed. Once the device is paired, the display will automatically show the Bluetooth Setting Menu main page.

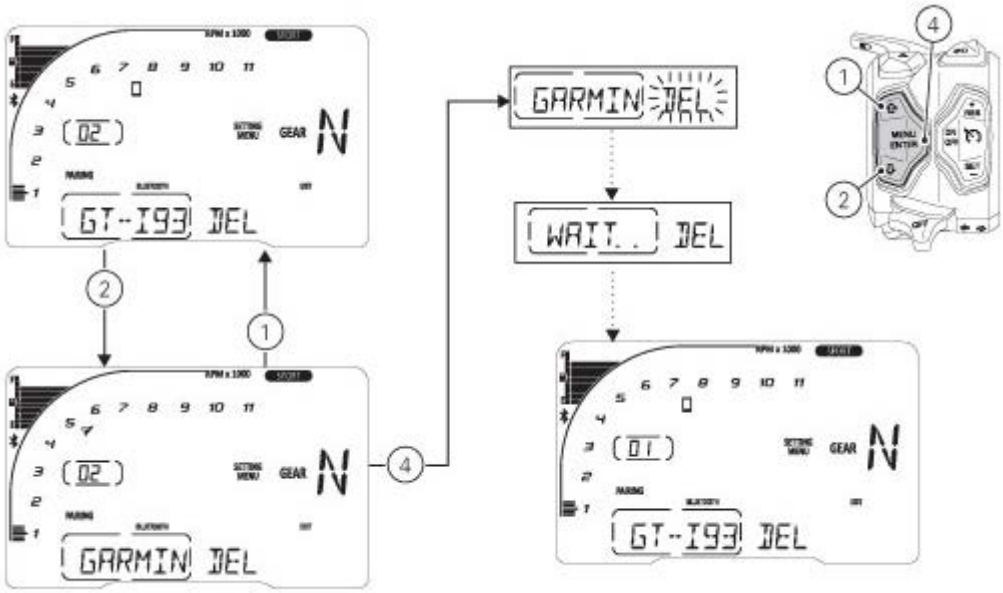


If no device is selected during the pairing phase, Menu 1 will show "NO DEV" and the displayed number will be ZERO. If no device is connected, no icon of the device type will be displayed.



Deleting associated devices

From the Bluetooth Menu it will be possible to access the list of paired devices in Menu 1. Use buttons (1) and (2) to select the desired device and confirm by pressing button (4): the DEL indication will start flashing in Menu 2. Then, by pressing button (4) for at least two seconds, the WAIT indication will be displayed in Menu 1. As soon as the deletion procedure is completed, the number of paired devices will be automatically updated.
Now, Menu 1 will show the name of the device that followed the deleted one and the EXIT function will start flashing. Select the flashing box of the EXIT option, and press button (4) to quit the list of associated devices and go back to Setting Menu main screen.



Setting the units of measurement

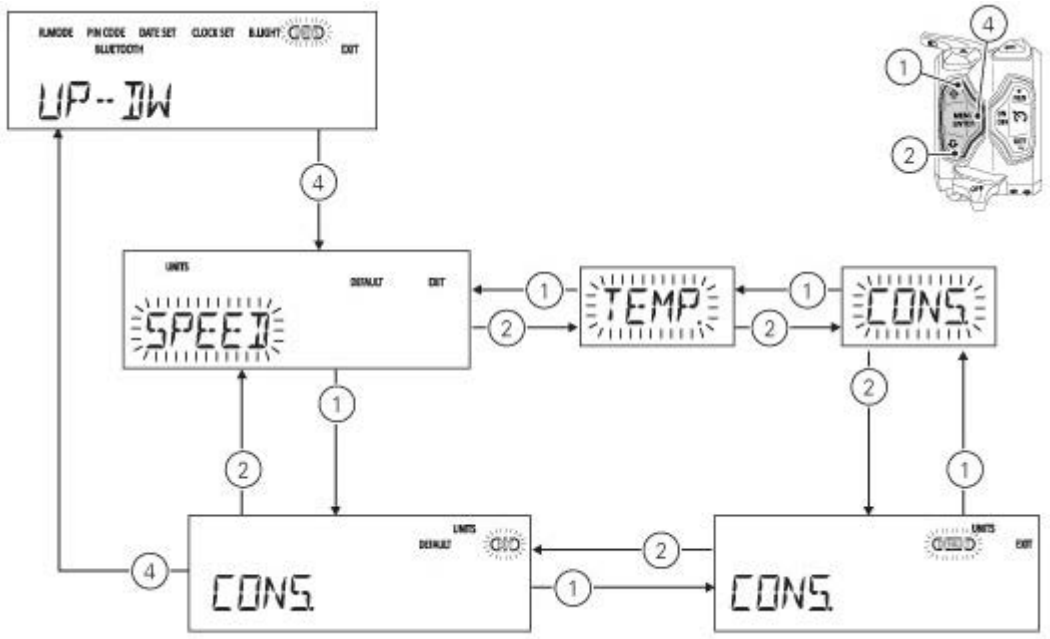
This function allows changing the units of measurement of the displayed values.
To manually set the units of measurement, you must enter the SETTING MENU.
Select UNITS option, by pressing button (1) or (2). Once function is highlighted, press button (4).

When entering this function, use buttons (1) and (2) to select the parameter for which you want to set a new unit of measurement or to restore the default settings:

- SPEED;
- temperature (TEMP.);
- fuel consumption (CONS.).

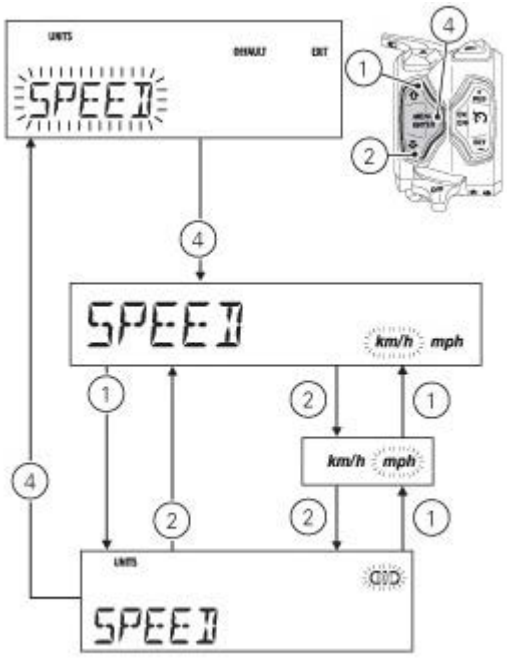
Besides the settings that can be modified, it is possible to select the "DEFAULT" box to restore the default units of measurement.

To exit the menu and go back to previous page, select EXIT and press button (4).



Setting the units of measurement: Speed

This function allows to change the units of measurement of speed (and hence even the ones of distance travelled).
You open the "UNITS" menu, as described on the previous pages.
Select "SPEED" option, by pressing button (1) or (2).
Once function is highlighted, press button (4). You open the "SPEED" menu.
When you enter the function, the current unit of measurement is displayed flashing, followed by the list of the possible units steady ON: km/h, mph.

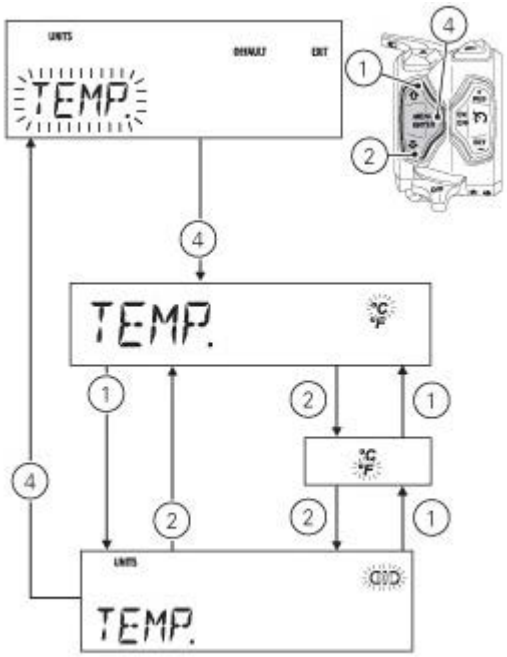


Press buttons (1) and (2) to highlight the units of measurement one by one: in particular, use button (2) to highlight the following item and button (1) to highlight the previous item. Select the required unit of measurement and then press button (4) to confirm the selected unit; then the selected unit of measurement is saved in the instrument panel and the SPEED indication starts flashing again.
Press button (1) to make the EXIT box flash; press button (4) to quit and go back to the previous window.
The selected unit of measurement will be used by the instrument panel for the following indications:

- motorcycle speed and Average speed (km/h or mph);
- Odometer, Trip1, Trip2 and Range (km or mi).

Setting the units of measurement: Temperature

This function allows you to change the units of measurement of the temperature.
You open the "UNITS" menu, as described on the previous pages.
Select "TEMPERATURE" option, by pressing button (1) or (2).
Once function is highlighted, press button (4).
You open the "TEMPERATURE" menu. When you enter the function, the current unit of measurement is displayed flashing, followed by the list of the possible units steady ON: °C, °F.



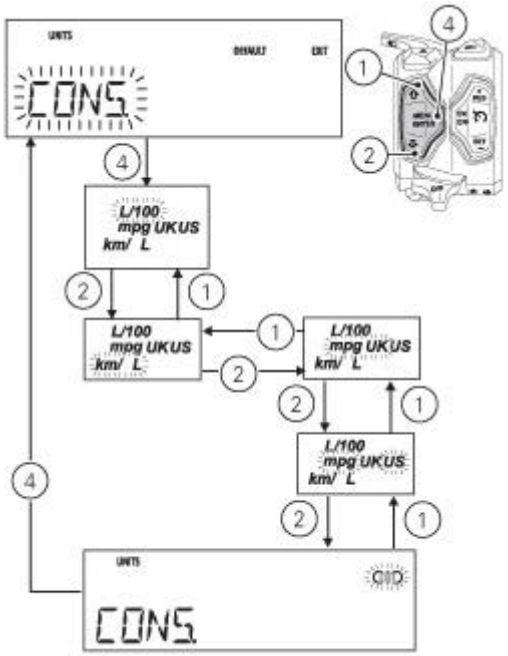
Press buttons (1) and (2) to highlight the units of measurement one by one: in particular, use button (2) to highlight the following item and button (1) to highlight the previous item. Select the required unit of measurement and then press button (4) to confirm the selected unit; then the selected unit of measurement is saved in the

instrument panel and the TEMPERATURE indication starts flashing again.
Press button (1) to make the EXIT box flash; press button (4) to quit and go back to the previous window.
The selected unit of measurement will be used by the instrument panel for the following indications:

- Engine coolant temperature and ambient air temperature.

Setting the units of measurement: Fuel consumption

This function allows you to change the units of measurement of the fuel consumption.
You open the "UNITS" menu, as described on the previous pages.
Select "CONSUMPTION" option, by pressing button (1) or (2).
Once function is highlighted, press button (4). You open the "CONSUMPTION" menu.
When you enter the function, the current unit of measurement is displayed flashing, followed by the list of the possible units steady ON: L / 100km, km / L, mpg (UK), mpg (USA).

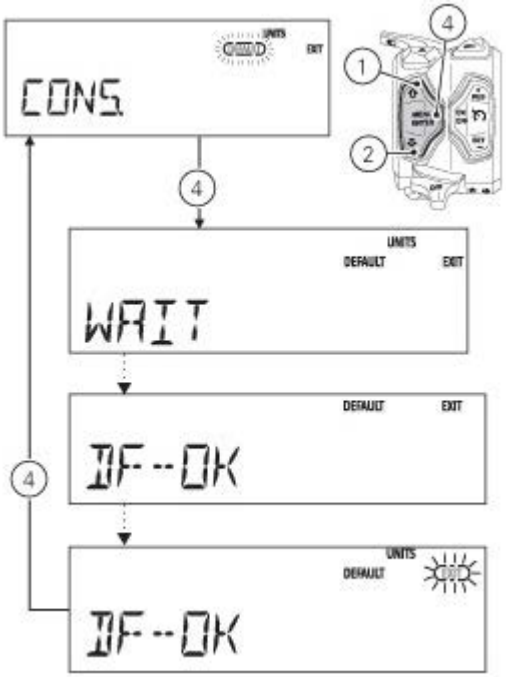


Press buttons (1) and (2) to highlight the units of measurement one by one: in particular, use button (2) to highlight the following item and button (1) to highlight the previous item.
Select the required unit of measurement and then press button (4) to confirm the selected unit; then the selected unit of measurement is saved in the instrument panel and the CONSUMPTION indication starts flashing again.
Press button (1) to make the EXIT box flash; press button (4) to quit and go back to the previous window.
The selected unit of measurement will be used by the instrument panel for the following indications:

- Instantaneous fuel consumption and Average fuel consumption.

Setting the units of measurement: Reset to automatic settings

This function allows you to restore the automatic settings for the units of measurement of all indications displayed on the instrument panel.
You open the "UNITS" menu, as described on the previous pages. Select "DEFAULT" option, by pressing button (1) or (2).
Once function is highlighted, press button (4) for 2 seconds. The display shows WAIT for two seconds; then the "DF-OK" message indicates that the units of measurement have been restored.
To exit the menu and go back to previous page, select EXIT and press button (4).

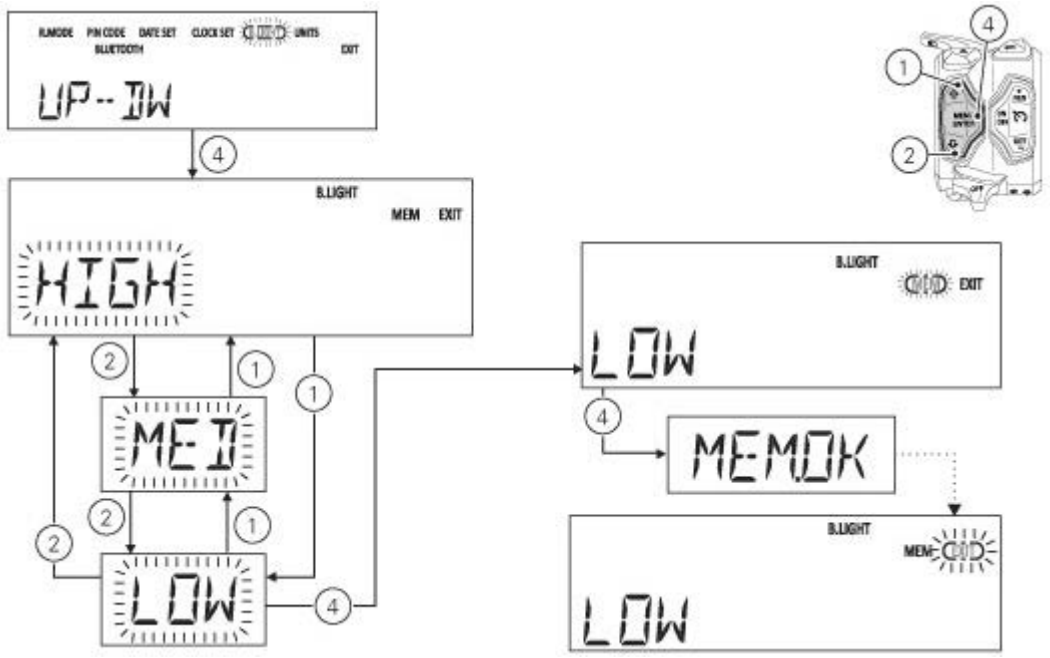

UNITS
EXIT
CONS
4
1
2
UNITS
DEFAULT
EXIT
WAIT
DEFAULT
EXIT
DF--OK
4
UNITS
DEFAULT
DF--OK

Backlighting setting

This function allows adjusting the backlighting intensity.
To set the backlighting, enter the SETTING MENU, use buttons (1) and (2) to select "B.LIGHT" and press button (4) to confirm.
When accessing the function, the active mode flashes whereas the MENU and EXIT messages will be steady on.
Use buttons (1) and (2) to select the desired brightness level (HIGH, MED, LOW) and press button (4) to confirm.
Select HIGH to set the display backlighting maximum brightness - recommended in conditions of strong ambient light.
Select MED to set the display backlighting medium brightness (80%) - recommended in conditions of medium/low ambient light.
Select LOW to set the display backlighting minimum brightness (60%) - recommended in conditions of low ambient light and/or during the night.
After confirming, the "EXIT" box will start flashing.
To exit the menu and go back to the previous page, select "EXIT" and press button (4).

Note

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



Clock setting

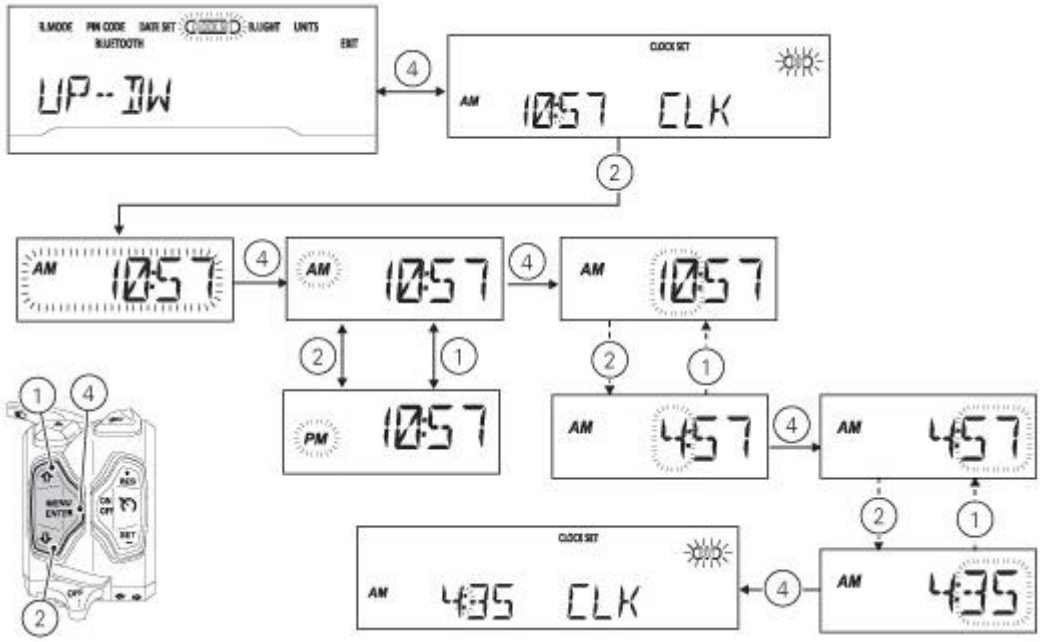
This function allows user to set or adjust the time.
You enter the Setting Menu. Select "CLOCK SET" option, by pressing button (1) or (2).
Once function is highlighted, press button (4). You open the "CLOCKSET" Menu.

It is possible to set the clock as follows:

- The "AM" indication starts flashing;
- if you press button (2) the "PM" indication starts flashing;
- press button (1) to go back to previous step.
- press button (4) to shift to hour setting, hours will start flashing;
- each time you press button (2), the digit will increase by 1 hour. If you hold button (2) down, the number increases cyclically in steps of one hour every second (when the button is held depressed, the hours do not flash);
- pressing button (4) gives access to the minute setting mode; minutes start to flash;
- each time you press button (2), the digit will increase by 1 minute. If you hold button (2) pressed, the count increases cyclically in steps of 1 minute every second;
- if button (2) is kept pressed for more than 5 seconds, steps increase in steps of 1 every 100 ms (seconds will not flash while button (2) is pressed).

To confirm (store) the new set time press button (4).
The EXIT box starts flashing, press button (4) to go back to the setting menu.
To quit, press button (4).

Note
Every time the battery is disconnected, the clock is reset and must be set again by the user.



Date setting

This function allows user to set or change the date.
You enter the Setting MENU.
Select "DATE SET" option, by pressing button (1) or (2).
Once function is highlighted, press button (4).

Important

Every time the battery is disconnected, the calendar date is reset and must be set again.

The displayed available settings are:

- Y: year
- M: month
  D: day

with the two-digit value next to each item.
When entering the function, the "Y" indication will flash.
To set and/or change the date, use buttons (1) and (2) to select the field to be modified (Y for year, M for month, D for day) and press button (4).
To go back to the previous page (setting menu), select EXIT and press button (4).

Year setting

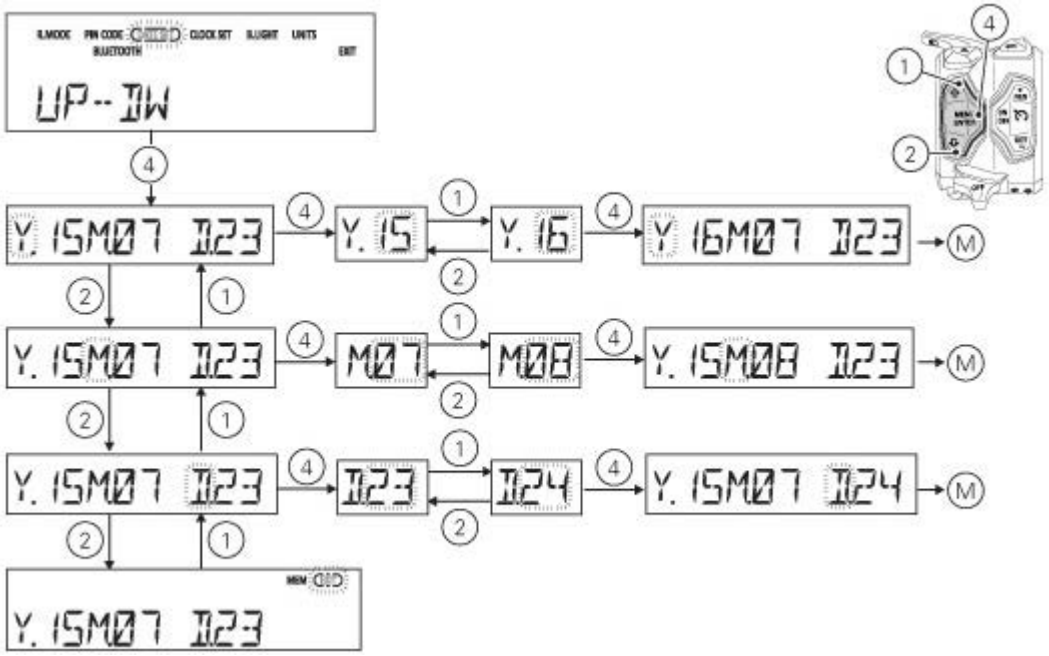
Select "Y" option, by pressing button (1) or (2).
Once option is highlighted, press button (4).
Year two-digit value starts flashing.
Press button (1) to decrease year value by 1 unit: 99, 98, ... 00, 99.
Press button (2) to increase year value by 1 unit: 00, 01, ... 99, 00.
Once you reach the value to be set, press button (4) and the set year will stop flashing.

Month setting

Select "M" option, by pressing button (1) or (2).
Once option is highlighted, press button (4).
Month two-digit value starts flashing.
Press button (1) to decrease month value by 1 unit: 12, 11, ... 01, 12.
Press button (2) to increase month value by 1 unit: 01, 02, ... 12, 01.
Once you reach the value to be set, press button (4) and the set month will stop flashing.

Day setting

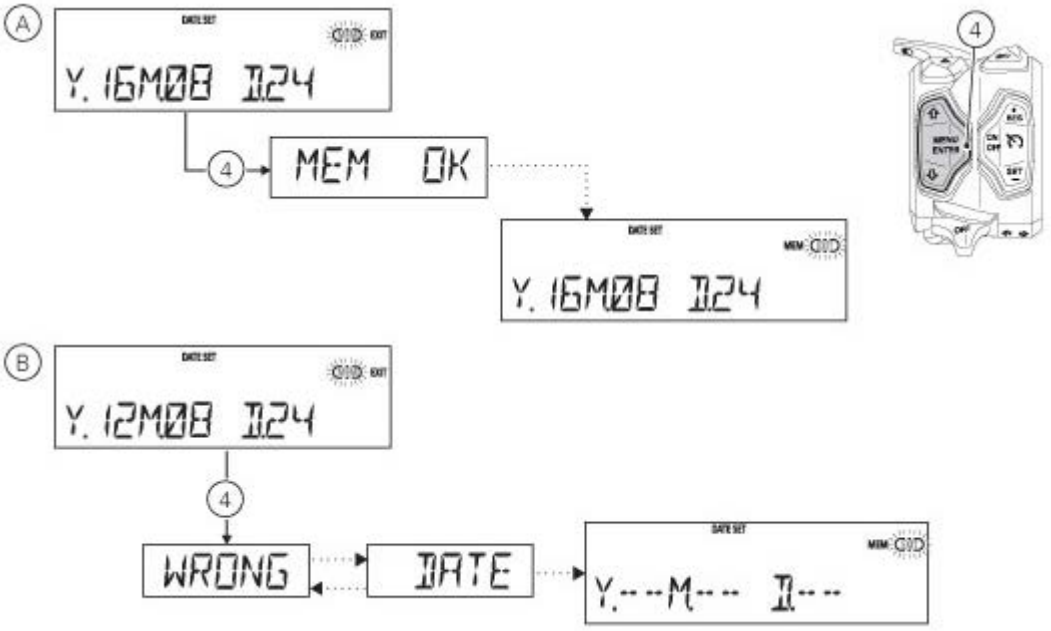
Select "D" option, by pressing button (1) or (2).
Once option is highlighted, press button (4).
Day two-digit value starts flashing.
Press button (1) to decrease day value by 1 unit: 31, 30, ... 01, 31.
Press button (2) to increase day value by 1 unit: 01, 02, ... 31, 01.
Once you reach the value to be set, press button (4) and the set day will stop flashing.



Storing the date

To store set/modified date, select MEM using buttons (1) and (2) and press button (4) for 2 seconds. The instrument panel will display "MEM OK" for two seconds and then automatically highlight "EXIT".

If date is not correct, the instrument panel will display "WRONG DATE" flashing for three seconds and then will automatically highlight EXIT, while date is indicated as "-- -- --" steady. It is still possible to set a new date. To go back to previous page (setting menu page), press button (4) when EXIT is highlighted.



Changing the PIN CODE

To change the existing PIN CODE and activate a new one, you must open the Setting Menu.
Select "PIN" option, by pressing button (1) or (2). Once function is highlighted, press button (4).

Note
If upon accessing this function, the "N : " (New) and four flashing dashes "- - - -" are shown, it means that the PIN CODE has never been activated and it is necessary to do it.

When accessing the function, the display will show "O: " (old) followed by four flashing dashes "- - - -".

Note
To change the PIN CODE, you must know the already stored PIN.

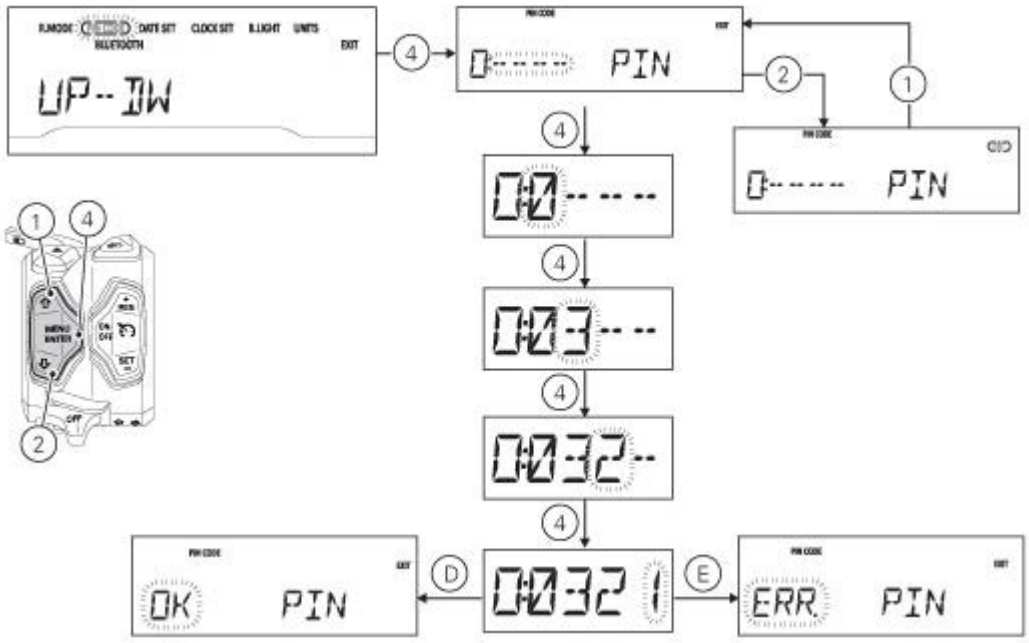
To go back to the previous indication without modifying the PIN CODE, press button (2); as soon as the "EXIT" box starts flashing, press button (4) again.

Entering the "old" code:

1 Press button (4), only one digit indicating "0" starts flashing;
2 Each time you press button (2) the displayed number increases by one (+ 1) up to "9" and then starts back from "0";
3 Each time you press the button (1) the displayed number decreases by one (- 1) up to "1" and then starts back from "0";
4 To confirm the number, press the button (4);

Repeat the procedures until you confirm all the 4 digits of the PIN CODE.
After pressing button (4) to confirm the fourth and last figure, the 4-digit code stops flashing.
Press button (4) for 2 seconds to check the entered PIN CODE. After 2 seconds:

- if the PIN CODE is correct (D), the instrument panel shows "OK" flashing for 2 seconds, followed by "N: " (new) and four flashing dashes "- - - -" relevant to the new PIN CODE (F);
- if the PIN CODE is not correct (E), the instrument panel shows "ERR." flashing for 2 seconds, followed by "EXIT".



Repeat the procedures until you confirm all the digits of the PIN CODE.

Entering the "new" code:

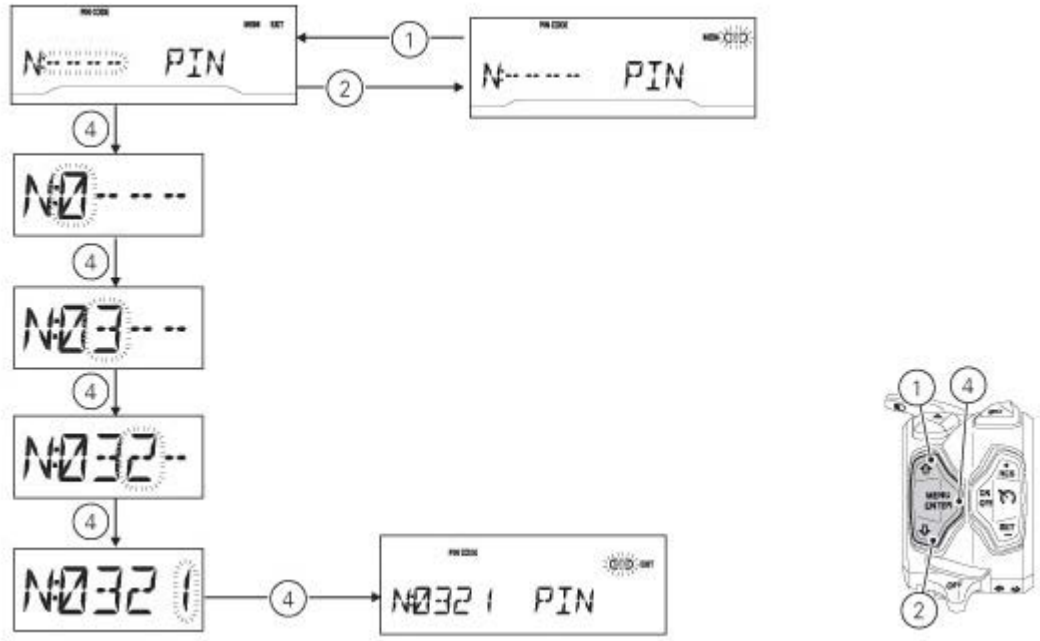
1 Press button (4), only one digit indicating "0" starts flashing;
2 Each time you press button (2) the displayed number increases by one (+ 1) up to "9" and then starts back

from "0";

3 Each time you press the button (1) the displayed number decreases by one (- 1) up to "1" and then starts back from "0";

4 To confirm the number, press the button (4);

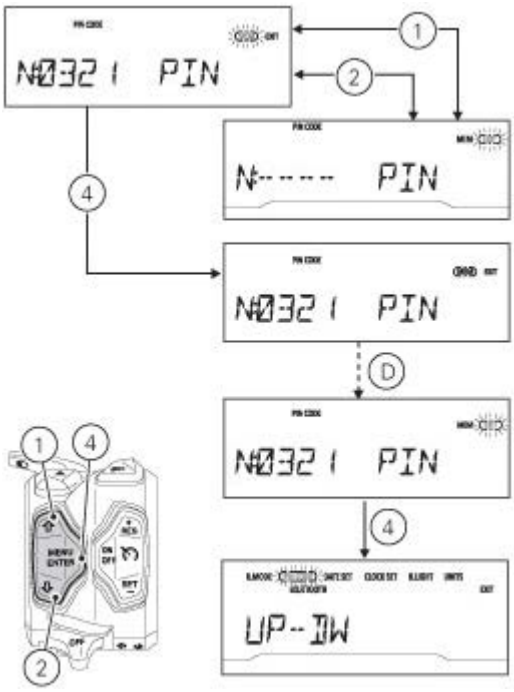
Repeat the procedures until you confirm all the digits of the PIN CODE.



When you press button (4) to confirm the fourth and last digit, the instrument panel highlights the message "MEM" and the relevant box will start flashing.
To save the new setting, hold button (4) for 2 seconds while the message "MEM" is highlighted.
If settings have been saved (D), the message "MEM" and the relevant box will be shown steady ON for 2 seconds, and then the "EXIT" box will start flashing.
If settings have not been saved, the instrument panel will highlight again the string of four dashes "- - - -" of the new PIN to allow the rider to try again and enter a new code.
To quit, press button (4).

Note

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



PIN CODE

This function allows the user to activate or modify the PIN CODE.
The PIN CODE is initially not present in the motorcycle, it must be activated by the user by entering his/her 4-digit PIN in the instrument panel, otherwise the motorcycle cannot be started temporarily in the case of a malfunction.
To activate this function, refer to "Activating the PIN CODE" procedure.
To change the PIN refer to "Changing the PIN CODE" procedure.
In order to temporarily start the motorcycle in case of malfunction, please refer to the Vehicle Overriding procedure .

Warning

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

Activating the PIN CODE

To activate the PIN CODE function and enter your own PIN CODE you must open the Setting Menu.
Select PIN CODE option, by pressing button (1) or (2).
Once function is highlighted, press button (4).

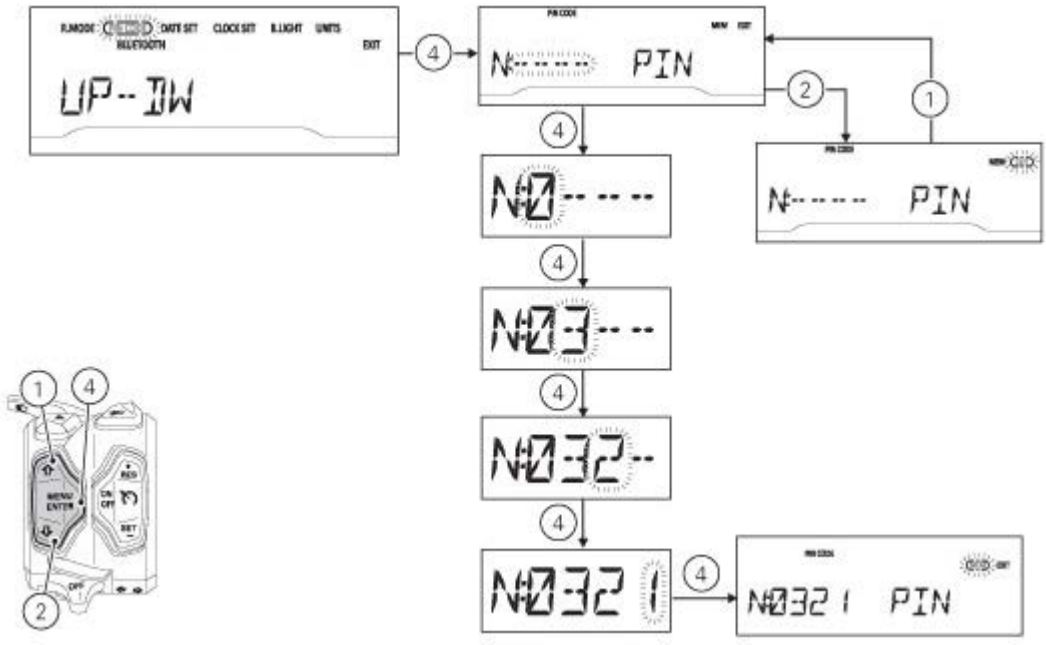
Note

If upon accessing this function, the "O : " (Old) indication is displayed together with four flashing dashes "- - - -", a PIN code is already stored and the Function is already active.

When accessing the function, the display will show "N:" (new) followed by four flashing dashes "- - - -".
To go back to the previous indication without activating a PIN CODE, press button (2); as soon as the "EXIT" box starts flashing, press button (4) again.
Entering the code:

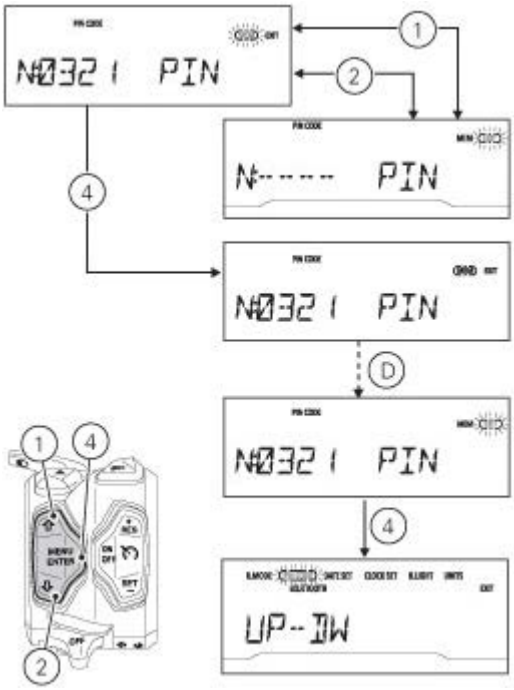
1 Press button (4), only one digit indicating "0" starts flashing;
2 Each time you press button (2) the displayed number increases by one (+ 1) up to "9" and then starts back from "0";
3 Each time you press the button (1) the displayed number decreases by one (- 1) up to "1" and then starts back from "0";
4 To confirm the number, press the button (4);

Repeat the procedures until you confirm all the 4 digits of the PIN CODE.



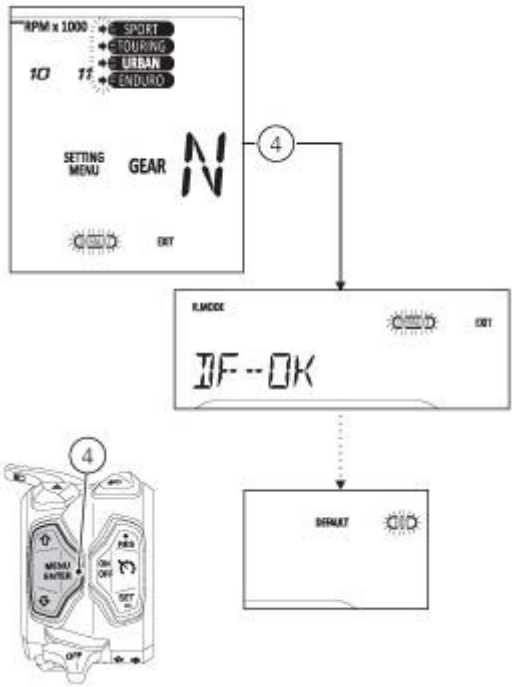
When you press button (4) to confirm the fourth and last digit, the instrument panel highlights the message "MEM" and the relevant box.
To memorise the entered PIN, keep button (4) pressed for 2 seconds.
If settings have been saved, the message "MEM" and the relevant box will be shown steady ON for 2 seconds, and

then the "EXIT" box will start flashing.
Once the first PIN CODE is stored, this menu page is no longer available and is replaced by the page for changing the PIN CODE.
To quit, press button (4).



Customising the Riding Mode: Reset to default settings (ALL DEFAULT)

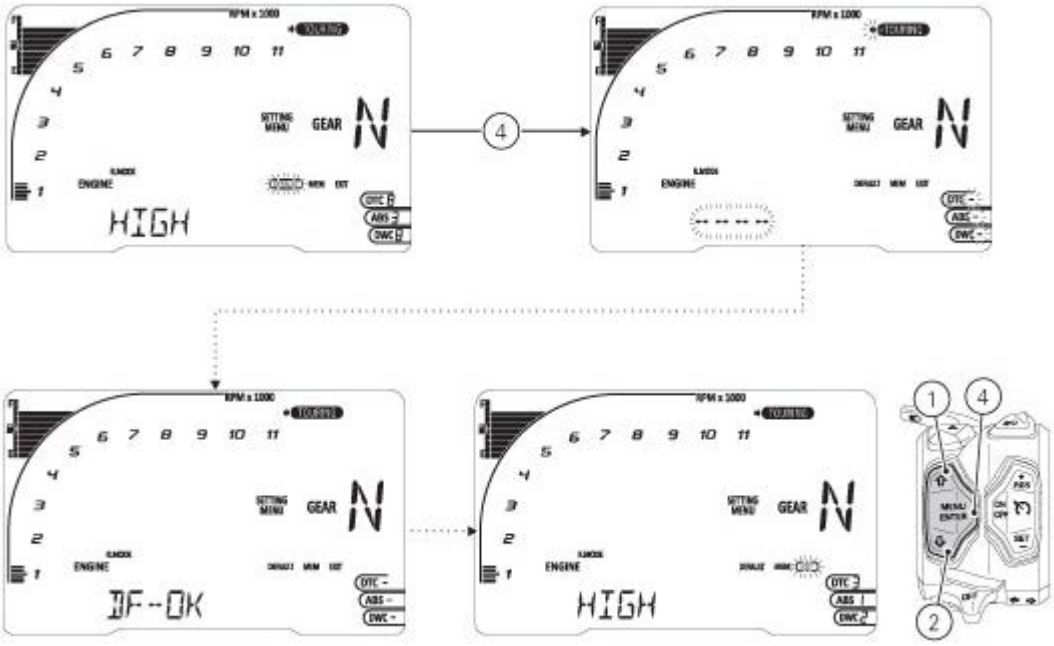
This function allows restoring the default values set by Ducati for all the parameters associated to all riding modes.
To do this, you must enter the Setting Menu.
Select the R.M. (Riding mode) option by pressing button (1) or (2). Once function is highlighted, press button (4).
You open the R.M. Menu (Riding mode). Select the DEFAULT box by pressing button (1) or (2). Once the desired indication is selected, press button (4) for 2 seconds.
After 2 seconds, the four arrows on the Riding Mode left side will flash (for 2 seconds); then the display will show "DF-OK" for 2 seconds to indicate that the default parameters have been restored.
After 2 seconds, the "EXIT" box starts flashing; press button (4) to quit and go back to the Setting Menu.



Customising the Riding Mode: Reset to default setting (DEFAULT)

This function allows restoring the default values set by Ducati for the parameters associated to a specific riding mode.
You enter the Setting Menu. Select the R.M. (Riding mode) option by pressing button (1) or (2).
Once function is highlighted, press button (4). You open the R.M. Menu (Riding mode).
Select the desired riding mode (SPORT, TOURING, URBAN or ENDURO), by pressing button (1) or (2). After selecting the desired riding mode (arrow beside the flashing riding mode), press button (4).
Select DEFAULT (DEFAULT box flashing) by pressing button (1) or (2). Once desired parameter is highlighted, keep button (4) pressed for 2 seconds.

After 2 seconds the arrow on the Riding Mode left side starts flashing and blinking dashes will be displayed instead of all parameters (ENGINE, DTC, DWC and ABS). Then the display shows "DF-OK" for 2 seconds to indicate that the default parameters have been restored. After 2 seconds, the "EXIT" box starts flashing; press button (4) to quit and go back to the Setting Menu.

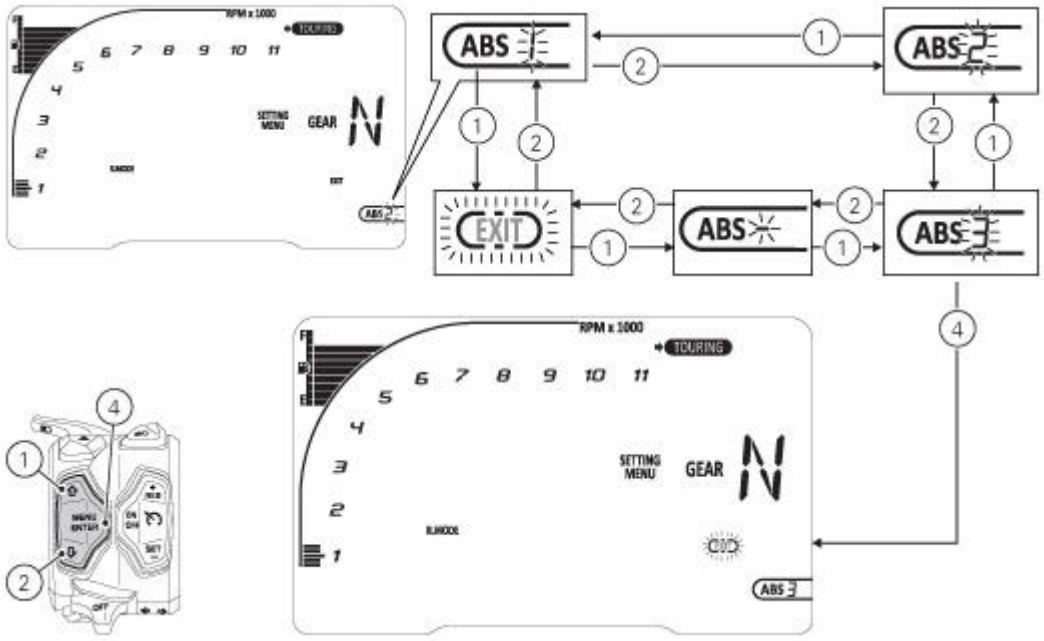


Customising the Riding Mode: ABS setting

This function disables or sets ABS level for the selected riding mode. You enter the Setting Menu.
Select the R.M. (Riding mode) option by pressing button (1) or (2).
Once function is highlighted, press button (4).
You open the R.M. Menu (Riding mode). Select the desired riding mode (SPORT, TOURING, URBAN or ENDURO), by pressing button (1) or (2).
After selecting the desired riding mode (arrow beside the flashing riding mode), press button (4). You open the selected riding mode customisation Menu. Select the parameter to be customised (ABS), by pressing button (1) or (2). Once the desired parameter is highlighted, press button (4).
When entering the function, the currently set ABS level or status starts flashing. Use buttons (1) and (2) to select the new desired intervention level (from 1 to 3) or the symbol " – " (that identifies the "OFF" status) and press button (4) to confirm.

The value will become automatically steady and the message "EXIT" will be highlighted.
To exit the menu and go back to previous page, select "EXIT" and press button (4). The instrument panel will go back to the previous menu level and it will be possible to start the "Parameter storage" procedure.

Note
To save the new ABS parameter setting follow the procedure "Storing Riding Mode settings" described in paragraph "Parameter storage". If the user quits the Riding Mode customisation menu without performing the storing procedure, the just-selected settings will be lost.



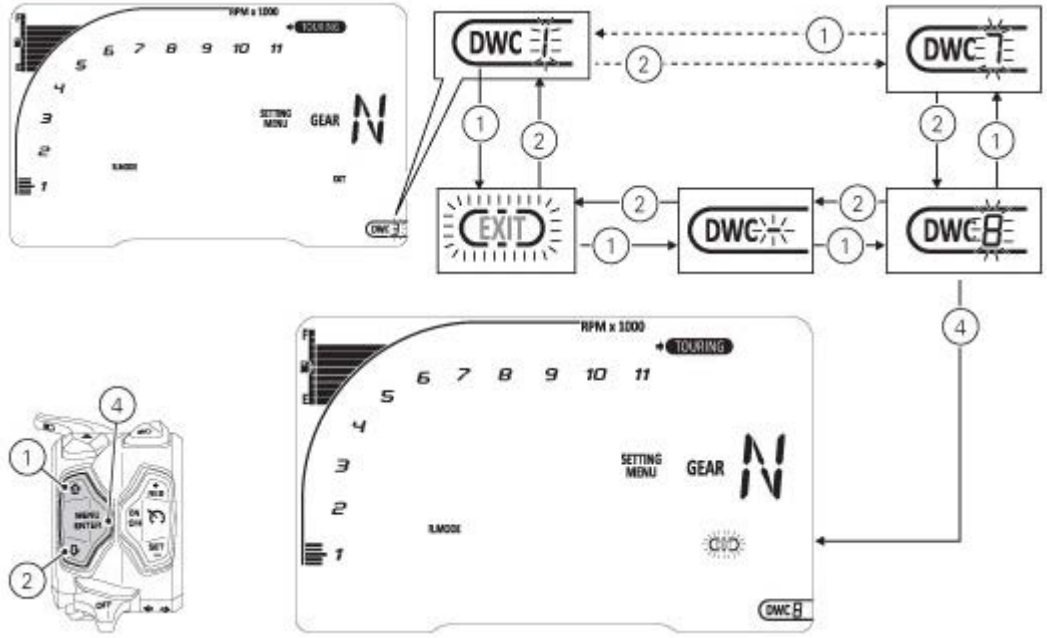
Note
When you enable or disable the ABS through this function, i.e. toggling from disabled to enabled system or vice-versa, the procedure for activating or deactivating the ABS is carried out: the change of status of the ABS control unit is not instantaneous, it requires at least 6 seconds.

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

Customising the Riding Mode: DWC level setting

This function disables or sets DWC level for the selected riding mode.
You enter the Setting Menu. Select the R.M. (Riding mode) option by pressing button (1) or (2). Once function is highlighted, press button (4).
You open the R.M. menu (Riding mode). Select the desired riding mode (SPORT, TOURING, URBAN or ENDURO), by pressing button (1) or (2). Once the desired riding mode is highlighted (arrow next to the flashing riding mode), press button (4).
You open the selected riding mode customisation Menu. Select the parameter to be customised (DWC), by pressing button (1) or (2). Once the desired parameter is highlighted, press button (4).
If the DTC is disabled (set to OFF), the DWC parameter can not be changed and is forced to level OFF.

When entering the function, the currently set DWC level or status starts flashing. Use buttons (1) and (2) to select the new desired intervention level (from 1 to 8) or the symbol " – " (that identifies the "OFF" status) and press button (4) to confirm.
The value will become automatically steady and the message "EXIT" will be highlighted.
To exit the menu and go back to previous page, select "EXIT" and press button (4). The instrument panel will go back to the previous menu level and it will be possible to start the "Parameter storage" procedure.



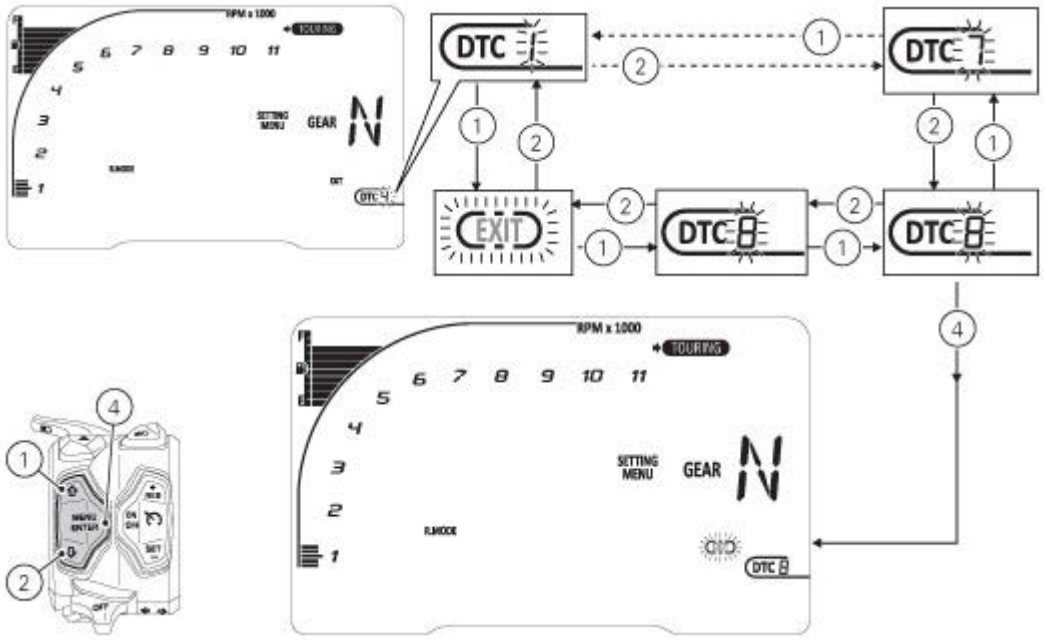
Note
To save the new DWC parameter setting, follow the procedure "Storing Riding Mode settings" described in paragraph "Parameter storage". If the user quits the Riding Mode customisation menu without performing the storing procedure, the just-selected settings will be lost.

If the DTC is disabled (set to OFF), the DWC parameter cannot be changed and is forced to level OFF and therefore the relevant setting menu is not available.

Customising the Riding Mode: DTC level setting

This function disables or sets DTC level for the selected riding mode.
Enter the SETTING MENU. Select the R.M. (Riding mode) option by pressing button (1) or (2).
Once function is highlighted, press button (4).
You open the R.M. Menu (Riding mode). Select the desired riding mode (SPORT, TOURING, URBAN or ENDURO), by pressing button (1) or (2).
After selecting the desired riding mode (arrow beside the flashing riding mode), press the MENU CONFIRMATION button (4).
You open the selected riding mode customisation Menu.
Select the parameter to be customised (DTC), by pressing button (1) or (2).
Once the desired parameter is highlighted, press button (4).

When entering the function, the currently set DQS level or status starts flashing. Use buttons (1) and (2) to select the new desired intervention level (from 1 to 8) or the symbol " – " (that identifies the "OFF" status) and press button (4) to confirm.
The value will become automatically steady and the message "EXIT" will be highlighted.
To exit the menu and go back to previous page, select "EXIT" and press button (4). The instrument panel will go back to the previous menu level and it will be possible to start the "Parameter storage" procedure.



Note
To save the new DTC parameter setting, follow the procedure "Storing Riding Mode settings" described in paragraph "Parameter storage". If the user quits the Riding Mode customisation menu without performing the storing procedure, the just-selected settings will be lost.

Note
By setting "– " (Off), the DTC will be disabled.

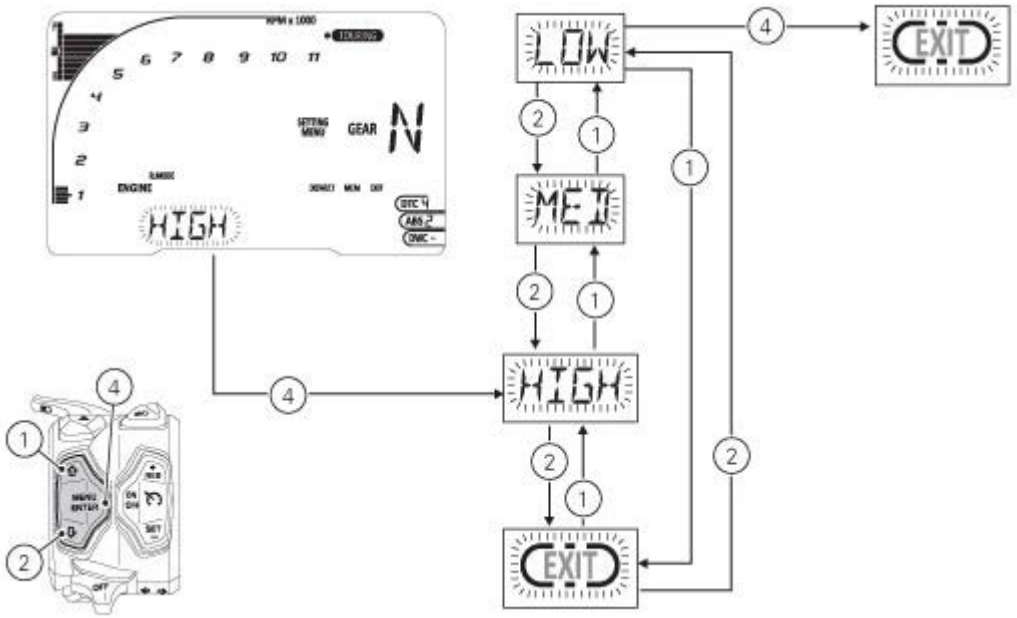
If the DTC is disabled (set to OFF), the DWC parameter cannot be changed and is forced to level OFF and therefore the relevant setting menu is not available.

Customising the Riding Mode: Engine setting

This function customises engine power associated with each riding mode.
Enter the SETTING MENU. Select the R.M. (Riding Mode) option by pressing button (1) or (2).
Once function is highlighted, press button (4). You open the R.M. Menu (Riding mode).
Select the desired riding mode (SPORT, TOURING, URBAN or ENDURO), by pressing button (1) or (2). After selecting the desired riding mode (arrow beside the flashing riding mode), press button (4).
You open the selected riding mode customisation Menu.
Select the parameter to be customised (ENGINE), by pressing button (1) or (2). Once the desired parameter is highlighted, press button (4).
When entering the function, the currently set engine power (HIGH, MED or LOW) starts flashing. Use buttons (1) and (2) to select the new desired engine power and press button (4) to confirm.

The value will become automatically steady and the message "EXIT" will be highlighted.
To exit the menu and go back to previous page, select "EXIT" and press button (4). The instrument panel will go back to the previous menu level and it will be possible to start the "Parameter storage" procedure.

Note
To save the new ENGINE parameter setting, follow the procedure "Storing Riding Mode settings" described in paragraph "Parameter storage". If the user quits the Riding Mode customisation menu without performing the storing procedure, the just-selected settings will be lost.



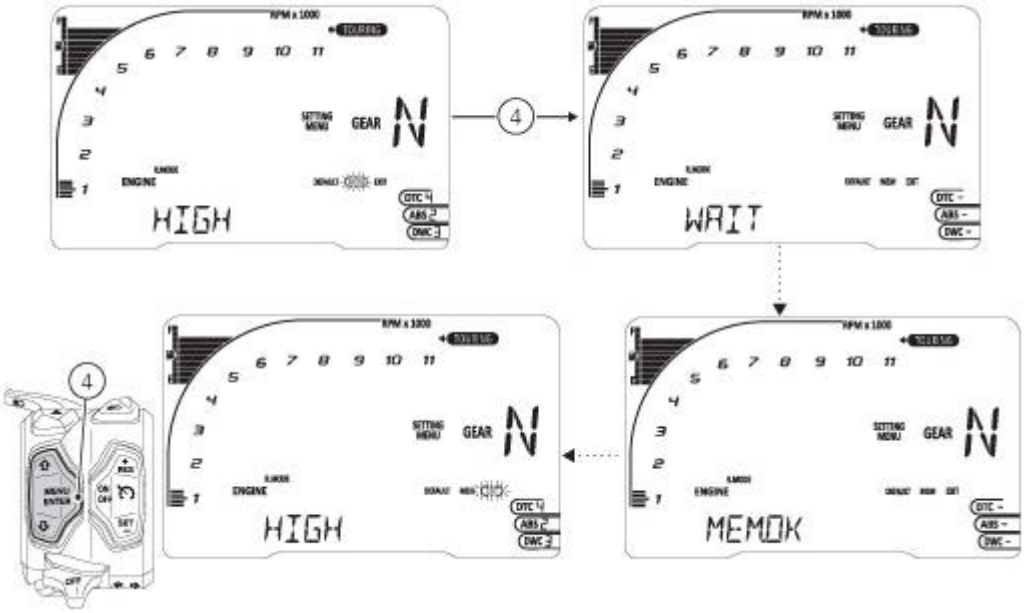
Customising the Riding Mode: Parameter storage

After changing a Riding Mode parameter (ENGINE, DTC, DWC and/or ABS), to make the change effective, it is necessary to save it before quitting the customisation menu.
It is possible to save the parameters set for each riding mode.
To save the parameter settings of a Riding Mode, it is necessary to gain access to the SETTING MENU, use buttons (1) and (2) to select the message "R.M." (Riding Mode) and press button (4). Then use buttons (1) and (2) to select the riding mode to change and press button (4). Then use buttons (1) and (2) to select "MEM" (flashing) and keep button (4) pressed for 2 seconds; then the display will show "WAIT" (for 2 other seconds) followed by "MEM. OK" to confirm that the new parameters have been memorised.

Any parameter change made is saved and remains in the memory also after a Battery-OFF. If you highlight "EXIT" and press button (4) you quit the sub-menu and go back to previous page.

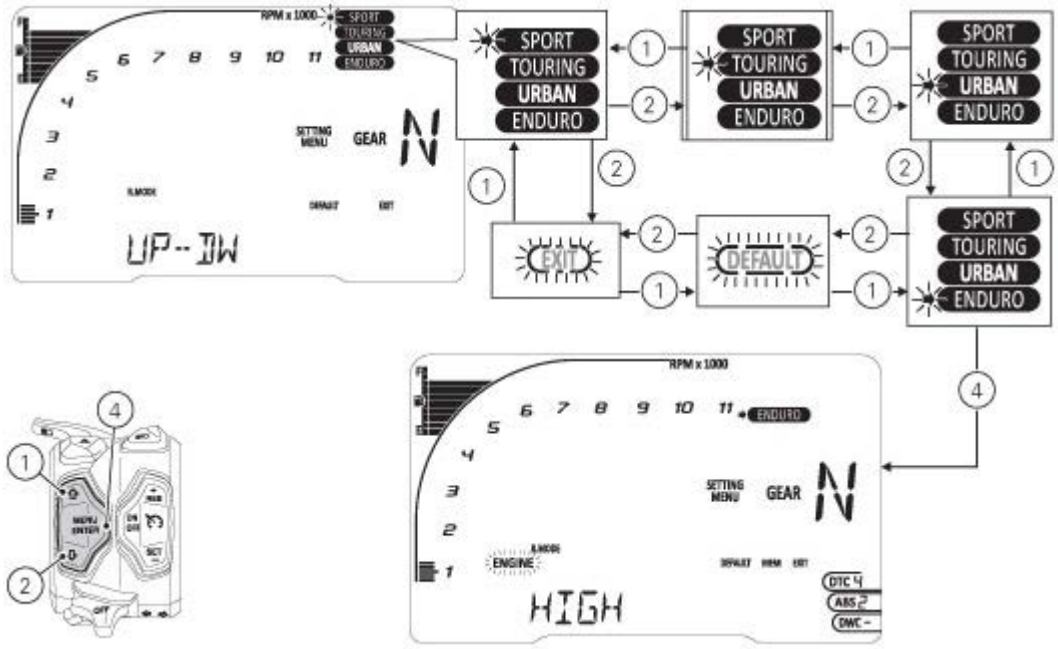
Warning

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



Customising the Riding Mode

All settings of every riding mode can be customised.
You enter the Setting Menu.
Select the R.MODE (Riding mode) option by pressing button (1) or (2). Once function is highlighted, press CONFIRM MENU button (4).
Enter the R.MODE (Riding mode) MENU.
After entering the function, the display shows the four available riding modes (SPORT, TOURING, URBAN or ENDURO). Press buttons (1) and (2) to select the riding mode to be customised (the arrow beside flashes). Press button (4) to enter the customisation of the selected Riding Mode.
While if you highlight "EXIT" and press button (4) you quit the sub-menu and go back to previous page.



The parameters that can be customised for every riding mode are the following:

- ENGINE
- DTC
- ABS
- DWC
- DEFAULT

When entering the customisation menu of the selected riding mode the ENGINE parameter is automatically highlighted (the relevant parameter flashes) and it is possible to scroll the menu items by pressing buttons (1) and (2) to select all available information (the selected parameter flashes) in the following sequence:

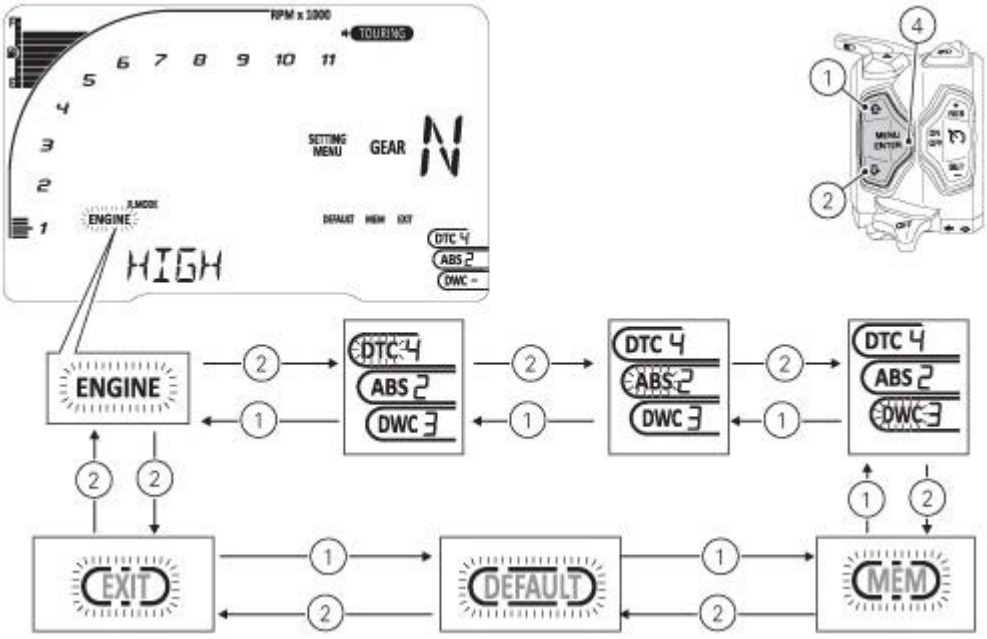
- ENGINE
- DTC
- ABS
- DWC
- DEFAULT
- MEM (memorisation)
- EXIT

If you highlight "EXIT" and press button (4) you quit the sub-menu and go back to previous page.

Warning

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

If the DTC is disabled (set to OFF), the DWC parameter can not be changed and is forced to level OFF.


RPM x 1000
TOURING
SETTING MENU
GEAR
N
ENGINE
HIGH
DTC 4
ABS 2
DWC 3
MENU ENTER
ENGINE
DTC 4
ABS 2
DWC 3
DTC 4
ABS 2
DWC 3
DTC 4
ABS 2
DWC 3
EXIT
DEFAULT
MEM

Setting MENU

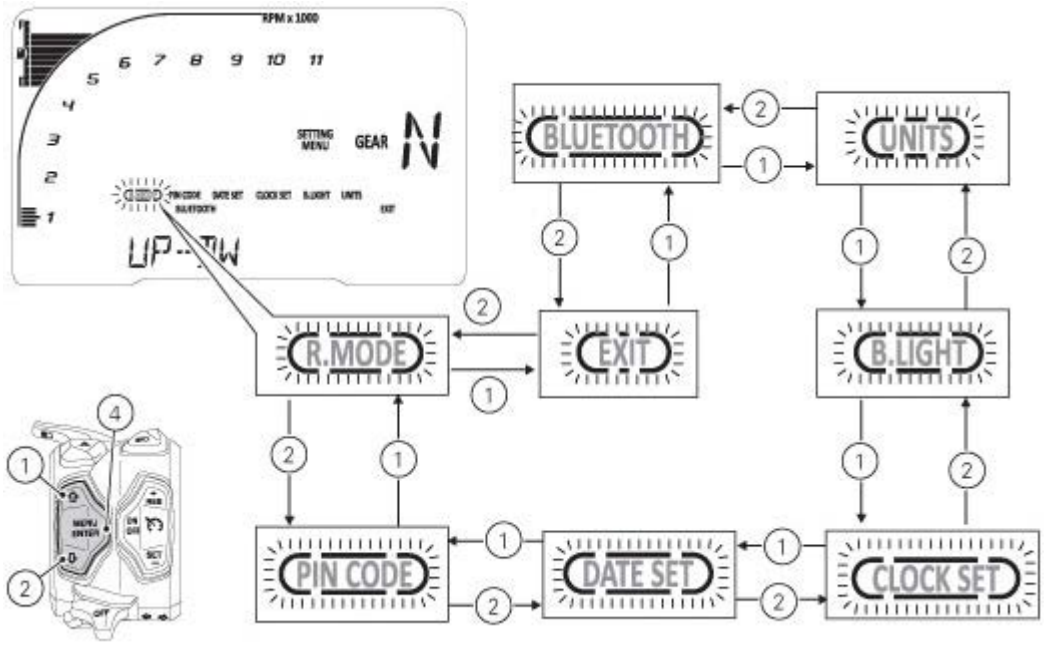
This menu allows enabling, disabling and setting some motorcycle functions.
To enter the Setting Menu it is necessary to hold button (4) for two seconds, with Key-ON and motorcycle actual speed ≤ (lower than or equal to) 20 km/h (12 mph): within this menu, it is no longer possible to view any other function.
The Setting MENU displays the following functions:

- RIDING MODE
- PIN CODE
- DATA SET
- CLOCK SET
- BACK LIGHT
- UNITS
- BLUETOOTH (only if the relevant control unit is fitted)

Important

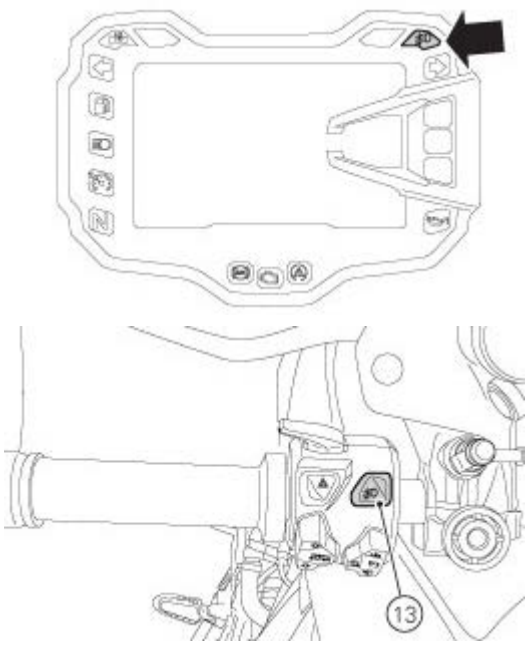
For safety reasons, it is recommended to use this Menu with the motorcycle at a standstill.

Press buttons (1) and (2) to highlight the customisable parameters one by one: in particular, use button (2) to highlight the following item and button (1) to highlight the previous item.
After highlighting the required parameter, press button (4) to open the corresponding menu page.
If function is not available or temporarily disabled, the menu page can not be opened.
At the top of instrument panel display is a text indicating the menu and sub-menu path during navigation through the setting functions.
To quit the Setting Menu you shall highlight "EXIT" and press button (4).



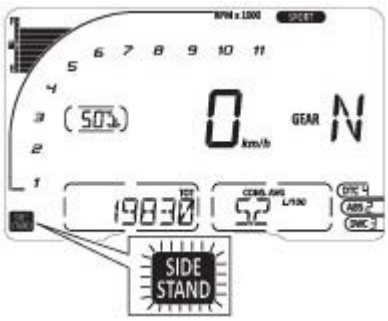
Fog lights

The instrument panel activates the fog light warning light when the fog lights (option) are present and active.
To enable/disable the fog lights, press button (13) (optional).
In case of fog light fault, the instrument panel displays the flashing Fog Light warning light and turns on the Generic Error light.



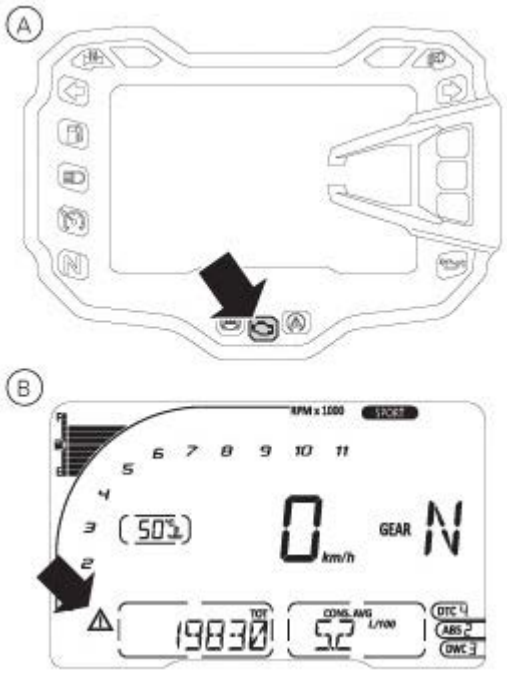
Side stand warning

The instrument panel receives information on side stand status and if side stand is down/open, the icon "SIDE STAND" is displayed.
In case of Side stand sensor fault, the instrument panel will display the stand down/up indication with MIL light on.
If instrument panel does not receive side stand status, stand down/open "SIDE STAND" indication will flash to indicate an undefined status.



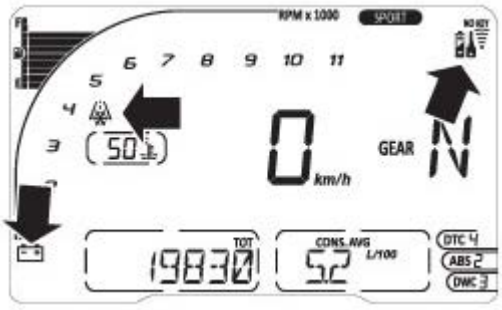
Error warnings

The instrument panel manages error warnings in order to allow the rider to identify any abnormal motorcycle behaviour in real time.
Upon Key-On, in case of errors, the instrument panel turns on the MIL light (A) (in case of errors directly connected to the engine control unit) or the Generic Error light (B) (in case of any other errors).
During normal operation, when an error is triggered, the instrument panel turns on the MIL light (A) or the Generic Error light (B).



Warnings/Alarms

The instrument panel manages a number of warnings / alarms, aimed at giving useful information to the rider during use.
Upon Key-On, if there are any active warnings, the instrument panel displays the present warnings.
During normal use, whenever a warning is triggered, the instrument panel automatically displays the warning.



Ice

This function warns the rider when there might be ice on the road, due to the low external temperature.
This warning turns on when temperature drops to 4°C (39°F) and turns off when temperature raises to 6°C (43°F).

Warning

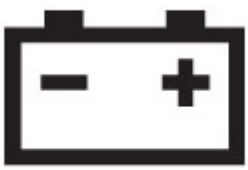
This warning does not eliminate the possibility of icy road areas even with temperatures above 4°C (39°F); when ambient temperature is "low", ride responsibly, especially on road areas not exposed to sunlight and/or on bridges.

Low battery indication (LOW Battery)

This function warns the user that the status of the vehicle battery is low.
Warning is activated when battery voltage is lower than/equal to 11.0 Volt.

Note

In this case, Ducati recommends charging battery in the shortest delay using the special instrument as engine could not be started.



Hands Free (HF) Key not acknowledged

The activation of this "warning" indicates that the Hands Free system does not detect the "active key" near the vehicle.

Note

In this case, Ducati recommends making sure that the active key is nearby (and that it was not lost) or that it

works properly.

"Low" battery level of Hands Free (HF) key

The activation of this "warning" indicates that the Hands Free system has detected that the battery that permits the active key to communicate and turn the vehicle on is almost discharged.

Note

In this case, Ducati recommends changing battery in the shortest delay.

To change battery, refer to paragraph "Replacing the battery in the active key".

Date setting

This "warning" indicates that it is necessary to enter the date through the setting Menu. The instrument panel shows "INSERT" and "DATE" 6 seconds upon Key-ON.

Steering lock fault indication (Unlock Error)

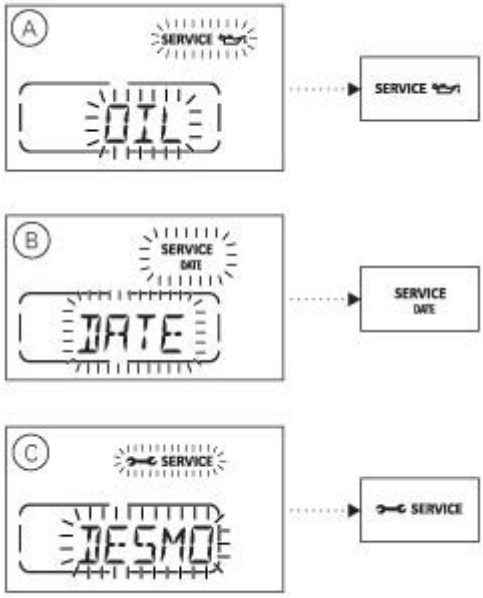
This "warning" indicates that the steering could not be unlocked due to an error. The instrument panel shows "UNLOCK ERR".

OIL SERVICE or SERVICE DATE or DESMO SERVICE indication

When the service threshold is reached, the warning for the type of service required is triggered:

- OIL SERVICE (A);
- SERVICE DATE (B);
- DESMO SERVICE (C).

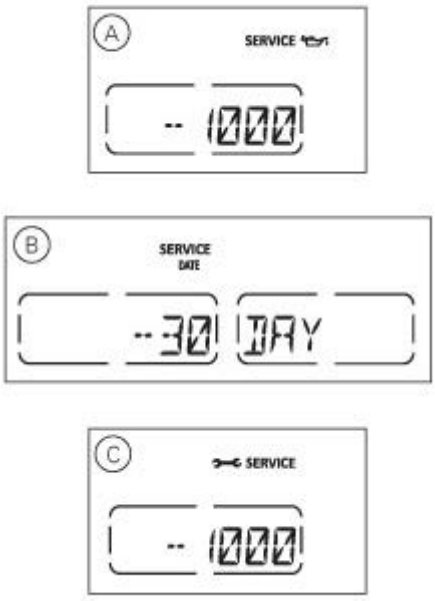
The indication includes displaying for 5 seconds the flashing message SERVICE, the Oil or the Desmo or DATE symbols as well as the message OIL or DESMO or DATE upon each Key-ON; after 5 seconds, both the message SERVICE and the Oil or Desmo or DATE symbols become steady until Key-OFF or until an Authorised Ducati Service Centre performs a Reset.



OIL SERVICE or SERVICE DATE or DESMO SERVICE countdown indication

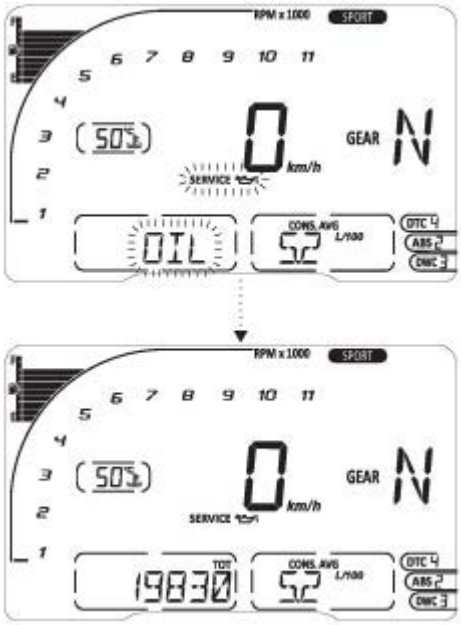
After OIL SERVICE zero indication first reset (at 1,000 km - 600 mi), the instrument panel activates the following indications for 5 seconds upon Key-ON:

- the count of the mileage in kilometres (miles) remaining before the next OIL SERVICE (A) 1000 km (600 mi) earlier than the service threshold;
- the count of the days remaining before the next SERVICE DATE (B) 30 days earlier than the service threshold;
- the count of the mileage in kilometres (miles) remaining before the next DESMO SERVICE (C) 1000 km (600 mi) earlier than the service threshold.



OIL SERVICE zero warning

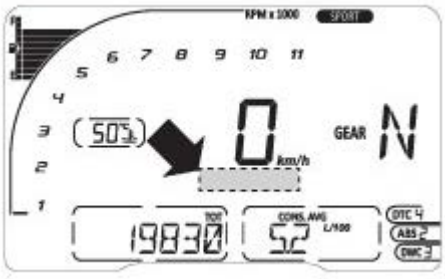
The first maintenance indication is OIL SERVICE zero, enabled for 5 seconds upon each key-on when the odometer counter reaches the first 1,000 km (600 mi).
The indication includes displaying for 5 seconds the flashing message "SERVICE", the Oil symbol and the message "OIL" upon each Key-ON; after 5 seconds, both the message "SERVICE" and the Oil symbol become steady until Key-OFF or until an Authorised Ducati Service Centre performs a reset.



Service indication (SERVICE)

This indication shows the user that the motorcycle is due for service and must be taken to a Ducati Authorised Service Centre.
The service warning indication can be reset only by the Authorised Ducati Service Centre during servicing.
There are 3 types of scheduled maintenance interventions:

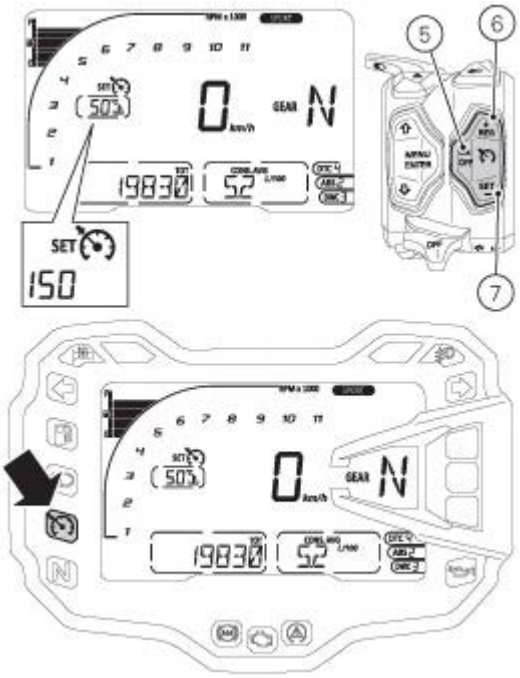
- OIL SERVICE ZERO: service at the first 1000 km (600 mi);
- OIL SERVICE and SERVICE DATE: oil service or annual service (requiring the same maintenance operations);
- DESMO SERVICE.



Cruise Control

Multistrada 1200 is equipped with a system for maintaining the cruise speed: Ducati Cruise Control.

This function displays Cruise Control status and "target" speed.
When the Cruise Control is activated by pressing ON/OFF button (5), the relevant warning light and icon will be turned ON on the instrument panel.
In these conditions, the Ducati Cruise Control is ready to be set with the target speed to be maintained automatically, with no need to hold the throttle twistgrip in position.



When SET button (see Fig 1) 7, is pressed, current speed is set as target cruise speed.
To confirm correct setting of cruise speed, the target speed is activated on the instrument panel for 5 seconds.
It is possible to increase or decrease set cruise speed, by pressing buttons (see Fig 1) 6 and (see Fig 1) 7, respectively.
Every "click" corresponds to a speed increase or decrease of 1 Km/h.
The new set target speed is displayed in the coolant temperature box when system is reaching said speed.
When the new requested target speed has been reached for over 5 seconds the display will show the coolant temperature again.
Press RES button (6) to resume previous SET speed, in case the Ducati Cruise Control was previously disabled.

Important

In case of a long DTC (Traction Control) event, the Cruise Control will automatically turn off.

Once the system is enabled, it is possible to set the current speed as the desired speed by pressing RES (see Fig 1) 6 or SET (see Fig 1) 7: press RES (see Fig 1) 6 if no target speed has been previously set.
In this case, the system saves the vehicle current speed and keeps it without the rider having to work on the twistgrip: the set speed is displayed on the instrument panel.

In stand-by mode, if you press RES (see Fig 1) 6 and a target speed has been previously set and the operating conditions are met, the system starts working again and brings the vehicle to the last set target speed.

It is possible to enable the Ducati Cruise Control only if the below conditions are met:

- second gear or higher engaged;
- vehicle speed higher than or equal to 50 Km/h (30 mph) or lower than or equal to 200 Km/h (125 mph);
- the brake has been applied at least once (no matter if at the front or the rear side) after the key-ON.

The Ducati Cruise Control can be disabled as follows:

- turning the throttle twistgrip in the direction as to decelerate;
- pressing button **5**;

- activating the front brake;
- activating the rear brake;
- pulling the clutch.

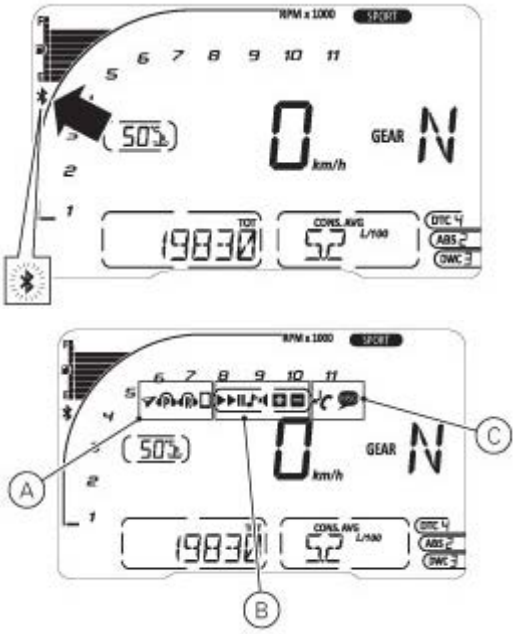
The Ducati Cruise Control system controls the vehicle speed only between 50 Km/h (30 mph) and 200 Km/h (125 mph).

Infotainment

Multistrada 1200 can fit the Ducati Multimedia System (DMS) only when the Bluetooth control unit is available; thanks to the DMS system the user can answer phone calls, select and listen to music tracks, and receive SMS notifications by means of the Bluetooth technology.
In this model, the Bluetooth control unit can be purchased by a Ducati Dealer or Authorised Service Centre.
The instrument panel displays the Infotainment function status: Bluetooth activation and any connected devices (smartphone, earphones, navigator).

When the Bluetooth is active, the main screen displays the Bluetooth icon.
Furthermore, the Infotainment functions can be viewed in the dedicated menus:

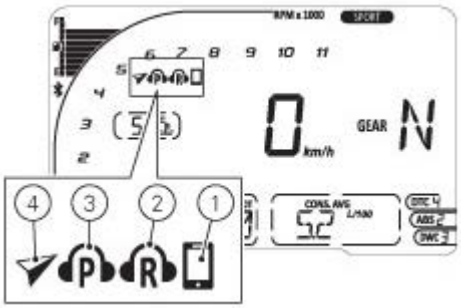
- Connected devices (A);
- Player (B);
- Telephone (C).



If Bluetooth is active, apart from the Bluetooth icon, also connected device indication is displayed, such as:

1 Smartphone;
2 Rider helmet earphones;
3 Passenger helmet earphones;
4 Ducati GPS navigator.

It is possible to connect up to a maximum of 4 devices.



Phone

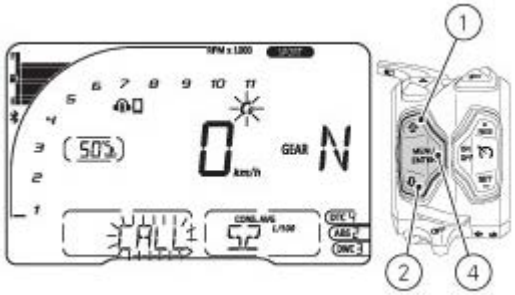
Use the PHONE function:

- to manage incoming calls by means of button (1) and button (2);
- to recall the last calling number within 5 seconds from call interruption (RECALL function).

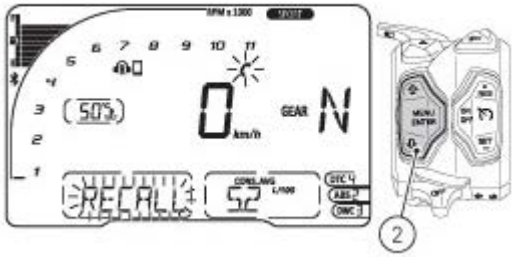
Note

It is not possible to make a call by selecting the name/number from the contact list through the function buttons.

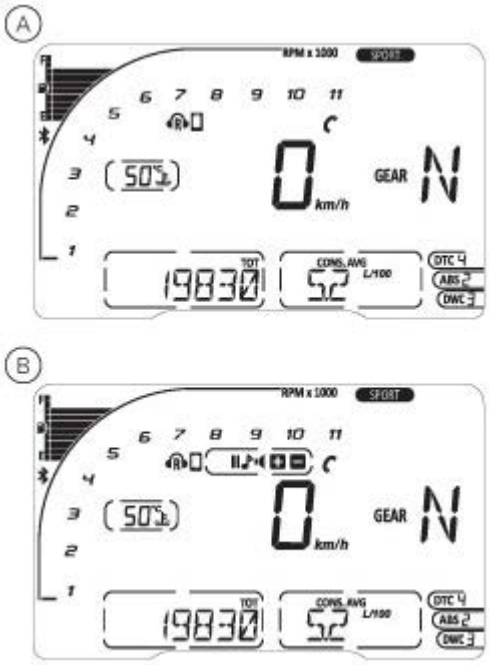
When there is an incoming call, the relevant symbol starts flashing whereas, when you answer the call, the same symbol remains steady ON.
To answer the call, press button (2).
To terminate the call, keep button (1) pressed for 2 seconds.



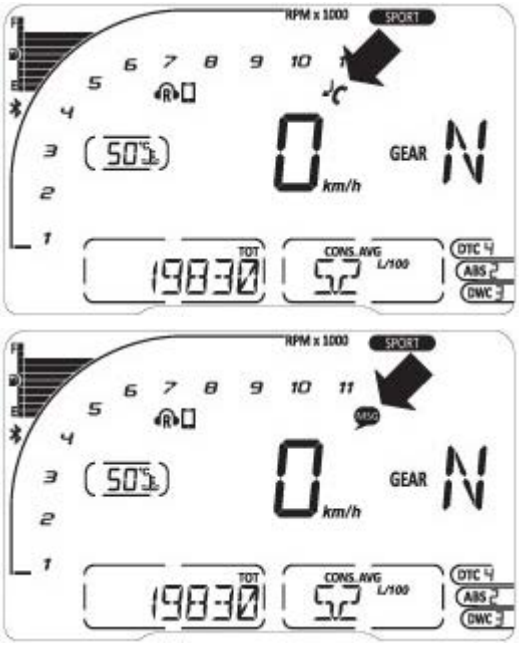
During the 5 seconds after hang-up, the Recall function is activated to allow the recall: Menu 1 shows the indication RECALL.
After this 5 second time, the Recall function is disabled.
To activate the Recall function within the 5 seconds, press button (2).



During a call, the receiver symbol (A) is displayed.
If there is an incoming call while the Player (B) is active, the latter is paused throughout the phone call and will resume operation when call is over.



In case of missed calls from the moment the smartphone is connected to the bike to the moment it is disconnected, the missed call symbol will be displayed for one minute. The number of missed calls is not displayed.
In case there is at least one SMS/MMS/EMAIL not read from the moment the smartphone is connected to the bike to the moment it is disconnected, the unread message symbol will be displayed for one minute. The number of unread messages is not displayed.

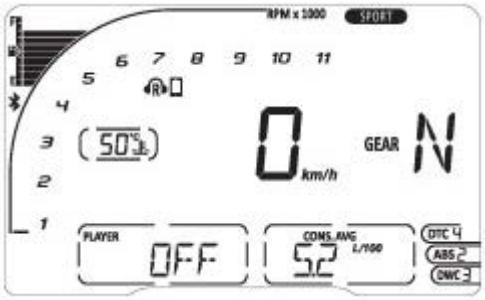


Player

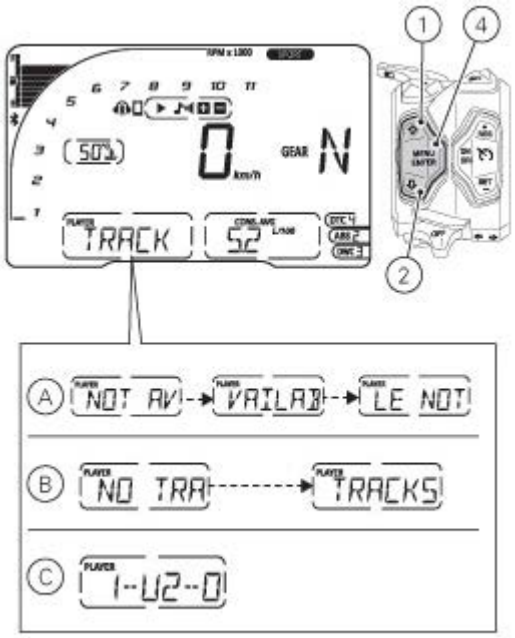
If at least one Smartphone is connected, Menu 1 will show the PLAYER OFF function.
The Player is activated by pressing button (1) for 2 seconds.

Important

The Player function can not be activated through Menu 1 when a call is incoming, in progress or in recall.



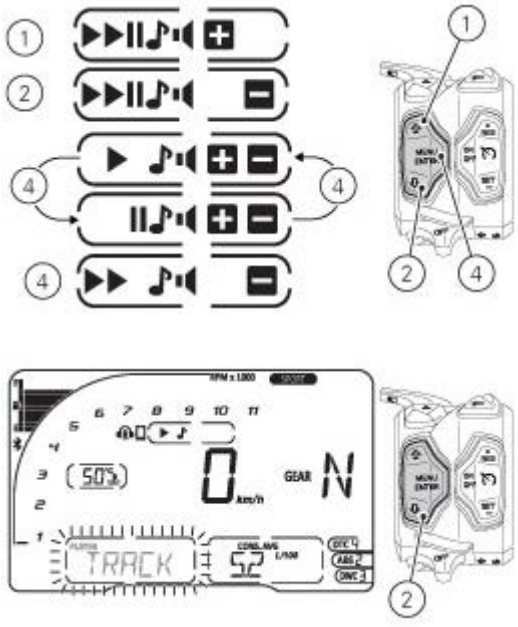
On instrument panel, Menu 1 PLAYER option and the active track name (C) are displayed. together with the Player menu. If the Player is turned on, button (1), button (2) and button (4) can only be used to control the PLAYER.
If there are no tracks to be played, Menu 1 will show "NO TRACK" (B).
If the Player is ON, but instrument panel is not receiving track name, it pauses the track being played and Menu 1 will read the message "PLAYER NOT AVAILABLE" (A).



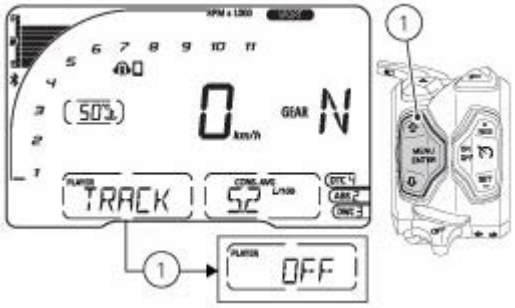
Adjust volume as follows:

- increase volume: press button (1);
- decrease volume: press button (2).

The Player can be cyclically set to pause/play by pressing button (4) for 2 seconds.
It is possible to skip to next track, pressing button (4): system will skip forward once every time button is pressed.
Press button (2) for 2 seconds to quit Player controls, although maintaining Player ON, in the current status.
After disabling the Player controls, they can be re-enabled after 3 seconds if the item PLAYER and the track name are available in Menu 1.



The Player can be turned off by quitting the player control and pressing button (1) for 2 seconds: Menu 1 will show PLAYER OFF option.



F.A.Q.

1) Why don't I receive any notification of received e-mails?

E-mails are notified only if configured on the telephone source application. Check also that your phone supports the MAP profile.

If so, the DUCATI MULTIMEDIA SYSTEM, during the pairing phase, will send an access request to such profile which can be notified to the user explicitly (depending on the operating system) by requesting access authorisation to message notifications.

2) Why don't I receive any notification of received messages?

Check that your phone supports the MAP profile.

If so, the DUCATI MULTIMEDIA SYSTEM, during the pairing phase, will send an access request to such profile which can be notified to the user explicitly (depending on the operating system) by requesting access authorisation to message notifications.

3) Earphones do not connect. Why?

If they have been already paired once, we recommend resetting the earphones and pair them again with the motorcycle (see earphones instruction manual).

4) When I receive a call, the instrument panel displays the caller number but not the name (despite being saved in the contact list).

Check that the phone supports the PBAP profile.

If so, the DUCATI MULTIMEDIA SYSTEM, during the pairing phase, will send an access request to such profile which can be notified to the user explicitly (depending on the operating system) by requesting access authorisation to the phone contact list.

5) By activating the Player through the instrument panel, music does not start.

The activation depends on the phone settings. In this case, after activating the Player through the instrument panel, also start the music application on your Smartphone.

6) It happens that the music is played with continuous interruptions.

If the devices have just been connected, it may be that the Bluetooth control unit is sill completing the connection phase with the concerned devices. It is furthermore necessary to activate the PBAP and MAP profiles. Therefore, in case of iOS, please refer to point 7). In case of Android, please refer to points 2)4)

7) I do not receive any message notification on my iPhone. Why?

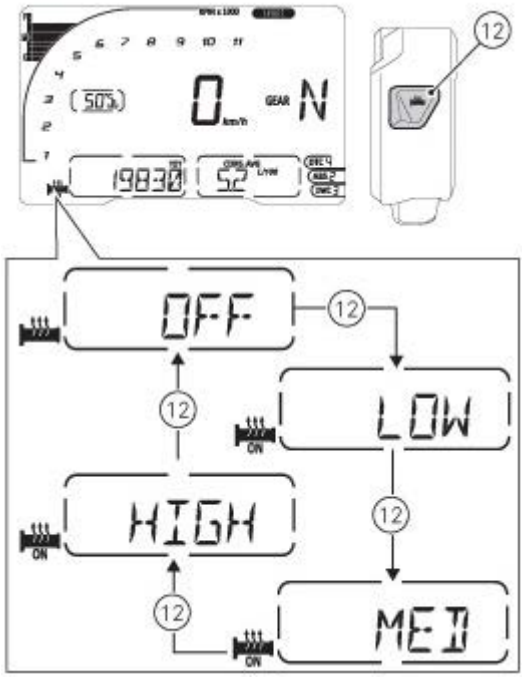
Select Bluetooth in the Setting Menu. In the list "My devices" select "i" next to "Ducati Media System". Flag "Show notifications".

Auxiliary functions

Heated handgrips (option) control function

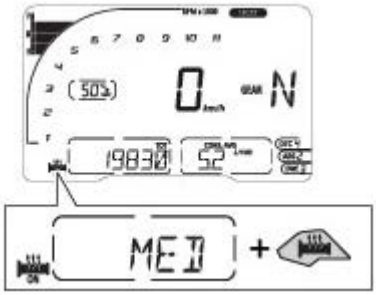
This function allows enabling and adjusting the heated handgrips.
Press the heated handgrips button (12) and the instrument panel will display grip icon followed by OFF indication.
Any time you press button (12), the instrument panel will toggle from OFF to the following settings: LOW, MED and then HIGH (and then back to OFF).

Note
The heated handgrips are actually "on" (heating) only when engine is running.



Select the desired setting then leave button (12) undisturbed; after three seconds with no controls, the instrument panel will maintain the last stored condition.
When the heated handgrips are ON, the relevant warning light turns on together with the indication "ON".

Note
In case of Battery-Off, upon the following Battery-On / Key-On, the Dashboard sets this function by default to "OFF".



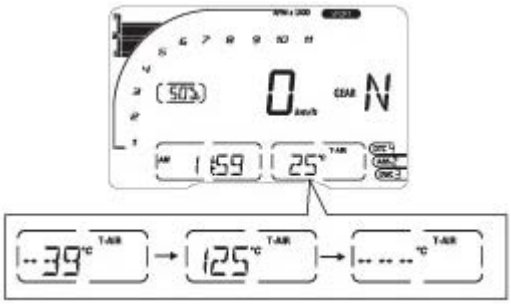
Note
This means that if heated handgrips are enabled and engine stops, the heating is "temporarily" disabled but the ON indication is still active. Heating will automatically turn on when engine is started again.

Note
Handgrip heating requires a high current draw which, at low engine rpm, might result in the battery getting soon flat. If the battery is not fully charged (voltage below 11.9 V) handgrip heating is disabled to ensure engine start-up ability; it will automatically activate again when battery voltage is above the specified value.

Ambient air temperature

The instrument panel displays the ambient temperature in the set unit of measurement (°C or °F), followed by the set unit of measurement and the message T AIR. The temperature value is displayed when ranging from -39 °C to +125 °C (or -38 °F ÷ +257 °F). For any different temperature (below -39 °C (-38 °F) or above +125 °C (+257 °F)) a string of three dashes " - - - " is steadily displayed, followed by the unit of measurement.
If the air temperature sensor is in fault, the instrument panel will show three flashing dashes " - - - " as air temperature value, followed by the unit of measurement and the Generic Error light will turn on. If the instrument panel is not receiving air temperature value, a string of three steady dashes "- - -" is displayed, followed by the unit of measurement.

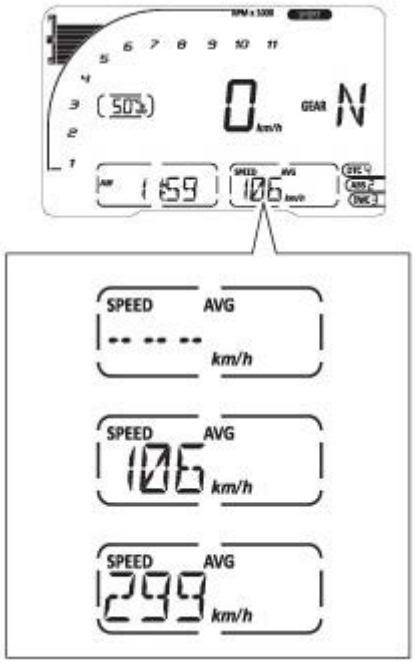
Note
When the motorcycle is stopped, the engine heat could influence the displayed temperature.



Average speed

The instrument panel calculates and displays the motorcycle average speed, the set unit of measurement and SPEED AVG text.
The calculation considers the distance and time since TRIP1 was last reset.
The average speed value displayed is calculated by adding 5% so as to be consistent with motorcycle speed indication.

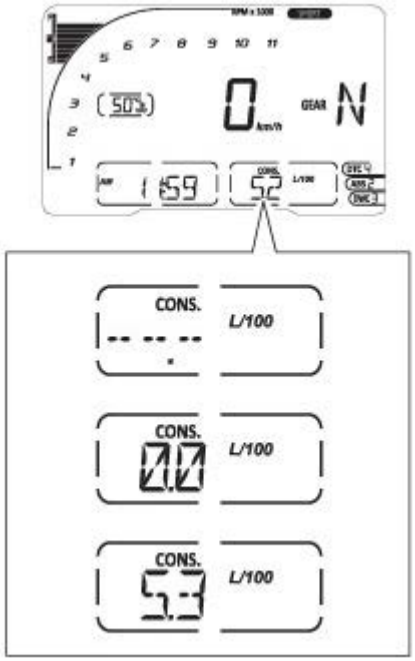
Note
It is possible to change the units of measurement of "speed" (and "distance" travelled) from Km/h (and Km) to mph (and miles) through the Setting menu, using the "SET UNITS" Function.



When TRIP1 is reset, the value is reset and the first value available is displayed 10 seconds after the reset.
During the first 10 seconds, when the value is not yet available, the display will show a string of three dashes " - - - " steadily as average speed.
The active calculation phase occurs when the engine is running even if the motorcycle is stopped (moments when the motorcycle is not moving and the engine is OFF are not considered).

Instantaneous fuel consumption

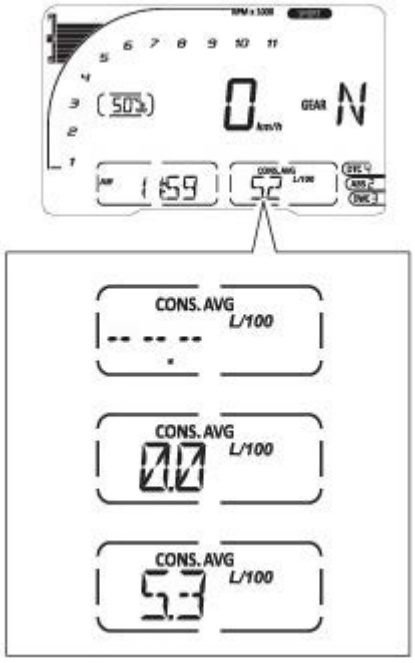
The instrument panel calculates and displays the motorcycle instantaneous fuel consumption, the set unit of measurement and CONS. text.
The calculation is made considering the quantity of fuel used and the distance travelled during the last second.
Value is expressed in the set unit of measurement: litres / 100 km or mpg UK or mpg USA.
The active calculation phase only occurs when the engine is running and the motorcycle is moving (moments when the motorcycle is not moving when speed is equal to 0 and/or when the engine is OFF are not considered). When the calculation is not made, a string of three dashes is displayed " - - . - " steadily as instantaneous fuel consumption.



Note
It is possible to change the units of measurement for "Consumption" (both average and instantaneous together) from L/100 to km/L through the Setting MENU, using the UNITS function.

Average fuel consumption

The instrument panel calculates and displays the motorcycle average fuel consumption, the set unit of measurement and CONS. AVG.
The calculation is made considering the quantity of fuel used and the distance travelled since TRIP1 was last reset.
When TRIP1 is reset, the value is reset and the first value available is displayed 10 seconds after the reset.
During the first 10 seconds, when the value is not yet available, the display will show a string of three dashes "- - . - " steadily as average fuel consumption. Value is expressed in the set unit of measurement (litres / 100 km or mpg UK or mpg USA).



The active calculation phase occurs when the engine is running and the motorcycle is stopped: (moments when the motorcycle is not moving and the engine is OFF are not considered).

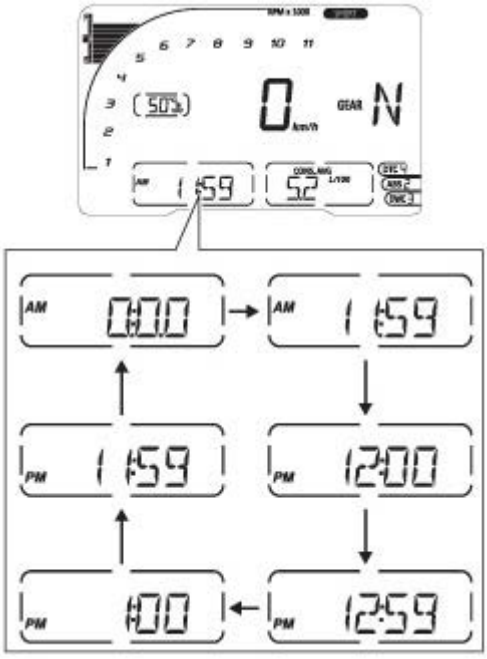
Note
It is possible to change the units of measurement for "Consumption" (both average and instantaneous together) from L/100 to km/L through the Setting MENU, using the UNITS function.

Clock

The instrument panel receives information about the time to be displayed.
The instrument panel shows the time in the following format:

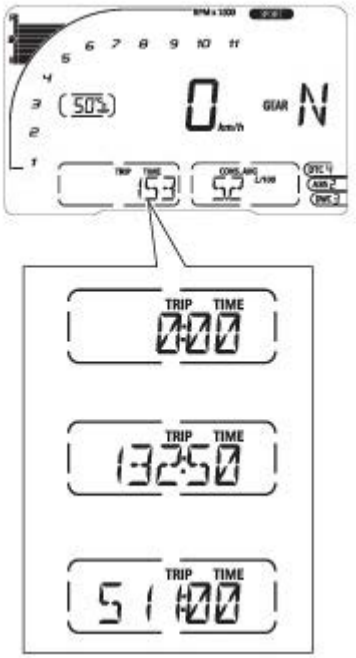
- hh (hours) : mm (minutes);
- followed by a.m. (from 12:00 to 11:59) or p.m. (from 12:00 to 11:59).

In case of a power off (Battery Off), upon the following Key-On, the instrument panel displays 4 dashes " - - : - - " steadily and with flashing colon.



Trip time (TRIP TIME)

The instrument panel calculates and displays the trip time as hhh:mm followed by TRIP TIME. The calculation considers the time since TRIP1 was last reset. When TRIP1 is reset, this value is reset as well. The time count active phase occurs when the engine is running and the motorcycle is stopped (the time is automatically stopped when the motorcycle is not moving and the engine is OFF and restarts when the counting active phase starts again).
When the reading exceeds 511:00 (511 hours and 00 minutes), the meter is reset and automatically starts counting from 0 again.



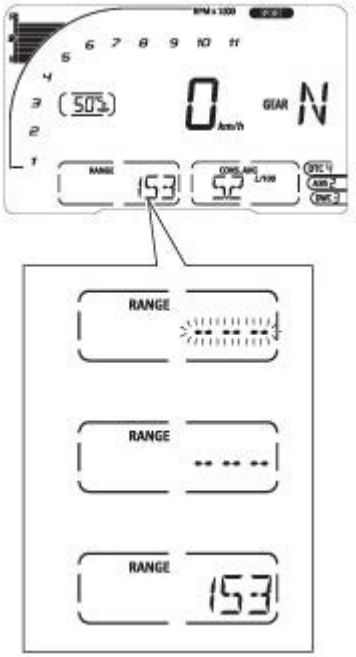
Note

If you change the unit of measurement for an item connected to Speed (and distance) or Consumption or after a Battery-Off, the trip time value will be automatically reset.

Residual range (RANGE)

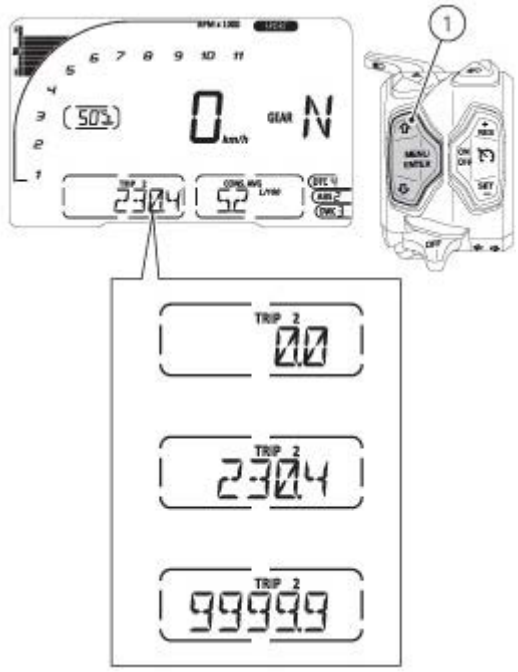
This function displays the range according to the remaining fuel in the tank.
Information is indicated as RANGE.

If there is any function fault, the instrument panel will display three flashing dashes "- - -".
If the instrument panel is not receiving RANGE information, a string of three steady dashes "- - -" is displayed.



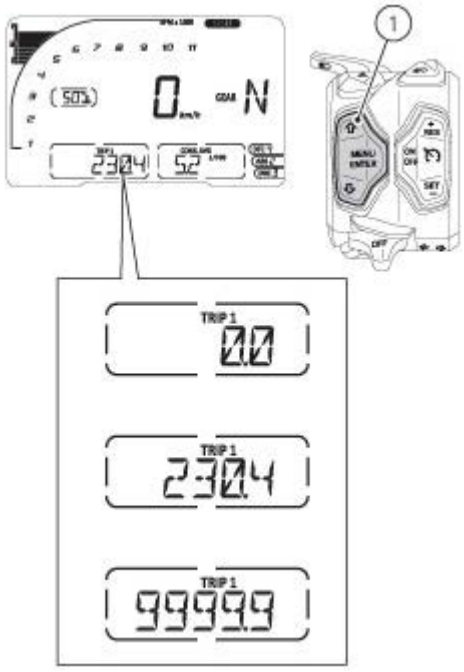
Trip meter 2 (TRIP 2)

The trip meter counts and displays the partial distance covered by the motorcycle with the set unit of measurement (km or mi).
The TRIP2 number (in km or miles) is displayed with the message TRIP2 and the indication of the unit of measurement.
When the reading exceeds the maximum value of 9999.9 km or 9999.9 mi, distance travelled is reset and the meter automatically starts counting from 0 again.
While the trip meter is displayed, press button (1) for 2 seconds to reset TRIP 2.
The TRIP2 counter is automatically reset in case the system unit of measurement is changed manually or after a battery-OFF: the counter will then start back from zero, considering the new units of measurement.



Trip meter 1 (TRIP 1)

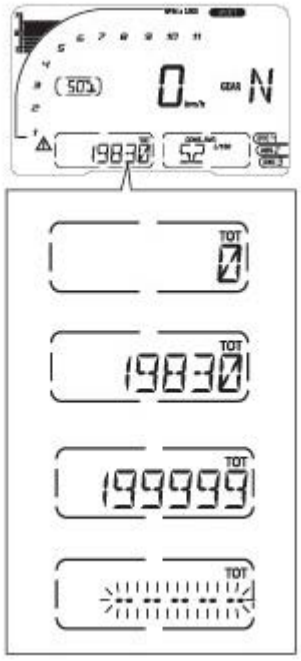
The trip meter counts and displays the partial distance covered by the motorcycle with the set unit of measurement (km or mi) and is used as a basis to calculate average fuel consumption, average speed and trip time. The TRIP1 number (in km or miles) is displayed with the message TRIP1 and the indication of the unit of measurement.
When the reading exceeds the maximum value of 9999.9 km or 9999.9 mi, distance travelled is reset and the meter automatically starts counting from 0 again.
While the trip meter is displayed, press button (1) for 3 seconds to reset TRIP 1. When TRIP1 is reset, the average fuel consumption, average speed and trip time data are reset as well.



The TRIP1 counter is automatically reset in case the system unit of measurement is changed manually or after a battery-OFF: the counter will then start back from zero, considering the new units of measurement.

Odometer (TOT)

The odometer counts and displays the total distance covered by the motorcycle with the set unit of measurement (km or mi).
The odometer number (in km or miles) is displayed with the message TOT and the indication of the unit of measurement. When the maximum value is reached (199999 km or 199999 mi) the instrument panel will permanently display said value.
The odometer value is saved permanently and cannot be reset under any circumstances.



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

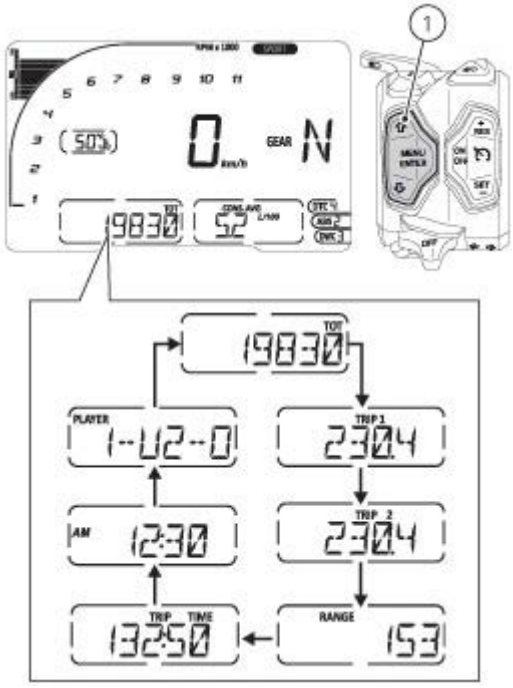
Note
If a string of flashing dashes " ----- " is displayed within odometer function, please contact a Ducati Dealer or Authorised Service Centre.

Menu Functions

Menu 1 displayed functions are:

- Odometer (TOT)
- Trip meter 1 (TRIP1)
- Trip meter 2 (TRIP2)
- Residual range (RANGE)
- Trip time (TRIP TIME)
- Clock
- PLAYER (if Bluetooth control unit is available)

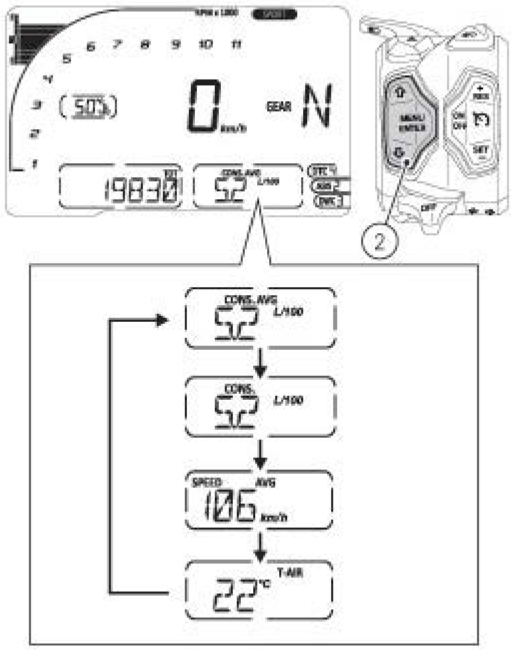
By pressing button (1) it is possible to view the functions of Menu 1.



Menu 2 displayed functions are:

- Average fuel consumption (CONS. AVG)
- Instantaneous fuel consumption (CONS.)
- Average speed (SPEED AVG)
- Ambient air temperature

By pressing button (2) it is possible to view the functions of Menu 2.

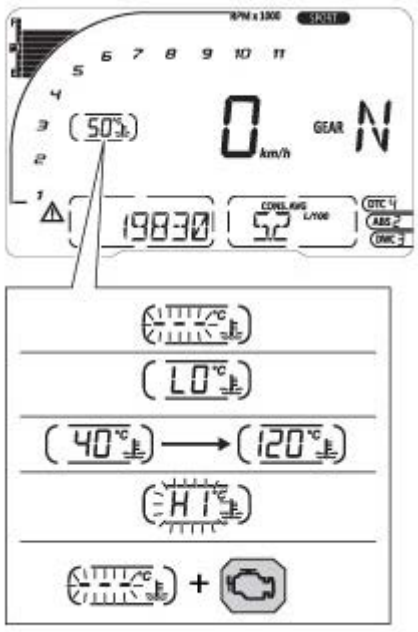


GEAR
N
km/h
19830
MENU/
ENTER
SET
2
CONS. AVG
L/100
CONS.
L/100
SPEED
AVG
106
km/h
22
°C
T-AIR

Engine Coolant temperature

The instrument panel receives information about the engine temperature (already calculated in °C) and displays the value in the set unit of measurement (°C or °F), followed by the unit of measurement and the engine temperature symbol.
The temperature display range goes from 40 °C to +120 °C (+104 °F ÷ +248 °F).
If reading is:

- <= (lower than or equal to) -40 °C (-40 °F), a string of flashing dashes " - - - " is displayed;
- within the range -39 °C (-38 °F) to +39 °C (+102 °F), "LO " is displayed steadily;
- within the range +40 °C (+104 °F) to +120 °C (+248 °F), the value is displayed steadily;
- >= (higher than or equal to) +121 °C (+250 °F), "HI" is displayed flashing.



If the coolant temperature sensor is in fault, a string of flashing dashes "- - -" is displayed with the set unit of measurement and the MIL light turns on.
If the instrument panel is not receiving coolant temperature value, a string of steady dashes "- - -" is displayed, followed by the unit of measurement.

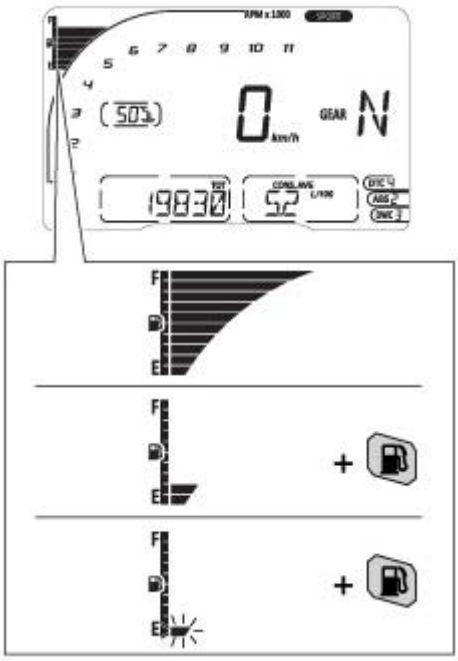
Note
If the instrument panel does not receive any information on the unit of measurement, the last unit of measurement set is displayed flashing.

Fuel level

This function displays the fuel level.
The low fuel light turns on when the level goes down to 2 steady marks: this means that there are approximately 4 litres in the tank.
If the level goes further down, the last mark will be flashing.

Important

If the vehicle enters the reserve status and the light has turned on, it is recommended to turn the vehicle off when refuelling (Key-Off); if fuel is added without turning it off (Key-On and engine off) the data may not be immediately updated.

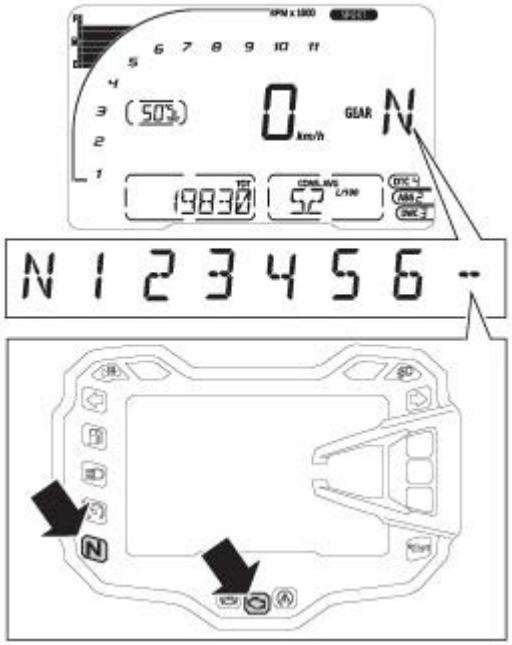


Note

In the case of a level sensor "error", the bargraph without marks is displayed and the rest of the digit will flash.

Gear

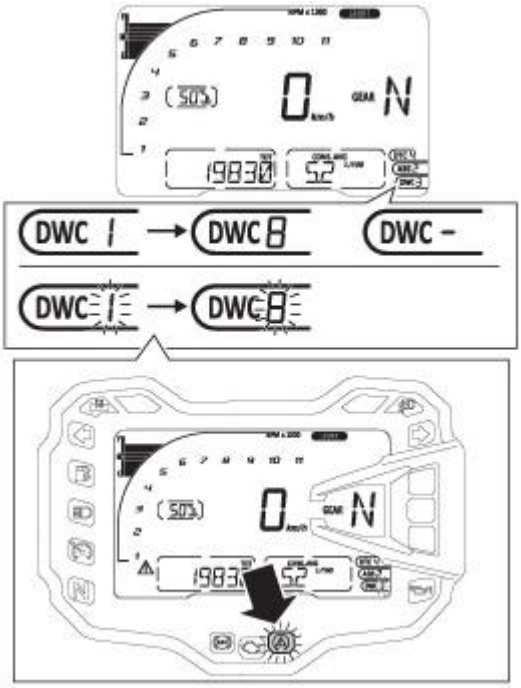
The instrument panel receives information about the gear engaged and displays the corresponding value.
If a gear is engaged, the displayed value may range from 1 to 6, while if in neutral N is displayed.
A string of flashing dashes "--" is displayed if gear teach-in procedure has not been carried out yet (the Neutral warning light turns on), or if instrument panel is not receiving gear information.
If the gear sensor is in fault, a string of dashes "--" is displayed steady on.



DWC

The instrument panel displays DWC status as follows:

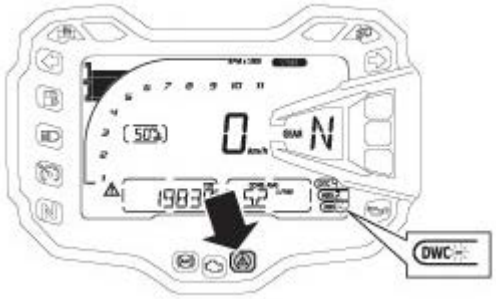
- if DWC is active, the "DWC" and the rectangle with the relevant intervention level number (1 to 8);
- if DWC is active, but system is in degraded operation due to a fault, DWC lettering, the DWC intervention level number from 1 to 8 (flashing) and the relevant rectangle; also the DTC/DWC warning light starts flashing;
- if the DWC is disabled, the DWC lettering and the dash “-” are steady ON;
- if there is a fault in the system, the DWC lettering will flash.



If DWC is in fault or the Black Box is in fault, the instrument panel will display "DWC" and “-” flashing and DTC/DWC warning light will be steady on.

Note

If DTC is set to OFF, DWC is also forced to OFF.



The Ducati Wheelie Control system (DWC) supervises control of wheelie movement and settings vary through eight different levels that are calibrated to offer a different prevention and reaction to wheelies. Each Riding Mode features a pre-set intervention level. Level eight indicates a setting that minimises motorcycle tendency to shift up in a wheelie and maximises reaction to the same, if it occurs. While level one is for expert riders and features a lower wheelie control in terms of prevention and less strong reaction to the same, if it occurs.

Warning

DWC is a rider aid that can be used both on the track and the road. The system is designed to make riding easier and to enhance safety, but in no way relieves the rider of the obligation to ride responsibly and maintain a high standard of conduct in accordance with traffic laws so as to avoid accident or force emergency maneuvers, whether caused by his own errors or those of other road users.

The rider must always be aware that active safety systems have a preventive function. The active elements help the rider control the motorcycle, making it as easy and safe to ride as possible. The presence of an active safety system should not encourage the rider to ride at speeds beyond the reasonable limits, not in accordance with the

road conditions, the laws of physics, good riding standards and the requirements of the road traffic code.

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

DWC	USE		DEFAULT
OFF		The DWC is disabled.	NO
1	HIGH PERFORMANCE	Road use and track use for expert riders. The system allows wheelies, but decreases the speed at which the front wheel lifts.	NO
2	PERFORMANCE	Road use and track use for expert riders. The system allows wheelies, but decreases the speed at which the front wheel lifts.	It is the default level for the "SPORT" Riding Mode
3	SPORTIVE	Track use and road use for expert riders. The system reduces the motorcycle's proneness to do wheelies and intervenes in case of wheelie.	It is the default level for the "TOURING" Riding Mode
4	SPORTIVE	Track and road use for all kinds of riders. The system reduces the motorcycle's proneness to do wheelies and intervenes in case of wheelie.	NO
5	SAFE & STABLE	Level for all kinds of riders. The system reduces the motorcycle's proneness to do wheelies and sensitively intervenes in case of wheelie.	It is the default level for the "URBAN" Riding Mode
6	SAFE & STABLE	Level for all kinds of riders. The system reduces the motorcycle's proneness to do wheelies and sensitively intervenes in case of wheelie.	NO
7	HIGH SAFE & STABLE	Level for all kinds of riders. The system reduces the motorcycle's proneness to do wheelies and sensitively intervenes in case of wheelie.	NO
8	HIGH SAFE & STABLE	Level for all kinds of riders. The system reduces the motorcycle's proneness to do wheelies to a minimum level and sensitively intervenes in case of wheelie.	NO

Tips on how to select the sensitivity level

Warning

Excellent operation of the DWC system, for all available levels, is ensured only with the OE final drive ratio and with OE tires and/or with the ones recommended by Ducati. In particular, OE tires for this motorcycle are Pirelli Scorpion Trail II in the following sizes: 120/70ZR17 at the front, 190/55ZR17 at the rear. Using tires with different size and characteristics from the original tires may alter the operating characteristics of the system thus making it unsafe. It is recommended not to install tires of different size than the ones approved for your vehicle.

At level 8 the DWC system reduces the motorcycle's proneness to do wheelies to a minimum level and sensitively intervenes in case of wheelie. Between level 8 and level 1 there are further intermediate levels of intervention for the DWC. Levels 1, 2 and 3 allow easier wheelies, but reduce their speed: these levels are recommended only for track use and for expert riders who can control wheelies on their own and exploit the system feature that reduces the speed at which the front wheel tends to lift.
The choice of the correct level mainly depends on the following parameters:

- The rider's experience;
- The characteristics of the path/circuit (bend exit with low or high gear engaged).

The rider's experience

The choice of level setting depends greatly on the riders' experience and ability to control wheelies on their own. Levels 1, 2 and 3 require a great experience to ensure proper control.

Level depends on type of track/path

If the track/path features bends where out speed and gear are low, a lower level will be necessary; while a track/path with faster bends will allow the use of a higher level setting.

Tips for use on the track

We recommend to use level 8 for a couple of full laps in order to get used to the system. Then try levels 7, 6, etc., in succession until you identify the DWC sensitivity level that suits you best (always try each level for at least two laps to allow the tyres to warm up).

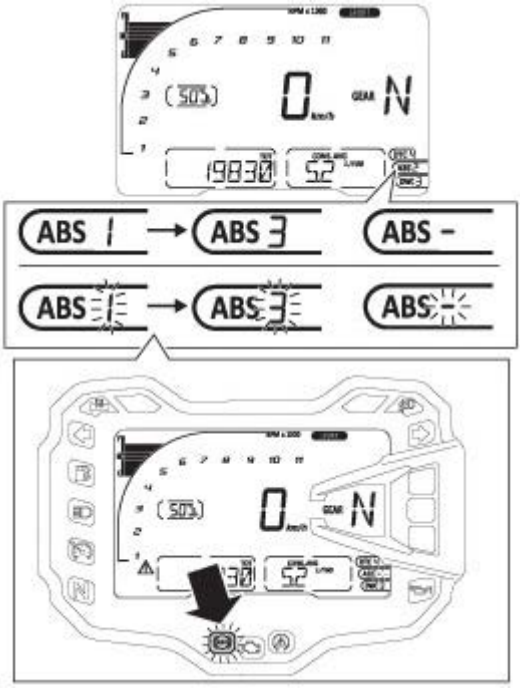
Tips for use on the road

Activate the DWC, select level 8 and ride the motorcycle in your usual style; if the level of DWC sensitivity seems excessive, try levels 7, 6, etc., until you find the one that suits you best. If changes occur in the circuit characteristics, and the level setting is no longer suitable, switch to the next level up or down and proceed to determine the best setting (e.g. if with level 7 the DWC intervention seems excessive, switch to level 6; alternatively, if on level 7 you cannot perceive any DWC intervention, switch to level 8).

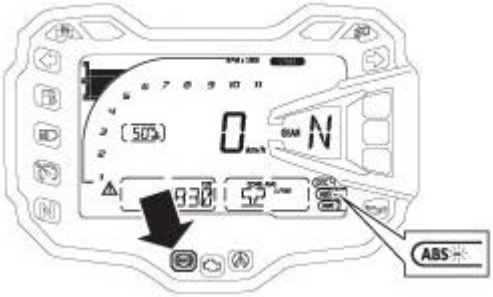
ABS

The motorcycle is equipped with ABS, the instrument panel indicates ABS status (on or off) by switching off, on or flashing the ABS warning light.
The instrument panel displays:

- if the ABS is active, the message "ABS" and the rectangle with the set intervention level number (1 to 3) steady ON;
- if ABS is active, but system is in degraded operation due to a fault (no "cornering" feature"), ABS lettering, the ABS intervention level number, 1 to 8 (flashing) and the relevant rectangle; also the ABS warning light starts flashing;
- if the ABS is disabled, the "ABS" lettering, the dash "-" and the ABS warning light will be steady ON;
- if there is a fault in the system, the ABS lettering will flash.



If the ABS is in fault, the instrument panel will display ABS, the dash “-” and ABS warning light will be steady on.



Using the brakes correctly under adverse conditions is the hardest – and yet the most critical - skill to master for a rider. Braking is one of the most difficult and dangerous moments when riding a two wheeled motorcycle: the possibility of falling or having an accident during this difficult moment is statistically higher than any other moment. A locked front wheel leads to loss of traction and stability, resulting in loss of control.
The Anti-Lock Braking System (ABS) has been developed to enable riders to use the motorcycle braking force to the fullest possible amount in emergency braking or under poor pavement or adverse weather conditions. ABS is an electro-hydraulic device that controls the pressure in the brake circuit when the control unit, by processing information from wheel sensors, determines that one or both wheels are about to lock up. In this case, pressure decrease in the brake circuit allows the wheel to carry on turning, thereby preserving grip. After that, the control unit restores the pressure in the brake circuit, to resume the braking action. This cycle is repeated many times until the problem is completely eliminated. Normally, the rider will perceive ABS operation as a harder feel or a pulsation of the brake lever and pedal.
The front and rear brakes do not use separate control systems: the ABS on this bike provides for an electronic combined braking action that also activates the rear brake system when the rider uses only the front brake. The contrary is not true: the rear brake control will not affect the front brake.
The Multistrada 1200 ABS also features a "cornering" function that widens ABS functionality to the conditions where the motorcycle is leaning over, thus controlling the front and rear brake systems depending on the vehicle lean angle with the purpose of preventing wheel lockup and slipping as much as possible, within the physical limits

allowed by the vehicle and by the road conditions.
If desired, the system can be deactivated from the instrument panel, setting the level to OFF within the Riding Mode for which you wish to disable it.

Warning

Although combined braking is available (rear brake activation when rider uses only the front brake), using the two brake controls separately reduces the motorcycle braking power.

Never use the brake controls harshly or suddenly as you may cause rear wheel lift-up and lose control of the motorcycle.
When riding in the rain or on slippery surfaces, braking will become less effective. Always use the brakes very gently and carefully when riding under these conditions. Any sudden manoeuvres may lead to loss of control.
When tackling long, high-gradient downhill road tracts, shift down gears to use engine braking. Apply one brake at a time and use brakes sparingly. Keeping the brakes applied all the time would cause the friction material to overheat and reduce braking power dangerously.
Underinflated and overinflated tyres reduce braking efficiency, handling accuracy and stability in a bend.

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

ABS	RIDING MODE	CHARACTERISTIC	DEFAULT
OFF		The ABS is disabled	NO
1	OFF-ROAD	This level is designed exclusively for off-road use, for expert riders (not recommended for road use). ABS in this level only controls the front wheel, and thus allows rear wheel lockup (thus helping braking efficiency on dirt roads). The system in this level does NOT control lift-up, there is NO front-to-rear combined braking and the cornering feature is NOT active.	It is the default level for the "ENDURO" Riding Mode
2	SPORT	This level is designed for road use, with good grip conditions. ABS in this level controls both wheels, system creates pressure also at the rear calliper when the rider uses only the front brake (combined braking) and the cornering function is active. In this level system does NOT control lift-up: this calibration focuses on braking power and wheel lift-up should be managed by the rider.	It is the default level for the "SPORT" Riding Mode
3	SAFE & STABLE	This level is designed for use in any riding conditions to provide a safe and consistent braking action. ABS in this level controls both wheels, system creates pressure also at the rear calliper when the rider uses only the front brake (combined braking), and the cornering function and lift-up control function are active.	It is the default level for the "TOURING" and "URBAN" riding modes.

Tips on how to select the sensitivity level

Warning

Excellent operation of the ABS system, for all available levels, is ensured only with the OE brake system and with OE tires and/or with the ones recommended by Ducati. In particular, OE tires for this motorcycle are Pirelli Scorpion Trail II in the following sizes: 120/70ZR17 at the front, 190/55ZR17 at the rear. Using tires with different size and characteristics from the original tires may alter the operating characteristics of the system thus making it unsafe. It is recommended not to install tires of different size than the ones approved for your vehicle.

Selecting level 3, the ABS will ensure a very stable braking thanks to lift-up control and front-to-rear combined braking, and the motorcycle will keep a good alignment during the whole braking action. ABS level 3 features active cornering function which, with vehicle leaning over, prevents wheel lockup and slipping as much as possible, within the physical limits allowed by the vehicle and by the road conditions.
Selecting level 2, the ABS will privilege more and more the braking power rather than stability and lift-up control, which is disabled in level 2. Level 2 provides for the front-to-rear combined braking and the cornering function.
ABS level 1 is specific for off-road use and ABS is active only on the front wheel to help braking performance on dirt roads. In this level there is no lift-up control, neither front-to-rear combined braking, nor cornering function.
The choice of the correct level mainly depends on the following parameters:

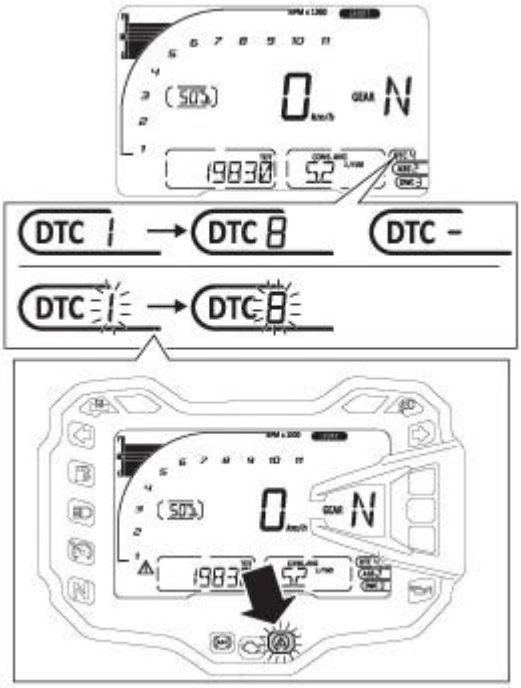
1 The tyre/road grip (type of tyre, amount of tyre wear, the road/track surface, weather conditions, etc.).

2 The rider's experience and sensitivity: expert riders can tackle a lift-up in trying to reduce the stopping distance to a minimum, while less expert riders are recommended to use setting 3, that will help them keeping the motorcycle more stable even in emergency braking.

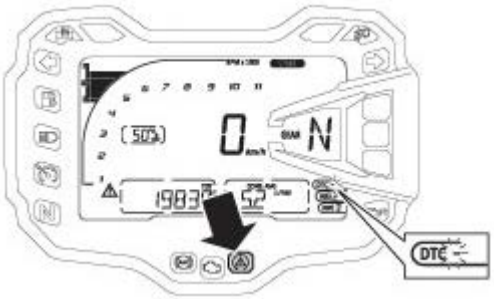
DTC

The instrument panel displays DTC status as follows:

- if DTC is active, the "DTC" and the rectangle with the Traction Control intervention level number (1 to 8);
- if DTC is active, but system is in degraded operation due to a fault, DTC lettering, the DTC intervention level number from 1 to 8 (flashing) and the relevant rectangle; also the DTC/DWC warning light starts flashing;
- if the DTC is disabled, the DTC lettering and the dash “-” are steady ON;
- if there is a fault in the system, the DTC lettering will flash.



If DTC is in fault or the Black Box is in fault, the instrument panel will display "DTC" and “-” flashing and DTC/DWC warning light will be steady on.



Warning

DTC is a rider aid that can be used on the track, on the road and off road. The system is designed to make riding easier and to enhance safety, but in no way relieves the rider of the obligation to ride responsibly and maintain a high standard of conduct in accordance with traffic laws so as to avoid accident or force emergency maneuvers, whether caused by his own errors or those of other road users.

The rider must always be aware that active safety systems have a preventive function. The active elements help the rider control the motorcycle, making it as easy and safe to ride as possible. The presence of an active safety system should not encourage the rider to ride at speeds beyond the reasonable limits, not in accordance with the road conditions, the laws of physics, good riding standards and the requirements of the road traffic code.

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

DTC	RIDING MODE	USE	DEFAULT

OFF		The DTC is disabled.	NO
1	OFF-ROAD Professiona	This level is designed exclusively for off-road use, for very expert riders (not recommended for road use). The DTC in this mode allows considerable spinning of the rear wheel. In this level, the system does NOT ensure a correct control of traction loss on asphalt.	NO
2	OFF-ROAD	This level is designed exclusively for off-road use, for not very expert riders (not recommended for road use). In this level, the system does NOT ensure a correct control of traction loss on asphalt.	It is the default level for the "ENDURO" Riding Mode
3	SPORT / TRACK	This level is designed for track use, with good grip conditions, for very expert riders. In this mode, the DTC allows sideslipping.	NO
4	SPORT	This level is designed for both track and road use, with good grip conditions.	It is the default level for the "SPORT" Riding Mode
5	TOURING	This level is designed for road use, with good grip conditions.	It is the default level for the "TOURING" Riding Mode
6	SAFE & STABLE	This level is designed for use in any riding conditions, on the road with good grip.	It is the default level for the "URBAN" Riding Mode
7	RAIN	This level is designed for road use, when surface is wet.	NO
8	HEAVY RAIN	This level is designed for road use, when surface is wet and very slippery.	NO

Tips on how to select the sensitivity level

Warning

Excellent operation of the DTC system, for all available levels, is ensured only with the OE tires and/or with the ones recommended by Ducati. In particular, OE tires for this motorcycle are Pirelli Scorpion Trail II in the following sizes: 120/70ZR17 at the front, 190/55ZR17 at the rear. Using tires with different size and characteristics from the original tires may alter the operating characteristics of the system thus making it unsafe. It is recommended not to install tires of different size than the ones approved for your vehicle.

If level 8 is selected, the DTC will kick in at the slightest hint that the rear wheel is starting to spin. Between level 8 and level 1 there are other 6 intermediate levels. DTC intervention decreases regularly from level 8 to level 1.

Levels 1 and 2 were specifically designed for off-road use and do not ensure a correct control of traction loss on asphalt.
With levels 3 and 4, DTC control unit allows both rear tyre spinning and sliding sideways when exiting a turn; we recommend using these levels only on track and to very experienced riders.
The choice of the correct level depends on 3 main variables:

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

Level depends on grip conditions

The choice of level setting depends greatly on the grip conditions of the track/path (see below, tips for use on the track and on the road). Poor grip requires a higher level that ensures a more aggressive DTC intervention.

Level depends on type of track/path

If the track/path features bends all taken at similar speeds, it will be easier to find a level suitable for all bends; while a track/path with bends all requiring different speeds will require a DTC level setting that is the best compromise for all bends.

Level depends on riding style

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

Tips for use on the track

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

Tips for use on the road

We recommend level 6 be used in order to get used to the system (default level for the URBAN riding mode). If the level of DTC intervention seems aggressive, try reducing the setting to levels 5, 4, etc., until you find the level that suits you best.
If changes occur in the grip conditions and/or circuit characteristics and/or your riding style, and the level setting is no longer suitable, switch to the next level up or down and proceed to determine the best setting (e.g. if with level 7 the DTC intervention seems excessive, switch to level 6; alternatively, if on level 7 you cannot perceive any DTC intervention, switch to level 8).

Tips for off-road use

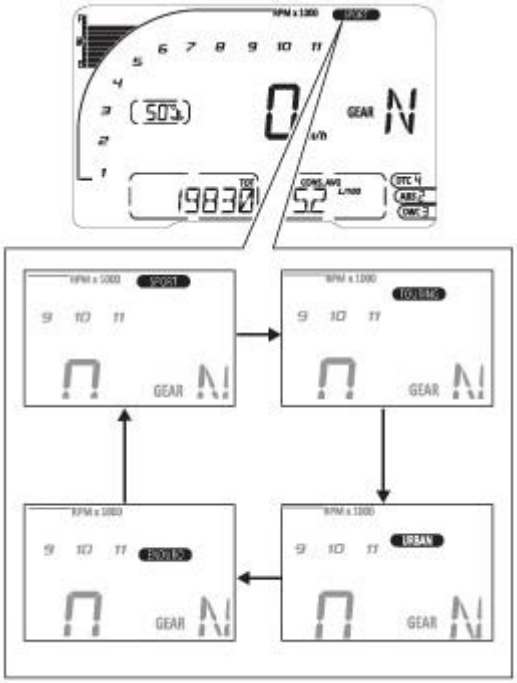
We recommend level 2 be used in order to get used to the system (default level for the ENDURO riding mode). If DTC intervention is felt to be too much aggressive, try level 1.

Riding Mode

The Riding Mode can be selected from the instrument panel. Four preset riding modes are available: SPORT, TOURING, URBAN and ENDURO.
The selected and active riding mode is displayed on the top part of the instrument panel display, above the speed indication, in all four layouts.

Warning

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

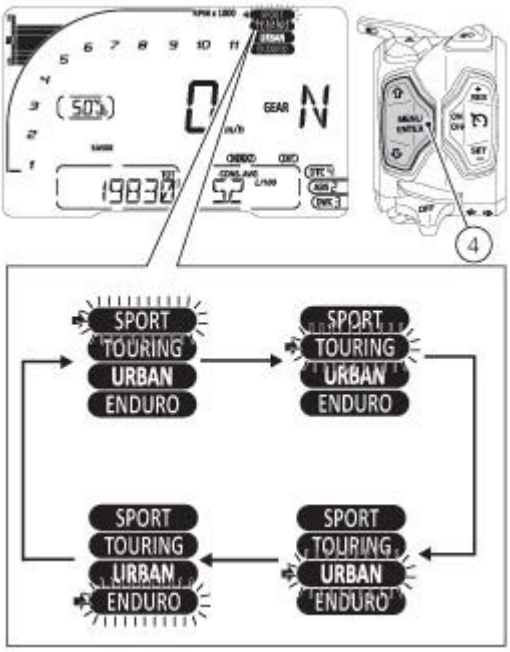


Every Riding Mode contains the following parameters, set by Ducati or customised by the user through the setting function pages:

- a specific level of intervention for the DTC traction control (1, 2, 3, 4, 5, 6, 7, 8, OFF);
- a specific level of intervention for the DWC (1, 2, 3, 4, 5, 6, 7, 8, OFF);
- a specific ABS calibration (1, 2, 3, OFF);
- a specific engine power that will change throttle behaviour (HIGH, MEDIUM, LOW).

Riding mode change function

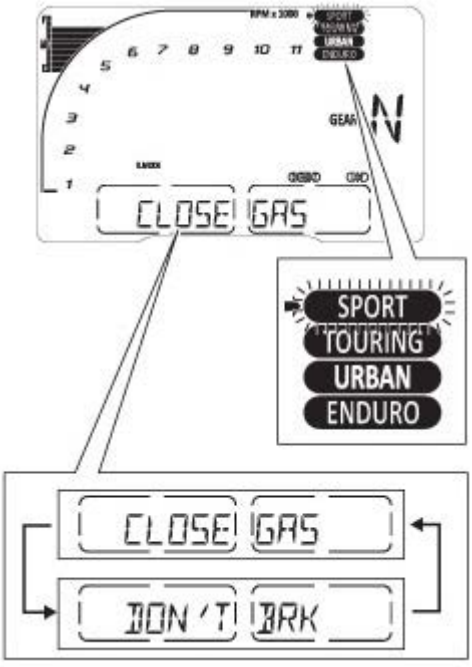
This function allows changing vehicle riding mode.
Press the CONFIRM MENU button (4) to change the riding mode.
The display shows the four riding modes (SPORT, TOURING, URBAN and ENDURO).
Each time you press button (4), the instrument panel makes a Riding Mode name flash and shifts the arrow to the left side of the name to indicate the selected Riding Mode.
After selecting the desired riding mode, confirm it by keeping the CONFIRM MENU (4) button pressed for 1, 5 seconds.



Once the desired riding mode is highlighted, if the CONFIRM MENU button (4) is not pressed within 5 seconds, the new riding mode selection is not stored and the standard screen is displayed.

When system requests rider to confirm the riding mode change, the procedure will output an error if:

- the vehicle is still and the throttle control is open so the "CLOSE GAS" indication will be displayed.
- The vehicle is moving, the throttle control and the brake pressure are checked and "CLOSE GAS" and "DON'T BRAKE" may be displayed.

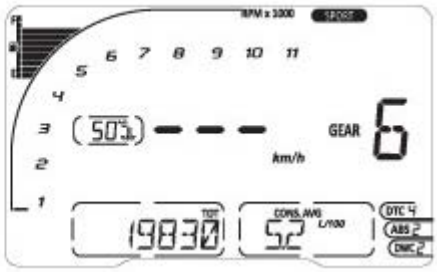


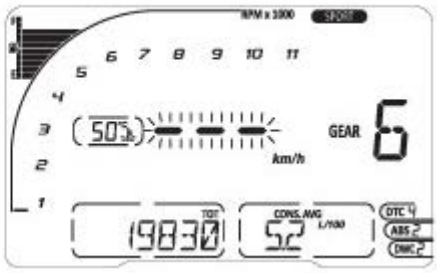
Motorcycle speed

The instrument panel receives information about the actual motorcycle speed (calculated in km/h) and displays the value increased by 5% and converted in the set unit of measurement (km/h or mph).
The max. displayed speed is 299 km/h (186 mph).

A string of dashes "- - -" is displayed with the set unit of measurement if:

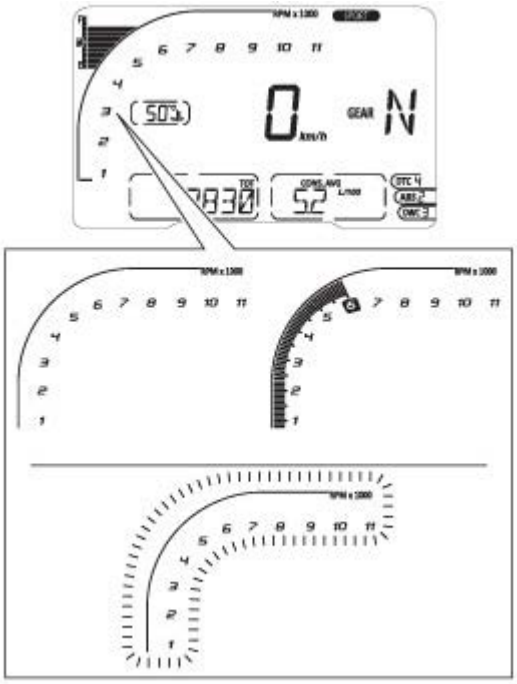
- speed is equal to 299 km/h or 186 mph or if instrument panel is not receiving the speed value ("- - -" steady ON);
- the rear speed sensor is in fault (flashing "- - -").





Engine rpm indication (RPM)

This function allows displaying engine rpm.
Instrument panel receives rpm value and displays it.
The information is displayed by the bargraph filling from the left to the right according to the engine rpm and with the negative display (switching OFF of the digit and switching on of its rectangle) of the numerical digit of the relevant miles.



When the threshold before the rpm limiter is reached, the corresponding warning lights will turn on.

Main functions

The functions displayed in the Standard screen are the following:
Main information

- Engine rpm indication (RPM)
- Motorcycle speed
- Fuel level
- Engine Coolant temperature
- Riding Mode
- ABS
- DTC
- DWC
- Gear
- Menu 1 displays the following functions:
  - Odometer (TOT)
  - Trip meter 1 (TRIP1)
  - Trip meter 2 (TRIP2)
  - Residual range (RANGE)
  - Trip time (TRIP TIME)
  - Clock
  - Player if Bluetooth is available
- Menu 2 displays the following functions:
  - Average Fuel Consumption (CONS. AVG)
  - Instantaneous fuel consumption (CONS.)
  - Average speed (SPEED AVG)
  - Ambient air temperature

Additional information

- Infotainment — Bluetooth
- Cruise Control
- Service indication (SERVICE)
- Warnings/Alarms
- Heated handgrip (optional)

The functions within the Setting Menu that can be modified by the user are the following:

- Riding mode customisation (RIDING MODE): this menu allows customisation of:
  - Engine setting (ENGINE)
  - DTC level setting (DTC)
  - DWC level setting (DWC)
  - ABS setting (ABS)
  - Reset to default settings (DEFAULT)
- PIN CODE (enter/change)
- Date setting (DATE SET)
- Clock setting (CLOCK SET)
- Display backlighting (BACK LIGHT)
- Unit setting (Speed - Temperature - Fuel consumption) (UNITS)
- Bluetooth setting (pairing/deleting any paired devices, only if available)

Parameter setting/displaying

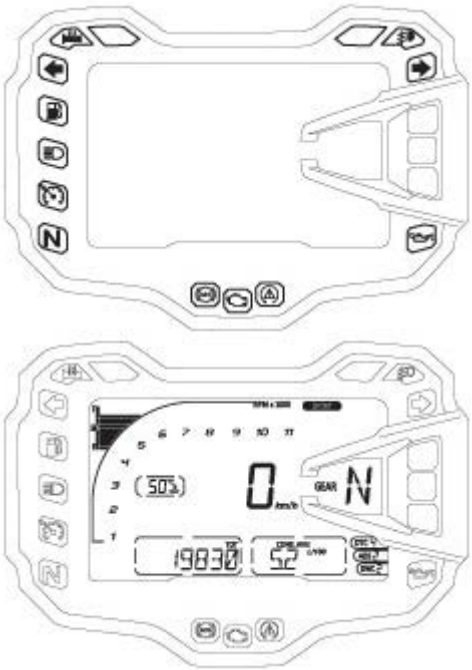
Upon key-on, the instrument panel:

- turns on the display backlighting;
- activates the rev counter which increases from 0 to 11000 and decreases back to 0;
- activates the vehicle speed digits and shows a counting from 0 to 300 and then back to 0;
- turns on the warning lights from the outer to the inner ones.

At the end of the check, the instrument panel displays the main screen ("standard screen") showing the available functions and turns on the warning lights, if necessary.

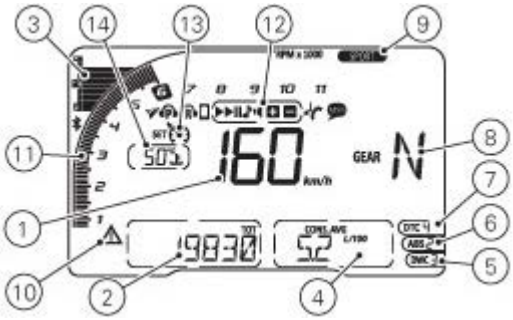
During this first check stage, if the motorcycle speed exceeds 10 km/h (actual speed), the instrument panel will stop:

- the display check routine and display the standard screen containing updated information;
- the warning light check routine and leave ON only the warning lights that are actually active at the moment.



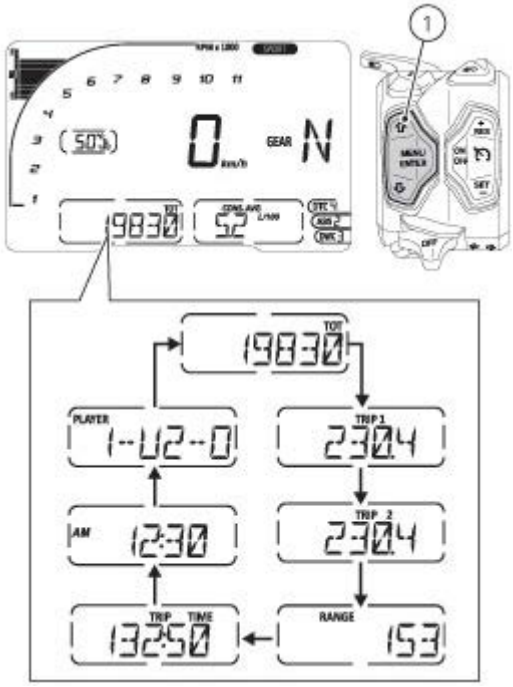
Data displayed on the main screen are as follows:

1 Motorcycle speed.
2 Menu 1 (Odometer, Trip 1, Trip 2, Range, Trip time, Clock and Player if the Bluetooth is available).
3 Fuel level.
4 Menu 2 (Average fuel consumption, Instant fuel consumption, Average speed, Ambient air temperature).
5 DWC level indication or DWC off indication.
6 ABS ON/OFF indication.
7 DTC level indication (ON) or DTC OFF indication.
8 Gear indication.
9 Set Riding Mode.
10 Generic error warning light.
11 Rev counter.
12 Infotainment (if any).
13 Cruise Control indication.
14 Engine Coolant temperature



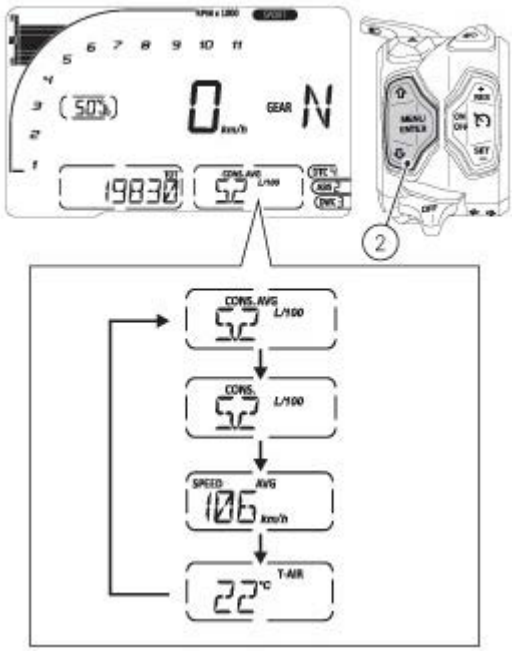
From the main screen, press button (1) on LH switch to view Menu 1 information.

- Odometer (TOT);
- TRIP 1;
- TRIP 2;
- RANGE;
- TRIP TIME;
- Clock;
- Player (if Bluetooth is available).



Press button (2) on LH switch to view Menu 2 information.

- Average fuel consumption (CONS. AVG);
- Instantaneous fuel consumption (CONS.I);
- Average speed (SPEED AVG);
- Air temperature.



The instrument panel stores Menu 1 and Menu 2 settings in use upon KEY-OFF. On the following KEY-ON, previously stored Menu 1 e Menu 2 pages are displayed.
In case of sudden and unexpected power OFF, the instrument panel displays the default settings for Menu 1 and Menu 2 upon the following KEY-ON; in particular:

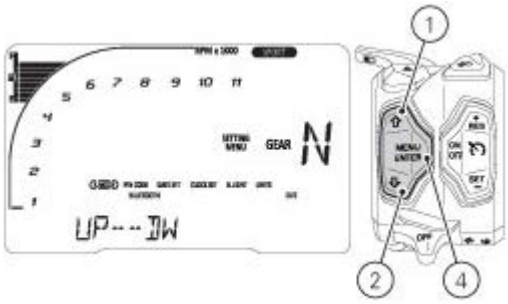
- Menu 1 default page = Odometer (TOT);
- Menu 2 default page = Average fuel consumption (CONS.AVG).

Upon KEY-ON, for every display layout, instrument panel shows for 10 seconds in Menu 1 the "Odometer" page and then shows the page saved upon previous KEY-OFF.

When the standard screen is displayed, hold the button (4) for 2 seconds, when actual motorcycle speed is <= (lower than or equal to) 20 km/h, to enter the Setting Menu, where you can set any function.

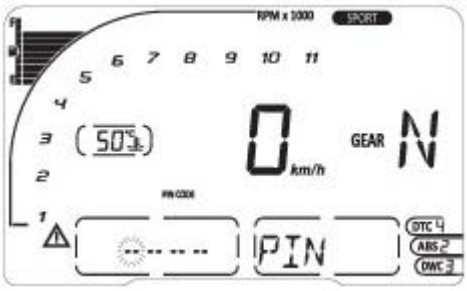
Important

You can enter the SETTING MENU only if vehicle actual speed is <= (lower than or equal to) 20 km/h. Within the SETTING MENU, if vehicle actual speed exceeds 20 km/h, the instrument panel automatically quits the menu and shows the standard screen.



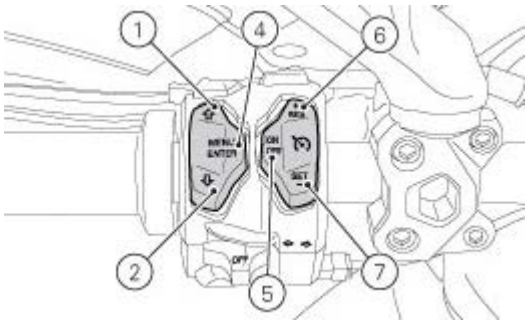
If the key is not acknowledged upon Key-ON and once the check routine is over, the following will happen:

- if the PIN CODE function is not active, the instrument panel skips the warning light check, displays the standard screen with an error warning and does not allow accessing the Setting Menu;
- if the PIN CODE function is active, the PIN CODE function page is displayed on the instrument panel, allowing rider to enter the release code.

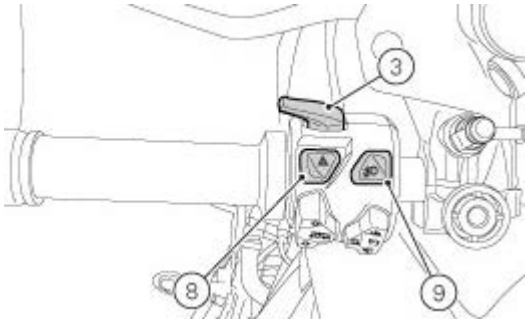

RPM x 1000
SPORT
5
6
7
8
9
10
11
4
3
2
1
50%
0
km/h
GEAR
N
PIN CODE
PIN
DTC 4
ABS 2
DWC 3

Function buttons

1) UP CONTROL SWITCH
Button used to display and set instrument panel parameters with the position.
2) DOWN CONTROL SWITCH
Button used to display and set instrument panel parameters with the position .
3) HIGH-BEAM/FLASH BUTTON (FLASH) (see Fig)
The high-beam flash button may also be used for LAP functions.
4) CONFIRM MENU / SETTING MENU ENTRY BUTTON
Button used to confirm during MENU navigation.
5) CRUISE CONTROL BUTTON - ON/OFF
Button used to switch the Cruise Control function on/off.



6) CRUISE CONTROL BUTTON - RES (Resume) / + (more) (see Fig 1)
Button used to increase set cruise speed for the Cruise Control.
7) CRUISE CONTROL BUTTON - SET (Setup) / - (less) (see Fig 1)
Button used to set/decrease set cruise speed for the Cruise Control.
8) HAZARD BUTTON
Button used to switch on/off all four turn indicators (Hazard function).
9) FOG LIGHT BUTTON (OPTION)
Button used to switch on/off the fog lights (option).



Instrument panel

1) LCD display.
2) NEUTRAL LIGHT N (GREEN).
Comes on when in neutral position.
3) CRUISE CONTROL LIGHT (GREEN).
Comes on to indicate operation of the Cruise Control.
4) HIGH BEAM LIGHT (BLUE).
It turns on to indicate that the high beam lights are on and when the flasher is activated.
5) FUEL WARNING LIGHT (AMBER YELLOW).
Comes on when fuel is low and there are about 4 litres of fuel left in the tank.
6) TURN INDICATOR LIGHTS (GREEN).
Illuminates and flashes when the turn indicator is in operation.
7) ENGINE OIL PRESSURE LIGHT (RED).
Comes on when engine oil pressure is too low. It must turn on at "KEY-ON", but must turn OFF a few seconds after the engine has started. It may shortly come on when the engine is hot, however, it should go out as the engine revs up.

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

8) DTC / DWC WARNING LIGHT (AMBER YELLOW).

This light indicates DTC/DWC system enabling/disabling status.

Speed below 5 Km/h (3 mph)		
Light OFF	**Light flashing**	**Light steady on**
DTC/DWC enabled and functioning	DTC/DWC enabled but not yet functioning since initialisation is in progress or functioning with degraded performance	DTC/DWC disabled and/or not functioning due to a fault in the BBS control unit.
Speed above 5 Km/h (3 mph)		
Light OFF	**Light flashing**	**Light steady on**
DTC/DWC enabled and functioning	DTC/DWC enabled but there is a fault in the system causing degraded performance	DTC/DWC disabled and/or not functioning due to a fault in the BBS control unit.

9) "ENGINE DIAGNOSIS - MIL" LIGHT (AMBER YELLOW).

It turns on in the case of "engine" errors that in some cases will lock the engine.

10) ABS LIGHT (AMBER YELLOW).

Indicates ABS status.

Speed below 5 Km/h (3 mph)		
Light OFF	**Light flashing**	**Light steady on**
-	ABS enabled but not yet functioning since initialisation is in progress or there is a fault of the IMU control unit	ABS disabled and/or not functioning due to a fault in the ABS control unit
Speed above 5 Km/h (3 mph)		
Light OFF	**Light flashing**	**Light steady on**
ABS enabled	ABS enabled but a fault is detected by the IMU control	ABS disabled and/or not functioning

and functioning	unit	due to a fault in the ABS control unit

11) GENERIC ERROR WARNING LIGHT.
It turns on when there are any "vehicle" errors, i.e. active errors triggered by any control unit other than the engine control unit.
12) HEATED HANDGRIP LIGHT (AMBER YELLOW) (OPTIONAL).
It turns on when the heated handgrip (optional) are activated / deactivated.
13) FOG LIGHT WARNING LIGHT (GREEN) (OPTIONAL).
It turns on when the fog lights (optional) are activated / deactivated.

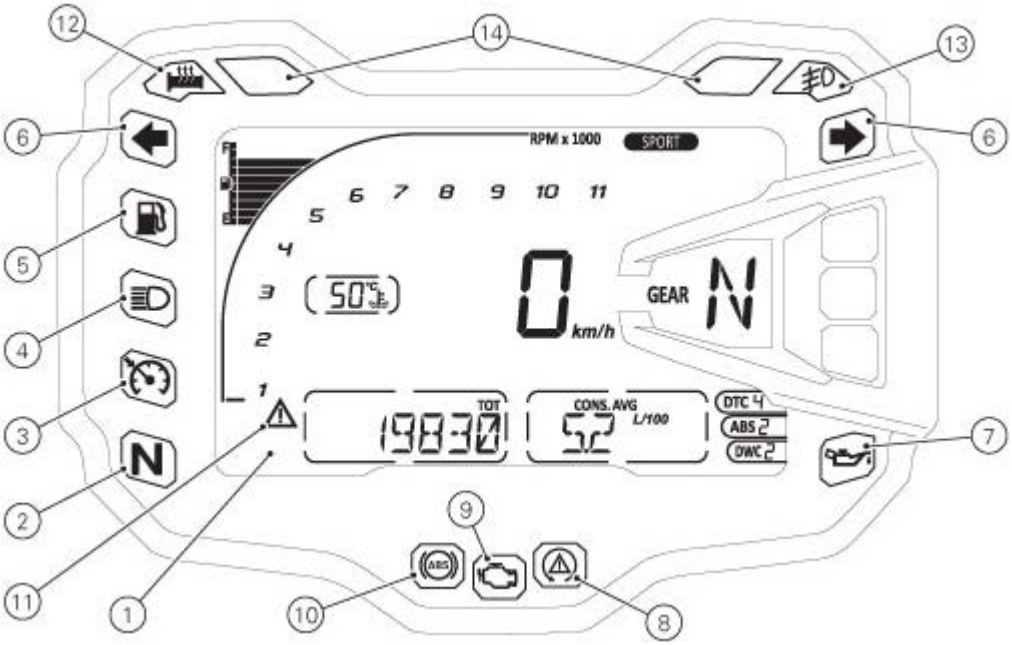
14) OVER REV / DTC / IMMOBILIZER SYSTEM (RED)

	Over rev
No intervention	Light OFF
First threshold (N RPM before the limiter kicks in)	Light steady ON
Limiter	Light ON flashing

	DTC
No intervention	Light OFF
Spark advance cut	Light steady ON
Injection cut	Light steady ON

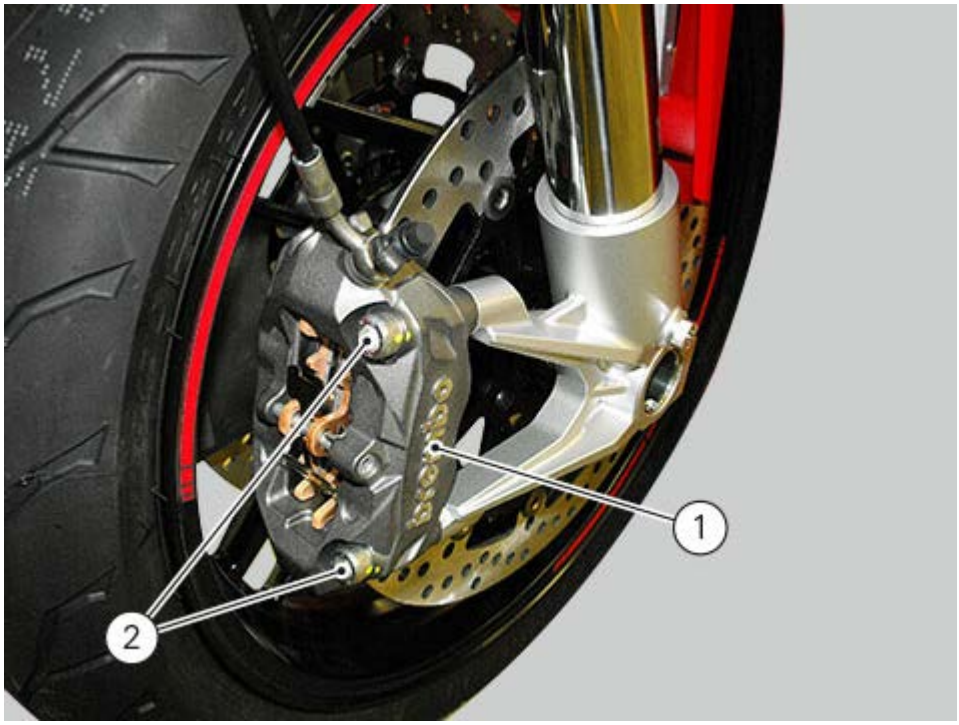
Note
Each calibration of the Engine Control Unit may have a different setting for the thresholds that precede the rev limiter and the rev limiter itself.

	Immobilizer
Key-ON status	Light OFF
Key-OFF status	Light ON flashing
Key-off status for over 1 hour	Light OFF


12
14
13
6
6
RPM x 1000
SPORT
5
6
7
8
9
10
11
4
3
2
1
5
4
3
2
N
50°C
0
km/h
GEAR
N
TOT
19830
CONS. AVG
L/100
52
DTC 4
ABS 2
DWC 2
7
9
11
1
10
8

Removing the front wheel

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



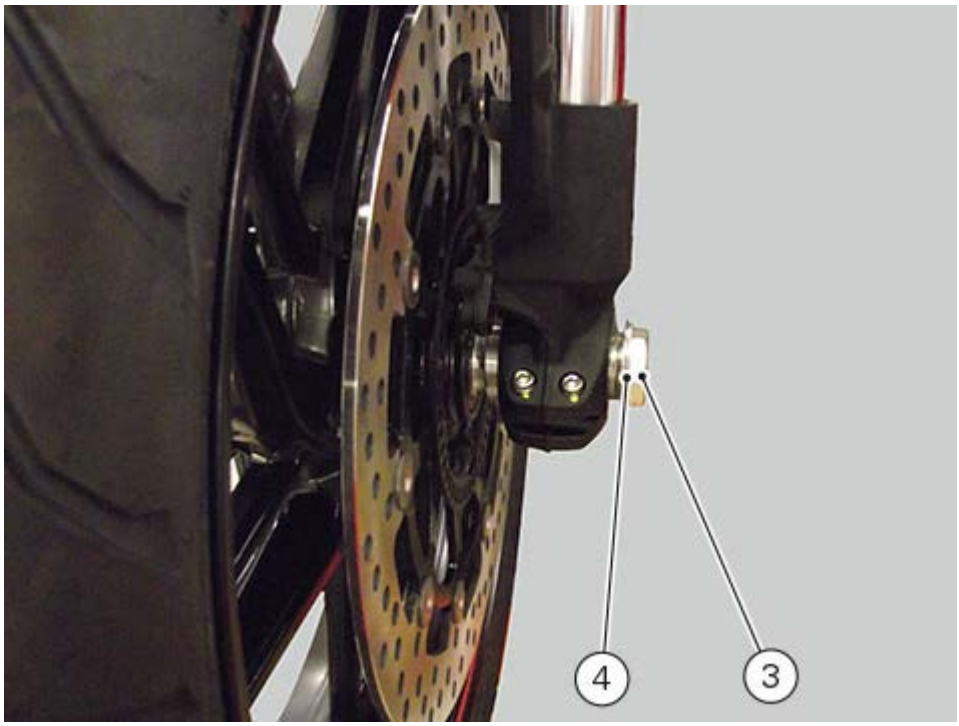
S Version

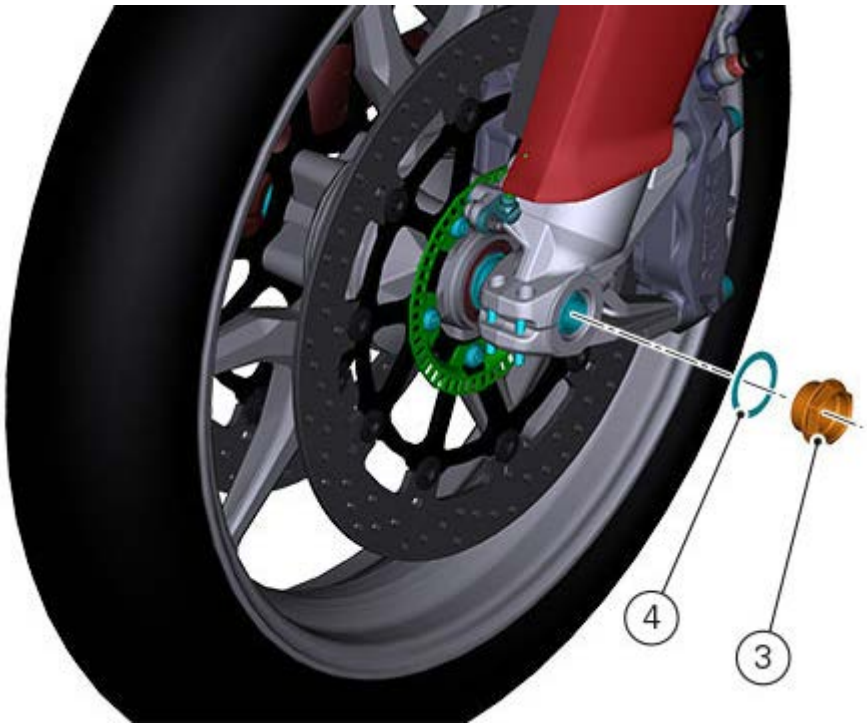
Keep the spacers (A).

Warning

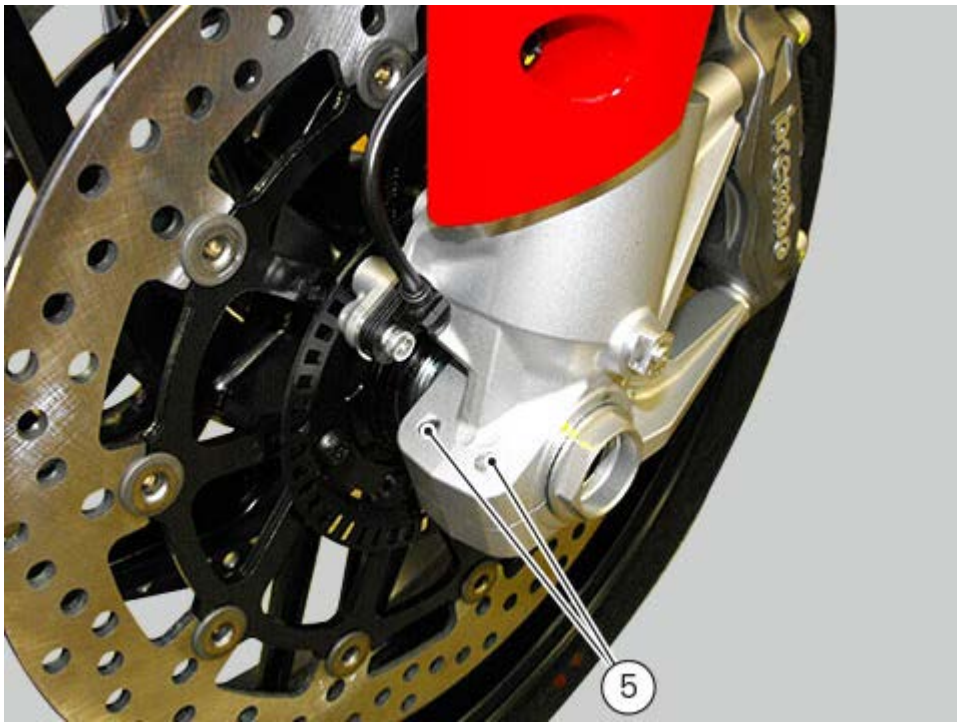
Do not operate the brake lever when the callipers are removed. This can cause the brake pad pistons to come out.

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

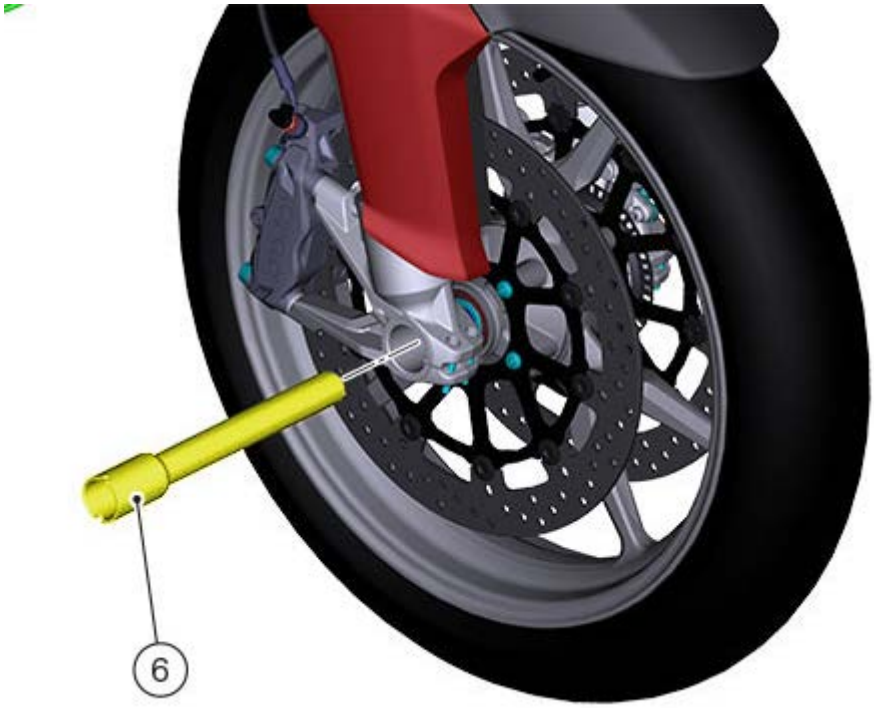




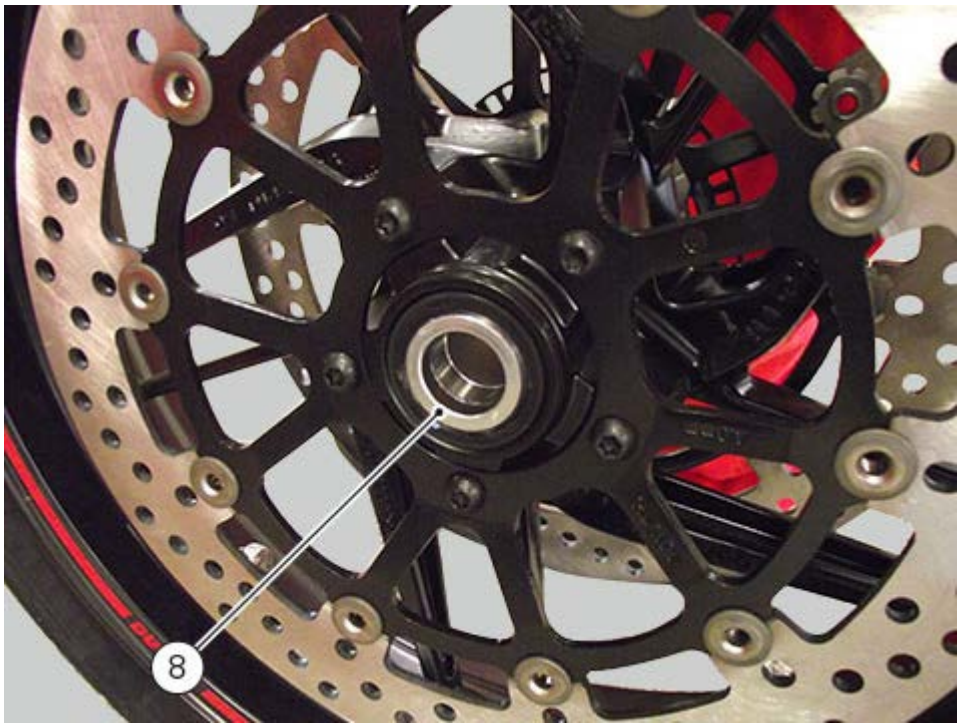
Loosen the wheel shaft retaining screws (5) on both fork bottom ends.



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

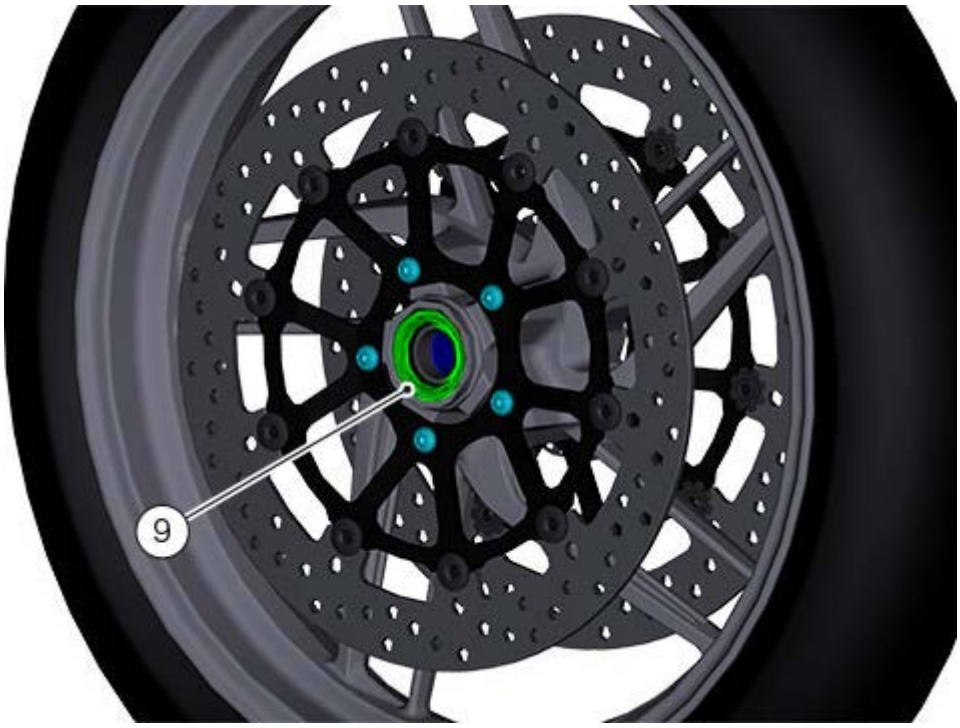


Remove the wheel and collect spacers (7) and (8).



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

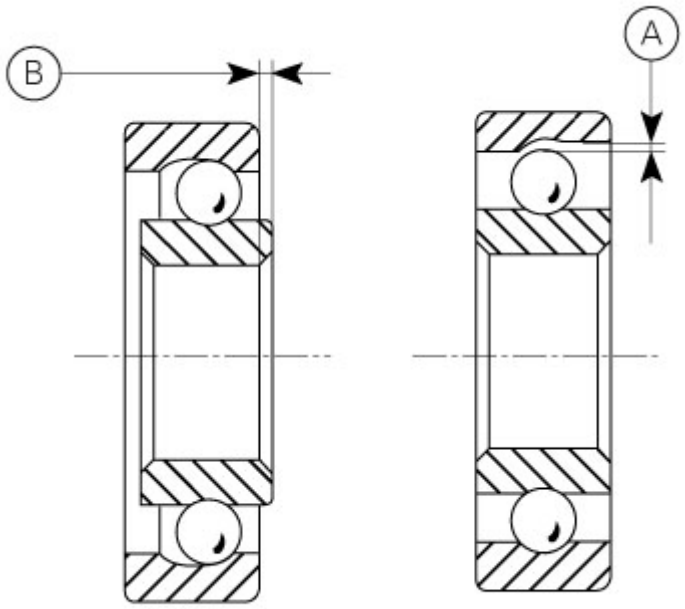

9


9

Overhauling the front wheel

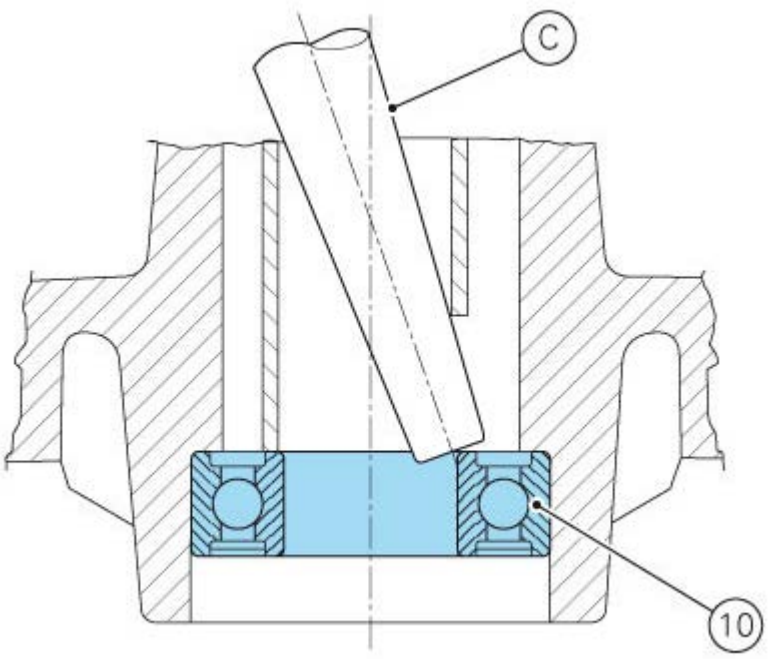
Wheel bearings

Before checking the dimensions, check for wear on wheel hub bearings. Check for wear by hand after cleaning and degreasing the bearings in their seats.
Turn the internal ring and check that the internal balls move freely: any irregularity indicates deformations like those indicated in values "A" and "B".
An excessive wear can cause vibrations and instability of the vehicle and therefore it is necessary to replace them.

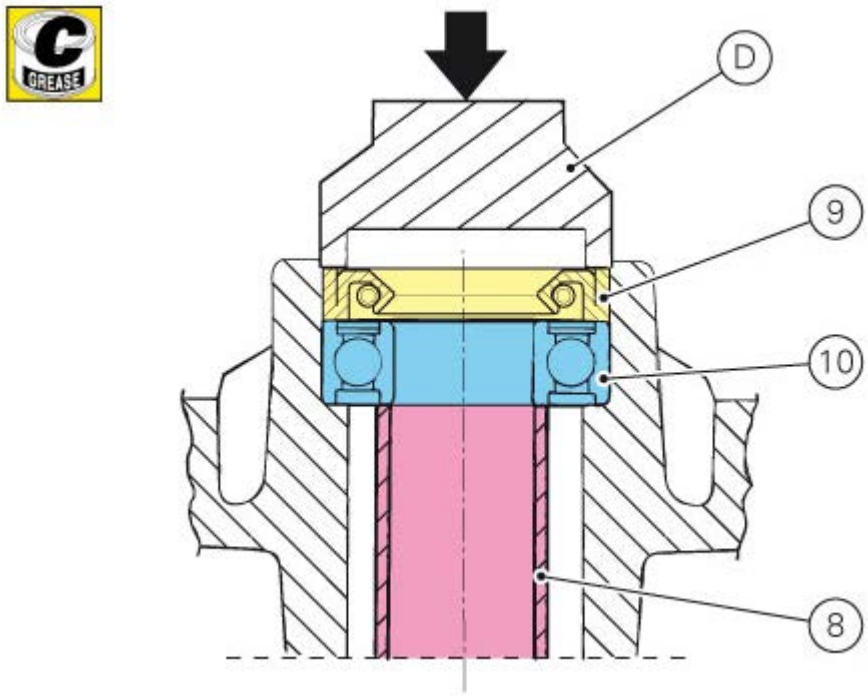


To remove the bearings and the sealing rings from the wheel hub follow the instructions below.
Position a drift (C) against the inner ring of the bearing (10).
Tap with a hammer until removing the bearing (10).
Apply the drift at different points to facilitate the removal.

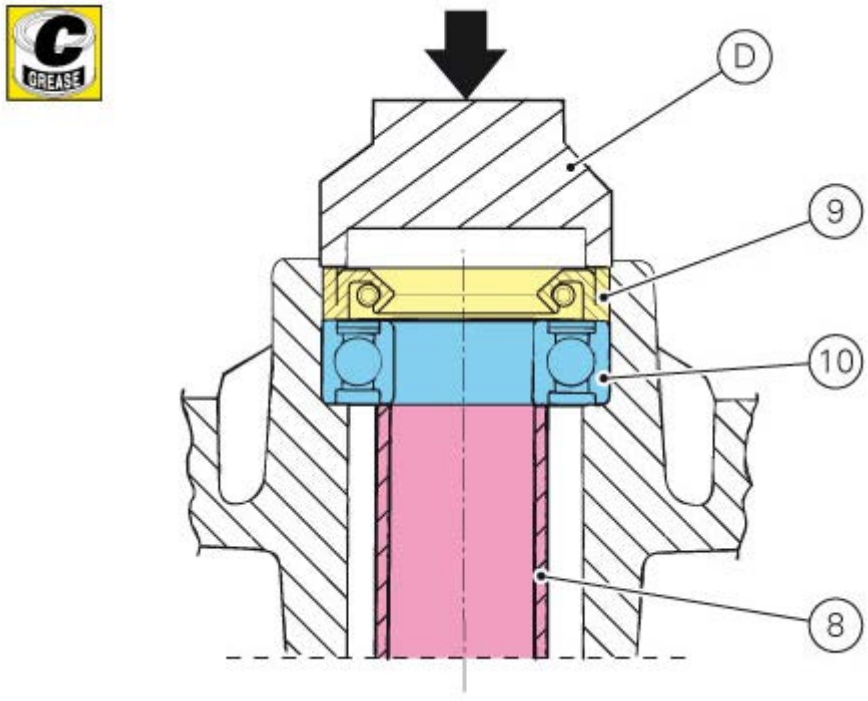
Important
Once removed, the used bearings and sealing rings must not be refitted.



Before fitting new bearings, check that the seat is clean and free from scoring and damage.
Grease the bearing seat and then push the new bearing into its seat.
Using a tubular drift (D) that only bears on the outer ring of the bearing (10) to drive the latter fully into its seat.



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

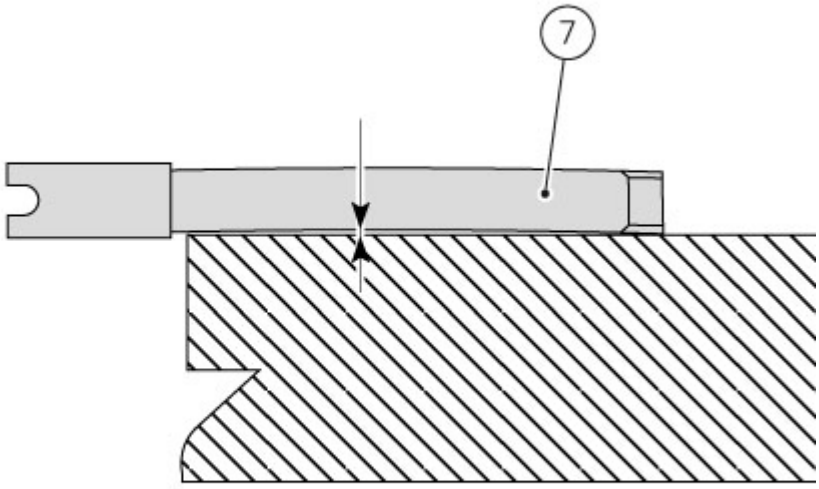


Note
Wheels must be rebalanced after repair, maintenance and overhaul operations.

Inspecting the wheel shaft

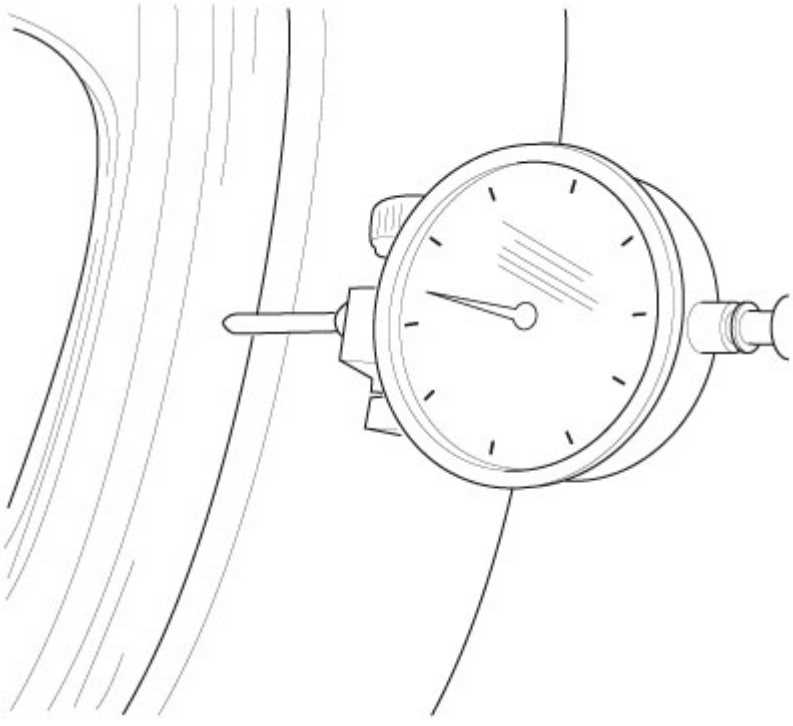
For the check values refer to paragraph (Front Wheel).

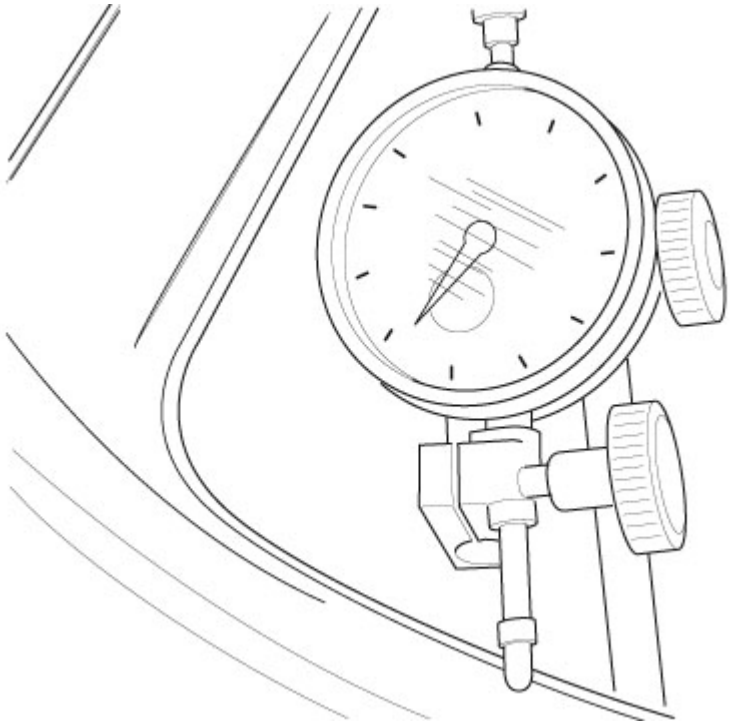
Check the wheel shaft (7) for straightness. Turn the shaft on a reference surface and measure maximum distortion using a feeler gauge.



Overhauling the wheel rim

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





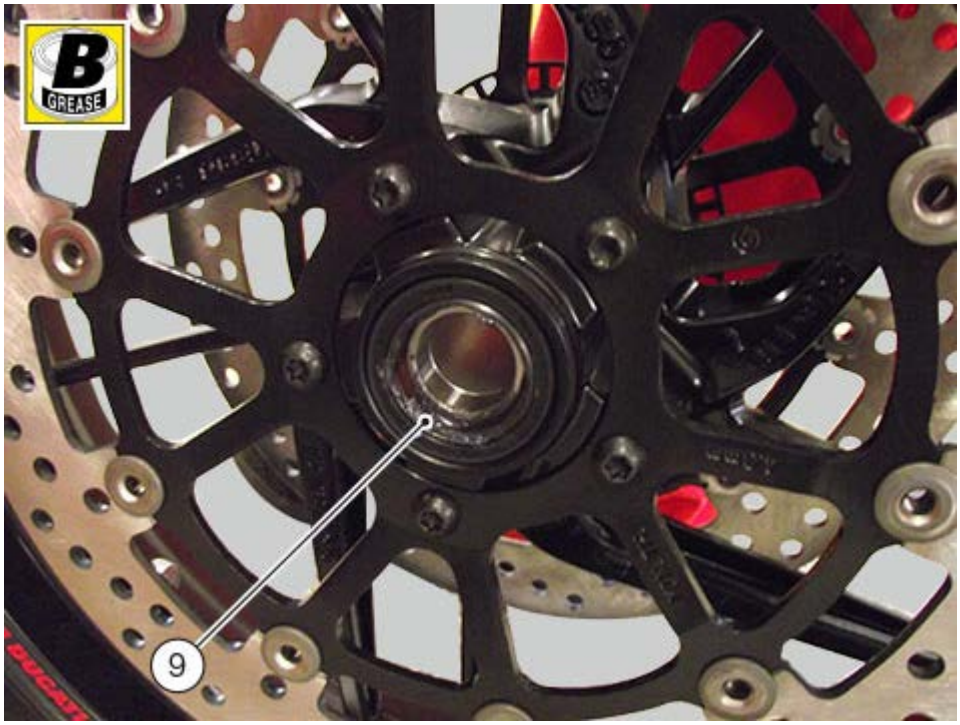
If the values measured are not within the tolerance limits, replace the wheel.

Refitting the front wheel

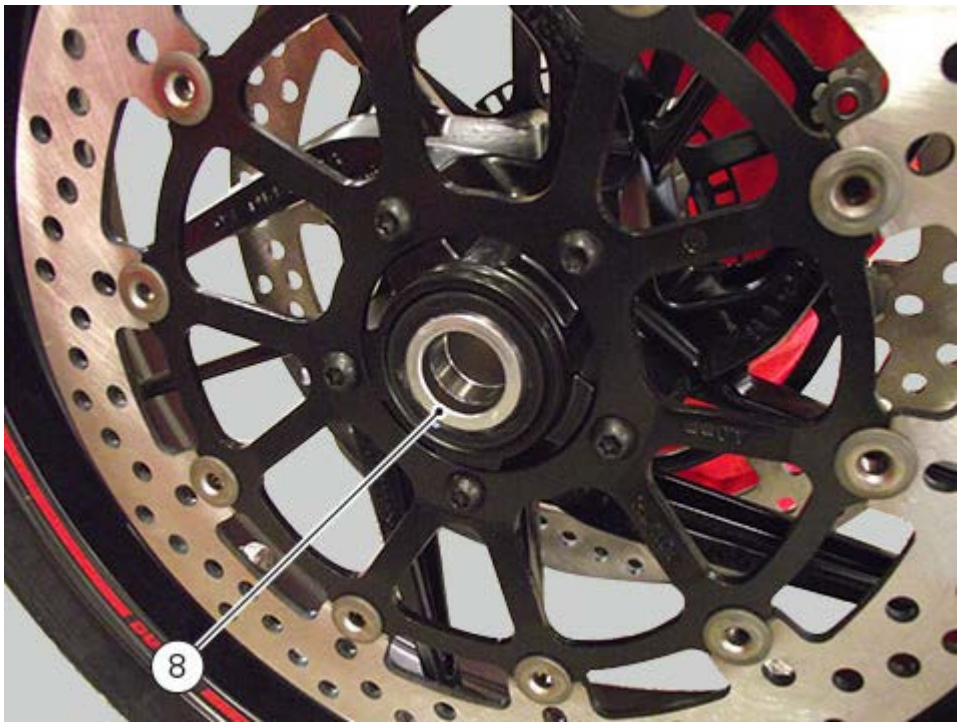
When all the necessary inspections have been completed, refit the wheel as follows.

Check the central spacer (8) is present on the wheel, see (Overhauling the front wheel).

On the right side, lubricate seal (9) using the specified product.



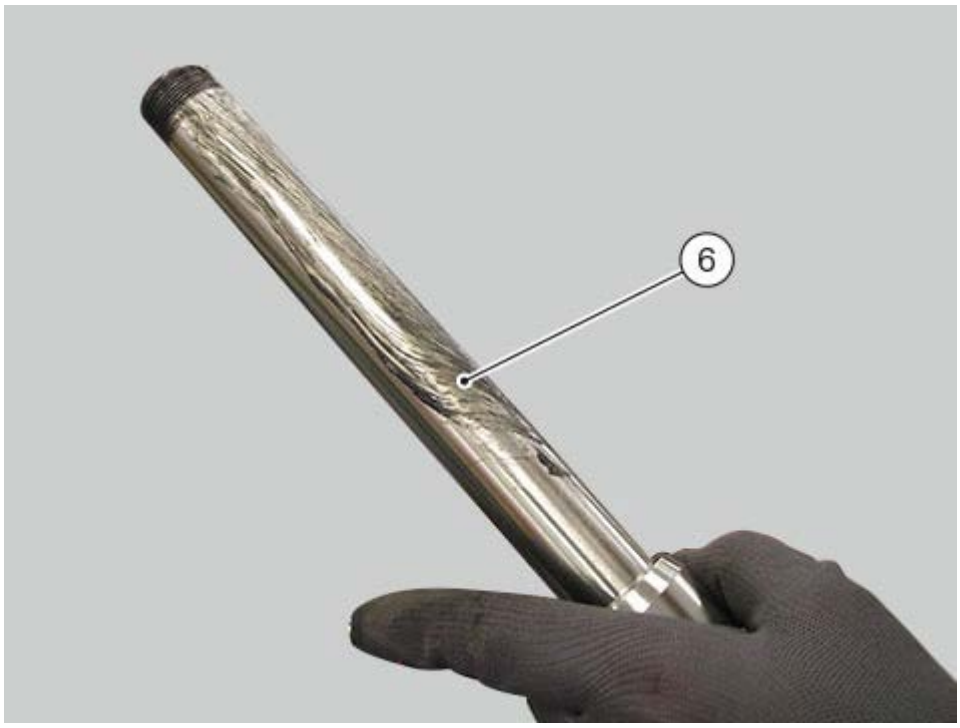
Fit spacer (8).



From the left side, lubricate spacer (7) with the specified product.

Fit spacer (7) in the wheel.

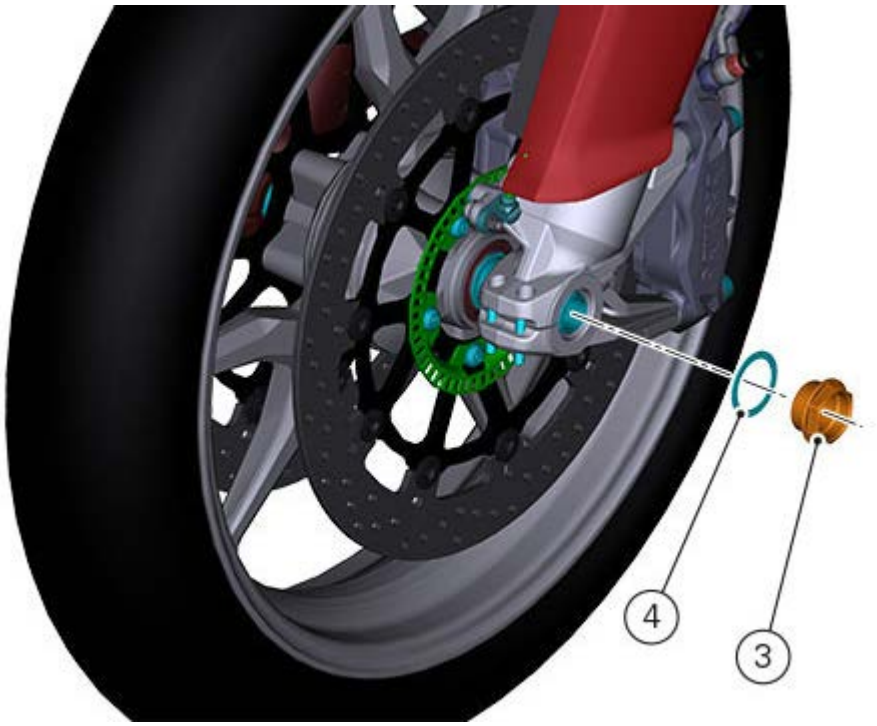
Apply the recommended grease on wheel shaft (6), thread included.

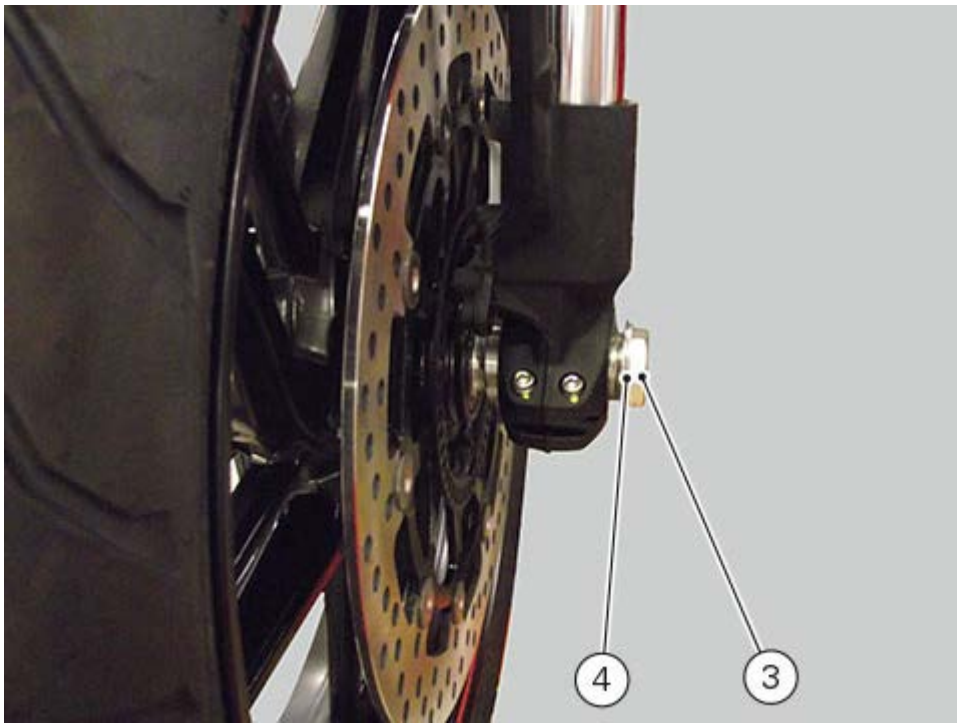


Fit the complete wheel between the fork bottom ends.
Take pin (6) fully home into the wheel hub.

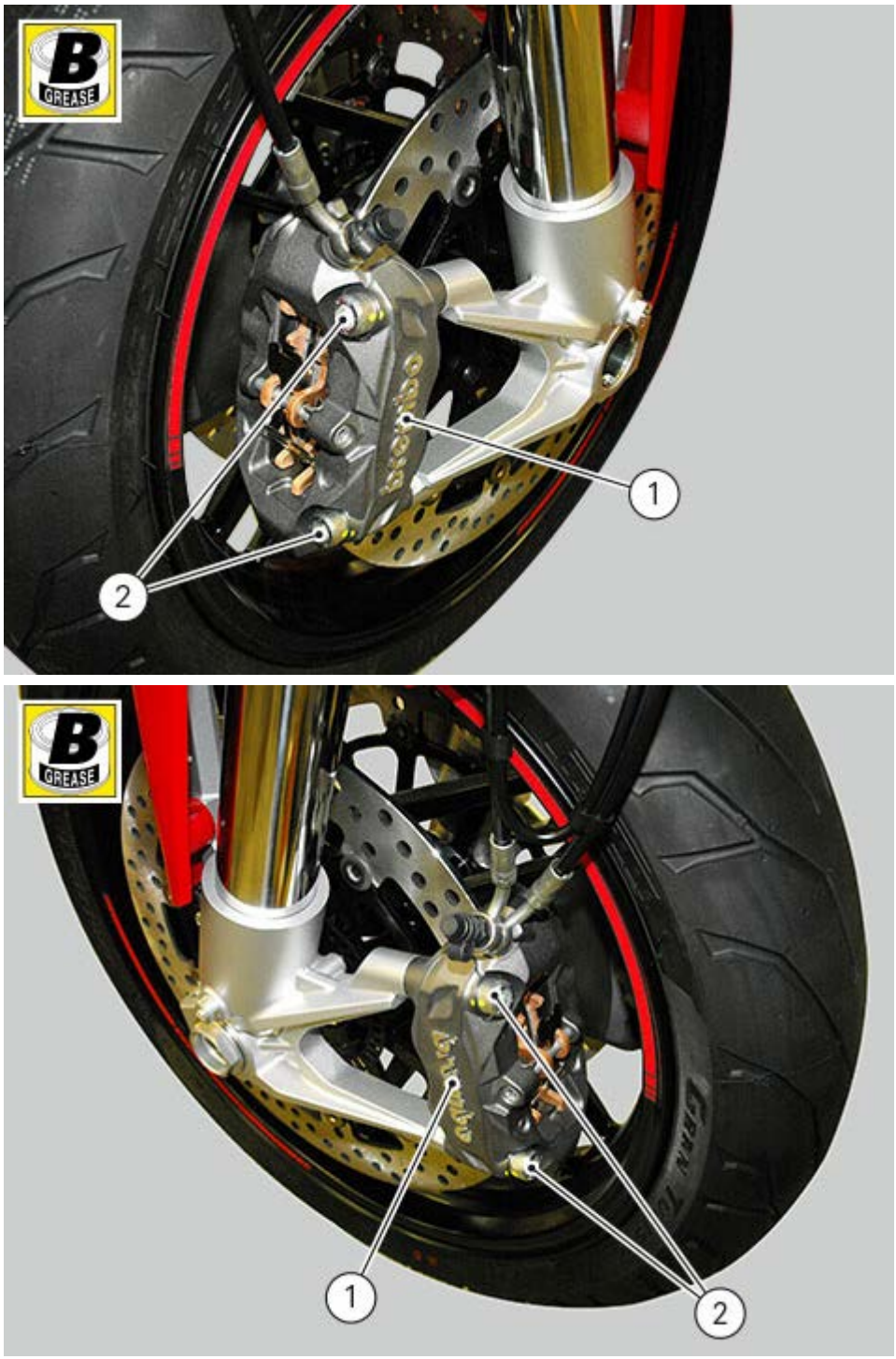
Fit the washer (4) on the end of the wheel shaft.
Use the indicated product to grease the thread and underhead of the retaining nut (3).

Fit nut (3) without tightening it to torque.





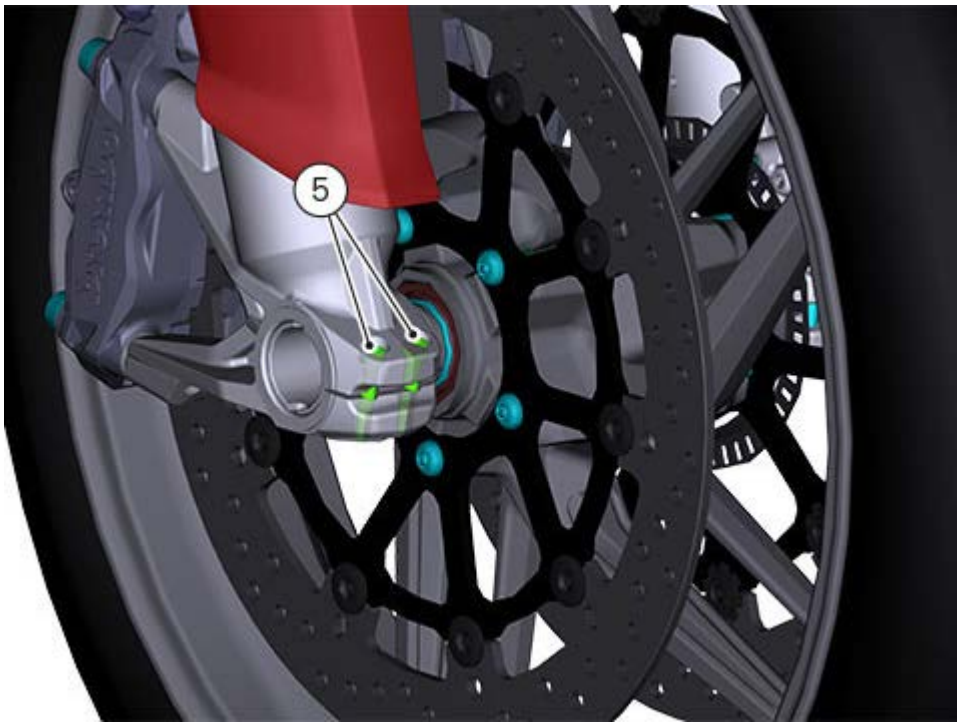
Apply the recommended grease to the thread and underhead of screws (2) retaining calliper (1).
Pre-tighten the two screws (2) to a torque of 2 Nm ± 10%.
Pull the brake lever many times.
Hold the lever pulled towards the handgrip and simultaneously tighten the screws (2) to a torque of 45 Nm ± 5%.

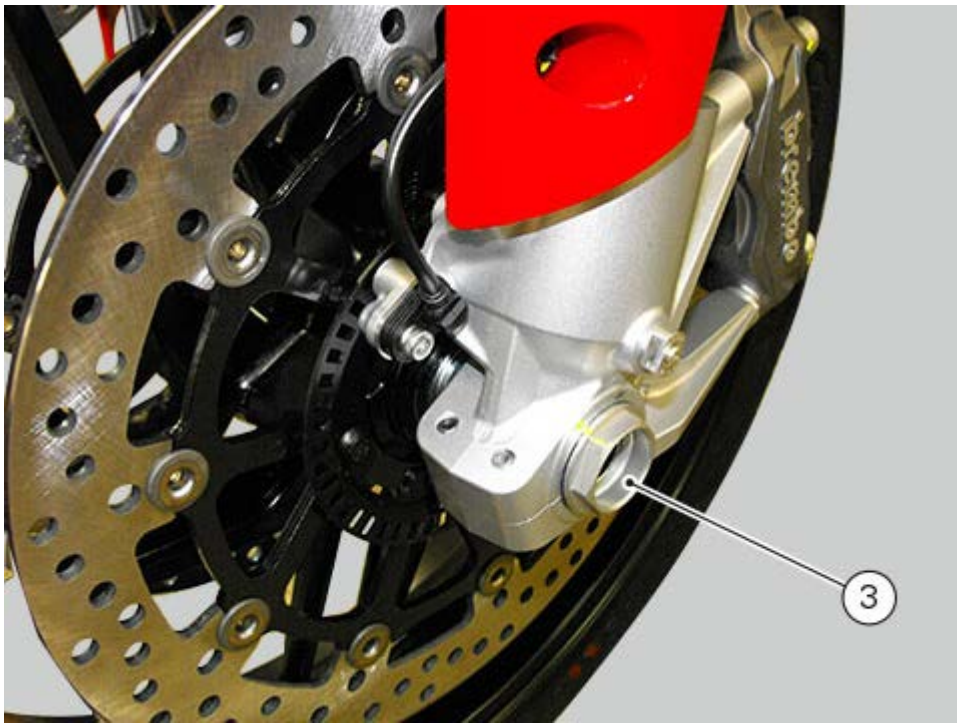


S Version

Apply the recommended grease to the thread and underhead of screws (2) retaining calliper (1).
Fit the two spacers (A).
Pre-tighten the two screws (2) to a torque of 2 Nm ± 10%.
Pull the brake lever many times.
Hold the lever pulled towards the handgrip and simultaneously tighten the screws (2) to a torque of 45 Nm ± 5%.

Tighten the screws (5) on the vehicle right side to a torque of 10 Nm ± 5%, following a 1-2-1 sequence.
Tighten nut (3) to a torque of 63 Nm ± 5%.

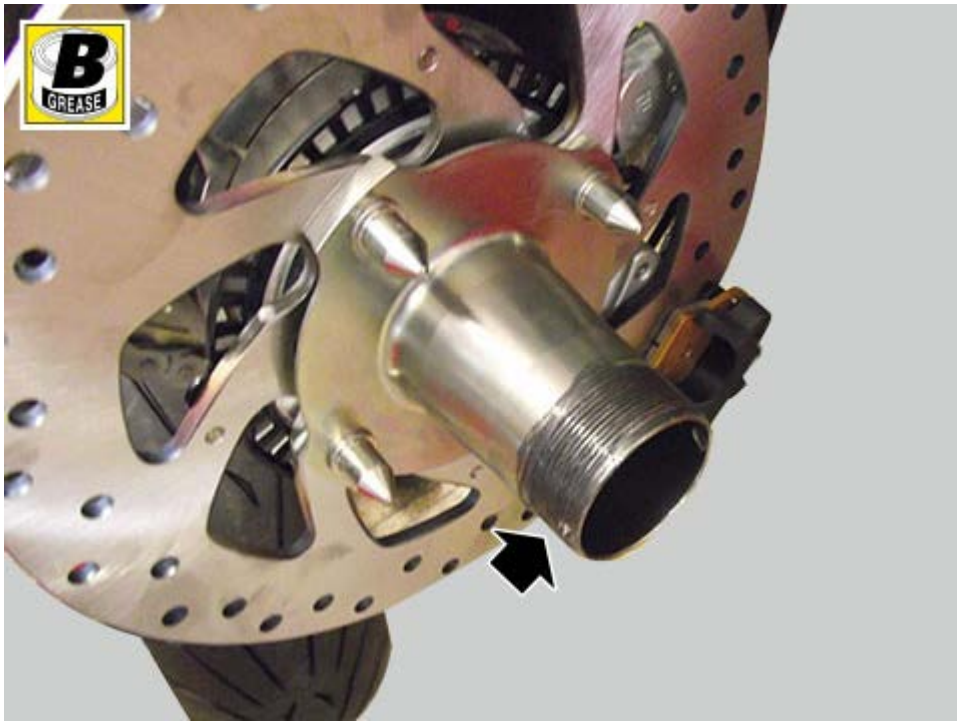




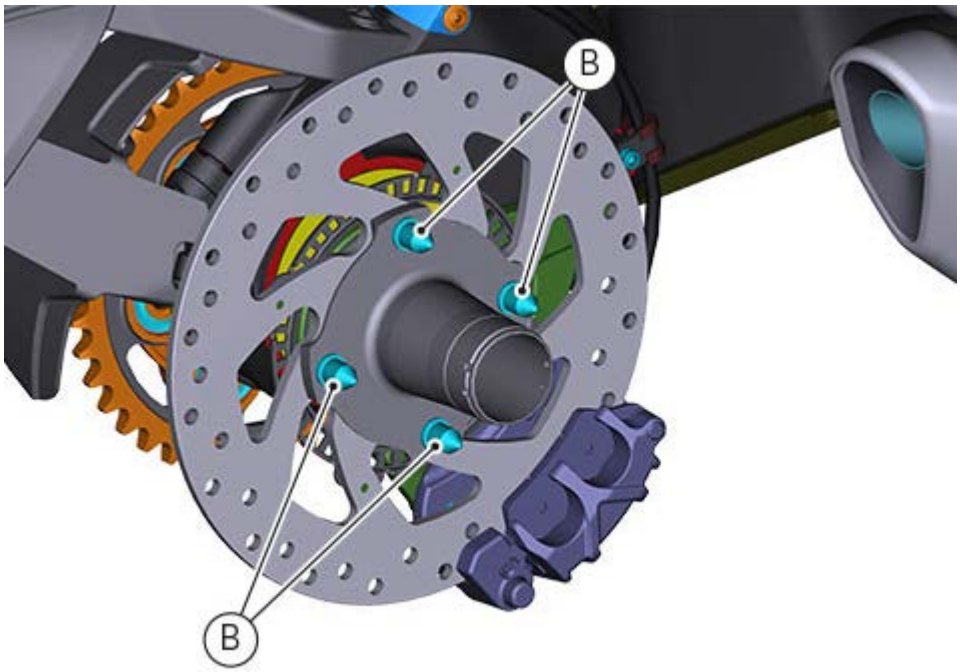
Loosen screws (5) that have been previously tightened to torque.
Lower the motorcycle to the ground and push up and down the handlebars to load the suspension; so the fork bottom ends will become properly seated onto the wheel shaft.
Tighten the screws (5) on both sides to a torque of 10 Nm ± 5%, following a 1-2-1 sequence.

Refitting the rear wheel

Lubricate the wheel shaft threaded end with indicated grease.

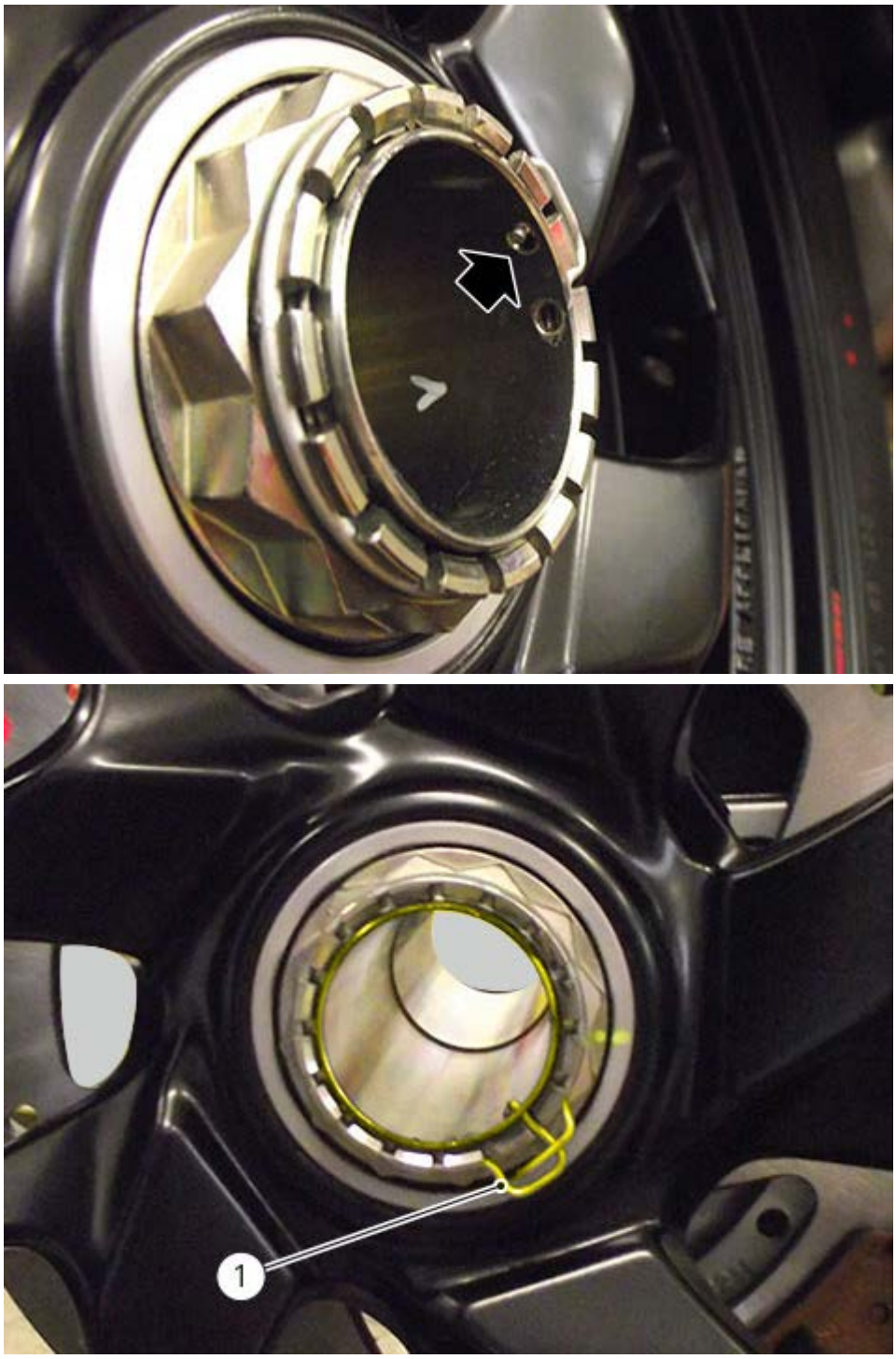


Fit the wheel shaft by matching holes (A) on the rear rim with pins (B) on the rear hub.

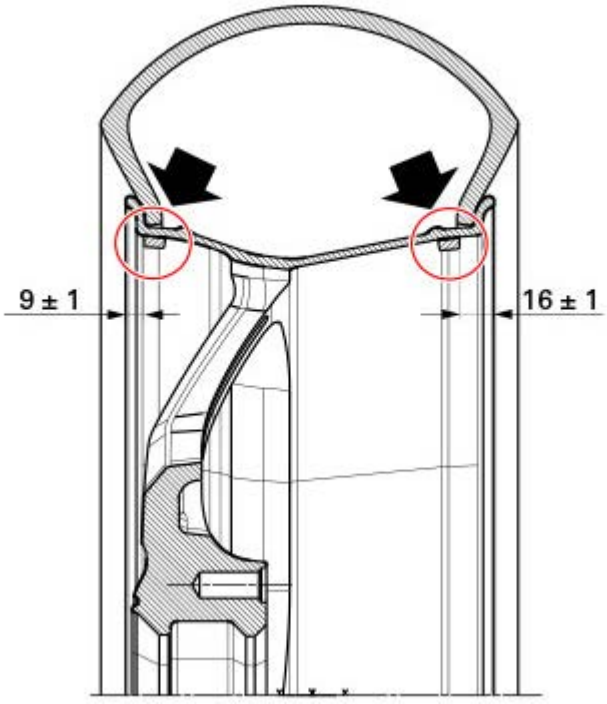


Install spacer (4), with the tapered surface facing the wheel, and washer (3).
Tighten the nut (2) to a torque of 230 Nm ± 10%, checking that the hole on the nut is aligned with one of those on the wheel shaft.

Fit the clip (1), fitting the end into one of the holes in the shaft, orienting it as shown in the figure.



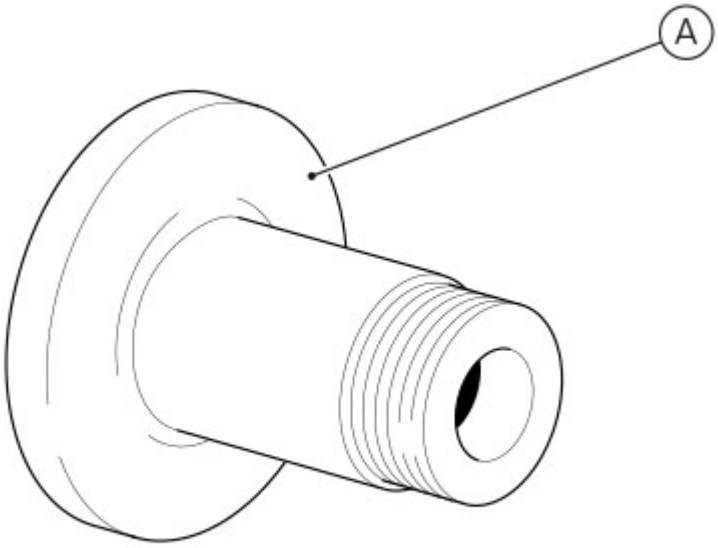
In case of tyre replacement fit the counter-weights by respecting the values indicated in the figure.


9 ± 1
16 ± 1

Overhauling the rear wheel

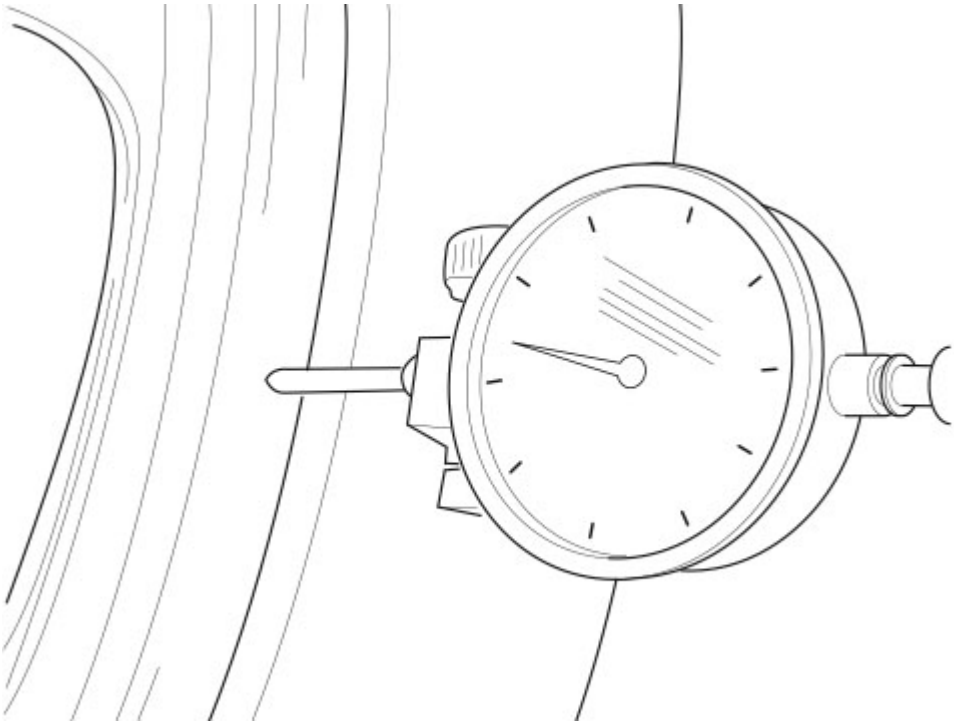
Check wheel rim conditions.
As the wheel rim has no bearings, it should be supported using the service tool (A) no. **88713.2951**.

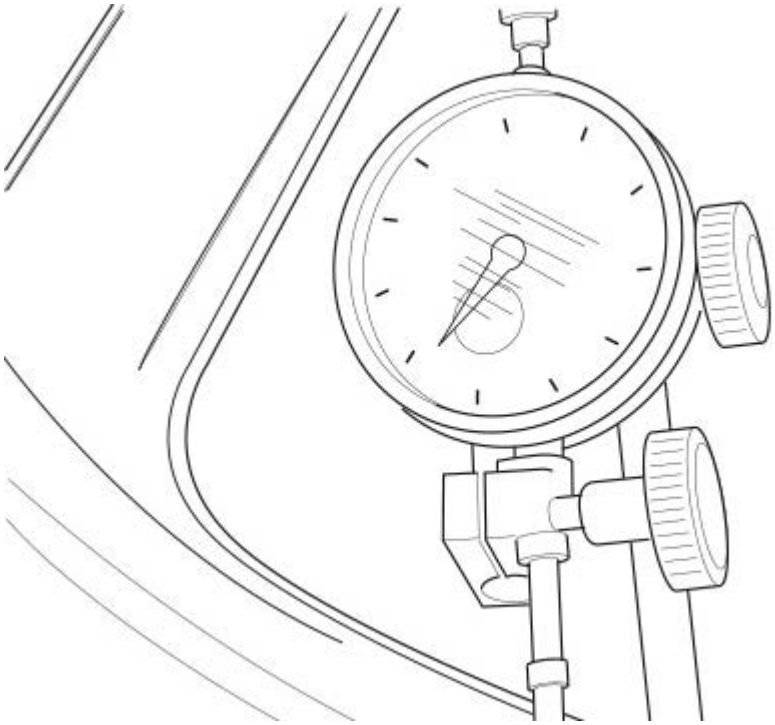
Note
The service pin mentioned above allows fitting the wheel on the balancing machine.



Overhauling the wheel rim

Inspect the wheel rim as follows.
Visually inspect the rim for cracks, scoring and deformation: change the rim if damaged.
Fit the wheel rim on the service shaft no. **88713.2951** using the original fasteners.
Using a dial gauge, duly supported, measure rim runout and out-of-round relative to the shaft axis (Rear wheel).
If the values measured are not within the tolerance limits, replace the wheel.

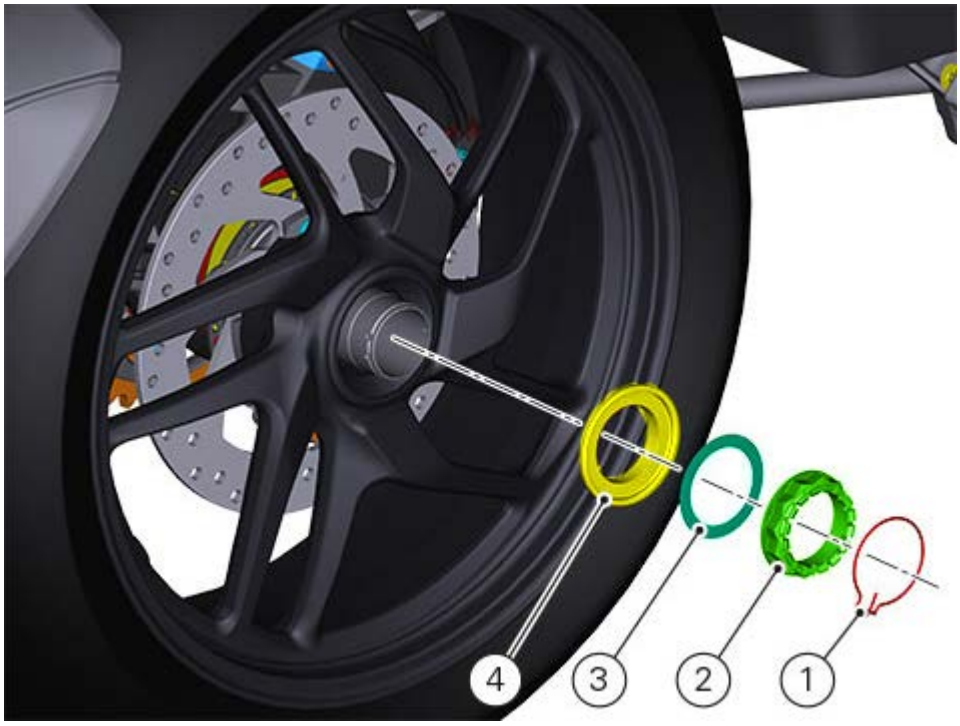


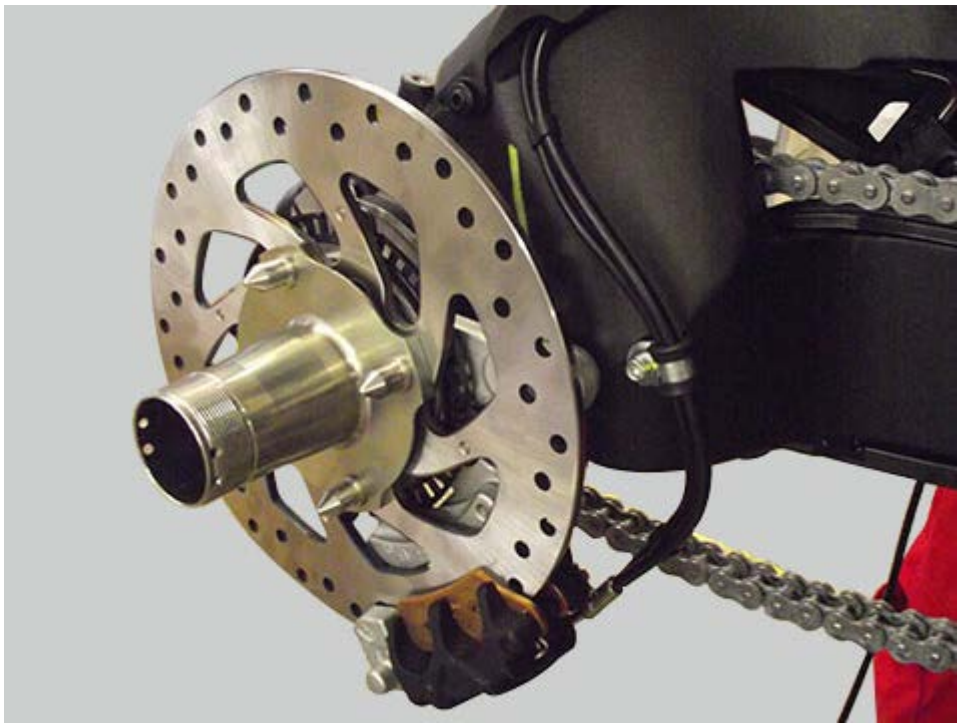


Removing the rear wheel

Remove the silencer. (Removing the silencer)

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





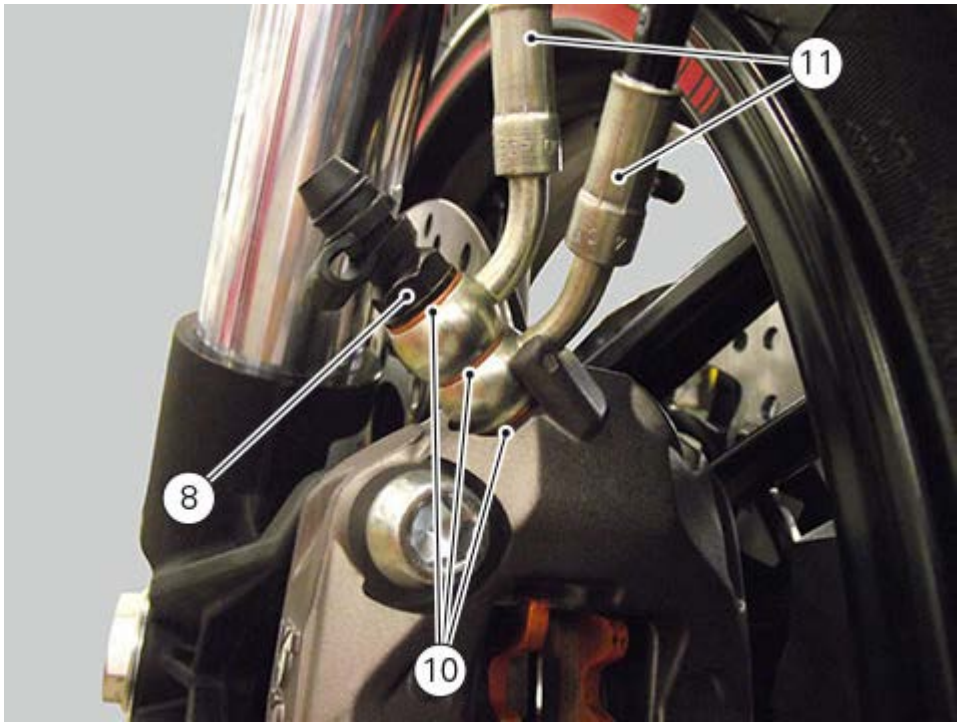
Refitting the front brake system

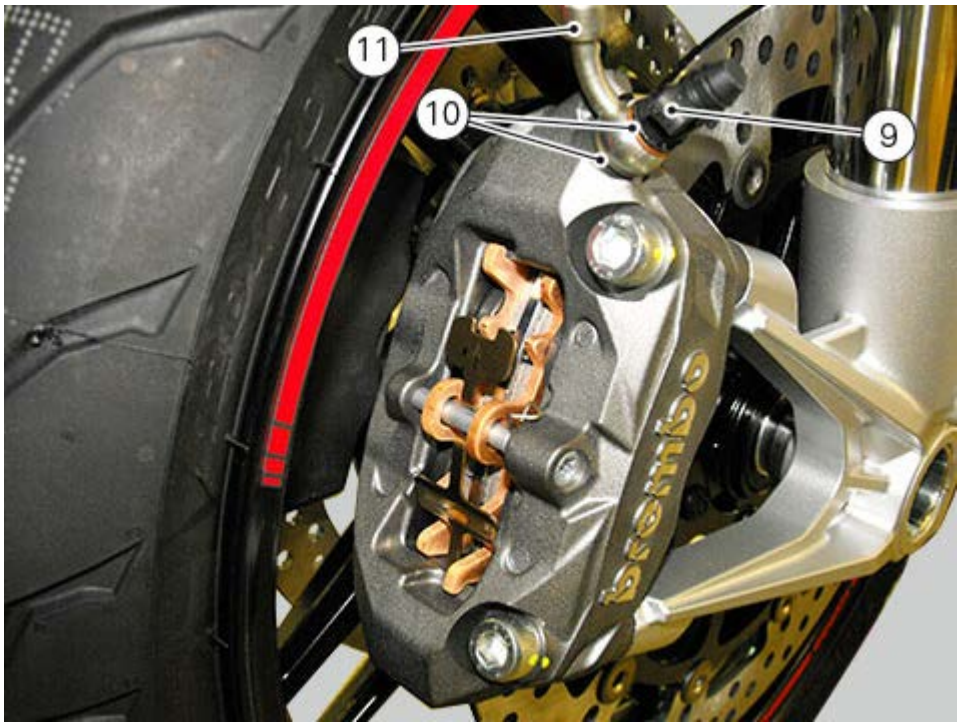
Warning
The following procedure applies to both vehicle versions.

Upon the system refitting, pay attention to the orientation of the hose unions (11), (13) and (14).

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

After having aimed the hose unions (11) on the front brake callipers (13) and (14), tighten special screws (8) and (9) to the torque of 23 Nm ±10%.



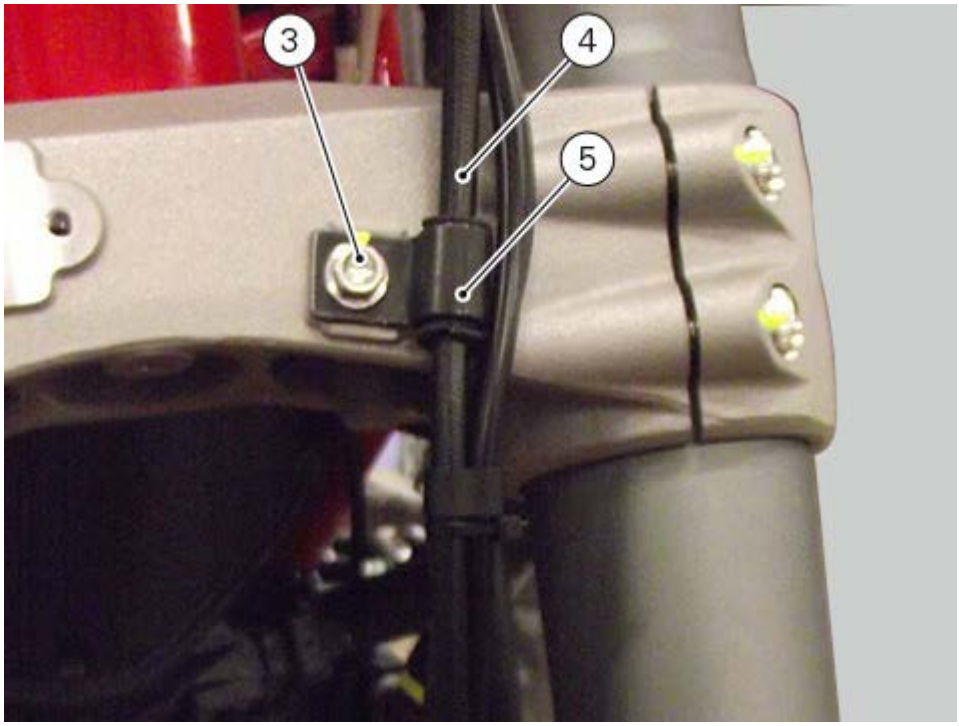


Insert the LH (13) and RH (14) brake callipers on the relevant discs.
Apply the specified grease to screws (12).
Start screws (12) to secure the callipers to the fork legs.

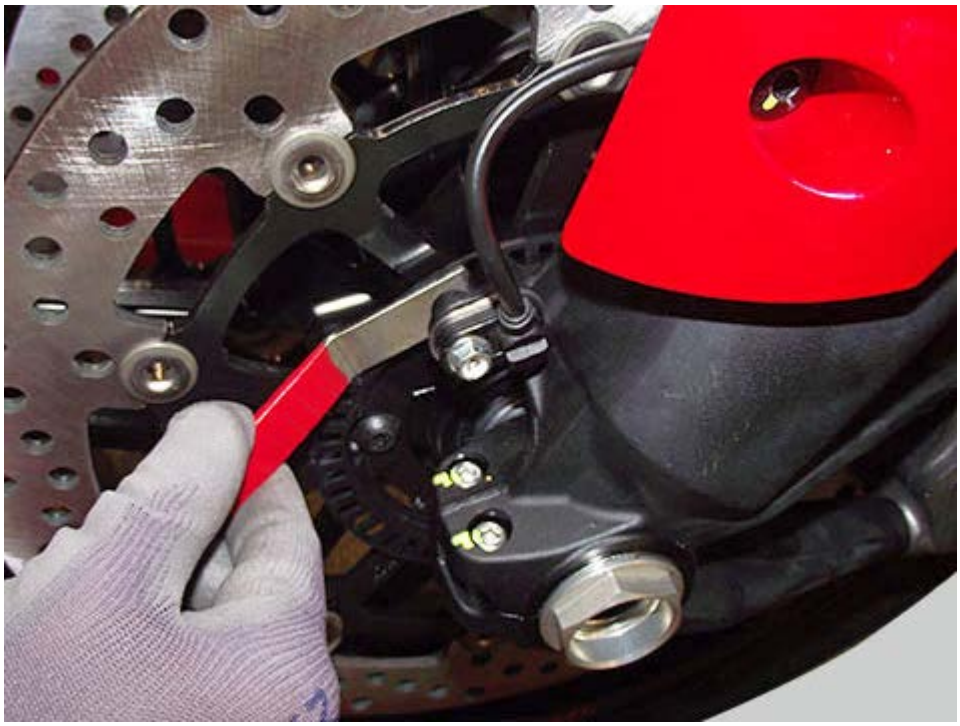
Operate the brake lever two or three times to pressurise the circuit so that the brake pads are brought into contact with the brake disc.

Hold the lever pulled towards the handgrip and simultaneously tighten the calliper screws (12) to a torque of 45 Nm ± 5%.
Refit the front brake hose protection (7) by starting and fitting screws (6) to a torque of 3.5 Nm ± 10%.

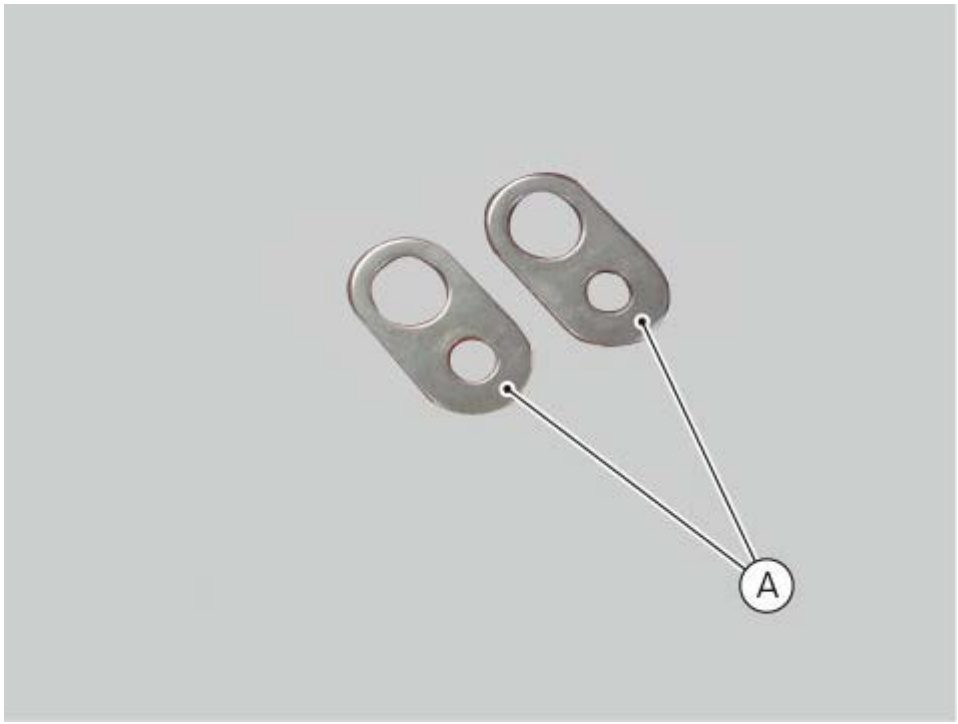
Position the front brake hose (4) on bracket (5).
Tighten screw (3) to a torque of 10 Nm ±5%.



If the speed sensor has been removed, it will be necessary to adjust the AIR-GAP.
There must be a gap between ABS sensor and phonic wheel of 1.3 mm to 1.9 mm. To check it, use a suitable feeler gauge.



Tighten the sensor securing screw fully home every time you add or remove shims.
Once the shimming is completed, tighten the sensor retaining screw to a torque of 10 Nm ± 10%.
For the shimming, use two feeler gauges (A) of 0.2 mm and 0.5 mm.



Warning
Shim pack shall never exceed 3 mm.

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

Refit the front brake master cylinder (Refitting the front brake master cylinder).
Fill the front braking system (Changing the front brake system fluid).

Refitting the brake discs

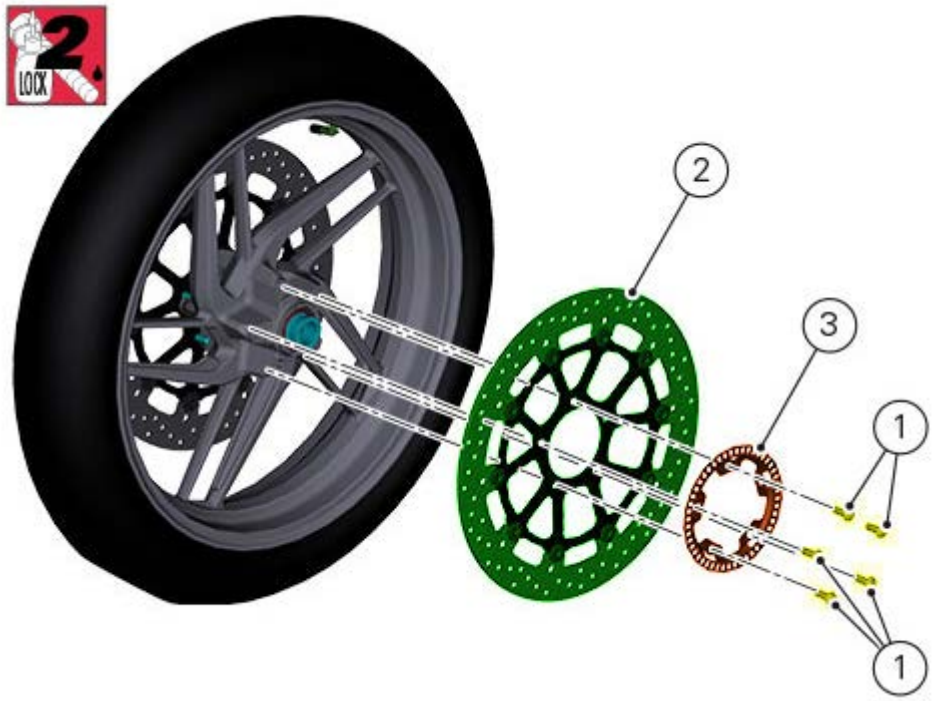
Warning

The following procedure applies to both vehicle versions.

Before refitting the brake disc to the wheel, clean all contact surfaces thoroughly and apply the indicated threadlocker on the threads of retaining screws (1).

LEFT SIDE

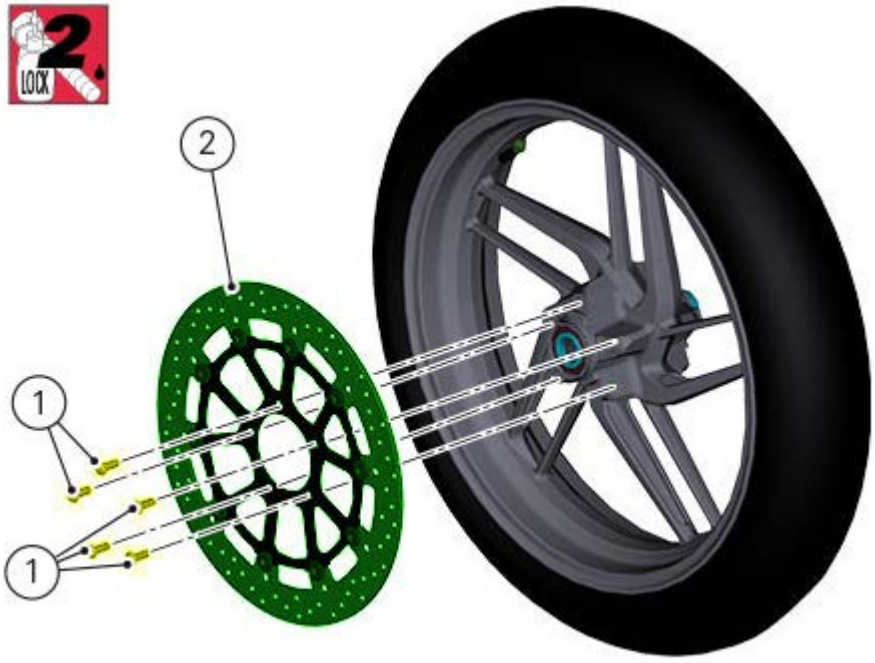
Fit the phonic wheel (3).
Tighten the screws (1) retaining the brake disc (2) to the wheel following this sequence: 1-3-5-2-4.



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

RIGHT SIDE

Follow the same procedure performed for the LH disc, except for the indications regarding the phonic wheel.



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

Overhauling the front brake components

Important

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

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

Removing the brake discs

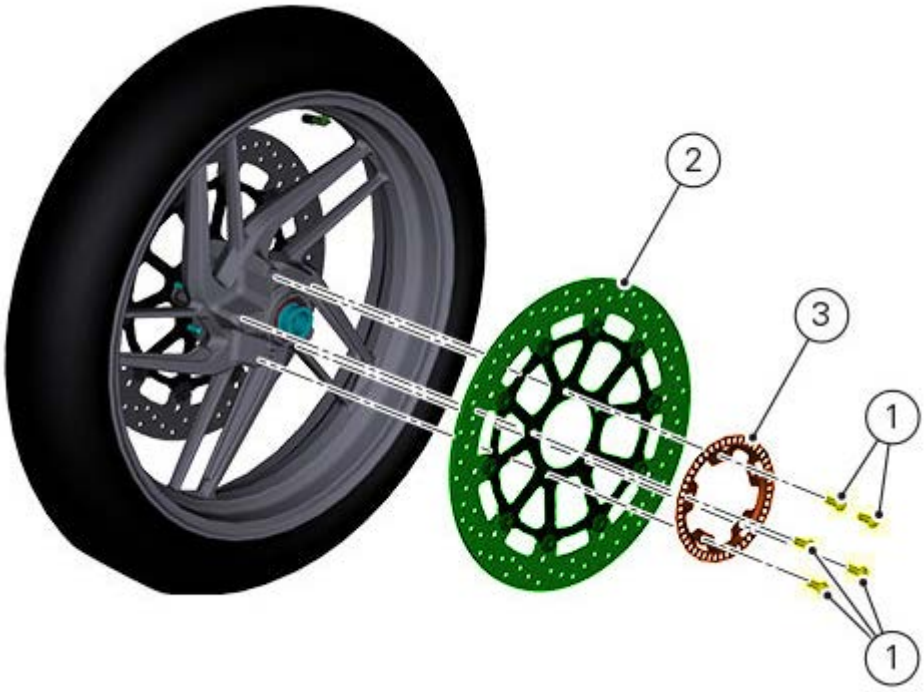
Warning

The following procedure applies to both vehicle versions.

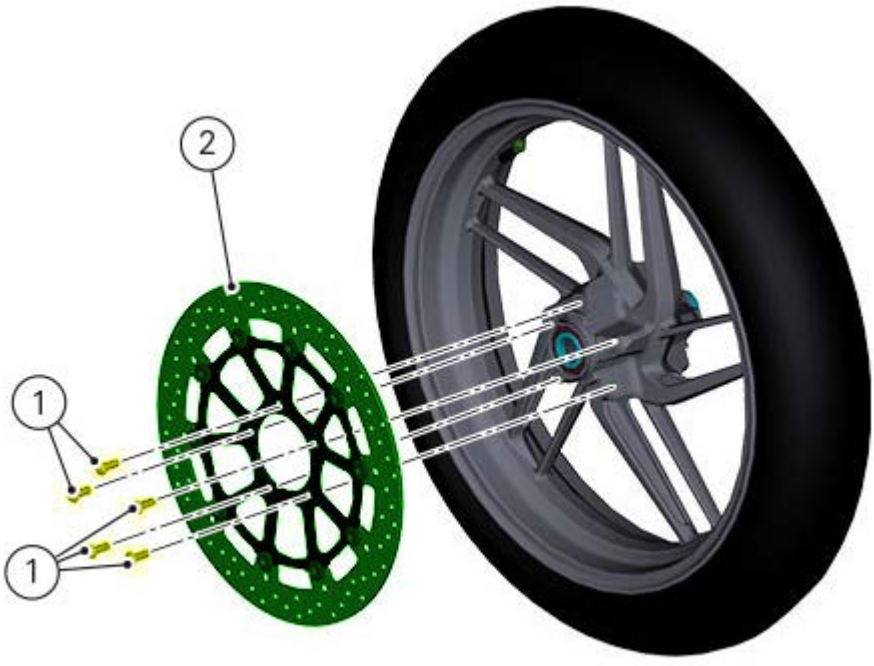
The front brake discs consist of an inner carrier, which is mounted to the wheel, and an outer rotor. Both parts must be replaced together as a pair.

Remove the front wheel (Removing the front wheel).
Undo the screws (1) securing the brake disc to the wheel, remove disc (2). From the left side, remove also the phonic wheel (3).

LEFT SIDE



RIGHT SIDE



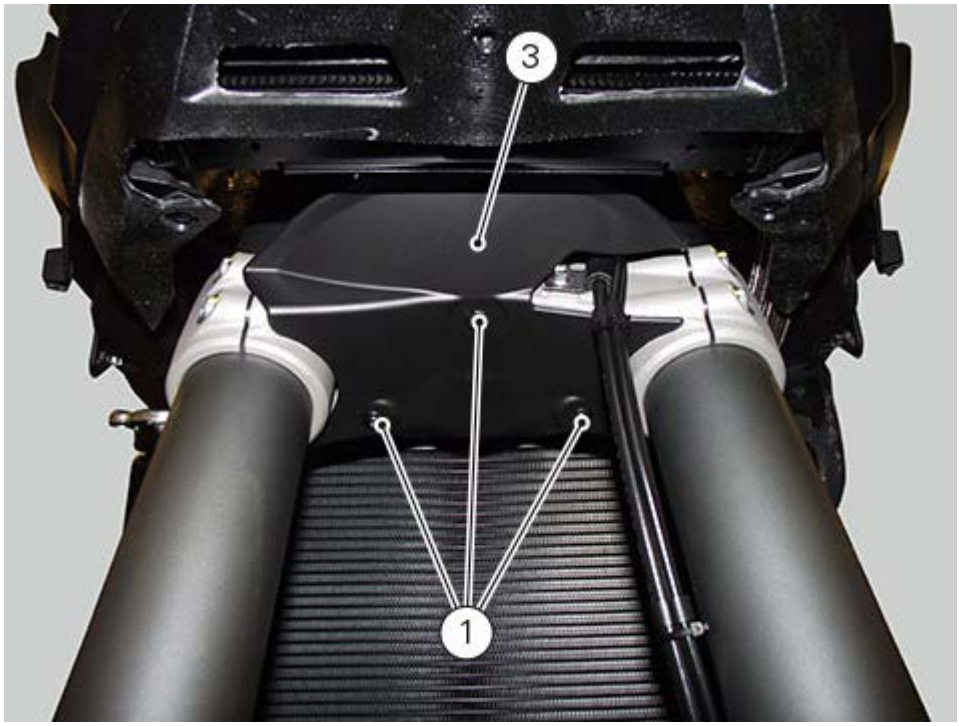
Removing the front brake system

Warning

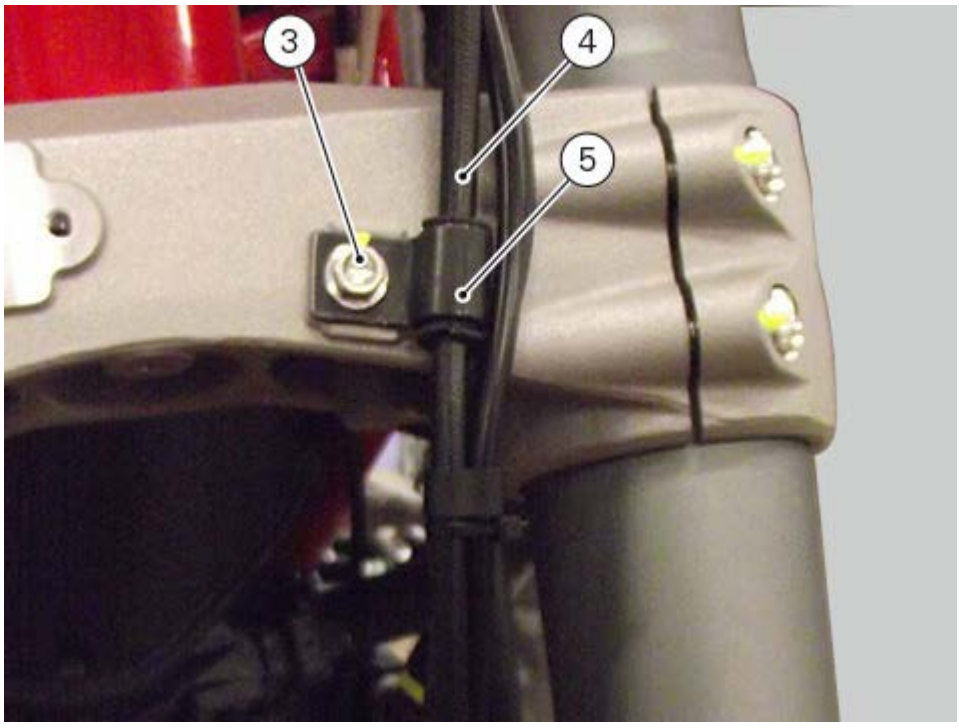
The following procedure applies to both vehicle versions.

Drain the front braking system (Changing the front brake system fluid).
Remove the front brake master cylinder (Removing the hydraulic front brake master cylinder).

Loosen the screws (1) and remove the protection (2).

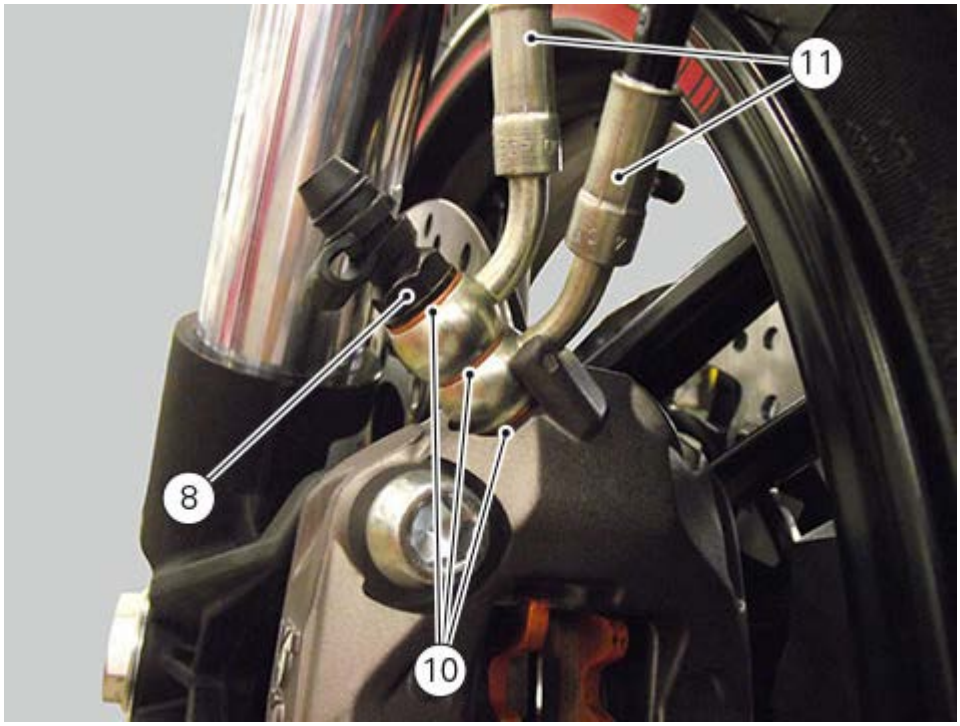


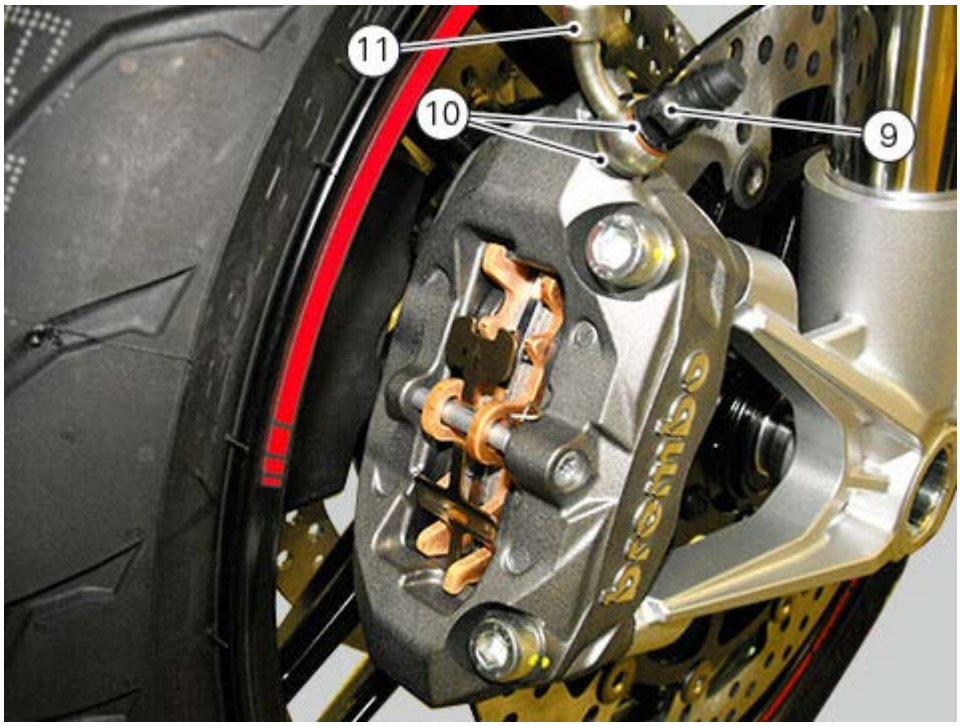
Undo the screw (3) and slide the front brake hose (4) from the hose grommet (5) on the bottom yoke.



Loosen screws (7) and remove the front brake hose protection (6).

Undo the special screws (8) and (9) from both callipers and collect the seals (10).
Remove the front brake callipers from hoses (4) and (11).





Loosen the two retaining screws (12) securing the left front brake calliper (13) to the fork leg. Repeat the operation for the right brake calliper (14).


12
14
brembo

Maintenance operations

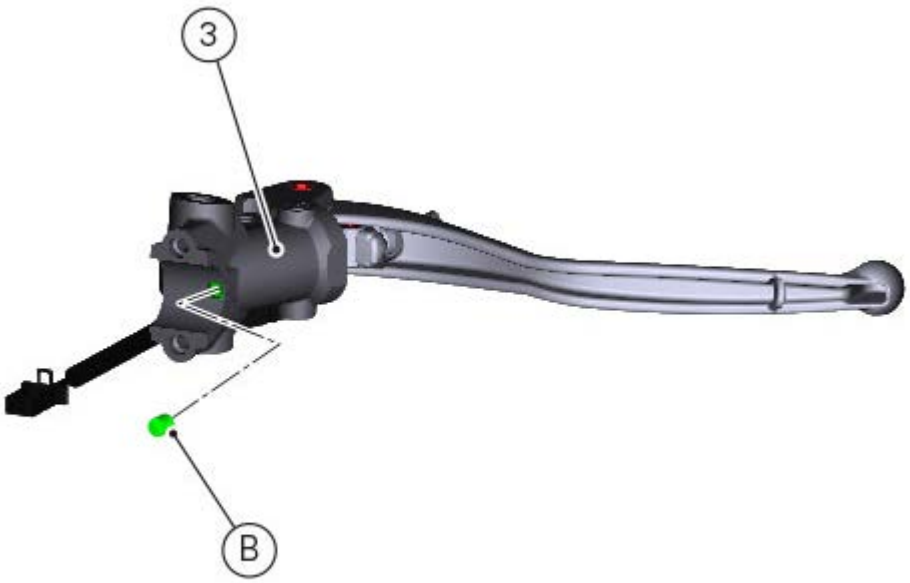
 Warning

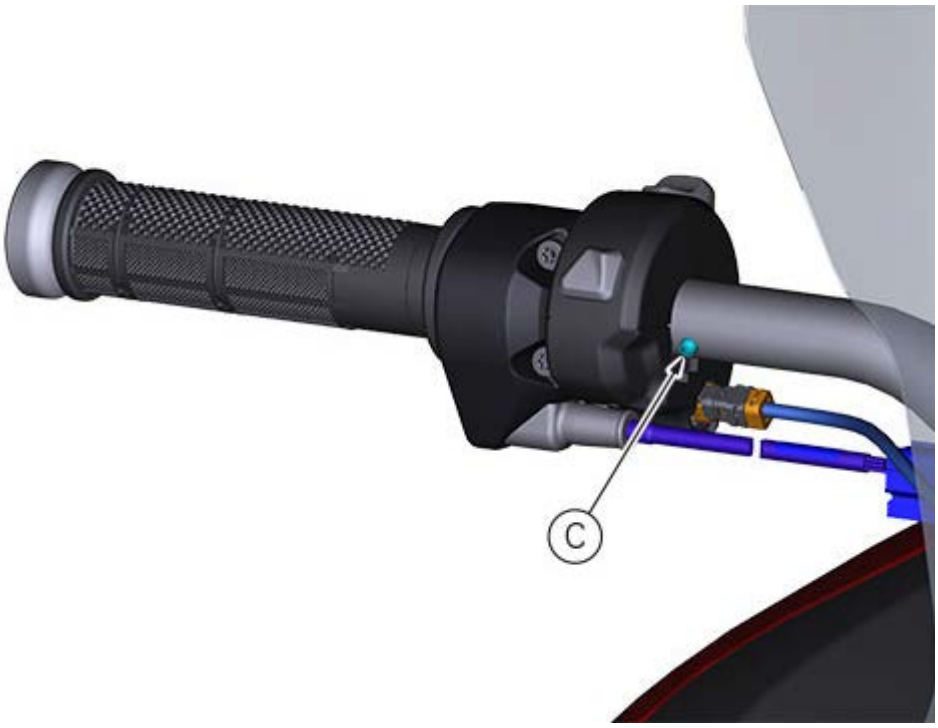
Brake fluid is corrosive and will damage paint. Avoid contact with eyes and skin. In case of accidental contact, wash thoroughly with water.

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

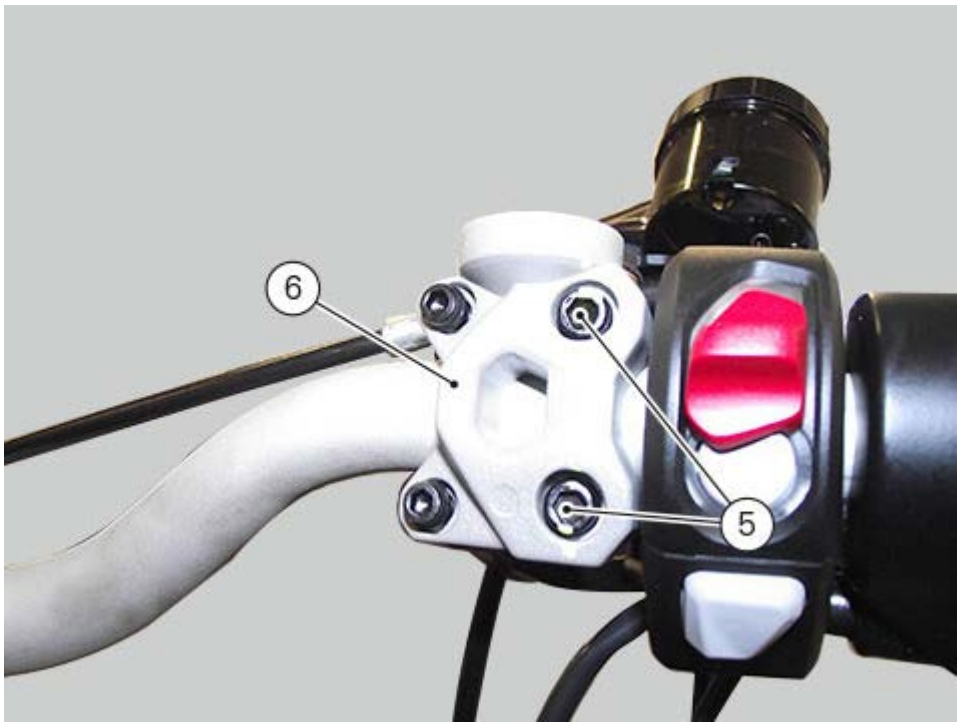
Refitting the front brake master cylinder

Reposition the front brake master cylinder assembly (3) on the handlebar by inserting pin (B) in the relevant seat (C) of the handlebar.



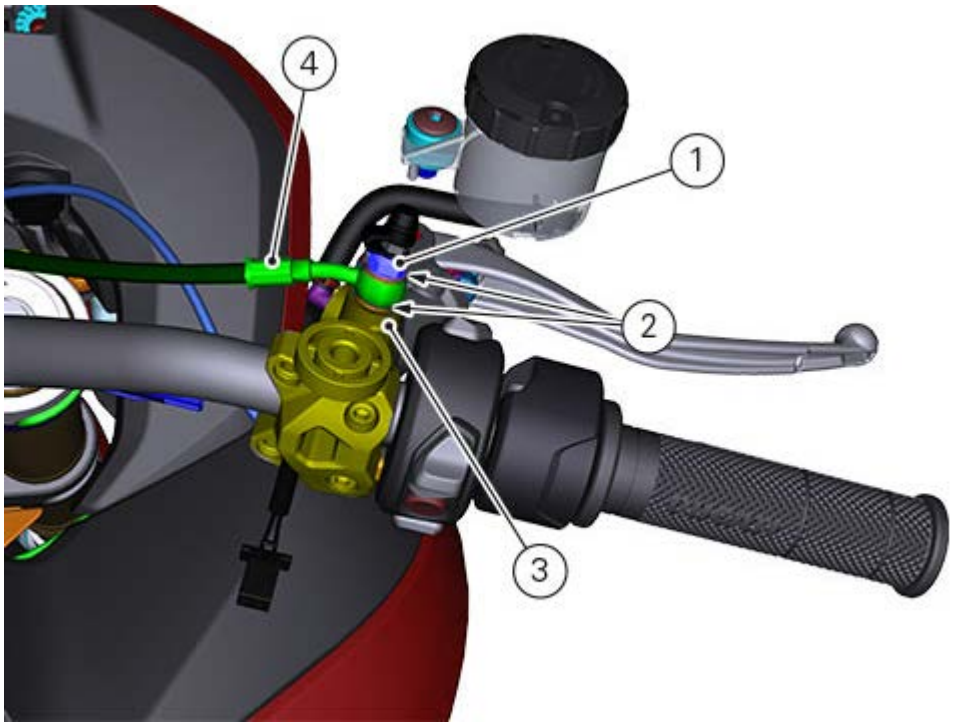


Position U-bolt (6) on the handlebar by starting the screws (5) as shown in the figure.
Tighten the fastening screws (5) to the specified torque of 10 Nm ± 10% following the sequence 1-2-1 starting from the upper screw.



Connect the front brake switch connector (A) to the main wiring harness.

Position the hose (4) and sealing washers (2) on the master cylinder unit (3) and secure with the special screw (1), without tightening.
Tighten the special screw (1) to a torque of 23 Nm ± 10%.



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

For the positioning of the hose (4) and retaining ties, see Section "Routing wiring/hoses".

Refit the RH switch.
Refit the rear-view mirrors (Refitting the rear-view mirrors).
Fill in the braking system (Changing the front brake system fluid).
Refit the tank filler plug cover (Refitting the tank fairings).

Removing the front brake master cylinder

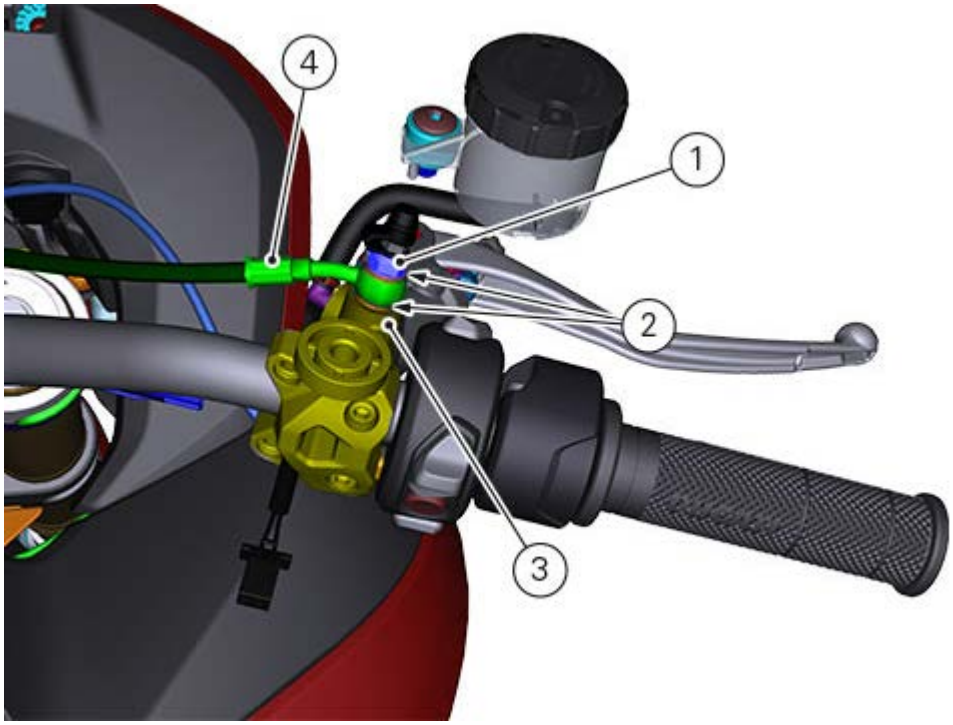
Warning

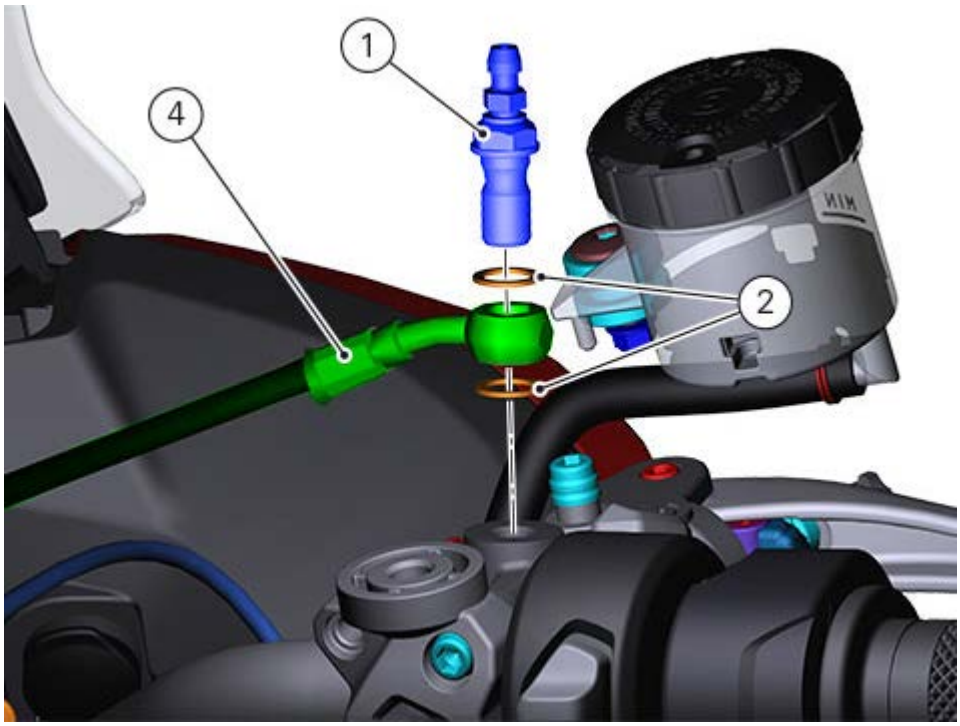
The brake master cylinder manufacturer advises against servicing the brake master cylinder due to the safety critical nature of this component. Incorrect overhaul can endanger rider and passenger safety. Maintenance operations on these units are limited to replacement of the following parts: control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

Drain the braking system (Changing the front brake system fluid).
Remove the rear-view mirrors (Removing the rear-view mirrors).
Remove the tank filler plug cover (Removing the tank fairings).

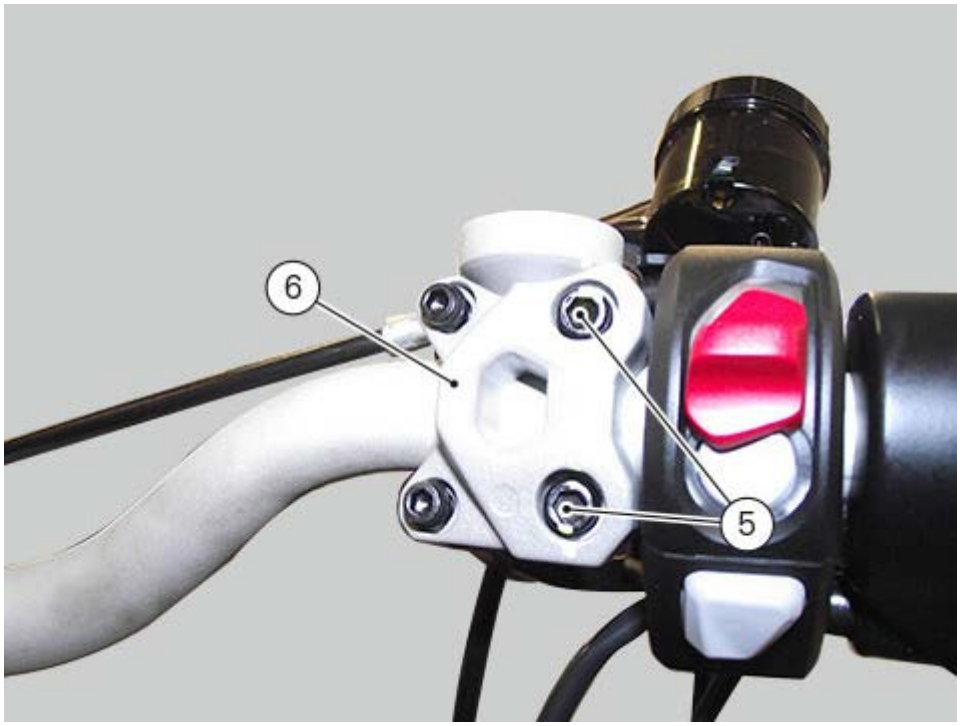
Disconnect the front brake switch connector (A) from the main wiring harness.

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





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



Refitting the rear brake calliper

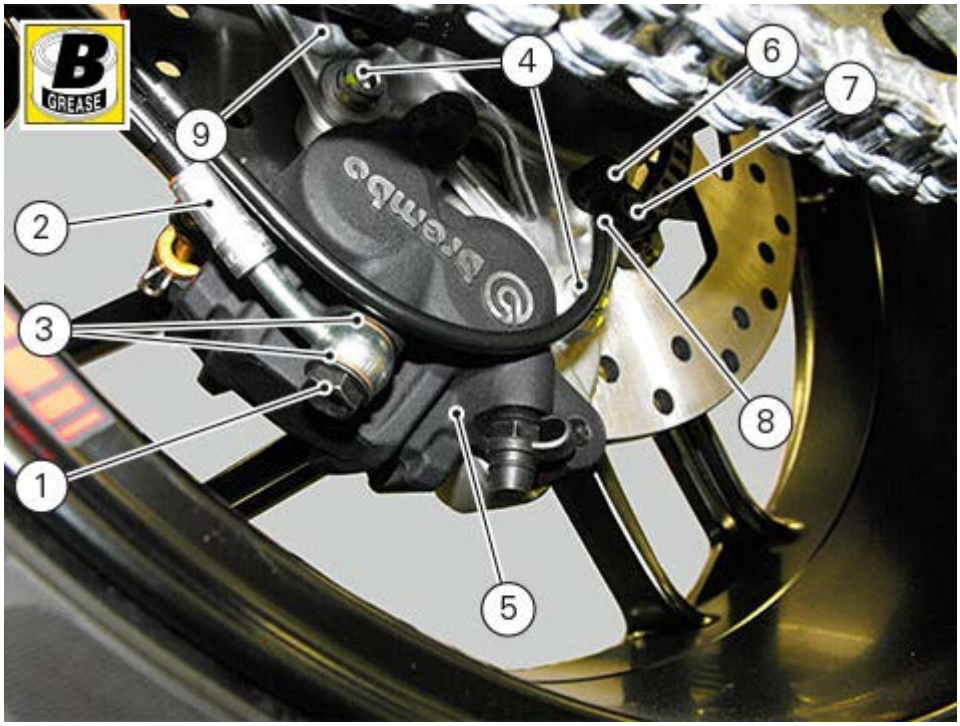
If the brake lines (2) are replaced or if one of the rear brake system components has been removed, make sure that the hose unions on the master cylinder and the calliper are correctly positioned.

Warning

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

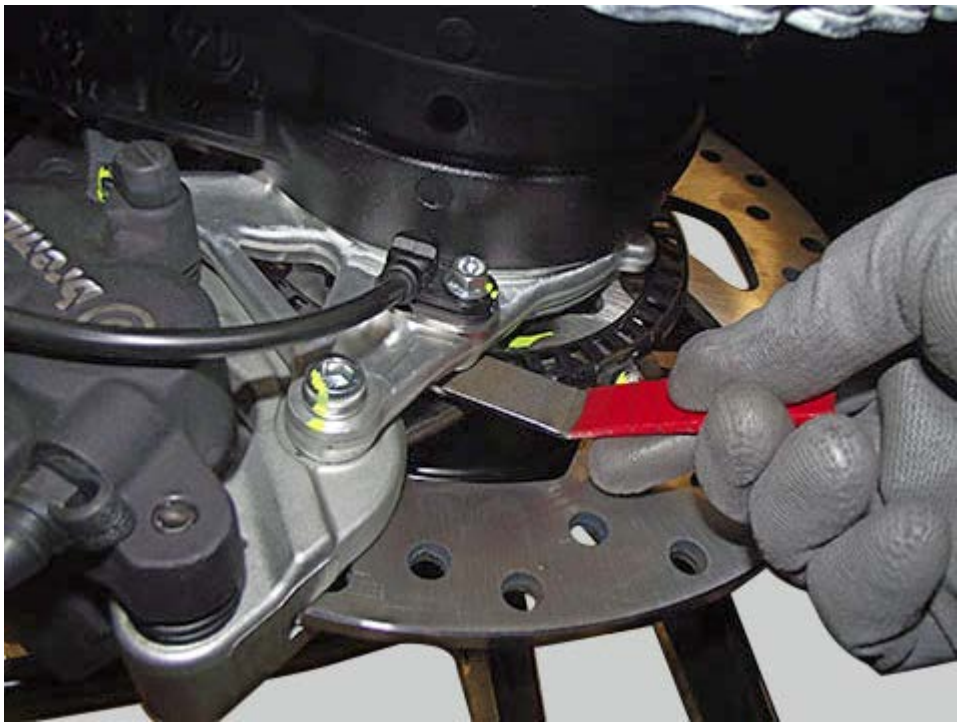
Remember to fit the copper gaskets (3) to the hose end union when reconnecting the brake line to the brake calliper (5).
After having aimed the hose union, tighten special screw (1) to the torque of 23 Nm ±10%.
If the speed sensor (6) is removed, fit it to the calliper holder plate (9) with the spacer (8), and tighten the screw (7) to a torque of 10 Nm ± 10%.

If calliper holder plate (9) has been removed, refer to Section "Refitting the rear wheel eccentric hub and rear wheel shaft" to refit it.
Insert the rear brake calliper (5) on the brake disk, aligning it with the holes of calliper holder plate (9).
Apply the indicated grease on screws (4) and tighten them to 25 Nm ± 5%.



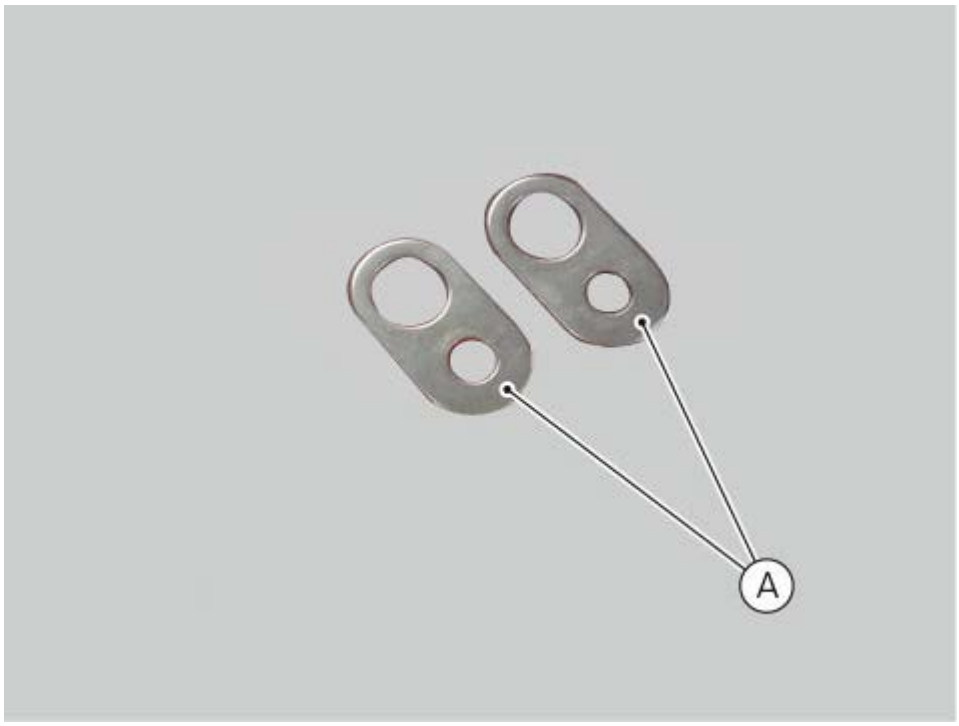
Fill the rear brake system.

If the speed sensor has been removed, it will be necessary to adjust the AIR-GAP.
There must be a gap between ABS sensor and phonic wheel of 1.3 mm to 1.9 mm. To check it, use a suitable feeler gauge.



Tighten securing screw (7) fully home on sensor (6) every time you add or remove shims.

Once the shimming is completed, tighten the sensor retaining screw to a torque of 10 Nm ± 10%.
For the shimming, use two feeler gauges (A) of 0.2 mm and 0.5 mm.



Warning

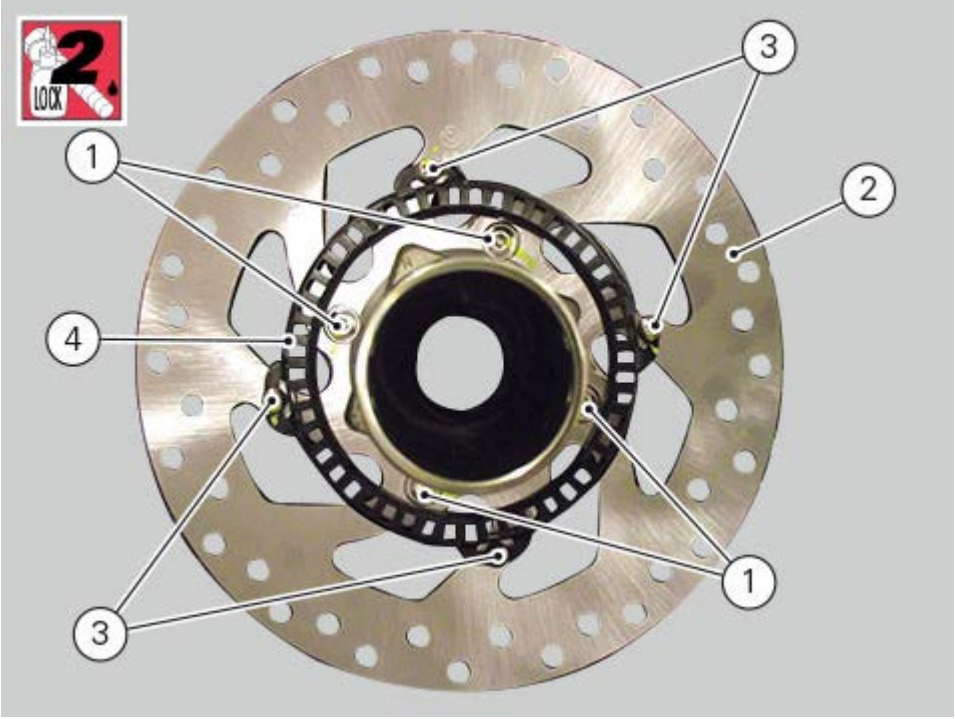
Shim pack shall never exceed 3 mm.

Note

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

Refitting the front brake disc

Position disc (2) on the flange and fix it with screws (1) after applying the indicated threadlocker.
Position the phonic wheel (4), apply the indicated threadlocker and fix using screws (3).

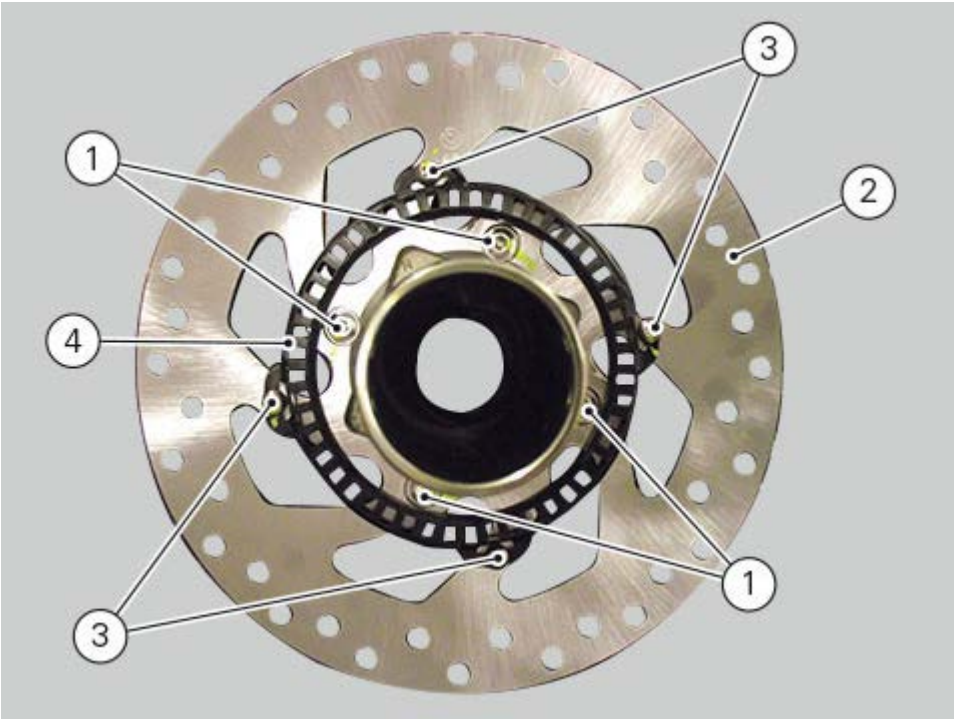


Refit the rear wheel (Refitting the rear wheel).

Removing the rear disc.

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

Loosen screws (3) of phonic wheel (4) and remove it.
Loosen the retaining screws (1) and remove disc (2).



Removing the rear brake calliper

Warning

The following procedure applies to both vehicle versions.

Important

The brake calliper manufacturer advises against servicing the brake calliper or master cylinder due to the safety critical nature of this component. Incorrect overhaul can endanger rider and passenger safety.

Before removing the concerned parts, you must first carry out the following operations:

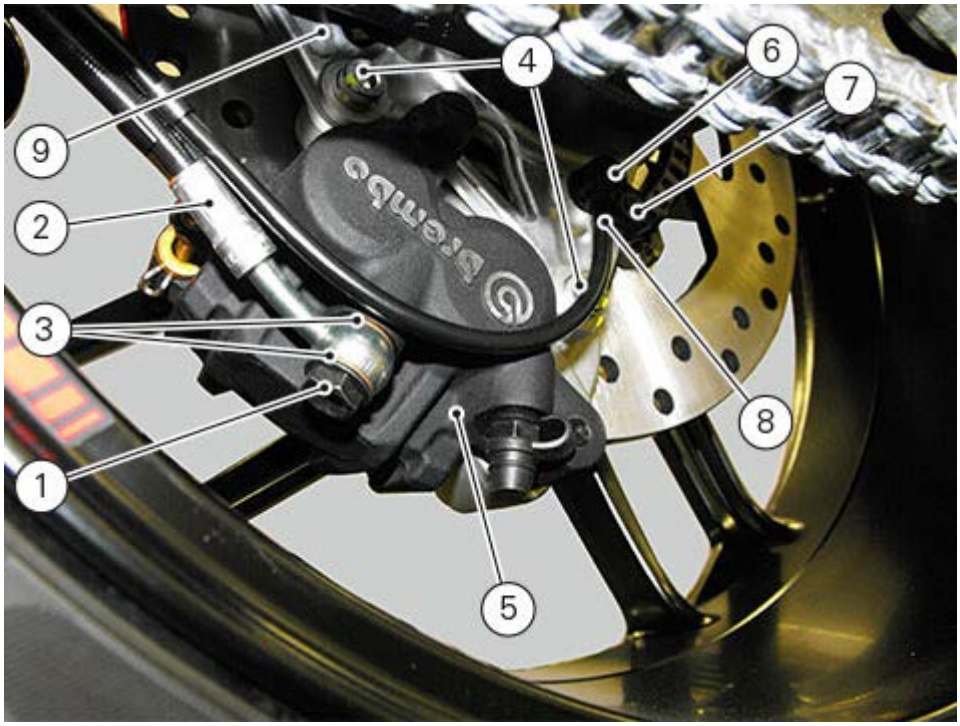
Drain the rear braking circuit (Changing the rear brake system fluid).

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

Undo the two fastening screws (4) securing the rear brake calliper (5) to the calliper holder bracket, and remove the brake calliper (5).
If it is necessary to remove the calliper holder plate (9), refer to Section "Removing the rear wheel eccentric hub and the rear wheel shaft".

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

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



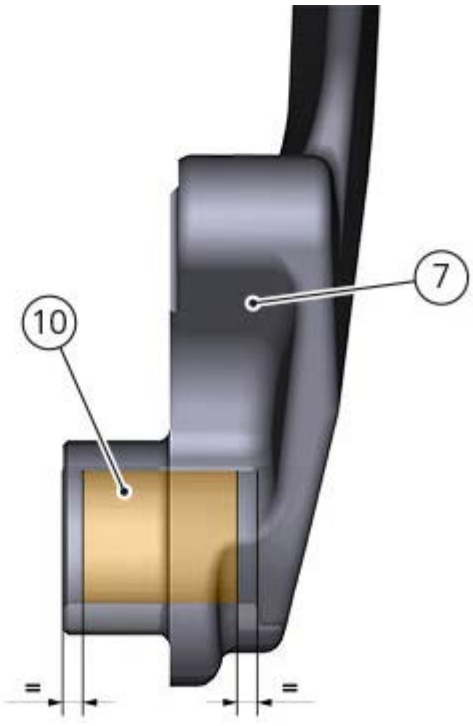
Only the following parts should be replaced:

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

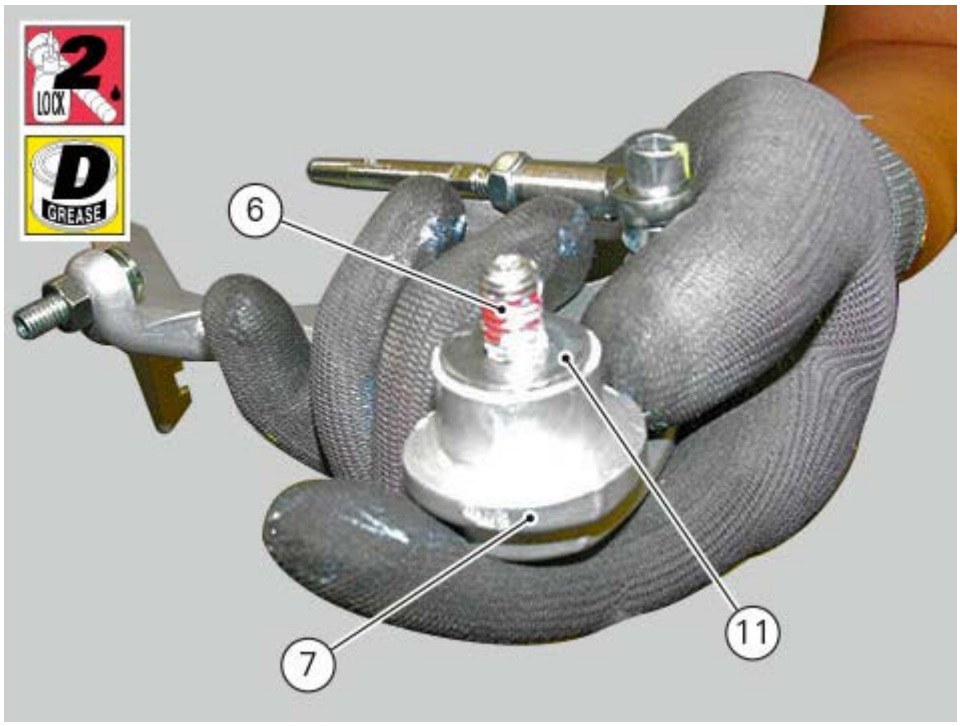
Refitting the rear brake control

Make sure that bushing (10) is set in the relevant seat of the rear brake lever (7).

Bushing (10) must be at the same distance from the external edges of rear brake lever seat (7).



Apply the indicated grease on the inner surface of the bush (10) and threadlocker on the shaft (6).
Install O-ring (9) onto shaft (6).
Insert shaft (6) on brake control lever (7), fit the other O-ring (9) and washer (11).


2.
LOCK
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GREASE
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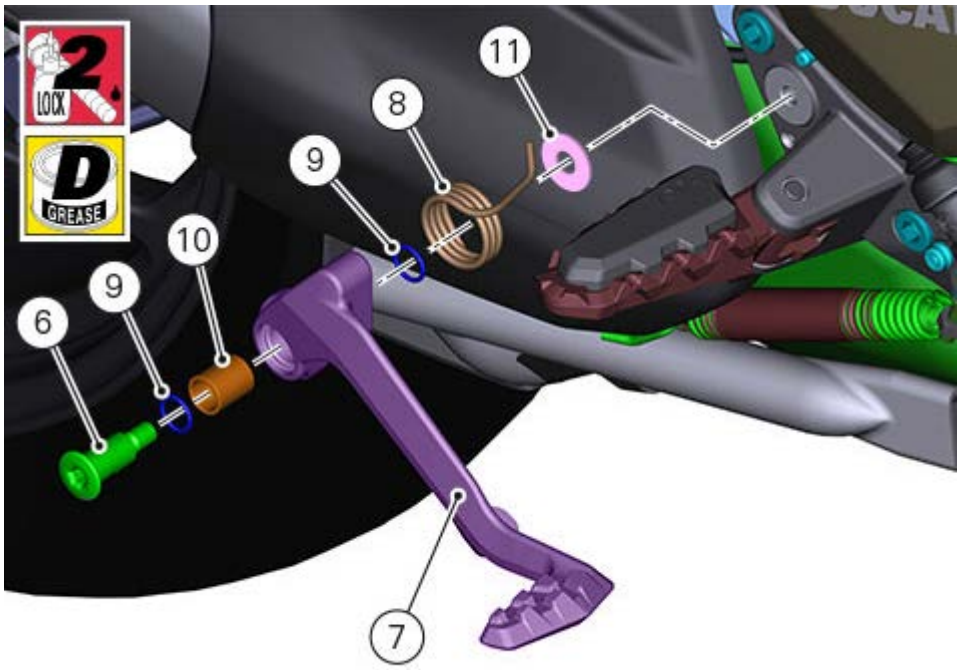
2.
LOCK
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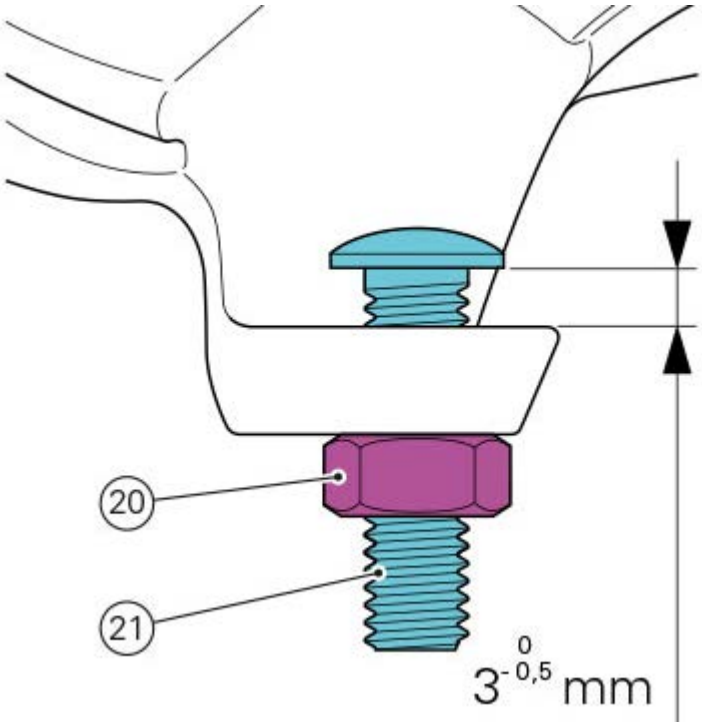
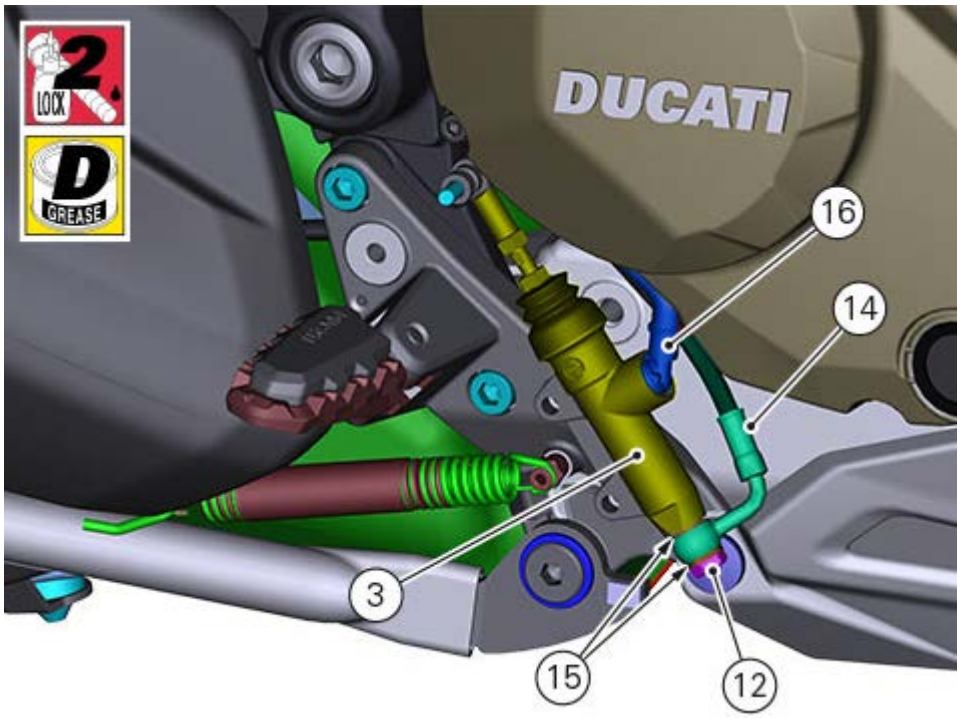
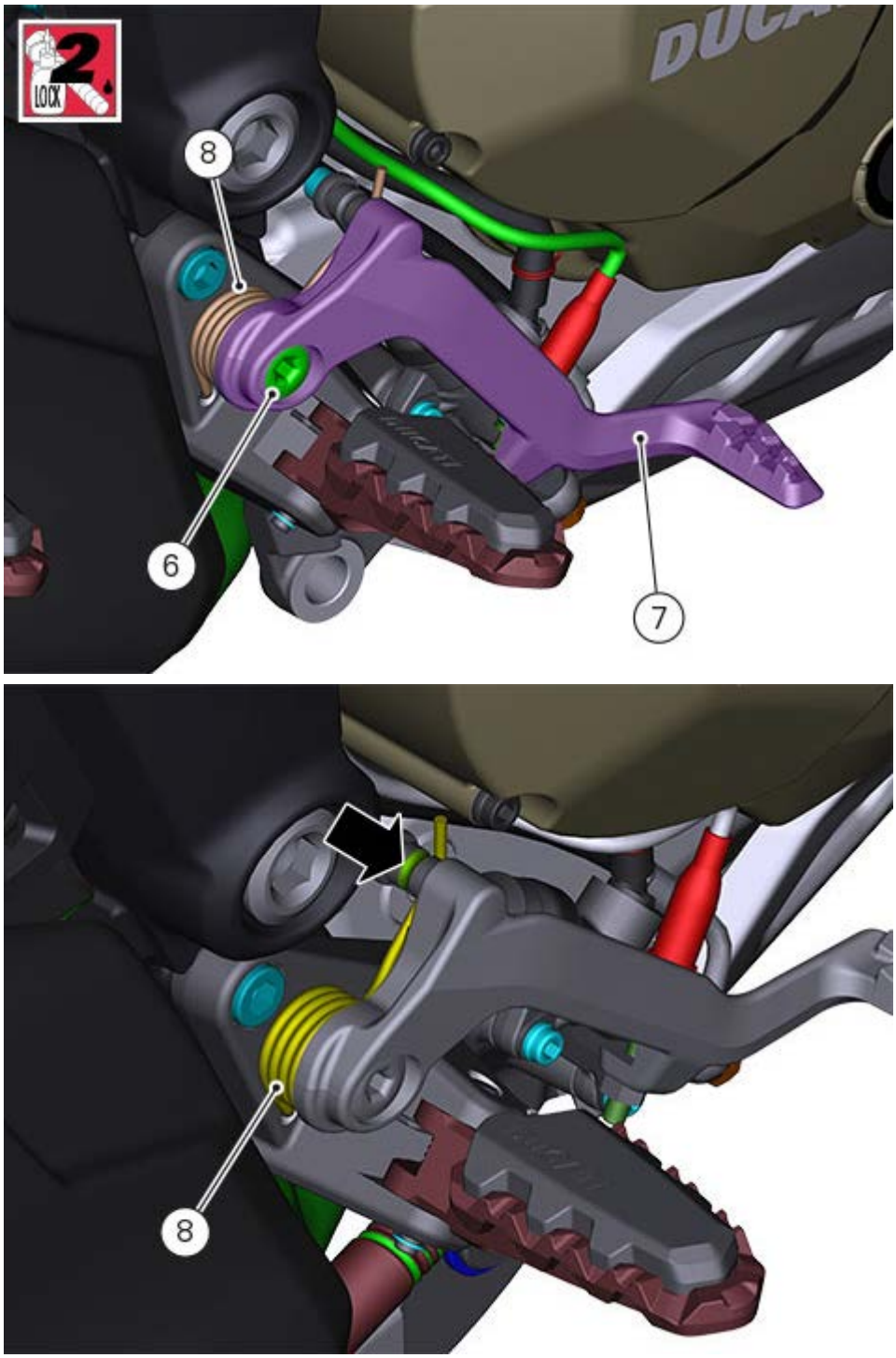


Reconnect the hose (14), locating the seals (15) on both sides of the hose end union, and secure it with the special screw (12) and securing hose (16) with hose clip (13).
Tighten the special screw (12) to a torque of 23 Nm ± 10%.

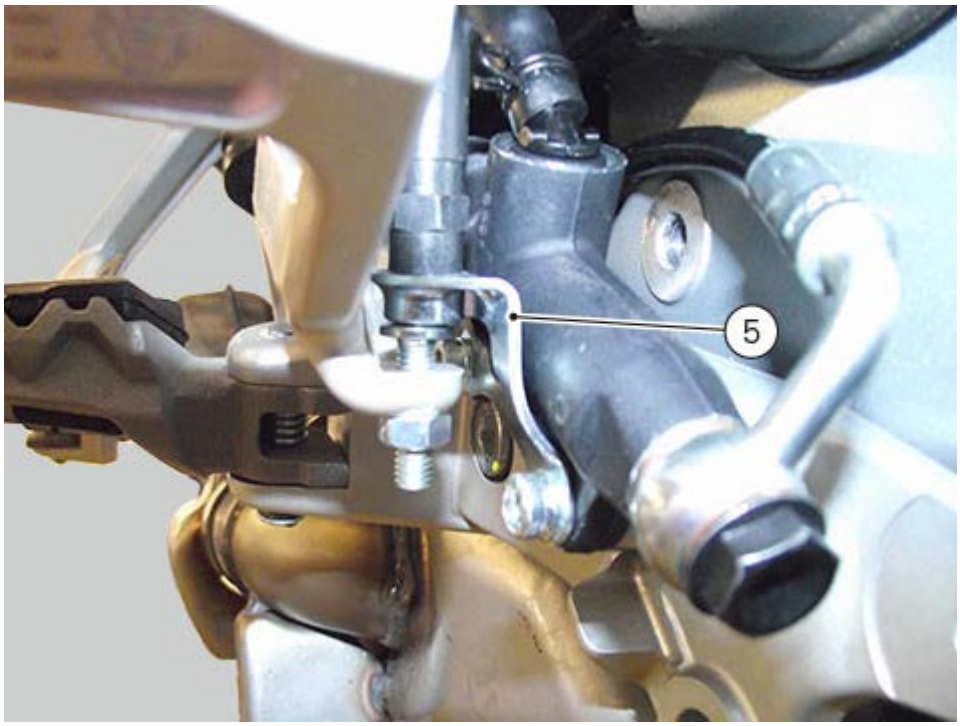


Note
Pay particular attention to the hose routing and hose coupling on the rear brake master cylinder.

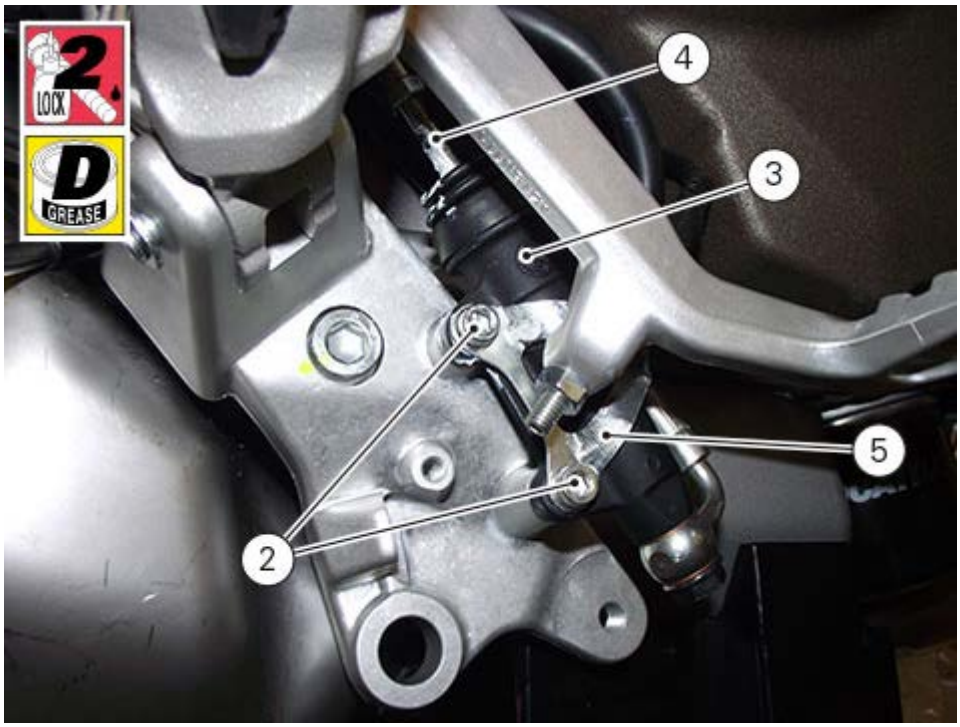
Apply the indicated threadlocker on shaft (6).
Fit brake lever (7) with spring (8) starting shaft (6).
Position the spring end (8) in the spacer seat as shown in the figure.
Tighten shaft (6) to a torque of 23 Nm ± 10%.



Refit the rear brake control (7) and the bracket (5) that retains the rear stop light (1).



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

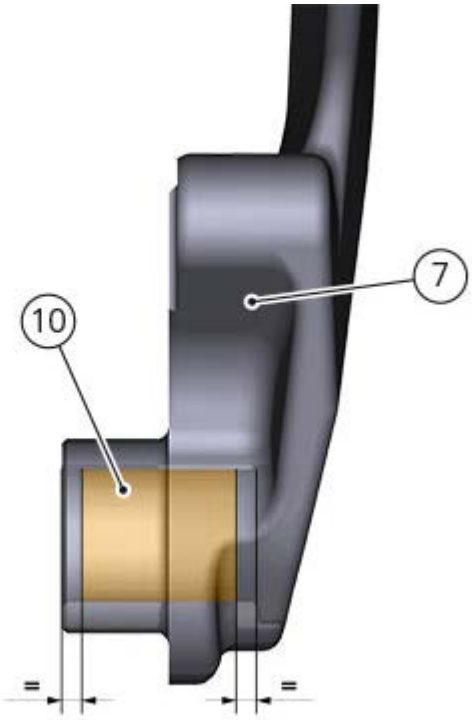


Connect rear stop switch (1) to main wiring.

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

Disassembling the rear brake control

The brake master cylinder is supplied only as a complete unit; internal components cannot be replaced.
If the bush (10) inside the brake pedal (7) needs to be replaced, grease the external surface and fit the new bush using a press to insert it. The bush must be placed at the indicated value.



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

Removing the rear brake control

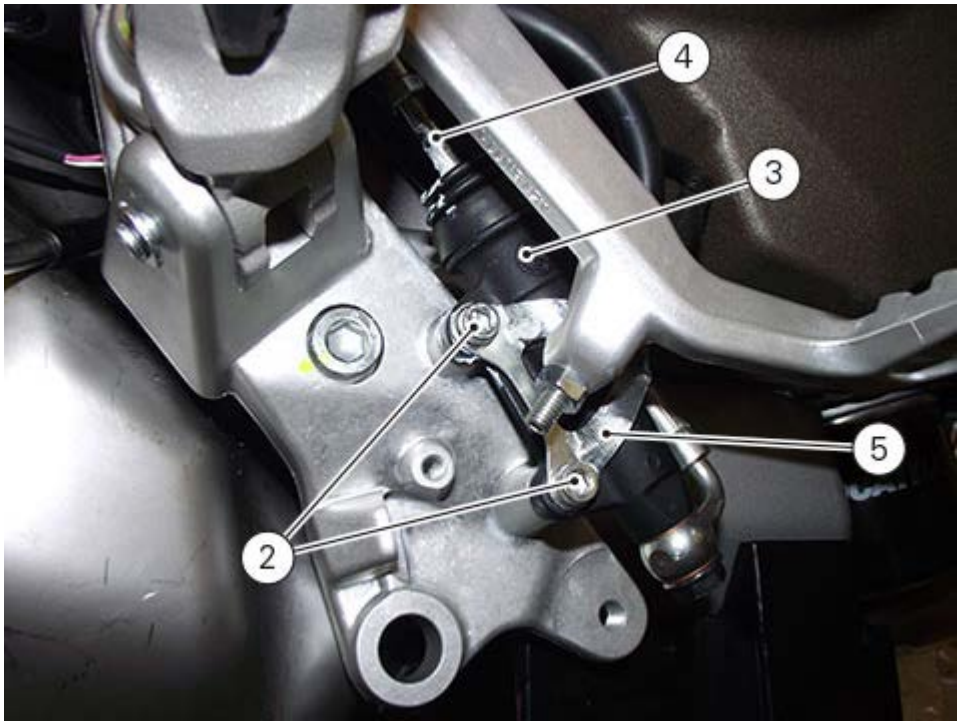
Warning

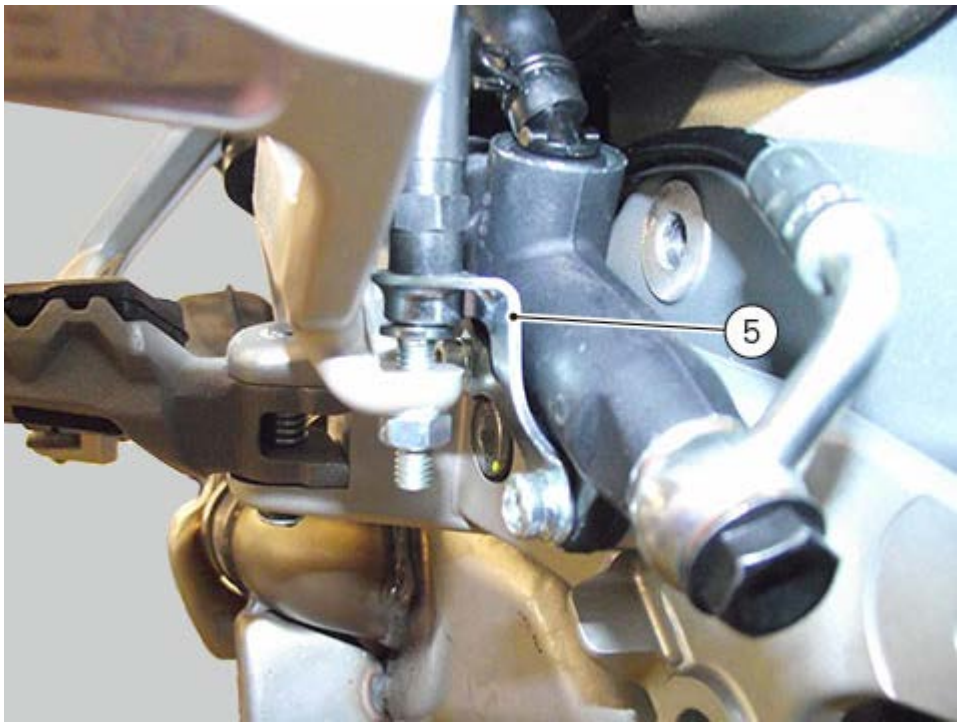
The brake master cylinder manufacturer advises against servicing the brake master cylinder due to the safety critical nature of this component. Incorrect overhaul can endanger rider and passenger safety. Maintenance operations on these units are limited to replacement of the following parts: control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

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

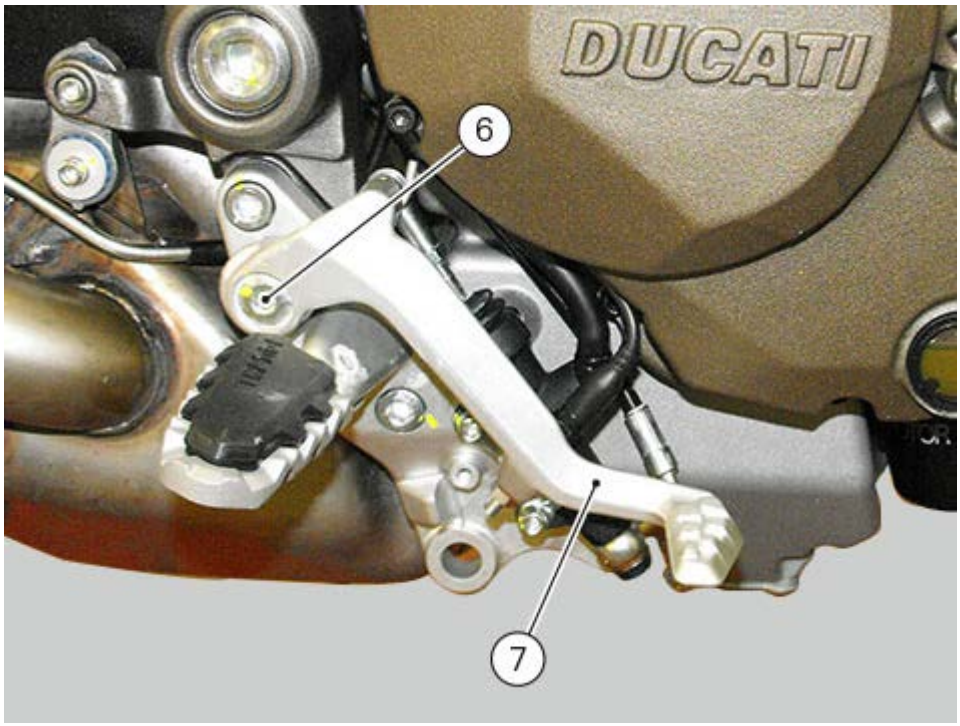
Disconnect rear stop switch (1) from main wiring.

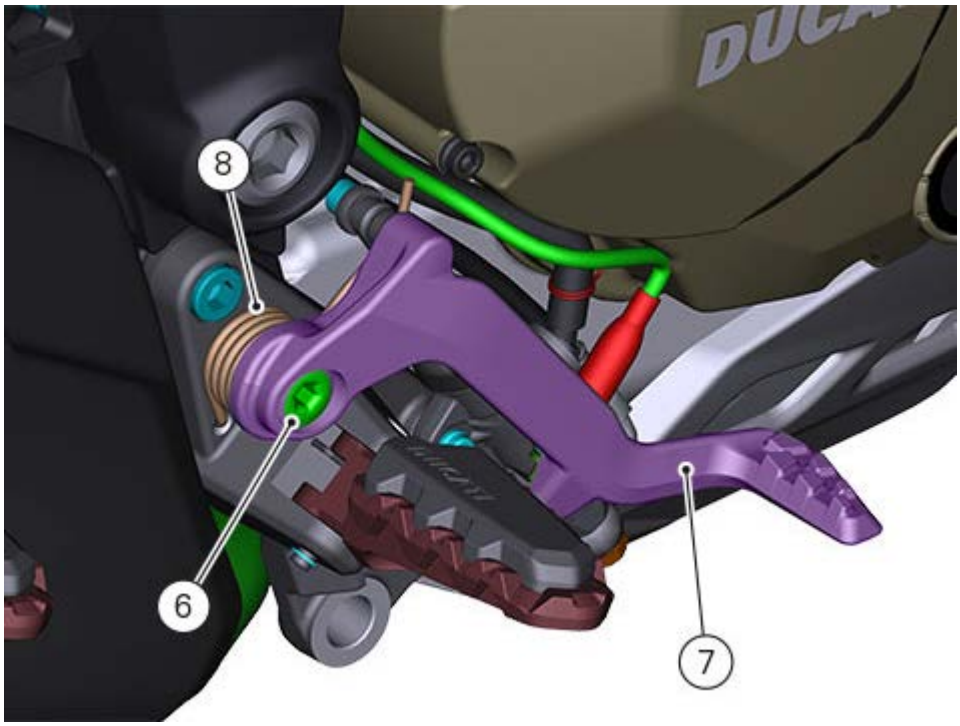
Loosen rear brake master cylinder retaining screws (2).
Slide out rear brake master cylinder (3) from the adjusting rod (4), collect bracket (5) securing rear stop (1).



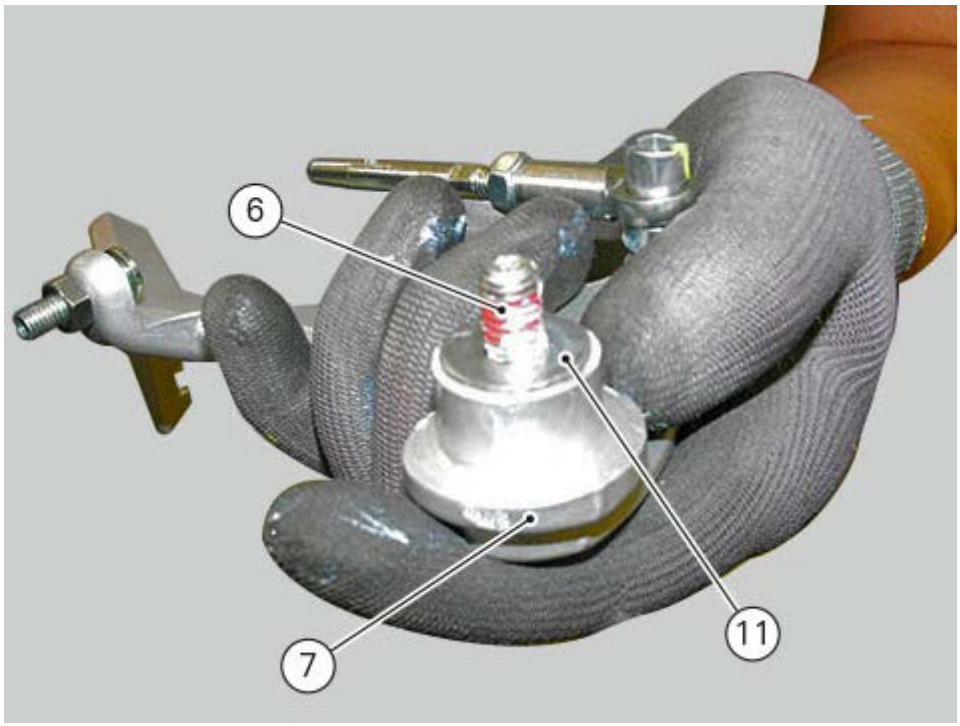


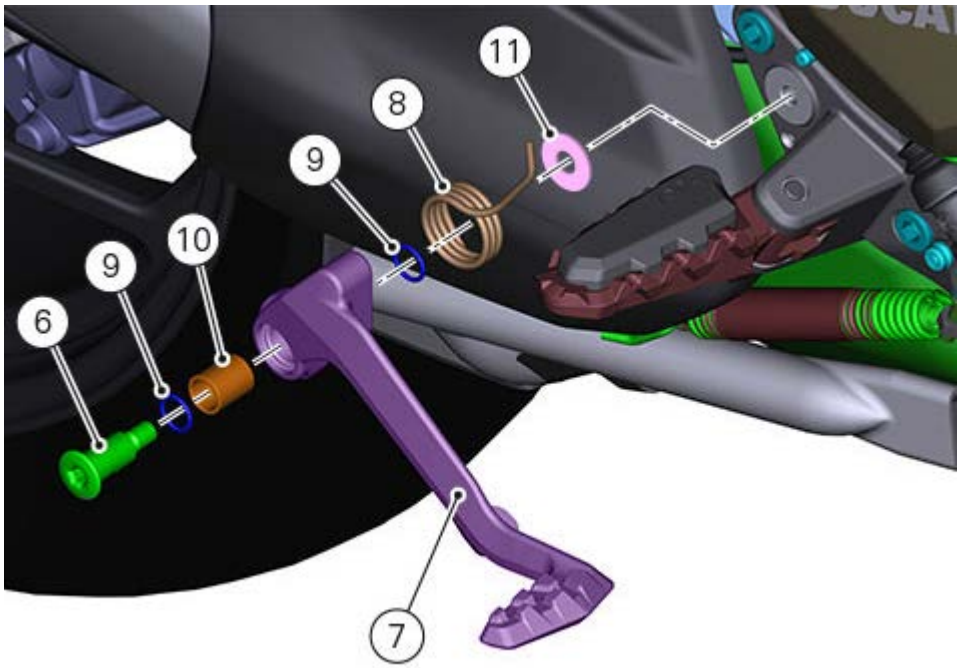
Undo pin (6) securing the brake lever (7), collecting spring (8).



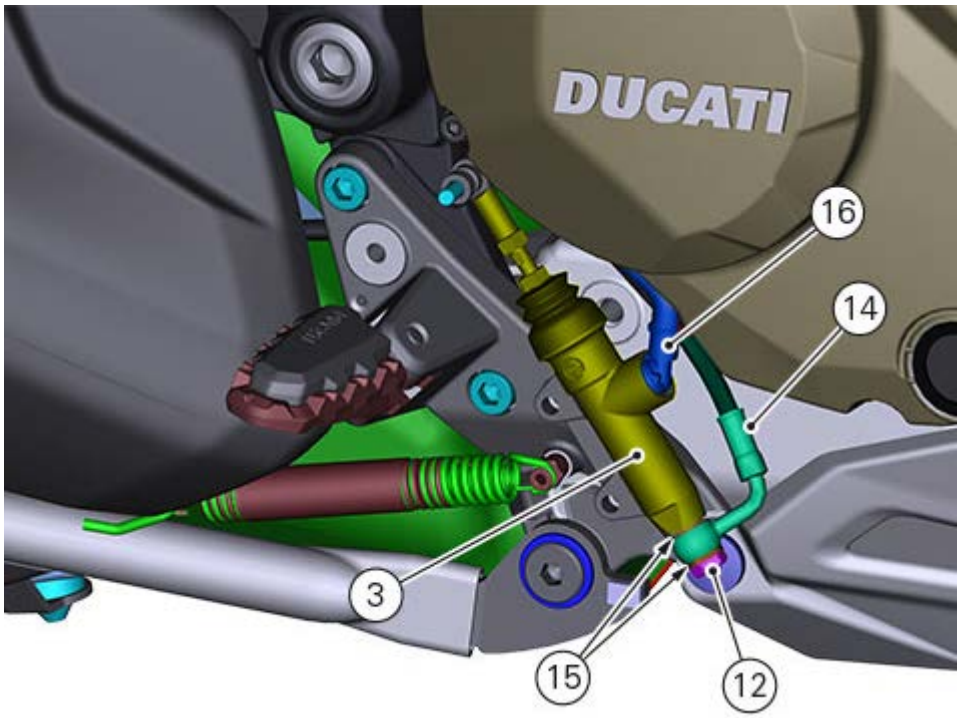


Slide out the brake lever (7) and collect pin (6), bushing (11) and O-rings (9).





Undo the special screw (12) from master cylinder (3) by removing the hose clip (13); slide out hose (14), collecting the seals (15) and hose (16).
Remove rear brake master cylinder (3) from vehicle.



ABS system deactivation

ABS (Antilock Braking System) intervention can be customised and possibly disabled.
To set and disable the ABS, refer to "ABS system operation information".

ABS system operation information

The ABS control unit diagnosis will check the system main component operation by analysing the system software and hardware. The ABS control unit then communicates any error detected on the CAN line to be validated in the engine or BBS control unit according to whether the error is linked with an emission-relevant component.

From the model menus of the DDS2.0 diagnosis software, select MULTISTRADA family, then model MULTISTRADA 1200 S/T, and then select a model from model year 15 on. The Global Scan functions will be automatically started by the diagnosis software; connect the instrument to the CAN diagnosis socket on the bike. To find the connector position, refer to the displayed image.
Wait for the correct configuration to be loaded and, when requested, switch the vehicle to key-on state.
Tester communicates to the different control units present on bike, ABS control unit included; wait for the scan to be completed.

Among the displayed information a "dot" icon is shown: based on its colour, it refers to validated errors inside the different control units.
In particular, if errors are stored, icon will be yellow or if errors are currently present, icon will be red, while if no errors are present, icon will be green. The "dot" will be grey if the control unit is not detected by the diagnosis instrument, i.e. it does not respond to requests with the diagnosis protocol.

The MULTISTRADA 1200 Model Year 15 is the first Ducati bike compliant with the EURO 4 emission standard.
Please be reminded that the presence of any actual errors may have to be acknowledged by starting the engine.
In case of component checks or replacements, we recommend reading the errors only after a first engine start and stop.
To make a deeper analysis of the ABS control unit, select ABS control unit and SELF-DIAGNOSIS or, as an alternative, make a double selection on the same item with your mouse.
Once in this configuration, a number of parameters and states of the ABS control unit and information concerning the control unit itself may be selected and displayed.
The INFO menu allows reading the software version loaded on the control unit as well as other information.

Two further columns dedicated to the ABS control unit have been added to the Global Scan function providing the following information in case of IMU sensor and BBS, ABS component replacement:

- BBS setting (indicates the setting of the BBS: Standard or Pikes Peak);
- ABS setting (indicates the setting of the ABS: Standard or Pikes Peak);
- ABS EOL mode (indicates whether the test of IMU sensor correct installation has been performed or not).

The spare ABS control unit has not default setting; it acquires the setting of the BBS control unit upon first key-on after its installation. In case of ABS setting errors it is possible to reset the self-learnt ABS setting using the specific function in the ABS diagnosis: "ABS setting reset".

To change the BBS setting, which is possible only on hardware for the MULTISTRADA 1200 version, it is possible to use the function "BBS set version". This function is to be used in the initialisation operations of the spare BBS control unit to change its setting from Standard to Pikes Peak and vice versa.

In case of replacement of the ABS control unit with a spare one, it is necessary to check the correct installation of the IMU sensor. Otherwise the ABS warning light will blink also when exceeding 5 km/h to indicate the system degraded operation. In this condition, the "ABS cornering" function remains disabled until the activation "IMU sensor correct installation check" is performed successfully.

To check the IMU sensor correct installation after replacing the ABS control unit, start the activation "IMU sensor correct installation check" in the ABS diagnosis section, following the displayed instructions on how to position the bike during the check.

The same activation is recommended after replacing the IMU sensor with a spare one. In this case it is possible to force the ABS in EOL mode using the setting "Setting the ABS in EOL mode" and then it will be possible to perform the activation "IMU sensor correct installation check".

When a spare part is installed it is necessary to copy the VIN from the other bike control units to the ABS control unit, which is possible using the setting "VIN writing" in the ABS diagnosis section.

Select the function "View errors"

Before reading the errors we recommend starting and stopping the engine to ensure the acknowledgement of any actual errors upon validation phase.

In this section the tester function provides the user with information concerning the error list in the ABS control

unit memory, indicating if errors are stored or current. A new error status is available and indicated with a red dot and the message [waiting for acknowledgement]; these errors are still active and so the MIL light is OFF and will be turned ON upon engine start.

The following codes are given after a short description of the diagnosis type: MEM, indicating that the error has been stored previously by the ABS control unit but has not been detected in the current test session. ATT, indicating that the error is current and has been detected during the current test session.

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

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

Error code	Errors	Description
C1033	Front Speed Sensor Error	Front wheel sensor signal Open circuit/short circuit to GND/short circuit to Uz of front wheel speed sensor
C1034	Front speed sensor signal - Plausibility	Front speed sensor fault - Plausibility
C1031	Rear Speed Sensor Error	Rear wheel sensor signal Open circuit/short circuit to GND/short circuit to Uz of rear wheel speed sensor
C1032	Rear speed sensor signal - Plausibility	Rear speed sensor fault - Plausibility
C1024	Plausibility of difference between front and rear wheel speeds	Front and rear wheel speed difference
C1019	Valve relay fault	Valve relay fault (Failsafe relay)
C1054	Front inlet valve fault	Front inlet valve fault
C1049	Front outlet valve fault	Front outlet valve fault
C1052	Rear inlet valve fault	Rear inlet valve fault
C1048	Rear outlet valve fault	Rear outlet valve fault
C1071	Rear HSV valve fault	Rear HSV valve fault

C1072	Rear USV valve fault	Rear USV valve fault
C1331	ABS pressure to front calliper sensor fault	Hardware fault
C1332	ABS pressure to front calliper sensor fault	Offset fault
C1081	ABS pressure to front pump sensor fault	Hardware fault
C1082	ABS pressure to front pump sensor fault	Offset fault
C1087	ABS pressure to rear calliper sensor fault	Hardware fault
C1088	ABS pressure to rear calliper sensor fault	Offset fault
C1085	ABS pressure to rear pump sensor fault	Hardware fault
C1086	ABS pressure to rear pump sensor fault	Offset fault
C1333	ABS pressure sensor fault	Overvoltage
C1015	ABS pump motor fault	ABS pump motor fault
C1059	ABS control unit [Overvoltage]	ABS control unit [Overvoltage]
C1058	ABS control unit [Undervoltage]	ABS control unit [Undervoltage]
C1021	ABS control unit fault	ABS control unit fault
C1334	ABS control unit [Error in EEPROM during coded variant reading]	ABS control unit [Error in EEPROM during coded variant reading]
U2924	ABS control unit [wrong coded variant]	ABS control unit [wrong coded variant]
C1335	ABS control unit [wrong variant]	ABS control unit [wrong variant]
C1077	Mismatching front braking system pressure	Mismatching front braking system pressure

C1078	Mismatching rear braking system pressure	Mismatching rear braking system pressure
C1092	IMU sensor [wrong installation]	IMU sensor [wrong installation]
C1094	IMU sensor [mismatching signal]	IMU sensor [mismatching signal]
U2927	IMU sensor [wrong signal]	IMU sensor [wrong signal]
U2928	IMU sensor [Timeout]	IMU sensor [Timeout]
U100C	IMU sensor [Generic error]	IMU sensor [Generic error]
U0121	CAN communication problem with ABS [ABS_Data02 message timeout]	CAN communication problem with ABS [ABS_Data02 message timeout]
U0415	CAN communication problem with ABS [ABS_Data02 message checksum]	CAN communication problem with ABS [ABS_Data02 message checksum]
U0315	ABS compatibility error	ABS compatibility error

Operating principle

The Anti-Lock Braking System (ABS) has been developed to enable riders to use the motorcycle braking force to the fullest possible amount in emergency braking or under poor pavement or adverse weather conditions. ABS is an electro-hydraulic device that controls the pressure in the brake circuit when the control unit, by processing information from wheel sensors, determines that one or both wheels are about to lock up. In this case, pressure decrease in the brake circuit allows the wheel to carry on turning, thereby preserving grip. After that, the control unit restores the pressure in the brake circuit, to resume the braking action. This cycle is repeated many times until the problem is completely eliminated. The system can modulate pressure at the calliper through a set of solenoid valves which first prevent any further increase of hydraulic pressure (EV valve closing), and then make the pressure decrease (AV valve opening). When the wheel begins to turn again in response to the diminished braking force applied and its speed reaches the reference value, the AV release valve will be closed. Simultaneously, the EV inlet valve is reopened, restoring normal operation of the brake system.

Normally, the rider will perceive ABS operation as a harder feel or a pulsation of the brake lever and pedal. The front and rear brakes use separate control systems.

The Ducati ABS functionality is disabled at vehicle speeds lower than 5 km/h.

The Multistrada 1200 is provided with further functions compared to the standard ABS as outlined below:

- "ABS cornering" function that widens ABS functionality to the conditions where the motorcycle is leaning over, thus controlling the front and rear brake systems depending on the vehicle lean angle with the purpose of preventing wheel lockup and slipping as much as possible, within the physical limits allowed by the vehicle and by the road conditions. The ABS system limits the braking gradient and pressure at the calliper upon the first braking besides the standard ABS mode with pressure reduction and increase at the calliper to prevent the wheel from blocking.
- braking force distribution only from the front to the rear wheel allowing to restore the bike track alignment during the braking. By means of the ABS valve activation, the pressure on the front calliper is released and thanks to the dedicated valves called USV and HSV and the ABS pump the pressure is increased at the rear calliper.
- anti lift-up function that improves the feeling during strong braking especially on the front wheel.

These functions are divided into 3 different levels, each associated with a Riding Mode.

According to the selected level, some of the just described functions will be disabled. Refer to the owner's manual of the Multistrada 1200 for further details.
If desired, the ABS system can be deactivated from the instrument panel, setting the level to OFF within the Riding Mode for which you wish to disable it.

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

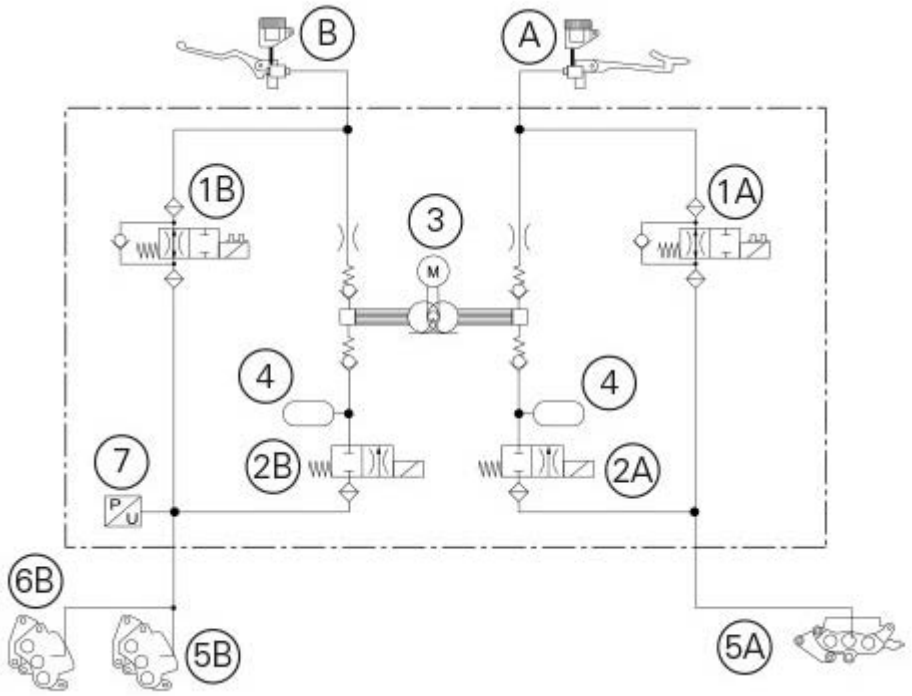
Key to ABS hydraulic system colours:
Green: oil delivery
Light blue: oil return

Key to ABS hydraulic system

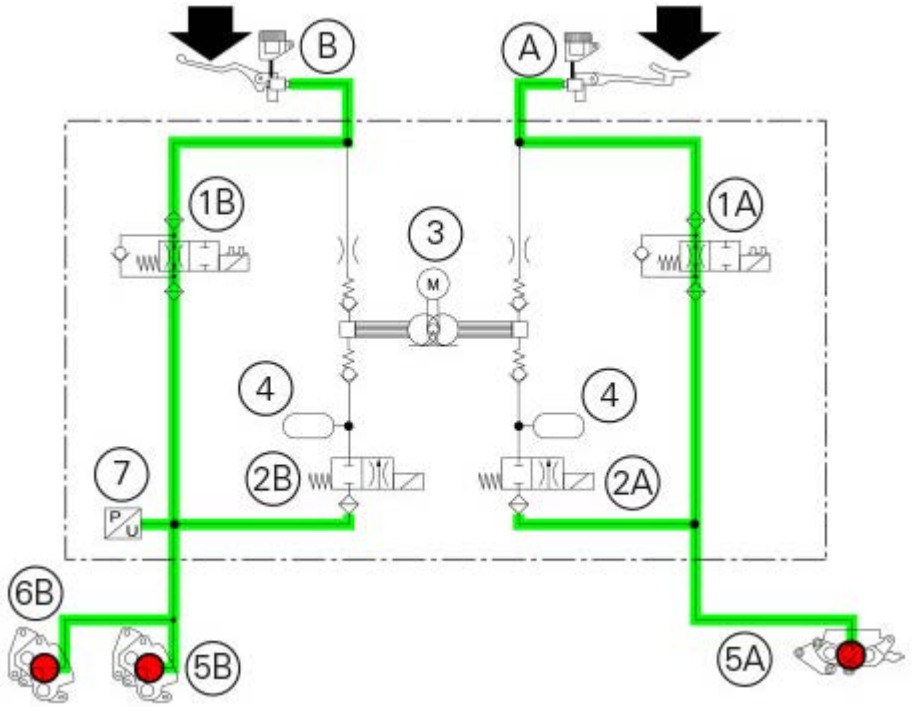
A	Rear brake master cylinder
B	Front brake master cylinder
1A	Rear brake calliper inlet valve
1B	Front brake calliper inlet valve
2A	Rear brake calliper exhaust valve
2B	Front brake calliper exhaust valve
3	Master cylinder
4	Little tanks

5A	Rear calliper
5B	Left front calliper
6B	Right front calliper
7	Pressure transducer

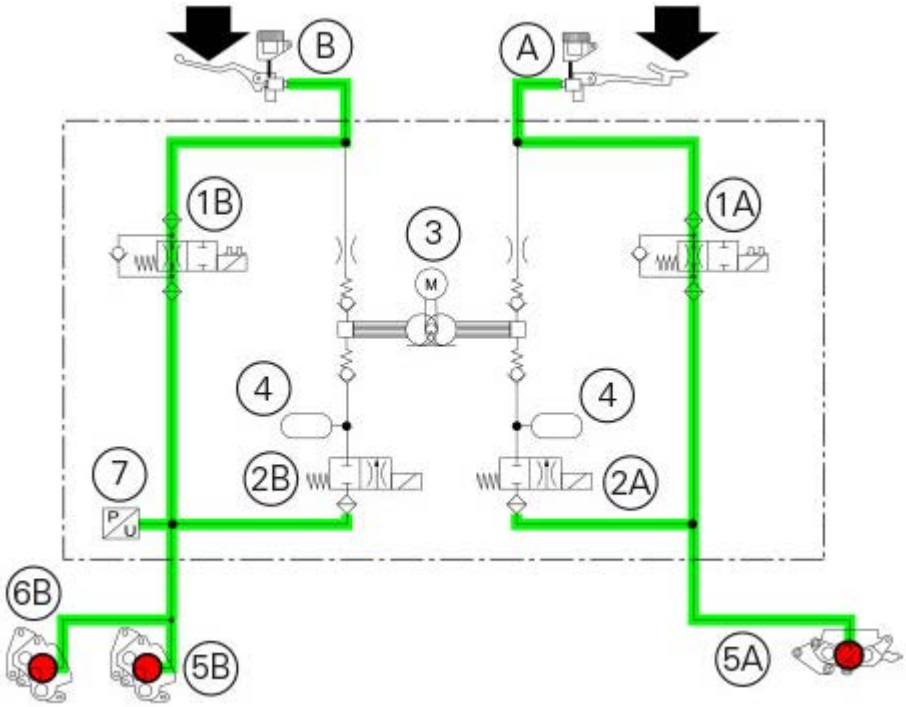
Brake system diagram.



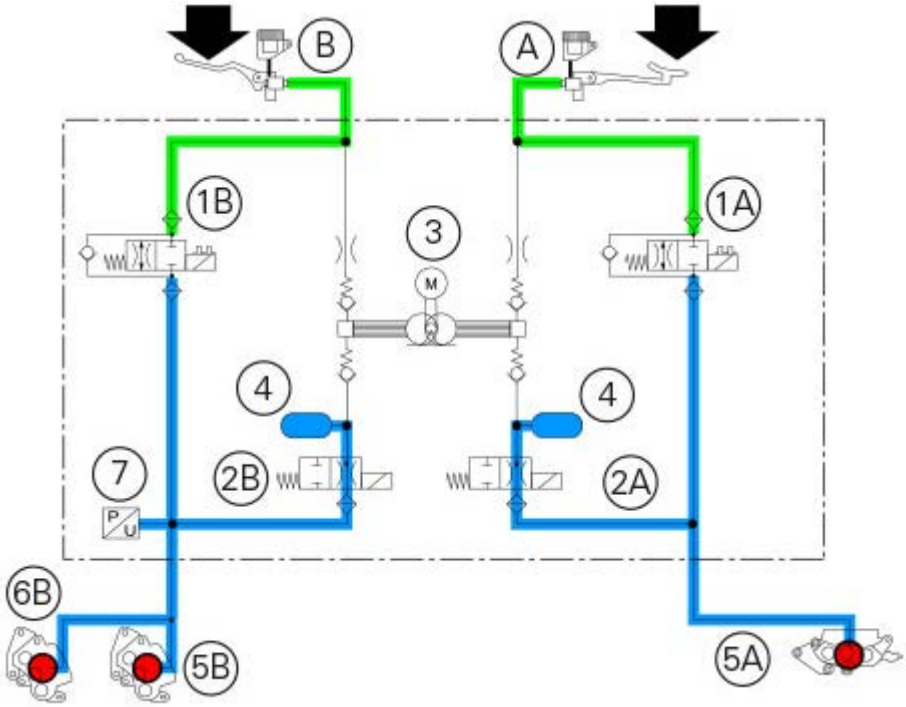
Braking without ABS.



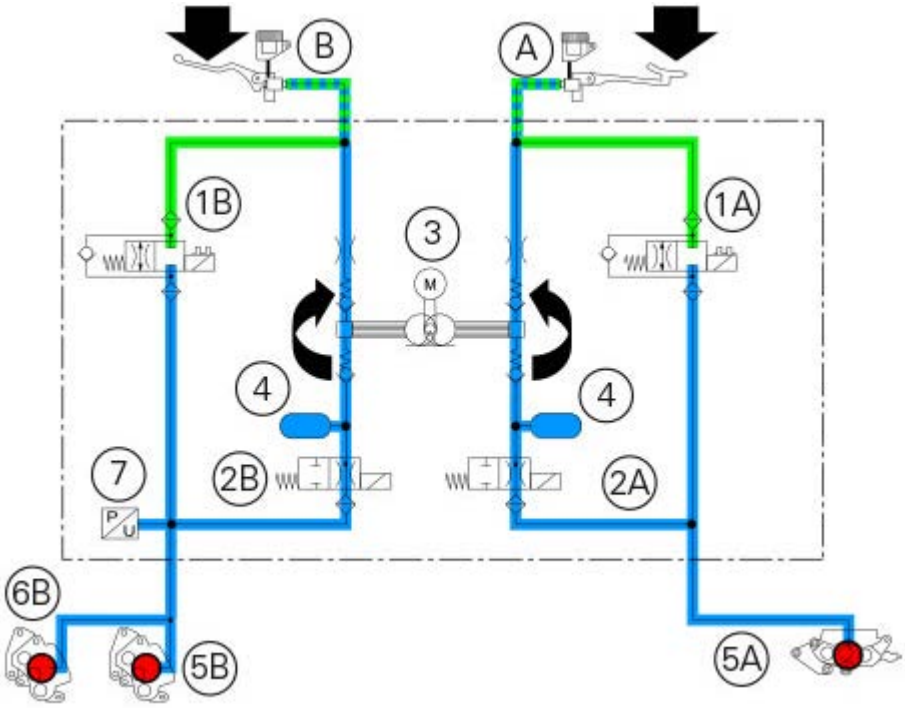
ABS 1 modulation: braking.



ABS 2 modulation: pressure partial reduction on callipers.



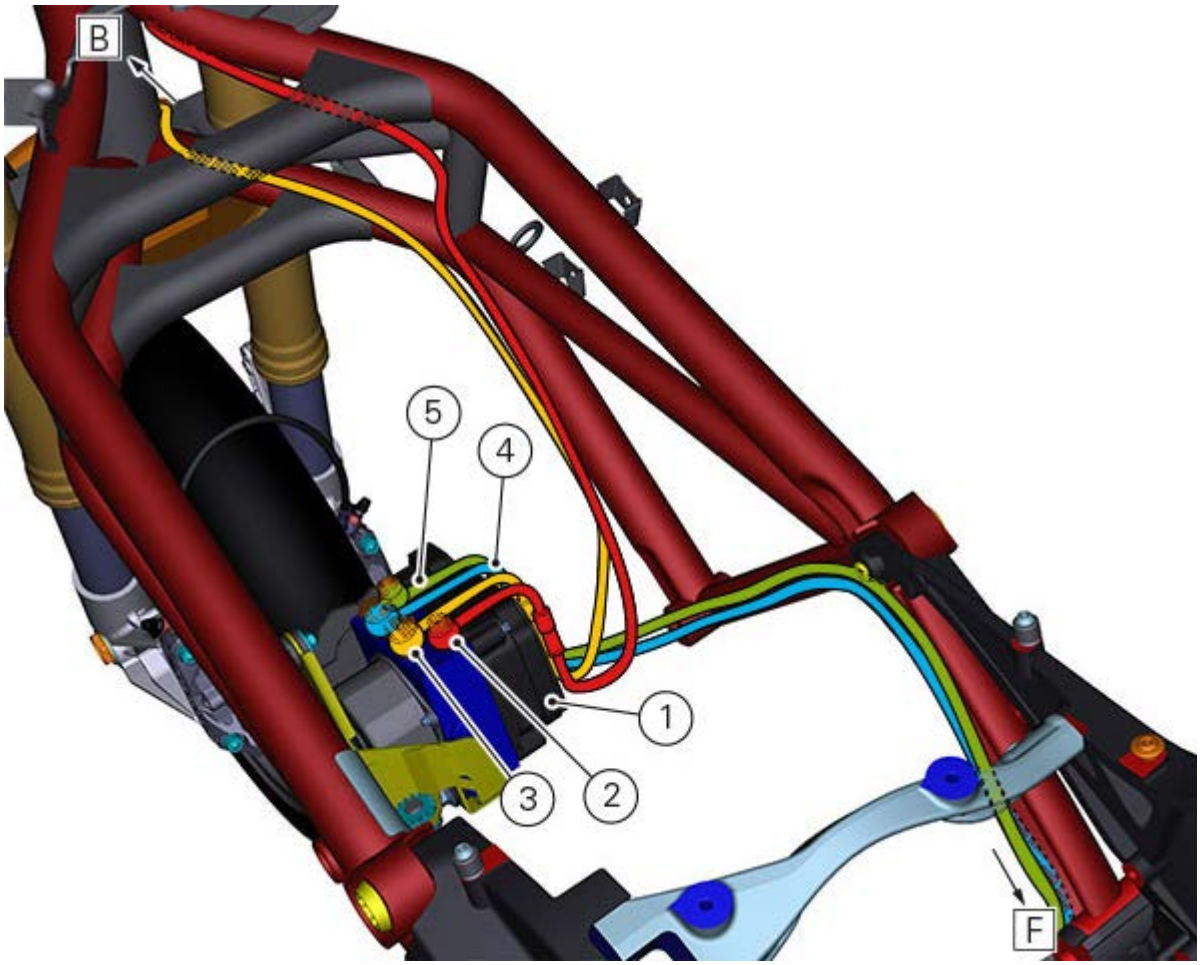
ABS 3 modulation: pressure total reduction on callipers.

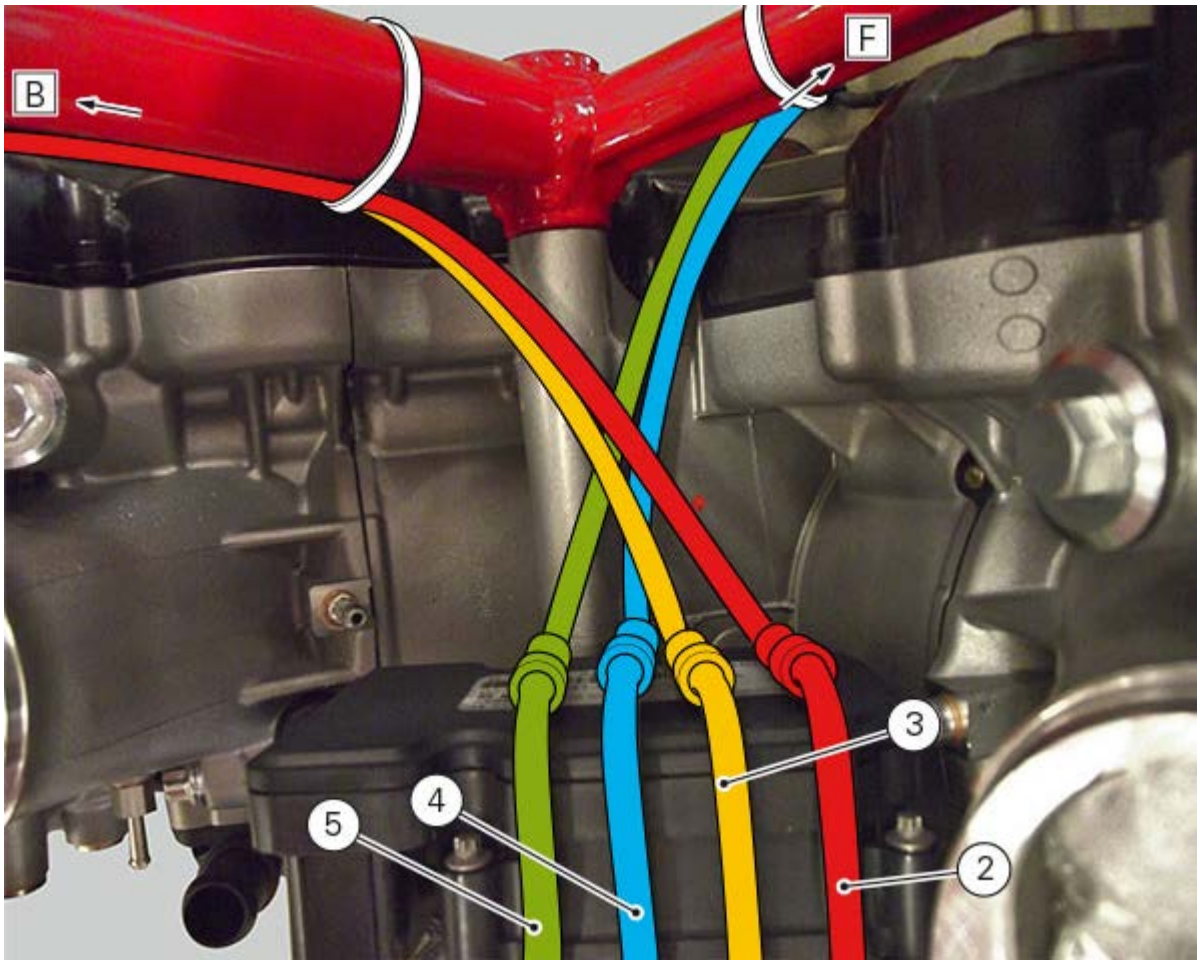

B
A
1B
1A
3
M
4
4
7
2B
2A
P/U
6B
5B
5A

Routing wiring harnesses/hoses

Table	Position	Description
A-F	1	ABS control unit
A-B-C-D-E-F	2	Hose from front calliper to ABS control unit
A-B-C-E-F	3	Hose from front master cylinder to ABS control unit
A-F	4	Hose from rear master cylinder to ABS control unit
A-F-G-H	5	Hose from rear calliper to ABS control unit
C-D	6	Front RH brake calliper hose — Front LH brake calliper hose
D	7	Front speed sensor
F-G-H	8	Rear speed sensor

TABLE A





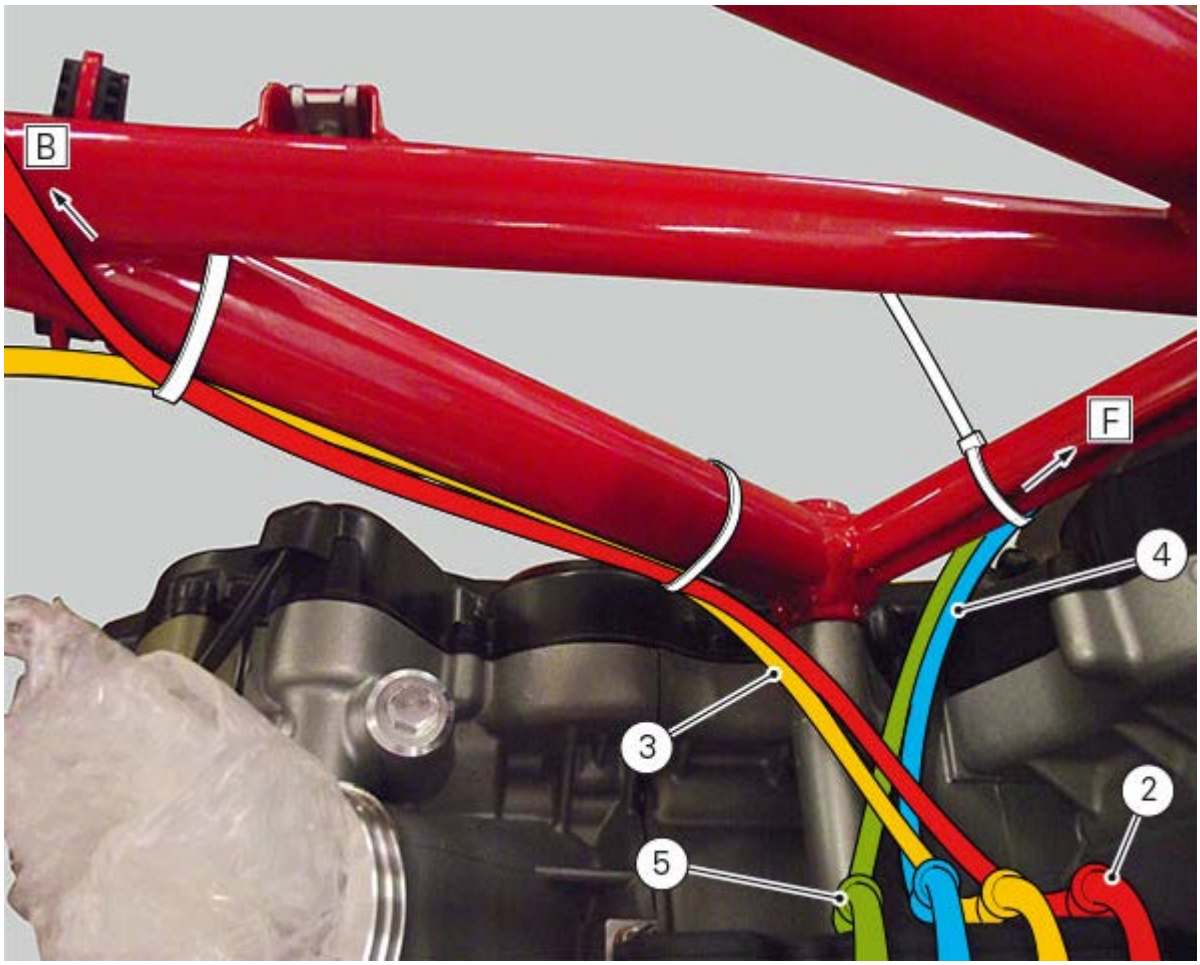


TABLE B

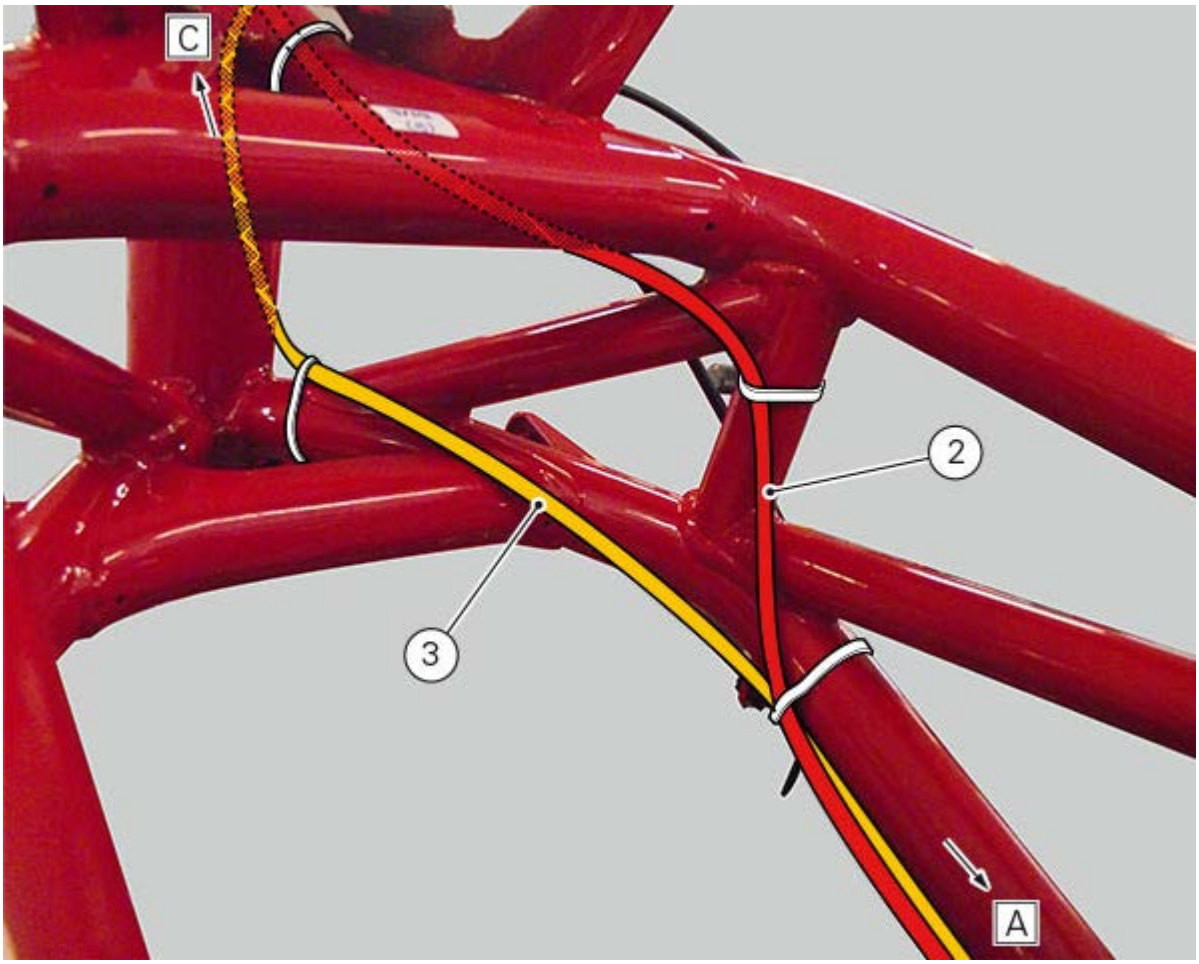
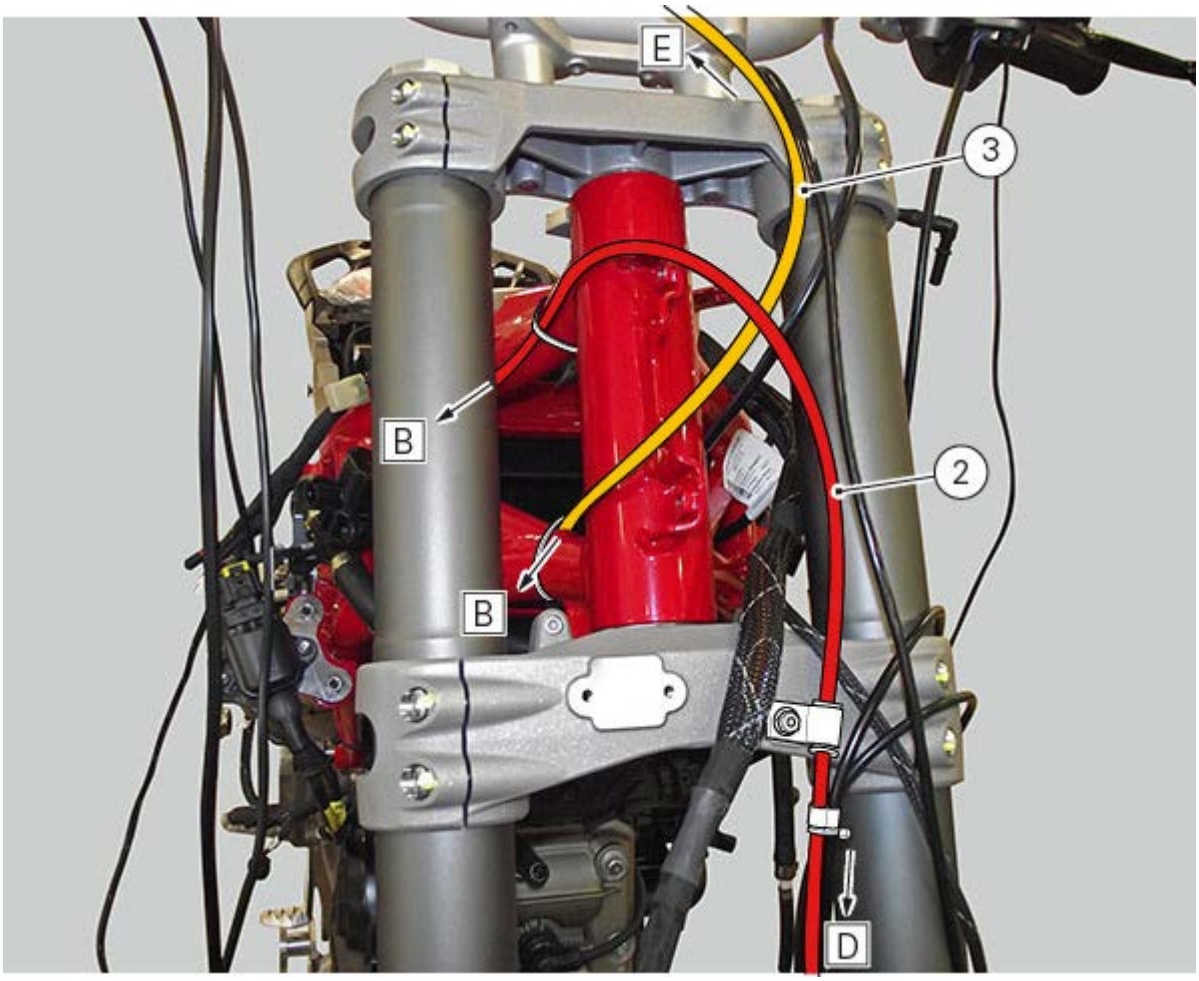


TABLE C



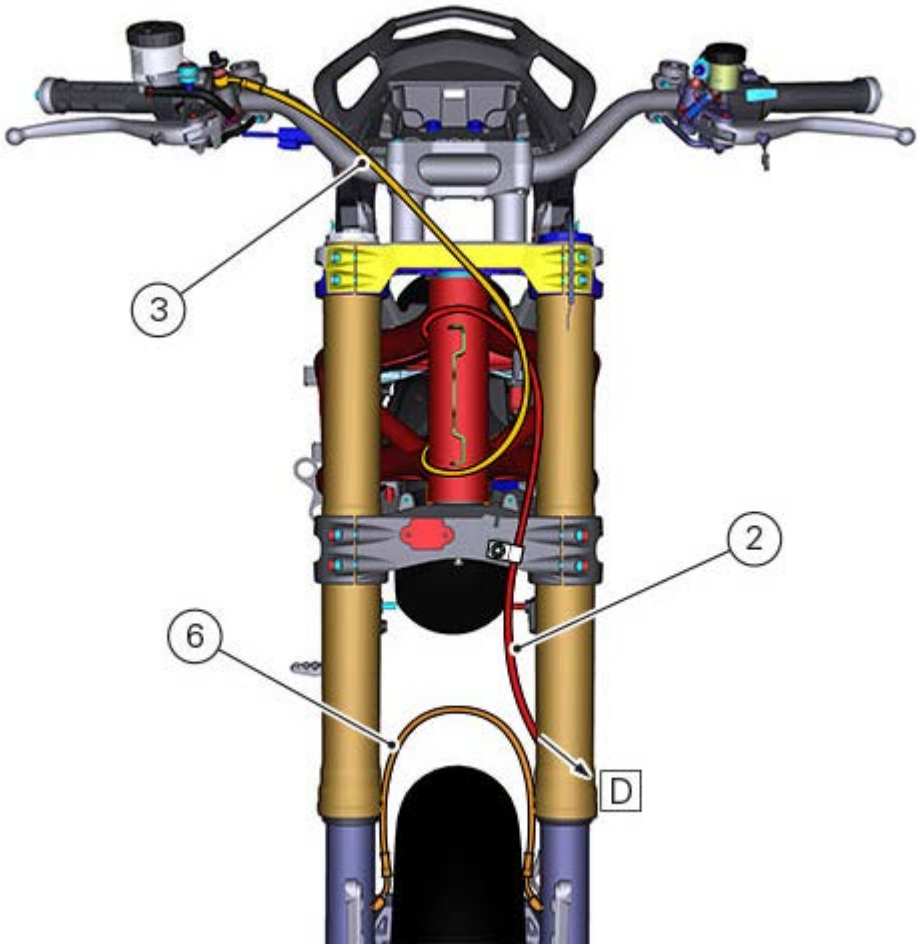
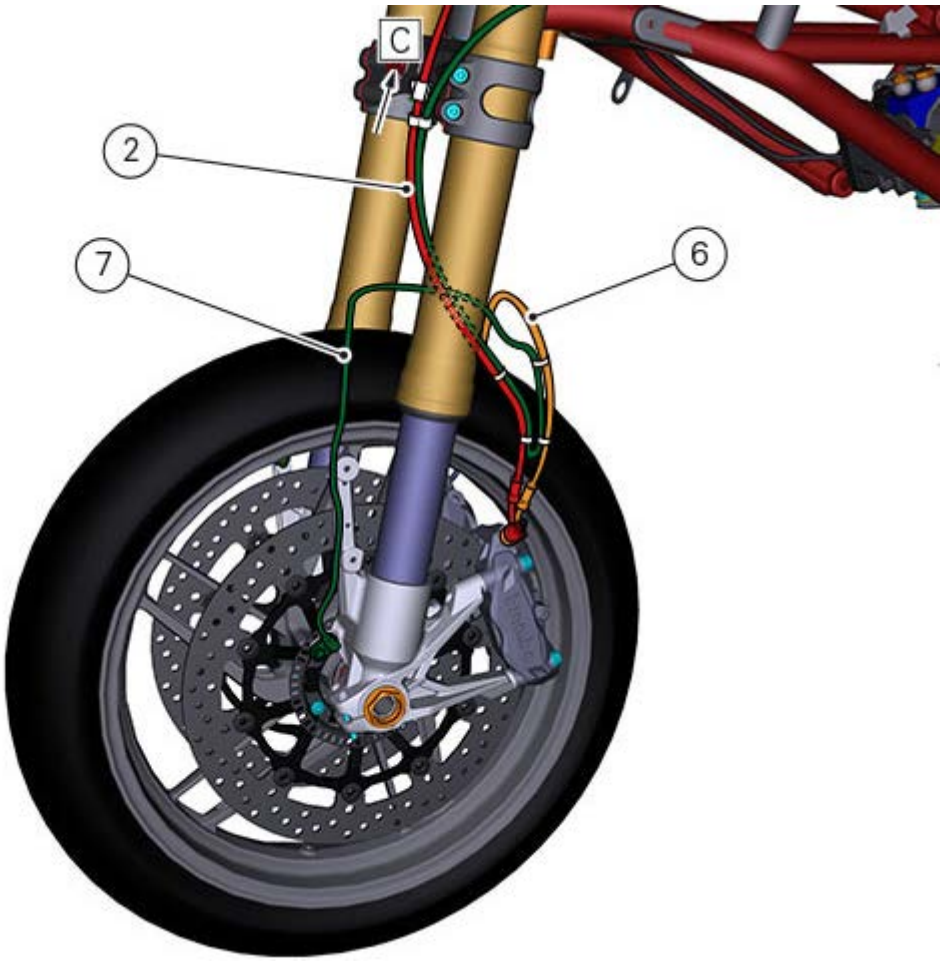


TABLE D



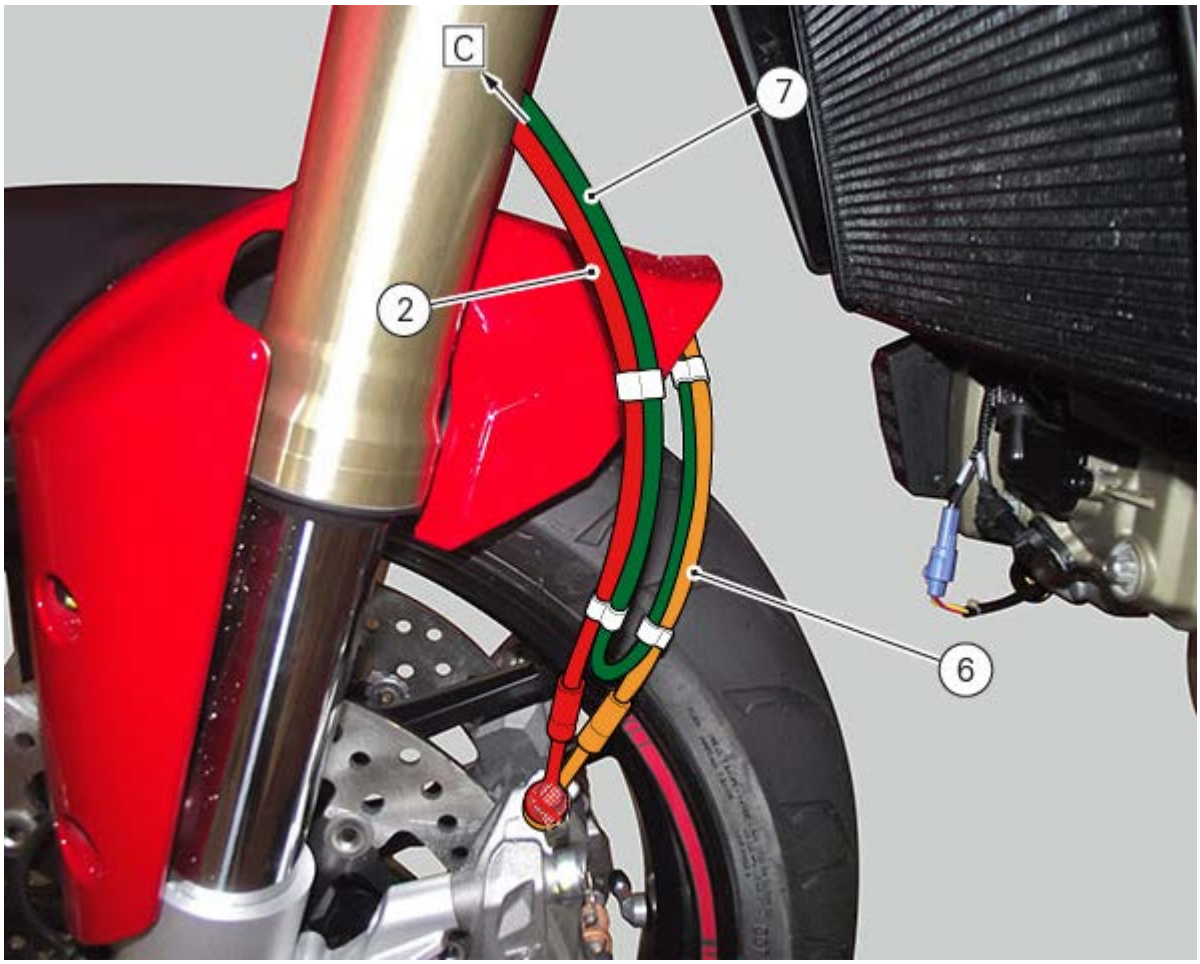


TABLE E

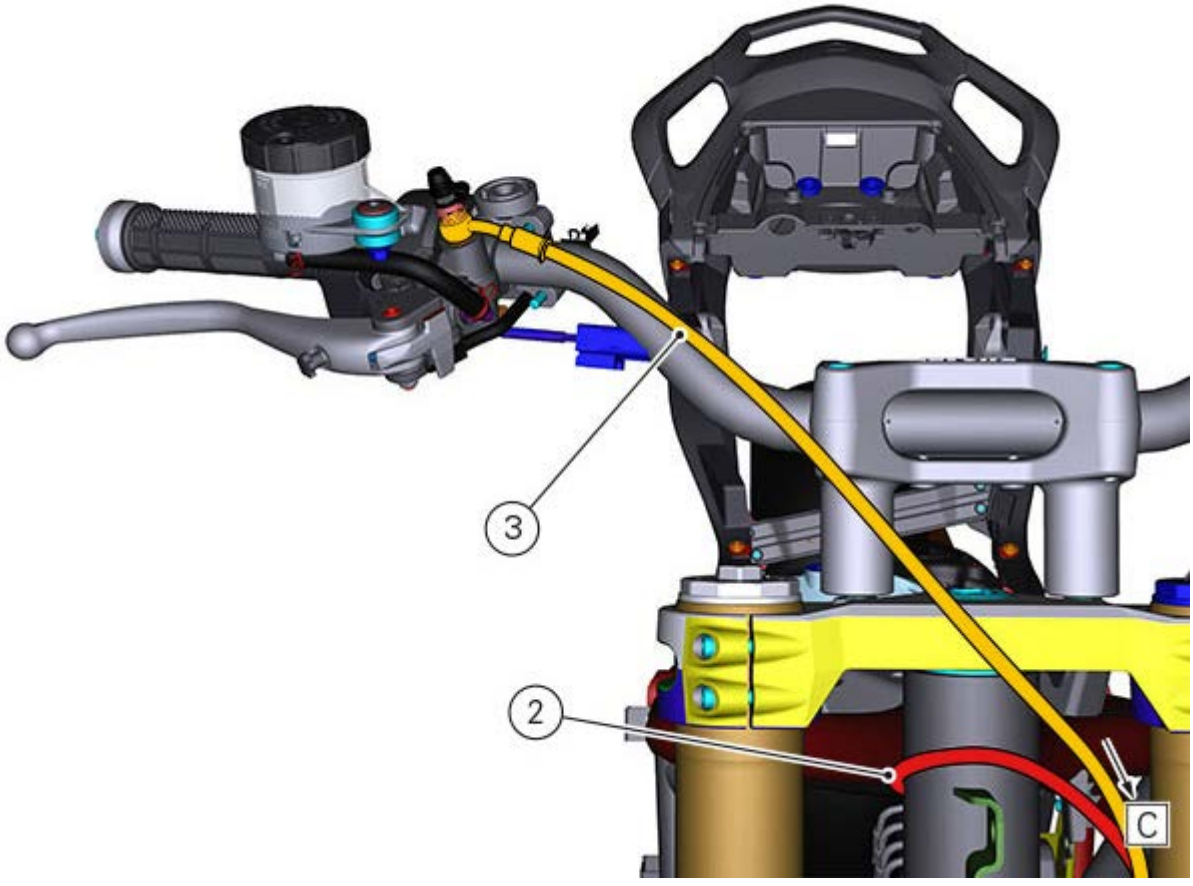


TABLE F

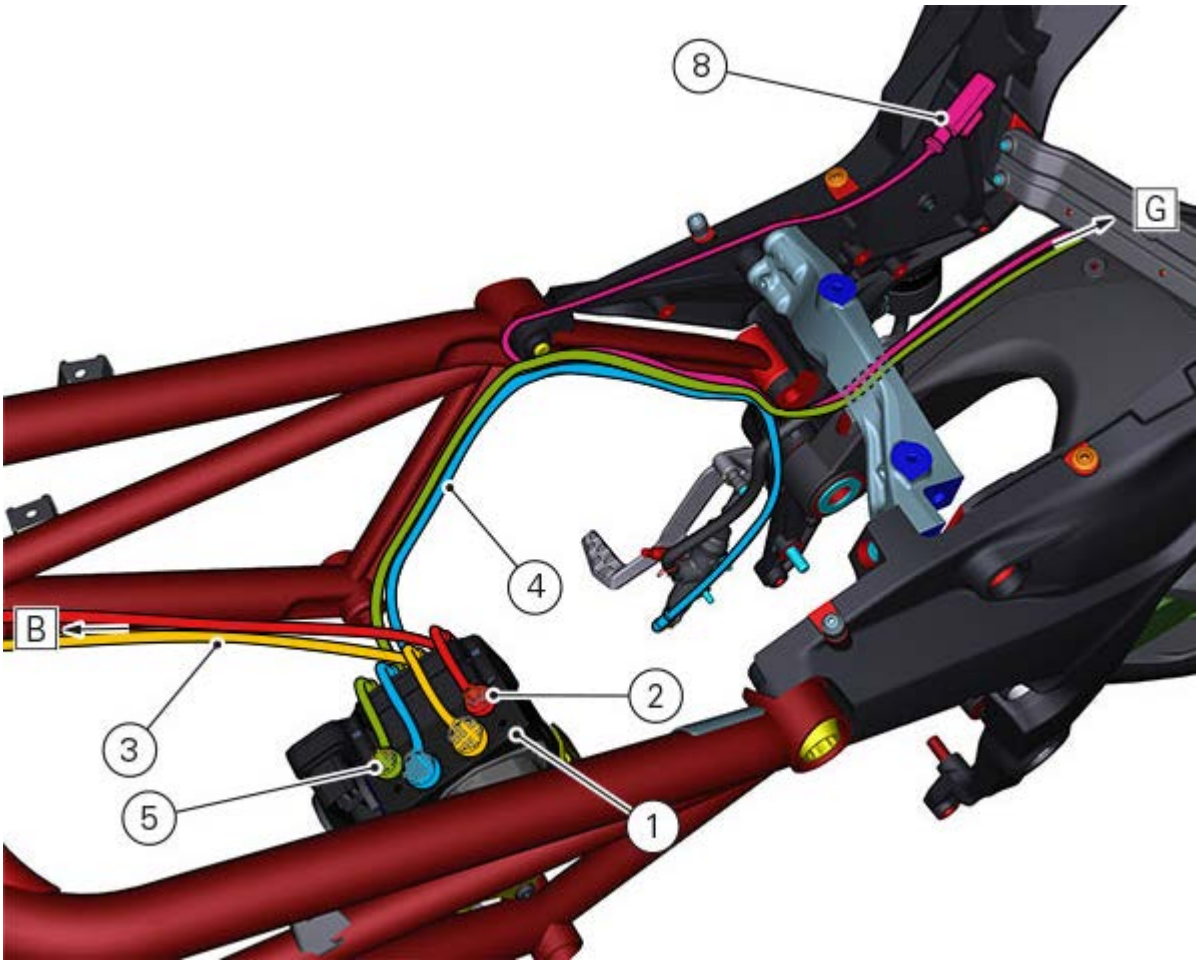


TABLE G

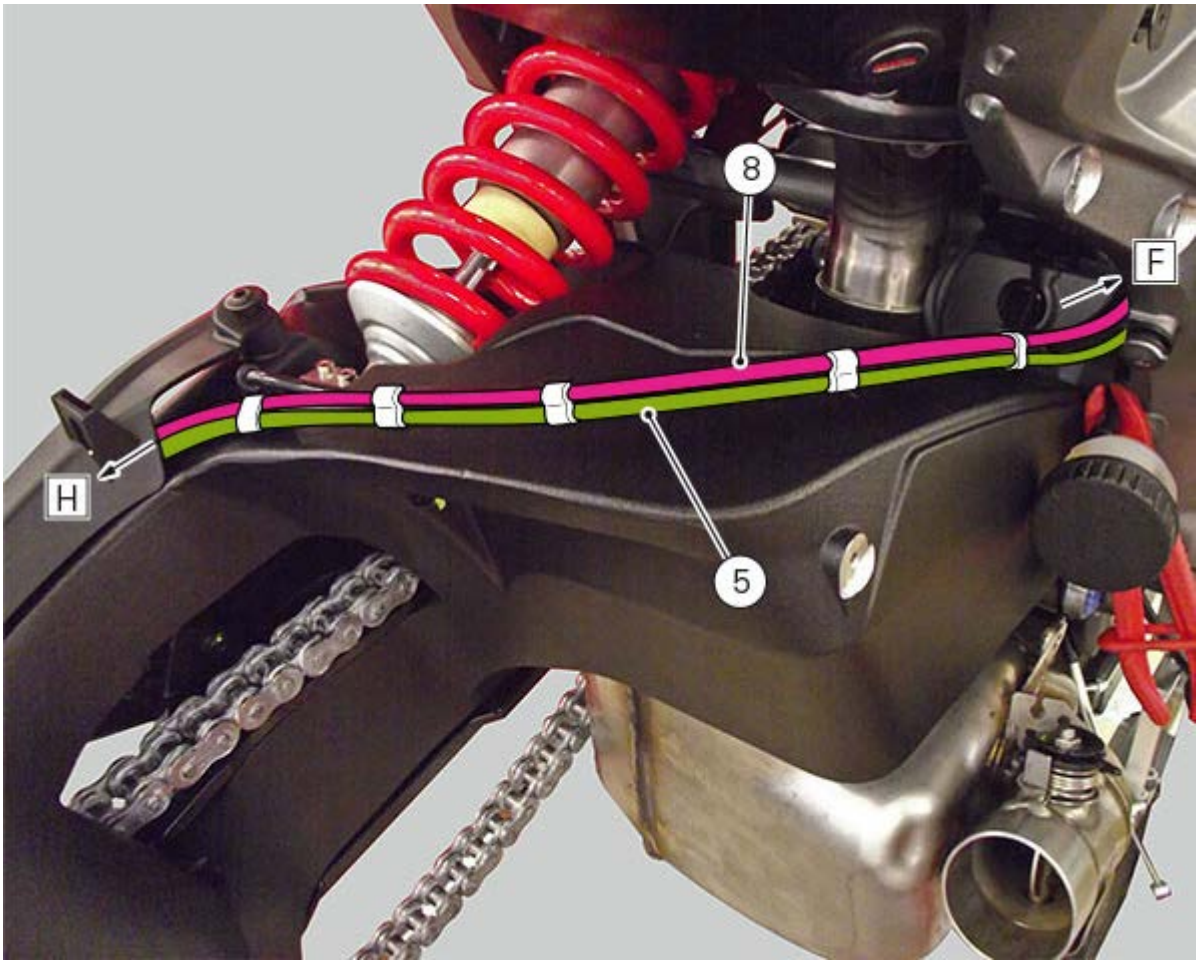
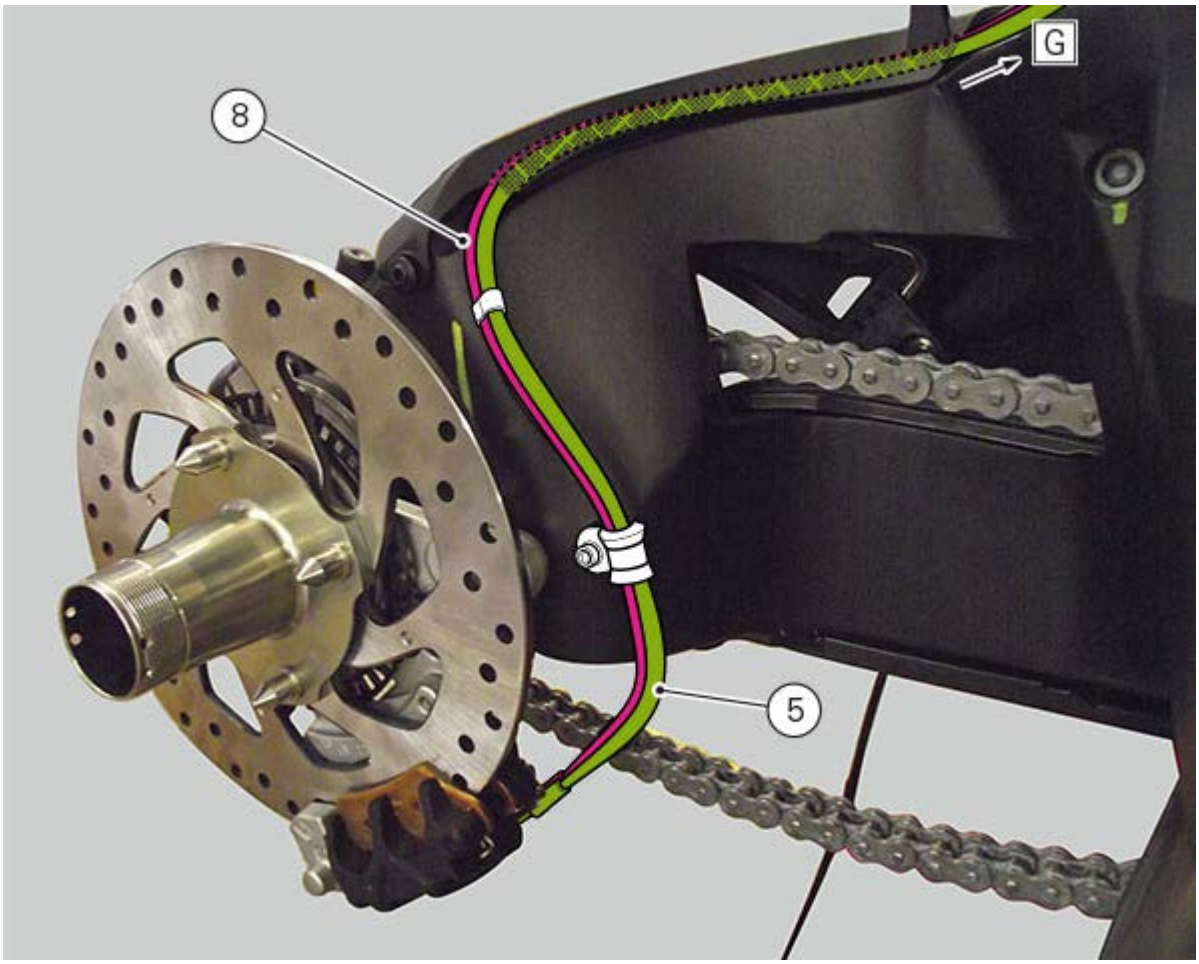
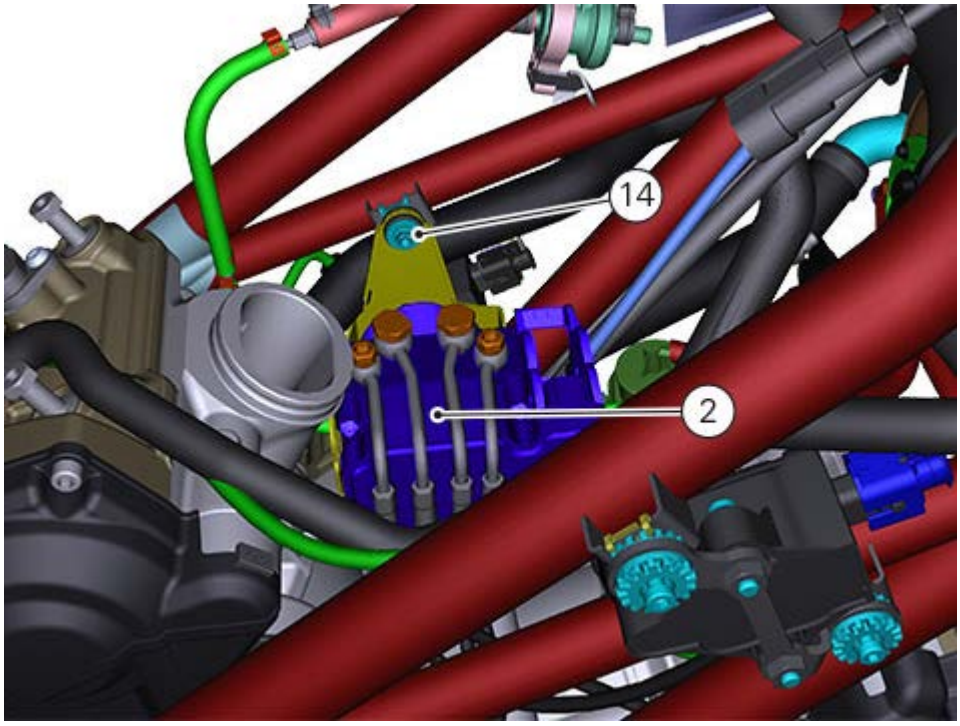


TABLE H

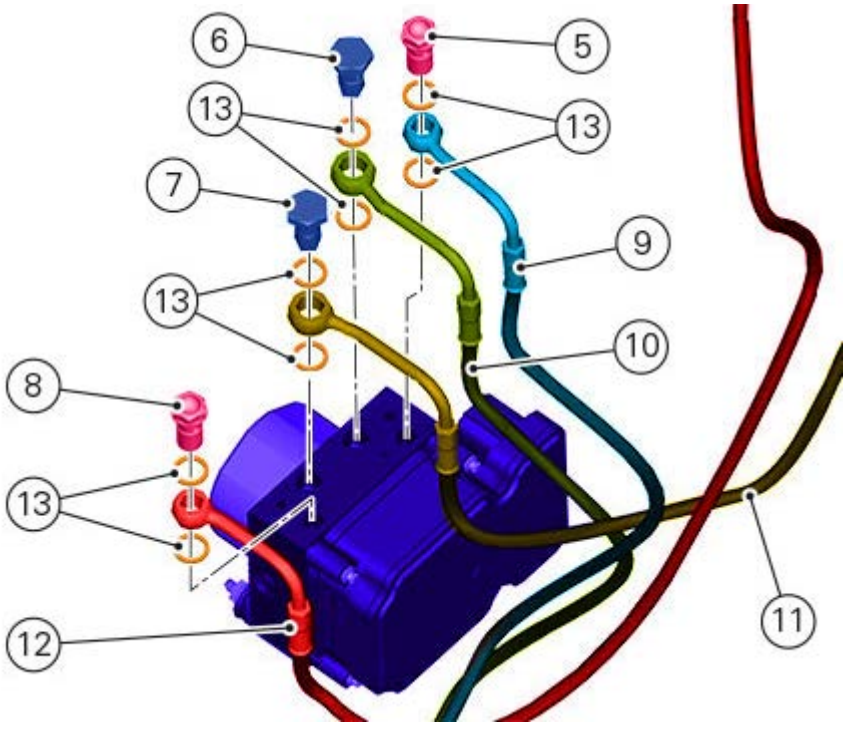

G
8
5

Refitting the ABS control unit

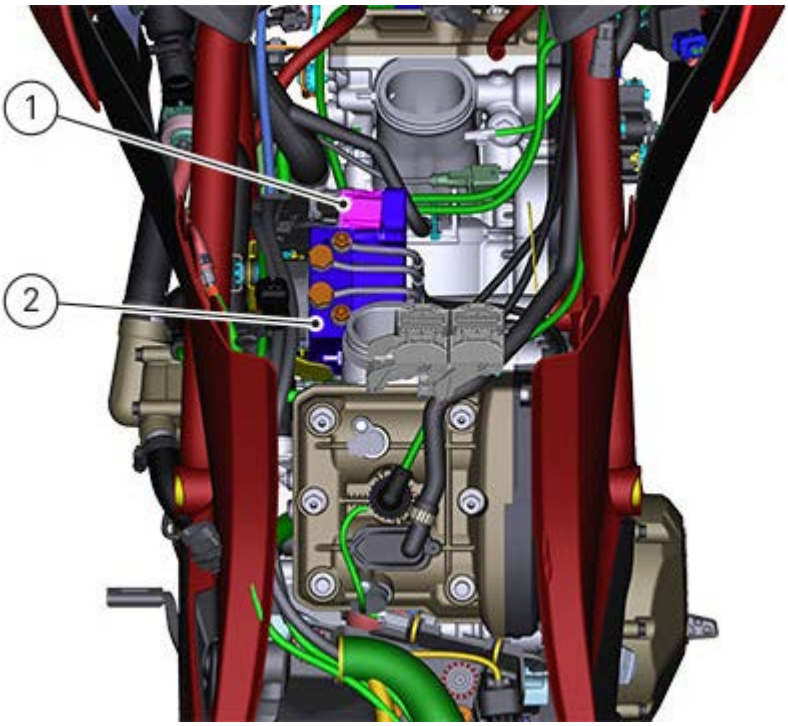
Refit the ABS control unit (2) by tightening screw (14) to a torque of 5 Nm ± 10%.

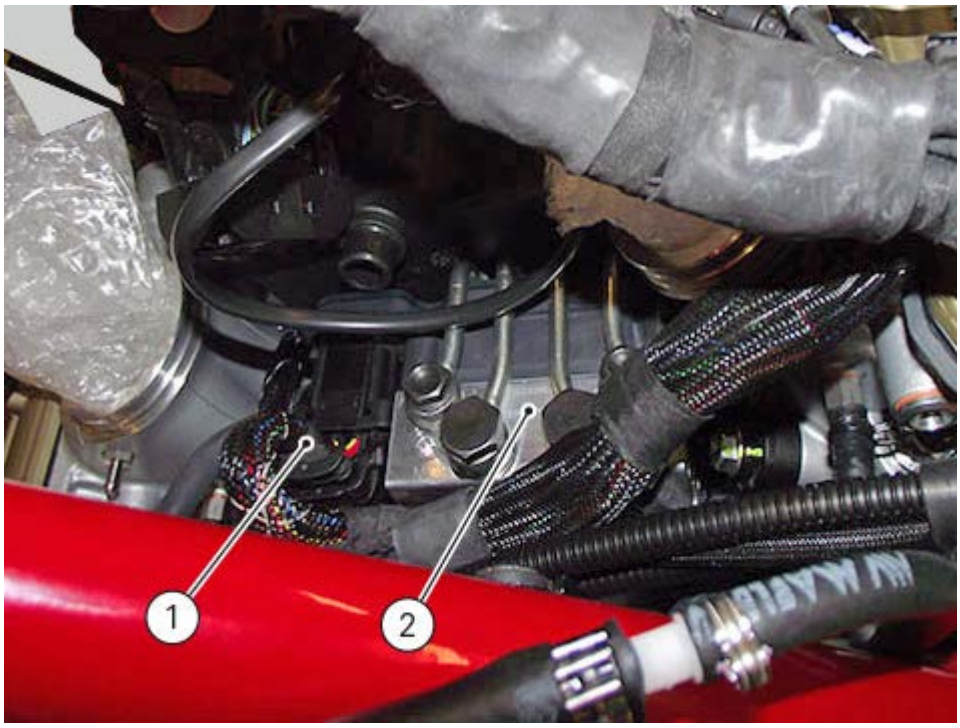


Hoses (9), (10), (11) and (12) must be secured in place using new sealing washers (13) on unions. Tighten screws (5), (6), (7) and (8) to a torque of 23 Nm ± 10%.



Connect connector (1) to the ABS control unit (2).





Important

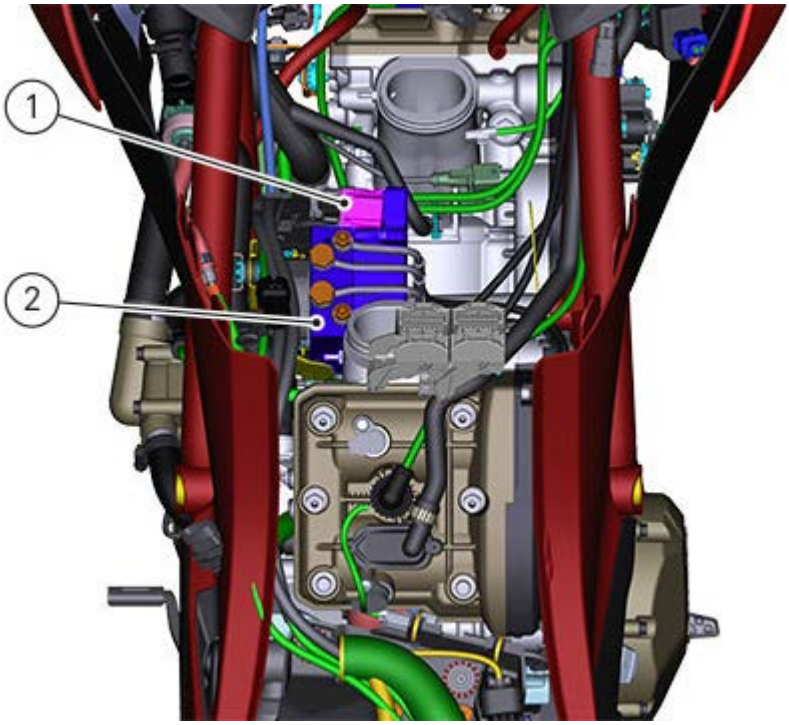
If the ABS hydraulic control unit has been replaced, it will be supplied with the secondary circuit already filled with fluid. Control unit must thus be assembled and the system filled and drained as a traditional system.

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

Removing the ABS control unit

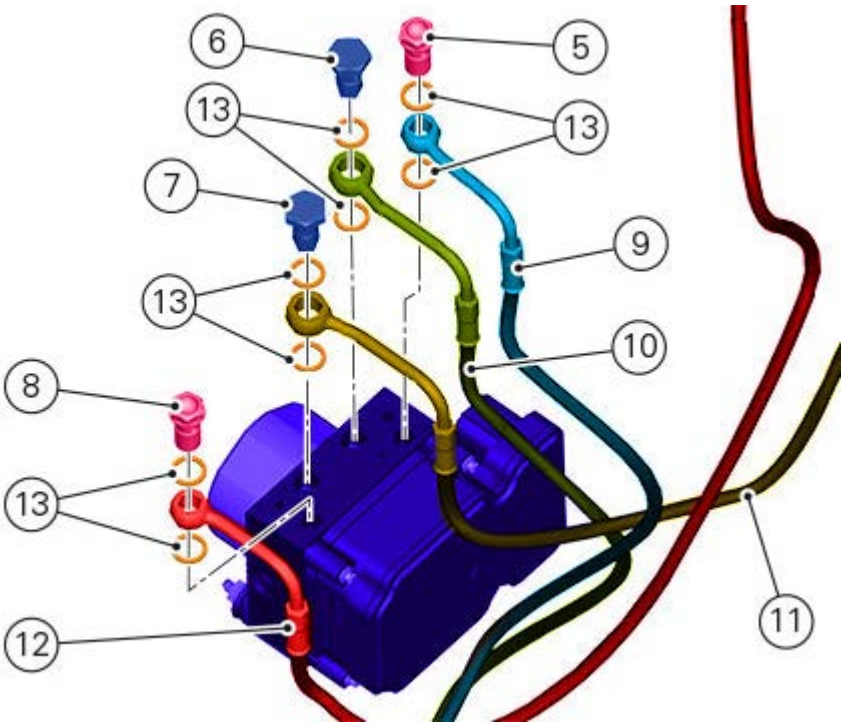
Remove the seat (Removing the seat).
Remove the fuel tank (Removing the tank).
Remove the airbox (Removing the airbox).

Disconnect ABS control unit (2) connector (1), lift unit from the vehicle.

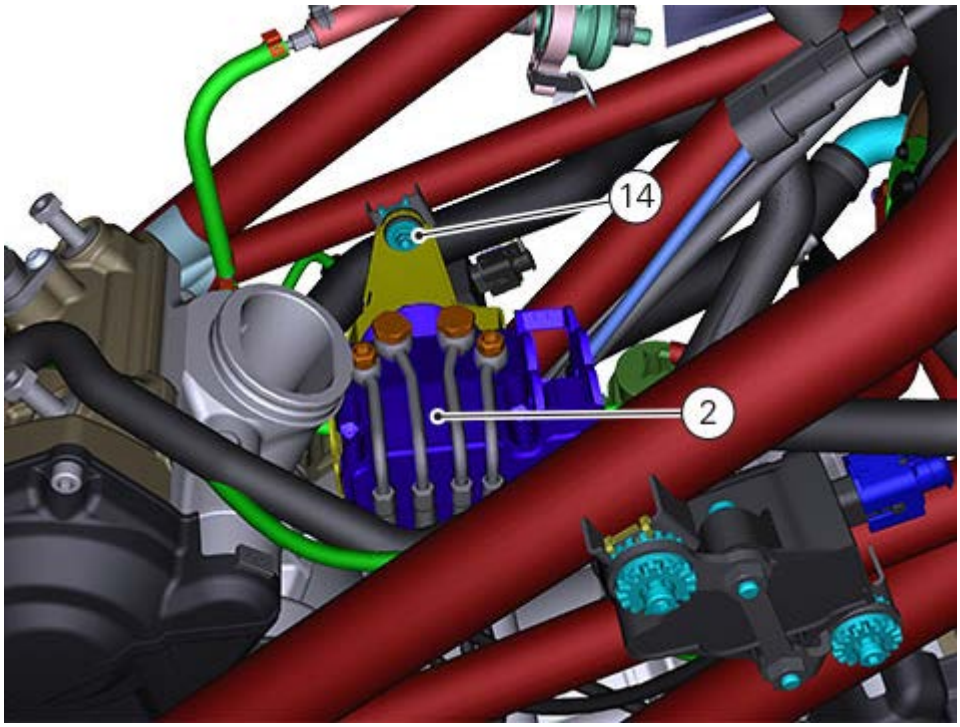


Loosen the special screws (5), (6), (7) and (8) that retain hoses (9), (10), (11) and (12), and remove seals (13).

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



Loosen screw (4) and remove the ABS control unit (2).



Important

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

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

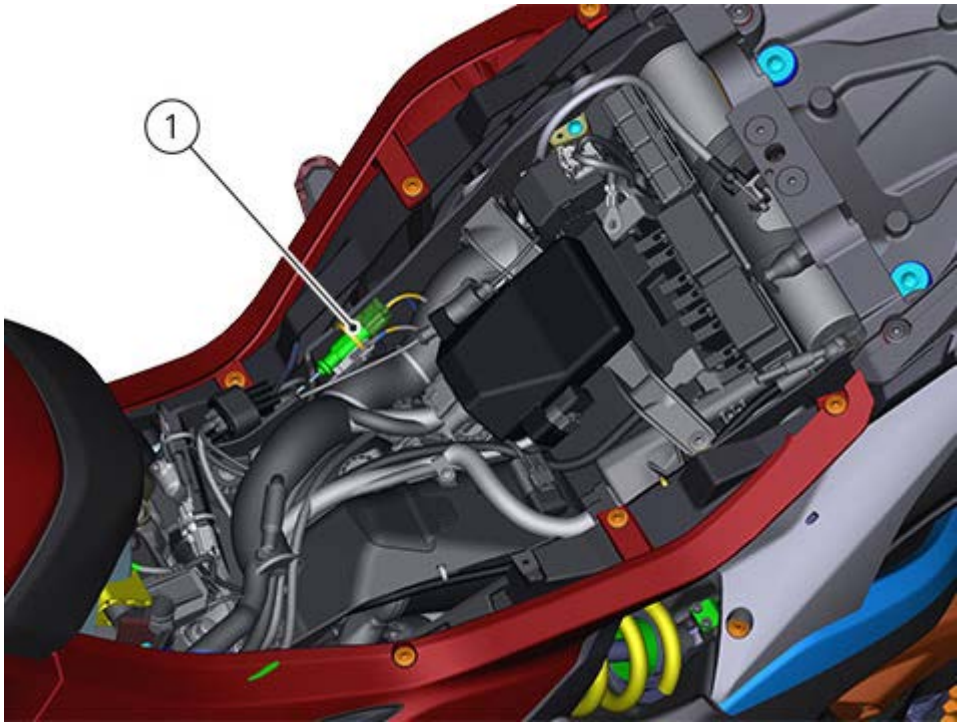
Changing the rear phonic wheel sensor

Warning

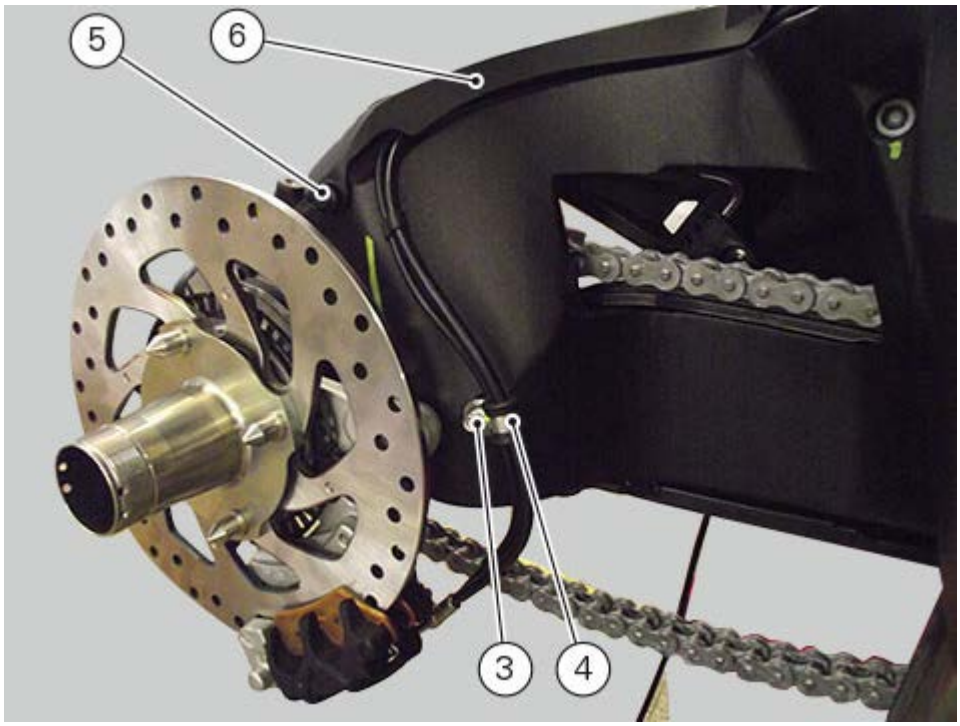
The following procedure applies to both vehicle versions.

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

Disconnect connector (1) of rear ABS sensor (2) from main wiring.
Open all the ties that retain the rear ABS sensor cable (2).



Loosen screw (3) of hose grommet (4).
Remove screw (5) that secures swinging arm cable cover (6).



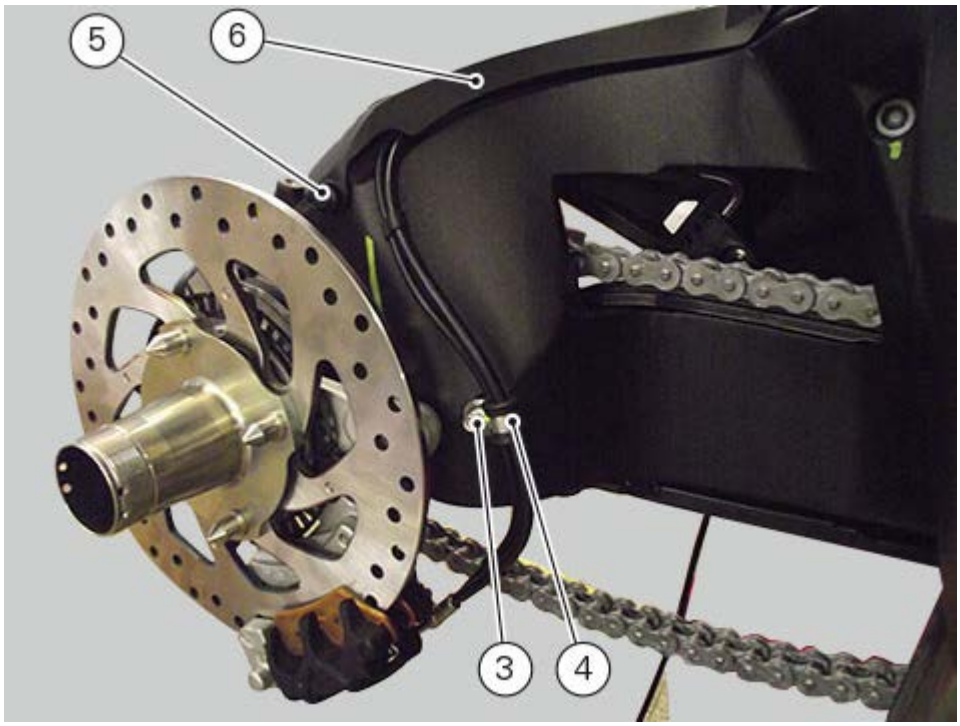
Undo the screws (7) and remove the rear swinging arm cable cover (6).
Remove the ties.

Loosen screw (8) and remove the speed sensor (2).
Collect the calibrated seal (9).

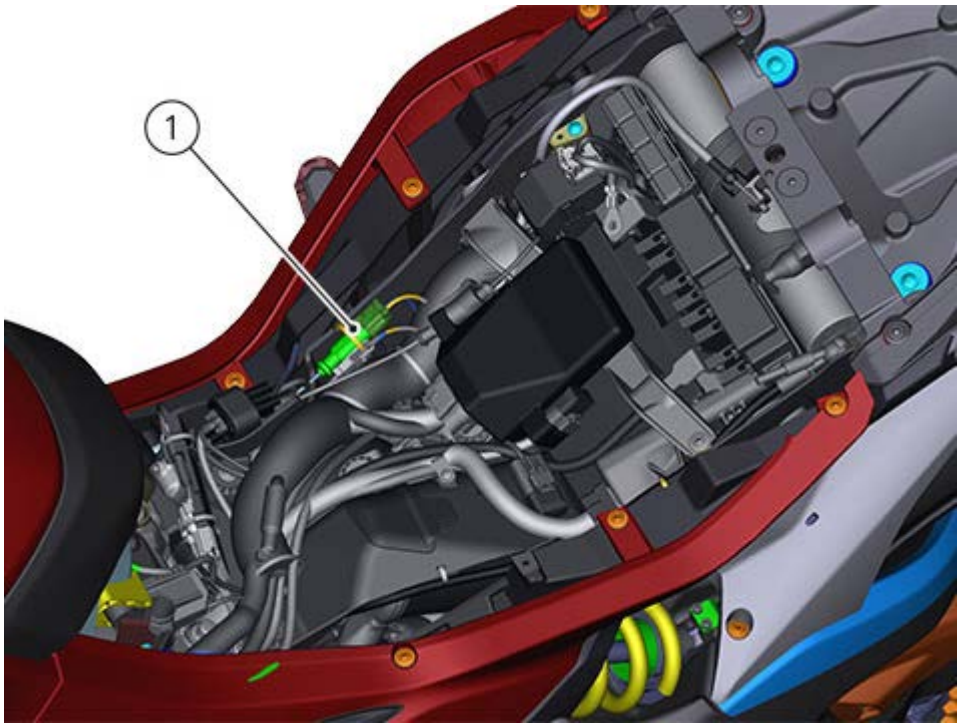
Check air gap between the new rear ABS sensor and the rear phonic wheel as explained under: "Adjusting the AIR-GAP of phonic wheel sensor".

REFITTING THE REAR PHONIC WHEEL SENSOR

Fasten the sensor to the calliper holder plate by tightening screw (8) to a torque of 8 Nm ± 10%.
Reposition the speed sensor cable (2) as described in chapter "Routing wiring harnesses / hoses".
Position the rear swinging arm "cable cover" (6) and fix by tightening screws (5) and (7) to a torque of 5 Nm ± 10%.
Fix cable ring (4) by tightening screw (3) to a torque of 5 Nm ± 10%.



Connect the connector (1).



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

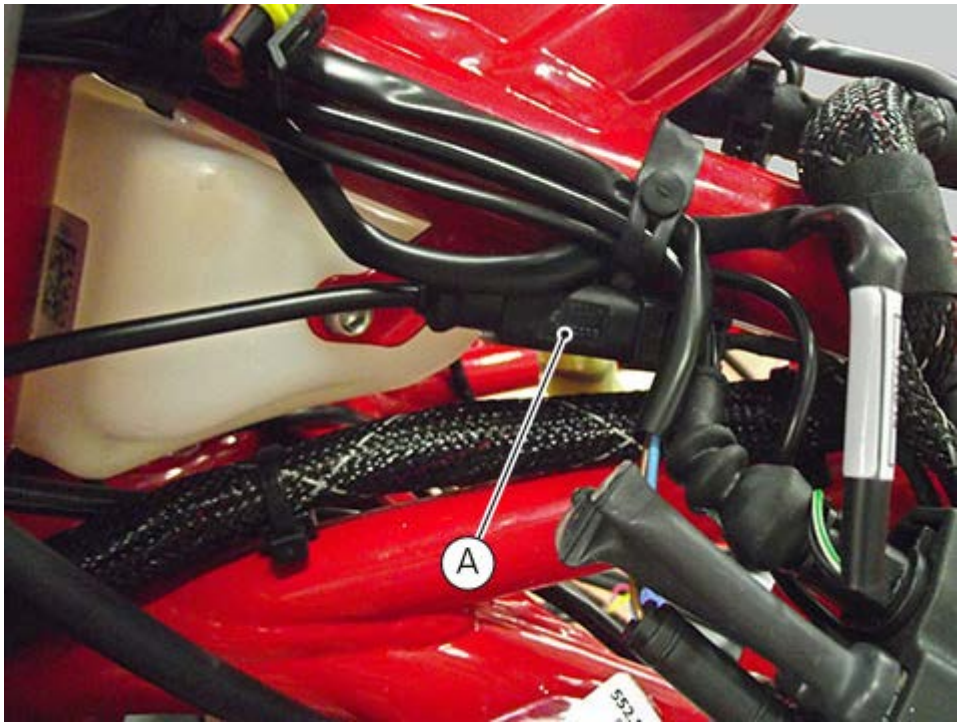
Changing the front phonic wheel sensor

Warning

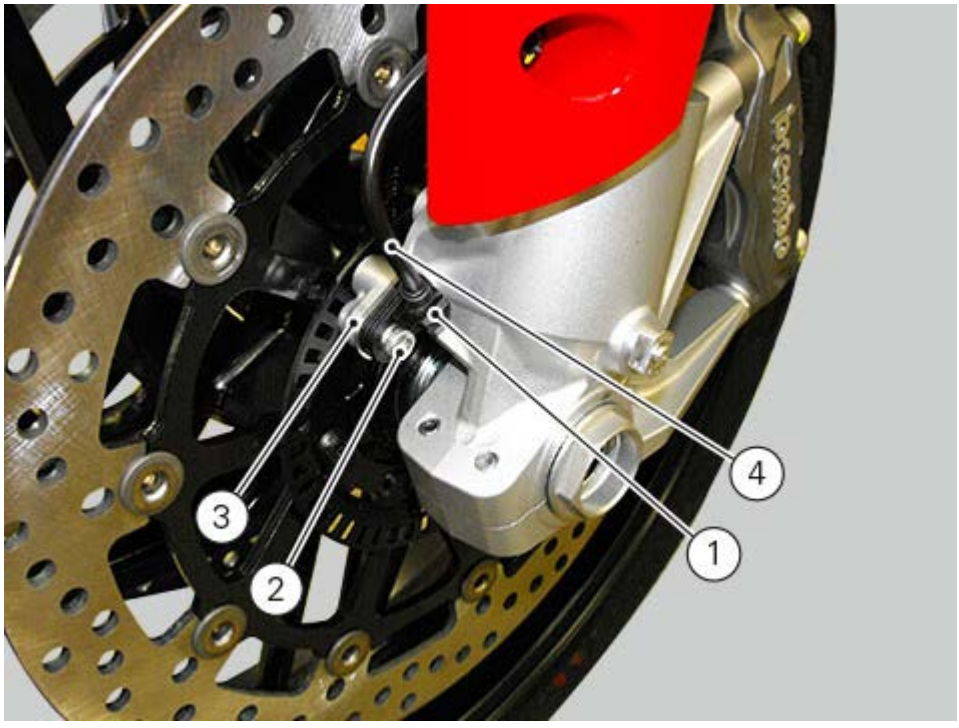
The following procedure applies to both vehicle versions.

Remove the panel (Removing the panel).
Remove the front half-casing (Removing the front half-casing).

Disconnect front ABS sensor (1) connector (A) from main wiring.



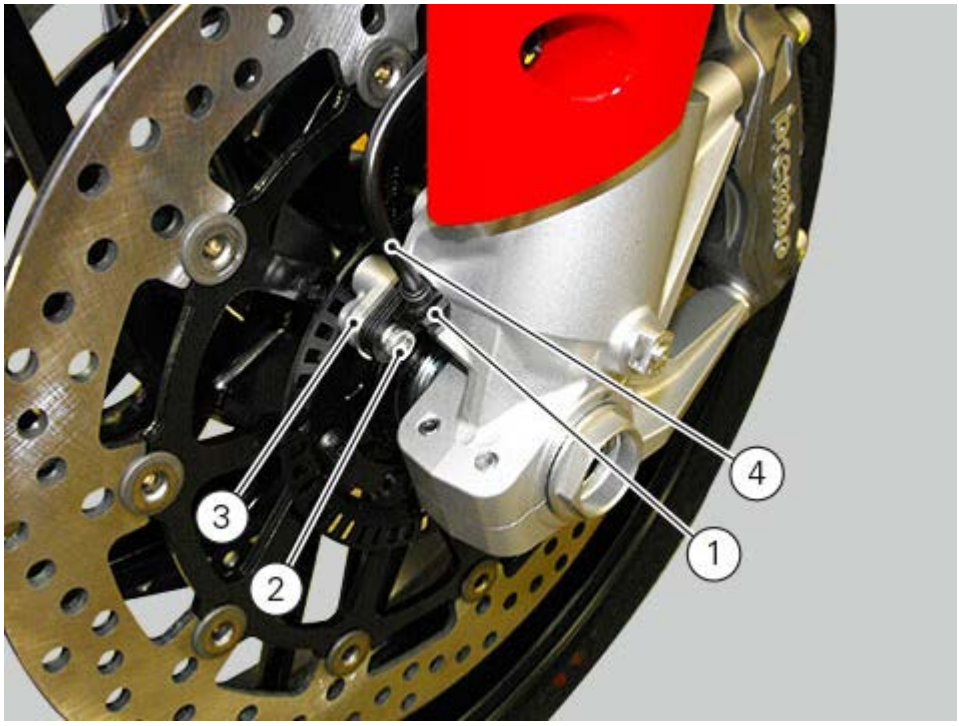
Undo the retaining screw (2), and remove front ABS sensor (1) with calibrated gasket (3), sliding cable out from cable grommet (4).



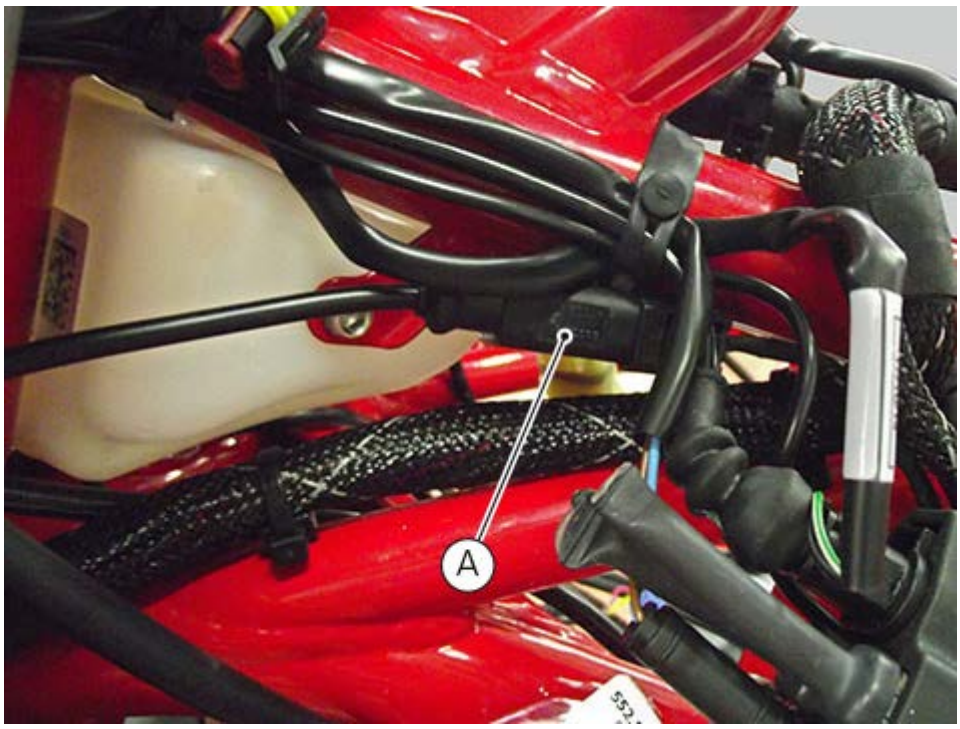
Before refitting, make sure that contact parts between front ABS sensor (1) and its seat are free of damage and perfectly clean.
Fit the new front ABS sensor (1) on its seat inserting the screw (2).
Check air gap between front ABS sensor (1) and front phonic wheel (6) as explained under Section "Adjusting the

AIR-GAP of phonic wheel sensor.".

Tighten screw (2) to a torque of 10 Nm ±10%.



Connect the connector (A) to main wiring.
Refit all the ties that retain the front ABS sensor cable (1).



Refit the front half-casing (Refitting the front half-casing).
Refit the panel (Refitting the panel).

Bleeding of the ABS hydraulic system

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

S Version


A


A
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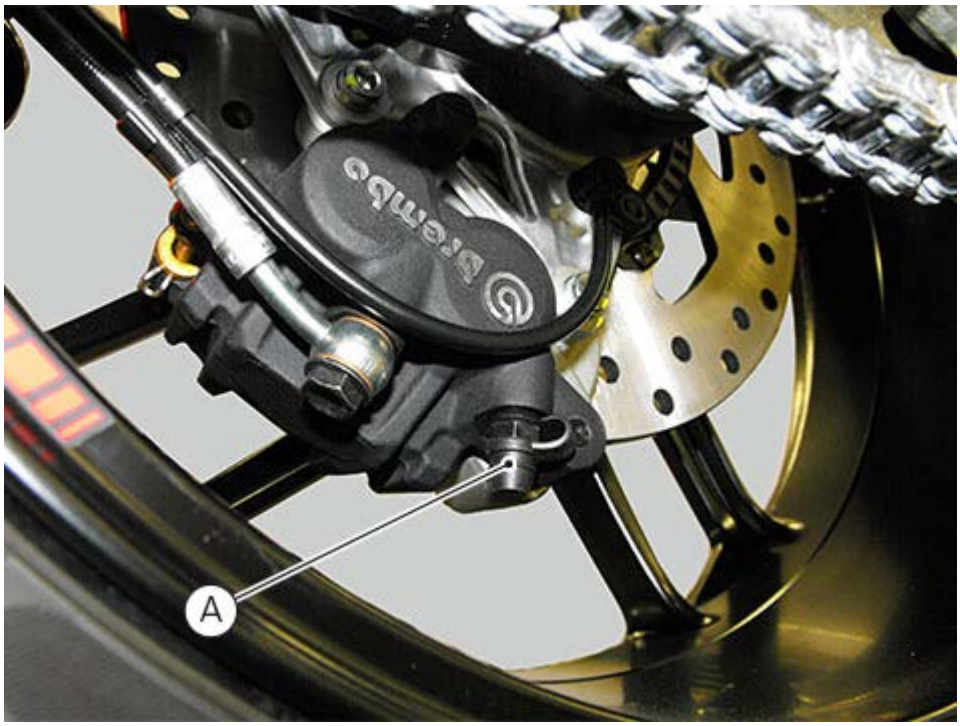


Important

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

Important

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

Important

Should it prove difficult to bleed the braking system, it is possible to use a dedicated activation to operate the pump and the ABS outlet valves to facilitate the ABS secondary circuit bleed which would be otherwise impossible following a standard procedure.

DEDICATED PROCEDURE

Pull/press completely the brake lever/pedal during the bleed procedure.

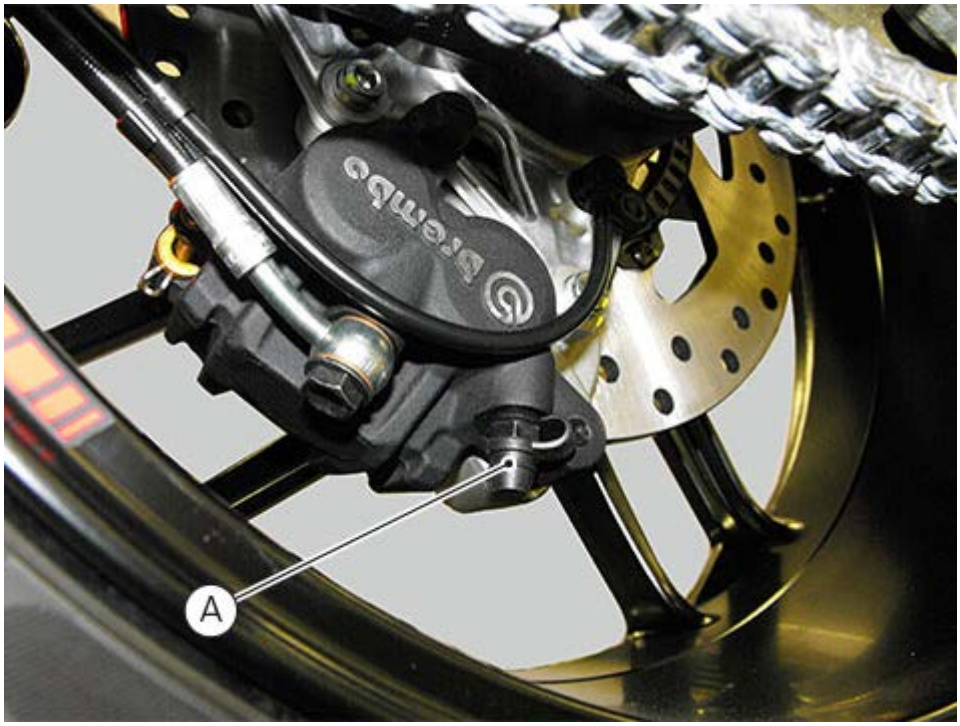
ABS circuit front part (AV)

Prepare to open the bleed valve (A) on the front calliper.

Connect the DDS 2.0 and start the first stage of the activation function that opens the front outlet valve (AV) for 5 seconds.
During this time, open and close repeatedly the bleed valve (A) of the front calliper.

ABS circuit rear part (AV)

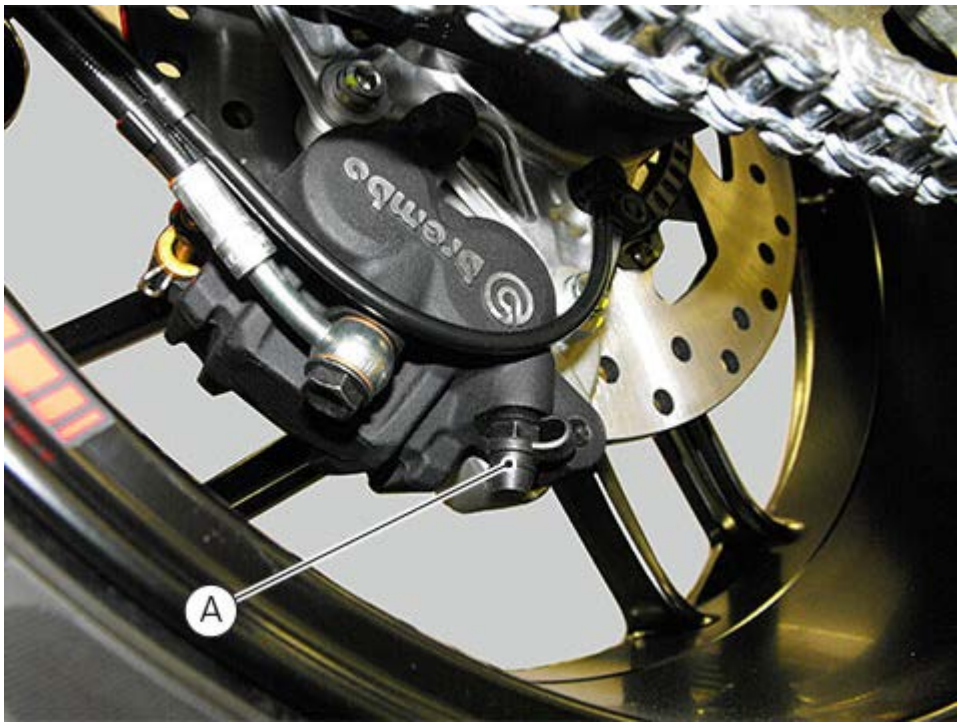
Prepare to open the bleed valve (A) on the rear calliper.



Still with DDS 2.0 start the second stage of the activation function that opens the rear outlet valve (AV) for 5 seconds.
During this time, open and close repeatedly the bleed valve (A) of the rear calliper.

ABS circuit rear part (AV) and (HSV)

Prepare to open the bleed valve (A) on the rear calliper.



Use the DDS 2.0 to start the third stage of the activation function to open the rear outlet valves (AV) and (HSV) with activation of the ABS pump.
During this time, open and close repeatedly the bleed valve (A) of the rear calliper.

Adjusting the AIR-GAP of phonic wheel sensor

Warning

The following procedure applies to both vehicle versions.

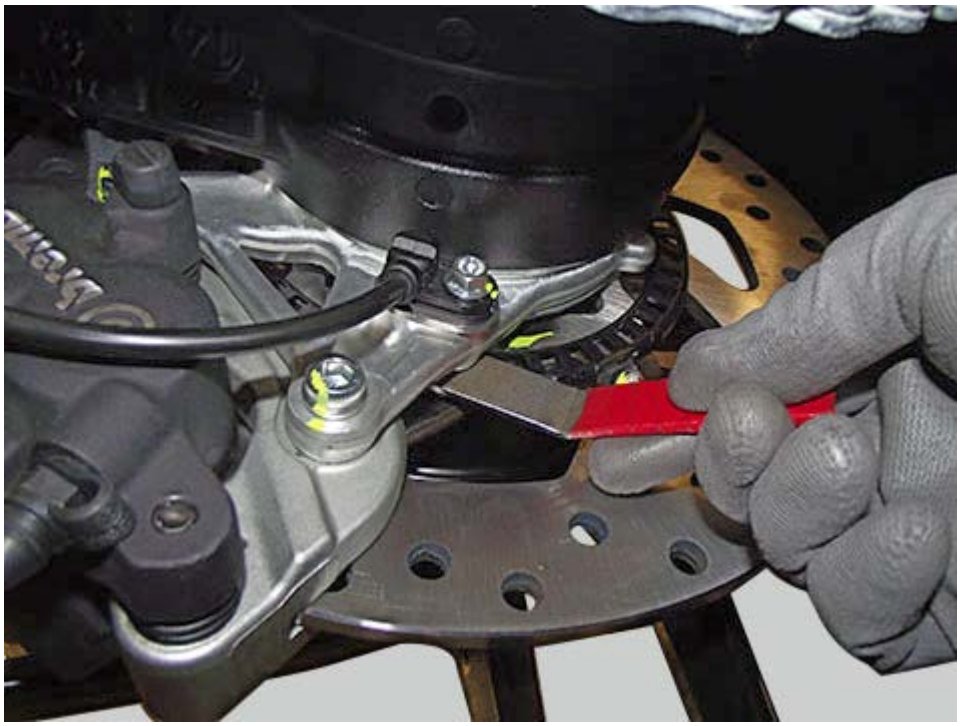
(For front as well as rear sensor) In each case of maintenance that foresees:

- replacement or refitting of the wheel;
- replacement or refitting of the phonic wheel (1) or (2);
- replacement or refitting of the brake discs;
- replacement or refitting of the speed sensor (3) or (4);
- (front) replacement or refitting of the sensor holder bracket;
- (rear) replacement or refitting of the calliper holder plate.

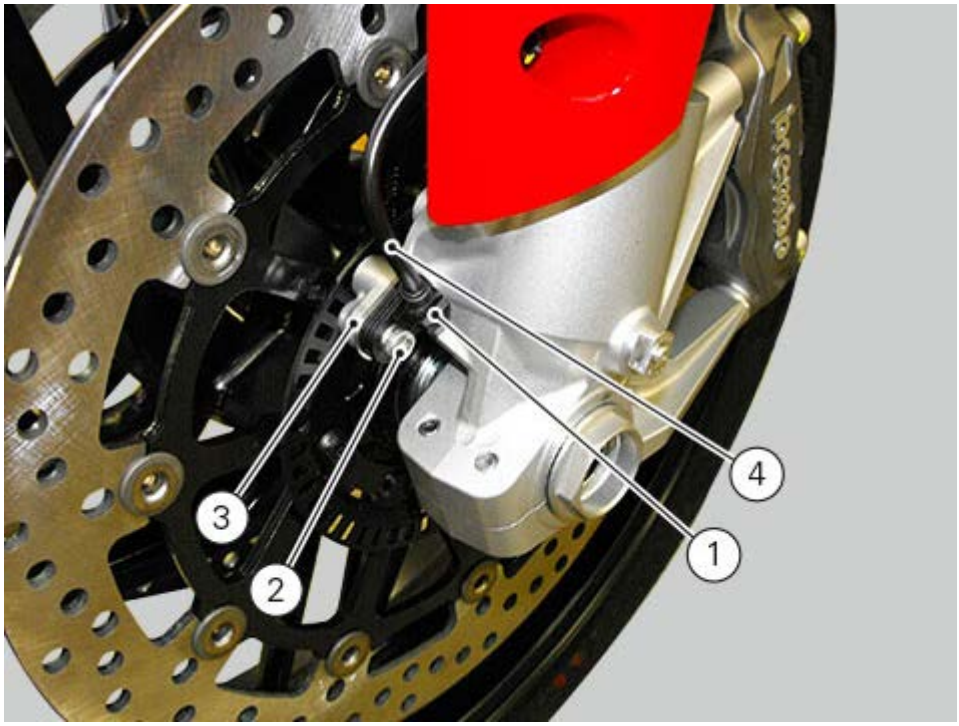
It is necessary to check the air-gap between the speed sensor and the phonic wheel, once the components are refitted.

For this purpose, use a feeler gauge to check the air-gap; then, carry out 3 measures of the air-gap, one every 120° of wheel turn.

There must be a gap between ABS sensor and phonic wheel of 1.3 mm to 1.9 mm. To check it, use a suitable feeler gauge.

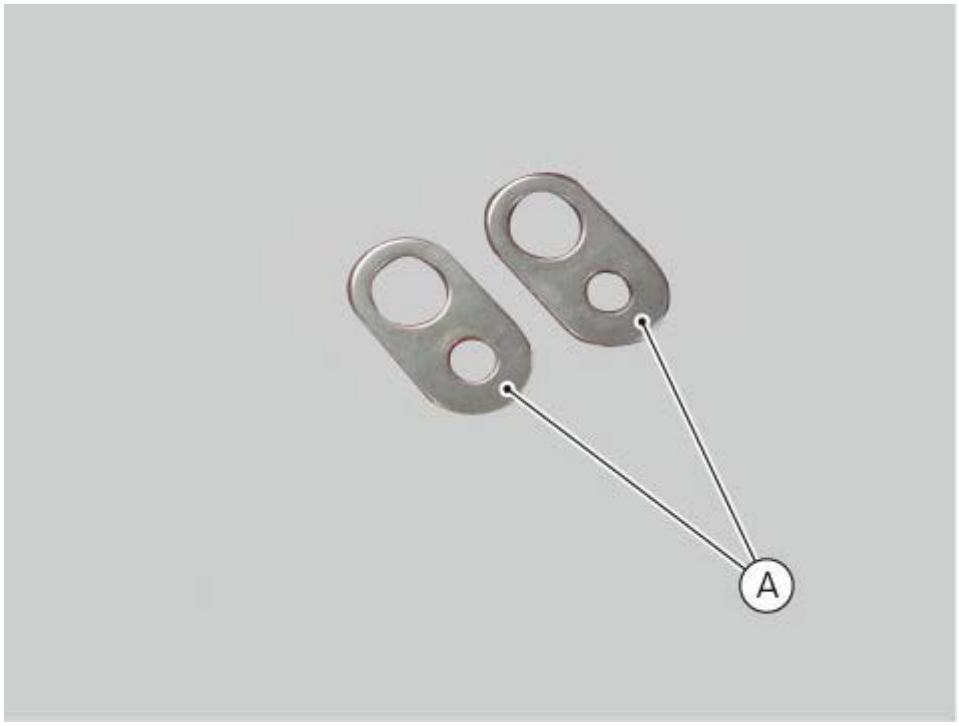


FRONT
Tighten securing screw (2) fully home on sensor (1) every time you add or remove shims.



REAR
Tighten securing screw (7) fully home on sensor (6) every time you add or remove shims.

Once the shimming is completed, tighten the sensor retaining screw to a torque of 10 Nm ± 10%.
For the shimming, use two feeler gauges (A) of 0.2 mm and 0.5 mm.



Warning
Shim pack shall never exceed 3 mm.

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

Phonic wheels cleaning

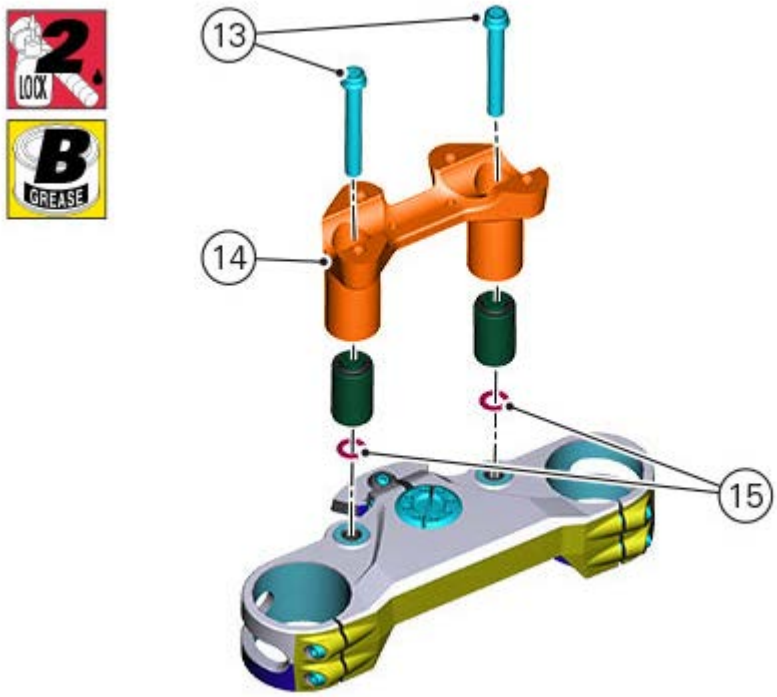
It is important to check that both phonic wheels (1) and (2) are always clean.
Otherwise: gently remove any possible dirt deposits with a cloth or metal brush.
Avoid using solvents, abrasives and aiming air or water jets directly on the phonic wheel (1) or (2).


1

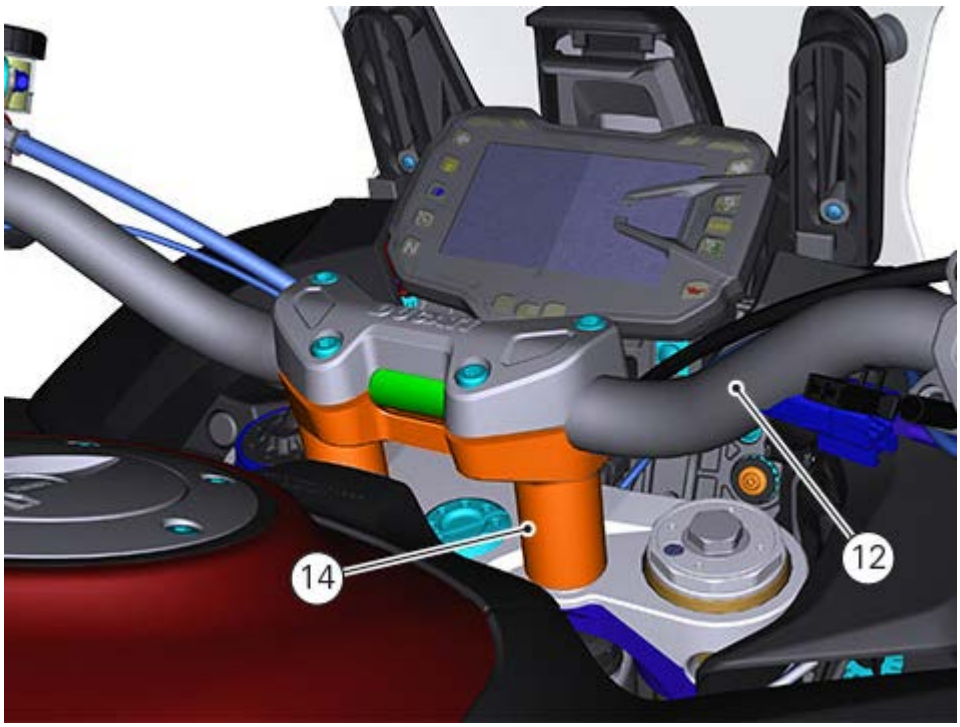

2

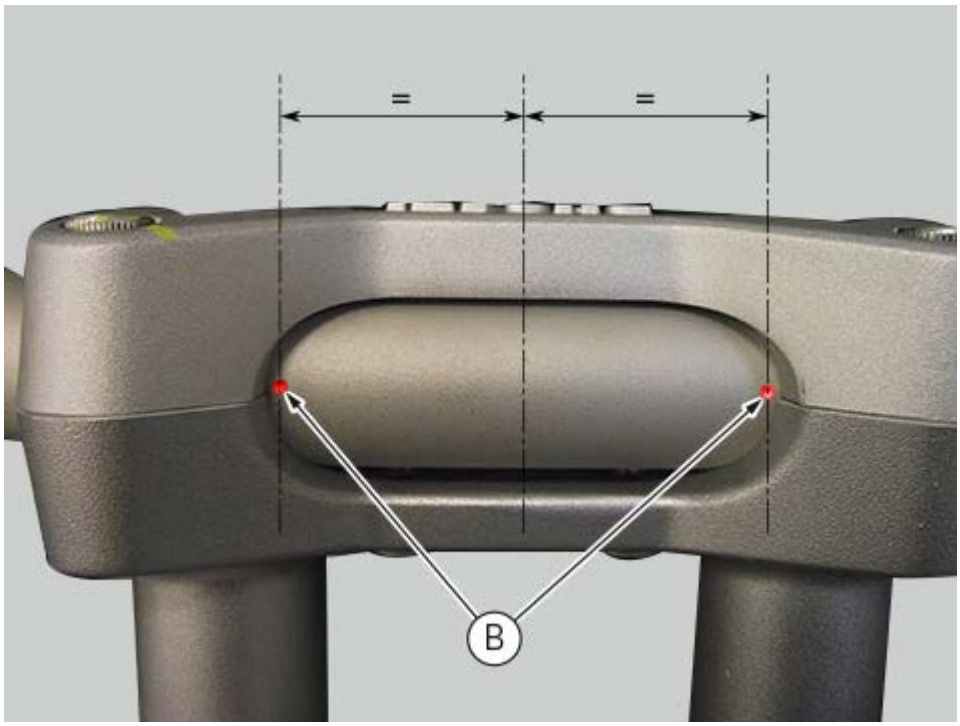
Refitting the handlebar

Apply the recommended grease to the underside of the screws (13).
Insert the screws (13) on the lower U-bolt (14).
Fit the toothed washers (15).
Apply the recommended threadlocker on the thread in view of screws (13).
Refit the lower U-bolt (14) and start screws (13).
Tighten the screws (13) to a torque of 45 Nm ± 5%, (1-2-1 sequence).

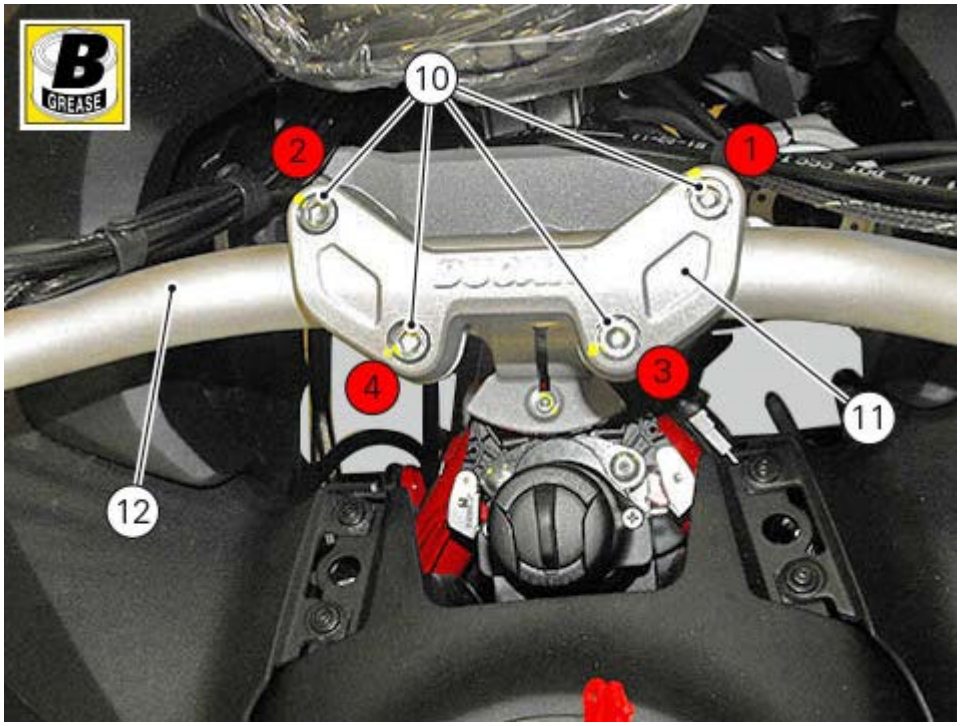


Position handlebar (12) in its seat on the lower U-bolt (14).
Reference points (B) on handlebar must be at the same distance from the symmetry axis and flush with the lower U-bolt surface (14).



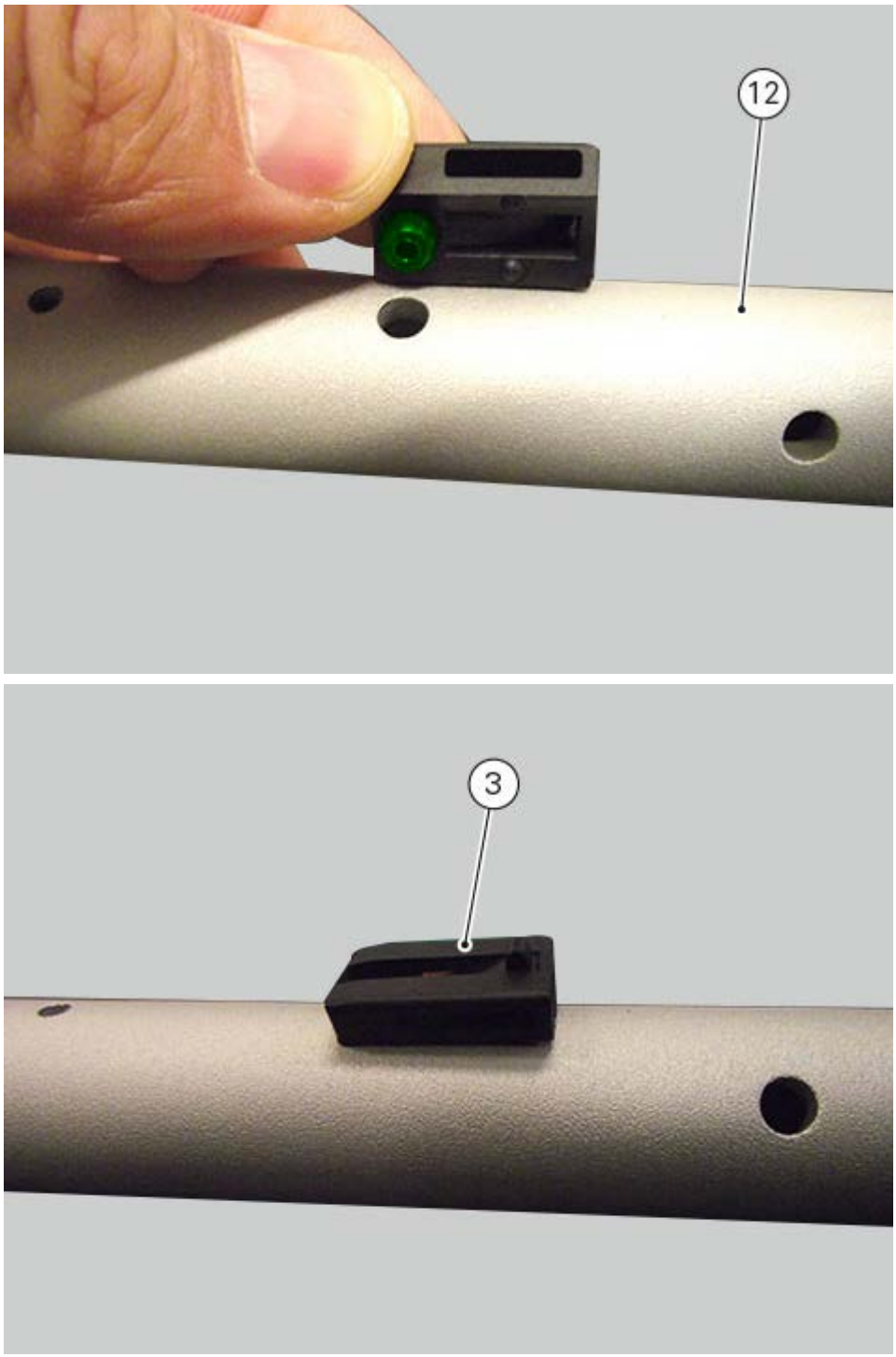


Smear screws (10) with specified grease.
Refit the upper U-bolt (11) and insert the screws (10).
Tighten screws (10) to a torque of 25 Nm ± 5%, following a 1-2-3-4-3 sequence, as shown.

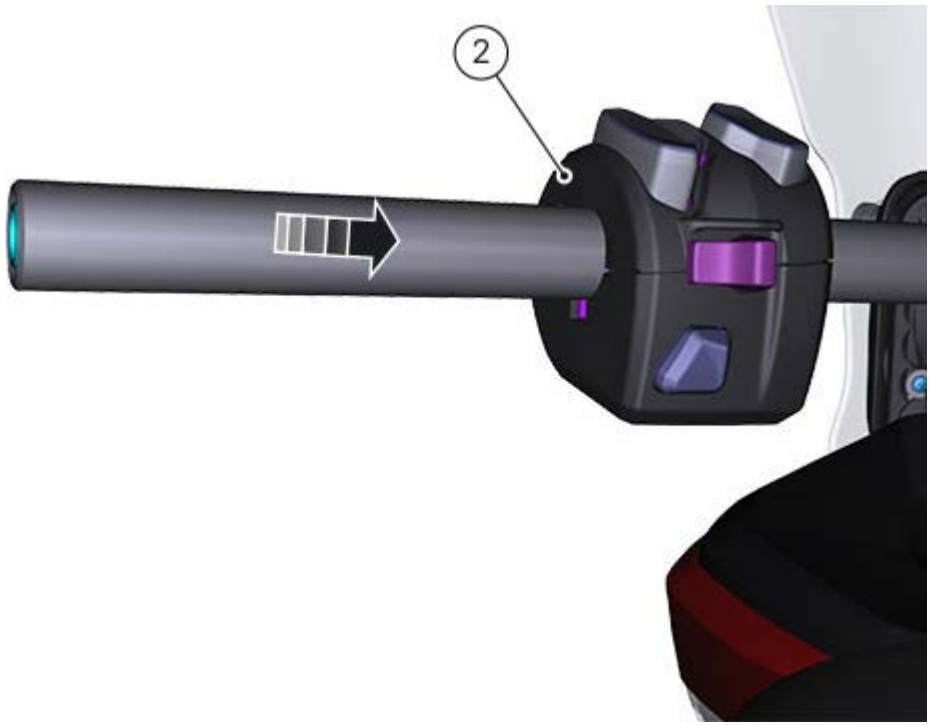


Refitting the switches

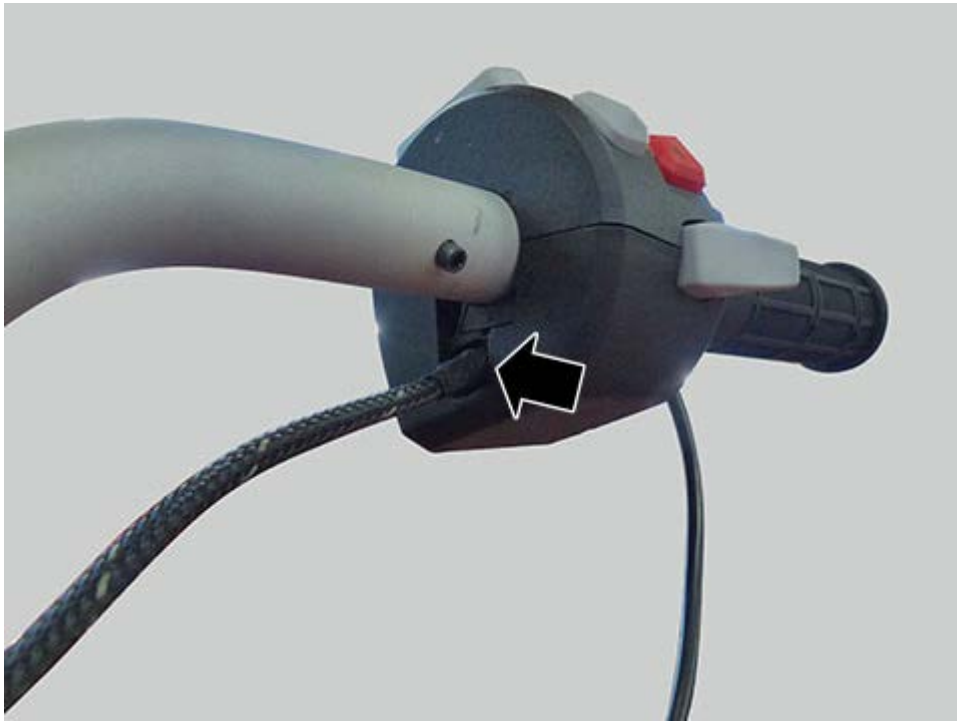
Following is the procedure to refit the LH switch. The same procedure applies also to the RH switch. Position support (3) by inserting the pin in the hole on handlebar (12).



Fit switch (2) fully home on support (3).
Check that the switch is actually blocked.

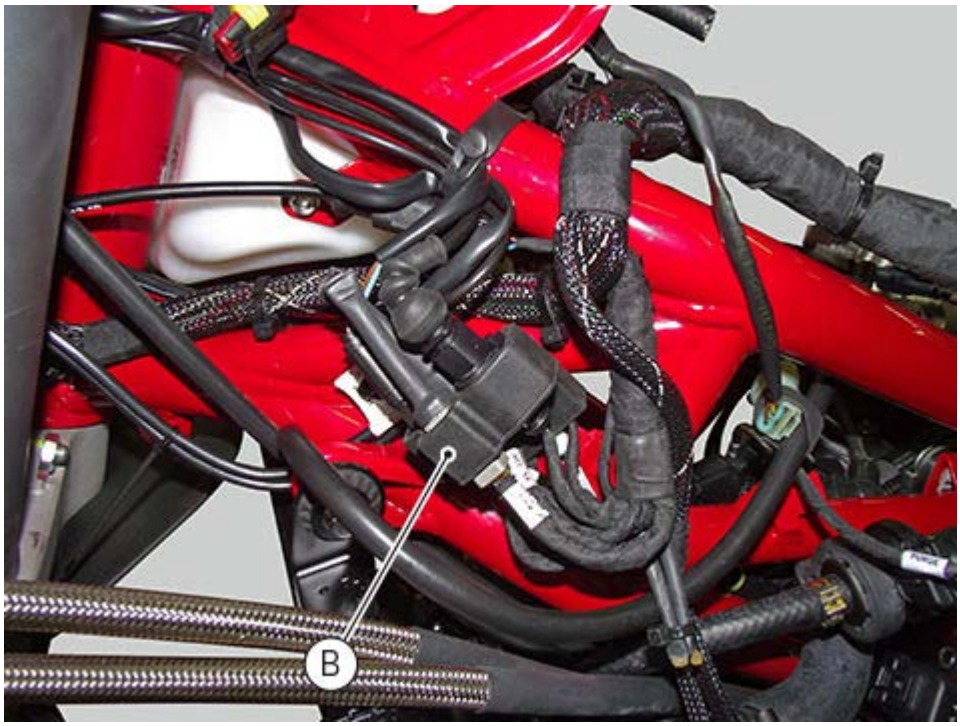


Reconnect the connector.

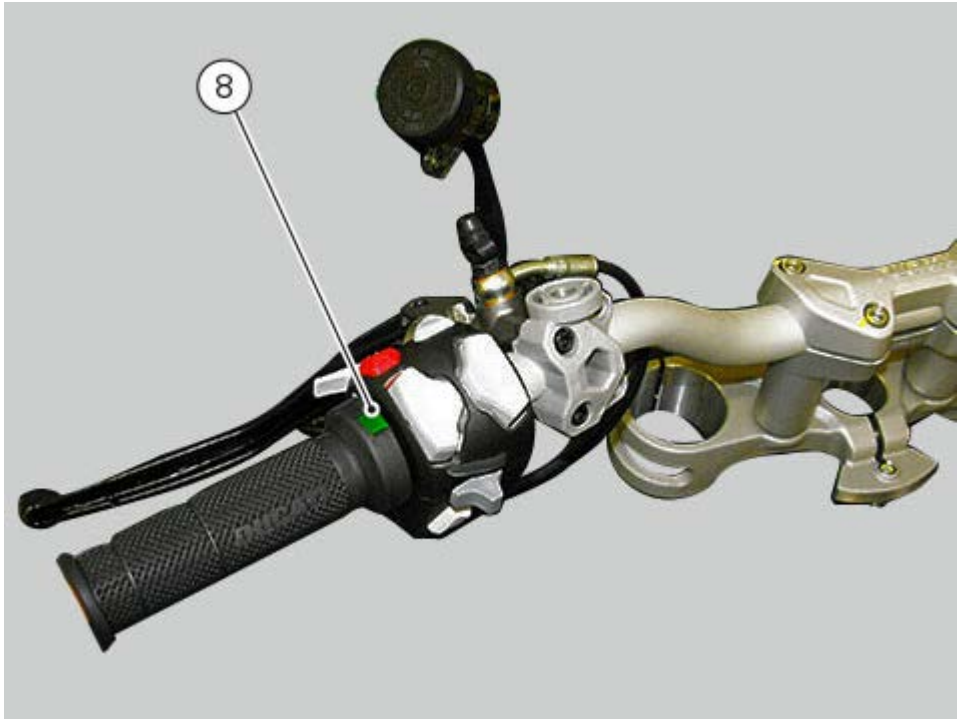


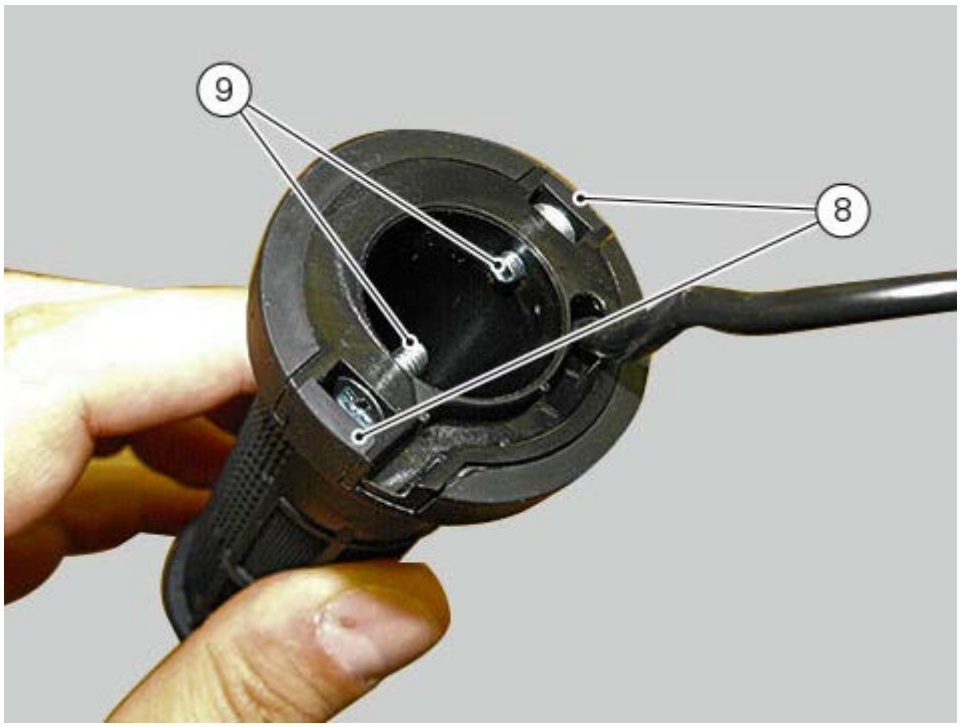
Refitting the heated handgrips

LH HANDGRIP
Connect connector (7) to the main wiring located in the connector support (B).



Tighten screws (9) to a torque of 2.8 Nm ± 10%.

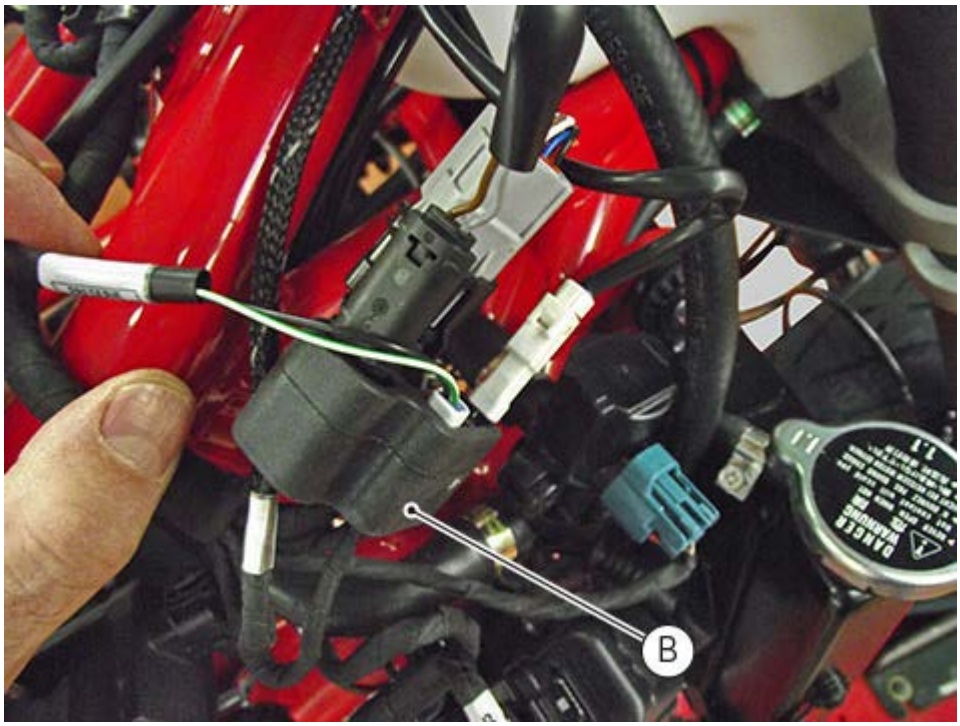


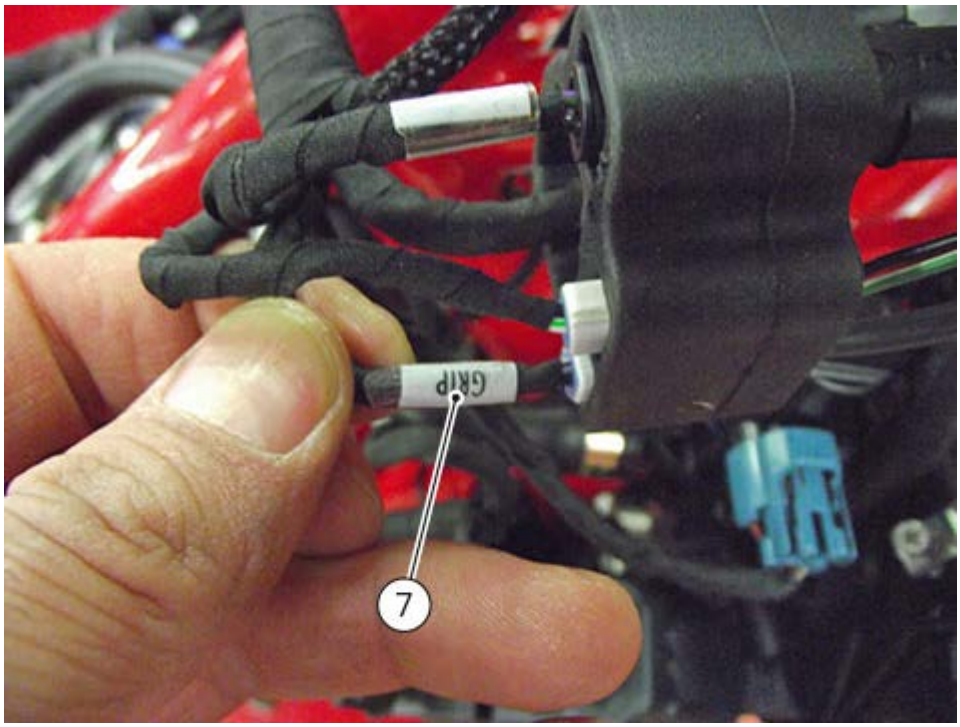


RH HANDGRIP

For the RH handgrip, refer to chapter "Refitting the throttle control".

Connect connector (7) located on support (B).





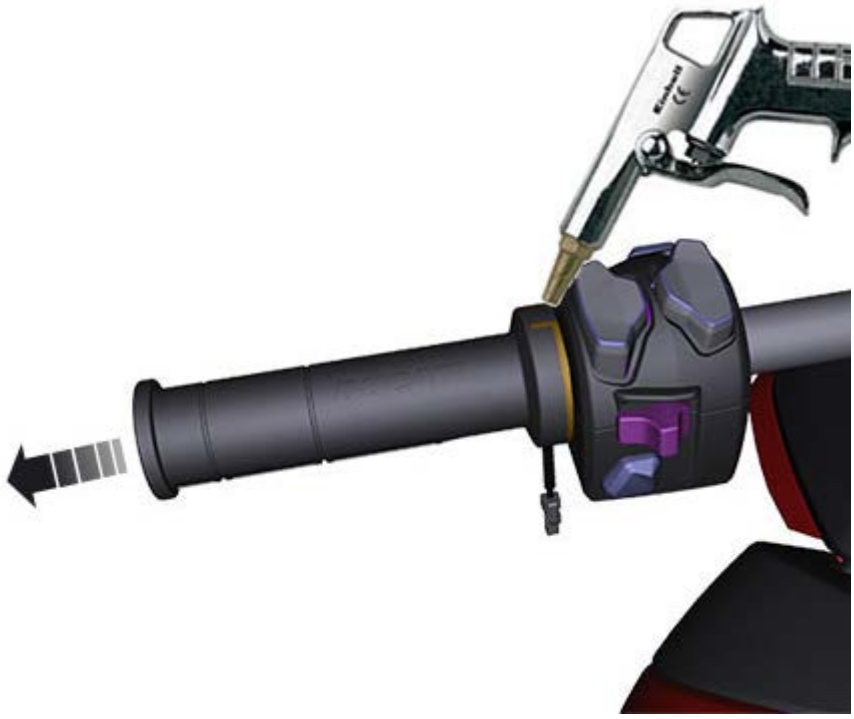
Refit the front brake control (Refitting the front brake master cylinder).
Refit the clutch hydraulic control (Refitting the clutch hydraulic control).
Refit the hand guards (Refitting the hand guards).

Removing the handlebar

Remove the hand guards (Removing the hand guards).
Remove the throttle control (Removing the throttle control).
Remove the front brake control (Removing the front brake master cylinder).
Remove the hydraulic clutch control (Removing the clutch master cylinder assembly).

Removing the left handgrip

Slide out the LH handgrip using a pressure air gun.



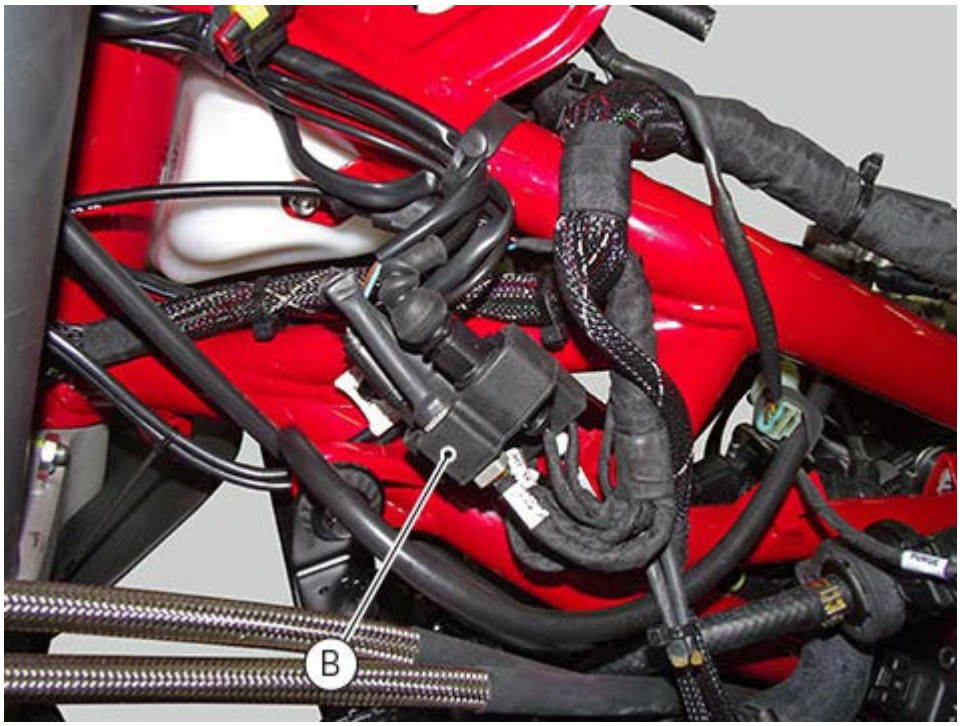
Repeat this operation on the other handgrip.

Heated handgrips

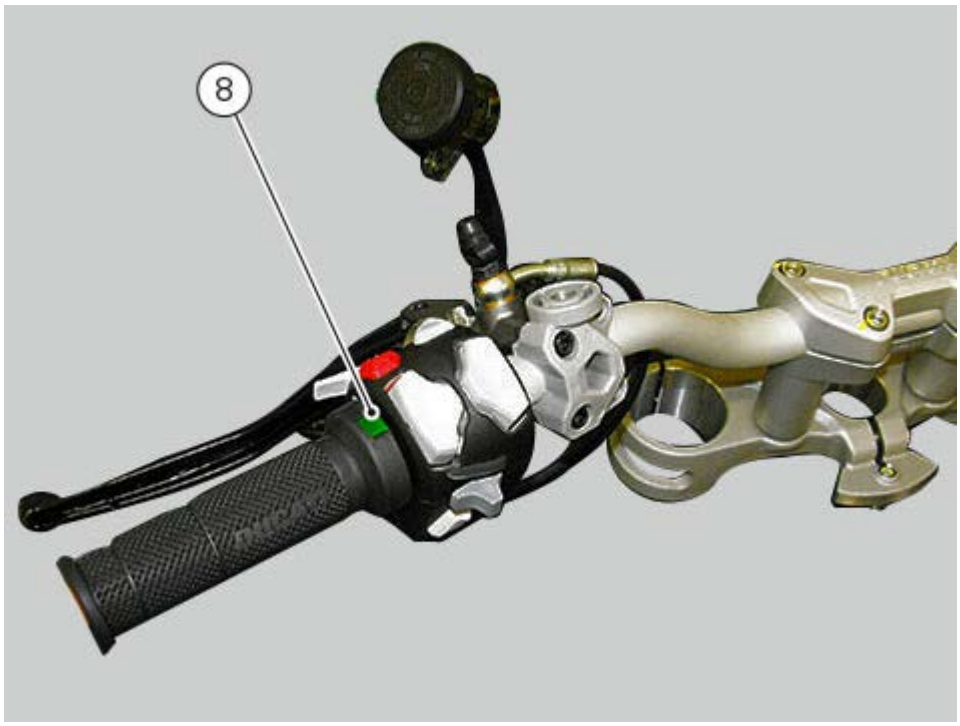
Remove the tank fairing.

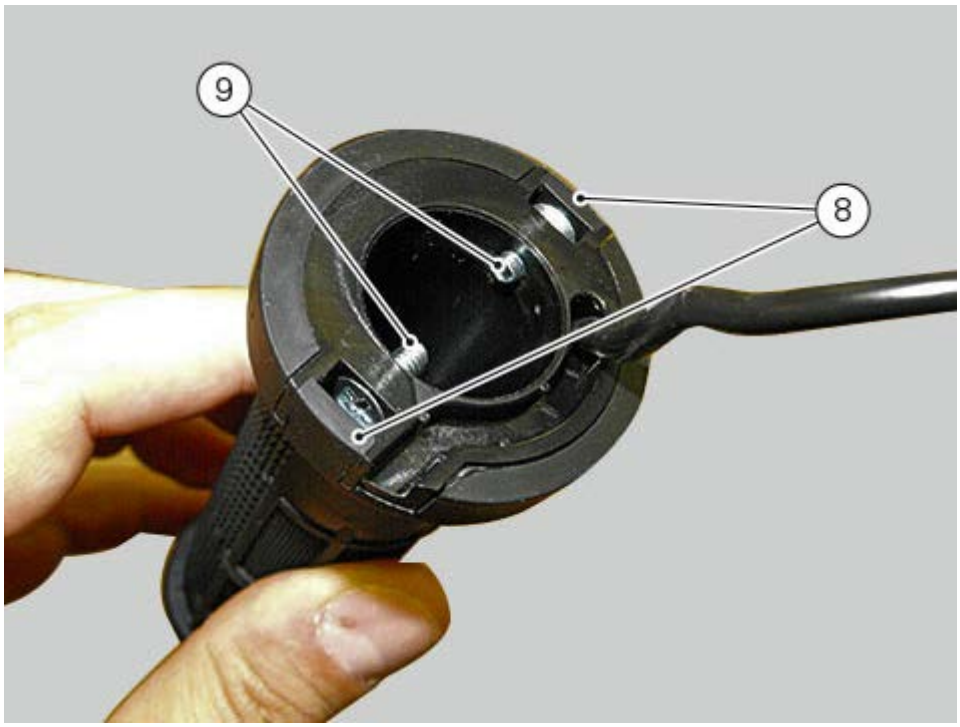
LH HANDGRIP

Release the main wiring handgrips by disconnecting connector (7) located on the vehicle left side in the connector support (B).



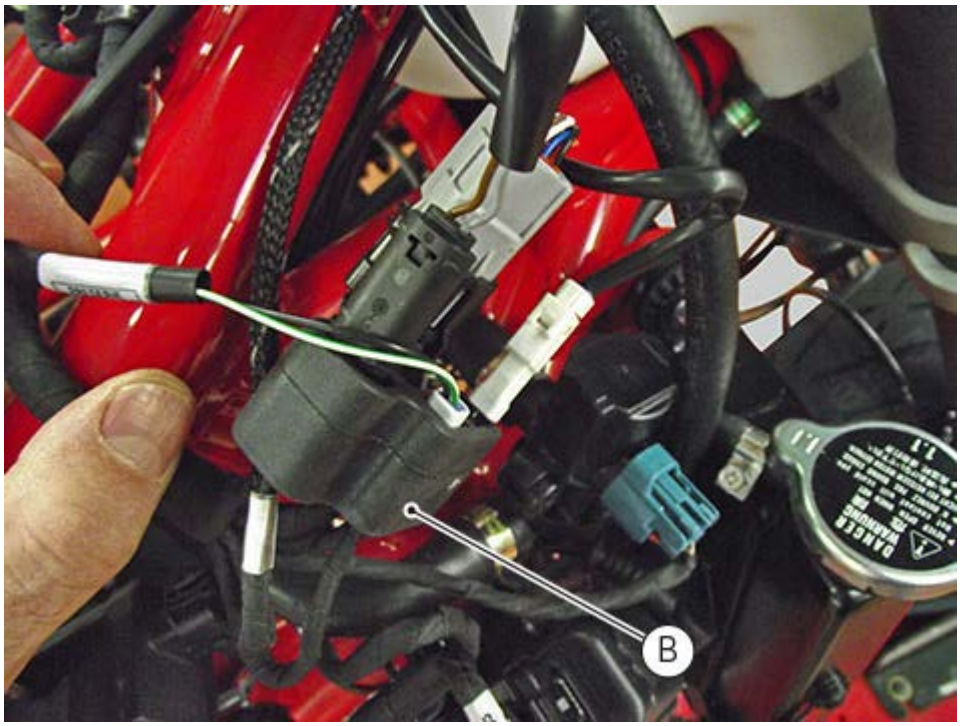
Remove the two protection plugs (8) and loosen the two retaining screws (9).
Slide the heated handgrip out of the handlebar.

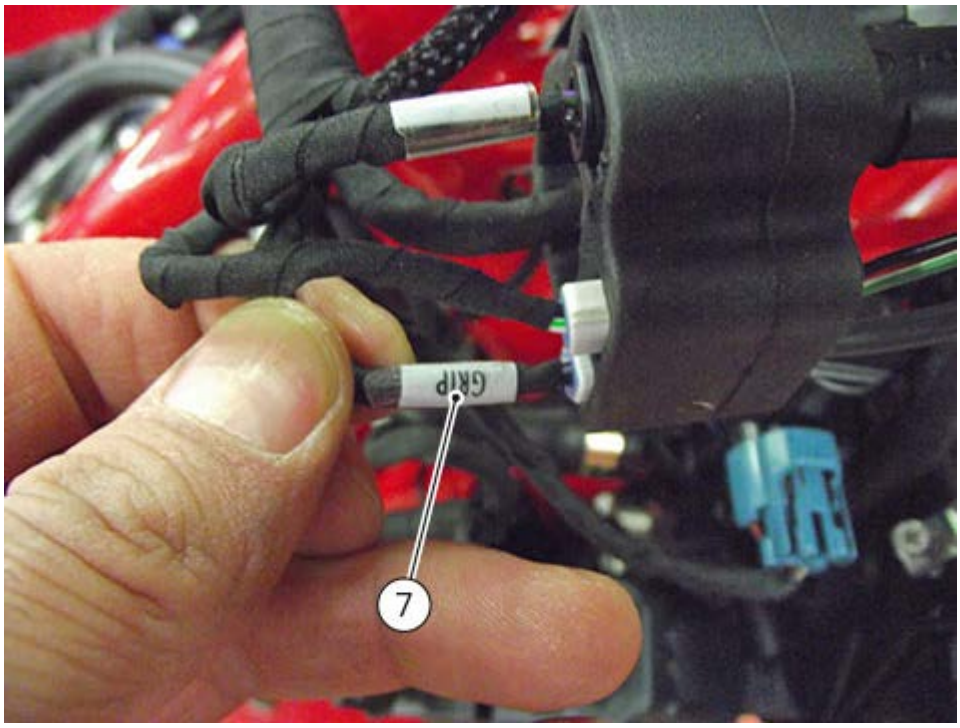




RH HANDGRIP

The "heating" system of the RH handgrip is integrated in the throttle control.
Disconnect connector (7) located on the vehicle right side in support (B).

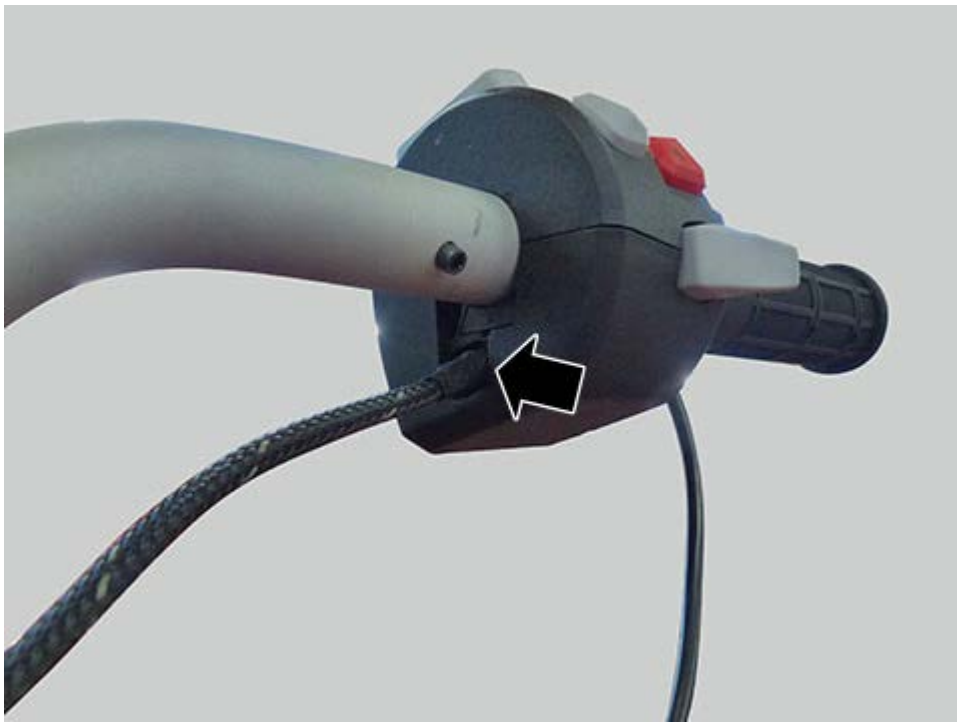




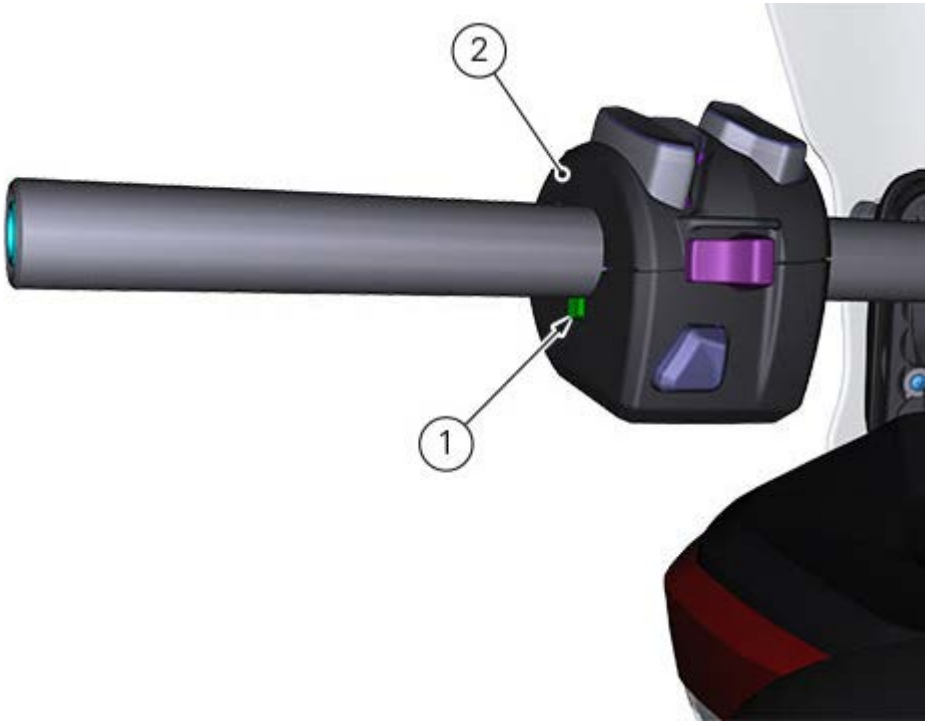
Continue the procedure as described in chapter "Removing the throttle control".

Removing the switches

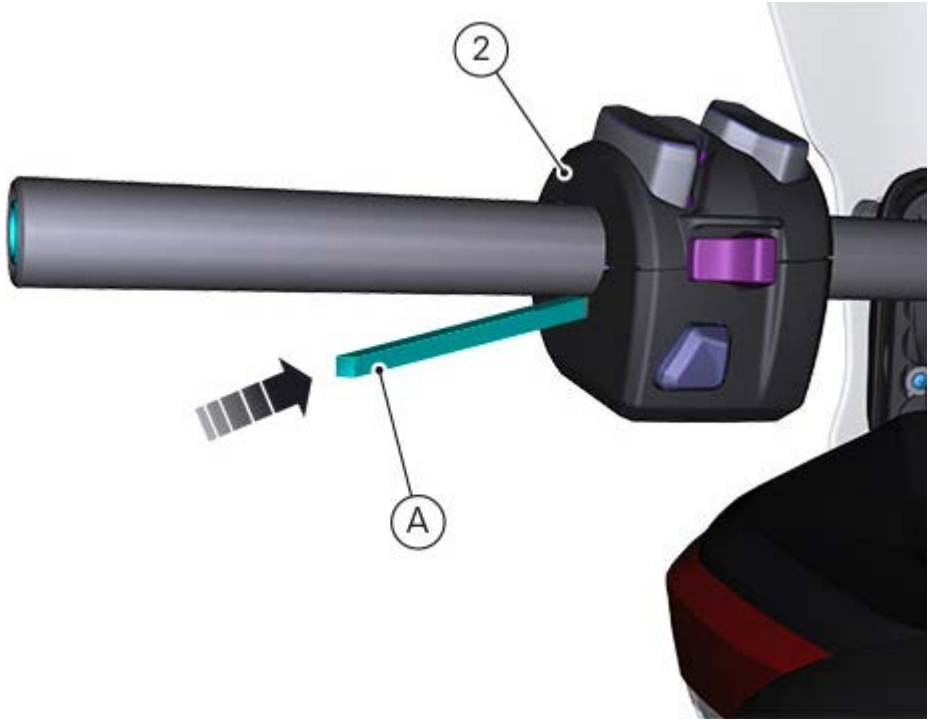
To remove the switches it is necessary to use tool no. **88713.4967**.
Following is the procedure to remove the LH switch. The same procedure applies also to the RH switch.
Remove the connector from the switch.



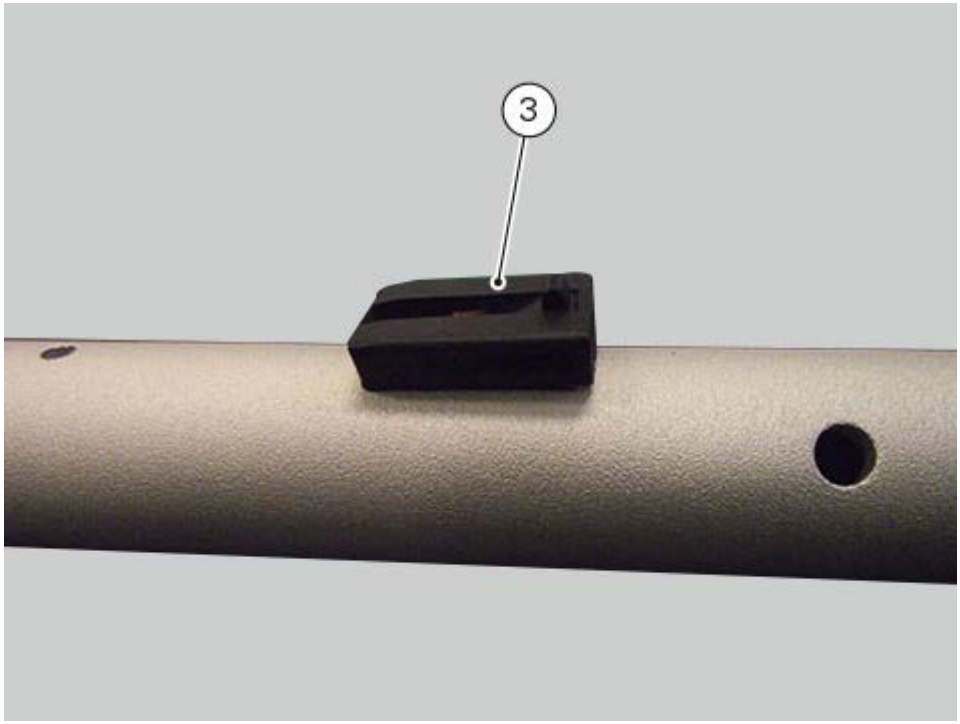
Insert tool (A) inside seat (1) of switch (2).



Push tool (A) until releasing switch (2).



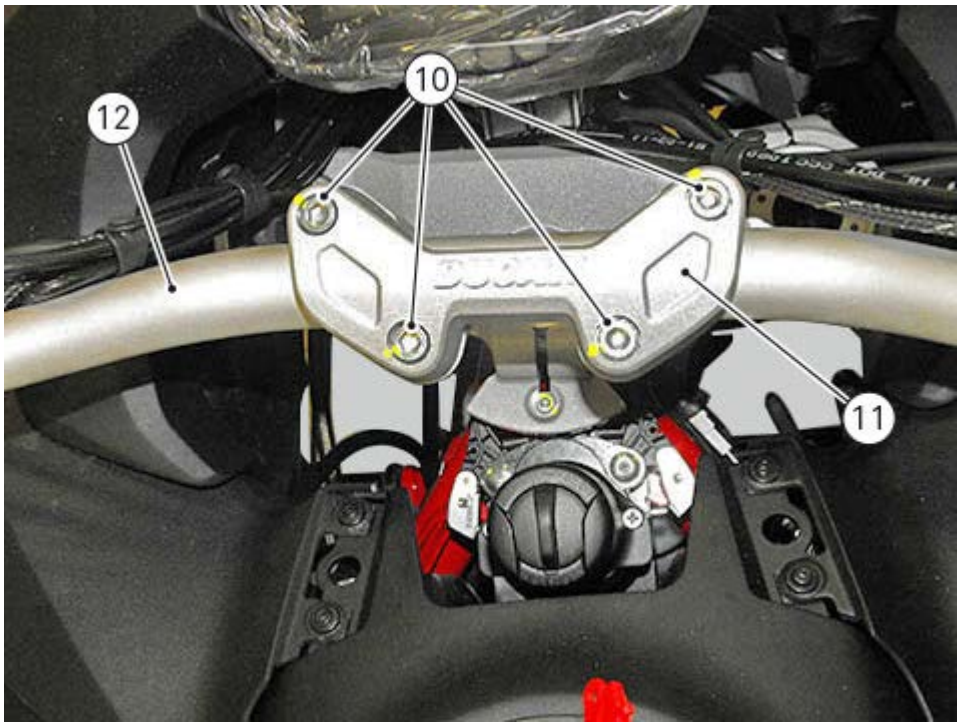
Collect support (3).



Remove the switch (2).

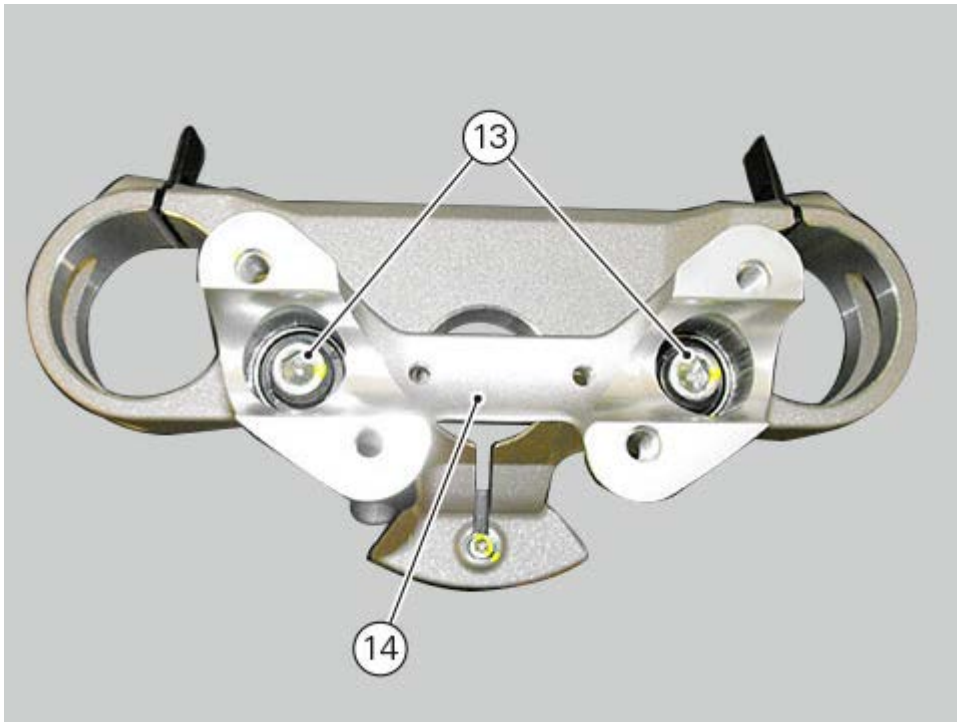
Removing the handlebar

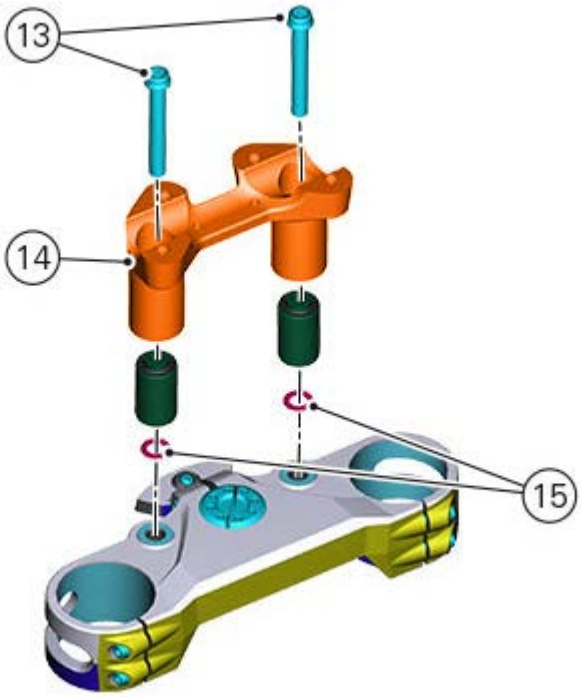
Undo and remove the screws (10) securing the upper U-bolt (11).
Remove the upper U-bolt (11) that retains the handlebar.
Remove the handlebar (12) from its seat on the steering head.



Remove the steering head (Removing the steering tube components).

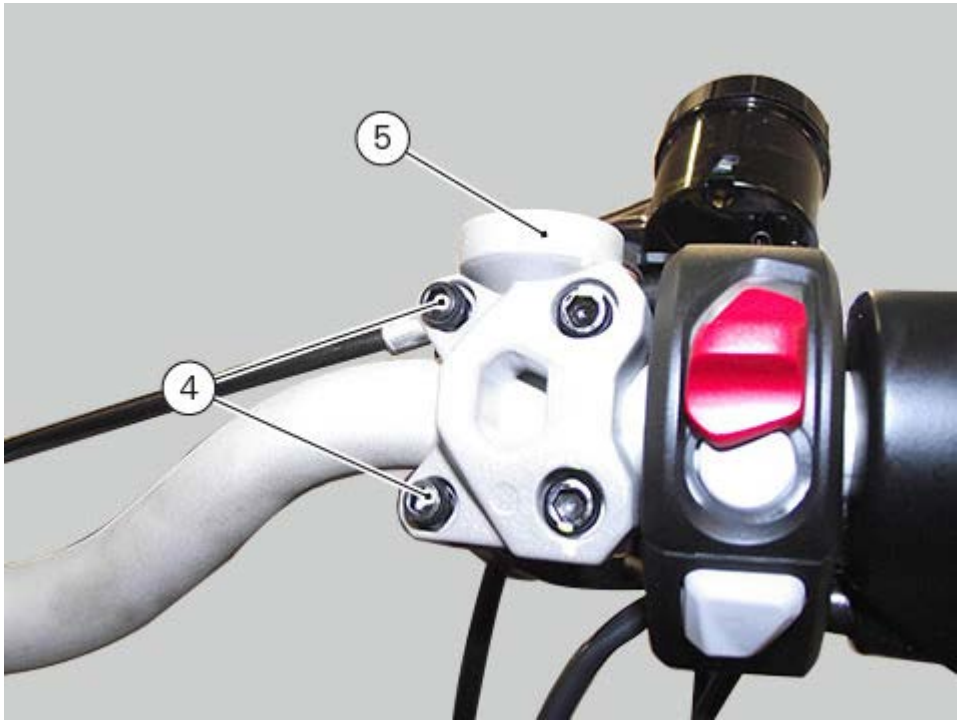
Undo the screws (13), remove the lower U-bolt (14) and recover washers (15).



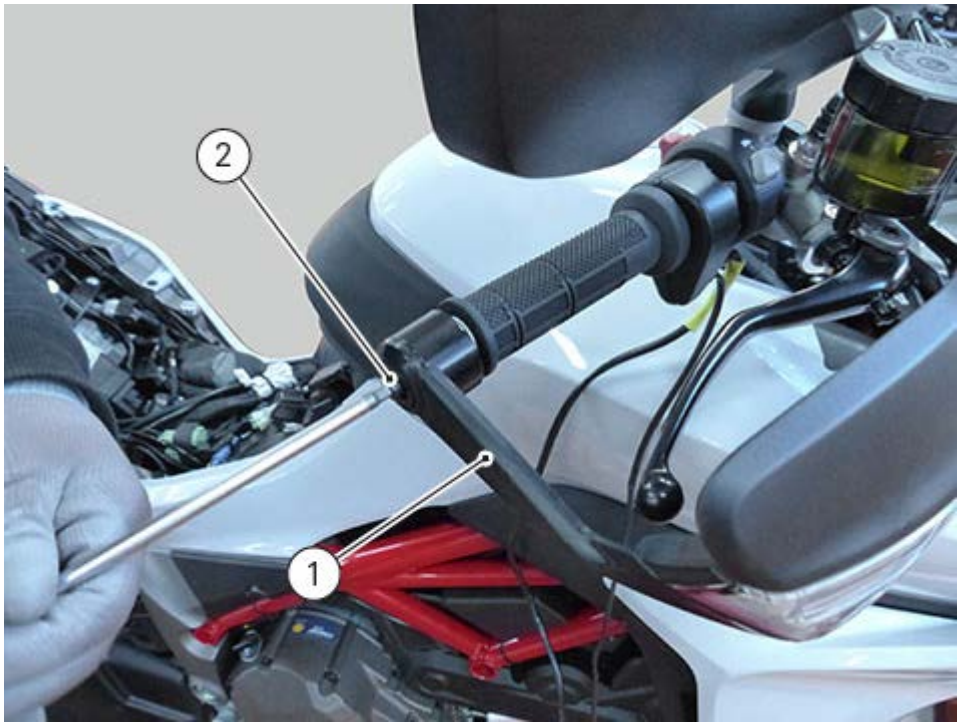

13
14
15

Reassembling the hand guards

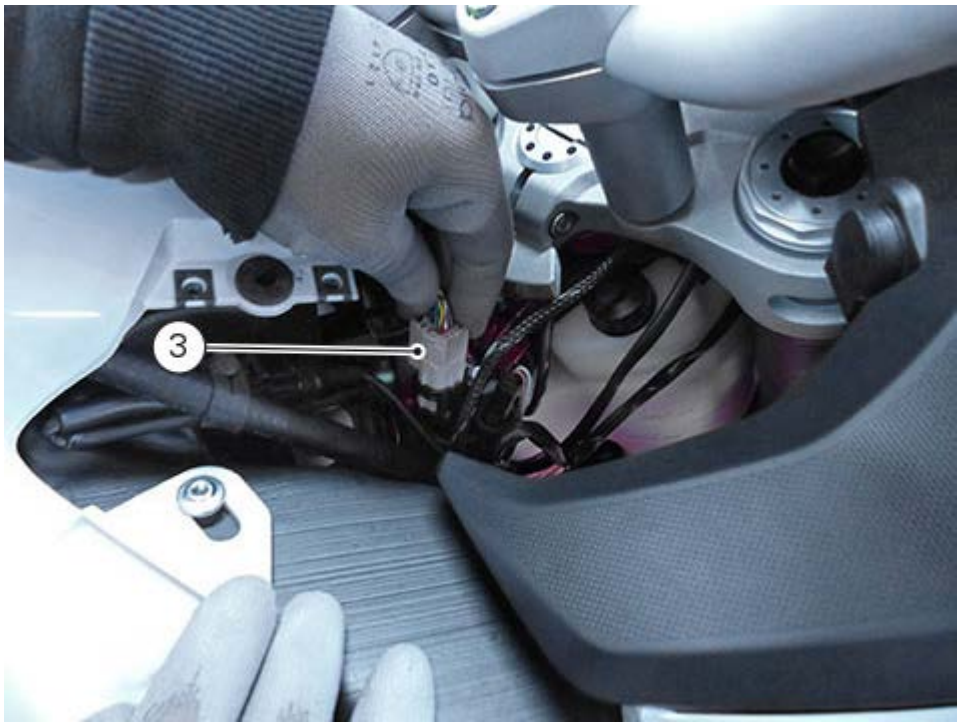
The following procedure is the same for both hand guards.
Position the hand guard.
Tighten the two screws (4) of support (5) to a torque of 5 Nm ± 10%.



Fix the hand guard by tightening screw (2) to a torque of 10 Nm ± 10%.

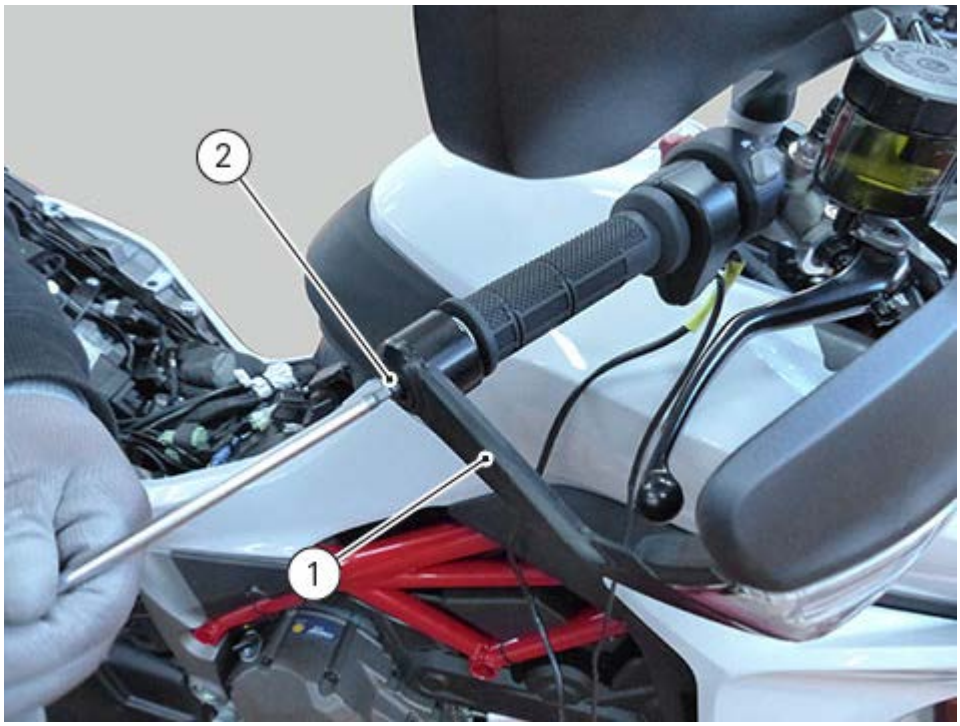


Connect the connector (3).

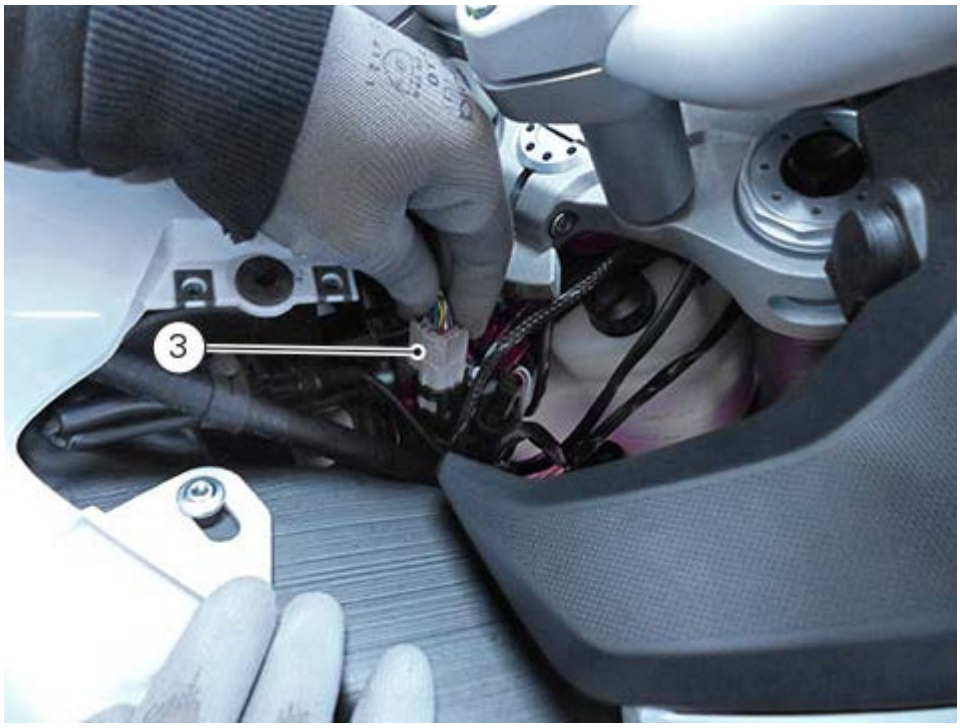

3

Removing the hand guards

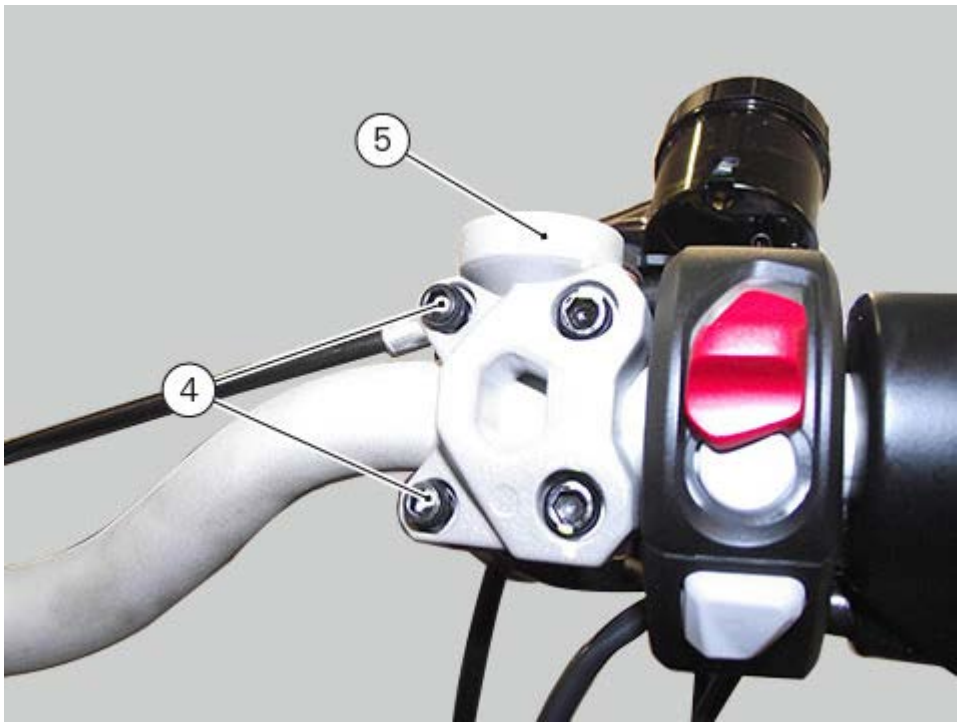
The following procedure is the same for both hand guards.
Undo screws (2) of the hand guard (1).



Disconnect the connector (3).



Loosen the two screws (4) of support (5).
Remove the hand guard.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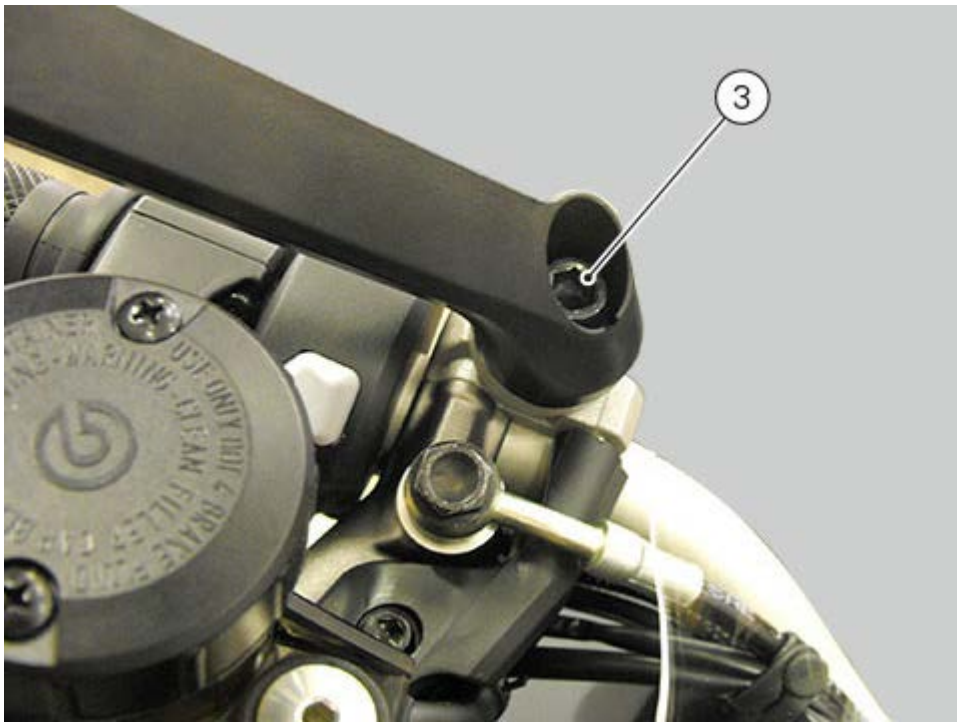
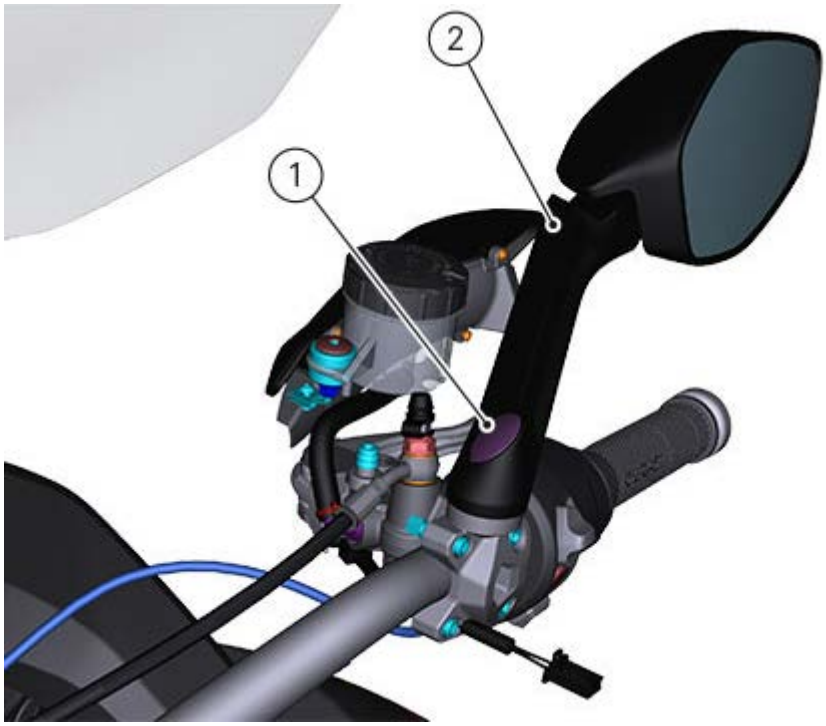
4

Refitting the rear-view mirrors

Start screw (3) in the rear-view mirror (2).
Insert the rear-view mirror (2) in the U-bolt.
Tighten the screw (3) to a torque of 40 Nm ± 10%.



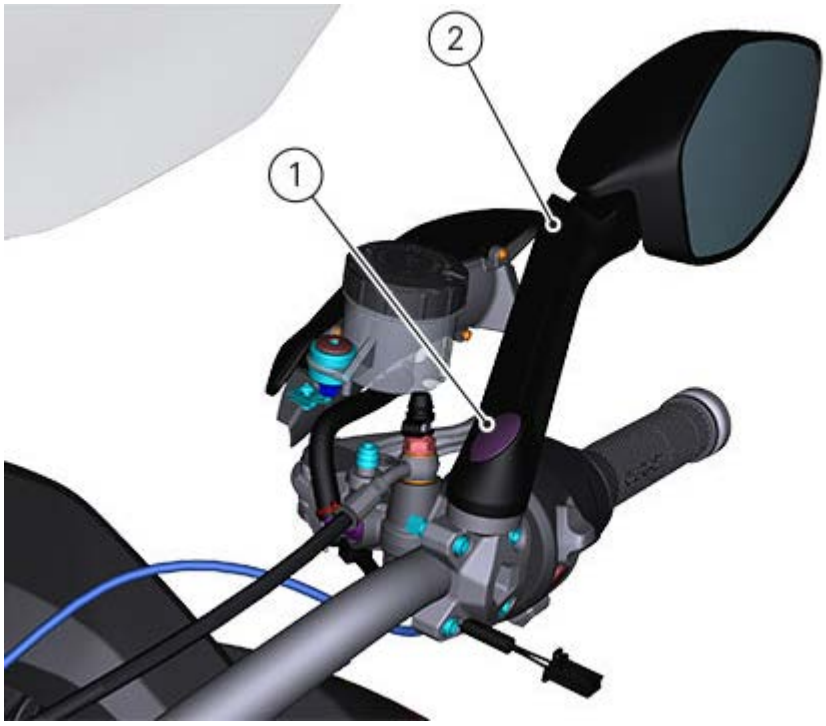
Insert plug (1).



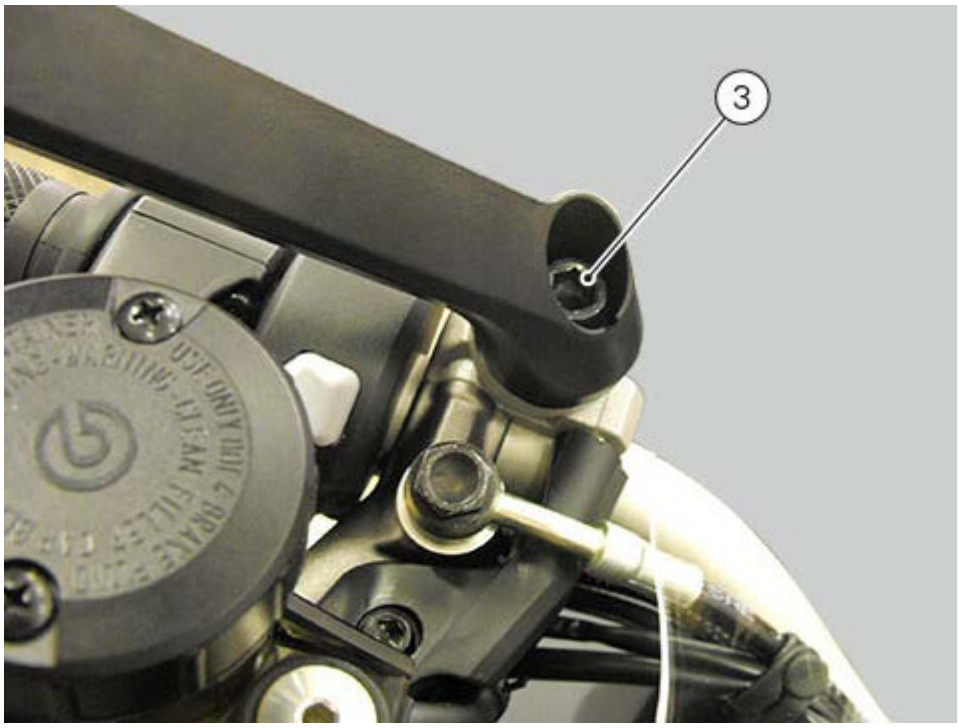
Important
Pay attention to the different threading: the left rear-view mirror has a left threading.

Removing the rear-view mirrors

Remove plug (1) from the rear-view mirror (2).



Undo screw (3) and remove the rear-view mirror.



Repeat the described operations for the other mirror.

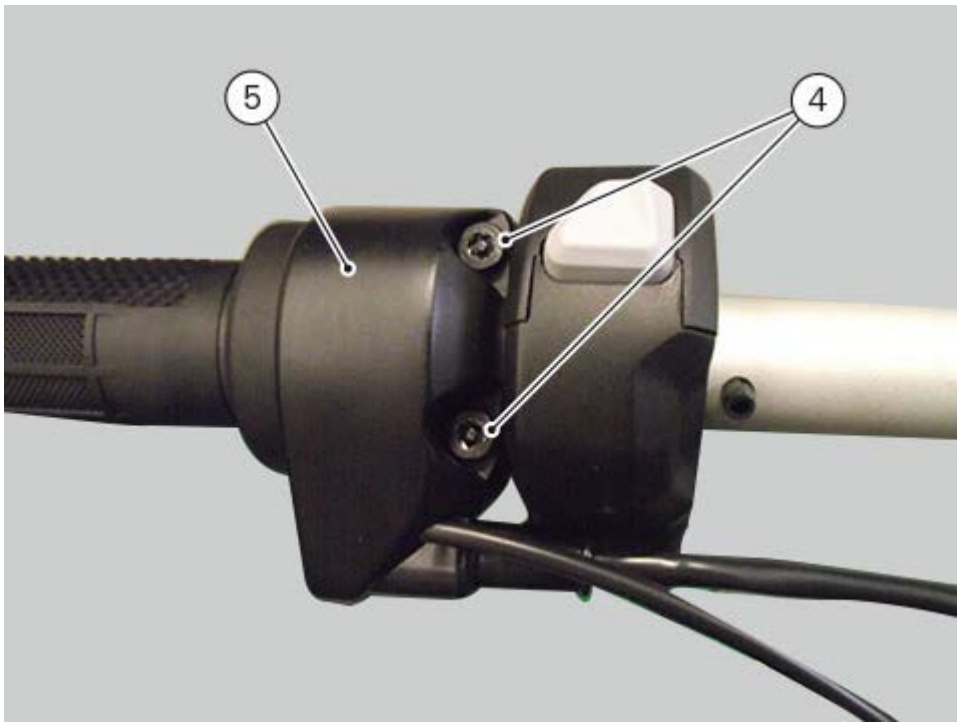
Important

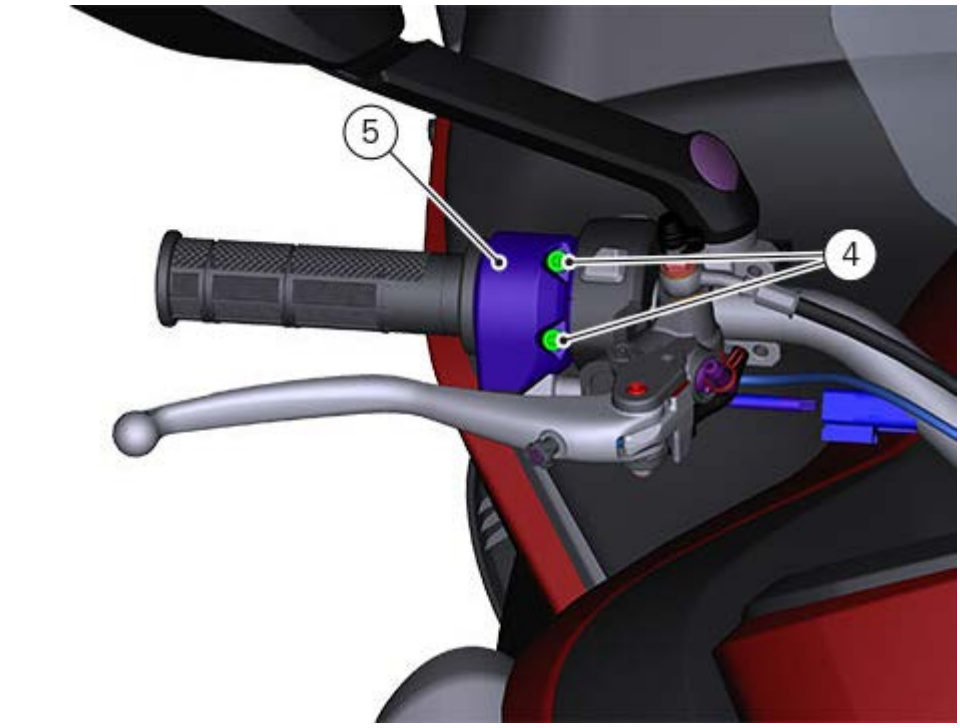
Pay attention to the different threading: the left rear-view mirror has a left threading.

Refitting the throttle control

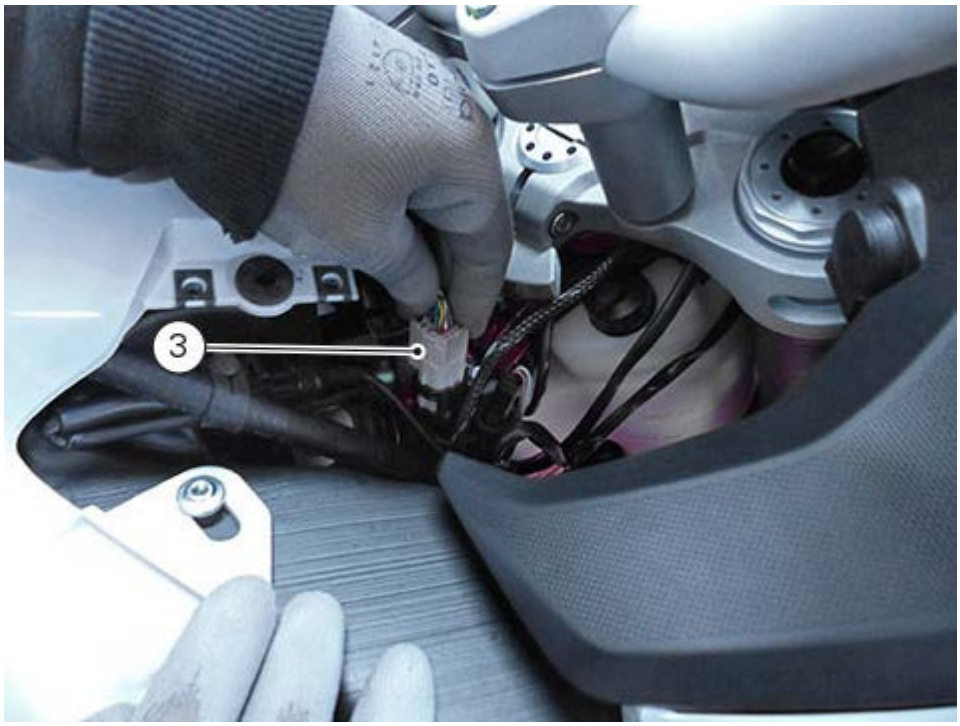
Position the throttle control on the handlebar by inserting the reference pin in the relevant seat.

Assemble the two parts of the throttle control.
Tighten screws (4) to a torque of 4.5 Nm ± 10%.

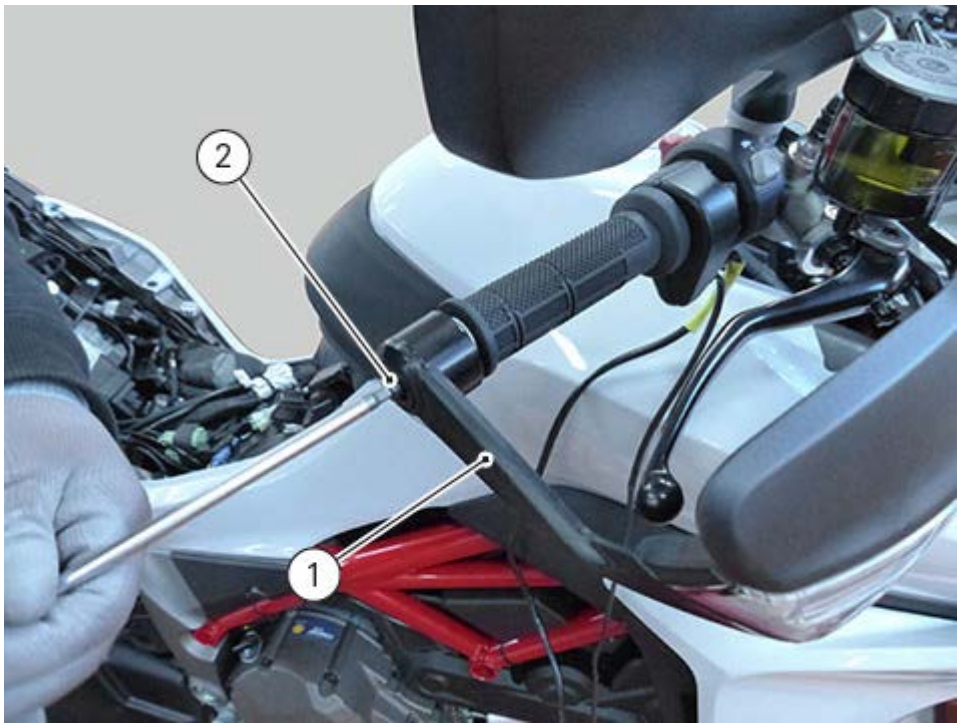




Connect the throttle control cable (3) to the switch.



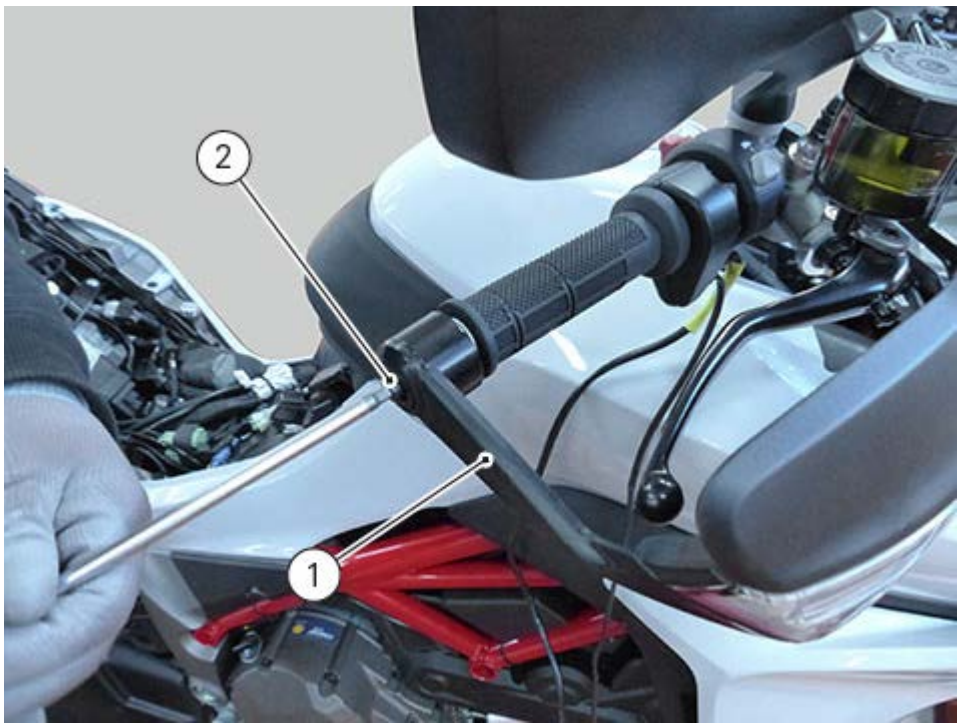
Position the hand guard (1) by tightening screw (2) to a torque of 10 Nm ± 10%.



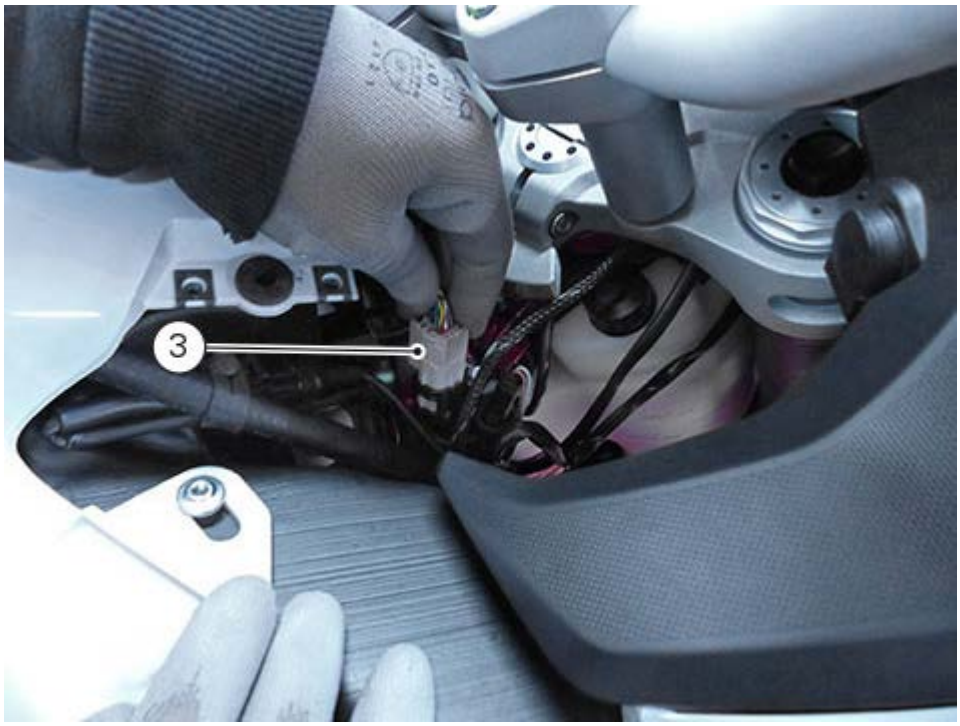
Removing the throttle control

Remove the tank fairings (Removing the tank fairings).
Remove the front half-fairings (Removing the front half-fairing).

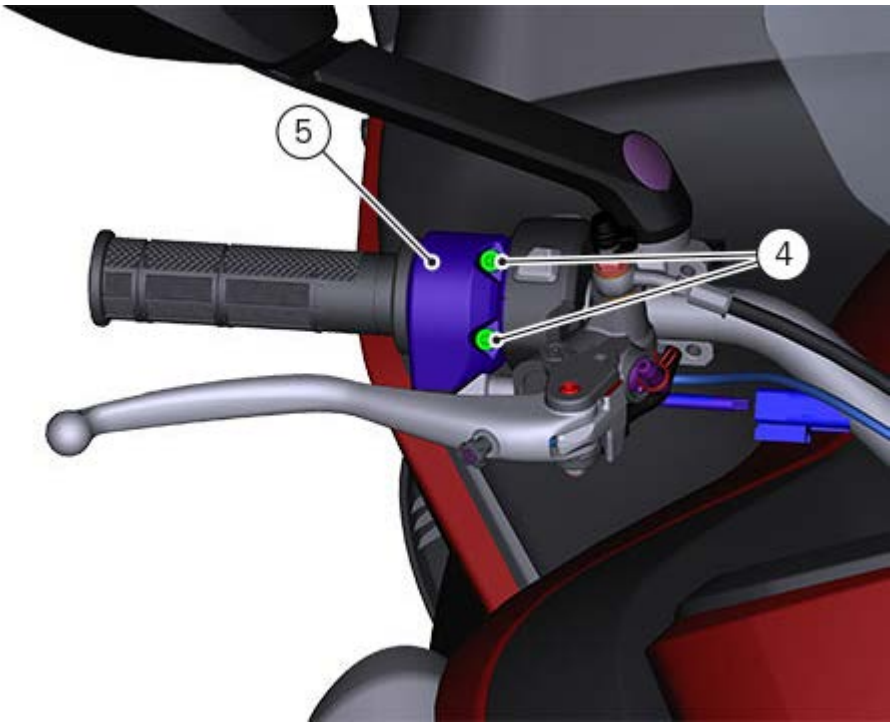
Move hand guard (1) by loosening screw (2).



Disconnect the throttle control cable (3) from the main wiring harness.



Loosen the screws (4) and remove the throttle control (5) from the handlebar.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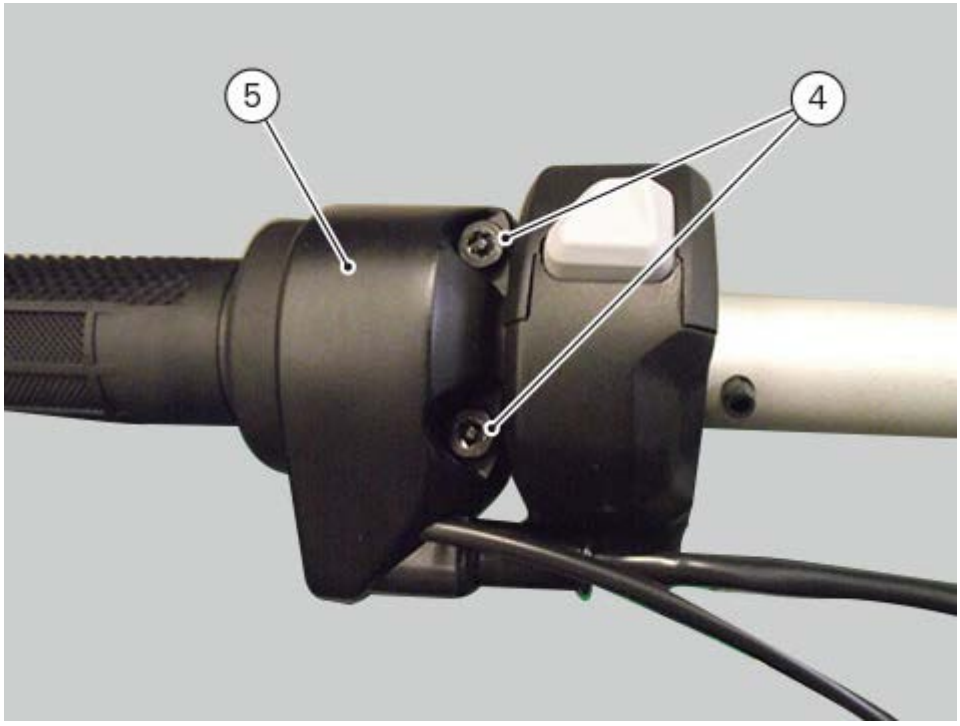
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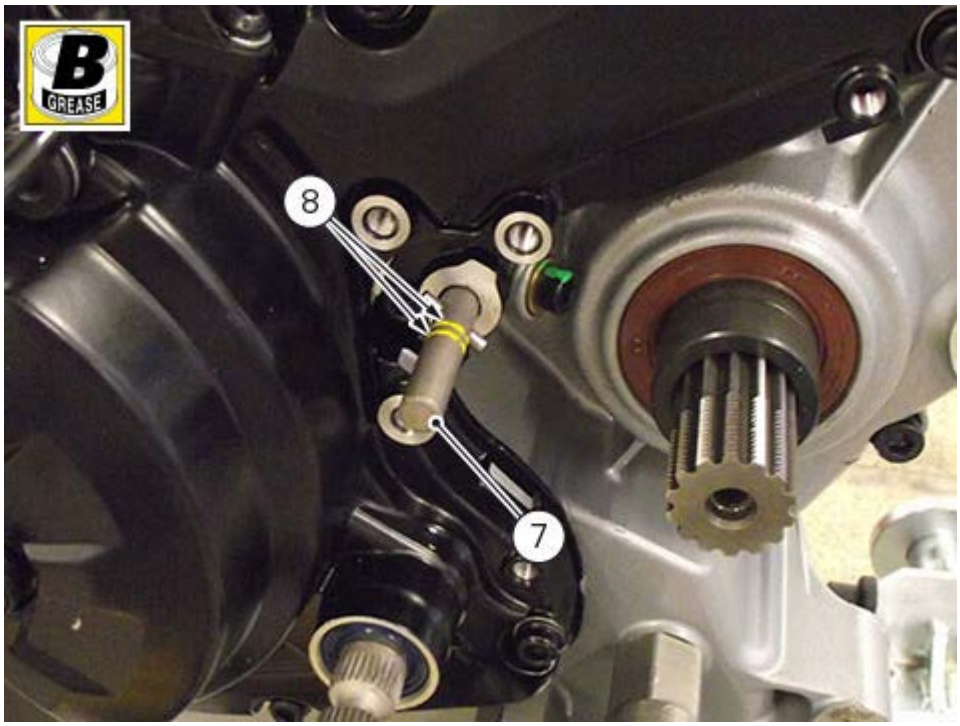
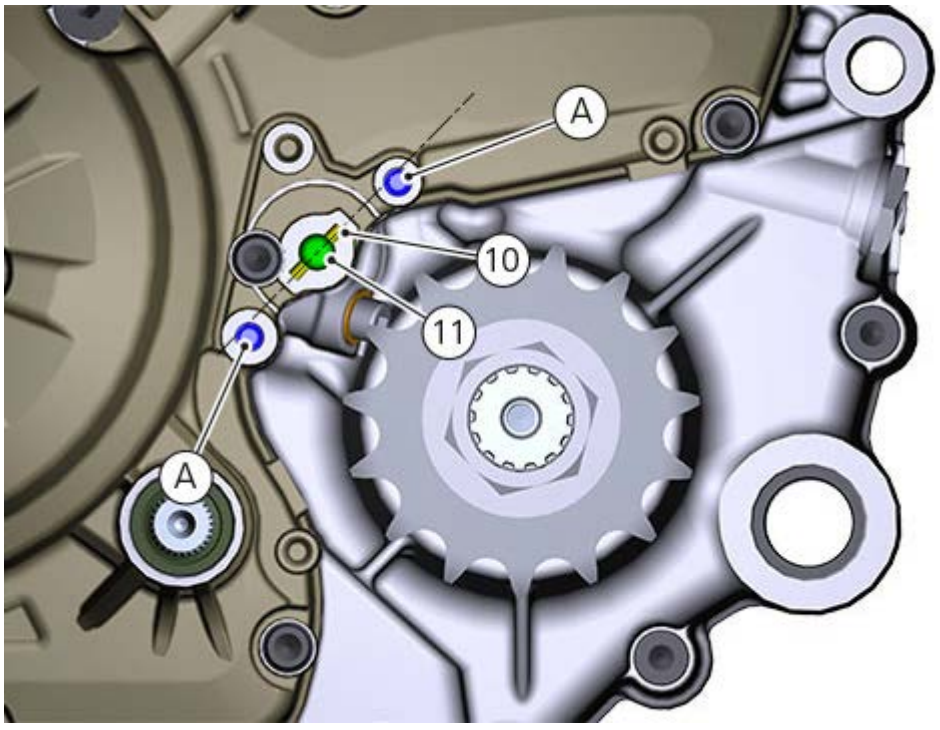
Refitting the clutch slave cylinder

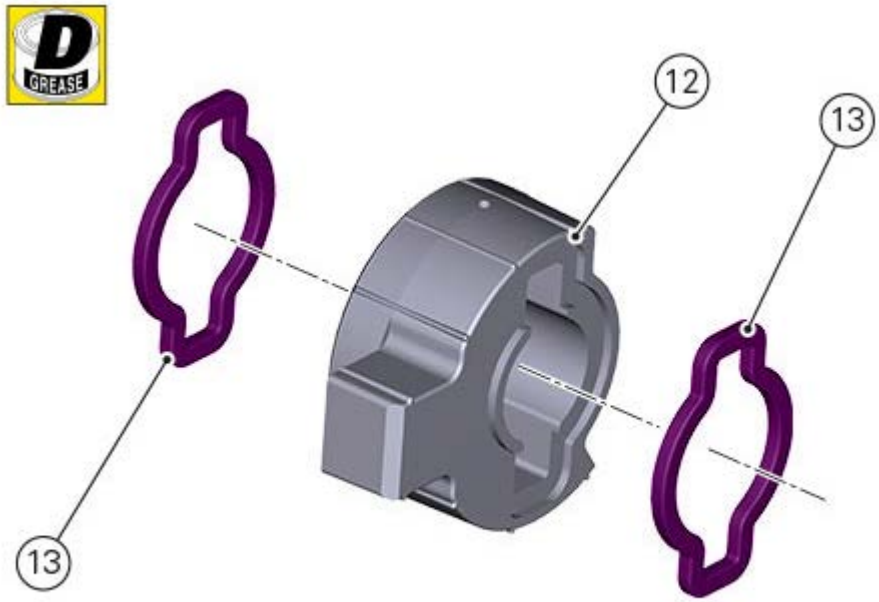
If the clutch pushrod (7) must be replaced, it is necessary to replace also the two O-rings (8).
Lubricate with the indicated product and reposition the clutch pushrod (7) with the two O-rings (8).



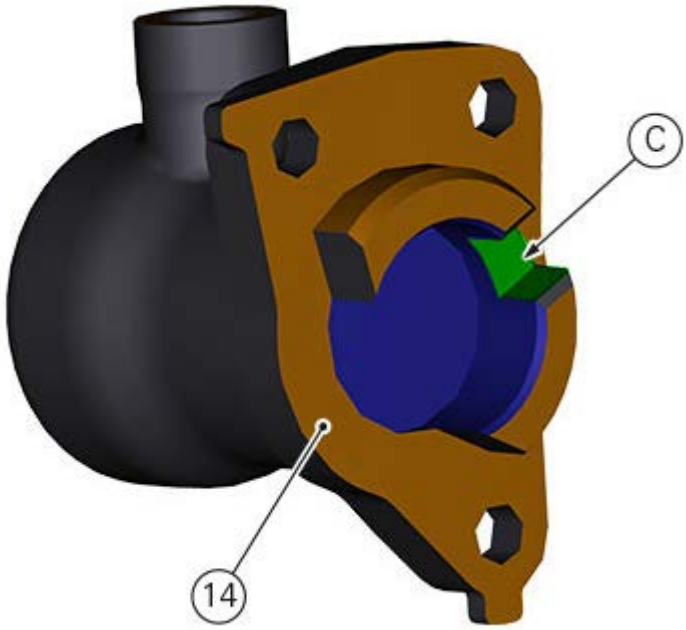
Position the anti-rotation pin (10) so as to align it with holes (A) as shown in the figure.

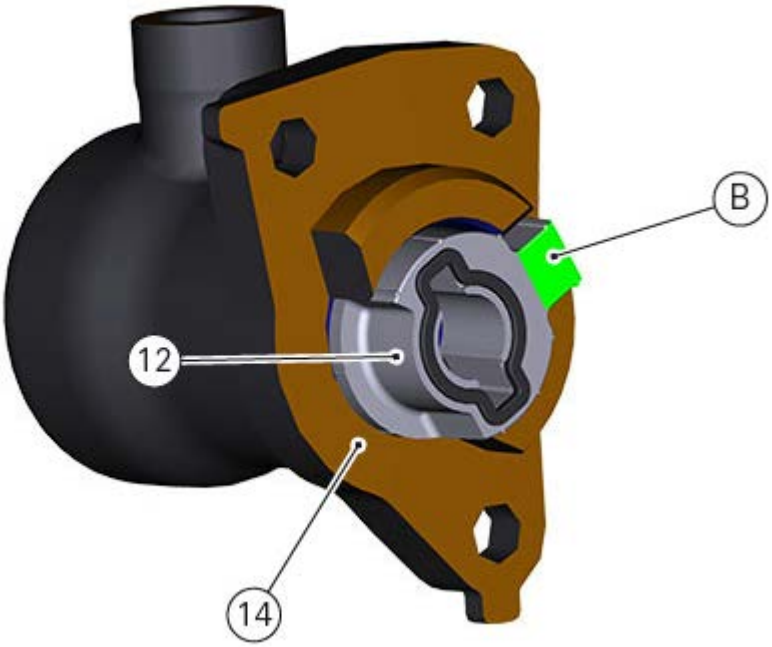


Fit seals (13) on the anti-rotation insert (12).
Apply the recommended grease to the seal (13).

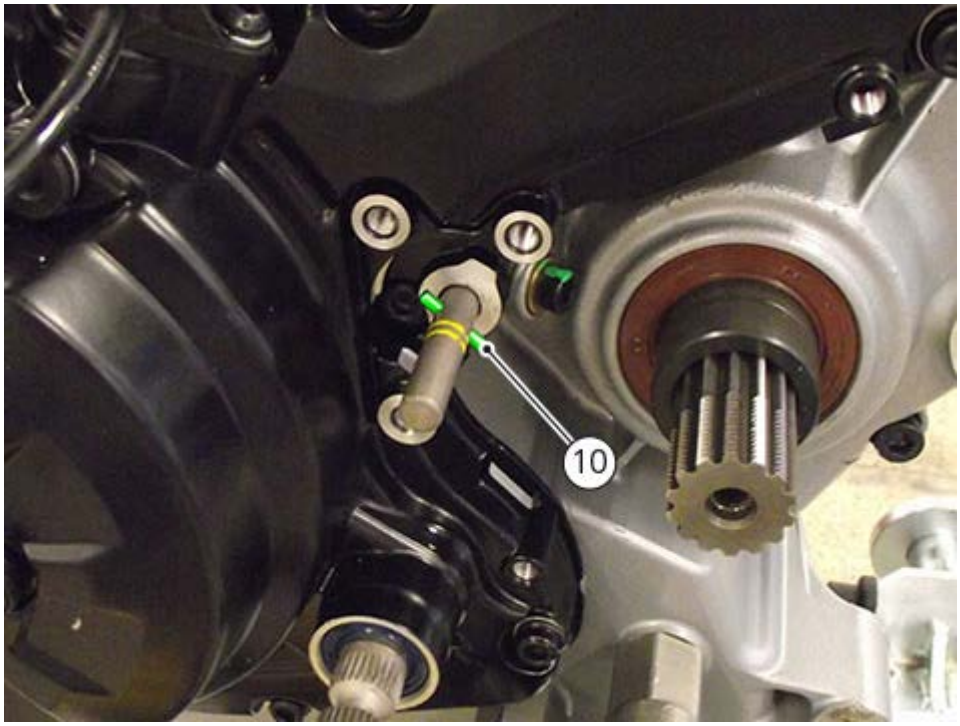


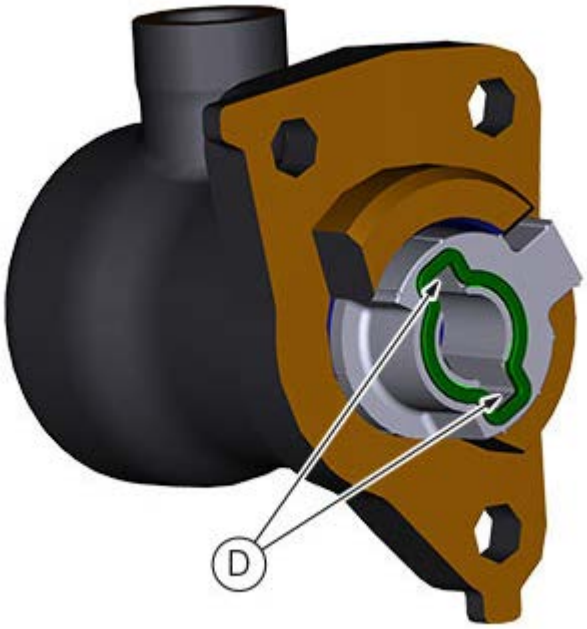
Fit the anti-rotation insert (12) into clutch slave cylinder (14), making sure to match part (B) of insert (12) with slot (C) on the actuator.





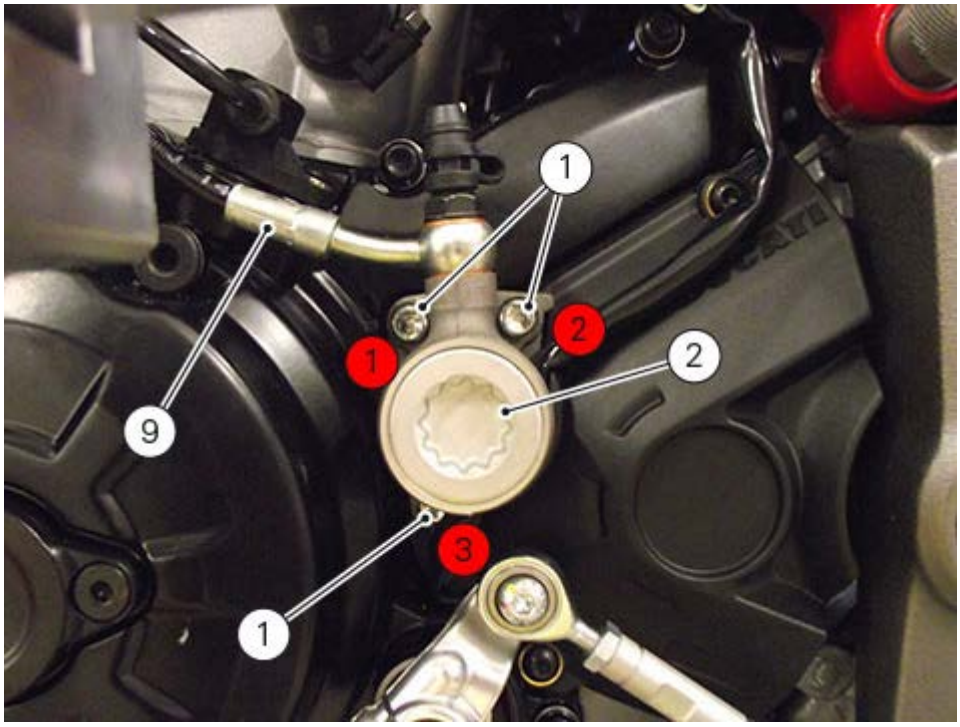
Insert clutch slave cylinder (14), including anti-rotation insert (12), on clutch pushrod (7) already positioned. The anti-rotation pin (10) must engage into the corresponding slots (D) on anti-rotation insert (14).





Fix the clutch slave cylinder (2) by starting screws (1).
Tighten screws (1) to a torque of 10 Nm ± 10%, by in the 1 - 2 - 3 - 1 sequence.

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



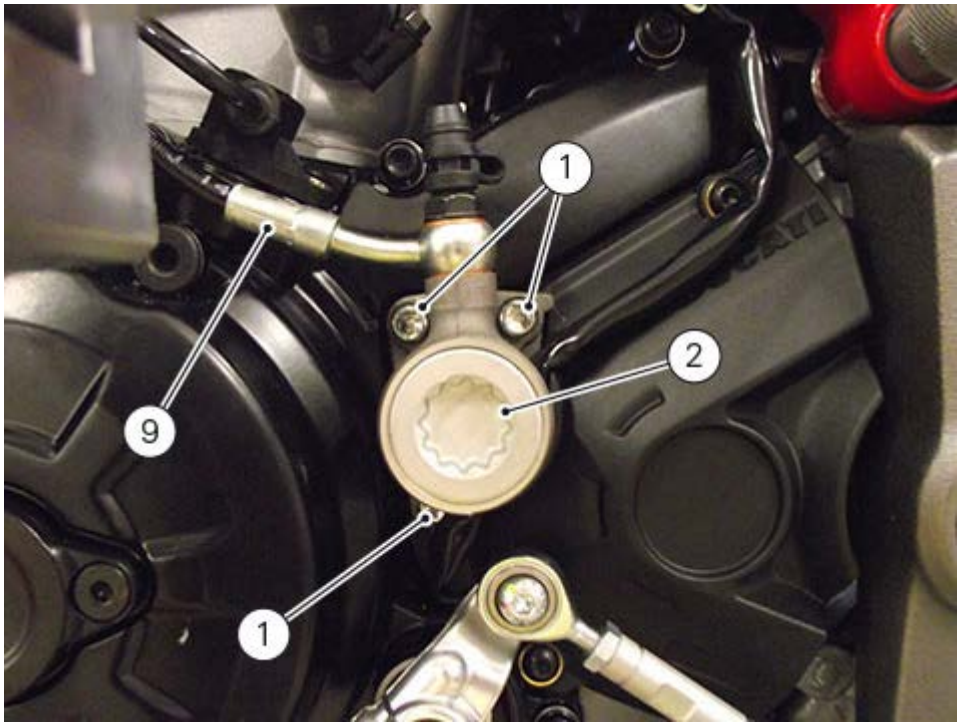
Removing the clutch slave cylinder

Warning

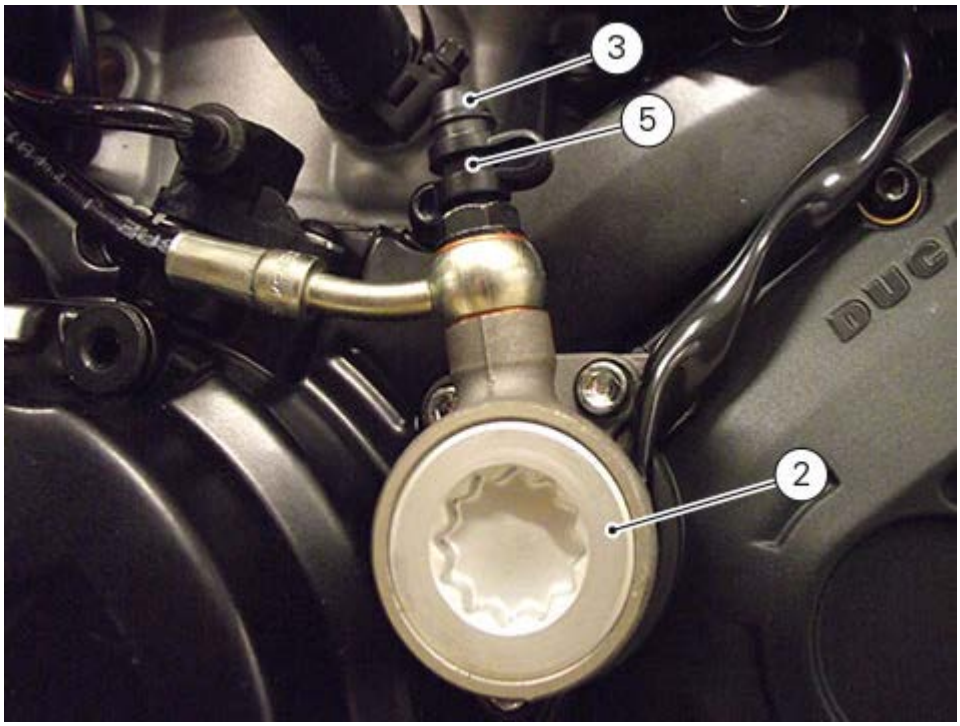
The clutch slave cylinder manufacturer advises against servicing the slave cylinder due to the safety critical nature of this component.
Incorrect overhaul can endanger rider and passenger safety.
The replacement operations that can be performed on the slave cylinder regard the bleeding unit, the seal and the complete piston.

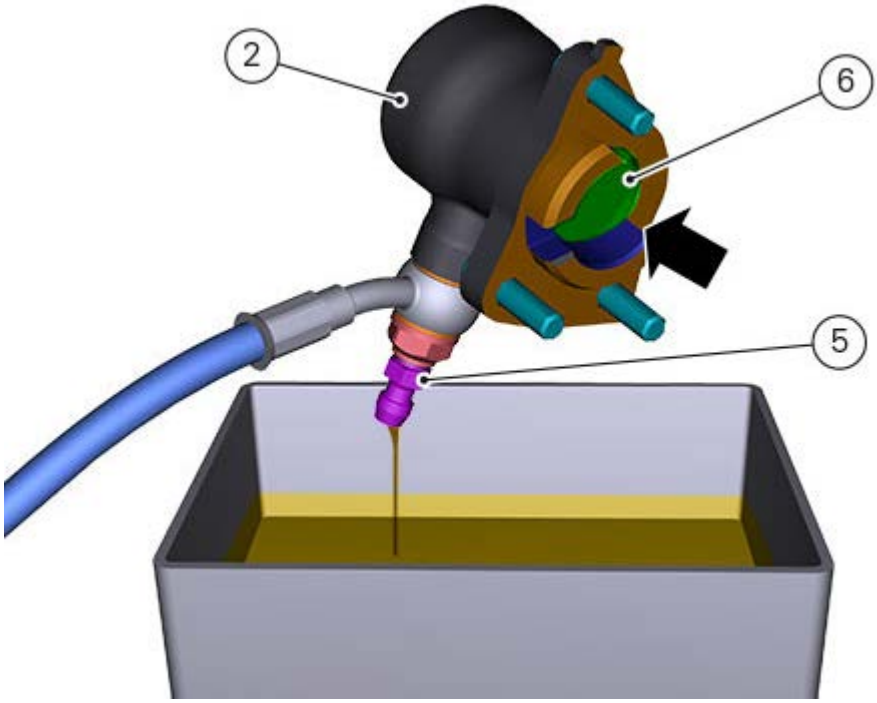
Drain the clutch system (Draining the clutch system circuit).

Undo screws (1) of the clutch slave cylinder (2).

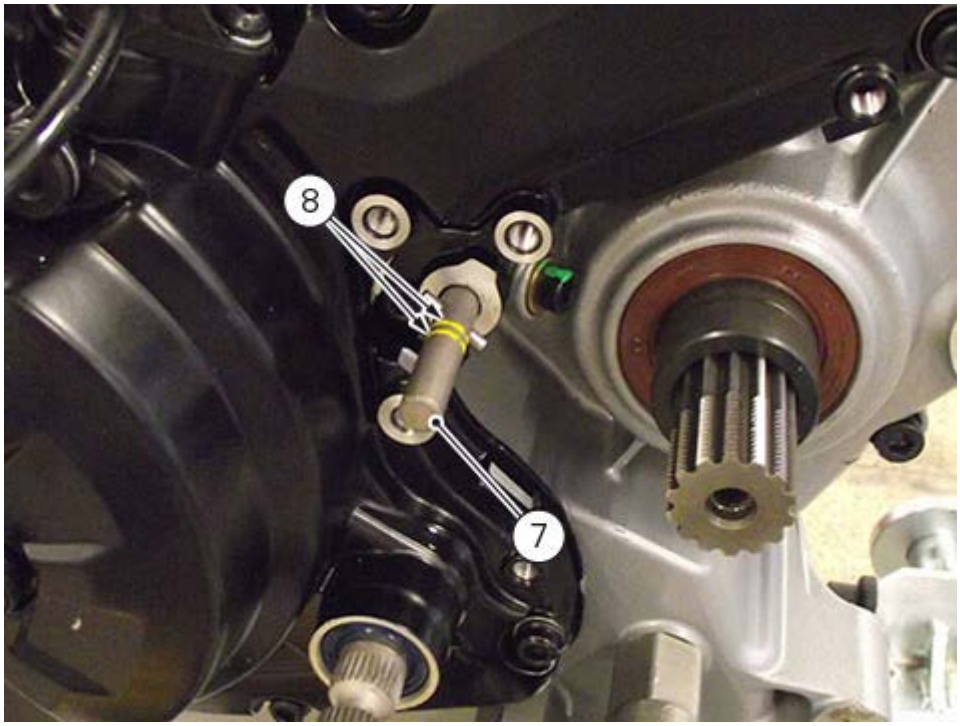


Slide out the clutch slave cylinder (2).
Remove dust seal (3) by loosening the bleed screw (4).
Turn the clutch slave cylinder upside-down on a collection container with suitable capacity.
Loosen screw (5) and press on piston (6) to let oil flow out.



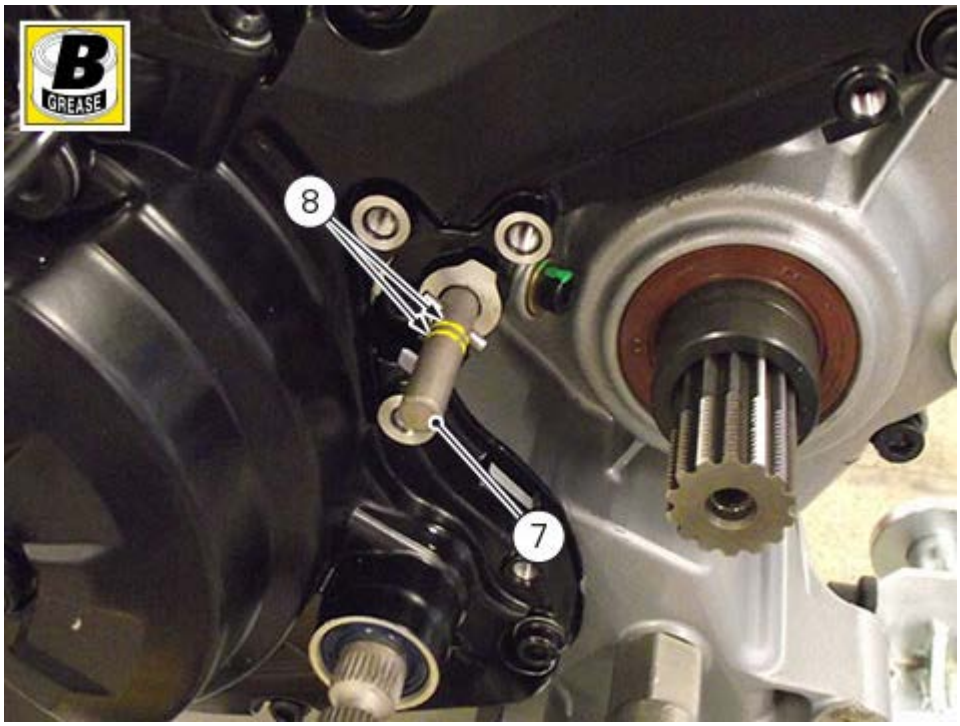


Now it is possible to slide out clutch pushrod (7).
Check the condition of the two O-rings (8) and replace them if necessary.

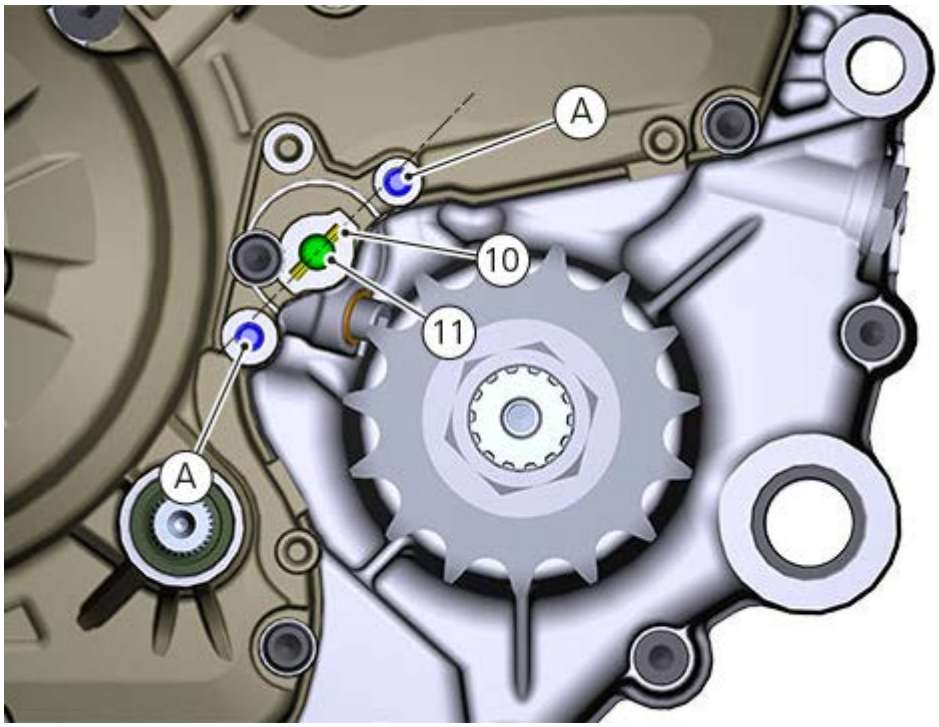


Refitting the clutch slave cylinder

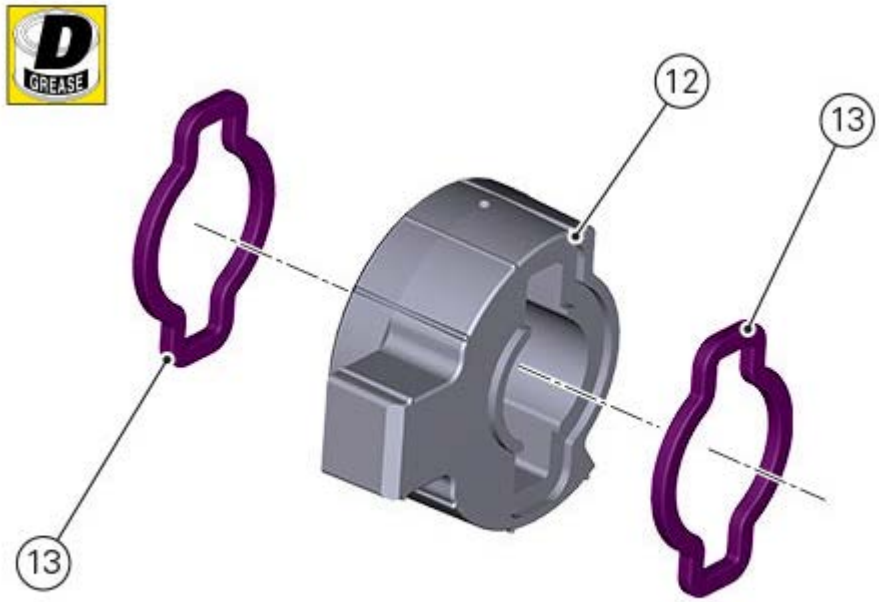
If the clutch pushrod (7) must be replaced, it is necessary to replace also the two O-rings (8).
Lubricate with the indicated product and reposition the clutch pushrod (7) with the two O-rings (8).



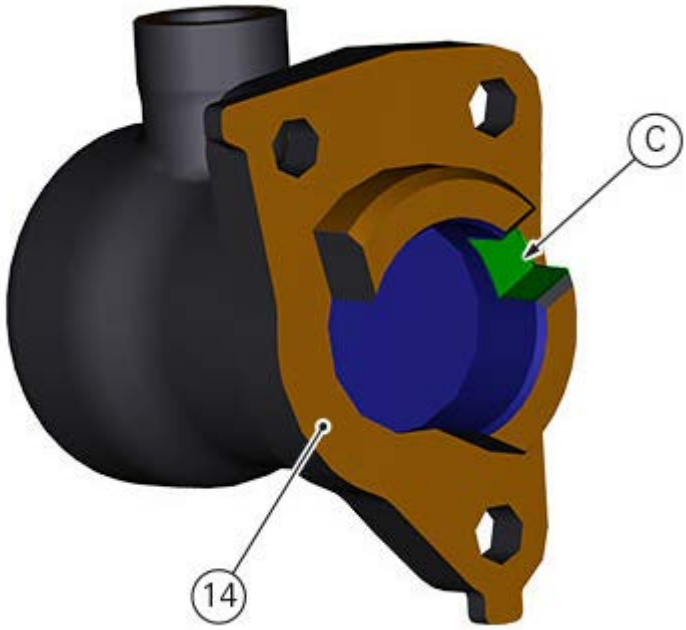
Position the anti-rotation pin (10) so as to align it with holes (A) as shown in the figure.

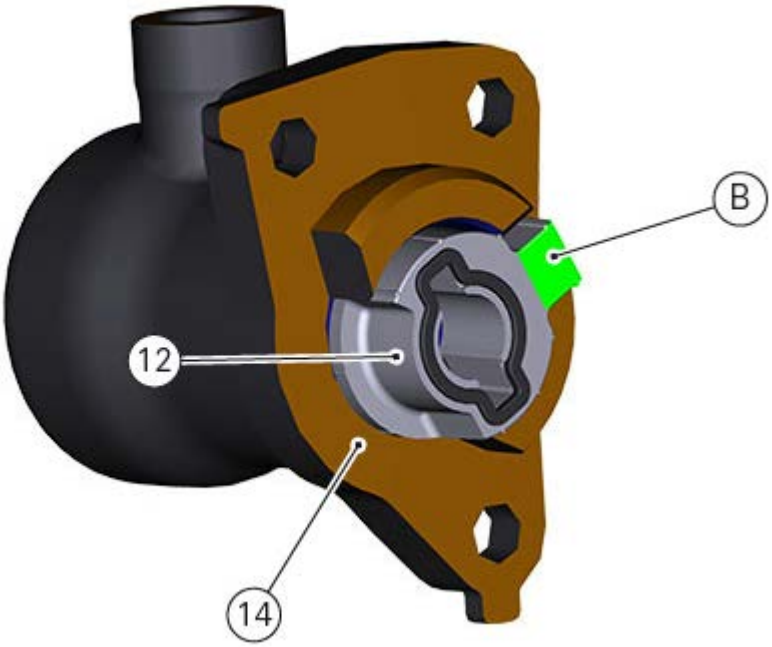


Fit seals (13) on the anti-rotation insert (12).
Apply the recommended grease to the seal (13).



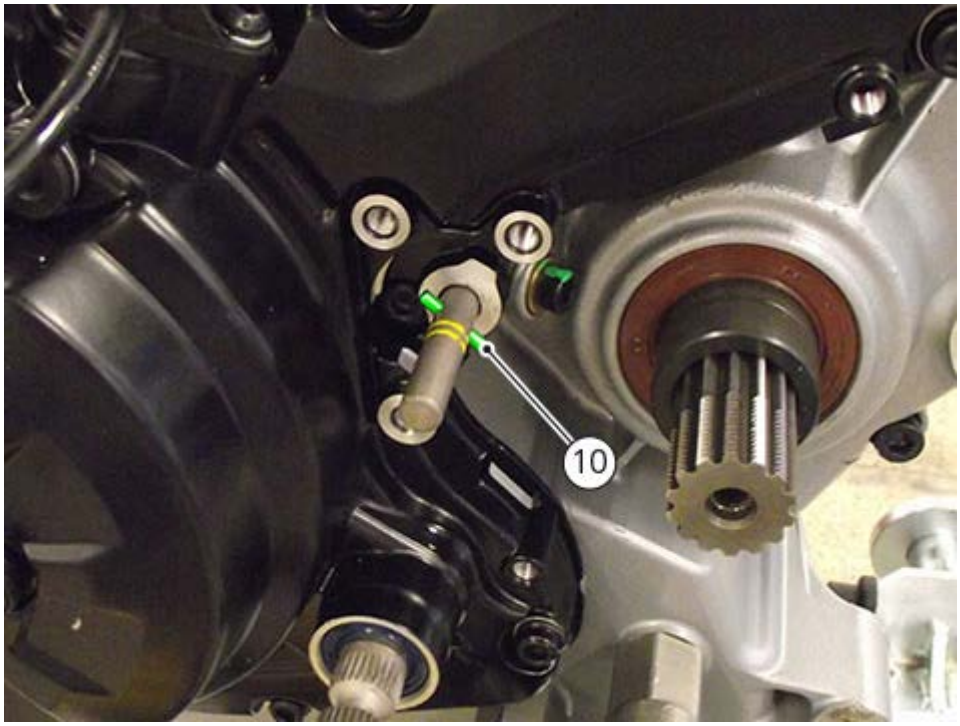
Fit the anti-rotation insert (12) into clutch slave cylinder (14), making sure to match part (B) of insert (12) with slot (C) on the actuator.

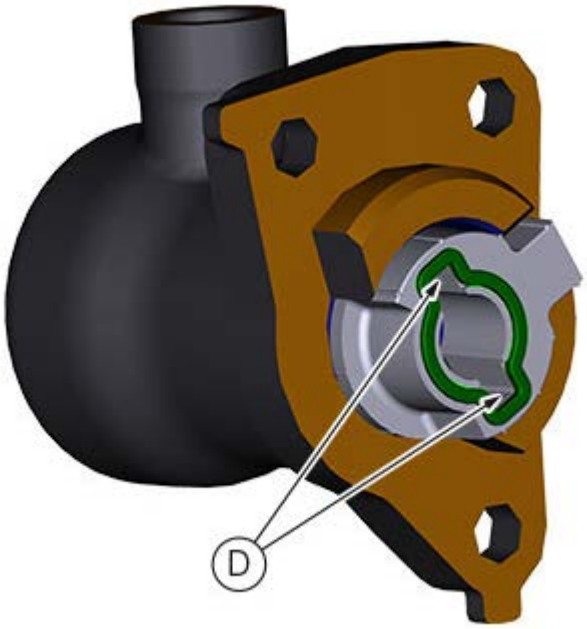




Insert clutch slave cylinder (14), including anti-rotation insert (12), on clutch pushrod (11) already positioned. The anti-rotation pin (10) must engage into the corresponding slots (D) on anti-rotation insert (14).

In the picture below the rod is not in the correct position, yet.

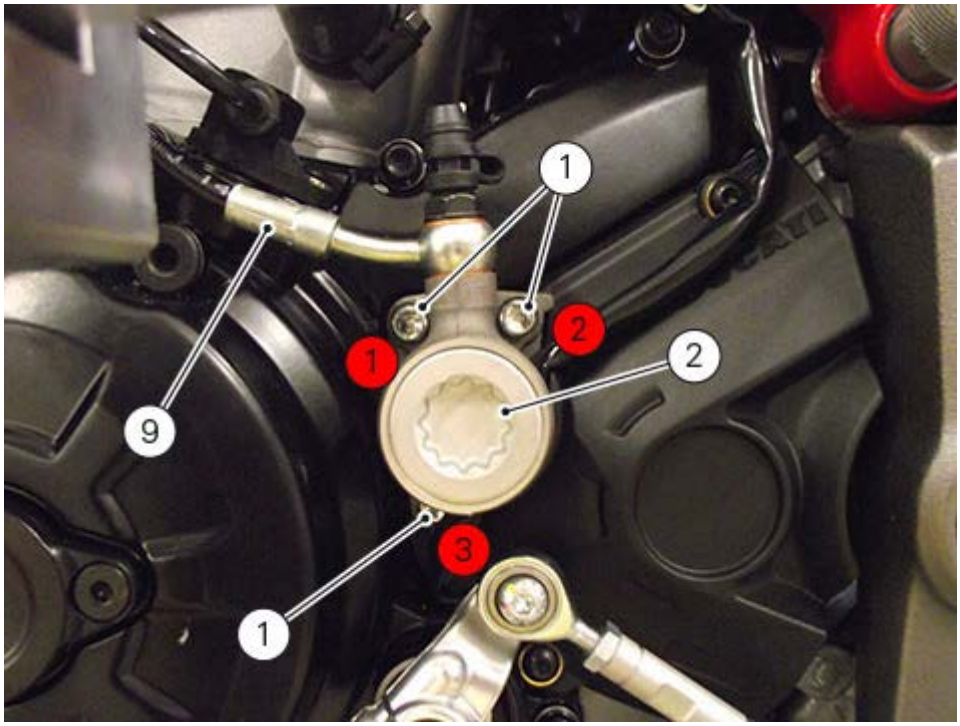




Fix the clutch slave cylinder (2) by starting screws (1). Tighten screws (1) to a torque of 10 Nm ± 10%, by in the 1 - 2 - 3 - 1 sequence.

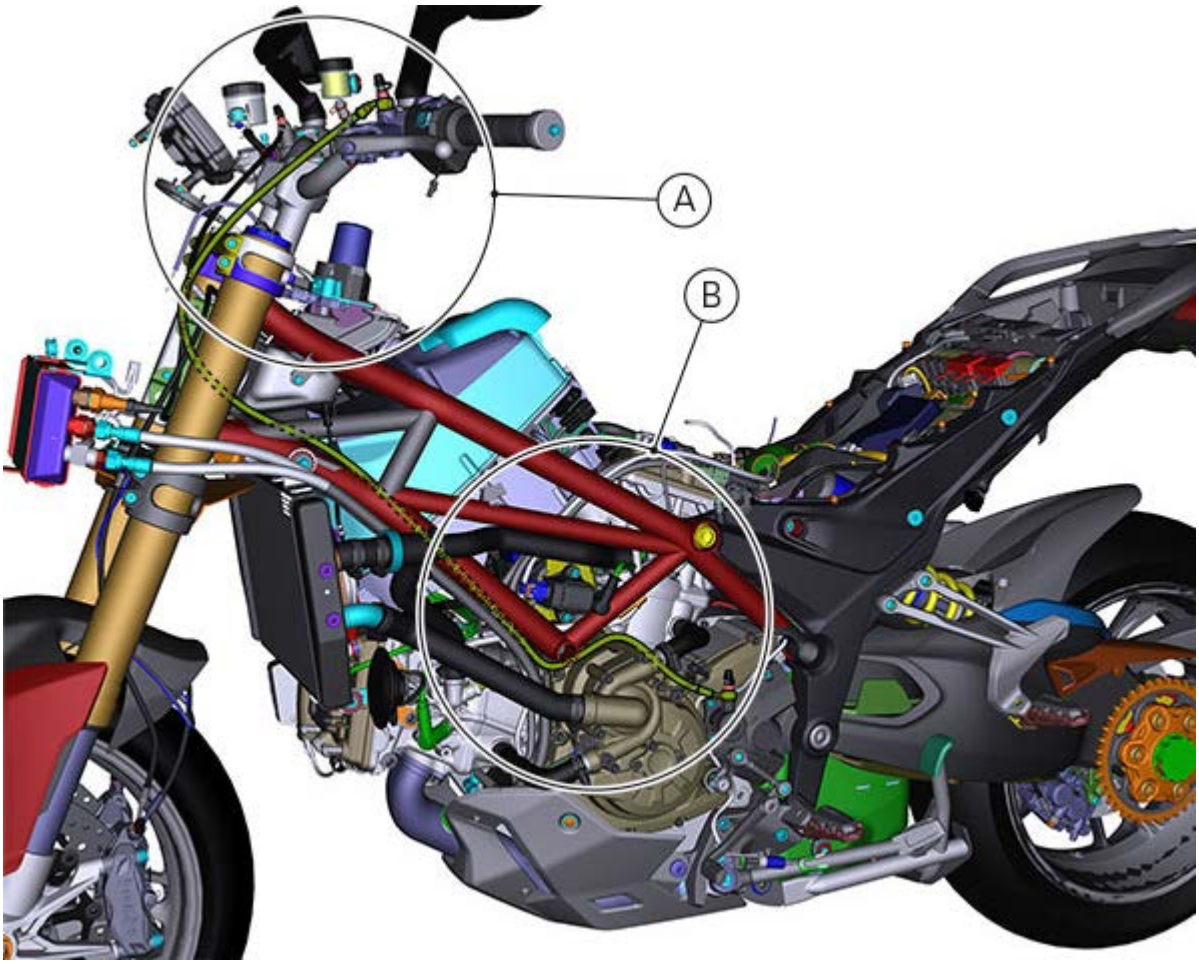
Note

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

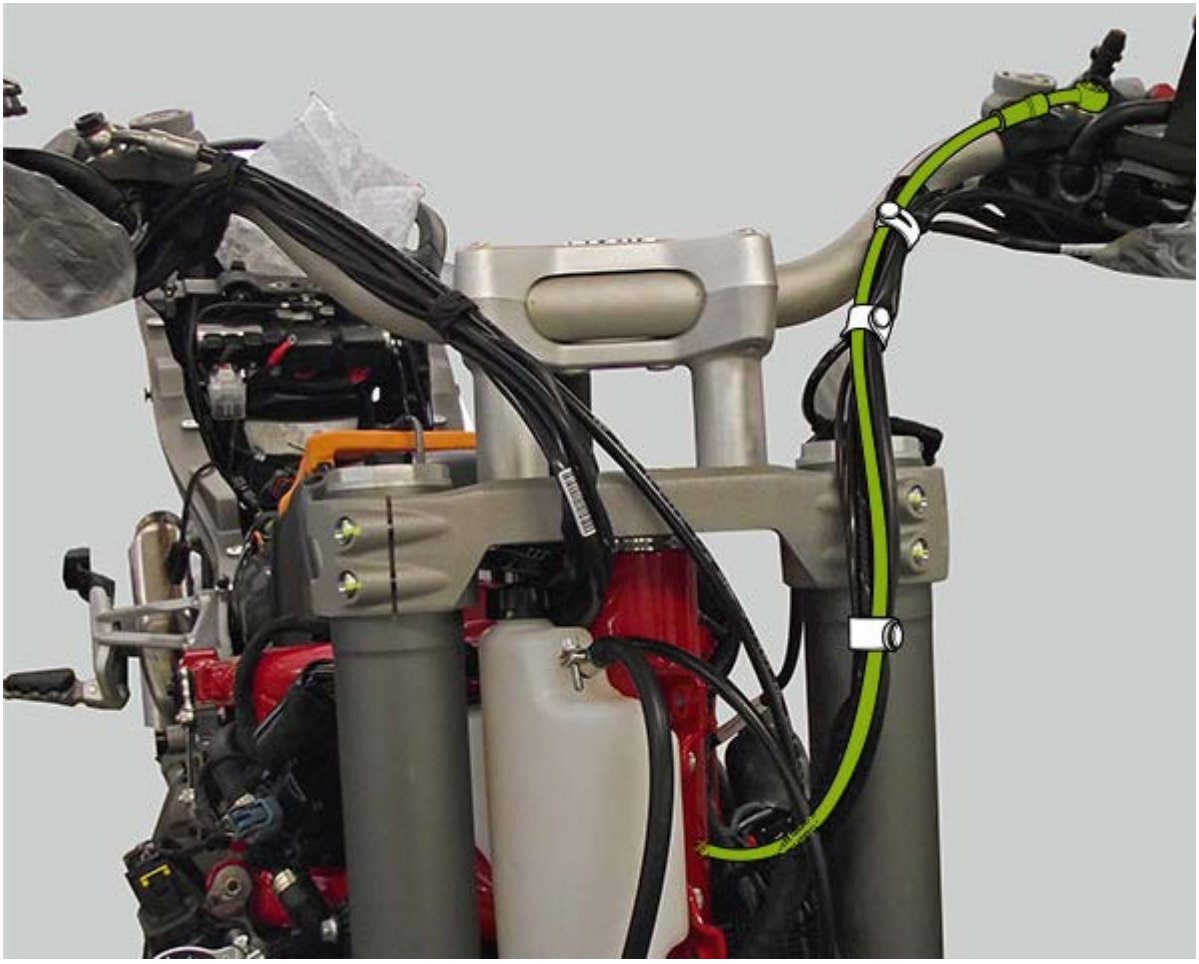


Fill the clutch system (Filling the clutch system circuit).

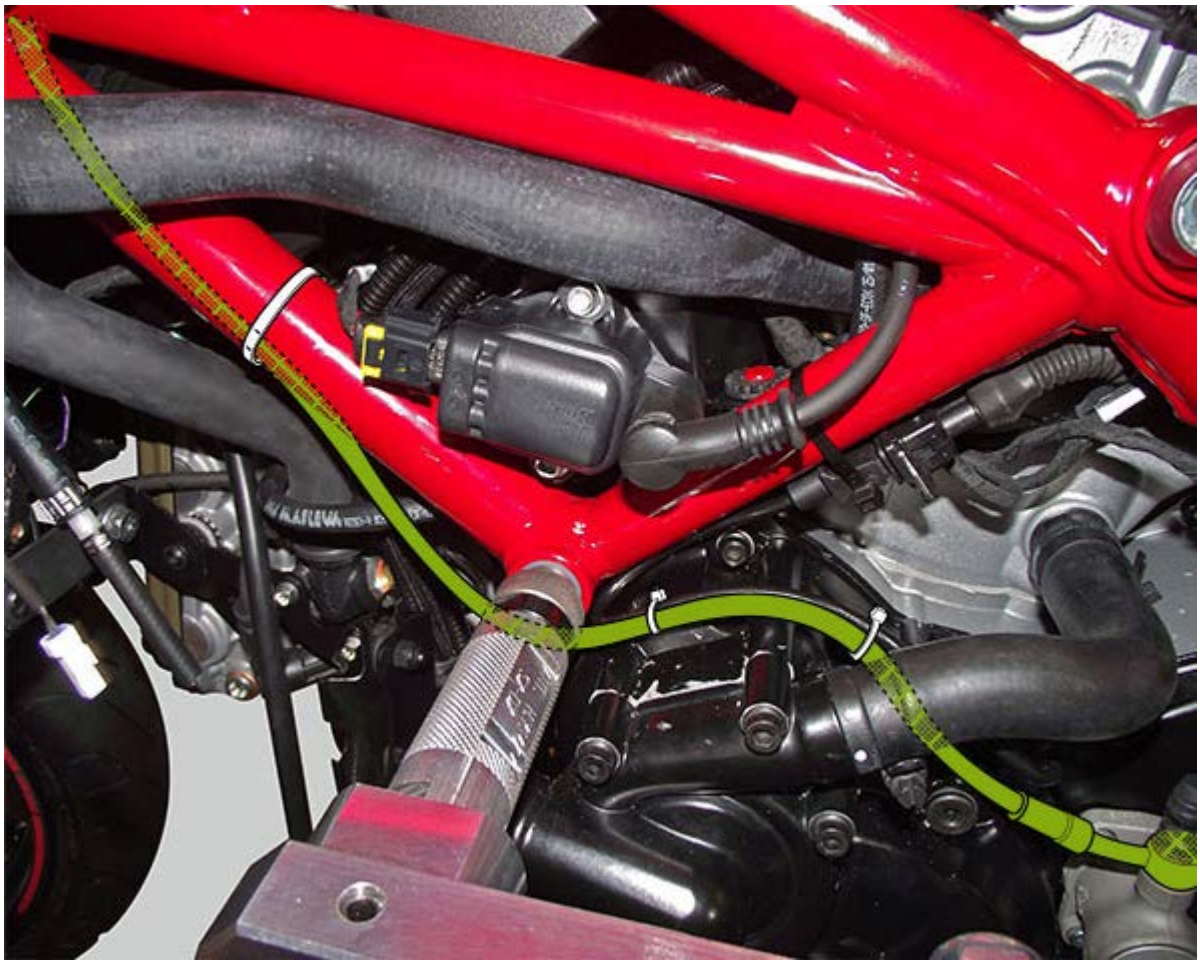
Clutch system hose positioning.



Component (A)

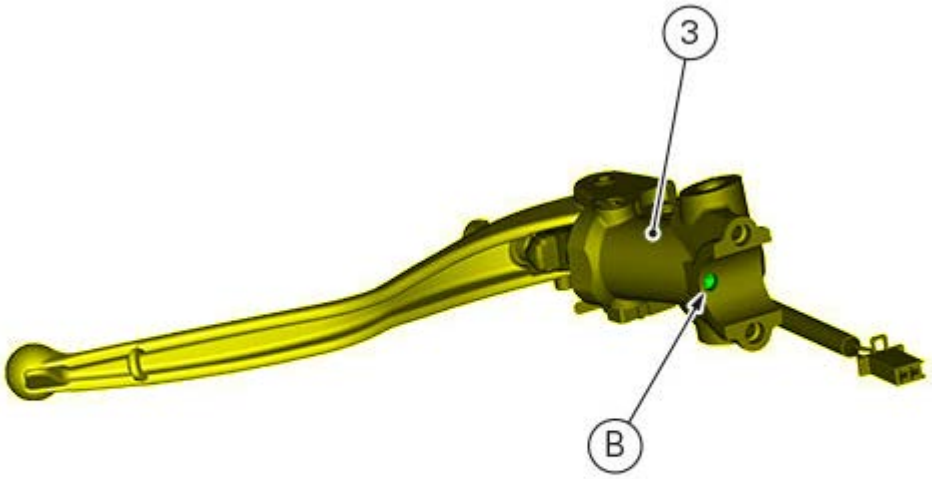


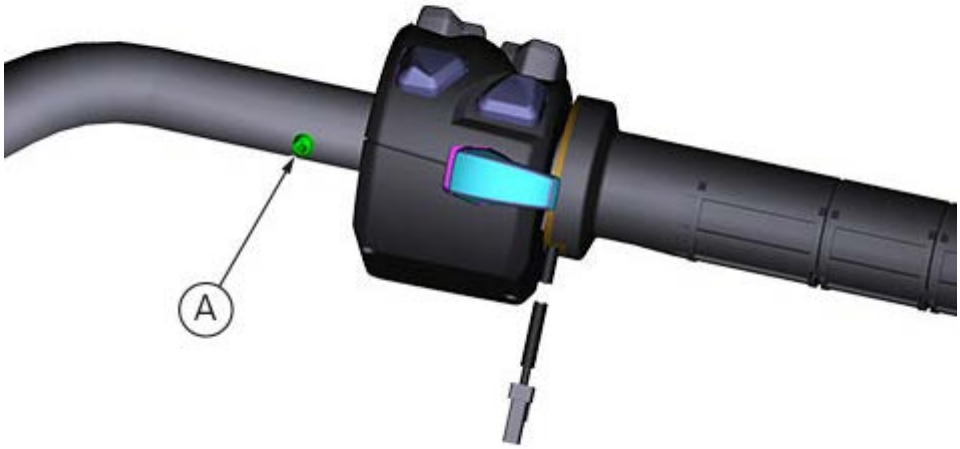
Component (B)



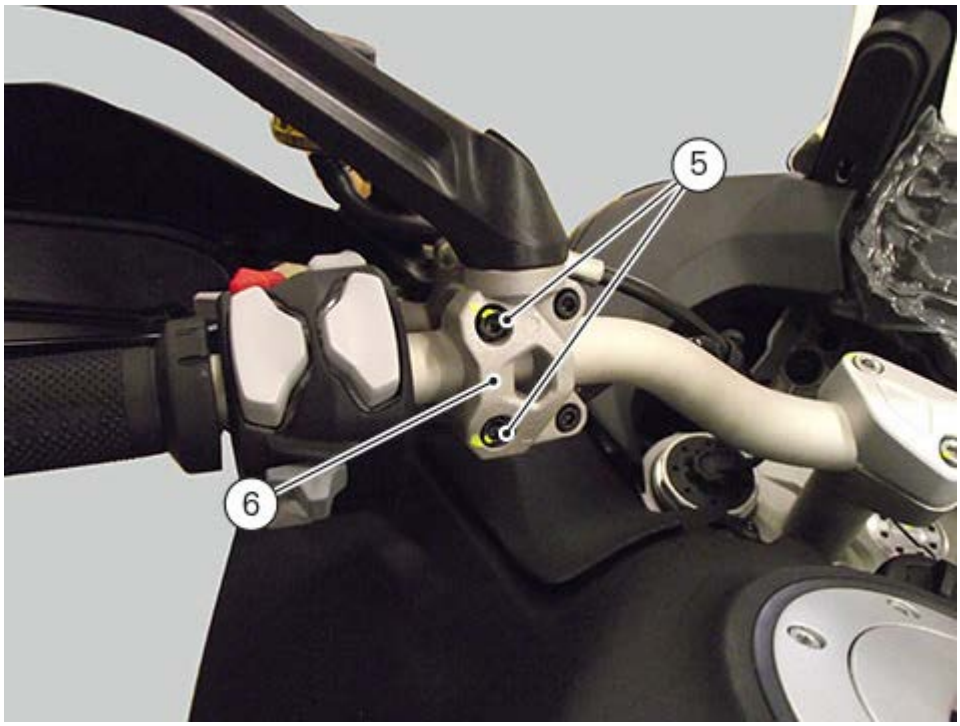
Refitting the clutch master cylinder assembly

Fit the clutch master cylinder assembly (3) on the LH handlebar by inserting centring pin (A) in hole (B) of the clutch master cylinder control.





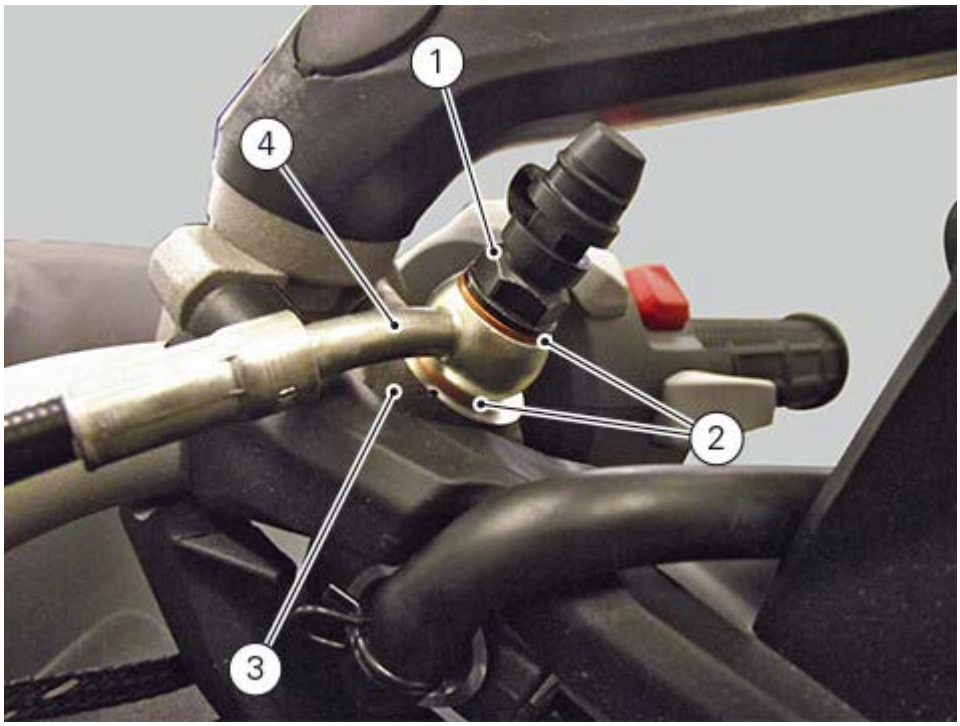
Couple clamp (6) with the clutch master cylinder control and fix them with screws (5). Tighten the fastening screws (5) to the specified torque of 10 Nm ± 10% following the sequence 1-2-1 starting from the upper screw.

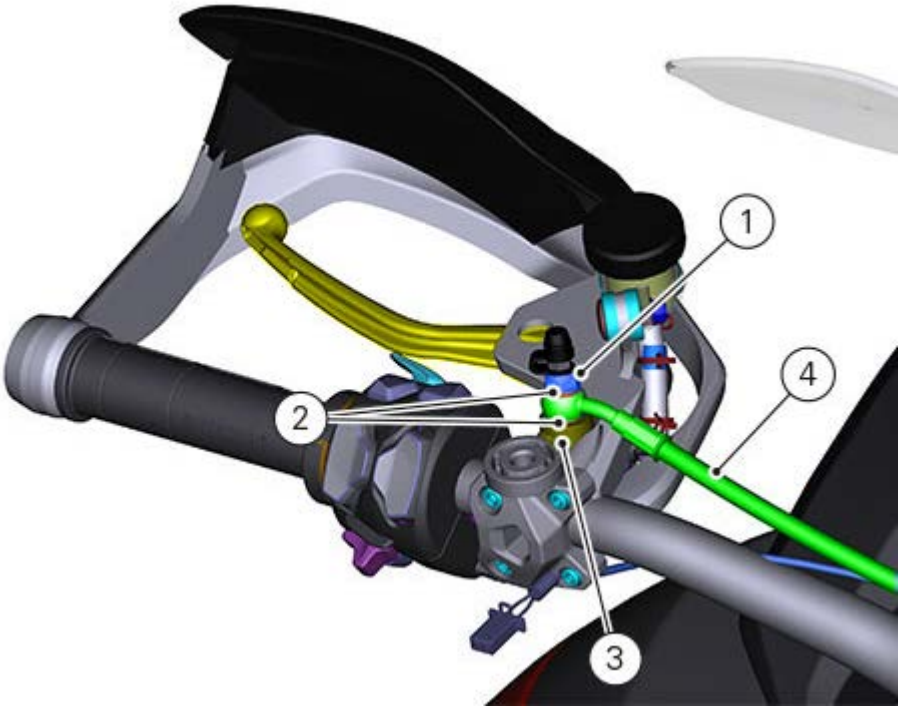


Position the hose (4) and sealing washers (2) on the master cylinder unit (3) and secure with the special screw (1), without tightening.

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

For the positioning of the clutch hose (4) and retaining clips, refer to "Refitting the clutch slave cylinder".
Tighten the special screw (1) to a torque of 23 Nm ± 10%.

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2
3
4

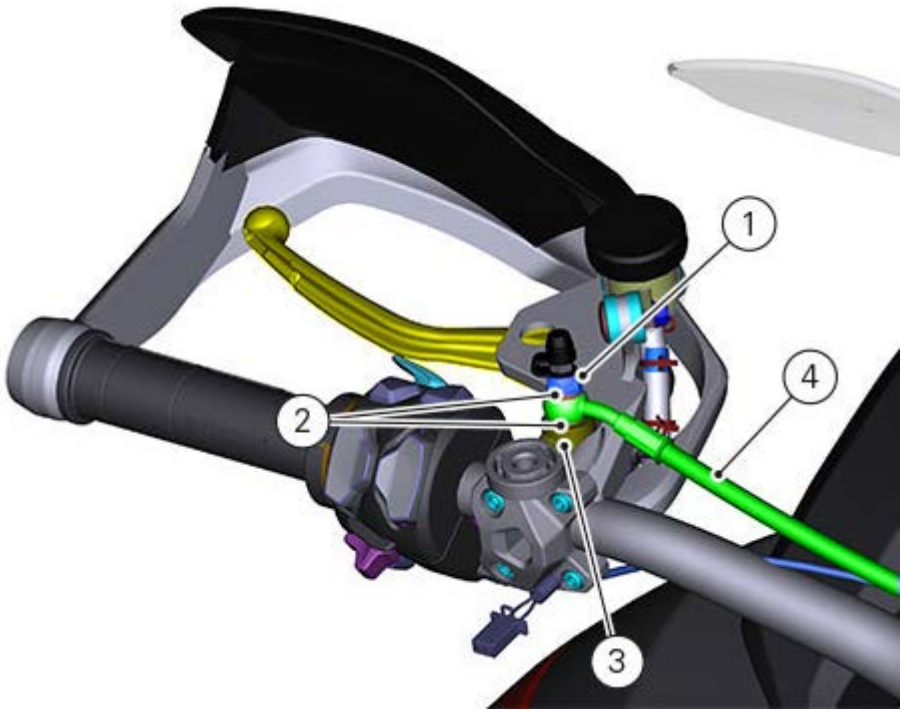
Removing the clutch master cylinder assembly

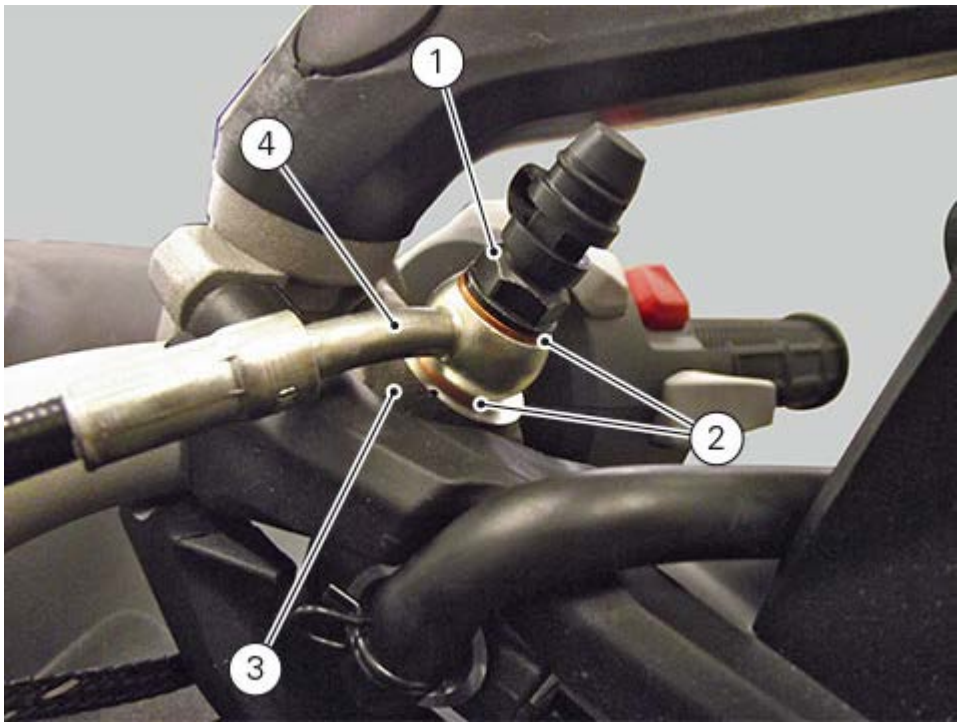
Warning

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.

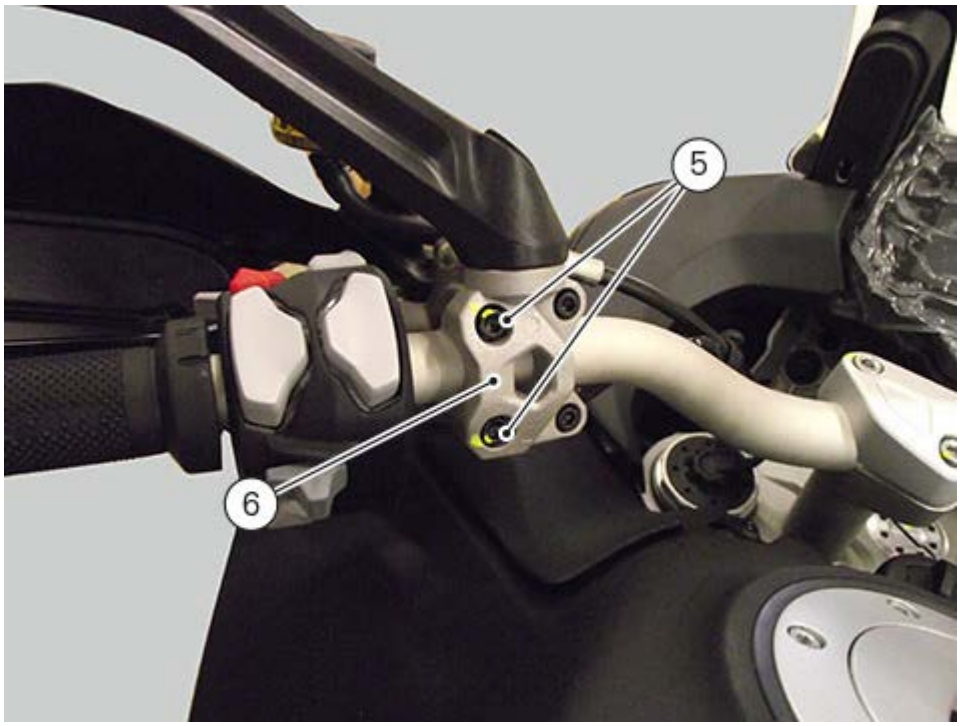
Drain the clutch system (Draining the clutch system circuit).
Remove the LH rear-view mirror (Removing the rear-view mirrors).
Remove the left hand guard (Removing the hand guards).

Unscrew the special screw (1) recovering the sealing washers (2), to release the clutch master cylinder unit (3) from the clutch control pipe (4).





Undo the screws (5) securing the U-bolt (6), and then remove the clutch brake master cylinder assembly from the handlebar.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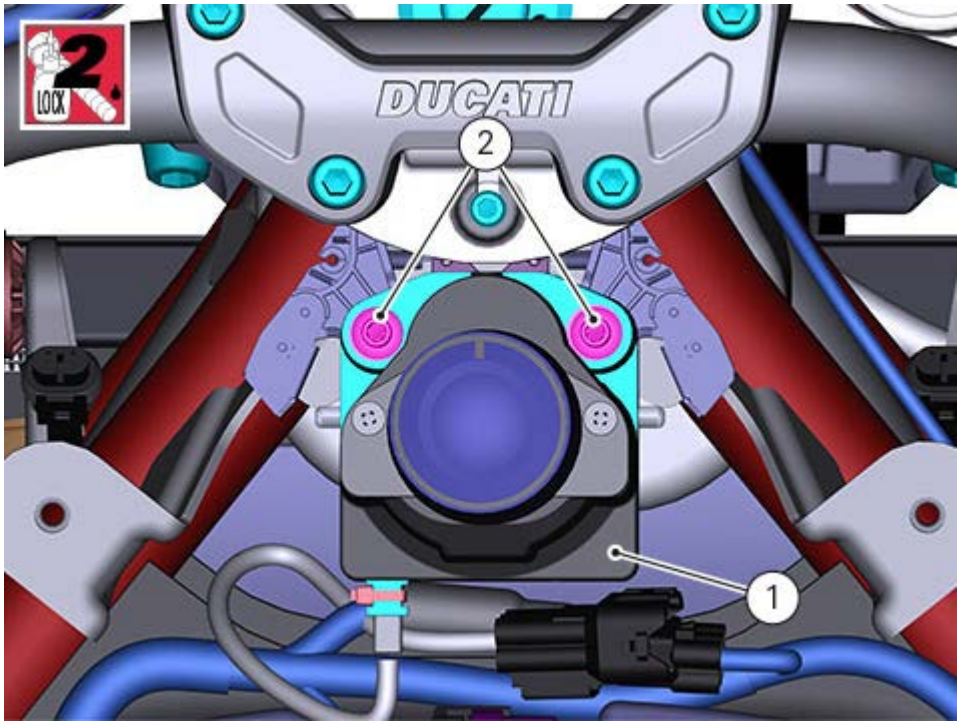
Refitting the Hands Free

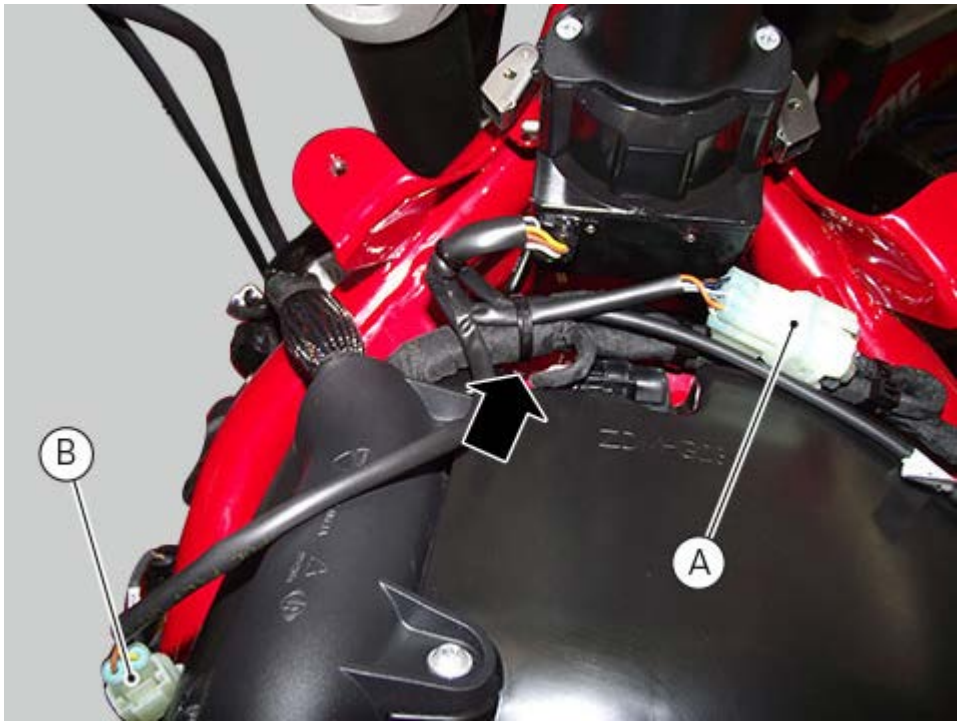
For reassembling, follow the removal procedure in the reverse order. In particular, apply specified threadlocker to screws (2) and tighten them to a torque of 15 Nm ± 10%.
To position the wiring, refer to Section "Routing of wiring on frame".



Removing Hands Free

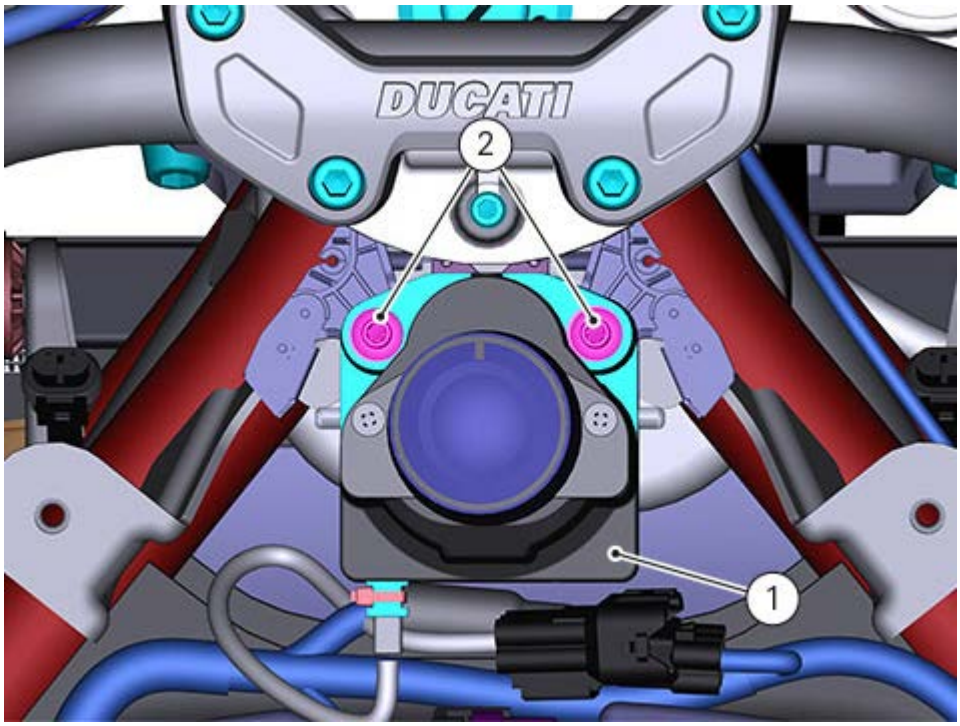
Remove the fuel tank (Removing the fuel tank).

Disconnect the Hands-free system wiring (A) from the main wiring.
If the electronic tank plug kit is installed, it will be necessary to disconnect the tank plug wiring (B).
Remove the clamp shown in the picture.



Disconnect the immobilizer antenna connector (C).

Loosen screws (2) and remove the Hands-free system (1) from the frame.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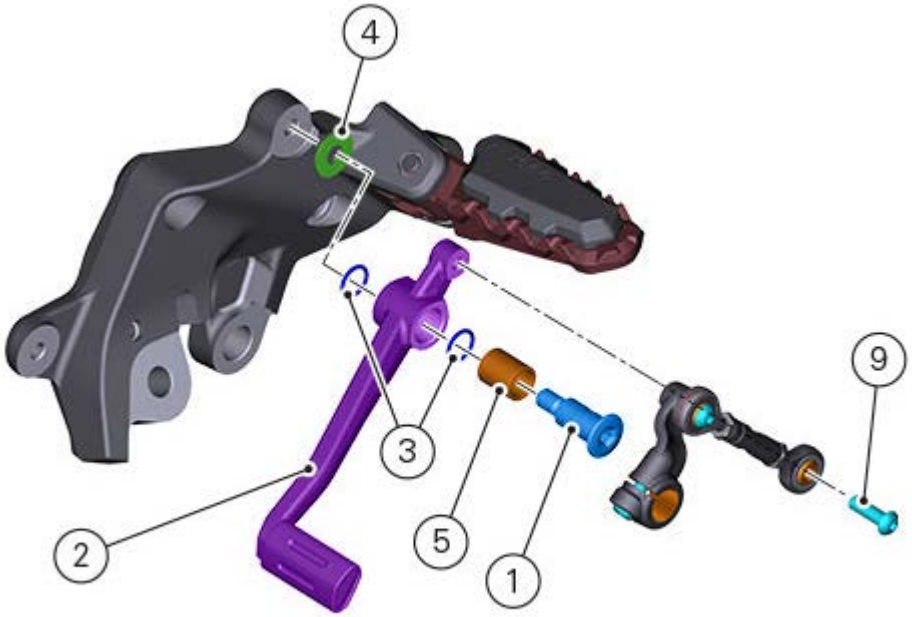
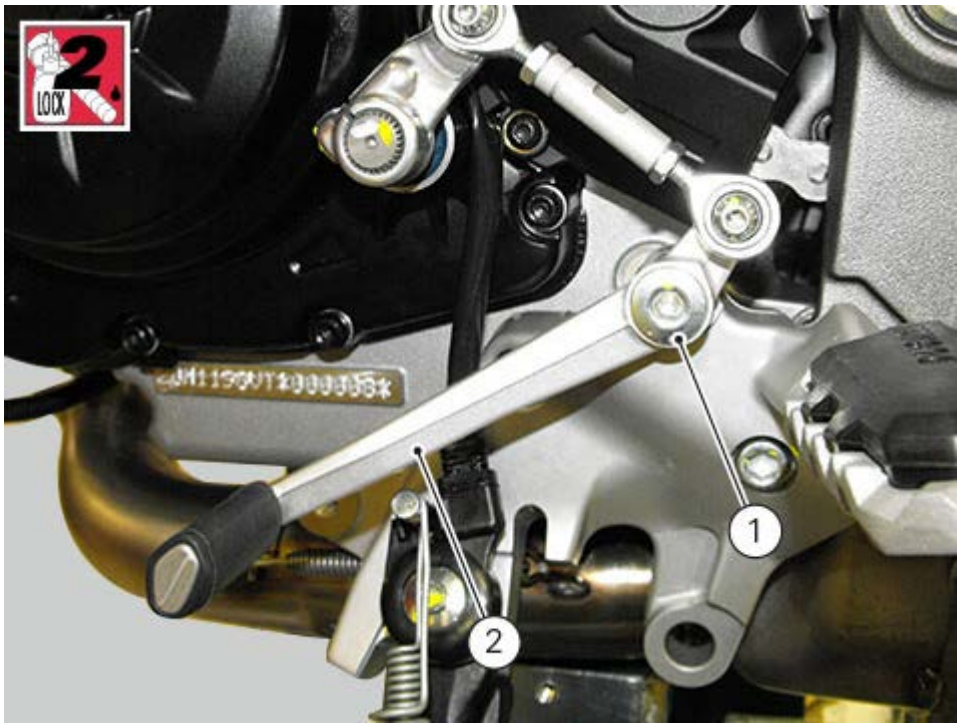
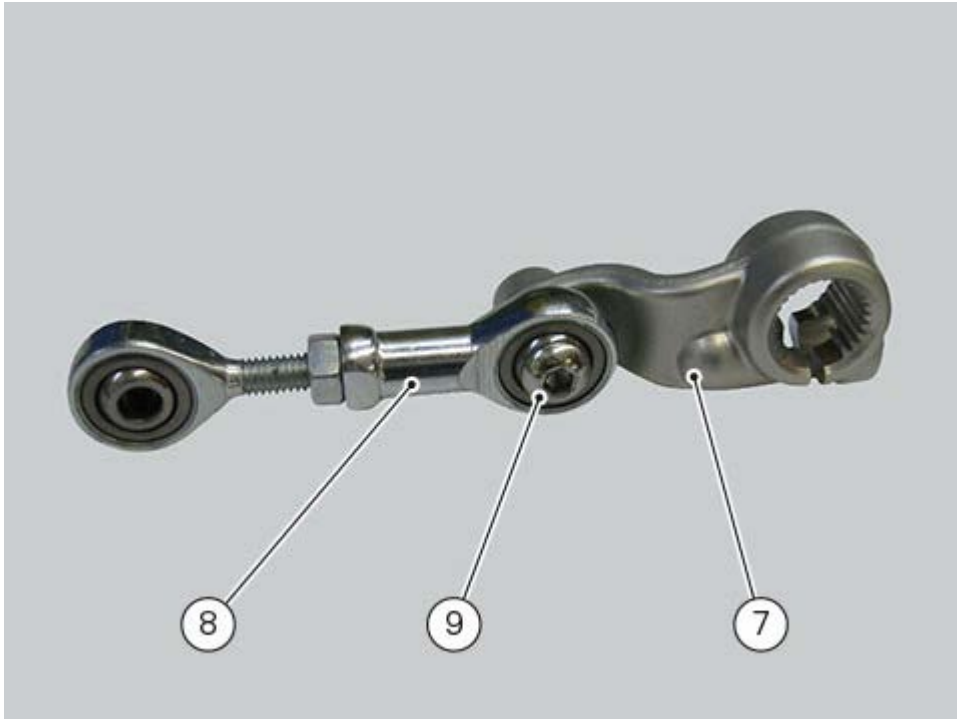
Refitting the gear change control

Apply the indicated threadlocker on shaft (1).
Install O-ring (3) onto shaft (1).
Insert the shaft (1) in the gear lever (2), and insert the other O-ring (3) and the washer (4).
Fit the gear lever (1) on the footpeg plate by inserting and tightening the shaft (1) to the specified torque of 23 Nm ±10%.





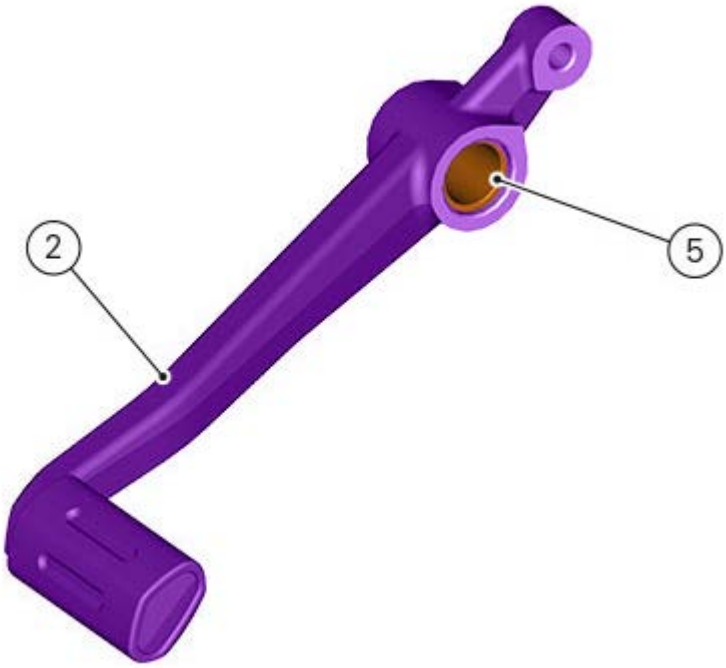
Fit lever (7) on gear transmission rod assembly (8), starting screw (9).
Tighten screw (9) to a torque of 10 Nm ±10%.

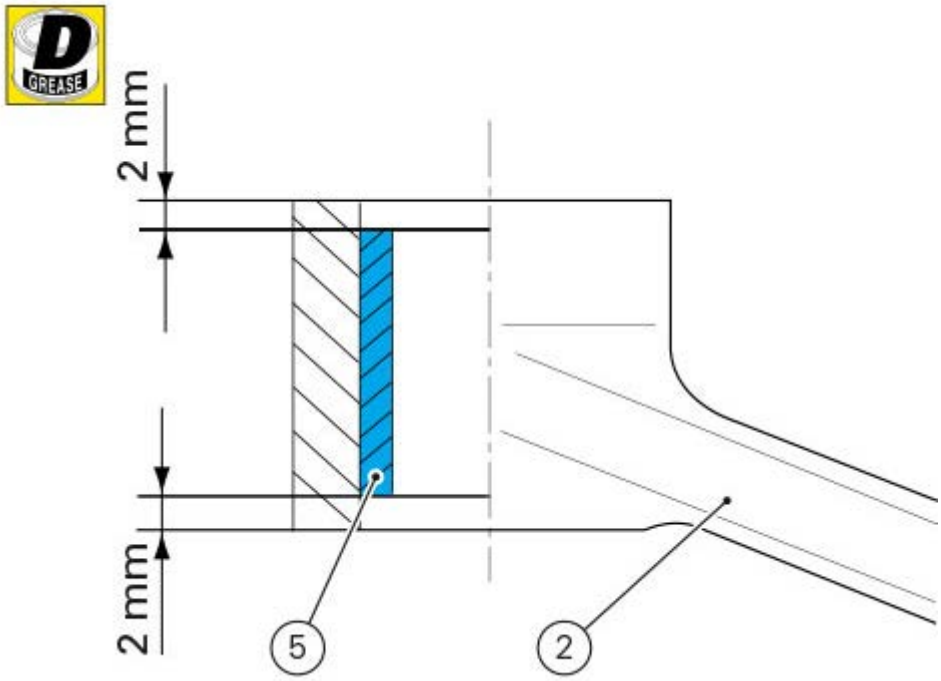


Fit the gear change unit inserting the lever (7) on the gear control pin, apply threadlocker on the screw (6) and insert it on the lever (7).
Tighten screw (6) to a torque of 10 Nm ±10%.

Disassembling the gear change control

If the bush (5) inside the pedal (2) needs replacing, grease the external surface and drive the new bush into place using a press. The bush must be seated 2 mm below the outer face of the pedal.





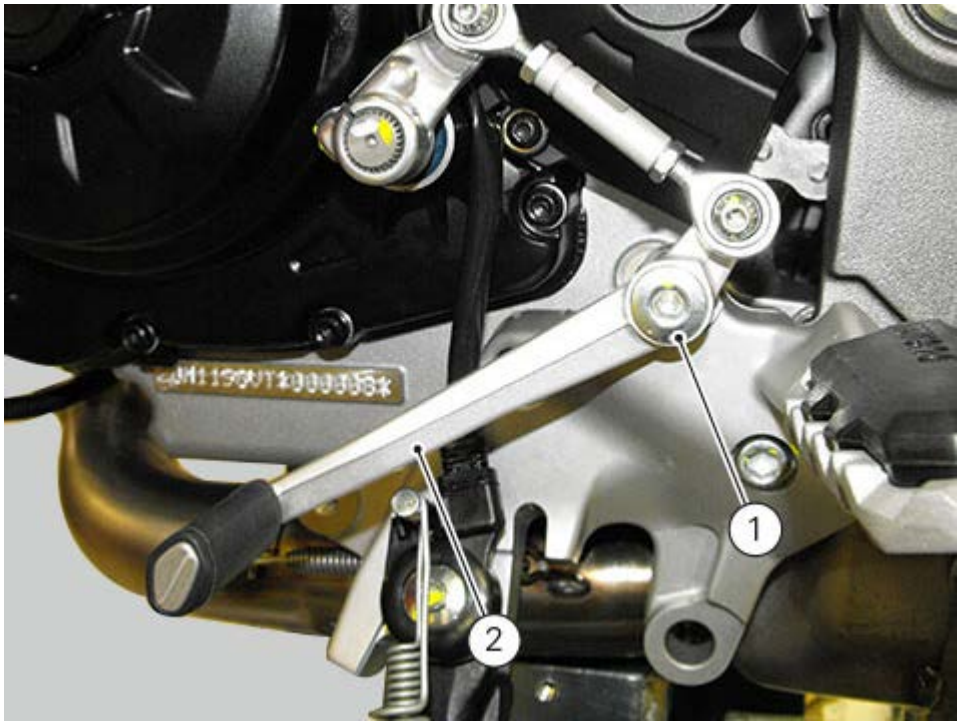
Warning

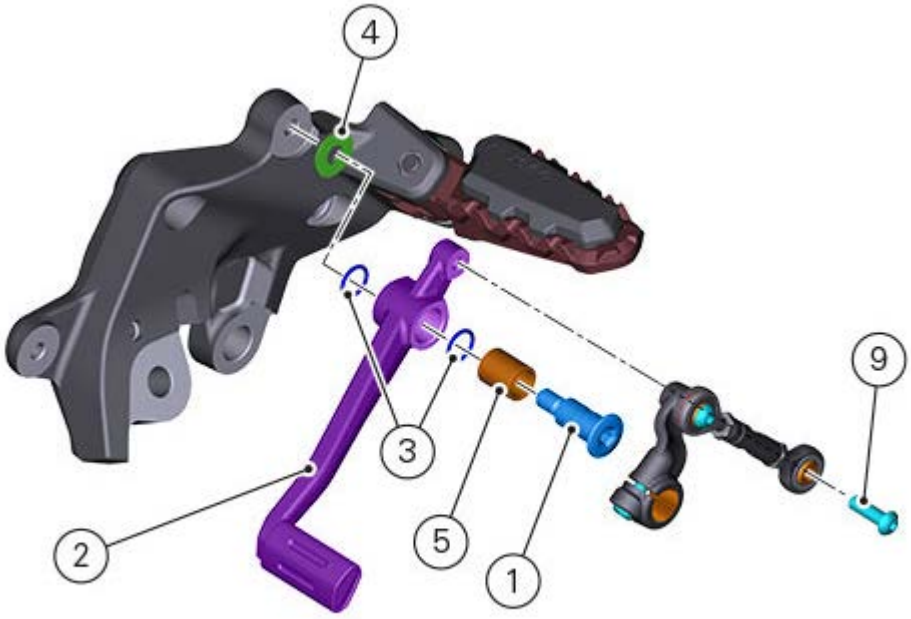
After working on the gear change control, check the position of the gear pedal.

To adjust the gear pedal position, follow the instructions under Section "Adjusting the position of the gear and rear brake pedals.".

Removing the gear change control

Loosen and remove the pin (1) securing the gear pedal (2), and collect the O-rings (3), the washer (4) and bush (5).
Undo and remove the screw (6) securing the gear lever (7) to the gearbox shaft.
Remove the lever (7) complete with the gear control assembly.

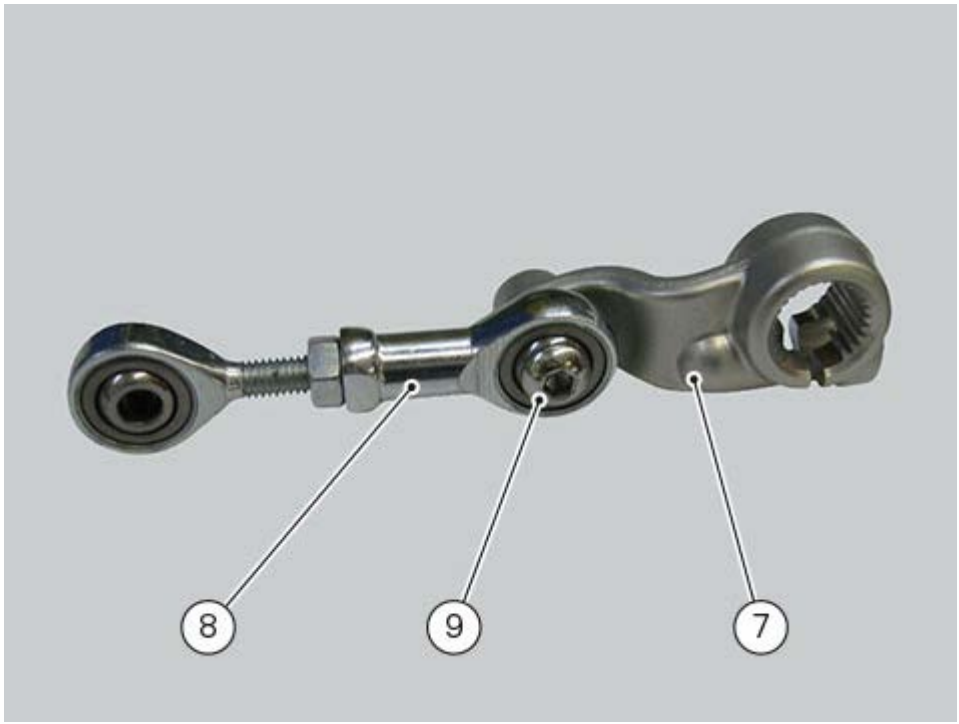




Note

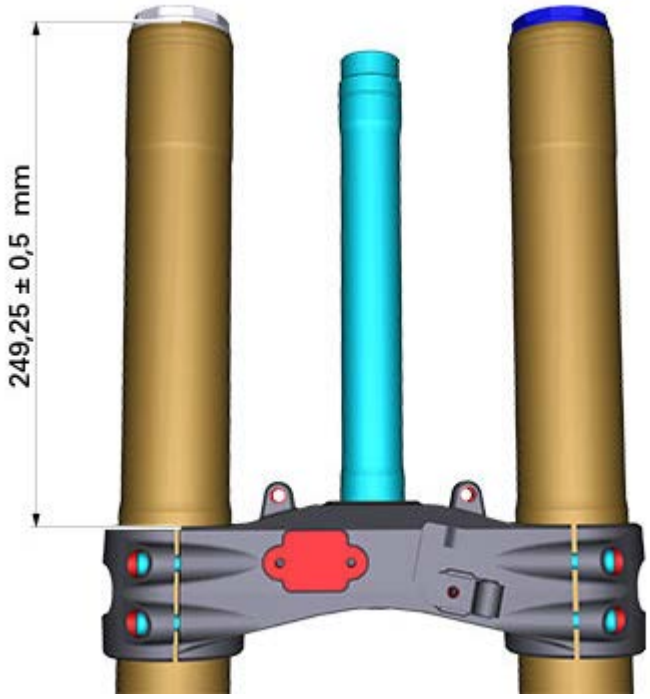
Mark the position of lever with respect to the gear selector shaft.

To remove lever (7) from gear transmission rod assembly (8), loosen screw (9) then slide out lever (7).



Refitting the front fork

Refit the fork legs setting them at the indicated height to the bottom yoke.



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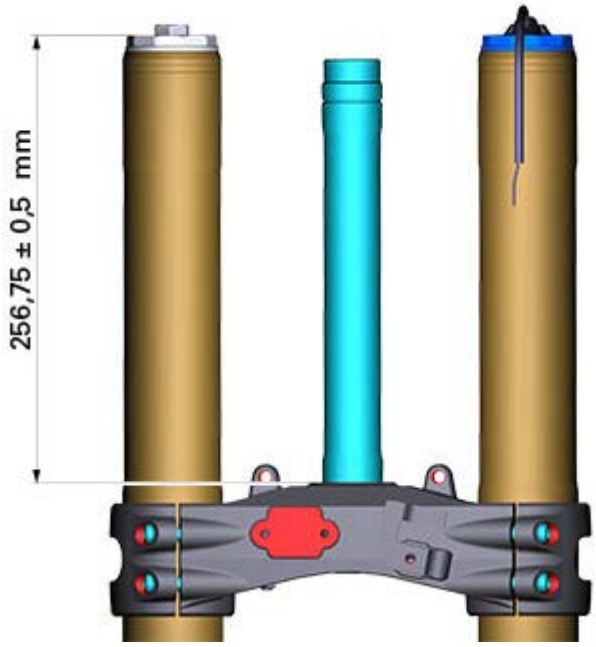


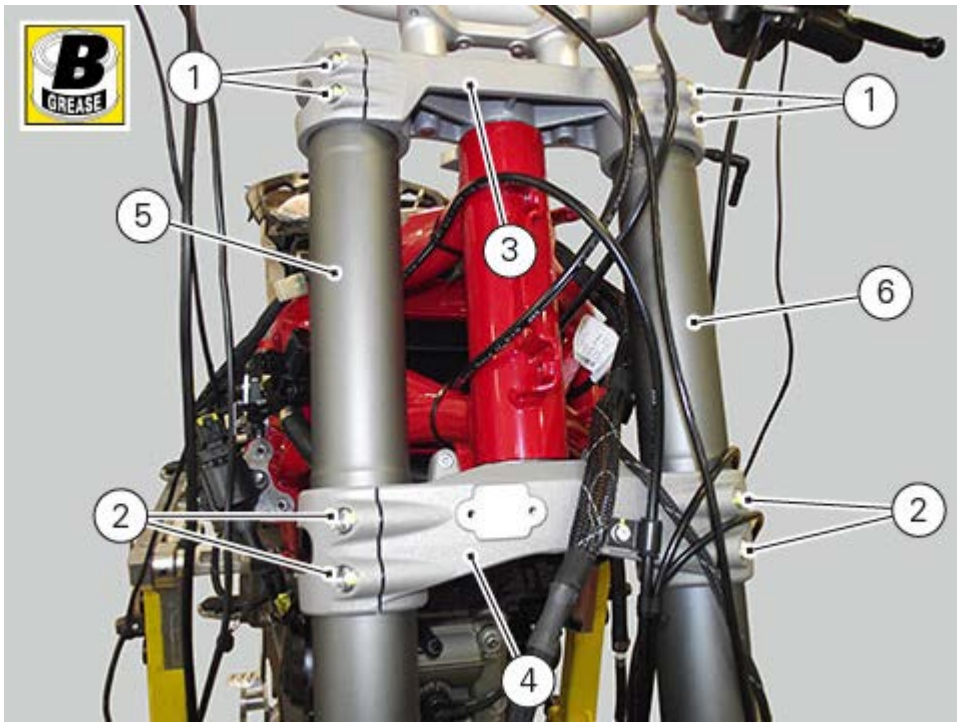
Warning

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

Position fork legs (5) and (6) on bottom yoke (4) and steering head (3).
Fasten fork legs by tightening screws (1) to 10 Nm ±5% and screws (2) to 16 Nm ±5% retaining bottom yoke (4) and steering head (3): tighten screws (2) in a 1-2-1 sequence starting from the top.
Tighten one leg at a time.

Important

If the screws were removed upon disassembly, smear their threads with the specified grease before tightening.



Refit any parts removed from the frame.

Refit the front mudguard (Refitting the front mudguard).
Refit the front wheel (Refitting the front wheel).
Refit the front half-fairings (Refitting the front half-fairing).
Refit the front brake callipers (Refitting the front brake system).

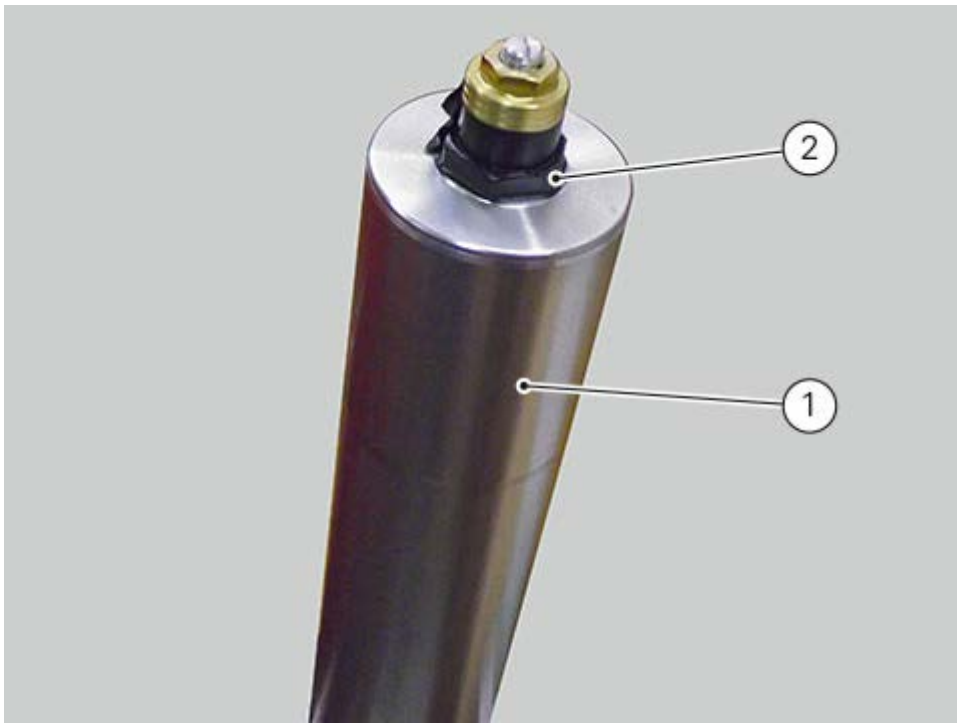
Warning
Do not use the motorcycle when front mudguard is not in place since this part supports the brake lines and avoids that they interfere with the wheel under braking.

Overhauling the front fork

REMOVAL PROCEDURE

Remove the front wheel (Removing the front wheel).
Remove the forks (Removing the front fork).

Vice the fork (1) and pay attention to protect the sleeve.
Apply some adhesive tape on the hexagon flat to prevent any damage.



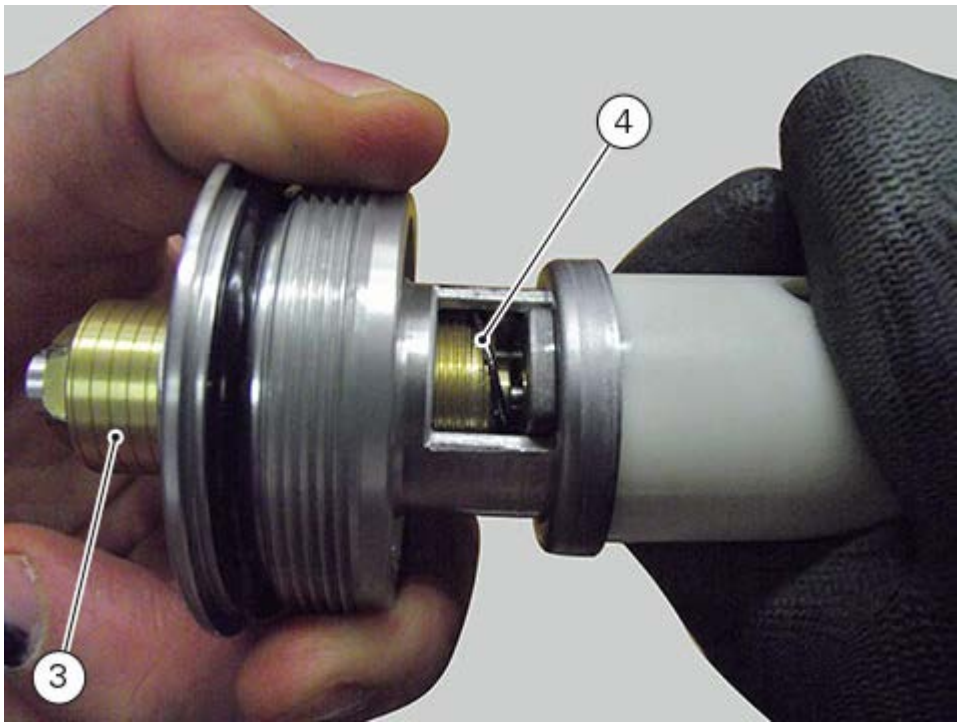
Slacken the top plug.

Take the outer sleeve (1) down.

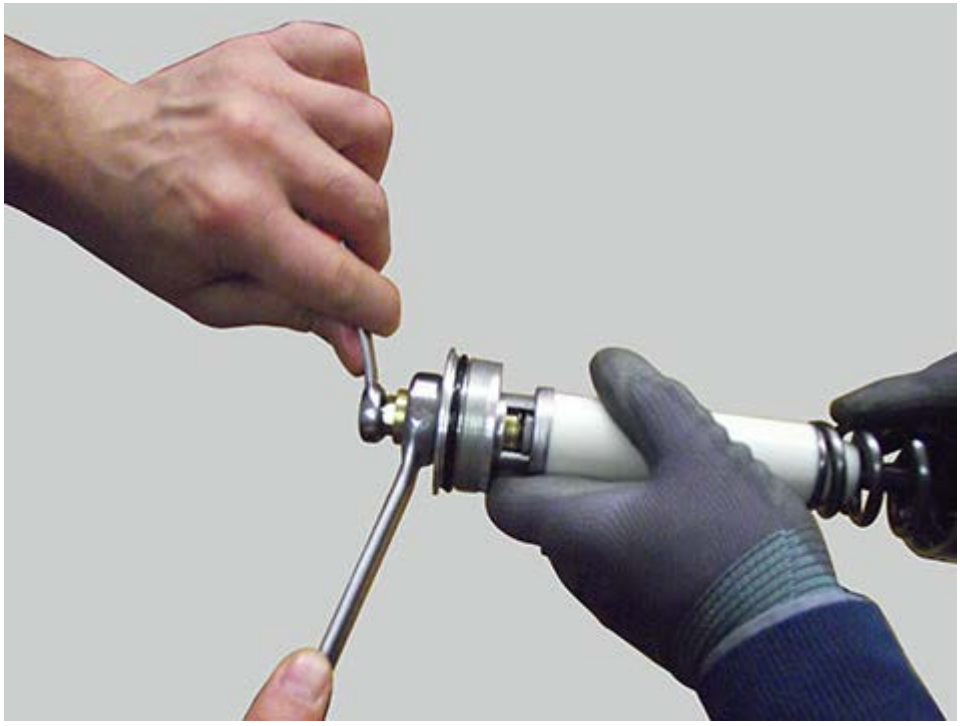
Drain all fluid from the sleeve.
To help draining, move damper rod a few times, then leave sleeve upside-down until fluid has completely drained.

Important
Draining all fluid from the fork is very important. This because, due to fork construction and design, it is not possible to measure the air volume from fluid surface to fork edge when filling the fork with fluid.

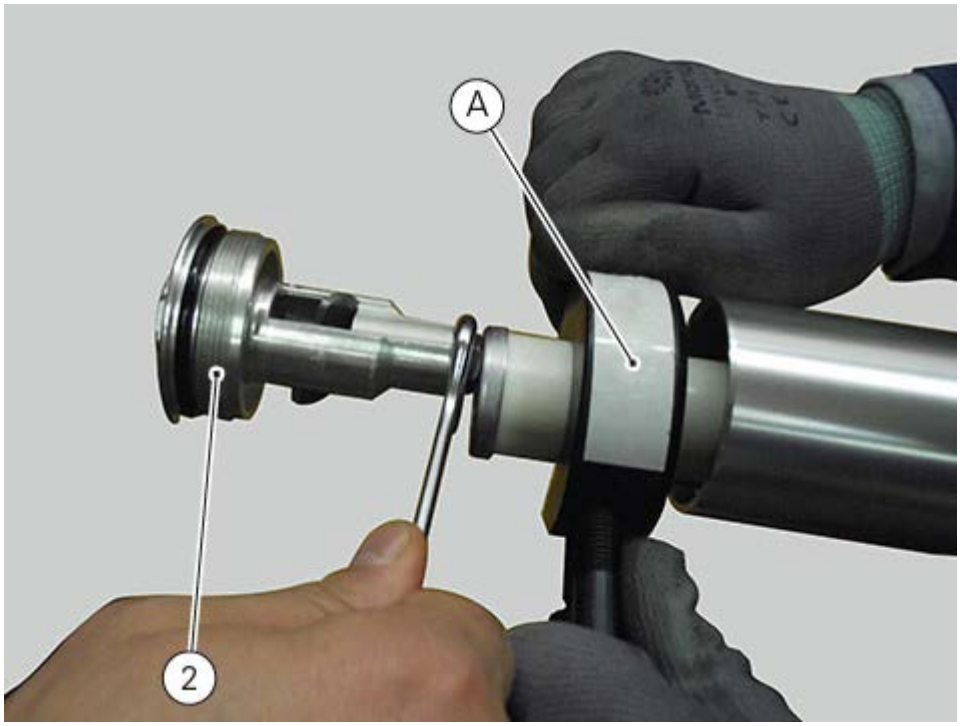
If necessary, remove retainer (4) from the preload adjuster (3) as explained below.



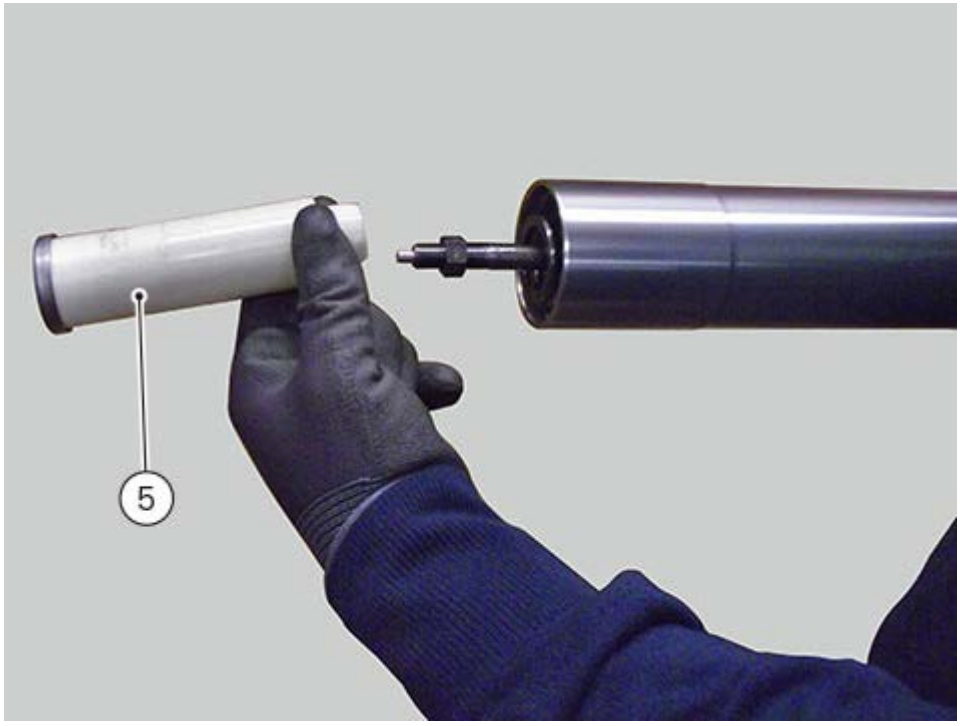
Remove the preload adjuster (3).



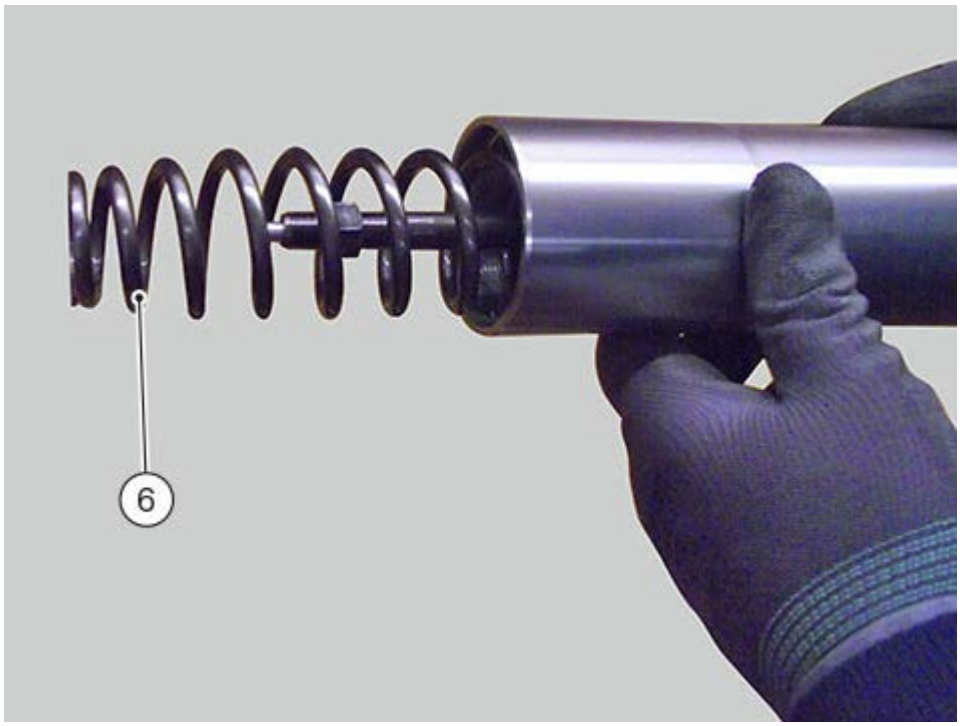
Use tool (A) no. **88713.0957** to lower the preload tube (5) and remove the upper plug (2) by loosening the lock nut.



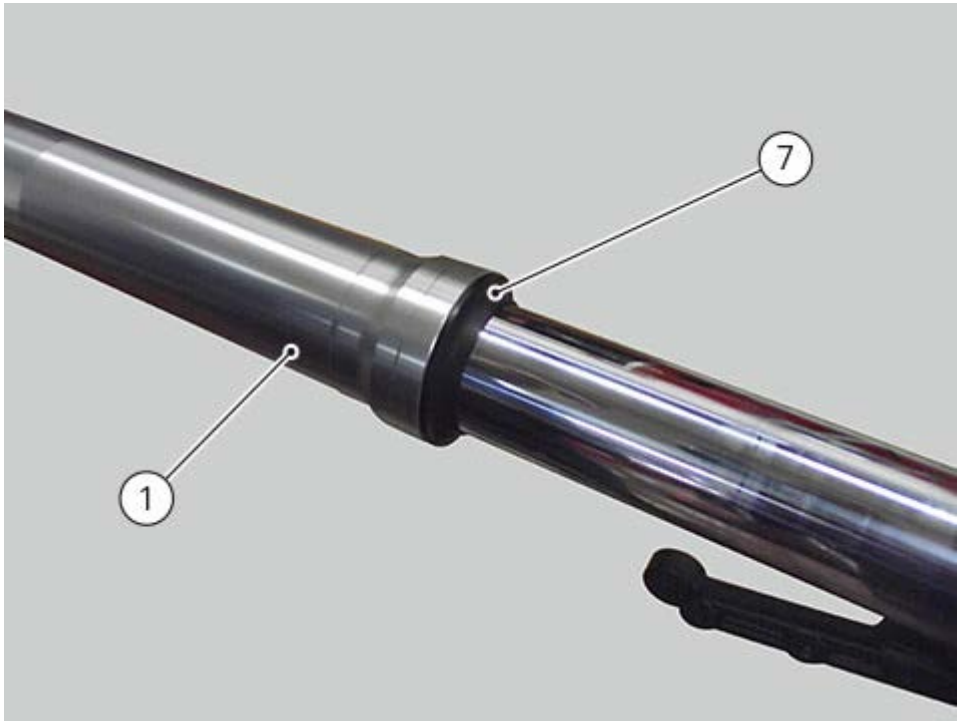
Remove the preload tube (5).

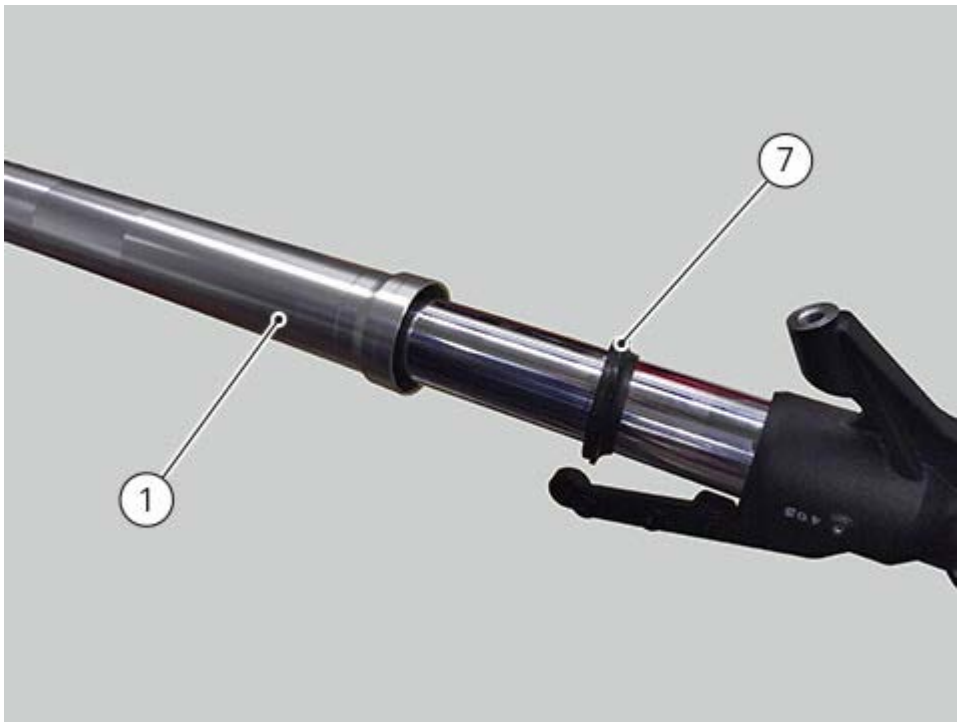


Remove spring (6).

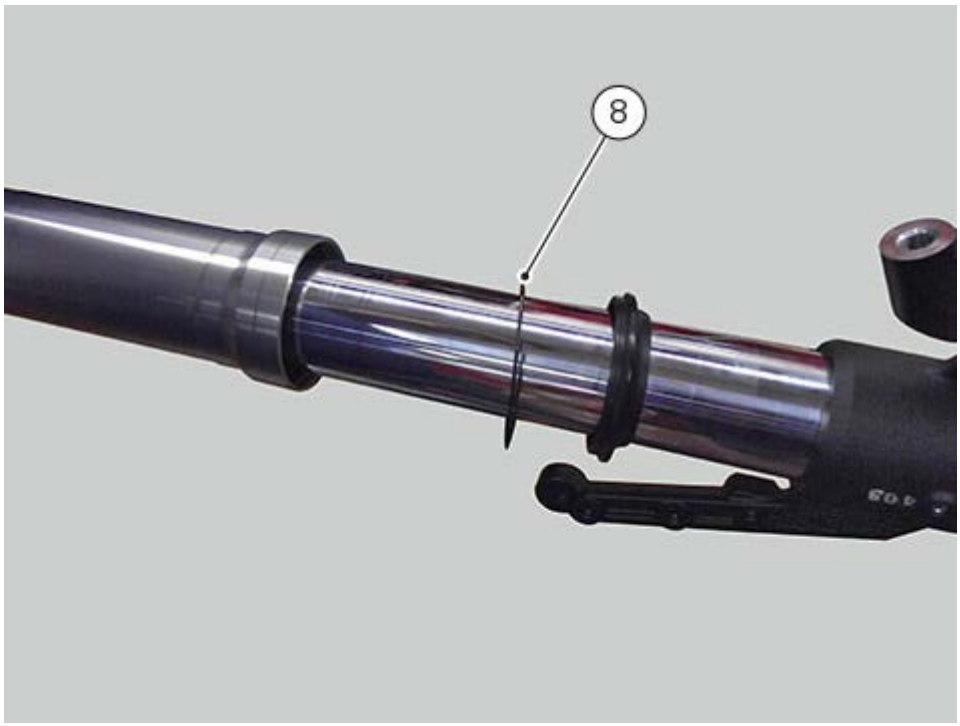


Remove dust seal (7) from outer sleeve (1).

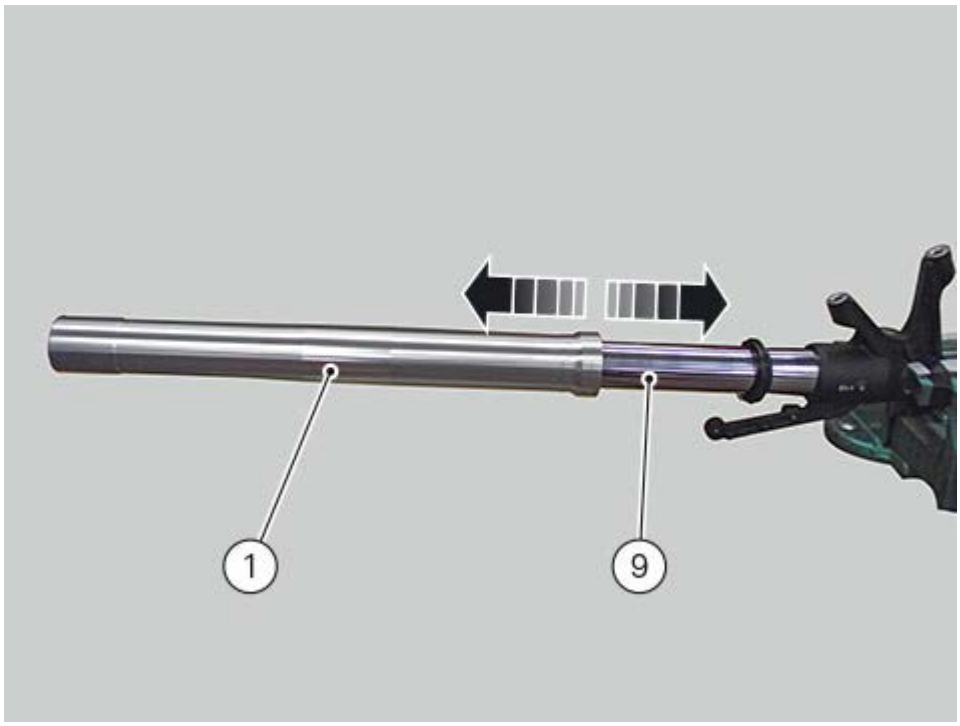




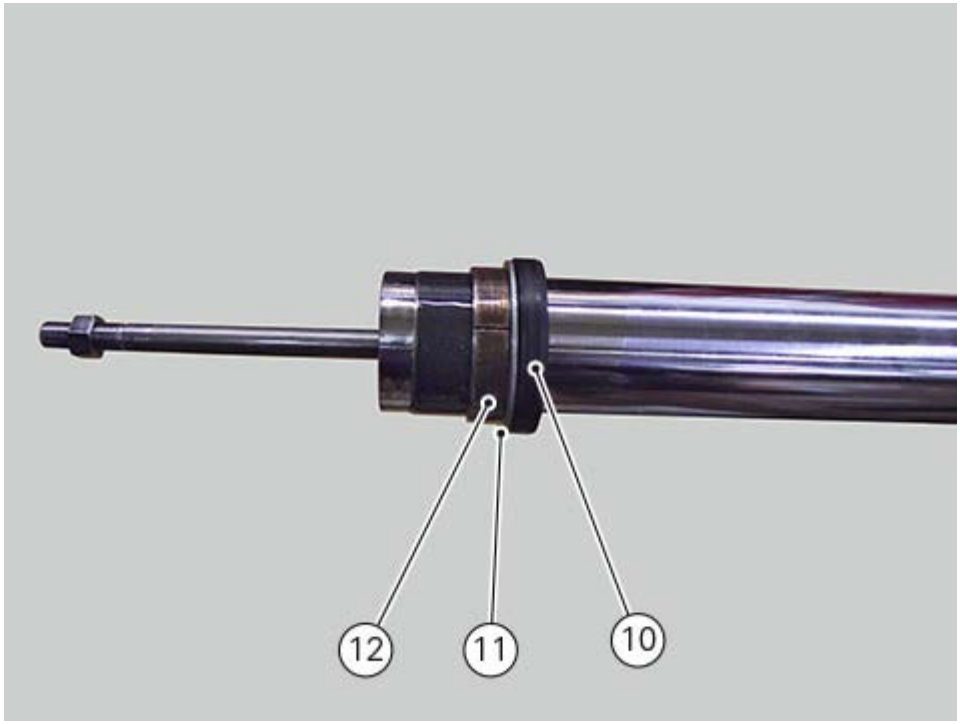
Remove snap ring (8).



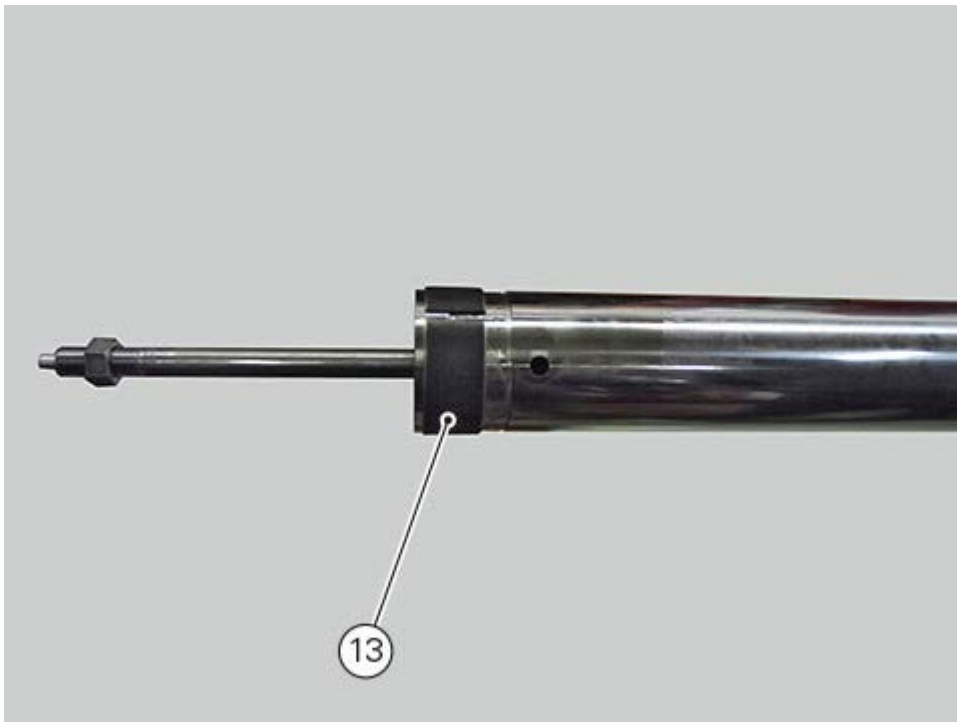
Slide out outer sleeve (1) from fork leg (9) by hitting several times to counter-hold the sliding bushing resistance.



Using suitable tools, remove oil seal (10) washer (11) and bushing (12).



Remove bushing (13) from the leg.



Important

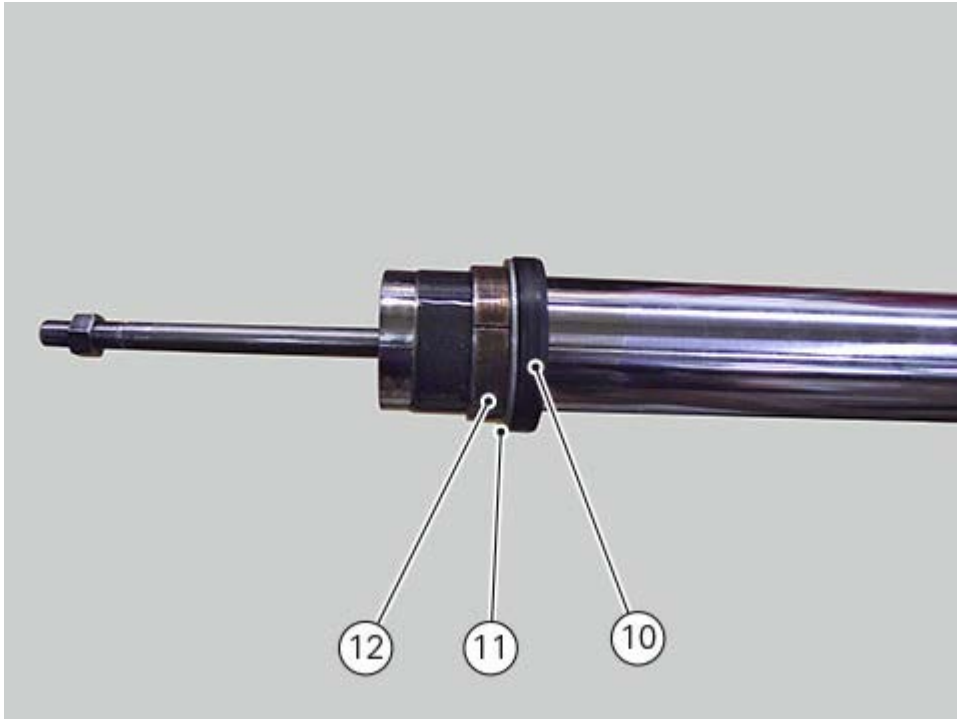
To help bushing removal, heat up the outer sleeve in the areas of the bushings up to a temperature of 100°.

REFITTING PROCEDURE

Protect bushing seat with some adhesive tape.

Lubricate fork leg with fork oil and install, in this sequence:

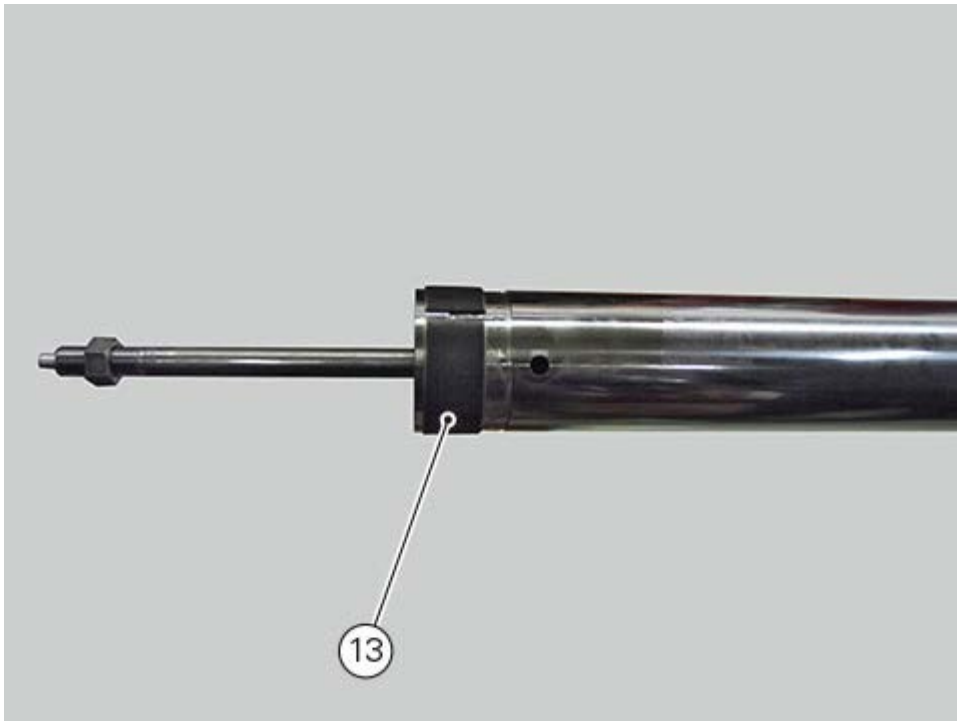
- Dust seal (7);
- Snap ring (8);
- Oil seal (10);
- Shim (11);
- Bushing (12).



Note
Pay attention to the direction of installation of oil seal, spring must face outward.

Remove the adhesive tape previously applied.

Fit the sliding bushing (13) in its housing.

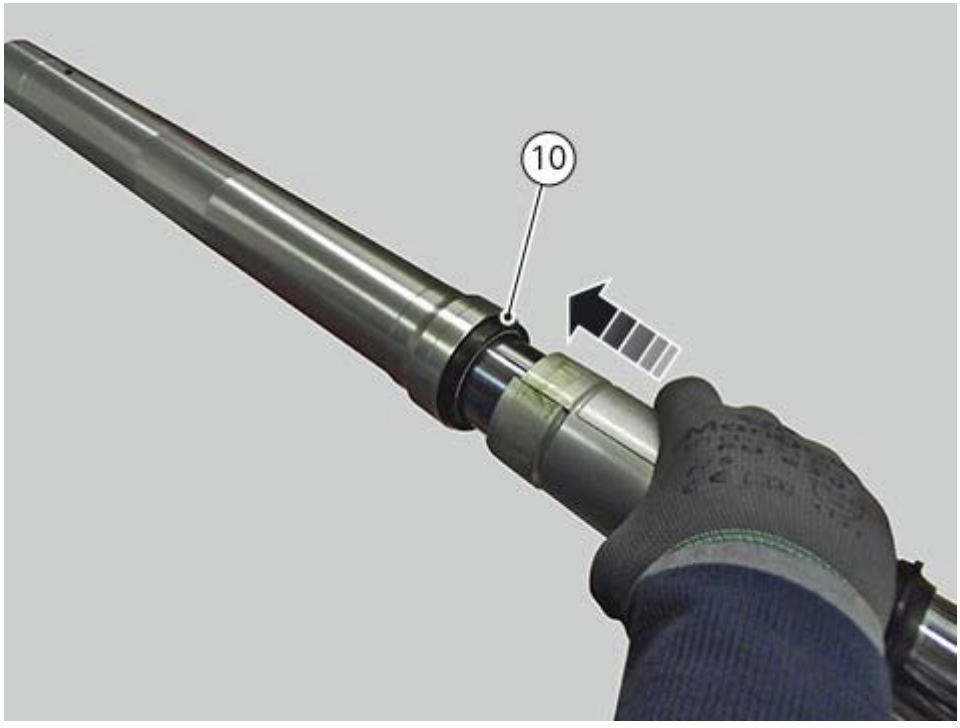


Fit leg into the sleeve.

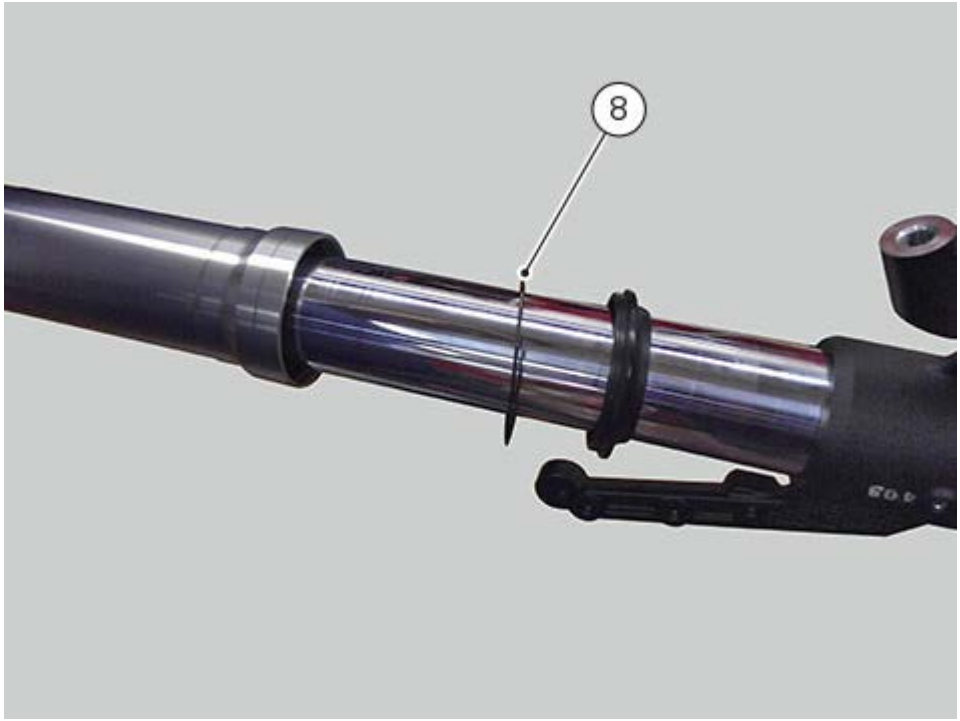
Install bushing (12) in its housing.
Fit shim (11) on bushing.

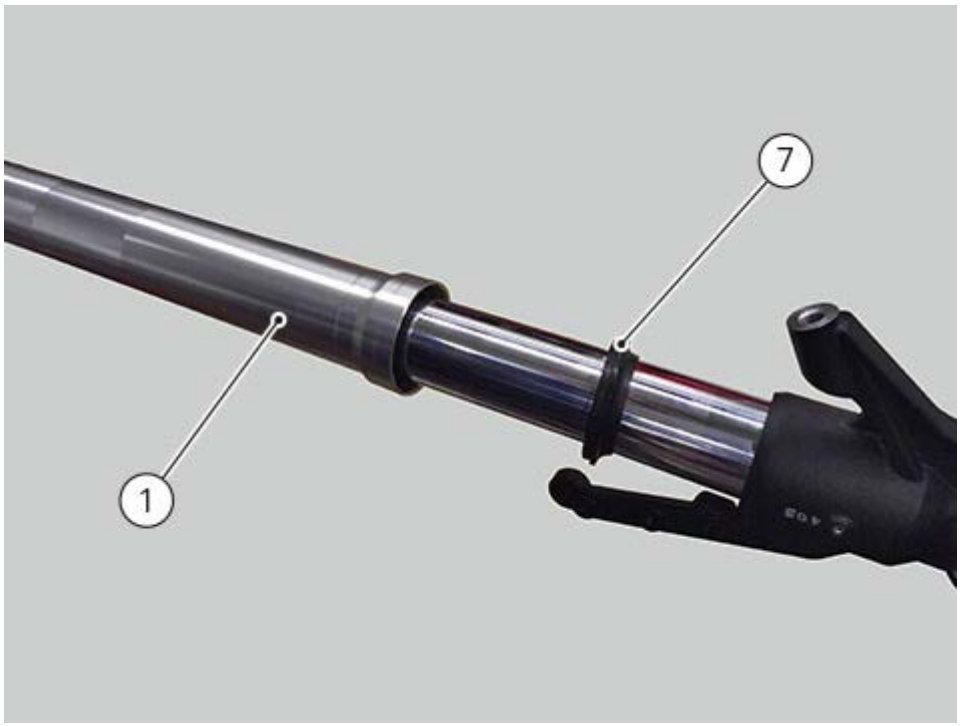
Using a drift, push bushing/shim assembly fully home.

Then, using the same tool, install oil seal (10).

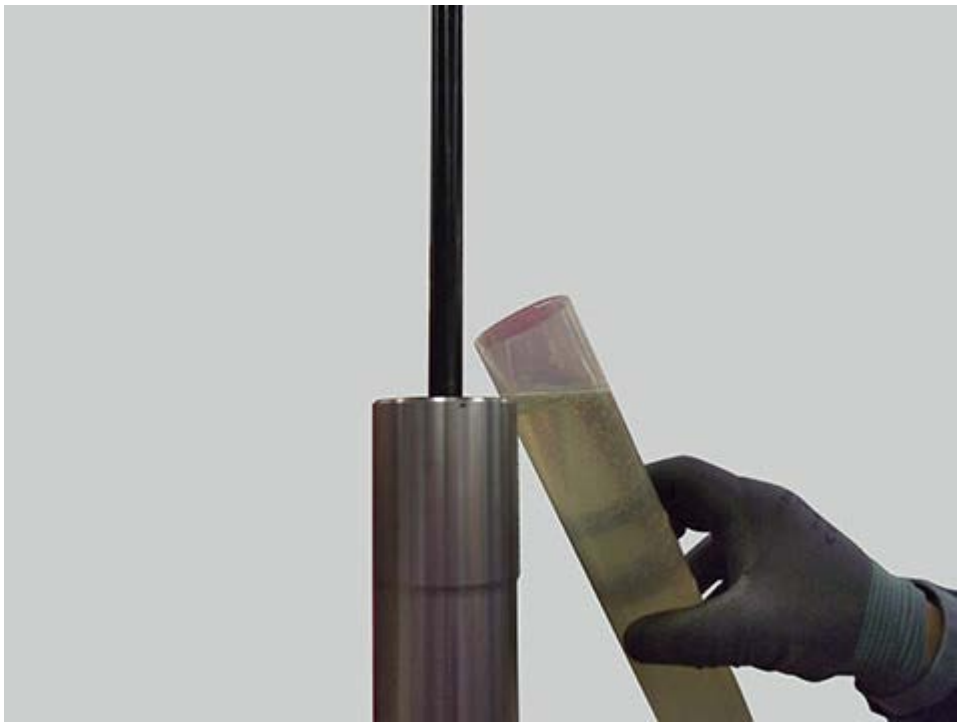


Fit snap ring (8) and dust seal (7).



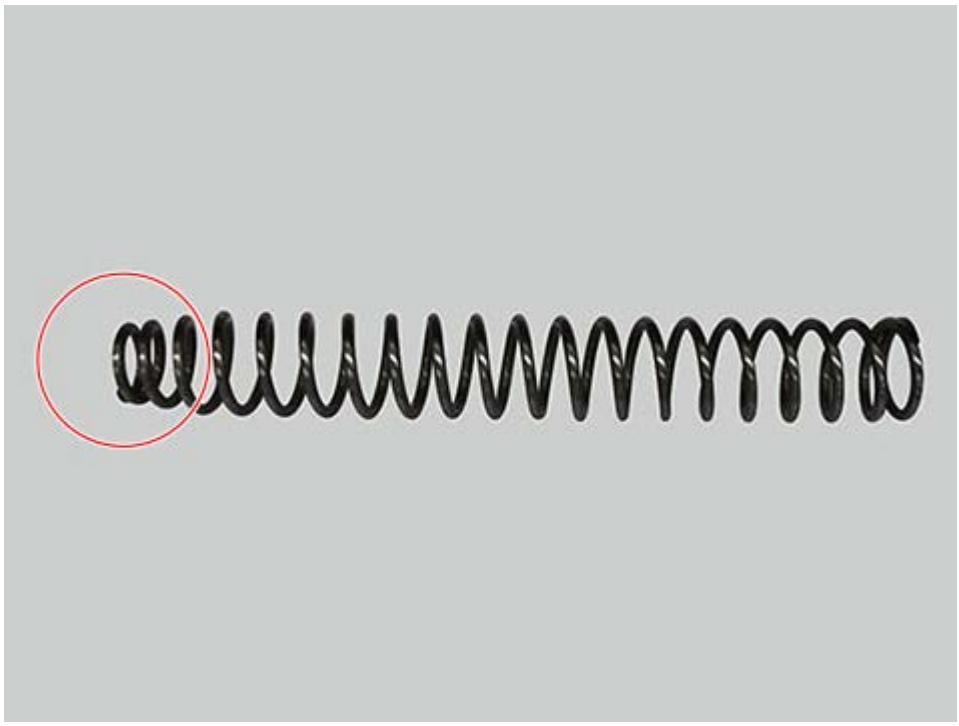


Fill in 556 cc of oil in both legs.

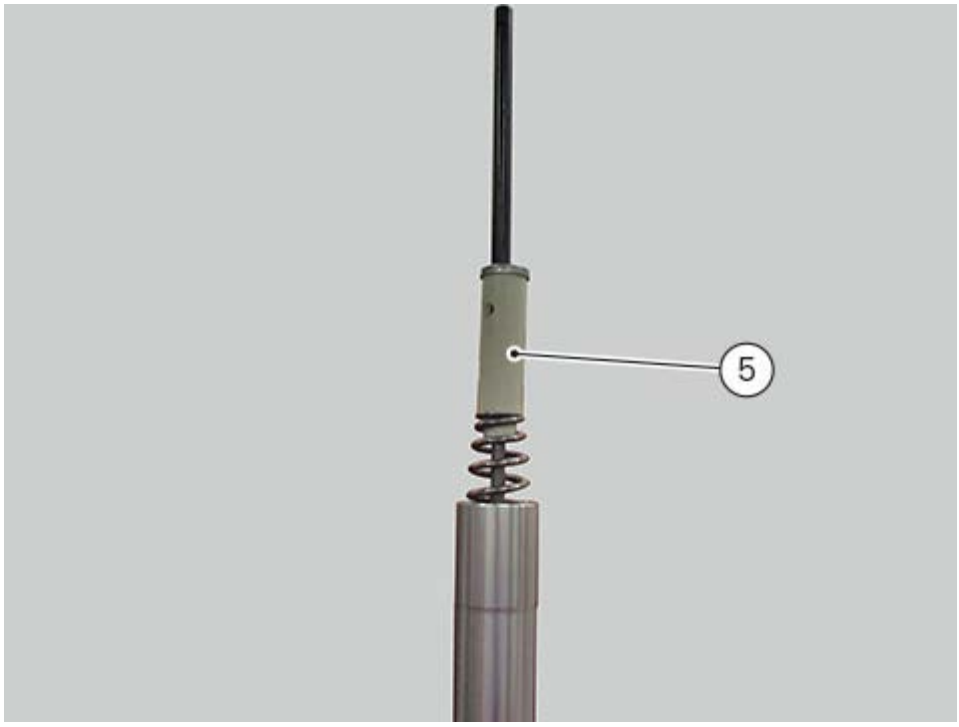


Use tool (B) no. **88713.3203** to insert spring (6).

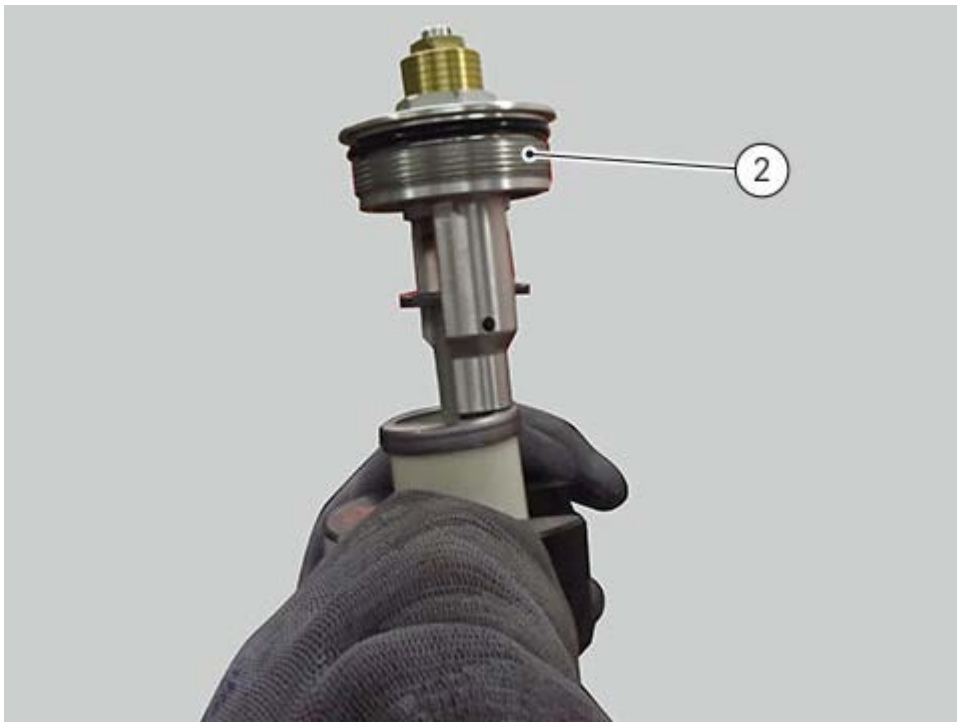
Pay attention to the spring installation sense: the narrower part must be against the preload tube (5).

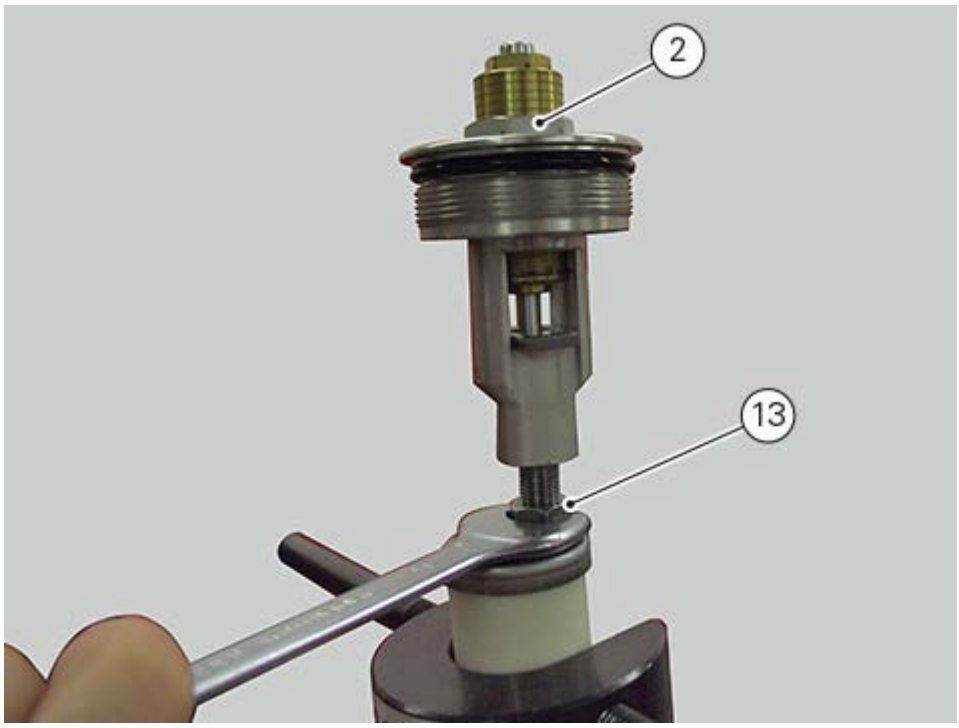


Insert the pre-load tube (5).



Insert plug (2) and tighten lock nut (13).





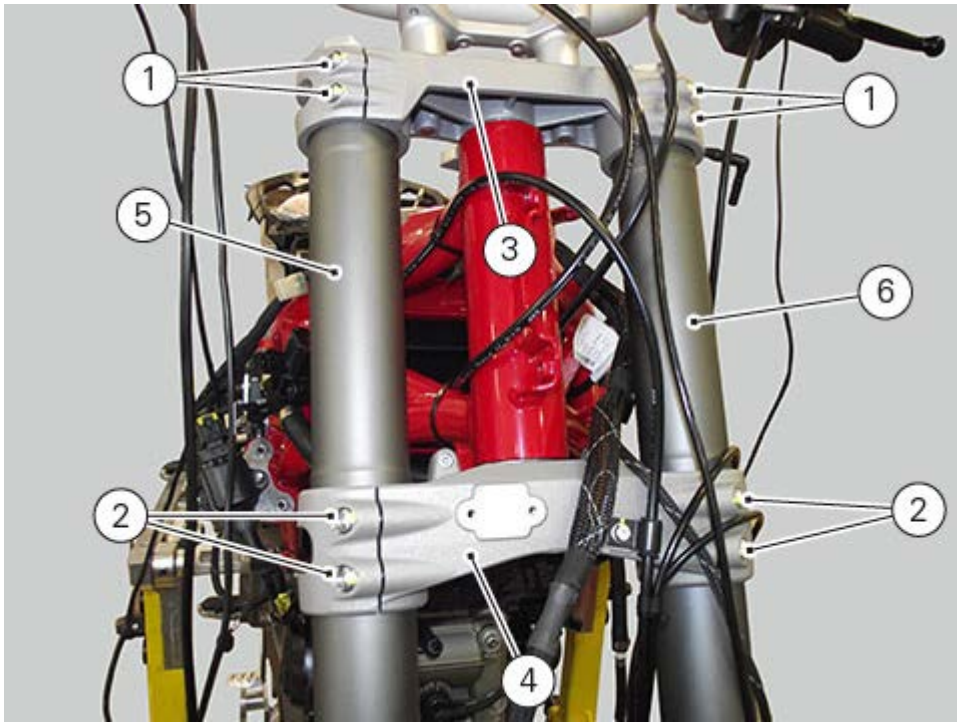
Tighten nut (2).

Removing the front fork

Before removing this part, it is first necessary to remove the following parts:

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).
Remove the front half-fairings (Removing the front half-fairing).

Loosen the screws (1) securing the fork legs to the steering head (3).
Loosen the screws (2) securing the fork legs to the bottom yoke (4).
Withdraw the fork legs (5) and (6) downwards in order to carry out all the necessary overhaul operations.



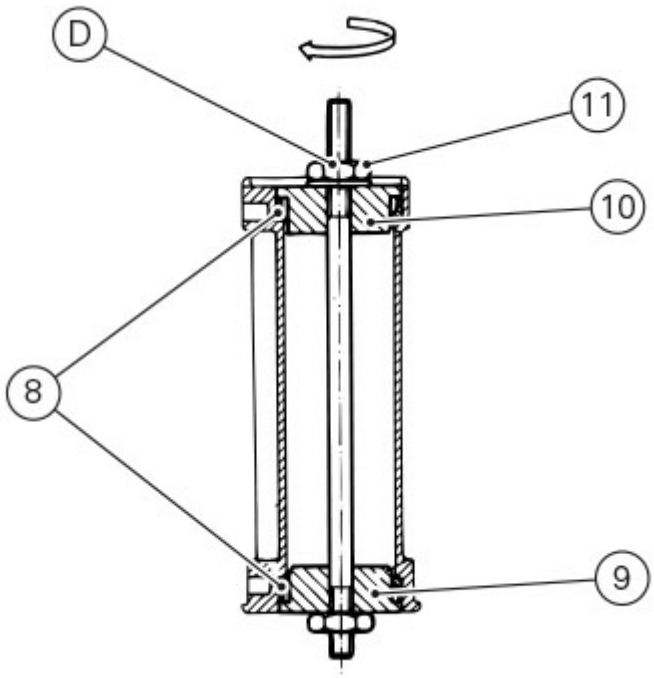
Refitting the steering tube components

Important

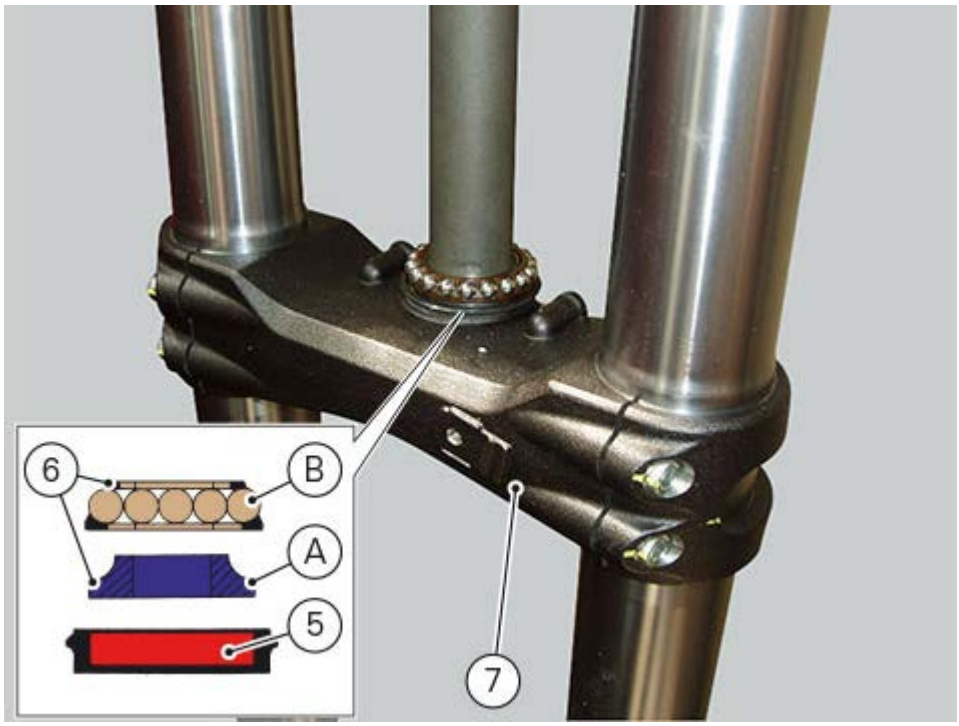
The steering tube bearings are identical but in no case may their components be swapped during refitting.

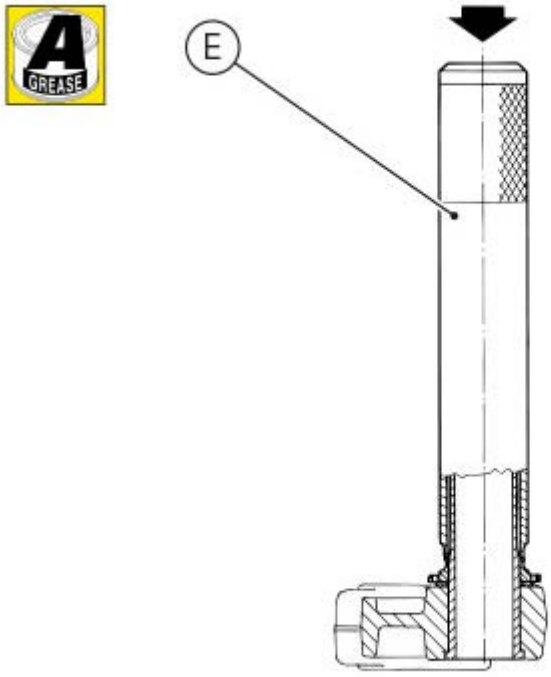
Clean all contact surfaces and lubricate with the recommended grease.
To fit the outer rings (8) of bearings (6) to the steering tube, use tool (D) no. 88713.1062;
Proceed as follows:

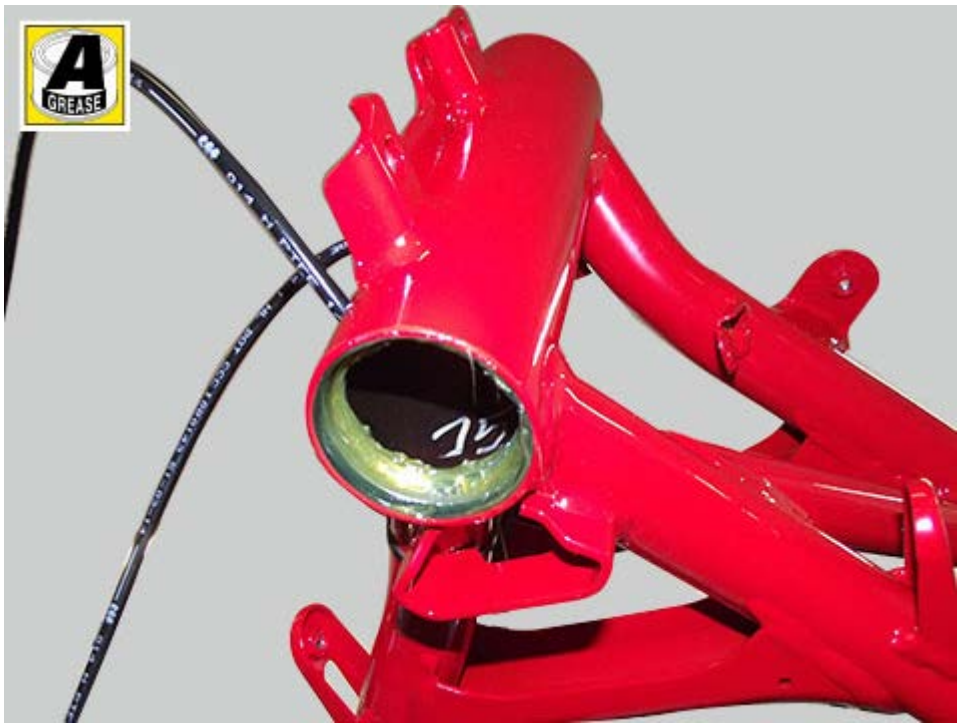
- heat the steering tube to 150 °C;
- fit the outer rings (8) in their seats on the steering tube;
- fit the fixed bush (9) with threaded hole of the tool into the lower ring;
- fit the other movable bush (10) into the upper end of the tool and drive it fully home against the upper bearing race;
- tighten the nut (11), and use a wrench to seat the outer rings (8) fully in the steering tube;
- leave the tool fitted until the steering tube has cooled down to ensure that bearings are properly seated.



Insert the sealing ring (5) (with the rim facing upwards) and the inner ring (A) of the bottom bearing (6) onto the steering shaft after heating it for about 10 minutes to 120 °C.
Insert drift (E) part no. 88713.1072. Push the inner ring (A) on the sealing ring (5), manually pushing for at least 10-15 seconds.
Lubricate the inner ring (A) with the recommended grease. Fit the ball race (B) on the steering shaft with the smaller diameter of the cage facing upwards, and grease the ball race. Insert the steering shaft into the steering tube, and push it in until it is axially seated

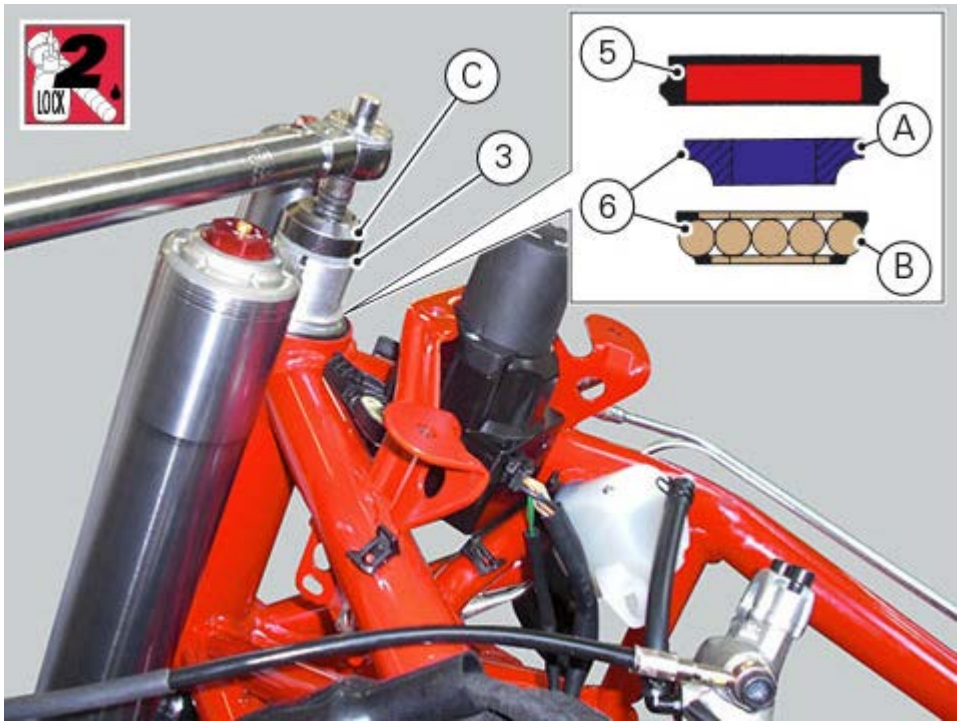

6
B
A
5
7


GREASE
E

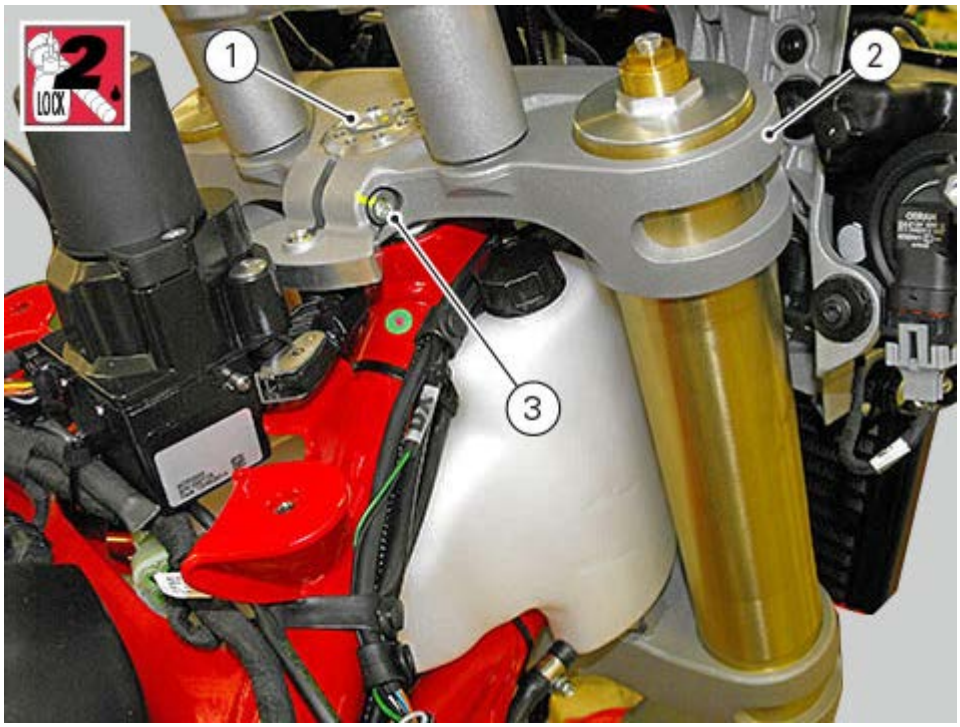


Fit the bottom yoke assembly to frame.
Grease the ball race (B) and fit it to the upper outer ring (8) of the frame.
Fit the inner ring (A) of the upper bearing (6) to the steering head, with the larger diameter side of the race facing upwards.
Install the sealing ring (5) with the flat side facing upwards.

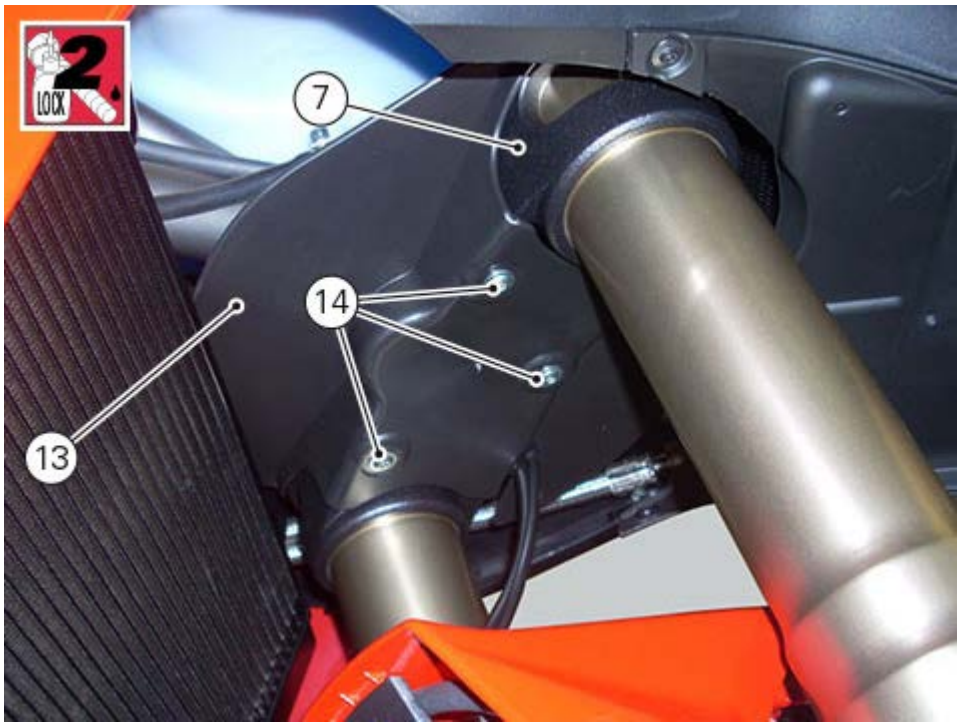
Tighten the adjuster ring nut (3) by hand until it seats against the sealing ring (5).
Fit on ring nut (3) the special bush (C) part no. 88713.1058 and fit the torque wrench on it.
Apply recommended threadlocker on thread and tighten adjuster ring nut (3) to 35 Nm ±5%.



Fit the steering head (2) on the ring nut (3), aligning the fork leg seats with the corresponding seats on the bottom yoke.
Refit the fork legs. Apply recommended grease to the screw (1).
Tighten screw (1) on steering head to a torque of 18 Nm ±5%.



If previously removed, position splash guard (13) onto bottom yoke (7), and secure it in place by starting screws (14) with the specified threadlocker, then tighten them to a torque of 3 Nm ± 10%.



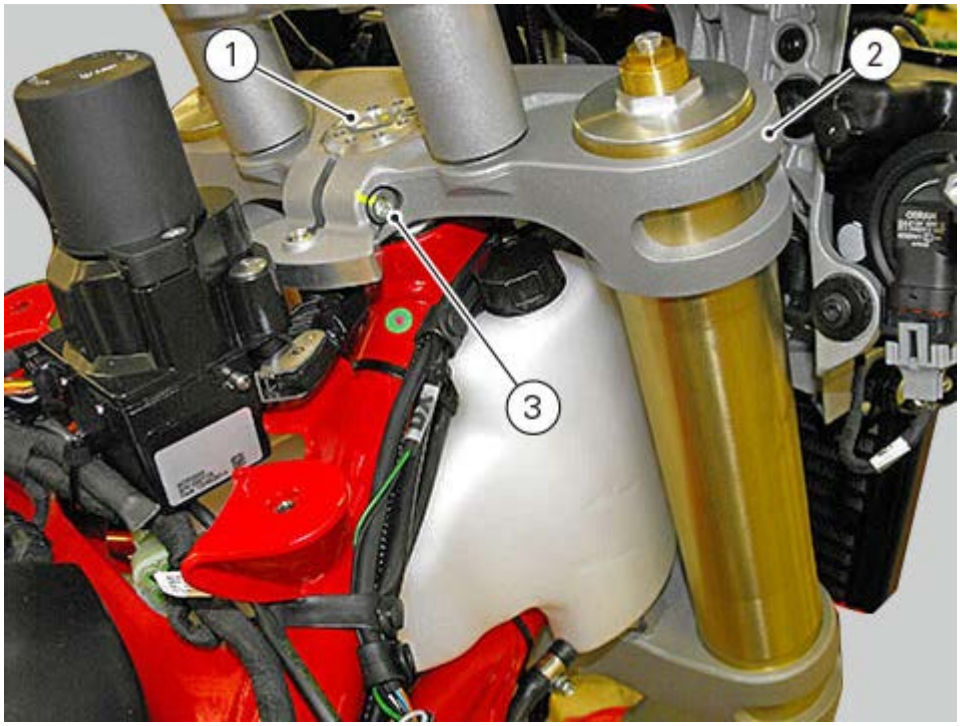
Refit the front brake callipers (Refitting the front brake system).
Fill the braking system (Changing the front brake system fluid).

Removing the steering tube components

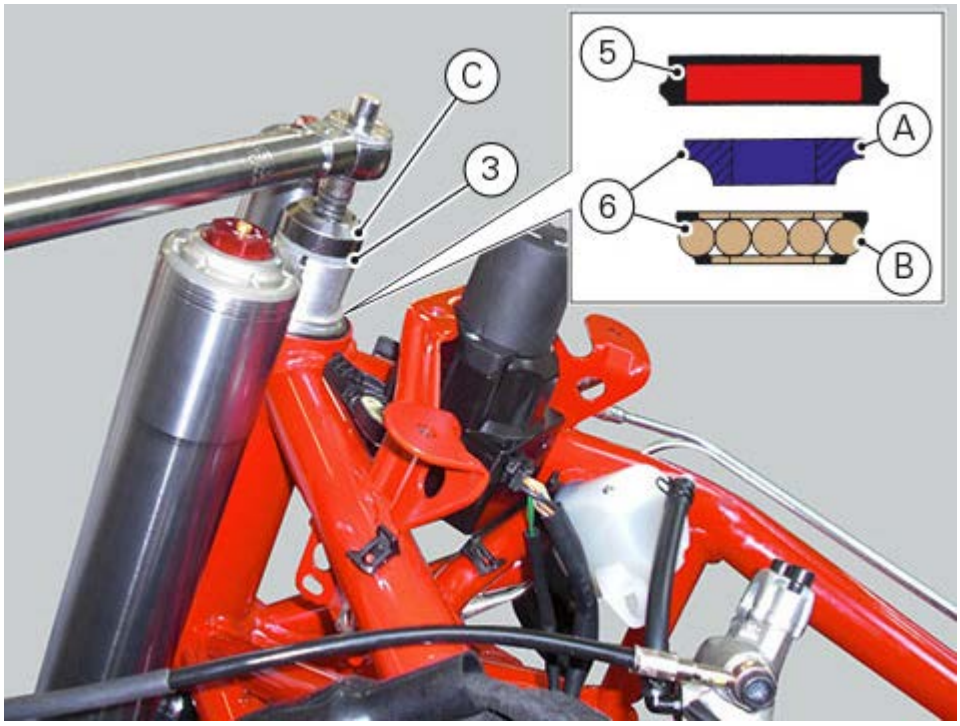
Drain the braking system (Changing the front brake system fluid).
Remove the front brake callipers (Removing the front brake system).
Remove fork legs (Removing the front fork).

Warning
All parts fitted to the steering head and bottom yoke, including wiring and hoses, can remain on the motorcycle provided they do not hinder the following operations.

Loosen the screw (1) securing the steering head (2) to the ring nut (3).
Remove the steering head (2).

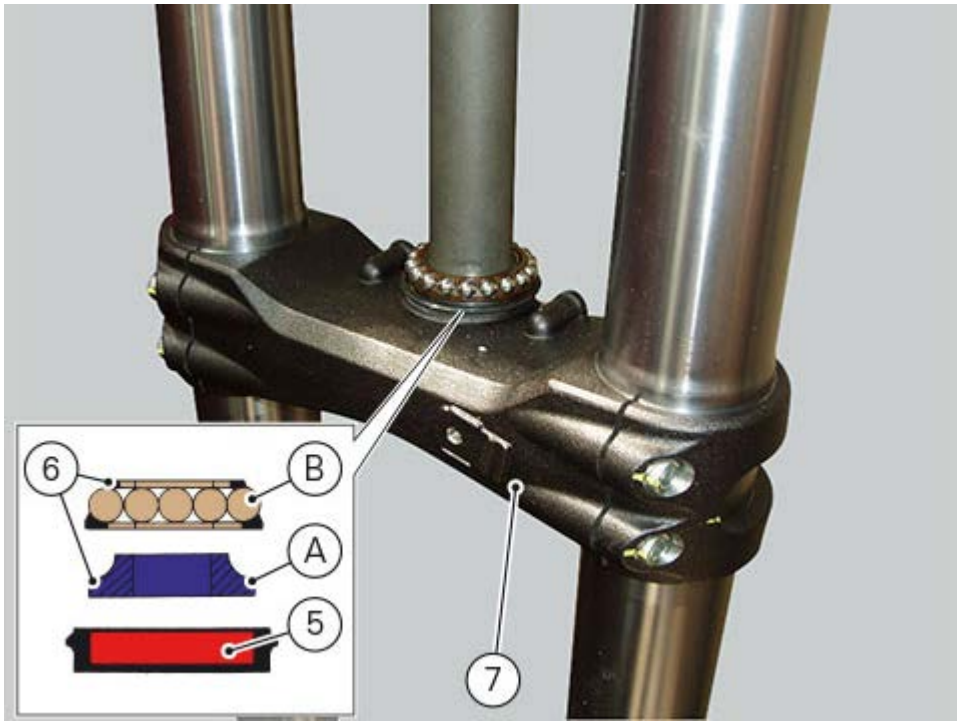


With tool (C) part no. **88713.1058** loosen the ring nut (3) and unscrew it from the steering shaft.
Slide the sealing ring (5), the inner ring (A) and the ball race (B) of the upper bearing (7) off the steering shaft.

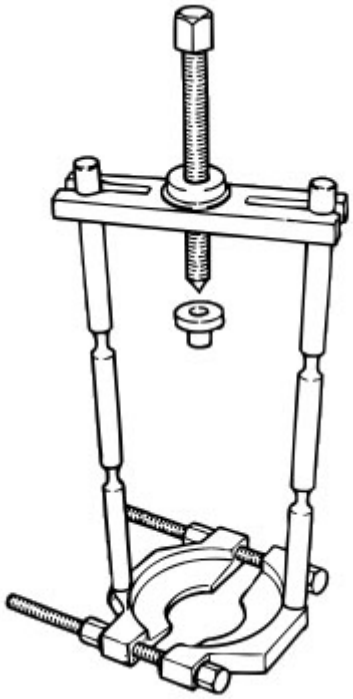


Remove the bottom yoke (7) complete with the steering shaft from the frame tube.

Remove the ball race (B) of the lower bearing (6).
The inner ring (A) of the lower bearing (6) and the sealing ring (5) will remain on the steering shaft.



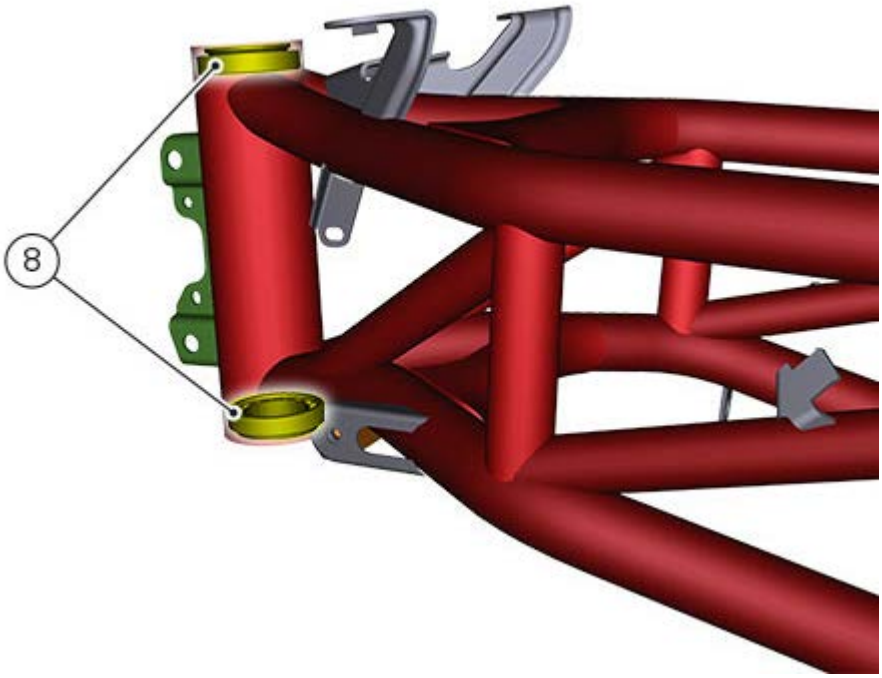
Using a universal puller (see figure), remove the inner ring (A) from the steering shaft, taking care not to damage the seat.



Important
The removed seals and bearings shall not be reused and must be replaced with similar new components.

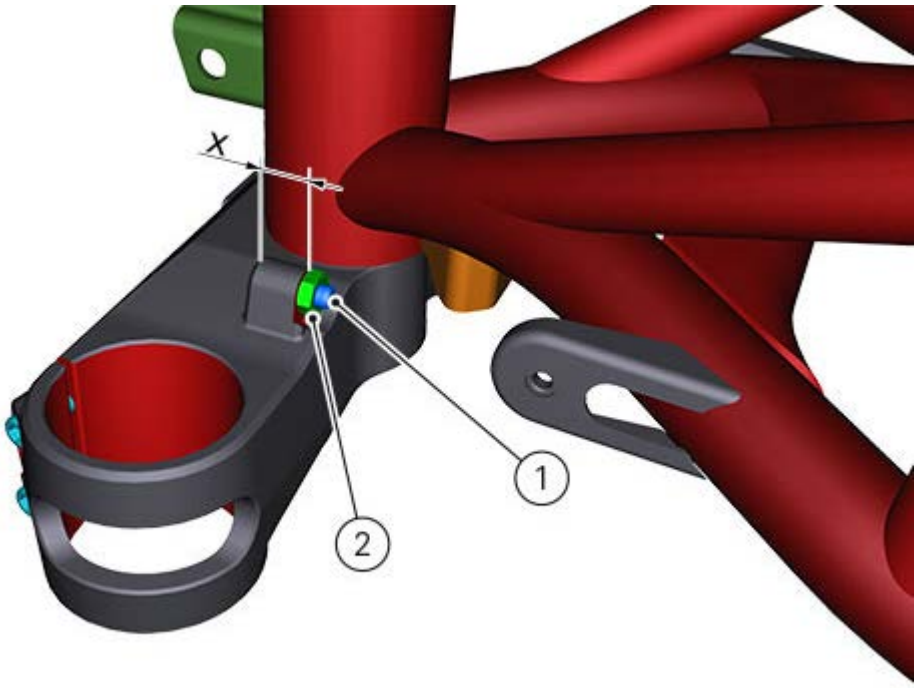
Using a suitable punch, remove the outer bearing races (8) from the steering tube. Proceed with extreme care to avoid damaging the seats.

The picture shows also the bearings.


8

Steering angle adjustment

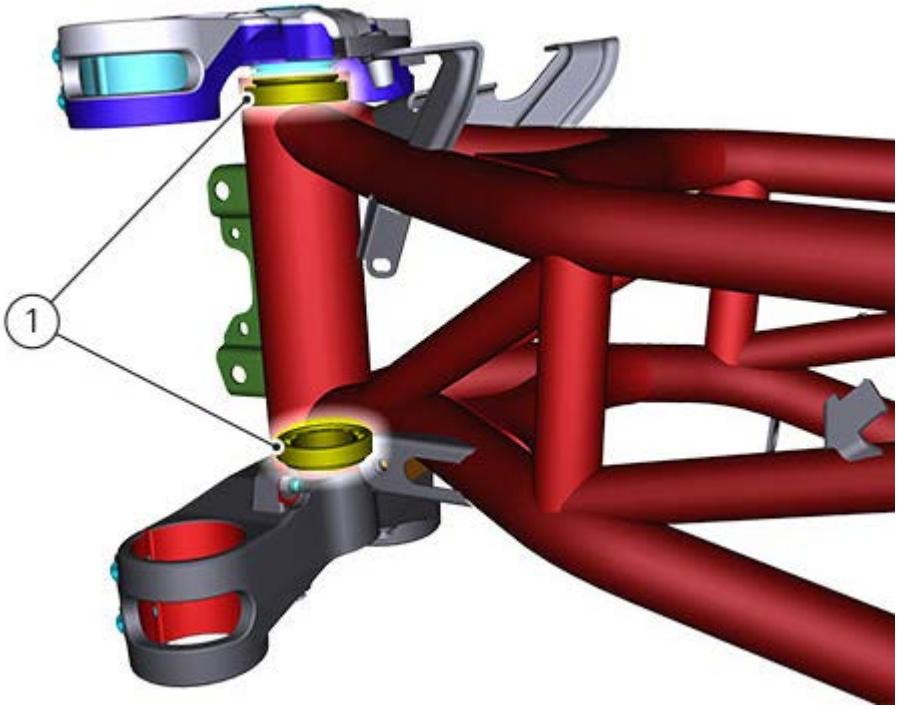
Loosen the nuts (2).
Screw or loosen dowel (1) so as to respect value X: 6÷ 6.5 mm.
Keep dowel (1) and screw nut (2) fully home.



Adjusting the steering head bearing clearance

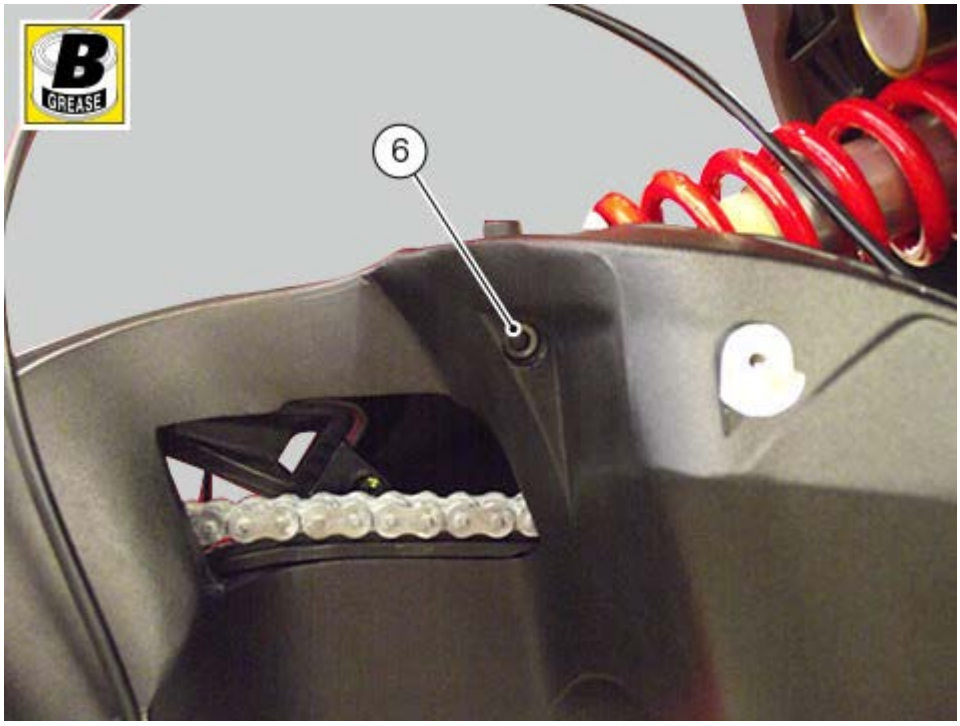
Adjust steering bearing clearance as explained under Section "Adjusting the steering head bearing clearance".

If the problems found are not solved, check the wear of steering bearings (1) and replace them, if necessary, as described in paragraph "Removing the steering tube components".



Refitting the rear suspension

Apply recommended grease on thread and underside of top screw (5) and bottom screw (6).
Fit the shock absorber bottom end into the rear swinging arm and tighten screw (6); fit shock absorber top end to rear subframe and tighten screw (5).
Tighten screws (5) and (6) to a torque of 42 Nm ± 5 %.



Refit the rear mudguard (Refitting the rear mudguard).
Refit the rear wheel (Refitting the rear wheel).
Refit the silencer (Refitting the silencer).
Refit the rear LH side body panel (Refitting the side body panels and the tail guard).
Refit the seat (Refitting the seat).

Overhauling the rear shock absorber

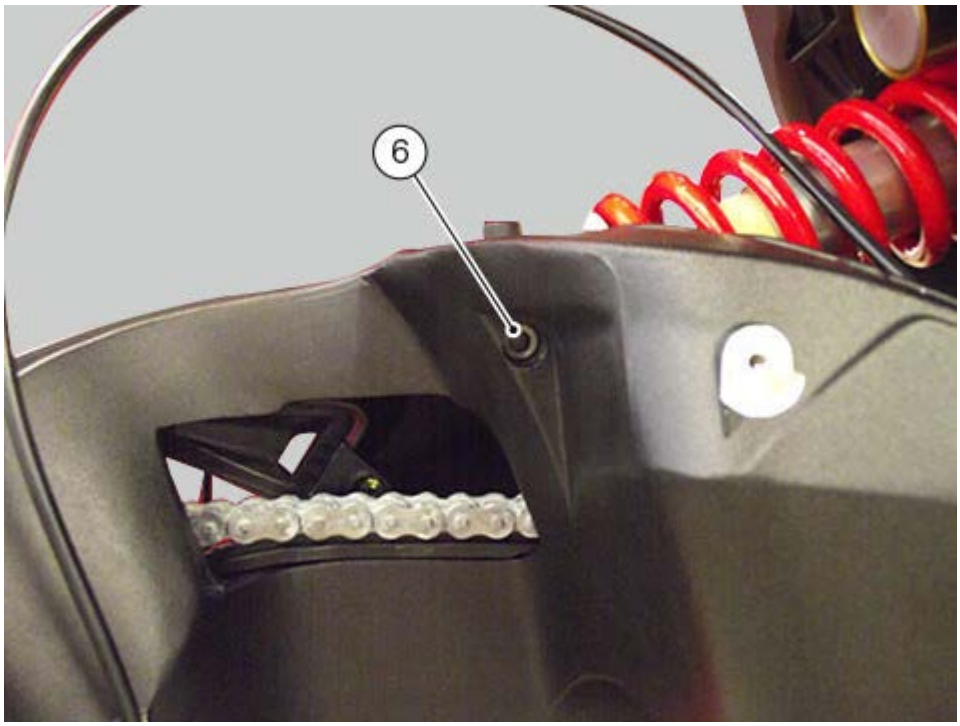
Important

For any problem concerning the shock absorber operation, contact a SACHS authorised service centre.

Removing the rear shock absorber

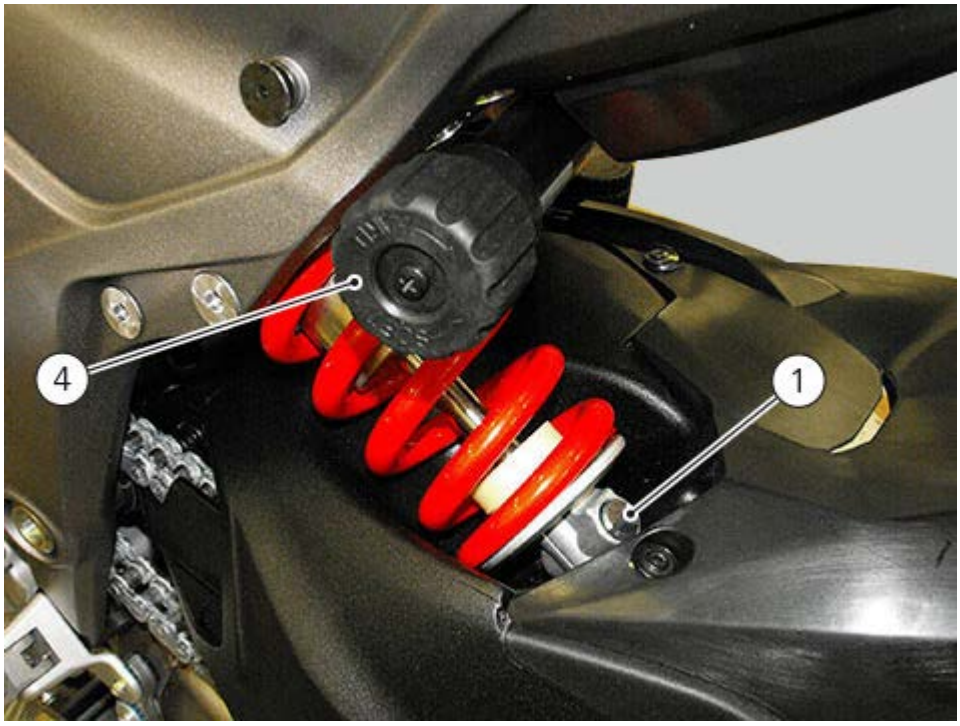
Remove the seat (Removing the seat).
Remove the rear LH side body panel (Removing the side body panels and the tail guard).
Remove the exhaust silencer (Removing the silencer).
Remove the rear wheel (Removing the rear wheel).
Remove the rear mudguard (Removing the rear mudguard).

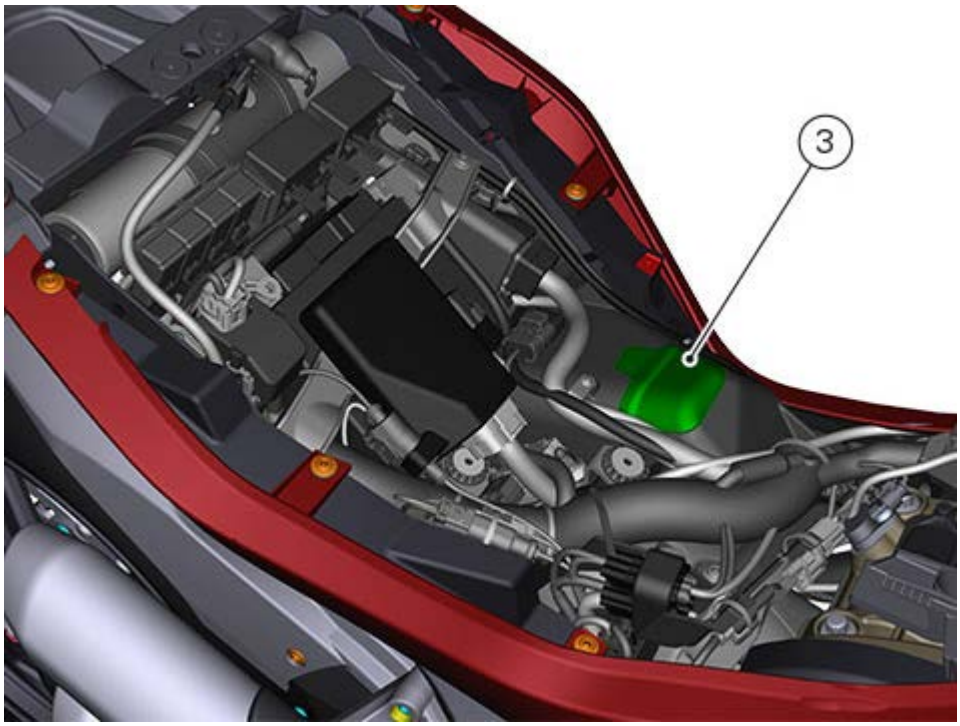
To remove the rear shock absorber from the vehicle, undo the upper (5) screw and the lower screw (6). Then slide out the rear shock absorber.



Rear suspension system

The rear suspension system uses a hydraulic monoshock absorber that is completely adjustable.
The shock absorber can be adjusted both in rebound by means of adjuster (1) and in compression by means of adjuster (2) located under plug (3).
It is possible to adjust the spring preload through knob (4).




3

Refitting the rear swinging arm

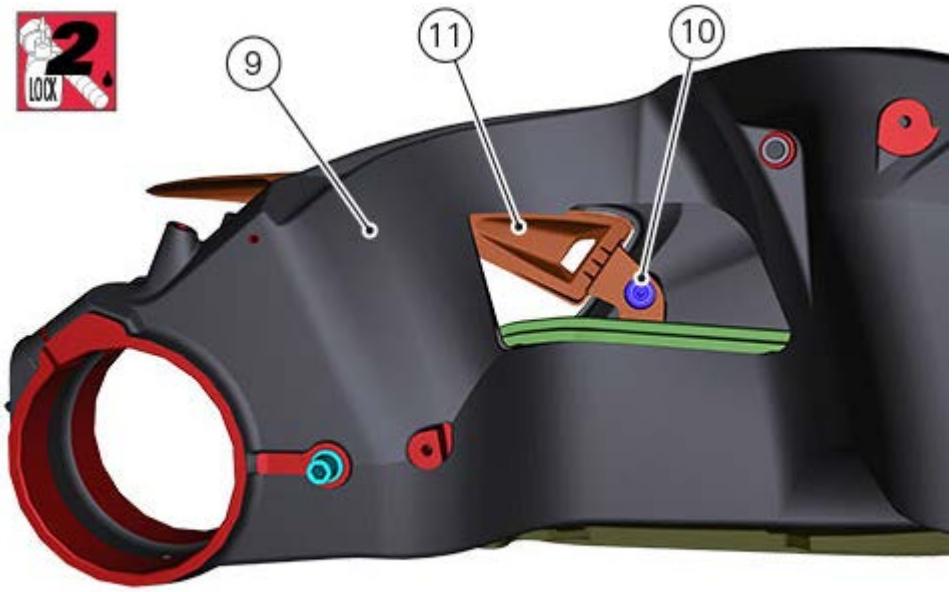
Chain sliding shoe

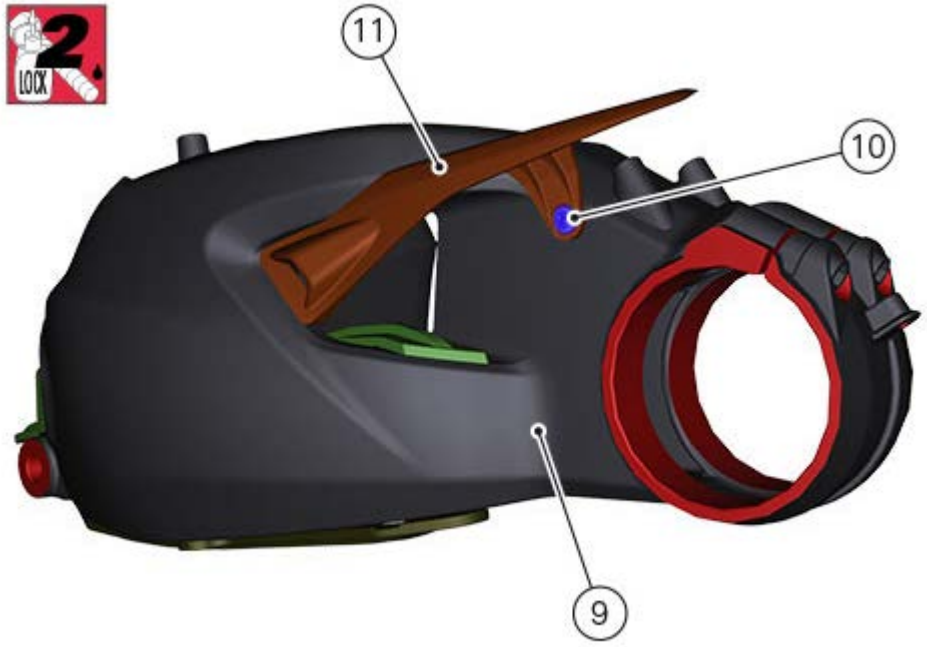
Fit chain sliding shoe (13) on swinging arm (9).
Apply the indicated threadlocker on screw (12) and tighten it to 5 Nm ± 10%.

Chain guard

Apply indicated threadlocker on screws (10), position chain guard (11) and fix it by tightening screws (10) to a torque of 5 Nm ± 10%

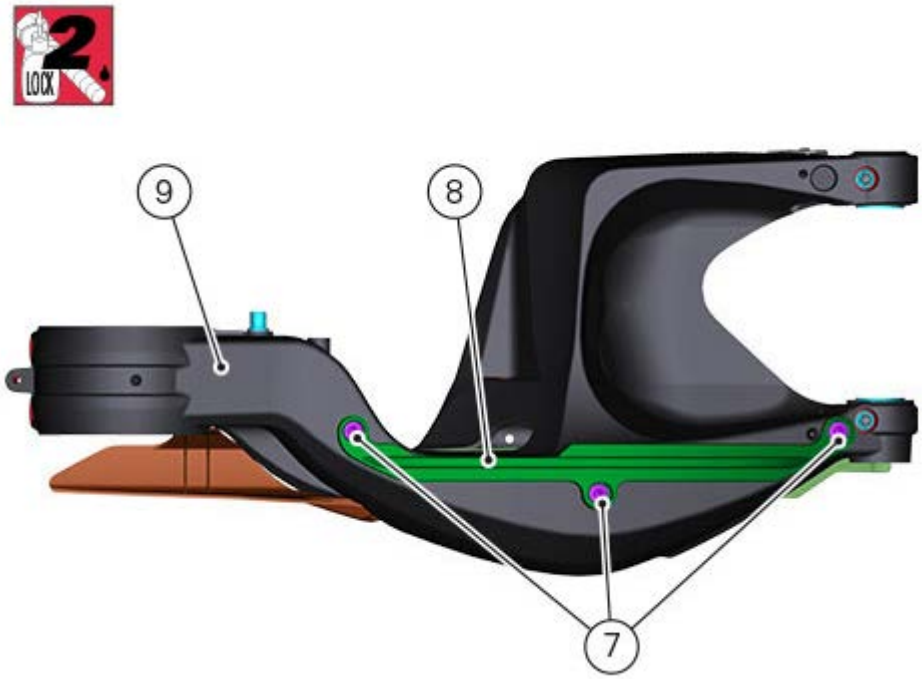
Note
For a correct installation, first position the chain sliding shoe and then the chain guard.



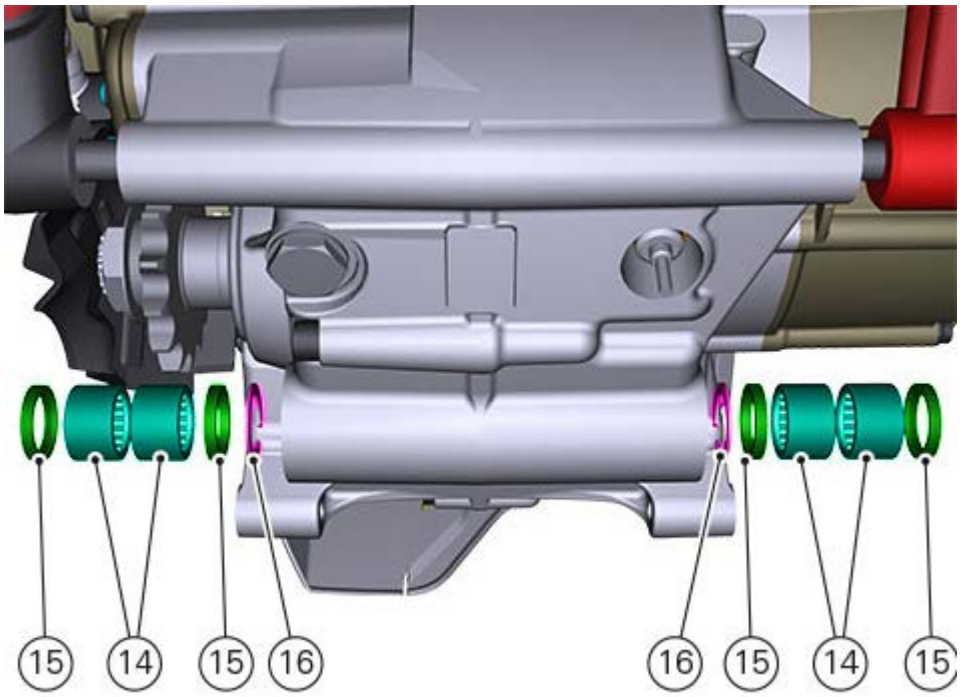


Lower chain sliding shoe

Fit the lower sliding shoe (8) on swinging arm (9) as shown in the figure. Apply threadlocker on the three screws (7) and tighten them to a torque of 5 Nm ± 10%.

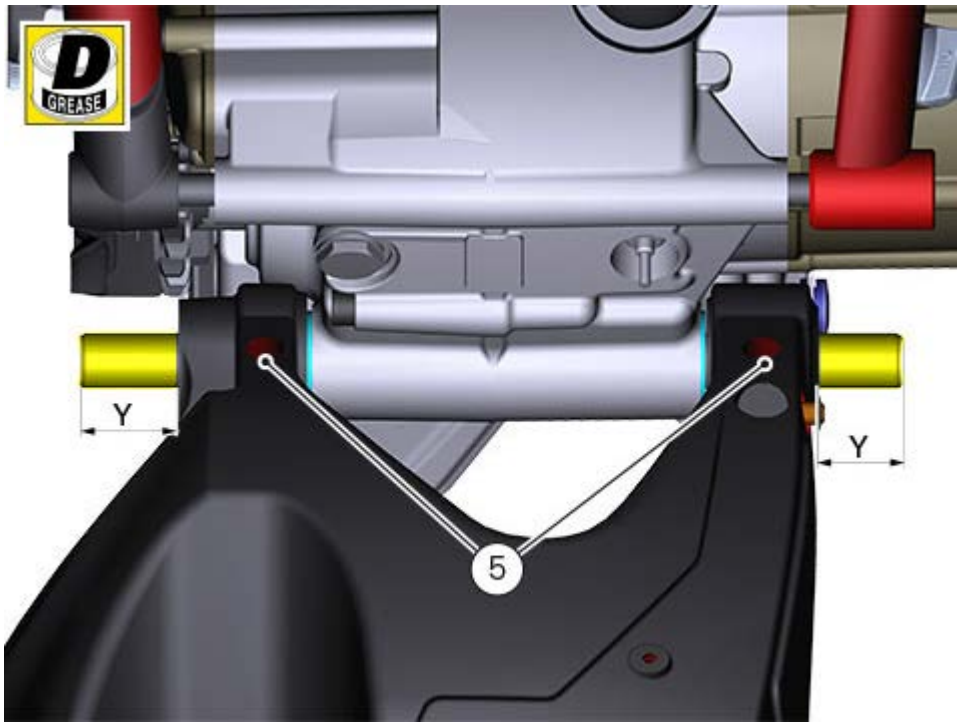


Check the bearing (14) movement: they must move freely without faulty frictions or noise.
If they have to be replaced, proceed as follows:
use a suitable puller to remove the external seal ring (15) of bearings (14), the internal seal ring (15) and snap ring (16).



Fit a new snap ring (16) using a suitable drift.
Using the same tool insert the snap ring set (15) of bearings (14).
Lubricate the bearings (14) on both sides using the indicated product.

Lubricate the swingarm shaft with the specified product.
Calculate the allowed end float of the swinging arm (Overhauling the swinging arm).
Centre the swingarm shaft and check that distance Y is the same on both sides.
Fix the swingarm shaft by tightening screws (5) to a torque of 18 Nm ± 10%.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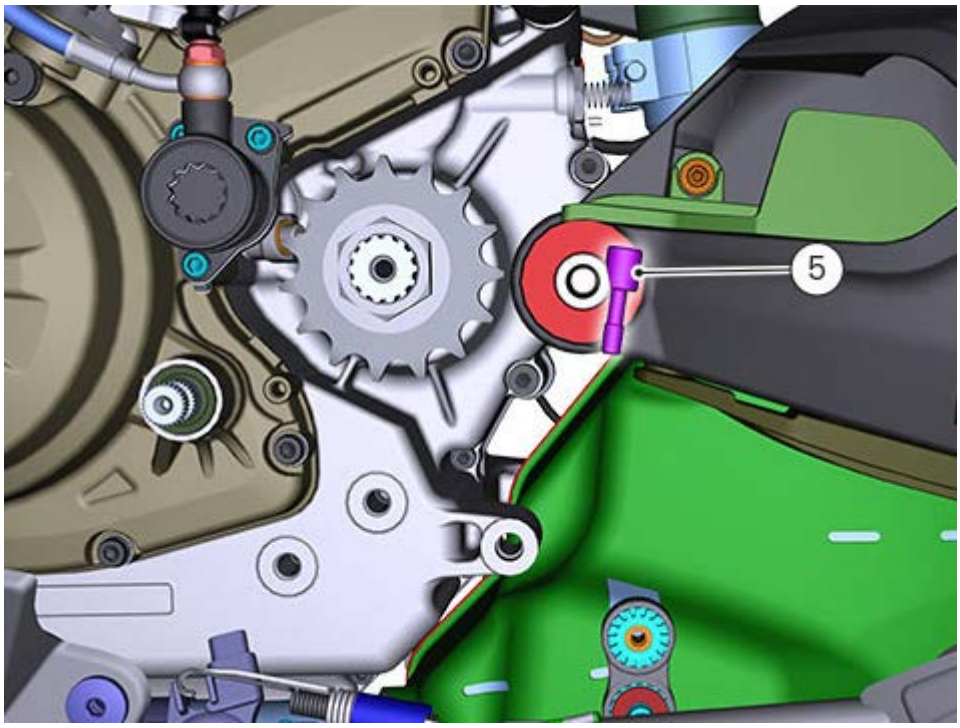
GREASE
Y
Y
5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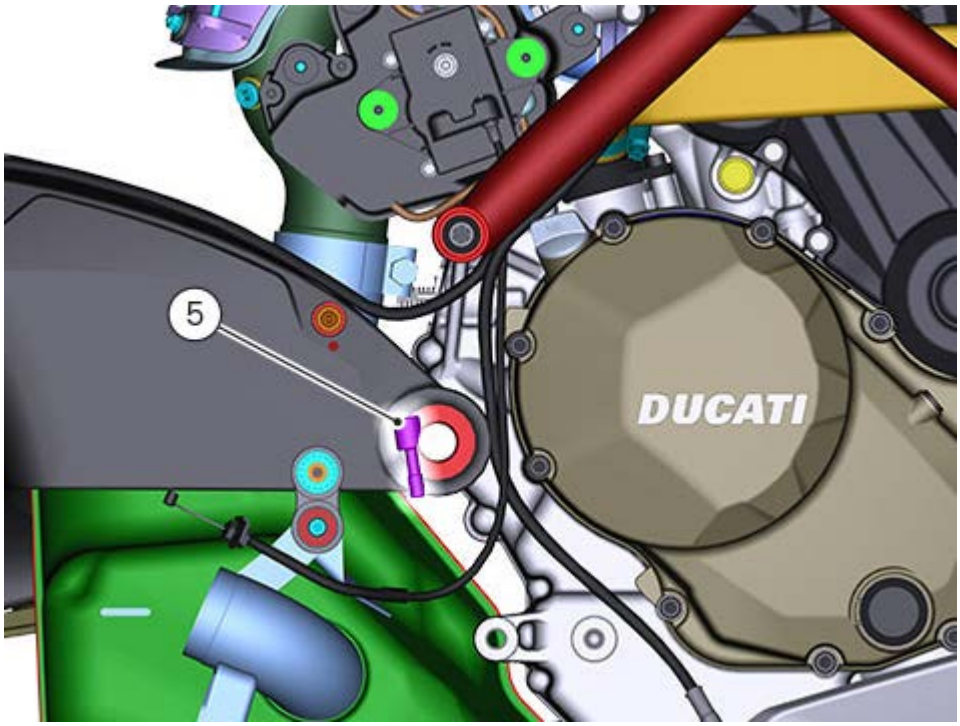
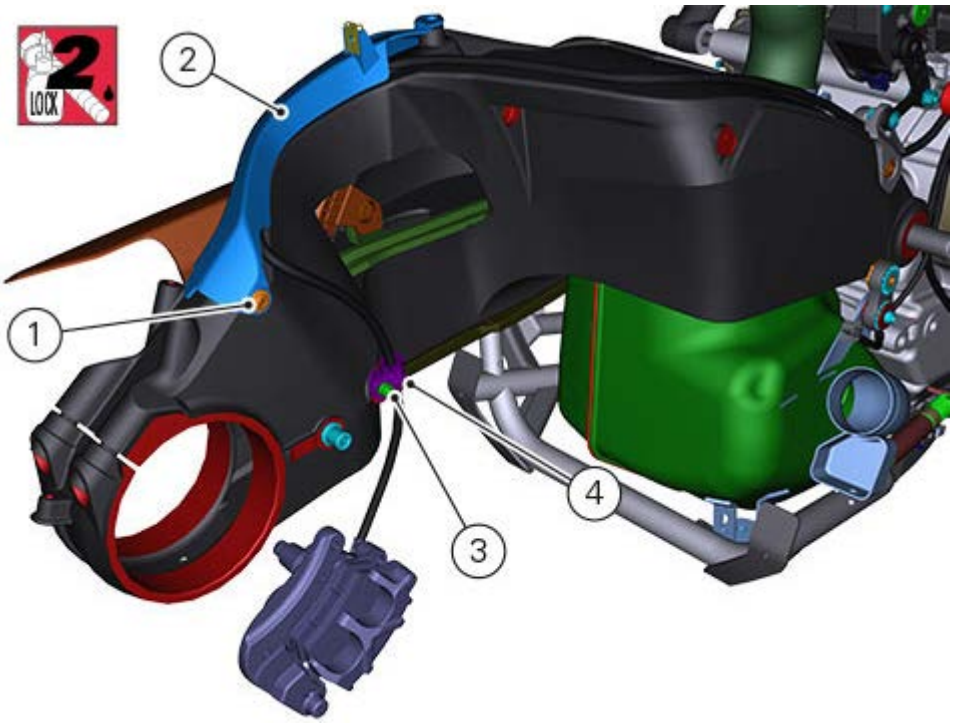


Position the rear brake hose and the rear speed sensor cable on the swinging arm by starting screw (1) of cable ring (2) after applying the specified threadlocker.
Refit the upper hose grommet (4) and start screw (3) after applying the recommended threadlocker.
Tighten the screw (1) to a torque of 5 Nm ±10% and screw (3) to a torque of 8 Nm ± 10%.



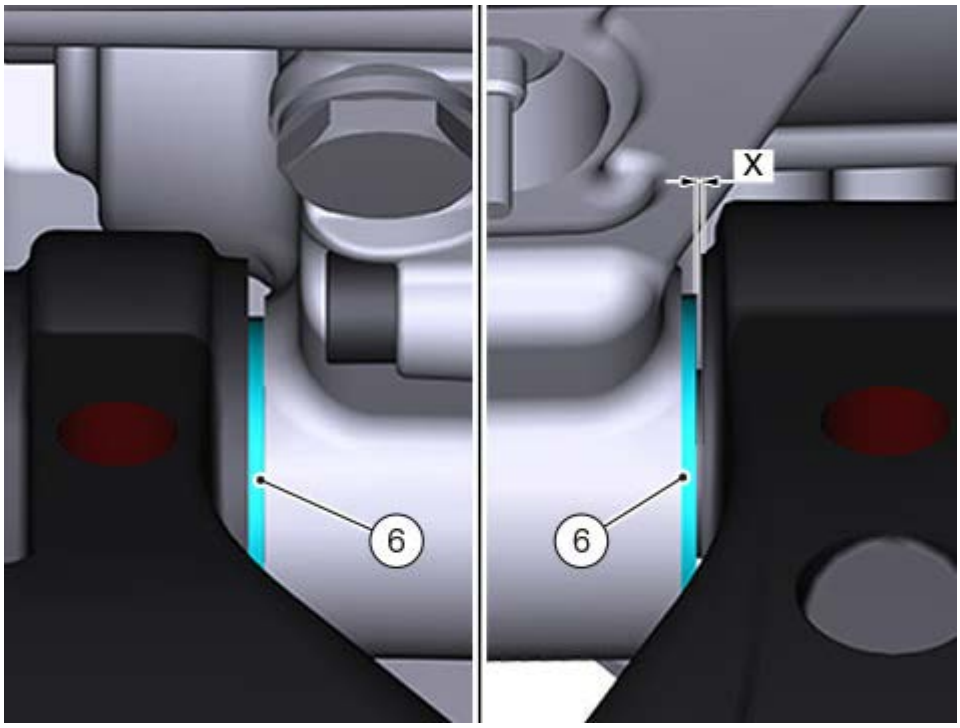
Refit the rear subframe(Refitting the side plates).
Refit the splash guard (Refitting the number plate holder).
Refit the rear eccentric hub (Refitting the rear wheel eccentric hub).
Refit the rear mudguard (Refitting the rear mudguard).
Refit the shock absorber (Refitting the rear shock absorber).
Refit the rear brake calliper (Refitting the rear brake calliper).
Refit the chain.
Refit the rear sprocket (Refitting the rear sprocket).
Refit the rear wheel (Refitting the rear wheel).
Refit the exhaust silencer (Refitting the silencer).

Overhauling the rear swinging arm

Select the shim (6) size upon swinging arm refitting.

To check the end float, proceed as follows:

- fit shim (6), **1.8** thick on engine both sides and insert the swingarm shaft;
- set the left side of the swinging arm on the engine and use a feeler gauge or calibrated to check the play on the engine opposite side, value (X).



The maximum side play allowed is **0.10** mm.
If the gauge size is **0.18** mm and it fits with difficulties, do not fit any shim.
If this is not the case, the available shim sizes are **0.20** mm and **0.10** mm with which it is possible to restore the specified play.

Example:

Measured play	**Left-hand side shims**	**Right-hand side shims**
0.10	-	no.1 shim (0.10 mm)
0.20	no.1 shim (0.10 mm)	no.1 shim (0.10 mm)
0.50	no.1 shim (0.20 mm)	no.1 shim (0.20 mm) + no.1 shim (0.1 mm)

Important
The shims with greater size have to be fitted on the swinging arm right-hand side. The thinner shim must always be in contact with the swinging arm.

Important
Do not fit shims with size equal to 0.1 on the left side.

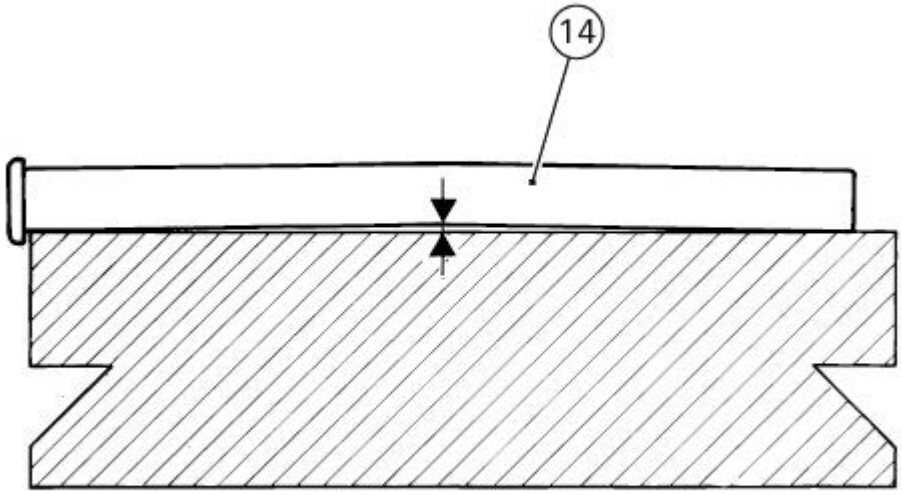
Warning
The maximum value of the set of shims on the left must be 2 mm (1.8 + 0.2 max.). The maximum swinging arm rear end play is within 1 mm.

Warning

The maximum swinging arm rear end play is within 1 mm.

Inspecting the swinging arm shaft

Before refitting the swinging arm shaft (14), check it carefully for distortion.
Turn the shaft on a reference surface and measure distortion using a feeler gauge (Rear wheel).

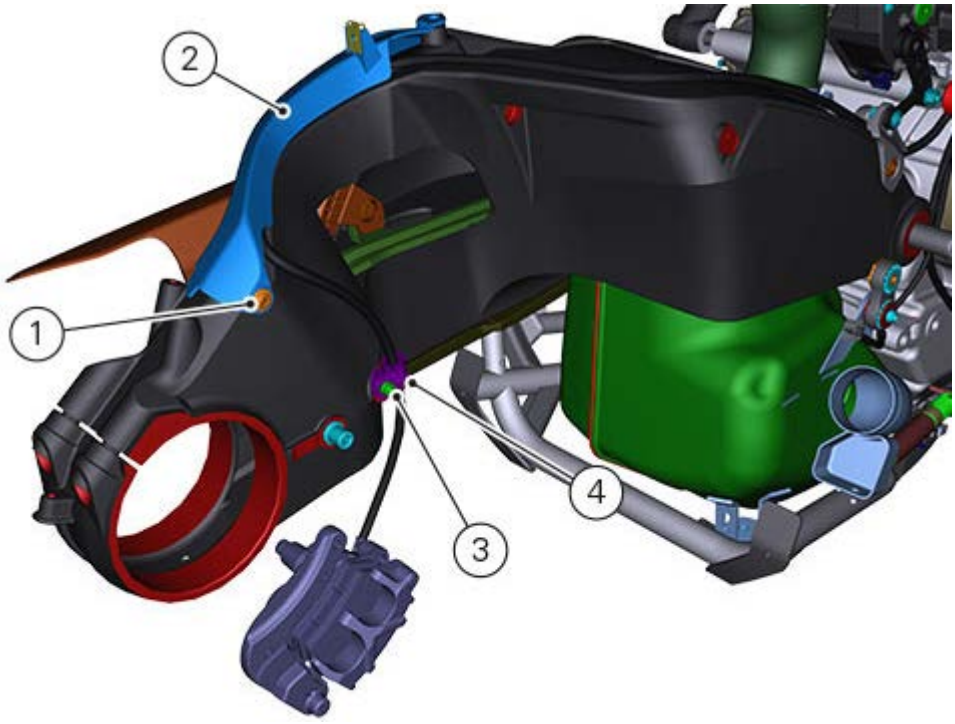


Removing the swinging arm

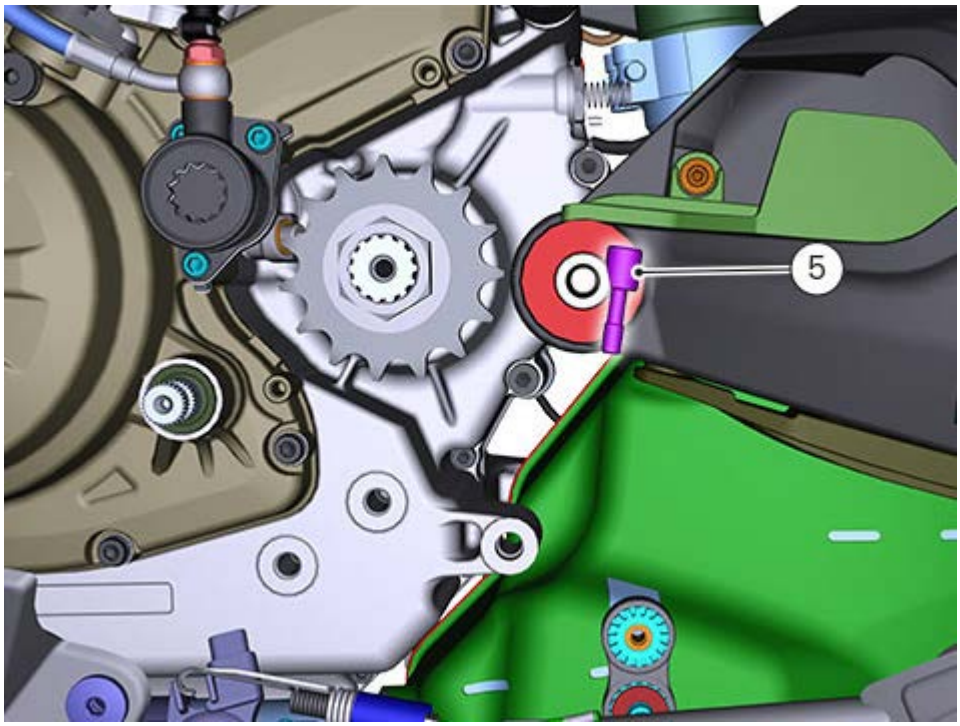
Before removing the concerned parts, you must first carry out the following operations:

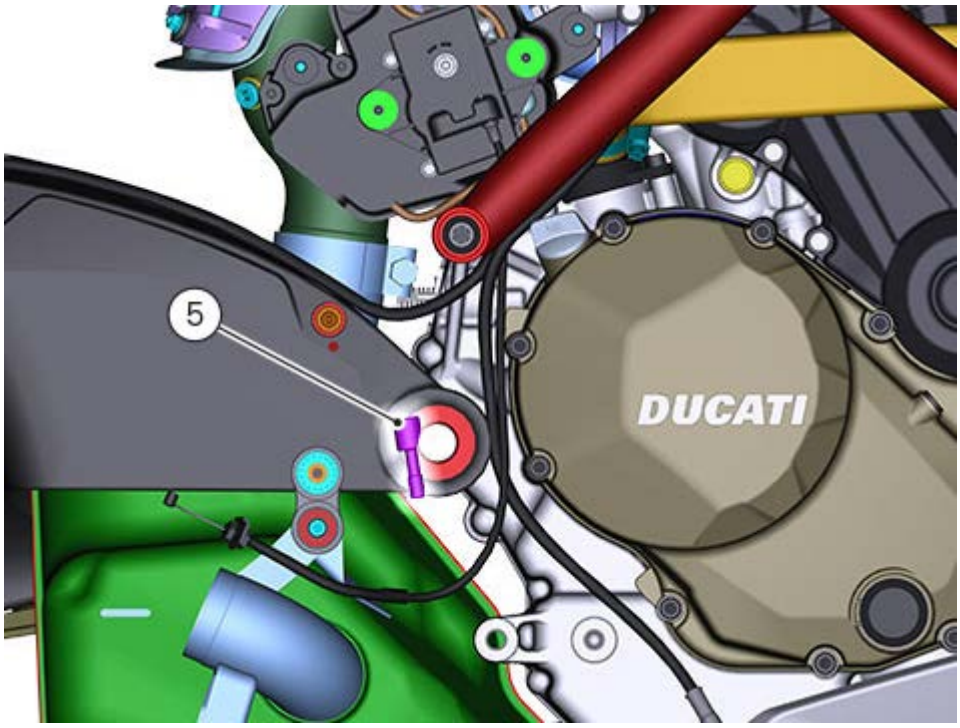
Remove the exhaust silencer (Removing the silencer).
Remove the rear wheel (Removing the rear wheel).
Remove the rear sprocket (Replacing the rear sprocket).
Remove the chain.
Remove the rear brake calliper (Removing the rear brake calliper).
Remove the shock absorber (Removing the rear shock absorber).
Remove the rear mudguard (Removing the rear mudguard).
Remove the rear eccentric hub (Removing the rear wheel eccentric hub).
Remove the splash guard.
Remove the rear subframe.

Support the vehicle with a suitable service stand.
Undo the screws (1) and remove the upper hose cover (2).
Release the rear brake hose and the rear speed sensor cable from the swinging arm by loosening screw (3) and collecting cable ring (4).

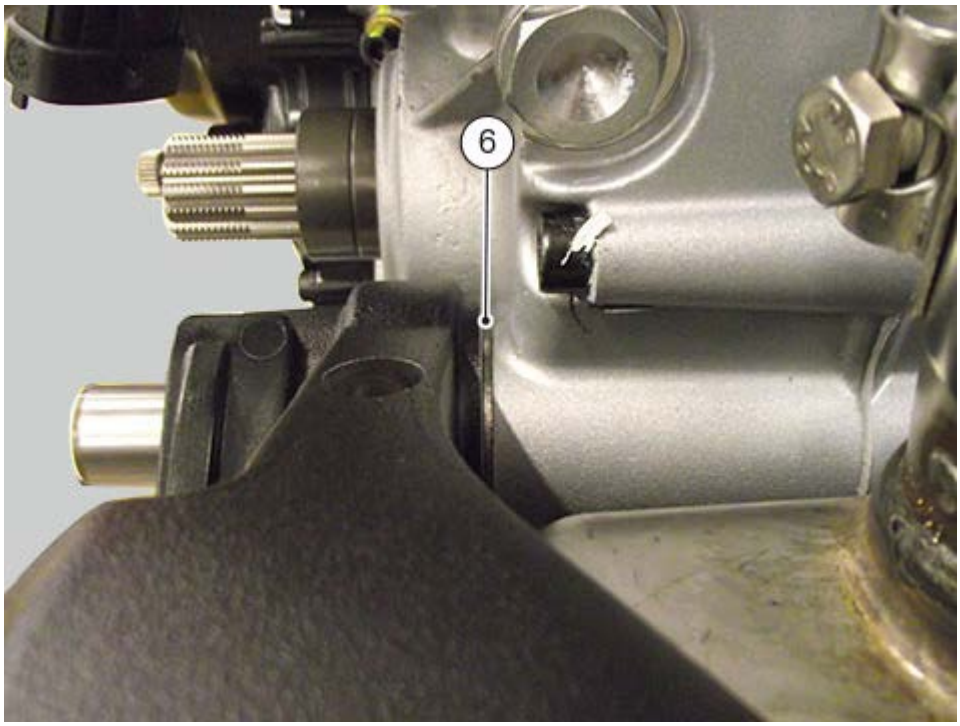


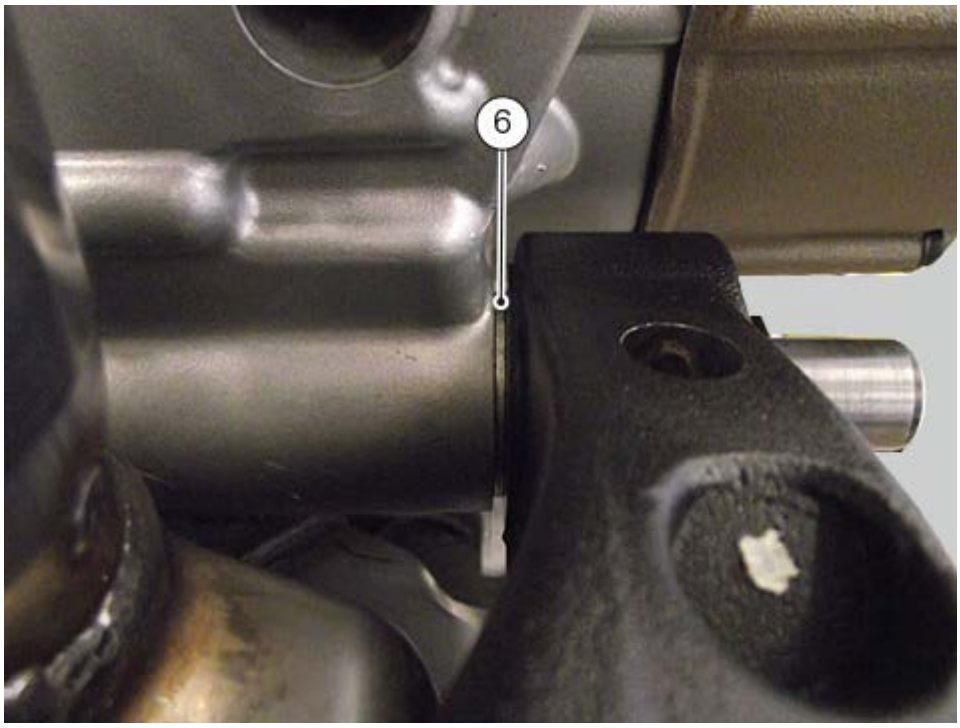
Loosen the two screws (5) that retain the swingarm shaft.





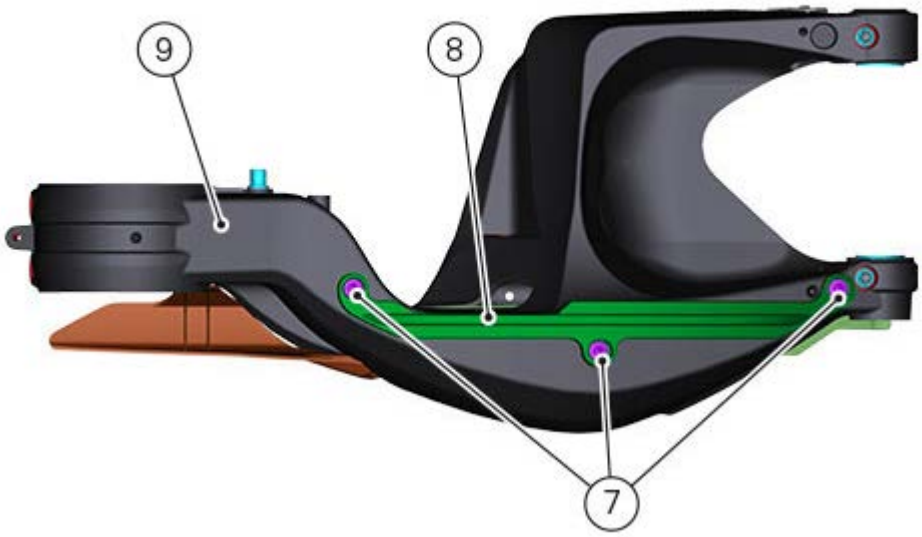
Using tool no. 88713.1074, fully extract the swinging arm shaft. Pay attention to the two spacers (6): upon reassembly it will be necessary to calculate the end float (Overhauling the swinging arm).
Remove the swinging arm.





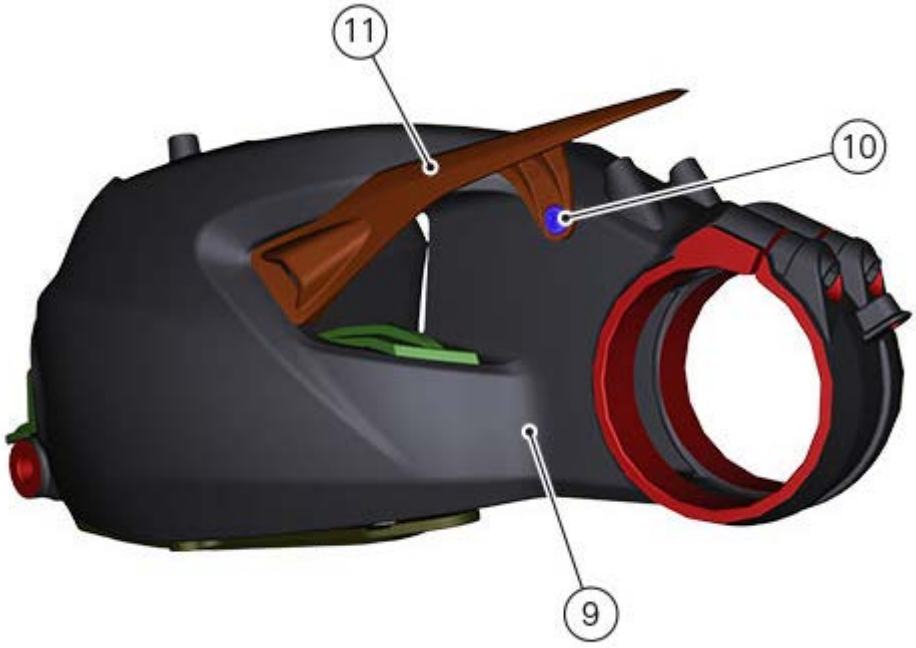
Lower chain sliding shoe

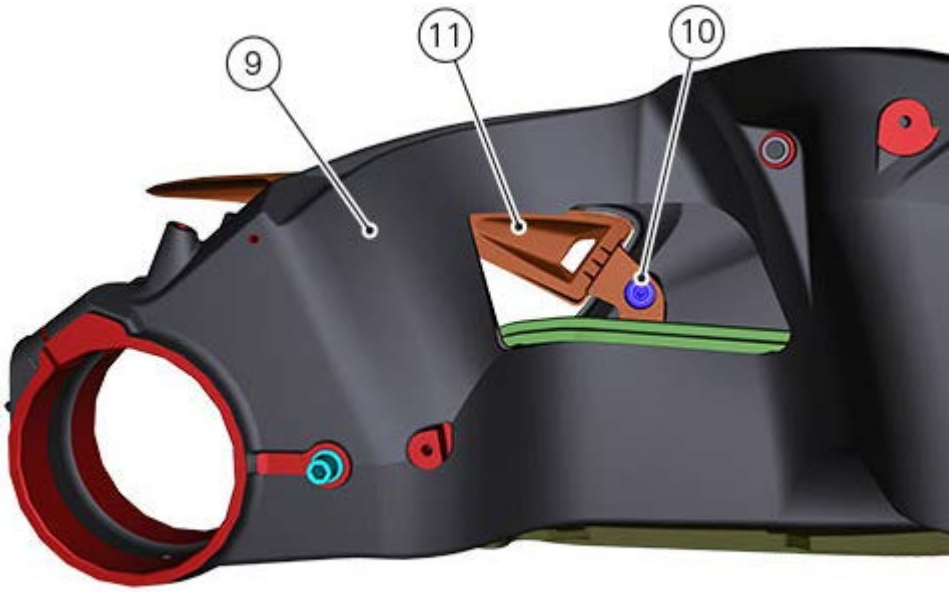
Undo the screws (7) to remove the lower chain sliding shoe (8) from the swinging arm (9).



Chain guard

Undo the screws (10) to remove the chain guard (11) from the swinging arm (9).

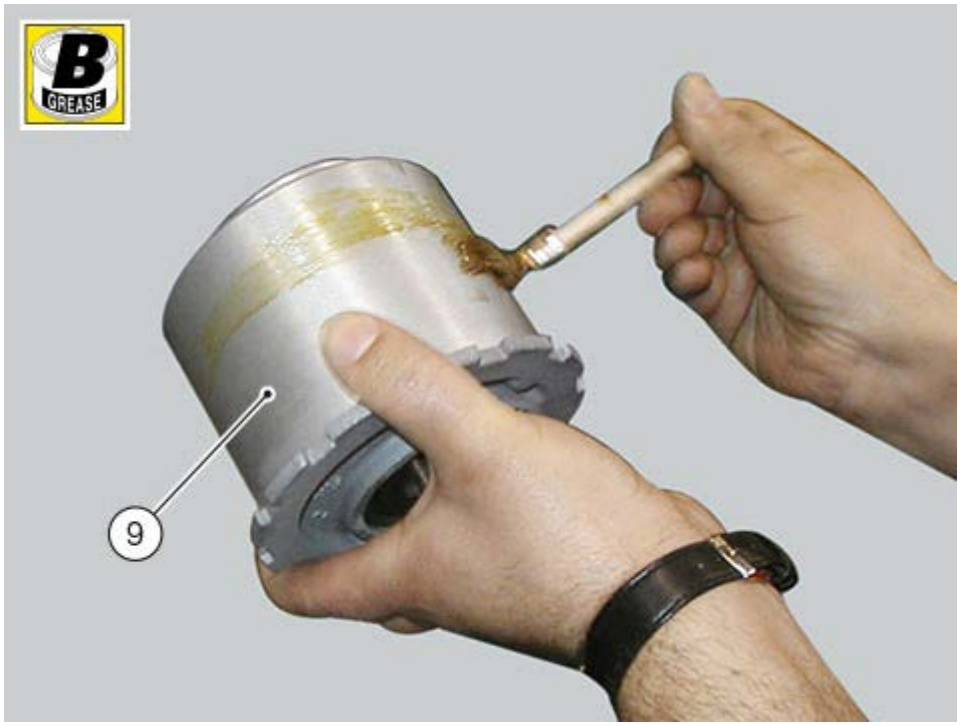



9
11
10

Refitting the rear wheel eccentric hub and rear wheel shaft

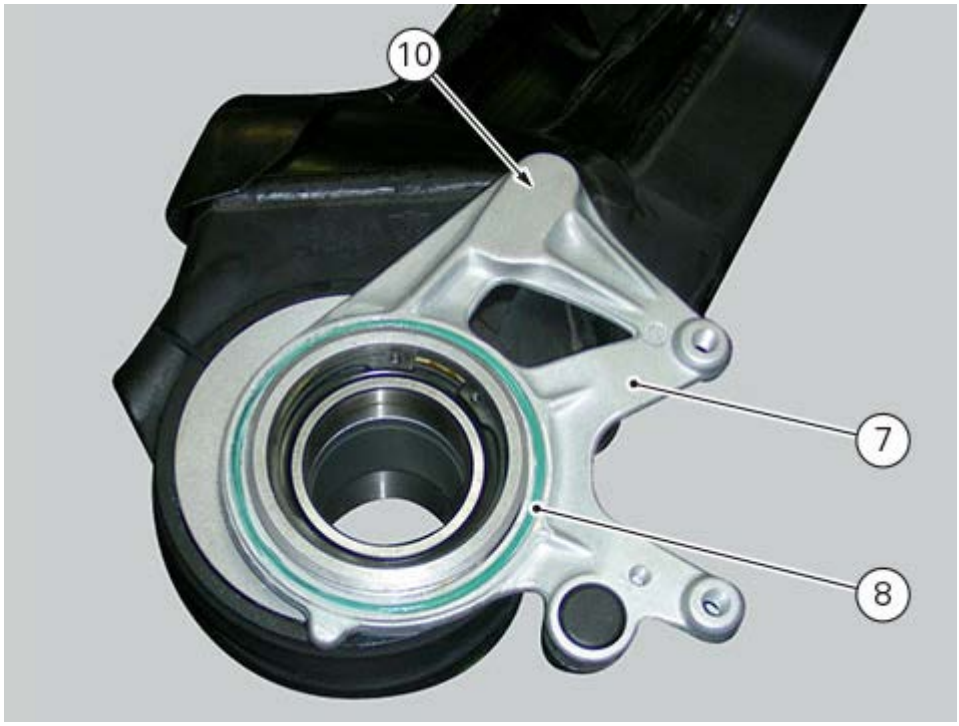
Refitting is the reverse of removal, with attention to the following points.
If the calliper bracket locating pin (10) was removed, apply the recommended threadlocker upon reassembly.
Tighten shaft (10) to a torque of 33 Nm ± 5%.

Before refitting, apply recommended grease on the eccentric hub (9).

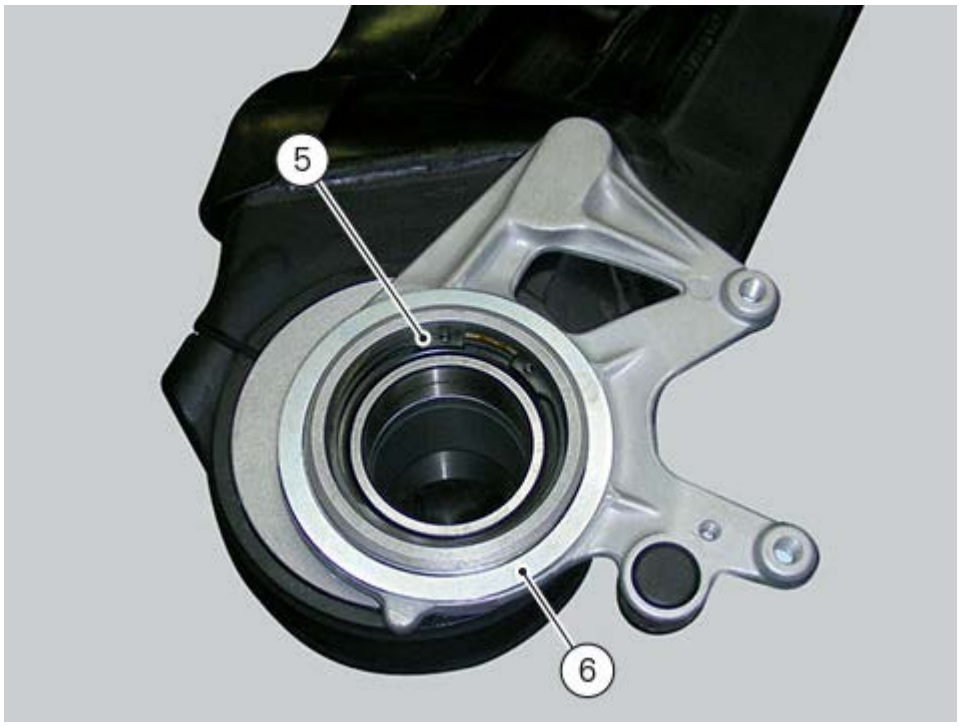


Fit the first washer (6).

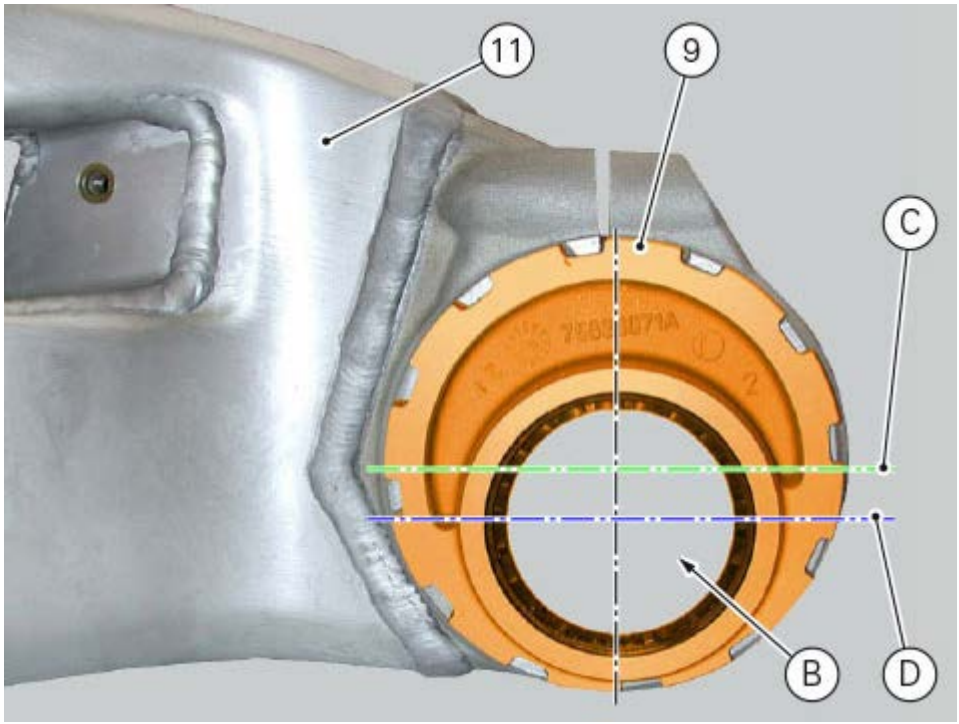
Apply recommended grease on seals (8) and position them in the seat of plate (7).
Fit plate (7) to swinging arm: pin (10) must be engaged in the plate (7).



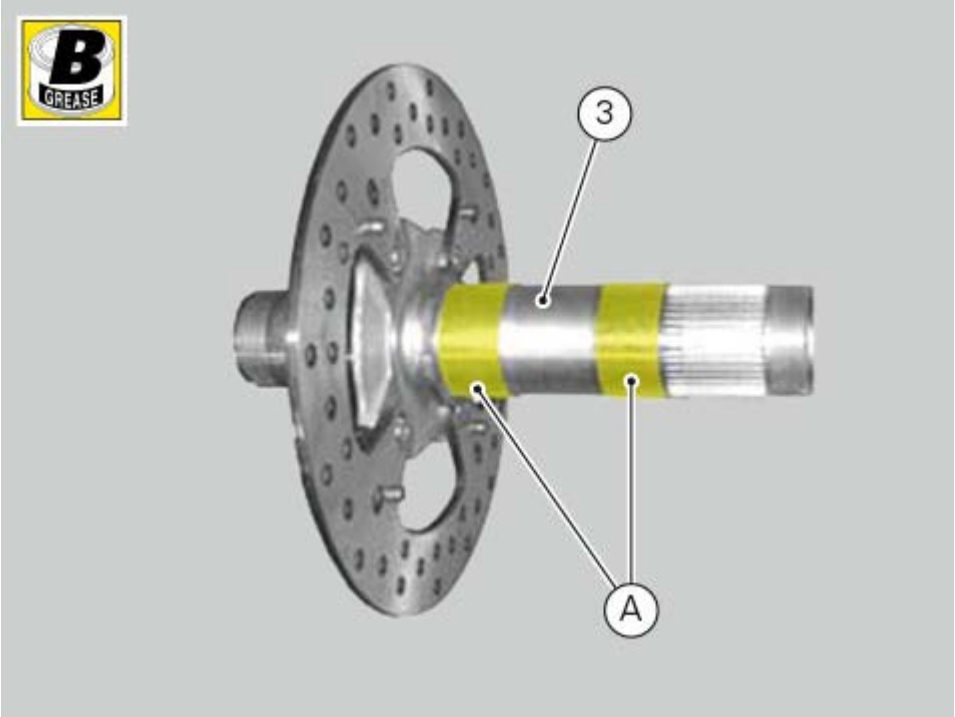
Refit the other washer (6).
Fit the circlip (5) with the sharp edge facing out.



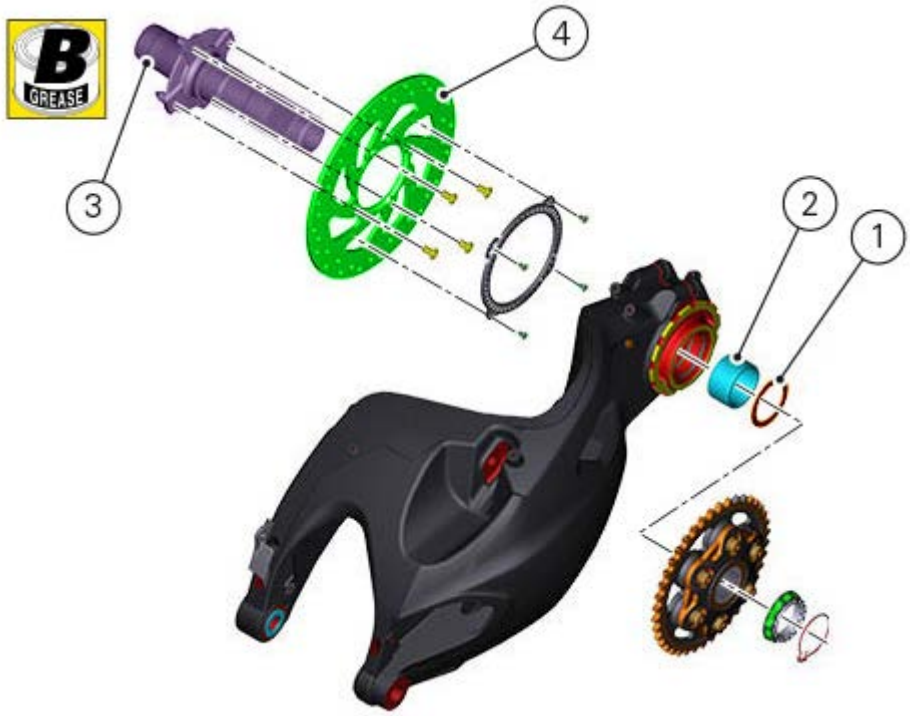
Make sure that the eccentric hub (9) position to swinging arm (11) is with the horizontal axis (D) of the hub hole (B) below the horizontal axis (C) of the hub seat.

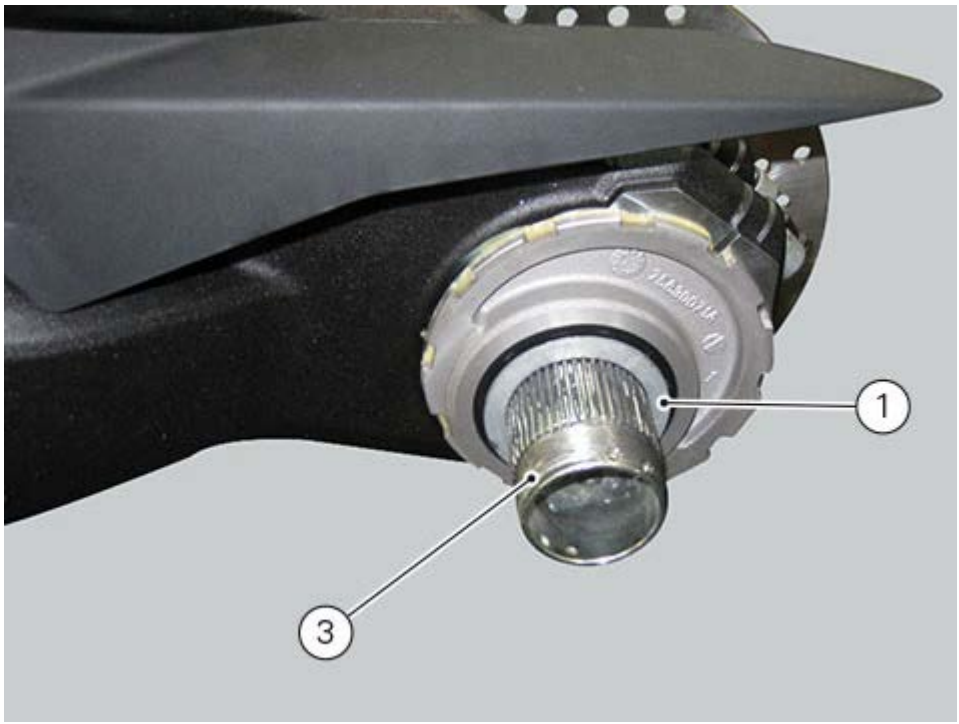


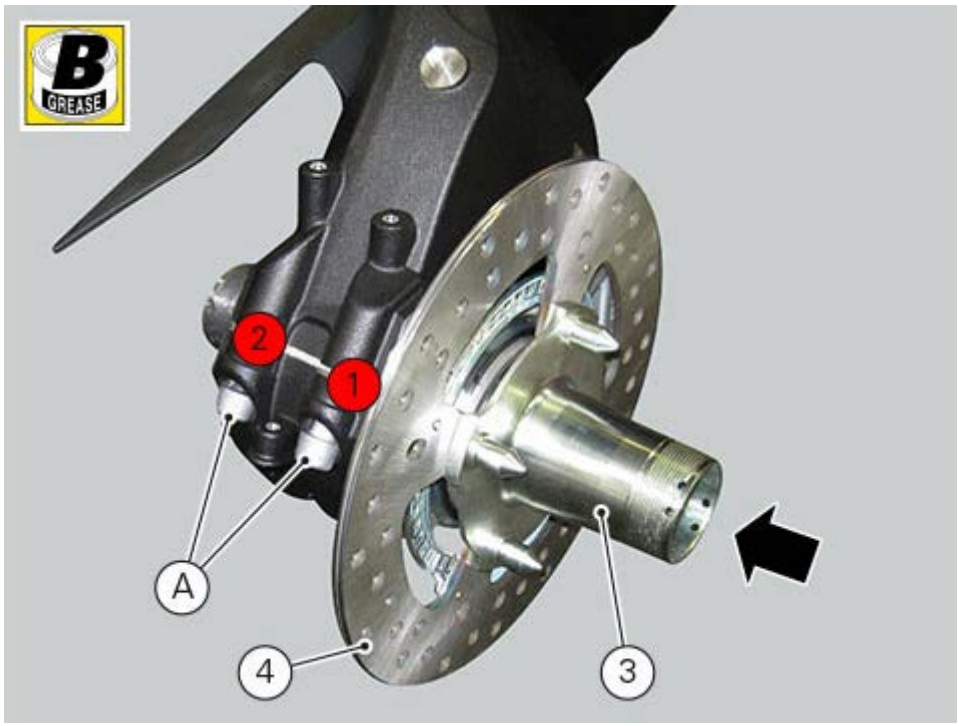
Apply an even coating of the recommended grease in the areas (A) of the shaft (3).



Insert the rear wheel shaft (3) in the hub.
Ensure the wheel shaft (3) is seated in the hub.
Fit the inner ring (2) on the wheel shaft (3).
Insert the inner ring (2) in the hub.
Apply recommended grease to screws (A) and tighten to 35 Nm ±5% in the 1-2-1 sequence.







Refit the rear brake calliper (Refitting the rear brake calliper).
Refit the rear sprocket (Refitting the rear sprocket).
Refit the rear wheel (Refitting the rear wheel).
Refit the exhaust silencers (Refitting the silencer).

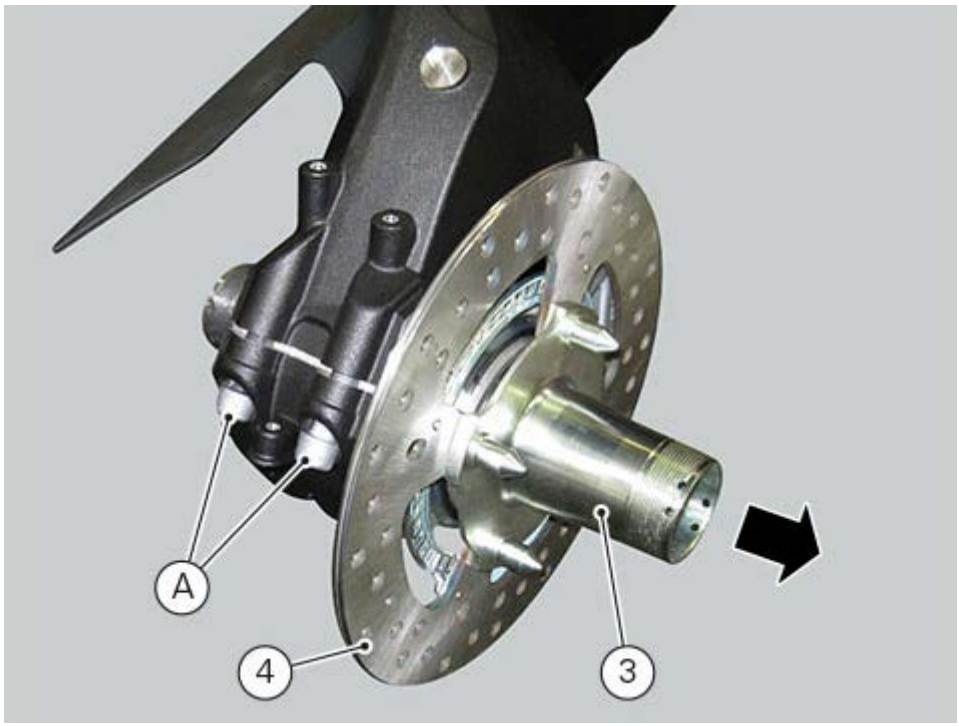
Tension the chain as described in "Adjusting the chain tension".

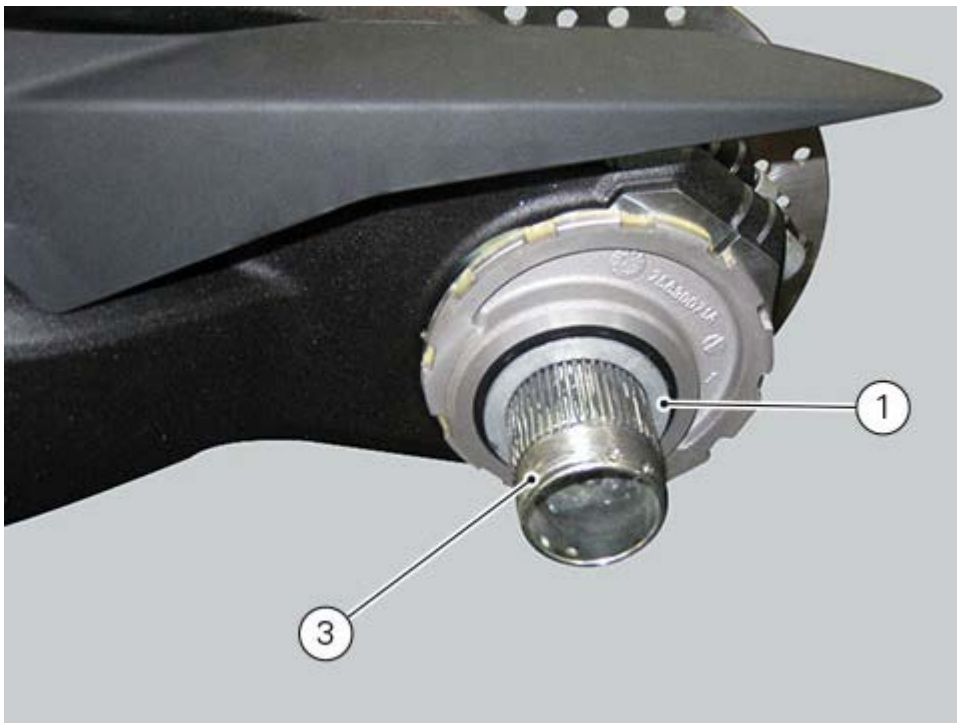
Removing the rear wheel eccentric hub and the rear wheel shaft

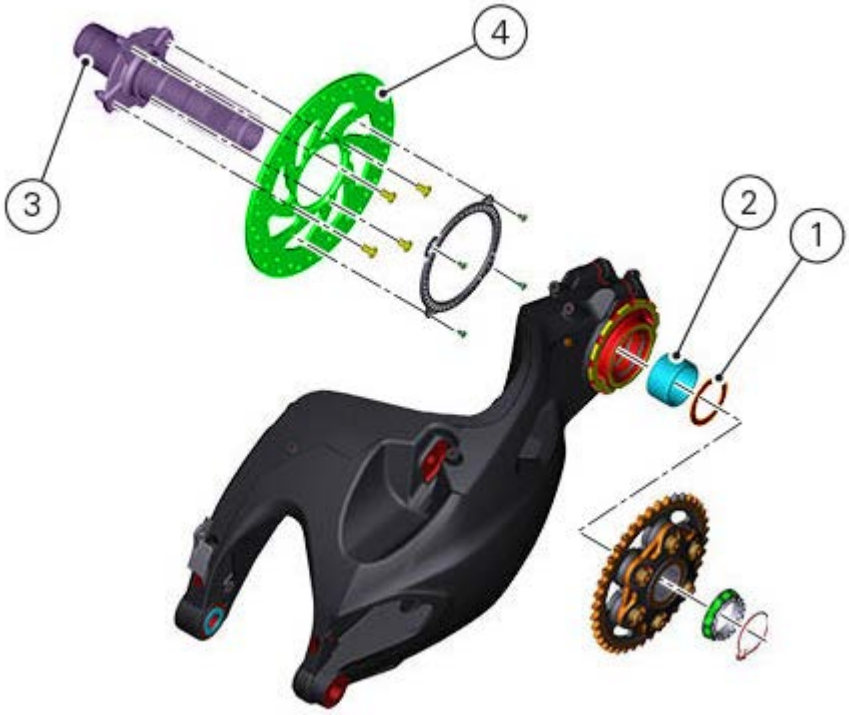
Before removing the concerned parts, you must first carry out the following operations:

Remove the exhaust silencers (Removing the silencer).
Remove the rear wheel (Removing the rear wheel).
Remove the rear sprocket (Replacing the rear sprocket).
Remove the rear brake calliper (Removing the rear brake calliper).

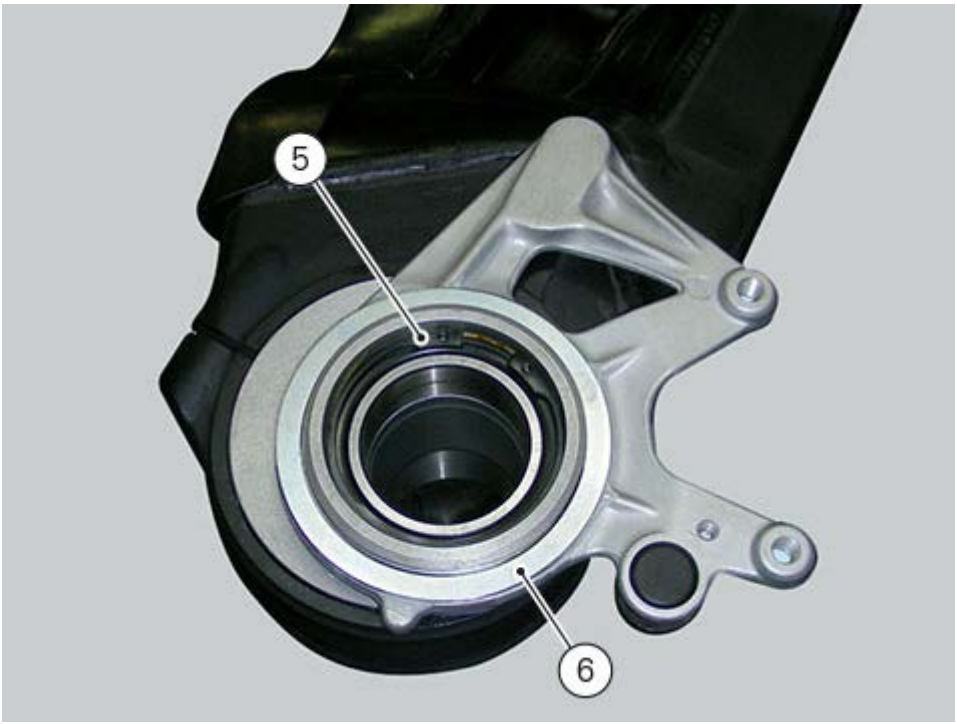
Loosen screws (A).
Remove the spacer (1) and the inner ring (2) on the chain side, and remove the wheel shaft (3) with the brake disc (4) from the opposite side.

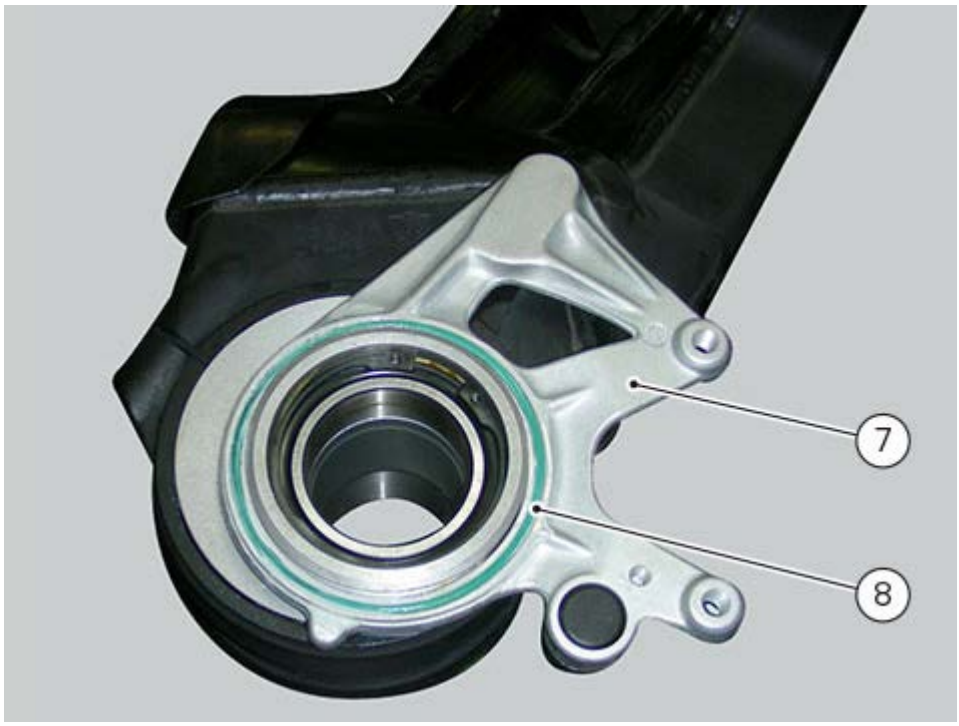






Remove the circlip (5) on the wheel side of the eccentric hub.
Remove the washer (6) and the calliper mounting bracket (7) with the O-rings (8).





Remove the second washer (6).

Slide out the eccentric hub (9) from swinging arm chain side.

Warning

The rear hub is very important for vehicle dynamic safety; it is available as a single spare part since you must not service its internal parts.

Lubricating the chain

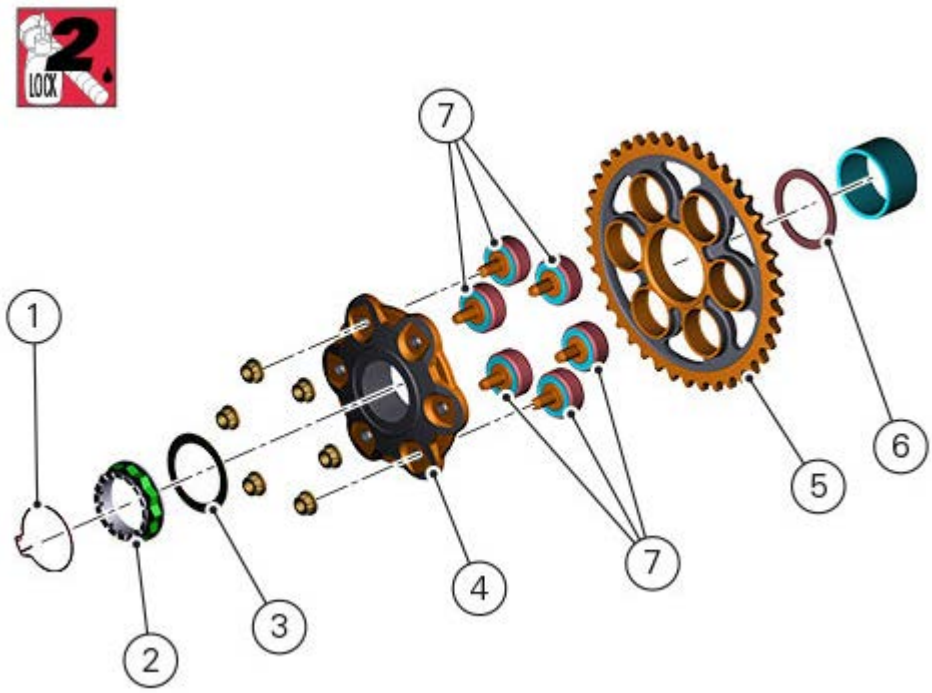
O-ring chains have sealed, life-lubed link studs and bushes.
However, these chains need to be lubricated at regular intervals to protect metal parts of the chain and the O-rings.
Lubrication also serves to keep the O-rings soft and pliable to ensure the maximum sealing efficiency.
Using a brush, apply a thin protective layer of high-density gearbox oil along the entire length of the chain both inside and outside.

Washing the chain

Chains with O-rings must be washed in oil, diesel fuel or paraffin.
Do not use fuel, trichloroethylene or other solvents which will damage the rubber O-rings.
For the same reason use only sprays specifically formulated for use with O-ring chains.

Refitting the rear sprocket

Check the cush drive dampers (7) condition and, if necessary, replace them by removing them from the flange.
Apply the recommended grease to the outer diameter of rear sprocket holder flange (4).
Fit rear sprocket flange (4) onto rear sprocket (5), engaging cush drive damper pins (7).
Apply recommended threadlocker to the nut thread (8).
Start nuts on cush drive damper pins threaded end (7).
Tighten the nuts (8) to a torque of 44 Nm ± 10%, following a cross pattern.



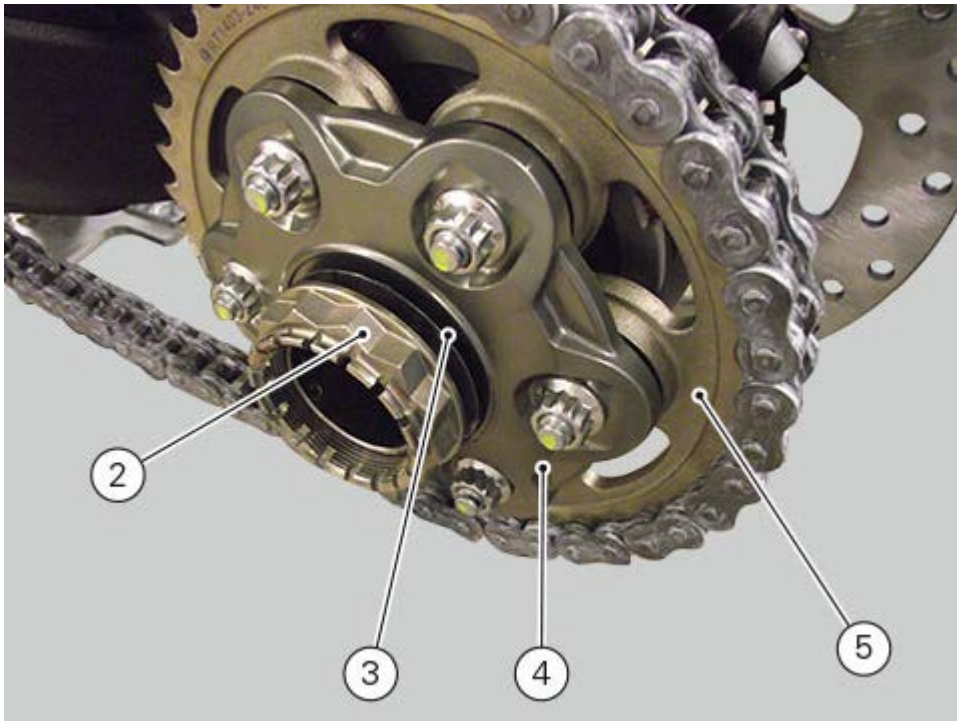
Check for wear as described under Section "Inspection of the final drive".
To refit the nut (2), follow the specifications for the wheel locking nut, in Section "Refitting the rear wheel".

Replacing the rear sprocket

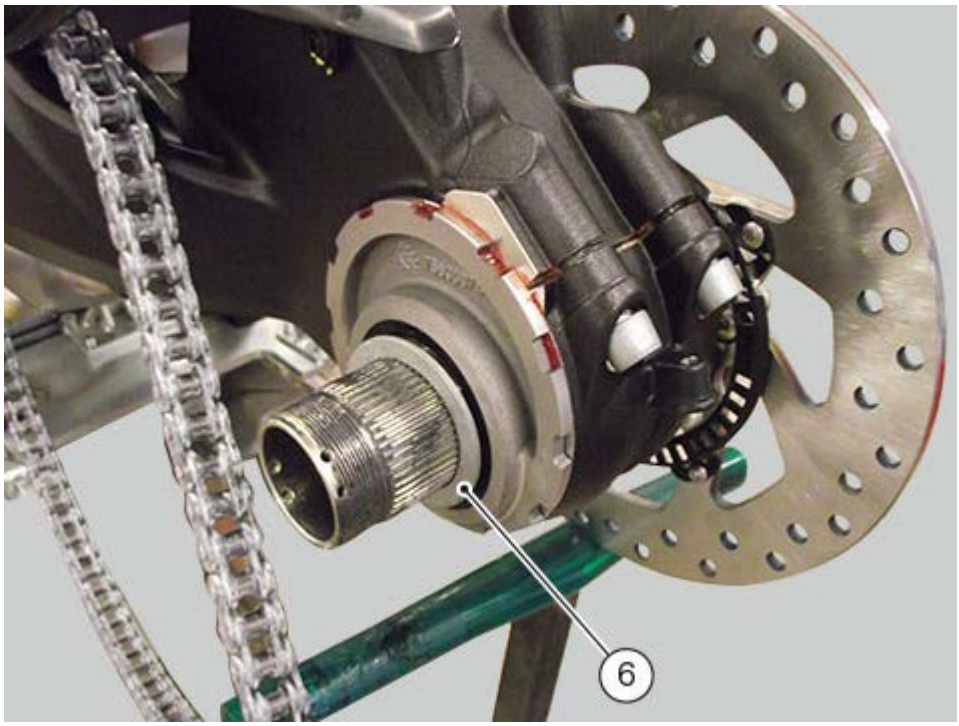
Slacken the chain (Adjusting the chain tension).
Remove the exhaust silencers (Removing the exhaust system).
Remove the rear wheel (Removing the rear wheel).

Restrain wheel shaft against rotation.
Remove the circlip (1).

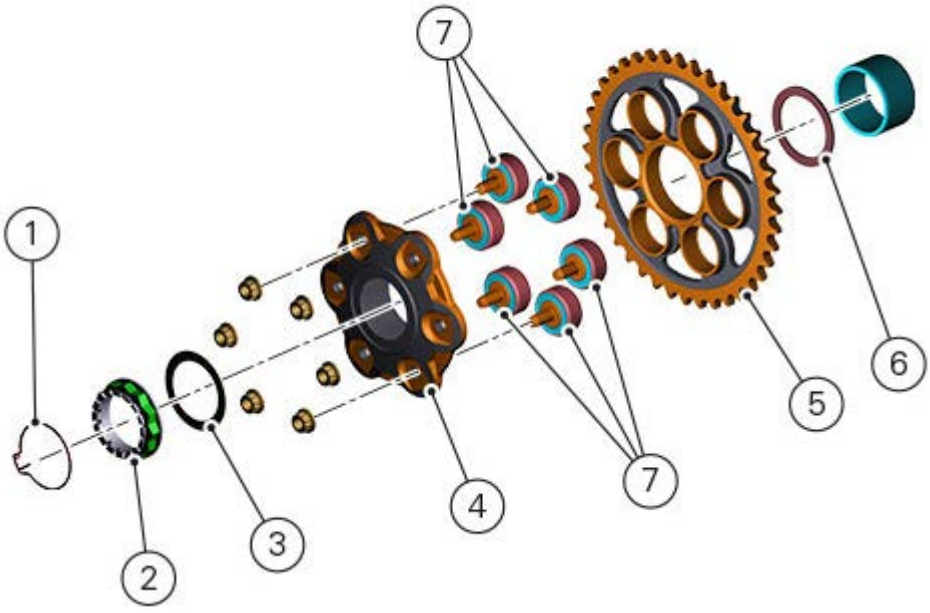
Using a suitable socket wrench, loosen nut (2).
Fully unscrew the nut (2) and remove the washer (3) and the flange (4) with the sprocket (5).



Collect spacer (6).

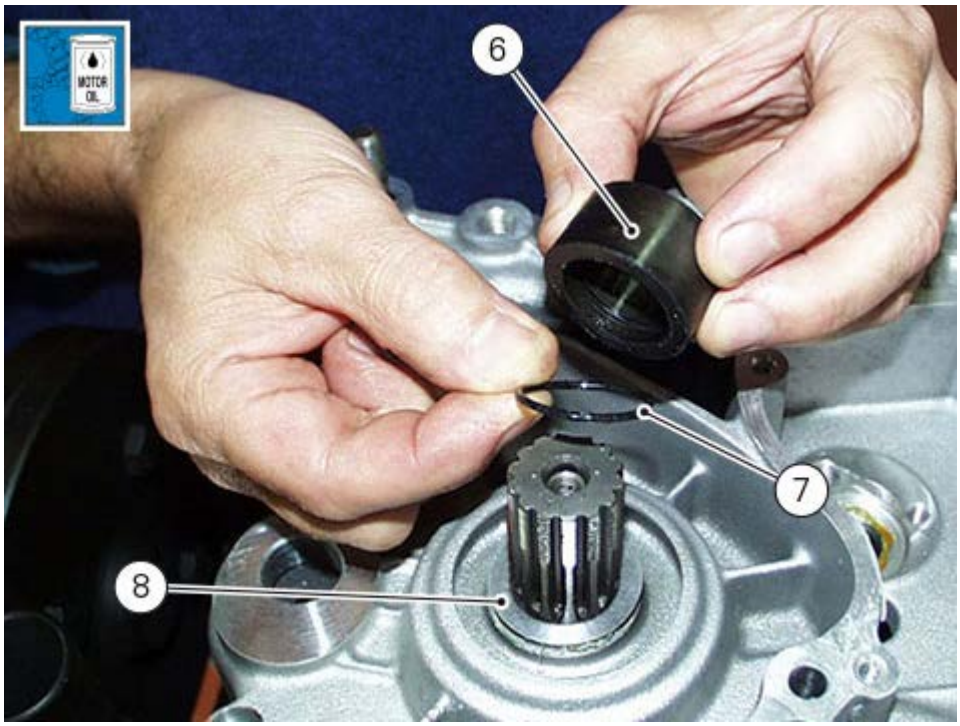


Using a mallet, tap the sprocket flange (4) with the cush drive damper (7) off the rear sprocket (5).

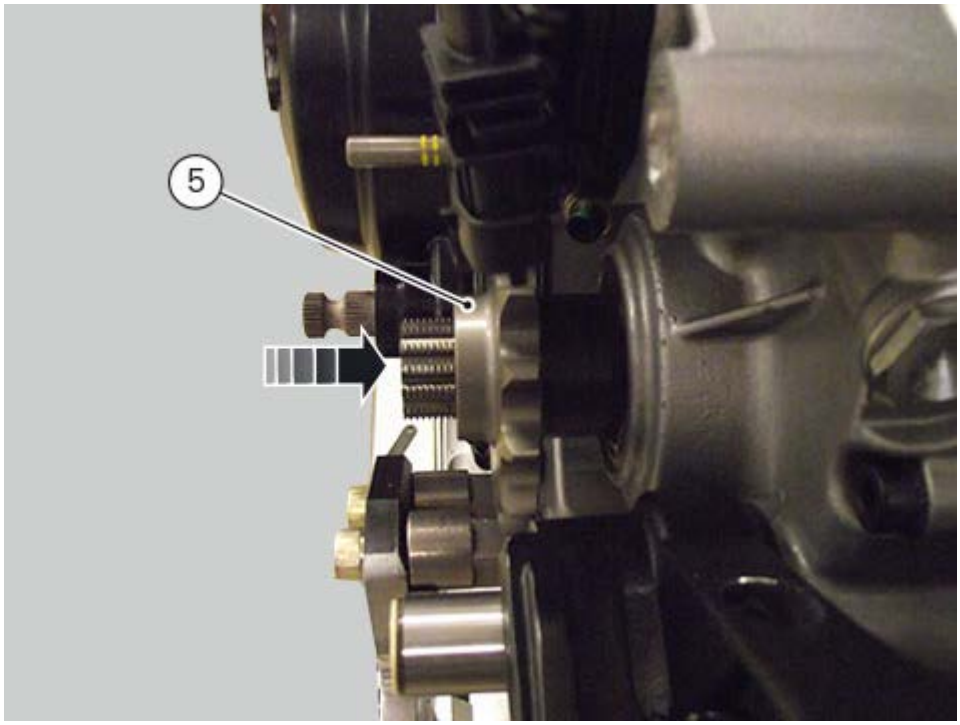


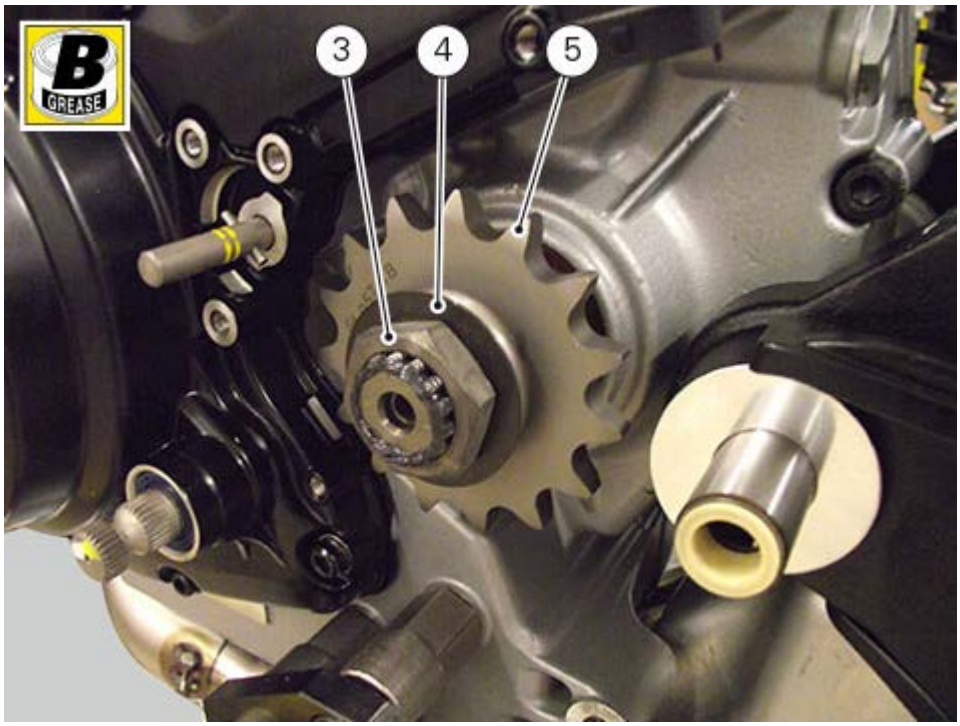
Refitting the front sprocket

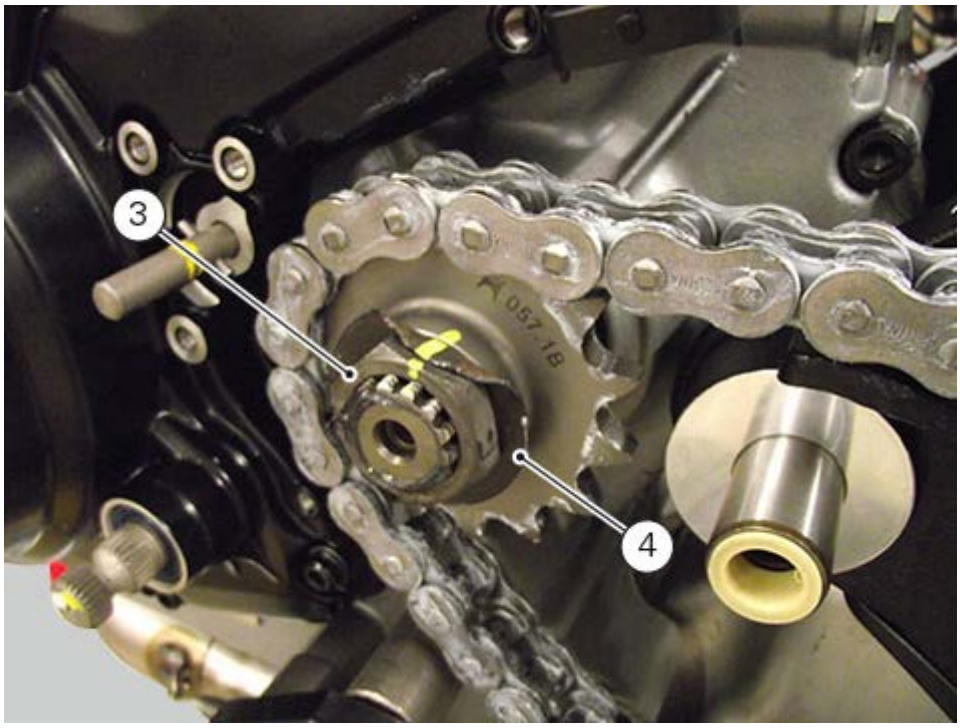
Refit the ring (8) (Closing the crankcase halves).
Grease the O-ring (7), and install it on the front sprocket spacer (6).
Fit the spacer, from the O-ring side, on the secondary shaft and drive it fully home against the inner ring of the bearing.
Before refitting the front sprocket, check that the spacer (6) is installed on the gearbox secondary shaft.



Check that the splines of the gearbox secondary shaft and the sprocket are in perfect condition.
Fit the front sprocket (5) on the gearbox secondary shaft, orienting it as shown. Fit lockwasher (4).
After having applied the indicated threadlocker, tighten the nut (3) to a torque of 186 Nm ± 5%.
Bend the washer (4) over the nut.







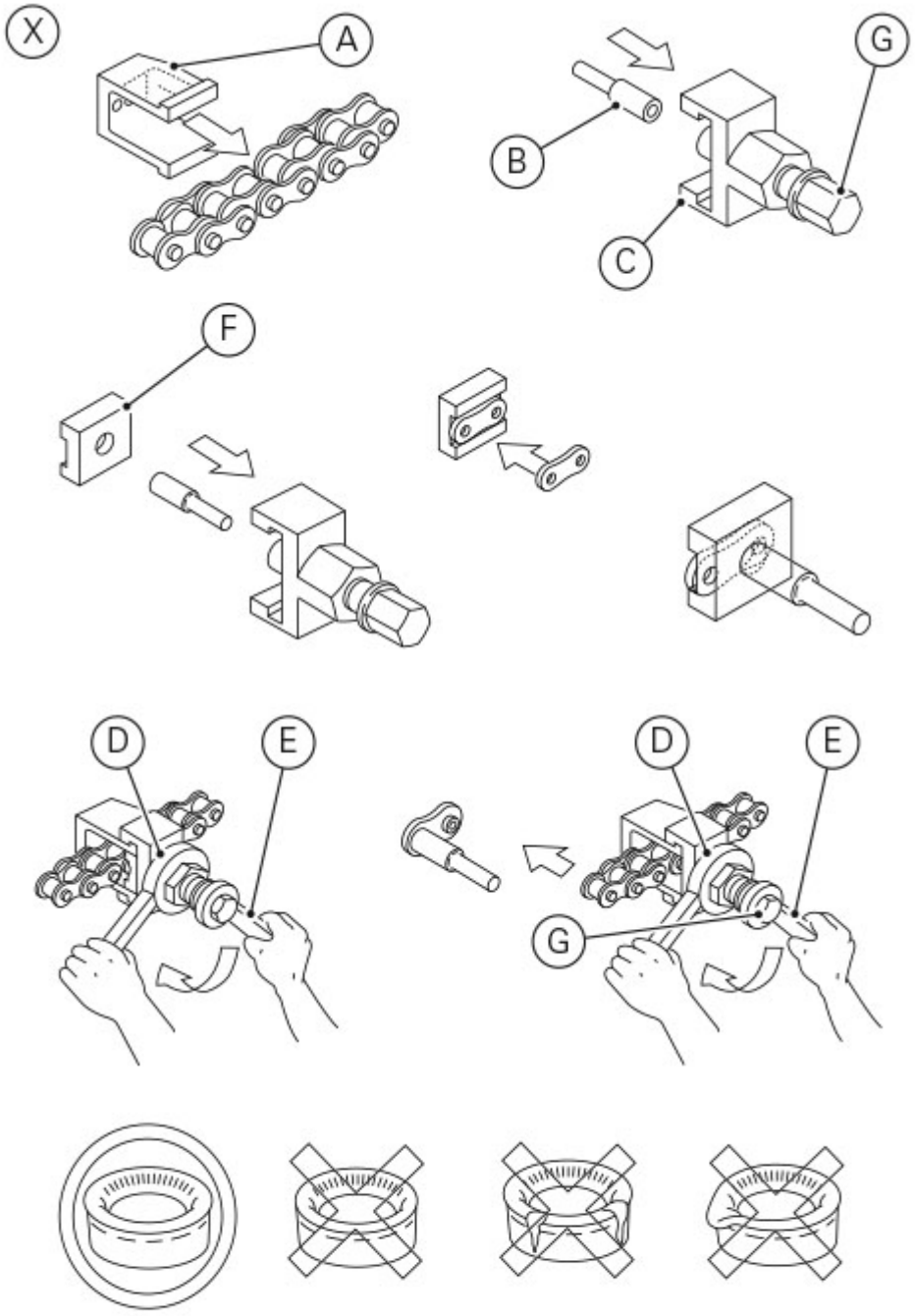
Fit the chain and close it using the tool (X) no. **88713.1344**, which was used to open the chain.
The tool consists of a holder (A), a punch (B), body (C) and two wrenches (D) and (E) and a plate holder (F).
Connect the two ends of the chain with the external link, and manually fit the plate onto the pins.

Warning
Lubricate the pins abundantly; try to avoid touching them with your hands.

Fit the holder (A) onto the external link.
Fit the punch (B) into the body (C) and the plate holder (F).
Fit the body (C) onto the holder (A) which holds the chain in position.
Manually turn the bolt (G) until the plate holder (F) is seated against the plate itself.
Use wrenches (D) and (E) to turn the bolt (G) clockwise until the chain pin is in contact with the holder (F).
Remove the holder (A) from the tool.
Manually turn the bolt (G) until the punch (B) is brought into contact with the pin to be riveted, taking care that they are aligned.
Use wrenches (D) and (E) to turn the bolt clockwise until the punch (B) is seated against the chain plate.
To complete riveting, repeat the entire procedure with the second pin.

Warning

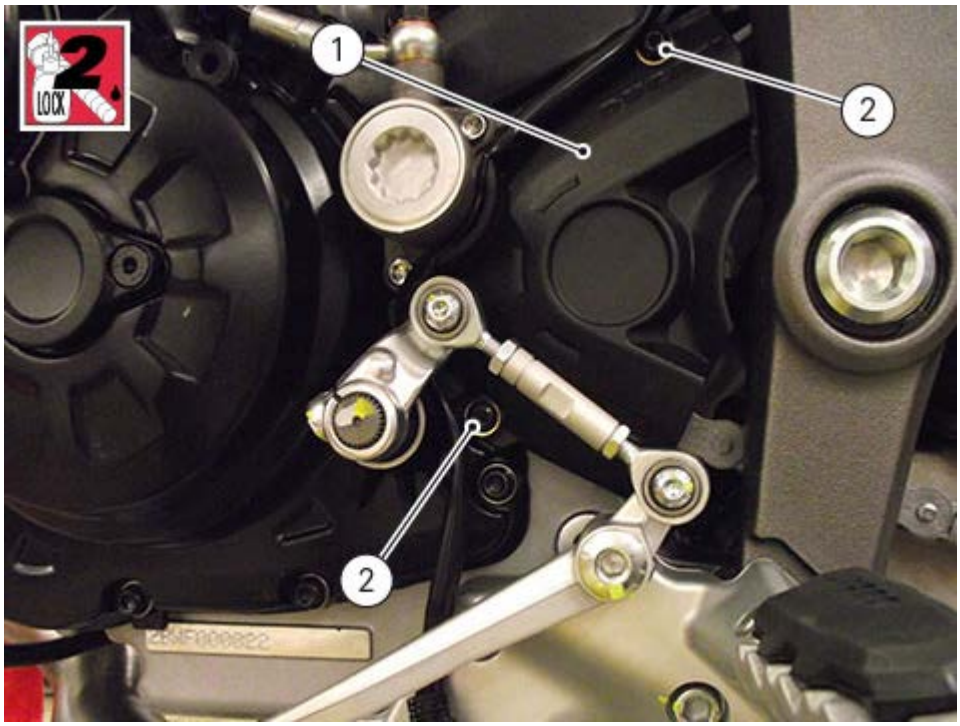
Carefully check the two pins: the figure shows the correct result of the procedure.



Tension the chain (Adjustment of chain tension).

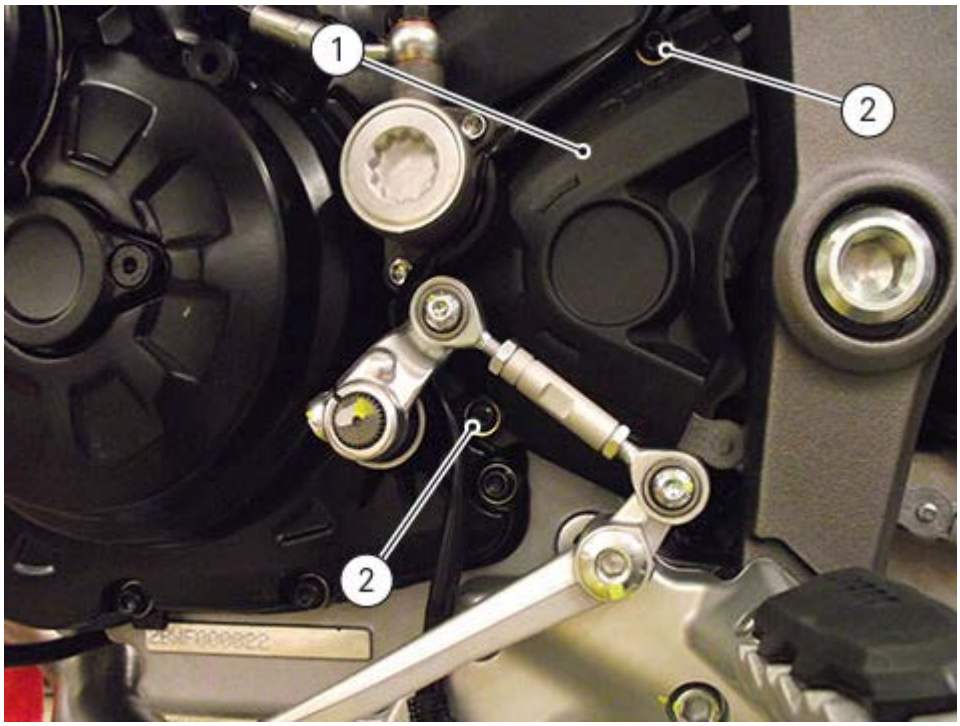
Apply the recommended threadlocker to the screws (2).

Fit the sprocket cover (1) and tighten the screws (2) to a torque of 6 Nm ±10%.

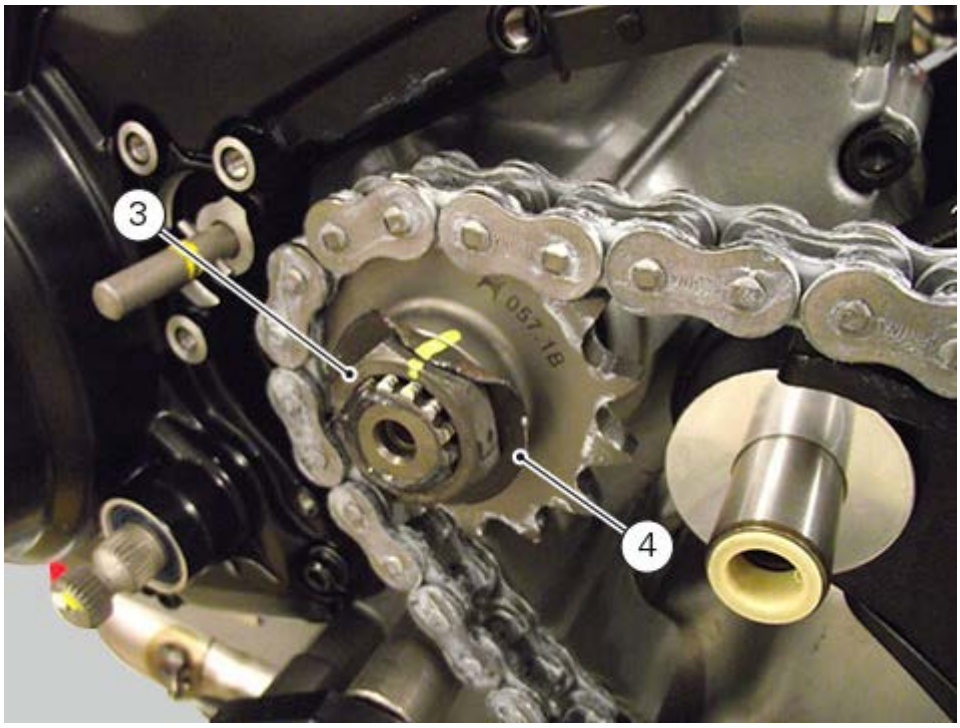

2.
LOCK
1
2
2

Removing the front sprocket

Undo the screws (2), and remove the chain cover (1).
Slacken the chain (Adjusting the chain tension).



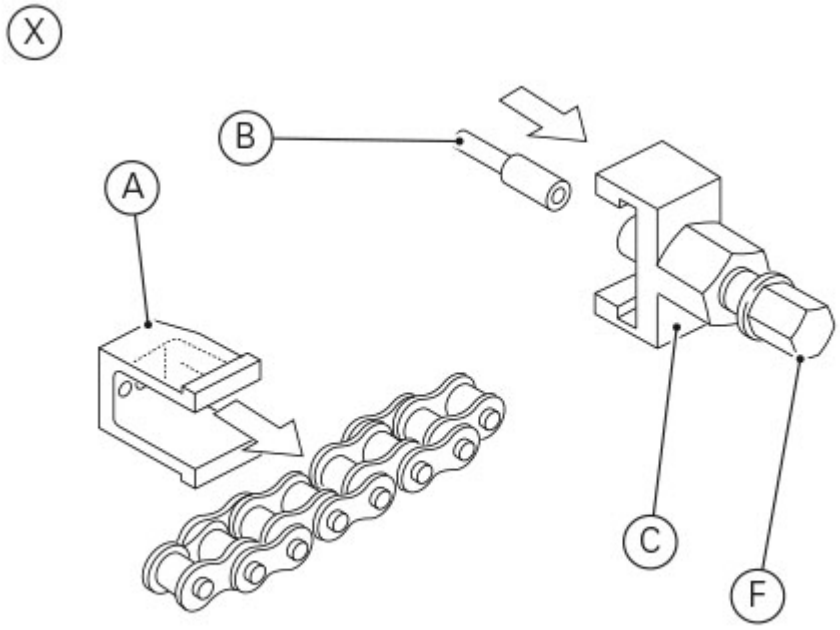
To loosen nut (3) it is necessary to fold the lockwasher (4) edge.

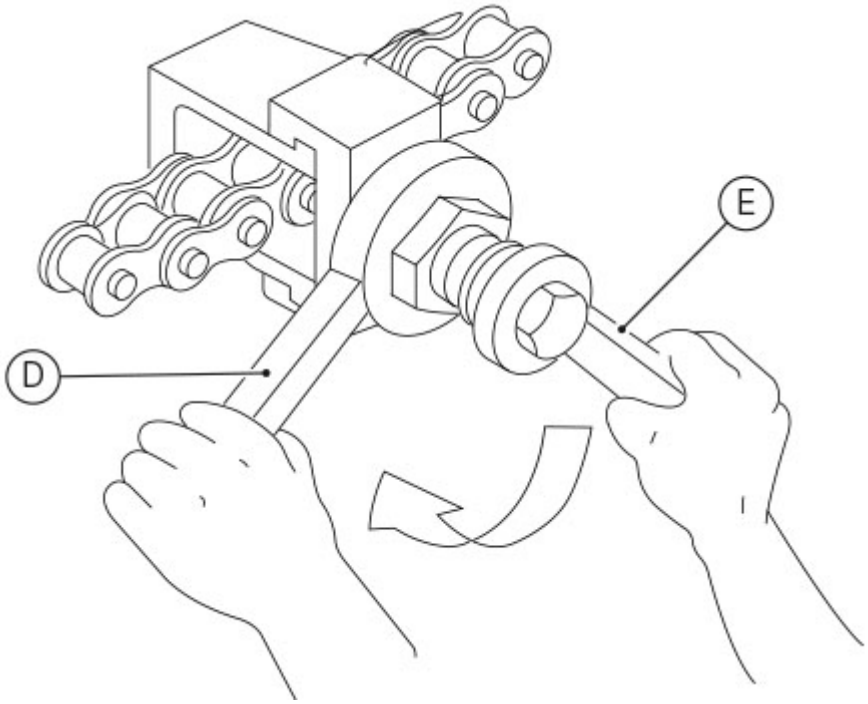


Engage the first gear.
Loosen nut (3) and the lockwasher.
Remove the chain.

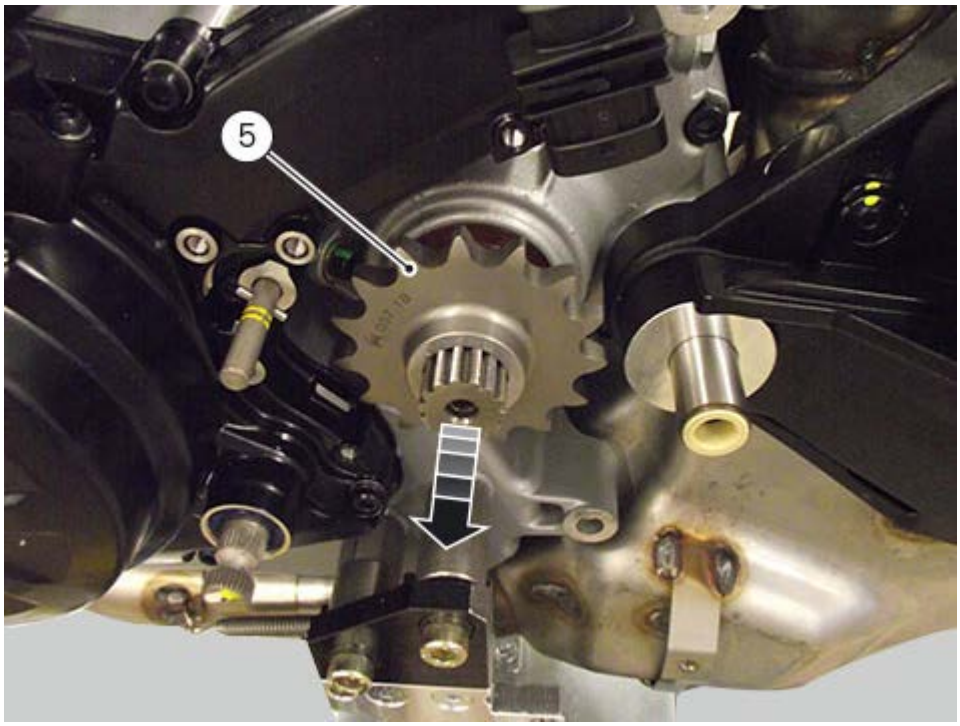
Remove the chain using tool (X) part no. **88713.1344**.
The tool consists of a holder (A), a punch (B), a body (C) and two wrenches (D) and (E).
Fit the link to be opened into the holder (A).
Fit the punch (B) into the body (C) and manually undo the screw until the punch no longer protrudes.
Fit the holder (A) and the link into the body (C).
Manually turn the bolt (F) on body (C) so that the punch (B) gets against the pin, taking care that they are aligned.

Fit the hexagon wrench (D) into the hexagonal part of the body (C) and the wrench (E) onto the bolt.
Turn clockwise the bolt (F) until the pin comes out.





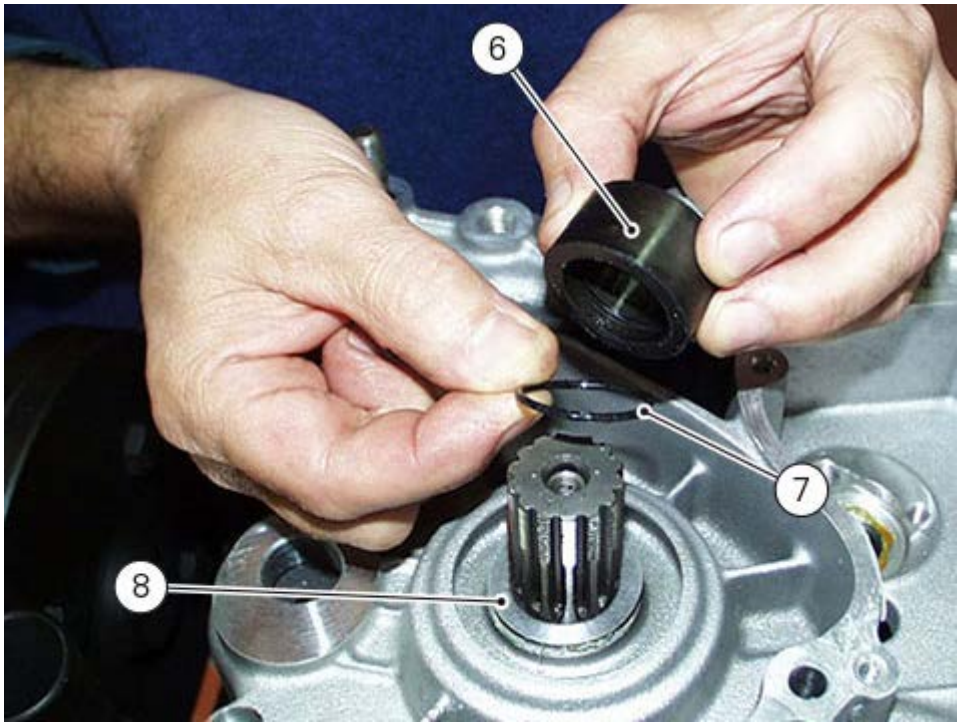
Remove the chain.
Engage a low gear and unscrew the nut (3).
Remove the nut (3) and the lockwasher (4) on the sprocket.
Remove the front sprocket (5) from the gearbox secondary shaft.



Remove the spacer (6) with O-ring (7) and washer (8) from the gearbox secondary shaft.

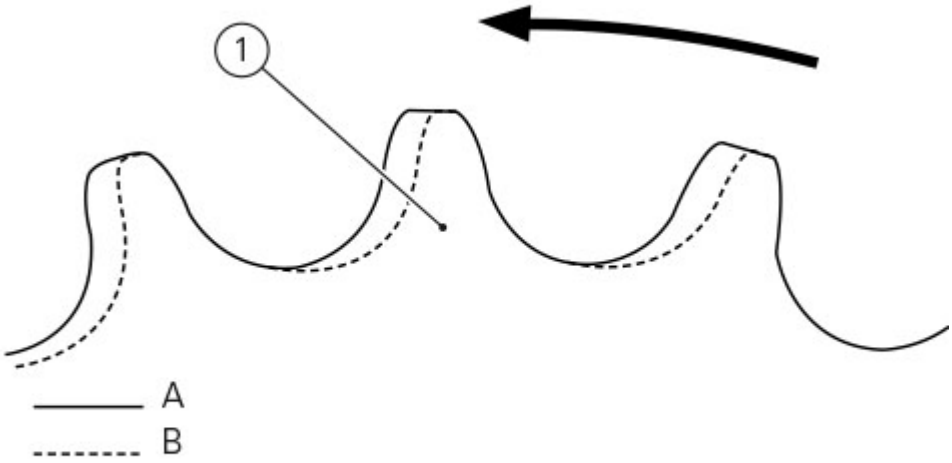
Important

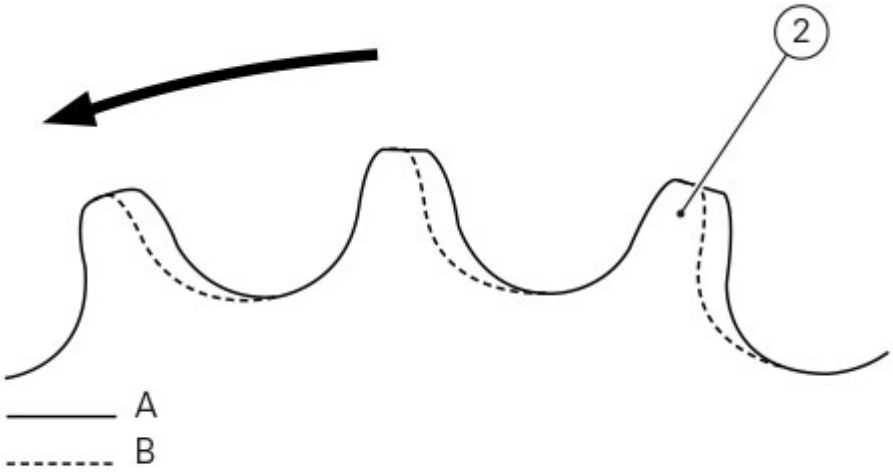
The O-ring must be renewed upon removal.



Inspection of the final drive

To check the final drive wear, visually check the front sprocket (1) and the rear sprocket (2).
If the teeth are worn as shown in the figure (dotted line), the final drive must be replaced.





Important

Make sure that the rear sprocket, front sprocket and chain are all replaced together as a set.

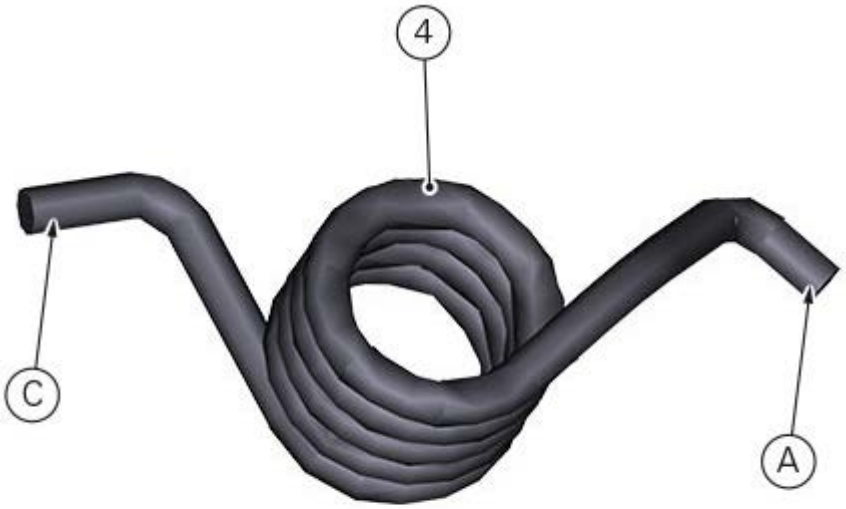
Refitting the footpegs

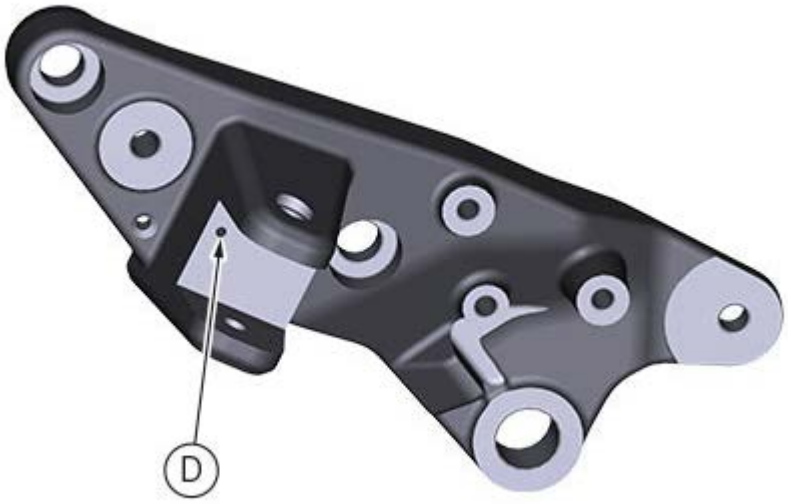
Refitting the front footpegs

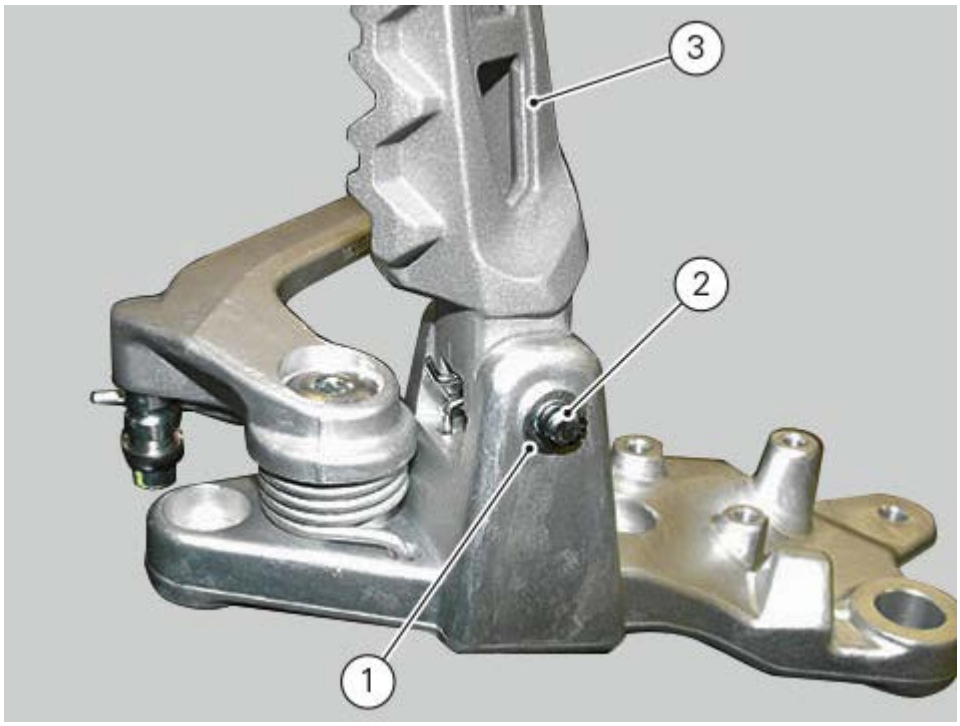
Note

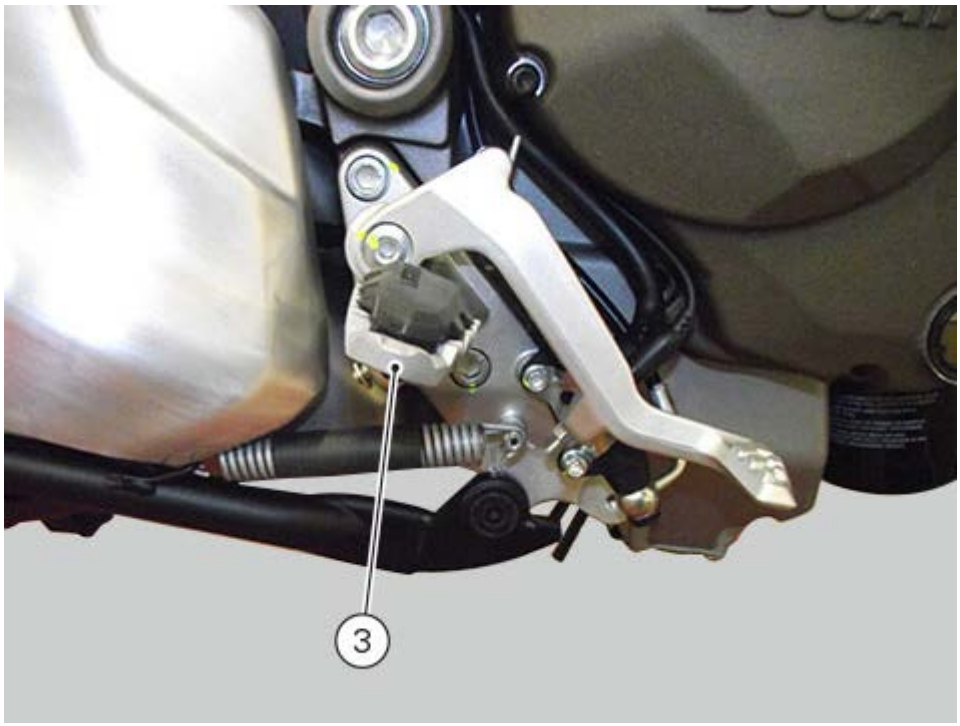
The refitting of the front RH footpeg is described in detail; the LH footpeg can be removed following the same procedure.

Position spring (4) so that the end (A) rests on the footpeg (3).
Position footpeg (3) inserting the end (C) of spring (4) in the hole (D) of the frame plate.
Fit pin (2) as shown.
Lock pin using circlip (1).







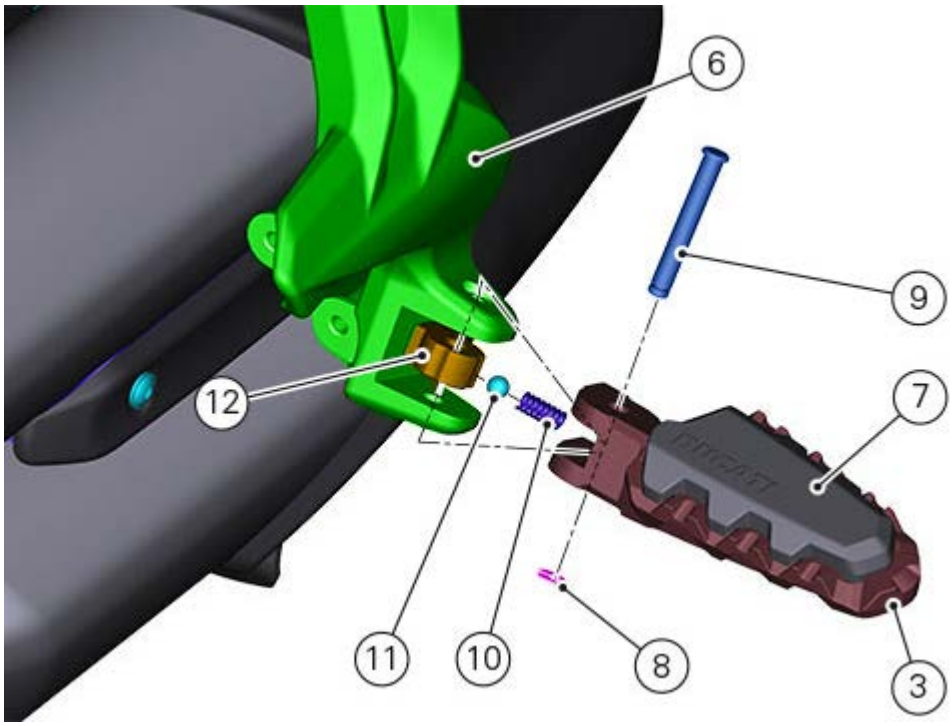


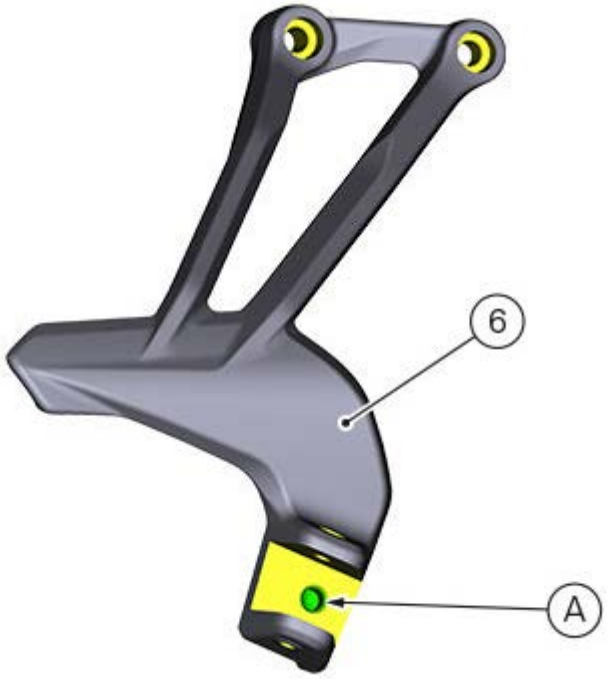
Refitting the rear footpegs

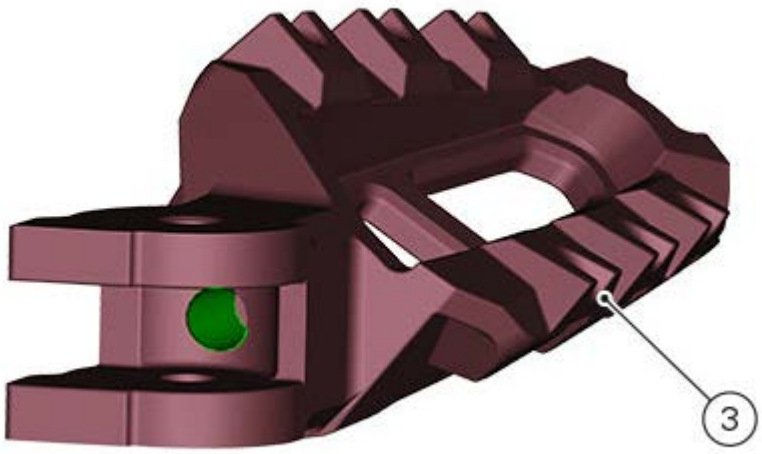
Note

Refitting of the rear RH footpeg is described in detail; the LH footpeg can be removed following the same procedure.

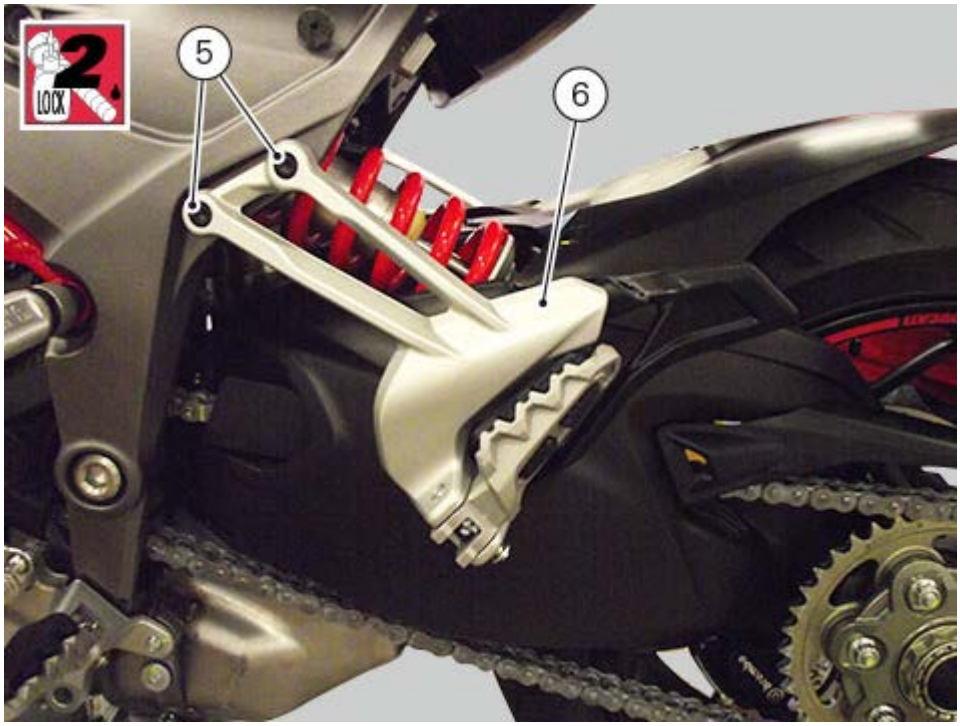
Insert spring stopper (12) into the hole (A) of the rear footpeg holder plate (6) as shown.
If necessary, smear pin (B) retaining spring (12) with recommended grease in order to keep it in the correct position.
Insert the spring (10) into the special hole of the footpeg (3).
Fit the ball (11) on the spring (10).
Fit the footpeg (3) to rear RH footpeg holder plate (6) fitting pin (9), positioning parts as shown.
Fasten pin using circlip (8).
If previously removed, refit the footpeg rubber block (7).


6
9
12
7
11
10
8
3


6
A



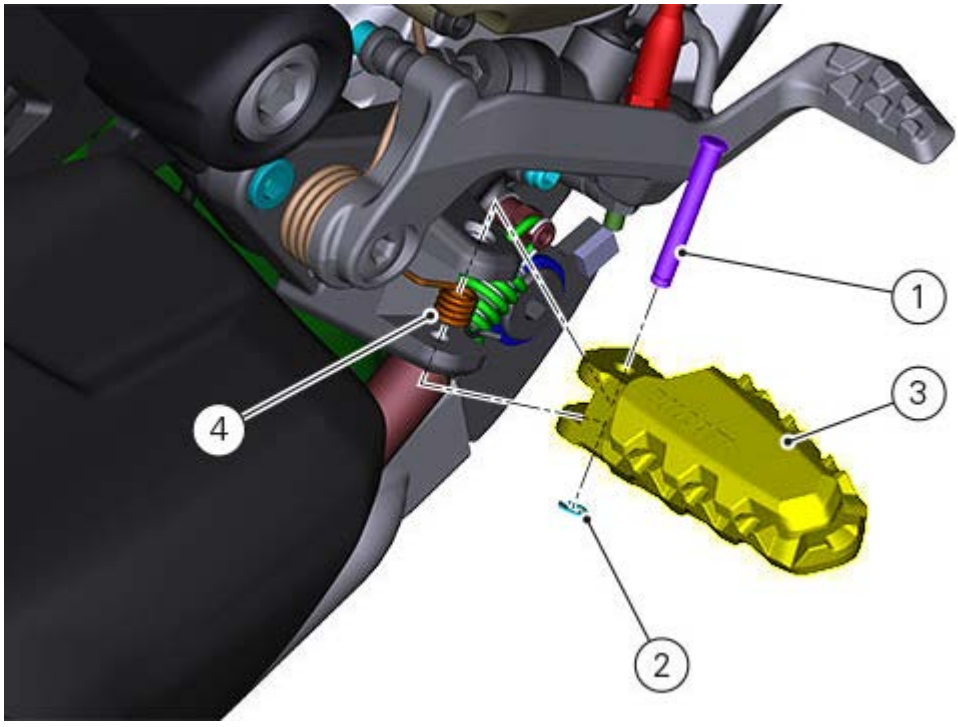
Apply the recommended threadlocker to the screws (5).
Position passenger rear footpeg holder plate (6) on frame and tighten screws (5) to a torque of 24 Nm ± 10 %.

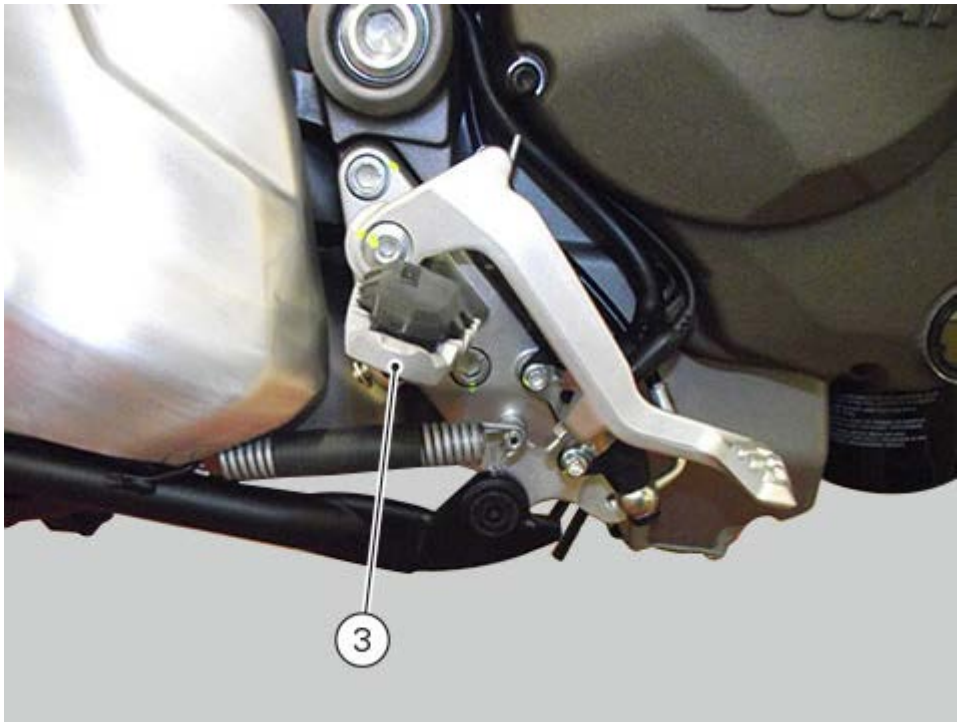


Removing the footpegs

Removing the front footpegs

Remove the circlip (1) thereby releasing the pin (2).
Slide out pin (2), while supporting the footpeg (3).
Slide out footpeg (3) from its seat and collect spring (4).

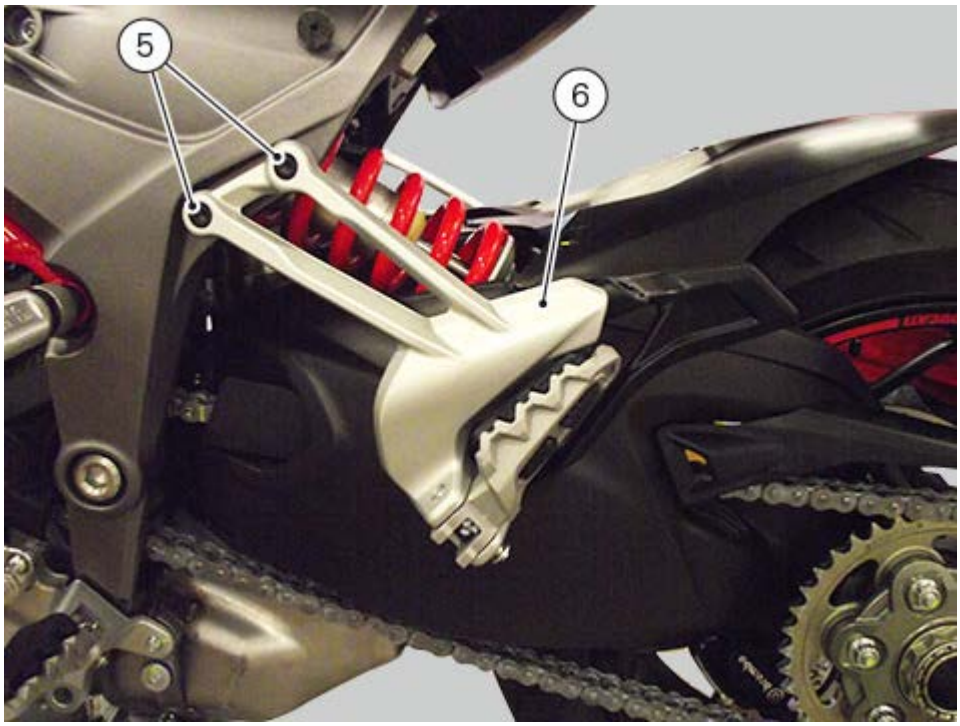




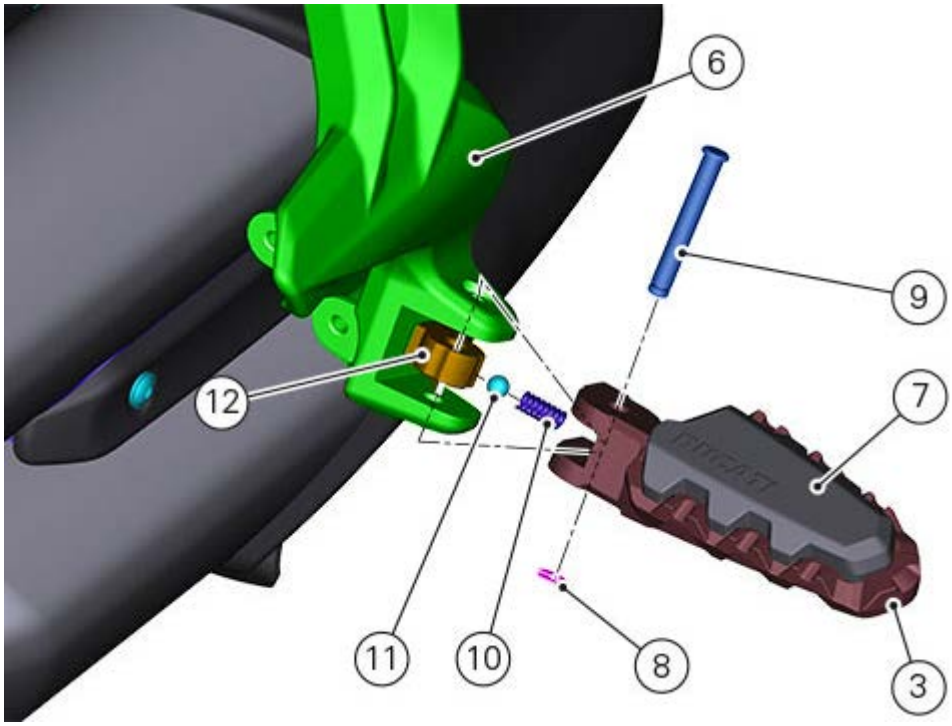
Removing the rear footpegs

Note
Removing of the rear RH footpeg is described in detail; the LH footpeg can be removed following the same procedure.

Loosen screws (5) and remove the RH rear footpeg plate (6) from the frame.

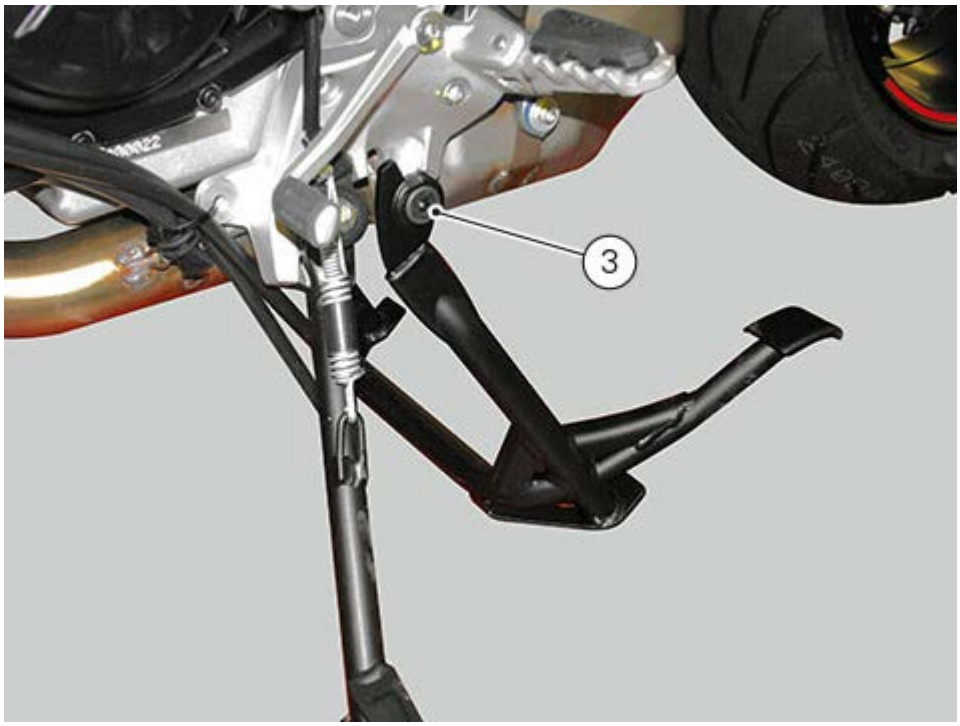


If necessary, remove the rubber cap (7).
Remove the circlip (8) thereby releasing the pin (9).
Slide out pin (9) from footpeg holder plate (6), holding the footpeg (3) and making sure that the ball (11) and the spring (10) are not released.
Slide out footpeg (3) from its seat and collect spring (10) and ball (11).
Remove the spring stopper (12).

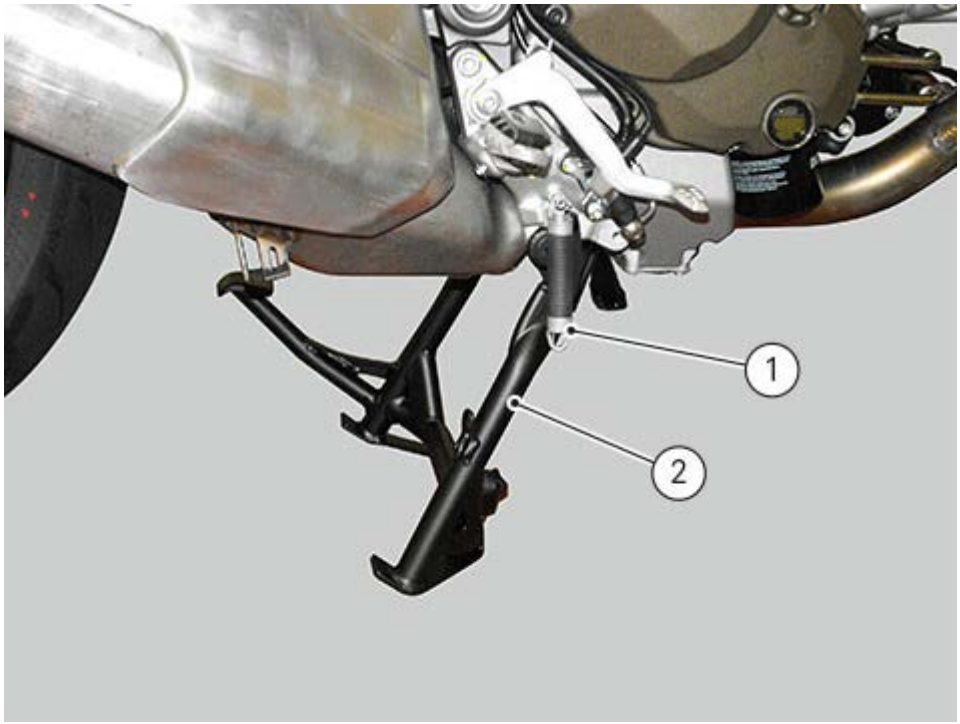


Refitting the centre stand

Insert pins (3) from both the left and the right side.
Tighten the two pins to a torque of 50 Nm ± 10%.
The picture shows only the left pin.

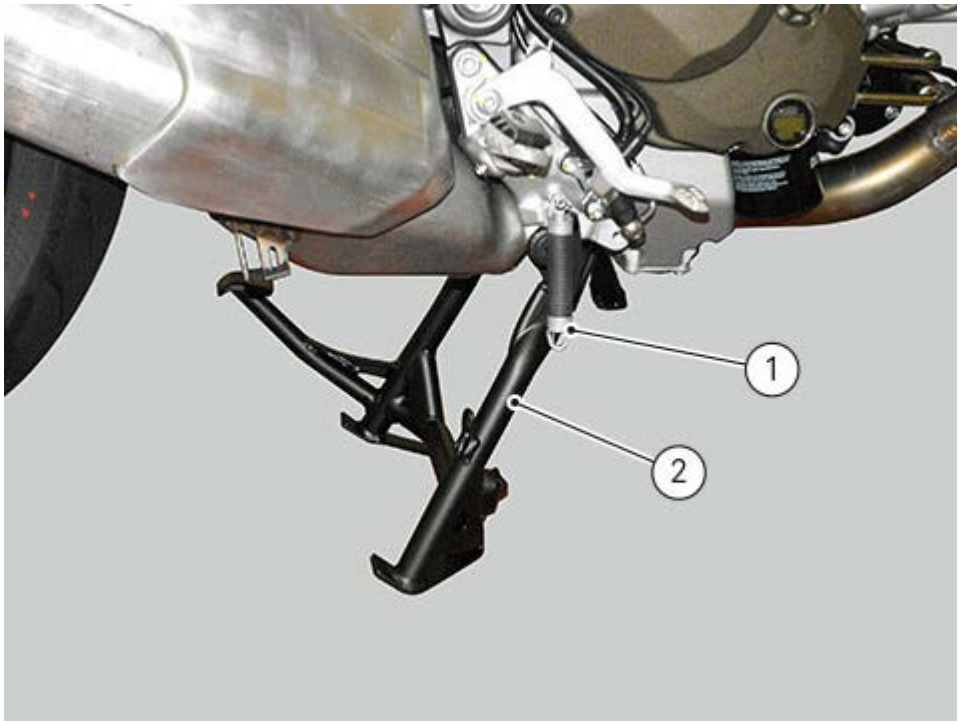


Connect the spring (1) to the stand (2).

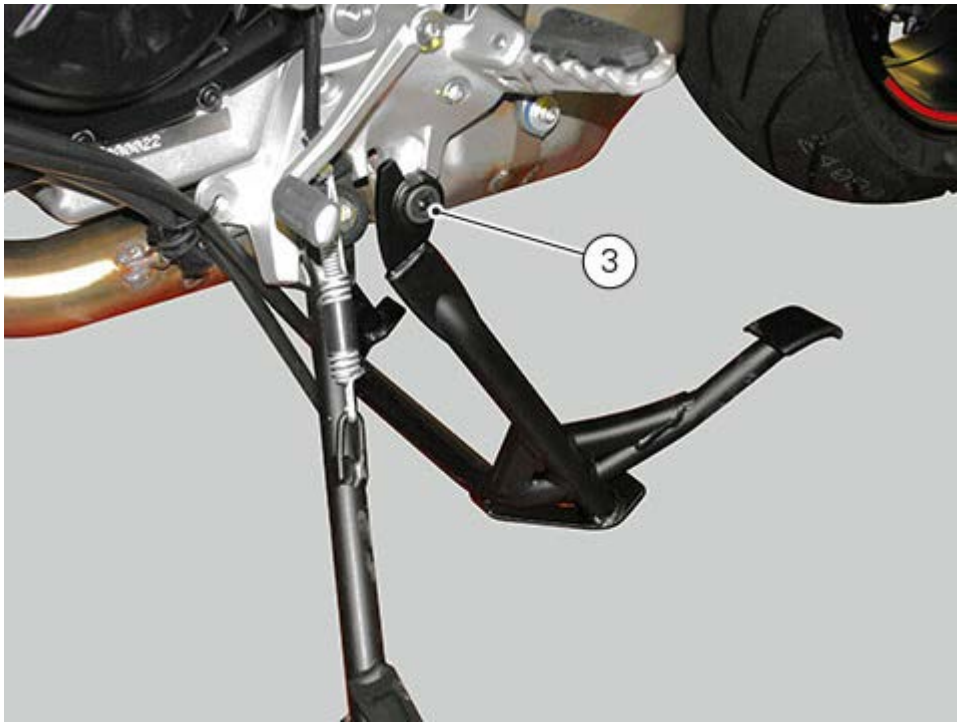


Removing the centre stand

Release the spring (1) of the central stand (2).



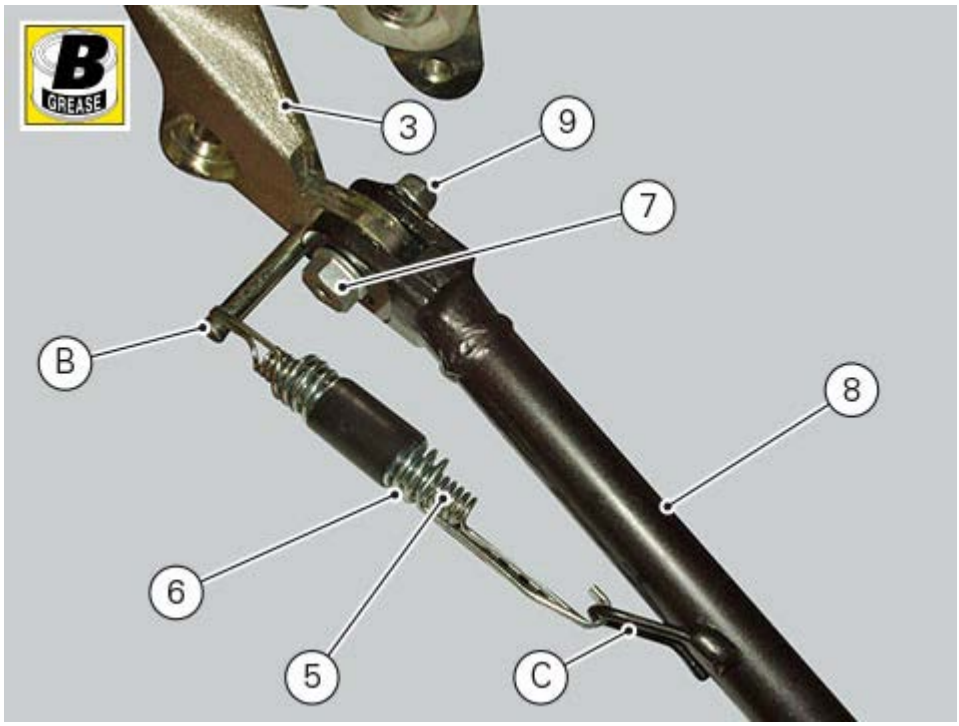
Loosen pins (3) on both sides.
Remove the stand.
The picture shows only the left pin.



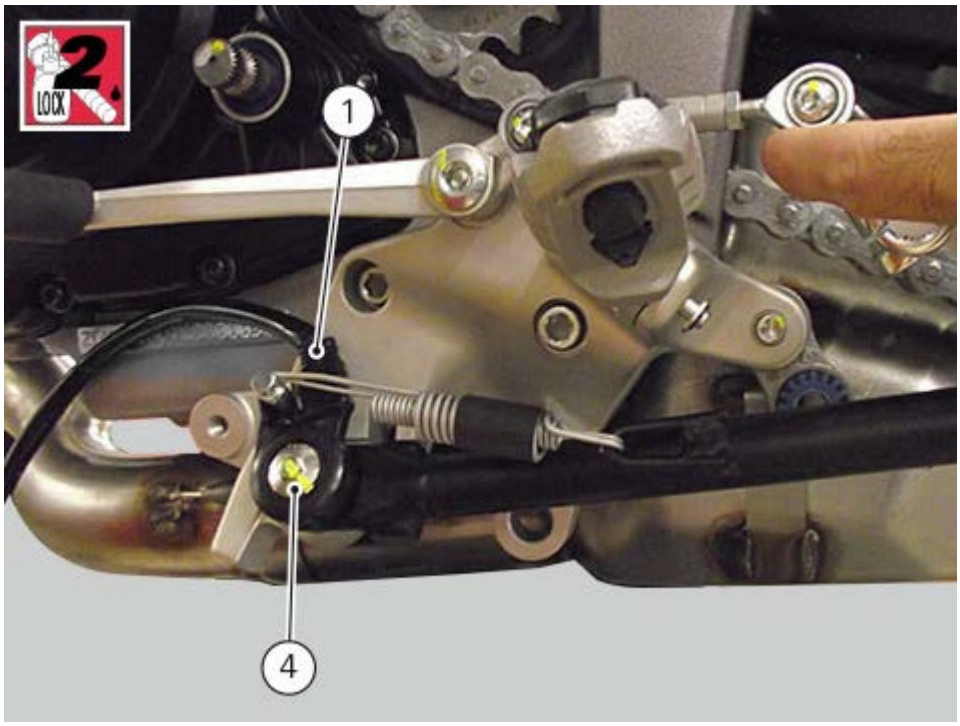
Refitting the side stand

Reassembling the side stand

Insert the duly lubricated side stand (8) and fit it to the plate (3). Secure it with the pin (7) and the nut (9).
Tighten nut (9) to a torque of 20 Nm ± 10%.
Position the side stand return springs (5) and (6) and attach them to fasteners (B) and (C) on bracket and stand.

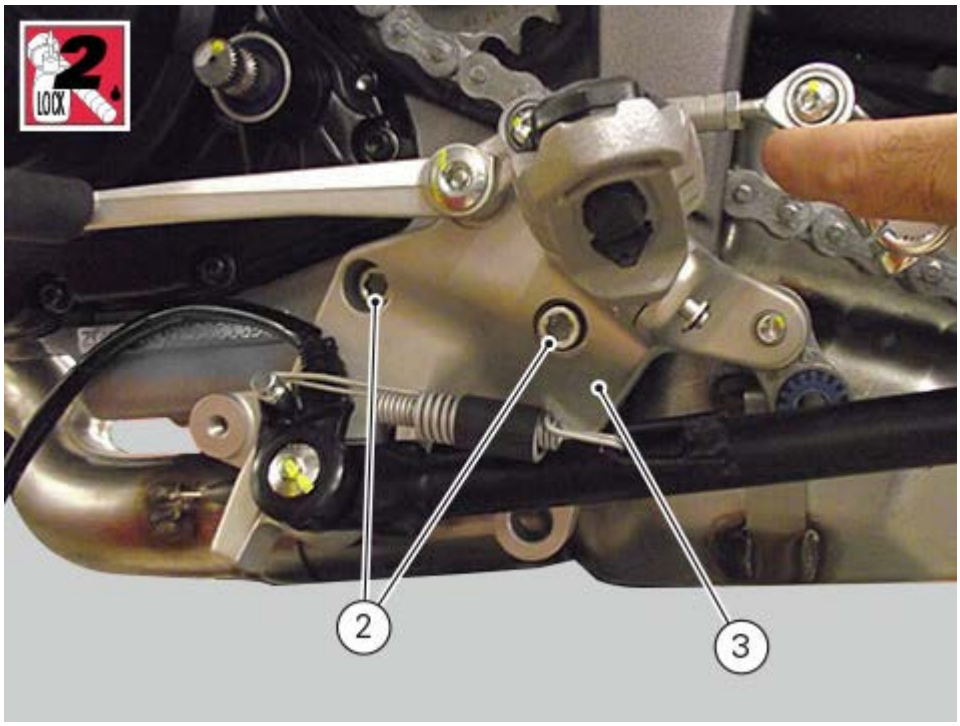


Place the switch (1) on the plate, on its pin (7).
Fit the retaining screw (4) with recommended threadlocker and tighten to a torque of 5 Nm ±10%.

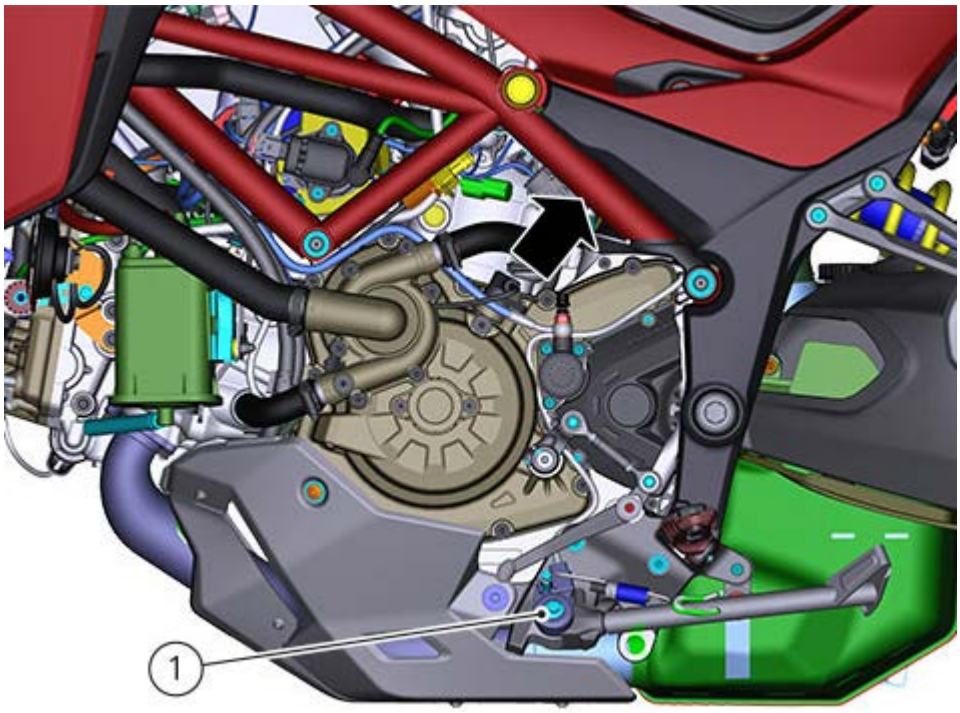


Refitting the side stand

Position the side stand bracket (3) to the frame and fit the two screws (2) smeared with recommended threadlocker.
Tighten screws (2) to a torque of 43 Nm ± 10%.

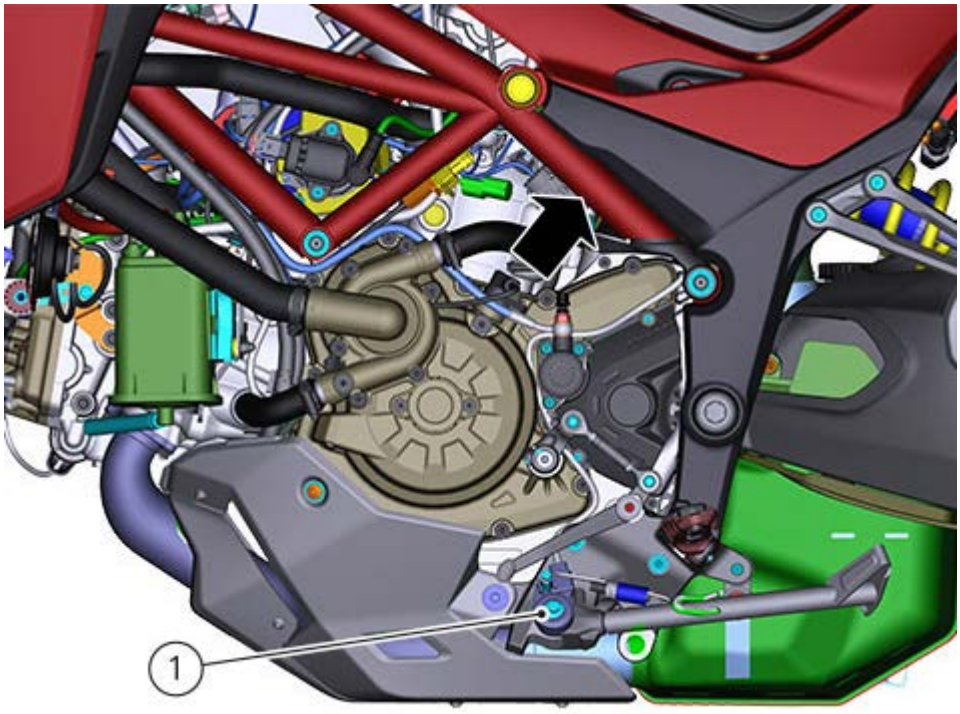


Connect the side stand switch connector (A) to the main wiring.

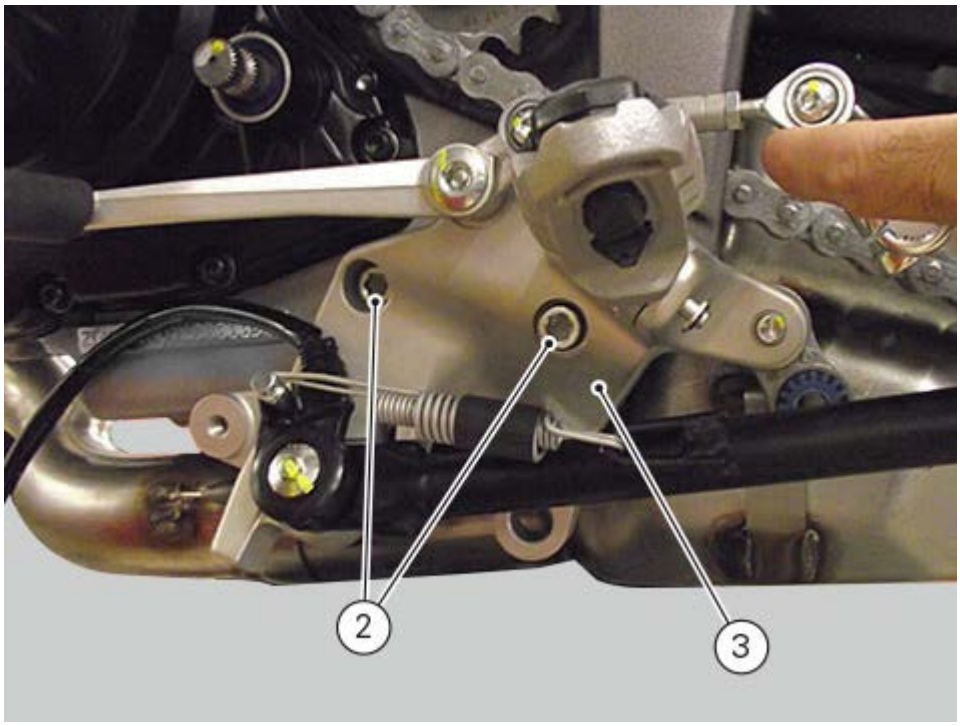

1

Removing the side stand

Disconnect connector (A) of the stand switch (1) from the main wiring.

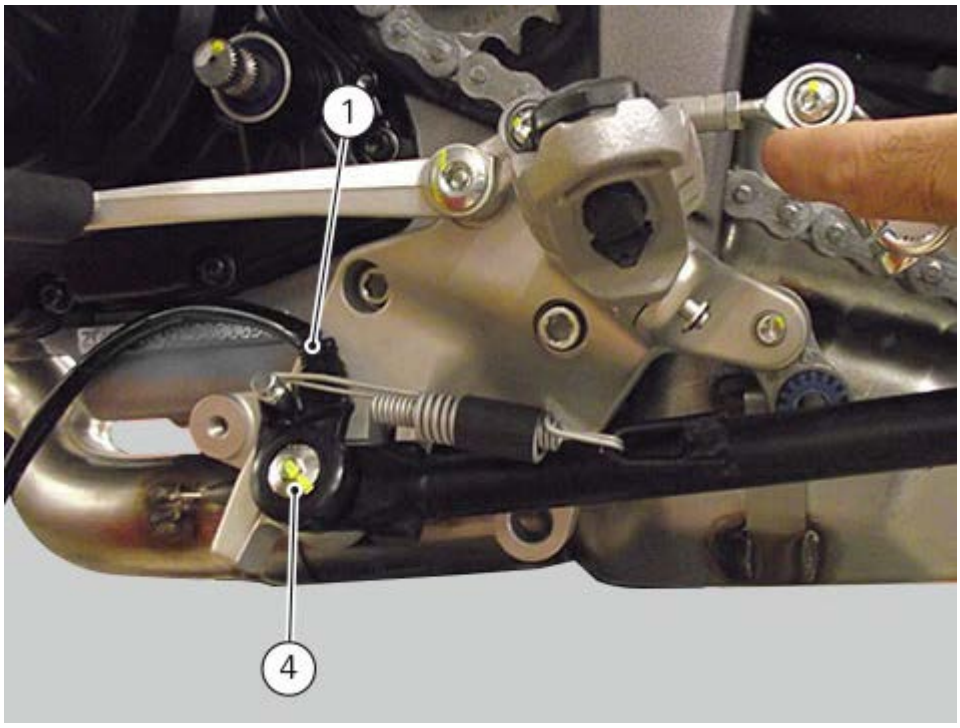


Undo the two fastening screws (2) of the side stand support plate (3) to the engine and remove the complete side stand.

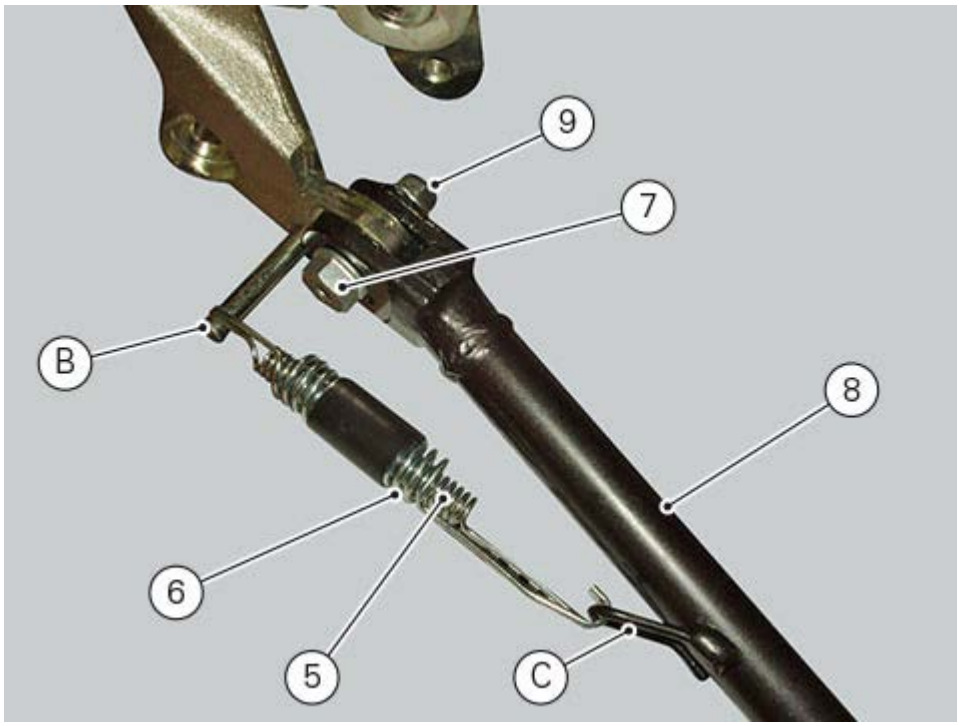


Disassembling the side stand

Undo the retaining screw (4) and remove the side stand switch (1).



Release stand return springs (5) and (6) disengaging them from retainers (B) and (C).
Unscrew the pin (7) securing the side stand to the bracket and remove side stand (8) and nut (9).

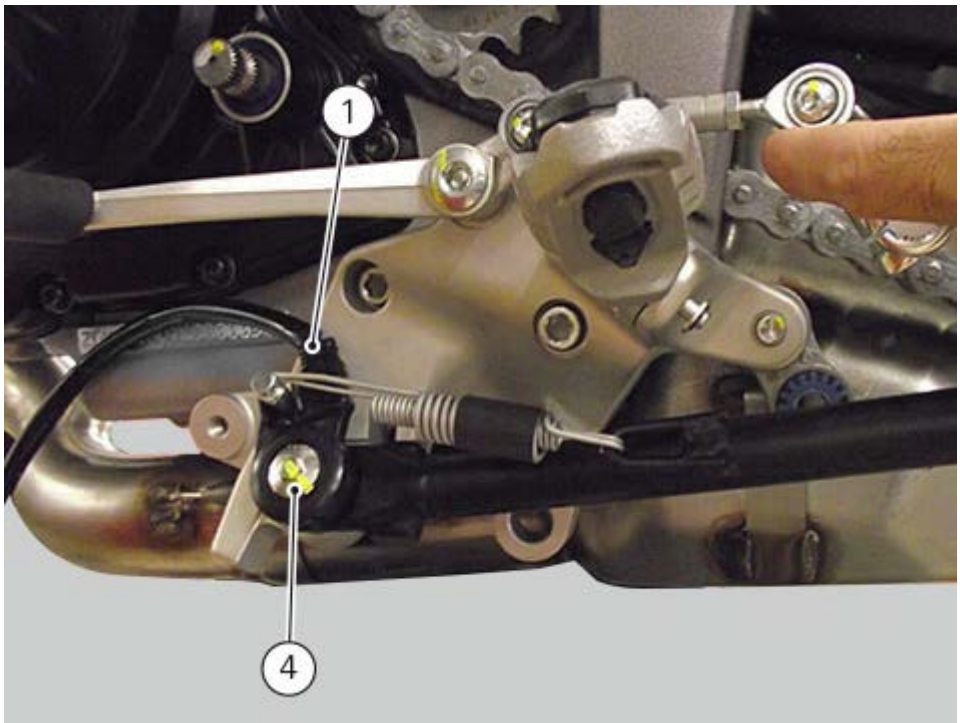


Inspecting the side stand

Fit the side stand to the plate and check that there is no excessive clearance. Ensure that the ends of the side stand are not bent with respect to the shank.

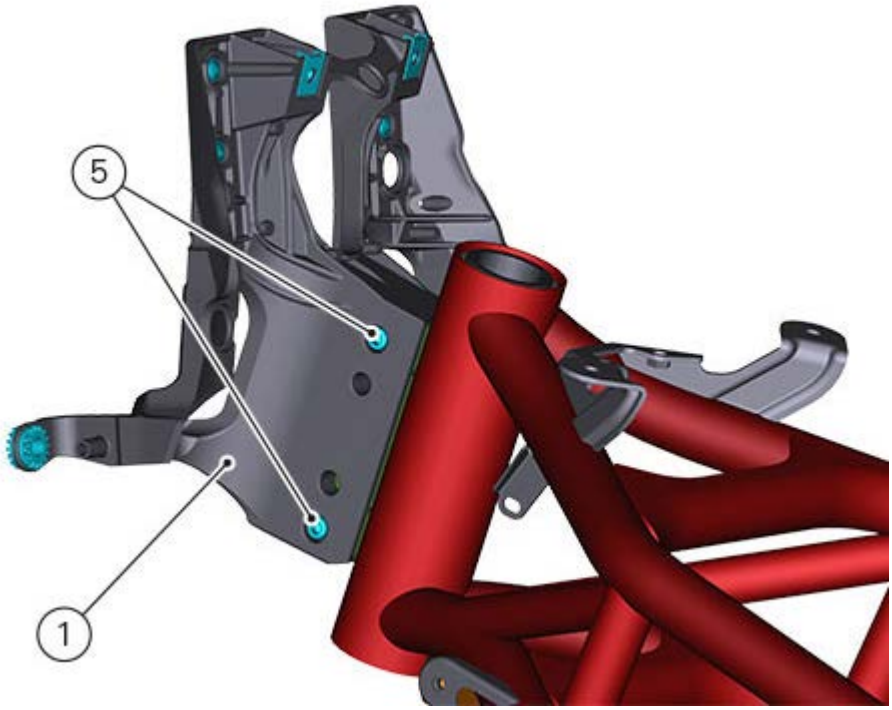
A side stand which shows signs of cracking must be replaced immediately.

Check switch (1) operation.



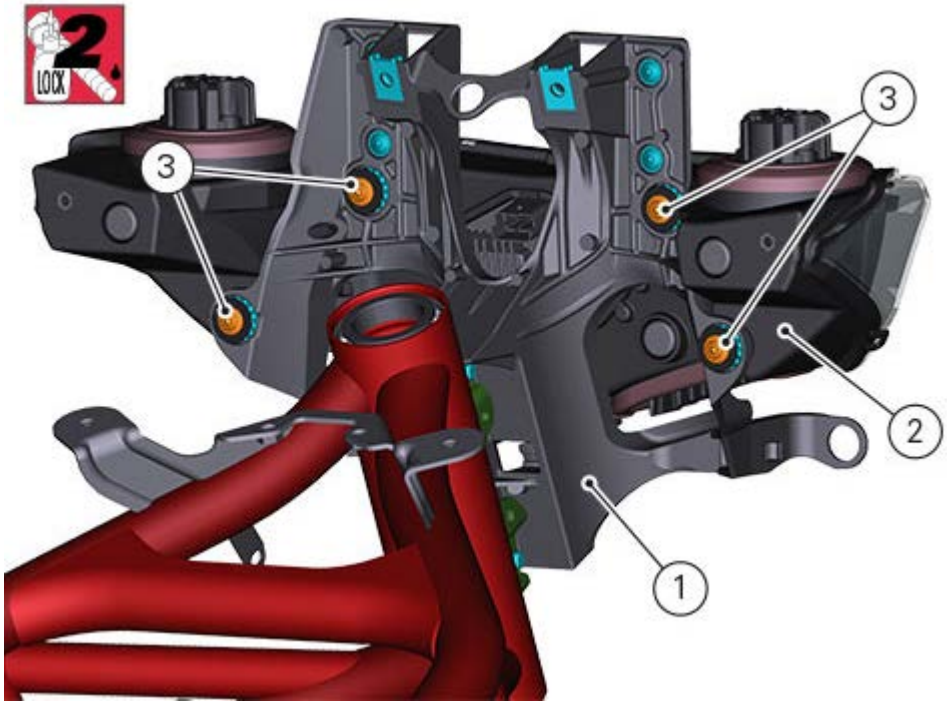
Refitting the light assembly

Position the light assembly support (1) onto steering tube, and lock it in place by starting screws (5).
Tighten screws (5) to a torque of 25 Nm ± 10%.



Lay wiring front branch on headlight support (1), and position cable ring.
Secure wiring in place using clamps (4).

Fit front light assembly (2) on headlight support (1).
If screws (3) are not new, apply the specified threadlocker.
Start screws (3) and tighten them to a torque of 5 Nm ± 10%.



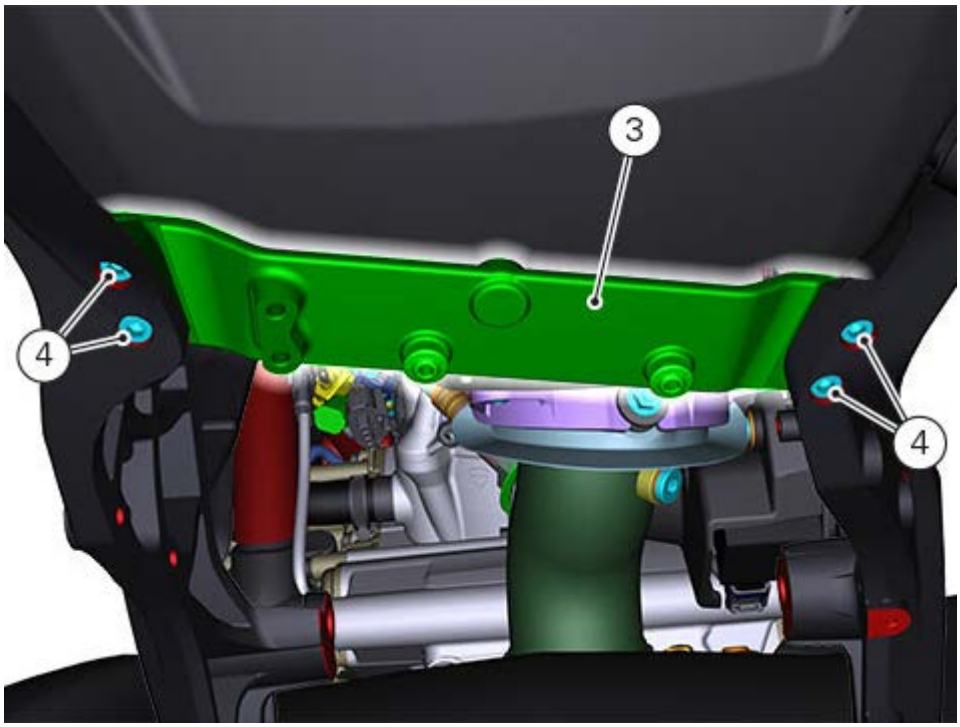
Refit the side panels (Refitting the panel).

Refitting the side plates

Before reassembling, loosen all frame retaining screws.
Then, proceed with the reassembling following the screw tightening sequence indicated in chapter "Refitting the structural parts and frame".

Then fix the rear grab handle (Refitting the side body panels and the tail guard).

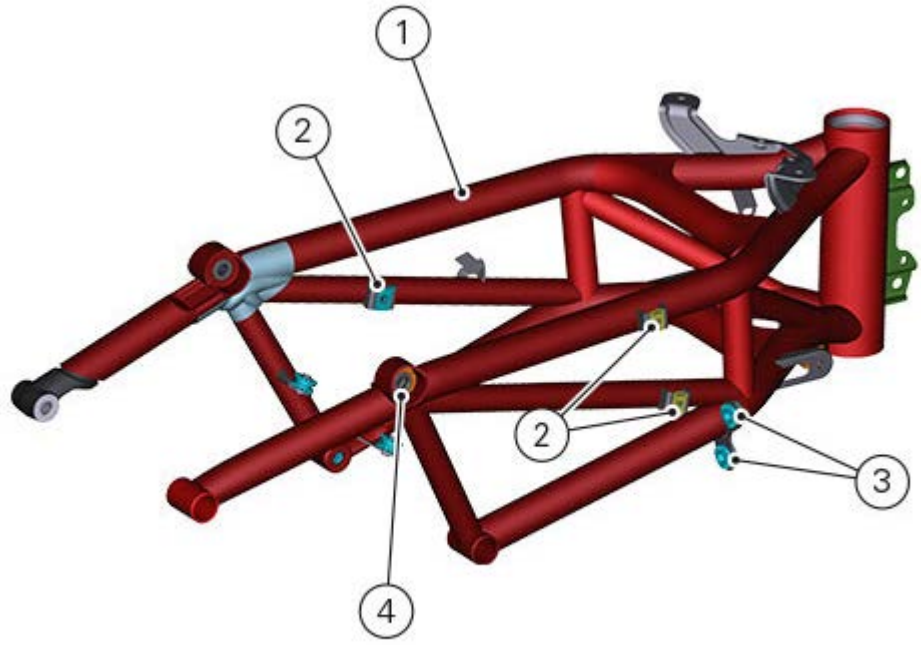
Refit the subframe lower bracket (3) and tighten the screws (4) to a torque of 10 Nm ± 10%.

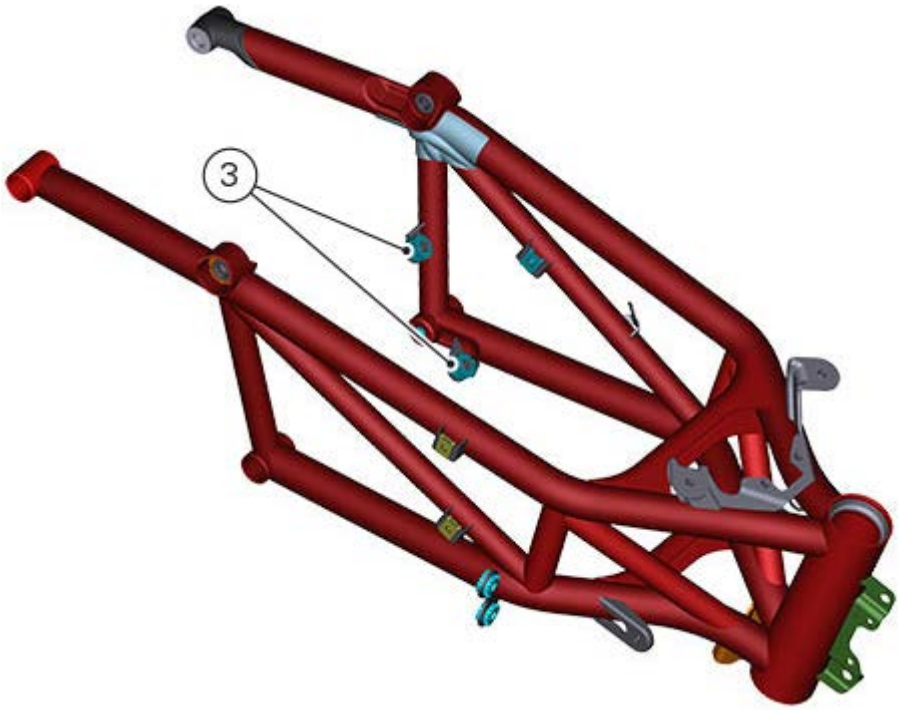


Refit the number plate holder (Refitting the number plate holder).
Refit the rear wheel (Refitting the rear wheel).
Reconnect the rear brake sensor.
Refit the rear footpegs (Refitting the rear footpegs).
Refit the sump guard (Refitting the sump guard).
Refit the side stand (Refitting the side stand).
Refit the gear shift (Refitting the gear shift).
Refit the exhaust silencer (Refitting the exhaust silencer).
Refit the side body panels (Refitting the side body panels and the tail guard).
Refit the seats (Refitting the seat).

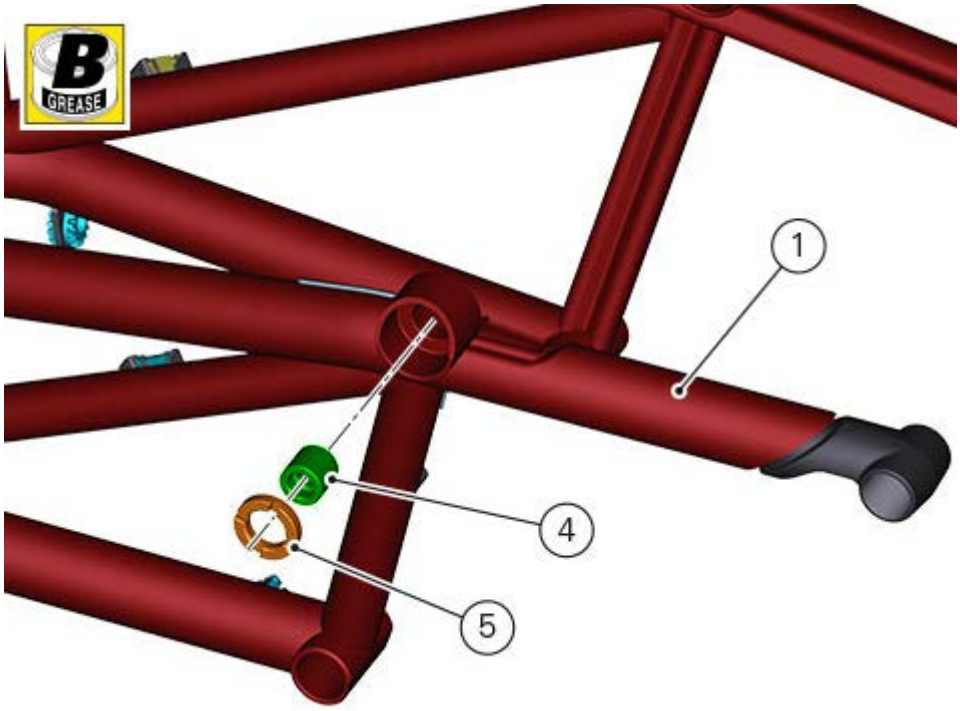
Refitting the structural parts and frame

Check that on frame (1) there are clips (2), elements (3) and adjusters (4).





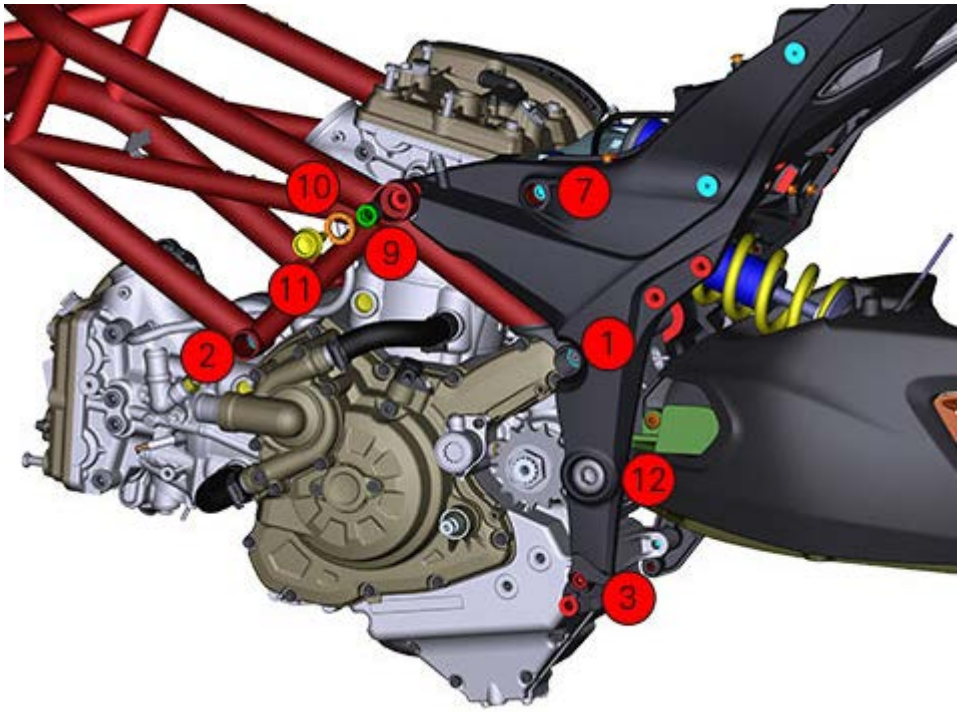
Apply the indicated grease on the threads of adjusters (4) and ring nuts (5).
Manually screw the adjusters.

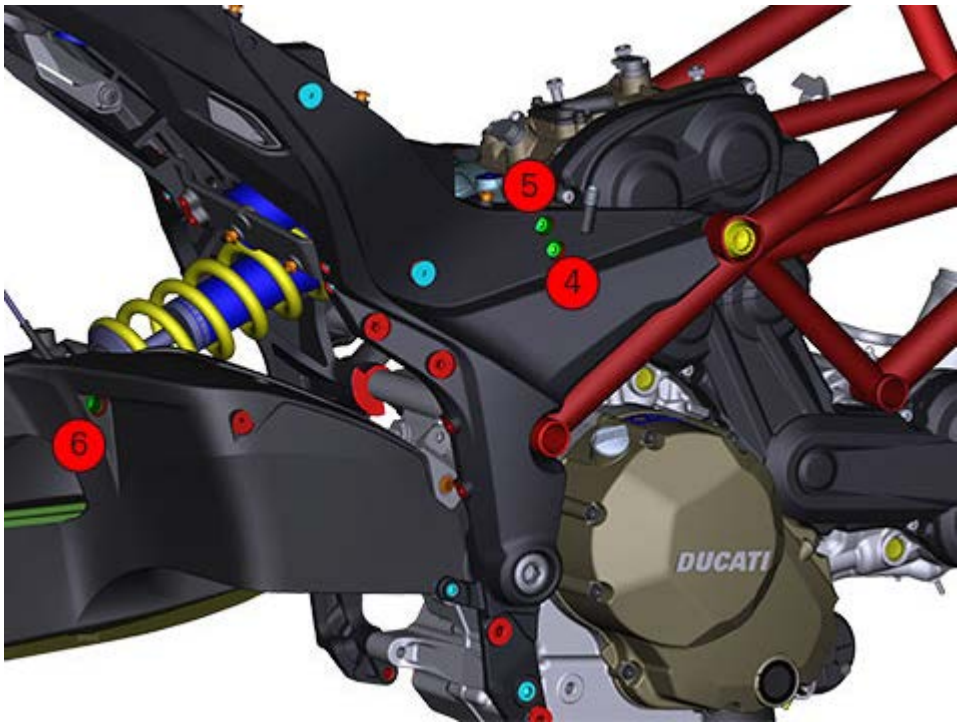


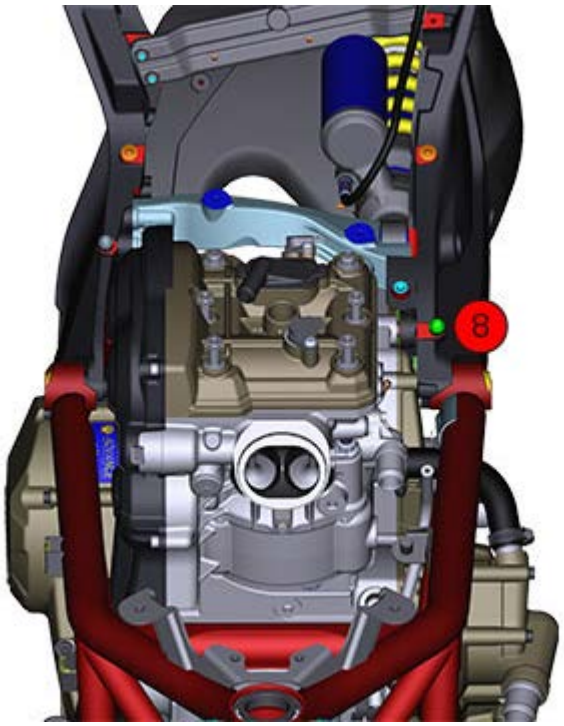
When refitting frame, engine and rear plates, respect the following screw tightening sequence to the relevant torque, by alternating screws on the left and on the right side of the vehicle.

POSITION	DESCRIPTION	TORQUE	PRODUCT
1	Frame special screw	60 Nm ± 10%	-
2	Frame special machined screw	60 Nm ± 10%	-
3	Frame lower retaining screw	40 Nm ± 10%	LOCK 2
4	Shock absorber bracket retaining side screw	25 Nm ± 10%	GREASE B

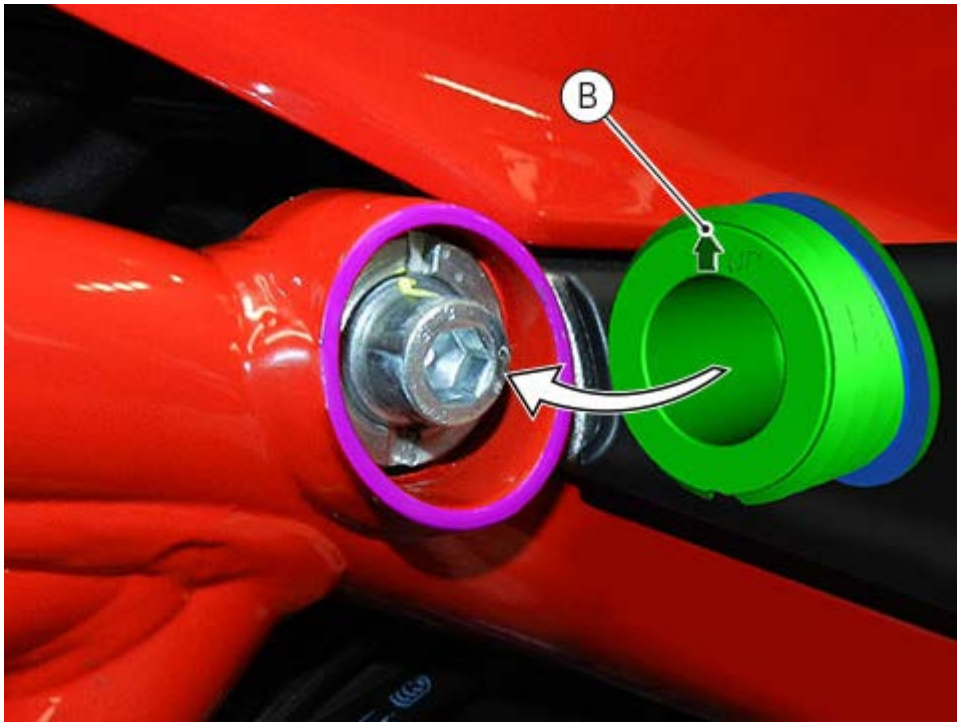
5	Shock absorber bracket retaining side screw	25 Nm ± 10%	GREASE B
6	Rear shock absorber lower retaining screw	42 Nm ± 10%	GREASE B on thread and underhead
7	Rear shock absorber upper retaining screw	42 Nm ± 10%	GREASE B
8	Shock absorber bracket retaining front screw	25 Nm ± 10%	-
9	Adjuster screw	Manually, fully home	-
10	Adjuster ring nut	80 Nm ± 10%	-
11	Adjuster blanking plug	50 Nm ± 10%	-
12	Swinging arm pivot plug	50 Nm ± 10%	-







Apply three drops of adhesive in the RH and LH plugs at 120° one from the other.
Remember to point the arrows (B) as shown in the figure.



Fit the tail guard (Refitting the tail guard).

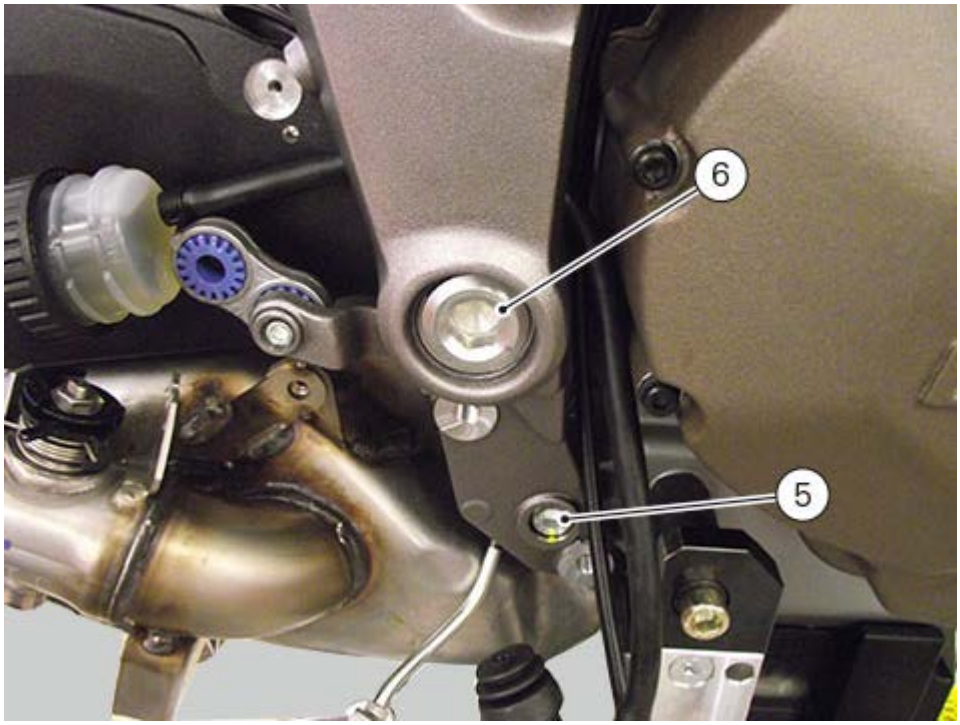
Removing the side panels

Remove the seats (Removing the seat).
Remove the side body panels (Removing the side body panels and the tail guard).
Remove the exhaust silencer (Removing the exhaust silencer).
Remove the gear shift (Removing the gear shift).
Remove the side stand (Removing the side stand).
Remove the sump guard (Removing the sump guard).
Remove the rear footpegs (Removing the rear footpegs).
Remove the rear wheel (Removing the rear wheel).
Remove the rear shock absorber (Removing the rear shock absorber).
Remove the number plate holder (Removing the number plate holder).
Remove the glove compartment (Removing the glove compartment).

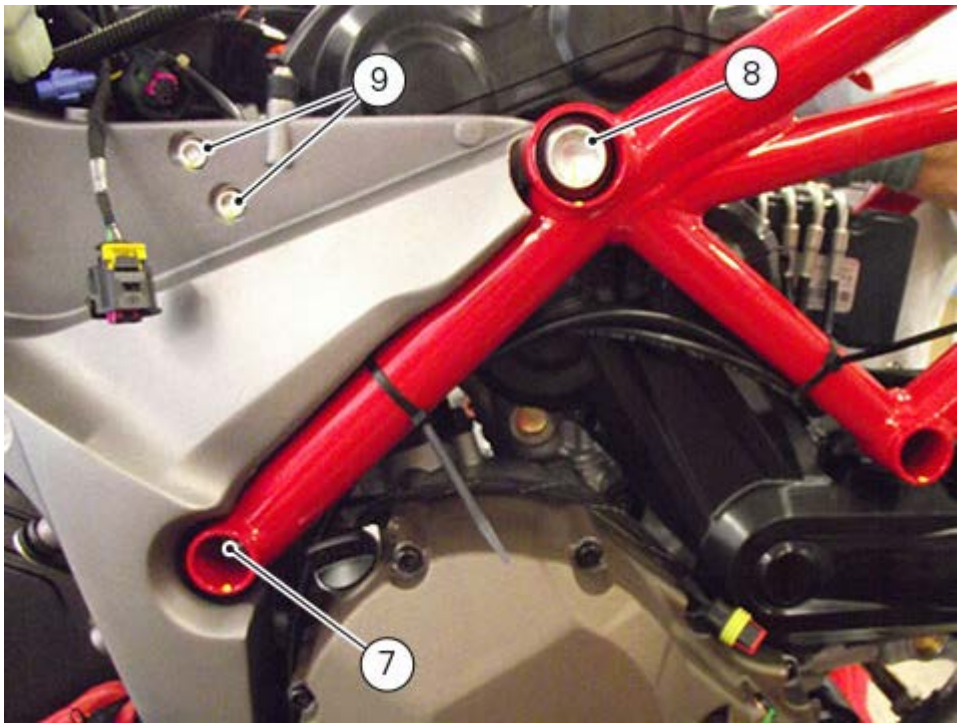
Release the rear brake reservoir (1) by loosening screw (2).

Remove the rear subframe lower bracket (3) by loosening the screws (4).

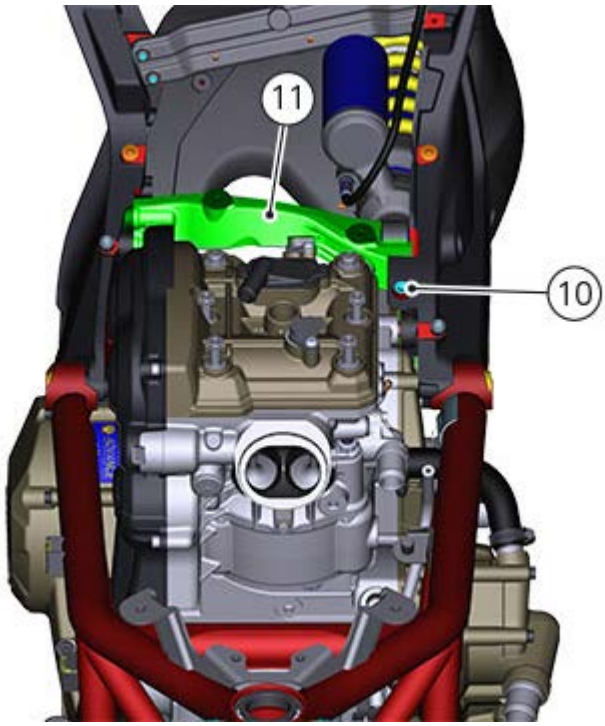
From both sides of the vehicle loosen screw (5) and the swingarm shaft plug (6).



Loosen screw (7), plug (8) of the adjuster, and from the vehicle right side the two screws (9) retaining the shock absorber upper bracket.

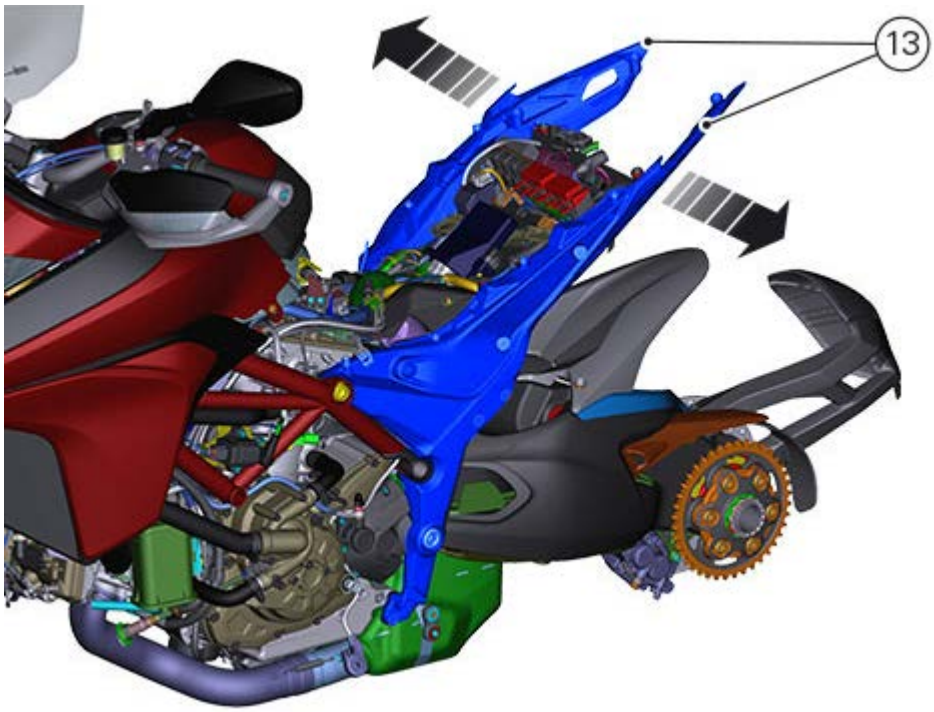


Remove the front screw (10) that retains the shock absorber upper bracket (11).



Loosen ring nut (12) of the adjuster.

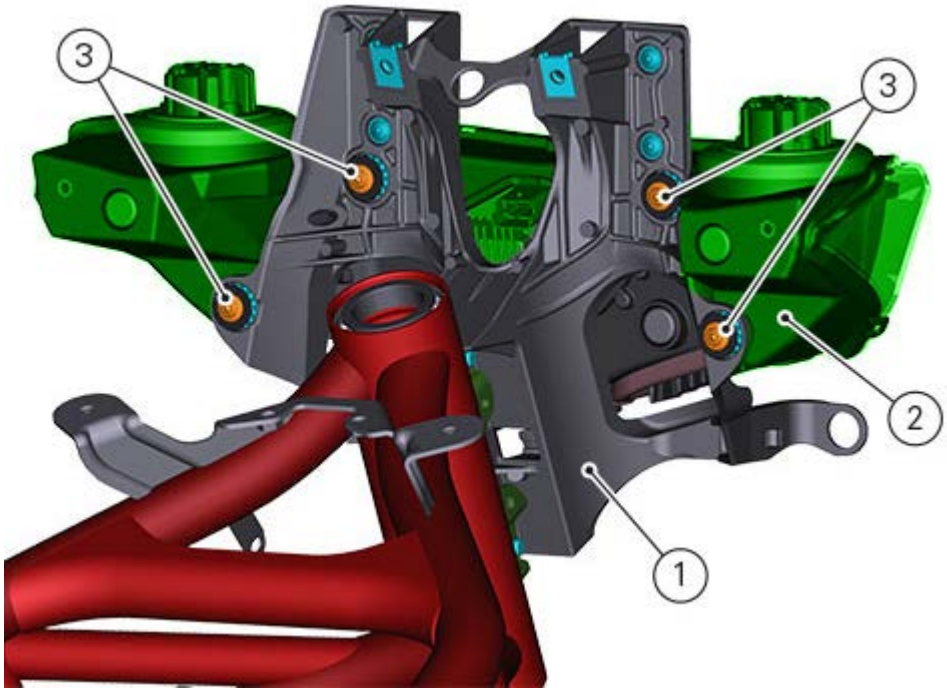
Remove the two lateral plates (13).


13

Removing the light assembly

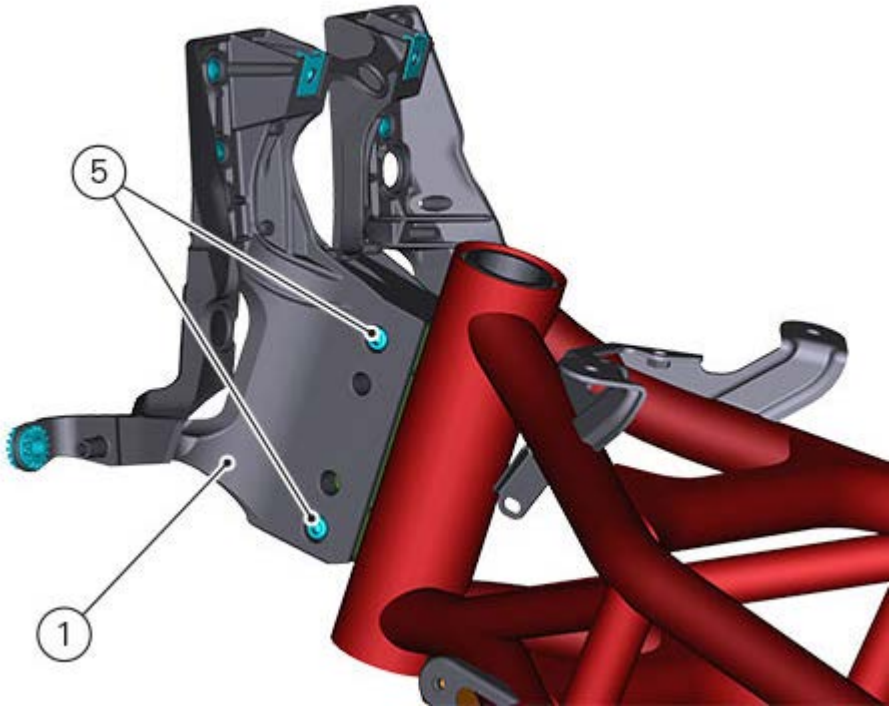
Remove the side panels (Removing the panel).

Loosen screws (3) and remove the front headlight assembly (2) from the front headlight assembly unit (1).



Remove ties (4) and release the whole wiring from the headlight support (1).

Loosen screws (5) and remove the complete headlight assembly support (1).


5
1

Removing structural components and frame

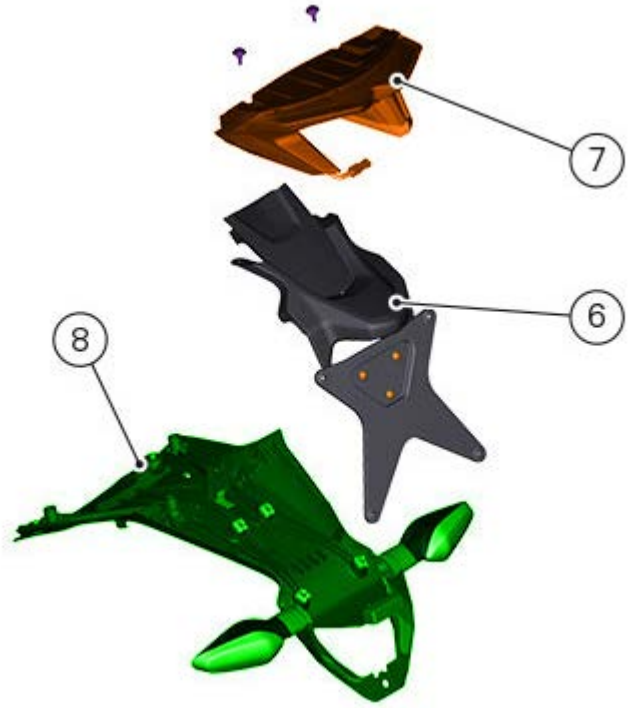
Before carrying out dimensional checks on the frame, remove all the fitted superstructures, referring to the removal procedures outlined in the relevant sections of this manual.
The rear subframe is a structural component of the frame.
Both serve to support motorcycle superstructures and must therefore be in perfect condition.

The list below indicates the components to be removed in a logical order.
Remove the seats (Removing the seat).
Remove the sump guard unit (Removing the sump guard).
Remove the instrument panel internal covers (Removing the panel).
Remove the fuel tank (Removing the fuel tank).
Remove the airbox, the throttle body, the blow by and the oil breather pipe (Removing the airbox and throttle body).
Remove the secondary air system pipes and valve (Removing the secondary air system).
Remove the supply system and the injectors from the intake manifolds.
Disconnect the caps from the spark plugs (Replacing the spark plugs).
Remove the exhaust system (Removing the exhaust system).
Drain the lubrication system (Changing the engine oil and filter cartridge).
Drain the coolant (Changing the coolant).
Remove the cooling system hoses and unions from the engine block (Removing cooling system hoses and unions).
Remove the water radiator lower retainer from the engine (Removing the water radiator).
Disconnect the starter motor/solenoid starter cable (Removing the starter motor).
Remove the gear shift (Removing the gear shift).
Remove the clutch slave cylinder (Removing the clutch slave cylinder).
Remove the front sprocket (Removing the front sprocket).
Remove the side stand (Removing the side stand).
Remove the engine block from frame.

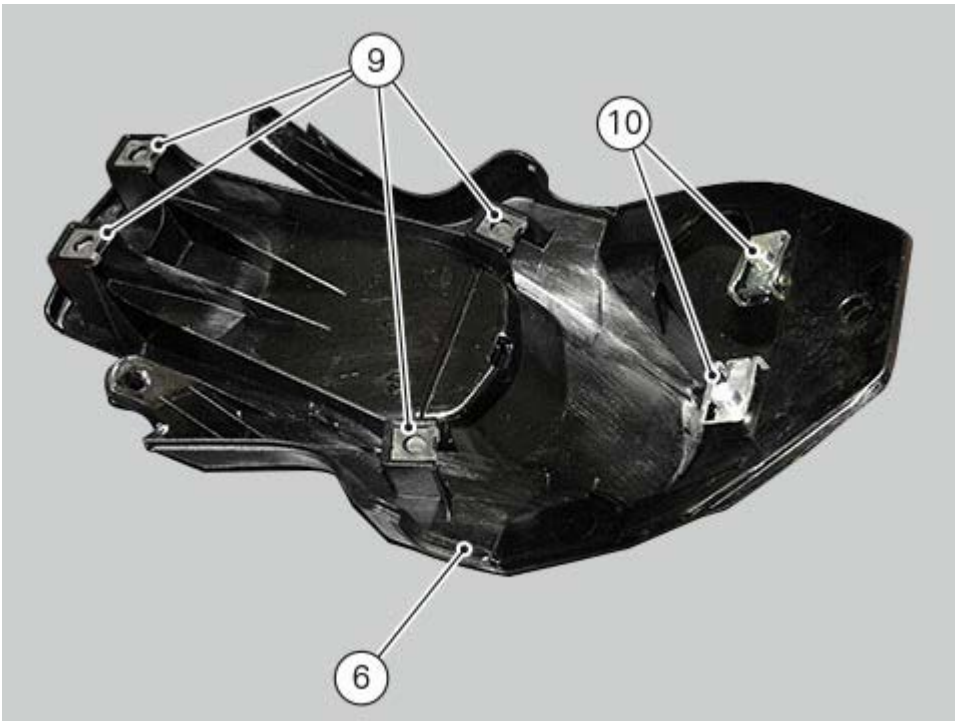
Refitting the number plate holder

If previously removed, fit the number plate holder/tail light as follows.

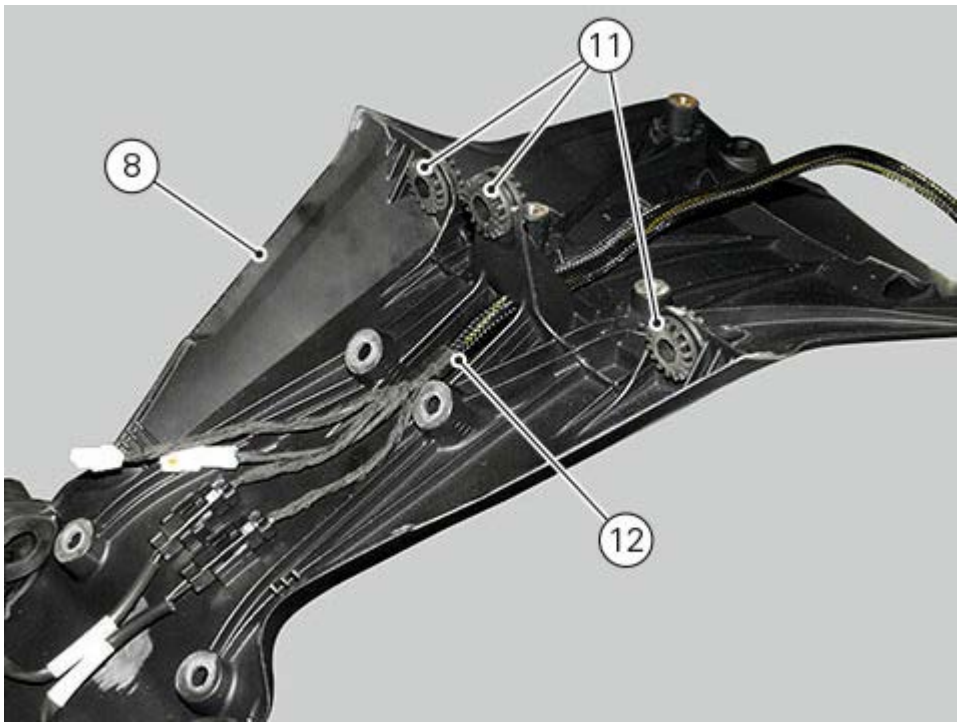
The number plate holder (5) consists of three parts:
6) number plate holder;
7) tail light;
8) number plate holder cover.

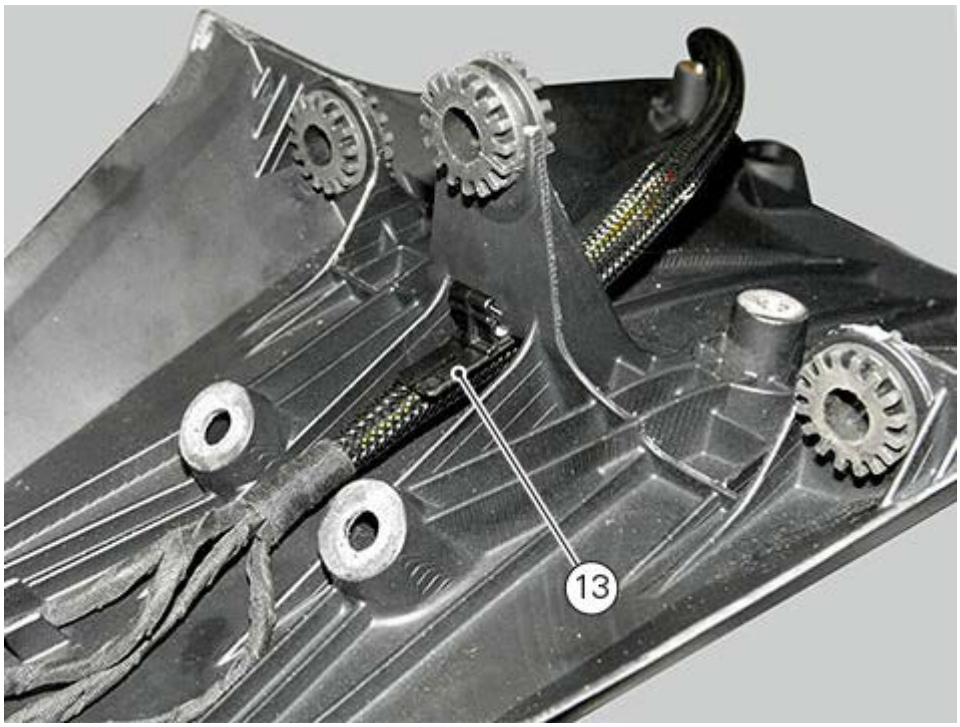


Make sure that clips (9) and (10) are present on number plate holder (6).

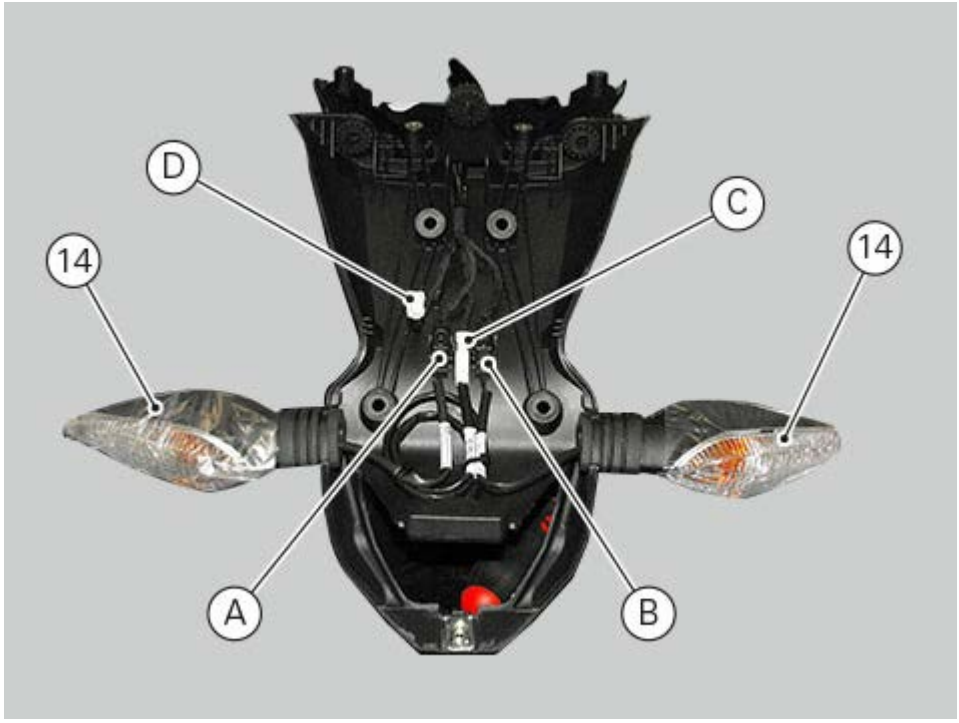


Fit the three rubber elements (11) in the number plate holder cover (8) and position the wiring (12).
Insert the cable ring (13).

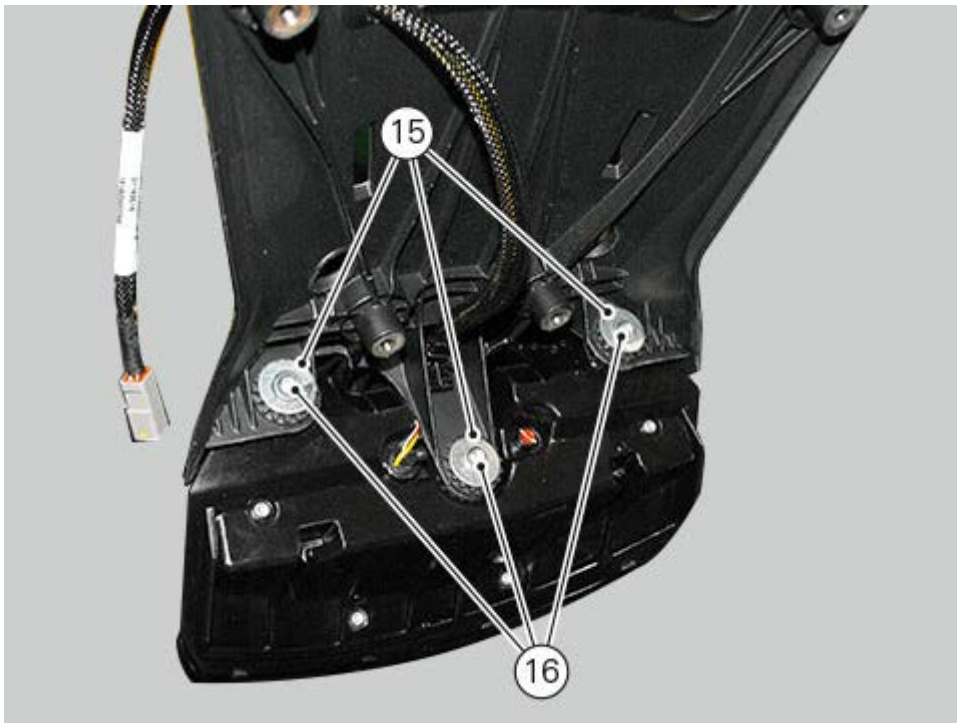




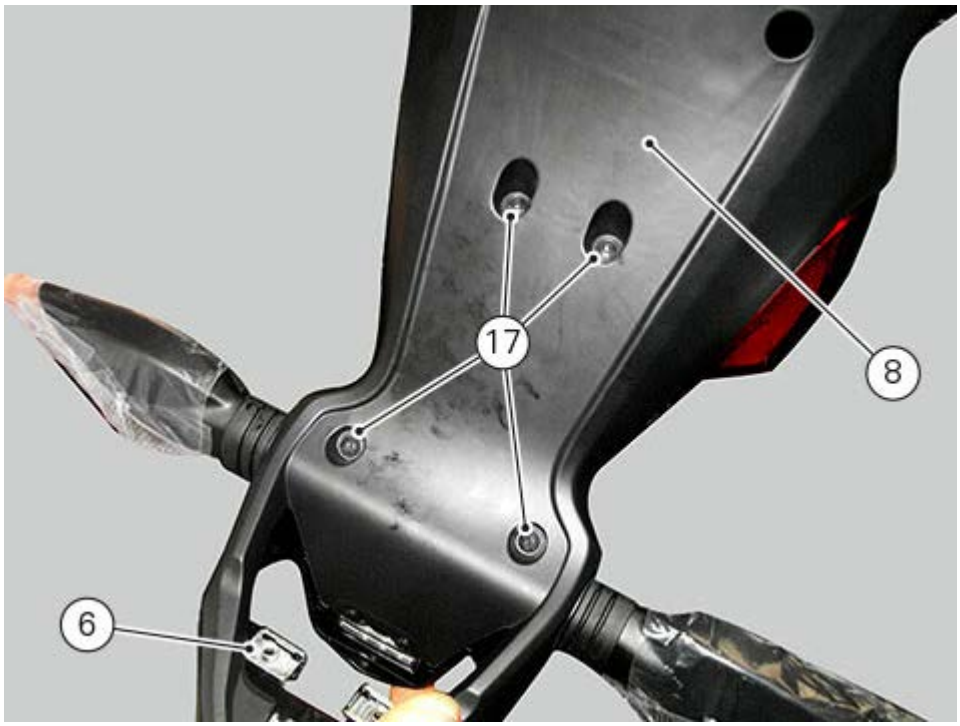
Fit the two turn indicators (14) and the wiring as shown in the figure:
A) Left turn indicator;
B) Right turn indicator;
C) Number plate light;
D) Tail light.



Connect the tail light and fix it by means of screws (16) with washer (15).



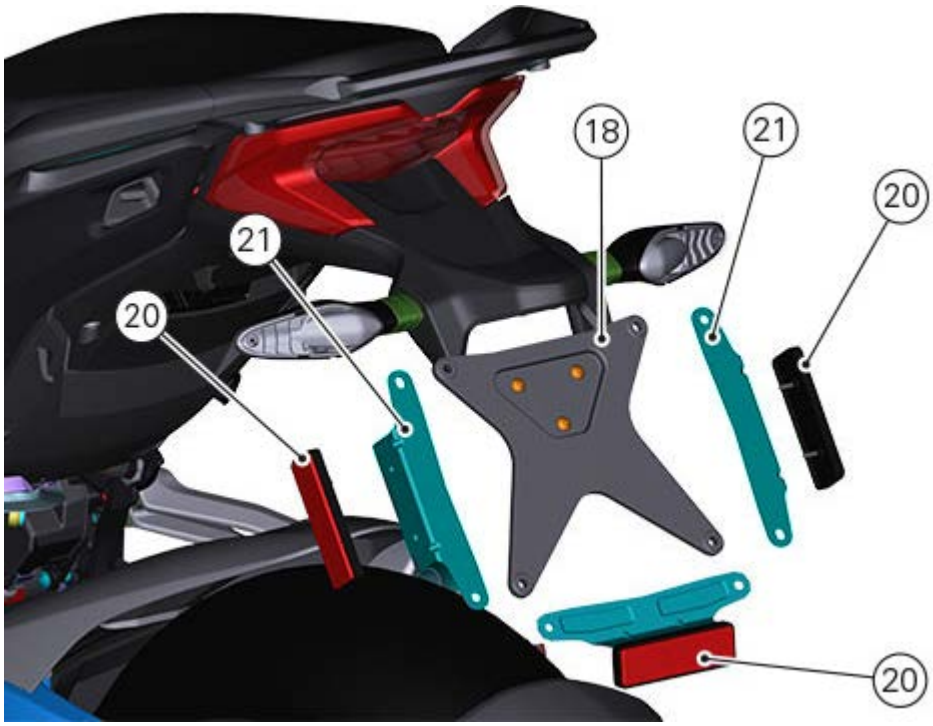
Fix the number plate holder (6) to cover (8) by means of screws (17).



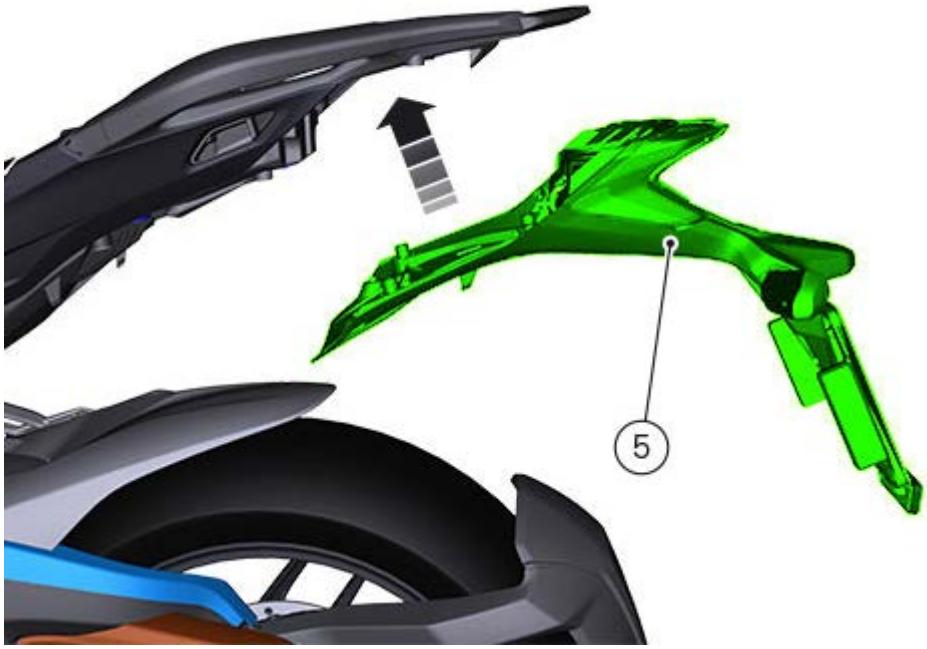
Fit the number plate holder plate (18) by tightening screws (19).

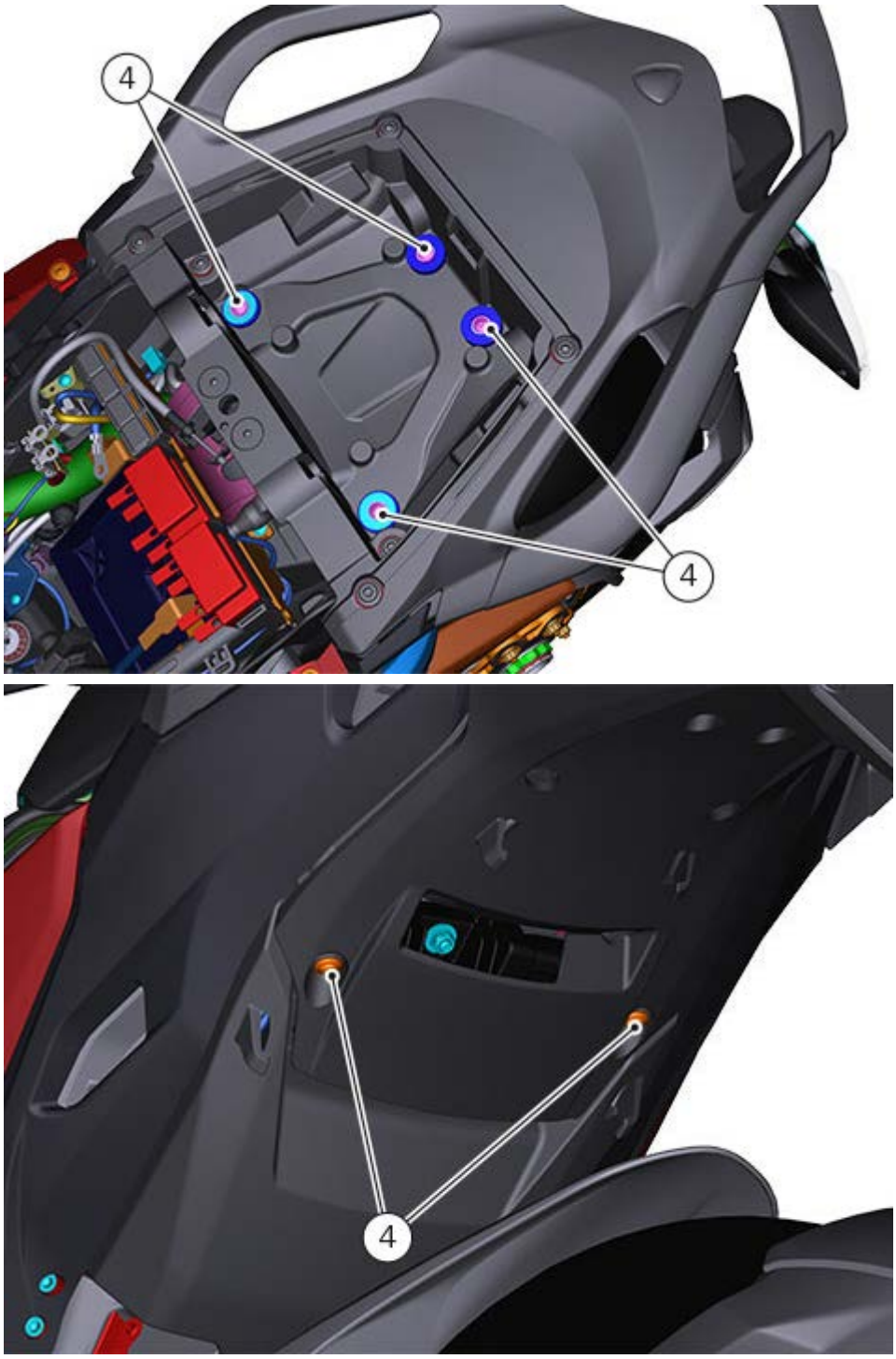
USA version

For this version, fit also cat's eye (20) with brackets (21) in the number plate holder.



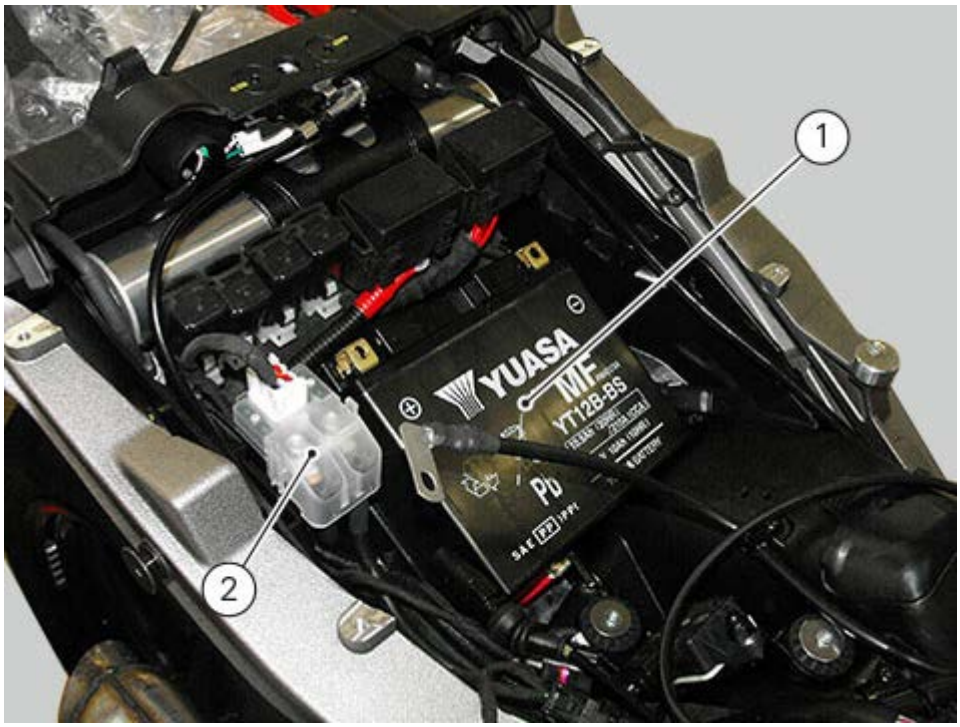
Insert the number plate holder assembly (5) in the rear subframe and fix it with screws (4).





Connect the connector (3).

Refit the ignition relay (2) and the battery (1).

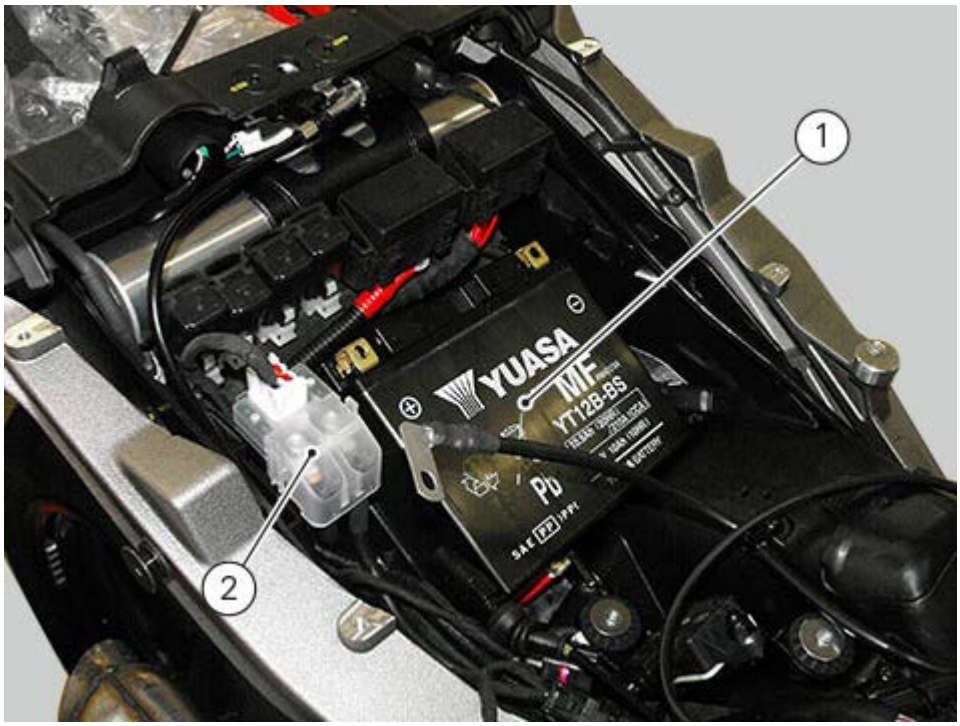


Refit the rider and passenger seats (Refitting the seat).

Removing the number plate holder

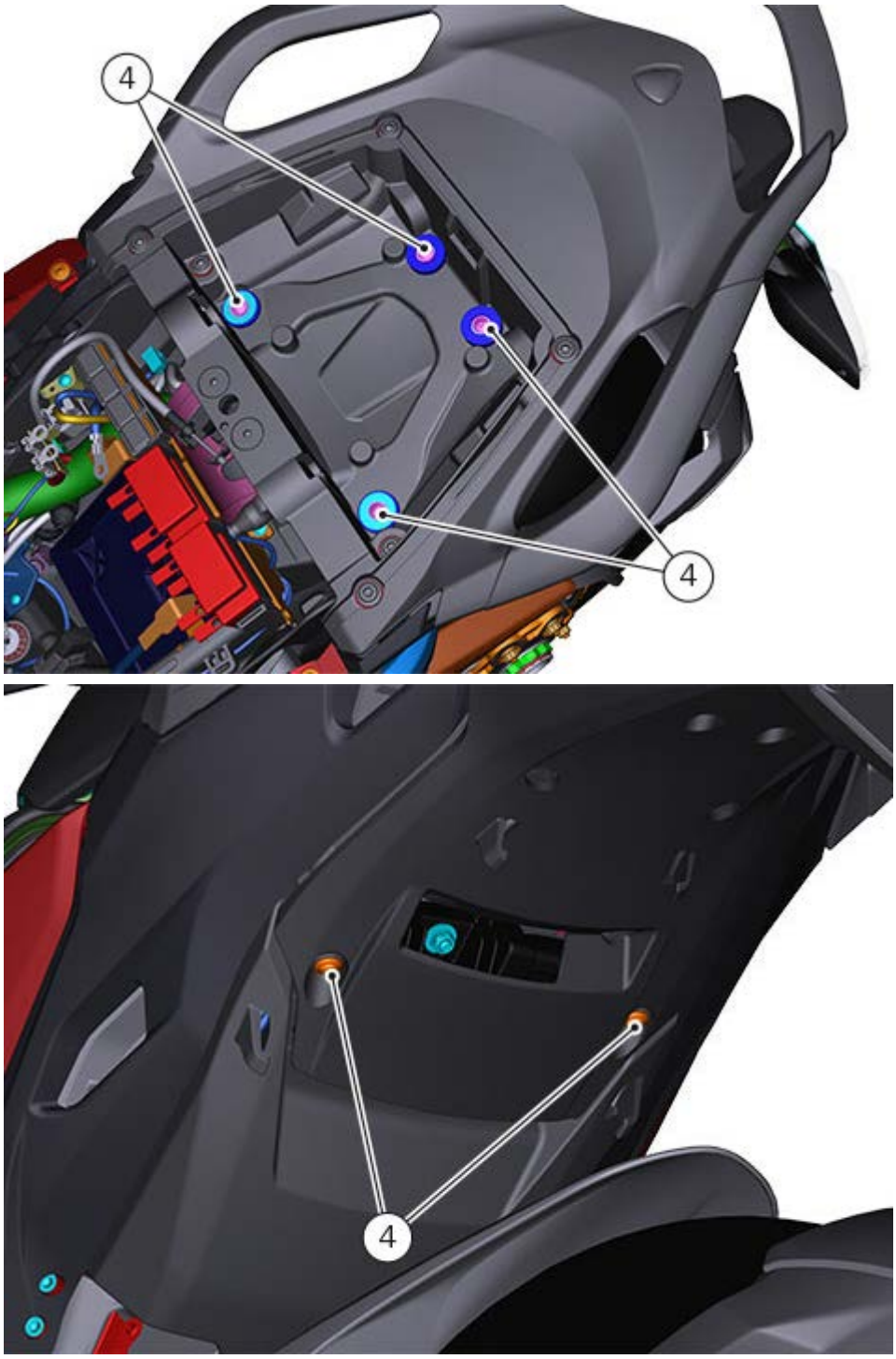
Remove the rider and passenger seats (Removing the seat).

Remove the battery (1) as described in paragraph "Battery" and the starter relay (2).

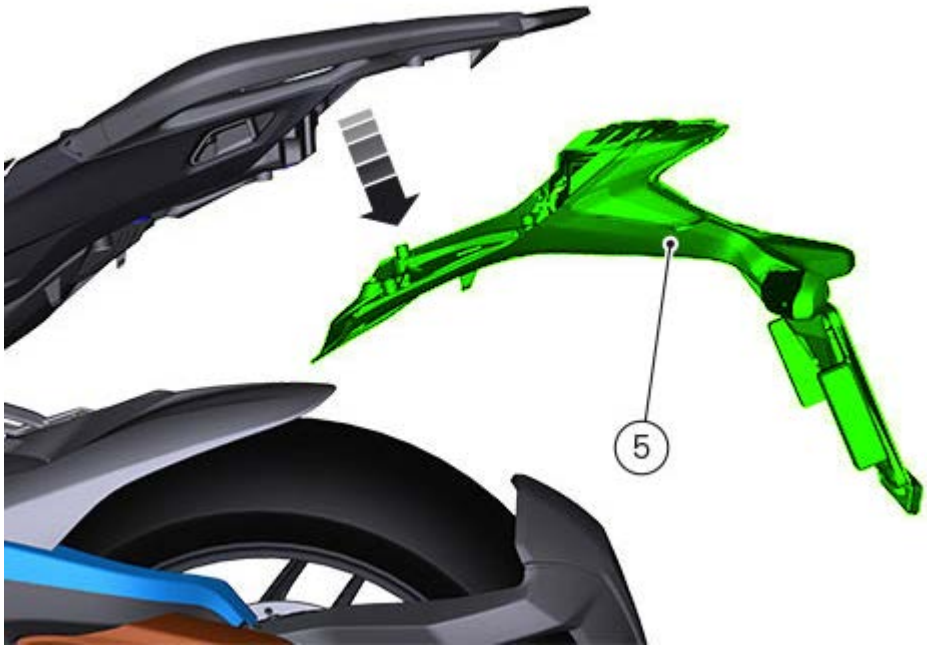


Release the wiring from any tie and disconnect the tail light connector (3).

Loosen the four upper retaining screws (4) of the number plate holder and the two lower ones.



Remove the number plate holder (5).

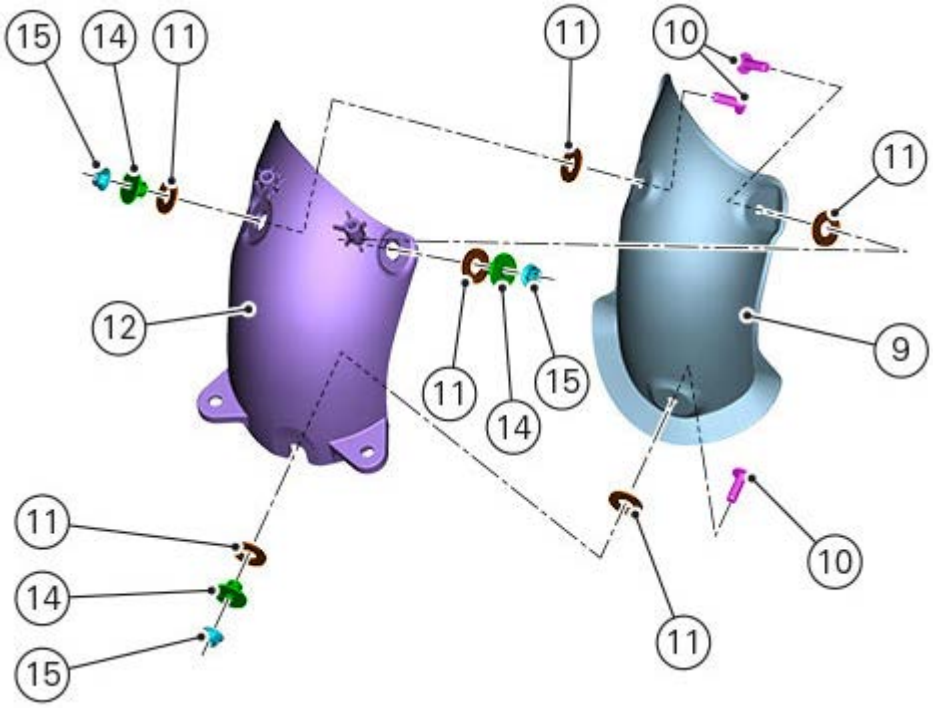

5

Refitting the electric components compartment

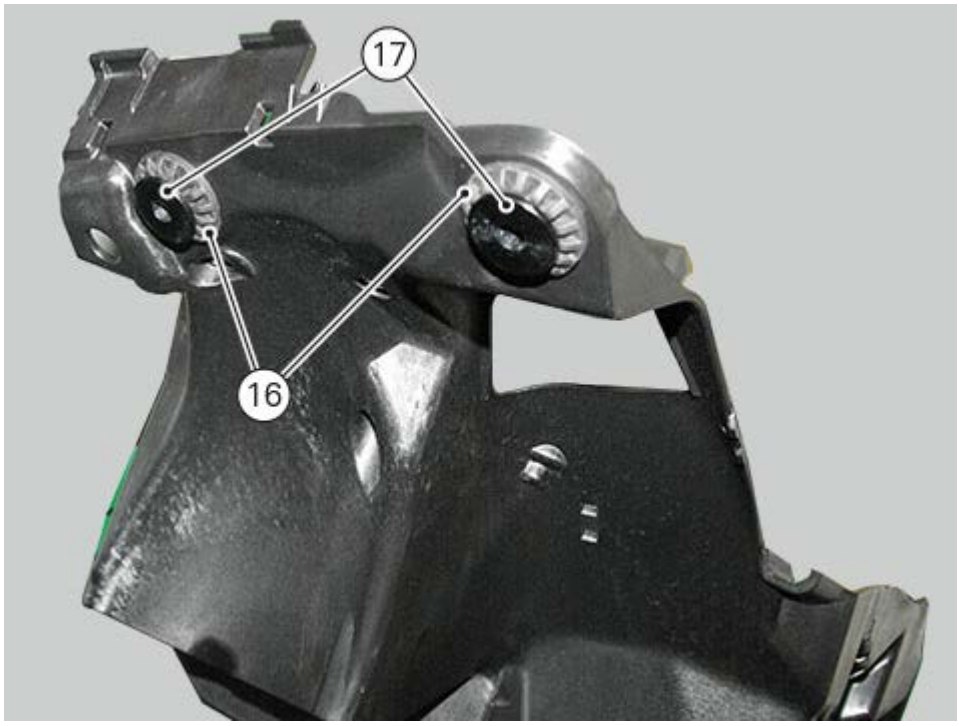
If previously removed, fit the electrical components compartment as follows.

Reassembling the heat guard

Position the heat guard sheet (9), insert three screws (10) and washer (11).
Fit on screws (10) the plastic heat guard (12) with washer (13).
Tighten the heat guard sheet (9) with plastic heat guard (12) by means of nuts (15) and washer (14).

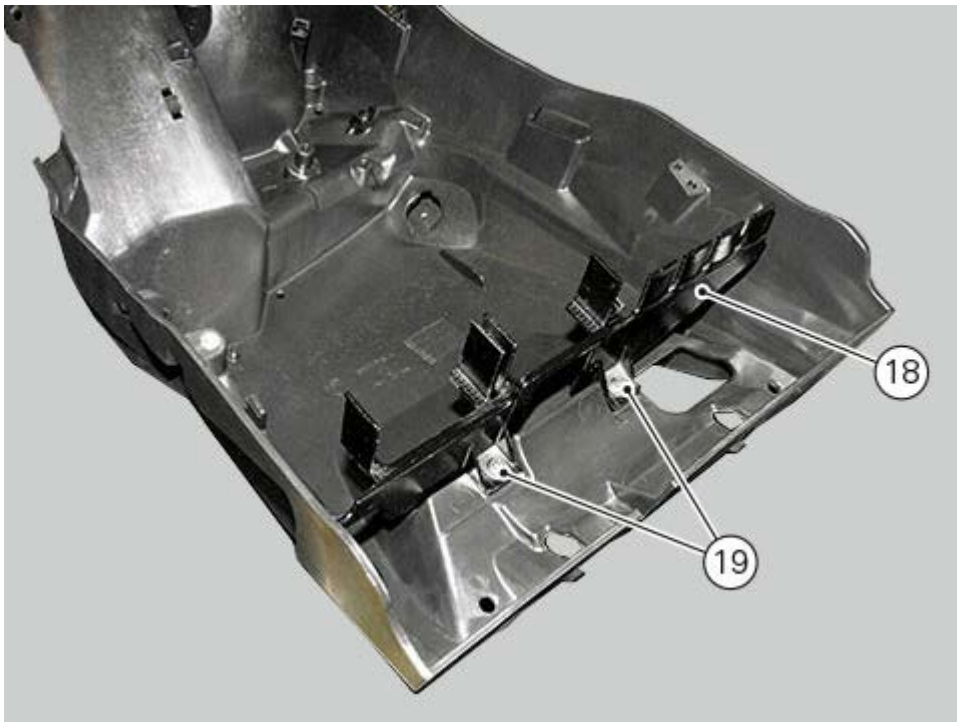


Fit the two rubber elements (16) with spacer (17) in the compartment front part.

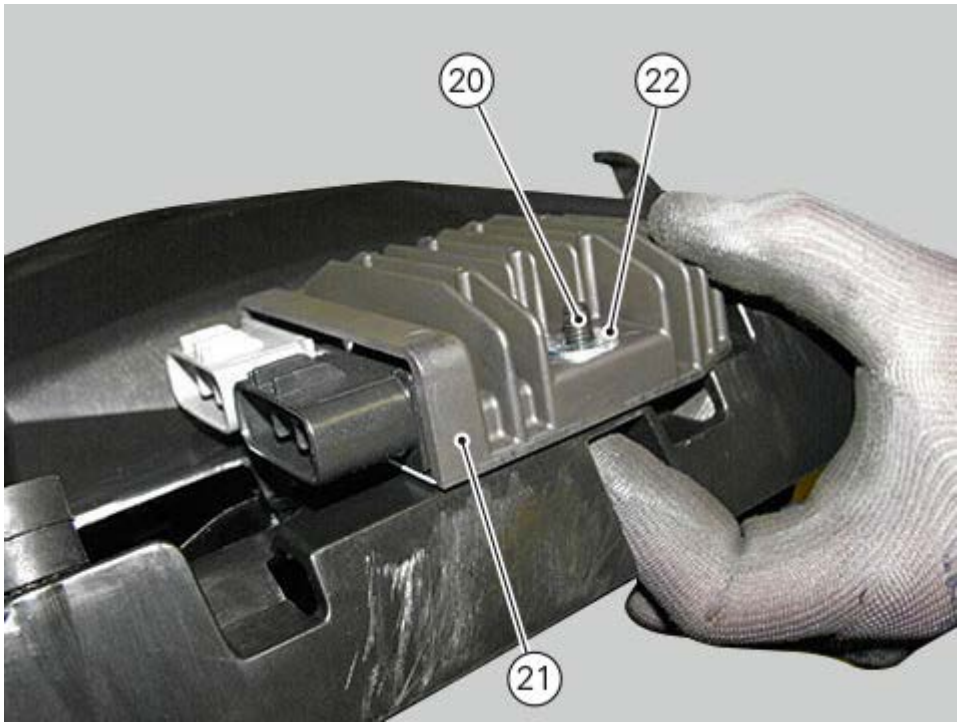


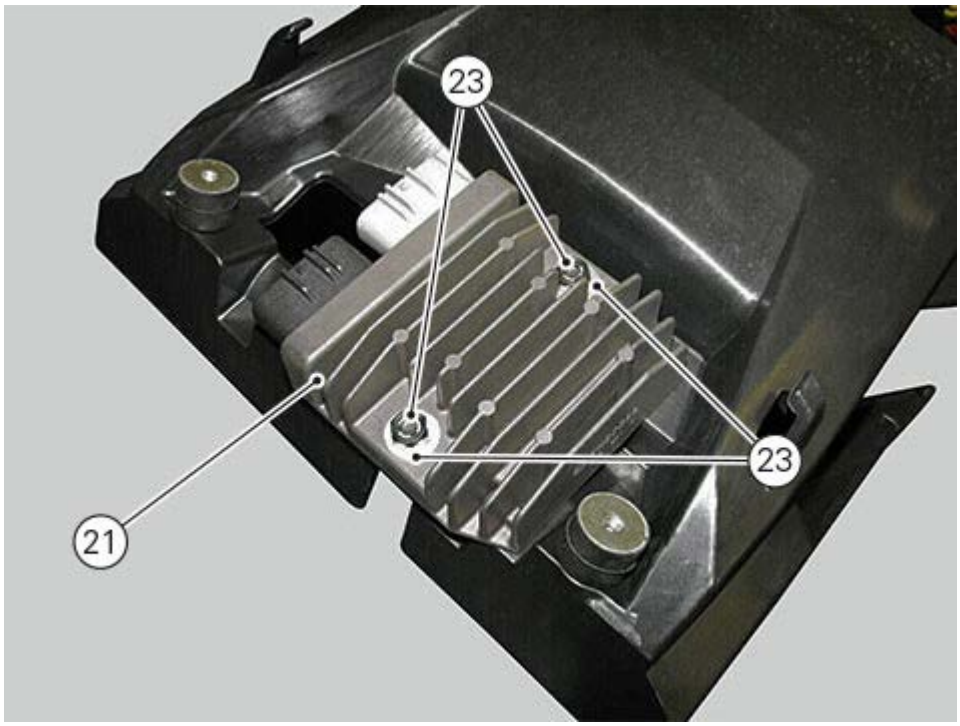
Fitting the fuse support and the regulator

Insert the fuse support (18) and fix it with screws (19).

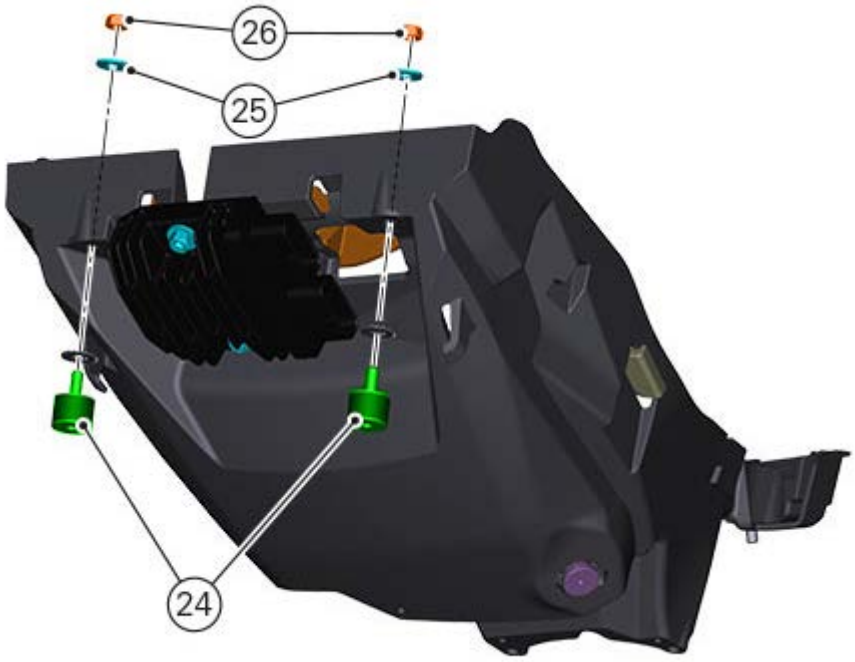


Tighten the two screws (20) securing voltage regulator (21).
Fit washer (22) and tighten with nut (23).





Fit the two vibration damping pads (24), block them with the two nuts (23) and washers (22).



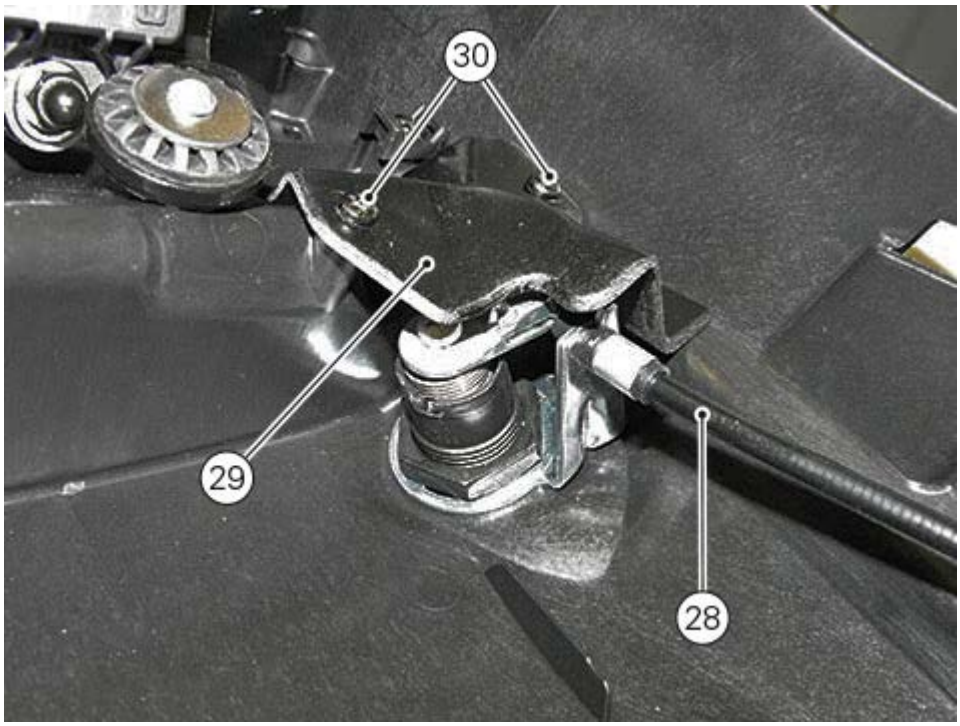
Fitting the seat lock

Fit the lock in the suitable seat (25) of the electrical components compartment by engaging the lock tabs in the relevant recesses.

Fit plate (26) by engaging lock tabs (A) and (B) in the recesses.

Fix the lock by starting nut (27).
Tighten the nut to the specified torque.

Insert latch cable (28) and position its bracket (29) and fix it with screws (30).

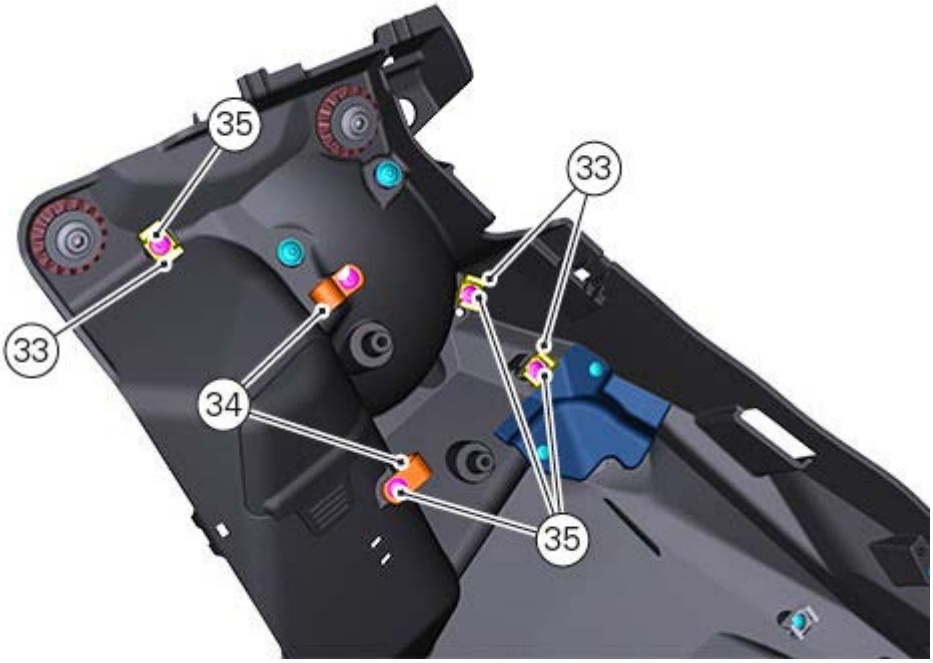


Installing the heat guard on the compartment

Position the heat guard and fix to the bottom part of the electrical components compartment by means of the two screws (31).
In the upper part, fix the heat guard with the two screws (32).

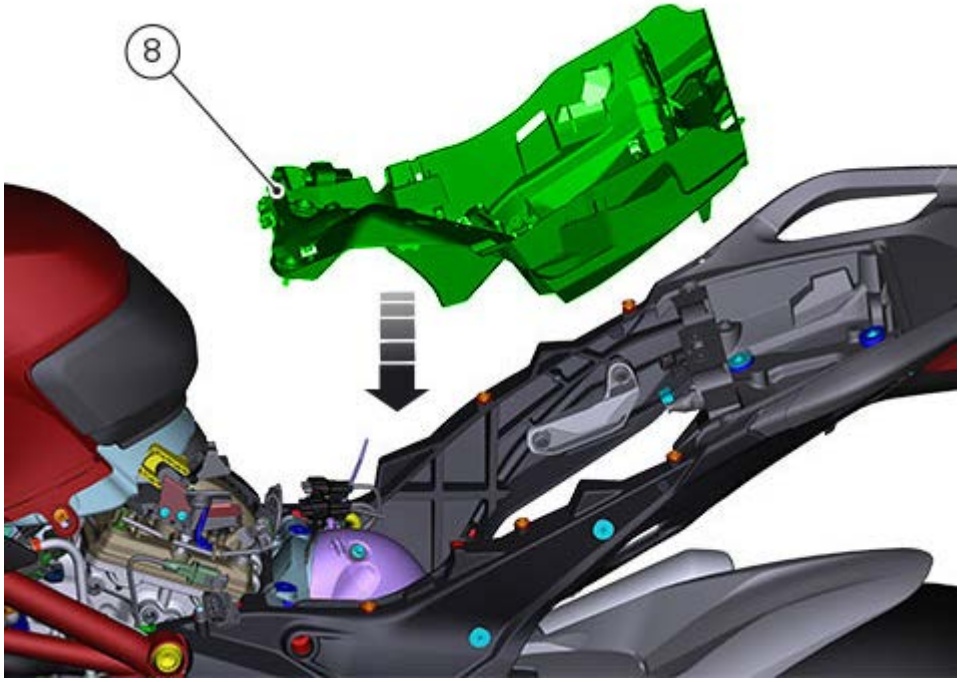
Fitting supports and hose clips

Position supports (33) and cable rings (34) and fix them with screws (35).

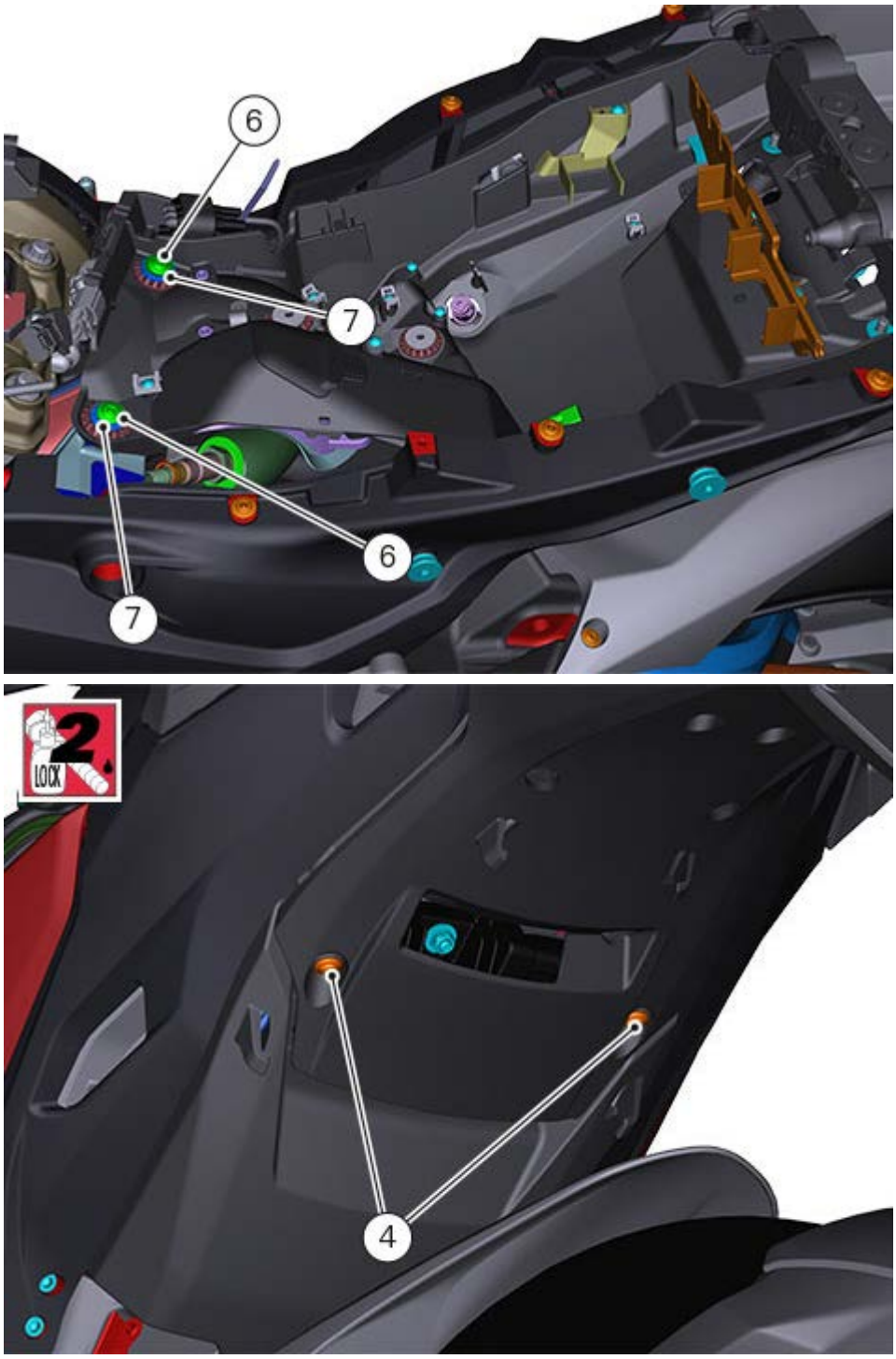


Position the remote control switch support (36) and fix it with the screw (37). Route the latch cable as shown in the figure.

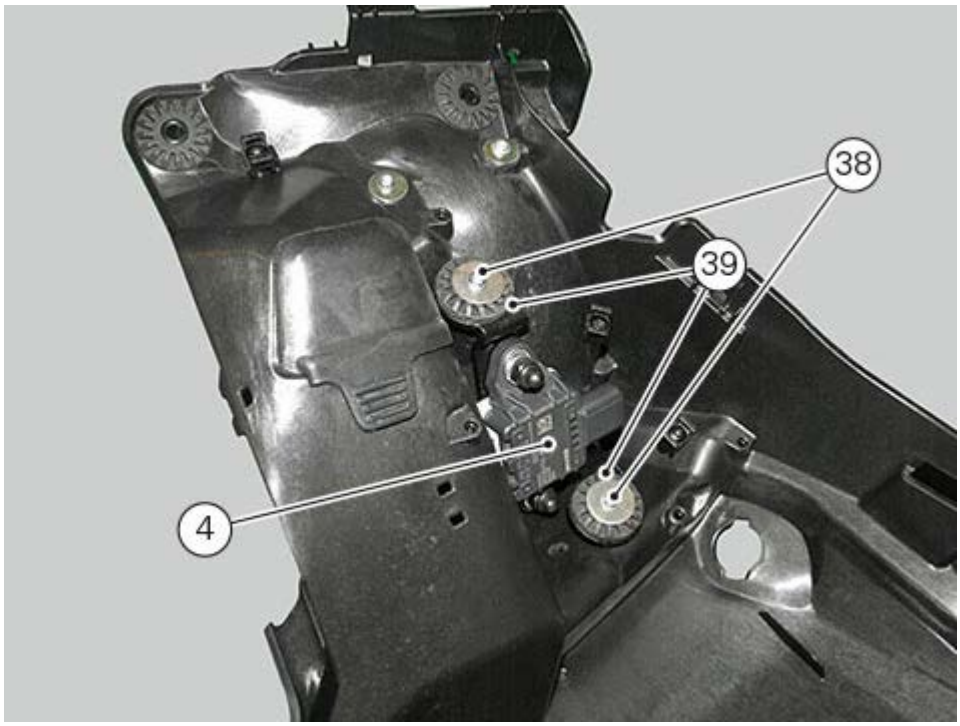
Position the electrical components compartment (8) inside the rear frame.



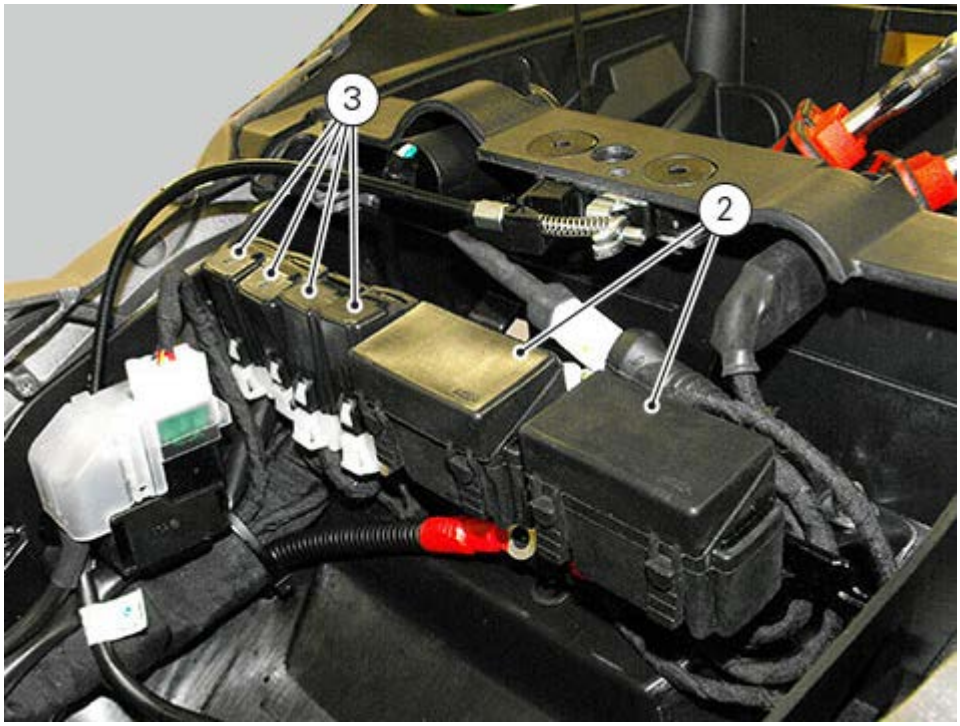
Fix the electrical components compartment (8) with screws (6) and washer (7) and with screws (4) in the bottom part.



Fit the inertial platform (4).
Fix it on the vibration damping pads (39) by tightening screws (38) to a torque of 10 Nm ± 10%.



Reposition relays (3) and the fuse boxes (2).
Route the wiring as indicated in chapter "Routing the electric wirings".



Tighten the two screws (1) of the lock control.

Reconnect the black box after installing its support.
Reconnect the starter relay.
Install the battery and its mount.
Refit the side body panels (Refitting the side body panels and the tail guard).
Refit the rider and passenger seats (Refitting the seat).

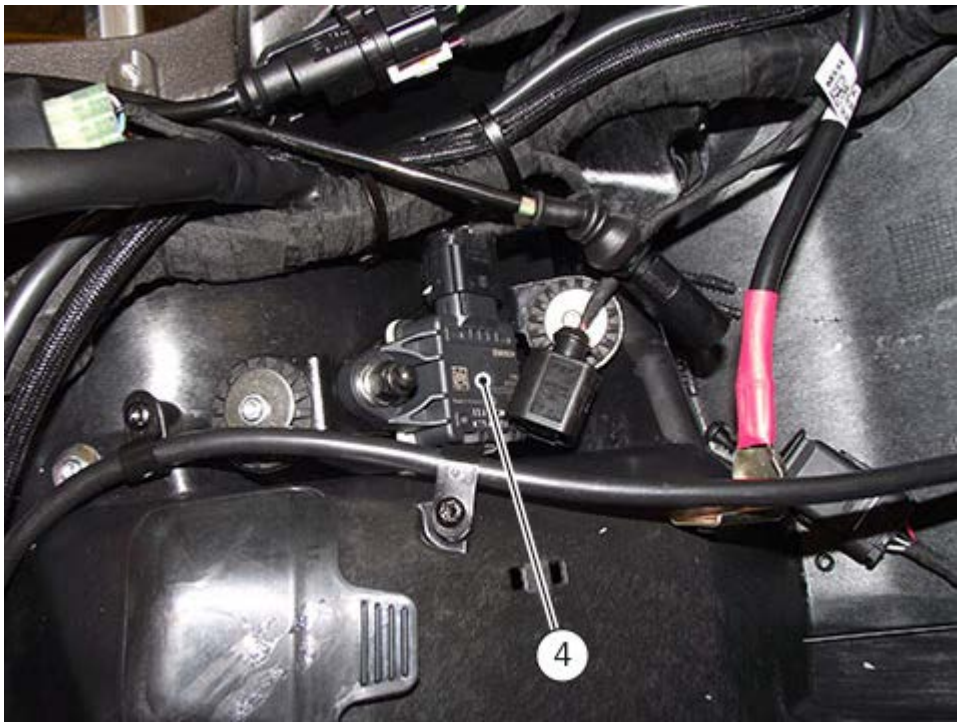
Removing the electric components compartment

Remove the rider and passenger seats (Removing the seat).
Remove the side body panels (Removing the side body panels and the tail guard).
Remove the battery and its mount.
Remove the starter relay.
Disconnect the black box and remove it with its support.

Remove the lock cable by loosening the two screws (1).

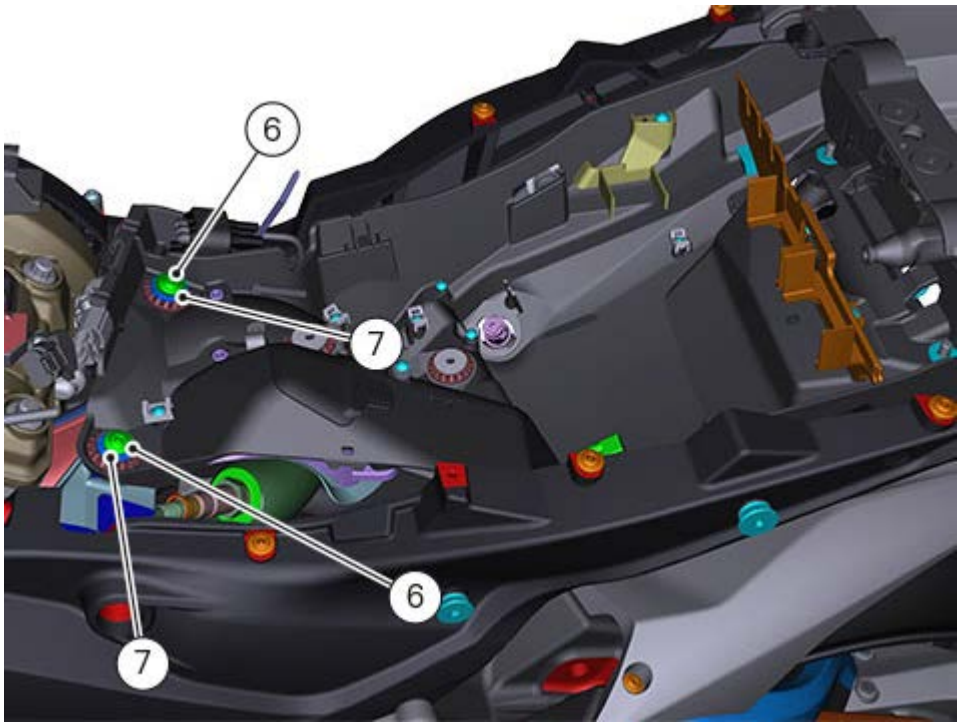
Remove the fuse boxes (2) and relays (3).

Remove the inertial platform (4).

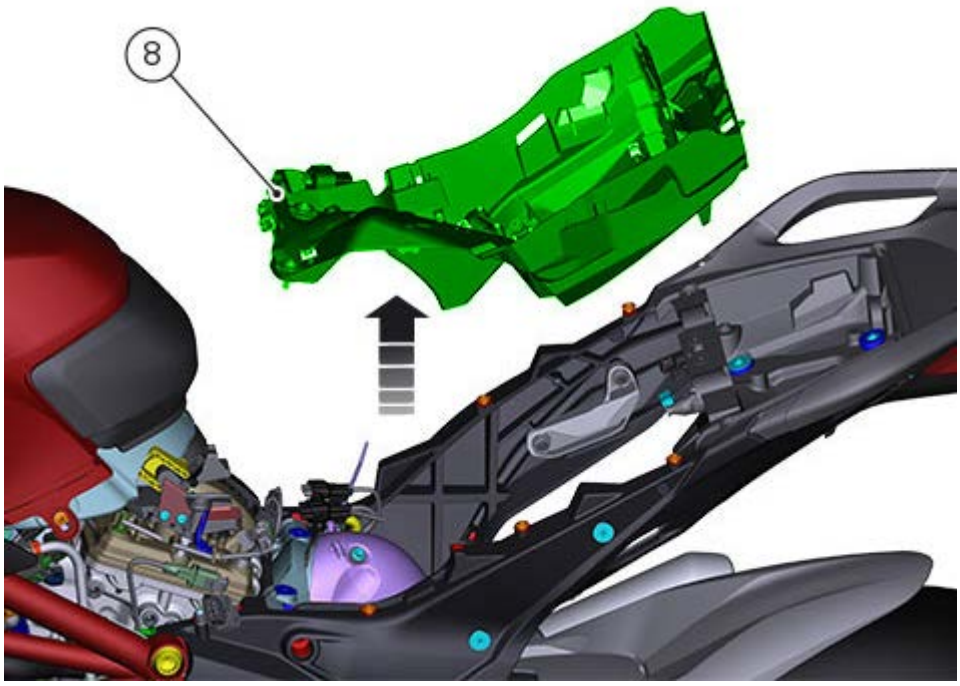


Release the wiring from the hose guides and clamps.
Loosen the two retaining lower screws (5) of the number plate holder cover.

Loosen the screws (6) and collect washer (7).

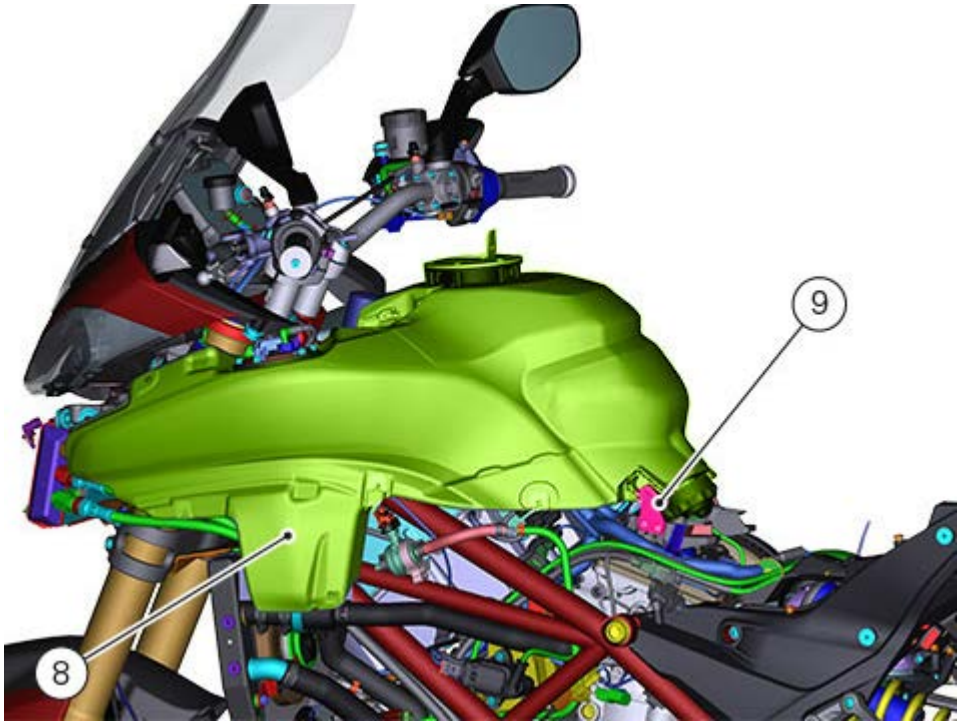


Remove electrical components compartment (8).

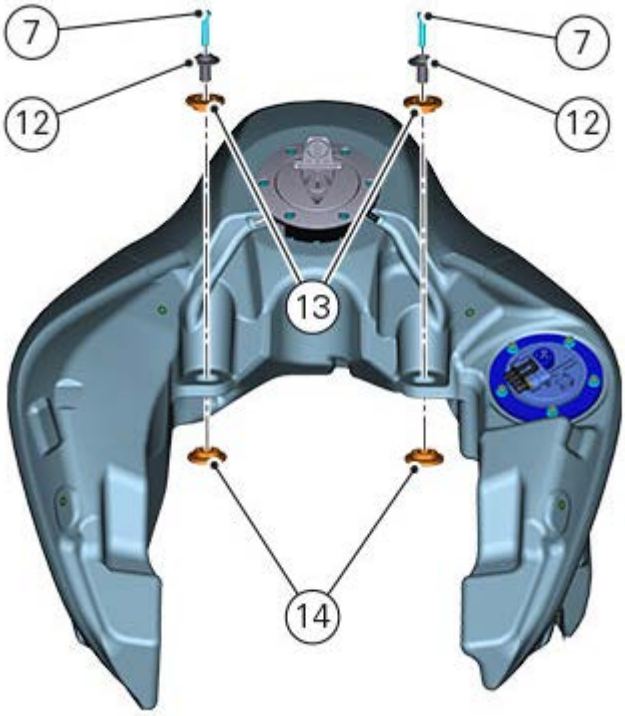


Refitting the fuel tank

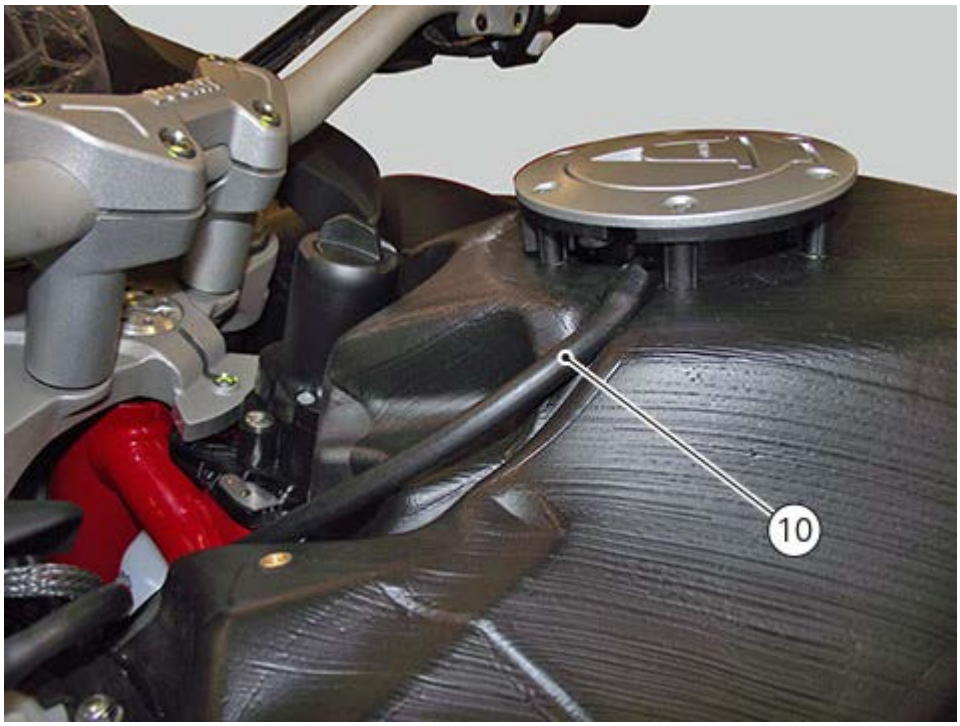
Reposition tank (8) on the frame by fitting the two forks on support (9).



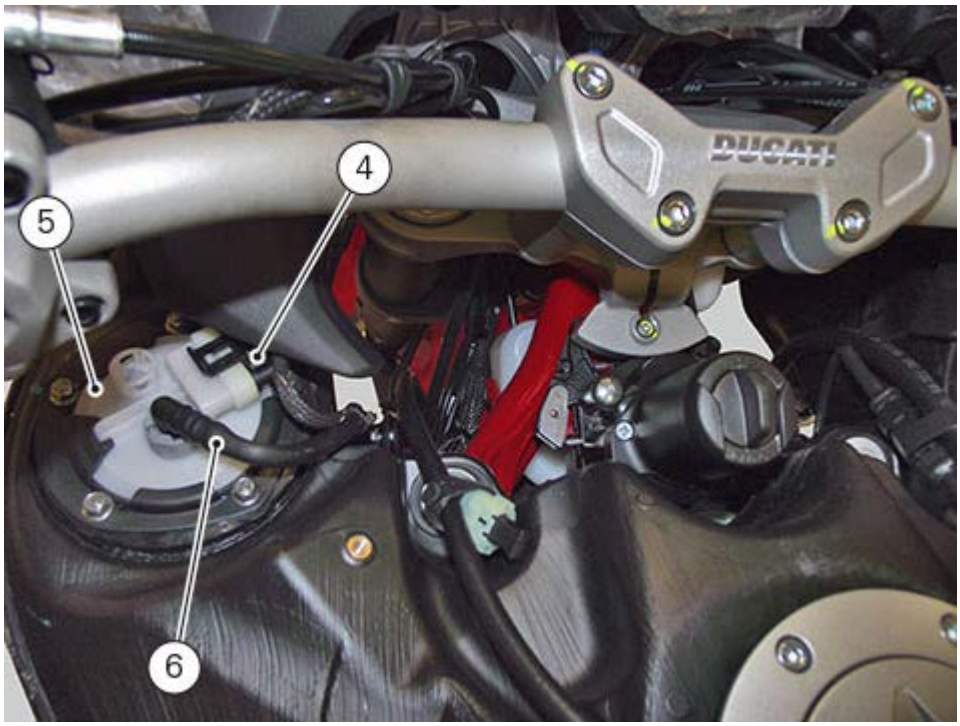
Fix the tank by means of screws (7). Check for the presence of the lower (14) and upper (13) blocks and spacer (12).

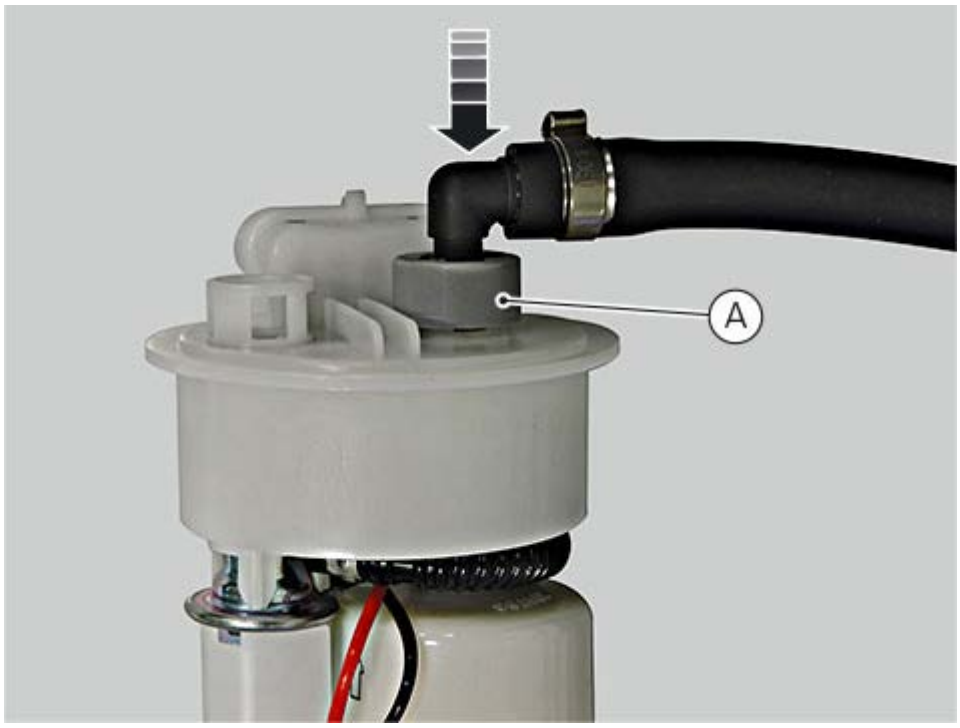


Connect the two breather pipes (10) and (11) to the tank plug.

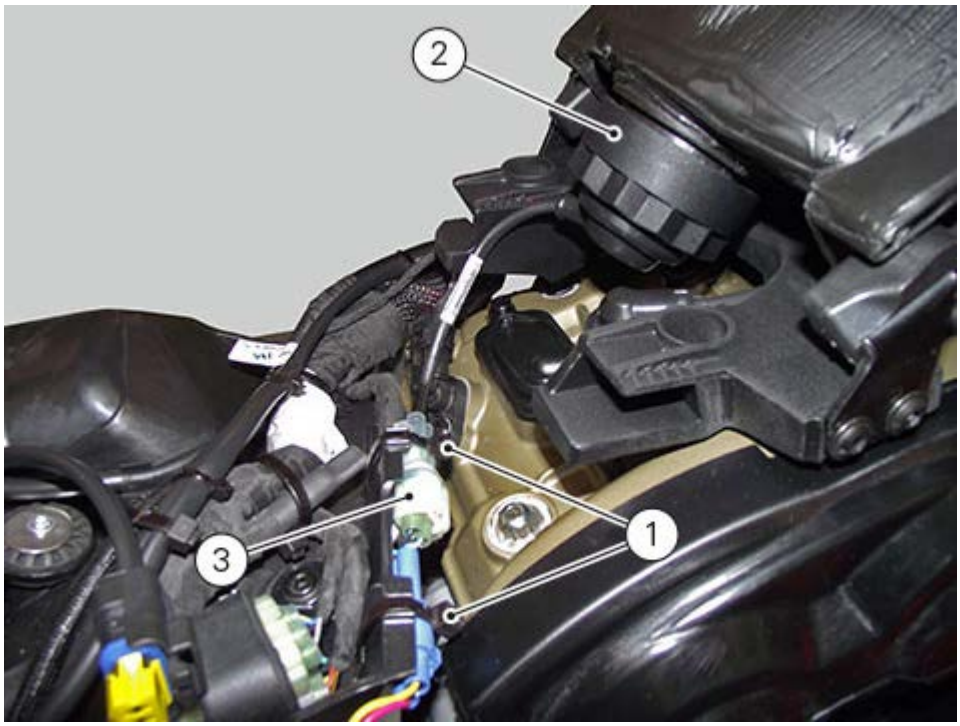


Reconnect the fuel pump connector (4) and hose (6).
Grip and press flange (A) to insert hose (6).



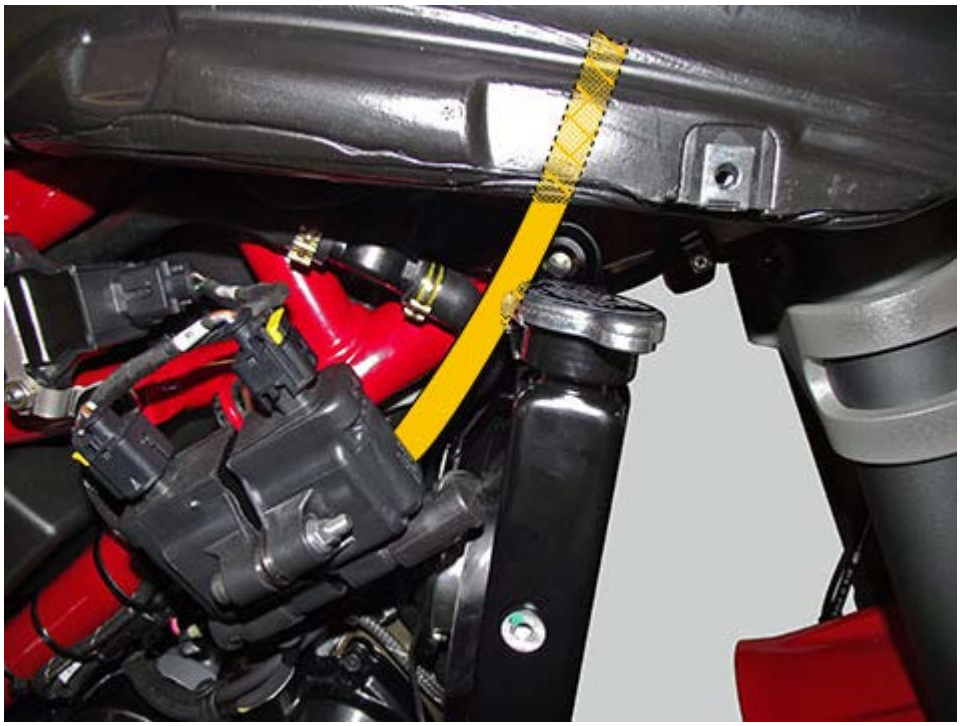


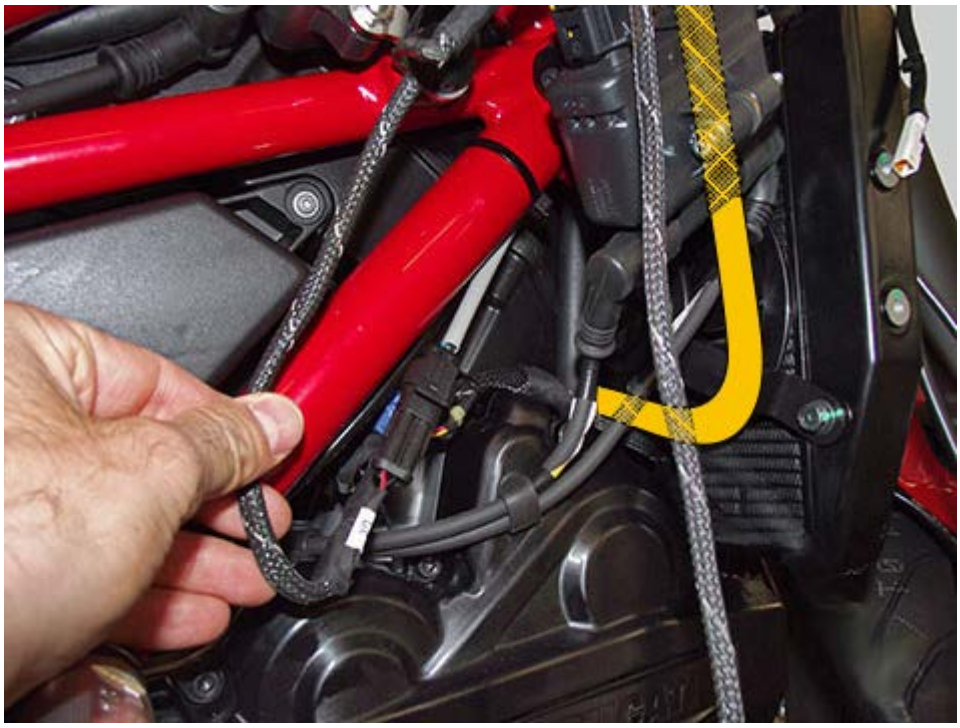
Reconnect the fuel level connector (3) and reposition the clips (1).

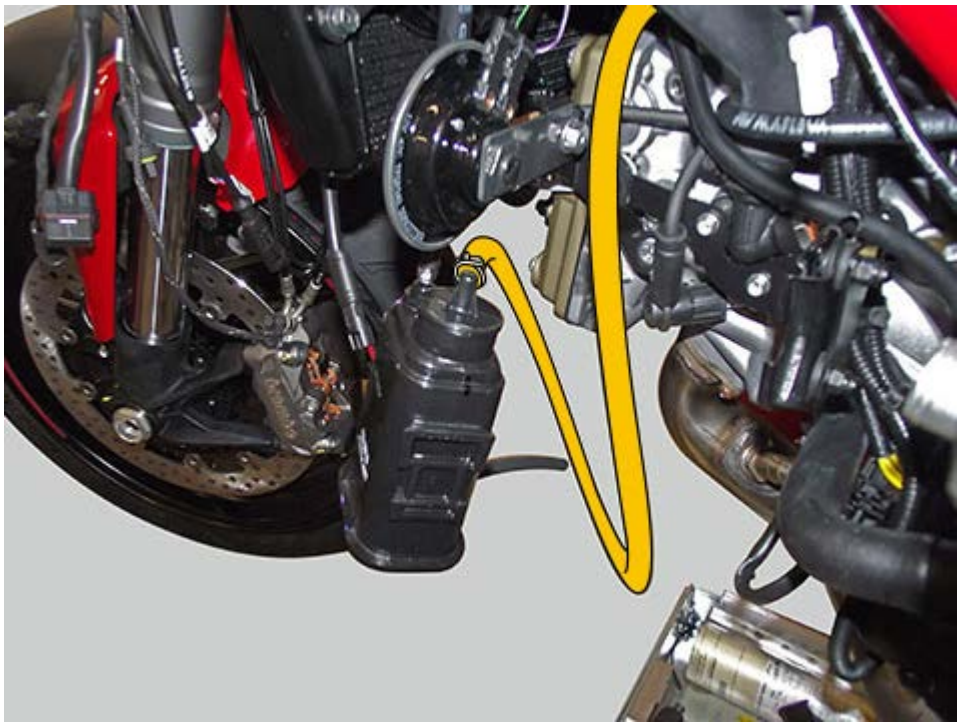


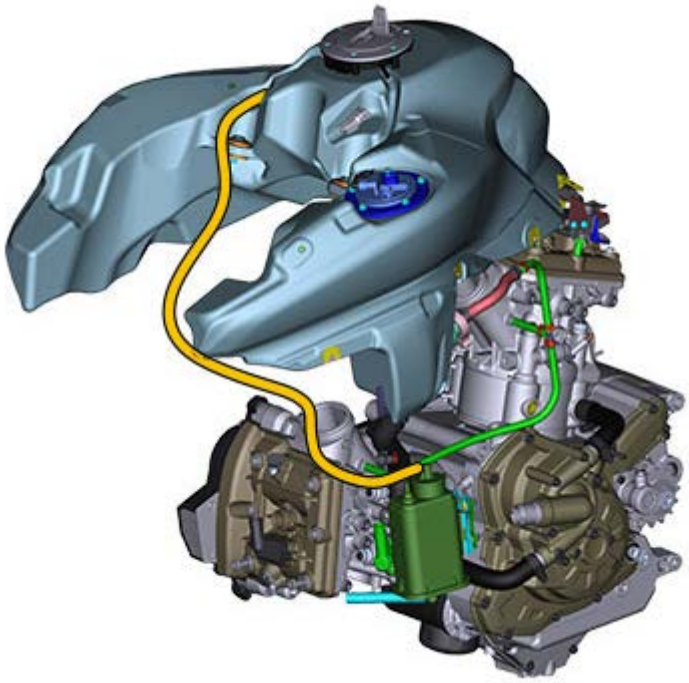
Refit the tank fairings (Refitting the tank fairings).
Refit the side body panels (Refitting the side body panels).
Refit the seat (Refitting the seat).

Positioning the fuel tank breather pipe.

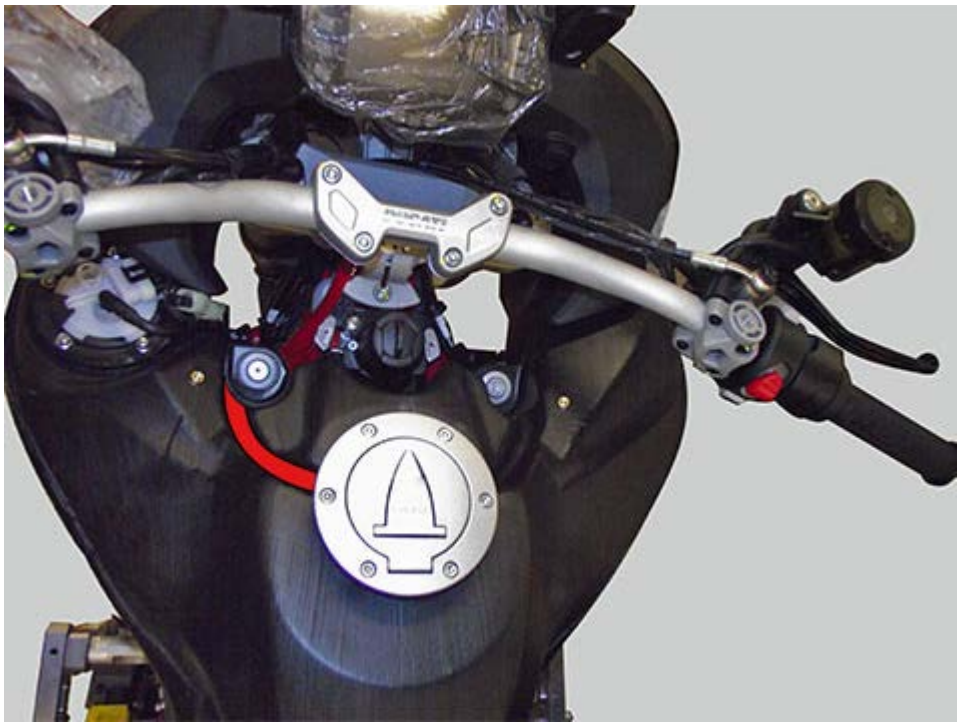


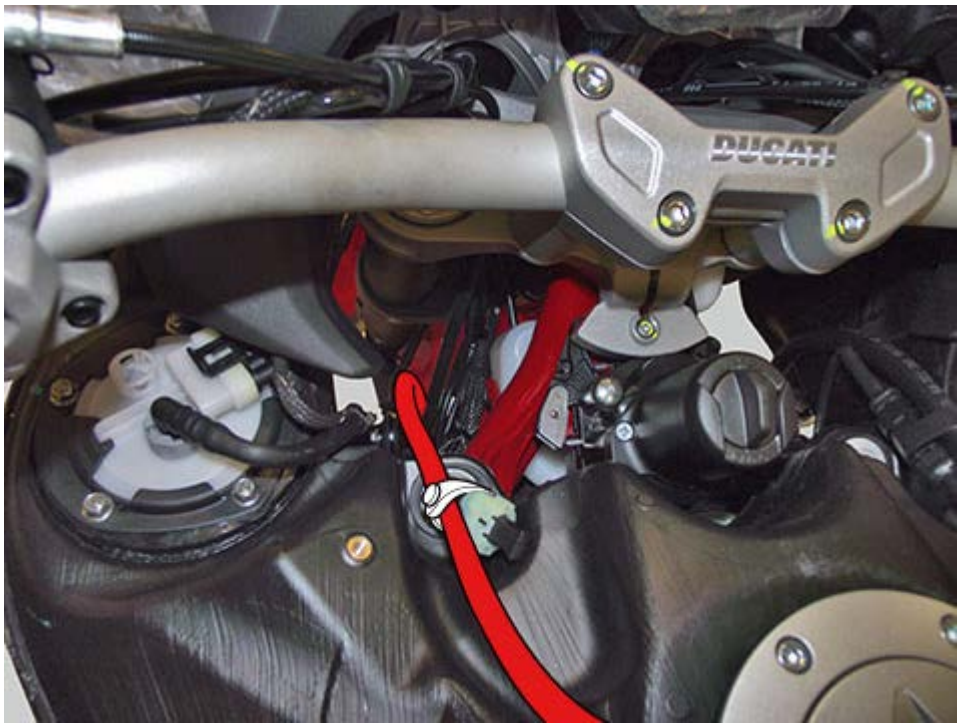






Positioning the fuel tank drain pipe.

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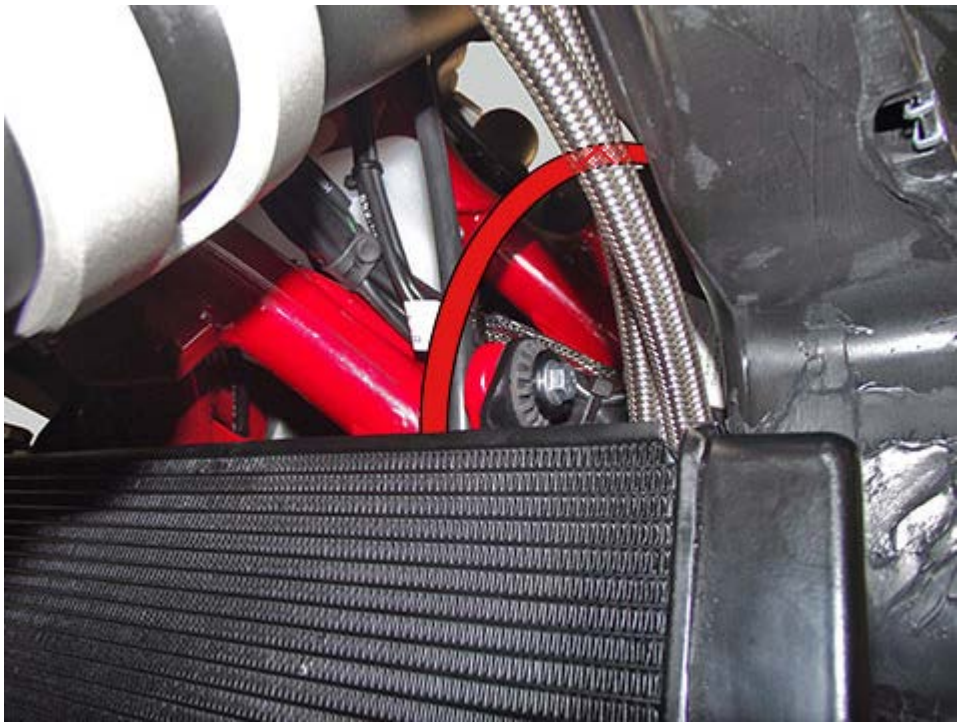
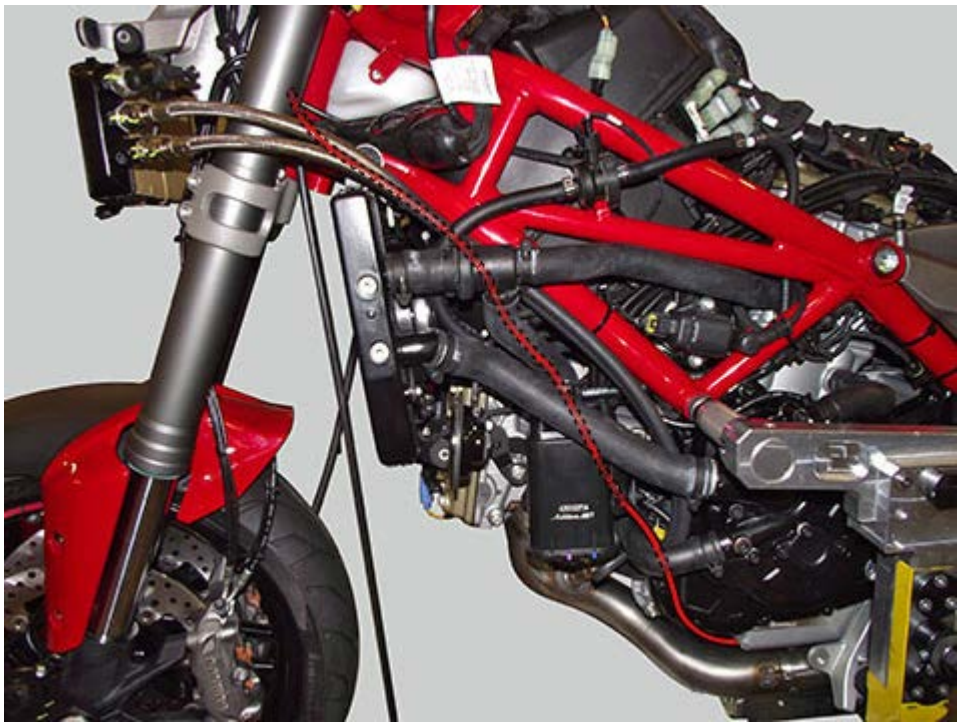
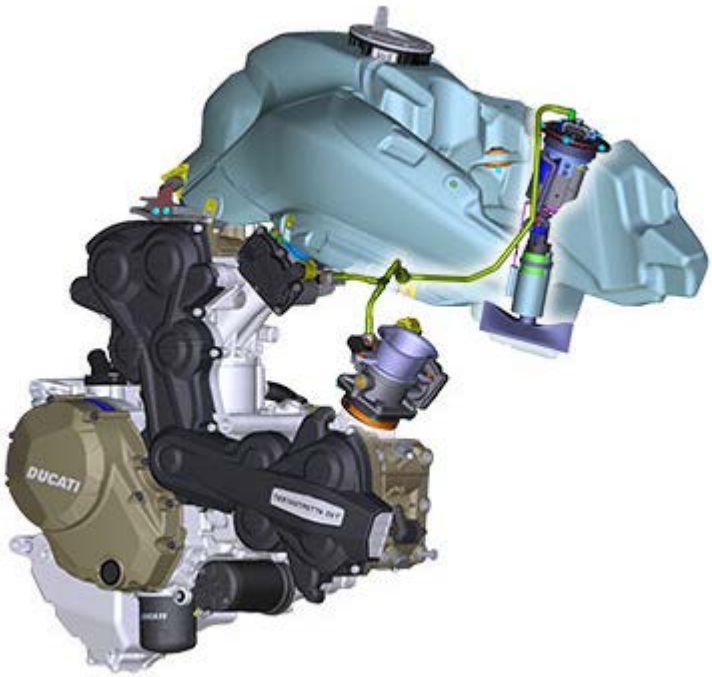




Positioning the fuel pipes.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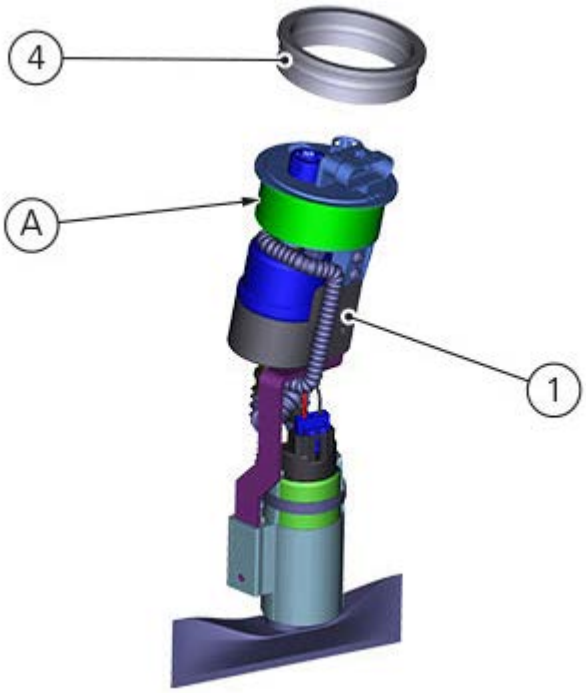
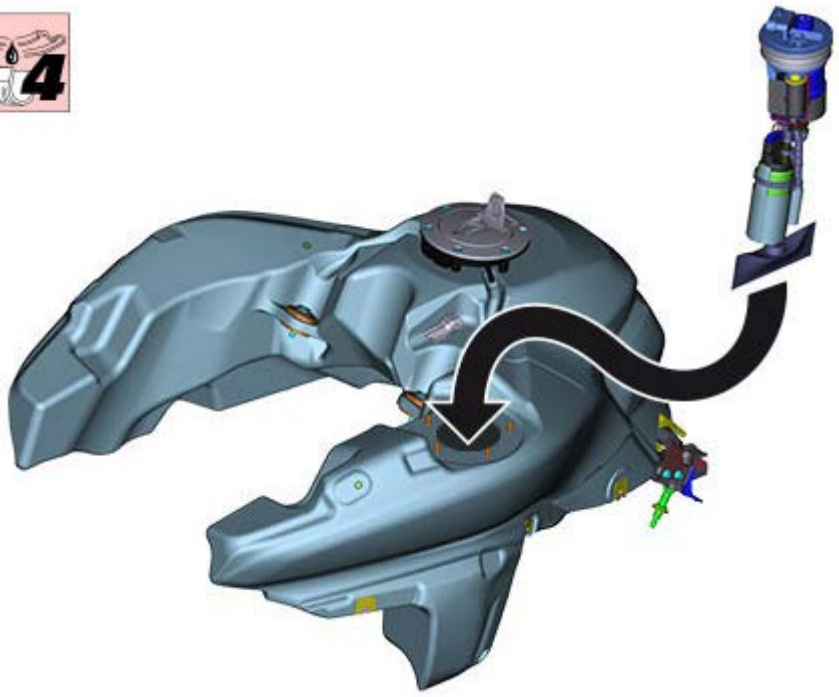
Refitting the fuel tank flange

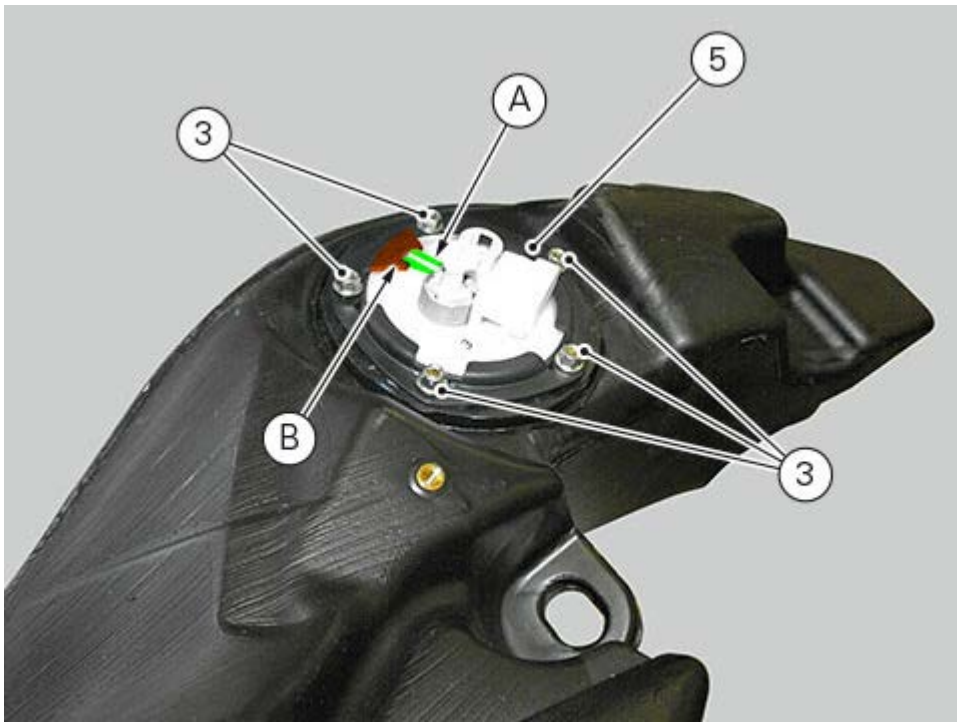
Make sure that pump area (A) and gasket (4) are perfectly clean.
Fit gasket (4) fully home on the pump (1) as shown in the figure.



Lubricate the gasket (4) with the indicated product and fit it in the fuel tank (2).



Position the pump locking flange (5) on pump (1), centring notch (B) on rib (C).
Block the pump locking flange (5) by tightening nuts (3).

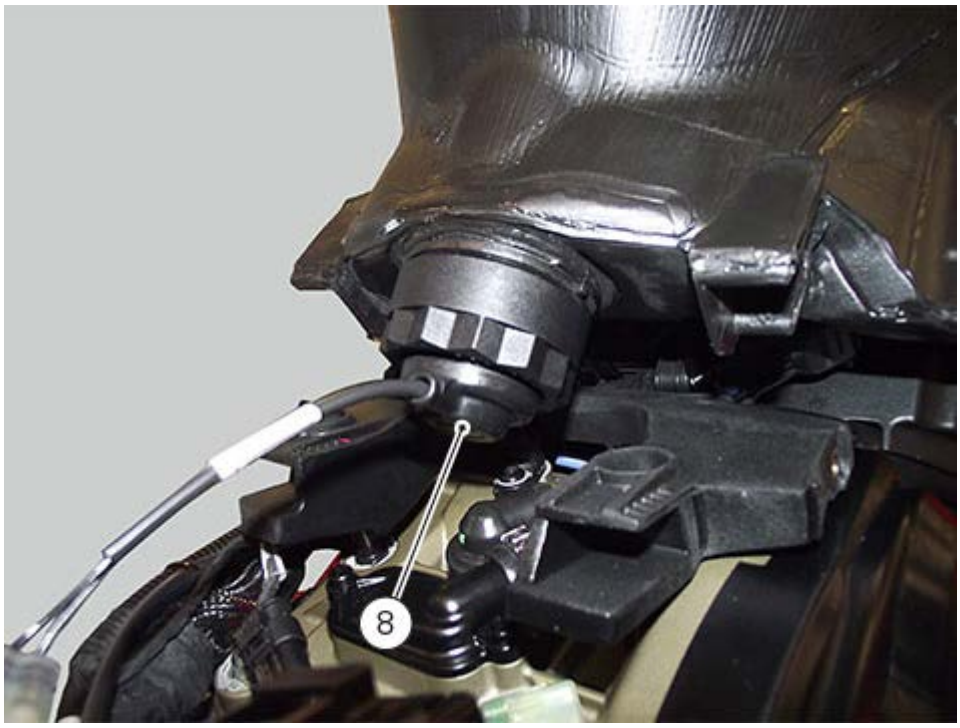


Fuel level sensor

Insert the fuel level sensor inside the tank.
Use the indicated product to lubricate the sensor gasket.
Insert the sensor so that tab (5) engages into slot (6).

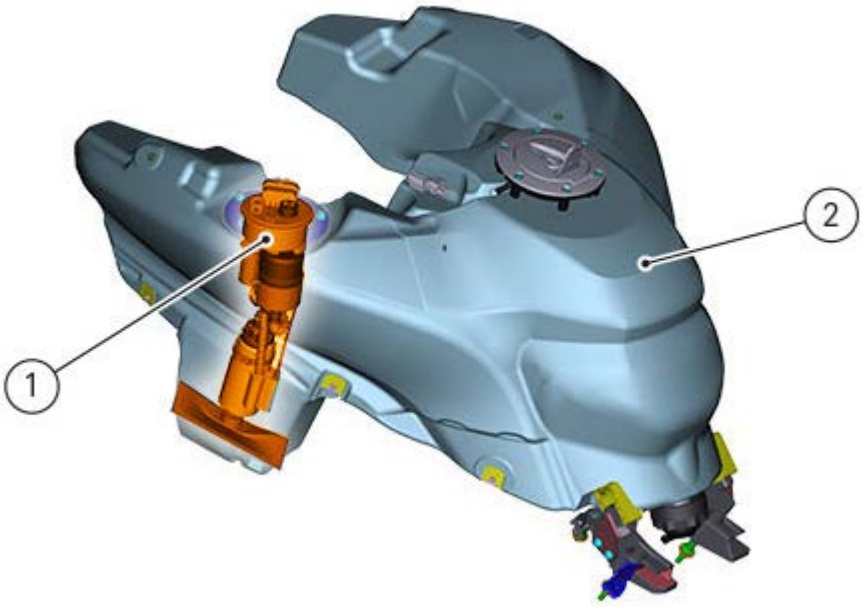
Fit the ring nut (7) and tighten it to a torque of 8 Nm ± 10%.

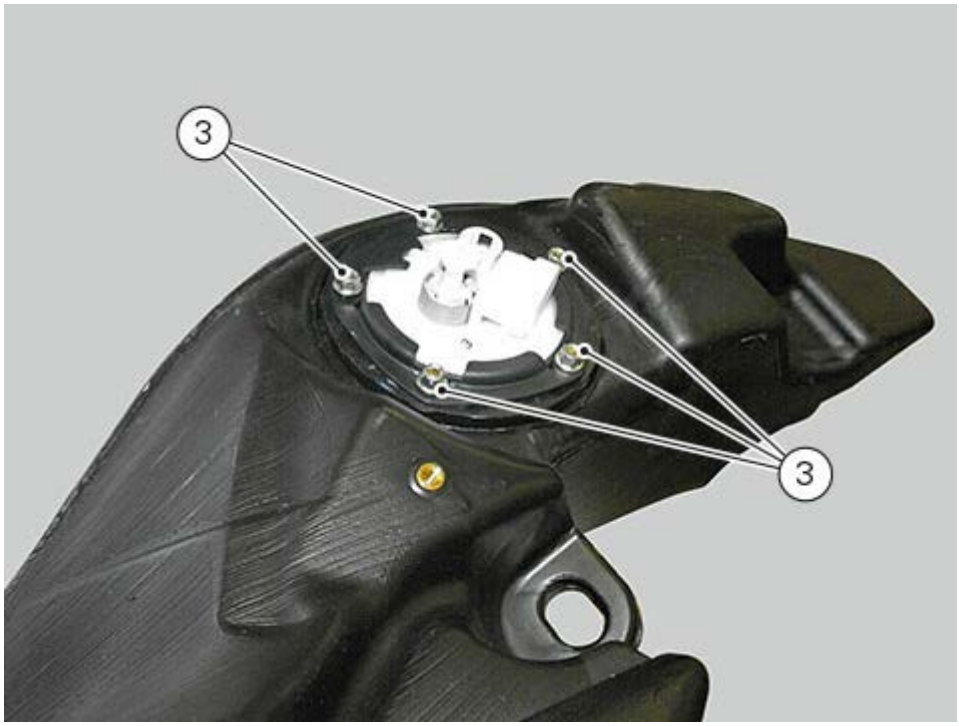
Insert plug (8).



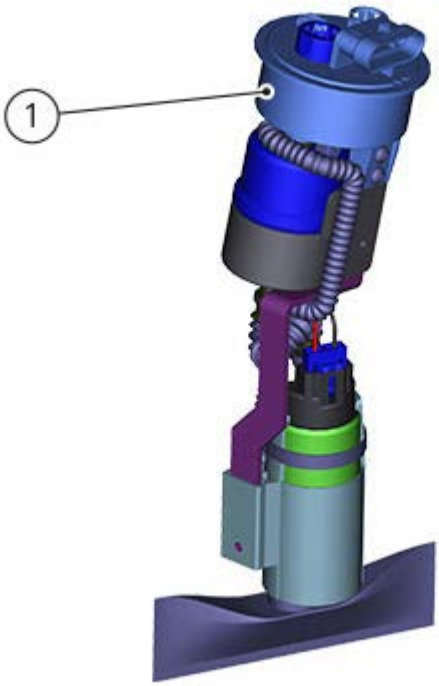
Removing the fuel tank flange

To remove flange (1) from tank (2), loosen the retaining nuts (3).





Remove flange (1) from tank (2).

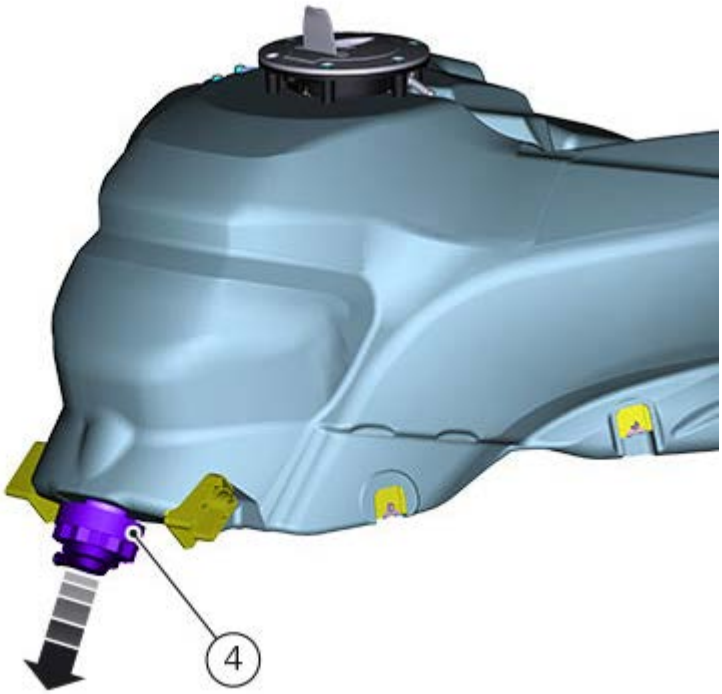


Before refitting, carefully remove any deposits or scale from all parts.

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.

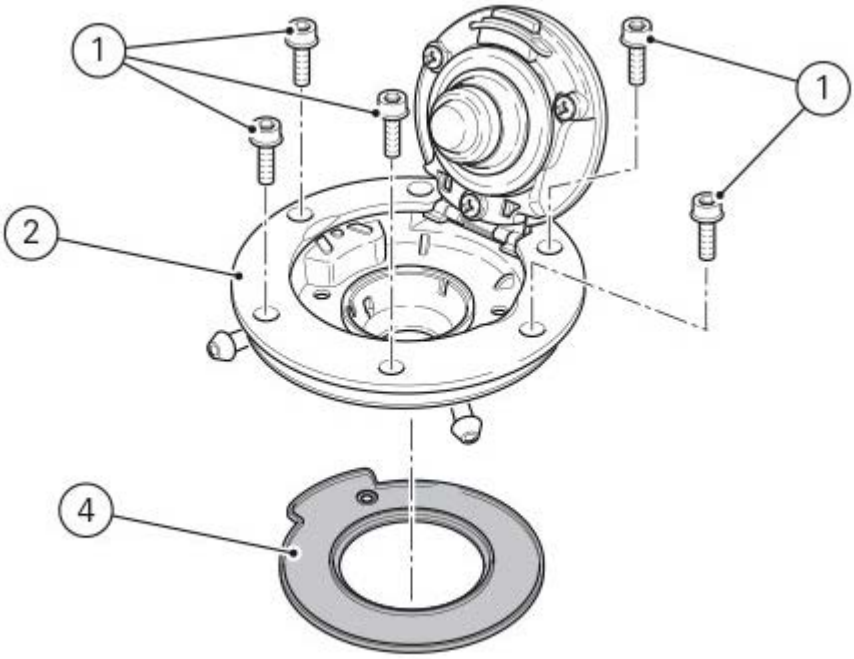
Fuel level sensor

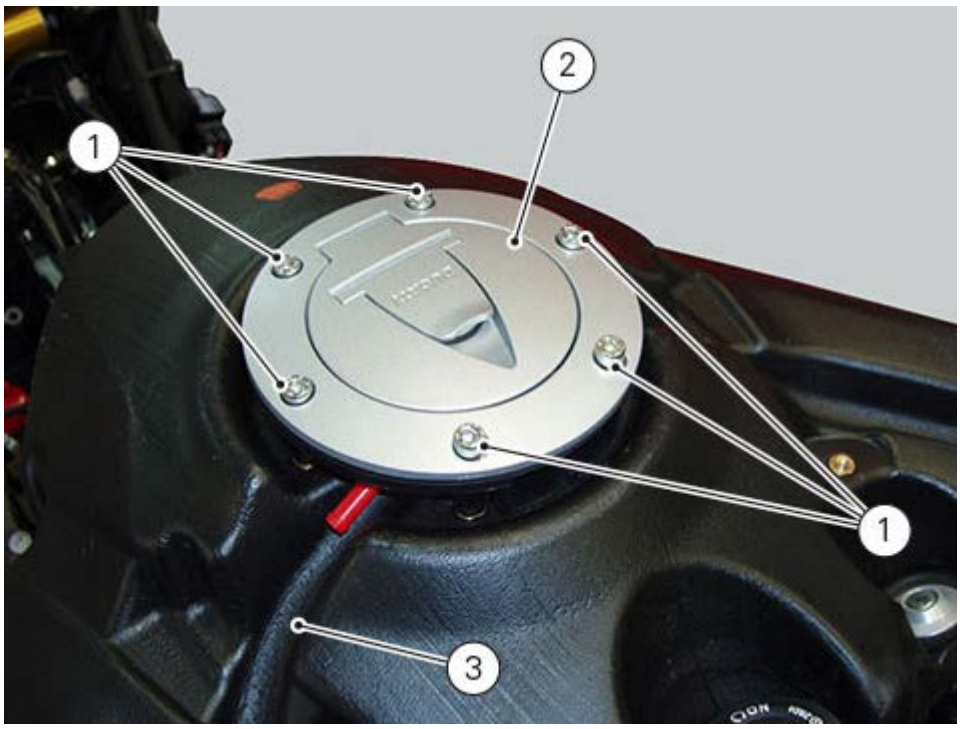
Remove the level sensor (4) by loosening the ring nut.



Refitting the tank filler plug

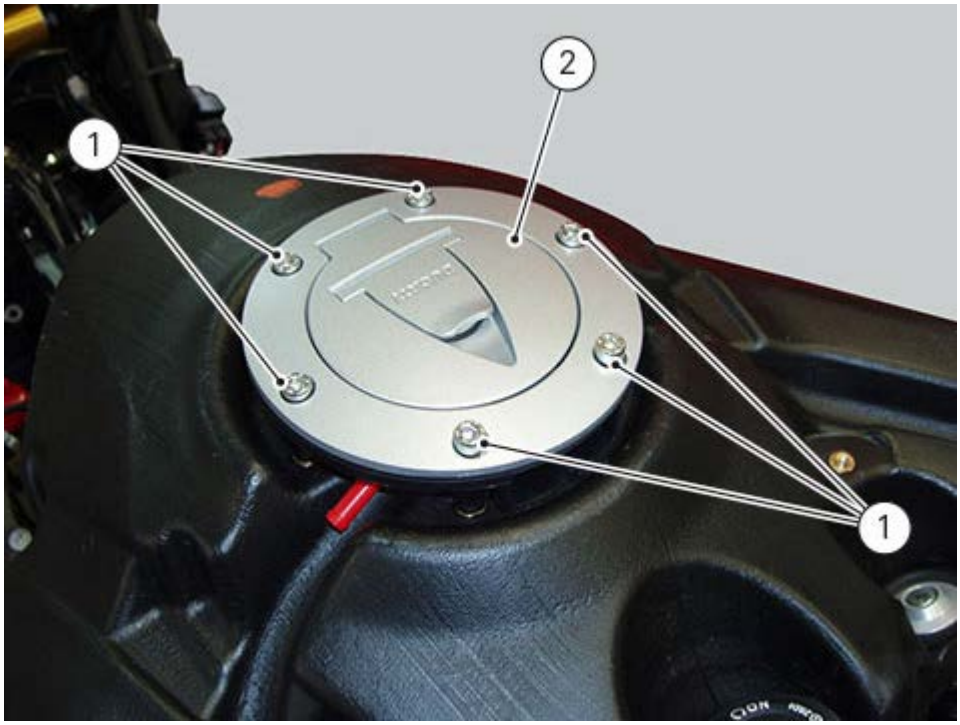
Duly grease the new sealing washer (4) and its seat on tank.
Position the complete filler cap (2) paying attention to fit the two breather hoses (3) in the relevant seats.
Start and tighten the six securing screws (1) to a torque of 4 Nm ± 10%.

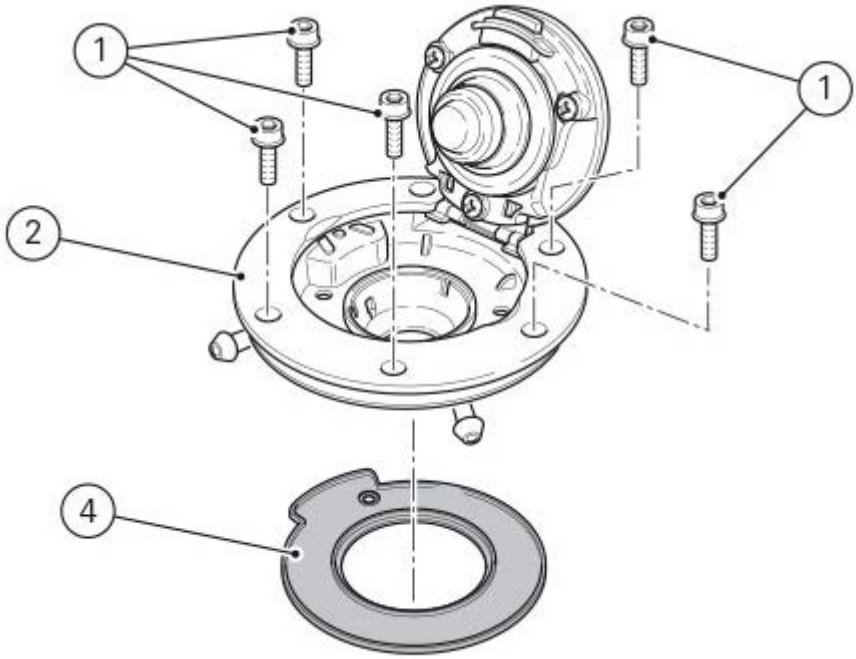




Removing the tank filler plug

Loosen and remove the six securing screws of the tank plug (1).
Remove the complete plug (2) paying attention to recover the two breather pipes (3).
Collect the seal (4).

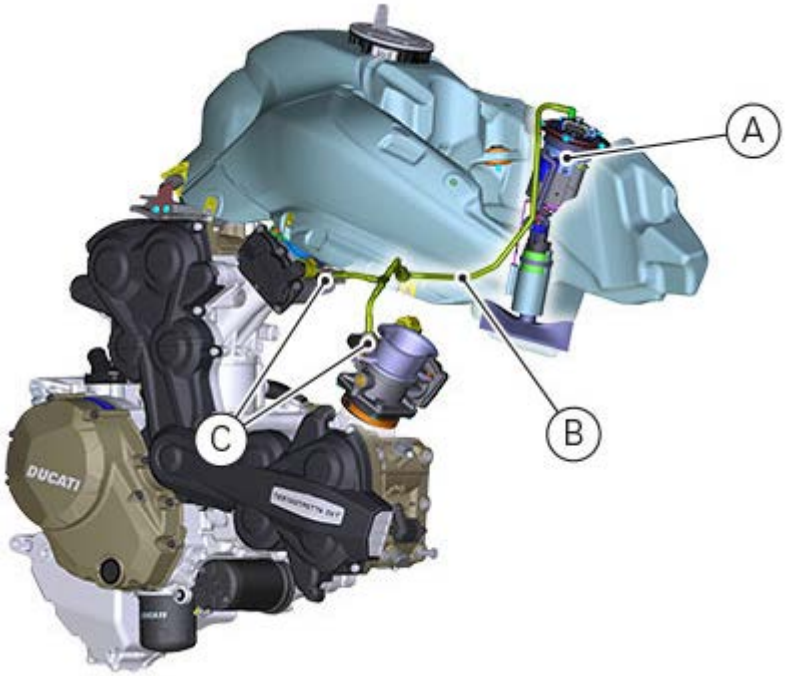




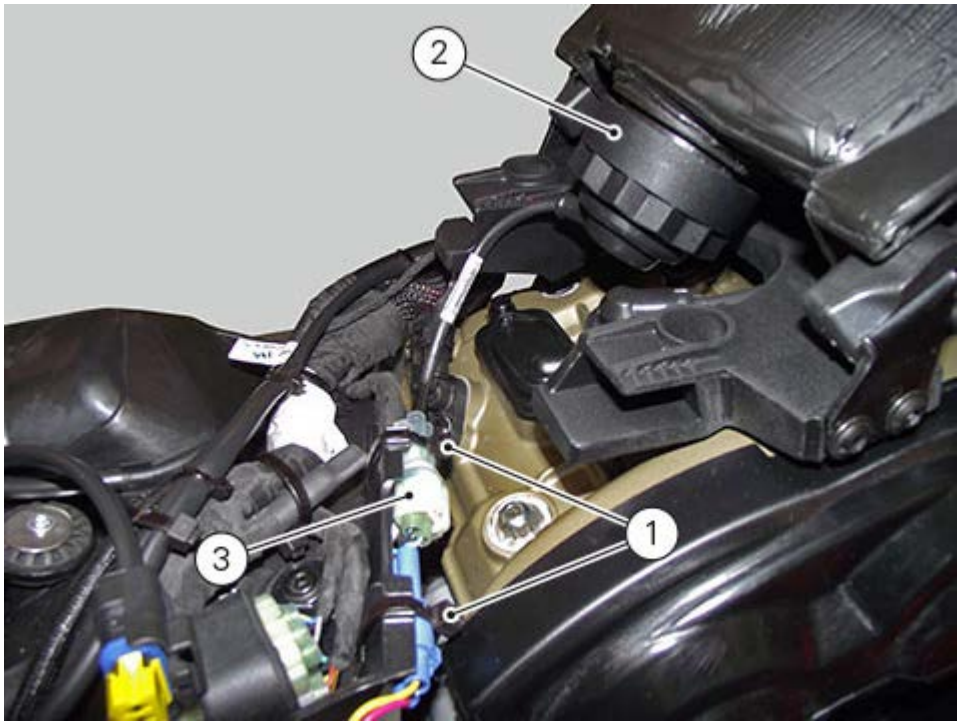
Removing the fuel tank

Remove the seat (Removing the seat).
Remove the tank fairings (Removing the tank fairings).
Remove the side body panels (Removing the side body panels).

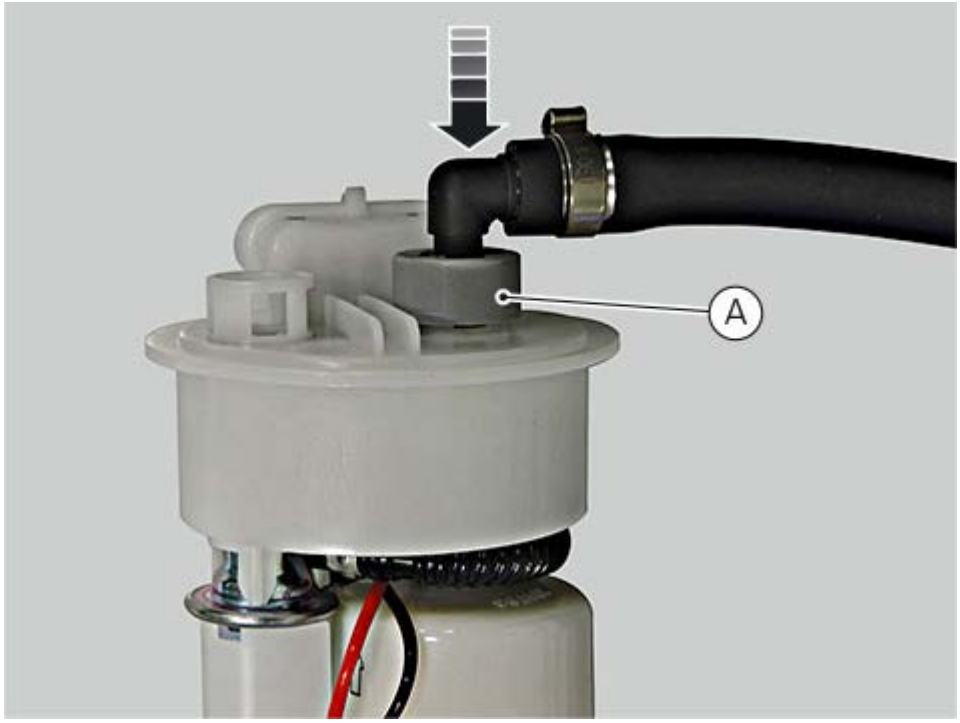
The figure shows the fuel supply circuit lay-out.
A) Fuel pump, immersed in the fuel and provided with filter and pressure regulator.
B) Fuel delivery pipes.
C) Injectors.



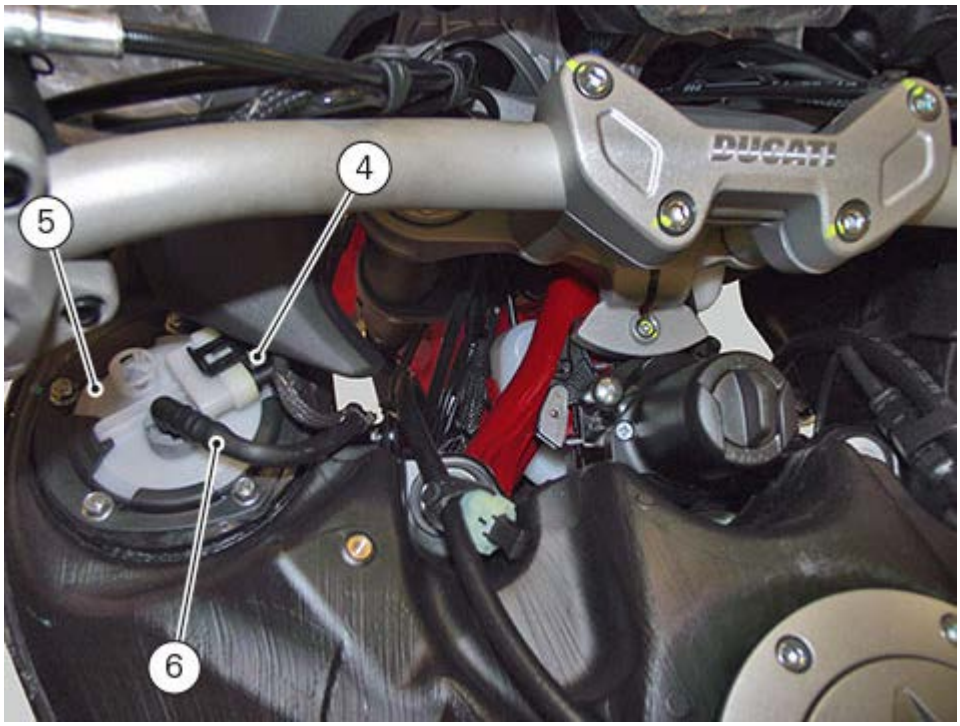
Remove the two clips (1).
Disconnect connector (3) from the fuel level sensor (2).



Grip the flange (A) and push it down.
Slide out hose (6).



Disconnect connector (4) from the fuel pump (5).
Remove the fuel pipe (6) and the breather pipes (10) and (11).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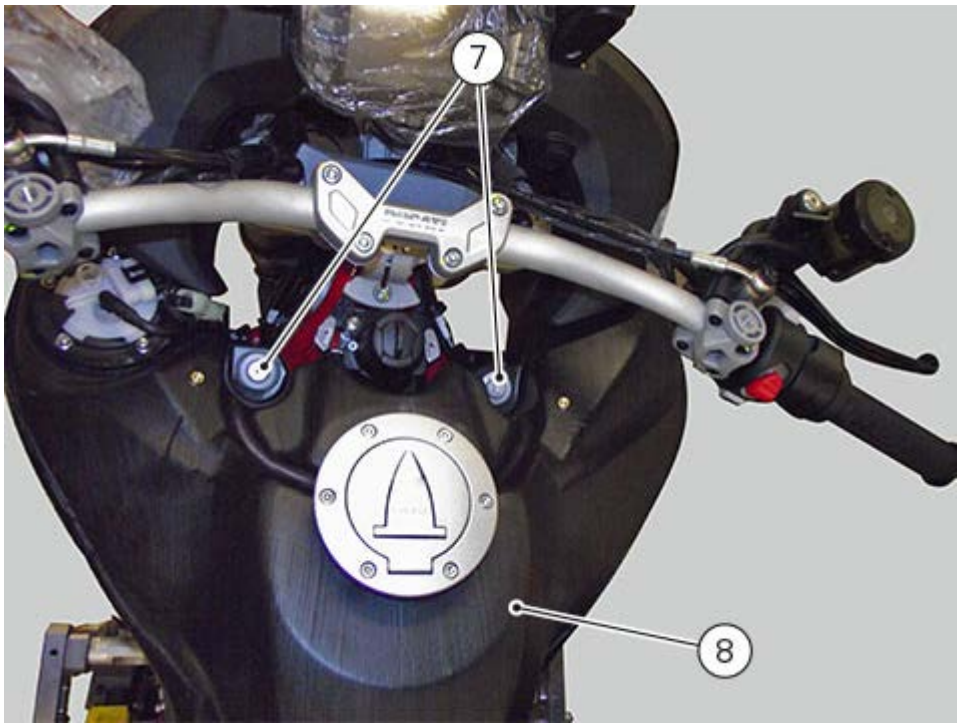
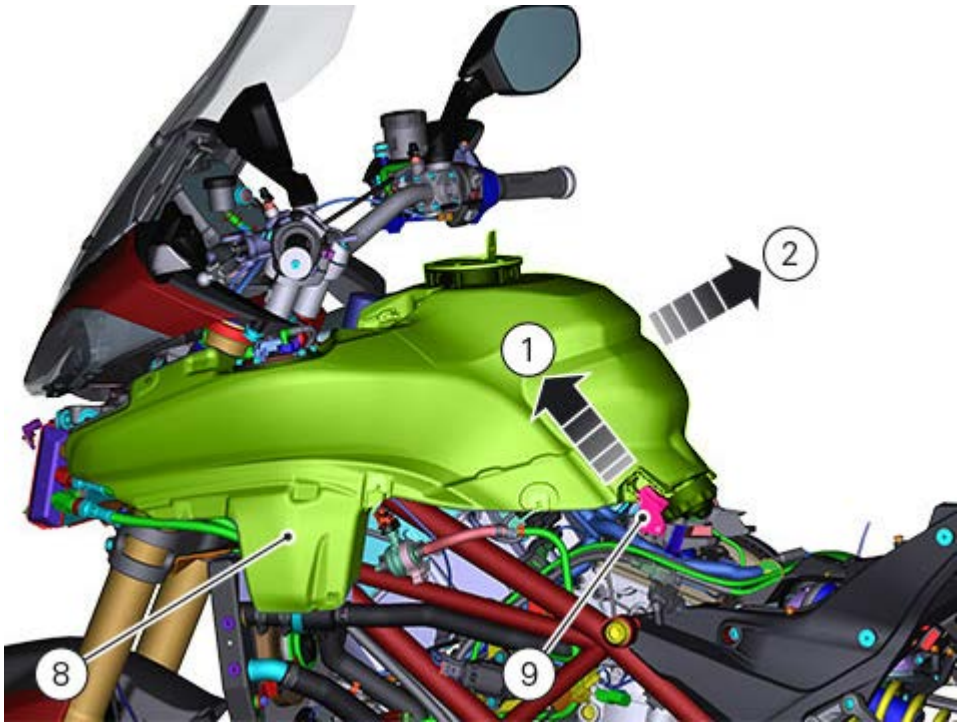
Remove the two retaining screws (7) of tank (8).



Remove tank (8) from the vehicle by sliding it out of support (9).
To do this, first push it forwards and after removing the support (9) lift it vertically.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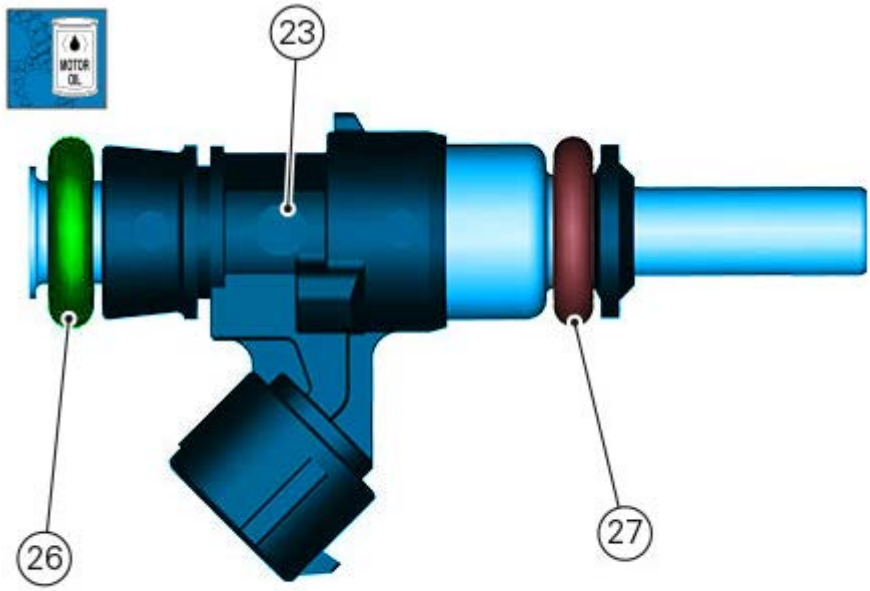
Refitting the airbox and throttle body

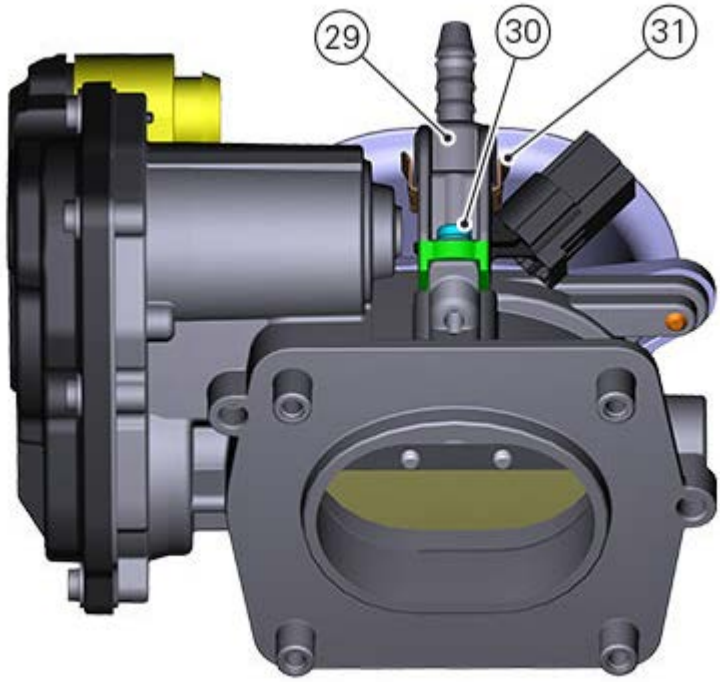
REFITTING THE THROTTLE BODY

Working on both intake manifolds, ensure that O-rings (26) and (27) are installed on injectors (23).
Apply the indicated grease on the O-rings (26) and (27) of injectors (23), thoroughly avoiding to leave any product residue on injector surface and using the quantity of product strictly necessary to carry out the following assembly operations.
Insert injector (23) onto fuel pipe unit union (28).

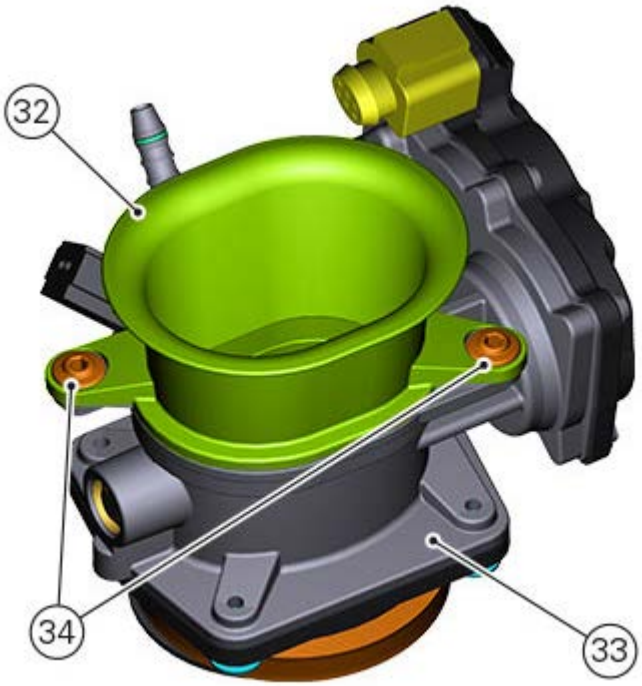
Important
To avoid damaging the O-rings, drive the injector fully home on the throttle body, keeping it in line with its seat.



Holding the unions (29) pressed down on the injectors, start and tighten screws (30) fully home.
Tighten the retaining screw (30) to a torque of 5 Nm ± 10% ensuring that during this operation the teeth highlighted in the figure remain in the indicated position.
Secure the union with clip (31).



If previously removed, fit the intake funnel (32) on the throttle body (33).
Fix the intake funnel (32) with the two screws (33).

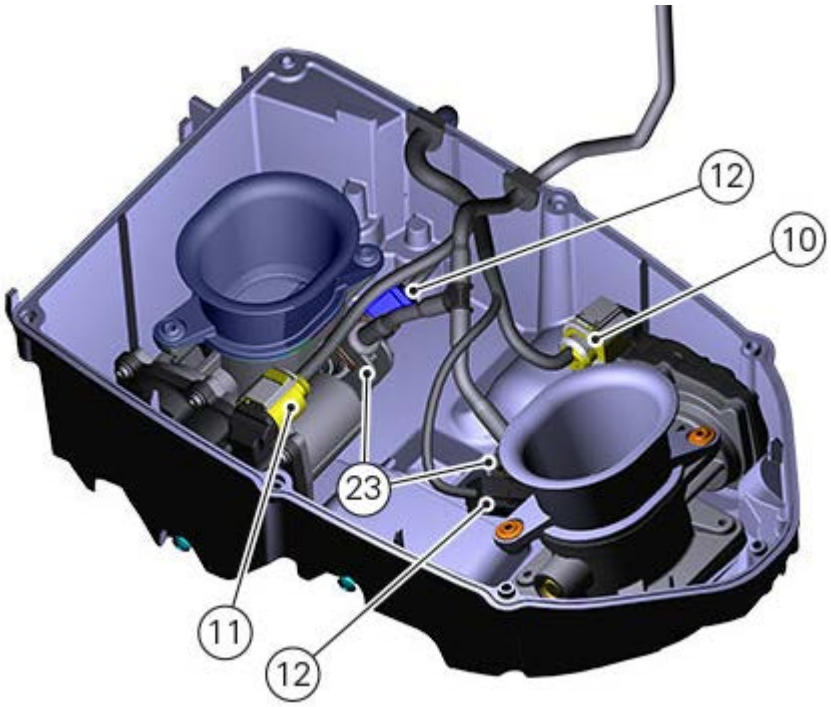


Check that the throttle body bearing surface is clean.

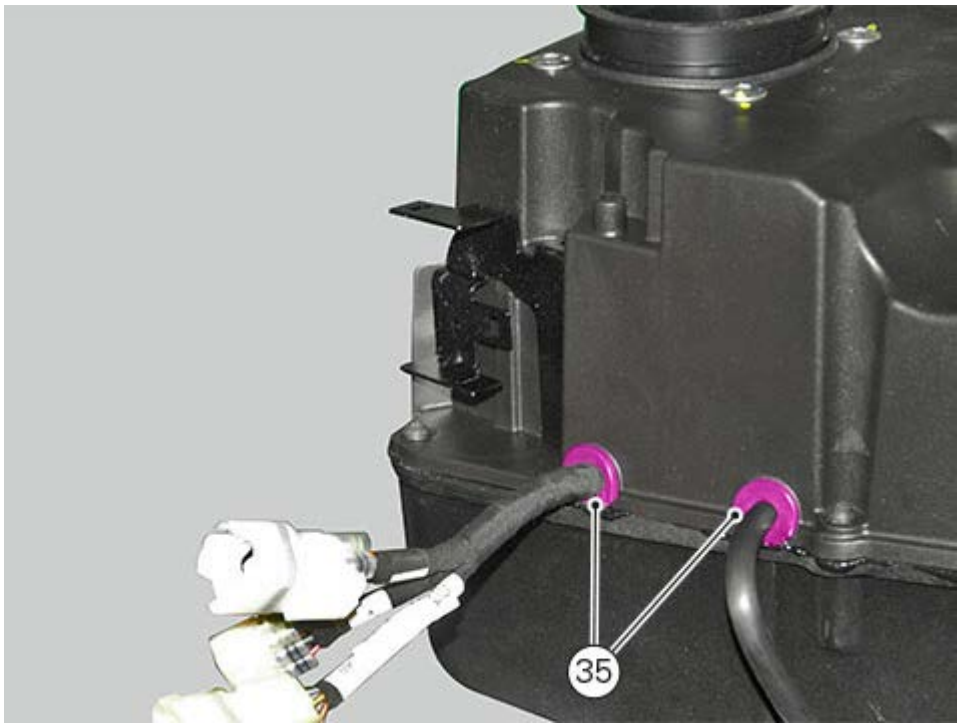
Check that the two O-rings (34) on the sleeve are not worn out or damaged. Replace them if necessary.

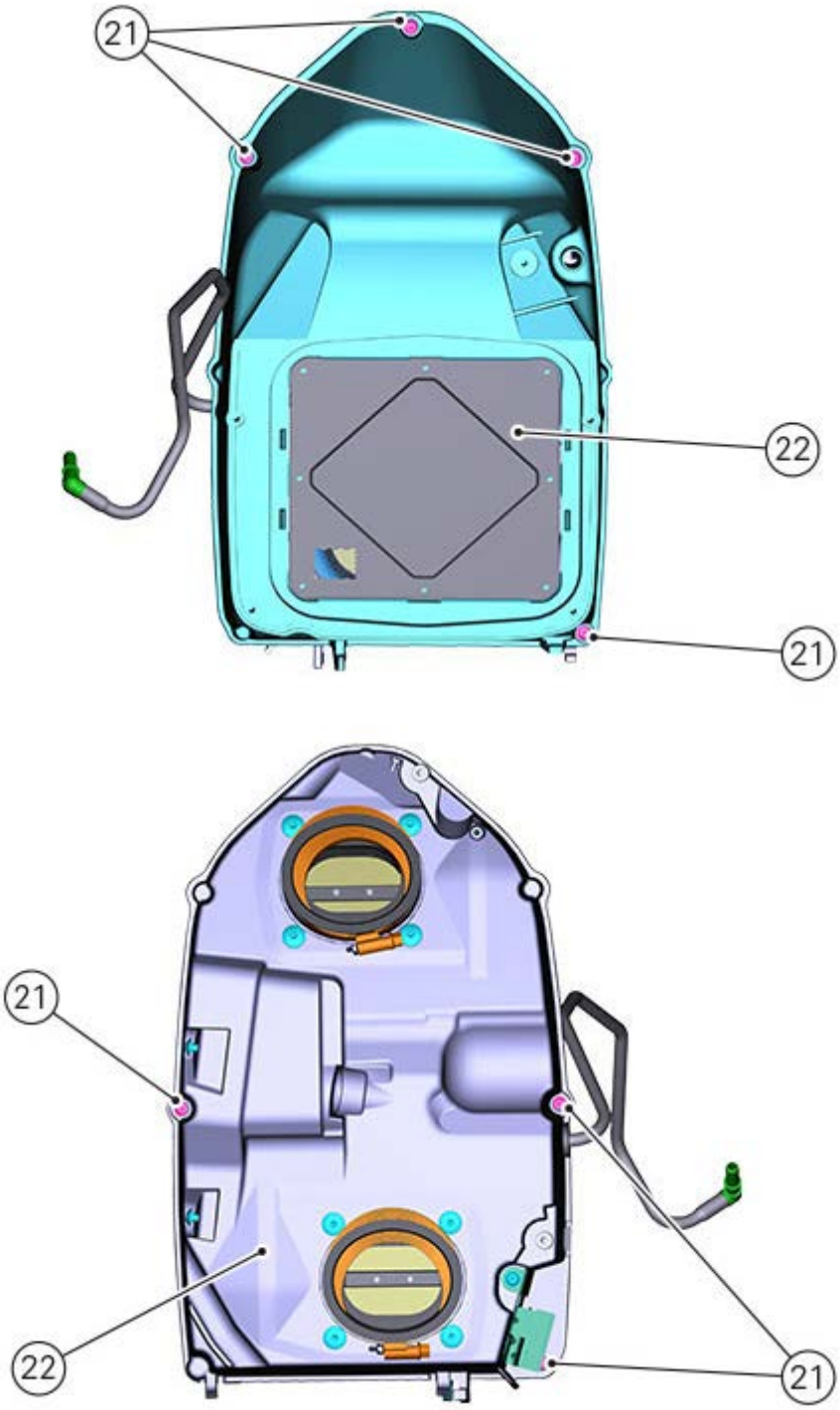
Fit the throttle body on the airbox and fix the latter with screws (24).

Reconnect the connectors of injectors (12) and of the ETV motor (10) and (11).
Reconnect the fuel pipe (23).



Position the upper airbox (22).
Start screws (21) retaining the upper airbox (22). Pay attention to the two washers (35) of the fuel pipe and cable passages.
Tighten screws (21) to the specified torque.





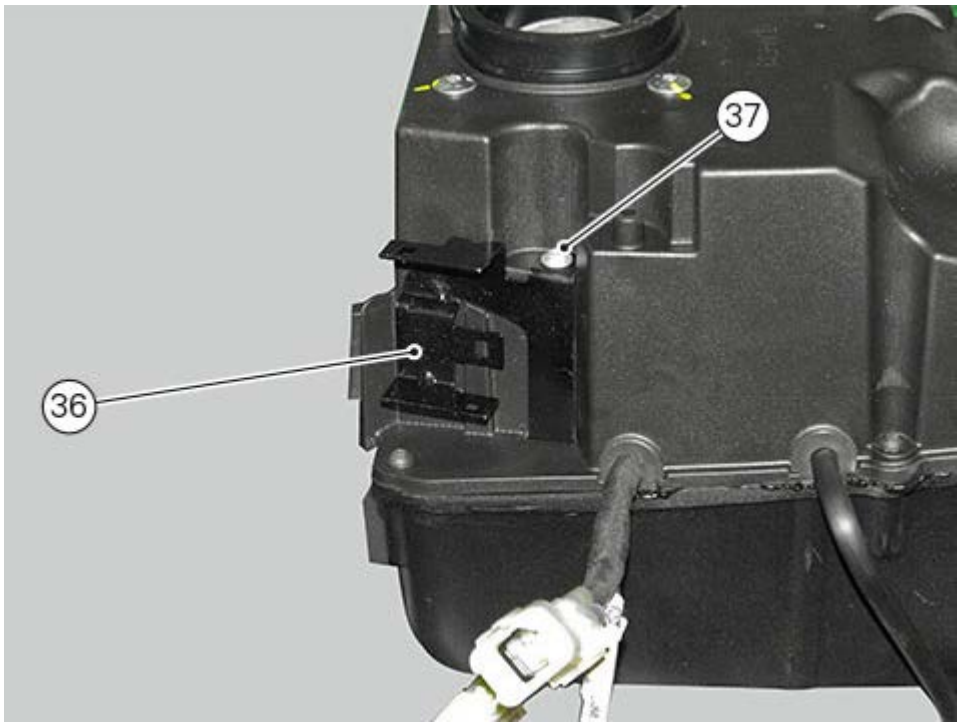
REFITTING THE AIR FILTER

Position filter (20) as shown in the figure.

Position cover (18) and tighten the screws (19).

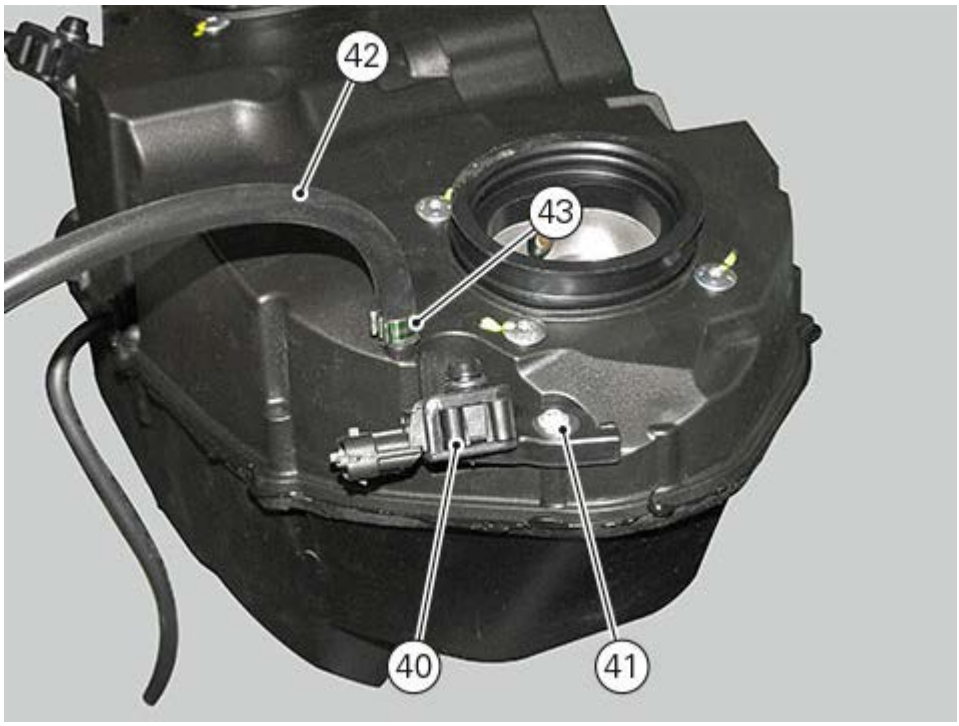
REFITTING THE AIRBOX

If previously removed, fix the connector bracket (36) and tighten screw (37).



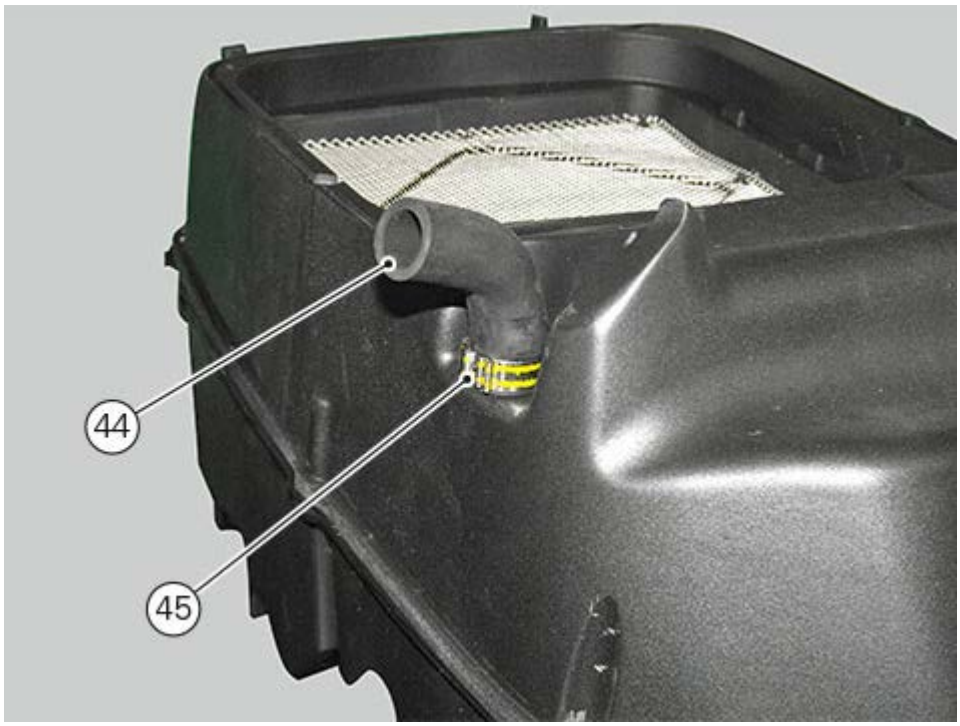
Position the horizontal MAP sensor (38) and fix it using the screw (39) with the relevant spacer.

If previously removed, position the vertical MAP sensor (40) and fix it using the screw (41) with the relevant spacer.
Fit the breather hose (42) and tighten clip (43).

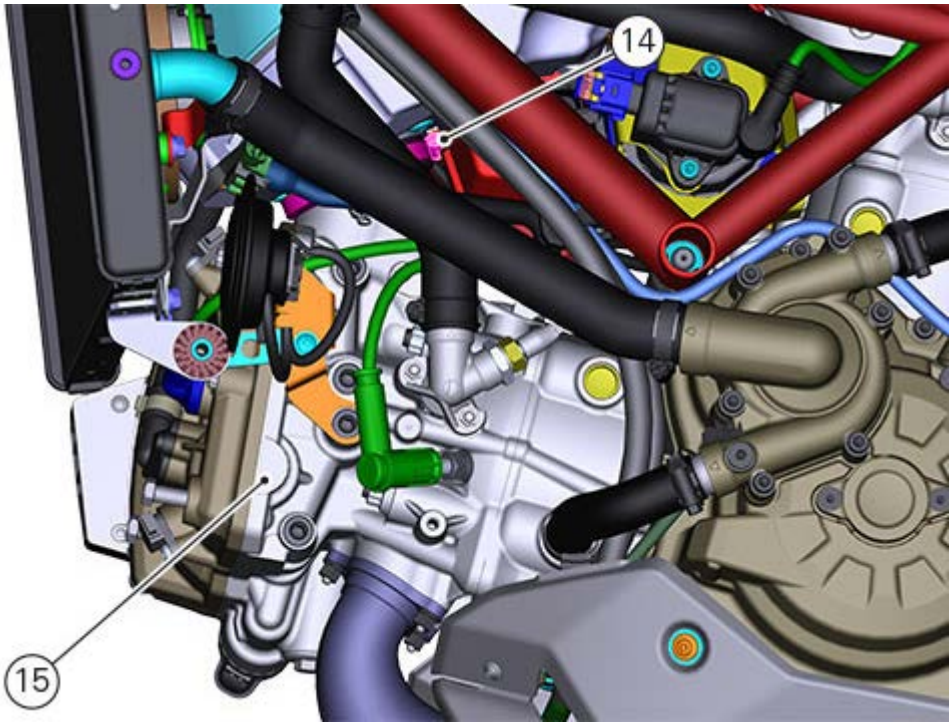


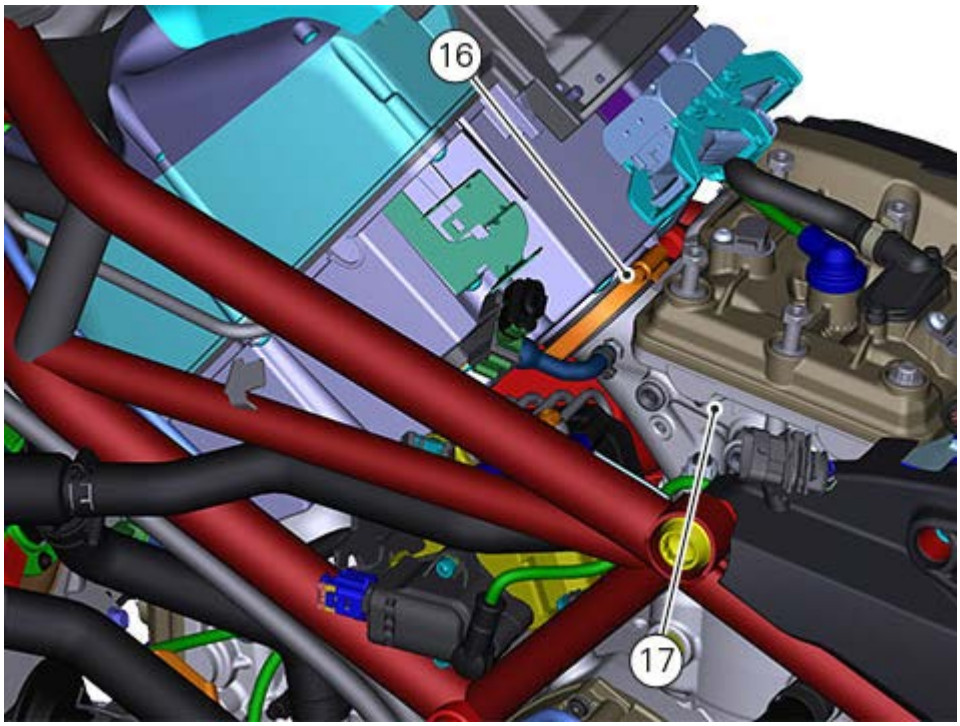
Use the indicated product to lubricate the O-ring and fit it fully home in the airbox.

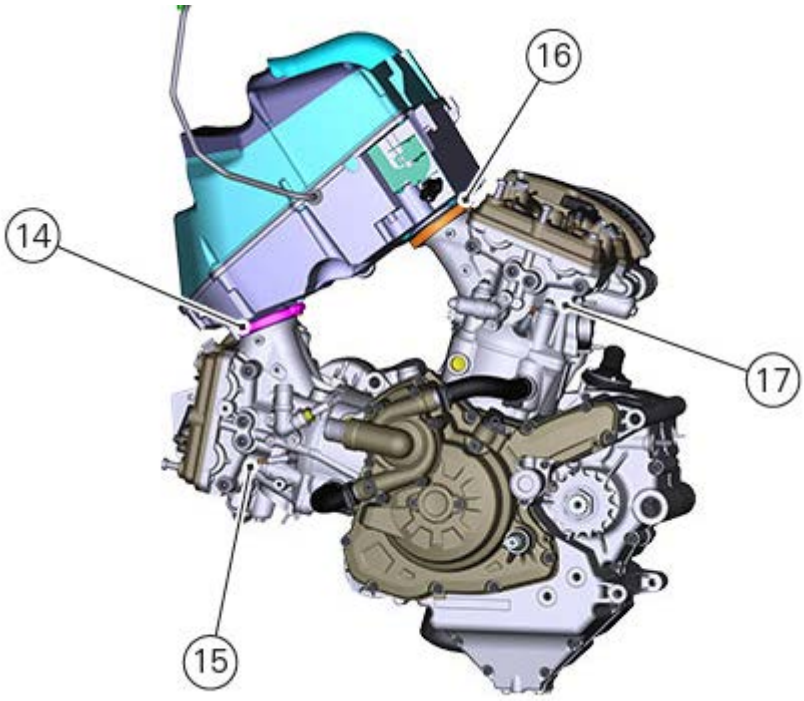
Insert the union hose (44) for the secondary air system actuator.
Fix it with clamp (45).



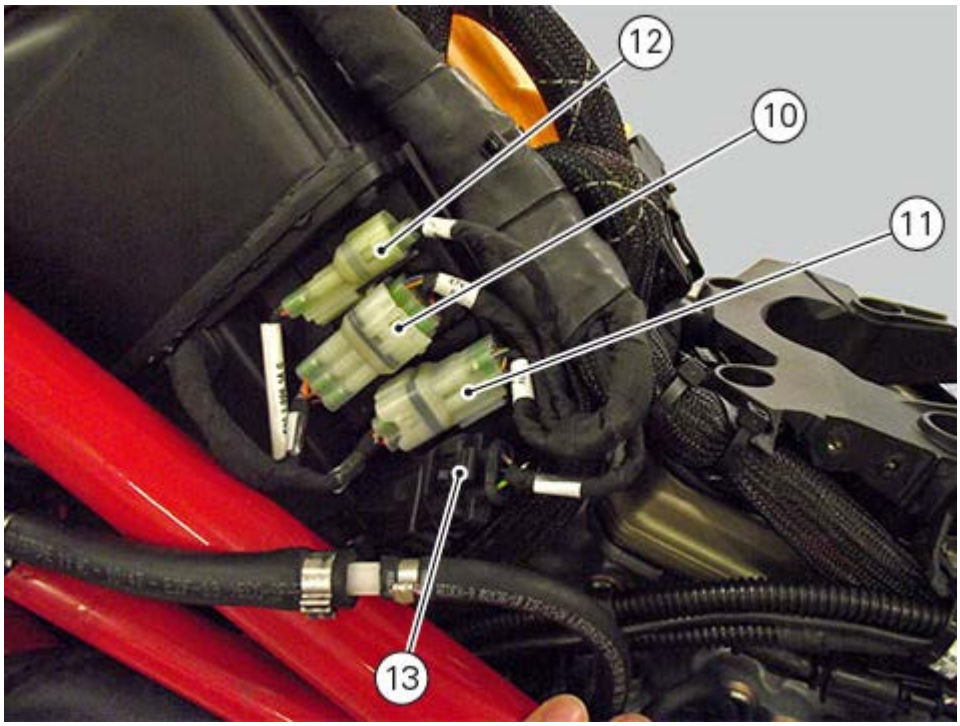
Position the airbox on the heads.
Tighten clamp (14) that keeps the airbox against the horizontal cylinder head (15).
Tighten clamp (16) that keeps the airbox against the vertical cylinder head (17).

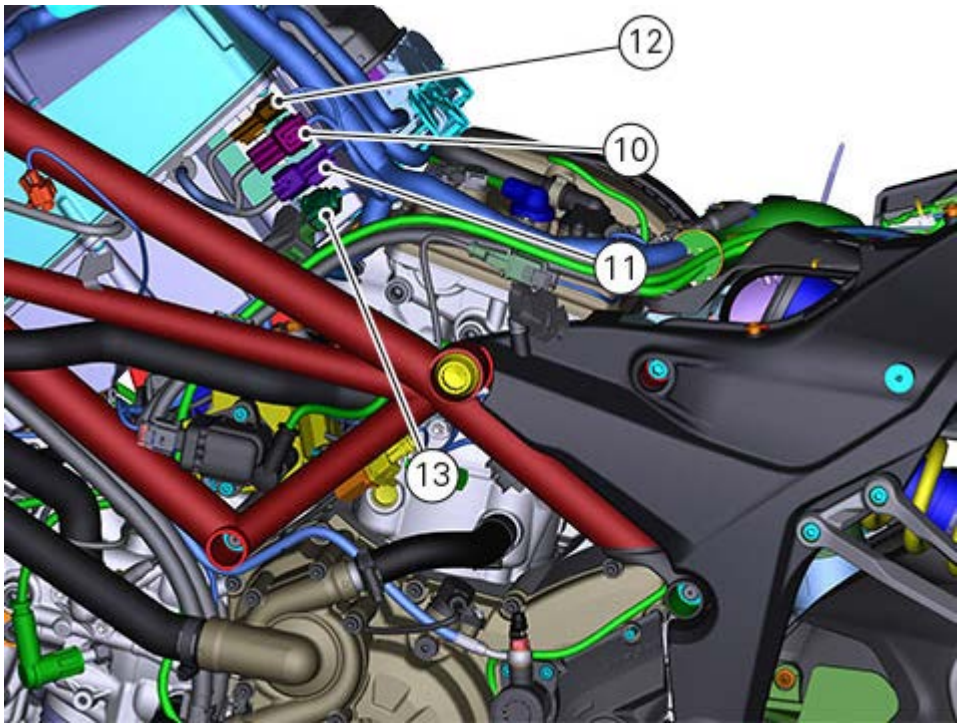


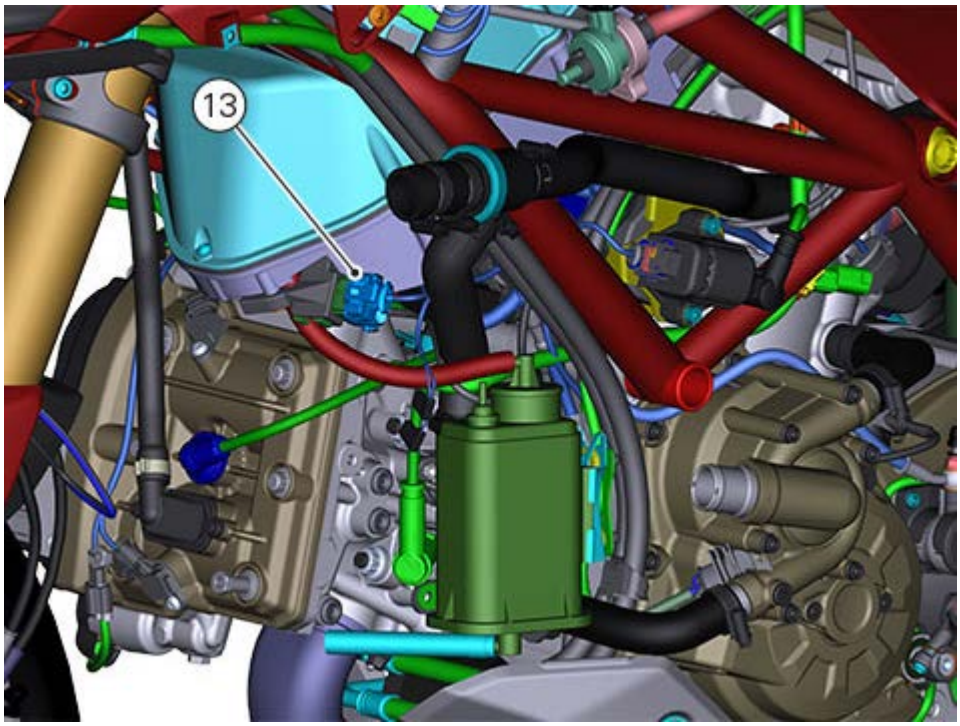




Connect the two ETV connectors (10) and (11), the injection connector (12) and the vertical map sensor (13).

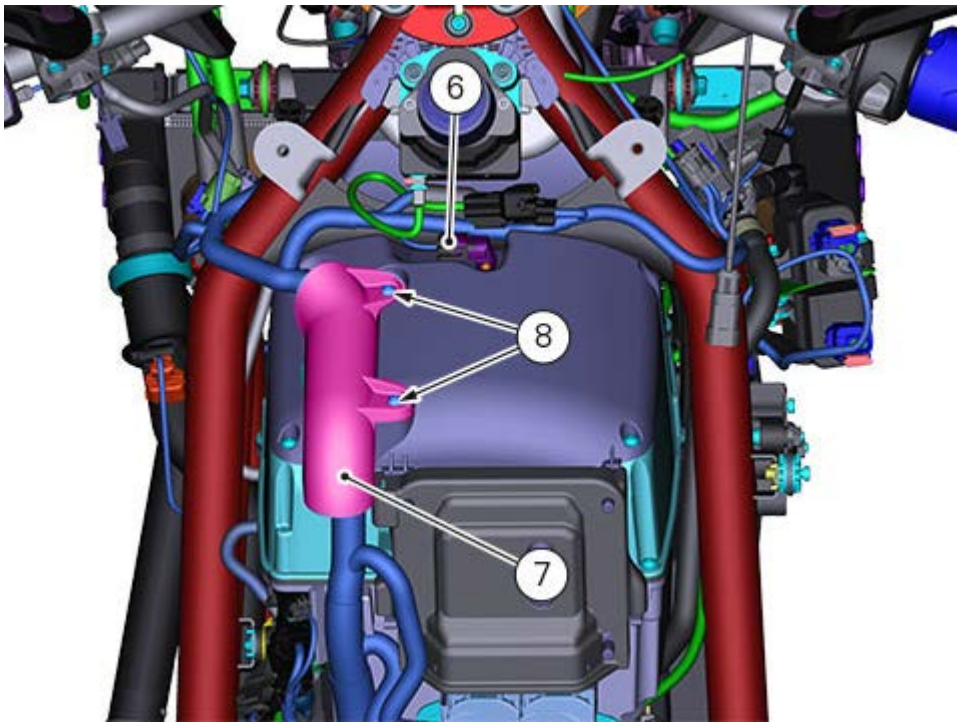

12
10
11
13


12
10
11
13



Engage the control unit in the pins.
Connect the control unit (9).

Position the main wiring on the airbox.
Position wiring cover (7) and fix it by tightening the two screws (8).
Connect the air sensor (6).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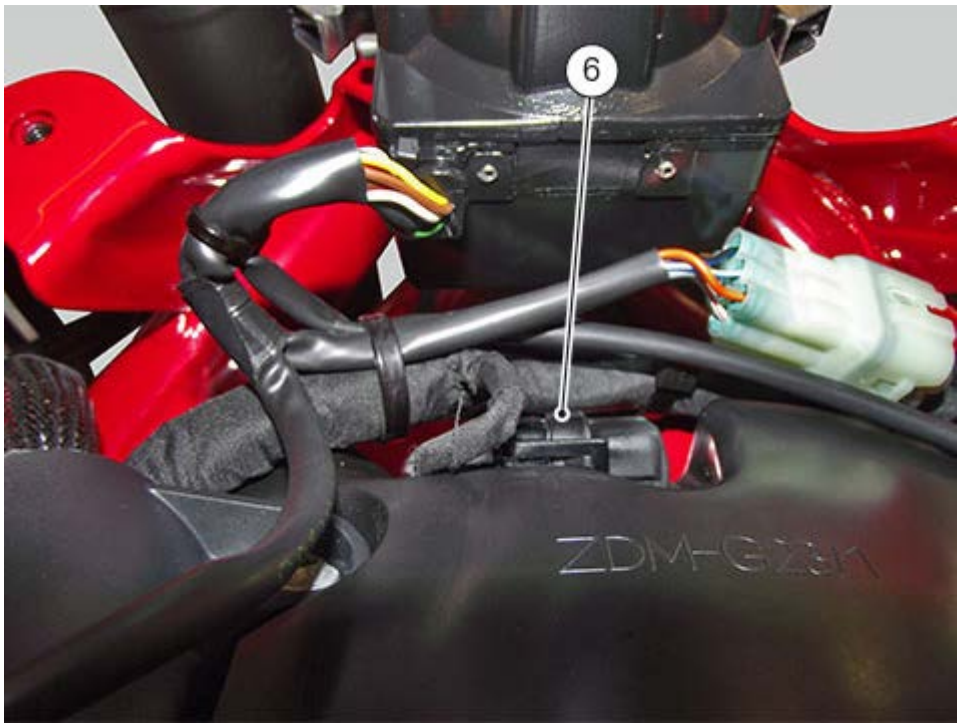
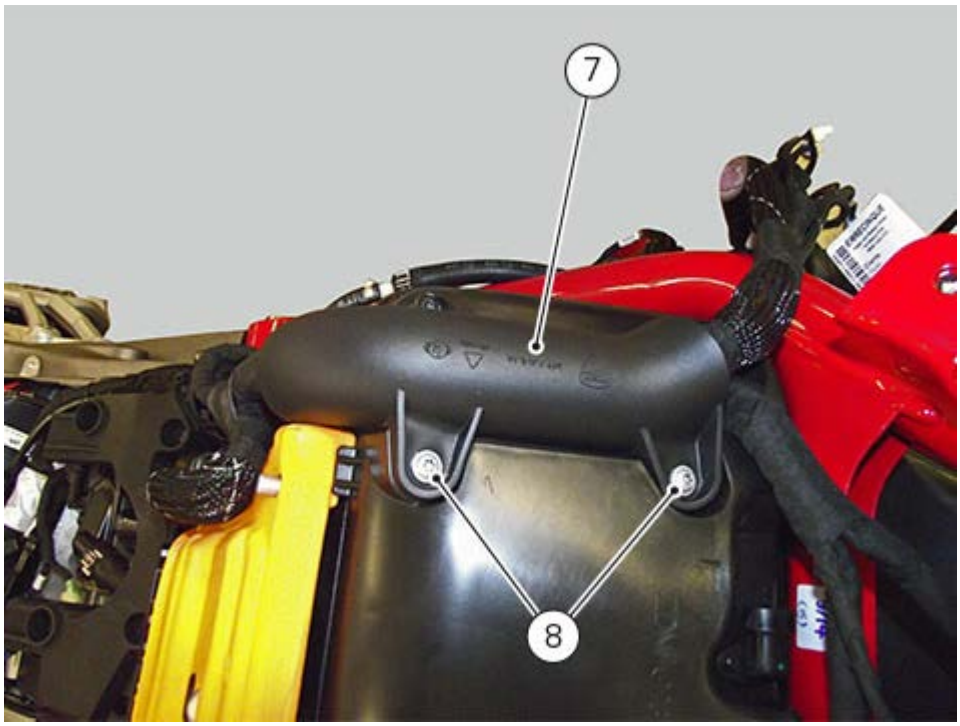
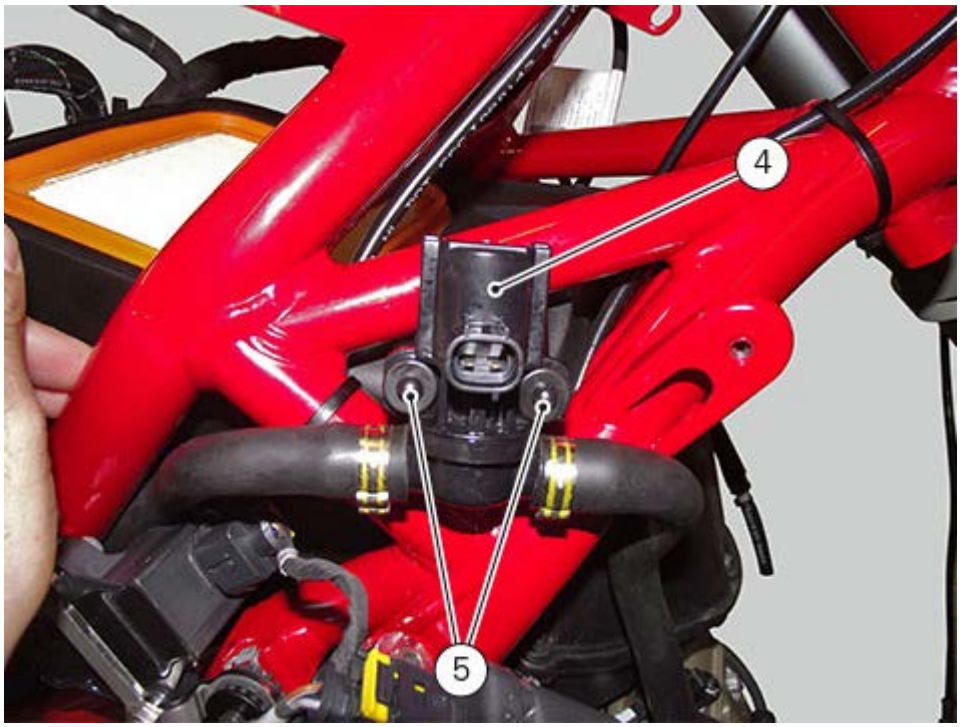
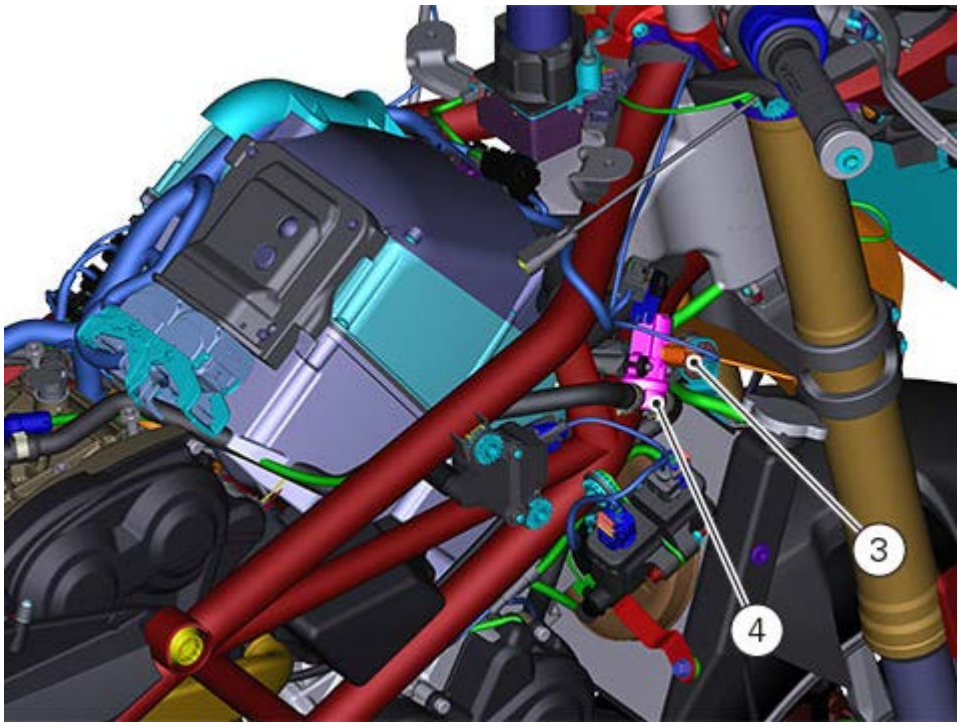

6



Fit the secondary system valve (4) and fix it with the two pins (5).



Connect connector (3) of the secondary air valve (4).
Tighten the retaining clamp.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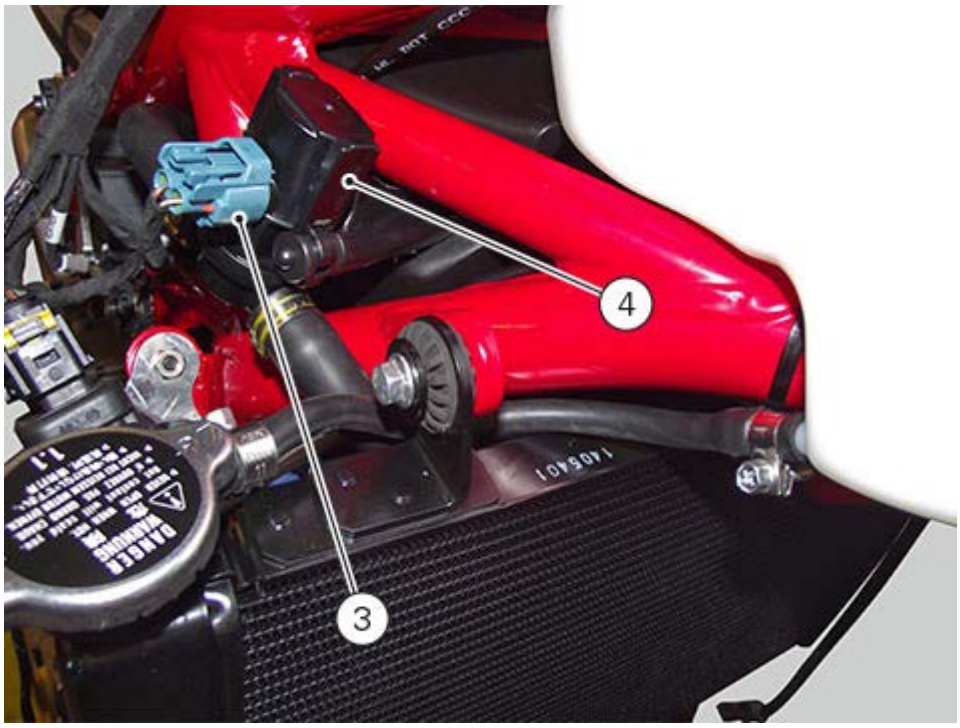
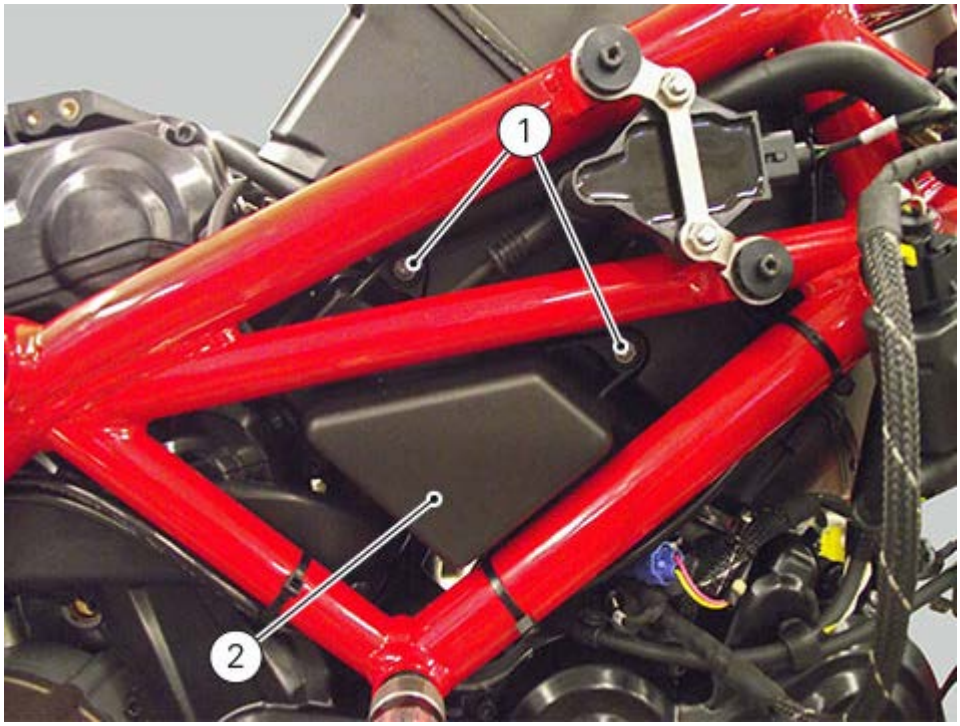
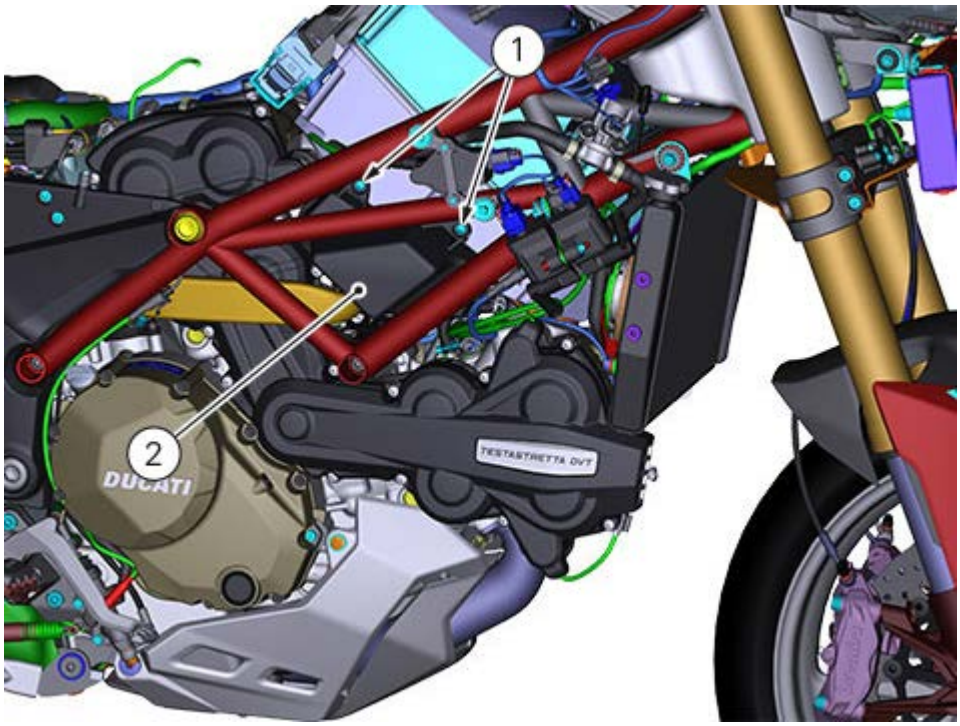

4
3

Fit the Blow-by tank union in the airbox having care not to damage the O-ring.
Tighten the two retaining screws (1) of the Blow-by tank (2).



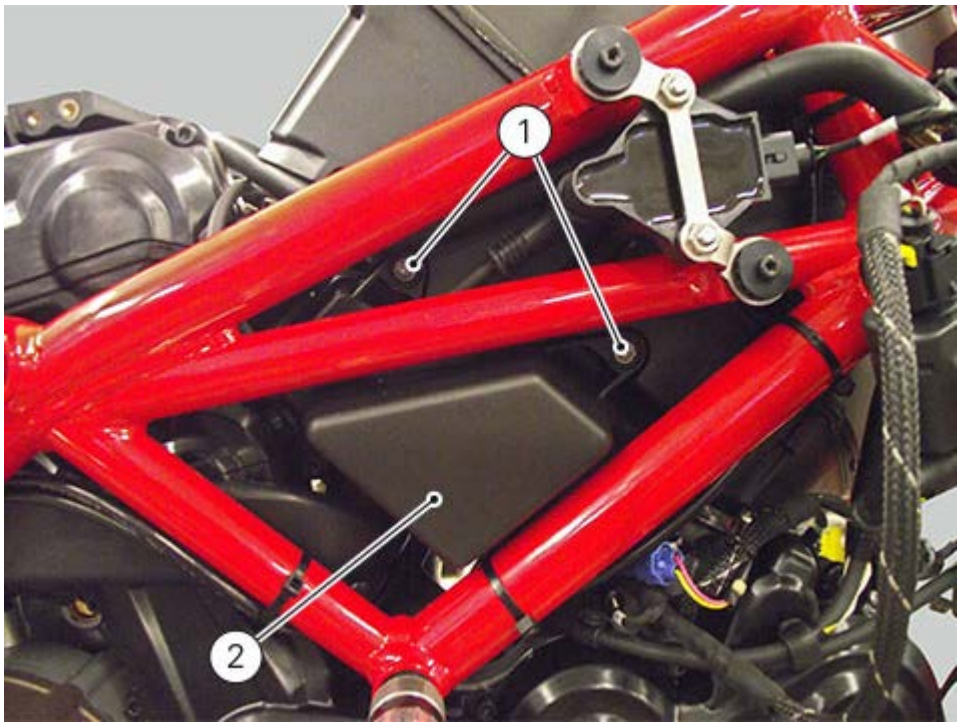


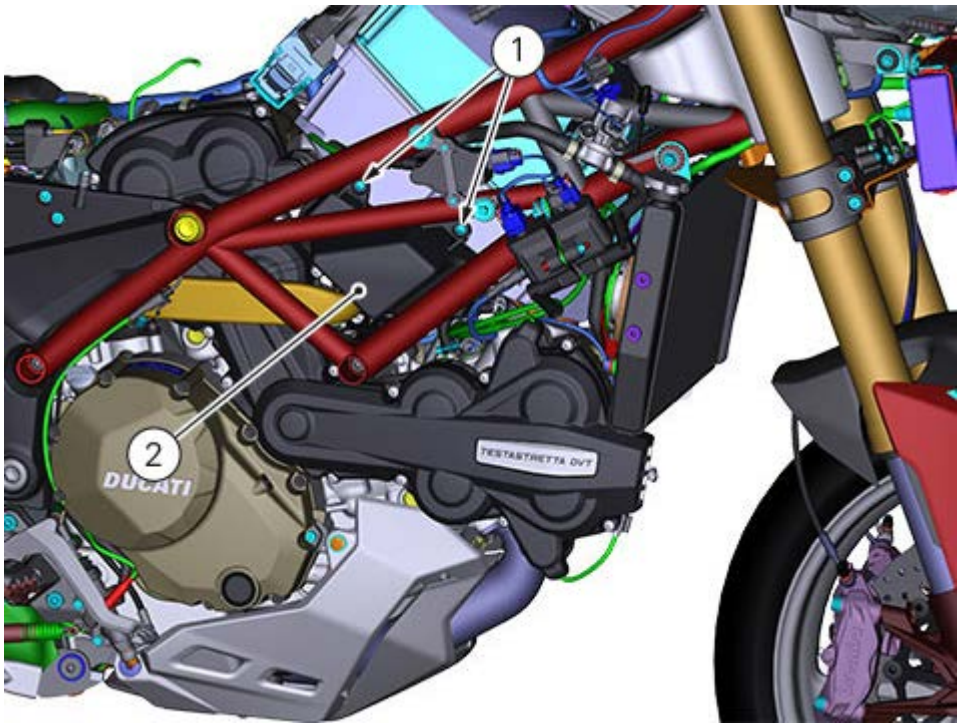
Refit the tank (Refitting the tank).

Removing the airbox and throttle body

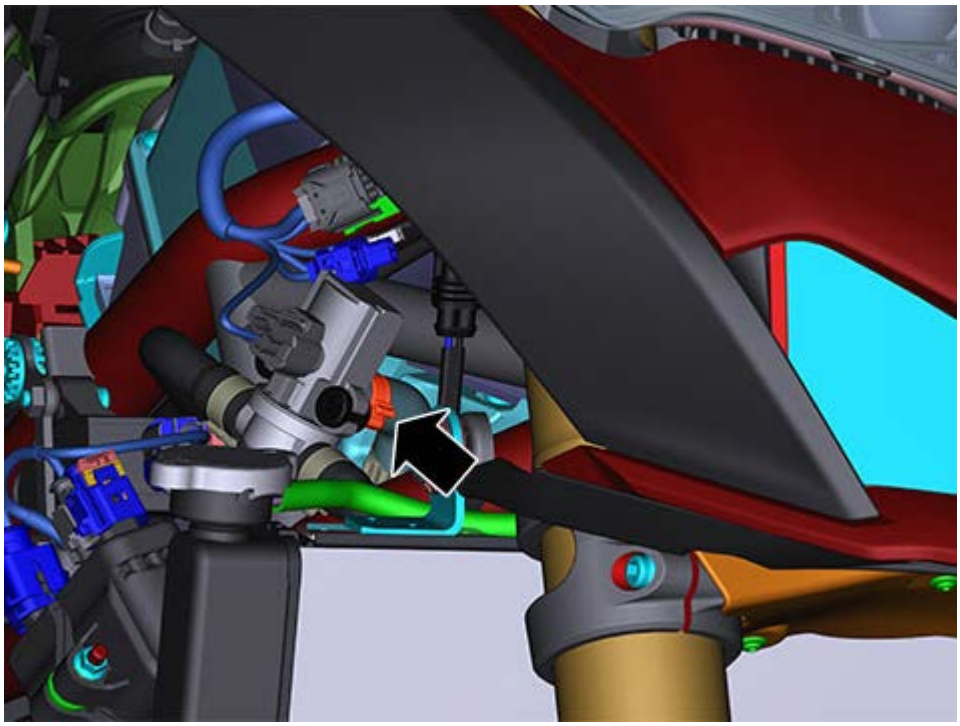
Remove the fuel tank (Removing the tank).

Loosen the two retaining screws (1) of the Blow-by tank (2).

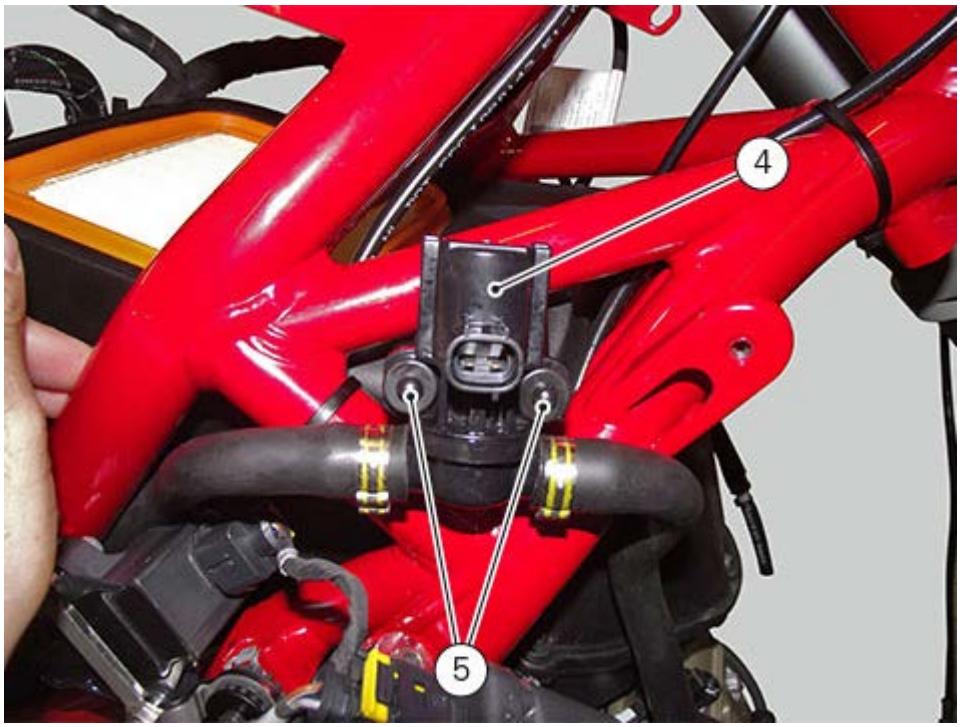




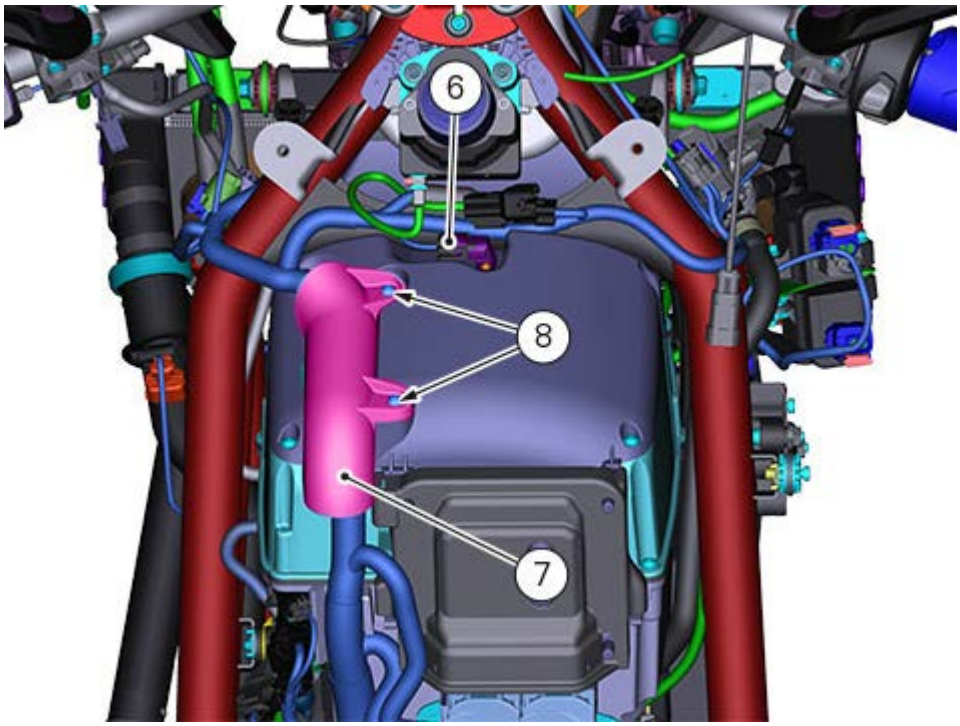
Remove the secondary air system union tie.



Remove the secondary system valve (4) by sliding it out of the two pins (5).



Disconnect the air sensor (6).
Remove the wiring cover (7) by loosening the two retaining screws (8).
Release the wiring from the airbox.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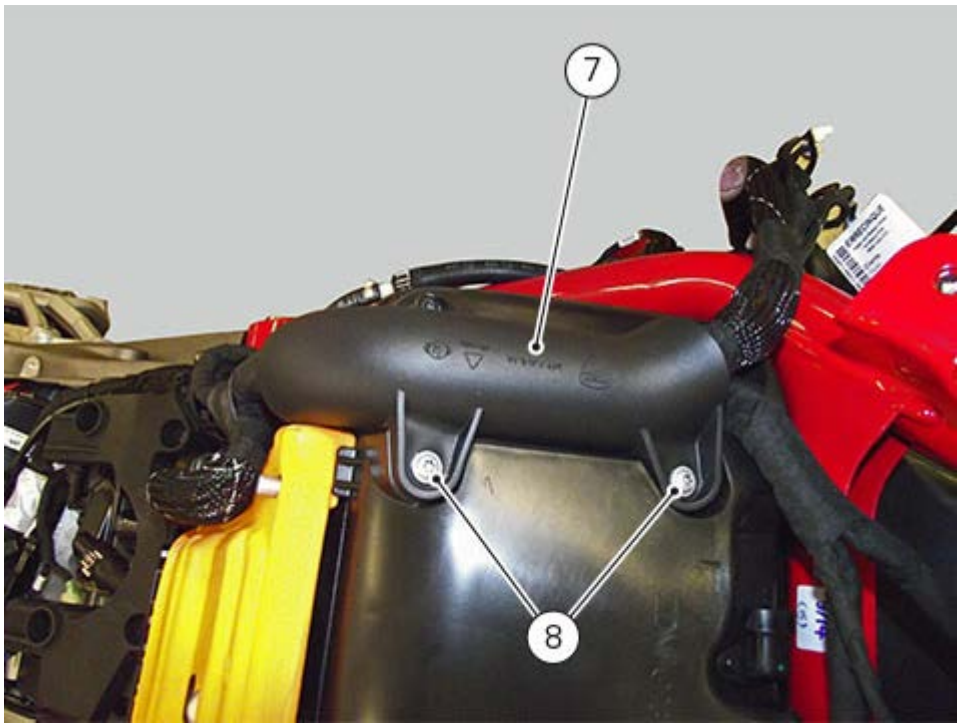
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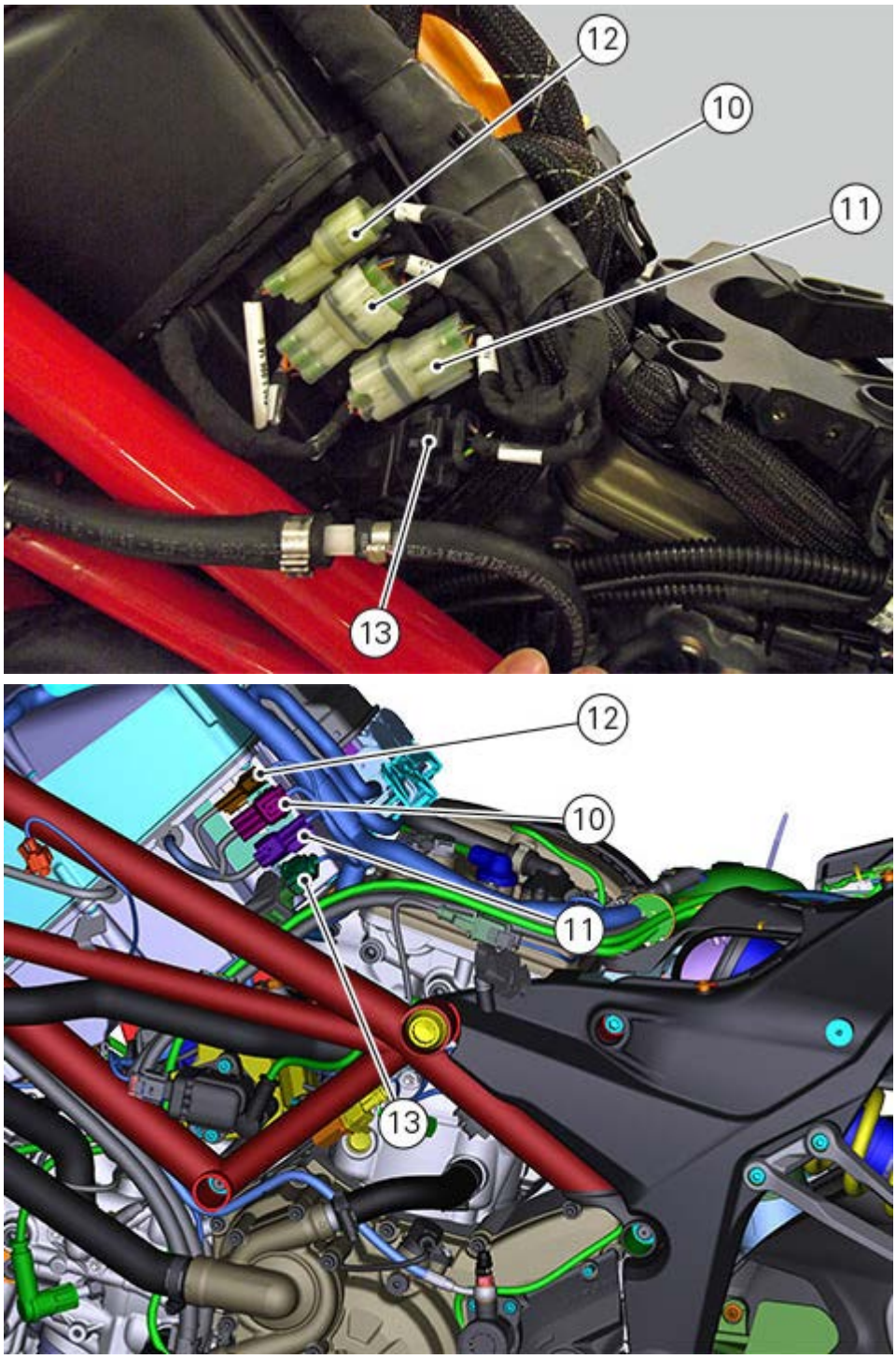
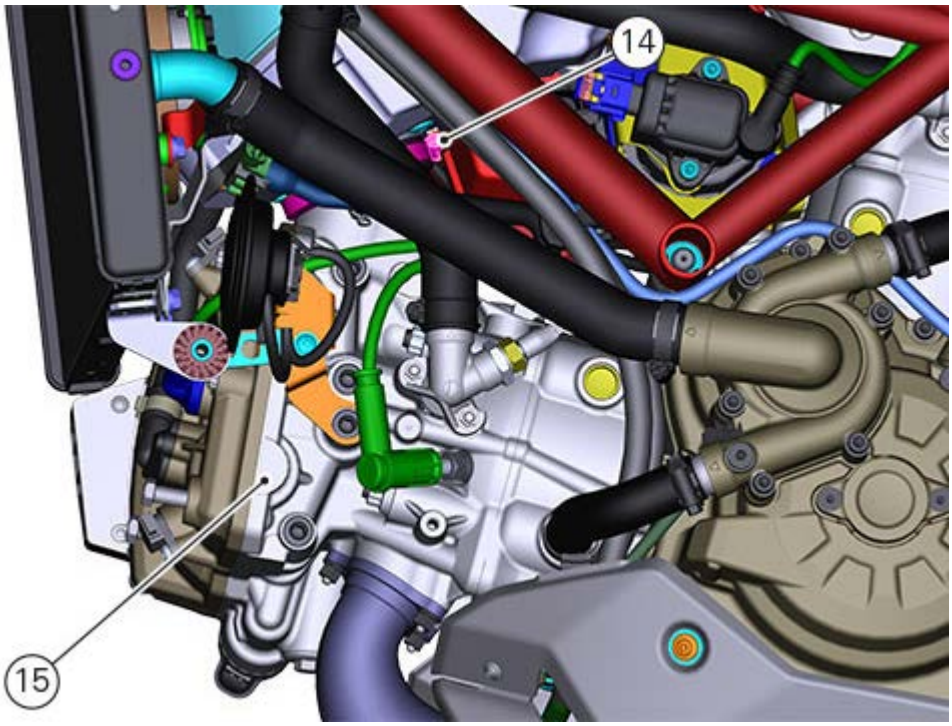
Disconnect the control unit (9) and remove it by sliding it upwards.

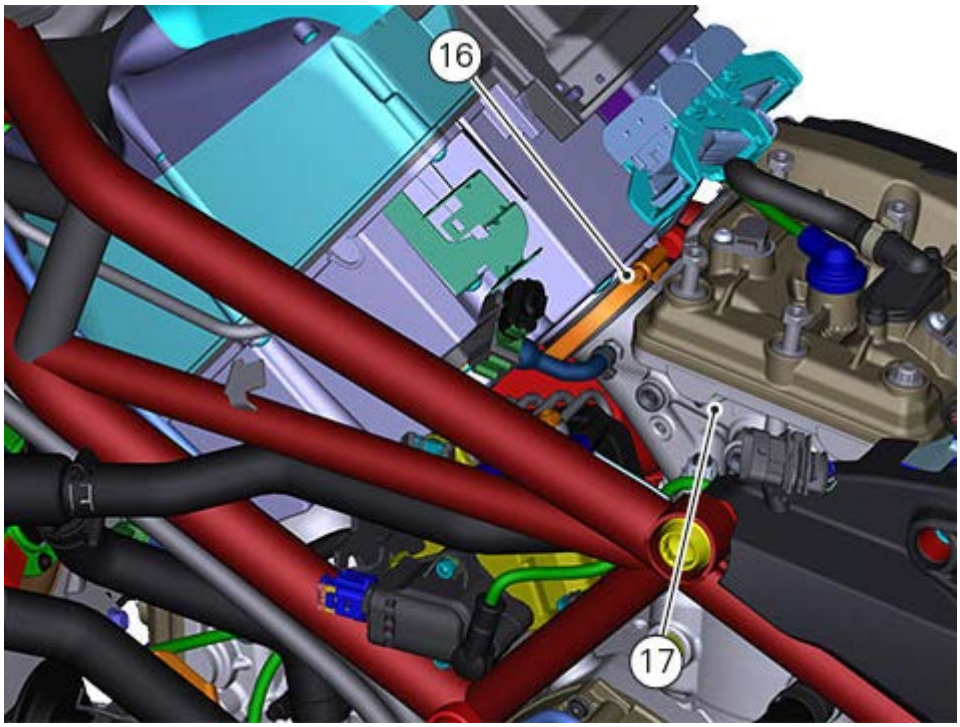
Disconnect the two ETV connectors (10) and (11), the injection connector (12) and the vertical and horizontal map sensor (13).

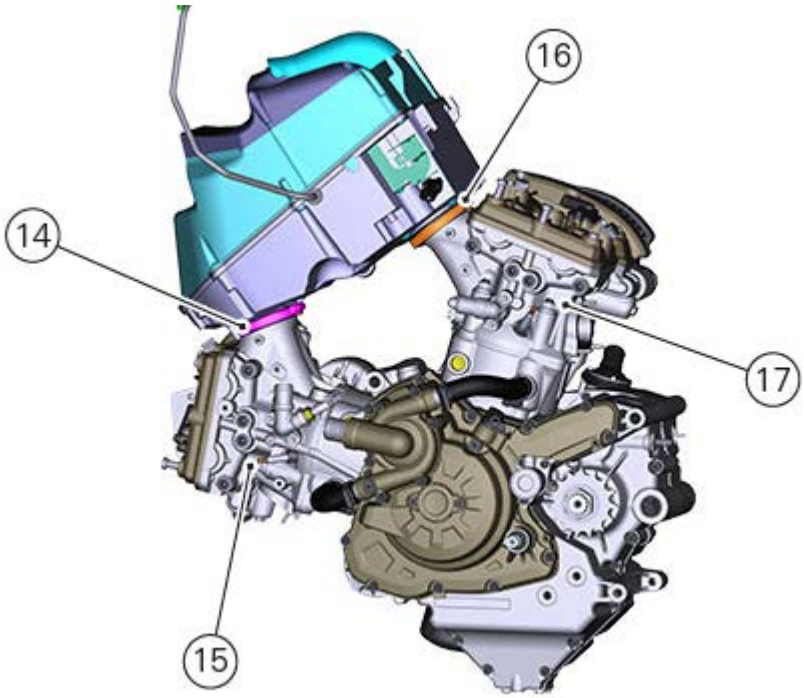


Loosen clamp (14) that keeps the airbox against the horizontal cylinder head (15).



Loosen clamp (16) that keeps the airbox against the vertical cylinder head (17).





Remove the airbox.

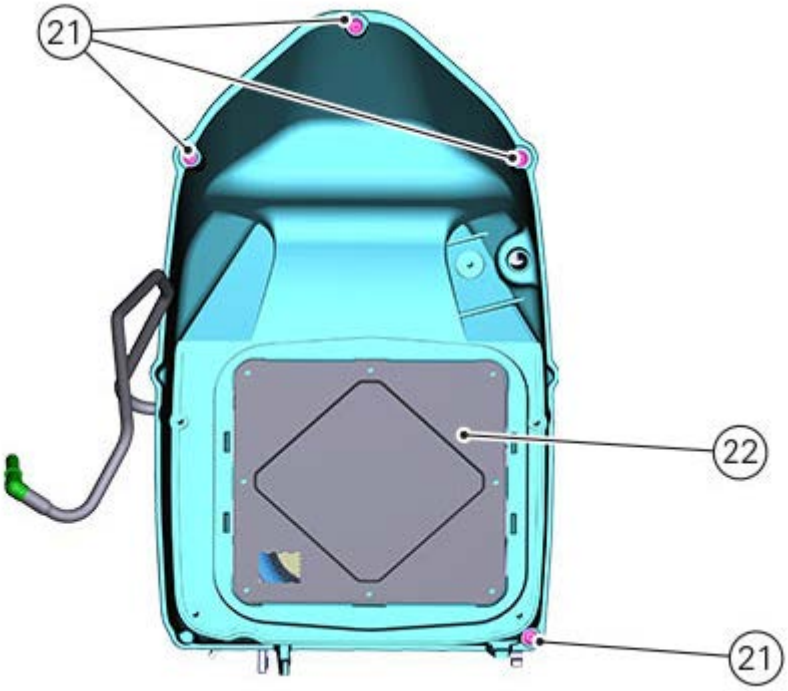
REMOVING THE AIR FILTER

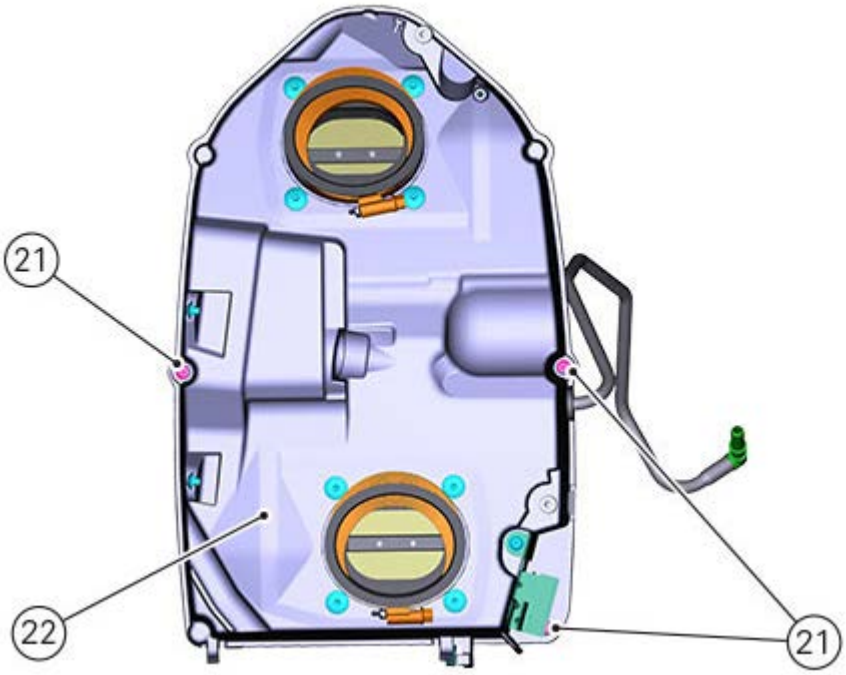
Loosen screws (19) and remove cover (18).

Remove the airbox (20).

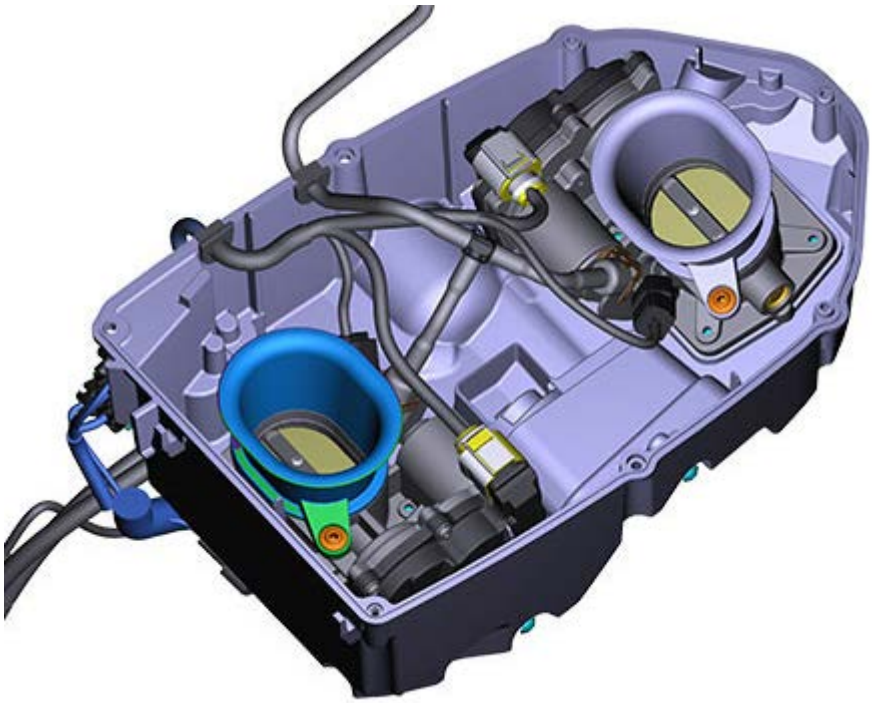
REMOVING THE THROTTLE BODY

Loosen screws (21) retaining the upper airbox (22).

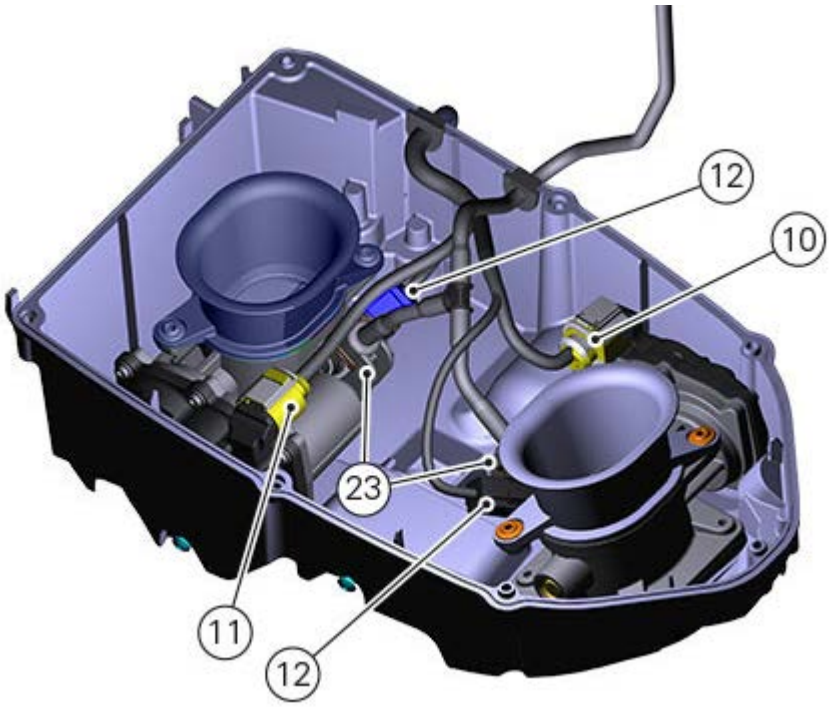




Remove the upper part of the airbox (22).



Disconnect the connectors of injectors (12) and of the ETV motor (10) and (11).
Loosen the retaining screw to remove the injectors (23).



Working on the opposite side, loosen the eight retaining screws (24) and remove the two throttle bodies (25).


25

Refitting the secondary air system

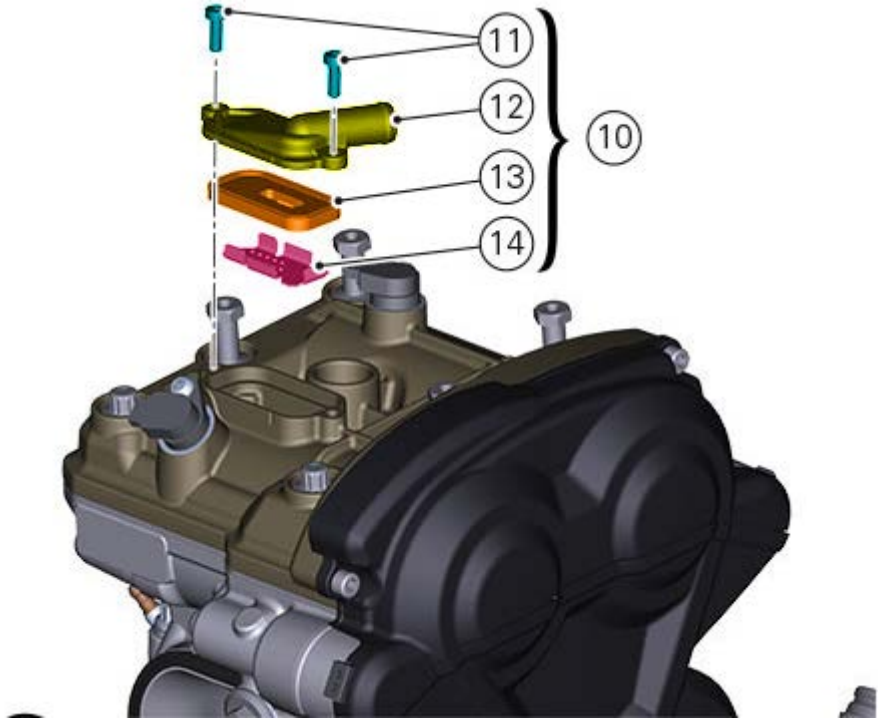
Note

Remove cloth from the secondary air system duct on head cover.

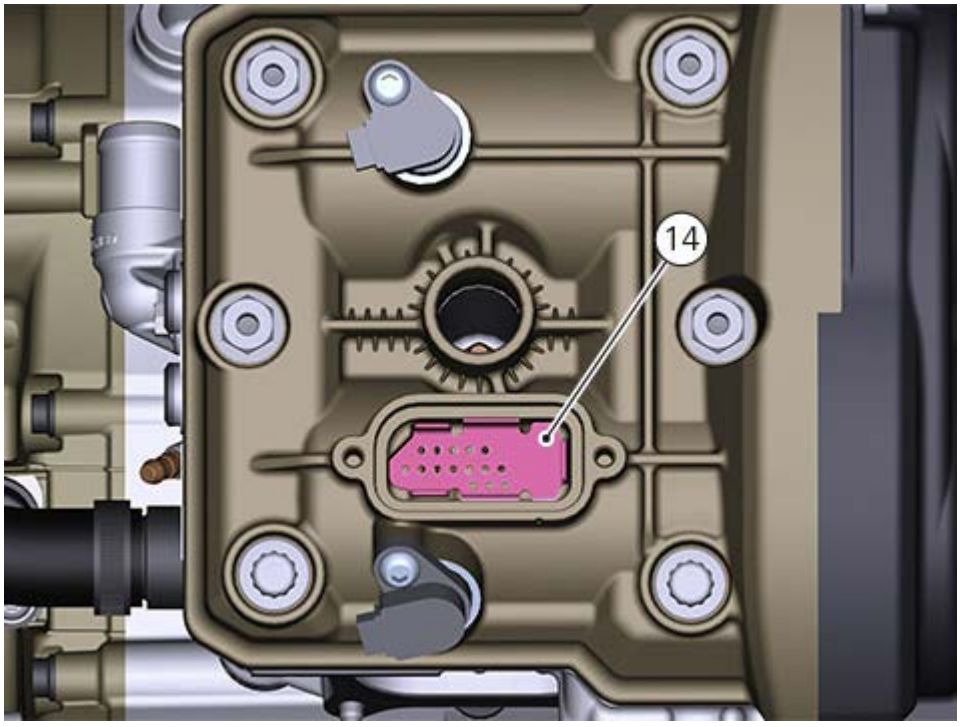
Warning

Do not invert the positions of the covers and components of the two valves of the secondary air system. Refer to the reference notches present on the secondary air system valve cover and on head cover.

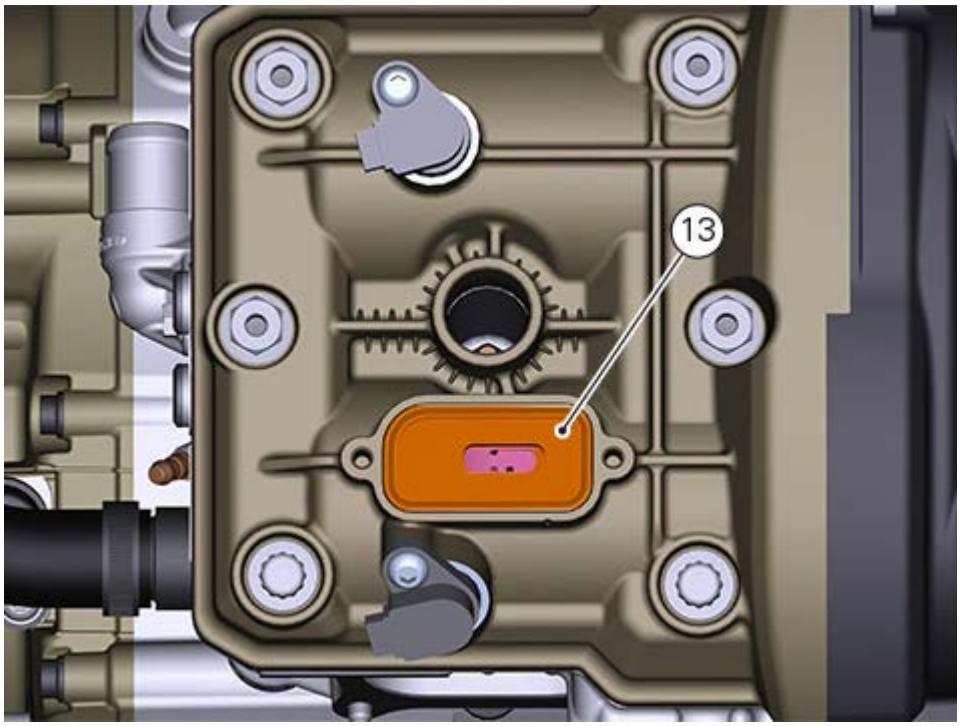
If disassembled, refit secondary air system valves (10) applying the same procedure for both of them.



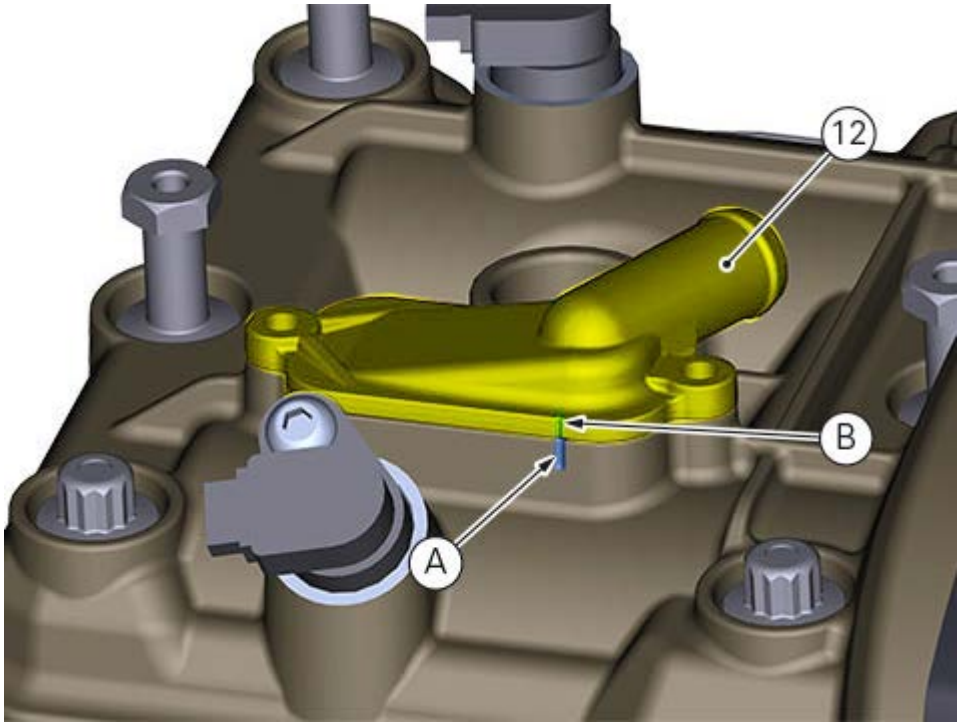
Fit the spark arrestor (14).



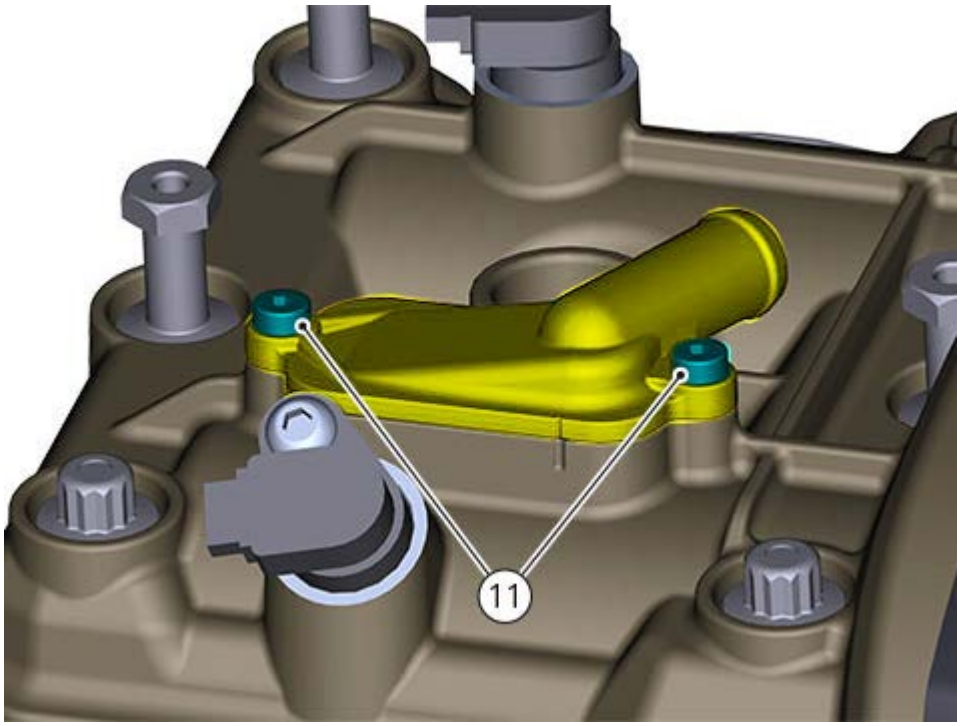
Fit the reed valve (13).



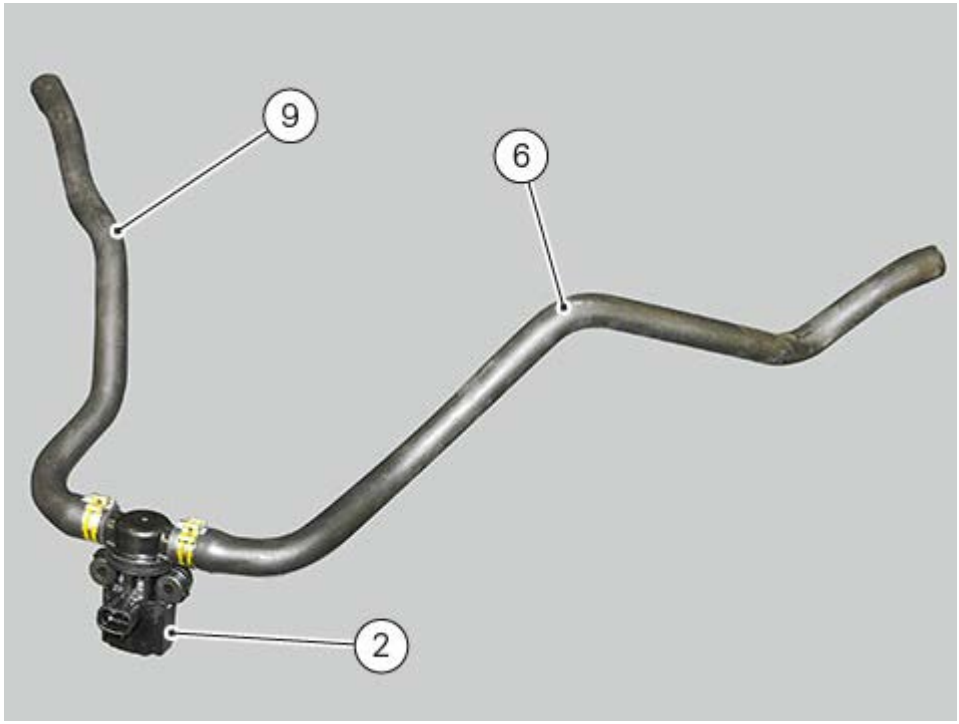
Fit the secondary air system cover (12) on head cover, aiming it as shown, by aligning the references (A) with those on head cover and references (B) with those on valve cover (12).



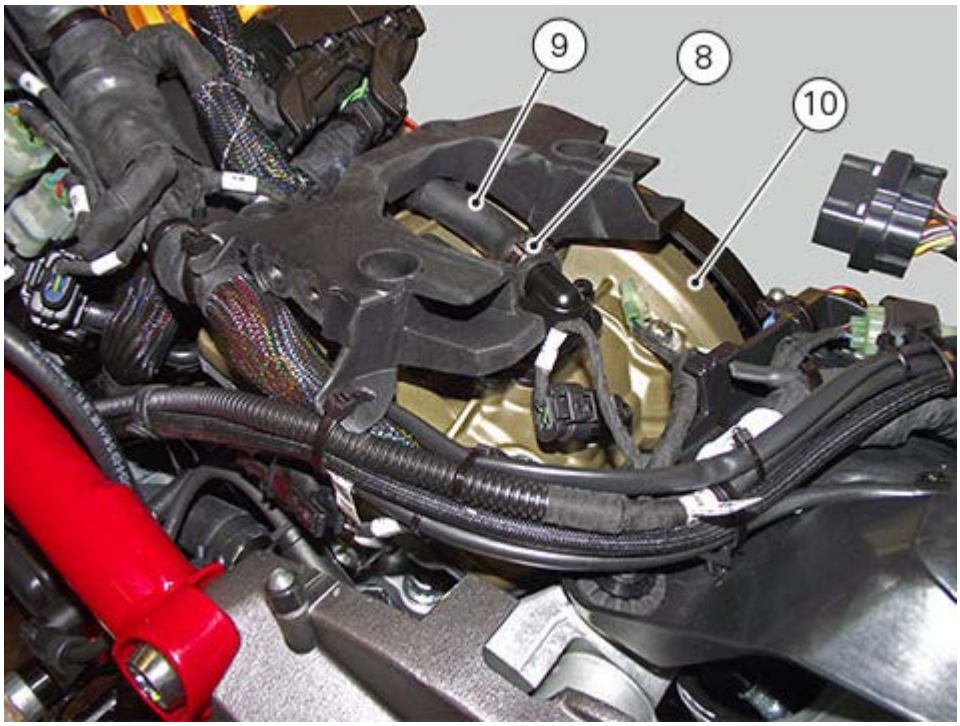
Start the two screws (11).
Tighten the two screws (11) to a torque of 6Nm (min. 5 Nm. - max. 7 Nm).



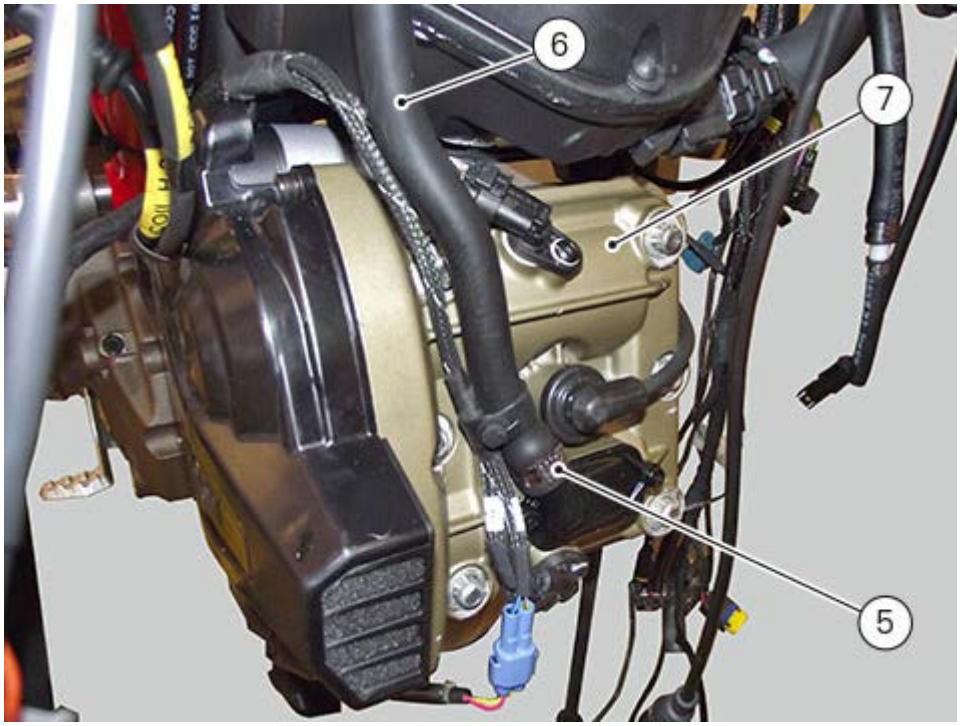
Fit the secondary air actuator (2) with the two pipes (6) and (9).



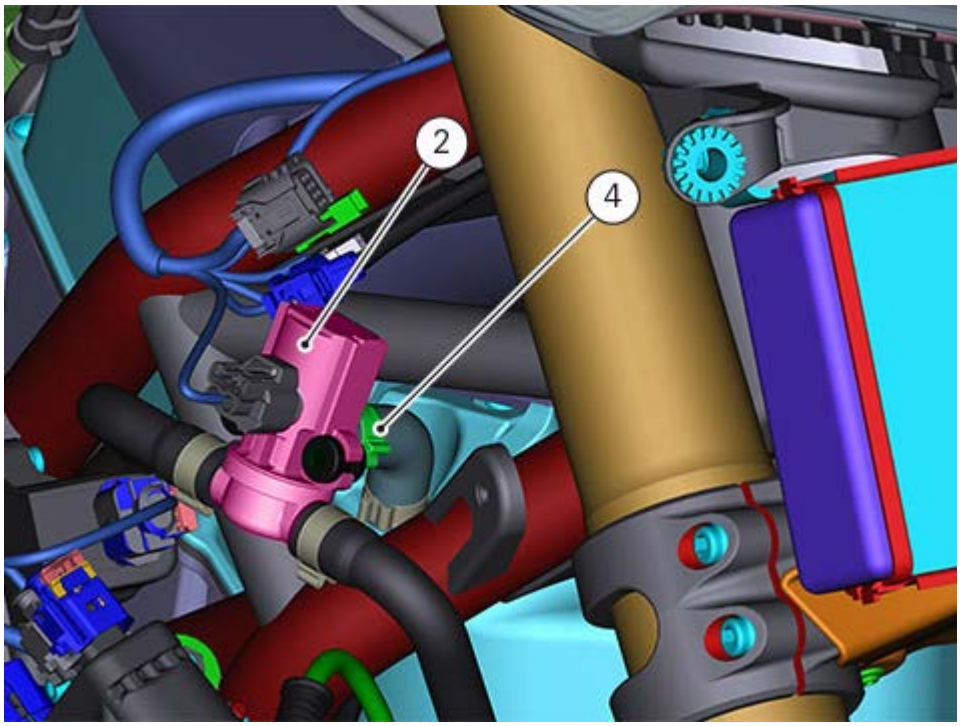
Working on the vertical head, fit the retaining clamp (8) of the secondary air system pipe (9).
Tighten the retaining clamp (8).



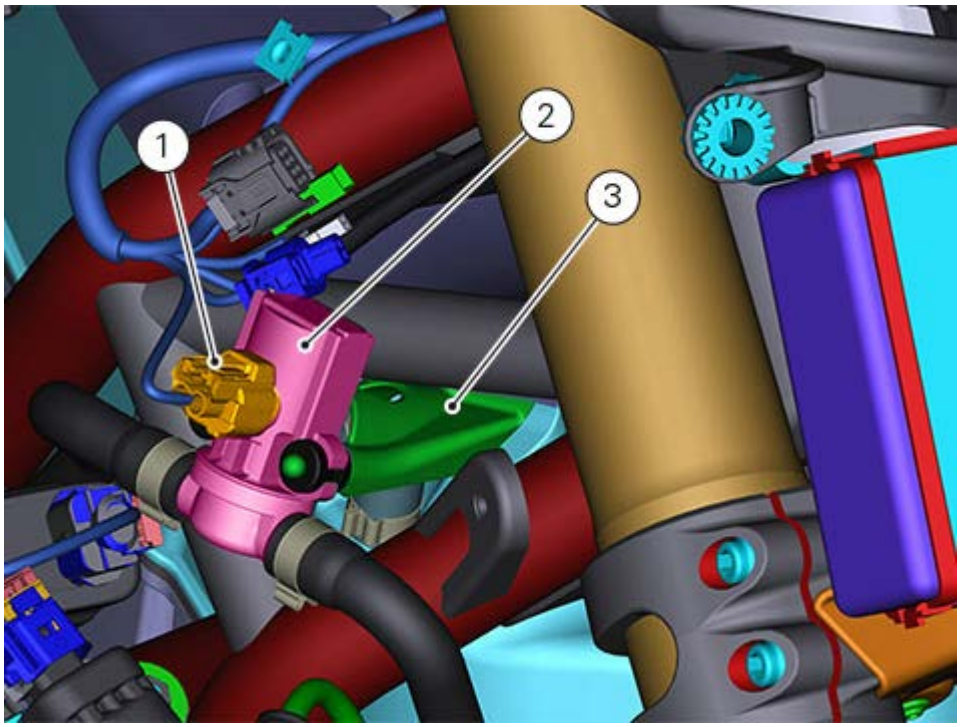
Working on the horizontal head, fit the retaining clamp (5) of the secondary air system pipe (6).
Tighten the retaining clamp (5).



Insert the secondary air actuator (2).
Fix it with clamp (4).



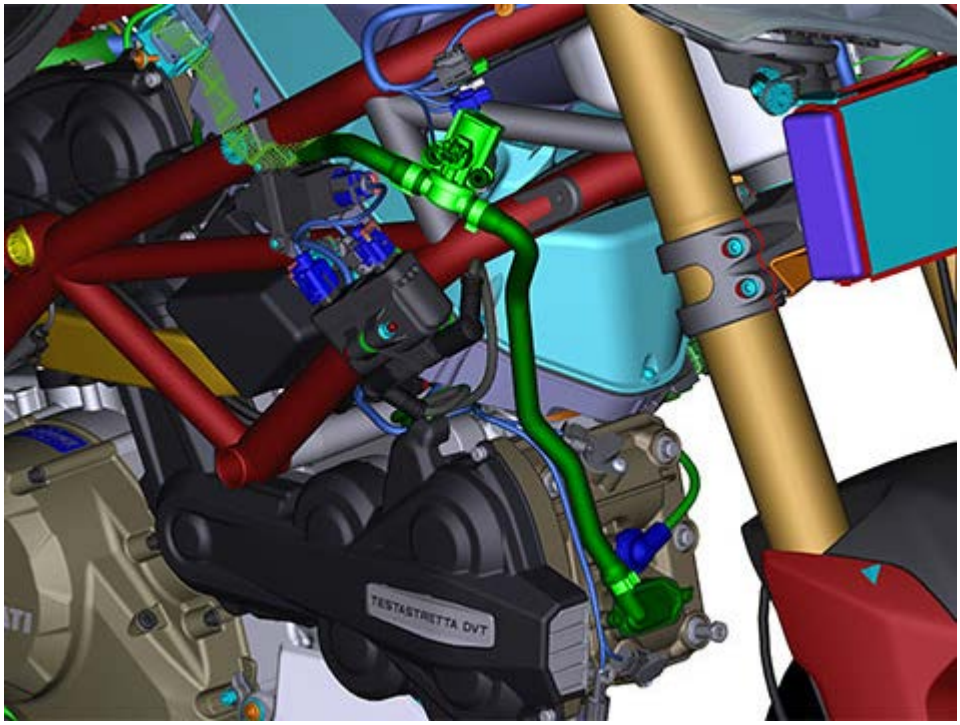
Reconnect connector (1) of the secondary air actuator (2).

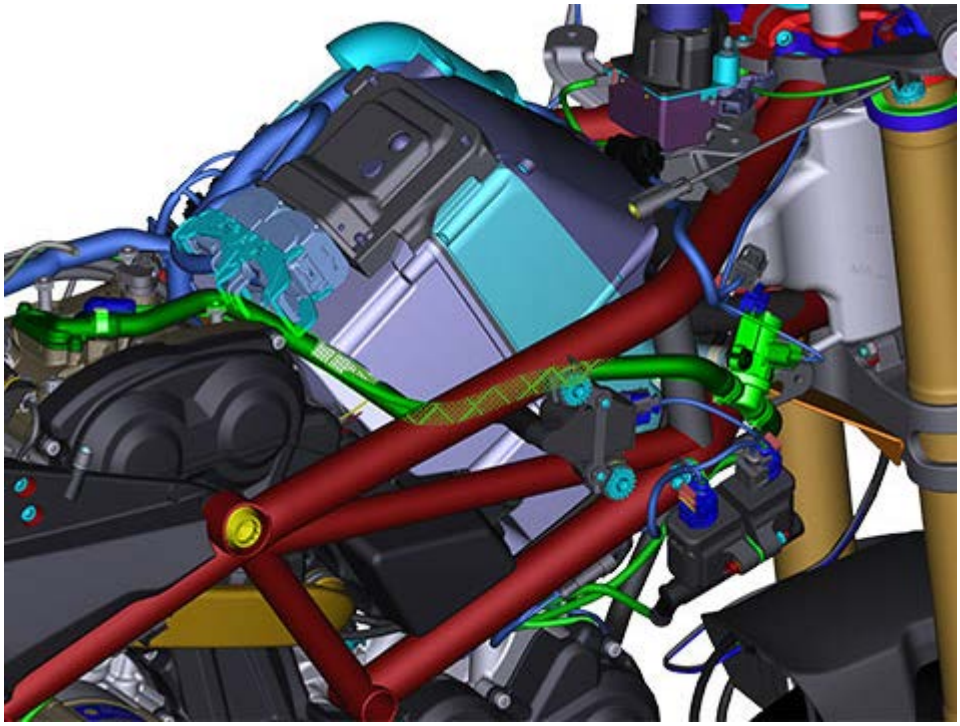


Refit the fuel tank (Refitting the fuel tank).

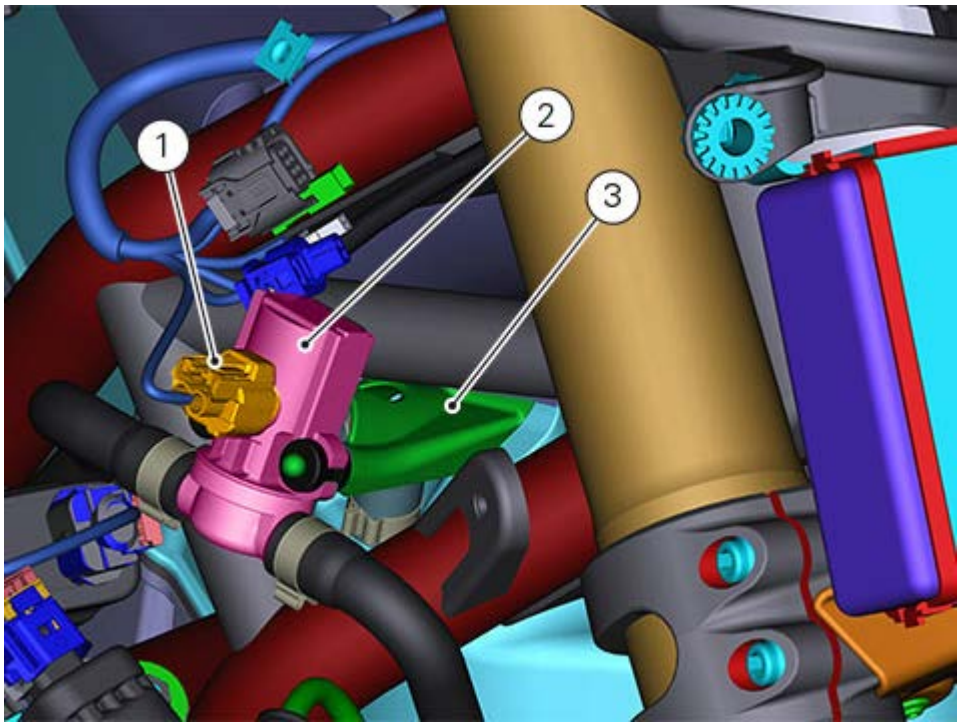
Removing the secondary air system

Remove the fuel tank (Removing the tank).

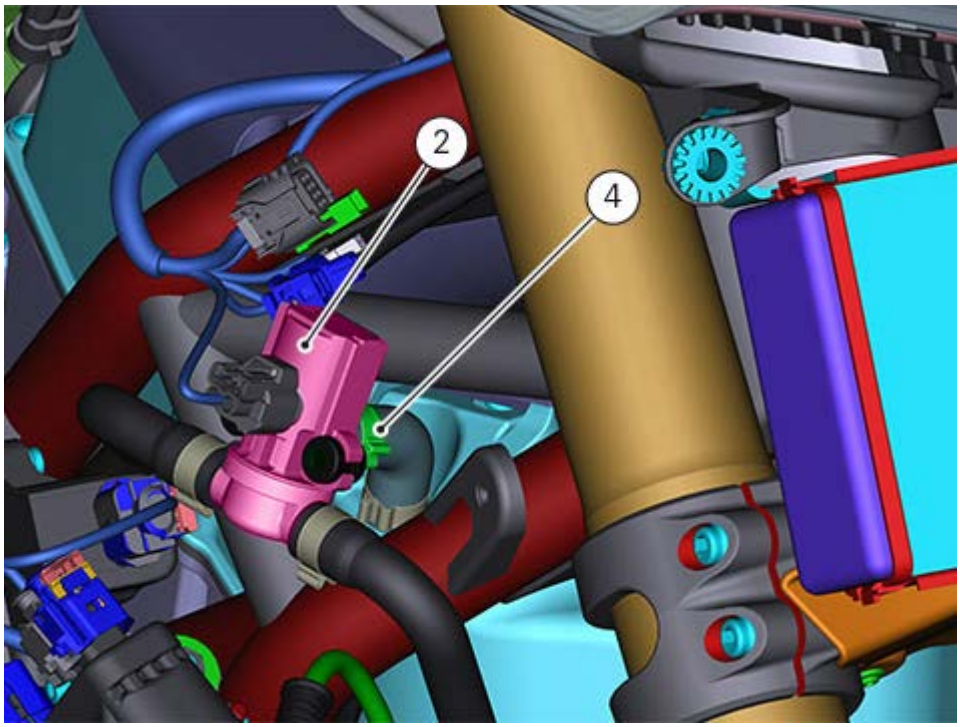




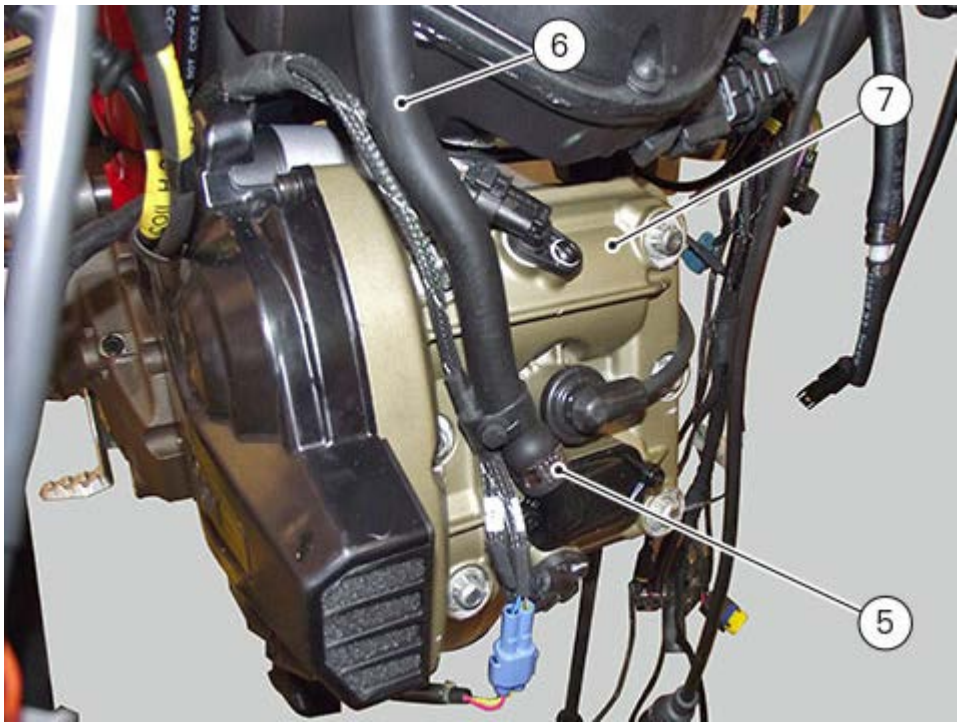
Disconnect connector (1) of the secondary air actuator (2).
Remove it from its support (3).



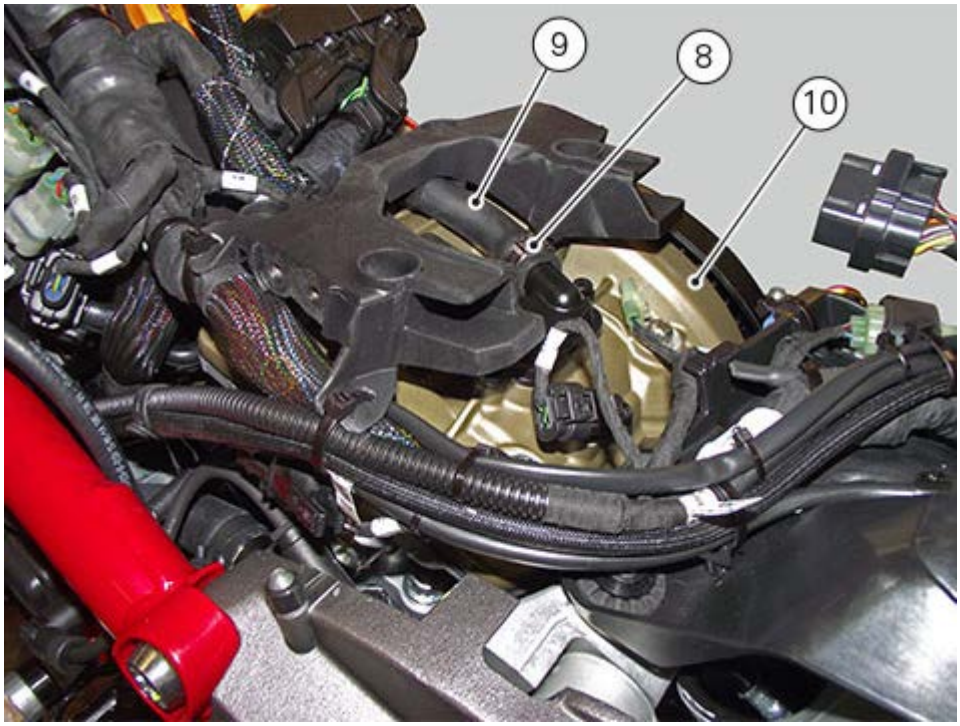
Remove clamp (4) and secondary air system actuator (2).



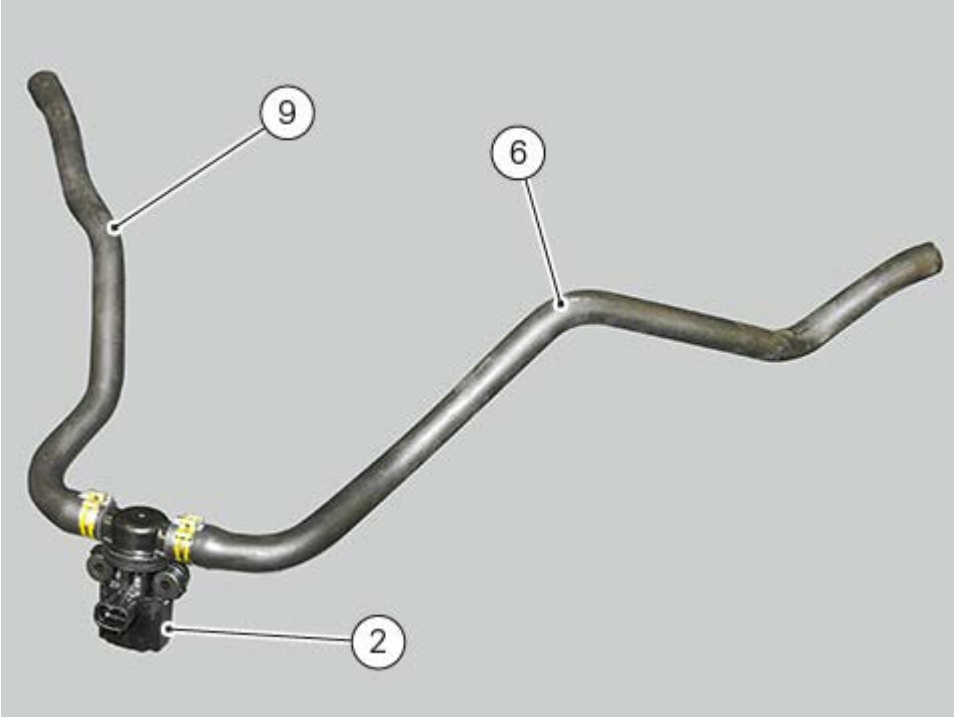
Working on the horizontal head, remove the retaining clamp (5) of the secondary air system pipe (6). Slide the secondary air system pipe (6) out of the horizontal head (7).



Working on the vertical head, remove the retaining clamp (8) of the secondary air system pipe (9). Slide the secondary air system pipe (9) out of the vertical head (10).

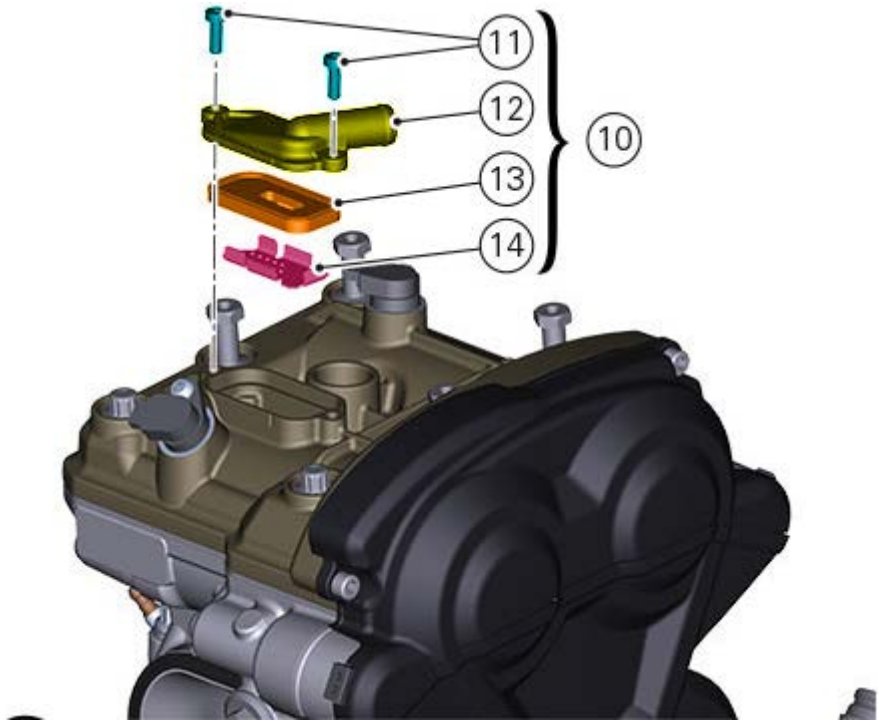


Slide out of the vehicle the secondary air actuator (2) with the two pipes (6) and (9).



Disassembly

If necessary, disassemble secondary air system valves (10) applying the same procedure for both heads.
Loosen the two screws (11) and slide out cover (12), reed valve (13) and spark arrestor (14) in this order.



Note
block off the secondary air system duct on head cover with a clean cloth so as to avoid any impurities from entering the duct.

Refitting the air filter

Position filter (20) as shown in the figure.

Position cover (18) and tighten the screws (19).

Removing the air filter

Remove the fuel tank (Removing the fuel tank).

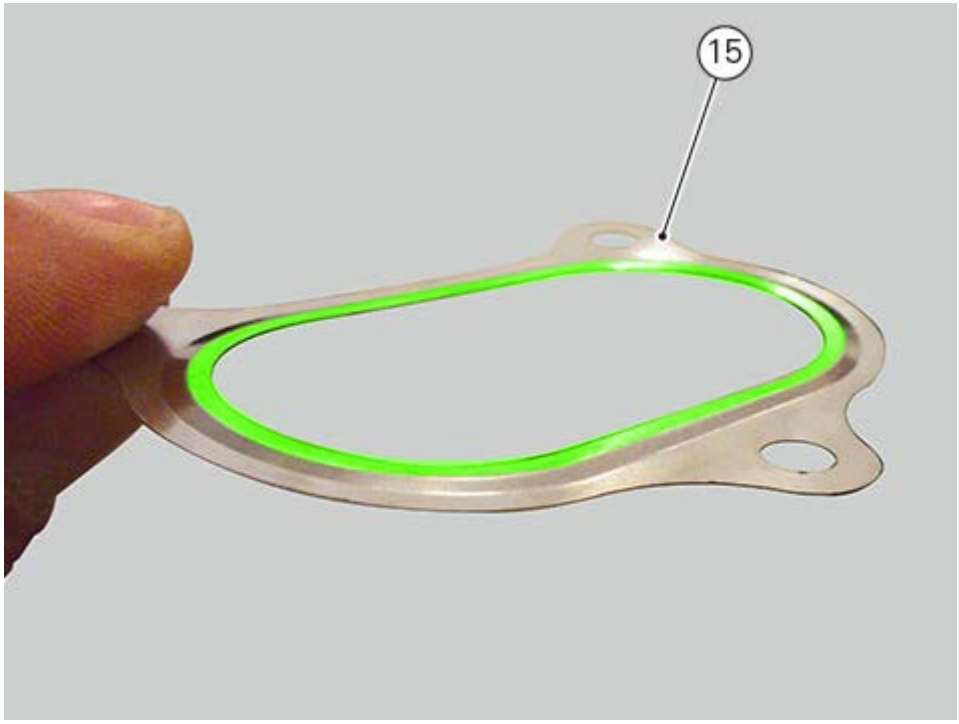
Loosen screws (19) and remove cover (18).

Remove the airbox (20).

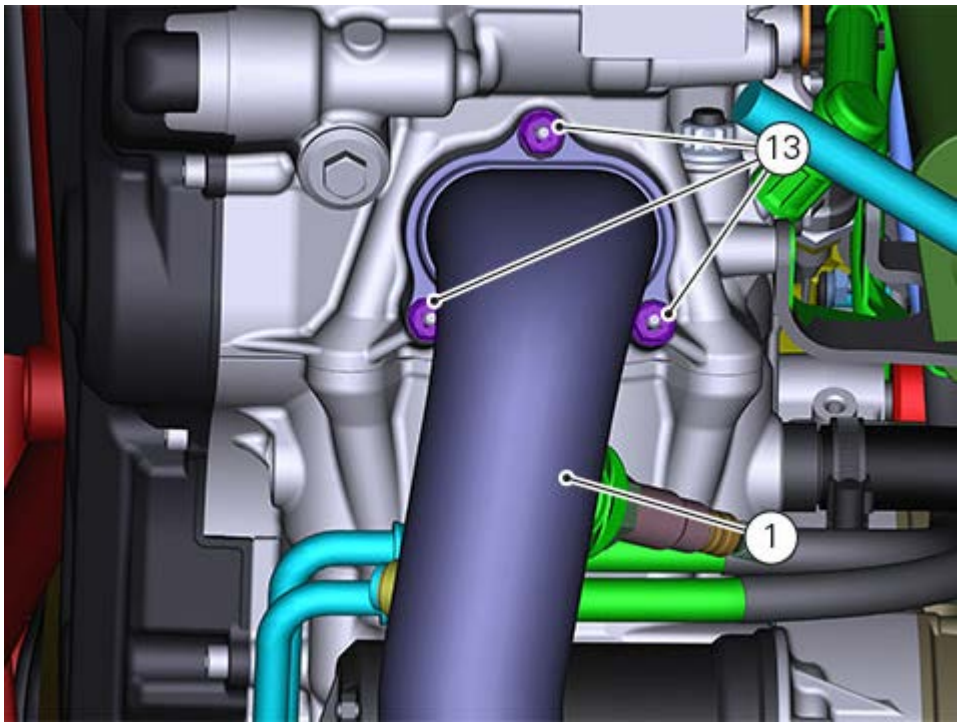
Refitting the exhaust system

Fit the horizontal exhaust pipe (1) on the horizontal cylinder with the gasket (15).

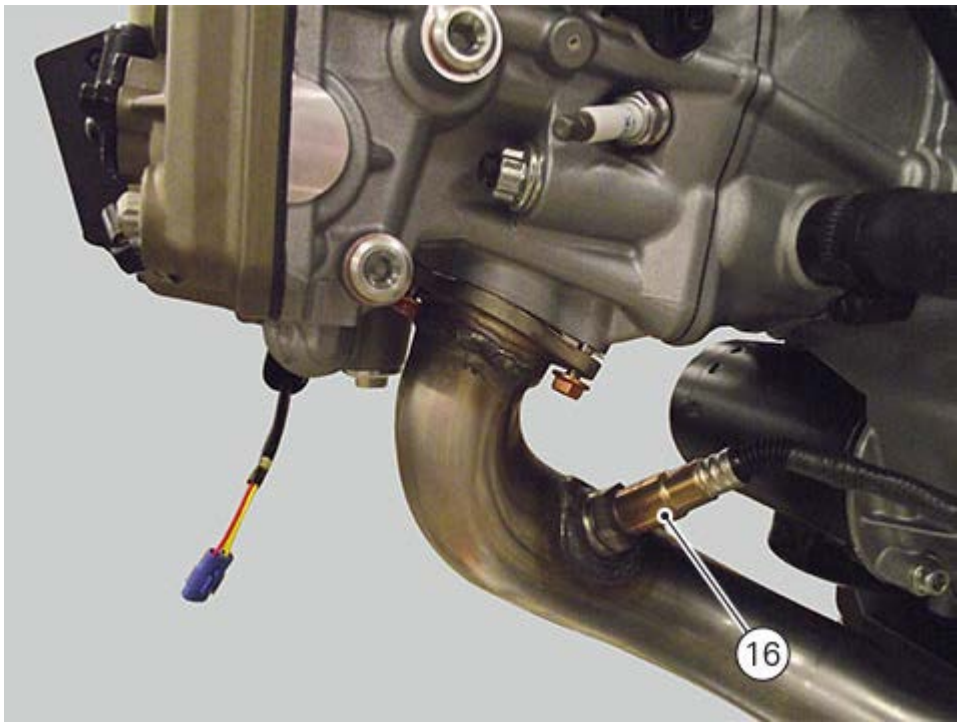
Note
The gasket convex side must be facing outwards.



Tighten retaining nuts (13) to a torque of 10 Nm ± 10%.

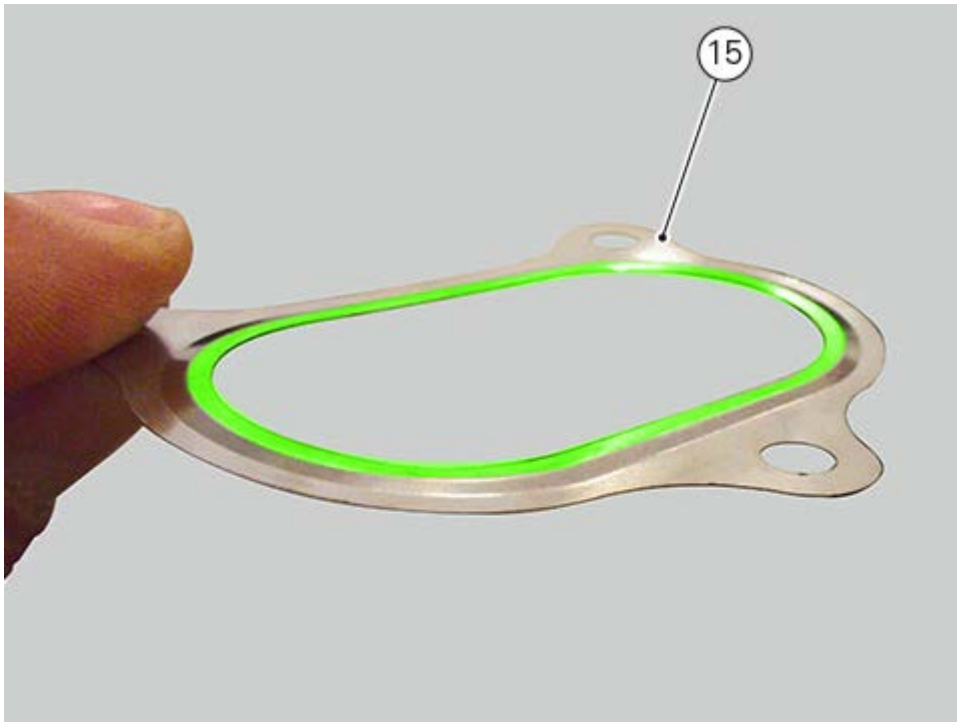


If previously removed, tighten the horizontal lambda sensor (16) to the torque of 24.5 Nm ± 10%.

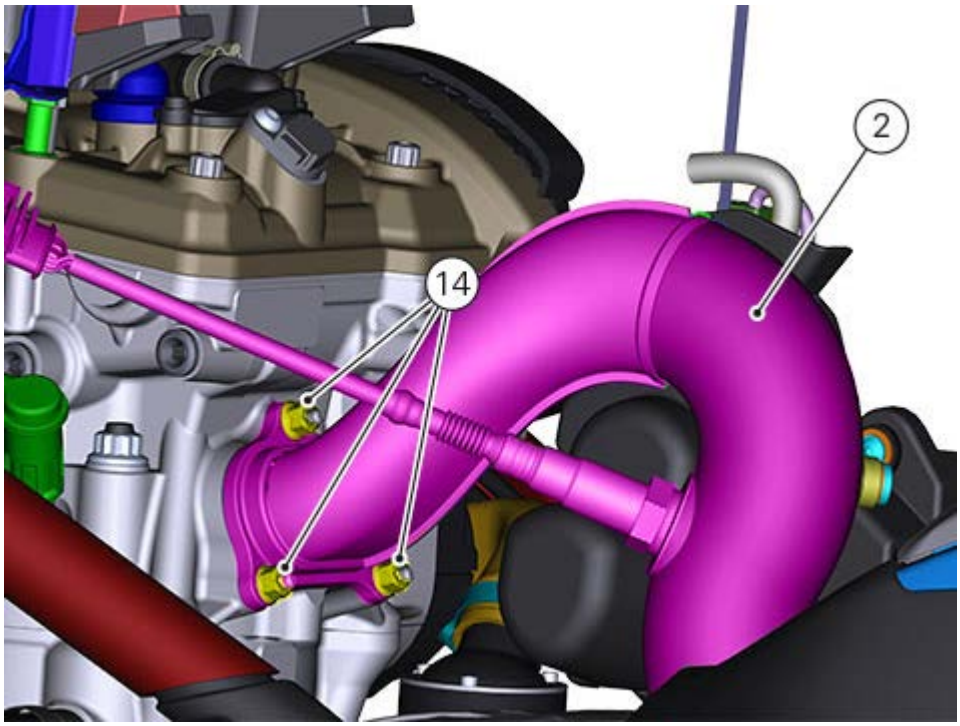


Fit the vertical exhaust pipe (2) on the horizontal cylinder with the gasket (15).

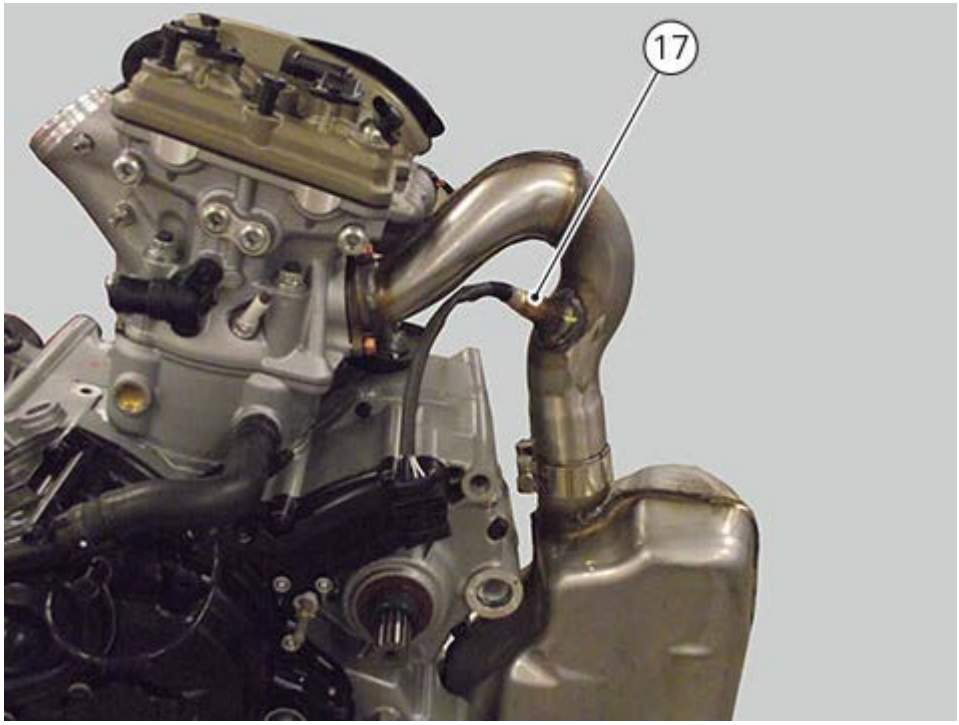
Note
The gasket convex side must be facing outwards.



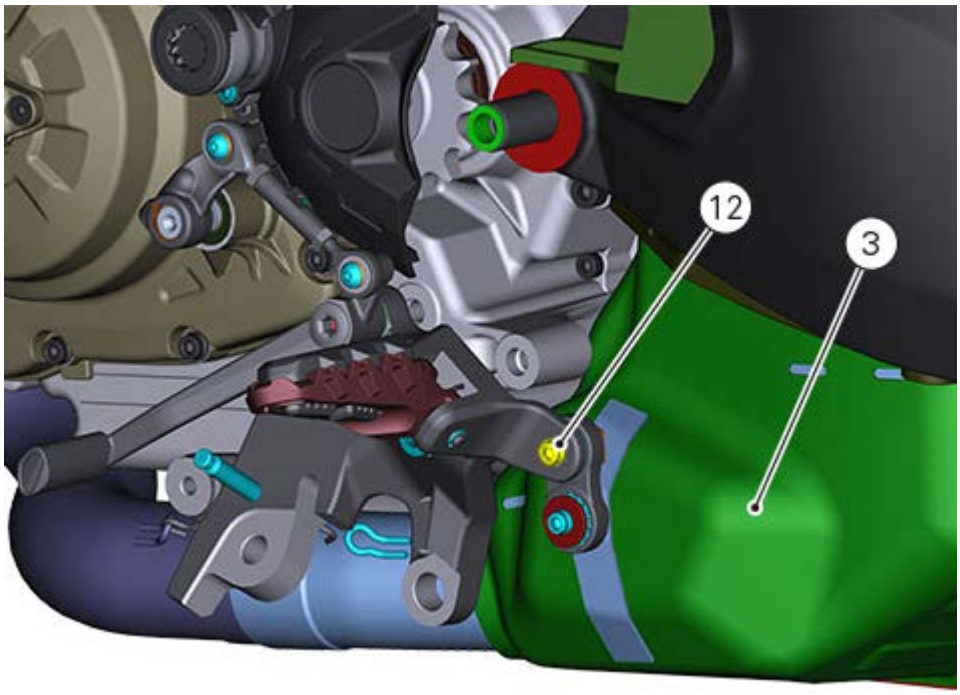
Tighten retaining nuts (14) to a torque of 10 Nm ± 10%.



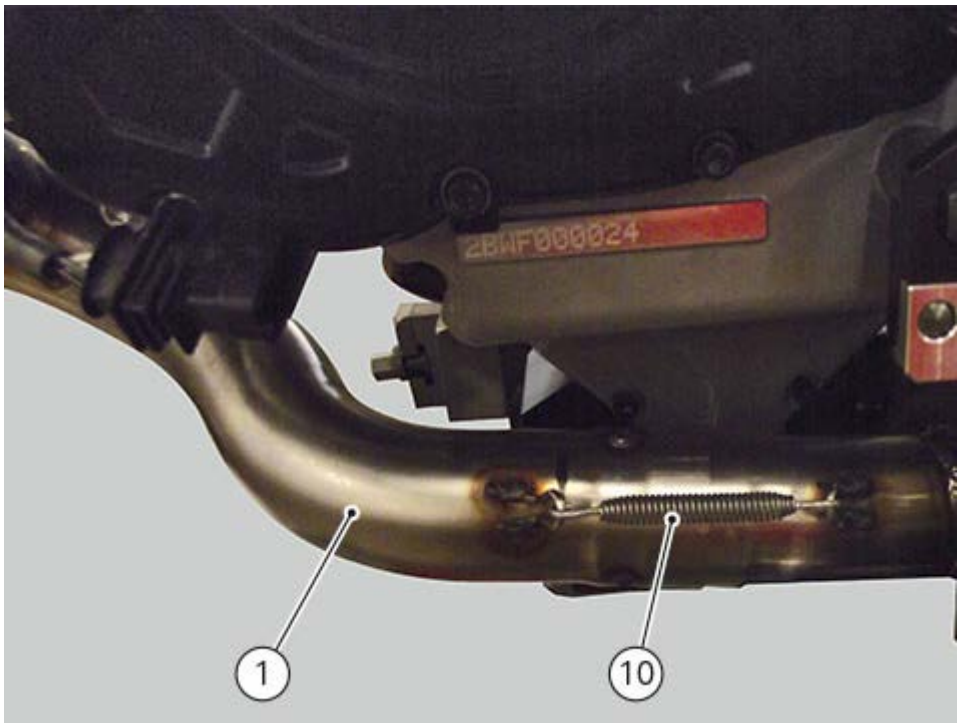
If previously removed, tighten the vertical lambda sensor (17) to the torque of 24.5 Nm ± 10%.



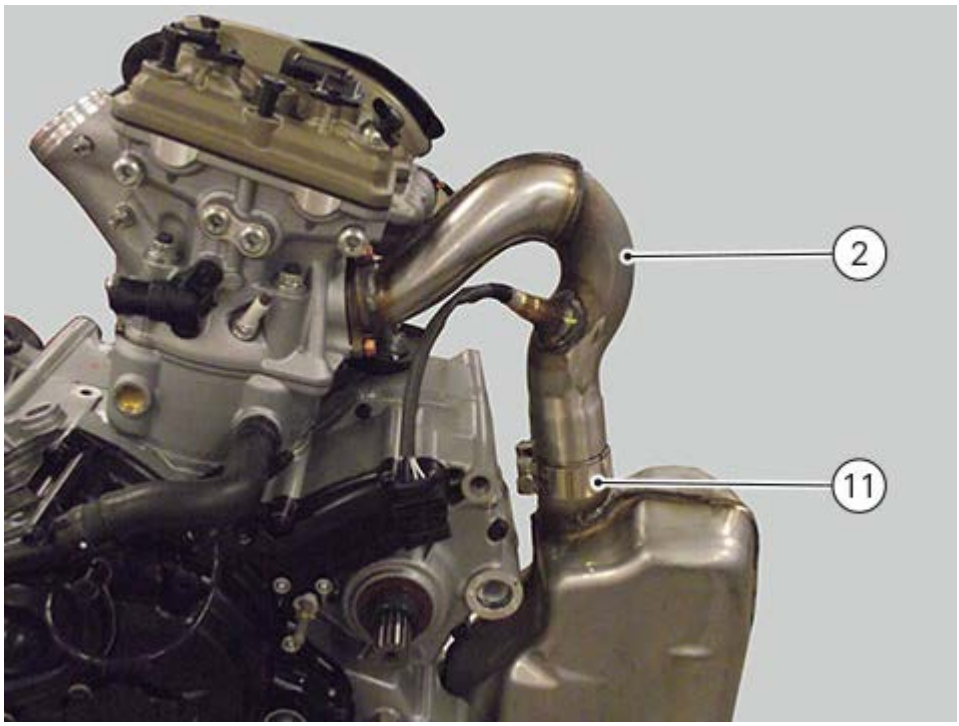
Fit catalytic converter (3) and fix it to the frame with screw (12).
Tighten the screw (12) to a torque of 10 Nm ± 10%.



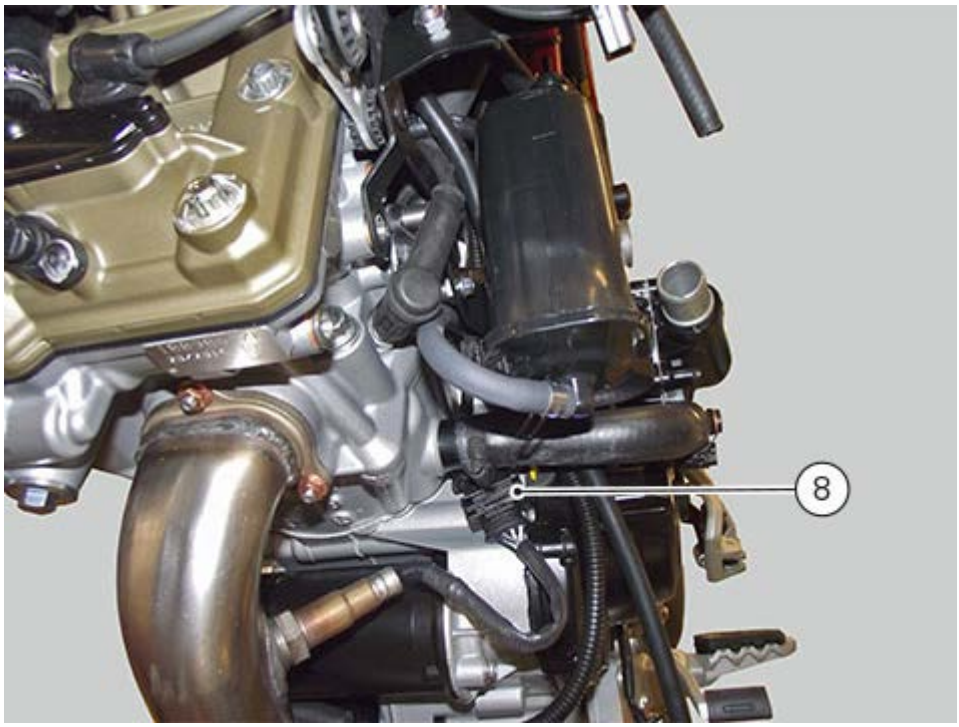
Position the retaining spring (10).

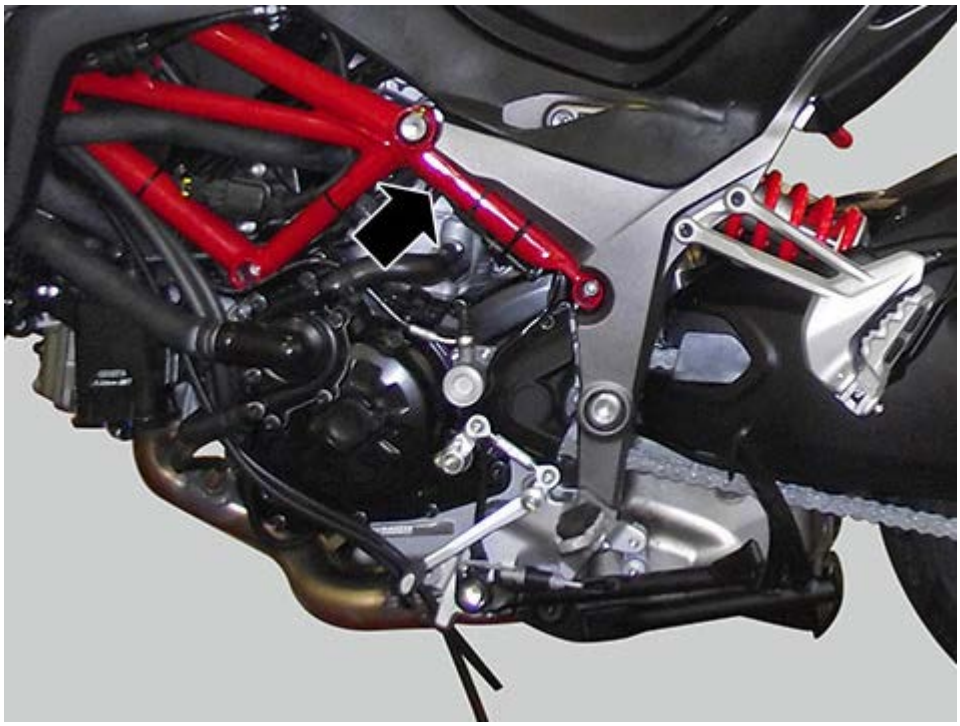


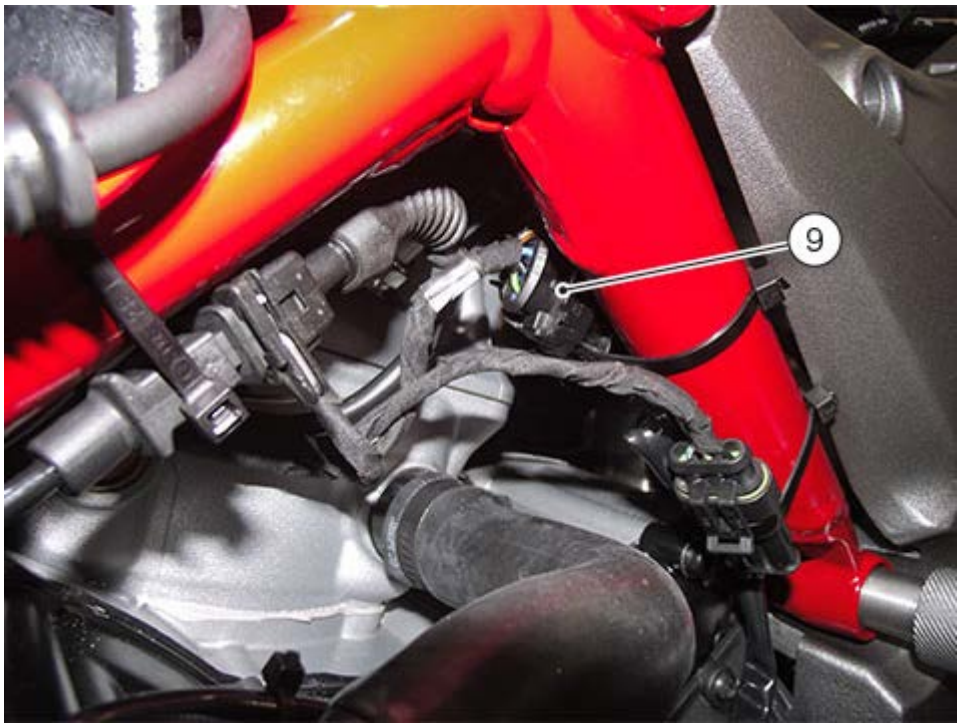
Tighten clip (11) to a torque of 18 Nm ± 10%.



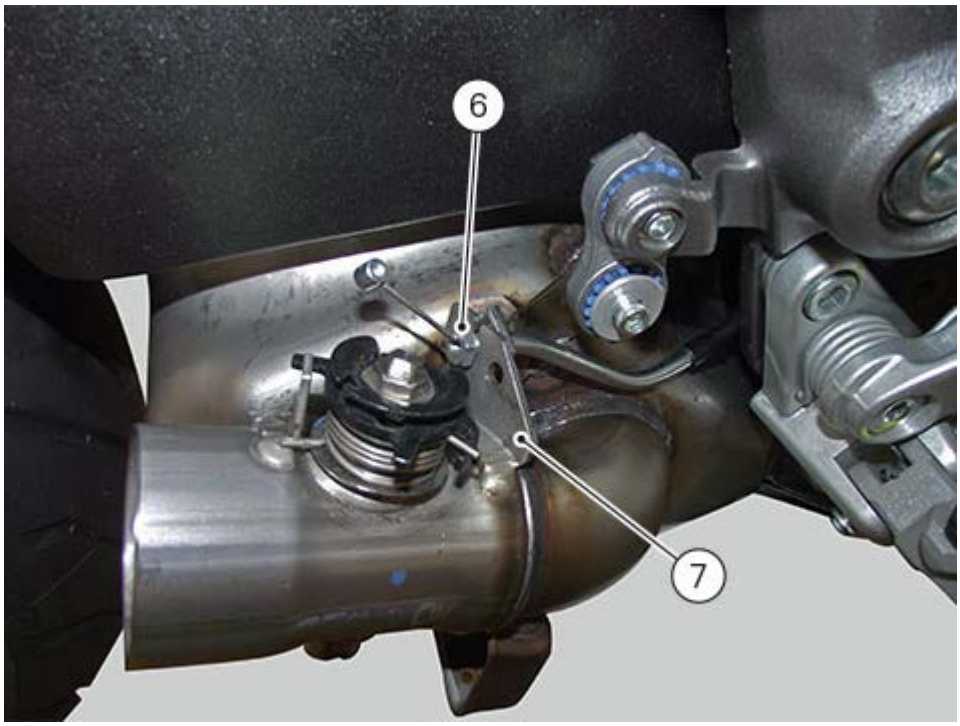
Reconnect the two lambda sensors (9) and (8).



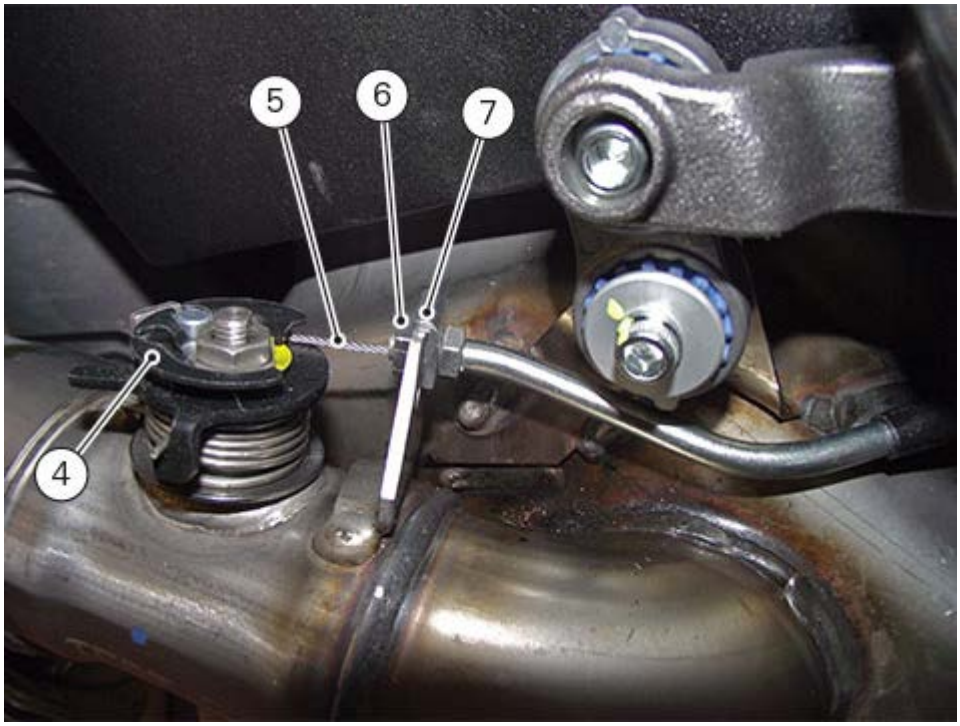




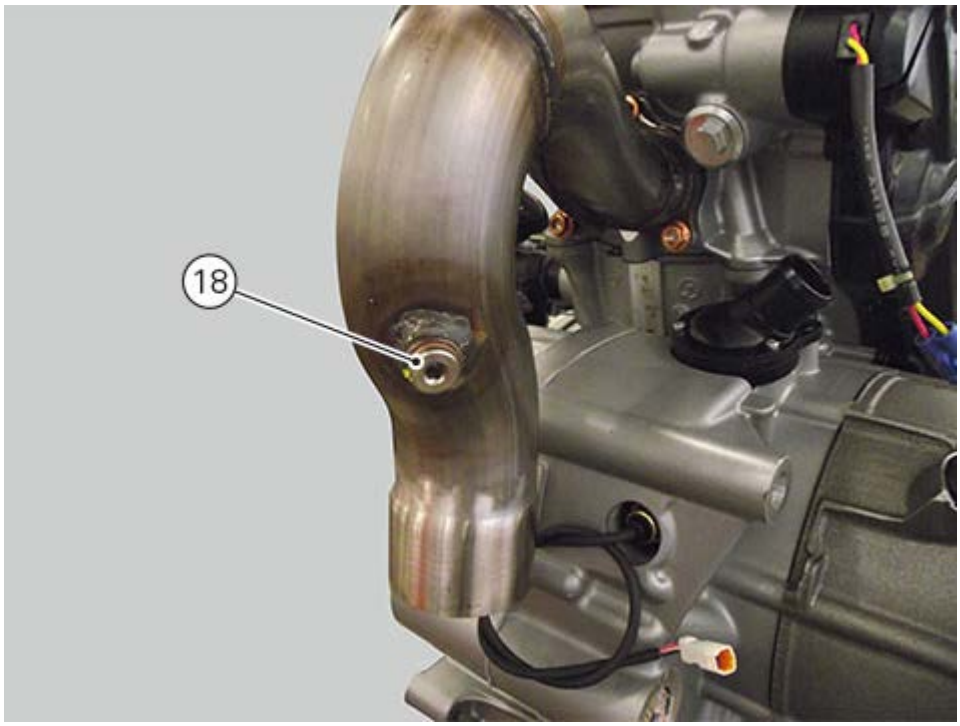
Position control cable (5) in plate (7).

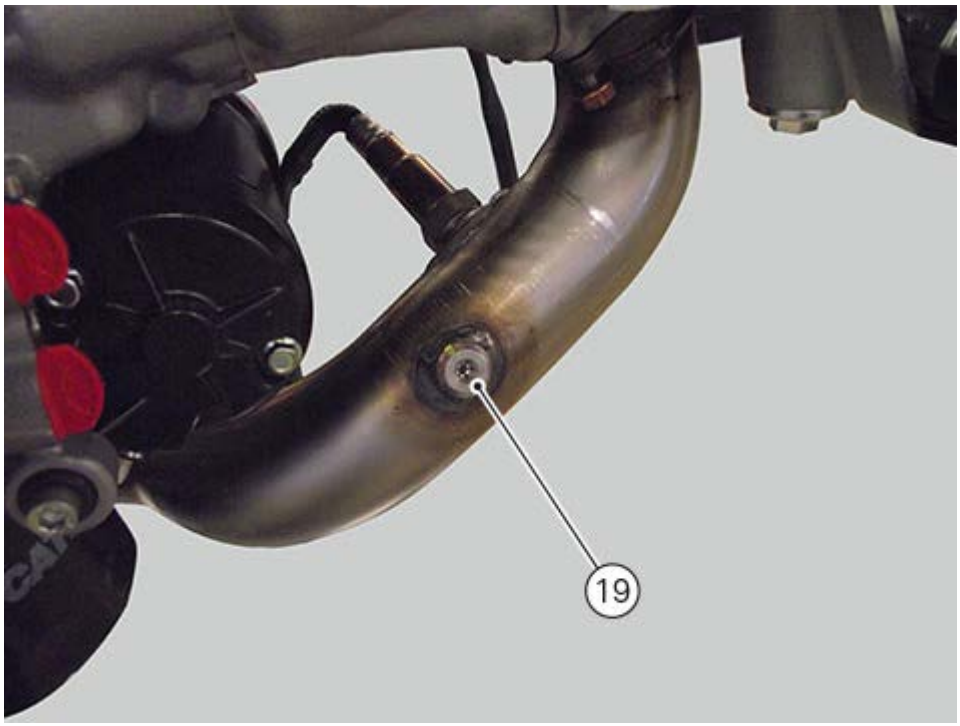


Turn the pulley (4) of the exhaust valve to facilitate the control cable insertion (5).
Tighten retaining nut (6) to a torque of 2.5 Nm ± 10%.



If previously removed, insert plugs (18), copper washers (19), start plugs in the vertical and horizontal head exhaust manifolds and tighten them to 25 Nm ± 10%.





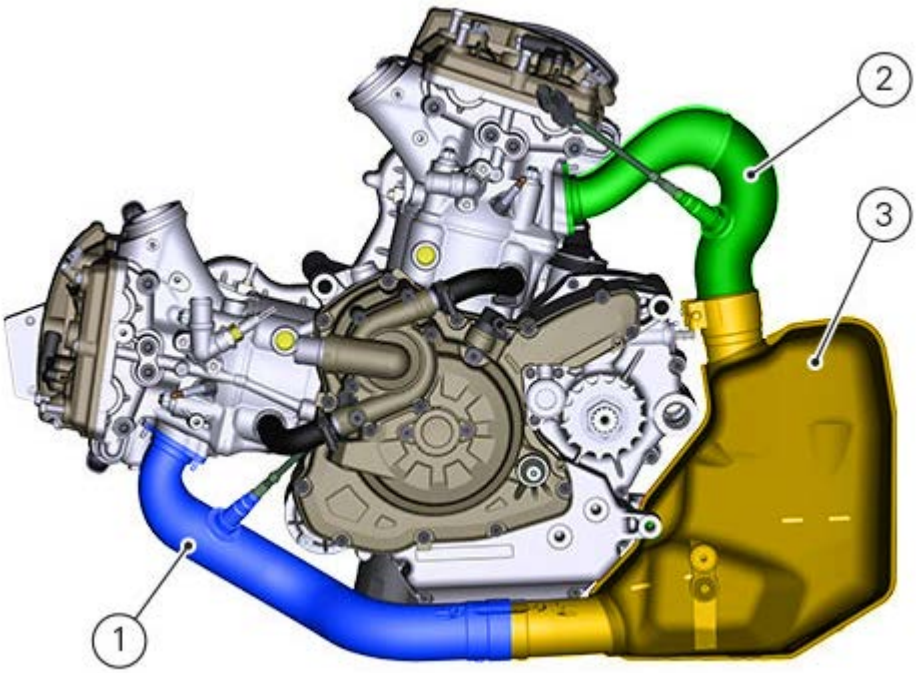
Refit the lateral plates.
Refit the exhaust silencer (Refitting the exhaust silencer).
Refit the sump guard (Refitting the sump guard).

Removing the exhaust system

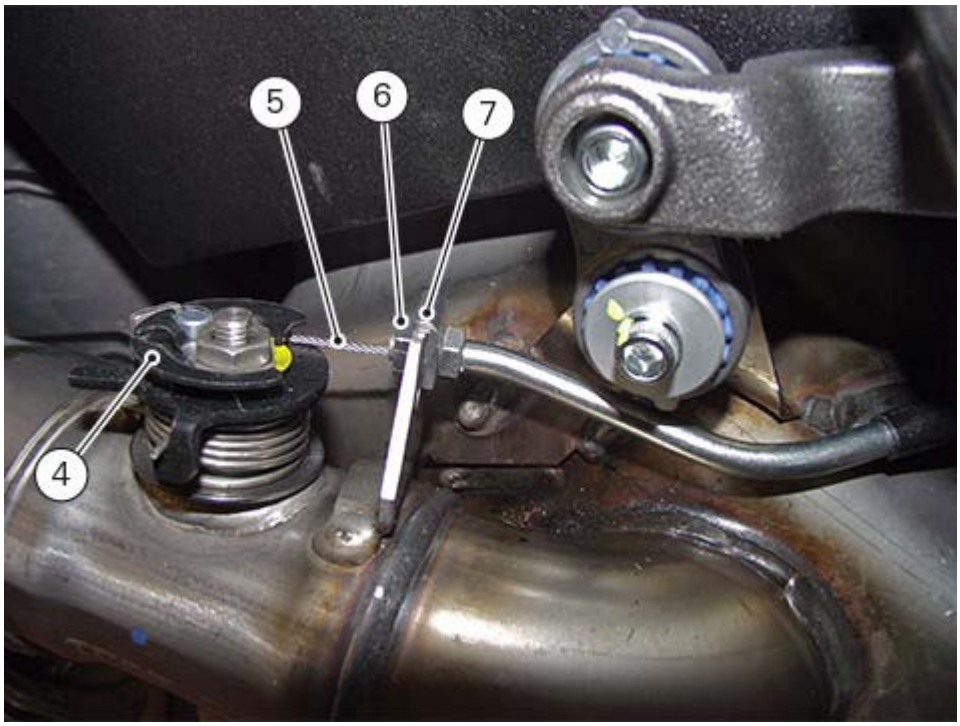
Remove the lateral plates.
Remove the exhaust silencer (Removing the exhaust silencer).
Remove the sump guard (Removing the sump guard).

The exhaust system consists of the following parts:

1 Horizontal primary pipe
2 Vertical primary pipe
3 Catalytic converter.



Turn the pulley (4) of the exhaust valve to facilitate the control cable exit (5).
Slide out from the pulley (4) the control cable (5).
Loosen nut (6).
Release control cable (5) from plate (7).


5
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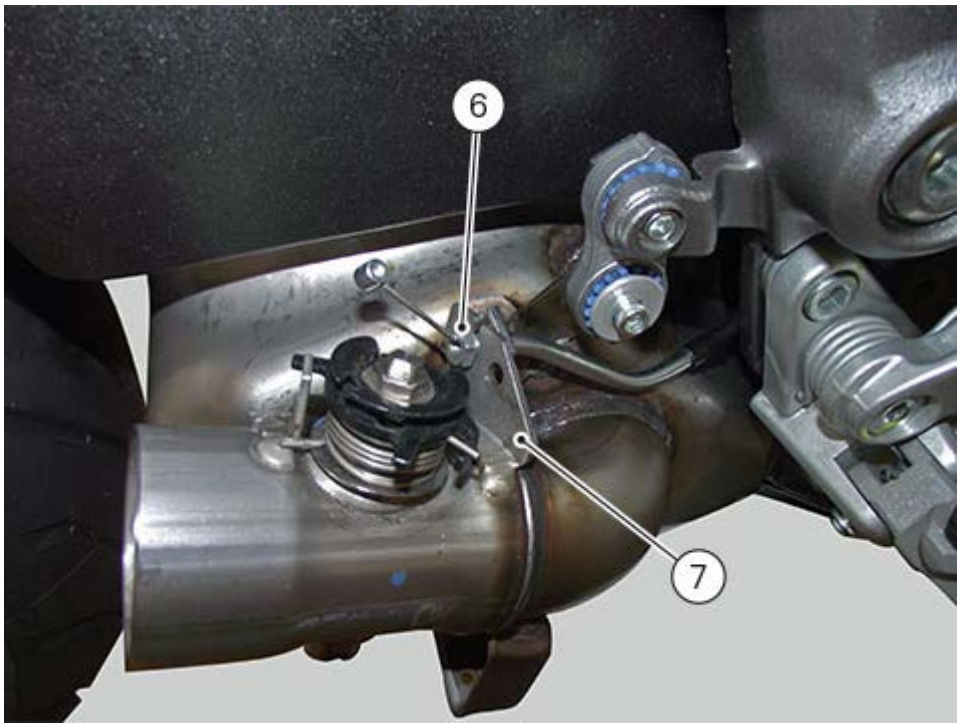
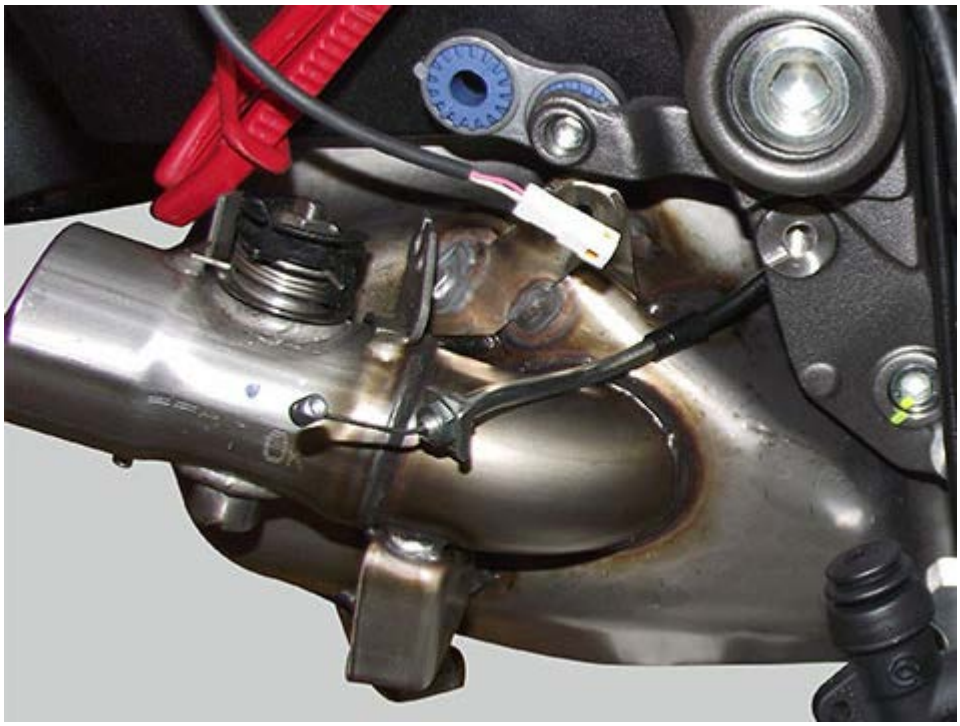
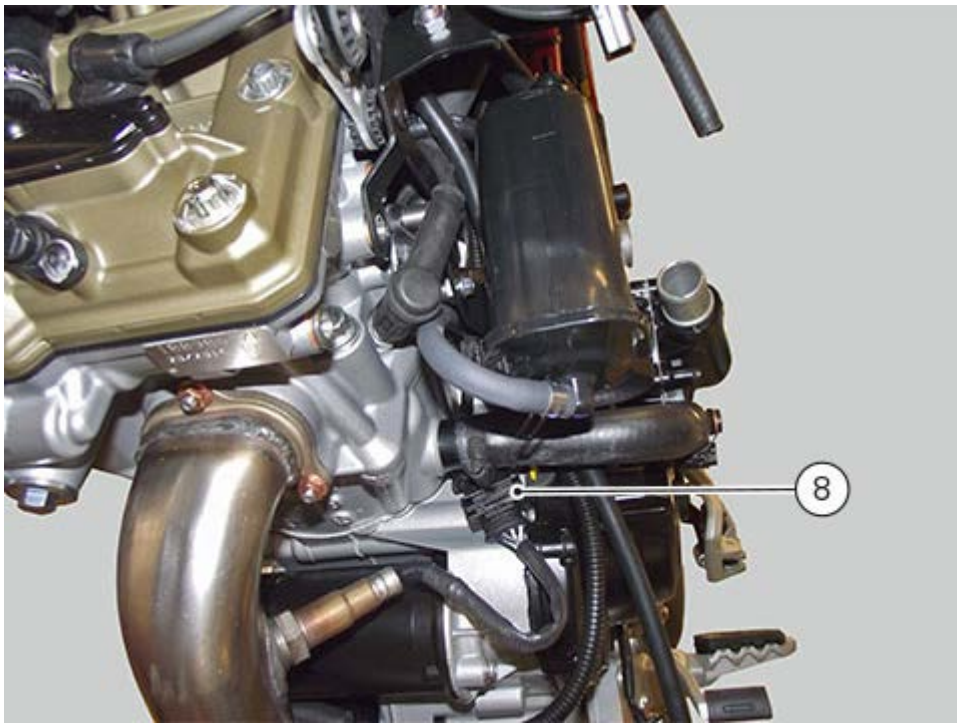
4

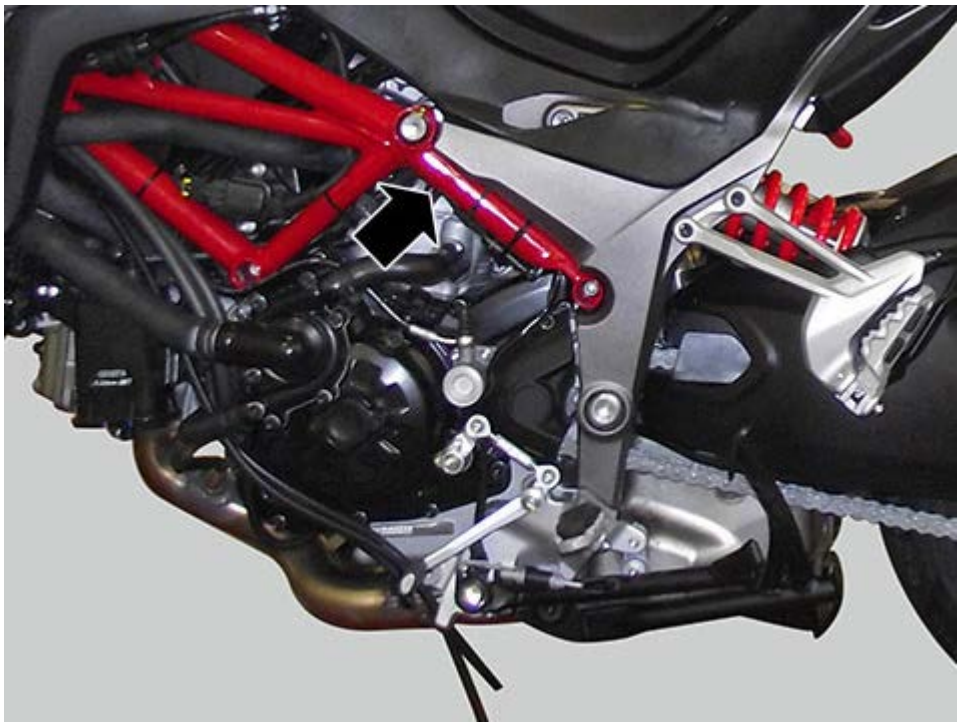

6
7

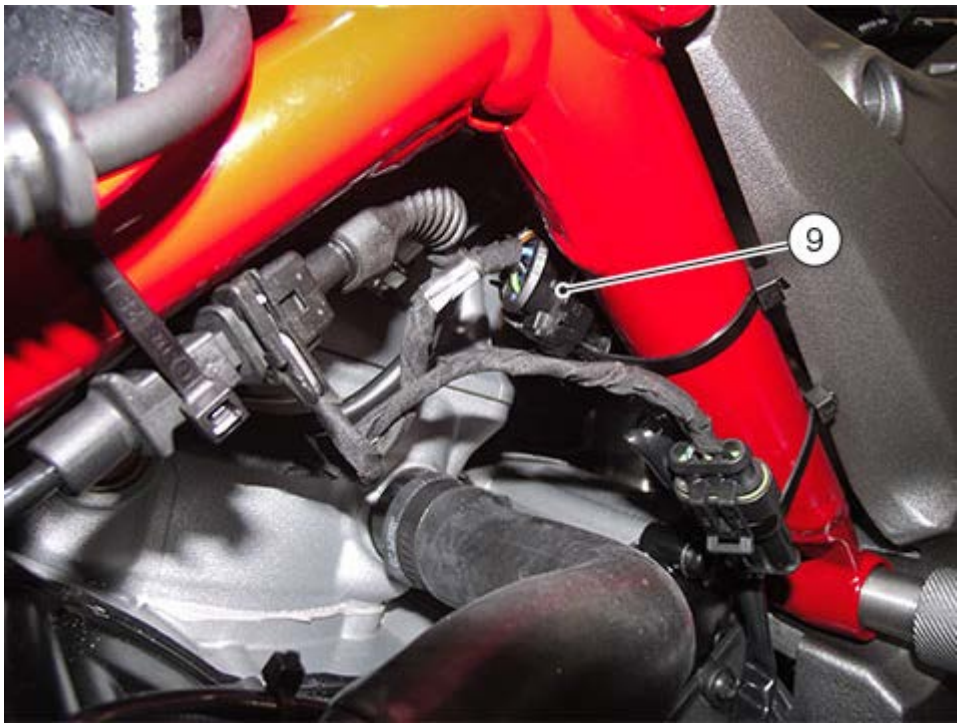


Disconnect the horizontal exhaust lambda sensor (8).

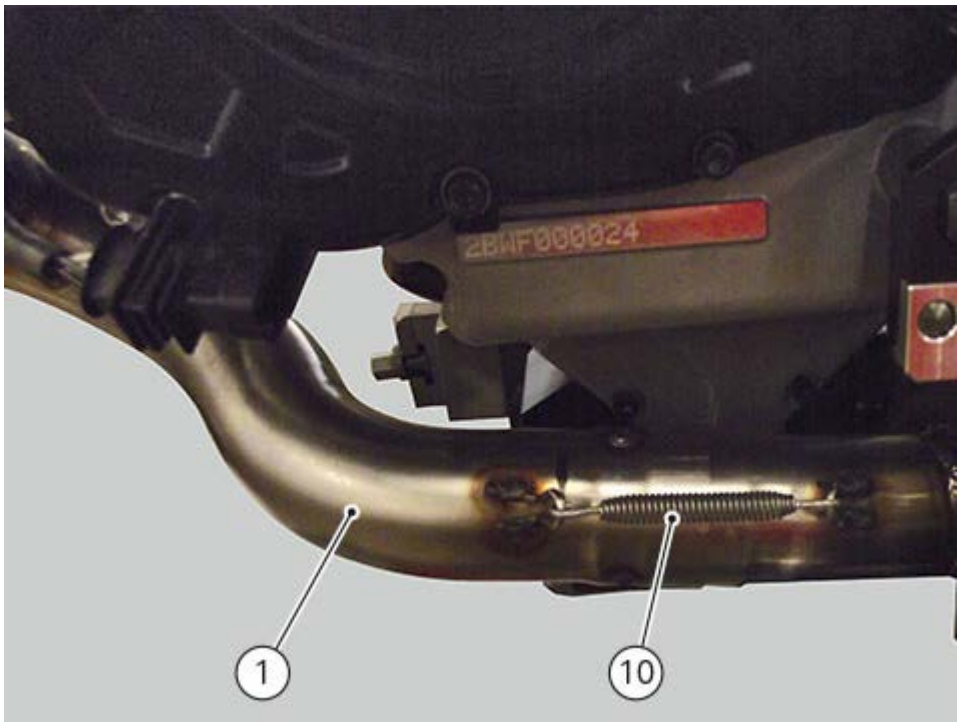


Disconnect the vertical exhaust lambda sensor (9).

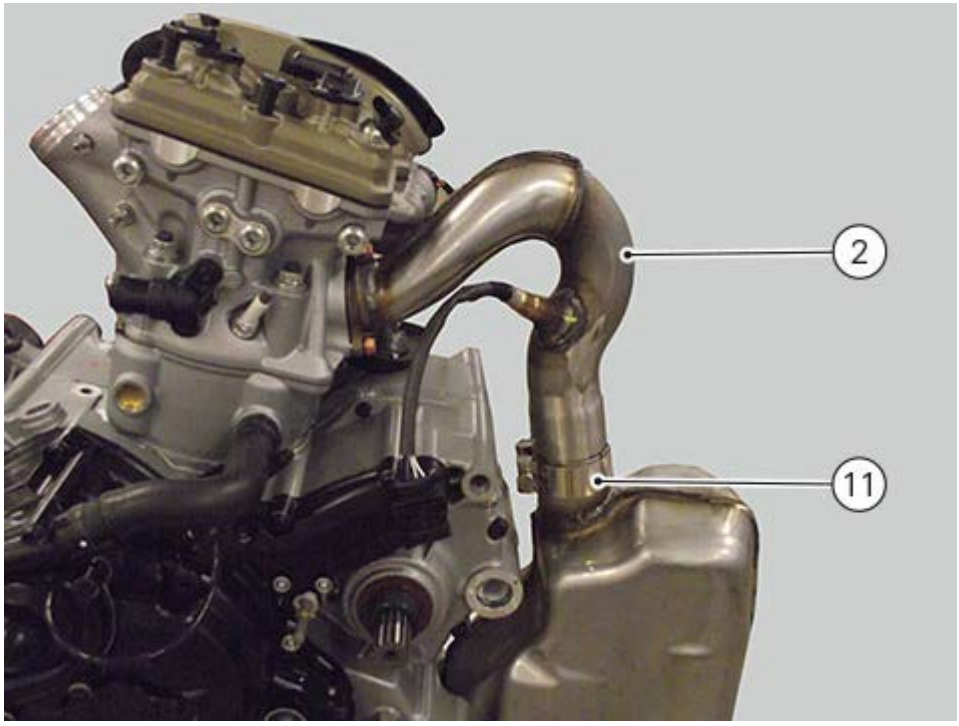




Remove retaining spring (10) of the horizontal exhaust pipe (1).



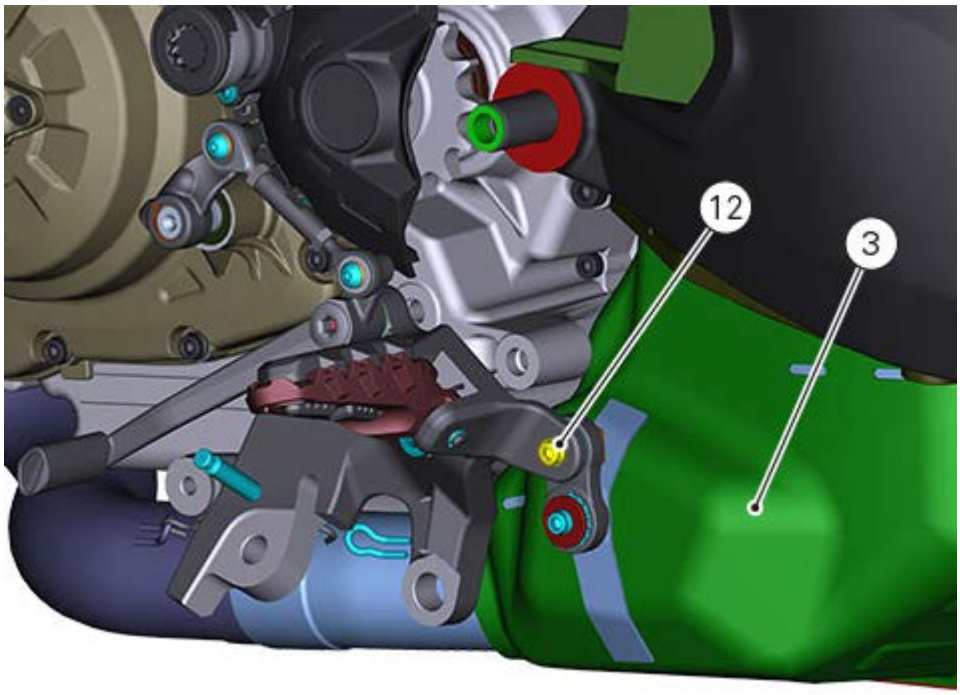
Loosen the clamp (11) retaining vertical exhaust pipe (2).



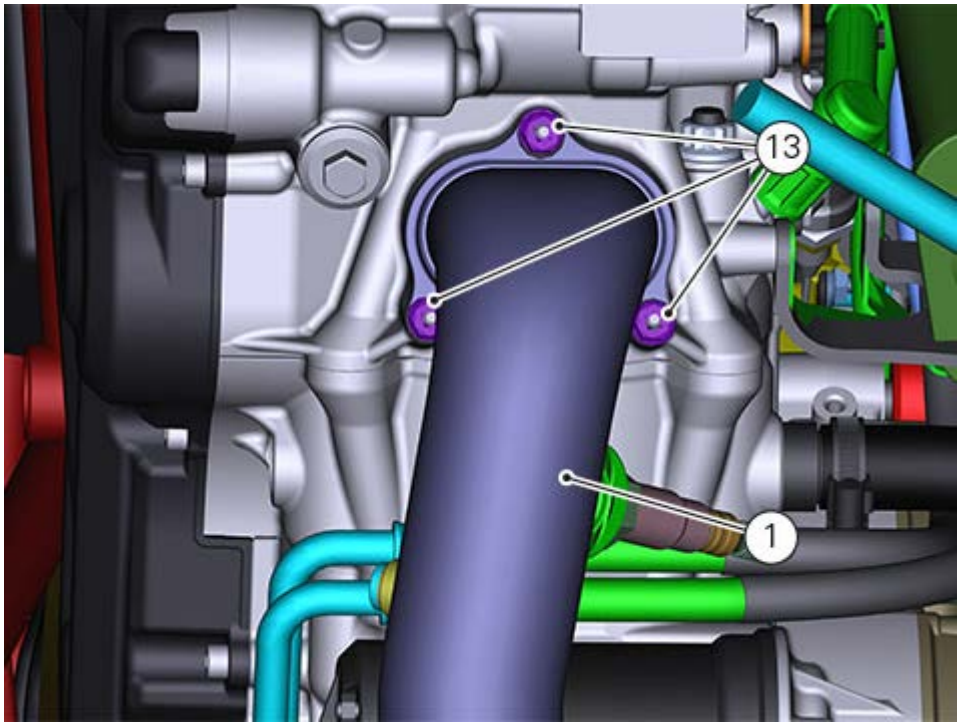
Note

For clarity reasons, the figure shows the engine removed from the frame.

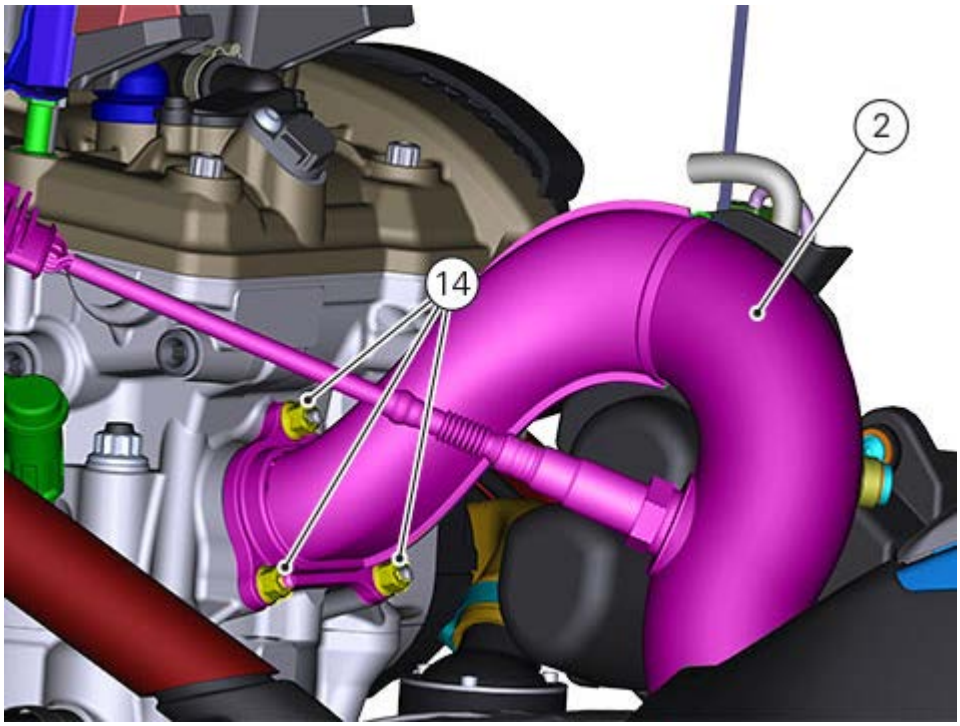
Working on the vehicle left side, loosen and remove screw (12).
Slide out the catalytic converter (3) from the exhaust pipes.



Working on the horizontal cylinder, loosen and remove the three retaining nuts (13).
Remove the horizontal exhaust pipe (1) by recovering the gasket.

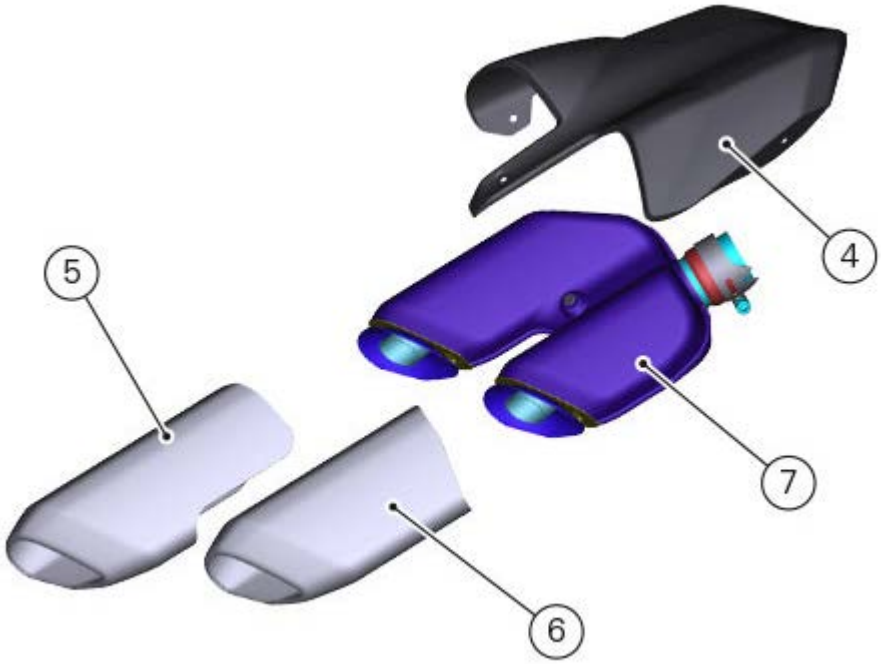


Working on the vertical cylinder, loosen and remove the three retaining nuts (14).
Remove the vertical exhaust pipe (2) by recovering the gasket.

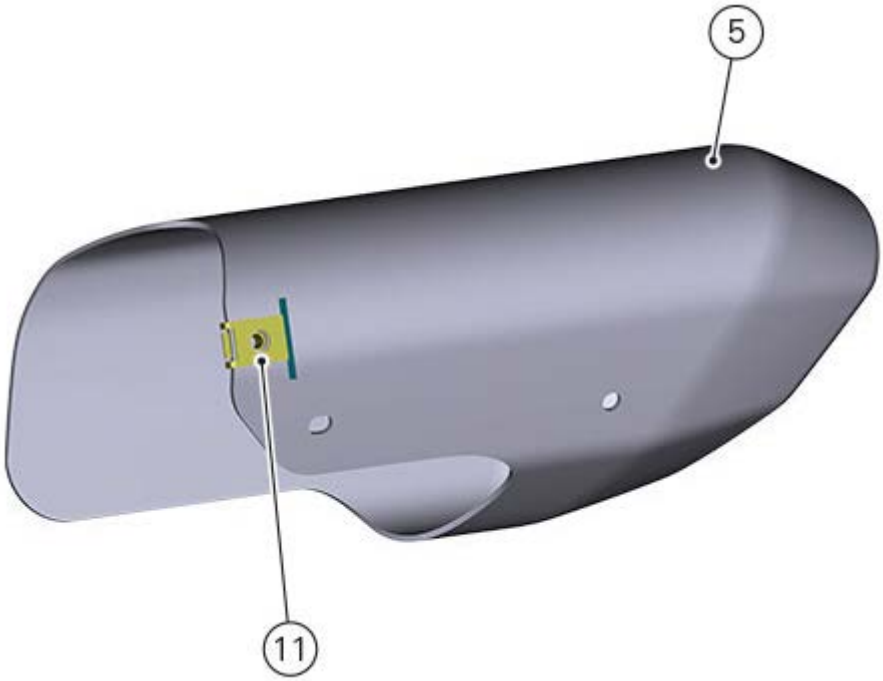

2
14

Refitting the silencer

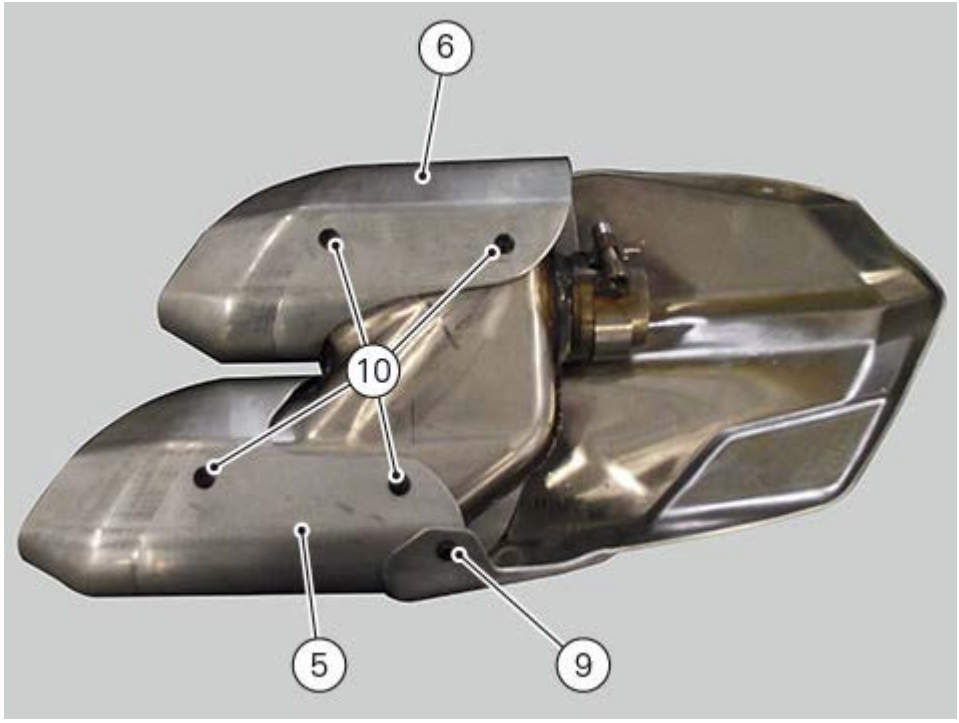
REASSEMBLING THE SILENCER



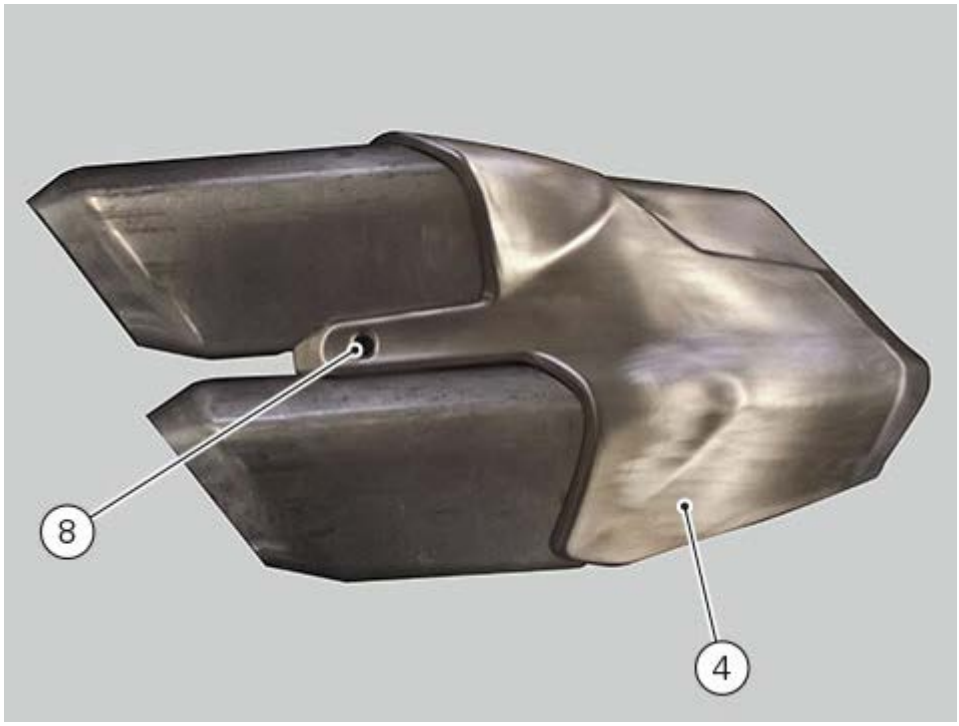
Check that on the upper pipe cover (5) there is clip (11)



Fit on silencer (7) the upper pipe cover (5) and the lower pipe cover (6).
Fix the two covers by tightening screws (10) to a torque of 5 Nm ± 10%.

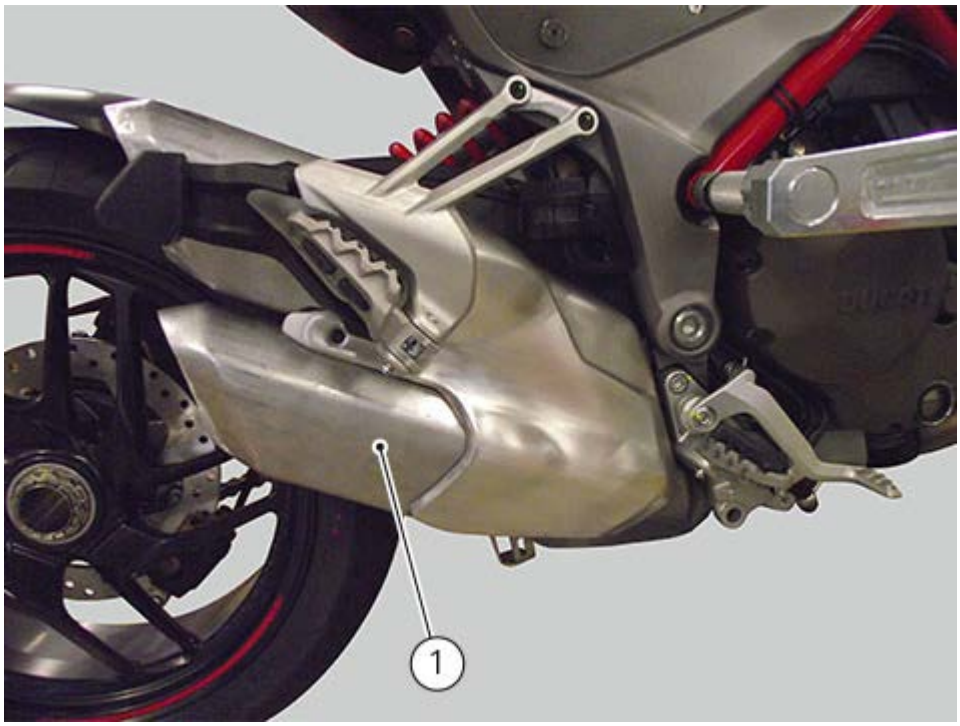


Fit the central cover (4) and fix it with the screws (9) and (8).
Tighten screws (8) to a torque of 5 Nm ± 10%.

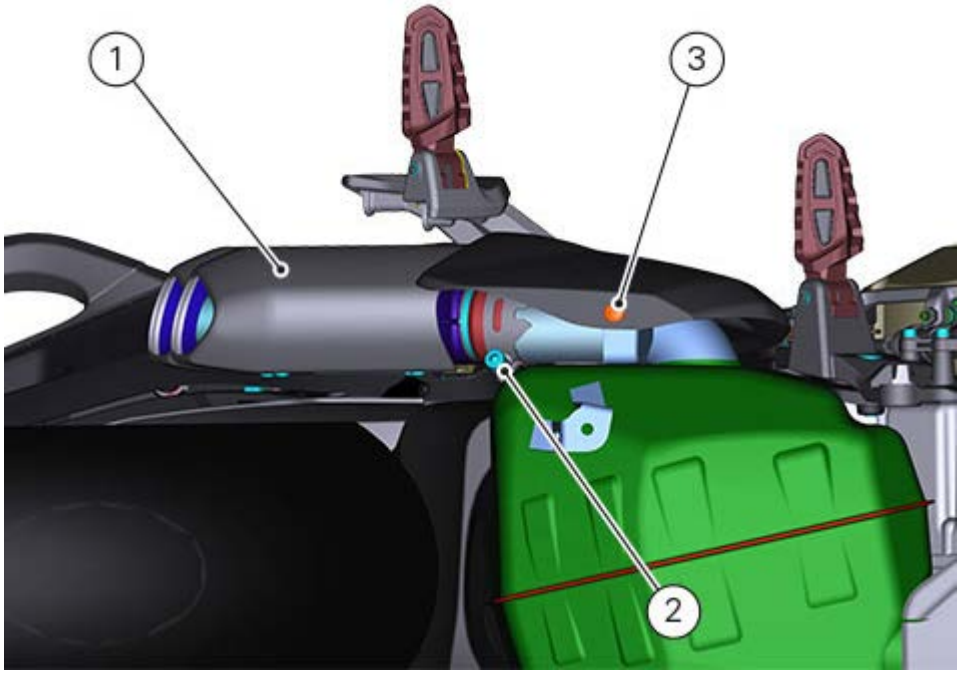


REFITTING THE SILENCER

Insert silencer (1) in the exhaust.

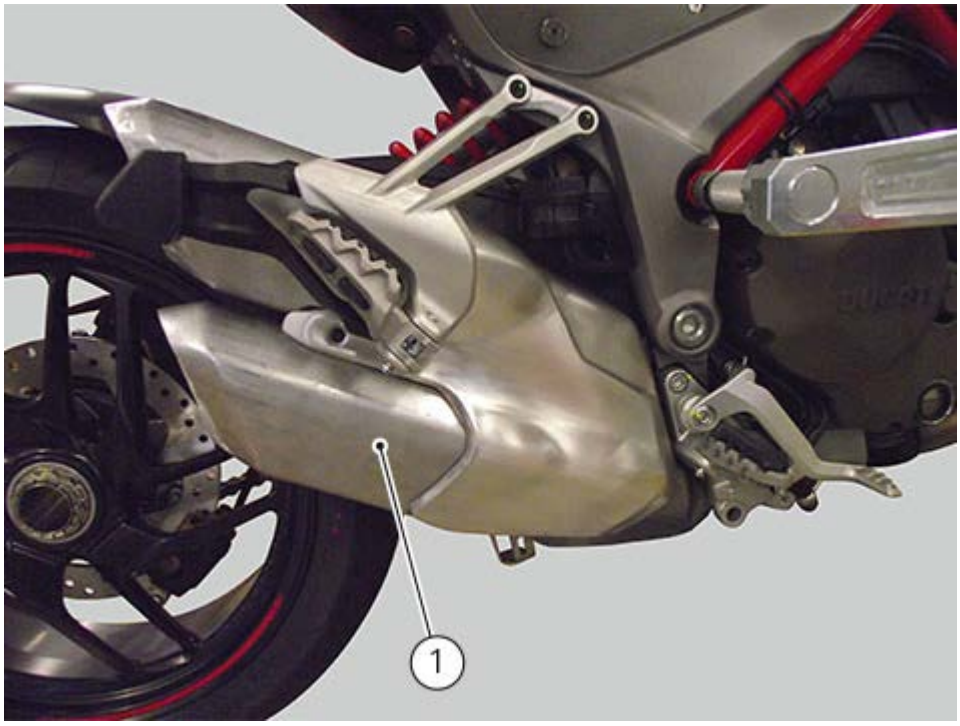


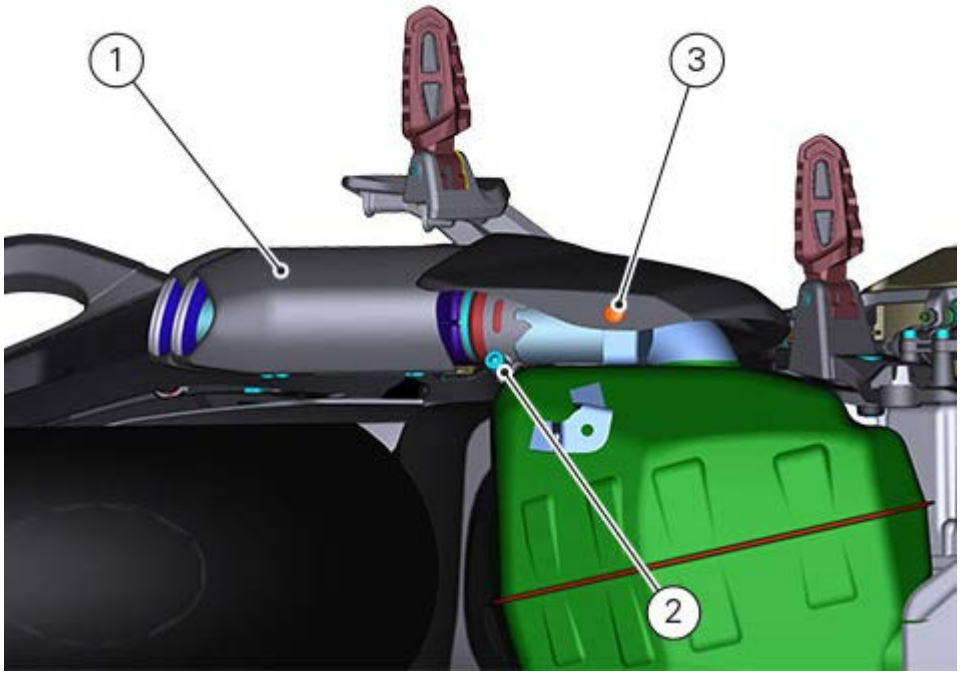
Tighten the screw (3) to a torque of 5 Nm ± 10%.
Tighten clip (2) to a torque of 22 Nm ± 10%.



Removing the silencer

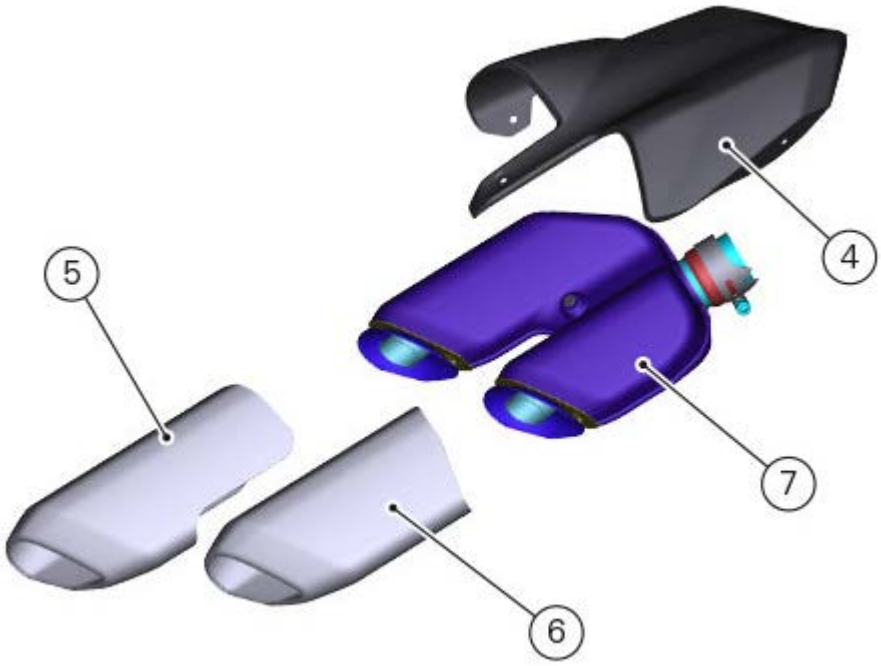
Remove silencer (1) by loosening clamp (2) and screw (3).



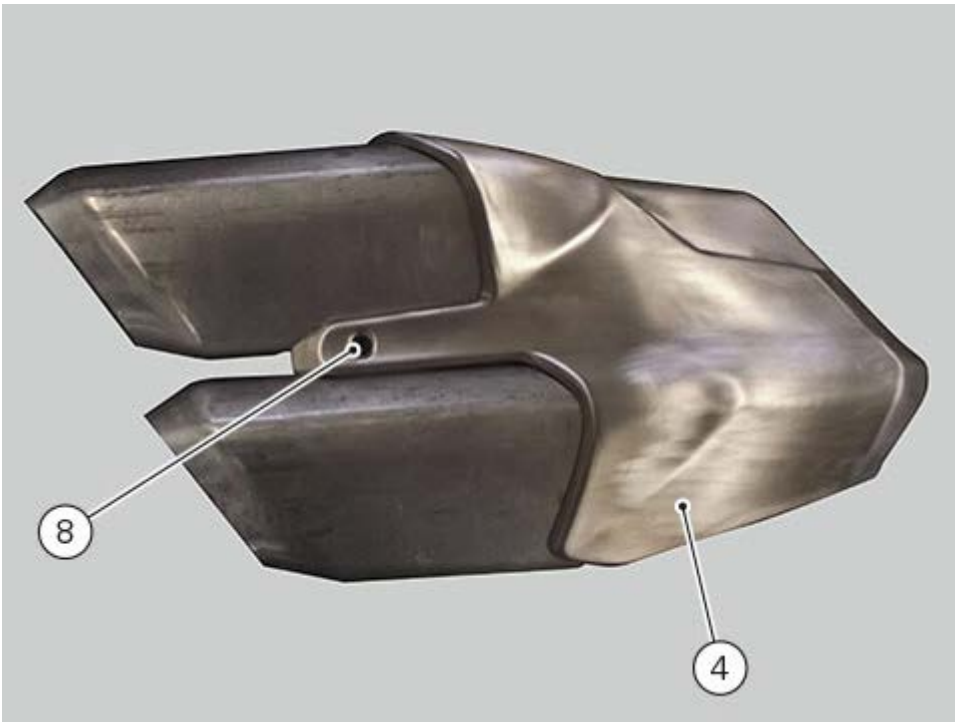


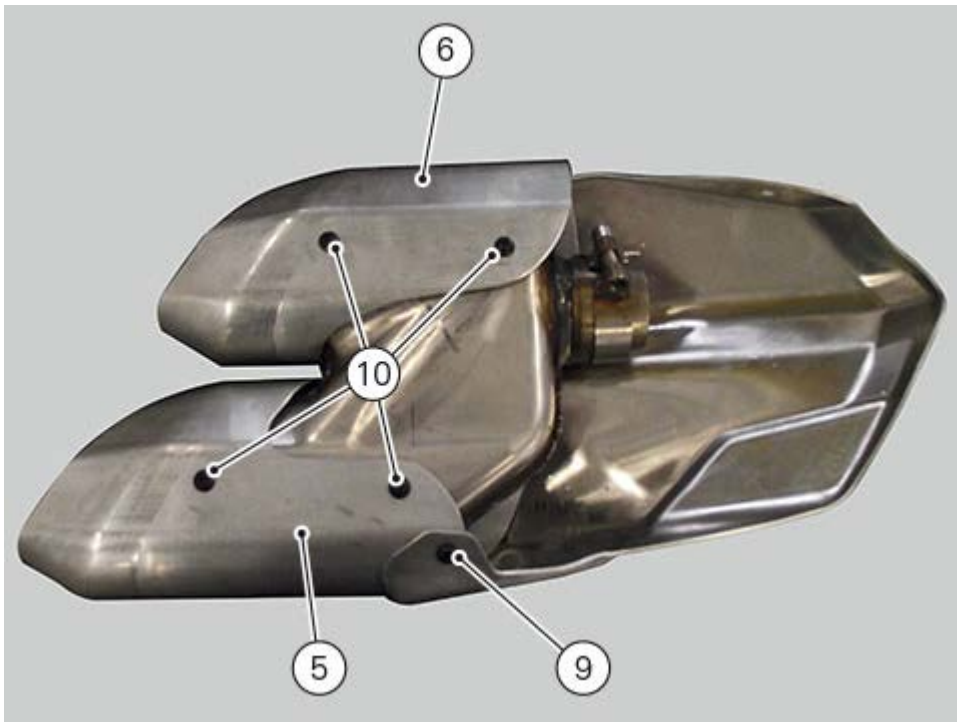
DISASSEMBLING THE SILENCER

The exhaust silencer consists of the following parts:
4) Central cover
5) Upper pipe cover
6) Lower pipe cover
7) Silencer.



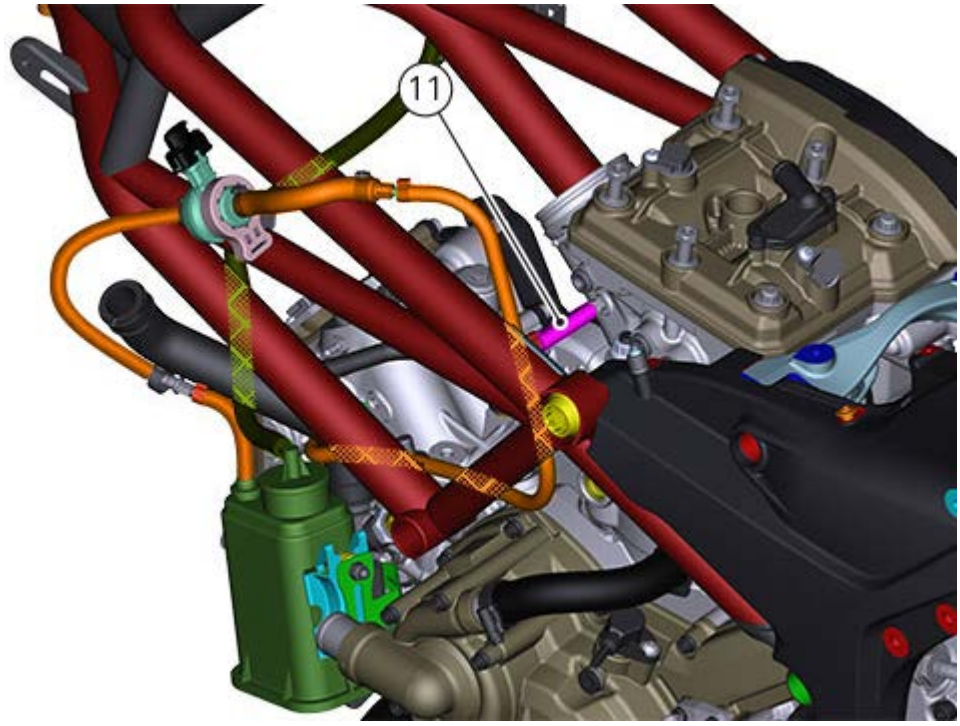
Loosen the screws (8) and (9) and remove the central cover.
Loosen the screws (10) and remove the upper (5) and lower (6) pipe covers.

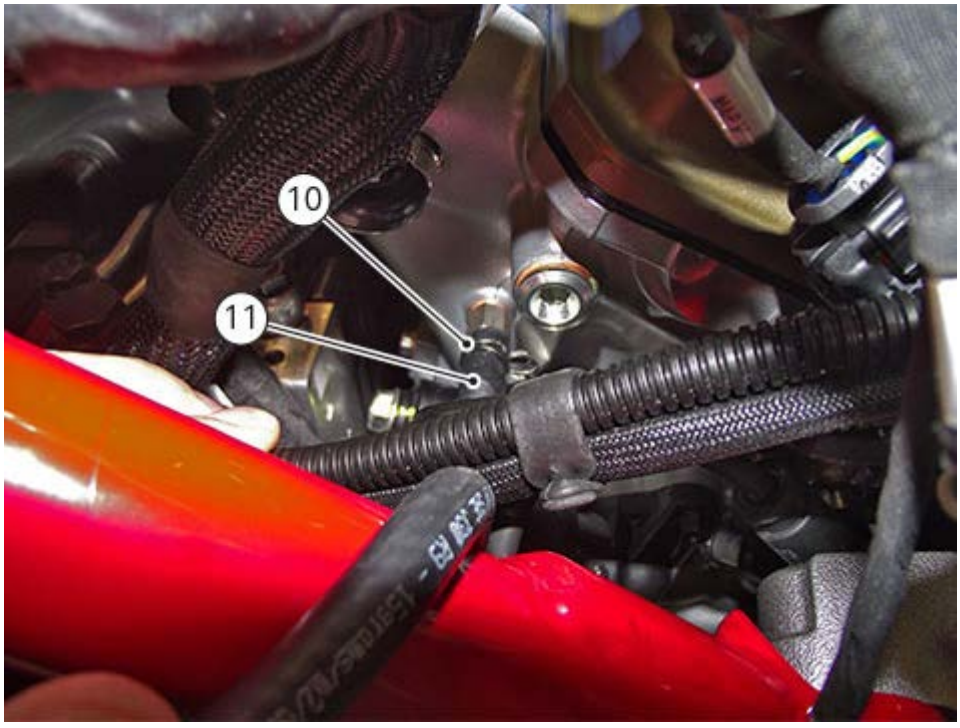



6
10
5
9

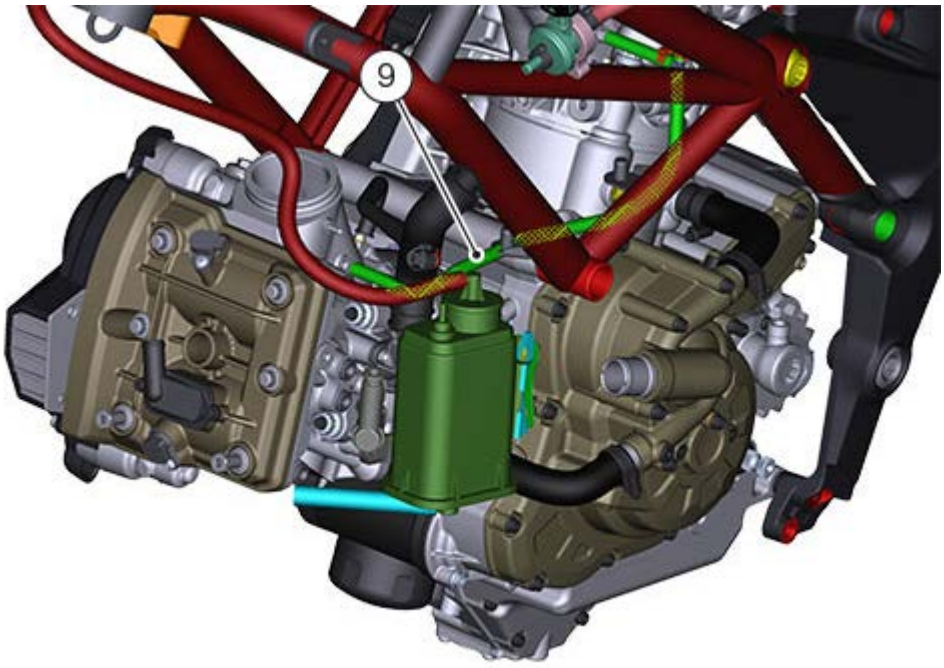
Refitting the Canister filter

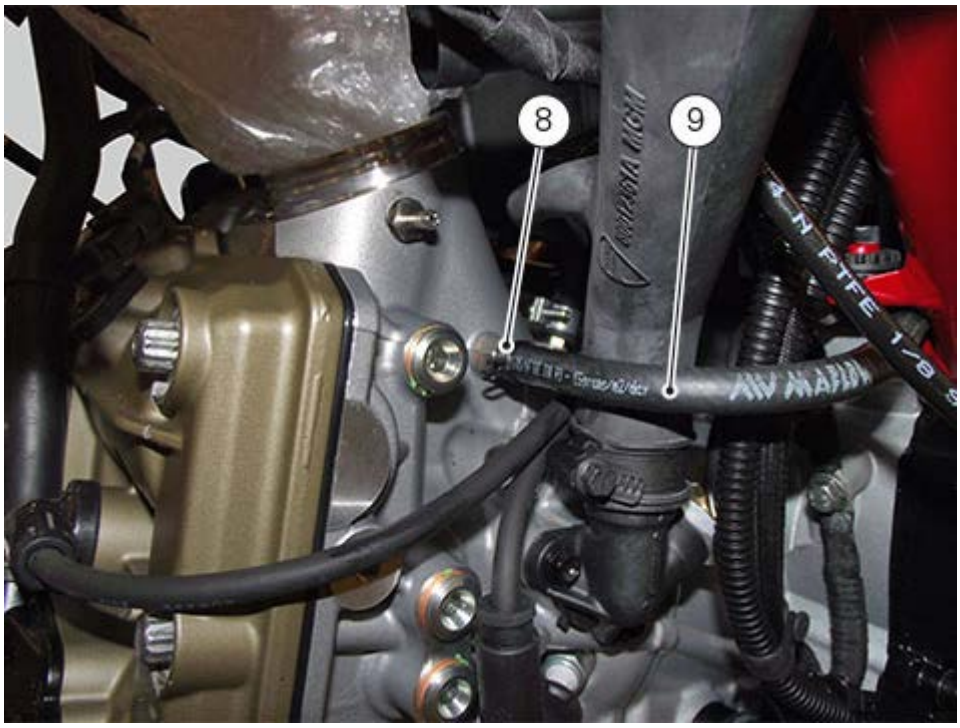
Position pipe (11) on the vertical head and fix it with clip (10).



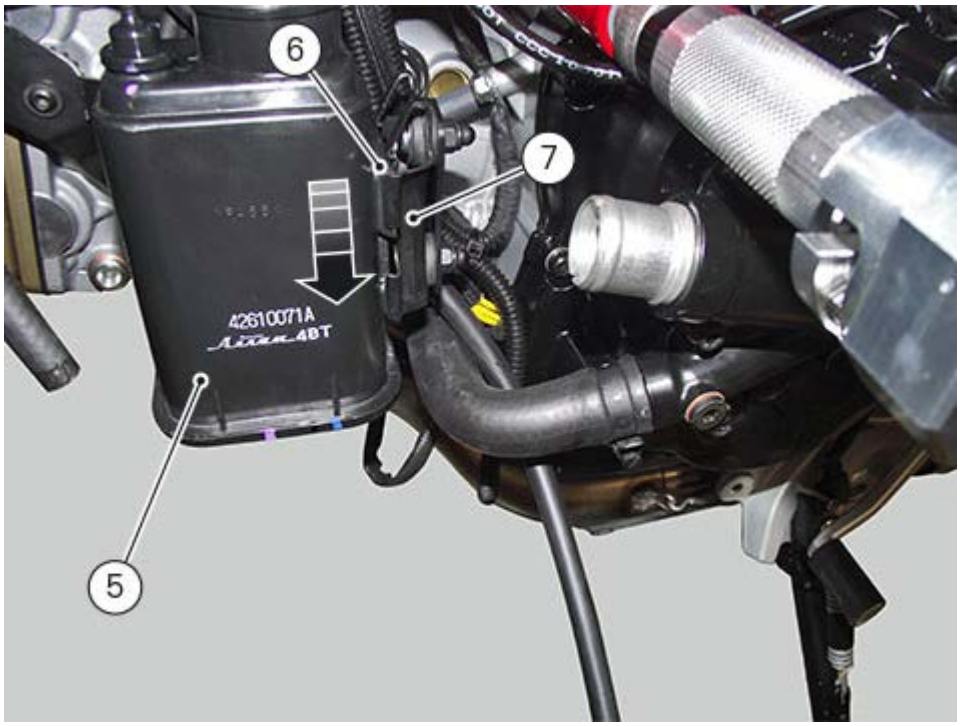


Position pipe (9) on the horizontal head and fix it with clip (8).

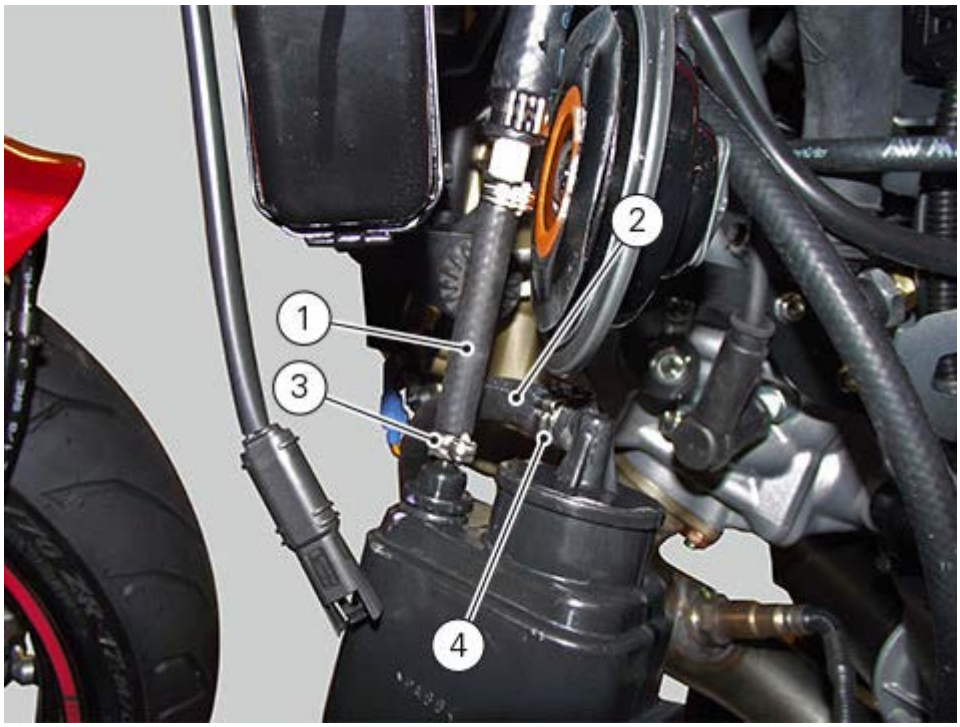




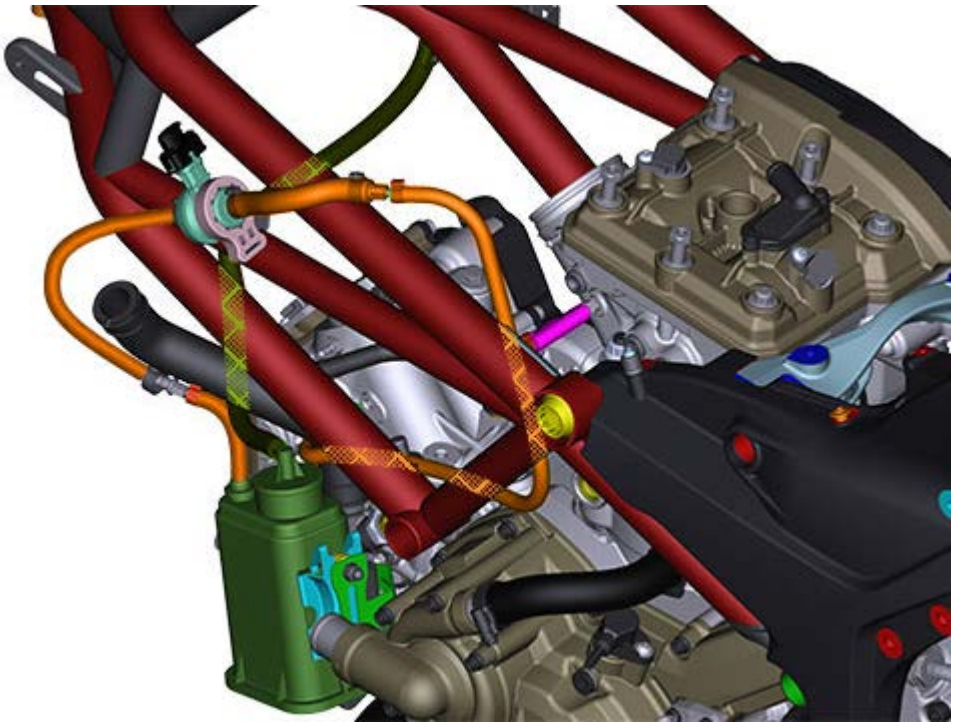
Fit canister filter (5) from the top. It must be fitted into plate (7) guides (6).

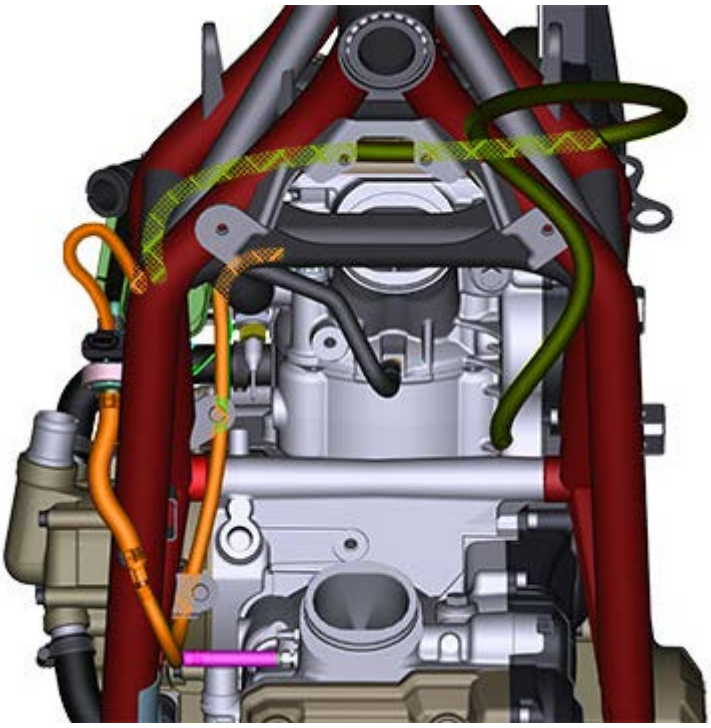


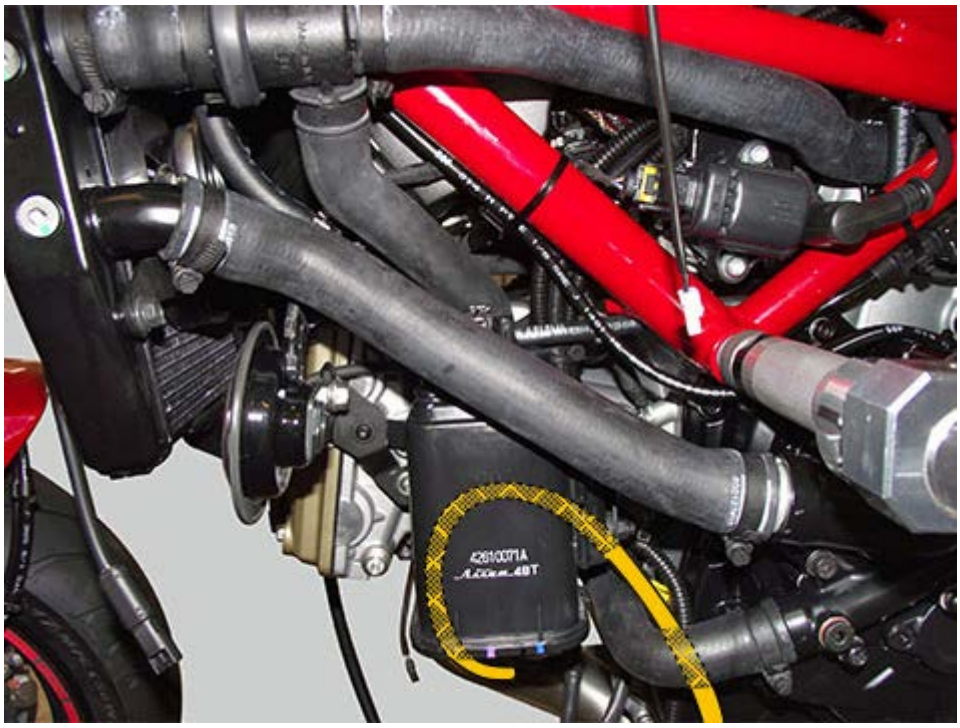
Reconnect pipes (1) and (2) and fix them with clamps (3) and (4).

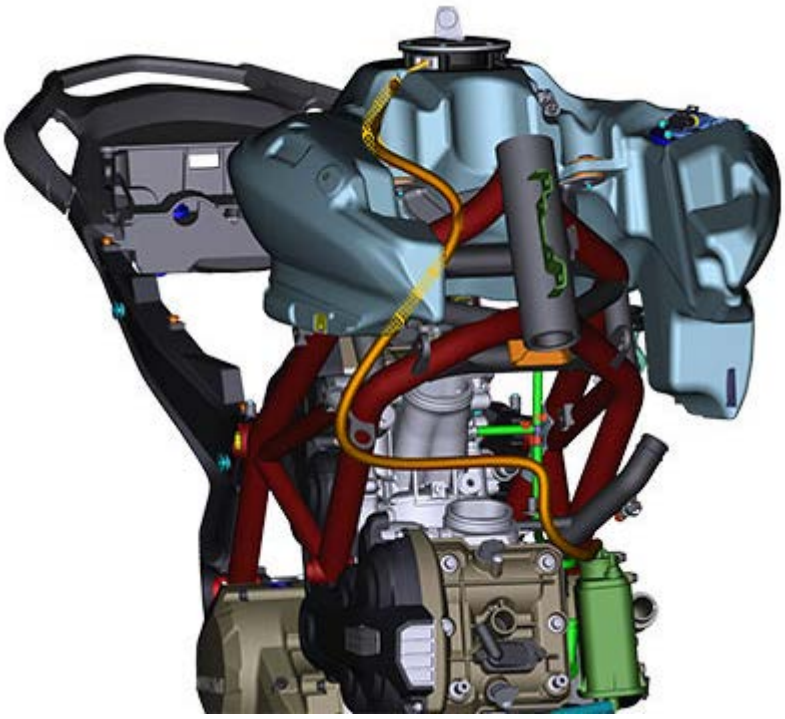


POSITIONING THE CANISTER FILTER PIPES



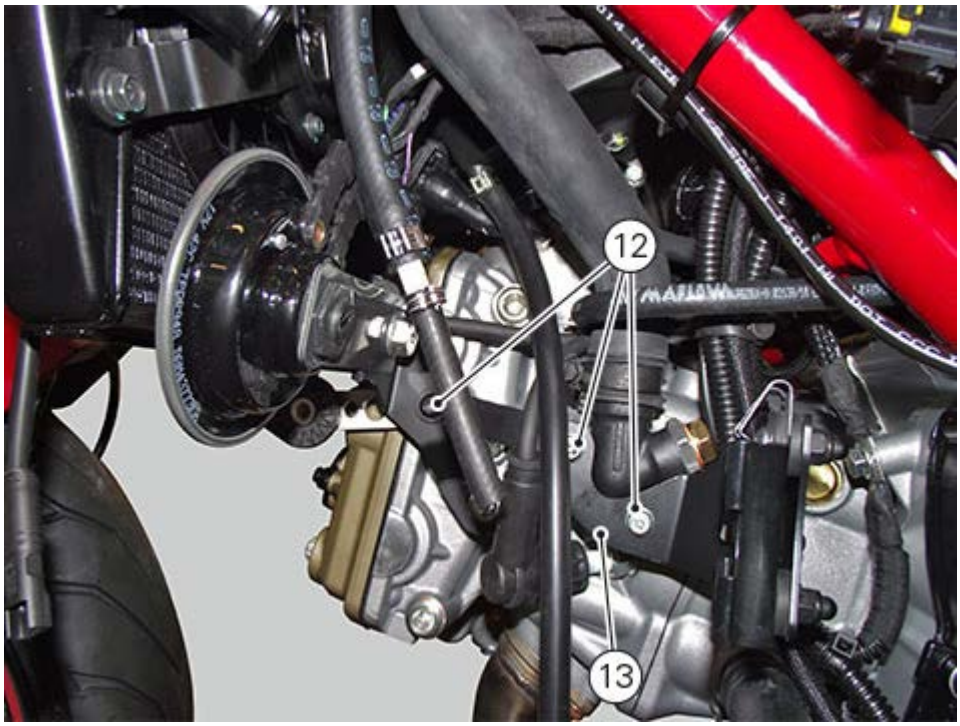






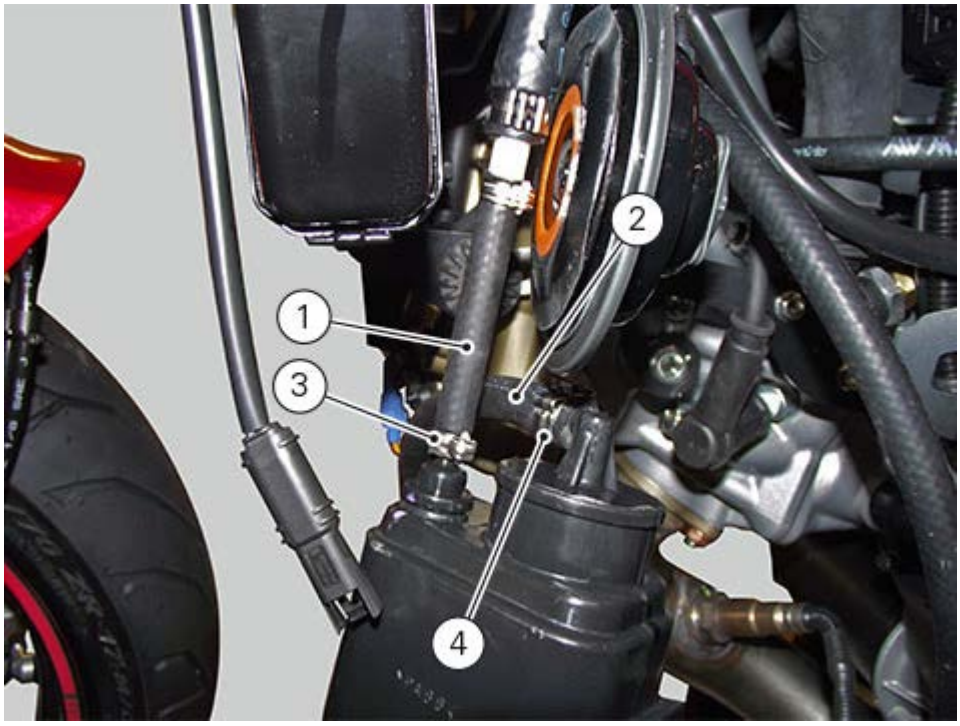
REFITTING THE CANISTER FILTER SUPPORT

Position the canister support (13) and fix it with the three retaining screws (12).

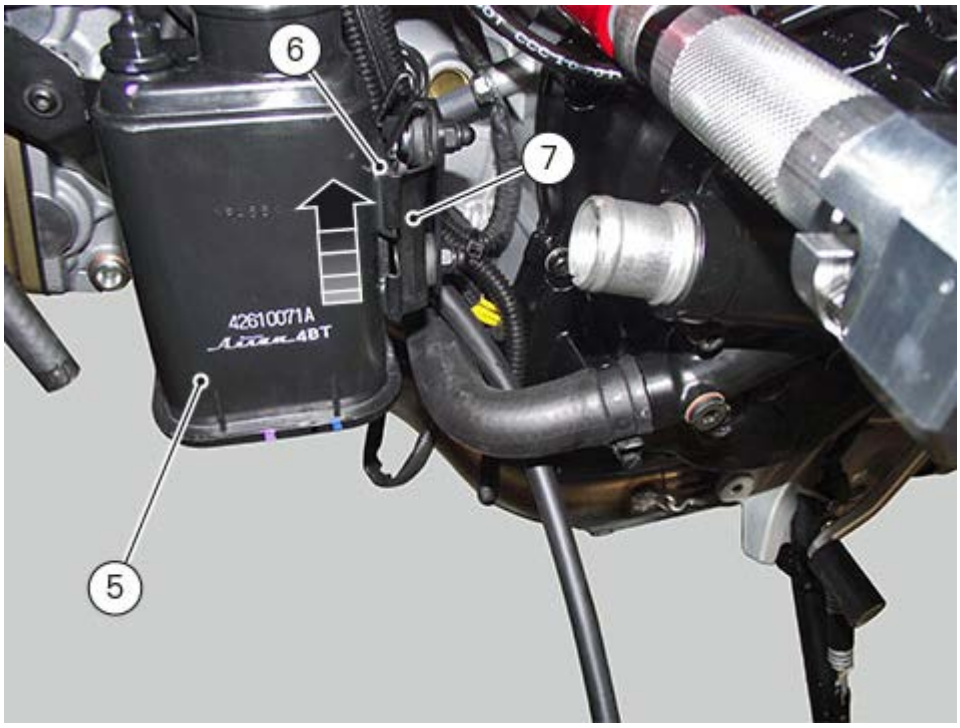

12
13

Removing the canister filter

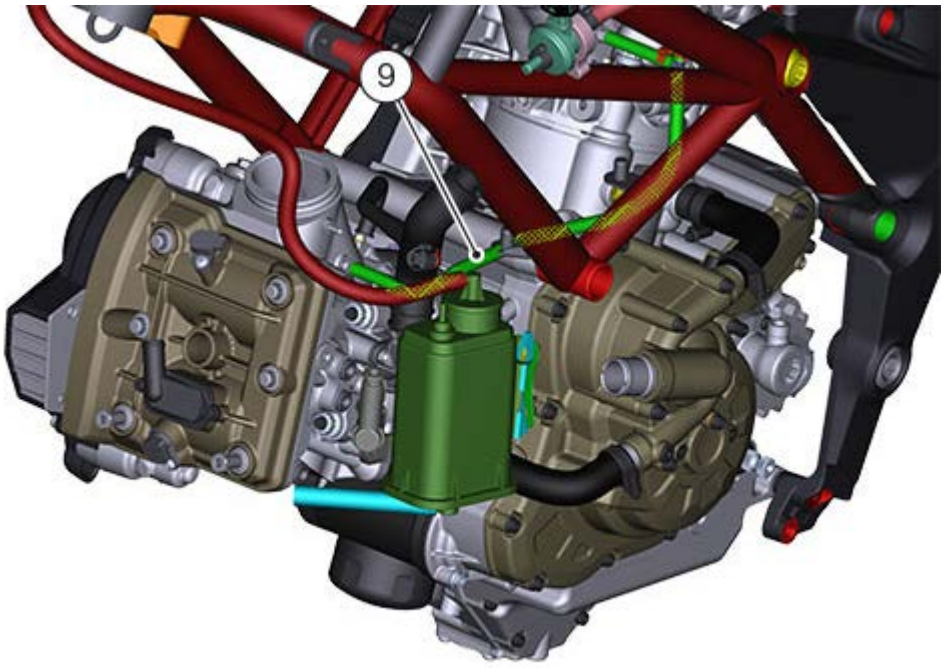
Disconnect pipes (1) and (2) by removing clamps (3) and (4).

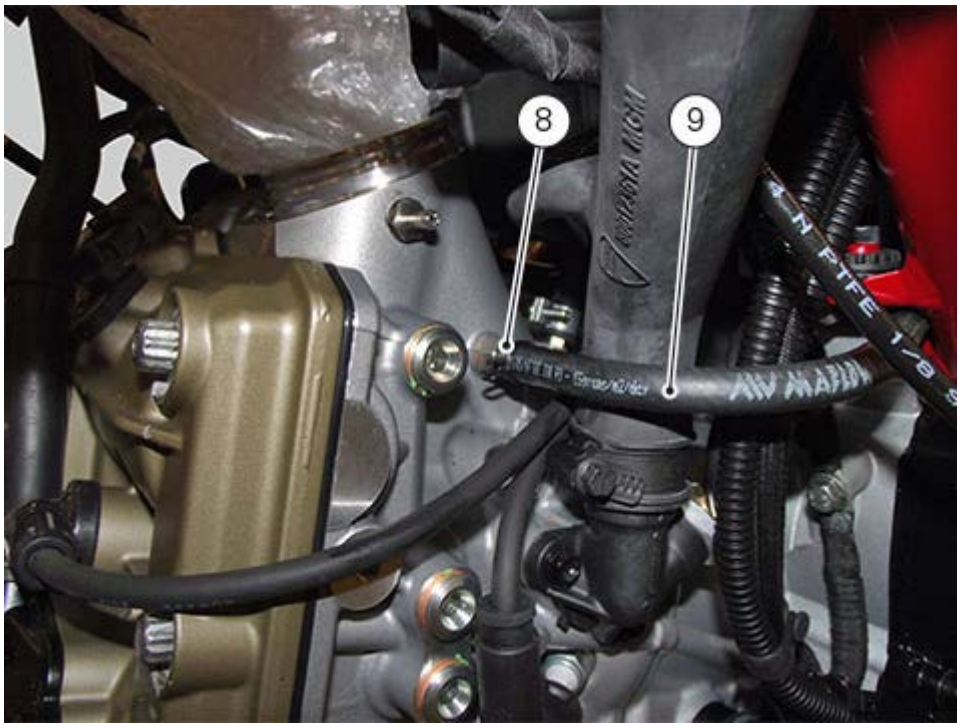


Remove canister filter (5) by sliding it upwards on the plate (7) guides (6).

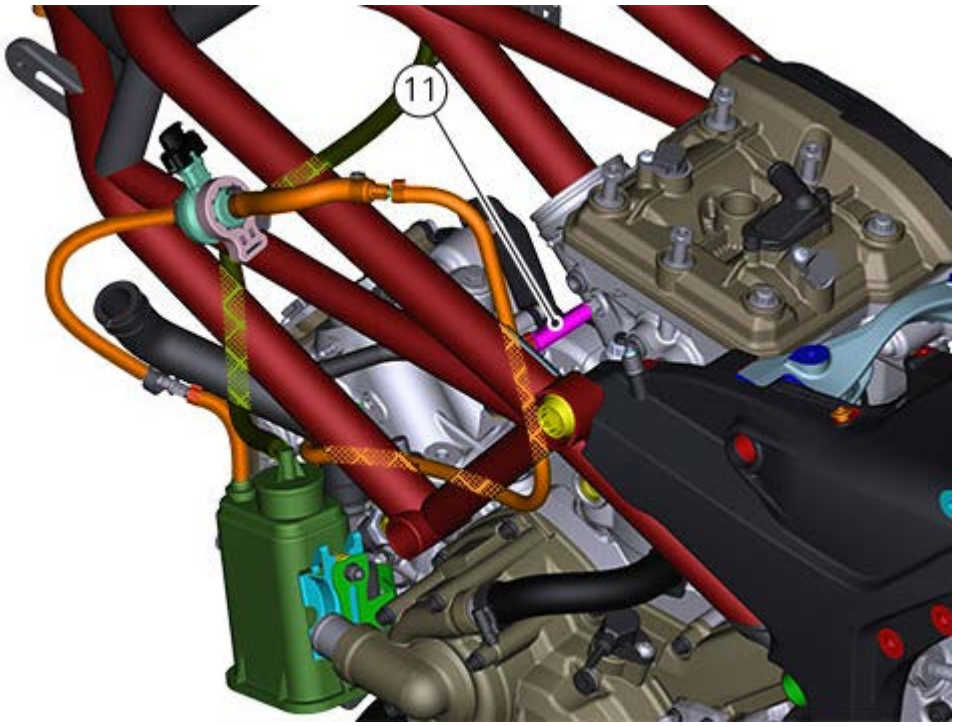


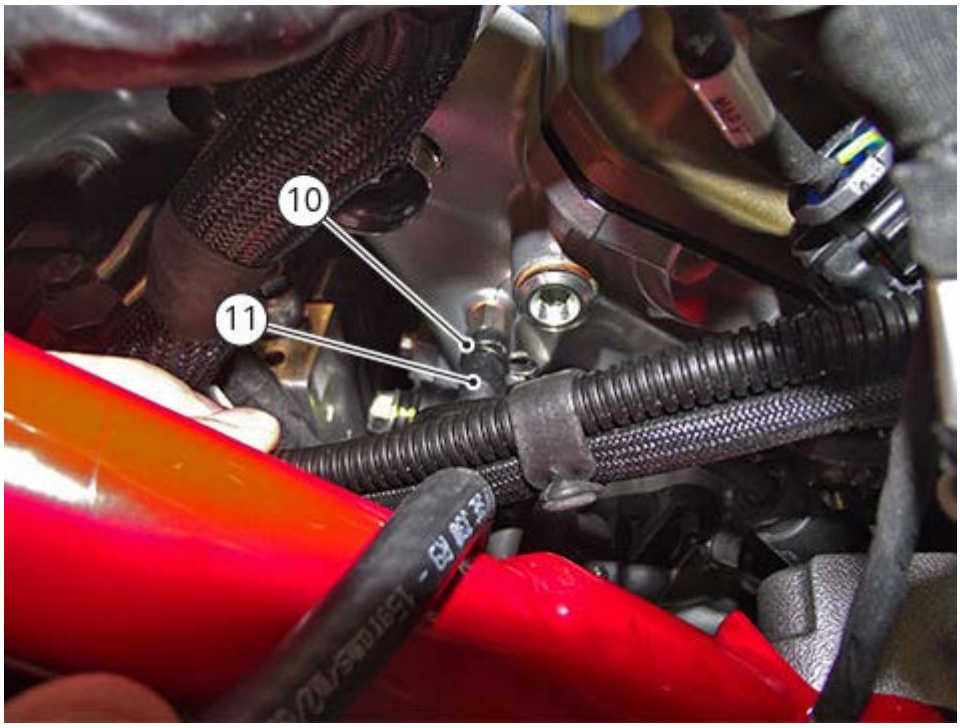
Work on the horizontal head and remove clip (8) and disconnect pipe (9).





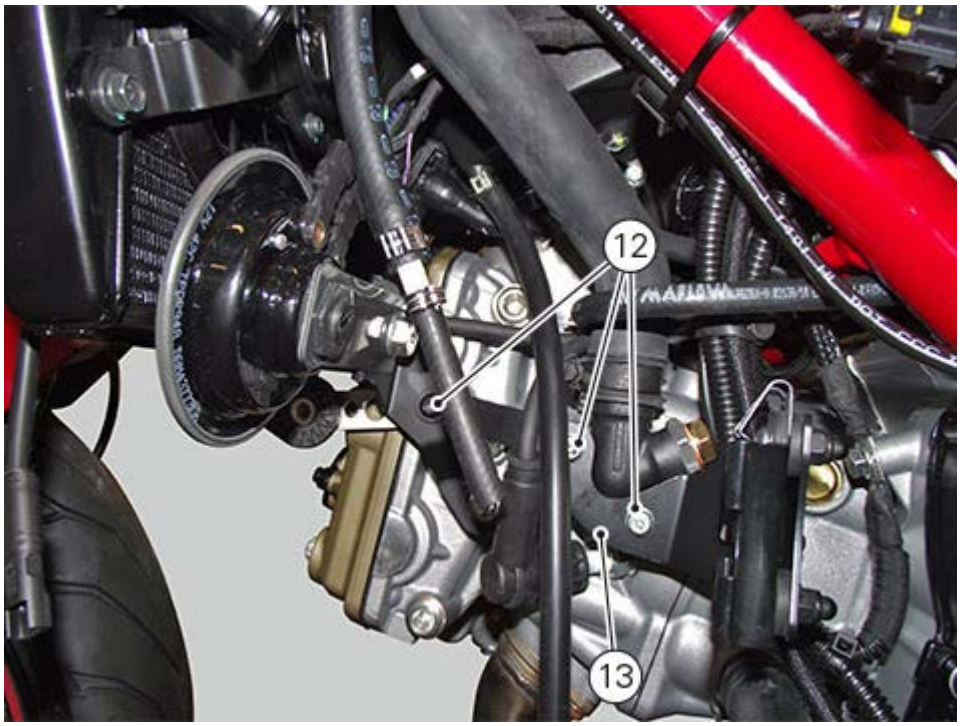
Work on the vertical head and remove clip (10) and disconnect pipe (11).





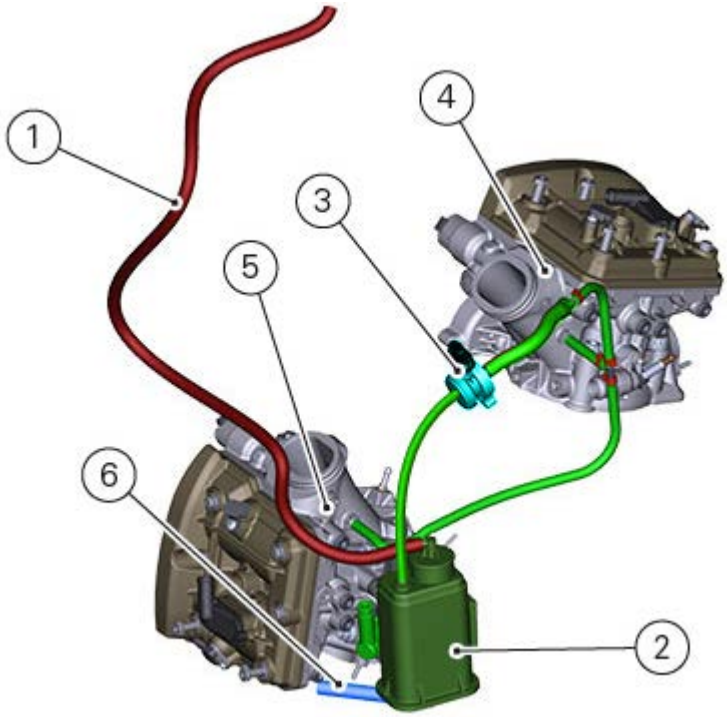
REMOVING THE CANISTER FILTER SUPPORT

Remove the three retaining screws (12) and remove the canister support (13).


12
13

Canister filter system

The canister filter is a system that collects the fuel vapour released by the fuel tank. This filter is positioned along the tank breather tube and must keep the fuel vapours when the vehicle is not moving.
To maintain the efficiency of the active carbons, the system is active while the engine is ON. The vacuum generated in the intake manifolds makes fresh air flow through the canister filter and clean it.
The vapours generated while riding are conveyed to the intake system. To prevent the mixture from getting too rich, the pipe has a purge valve that is opened and closed according to the riding conditions.



PARKED MOTORCYCLE AND PURGE VALVE CLOSED

In this condition the vapours released by the tank by means of pipe (1) are conveyed in the canister filter (2). The Purge valve (3) remains closed.
The filtered air comes out of pipe (6).

MOVING MOTORCYCLE AND PURGE VALVE OPEN

In this condition air flows in pipe (1) to ventilate the tank. The Purge valve (3) is open and so the fuel vapours coming from the canister (2) are sucked by pipes (4) and (5).
Fresh air from outside enters into pipe (6).

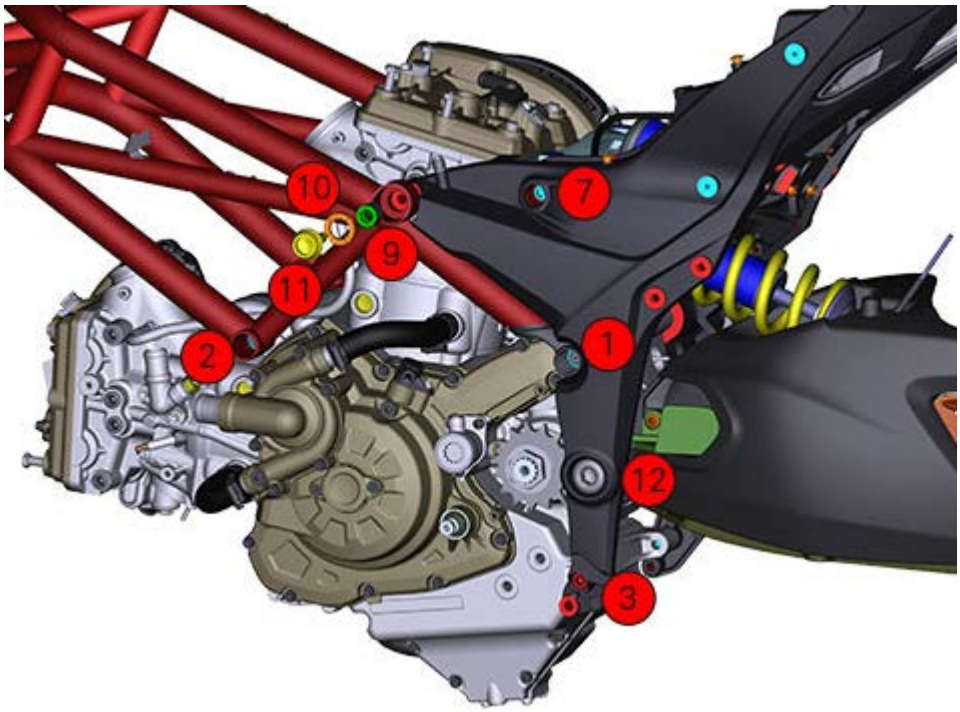
MOVING MOTORCYCLE AND PURGE VALVE CLOSED

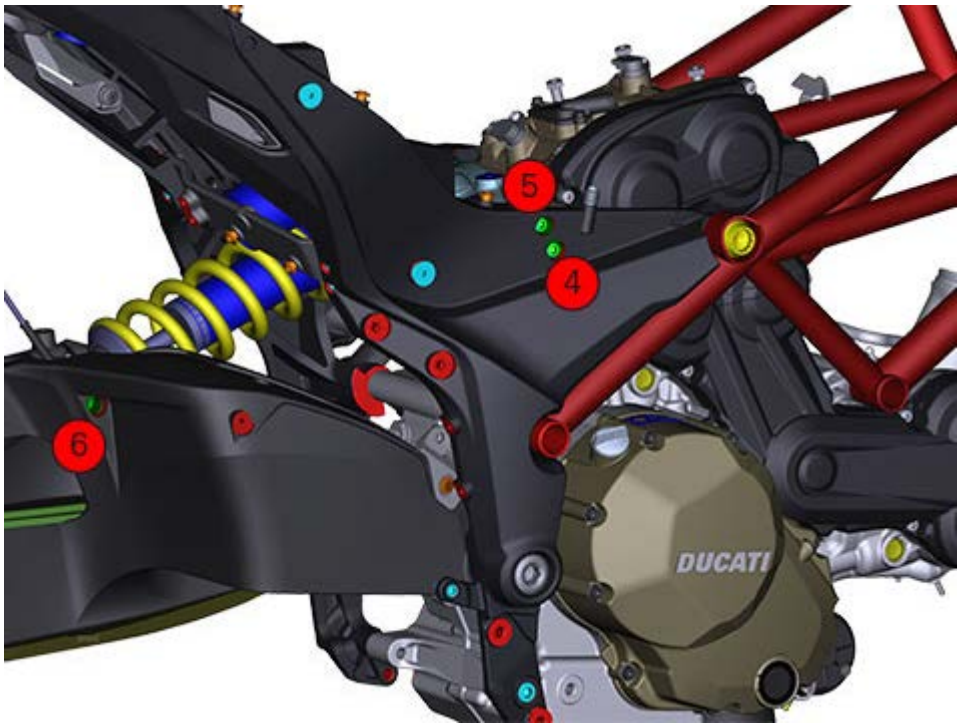
In this condition air flows in pipe (1) to ventilate the tank. The Purge valve (3) is closed and so there is no passage of fuel vapours in pipes (4) and (5).
Fresh air from outside enters into pipe (6).

Refitting the engine

Position the engine in the frame and fix it as described in chapter "Refitting the structural parts and frame".

Pay attention to the tightening sequence.





Refit the swingarm shaft (Refitting the swinging arm).

Refit the side stand (Refitting the side stand).
Refit the gear shift (Refitting the gear shift).
Refit the clutch slave cylinder (Refitting the clutch slave cylinder).
Refit the cooling system hoses and unions on the engine block (Refitting the cooling system hoses and unions).
Refit the water radiator lower retainer on the engine block (Refitting the water radiator).
Fill the lubrication system (Changing the engine oil and filter cartridge).
Fill the cooling system (Changing the coolant).
Refit the complete exhaust system (Refitting the exhaust system).
Refit the airbox, the throttle body, the blow by and the oil breather pipe (Refitting the airbox and throttle body).
Refit the panel (Refitting the panel).

Refit the fuel tank (Refitting the fuel tank).
Refit the sump guard unit (Refitting the belly pan).
Refit the seats (Refitting the seat).

Removing the engine

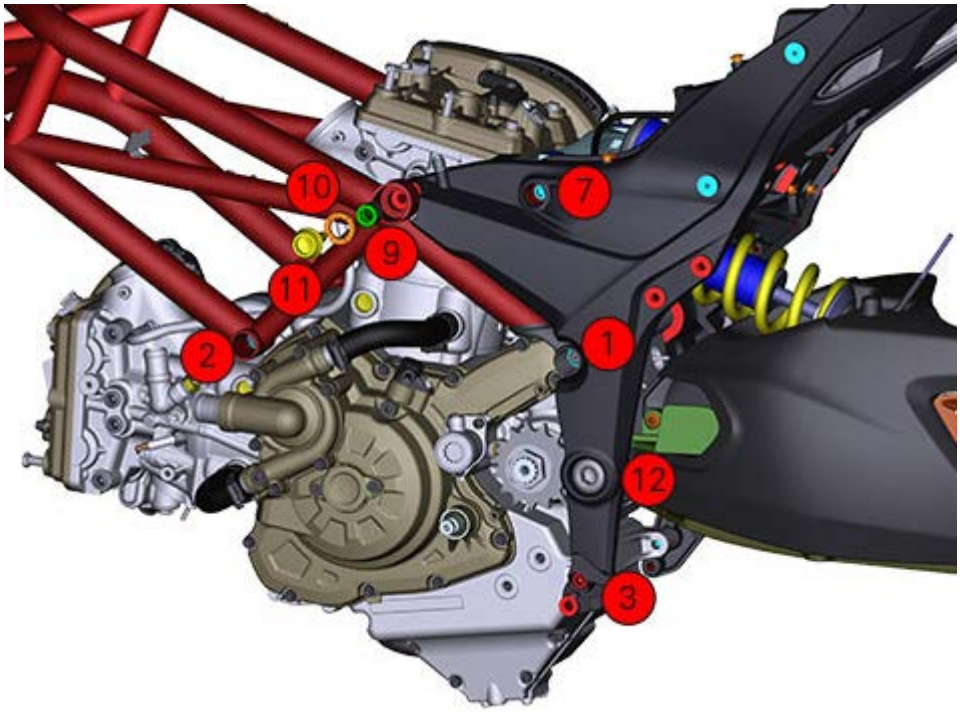
To remove the engine follow the procedure below.

Support the engine with suitable equipment.

Remove the seats (Removing the seat).
Remove the sump guard unit (Removing the sump guard).
Remove the instrument panel internal covers (Removing the panel).
Remove the fuel tank (Removing the fuel tank).
Remove the airbox, the throttle body, the blow by and the oil breather pipe (Removing the airbox and throttle body).
Remove the secondary air system pipes and valve (Removing the secondary air system).
Remove the supply system and the injectors from the intake manifolds.
Disconnect the caps from the spark plugs (Replacing the spark plugs).
Remove the exhaust system (Removing the exhaust system).
Drain the lubrication system (Changing the engine oil and filter cartridge).
Drain the coolant (Changing the coolant).
Remove the cooling system hoses and unions from the engine block (Removing cooling system hoses and unions).
Remove the water radiator lower retainer from the engine (Removing the water radiator).
Disconnect the starter motor/solenoid starter cable (Removing the starter motor).
Remove the gear shift (Removing the gear shift).
Remove the clutch slave cylinder (Removing the clutch slave cylinder).
Remove the front sprocket (Removing the front sprocket).
Remove the side stand (Removing the side stand).

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

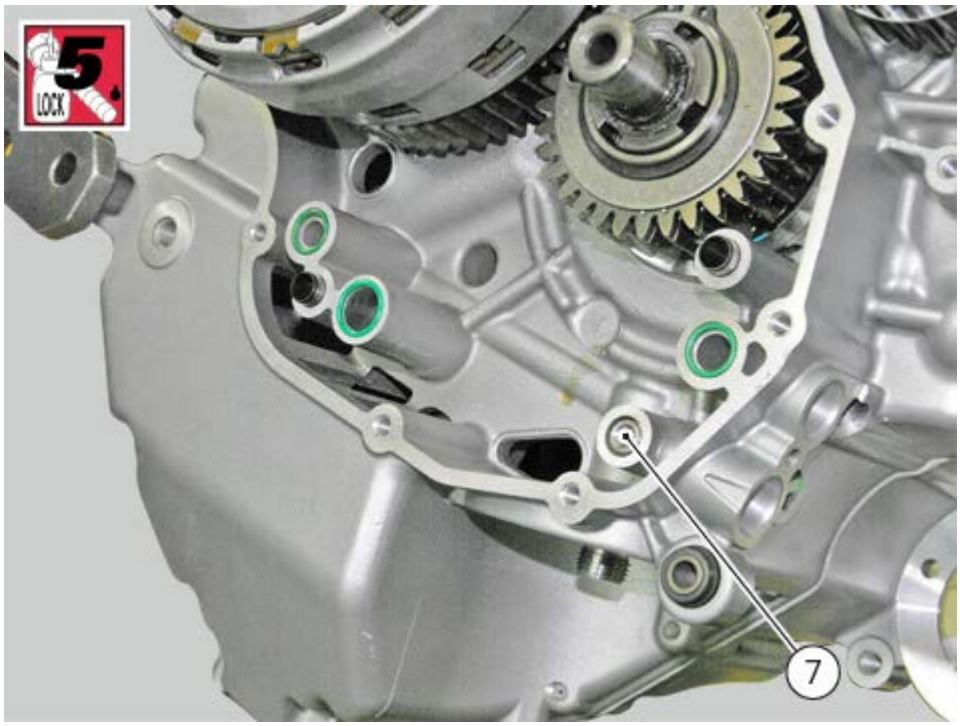
Remove the retaining screws/pins (1), (2) and (3) and the adjuster (11).

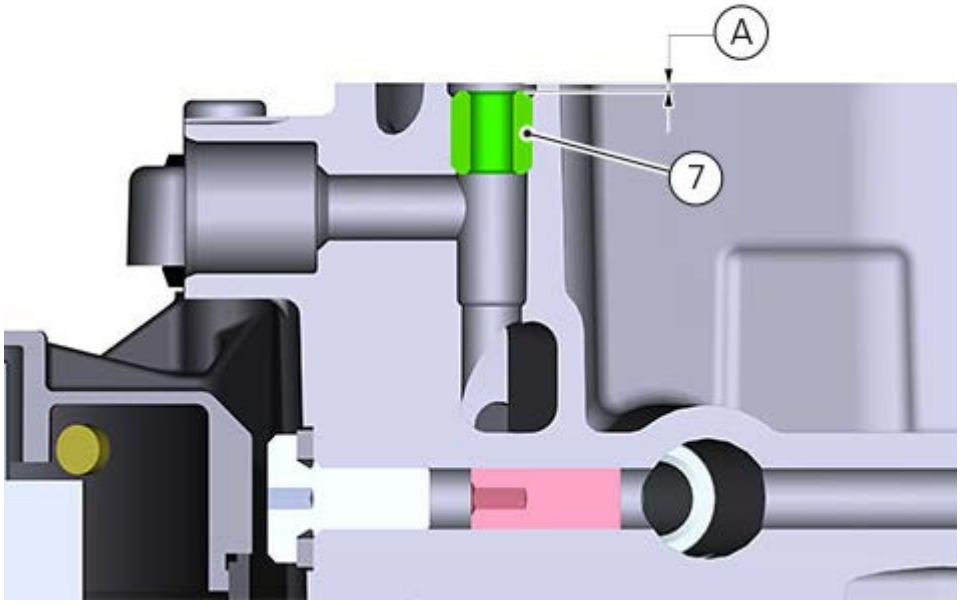


It is now possible to remove the engine from the frame.

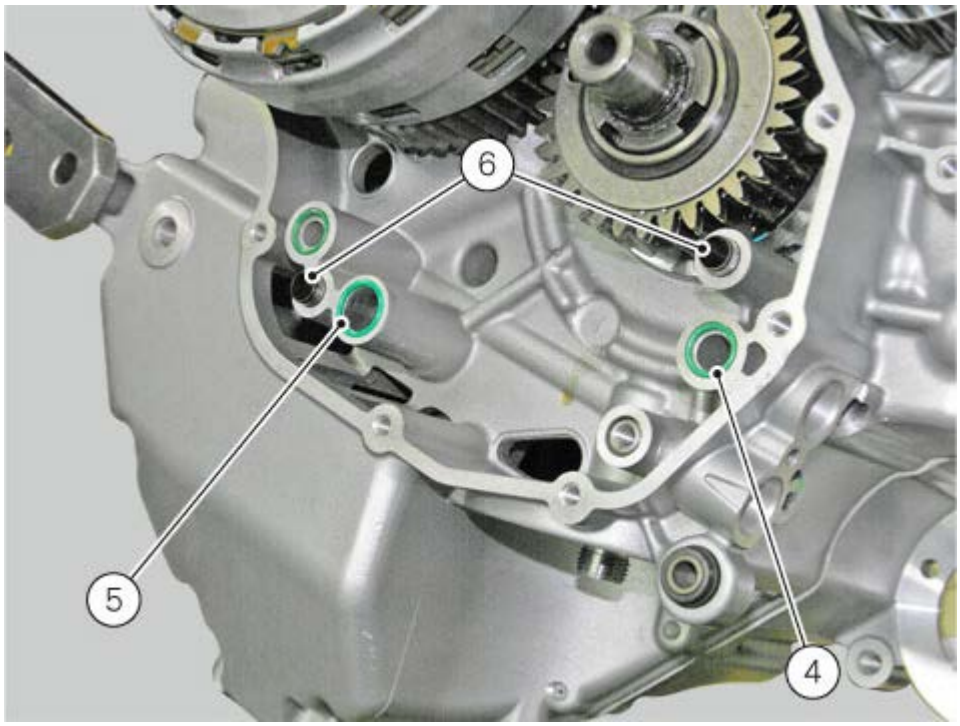
Refitting the oil pump

If removed, apply specific threadlocker on the bush (7) and screw it in the crankcase half, observing the value (A) of 1 mm ± 0.2%.

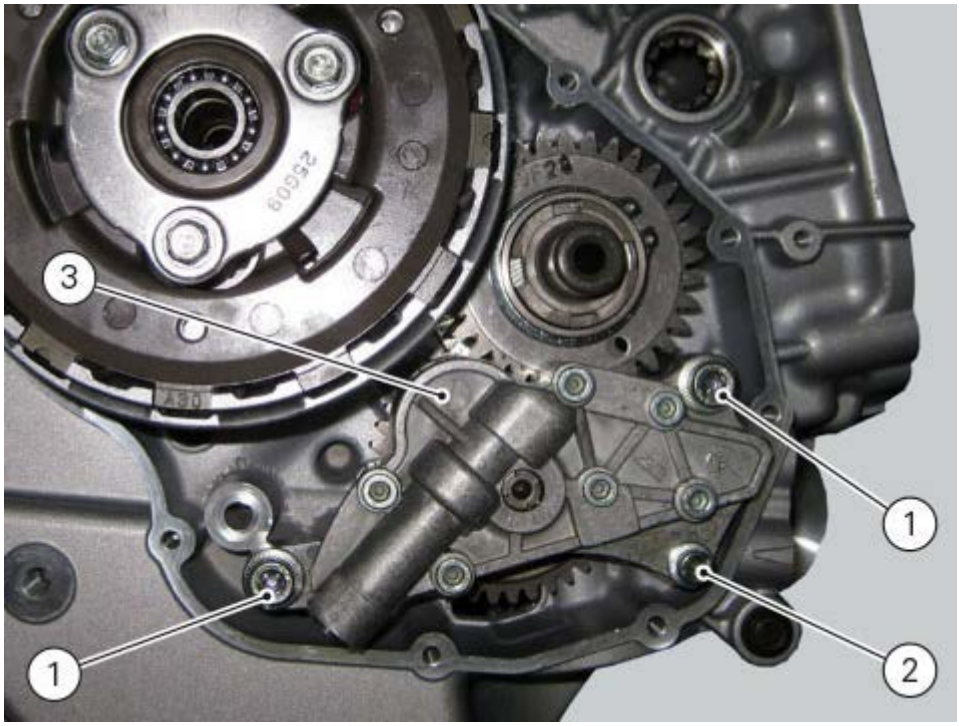


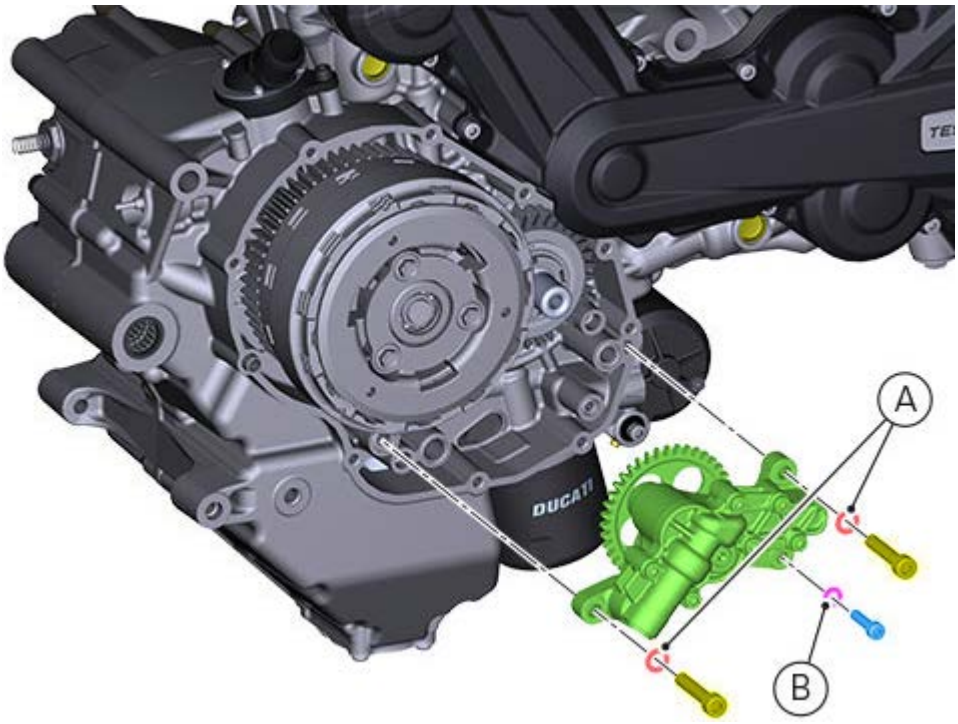


Position the reference bushes (6) and the O-rings (4) and (5) according to the casing lubrication channels.

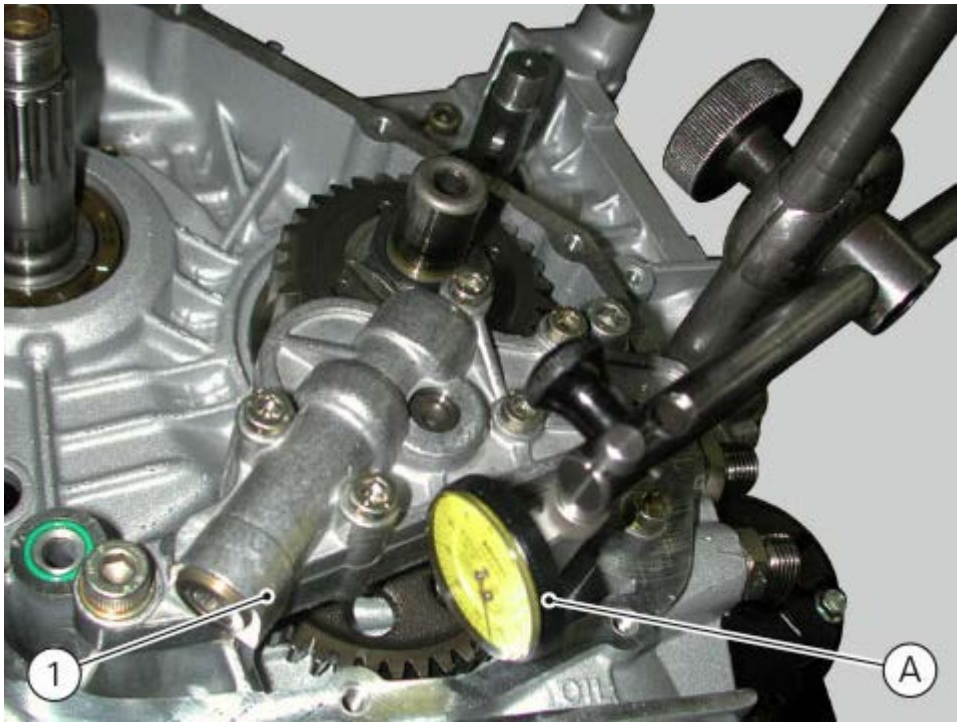


Position the complete oil pump (3) on the casing, fit the relevant washers (A) and (B) and tighten screws (1) to 26 Nm (Min. 23 Nm - Max. 29 Nm) and screw (2) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).





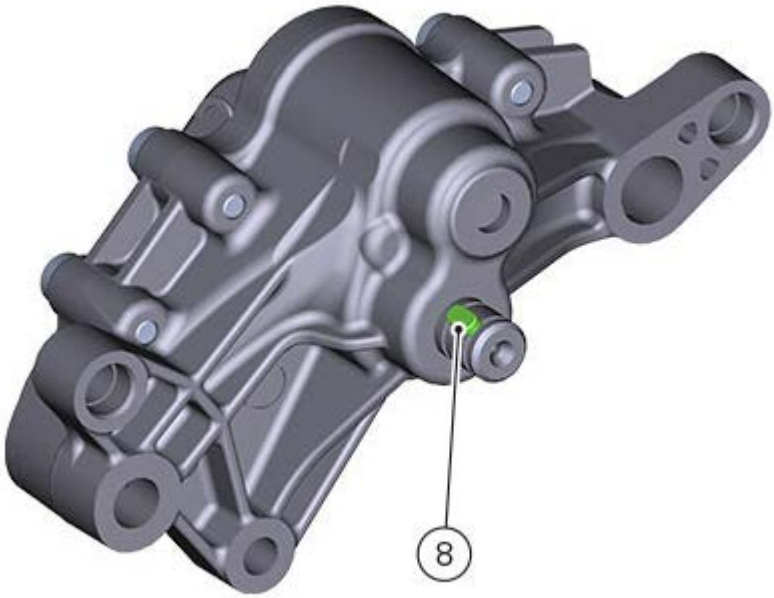
Check the gear clearance with the front sprocket by fixing a dial gauge (A), equipped with the appropriate stylus, to the crankcase half.
Position the dial gauge stylus on one tooth of oil pump gear and set the gauge to zero in this position.
Move the gear slightly to measure the backlash; take four readings in diametrically opposed positions of the gear.
The clearance should be 0.10 mm.

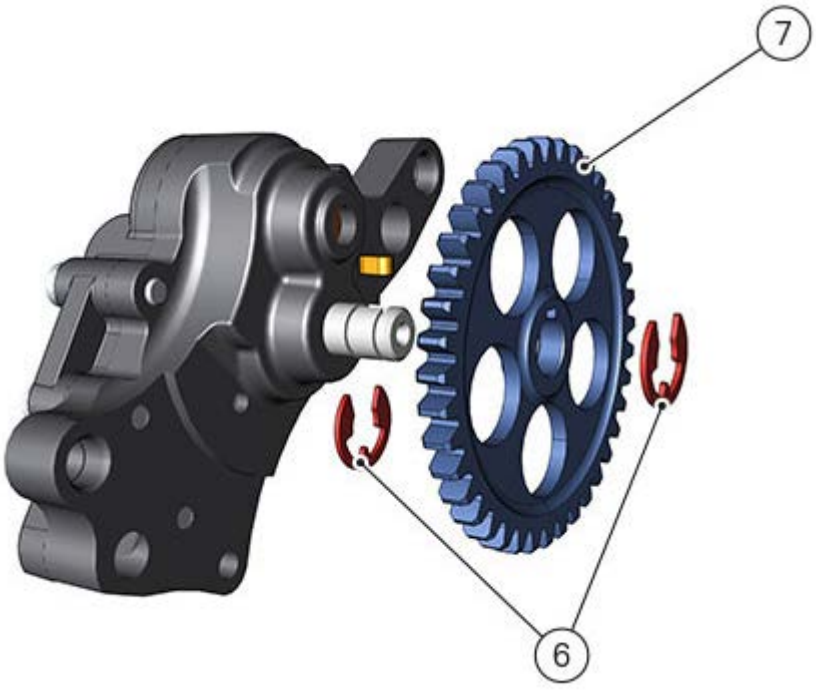


Refit the clutch cover (Refitting the clutch cover).
Refit the RH belly pan (Refitting the belly pan).
Fill the system (Changing the engine oil and filter cartridge).

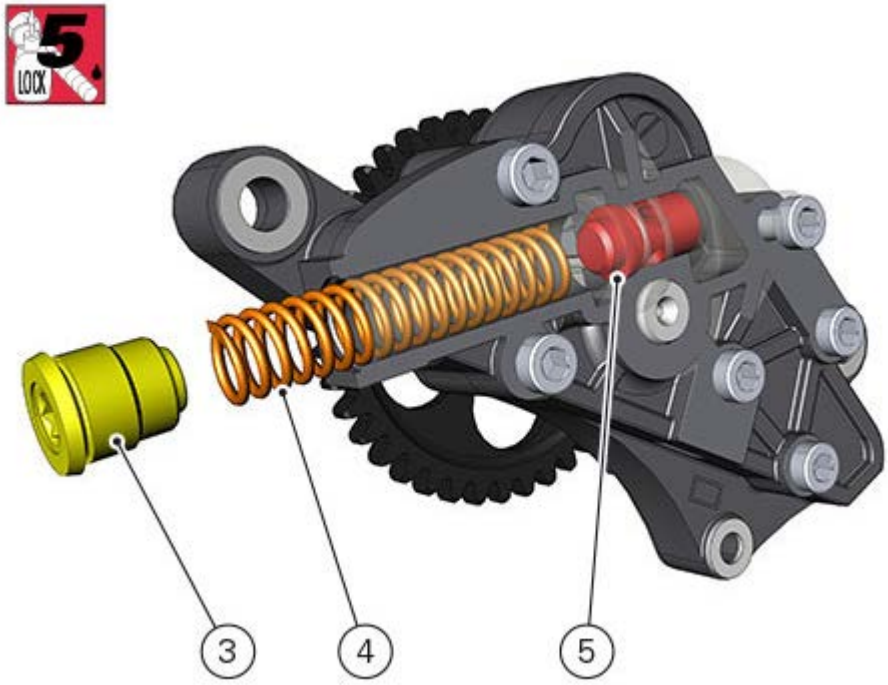
Reassembling the oil pump

Check that the spring (8) and key (6) are present on the pump.
Fit the pump drive gear (7) on to the oil pump and secure it by installing the circlip (6) in its groove.



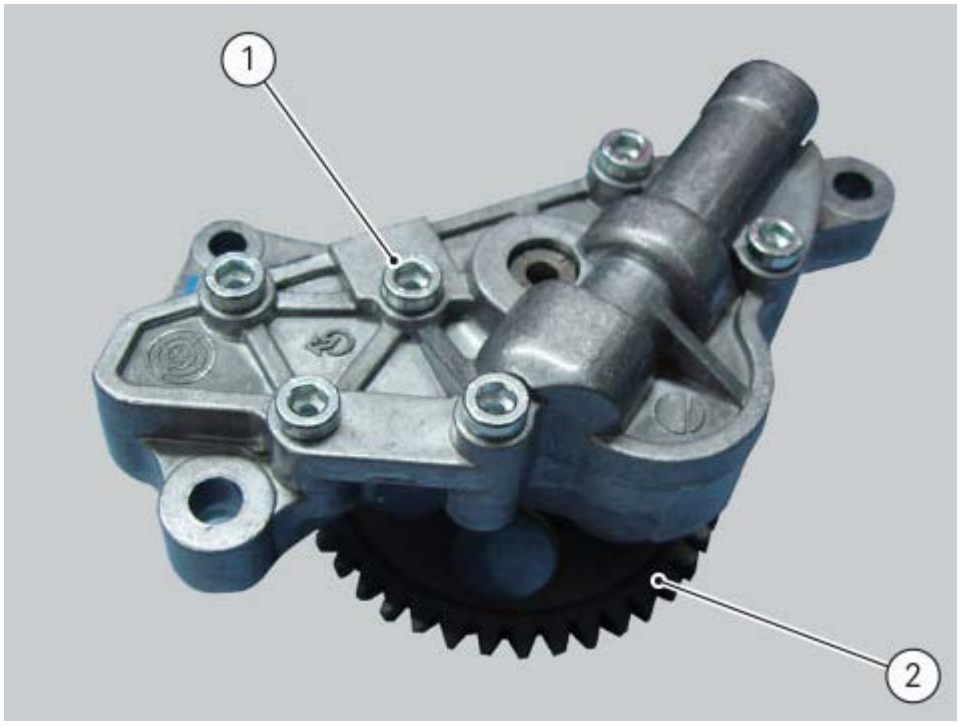


Insert by-pass valve (5), spring (4) in the pump and tighten plug (3) to a torque of 17 Nm (Min. 15 Nm - Max. 19 Nm) by applying medium-strength threadlocker.


5.
LOCK
3
4
5

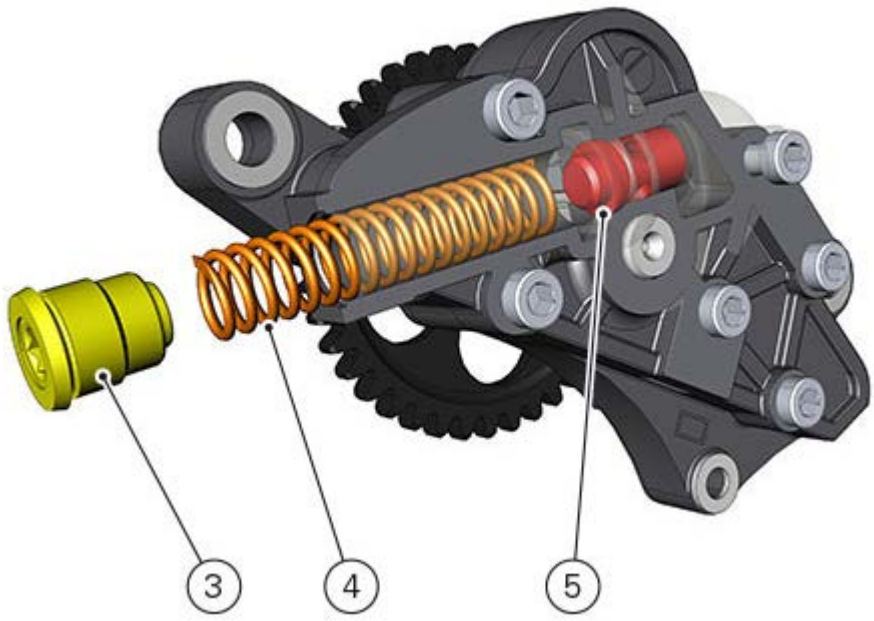
Disassembling the oil pump gear

Hold the oil pump (1) in a vice taking care not to damage the drive gear (2).

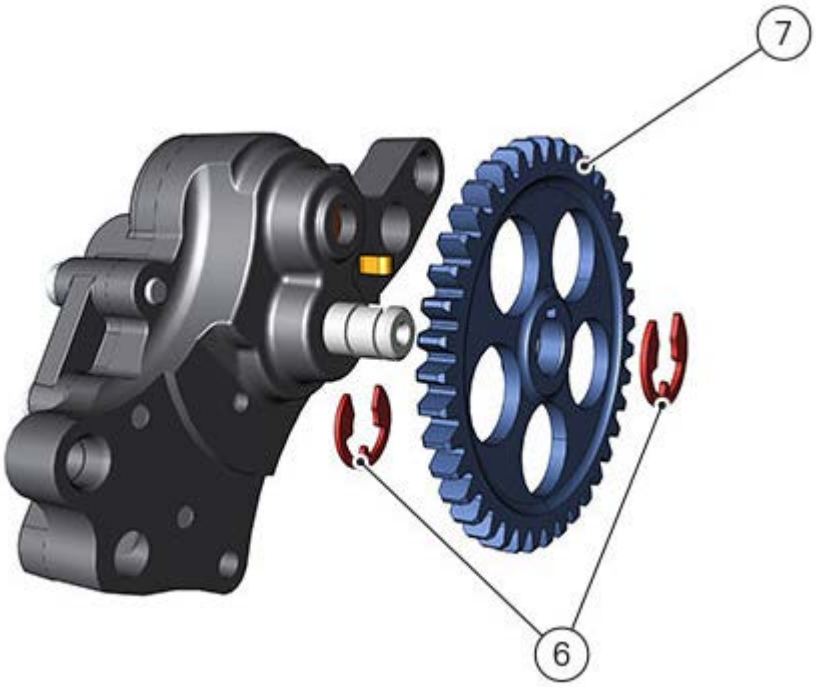


Warning
Make sure that vice jaws are faced with soft material.

Remove the plug (3) and extract the spring (4) and by-pass valve (5).



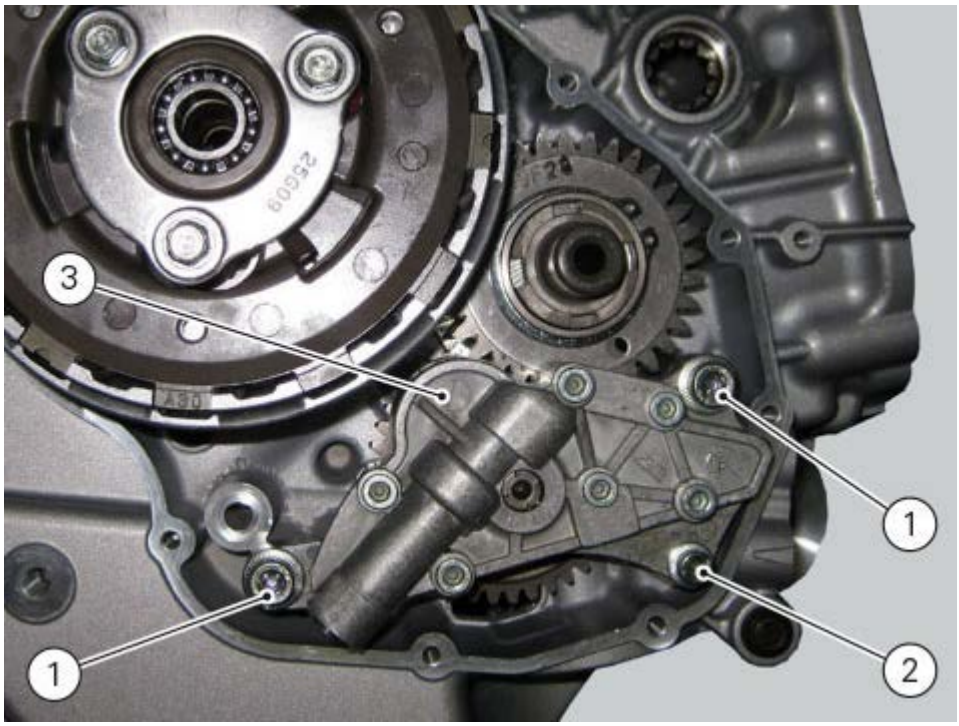
Check the condition of the above components.
Remove the circlip (6) and withdraw the pump drive gear (7).

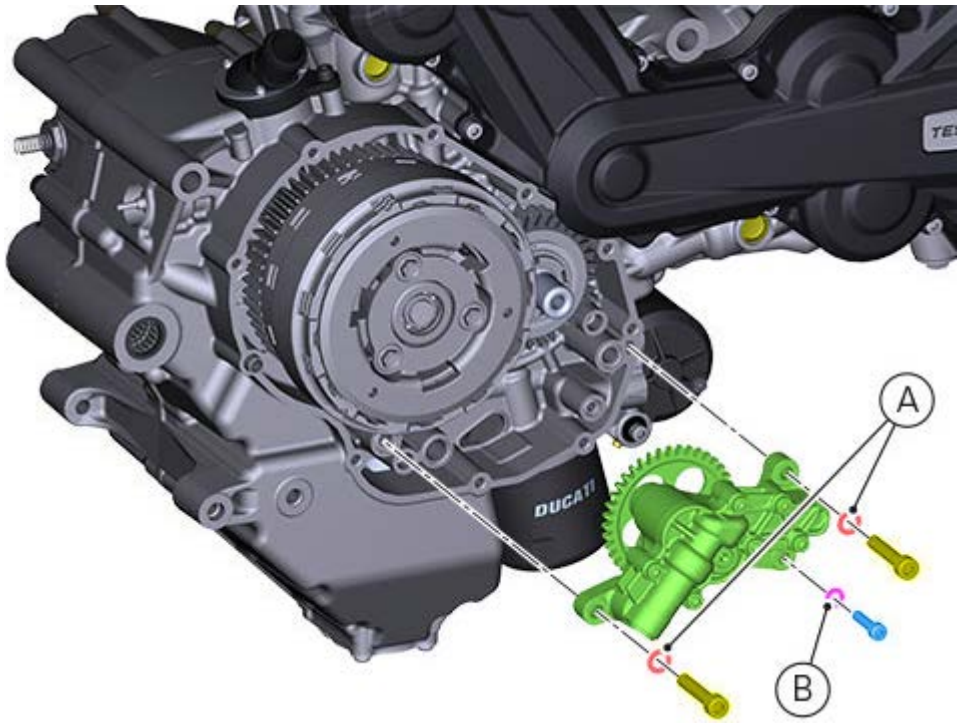

7
6

Removing the oil pump

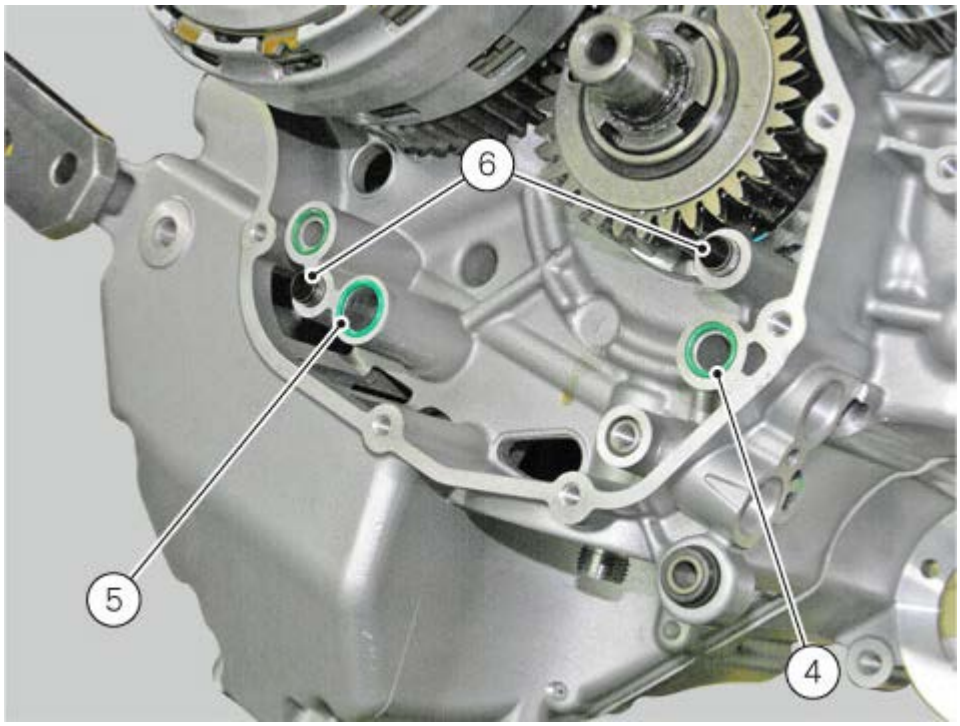
Drain the system (Changing the engine oil and filter cartridge).
Remove the RH belly pan (Removing the belly pan).
Remove the clutch cover (Removing the clutch cover).

Loosen and remove screws (1) and (2) that retain the complete pump and collect the relevant washers (A) and (B).





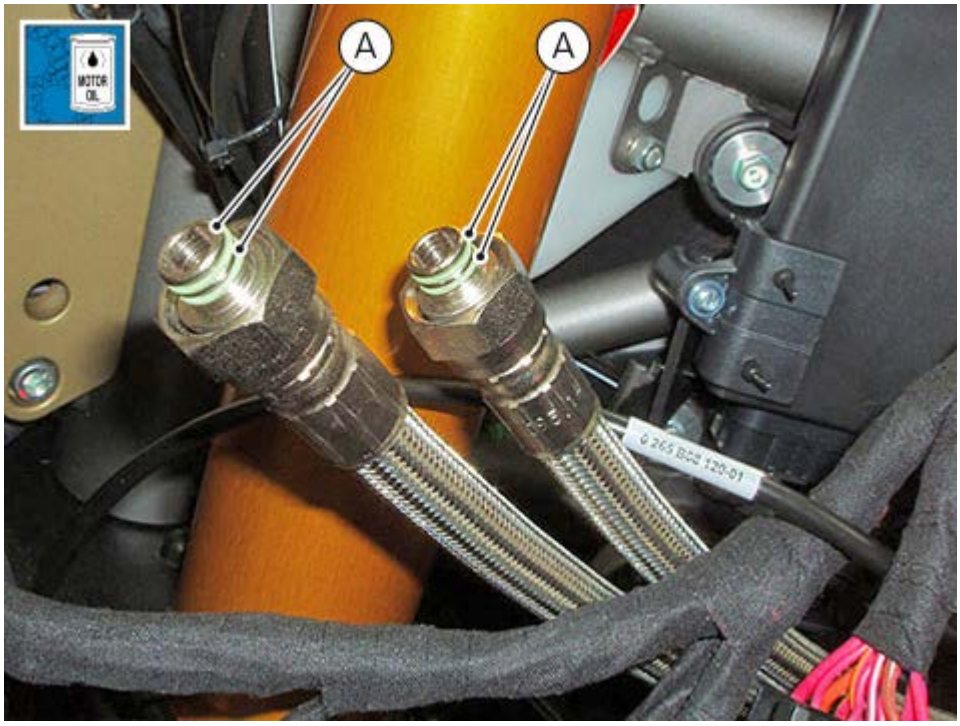
Remove the oil pump assembly (3) and extract the O-rings (4) and (5) from the crankcase half together with two centring bushes (6).

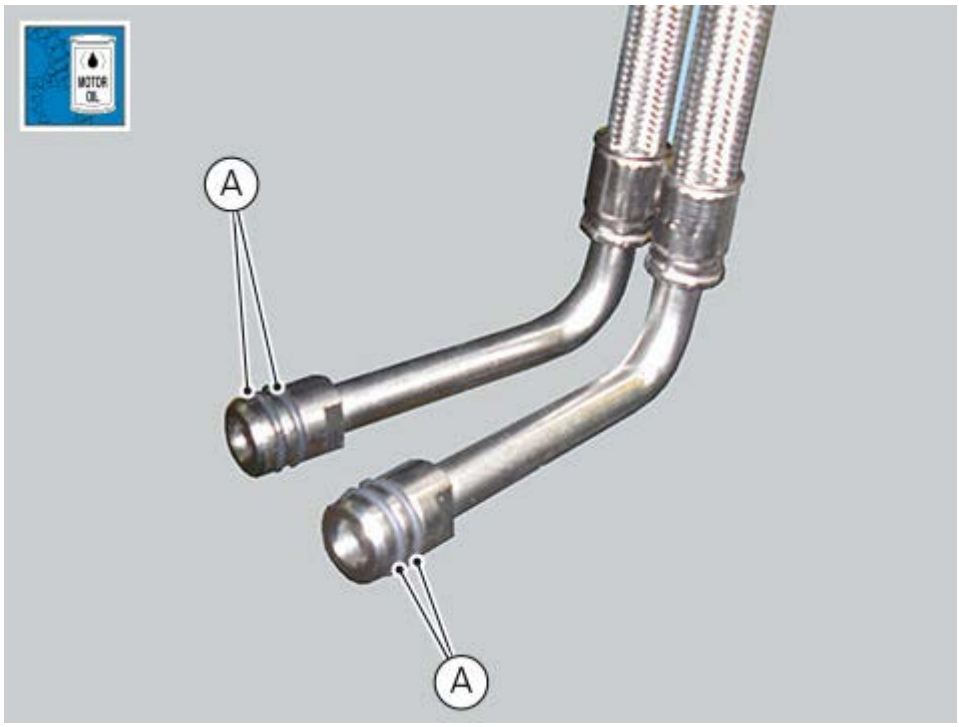

6
5
4

Refitting the lubrication system

Note

Before fitting the hoses check the presence of O-rings and lubricate them with the indicated oil.



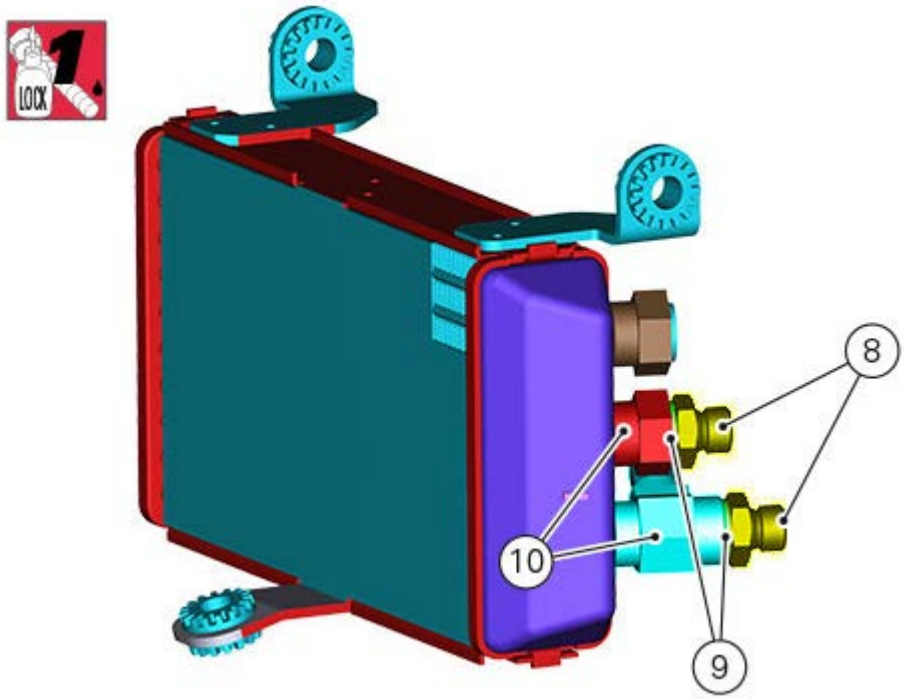


If nipples (8) have been removed from the cooler, fit a washer (9) on each nipple (8) and apply specified threadlocker on the cooler side threads.

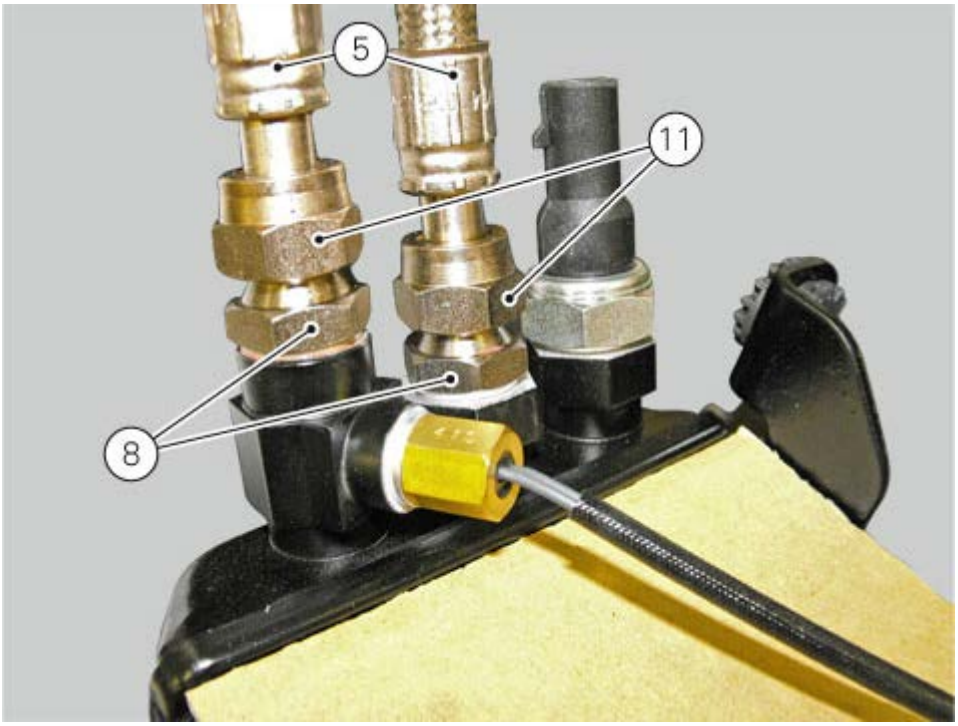
Important

The gasket must be positioned with the sharp edge facing the cooler.

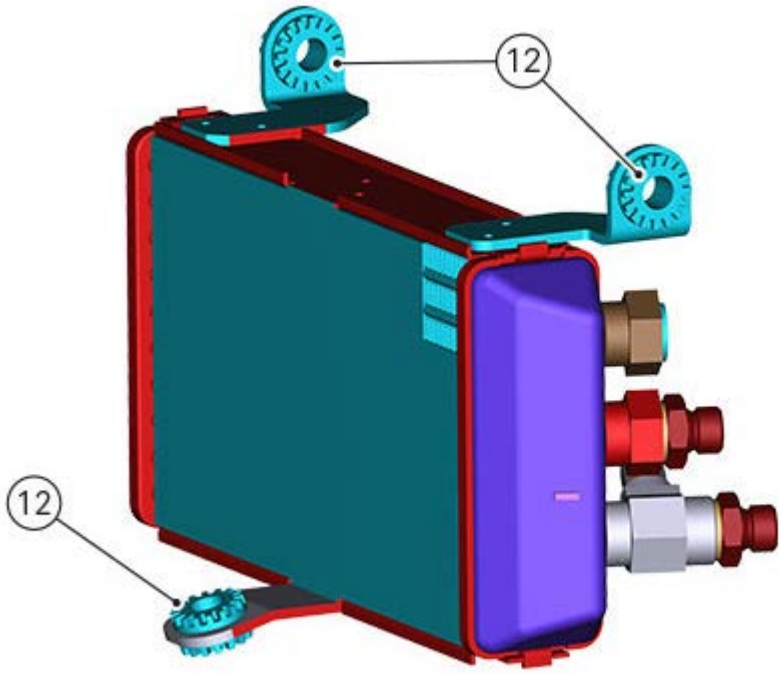
After applying the indicated threadlocker, start nipples (8) on the oil cooler and tighten them to 23 Nm ± 10% while holding the hex nuts (10).



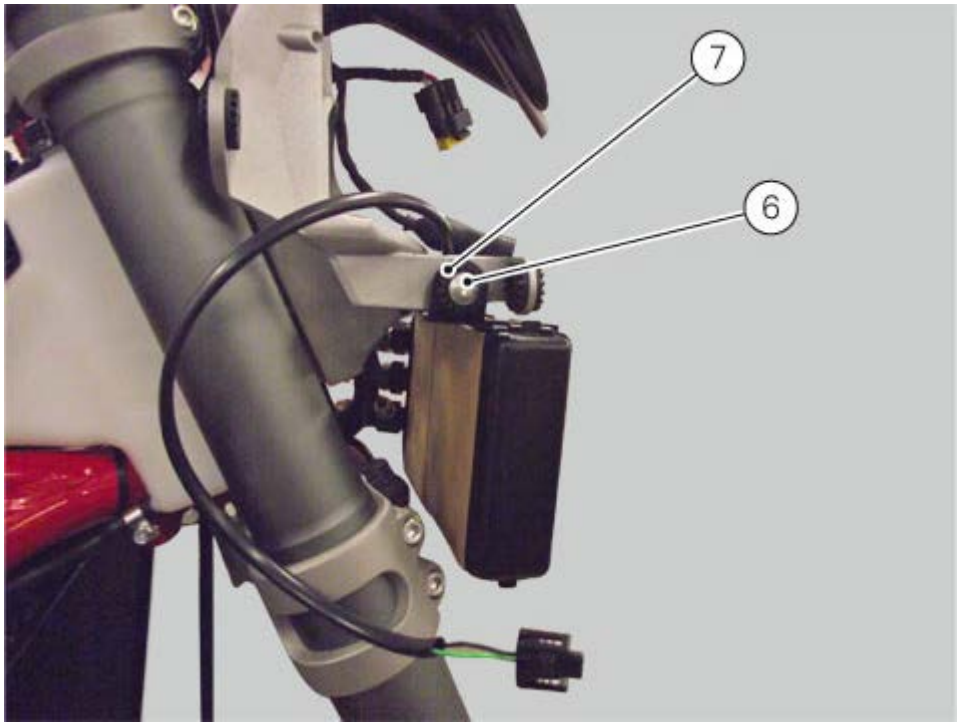
Attach the hoses ends (5) to the cooler nipples (8) and finger-tighten the nuts (11) fully home. Tighten the nuts (11) to a torque of 18 Nm ± 5% while holding the nipple hex nuts.

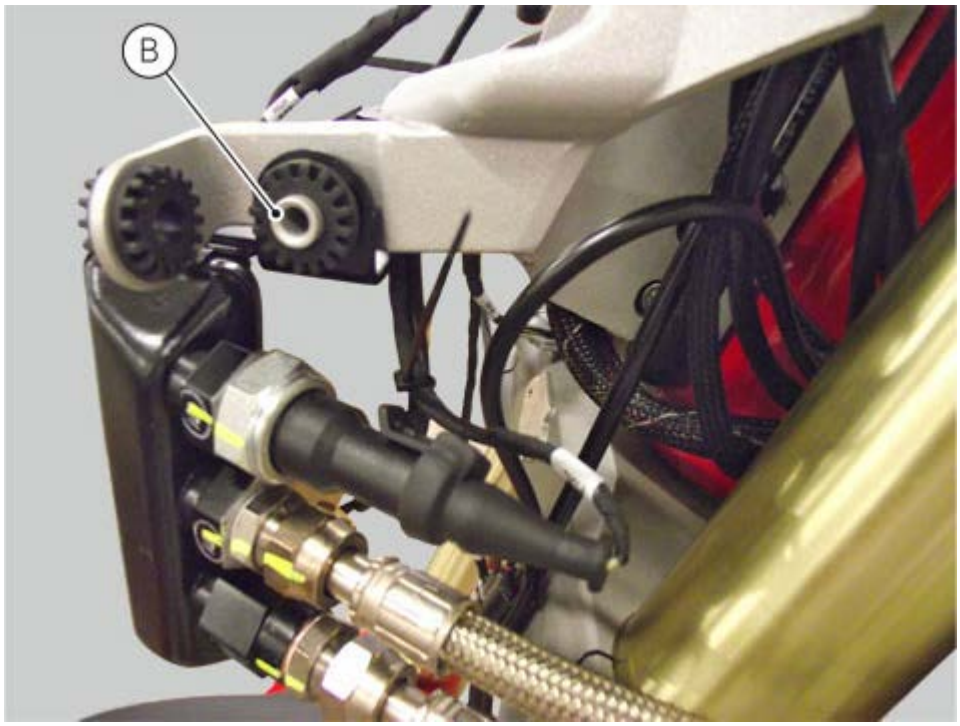


Check the presence of vibration damping pads (12) on both sides of the cooler.

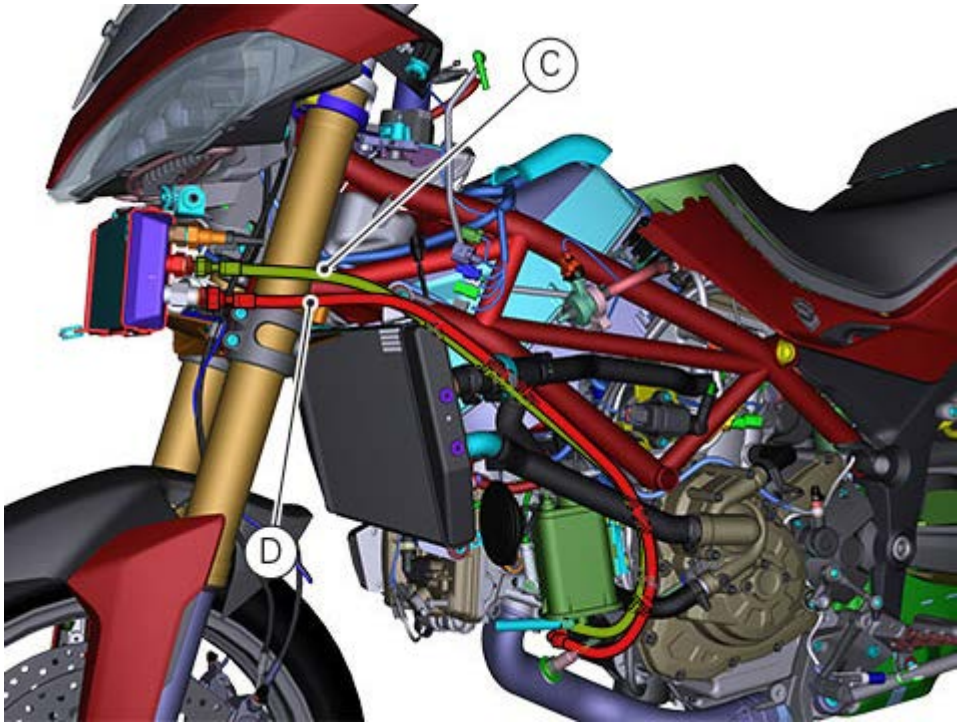


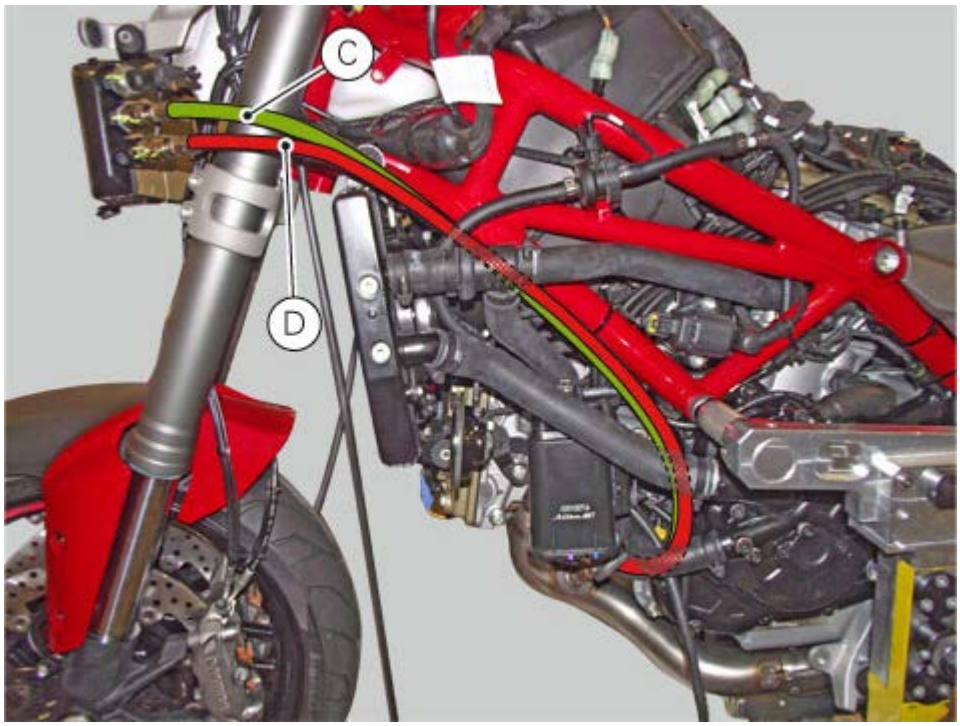
Fit the oil cooler by inserting it first in the headlight support pin (B).
Fit spacer (7) and screw (6) and tighten it to a torque of 6 Nm ± 10%.

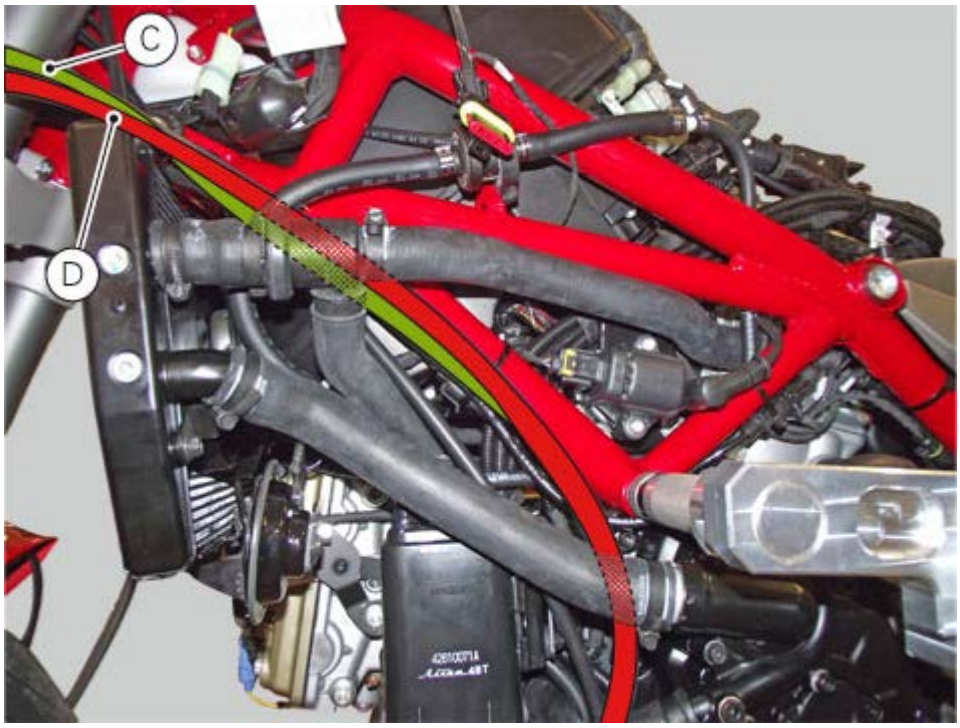


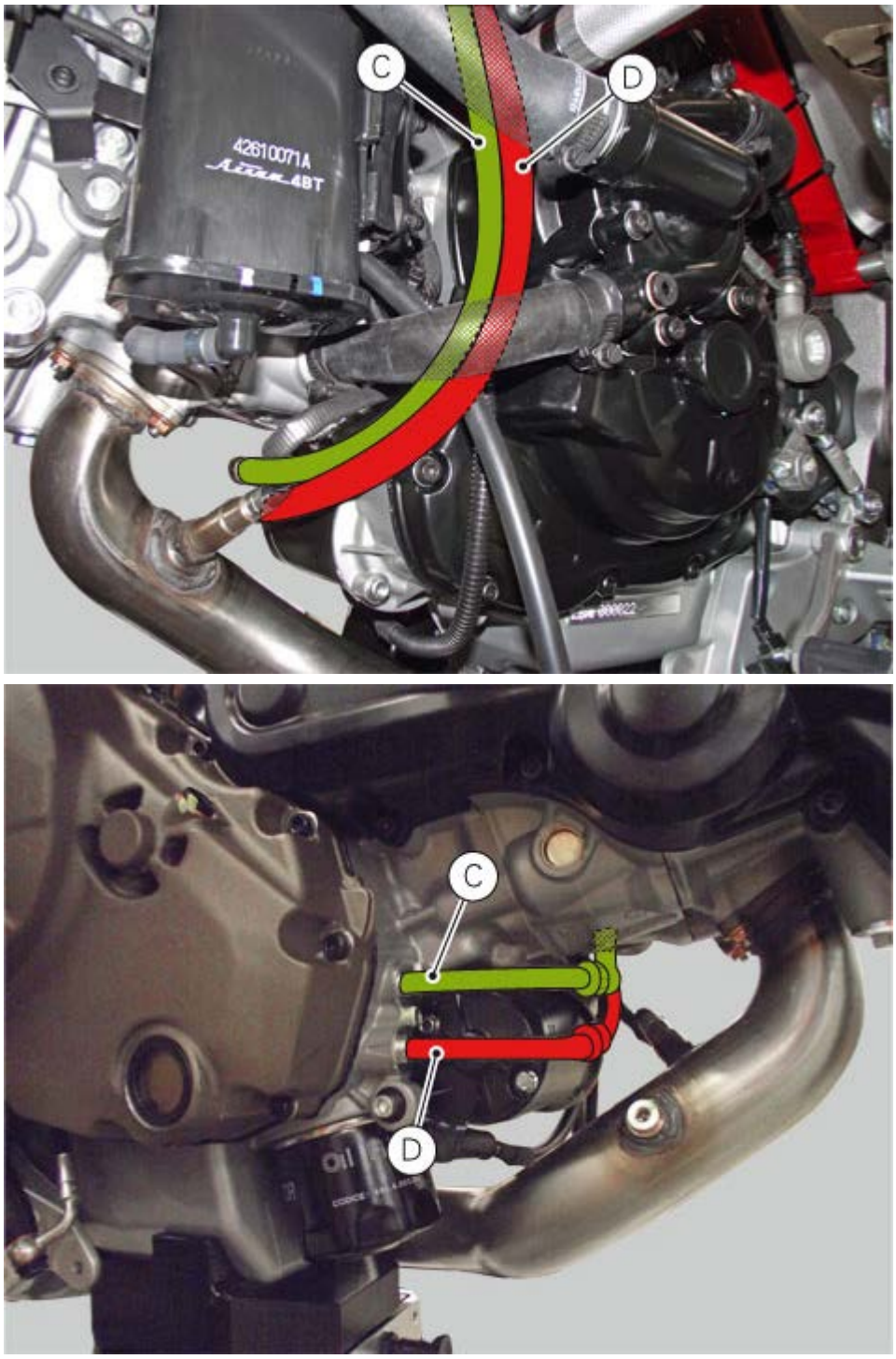


Position pipes (5) as shown in the figure.
C) delivery
D) return

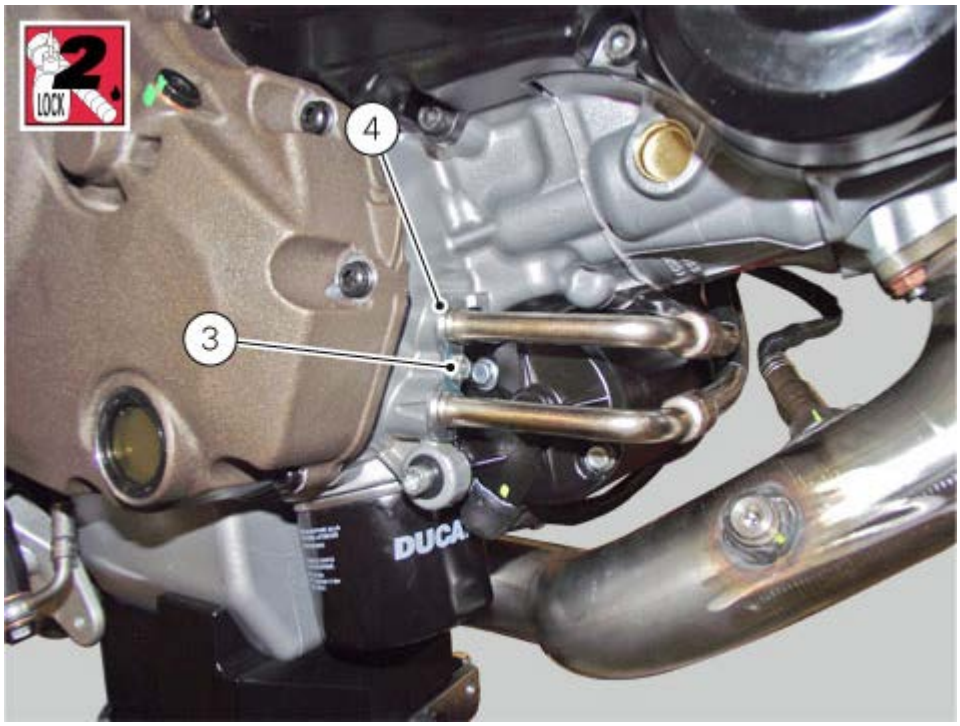



C
D

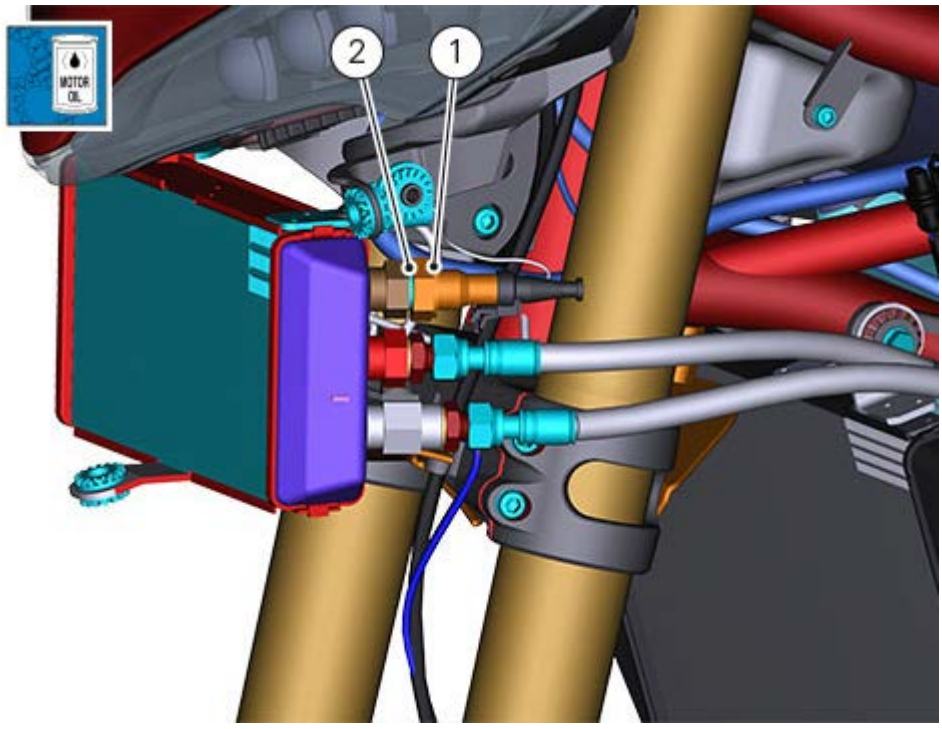

C
D



Insert the pipes in the crankcase half.
Position plate (4). Apply the specified threadlocker and tighten screw (3) to a torque of 10 Nm ± 10%.



If previously removed, position oil pressure switch (1) with washer (2) on the cooler and tighten sensor (1) to a torque of 19 Nm ± 10%.
Connect the oil pressure switch (1) to main wiring.



Fill the system (Changing the engine oil and filter cartridge).
Refit the front half-fairings (Refitting the front half-fairing).
Refit the belly pan unit (Refitting the belly pan).

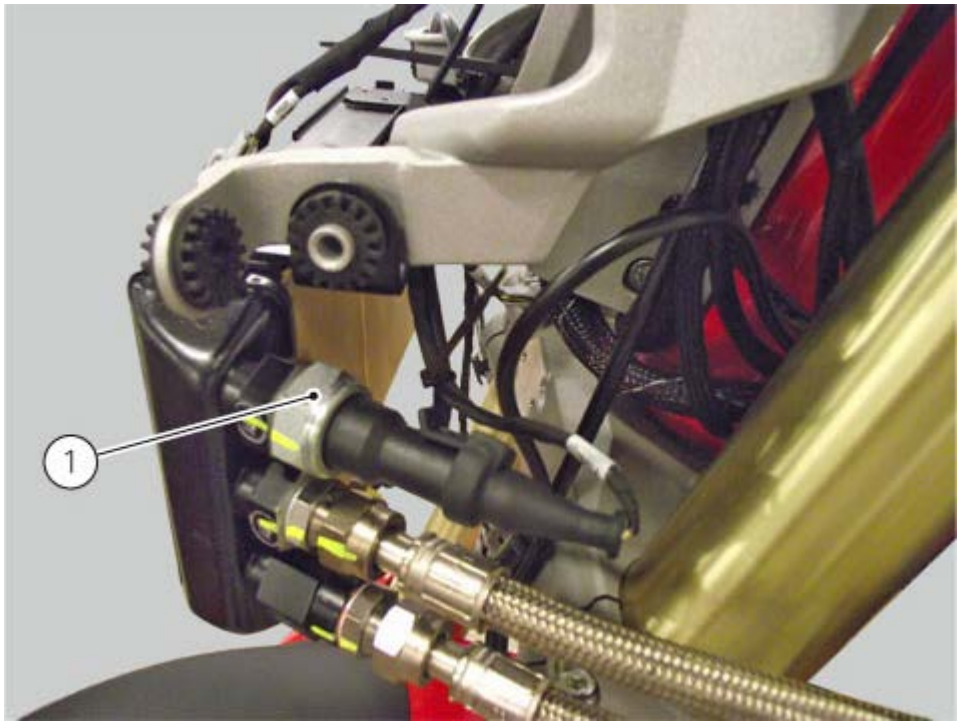
Inspecting the oil cooler

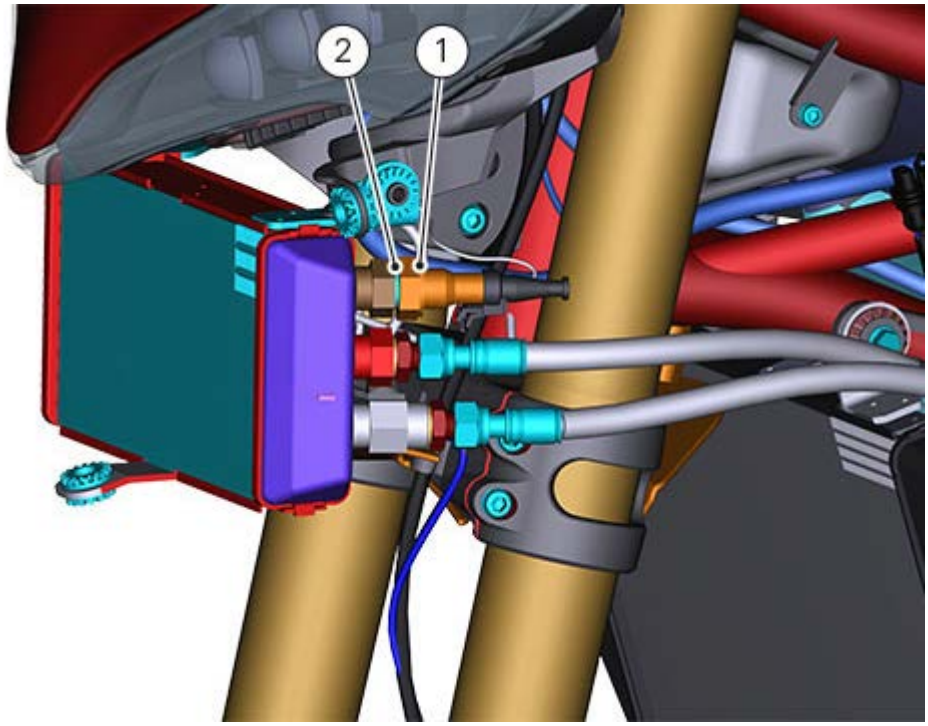
Visually inspect the cooler. Replace it at any sign of damage or leaks.

Removing the lubrication system

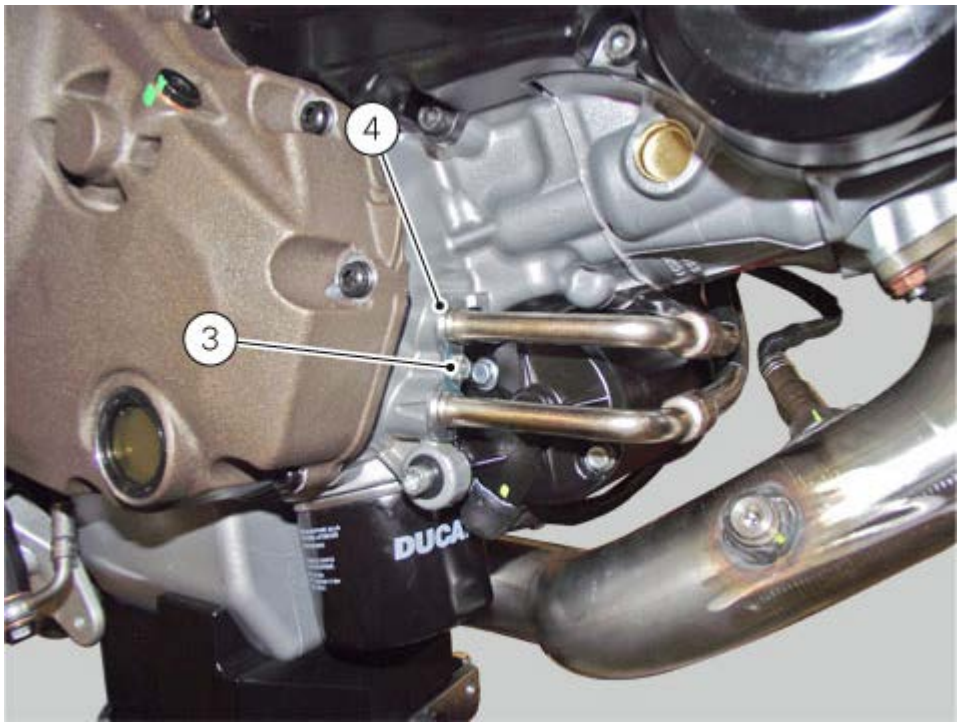
Remove the belly pan unit (Removing the belly pan).
Remove the front half-fairings (Removing the front half-fairing).
Drain the system (Changing the engine oil and filter cartridge).

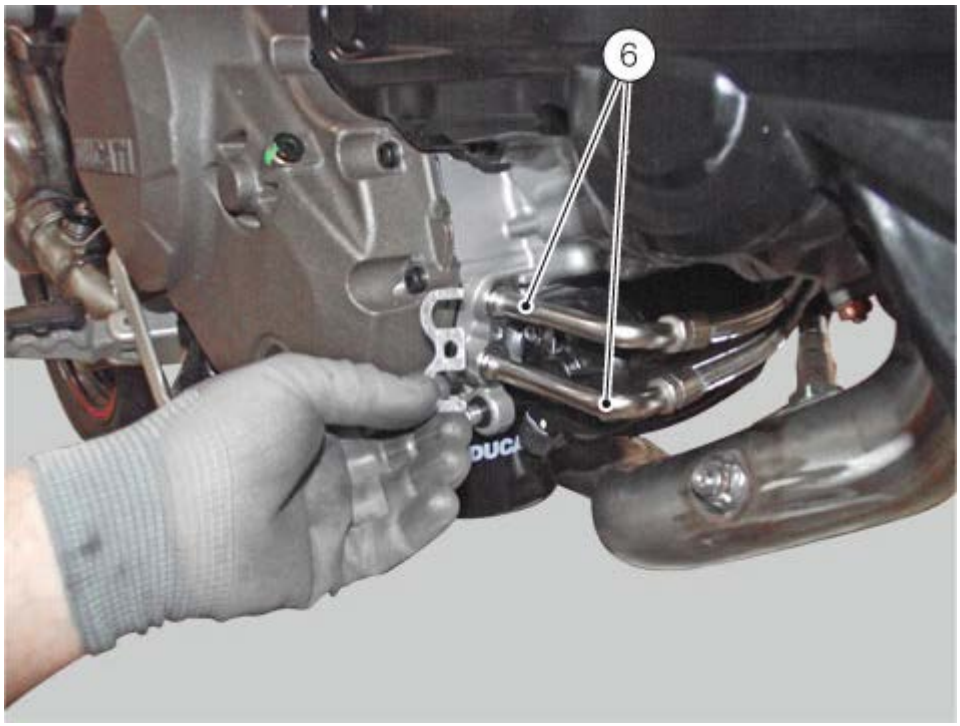
Disconnect the oil pressure switch (1) from the main wiring and remove washer (2).



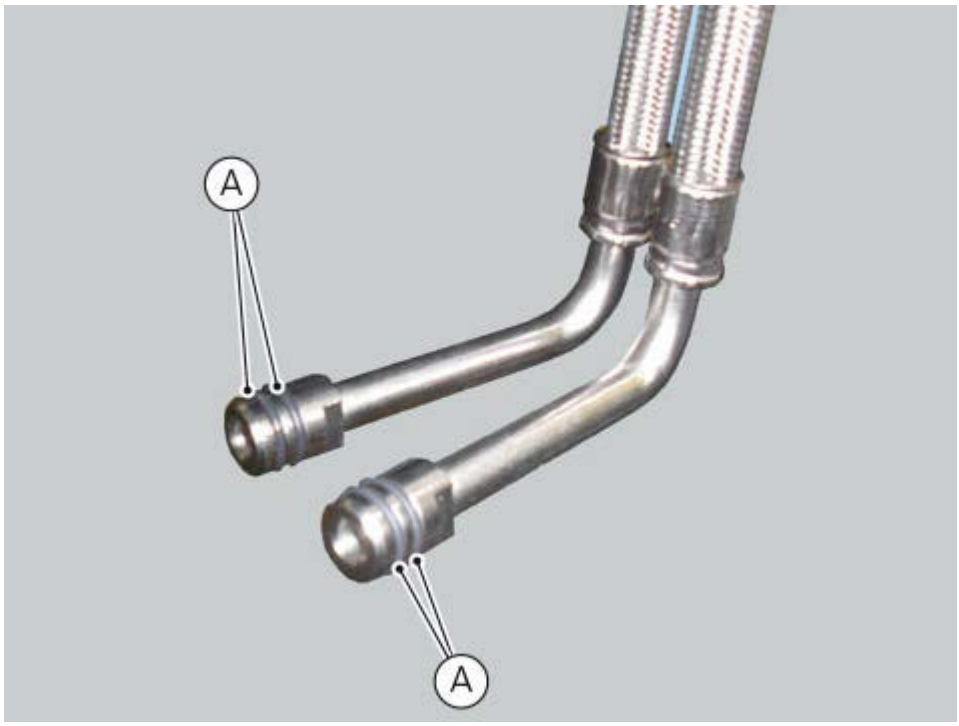


Undo screw (3) of plate (4) and slide the latter out.
Slide crankcase half pipes (5) out having care not to damage the O-rings.

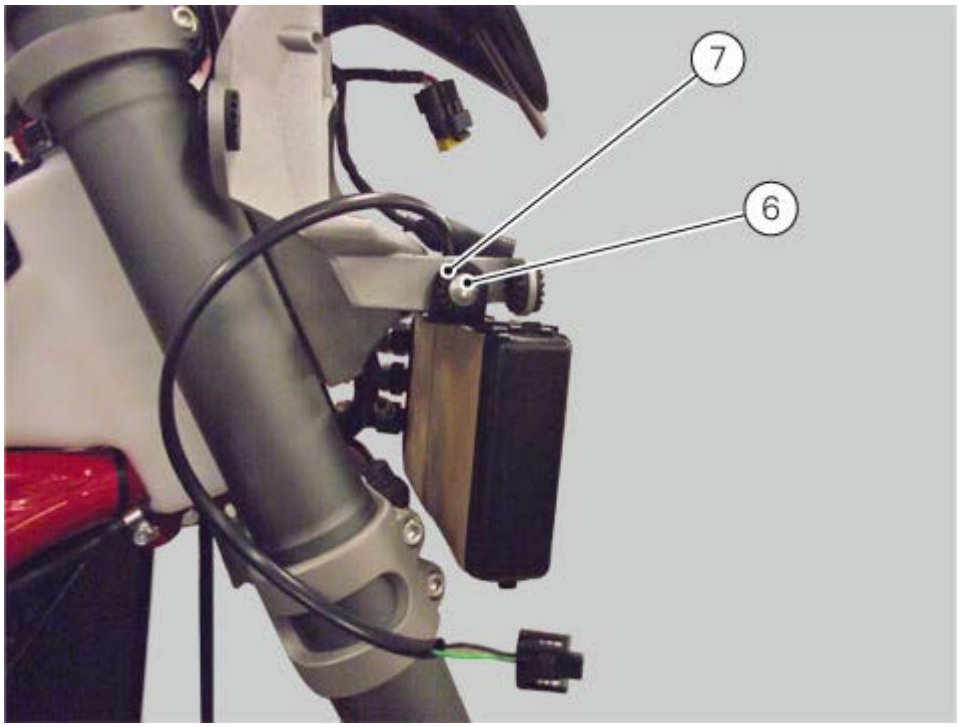




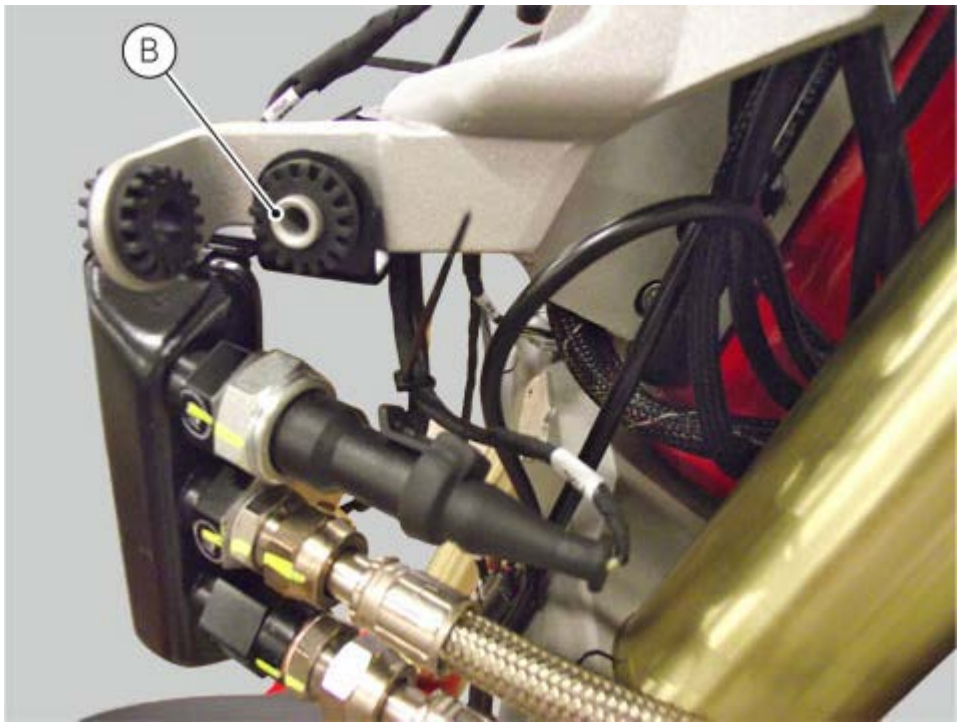
Upon disassembly, make sure not to lose the O-rings (A) that guarantee the coupling sealing.



Loosen and remove screw (6) with spacer (7) that retains the radiator to the headlight support.

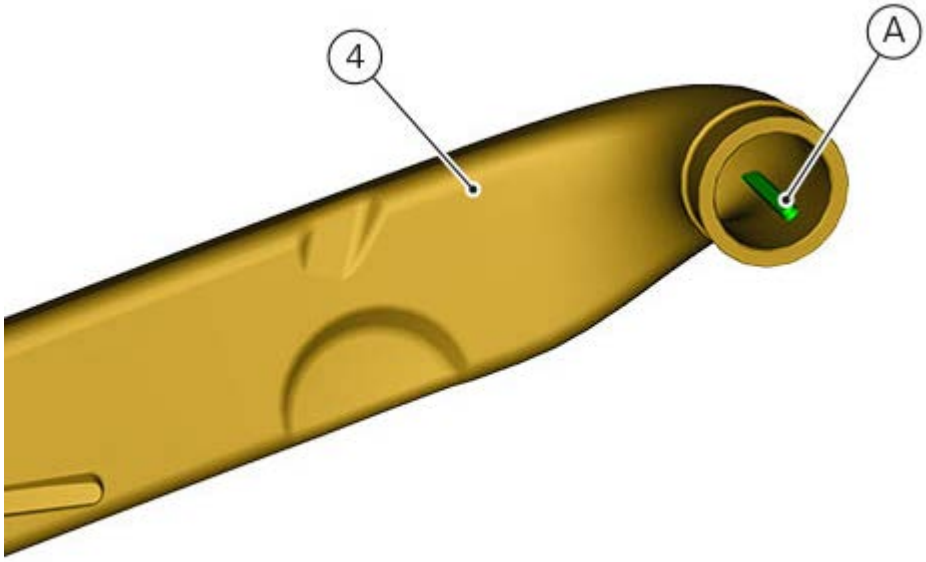


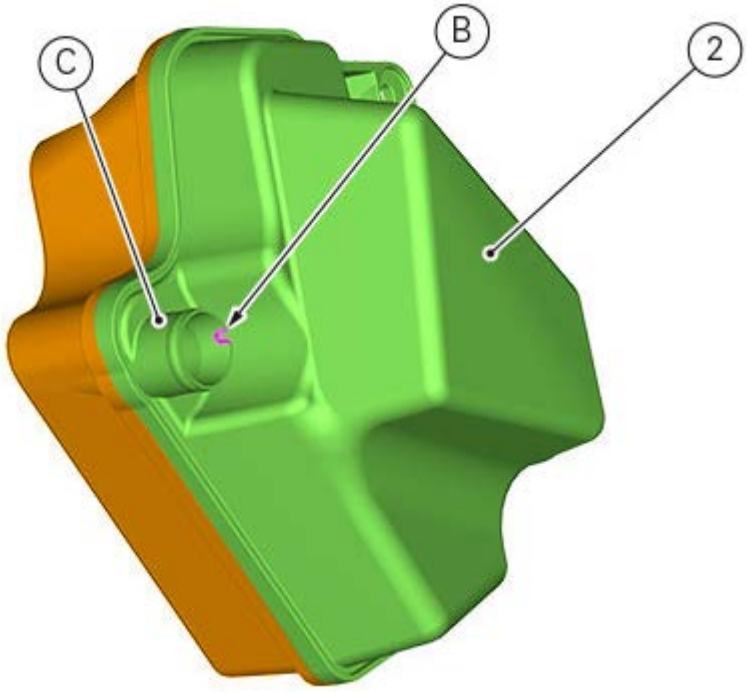
Remove the radiator from the headlight support by sliding it out of pin (B).


B

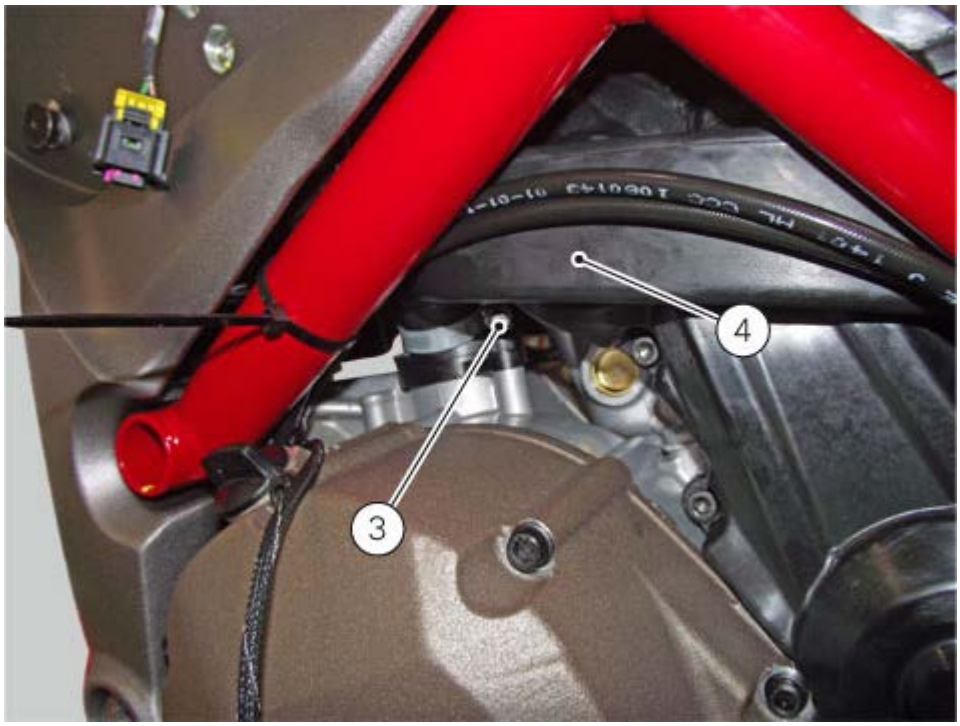
Refitting the oil breather reservoir

Insert pipe (4) in tank (2) by matching tooth (A) inside the pipe with recess (B) of union (C).



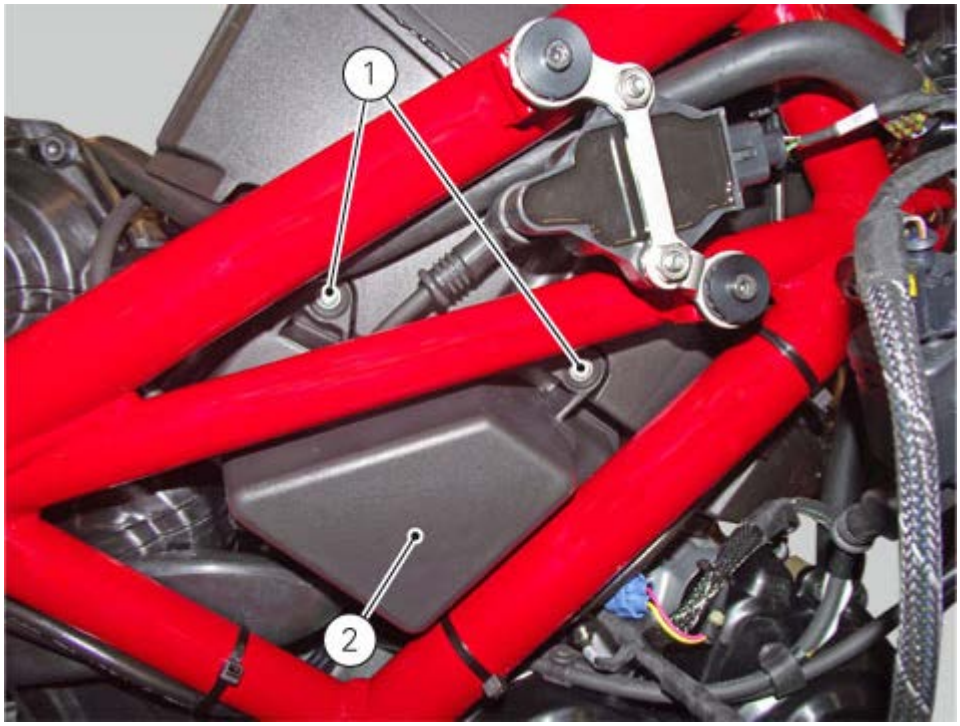


Position reservoir (2) with hose (4) in the frame.
Connect the hose (4) to the blow-by and tighten clamp (3) to a torque of 1.5 Nm ±10%.



Refit the airbox (Refitting the airbox).

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



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

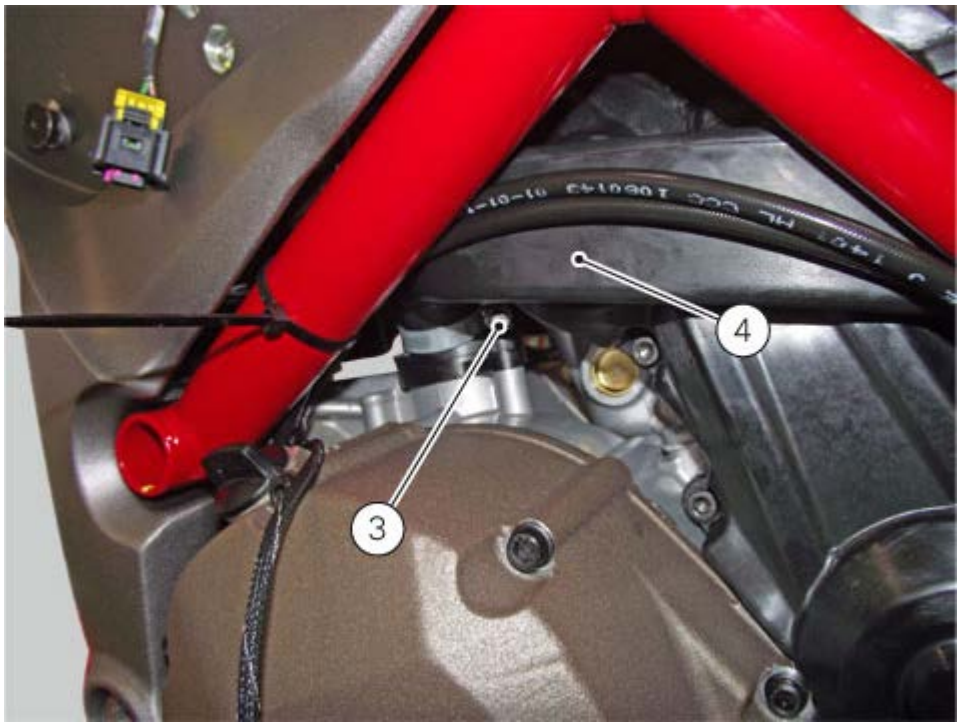
Removing the oil breather reservoir

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

Loosen screws (1) of the blow-by tank (2).

Remove the airbox (Removing the airbox).

Loosen clamp (3) to slide hose (4) out of the blow-by.



Slide the blow-by tank (2) out of the frame.

To disassemble reservoir (2) from hose (4), loosen clamp (5).
Separate the two parts.

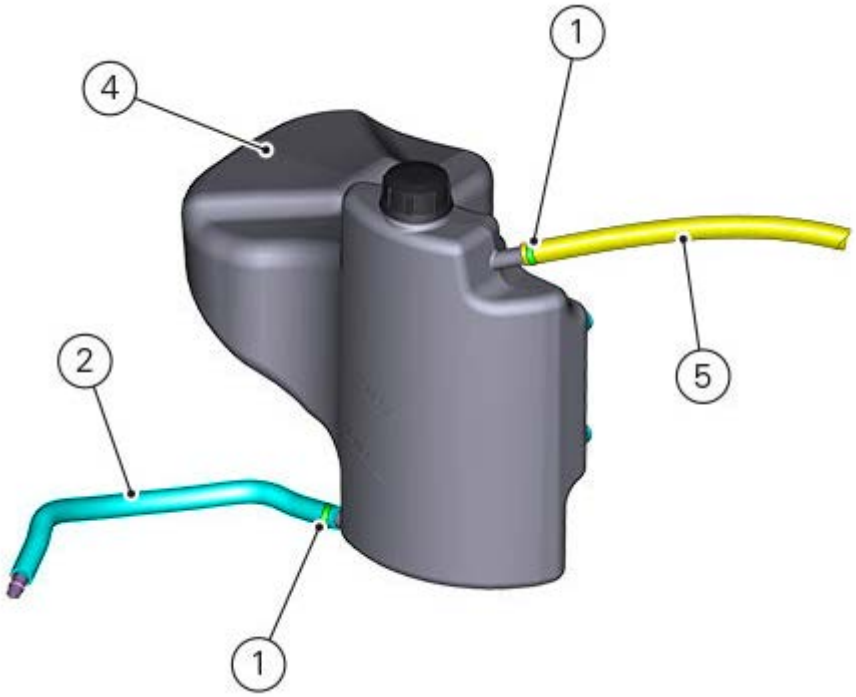

4
2
5

Refitting the water tank

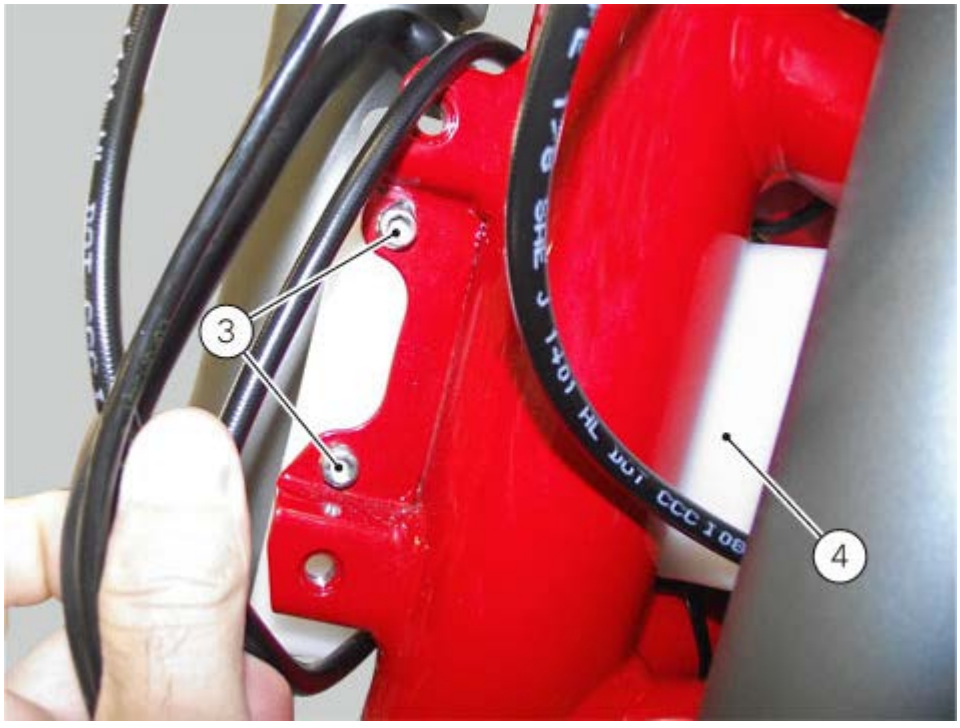
Insert pipe (5) with clamp (1) and pipe (2) with clamp (1) in tank (4).

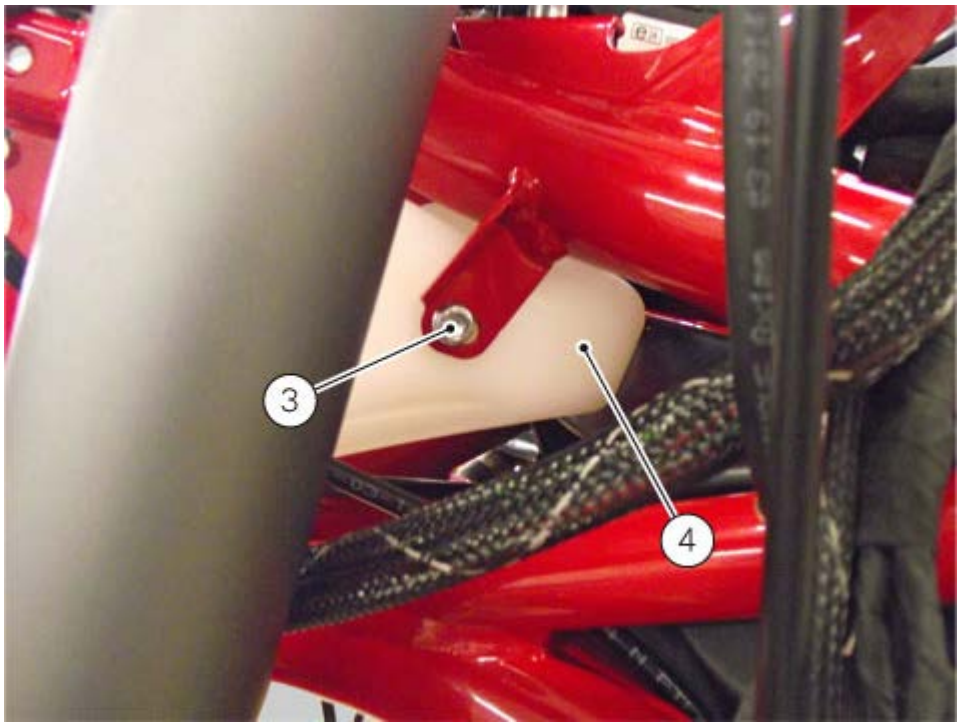
Note
If it proves hard to fit the tubes in the relevant unions, it is recommended to use RUBBER LUBRICANT, and apply some on the unions.

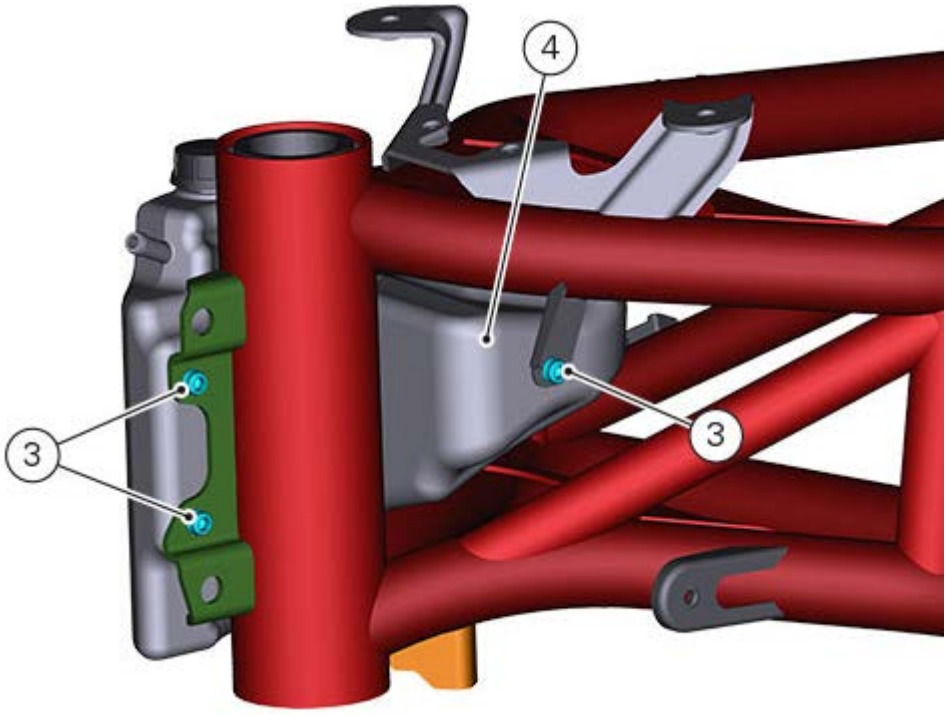
Tighten clips (5) to a torque of 1 Nm ± 10%.



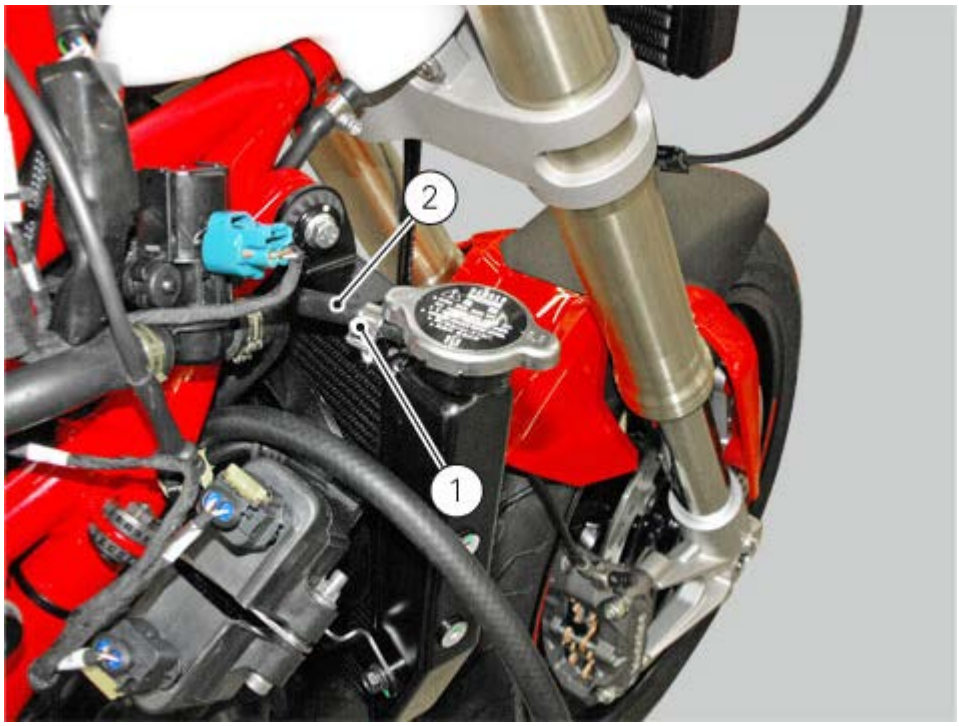
Position tank (4) and hoses (2) and (5).
Start screws (3) and tighten them to a torque of 8 Nm ± 10%.

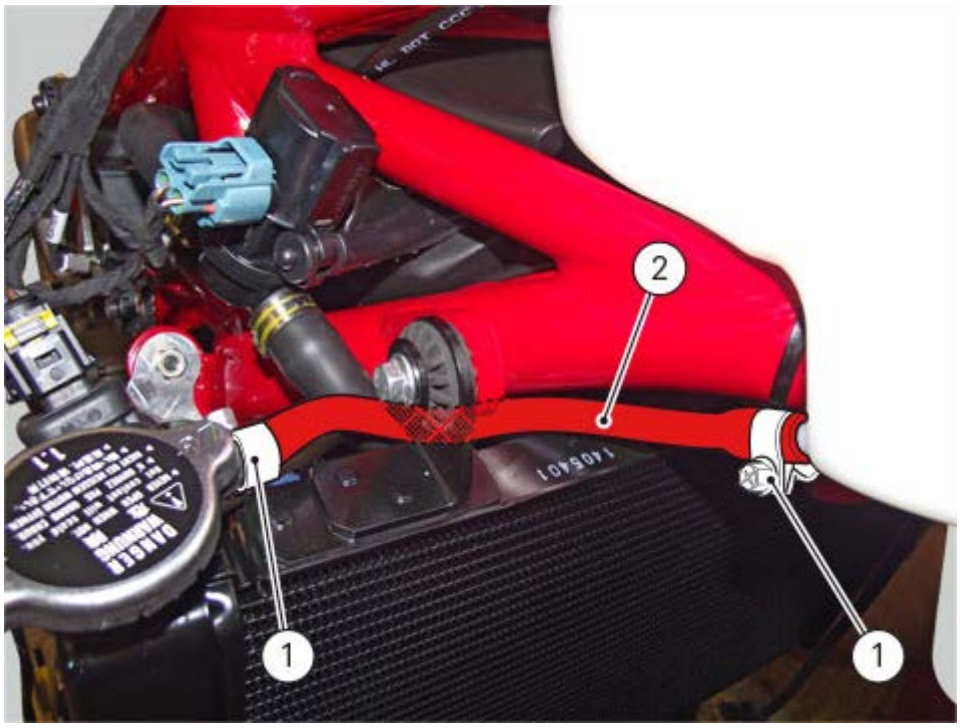






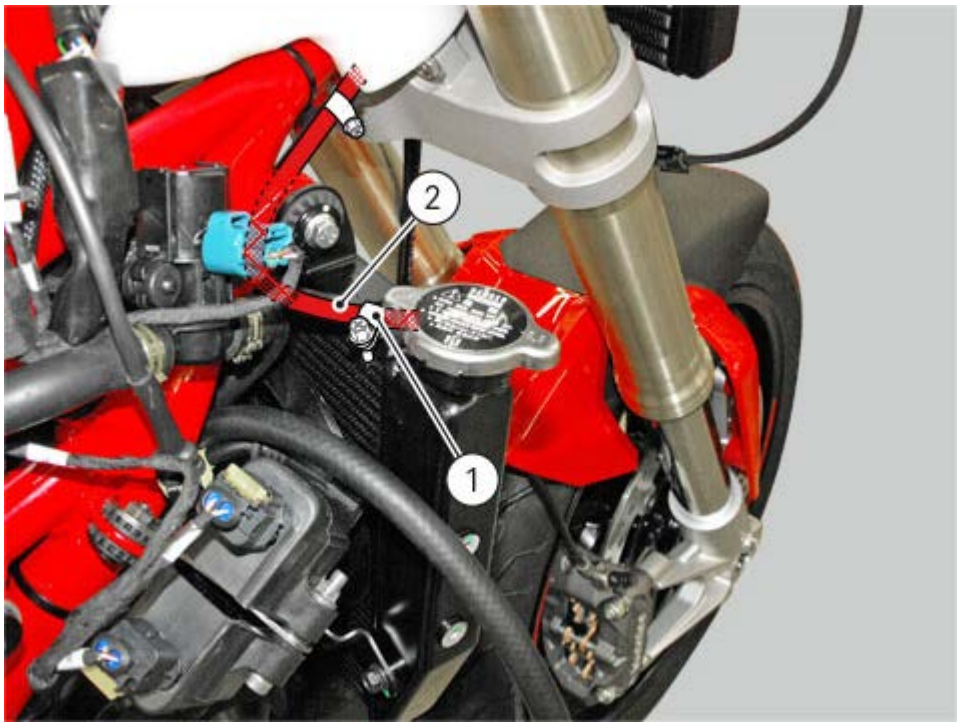
Position hose (2) on the radiator with clip (1) and tighten clip (1) to a torque of 1 Nm ± 10%.

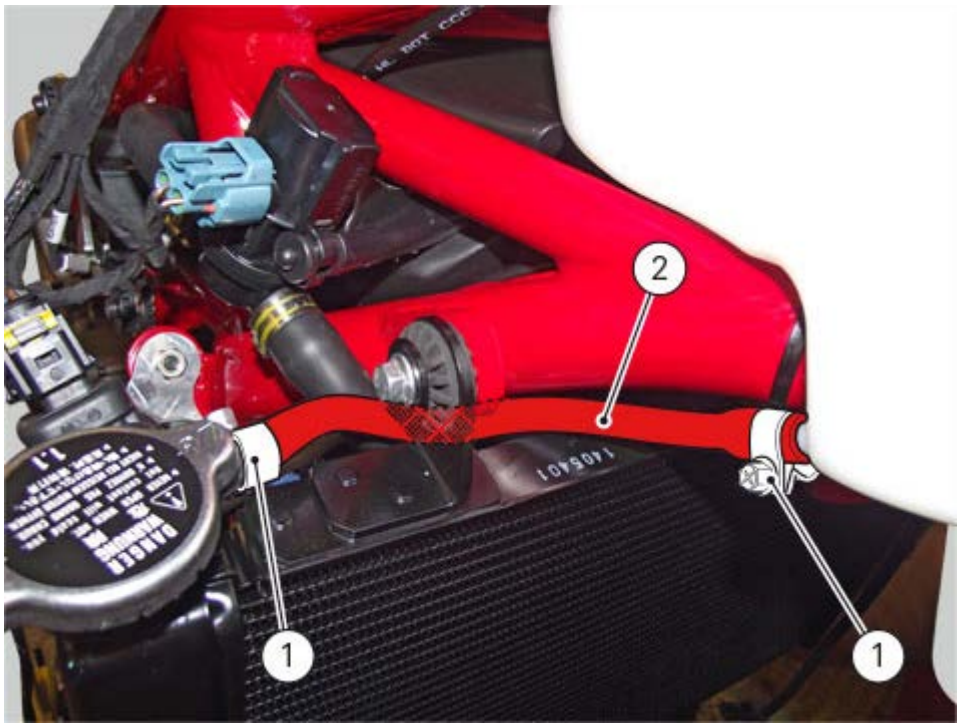




Refit the front half-fairings (Refitting the front half-fairing).
Refit the half-fairings (Refitting the tank fairings).
Fill the cooling system (Changing the coolant).

Positioning the water tank pipe - water radiator

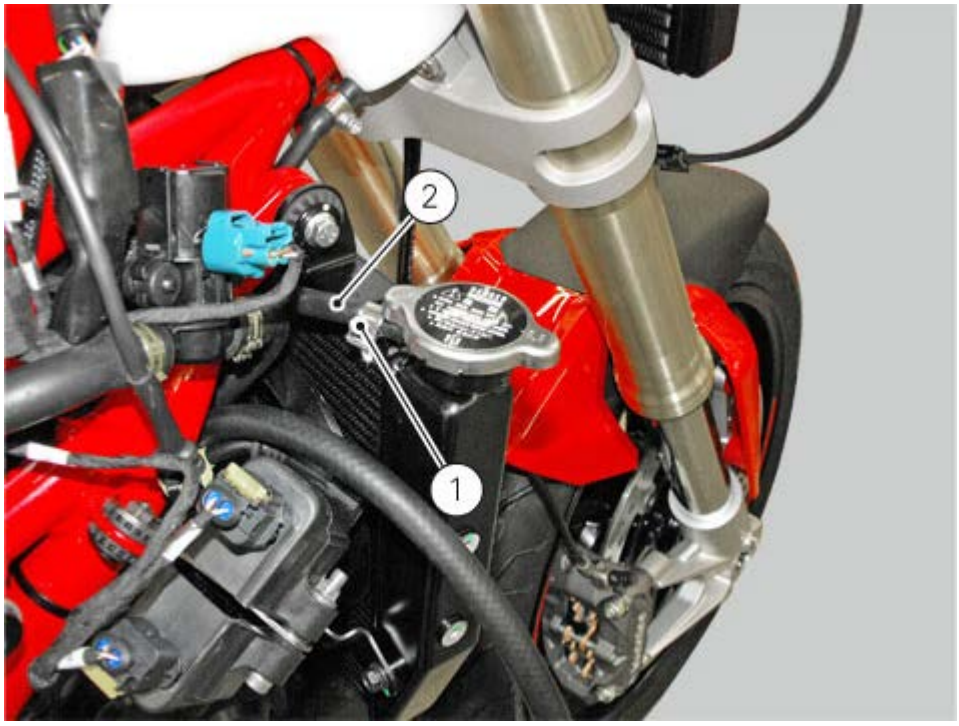

2
1


2
1
1

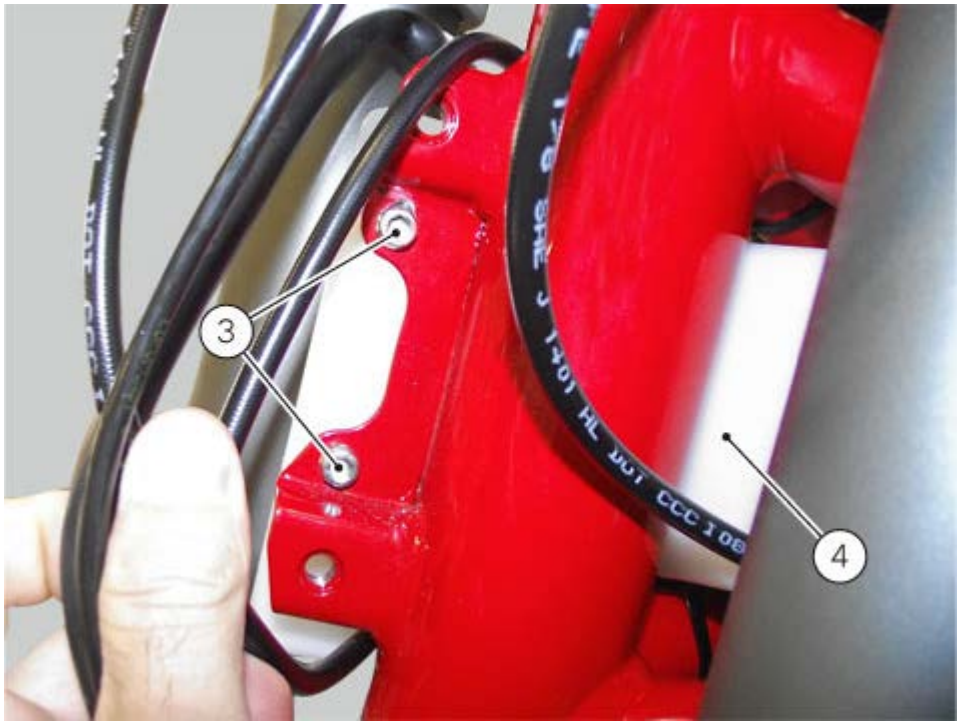
Removing the water tank

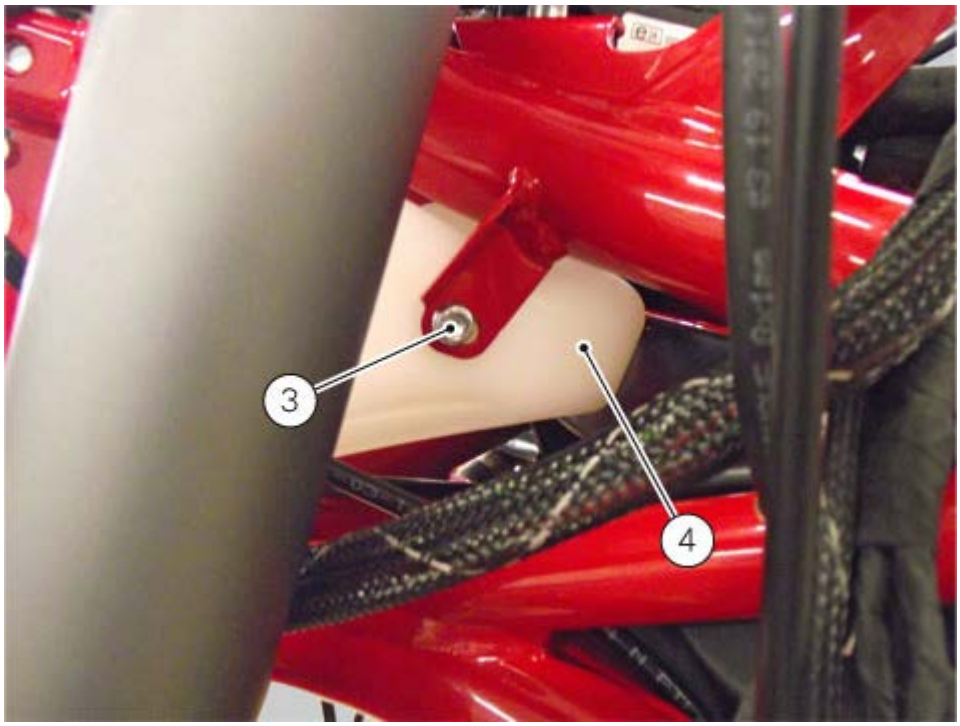
Drain the coolant (Changing the coolant).
Remove the front half-fairings (Removing the front half-fairing).
Remove the half-fairings (Removing the tank fairings).

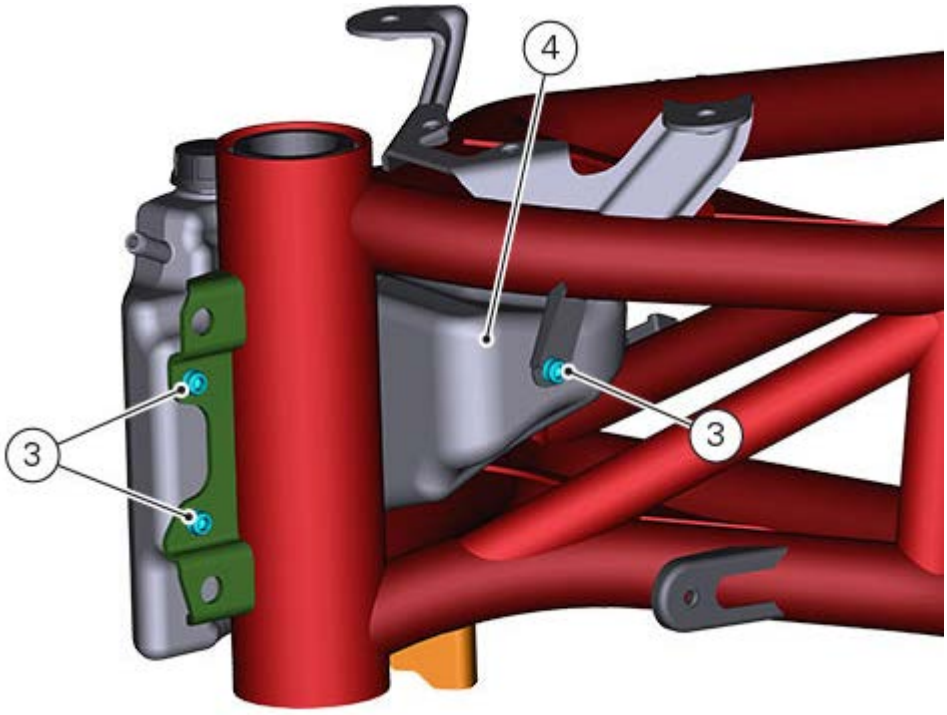
Loosen clamp (1) and slide hose (2) out of the radiator.



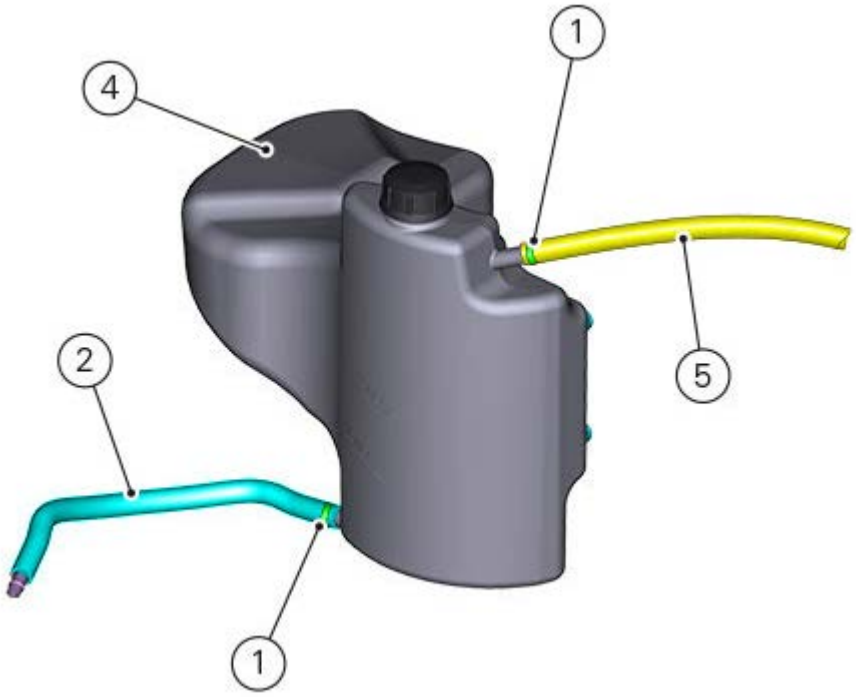
Loosen the screws (3).
Remove tank (4) and hoses (2) and (5).





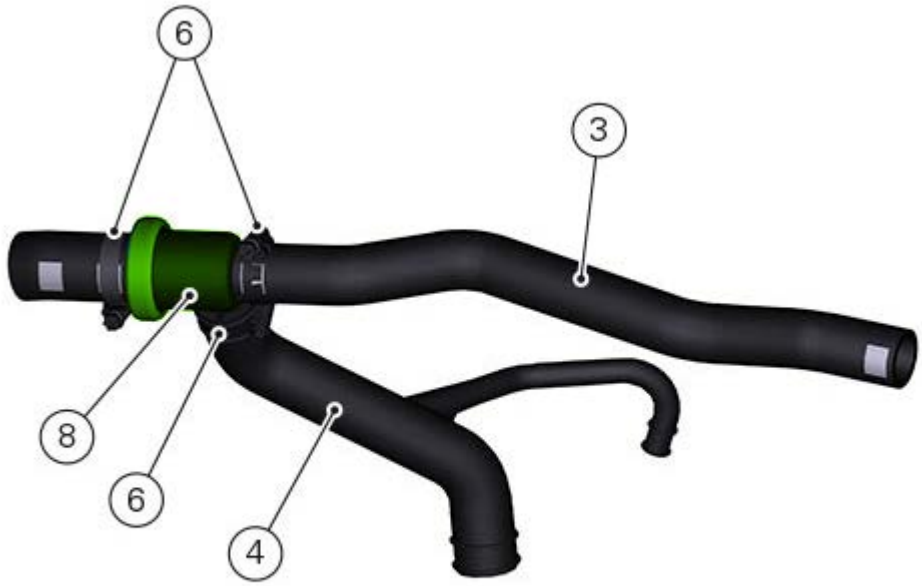


Loosen the clamps (1) to remove the hoses (2) and (5) from the tank (4).

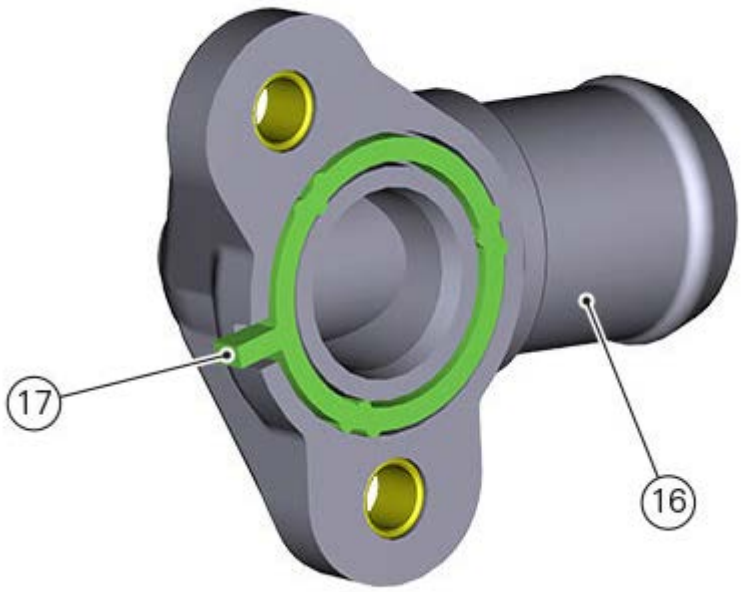

1
4
2
5
1

Refitting the cooling system hoses and unions

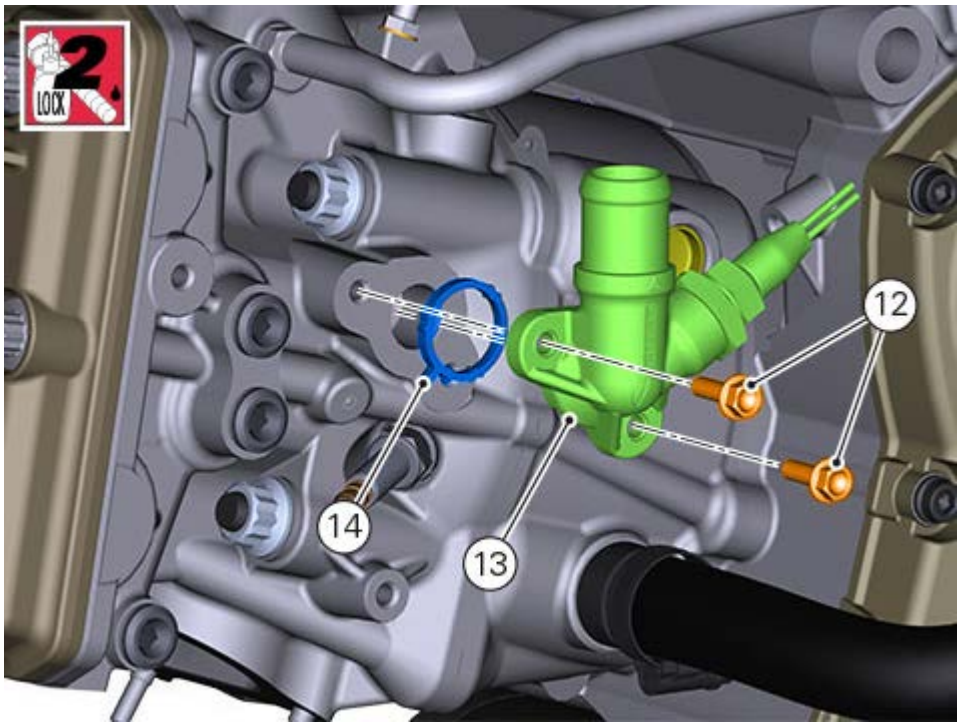
If previously removed, refit valve (8) as shown in the figure, by tightening the clamps to a torque of 2.5 Nm ± 10%

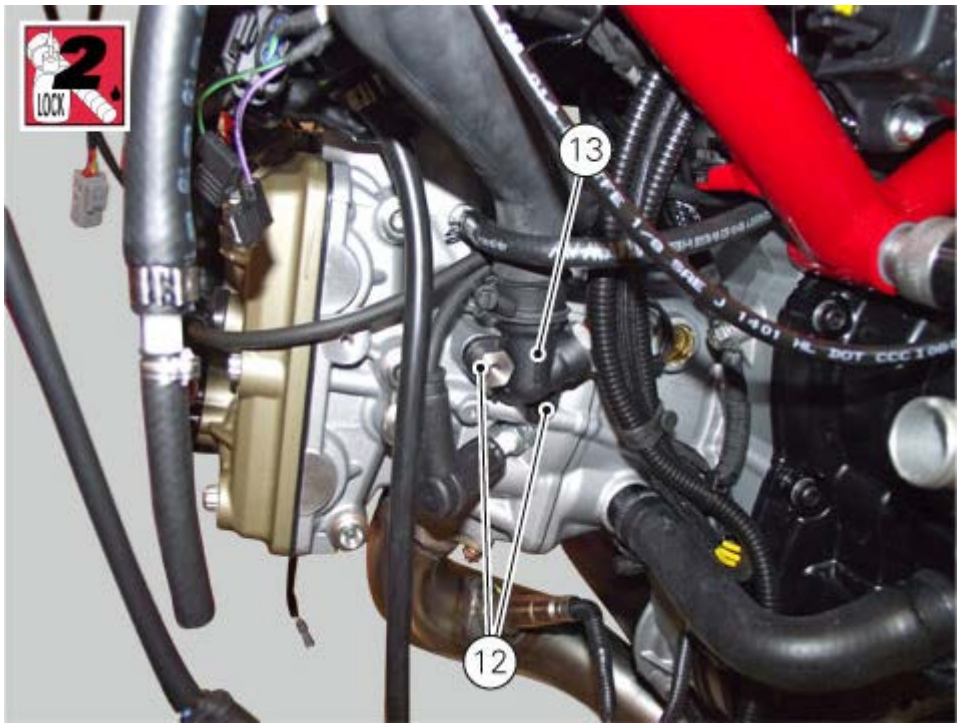


Install an O-ring (17) in the seat of the vertical head union (16) and one in horizontal head union seat (13).

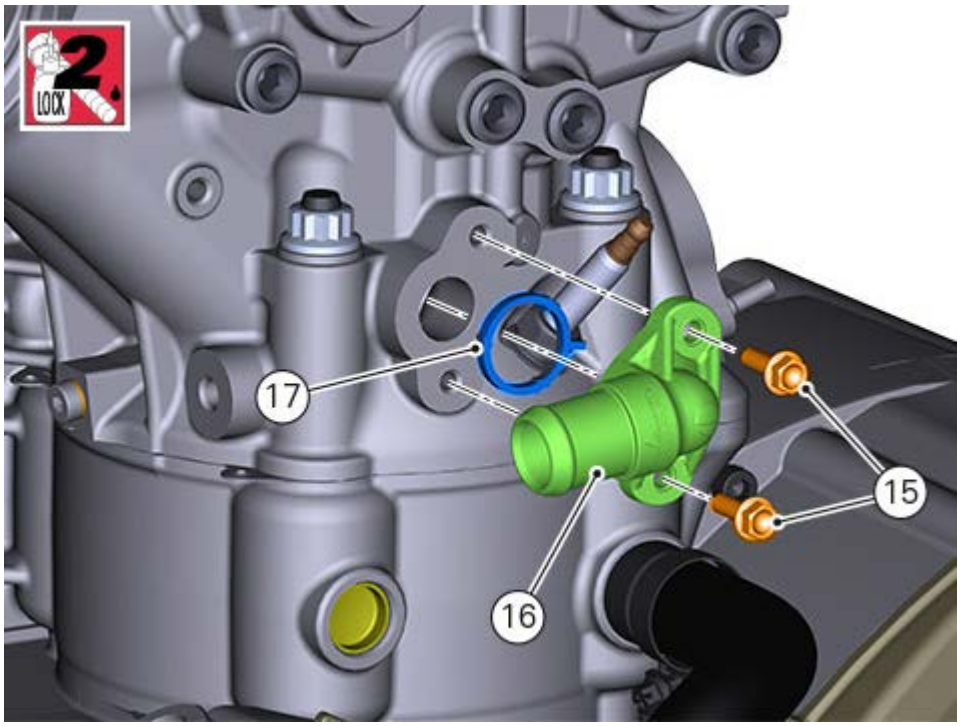


Fix union (13) on the horizontal head with screws (12) with specified threadlocker and tighten them to a torque of 6 Nm (Min. 5 Nm - Max. 7 Nm).

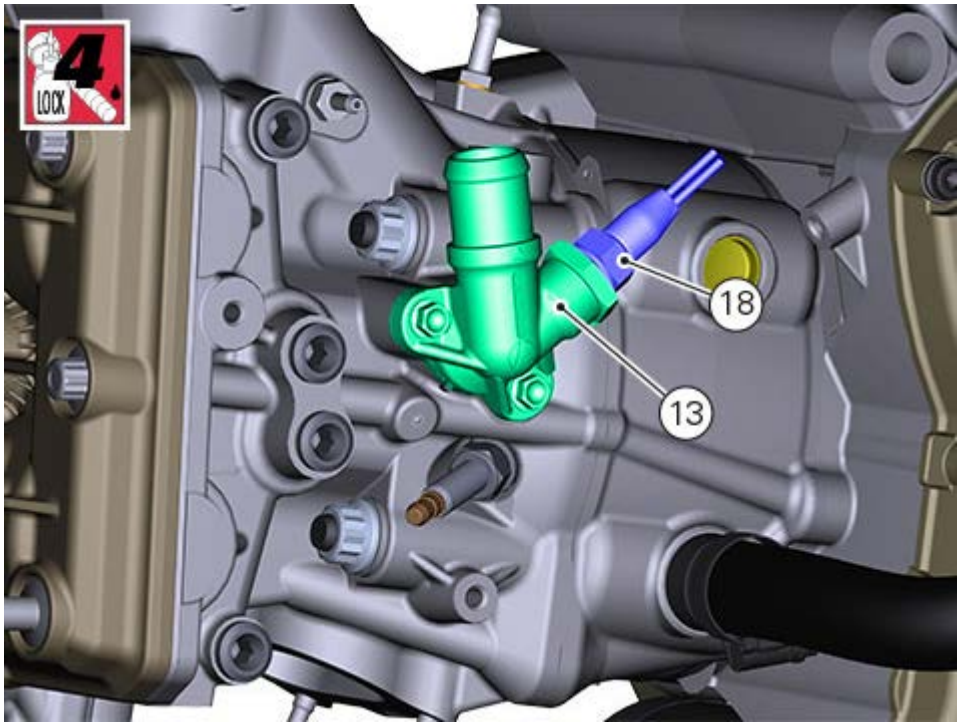




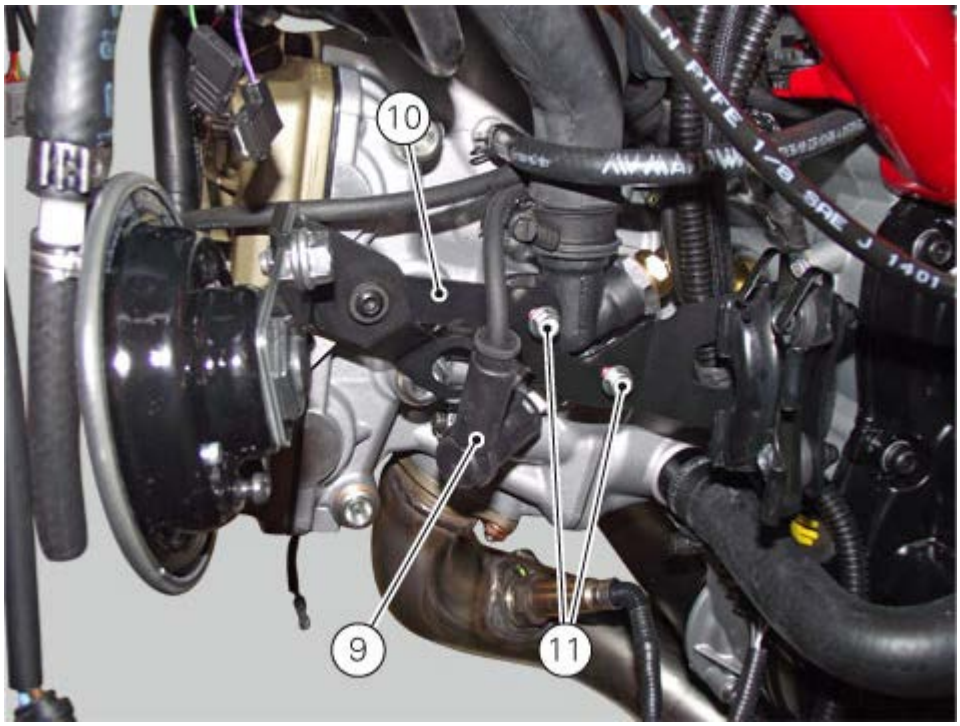
Fix union (16) on the vertical head with screws (15) with specified threadlocker and tighten them to a torque of 6 Nm (Min. 5 Nm - Max. 7 Nm).



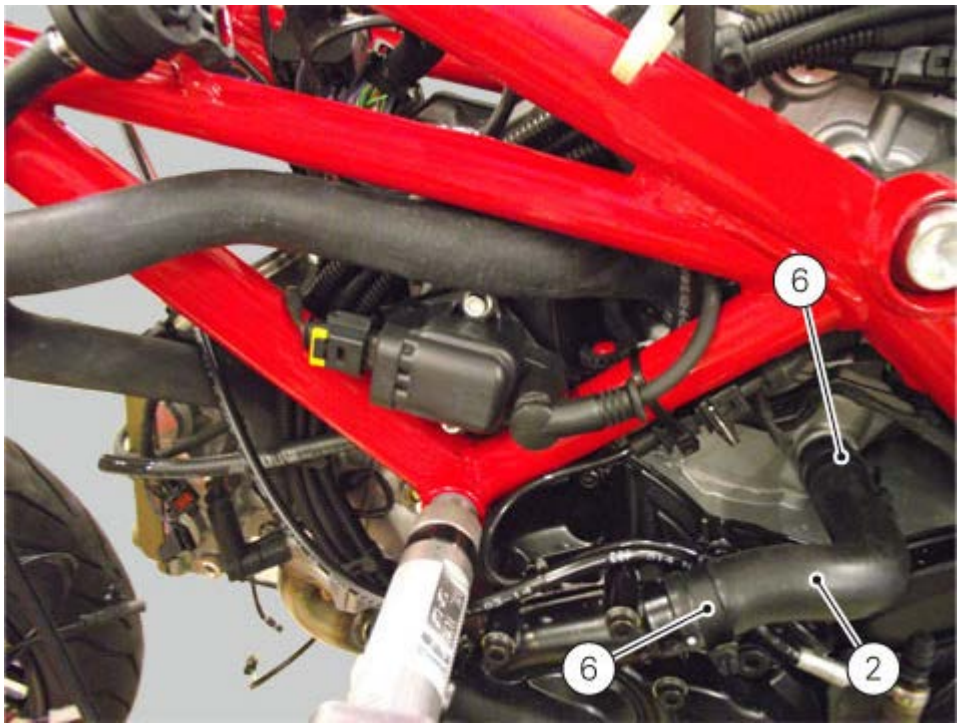
If previously removed, fit water temperature sensor (18) on union (13) and tighten it to a torque of 23 Nm (Min. 20 - Max. 26).



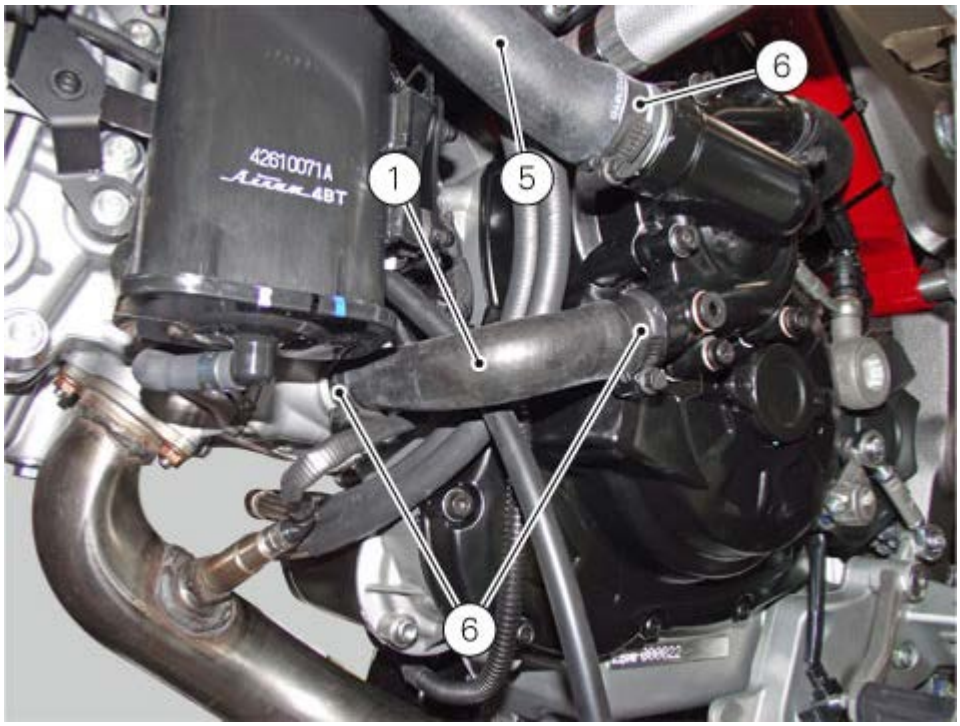
Working on the horizontal head, fit the canister/horn support bracket (10) and fix it with screws (11).
Fit the spark plug cap (9).



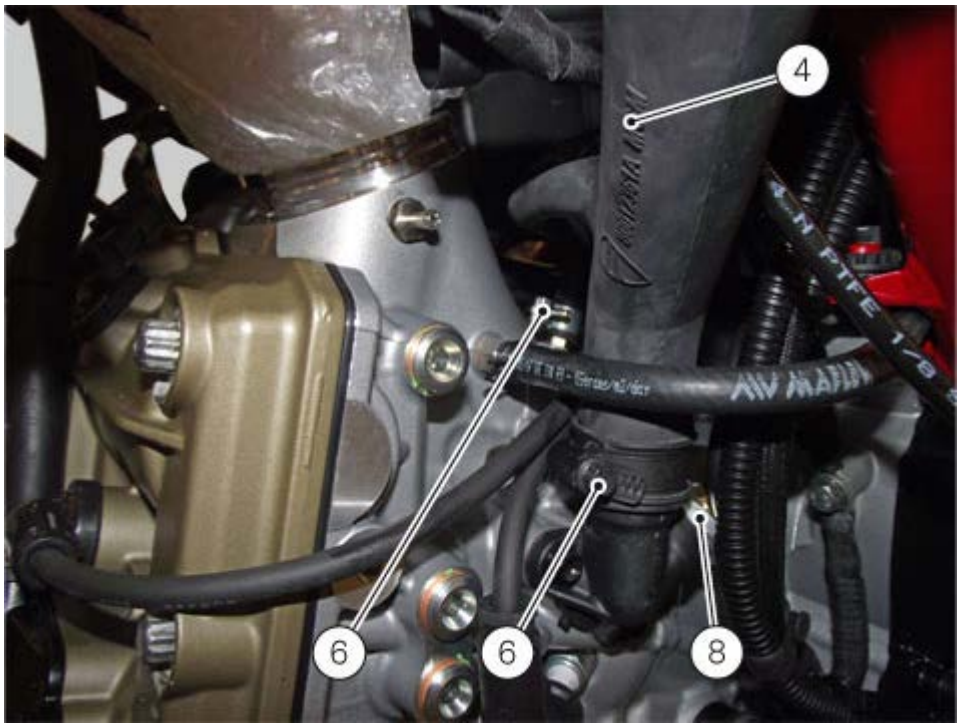
Position the pump pipe (2) to the vertical cylinder and tighten the two clips (6) to a torque of 3 Nm ± 10%.



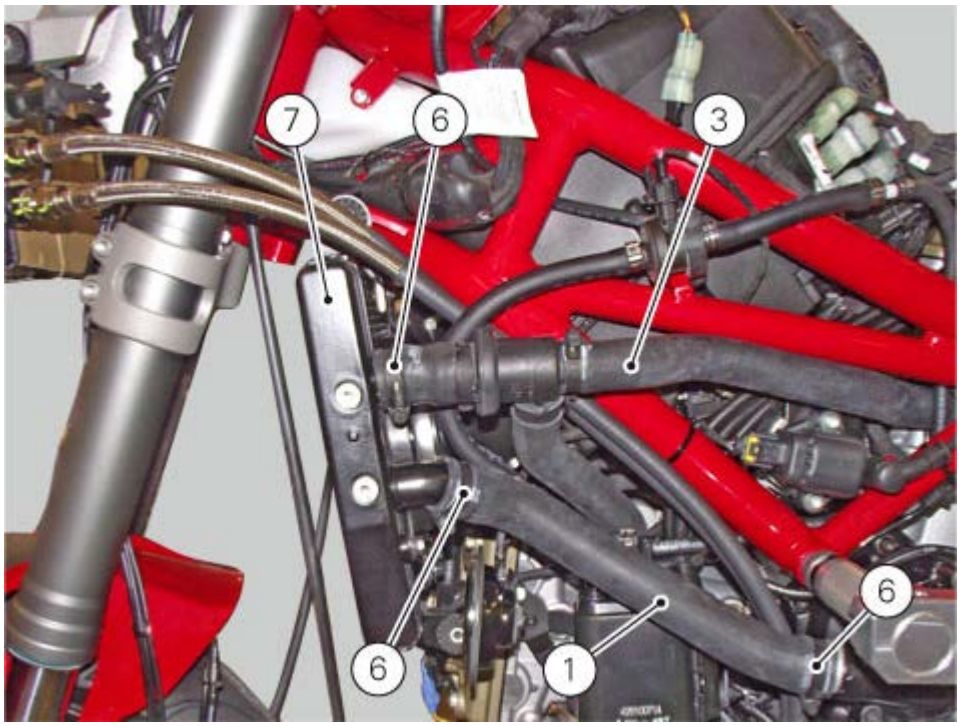
Position the pump pipe (1) to the horizontal cylinder and tighten the two clips (6) to a torque of 3 Nm ± 10%.
Repeat the operation with the pump (5) from the water radiator to the pump.



Working on the horizontal head, insert pipe (4) from the horizontal head to the radiator and tighten clip (6) to a torque of 3 Nm ± 10%.
Tighten clip (6) with horizontal head bleed screw to a torque of 1 Nm ± 10%.



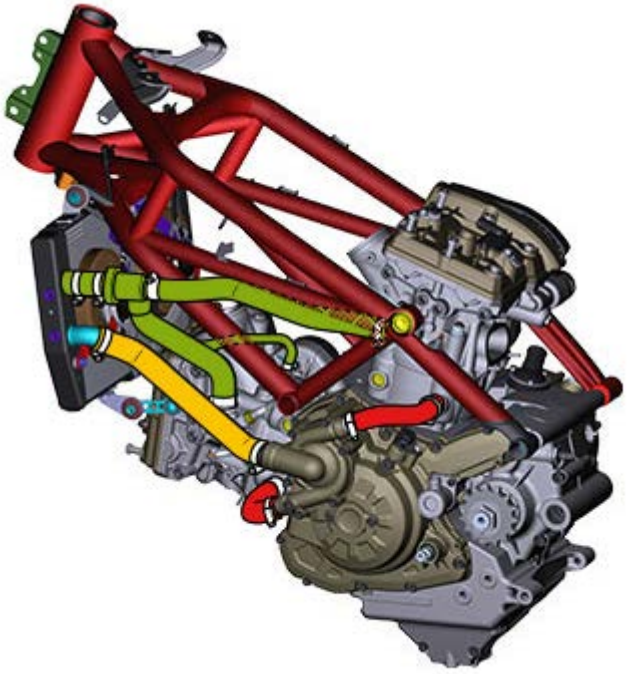
Position vertical head to water radiator pipe (3) and pump to water radiator pipe (1) by tightening clips (6) to a torque of 3 Nm ± 10%.

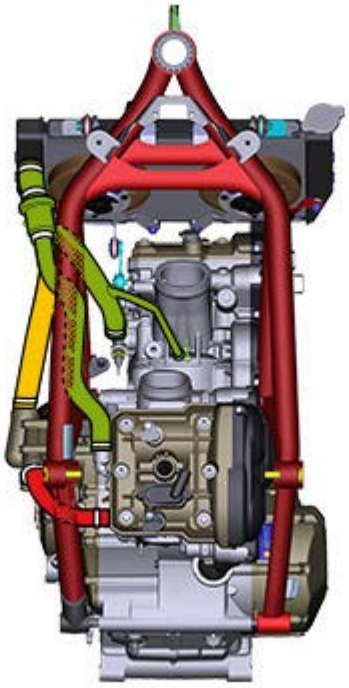


Fill the cooling system (Changing the coolant).
Refit the half-fairings (Refitting the tank fairings).
Refit the front half-fairings (Refitting the front half-fairing).

Positioning hoses and clamps

Position the vertical and horizontal head clamps as shown in the figure.

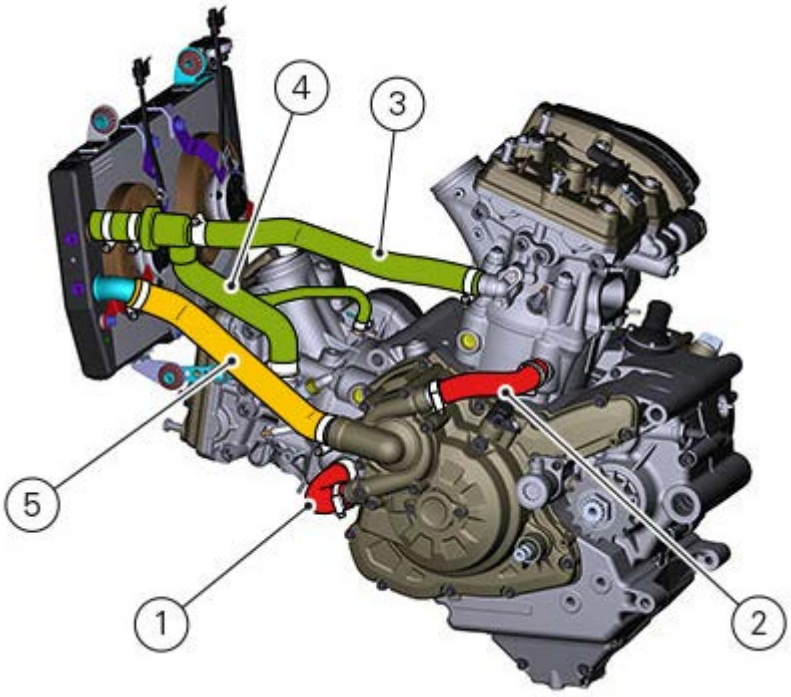




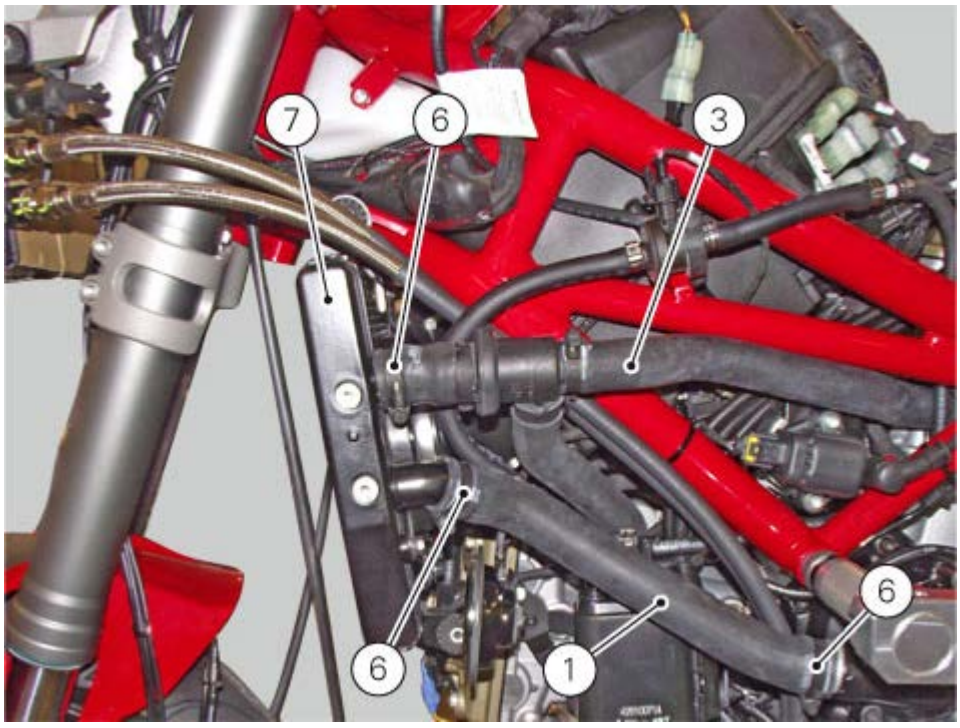
Removing the cooling system hoses and unions

The cooling system consists of the following pipes:

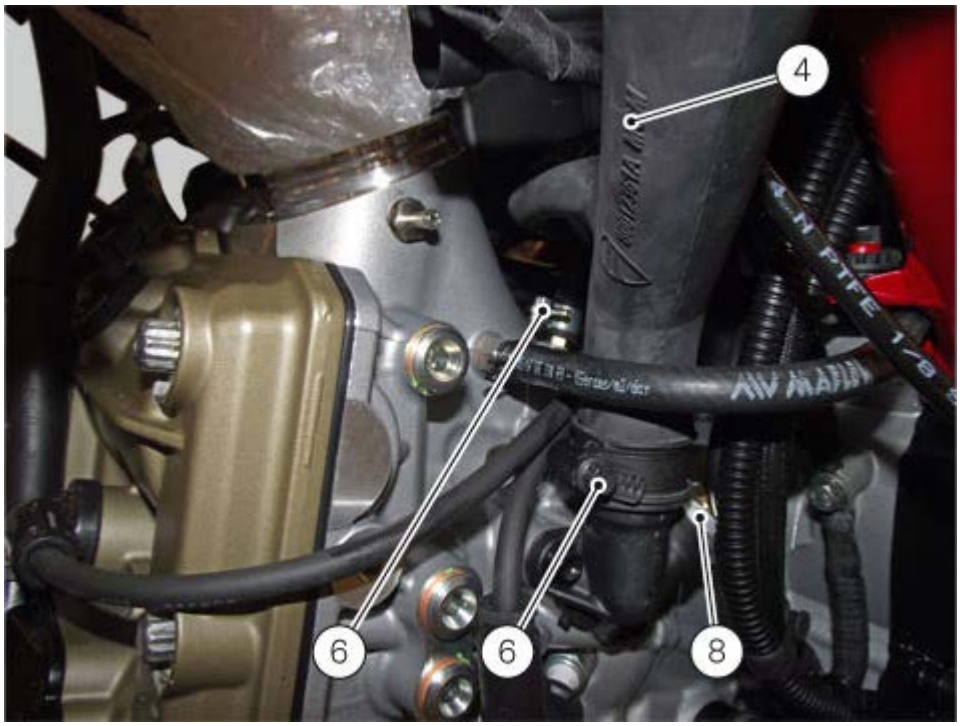
1 water pump to horizontal cylinder pipe;
2 water pump to vertical cylinder pipe;
3 vertical head to radiator pipe;
4 horizontal head to radiator pipe;
5 water radiator to water pump pipe.



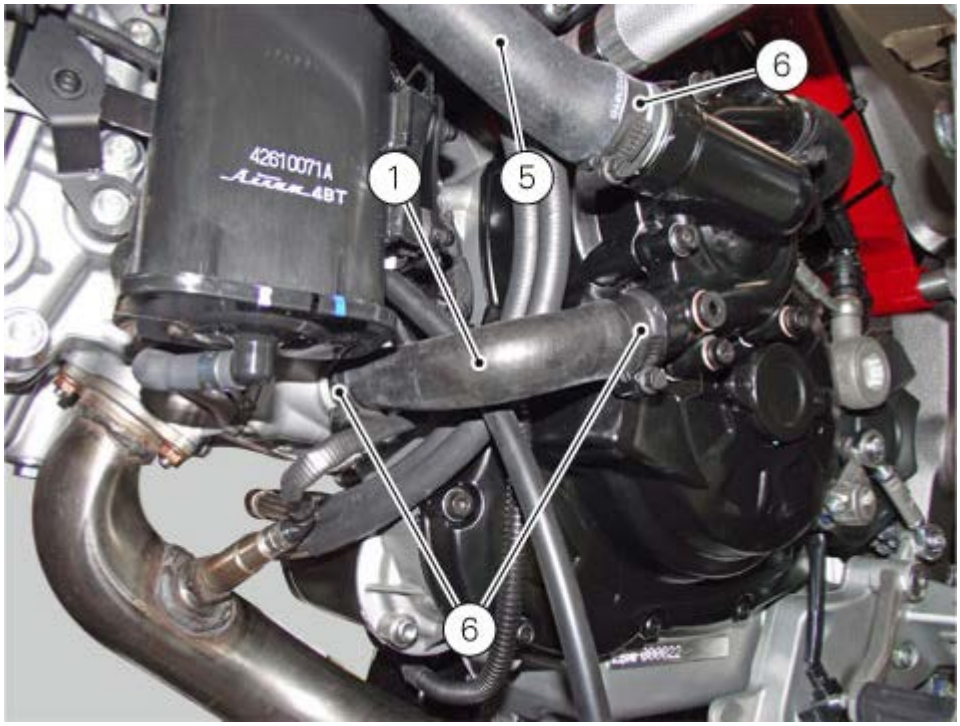
Loosen clamps (6) retaining the water radiator (7) hose (1) to the pump and the fixing clamps of the radiator/thermostat hose (4) to the thermostat.



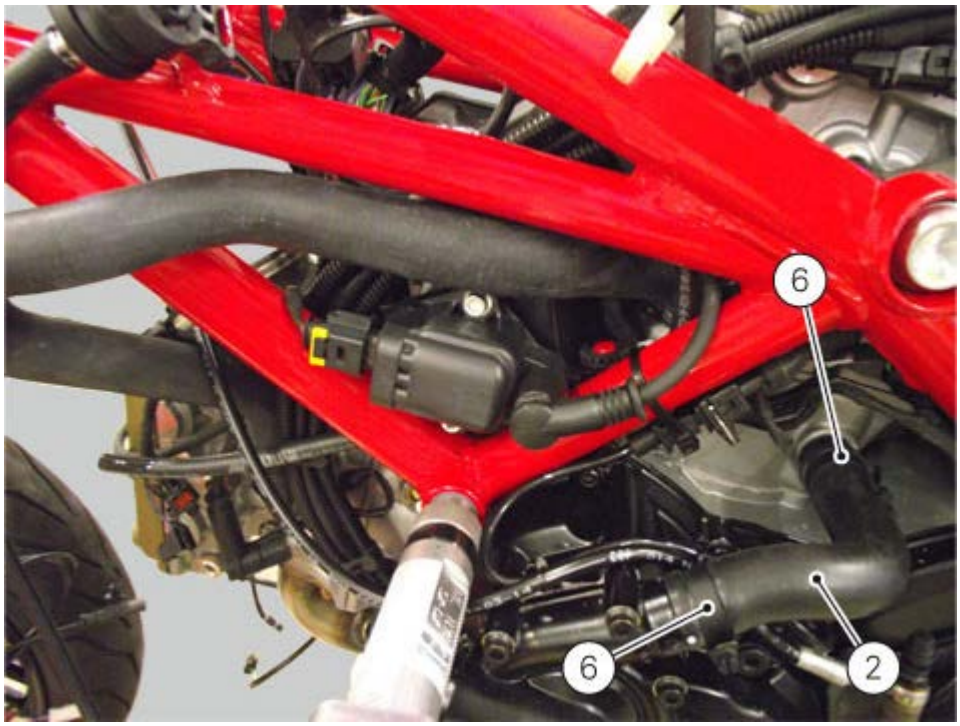
Loosen clamps (6) retaining pipe (4) and the thermostat unit (8).



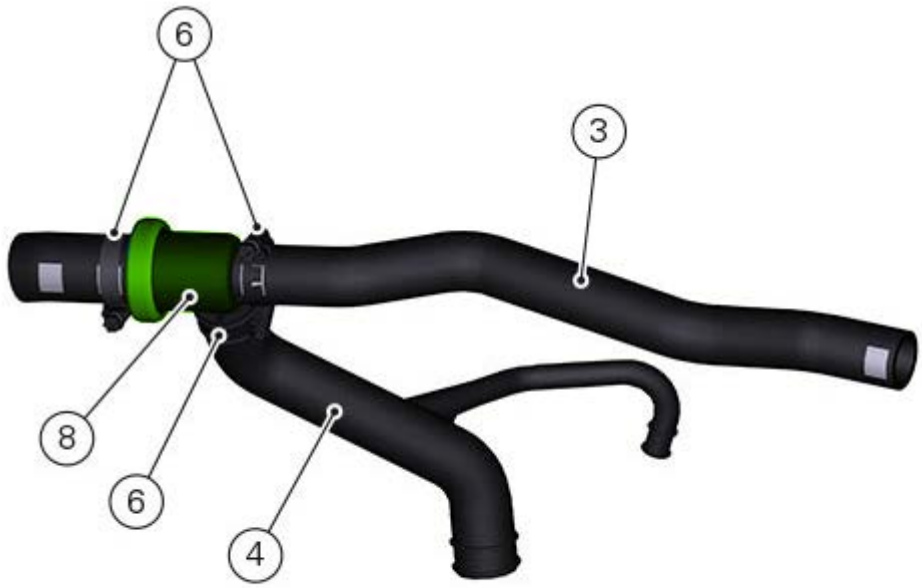
Loosen the clamps (6) that retain the pipe (5) that goes from the radiator to the pump and clamps (6) and pipe (1) that goes from the pump to the vertical cylinder.



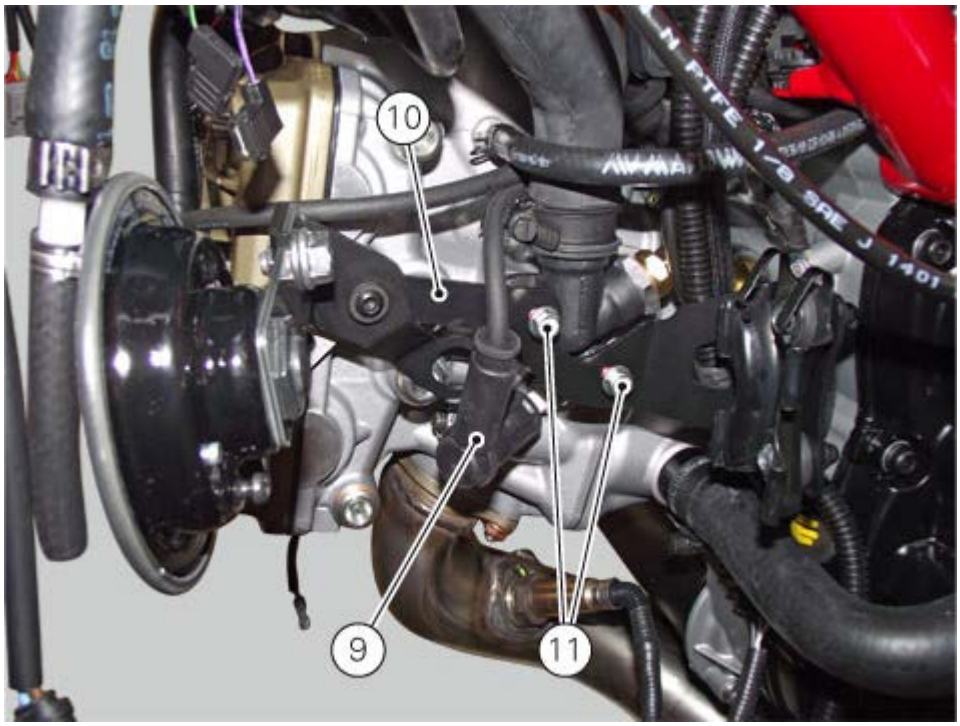
Loosen clamps (6) retaining pipe (2) and the vertical cylinder water pump.



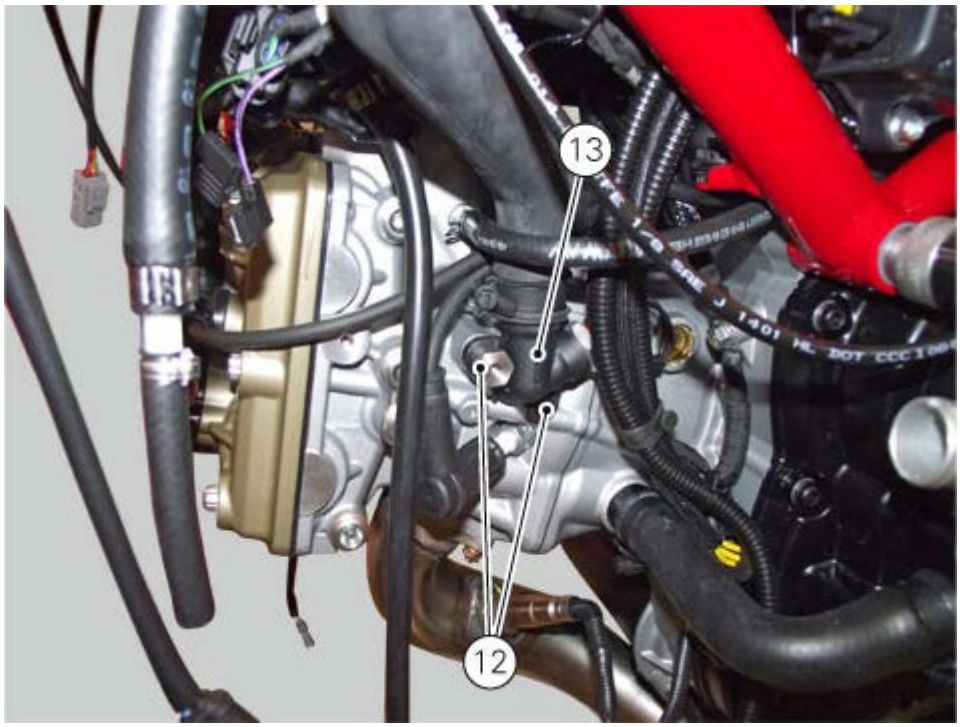
Loosen the clamps (6) to remove the valve (8) from the pipes (3) and (4).

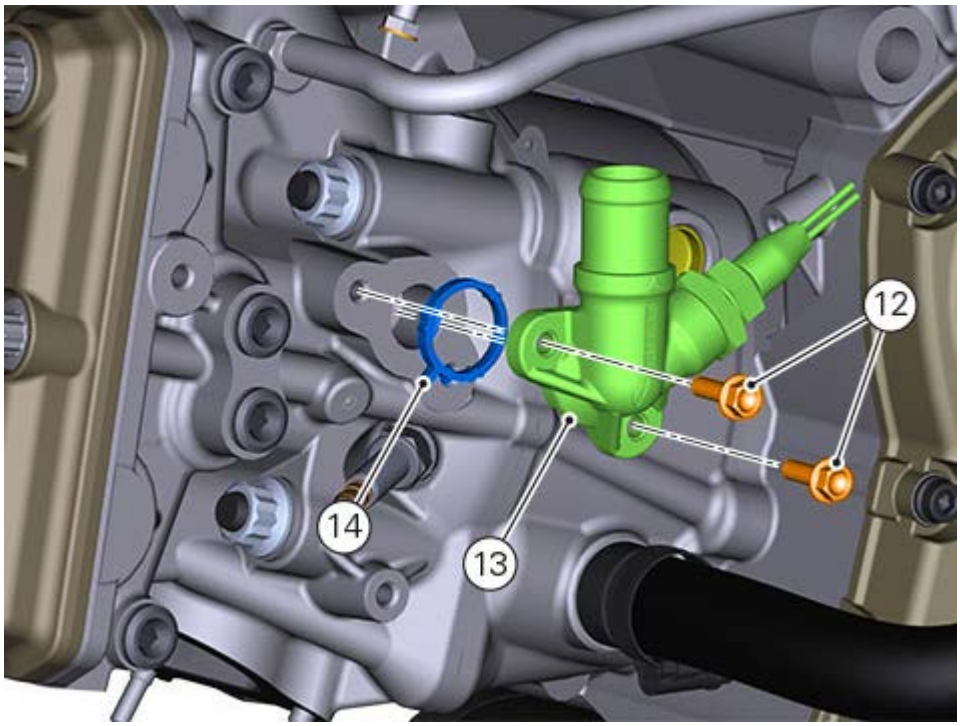


Working on the horizontal head, remove the spark plug cylinder head (9).
Undo the screws (11) and remove the horn/canister support bracket (10).

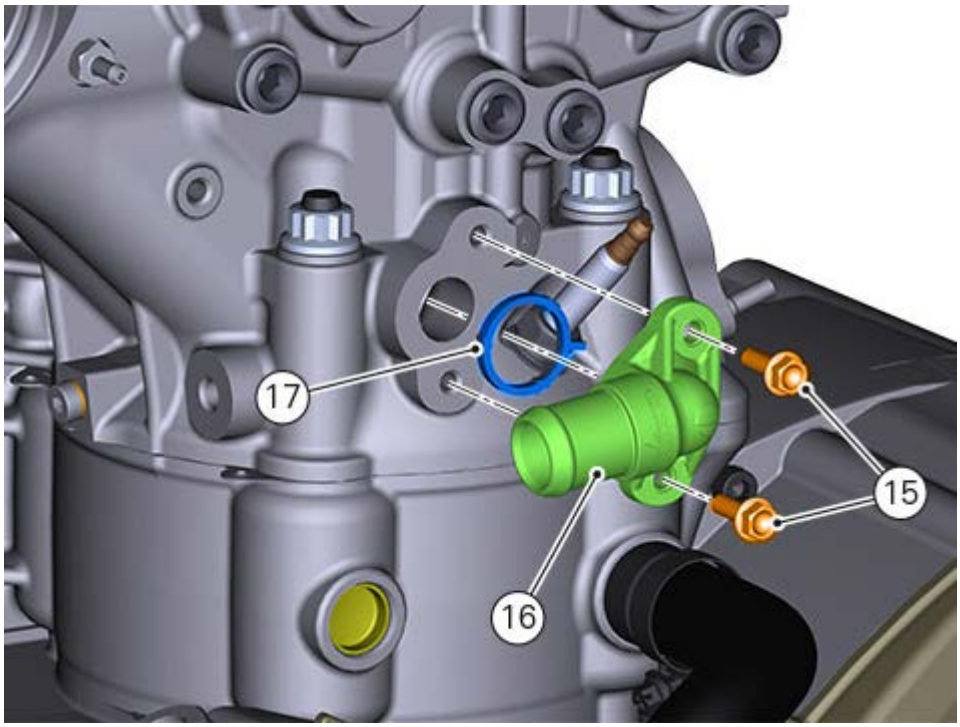


Undo the screws (12) and remove the water union (13) and recover clip (14).





Working on the vertical head, undo the screws (15) and remove the water union (16) and recover clip (17).

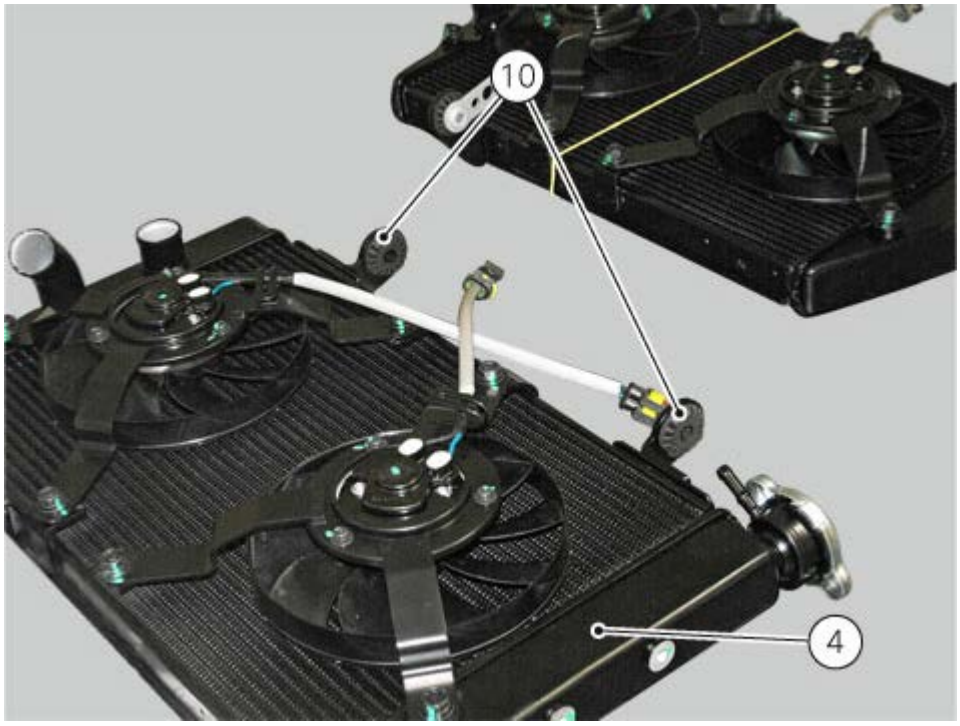


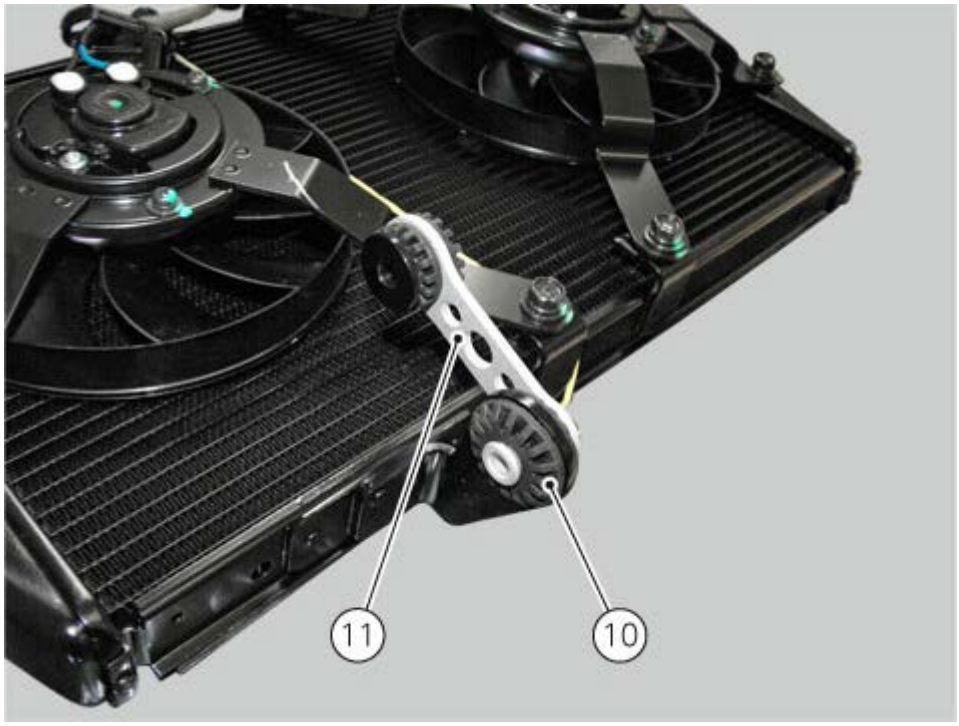
Important

Periodically check the connection unions for leaks. Hoses that are cracked, swollen, or hardened due to dry sleeves should be replaced.

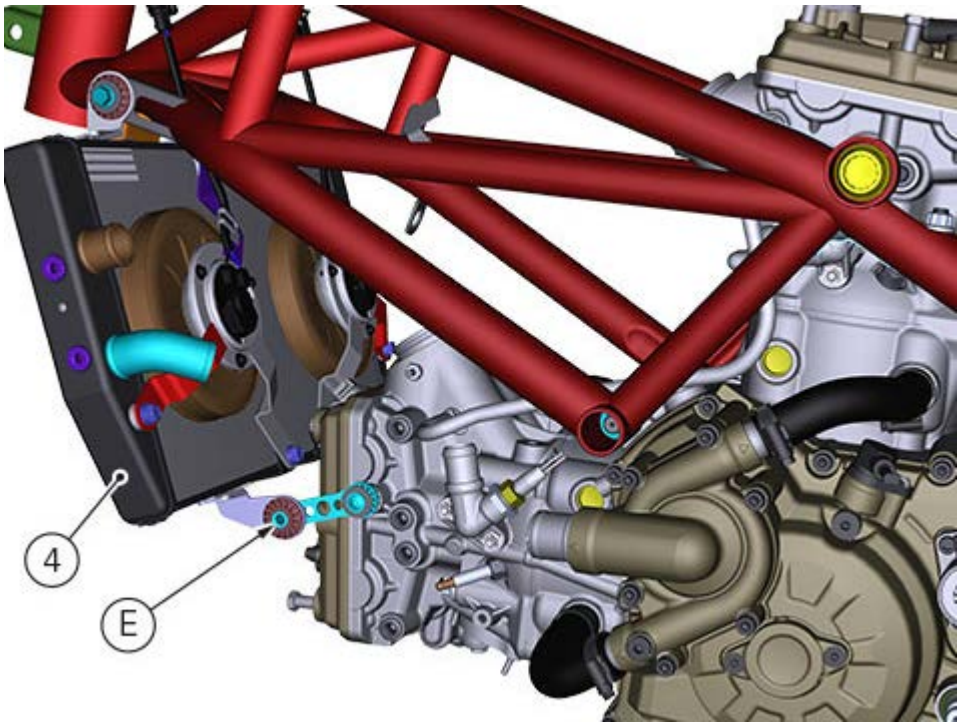
Fitting the radiator

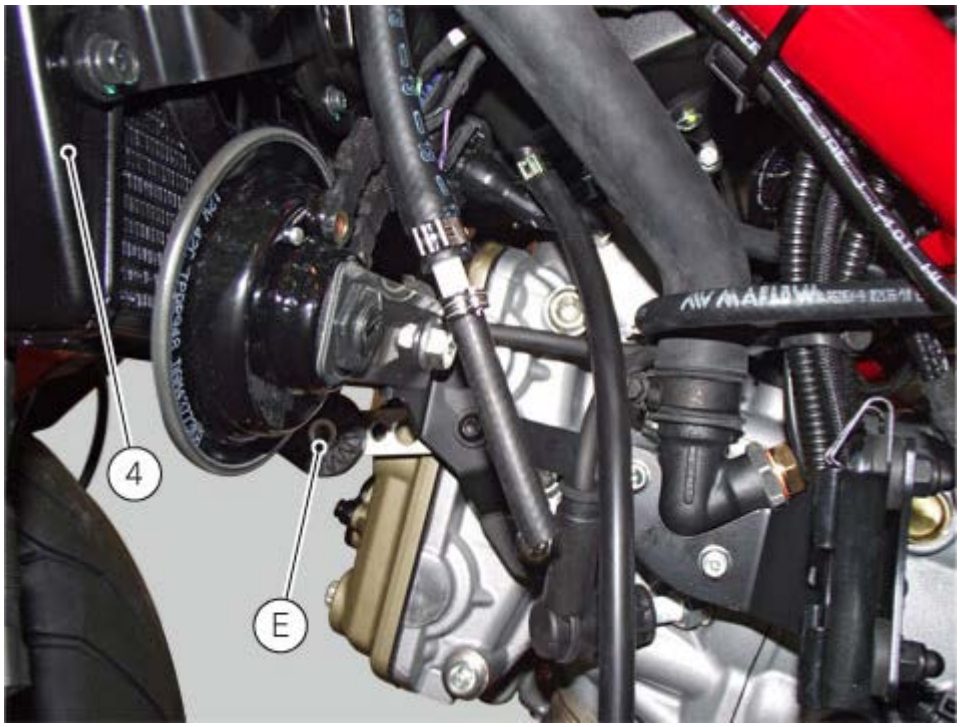
Check for the presence of vibration damping pads (10) and support (11) on the radiator brackets (4).



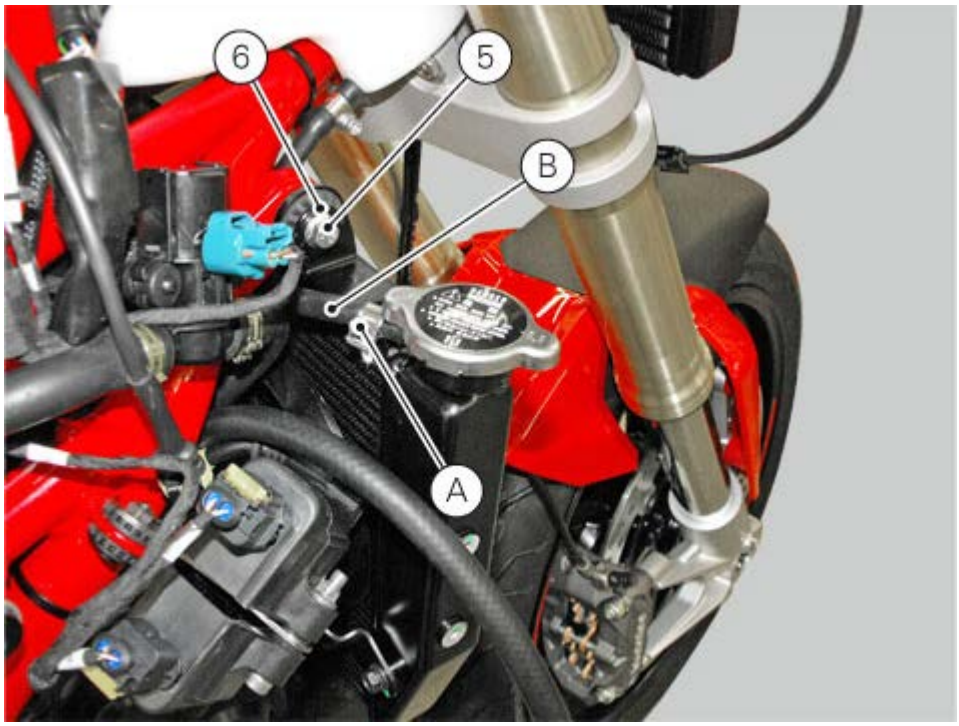


Insert the radiator support (4) in pin (E).

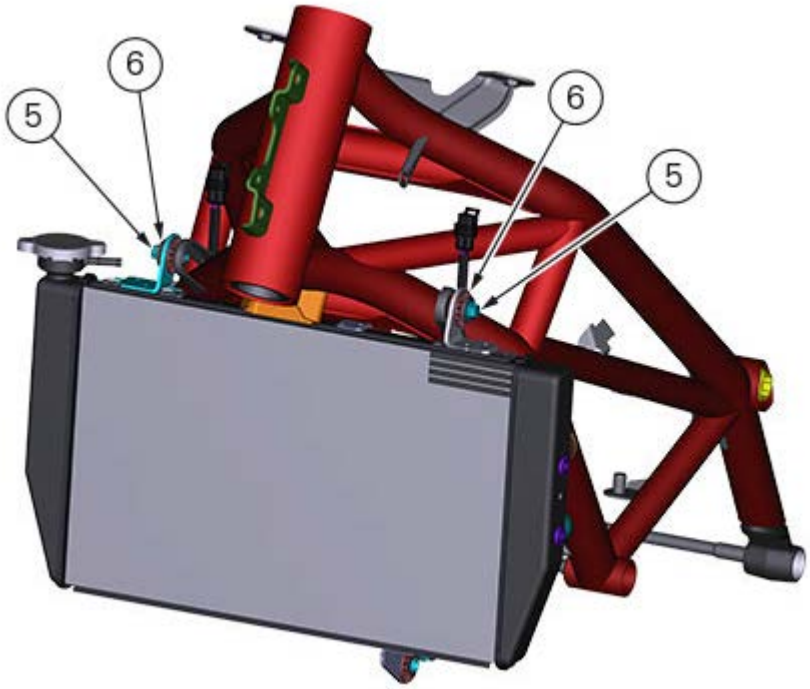




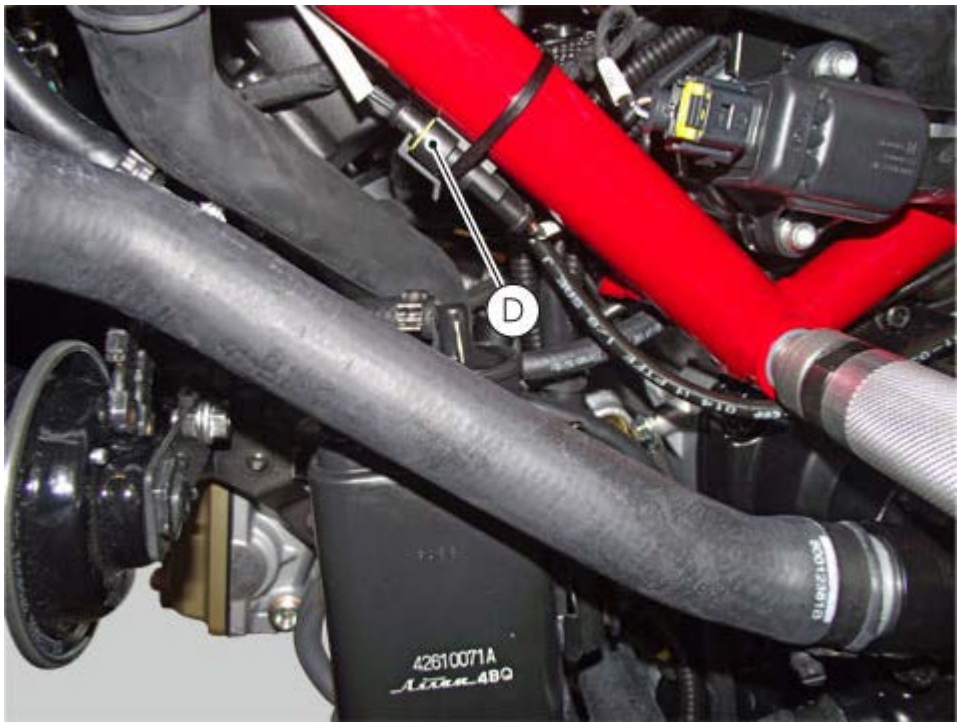
Start screw (5) with spacer (6) on the left and right sides.
Tighten the screws (5) to a torque of 10 Nm ± 10%.


6
5
B
A

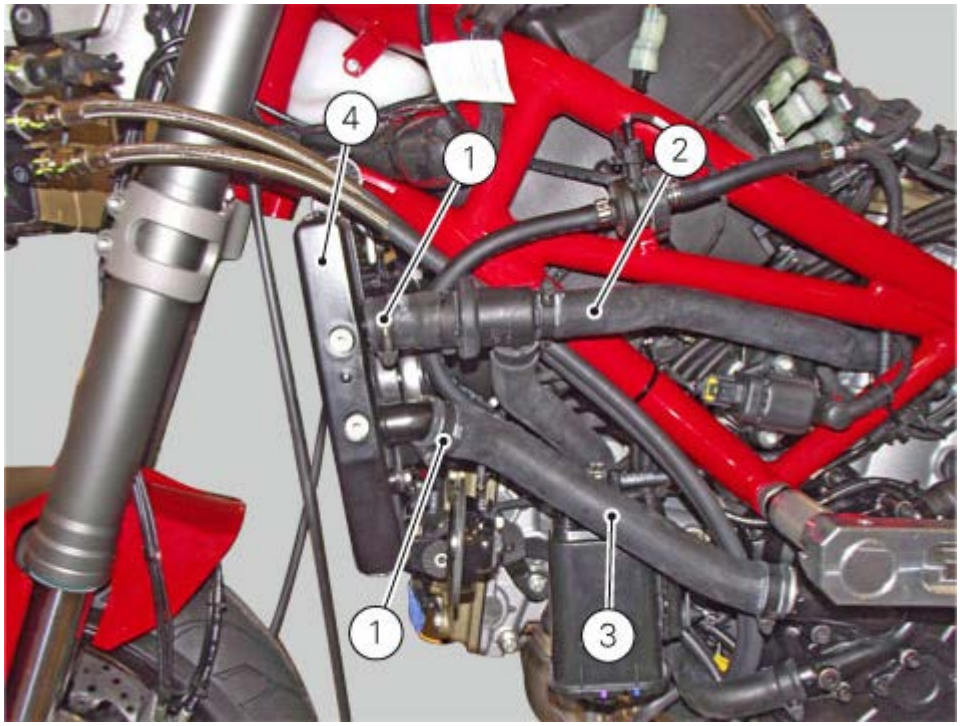

6
5



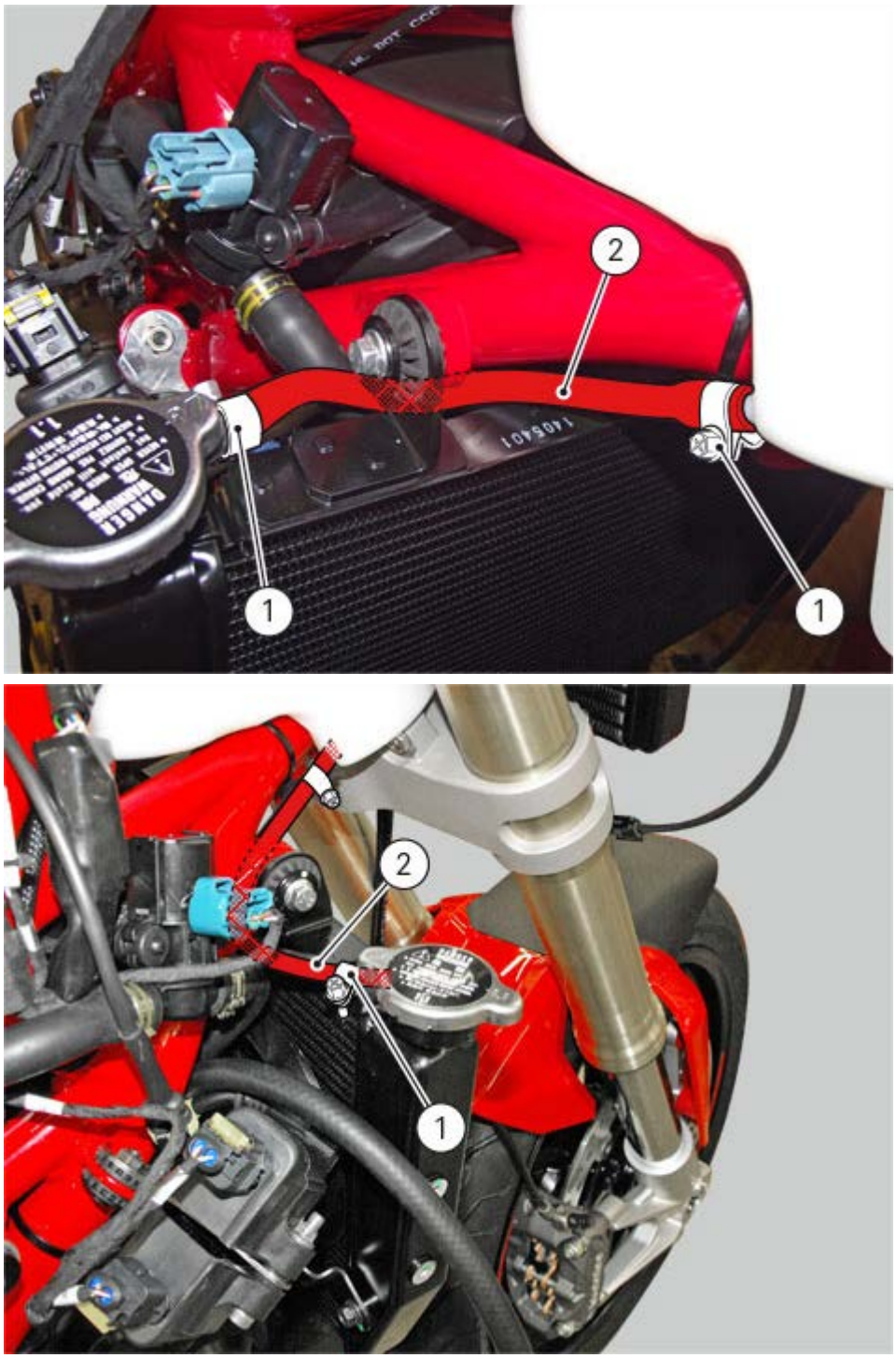
Reconnect the fan wiring to the main wiring (C) and (D).



Insert the cooling system pipes (2) and (3) in the relevant unions on the radiator and tighten clamps (1) to a torque of 2.5 Nm ± 10%.



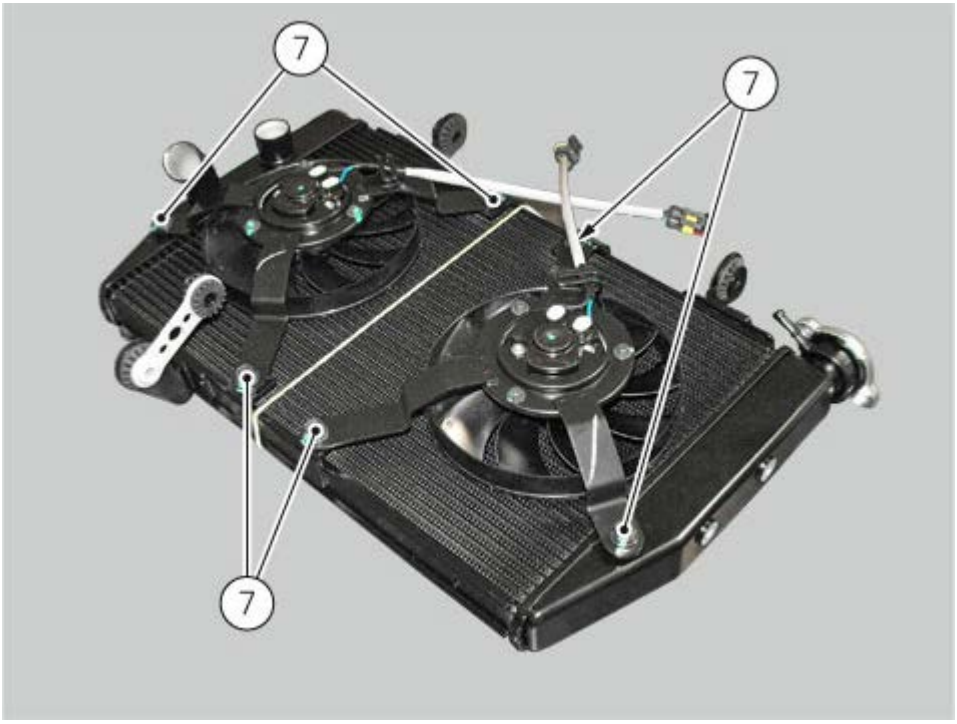
Insert pipe (B) between water tank and water radiator on the inlet of the radiator plug with clamp (A) and tighten the latter to a torque of 1 Nm ± 10%.



Fill the cooling system (Changing the coolant).
Refit the half-fairings (Refitting the tank fairings).
Refit the front half-fairings (Refitting the front half-fairing).

Replacing the electric fan

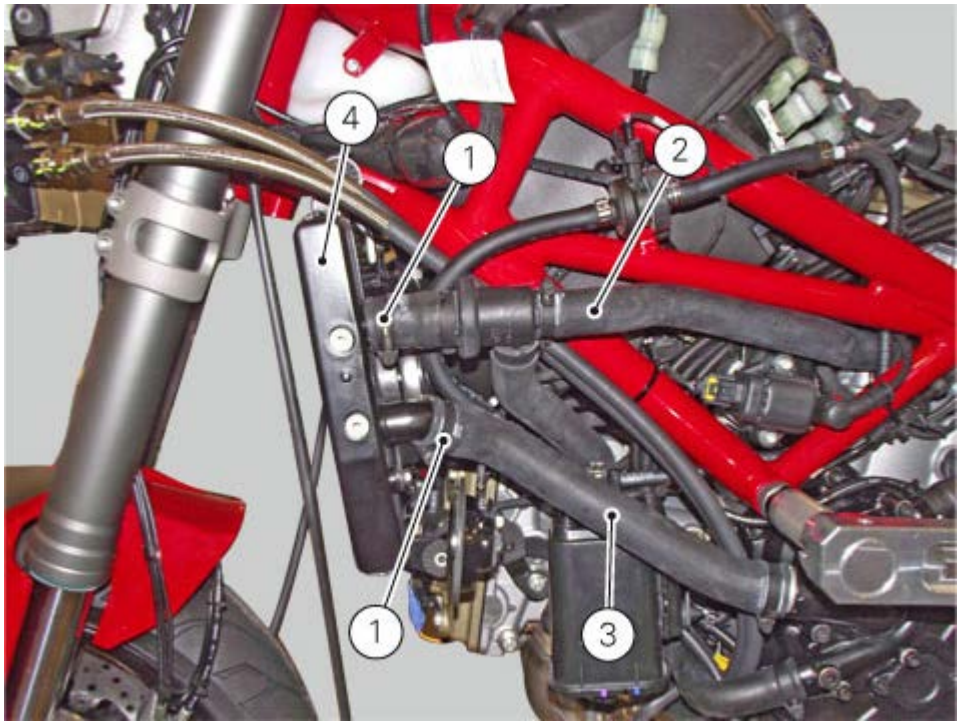
Undo the electric fan three retaining screws (7) and remove the electric fan (8) from the radiator. Repeat the operation for the second solenoid valve (9). Upon reassembly tighten screws (7).



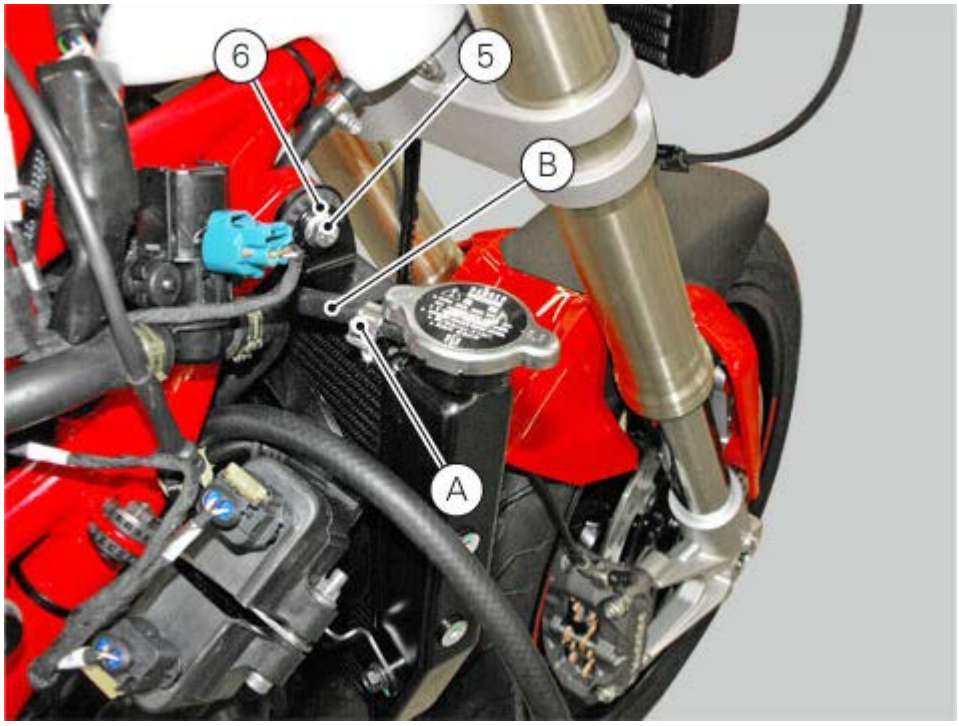
Removing the radiator

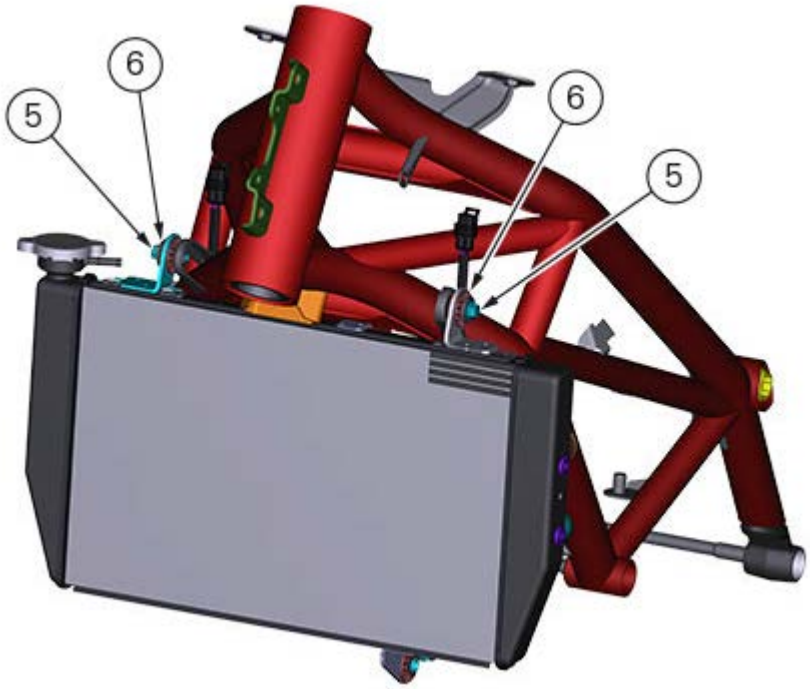
Remove the half-fairings (Removing the tank fairings).
Remove the front half-fairings (Removing the front half-fairing).
Drain the coolant (Changing the coolant).

Loosen clamps (1) of water pipes (2) and (3) and slide them out of the radiator unions (4).



Loosen clamp (A) that connects the water tank and the radiator and slide out pipe (B).
Loosen the screw (5) with spacer (6) securing the water radiator to the frame RH side.

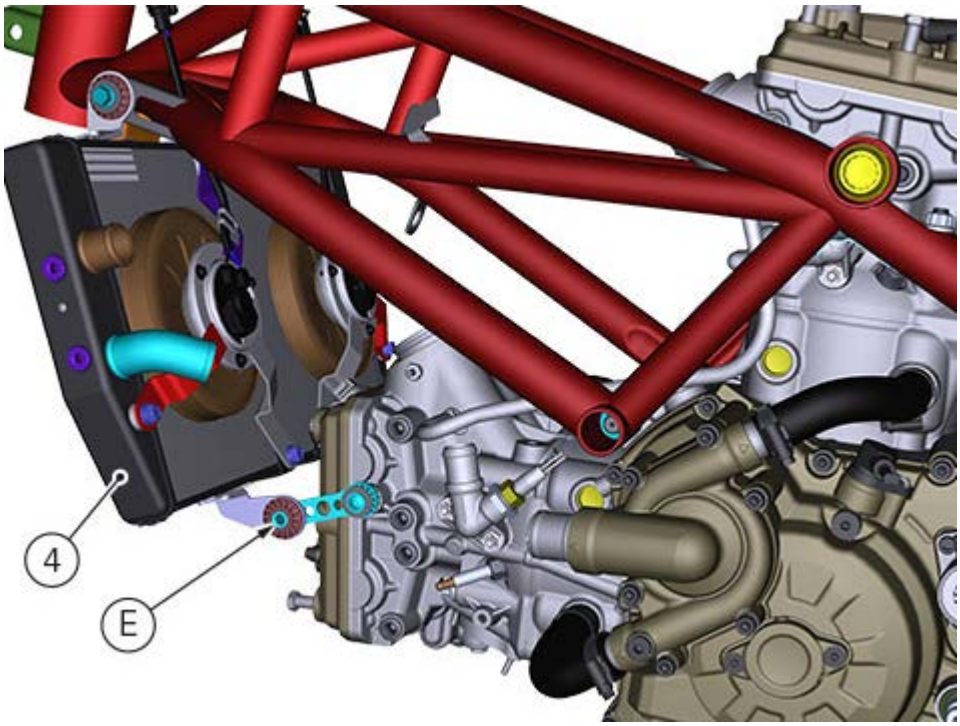


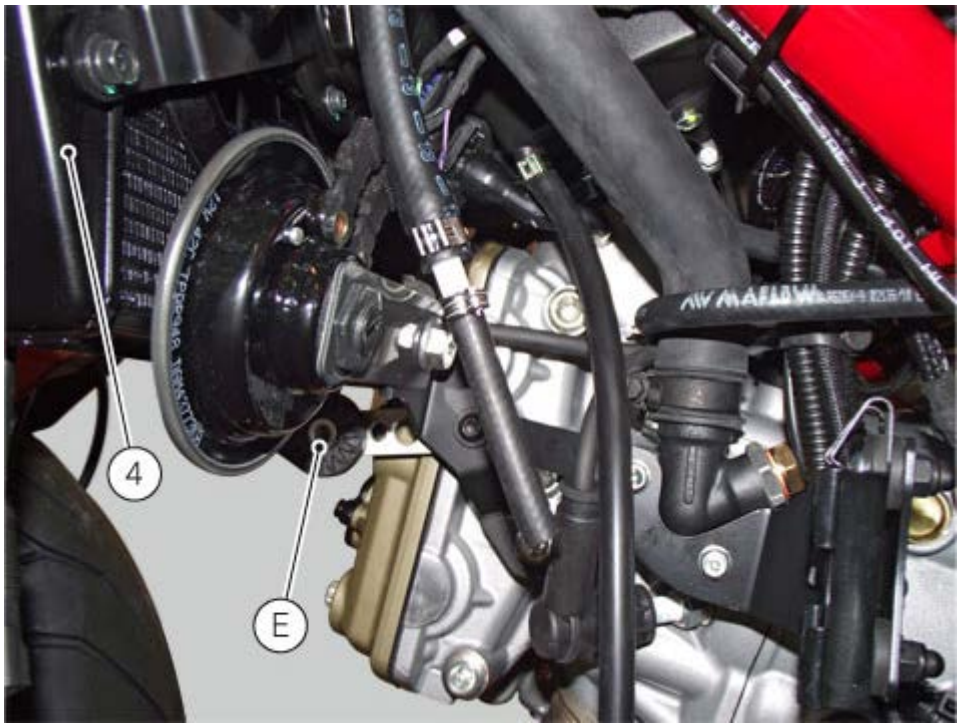


Loosen the screws (5) with spacer (6) securing the radiator to the frame LH side.

Disconnect the main wiring connections, the RH solenoid valve (C) and the LH solenoid valve (D).

Remove water radiator (4) from the vehicle by disengaging it from pin (E).





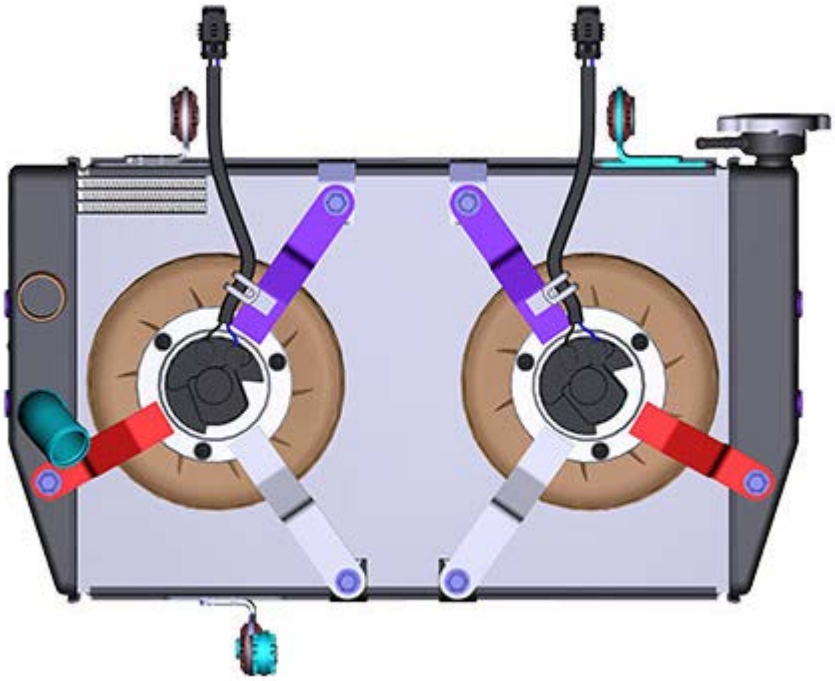
Inspecting the water radiator

Visually inspect the cooler. Replace it at any sign of damage or leaks. Check also that the air flow through the radiator fins are not obstructed by leaves, insects, mud, etc.

Important

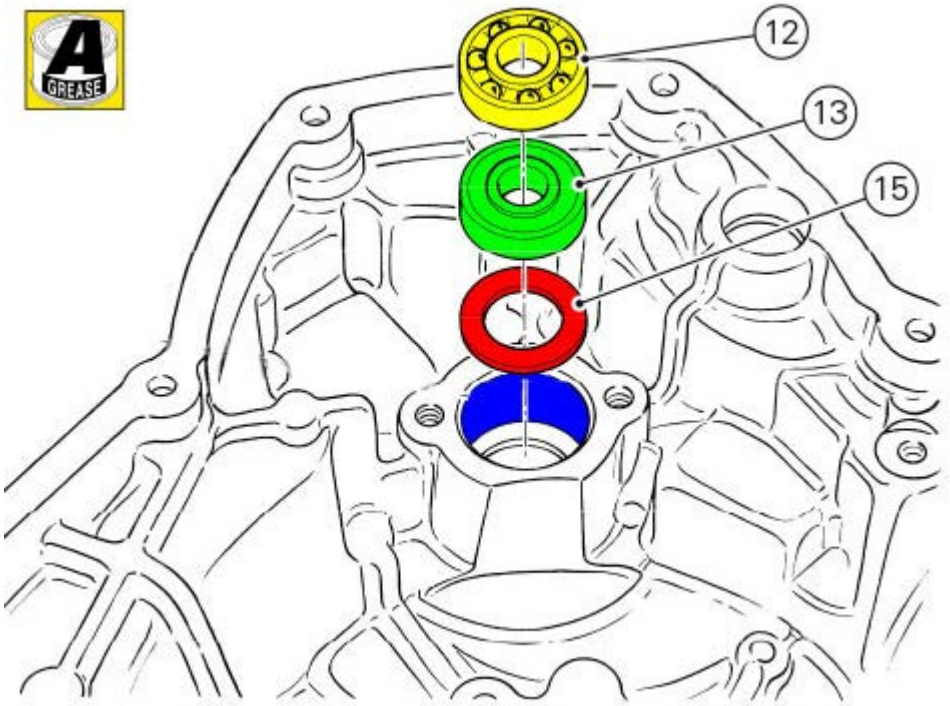
Excessive coolant temperature can be caused by a partial obstruction of the radiator fins.

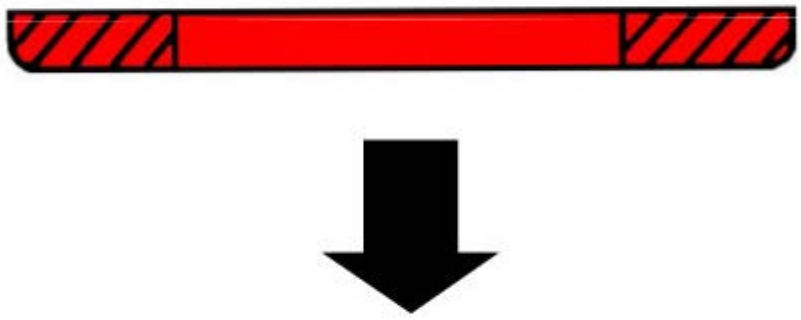
Carefully check the condition of the radiator fins.



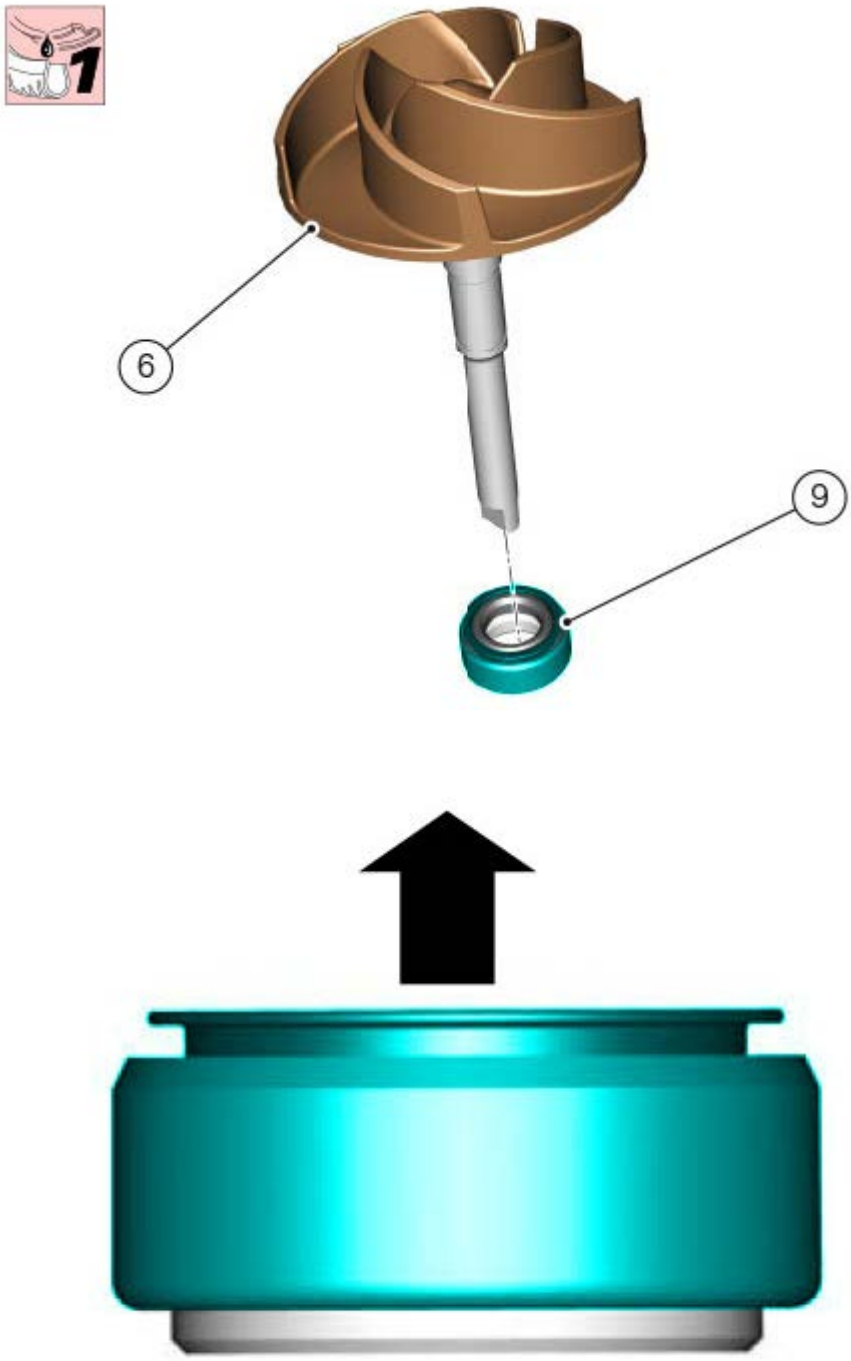
Refitting the water pump

Use the indicated grease to lubricate the seat of the crankcase (A).
Fit spacer (15) so that the chamfered edge is facing downwards.
Position bearings (13) and (12) fully home.



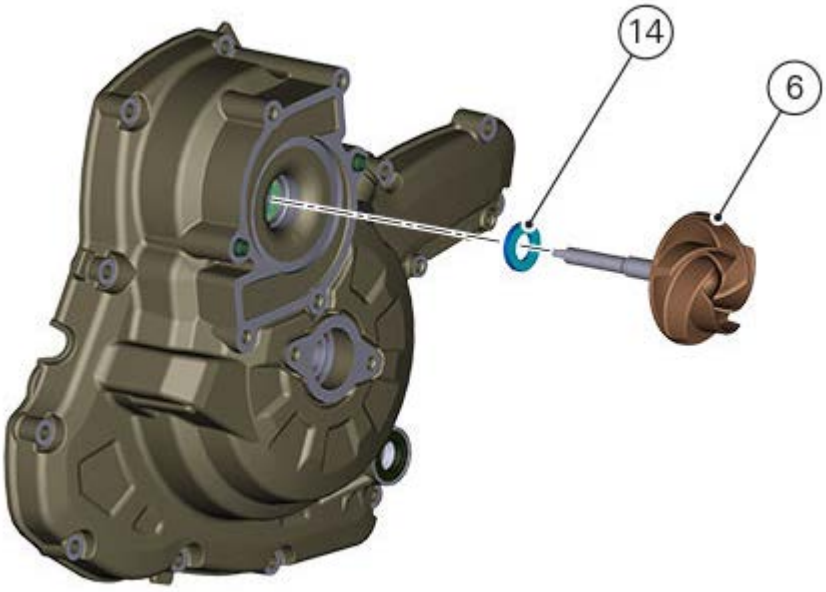


Fit the impeller shaft (6) by lubricating washer (9) and positioning it as shown in the figure.
Bring the washer fully home.

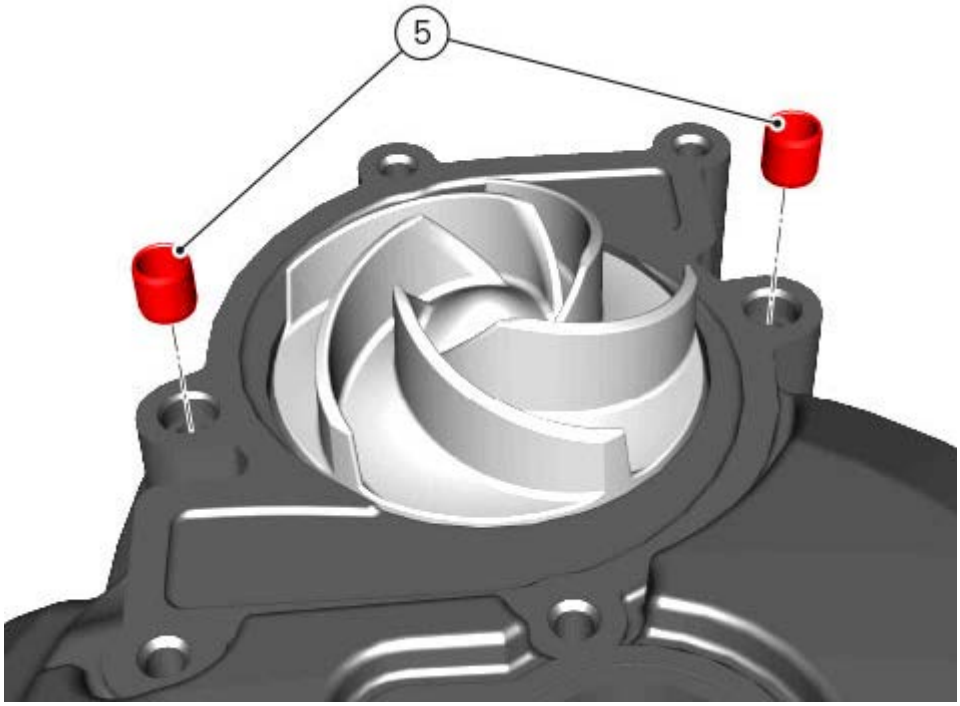


Warning
While fitting the washer, pay attention not to pinch the rubber seal on the impeller edge.

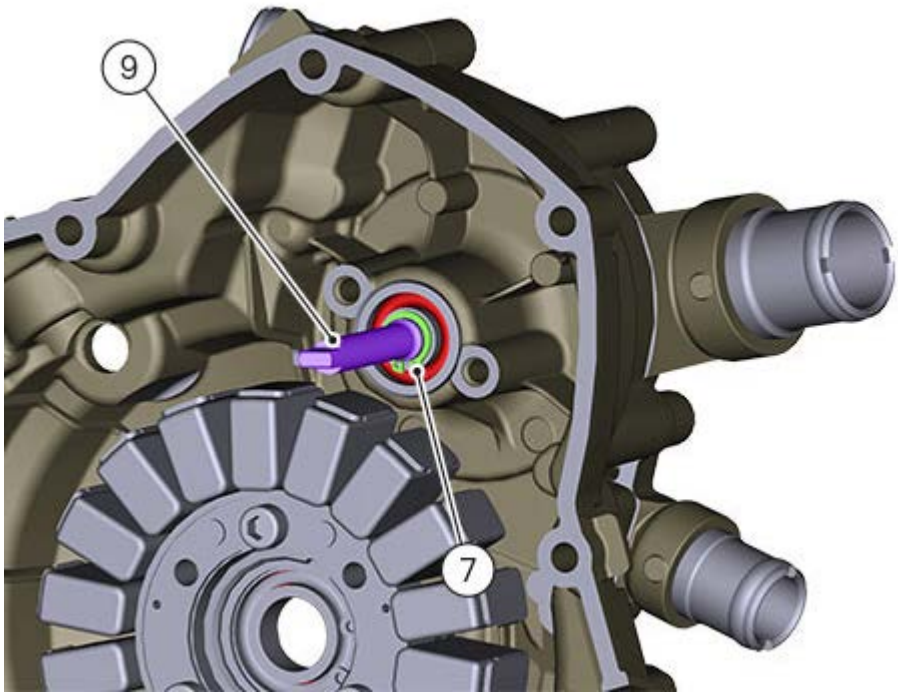
Fit counter-washer (14) fully home in the generator cover.
The counter-washer must be positioned with the white side facing outwards.
Fit the impeller (6) with the relevant washer.



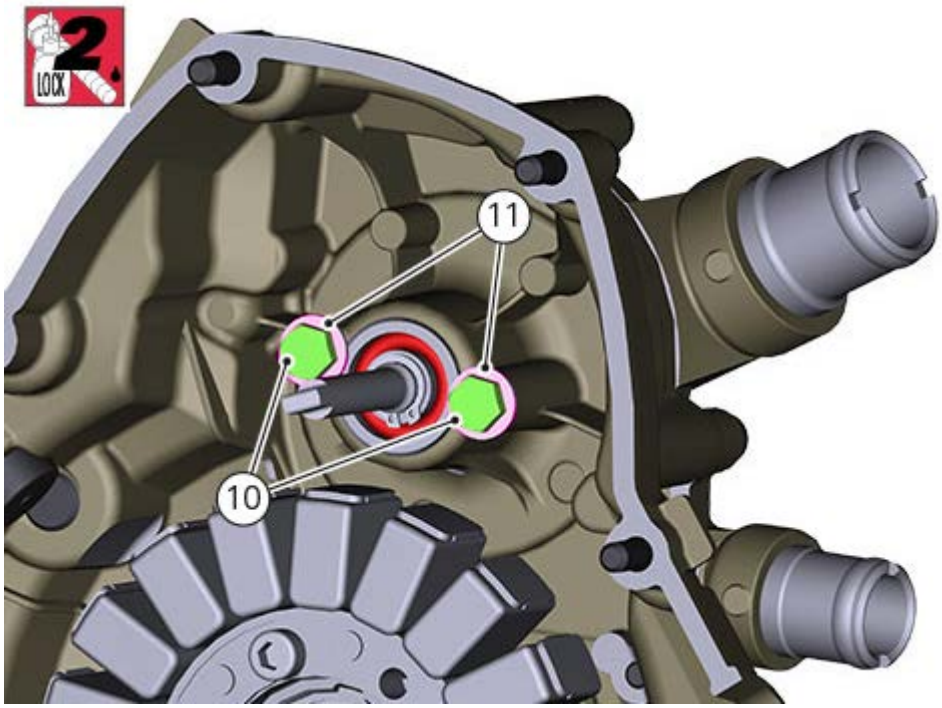
Check that the two centring bushes (5) are correctly fitted on the generator cover.



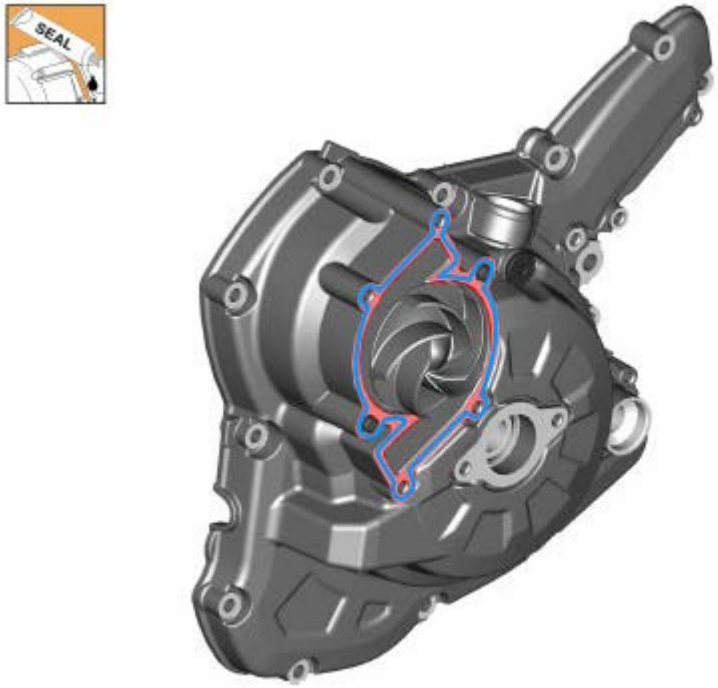
Working on the opposite side, tighten the impeller (6) by means of the snap ring (7).



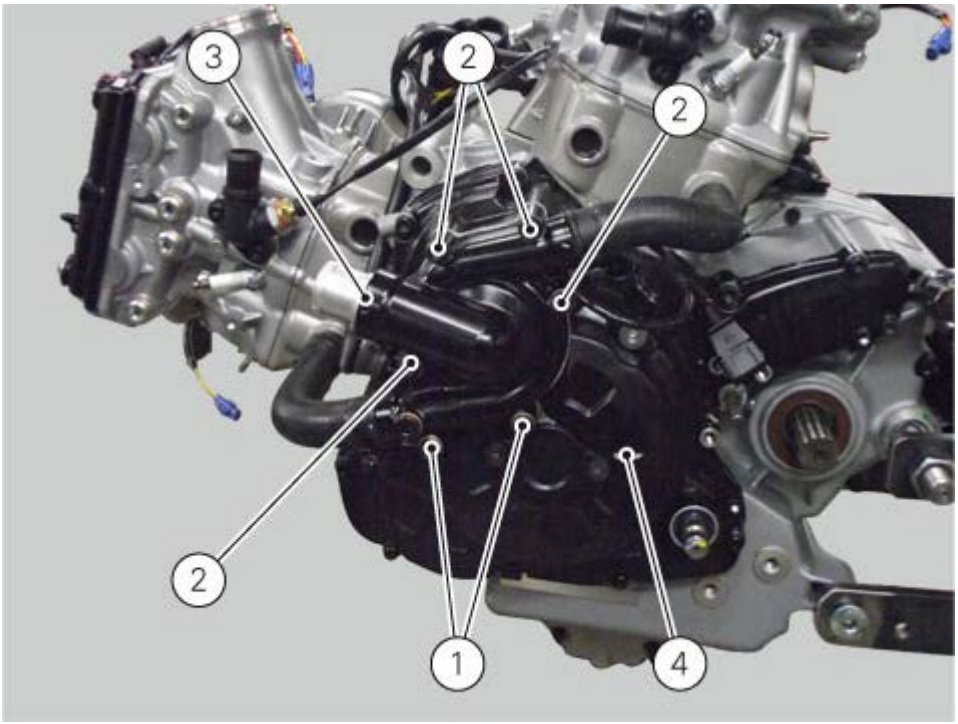
Apply the indicated threadlocker on the screws (10).
Fit the two screws (10) with the washers (11), and tighten to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).

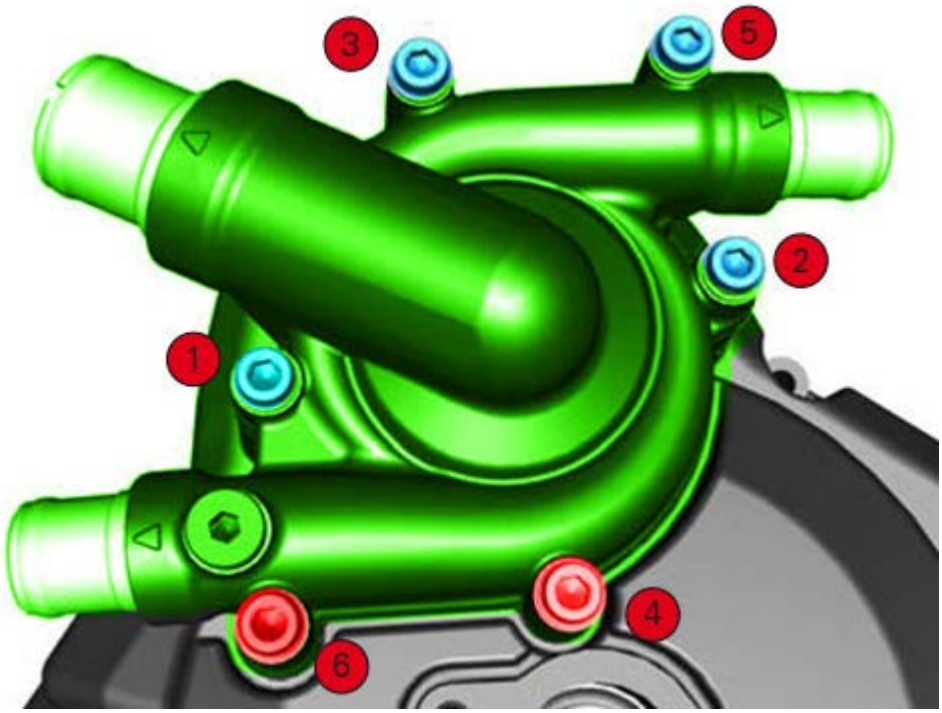


Apply an even bead of sealing compound on the generator cover by respecting the shown path.



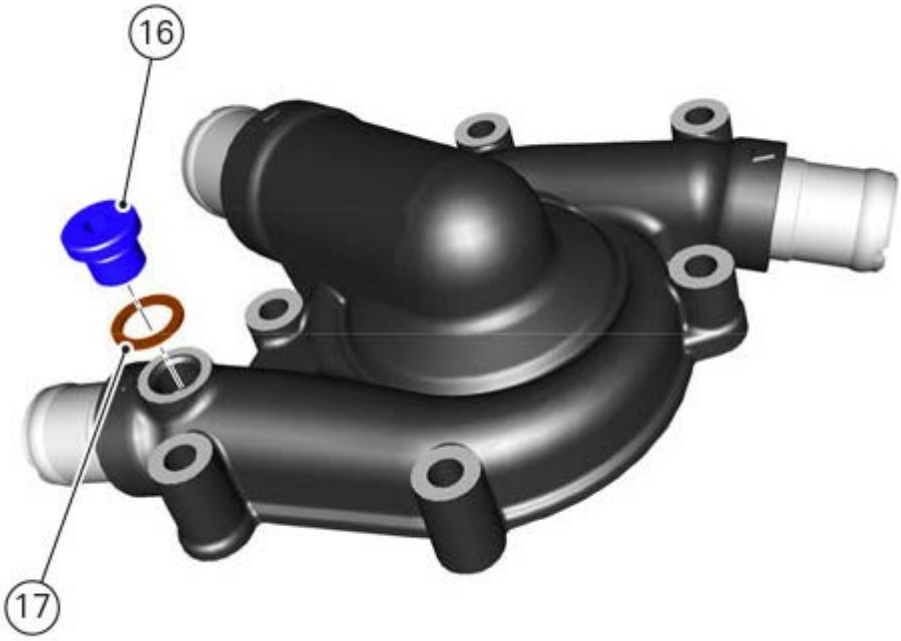
Tighten the screws (1) and (2) to a torque of 13.5 Nm (Min. 12.5 Nm - Max. 14.5 Nm), respecting the sequence shown in the figure.





Pay attention to the screws as they are not all the same:
screws (1) M6x32 mm
screws (2) M6x30 mm

If previously removed, fit plug (16) with the washer (17) and tighten it to a torque of 15 Nm (Min. 13.5 – Max 16.5).

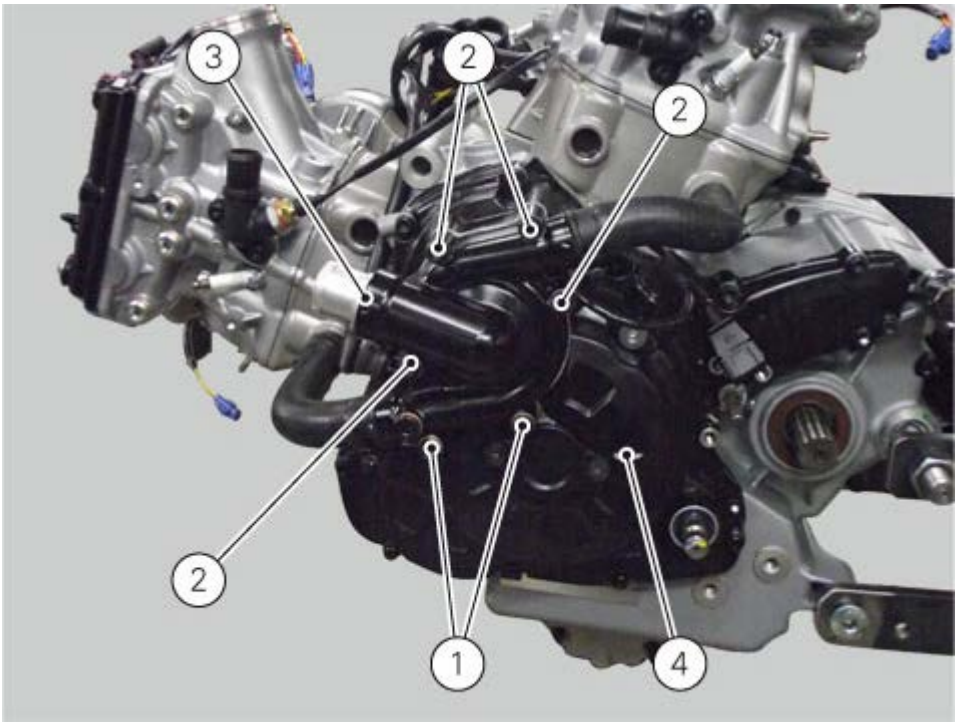


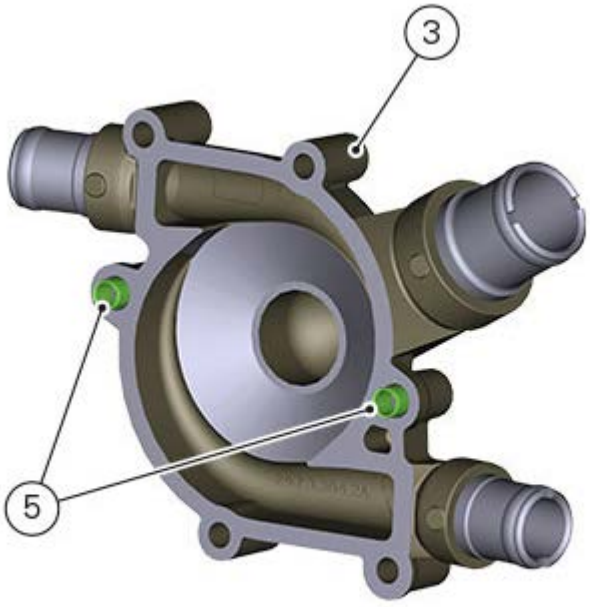
Removing the water pump

Remove the front half-fairings (Removing the front half-fairing).
Remove the half-fairings (Removing the tank fairings).
Drain the coolant (Changing the coolant).
Remove the cooling system hoses from the water pump cover (Removing cooling system hoses and unions).
Remove the front sprocket cover (Removing the front sprocket cover).
Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the clutch slave cylinder (Removing the clutch slave cylinder).
Remove the generator cover (Removing the generator cover).

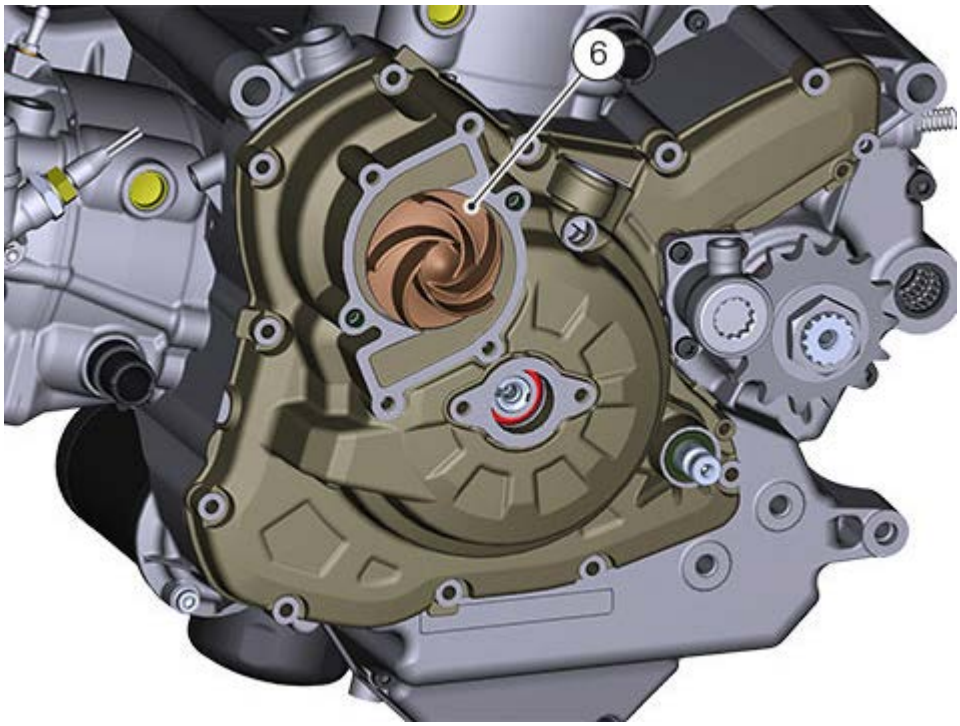
Note
For clarity, the figures show the engine removed from the frame.

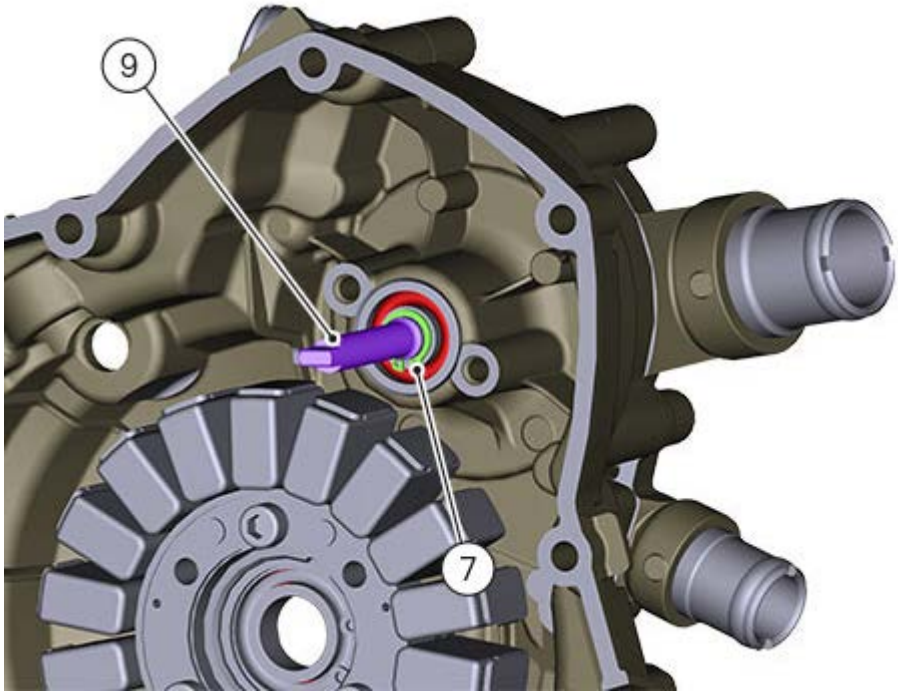
Loosen and remove screws (1), (2) and (16) with the relevant washer securing the water pump cover (3) to the generator cover (4).
Remove the water pump cover (3) and collect centring bushings (5).



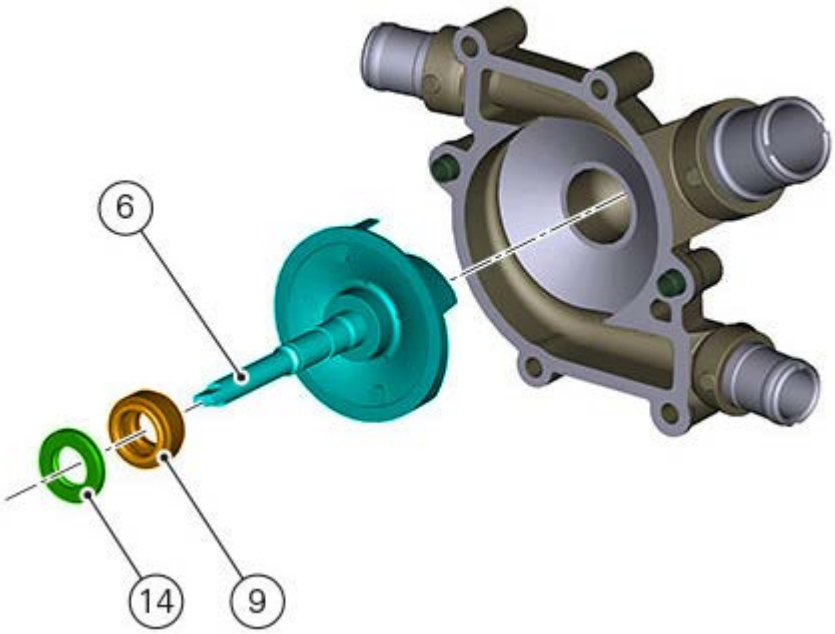


Clean the pump housing from any coolant scale. Check the bearing wear by turning the impeller shaft (6); in case of excessive clearance, it is necessary to replace them as follows.
Remove the snap ring (7) from the impeller shaft (9).
Slide off the impeller (6) with the sealing ring (9) from the outside.

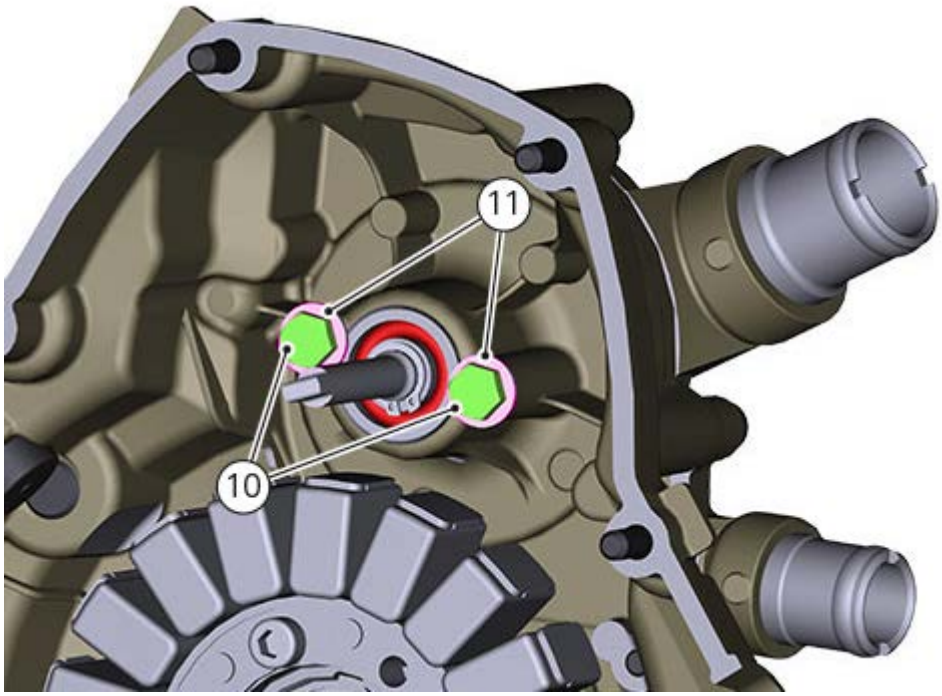




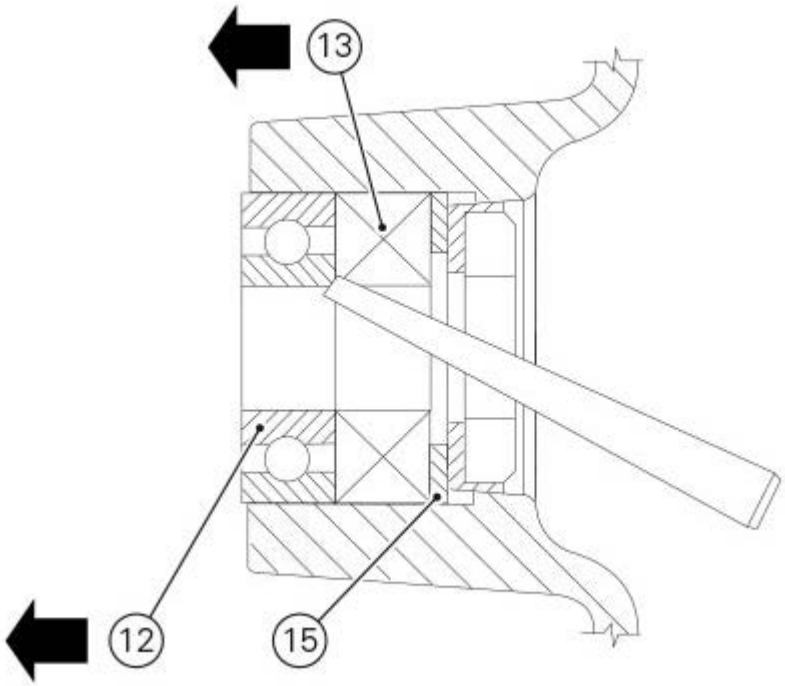
Collect the ceramic washer and the seal ring union (14).



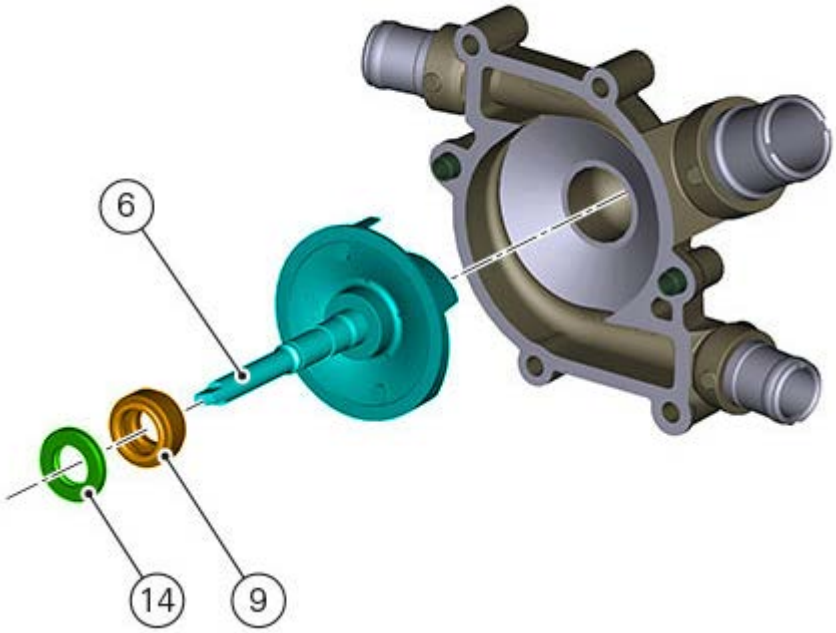
Undo and remove the screws (10) with the washer (11).



Working from the impeller side, use a suitable drift to press on the inner ring of end bearing (12) until it can be extracted from the cover.
Use the same technique to remove the other bearing (13).
Remove the inner spacer (15).



Check the condition of the mechanical seal components (9) and of the counter-washer (14): there should be no signs of deformation, cracking, or excessive wear. In case of damage, both components must be replaced.

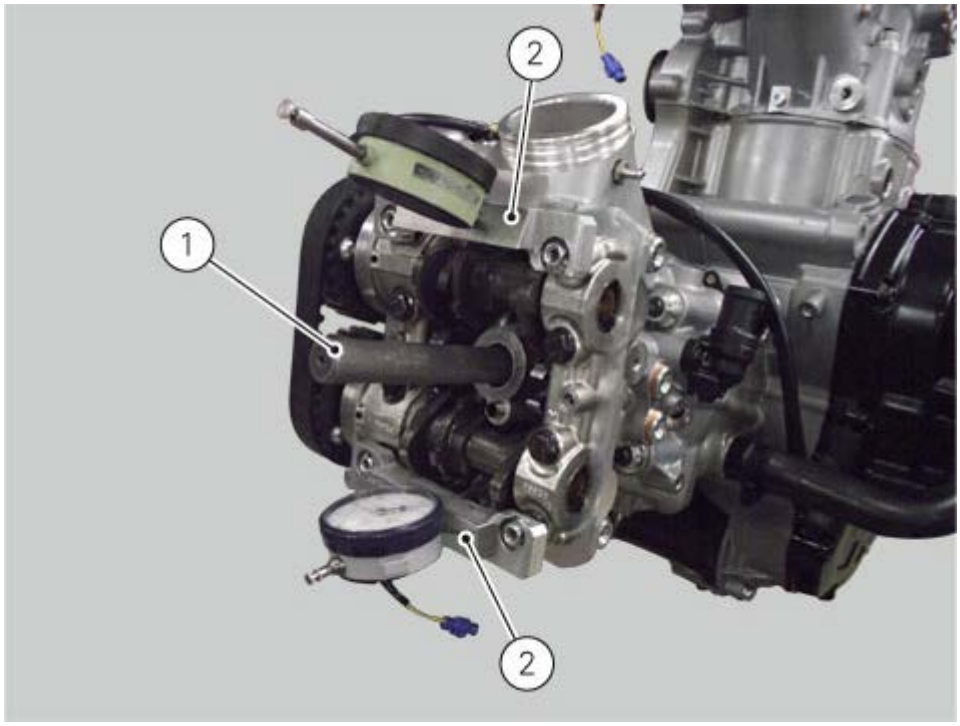


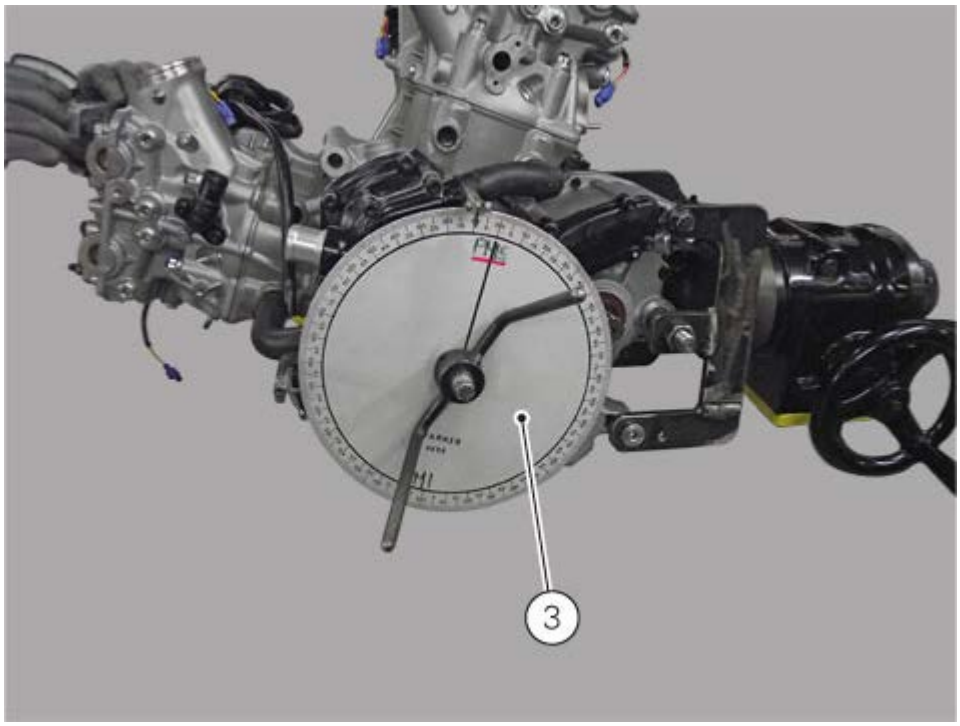
Checking the engine timing

Remove the seat (Removing the seat).
Remove the rear RH side body panel (Removing the side body panels and the tail guard).
Remove the fuel tank (Removing the fuel tank).
Remove the airbox (Removing the airbox and throttle body).
Loosen the timing belt covers (Removing the timing belt external covers).
Loosen the water radiator retaining screws by leaving the radiator connected to the cooling system (Removing the water radiator).
Disconnect the spark plug caps.
Disconnect the secondary air unit of the head covers (Removing the secondary air system).
Remove the cylinder head cover (Removing the camshafts).

Set the engine to the condition described for the operation under (Checking and adjusting the valve clearance), indicated before.

Install tool no. **88713.2087** (1) in the spark plug bore to determine the piston TDC, the gauges (2) on tool no. 88765.1723 and the timing check tool of degree wheel (3) no. **88713.0123** with graduated disk.





Check that the opening valve clearance is zero when the camshafts are in rest position by fitting a feeler gauge, of suitable thickness, between the upper rocker arm and the opening shim.

Check that in this condition the camshaft can rotate. If it moves stiffly, use a thinner feeler gauge.

In this condition, with the piston of the horizontal cylinder at TDC with the valves fully closed as confirmed by the reading on the gauge, set the gauges (2) to zero.

Tension the belts according to the value specified in paragraph "Checking and adjusting timing belt tension".
Turn the degree wheel (3) counter clockwise until the gauge dial (2), on the exhaust side, shows a lift of 1 mm.

Check that the value of the angular displacement read on the degree wheel (3) is the specified one.

	REFERENCE	ASSEMBLY VALUE	CHECKING CLEARANCE
Valve lift	With 1 mm valve clearance		
	Intake	Opening - 22° ± 3° B.T.D.C. Closing 84° ± 3° A.T.D.C.	
	Exhaust	Opening 80° ± 3° B.B.D.C. Closing 15° ± 3° A.B.D.C.	

Continue to rotate in the same direction until you obtain a lift of 1 mm on the intake side.
Check the angular value on the degree wheel.
Continue to rotate until you obtain an intake valve lift of 1 mm on the gauge (2), during closure of the valve for the compression stroke.
Check the angular displacement value with the specified one.

Repeat the procedure for the vertical cylinder.
A tolerance of ±3° is allowed in the values detected with the described procedure compared to the specified ones.

Remove the installed tools to check timing. Then tension the belts to the prescribed operation value.

	REFERENCE	ASSEMBLY VALUE (new belt)	ASSEMBLY VALUE (used belt)
Cold belt tension adjustment	DDS 2	90 ± 5 Hz (horizontal) 90 ± 5 Hz (vertical)	80 ± 5 Hz (horizontal) 80 ± 5 Hz (vertical)

In case of values different from the specified ones, repeat the timing procedure.

Refit the components removed in the procedure.

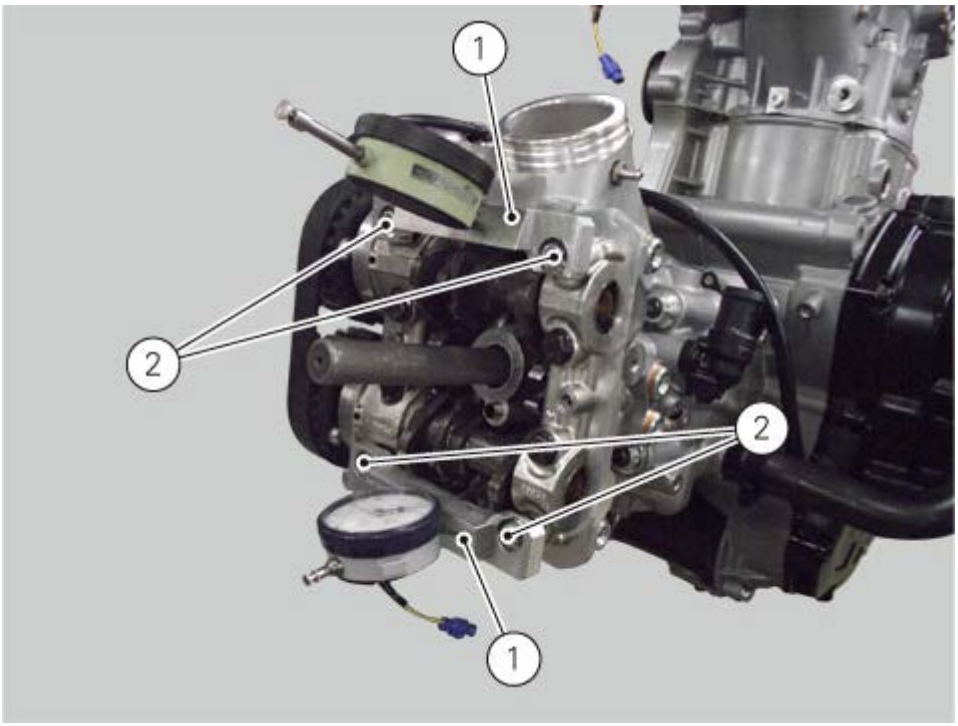
Refit the cylinder head cover (Refitting the camshafts).
Connect the caps to the spark plugs.
Connect the secondary air system pipe on the cylinder head (Removing the secondary air system).
Fix the water radiator to the frame (Refitting the water radiator).
Fix the timing belt covers (Refitting the timing belt external covers).
Refit the airbox (Refitting the airbox and throttle body).
Refit the fuel tank (Refitting the fuel tank).
Refit the rear RH side body panel (Refitting the side body panels and the tail guard).
Refit the seat (Refitting the seat).

Checking valve lift

Remove the seat (Removing the seat).
Remove the rear RH side body panel (Removing the side body panels and the tail guard).
Remove the front half-fairings (Removing the front half-fairing).
Remove the fuel tank (Removing the fuel tank).
Remove the airbox (Removing the airbox and throttle body).
Loosen the timing belt covers (Removing the timing belt external covers).
Loosen the water radiator retaining screws by leaving the radiator connected to the cooling system (Removing the water radiator).
Disconnect the spark plug caps.
Disconnect the secondary air unit of the head covers (Removing the secondary air system).
Remove the cylinder head cover (Removing the camshafts).

Set the engine to the TDC condition described for the operation under "Checking and adjusting the valve clearance", indicated before.

Place tool (1) part no. 88765.1723 on the cylinder head: the part marked "A" should be on the intake side and the part marked "S" should be on the exhaust side.
Seat the tool (1) and tighten the screws (2).



Set the opening valve clearance to zero when the camshafts are in rest position by fitting a feeler gauge, of suitable thickness, between the upper rocker arm and the opening shim.

Lock the dial gauge into the support seat with mark "A" and position fork probe against the face of the closing shim.

Set the dial gauge to zero when the valve is fully closed.

Rotate the intake camshaft so as to allow the intake valves to lift fully.
Check on the dial gauge that the measured value corresponds to the prescribed one (Timing system/valves).

	REFERENCE VALUES	ASSEMBLY VALUE	CHECKING CLEARANCE
Valve lift	With 0 mm valve clearance	Intake 12.2 mm Exhaust 11.2 mm	
	Opening rocker arm - intake	0.13 ± 0.18 mm	0.10 ± 0.25 mm
	Opening rocker arm – exhaust	0.13 ± 0.18 mm	0.10 ± 0.25 mm

	Closing rocker arm – intake	0.05 ± 0.10 mm	0.05 ± 0.15 mm
	Closing rocker arm - exhaust	0.05 ± 0.10 mm	0.05 ± 0.15 mm

Refit the 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 cylinder head cover (Refitting the camshafts).
Connect the caps to the coils.
Connect the secondary air system pipe on the cylinder head (Removing the secondary air system).
Fix the water radiator to the frame (Refitting the water radiator).
Fix the timing belt covers (Refitting the timing belt external covers).
Refit the airbox (Refitting the airbox and throttle body).
Refit the fuel tank (Refitting the fuel tank).
Refit the front half-fairings (Refitting the front half-fairing).
Refit the rear RH side body panel (Refitting the side body panels and the tail guard).
Refit the seat (Refitting the seat).

Checking and adjusting the valve clearance

Remove the seat (Removing the seat).
Remove the rear body panels (Removing the side body panels and the tail guard).
Remove the front half-fairings (Removing the front half-fairing).
Remove the tank fairing (Removing the tank fairings).
Remove the fuel tank (Removing the fuel tank).
Remove the airbox (Removing the airbox and throttle body).
Loosen the timing belt covers (Removing the timing belt external covers).
Loosen the water radiator retaining screws by leaving the radiator connected to the cooling system (Removing the water radiator).
Disconnect the coil caps.
Disconnect the secondary air units of the head covers (Removing the secondary air system).
Remove the cylinder head cover (Removing the camshafts).

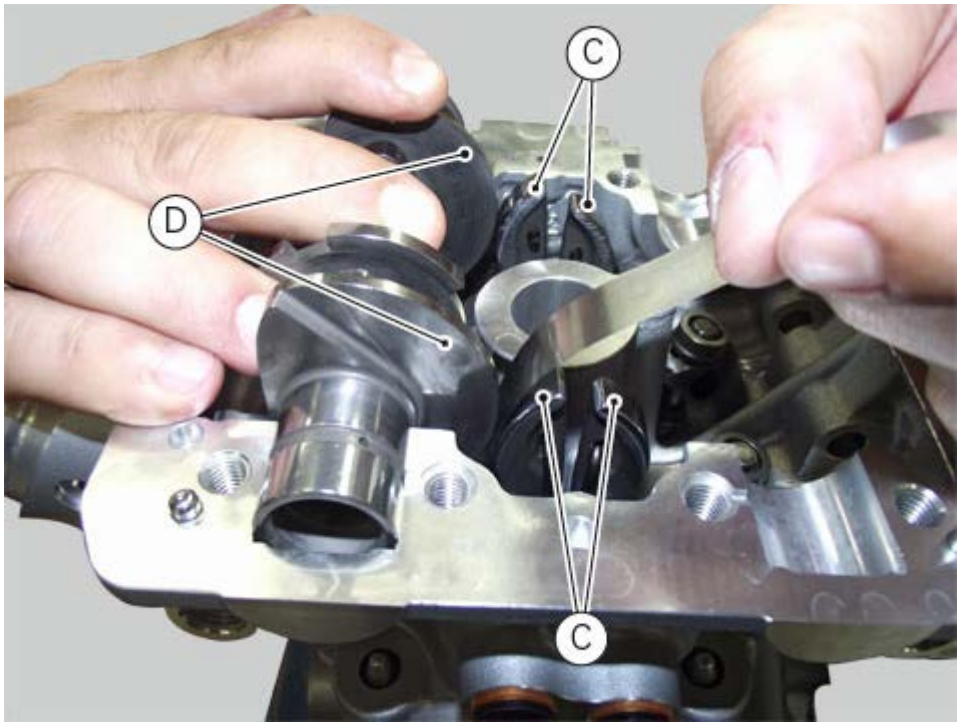
Note
For better clarity, some of the following figures show the engine removed from the frame.

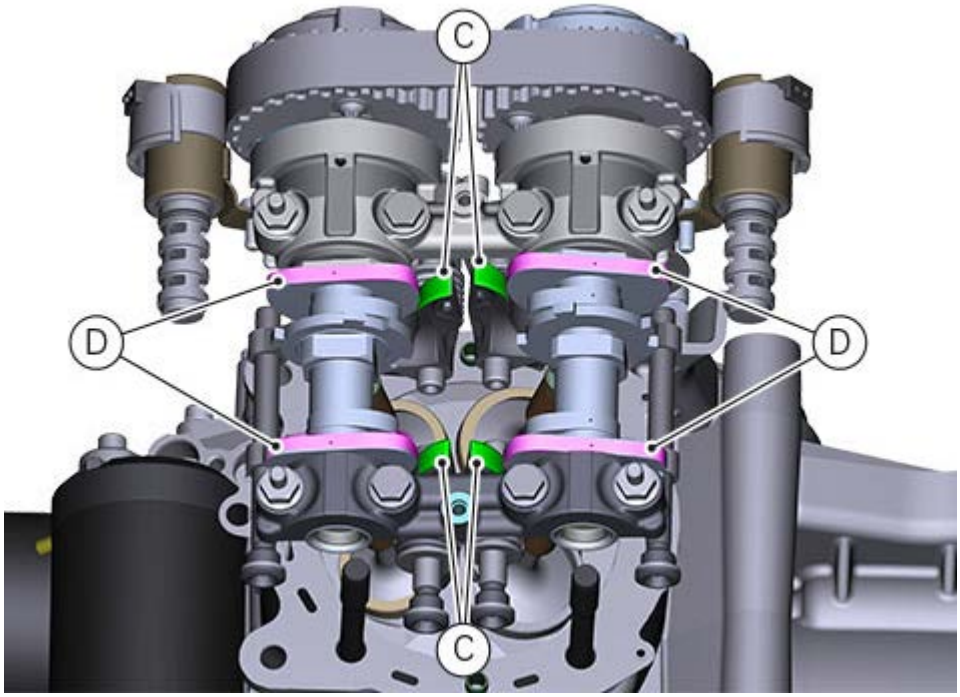
Bring the horizontal cylinder to the TDC and proceed as described in chapter "Timing"

Then, all valves are closed and the camshafts are in rest position, i.e. free to rotate.

Checking the closing clearance

Using a feeler gauge, check the clearance between the closing rocker arm (C) sliding shoe and the highest point of the camshaft lobe (D).

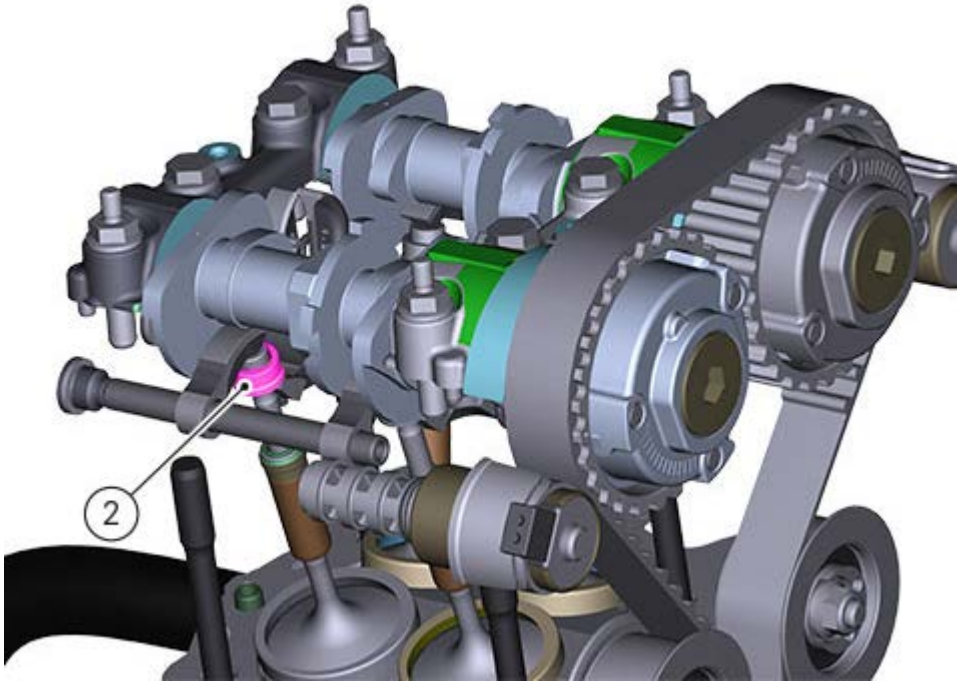




The value must be within the prescribed ones.

VALVES	CLOSING CLEARANCE (mm)
INTAKE	0.05 ÷ 0.10
EXHAUST	0.05 ÷ 0.10

If not, remove the closing shim (2), as described in paragraph "Removing the valves", and replace it with one of suitable height to obtain the prescribed clearance.



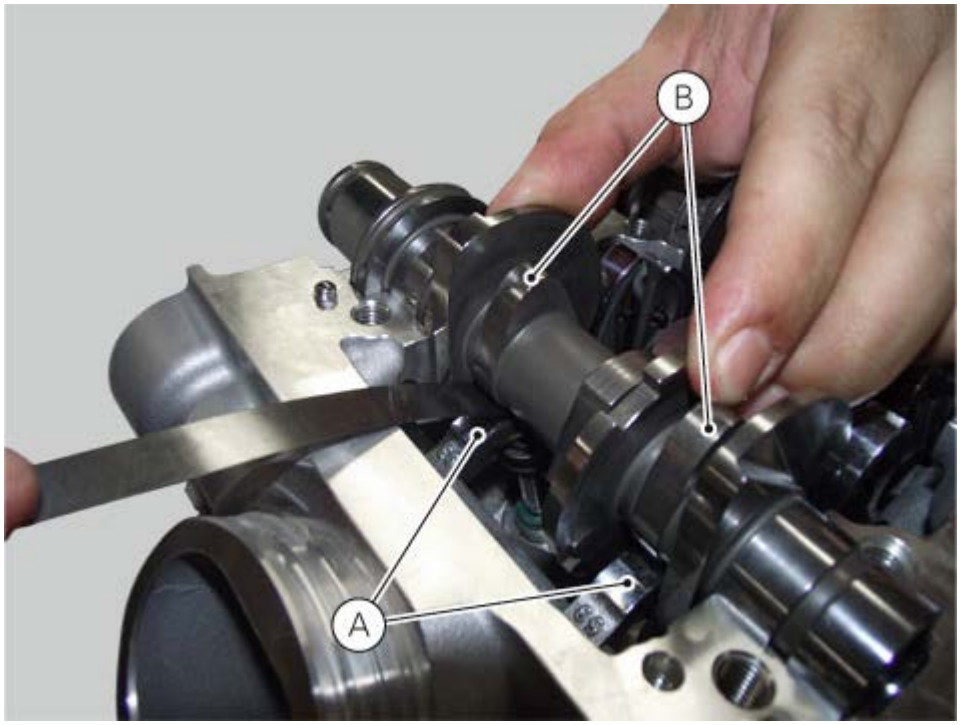
Note

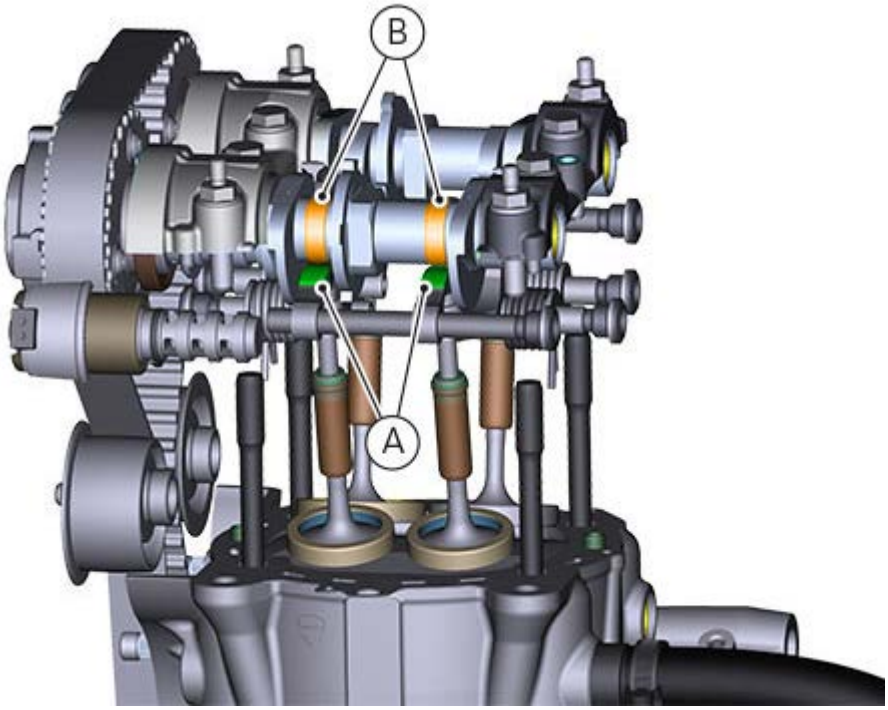
Opening rocker arm shims measuring 1.80 to 3.45 are available as spare parts: the size is punched on the shim.

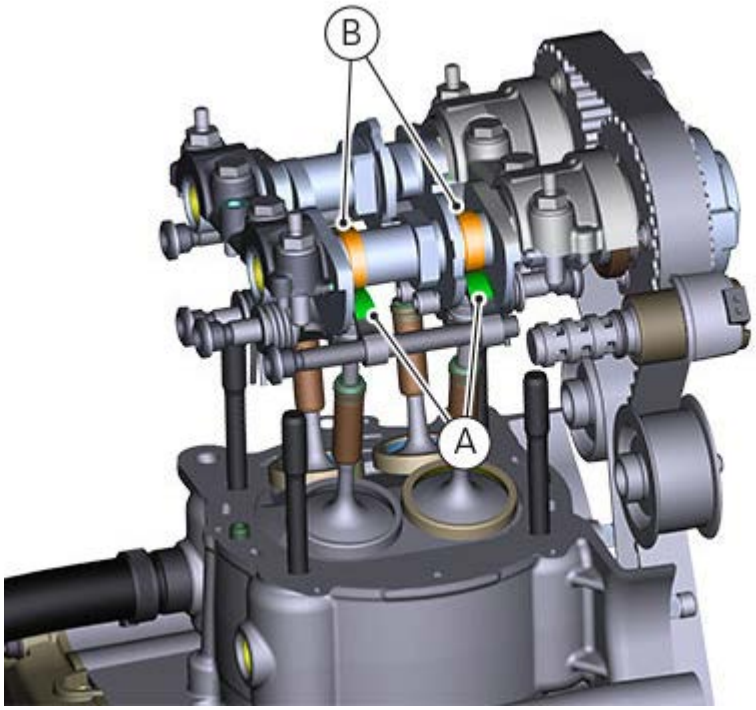
Checking the opening clearance

Using a feeler gauge, check the clearance between the opening rocker arm (A) and the lowest point of the

camshaft lobe (B).



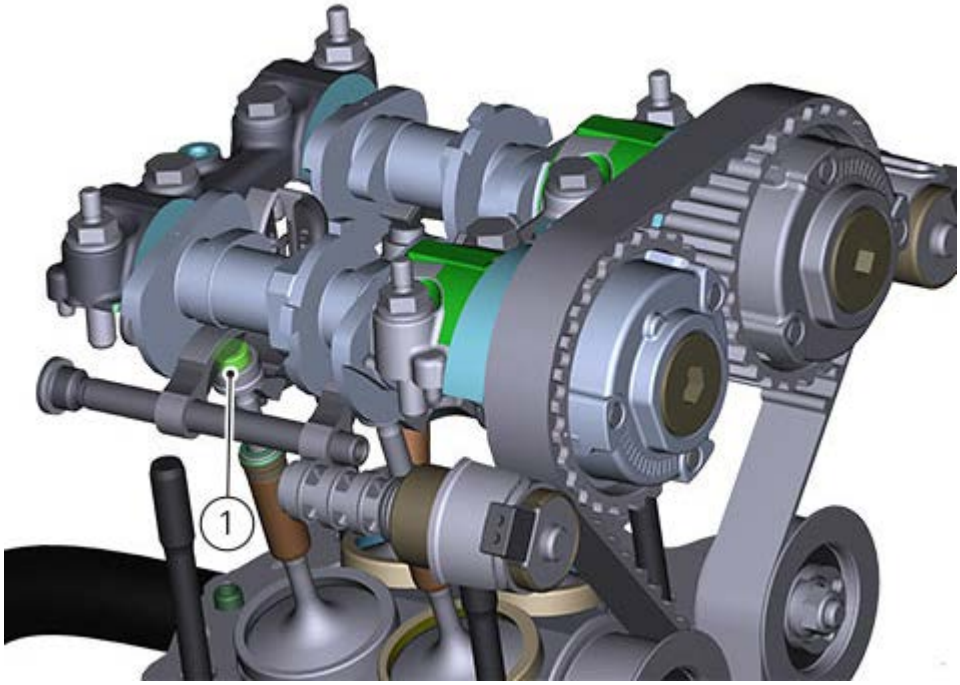




The value must be within the prescribed ones.

VALVES	CLOSING CLEARANCE (mm)
INTAKE	0.13 ÷ 0.18
EXHAUST	0.13 ÷ 0.18

If not, remove the opening shim (1), as described in paragraph "Removing the valves", and replace it with one of suitable height to obtain the prescribed clearance.



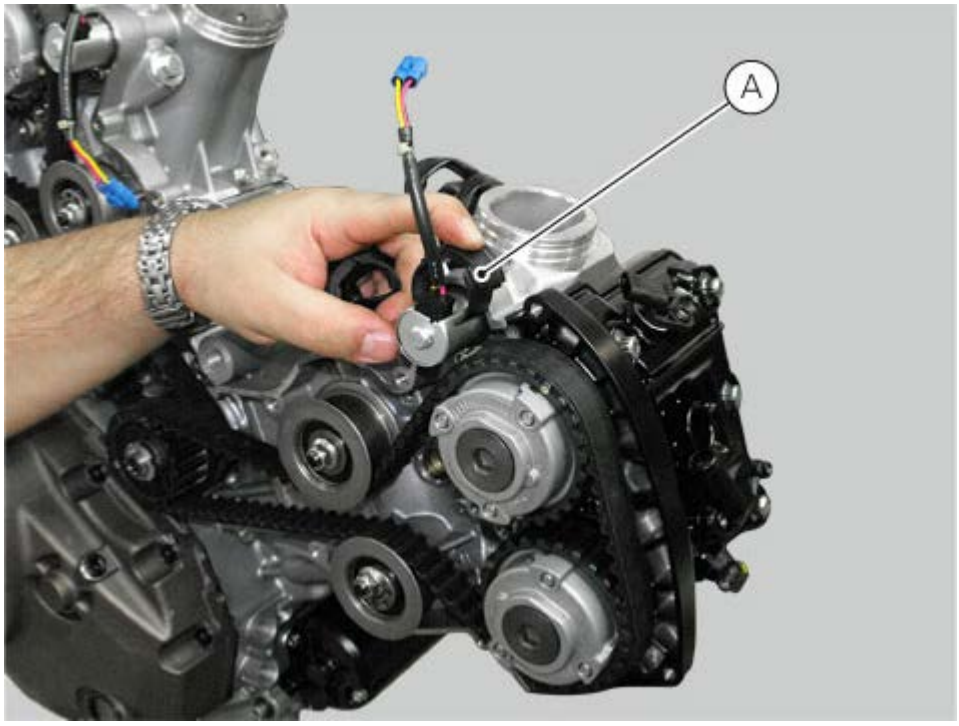
Note

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

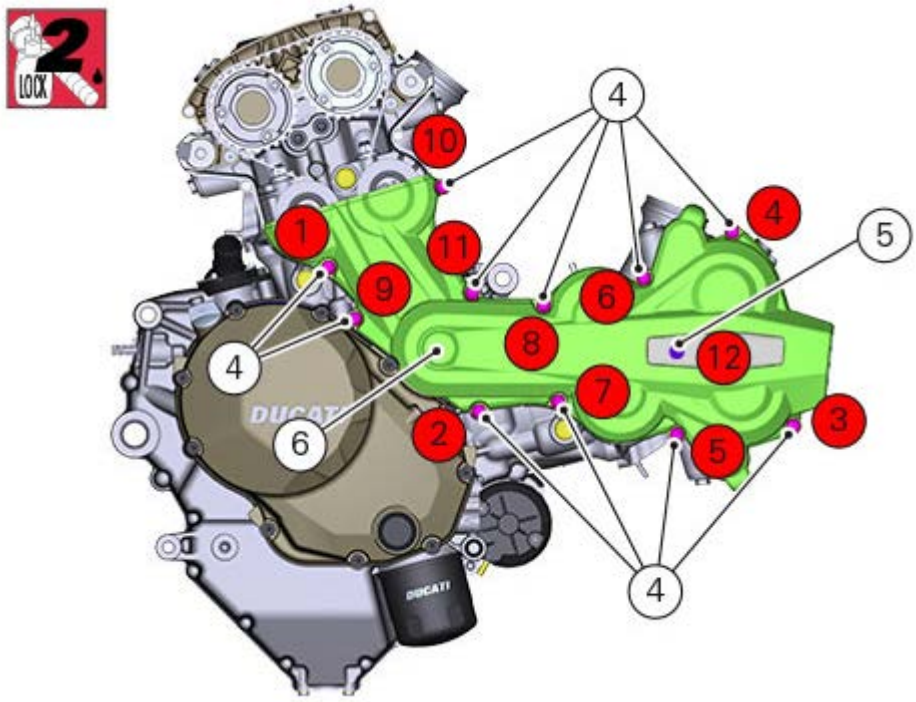
Bring the vertical cylinder to the TDC. Repeat the operations performed on the vertical head for the horizontal head.

Refitting the timing outer covers

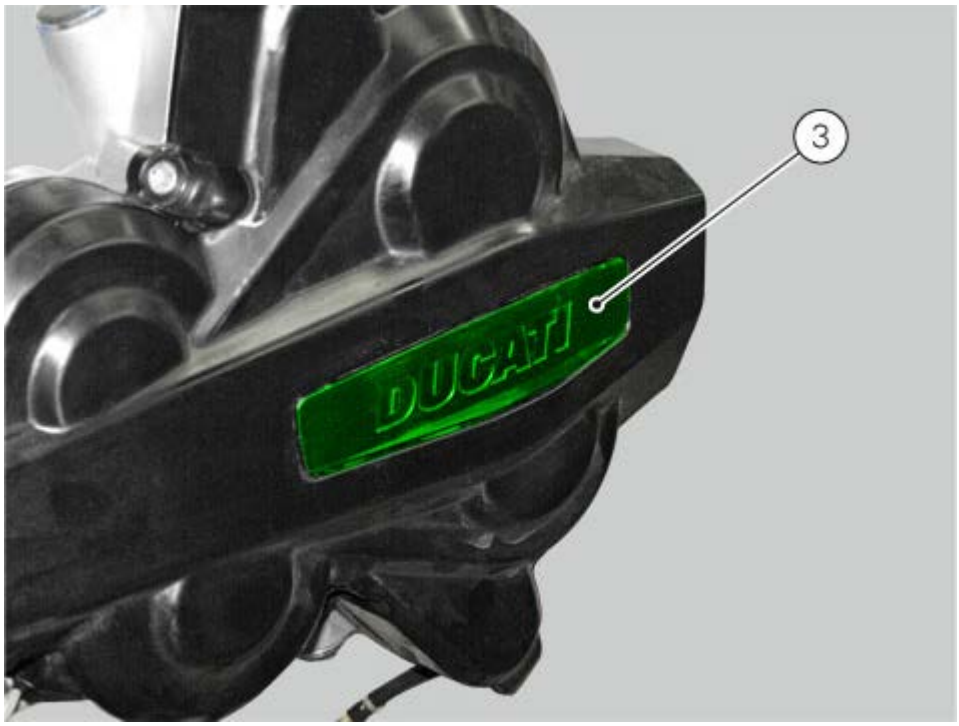
If previously removed, refit the actuator covers (A) on the heads.



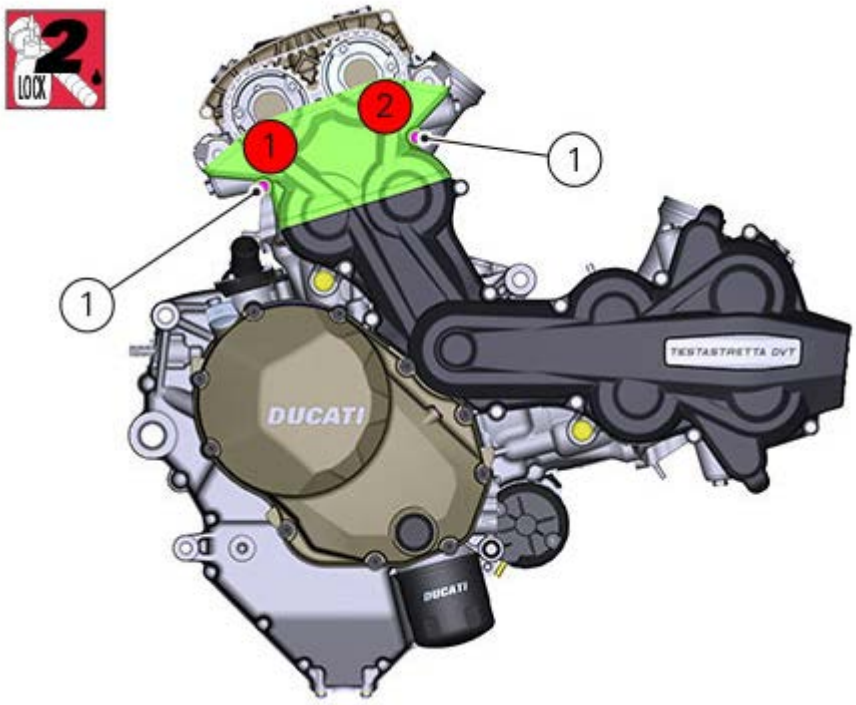
Apply the specified threadlocker to screws (4) and (5).
Position the external cover (6) by starting screws (4) and (5).
Tighten the screws (4) and (5) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm), following the sequence indicated in the figure.



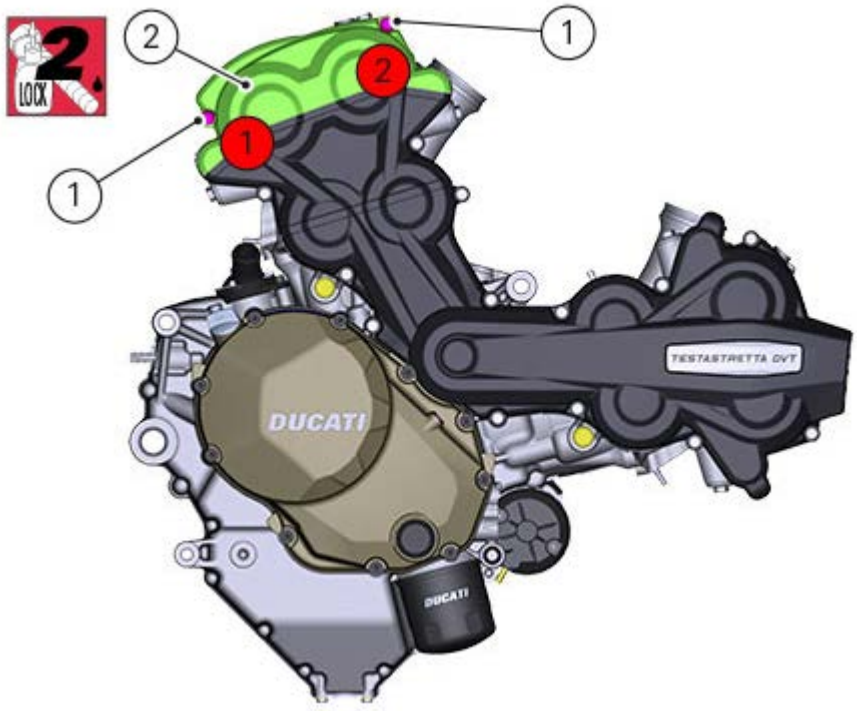
Reposition plug (3).



Apply the recommended threadlocker to the screws (1).
Position the central cover and start the screws (1).
Tighten the screws (1) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm), following the sequence indicated in the figure.



Apply the recommended threadlocker to the screws (1).
Position upper cover (2) by starting screws (1).
Tighten the screws (1) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm), following the sequence indicated in the figure.



Note

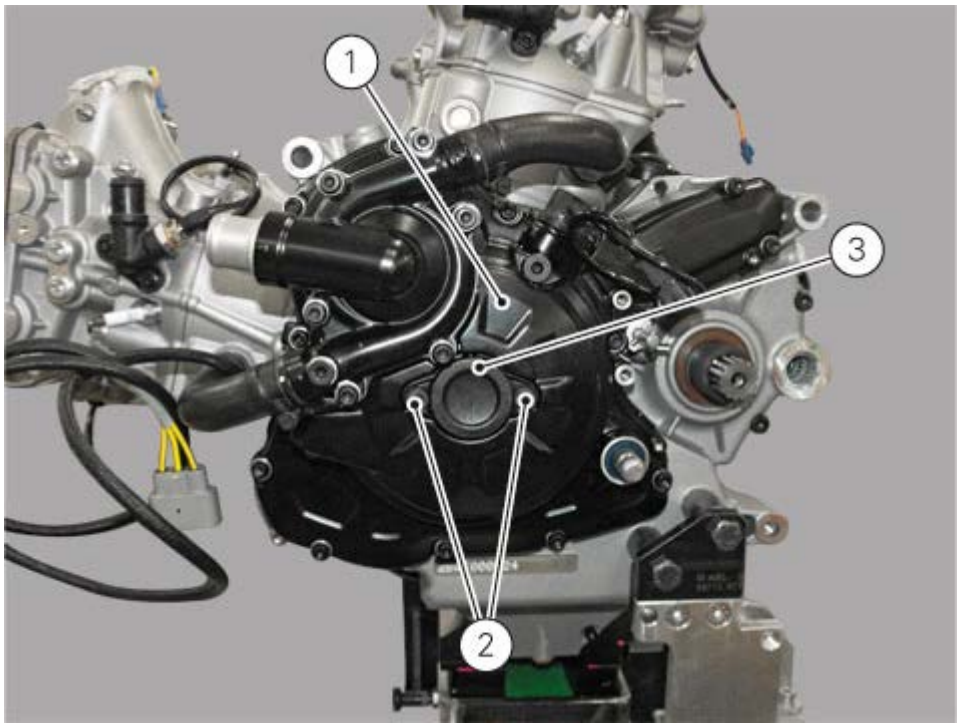
If the above operations have been carried out with the engine installed in the frame, refit the previously removed parts.

Refitting the timing belts

Remove the external belt covers (Removing the timing belt external covers).
Remove the cylinder head covers (Removing the head covers).
Remove the timing belts (Removing the mobile tensioner/timing belt).

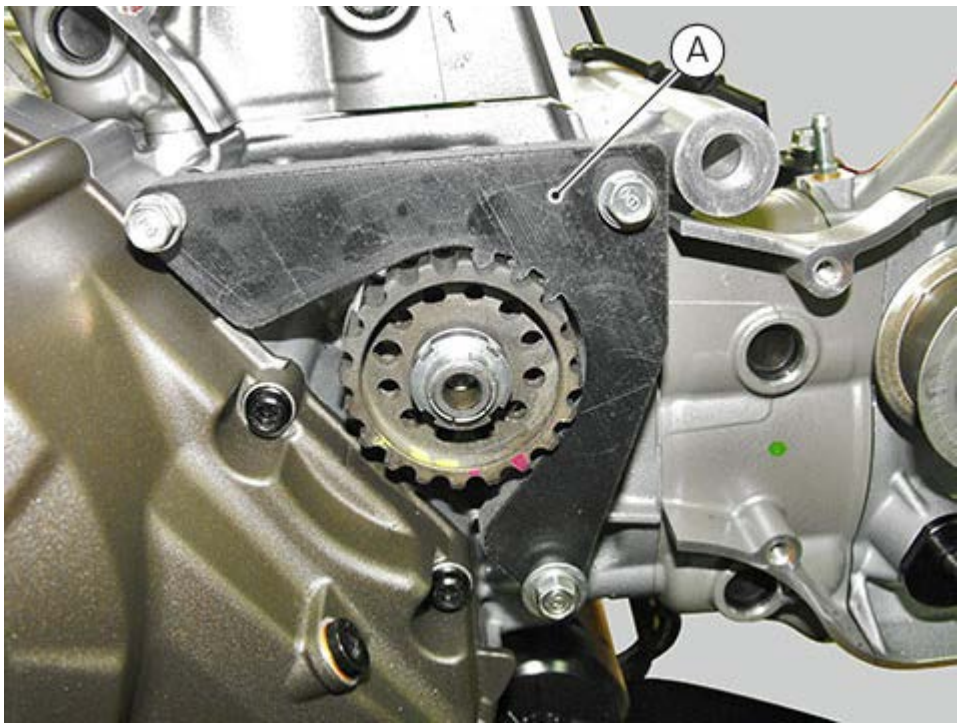
Working on the generator cover (1) loosen the screws (2) and remove cover (3).

For better clarity, some of the following figures show the engine removed from the frame.

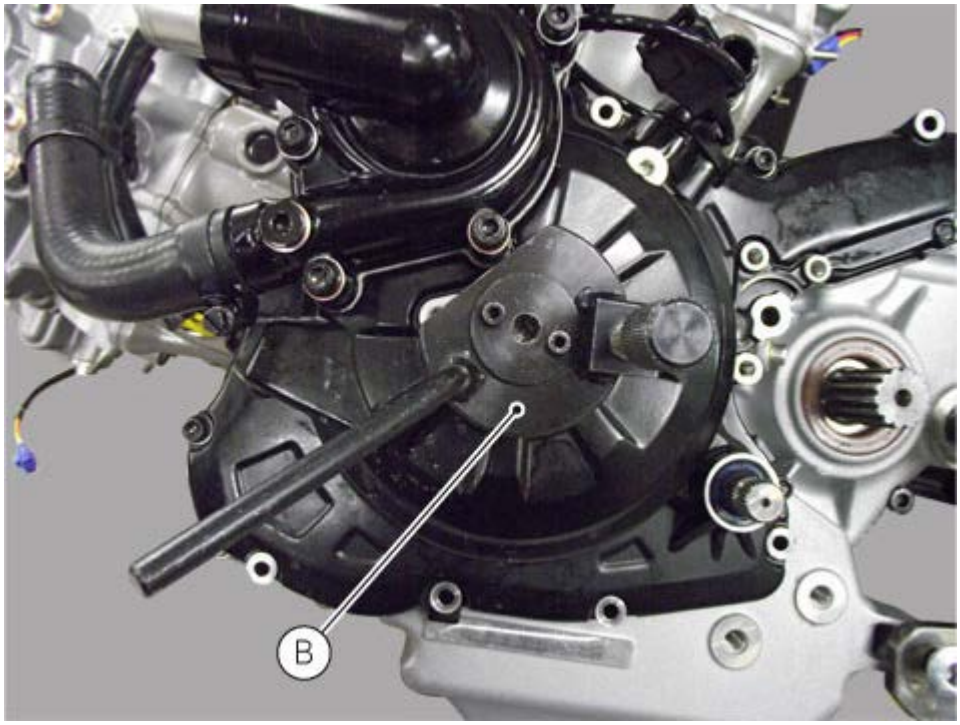


Use tool no. **88765.1523** to rotate the crankshaft in the vehicle direction of travel (by looking the tool from the front side, counter clockwise), to bring the horizontal cylinder piston to the TDC.

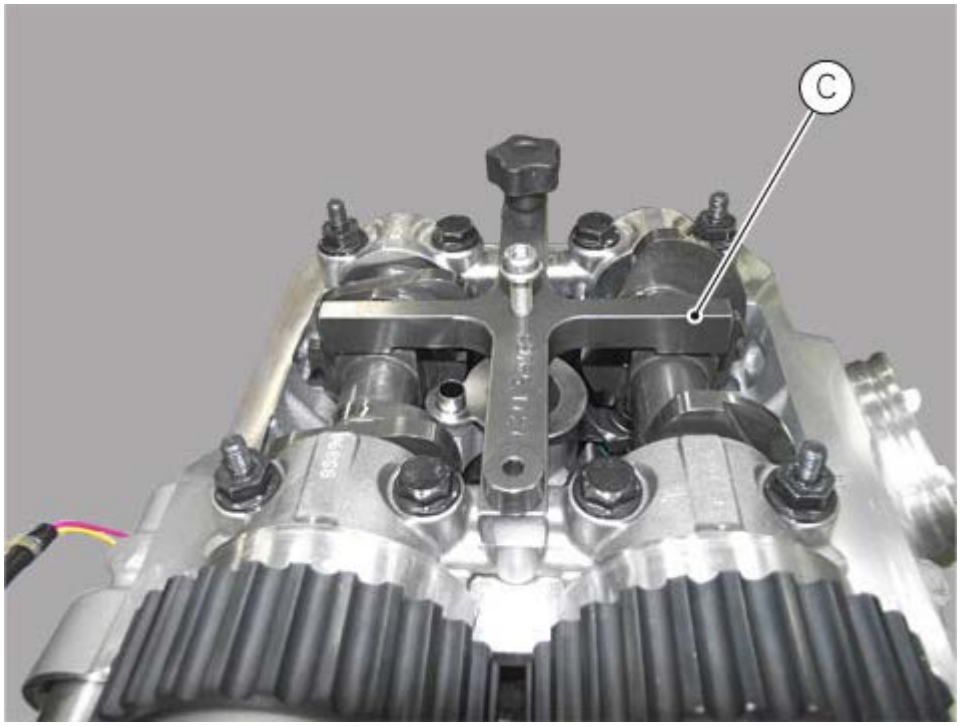
In this condition, the check tool (A) no. **88713.5009** fitted on the timing layshaft pulley must perfectly match with the crankcase holes.
If this is not the case, rotate the crankshaft until reaching the TDC again and try refitting the tool.
For this type of engine, there is just one TDC that allows performing a correct timing.



When the timing is correct, fit tool (B) no. **88713.2011** to block the crankshaft.

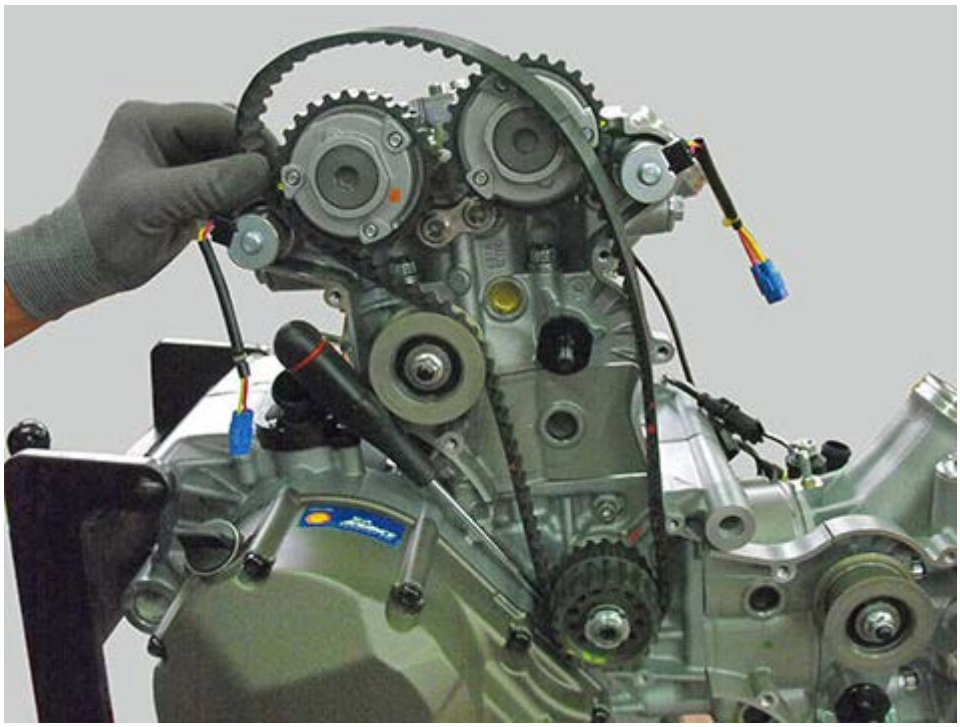


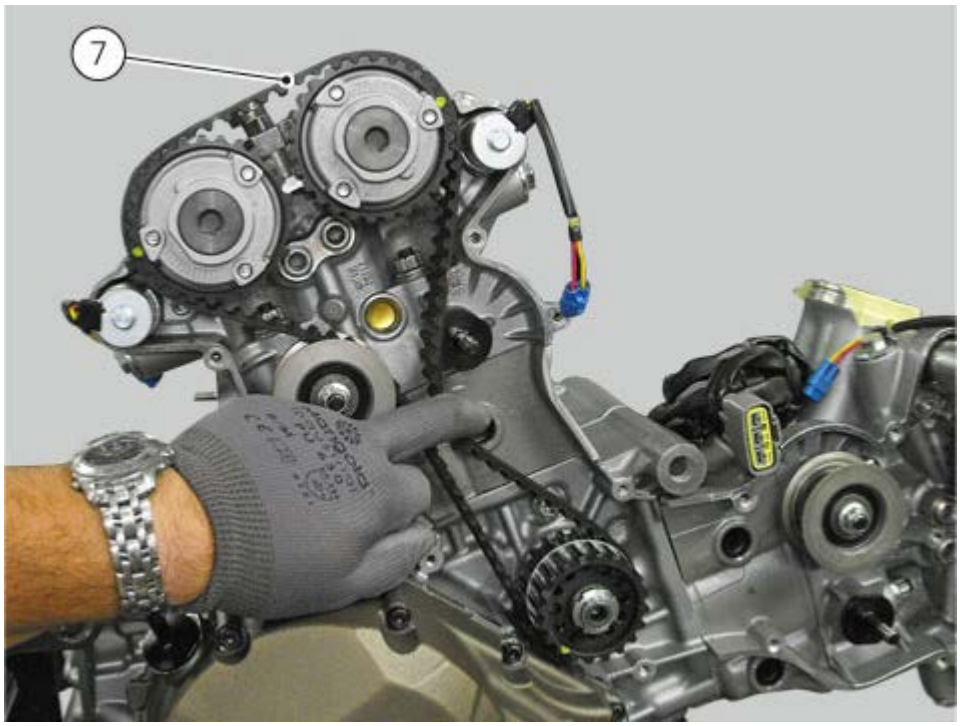
On the vertical head install tool (C) part no. **88765.1737**.



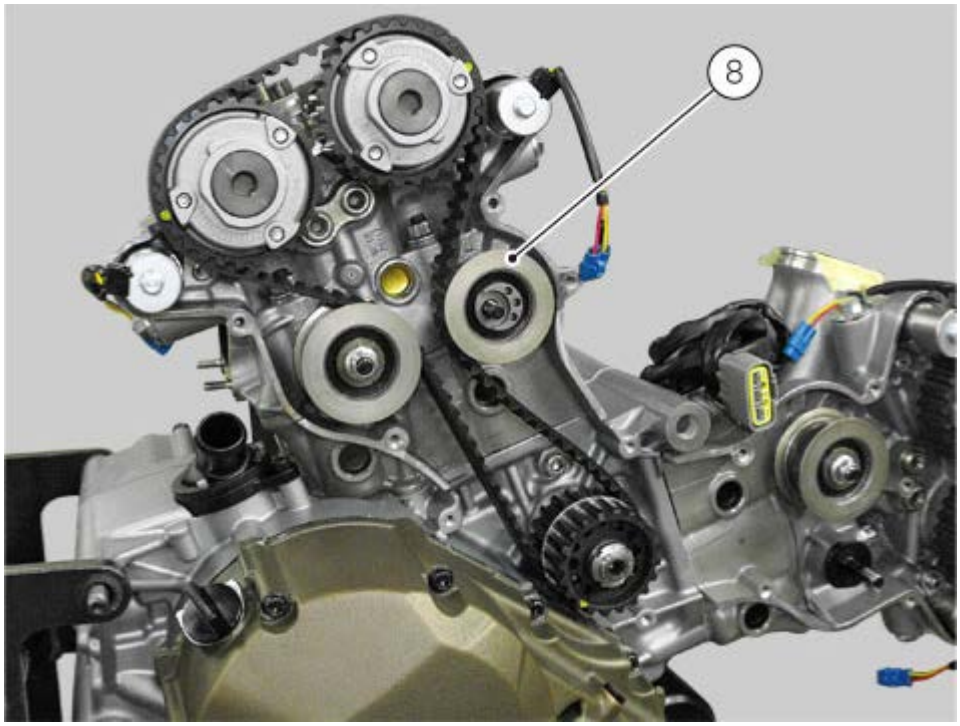
Check the variators alignment, i.e. they must be flush with the "head flat surface".

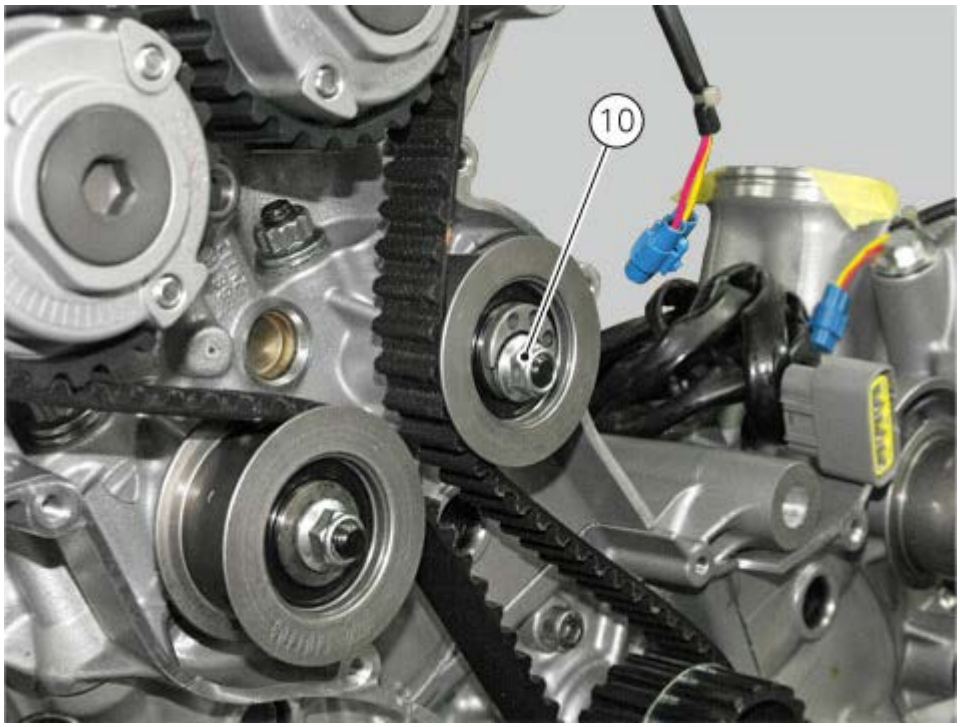
Fit the belt (7) as shown in the figure using a screwdriver to tension it.



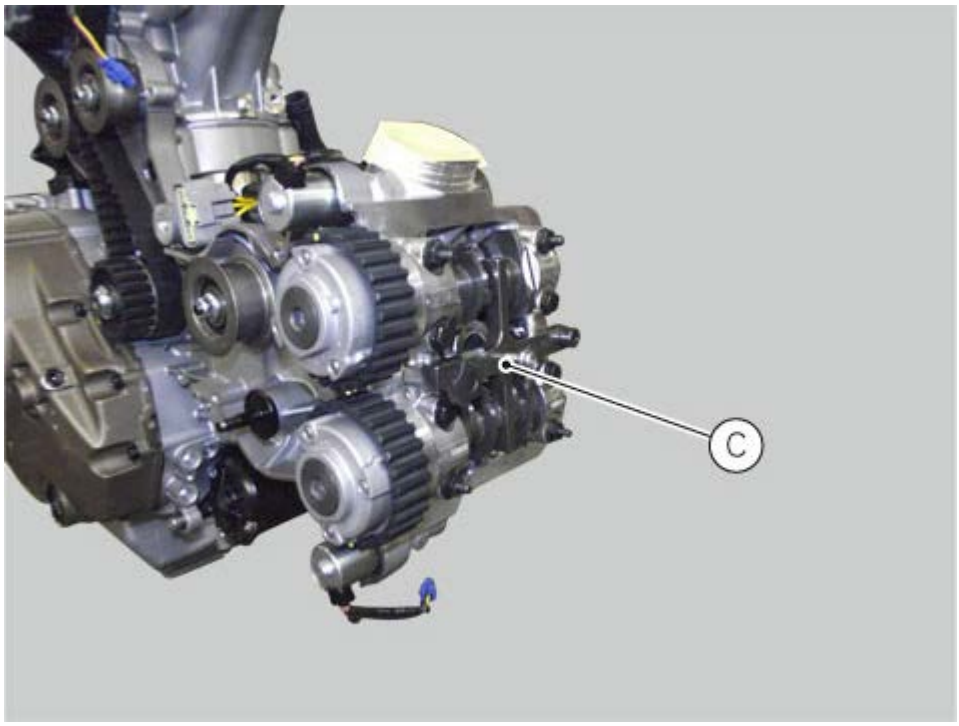


If previously removed, fit the chain tensioner (8), washer (9) and tighten it by means of nut (10). Do not tighten to torque.

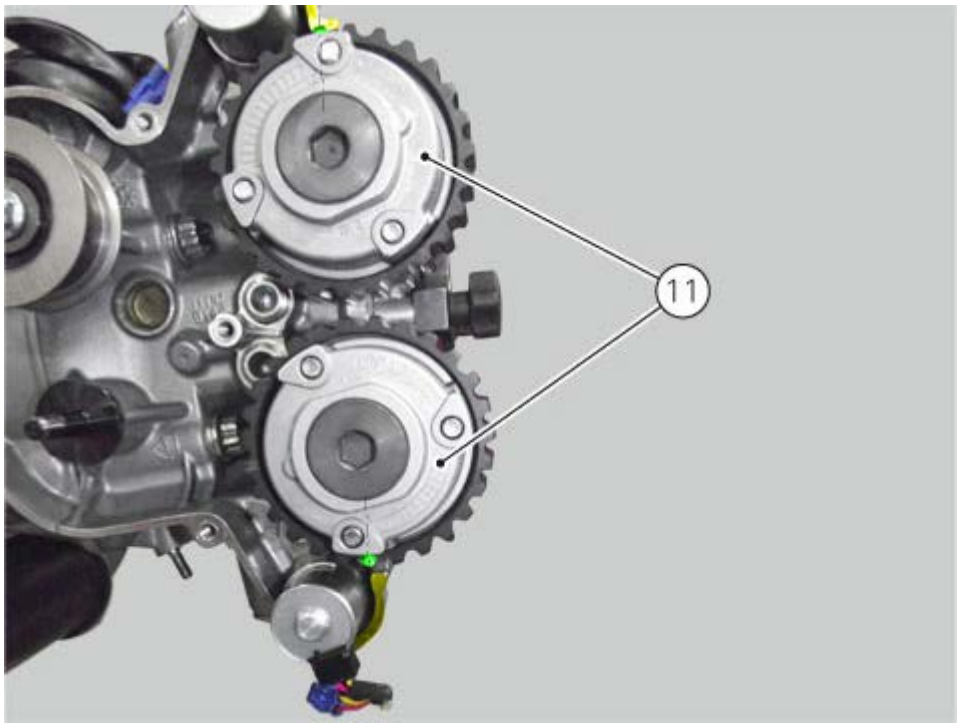




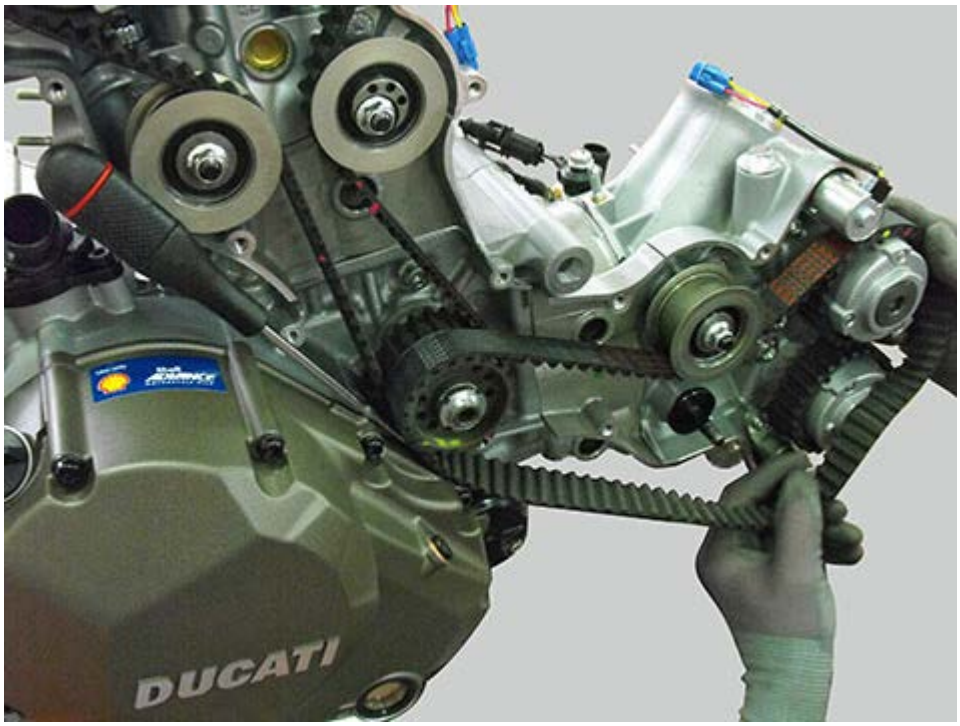
Remove tool (C) part no. **88765.1737** and fit it on the horizontal head.

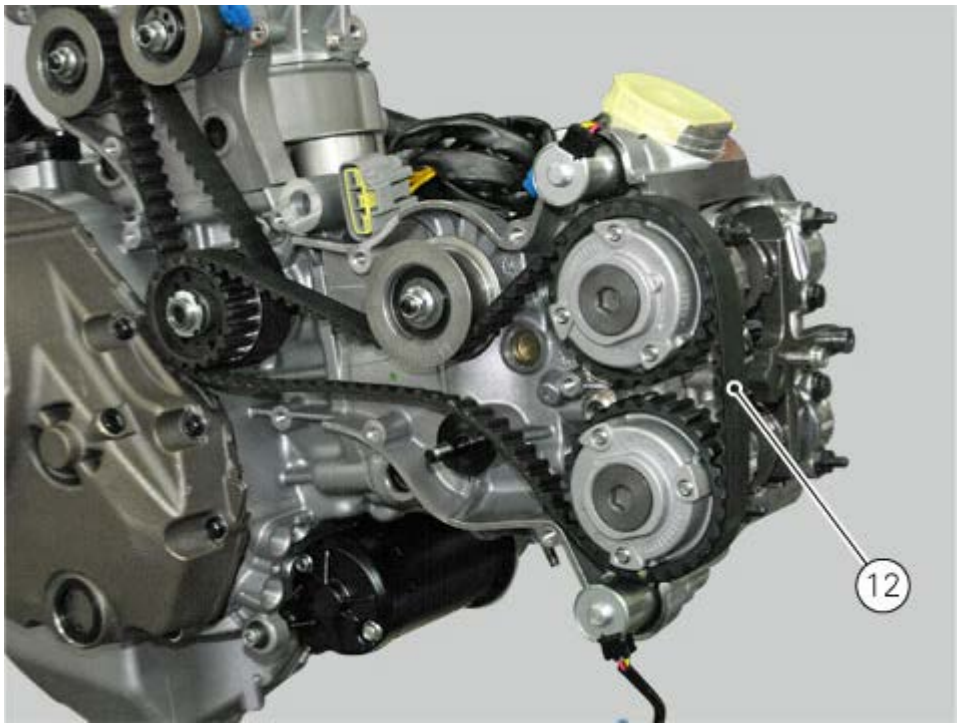


Check on the variators (11) that the references are aligned with the "head flat surface".

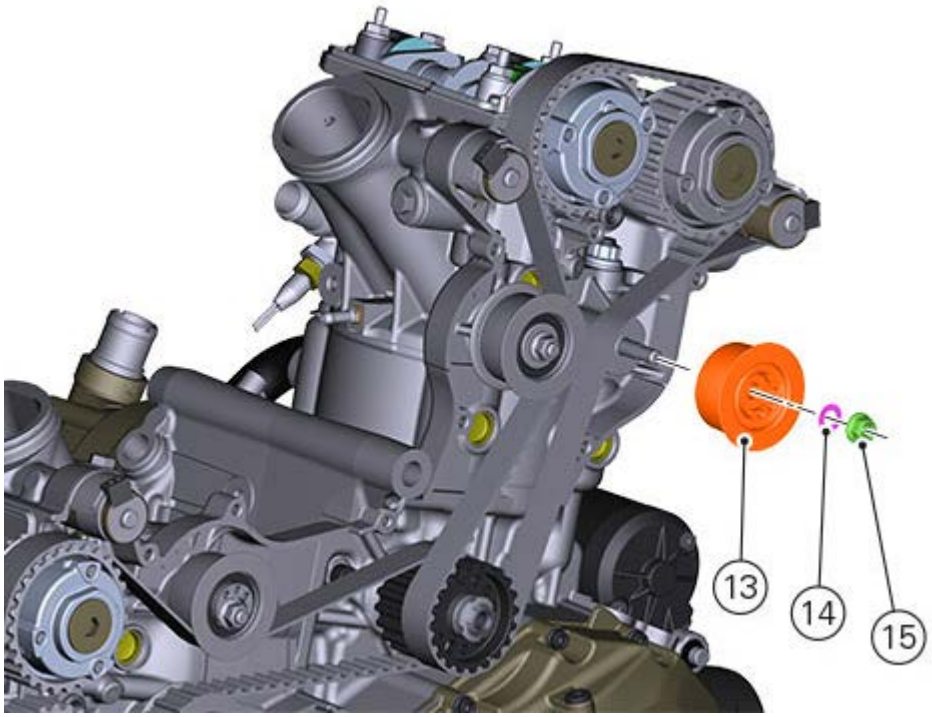


Fit the belt (12) in the horizontal head as shown in the figure using a screwdriver to tension it.



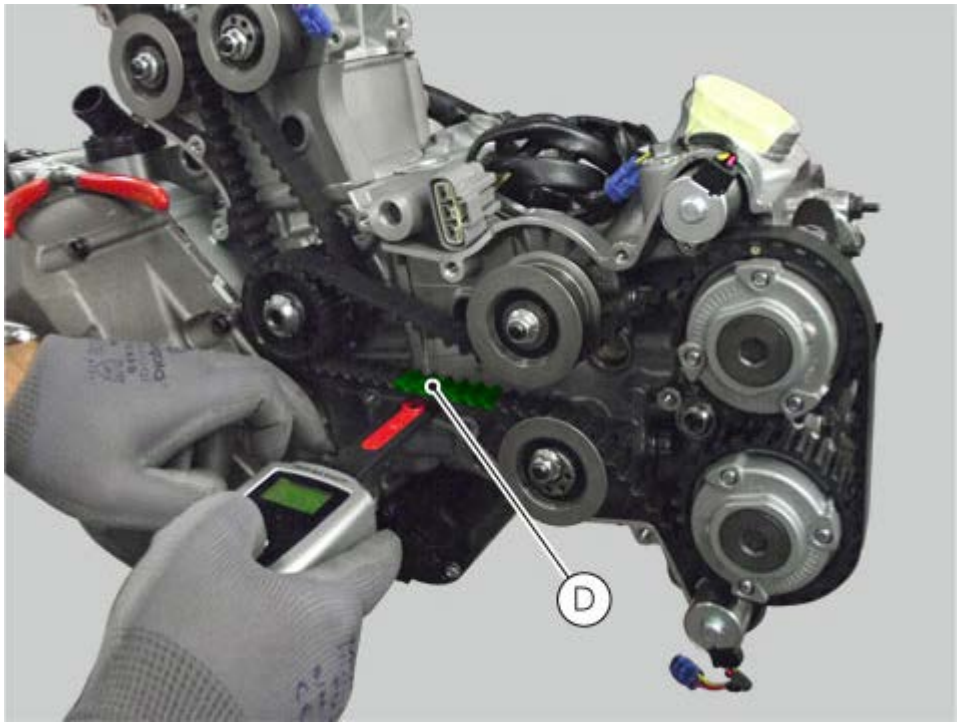


If previously removed, fit the chain tensioner (13), washer (14) and tighten it by means of nut (15).
Do not tighten to torque.



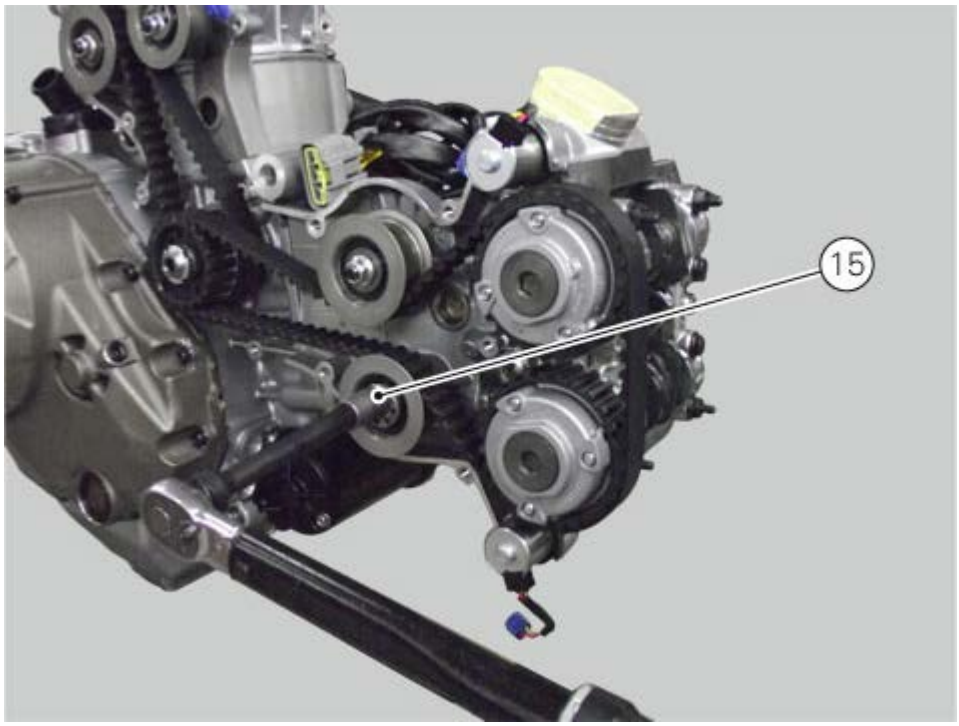
Remove the camshaft locking tool.

Check the horizontal head belt tension in the indicated point (D).
Tension the belt according to the values indicated in the table.



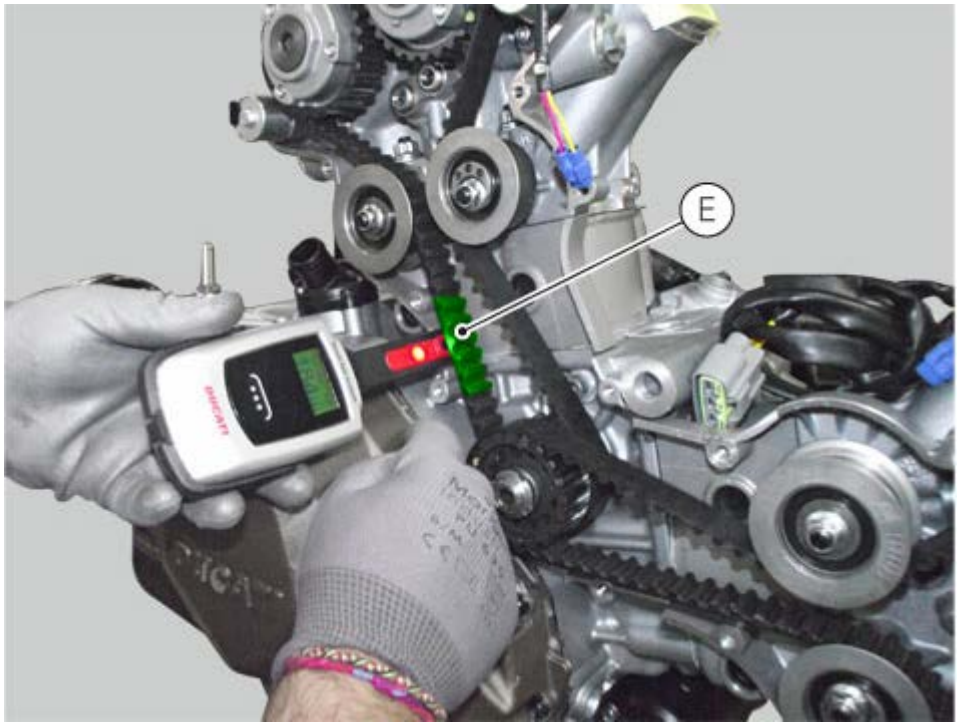
	Reference	**Assembly Value (new belt)**	**Assembly Value (used belt)**
Cold belt tension adjustment	DDS 2	90 ± 5 Hz (horizontal) 90 ± 5 Hz (vertical)	80 ± 5 Hz (horizontal) 80 ± 5 Hz (vertical)

Tighten nut (15) to a torque of 25 Nm (Min. 22 - Max. 28).



Rotate the crankshaft by 270° in its rotation sense so as to bring the vertical cylinder piston to the stroke TDC.

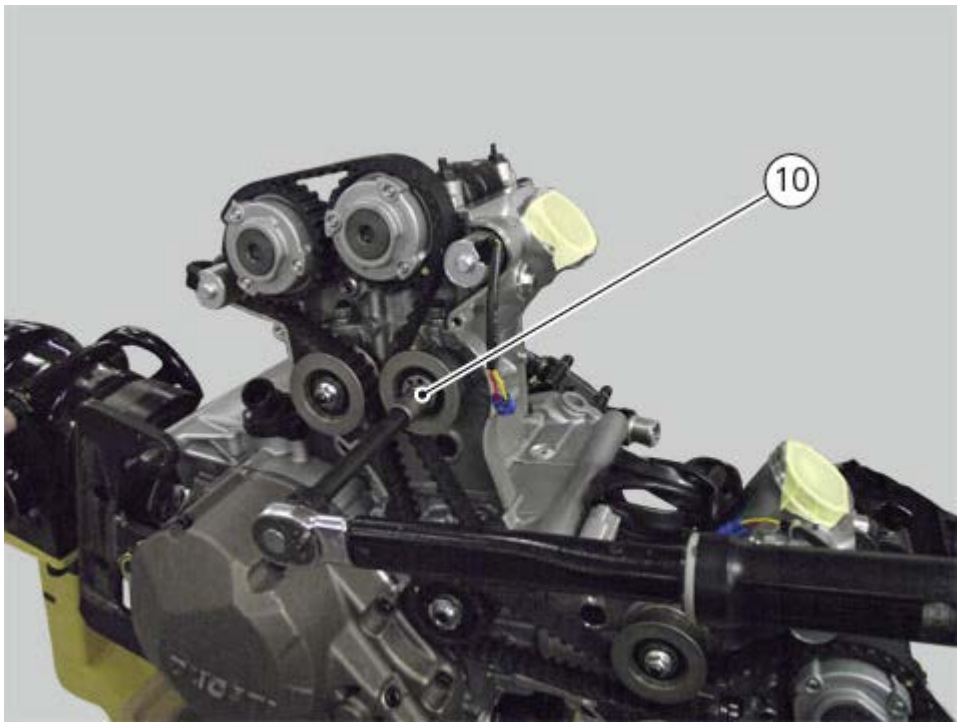
Check the vertical cylinder belt tension in the indicated point (E).
Tension the belt according to the values indicated in the table.



	Reference	**Assembly Value (new belt)**	**Assembly Value (used belt)**
Cold belt tension adjustment	DDS 2	90 ± 5 Hz (horizontal) 90 ± 5 Hz (vertical)	80 ± 5 Hz (horizontal) 80 ± 5 Hz (vertical)

Note
With used belt we mean after the first heating up of the engine.

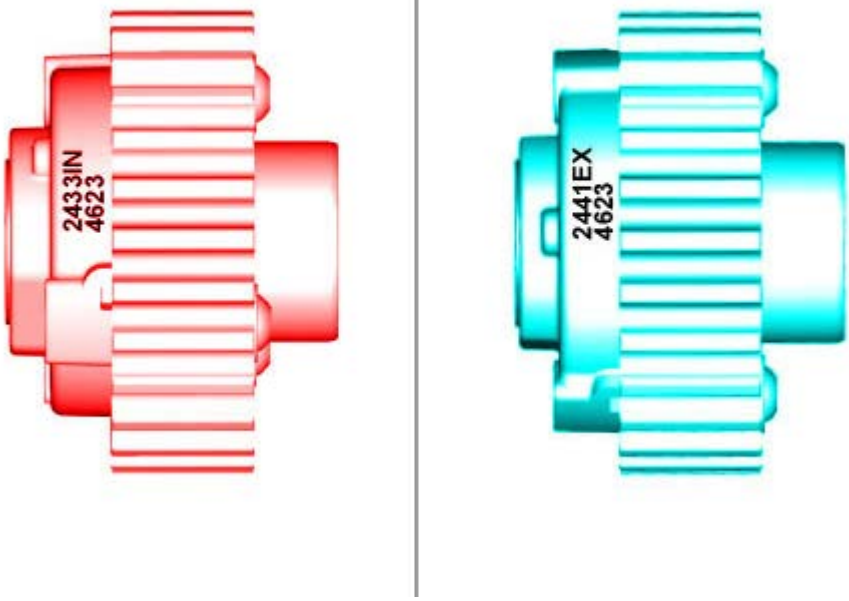
Tighten nut (10) to a torque of 25 Nm (Min. 22 - Max. 28).



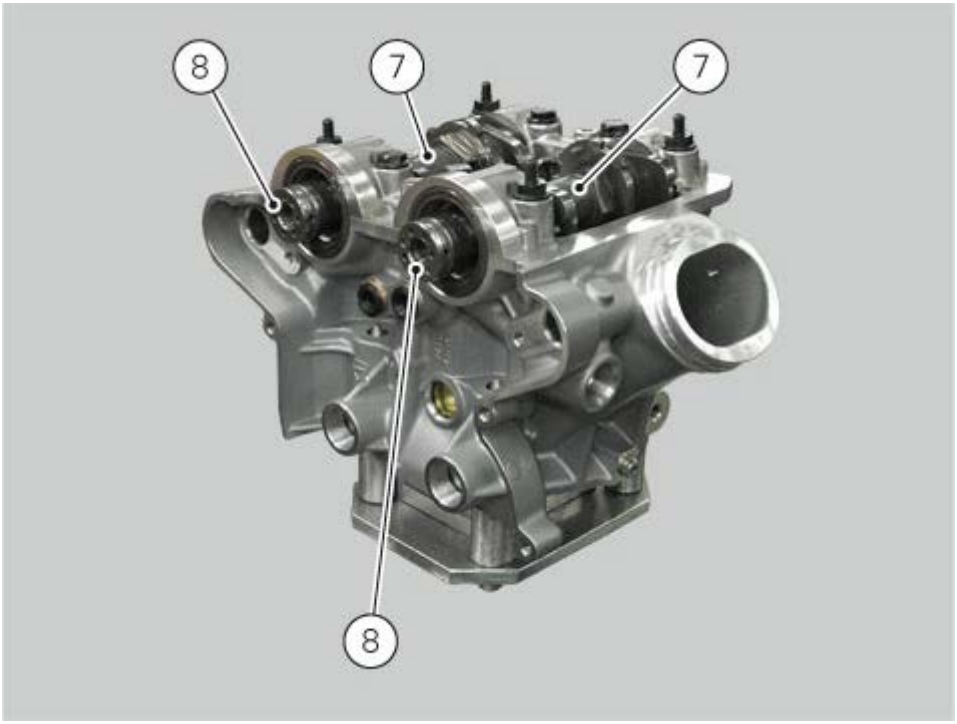
Remove all the previously installed tools.
Refit the cylinder head covers (Refitting the camshafts).
Refit the external timing belt covers (Refitting the timing belt external covers).

Refitting the cylinder heads pulleys/idler pulleys

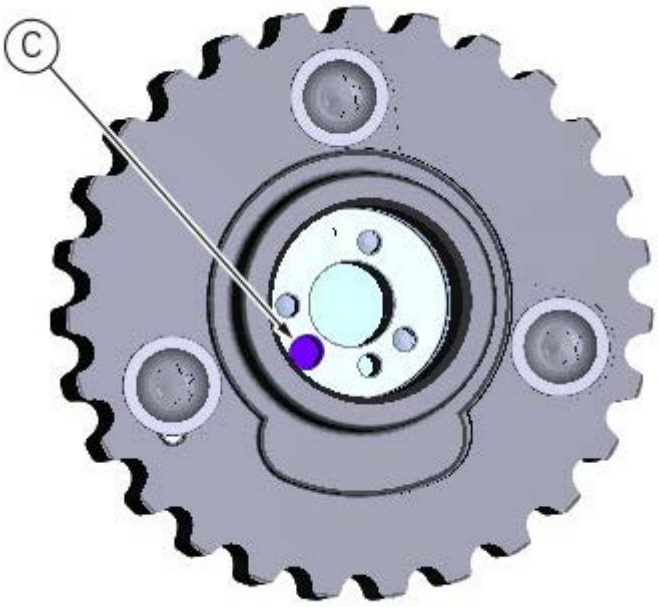
Check the pulleys of the intake side "IN" and of the exhaust side "EX".

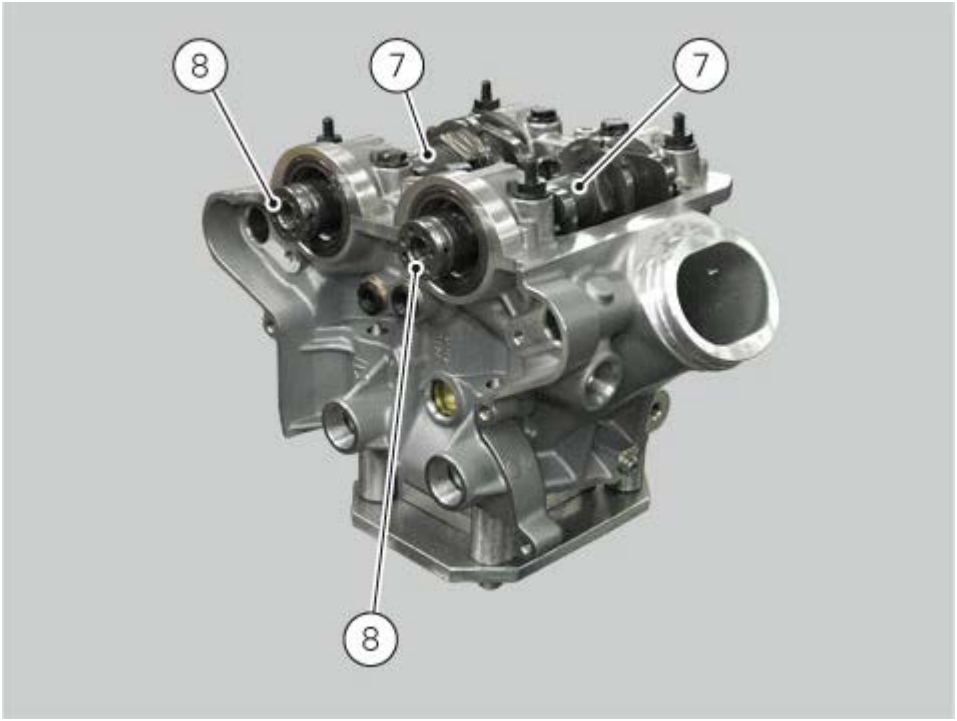


Check that pins (8) are present on the camshafts (7).
Take special care when positioning the pins (8). They must protrude by 4÷5 mm.



Insert the pulley fully home on the camshaft by centring pin (8) in hole (C).





Lubricate screws (5) with the indicated product and tighten them by respecting the following sequence:

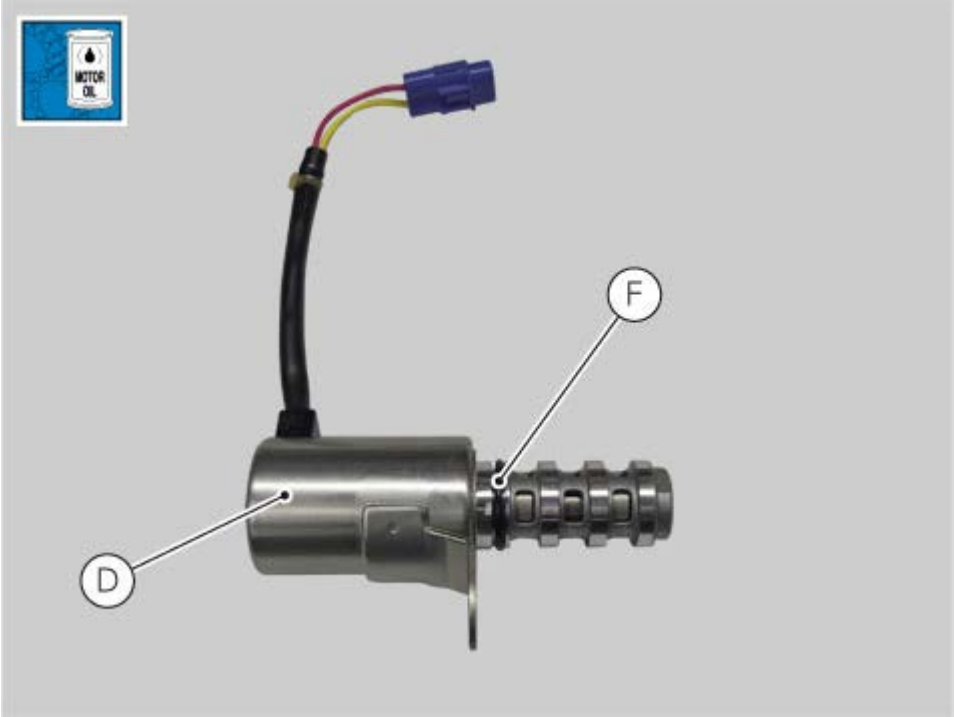
- pre-tightening to 20 Nm ± (Min. 18 - Max. 22);
- check clearance between pulley and camshaft;
- final tightening to 90 Nm ± (Min. 85 - Max. 95);
- check clearance between pulley and camshaft.

Fit the two rings on the two plugs (4).
Start plugs (4) and tighten them to a torque of 20 Nm (Min. 18 – Max. 22).

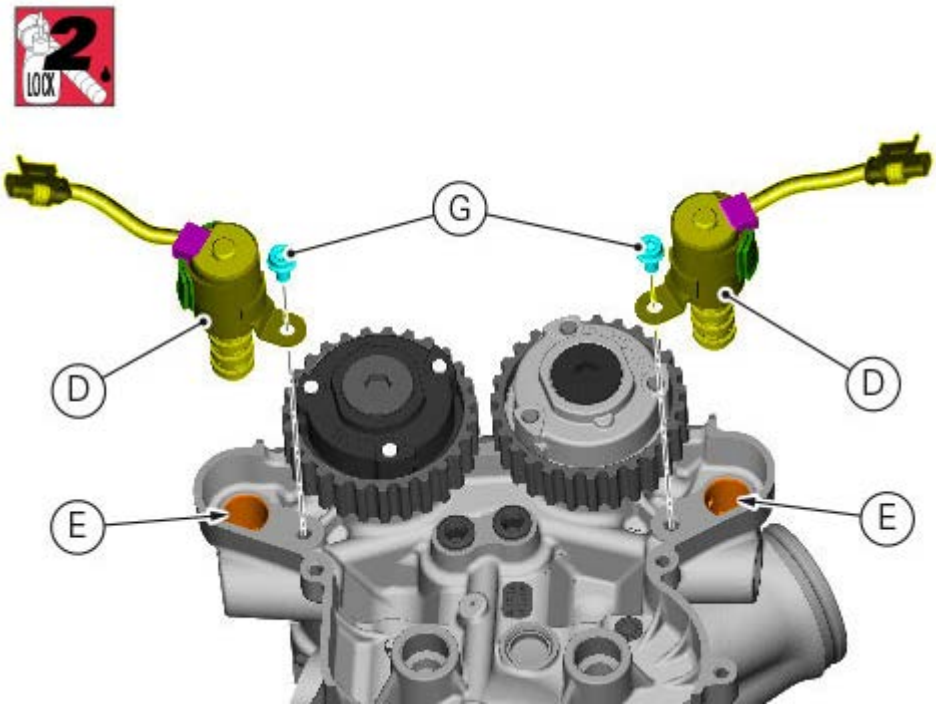
Fitting the variable timing actuators

If previously removed, fit the variable timing variators (D).

Use the indicated product to lubricate the O-rings (F).

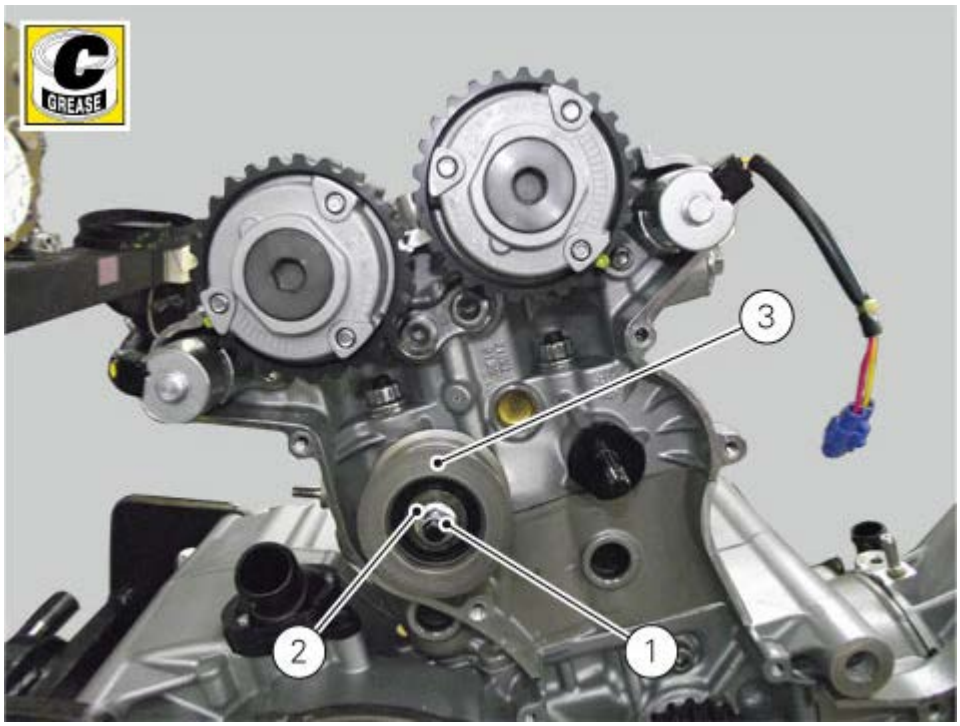


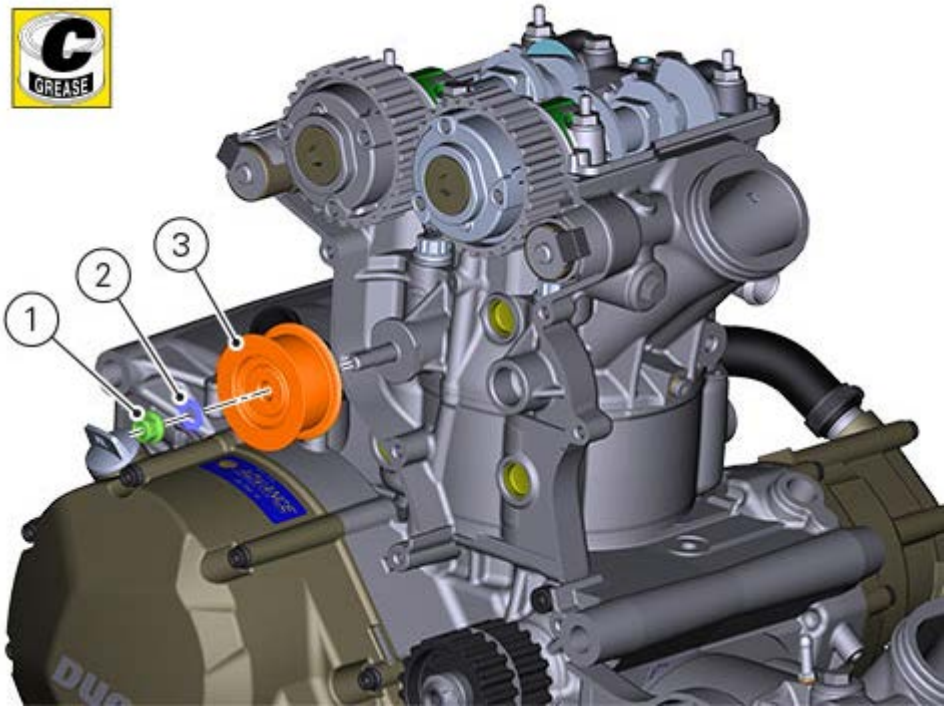
Make sure that ducts (E) on the head are perfectly clean.
Fit the two actuators (D) fully home by slightly forcing them to overcome the O-ring force (F).
Apply the recommended threadlocker on the thread of screws (G) and tighten them to 10 Nm (Min. 9 - Max. 11).



Fixed tensioner

Apply the indicated product and insert the fixed tensioners (3) with relevant bearing and washers (2), in the head pins and tighten nuts (1) to a torque of 25 Nm (Min. 22 Nm - Max. 28 Nm).

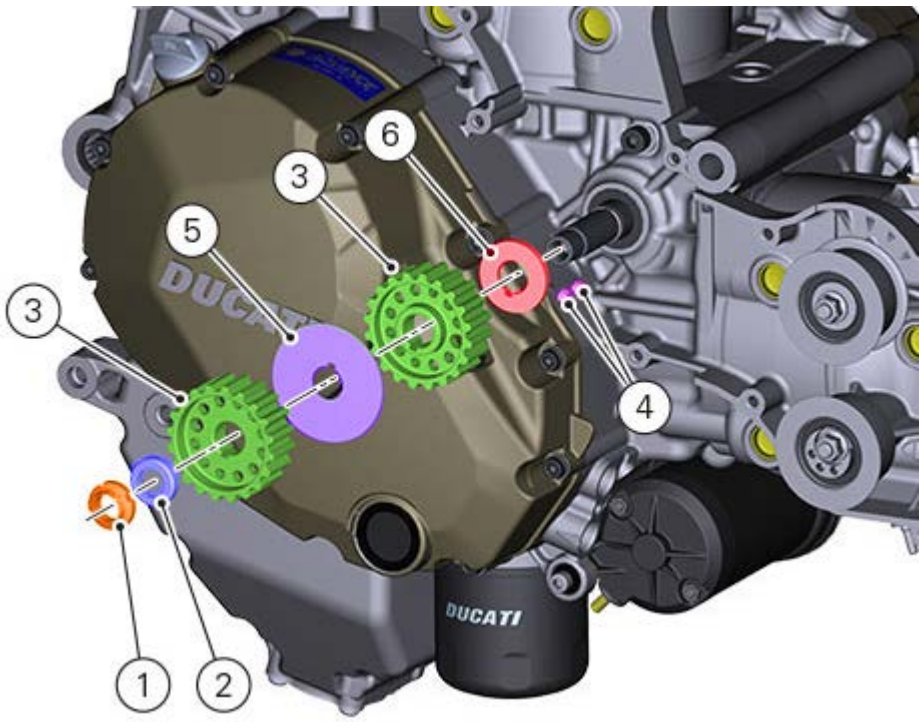

C
GREASE
3
2
1


C
GREASE
1
2
3

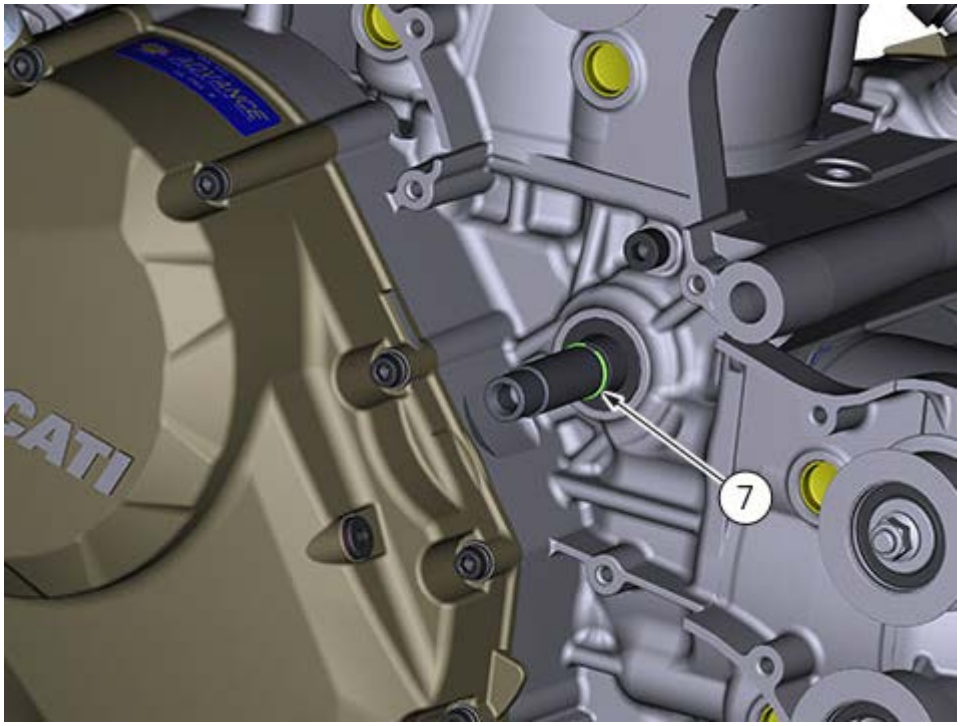
Refitting the tensioner pins

Apply the recommended threadlocker to the pin thread.
Insert the tensioner pins (1) on the heads and tighten them with tool (A) no. **88713.1821**.
Tighten the tensioner pins to a torque of 50 Nm (Min. 45 Nm - Max. 55 Nm).

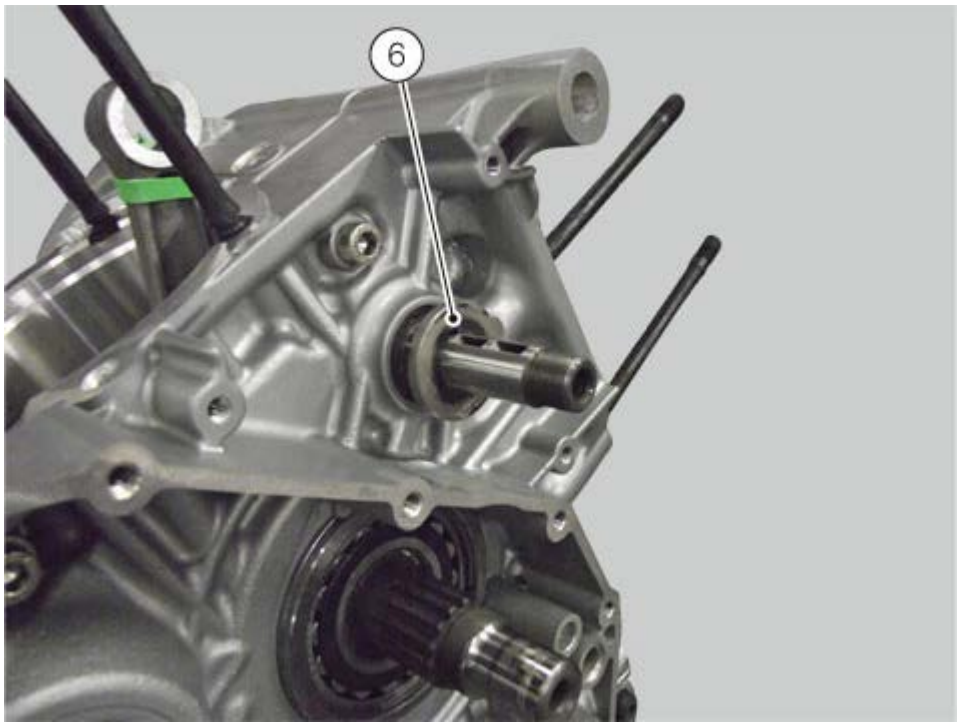
Refitting the timing layshaft pulley



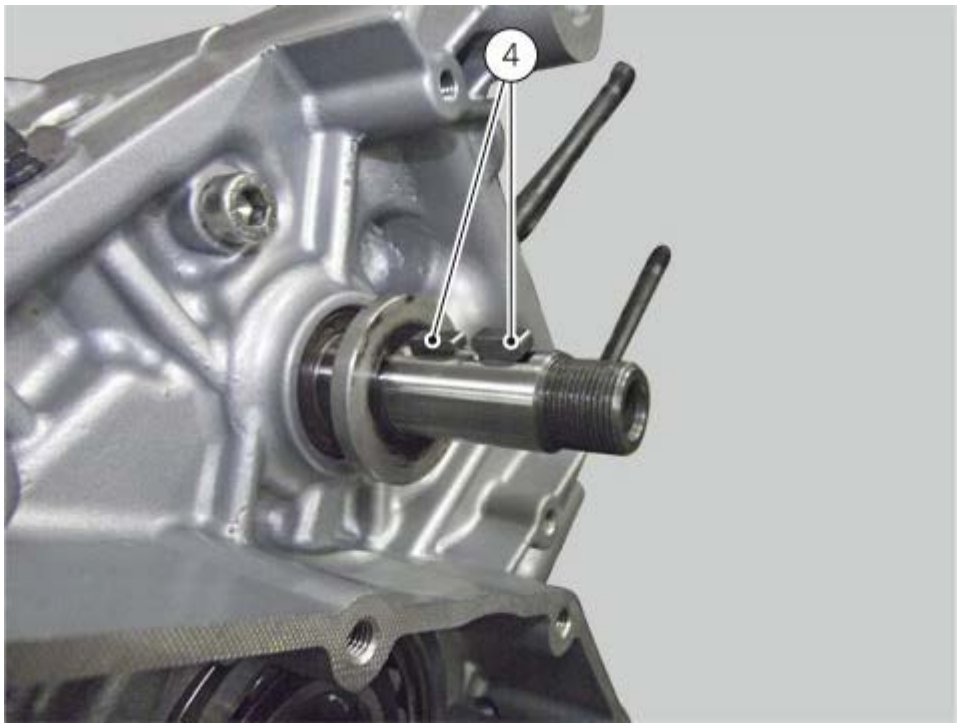
To fit the snap ring (7) in the timing layshaft seat, use the tool no. **88713.2834**.



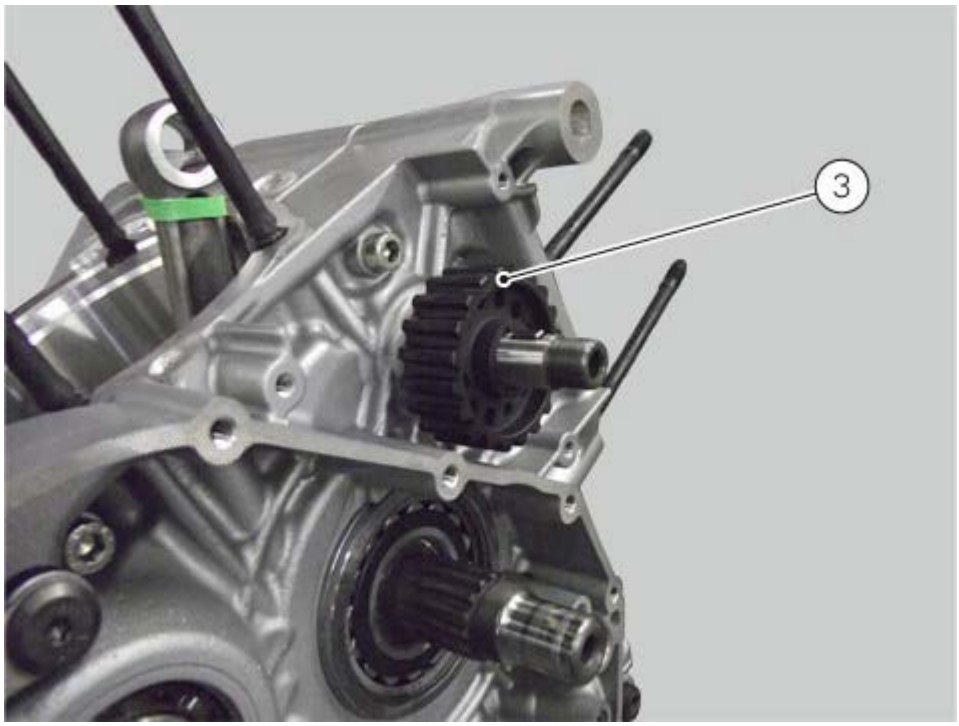
Install the inner spacer (6) on the timing layshaft, taking care to match the key notch.



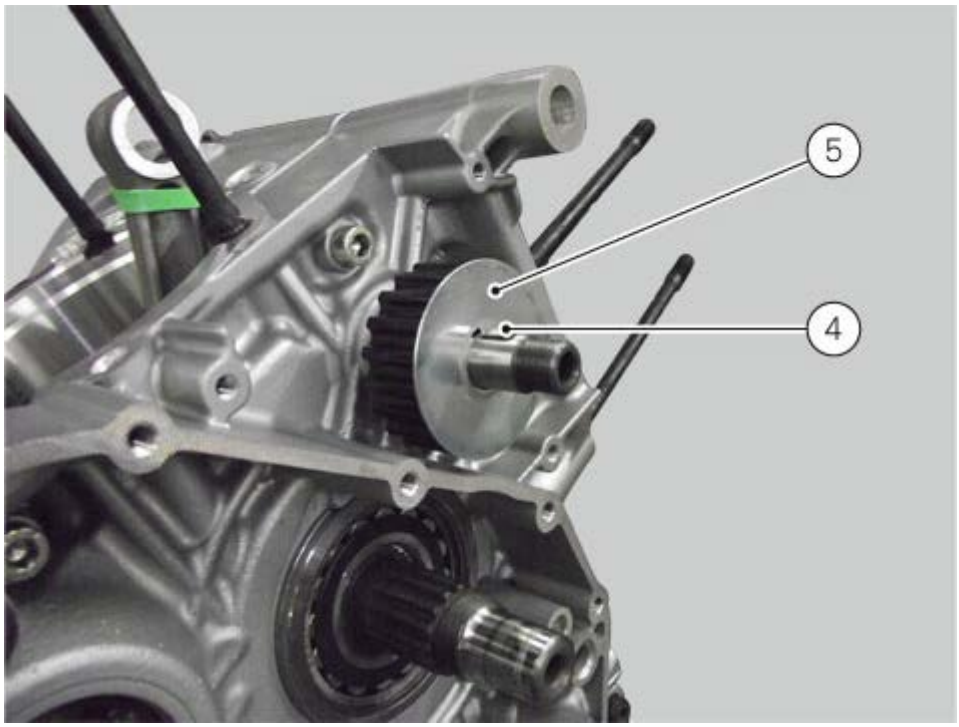
Fit the first key (4) on the timing layshaft.



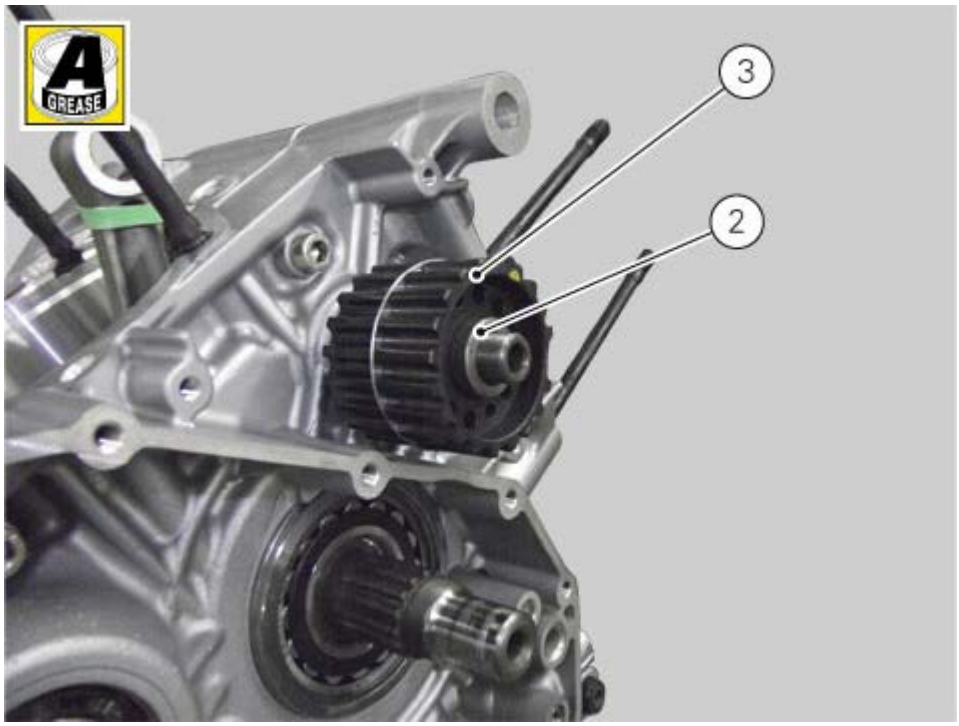
Locate the inner pulley (3).



Refit the second key (4) and the washer (5).



Locate the outer pulley (3) and the spacer (2).
Apply the recommended grease to the threads of the shaft.



Fit the ring nut (1).

Important

To prevent the ring nuts from loosening and consequent serious engine damage, always use new self-locking ring nuts on all the timing belt rollers.

Block with tool (A) no. 88713.1805 the rotation of the belt rollers and tighten to 71 Nm (Min. 64 Nm - Max. 78 Nm) the self-locking ring nut using the insert supplied with the wrench and a torque wrench.

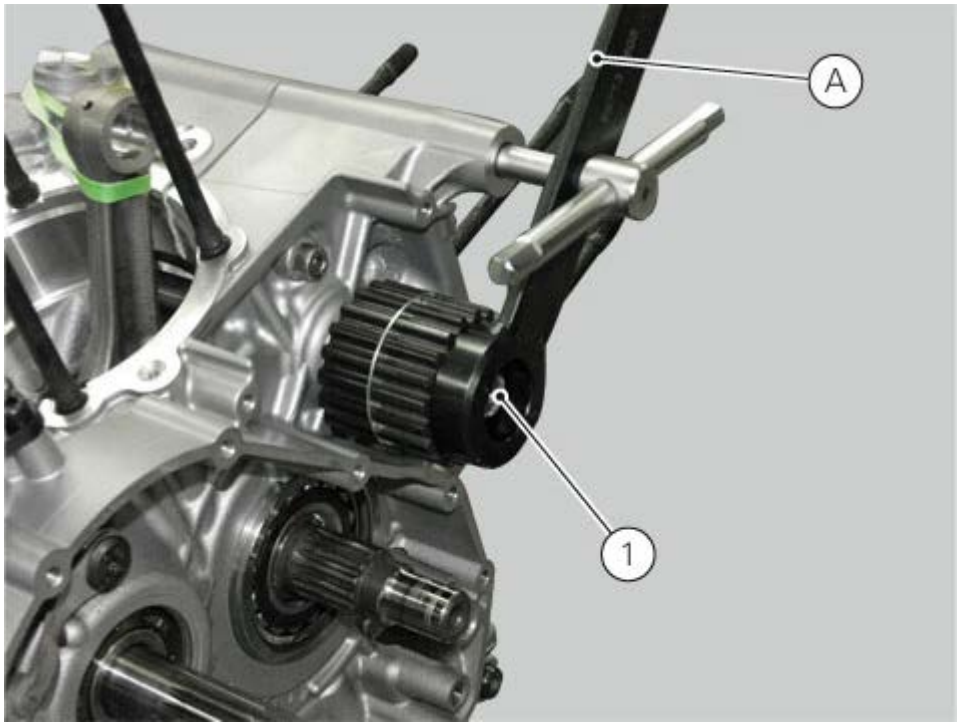
Removing the timing layshaft pulleys

Remove the timing belt covers.

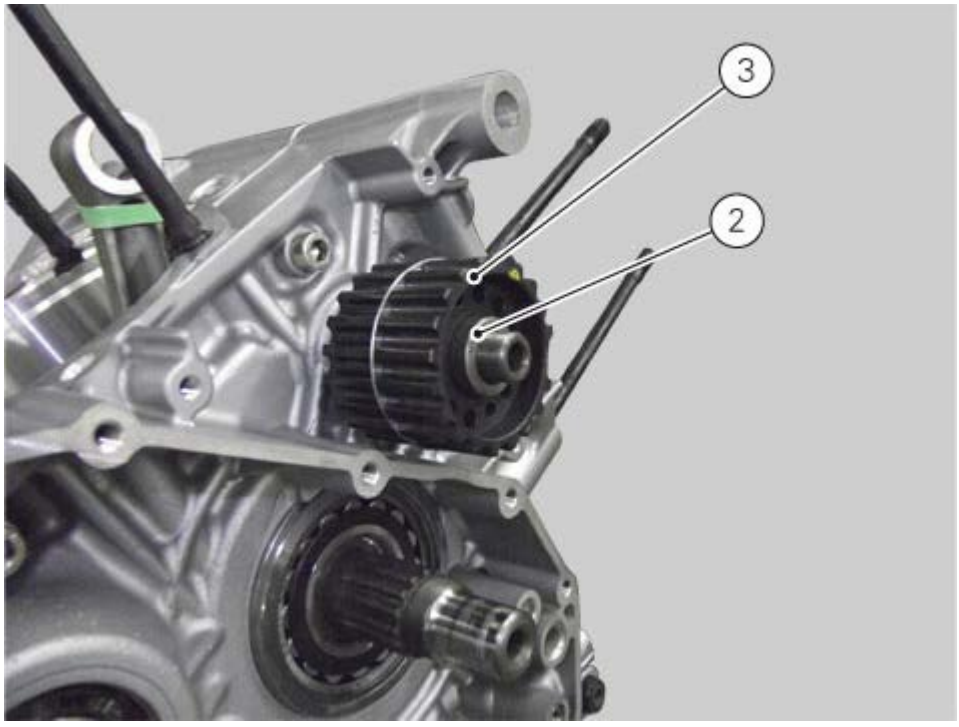
Block with tool (A) no. 88713.1805 the rotation of the driving belt rollers on the crankcase.

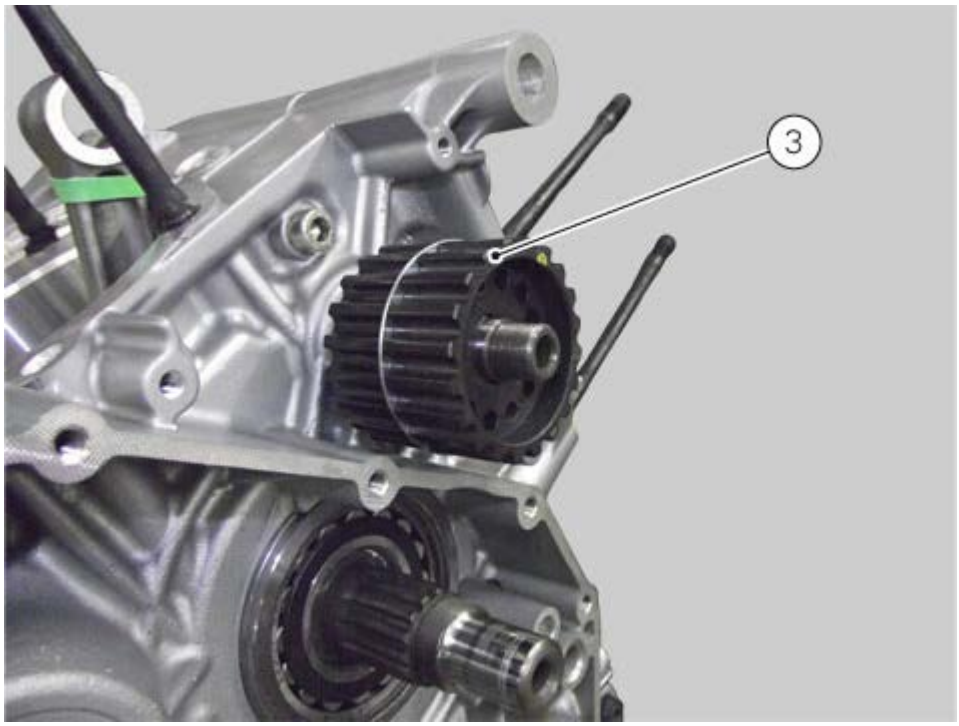
If this operation is carried out with the engine installed in the frame, hold the driving pulleys against rotation using tool no. 88713.2011 mounted on the generator cover.

Loosen ring nut (1).

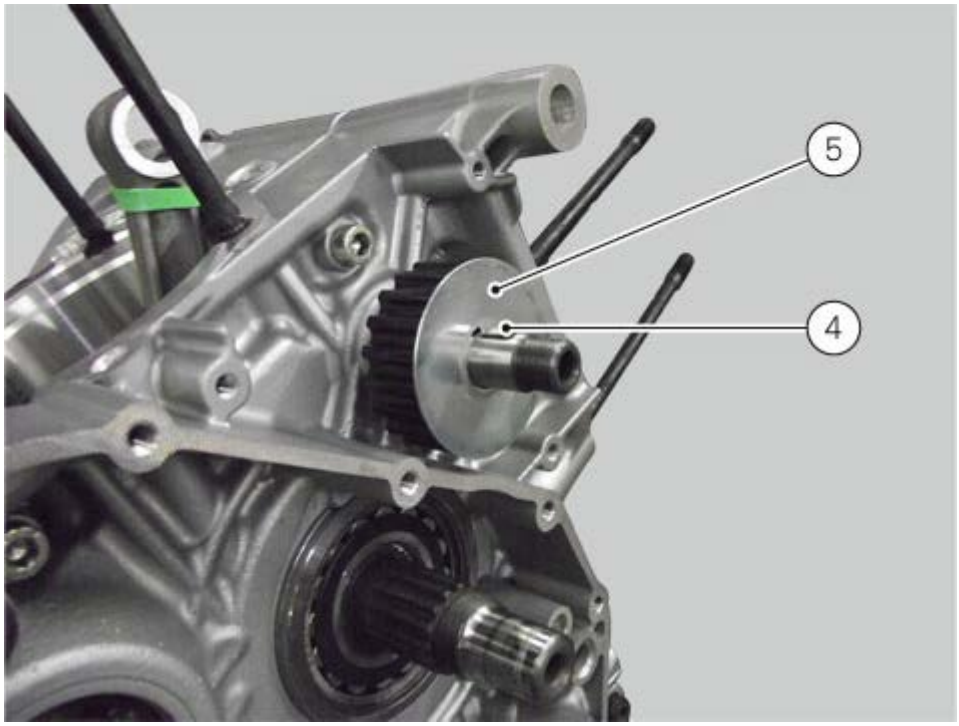


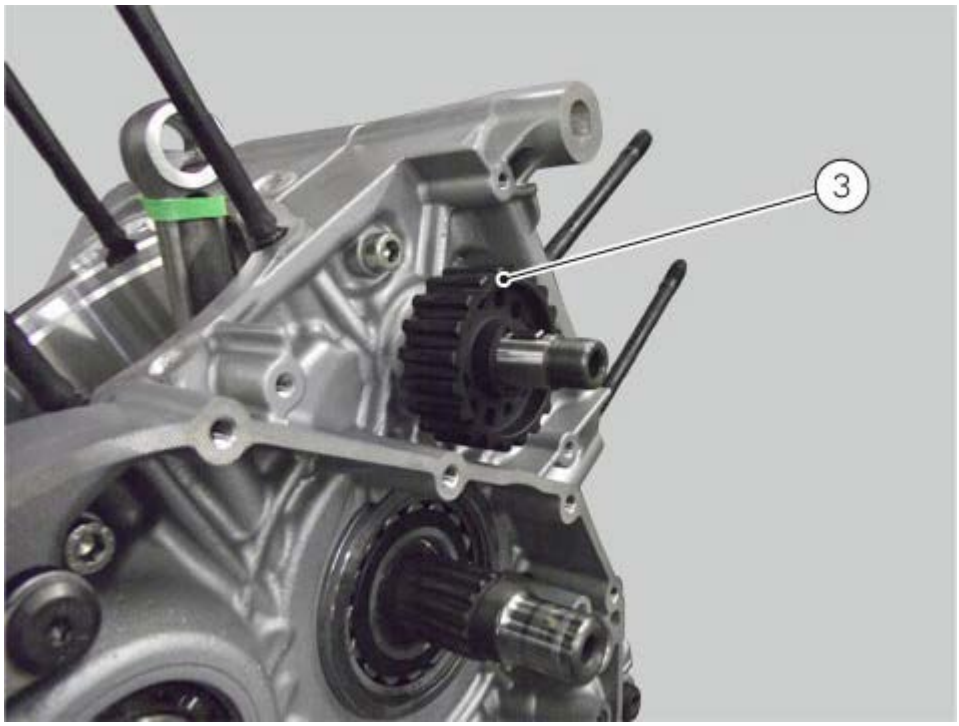
Remove the ring nut (1), the spacer (2) and the outer pulley (3).



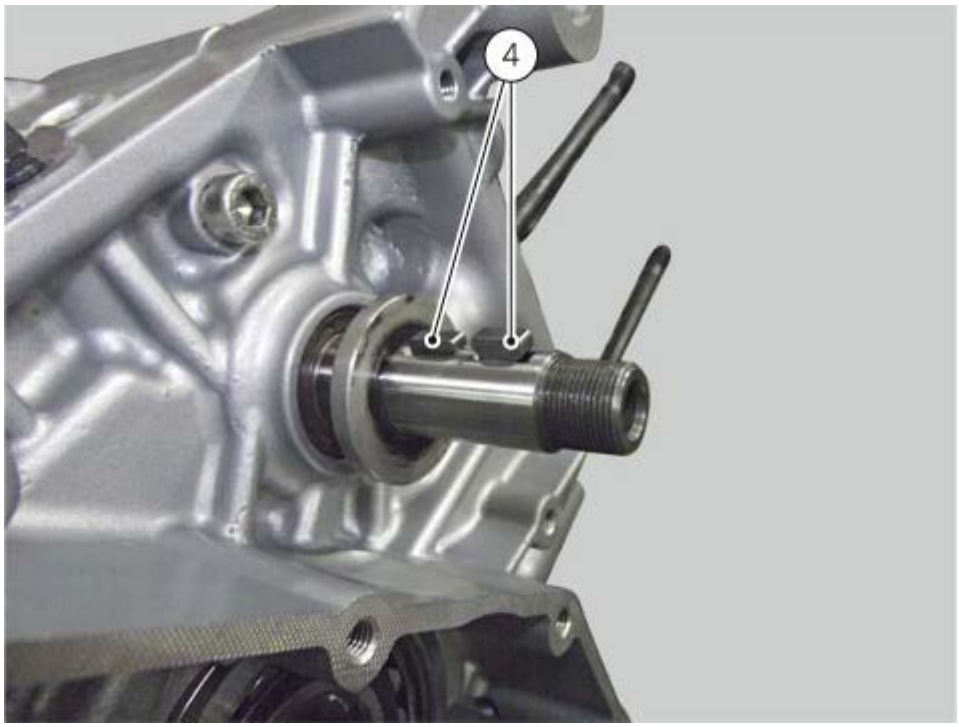


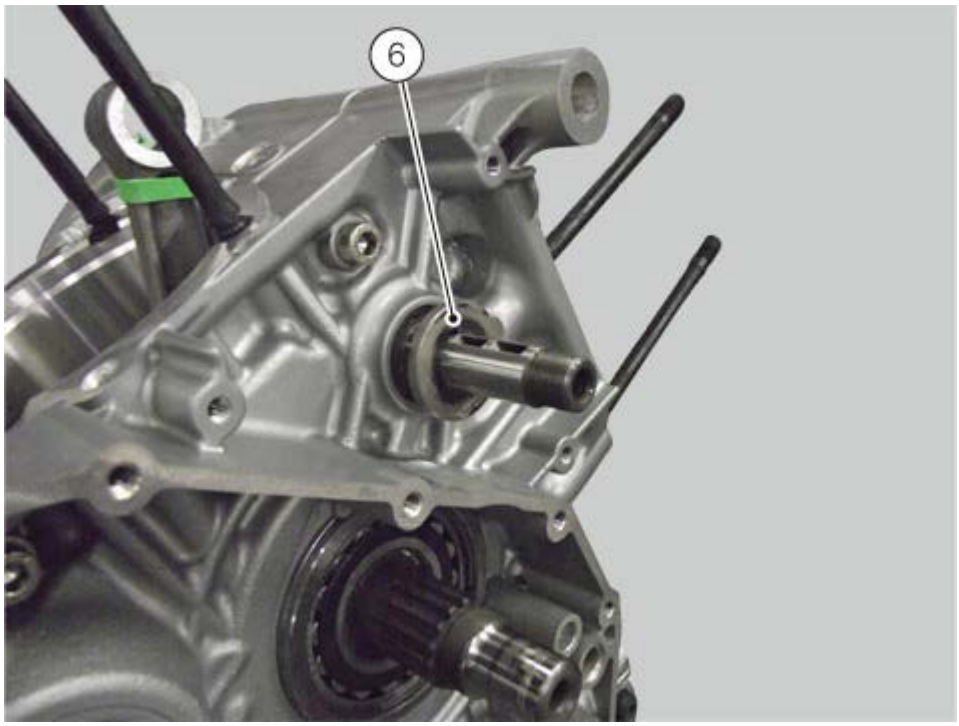
Remove the first key (4) from the timing layshaft.
Remove the spacer (5) and the inner pulley (3).

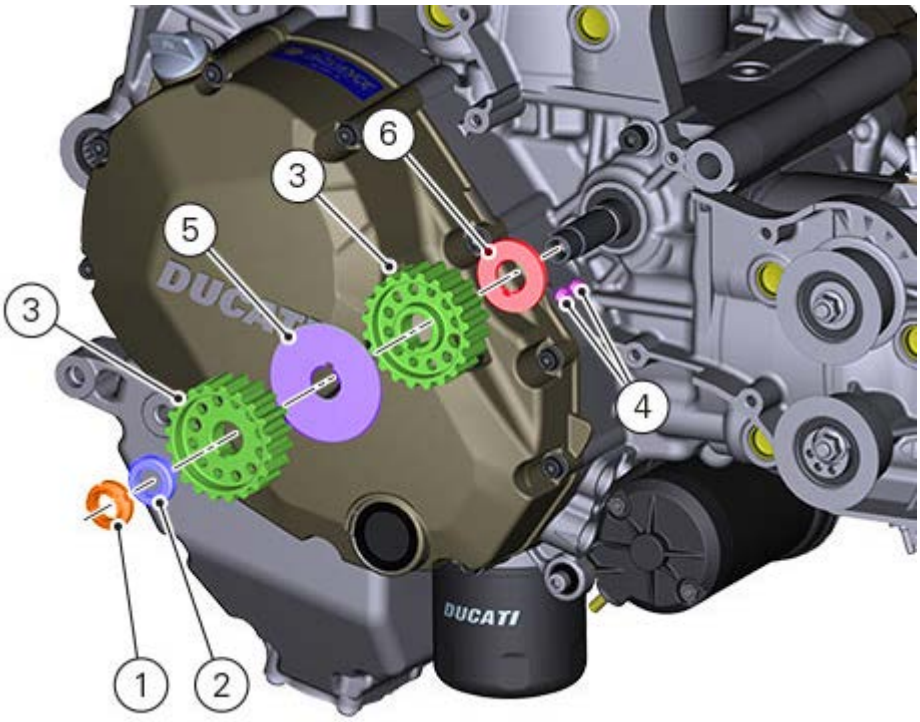




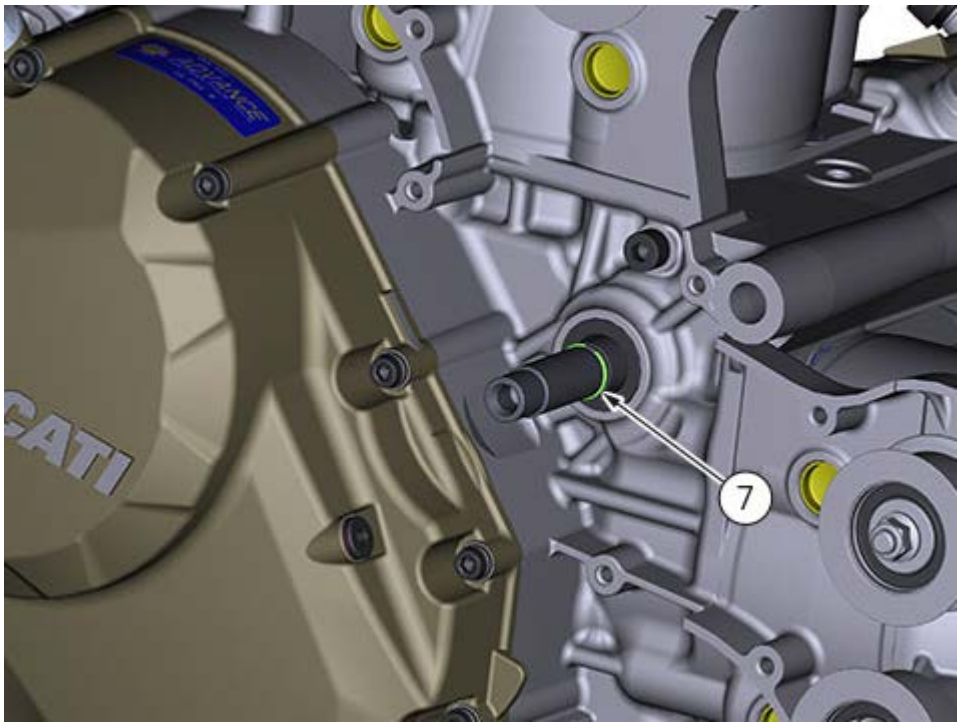
Remove the inner spacer (6) and second key (4) on the timing layshaft.







It is now possible to remove the snap ring (7) on the timing layshaft.


7

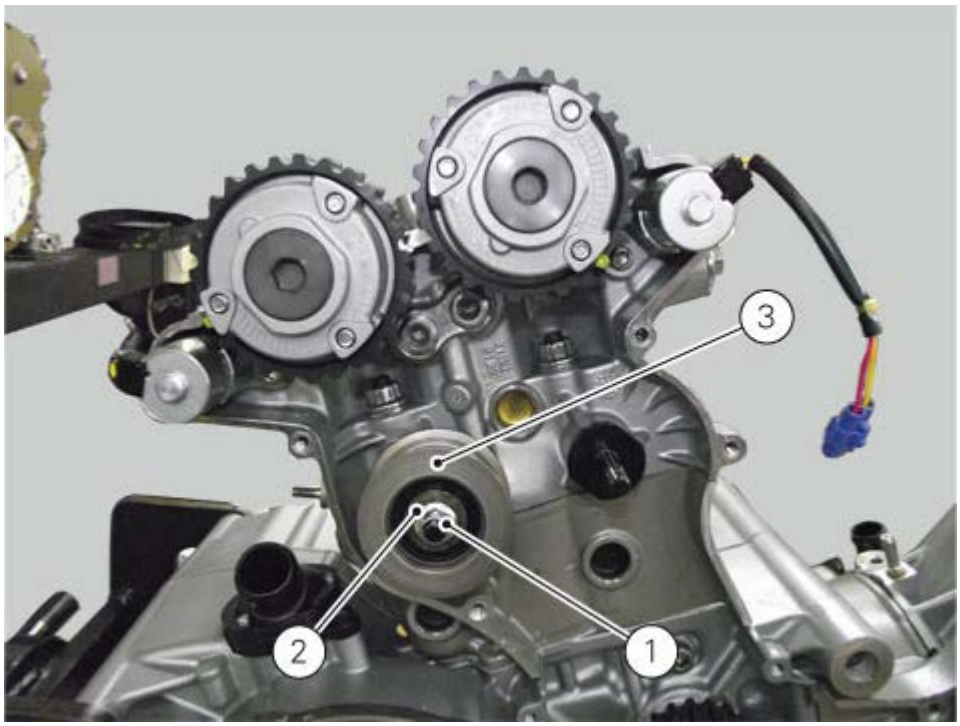
Removing the tensioner pins

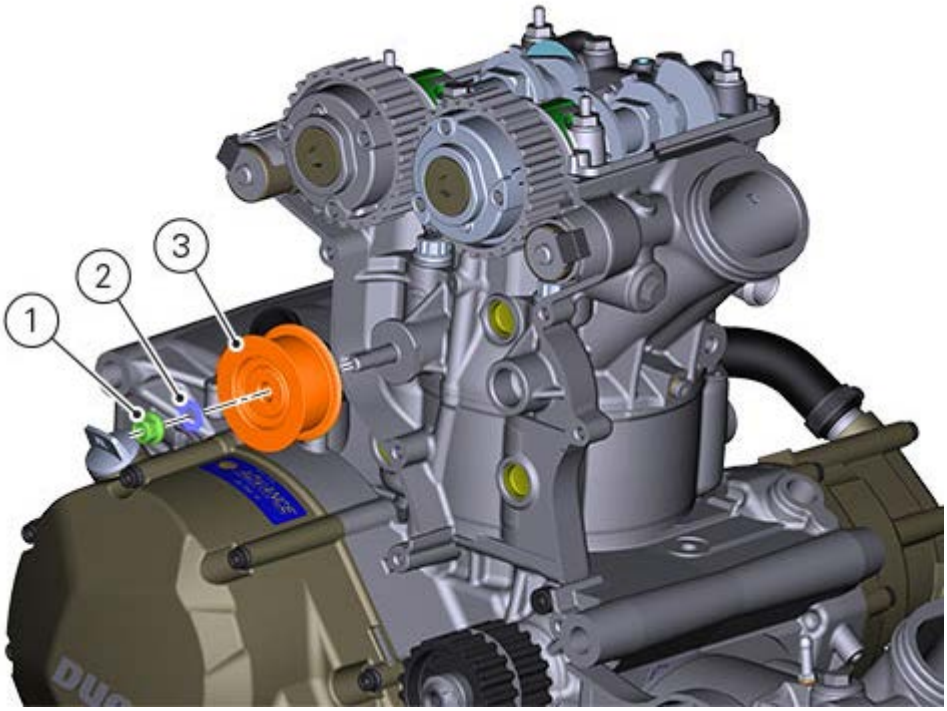
Use tool part no. 88713.1821 to remove tensioner pins (1) from the heads.

Removing the cylinder head pulley/fixed tensioner

Note
The procedure below refers to one head but it applies to both coils.

Loosen the nut (1), recover washer (2) and slide out tensioner pulley (3).





Loosen the two closing plugs (4).

Loosen the two retaining screws (5) and remove the two pulleys.

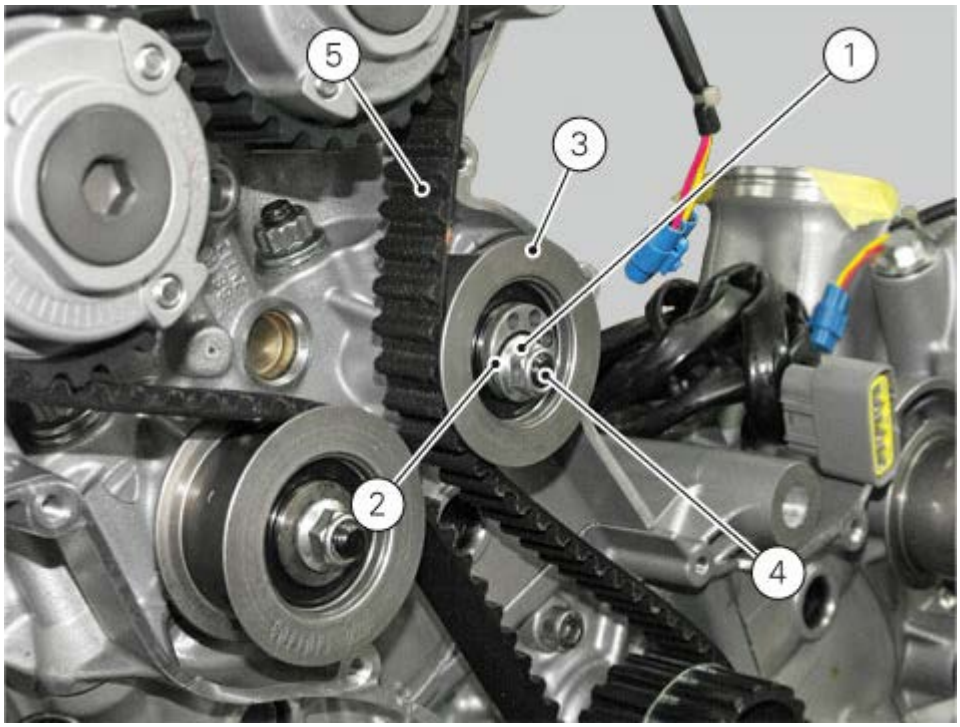
Removing the mobile tensioner/timing belt

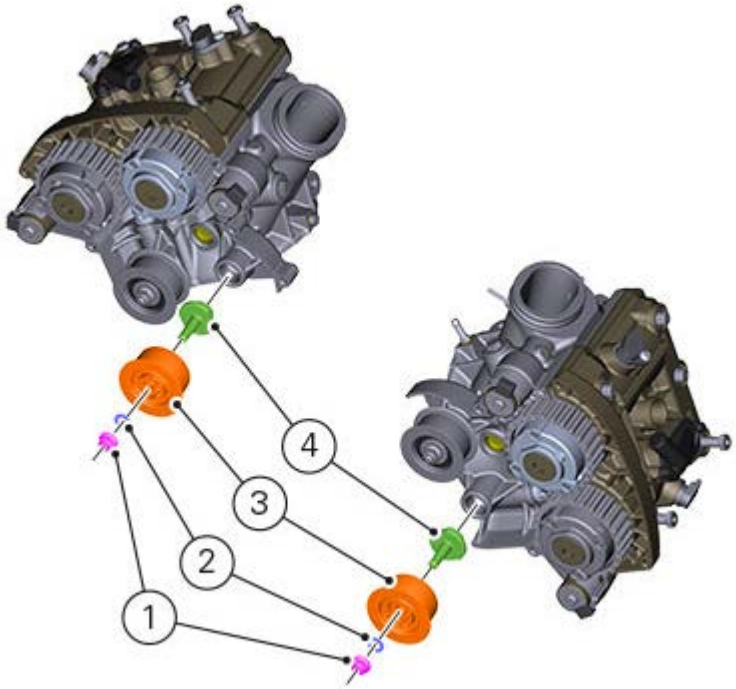
Loosen the nut (1) and remove the washer (2) and the mobile tensioner (3) from the pin (4) on the cylinder head. Remove the timing belt (5) from the piston-cylinder assy.

Important

If the belts are to be re-used, mark the direction of rotation with an arrow and also mark the piston-cylinder assy they belong to.

Repeat the procedure for the other piston-cylinder assy.

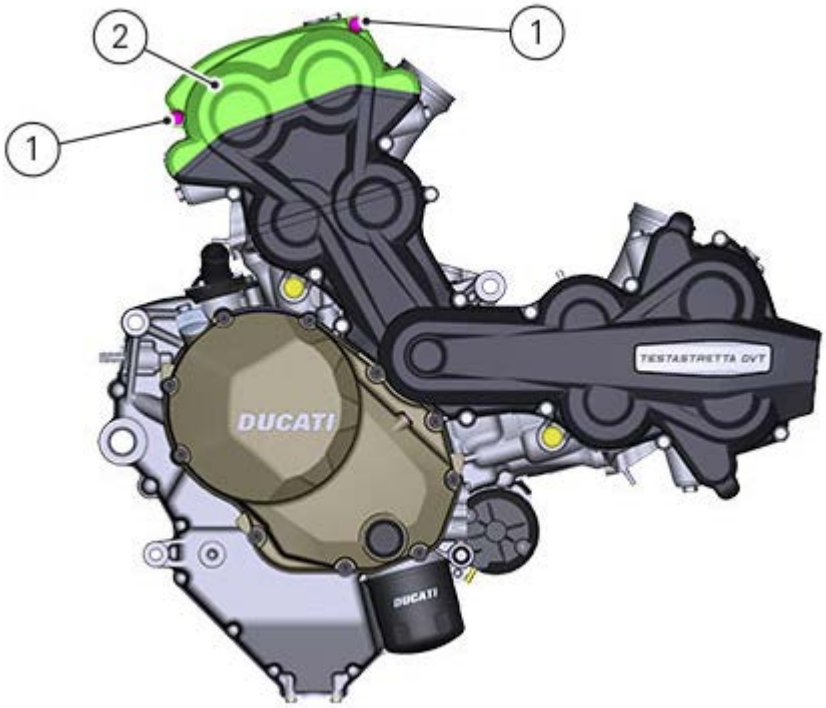


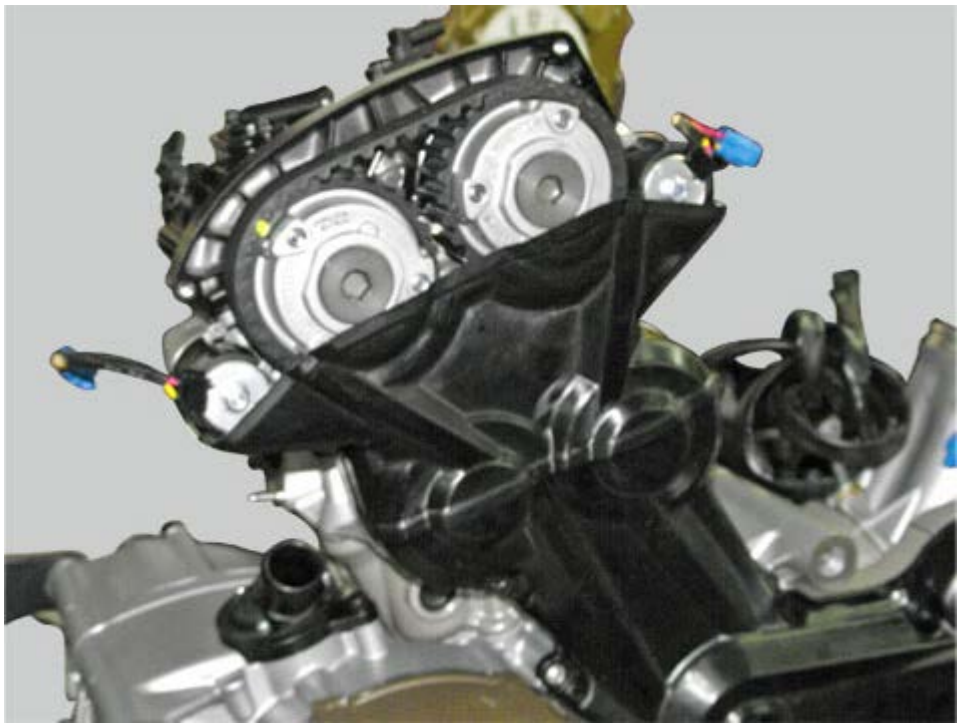


Removing the timing belt covers

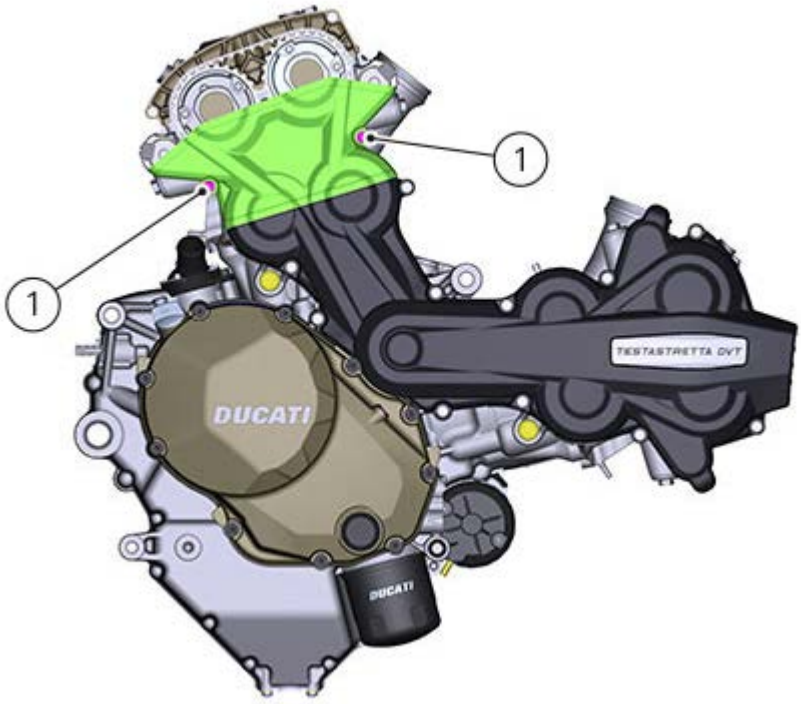
For clarity, the figures show the engine removed from the frame.

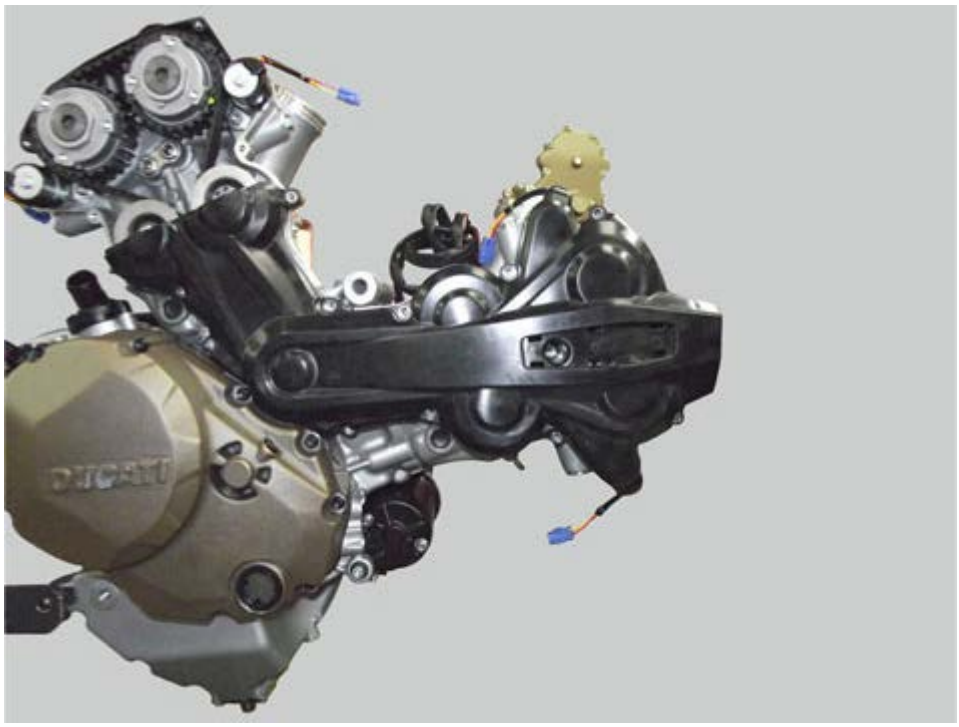
Undo the fixing screws (1) of the upper external cover (2) and remove it from the vertical piston-cylinder assy.



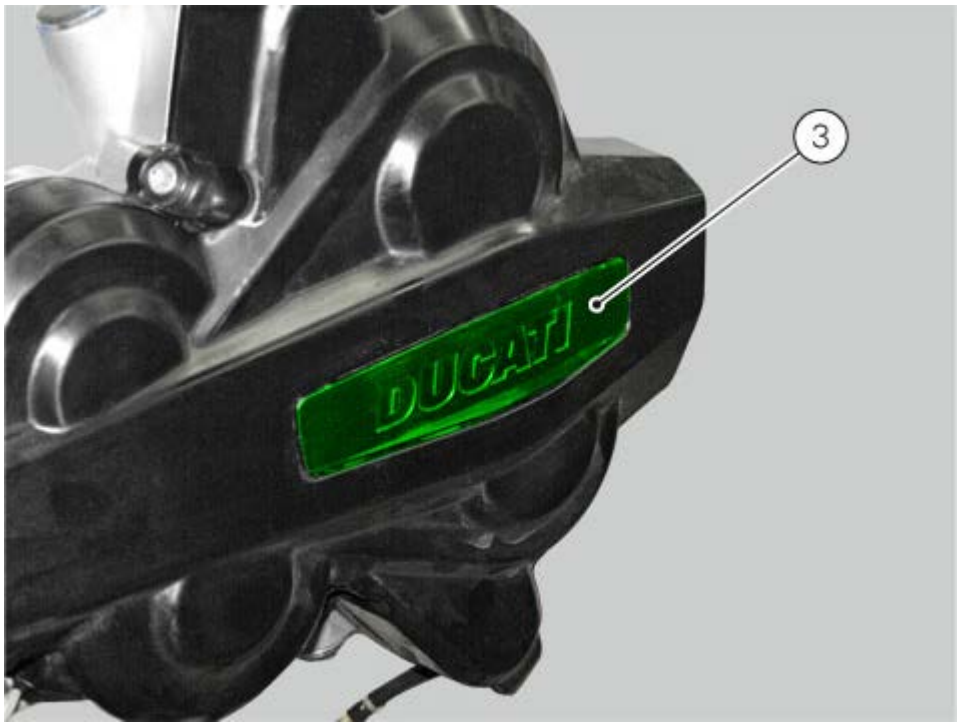


Undo screws (1) of the intermediate external central cover.

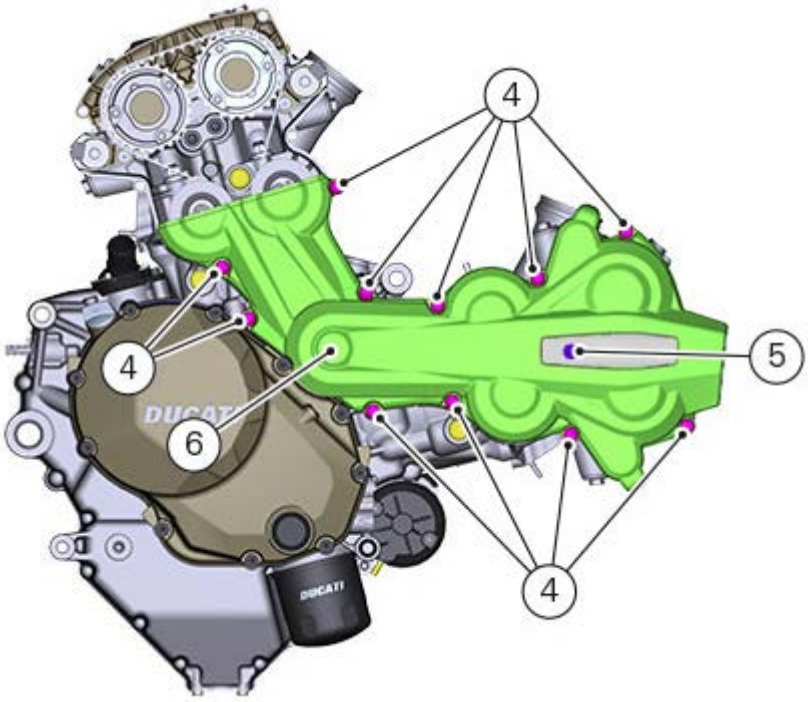




Using suitable tools lift up plug (3) to remove it.

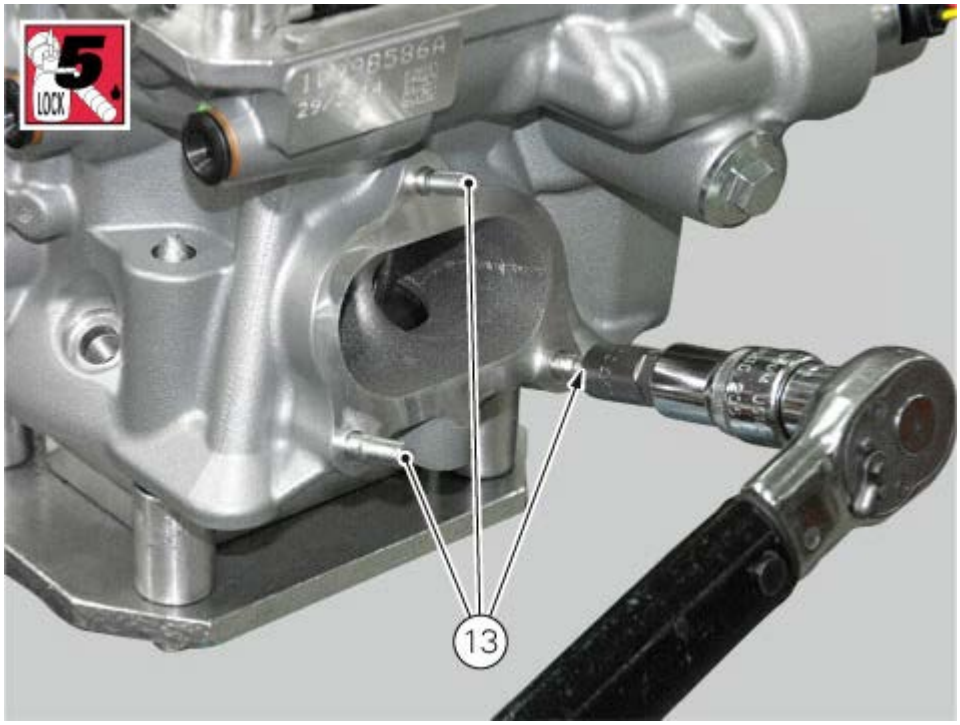


Loosen the fastening screws (4) and (5) on the main cover (6).

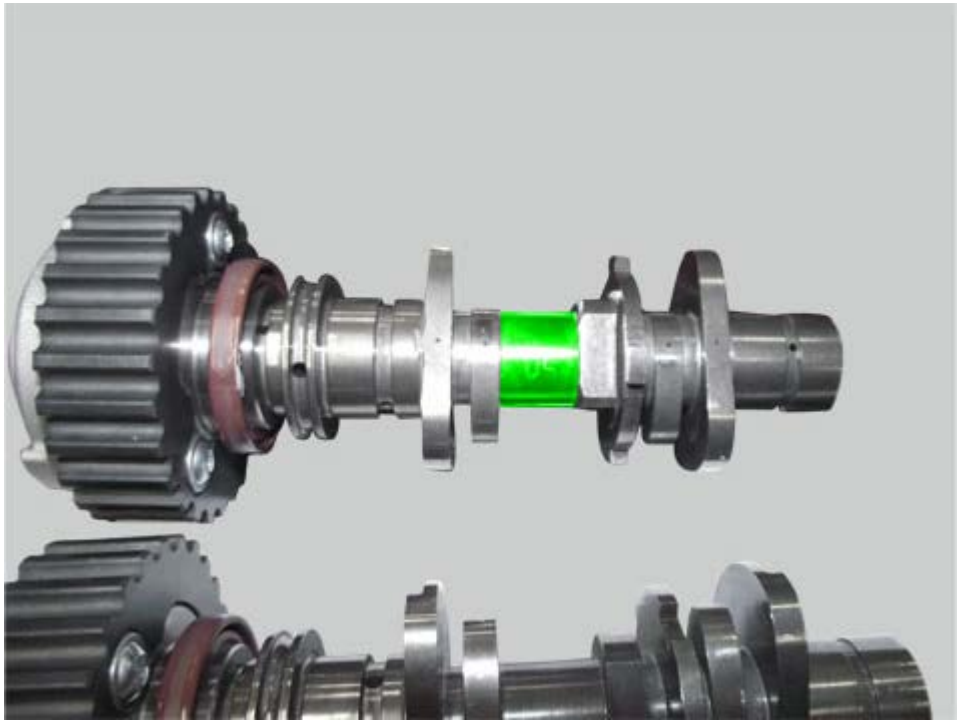


Refitting the camshafts

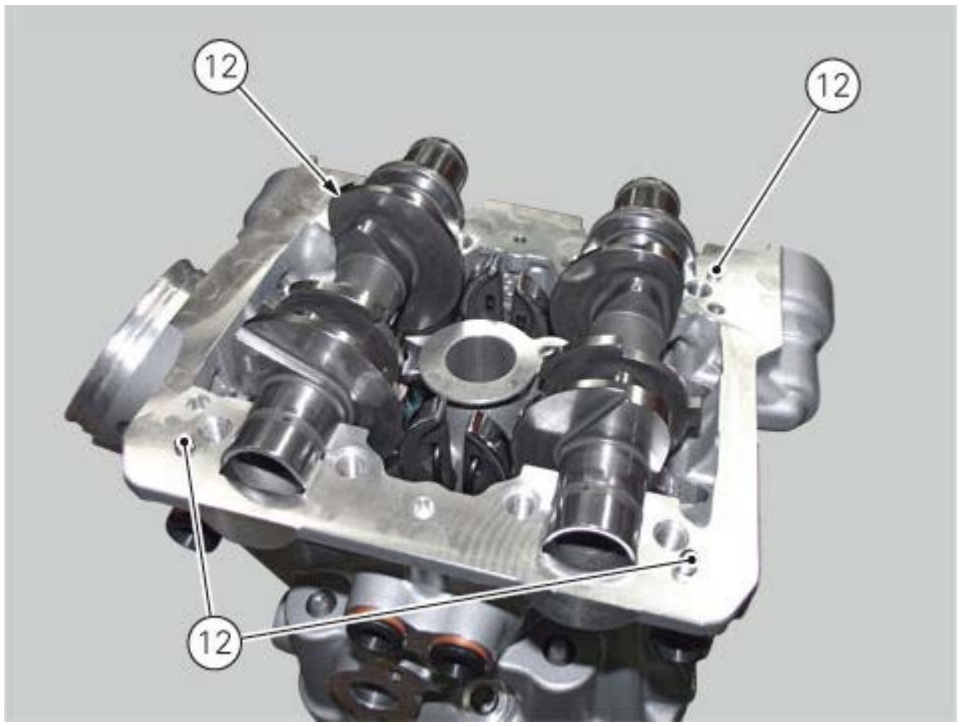
If the stud bolts (13) were removed, apply the recommended threadlocker to the short end of the stud bolts (13), i.e. the side that is to be screwed into the cylinder head.
Tighten stud bolts (13) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).

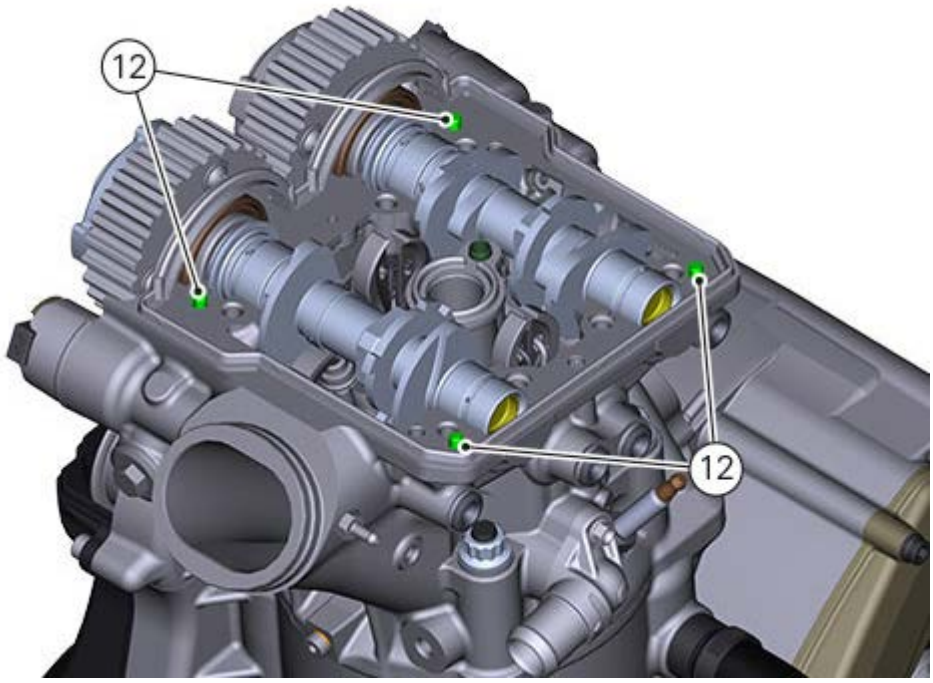


Check that the camshafts (marked "VA" and "VS" for the vertical head and "OS" and "OA" for the horizontal head) are clean and in good condition.
If the camshafts are not new, use emery cloth to remove signs of wear on the cam and support surfaces, working on a flat surface.

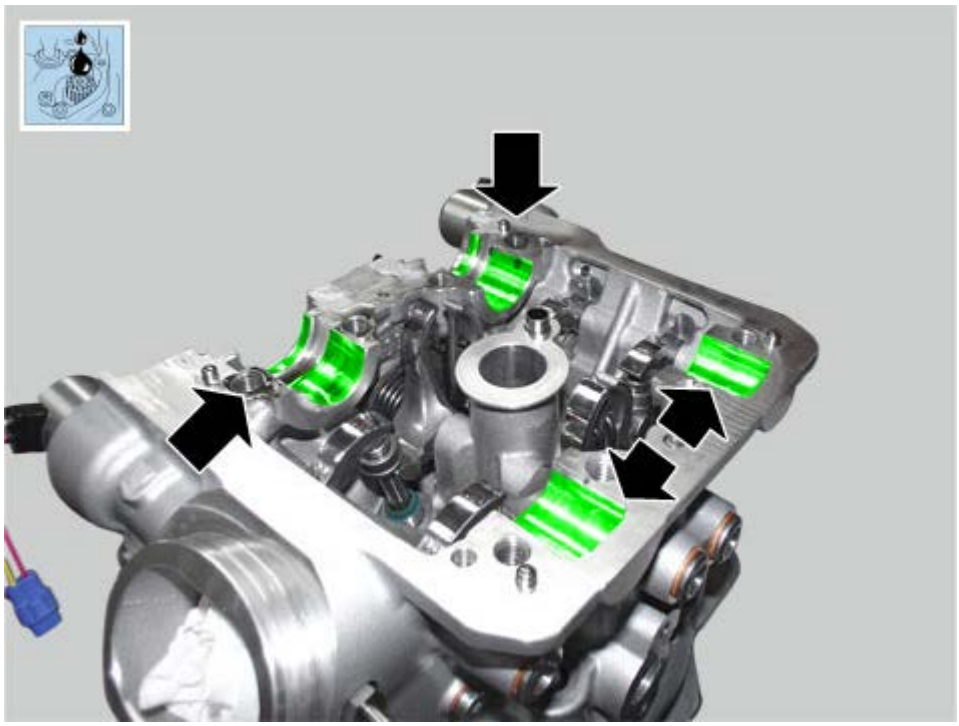


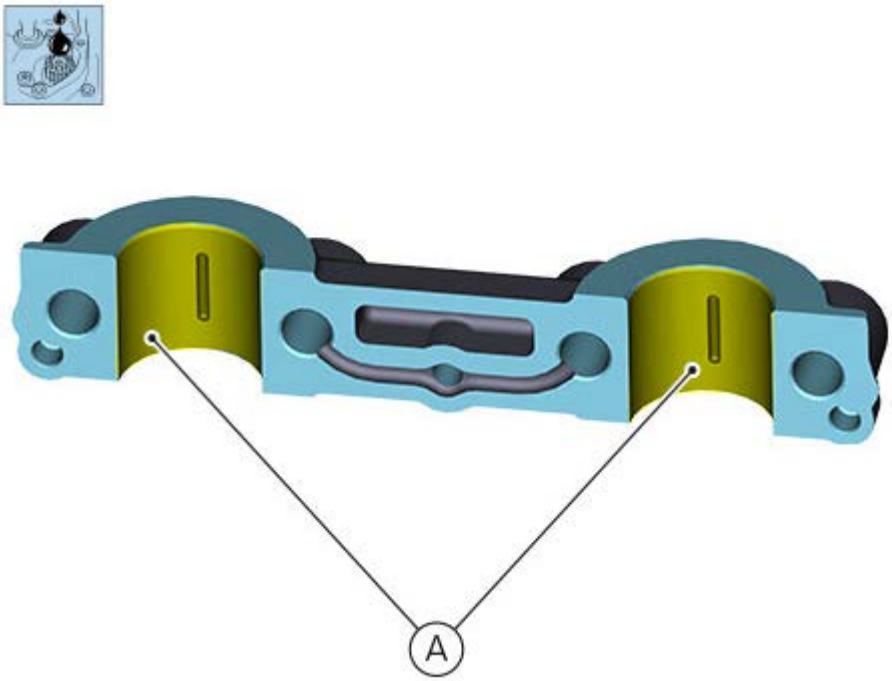
Check that the centring dowels (12) are present.

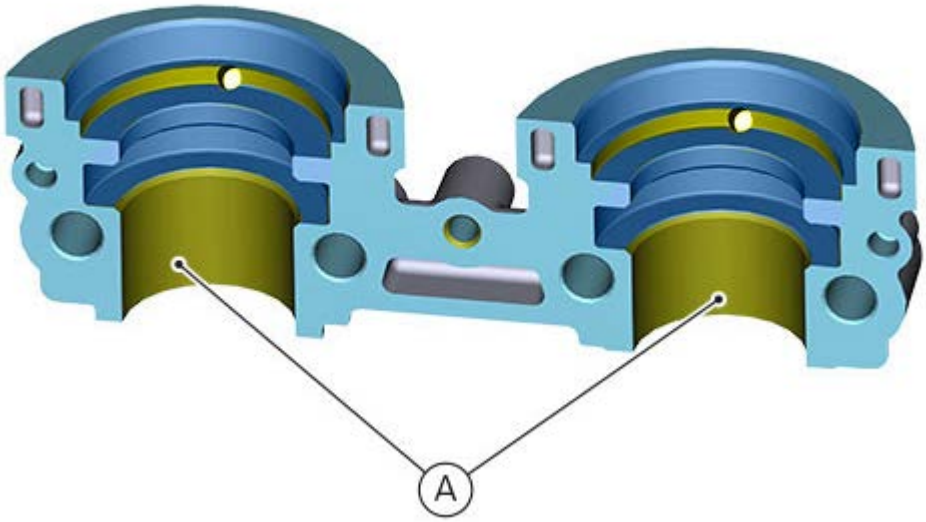




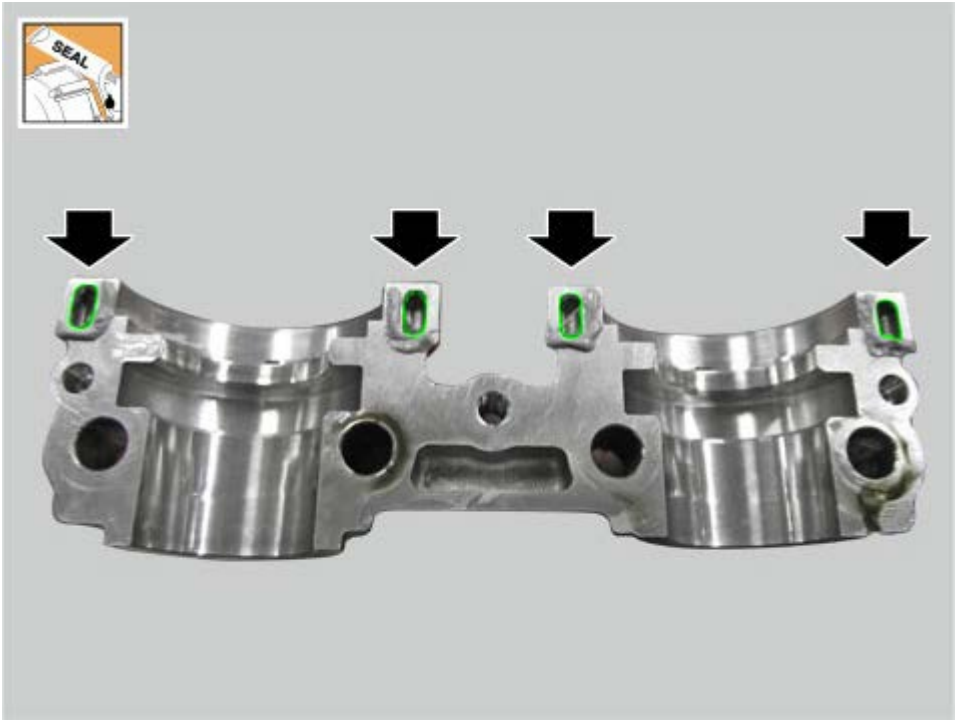
Use the specified lubricant to lubricate the head, the supports (10) and (11) and the camshaft seats.
Fill tanks (A) with specified lubricant.




A

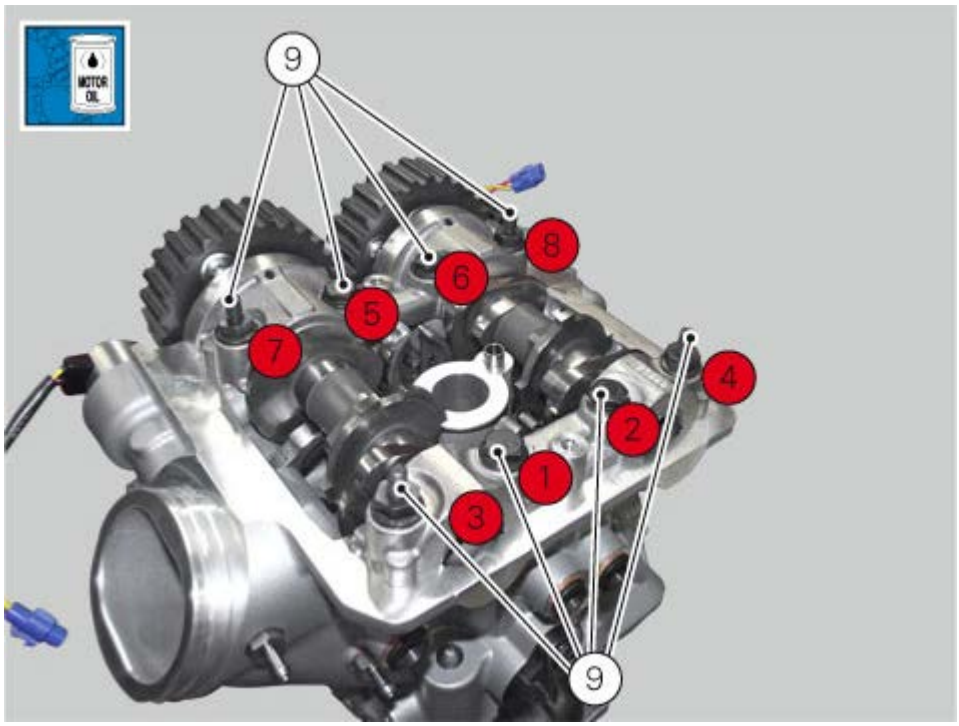


Install the camshafts in the cylinder head, and rotate them to distribute the lubricant evenly.
Bed down the supports.
Apply sealant at the four points of the support (10) as shown in the figure.
Clean off any excess of sealant.



Check that plugs (14) are present on the camshafts (15) and (16).

Apply engine oil to the thread and underhead of screws (9). Start screws (9).
Pre-tighten screws (9) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).
Pre-tighten one support at a time, working in the sequence 1-2-3-4-5-6-7-8.
Then tighten screws to a torque of 22.5 Nm (Min. 21 Nm - Max. 25 Nm).
Tighten one support at a time, working in the sequence 1-2-3-4-5-6-7-8.
Turn the camshafts by hand to check that they rotate freely.

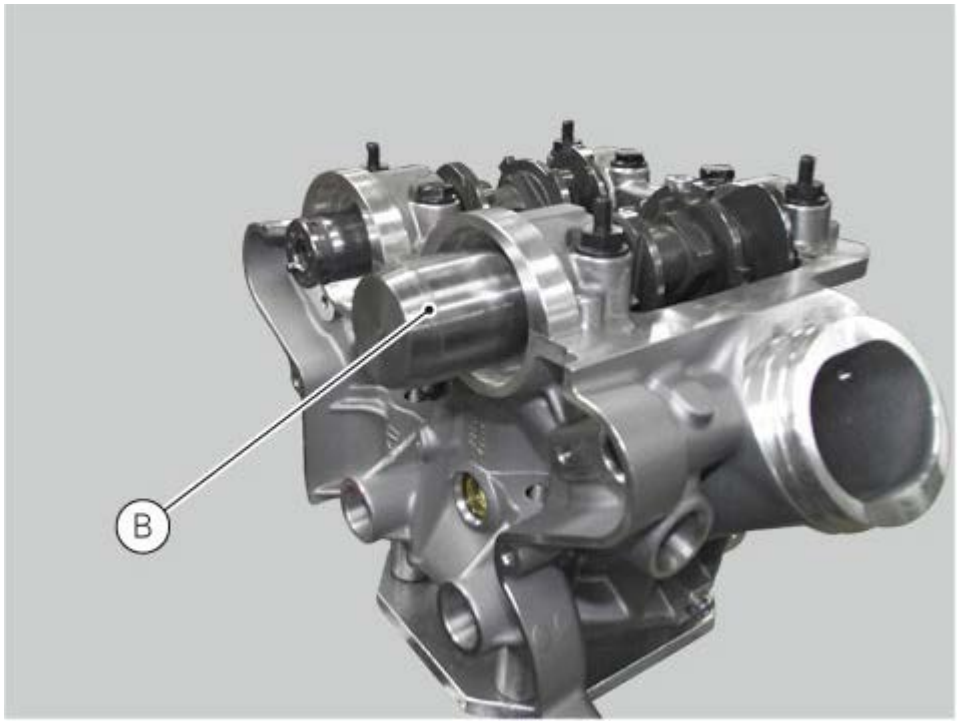


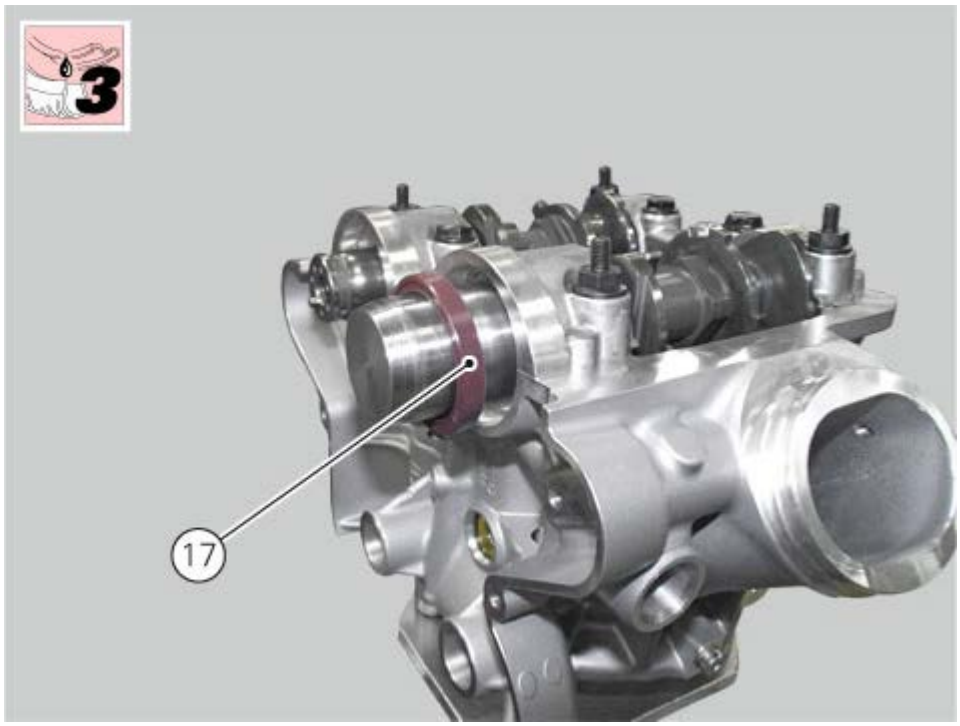
Check valve lift as explained in chapter (Checking valve lift).

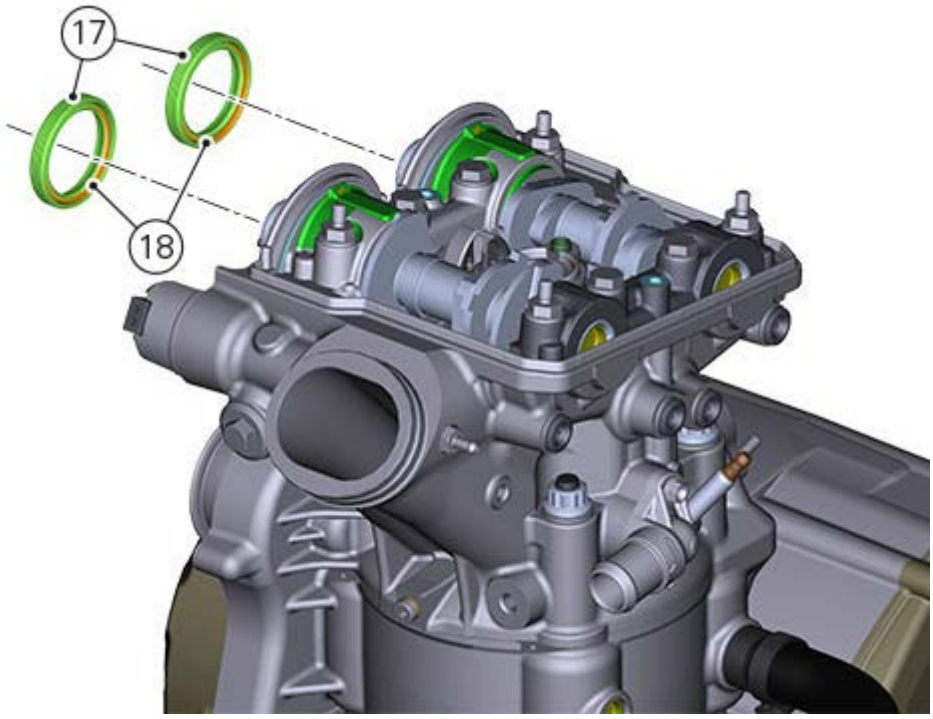
Sealing rings

Lubricate the sealing rings (17) with denatured alcohol.
Install driving tool (B) no. 88713.4648 on the camshaft and start the seal ring on the cylinder head with the side featuring a spring (18) facing inwards.

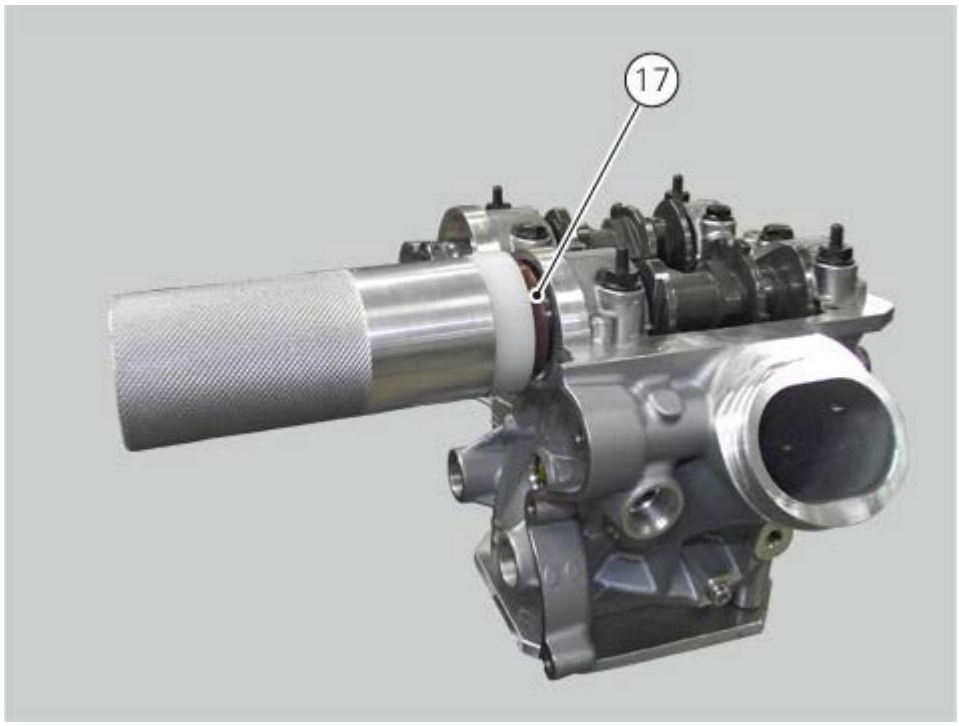
Important
Always fit new sealing rings upon reassembly.



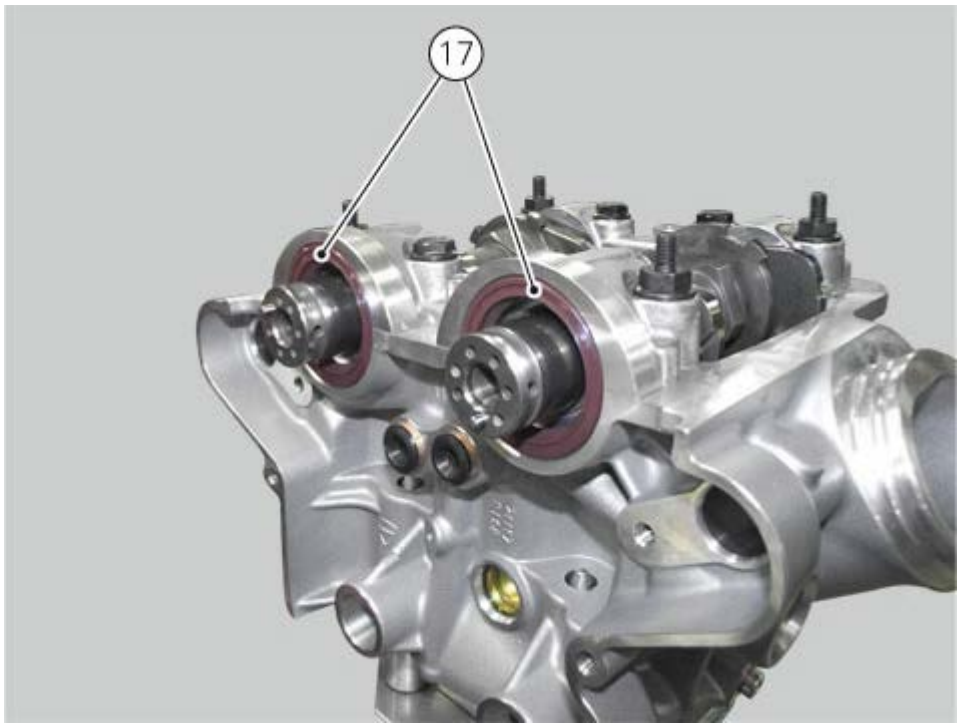




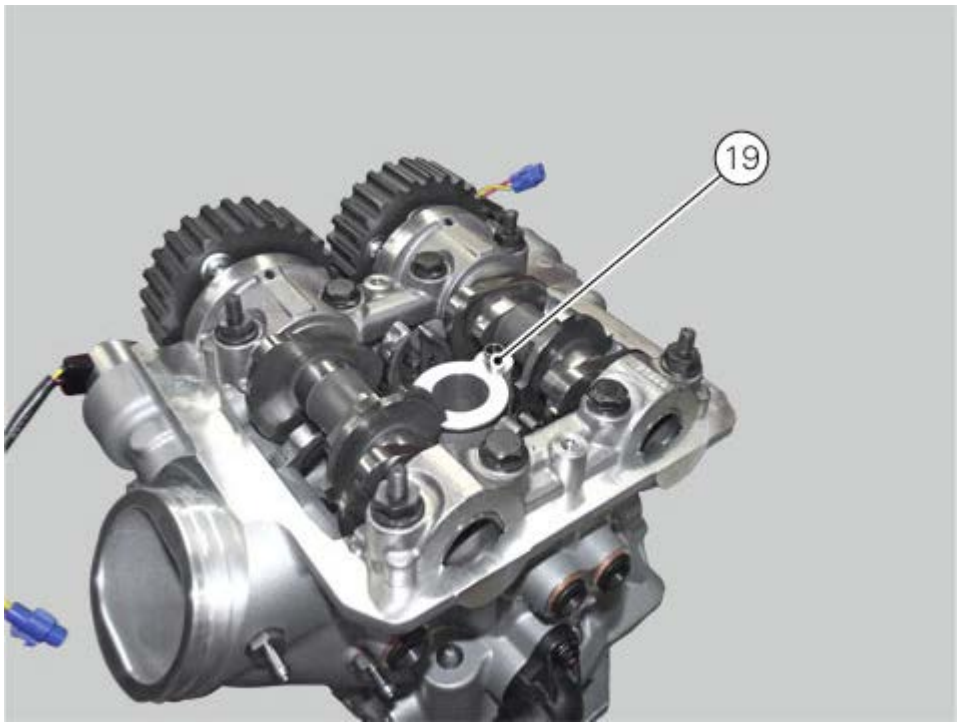
Using the drift no. **88713.4965** provided with the tool and a mallet drive the sealing rings into their seats.



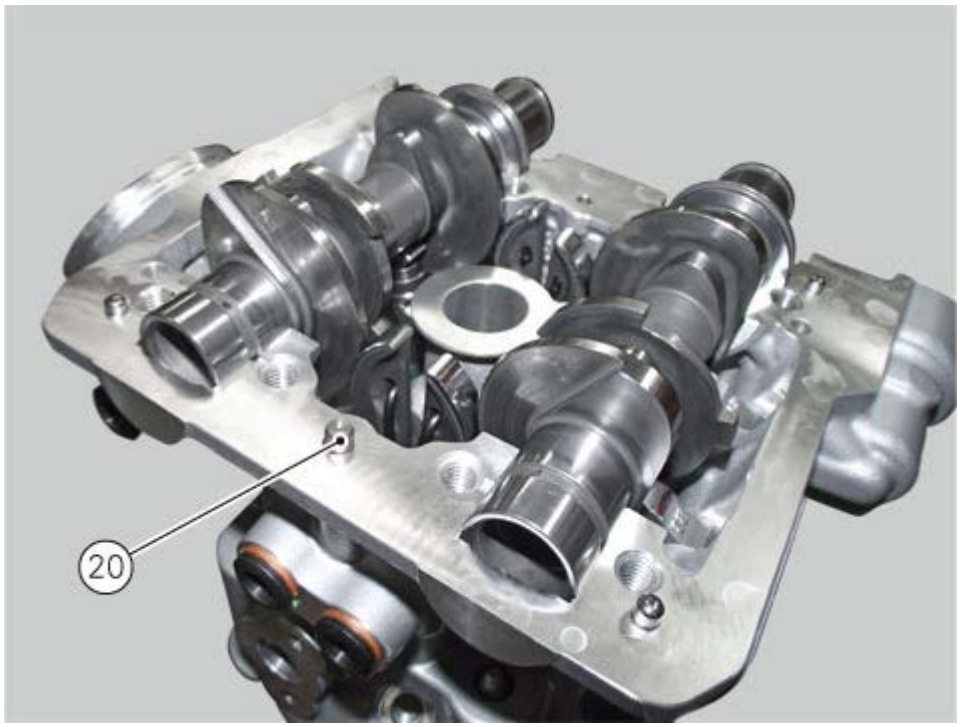
When correctly installed, the sealing ring (17) should be flush with the bevel of the cylinder head.



Check that the head features the centring bushing (19).
Fit the variators as described in chapter "Refitting the cylinder head pulley/fixed tensioner".



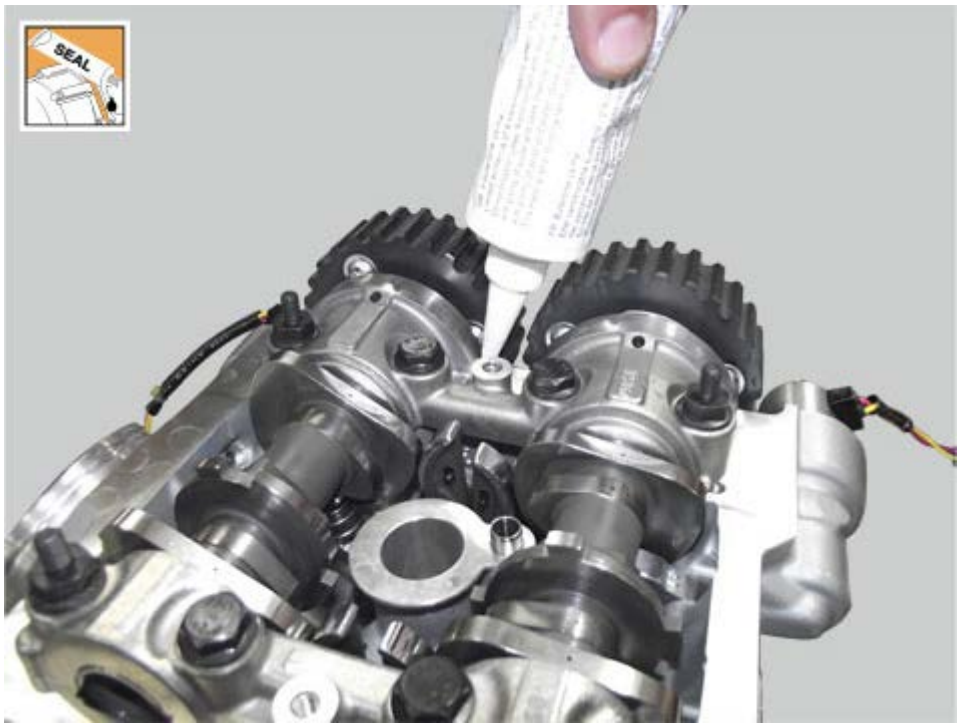
If previously removed, install the oil flow pin (20) using suitable tools.



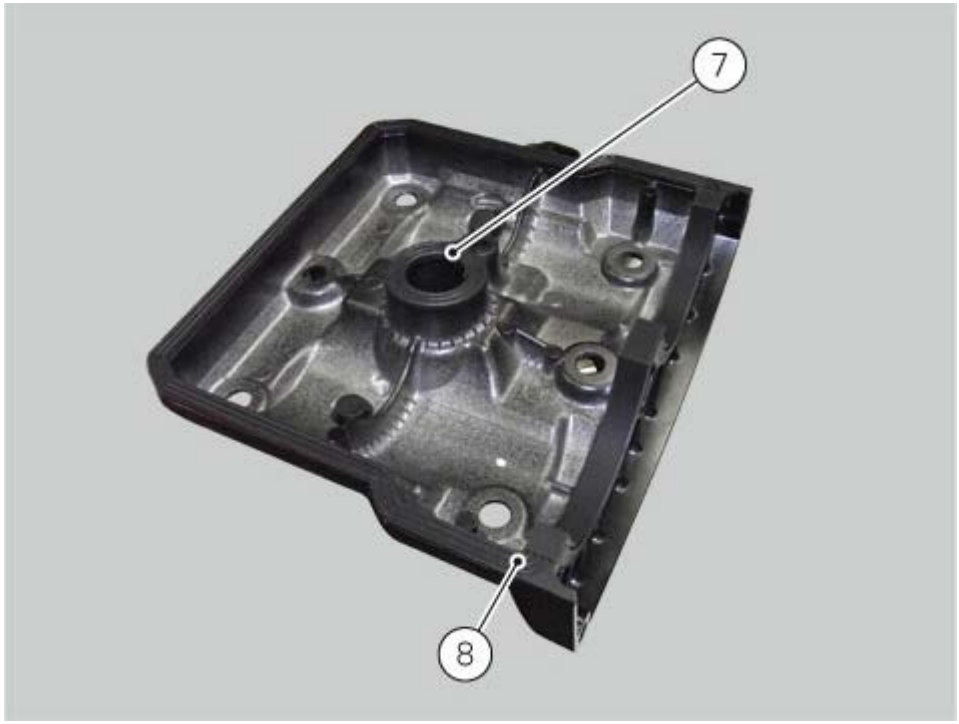
Cylinder head cover

Apply the indicated sealant on the four highlighted points.


SEAL

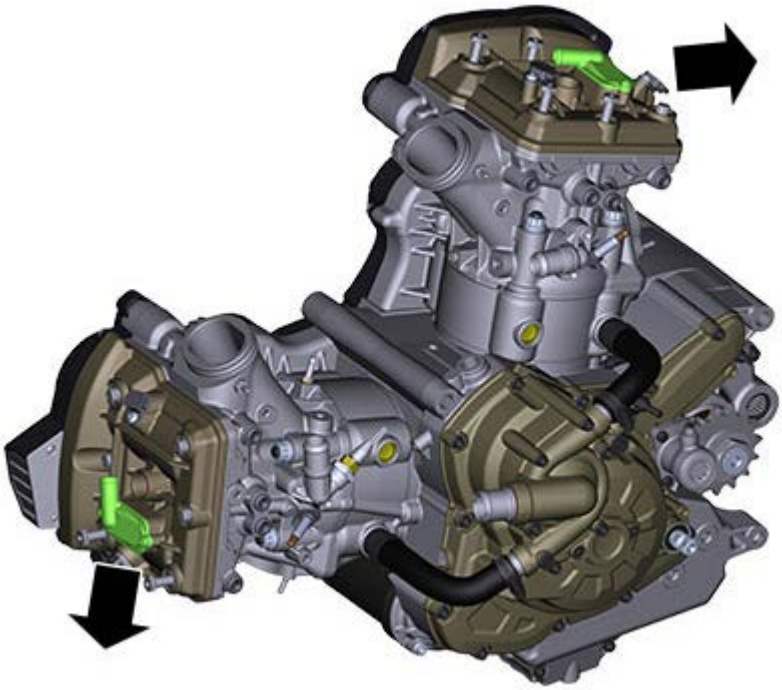

SEAL

Fit the gaskets (7) and (8) on the cylinder head cover, as shown in the figure.

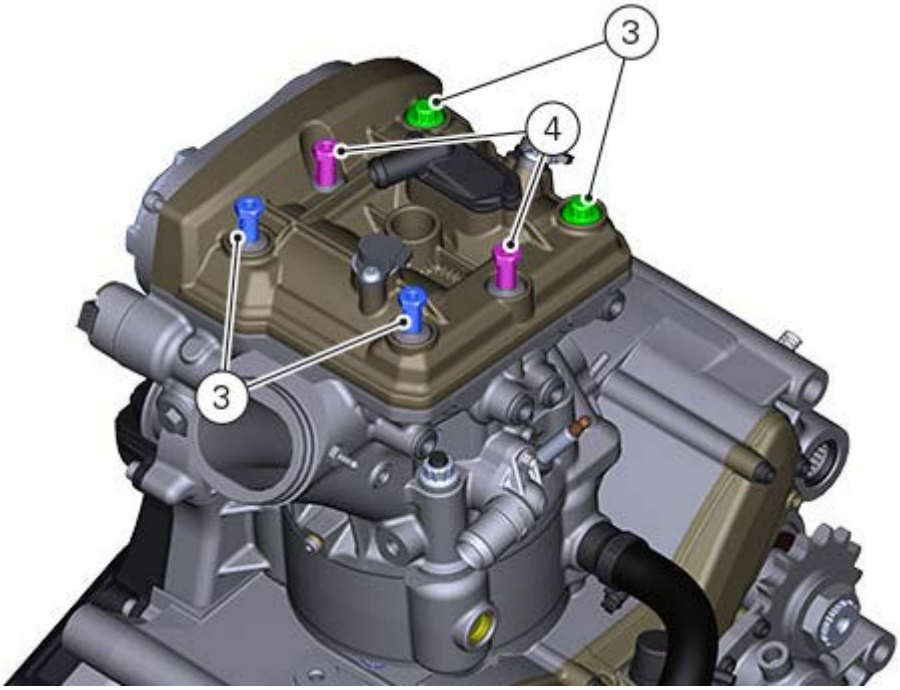


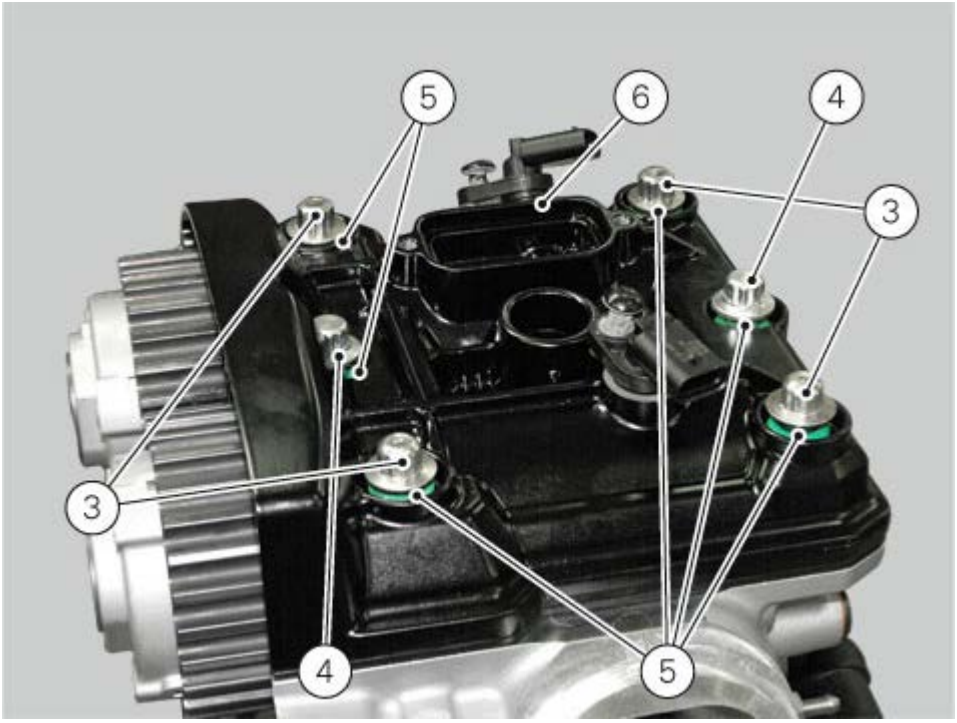
Cylinder head cover identification

To distinguish the two heads, check that the secondary air valve is outwards as shown in the figure.

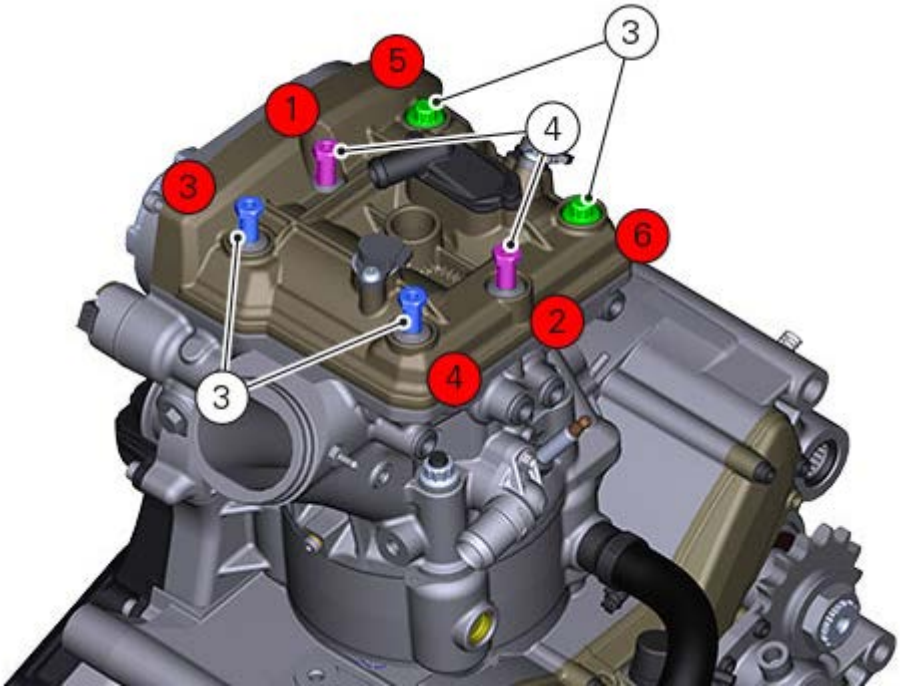


Locate cover (6) on the cylinder head, aligning it with the four fixing holes.
Start screws (3) and (4) with O-rings (5).

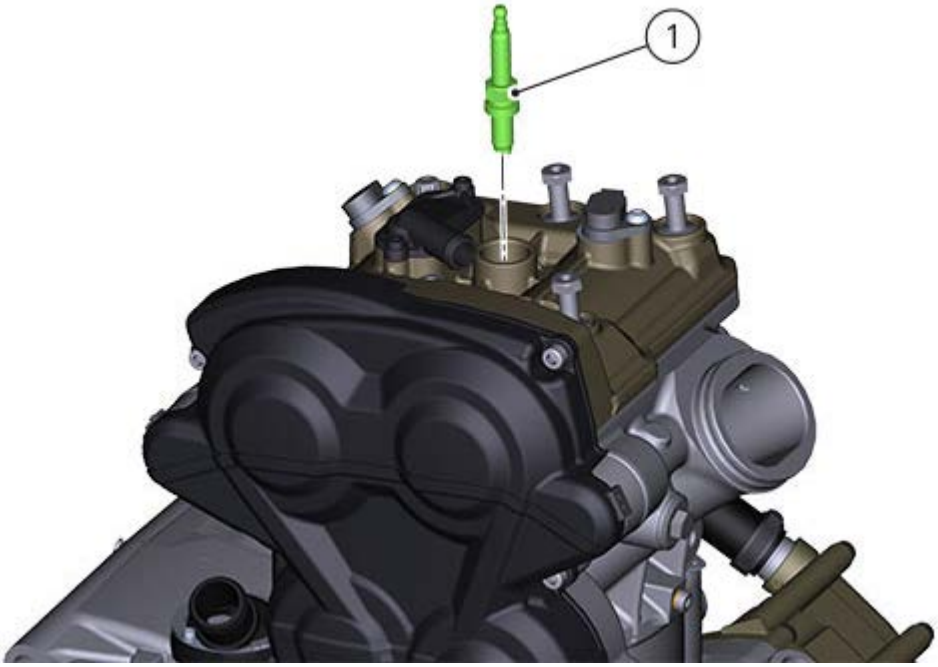




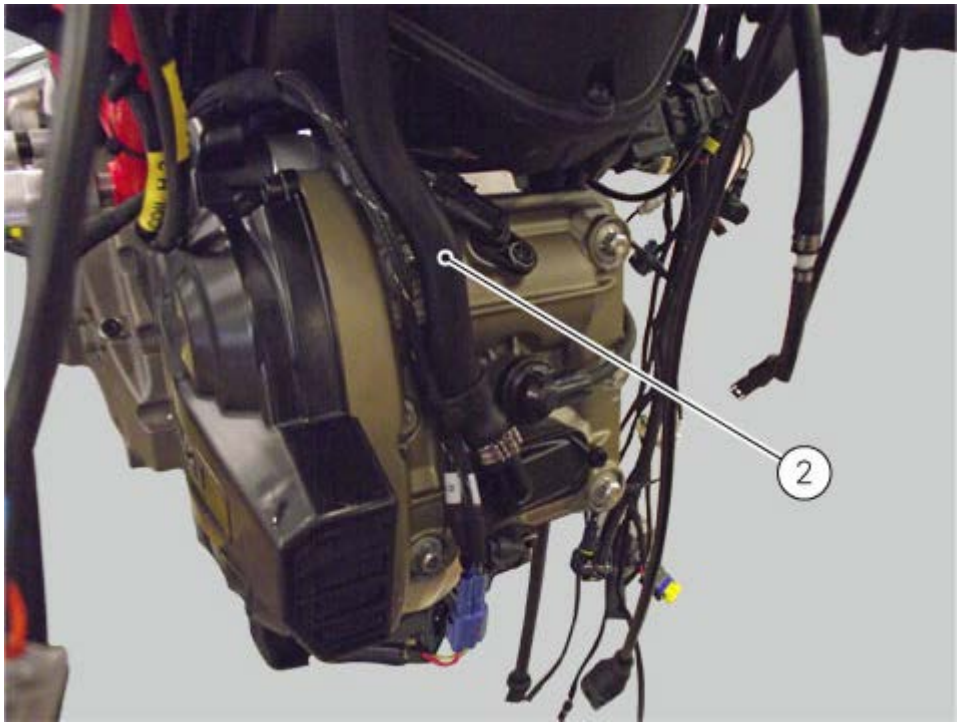
Tighten the screws (3) and (4) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm), respecting the indicated sequence.



Repeat the same procedure for the other cylinder head.
Install and tighten spark plug (1) with a suitable wrench no. 887132877.



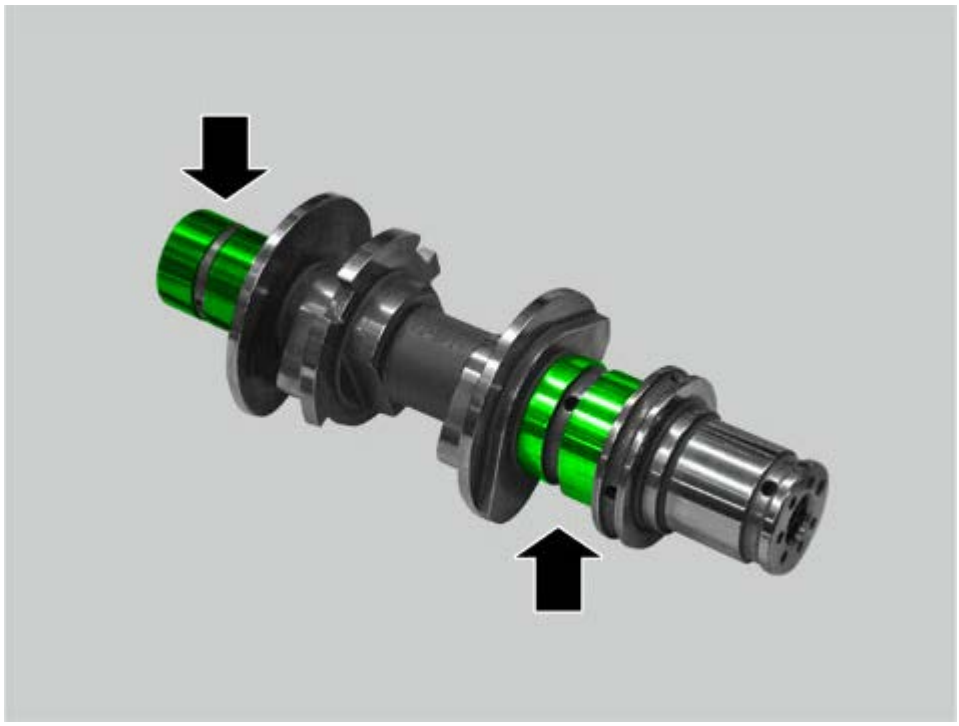
Connect the secondary piping and position the clip.
Refit the previously removed components.



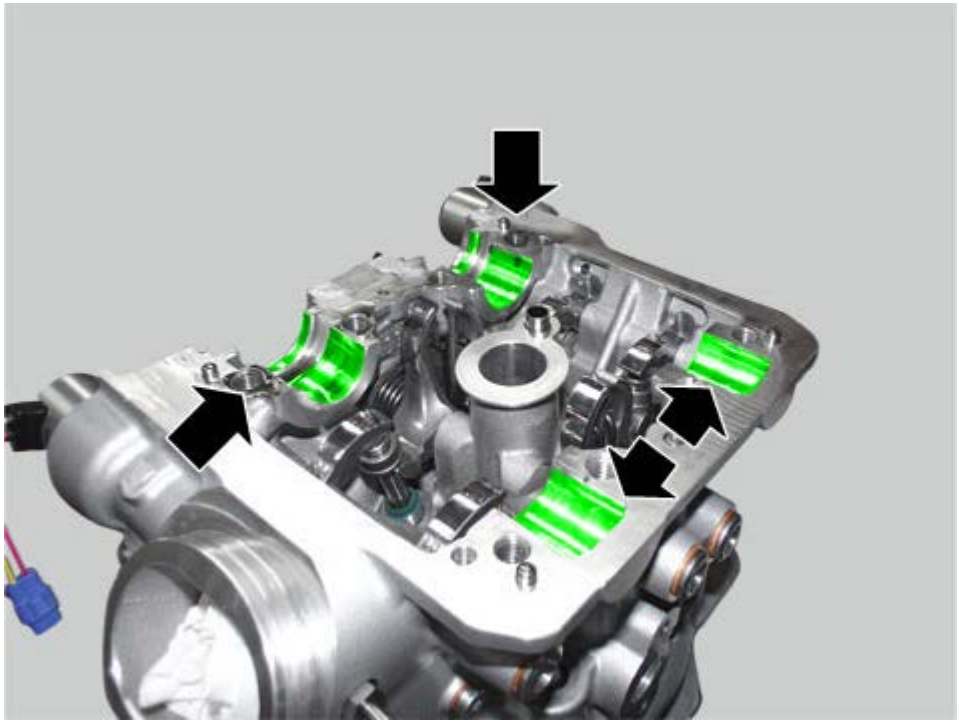
Connect the coils.
Fix the water radiator to the frame (Refitting the water radiator).
Fix the timing belt covers (Refitting the timing belt external covers).
Refit the airbox (Refitting the airbox and throttle body).
Refit the fuel tank (Refitting the fuel tank).
Refit the front half-fairings (Refitting the front half-fairing).
Refit the rear RH side body panel (Refitting the side body panels and the tail guard).
Refit the seat (Refitting the seat).

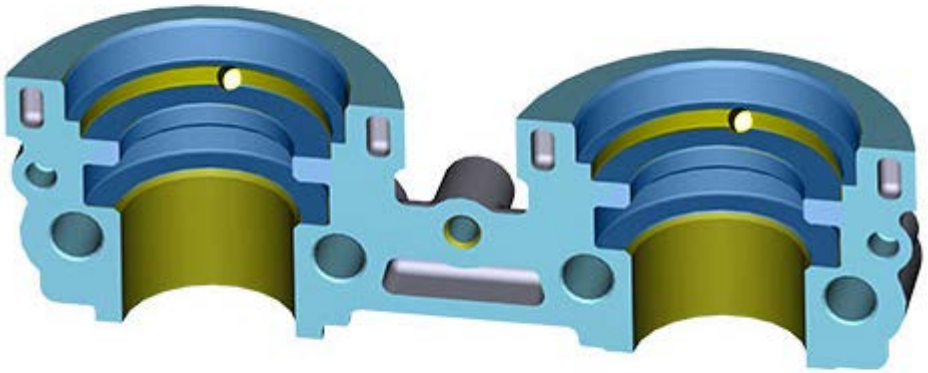
Check of the camshafts and supports

Check the cam contact surfaces for scratches, grooves, steps and waving.
Worn cams are frequently the cause of poor timing, which leads to loss of engine power.
Place the camshaft between two opposite centres and check the run-out on the areas indicated using two dial gauges.
Service limit: 0.1 mm.



Visually inspect the camshaft tracks for scoring and abnormal wear. If any of the above defects are found, the camshaft should be replaced.
If you find scoring or excessive wear, check the operation of the engine lubrication circuit.

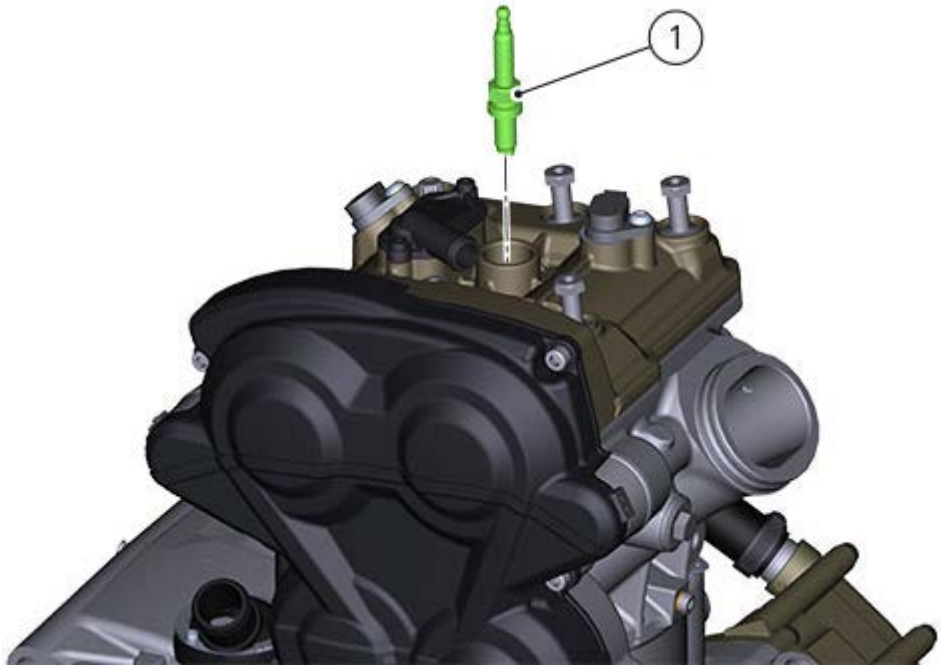




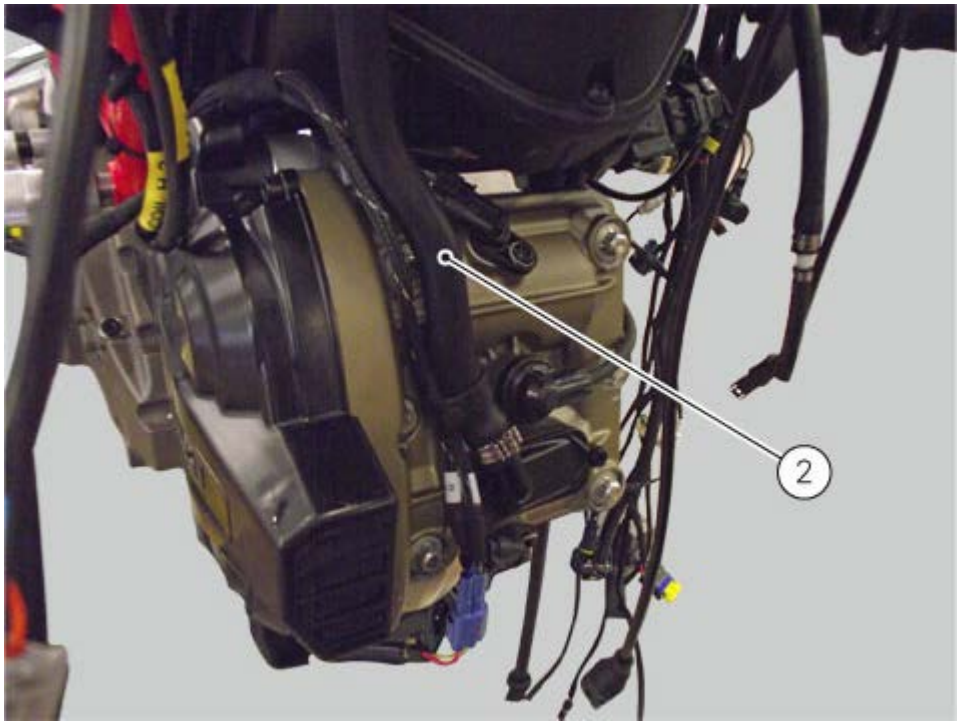
Removing the camshafts

Remove the seat (Removing the seat).
Remove the rear RH side body panel (Removing the side body panels and the tail guard).
Remove the front half-fairings (Removing the front half-fairing).
Remove the fuel tank (Removing the fuel tank).
Remove the airbox (Removing the airbox and throttle body).
Loosen the timing belt covers (Removing the timing belt external covers).
Loosen the water radiator retaining screws by leaving the radiator connected to the cooling system (Removing the water radiator).

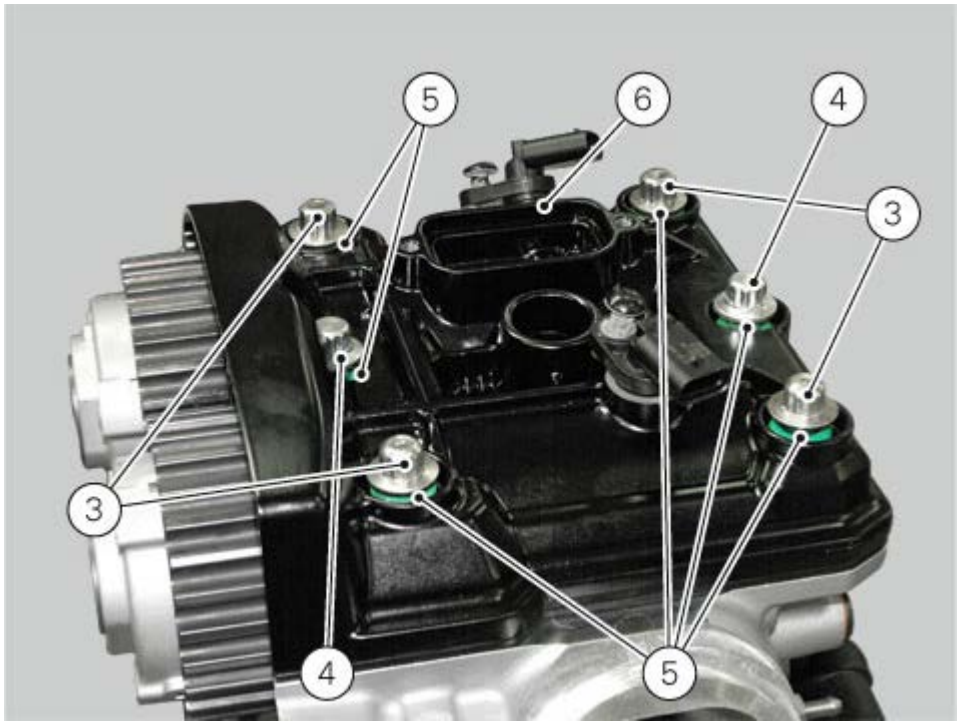
The described operations apply to both heads.
Remove the upper spark plug (1) with a suitable wrench no. **887132877**.

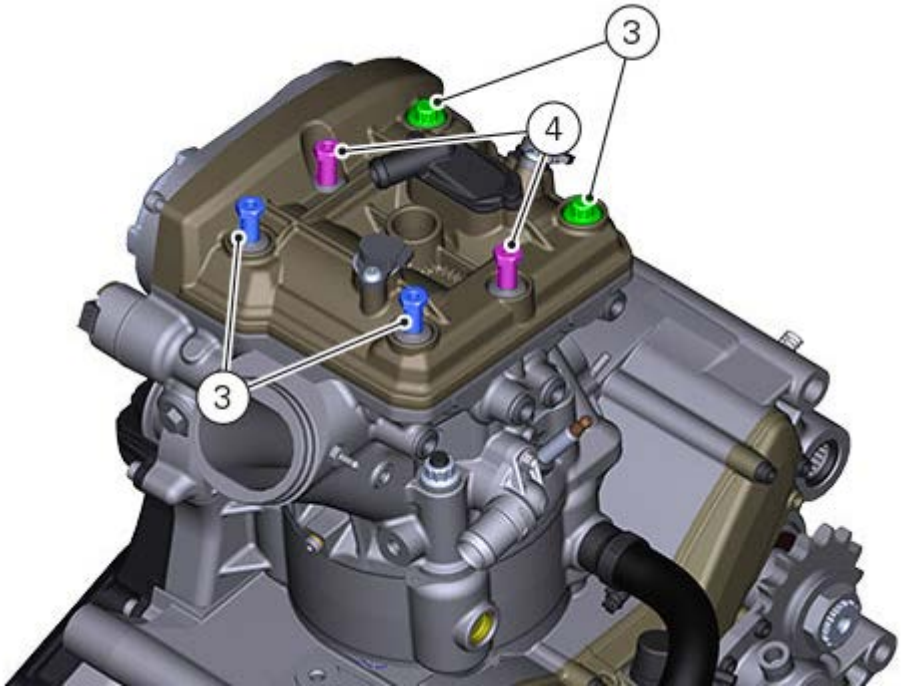


Slide clamp out and disconnect the secondary air system pipe (2).

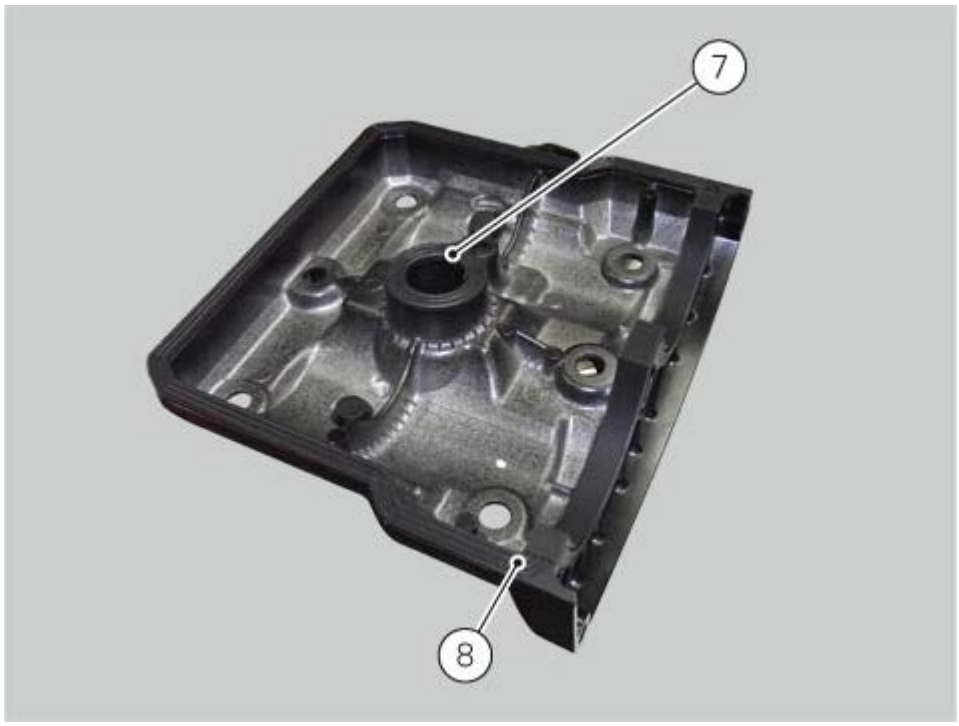


Undo and remove the screws (3) and (4) and the O-rings (5) from the cylinder head covers.
Remove the cylinder head cover (6).



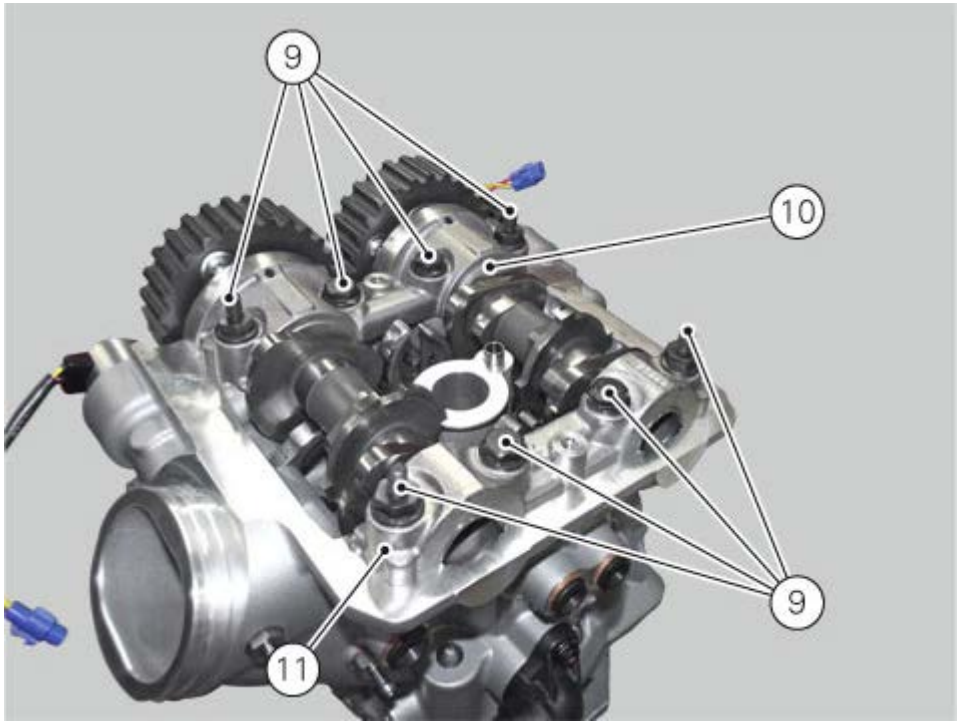


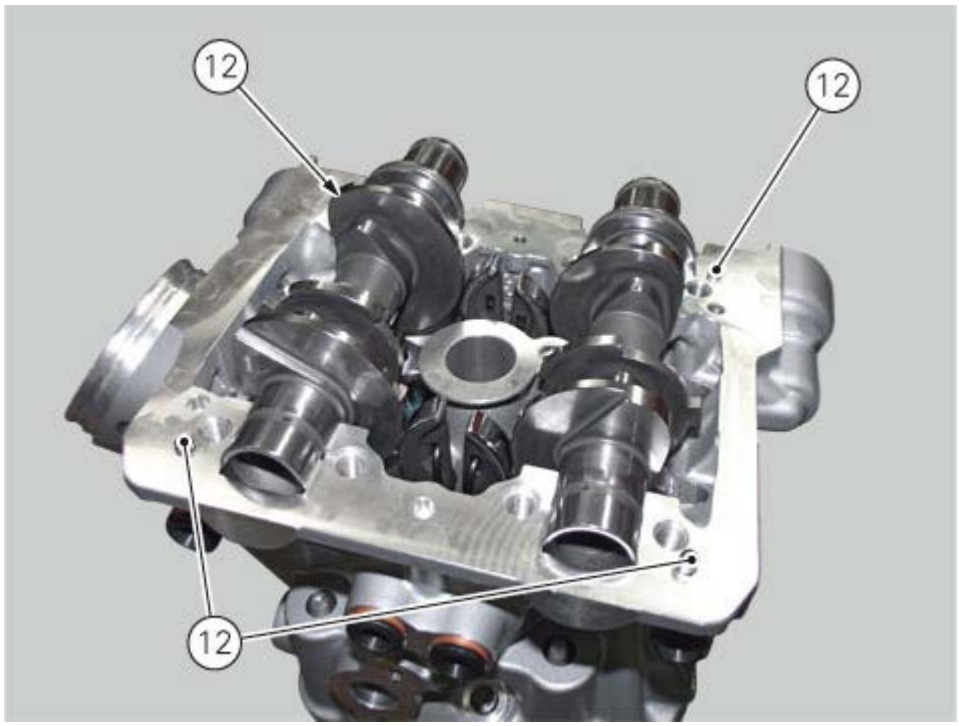
Remove the gaskets (7) and (8).



Removing the camshafts

Undo the screws (9) securing the camshaft supports.
Withdraw the camshaft supports (10) and (11) straight out from the cylinder head by prying in the indicated points, taking care not to damage the machined faces and centring dowels (12).

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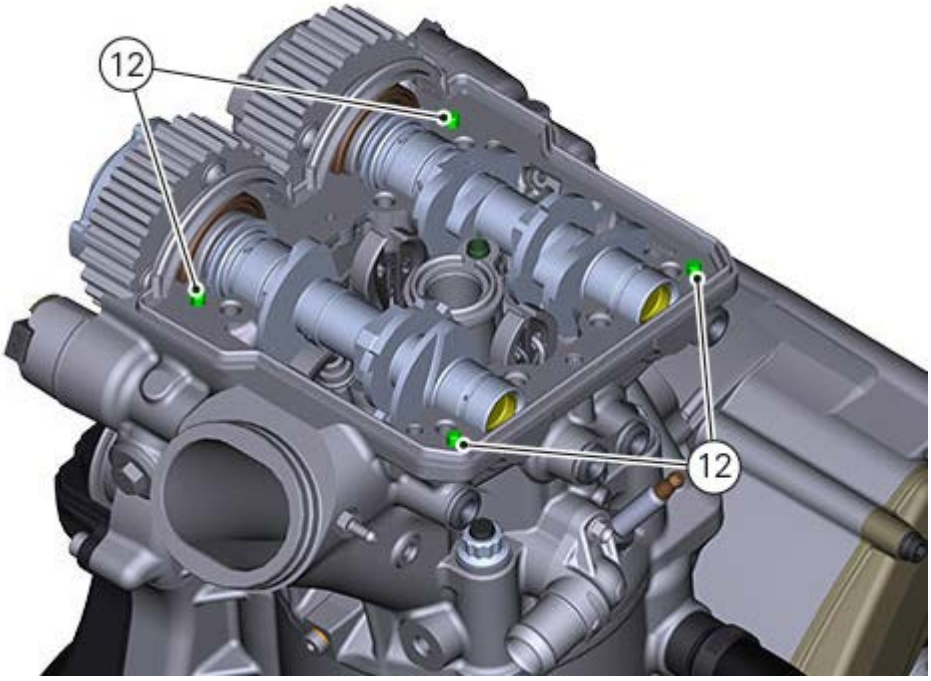
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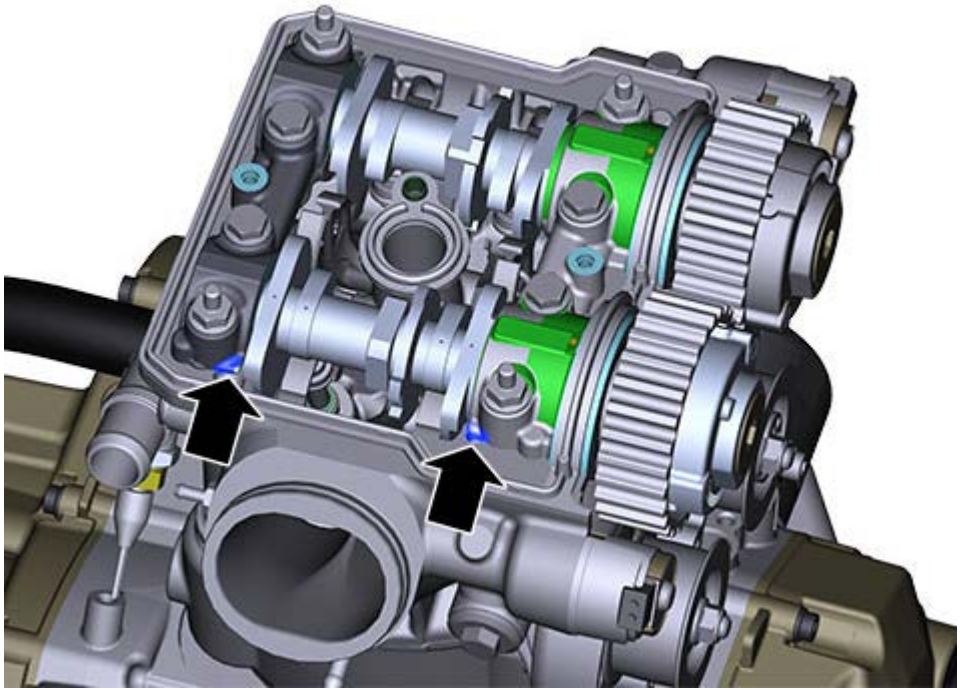
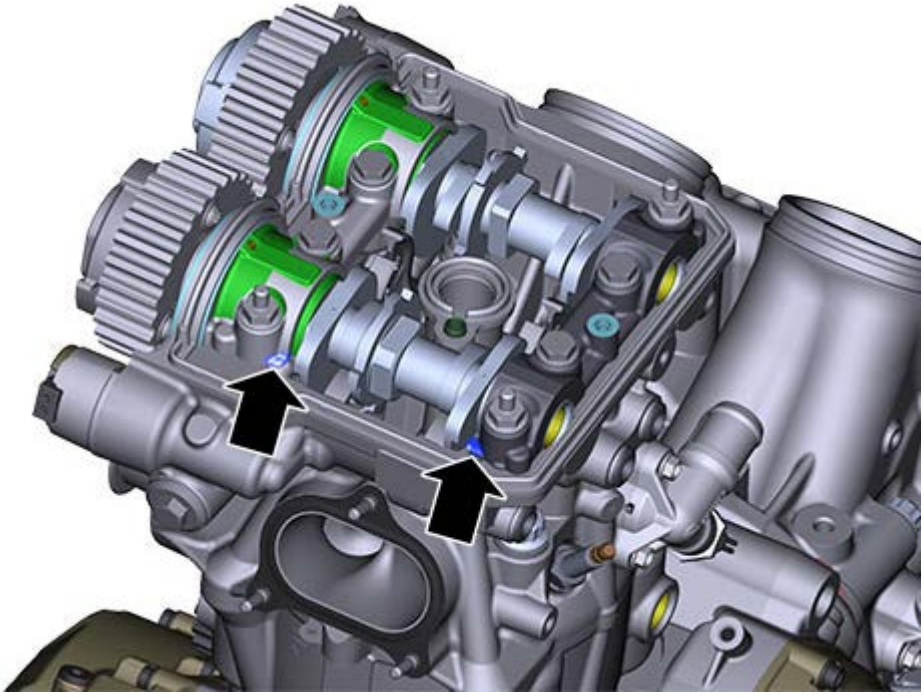


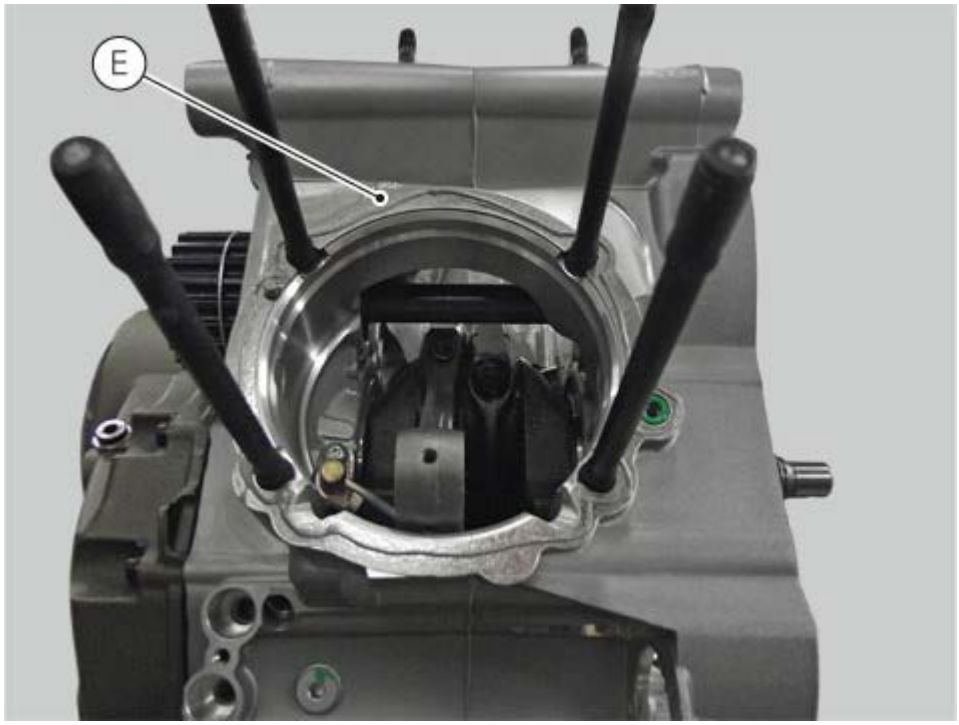


Refitting the cylinder head assemblies

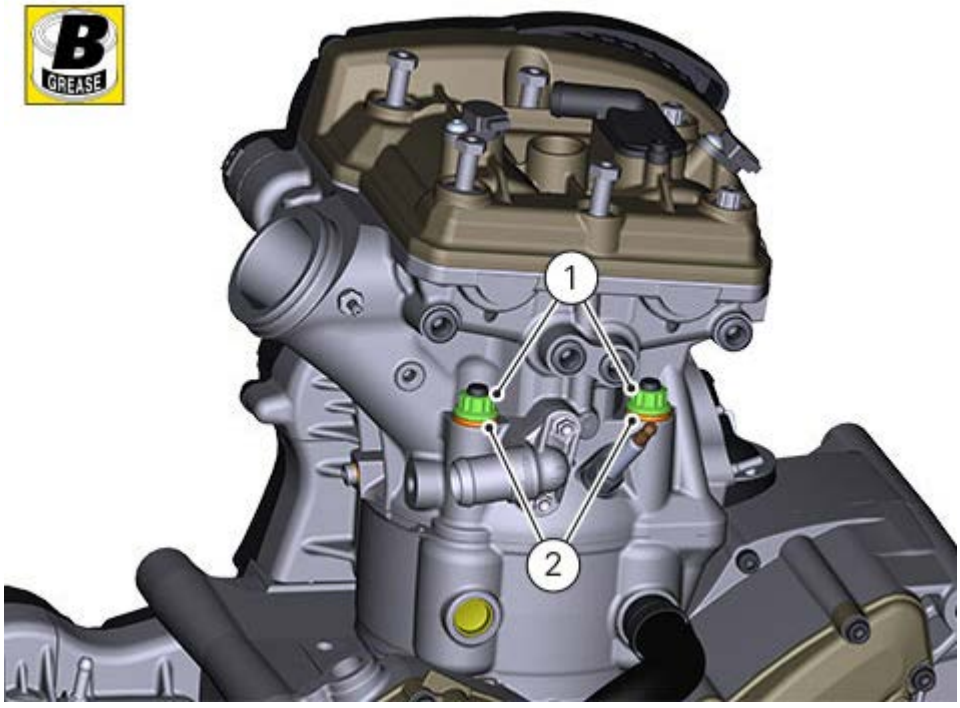
Warning

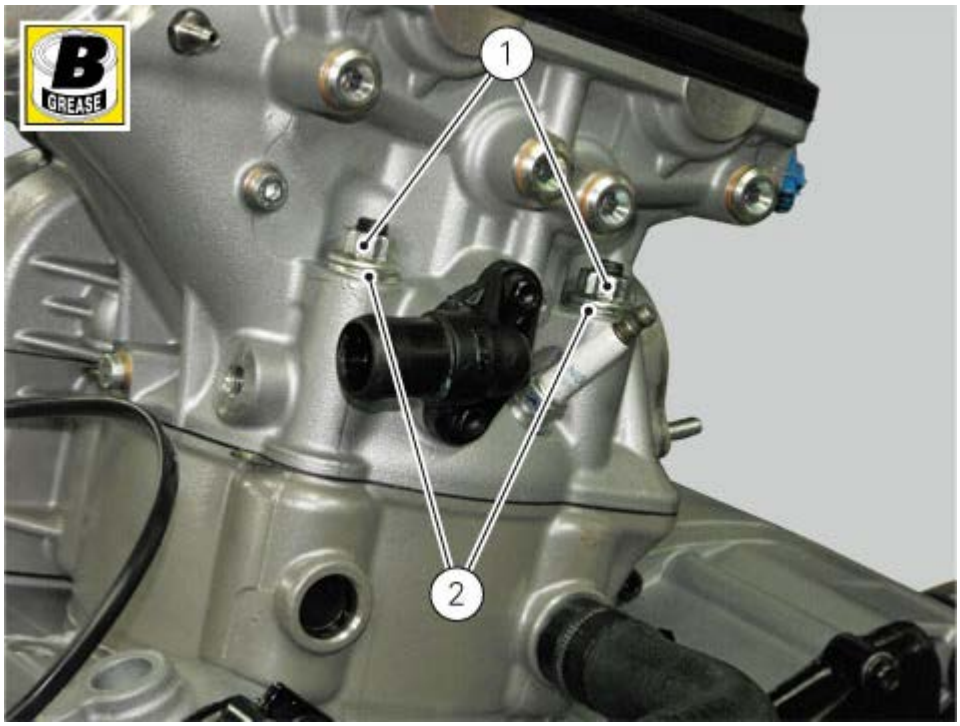
To prevent oil leaks in the contact area between cylinders and crankcase, each time the head is removed, cylinder and piston must be removed as well to clean the mating faces of crankcase and cylinder and restore the worn gaskets and O-rings and apply again sealing compound.

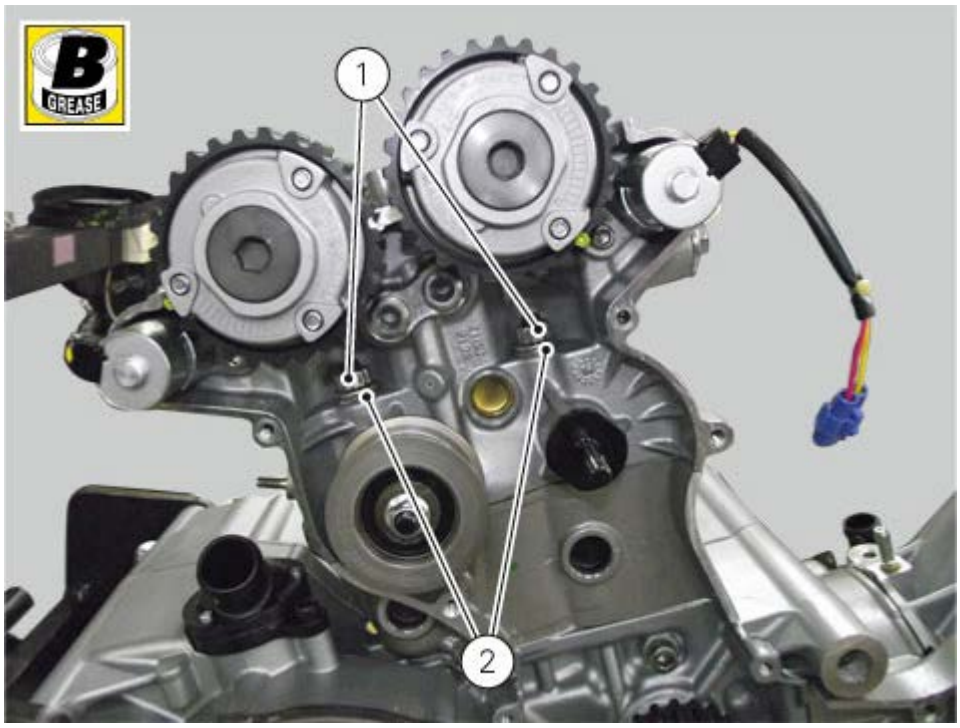
Before fitting the head, check that the gasket (E) is fitted on the mating surface between head and cylinder.



Lower the cylinder head carefully over the stud bolts. Take care not to damage the threads.
Fit the special washers (2) and polygonal nuts (1) onto the cylinder head stud bolts.
Screw the polygonal nuts (1) on the stud bolts following a cross pattern using tool no. **88713.2676** together with a torque wrench.
Apply a snug torque of 20 Nm to nuts (1);
pre-tighten to a torque of 40 Nm (Min. 38 Nm - Max. 48 Nm);
and tighten to a torque of 60 Nm (Min. 57 Nm - Max. 63 Nm).



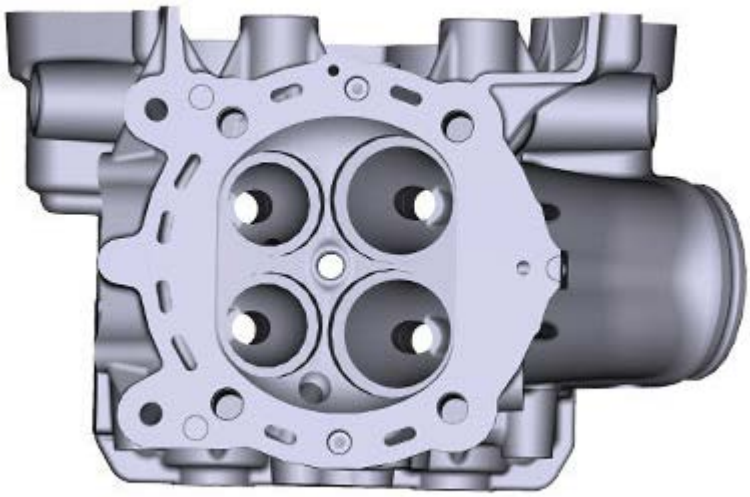


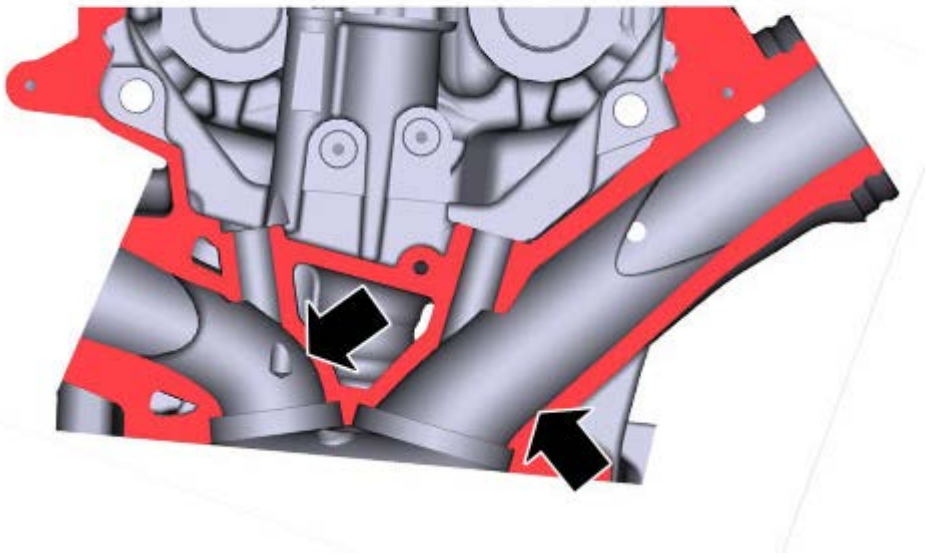


Refit the cooling system hoses (Refitting cooling system hoses and unions).
Refit the timing belts and covers (Refitting the cylinder head pulleys/fixed tensioners).
Refit the engine in the frame (Refitting the engine).

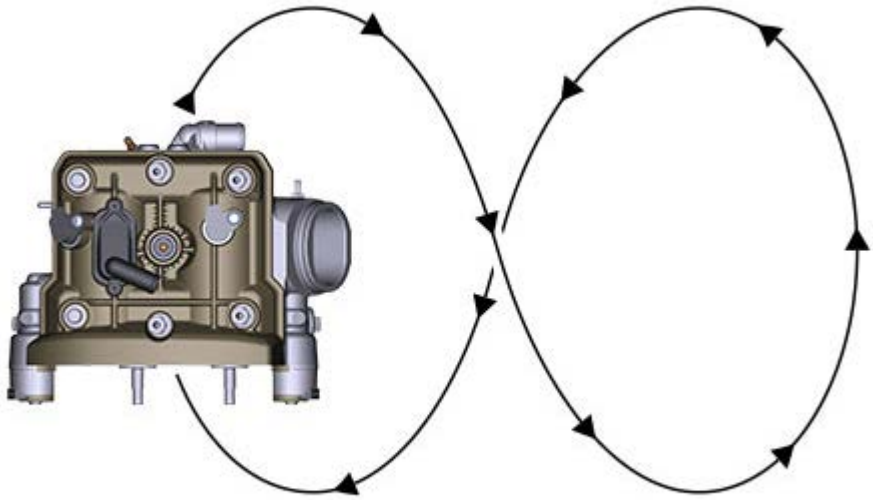
Overhauling the cylinder head components

Remove any carbon deposits from the combustion chamber and its ducts.
Remove any scale from the coolant ducts.
Check for cracking and inspect the sealing surfaces for scoring, steps or other damage.





Check that the cylinder mating surfaces of the cylinder head are free of carbon deposits and scale.
If this is not the case, spread diamond lapping paste (6 to 12 micron thickness) on a reference surface and slide the cylinder head on the surface as shown in the figure until a flat surface is obtained.



Important

Since it is absolutely necessary that the machining is extremely precise, we recommend having it performed by operators specialised in grinding operations.

Maintaining the valve seat

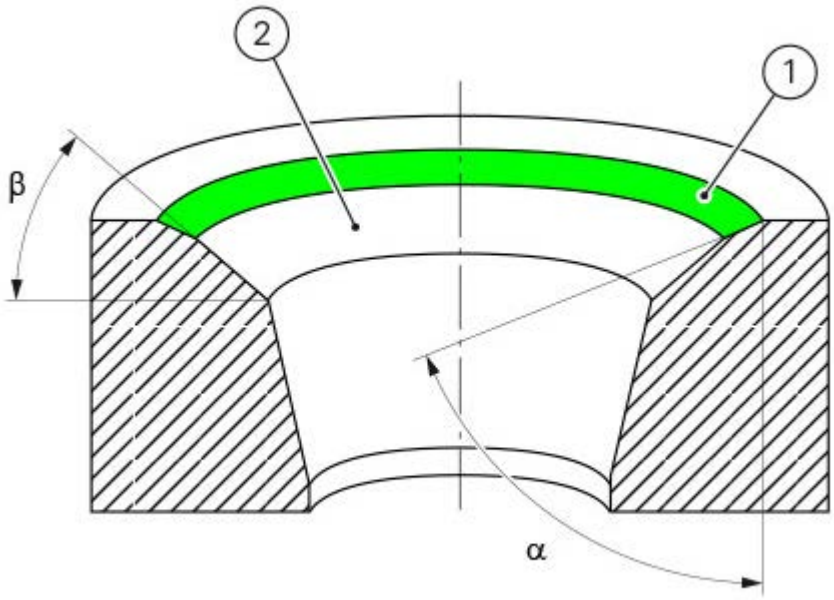
Visually check the contact surface between the valve and its seat on the head. There must be no pitting or cracks.

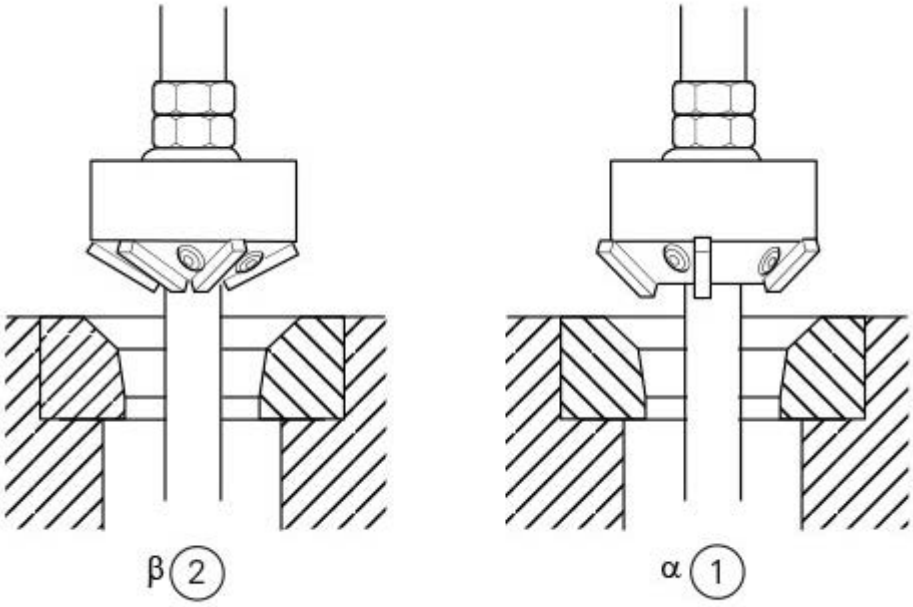
Check that the outer diameter of the valve seat contact surface.

Standard: exhaust
Standard: intake

"Minor" damage can be repaired by grinding with special α (1) and β (2) single-blade grinders.
Grind the valves and check the seal.

Valve	Grinder	
	α	β
Intake	60°	45°
Exhaust	60°	45°





Remove the least possible quantity of material from the seat.
If the valve seats are excessively damaged, fit oversize seats. Replacement seats are available with 0.03 and 0.06 mm oversized outside diameters.

Warning
Check that there are no leaks by filling the intake and exhaust pipes with a suitable product. In case of leaks, check the repair quality with Prussian blue.

Replacing the valve seat

Important
When you change the valve seats, change the valve guides as well.

Change the valve guides as follows:

1 Remove the worn out seats by grinding them carefully;
2 Check the diameter of head housings and choose the oversized valve seat that will give an interference fit of

0.04 to 0.10 mm.

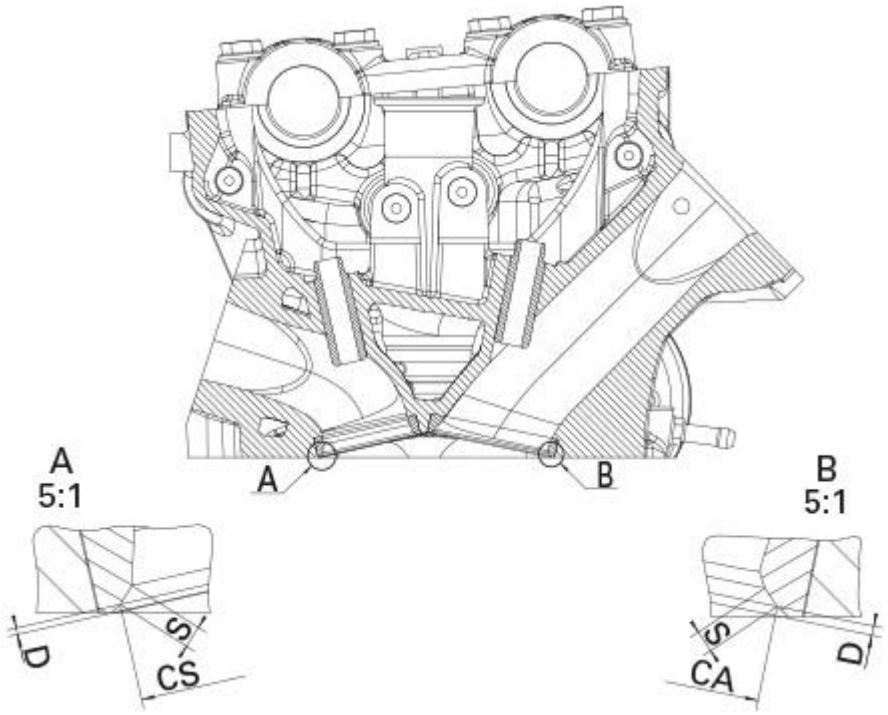
3 The valve seats are available as spare parts with outer diameter oversized by 0.03 and 0.03 mm.

4 Heat the cylinder head gradually and evenly up to 150 °C and chill the new valve seats in dry ice.

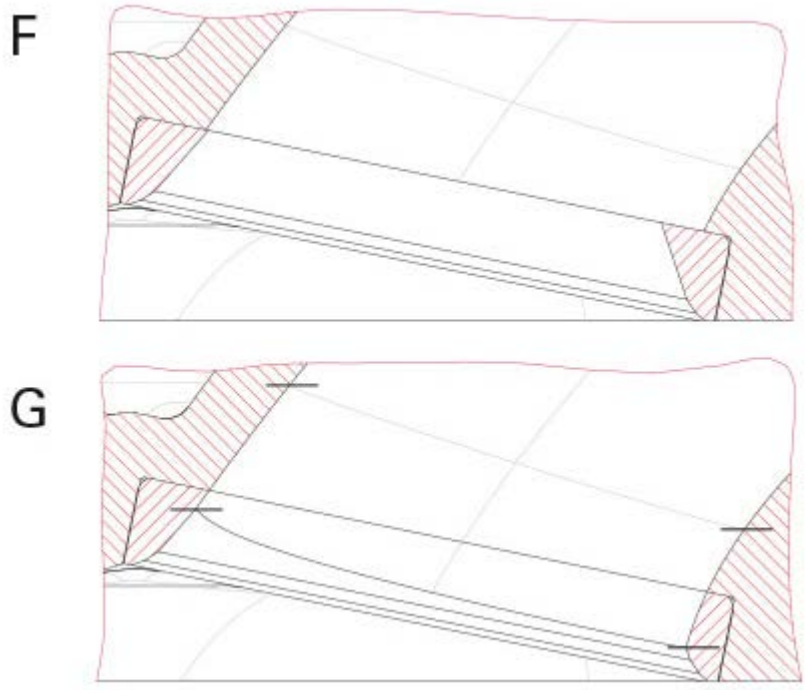
5 Drive the seats perfectly square into the head housings using the appropriate installers 88713.2846 and 88713.2847.

6 Allow the cylinder head to cool down and grind the seats to the following dimensions:

Valve	
Intake (CA)	
Exhaust (CS)	
S	
D	

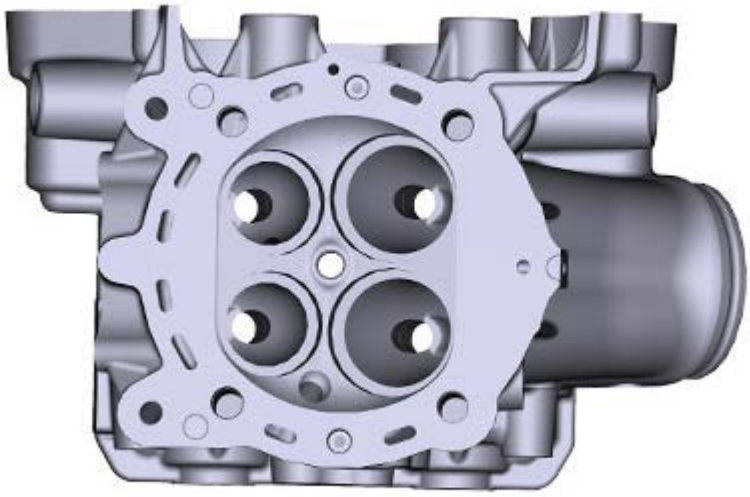


It is advisable to lap the radius between the intake valve seats and the intake ducts (F = before; G = after).

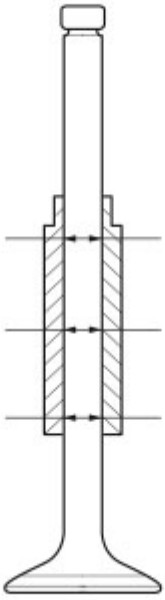


Valve guides

Check the internal surface of the valve guides: there should be no signs of deformation or cracking.



Thoroughly check the dimensions of the valve guide.
Measure the inside diameter with a suitable gauge.
Measure the diameter at different positions of the valve guide.



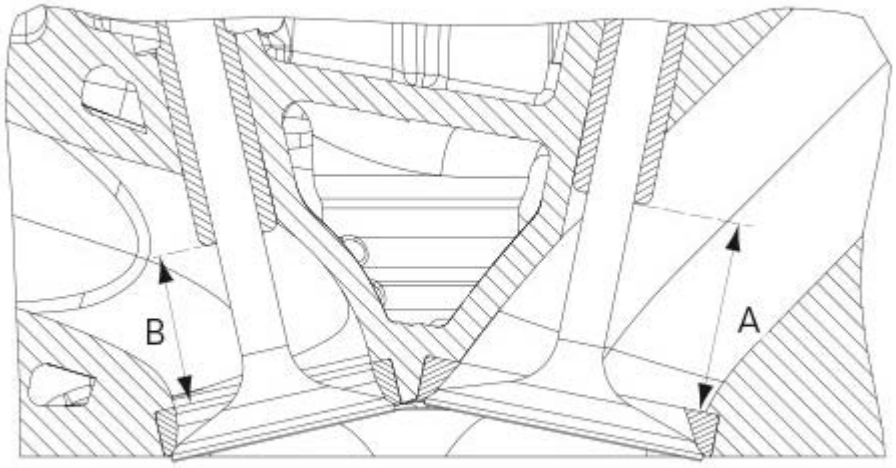
The clearance upon fitting must be: maximum detected value - minimum detected value = 0.028÷0.013 mm.
Change the valve guides when the ovality exceeds permissible limit or the valve stem clearance is outside the tolerance range.
When you change the valve guide, you must also change the valve.
Valve guides as spare parts are available with outside diameter oversized by 0.03, 0.06 and 0.09 mm.

Change the valve guides as follows:

- heat up the cylinder head gradually and evenly up to 150 °C;
- remove the original valve guides using tool no. 88713.2842;

- allow the cylinder head to cool down and check the condition of the seats;
- choose suitable valve guides to obtain an interference fit in the cylinder head of 0.022 to 0.051 mm;
- heat up the cylinder head again and chill the new valve guides in dry ice;
- lubricate the seats in the cylinder head and install the valve guides using the appropriate service tools and with reference to the dimensions given in the figure.

INTAKE (A)= 26.2 mm
EXHAUST (B) = 20.8 mm



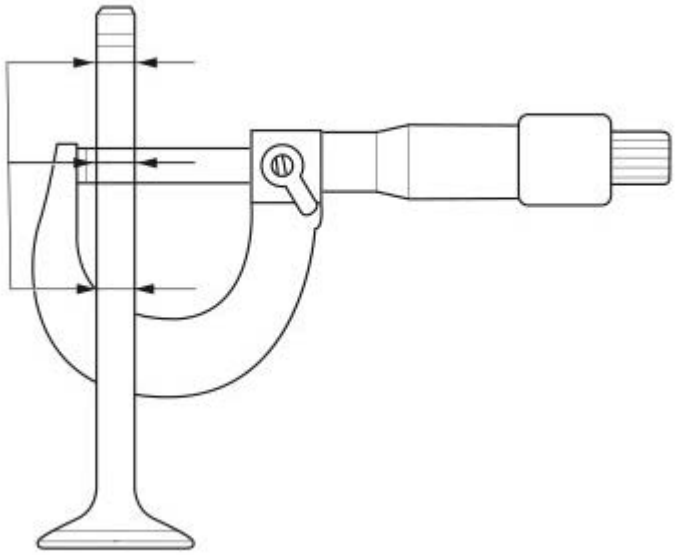
Checking the valve

Check that the stem and the valve seat contact surface are in good condition.
There must be no pitting, cracks, deformations or signs of wear.

Warning
The valves cannot be ground.

Perform the following checks:

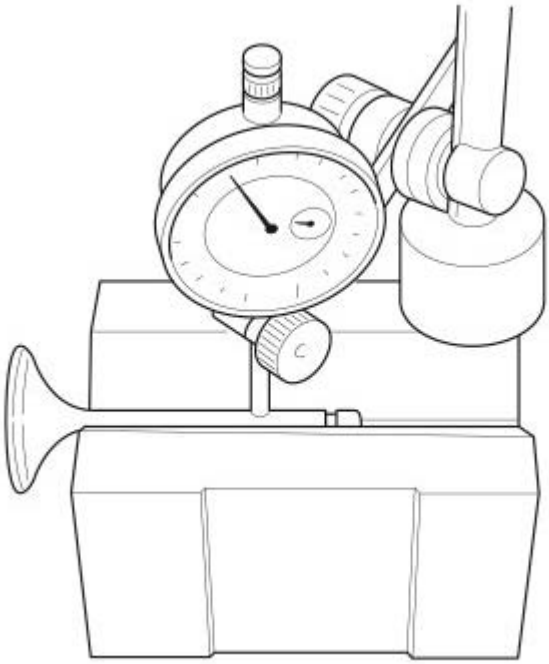
- Measure the diameter of the valve stem at various points along the section that runs in the valve guide.



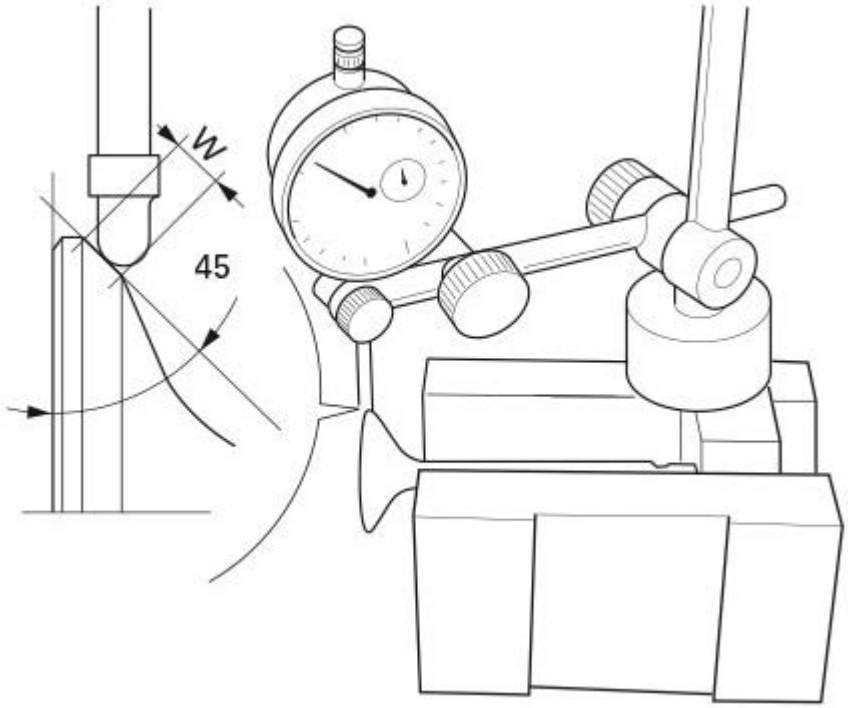
- Check the valve stem for buckling. Place it on a "V" reference and measure deformation with a dial gauge.

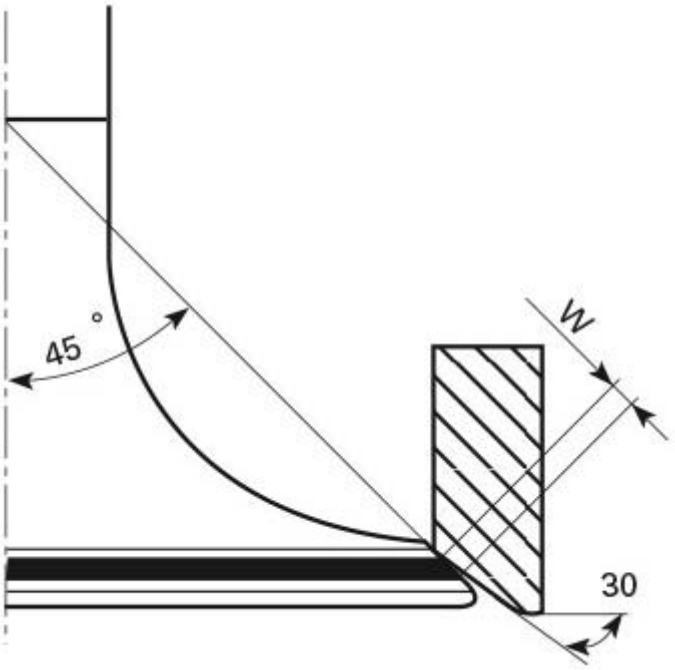
Service limit: 0.053 mm.
Check the valve stem for buckling. Place the valve on a "V" reference block, set a dial gauge perpendicular to head and measure concentricity of valve face at 45°:

- nominal concentricity: 0.01 mm;
- service level: 0.03 mm.



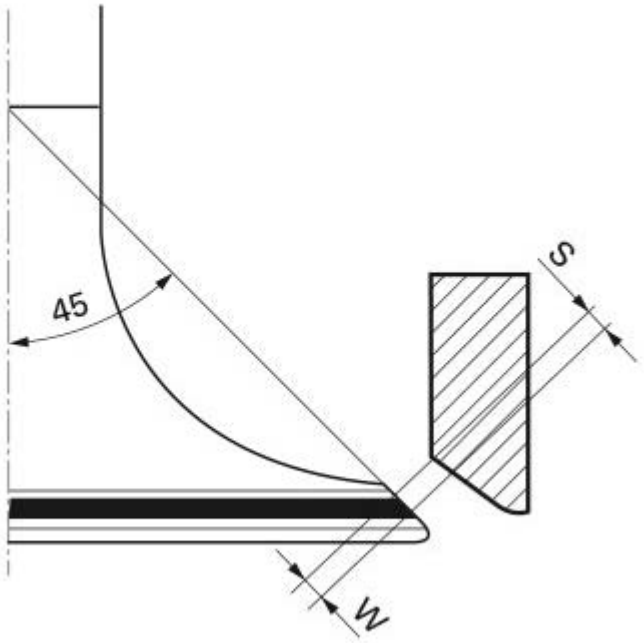
Use Prussian blue or a mixture of minium and oil to check that the contact surface (W) between valve and seat is 1.4 to 1.6 mm (1.05 to 1.35 mm when new).
Grind the seat if the dimension measured is greater than the above limit.





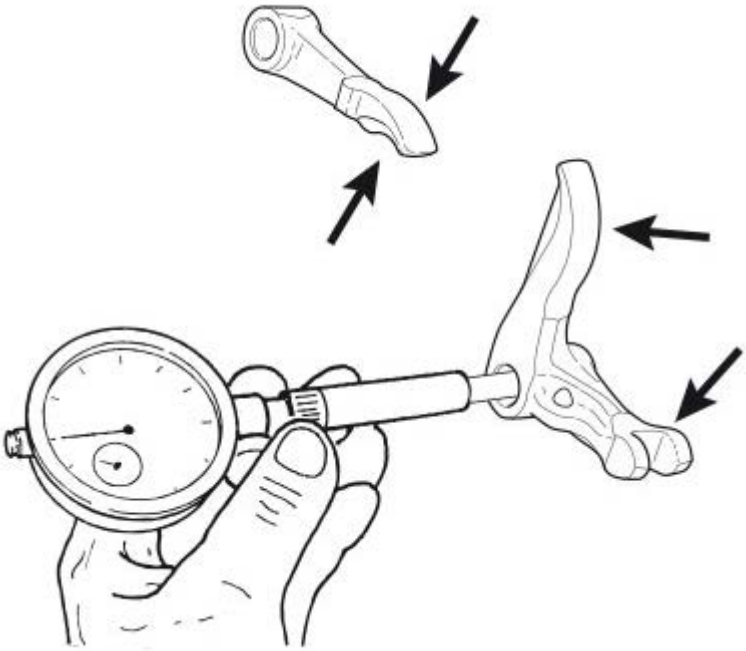
Checking the valve seal

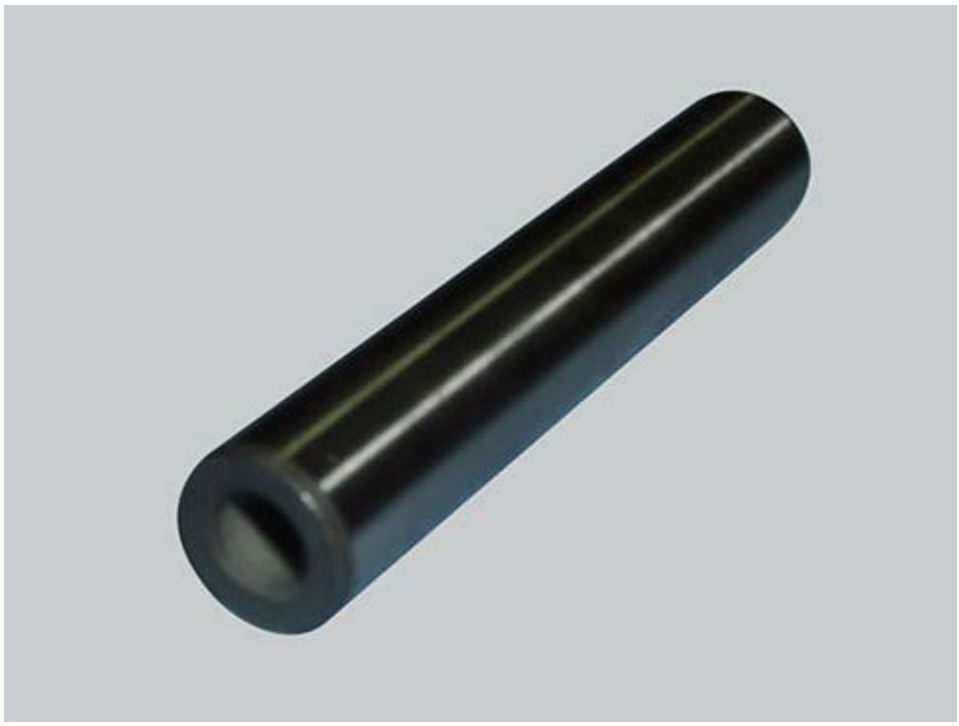
After grinding the seats it is important to check the seal between valve face and seat: if the seat contact area (S) on the valve is wider than the 45° band (W) this could lead to poor sealing.



Checking the rocker arms

Check for signs of wear, grooves or chrome flaking off.
Check the condition of rocker arm bore and shaft.
Clearance upon fitting: 0.025÷0.049 mm.
Wear limit: 0.08 mm.





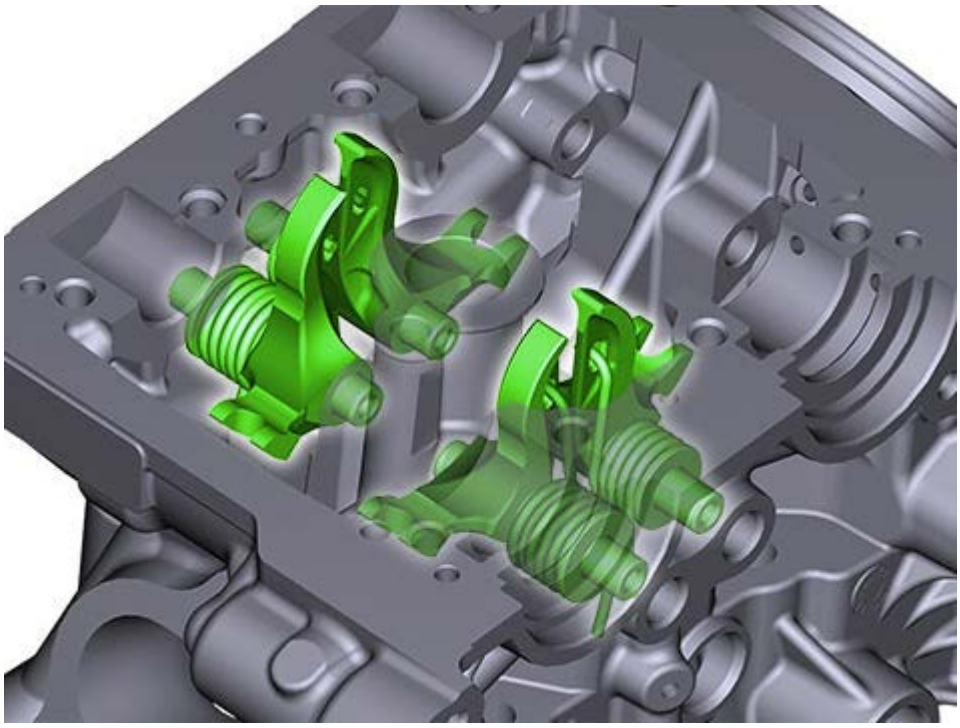
Check the conditions of the return springs of the closing rocker arms: no cracks, deformations or failure must be present.

Refitting the valve rocker arms

Check the rocker arm conditions: they must feature no scratches or breakage.

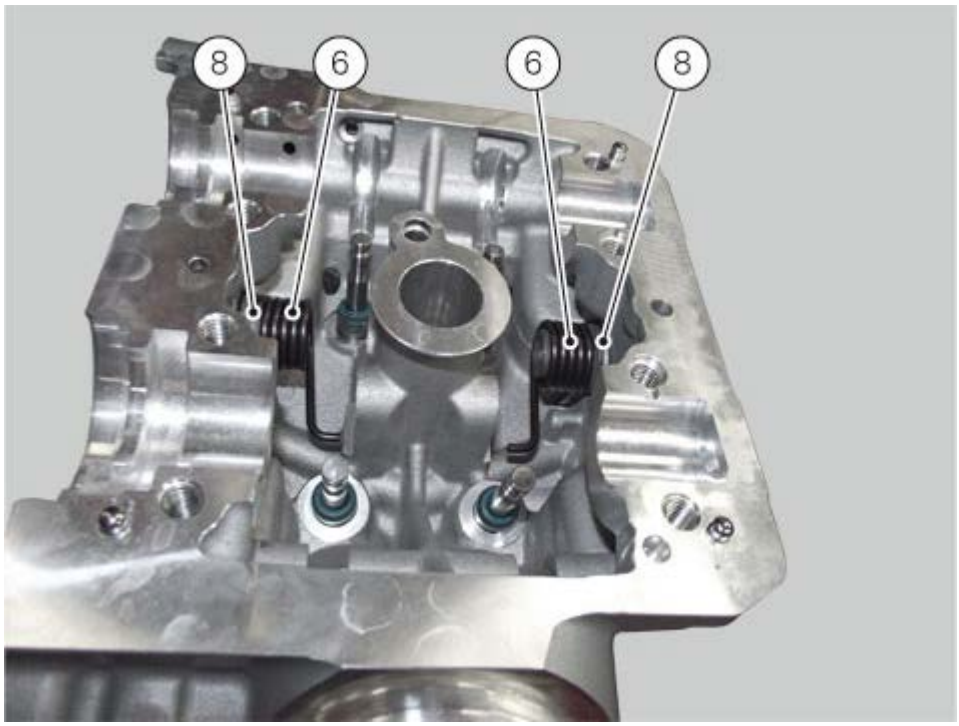
Note
The closing rocker arms are longer than the opening ones.

OPENING ROCKER ARMS

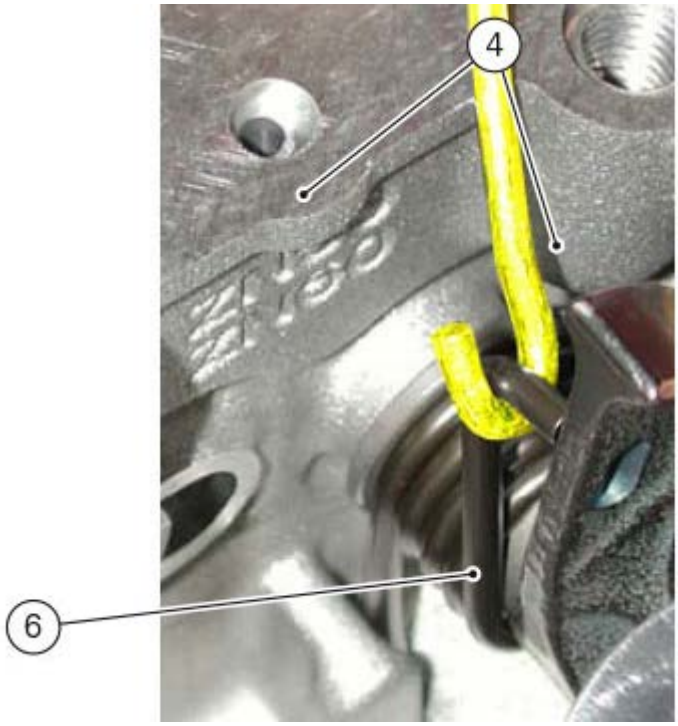


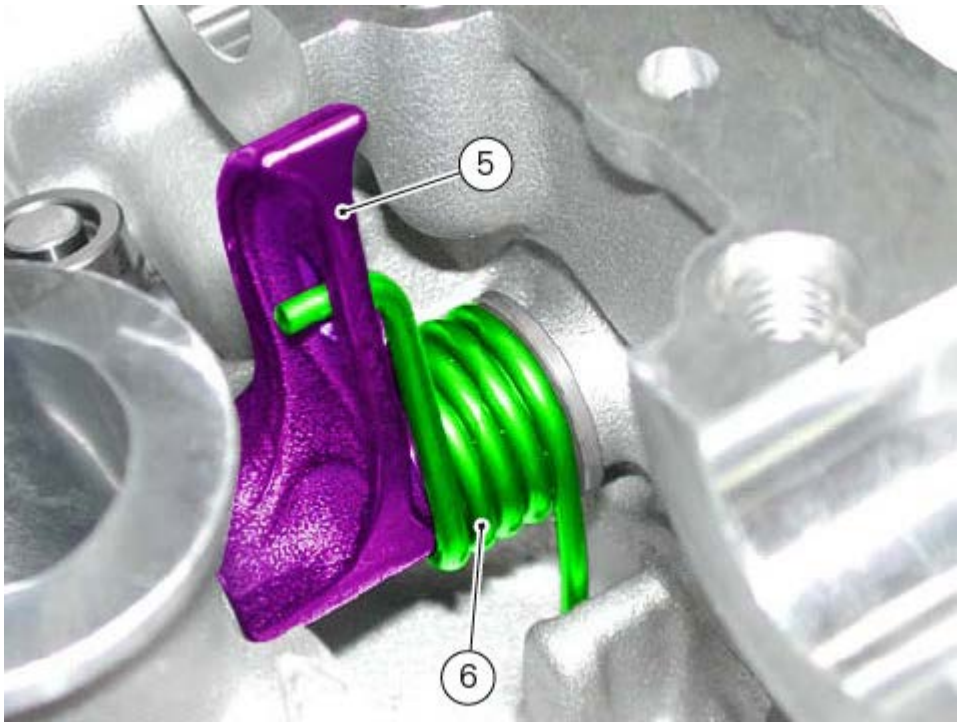
Fit the opening rocker arm shafts (7) using suitable tools.

Position spacer (8) and spring (6) on shaft (7).



Using the pawl of the rocker arm spring tensioning kit no. 88713.2069, fit springs (6) in the closing rocker arms (5).



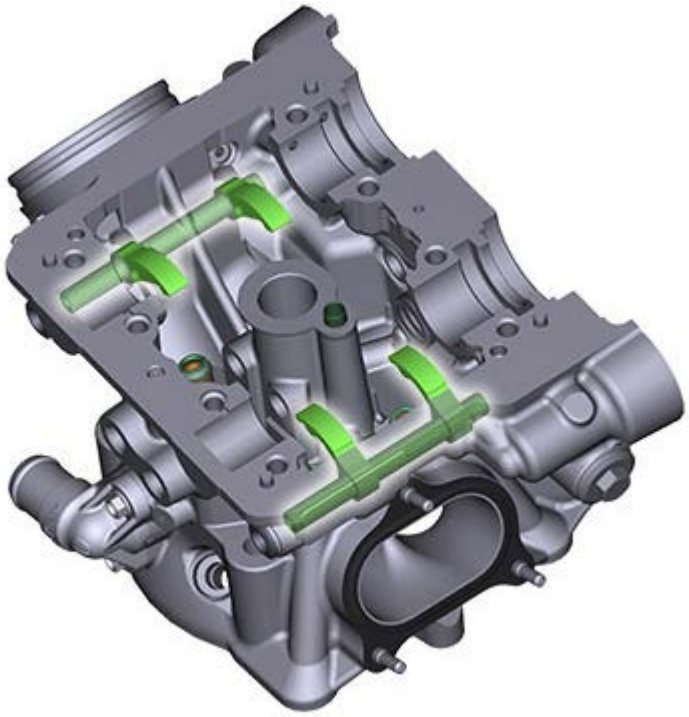


Follow the same procedure to refit the opening rocker arms.

Note
Always install the closing rocker arms on the exhaust side before those on the intake side.

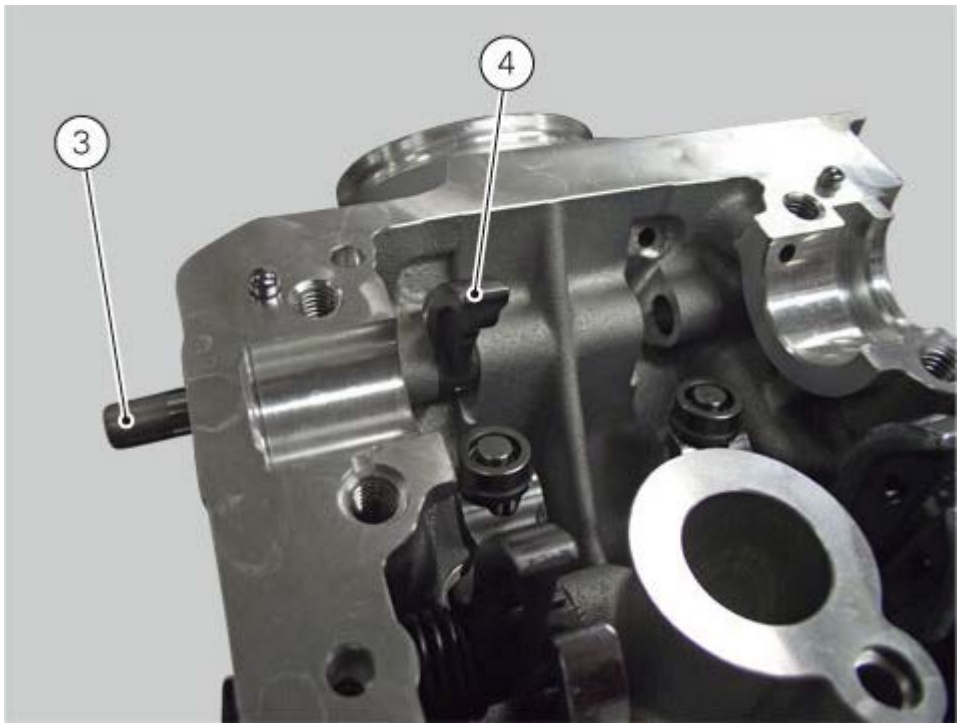
Warning
Take care not to damage the shoe of the closing rocker arm with the intake spring during assembly.

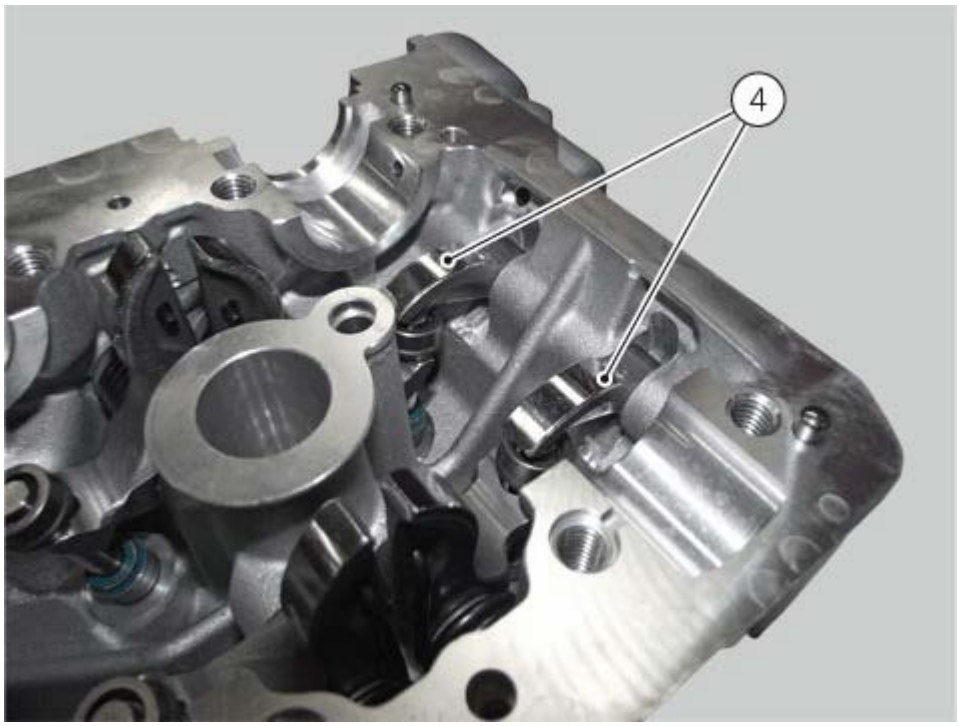
CLOSING ROCKER ARMS



Fit the closing rocker arm shafts (3) using suitable tools.

Locate the closing rocker arm (4) and drive the shaft (3) home.





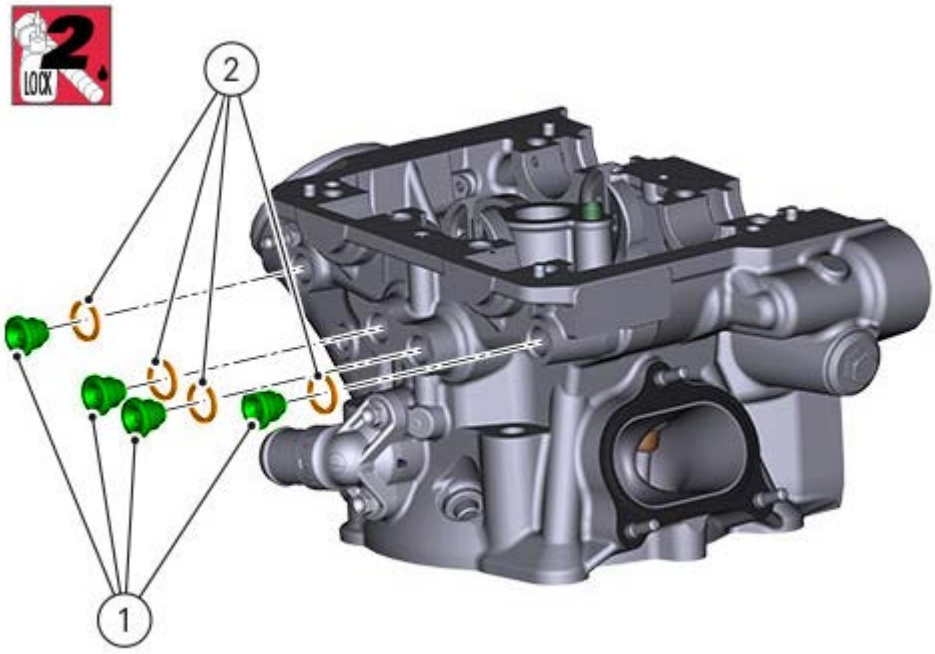
Follow the same procedure to refit the closing rocker arms.

If not installed before, lift the opening rocker arms (4) and insert the opening shim as described in chapter "Refitting the valves".

Refit the camshafts (Refitting the camshafts) and check the valve opening clearance (Checking and adjusting the valve clearance).

Insert the gaskets (2) on the plugs (1), orienting them (preferably) with the square edge side (T) facing the cylinder head.
Apply the recommended threadlocker on the plug (1) threads: apply the product on the first two plug threads, spreading it for the half circumference (about 180°).
Tighten the plugs to a torque of 15 Nm (Min. 14 Nm - Max. 16 Nm).

Note
After tightening, remove any excessive sealant.



Refit the camshaft supports and the head covers (Refitting the camshafts).

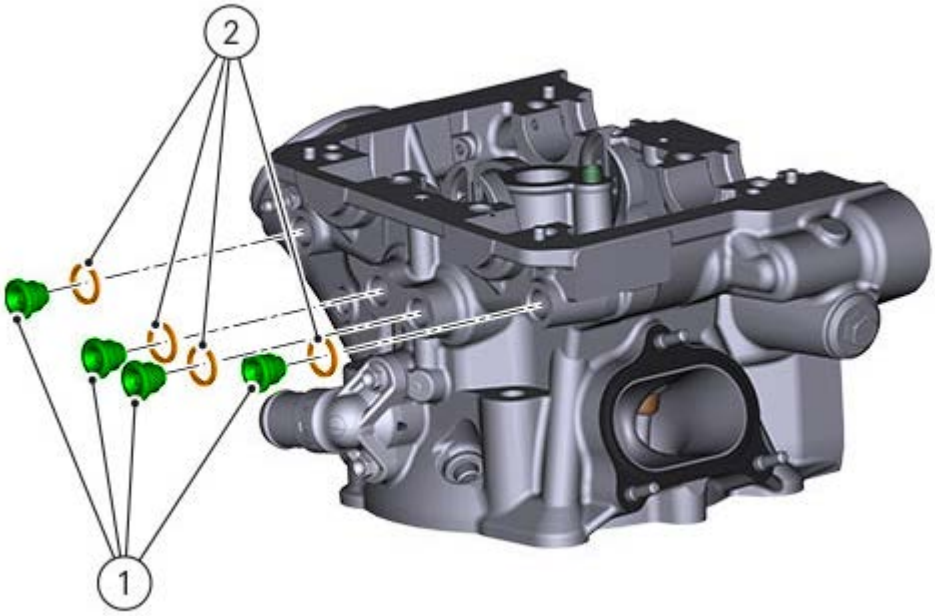
Refit the timing pulleys (Refitting the cylinder head pulleys/fixed tensioners).
Connect the caps to the coils.
Connect the secondary air pipe (Refitting the secondary air system).
Refit the complete head (Fitting the complete heads).

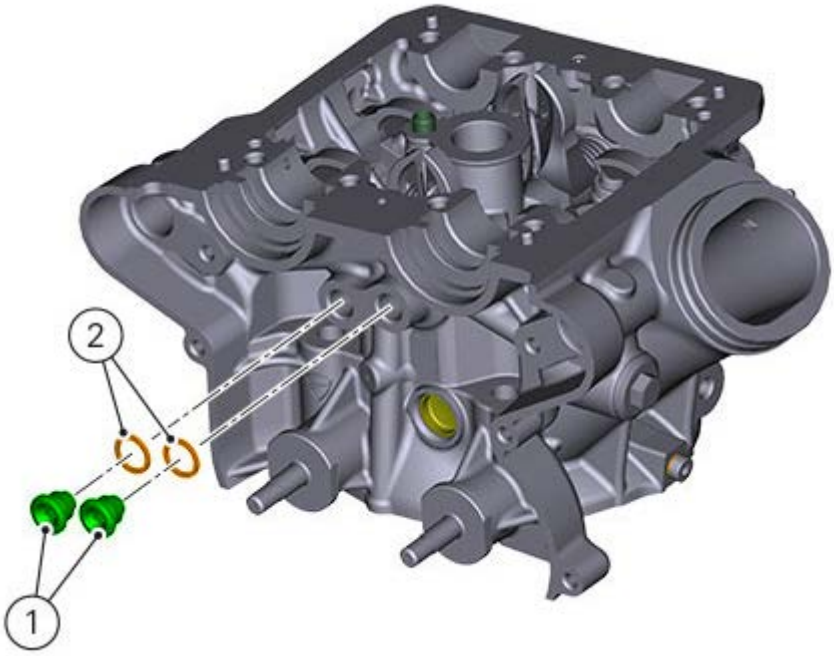
Removing the valve rocker arms

Remove the heads from the cylinder (Removing the engine heads).
Remove the camshafts (Removing the camshafts).

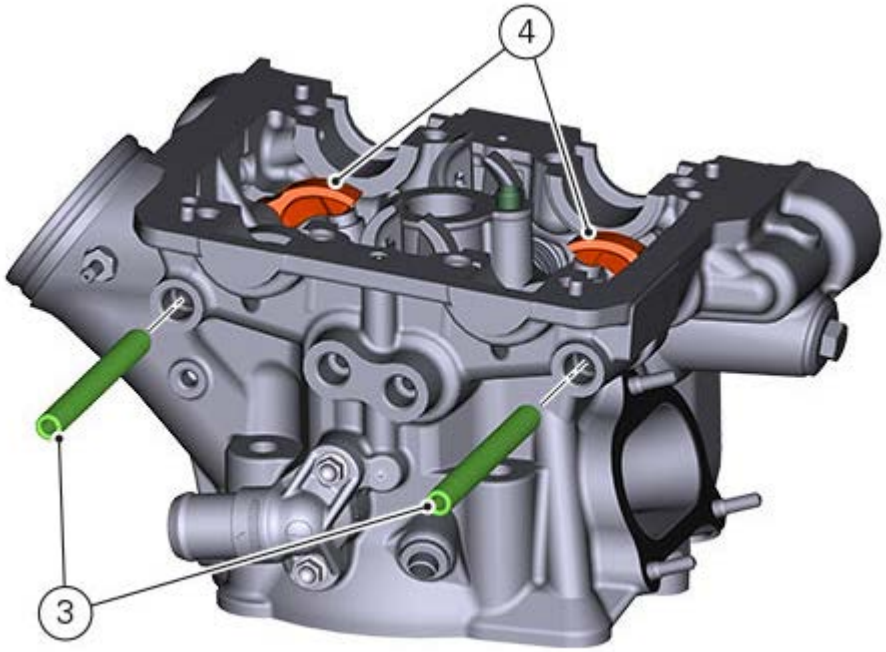
The procedure below refers to one head but it applies to both coils.

Loosen blanket plugs (1) and collect seals (2).

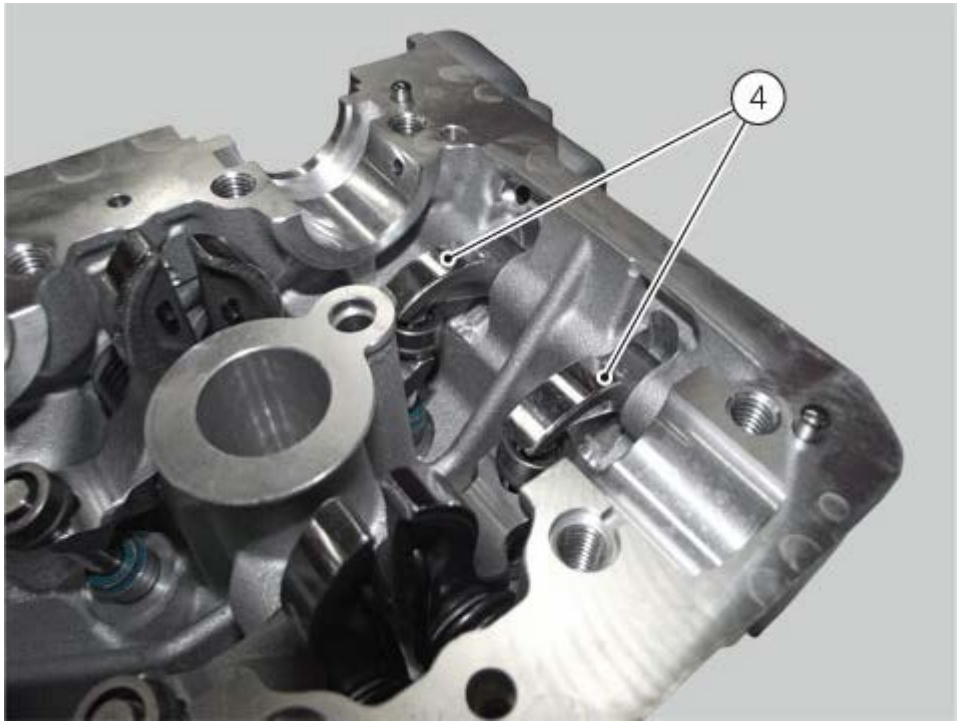




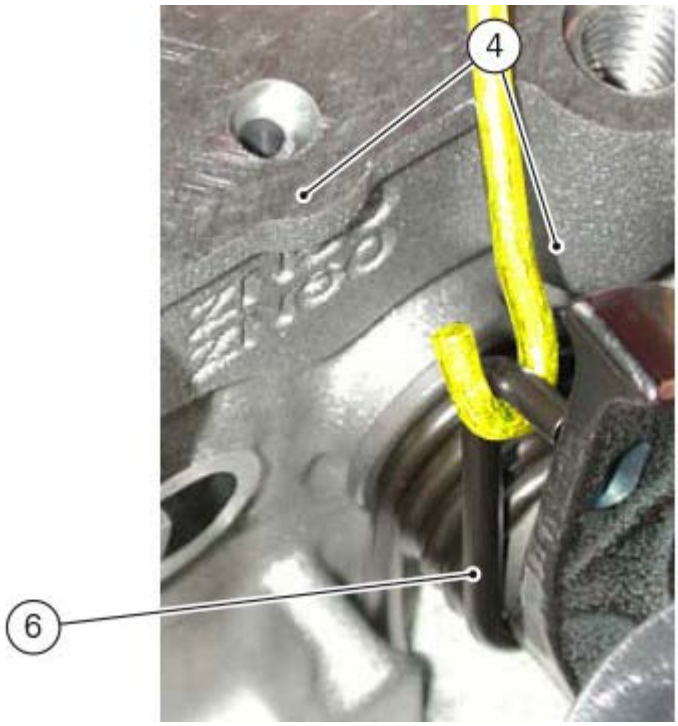
Use suitable tools to slide out shafts (3) of the opening rocker arms (4) both on intake and exhaust side.



Follow the same procedure to remove the opening rocker arms (4) on the intake and exhaust side.



Using the pawl of the rocker arm spring tensioning kit no. 88713.2069, slide springs (6) out of the closing rocker arms (5).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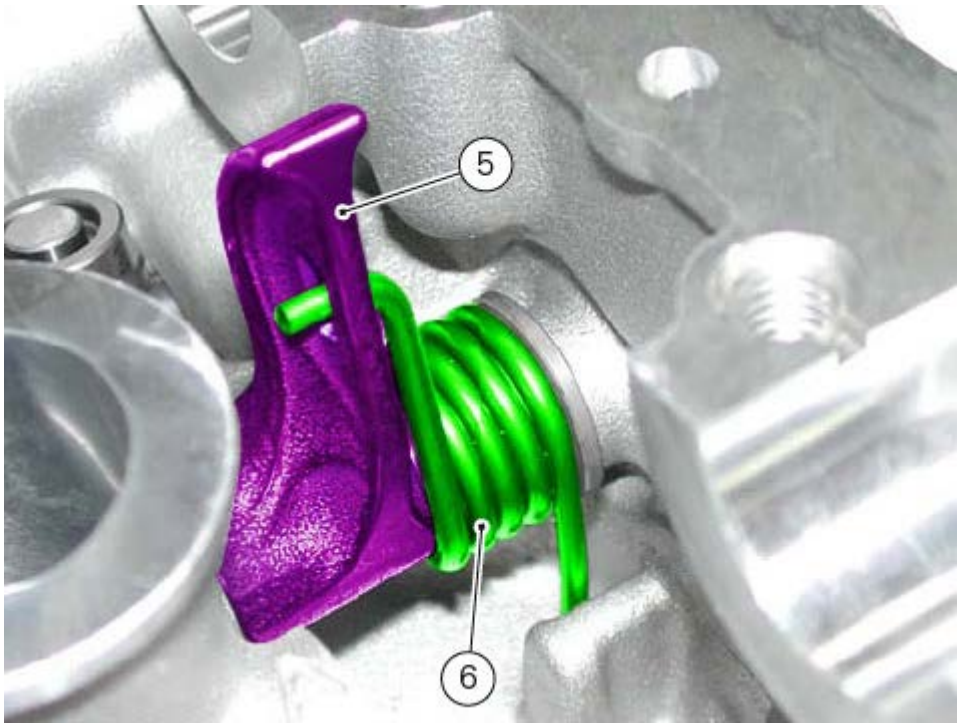
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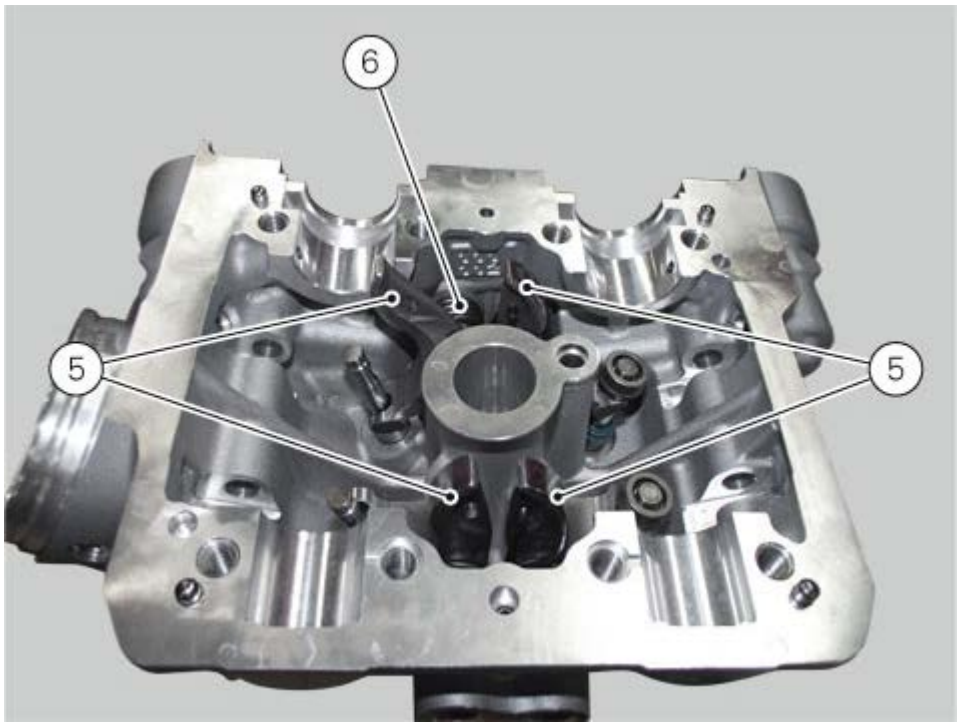
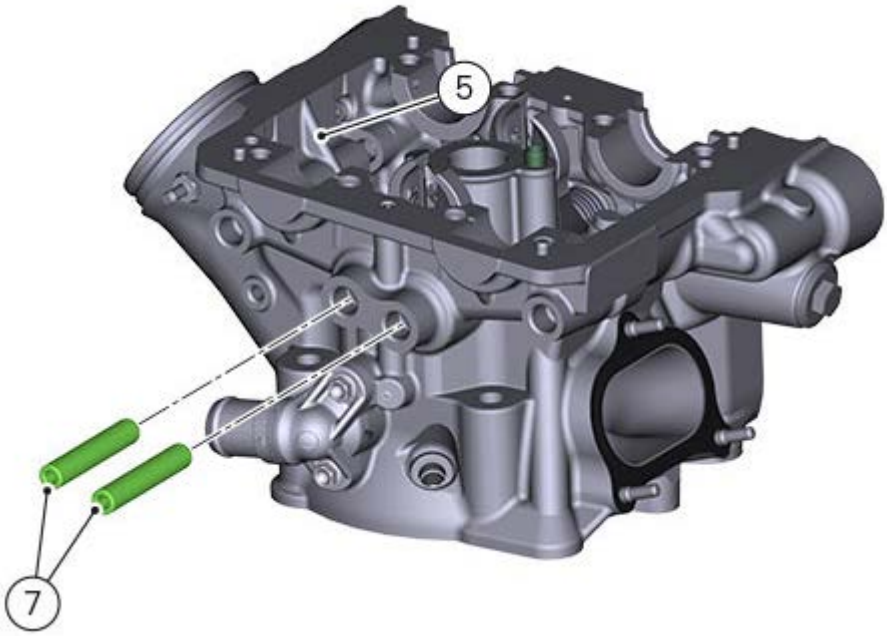
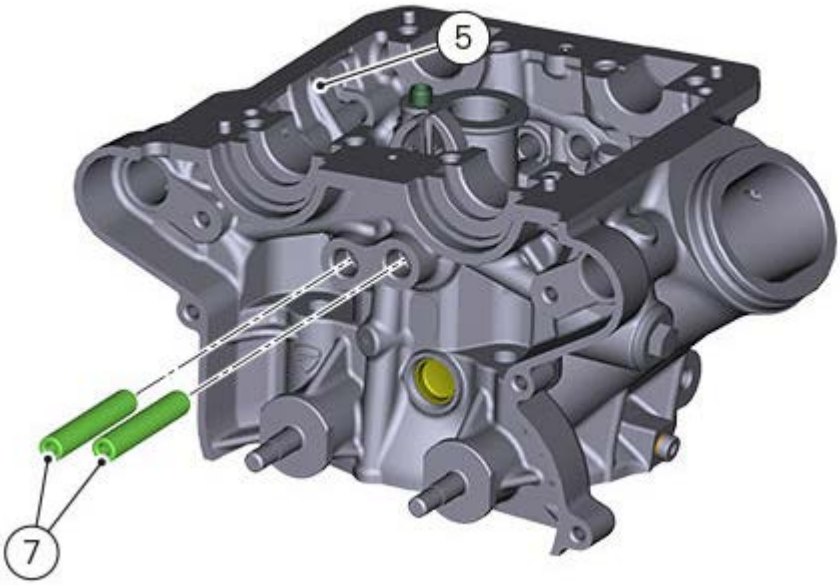
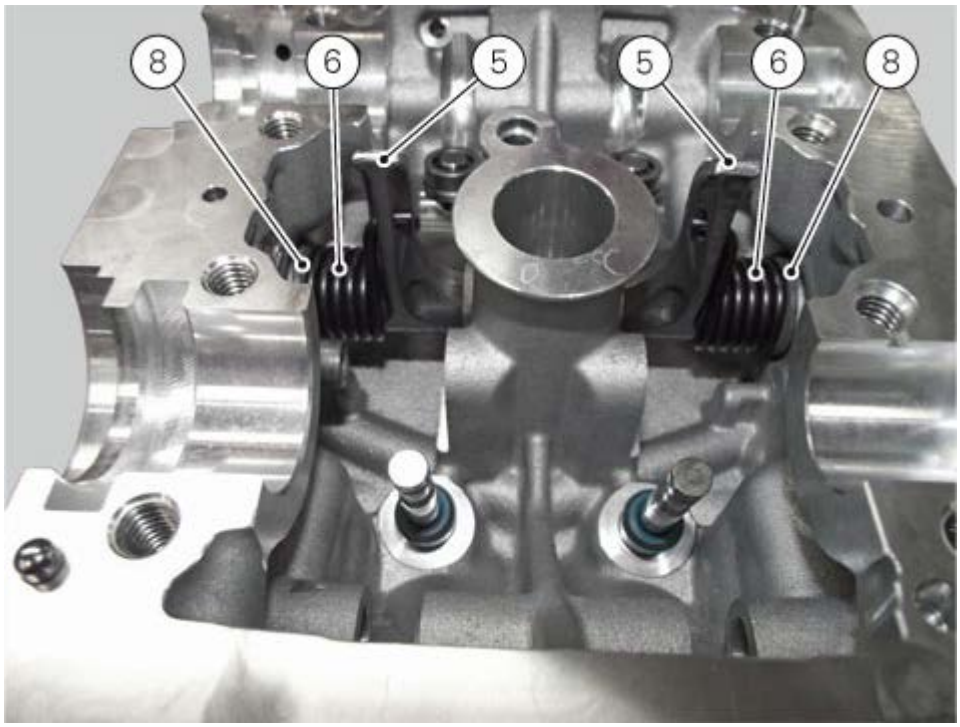


Withdraw the shafts (7) of the closing rocker arms on the exhaust and intake sides.



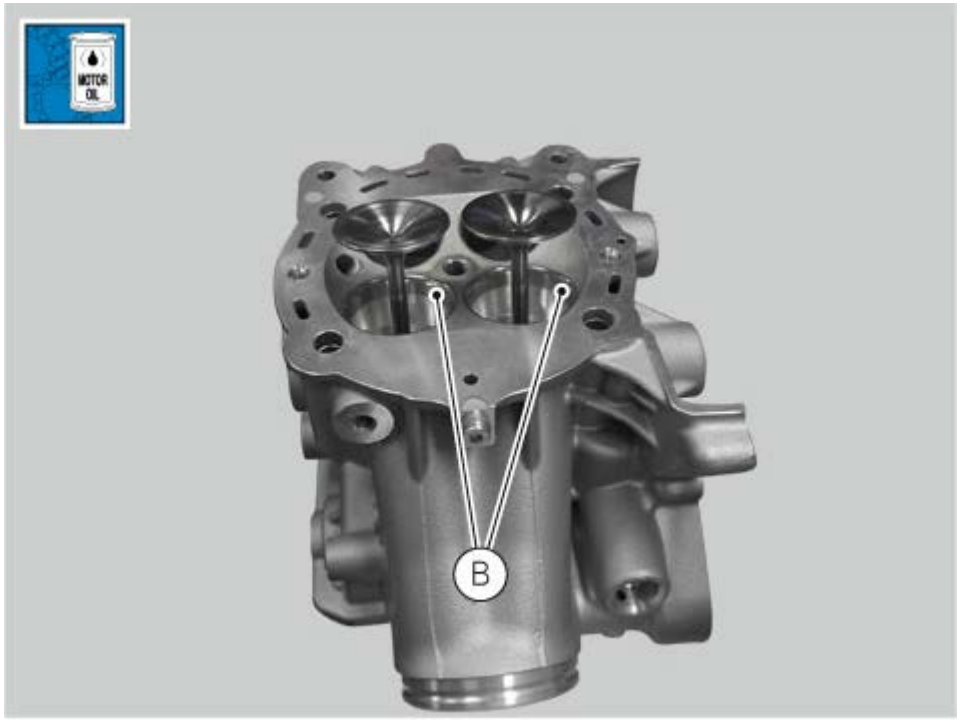


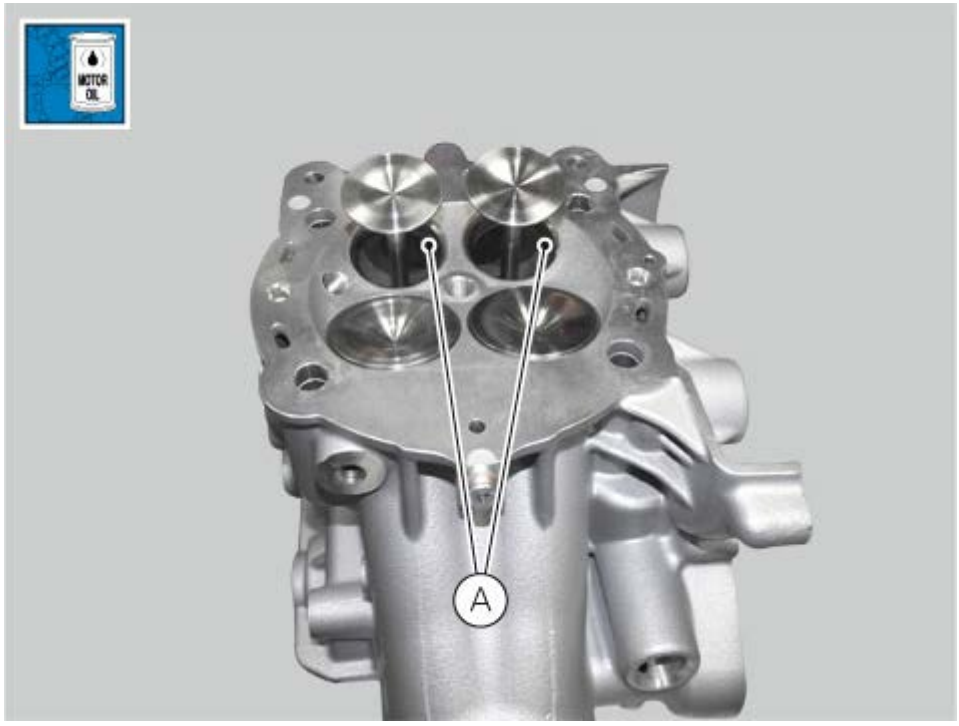
Remove the closing rocker arms (5), the springs (6) with the spacers (8).

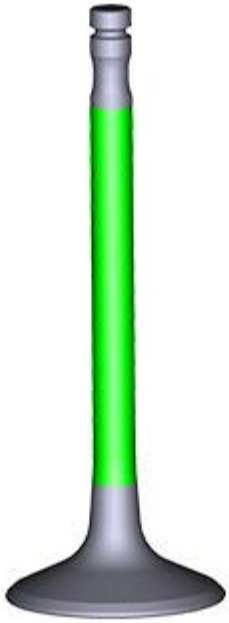


Refitting the valves

Carefully clean the two intake valve seats (A) and the two exhaust valve seats (B).
Lubricate the stems of the two intake valves (5) and the two exhaust valve stems (4) with engine oil.
Fit the valves in their seats on cylinder head, fully home.



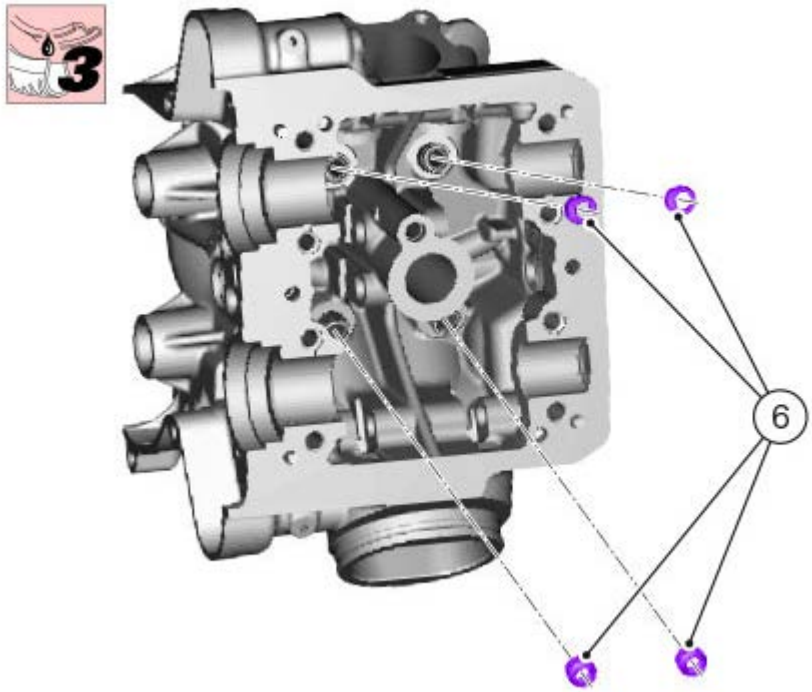




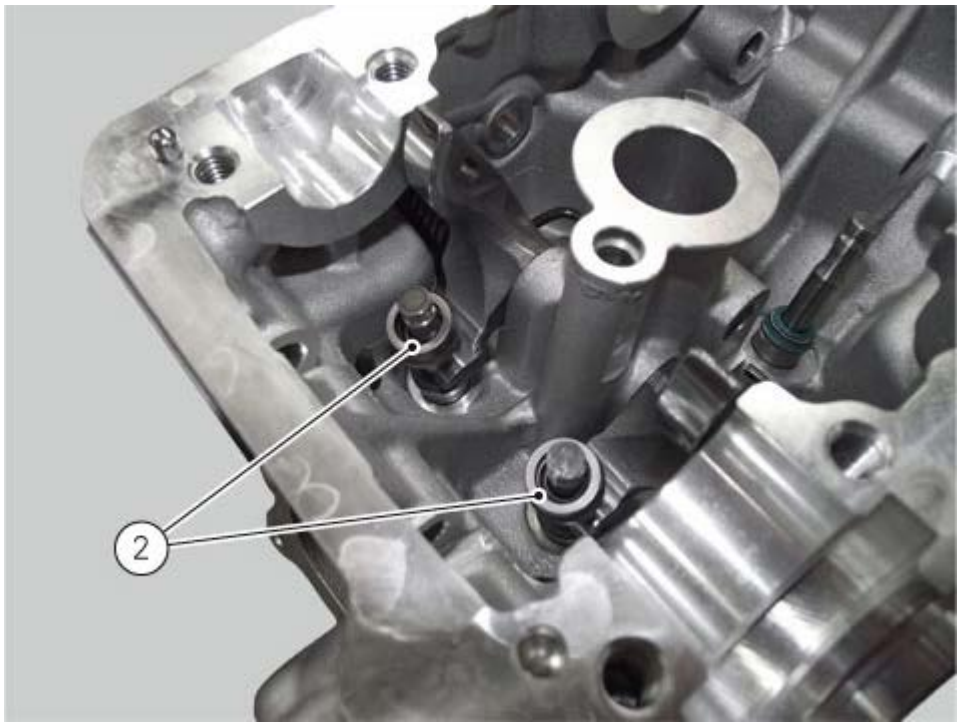
If previously removed, fit the seal rings before installing the valves.
Lubricate the rings with indicated product, then use tool no. 88713.2442 to drive the four seal rings (6) in the relevant valve guide seats.

Important
Pay attention not to lubricate the ring seats.

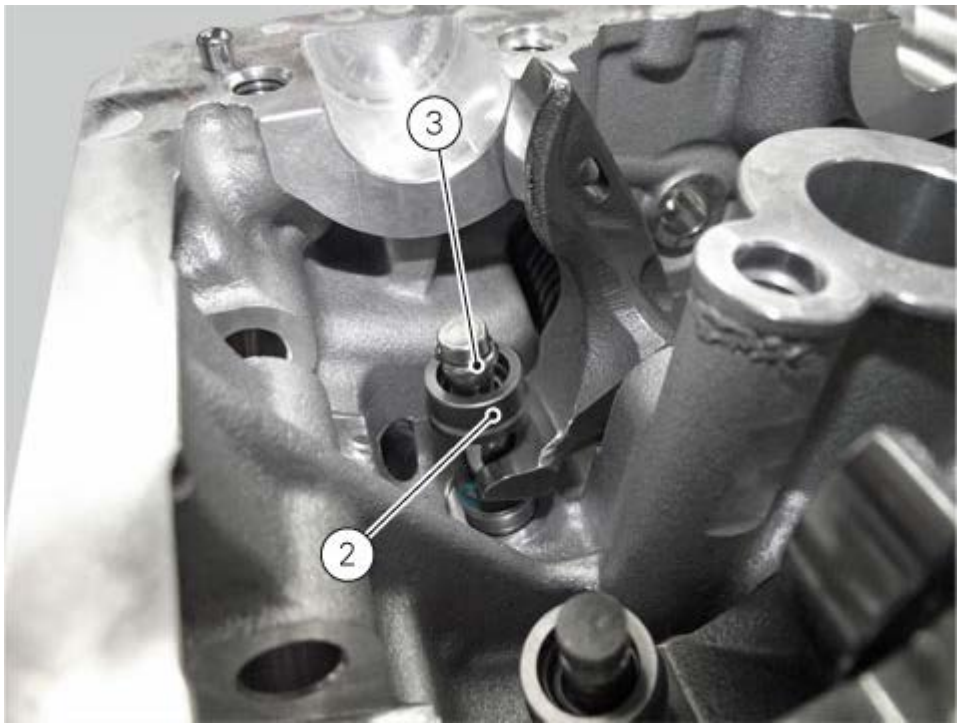
Note
Position the seal ring as shown in the figure.



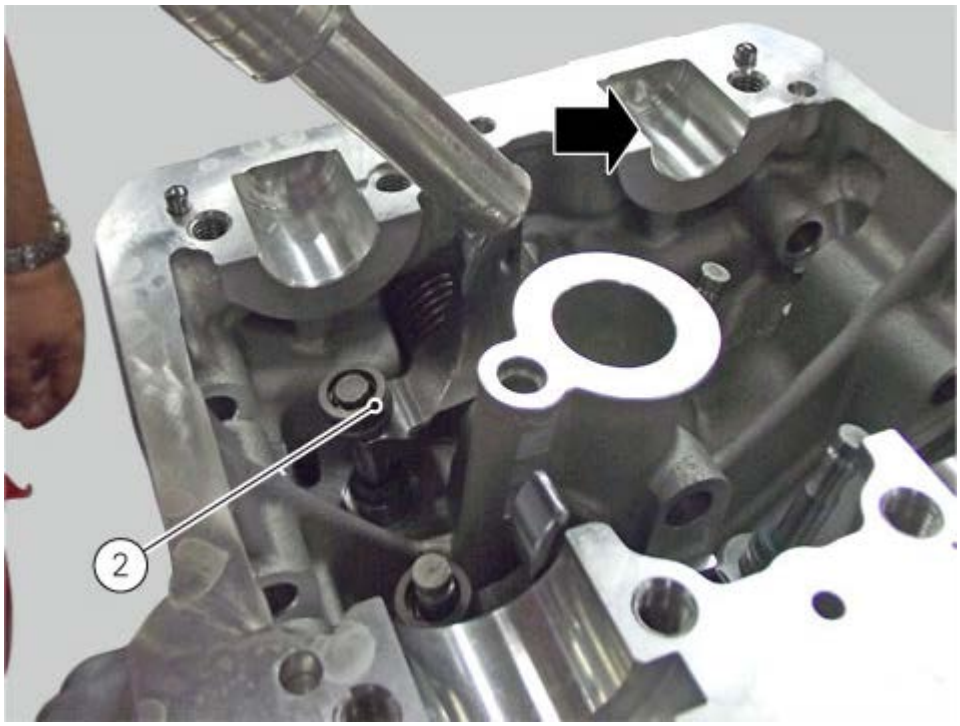
Fit the closing rocker arms as described in chapter (Refitting the rocker arms).
Insert closing shims (2) in the valve stem.



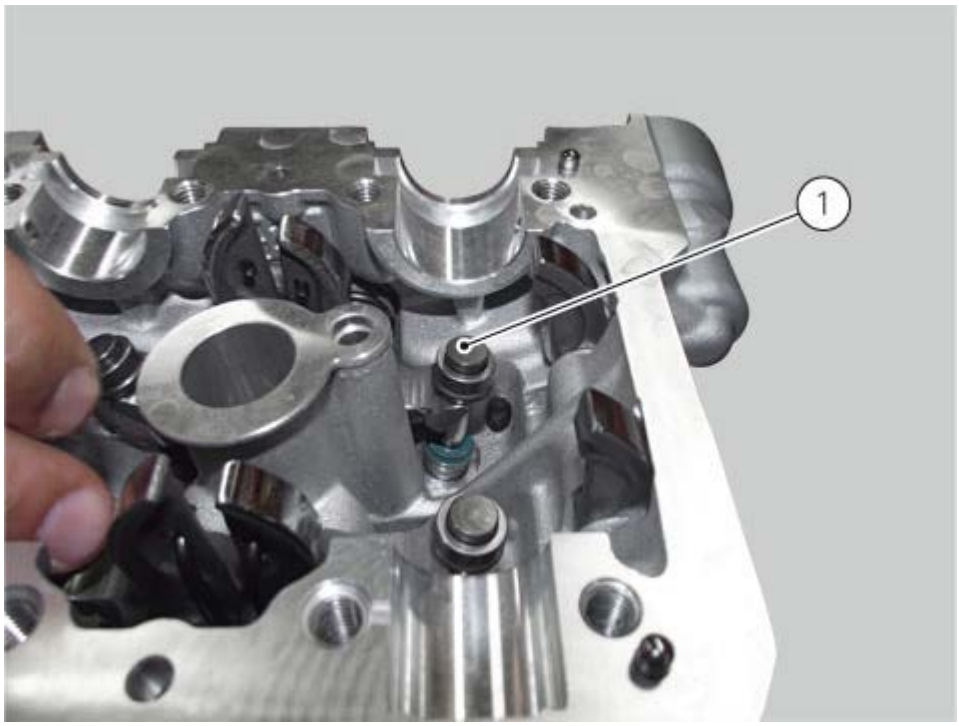
Insert the two split rings (3) in the valve seat.



Using suitable tools, quickly push the closing rocker arm to bring the shim (2) into seat.



Fit the opening shims (1).

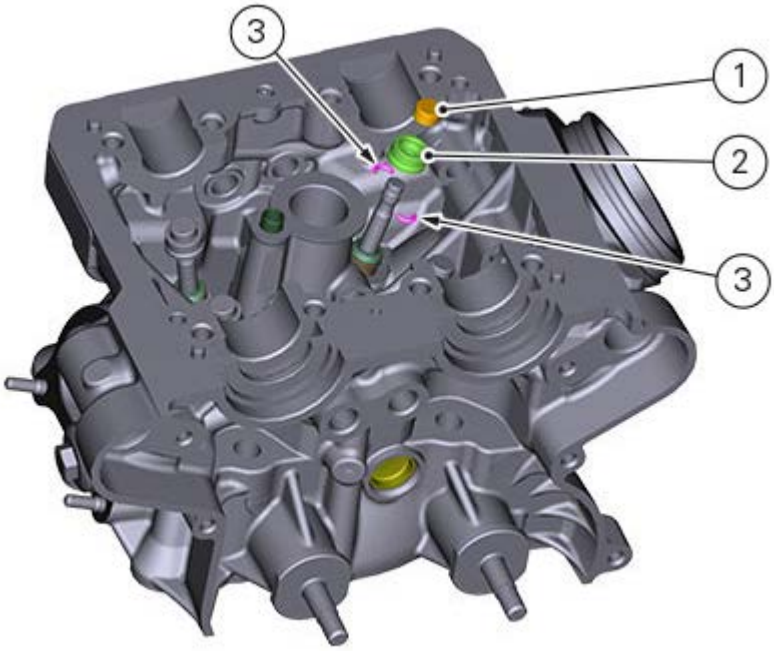


Repeat the same procedure for the other valves.

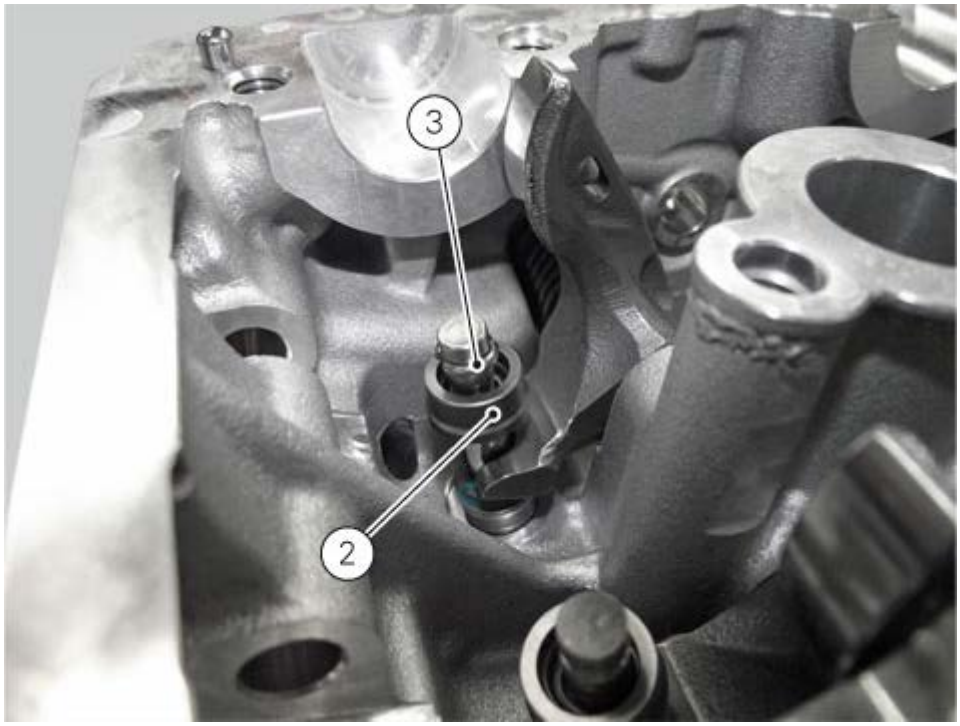
Removing the valves

Remove the rocker arms (Removing the rocker arms).

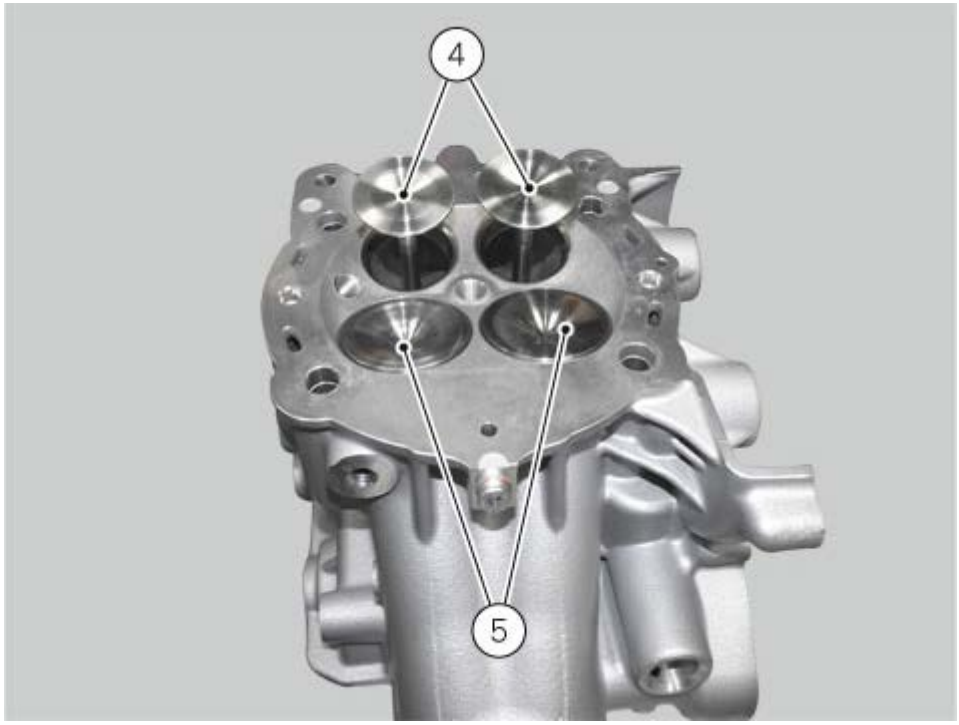
Remove the opening shim (1) from the valve using a pair of pliers.



Lower the closing shim (2) and remove the split rings (3) using a magnet screwdriver.



Withdraw the exhaust and intake valves (4) and (5) from underhead of the cylinder head.



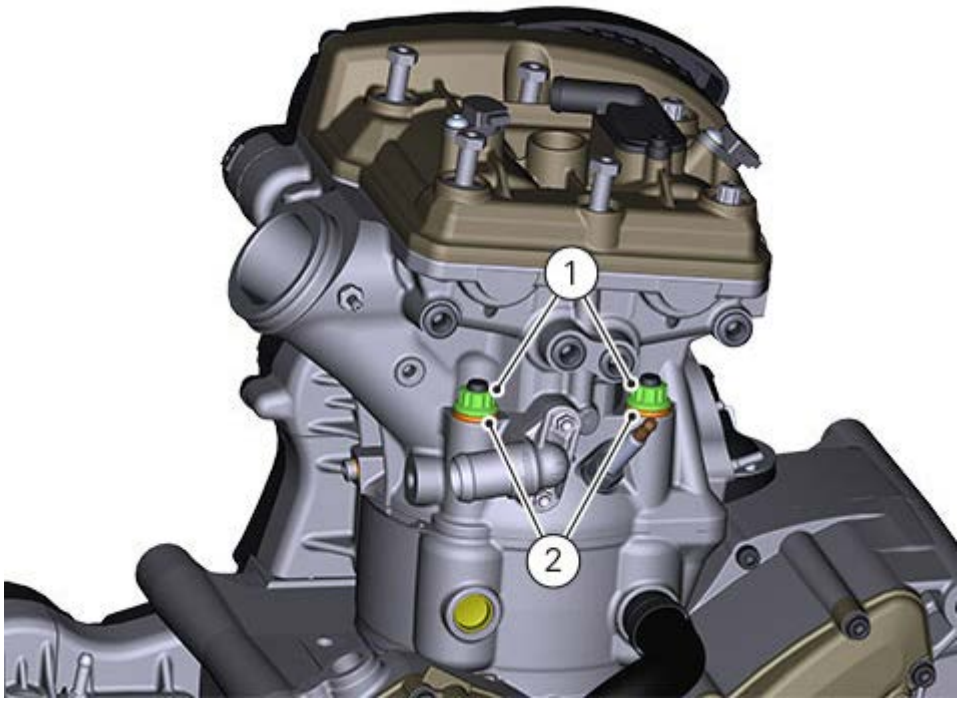
Repeat the same procedure for the other cylinder head.

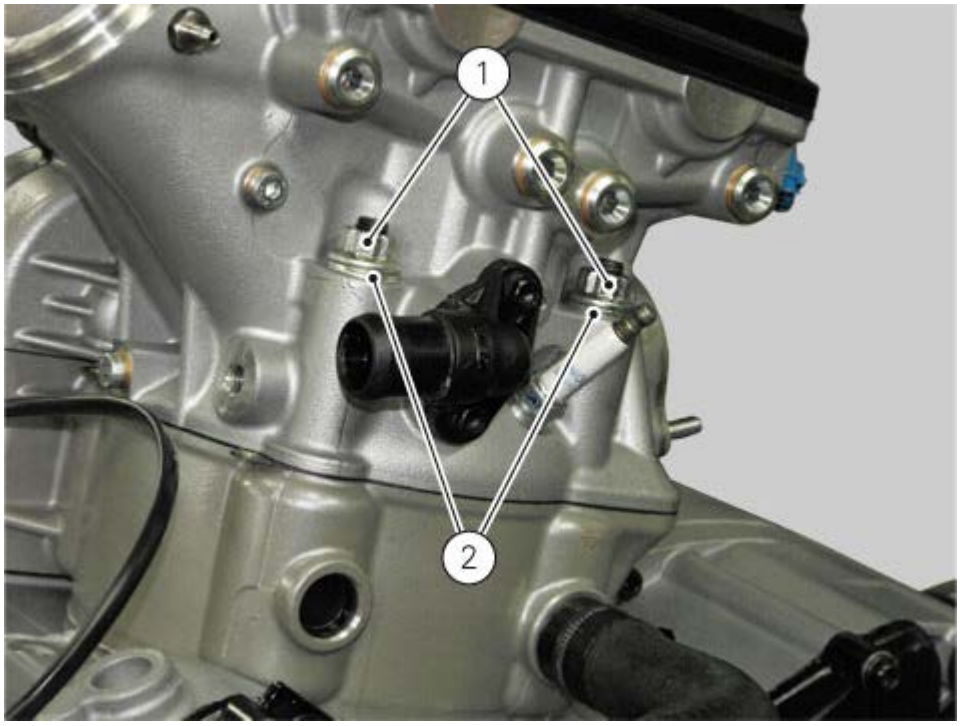
Removing the cylinder heads

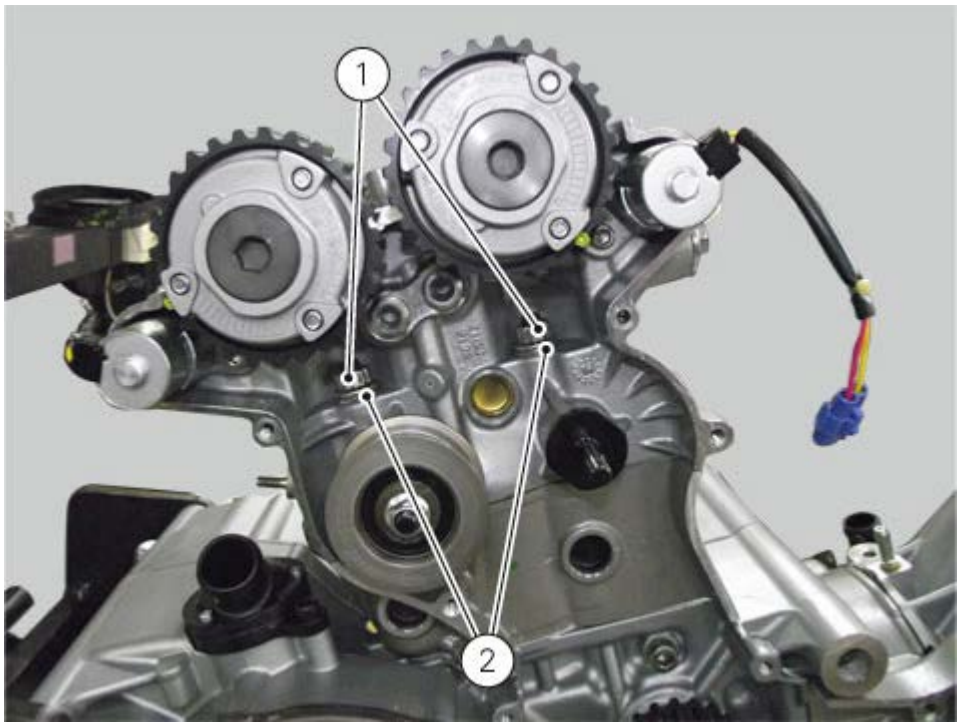
Remove the engine from the frame (Removing the engine).
Remove the cooling system hoses (Removing cooling system hoses and unions).
Remove the belts and their external covers (Removing the timing belt external covers).

Use tool part no. **88713.2676**, undo the nuts (1) on the cylinder head stud bolts.

Remove the polygonal nuts (1) and special washers (2).







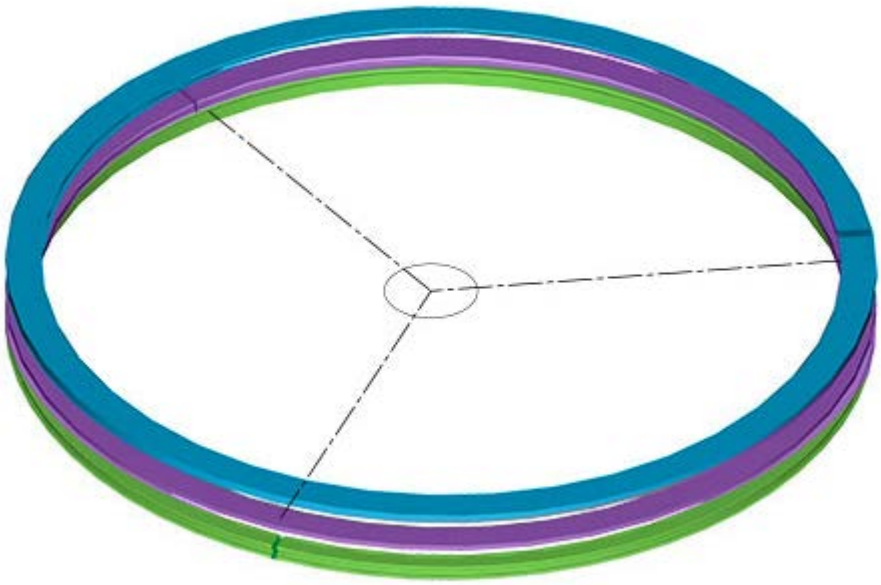
Remove the cylinder head assembly by lifting it off the engine stud bolts.
Repeat the same procedure for the other cylinder head.

Refitting the cylinder/piston assembly

If new parts are used, it is necessary to match cylinders and pistons of the same selection see chapter "Overhauling the cylinder/piston components".

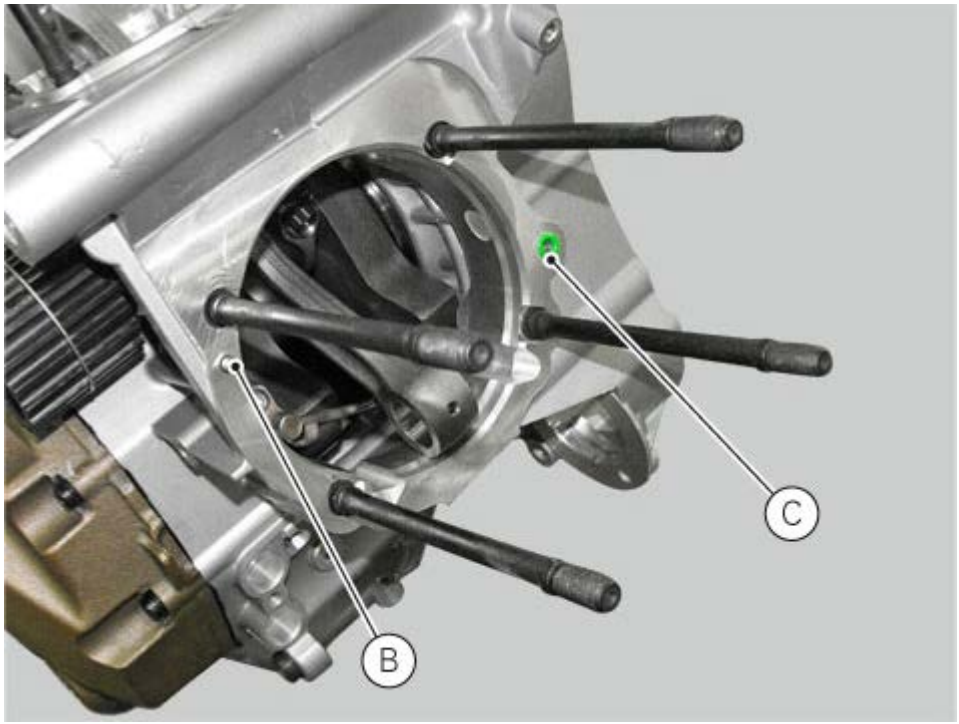
Note

If the pistons have been separated from their cylinders, before reassembling these components, position the piston ring gaps at 120° from one another (the markings must always face the piston crown).

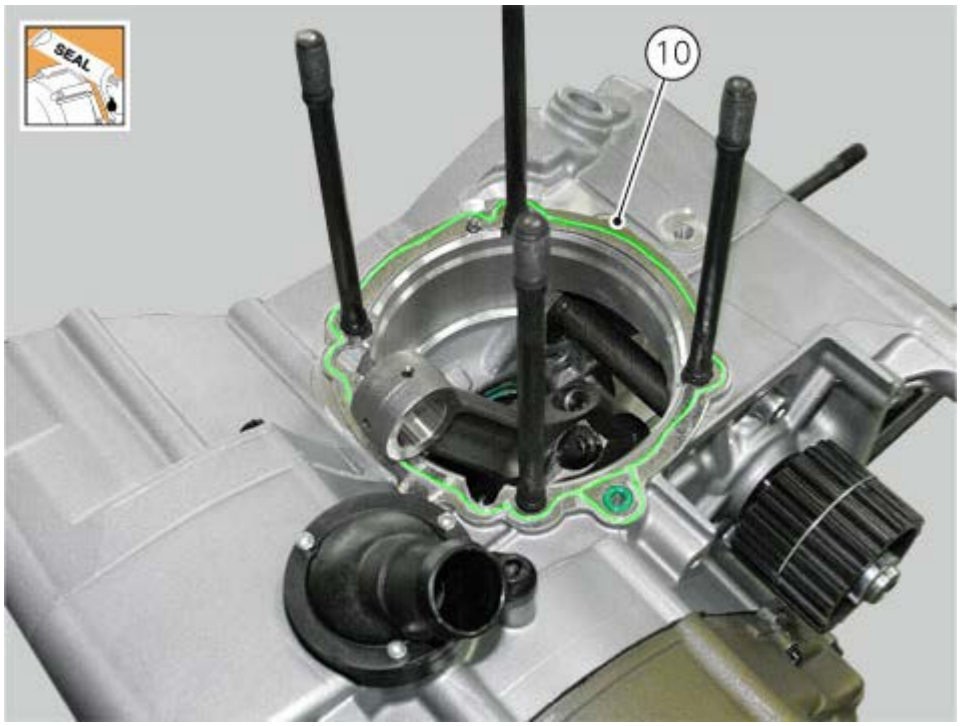


Using a universal tool, gently insert the piston in the cylinder (lubricate the cylinder inner side with engine oil before inserting the piston).

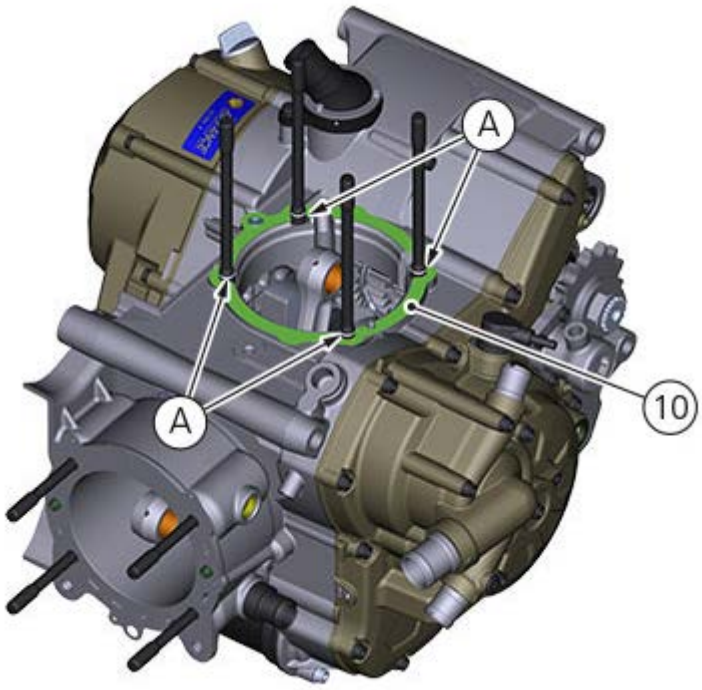
Remove any deposits and degrease the contact surfaces of the crankcase half and the cylinders. Check that on the engine block there is the cylinder centring dowel (B) O-ring (C).



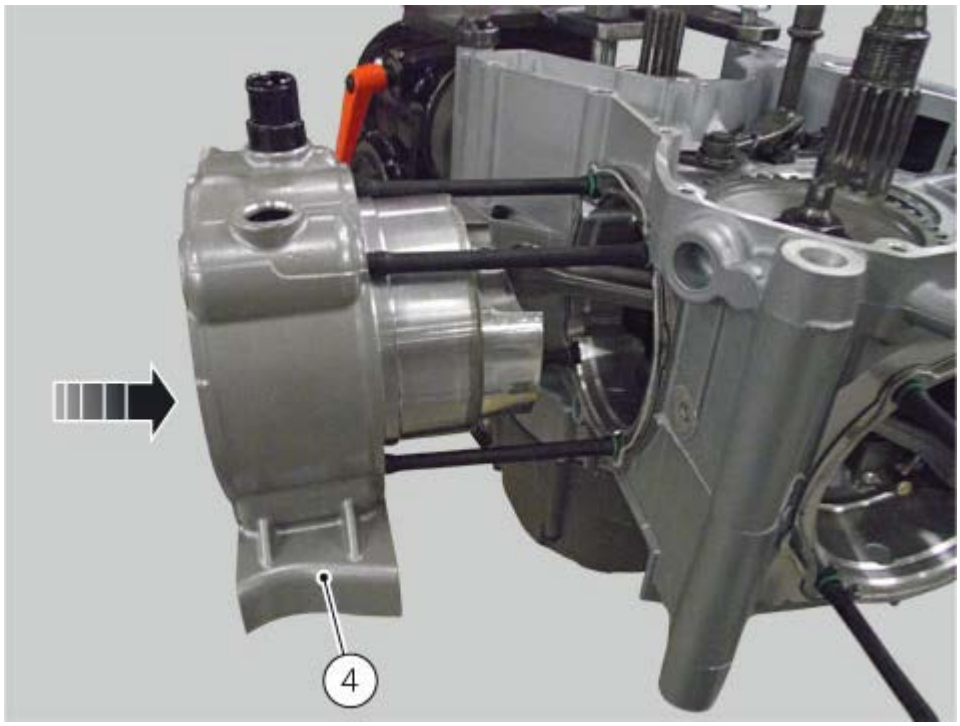
Apply the indicated sealant on both sides of gasket (10).



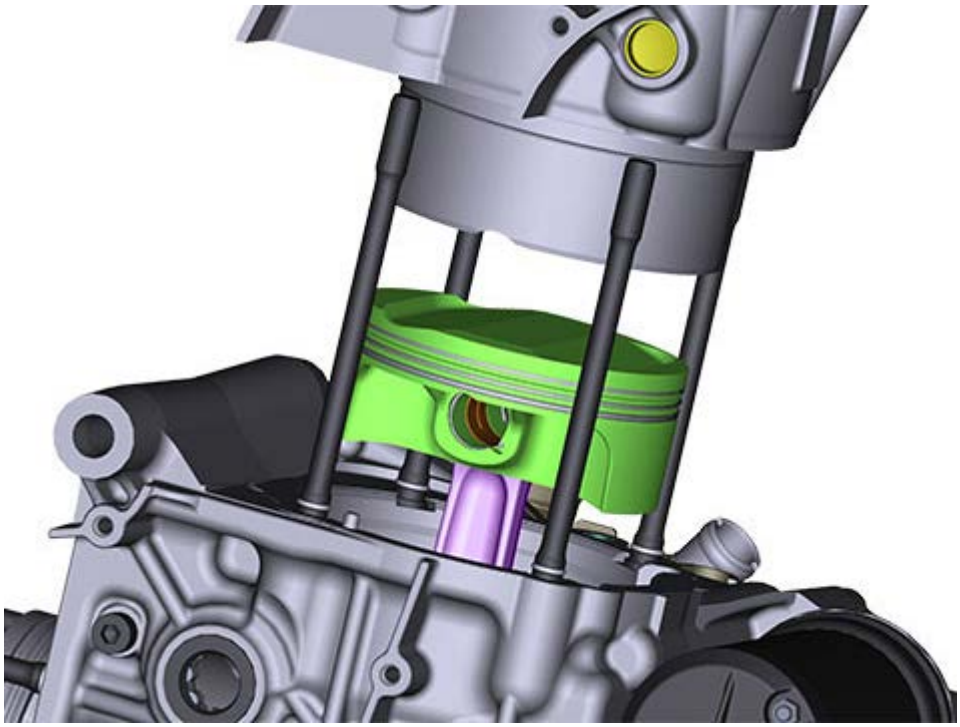
Using cap no. **88713.1920**, fit the O-rings (A) on each stud bolt and guide them into their seats in the crankcase.



Bring the con-rod small end to the TDC and insert cylinder (4) on the stud bolts.

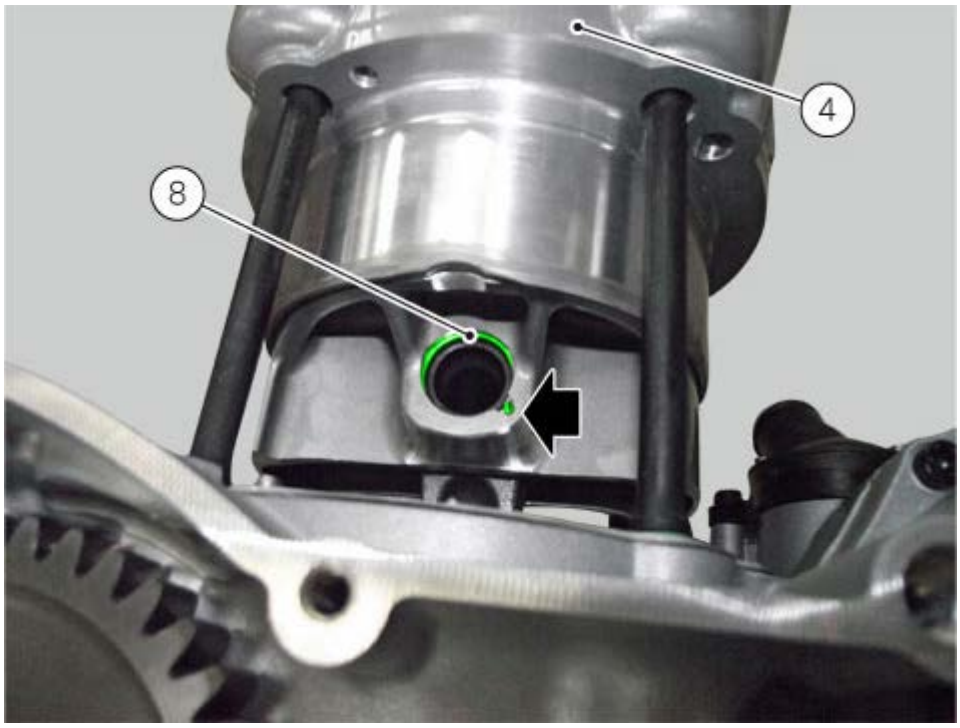


Match the con-rod small end with the hole for the piston gudgeon pin hole.

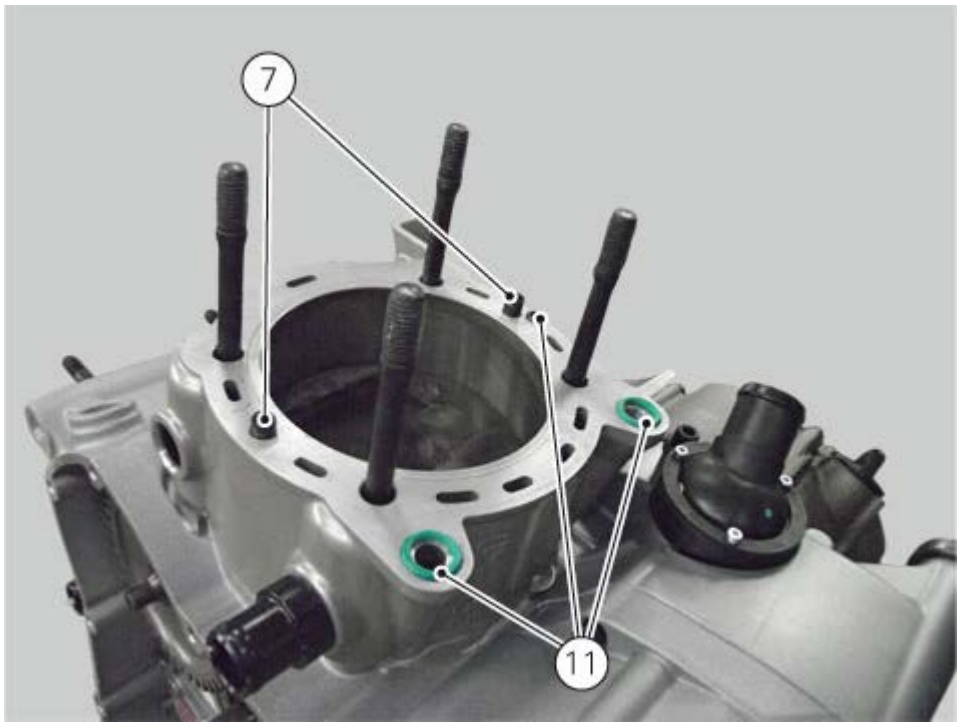


Insert gudgeon pin (9) must slide smoothly in the connecting rod small end bush and in the piston.
Close the crankcase opening with a cloth to prevent foreign objects from falling inside and then fit the snap ring (8) as shown in the figure.

Important
Always fit new circlips upon reassembly.



Push the cylinder (4) down until it seats against the crankcase.
Refit bushings (7) and O-ring (11).

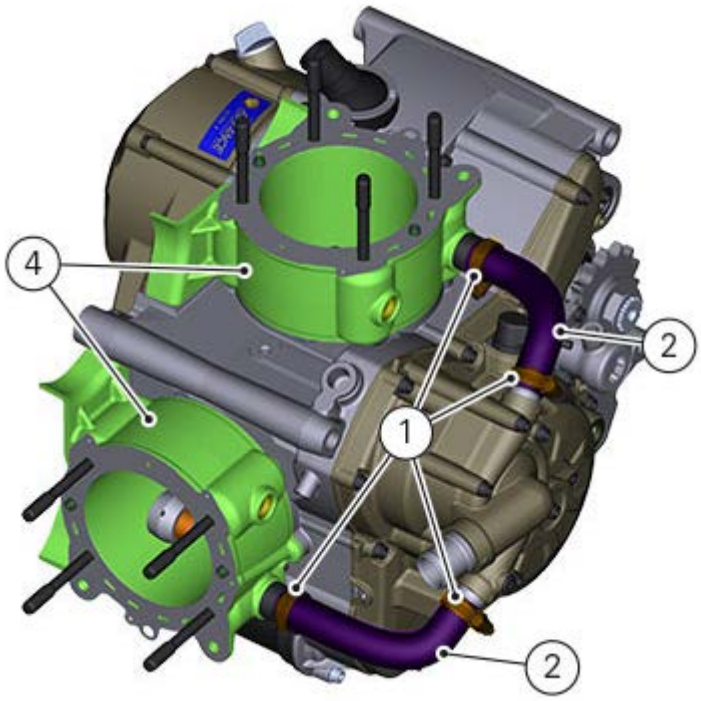


Fit the cylinder head gasket (6) over the stud bolts.
The side marked with the part number must be facing the cylinder head.

Note
The shape of the gasket prevents incorrect fitting, provided that the fluid flow holes are aligned with those on the cylinder.

Repeat the procedure for the other cylinder and refit the cylinder heads (Refitting the cylinder head assemblies).
In case they have been removed, apply prescribed threadlocker to unions (5) and tighten them to a torque of 25 Nm (Min. 23 Nm - Max. 27 Nm).

Fit hoses (2) and (3), and tighten the clips (1) to a torque of 2.5 Nm (Min. 2 Nm - Max. 3 Nm).



Refit the belts and their external covers (Refitting the timing belt external covers).
Refit the cooling system hoses (Refitting cooling system hoses and unions).
Refit the engine in the frame (Refitting the engine).

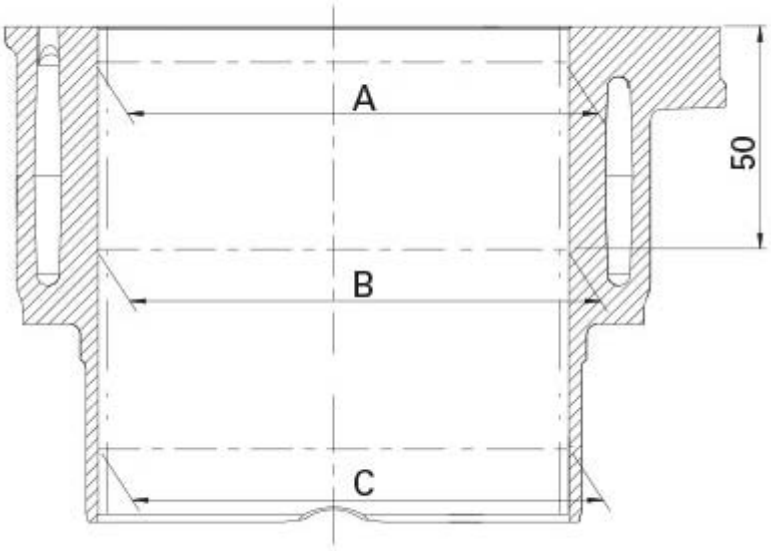
Overhauling the cylinder/piston components

Overhauling the cylinder

Check that the walls of the cylinder are perfectly smooth. Measure the cylinder diameter at 50 mm from the top face and determine the size class to which it belongs in accordance with the values specified in Sect. Cylinder/piston. Repeat measurement of the diameter at three heights A (10 mm from the upper surface), B (50 mm from the upper surface) and C (100 mm from the upper surface) and in two directions at 90° between them; check that the measurements of taper and ovality fall within the range specified in Sect. Cylinder/piston.

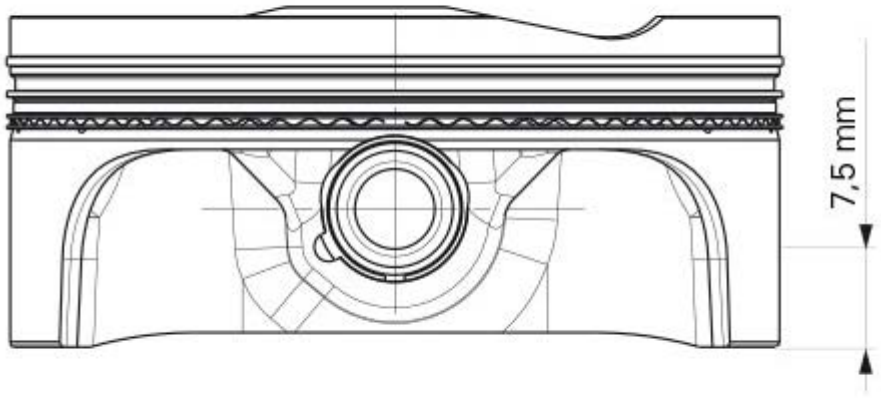
In order for the liner to be conforming, the following conditions must be true:
Ø A < Ø B < Ø C
Ø C – Ø A = 0.015

In the event of damage or excessive wear the cylinder must be replaced as it has a silicon carbide coating (which provides the cylinder walls with excellent anti-friction and anti-wear properties) and therefore cannot be ground. The cylinders are marked with letters (stamped between the two oil return ways) indicating their size class. Always match cylinders with pistons from the same size class.



Overhauling the piston

Clean the piston crown and piston ring grooves, removing any carbon deposits.
Visually inspect the piston and check its dimensions carefully: there must be no signs of scuffing, scoring, cracks, or other damage.
The piston diameter must be measured at 7.5 mm up from the bottom of the skirt and in perpendicular direction to the gudgeon pin axis.
The pistons must always be replaced as a pair.

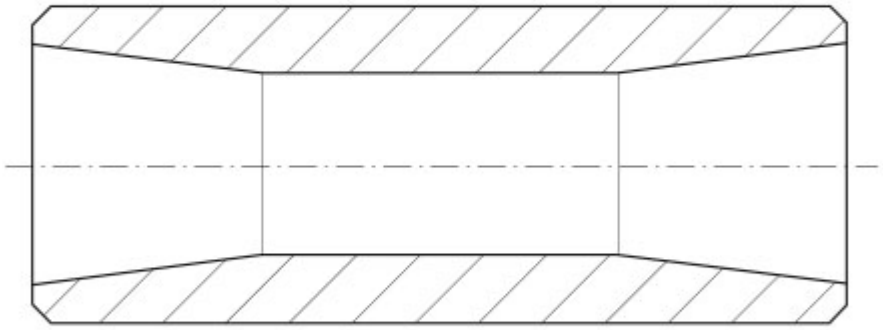


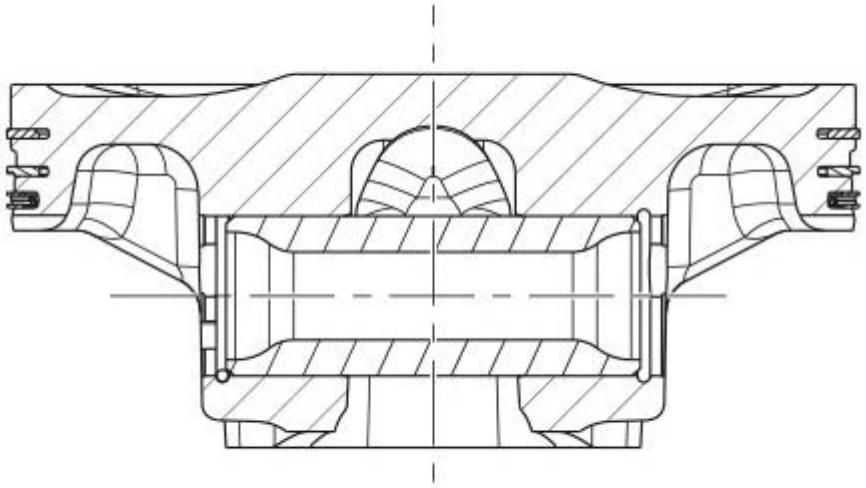
Checking the piston-cylinder clearance

The pistons are marked with a letter (punched into the piston crown) that indicates the size class to which they belong.
Always match piston with cylinder from the same size class.
For the correct values refer to chapter "Cylinder/piston".

Overhauling the gudgeon pins

Gudgeon pins must be perfectly smooth without signs of scoring, steps, or blueing due to overheating. The well-lubricated gudgeon pin must slide smoothly inside the piston without stiffness.
For the coupling clearance values with the piston and the connecting rod, see chapter "Cylinder/Piston".
If a new gudgeon pin is fitted, you must also change the connecting rod small end bush.



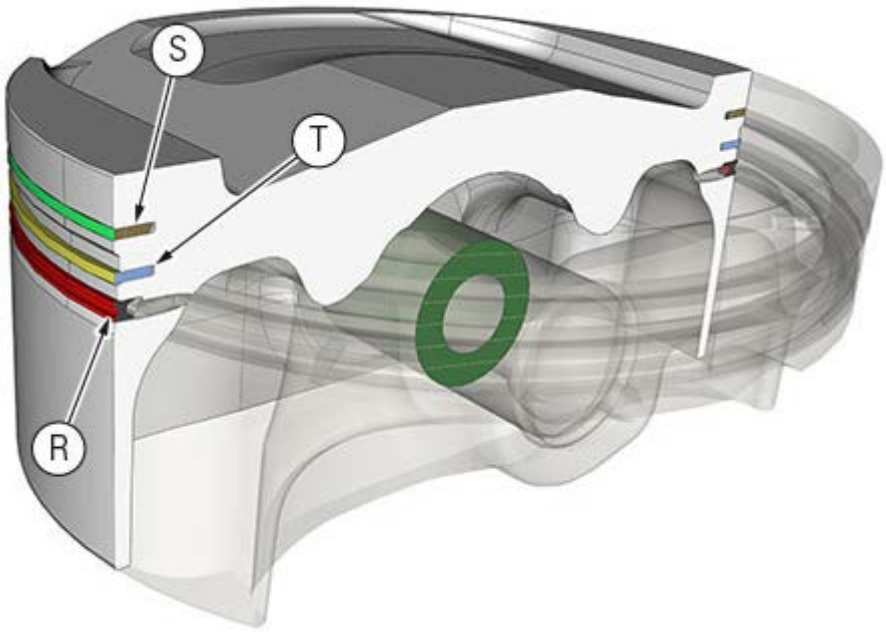


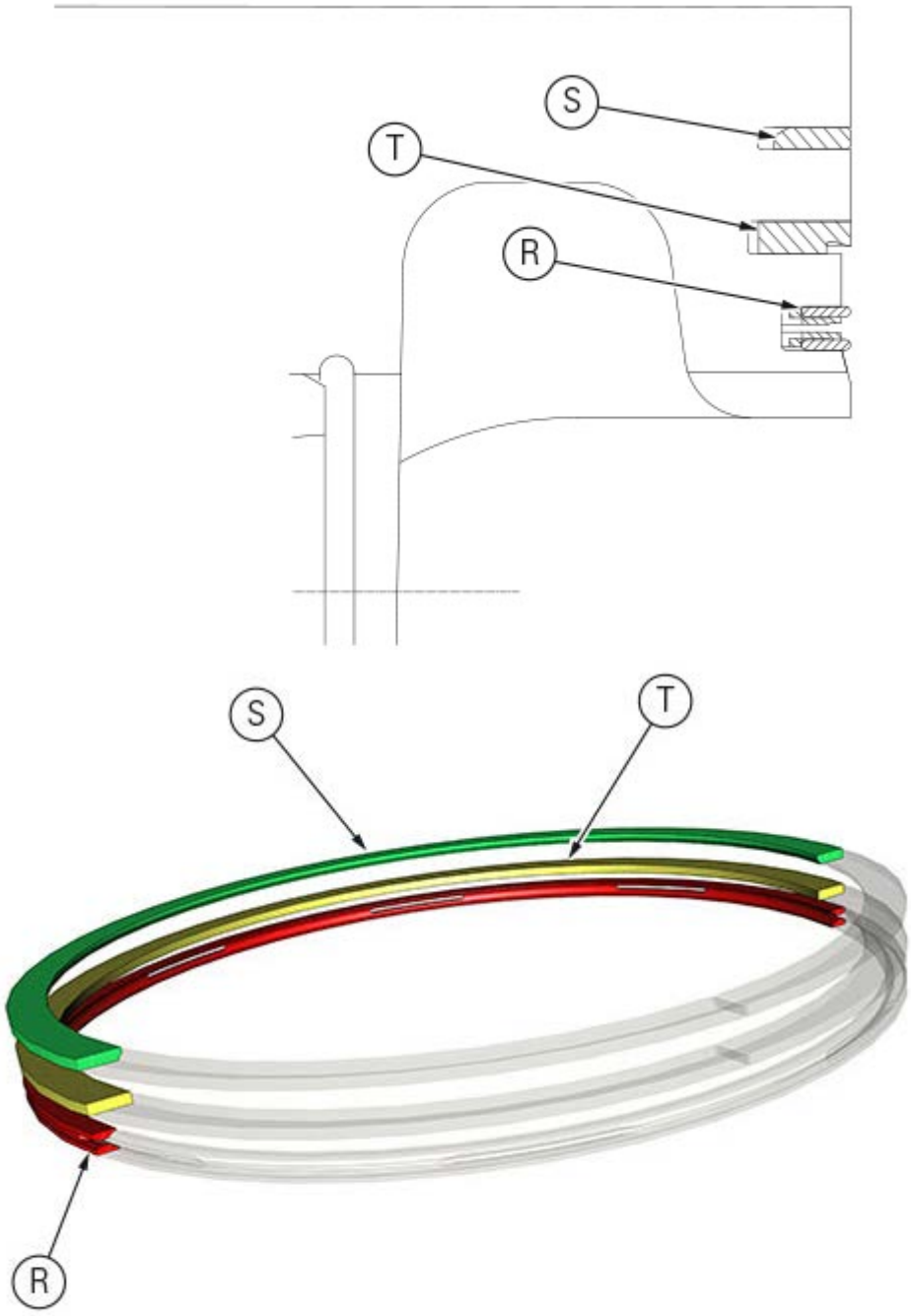
Overhauling the piston rings

The piston rings must not show any signs of scuffing or scoring. Spare pistons are supplied complete with piston rings and gudgeon pin.

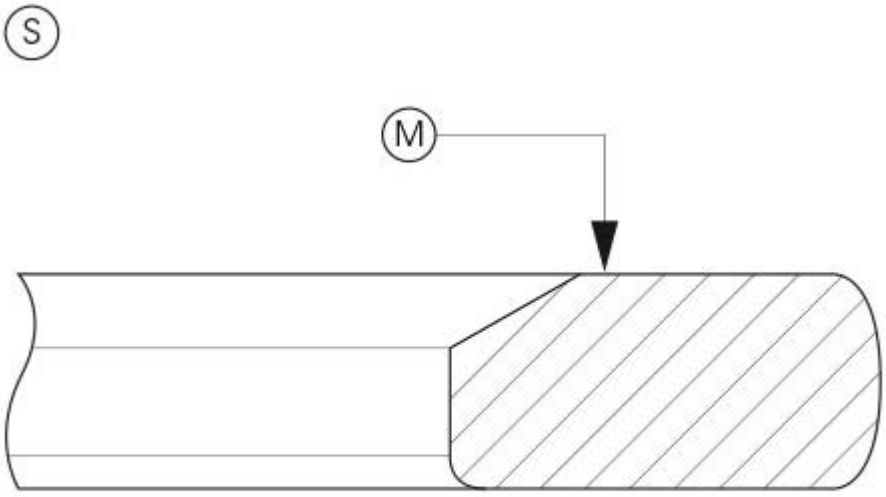
Checking the piston ring-grooves clearance

The maximum permissible wear limit is 0.15 mm for the top ring (1st ring "S") and 0.10 mm for the others (2nd ring "T" and oil scraper ring "R").
The piston rings must always be fitted with markings (M) facing upwards.

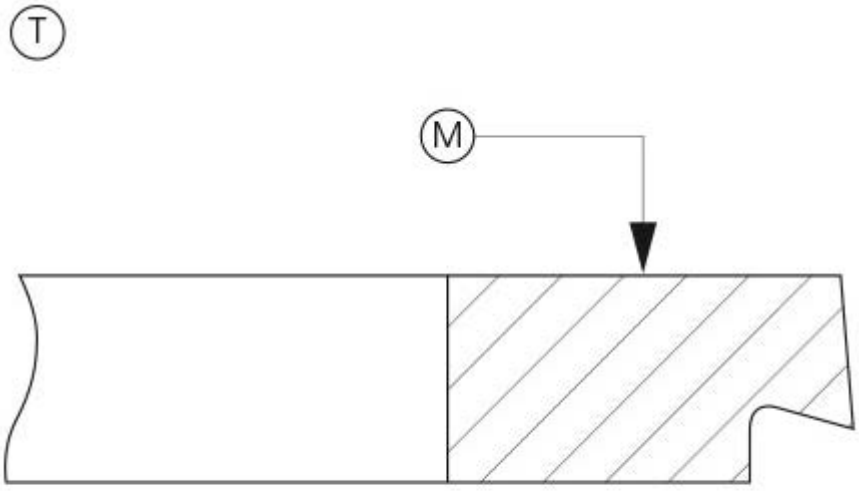




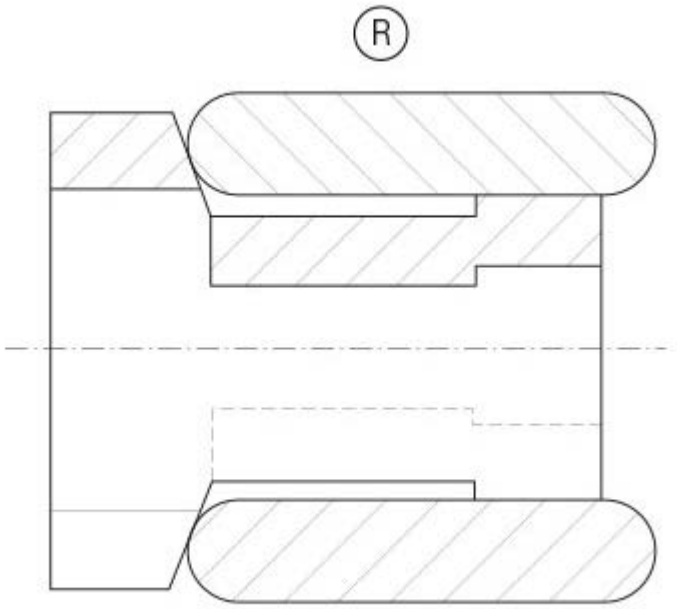
First ring (S).



Second ring (T).



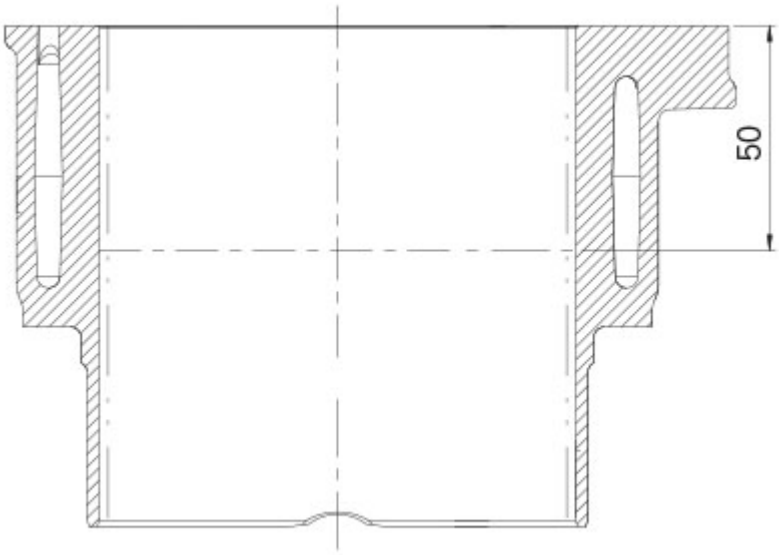
Oil scraper ring (R).



Checking the piston ring/cylinder clearance

Insert the piston ring 50 mm from the top face of the cylinder; make sure that the ring is positioned perfectly square to the cylinder axis by checking with a gauge at several points around the ring that the top surface of the ring is 50 mm from the cylinder top face.
Measure the piston ring gap (A):

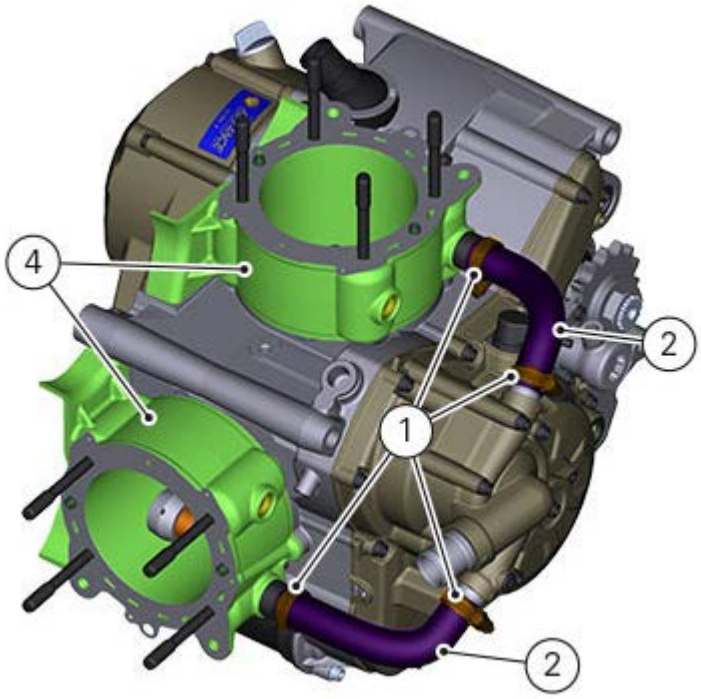
	Distance (A) mm	Wear limit
Upper piston ring	0.2 to 0.4	0.8
Intermediate piston ring	0.3 to 0.5	0.8
Oil scraper ring	0.2 to 0.7	1.0



Removing the cylinder/piston assembly

Remove the engine from the frame (Removing the engine).
Remove the cooling system hoses (Removing cooling system hoses and unions).
Remove the belts and their external covers (Removing the timing belt external covers).
Remove the heads from the engine block (Removing the engine heads).

Loosen the clips (1) and remove the hoses (2) and (3) from the cylinders (4) and from the generator cover.

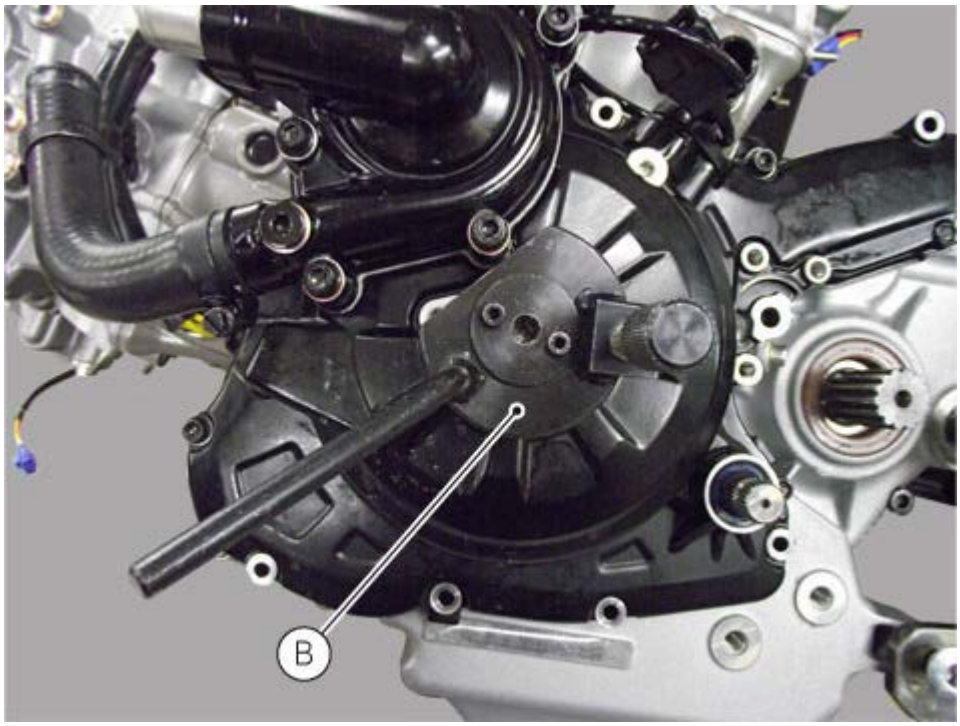


If damaged, unscrew the unions (5).

Remove the cylinder head gasket (6) from the piston-cylinder assy.

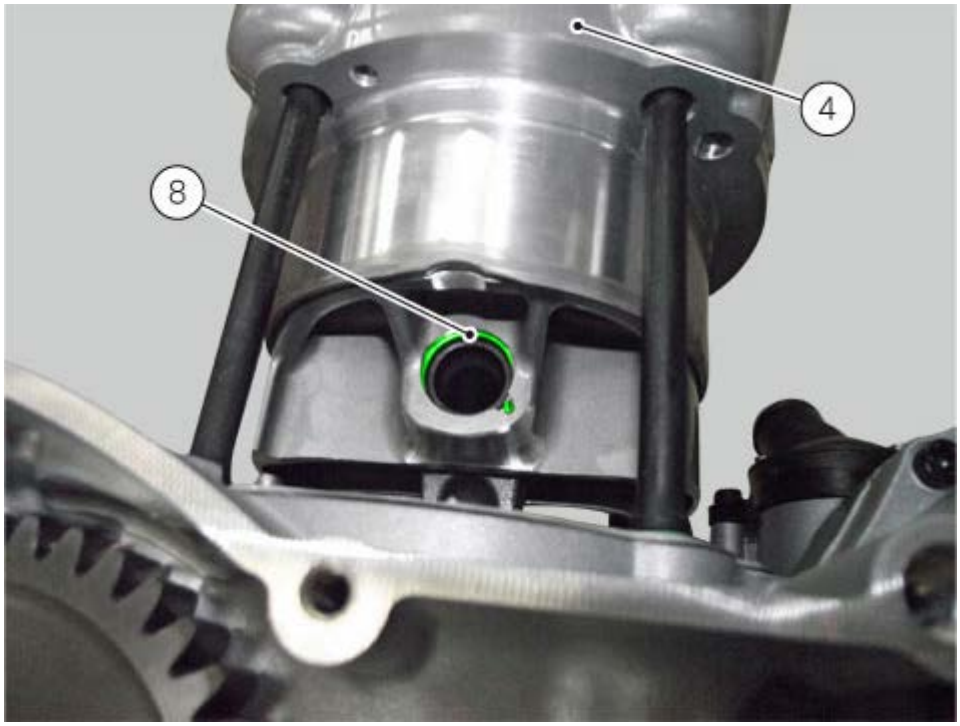
Remove the bushes (7).

Use tool (B) part no. **88765.1657** to bring the piston of the horizontal cylinder near the TDC.



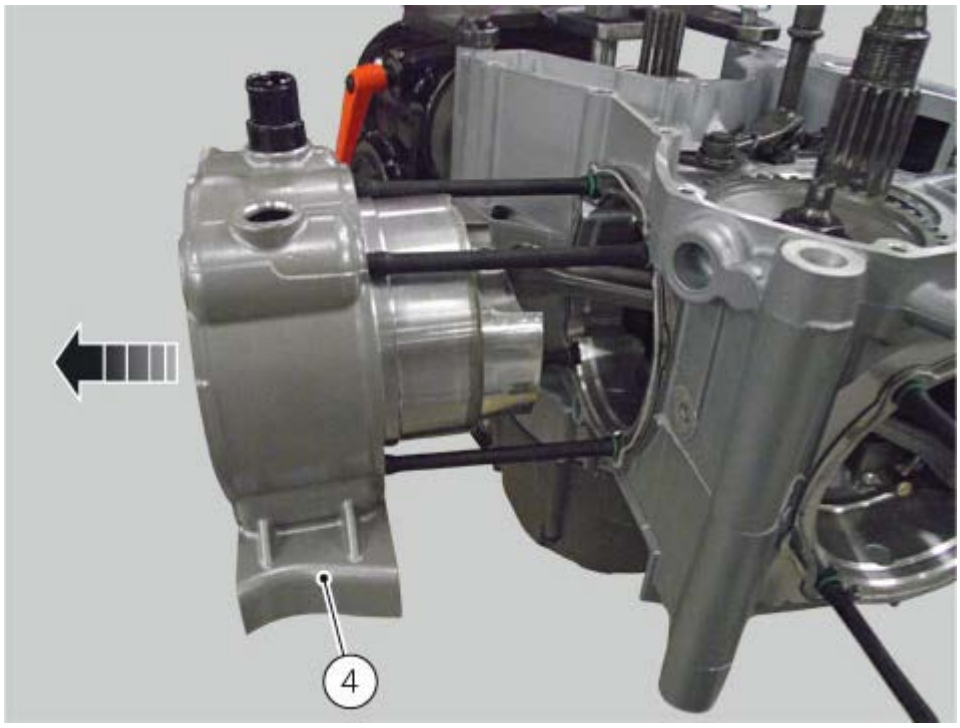
Carefully lift the cylinder (4) off the crankcase, keeping it vertical. If necessary, rock the cylinder slightly using both hands or tap its base gently with a rubber mallet. Continue to lift the cylinder until you can access the gudgeon pin (8).
Since insertion of piston in the cylinder is a difficult operation to perform at the time of reassembly, remove the piston together with the barrel as described below.
Stuff the crankcase opening with a rag or soft paper to prevent foreign material from falling inside.

Remove the snap ring (8) from the gudgeon pin on the clutch side.

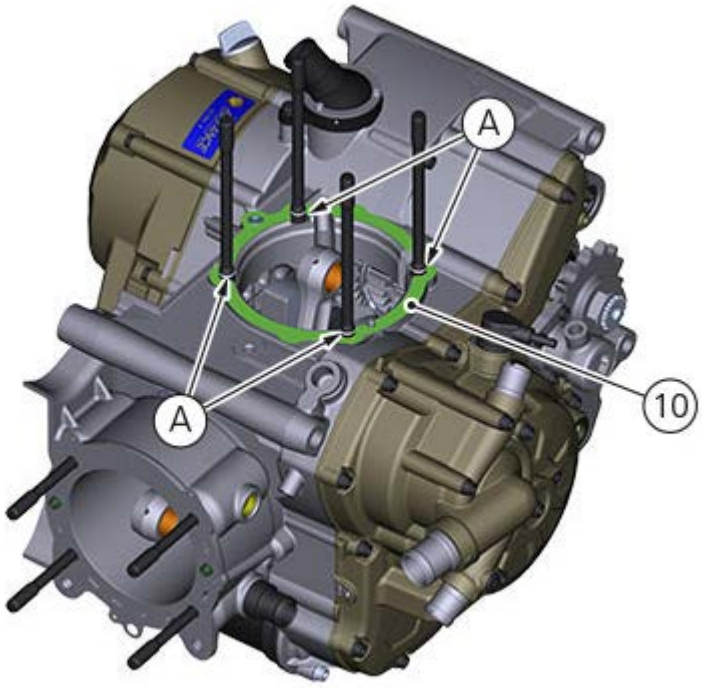


Working from the opposite side, drive out the gudgeon pin sufficiently to release the connecting rod.

Lift the cylinder-piston assembly clear of the crankcase stud bolts.
If work is to be carried out on the piston, carefully withdraw it from the cylinder.



Remove from the cylinder head stud bolts the four O-rings (A) located on the crankcase between the cylinder and the gasket (10).



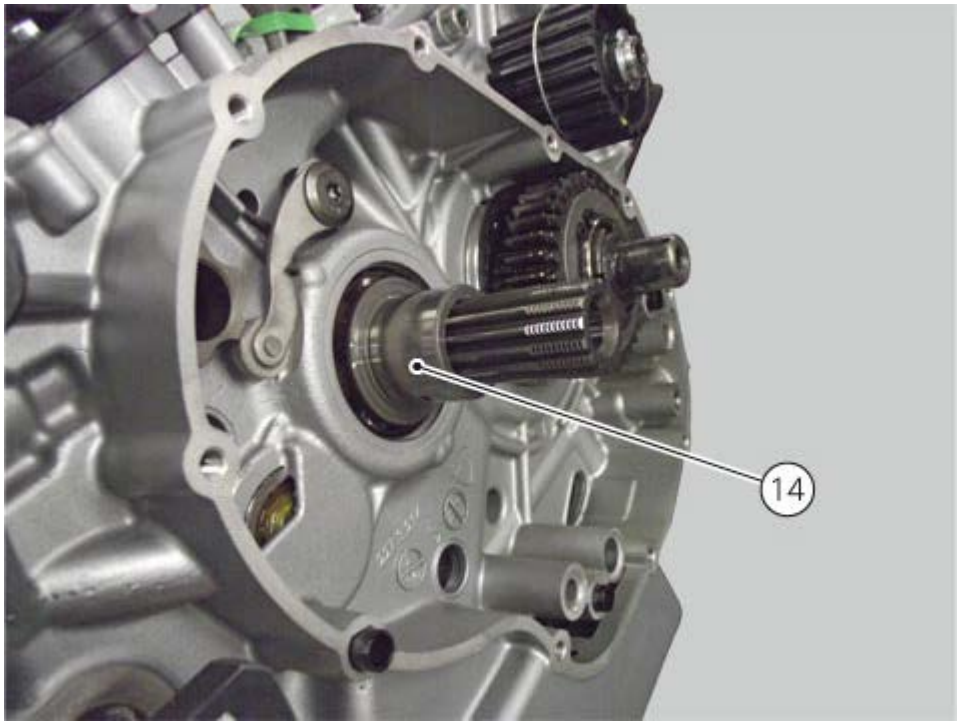
Proceed in the same way for the other cylinder.

Important

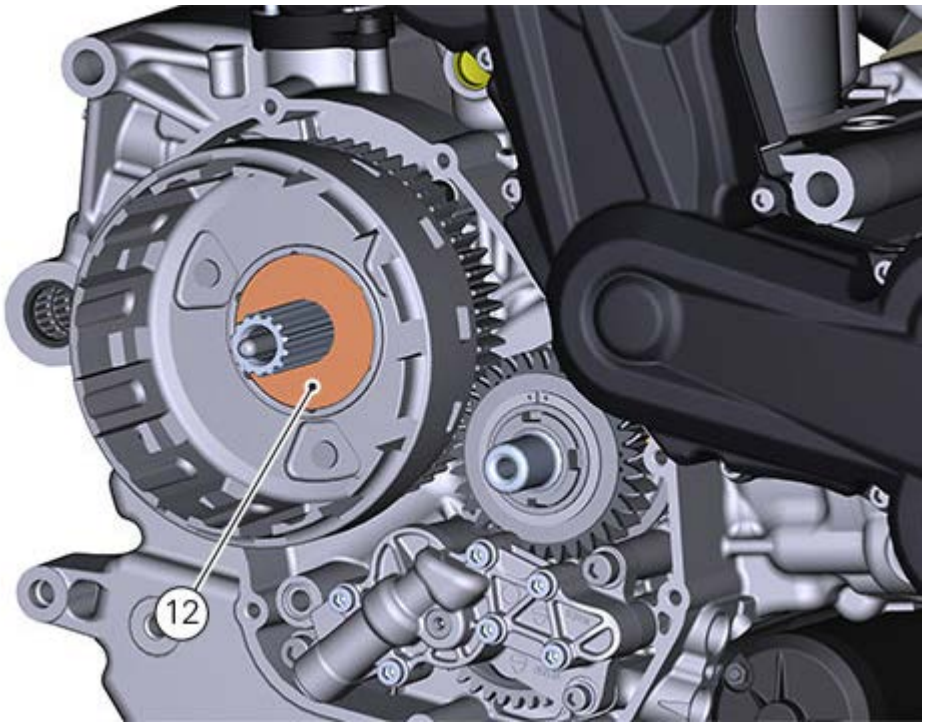
Mark the pistons to show from which cylinder they were removed:
V= Vertical - O= Horizontal.

Refitting the clutch

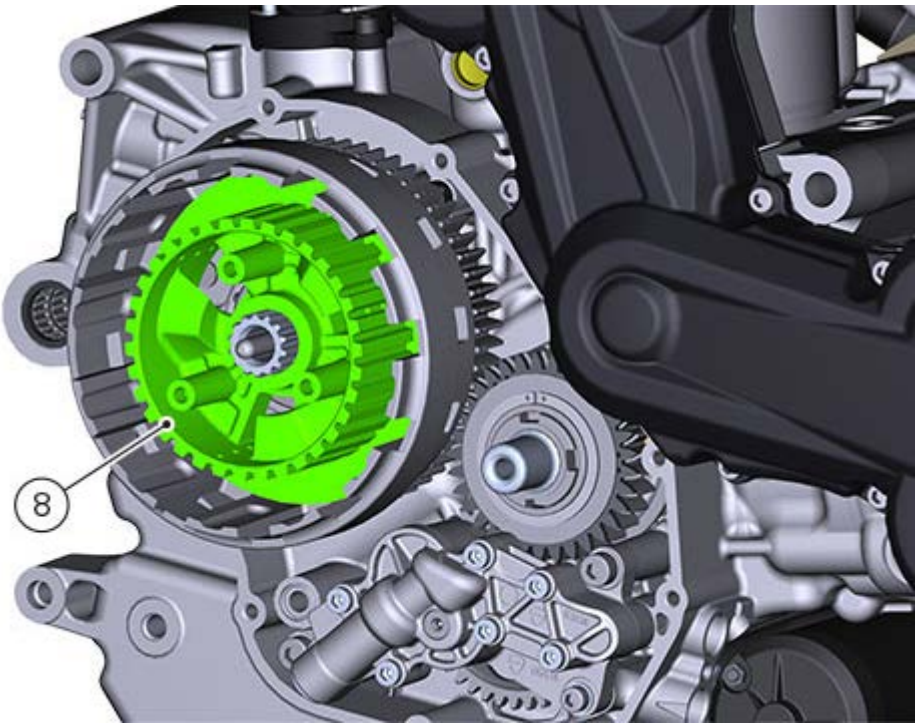
Insert guide (14).



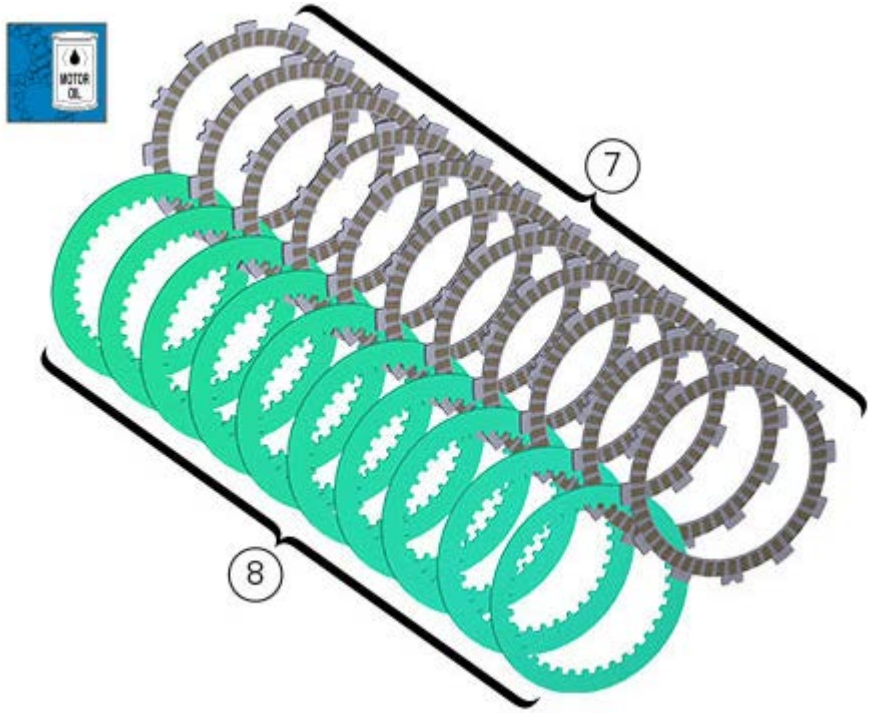
Locate the clutch housing (13) and the spacer (12).



Position the clutch drum (8).

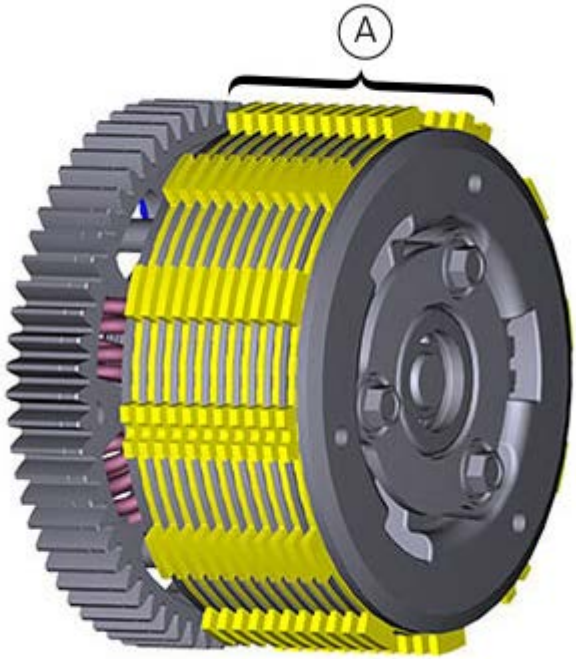


Fit the clutch plates on the hub.
When removing new plates, the driving ones (7) must be lubricated on both sides with the indicated product.



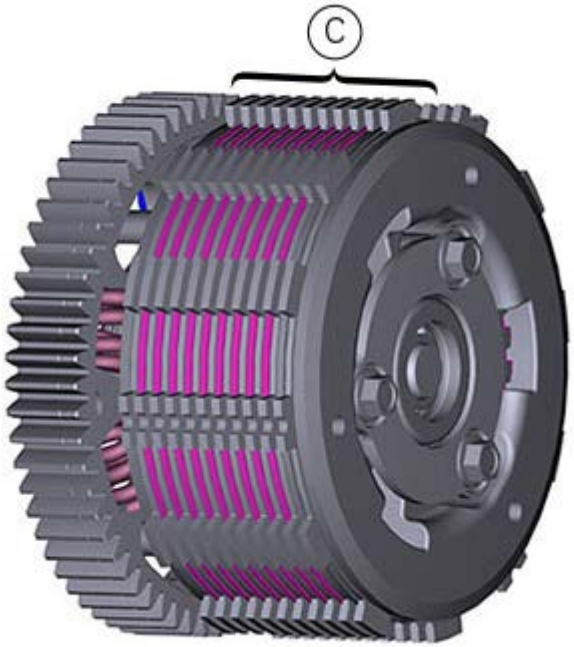
The plate pack consists of:

11 driving plates (A) with 2.8 mm thickness



1 driven plate (B): 2.0 mm thickness

9 driven plates (C): 2.0 mm thickness



1 judder spring (D): thickness 1.0 mm
1 anti juddering spacer (E): 1.2 mm thickness.

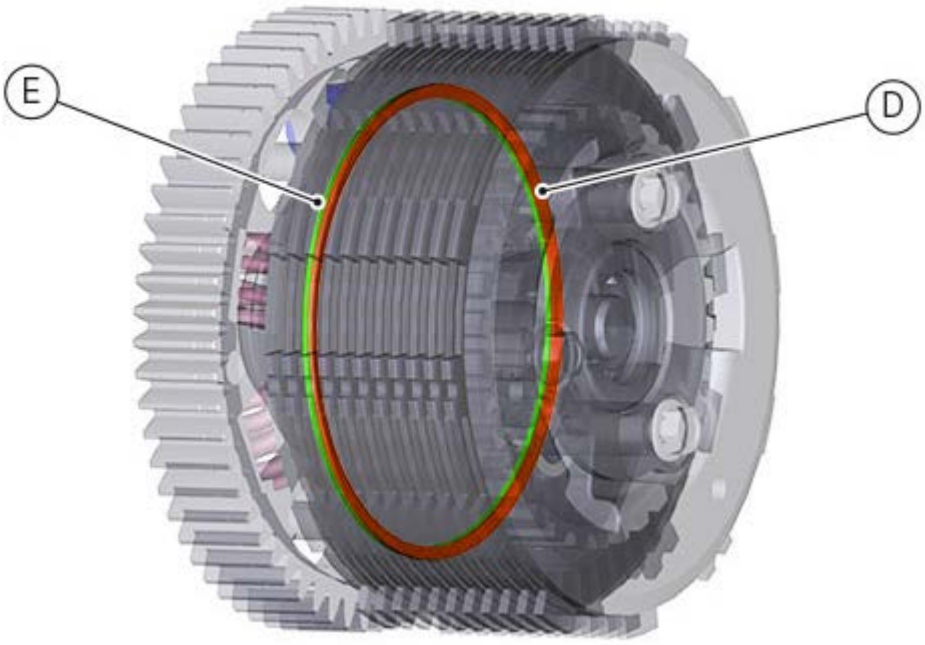
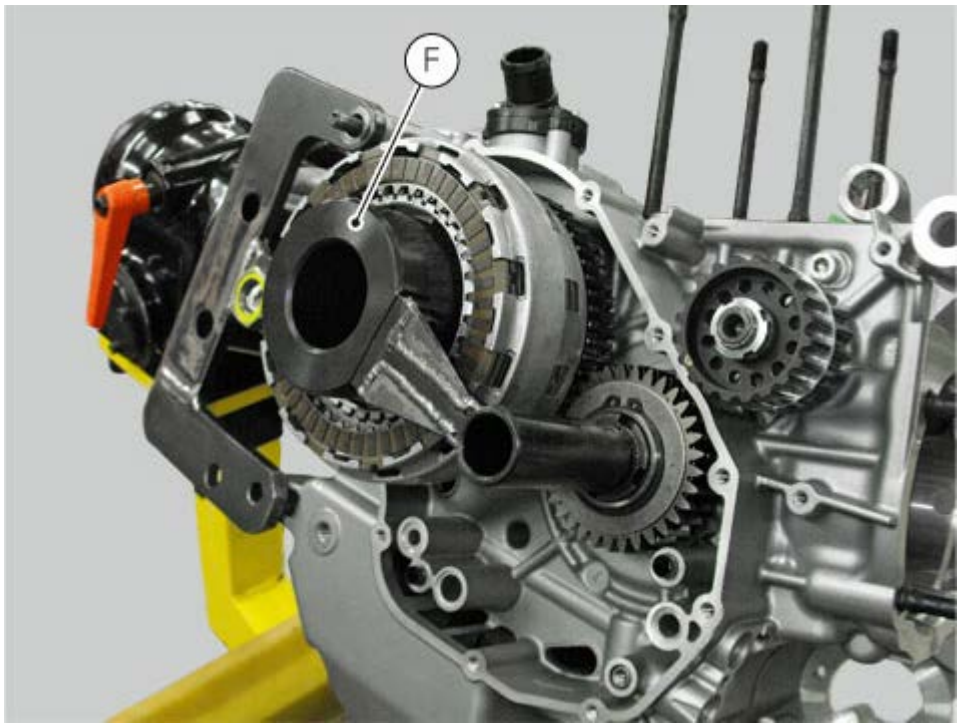


Plate pack thickness 50.8 (+0.3-0.7).

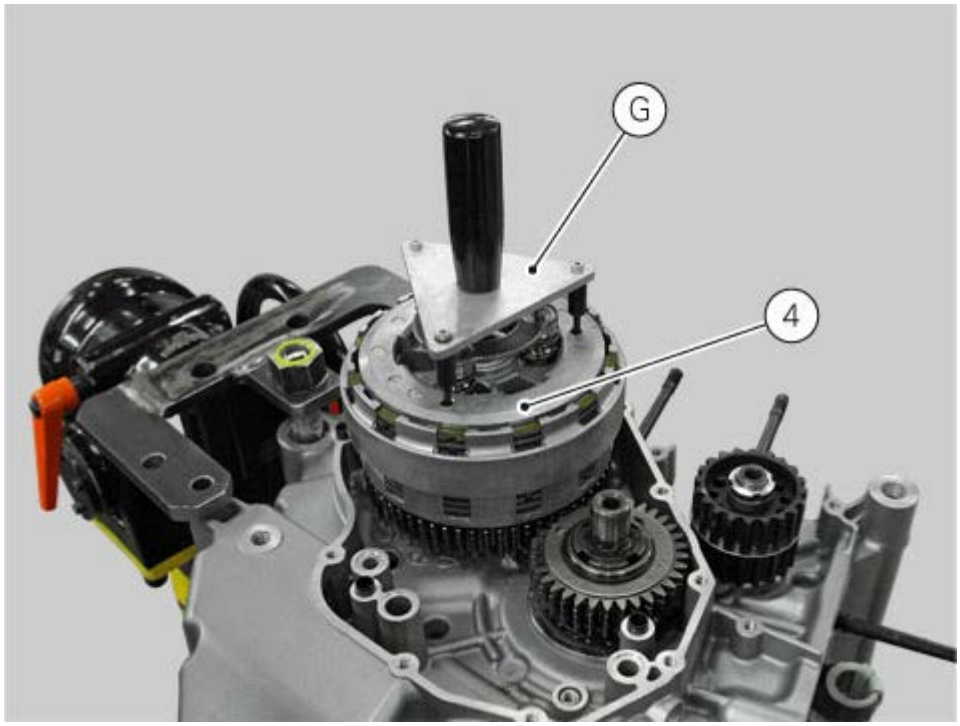
Locate the Belleville washer (10).

Apply the indicated grease to the thread of the gearbox primary shaft and the mating surface of nut (9), and fit it over Belleville washer (10).
Block the clutch drum using tool (F) part no. **88713.3408** and tighten the retaining nut (9) to a torque of 190 Nm (Min. 180 Nm - Max. 200 Nm).

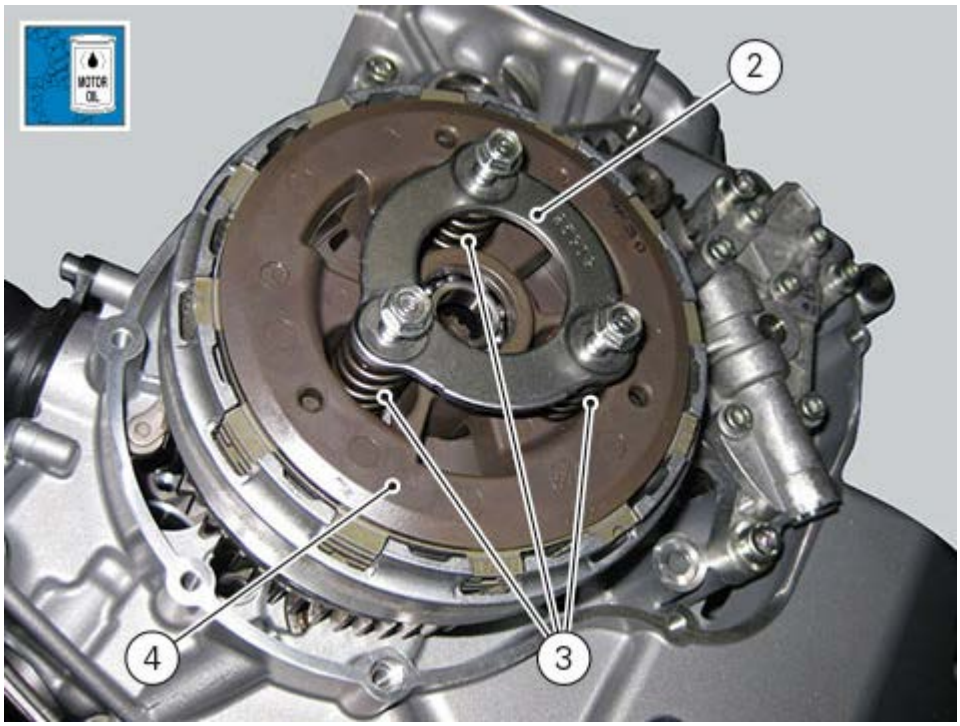


Insert the control pin (6) in the bearing (7) and the latter in the gearbox primary shaft.

Place the pusher plate (4) on the centring tool (G) part no. **88713.3352**.
Fit the pressure plate (4).



Insert a spring (3) in each recess.
Position ring (2).
Lubricate the thread of the screws (1) with oil.
Start screws (1).



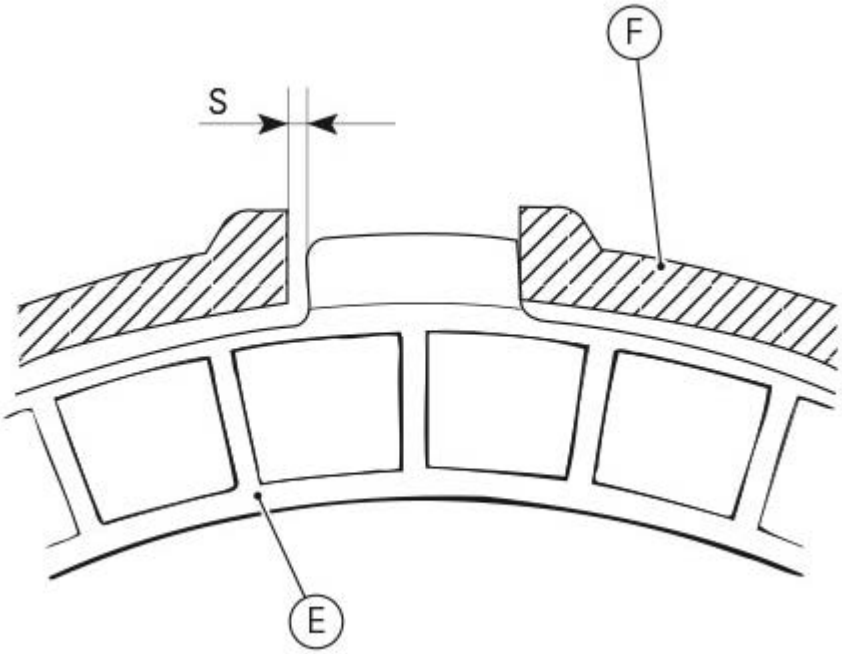
Tighten the screws (1) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).

Refit the clutch cover (Refitting the clutch cover).
Fill the engine with oil (Changing the engine oil and filter cartridge).
Refit the sump guard unit (Refitting the belly pan).

Checking and overhauling the components

Clearance between the clutch housing and friction plate

Insert a friction plate (E) in the clutch housing (F) 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.

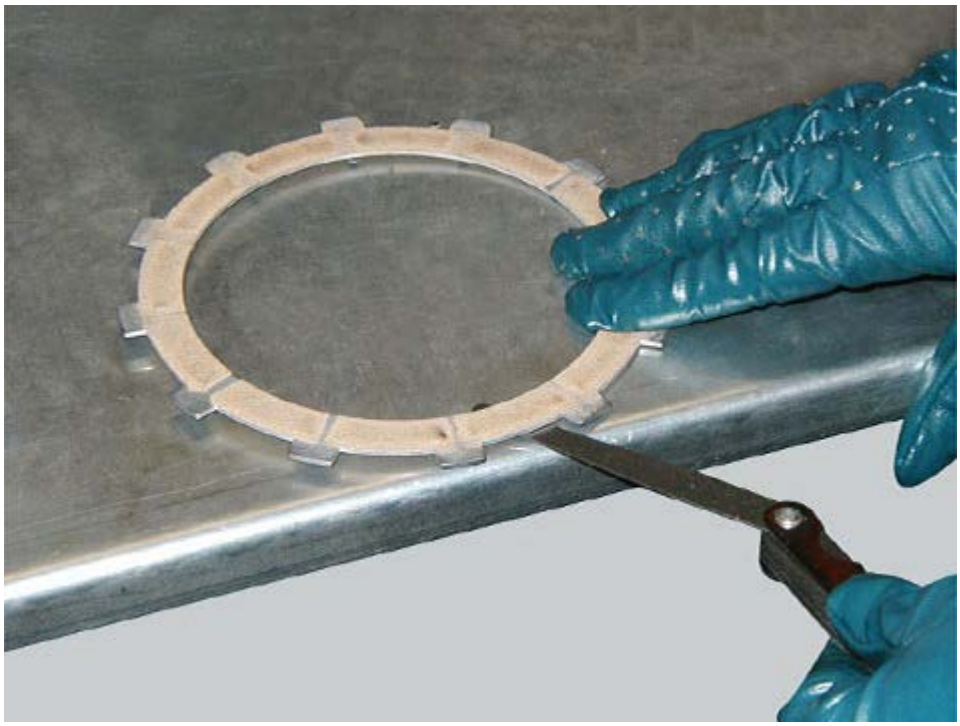


Overhauling the clutch plates

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.

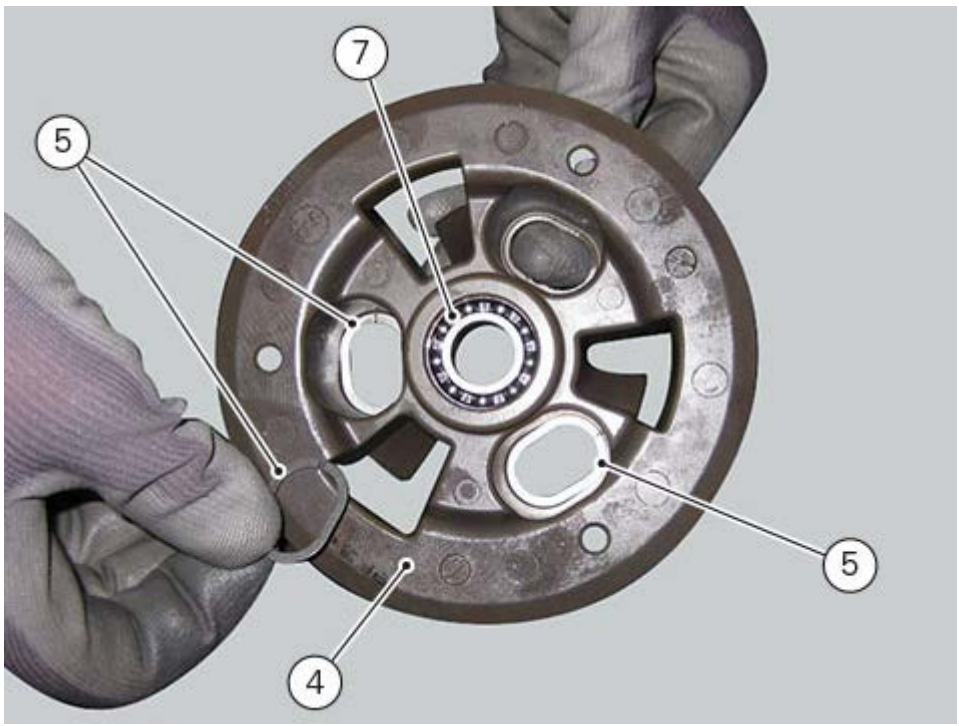
Important
The total thickness of the plates pack must not be less than 46.1 mm.

Place the plate on a flat surface and check the amount of deformation with a feeler gauge.
Max. flatness error: 0.2 mm.



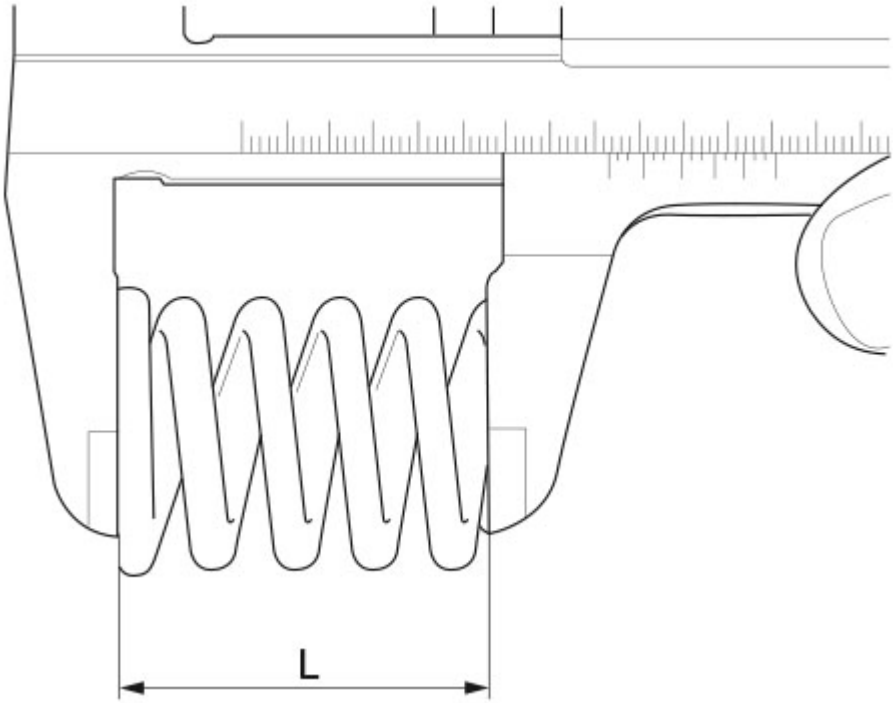
Overhauling the pressure plate

Check bearing (7) conditions: replace the bearing if the play is excessive.
Check the contact surface of the last friction plate; if extremely scored, polish it in the same manner as described previously for the cylinder head surface (Overhauling the cylinder head components).
Check the condition of the spring guide seats (G) of pusher plate (4) and of snap rings (5).



Overhauling the pusher plate springs

Measure the uncompressed length "L" of each spring (3).
Minimum length: 47.74 mm.
Replace any springs that are shorter than the above limit value.

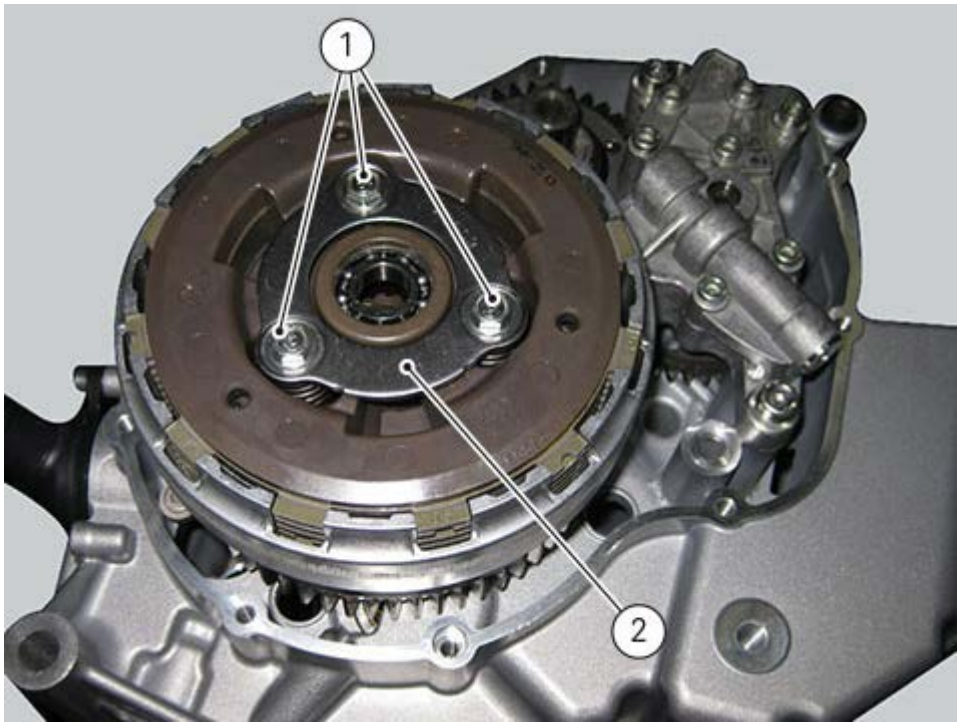

L

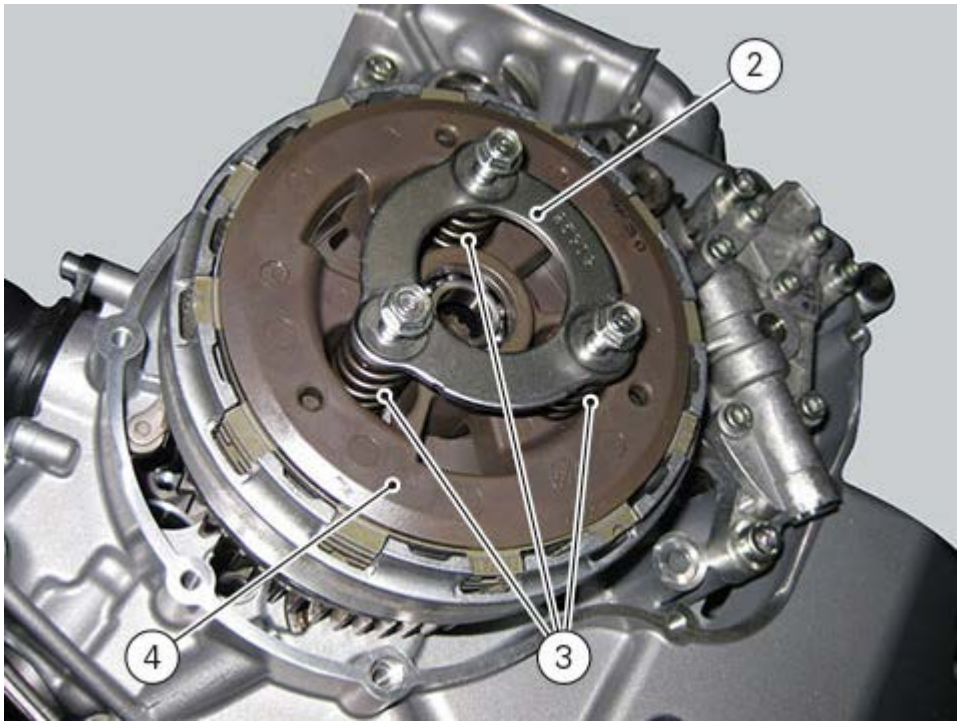
Removing the clutch

Remove the belly pan unit (Removing the belly pan).
Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the clutch cover (Removing the clutch cover).

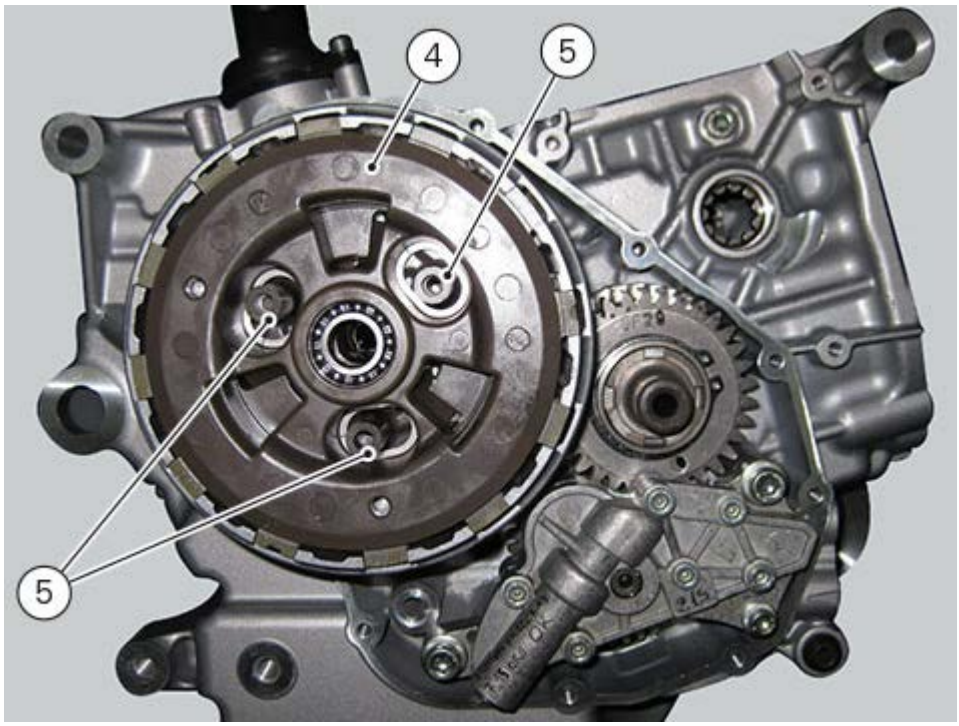
Note
For clarity, the figures show the engine removed from the frame.

Undo the fixing screws (1) and remove the ring (2) and the springs (3) from the pusher plate (4).



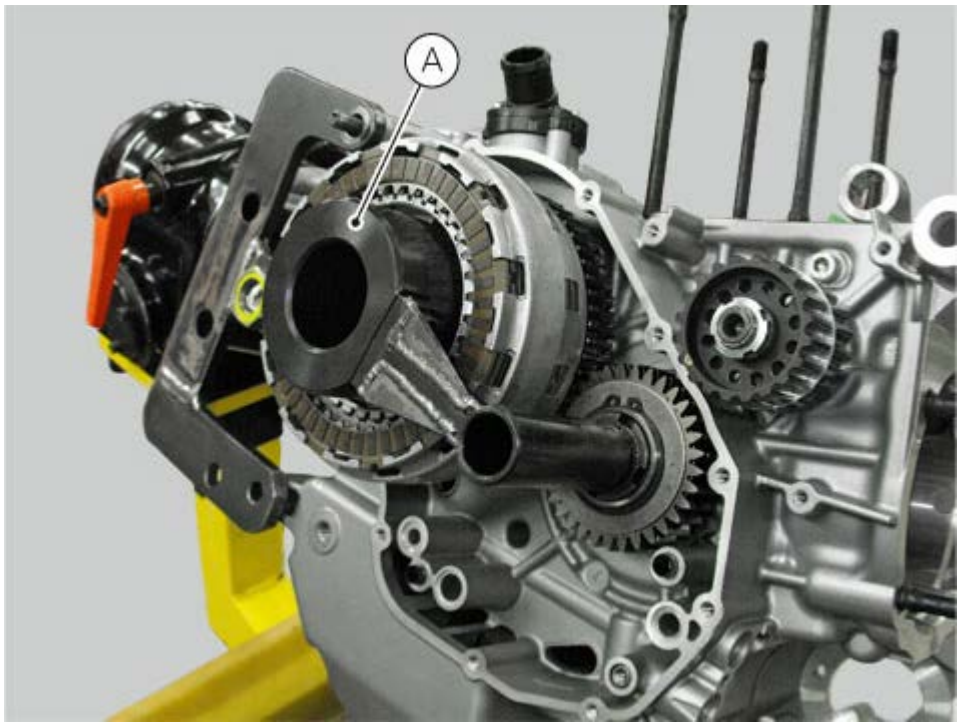


Slide out pusher plate (4) taking care not to damage snap rings (5).

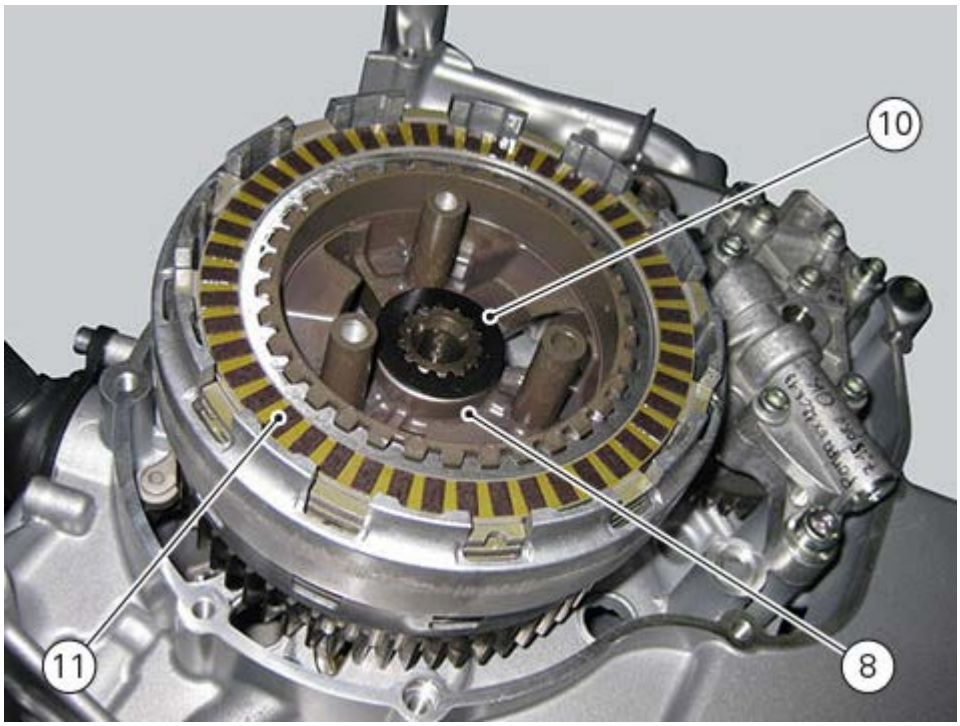


Remove the clutch control pin (6) and bearing (7).

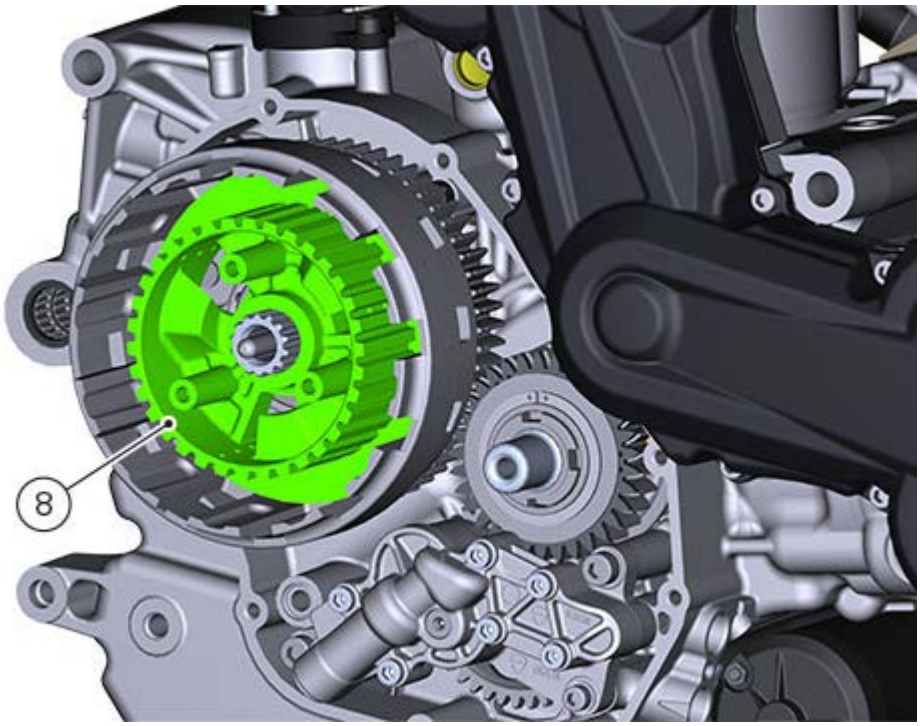
Block clutch drum (8) using the tool part no. **88713.3408** and loosen retaining nut (9).



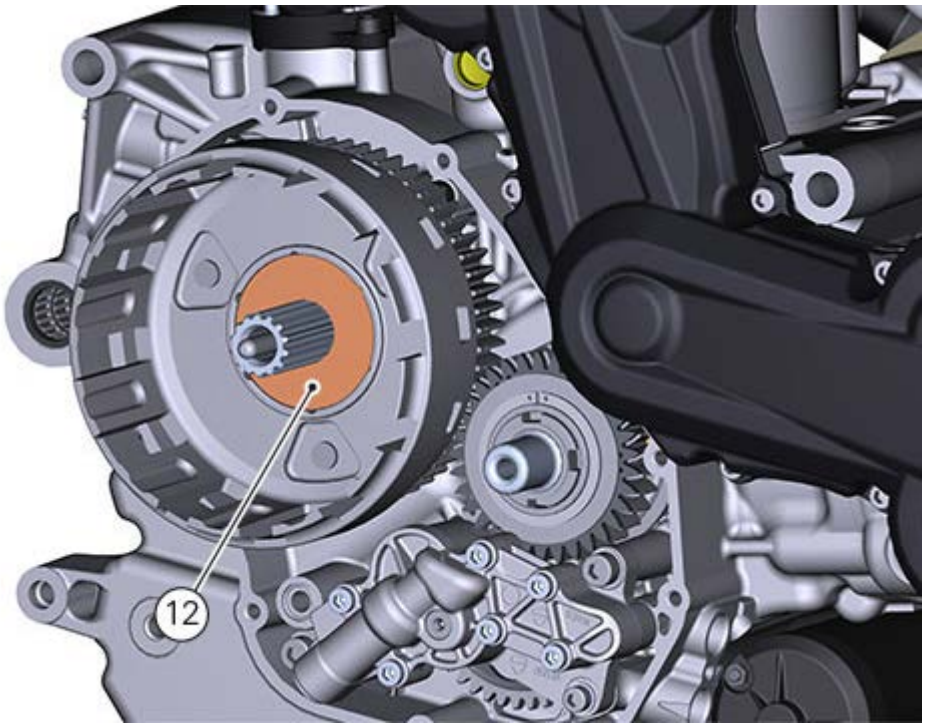
Remove Belleville washer (10) and remove clutch plates (11) from the clutch housing.
Slide out the clutch drum (8).


10
11
8


11

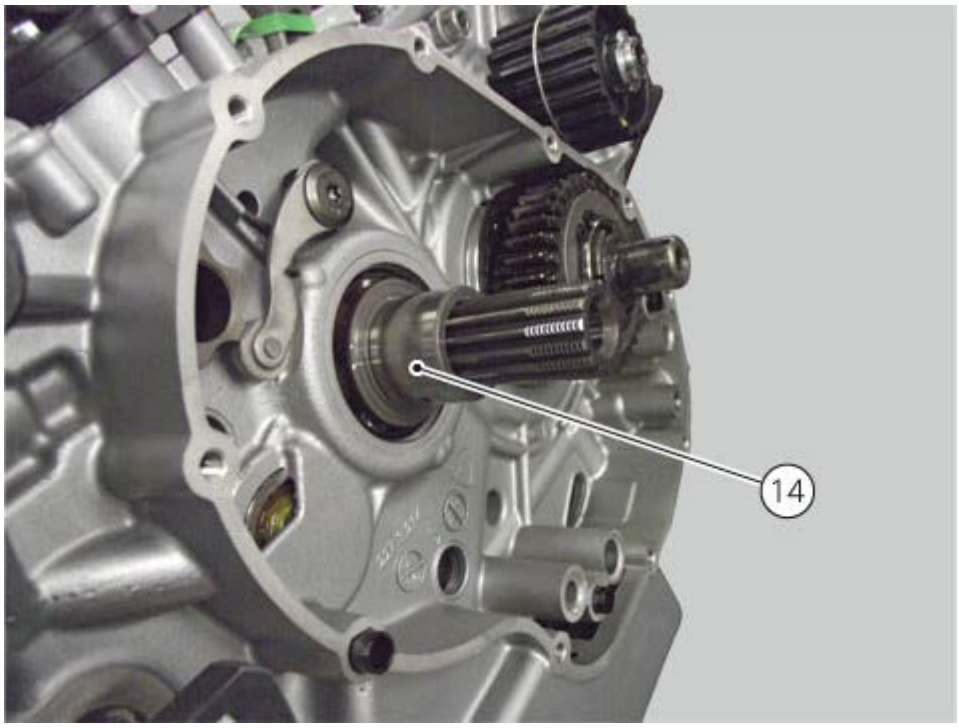


Slide out the spacer (12).



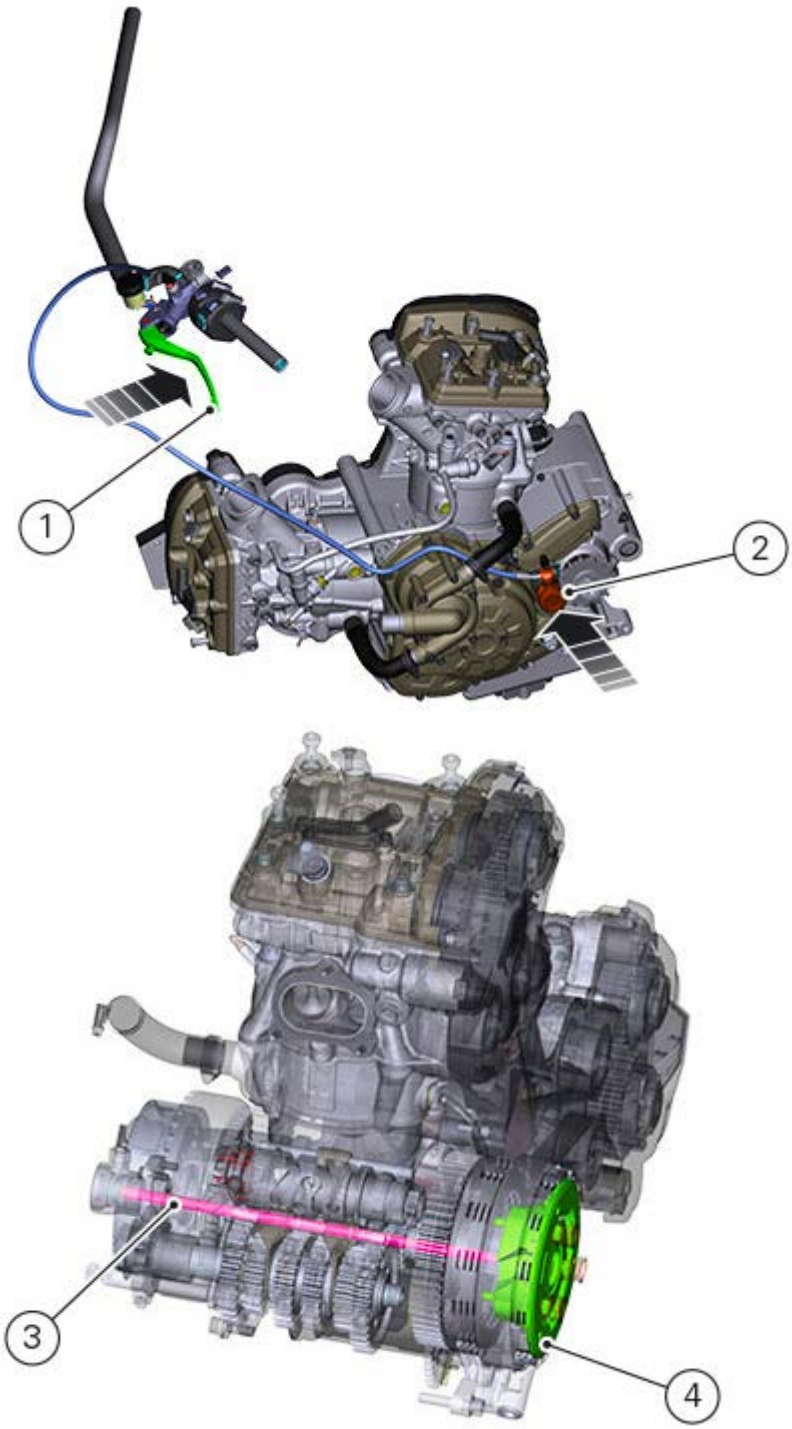
Slide out the clutch housing (13).

Slide off the guide (14).

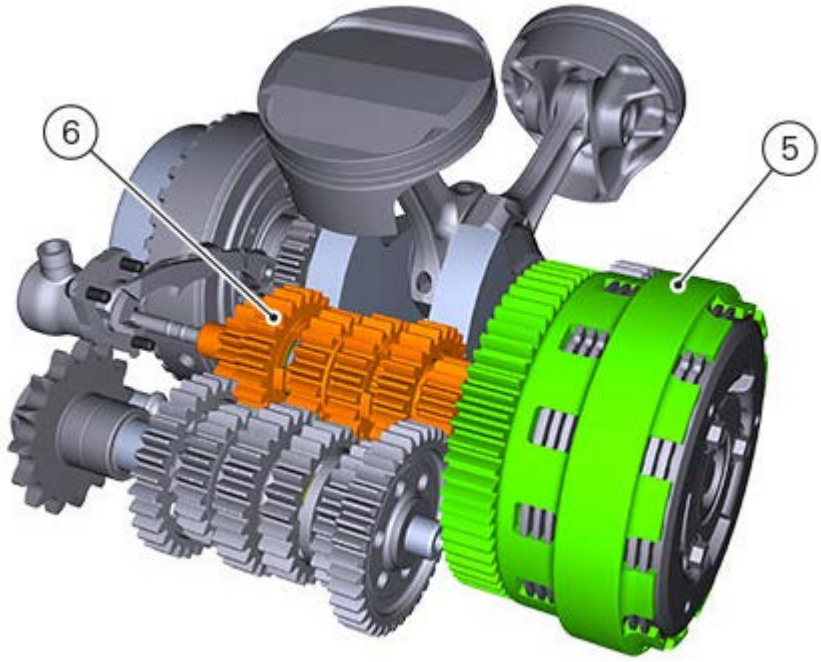


Description of the clutch assembly

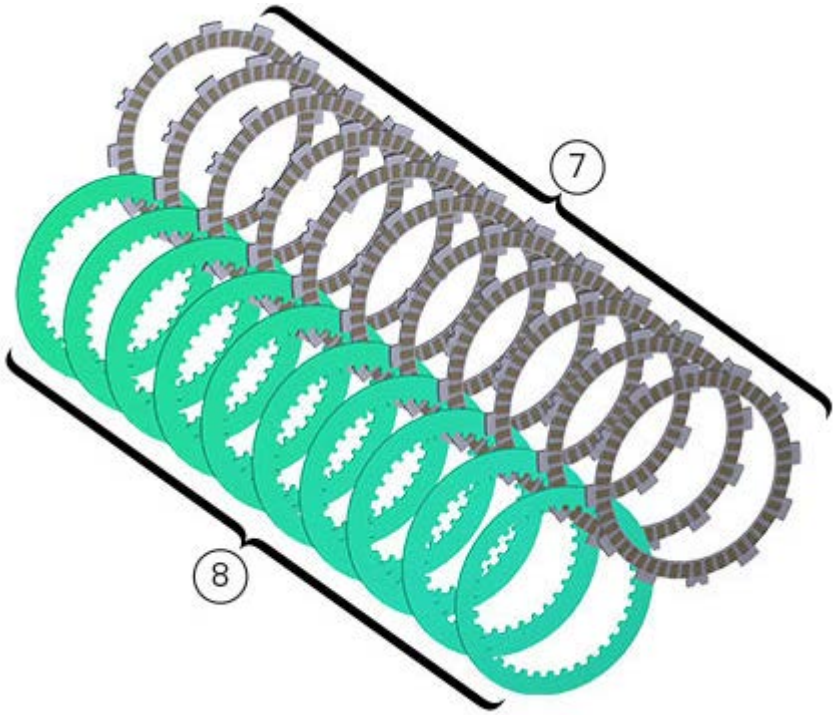
The clutch has the important function to immediately disconnect the gearbox primary shaft from the crankshaft. Working on clutch lever (1) the master cylinder (2) is pressurized and pushes on the control rod (3). Therefore the pusher plate (4) is moved and detaches the driven plates from the driving ones.



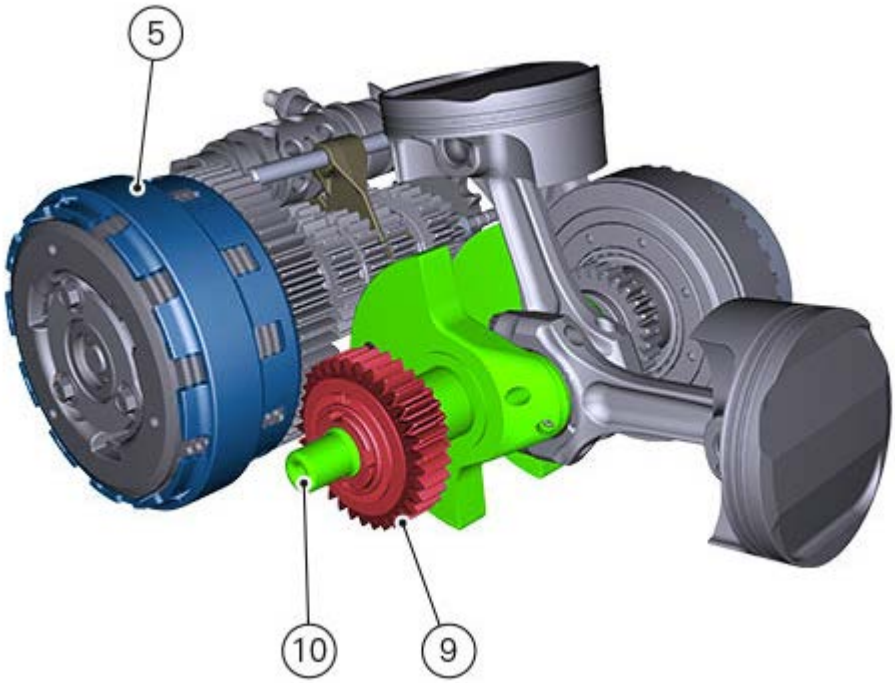
The clutch consists of a housing (5) that rotates freely on the primary shaft (6).

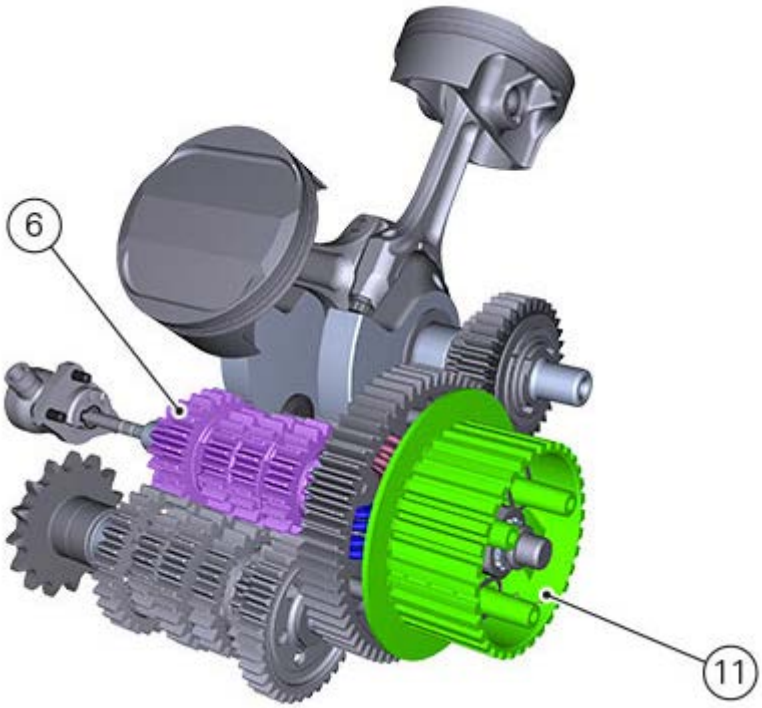


Inside the clutch housing there the driving plates (7) and the driven plates (8).

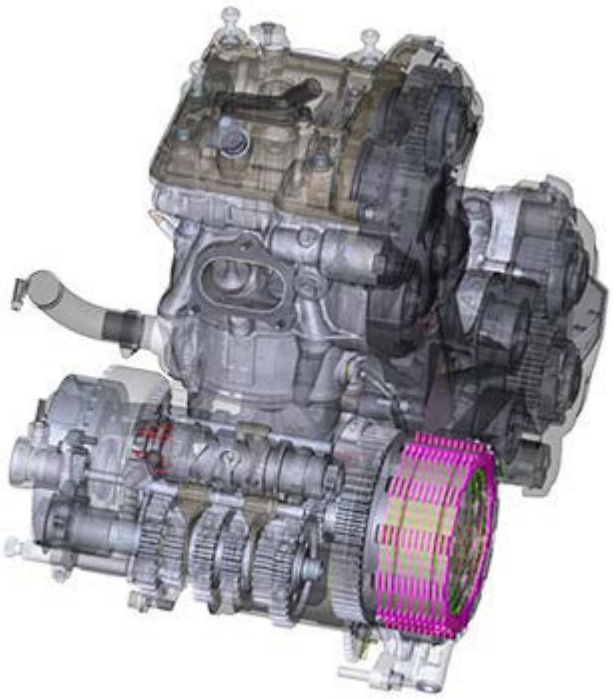


The driving clutch plates move together with housing (5) and crankshaft (10) by means of gear (9).
While the driven plates move together with the clutch hub (11) that is fixed to the gearbox shaft (6).
The entire system is moved by the pressure on the hub springs.





Working on the clutch lever, thanks to the pusher plate mechanism, the clutch will be detached and the plates will rotate freely with no connection to housing and hub.
This will allow the detachment of crankshaft and gearbox shaft.



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:

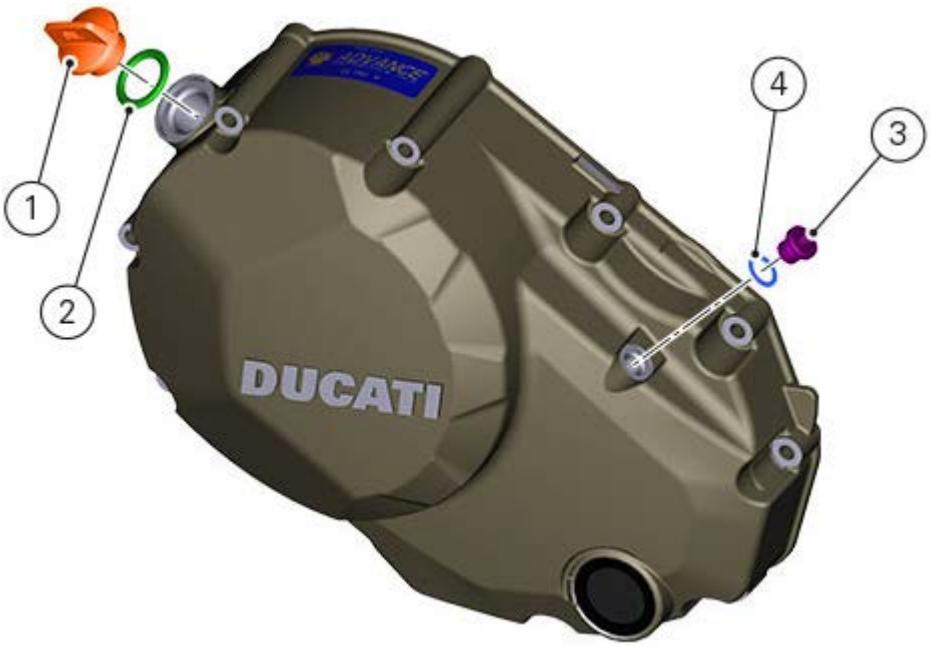
- no backlash of the control lever;
- worn out clutch plates;
- weakened springs;
- faulty clutch release mechanism;
- excessive wear of the hub or clutch housing.

A noisy clutch may be caused by:

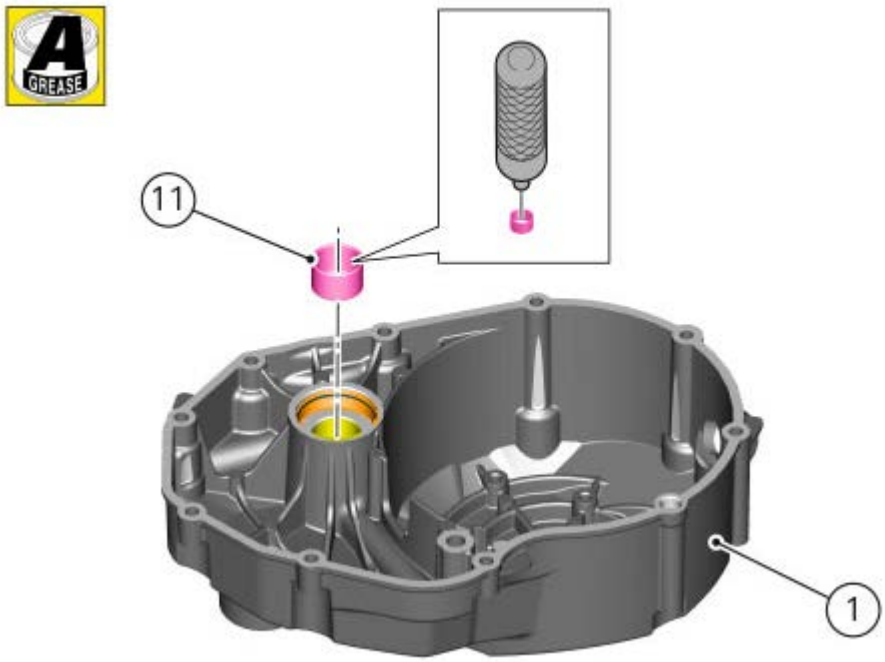
- excessive backlash between the primary drive gears;
- damaged primary drive gear teeth;
- excessive housing between driving plate tabs and the clutch housing;
- worn gear/clutch housing bearings;
- the presence of metal particles (filings) on the gear teeth.

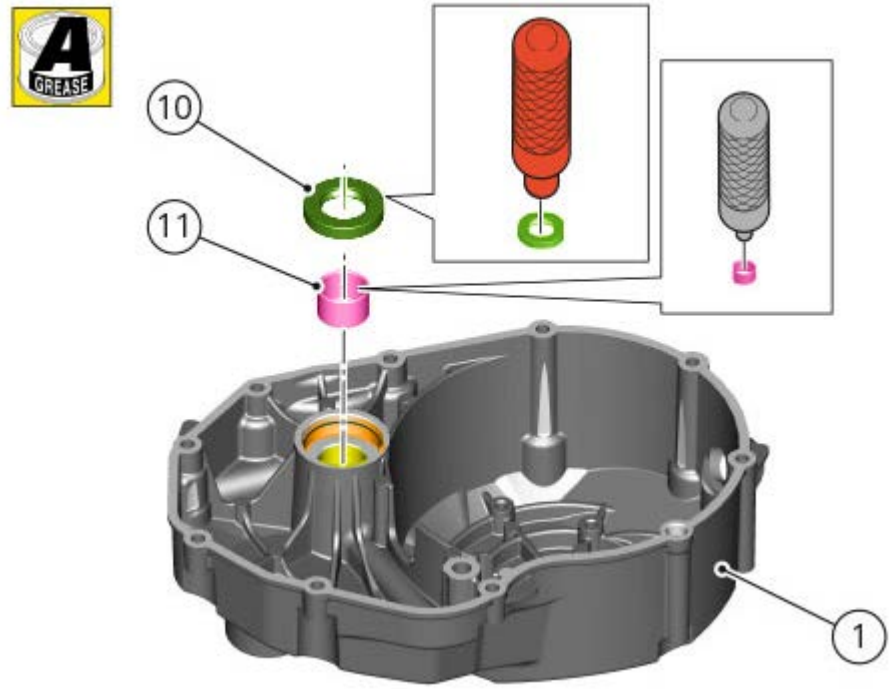
Reassembling the clutch cover

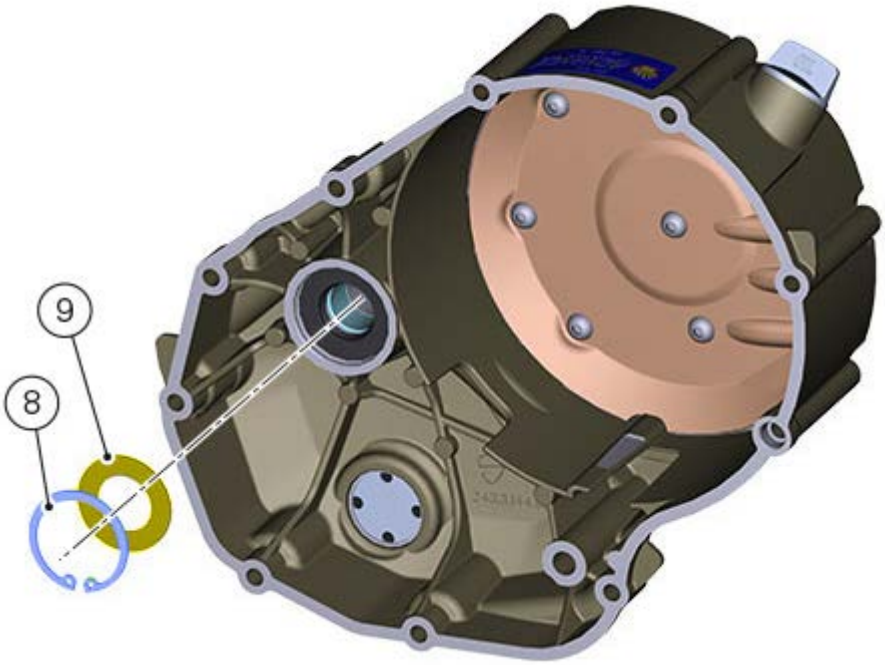
Fit the plug (1) and the gasket (2).
Fit the plug (3) and the gasket (4).



If the bush has been replaced, fully seat the new bush (11) in the slot in the cover using a suitable drift and a press.
Lubricate the sealing ring (10) with indicated product, refit the new part (10) in the clutch cover, positioning it so that the side without a spring is facing the circlip (8).
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 (9) and the circlip (8).

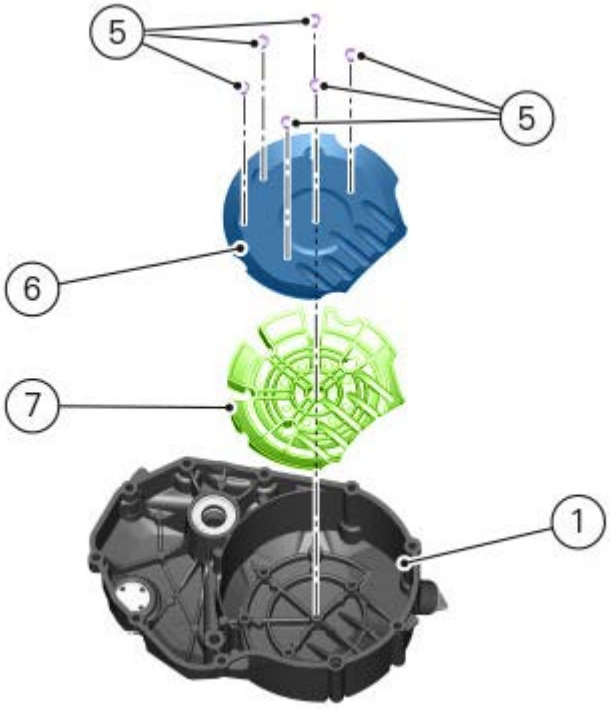






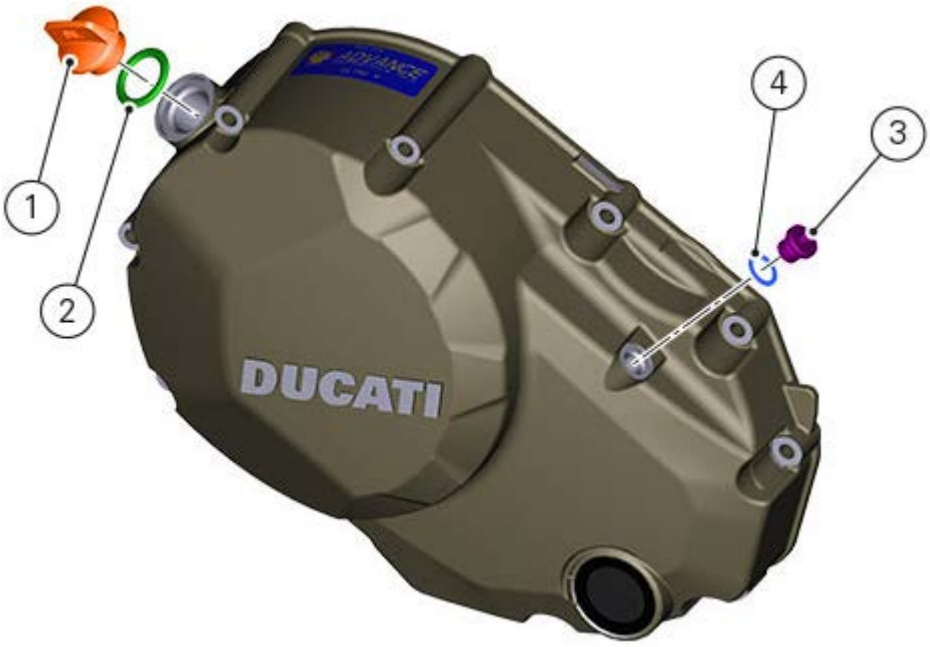
In order for the sealing ring (10) to perform correctly, it must have an assembly clearance that allows the circlip (8) to rotate.

Position the soundproofing panel (7) inside the clutch cover as shown in the figure.
Position the internal cover (6) on panel (7).
Apply the recommended threadlocker to the screws (5).
Tighten the retaining screw (5) to a torque of 8 Nm (Min. 7 Nm - Max. 9 Nm).

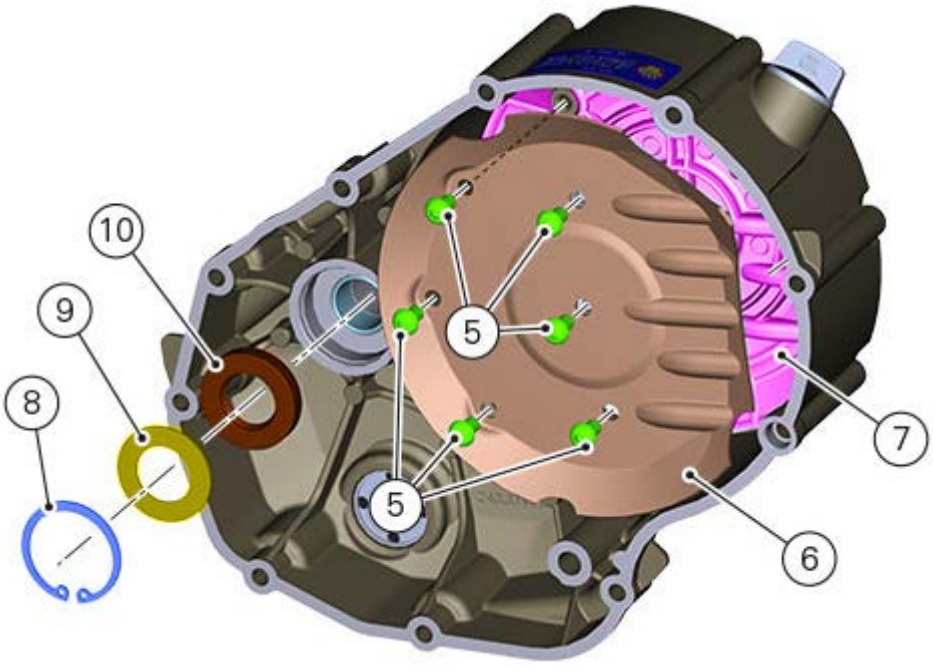

5
5
6
7
1

Disassembling the clutch cover

Remove the plug (1) and the relevant O-ring (2) from the cover, the plug (3) and its seal (4).



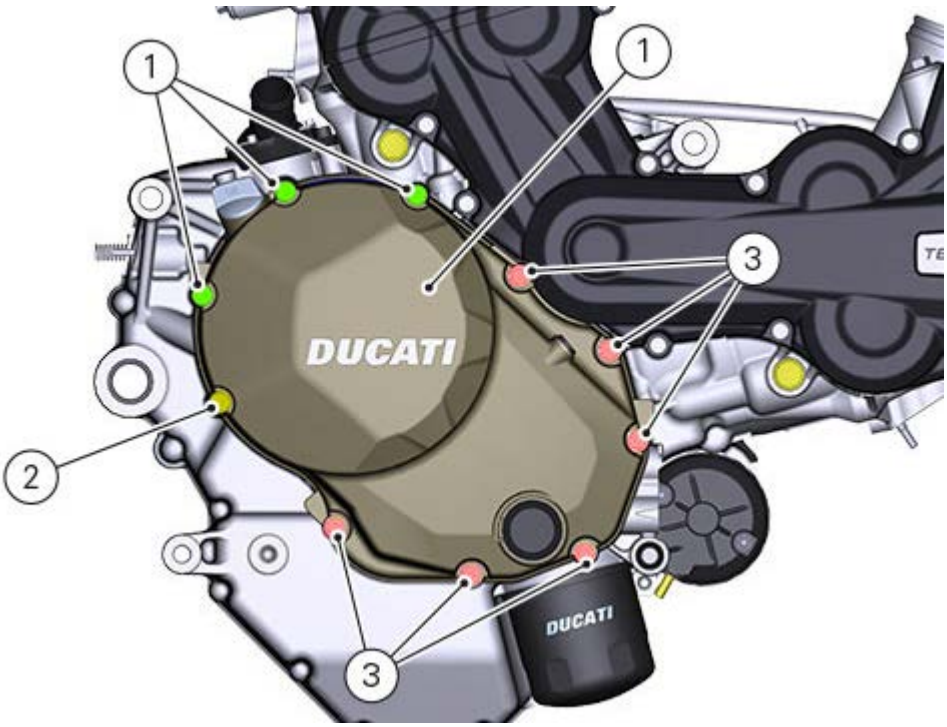
Undo screws (5) of the inner cover (6).
Remove the inner cover (6) and the soundproofing panel (7).
Remove the circlip (8) and withdraw the shim (9) and the sealing ring (10).
Visually inspect the sealing ring (10) and replace it if necessary.



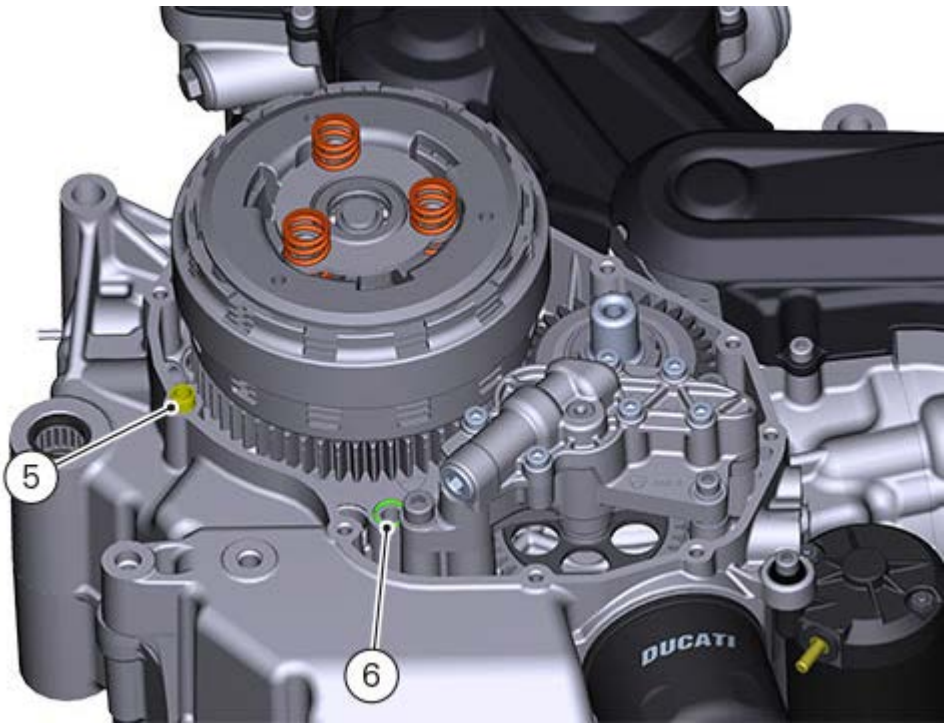
Removing the clutch cover

Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the belly pan unit (Removing the belly pan).

Loosen the fastening screws (2), (3) and (4) on the clutch cover (1).



Tap around the edge of the cover with a plastic mallet to detach it from the crankcase half.
Remove the clutch cover (1) paying attention to the centring bush (5) and O-ring (6).
Check the condition of the centring bush (5) and replace if deformed.



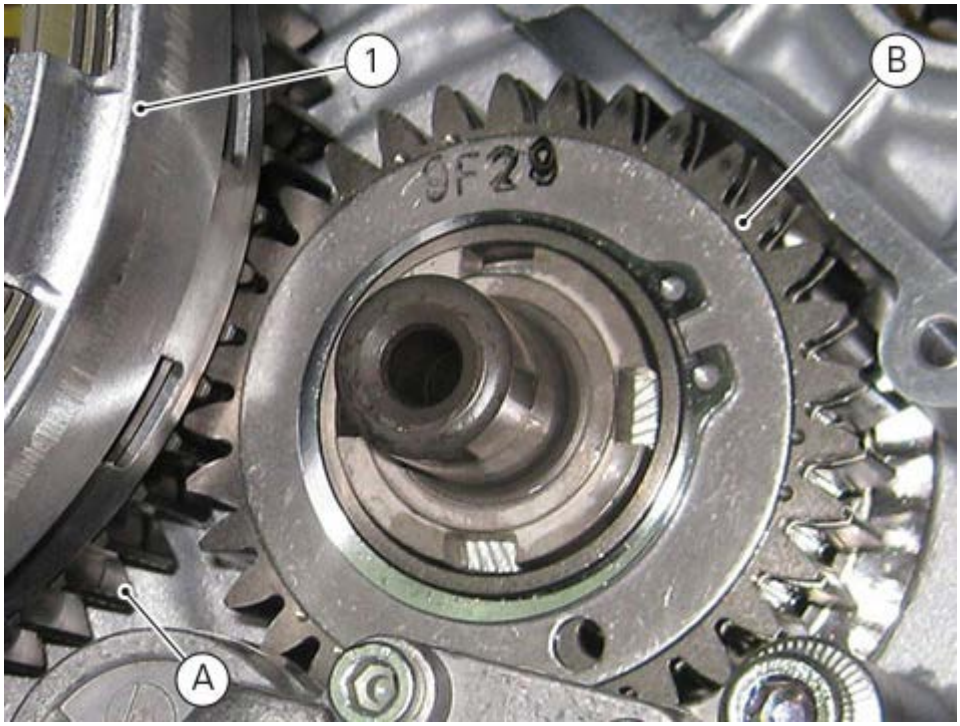
Refitting the primary drive gears and checking backlash

Fully degrease the crankshaft splined end and the corresponding spline on the primary drive gear.
Position spacer (D) on the crankshaft.

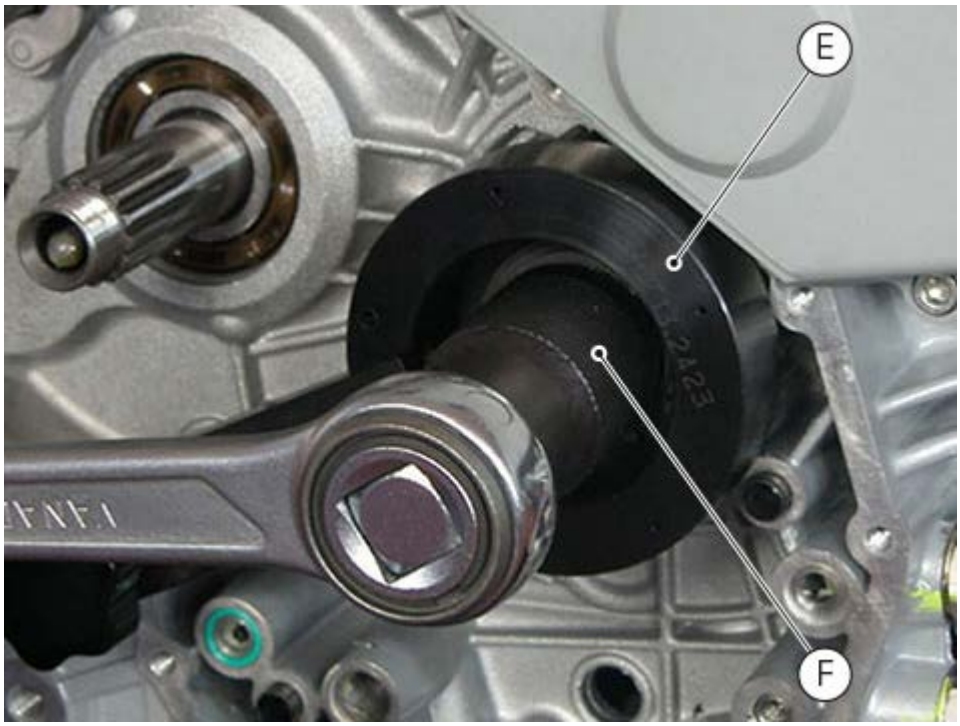
Fit the driving gear (B) onto the crankshaft with the oil pump drive sprocket facing the crankcase.

Temporarily secure the gear with the washer (4) and ring nut (3).
If fitting a new primary driving gear (B), check the backlash.

To check the backlash, temporarily fit the clutch housing (1) complete with the primary driven gear (A) on the gearbox primary shaft. Fix a dial gauge to the crankcase, positioning the stylus against a gear tooth. Turn the driven gear (A) to mesh the teeth and check that backlash ranges between 0.05 and 0.07 mm.
Repeat the check at 16 different points of the driven gear.
If the measured values are outside the tolerance limits, try changing the position of driven gear (A) on the primary shaft, leaving the driving gear (B) on the crankshaft. If the backlash is still outside the tolerance limits, replace the complete primary drive gear (1).

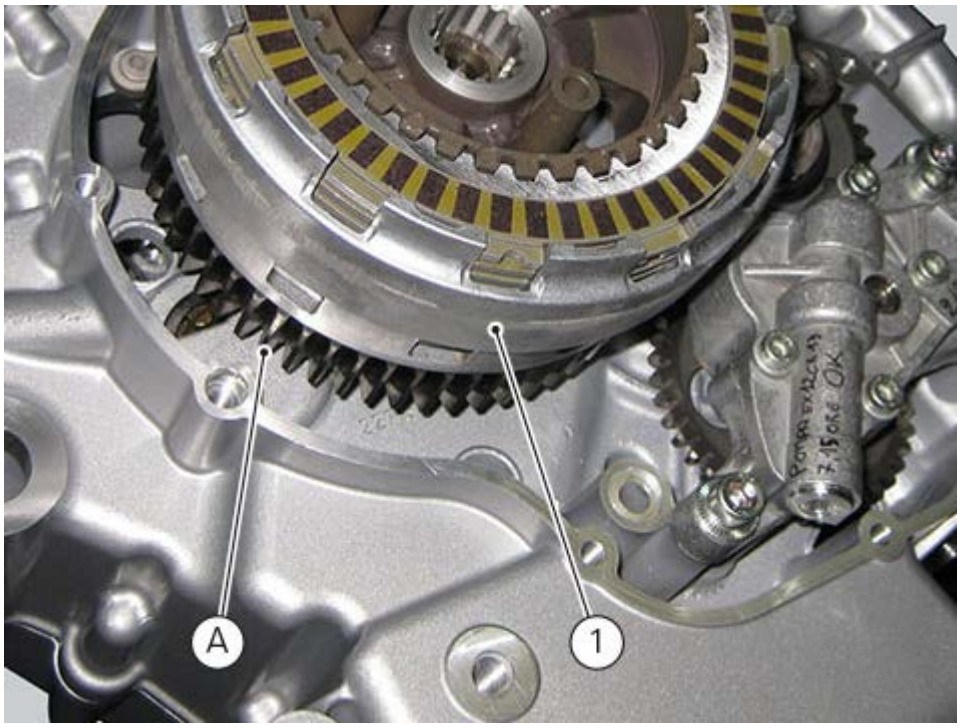


After having checked the backlash, apply bush (F) part no. **88713.3406** on a torque wrench, lock sprocket (B) with holding tool (E) part no. **88713.3417**.



Position washer (4) and ring nut (3). Using the suitable tool (U), tighten ring nut (3) to a torque of 190 Nm (Min. 171 Nm - Max. 209 Nm).

Refit the oil pump (C) and check the backlash between the oil pump gear and primary drive gear on the crankshaft (Refitting the oil pump).
Thoroughly degrease the mating surfaces of the clutch housing (1). Fit the spacer (2) onto the primary shaft. Fit the clutch housing (1) along with the driven gear (A).

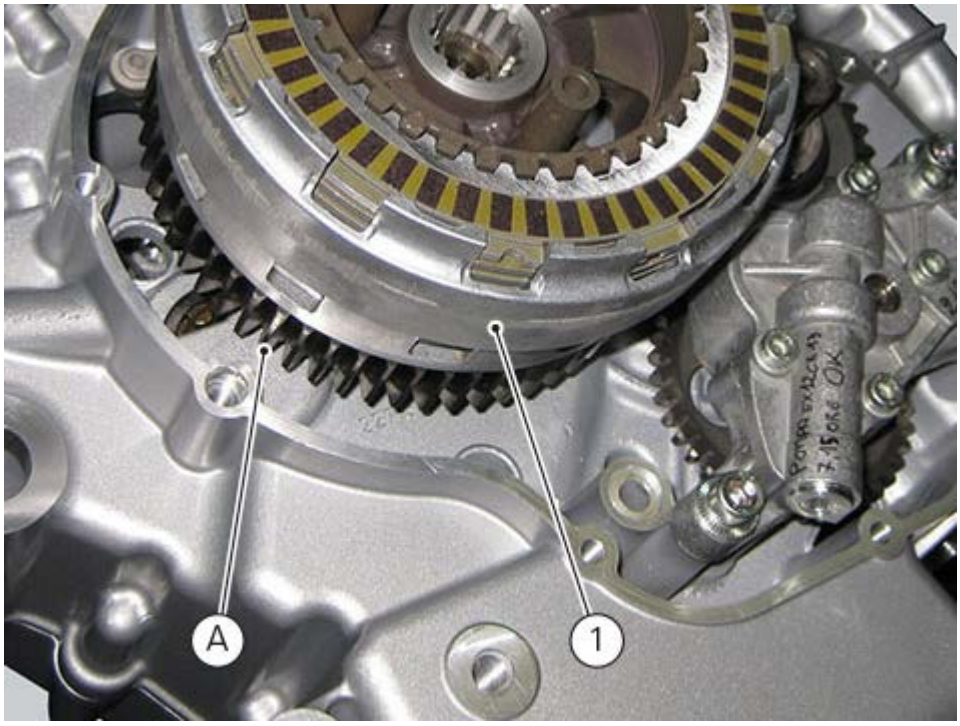


Refit the clutch unit (Refitting the clutch).
Refit the clutch cover (Refitting the clutch cover).
Refit the belly pan unit (Refitting the belly pan).
Fill the engine with oil (Changing the engine oil and filter cartridge).

Removing the primary drive gears

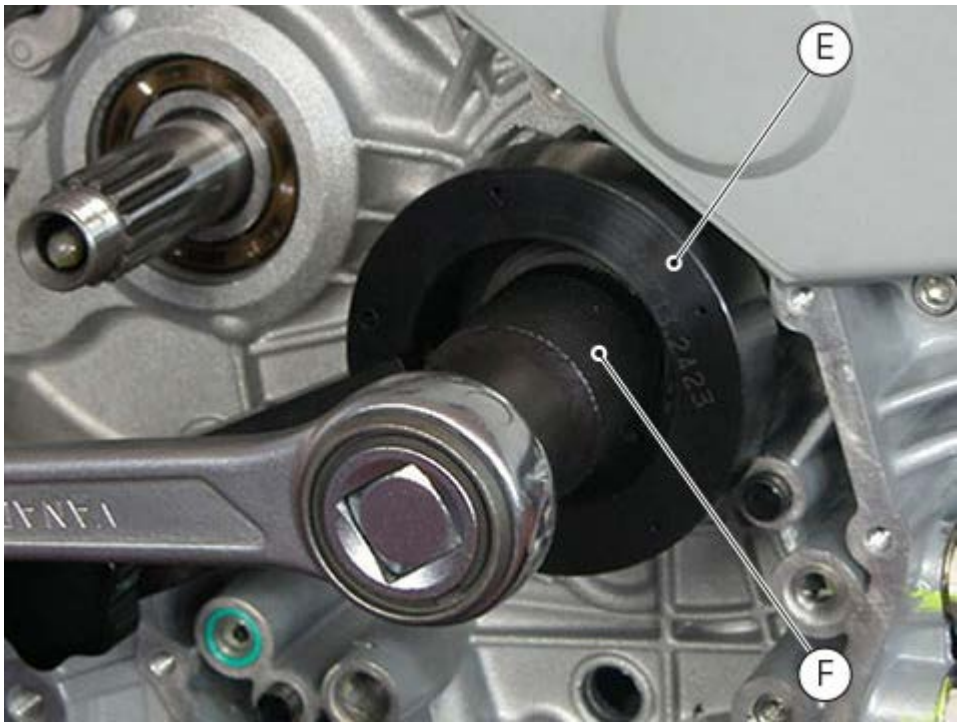
Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the belly pan unit (Removing the belly pan).
Remove the clutch cover (Removing the clutch cover).
Remove the clutch unit (Removing the clutch).

Withdraw the clutch housing (1) complete with driven gear of the primary drive gear (A).



Remove the inner spacer (2).
Remove the oil pump (C) (Removing the oil pump).

Lock the primary sprocket (B) with holding tool (E) part no. **88713.3417** and loosen the threaded ring nut (3) that locks the sprocket, using bush (F) part no. **88713.3406**.



Remove the ring nut (3) and the lock washer (4).

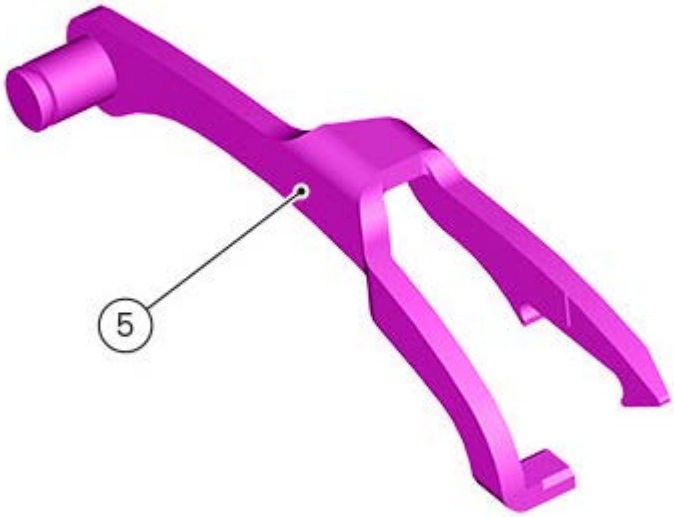
Remove the complete primary drive driving gear (B) using a commercial puller and placing a brass or aluminium pad between crankshaft and puller screw.

Remove spacer (D).

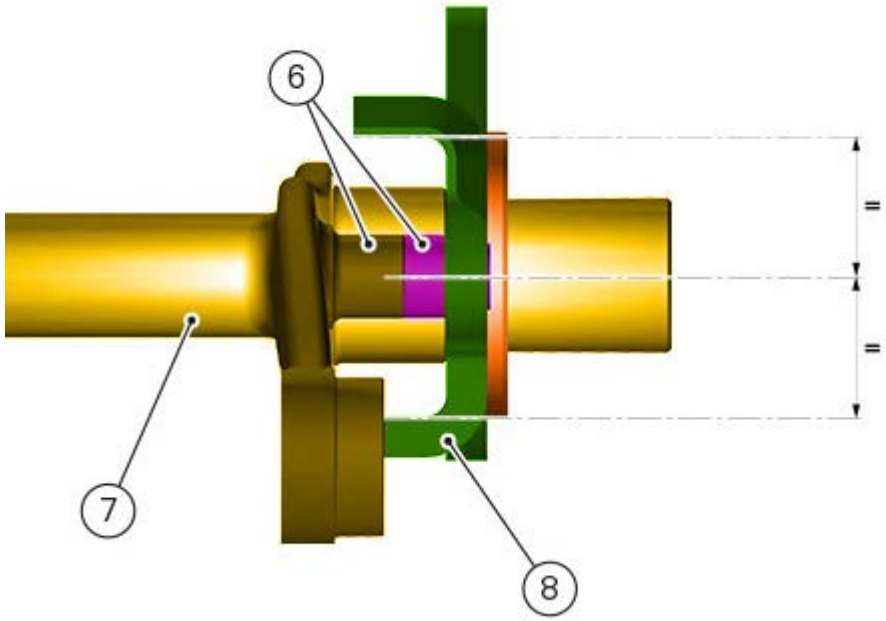

D

Refitting the gearchange mechanism

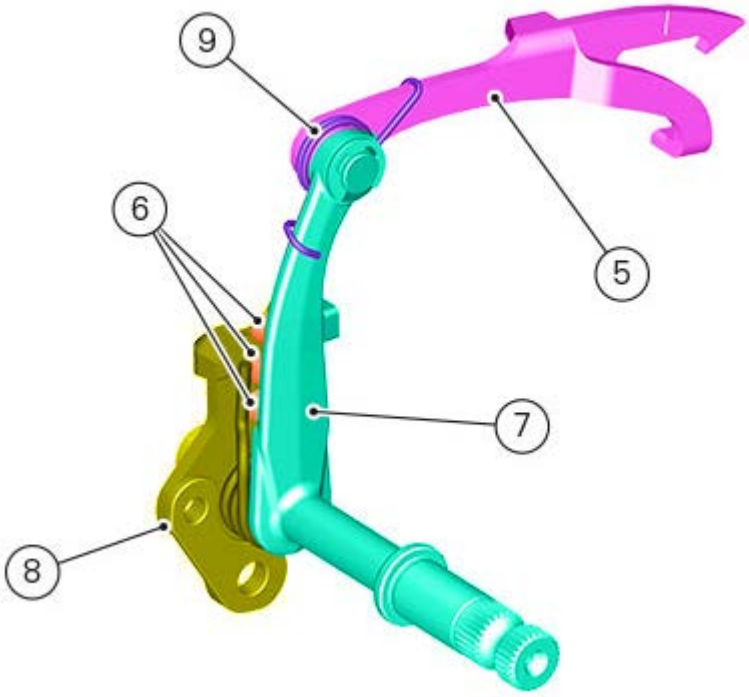
Visually inspect the gear selector fork (5) for wear, particularly around the area where it contacts the selector drum.



If it proves necessary to change components, disassemble the gearchange mechanism.
Reassemble the gearchange mechanism orienting the pins (6), suitably lubricated, in such a way that the lever (7) is positioned centrally with respect to the shoulders of the stop plate (8).

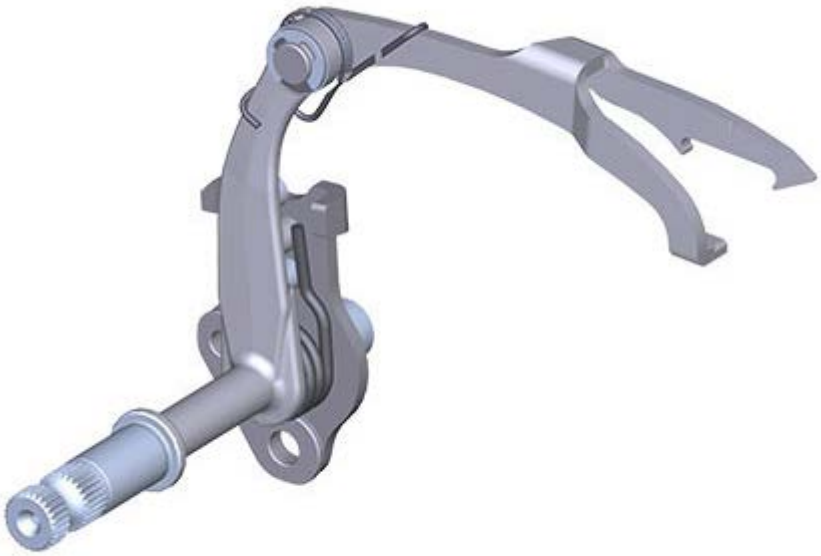


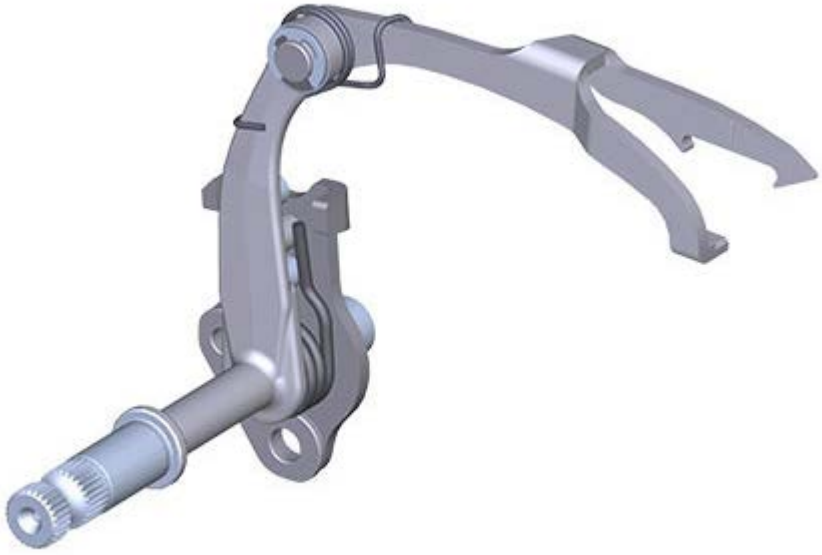
Check that the spring is installed correctly as shown in the figure.



Note

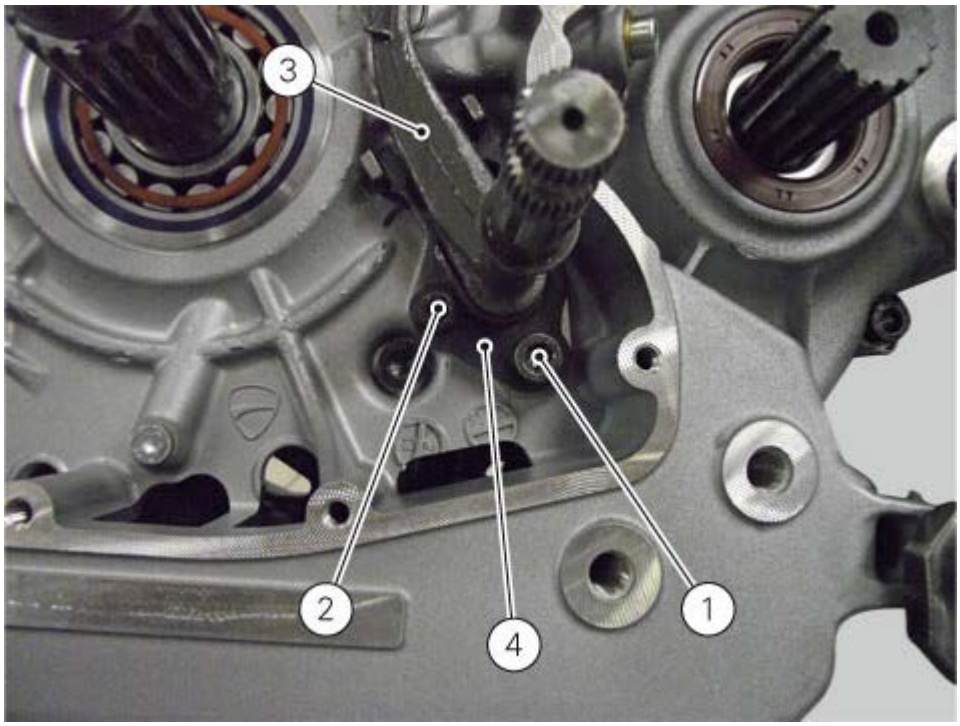
There are two types of springs, therefore pay attention to the installation seats.



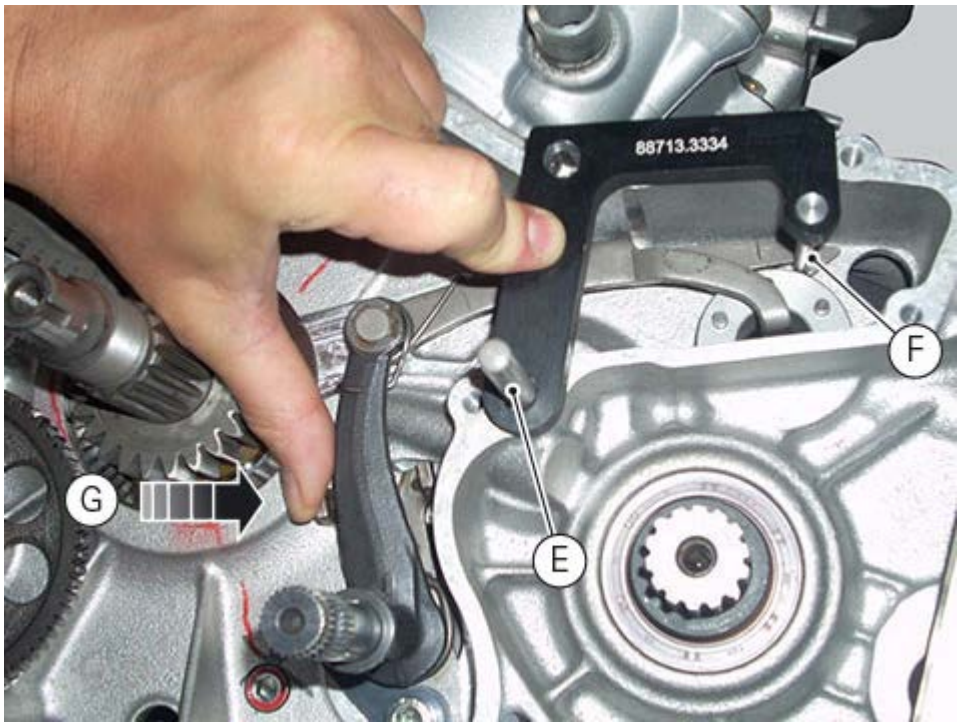


Position the gearbox drum selector fork in the centre of the gear rollers.
Position the gearchange mechanism (3) together with control shaft, spring and plate into the chain-side crankcase half.

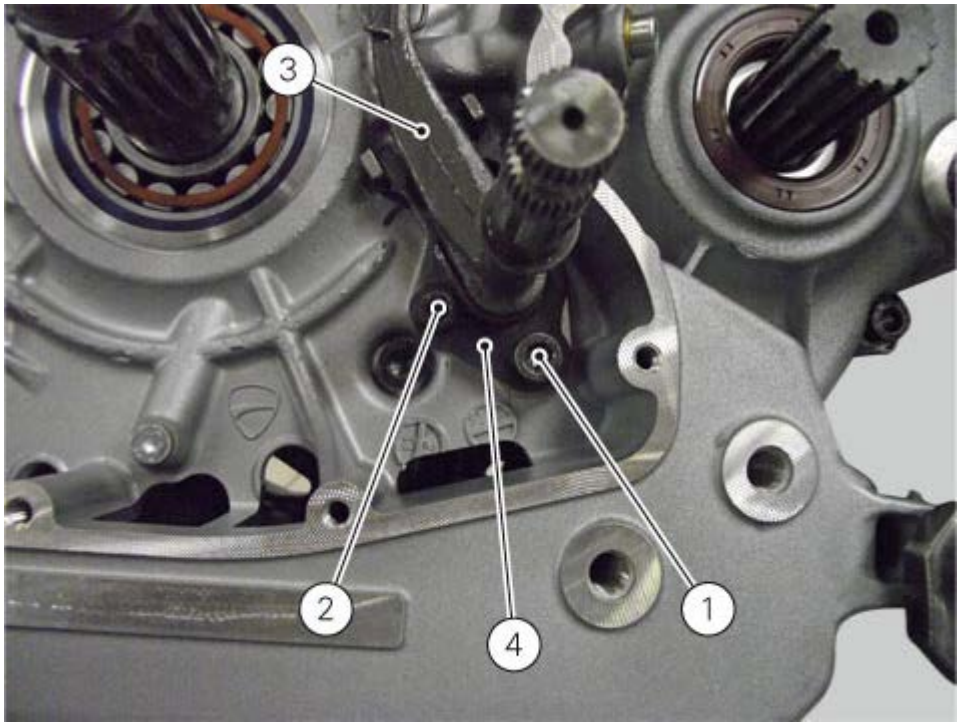
Insert the screws (1) and (2) with the spacer (4).
Temporarily fit gearchange lever (or a service lever) and engine sprocket and shift to neutral gear.



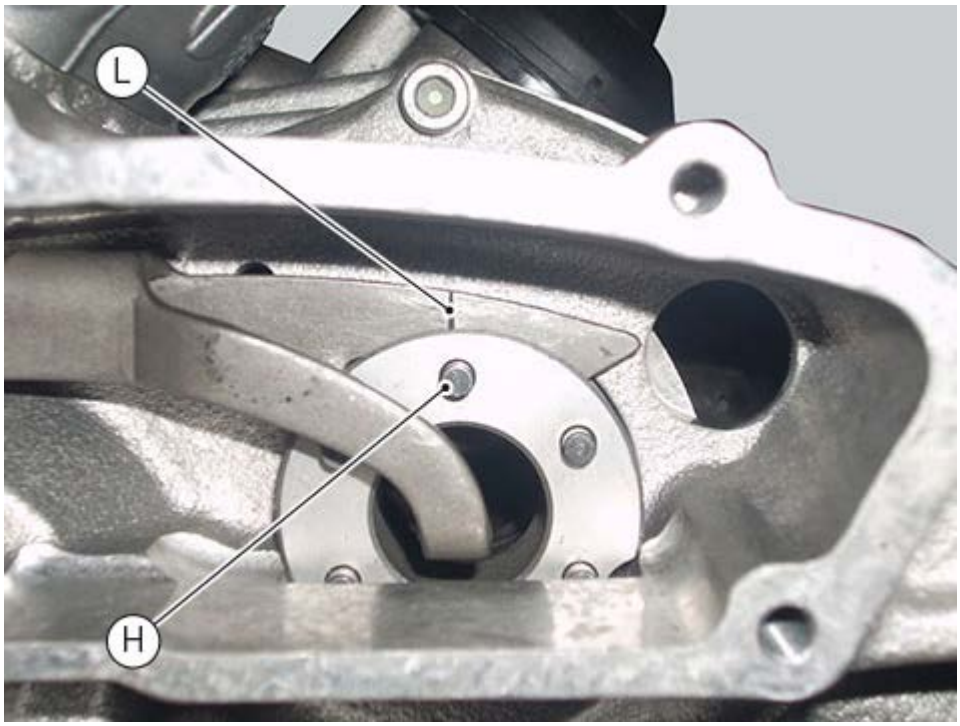
Place tool (A) part no. **88713.3334** inserting the clutch rod (E) into the tool hole, block the pin (F) of the tool in the gear pawl pressing with the hand in the point (G) (pawl stroke stop plate) towards the right, as shown in photo.



In this position tighten the screw (1) to a torque of 36 Nm (Min. 34 Nm - Max. 38 Nm) and the screw (2) to a torque of 16 Nm (Min. 15 Nm - Max. 17 Nm).



Remove service tool.
Check that the pin (H) placed on the gearbox selector drum is aligned with the notch (L) on the gear pawl (with gear in neutral).

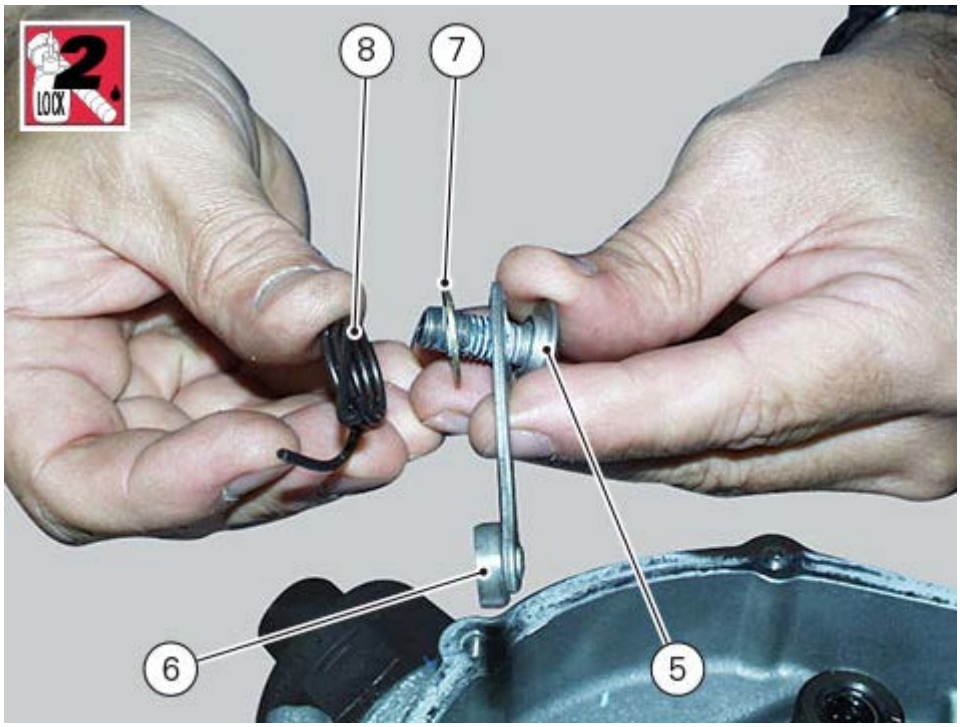


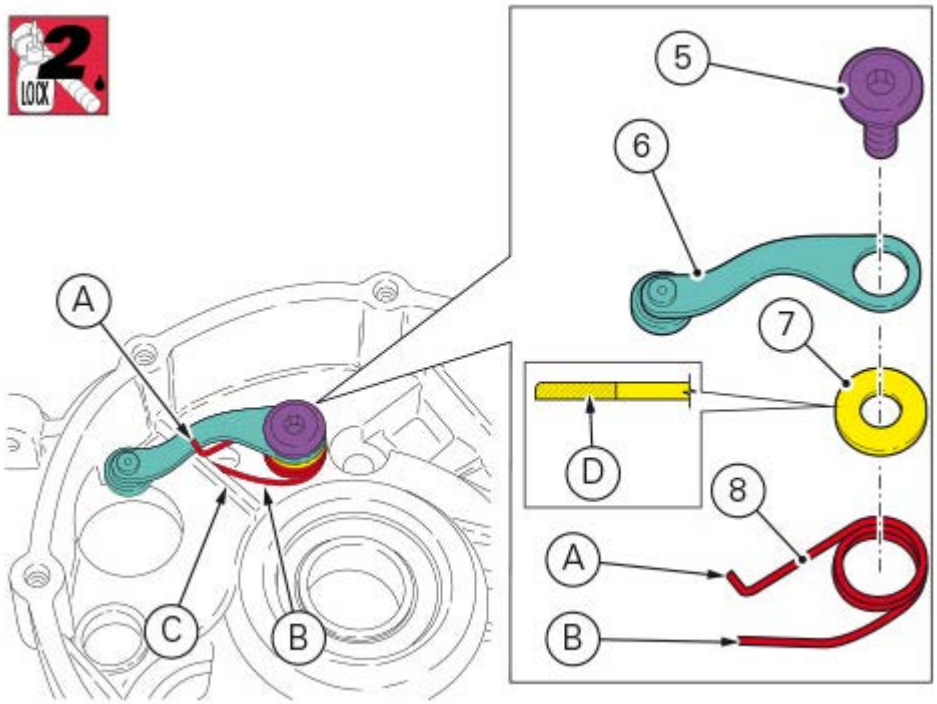
With the gearbox in neutral, check that the lever travel is the same when shifting up and down. The same should apply when a gear is engaged.
Operate the gearchange lever and turn the front sprocket at the same time to check that all the gears engage when shifting up and down.
Remove the previously installed lever and sprocket.

Refit the flywheel/generator assembly and the generator cover (Refitting the flywheel/generator assembly).
Refit the pump-water radiator hose (Refitting cooling system hoses and unions).
Refit the pump-cylinder hoses (Refitting the cylinder/piston assembly).
Refill the cooling system (Changing the coolant).
Refit the clutch slave cylinder (Refitting the clutch slave cylinder).
Refit the front sprocket cover (Refitting the front sprocket cover).
Fill the system with engine oil (Changing the engine oil and filter cartridge).
Refit the sump guard unit (Refitting the sump guard).

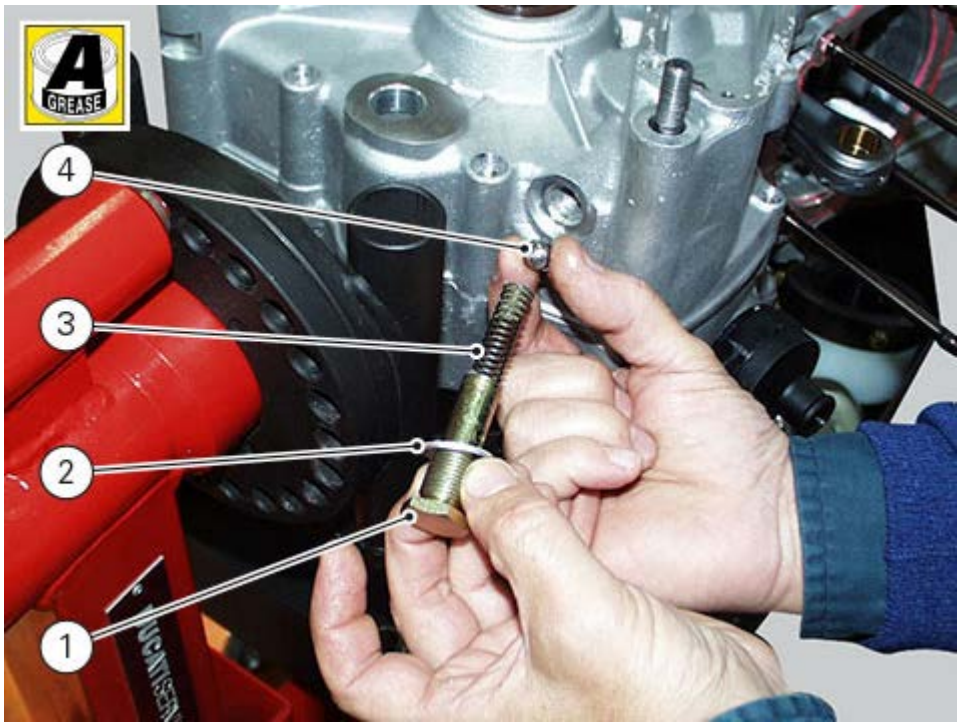
Refitting the gear interlock plunger and ratchet

On the special screw (5), fit the gear ratchet (6), orienting it as shown in the figure, the washer (7) with the square edge side (D) facing the clutch-side crankcase half, and the spring (8), positioning it so that the hook end (A) is facing the gear ratchet.
Locate the hook (A) of the spring on the gear ratchet as shown in the figure.
Apply threadlocker to the screw thread.
Start the screw in the crankcase half.
Position end (B) of the spring so that it rests against rib (C) of the crankcase half, as shown in the figure.
Tighten screw (5) to a torque of 18 Nm (Min. 16 Nm - Max. 20 Nm).
Manually move the gear ratchet to check for proper spring operation.





Grease and then fit the ball (4), spring (3), and seal (2) to the gear interlock plunger (1).
Tighten the gear interlock plunger to a torque of 30 Nm (Min. 27 Nm - Max. 33 Nm).

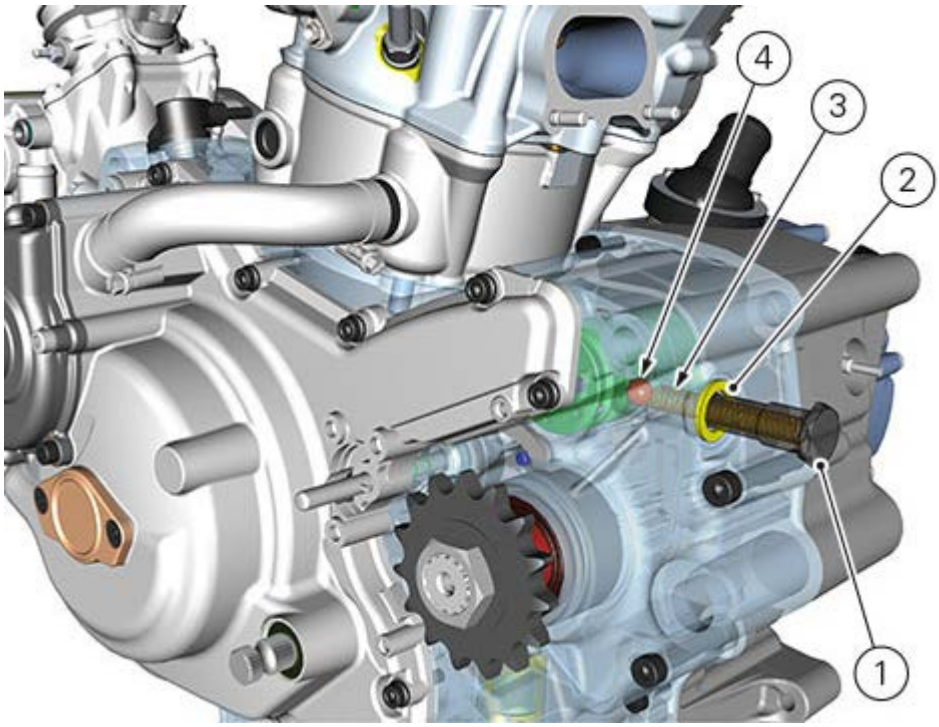


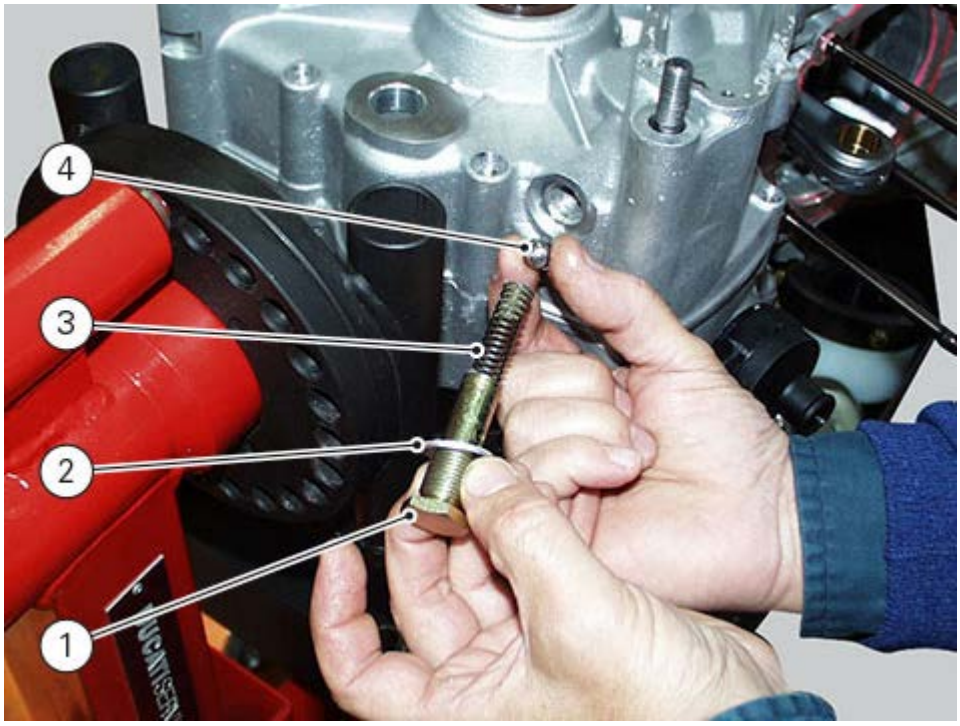
Refit the clutch unit (Refitting the clutch).
Refit the clutch cover (Refitting the clutch cover).
Fill the system with engine oil (Changing the engine oil and filter cartridge).
Refit the sump guard unit (Refitting the sump guard).

Disassembling gear interlock plunger and ratchet

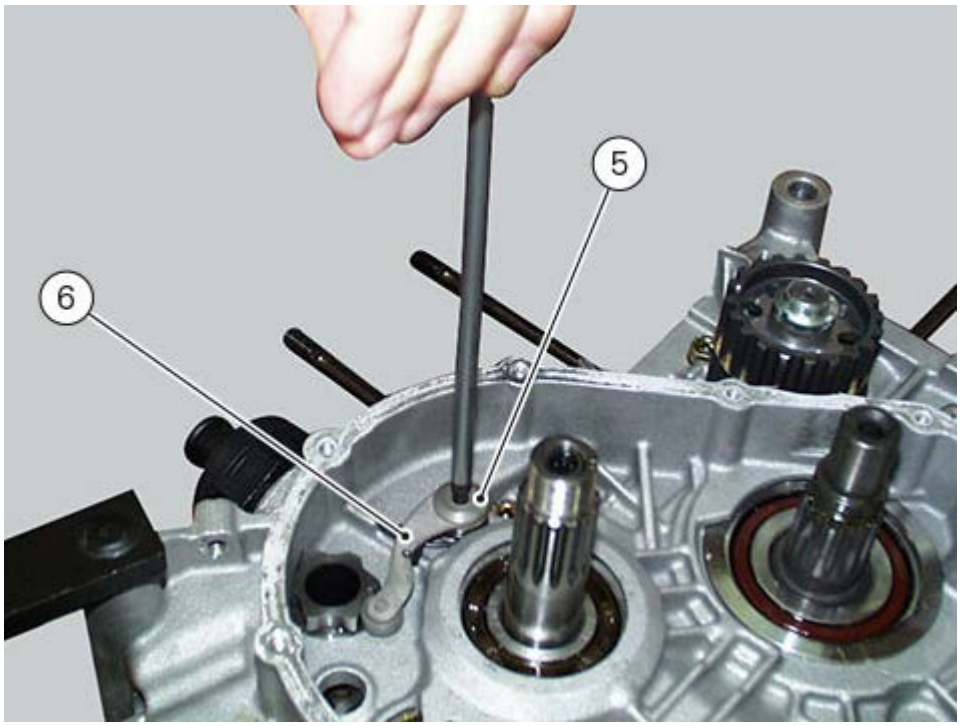
Remove the sump guard unit (Removing the sump guard).
Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the clutch cover (Removing the clutch cover).
Remove the clutch unit (Removing the clutch).
Remove the primary drive gear (Removing the primary drive gear).

Undo the interlock plunger screw (1) and remove the seal (2), the spring (3) and the ball (4).





Undo the clutch-side crankcase half screw (5) and remove the ratchet (6), the washer (7) and the spring (8).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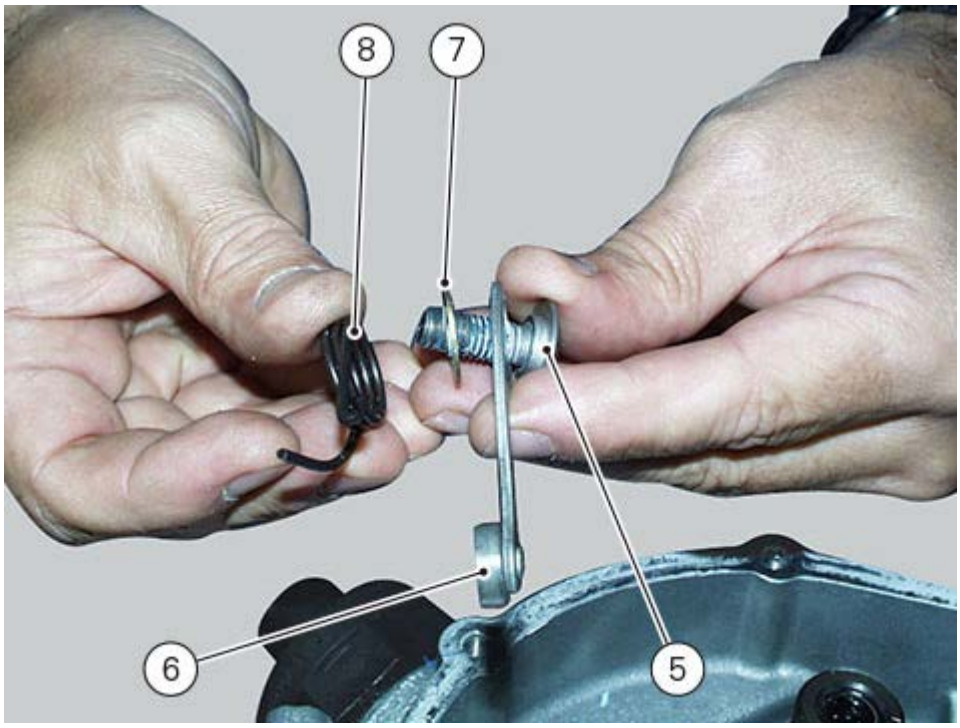
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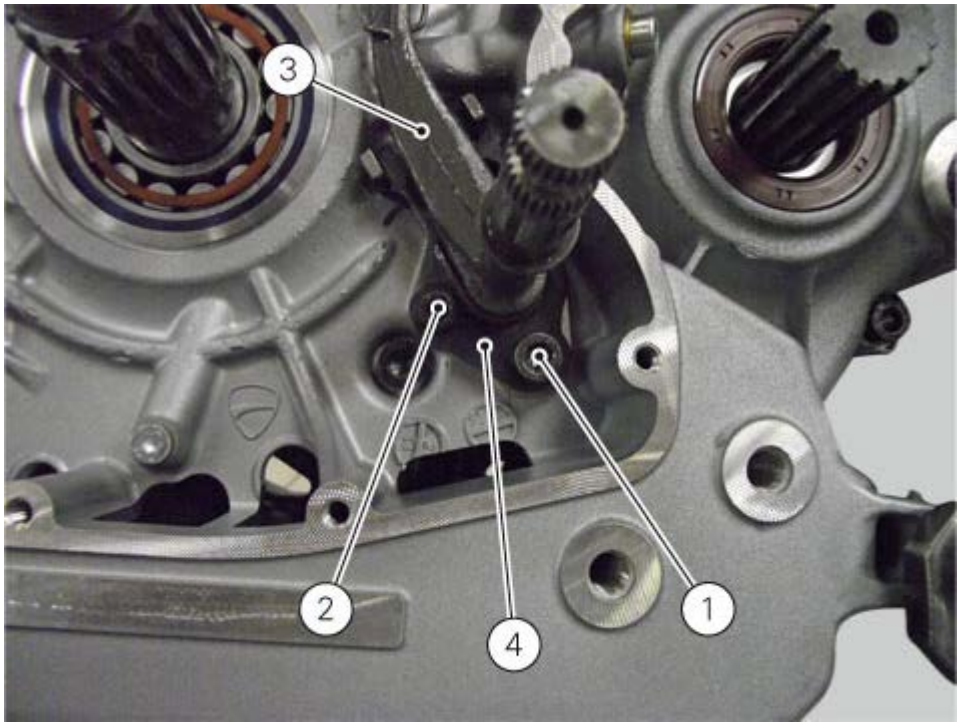
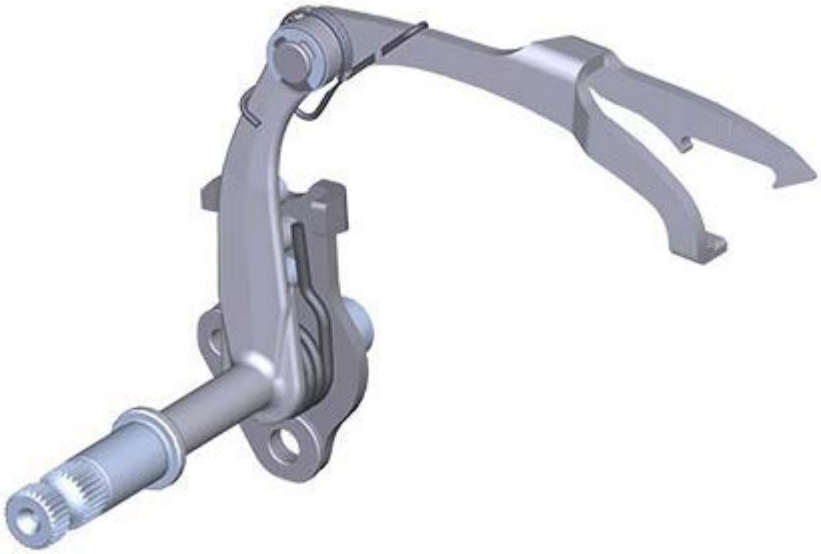
Removing the gearchange mechanism

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

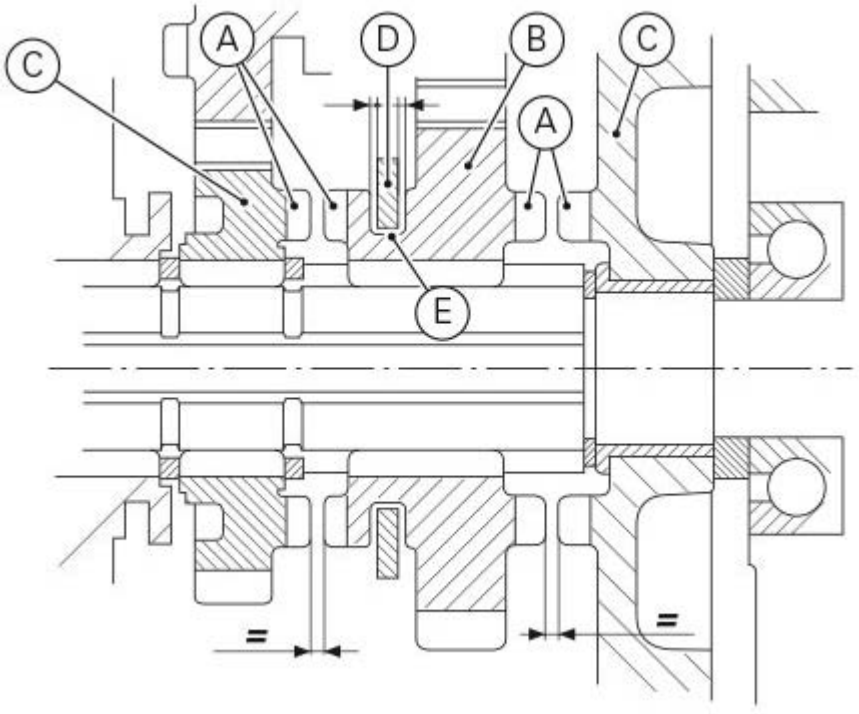
Undo and remove the fixing screws (1) and (2) of the complete gearchange mechanism (3) and collect the spacer (4).
Remove the gearchange mechanism complete with the shaft, spring, and plate.





Reassembling the gearbox assembly

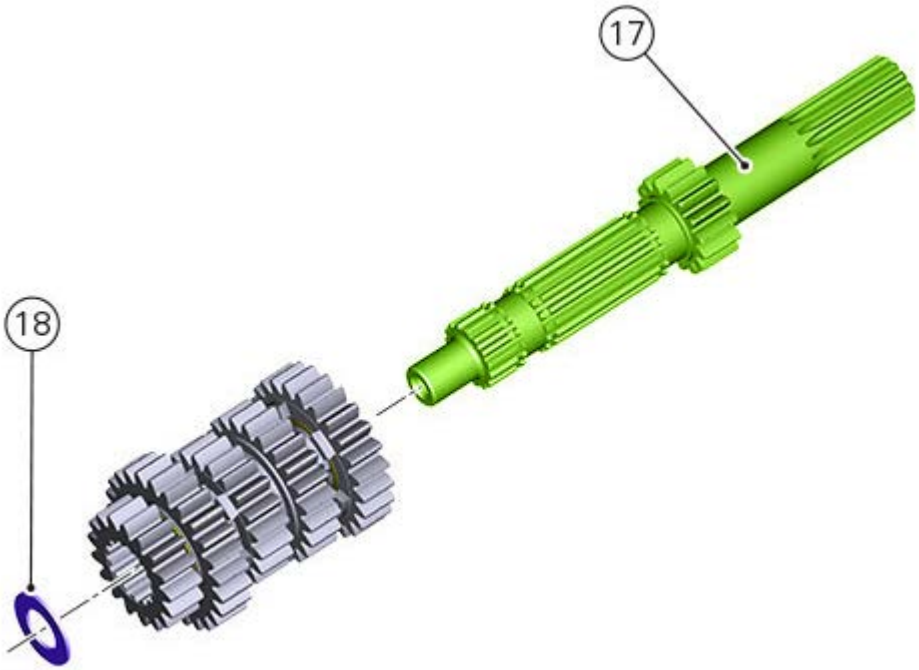
To refit the gearbox components follow the procedure under chapter, "Closing the crankcase", relating to the reassembly of the engine crankcase.
As a final practical test, ensure that with the gearbox in neutral the front coupling dogs (A) of sliding gears (B) are equidistant on both sides with respect to the corresponding coupling dogs on the fixed gears (C).
Check also that there is always a small amount of clearance between fork (D) and relative groove (E) on sliding gear (B) when engaging the gears.



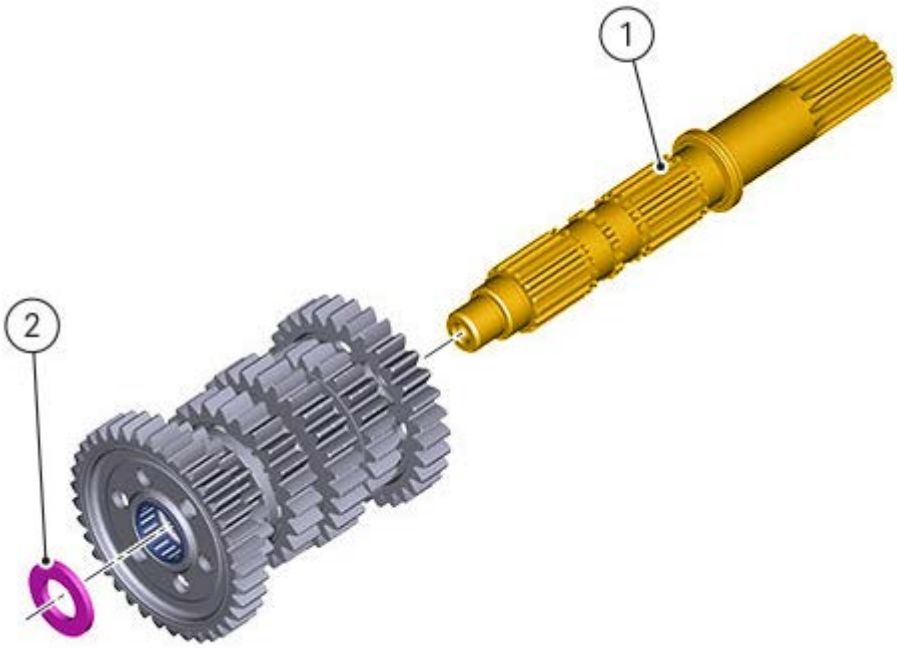
Refit the clutch cover (Refitting the clutch cover).
Refit the cover, the drum and the clutch housing (Refitting the clutch).
Refit the starter motor (Refitting the starter motor).
Refit the oil pump (Refitting the oil pump).
Refit the generator assembly and the generator side cover (Refitting the flywheel/generator assembly).
Refit the complete cylinder/piston assembly (Refitting the cylinder/piston assembly).
Refit the complete cylinder head assembly (Refitting the cylinder head).
Refit the camshaft assembly (Refitting the camshafts).
Refit the timing system components (Refitting the cylinder head pulleys/fixed tensioners).
Fit the engine on the frame (Refitting the engine).

Reassembling the gearbox shafts

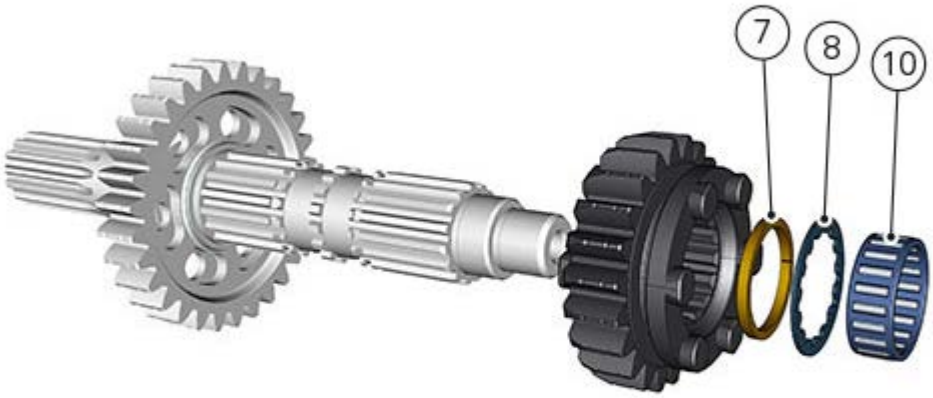
The figure shows all the parts to be reassembled on the gearbox primary shaft (17), with the calculated end shim (18) (Reassembling the crankcase halves).



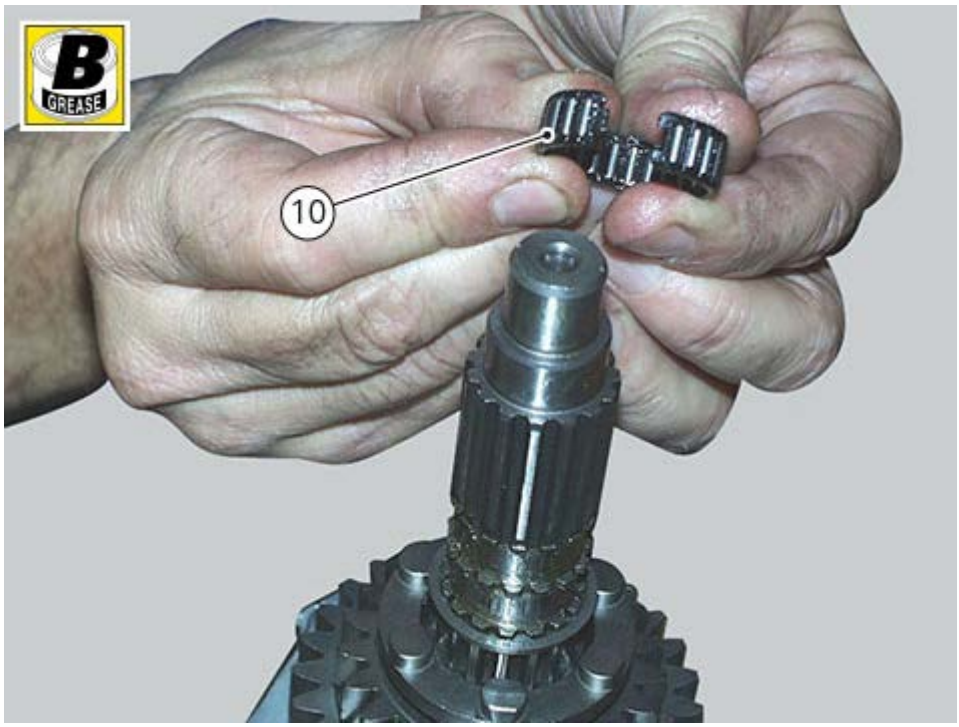
The figure shows all the parts to be reassembled on the gearbox secondary shaft (1), with the calculated end shim (2) (Reassembling the crankcase halves).

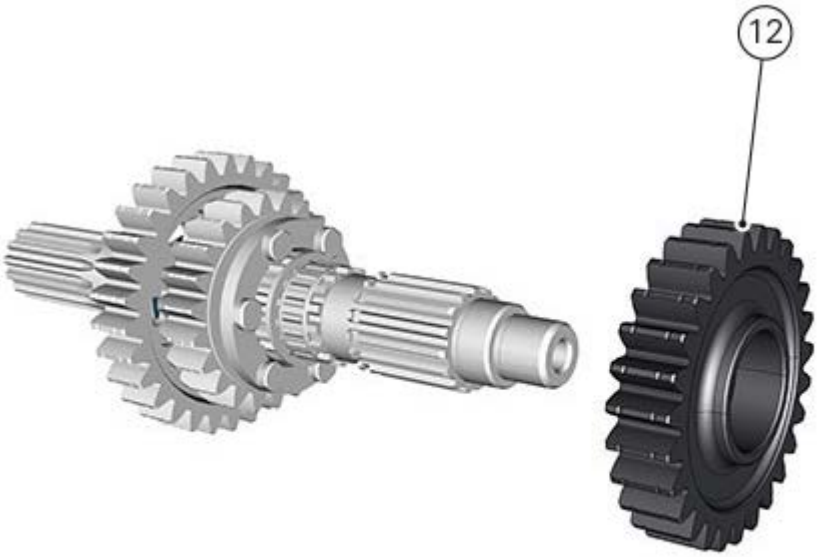


Reassemble the gears on the gearbox shafts by reversing the disassembly procedure.
Take particular care when installing the idler gears.
The assembly of the 3rd (12) and 4th (9) speed gears and the relative fixing components on the secondary shaft is given as an example.
Fit the snap ring (7), checking that it is fully inserted into its groove on the shaft.
Push the snap ring into position with a suitable size tubular drift.
Slide the splined washer (8) over the shaft until it locates against the snap ring you have just fitted.
To fit the roller bearing cage (10) 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.

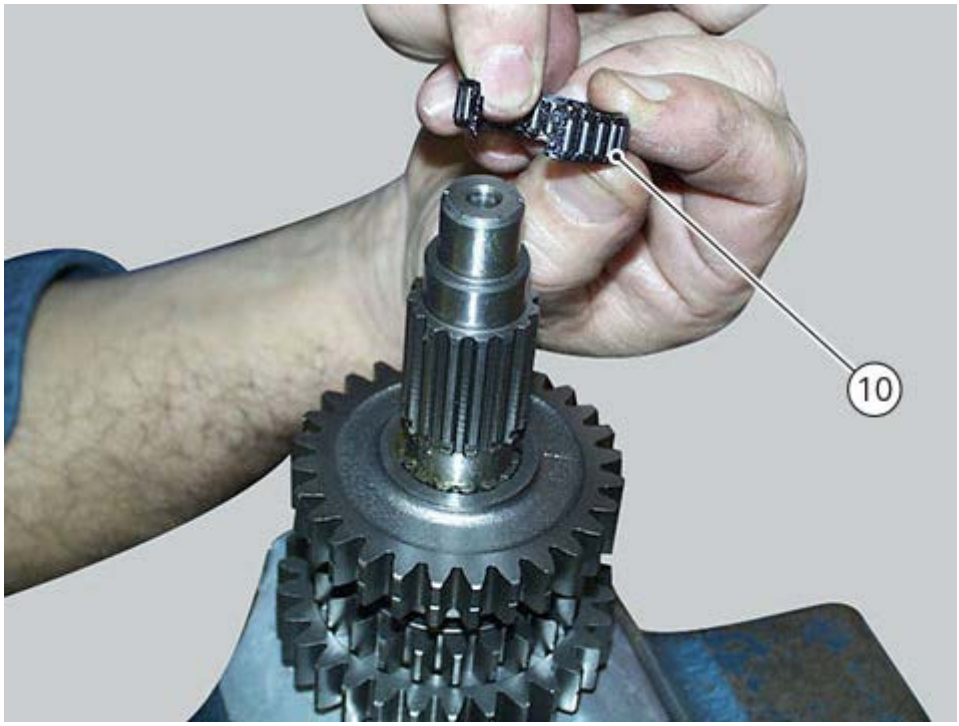


Fit the 3th speed gear (12).

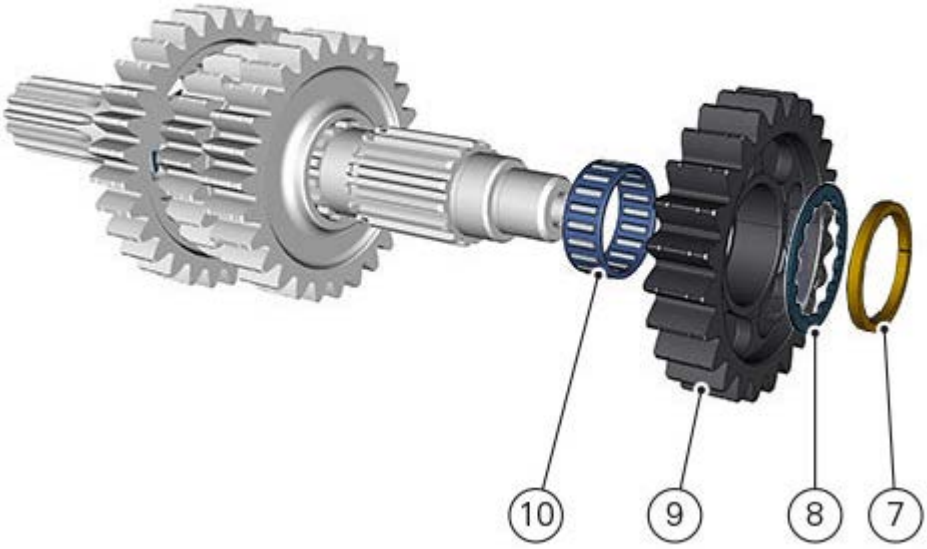




Install the splined washer (8) on the gear.
Fit another roller bearing cage (10) using the method already described.
Fit the 4th speed gear (9).



Fit another three-pointed washer (8) and another snap ring (7) into the shaft. Push it inside its seat using the previously used drift.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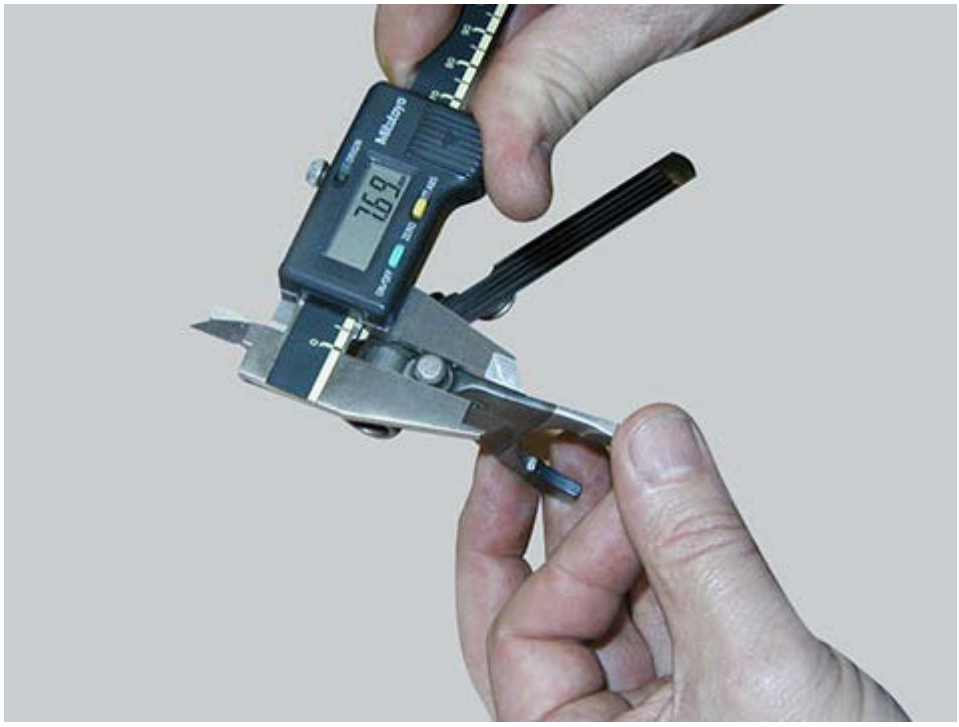
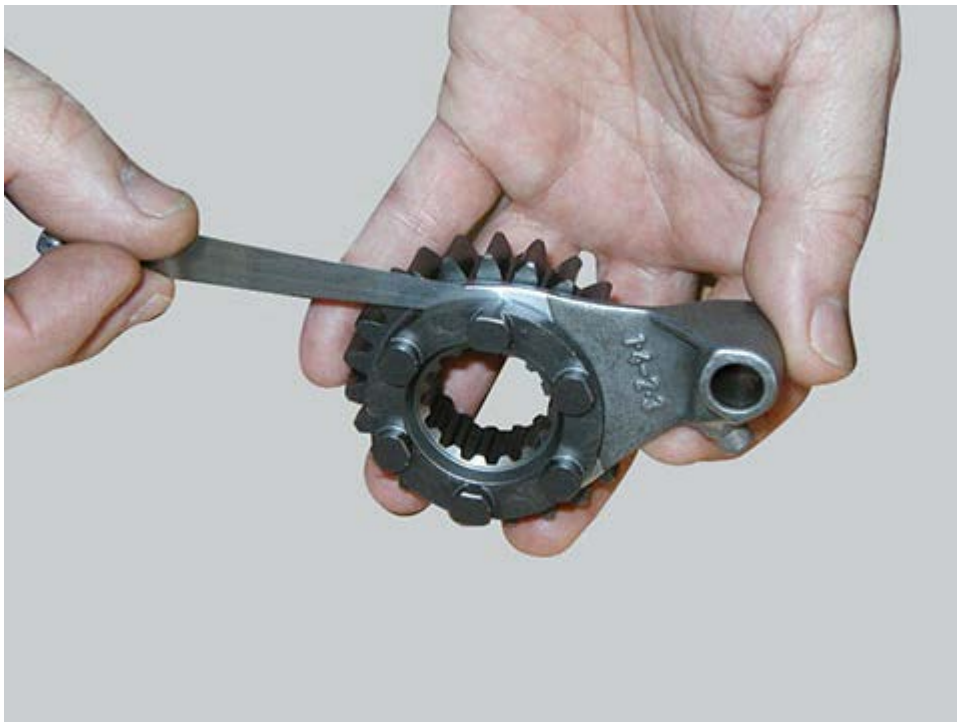
Inspecting the fork selector drum

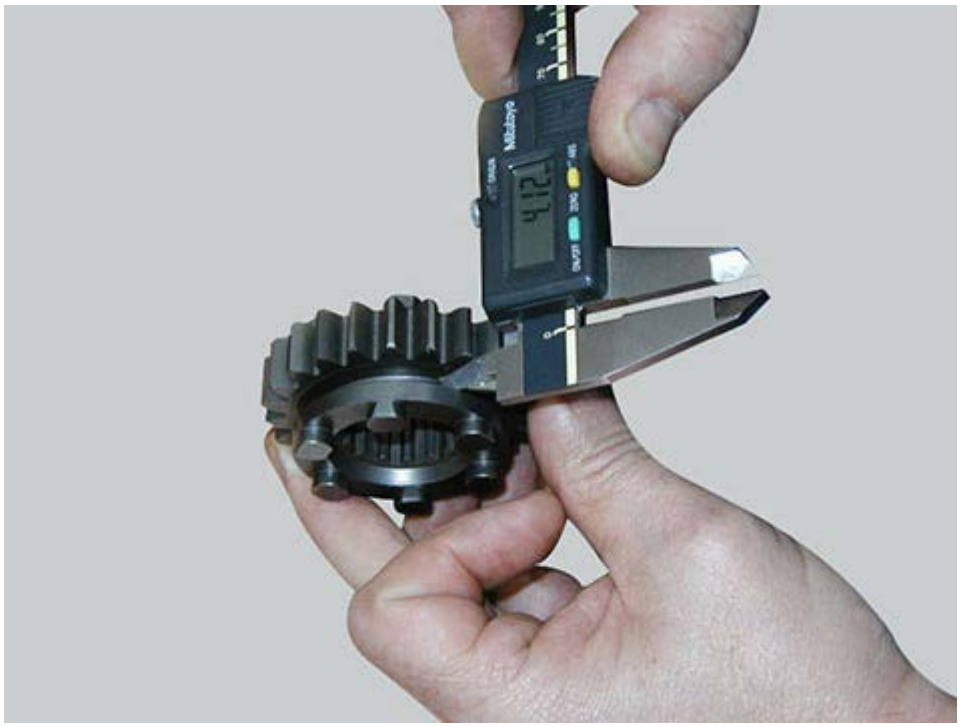
Use a gauge to measure the clearance between fork pin and the groove on the selector drum.
If the service limit has been exceeded, determine which part must be replaced by comparing these dimensions with those of new components (Gearbox).
Also check the wear on the drum support pins; these must not show any signs of scoring, burrs, or deformation.
Turn the drum in the crankcase to establish the extent of radial play. If play is excessive, change whichever part is most worn.



Inspecting the gear selector forks

Visually inspect the gear selector forks. Bent forks must be replaced 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 (Gearbox).

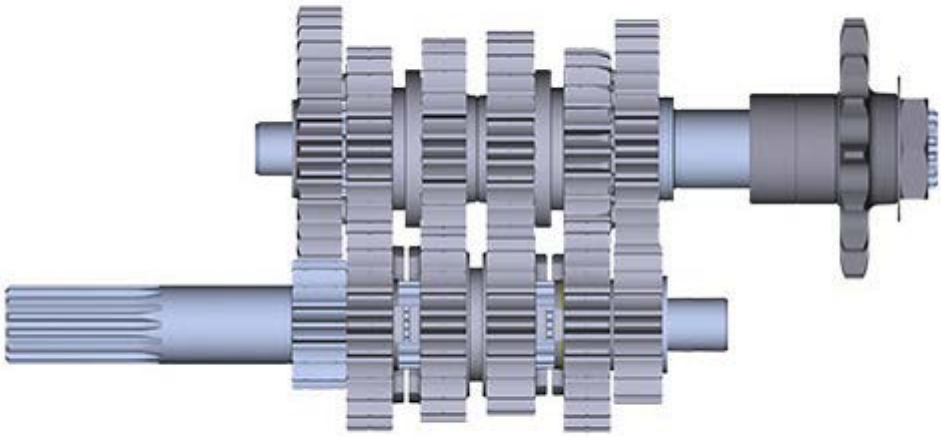





Mitutoyo

Overhauling the gearbox

Check the condition of the front coupling dogs of the gears. They must be in perfect condition and with no sign of wear on the edges of the teeth.
The idler gears must rotate freely on their shafts.
When refitting, make sure the circlips are correctly positioned.
Check the needle roller bearings for wear.
The threads and splines of the shafts must be in perfect condition.
Also check that the component parts of the gear selector mechanism are in good condition.



Engage the gears and check that the gearchange mechanism does not stick (selector fork-gear groove, and fork pin-desmodromic drum groove) due to incorrect end float.
Restore the correct end float by shimming the gearbox shafts and the selector drum with suitable shims.
For the total gearbox shaft and selector drum end clearance values, refer to Chapter "Gearbox".

Disassembling the gearbox shafts

Place the shaft in a vice in such a way to facilitate the disassembly operations.

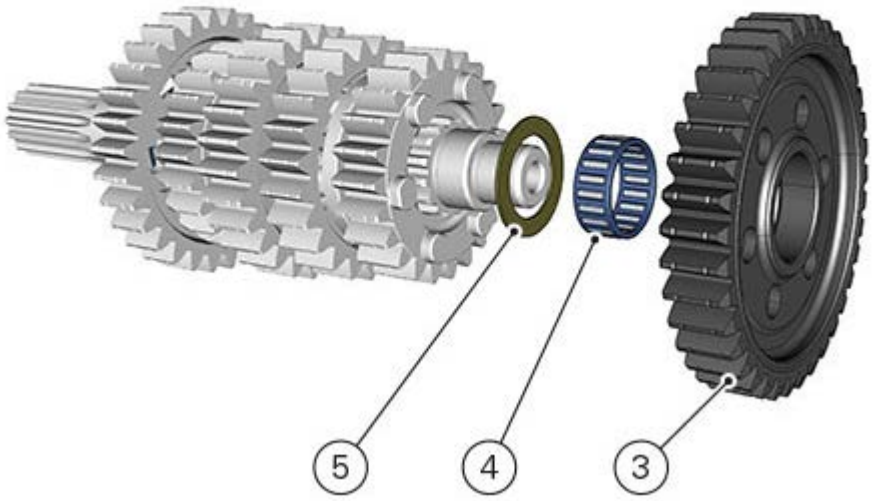
Important

Take care not to invert the shim position upon reassembly: this would potentially lead to jamming when using the gear selector control, making it necessary to reopen the crankcase.

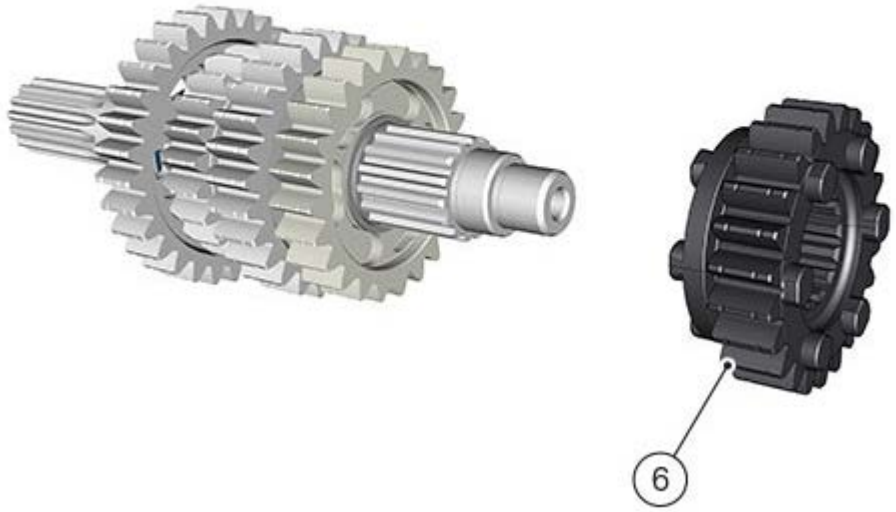
Disassembling the gearbox secondary shaft

Remove washer (2) from the secondary shaft (1).

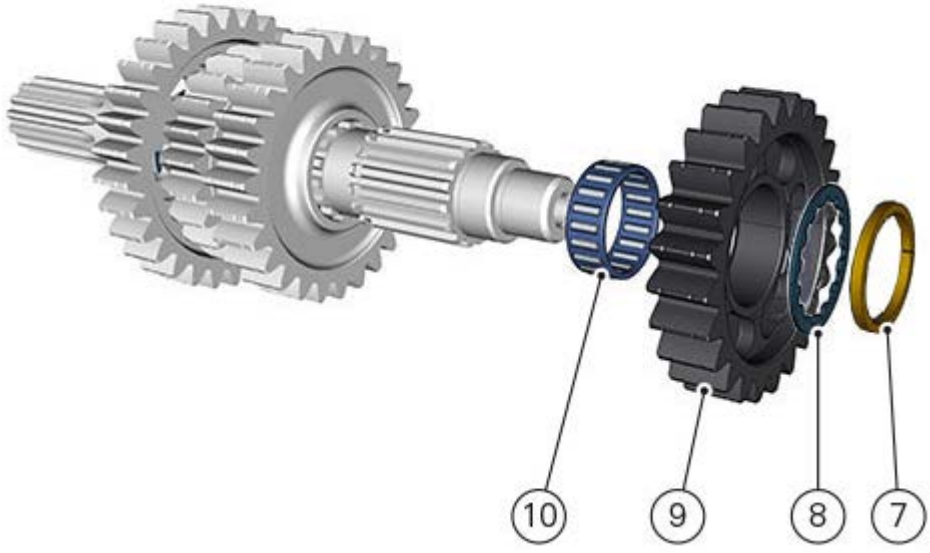
Withdraw the first speed driven gear (3) with the roller cage (4) and the shim (5).



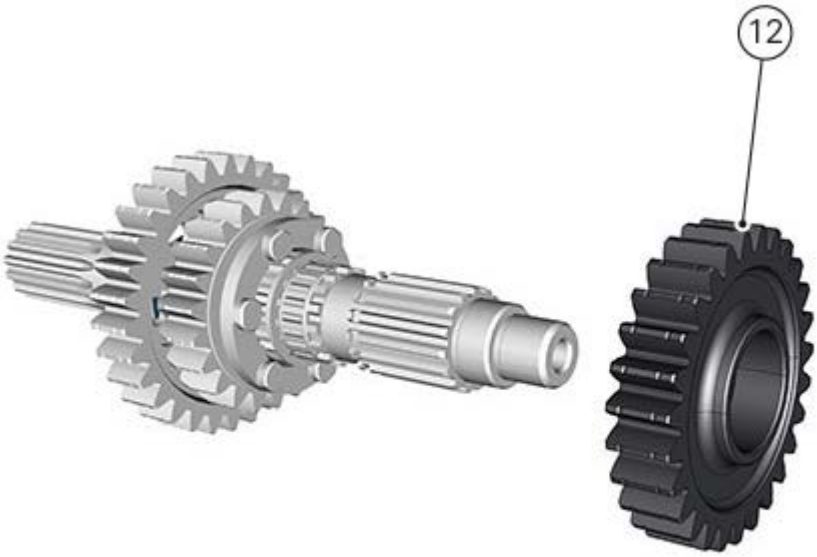
Remove the fifth speed driven gear (6).



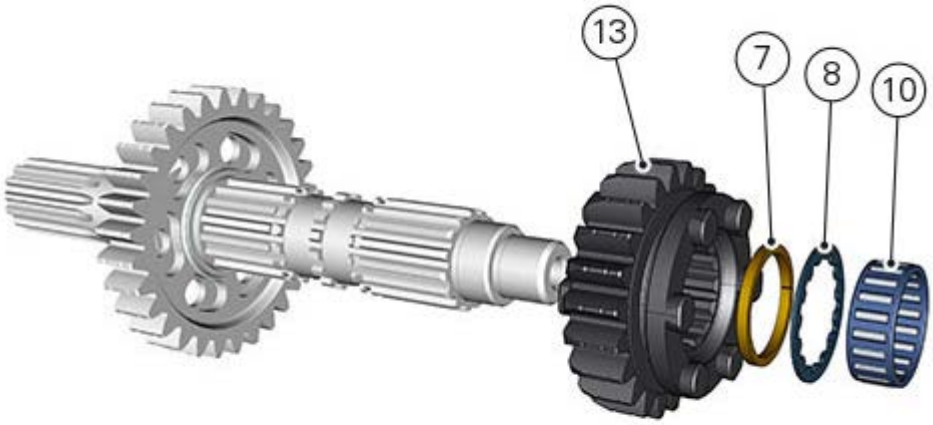
Use two flat blade screwdrivers to remove the snap ring (7) from its seat, taking care not to damage the shaft surface.
Slide off the splined washer (8).
Remove the fourth speed driven gear (9) with its roller bearing cage (10).



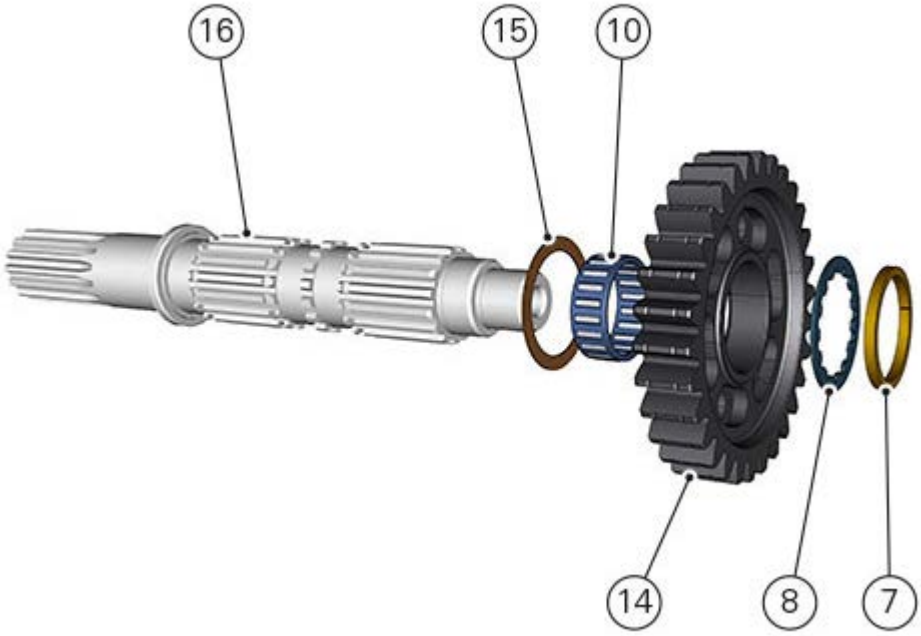
Remove the third speed driven gear (12).

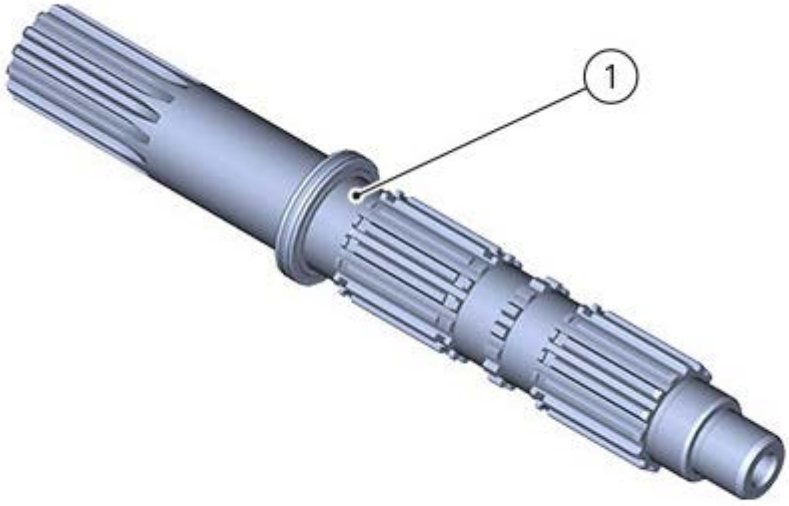


Remove the roller bearing cage (10), the splined washer (8) and the snap ring (7).
Remove the sixth speed driven gear (13).



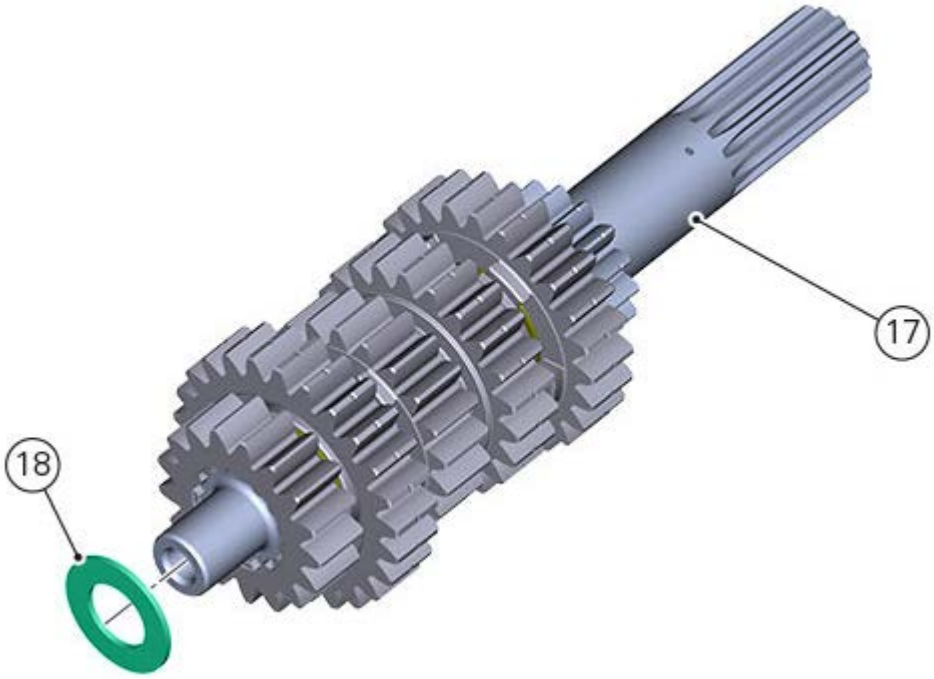
Remove the snap ring (7) and withdraw the splined washer (8) and the second speed driven gear (14). Withdraw the roller cage (10) and the shim (15). All the components have thus been removed from gearbox secondary shaft.



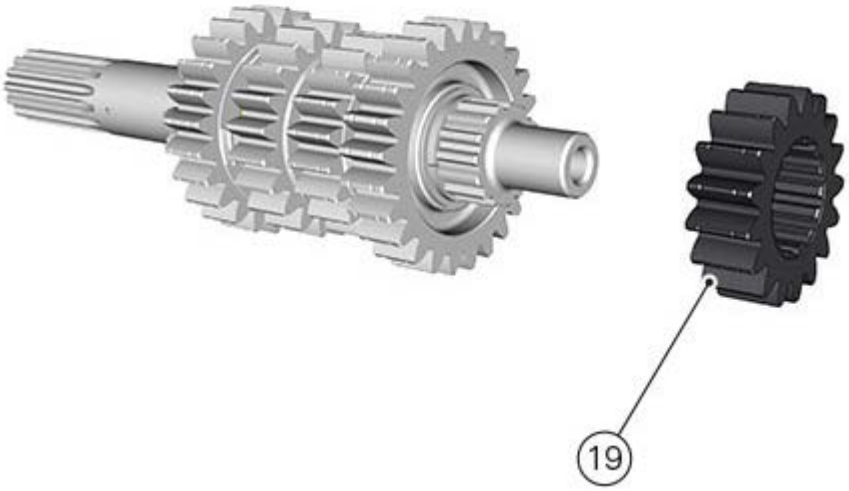


Disassembling the gearbox primary shaft

Remove washer (18) from the primary shaft (17).



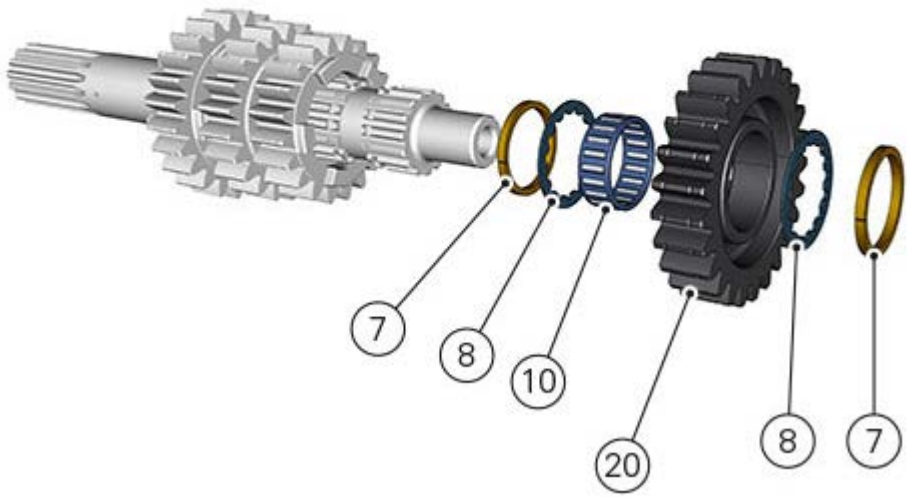
Remove the second speed driving gear (19). Use two screwdrivers to prise out the snap ring (7) and the splined washer (8).



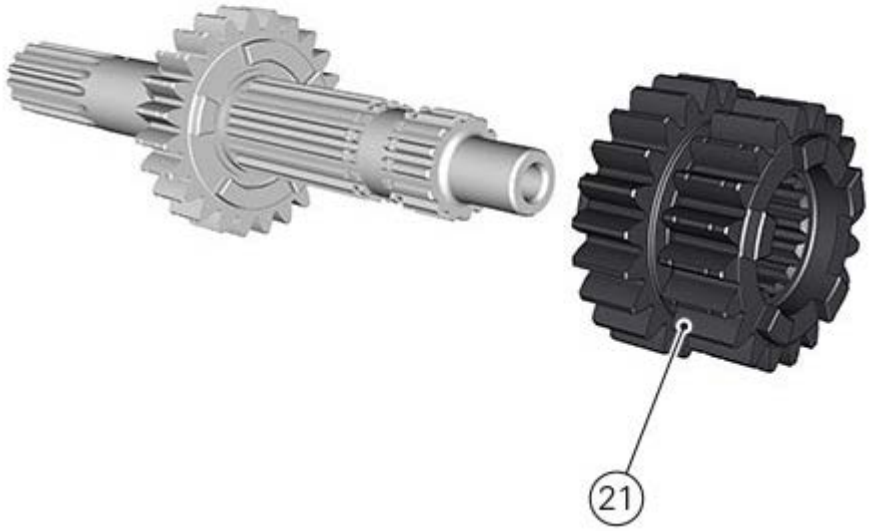
Important

Take care to avoid damaging the surface of the shaft while removing the snap ring.

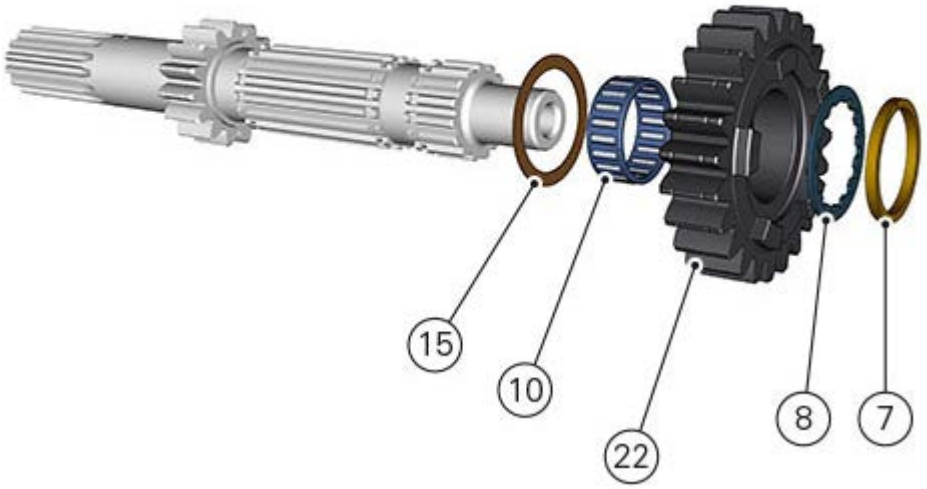
Remove the snap ring (7) and the splined washer (8).
Remove the sixth speed driving gear (20) with its roller cage (10).
Remove the splined washer (8) and the snap ring (7).



Withdraw the third and fourth speed driving gear (21).



Remove the snap ring (7) and the splined washer (8).
Slide out the fifth speed driving gear (22) with the relevant roller bearing cage (10) and the shim (15). All the components have thus been removed from gearbox primary shaft (17).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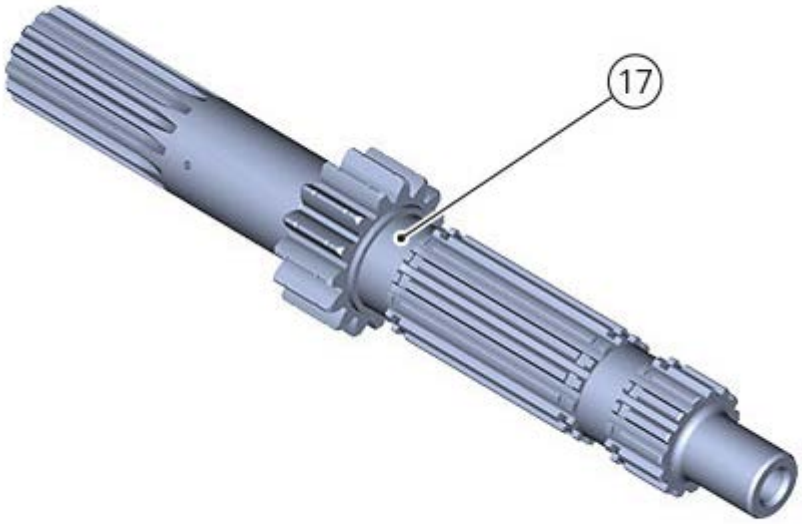
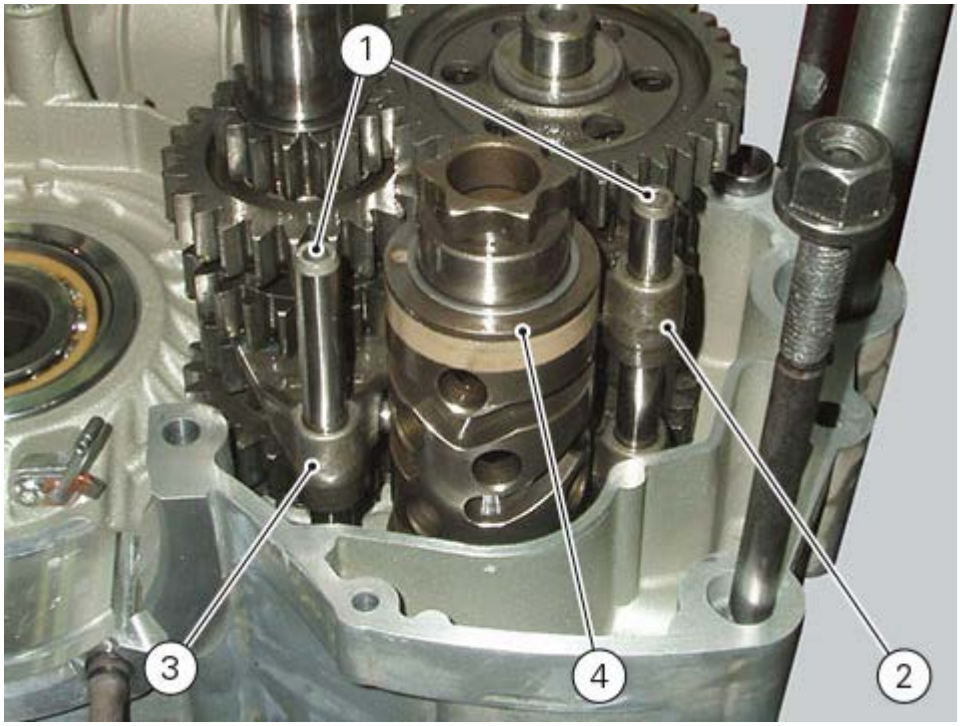

17

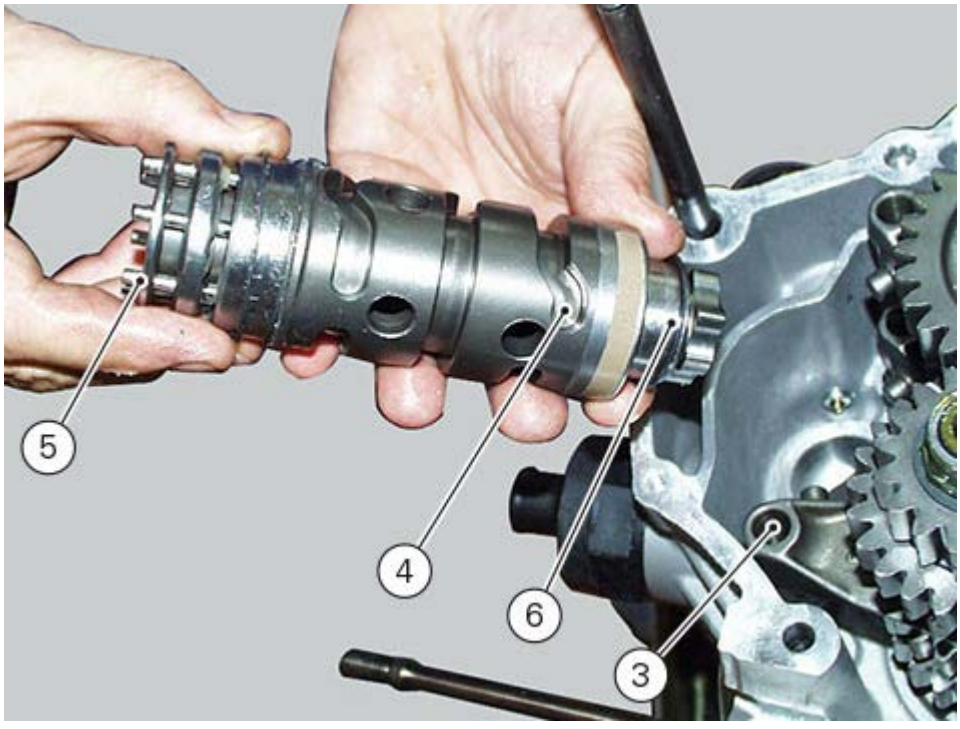
Removing the gearbox assembly

Remove the engine from the frame (Removing the engine).
Remove the timing components (Removing the timing outer covers).
Remove the camshaft assembly (Removing the camshafts).
Remove the complete cylinder head assembly (Removing the cylinder heads).
Remove the complete cylinder/piston assembly (Removing the cylinder/piston assembly).
Remove the generator side cover and the generator assembly (Removing the generator cover).
Remove the oil pump (Removing the oil pump).
Remove the starter motor (Removing the starter motor).
Remove the cover, the drum and the clutch housing (Removing the clutch).
Separate the crankcase halves (Separating the crankcase halves).

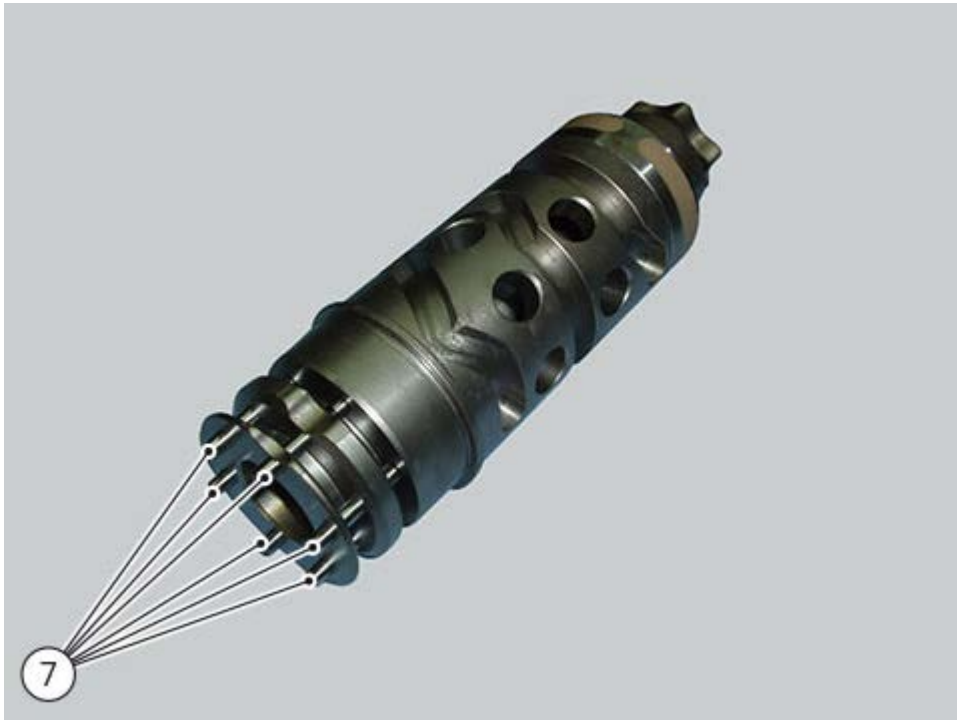
Withdraw the selector fork shafts (1).
Move the forks (2) and (3) to disengage them from the slots in the gear selector drum (4).



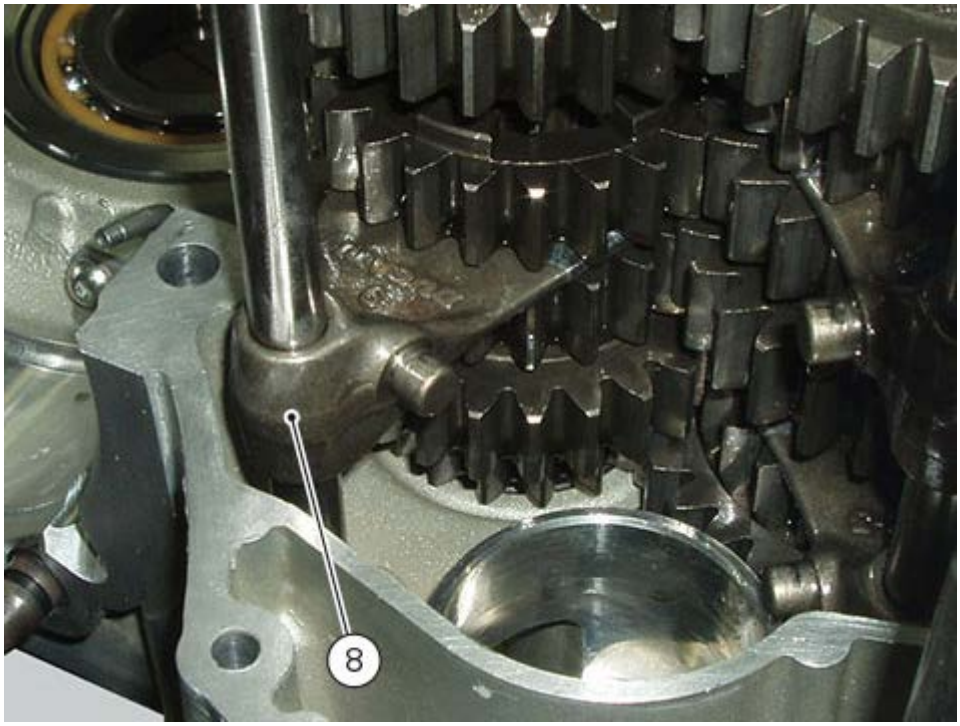
Remove the gear selector drum (4) taking care not to invert the fitted shims (5) and (6).



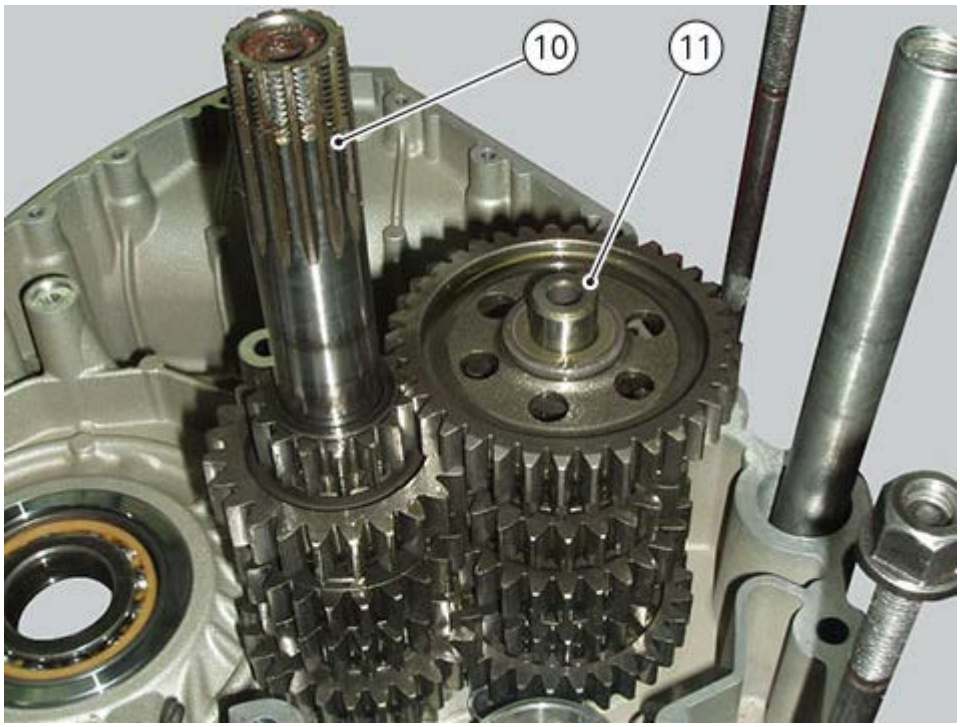
Once removed, it is possible to replace the special rollers (7).

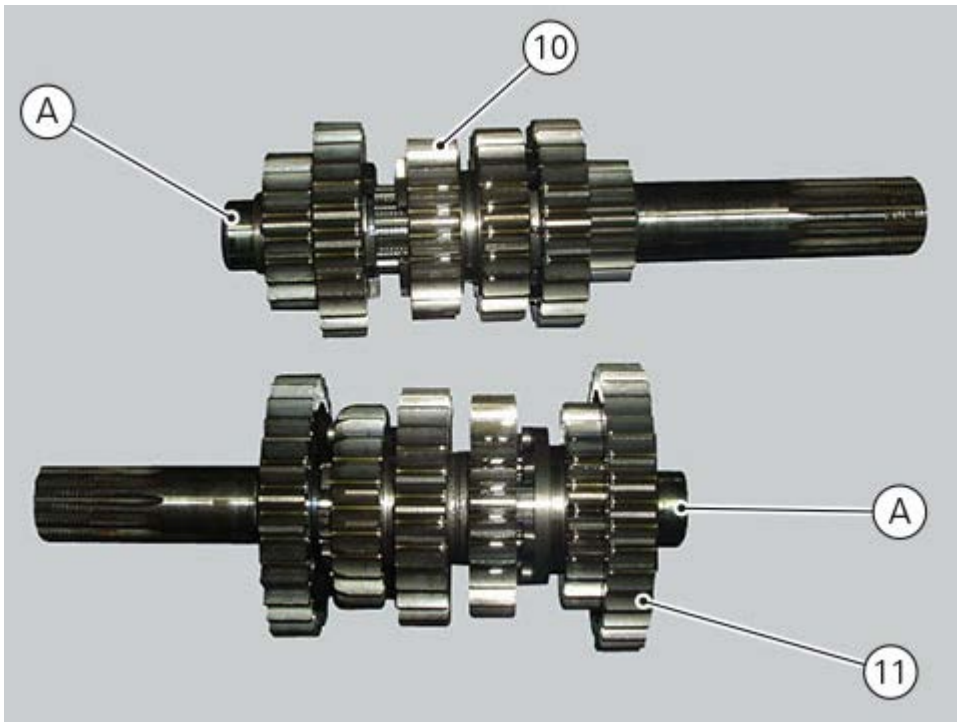


Remove gear selector forks (8) and (9).



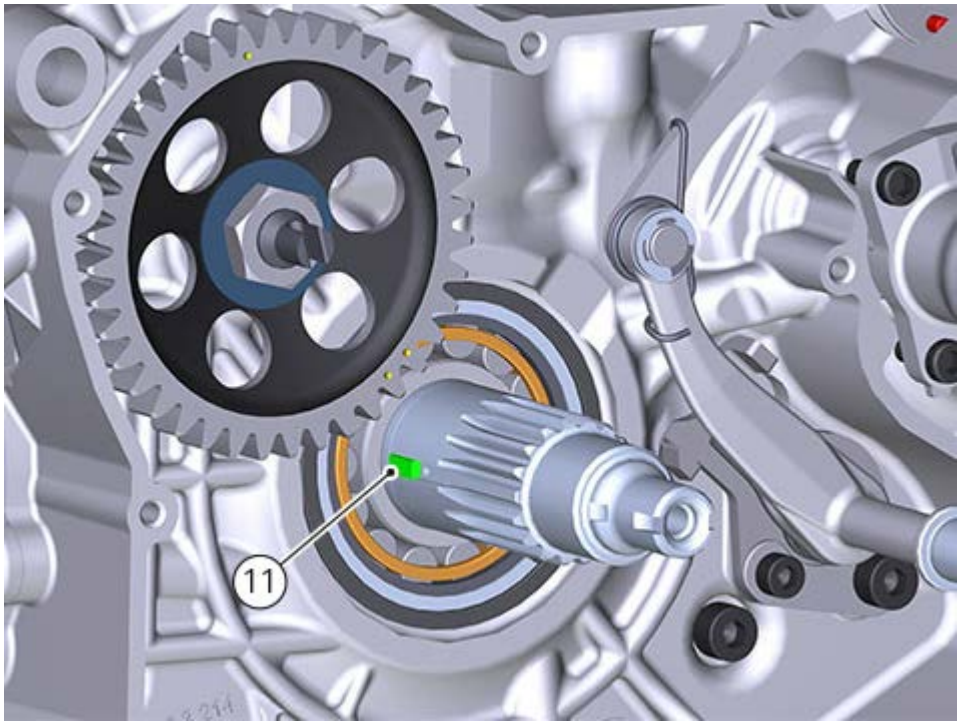
Remove the gearbox primary (10) and secondary (11) shafts complete with gears, taking care to recover the shim washers on the ends of the shafts.
If the bearing inner rings (A) are left on the shafts, slide them off the ends of the gearbox primary (10) and secondary (11) shafts as described in "Separating the crankcase halves".




10
A
A
11

Refitting the flywheel/generator assembly

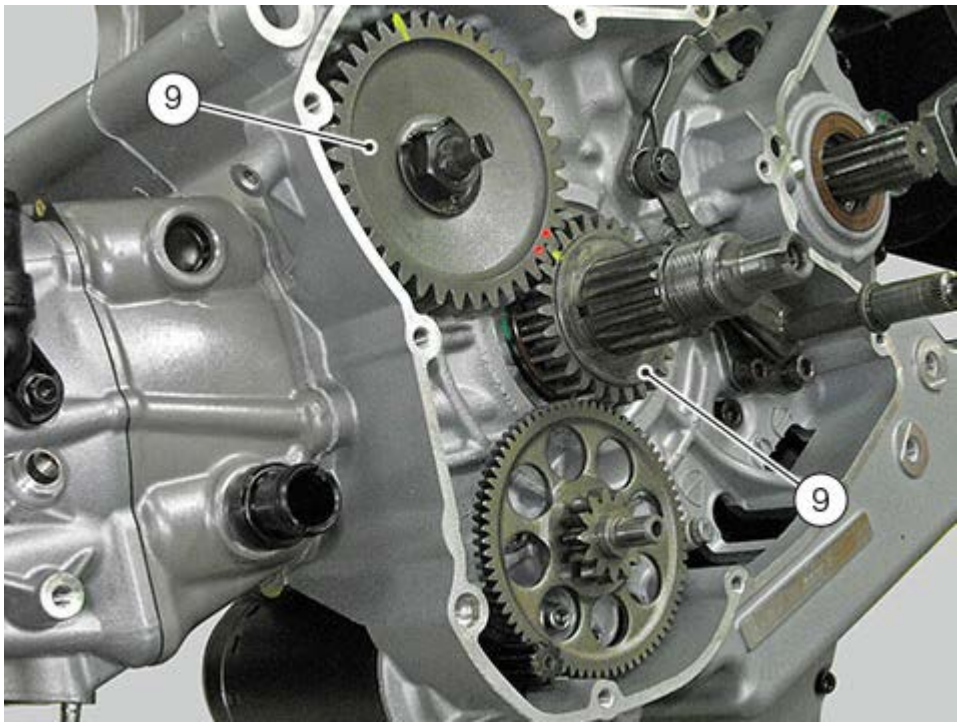
Check that tab (11) is installed on the crankshaft.



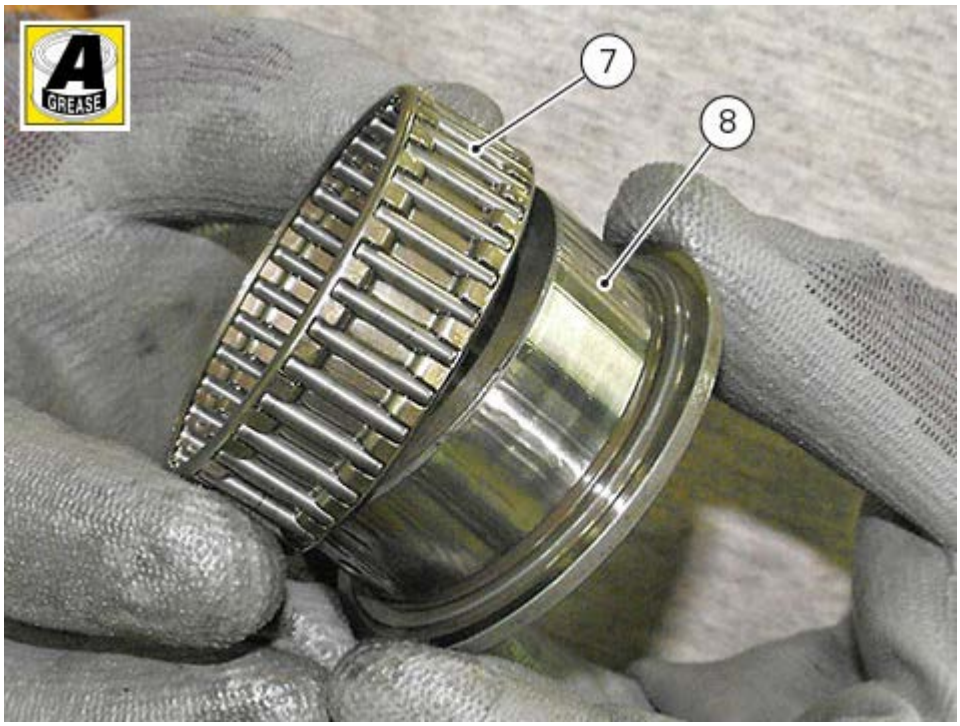
Fit gear (9) so that the reference point is centred on the references of the timing gear (10).

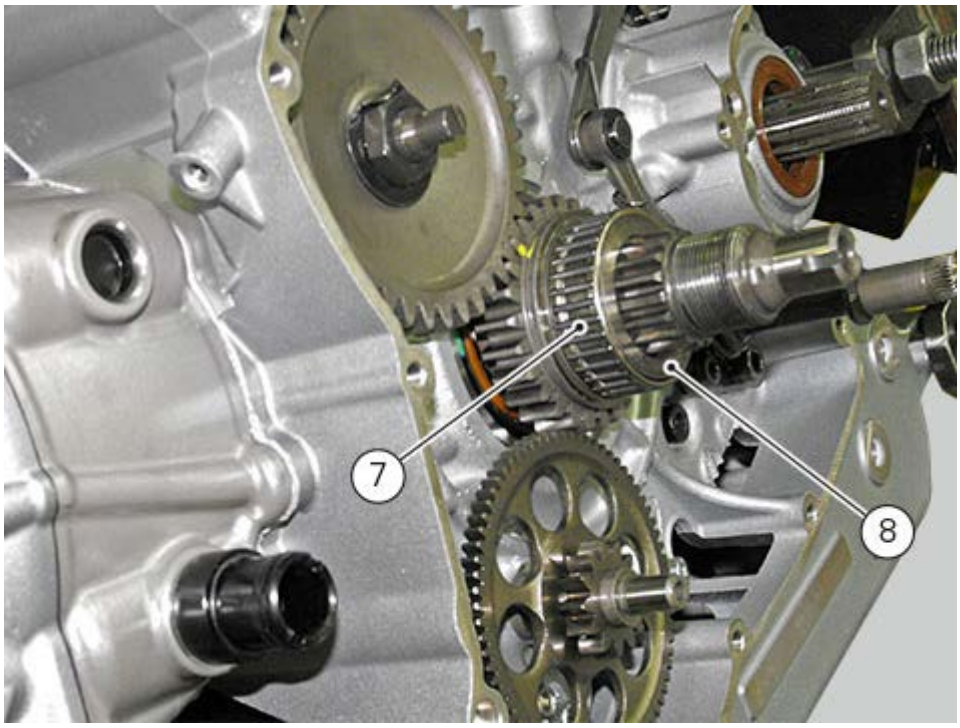
Note

Check that, in this position, the horizontal cylinder piston is at top dead centre.

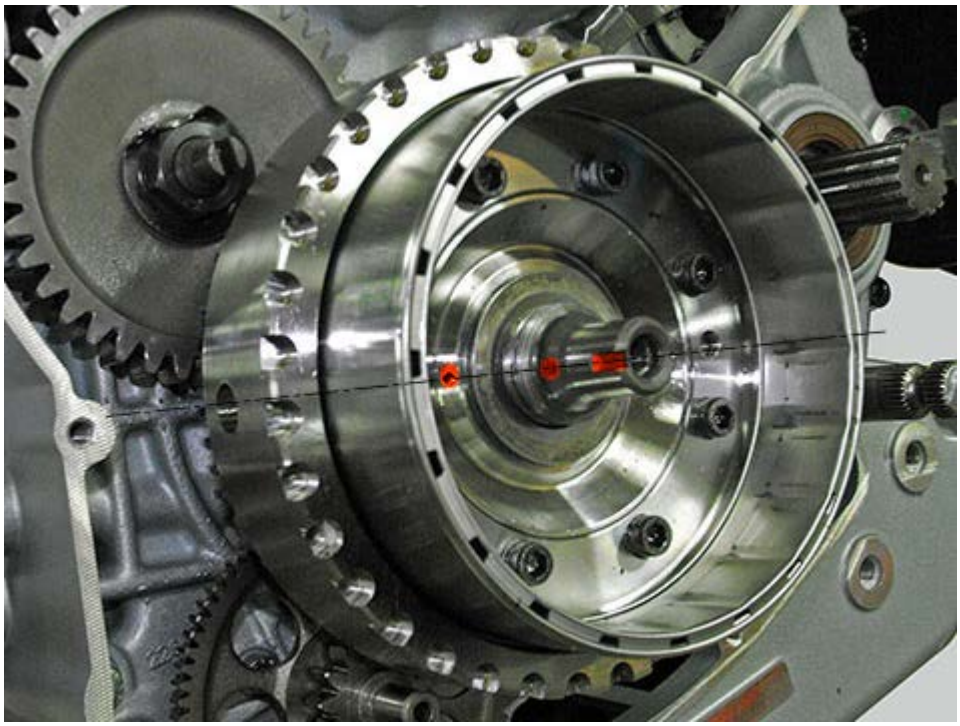


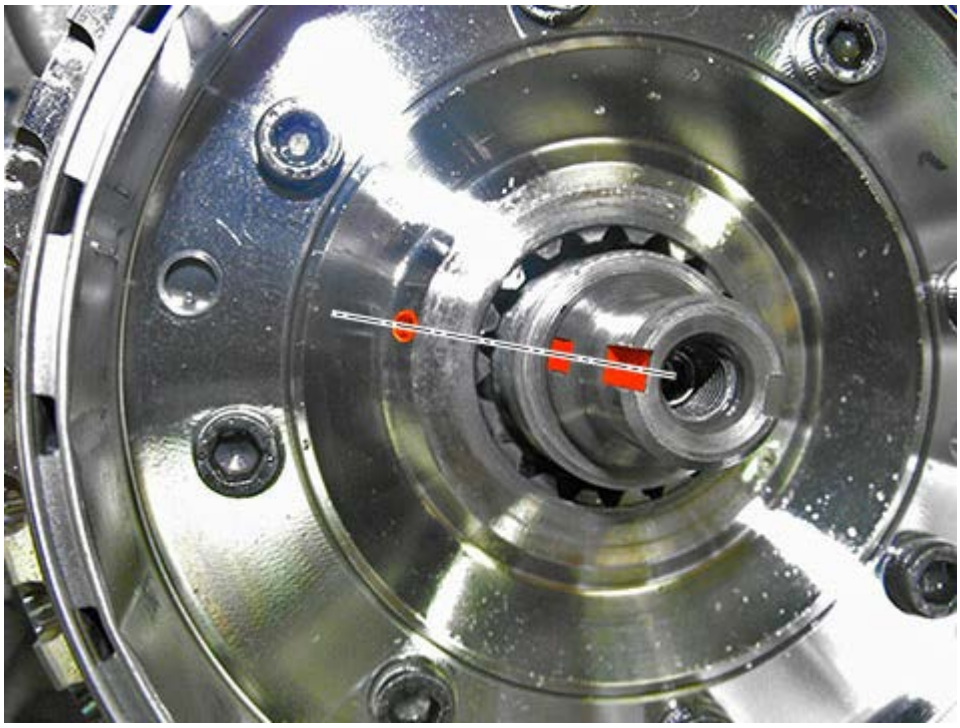
Fit the roller bearing cage (7) in bushing (8) by applying the specified grease on the washer.
Install the roller bearing cage / bushing assembly on the crankshaft.





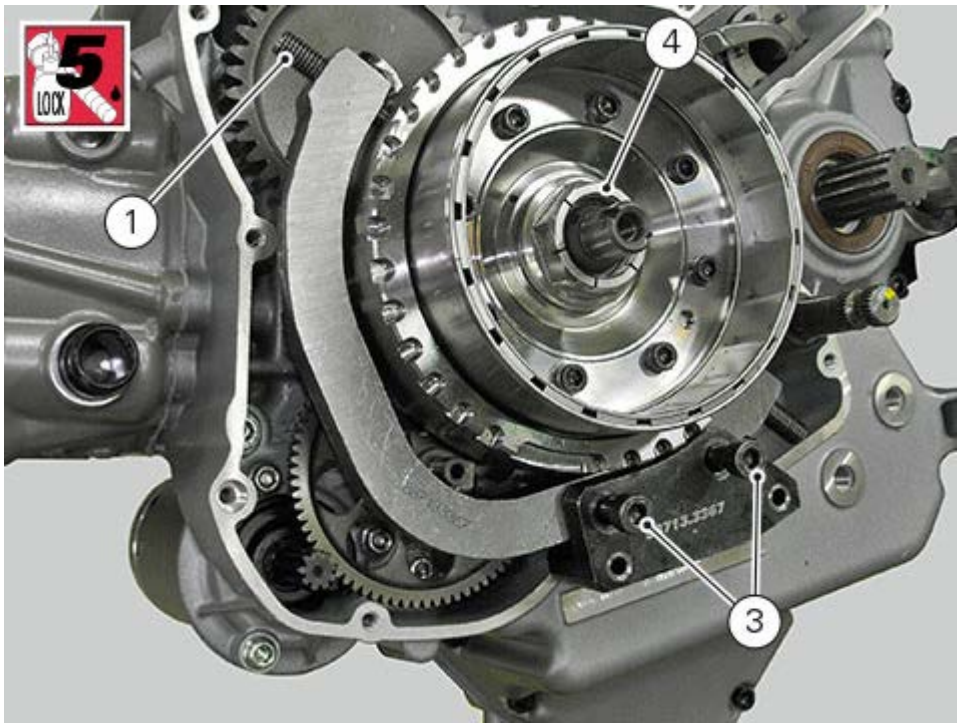
Thoroughly clean the shaft and nut threads and ensure they move freely.
Heat up the flywheel to 100° ± 5°.
Install the flywheel assembly (6) with the gear (7), aligning the notches as shown in the photo.





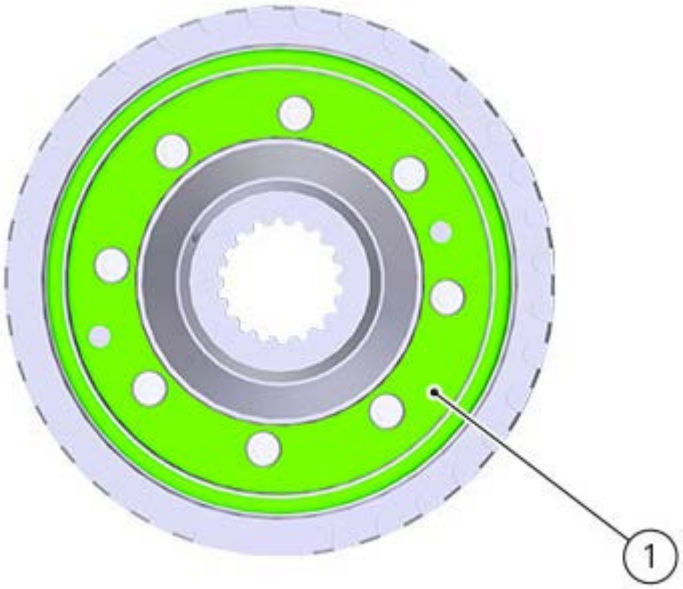
Block the flywheel rotation with the suitable tool no. **88713.3367**.
Fit washer (5).

Fit the rotor on the shaft and tighten it to 150 Nm.
Wait for the flywheel to cool down.
Completely loosen the nut that was tightened before and apply the product on the first 4/5 threads.
Tighten nut (4) to 300 Nm.
Thoroughly clean any residues of threadlocker on the top of the nut.



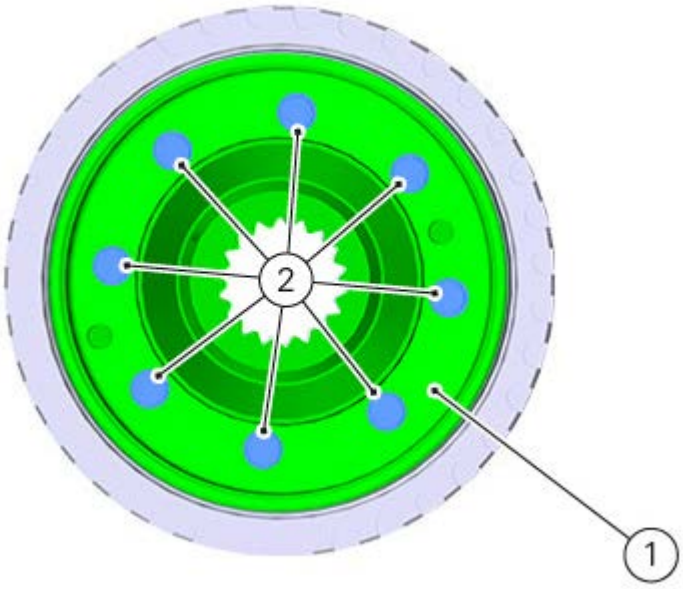
Overhauling the flywheel/generator assembly

Inspect 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.

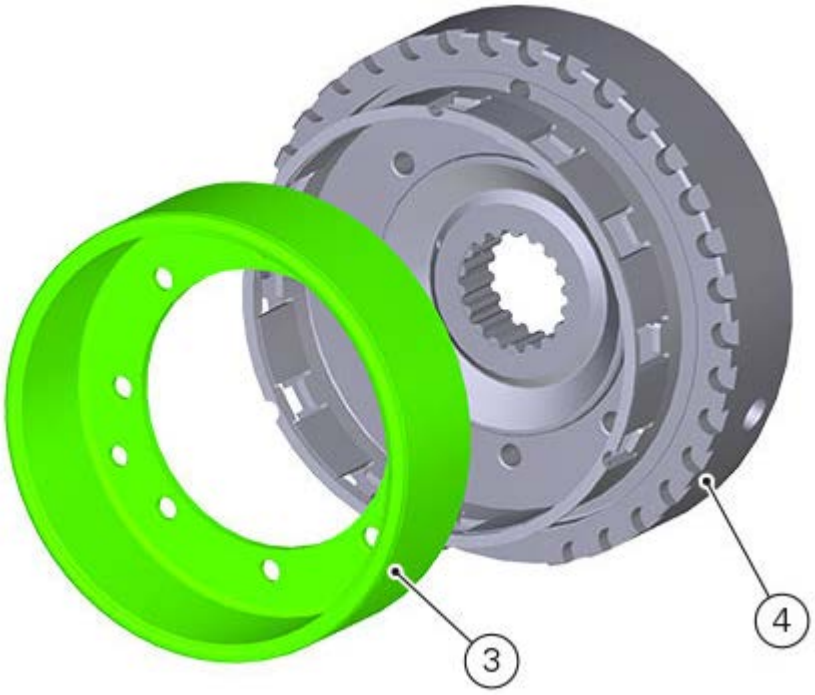


Disassembling the generator flywheel

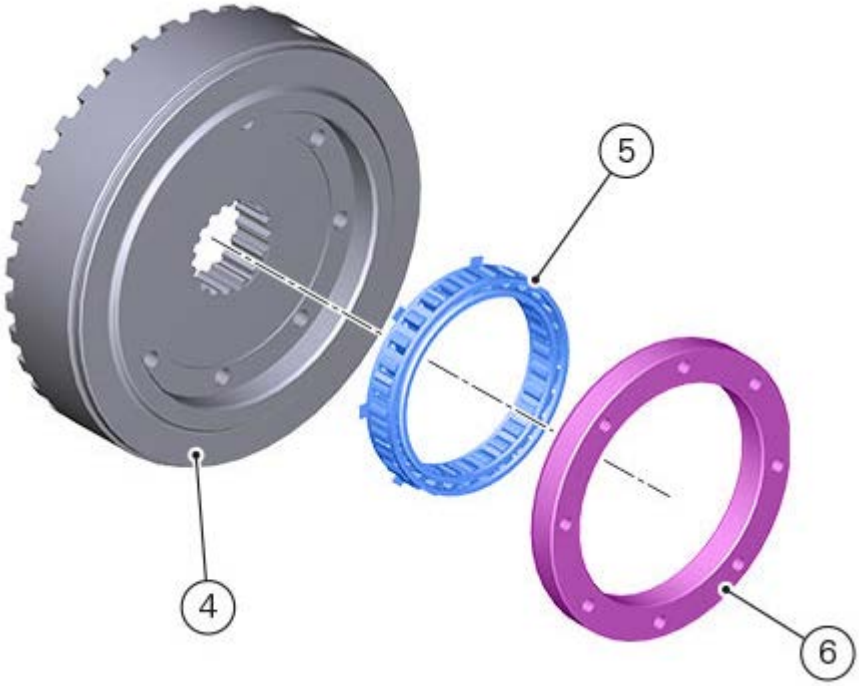
Unscrew the screws (2) and remove the generator rotor (1) from the flywheel.



Remove rotor (3) from flywheel (4).



Remove starter clutch (5) with flange (6) from flywheel (4).

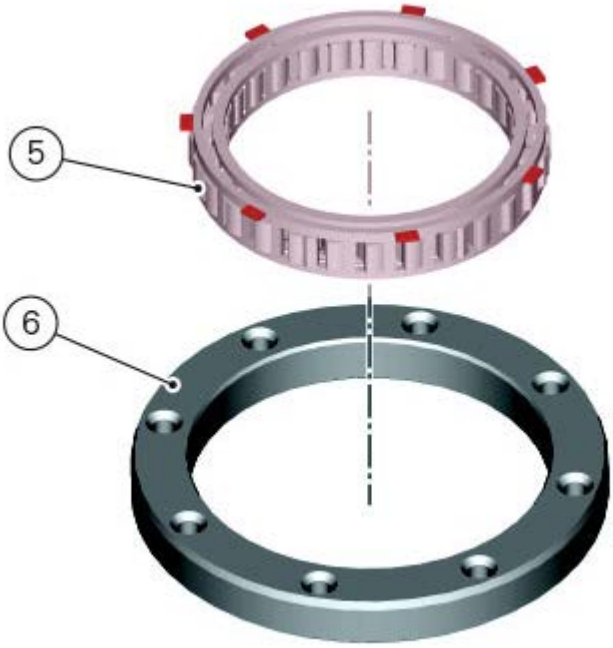


Reassembling the flywheel/generator assembly

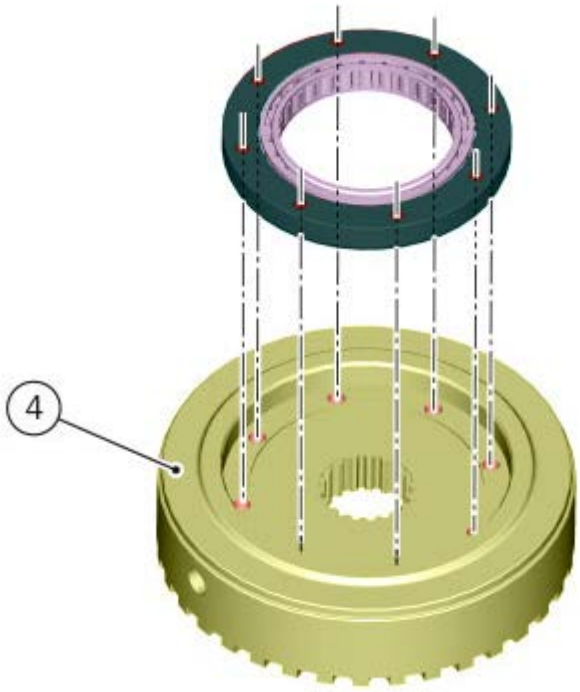
Fit starter clutch (5) on flange (6) taking starter clutch edge (A) fully home on flange.

Important

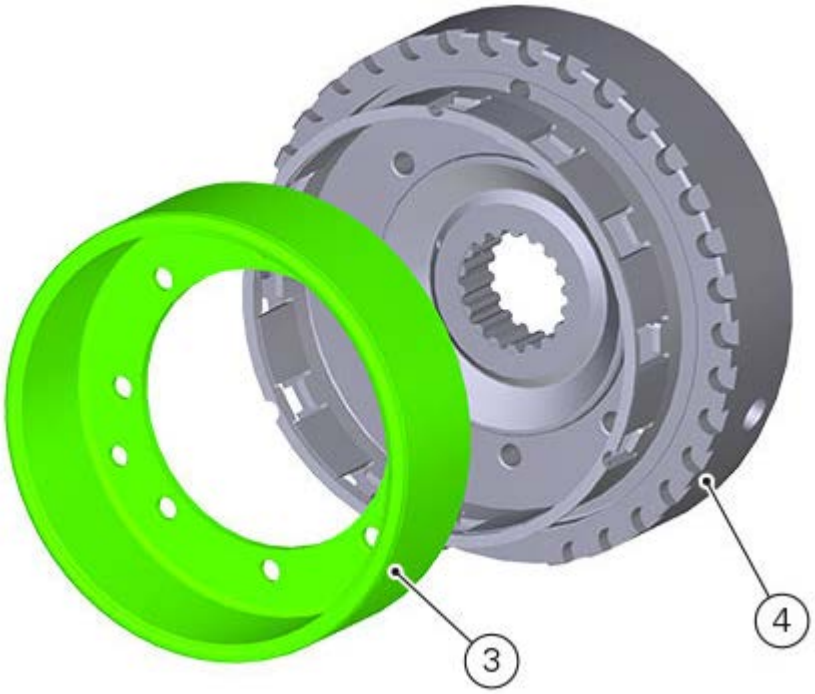
The edge of the starter clutch must be on the side where the flange has the chamfer.



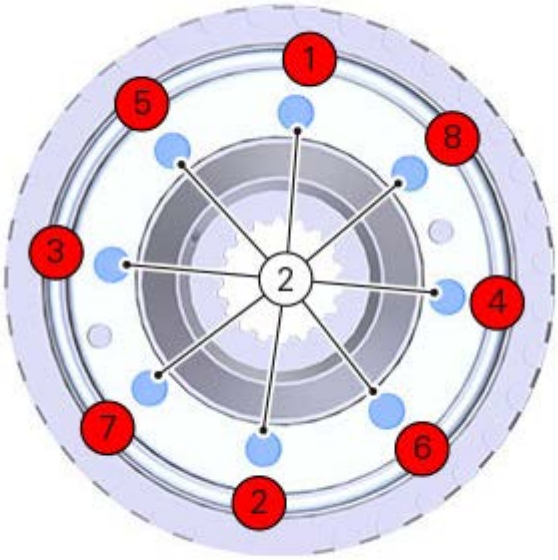
Insert the flange with starter clutch in the flywheel (4) so that the holes are concentric.



Insert rotor (3) on flywheel (4) and apply the indicated threadlocker.



Tighten the screws (2) to a torque of 13 Nm (Min. 11 Nm – Max: 15 Nm), respecting the indicated sequence.

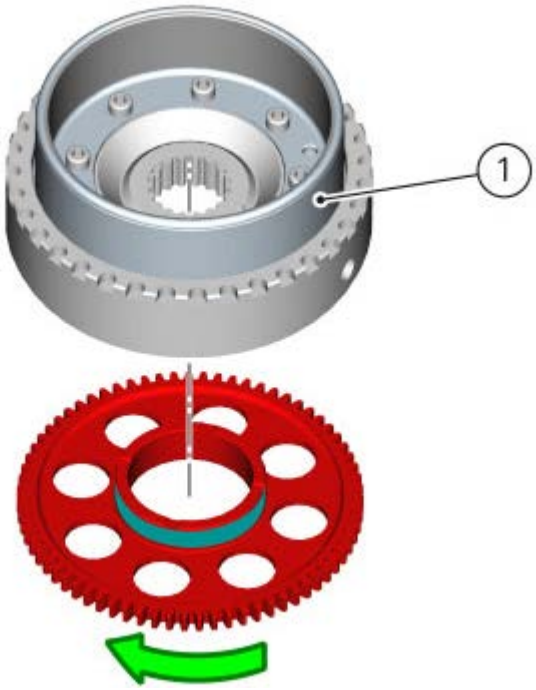


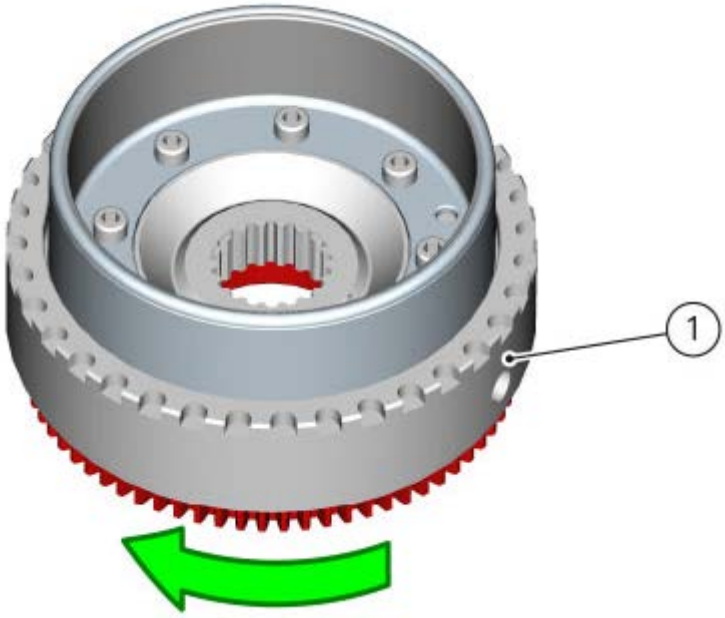
Use engine oil to lubricate the driven gear race as shown in the figure. Fit the driven gear on the starter clutch, ensuring it is properly seated.

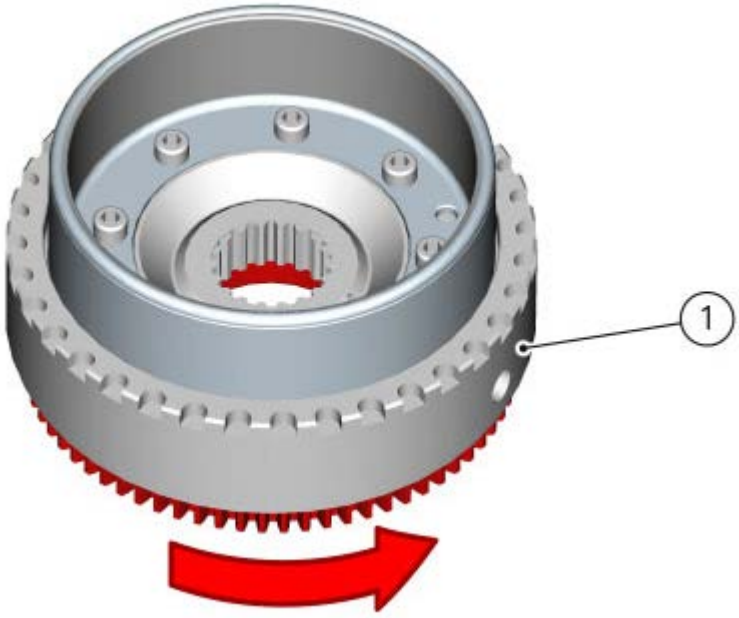
Note
To help insertion, turn the driven gear in the direction indicated by the green arrow.

Hold the flywheel (1) with one hand and check that the driven gear can rotate freely in the direction of the green arrow but not in the direction of the red arrow.
If either of these two conditions is not met, this means that the starter clutch has not been fitted correctly.


MOTOR
OIL

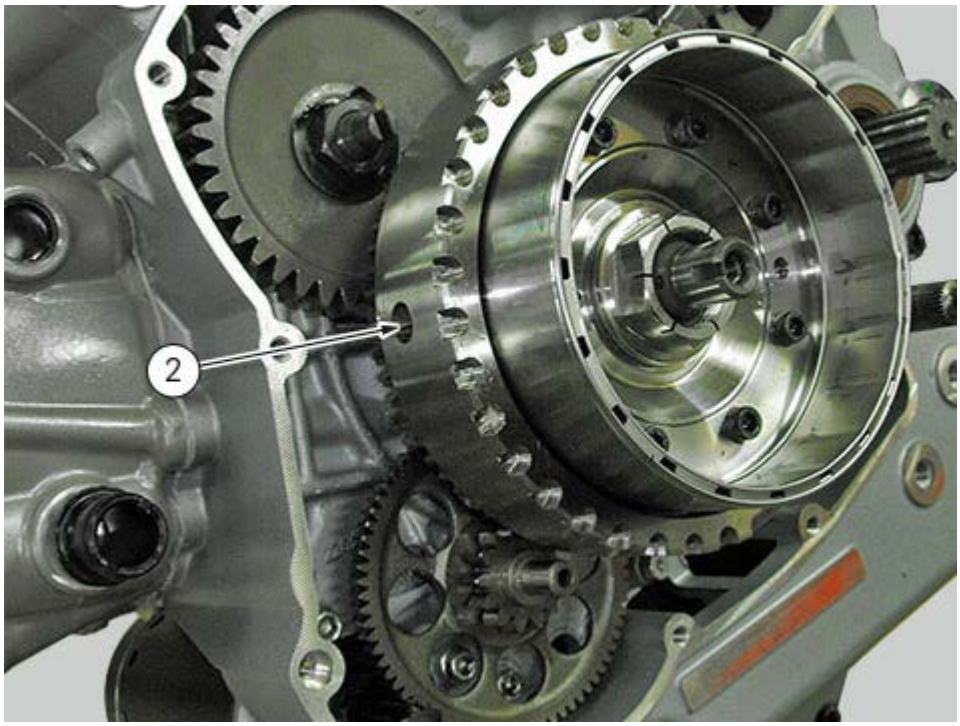

1

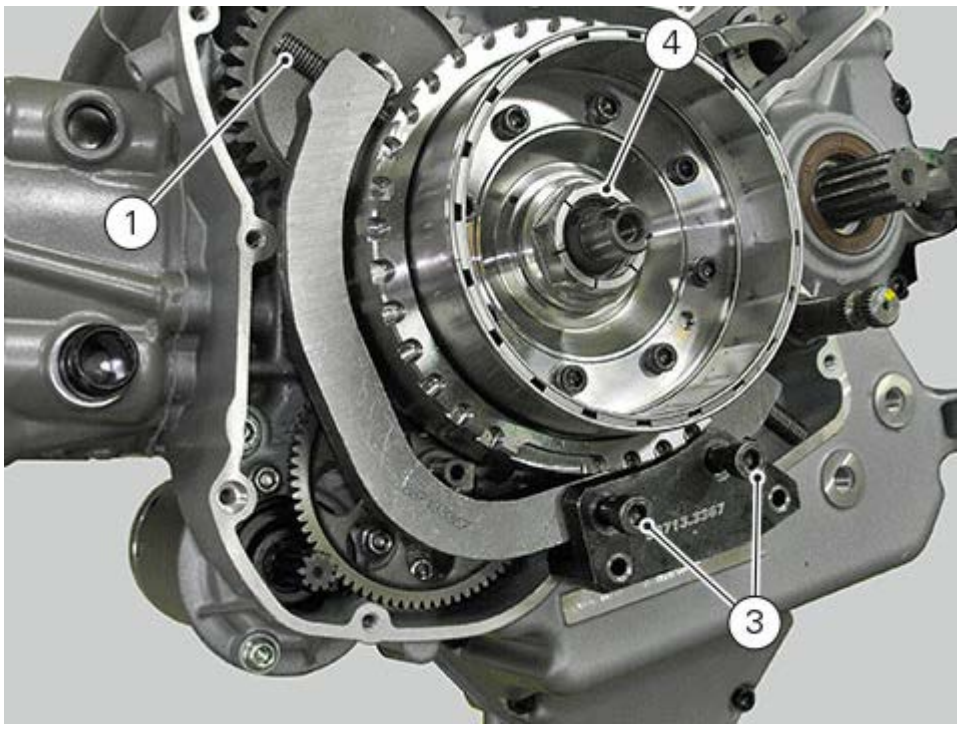

1


1

Removing the flywheel/generator assembly

Fix tool (A) part no. 88713.3367.
Block the tool on the flywheel by inserting screw (1) into hole (2) and on the casing by means of screws (3).
Unscrew the generator-flywheel retaining nut (4).

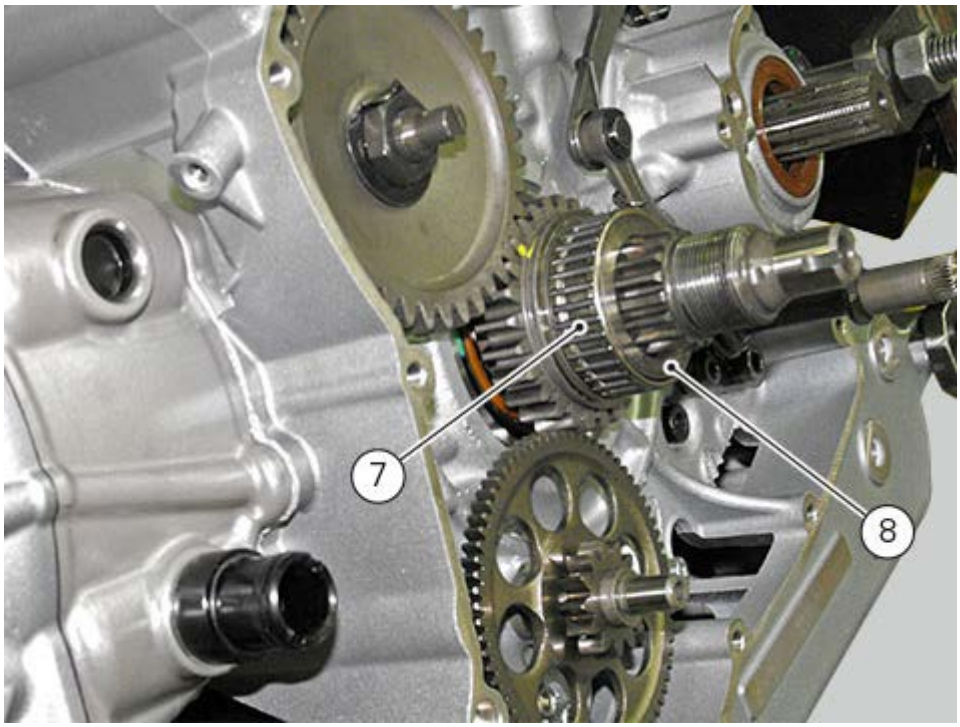




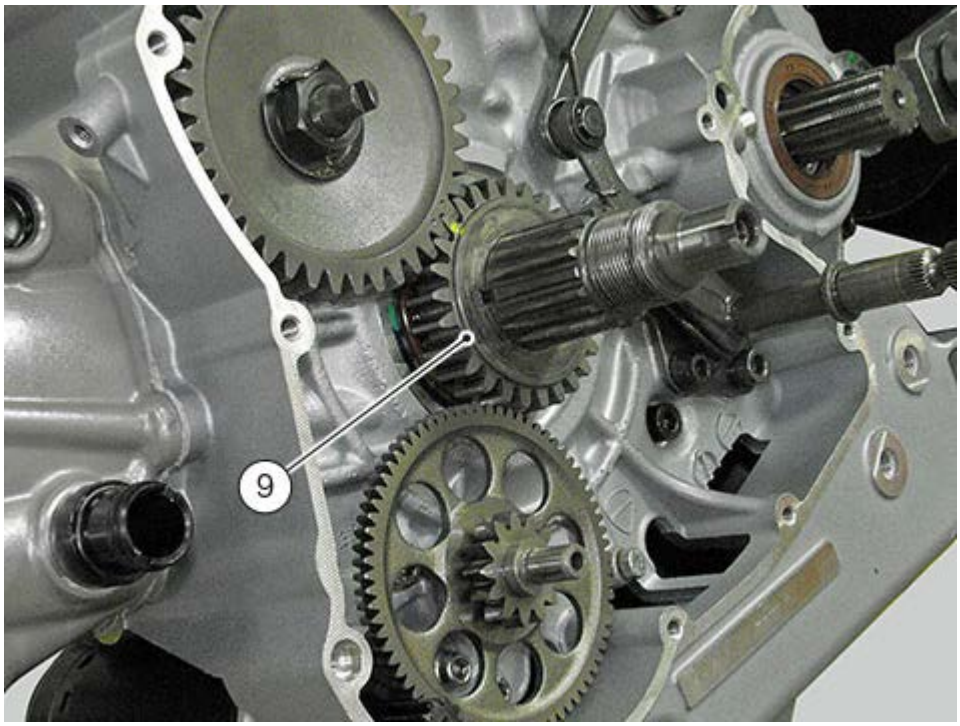
Remove nut (4) and washer (5).

Remove the flywheel unit (6) and the driven gear (7).

Remove the roller bearing (7) and bushing (8).

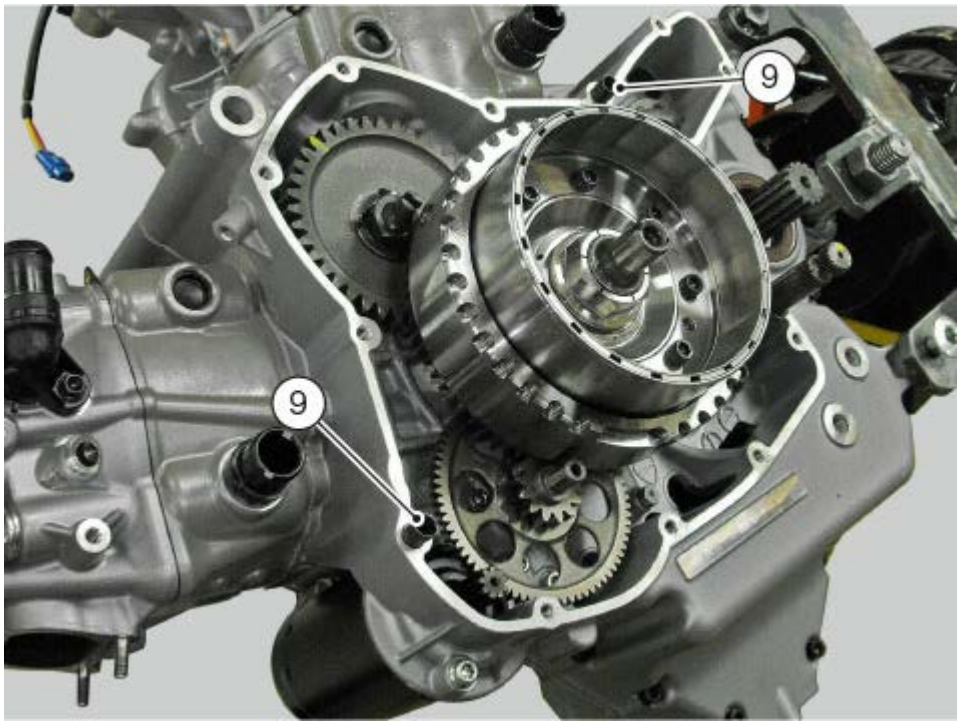


Remove gear (9).

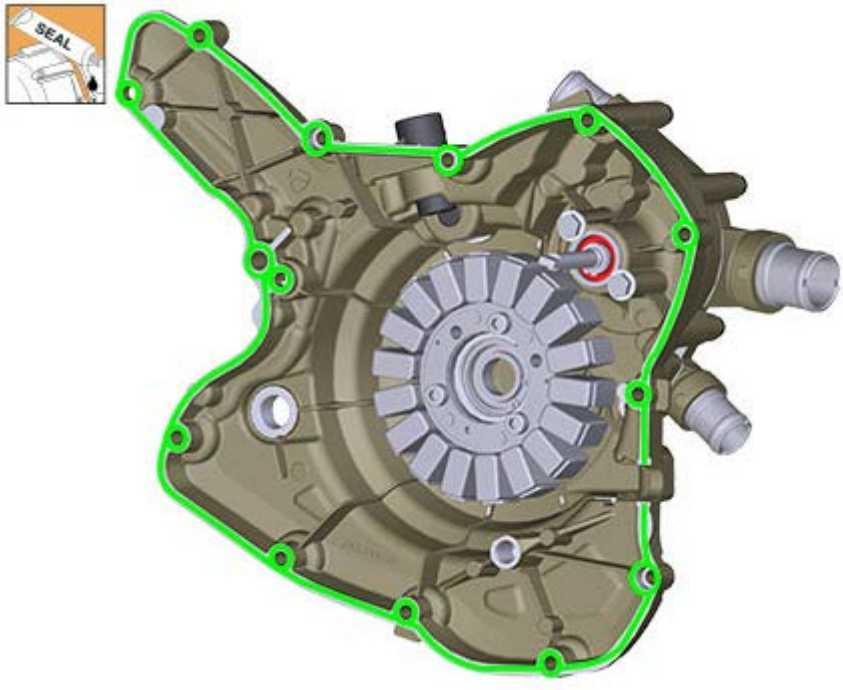

9

Refitting the generator cover

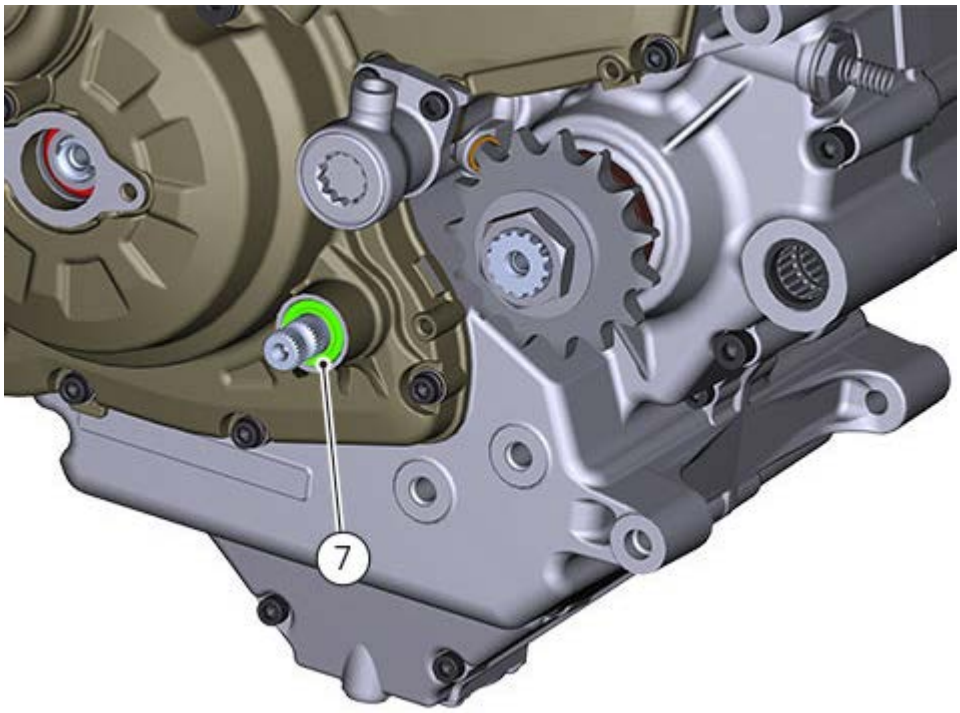
Remove any scale and grease from the mating surfaces of the left-hand crankcase half and the generator cover.
Fit the two centring bushes (9).



Spread a continuous uniform bead of DUCATI sealing compound on the cover mating surface, and around the holes for the screws and bushes.



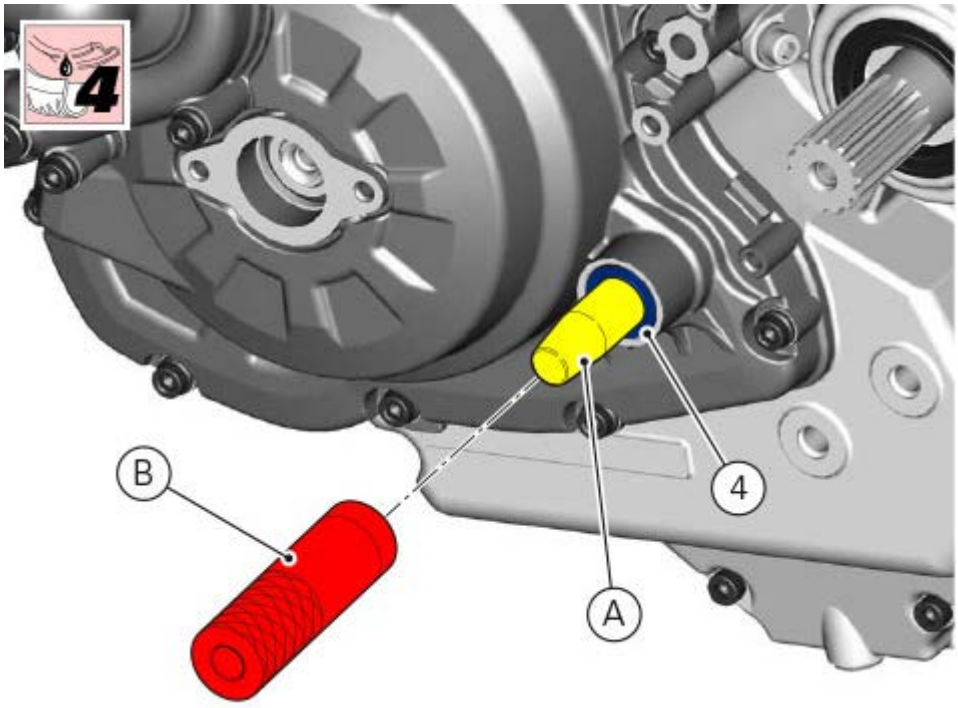
Grease the crankshaft and the gearchange lever shaft ends to facilitate installation of the cover and to prevent the sealing ring (7) from being damaged, if already installed in the cover.
While positioning the cover on the crankcase half, slightly turn the timing layshaft belt rollers to facilitate insertion of the pump control shaft.



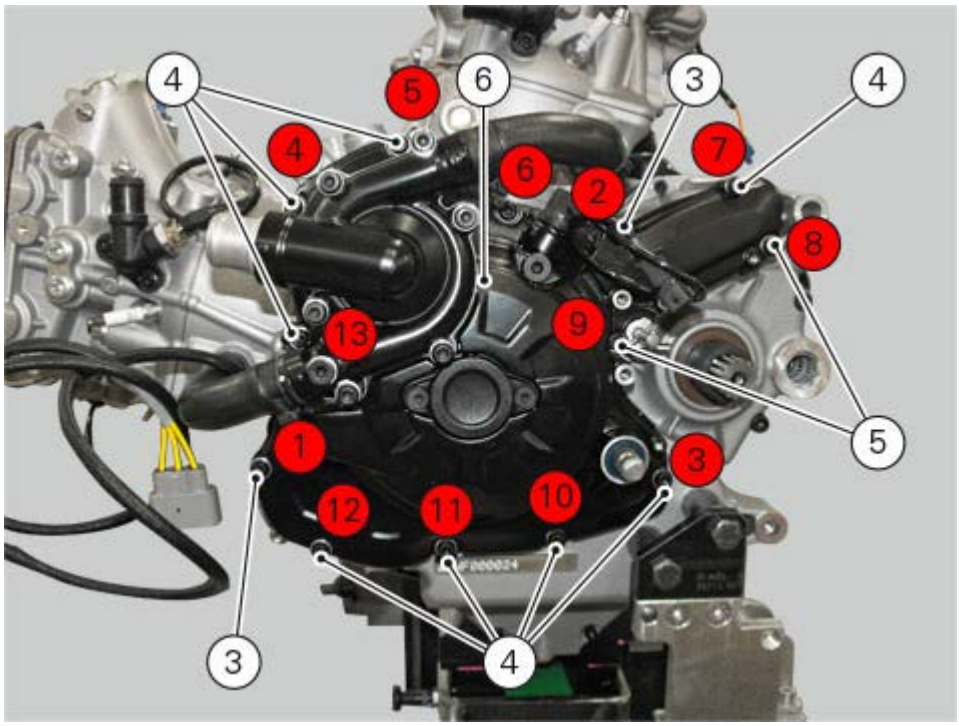
If necessary, insert a new seal ring as follows:

Fit tool (A) part no. 88713.3394 on the gearbox driving shaft.
Lubricate with the indicated product the oil seal (4) and orient the spring inwards.

Fit the oil seal fully home with tool (B) 88713.3394.
Remove the tools.



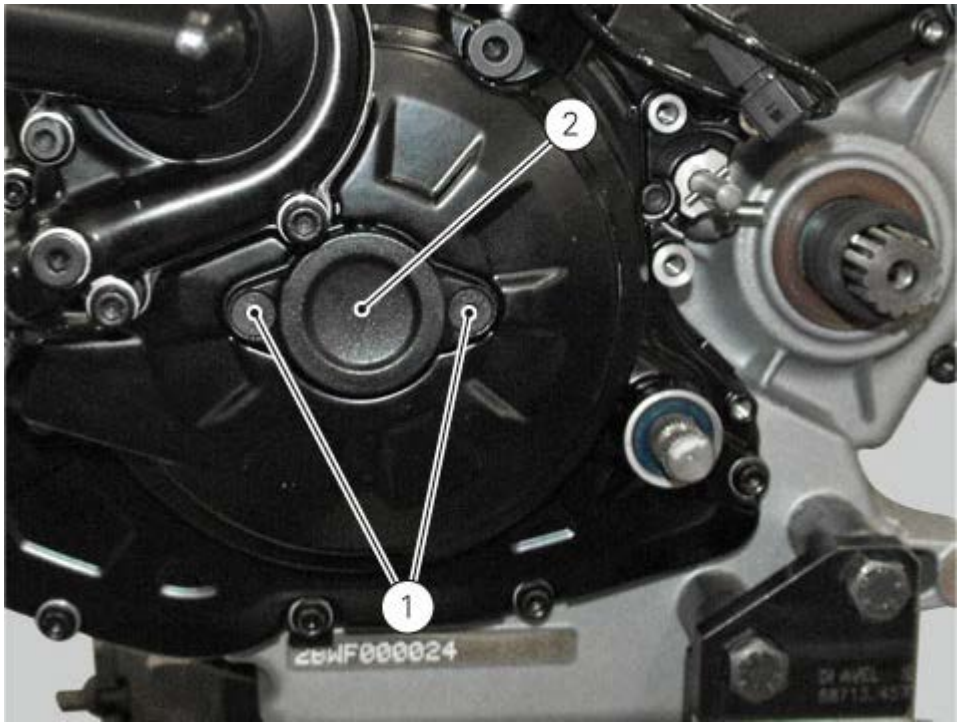
Start the generator cover retaining screws.
Tighten them following the indicated sequence to a torque of 13.5 Nm (Min. 12.5 – Max. 14.5).



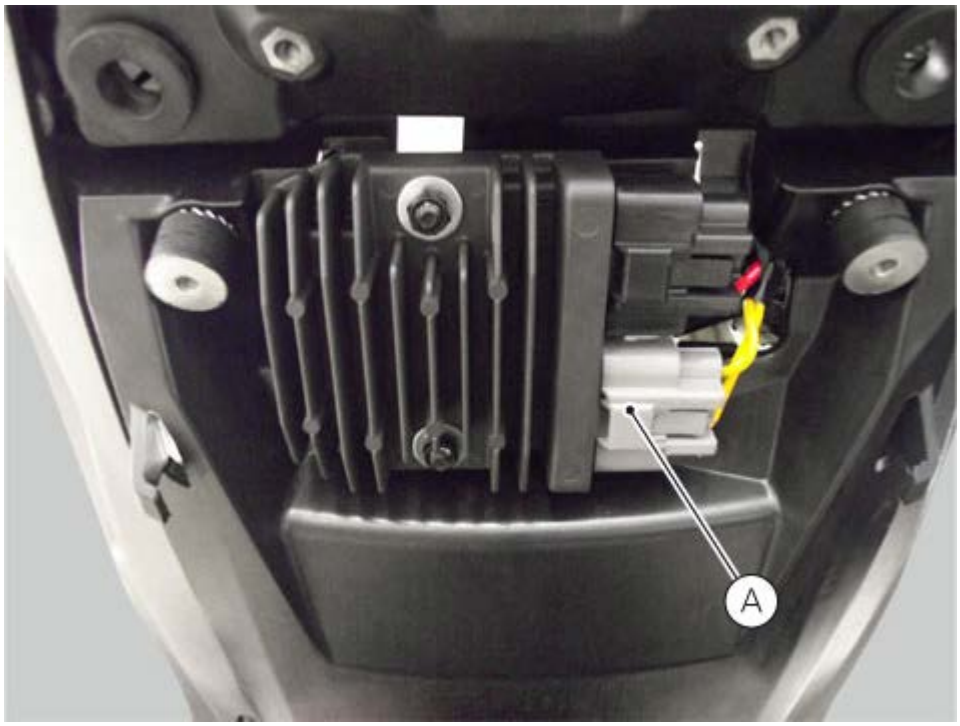
Pay attention to screws (3), (4) and (5) since they are different.

- Screws (3) 6x35 mm
- Screws (5) 6x20 mm
- Screws (4) 6x30 mm

Fit cover (2) with the relevant gasket.
Fix it with the two screws (1). Tighten them to a torque of 5 Nm (Min. 4.5 – Max. 5.5).



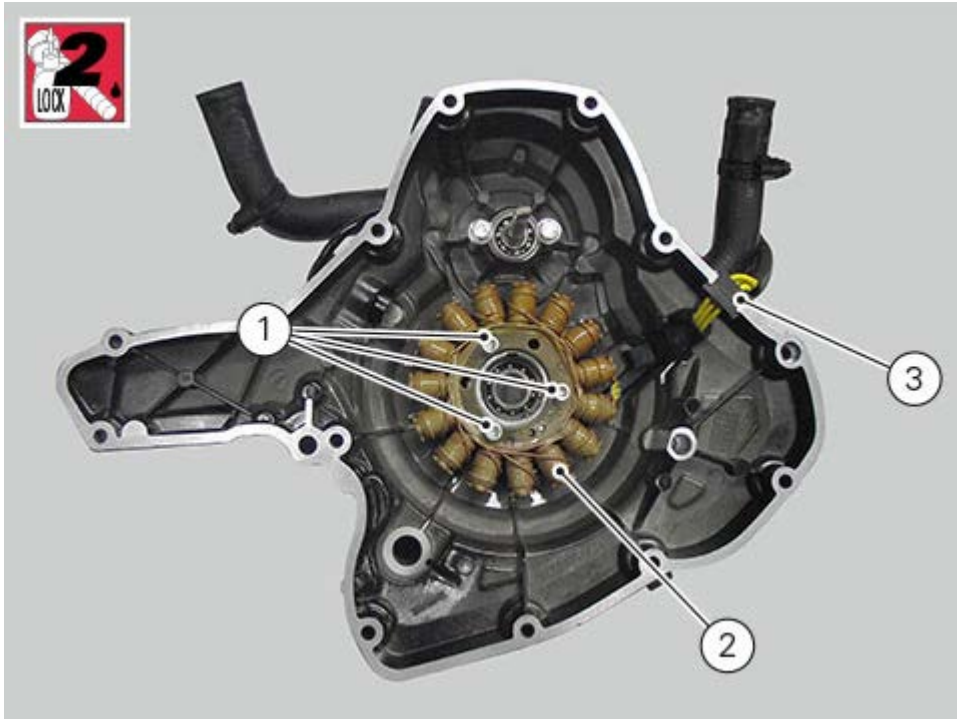
Connect connector (A) to the voltage regulator.



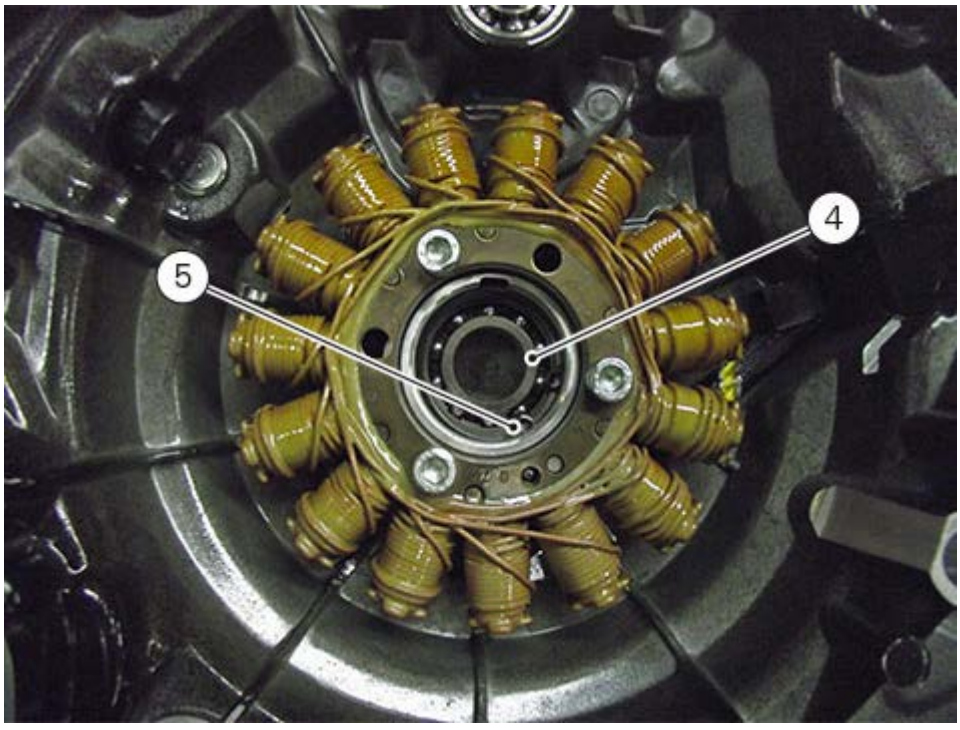
Refit the water pump-radiator hose (Refitting the water pump).
Refit the pump-cylinder hoses (Refitting the cylinder/piston assembly).
Fit the clutch slave cylinder (Refitting the clutch slave cylinder).
Refit the front sprocket cover (Refitting the front sprocket cover).
Fill with engine oil (Changing the engine oil and filter cartridge).
Refill the cooling system (Changing the coolant).
Refit the belly pan unit (Refitting the belly pan).

Reassembling the generator cover

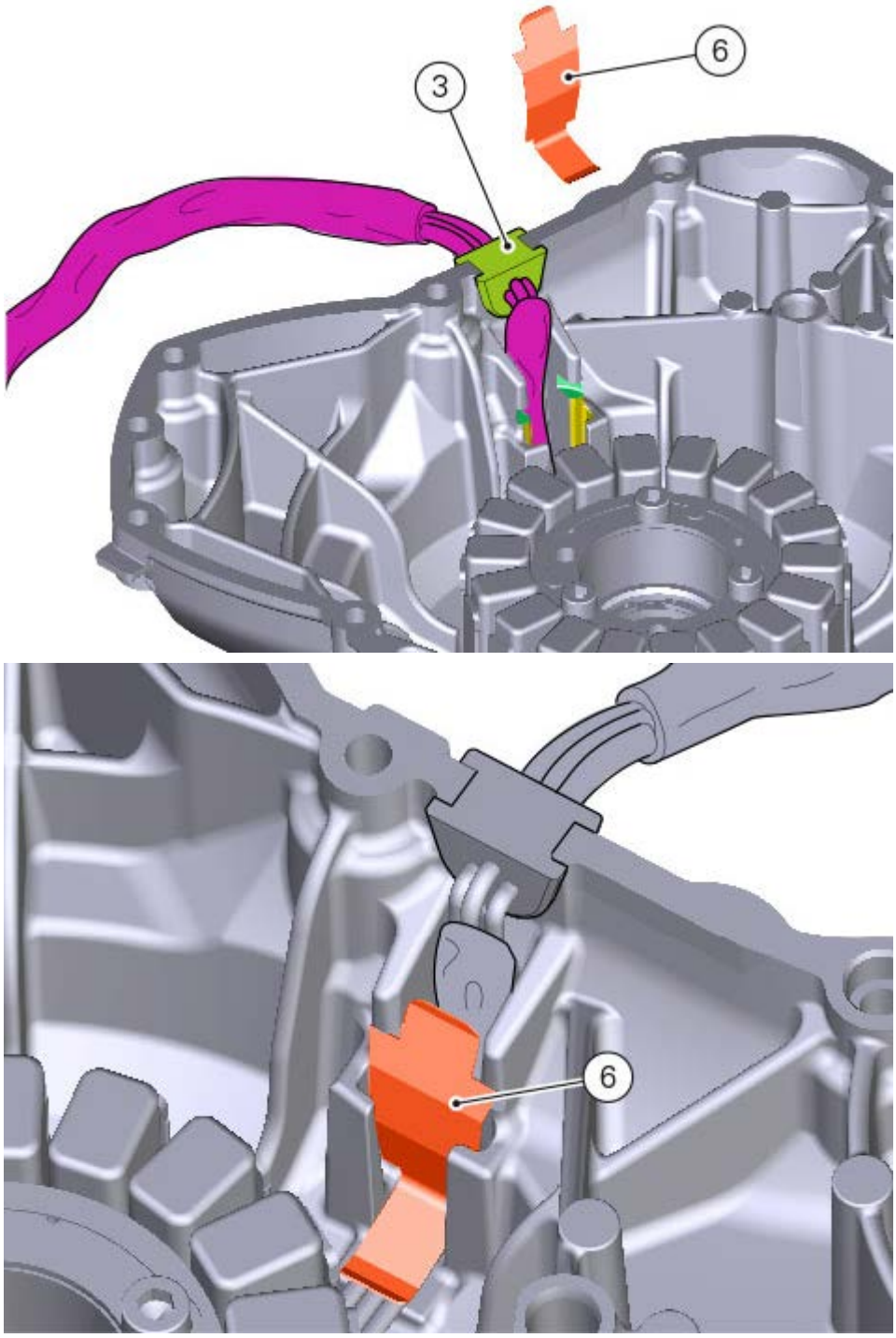
If previously removed, install stator (2) on the generator cover by means of the three screws (1).
Apply the indicated threadlocker on screws (1) and tighten them to 10 Nm (Min. 9 – Max. 11).



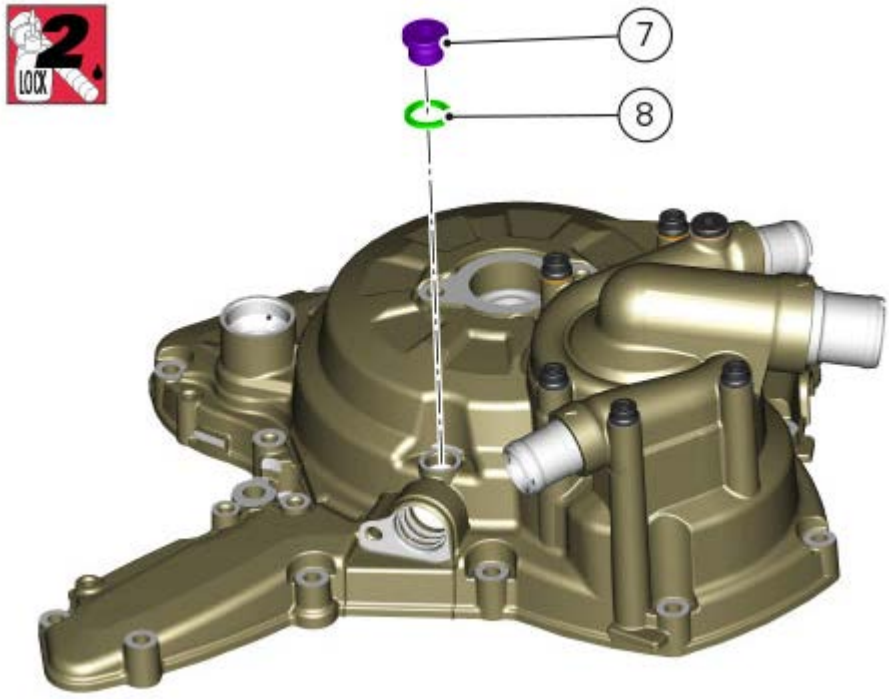
Fit bearing (4) and fix it with circlip (5).



Check that the cable ring (3) is correctly fitted.
Insert plate (6) as shown in the figure.
Push it downwards along the guides ensuring that the stator cable is under the plate.
Once fully home, pull the plate outwards from the cover so as to fasten it.



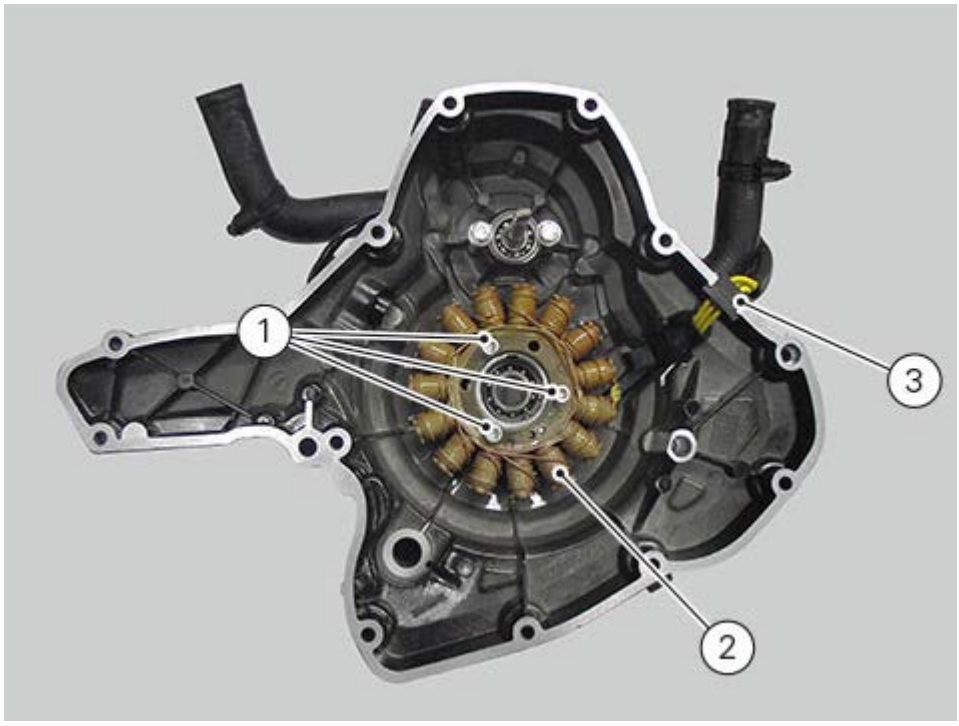
If previously removed, fit the Pick-Up plug (7) with threadlocker and the relevant seal (8).
Tighten plug to a torque of 15 Nm (Min. 13 – Max. 17).



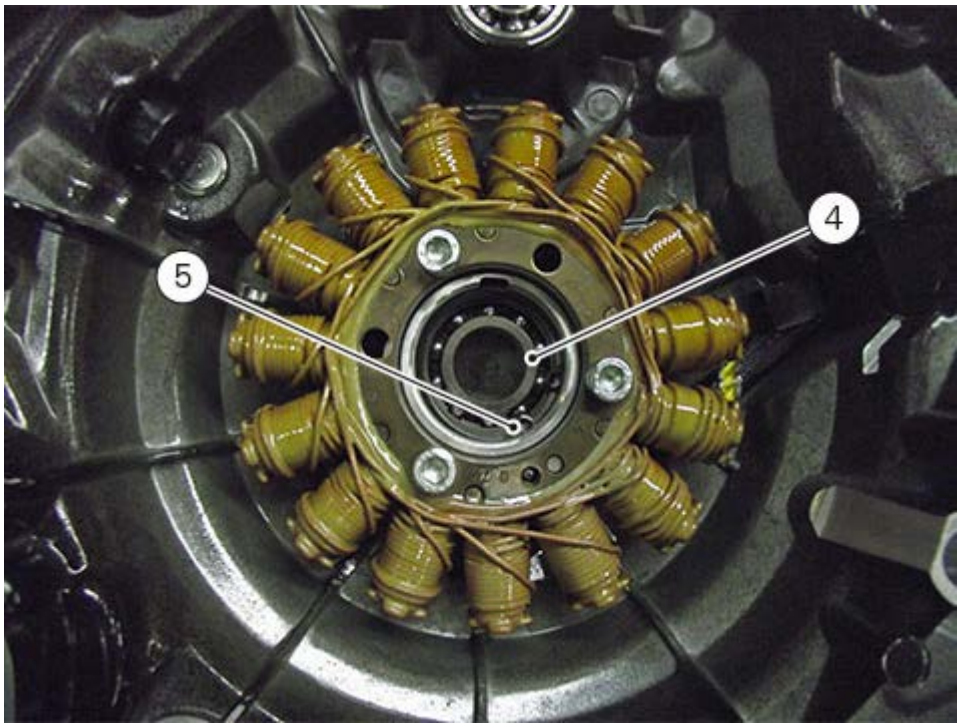
If necessary, fit the water pump assembly (Refitting the water pump).

Disassembling the generator cover

Loosen screws (1) that retain stator (2), remove the cable ring (3) and stator (2).



The generator cover is fitted with a bearing (4), held in place by the circlip (5), which is located on the end of the crankshaft.
Remove the circlip (5) with suitable pliers.
Remove the bearing (4) using a universal puller.

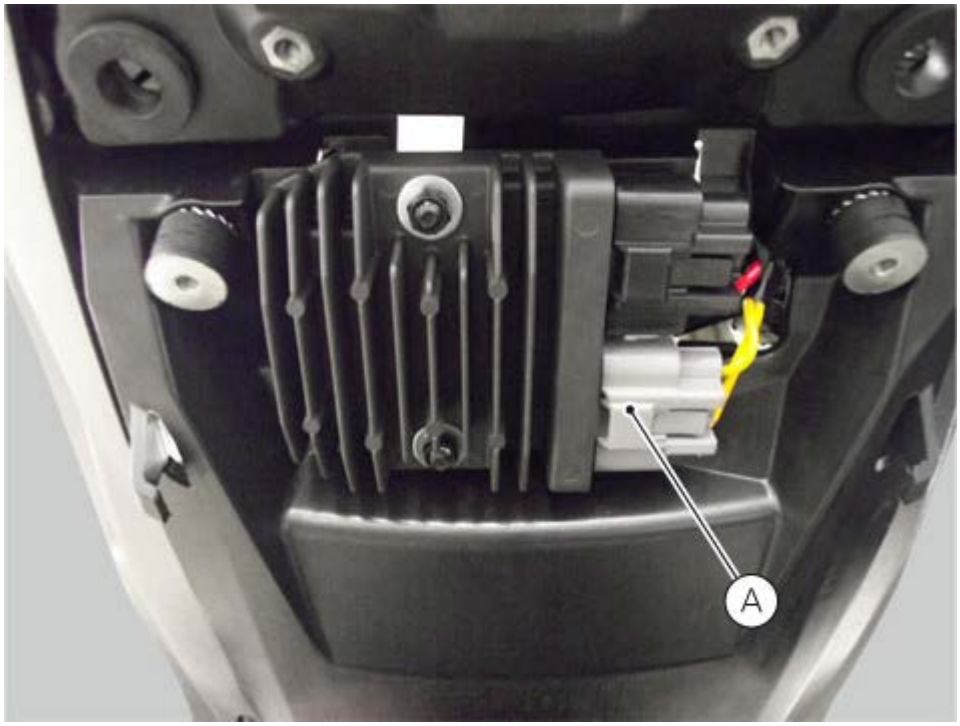


Removing the generator cover

Remove the belly pan unit (Removing the belly pan).
Drain the coolant (Changing the coolant).
Remove the front sprocket cover (Removing the front sprocket cover).
Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the clutch slave cylinder (Removing the clutch slave cylinder).
Remove the pump-cylinder hoses (Removing the cylinder/piston assembly).
Remove the water pump-radiator hose (Removing the water pump).
Remove the gear shift (Removing the gear shift)

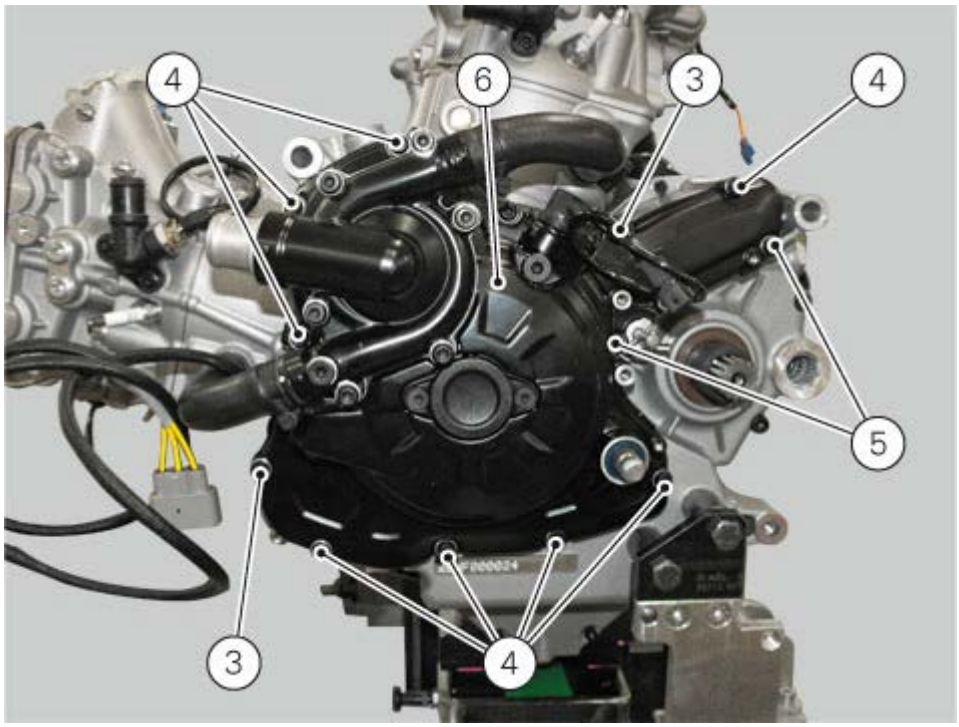
Note
This operation is described for an engine removed from the frame since all reassembly procedures are easier with the engine on the bench.

Disconnect the generator cable connector from the main wiring (A).

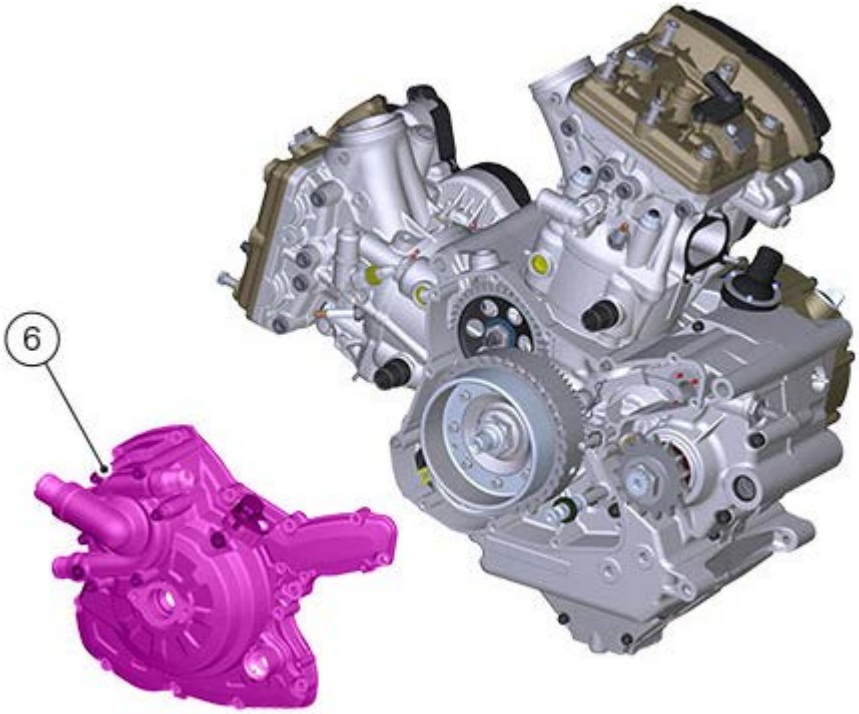


Undo the two retaining screws (1) of cover (2) over the end of the crankshaft and collect the gasket.

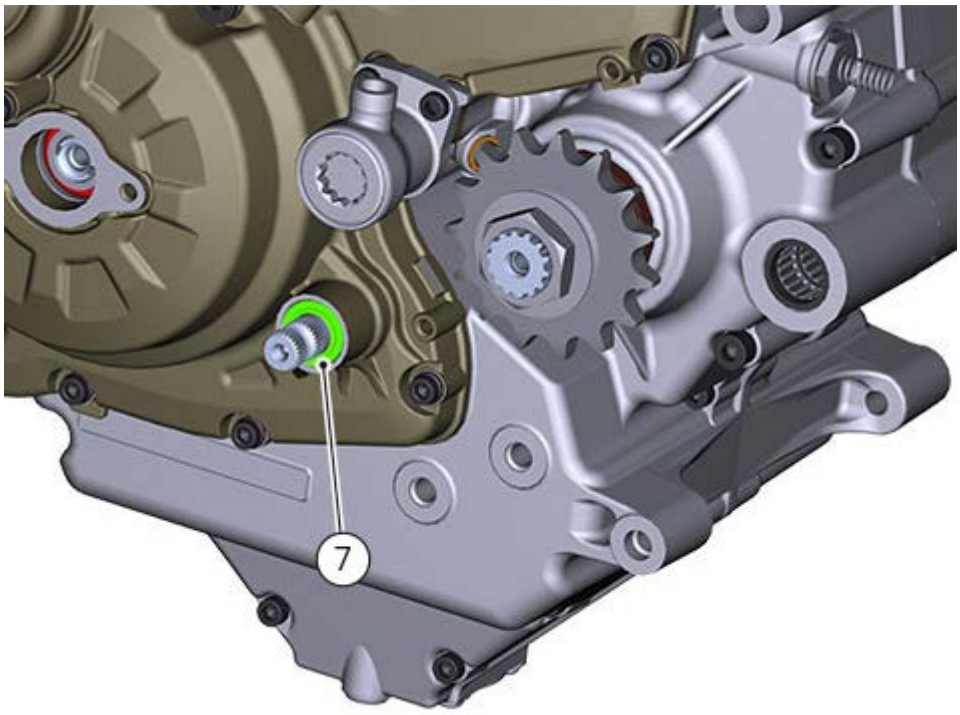
Loosen the fastening screws (3), (4) and (5) on the generator cover (6).



Fix service tool no. **88713.1749** to the holes left vacant by the screws (1) you have just removed.
Turn the tool shaft slowly to separate the cover (6) from the LH crankcase half.

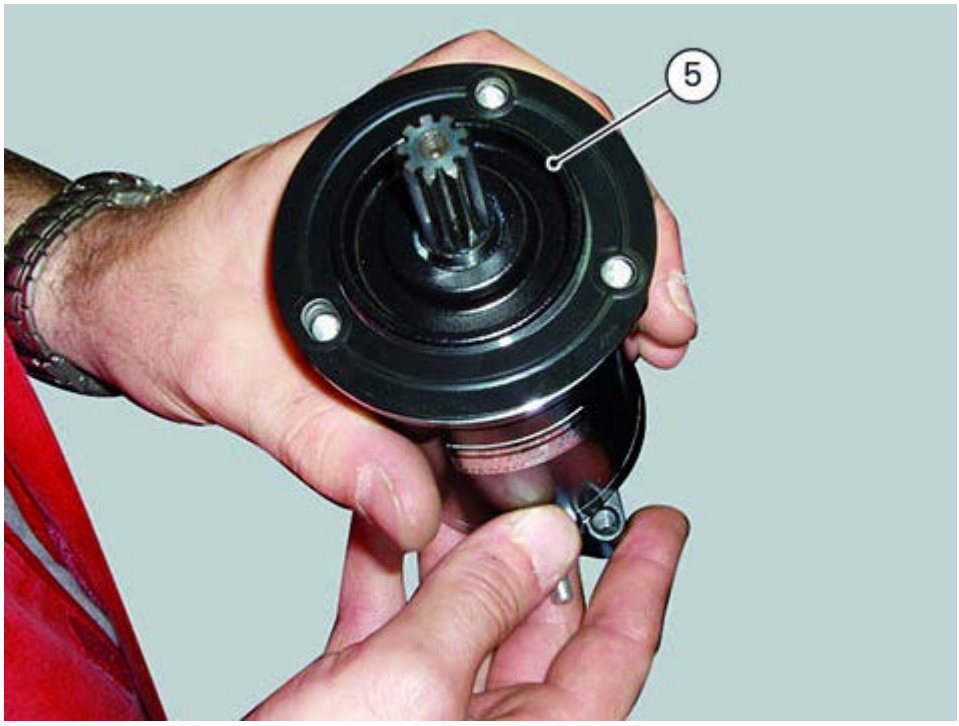


There is a sealing ring (10) on the cover in correspondence with the gearchange lever shaft that may be damaged when removing the generator cover.
Always check the condition of this sealing ring and replace it if damaged.

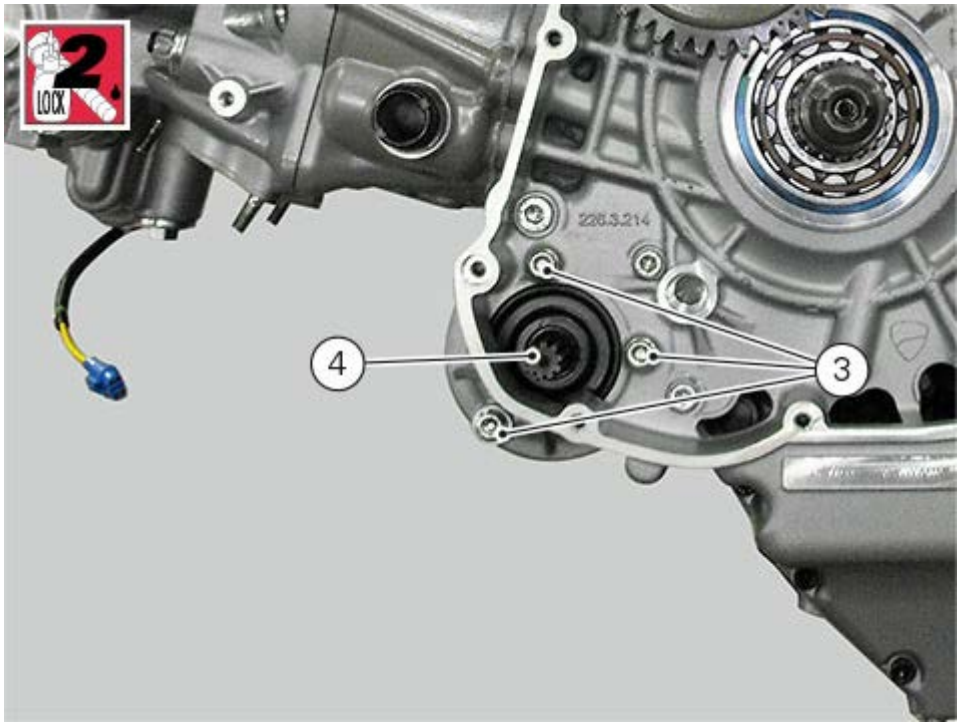


Refitting the starter motor

Visually check the gasket (5) for wear and replace it if necessary.



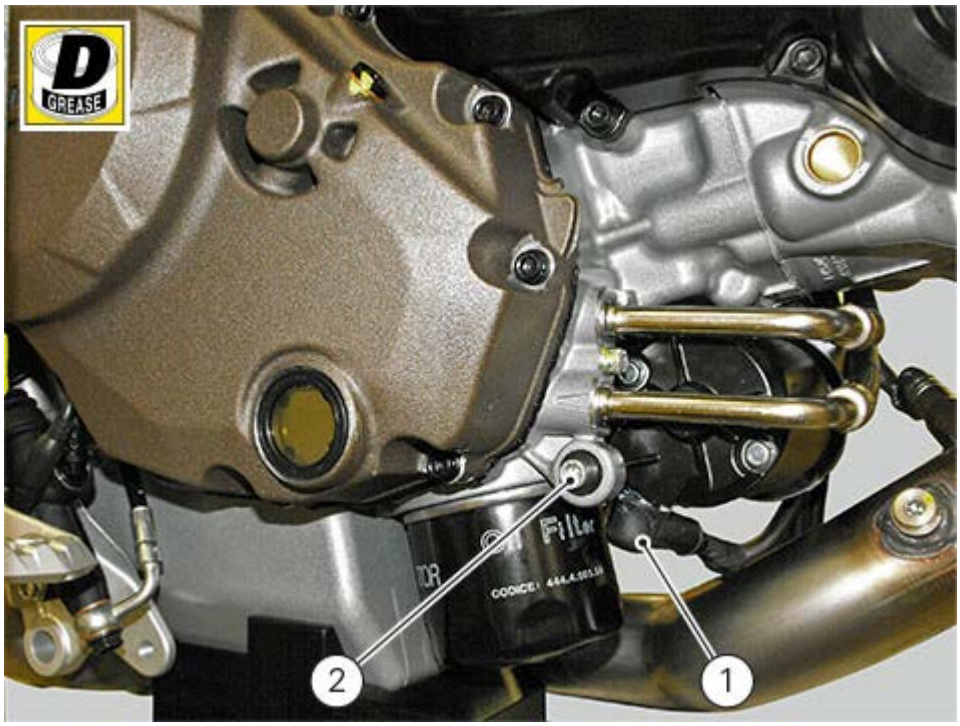
Position the gasket (5) and starter motor on the crankcase.
Start retaining screws (3) with specified threadlocker.
Tighten the screws (3) to a torque of 10 Nm (min. 9 Nm. - max. 11 Nm).



Start the retaining screw (2) and tighten it to a torque of 10 Nm ± 10%.
Place starter motor/solenoid starter cable (1) and tighten nut to a torque of 5 Nm ± 10%.

Important

Fill the protection cap with protective grease before fitting it on the starter motor.


D
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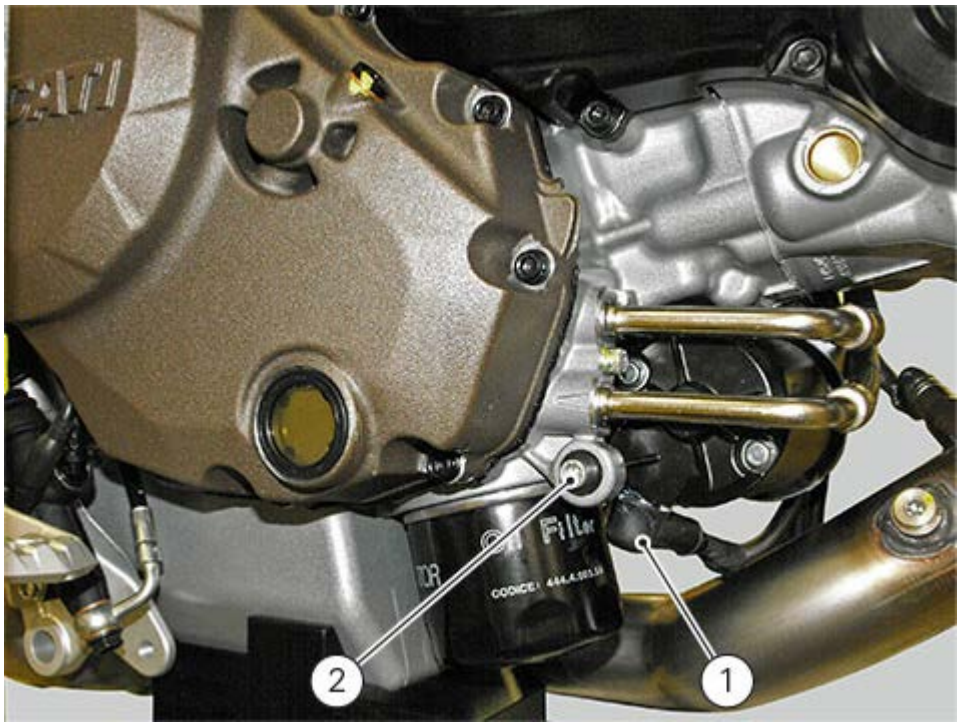
1

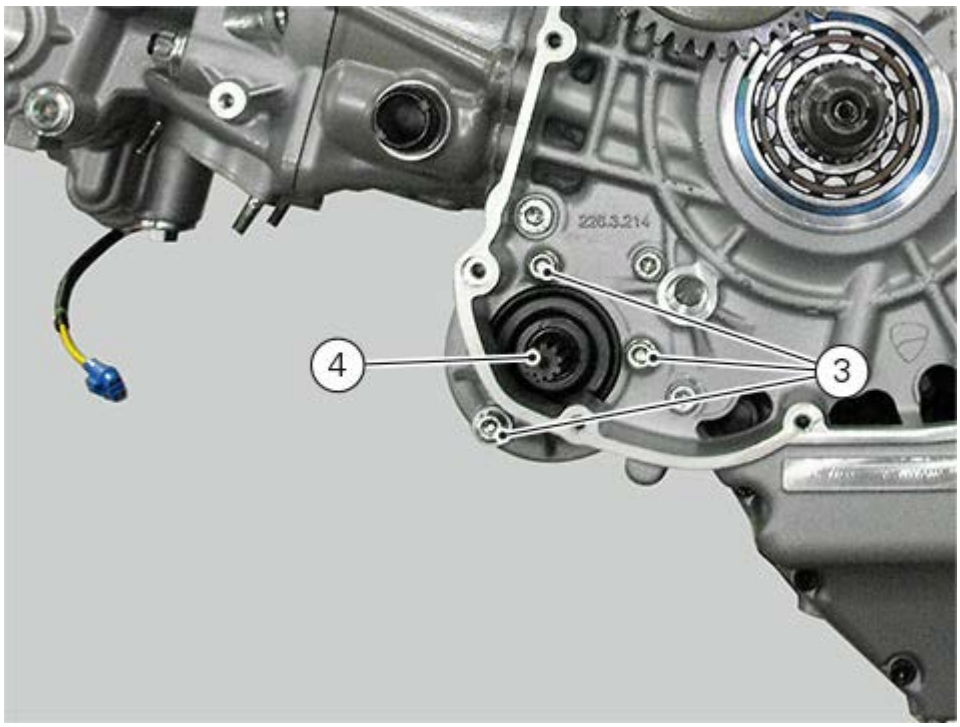
Removing the starter motor

Loosen nut and remove starter motor cable (1).
Undo the retaining screw (2).



Remove the flywheel assembly (Removing the flywheel/generator assembly).

Working on the other side, loosen the retaining screw (3).
Remove starter motor (4).

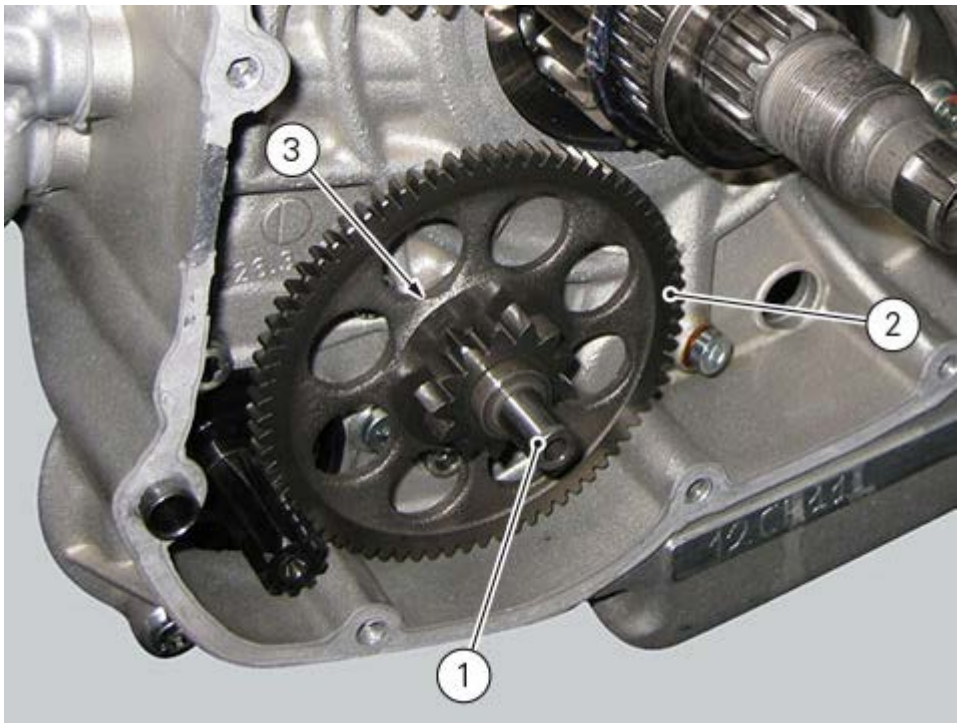


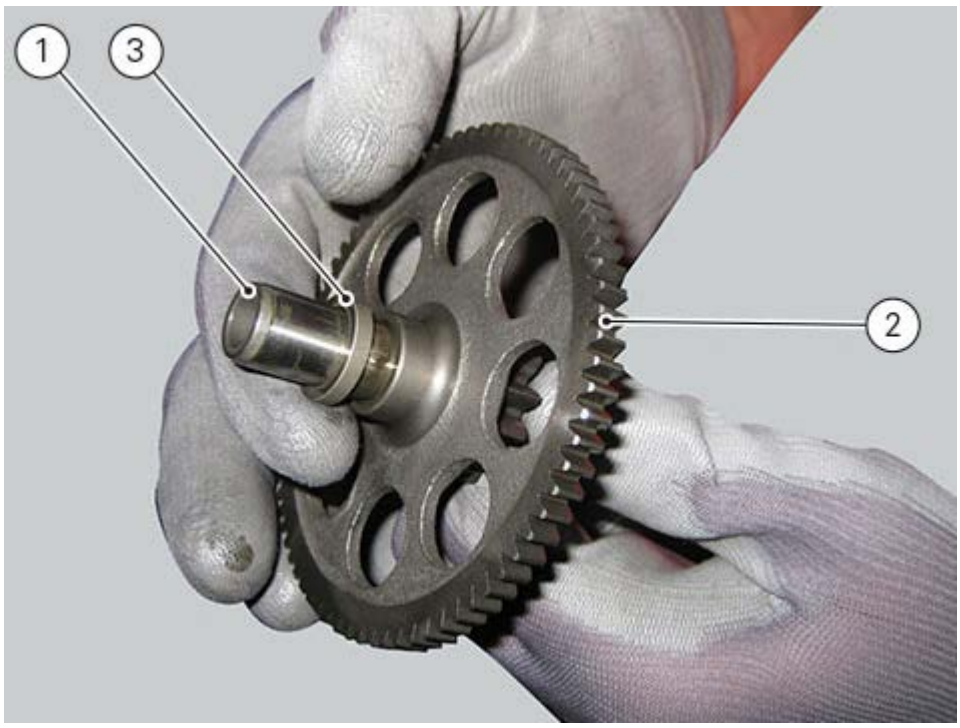
Removing the starter motor idler gear

Remove the sump guard unit (Removing the sump guard).
Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the front sprocket cover (Removing the front sprocket cover).
Remove the clutch slave cylinder (Removing the clutch slave cylinder).
Drain the coolant (Changing the coolant).
Remove the pump-water radiator hose (Removing cooling system hoses and unions).
Remove the generator cover and flywheel-generator assembly (Removing generator cover).

Slide out the transmission pin (1) with gear (2) and washer (3).

Warning
Be careful when performing this operation since the washer could fall inside the crankcase halves.





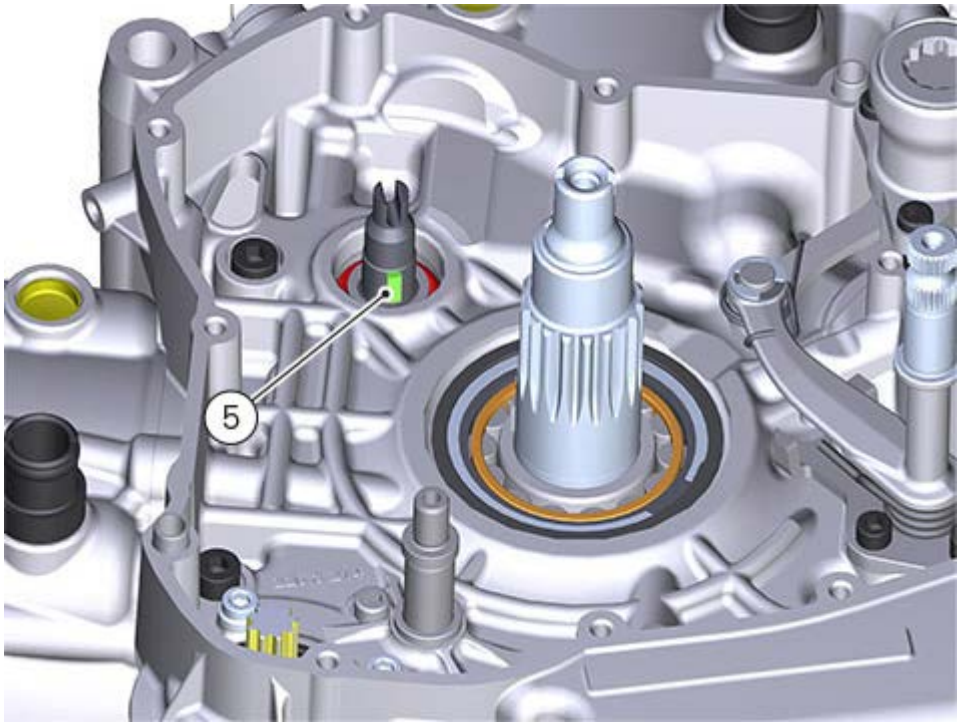
At this point, it is possible to remove the starter motor as described under chapter Starter motor.

Refitting the timing gears

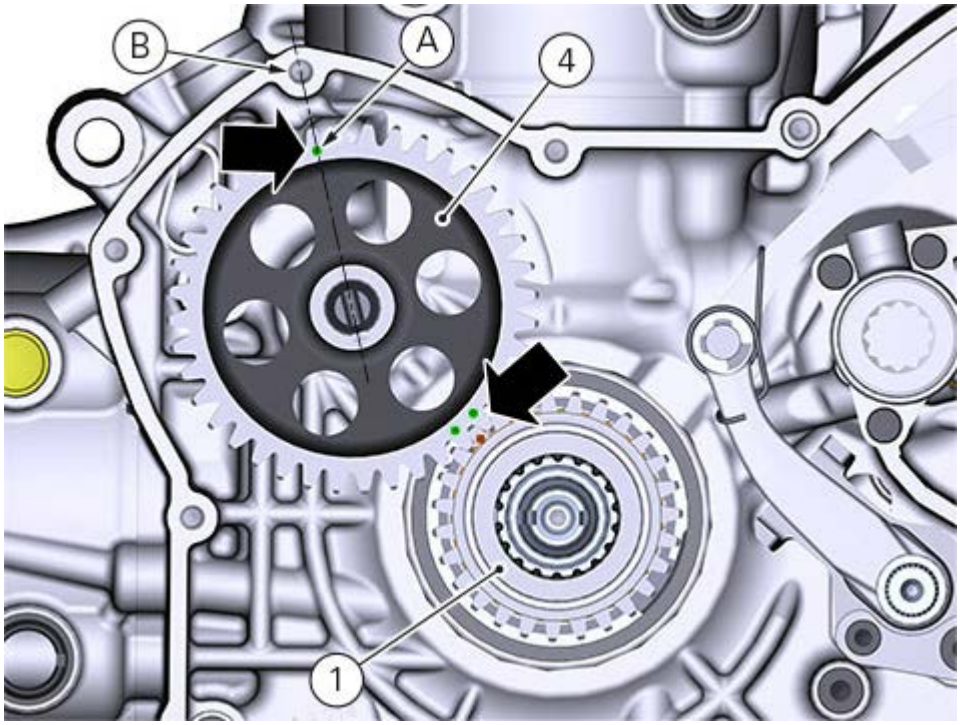
Before reassembling the removed parts, check timing gears for wear. Change, if necessary.

Important
The timing gears must always be replaced as a pair.

Refitting is the reverse of removal.
Check that tab (5) is present and correctly fitted on the shaft.



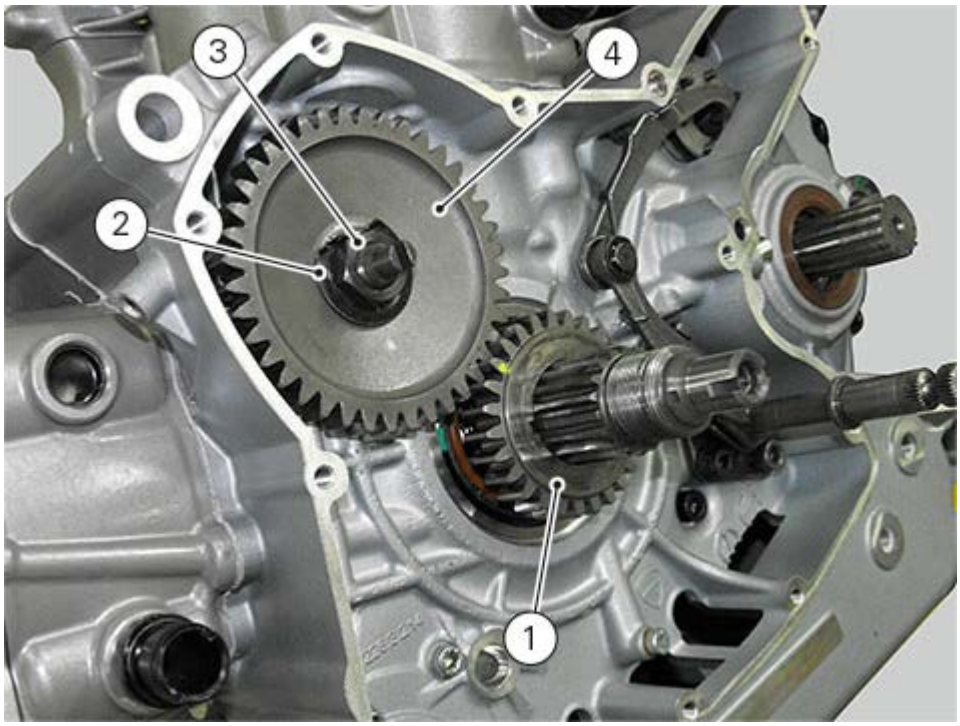
When fitting the timing gear (4) align reference (A) to the cover hole (B).
The timing gear (4) should be aligned with the driving gear (1).
This condition is met when the reference on gear (1) is between the two references of the timing gear (4).
To fit the driving gear (1) refer to chapter "Refitting the flywheel/generator assembly".



Note

Check that, in this position, the horizontal cylinder piston is at top dead centre.

On completion of the refitting operations, check that washer (2) is staked against nut (3) in such a way to prevent the nut from working loose.

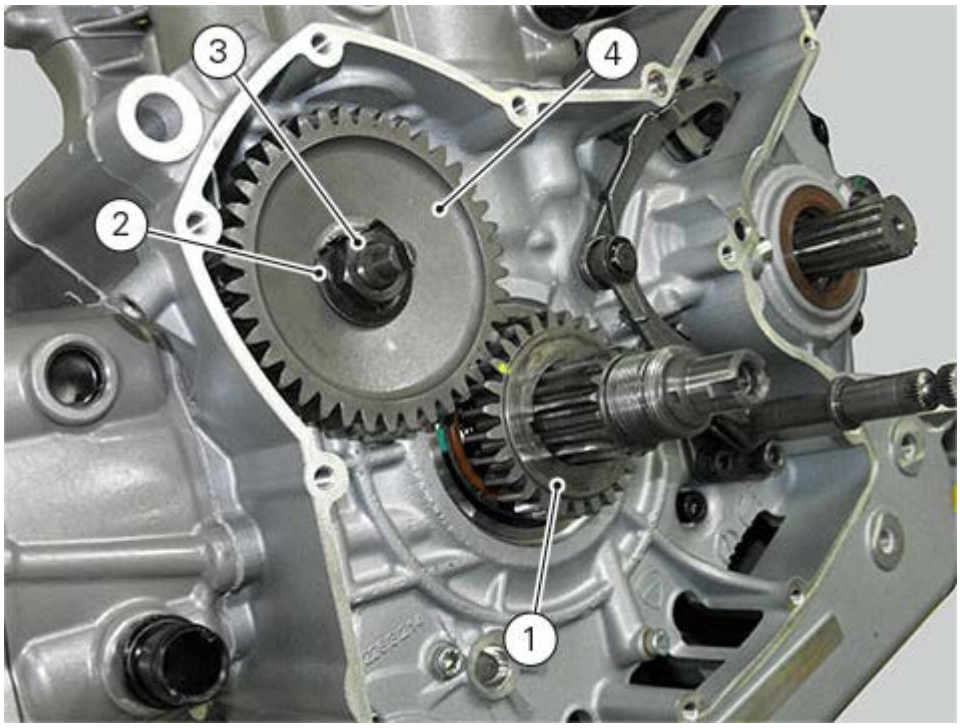


Refit the flywheel/generator assembly and the generator cover (Refitting the flywheel/generator assembly).
Refit the pump-water radiator hose (Refitting cooling system hoses and unions).
Refit the pump-cylinder hoses (Refitting the cylinder/piston assembly).
Refill the cooling system (Changing the coolant).
Refit the front sprocket cover (Refitting the front sprocket cover).
Fill the system with engine oil (Changing the engine oil and filter cartridge).
Refit the belly pan unit (Refitting the belly pan).

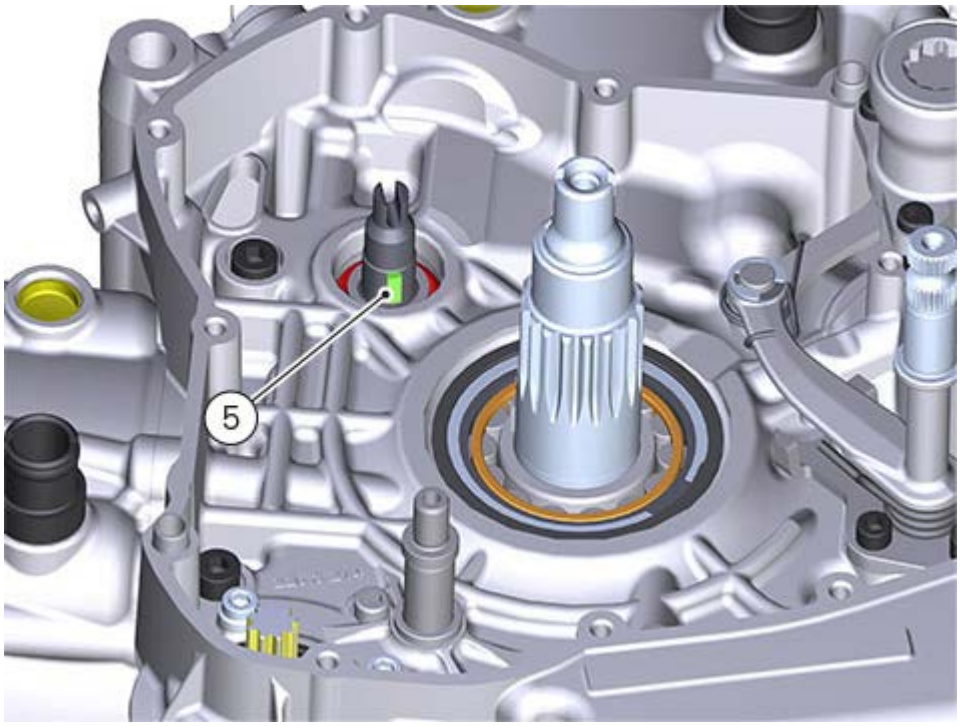
Removing the timing gears

Remove the belly pan unit (Removing the belly pan).
Drain the engine oil (Changing the engine oil and filter cartridge).
Remove the front sprocket cover (Removing the front sprocket cover).
Remove the clutch slave cylinder (Removing the clutch slave cylinder).
Drain the coolant (Changing the coolant).
Remove the pump-water radiator hose (Removing cooling system hoses and unions).
Remove the generator cover and flywheel-generator assembly (Removing generator cover).
Remove the flywheel/generator assembly.

After removing the driving gear (1), straighten the washer (2) and loosen nut (3) using a pin to lock the timing gear (4) rotation.

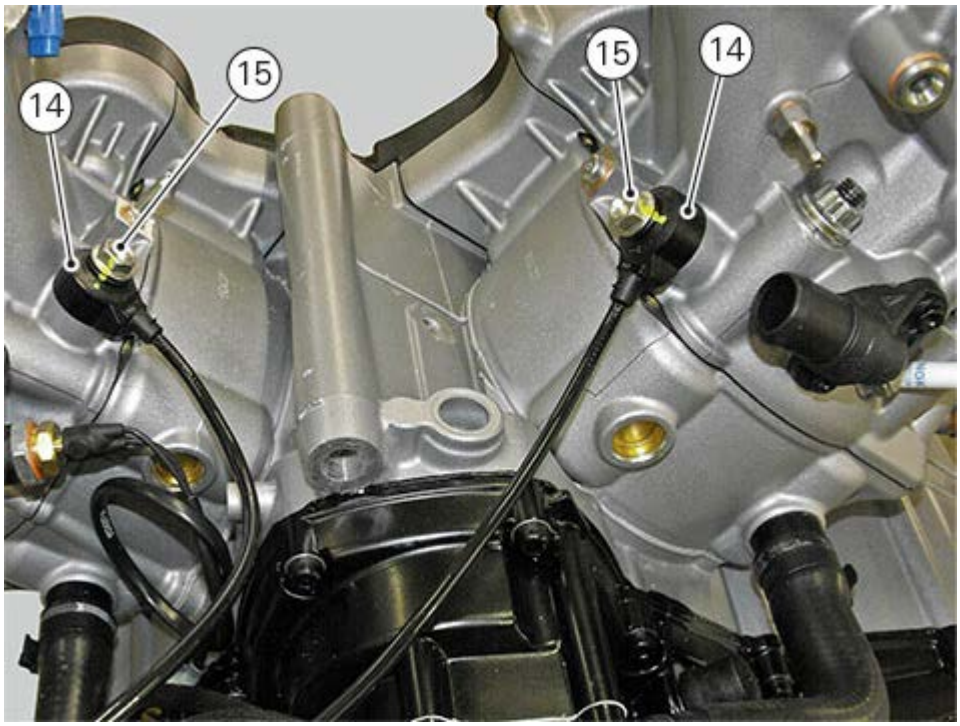


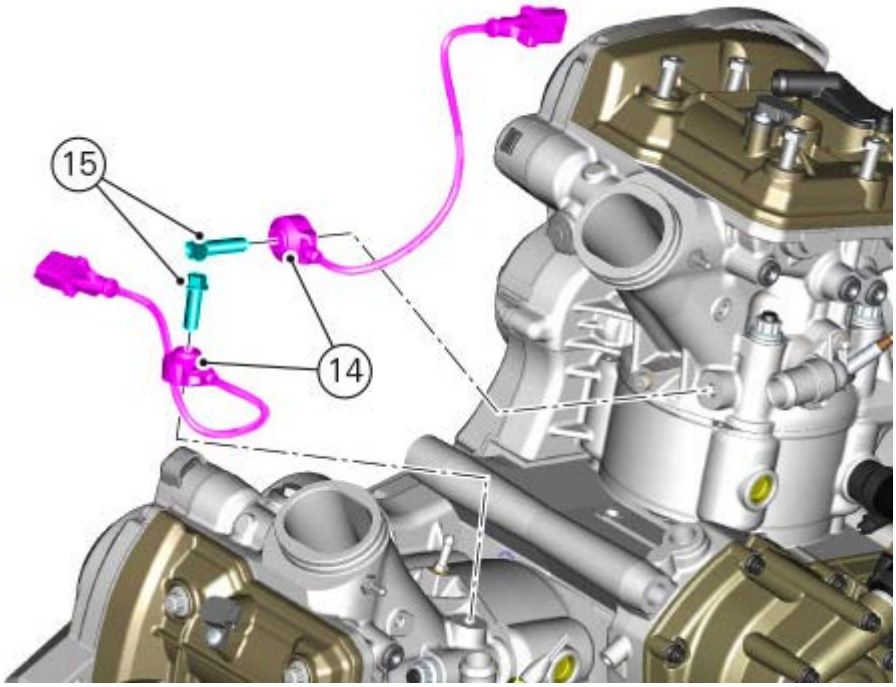
Remove tab (5).



Refitting the external components

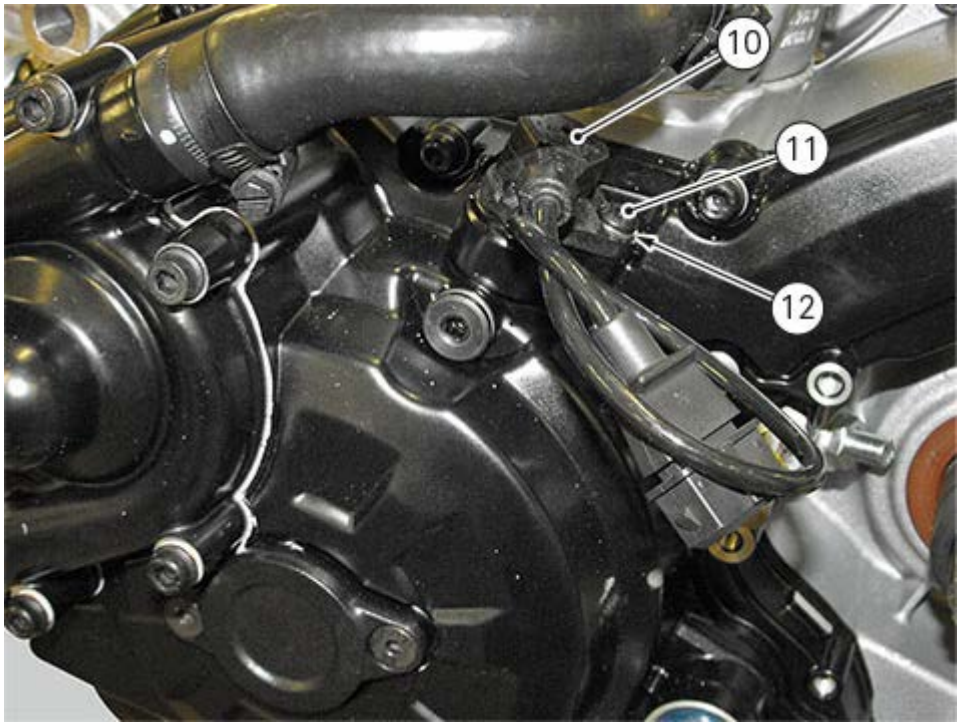
Position the knock sensor (14) on the head as shown in the figure and fix it by starting screw (15).
Tighten the screw (15) to a torque of 25 Nm (Min. 22.5 - Max. 27.5).



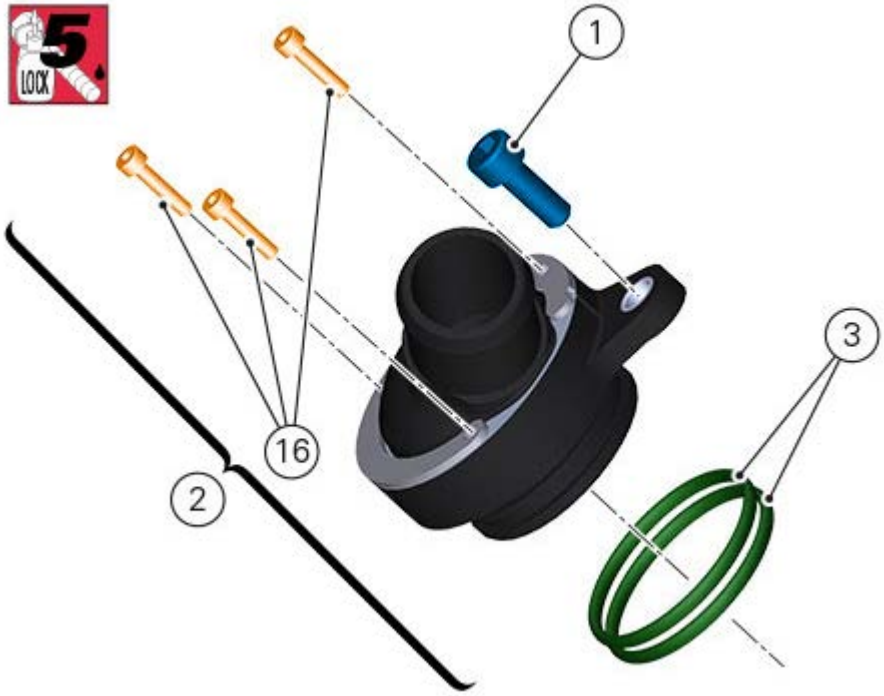


Make sure that the O-rings (13) are fitted on the crankcase.

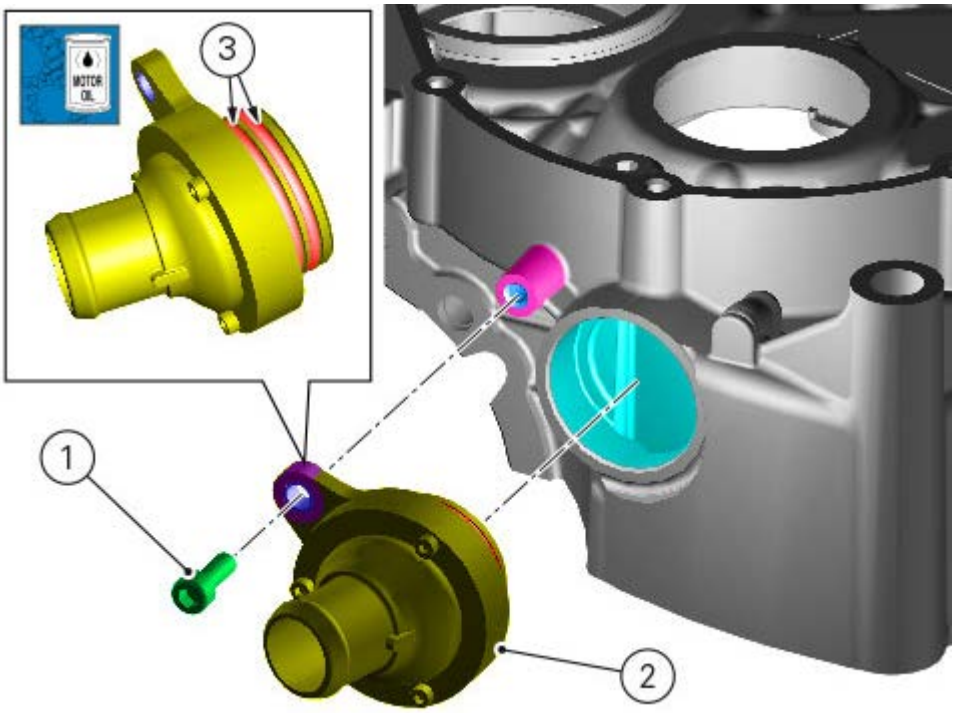
Fit the engine sensor (10) in its seat in the crankcase half.
Start the screw (11) with the washer (12) and tighten to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).



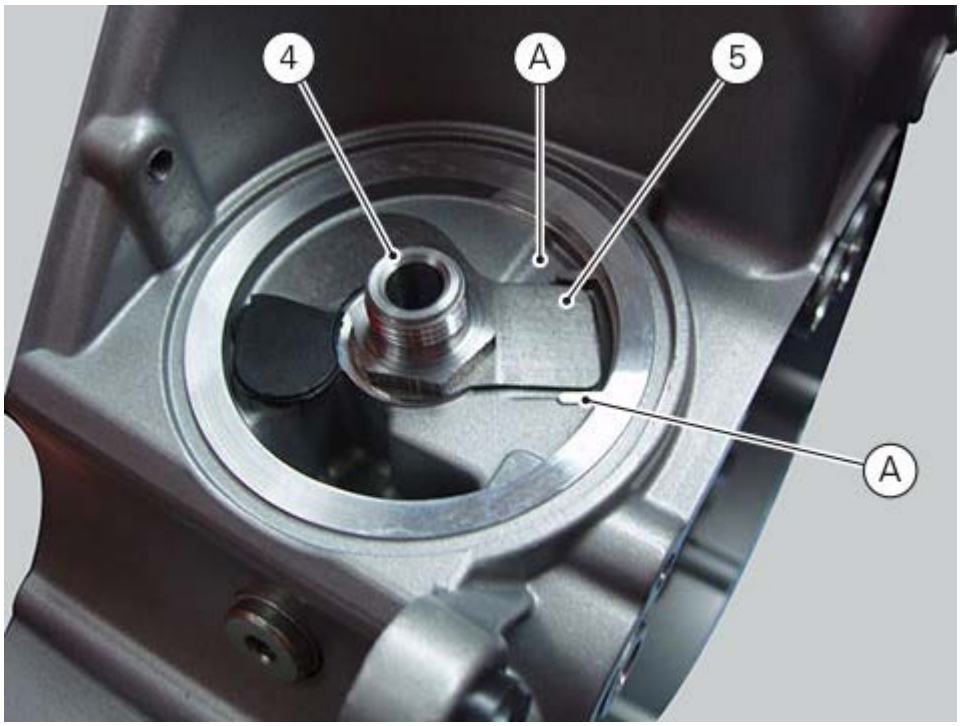
If the oil breather valve (2) has been disassembled, reassemble it tightening the three screws (18) to a torque of 1Nm±10%.



Check the condition of O-rings (2) and replace if necessary.
Install the oil vapour breather valve (1) in the crankcase along with O-rings (2), previously lubricated.
Tighten screw (1) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).

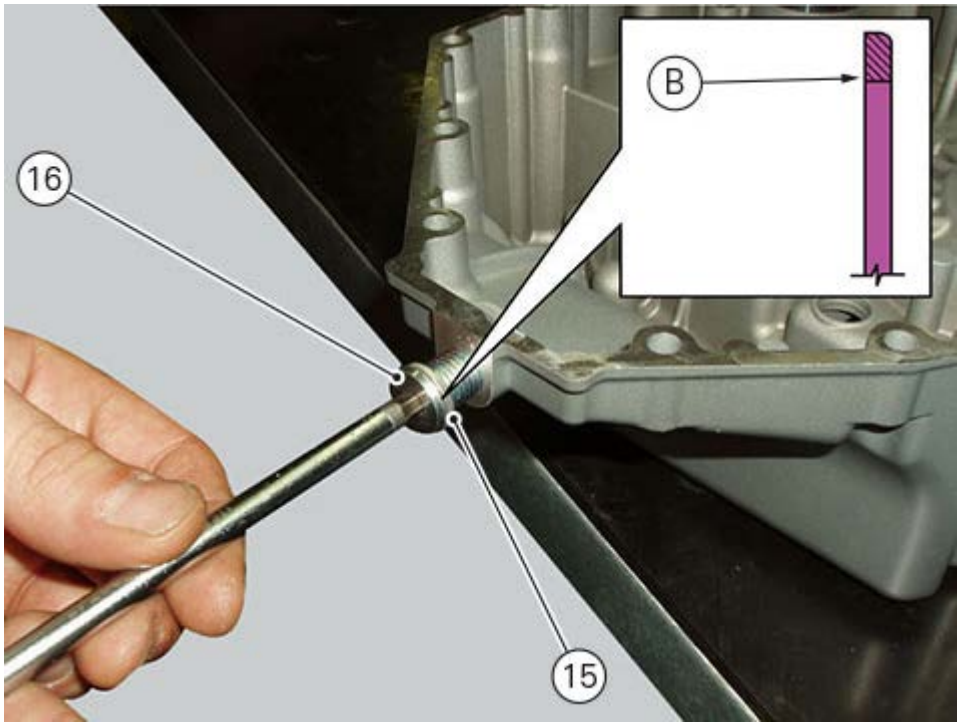


Position the by-pass spring (5) on the nipple (4) and apply the recommended threadlocker to the end of the nipple to be screwed in the crankcase half.
Screw oil filter cartridge fitting (4) fully into the crankcase half, positioning the spring in the seat between the two notches (A).
Tighten the nipple to a torque of 42 Nm (Min. 38 Nm - Max. 46 Nm).

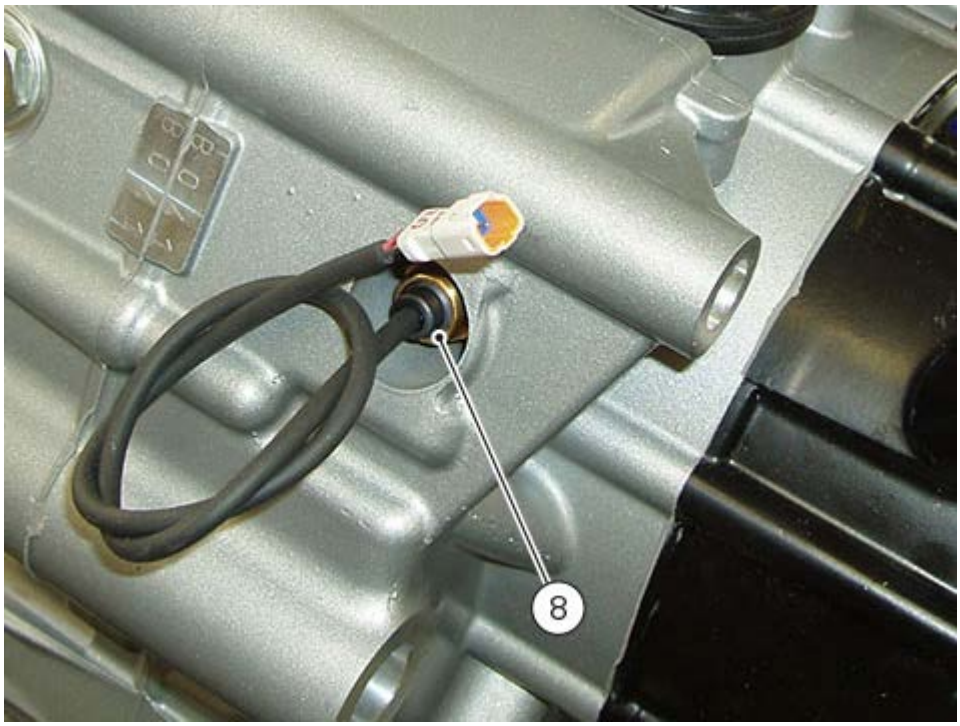


Fit the seal (15) on the oil drain plug (16).
Position the seal so that the side with the square edge (B) is facing the chain side crankcase half.
Clean the plug thread, apply a bead of Ducati sealing compound along the plug thread spreading it by the entire circumference (360°).
Screw the drain plug (16) with seal (15) to a torque of 6 Nm (Min. 5 Nm - Max. 7 Nm).

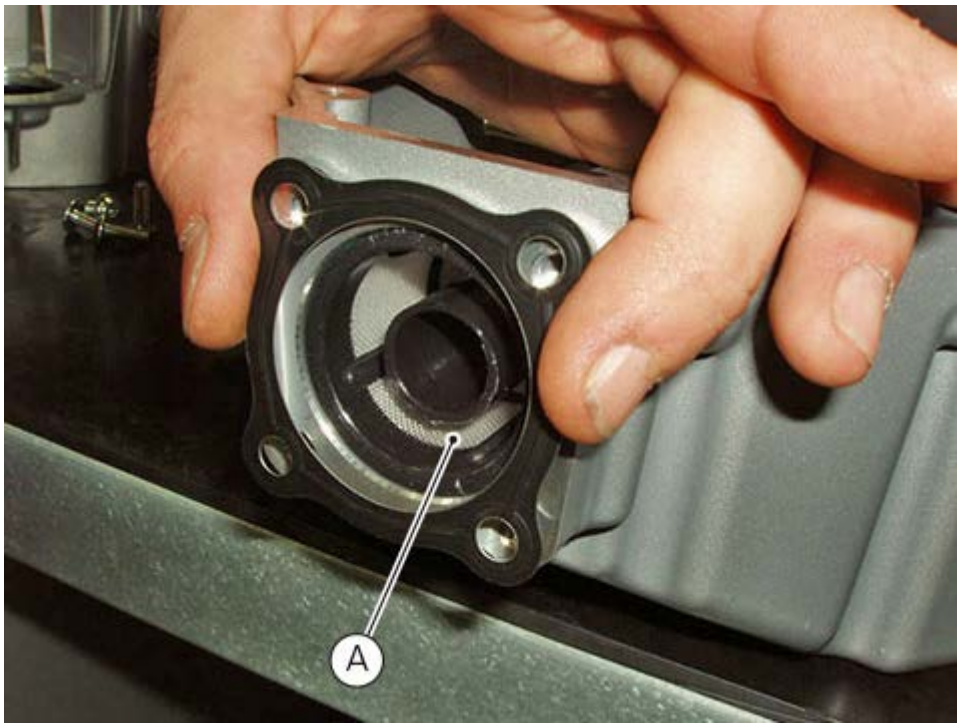
Note
After tightening, remove any excessive sealant.



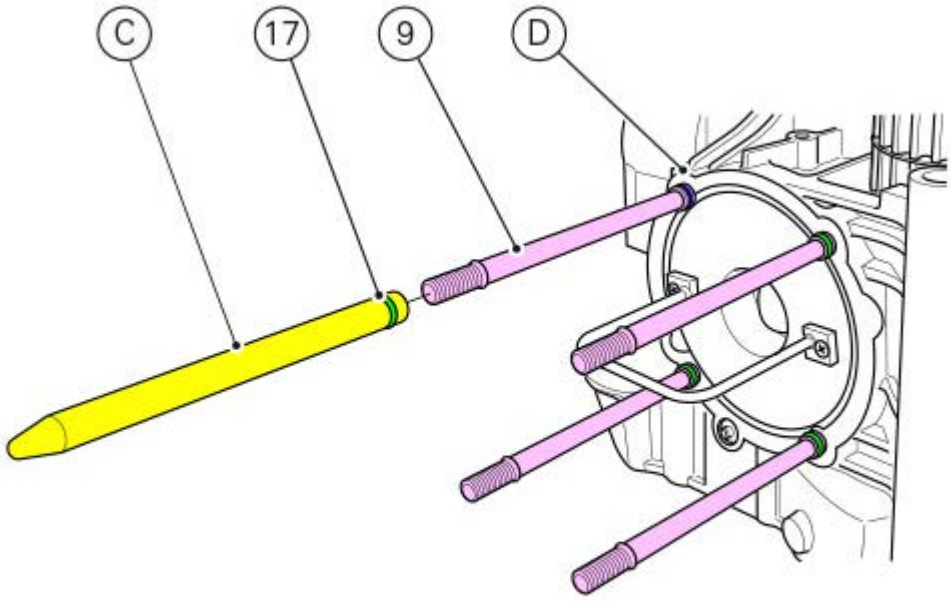
Refit the gearbox neutral position sensor (4) with tool part no. **88713.3407**.



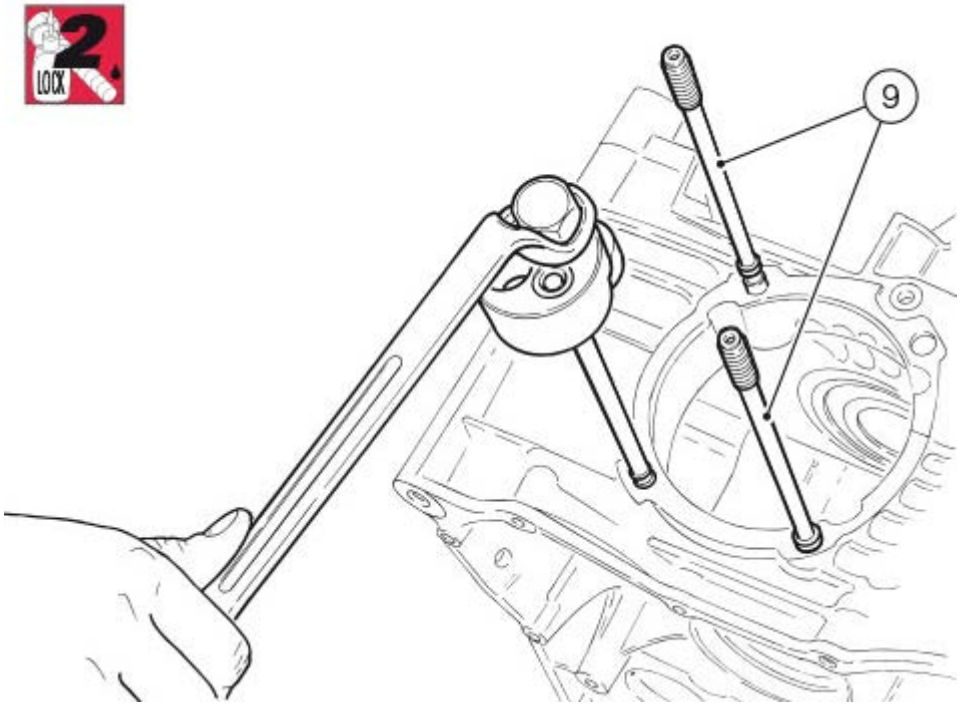
Refit the mesh filter (A) (Changing the engine oil and filter cartridge).



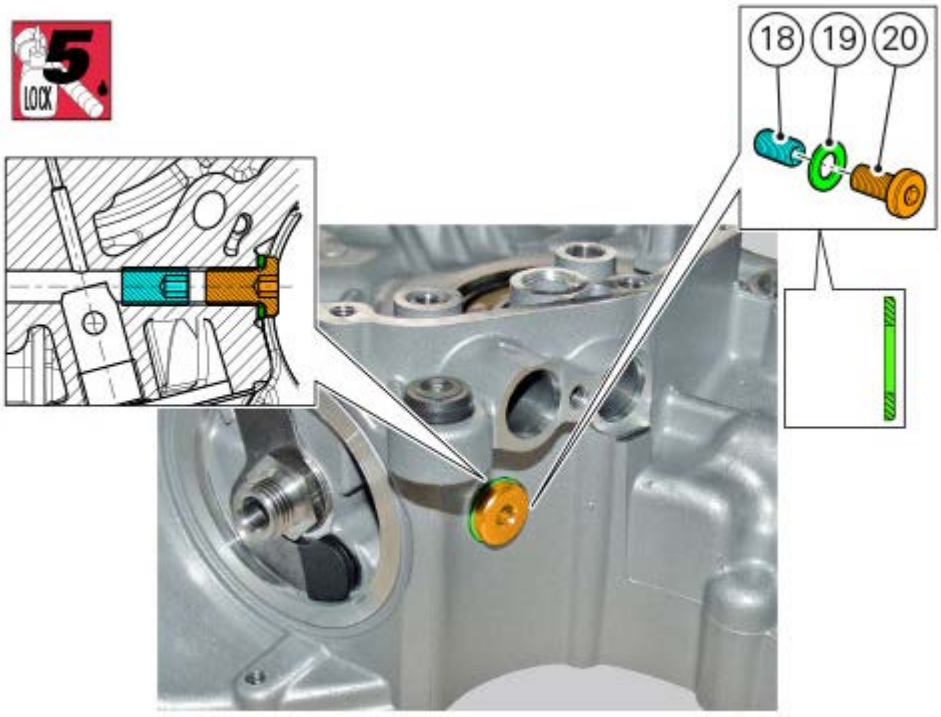
Check the condition of the O-rings (17) of the stud bolts (9) and replace them if necessary.
Use tool (C) part no. **88713.1920**, to fit the O-rings (17) in the suitable seats (D) of stud bolts (9).



Now fit the stud bolts (9) on the crankcase halves, applying sealant on the thread and tightening to a torque of 30 Nm (Min. 28 Nm - Max. 32 Nm).
Use the appropriate commercial tool for this operation.



If previously removed, apply recommended threadlocker on dowel (18), tighten to a torque of 15 Nm (Min. 13.5 Nm - Max. 16.5 Nm), fit the seal (19) on the service plug (20): the seal must be positioned so that the square edge faces the clutch-side crankcase half.
Apply the specified threadlocker on the plug thread (20), insert it in the crankcase half and tighten to a torque of 15 Nm (Min. 13 Nm - Max. 17 Nm).

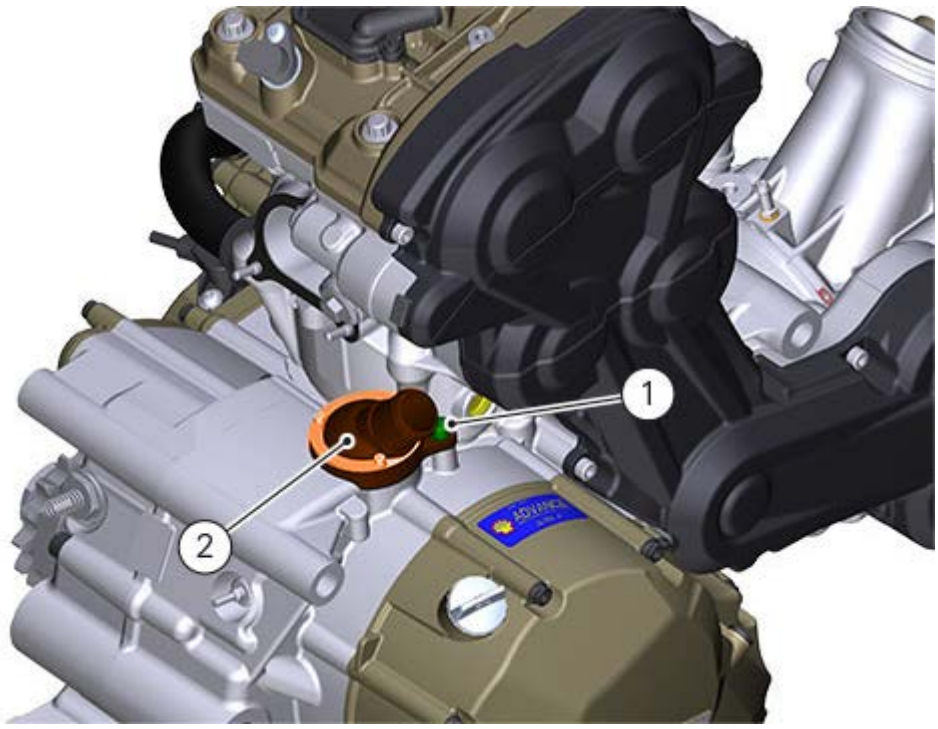


Refit the mesh filter (Changing the engine oil and filter cartridge).
Refit the oil pump (Refitting the oil pump).
Refit the clutch unit (Refitting the clutch).
Refit the clutch cover (Refitting the clutch cover).
Refit the starter motor (Refitting the starter motor).
Refit the generator assembly and the generator side cover (Refitting the flywheel/generator assembly).
Refit the complete cylinder/piston assembly (Refitting the cylinder/piston assembly).
Refit the complete cylinder head assembly (Reassembling the cylinder head).
Refit the camshaft assembly (Refitting the camshafts).
Refit the timing system components (Refitting the cylinder head pulleys/fixed tensioners).
Refit the engine in the frame (Refitting the engine).

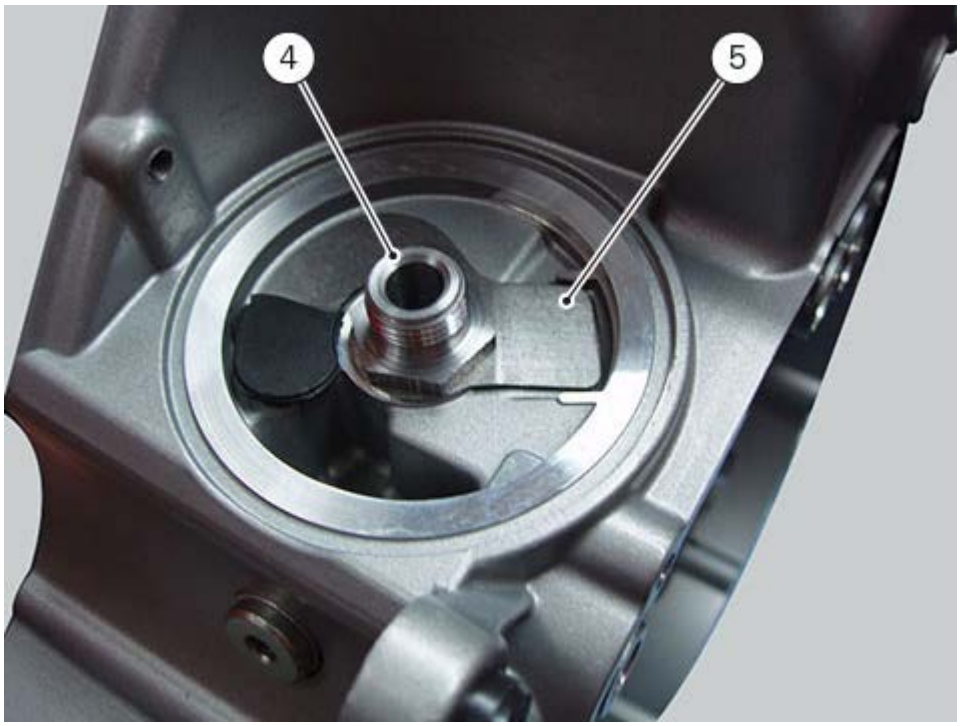
Removing outer components

Remove the engine from the frame (Removing the engine).
Remove the timing components (Removing the timing outer covers).
Remove the camshaft assembly (Removing the camshafts).
Remove the generator side cover and the generator assembly (Removing the generator cover).
Remove the starter motor (Removing the starter motor).
Remove the clutch cover (Removing the clutch cover).
Remove the clutch unit (Removing the clutch).
Remove the oil pump (Removing the oil pump).
Remove the mesh filter (Changing the engine oil and filter cartridge).

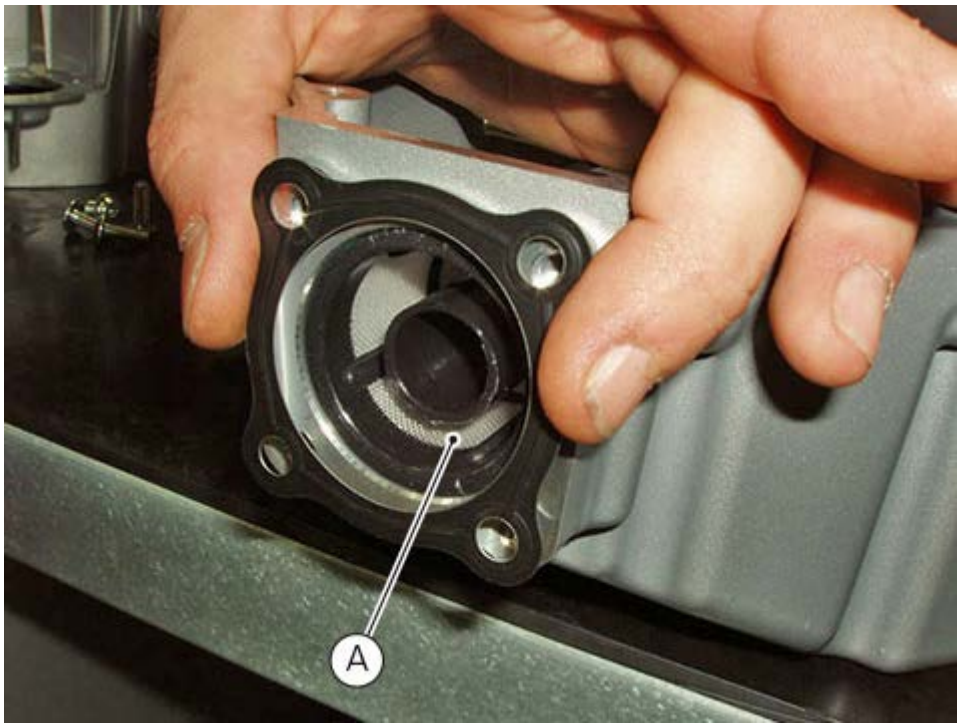
Undo the screw (1) and remove the oil breather valve (2) with the O-rings (3) from the engine.
Check the condition of O-rings (3) and replace them if necessary.



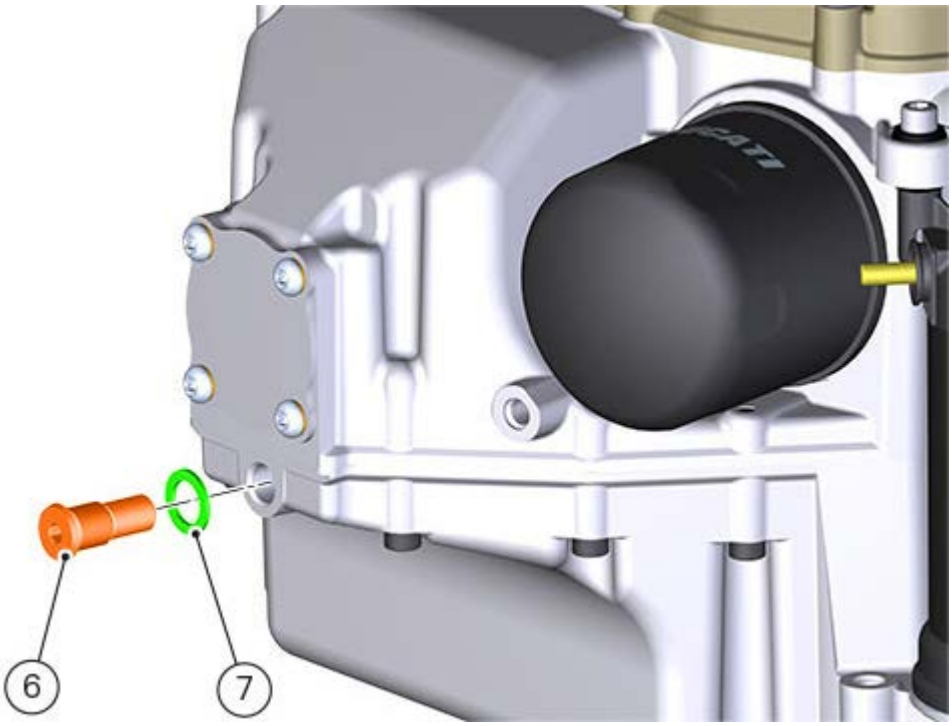
Unscrew and remove the oil filter support nipple (4) and remove also by-pass spring (5).



Remove the mesh filter (A) from the clutch-side crankcase half.

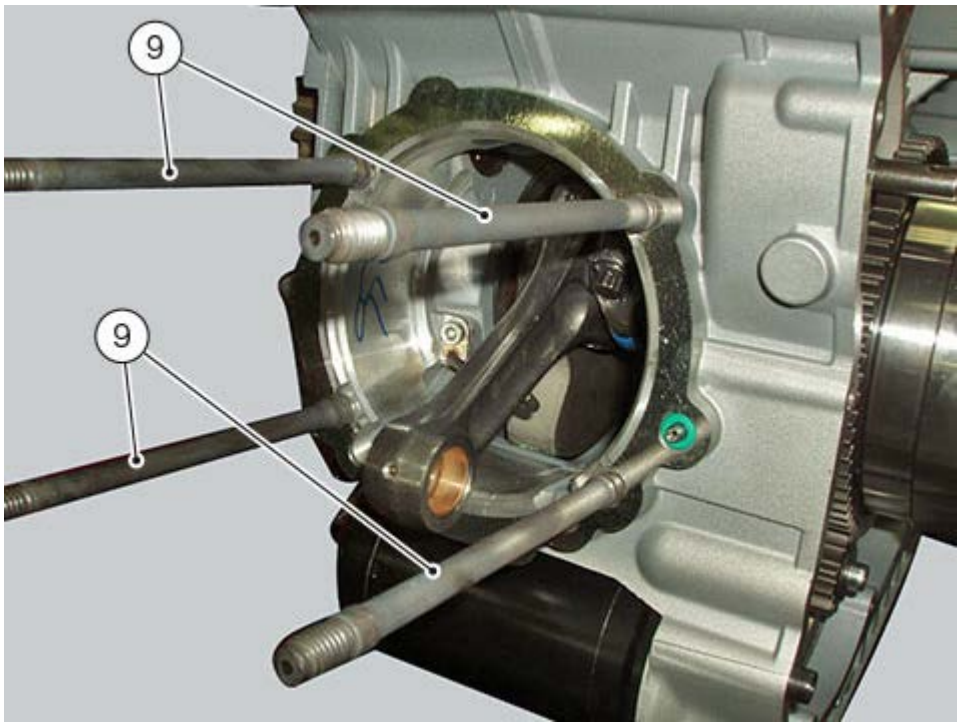


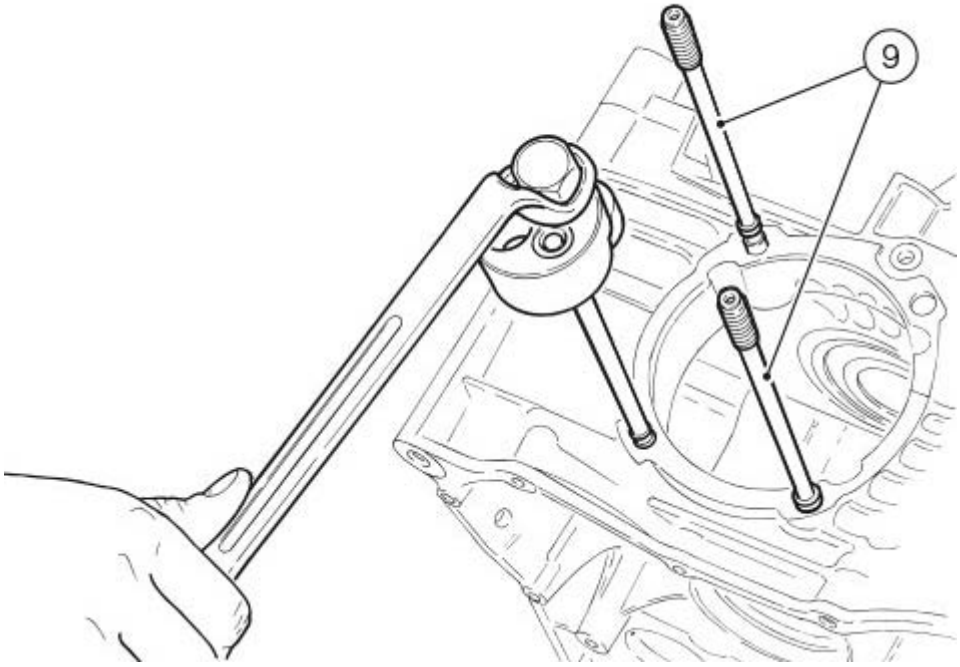
Remove the drain plug (6) with its seal (7).



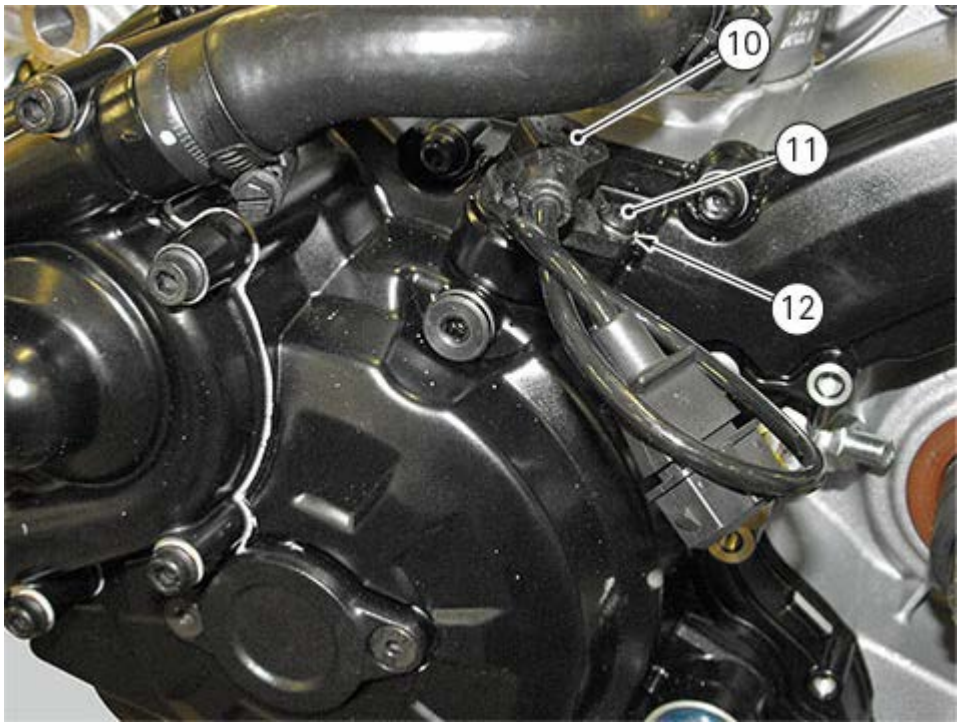
Remove the gearbox position sensor (8) with tool part no. **88713.3407**.

Remove the cylinder head stud bolts (9) with the aid of the appropriate tool.



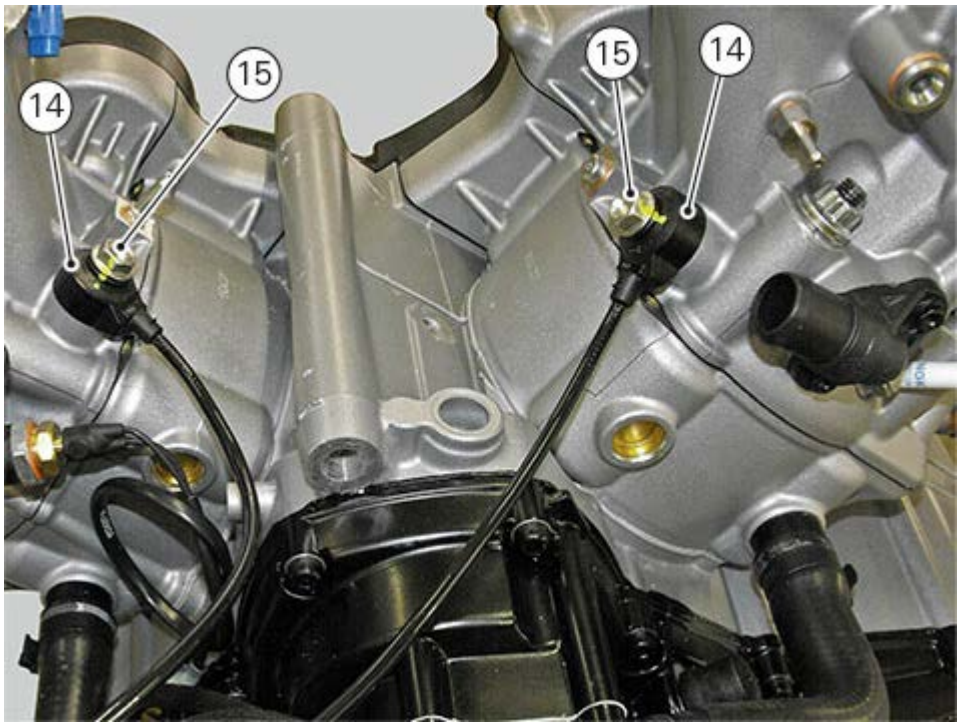


To remove the engine sensor (10), undo the screw (11) and collect the washer (12).



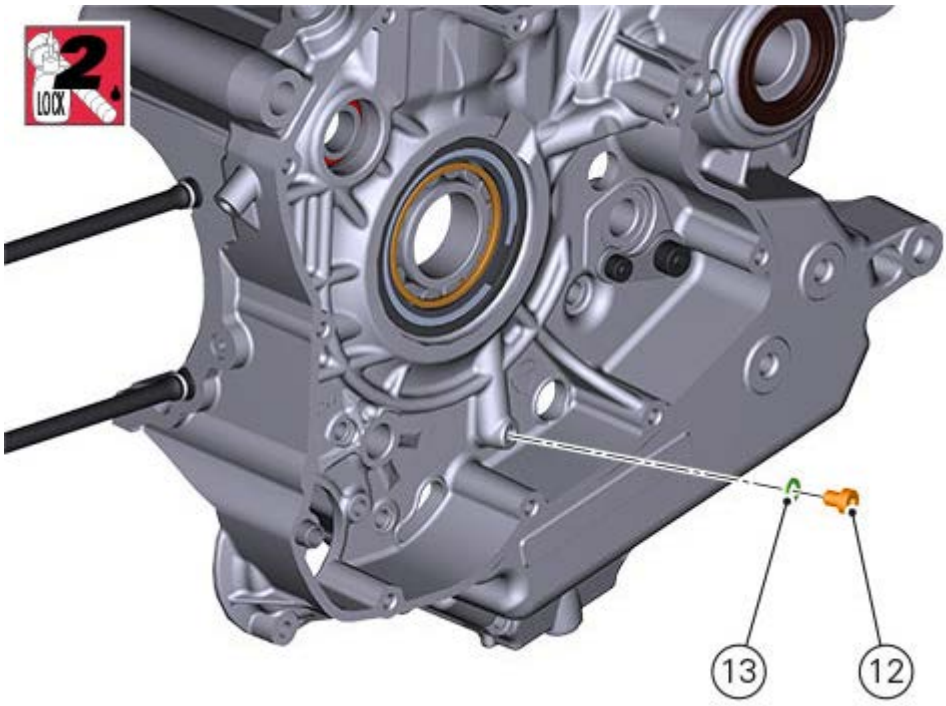
Check the condition of O-rings (13) and replace them if necessary.

Remove the knock sensors (14) by loosening screws (15).

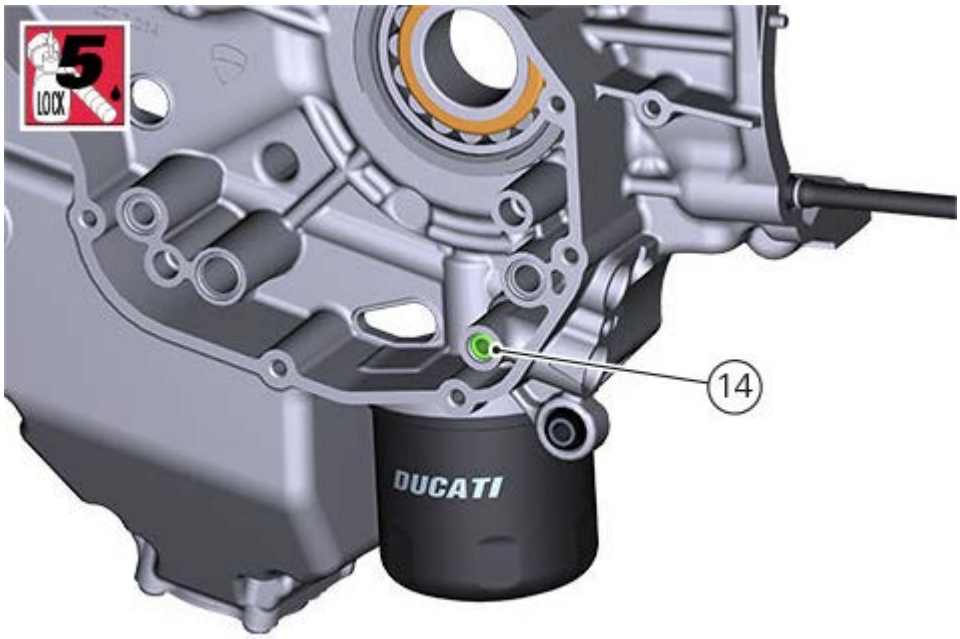

14
15
15
14

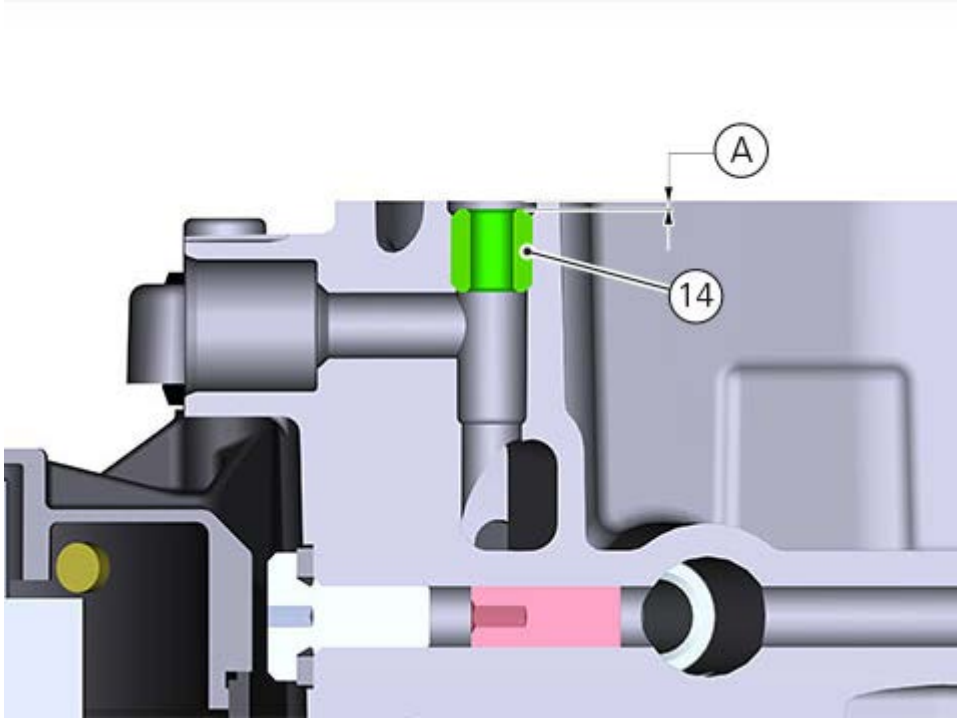
Closing the crankcase

If previously removed, apply specified threadlocker on the screw thread (12).
Start the screw (12) with gasket (13) and tighten it to a torque of 5 Nm (Min. 4 - Max. 6).

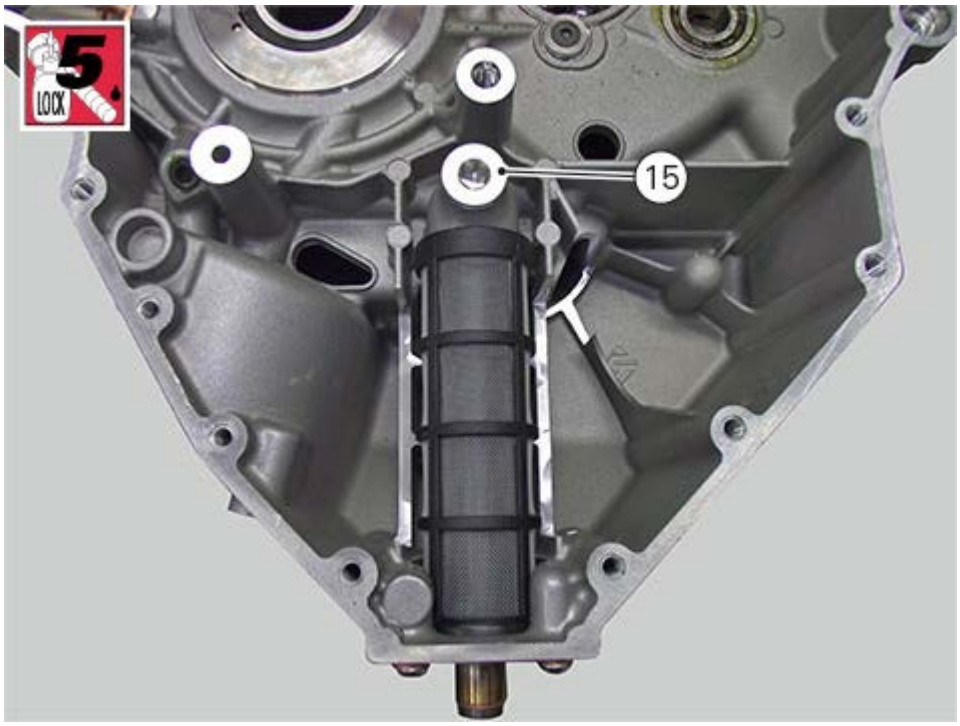


If previously removed, apply threadlocker on dowel (14), tighten to a torque of 20 Nm (Min. 18 Nm - Max. 22 Nm).
During this operation, respect the indicated value (A): 1 ± 0.2 mm.

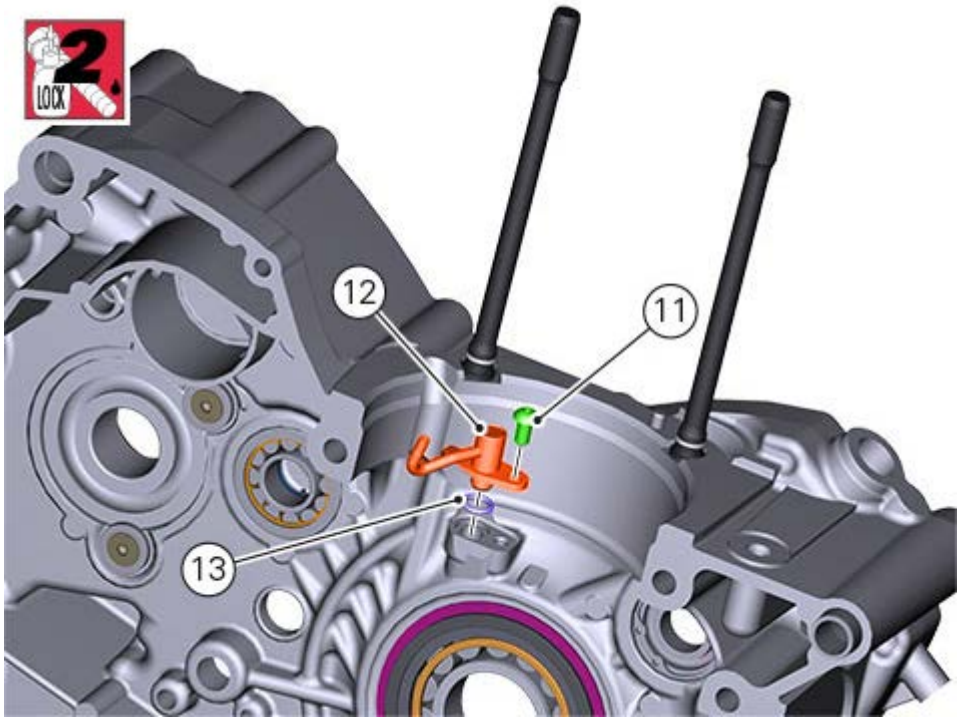




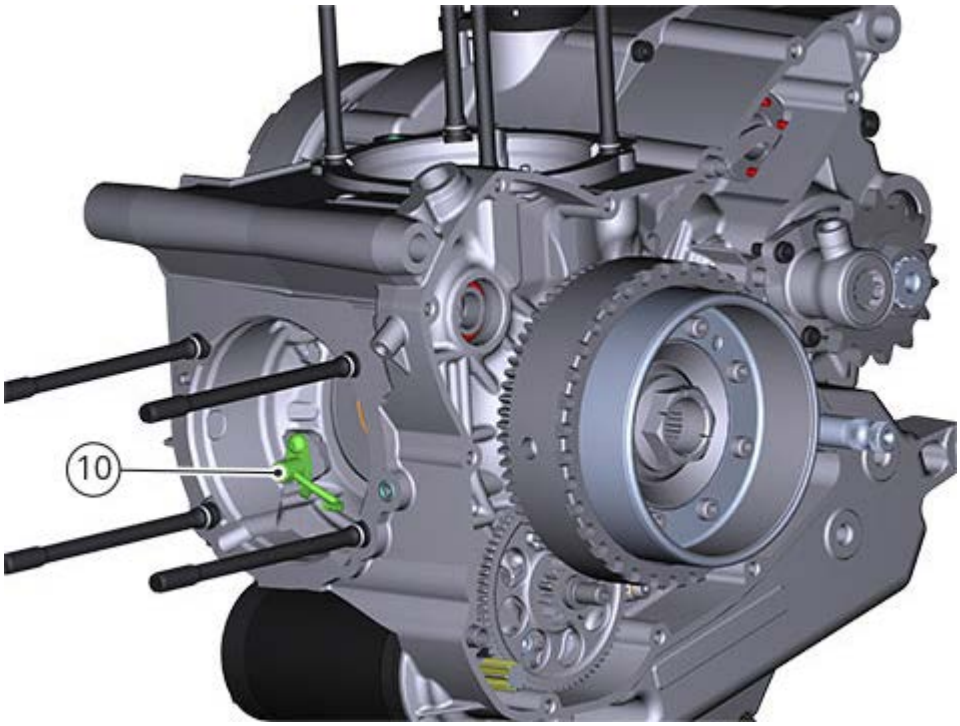
If previously removed, apply recommended threadlocker to the plug (15) and tighten to a torque of 24 Nm (Min. 21 Nm - Max. 27 Nm).

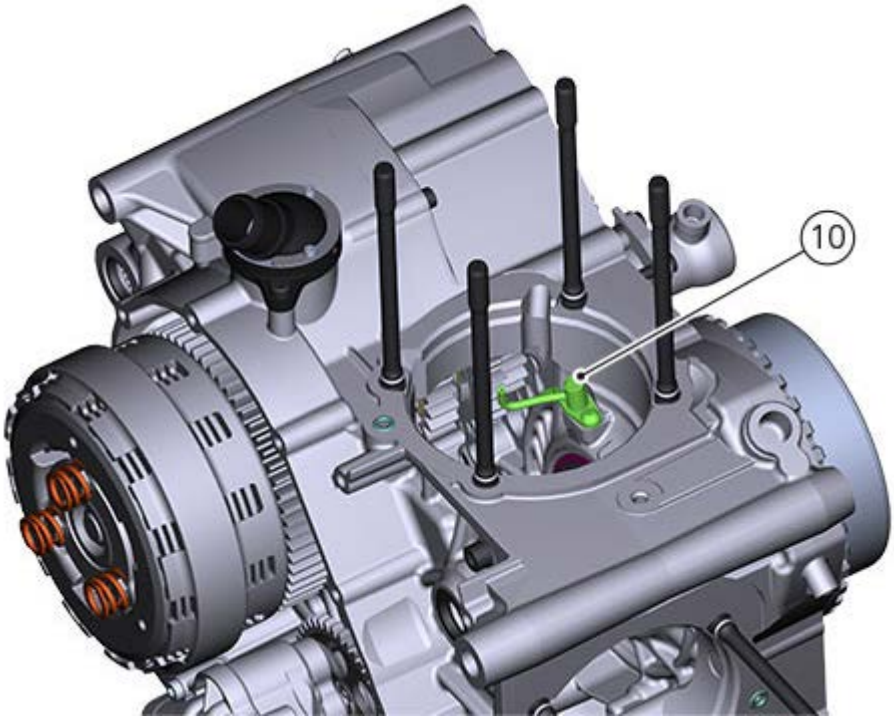


If previously removed, fit the lubrication valves (12).
Install the O-ring (13) in its seat in the crankcase half.
Apply the indicated threadlocker on screw (11).
Tighten screw (11) to a torque of 8 Nm (Min. 7 Nm - Max. 9 Nm).
Repeat the operations described above with the other valve.

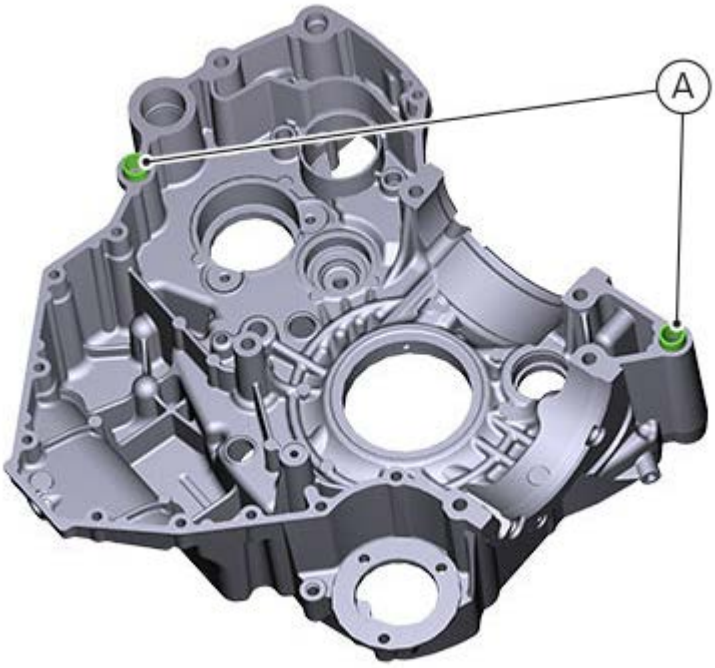


Note
The following images show the already assembled crankcase.

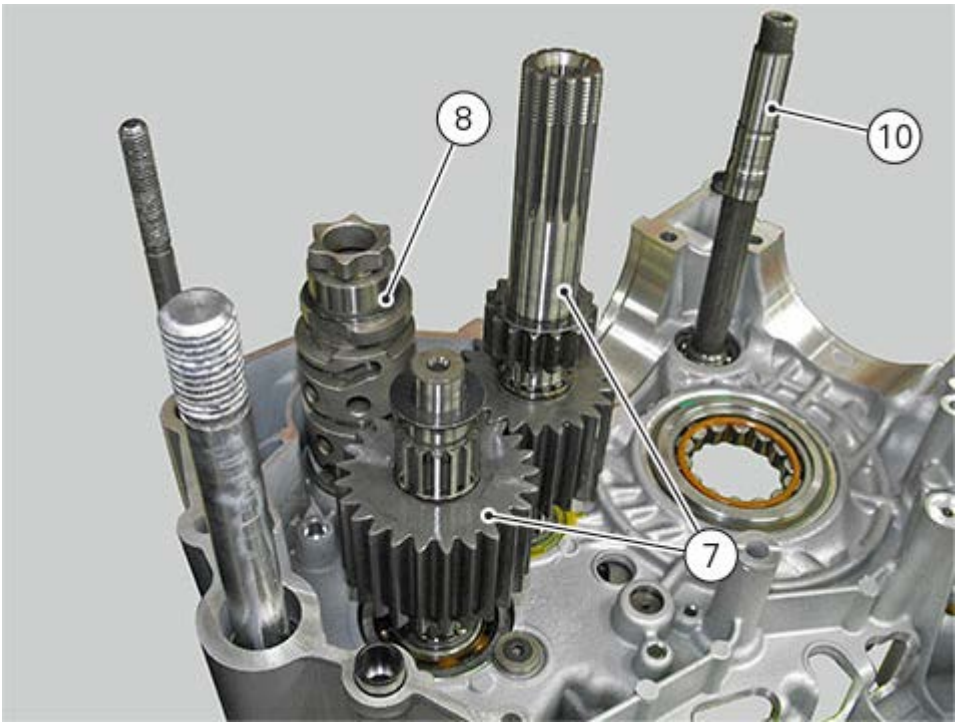




Make sure that the two centring bushes (A) are correctly fitted on the crankcase.

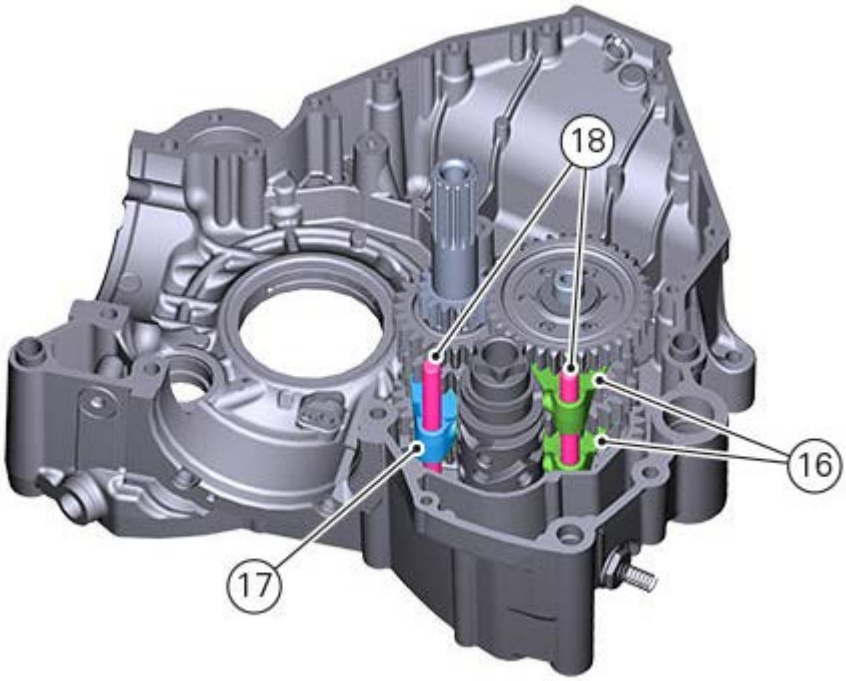


Fit the gearbox shafts (7), the gearbox drum (8) and the timing layshaft (10) following the procedure described below.

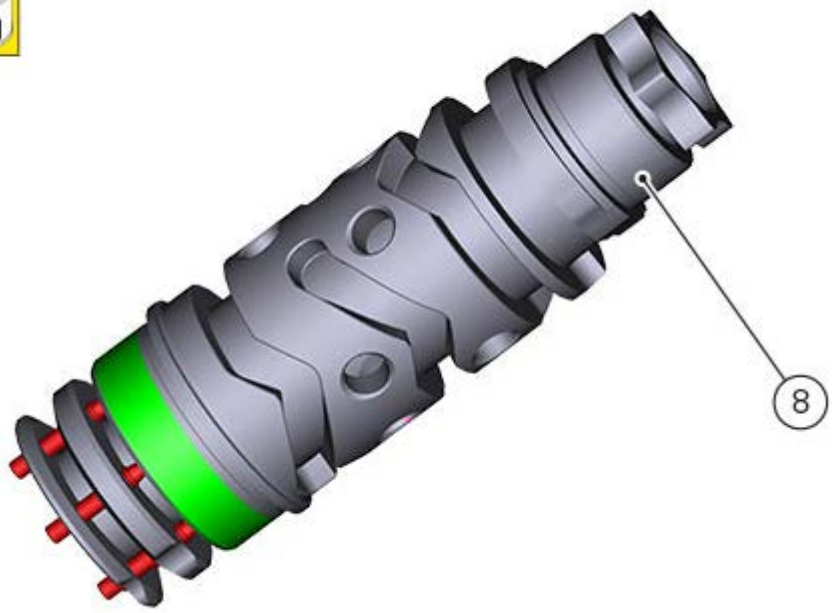


Shim the gearbox shafts (7) as described in "Shimming the shafts" and fit them.
Drive the two shafts into seat using a mallet.
Check the shaft movement.

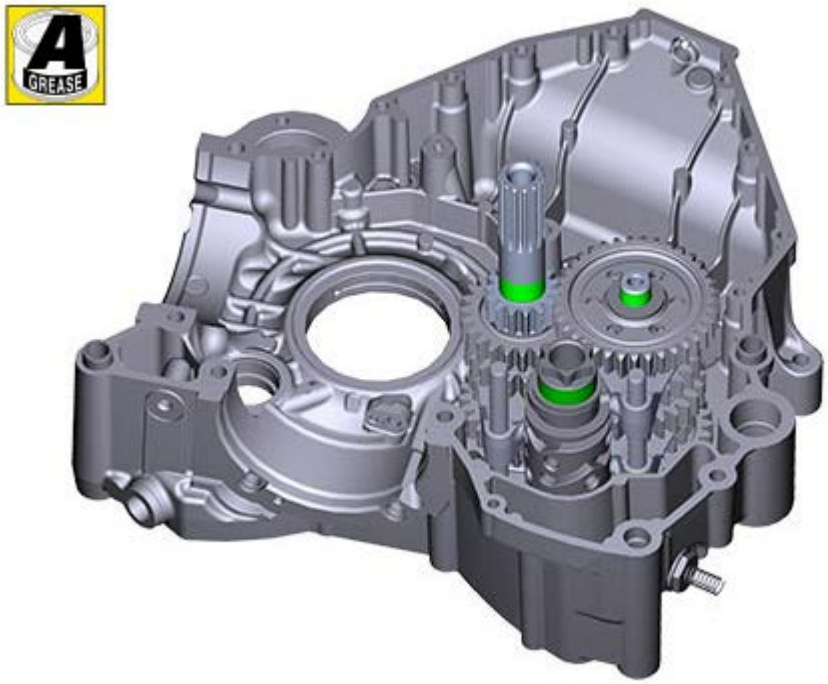
Fit the gearbox forks (16) in the secondary shaft seat.
Fit the gearbox fork (17) in the primary shaft seat.
Insert the two pins (18) in the gearbox forks.



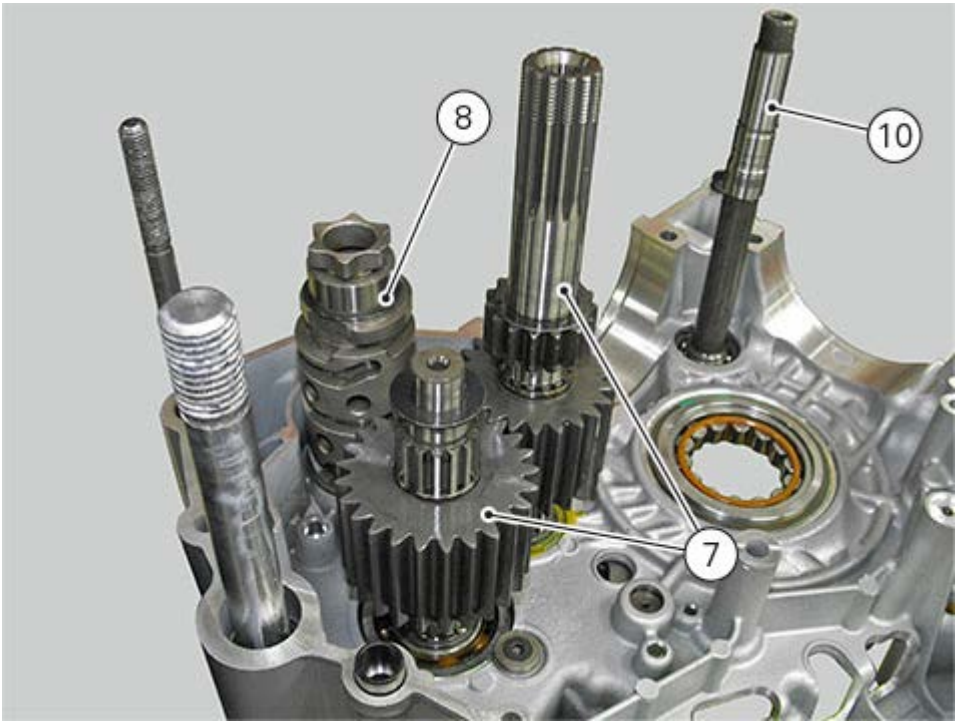
Apply the indicated product on the gearbox drum (8) in the area shown in the figure.
Shim the gearbox drum as described in "Shimming the shafts" and insert it in the crankcase half.
Insert pins of the gearbox forks in the gearbox drum seats.



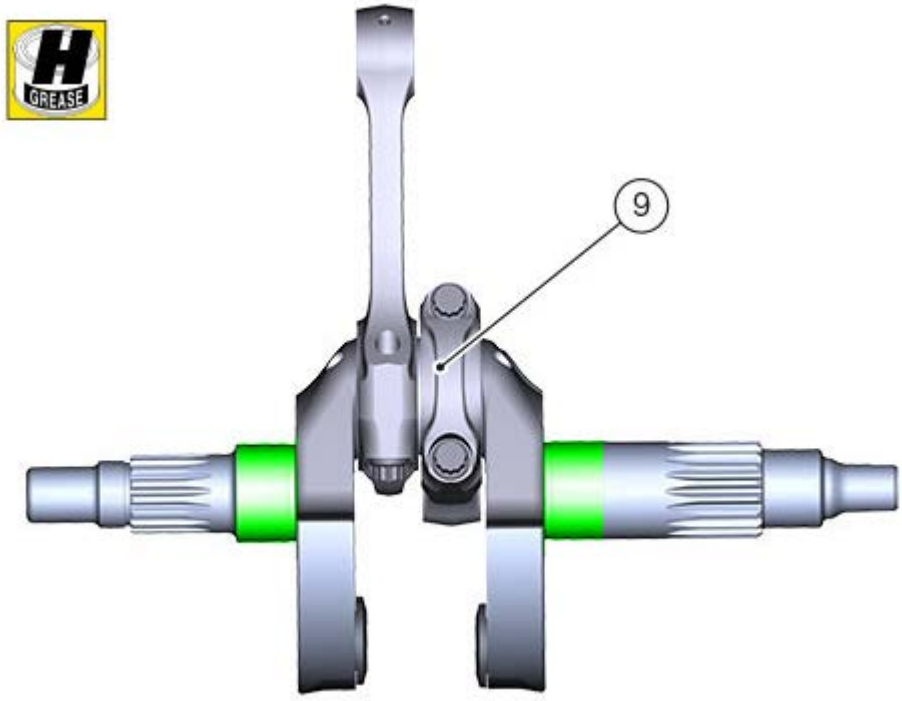
Apply specified grease in the areas indicated in the figure.

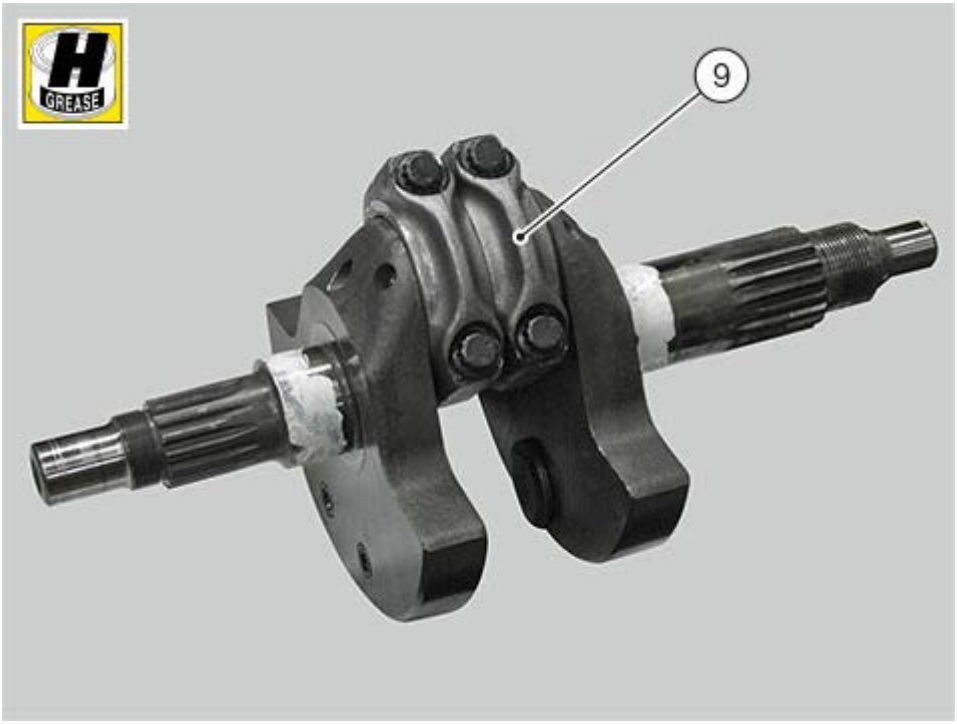


Insert the timing shaft (10).

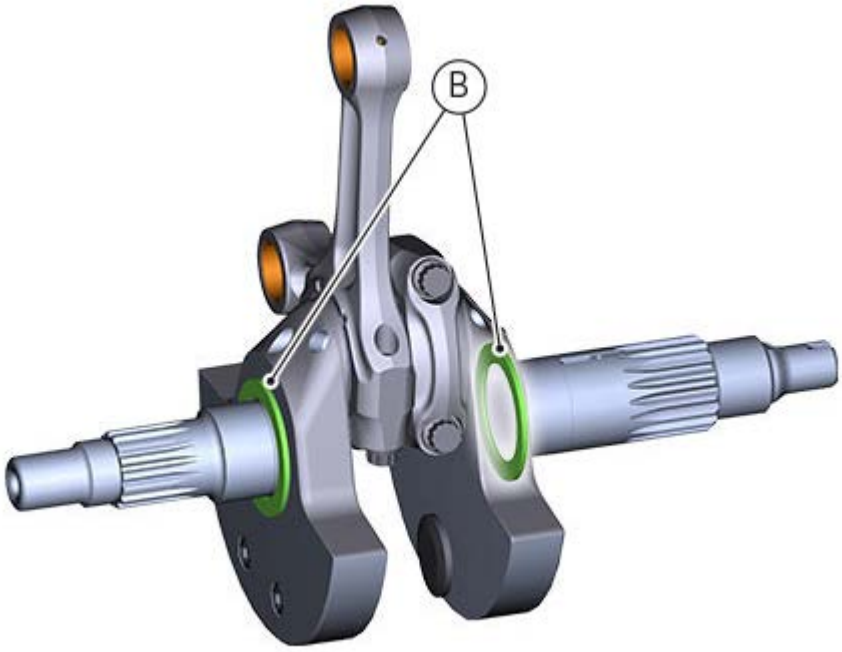


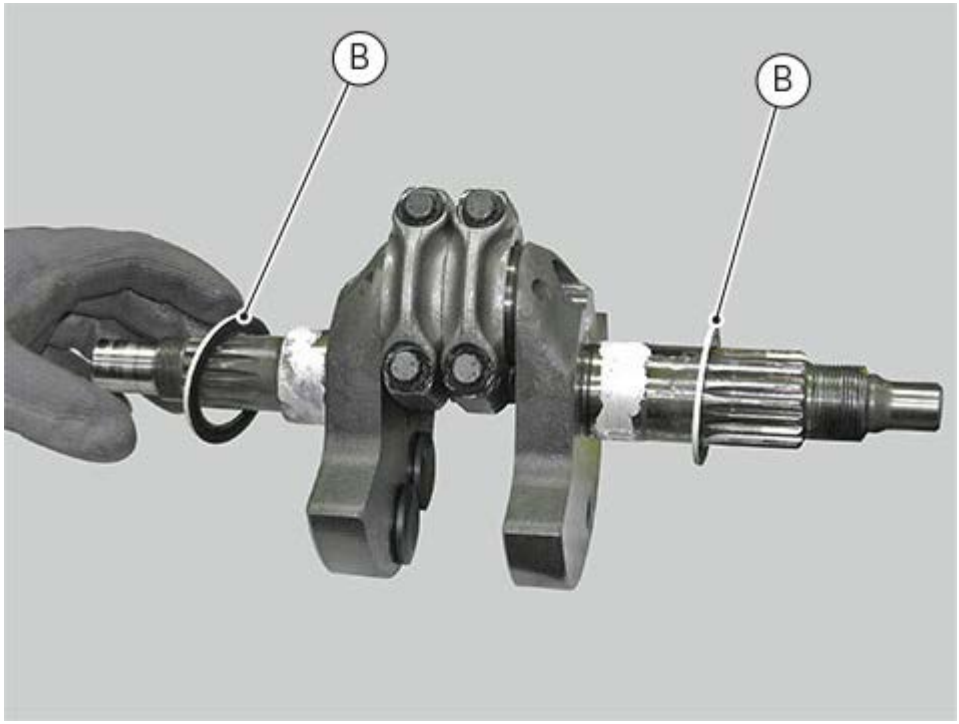
Lubricate the crankshaft (9) with the indicated product in the areas shown in the figure.





Fit the two spacers (B) with the chamfered side facing the crankshaft.





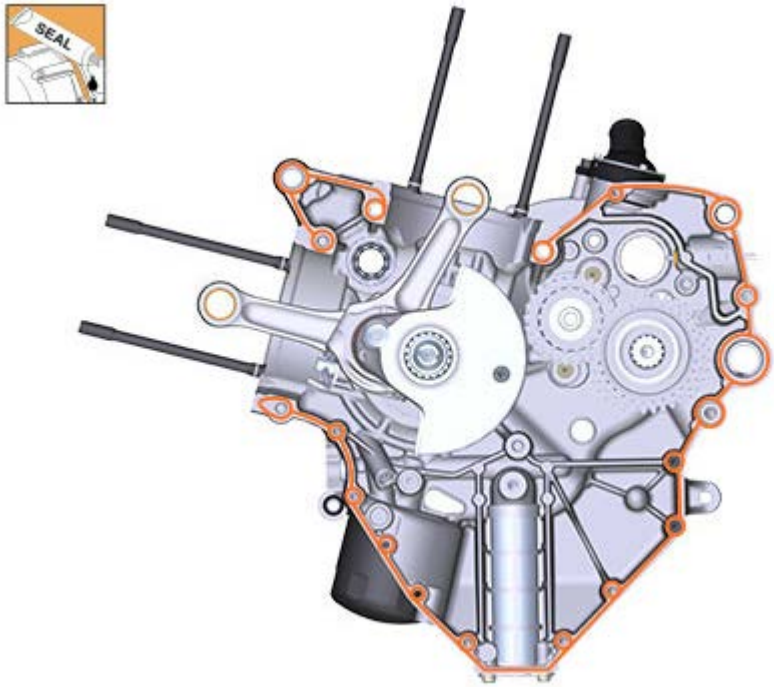
Fit the crankshaft with spacers in the crankcase half bearing.
Position the connecting rods matching the corresponding seats of the cylinders.

Important

Make sure that the connecting rods are correctly positioned in the relevant cylinder seats. Incorrect positioning of the connecting rods at this stage will inevitably lead to the need to re-open the crankcase halves.

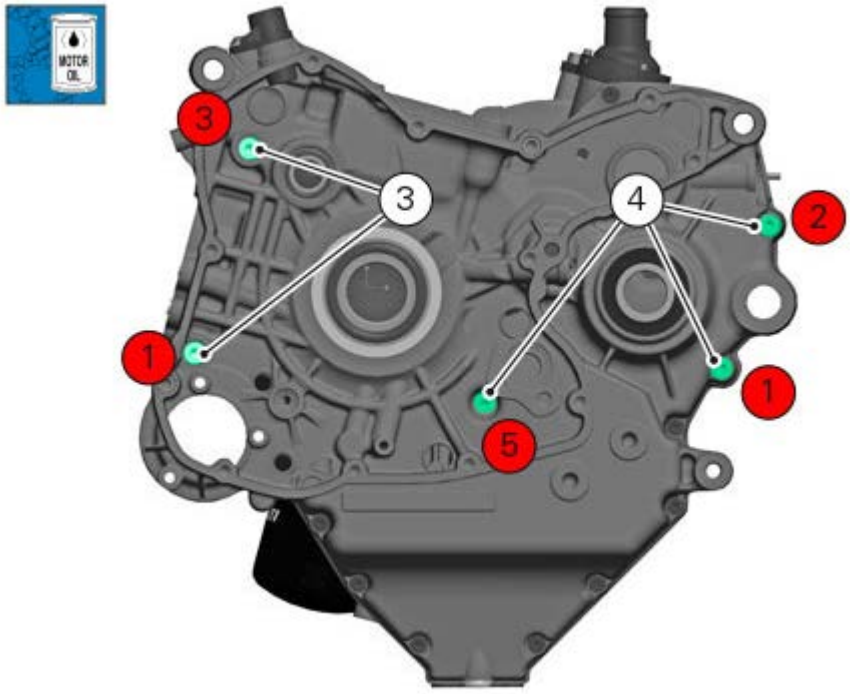
Fit the O-ring (19) after having lubricated it with the indicated product.

Apply a uniform and continuous bead of DUCATI sealing compound to the mating surfaces of the crankcase halves, going around all the holes as shown in the figure.

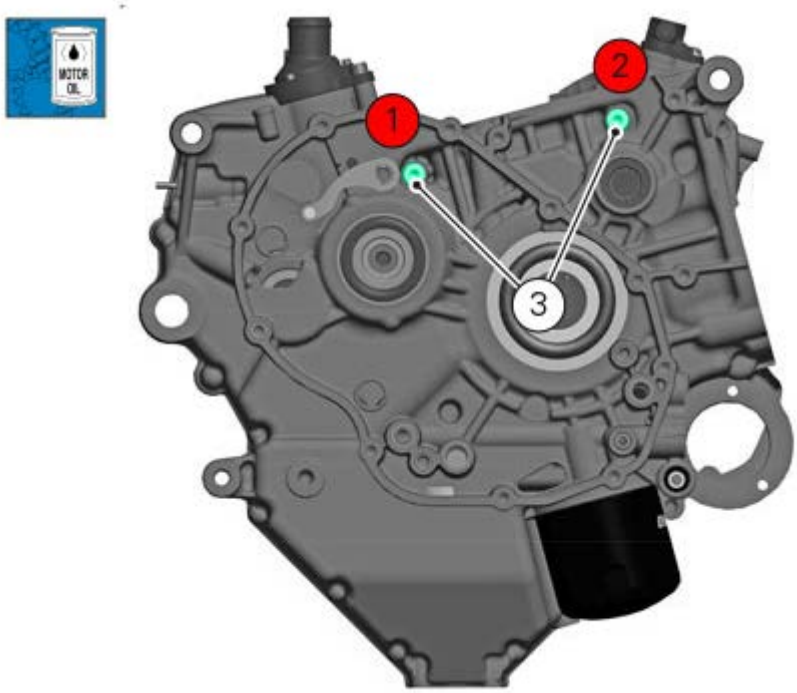


Install the timing layshaft (2) in the needle roller bearing on the clutch-side crankcase half.
To avoid damaging the sealing ring on the timing layshaft, protect the threaded end of the shaft with the special protective cap (D) part no. 88713.3520.
Fit the snap ring (1) in the groove on the shaft and remove the protective cap.

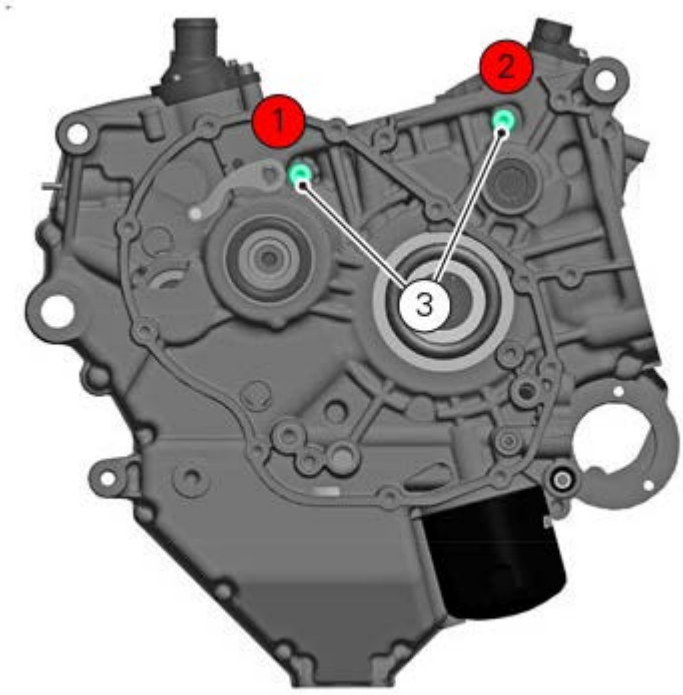
Bring the two crankcase halves together, tapping if necessary with a rubber mallet on the shafts, if necessary.
Fix the two crankcases by means of screws (3), (4), (5) and (6) following the described procedure:
All screws must be lubricated with the specified product.
Position and start the screws (3) and (4) by pre-tightening them to 19 Nm (min. 17 – Max. 21), respecting the indicated sequence.



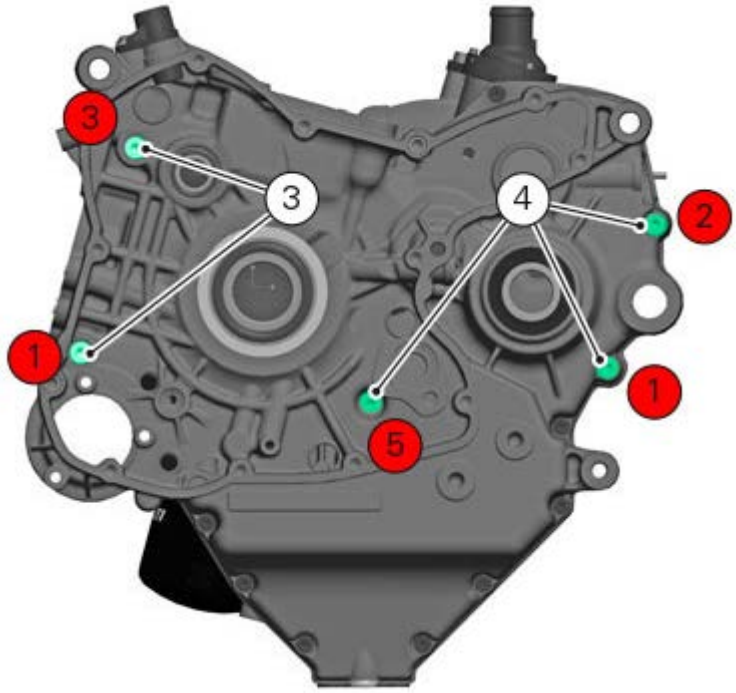
Position and start the screws (3) by pre-tightening them to 19 Nm (min. 17 – Max. 21), respecting the indicated sequence.



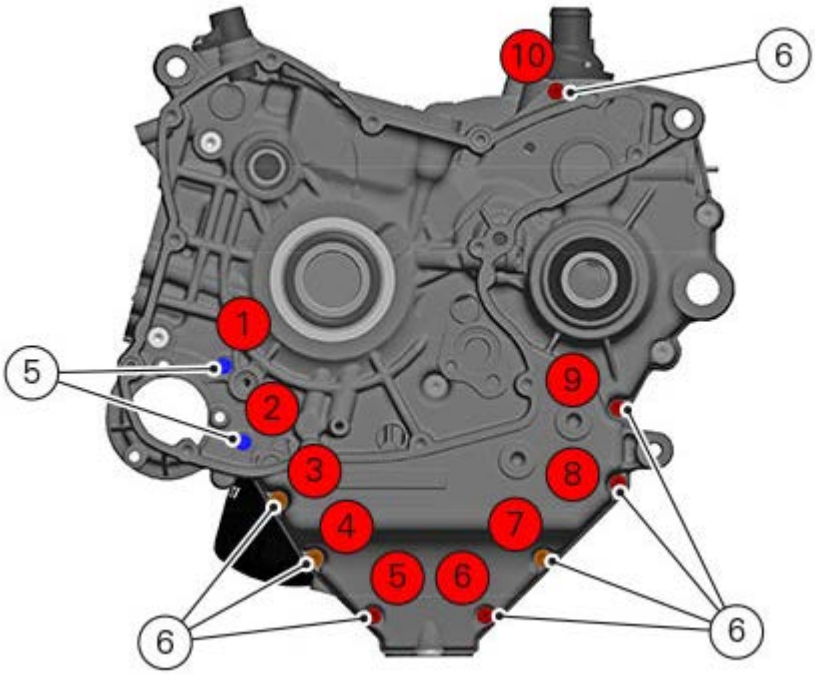
Tighten the screws (3) to a torque of 25 Nm (Min. 22 - Max. 28), respecting the indicated sequence.



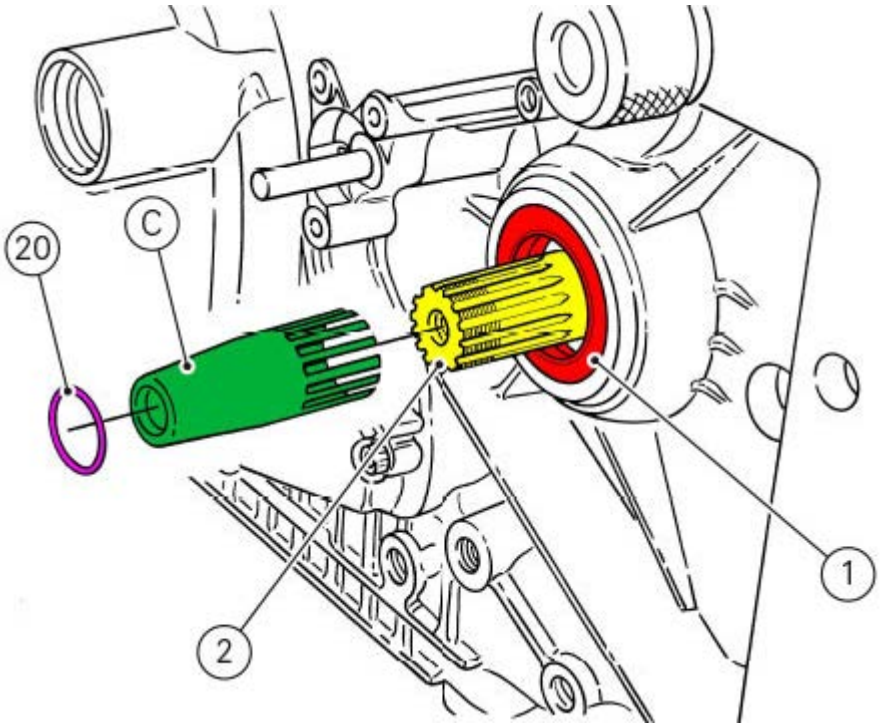
Tighten the screws (3) and (4) to a torque of 25 Nm (Min. 22 - Max. 28), respecting the indicated sequence.

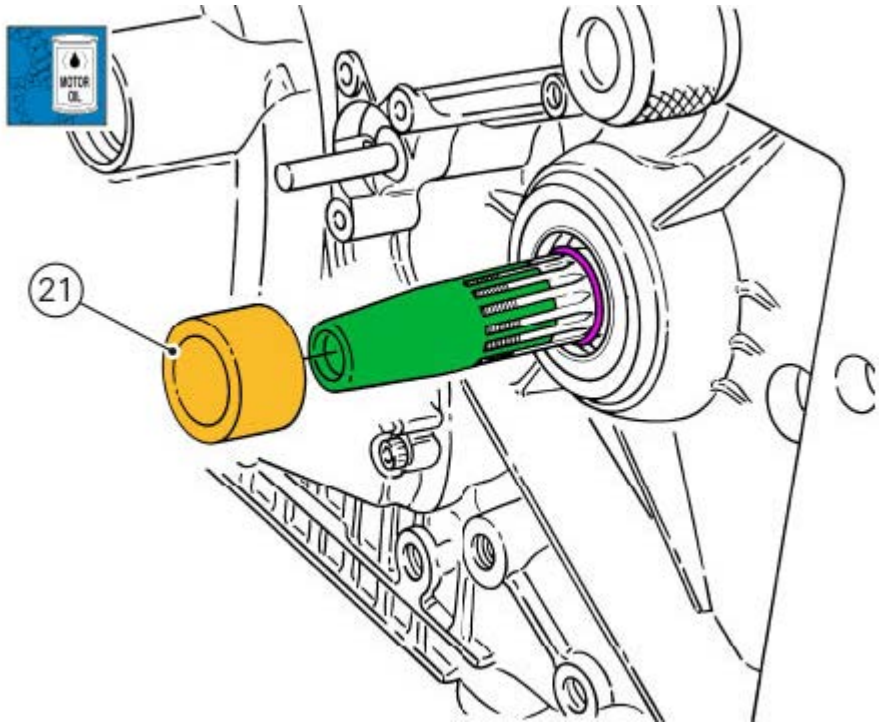


Tighten screws (5) and (6) to a torque of 10 Nm (Min. 9 – Max. 11), respecting the indicated sequence.



Insert the guide of tool (C) part no. 88700.5685 on the gearbox secondary shaft bearing (7).
Fit the O-ring (20) on the guide with spacer (21) duly lubricated with the indicated product and push the O-ring into seat.
Remove tool (C).





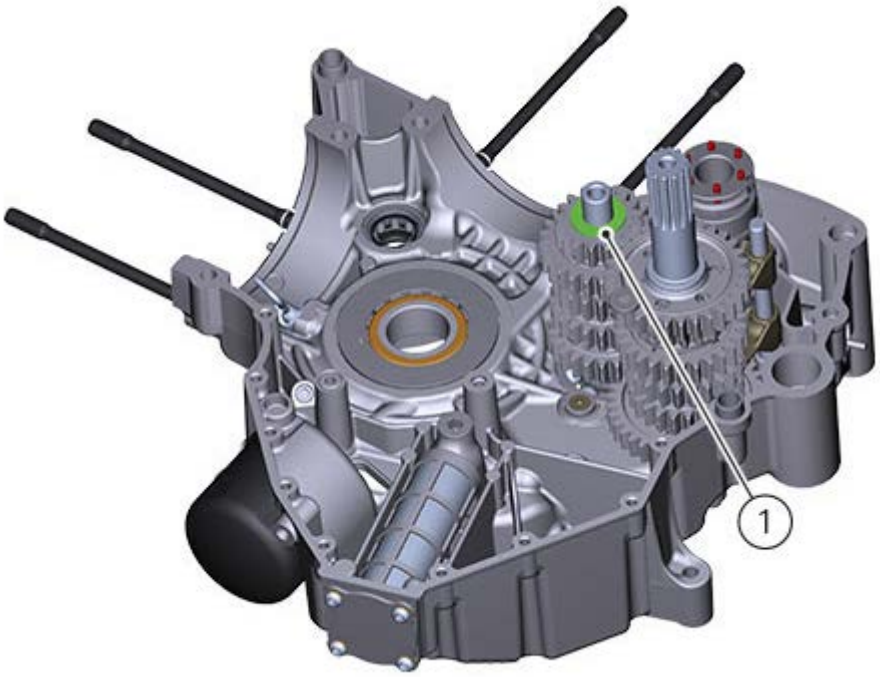
Refit the mesh filter (Changing the engine oil and filter cartridge).
Refit the oil pump (Refitting the oil pump).
Refit the clutch unit (Refitting the clutch).
Refit the clutch cover (Refitting the clutch cover).
Refit the starter motor (Refitting the starter motor).
Refit the generator assembly and the generator side cover (Refitting the flywheel/generator assembly).
Refit the complete cylinder/piston assembly (Refitting the cylinder/piston assembly).
Refit the camshaft assembly (Refitting the camshafts).
Refit the timing system components (Refitting the cylinder head pulleys/fixed tensioners).
Fit the engine on the frame (Refitting the engine).

Shimming the shafts

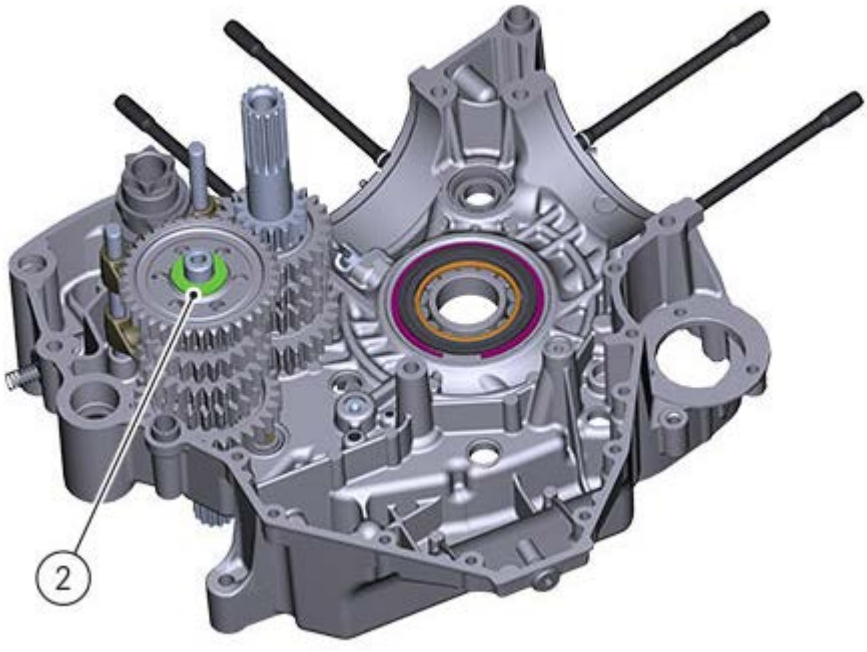
The following shims are supplied as spare parts.

Gearbox shaft shims

Position	Clutch side (mm)	Chain side (mm)
Gearbox primary shaft (1)	—	1.6



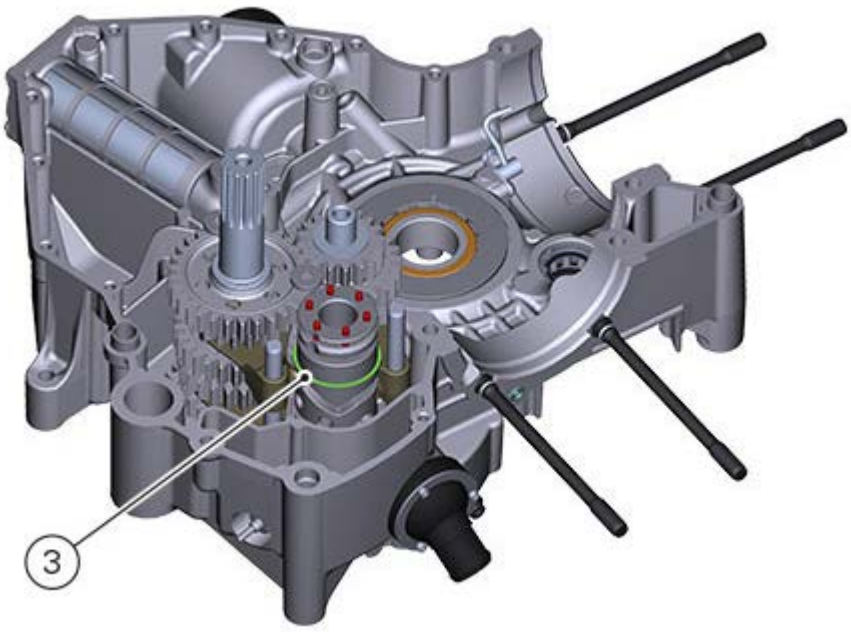
Position	Clutch side (mm)	Chain side (mm)
Gearbox secondary shaft (2)	3.15	—

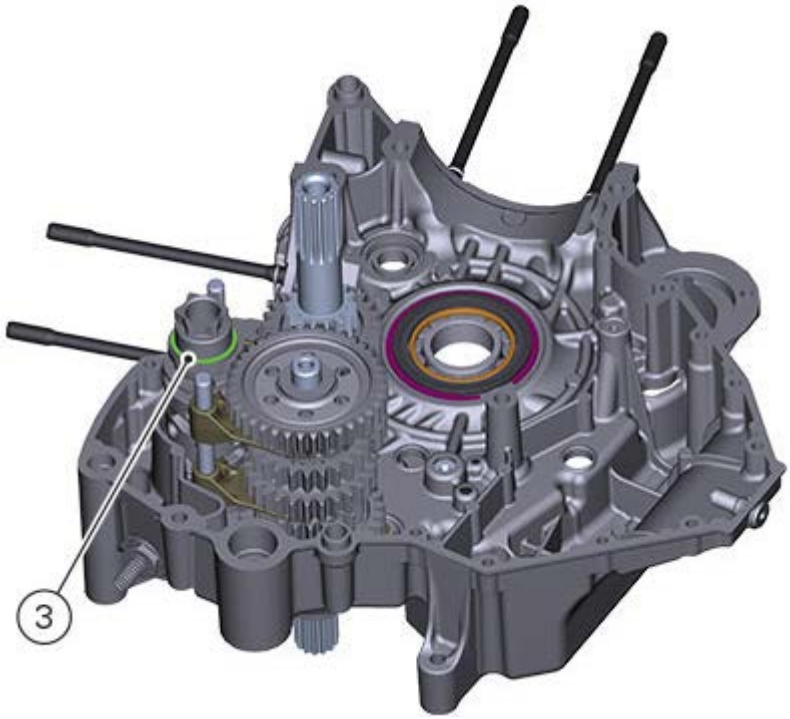


Gearbox selector drum shims

The following shims are supplied as spare parts.

Position	Clutch side (mm)	Chain side (mm)
Gear shift drum (3)	1.0	0.9

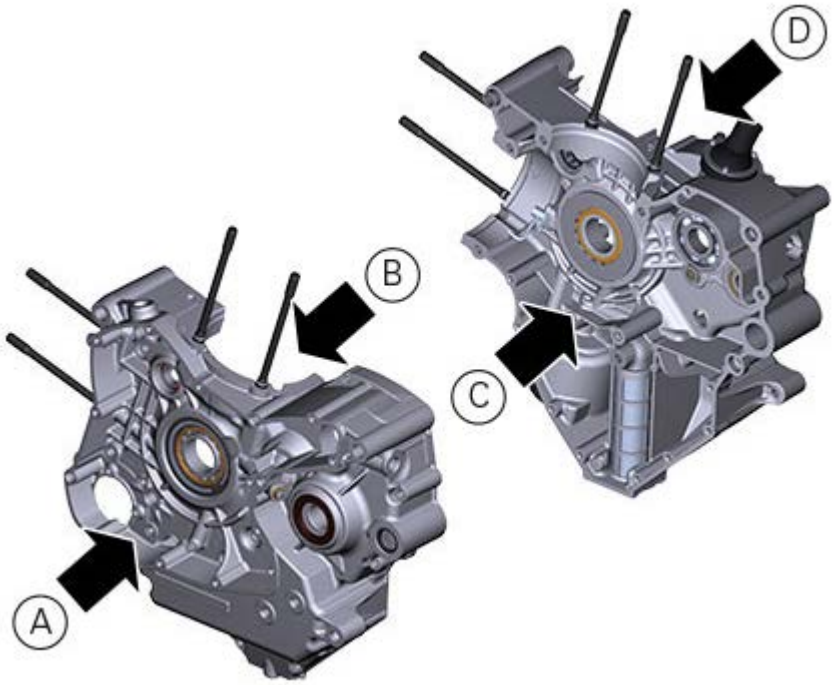




Reassembling the crankcase halves

To better identify the position of each component, the casing has been divided into four areas:

A) generator side, external part;
B) generator side, internal part;
C) clutch side, internal part;
D) clutch side, external part.

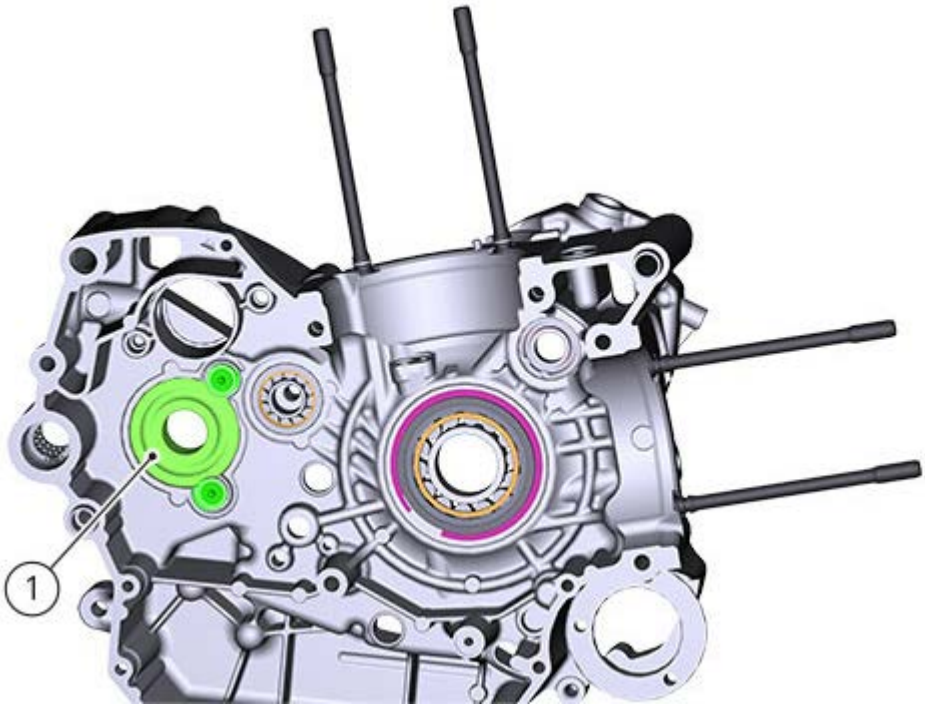


The crankcase halves must be in good condition and perfectly clean.
The mating surfaces must be perfectly flat and free from burrs.
To fit the bearings we recommend heating up the casings to a temperature between 95 °C and 110 °C.

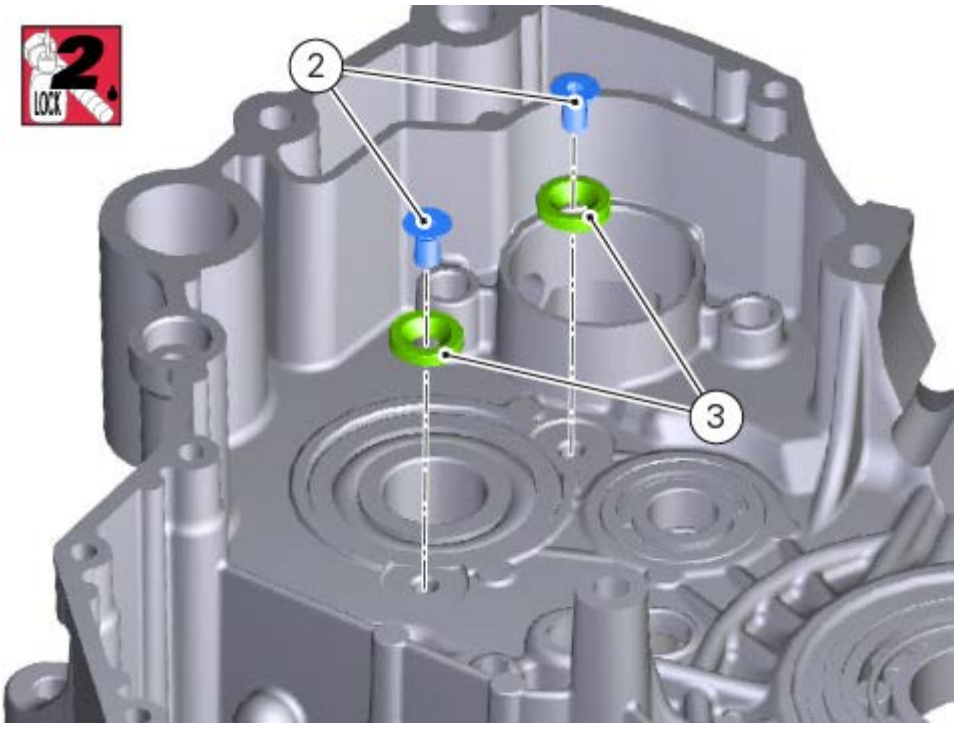
Note
Bearings do not have a specific mounting position (except main bearings), however it is good practice to install the bearings so that the written side is facing inwards.

Generator side, internal part (Side B)

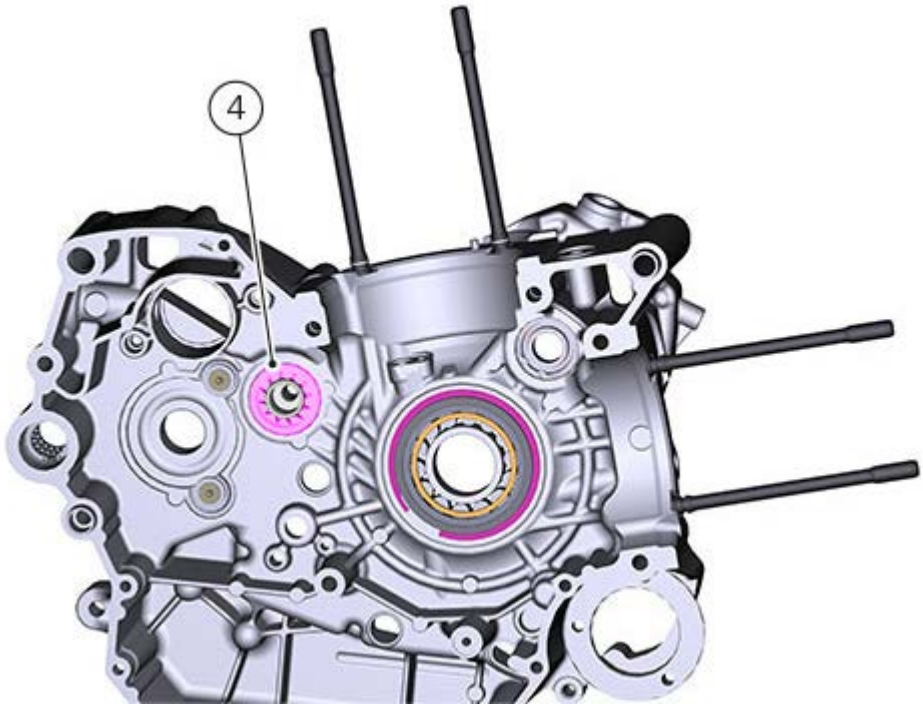
SECONDARY SHAFT BEARING (1)



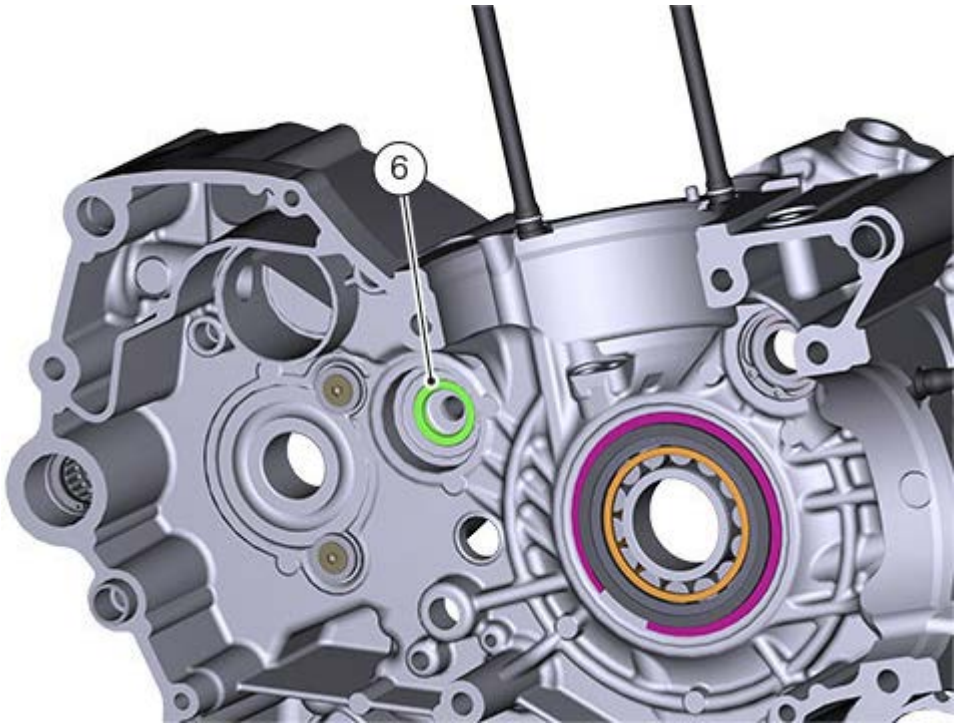
Insert bearing (1) with the marks facing up. Fit the two spacers (3) and the two screws (2) with the indicated threadlocker.
Tighten the screws (2) to a torque of 10 Nm (Min. 9 - Max. 11).

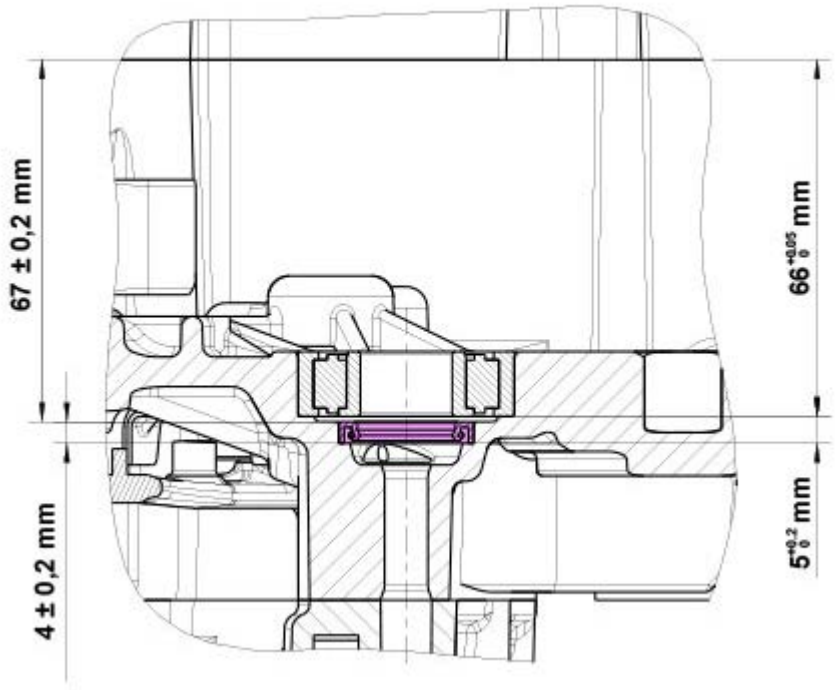


PRIMARY SHAFT BEARING (4)



Fit the oil seal (6) by respecting the values indicated in the figure.

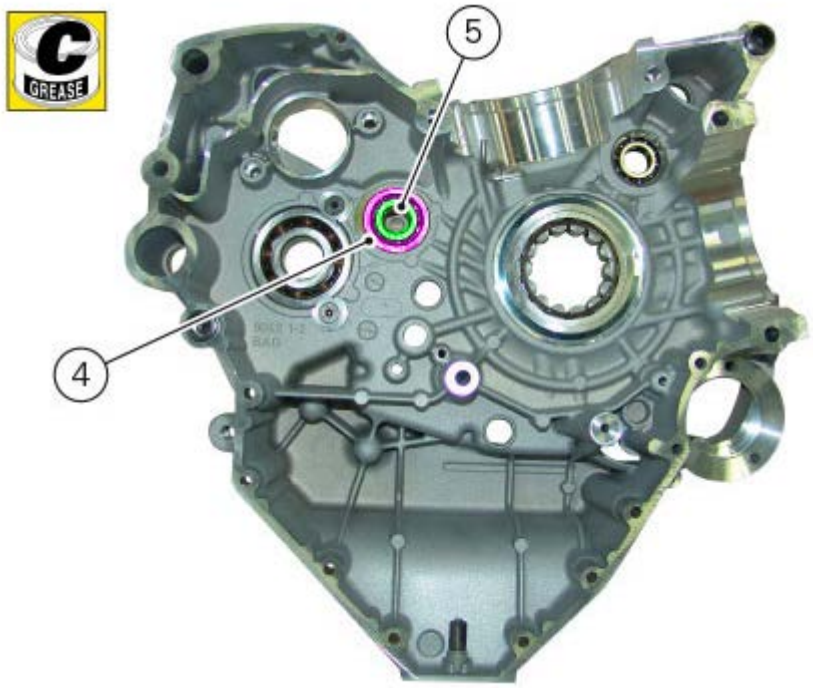


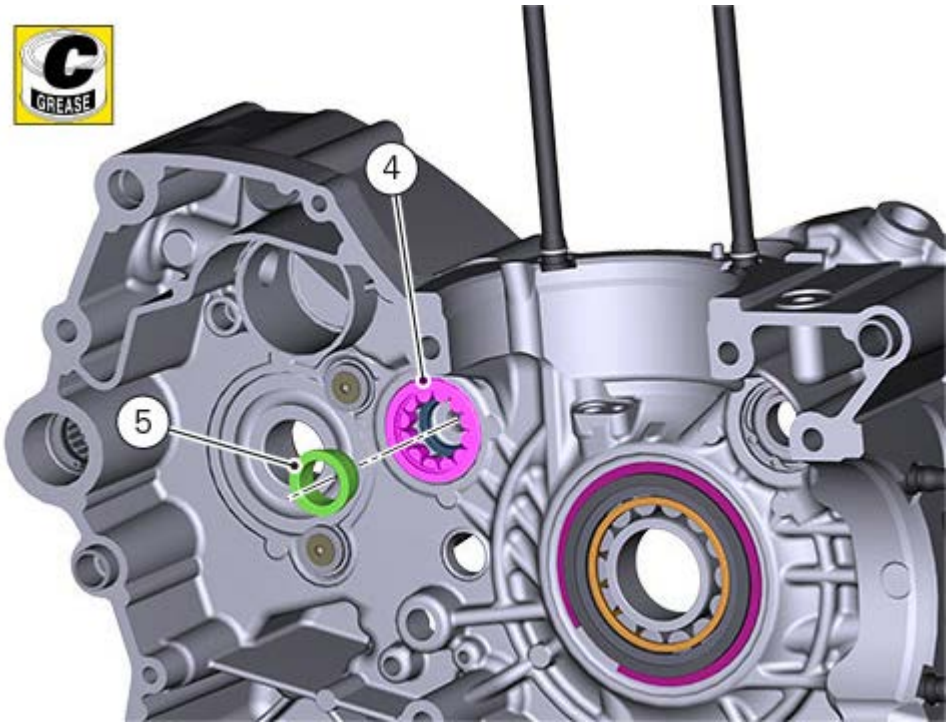


Important

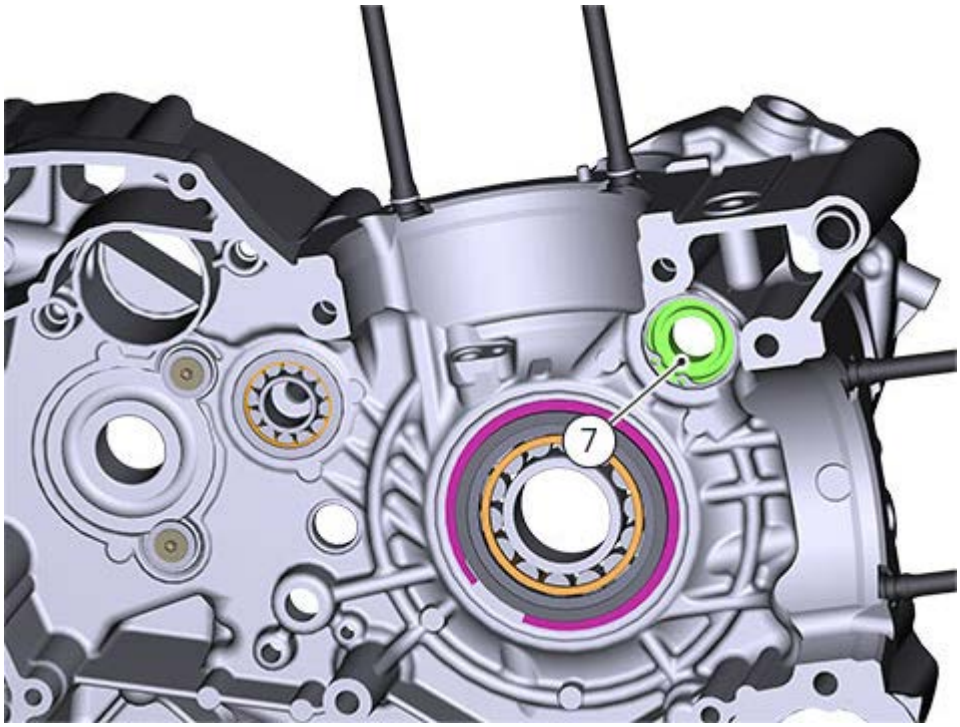
While heating the casing, if the seal ring is heated to a temperature above 120 °C looses its properties.

Apply indicated grease on the bearing needles (4).
Fit ring (5) in bearing (4) with the marks facing up.

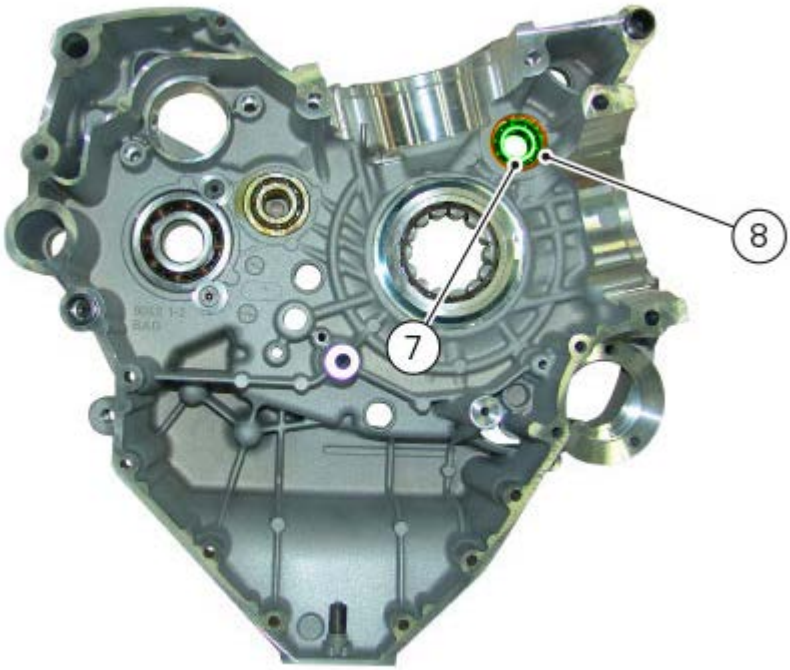


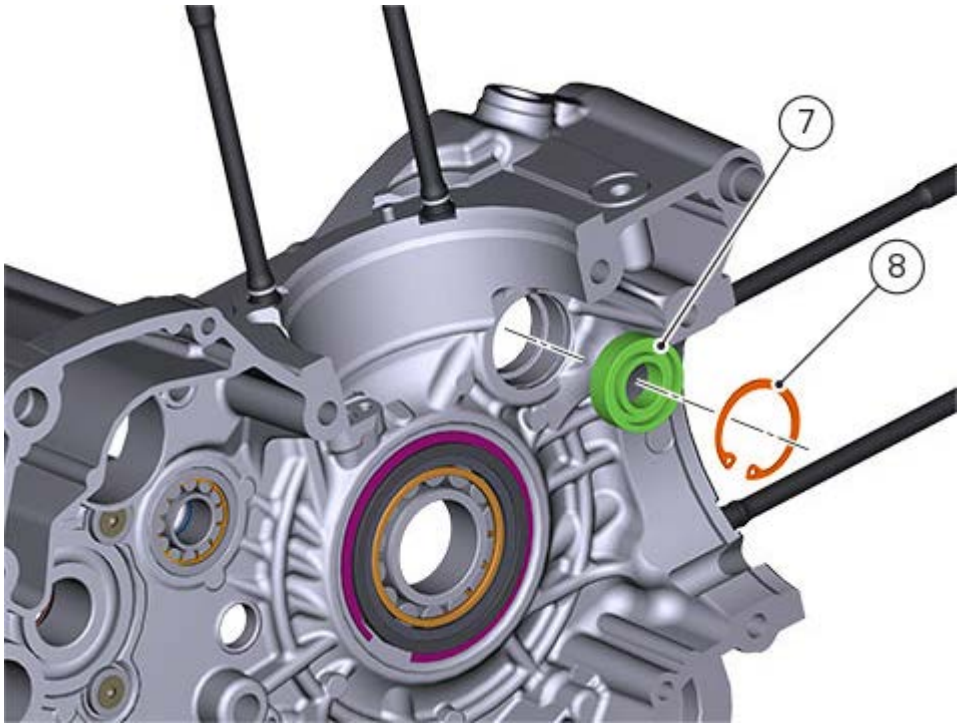


TIMING LAYSHAFT BEARING (7)



Fit bearing (7) and fix it with snap ring (8).

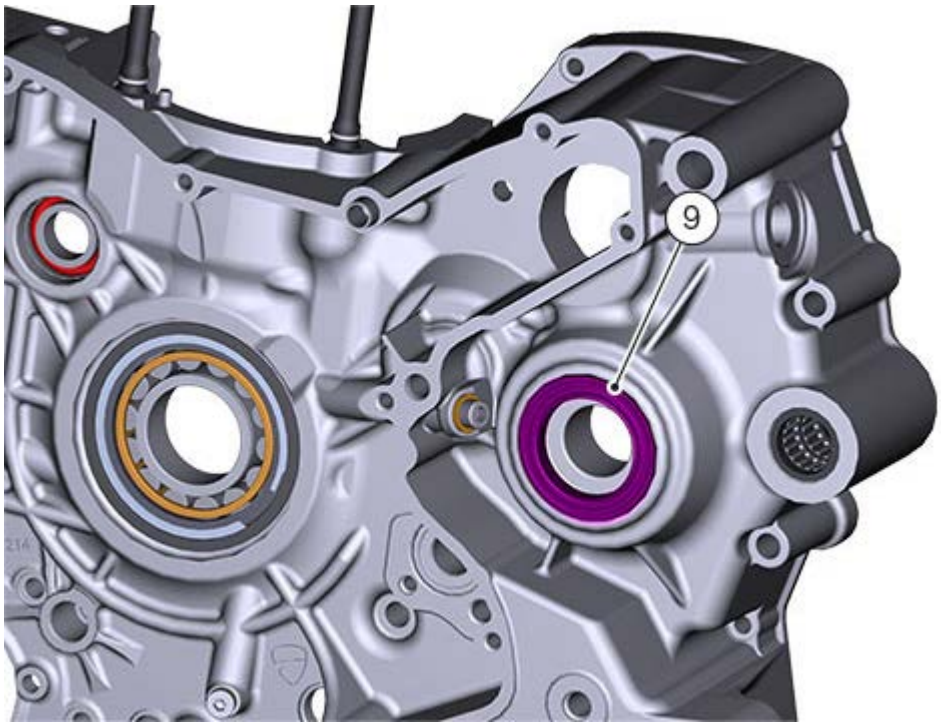




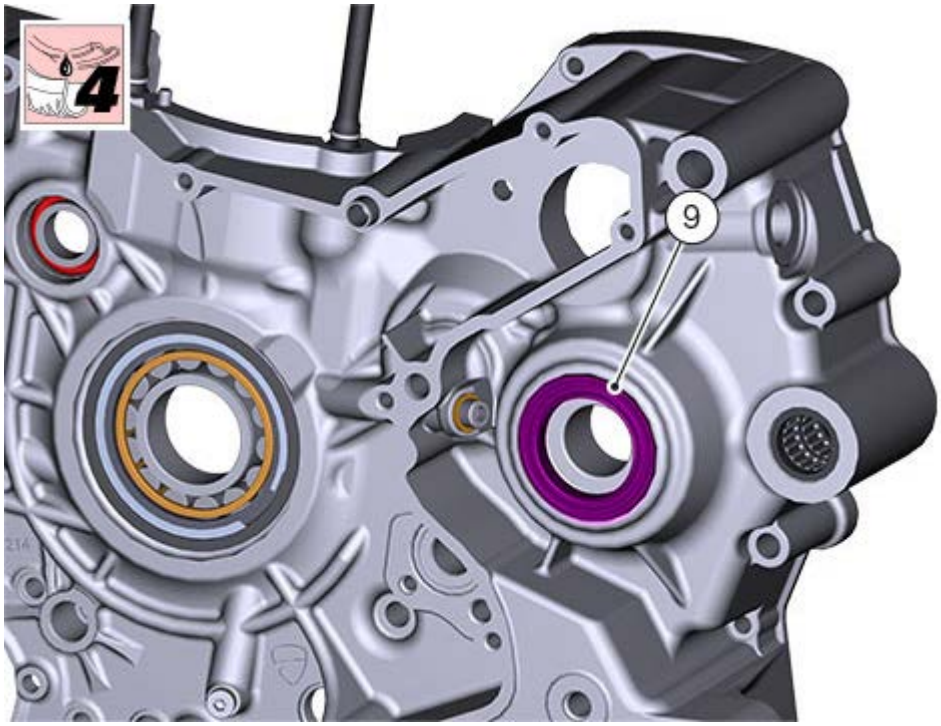
Note
The closed side of the plastic cage must be facing towards the crankcase half.

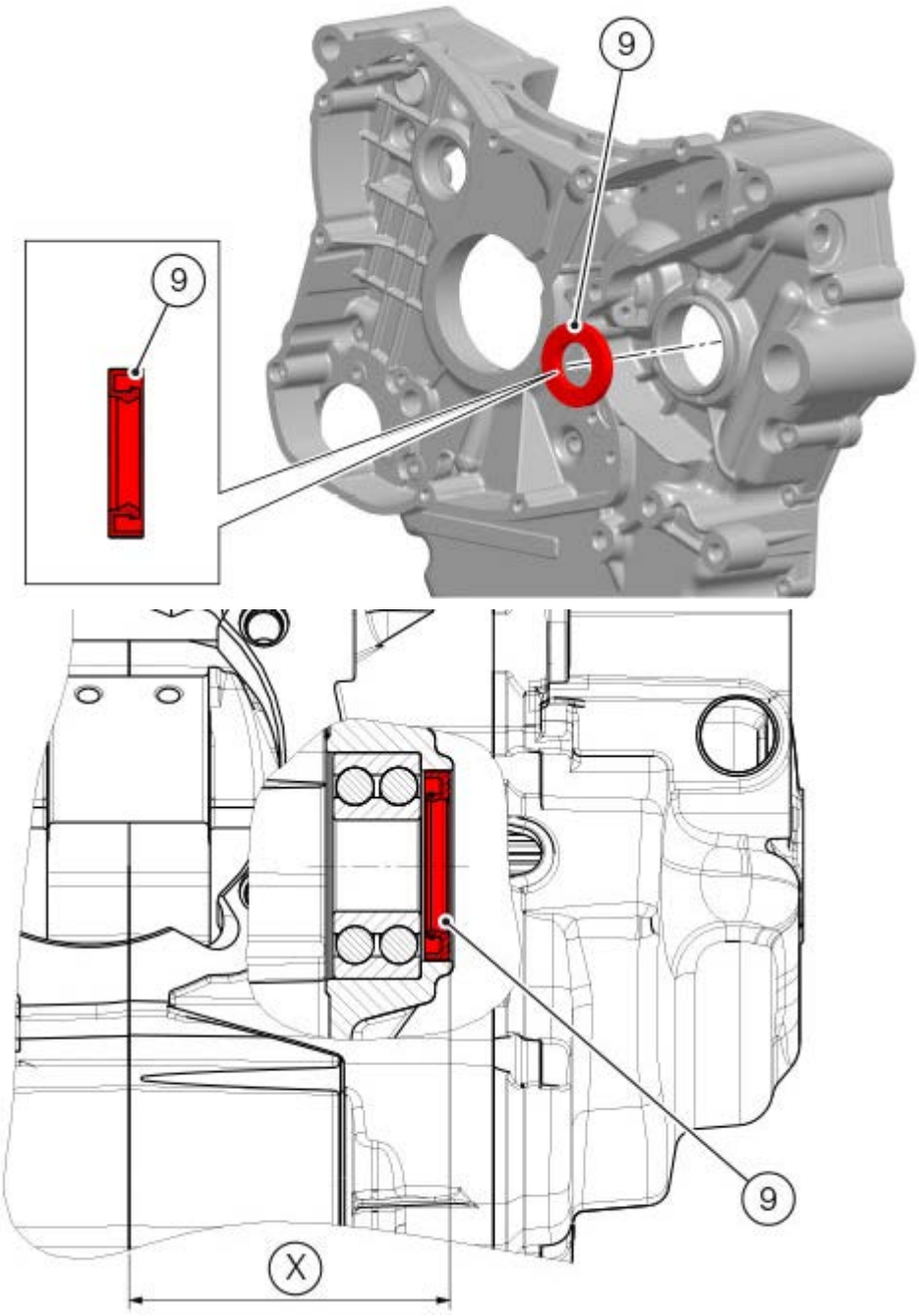
Generator side, external part (Side A)

SECONDARY SHAFT OIL SEAL (9)

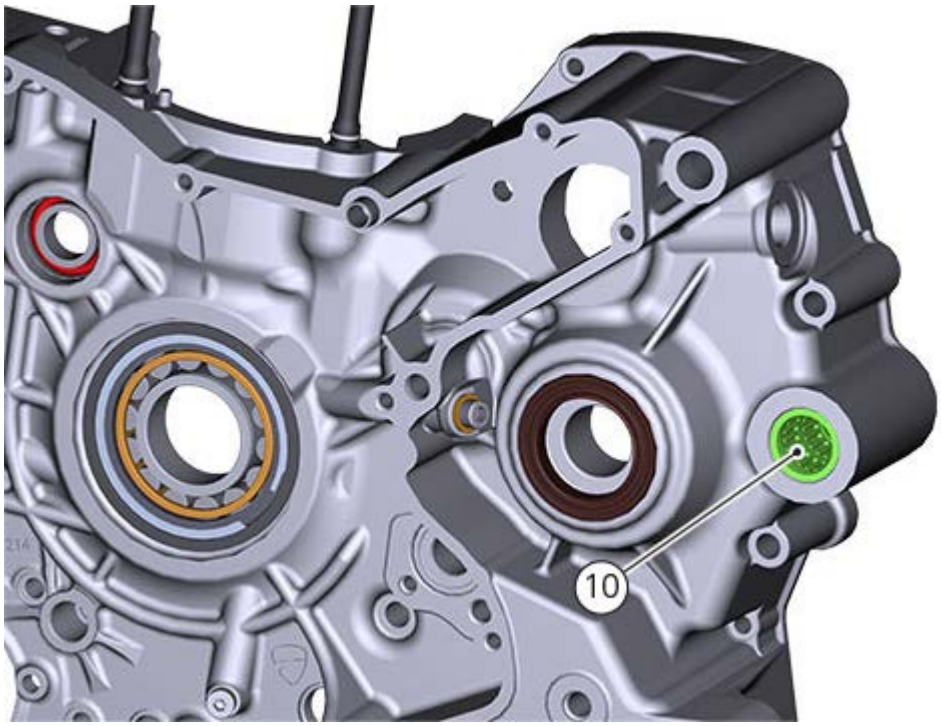


Lubricate the oil seal with the recommended product.
Fit the oil seal (9) by respecting value (X) 88 ± 0.2 mm as shown in the figure.

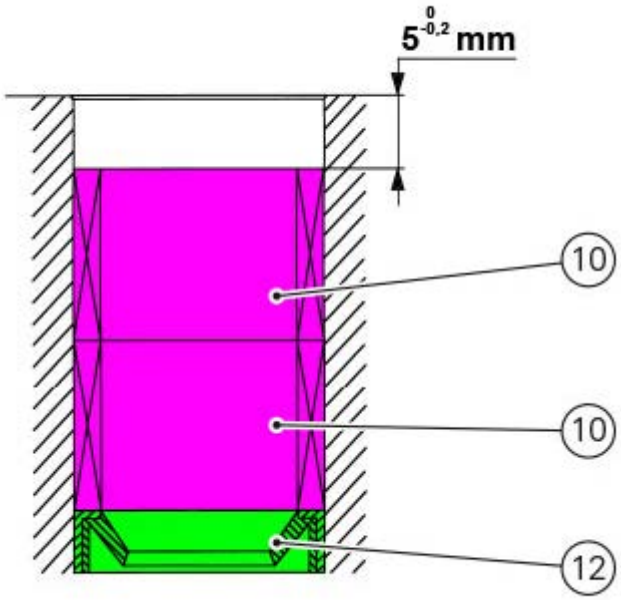




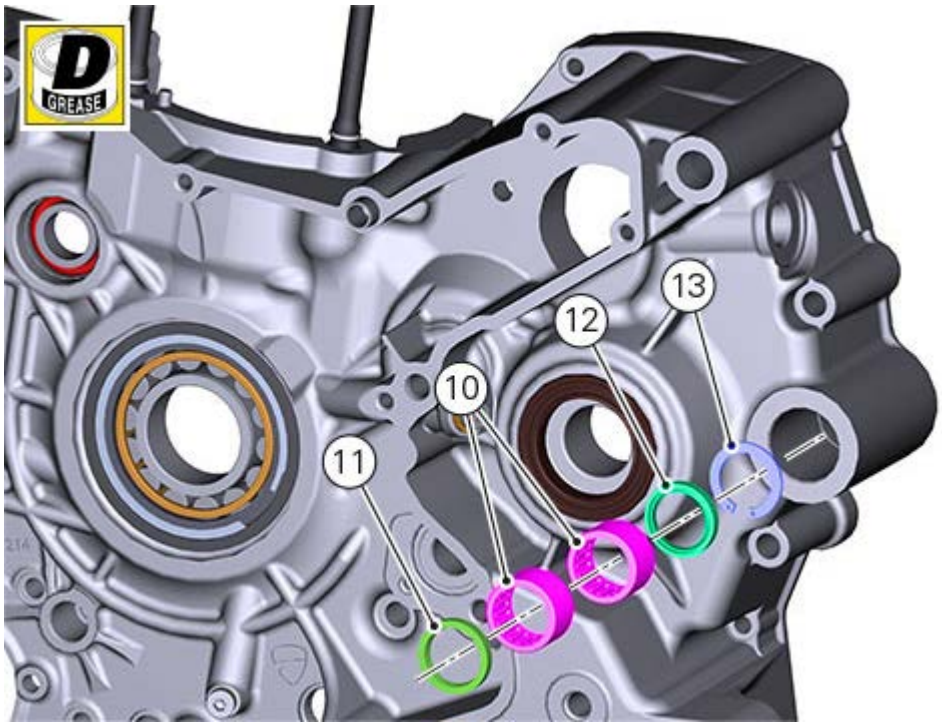
NEEDLE ROLLER BEARINGS (10) FOR SWINGARM SHAFT



Fit snap ring (13) in the crankcase half.
Apply indicated grease in the hole.
Fit seal ring (12) and the two needle roller bearings (10) respecting the indicated value.
The bearing marks must be facing up.

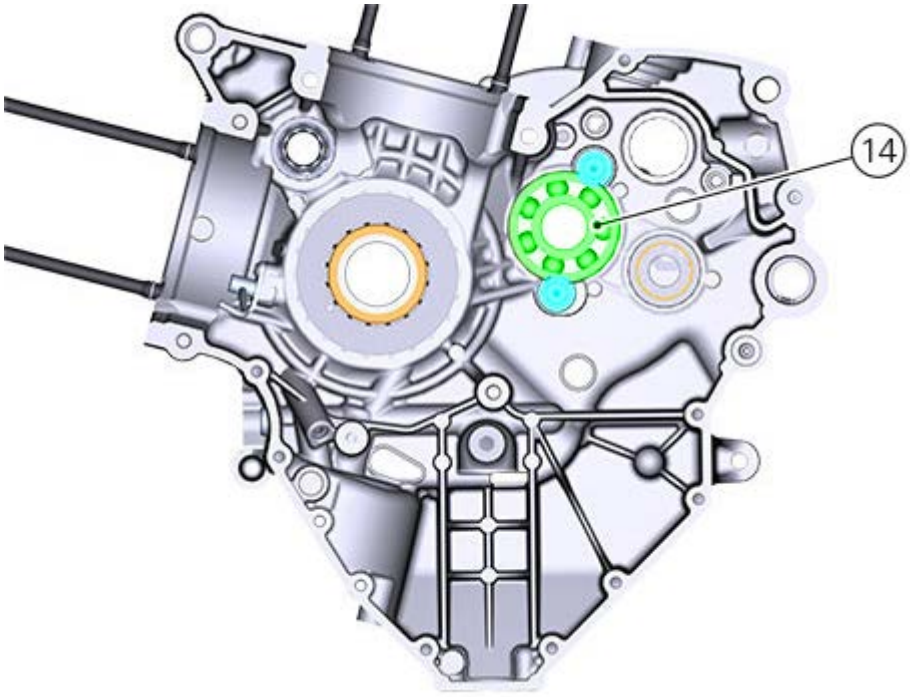


Fit the sealing ring (11).

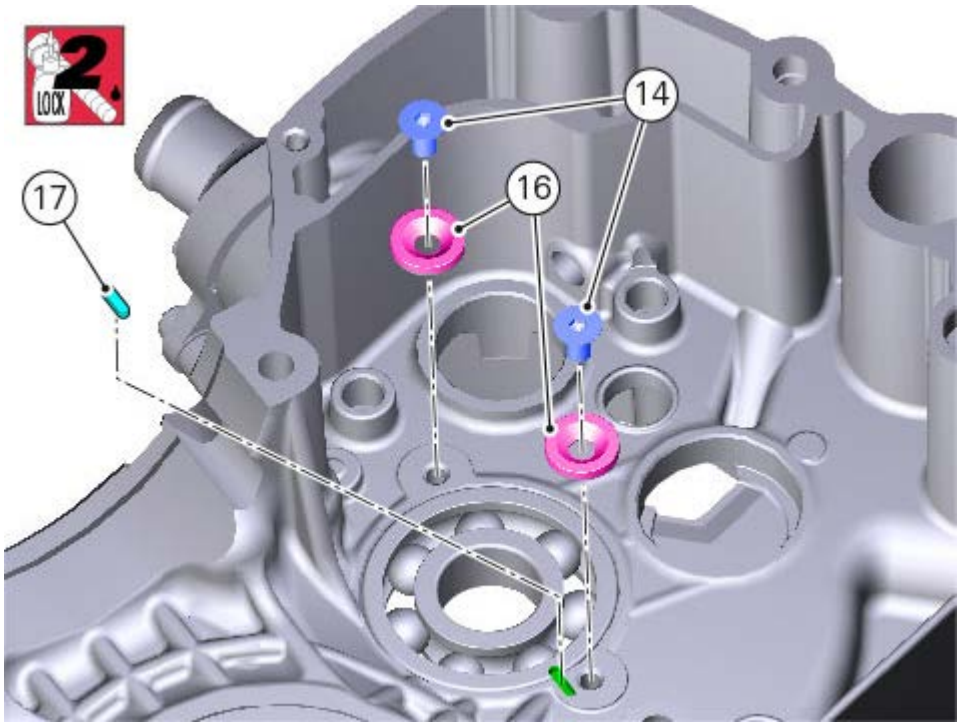


Clutch side, internal part (Side C)

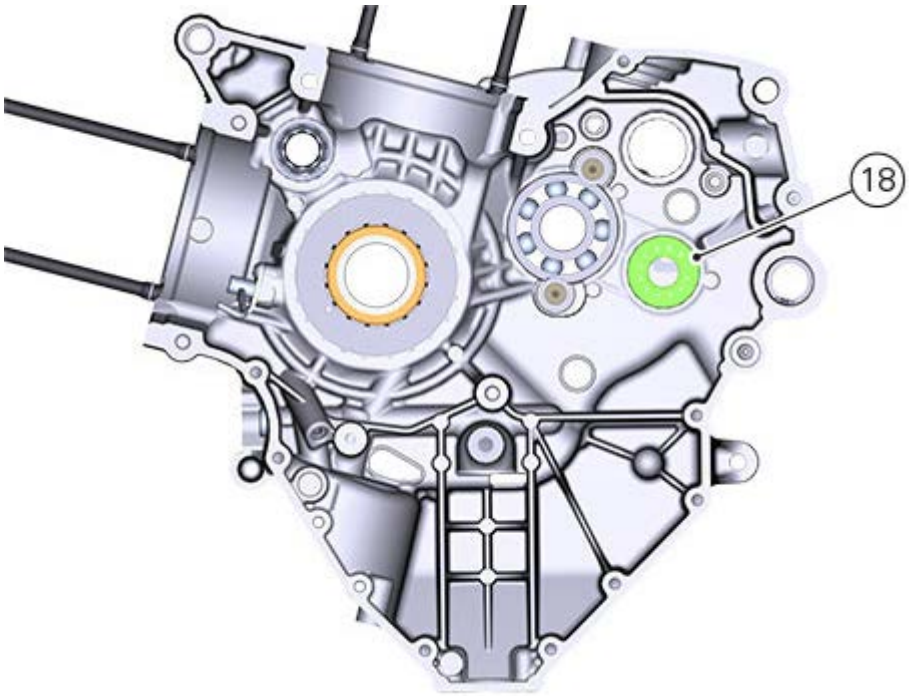
PRIMARY SHAFT BEARING (14)



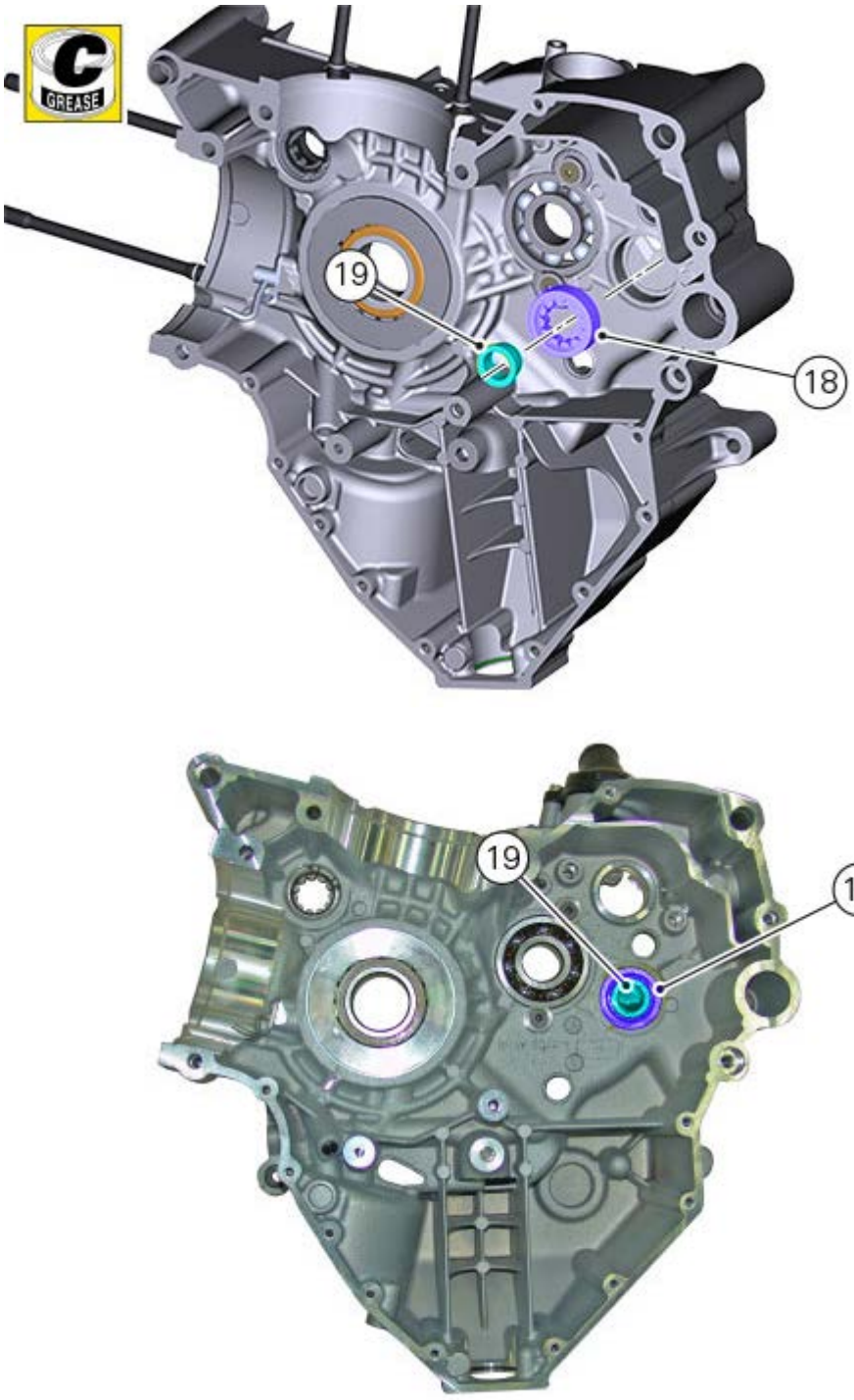
Insert bearing (14) with the marks facing up. Fit tab (17) in the groove on the crankcase.
Fit the two spacers (16) and the two screws (14) with the indicated threadlocker.
Tighten the screws (2) to a torque of 10 Nm (Min. 9 - Max. 11)



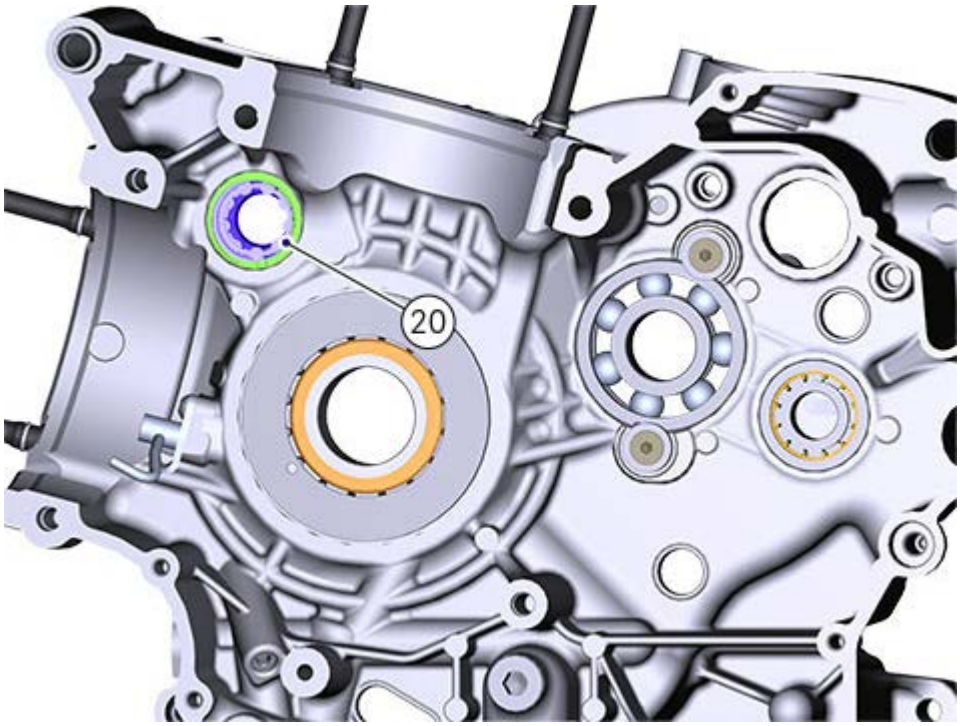
SECONDARY SHAFT BEARING (18)



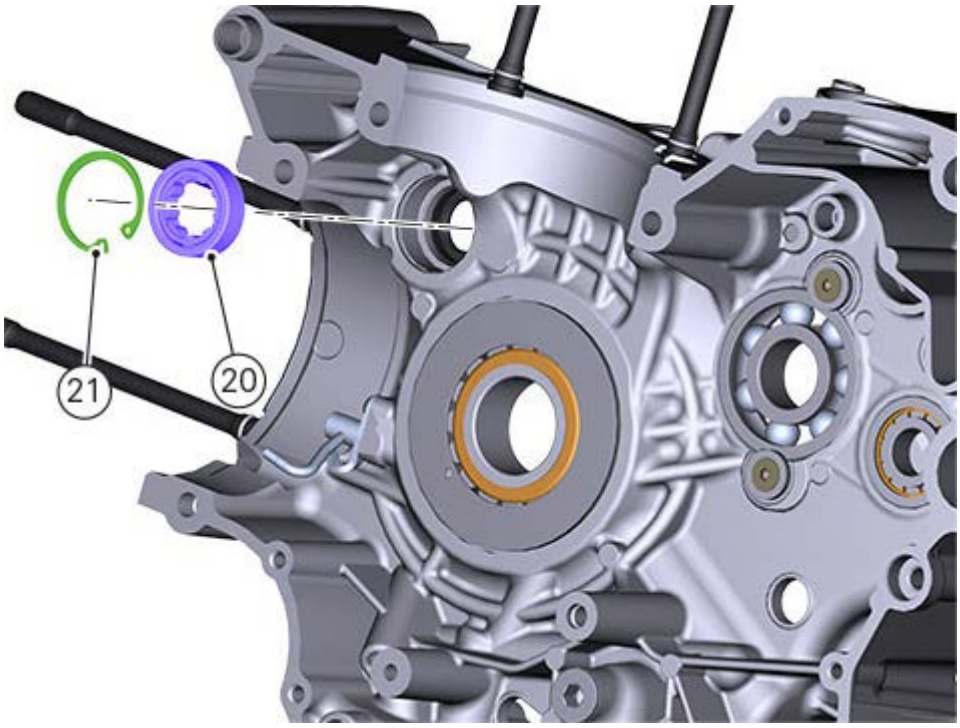
Apply indicated grease on the bearing needles (18). Fit ring (19) in bearing (18) with the marks facing up.

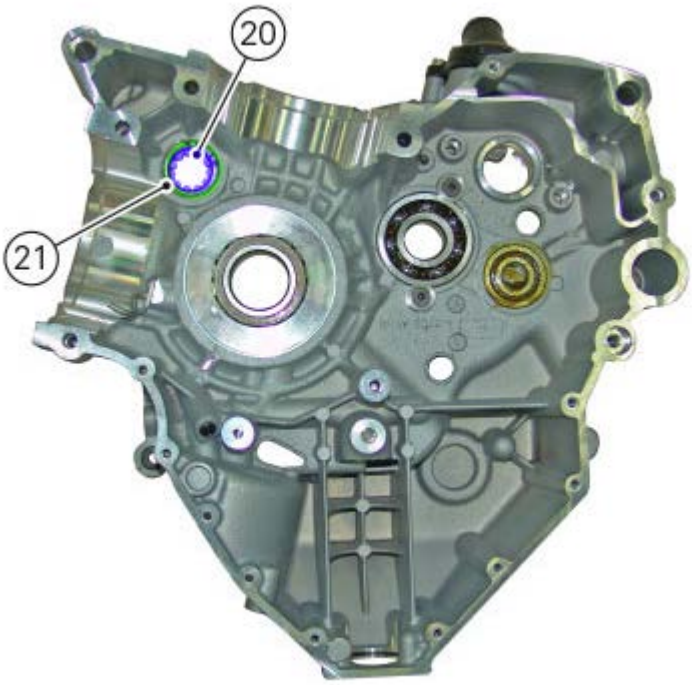


TIMING LAYSHAFT BEARING (20)



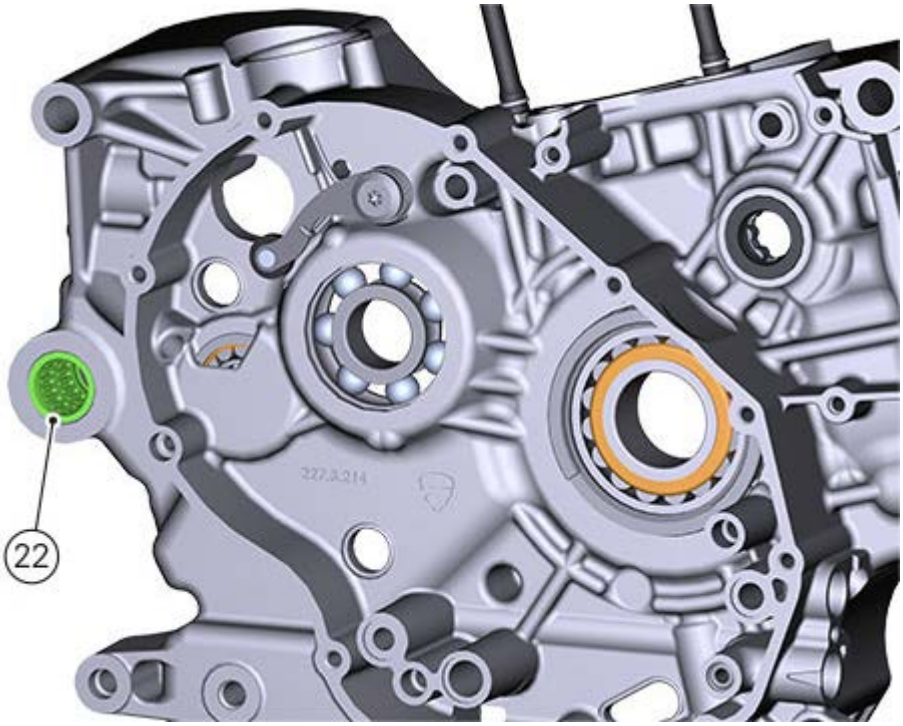
Fit bearing (20) and fix it with snap ring (21).





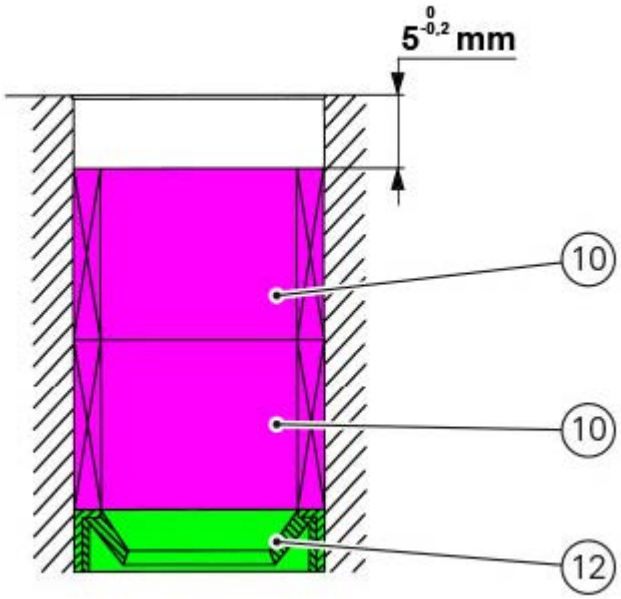
Clutch side, external part (Side D)

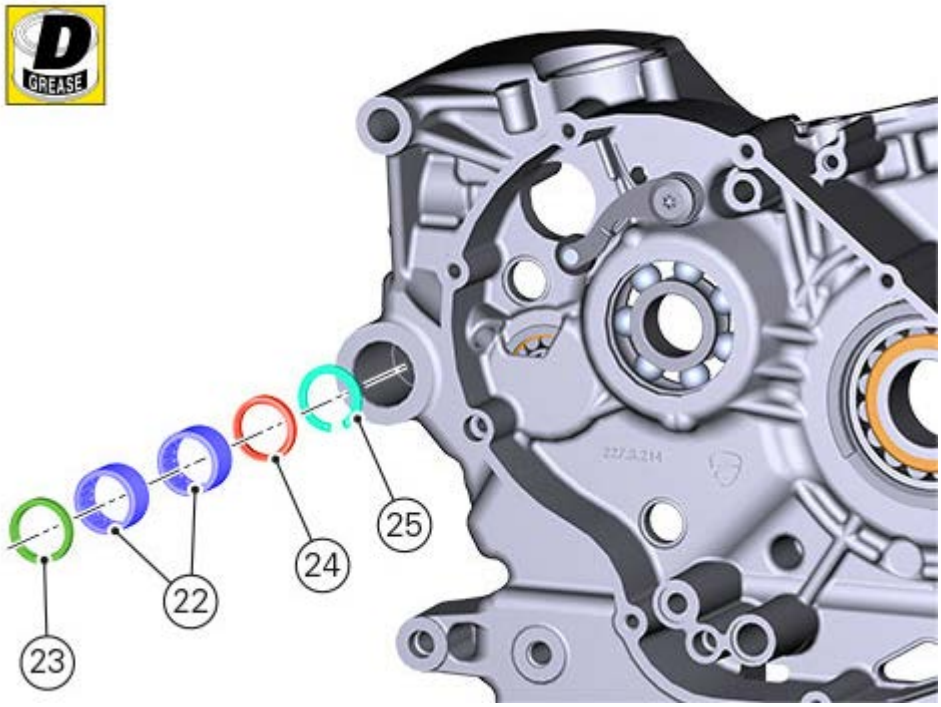
NEEDLE ROLLER BEARINGS (22) FOR SWINGARM SHAFT



Fit snap ring (25) in the crankcase half.
Apply indicated grease in the hole.
Fit seal ring (24) and the two needle roller bearings (22) respecting the indicated value.
The bearing marks must be facing up.

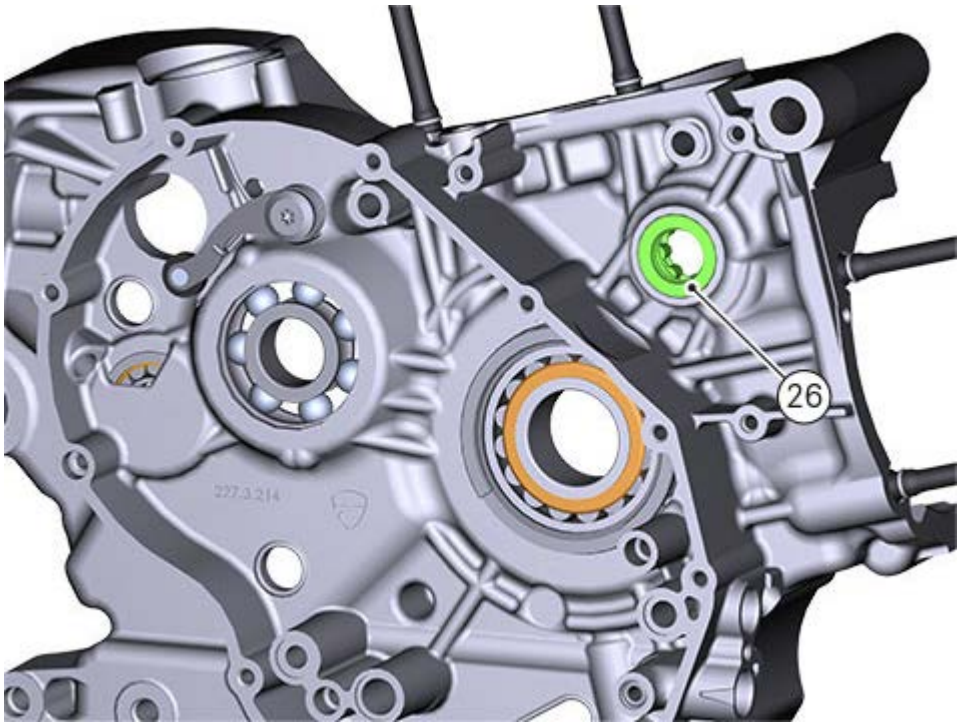
Note
The picture shows the needle roller bearings on the flywheel side but the reference value is the same.



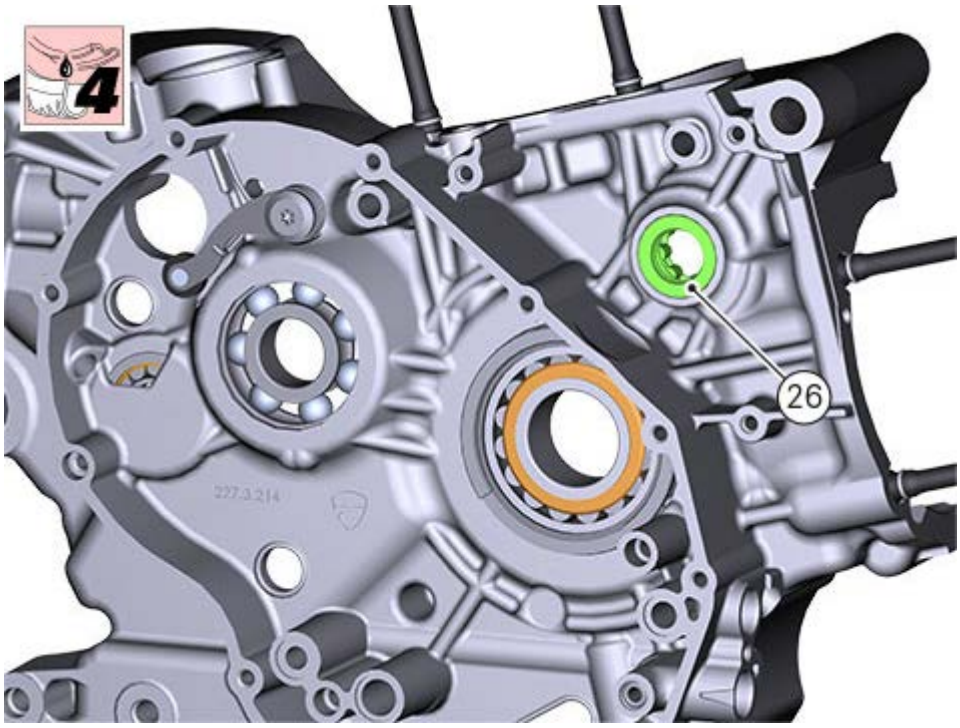


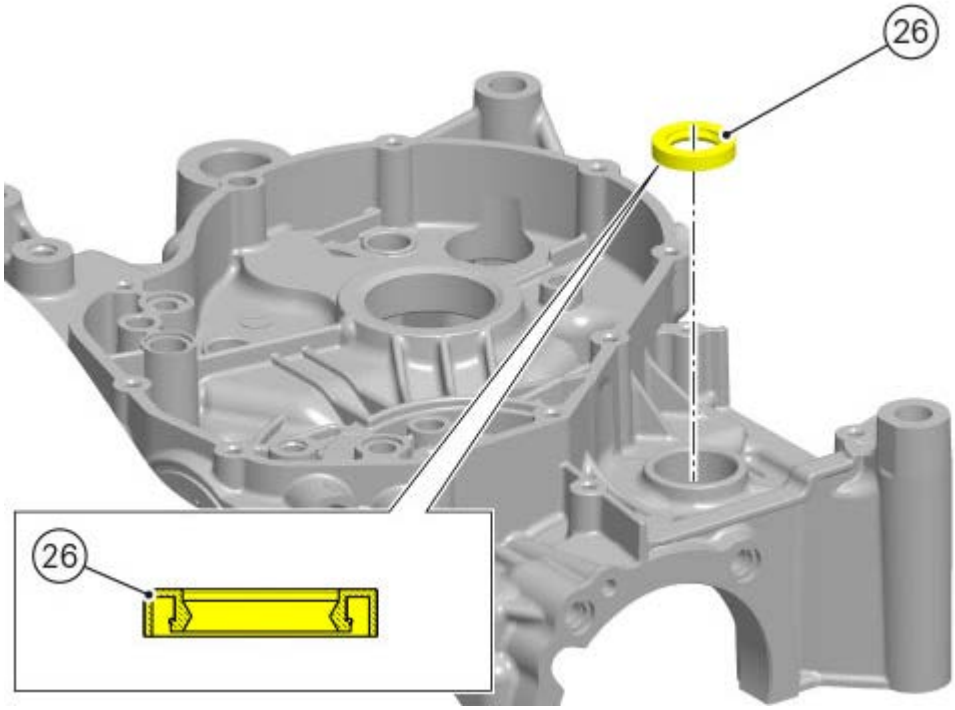
Fit the sealing ring (23).

TIMING SHAFT SEAL RING (26)

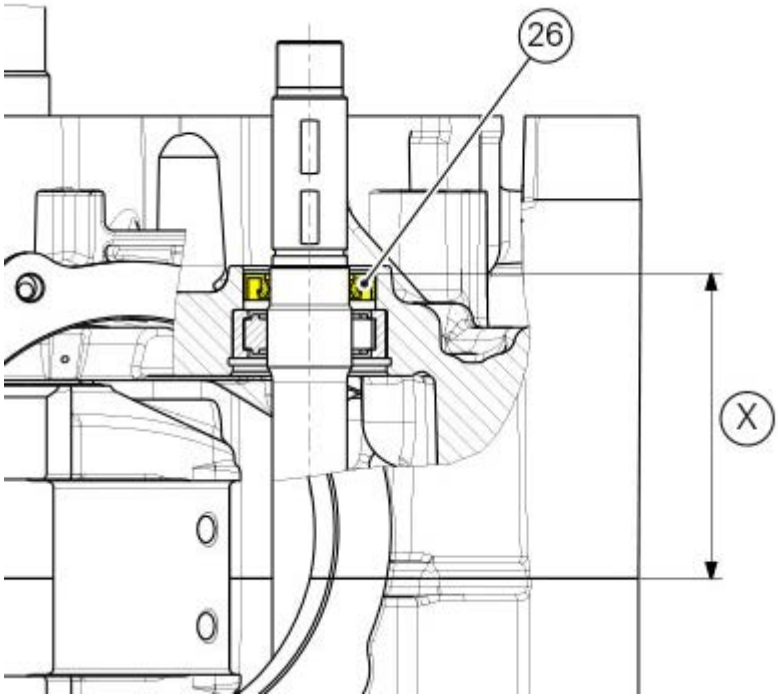


Lubricate seal (26) using the specified product.

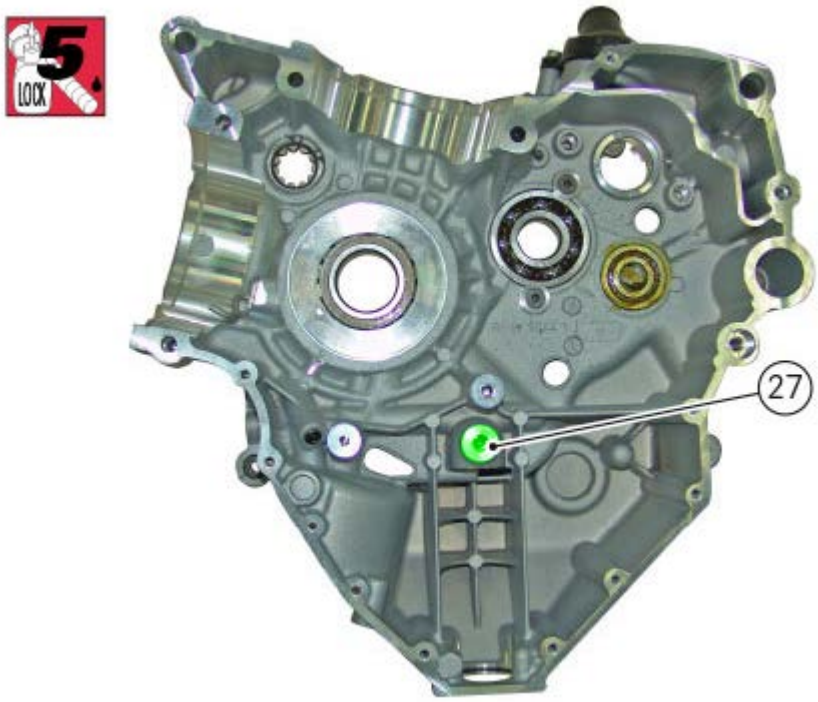




Fit seal ring (26) by respecting the indicated values (X) 69.2 ± 0.2 mm.



Check the presence of the oil intake pipe plug (27).
If previously removed, apply threadlocker to the plug (27) and tighten to a torque of 24 Nm (Min. 21 - Max. 27).


5.
LOCK
27

Main bearings

REMOVAL PROCEDURE

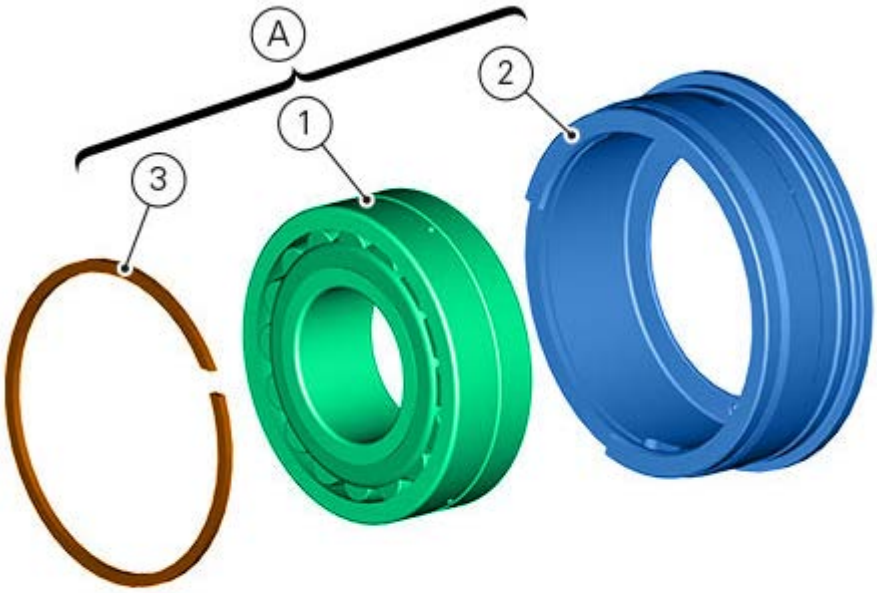
To replace the bearings proceed as follows:

- heat the crankcase half to 100 °C;
- remove the bearing using a drift and hammer;

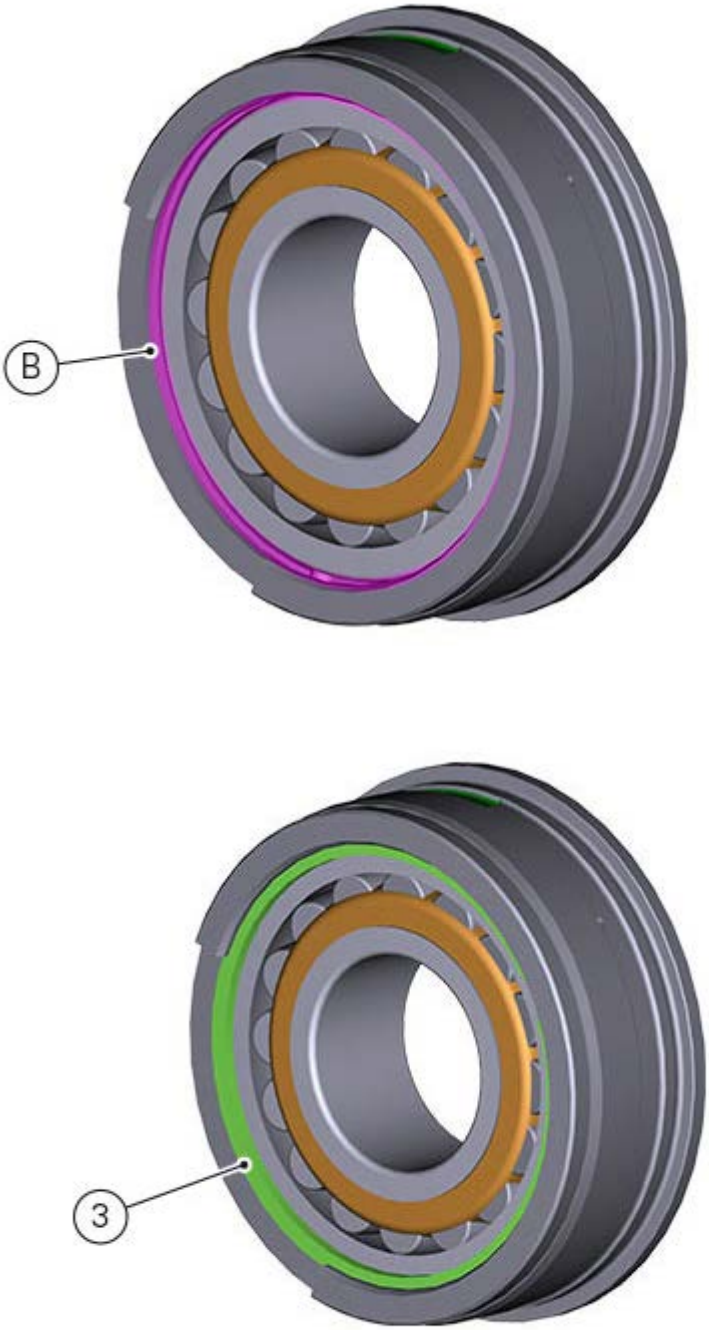
Note
Fit all bearings ensuring that the side with marks faces upwards and is fully home on the bush.

REFITTING PROCEDURE

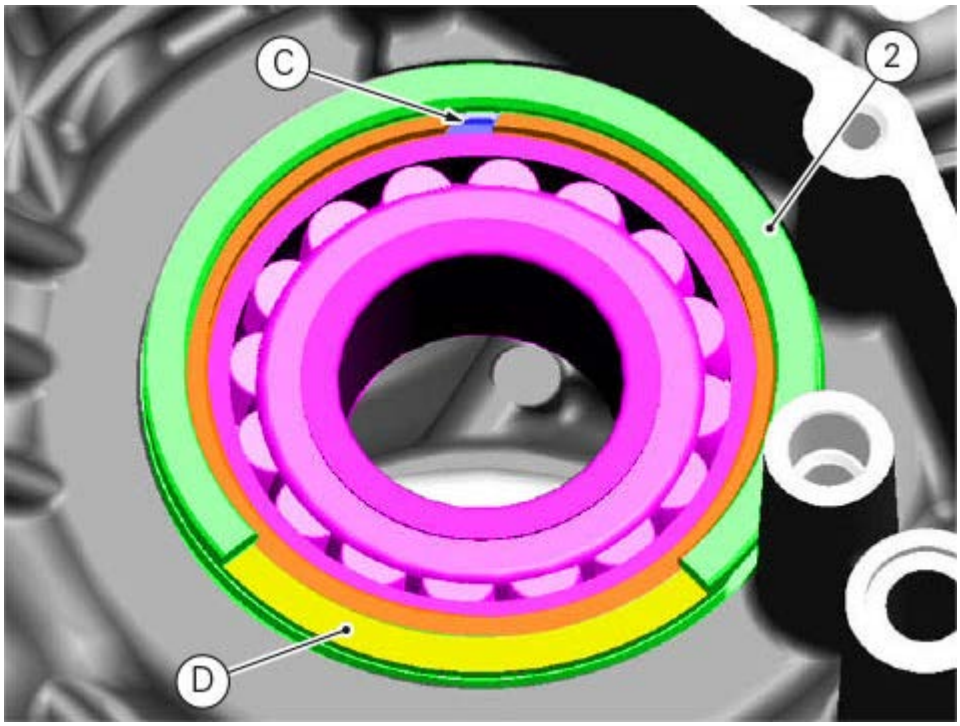
CLUTCH SIDE MAIN BEARING



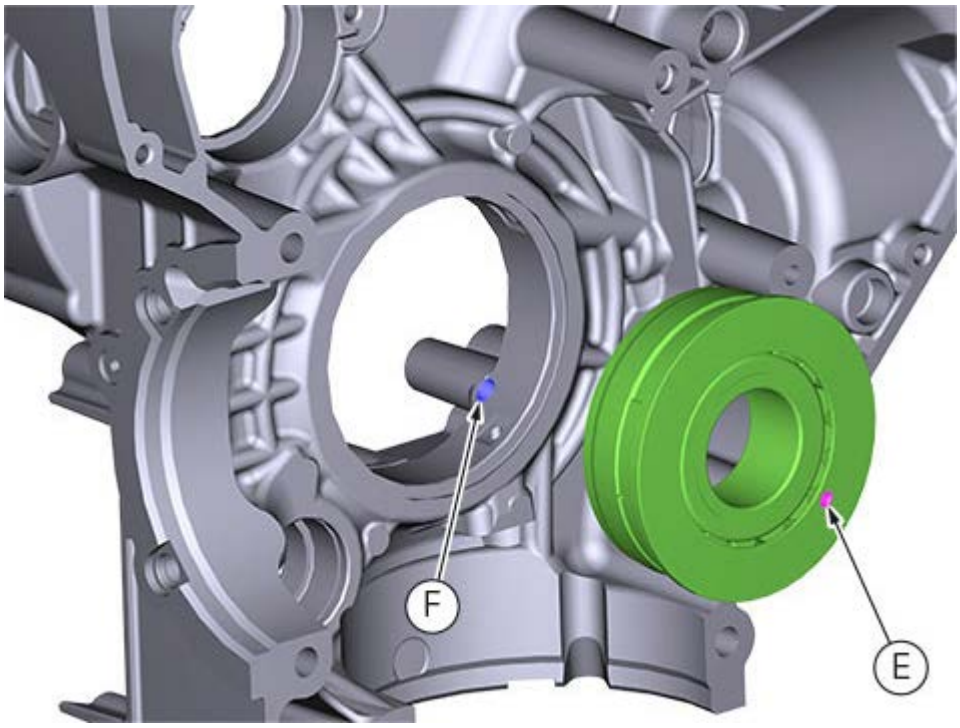
To refit the bearing (A), insert the roller bearing (1) so that the side with "marks" faces outwards and is fully home on the bush (2).
Make sure that groove (B) is fully visible.
Install the snap ring (3) into the groove (B), locking the roller bearing (1) into the bush (2).



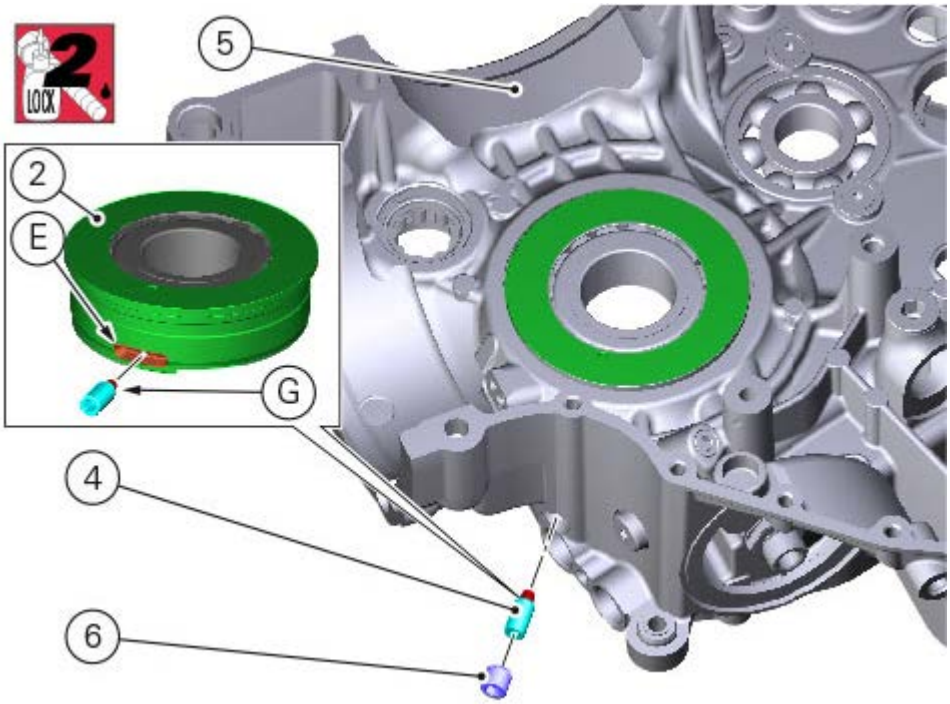
Make sure that opening (C) is in a diagonally opposed position of machining (D) of bush (2).

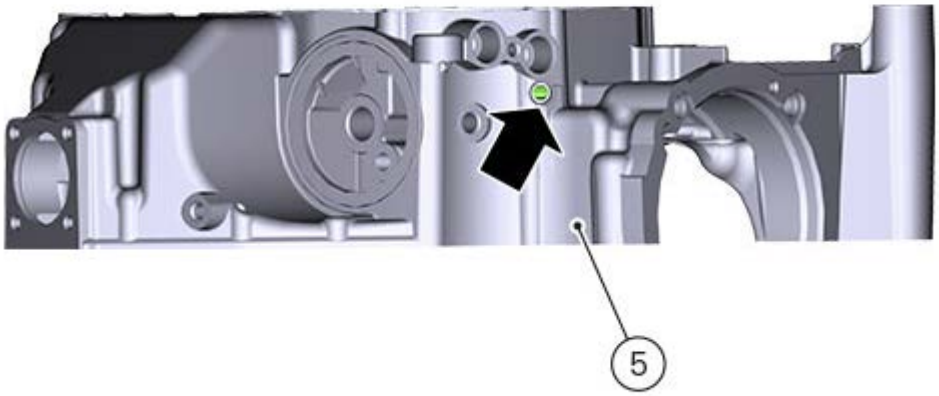


Heat up the crankcase half to a temperature between 95 °C and 110 °C.
Once the desired temperature is reached, drive the bearing assembly (A) fully inside the crankcase half.
Pay attention during this operation that reference (E) that indicates the centre of bush (2) slot is aligned with hole (F) of the locking dowel.

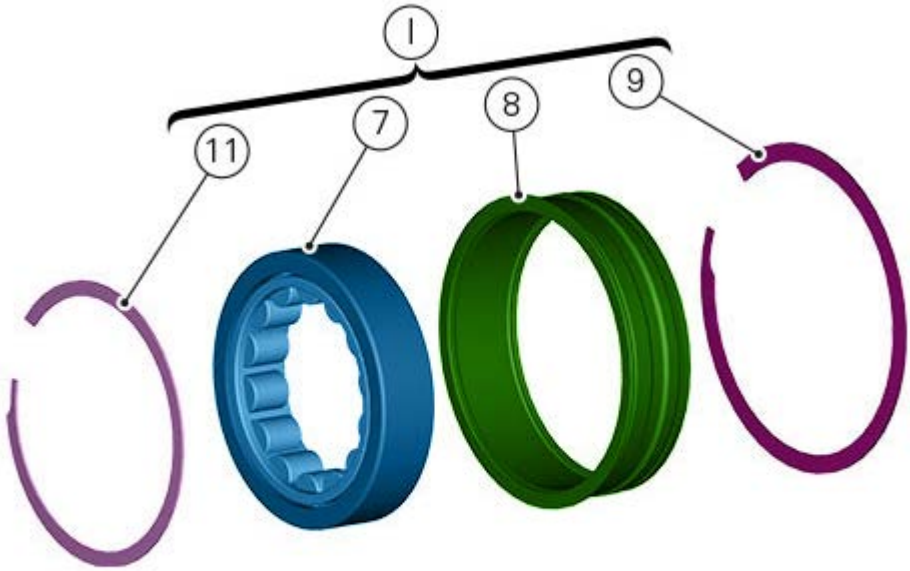


Apply recommended threadlocker to the special dowel thread (4).
Tighten the special dowel (4) on the crankcase half (5) fitting the tapered side (G) inside the slot (E) of the previously installed bush (2).
Tighten the special dowel (4) to a torque of 16 Nm (Min. 15 Nm - Max. 17 Nm).
Apply threadlocker to the dowel thread (6). Screw the dowel (6) on the crankcase half (5) and tighten it to a torque of 22 Nm (Min. 20 Nm - Max. 24 Nm).
After tightening, remove any excess of threadlocker.

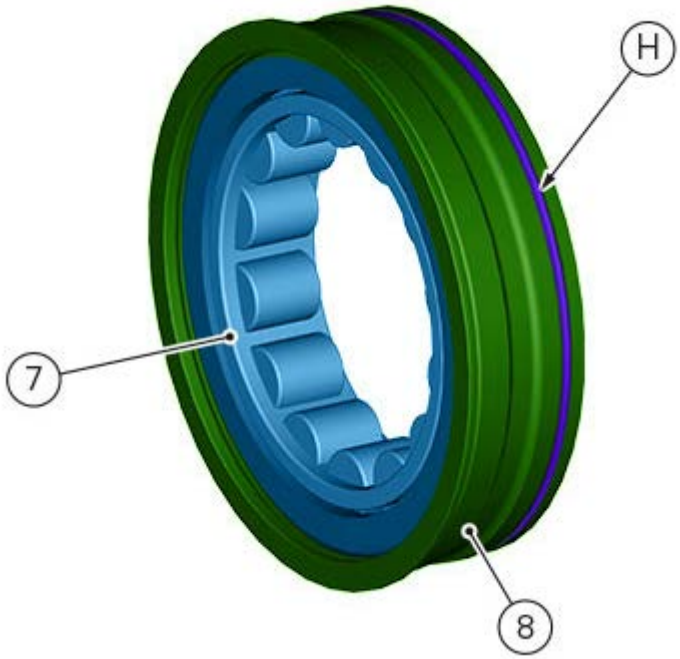


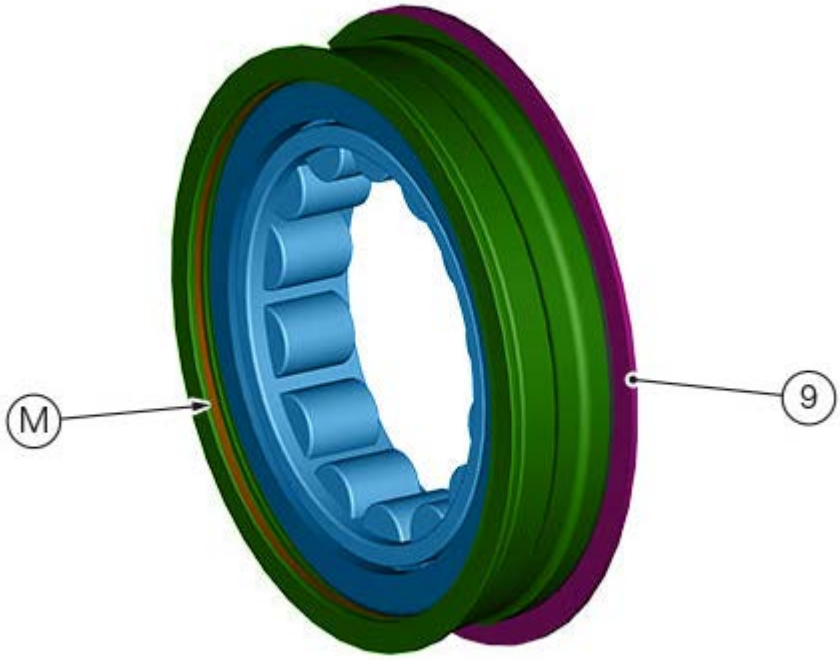


GENERATOR SIDE MAIN BEARING

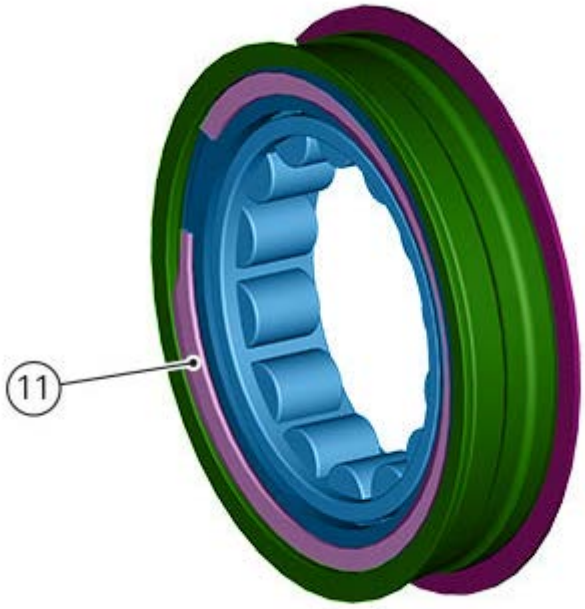


To refit the bearing (I), insert bearing (7) so that the side with "marks" faces outwards and is fully home on the bush (8).
Groove (H) must be visible. Fit snap ring (9) in groove (N).

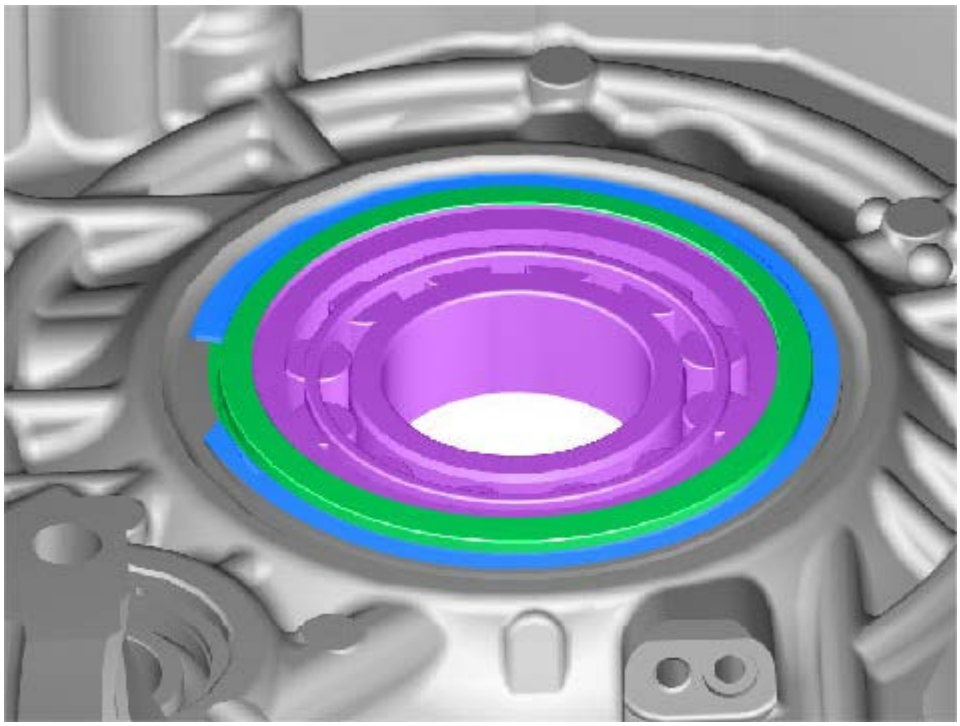




Block bearing (7) by means of snap ring (11) in groove (M).



Heat up the crankcase half to a temperature between 95 °C and 110 °C.
Once the desired temperature is reached, drive the bearing assembly (l) fully inside the crankcase half.

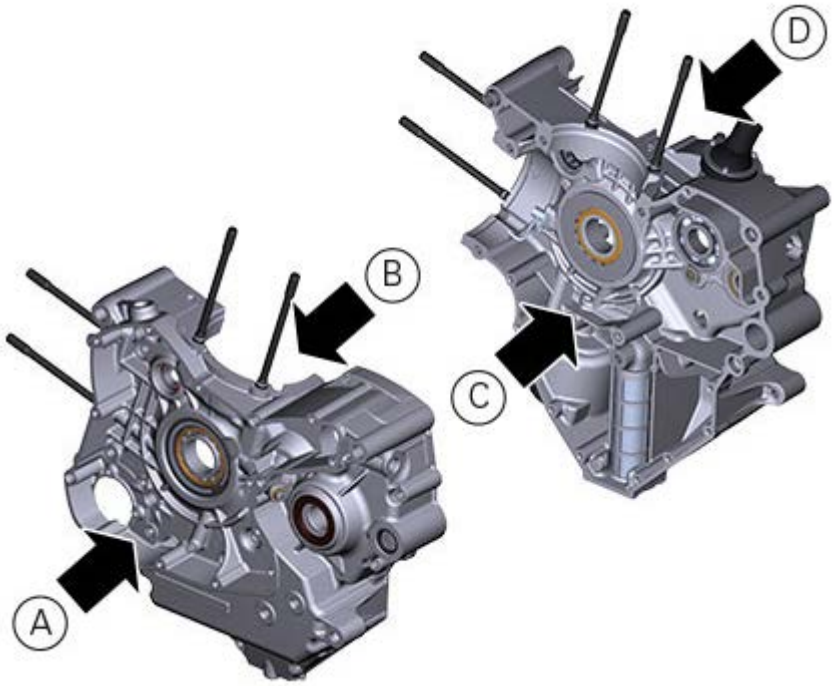


Overhauling the crankcase halves

Visually inspect the engine crankcase halves.
Check that the surfaces of the crankcase halves are perfectly flat using a reference surface.
Check that the oilways are free of restrictions or clogging.
Check the condition of centring bushes. If apparently distorted or loose in their seats, change them using proper tools.

To better identify the position of each component, the casing has been divided into four areas:

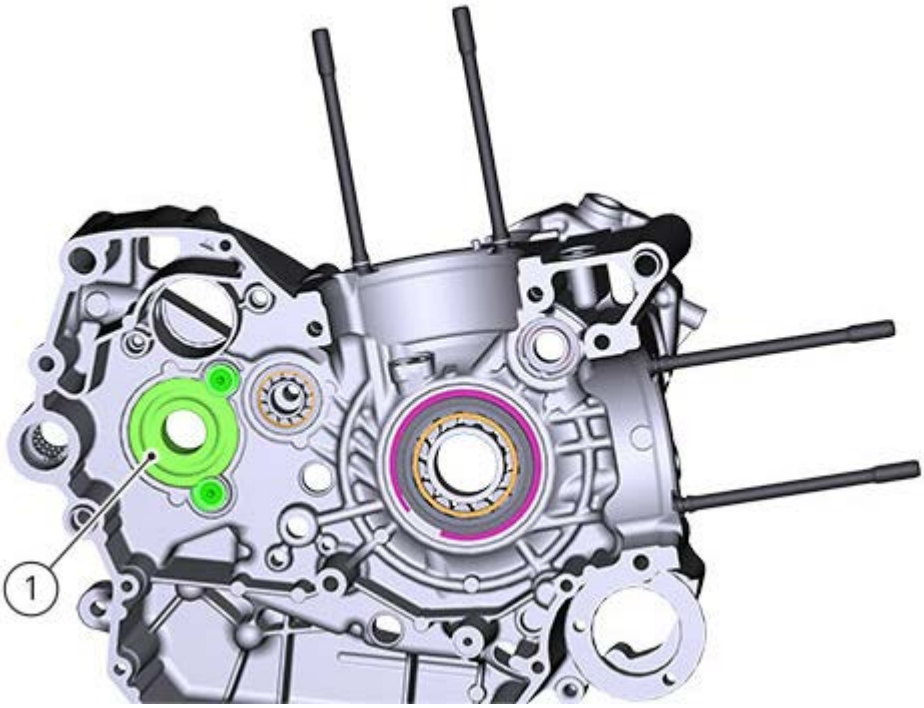
A) generator side, external part;
B) generator side, internal part;
C) clutch side, internal part;
D) clutch side, external part.



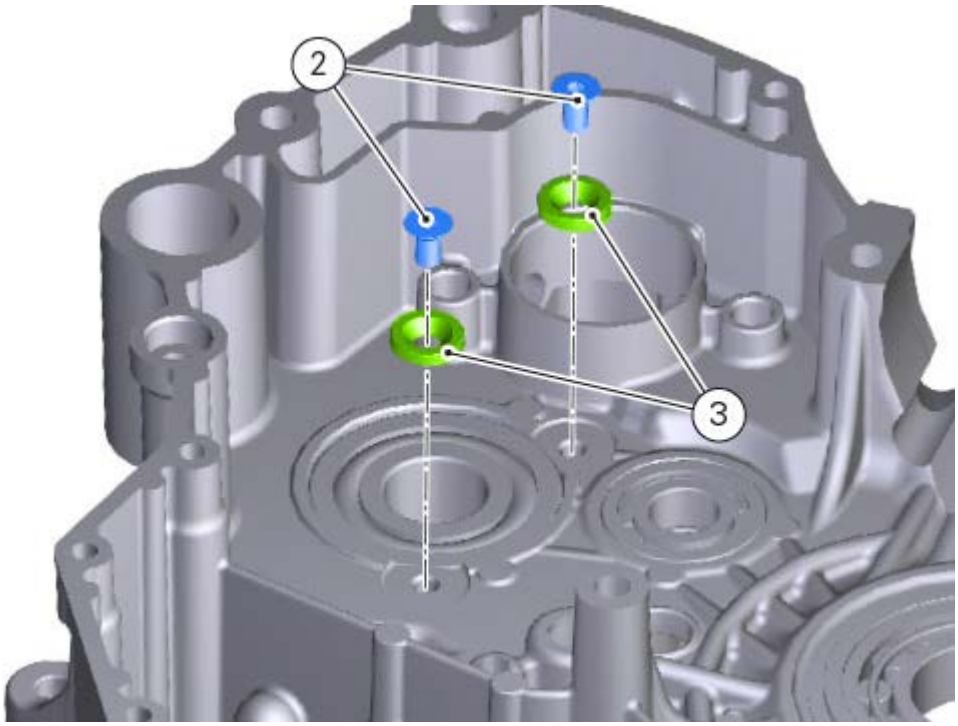
To replace the main bearings, refer to chapter "Main bearings".

Generator side, internal part (Side B)

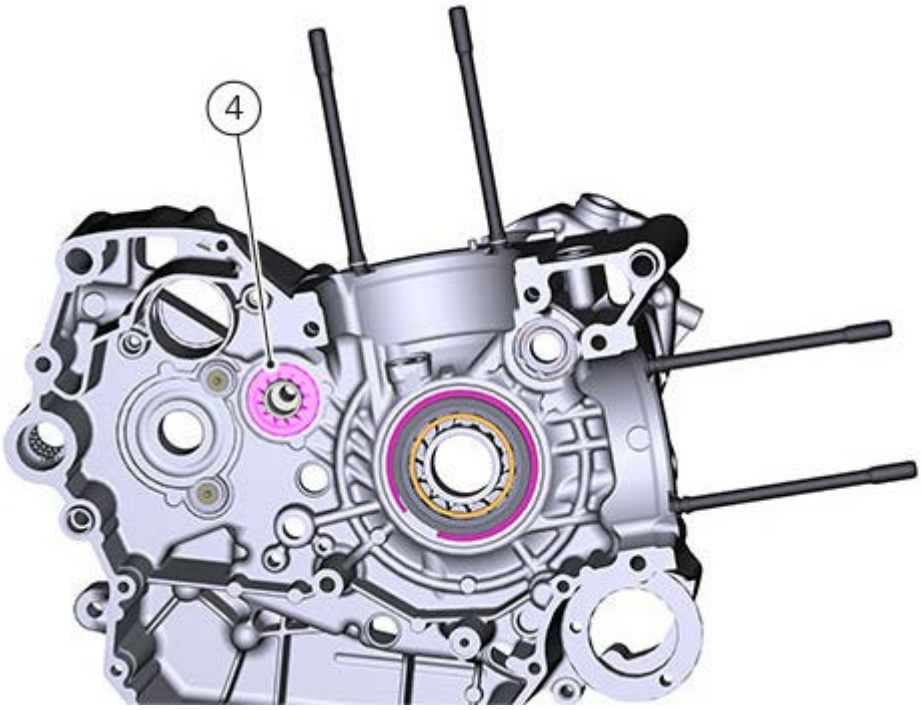
SECONDARY SHAFT BEARING (1)



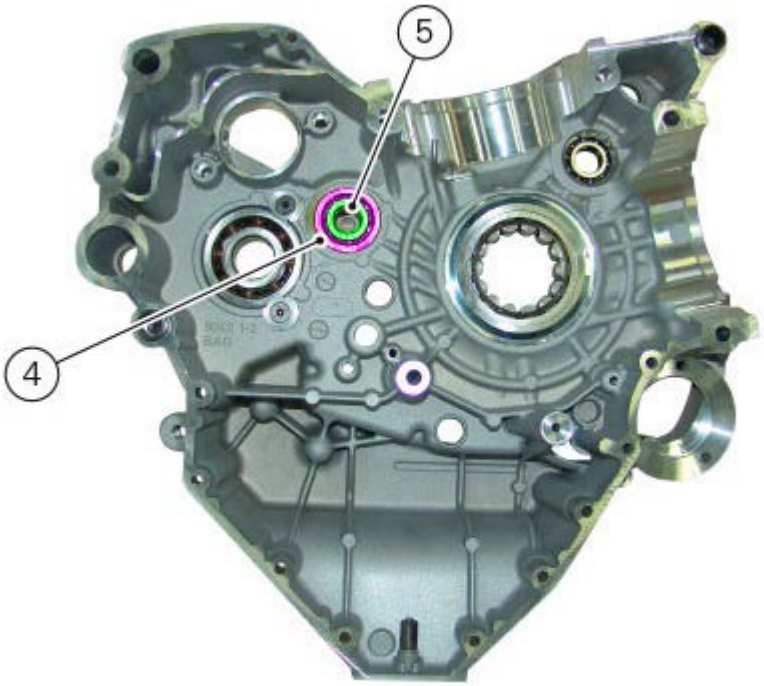
Undo the two retaining screws (2) and recover spacers (3).
Remove the bearing (1).

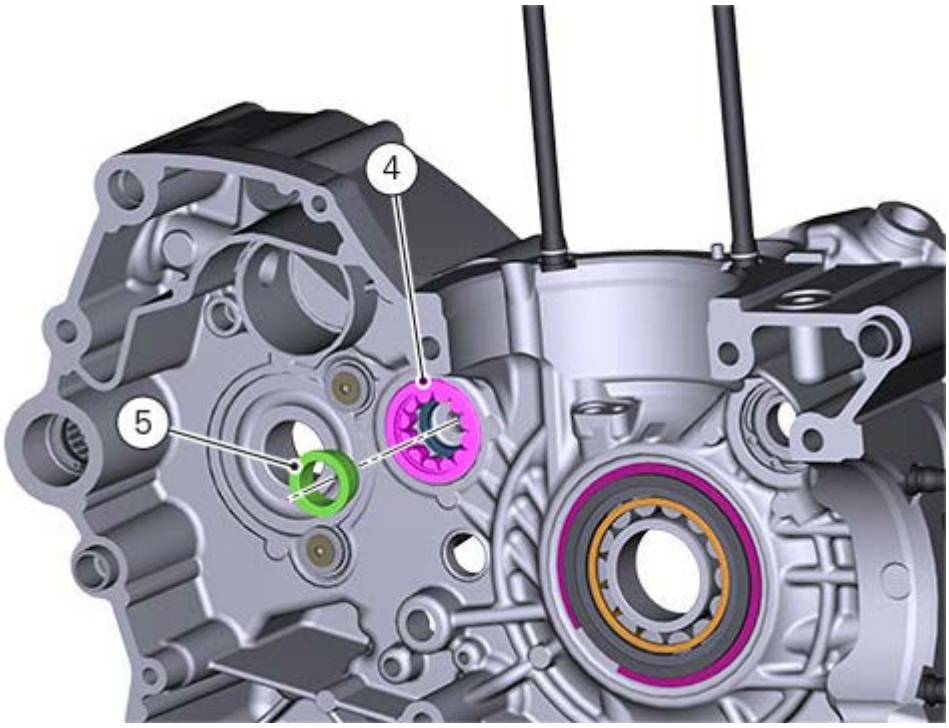


PRIMARY SHAFT BEARING (4)

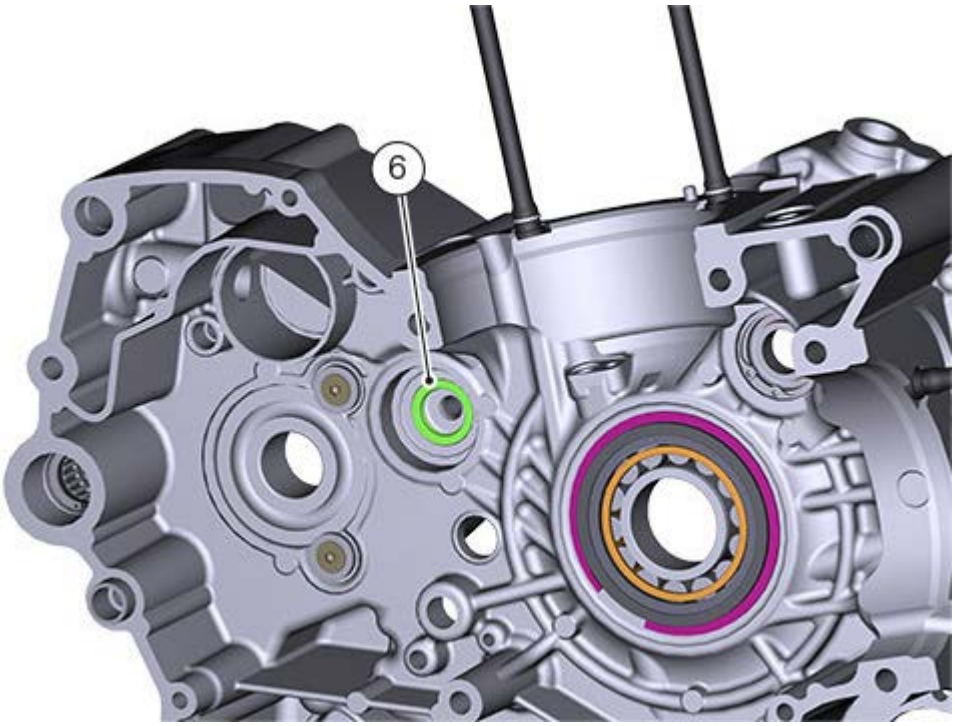


Remove the internal ring (5).
Remove the bearing (4).

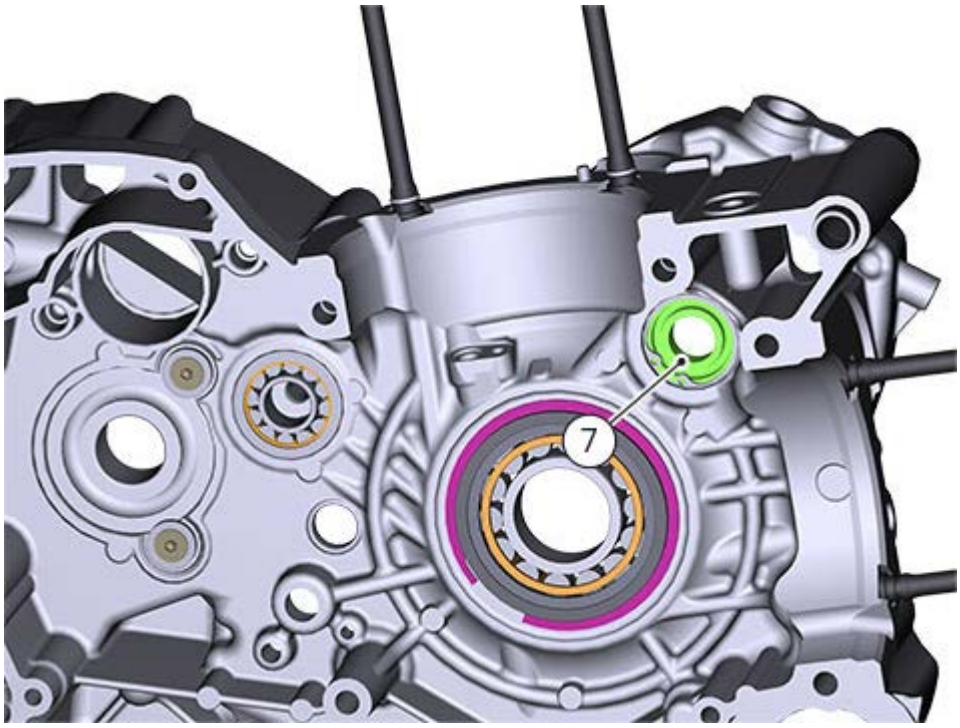




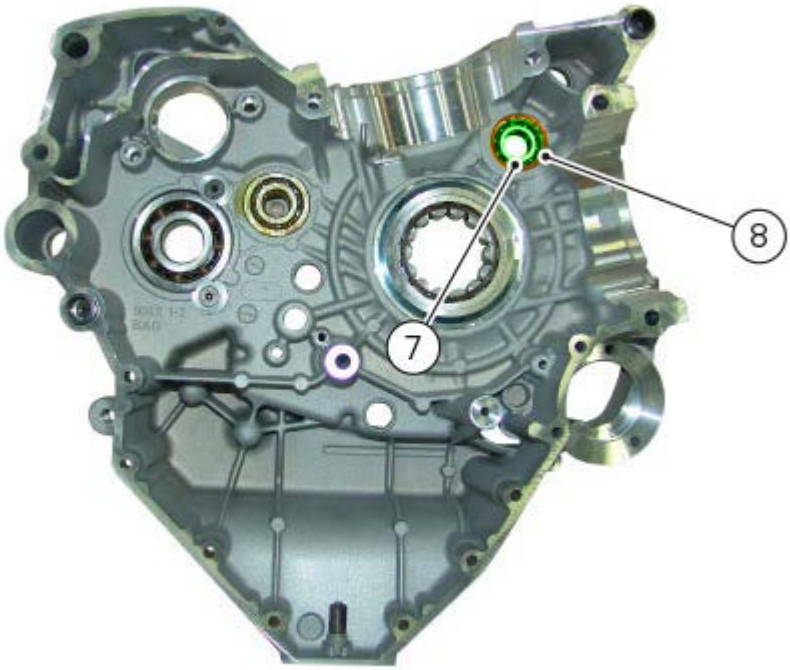
Remove the sealing ring (6).

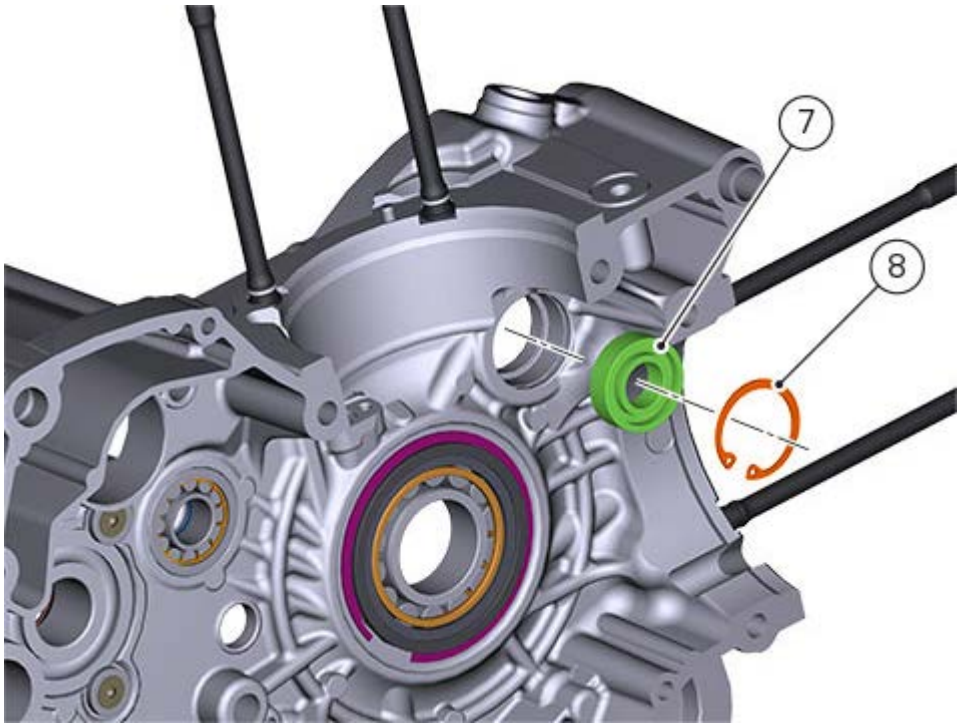


TIMING LAYSHAFT BEARING (7)



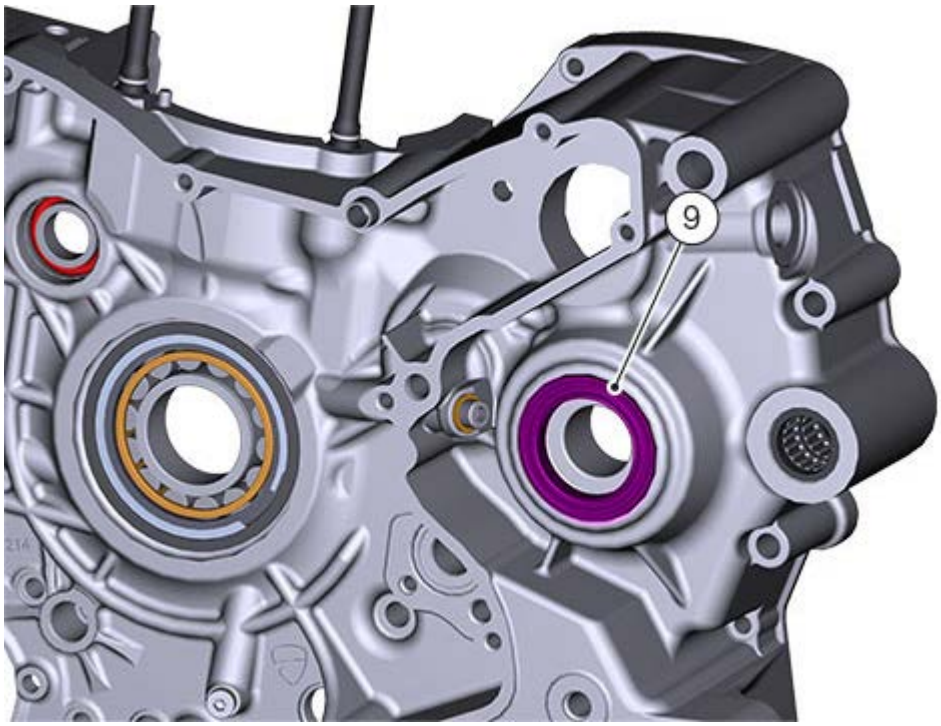
Remove the snap ring (8).
Remove the bearing (7).





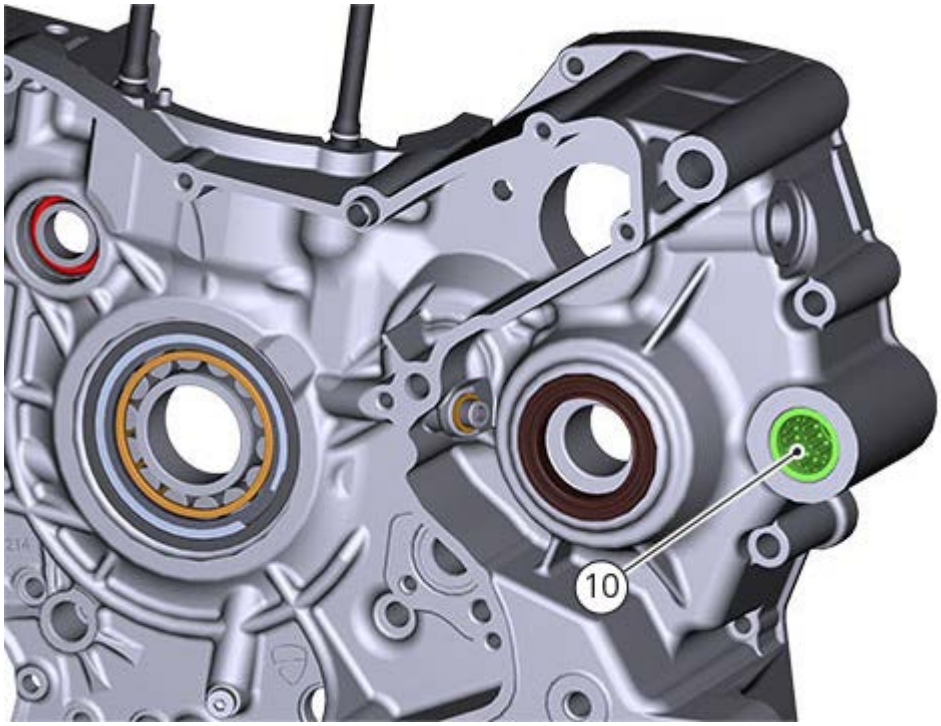
Generator side, external part (Side A)

SECONDARY SHAFT OIL SEAL (9)



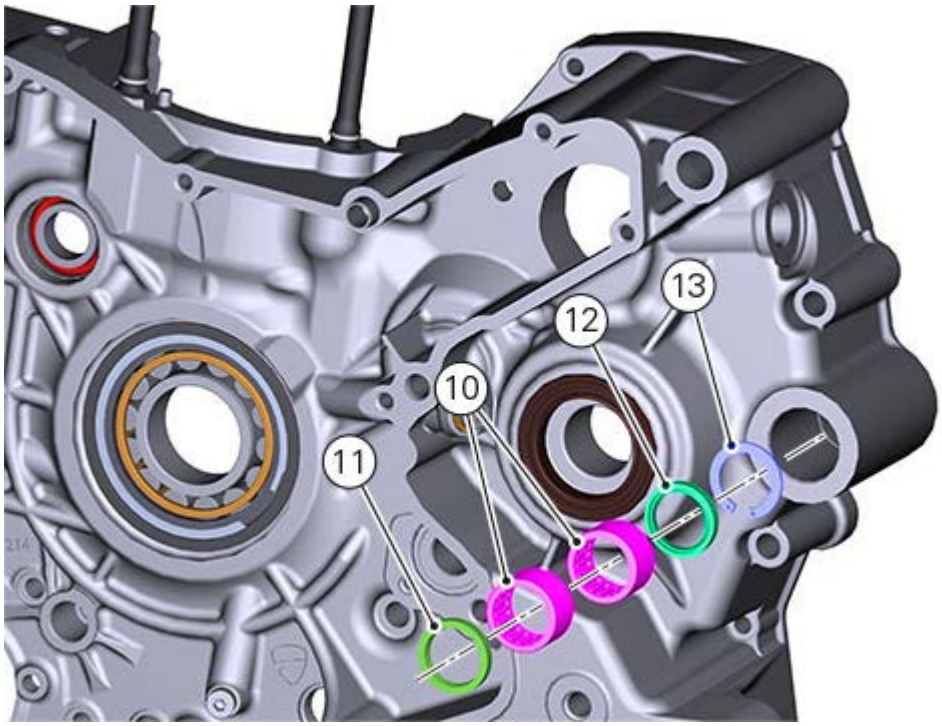
Remove oil seal (9).

NEEDLE ROLLER BEARINGS (10) FOR SWINGARM SHAFT



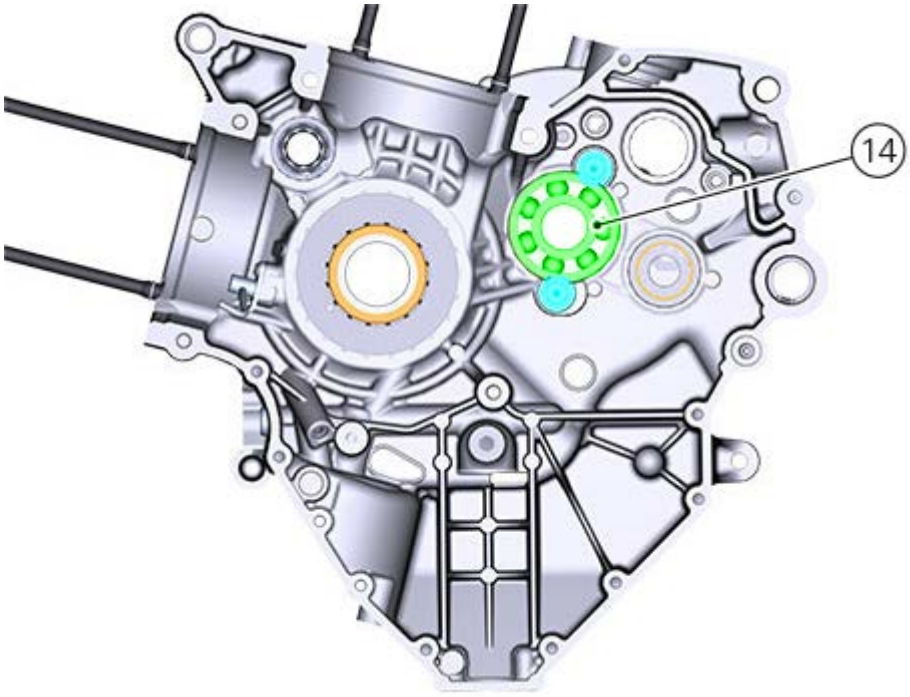
Remove the following components in the following sequence:

- sealing ring (11);
- needle roller bearings (10);
- sealing ring (12);
- snap ring (13).

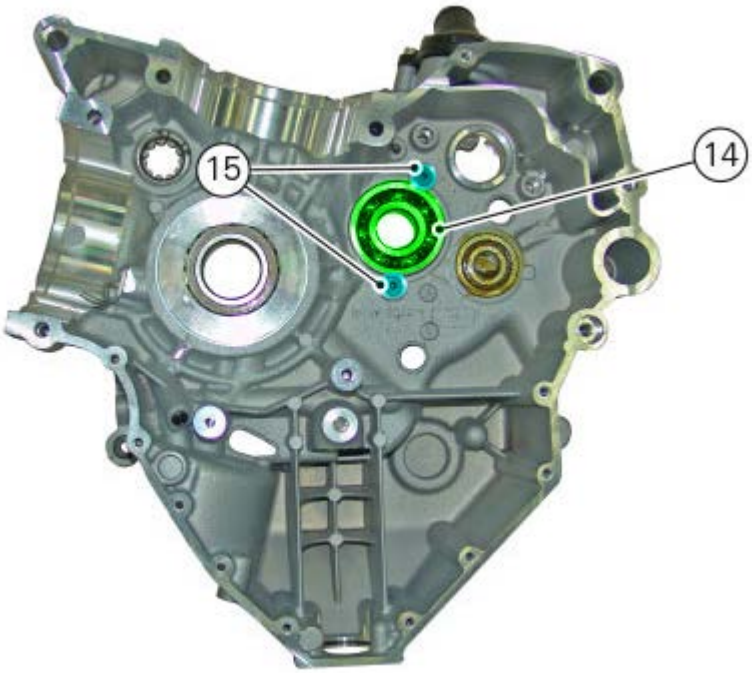


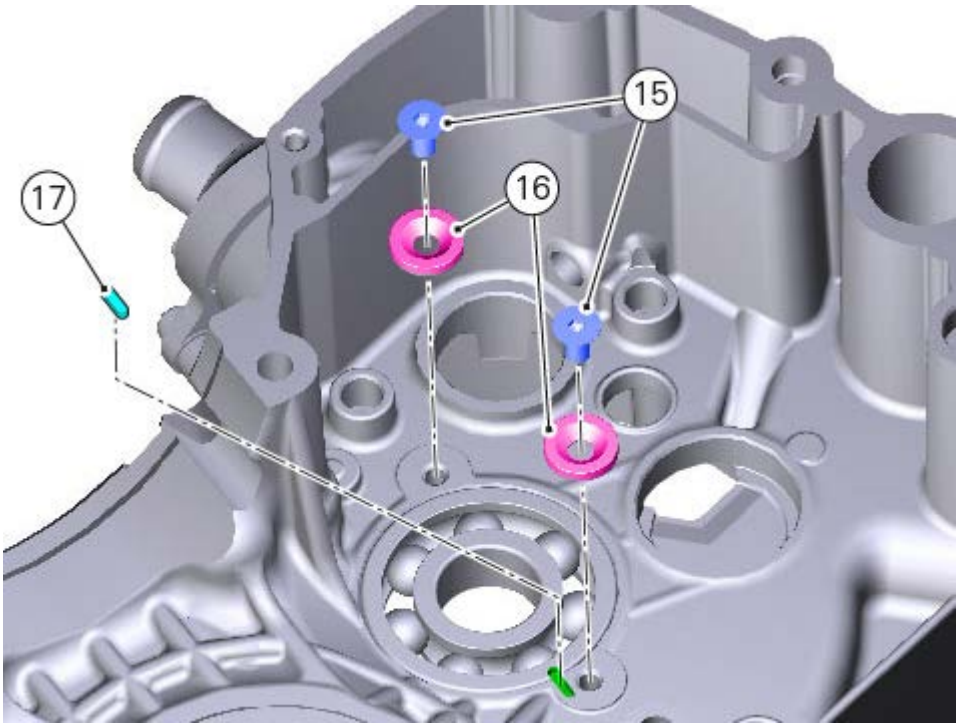
Clutch side, internal part (Side C)

PRIMARY SHAFT BEARING (14)

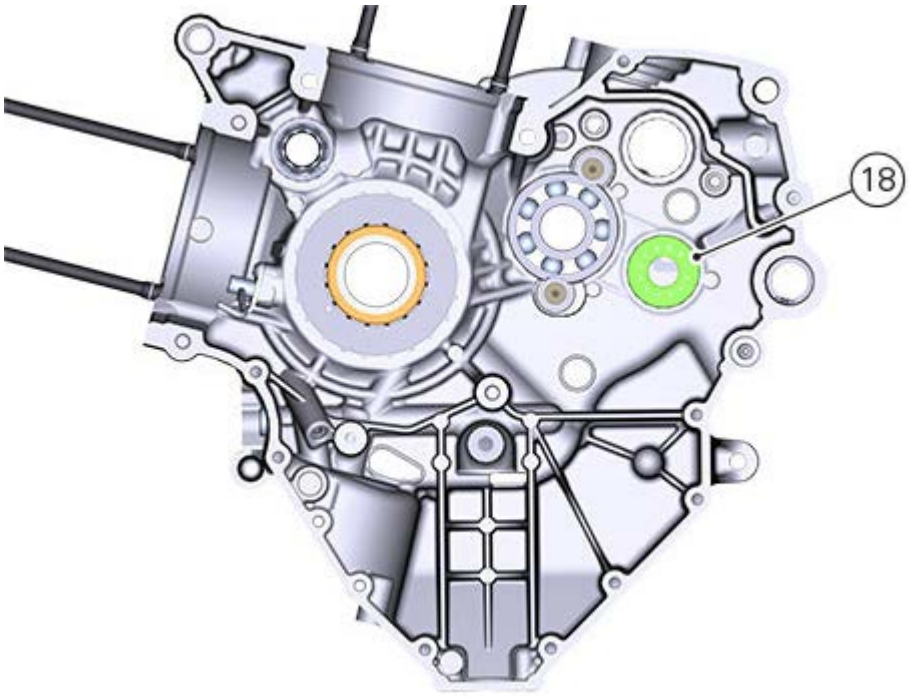


Undo the two retaining screws (15) and recover spacers (16).
Remove bearing (14) and tab (17).

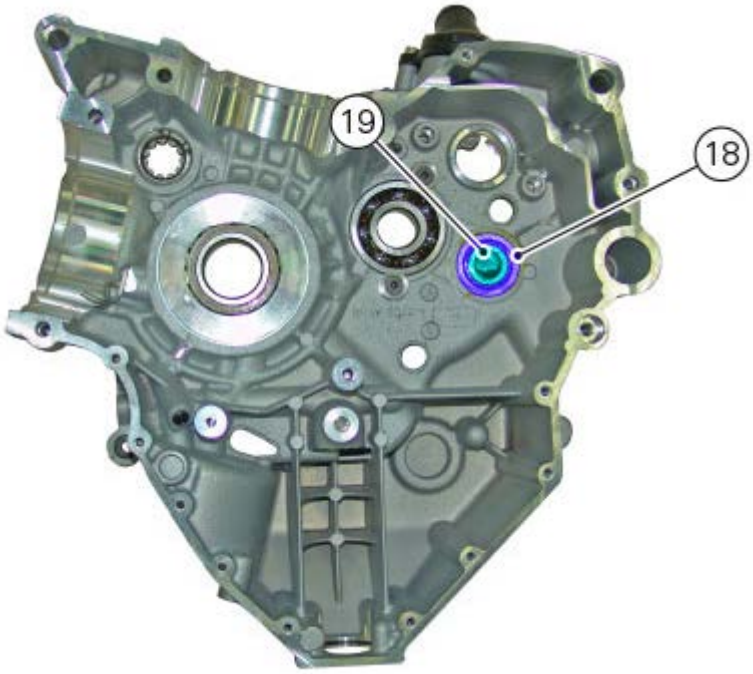


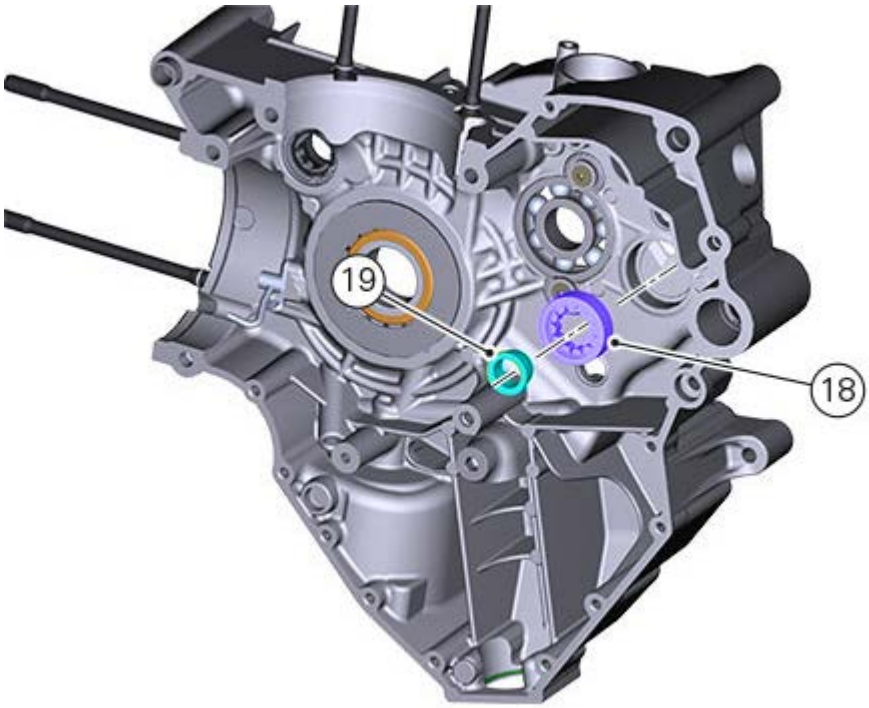


SECONDARY SHAFT BEARING (18)

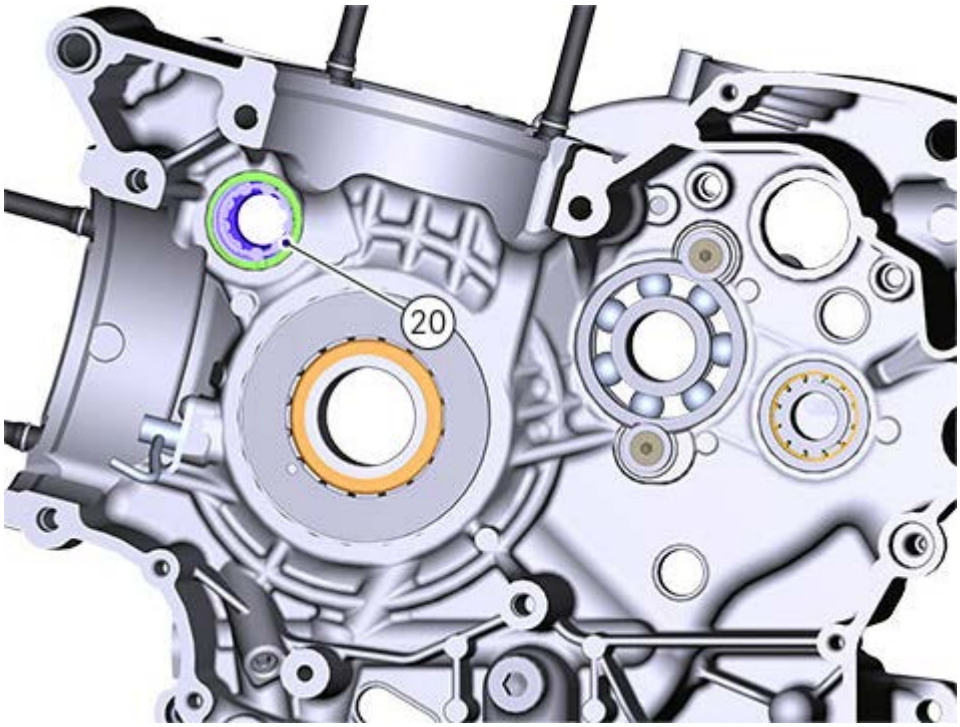


Remove the internal ring (19).
Remove the bearing (18).

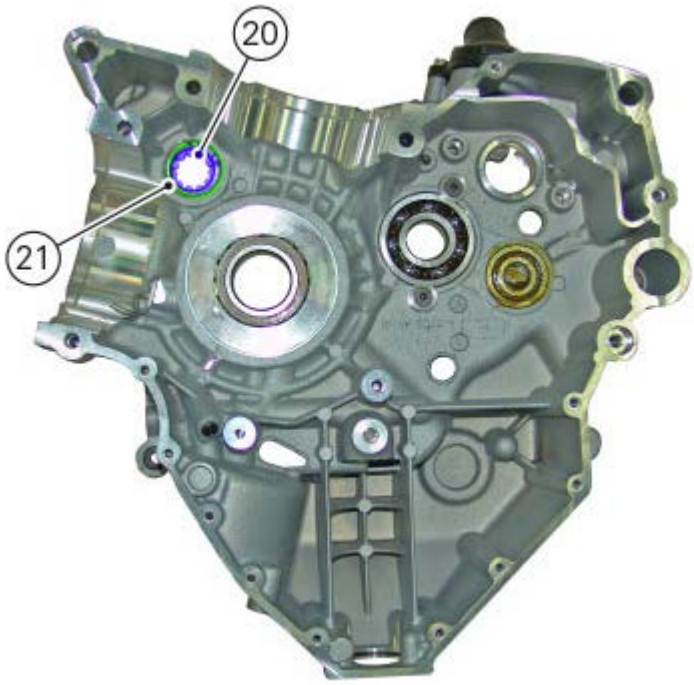


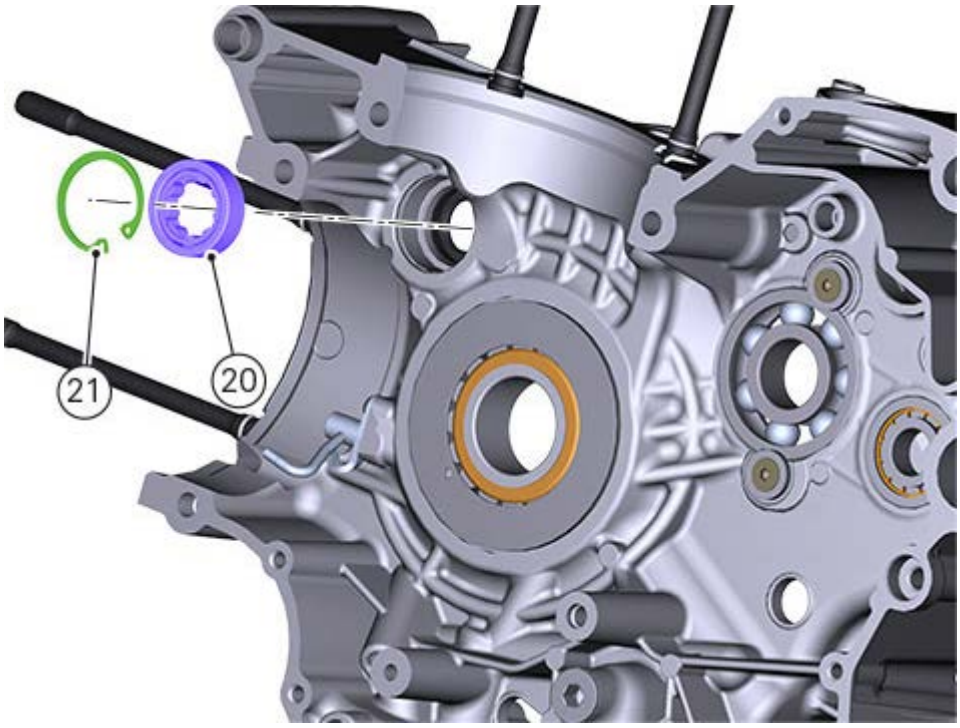


TIMING LAYSHAFT BEARING (20)



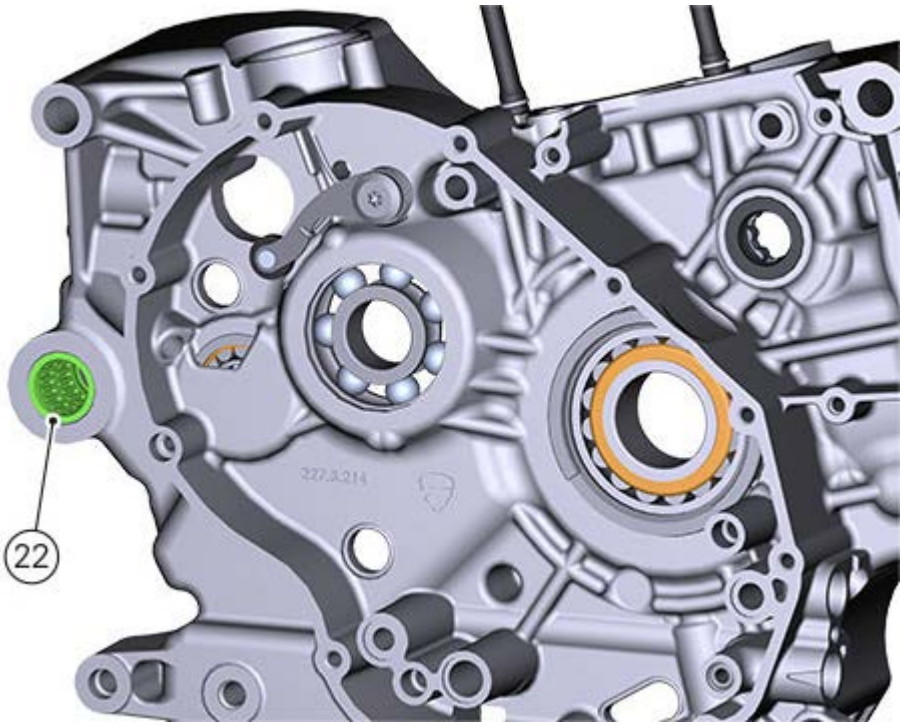
Remove the snap ring (21).
Remove the bearing (20).





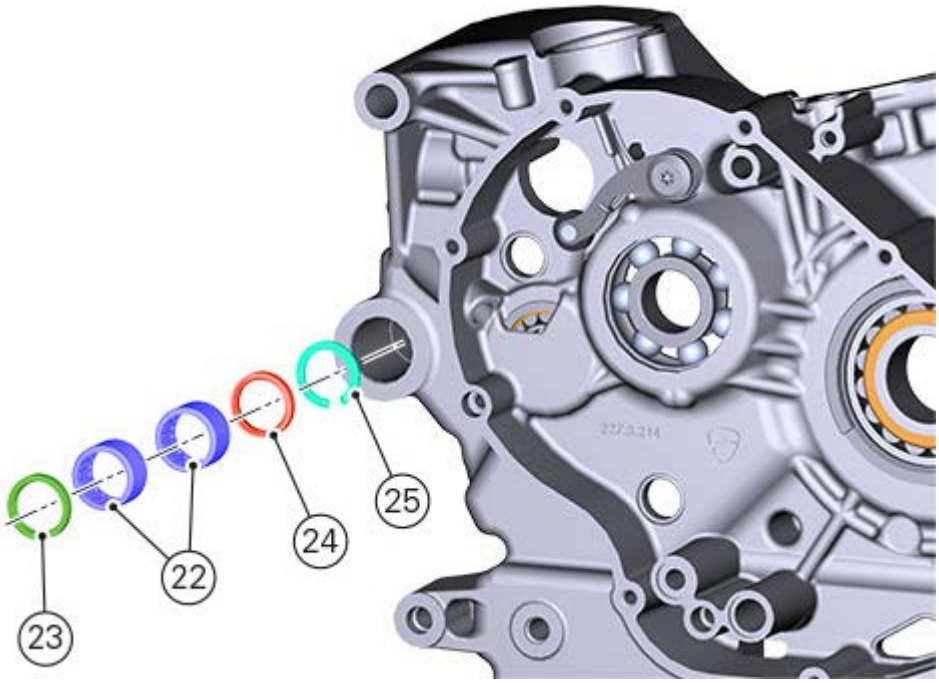
Clutch side, external part (Side D)

NEEDLE ROLLER BEARINGS (22) FOR SWINGARM SHAFT

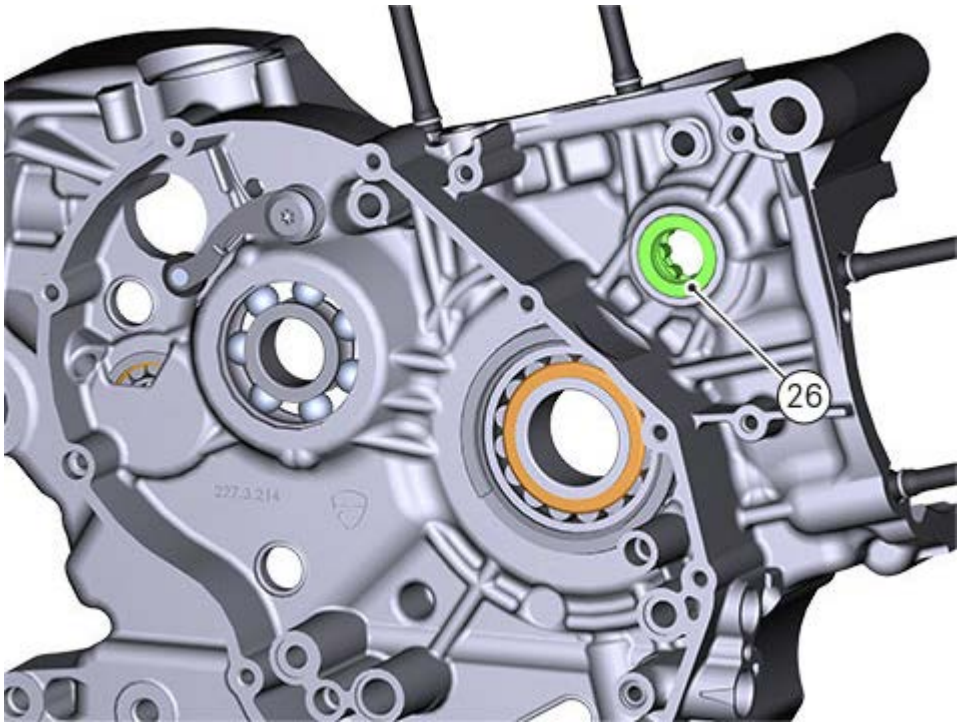


Remove the following components in the following sequence:

- sealing ring (23);
- needle roller bearings (22);
- sealing ring (24);
- snap ring (25).



TIMING SHAFT SEAL RING (26)



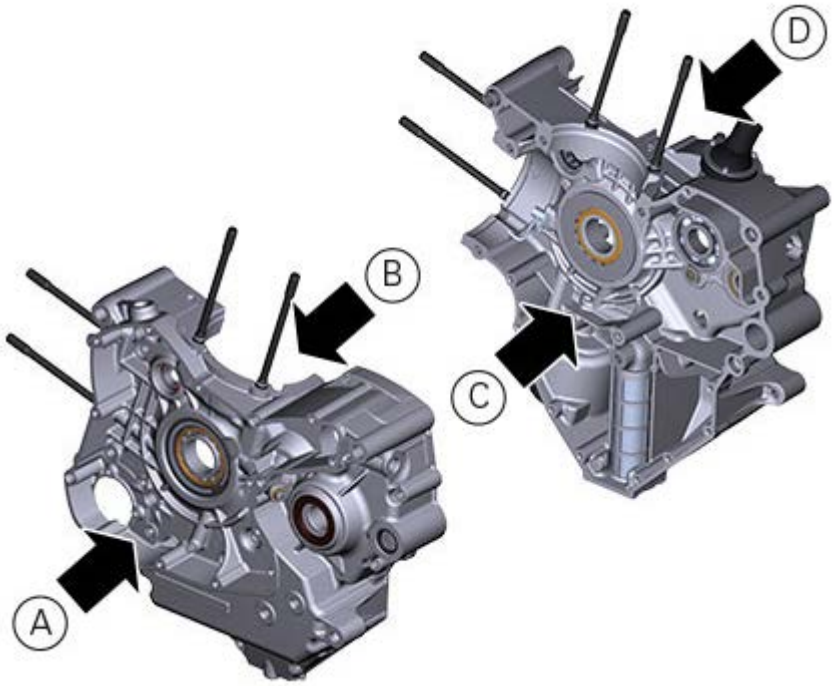
Remove the sealing ring (26).

Separating the crankcase halves

Remove the engine from the frame (Removing the engine).
Remove the generator side cover and the generator assembly (Removing the generator cover).
Remove the starter motor (Removing the starter motor).
Remove the clutch unit (Removing the clutch).
Remove the oil pump (Removing the oil pump).
Remove the mesh filter (Changing the engine oil and filter cartridge).
Remove the gearchange mechanism (Removing the gearchange mechanism).

To better identify the position of each component, the casing has been divided into four areas:

A) generator side, external part;
B) generator side, internal part;
C) clutch side, internal part;
D) clutch side, external part.

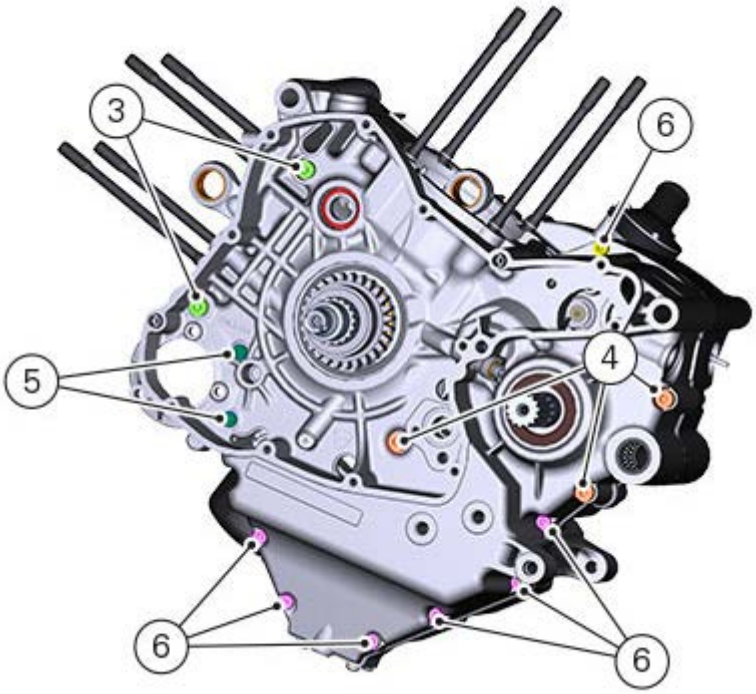


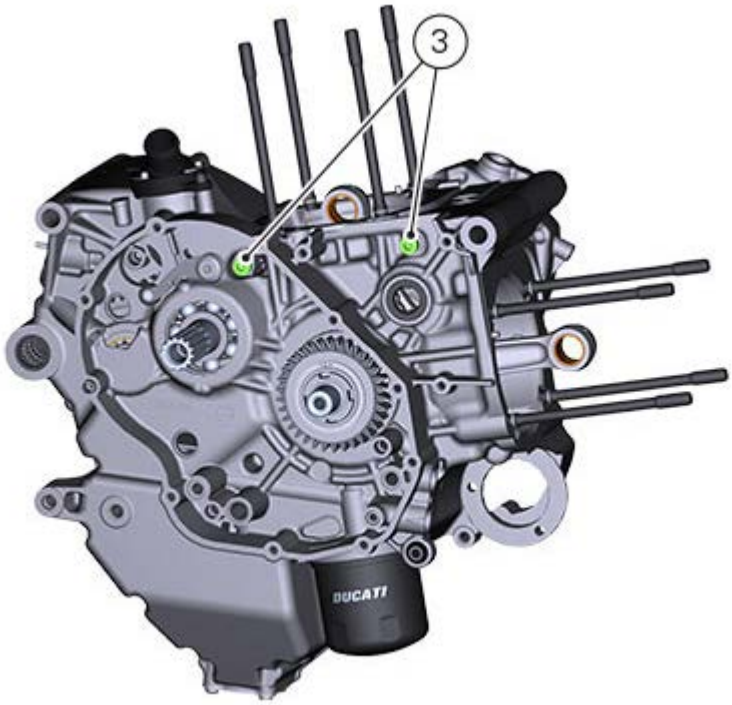
Use two screwdrivers to remove the snap ring (1) from the timing layshaft (2) on the clutch-side crankcase half (**Side D**).

Warning

Take care to avoid scoring the surface of the shaft while removing the snap ring.

Working on the generator side of the casing (**Side A**) and the clutch side (**Side D**) loosen the screws (3), (4), (5) and (6).

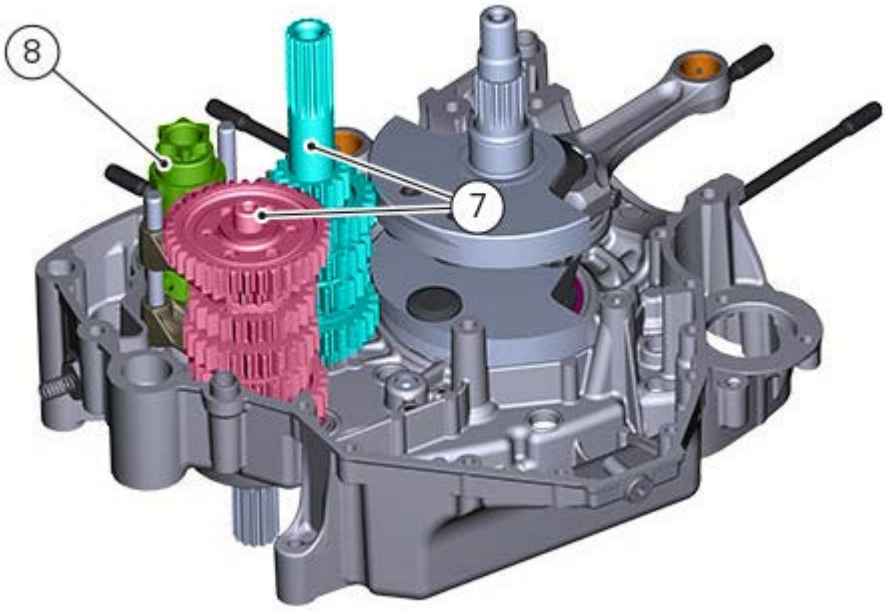




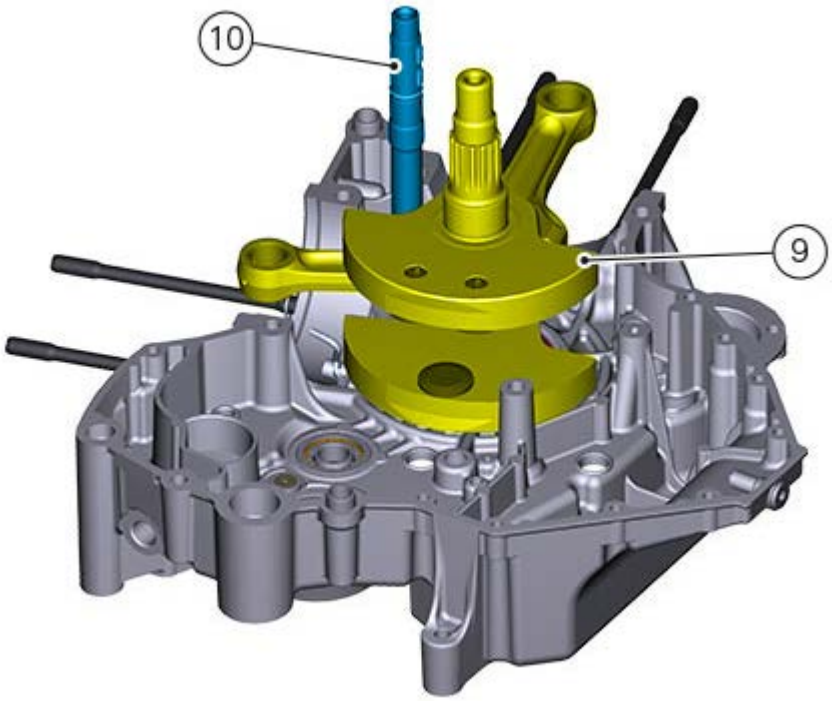
Reuse the generator cover or a service cover with puller part no. **88713.1749** fitted.
Secure cover to crankcase half with some of the original screws and begin separation by turning the central pin of the tool.
Tap the end of the gearbox secondary shaft with a plastic mallet to separate the crankcase halves.

Note
Take care not to lose the shim washers on the shafts and on the selector drum.

Working on the crankcase half internal side (**Side B**) remove the gearbox shafts (7) and the gear selection drum (8) from the crankcase halves as described in section "Removing the gearbox assembly".



Drive out the crankshaft (9) using a plastic mallet, taking care not to lose the snap ring.
Remove the timing layshaft (10).



Loosen screw (11), remove the lubrication valve (12) and collect the O-ring (13).

Refitting the connecting rod assembly

Install the connecting rod assembly in the crankcase half, carry out the shimming and crankcase half reassembly procedure as described in section "Closing the crankcase".

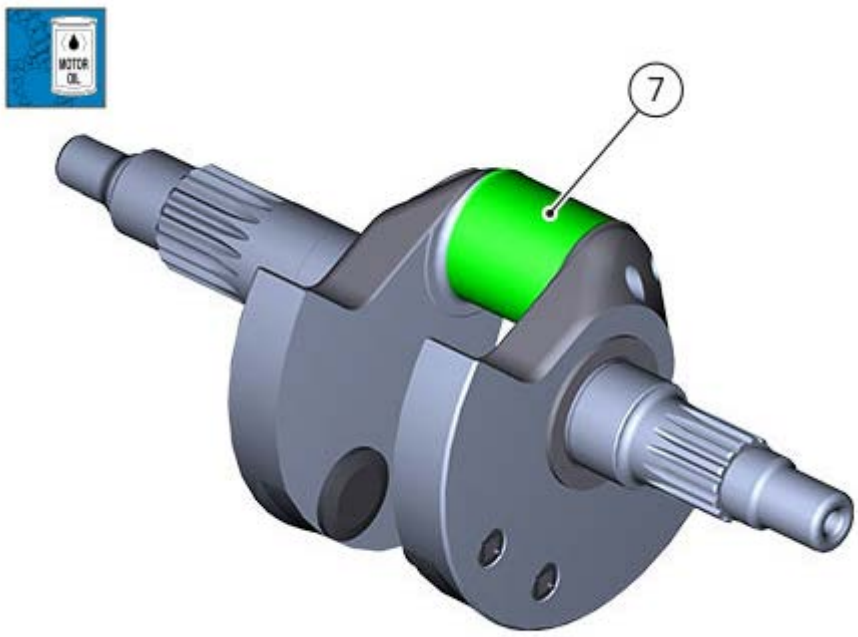
Important

Make sure that the connecting rods are correctly positioned in the relevant cylinder seats. Incorrect positioning of the connecting rods at this stage will inevitably lead to the need to re-open the crankcase halves.

Reassemble the crankcase halves (Closing the crankcase).
Refit the mesh filter (Changing the engine oil and filter cartridge).
Refit the oil pump (Refitting the oil pump).
Refit the clutch unit (Refitting the clutch).
Refit the clutch cover (Refitting the clutch cover).
Refit the starter motor (Refitting the starter motor).
Refit the generator assembly and the generator side cover (Refitting the flywheel/generator assembly).
Refit the complete cylinder/piston assembly (Refitting the cylinder/piston assembly).
Refit the camshaft assembly (Refitting the camshafts).
Refit the timing system components (Refitting the cylinder head pulleys/fixed tensioners).
Fit the engine on the frame (Refitting the engine).

Reassembling the connecting rod assembly

Before coupling the crankshaft with the con-rods, check the conditions of the crankshaft (Overhauling the connecting rod assembly), thoroughly clean the crank pin (7) and lubricate it with the indicated product.

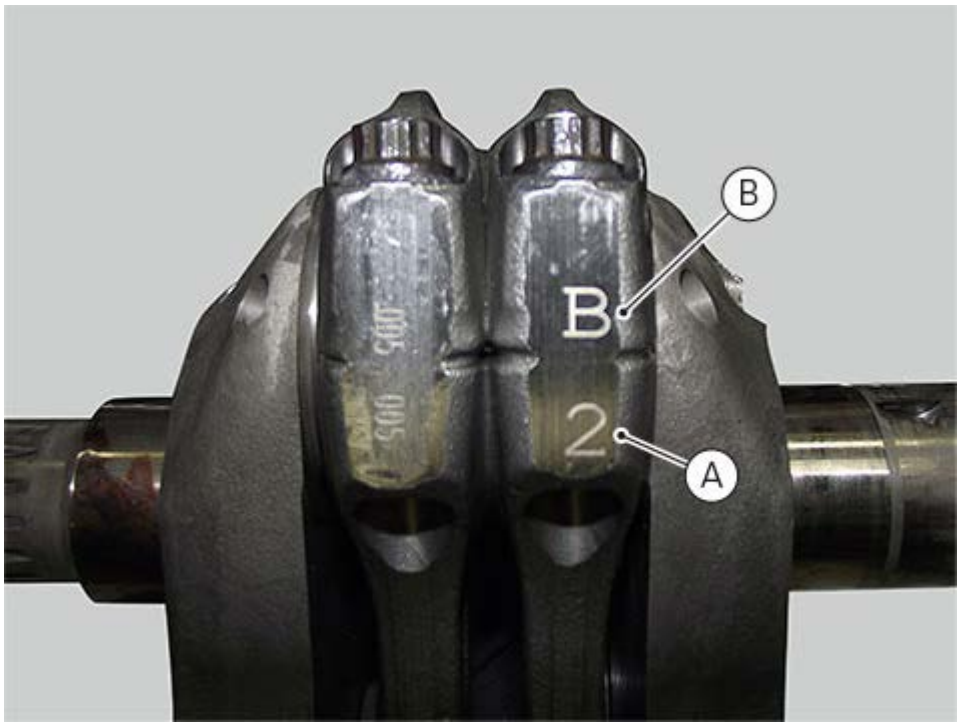


Check the crankshaft/con-rod coupling (Checking the crankshaft/con-rod clearance).

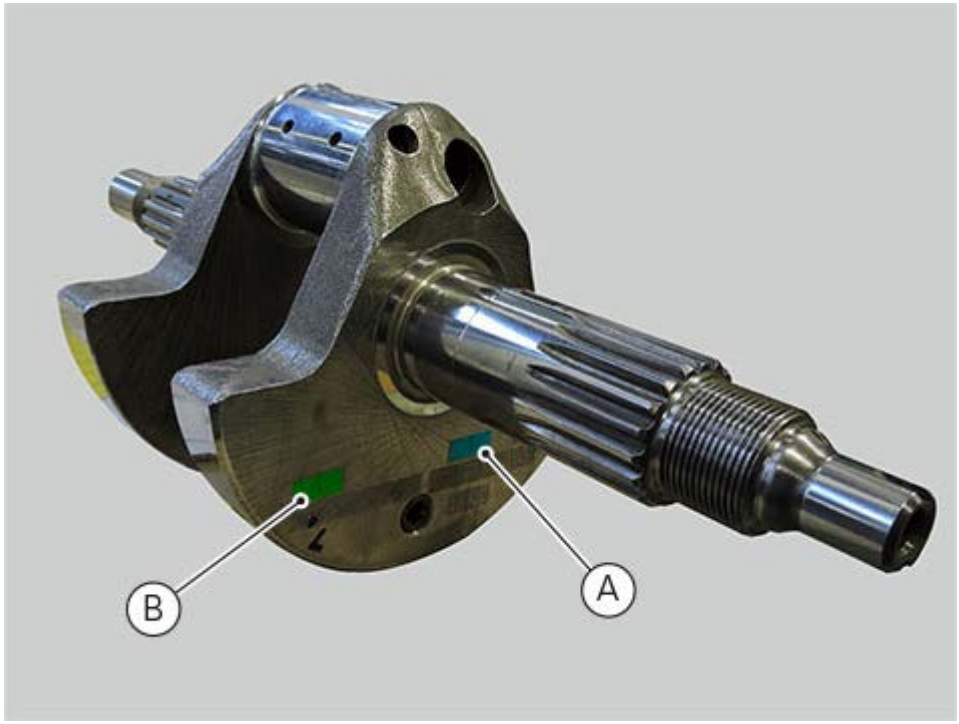
Replacing connecting rod big end bearings.

Before installing the bearing in the con-rod it is necessary to check the crankshaft and con-rod classes.
There are two classes:
(A) according to the con-rod and crankshaft weight;
(B) according to the geometric tolerances.

Connecting rod



Crankshaft



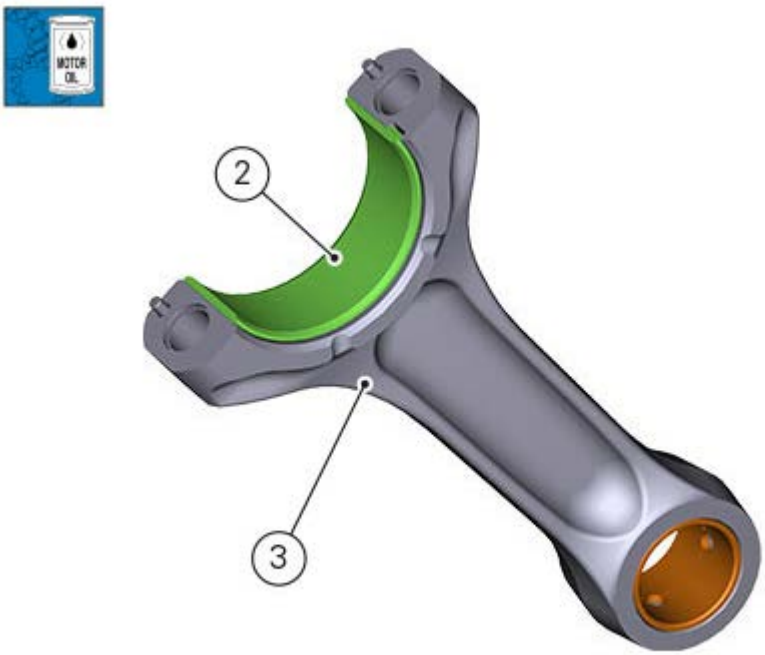
Bearings

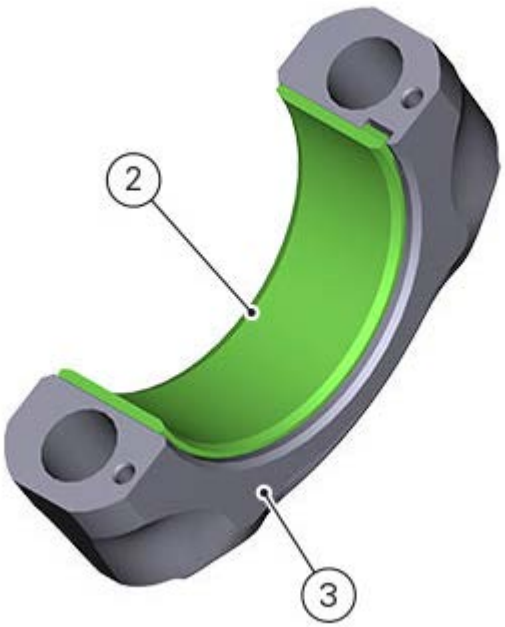
Each class corresponds to a certain colour on the bearings highlighted on the edge (as shown in the figure).

Connecting rod class	Crankshaft class	Bearings colour
A	A	YELLOW/BLUE
A	B	YELLOW/YELLOW
B	A	BLUE/BLUE
B	B	YELLOW/BLUE

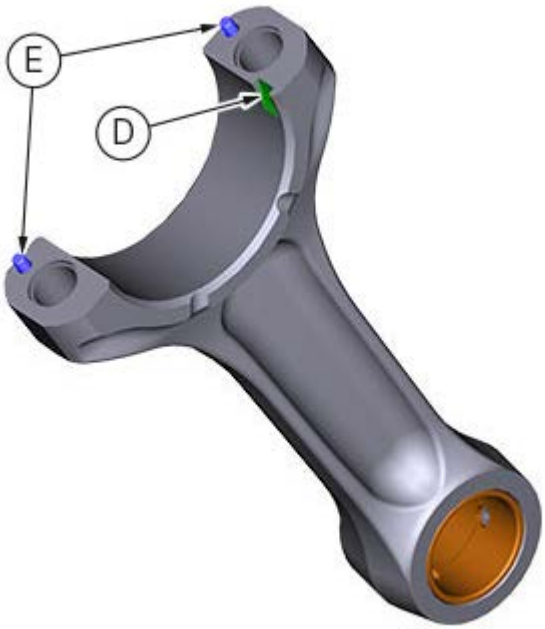
Con-rod weight class	Crankshaft weight class	Weight

After checking and choosing the bearing type (2) lubricate it with the indicated product and insert it in con-rod (3).

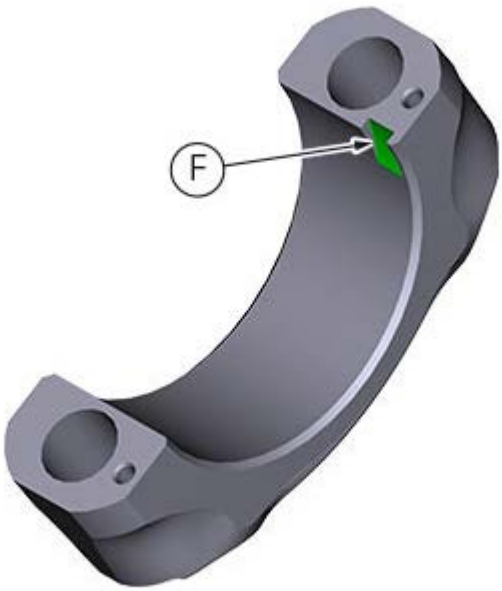




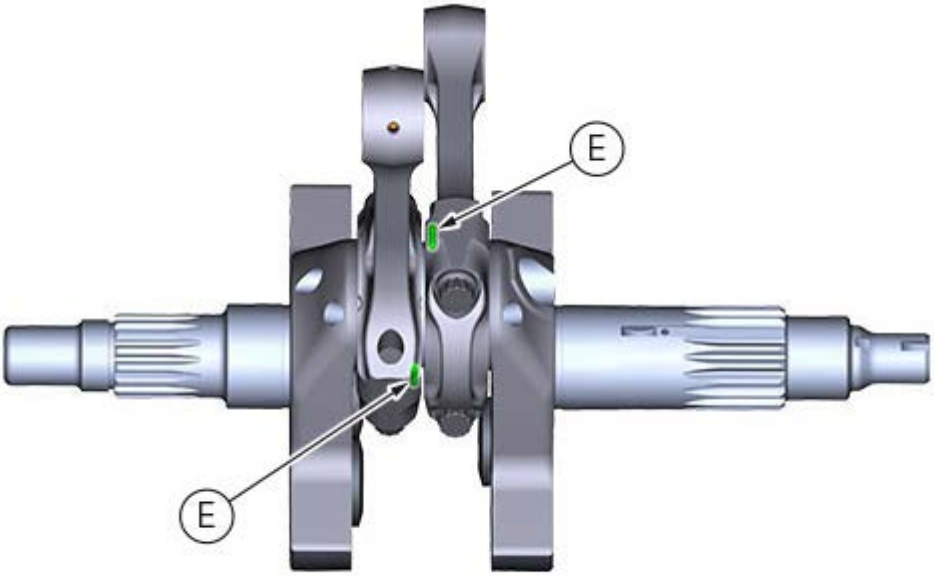
While inserting it, pay attention that shell tooth (C) matches with seat (D) of the con-rod shank and the other shell with seat (F) of the con-rod cap.
Check that the centring dowels (E) are present.


E
D

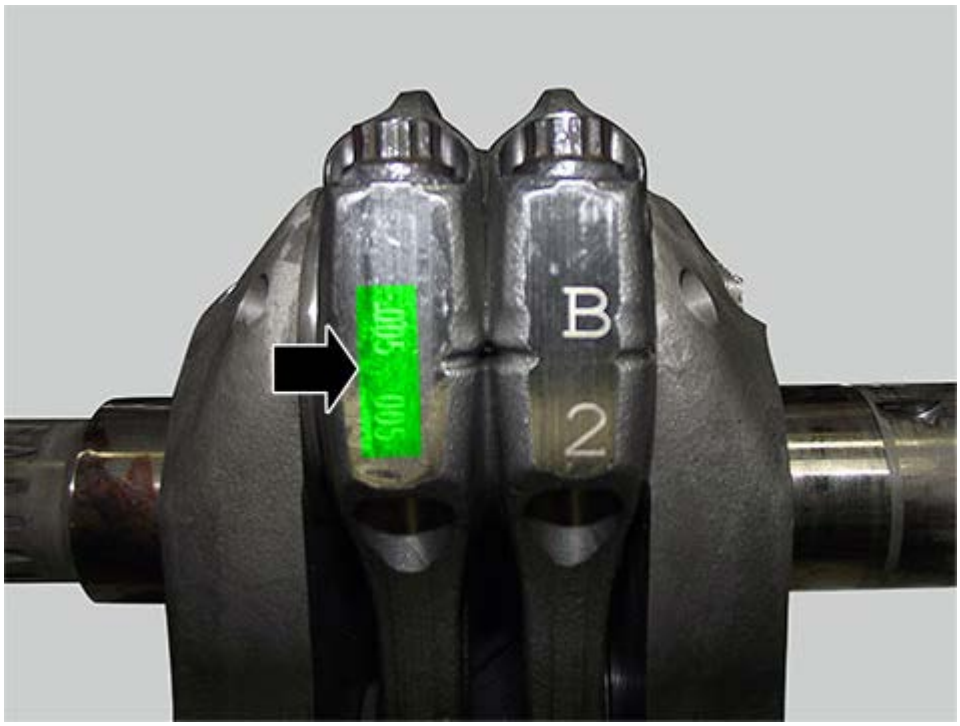

C



Fit the connecting rods on the crankshaft, in the same position in which they were removed.
Insert the connecting rods in the crankshaft, so that the centring pins (E) face the internal side of the crankshaft.



Join the connecting rod cap with the corresponding connecting rod shank, ensuring that the progressive number stamped on the two pieces is the same, as shown in the figure.



Important

Check that the progressive numbers of a connecting rod are consistent with the selection of the other connecting rod.

Fill the recommended grease into the two ends of the hole to lubricate threads and underside of the new screws (4) and the thread of the shaft.

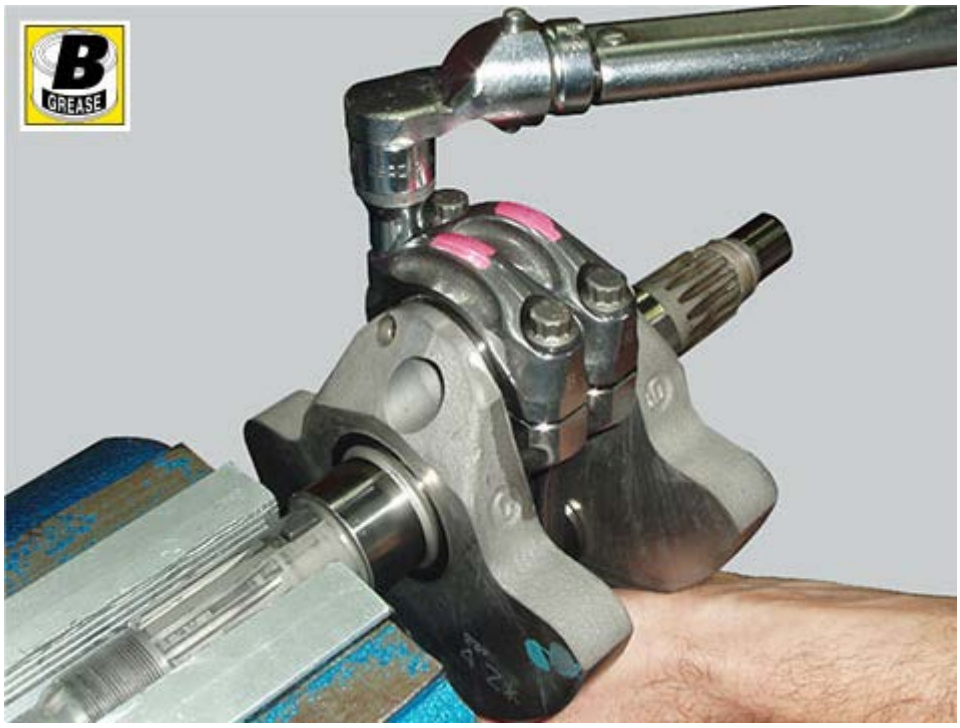
Warning

The grease utilised is irritant in contact with the skin; wear protective gloves.

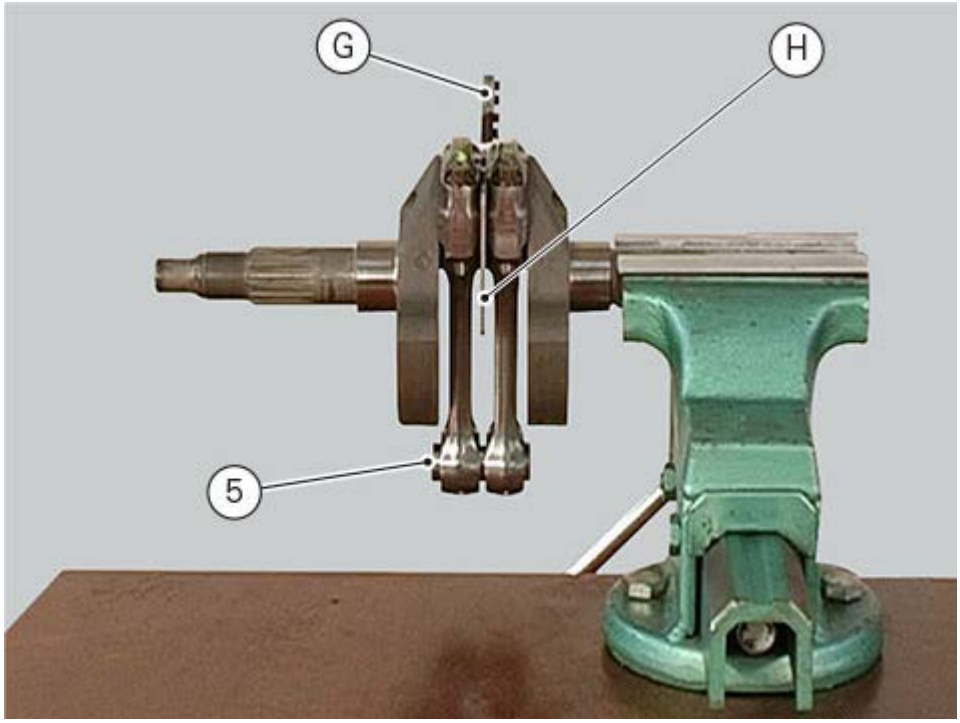
Important

Lubrication of con-rod bolts is essential to obtain the correct coupling and to prevent breakage of the parts.

The con-rod screws may only be used for one tightening.
Insert screws (4) fully home manually or using a wrench without tightening.
If this proves difficult or if the screws jam, undo them and lubricate them again.
Remove any excess grease.
Tighten the screw by hand until the head seats against the connecting rod.



Fit spacer (G) of tool **88713.2878** between the con-rods and take up residual axial clearance with the fork feeler gauge (H) of tool no. **88713.2878** which has shims of the following sizes: **0.1** mm - **0.2** mm - **0.3** mm. Temporarily fit the gudgeon pin (5) to align the connecting rods and then tighten the screws.



Tighten the connecting rod bolts (Class 14.9) as described below:

- apply the recommended grease to the thread;
- tighten the screw to a torque of 35 Nm ± 10%;
- wait for 2 seconds then loosen by 360°;
- tighten to a snug torque of 20 Nm ± 10%;
- tighten to a snug torque of 35 Nm ±10%;
- tighten with a rotation of 65°±1°;
- check the applied tightening torque (Min. 70Nm - Max. 113Nm).

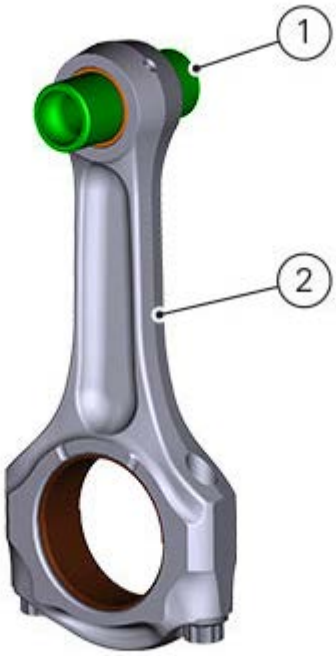
Overhauling the connecting rod assembly

Following are the overhaul operations that can be performed on the connecting rod assembly:

1 checking and replacing the con-rod small end bush;
2 checking the con-rod parallelism;
3 checking and replacing the con-rod big end bearings;
4 checking the crankshaft;
5 checking the crankshaft/con-rod clearance.

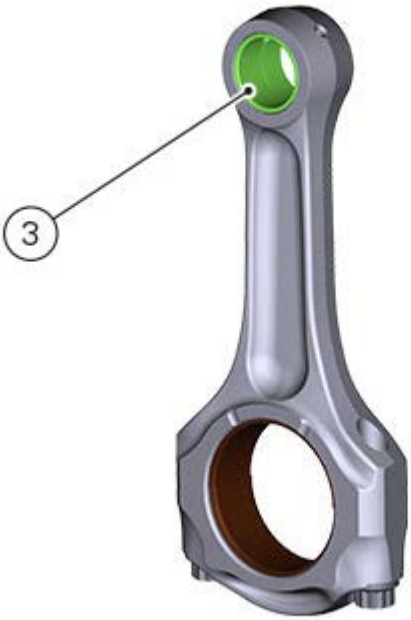
1) checking and replacing the con-rod small end bush.

The clearance between gudgeon pin (1) and con-rod (2) must be within the following range: **0.035** ÷ **0.049** mm.

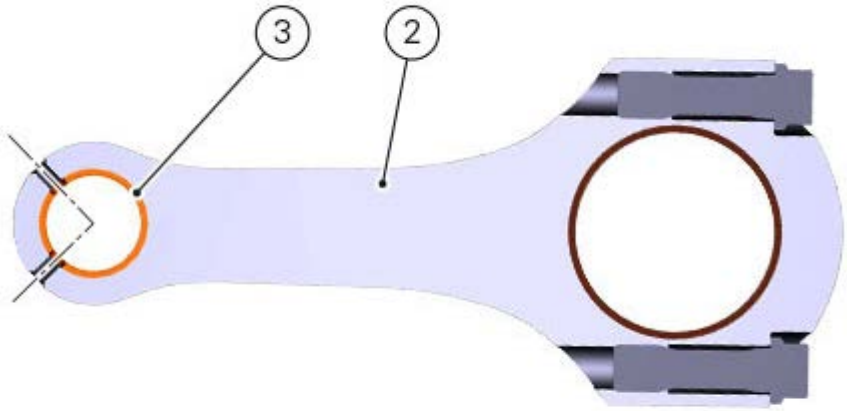


If not, check the gudgeon pin diameter (A) (Ø 20 / 0÷0.003).

If the gudgeon pin is conforming, replace bushing (3) of the con-rod small end.

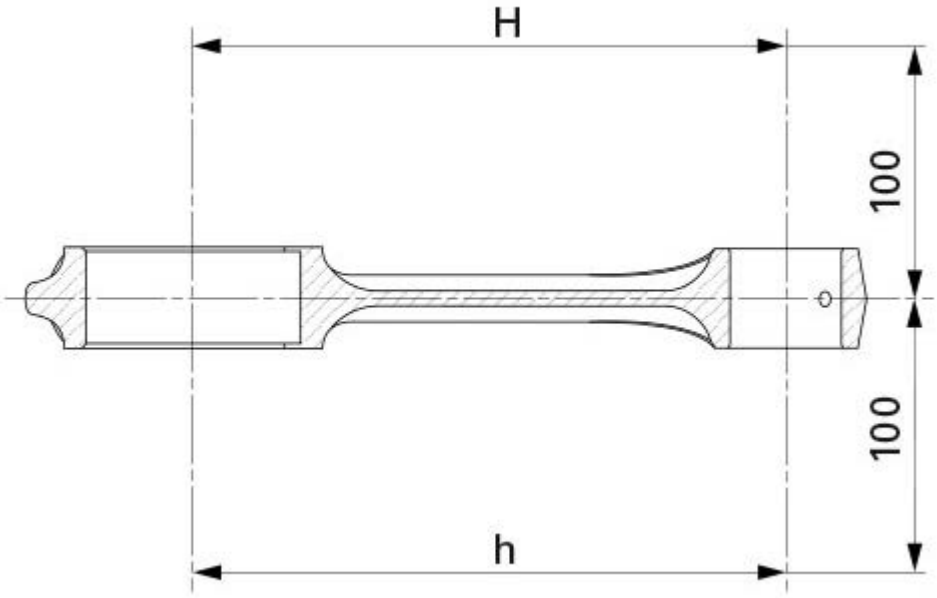


To remove the worn bush, use a suitable punch and a press.
When installing the new bushing (3) align its concentric holes with the holes of the con-rod (2).



2) Checking the con-rod parallelism

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.



3) Checking the con-rod big end bearings

Check that the con-rod big end bearings are free from burrs or evident signs of machining.

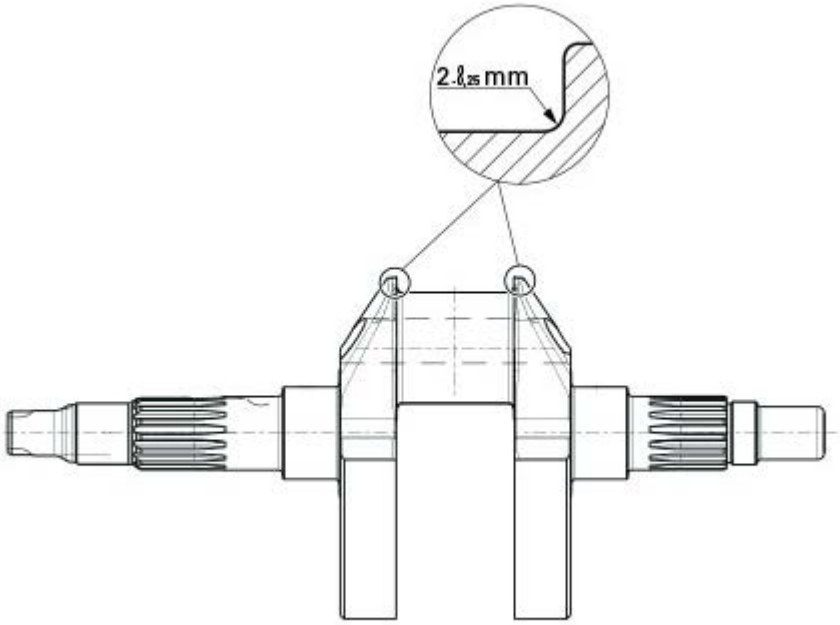
The connecting rod is supplied in two size classes A and B relative to the big end diameter as punch marked on the side of the cap and two weight classes 1 and 2.

Connecting rod class	**Crankshaft class**	**Bearings colour**
A	A	YELLOW/BLUE
A	B	YELLOW/YELLOW
B	A	BLUE/BLUE
B	B	YELLOW/BLUE

For their replacement, refer to chapter "Reassembling the connecting rod assembly".

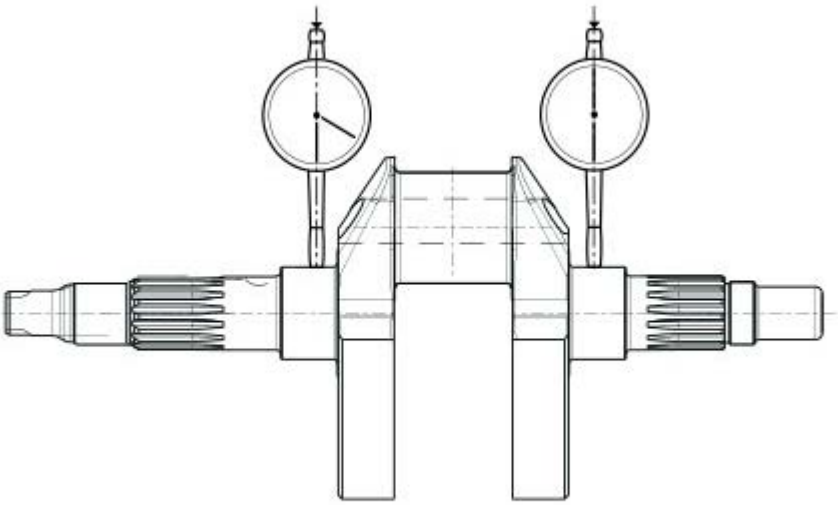
4) Checking the crankshaft

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.
Fillet radius: 3mm.

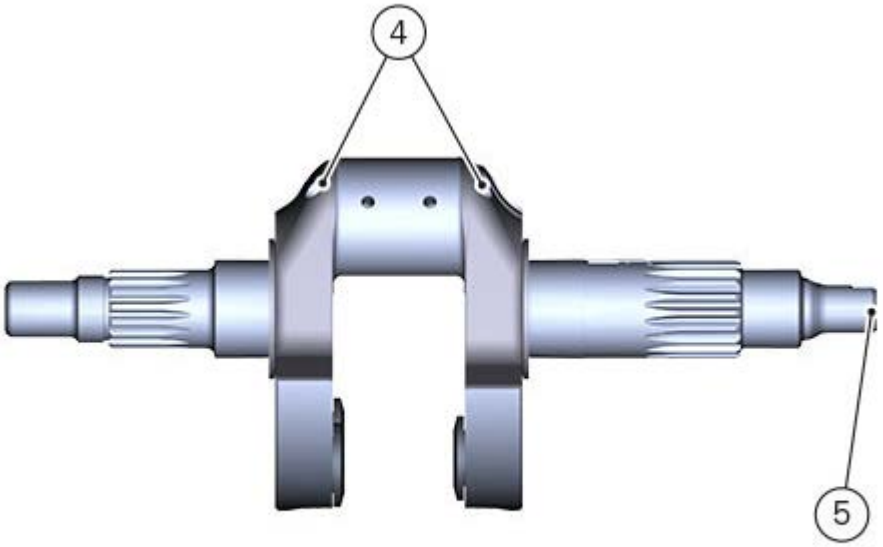


Use a micrometer to measure oval and taper of the crank pin. Measure oval and taper in several different directions.
Use a dial gauge to measure the alignment of the main journals by positioning the crankshaft between two centres.

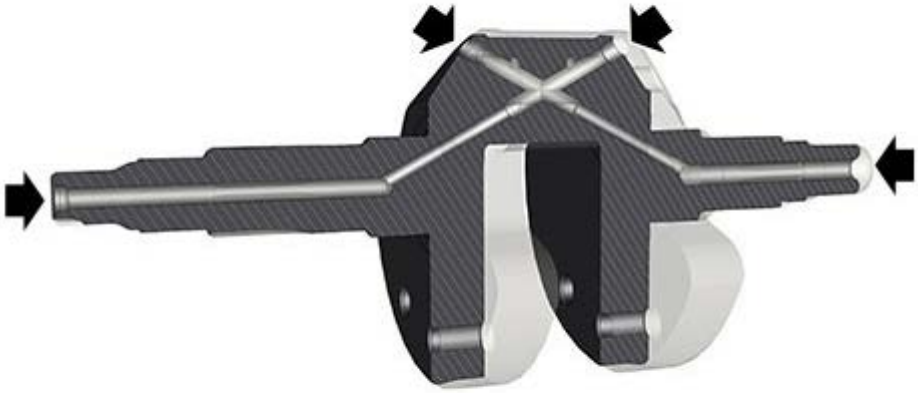
Oval **0.005** mm.
Taper **0.005** mm.
Main journals alignment Ø **0.01** mm.

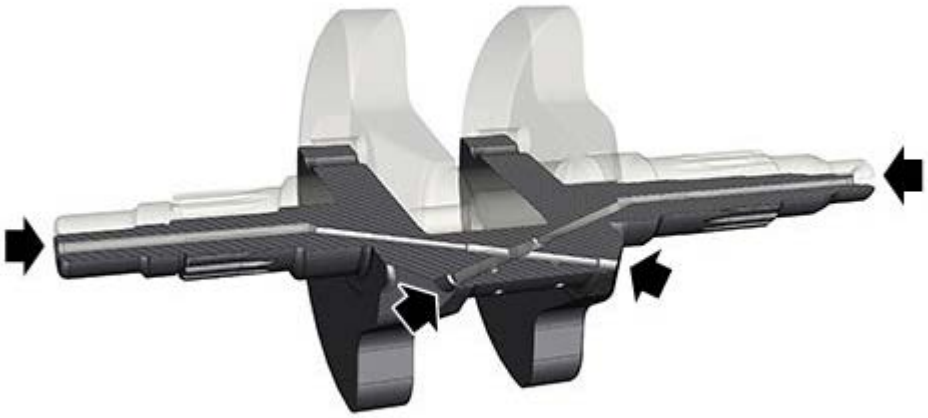


Loosen all crankshaft plugs (4) and (5), heating the crankshaft, if necessary, to remove the sealant applied at the time of assembly.

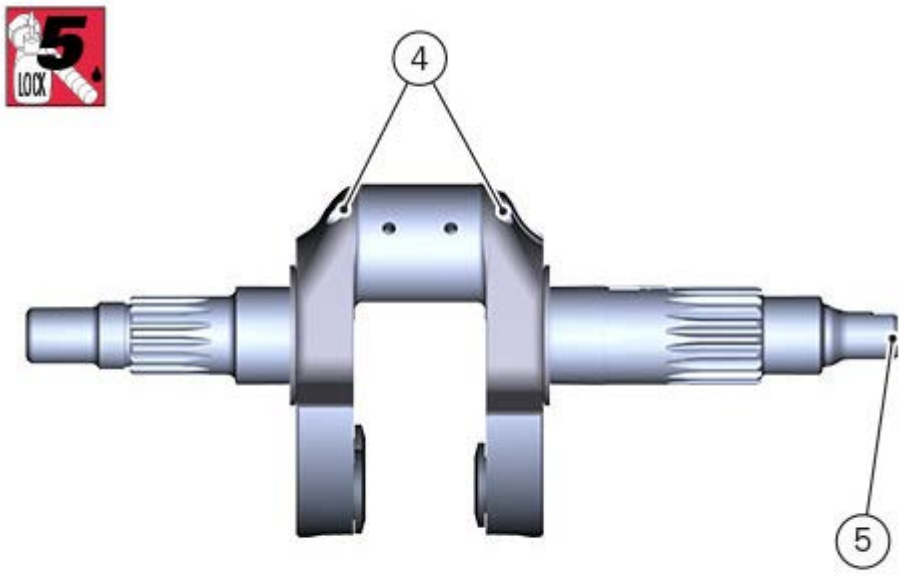


Clean all the oilways using suitable diameter metal brushes and then blow with compressed air to remove any residues that have accumulated and are restricting the oil flow.



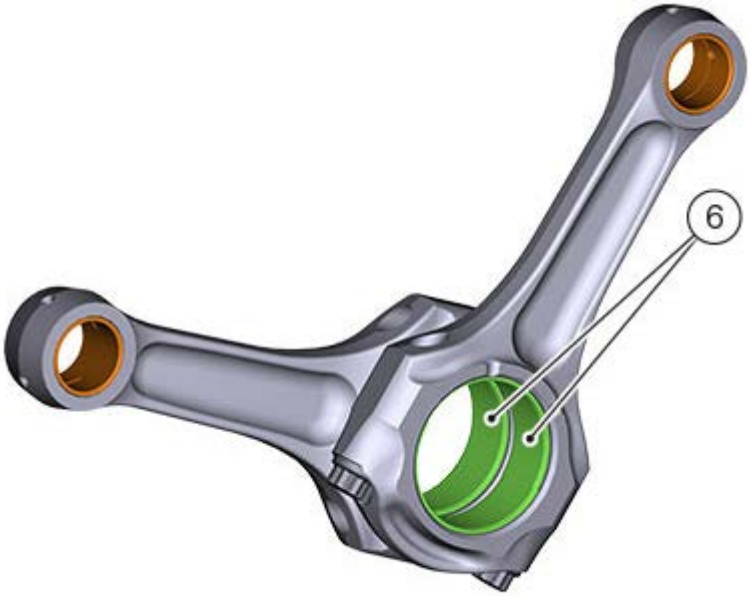


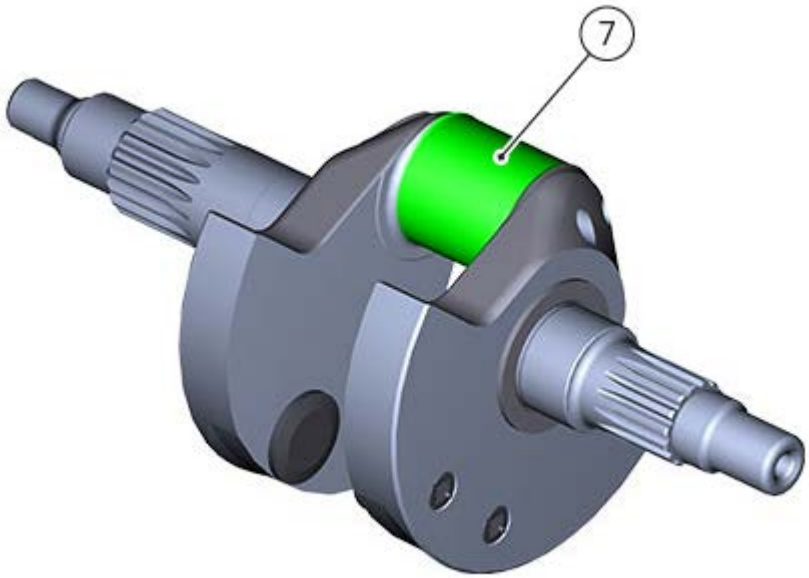
Apply recommended threadlocker to the threads of plugs (4) and (5), and refit them.
Tighten all plugs to a torque of 13 Nm (Min. 11 Nm - Max. 15 Nm).



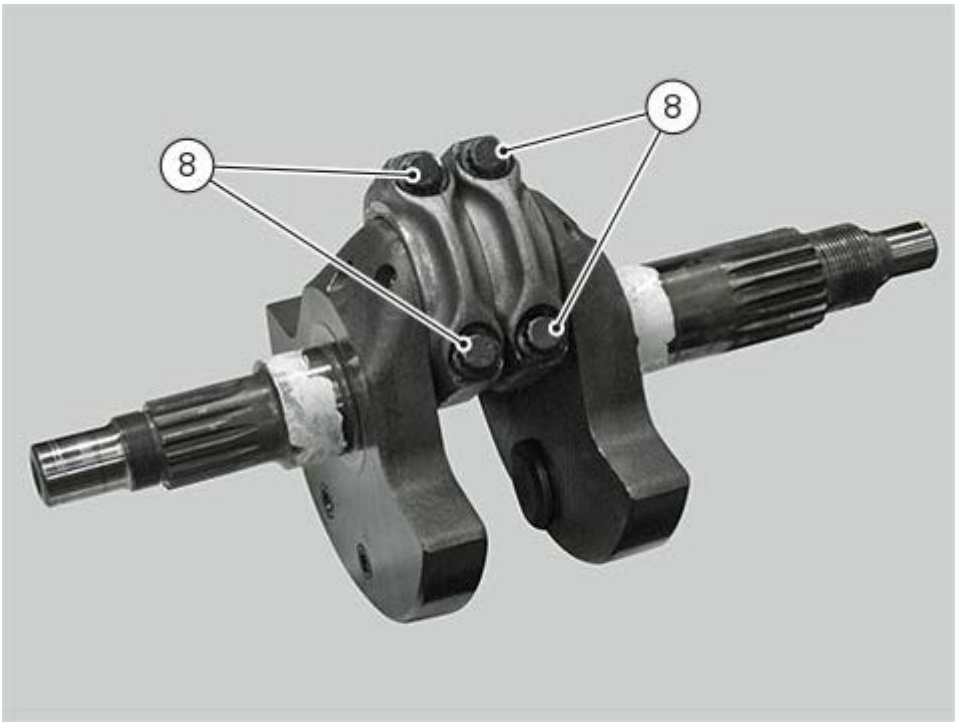
5) Checking the crankshaft / con-rod clearance

In order to correctly couple big-end bearings (6) and crank pin (7), proceed as follows:





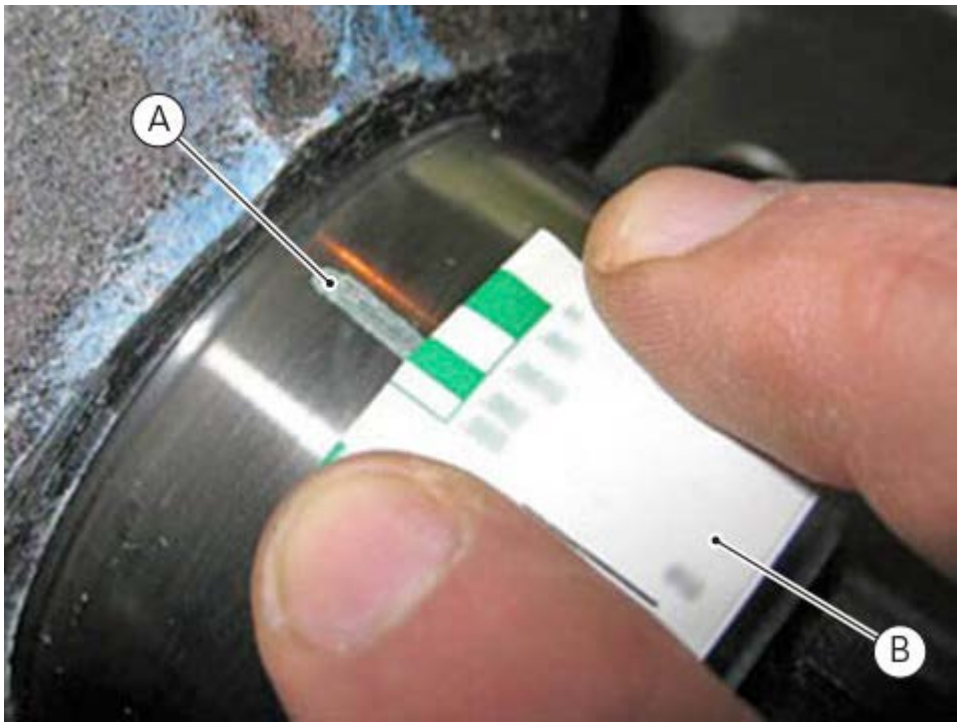
- apply a strip (A) of GREEN "Plastigauge PG-1" to the crank pin;
- fit the used con-rod and bearing;

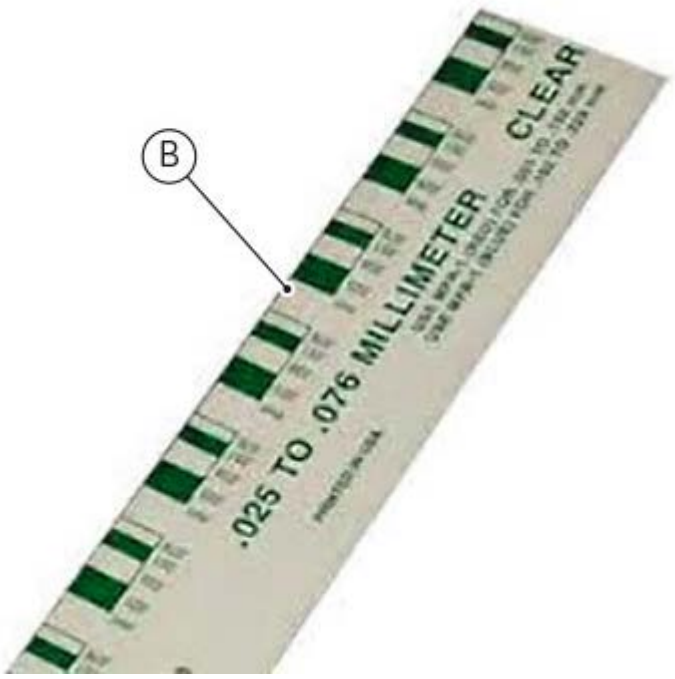


- tighten screws (8) to a torque of 35 Nm ± 10%.
- wait for 2 seconds then loosen by 360°;
- tighten to a snug torque of 20 Nm ±10%;
- tighten to a snug torque of 35 Nm ±10%;
- tighten with a rotation of 65°±1°;
- Check the applied tightening torque (Min. 70Nm - Max. 103Nm).

Continue the coupling procedure as described below:

- loosen the screws and remove the connecting rod;
- check the width of the strip of GREEN "Plastigauge PG-1" (A), using the suitable reference scale (B);
- the thickness detected with the scale (B) represents the actual clearance; if it is not within the following range **0.046** ÷ **0.076**the bearings (Reassembling the connecting rod assembly) or the crankshaft must be replaced and the procedure must be repeated;





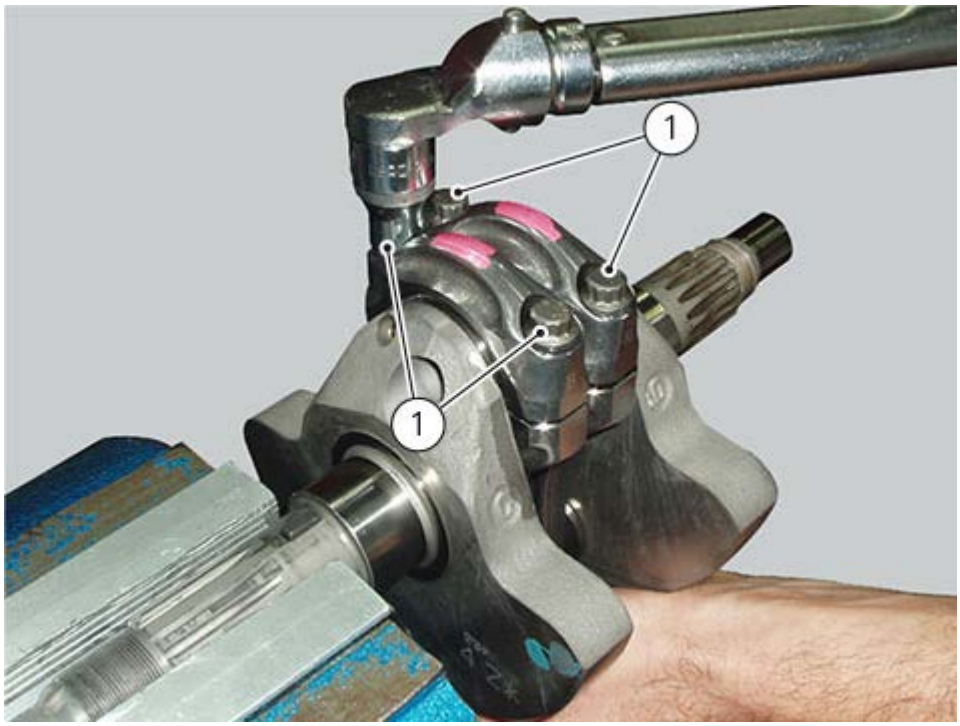
- if the clearance value complies with the established limits, carefully remove the strip of GREEN "Plastigauge PG-1" (A) from the crankshaft and repeat the tightening procedure as described above.

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

Remove the engine from the frame (Removing the engine).
Remove the timing components (Removing the timing outer covers).
Remove the camshaft assembly (Removing the camshafts).
Remove the generator side cover and the generator assembly (Removing the generator cover).
Remove the starter motor (Refitting the starter motor).
Remove the clutch cover (Removing the clutch cover).
Remove the clutch unit (Removing the clutch).
Remove the oil pump (Removing the oil pump).
Remove the mesh filter (Changing the engine oil and filter cartridge).
Separate the crankcase halves (Separating the crankcase halves)