DUCATI

DIAVEL

DIAVEL CARBON

WORKSHOP MANUAL

0GENERAL INDEX

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1 -How to use this manual

How to use this manual

How to use this manual

This manual has been prepared for technical personnel at Ducati Authorized Service Centres with the aim of providing fundamental information on how to work in accordance with the modern concepts of “best practice” and “safety in the workplace” during the maintenance, repair or replacement of original components of the cycle parts and engine of this motorcycle.
All operations described in this manual must be carried out by experienced, skilled technicians, who are required to follow the Manufacturer's instructions in full.
Some information has been intentionally omitted, as we believe that all specialised technicians should have a basic technical background. Additional information on how to install various components is provided in the spare parts catalogue.

Important
This manual also describes the essential checks to be carried out prior to delivery of the motorcycle.

Ducati Motor Holding S.p.A. declines all liability for any technical errors or omissions in this manual and reserves the right to make changes made necessary by the technical evolution of its products without prior notice.
The information contained herein was correct at the time of going to press.

Important

Ducati Motor Holding S.p.A.

Layout of the manual

This manual is divided into sections (1), each identified by a letter.

Each section (1) is made up of several chapters (2), which are numbered consecutively.
The chapters (2) may be further subdivided into paragraphs (3).

The manual describes all repair operations starting from the fully assembled motorcycle.
The full procedure is described up to the point in which the motorcycle is restored to its fully assembled starting condition.

Important
Some of the sections of this manual are not included, since the motorcycle in question is not equipped with the relevant parts.

Important
The structure of the manual has been designed so that all the models types of the DUCATI MOTOR HOLDING products can be included.
To facilitate consultation of the manual, the table of contents is identical for all motorcycle models.

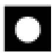
2 -Symbols - Abbreviations - References

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 an aid to memory. Please refer to this page whenever in doubt as to their meaning.

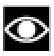
The terms RIGHT-HAND and LEFT-HAND refer to the motorcycle viewed from the riding position.

 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.

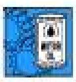
Text references

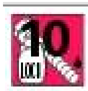
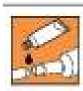
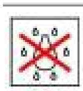
(**X**)
References in bold type indicate a part that is not illustrated in the figures next to the text, but which can be found in the exploded views at the beginning of each chapter.

(X)
References in non-bold type indicate a part that is illustrated in the figures alongside the text.

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 Sect. 3 - 2, Fuel, lubricants and other fluids).	SHELL Advance Ultra 4
		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% solution in 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	PANKL grease - PLB 05.	
	GREASE F	OPTIMOL grease - PASTE WHITE T.	
	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	Flange 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 smooth or threaded cylindrical fasteners 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 fasteners. For water and gases (except oxygen). Maximum filling capacity: 0.40 mm diameter clearance.	Loctite 577
	LOCK 7	Speed bonder 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. 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 cylindrical freely sliding 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 fluid gasket.	942470014
		Exhaust pipe paste. Self-sealing paste, hardens when heated; resists temperatures exceeding 1000 °C.	Holts Firegum
		Spray used to protect electric systems. Eliminates moisture and condensation and provides excellent corrosion resistance. Water repellent.	SHELL Advance Contact Cleaner
		Dry lubricant, polymerising on contact with air.	Molykote D321R Molykote M55 Plus

Emulsion for lubrication of rubber. P 80

3 -Hazardous Products - Warnings

General safety rules

Carbon monoxide

When a maintenance operation must be performed with the engine running, maker sure that the working area is well-ventilated. Never run the engine in an enclosed space.

Warning

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

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

Fuel

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

Warning

Petrol 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; take special care not to touch the exhaust system with any part of your body and do not park the motorcycle next to inflammable material (wood, leaves, etc.).

Used engine oil

Warning

Prolonged or repeated contact with used engine oil may cause skin cancer. If working with engine oil on a daily basis, make it a rule to wash your hands thoroughly with soap immediately afterwards. Keep away from children.

Brake pad dust

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

Warning

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

Brake fluid

Warning

Avoid spilling brake fluid onto plastic, rubber or painted parts of the motorcycle to avoid the risk of damage. Protect these parts with a clean shop cloth before proceeding to service the motorcycle. Keep away from children.

Coolant level

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 an irritant and is 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 if it comes into contact with the skin.

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.

General maintenance indications

Useful tips

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

General advice on repair work

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

02 - Impianto elettrico

1 -Identification data

Diavel identification data

Each Ducati motorcycle has two identification numbers -the frame number and the engine number- and an EC nameplate (A) (NOT PRESENT ON THE US VERSION).

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

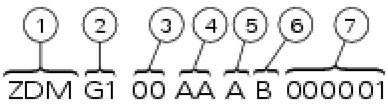
Data stamped on the frame

Europe version

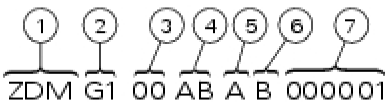
Identification data

1 Manufacturer: Ducati Motor Holding
2 Type - same for all Diavel / Diavel Carbon models
3 Variant
4 Version:
AA = Diavel / Diavel Carbon
AB = Diavel ABS / Diavel Carbon ABS
5 Year of manufacture:
(A=2010)
(B=2011)
6 Manufacturing facility
7 Progressive serial No.

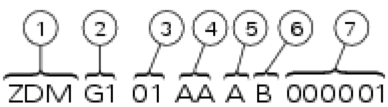
Data stamped on the frame
Europe version



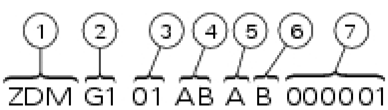
Data stamped on the frame
Europe version (ABS)



Data stamped on the frame
Version France



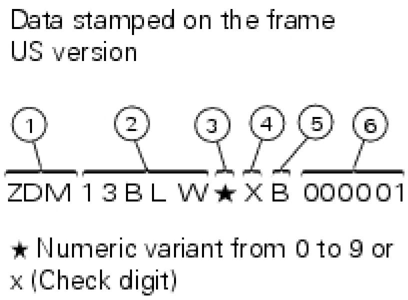
Data stamped on the frame
French version (ABS)



Data stamped on the frame

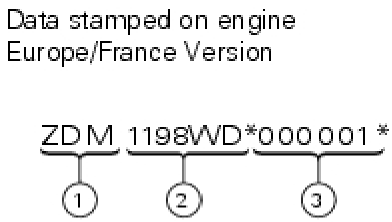
US version
1 Manufacturer: Ducati Motor Holding
2 Motorcycle type

3 Variant – Numeric or X (Check digit)
4 Model year (A=2011)
5 Manufacturing facility
6 Progressive serial No.



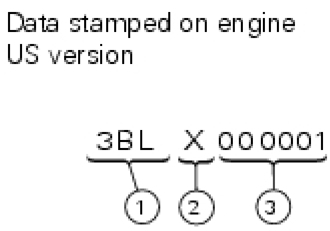
Data stamped on engine

Europe version
1 Manufacturer: Ducati Motor Holding
2 Engine type
3 Progressive production No.



Data stamped on engine

US version
1 Engine type
2 Model year (B=2011)
3 Progressive production No.



03 - Impianto elettrico

1.1 -Technical specifications

General

	Reference	Technical specifications
Motorcycle dimensions	Total length	2235 mm
	Total width	860 mm
	Total height	1115 mm
	Seat height	770 mm
	Minimum ground clearance	139 mm
	Wheelbase	1580 mm
Frame	Type	ALS450 steel tubular trellis frame
Subframe	Type	Cast aluminium
	Steering head angle	28°
	Steering angle	34° rh/lh
	Trail	130 mm
	Front suspension (Diavel ABS)	MARZOCCHI: upside-down hydraulic fork with adjustable compression, rebound and spring preload. Fork legs Ø 50 mm.
	Front wheel travel (Diavel ABS)	120 mm
	Front suspension (Diavel Carbon ABS)	MARZOCCHI: Upside-down fork with DLC coating, adjustable compression, rebound and spring preload. Fork legs Ø 59.5 mm.
	Front wheel travel (Diavel Carbon ABS)	120 mm
	Rear suspension (Diavel ABS)	SACHS: The rear suspension system uses a hydraulic monoshock absorber with rebound, compression and spring preload adjustment. Rear wheel travel: 120 mm Shock absorber stroke: 59.5 mm.
	Rear suspension (Diavel Carbon ABS)	SACHS: The rear suspension system uses a hydraulic monoshock absorber with rebound, compression and spring preload adjustment. Rear wheel travel: 120 mm Shock absorber stroke: 50 mm
	Front wheel rim (Diavel ABS)	Light alloy with 14 spokes.
	Front wheel rim (Diavel Carbon ABS)	Forged in light alloy with 9 spokes.
	Front wheel size	MT 3.50x17”
	Front tyre size	120/70 - ZR 17
	Rear wheel rim (Diavel ABS)	Light alloy with 14 Y-spokes.
	Rear wheel rim (Diavel Carbon ABS)	Forged in light alloy, 9 Y-spokes.
	Rear wheel size	MT 8.00x17”
	Rear tyre size	240/45 - ZR 17
	Type of tyre	Radial tubeless tyres
	Front brake	Hydraulic, 2 callipers with ABS model
	Rear brake	Hydraulic, 1 calliper with ABS model
Engine	Type	Twin cylinder, four-stroke, 90° “L“ type, longitudinal, with deep sump die-cast crankcase.
	Bore	106 mm
	Stroke	67.9 mm
	Displacement	1198 cm^3
	Compression ratio	11.5±0.5:1

	Timing system	A toothed belt with two overhead camshafts, 4 valves per cylinder
	Lubrication system	Forced lubrication by pump, with double oil cooler
	Oil pump type	Gear pump with bypass valve
	Cooling system	With fluid with thermostat
	Air filter	Filtering element in the airbox
	Crankshaft type	One-piece

Colours

	Description	Code no
Diavel ABS	Ducati red enamel Red frame and black rims.	54D234015 (AKZO)
	Diamond black Enamel Clear lacquer Racing Black frame and black wheel rims.	57E22714 (AKZO) 54M22705 (AKZO); 228.880 (PPG)
Diavel Carbon ABS	Red and Mat Carbon Ducati red enamel Red frame and black rims.	54D234015 (AKZO)
	Glossy and Matt Carbon; Pearl White Silk enamel Racing Black frame and black wheel rims.	53E23102 (AKZO); 228.880 (PPG)

Transmission

	Reference	Technical specifications
	Clutch	Wet clutch with multiple discs
	Clutch control	Hydraulic
	Gearbox	6 speed
	Primary drive	33/61
	Transmission ratio	1.84
	Final drive	15/43
	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

Timing system/valves

	Reference	Adjusting clearance	Control value every 24,000 Km
Timing diagram	With 1 mm valve clearance		
	Intake	Opening 4° B.T.D.C. Closing 58° A.B.D.C.	
	Exhaust	Opening 58° B.B.D.C. Closing 7° A.T.D.C.	
	Intake valve diameter	43.5 mm	
	Exhaust valve diameter	35.5 mm	
Valve lift	With 0 mm valve clearance	Intake 12.2 mm Exhaust 11.2 mm	
	Opening rocker arm - intake	0.13 to 0.18 mm	0.10 to 0.25 mm
	Opening rocker arm - exhaust	0.13 to 0.18 mm	0.10 to 0.25 mm

	Closing rocker arm - intake	0.05-0.10 mm	0.05 to 0.15 mm
	Closing rocker arm - exhaust	0.05-0.10 mm	0.05 to 0.15 mm
	Reference	Adjusting clearance (new belt)	Reset value (used belt)
Belt tensioning when cold	DDS	110±5 Hz (horizontal) 110±5 Hz (vertical)	80±5 Hz (horizontal) 80±5 Hz (vertical)
	Limit minimum value with cold machine		70 Hz
	Voltage value accepted at the moment of the engine service	HORIZONTAL Voltage (Hz) ±5 Min. 80 Max. 100	VERTICAL Voltage (Hz) ±5 Min. 88 Max. 100

Crankshaft

	Reference	Standard value	Service limit
Crankshaft	Ovality		0.005 mm
	Taper		0.005 mm
	Main bearing journal alignment		0.01 mm on diameter

Cylinder/Piston

	Reference	Standard value	Service limit
	Cylinder nominal diameter	106 mm	
	Max. bore ovality		0.010 mm
	Max. bore taper		0.015 mm
	Diameter Section A Section B Section C	106.000 mm to 106.010 mm 106.010 mm to 106.020 mm 106.020 mm to 106.030 mm	
Piston-to-bore clearance		0.085 to 0.105 mm	
Piston	Nominal diameter	106 mm	
	Diameter Class A Class B Class C	105.905 mm to 105.915 mm 105.915 mm to 105.925 mm 105.925 mm to 105.935 mm	
Connecting rod	Connecting-rod big-end diameter	45 mm	
	Crankshaft class	Connecting rod class	Bearings colour
Big-end bearing pairings	A B A B	A A B B	Blue + Yellow Yellow + Yellow Blue + Blue Blue + Yellow
Big-end bearing-to-crankpin clearance	Pin selection	Ø 42.014 mm/0 to 0.016 mm	
Gudgeon pin–to-piston clearance		0.015 to 0.024 mm	
	Nominal diameters	Ø 20 mm	
	Piston	Ø 20 mm/0.020 to 0.015	
	Gudgeon pin	Ø 20 mm/0 to 0.004	
Gudgeon pin-to-connecting rod clearance		0.035 to 0.049 mm	
Engine cylinder compression measured with DDS instrument		11 to 12 bar	10 bar (MIN.), difference between the two cylinders: 2 bar (MAX.)

Gearbox

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

Cooling system

	Reference	Technical specifications
Type	fluid with two radiators with closed circuit, with double curved radiator with double fan and mixing thermostat	
Coolant capacity		2.3±0.5 litres
Thermostat	Opening start	65 °C ±2 °C
	Electric fan insertion	103 °C
	Electric fan deactivation	102 °C

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) 2.6 bar (with passenger 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

Front suspension (Diavel ABS)

	Reference	Technical specifications
Type		MARZOCCHI: Upside-down hydraulic fork with adjustable compression, rebound and spring preload. Fork leg Ø 50 mm
	Travel along leg axis	120 mm
	Oil charge per fork leg	720 cm^2 (per leg)

Front suspension (Diavel Carbon ABS)

	Reference	Technical specifications
Type		MARZOCCHI: Upside-down fork with DLC coating, adjustable compression, rebound and spring preload. Fork legs Ø 50 mm.
	Travel along leg axis	120 mm
Fork	Oil level per fork leg	720 cm^2
	Hydraulic damping standard setting. Undo adjusters from the fully closed position (turn counter clockwise).	Compression: 1 turn and a half Rebound: 2 turns
	Spring preload	Fully open

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) 2.6 bar (with	

		passenger and/or bags)	
Swingarm pivot 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 Type	DID HV2 525	
	Dimensions	5/8“ x 1/16“	
	No. of links	118	

Rear suspension (Diavel ABS)

	Reference	Technical specifications
Type		SACHS: The rear suspension system uses a hydraulic monoshock absorber with rebound, compression and spring preload adjustment. Rear wheel travel: 120 mm Shock absorber stroke: 50 mm
Shock absorber	Stroke	50 mm

Rear suspension (Diavel Carbon ABS)

	Reference	Technical specifications
Type		SACHS: The rear suspension system uses a hydraulic monoshock absorber with rebound, compression and spring preload adjustment. Rear wheel travel: 120 mm Shock absorber stroke: 50 mm
Shock absorber	Stroke	59.5 mm
	Hydraulic damping standard setting. Undo adjusters from the fully closed position (turn clockwise).	Compression: 25 clicks Rebound: 12 clicks
	Spring preload	Fully open (counter clockwise)

Hydraulic brakes

	Reference	Standard value	Service limit
		FRONT	
Brake disc	Type	Semi-floating drilled dual disc	
	Minimum thickness	4 mm	
	Disc thickness	4.5 mm	
	Braking surface material	Steel	
	Flange material	Aluminium	
	Disc diameter	320 mm	
Brake calliper	Make	Brembo	
	Type	M4.34a	
	Calliper cylinder diameter	34 mm	
	Pad friction material	TT2182 FF	
Cylinder	Type	PR 18/19	
	Master cylinder diameter	18 mm	
		REAR	
Brake disc	Type	Fixed drilled disc	
	Shim	5 mm	4.5 mm (min.)
	Flange material	Steel	
	Diameter	265 mm	
Brake calliper	Make	Brembo	
	Type	PF 30/32a	

	Calliper cylinder diameter	30 mm / 32 mm
	Pad friction material	TT2182 FF
Cylinder	Type	PS13
	Master cylinder diameter	13 mm

Charging system/alternator

	Reference	Technical specifications
Battery	Voltage	12 V
	Capacity	10 Ah
	Type	Sealed, maintenance free
Generator	Capacity	12 V - 430 W

Injection-ignition system

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

Fuel system

	Make	Type
	Unleaded fuel	95-98 RON
	Throttle body	Ø 56 mm
	Injectors per cylinder	1
	Holes per injector	12

Injection system

	Make	Type
Electronic Control Unit	MITSUBISHI	F8TJ

Lights/instrument panel

	Reference	Technical specifications
Headlight	low beam bulb type	1xH7 Blue Vision (12V-55W)
	high beam bulb type	1xH1 (12V-55W)
Parking light (front)	Bulb type	LED (12 V - 2.4 W)
Parking light (rear)		LED (13.5 V - 0.6 W)
Rear tail light	Bulb type	LED (13.5 V - 2.8 W)
Front turn signal	Bulb type	LED (13.5 V - 2.9 W)
Rear turn signal	Bulb type	LED (13.5 V - 2.06 W)
Number plate light	Bulb type	LED (13.5 V - 0.67 W)
Fuses	Regulator	30 A
Rear left fuse box key	-	-
	Dashboard	10 A
	ECU	5 A
	Key-sense	15 A
	Injection relay	20 A
	Throttle opening starter motor relay (ETV)	10 A
Rear right fuse box key	Black Box System (BBS)	7.5 A
	Navigator/Alarm	7.5 A

	ABS 2	25 A
	ABS 1	30 A
	Fans	10 A
	Diagnosis / Recharge	7.5 A

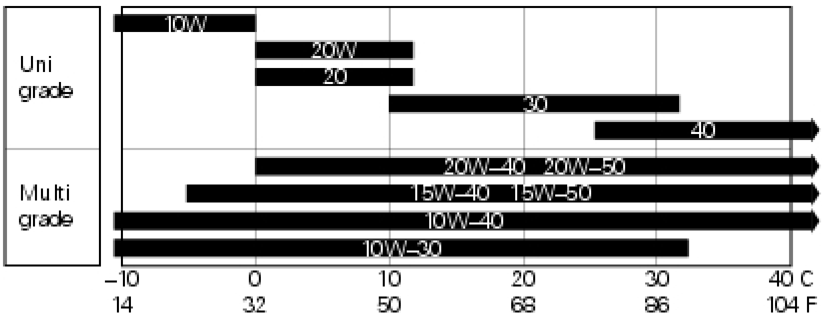
1.2 -Dimensions

2 -Fuel, lubricants and other fluids

Fuel, lubricants and other fluids	Type	Quantity
Fuel tank, including a reserve of 4 dm^3 (litres)	Unleaded fuel with 95 fuel octane rating (at least)	17 dm^3 (litres) 16 dm^3 (litres) (USA)
Lubrication circuit	SHELL - Advance Ultra 4	4.10 dm^3 (litres)
Front/rear brake and clutch circuits	Special hydraulic fluid SHELL - Advance Brake Dot 4	–
Protection for electrical contacts	SHELL - Advance Contact Cleaner spray for electric systems	–
Front fork	SHELL - Advance Fork 7.5 or Donax TA	720 cc (per leg)
Cooling system	SHELL Advance Coolant or Glyco SHELL 35-40% + water	2.5 dm^3 (litres)

Important

Do not use additives in fuel or lubricants.



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.

Viscosity

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

3 -Torque settings

Frame torque settings

Part	Thread (mm)	Nm ±10% Tolerance	Note
Top fairing			
Right rear-view mirror retaining screw	M8x1.25	25	
Left rear-view mirror retaining screw	M8x1.25	25	
Stand			
Side stand plate retaining screw on shock absorber support	M10x1.5	44	
Stand sensor screw	M6x1	5	
Front sprocket			
Front sprocket retaining nut	M25x1.5	186*	GREASE B
Sprocket cover retaining screw	M6x1	6	LOCK 2
Lights and reflectors			
Bracket support subframe retaining screw	M5x0.8	6	LOCK 2
Headlight - subframes (upper and lower) retaining screw	M5x0.8	6	LOCK 2
Lower subframe - bottom yoke retaining nut	M6x1	10	
Tail light - gloves compartment retaining screw	M6x1	6	
Front turn indicators - external conveyor retaining screw	AF4.5	2	
Instruments			
Silent block on instrument panel supporting clip	M5x0.8	2	
Instrument panel to support retaining screw	AF5	3	
Instrument panel support to handlebar U-bolts retaining nut	M5x0.8	2	
Tank instrument panel to tank plug cover retaining screw	M5x0.8	2	
Front fork			
Steering shaft nut	M35x1	30*	GREASE B
Steering head - fork leg closing screw	M8x1.25	20*	GREASE B
Steering head - central closing screw	M8x1.25	24*	GREASE B
Steering head - upper closing screw	M8x1.25	22*	GREASE B: Sequence 1-2-1
Steering head - lower closing screw	M8x1.25	12*	GREASE B: Sequence 1-2-1
Handlebar U-bolts closing screw	M8x1.25	25*	
Lower handlebar U-bolts to steering head retaining screw	M10x1.25	45*	
Supporting bracket - steering head retaining pin	M6x1	10	
Steering limit adjusting counter nut	M8x1.25	18	LOCK 2 to nut thread only
Clutch cable grommet to steering head retaining screw	M6x1	10	LOCK 2
Brake cable grommet to steering head retaining screw	M6x1	8	LOCK 2
Hose clip to bottom yoke retaining screw	M6x1	10	
Hose clip to left calliper retaining screw	M6x1	10	
Fork calliper closing screw		10*	
Electrical/electric system			
Electrical components support (rear) bracket to engine retaining screw	M8x1.25	10	
Electrical components supporting box to electrical components supporting (rear) bracket retaining screw	M8x1.25	24	solid threadlocker on screw
Electrical components support to radiator supporting bracket retaining screw	M6x1	10	
Radiator cover to electrical components support	M5x0.8	4	

retaining screw			
Electrical components cover - electrical components support retaining screw	M6x1	4	solid threadlocker on screw
Horn to battery support retaining screw	M8x1.25	18	
Voltage regulator to clip on electrical components support retaining screw	M6x1	10	
Hands free switch retaining screw	M6x1	4	LOCK 2
Hands free switch retaining nut	M6x1	4	
Speed sensor retaining screw	M6x1	10	
Relay support retaining screw	M5x0.8	5	
Front brake			
Screw securing front brake master cylinder to handlebar	M6x1	10	Sequence 1-2-1
Front and rear brake bleed valve	M6x1	23	
Front brake calliper pre-tightening	M10x1.25	2	
Front brake calliper retaining screw	M10x1.25	44*	GREASE B
ABS control unit			
ABS control unit to bracket retaining screw	M6x1	10	
ABS control unit bracket to airbox retaining screw	M6x1	10	
ABS pipe control unit fittings	M10x1	23	
Rear swingarm			
Eccentric hub tightening screw	M12x1.25	35 *	GREASE B: Sequence 1-2-1
Swingarm shaft screw	M15x1.25	72*	
Rear brake calliper mounting bracket locking pin	M12x1.25	33*	LOCK 8
Lower and upper chain sliding shoes retaining screw	M5x0.8	4	
Rear brake			
Rear brake master cylinder screw	M6x1	10	LOCK 2
Brake bleeder	M10x1	23	
Rear brake fluid reservoir to support retaining screw	M5x0.8	4	
Brake oil reservoir to footrest bracket retaining screw	M5x0.8	4	
Rear pipe clip to swingarm retaining screw	M6x1	10	
Screw securing rear brake hose guide to swingarm	M5x0.8	4	LOCK 2
Rear brake calliper screw	M10x1.25	44*	GREASE B
Number Plate Holder			
Number plate holder to swingarm retaining screw	M8x1.25	25	
Number plate holder fixing screw	M5x0.8	5	
Handlebar - Clutch lever			
Clutch bleed valve	M6x1	4	
Clutch hose connector	M10x1	23	
clutch transmission unit screw	M6x1	10	Sequence 1-2-3-1
Throttle twistgrip retaining screw	M6x1	6	
Clutch master cylinder screw	M6x1	10	“Sequence 1-2-1 starting from upper screw“
Throttle twistgrip housing retaining screw	M4x0.7	1.8	
Throttle control cable retainer retaining screw tightening	M10x1.25	4	
Throttle control cable adjuster retainer counter nut	M6x1	2.5	
Rear suspension			
Shock absorber support to left casing retaining screw pre-tightening	M10x1.5	2	
Shock absorber support to left casing retaining screw	M10x1.5	45*	After tightening of free play adjuster ring nuts
Nut on free play adjuster screw	M20x1	100*	
Shock absorber support to right casing retaining screw	M10x1.5	45*	
Shock absorber support to suspension linkage retaining screw	M10x1.5	45*	
Suspension linkage to rocker arm retaining screw	M12x1.5	45*	

Shock absorber to rocker arm retaining screw	M10x1.25	45*	
Rocker arm to swingarm retaining screw	M10x1.25	45*	
Front mudguard			
Mudguard to fork calliper retaining screw	M6x1	5	solid threadlocker on screw
Front brake pipe clip on mudguard retaining screw	AF3.5	0.35	
Fluid cooling			
Fan to fan support retaining screw	M4x0.7	1	
Internal conveyor and fan support to radiator upper retaining screw	M5x0.8	5	
Fan support to radiator lower retaining screw	M5x0.8	5	
Internal conveyor - radiator - external conveyor retaining screw	M5x0.8	5	
LH internal conveyor to RH internal conveyor retaining screw	M5x0.8	4	
Air conveyor and radiator to bracket retaining screw	M6x1	10	
Radiator support to chassis retaining screw	M6x1	10	
Radiator support to frame retaining screw	M6x1	10	
External conveyor to radiator lower retaining screw	M5x0.8	5	
Radiator to external conveyor support retaining screw	M5x0.8	5	
Separated union retaining screw	M5x0.8	5	
Expansion reservoir on bracket retaining screw	M6x1	8	
Expansion reservoir on drift retaining screw	M6x1	8	
Water pipe on radiator unions clamps		2.5	
Water pipe to pump intake clamp		2.5	
Water pipe on thermostat outlet clamp		2.5	
Vertical and horizontal head inlet water pipe clamp		2.5	
Clamp of expansion tank bleed pipe on plug		1	
Clamp on bleeder fitting		1	
Clamp on vertical head breather pipe		1	
Clamp on expansion tank “overflow“ pipe		1	
Footrest and linkage			
Rider footrest bracket to subframe retaining screw (left - right)	M8x1.25	25	
Rear footrest retaining threaded pin	M16x1.5	30	
Passenger footpeg spring plate to subframe retaining screw	M6x1	10	
Right side (rear brake)			
Brake lever pin on footrest bracket	M8x1	24	LOCK 2
Stop switch on footrest bracket	M8x1	10	
Stop switch on brake lever drive screw	M6x1	5	
Brake lever adjuster lock nut	M6x1	8	
Brake master cylinder pushrod retaining nut	M6x1	7.5	
Left side (gearbox)			
Gearbox lever pin on footrest bracket	M8x1	24	LOCK 2
Gearchange linkage pivot to gearchange lever / transmission lever retaining screw	M6x1	10	
Gearbox transmission lever on pawl closing screw	M6x1	10	
RH lock nut for gearchange linkage pivot	M6x1	5	LOCK 2
LH lock nut for gearchange linkage pivot	M6x1	5	LOCK 2
Rear mudguard			
Rear mudguard to swingarm retaining screws	M5x0.8	5	Solid threadlocker on screw
Front wheel			
Brake disc screw	M8x1.25	25*	LOCK 2
Front wheel nut	M25x1.25	63*	GREASE B
Rear wheel			
Wheel retaining nut (left and right)	48x1.5	230*	GREASE B (apply to the thread and the nut

			underside)
Rear wheel cush drive bush retaining nut	M10x1	44	LOCK 2
Phonic wheel to disc fixing screw	M5x0.8	6	solid threadlocker on screw
Brake disc to pin fixing screw	M8x1	27*	
Fuel tank			
Tank to frame retaining screw	M6x1	10	
Bitron flange to tank retaining screw	M5x0.8	6	Solid threadlocker on screw
Hose clip retaining screw	M5x0.8	5	
Tank filler cap screw	M5x0.8	3	
Exhaust			
Nut securing exhaust pipe flange to horizontal/ vertical cylinder head	M6x1	10	
Heat guard to vertical manifold retaining nut	M6x1	10	
Vertical main heat guard retaining screw	M6x1	8	
Lambda sensor fixing	M12x1.25	25	
Exhaust gas plug	M10x1.25	25	
Starter motor valve to support fixing screw	AF5	3	
Exhaust valve motor support to RH subframe retaining screw	M6x1	10	
Silencer to bracket retaining screw	M8x1.25	20	
Silencer retaining clamp		16	
Silencers support to footrest bracket retaining screw	M8x1.25	25	
Silencer to heat guard retaining screw	M6x1	8	
Seat			
Seat cover retaining screw	M5x0.8	4	
Frame			
Frame-engine retaining nut	M12x1.25	60*	GREASE B (apply to the thread and the nut underside)
Clearance adjuster	M20x1	0.6	GREASE B only on thread - do not grease the union surface
Nut on free play adjuster screw	M20x1	100*	GREASE B
Tank bearing drift on compartment retaining screw	M6x1	10	
Gloves compartment - handle guide retaining screw	M8x1.25	20*	
Handle guide - latch retaining screw	M6x1	10	
Handle releasing ring nut on pin	M5x1	5	
Seat lock nut	M22x1.5	3	
Subframes - gloves compartment retaining screws	M8x1.25	14*	
Frame - subframes retaining screw	M10x1.5	55*	GREASE B
Blackbox support silent block on LH subframe	M5x0.8	2	
Blackbox support to LH subframe retaining nuts	M5x0.8	2	
Blbox cover and blbox on support retaining screws	AF5	3	
GAC cover to subframe/compartment retaining screw	M5x0.8	4	
Underseat compartment cover to compartment retaining screw	M5x0.8	4	
Hands free antenna to compartment retaining screw	M4x0.7	2	
Oil cooler			
Fixing union to radiator (nipple)	M14x1.5	23	LOCK 1
Fixing tube to radiator coupling	M16x1.5	18*	Lubricate with engine oil
Fixing tube to radiator coupling	M16x1.5	18*	Lubricate with engine oil
Oil hose clamp to horizontal head retaining screw	M6x1	10	
Radiator bracket to horizontal head retaining screw	M6x1	10	
Radiator to bracket retaining screw	M6x1	6	
Pressure switch on oil cooler retainer		24	

Air intake oil breather			
Wiring protection on airbox lower half-housing	M5x0.8	5	
Oval intake funnel on airbox lower half-housing retaining screw	M5x0.8	5	
Conveyors to airbox retaining screw	M5x0.8	3.5	
Map sensor bracket to airbox upper half housing retaining screw	M6x1	10	
Air temperature sensor to LH conveyor retaining screw	M4x0.7	2	
Map sensor on bracket retaining screw	M6x1	10	
Blow-by pipe to airbox retaining clamp		1.5	
Fuel system			
Throttle body on intake funnels retaining screw	M5x0.8	3.5	solid threadlocker on screw
Intake ducts throttle body retaining clamp		2.5	
Injectors to funnels retainer	M5x0.8	5	
Canister to fuel tank (USA version) retainer	M5x1	4	
Fairings			
Plug cover to cover retaining screw	M5x0.8	2	LOCK 1
Plug cover and central cover to plug retaining screw	M5x0.8	2	LOCK 1
Central cover to tank retaining screw	M5x0.8	2	LOCK 1
Side cover to tank rear retaining screw	M5x0.8	2	LOCK 1
Central cover to plug cover retaining screw	M5x0.8	0.33	
Central cover to side cover retaining screw	M5x0.8	0.33	
Clip air inlets on tank plug cover retaining screw	M5x0.8	2	solid threadlocker on screw
LH conveyor / LH conveyor support retaining screw	M4x0.7	1.5	
LH conveyor support to tank side cover retaining screw	M5x0.8	0.33	
LH conveyor cover to LH conveyor support retaining screw	M5x0.8	5	
Central to lateral belly fairings retaining screw	M5x0.8	4	solid threadlocker on screw
LH belly fairing / radiator closure / central belly fairing retaining screw	M5x0.8	4	LOCK 1
RH belly fairing / radiator closure / central belly fairing retaining screw	M5x0.8	4	LOCK 1
LH belly fairing to electrical components retaining screw	M5x0.8	4	LOCK 1
RH belly fairing to electrical components retaining screw	M5x0.8	4	LOCK 1
LH belly fairing / electrical components cover / electrical components support retaining screw	M5x0.8	4	LOCK 1
RH belly fairing / electrical components cover / exhaust protection retaining screw	M5x0.8	4	LOCK 1

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

Note

For product specifications and symbols, refer to "Product specifications" (Sect. 1 - 2).

Engine torque settings

Part	Thread (mm)	Nm	Min.	Max.	Note
Idler and tensioner pulley bolts	M20x1	50	45	55	LOCK 2 or TB1324
Camshaft pulley retaining nut	M17x1	71	64	78	GREASE A
Rocker arm shaft covers	M12x1.25	15	14	16	LOCK 2 or TB1324
Coolant temperature sensor on coolant outlet union	M12x1.5	23	20	26	LOCK 4 – Restrain the insert when tightening
Cylinder head nut: Snug torque Preload torque Tightening torque	M10x1.5	 20 40 60	 38 57	 42 63	Apply GREASE C to the underside of the nut and the thread of the stud
Cam cap screw:	M8x1.25				Engine oil

Preload torque Tightening torque		10 22.5	9 21	11 25	
Coil retaining screw	M6x1	10	9	11	
Pulley flange retaining screws	M6x1	10	9	11	
Cylinder head cover screw	M6x1	10	9	11	
Exhaust manifold stud	M6x1	10	9	11	LOCK 5
Vacuum gauge connection screw on cylinder head (EU only)	M6x1	5	4	6	LOCK 2 or TB1324
Evaporative emissions canister fitting on cylinder head (California only)	M6x1	5	4	6	LOCK 2 or TB1324
Air breather fitting on horizontal cylinder head	M6x1	2.5	2	3	LOCK 2
Air breather blanking screw on vertical cylinder head	M6x1	10	9	11	LOCK 6
Intake manifold screw	M6x1	10	9	11	
Water temperature sensor	M6x1	6	5	7	
Screw securing coolant unions to cylinder head	M5x1	6	5	7	Pre-applied Tecnologic 150 threadlocker
Oil cartridge	M16x1.5	11	10	12	Engine oil on gasket
Oil cartridge nipple	M16x1.5	42	38	46	LOCK 2 or TB1324
Oil pick-up pipe plug	M14x1.5	24	21	27	LOCK 5
Oil cooler nipple	M14x1.5	32	29	35	LOCK 5
Oil drain plug with magnet	M12x1.5	20	18	22	THREEBOND TB1215
Gear sensor recognition	M12x1.25	12	11	13	
Clutch cover oilway blanking plug	M10x1.5	15	13	17	LOCK 5
Neutral sensor	M10x1.25	10	9	11	
Oil pump adapter screw	M10x1				LOCK 5
Clutch cover inner oilway screw	M10x1.5	15	13	17	LOCK 5
Cylinder head/barrel stud	M10x1.5	30	28	32	LOCK 2 or TB1324
Vertical cylinder zone crankcase screw: Preload torque Tightening torque	M8x1.25	 19 25	 17 22	 21 28	GREASE B or Agip GR SM on thread
Central crankcase screw + swingarm pivot bolt: Preload torque Tightening torque	M8x1.25	 19 25	 17 22	 21 28	GREASE B or Agip GR SM on thread
Gear stop lever screw	M8x1.25	18	16	20	LOCK 2 or TB1324
Blow-by valve fixing screw	M6x1	10	9	11	
Chain side secondary bearing retaining screw	M6x1	10	9	11	LOCK 2 or TB1324
Clutch side primary bearing retaining screw	M6x1	10	9	11	LOCK 2 or TB1324
Crankcase screw – idler area	M6x1	10	9	11	
Outer crankcase screw	M6x1	10	9	11	
Oil pick-up mesh filter screws	M6x1	10	9	11	TB1215
Chain cover oil circuit blanking screw	M6x1	8	7	9	LOCK 2 or TB1324
Under-piston oil jet retaining screw	M5x0.8	8	7	9	LOCK 2 or TB1324
Starter motor mounting screw	M6x1	10	9	11	Loctite 516 pre-applied to thread
Starter motor rear screw	M6x1	10	9	11	Loctite 516 pre-applied to thread
Idler gear shaft retaining screw	M6x1	10	9	11	LOCK 2 or TB1324
Primary sprocket nut retainer	M24x1	190	171	209	GREASE B
Ring nut fastening wet clutch primary pinion	M24x1	190	171	209	GREASE B
Flywheel retaining nut	M24x1	330	313	346	LOCK 5
Balancing cap	M12x1.25	28	26	30	LOCK 5
Con-rod bolts: Tightening of 45°±1° Torque check	M10x1	 30 65 to 95			Apply GREASE B to thread
Crankshaft grub screw	M8x1.25	13	11	15	LOCK 5
Drilled crankshaft grub screw	M8x1.25	13	11	15	LOCK 5
Selector drum locating screw	M16x1.5	30	27	33	
Selector claw screw	M8x1.25	36	34	38	LOCK 2 or TB1324

Selector claw locator nut	M6x1	10	9	11	
Selector claw screw	M6x1	16	15	17	LOCK 2 or TB1324
Idler and tensioner pulley bolts	M20x1	50	45	55	LOCK 2 or TB1324
Timing belt driveshaft pulley retaining nut	M15x1	71	64	78	GREASE A
Timing belt driveshaft gear nut	M14x1	55	50	60	GREASE A
Fixed tensioner bearing locking screw	M14X2	50	45	50	GREASE A
Idler and tensioner pulley nut	M8x1.25	25	22	28	GREASE A
Carbon fibre cover screw	M6x1	6	5.5	6.5	Loctite 516 pre-applied to thread
Plastic cover screw	M6x1	10	9	11	Loctite 516 pre-applied to thread
Carbon filter cover support fixing screw	M4x0.7	1.75	1.5	2	
Self-tapping screw for timing belt cover filter	M3.5				
Coolant inlet union	M30x1.5	25	23	27	LOCK 5
Coolant outlet union	M22x1.5	25	23	27	LOCK 5
Oil filler plug	M20x2.5				Tighten as far as it will go
Generator cover inspection plug	M15x1	20	18	22	TB1215
Pick-up sensor inspection screw	M12x1	15	13	17	LOCK 2 or TB1324
Water pump cover plug	M10x1	20	18	22	
Oil pressure sensor	M10x1	19	17	21	
Clutch oil pan cap	M10x1	15	13.5	16.5	
Oil way blanking plug	M10x1	20	18	22	LOCK 5
Coolant pump bearing stop screw	M6x1	10	9	11	LOCK 2 or TB1324
Stator wiring clamp bracket screw	M6x1	10	9	11	LOCK 2 or TB1324
Water pump cover screw	M6x1	10	9	11	
Generator-side crankcase cover screw	M6x1	10	9	11	
Generator cover to idle gear screw	M6x1	10	9	11	
Generator-side crankcase cover + water pump screw	M6x1	10	9	11	
Inspection cover screw	M6x1	5	4.5	5.5	
Generator-side crankcase cover screw	M6x1	10	9	11	
Alternator stator retaining screw	M6x1	10	9	1	LOCK 2 or TB1324
Clutch cover screw	M6x1	10	9	11	
Clutch cover screw	M6x1	10	9	11	
Wet clutch cover closing screw	M6x1	10	9	11	
Wet clutch cover closing screw	M6x1	10	9	11	
Wet clutch cover closing screw	M6x1	10	9	11	
Wet clutch drum nut	M25x1.5	190	180	200	GREASE B
Wet clutch spring screw	M6x1	10	9	11	
Spark plug	M10x1	12	11	13	
Alternator rotor/flywheel screw	M6x1	13	11	15	LOCK 5
By-pass pump cap	M15x1	25	22	28	LOCK 5
Oil pump retaining screw	M6x1	10	9	11	
Oil pump assembly screw	M6x1	10	9	11	
Oil pump retaining screw	M8x1.25	26	23	29	
Coolant outlet union	M22x1.5	25	23	27	LOCK 5
Coolant circuit hose clamps		2.5	2	3	

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

Note

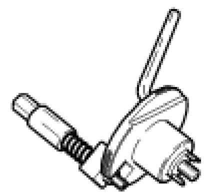
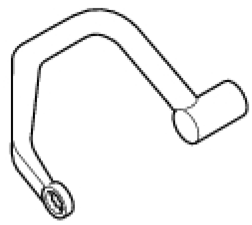
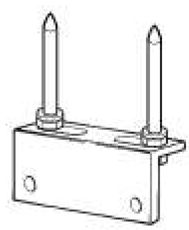
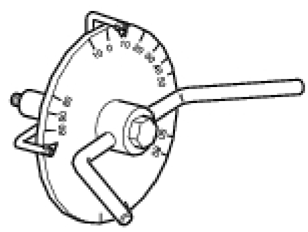
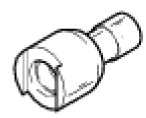
For product specifications and symbols, refer to paragraph "Product specifications" (Sect. 1 - 2).

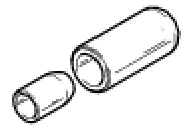
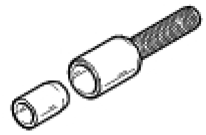
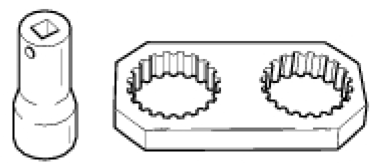
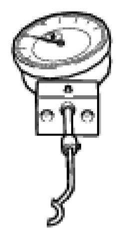
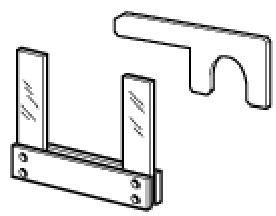
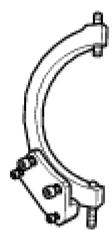
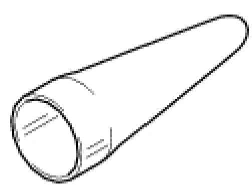
4 -Service tools

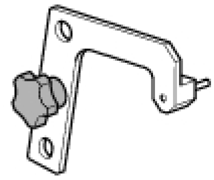
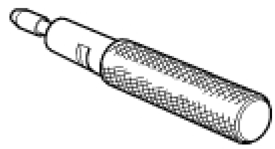
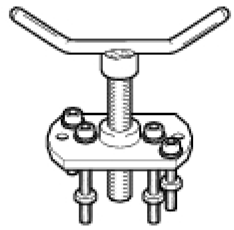
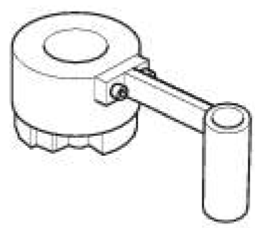
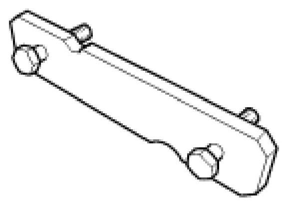
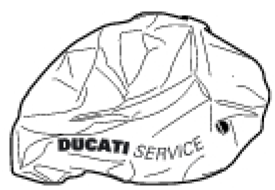
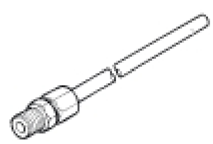
Spare parts catalogue

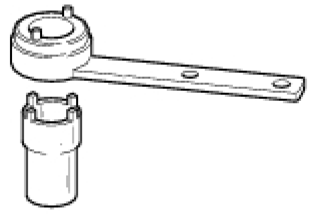
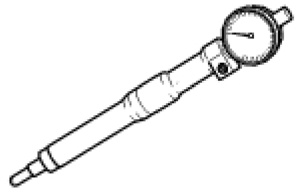
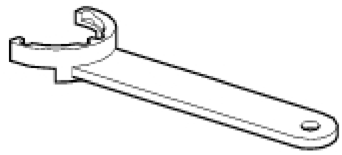
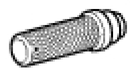
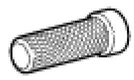
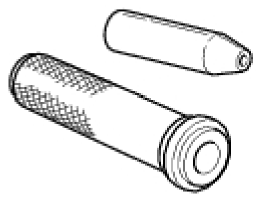
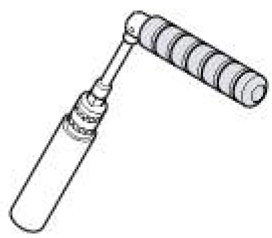
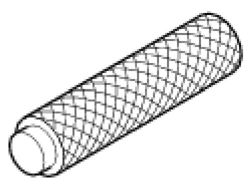
Diavel ABS	WORKSHOP SERVICE TOOLS
Diavel ABS	WORKSHOP SERVICE TOOLS
Diavel Carbon ABS	WORKSHOP SERVICE TOOLS
Diavel Carbon ABS	WORKSHOP SERVICE TOOLS

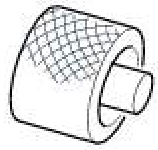
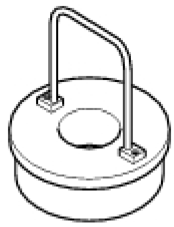
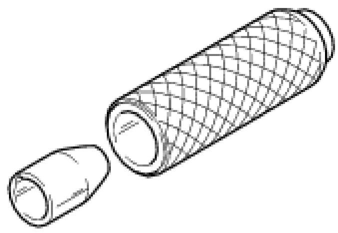
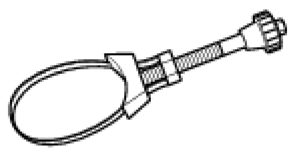
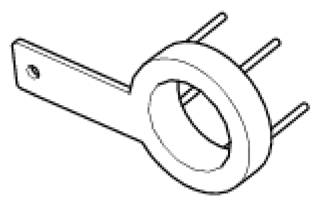
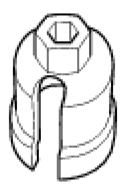
Specific tools for the engine

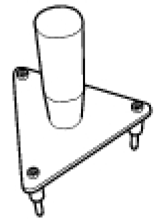
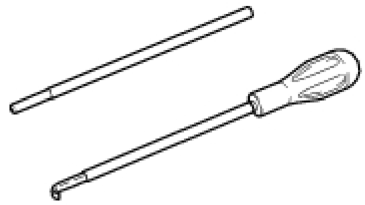
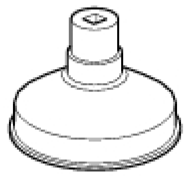
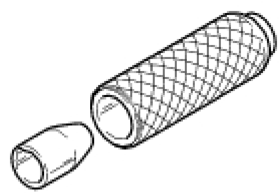
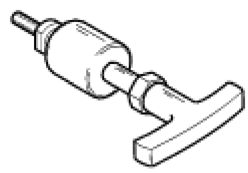
Code no.	Description	
88713.2011	Tool to lock crankshaft at Top Dead Centre	
88713.2676	Wrench for tightening cylinder head nuts	
88713.2103	Stand for cylinder head assembly	
88765.1657	Timing check tool	
88713.1821	Wrench for tightening timing belt tensioner pulley shafts	
88713.2861	Camshaft oil seal installer	

		
88713.3521	Gearbox output shaft oil seal installer	
88713.1806	Holding tool for pulley tightening	
97900.0215	DDS (Ducati Diagnosis System) + cylinder vacuum meter kit	
88765.1518	Valve lift gauge	
88713.2878	Fork-type feeler gauge 0.2 mm, 0.3 mm	
88713.3367	Flywheel tool	
88713.1920	Tool for installing O-rings on crankcase studs	

88713.3334	Plate for gear selector fork positioning	
88713.2442	Tool for installation of sealing ring on valve-guide	
88713.1749	Puller for drive pulley and cover	
88713.1832	Engine repair bench	
88713.3408	Wet FCC clutch drum holding tool	
88765.1623	Distribution pulley timing tool	
88713.1886	Engine cover sheet	
88713.1010	Exhaust gases pick-up connector	

88713.1805	Tool for tightening timing belt driveshaft pulley	
88765.2090	Top Dead Centre test gauge	
88713.3219	Holding tool for pulley tightening	
88713.0869	Water pump front seal installer	
88713.0870	Installation tool for counter plate for water pump front seal	
88700.5749	Crankcase half assembly cap	
88713.2877	Spark plug wrench	
88713.1980	Punch for installing caps on shafts	

88713.3497	Timing belt tensioner pulley wrench	
88765.1298	Spacer lower register control valve	
88713.2870	Connecting rod guide tool	
88713.3394	Punch to install circlip on the camshaft	
88713.3406	Wrench for tightening primary sprocket nut	
88713.2906	Oil filter cartridge wrench	
88713.3417	Torque wrench for tightening front sprocket nut	
88713.3407	Bush (gear position sensor)	

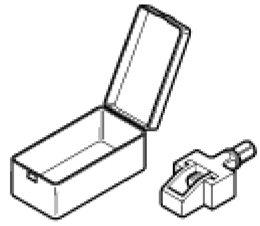
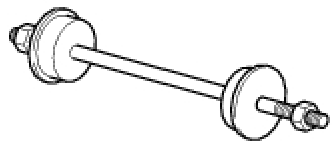
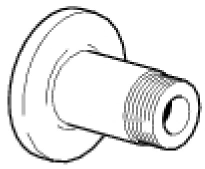
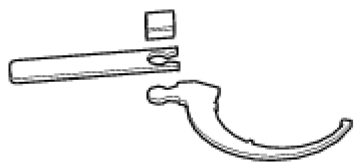
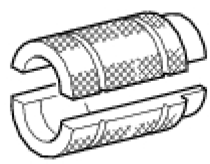
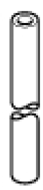
88713.3352	Timing tool (clutch plates series)	
88713.2069	Rocker arm springs tensioning kit	
88713.0944	Oil filter cartridge wrench	
88713.2834	Circlip fitting punch	
88713.1994	Rocker arm shaft puller	
88713.3734	Timing belt tensioner pulley wrench	

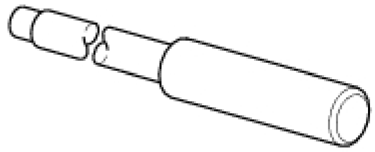
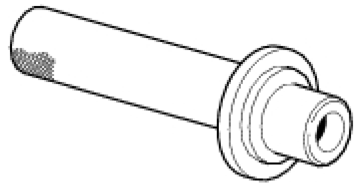
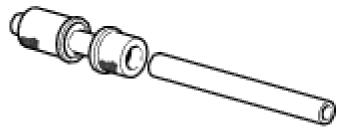
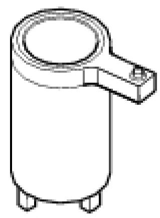
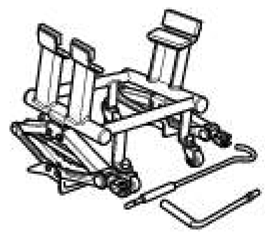
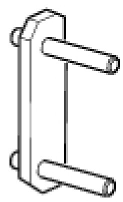
Spare parts catalogue

Diavel ABS	WORKSHOP SERVICE TOOLS
Diavel Carbon ABS	WORKSHOP SERVICE TOOLS

Specific tools for the frame

Code no.	Description	
88713.1072	Drift to install half bearing in bottom yoke	

		
88713.2562	Chain assembly tool	
88713.1058	Wrench for steering shaft nut	
88713.1062	Tool for installing steering head bearings	
88713.2951	Rear wheel balancing tool	
88713.3211	Wrench for adjustment of the eccentric hub	
88713.3204	MARZOCCHI fork service tool - Sealing ring fitting	
88713.3203	Pull bar for MARZOCCHI fork service	

88713.1074	Swingarm pivot bolt removal tool	
88713.1068	Drift for installing the swingarm needle roller bearings	
88713.2409	Swingarm ball bearing installation tool	
88713.3526	Frame plates assembling wrench	
88713.3396	Engine repair bench	
8000.70139	Front wheel shaft wrench	
88713.1515	Engine/frame support	

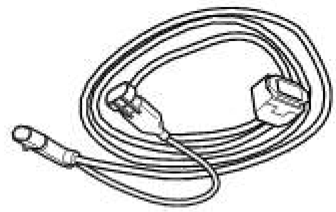
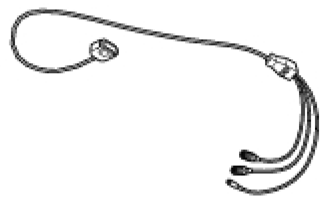
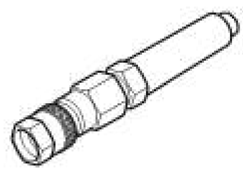
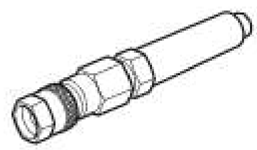
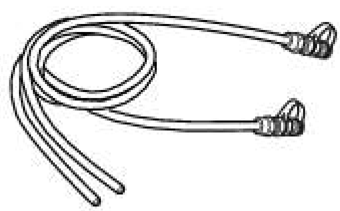
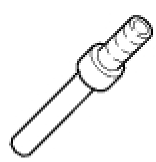
Spare parts catalogue

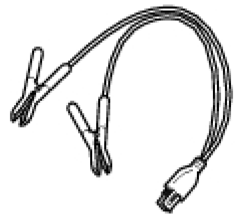
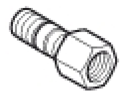
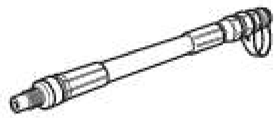
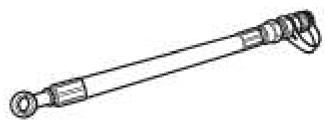
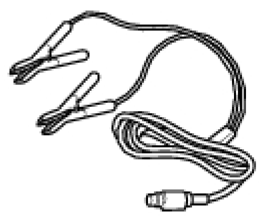
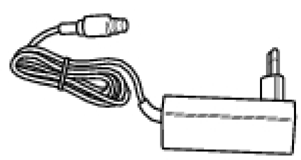
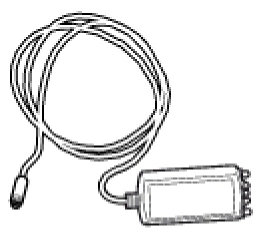
Diavel ABS	DDS TESTER
Diavel ABS	WORKSHOP SERVICE TOOLS
Diavel Carbon ABS	DDS TESTER
Diavel Carbon	

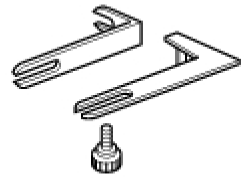
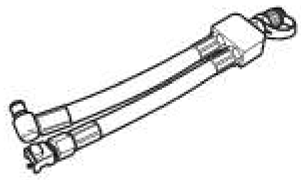
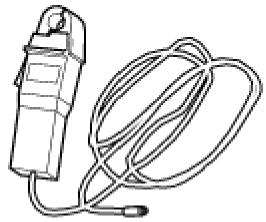
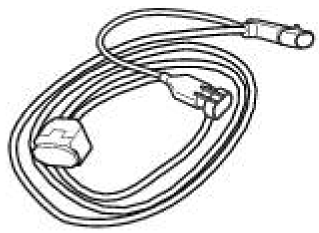
WORKSHOP SERVICE TOOLS

ABS

Appropriate diagnosis tools

Code no.	Description	
97900.0211	DDS (Ducati Diagnosis System) without cables	
97900.0227	Power cable and diagnosis	
97900.0222	Power cable and diagnosis 1060838 (Measurement Module)	
97900.0218	Vacuum sensor	
552.1.039.1A	Pressure sensor	
97900.0220	Pressure/vacuum tube	
97900.0221	Union	

97900.0228	Battery socket adapter	
814.1.114.1A	Oil pressure coupling	
514.1.032.1A	Auxiliary test cable	
552.1.038.1A	Cylinder compression cable M10 fitting	
875.1.065.1A	Oil pressure tube	
97900.0230	Feeder	
97900.0224	Feeder	
88765.1371	Belt tensioning sensor	

88765.1374	Belt tensioning sensor bracket	
590.1.189.1A	Fuel pressure tube	
88765.1126	Clamp-type amperemeter	
97900.0227S	CAN network diagnosis cable	

04 - Impianto elettrico

1 -Vehicle pre-delivery

1 Transport packaging integrity check (if required);
2 Removal from the transport packaging (if required);
3 Motorcycle integrity check;
4 Check of the supplied kit completeness (refer to the parts list supplied together with the bike packaging);
5 Only if the bike is supplied in a crate: handlebar and controls assembly; check of controls operation, freedom of movements and any interference;
6 Accessories assembly as of the Customer order, and check of their operation (for instance electric tank plug, anti-theft system, GPS, etc.);
7 Battery start-up and fitting on the vehicle;
8 Check of the tyres pressure:
 - Front: 2.5 bar (rider only) - 2.6 bar (two ups and/or luggage);
 - Rear: 2.5 bar (rider only) - 2.6 bar (two ups and/or luggage);
9 Brake and clutch fluid check (top-up if necessary);
10 Engine oil level check (top-up if necessary);
11 Check of the operation of lighting devices, turn indicators and horn; Check of the adjustment of the headlight luminous beam height;
12 Check of the operation of the active and passive key and the RH/LH steering lock;
13 Throttle control operation check;
14 Check of the front and rear wheel shaft tightening (Front: 63 Nm ± 5% - Rear: 230 Nm ± 10%);
15 Check the brake calliper retaining screws tightening (Front: 45 Nm ± 5% - Rear: 25 Nm ± 5%);
16 Fuel filling until the reserve warning light turns off (nearly 4 litres);
17 Check of the operation of the kill switch and the side stand switch;
18 Final and road test (ABS trigger check and heated handgrips, if fitted);
19 Vehicle cleaning;
20 On-board documentation filling in (warranty card);

2 -Scheduled maintenance chart

Operations to be carried out by the dealer

List of operations to be performed at 1000 km
Reading of the error memory with DDS on the engine control units, vehicle and ABS
Change the engine oil
Change the engine oil filter
Check the indicators and lighting
Check the safety devices (side stand switch, clutch lever switch, right switch engine stop switch and gear position sensor)
Check the battery charge level
Clean the engine oil intake filter
Checking the coolant level
Check the brake and clutch fluid levels
Check brake discs and pad wear
Check tyre pressure and wear
Check the drive chain tension and lubrication
Check freedom of movements of the side and central stand
Check the tightening of the safety components (ex. wheel disc nuts, brake callipers, sprocket tightening)
Check rubbing points, clearance and freedom of movement of the flexible cables and electric wiring in view
Road test of the motorcycle, testing the safety devices (ex. ABS)
Fill out that the service was performed in the Warranty Certificate

Operations to be carried out by the dealer

List of operations to be performed every 12000 km / year (first limit reached)
Reading of the error memory with DDS on the engine control units, vehicle and ABS
Change the engine oil
Change the engine oil filter
Check and/or adjust valve clearance (only every 24000 km)
Replace the timing belts (only every 24000 km/60 months)
Replace the spark plugs (only every 24000 km)

Replace the air filter (only every 24000 km)
Replace the front fork oil (only every 24000 km)
Replace the coolant (only every 24000 km)
Check the indicators and lighting
Check the safety devices (side stand switch, clutch lever switch, right switch engine stop switch and gear position sensor)
Check the battery charge level
Checking the coolant level
Check the brake and clutch fluid levels
Check brake discs and pad wear
Check tyre pressure and wear
Check the drive chain tension and lubrication
Check final drive wear
Check and lubricate the rear wheel shaft (only every 24000 km)
Check freedom of movements of the side and central stand
Check the tightening of the safety components (ex. wheel disc nuts, brake callipers, sprocket tightening)
Check rubbing points, clearance and freedom of movement of the flexible cables and electric wiring in view
Road test of the motorcycle, testing the safety devices (ex. ABS)
Fill out that the service was performed in the Warranty Certificate

Operations to be carried out by the customer

List of operations to be performed every 1000 km
Check the level of the engine oil
Adjust chain tension

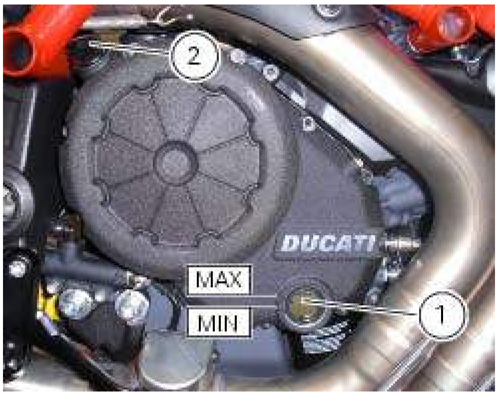
3 -Maintenance operations

Reading of the error memory with DDS on the engine control units, vehicle and ABS

Check if there are errors by following the procedure described in the paragraph “Guided diagnosis” (Sect. 6 - 11).

Check engine oil level

Check the engine oil level through the sight glass (1) on the right-hand side of the oil sump.
Stop the engine and allow a few minutes for the oil to settle to a steady level.
Oil level must be checked with the vehicle perfectly upright and the engine cold.
The oil must be between the MIN and MAX. marks. If the level is low, top it up.
Remove the filler cap (2) and top up with the recommended oil.
Refit the filler plug (2).

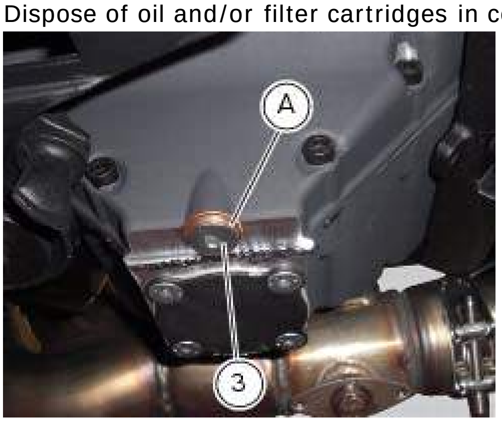


Changing the engine oil and filter cartridge

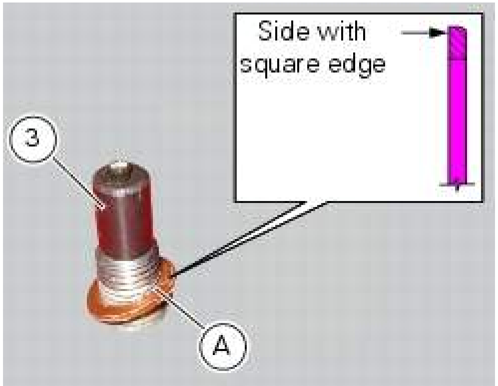
Note
This operation has to be carried out with hot engine (but turned off) because the oil in these conditions is more fluid and its evacuation is faster and complete.

Remove the drain plug (3) with seal (A) from the oil sump and allow the oil to drain off.

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



Remove any metallic deposits from the end of the magnetic drain plug (3). Clean the threads of the drain plug and apply THREE BOND TB1215. Refit the drain plug complete with gasket (A) to the sump.
Position seal (A) so that the side with the square edge is facing the chain side crankcase half.



Tighten the exhaust plug (3) to a torque of 20 Nm (Min. 18 Nm - Max. 22 Nm) (Sect. 3 - 3, Engine torque settings).
Remove the oil sump filter cartridge (4) using service tool **88713.2906**.

Important

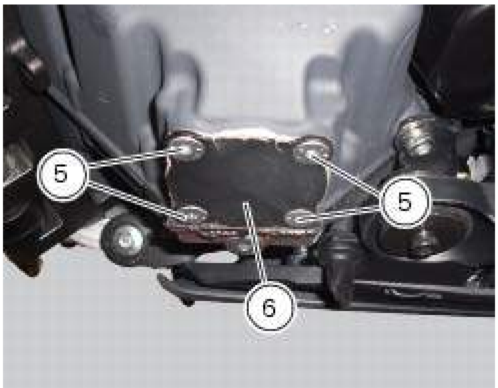
Dispose of the used cartridge, do not attempt to reutilise it.

Fit a new cartridge (4), using the tool **88713.2906** making sure to lubricate the gasket with engine oil.

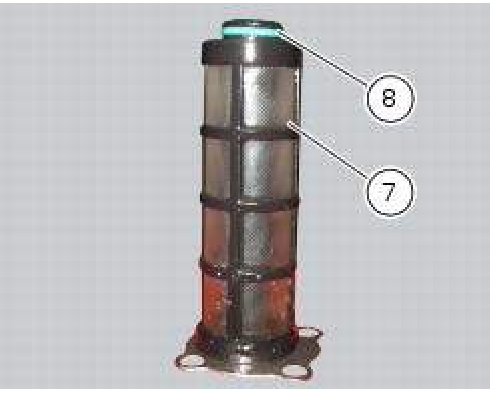
Note

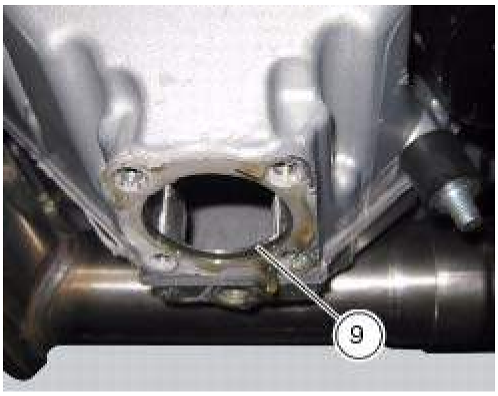
As an alternative, it is advisable to refill the filter cartridge with engine oil (4) before fitting it: this enables the recommended oil level to be maintained without topping up.

Screw the cartridge fully home and tighten it to a torque of 11 Nm (Min. 10 Nm - Max. 12 Nm) (Sect. 3 - 3, Engine torque settings).
Every two oil changes, clean the oil pickup gauze filter.
Undo the four screws (5) of the external cap (6) and remove it.

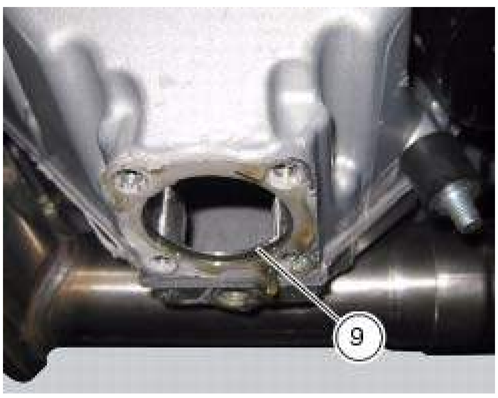


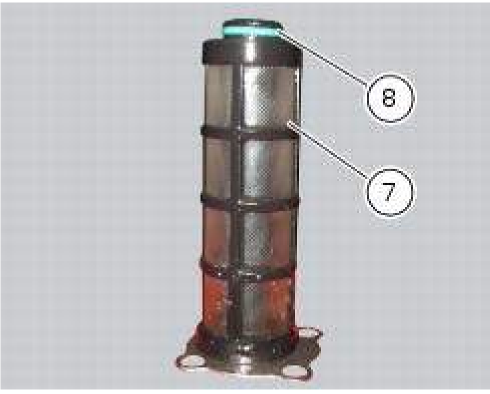
Remove the filtering element (7) and check the O-rings (8) and (9), replace them if necessary.
Clean the filter with petrol and compressed air. Take care not to damage the gauze.



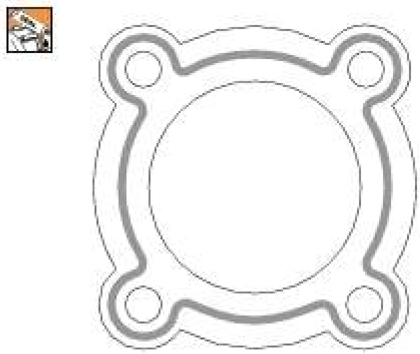


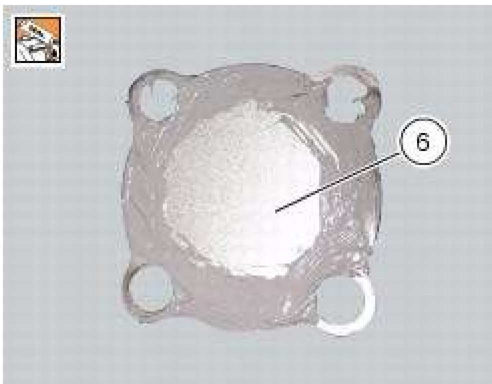
Place the O-ring (9) on the crankcase and the (8) one on the mesh filter (7).



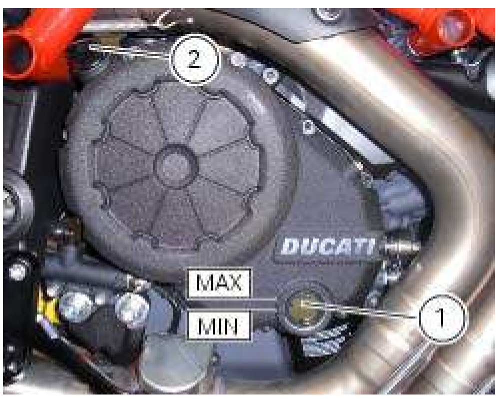


Refit the mesh filter (7).
Apply a bead of fluid gasket to the cap (6) as shown in the figure.

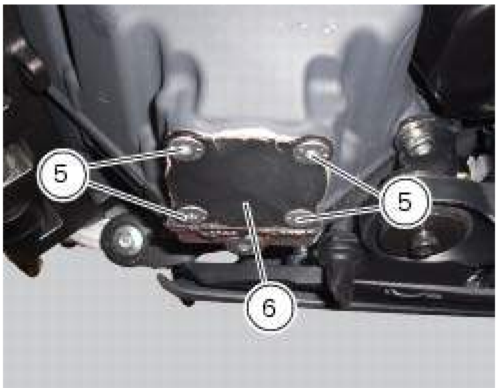




Remove the filler plug (2) and carry out refilling with the specified oil type (Sect. 3 - 2, Fuel, lubricants and other fluids) up to reaching the notch that identifies the MAX level in the sight glass (1).
Refit the filler cap (2). Run the engine at idle speed for a few minutes.



Check that there are no oil leaks and that the engine oil pressure warning light on the dashboard switches off some seconds after starting up the engine. If not, switch off 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 the external cap (6) retaining screws (5) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings).



Checking valve clearances

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

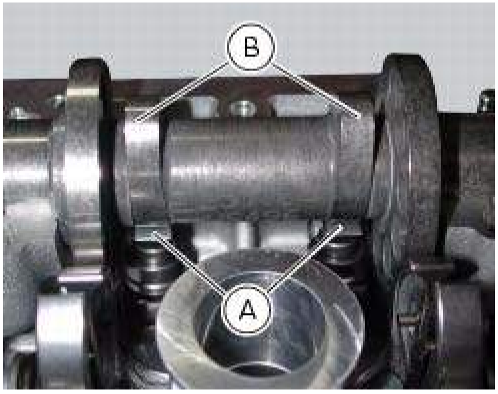
Operations	Section reference
Remove the saddles	5 - 3, Removal of the seat
Remove air conveyor covers	8 - 7, Removal of the air filters
Remove the tank half covers	5 - 2, Removal of the fuel tank fairings
Remove the fuel tank	8 - 2, Removal of the fuel tank
Remove the blow-by pipe	8 - 6, Removal the airbox and throttle body
Empty the coolant out of the cooling system	4 - 3, Changing the coolant
Loosen the clamps of the hose that connects the two radiators and the hose that connects the RH radiator to the union	9 - 3.1, Removal of the cooling system hoses and unions
Remove the water radiators leaving them connected to the cooling system	9 - 3.2, Removing the water radiators
Remove the exhaust unit	8 - 8, Removal of the exhaust system
Loosen the timing belt covers	9 - 4.2, Removal of the timing belt covers
Remove the coils	6 - 9, Ignition coils
Remove the cylinder head cover	9 - 4.4, Removal of the camshafts

Unscrew the two fixing screws (1) of the cover (2) according to the crankshaft.

Fit the tool handgrip **88713.0123** in the holes of the generator cover to be able to turn the crankshaft so that the valve on which the control is carried out is in rest position.

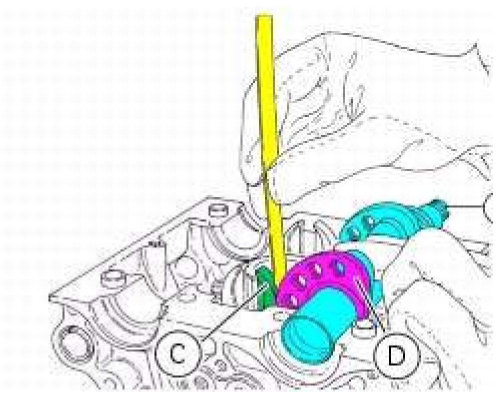
With the valve in the rest position, slide a feeler gauge between rocker arm (A) and the lowest side of the cam (B) to measure the clearance.
The clearances must be within the specified limits:

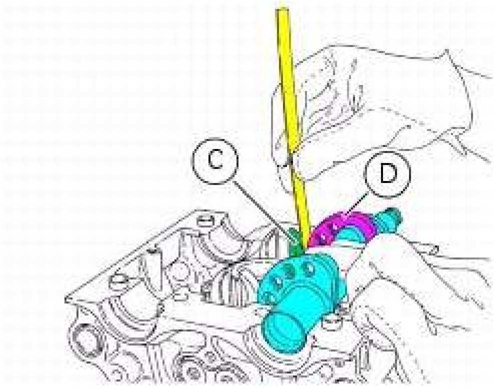
Opening rocker arm	
INTAKE:	
Operation	0.13 to 0.18 mm
Checking clearance	0.10 to 0.25 mm
EXHAUST:	
Operation	0.13 to 0.18 mm
Checking clearance	0.10 to 0.25 mm

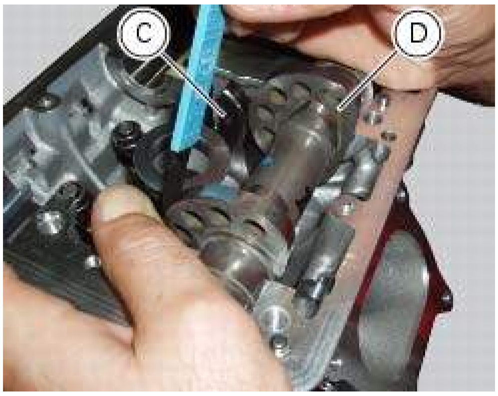


With the valve in the rest position, slide a feeler gauge between closing rocker arm (C) and the highest side of the cam (D) to measure the clearance.

Closing rocker arm	
INTAKE:	
Operation	0.05-0.10 mm
Checking clearance	0.05 to 0.15 mm
EXHAUST:	
Operation	0.05-0.10 mm
Checking clearance	0.05 to 0.15 mm





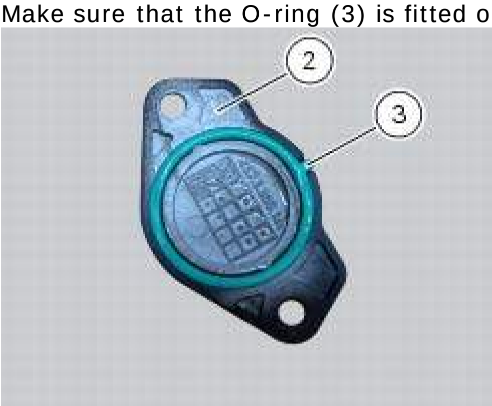


If detected values exceed the specified limits, replace opening and/or closing shims, as described in paragraph "Removing the valves" (Sect. 9 - 4.5), with an adequate height to obtain the specified clearance.

Note

Opening rocker arm shims measuring from 1.8 to 3.45 mm and closing rocker arm shims measuring from 2.2 to 4.5 are available as spare parts. The size is punched on the shim.

Remove the handgrip tool **88713.0123** from the hole of the generator cover.
Make sure that the O-ring (3) is fitted on the cover (2).



Refit the external cap (2) by tightening the two retaining screws (1) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings).

Operations	Section reference

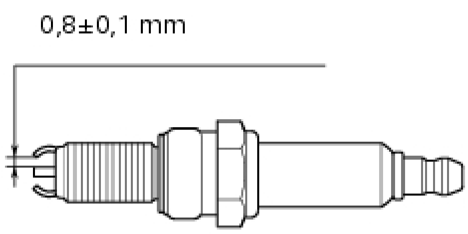
Refit the cylinder head cover	9 - 4.4, Refitting the camshafts
Refit the coils	6 - 9, Ignition coils
Refit the exhaust unit	8 - 8, Refitting the exhaust system
Fasten the timing belt covers	9 - 4.2, Refitting the timing covers
Reassemble the water radiators on the frame	9 - 3.2, Refitting the radiator
Tighten the clamps of the hose that connects the two radiators and the hose that connects the RH radiator to the union	9 - 3.1, Refitting the cooling system hoses and unions
Refill the cooling system	4 - 3, Changing the coolant
Reassemble the blow-by pipe	8 - 6, Refitting the airbox and throttle body
Refit the fuel tank	8 - 2, Refitting the fuel tank
Reassemble the tank half covers	5 - 2, Refitting the fuel tank fairings
Reassemble air conveyor covers	8 - 7, Refitting the air filters
Refit the saddles	5 - 3, Refitting the seat

Change timing belts

To replace the timing system belts follow the procedures described in paragraph "Removal of the movable tensioner/timing belt" and "Refitting the timing belts" (Sect. 9 - 4.2).

Spark plugs replacement

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 taken value is different from the specified one or the spark plug shows clear signs of carbon settling.

Important

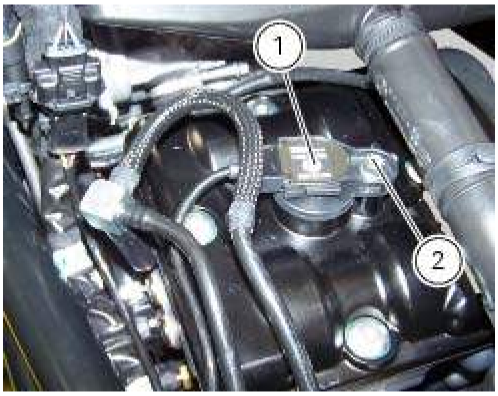
Do not use spark plugs with inadequate thermal rating or incorrect thread length.
The spark plug must be securely installed.
If a spark plug is loose, it can overheat and damage the engine.

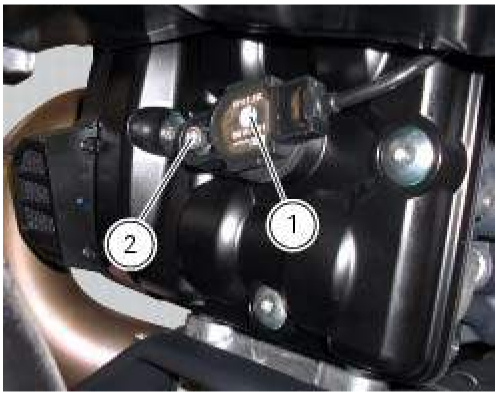
Spark plug type
Make: NGK
Type: MAR9A-J

Operations	Section reference
Remove the seat	5 - 3, Removal of the seat

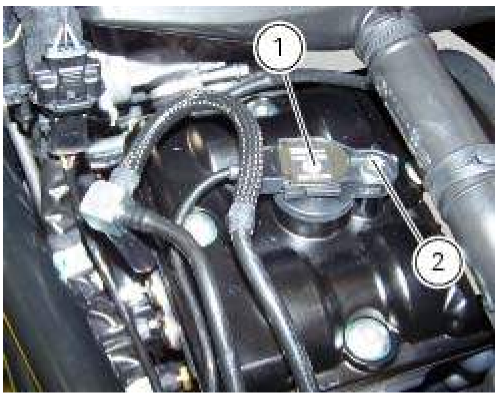
Remove the tank covers	5 - 2, Removal of the fuel tank fairings
Remove the fuel tank	8 - 2, Removal of the fuel tank

Remove the coil-spark plugs wires (1), loosening the screws (2) of both spark plugs.
Using the appropriate tool **88713.2877** to replace the spark plugs.





Place the coil-spark plugs wires (1) in the relevant seats and tighten the screws (2) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings).



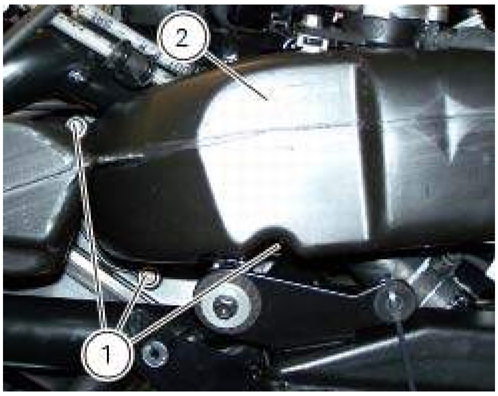
Operations	Section reference
Refit the fuel tank	8 - 2, Refitting the fuel tank
Refit the tank fairings	5 - 2, Refitting the fuel tank fairings
Refit the seat	5 - 3, Refitting the seat

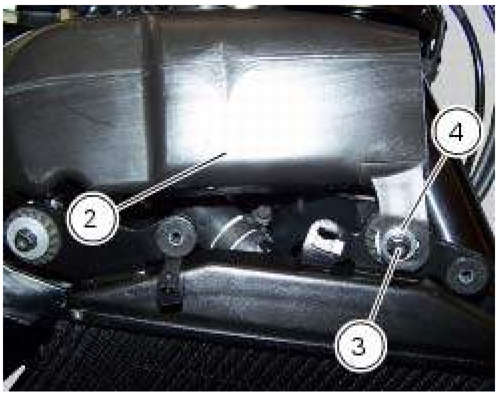
Changing and cleaning the air filters

The air filter must be replaced at the intervals described in the "Scheduled maintenance chart" (Sect. 4 - 2).

Operations	Section reference
Refit the seat	5 - 3, Refitting the seat
Remove the tank covers	5 - 2, Removal of the fuel tank fairings
Remove the fuel tank	8 - 2, Removal of the fuel tank
Remove the exhaust	8 - 8, Removal of the exhaust system

Work on the vehicle right side, loosen screws (1) that secure the intake duct (2) to the filter box, and the radiator retaining screw (3); recover the washer (4).
Remove the intake duct (2).





Pull out the filter cartridge (5) from the seat in the airbox.

The filter cartridge can be cleaned with a jet of compressed air or replace if necessary.

Important

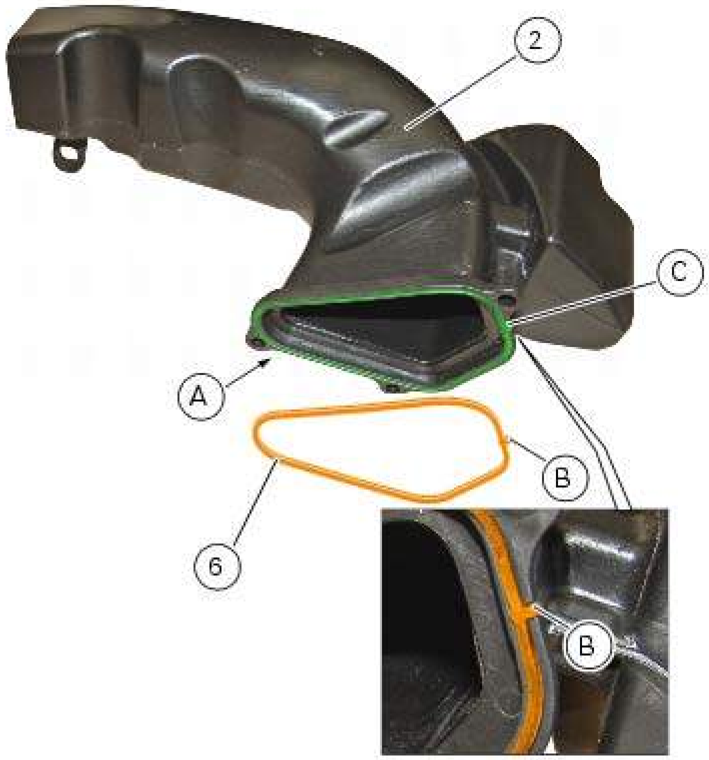
A clogged air filter will reduce air intake and engine power, increase fuel consumption and cause a build up of deposits on the spark plugs. Do not use the motorcycle without a filter as impurities in the air could get into the engine and cause damage.

Properly refit the cartridge in the filter box housing.
If the gasket (6) has been replaced, refit the new gasket in the proper seat (A) of the conveyor (2); place it so that the

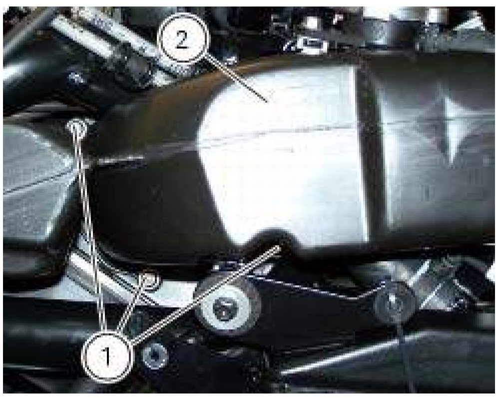
tab (B) of the gasket (6) matches with slot (C) of the RH conveyor (2) as shown in the figure.

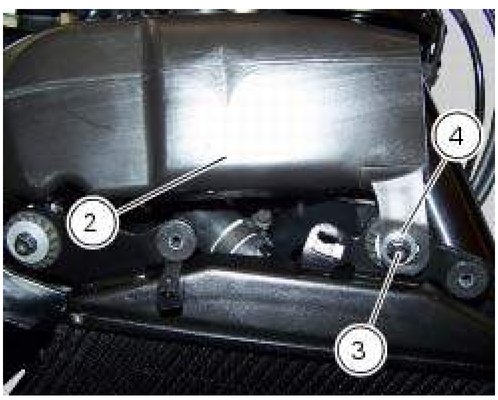
Note

Check for no abnormal wrinkles during gasket fitting.



Start the screws (1) and screw (3) with washer (4).
Tighten the screws (1) to a torque of 3.5 Nm ± 10% (Sect. 3 - 3Frame torque settings) and screw (3) to a torque of 10 Nm ±10% (Sect. 3 - 3, Frame torque settings).

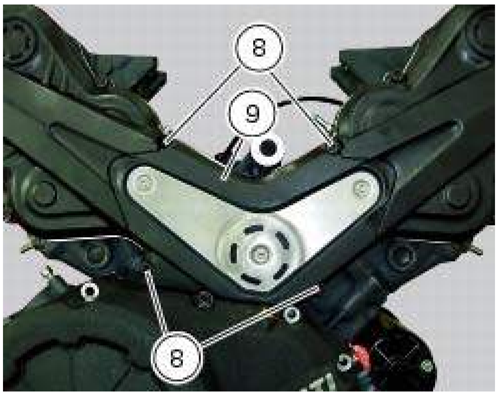




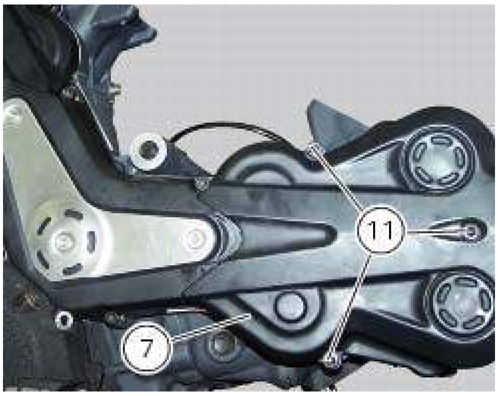
Important

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

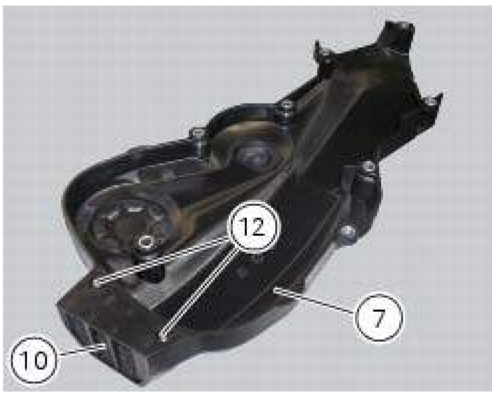
Check the air filter in the horizontal timing belt cover.
Loosen the screws (8) securing the central external cover (9) and remove it from the central side.



Loosen the screws (11) fixing the horizontal belt timing cover (7) and remove it from the horizontal cylinder assembly.



Loosen the screws (12) and remove the filter (10). Apply the recommended threadlocker to the screws (8) and (11).
Once the check has been carried out refit filter (10), screw without tightening the screws (12) and refit the horizontal timing belt cover (7) on the horizontal cylinder assembly by tightening the screws (11) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) for the plastic covers, and 6 Nm (Min. 5.5 Nm - Max. 6.5 Nm) for the carbon ones (Sect. 3 - 3, Engine torque settings).

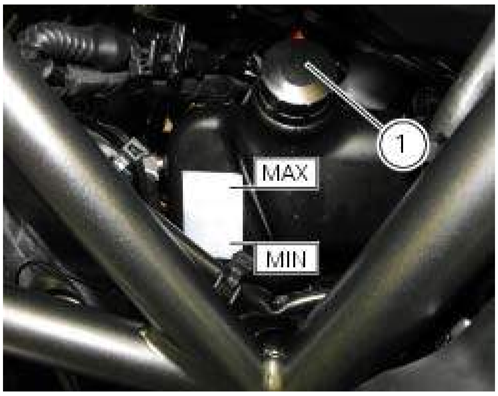


Refit the central timing belt cover (9) by tightening the screws (8) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) for the plastic covers, and 6 Nm (Min. 5.5 Nm - Max. 5.6 Nm) for the carbon ones (Sect. 3 - 3, Engine torque settings).

Operations	Section reference
Reassemble the exhaust	8 - 8, Refitting the exhaust system
Refit the fuel tank	8 - 2, Refitting the fuel tank
Refit the tank fairings	5 - 2, Refitting the fuel tank fairings
Refit the seat	5 - 3, Refitting the seat

Checking the coolant level

To the specified intervals in the "Scheduled maintenance chart" (Sect. 4 - 2) check the coolant level contained in the expansion reservoir, on the right side of the vehicle.
The coolant level must be between the MAX. and MIN marks on the tank.
If the level is low, top up with the recommended coolant.
Remove the filler cap (1) and top up with new coolant to the specified level.
Refit the plug (1).



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

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

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

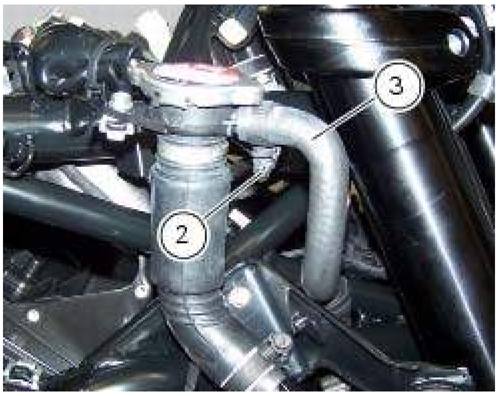
Changing the coolant

Warning
This operation must only be carried out when the engine is cold. Attempting to change the coolant with the engine hot could lead to burns from hot coolant or scalding steam.

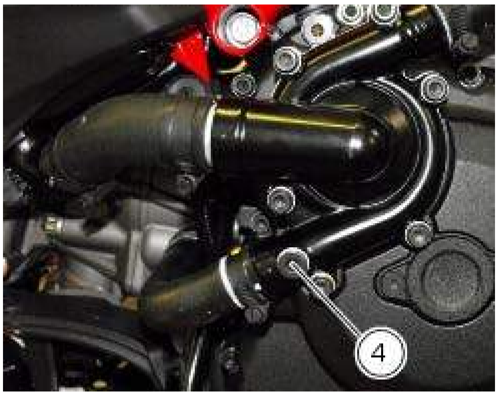
Operations	Section reference
Remove the RH front half-fairing	5 - 2, Removal of the fuel tank fairings
Remove the RH intake duct	8 - 7, Removal of the air filters

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

Loosen clip (2), disconnect the hose (3) and drain the coolant inside a container.

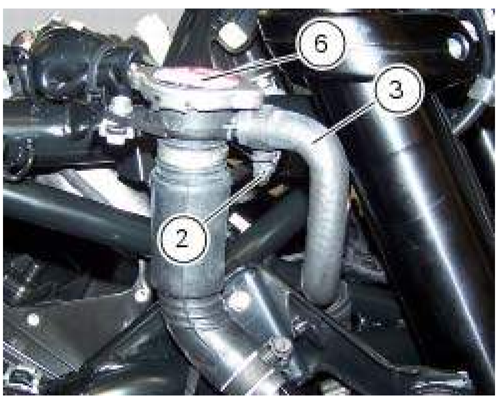


Loosen the cap (4) of the fluid exhaust hole placed on the pump cover.
Allow the coolant to drain off completely.
Screw plug (4) with a seal again in the fluid drain hole, and recover the new seal (5).
Tighten the plug (4) to a torque of 20 Nm (Min. 18 Nm - Max. 22 Nm) (Sect. 3 - 3, Engine torque settings).



Refill the circuit by pouring new coolant into the circuit via the remote filler cap (6).

Connect the pipe (3) by tightening the clamp (2) to a torque of 1 Nm ±10% (Sect. 3 - 3, Frame torque settings).



Allow several minutes for the coolant to fill all the internal passages.
Start up the engine and allow 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 cooling circuit.

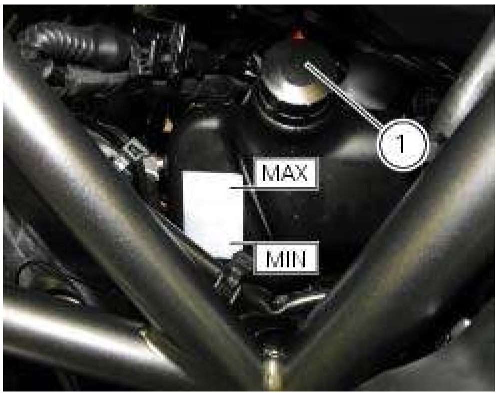
Warning

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 cooling circuit for possible leaks.

Top up the coolant through the expansion reservoir filler to bring the level up to the MAX. mark.
Tighten the cap (1) of the expansion reservoir.



Operations	Section reference
Reassemble the RH intake duct	8 - 7, Refitting the air filters
Reassemble the RH front half-fairing	5 - 2, Refitting the fuel tank fairings

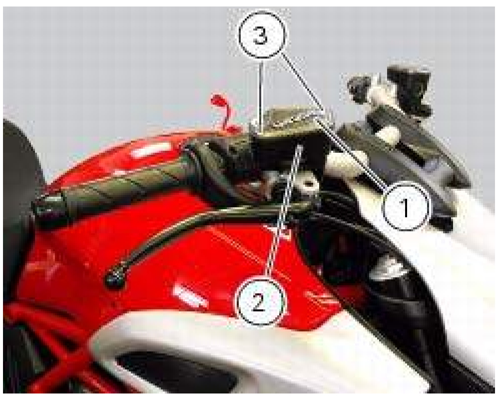
Changing the brake fluid

Warning

Brake fluid is corrosive and will damage paintwork. Avoid contact with eyes and skin. In the case of accidental contact, wash the affected area thoroughly with plenty of running water.

Changing the fluid in the front brake circuit

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



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

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

Fill the reservoir (2) with new brake fluid up to the MAX. mark.
Operate the lever to reach the 20 - 30 mm end of stroke and keep the lever in this position by using a non-elastic clamp.

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

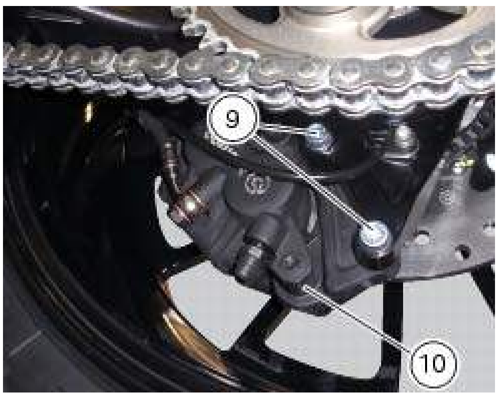
Tighten the bleed valve (5) to a torque of 23 Nm ±10% (Sect. 3 - 3, Frame torque settings) then release the lever.
Repeat the operation described above until the old fluid flows completely.
Then, with the bleed valve definitely closed to the specified torque actuate repeatedly the lever until a pressure is detected in the brake system.

Warning
After eliminating the old fluid from the tank, during the refilling operation always keep the oil level above the MIN mark to prevent the formation of air bubbles inside the circuit.

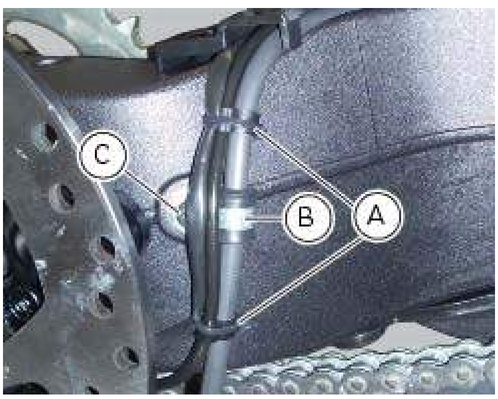
Changing the rear brake circuit fluid

Operations	Section reference
Remove the exhaust	8 - 8, Removal of the exhaust system
Remove the rear wheel	7 - 2, Removing of the rear wheel

Undo the two fixing screws (9) of the rear brake calliper (10) to the calliper holder bracket and remove the brake calliper (10).

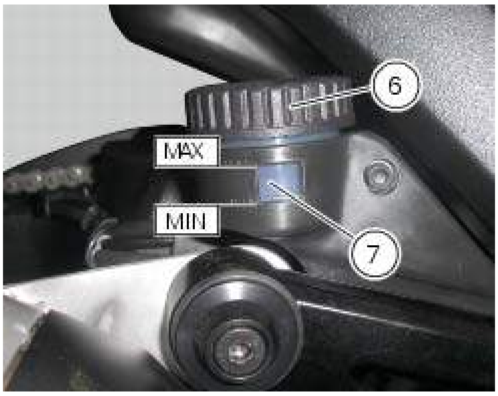


Remove the ties (A) and the hose clip (B) by loosening the screw (C).



Attach a length of transparent plastic tubing to the bleed valve (8) and insert the other end of the tubing in a container placed on the floor.

Unscrew the cap (6) of the rear brake fluid reservoir (7).
Siphon off the fluid from the reservoir (7).
Fill the reservoir (7) with new brake fluid up to the MAX. mark.



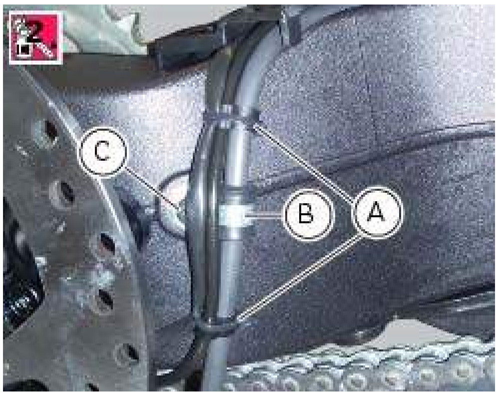
Press the pedal to allow the circuit to go under pressure.
Keep the pedal pressed to the bottom.

Loosen the bleed valve (8) to allow fluid to escape.
The pedal is at the end of the stroke in lower position.
At this point, tighten the bleed valve (8) to the specific torque of 23 Nm ±10% (Sect. 3 - 3, Frame torque settings) and release the pedal; press the pedal.
Repeat the operation described above until the old fluid flows completely.

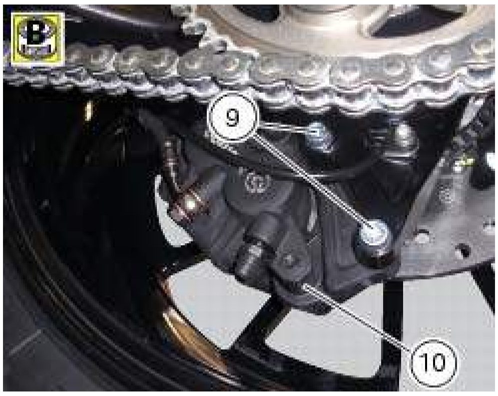
Warning

After eliminating the old fluid from the tank, during the refilling operation always keep the oil level above the MIN mark to prevent the formation of air bubbles inside the circuit.

Apply the recommended threadlocker on the screw (C).
Refit pipe grommet (B) and tighten the screw (C) to a torque of 4 Nm ±10% (Sect. 3 - 3, Frame torque settings).
Lock the rear brake hose, the tail light wiring and the speed sensor by means of the new ties (A).



Fit the rear brake calliper (10) over the brake disc, aligning it with the holes in the calliper mounting bracket.
Grease the screws (9) and tighten to the torque of 25 Nm ±5% (Sect. 3 - 3, Frame torque settings).



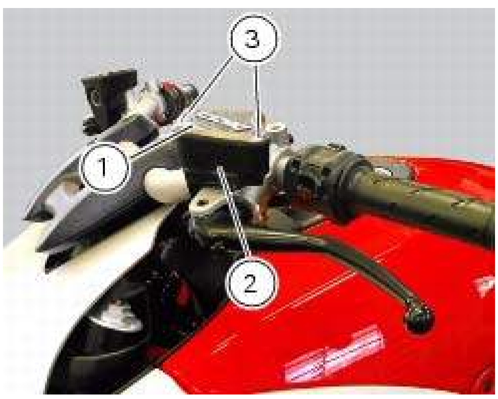
Operations	Section reference
Refit the rear wheel	7 - 2, Refitting the rear wheel
Reassemble the exhaust	8 - 8, Refitting the exhaust system

Changing the clutch fluid

Warning

Clutch fluid will damage painted surfaces if spilled on them. It is also very harmful if it comes into contact with the skin or with the eyes; in the event of accidental contact wash the affected area with abundant running water.

Remove cover (1) and membrane from the clutch fluid reservoir (2) by loosening the screws (3).
Siphon off the fluid from the reservoir (2).
Fill the tank (2) with new oil up to the MAX. mark.



Operate the clutch lever two or three times until the circuit is pressurised.
Hold the lever pulled in towards the grip.
Attach a length of transparent plastic tubing to the bleed valve (4) and insert the other end of the tubing in a container

placed on the floor.
Open the bleed valve (4) to allow fluid to escape.

Warning
During the filling operation, always keep the oil level above the MIN mark to prevent the formation of air bubbles in the circuit.

Allow the fluid to flow from the bleed valve (4) until it changes colour. Retighten the bleed valve (4) and tighten to a torque of 4 Nm ±10% (Sect. 3 - 3, Frame torque settings) and restore the correct level of oil in the tank.

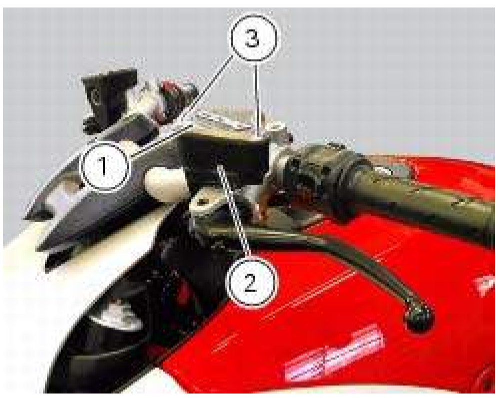
Draining the clutch hydraulic circuit

Warning
Clutch fluid will damage painted surfaces if spilled on them. It is also very harmful if it comes into contact with the skin or with the eyes; In the case of accidental contact, wash the affected area thoroughly with plenty of running water.

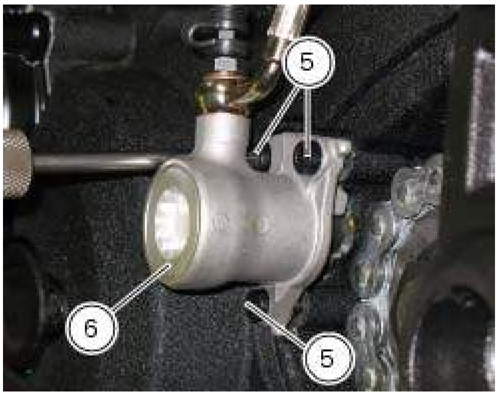
Remove the dust cap to expose the bleed valve (4).
Connect a clutch circuit bleeding tool to the clutch transmission unit bleed valve (4).

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

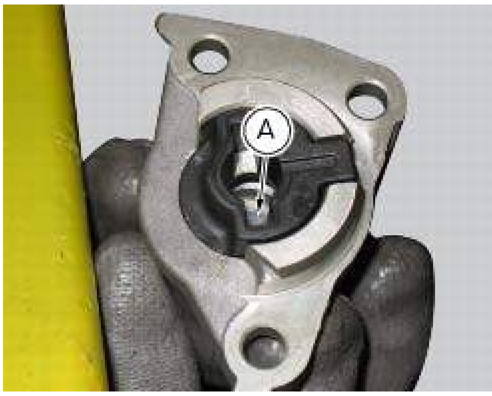
Remove cover (1) and membrane from the clutch fluid reservoir (2) by loosening the screws (3).
Open the bleed valve and pump with the bleeding tool until no more fluid emerges.
If you do not have a bleeding tool available, attach a length of transparent plastic tubing to the bleed valve (4) and insert the other end of the tubing in a container of old clutch fluid placed on the floor.



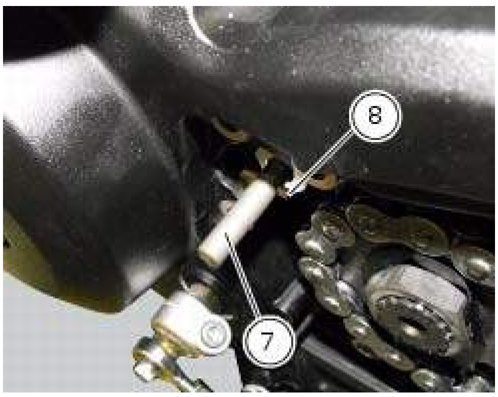
Unscrew the bleed valve by a **1 / 4** turn.
Operate the clutch lever until all the fluid has been expelled.
To completely empty the circuit it is advisable to remove the cap of clutch recover.
Undo the screws (5) and slide out the clutch slave cylinder (6).



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



Make sure the anti-rotation pin (8) is fitted on the clutch pushrod (7).

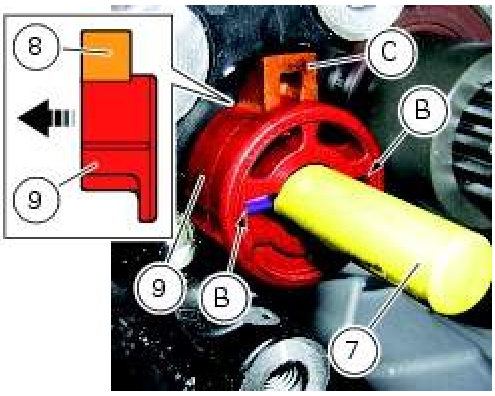


Proceed as follows in case the anti-rotation pin (8) has been removed from the clutch pushrod (7).
Turn the clutch pushrod (7) until the axis of the anti-rotation pin (8) positioning hole is horizontal, as shown in the figure;
Grease the anti-rotation pin (8) and insert it into the clutch pushrod (7) hole.

Insert the anti-rotation insert (9) fully home into the clutch pushrod (7) by matching the anti-rotation pin (8) with the slots (B) on the insert (9).

Note

The tab (C) of insert (9) must be inwards (casing side).



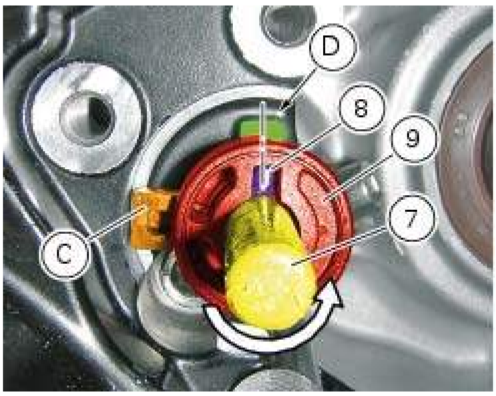
Turn the clutch pushrod (7) counter clockwise until the hole axis of the anti-rotation pin (8) is aligned with the centreline of the casing cover machined surface (D), as shown in the figure.
Insert the clutch actuator (6) into the pushrod (7) and bring it fully home on the anti-rotation insert (9).

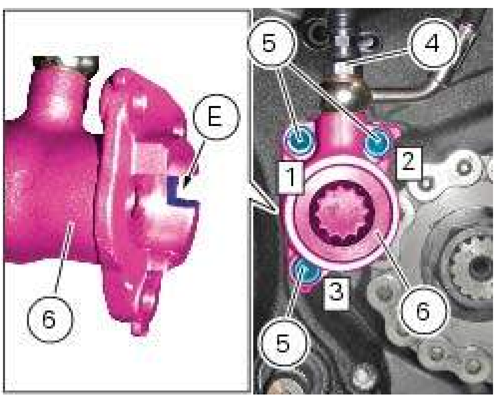
Note
Upon insertion of the clutch actuator (6), make sure that the tab (C) of insert (9) matches with the actuator slot (E).

Fix the clutch actuator (6) by starting the screws (5).

Note
To bring the clutch slave cylinder (6) internal surface near the casing cover as uniformly as possible, screw and tighten the screws (5) alternatively.

Tighten the screws (5) to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings), by following the sequence 1 - 2 - 3 - 1.
Tighten the screw (4) to a torque of 23 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

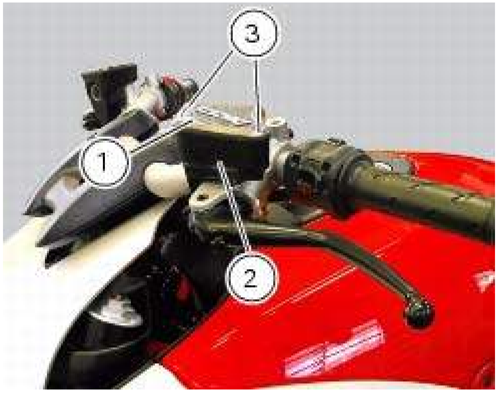




Filling the clutch circuit

Warning
Clutch fluid will damage painted surfaces if spilled on them. It is also very harmful if it comes into contact with the skin or with the eyes; In the case of accidental contact, wash the affected area thoroughly with plenty of running water.

Remove cover (1) and membrane from the clutch fluid reservoir (2) by loosening the screws (3).



Fill the tank with specified oil (Sect. 3 - 2, Fuel, lubricants and other fluids) taken from an intact container.

Important

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

Operate the clutch lever and keep it pulled to fill the circuit and expel any air.
Connect the bleed tool to the bleed valve (4).

Note

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

Loosen the bleed valve (4) and pump with the bleeder. Make sure that the reservoir level does not fall below the MIN mark.
Repeat the bleeding 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 length of transparent plastic tubing to the bleed valve (4) as outlined in the draining procedure.

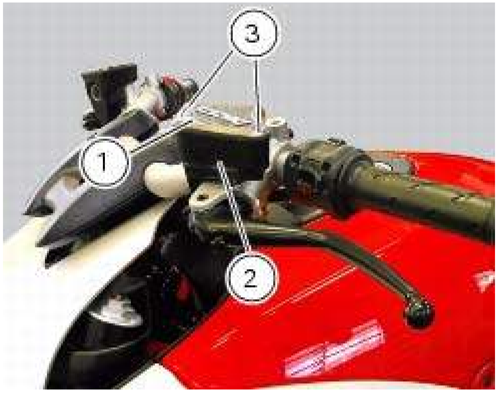
Open the bleed valve by **1 / 4** turn and operate the clutch lever several times until the fluid flows out of the bleed valve (4).
Pull the lever fully in and then loosen the bleed valve by at least a **1 / 4** turn.
Wait for a few seconds; then release the lever gradually while simultaneously closing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

Important

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

Repeat the bleeding operation until the fluid emerging from the plastic tube is free of air bubbles.
Close to a torque of 4 Nm ± 10% (Sect. 3 - 3, Frame torque settings) the bleed valve (4) and install the protection cover.

Top up the fluid level to approximately **3** mm above the MIN mark of the tank.
Reassemble cover (1) and membrane from the clutch fluid reservoir (2) by tightening the screws (3).

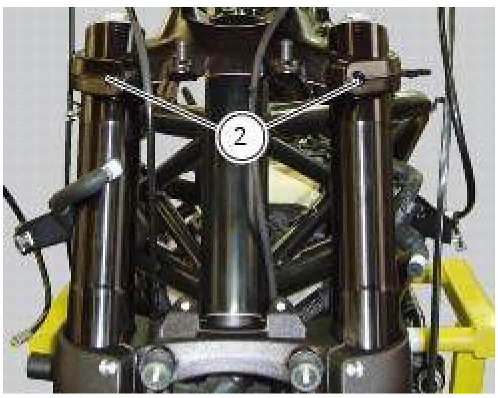


Adjusting the steering head bearings

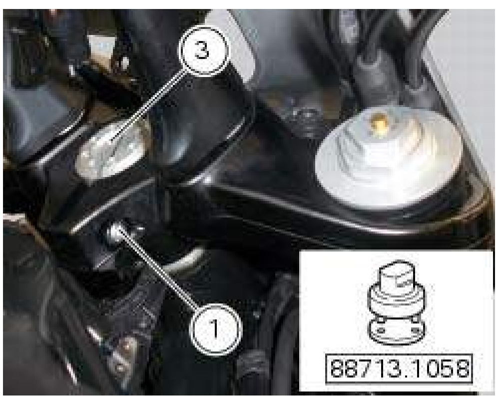
Excessive handlebar play or shaking forks in the steering head indicate that the play in the steering head bearings requires adjustment. Proceed as follows:

Loosen the clamp screw (1) that holds the steering tube to the steering head.

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

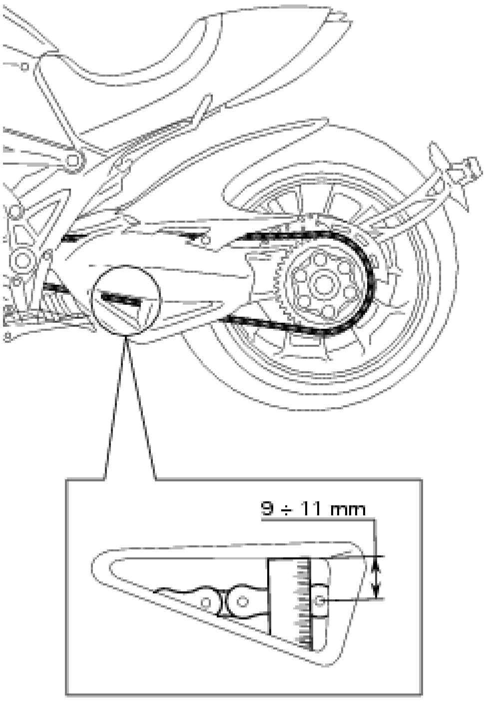


With specific wrench **88713.1058** tighten the adjustment ring nut (3) to a torque of 30 Nm ± 5% (Sect. 3 - 3, Frame torque settings).
Push the steering head against the ring nut (3) and tighten the screw (1) to a torque of 24 Nm ±5% and the screws (2) to 20 Nm ±5% (Sect. 3 - 3, Frame torque settings).



Adjusting the chain tension

Make the rear wheel turn until you find the position where chain is tightest. Set the vehicle on the side stand. Push down the chain at the point of measurement and release. Measure the distance between the “aperture” upper profile and pin centre.
The read distance must be: **9** to **11** mm.



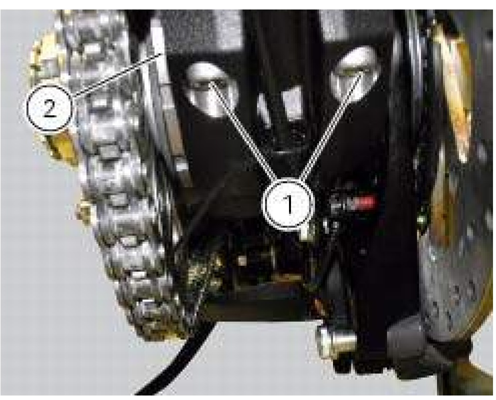
Important

If the drive chain is too tight or too slack, adjust it so that tension reading will fall within specified range.

To adjust the tension remove the rear splash guard (Sect. 7 - 13, Removal of the swingarm).
Slacken off the two clamp screws (1) that secure the rear wheel hub to the swingarm.
Fit the hook spanner code **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).

Important

An incorrectly tensioned chain will lead to accelerated wear of the transmission components.
If the screws (1) are removed, lubricate with specified grease underhead and thread, then tighten the screws (1) to the torque of 35 Nm ± 5% (Sect. 3 - 3, Frame torque settings) proceeding with sequence 1-2-1.



Warning

The correct tightening of the fixing screws of the eccentric hub is essential for the safety of the rider and the passenger (Sect. 3 - 3, Frame torque settings).

Refit the rear splash guard (Sect. 7 - 13, Refitting the swingarm).

Checking brake pad wear and changing brake pads

Warning
Brake fluid is corrosive and will damage paintwork. Avoid contact with eyes and skin. In the case of accidental contact, wash the affected area thoroughly with plenty of running water.

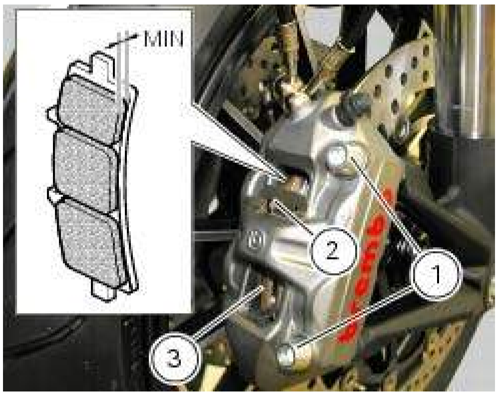
Important
On handing over the motorcycle after changing the brake pads, inform the customer that the front brake must be used gently for the first 100 km to allow the pads to bed in completely.

Checking front brake pad wear

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

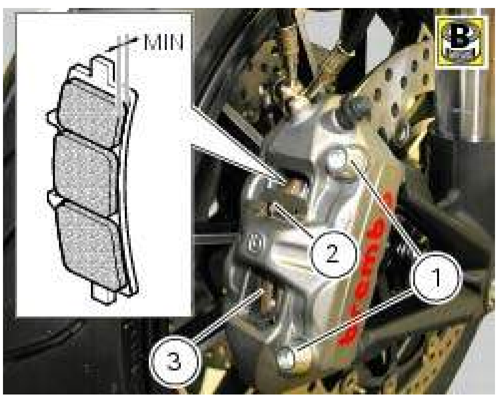
Warning
Friction material wear beyond this limit would lead to metal support contact with the brake disc thus compromising braking efficiency, disc integrity and rider safety.

Remove the callipers by loosening the retaining screws (1) of the front brake calliper to the fork leg.
Remove the safety cotter pins (2).
Remove the worn pads (3).



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

Insert new pads (3) with relevant safety cotter pins (2), push the calliper pistons fully inside their seats by forcing the pads apart.
Insert the front brake callipers into the discs.
Apply the recommended grease to the retaining screws (2).
Hand tighten the screws to secure the callipers to the fork legs.



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

Check that 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 (4) with membrane from the front brake fluid tank (5) by loosening the screws (6).

Top-up with specified fluid (Sect. 3 - 2, Fuel, lubricants and other fluids) until reaching the MAX notch.

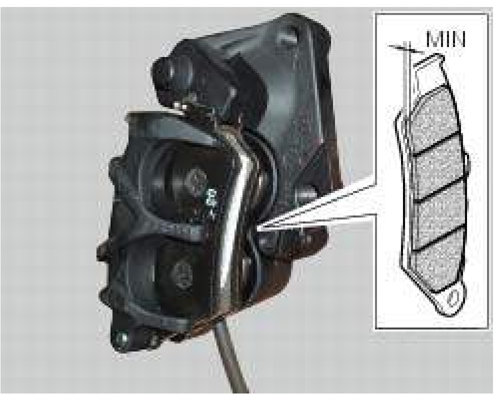
Hold the lever pulled towards the handgrip and simultaneously tighten the calliper screws (1) to a torque of 43 Nm ±10%(Sect. 3 - 3, Frame torque settings).

Checking rear brake pad wear

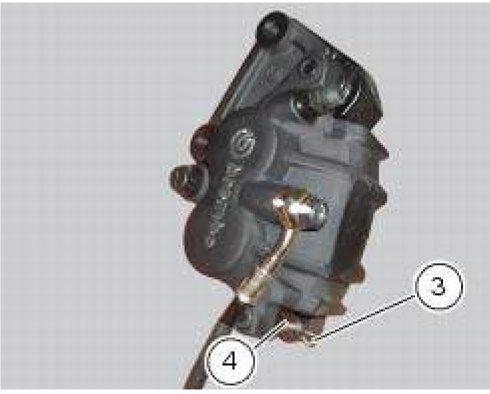
Remove the rear brake calliper (1) by loosening the screws (2).

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

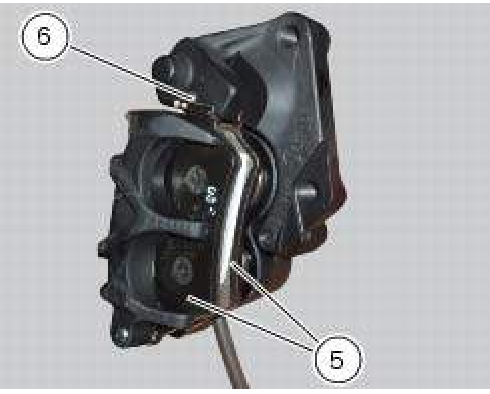
Warning
Friction material wear beyond this limit would lead to metal support contact with the brake disc thus compromising braking efficiency, disc integrity and rider safety.



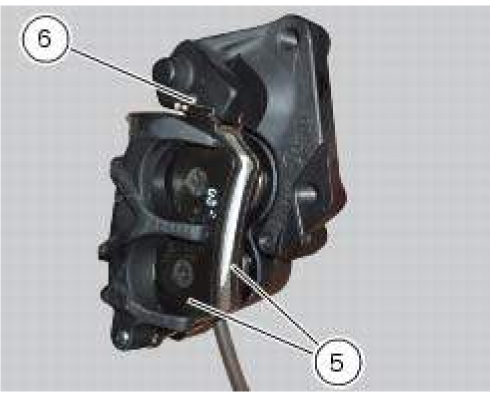
Change the brake pads as follows.
Remove the safety cotter pin (3) from the pad sealing pin (4).
Withdraw the brake pad retaining pin (4) and pull it out.



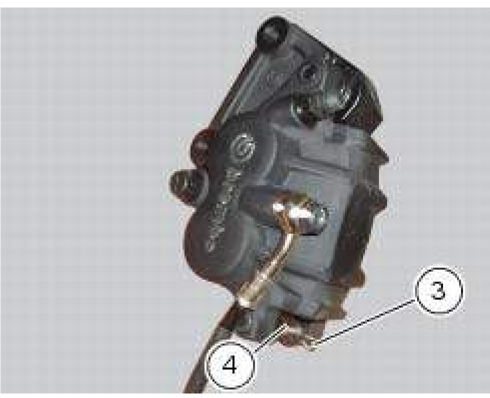
Force the brake pads apart to push the calliper pistons into their housings.
Release the worn pads (5) from the spring (6).



Insert the new pads (5) and the clip (6).



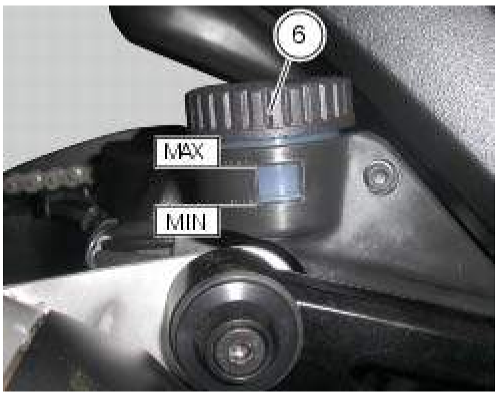
Slide in the pad retaining pin (3) and secure it in position with the safety cotter pin (2).



Force the pads apart to push the calliper pistons into their housings.
Insert the rear brake callipers in the disc.
Apply the recommended grease to the retaining screws (2).
Tighten the retaining screws (2) of the rear brake calliper to a torque of 44 Nm ±5% (Sect. 3 - 3, Frame torque settings).

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

Check that the brake fluid level in the tank is between the MIN and MAX. marks. If this is not the case, act on to the top-up after unscrewing the tank cap (6).

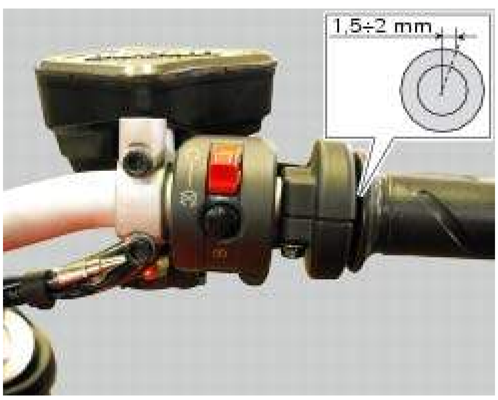


Warning

Being the brake callipers a safety component of the vehicle, follow instructions under Sect. 7 - 3, Refitting the front brake system, Sect. 7 - 4, Removing of the rear brake control and pay attention, during refitting, to the tightening torque of 44 Nm ±5% (Sect. 3 - 3, Frame torque settings) of the retaining screws (**2**) of the rear brake calliper.

Adjusting the throttle cable

The throttle grip in all steering positions must have free play, measured on the periphery of the flange of the grip, of **1.5 - 2.0** mm.

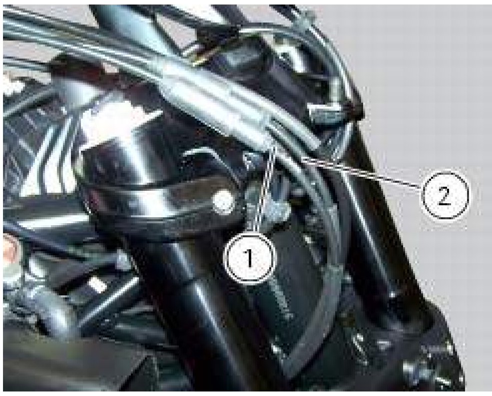


If necessary, adjust using the adjusters (1) and (2) located on the steering tube on the right side of the motorcycle.

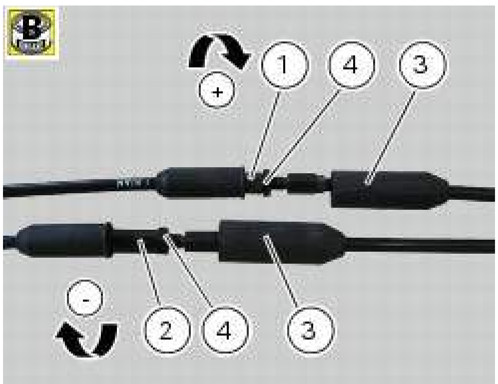
Adjuster (1) adjusts the throttle opening control, while adjuster (2) adjusts the throttle closing control.

Note

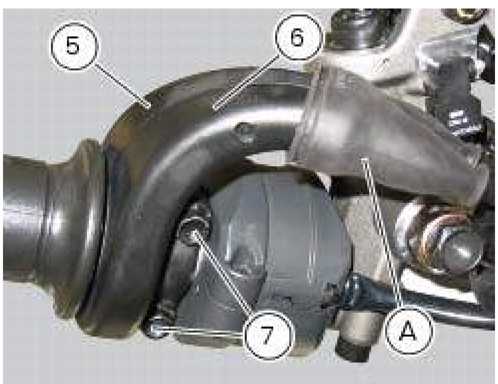
The throttle cables are distinguished by the writings in different colours on them:
- on the throttle opening cable (1) is a white writing;
- on the throttle closure cable (2) is a yellow writing.



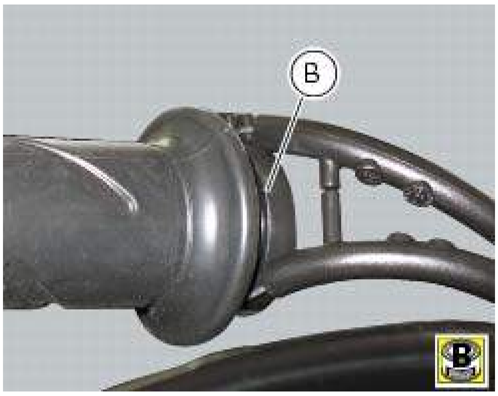
Slip the rubber gaiters (3) off the adjusters and loosen the check nuts (4).
Adjust both adjusters by the same amount: turn clockwise to increase free play and counter clockwise to reduce free play.
When finished, tighten the counter nuts and refit the protection gaiters (3) to the adjusters.
Periodically check the condition of the outer cables of the throttle opening (1) and closing cables (2). The plastic covering should show no signs of pinching or cracking.
Lubricate the ends of the inner cables with the specified grease periodically to ensure they run freely.



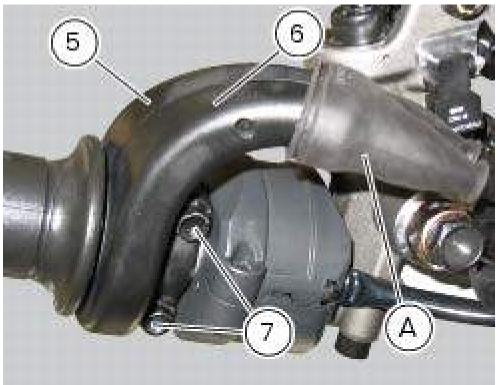
Operate the control to check that the inner cable slides smoothly inside the outer cable: if you feel excessive resistance or stiffness, renew the cable.
To lubricate the throttle grip, it is necessary to slide off the protection cover (A), loosen the screws (7) and remove the covers (5) and (6) of the throttle grip.



Lubricate the ends of the cable and the pulley (B) with the recommended grease.
When refitting the cover, make sure that the cables are correctly positioned in the pulley (B).



Place the covers (5) and (6) in the reference hole of the handlebar.
Fix covers (5) and (6) by tightening the screws (7) to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



Adjusting the clutch lever and front brake lever

The clutch lever (1) is fitted with a span adjuster (2) which serves to alter the distance of the lever from the 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. Correct use of the clutch lever is very important in all riding situations, especially when moving off.
The position of the front brake lever (3) can be adjusted in the same way.

Warning

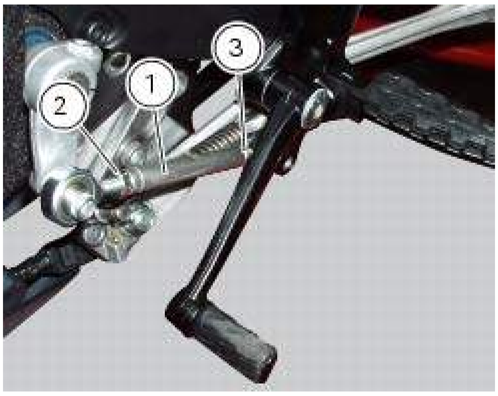
Any adjustment of clutch and brake levers must only be carried out when motorcycle is stationary.

Adjusting the position of the gear change and rear brake pedals

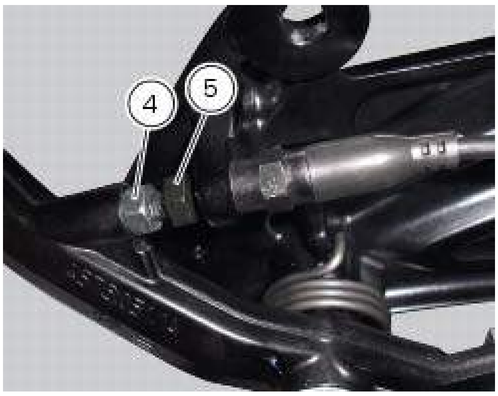
The position of the gear change and rear brake pedals in relation to the footrests can be adjusted to suit the preferred riding position.
To modify the gear change pedal position act in the following mode:
hold the linkage (1) and slacken the counter nuts (2) and (3).

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

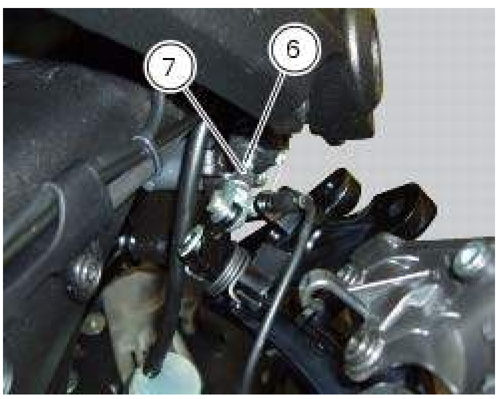
Fit an open-end wrench to hexagonal element of linkage (1) and rotate until setting pedal in the desired position.
Tighten both check nuts onto linkage.



To adjust the position of the rear brake pedal, proceed as follows.
loosen counter nut (4).
Turn pedal travel adjusting screw (5) until pedal is in the desired position.
Tighten the counter nut (4).



Work pedal by hand to make sure it has 1.5 - 2 mm free play before brake begins to bite.
If not, check to modify the length of the cylinder push-rod in the following mode.
Slacken off the counter nut (7) on the pushrod.
Screw the rod into the fork (6) to increase play, or unscrew it to reduce play.
Tighten the counter nut (7) and recheck the pedal free play.

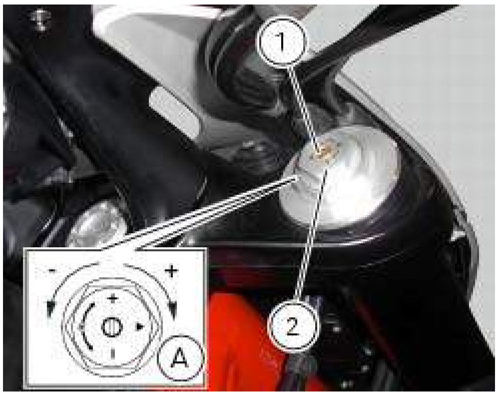


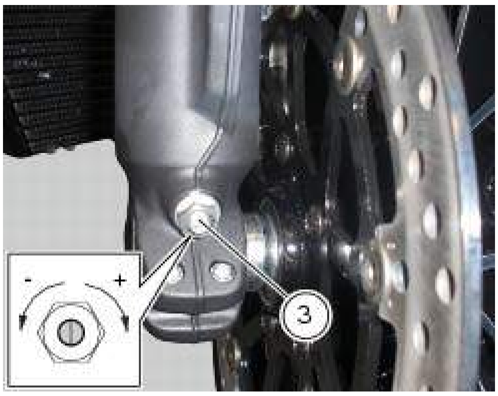
Adjusting the front fork

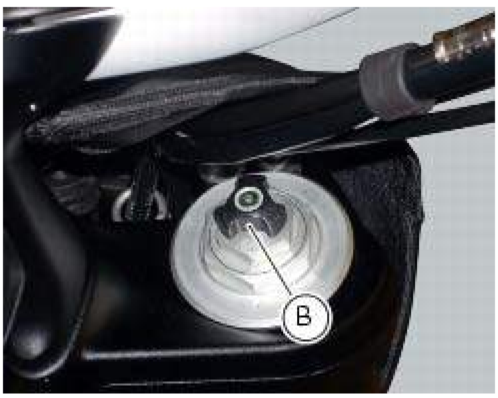
The front fork used on this motorcycle has rebound, compression and spring preload adjustment.
This adjustment is done using the outer adjusters:
1) rebound damping;
2) inner spring preload;

3) compression damping.

Park the motorcycle in a stable position on its side stand.
Turn the adjuster (1) on fork leg top with a flat screwdriver to adjust rebound damping.
On the Carbon model, adjustment is done using the knob (B) on the fork leg, without a screwdriver.
Turn the adjuster (3) on fork leg bottom with a flat screwdriver to adjust compression damping.
As you turn the adjusters (1) and (3), you will hear them click. Each click corresponds to different damping setting.
The stiffest damping setting is obtained with the adjuster turned fully clockwise to the “0” position. Starting from this position, turning counter clockwise, you can count the turns.
To change preload of the spring inside each fork leg, turn the hex. adjuster (2) with a **22** mm hexagon wrench, starting from the fully open position (clockwise). From reference (A), every full turn clockwise corresponds to 1 mm of preload of the spring, up to a maximum of **15** mm, corresponding to 3 full turns.







STANDARD settings, from fully open position, are as follows:
Compression:
1 turn and a half;
Rebound:
1 and a half turns.
Spring preload: FULLY OPEN (counter clockwise).

Important
Adjust both fork legs to same settings.

Adjusting the rear shock absorber

The adjuster (1) located on the lower connection holding the shock absorber to the swingarm adjusts the damping during the rebound phase (return).
The knob (2), located on the left side of the motorcycle, adjusts the preload of the shock absorber external spring.

Turn the adjuster (1) clockwise to increase damping **H**; or counter clockwise to reduce damping **S**.

STANDARD setting from the fully closed position (clockwise):
- unscrew adjuster (1) by 8 clicks.
Spring preload: 15 mm.

The two nuts (2) on the upper part of the shock absorber serve to adjust the preload on the external spring. To change spring preload, slacken the upper locking ring nut. Then tighten or slacken the lower ring nut to increase or decrease spring preload.

Important
The knob (3) located on the expansion reservoir of the shock absorber adjusts the damping during the compression phase.
Turning the adjusters (1) or the knobs (2) and (3) clockwise to increase preload damping; they decrease turning them in the opposite direction.

STANDARD setting:
from fully closed (clockwise) loosen:
register (1) of **12** clicks;
knob (2) FULLY OPEN (counter clockwise);
register (3) of **25** clicks.
Spring preload: **18** mm (Max.**18** mm - Min.**25** mm

Warning
The shock absorber is filled with high-pressure gas and can cause injuries if inexpertly dismantled.

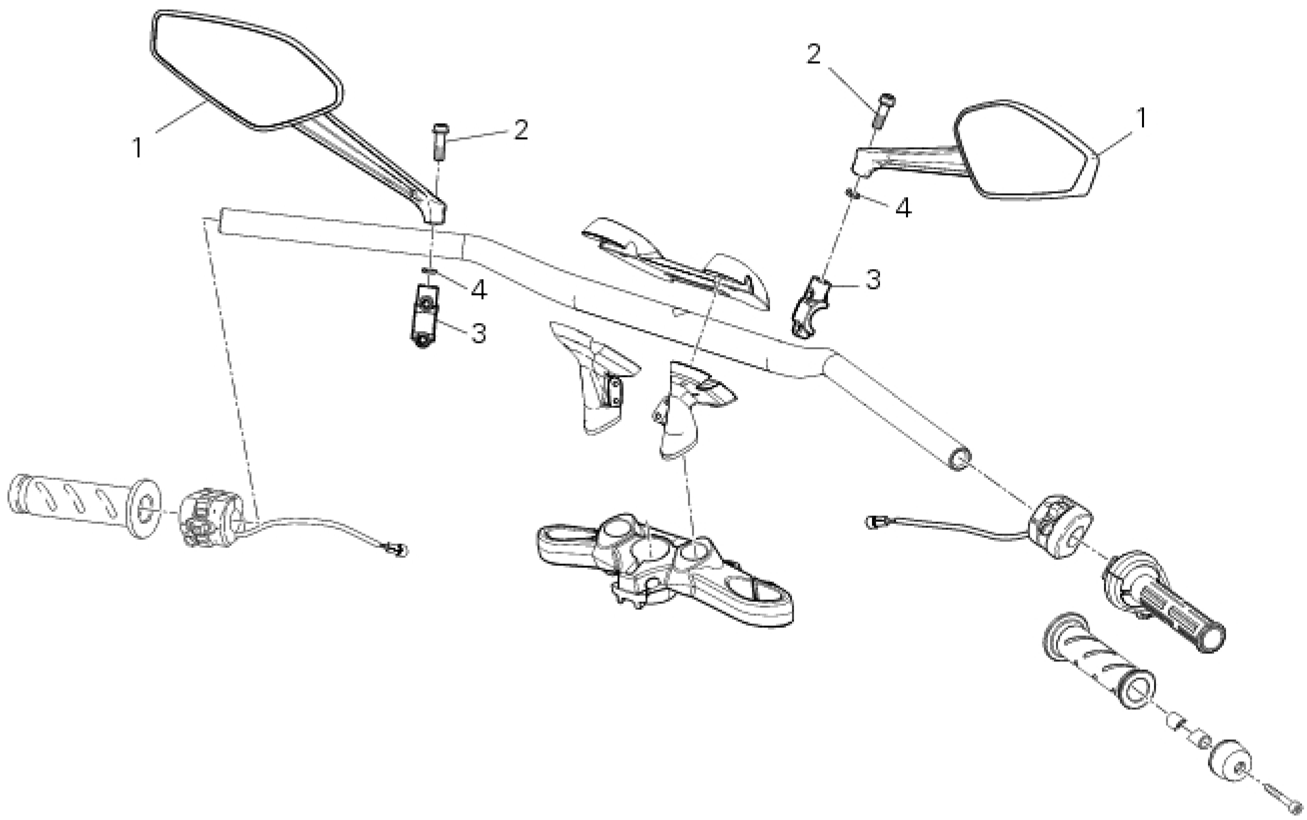
Important

If the motorcycle is to be ridden with a pillion rider and luggage, we recommend setting the rear shock absorber spring preload to the maximum to ensure the best handling and proper ground clearance at all times. It may also be necessary to adjust the rebound damping accordingly.

		Range	Default	Sport	Touring	Urban
Front fork						
Rider only	Compression	0 - 3	1.5	0.5	1	1.5
	Rebound	0 - 3	1.5	1	1.5	1.5
	Preload	0 - 15	0	4	1	0
Rider and passenger	Compression	0 - 3	1.5	0	0.5	1
	Rebound	0 - 3	1.5	1.5	1.5	2.5
	Preload	0 - 15	0	7	4	2
Rear shock absorber						
Rider only	Compression	0 - 40	25	6	15	25
	Rebound	0 - 24	12	4	9	12
	Preload	0 - 28	0	20	10	0
Rider and passenger	Compression	0 - 40	25	4	6	15
	Rebound	0 - 24	12	6	8	10
	Preload	0 - 28	0	28	20	15

05 - Impianto elettrico

1 -Rear-view mirrors



1 Rear-view mirror
2 Screw
3 U-bolt
4 Spring washer

Spare parts catalogue

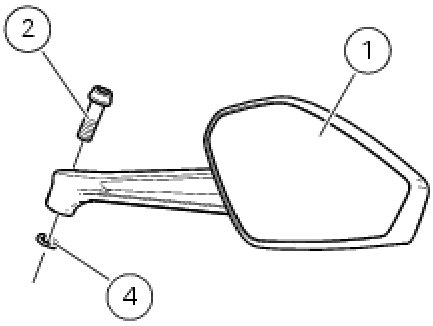
Diavel ABS	HANDLEBAR AND CONTROLS
Diavel Carbon ABS	HANDLEBAR AND CONTROLS

Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

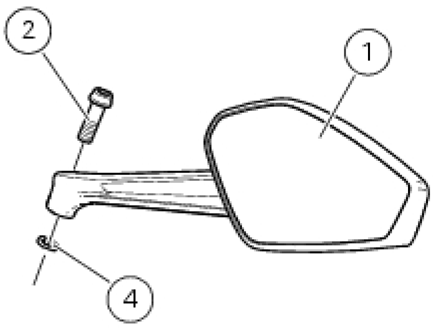
Removal of the rear-view mirrors

Undo the screws (2), remove the rear-view mirrors (1) and recover the washers (4).



Refitting the rear-view mirrors

Start the screws (2) in their thread on the rear-view mirrors (1), inserting the washers (4) as shown in the picture.

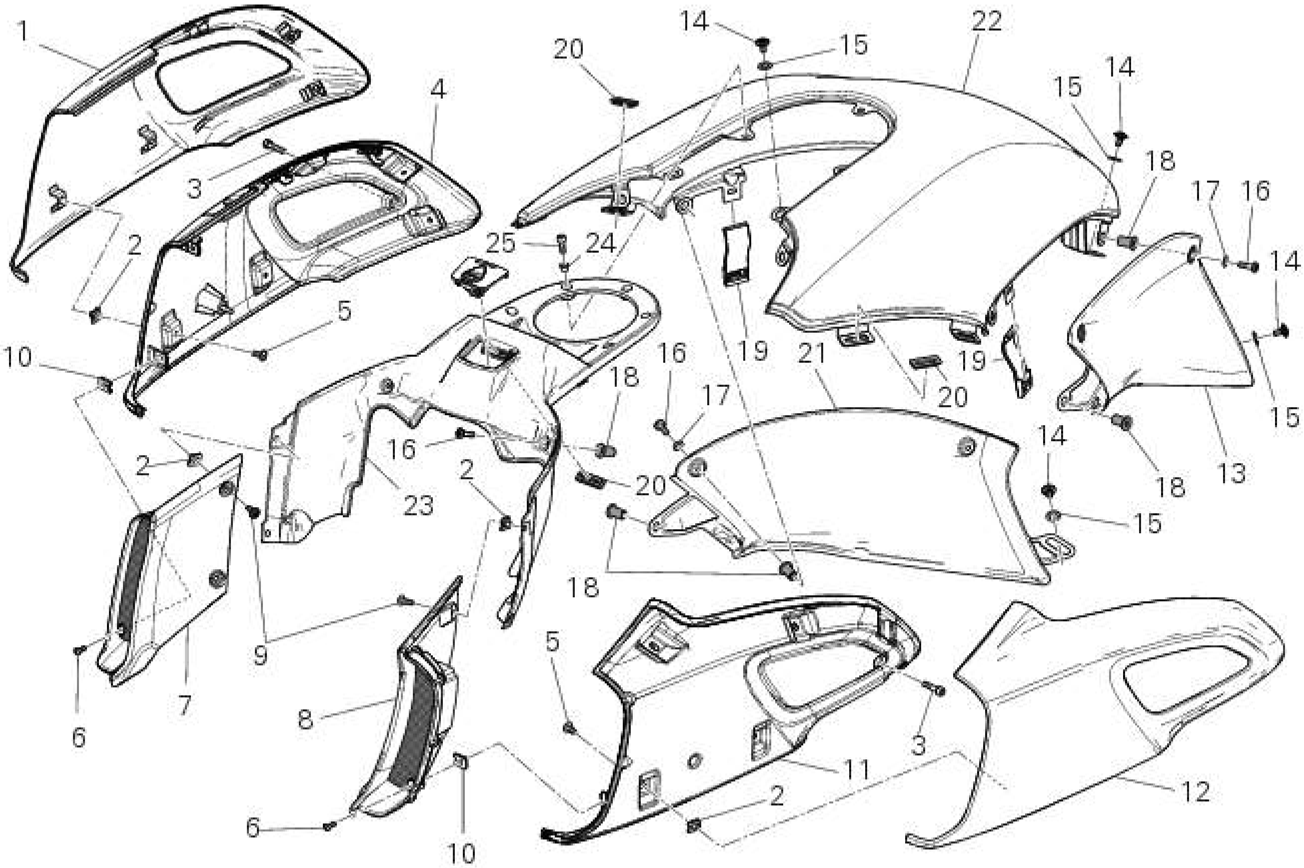


Insert the rear-view mirrors (1) in the U-bolts (**3**).
Tighten the screws (2) to a torque of 25 Nm ±10% (Sect. 3 - 3, Frame torque settings).

Warning

The left rear-view mirror screw (2) has a left-handed threading.

2 -Fairings



1 RH front half-fairing
2 Clip
3 Screw
4 Right-hand support
5 Screw
6 Screw
7 RH air inlet
8 LH air inlet
9 Screw
10 Clip
11 Left-hand support
12 LH front half-fairing
13 LH tank fairing
14 Screw
15 Nylon washer
16 Special screw
17 Washer
18 Spacer
19 Spring
20 Rubber pad
21 RH tank fairing
22 Tank fairing
23 Tank plug cover
24 Spacer
25 Screw

Spare parts catalogue

Diavel ABS	FAIRING
Diavel Carbon ABS	FAIRING

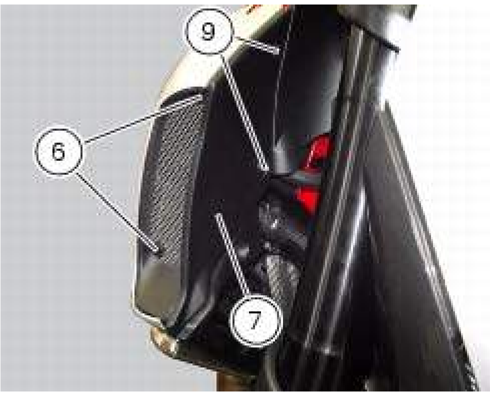
Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

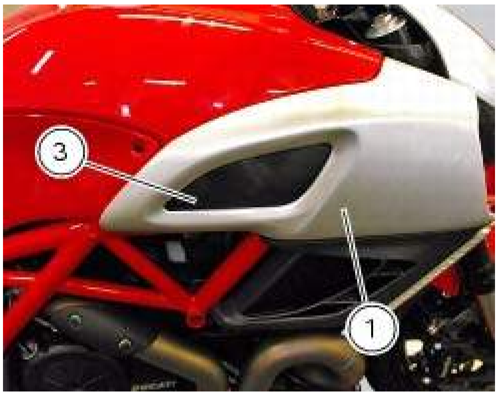
Removal of the fuel tank fairings

Operations	Section reference
Remove the seat	Sect. 5 - 3, Removal of the seat
Remove the handlebar dashboard	Sect. 6 - 7, Dashboard

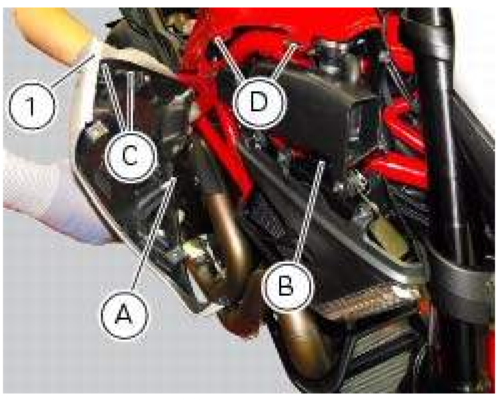
Remove the RH air inlet (7) by loosening screws (6) and (9).



Undo the retaining screw (3) of the RH front half-fairing (1).

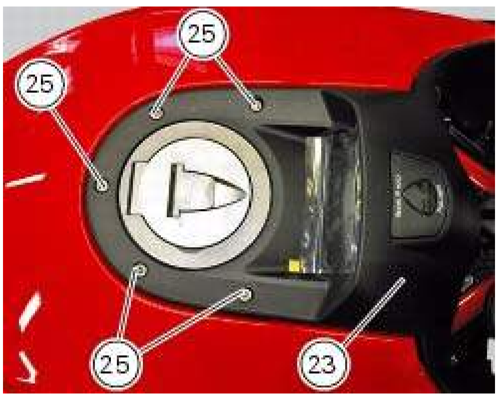


Slightly pull the pin (A) to disengage it from the seal (B), and remove the RH front half-fairing (1) by sliding it onwards and releasing the tabs (C) from the seals (D).

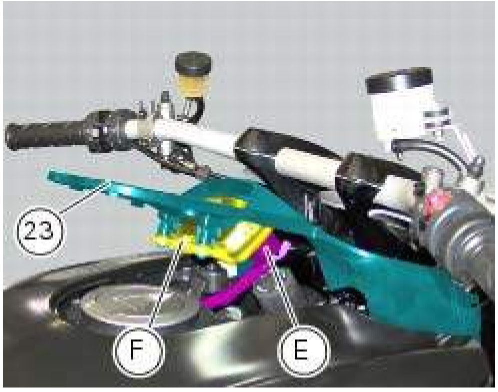


Follow the same procedure to remove the LH half-fairing (12).

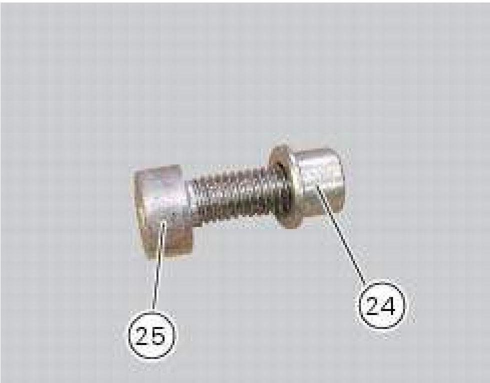
Loosen the screws (16) and (25) securing the tank plug cover (23) but do not remove it.



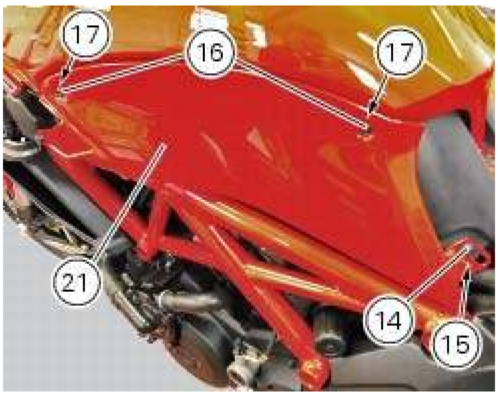
Lift the tank plug cover (23) up in order to reach the wiring (E) of the dashboard (F).
Disconnect the wiring (E) from the dashboard (F).



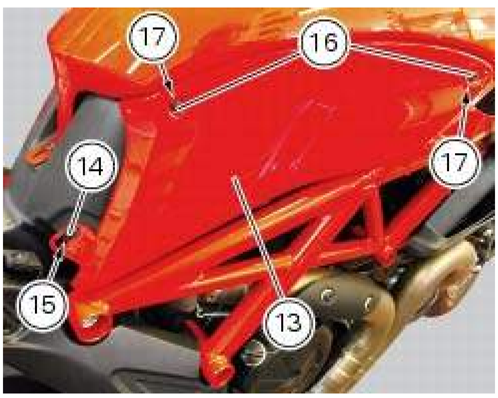
Remove the tank plug cover (23) from the vehicle recovering the screws (25) and spacers (24).



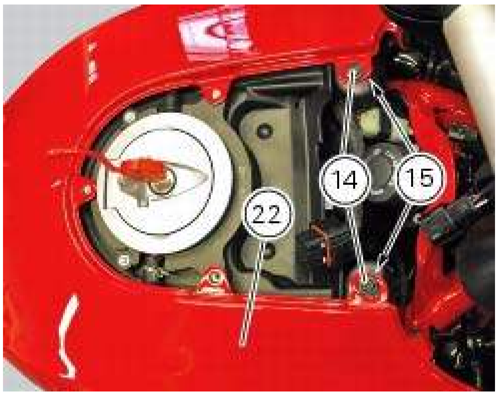
Remove the LH tank fairing (21) by loosening screws (16) and (14); recover the washers (17) and (15).

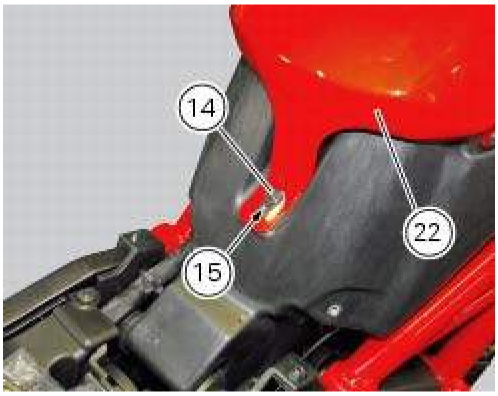


Remove the RH tank fairing (13) by loosening screws (16) and (14); recover the washers (17) and (15).



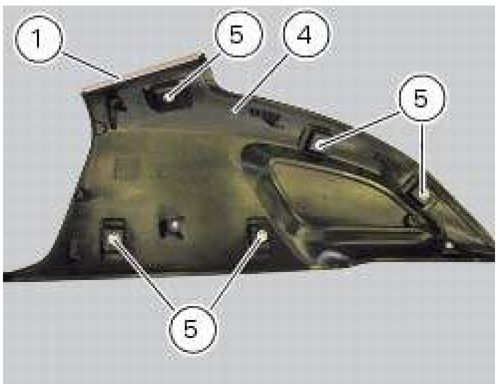
Remove the tank fairing (22) by loosening the screws (14); recover the nylon washers (15).





Disassembly of the front half-fairings

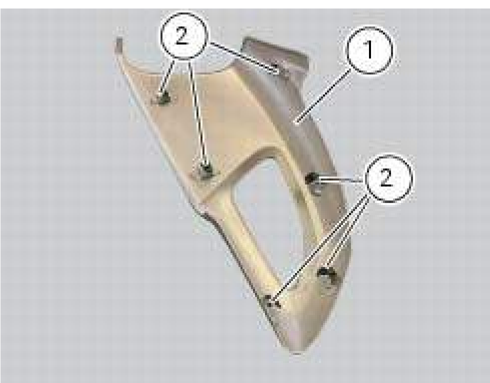
Undo the screws (5) and separate the RH support (4) from the front right half-fairing (1).



Follow the same procedure to disassemble the LH half-fairing (12).

Reassembly of the front half-fairings

Fit the clips (2) on the front RH half-fairing (1).

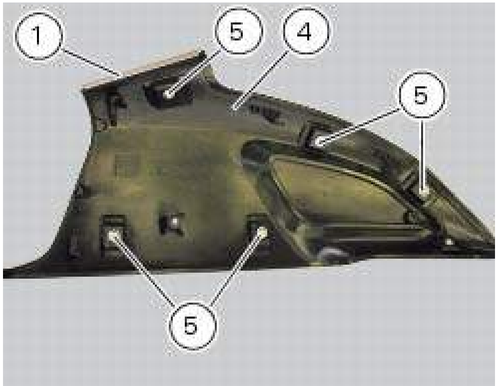


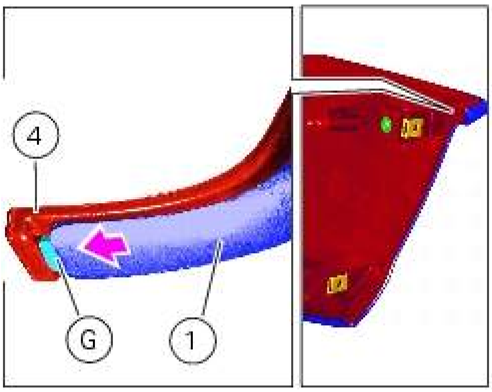
Join the RH support (4) and the front RH half-fairing (1) and keep them in position by starting the screws (5).

Note

To mount the RH support (4) in a proper way, it is necessary to insert the tab (G) of the front RH half-fairing (1) in the slot available in the support.

Tighten the screws (5) to a torque of 5 Nm ± 10% (Sect. 3 - 3, Frame torque settings).





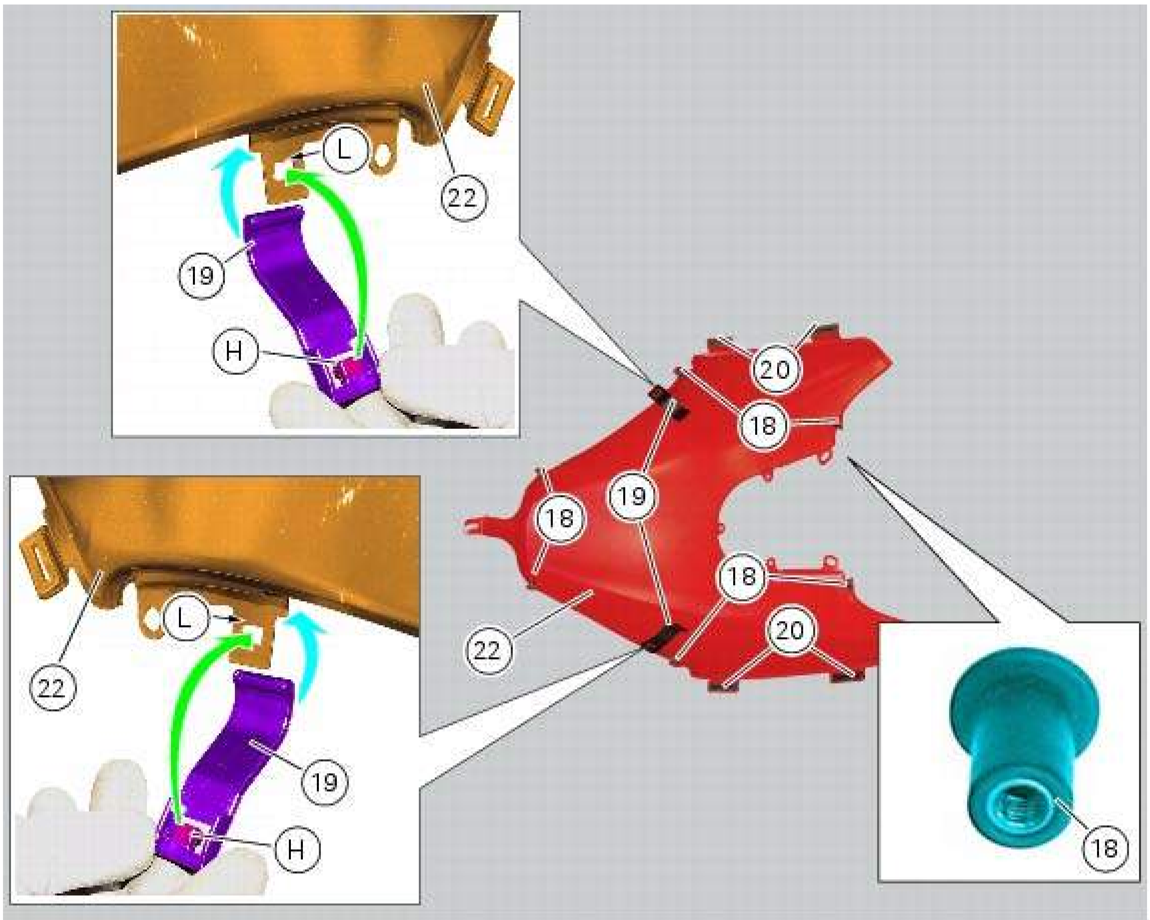
Fit the clips (10) on the front RH half-fairing (1).

Follow the same procedure to reassemble the LH half-fairing (**12**).

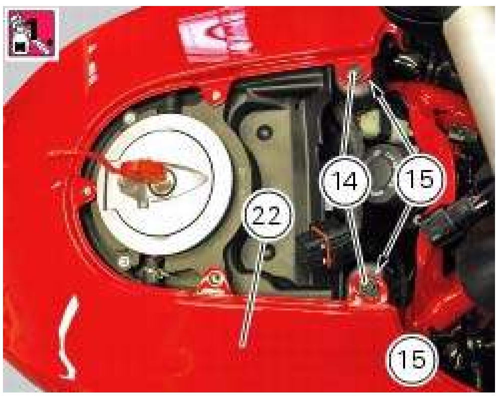
Refitting the fuel tank fairings

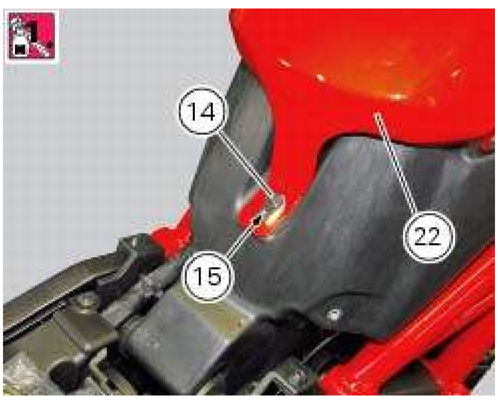
Make sure that the following components are fitted on the tank fairing (22):
- spacers (18);
- seals (20).

Fit the clips (19) to the central cover (22) at the positions shown, inserting the tabs (H) into the slots (L).

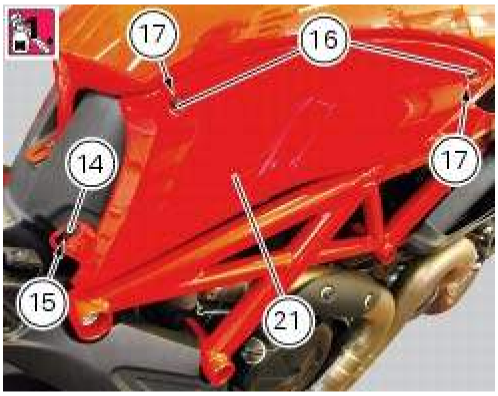


Apply threadlocker to the screws (14).
Place the tank fairing (22) on the tank and keep it in position by starting the screws (14) together with the relevant nylon washers (15).
Tighten to torque of 2 Nm ±10% (Sect. 3 - 3, Frame torque settings) the screws (14).

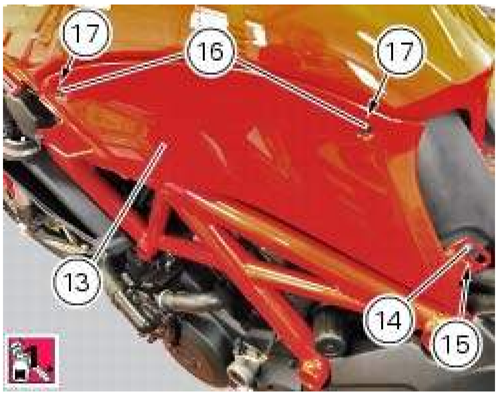




Fit the tank LH fairing (21) and keep it in position by starting the screws (16) together with the relevant washers (17).
Apply some threadlocker on the screw (14), fit the nylon washer (15) and start the screw.
Tighten the screw (14) to a torque of 2 Nm ± 10% (Sect. 3 - 3, Frame torque settings) and the screws (16) to a torque of 0.33 Nm ±10% (Sect. 3 - 3, Frame torque settings).



Fit the tank RH fairing (13) and keep it in position by starting the screws (16) together with the relevant washers (17).
Apply some threadlocker on the screw (14), fit the nylon washer (15) and start the screw.
Tighten the screw (14) to a torque of 2 Nm ± 10% (Sect. 3 - 3, Frame torque settings) and the screws (16) to a torque of 0.33 Nm ±10% (Sect. 3 - 3, Frame torque settings).

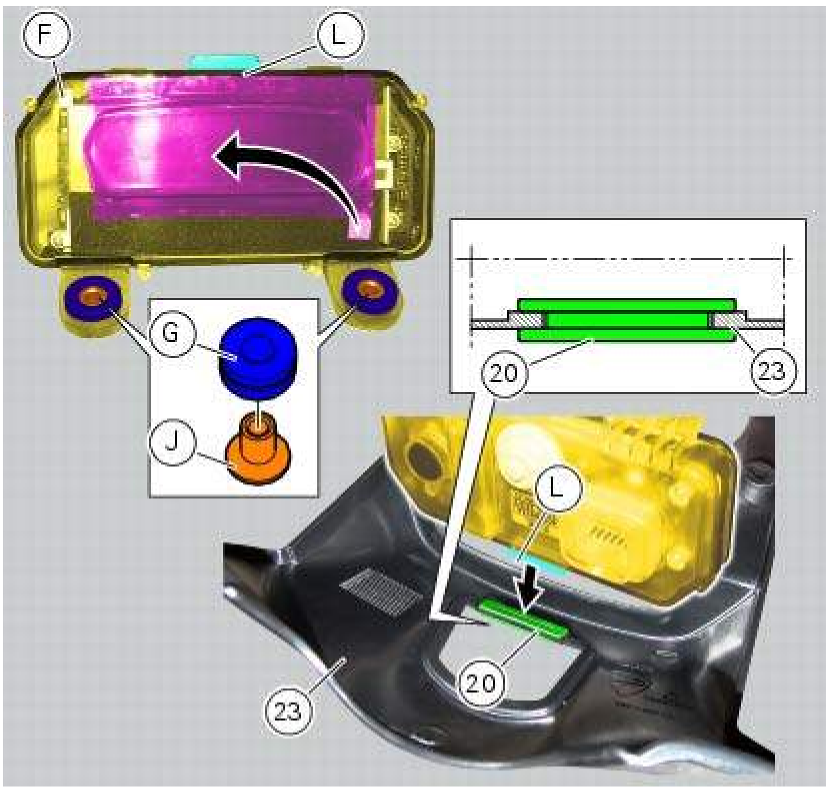


Fit the vibration dampers (G) to the master dashboard (F).
Insert the spacers with collar (J) onto the vibration dampers (G).
Fit the vibration damper (20) to the tank plug cover (23) at the position shown.

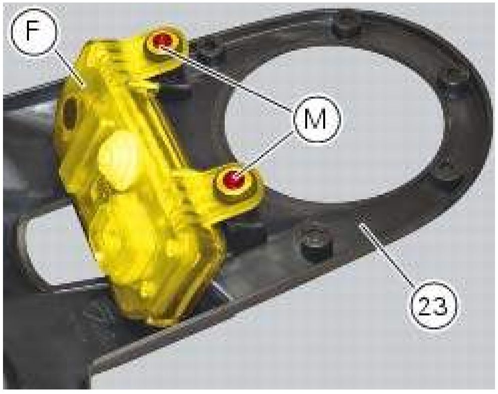
Important

On refitting, make sure that the vibration damper (20) is fully in place.

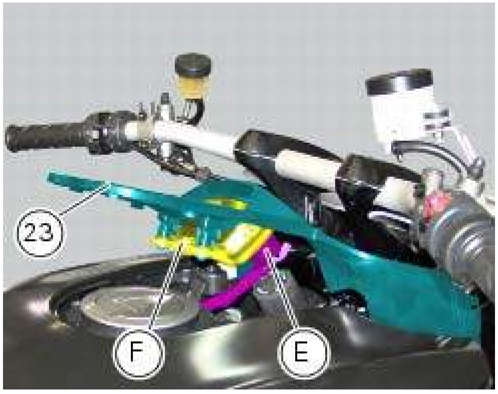
Fit the master dashboard (F) on the tank plug cover (23) inserting tab (L) into the vibration damper (20).



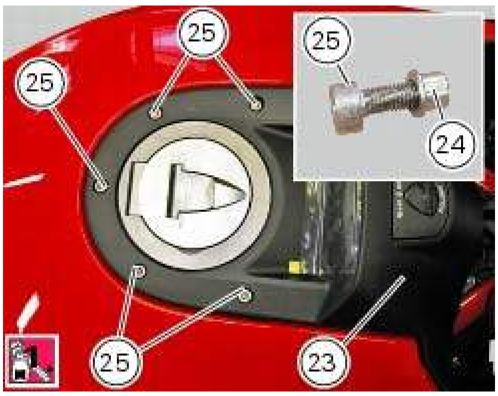
Fix the master dashboard (F) to the cover (23) by tightening the screws (M) to a torque of 2 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

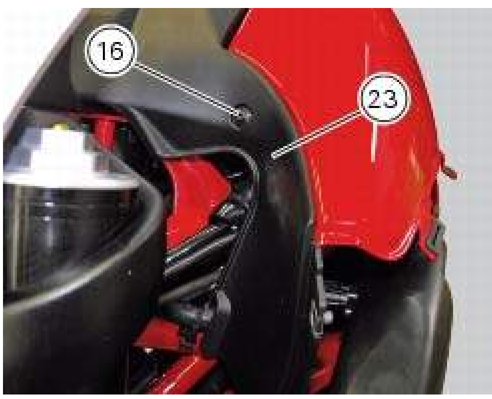


Place the tank plug cover (23) on the vehicle and connect connector (E) to the dashboard (F); push connector until an audible click indicates proper engagement.



Apply threadlocker to the screws (25).
Fit the tank plug cover (23), fit spacers (24), and start screws (25) and screws (16).
Tighten the screws (25) to a torque of 2 Nm ± 10% (Sect. 3 - 3, Frame torque settings) and the screws (16) to a torque of 0.33 Nm ±10% (Sect. 3 - 3, Frame torque settings).

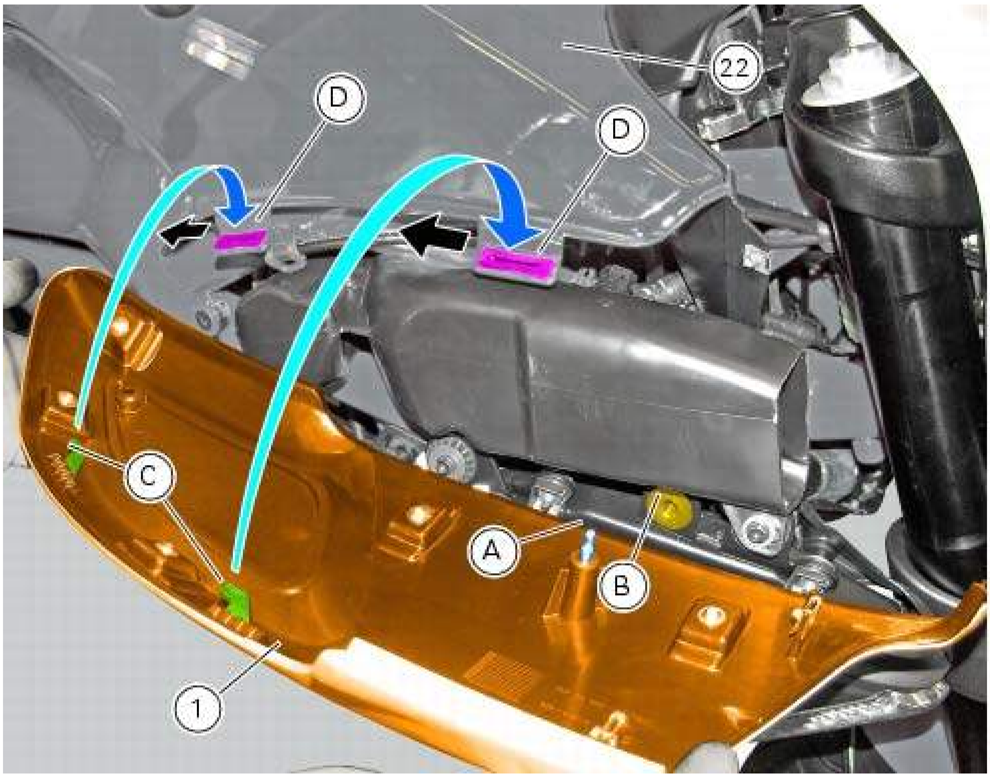




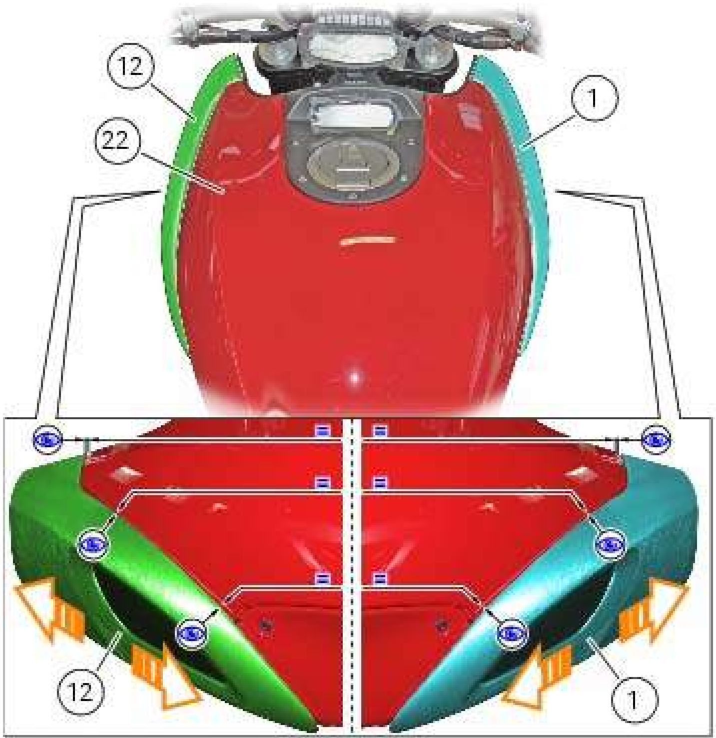
Lubricate the seals (D) of the central tank cover (22) using lubricant specific for rubber.
Position the front RH half-fairing (1) by inserting the tabs (C) into the seals (D) pushing downwards (blue arrows); after that, slide the half-fairing completely to the rear side of the motorcycle (red arrows).
Block the front RH half-fairing (1) by forcing pin (A) into the receptacle (B) in the RH water radiator.

Warning

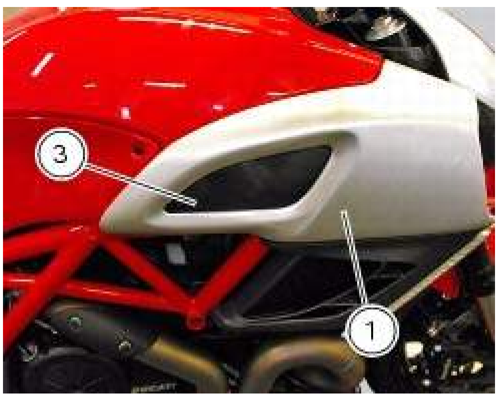
Before pushing on the pin (A), make sure it is centred in the receptacle hole (B). Then – and not until after checking for proper position – push moderately and increasingly harder until you hear the component engage.



Before tightening the screws securing the front left half-fairing (12) and the front right half-fairing (1), proceed as follows:
Visually check the distance between the front left half-fairing (12) and the central tank cover (22) along the upper mating edges of both parts.
Visually check the distance between the front right half-fairing (1) and the central tank cover (22) along the upper mating edges of both parts.
If the parts do not mate equally, shift the front half-fairings (12) and (1) forward or backward as required until achieving a condition in which the half-fairings (12) and (1) are at the same distance from the central tank cover (22).
After tightening, check again to ensure that the front half-fairings (12) and (1) are at the same distance from the tank cover (22). If not so, repeat the above procedure.

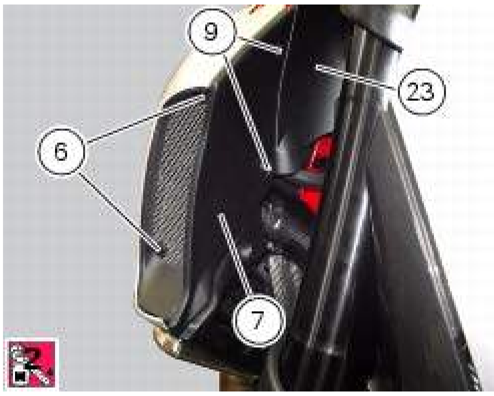


Fix the front RH half-fairing (1) by tightening the screw (3) to a torque of 0.33 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



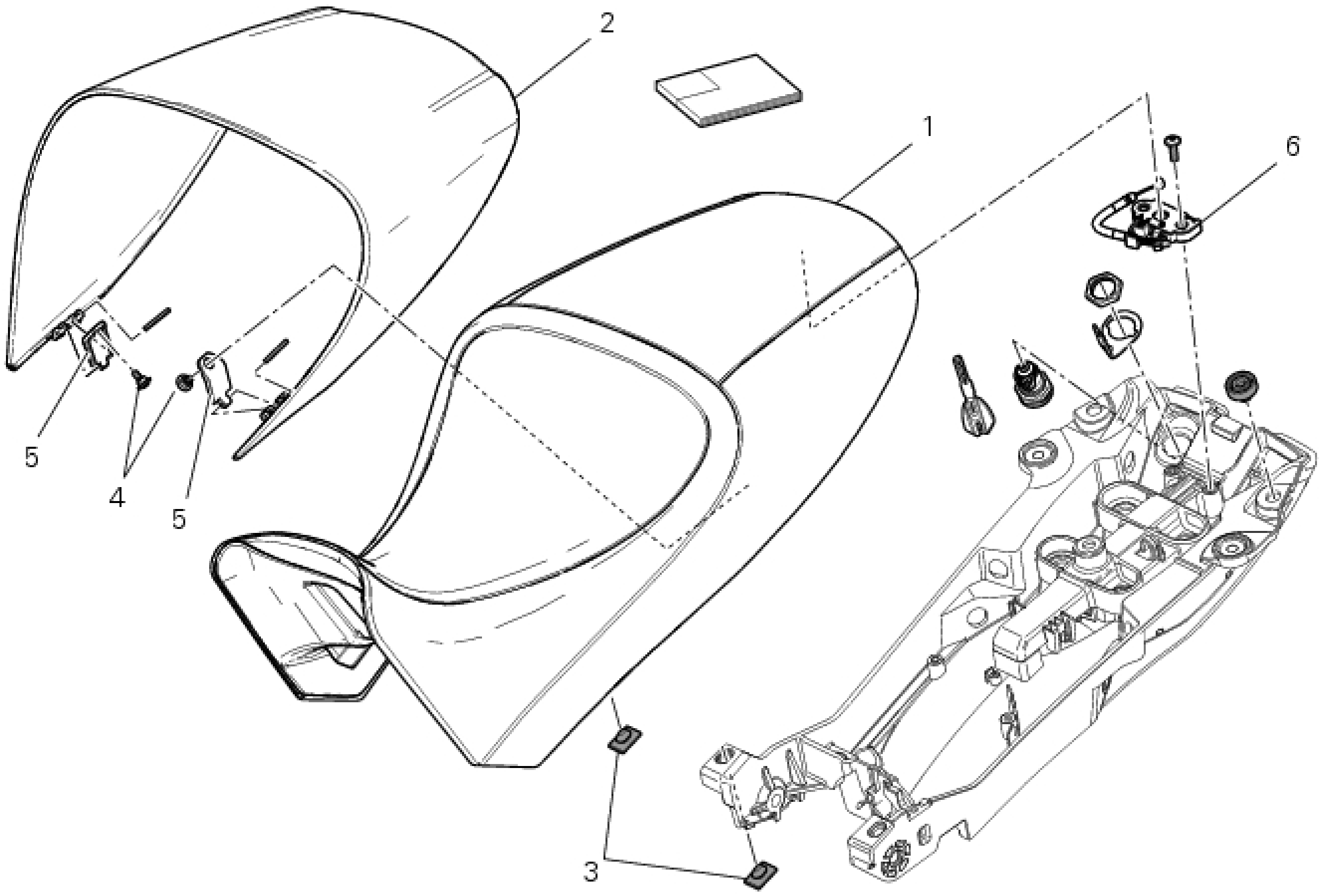
Follow the same procedure to reassemble the LH half-fairing (12).

Apply threadlocker to the screws (9).
Fit the RH air inlet (7) and fix it to the tank plug cover (23) by starting the screws (6) and (9).
Tighten the screws (9) to a torque of 2 Nm ± 10% (Sect. 3 - 3, Frame torque settings) and the screws (6) to a torque of 1.5 Nm ±10% (Sect. 3 - 3, Frame torque settings).
The procedure is the same for the LH air inlet (**8**).



Operations	Section reference
Reassemble the handlebar dashboard	Sect. 6 - 7, Dashboard
Refit the seat	Sect. 5 - 3, Refitting the seat

3 -Seat



1 Seat
2 Seat cover
3 Rubber mounting
4 Special screw
5 Plate
6 Latch

Spare parts catalogue

Diavel ABS	SEAT
Diavel Carbon ABS	SEAT

Important

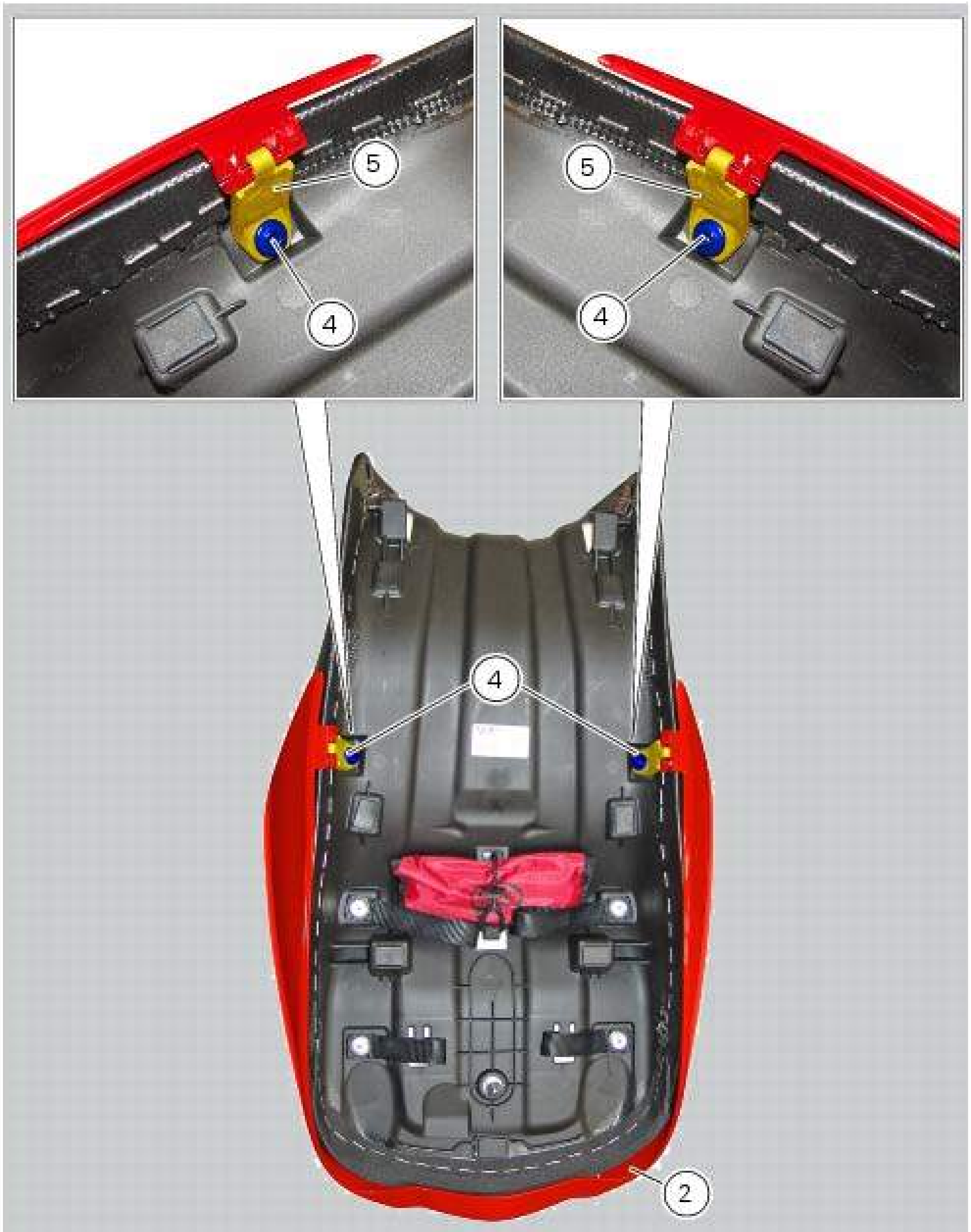
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Removal of the seat

Insert the key in the lock, turn it clockwise and release the seat.
Pull the seat (1) backwards to release it from the front catches and remove it.

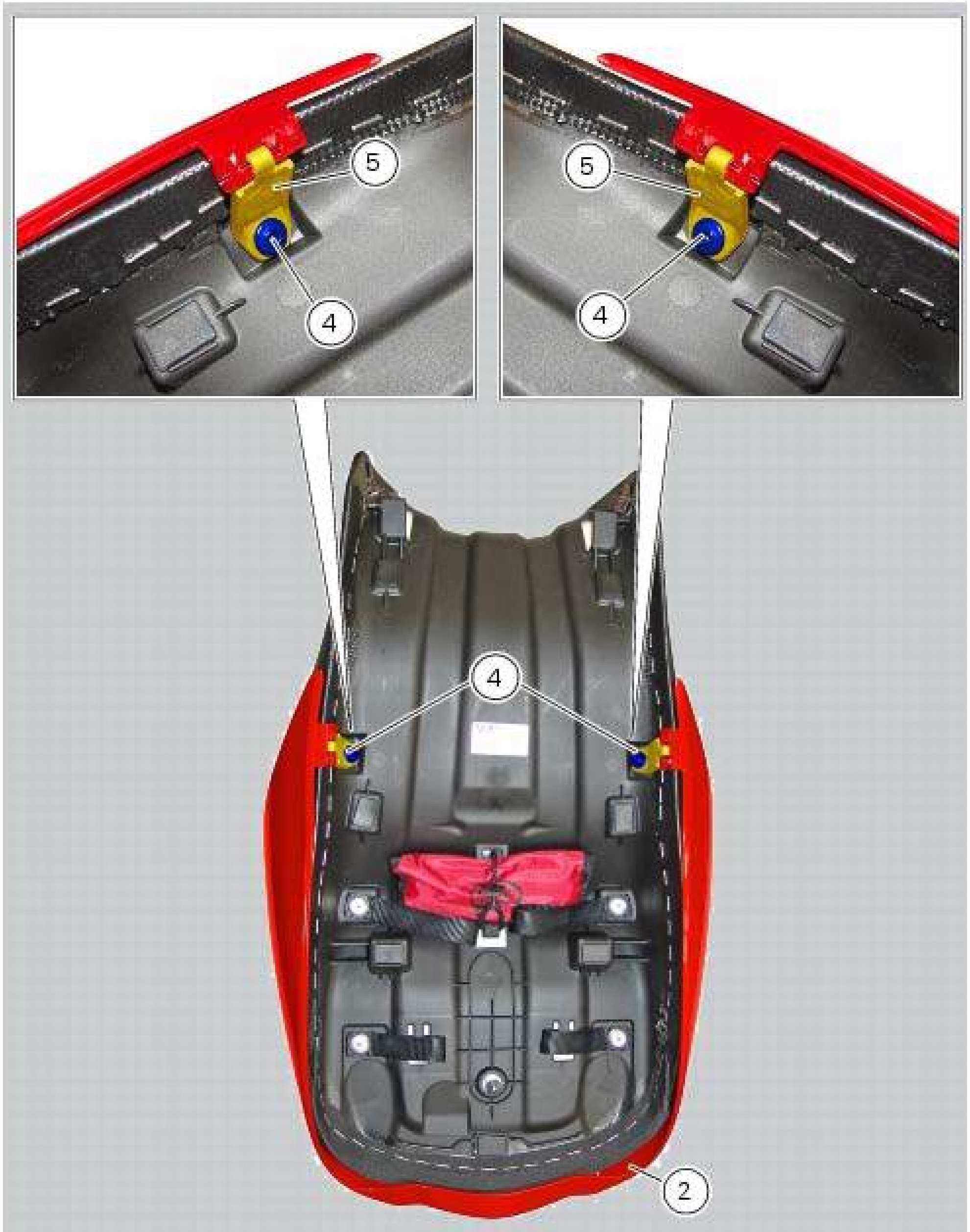
Disassembly of the seat

Remove the seat and turn it upside down.
Loosen the special screws (4), turn the plates (5) and open the seat cover (2) lateral sides to slide it out.



Reassembly of the seat

Place the seat cover (2) on the seat and fix it (on the lower side) by starting screws (4) on plates (5).
Tighten the screws (4) to a torque of 4 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



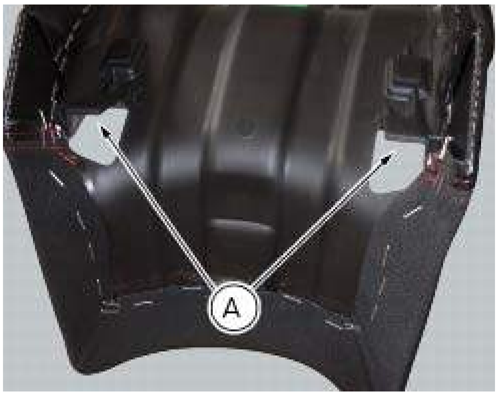
Refitting the seat

Note

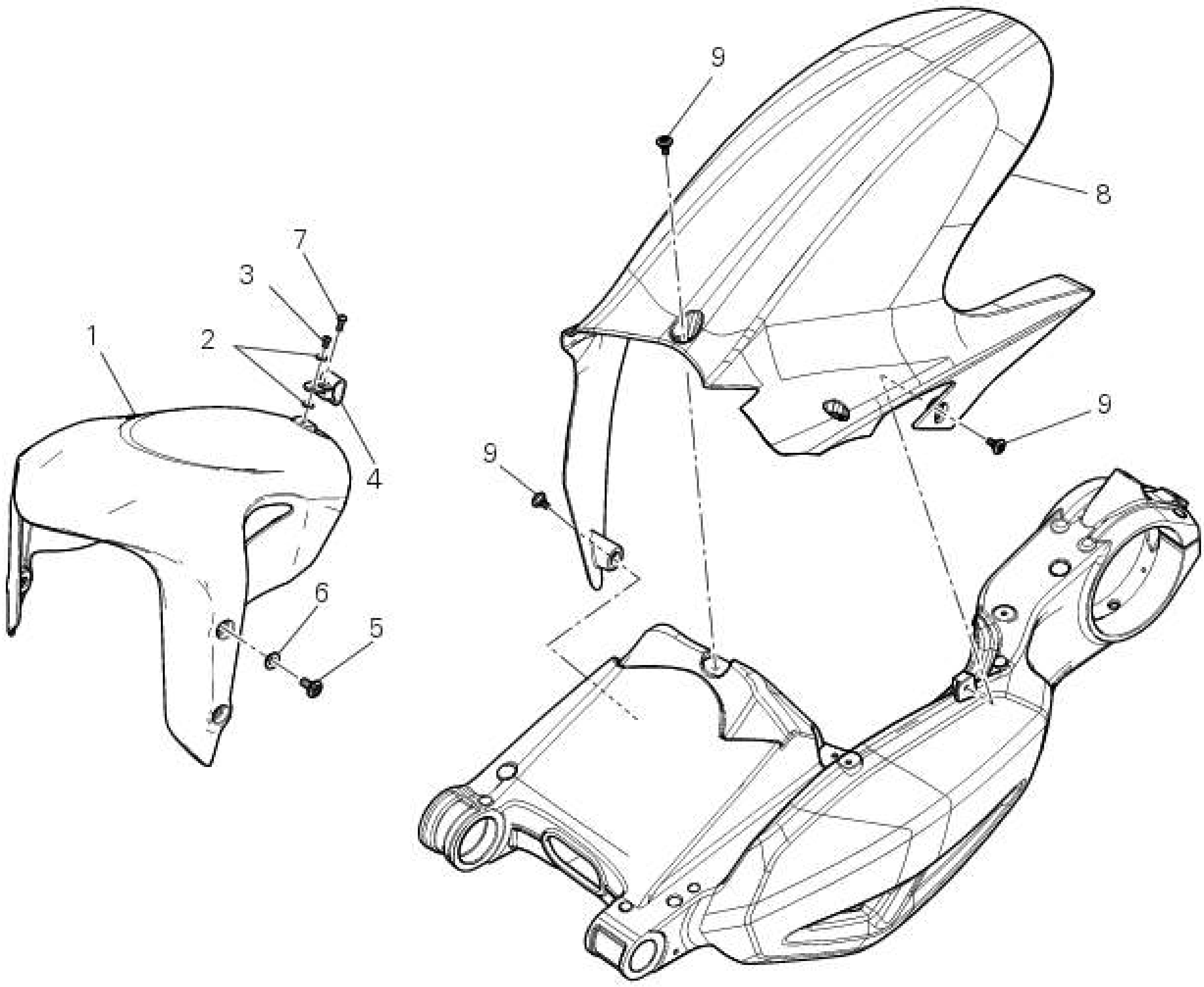
Apply recommended grease to the hole (A) of latch (6).

Fit the seat (1) as follows: insert the tabs (B) (on the front side) under the rubber pads (C) of the gloves compartment; then push the seat rear side until hearing the lock latch click.

Seat



4 -Front and rear mudguard



1 Front mudguard
2 Washer
3 Rivet
4 Clip
5 Screw
6 Spacer
7 Screw
8 Rear mudguard
9 Screw

Spare parts catalogue

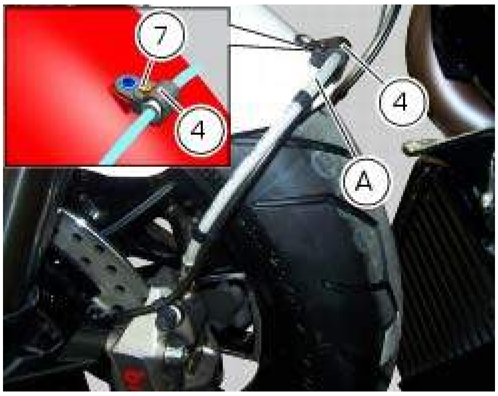
Diavel ABS	REAR SWINGARM
Diavel ABS	BELLY FAIRING
Diavel Carbon ABS	REAR SWINGARM
Diavel Carbon ABS	BELLY FAIRING

Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

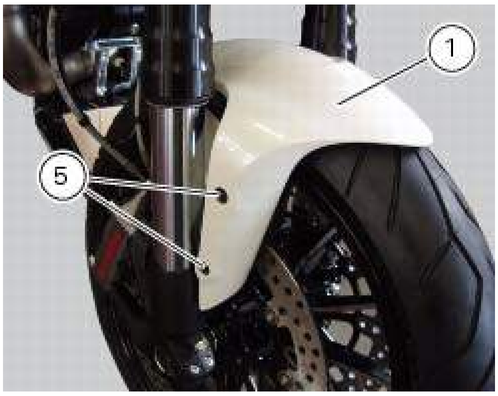
Removal of the front mudguard

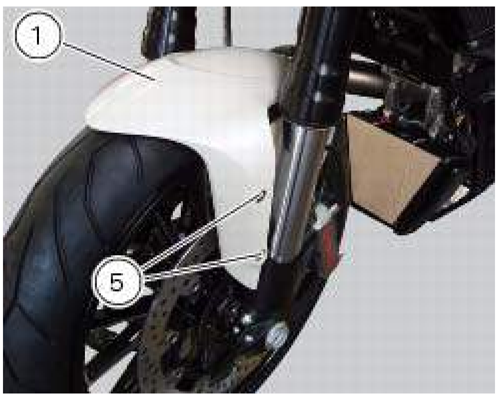
Undo the screw (7) and remove the front brake lines (A) from the hose grommet (4).



Undo and remove the special retaining screws (5): keep the spacers (**6**).
Remove the front mudguard (1).

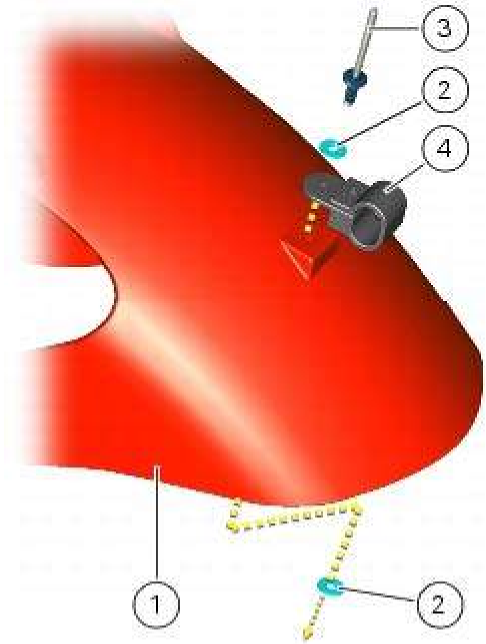
Warning
The version provided with carbon mudguards features nylon washers instead of the spacers (6).





Note
On USA versions, a reflector is mounted on the front mudguard (1).

Note
The hose grommet (4) is fastened to front mudguard (1) by means of a shear rivet (3) with two washers (2) in-between.

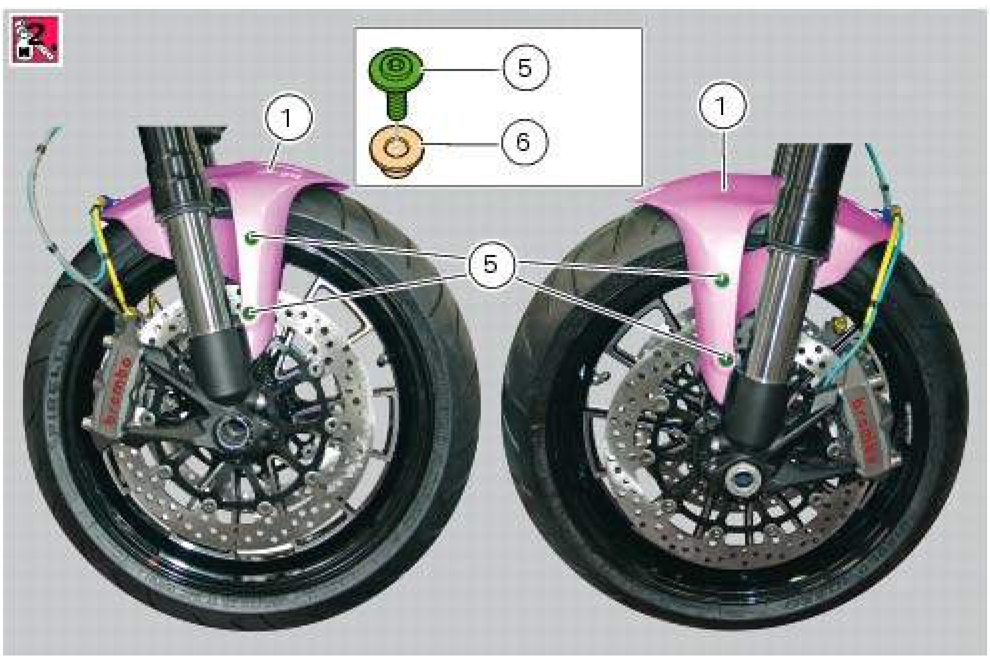


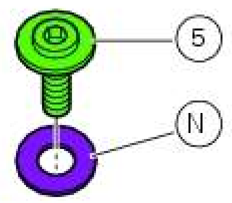
Refitting the front mudguard

Warning
Do not use the motorcycle without the front mudguard fitted to avoid the risk of the brake pipes fouling the wheel on braking.

Insert the screws (5) in spacers (6) with recommended threadlocker, as shown in the figure.
Position the front mudguard (1) and start the special screws (5).
Tighten the screws (5) to a torque of 5 Nm ±10% (Sect. 3 - 3, Frame torque settings).

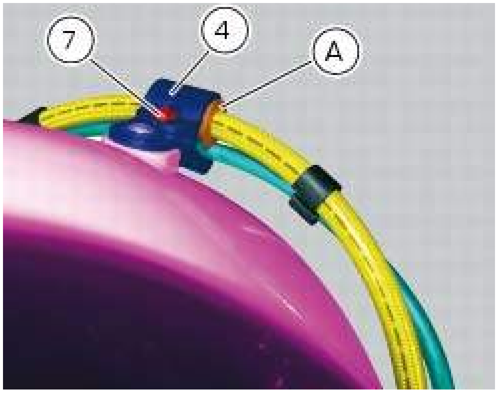
Warning
The version provided with carbon mudguards must feature nylon washers (N) instead of the spacers (6).





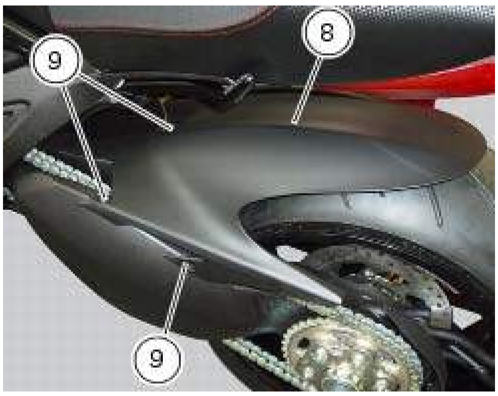
Version with carbon mudguard

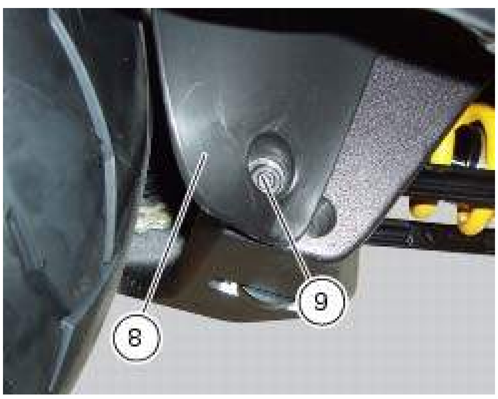
Place the hose grommet (A) of the front brake hose and the speed sensor cable inside clip (4) as shown in the figure.
Close the clip (4) and tighten the screw (7) to a torque of 0.35 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



Removing the rear mudguard

Undo the screws (9) and remove the rear mudguard (8) from the swingarm.

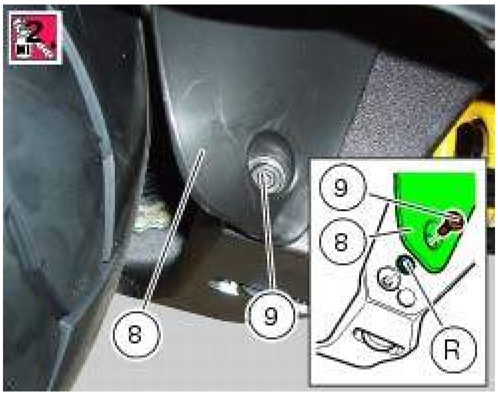




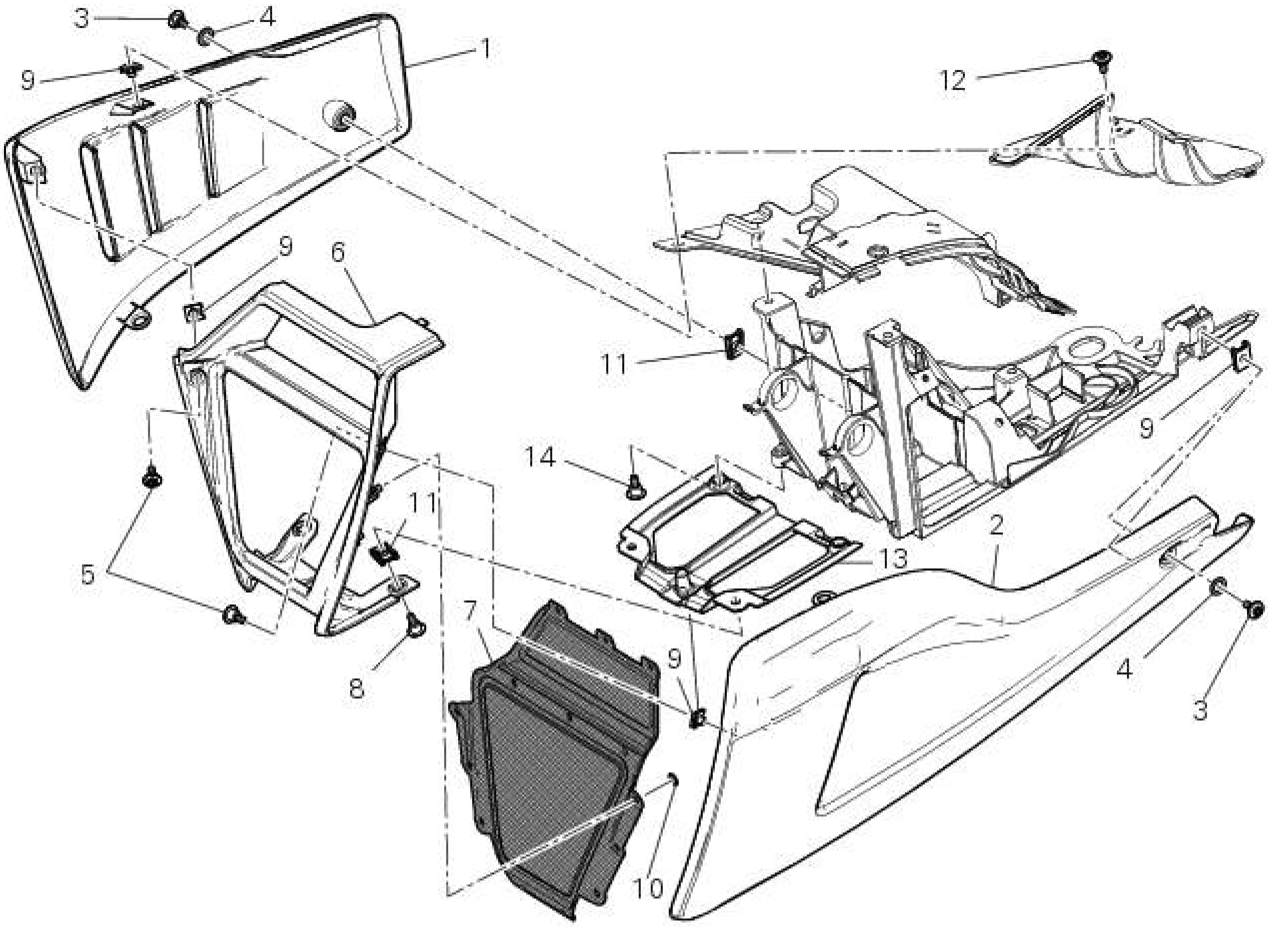
Refitting the rear mudguard

Place the rear mudguard (8) on the swingarm, fitting the screws (9) with recommended threadlocker.
The screw (9) in the bottom hole of the rear mudguard (8) must be installed with the washer (R).
Tighten the screws (9) to a torque of 5 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

Front and rear mudguard



5 -Belly fairing



1 RH belly fairing
2 LH belly fairing
3 Special screw
4 Nylon washer
5 Screw
6 Central belly fairing
7 Oil cooler shield
8 Special screw
9 Clip
10 Washer
11 Clip
12 Screw
13 Bracket
14 Screw

Spare parts catalogue

Diavel ABS	BELLY FAIRING
Diavel Carbon ABS	BELLY FAIRING

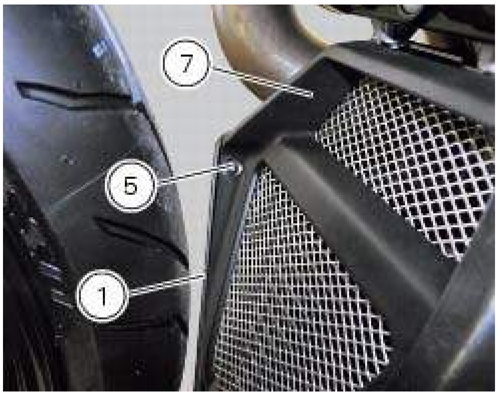
Important

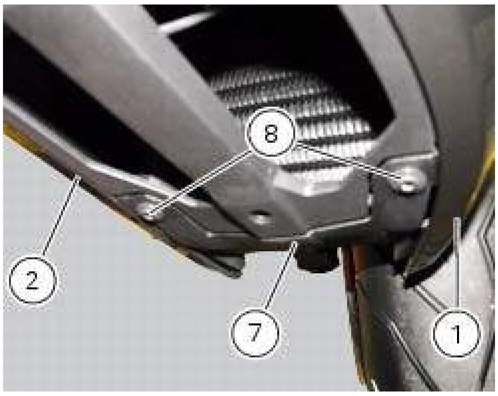
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Removal of belly fairing

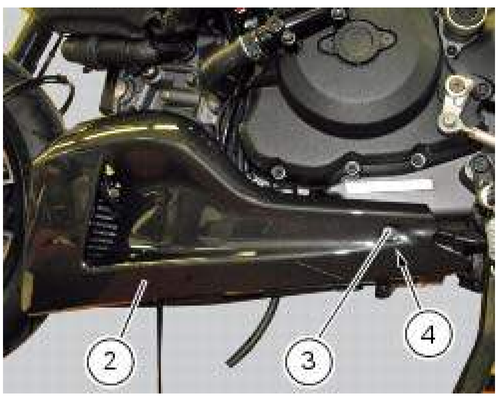
Loosen and remove the screws (5) and (8) that secure the oil cooler (7) to the RH (1) and LH (2) belly fairings.

Belly fairing



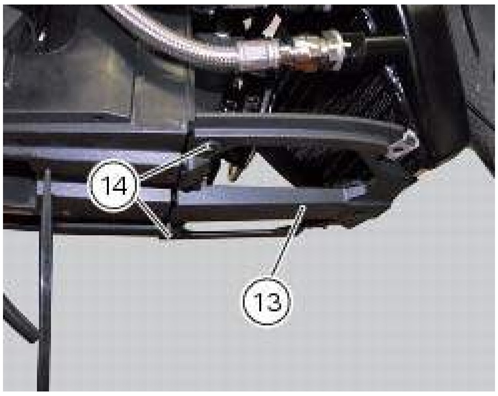


Remove the LH belly fairing (2) by loosening the screws (3) with relevant washers (4) and the screws (12).

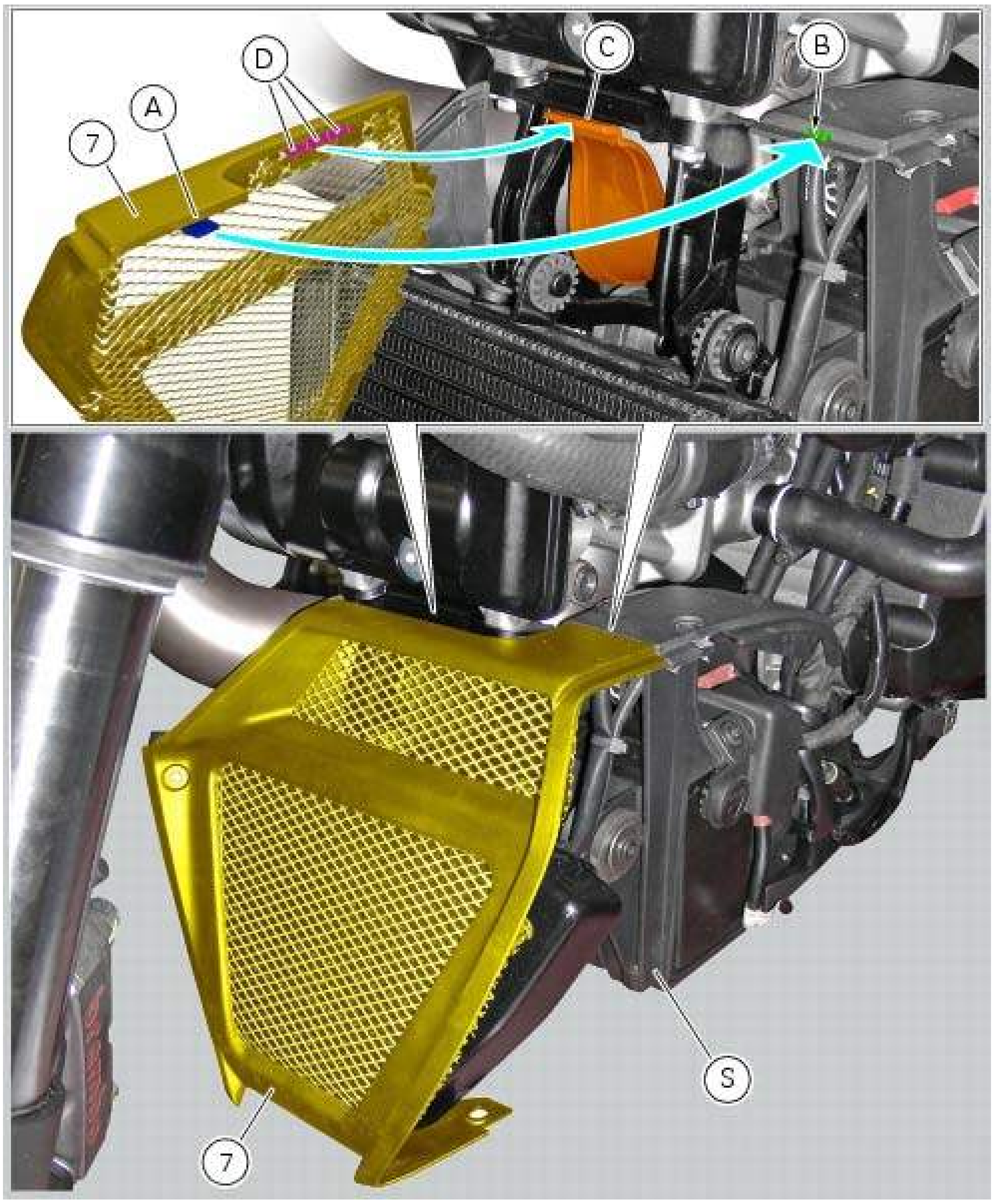


Follow the same procedure to remove the RH belly fairing (1).

Loosen the screws (14) and remove the bracket (13 from the electrical components support.



Remove the oil cooler shield (7) from the electrical components support (S) by releasing the tab (A) from the slit (B) and tab (C) from retainers (D).

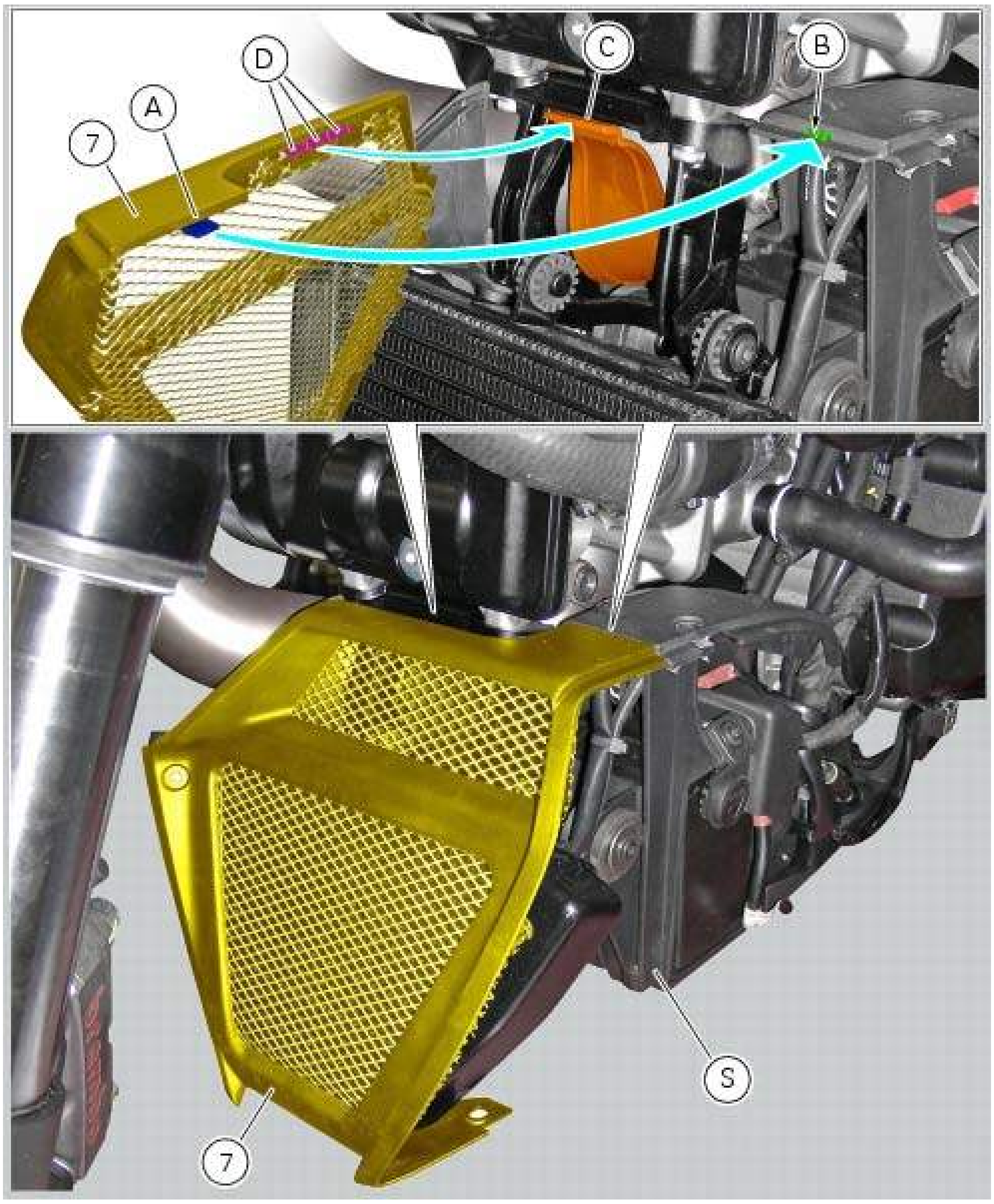


Reassembly of belly fairing

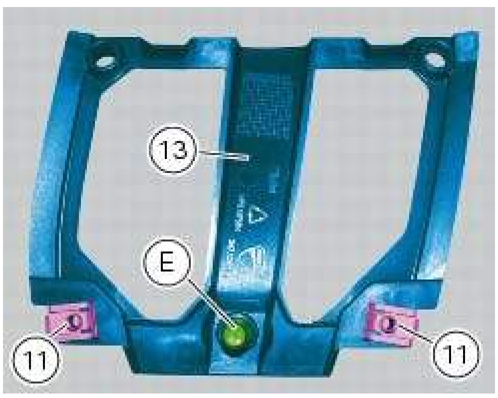
Position the oil cooler shield (7) inserting the tab (A) into the slit (B) in the electrical components support (S).

Note

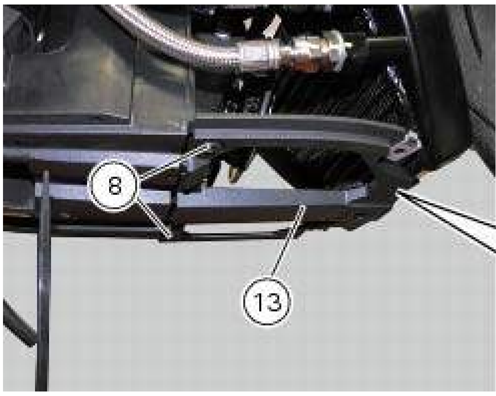
On refitting, make sure that the tab (C) remains positioned under the retainers (D) of the shield (7).

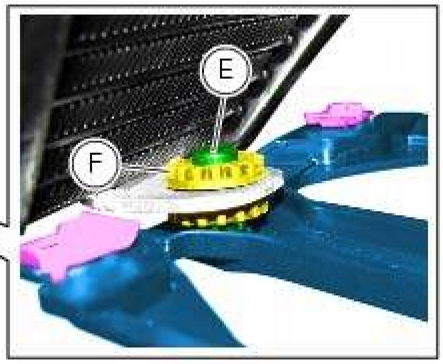


Fit clips (11) on bracket (13) and orient them as shown in the figure.

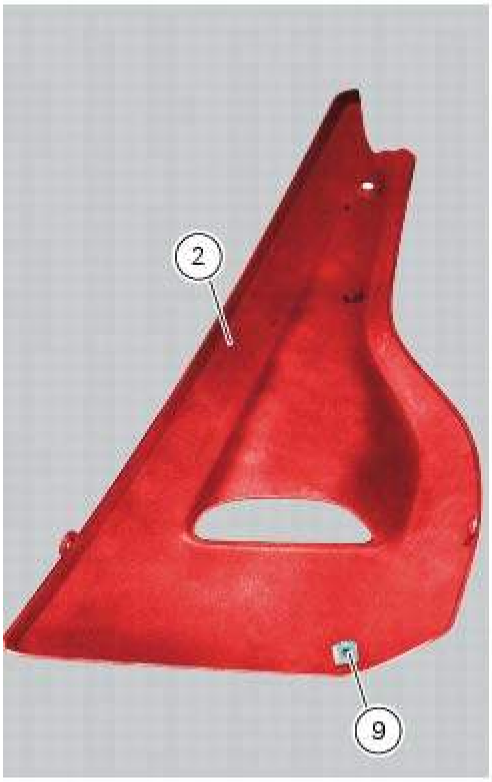


Apply rubber lubricant to the pin (E) of the bracket (13).
Insert pin (E) in the vibration damping pad (F) of the oil cooler.
Fit the bracket (13) on the electrical components support, and tighten the screws (8) to a torque of 4 Nm ± 10 % (Sect. 3 - 3, Frame torque settings).

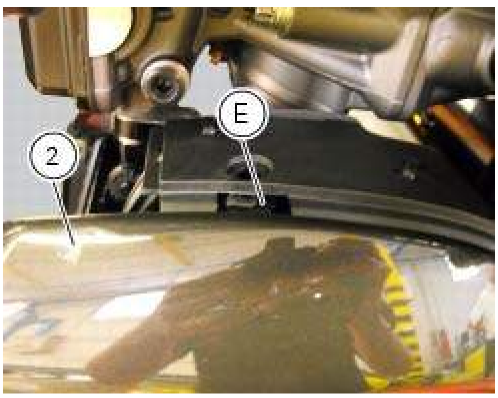




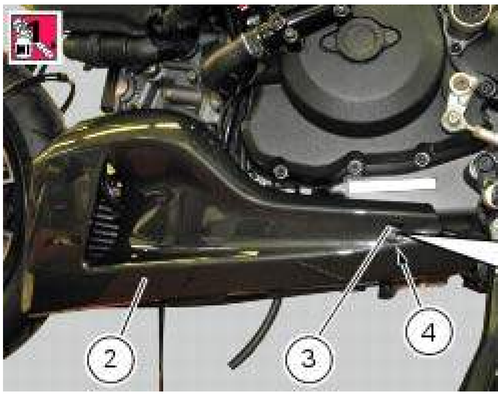
Fit clips (9) on LH belly fairing (2) and orient them as shown in the figure.

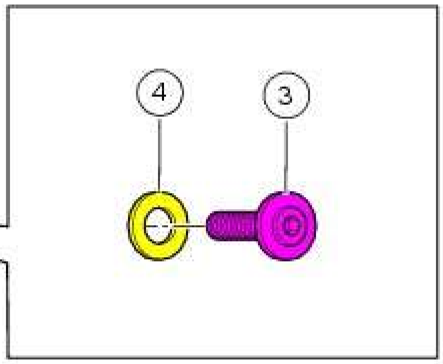


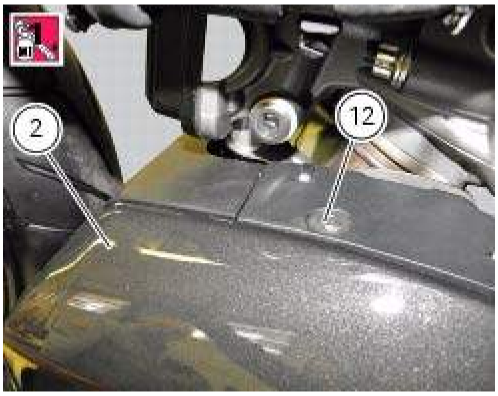
Put the LH belly fairing (2) in position by engaging slot (E) in the electrical components support, as shown in the figure.



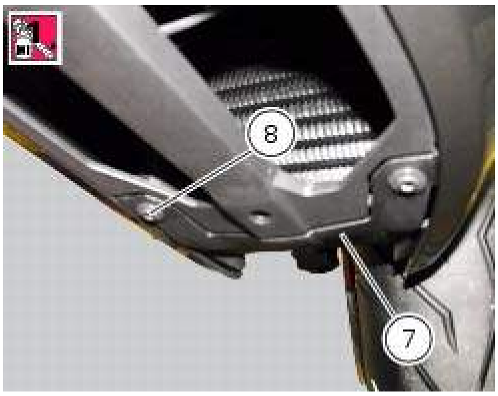
Apply recommended threadlocker on screws (3) and (12).
Fit the nylon washer (4) on the screw (3).
Fix the LH belly fairing (2) to the electrical components support by starting the screws (3) on the rear side, and the screw (12) on the upper side.





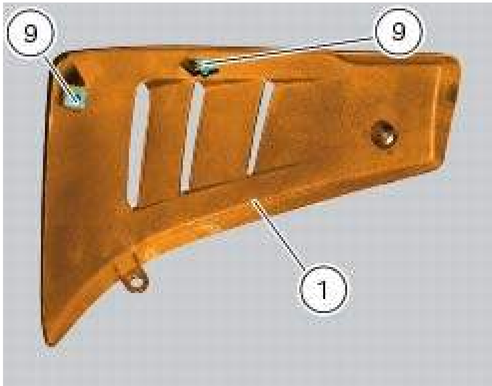


Apply recommended threadlocker to the screws (5) and (8).
Fix the LH belly fairing (2) to the oil cooler shield (7) by starting the screw (8) on the lower side, and the screw (5) on the front side.

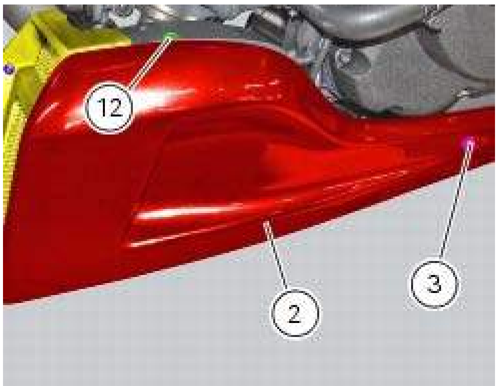


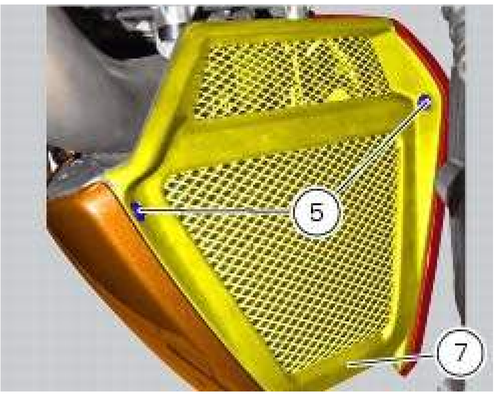
Fit the clips (9) on the RH belly fairing (1) orienting it as shown in the figure; follow the same procedure to refit the LH belly fairing (2).

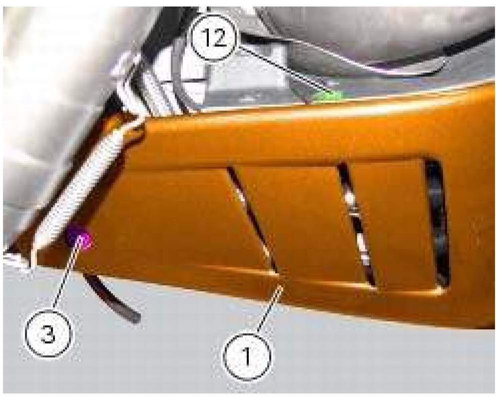
Belly fairing

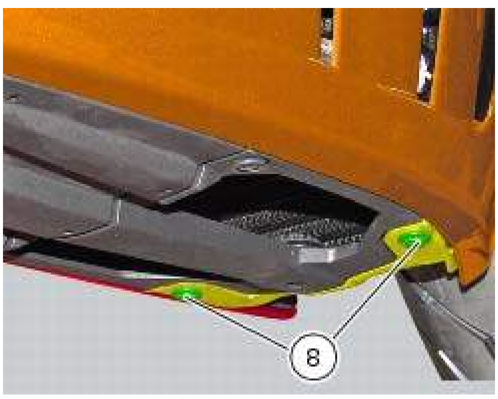


Tighten to a torque of 4 Nm ± 10% (Sect. 3 - 3, Frame torque settings) the screws (3), (5), (8) and (12) to fix the belly fairings (1) and (2) and the oil cooler shield (7).



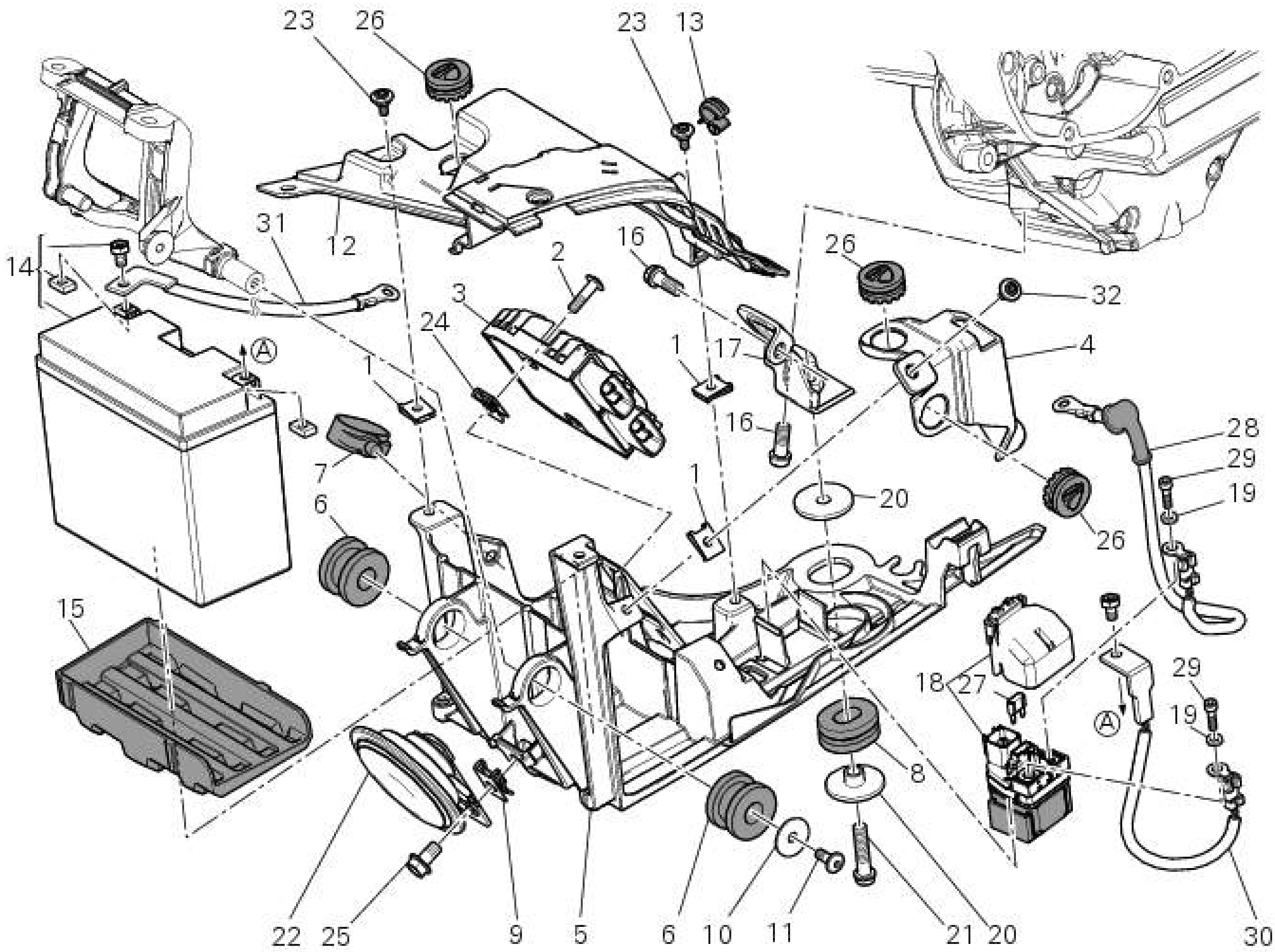






Belly fairing

6 -Electrical components support



1 Clip
2 Screw
3 Voltage regulator
4 Battery fixing bracket
5 Battery support
6 Vibration damper mount
7 Hose clip
8 Vibration damper mount
9 Clip
10 Washer
11 Screw
12 Cover
13 Cable grommet
14 Battery
15 Battery mat
16 Screw
17 Bracket
18 Solenoid starter
19 Spring washer
20 Spacer
21 Screw
22 Horn
23 Screw
24 Clip
25 Screw
26 Rubber pad
27 30 A fuse
28 Solenoid starter cable - starter motor
29 Screw
30 Battery cable - solenoid starter
31 Battery ground cable - engine
32 Special screw

Spare parts catalogue

Diavel ABS	BATTERY SUPPORT
Diavel Carbon ABS	BATTERY SUPPORT

Important

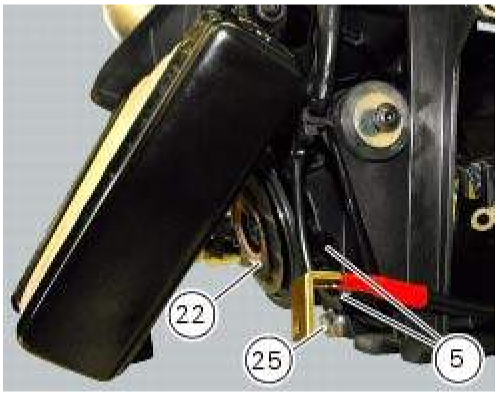
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

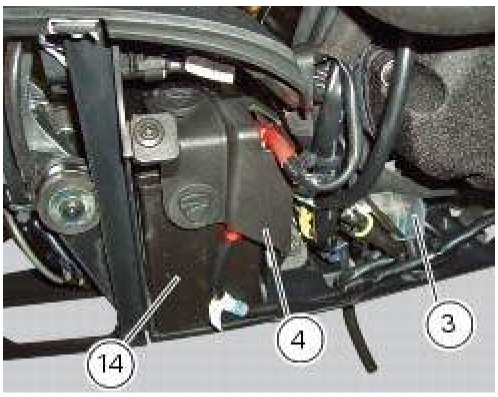
Removing the electrical components support

Operations	Section reference
Remove the belly fairing	5 - 5, Removal of belly fairing

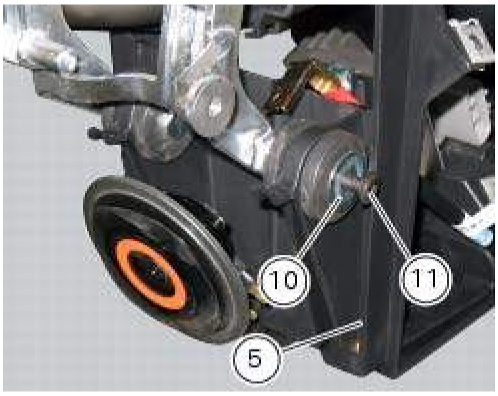
Remove the following elements located inside the electrical components support:
- the battery fixing bracket (4) and the battery (14) as specified under Section 6 - 2, Battery;
- the voltage regulator (3) as specified under Section 6 - 2,Rectifier-regulator;
- the solenoid starter (18) as specified under Section 6 - 3,Solenoid starter;

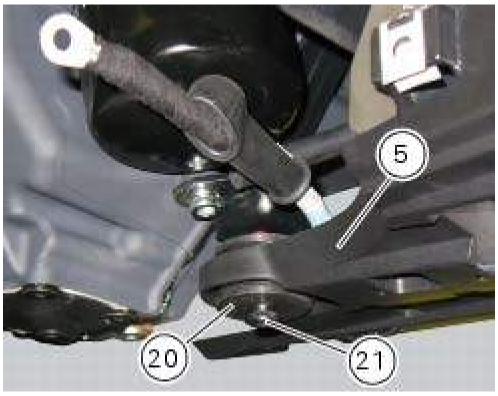
Remove the connector (A) of horn (22) from the main wiring.
Undo the screw (25) and remove the horn (22) from the vehicle.





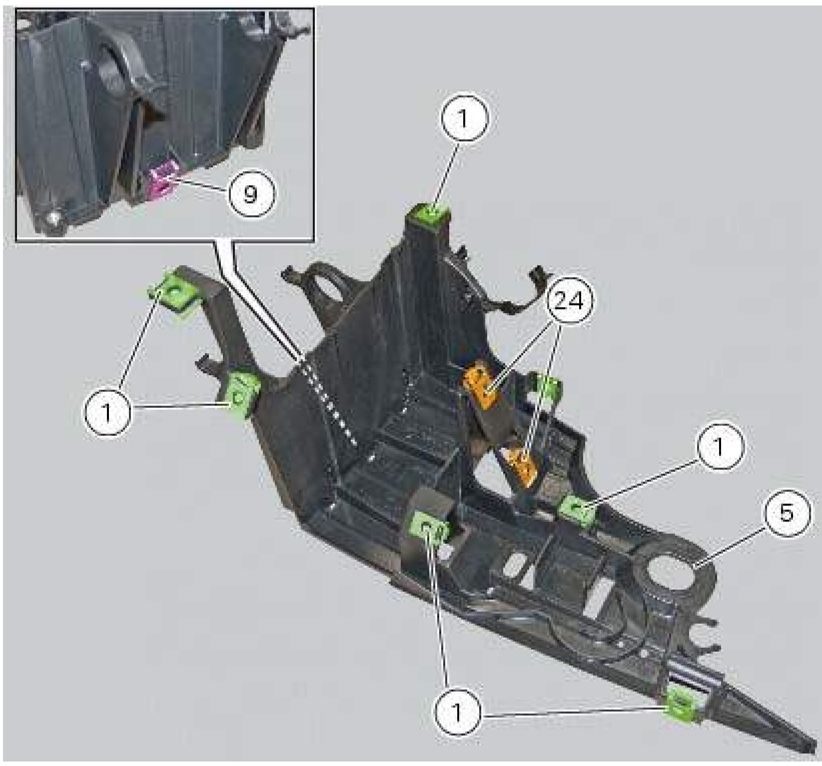
Loosen screws (11) and (21) and recover the washer (10) and the spacer (20).
Remove the electrical components support (5).
Pay attention to the main wiring branch and to any other wiring inside of it.
Refer to the tables reported in this Section for the components position.



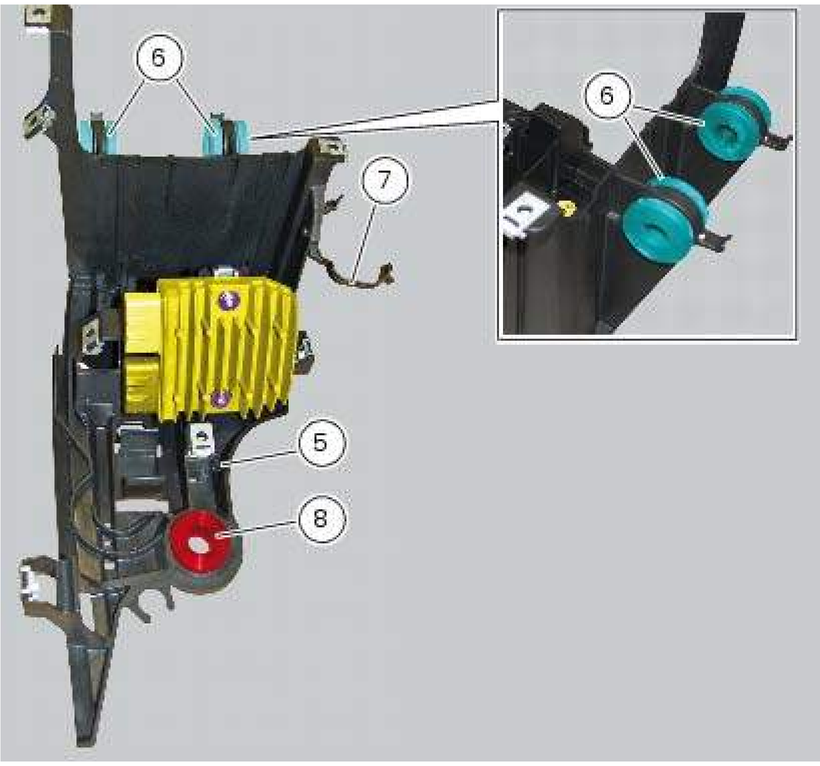


Reassembling the electrical components support

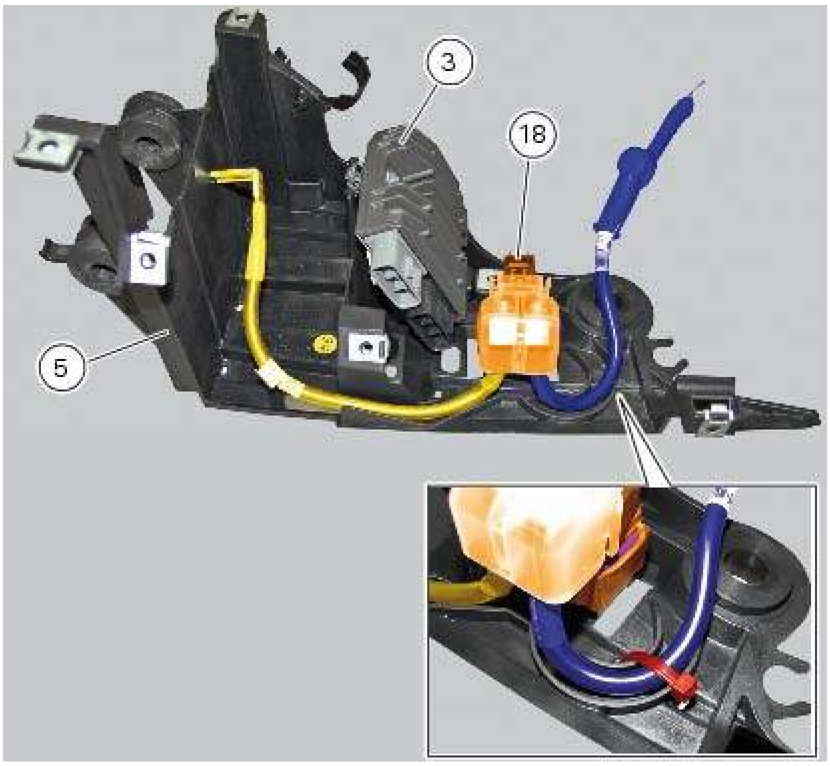
Check the presence of clips (1), (9) and (24) on the support (5).



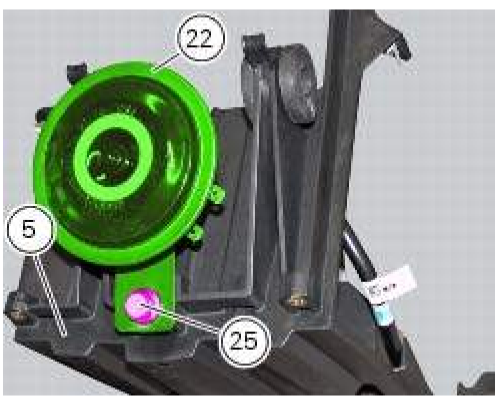
Check the presence of rubber pads (6) and (8) and of cable grommet (7).



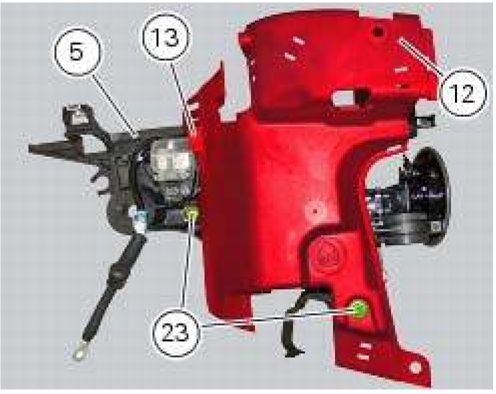
Check that the voltage regulator (3) and the solenoid starter (18) are in place on the support (5) with their wiring as shown.



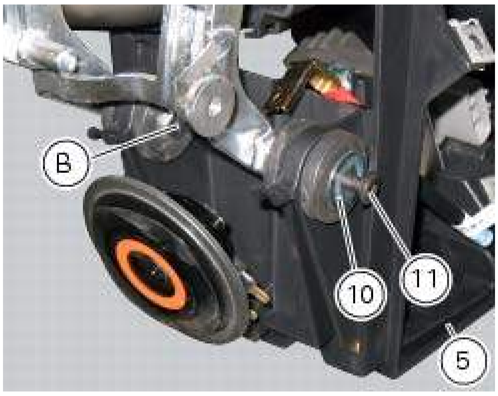
The horn (22) must be fixed to the support (5) tightening the screw (25) to 18 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



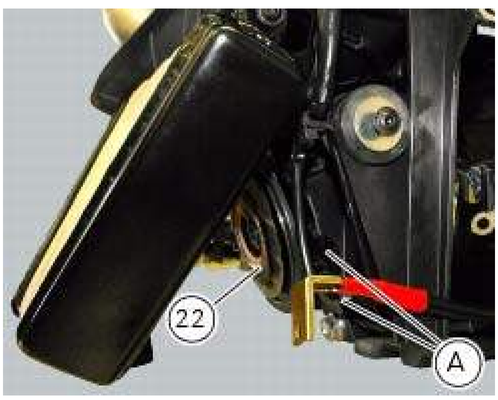
Check the presence of the grommet (13) on the cover (12).
Fit cover (12) on the support (5) by tightening the screw (23) to a torque of 4 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



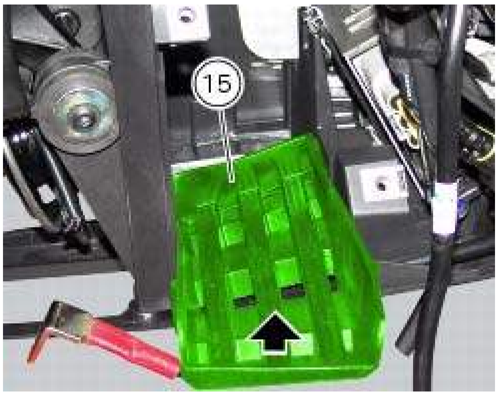
Fit the electrical components support (5) on the vehicle by engaging it in the retaining pin (B) on the cooler supporting bracket.
Apply the recommended threadlocker to the screw (21).
Start the screw (11) with washer (10) and the screw (21) with spacer (20).
Tighten the screw (11) to a torque of 10 Nm ±10% (Sect. 3 - 3, Frame torque settings) and the screw (26) to a torque of 24 Nm ±10% (Sect. 3 - 3, Frame torque settings).

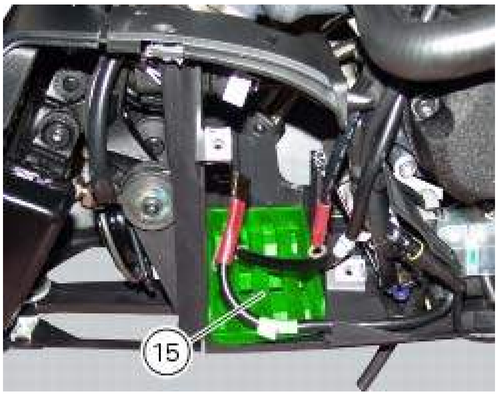


Connect the connector (A) of horn (22) to the main wiring.



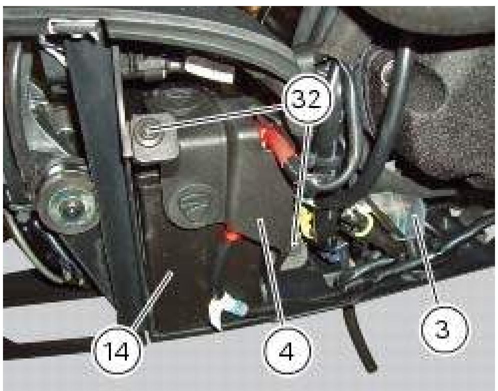
The mat (15) must be positioned as shown.





Reassemble the following elements located inside the electrical components support:
- the battery (14) as specified under Section 6 - 2, Battery;
- the voltage regulator (3) as specified under Section 6 - 2, Rectifier-regulator;
- the solenoid starter (18) as specified under Section 6 - 3, Solenoid starter;

After installing the battery, position the battery retaining bracket (4) by tightening the screws (32) to a torque of 5 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



Check wiring position as described in chapter: "Routing of wiring on frame", Sect. 6 -1.

Operations	Section reference
Refit all belly fairing covers	5 - 5, Reassembly of belly fairing

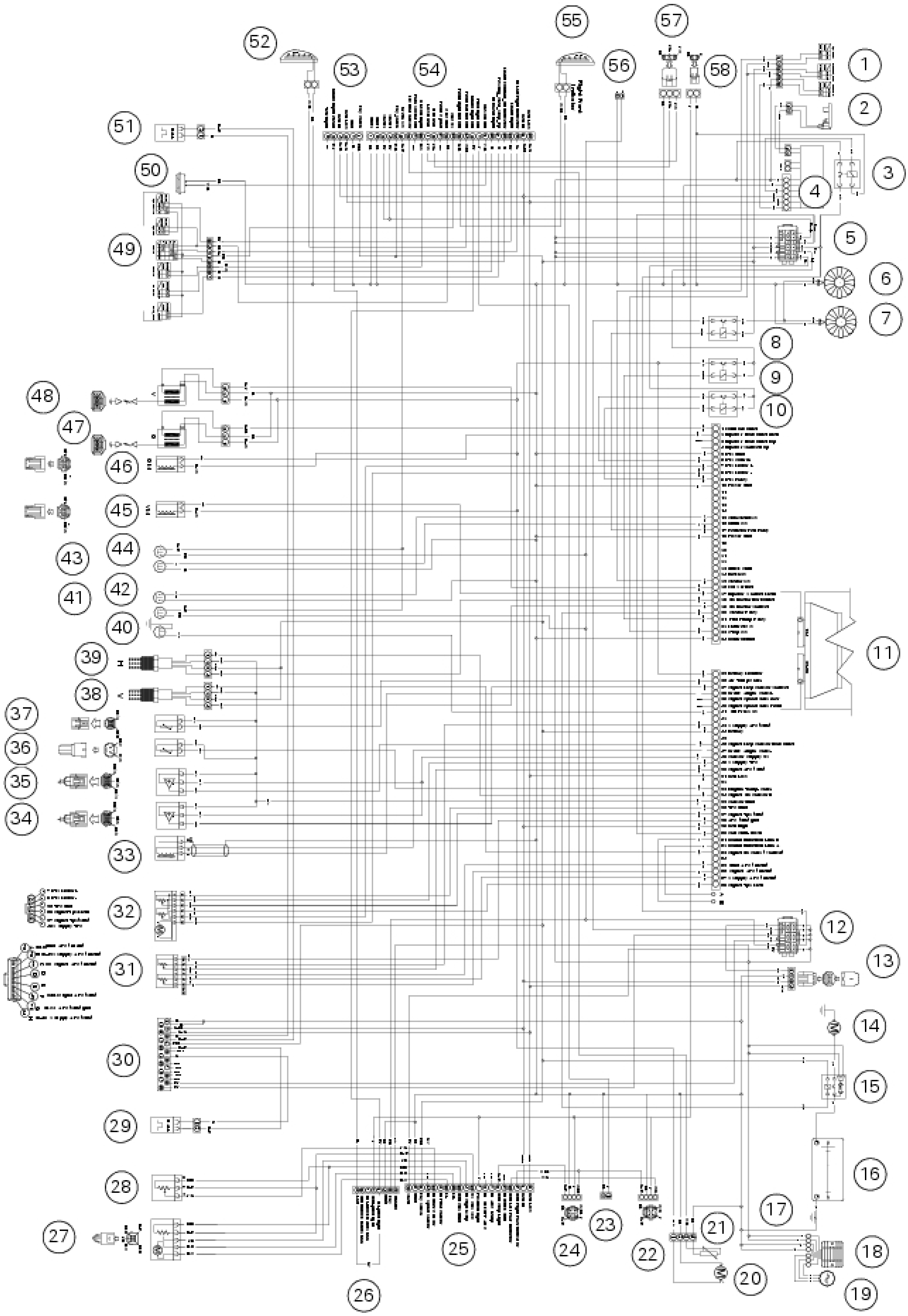
06 - Impianto elettrico

1 -Wiring diagram

DIAVEL ABS WIRING DIAGRAM

DIAVEL CARBON ABS WIRING DIAGRAM

Wiring diagram



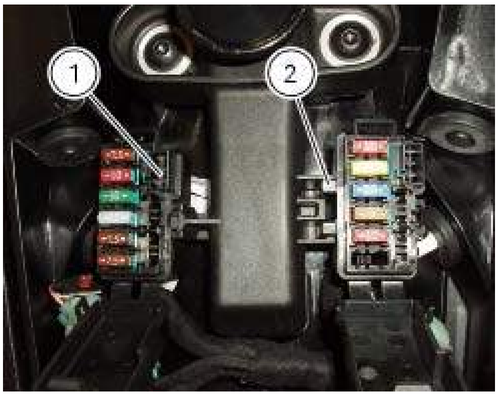
Key to wiring diagram

1 Right-hand handlebar switch
2 Immobilizer

3 Hands Free relay
4 Hands free
5 Front fuse box
6 Right fan
7 Left fan
8 Fan relay
9 Fuel pump relay
10 Ride-by-wire relay (ETV)
11 Injection control unit (EMS)
12 Rear fuse box
13 Data Acquisition/Diagnosis
14 Starter motor
15 Fused solenoid
16 Battery
17 Wiring ground
18 Regulator
19 Generator
20 Fuel pump
21 Fuel level
22 Rear right turn indicator
23 Rear light
24 Rear left turn indicator
25 Vehicle control unit (BBS)
26 Antitheft alarm
27 Exhaust valve starter motor
28 Gear sensor
29 Rear speed sensor
30 ABS control unit
31 Throttle twistgrip position sensor (APS)
32 Starter motor - position sensor / ride-by-wire (TPS/ETV)
33 Timing/rpm sensor
34 Vertical MAP sensor
35 Horizontal MAP sensor
36 Engine temperature
37 Air temperature sensor
38 Vertical lambda sensor
39 Horizontal lambda sensor
40 Oil pressure switch
41 Rear stop
42 Side stand switch
43 Clutch switch
44 Front stop
45 Main vertical injector
46 Main horizontal injector
47 Horizontal coil
48 Vertical coil
49 Left-hand handlebar switch
50 Horn
51 Front speed sensor
52 Front left turn indicator
53 Dashboard on handlebar
54 Dashboard on tank
55 Front right turn indicator
56 Navigator
57 High / Low beam
58 Parking light

Wiring diagram colour codes

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



Rear left fuse box (1) key

Pos.	Consumer	Rating
1	-	-
2	Dashboard	10 A
3	ECU	5 A
4	Key-sense	15 A
5	Injection relay	20 A
6	Throttle opening starter motor relay (ETV)	10 A

Rear right fuse box (2) key

Pos.	Consumer	Rating
1	Black Box System (BBS)	7.5 A
2	Navigator/Alarm	7.5 A
3	ABS 2	25 A
4	ABS 1	30 A
5	Fans	10 A
6	Diagnosis/Recharge	7.5 A

Routing of wiring on frame

The routing of the wiring has been optimised to ensure the minimum obstruction.
Each section is designed to prevent interference with parts that might damage wires or cause operating failures when riding. The plates on the following pages show the origins ("0" points) for correct re-routing of wiring and the locations of cable ties.
Each figure includes references to the plates showing the wiring routing or the item to which it must be connected.

Position		Description
1	Table A	0 point
2	Table B	Vertical cylinder coil connector
3	Table B	Vertical lambda sensor connector
4	Table B	Vertical coil
5	Table B	Vertical lambda sensor
6	Table C	Vertical MAP sensor
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8	Table D	LH switch wire
9	Table D	Clutch microswitch wire
10	Table D	Optional GPS navigator connector
11	Table E	Front left turn indicator connector wire
12	Table E	Air temperature sensor connector wire
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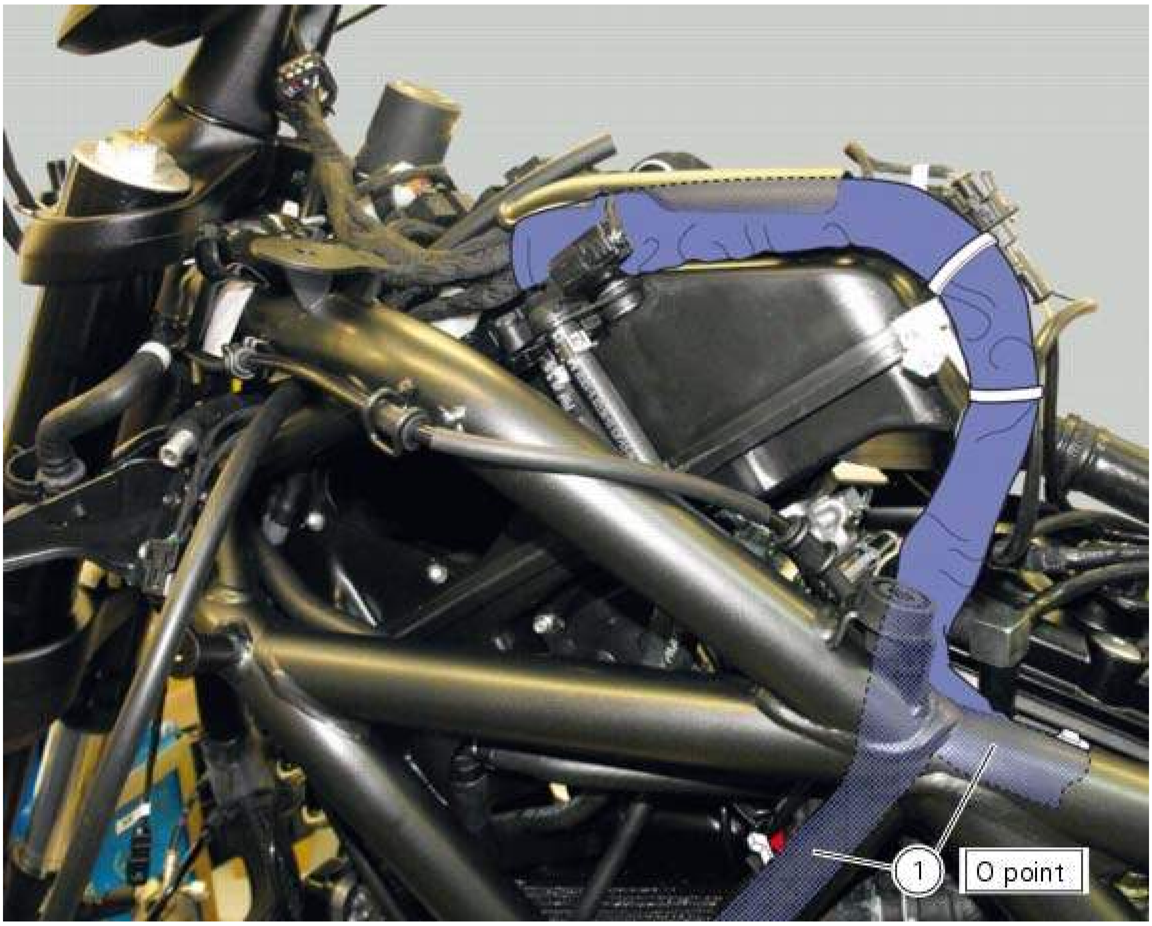
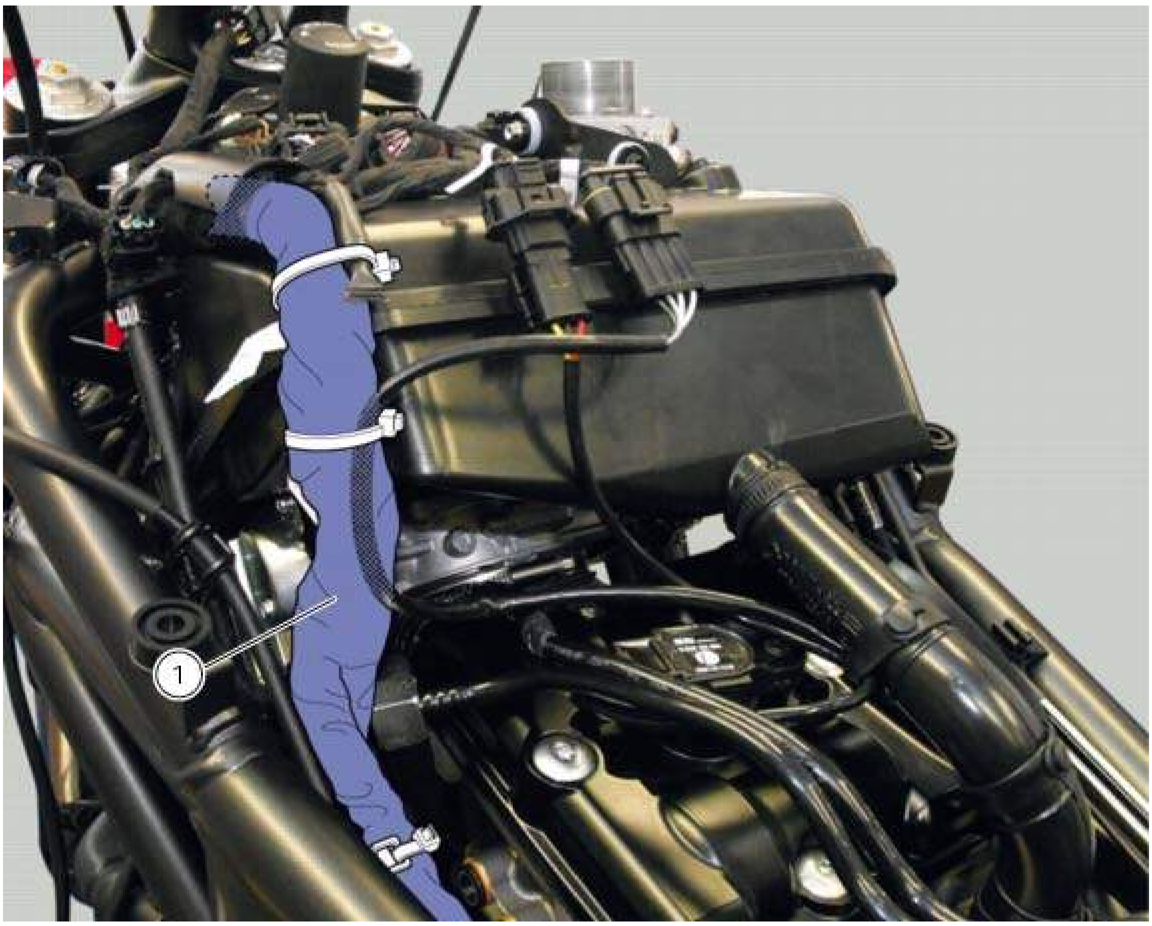
71	Table X	Solenoid starter - battery positive wire
72	Table X	ABS Positive wire
73	Table X/Table W	Ground cable - battery negative
74	Table X	Side stand switch

Table A





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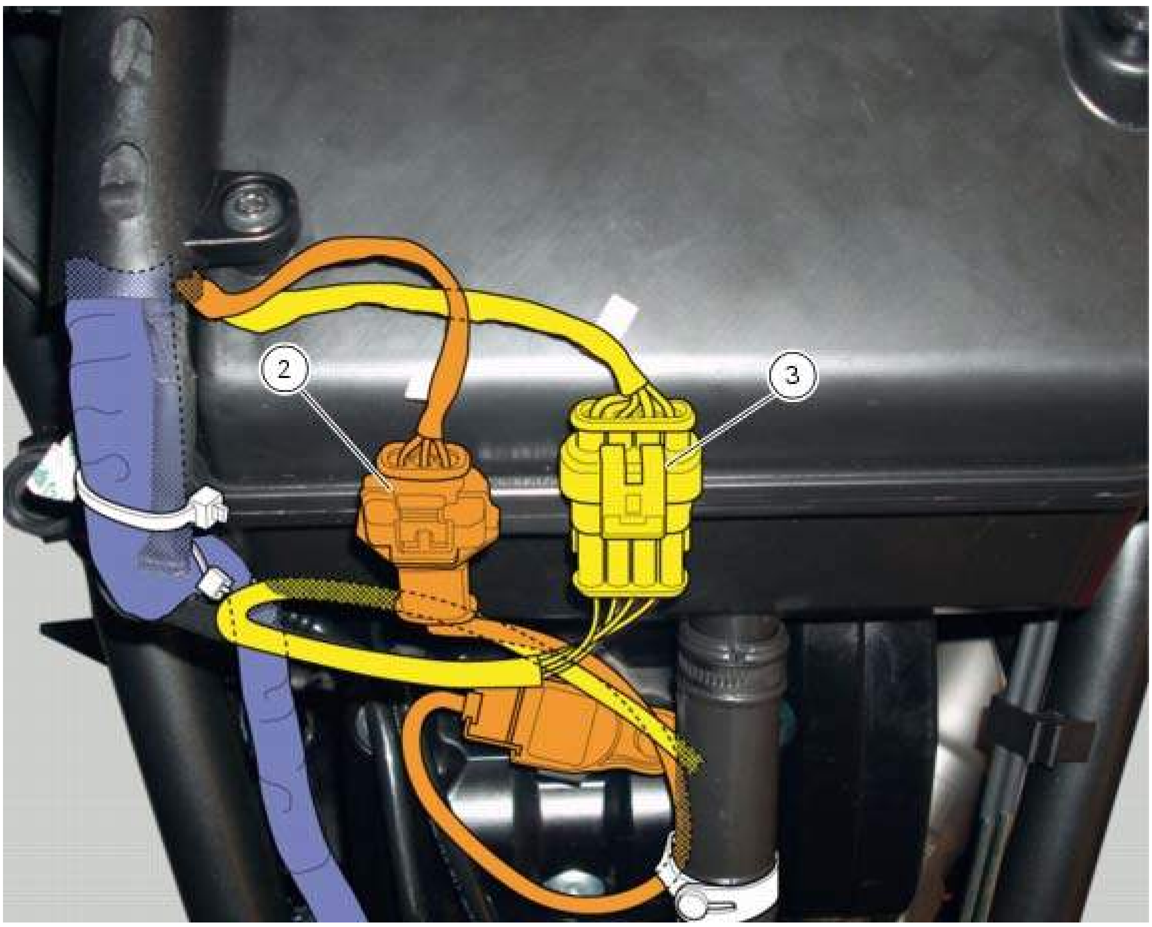

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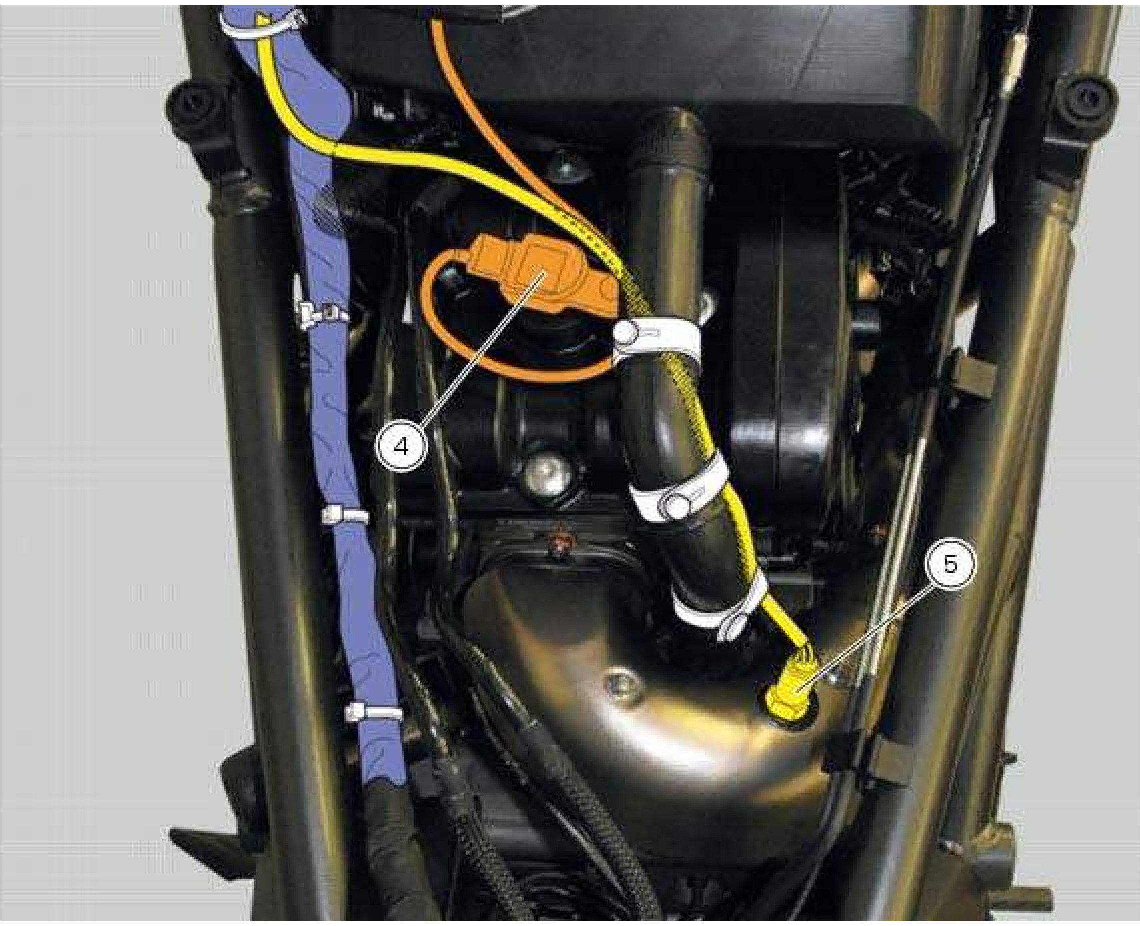

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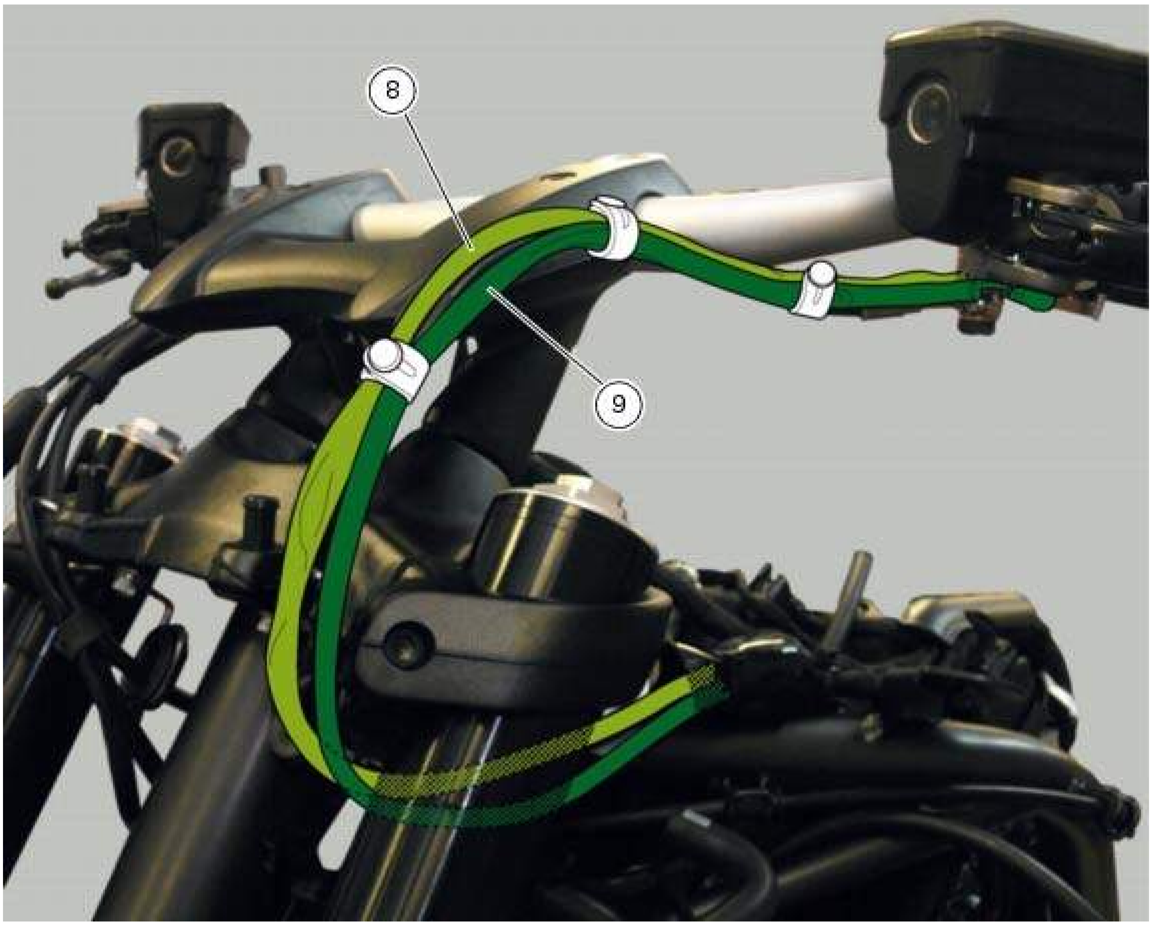

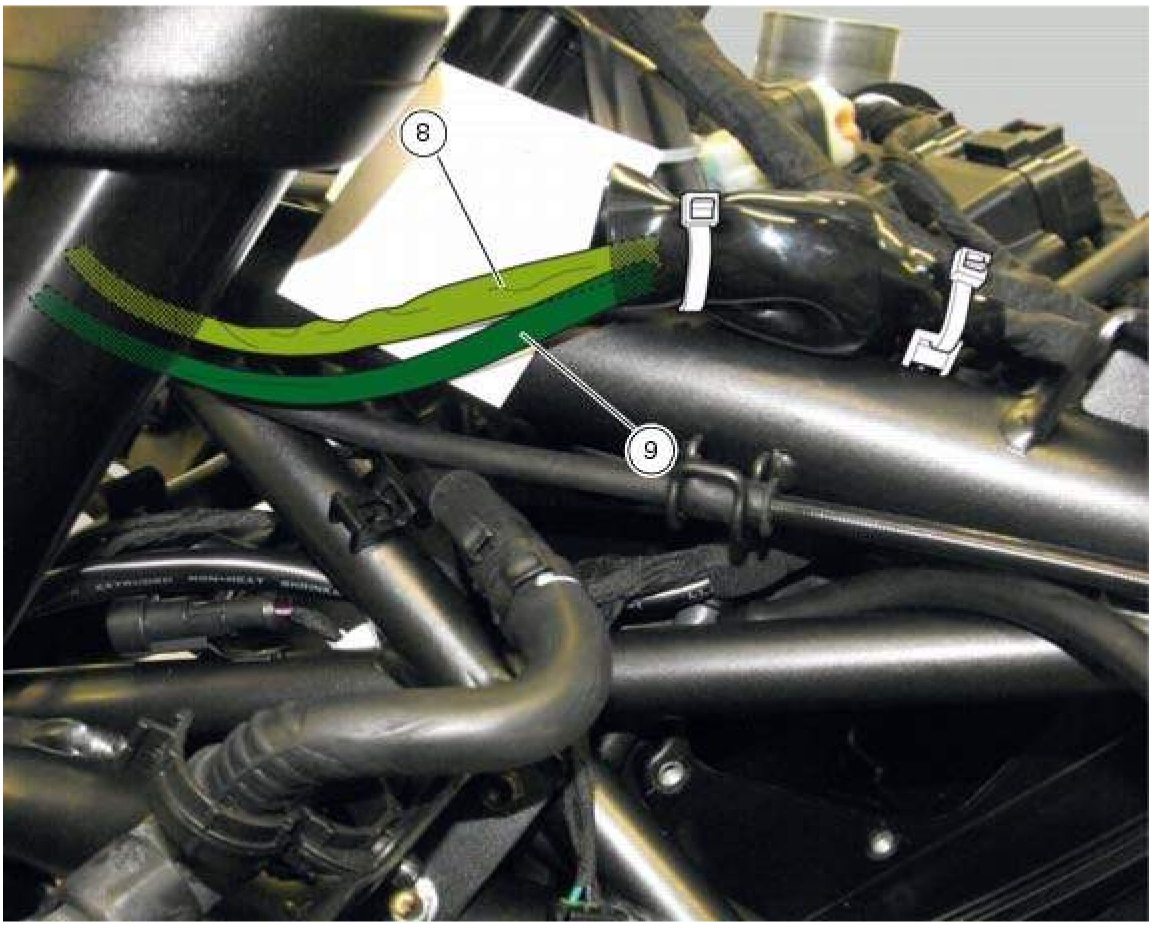

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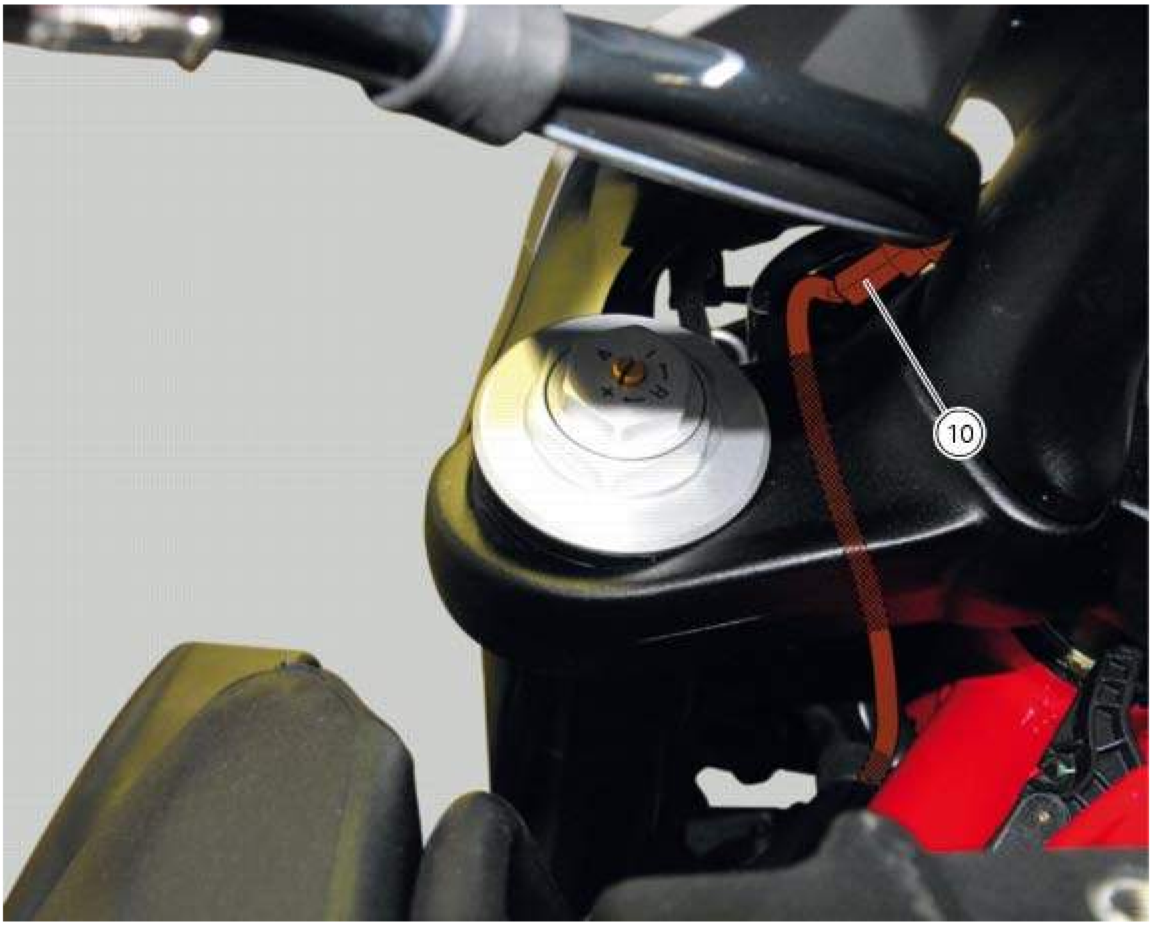

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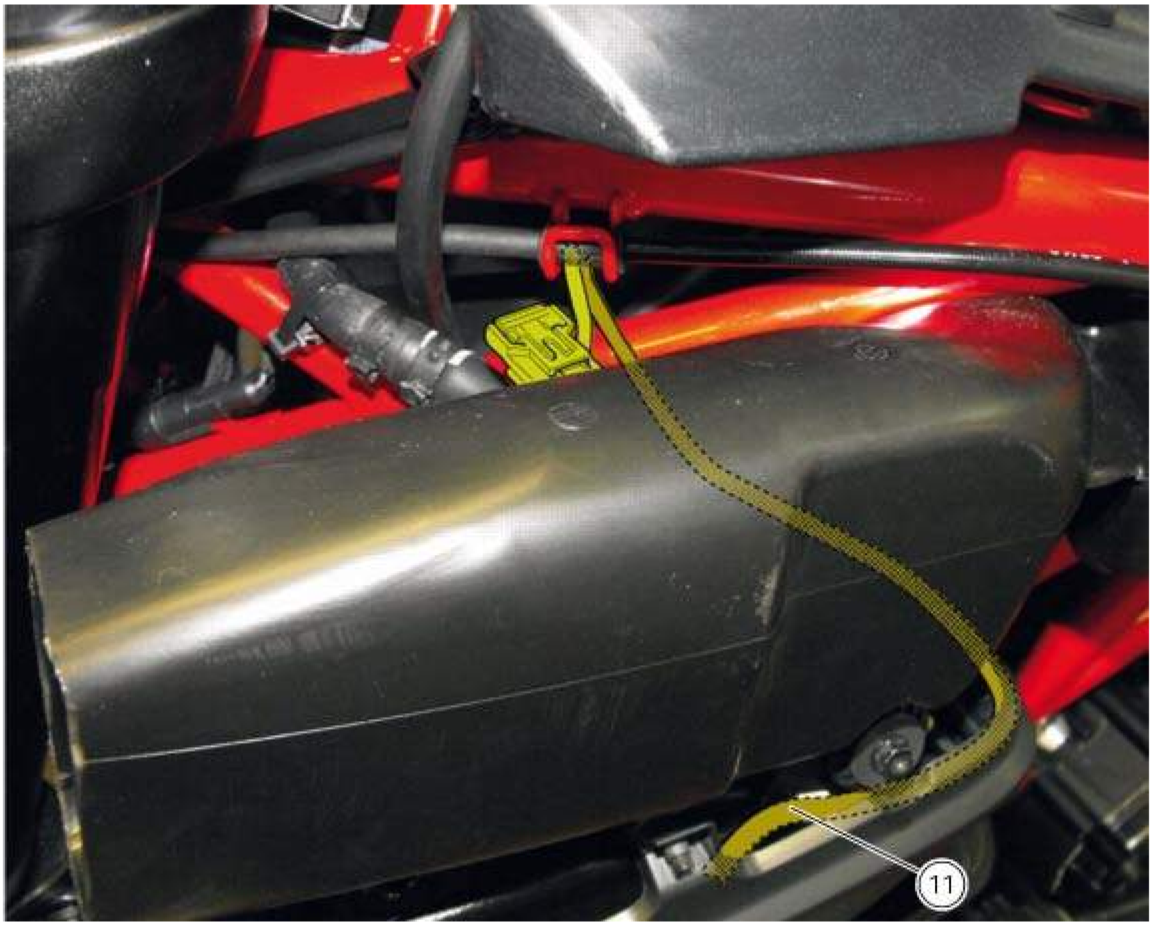

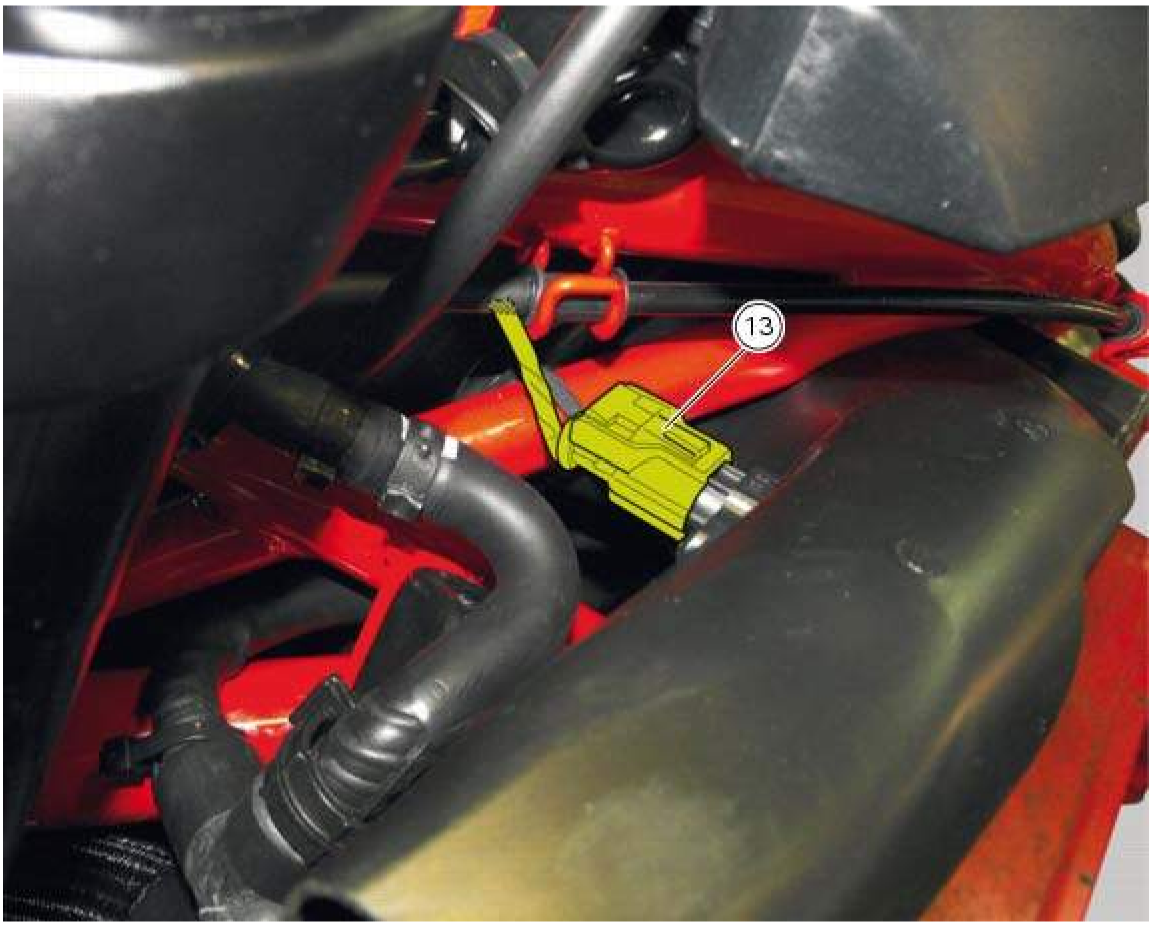

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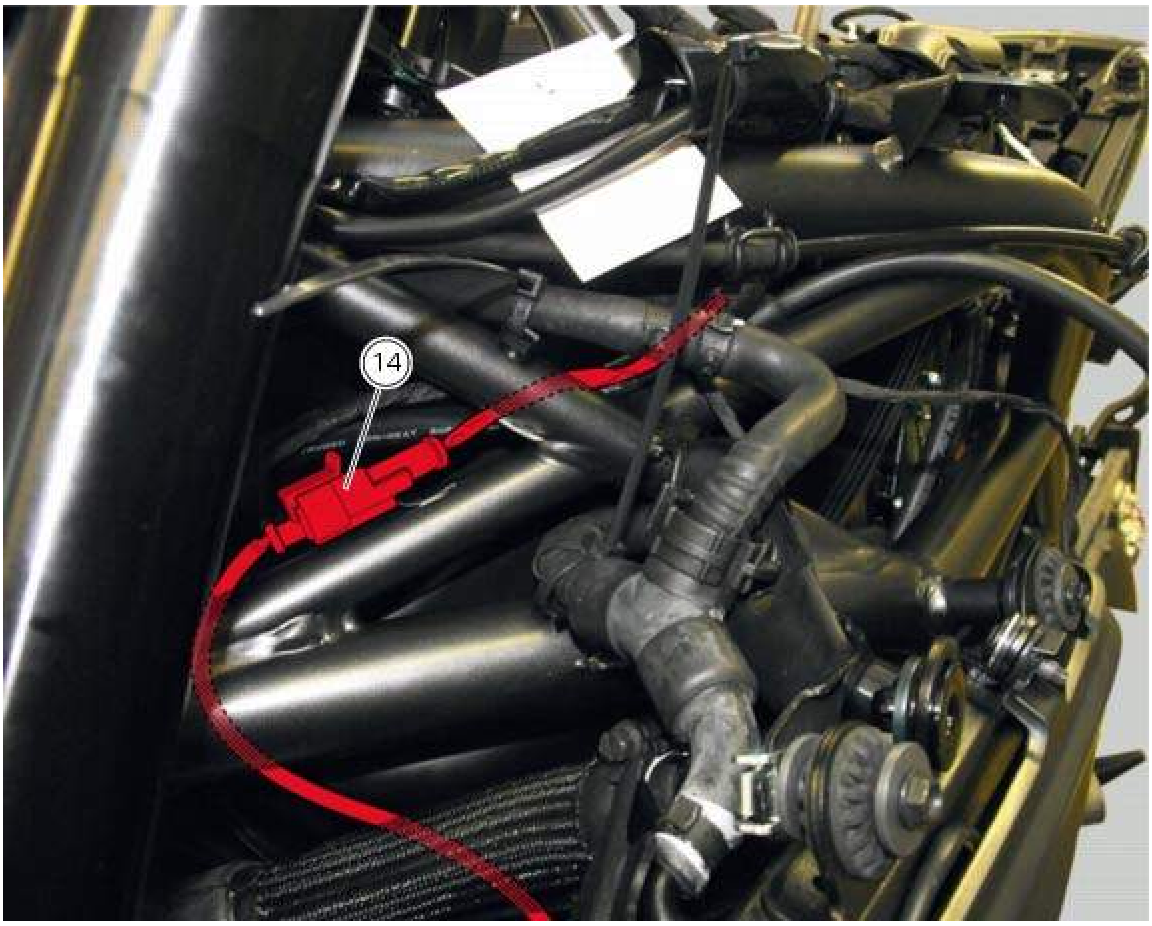

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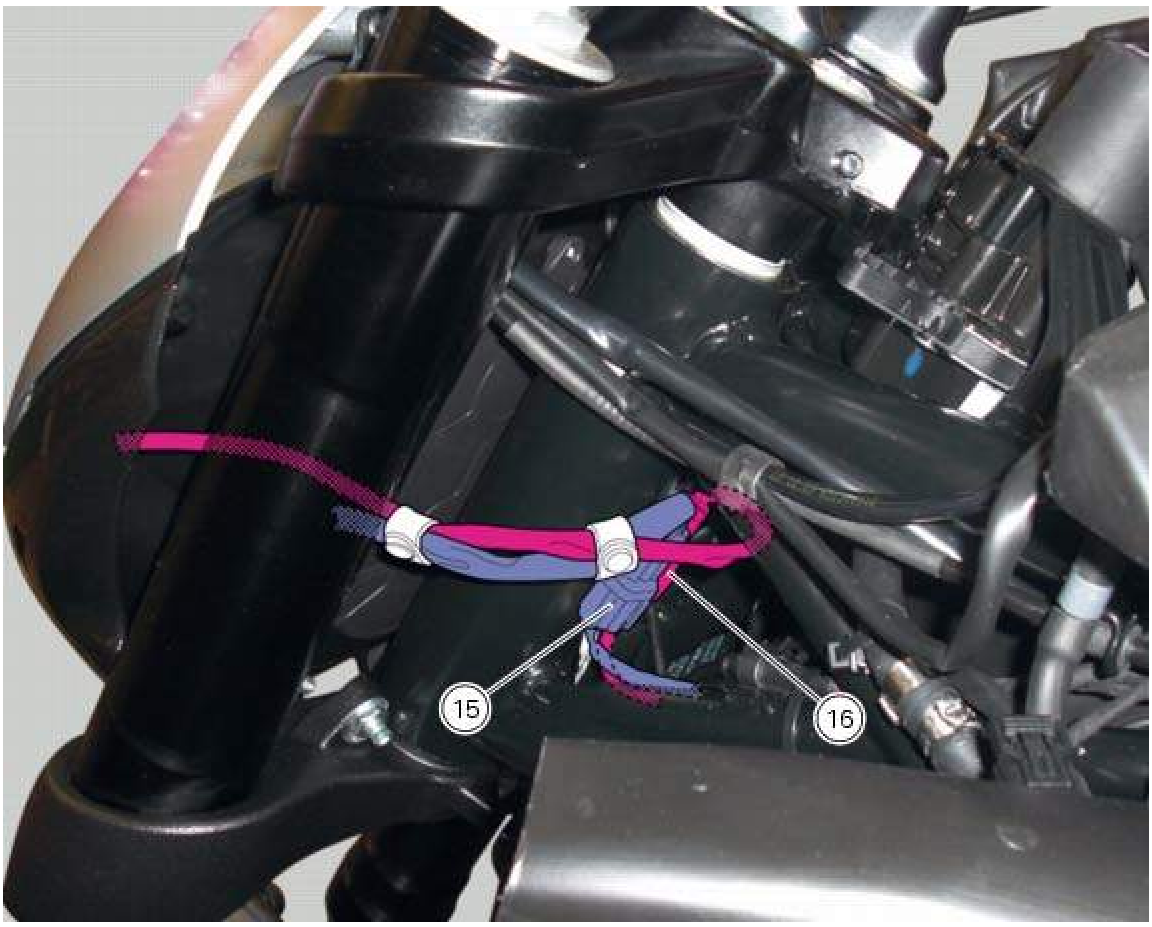

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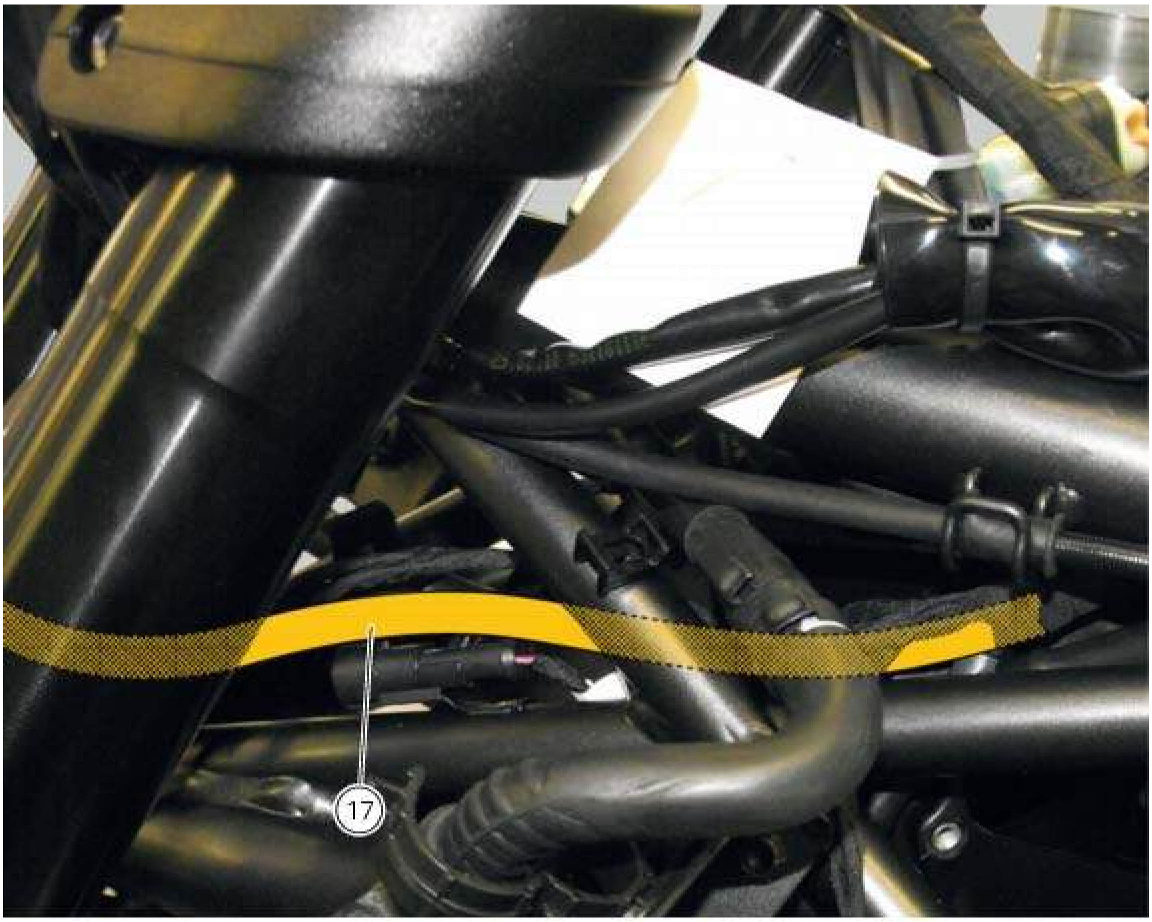

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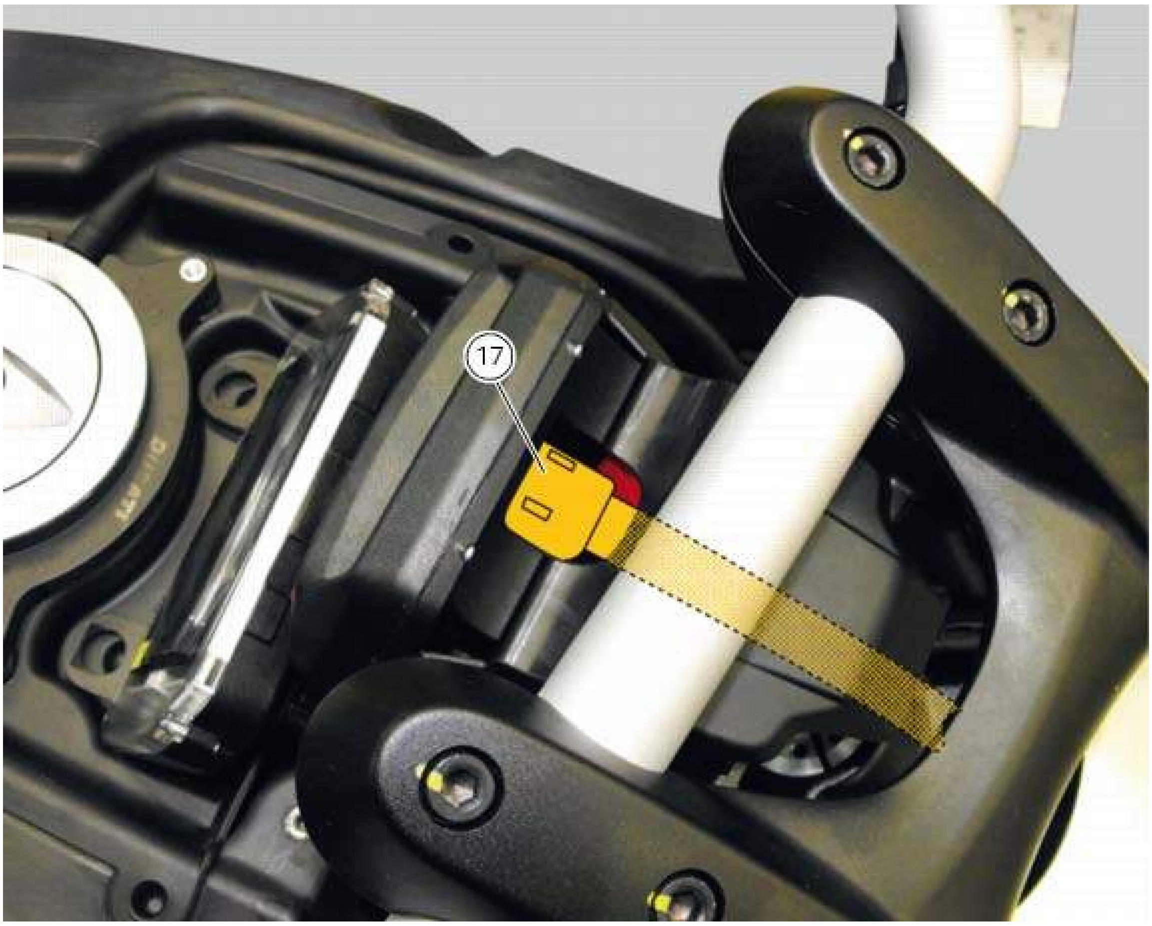

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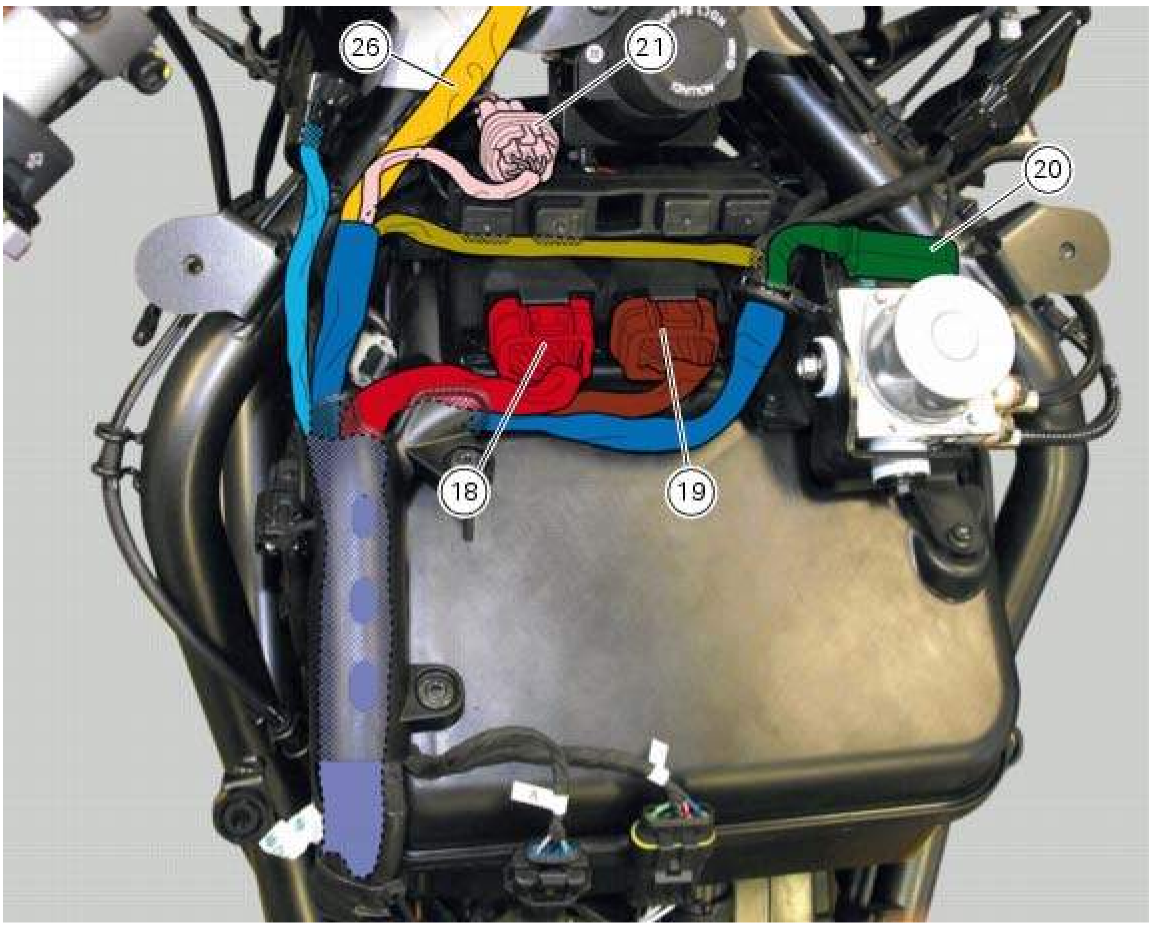

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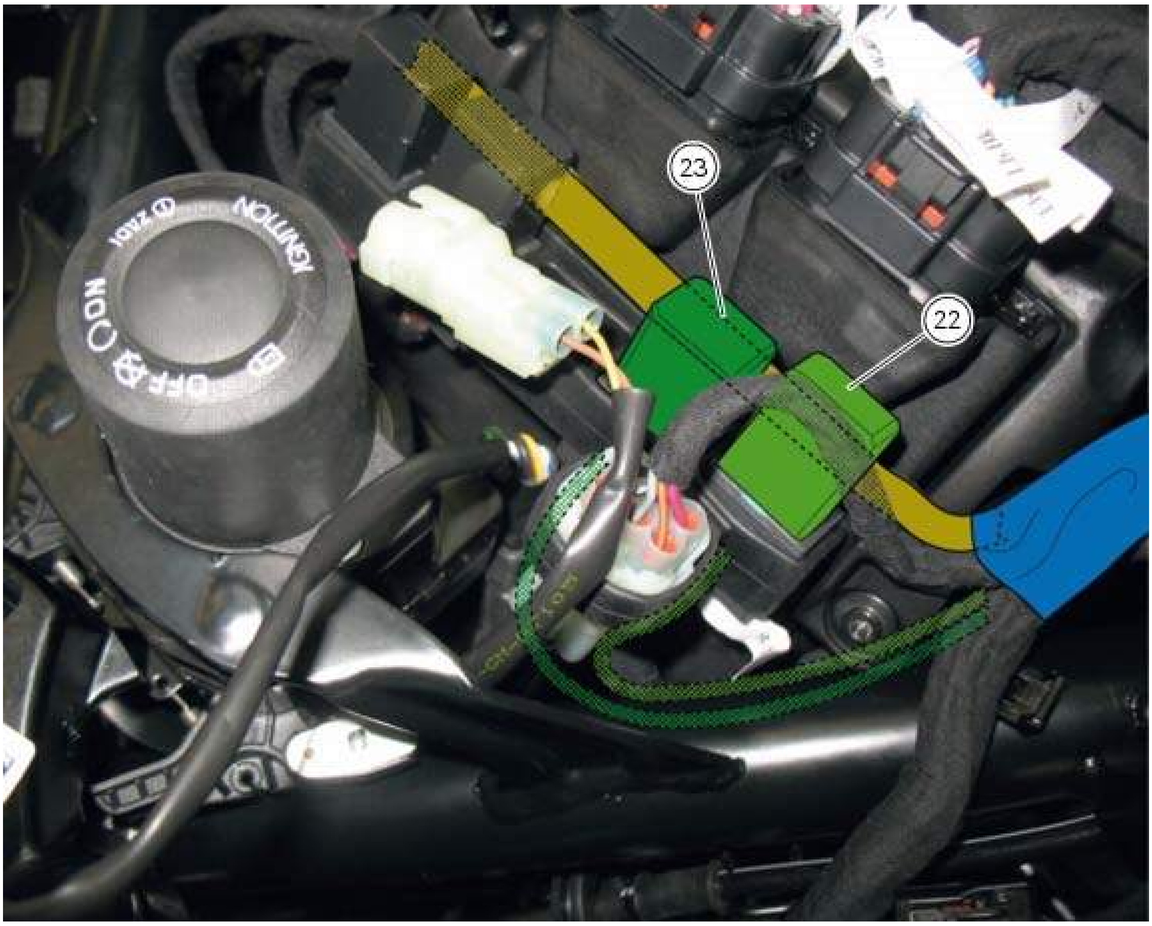

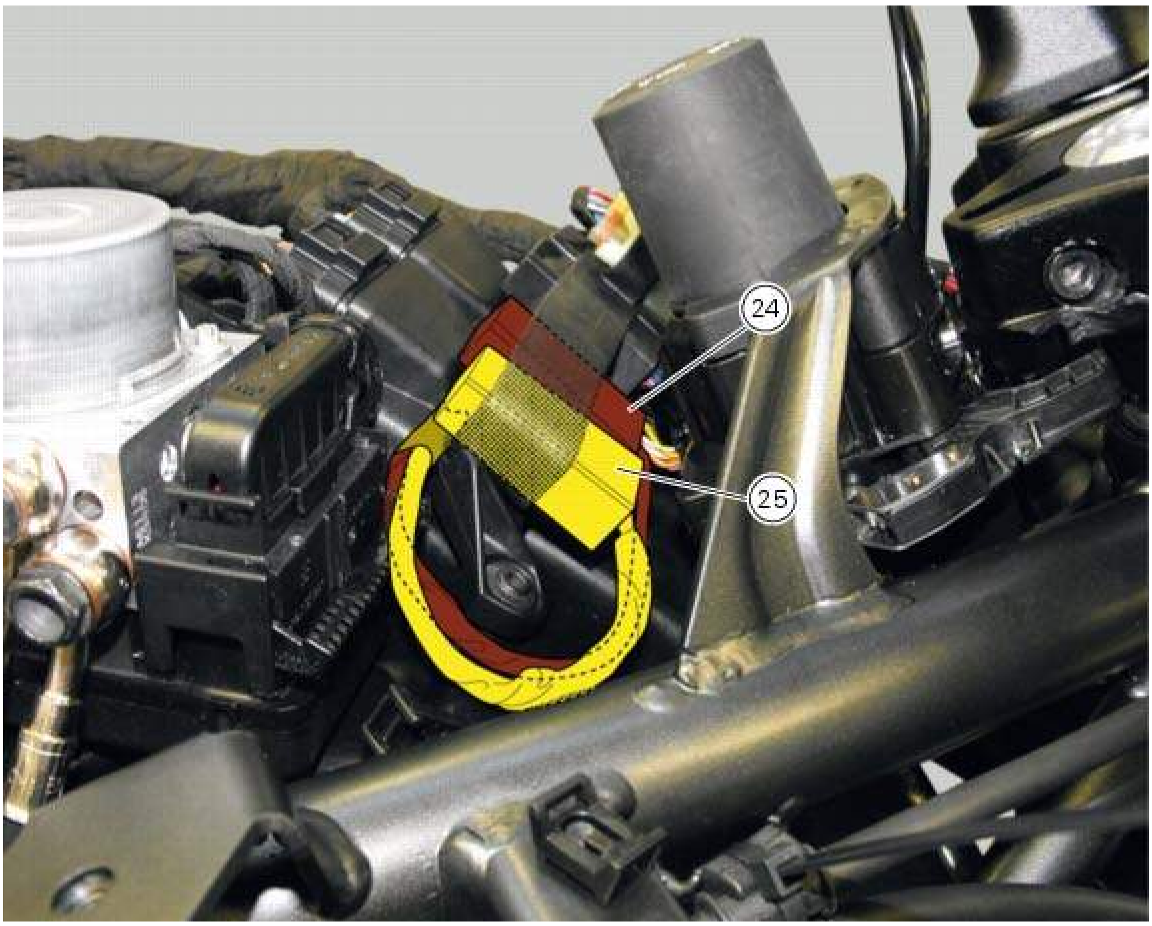

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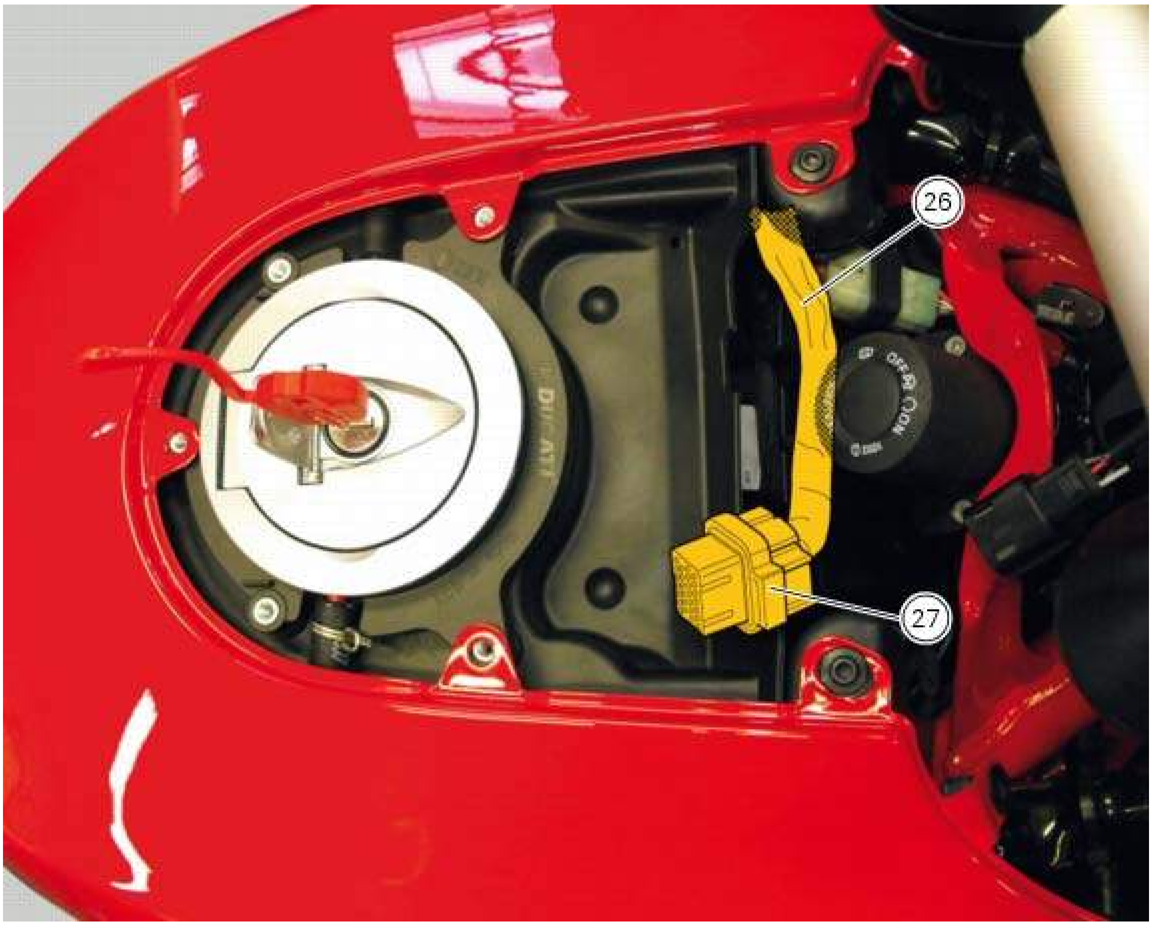

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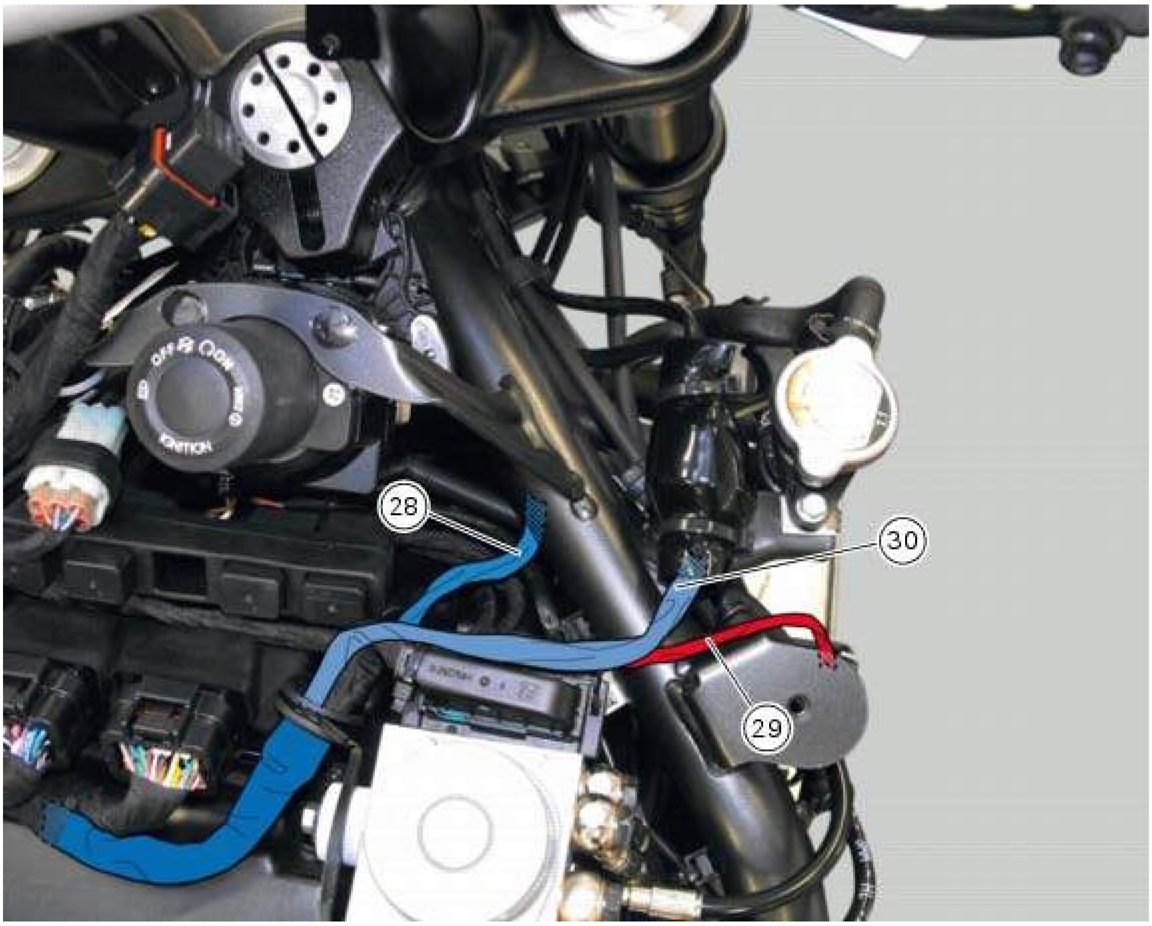

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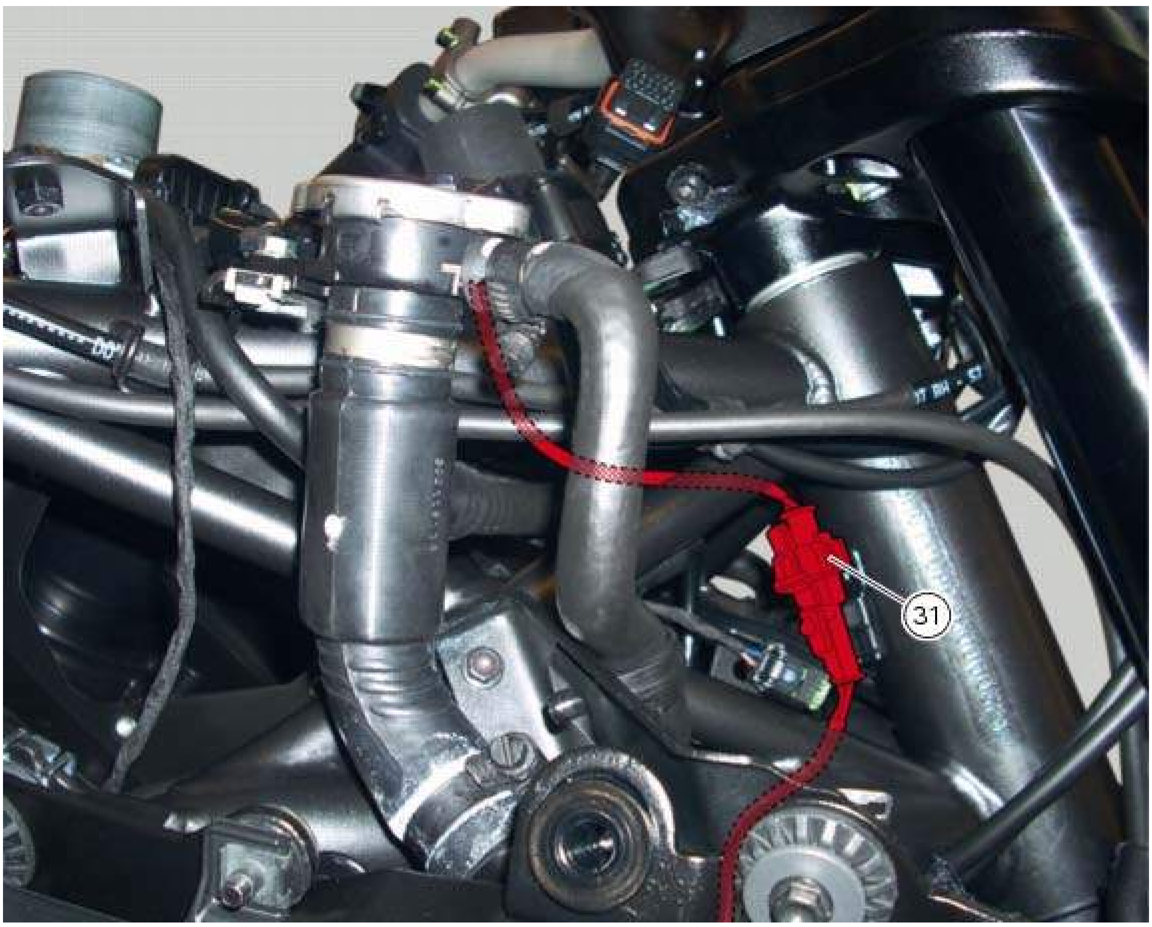

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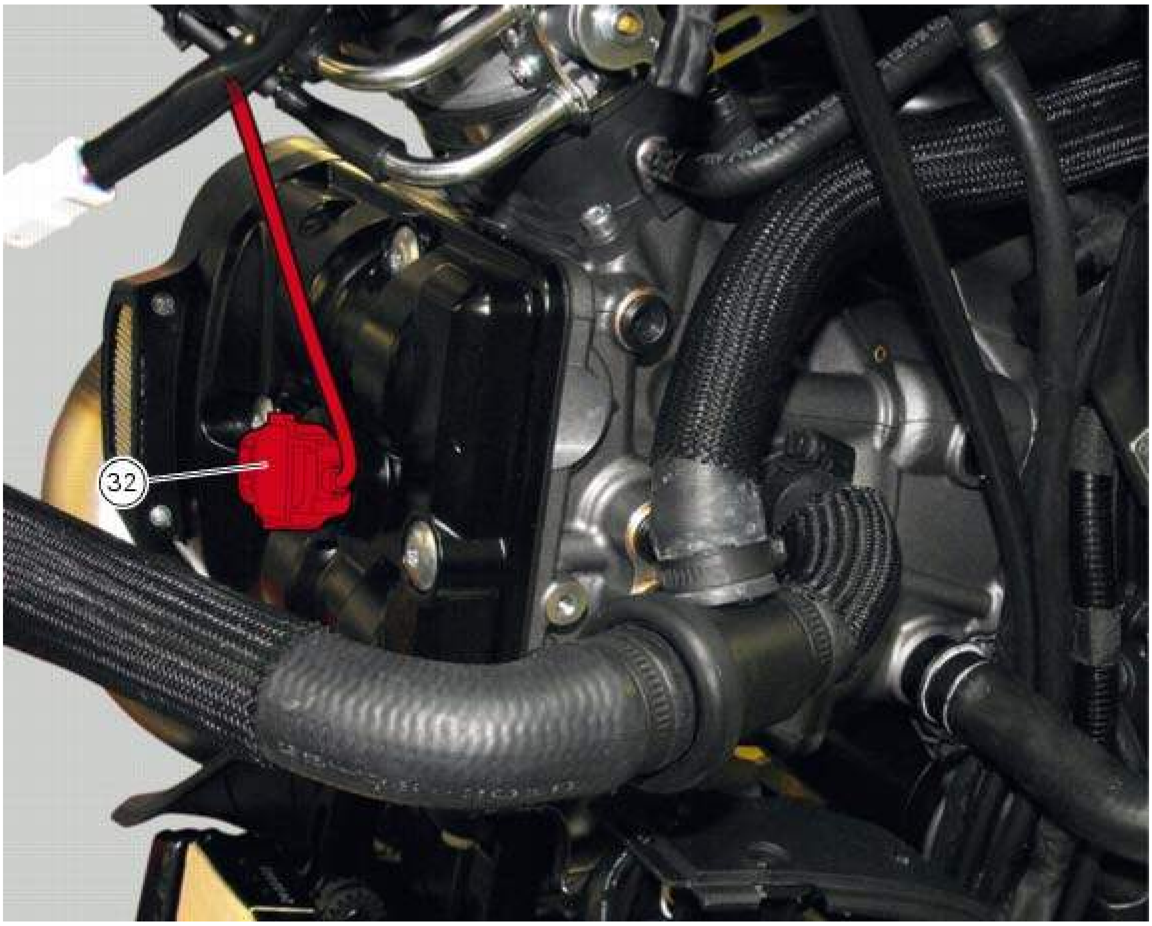

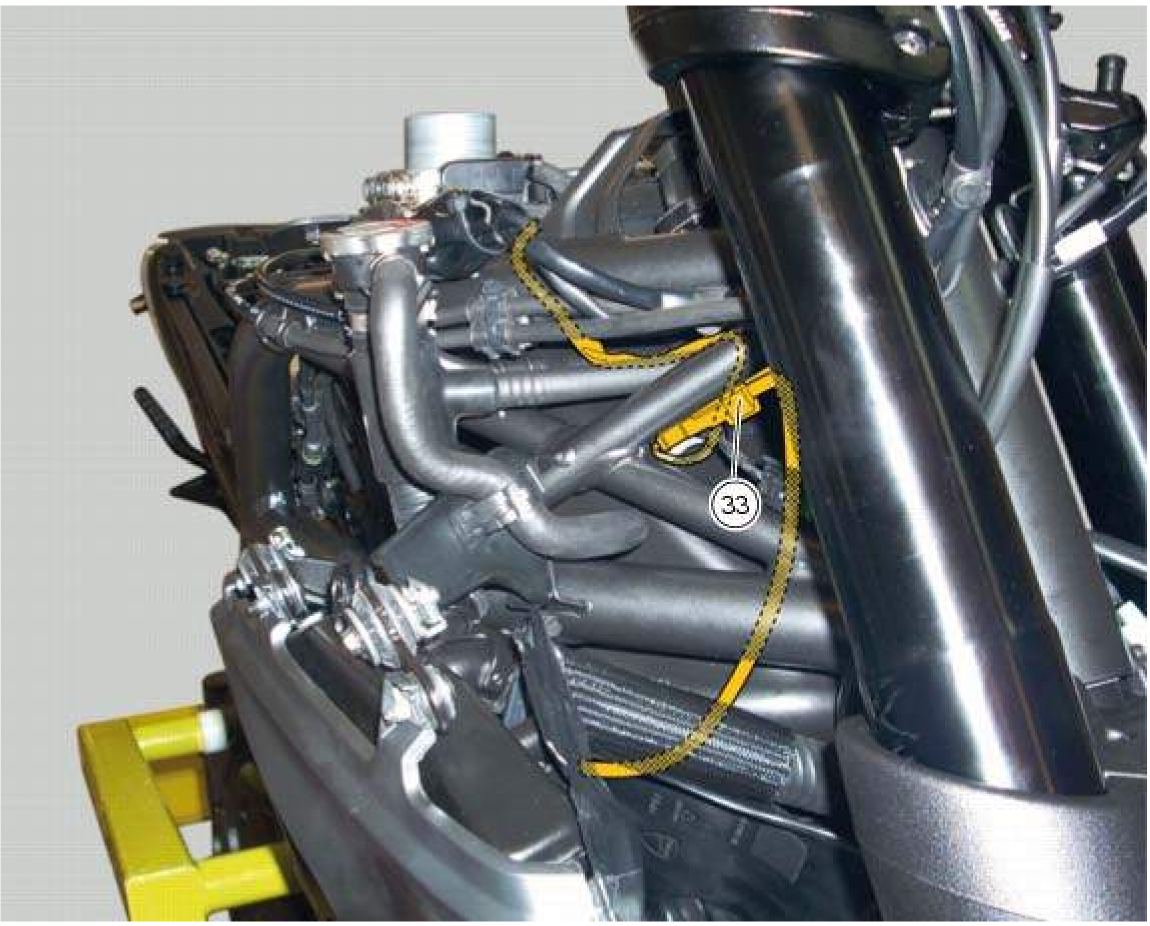

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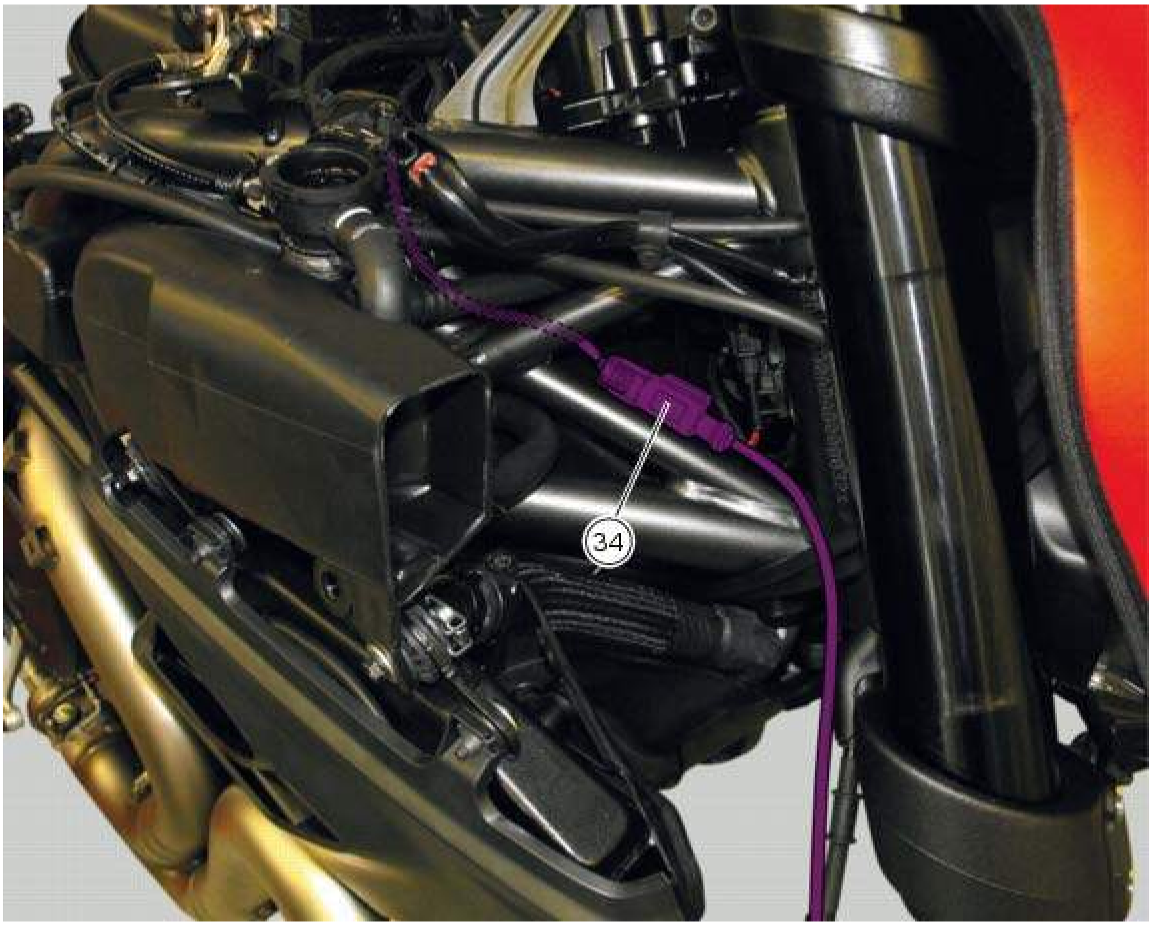

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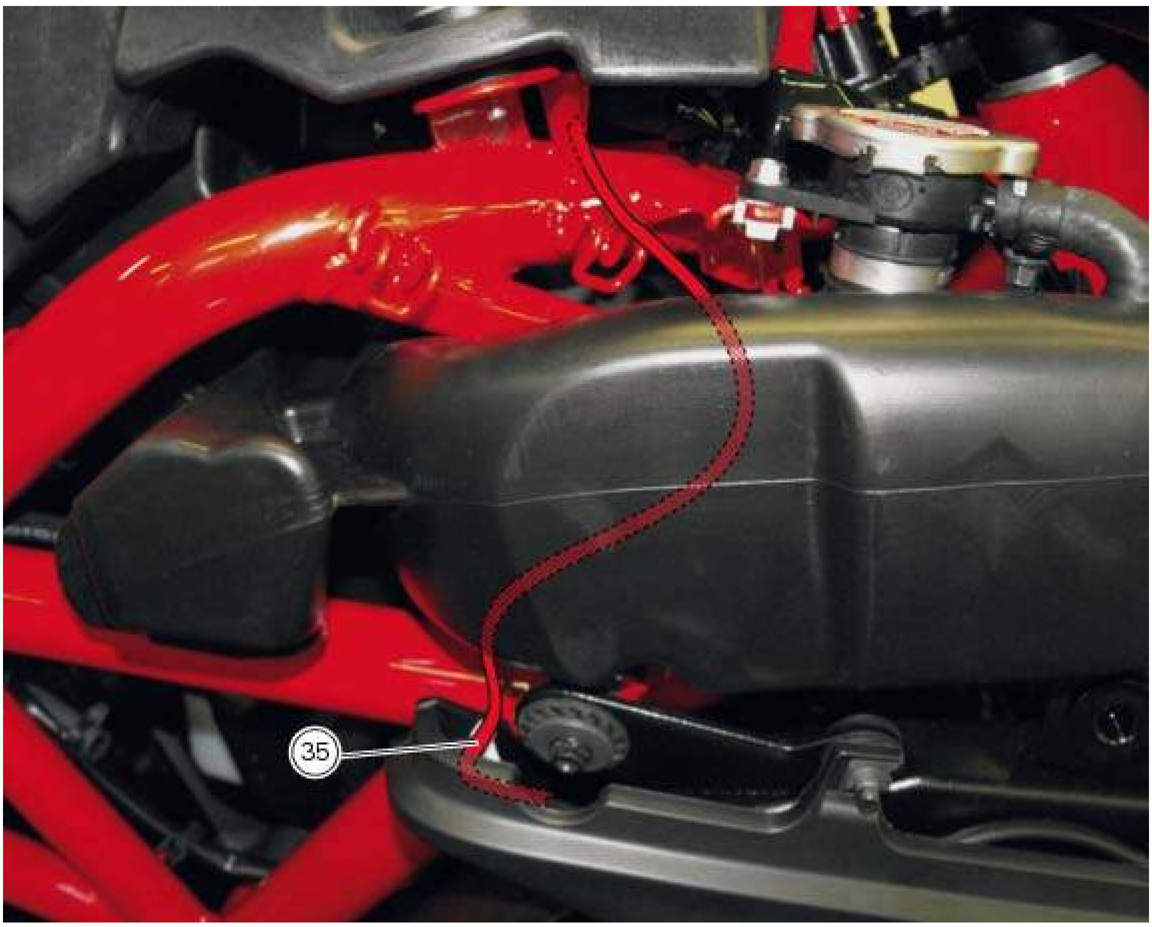

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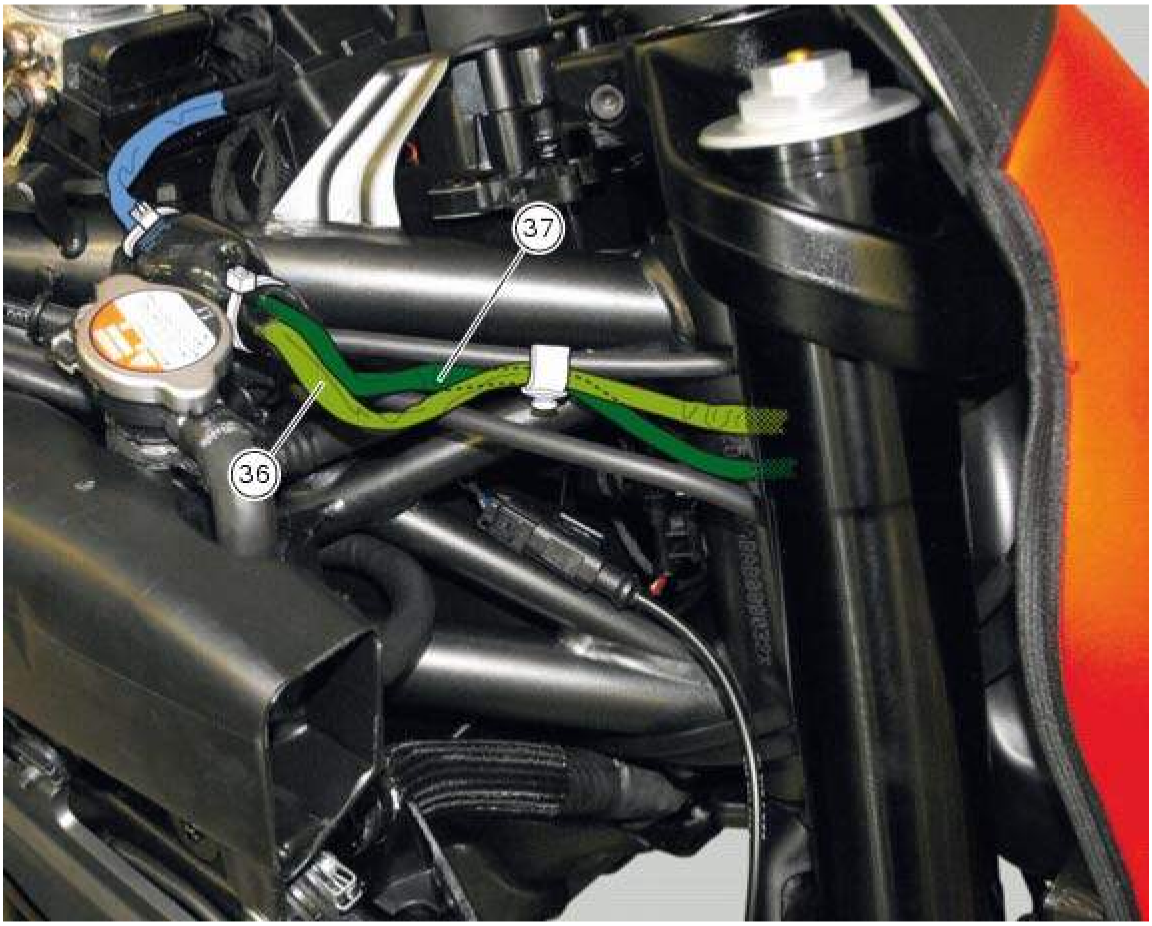

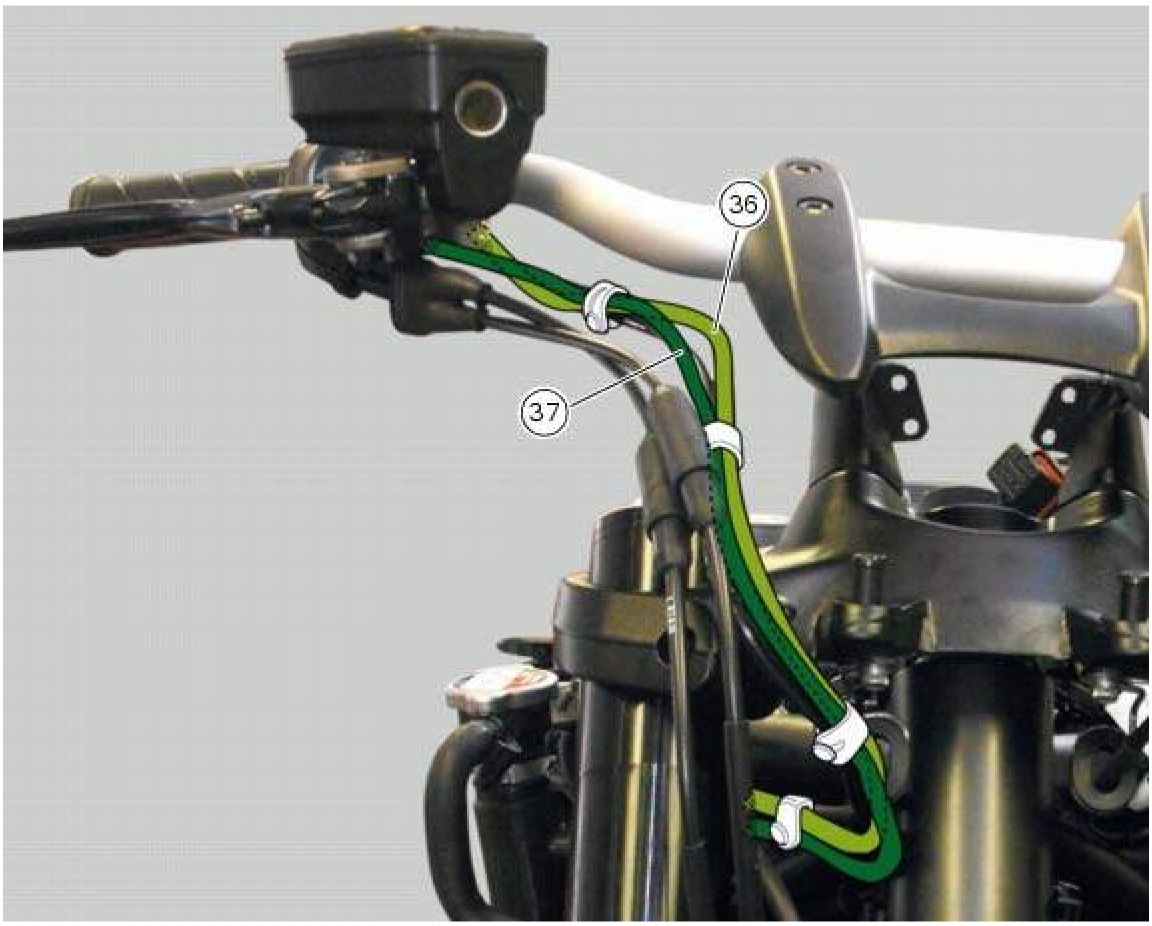

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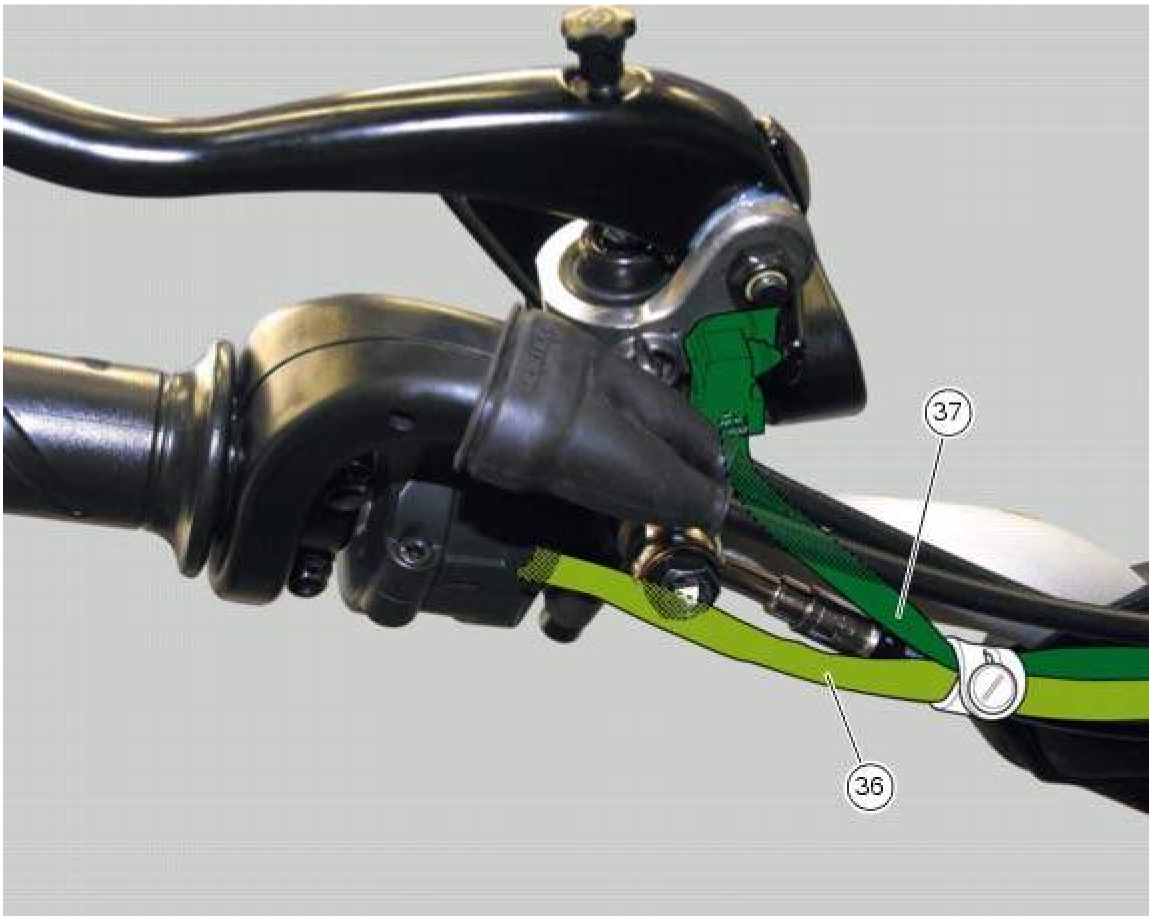

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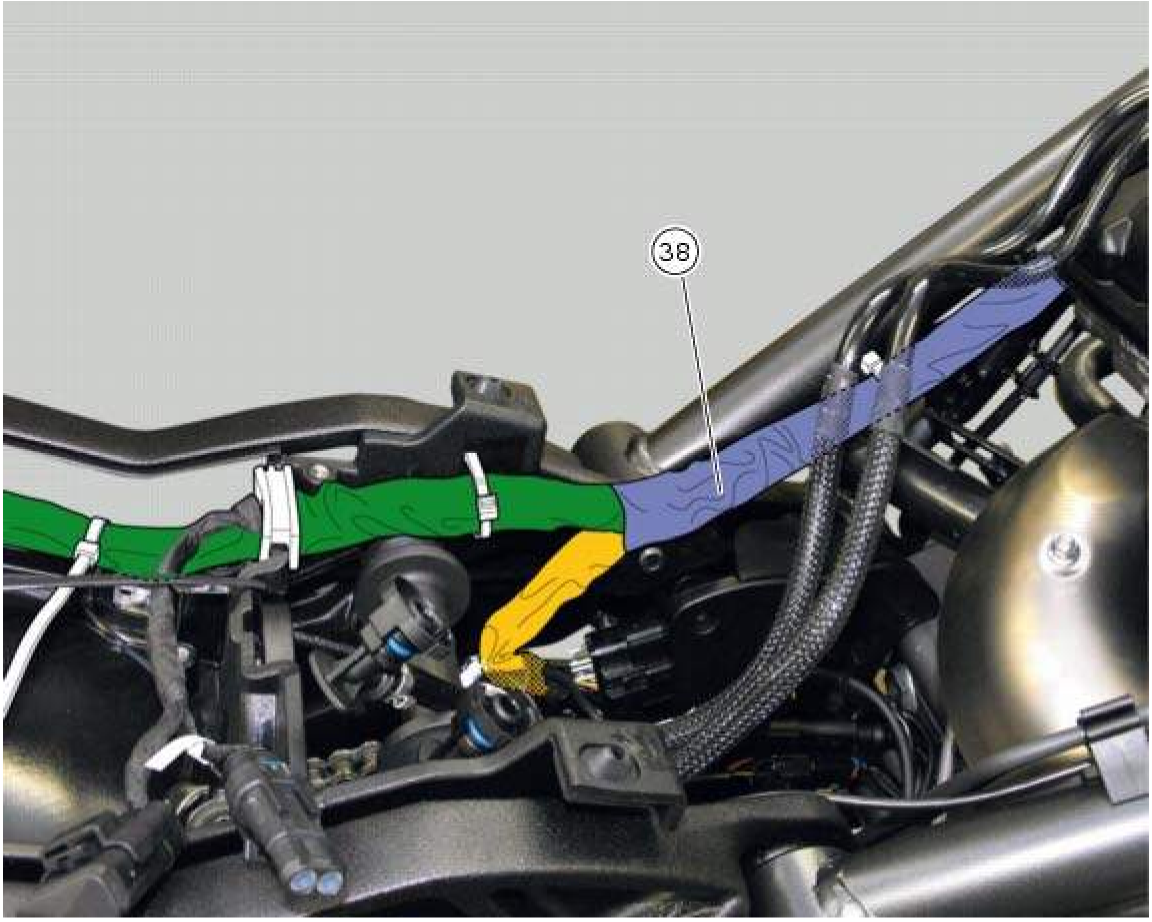

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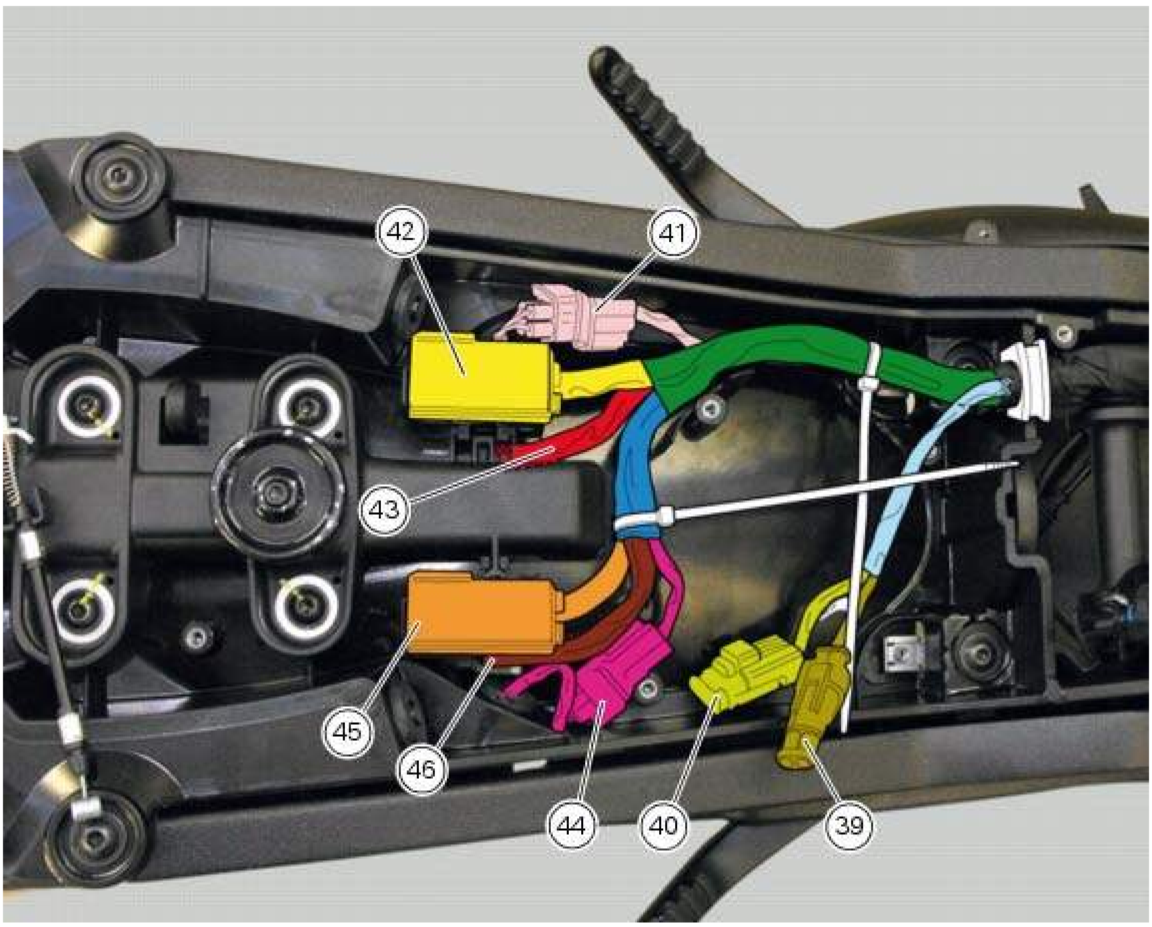

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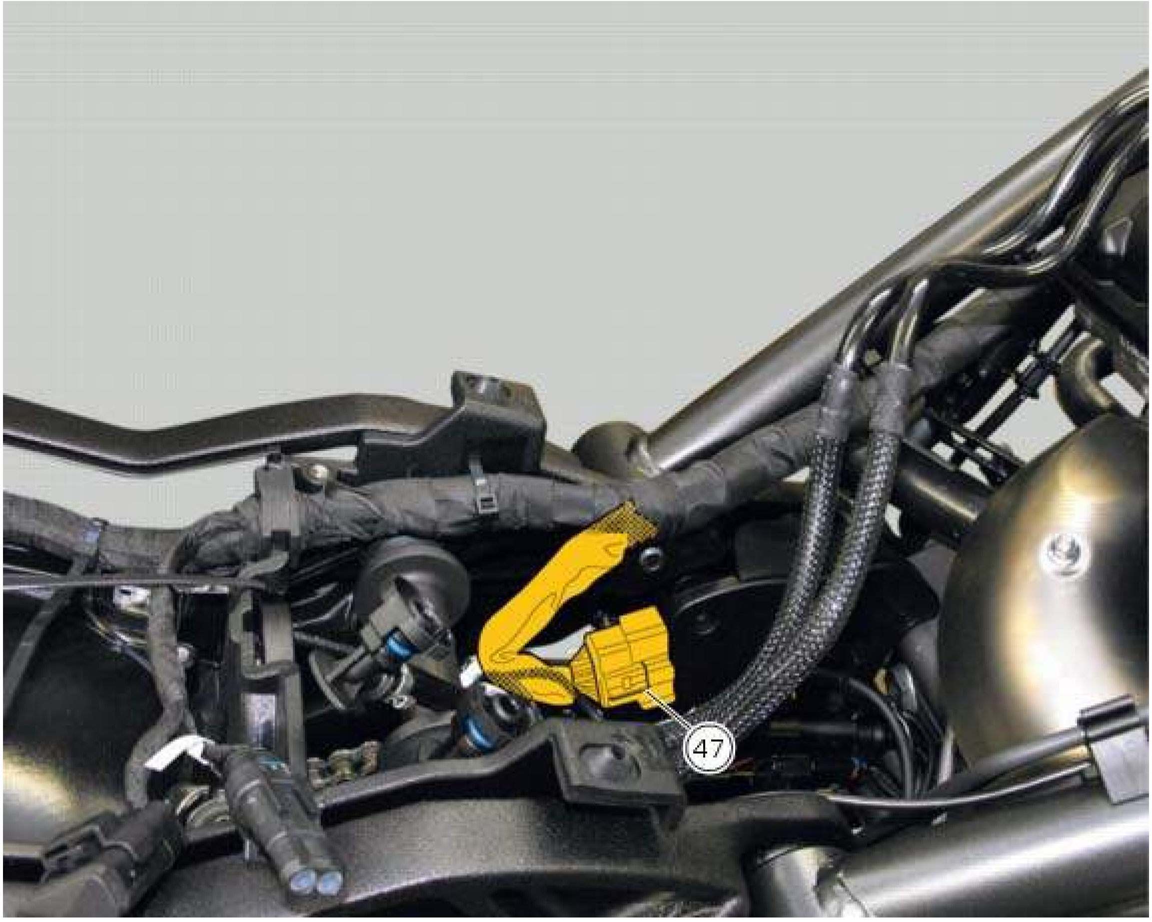

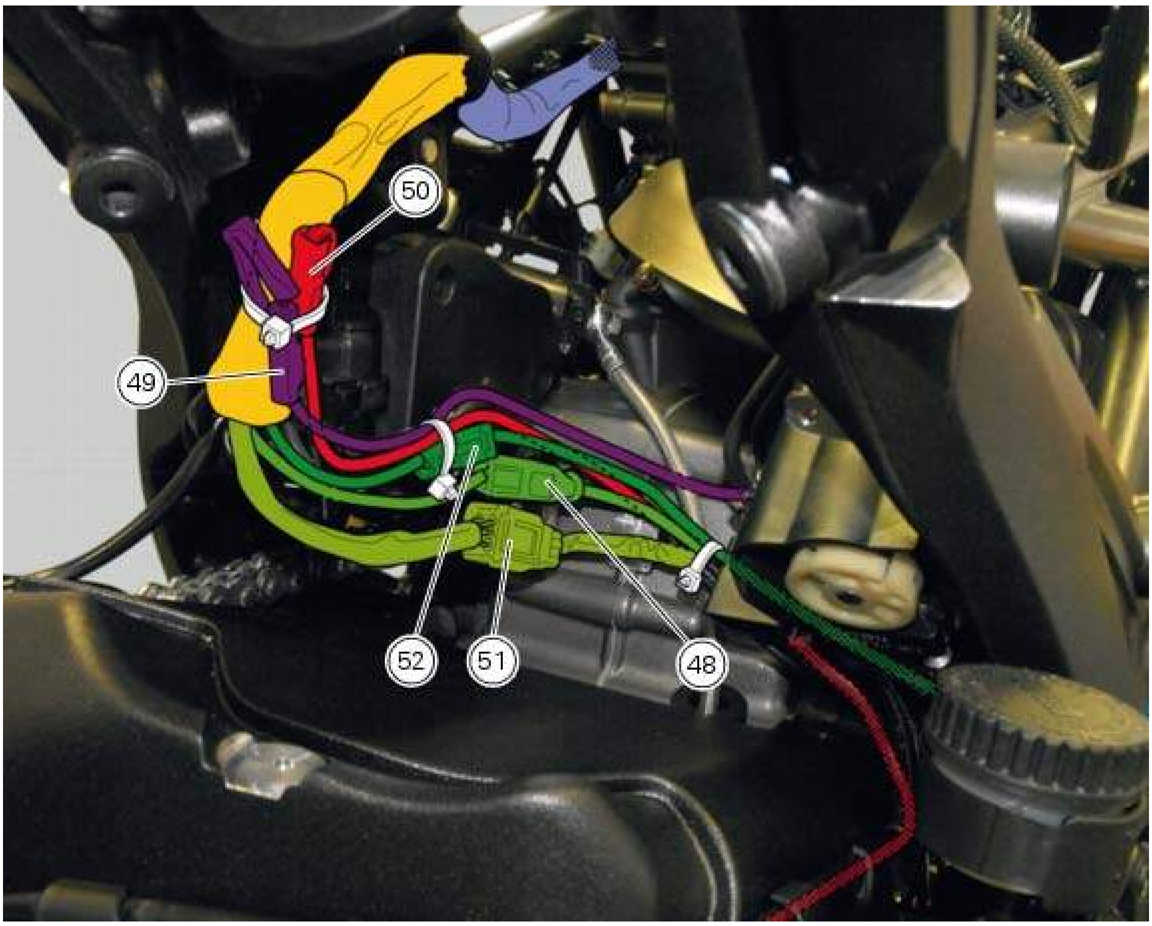

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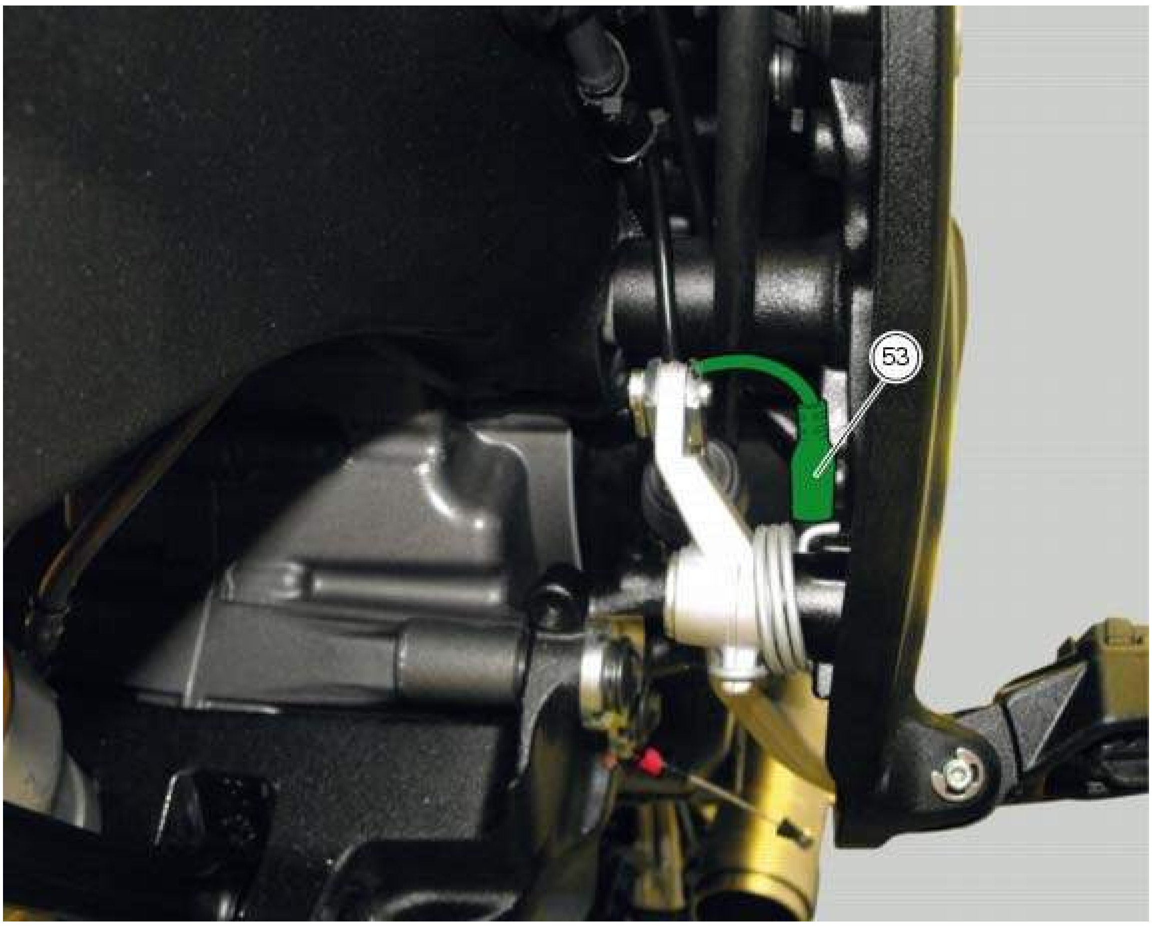

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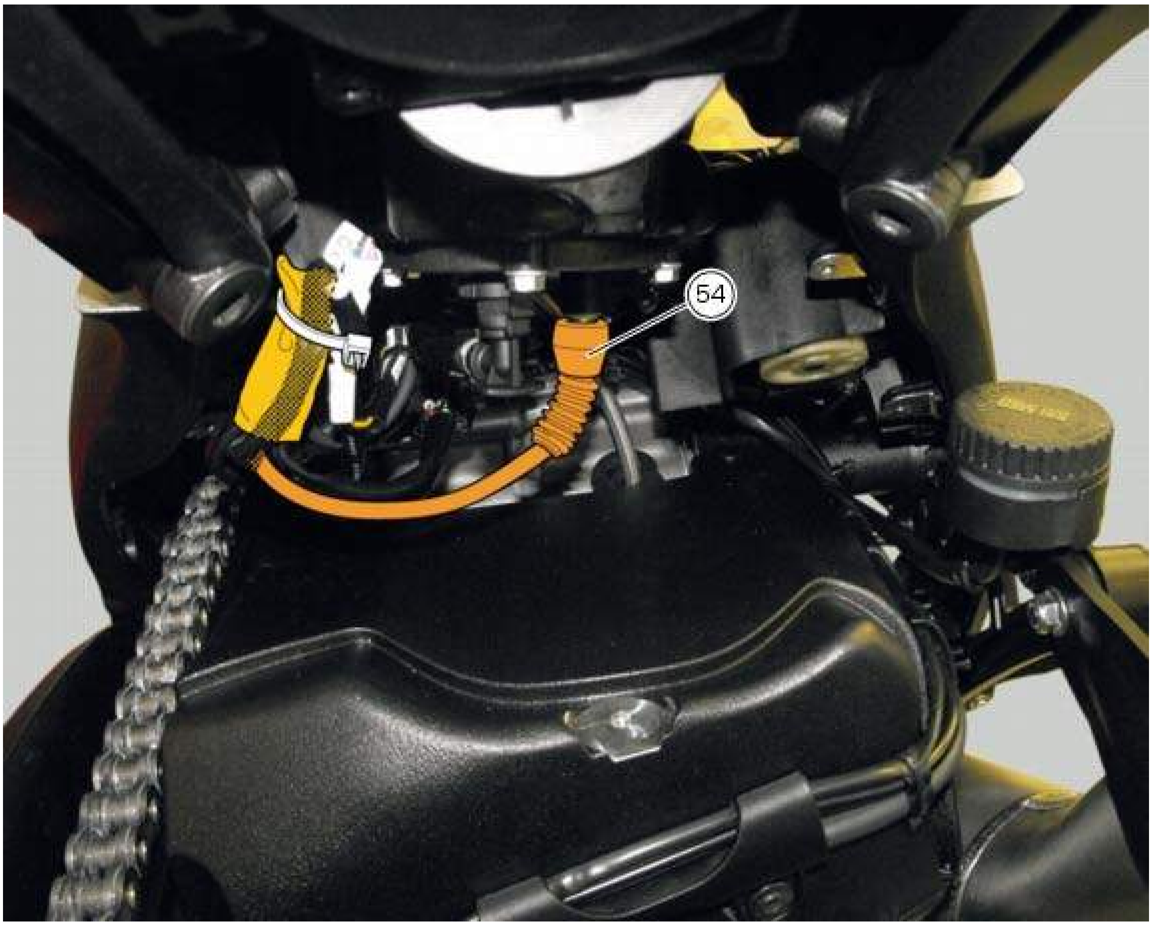

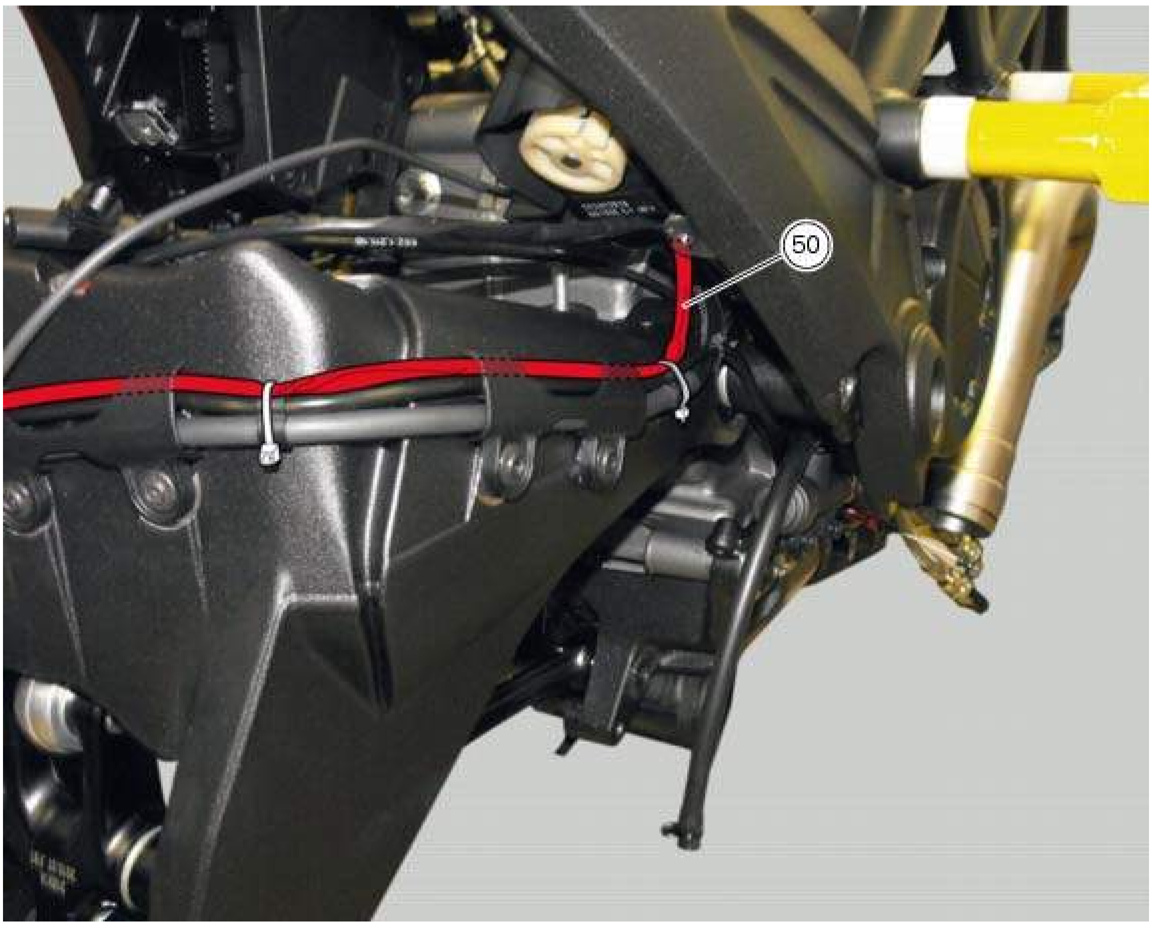

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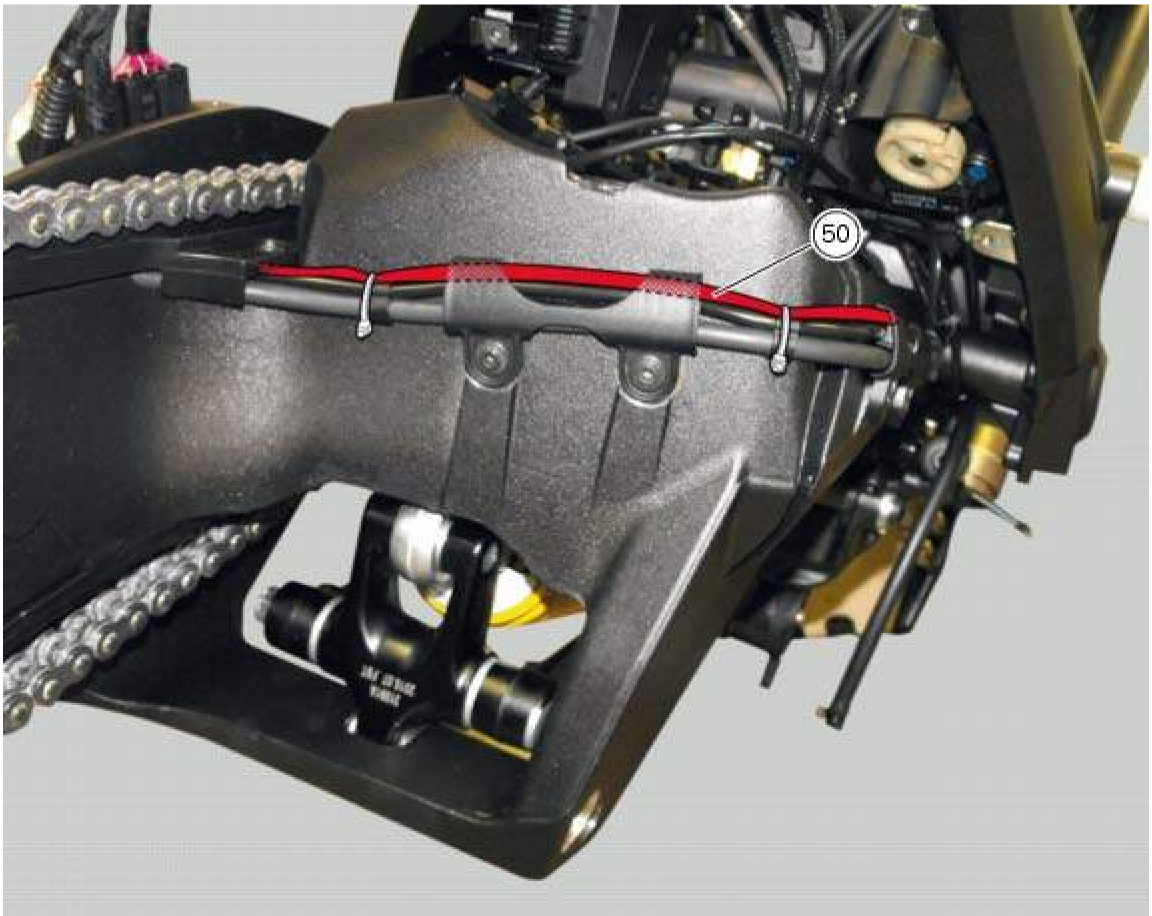

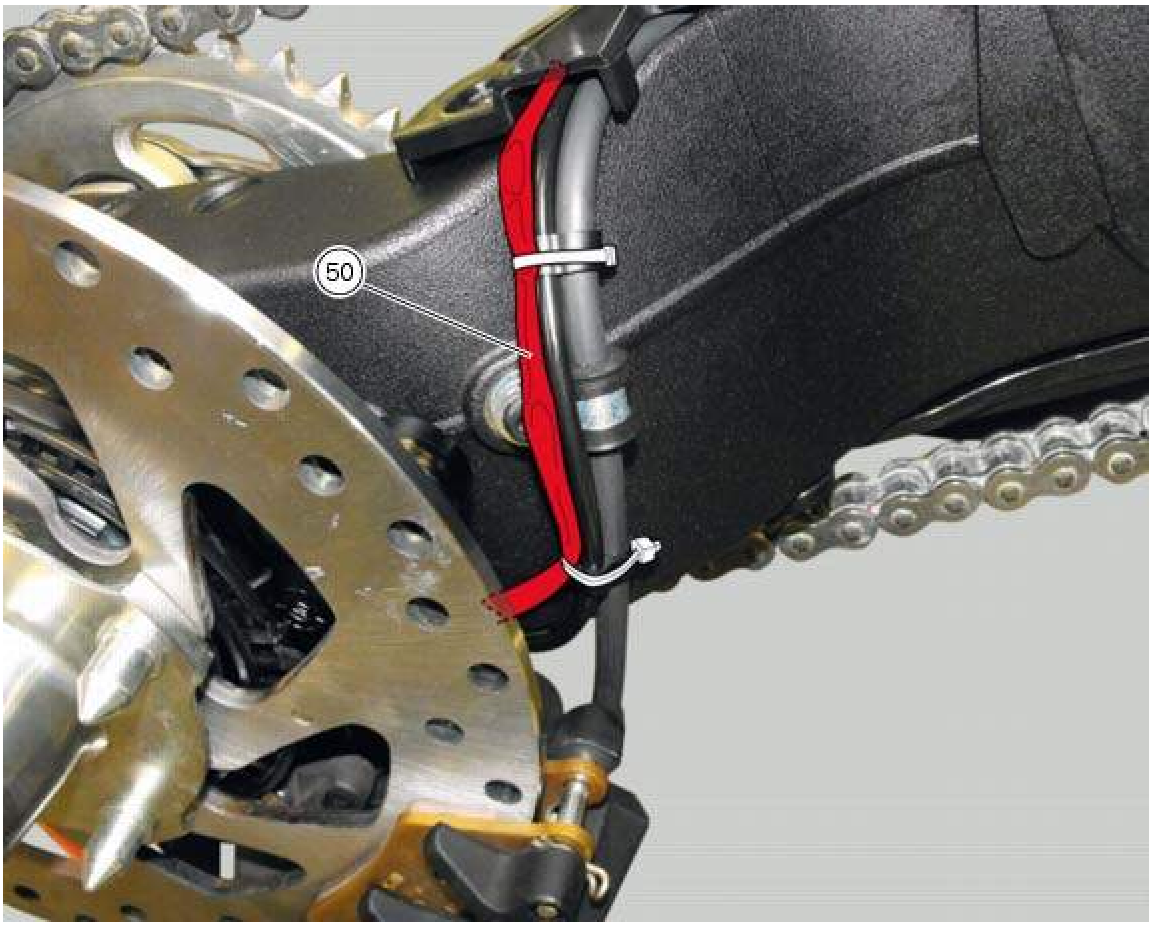

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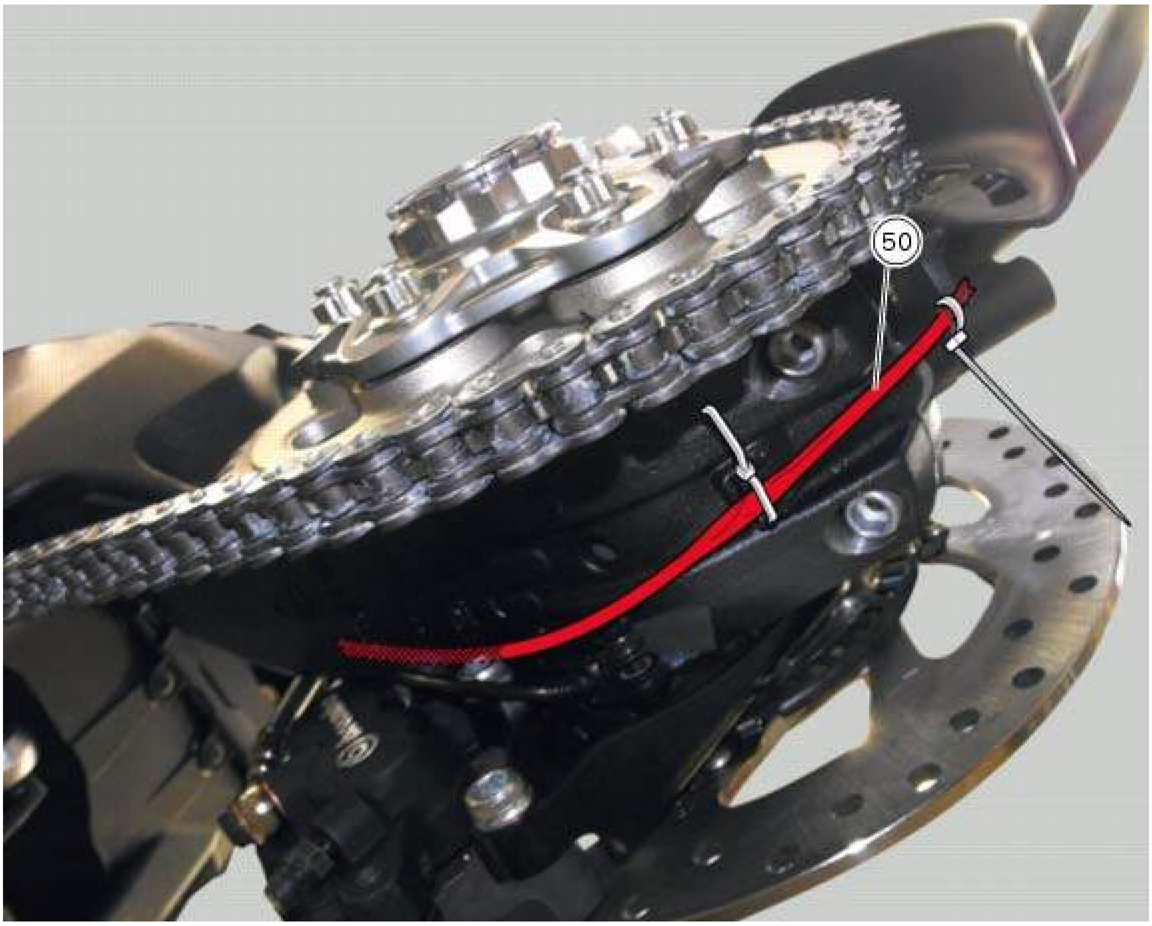

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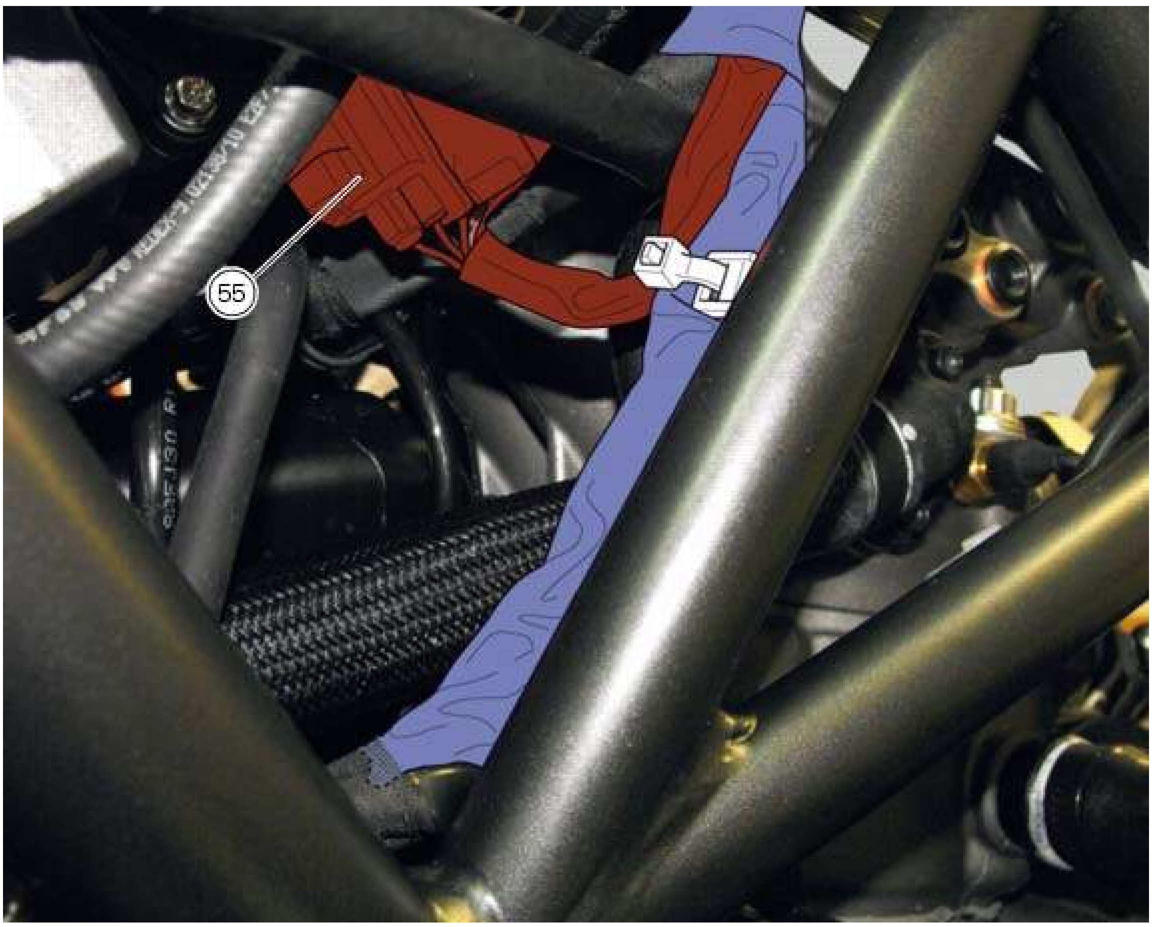

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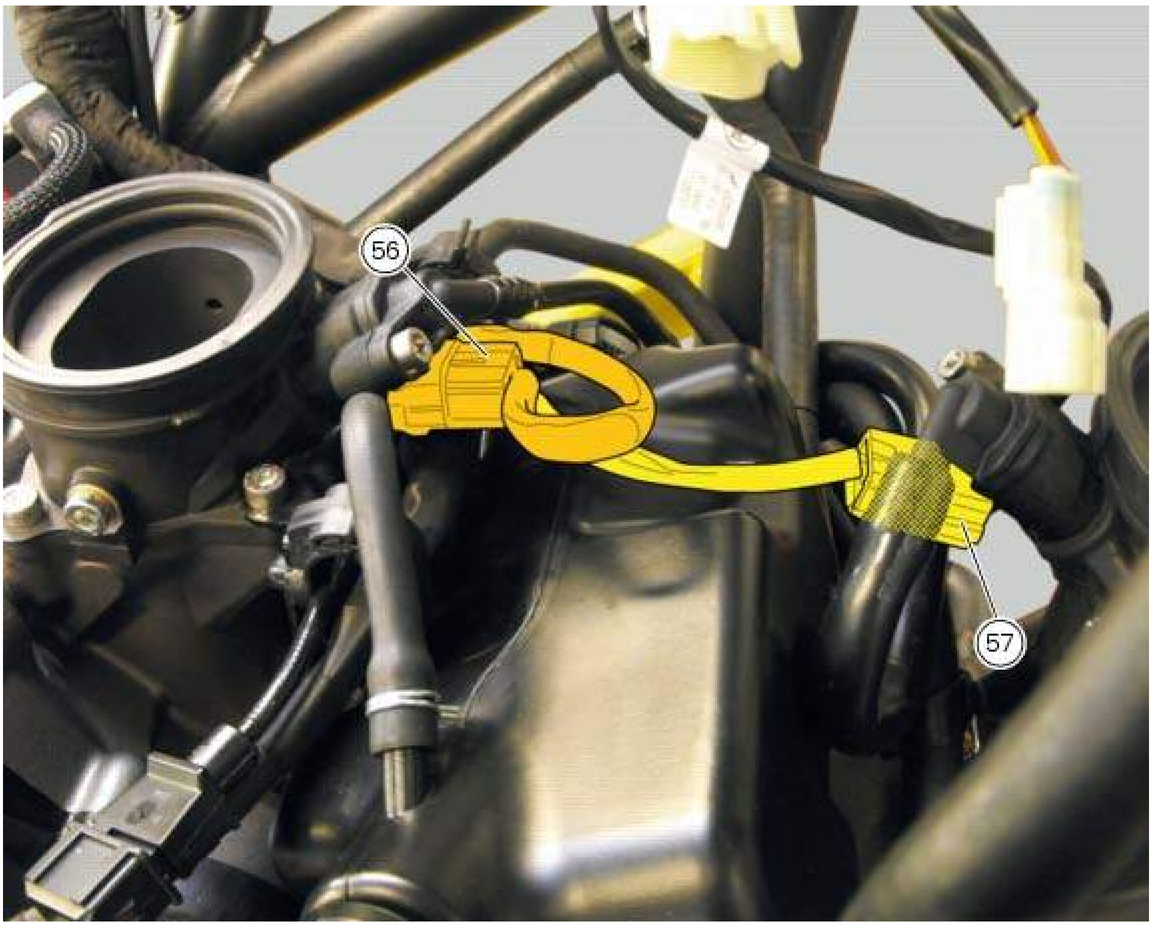

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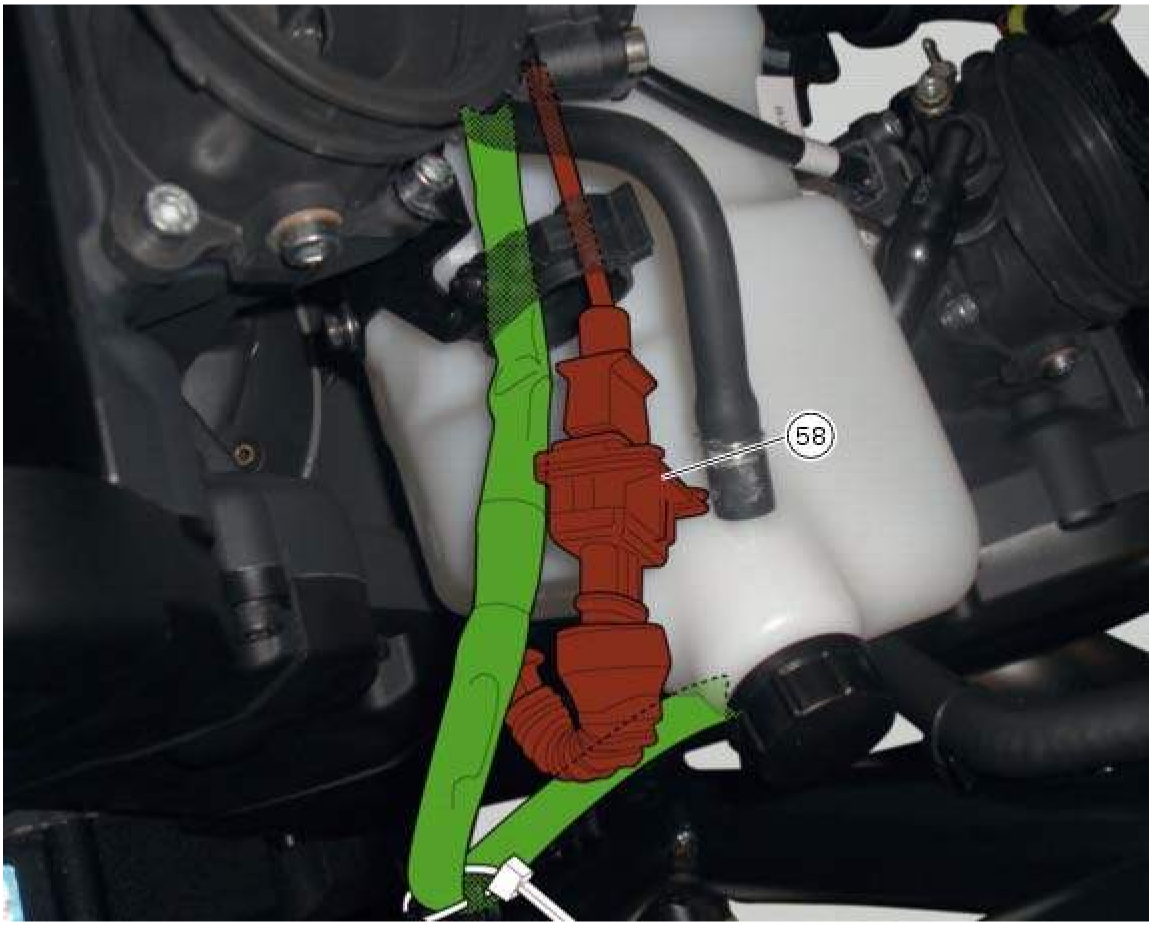

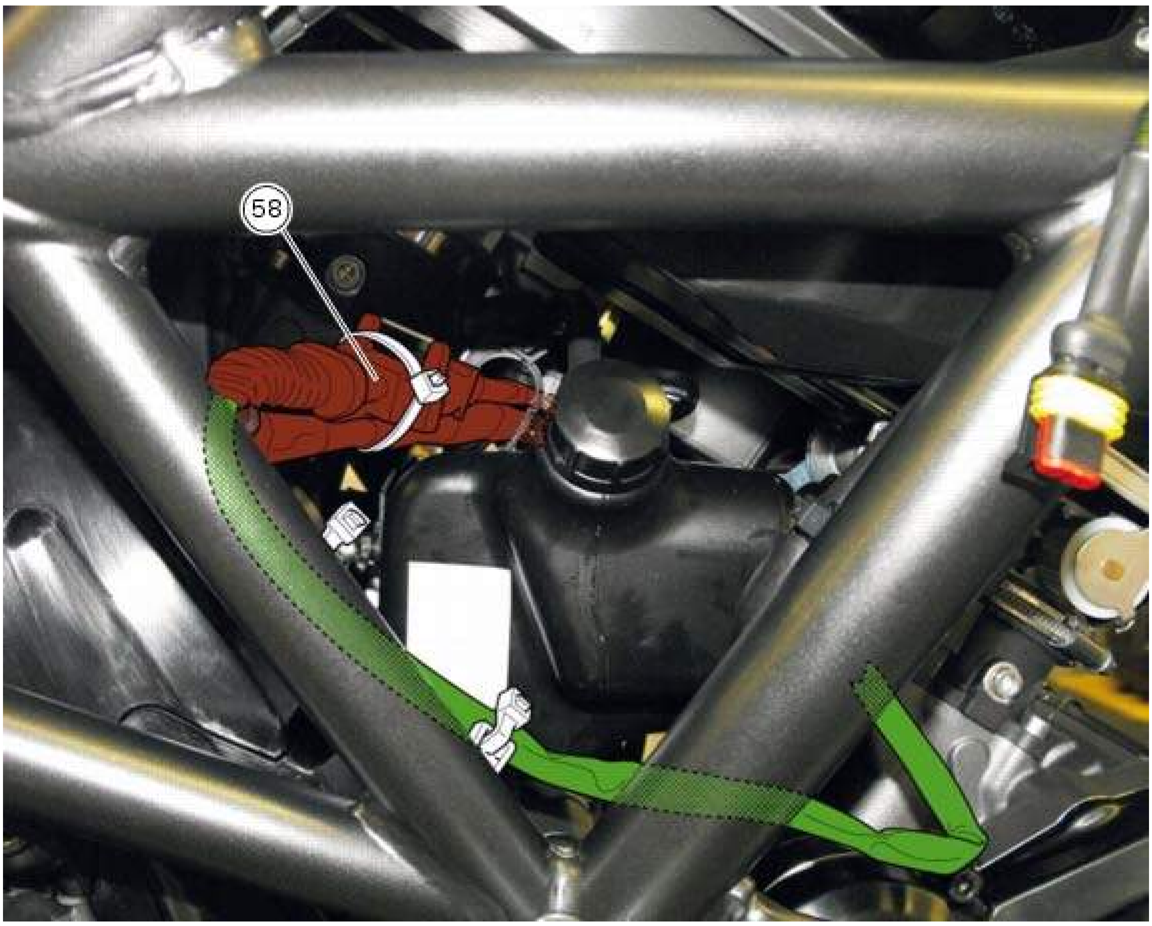

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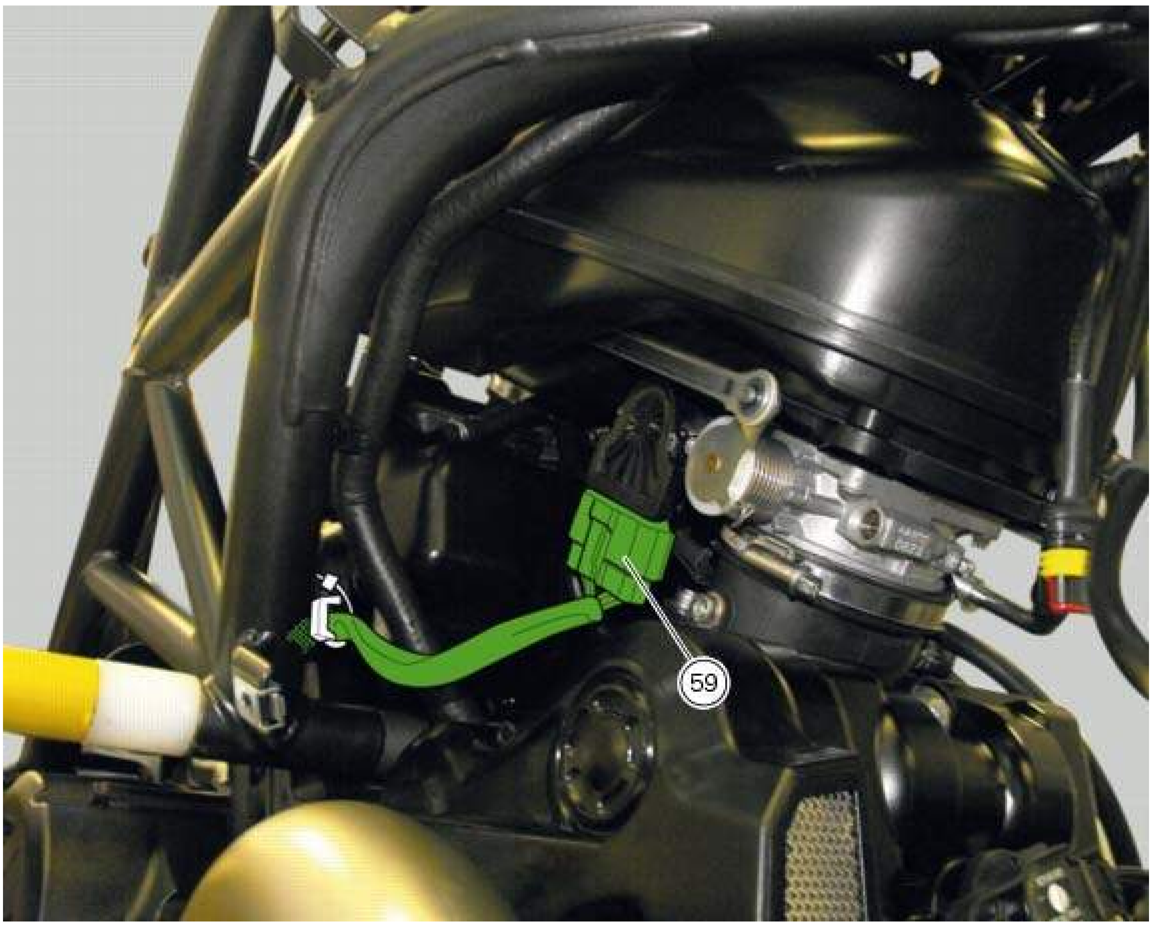

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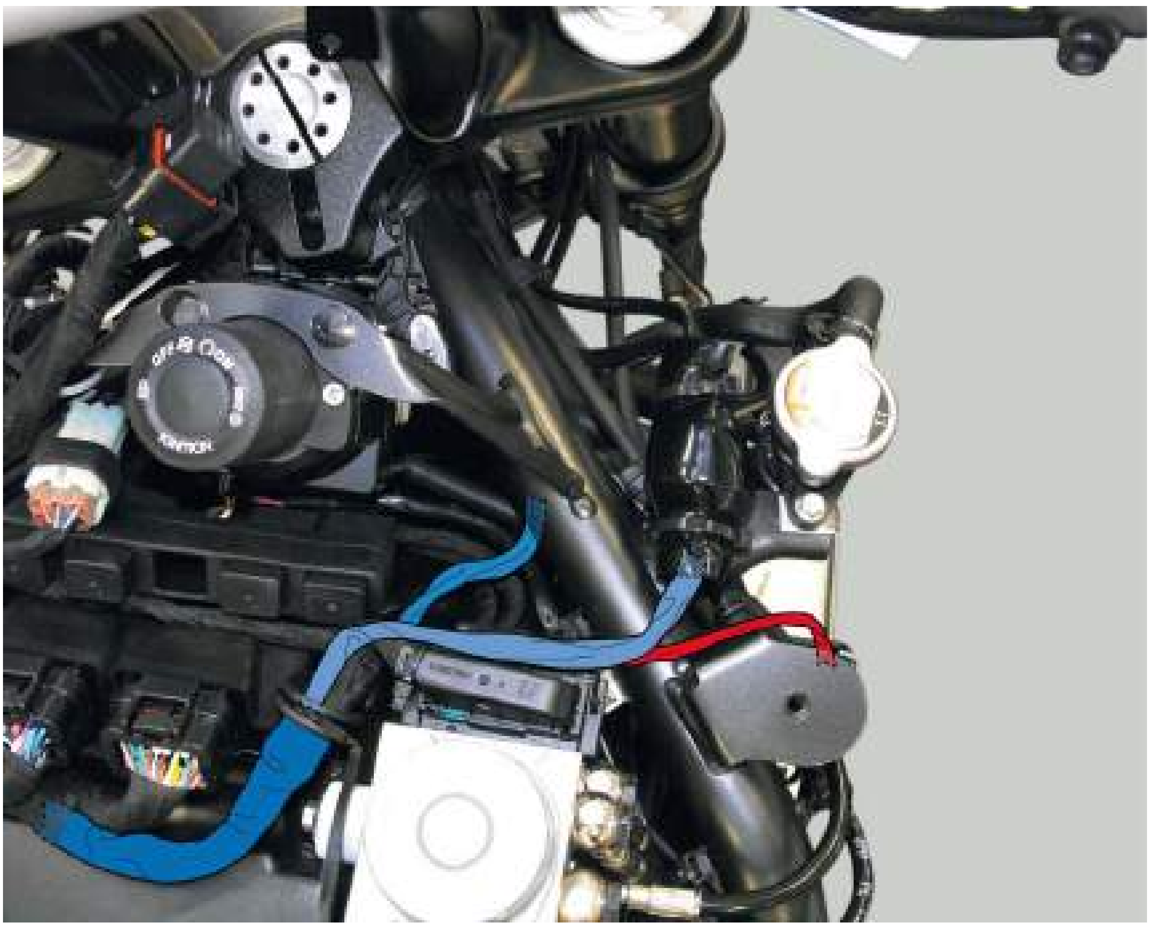

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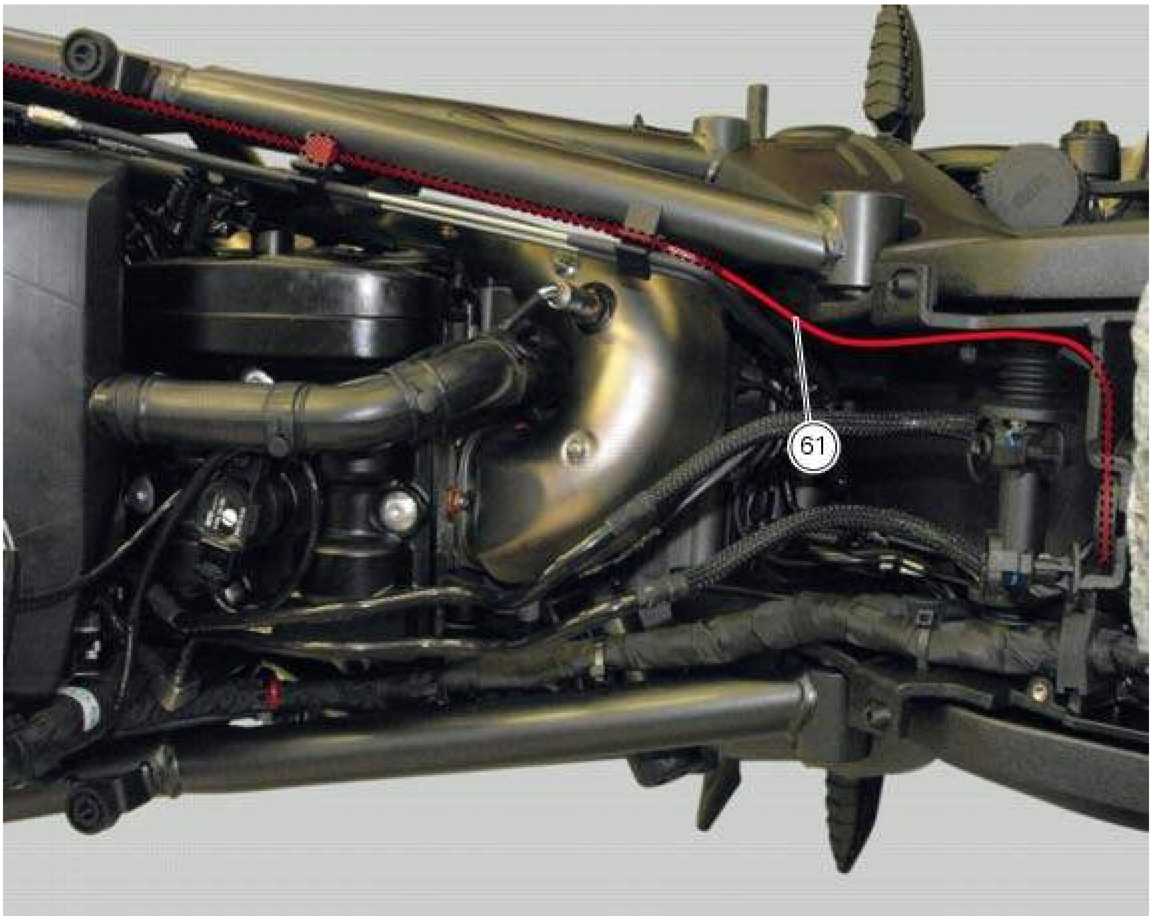

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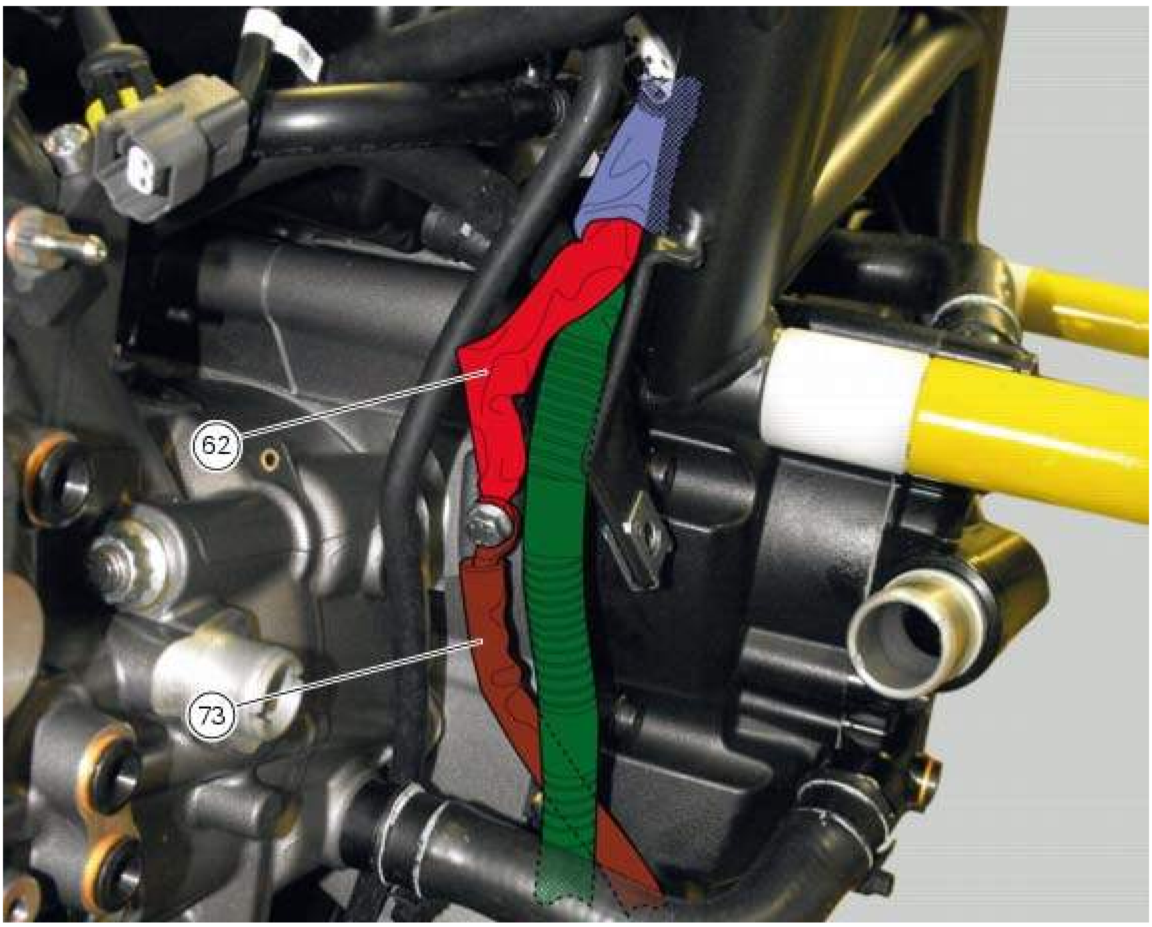

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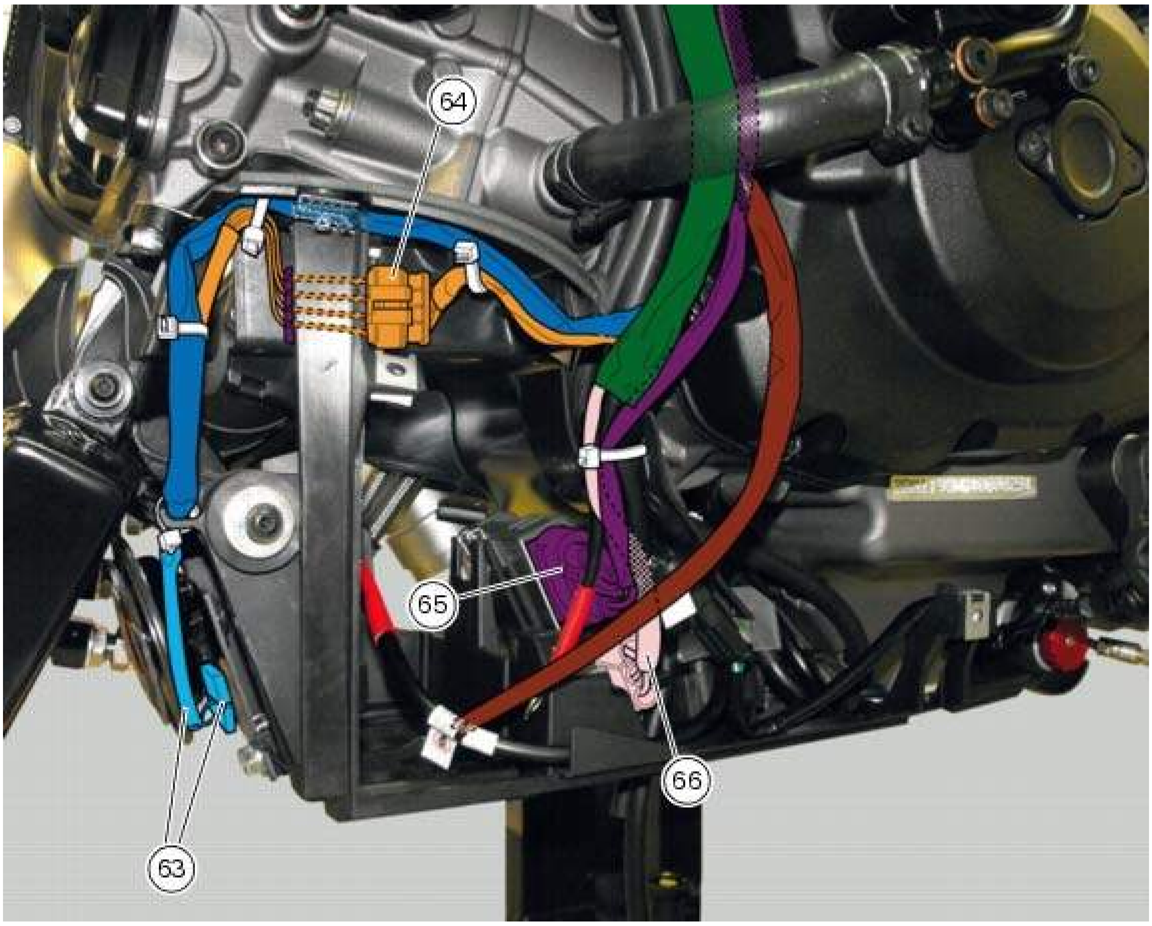

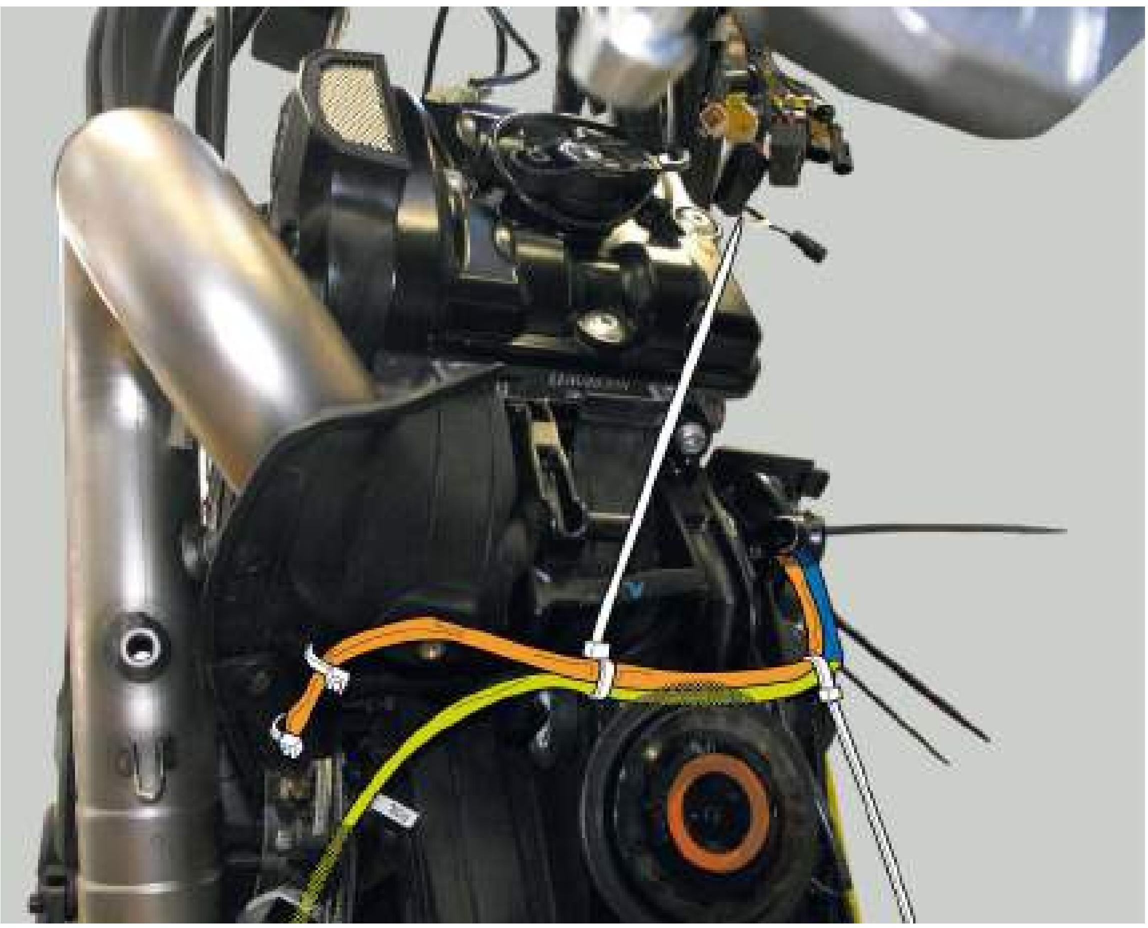

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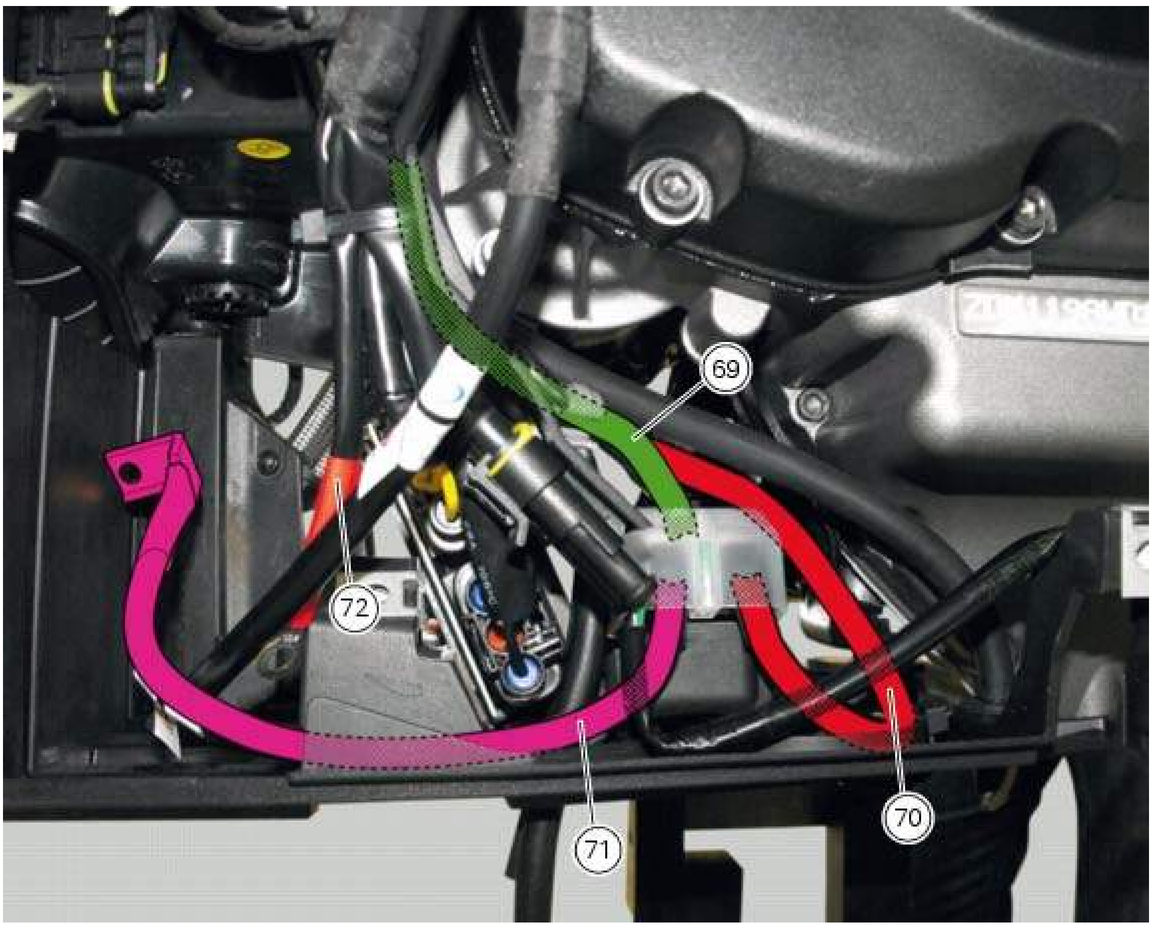

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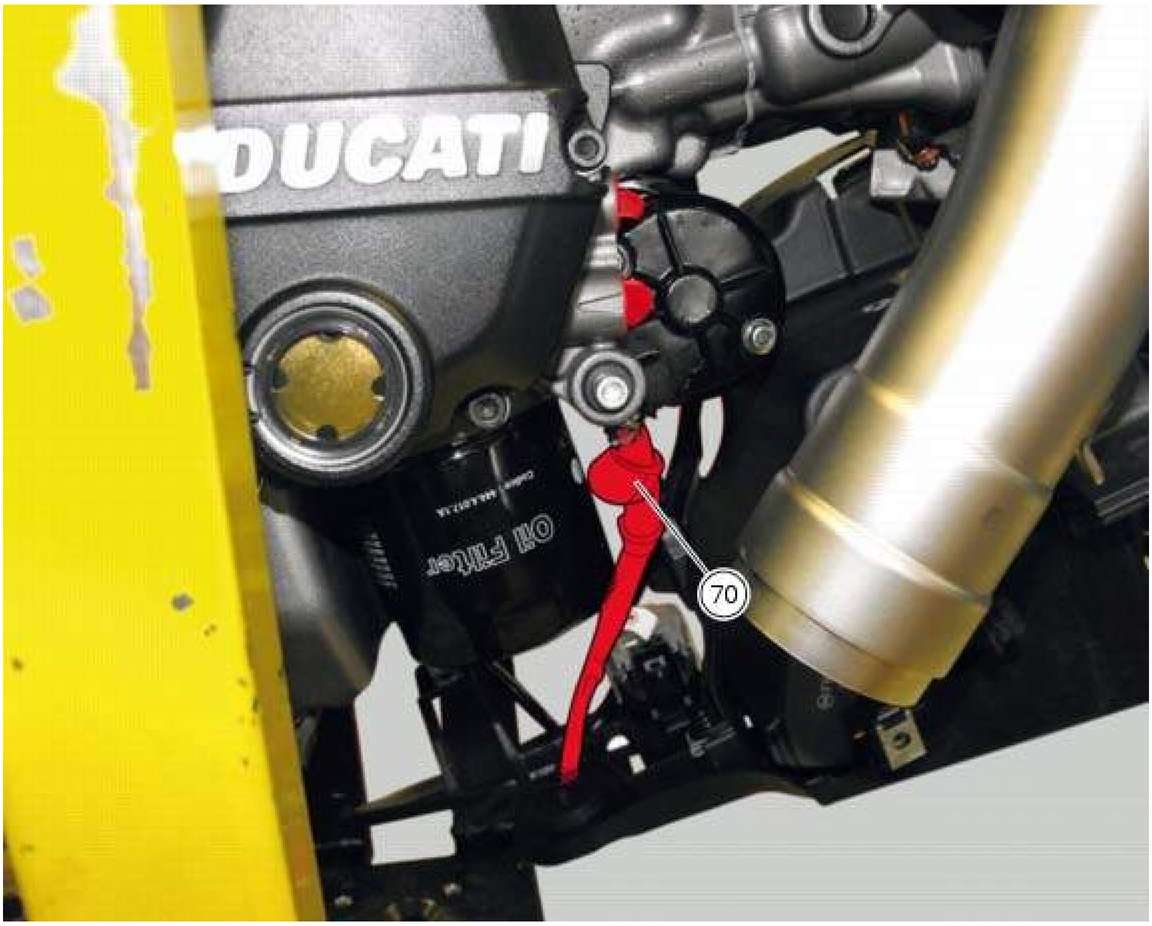

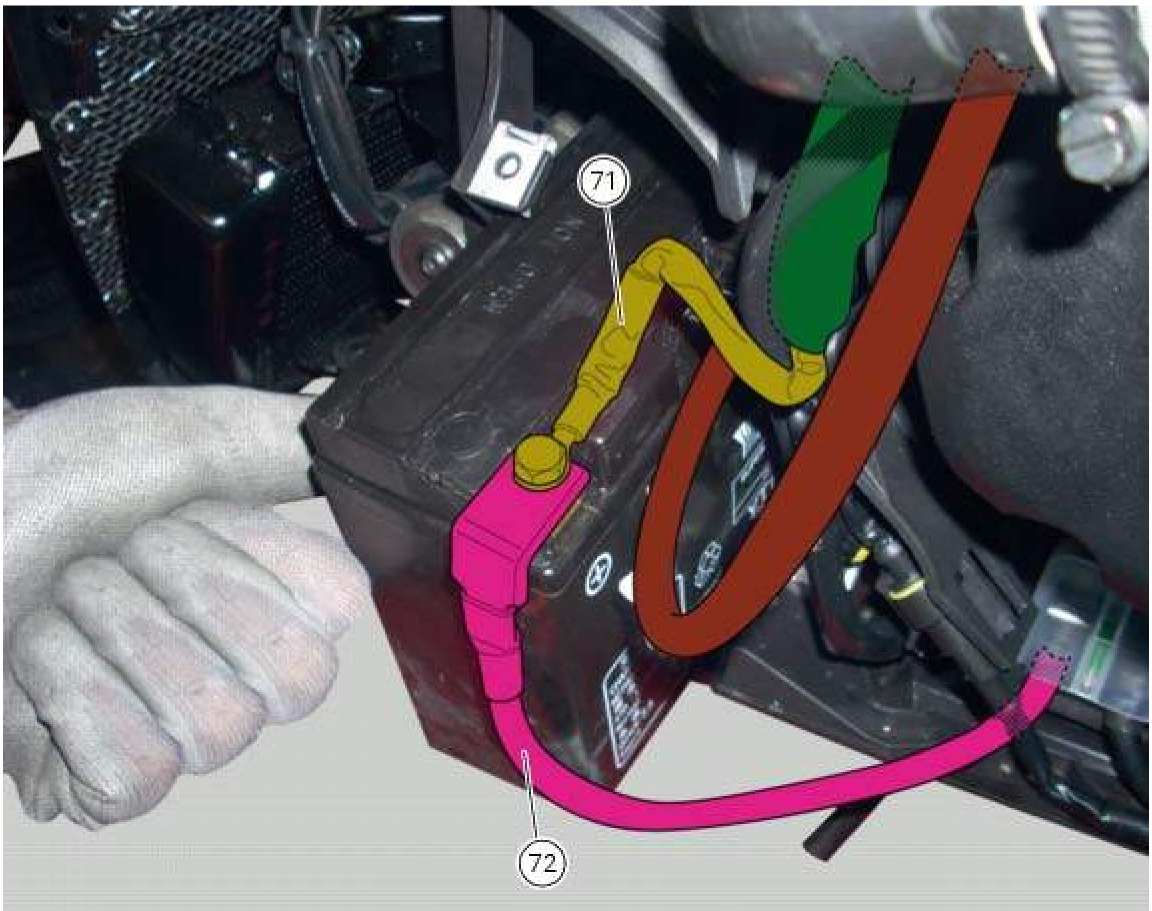

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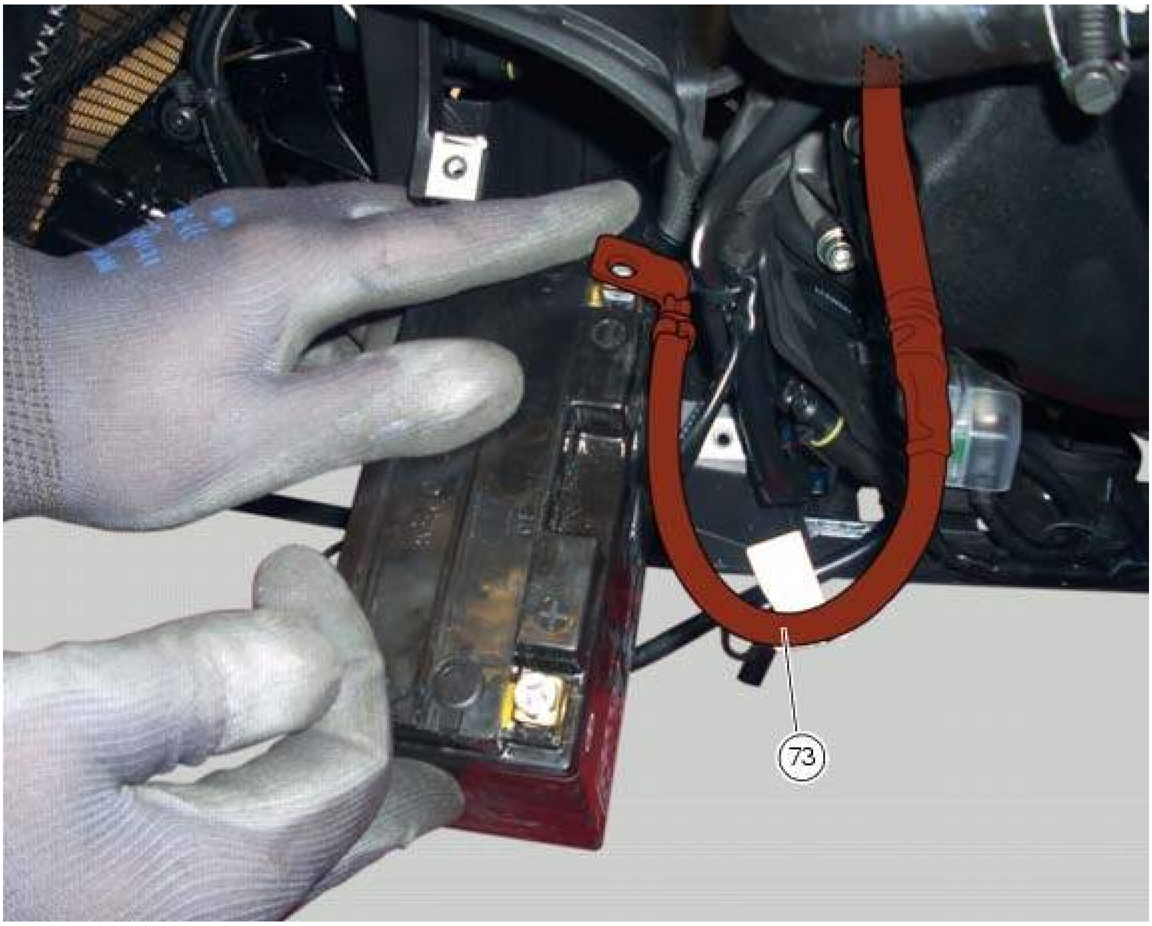
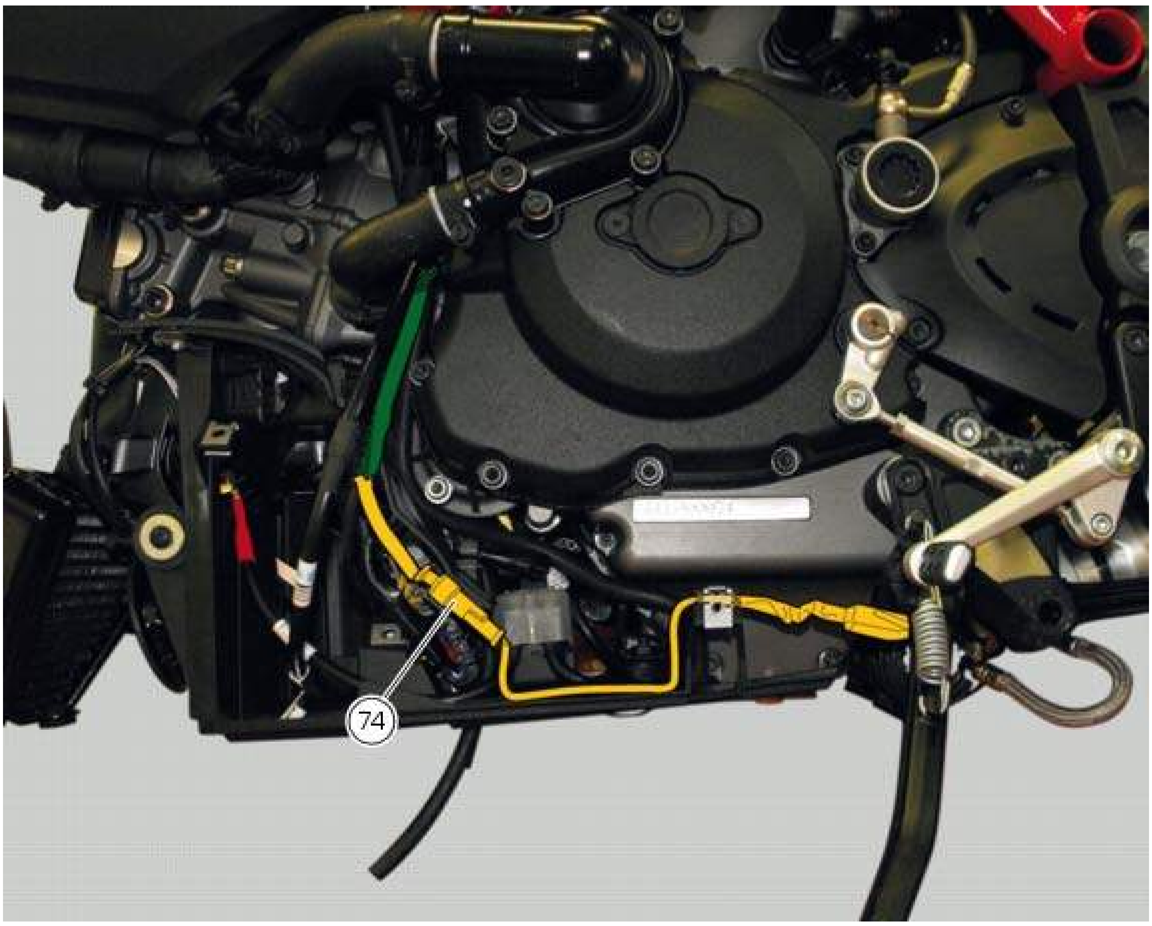




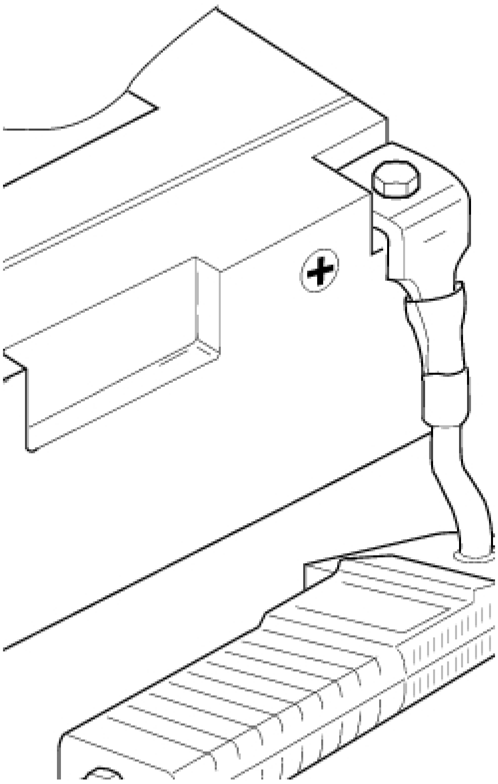
2 -Battery charging system

Checking the battery charging system

To check the current flow of the recharging circuit, use the “DDS” diagnosis instrument, which is equipped with an inductive clamp-type amperemeter: refer to chapter “Testing the battery charging system”, Sect. 6 - 11
With the DDS diagnosis instrument you can determine the engine rpm required for the alternator to produce sufficient current to charge the battery, feed the injection/ignition system and all the electrical equipment on the motorcycle. When applied to a cable, the clamp-type amperemeter detects the magnetic field generated by the current passing through that cable.
The tester performs an automatic calibration routine using its own transducer. If the measured current is a positive quantity, it means that generator is feeding all electric items and charging battery at the same time. A negative value means that charging system is not powering the loads and a significant amount of current must be supplied by the battery, which is discharging at the time of the measurement.
Or it is possible to use a multimeter (Sect. 6 -11, Diagnostic instruments); connect the multimeter probes to the battery terminals, select the DC scale on the instrument and check for the presence of **14.5** V± **0.5** at an engine speed of 3000 rpm.

Important

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



Recharging the battery

Examine the label on the battery showing the check 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.

Important

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

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

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

Use fast charging in emergencies only.

Storing the battery

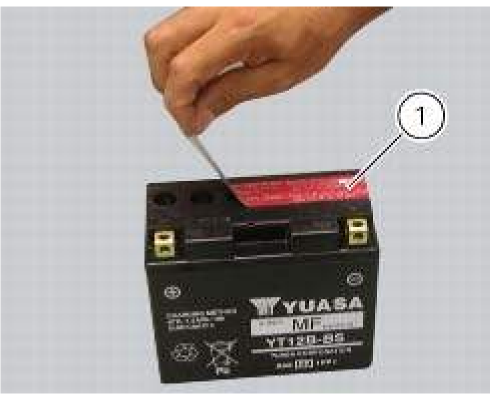
If the battery voltage is less than or equal to 11.5 V, it must be recharged.
Connect the battery charger to the battery.
Use a voltage of 16-17 V.
If the ammeter shows no change, increase the voltage to the maximum of 25 V.
Charge for 5 minutes.
If the ammeter shows a change, return the voltage to 16-17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

Topping up the electrolyte

Warning

Before carrying out any operations on the battery, keep in mind the safety standards (Sect.1 - 3, General safety rules).
The electrolyte in the battery is toxic and can cause burns if it comes into contact with the skin because it contains sulphuric acid. Wear protective clothing, a face-mask and goggles when adding electrolyte. If the liquid comes into contact with the skin, wash thoroughly with cold water. If it comes into contact with the eyes, wash thoroughly with water for 15 minutes and consult an ophthalmologist. In the event of accidental ingestion, drink large quantities of water or milk, and continue with milk of magnesia, beaten egg or vegetable oil. Do not allow sparks, flames, cigarettes or any other heat source to come near the battery, as it produces explosive gases. When recharging or using the battery indoors, make sure that the room is adequately ventilated. Do not inhale the gases produced during recharging. KEEP OUT OF REACH OF CHILDREN.

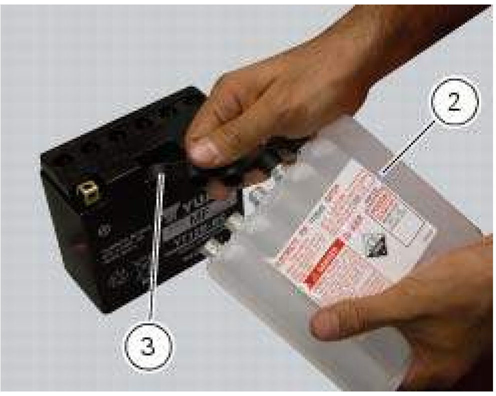
Place the battery on a flat surface. Remove the protective film (1).



Warning

Make certain 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).



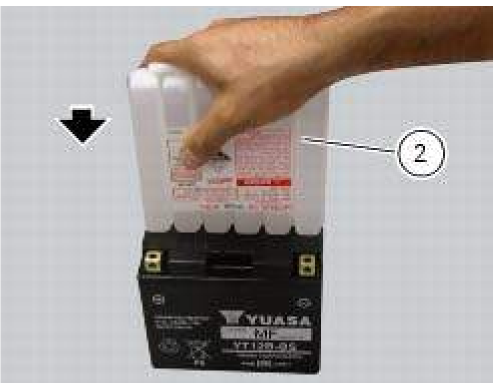
Important

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

Warning

Do not peel or perforate the sealed areas.

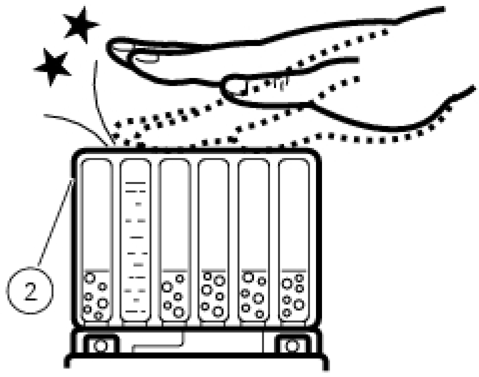
Place the electrolyte container (2) upside down. Align the six sealed elements with the six filler holes on the battery.
Push the container (2) downwards with sufficient force to break the seals and allow the liquid to flow out.



Note

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

Make certain 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 liquid container.

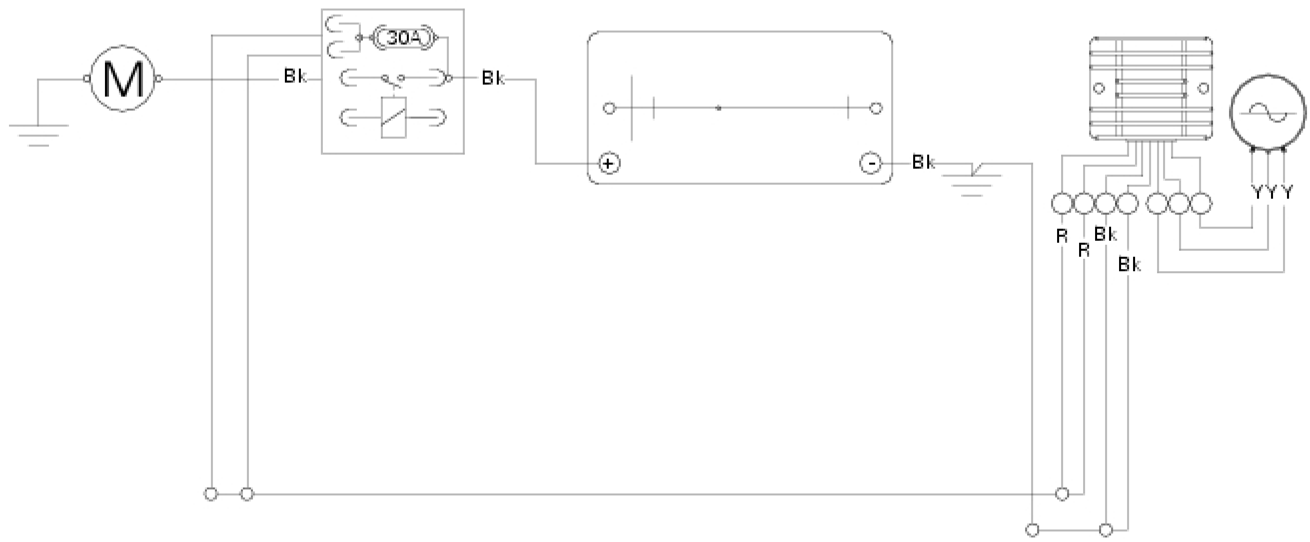
Make sure that all the electrolyte has flowed out. Carefully extract the container (2) from the battery.
Fit the cap bar (3) -previously removed from the electrolyte container (2)- to the battery, ensure the caps plug off all filler holes.

3 -12 Ah batteries: leave to stand for at least **30** min.
12 Ah batteries: leave to stand for at least **1** hour.
Rest the cap strip on the filler holes without fixing it. Recharge the battery as described in the paragraph “Recharging the battery”.

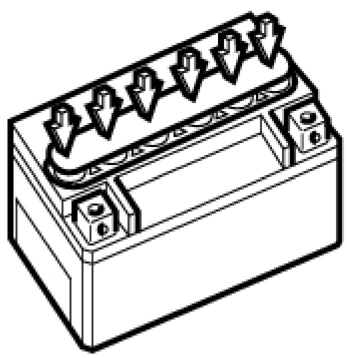
Note

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

Battery charging system



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



Battery

Battery safety rules

Warning
Before carrying out any operations on the battery, keep in mind the safety standards (Sect. 1 - 3, General safety rules).
When under charge, batteries produce explosive gases. Keep batteries away from heat sources, sparks or open flames.

Instructions for use

The battery is a sealed, maintenance-free type and therefore requires no servicing installation.

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

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

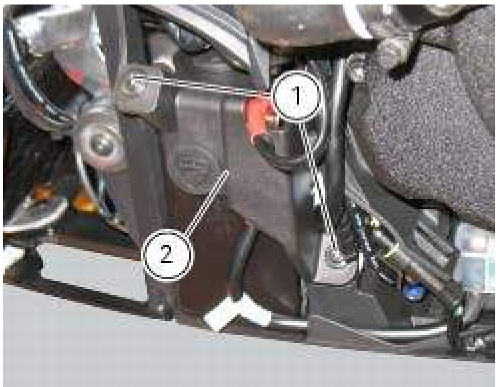
Important
If the motorcycle is left unused for more than 30 days, remove the battery and store it in a safe, cool place.

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

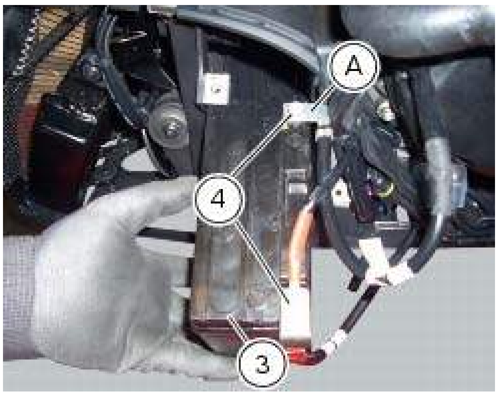
Removal of the battery

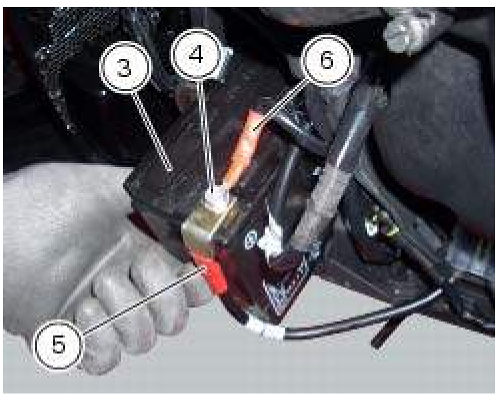
Operations	Section reference
Remove the left belly fairing	5 - 5, Removal of belly fairing

Undo the screws (1) and remove the battery retaining bracket (2).

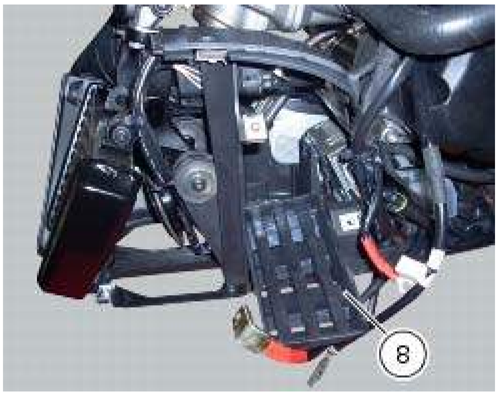


Slide out the battery (3) from its housing and, always starting from the negative terminal (-), loosen the screws (4). Remove the positive cable (5), the ABS positive cable (6) from the positive terminal, and the negative cable (7) from the negative terminal.



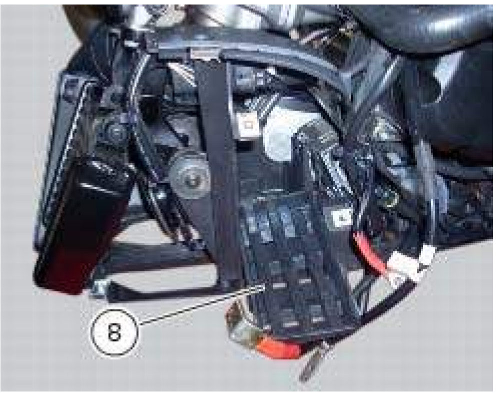


Remove the battery drift (6) on the battery support (7).

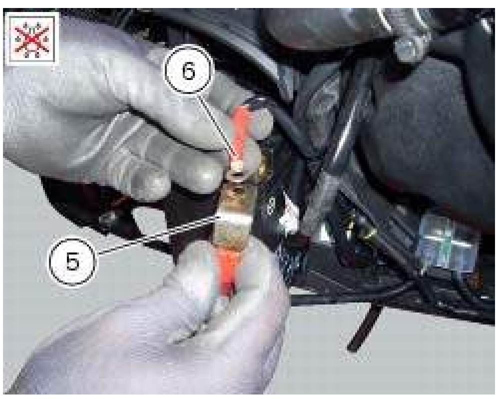


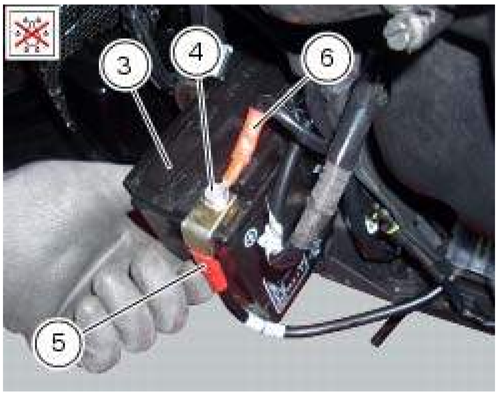
Refitting the battery

Position the battery drift (6) on the battery support (7).

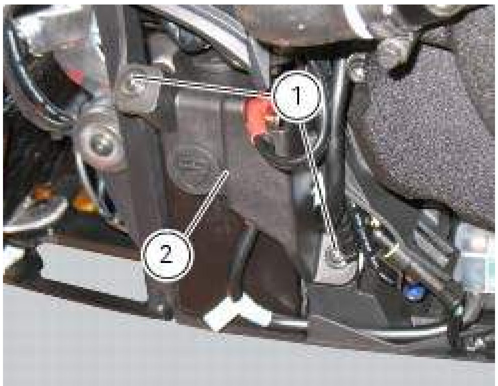


Place the battery (3) in its compartment by connecting first cable (7) to the negative terminal with the screw (4).
Connect the positive cable (5) and then the ABS positive cable (6) to the positive terminal with the screw (4).
Tighten the terminal screws (4) to a torque of 10 Nm ± 10% (Sect. 3 - 3Frame torque settings) and apply grease around the battery terminal clamps to prevent oxidation.





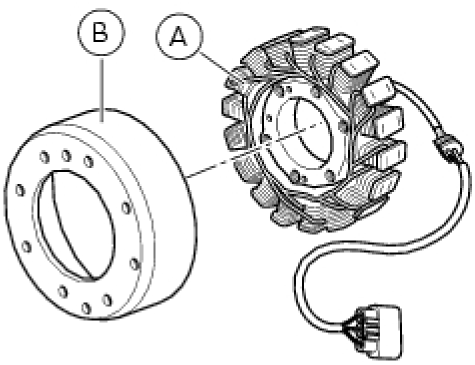
Place the battery (3) on its support, then position the retaining bracket (2) and tighten the screws (1) to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



Operations	Section reference
Reassemble the left belly fairing	5 - 5, Reassembly of belly fairing

Alternator

It is equipped with a **12** V, **430** W generator, consisting of a fixed element (stator, A) located on the generator cover and of a movable element (rotor, B) fixed to the crankshaft.



Note

To check the battery charging system for faults, use the DDS diagnosis instrument and follow the instructions given in the paragraph, "Testing the battery charging system" (Sect. 6 - 11).

The absolute value of voltage measured across the terminals of two of the three yellow cables (the measured value will be the same whichever combination of cable is used) must be within the range indicated in the table below.
(Ambient temperature: 35 °C - 70 °C)

Important

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

Engine speed	1500	2500
V effective (idle speed)	**25.9**	**43**
V effective (nominal)	**28.3**	**46.7**
V effective (maximum)	**30.3**	**50.0**

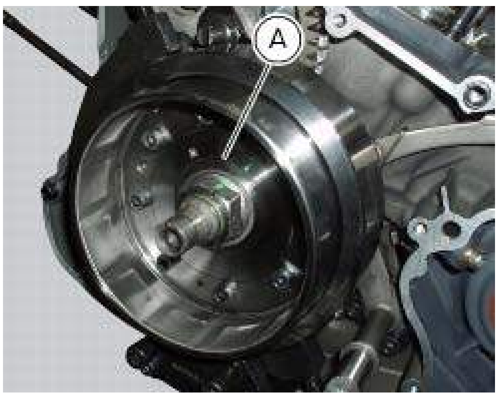
Values significantly lower than those indicated above can be due to:
- partially demagnetised rotor;
- short-circuited windings.

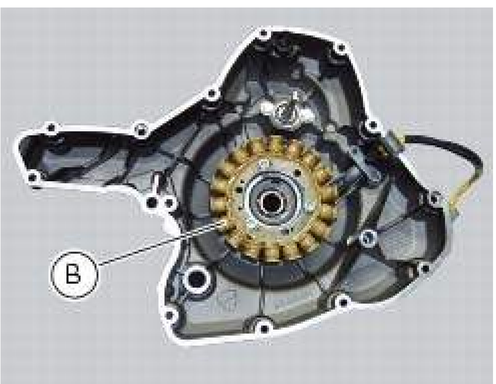
In the above cases the whole alternator assembly (rotor and stator) should be renewed.
If checks have a favourable outcome, reconnect the alternator to the regulator with ignition key on OFF. Make sure that no cables are damaged or disconnected.

Removal of the alternator

Operations	Section reference
Drain the cooling system	4 - 3, Changing the coolant
Remove the front sprocket cover	7 - 14, Removing of the front sprocket
Drain the engine oil	4 - 3, Changing the engine oil and filter cartridge
Remove the clutch pushrod	7 - 8.2, Removal of the clutch transmission unit
Remove the pump-cylinder hoses	9 - 5, Removal of the cylinder/piston assembly
Remove the water pump-radiator hose	9 - 3.3, Removal of the water pump

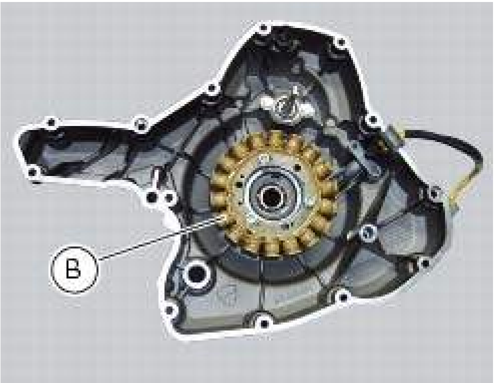
Disconnect the cables of the alternator-side electric system (Sect. 6 -1, Routing of wiring on frame).
Remove the generator cover, the stator (A) and the rotor (B) (Sect. 9 - 8, Removal of the generator cover).





Refitting the generator

Fit the rotor (B), the stator (A) and the alternator-side crankcase cover.
Connect the cables of the generator side electric system (refer to the table in chapter “Routing of wiring on frame”, Sect. 6 - 1).



Operations	Section reference
Refit the water pump-radiator hose	9 - 3.3, Refitting the water pump
Refit the pump-cylinder hoses	9 - 5, Refitting the cylinder/piston assembly
Refill the cooling system	4 - 3, Changing the coolant
Refit the clutch control piston	7 - 8.2, Refitting the clutch transmission unit
Refit the sprocket cover	7 - 14, Refitting the front sprocket
Refill the system with engine oil	4 - 3, Changing the engine oil and filter cartridge

Rectifier-regulator

The rectifier (1) is placed in the electrical components compartment.
The rectifier/regulator consists of an aluminium casing containing the diodes that rectify the current produced by the alternator. It also contains an electronic device that regulates the current supplied by the alternator in accordance with battery voltage.
If the battery is drained, the current has the value necessary to restore optimum operating conditions of the battery. In contrast, if the battery is fully charged, the current value will be lower.

Note

Control the charger current by using the DDS diagnosis instrument (Sect. 6 - 11, Diagnostic instruments).

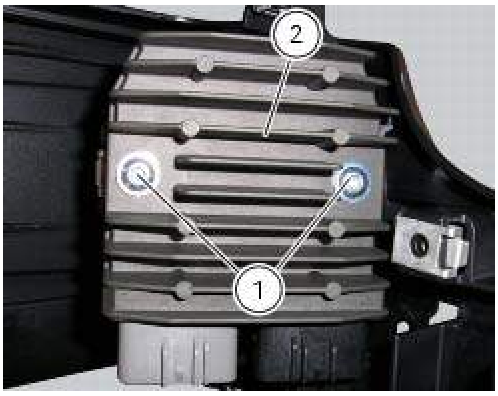
Removal of the regulator

Operations	Section reference
Remove the electrical components support	5 - 6, Removing the electrical components support

Undo the two fixing screws (1) of the voltage regulator (2) and remove it together with them.

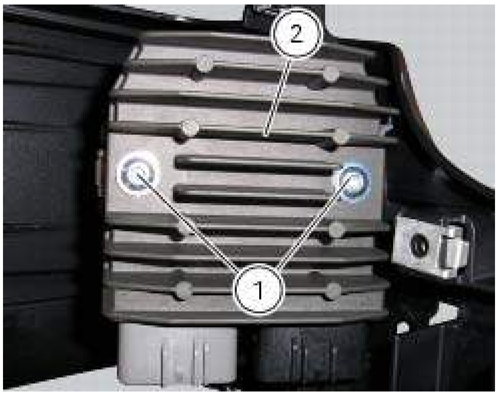
Important

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



Refitting the regulator

Position the regulator (1) on the support.
Tighten the screws (1) to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



Important

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

Operations	Section reference
Reassemble the electrical components support	5 - 6, Reassembling the electrical components support

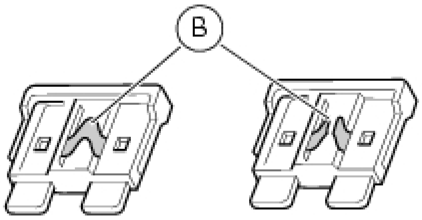
Regulator fuse

The 30 A fuse is located inside the solenoid starter in the electrical components compartment.

Operations	Section reference
Remove the left belly fairing	5 - 5, Removal of belly fairing

Remove the fuse cap (A) to reach it.

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



Important

To avoid possible short circuits, replace the fuse in key OFF condition.

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.

Operations	Section reference
Reassemble the left belly fairing	5 - 5, Reassembly of belly fairing

3 -Electric starting system

Note

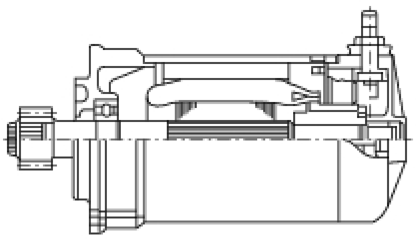
The references of the elements listed below are those of the "Wiring diagram", Sect. 6 -1.

Electric starting system

The key components of the electric starting system are a solenoid (6) and a starter motor (5) fed by the battery (7).

Starter motor

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

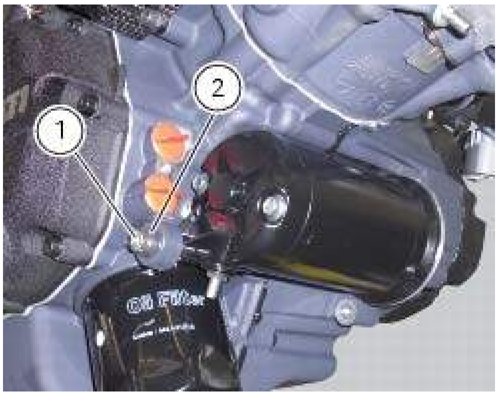


The starter motor is highly compact and reliable and therefore rarely gives any type of problem. In case of troubles, ensure that the starter motor cable terminal is properly tightened under the nut and shows no oxidation. If the terminal is properly tightened and free from corrosion, remove the starter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

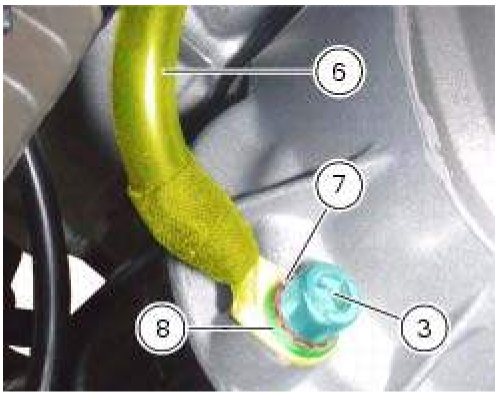
Removing the starter motor

Operations	Section reference
Remove the silencer and the vertical exhaust pipe	8 - 8, Removal of the exhaust system
Remove the left belly fairing	5 - 5, Removal of belly fairing
Drain the engine oil	4 - 3, Changing the engine oil and filter cartridge
Empty the coolant out of the cooling system	4 - 3, Changing the coolant
Remove the pump-cylinder hoses	9 - 5, Removal of the cylinder/piston assembly
Remove the water pump-radiator hose	9 - 3.2, Removing the water radiators
Remove the generator cover and the flywheel/alternator assembly	9 - 8, Removal of the generator cover
Remove the timing gears	9 - 9.1, Removal of the timing gears
Remove the starter motor idler gear	9 - 9.1, Removal of the starter motor idler gear

Remove the fixing screw (1) and, if necessary, the insert (2).



Unscrew the fixing screws (3): the lower screw (3) fixes also the ground cable (6). Collect the toothed washer (7) and the washer (8).



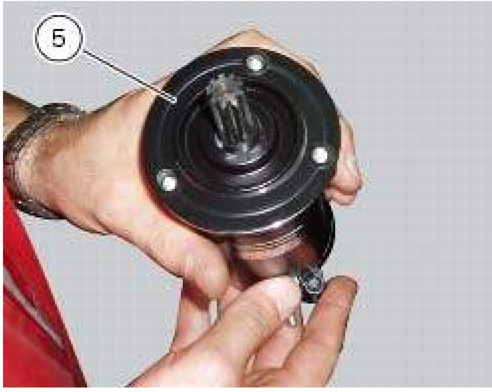
Note

The starter motor retaining screws are assembled with threadlocker.

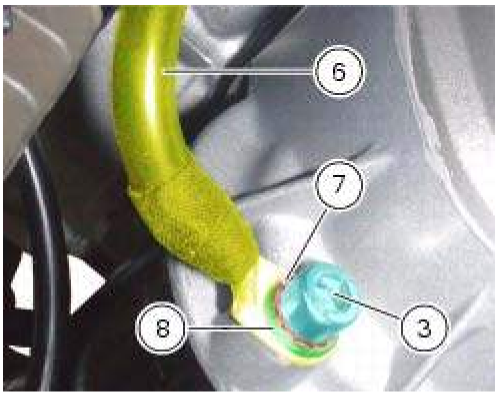
Slide out the starter motor and gasket (5).

Refitting the starter motor

Inspect the condition of the gasket (5) and renew if necessary.

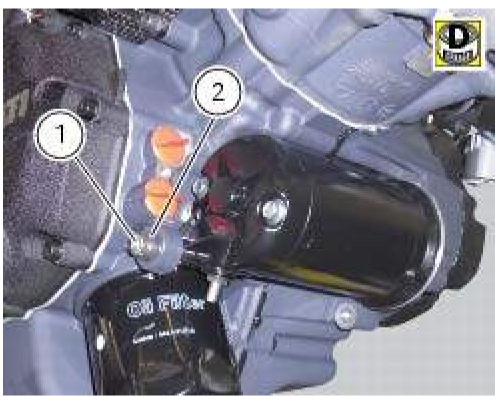


Position the gasket (5) and the starter motor on the crankcase. Start the retaining screws (3) with recommended threadlocker; the lower one (3) with the ground cable (6), the toothed washer (7) and the washer (8). Tighten the retaining screws (3) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings).



Locate the insert (2) (if removed) in the crankcase half, hand tighten the fixing screw (1) and tighten it to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Place the starter motor/solenoid starter cable (4) and tighten the retaining nut to a torque of 5 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

Important
Fill the cap with protective grease before fitting it on the starter motor.



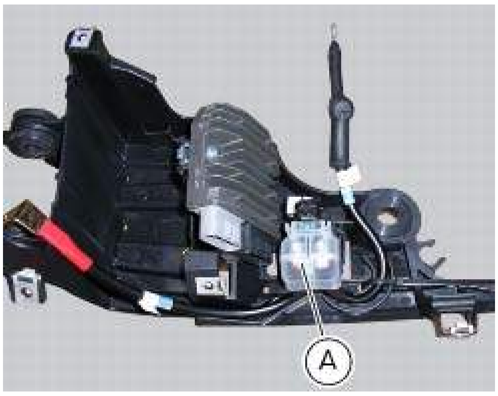
Operations	Section reference
Refit the timing cam chain idler	9 - 9.1, Refitting the timing gears

gears	
Refit the starter motor idler gear	9 - 9.1, Refitting the starter motor gear
Refit the flywheel/alternator assembly and the generator cover	9 - 8, Refitting the flywheel-alternator assembly
Refit the water pump-radiator hose	9 - 3.2, Refitting the radiator
Refit the pump-cylinder hoses	9 - 5, Refitting the cylinder/piston assembly
Refill the cooling system	4 - 3, Changing the coolant
Fill the system with engine oil	4 - 3, Changing the engine oil and filter cartridge
Reassemble the left belly fairing	5 - 5, Reassembly of belly fairing
Reassemble the silencer and the vertical exhaust pipe	8 - 8, Removal of the exhaust system

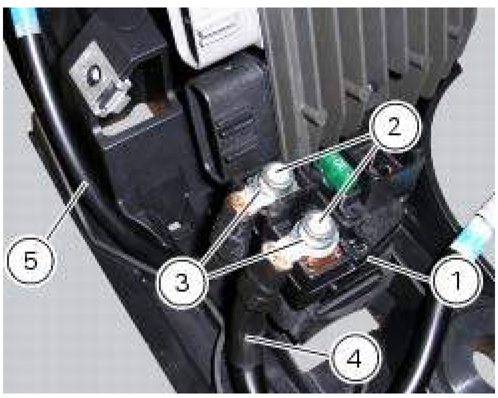
Solenoid starter

Operations	Section reference
Remove the left belly fairing	5 - 5, Removal of belly fairing

Remove the protection cover (A).



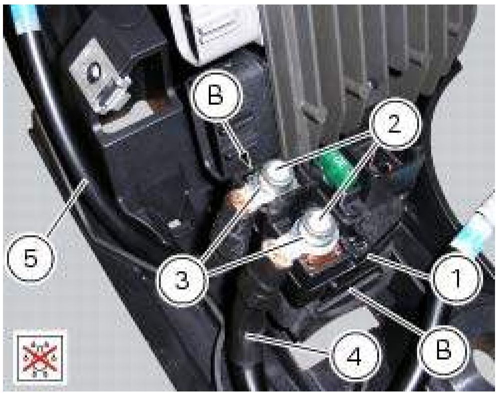
Undo the screws (2), taking care to collect the spring washers (3).
Remove the starter motor-solenoid cable (4) and the solenoid-battery cable (5).
Remove the starter solenoid (1) sliding it upwards.



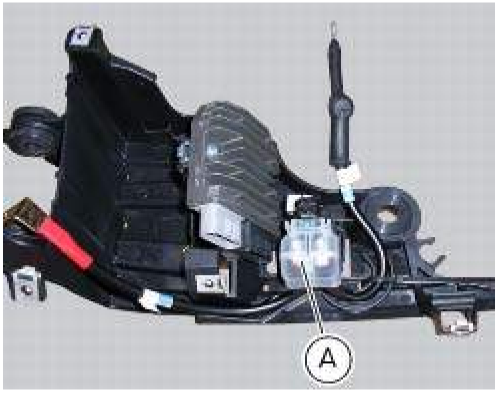
Checking operation of the starter solenoid

To check the solenoid starter proceed as indicated in Sect. 6 - 8, “Starter motor relay“.

Ensure that the terminals are not oxidised.
Position the solenoid-starter motor cable (4) and the solenoid-battery cable (5) on the solenoid terminals.
Start the screws (2) fitting the spring washers (3).
Tighten the screws (2) to a torque of 4 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Apply waterproof spray in the area of the screws.
Fix the starter solenoid (1) to the battery support inserting it in the tongues (B).



Refit the protection cover (A) inserting it on the solenoid starter guides until it engages with the tabs on both sides of the solenoid starter.



Operations	Section reference
Reassemble the left belly fairing	5 - 5, Reassembly of belly fairing

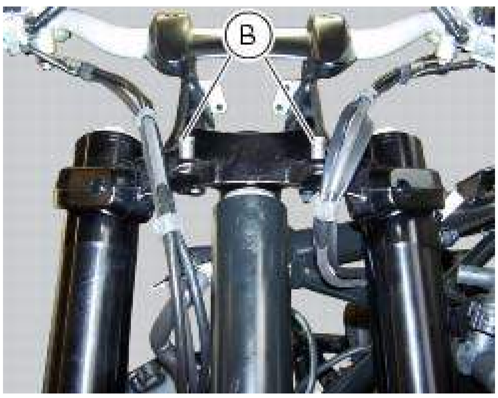
4 -Lights and indicating devices

Renewal of the headlight

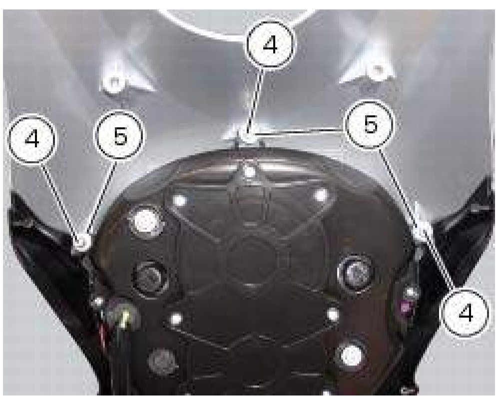
Disconnect the headlight connectors (A) from the main wiring (refer to the tables of paragraph "Routing of wiring on frame", Sect. 6 - 1).

Loosen nuts (2) that fix the front optical unit to the bottom yoke, and recover the washers (3).

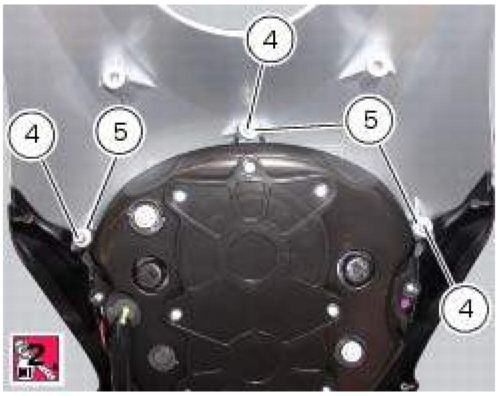
Remove the complete front optical unit by sliding it upwards and releasing it from pins (B) of the supporting bracket.



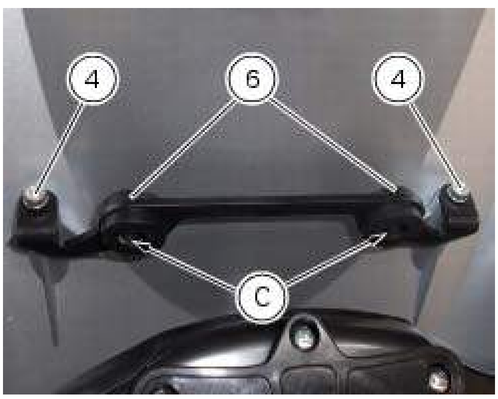
Release the headlight from the front optical unit support by loosening the screws (4) and recovering the washers (5).



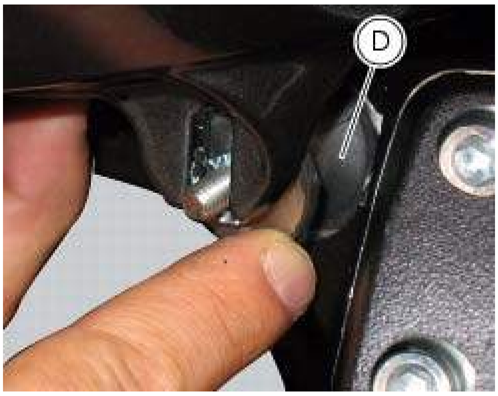
Refit the headlight on the front optical unit support, insert the spacers with collars (5) and the screws (4).
Apply the recommended threadlocker to the screws (4).
Tighten the screws (4) to a torque of 6 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

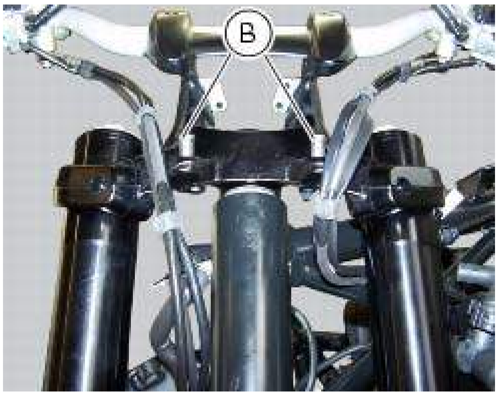


Check for the pads (6) on the supporting bracket.
Apply the recommended threadlocker to the screws (4).
Tighten the screws (4) to a torque of 6 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



Refit the front optical unit by placing its lower part on the pads (D) and inserting the pins (B) into the eyelets (C) of the supporting bracket.





Fix the front optical applying a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings) to the nuts (2) with washers (3).

Reconnect the headlight connectors (A) to the main wiring (refer to the tables of paragraph “Routing of wiring on frame“, Sect. 6 - 1).

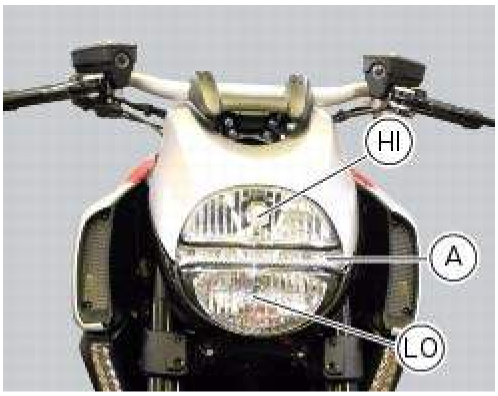
Changing bulbs

Changing the headlight bulbs

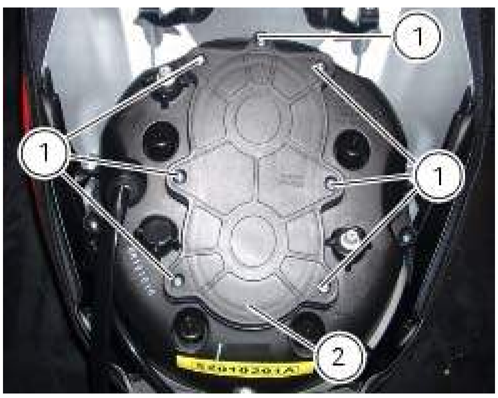
Before replacing a burnt out light bulb, ensure that the replacement bulb has the same voltage and power rating as specified for the lighting device in question (Sect. 3 - 1.1, Lights/instrument panel).

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

The position of the light bulbs in the headlight is as indicated below: low beam (LO), high beam (HI) and parking light (A).

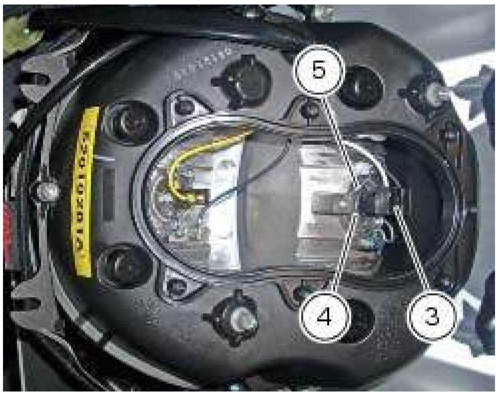


Remove the headlight, as described in the paragraph "Renewal of the headlight" of this section.
To access the headlight bulbs loosen the screws (1) and remove the cover (2).

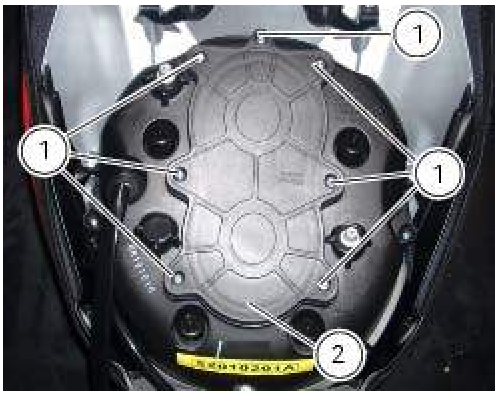


High beam (HI)

Disconnect the wiring connector (3) from the headlight bulb (4).
Release the retaining clip (5).
The bulb (4) has a bayonet base: press and twist counter clockwise to remove.
Fit the new bulb (4), insert the tabs on the bulb base into the corresponding slots to ensure the bulb is correctly positioned, push the bulb in and turn clockwise until it clicks into place.



Refit the connector (3) to the lamp (4), the cover (2) to the headlight, then tighten the screws (1).



Low beam (LO)

To change the Lo beam headlight bulb (6) see the procedure described above for the Hi beam headlight bulb.

Replace the lamp with a new one of the same type and rating (Sect. 3 - 1.1, Lights/instrument panel).

Note

Do not touch the transparent part of the bulb with your fingers, this will darken it and cause a loss of brightness.

Headlight aim

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

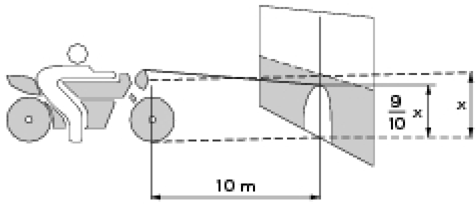
Note

If possible, perform this check in conditions of low ambient 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 nine tenths of the height of the centre of the headlight from the ground.

Note

This is the procedure specified by Italian regulations for checking the maximum height of the light beam.



The vertical alignment of the headlamp can be adjusted manually by turning screw (1).
Turn the screw (2) to set beam height.

5 -Indicating devices

Checking the indicating devices

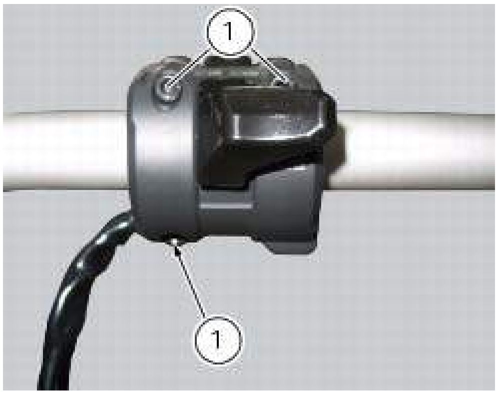
In the event of a fault, the internal connections of the device must be checked in all operating conditions. To do this, it is necessary to disconnect the switch connector from the main wiring harness (Sect. 6 - 1, Routing of wiring on frame). Then analyse the switch using an analogue or digital MULTIMETER (Sect. 6 - 11, Using a multimeter to check the electrical systems).

Note

The same test may be carried out using the “DDS” tester (Sect. 6 - 11, Diagnostic instruments).

Checking the left-hand handlebar switch

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



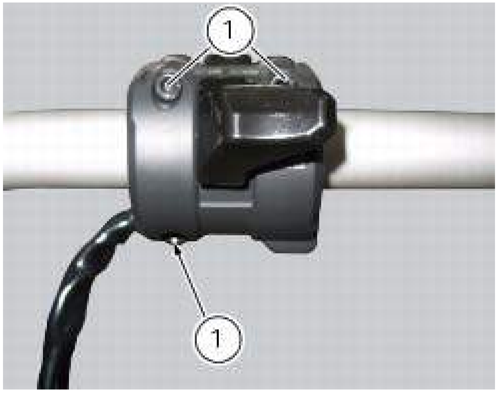
The colours mentioned in the following descriptions refer to the colours of the wires from the switch and not to the colours of the wires of the main electric system.

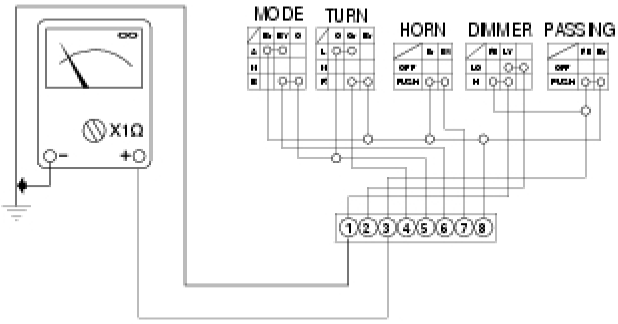
HORN button
Connect the terminals of a multimeter to the Blue/White and Brown cables to check for electrical continuity, which must be available when HORN is pressed (see Sect. 6 - 11, “Using a multimeter to check the electrical systems“, related to multimeter operation). When HORN button is pressed, resistance value taken by the multimeter should be close to zero and, if available, a continuity beep should be heard. When the horn button is not pressed, the resistance value should be infinity (there is no continuity as the electrical contacts inside the pushbutton are open) and no continuity beep should be heard. If these conditions are not met, the device must be replaced.

Turn signal switch (Turn)
Connect the multimeter to the Grey and Brown cables arriving from the turn signal switch and check for electrical continuity when operating the right turn indicator (see Sect. 6 - 11, “Using a multimeter to check the electrical systems“, related to operation of the multimeter). Repeat the above procedure for the right turn signal, but connect the multimeter to the (Orange and Grey) wires.

Low and high beam headlights (DIMMER)
Test using the same procedure, applying the probes of the meter to the cables: (RED/BLUE AND LIGHT BLUE/YELLOW).

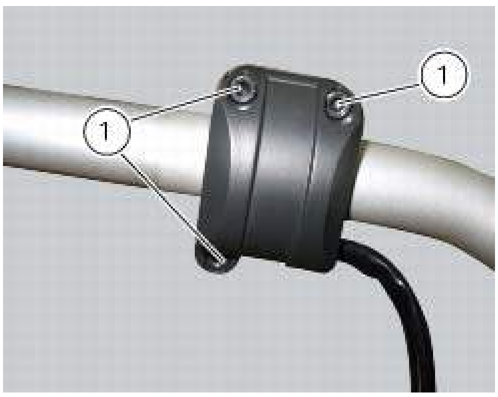
Control switch (MODE)
Connect the multimeter to the Brown and Blue/Yellow cables arriving from the function selector switch and check that when operating the pushbutton in the (s) position there is electrical continuity (Sect. 6 - 11, “Using a multimeter to check the electrical systems“, related to operation of the multimeter). Repeat the same procedure, operating the push button in the (t) position, connecting the multimeter to the Blue/Yellow and Orange cables.
Flasher (PASSING)
Check for continuity between the RED/BLUE AND BROWN cables.
Refit the LH switch tightening the screws (1) to a torque of 1.3 Nm ± 10% (Sect. 3 - 3, Frame torque settings).





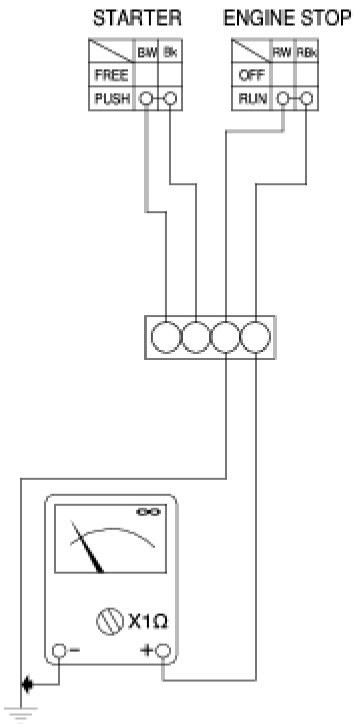
Checking the right-hand handlebar switch

To remove the right-hand handlebar switch, undo the retaining screws (1) and disconnect the wiring connector from the electric system.
The colours mentioned in the following descriptions refer to the colours of the wires from the switch and not to the colours of the wires of the main electric system.

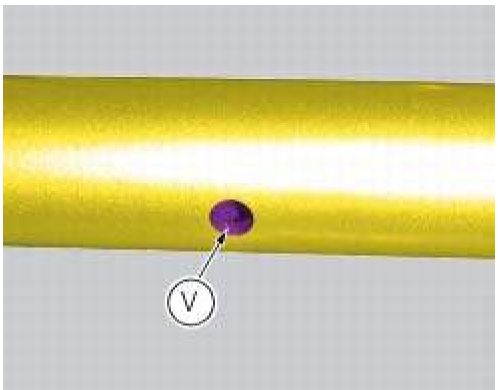


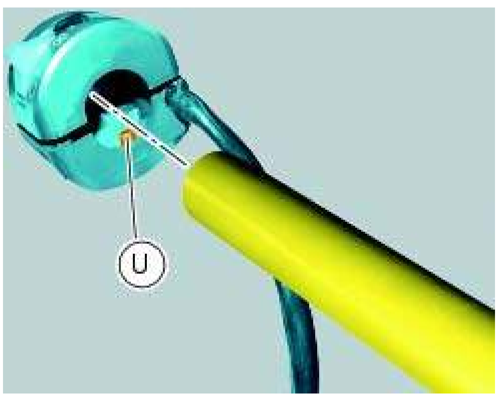
Engine Stop button
Using a multimeter, check for electrical continuity across the RED/WHITE AND RED/BLACK cables (see Sect. 6 - 11, Using a multimeter to check the electrical systems, related to the multimeter operation). When the switch is in the RUN position, there should be electrical continuity between the two wires. When the switch is in the OFF position there should be no electrical continuity between the two wires.
If these conditions are not met, the ENGINE STOP switch is not working correctly and must be renewed.

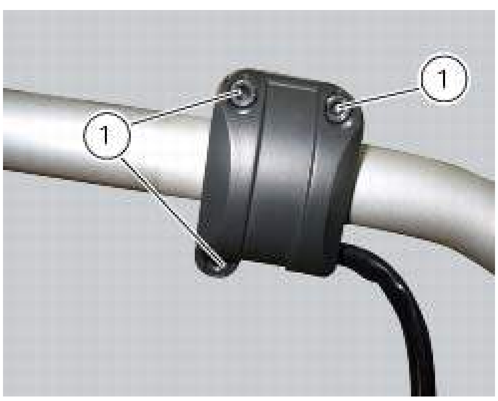
STARTER button
Proceed as described for the engine stop button and check for electrical continuity across the BLUE/WHITE AND BLACK cables when the STARTER button is pressed (see Sect. 6 - 11, Using a multimeter to check the electrical systems related to the multimeter operation). If there is no continuity, the STARTER switch is defective and must be renewed.



Refit the RH switch inserting the switch pin (U) into the hole (V) in the handlebar and tightening the screws (1) to a torque of 1.3 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



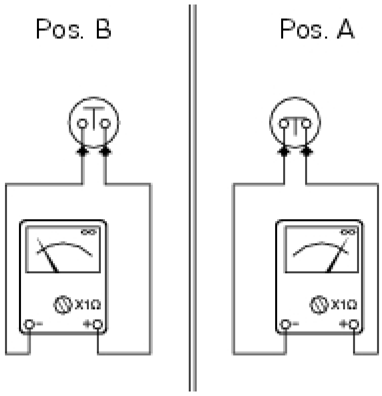


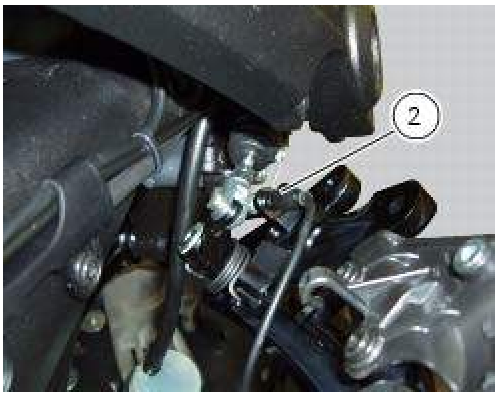


Checking the front and rear brake light switches, neutral light switch, oil pressure switch and clutch switch

Brake light switches

To check the operation of the front (1) and rear (2) STOP lights use a multimeter to check that when the front or rear brake is pressed, there is electrical continuity (Pos. A) across the terminals of the corresponding switch (Sect. 6 - 11, Using a multimeter to check the electrical systems, related to the multimeter operation). When the brake is released, there must be no electrical continuity across the terminals of the corresponding switch (Pos. B). If these tests fail to produce positive results, the part in question must be renewed.





Gear selector sensor warning light

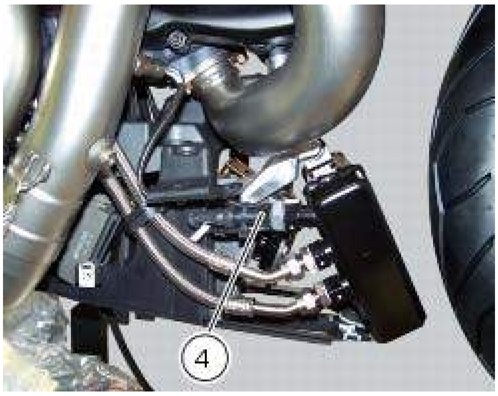
To check the gear selector warning light switch (3) proceed as follows.

The neutral light does not illuminate on the dashboard.
Remove the electric terminal connected to the neutral switch. Switch on the ignition switch (ignition key to ON position) and ensure that the light illuminates when the terminal is earthed. If the light switches on, the neutral light switch should be changed. If the light stays off, switch off the ignition (ignition key set to OFF) to switch off the dashboard and check for electrical continuity between the neutral switch and engine ECU with a multimeter.

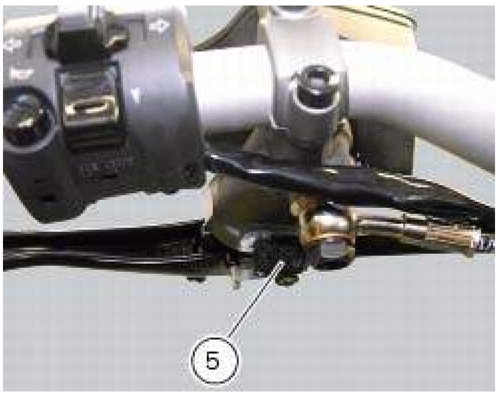
The neutral light on the dashboard is permanently illuminated.

Switch on the ignition (ignition key set to ON) and remove the electrical terminal from the neutral switch. If the light turns off, the neutral switch should be changed. If the light stays off, switch off the ignition (ignition key set to OFF) and use a multimeter to check whether the section of circuit between neutral switch and engine ECU is earthed.

Oil pressure sensor
To test the operation of the engine oil pressure sensor (4), proceed as follows.
Use the DDS to check that oil pressure into the engine lubrication circuit complies with the specified values (Sect. 6 - 11, Check the engine oil pressure).
If the engine oil pressure value is outside the specified range, check the oil circuit components and service as necessary.
If engine oil pressure value is within the specified range and the oil pressure warning light on the dashboard stays off, switch on the dashboard (ignition key set to ON) without starting the engine, and disconnect the electrical terminal from the pressure sensor and connect it to earth. If the warning light now illuminates, this means the sensor is defective and must be replaced. If the warning light does not illuminate, use a multimeter and check for electrical continuity in the section of the circuit between sensor and warning light on the dashboard (this check must be performed with the ignition key set to OFF, i.e. with dashboard off).
If the engine oil pressure complies with the stated values and the engine oil pressure warning light on the dashboard is continuously illuminated, switch on the dashboard (ignition key set to ON) and start the engine, then disconnect the electrical terminal normally inserted on the pressure sensor. If the warning light now switches off, this means the sensor is defective. If the warning light does not switch off, use a multimeter to check that the section of the circuit between sensor and warning light on the dashboard is not connected to earth (this check must be performed with the ignition key set to OFF, i.e. dashboard off).



Clutch switch
For the clutch switch (5) proceed in the same manner as for the brake light switches (see beginning of this paragraph).

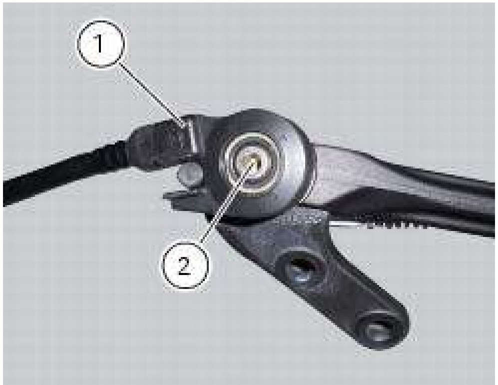


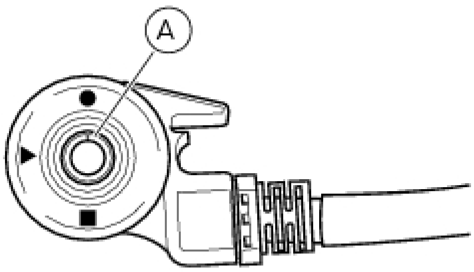
6 -Protection and safety devices

Checking protection and safety device components

Checking the side stand switch

Remove the switch (1) from the side stand undoing screw (2) and disconnect the main wiring connector from the switch (see paragraph "Routing of wiring on frame", Sect. 6 - 1).
Use an analogue or digital multimeter (Sect. 6 - 11, Using a multimeter to check the electrical systems) to check switch operation (see table).





Note
The same test may be carried out using the "DDS" tester (Sect. 6 - 11, Diagnostic instruments).

Pos. pin (A)	El. item	Rating
l - s	0	X
s - n	X	0
Multimeter pos.	Green/ Green White	Green/ Yellow Black

0 = Open contact
X = Closed contact

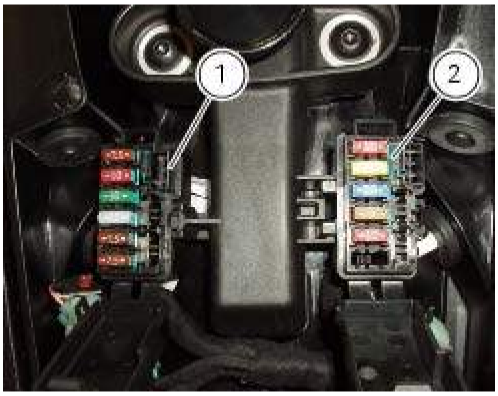
Refit switch (1) to side stand and tighten the screw (2) to a torque of 5 Nm ±10 (Sect. 3 - 3, Frame torque settings).

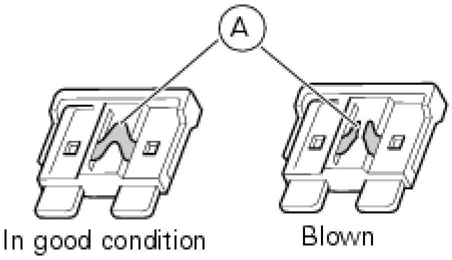
Checking the fuses

The main fuse box (1) and the secondary one (2) are located in the tool tray; to reach the fuse box remove the seat as specified under Sect. 5 - 3 "Removal of the seat".
The fuses are accessed by removing the cover, which shows the ampere ratings and mounting locations.
For ampere ratings, refer to the chapter "Routing of wiring on frame", Sect. 6 - 1.

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 the breakage of inner filament (A).





Important

Switch the ignition key to **OFF** before replacing a 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.

Besides the fuses inside the box, the motorcycle is also provided with one **30** A fuse (3), located near the voltage regulator (in the electrical components compartment) that protects the electronic rectifier (Sect. 6 - 2, Rectifier-regulator).

7 -Instruments

Dashboard

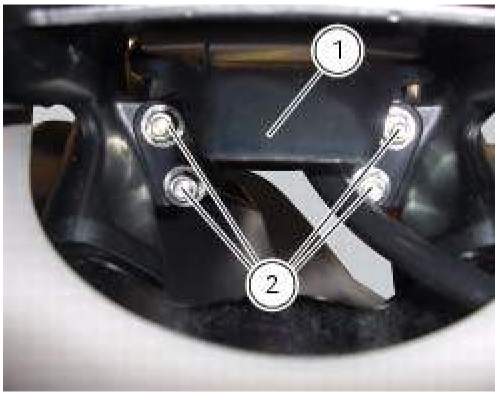
Note

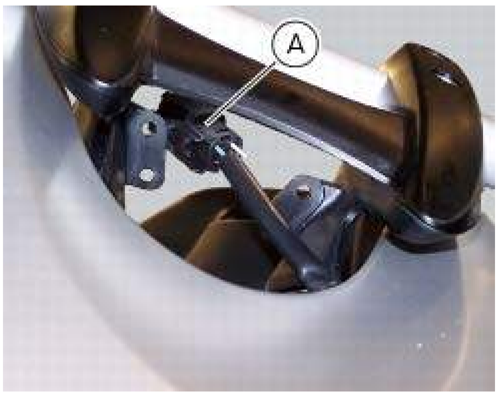
The dashboard is supplied as a single component; its internal components cannot be renewed separately.

Important

Whenever the dashboard is renewed, the ignition key programming procedure must be repeated.

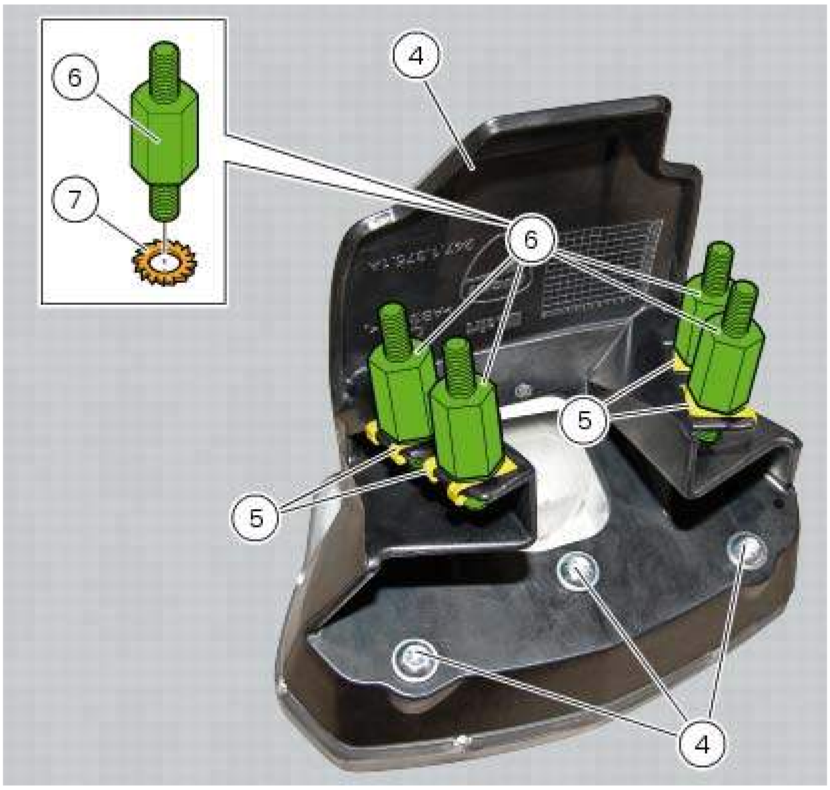
Loosen the nuts (2) to remove the master dashboard (1) from its seat and disconnect the connector (A) of the main wiring.





To remove the slave dashboard (3) remove the front tank fairing as indicated in Sect. 5 - 2, "Removal of the fuel tank fairings".

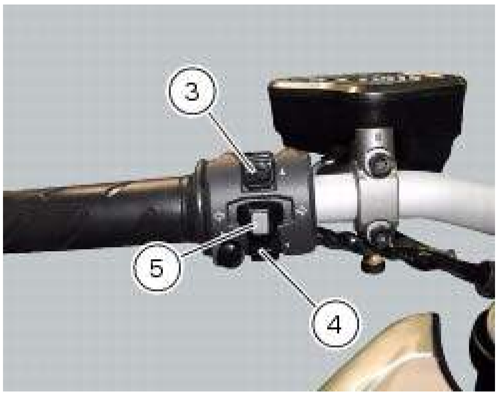
Refitting is the reverse of removal; be sure to check that the dashboard is mounted on its support with the screws (4) tightened to a torque of 3 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Check the presence of clips (5) and stud bolts (6) with washers (7). The stud bolts (6) must be tightened to a torque of 2 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

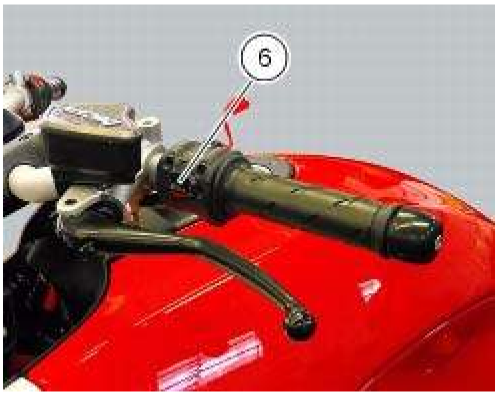


Tighten the nuts (2) to a torque of 3 Nm ±10% (Sect. 3 - 3, Frame torque settings).

Dashboard system

The vehicle is equipped with two dashboards: an LCD (1) located on the handlebar containing the key indications (speed, rpm, engine coolant temperature, and clock) and a TFT colour display (2) located in the tank fairing displaying trip information (riding style set, odometer, consumption, average speed, etc.) and the setting menu for activating and setting the various functions.
The type of information shown can be selected by two push-buttons (3) and (4), the turn indicator reset button (5) and the high-beam flashing button (6) on the LH switch.
In the dashboard on the handlebar there are six warning lights (three each side), and a further auxiliary warning light indicating when the “Over rev” limit is reached and when the DTC is activated.
The dashboard on the tank (2) automatically sets the background colour according to the exterior lighting conditions. When sensor detects “poor lighting” (night), it switches to black background mode; vice versa when a “significant” lighting is detected (day), it switches to white background mode. It is nevertheless possible to customise this function through the “setting” menu function “BACK LIGHT - DASHBOARD 1”, and possibly set one of the two modes available, NIGHT or DAY, as permanent setting (or go back to AUTO mode).
To protect the backlight LEDs in the event of voltage spikes, they are disabled if the power supply voltage exceeds 16 Volts; if the power supply voltage drops below 6 Volts, the LEDs switch off as general dashboard functionality is no longer ensured.





Indicator lights

The following lights are mounted on the handlebar dashboard:

5 NEUTRAL LIGHT N (GREEN): illuminates when the gearbox is in neutral.
6 LOW FUEL LIGHT (AMBER YELLOW): illuminates when there are approximately there are about 4 litres of fuel left in the tank.
7 TURN SIGNAL LIGHTS (GREEN): illuminate and flash when the corresponding turn signal is in operation.
If a turn signal does not work (e.g. burnt out bulb) its incorrect operation is signalled by making the light flash twice as fast as in comparison to correct operation.
8 ENGINE OIL PRESSURE LIGHT (RED): Illuminates 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. The case may occur that the light turns on briefly if the engine is very hot; it will turn off as the engine rpms increase.
9 HIGH BEAM LIGHT (BLUE): illuminates when the high beam headlight is on.
10 “ENGINE/VEHICLE DIAGNOSIS - EOBD” INDICATOR (AMBER YELLOW): It turns on in the case of an engine or motorcycle error; in some cases the engine will be locked.
11 “Over rev” rev limiter/traction control indicator “DTC” (RED):

	Over rev light
No limiter	Off
1st threshold - no. RPM before the limiter threshold (*)	On - STEADY
Rev limiter (limiter engaged due to overrevving) (*)	On - Flashing

(*) depending on the model, 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.

	DTC intervention lights
No intervention	Off

DTC intervention	On - Flashing

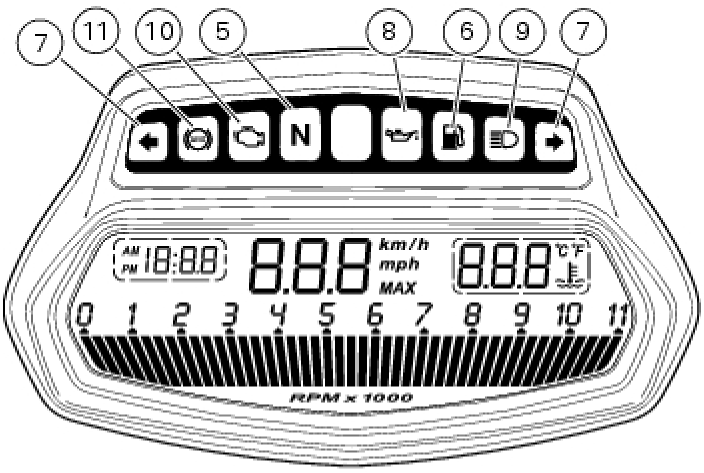
Note

If the Over rev function light and the DTC intervention light should both come on at the same time, the dashboard gives priority to the Over rev function.

12 ABS LIGHT (AMBER YELLOW).

This turns on to indicate that ABS is disabled or not functioning.

Engine off / speed below 5 Km/h		
Light off	Light flashing	Light steady
-	ABS disabled with the “ABS“ menu function (*)	ABS enabled but not functioning yet
Engine on / speed below 5 Km/h		
Light off	Light flashing	Light steady
-	ABS disabled with the menu function “ABS”	ABS enabled but not functioning yet
Engine on / speed above 5 Km/h		
Light off	Light flashing	Light steady
ABS enabled and functioning	ABS disabled with the menu function “ABS”	ABS disabled and not functioning due to a problem.

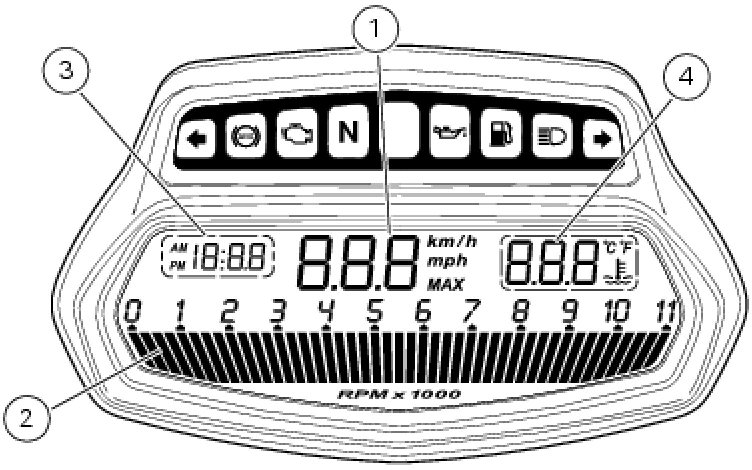


LCD unit functions

1 Speedometer.
Gives road speed
2 REV COUNTER.
Indicates engine revs per minute.
3 Clock.
4 Water temperature indicator.
Indicates engine coolant temperature.

Important

Stop riding if the temperature reaches the maximum value, otherwise the engine might be damaged.

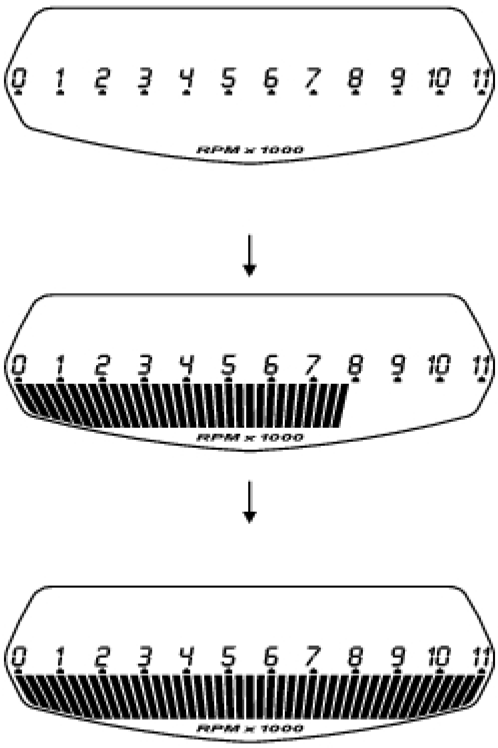


Vehicle speed indicator

This function displays vehicle speed (Km/h or mph depending on the set measurement system).
The dashboard receives information about the actual speed and displays the number increased by 5%.
Maximum speed displayed is 299 km/h (186 mph).
Over 299 km/h (186 mph) the display will show a series of dashes “- - -“ (steadily lit - not flashing).

Engine rpm indicator (RPM)

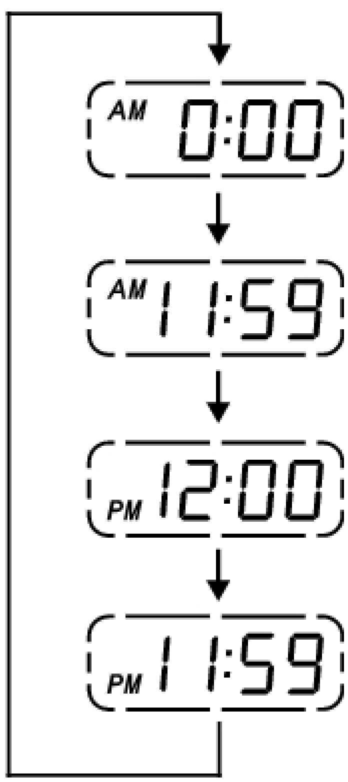
This function displays the rpms.
The dashboard receives the engine rpm information and displays it.
This information is displayed progressively from the left to the right, identifying the rpms.



Clock

This function shows the time.
Time is always displayed as follows:
AM from 0:00 to 11:59
PM from 12:00 to 11:59

If battery power is suddenly cut off (Batt-OFF), when battery power is restored and upon next Key-On, the clock is reset and restarts operating from “0:00“.



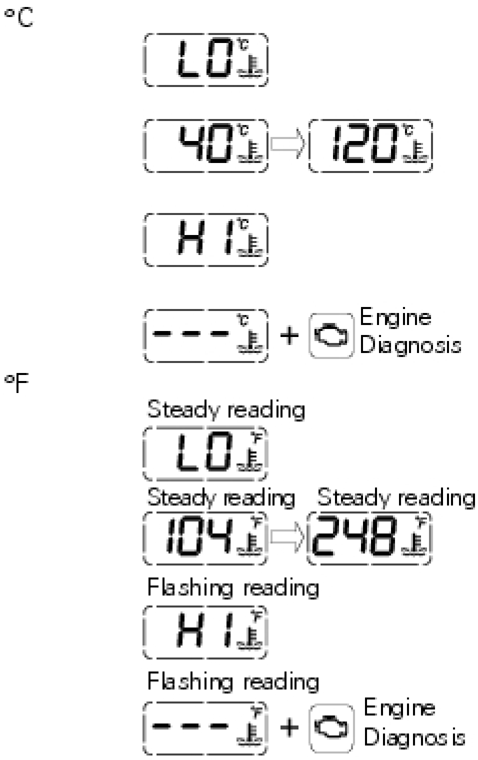
Coolant temperature

This function indicates coolant indication state.

The temperature unit of measure can be selected (°C or °F).
The reading is indicated as follows:
if the reading is between - 39°C and +39°C “LO” is shown flashing on the dashboard (steady);
if the reading is between +40°C and +120°C it appears on the dashboard (steady);
if reading is +121 °C or higher, “HI“ is shown flashing on the information panel.

Note

In the event of a sensor “error“, flashing dashes (“- - -”) are shown and the “Engine/vehicle diagnosis - EOBD“ indicator turns on.

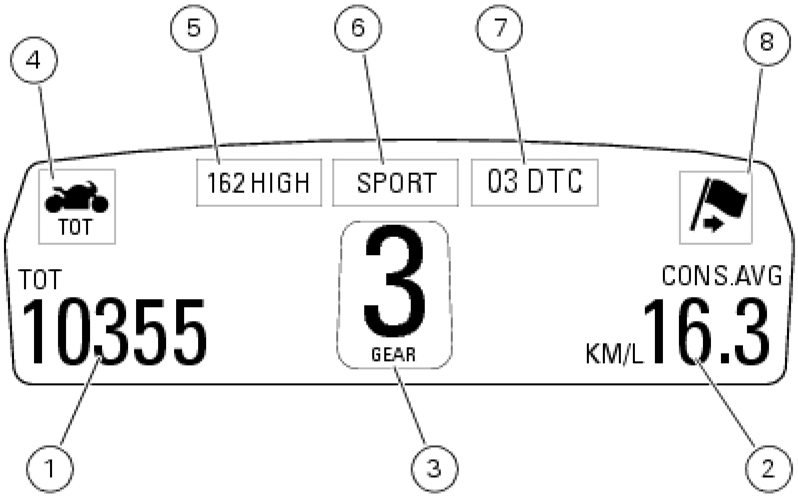


Display background colour (Automatic adjustment)

Dashboard background colour is set automatically according to exterior lighting conditions.
When sensor detects “poor lighting” (night), it switches to black background mode; vice versa when a “significant” lighting is detected (day), it switches to white background mode. It is nevertheless possible to customise this function through the “setting” menu function “BACK LIGHT - DASHBOARD 1”, on page 62, and possibly set one of the two modes available, NIGHT or DAY, as permanent setting (or go back to AUTO mode).

Dashboard on tank

1 Menu 1 (TOT, TRIP1, TRIP2, TRIP FUEL).
2 Menu 2 (CONS.AVG., CONS., SPEED AVG, AIR and TRIP TIME) if active.
3 Gear / Neutral Indication.
4 Icon referred to the function below from Menu 1.
5 Indication of Engine setting for the currently set riding style.
6 Currently set Riding Style (Riding Mode).
7 Indication of the intervention level of the DTC (Traction Control) for the currently set riding style.
8 Icon referred to the function below from Menu 2.



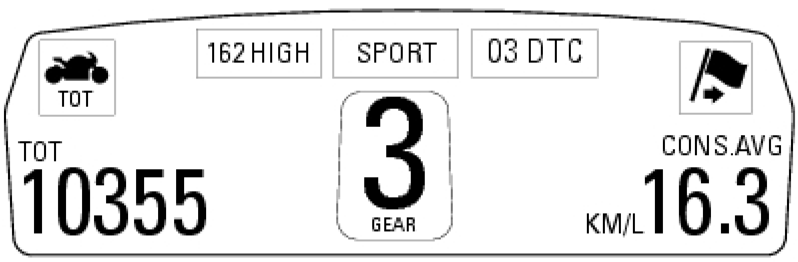
TFT - Parameter setting/display

Warning
Any adjustments to the dashboard must only be carried out when the motorcycle is stationary. Never operate the dashboard controls while riding the motorcycle.

At the end of the check, the dashboard always displays as the "main" indication the Odometer (TOT) on the left and the Average Fuel Consumption on the right (unless Menu 2 was disabled).

At the end of the initial check, the dashboard will always show the "main" display, indicating the following information:

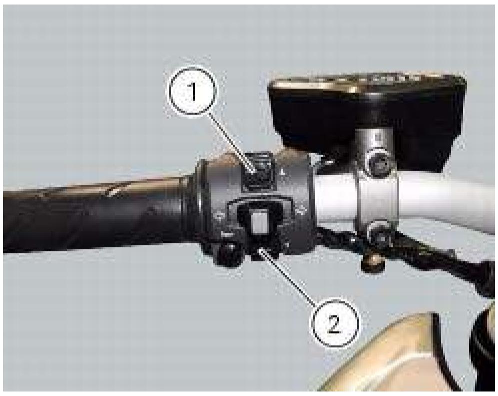
Set "Riding Style" (Riding Mode);
Gear indication (GEAR);
Menu 1: Odometer (TOT);
Menu 2: Average Fuel Consumption (CONS. AVG).



By pressing the button (1) "s" it is possible to switch to the following functions of menu 1:
TRIP1 - Trip meter 1;
TRIP2 - Trip meter 2;
TRIP FUEL - Distance travelled on fuel reserve (only if active);

By pressing the button (2) "t" it is possible to switch to the following functions of menu 2:
CONS. - Current fuel consumption;
SPEED AVG - Average speed;
TRIP TIME - Trip time;
AIR - Air temperature;

Menu 2 viewing can be disabled through the "MENU 2" Function of the Setting menu.



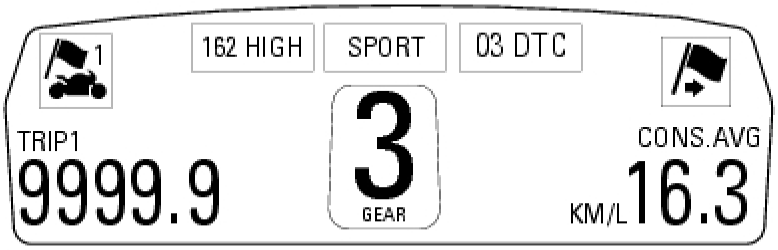
Total distance covered indicator: “Odometer“

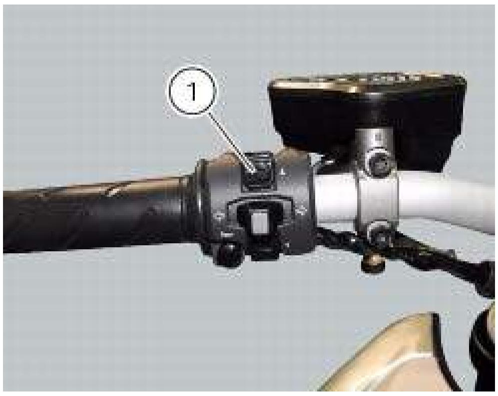
This function shows the total distance covered by the vehicle (in Km or miles depending on the specific application).
At Key-On the system automatically enters this function.
The odometer reading is stored permanently and cannot be reset.
If the distance travelled exceeds 199999 km (or 199999 miles), the value “199999” will be displayed permanently.

“Trip 1“ meter

This function shows the distance travelled since the Trip meter was last reset (in Km or miles depending on the specific application).
Press and hold (1) “s“ for 3 seconds while in this function to reset the trip odometer.
When the reading exceeds 9999.9, distance travelled is reset and the meter automatically starts counting from 0 again.
If the system measurement units are changed at any moment through the “Units of measurement modification function” function of the Setting menu, or if there is an interruption in the power supply (Battery Off), the distance travelled is reset and the count starts from zero (considering the newly set unit of measurement).

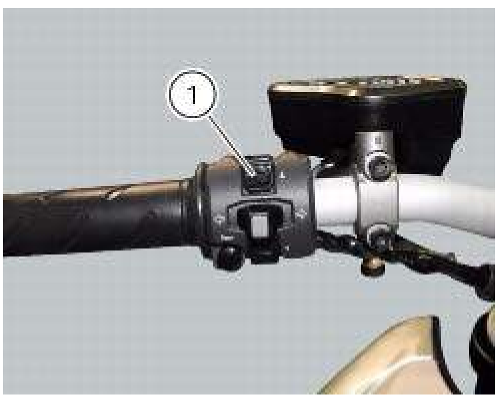
When this value is reset, also the “Average fuel consumption”, “Average speed” and “Trip time” functions are reset.





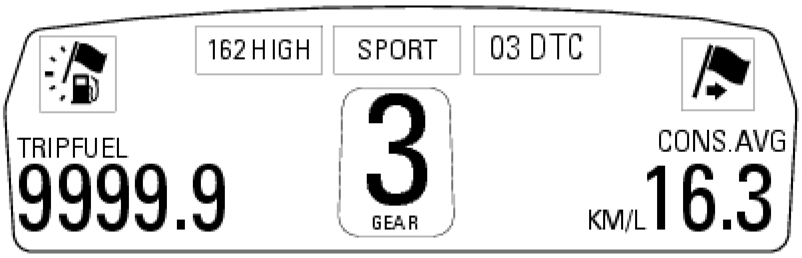
"Trip 2" meter

This function shows the distance travelled since the Trip meter was last reset (in Km or miles depending on the specific application).
Press and hold (1) "s" for 3 seconds while in this function to reset the trip odometer.
When the reading exceeds 9999.9, distance travelled is reset and the meter automatically starts counting from 0 again.
If the system measurement units are changed at any moment through the "Units of measurement modification function" function of the Setting menu, or if there is an interruption in the power supply (Battery Off), the distance travelled is reset and the count starts from zero (considering the newly set unit of measurement).



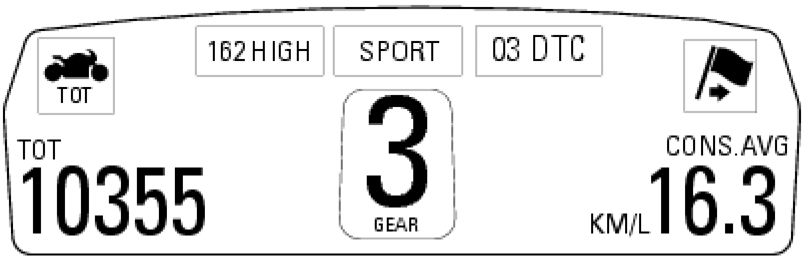
Distance travelled on fuel reserve: "TRIP FUEL"

This function shows the distance travelled on fuel reserve (in Km or miles depending on the specific application).
When the fuel light comes on, the display automatically switches to the "TRIP FUEL" indicator.
Trip fuel reading remains stored even after Key-Off until the vehicle is refuelled.
Count is interrupted automatically as soon as fuel is topped up to above minimum level.
When the reading exceeds 9999.9, it is reset and the count restarts automatically.



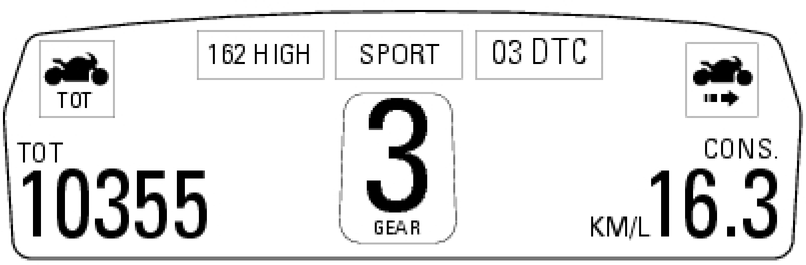
Indicator “CONS. AVG“ - Average fuel consumption

This function indicates the “average” fuel consumption.
The calculation is made considering the quantity of fuel used and the km travelled since the last Trip 1 reset. When Trip 1 is reset, the value is set to zero and the first available value is shown on the display 10 seconds after the reset. Dashes “- -.-” are shown on the display during the first 10 seconds when the value is not yet available.
the datum is expressed in “l / 100” (litres / 100 Km); it is possible to change the units of measurement for “Consumption” (both average and instantaneous together) from L/100 to Km/L through the “Units of measurement modification function” function of the Setting menu.
The active calculation phase occurs when the engine is running and the vehicle is stopped (moments when the vehicle is not moving and the engine is off are not considered).



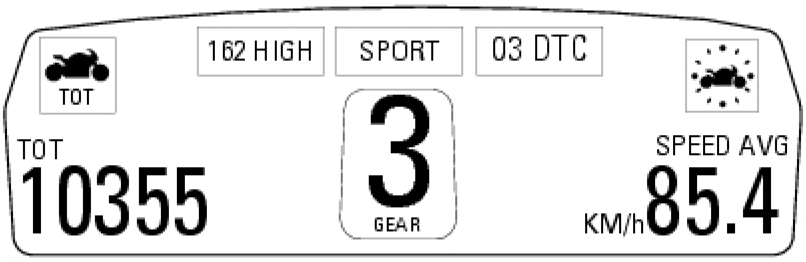
Indicator “CONS.“ - Instantaneous fuel consumption

This function indicates the “instantaneous” fuel consumption.
The calculation is made considering the quantity of fuel used and the distance travelled during the last second. the datum is expressed in “l / 100” (litres / 100 Km); it is possible to change the units of measurement for “Consumption” (both average and instantaneous together) from L/100 to Km/L through the “Units of measurement modification function” function of the Setting menu.
The active calculation phase only occurs when the engine is running and the vehicle is moving (moments when the vehicle is not moving when speed is equal to 0 and/or when the engine is off are not considered). Dashes “- -.-”. are shown on the display when the calculation is not made.



Indicator “SPEED AVG” - Average speed

This function shows the average speed of the motorcycle.
The calculation is made considering the distance and time travelled since the last Trip 1 reset. When Trip 1 is reset, the value is set to zero and the first available value is shown on the display 10 seconds after the reset. Dashes “- -.-” are shown on the display during the first 10 seconds when the value is not yet available.
The active calculation phase occurs when the engine is running and the vehicle is stopped (moments when the vehicle is not moving and the engine is off are not considered).
The calculated value is displayed increased by 5% to align it with the vehicle indicated speed.
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 ”Units of measurement modification function” function of the Setting menu.



Indicator “TRIP TIME“ - Trip time

This function shows the vehicle trip time.
The calculation is made considering the time travelled since the last Trip 1 reset. When Trip 1 is reset, the value is set to zero.
The active phase calculation occurs when the engine is running and the vehicle is stopped (when the vehicle is not moving and the engine is off the time is automatically stopped 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.

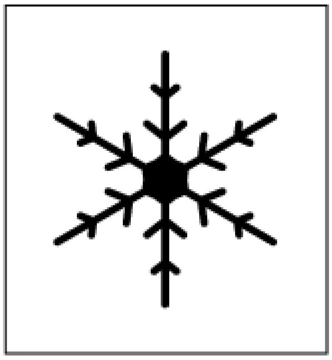
Indicator “AIR” - Air temperature

This function shows the external temperature.
Display limits: -39°C - +124°C
In the event of a sensor FAULT (-40°C, +125°C or disconnected), a string of dashes “- - -“ (not flashing) is displayed and the “Vehicle/Engine Diagnosis - EOBD“ light comes on.

Note

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

When the detected temperature drops to 4°C (39°F), the display warns that the formation of ice is possible. The indication turns off when the temperature rises to 6°C (43°F).



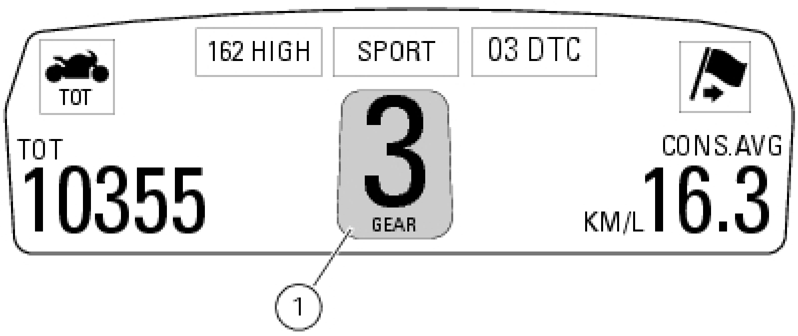
Warning

This warning does not exclude the possibility of icy road sections even at temperatures above 4°C (39°F); when external temperatures are “low“ it is always recommended to ride carefully, particularly on sections that are not exposed to the sun and/or on bridges.

Engaged gear indicator

This function displays the gears (1).
The dashboard receives information and indicates the engaged gear or “N” for neutral.

In the case of a gear sensor “error”, a dash “-” (not flashing) will be displayed.

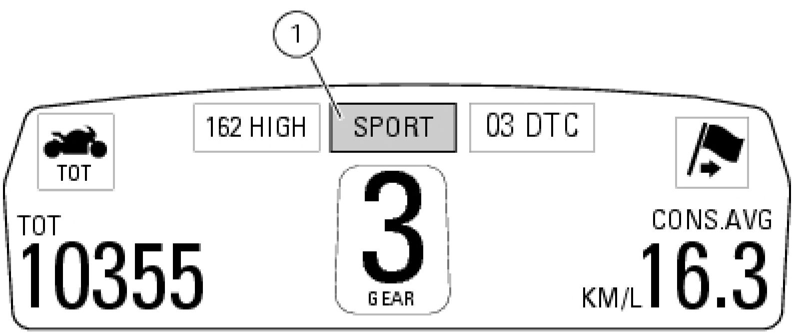


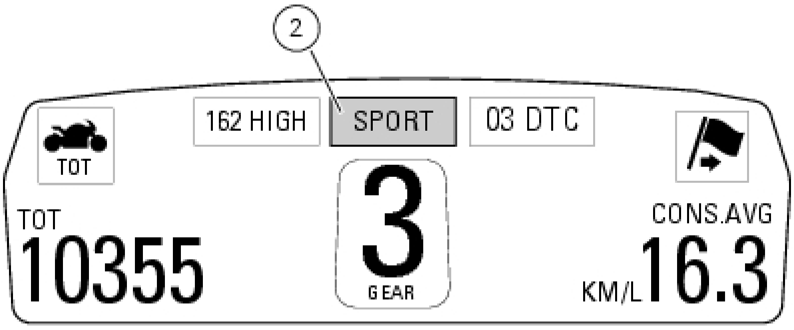
“Riding Mode set“ indication

This function indicates the “Riding Style” set for the vehicle.
THREE “Riding Modes” are available: SPORT, TOURING and URBAN.
Each riding mode can be changed using the “Riding Mode” function.

Note

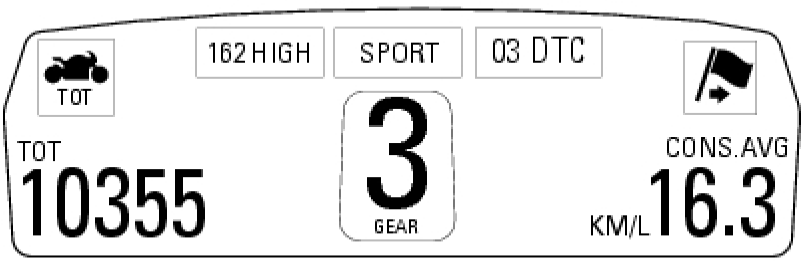
The background of the riding mode (SPORT, TOURING or URBAN) is blue (1) if currently set riding mode parameters are the default ones (Ducati factory setting) or yellow (2) if one or more parameters have been modified (customised) by means of the “RIDING MODE” function of the Setting menu.





Indication if the “LAP” function is active/not active

This function indicates if “LAP” function (Lap number) is active.
When “LAP” is not lit up, this means that the function has been switched off.
The “LAP” function can be activated using the “LAP” Function of the Setting menu.



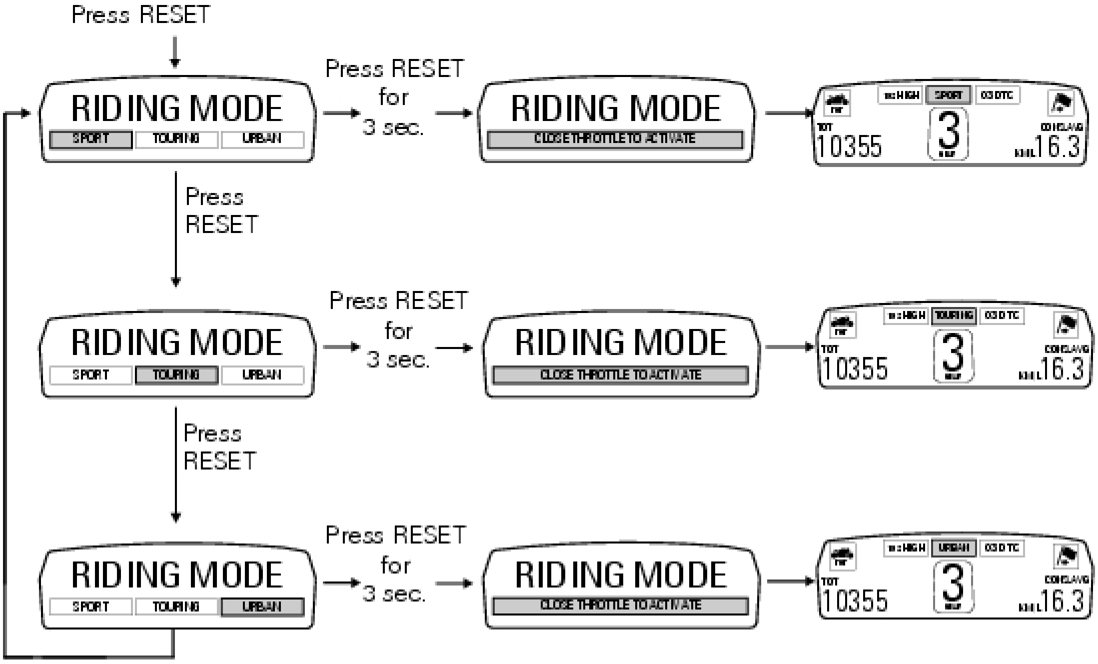
“Riding Style” function (riding style change)

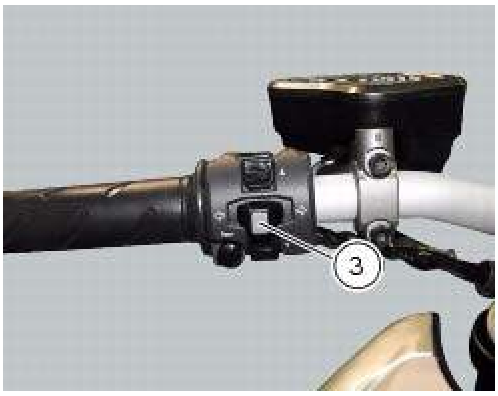
This function changes the motorcycle riding style.
Each riding style is associated with a different intervention level of the traction control (DTC - Ducati Traction Control) and different engine power and output.
To change the motorcycle riding mode, press the reset button once
(3) and the “RIDING MODE“ menu will appear on the display.
Select the desired riding mode by pressing the reset button (3) repeatedly. Press the same button for 3 seconds to confirm the riding style.
If the twistgrip is closed (vehicle stopped) the riding style change will occur immediately; if the twistgrip grip is open (vehicle moving) the message “CLOSE THROTTLE TO ACTIVATE” will appear on the display, which means that the throttle must be closed; this message will appear for 5 seconds, during which the gas must be closed in order to activate the new riding style.
If the twistgrip is not closed after 5 seconds, the procedure is aborted (no change is made).

If the “RIDING MODE” menu is activated and the reset button (3) is not kept pressed for 10 seconds, the dashboard will automatically exit the display mode without making any change.

Warning

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





Maintenance indicator

This function indicates that the vehicle is about to or has travelled a distance for which an Authorised Ducati Service Centre should be contacted to have the general maintenance or oil change performed.

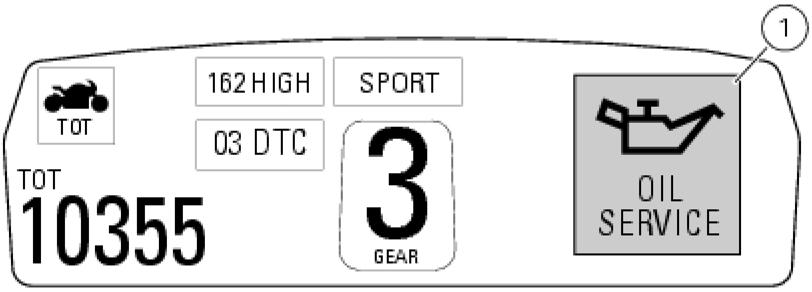
Maintenance table

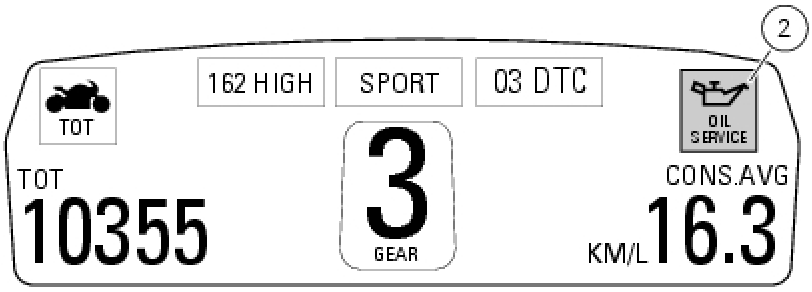
Indicator	Mileage travelled	count down -1000 DESMO SERVICE	count down -1000 OIL SERVICE	DESMO SERVICE	OIL SERVICE
1	1000				•
2	11000		•		
	12000				•
3	23000	•			
	24000			•	
4	35000		•		
	36000				•
5	47000	•			
	48000			•	
6	59000		•		
	60000				•
7	71000	•			

	72000			•	
8	83000		•		
	84000				•
9	95000	•			
	96000			•	

First warning - OIL SERVICE 1000 Km

The first warning is activated at 1000 Km (600 miles) of odometer reading.
The (red) warning is activated as a large icon for 10 seconds upon every Key-On (1) then as a small warning that remains displayed (2) until it is reset.

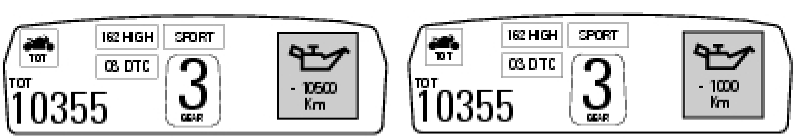




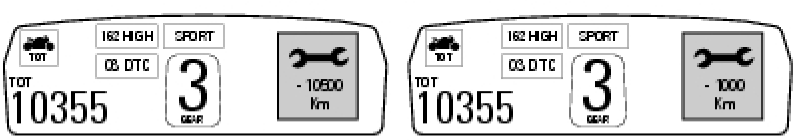
Residual range indication when the SERVICE is due

After resetting the first OIL SERVICE warning (triggered at 1000 Km), upon every Key-On the system displays the indication of which type of service should be performed next (OIL SERVICE or DESMO SERVICE) and the residual range.
A (green) warning (1) is activated for 2 seconds on every Key-On; while 1000 Km before the threshold an (amber yellow) warning (2) is activated for 5 seconds upon every Key-On.

OLI SERVICE (Count - down)



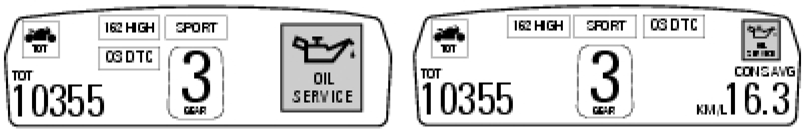
DESMO SERVICE (Count - down)



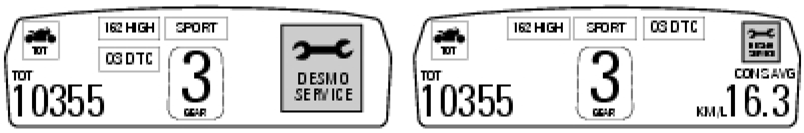
Indication of range reached for SERVICE

When service coupon threshold is achieved, upon every Key-On the system displays the indication of the type of intervention that is required (OIL SERVICE or DESMO SERVICE).
The (red) warning is activated as a large icon for 10 seconds upon every Key-On (1) then as a small warning that remains displayed (2) until it is reset.
After reset, the system will display again the type of intervention required next and the residual range (as described in the previous paragraph).

OIL SERVICE



DESMO SERVICE



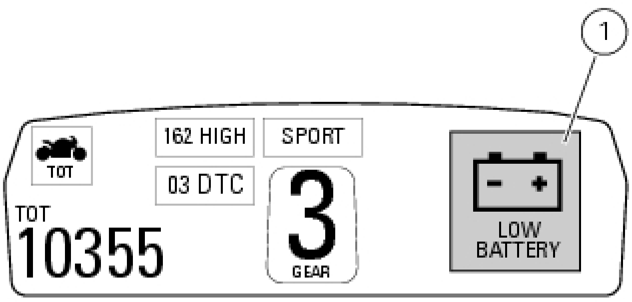
Warning indication (Alarms/Signals)

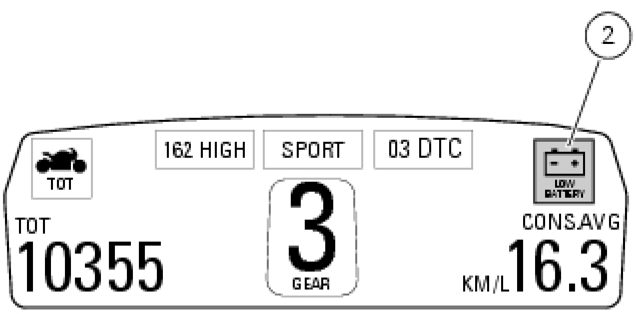
The dashboard activates in real-time some warnings / malfunction that are not dangerous for the correct operation of the vehicle.
At Key-On (at the end of the check) one or more “warnings” are displayed if they are active.
When a “warning” is triggered, the indication (amber yellow) remains well visible (1) for 10 seconds then becomes smaller (2).
If there are multiple indicators, they will scroll automatically every 3 seconds.

Note

No signal lights turn on if one or more “warnings” are activated.

The following “warnings” could be displayed:
“Low“ battery level (LOW BATTERY);
Traction Control “deactivated“ (DTC OFF);
Hands Free key (HF) “not recognised“;
“Low“ Hands Free key (HF) battery level;
“High“ engine coolant temperature (HIGH TEMP);
Steering release error - Steering still locked (Unlock error).
With one or more “warnings” active, the user may access other functions by pushing button (2) “t”.





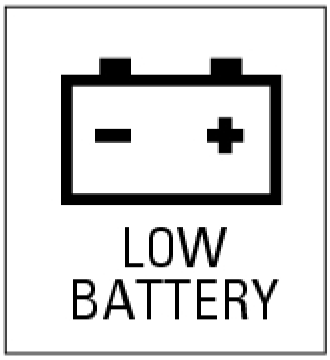
“Low” battery level

The activation of this (amber yellow) “warning” indicates that the status of the battery vehicle is low.

It is activated when the battery voltage is £ 11.0 Volt.

Note

In this case, Ducati recommends charging the battery as soon as possible with the specific device, as it is possible that the vehicle will not start.



Traction Control (DTC) deactivated

The activation of this (amber yellow) “warning” indicates that DTC (Ducati Traction Control) has been turned off.

Note

In this case, Ducati recommends being very careful when riding as the vehicle behaviour will be different in comparison to when operating with the Traction Control activated.

Hands Free key (HF) not recognised

The activation of this (amber yellow) “warning” indicates that the Hands Free system does not detect the active key (1, fig.62) near the vehicle.

Note

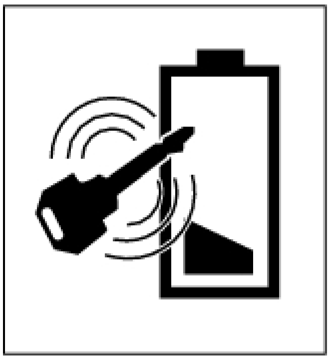
Check that the active key (A) is near the vehicle (and has not been lost) or that it works properly.

“Low“ Hands Free key (HF) battery level

The activation of this (amber yellow) “warning” indicates that the Hands Free system has detected that the battery that permits the active key (A) to communicate and turn the vehicle on is almost discharged.

Note

In this case replace as soon as possible the battery as indicated in Sect. 6 - 8 “Replacing the battery in the active key”.

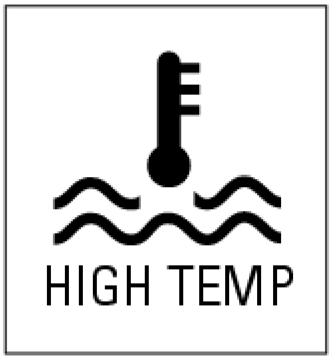


“High“ engine coolant temperature

The activation of this (amber yellow) “warning” indicates that the engine coolant temperature is high.
It is activated when the temperature reaches 121°C (250°F).

Note

In this case, stop the vehicle and switch the engine off immediately; make sure that the fans are working.



Steering release error - Steering still locked

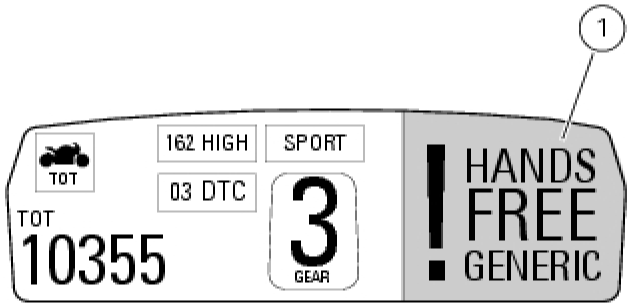
The activation of this (amber yellow) “warning” indicates that the Hands Free System was not able to extract the steering lock.

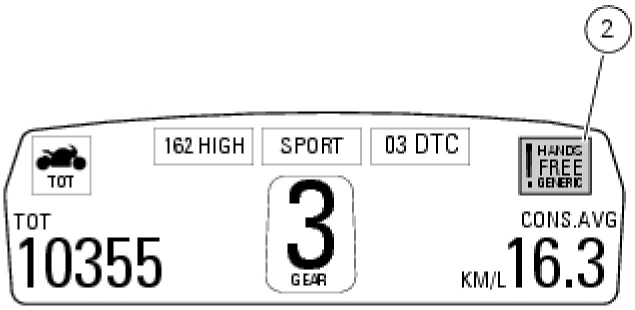
Note

In this case, we recommend switching the vehicle off and on (Key-Off / Key-On), while holding the handlebar pushed to full lock.

Dashboard diagnosis

This function identifies any abnormal vehicle behaviours.
The dashboard activates any abnormal vehicle behaviours in real time (ERRORS).
At Key-On (at the end of the check) one or more “ERRORS” are displayed in red (only if they are active).
When an “error” is triggered, the indication (red) remains well visible (1) for 10 seconds then becomes smaller (2).
If there are multiple errors, they will scroll automatically every 3 seconds. The “Engine/vehicle diagnosis - EOBD” light on dashboard located on handlebar always turns on when one or more errors are activated.
The table below shows the errors that can be displayed.





Warning light	Error message	Error
	BBS/DTC	Black Box / Traction Control control unit
	GEAR SENSOR	Gear sensor
	FUEL SENSOR	Fuel Level Sensor
	SPEED SENSOR	Speed sensor
	EXVL SYSTEM	Exhaust valve starter motor
	UNKNOWN DEVICE	Unknown control unit
	DEVICE ECU	ECU control unit not functioning
	DEVICE DSB SLAVE	Dashboard on handlebar not functioning
	DEVICE HANDS FREE	Hands Free control unit not functioning
	DEVICE BBS DTC	Black Box / Traction Control control unit not functioning
	THROTTLE POSITION	Incorrect throttle position
	ACCELER. POSITION	Incorrect accelerator position

ETV	Motor relay or Throttle Motor not functioning
DEVICE DBS MASTER	Dashboard on tank not functioning
PRESSURE SENSOR	Atmospheric pressure sensor
ENGINE TEMP.	Engine Temperature Sensor
T-AIR SENSOR	Air Temperature Sensor
FUEL INJECT.	Injection relay
COIL	Coil
INJECTOR	Injector
PICK UP	Timing/rpm sensor
LAMBDA	Lambda sensor
FAN RELAY	Fan relay
CAN LINE	CAN communication line
BATTERY	Battery voltage (HIGH or LOW)
DEVICE ABS	ABS control unit not functioning
STOP LIGHT	Rear stop light
ECU GENERIC	ECU error
KEY	HF communication problem
HANDS FREE GENERIC	Hands Free ECU error

“Setting” menu

This menu is used to enable/disable and set some motorcycle functions.
To access the “setting menu” press and hold button (2) “t” for 3 seconds.

Note

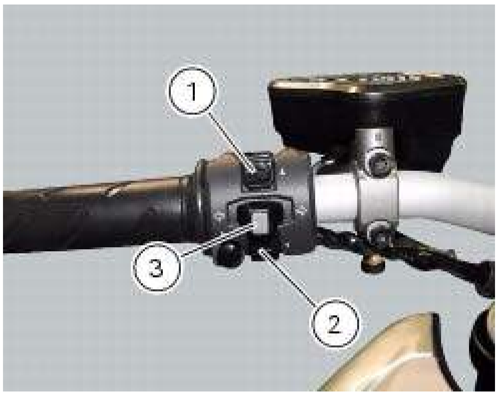
When within this menu no other function can be displayed.

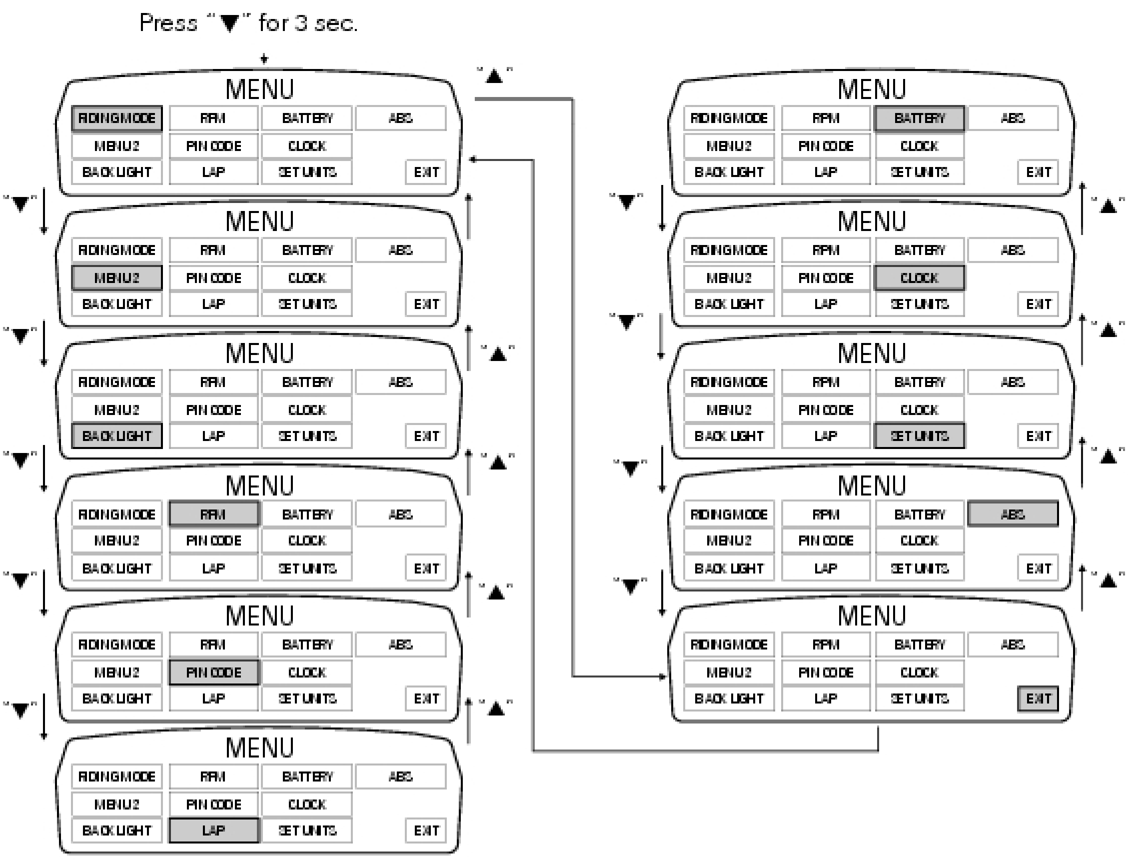
Important

For safety reasons, the setting menu can only be accessed when motorcycle speed is lower than or equal to 20 Km/h. If this menu is open and the speed of the motorcycle exceeds 20 km/h, the dashboard automatically exits the menu and returns to the “main“ display.
The setting menu contains the following “items”:

- RIDING MODE
- MENU 2
- BACK LIGHT
- RPM
- PIN CODE
- LAP
- BATTERY
- CLOCK
- SET UNITS
- ABS
- EXIT

To quit the setting menu, use button (1) “s” or button (2) “t” to select the “EXIT” indication and press the reset button (3).





“Riding Mode” customisation

This function customises each riding style.
To access the function it is necessary to view the “[“Setting” menu]”, using buttons (1) “s” or (2) “t” select the “RIDING MODE” function and press the reset button (3) to enter the following page.
When accessing the function, the three riding modes appear on the display; to customise the parameters, use buttons (1) “s” or (2) “t” to select the riding mode to be modified and press reset (3) to confirm.
The parameters that can be “customised” are “DTC” (Ducati Traction Control) and '”ENGINE”.
Any parameter change made is saved in the memory also after a Battery-Off.

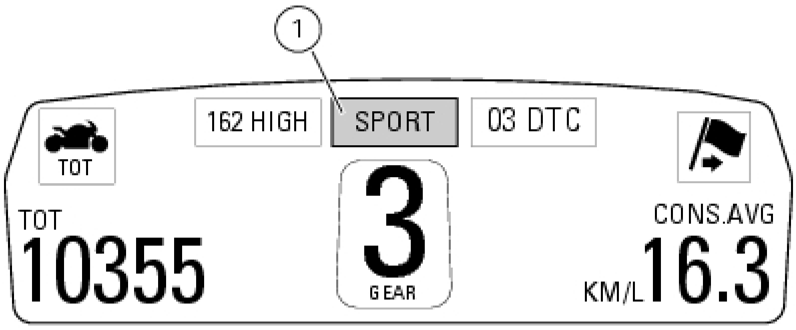
To modify the DTC parameters see the paragraph “DTC (Ducati Traction Control) setting function”.

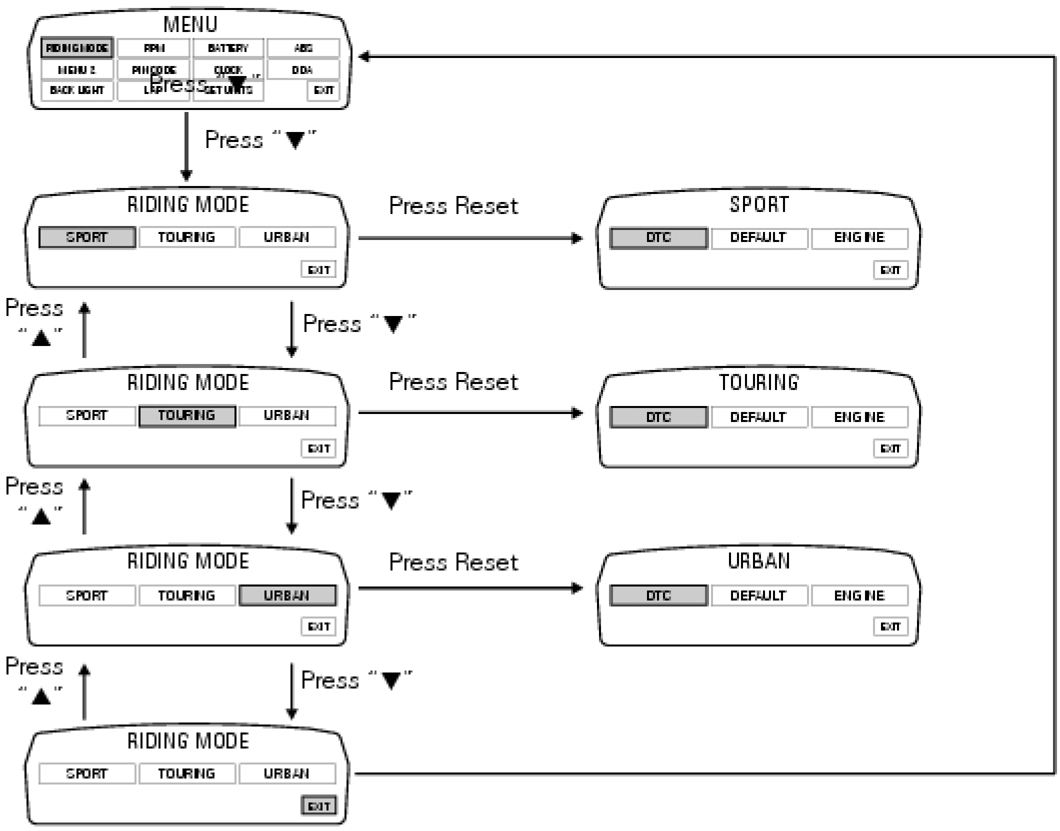
To modify the Engine parameters see the paragraph “ENGINE setting function (Engine Power Control)”.
The parameters set by Ducati for each individual riding style can be restored with the ”DEFAULT” function.

To reset the “default“ parameters see paragraph “DEFAULT function (Resetting Ducati default parameters)”.

If the parameters have not been modified (customised) or are reset using the “DEFAULT” function, when you quit the Setting menu, in the “main“ screen, the “background” indicating the riding style (SPORT, TOURING or URBAN) becomes blue (1).

Changes should only be made to the parameters by people who are experts in motorcycle setup; if the parameters are changed accidentally, use the “DEFAULT function (Resetting Ducati default parameters)” to reset the parameters.



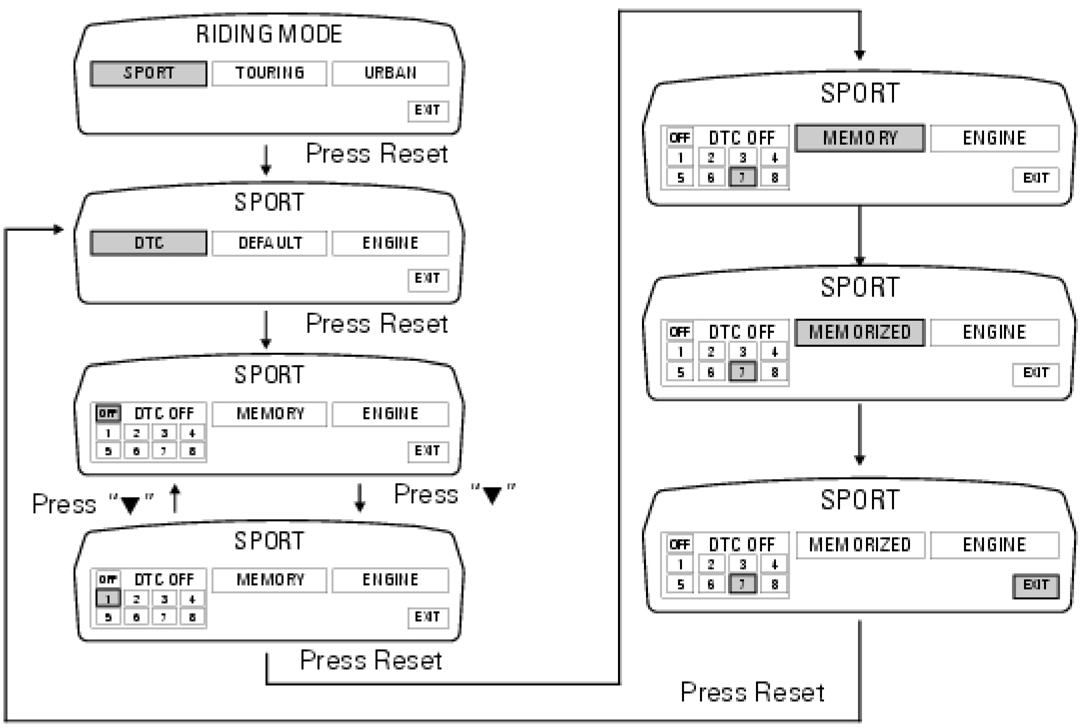


DTC (Ducati Traction Control) setting function

This function allows you to customise the level of DTC intervention (Ducati Traction Control) or disable it for every riding mode.
To access the function it is necessary to view the “““Setting” menu”, using buttons (1) “s” or (2) “t” select the “RIDING MODE” function and press the reset button (3) to enter the following page. Use button (1) “s” or (2) “s” to select the riding style to change and press the reset button (3).
To go to next page use button (1) “s” or (2) “s” to select the “DTC“ indication and press the reset button again (3) to confirm selection.
When accessing the function, the currently set DTC level appears at the left-hand side of the display, inside a rectangle (ex.: DTC 1). Use button (1) “s” or (2) “s” to select the new intervention level (1 to 8) or OFF to disable the Traction Control; after selecting the new setting, press the reset button (3) to highlight “MEMORY” indication. At this point, store the new setting by pressing and holding the reset button (3) for 3 seconds with “MEMORY” displayed. If the setting has been stored successfully, the display will show “MEMORIZED” in green for 2 seconds and the EXIT option will be highlighted automatically.

To exit the setting function, press the reset button (3) when “EXIT” is highlighted.
The DTC intervention increases, passing from level 1 to level 8.
The following table indicates the most suitable level of DTC intervention for the various riding types as well as the default settings in the “RIDING MODE“ that can be selected by the rider:

DTC level	Riding type	Use	Default?
1	Sport	Sporty riding on a road for expert users and on track	It is the default setting of the SPORT RIDING MODE
2	Sport-Touring	Riding on a road for expert users	/
3	Touring	Normal riding on a road	It is the default setting of the TOURING RIDING MODE
4	Touring 2	Normal riding on a road for less expert users	/
5	Urban	Riding in town	It is the default setting of the URBAN RIDING MODE
6	Urban 2	Riding in town for less expert users	/
7	Wet	Riding with damp ground	/
8	Rain	Riding with wet ground	/



Tips on how to select the sensitivity level

Warning

The 8 level settings of the DTC were calibrated using tyres of the same make, model and size as those originally fitted to the motorcycle.
The use of tyres of different size to the original tyres may alter the operating characteristics of the system.
In the case of minor differences, such as for example, tyres of a different make and/or model than the original, but with the same dimensions (rear = 240/45-17; front = 120/70-17), it may be sufficient to simply select the most suitable level setting from those available to restore optimal system operation.
If tyres of a different size class are used or if the tyre dimensions differ significantly from the original tyres, it may be that the system operation is affected to the point where none of the 8 available level settings will give satisfactory results.
In this case is it is advisable to deactivate the traction control system.

If level 8 is selected, the DTC control unit will kick in at the slightest hint that the rear wheel is starting to spin. Between level 8 and level 1 there are a further 6 intermediate levels. The level of DTC intervention decreases in equal steps from level 8 to level 1.
Level 1 allows considerable spinning and requires constant and good grip to operate correctly; Level 1 is thus recommended for expert users only and with excellent road conditions.
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 style (whether the rider has a “smooth” or a “rough” style)

The relation of the DTC intervention level to grip conditions:
The choice of level setting depends greatly on the grip conditions of the track/circuit (see below, tips for use on the track and on the road).

The relation of the DTC intervention level to the circuit characteristics:
If all the corners on the track/circuit can be taken at a similar speed, it will be easier to find an intervention level that is satisfactory for every bend; on the other hand, if the track has, for example, one corner that is much slower than all the others, it will necessary to find a compromise level (on the slow corner the DTC will tend to control more than on the faster corners).

The relation of the DTC intervention level to riding style:
The DTC will tend to kick in more with a “smooth” riding style, where the bike is leaned over further, rather than with a “rough” style, where the bike is straightened up as quickly as possible when exiting a turn.

Tips for use on the track

We recommend level 8 be used for a couple of full laps (to allow the tyres to warm up) in order to get used to the system. Then try levels 7, 6, etc., in succession until you identify the DTC intervention level that suits you best (always try each level for at least two laps to allow the tyres to warm up).
Once you have found a satisfactory setting for all the corners except one or two slow ones, where the system tends to kick in and control too much, you can try to modify your riding style slightly to a more “rough” approach to cornering i.e. straighten up more rapidly on exiting the corner, instead of immediately trying a different level setting.

Tips for use on the road

Activate the DTC, select level 8 and ride the motorcycle in your usual style; if the level of DTC intervention seems excessive, try reducing the setting to levels 7, 6, etc., until you find the level that suits you best.
If changes 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 as described above 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).

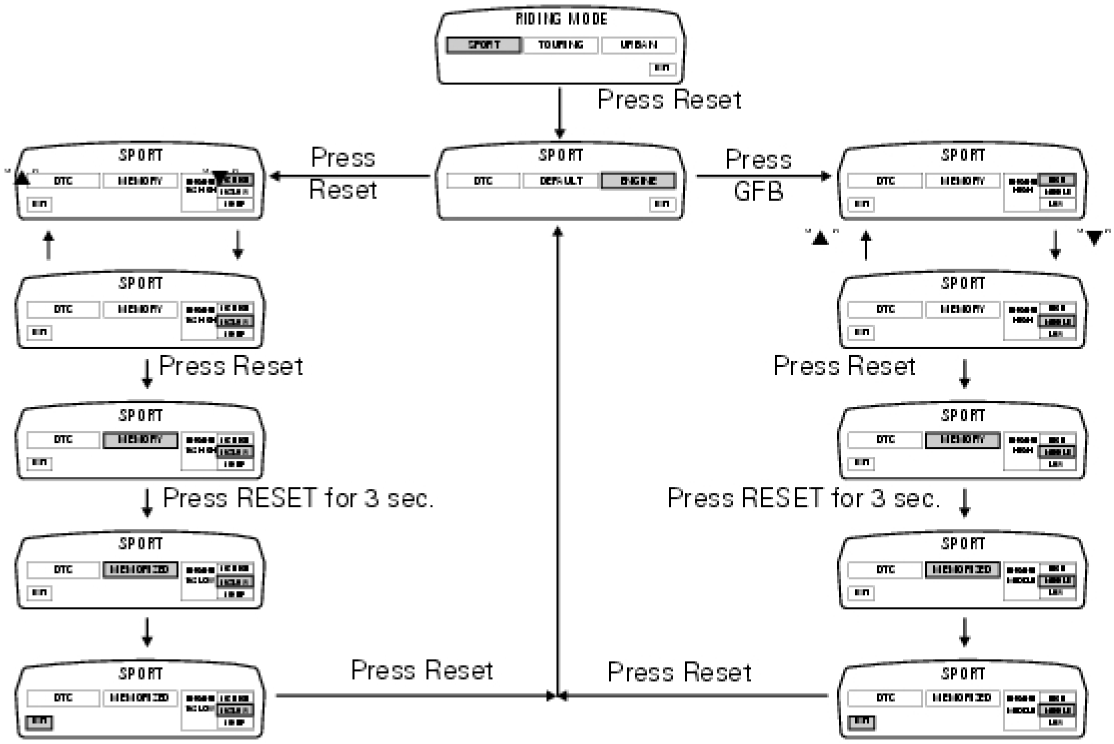
ENGINE setting function (Engine Power Control)

This function customises engine power and output.
To access the function it is necessary to view the ““Setting” menu”, using buttons (1) “s” or (2) “t” select the “RIDING MODE” function and press the reset button (3) to enter the following page.
Use button (1) “s” or (2) “t” to select the riding mode to be changed and press the reset button (3) to access the next page; use button (1) “s” or (2) “t” to select the “ENGINE“ indication and press the reset button again (3) to confirm selection.
When accessing the function, the engine setting (ENGINE 162 HIGH, 162 LOW o 100 HP) appears at the right-hand side of the display, inside a rectangle.

Note

In Japan and France versions, the display displays the settings (ENGINE HIGH, MIDDLE or LOW).

Using button (1) “s” or (2) “t” select one of the three available engine settings; after selecting the new setting, press the reset button (3) to highlight “MEMORY” indication.
At this point, store the new setting by pressing and holding the reset button (3) for 3 seconds with “MEMORY” displayed.
If the setting has been stored successfully, the display will show “MEMORIZED” in green for 2 seconds and the EXIT option will be highlighted automatically.
To exit the setting function, press the reset button (3) when “EXIT” is highlighted.



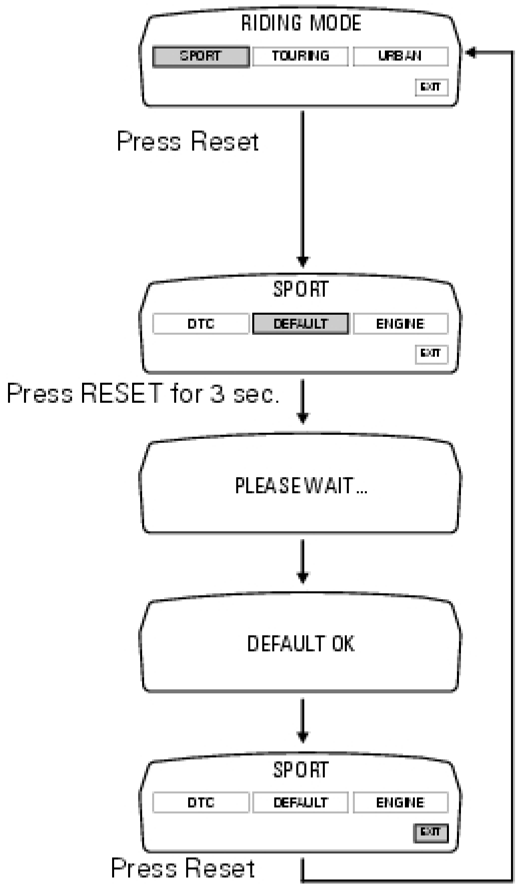
DEFAULT function (Resetting Ducati default parameters)

This function resets the parameters set by Ducati for each riding style.
To access the function it is necessary to view the "“Setting” menu", using buttons (1) “s” or (2) “t” select the “RIDING MODE” function and press the reset button (3) to enter the following page.
Use button (1) “s” or (2) “t” to select the riding mode to be reset to default (initial) parameters and press the button (3) to access the next page. Now, using button (1) “s” or (2) “t” select “DEFAULT” indication.
To restore original default parameters, press and hold the reset button (3) for 3 seconds.
For the parameter reset, approx. 3 seconds are needed during which “PLEASE WAIT...” will appear on the display; at the end of the procedure, “DEFAULT OK“ will appear on the display to indicate that the parameters were reset.

Important

This procedure restores the parameters for all riding styles.

To exit the setting function, press the reset button (3) when “EXIT” is highlighted.

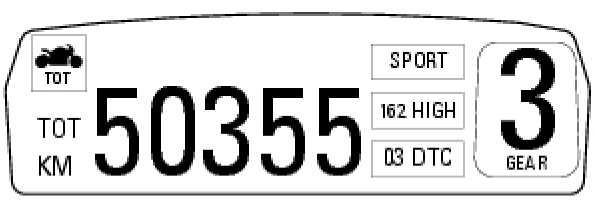


Menu 2 On/Off function

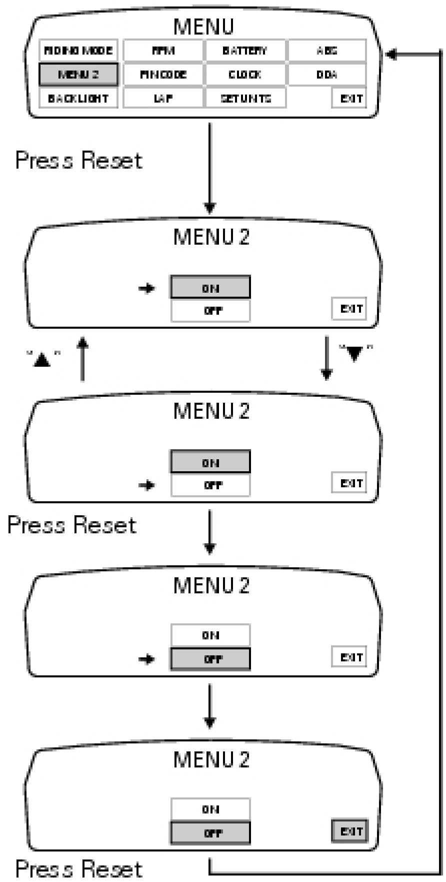
This function turns off and back on the Menu 2.
If Menu 2 is disabled, the functions for average fuel consumption (CONS.AVG), instantaneous fuel consumption (CONS.), average speed (SPEED AVG), trip time (TRIP TIME) and air temperature (AIR) will no longer be displayed in the "main screen". Nevertheless, all these functions will keep on their counters so that when Menu 2 is re-enabled data will be updated and consistent.

Menu 2 "ON"

Menu 2 "OFF"



To access the function it is necessary to view the "["Setting" menu]", using buttons (1) "s" or (2) "t" select the "MENU 2" function and press the reset button (3) to enter the following page.
Function state is highlighted on the display (ON in green or OFF in yellow); use button (1) "s" or (2) "t" to shift the arrow to the left onto the new setting and confirm by pressing the reset button (3).
To exit the setting function, press the reset button (3) when "EXIT" is highlighted.



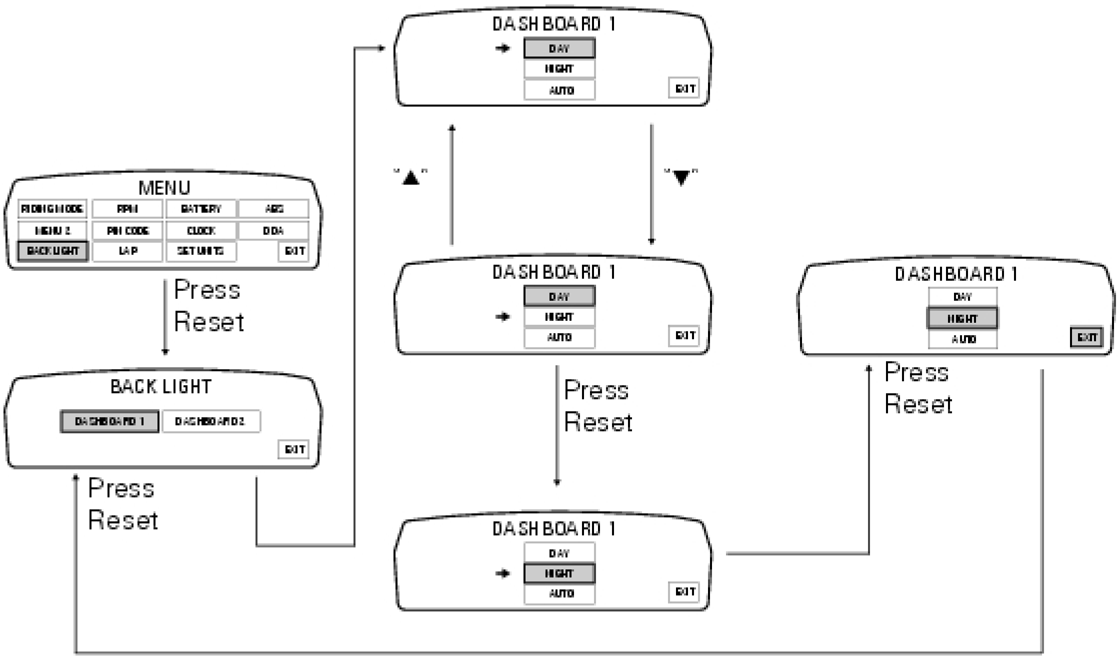
Background setting function for the dashboard on tank - DASHBOARD 1

This function allows setting the “background“ of the dashboard on tank.
To access the function it is necessary to view the “[“Setting” menu]”, using buttons (1) “s” or (2) “t” select the “BACK LIGHT” function and press the reset button (3) to enter the following page.
Use button (1) “s” or (2) “t” to select the “DASHBOARD 1” function and confirm by pressing the reset button (3).
Once you enter the “DASHBOARD 1” function, setting is highlighted on the display (DAY, NIGHT or AUTO in green); use button (1) “s” or (2) “t” to shift the arrow to the left onto the new setting and confirm by pressing the reset button (3).
To exit the setting function, press the reset button (3) when “EXIT” is highlighted.

“DAY” setting: dashboard background becomes permanently “white” to improve readout view - recommended with bright exterior lighting.
“NIGHT” setting: dashboard background becomes permanently “black” for a more dimmed visibility - recommended with poor exterior lighting and/or dark.
“AUTO” setting: dashboard background is set automatically according to exterior lighting conditions (detected by a sensor) and will be “black” for a more dimmed visibility with poor exterior lighting and “white” for an improved readout view with bright exterior lighting.

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 “AUTO” mode.

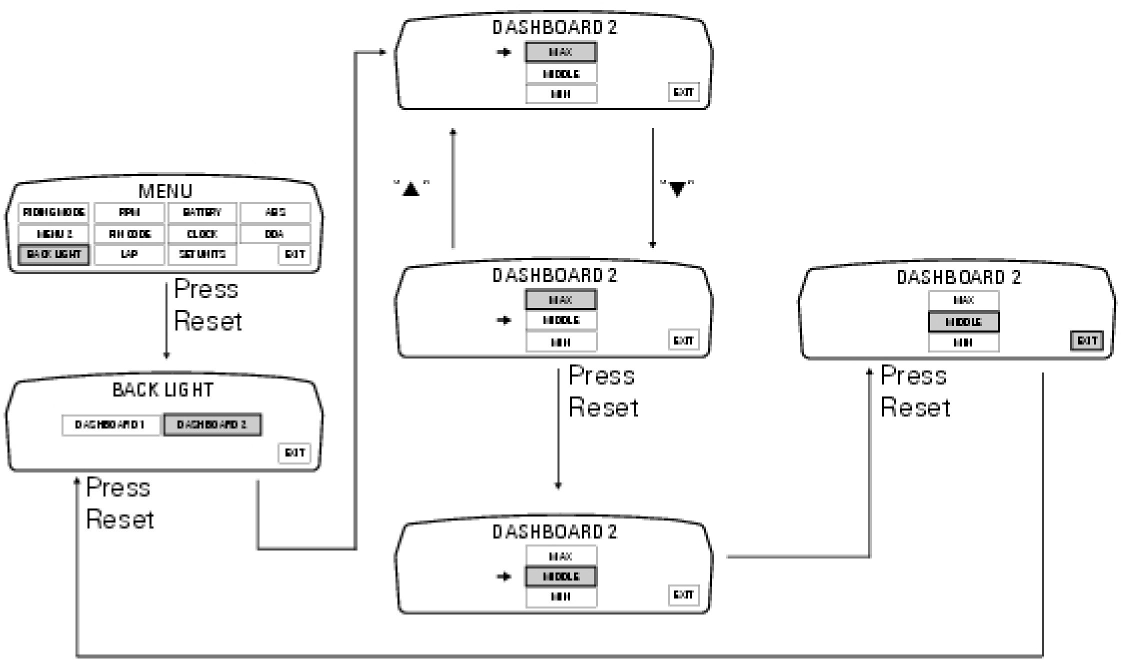


Backlighting setting function for the dashboard on handlebar - DASHBOARD 2

This function allows backlighting setting of the dashboard on handlebar.
To access the function it is necessary to view the "["Setting" menu]", using buttons (1) "s" or (2) "t" select the "BACK LIGHT" function and press the reset button (3) to enter the following page.
Use button (1) "s" or (2) "t" to select the "DASHBOARD 2" function and confirm by pressing the reset button (3).
Once you enter the "DASHBOARD 2" function, setting is highlighted on the display (MAX, MIDDLE or MIN in green); use button (1) "s" or (2) "t" to shift the arrow to the left onto the new setting and confirm by pressing the reset button (3).
To exit the setting function, press the reset button (3) when "EXIT" is highlighted.

Select "MAX" setting and the background of the dashboard on handlebar permanently sets backlighting to maximum power to improve readout view - recommended with bright exterior lighting.
Select "MIDDLE" setting and the background of the dashboard on handlebar permanently sets reduced backlighting to 30% of its maximum power for dimmed visibility - recommended with poor exterior lighting.

Select "MIN" setting and the background of the dashboard on handlebar permanently sets reduced backlighting to 50% of its maximum power for dimmed visibility - recommended with very poor exterior lighting and/or dark.

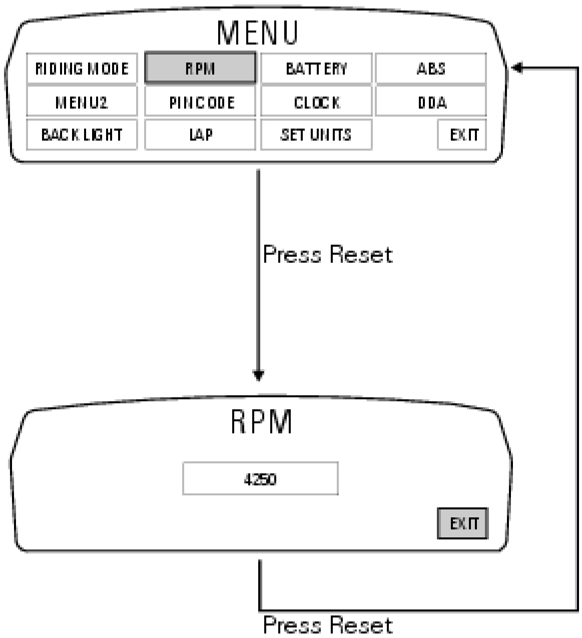


Digital RPM indication function

This function displays the number of RPMs for improved accuracy when setting idle rpm.

To access the function it is necessary to view the "“Setting” menu", using buttons (1) “s” or (2) “t” select the “RPM” function and press the reset button (3) to confirm.
The display shows the numerical value of the RPM with a precision of 50 rpm.

To exit the setting function, press the reset button (3) when “EXIT” is highlighted.



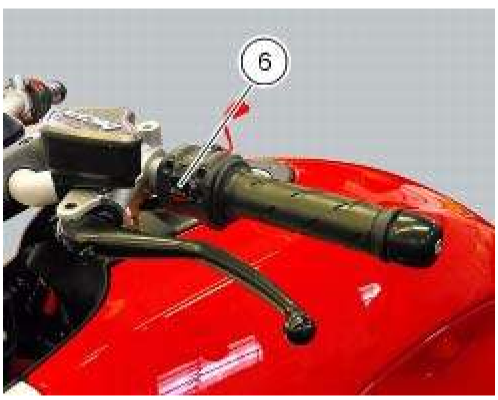
LAP Activation/Deactivation function (lap time)

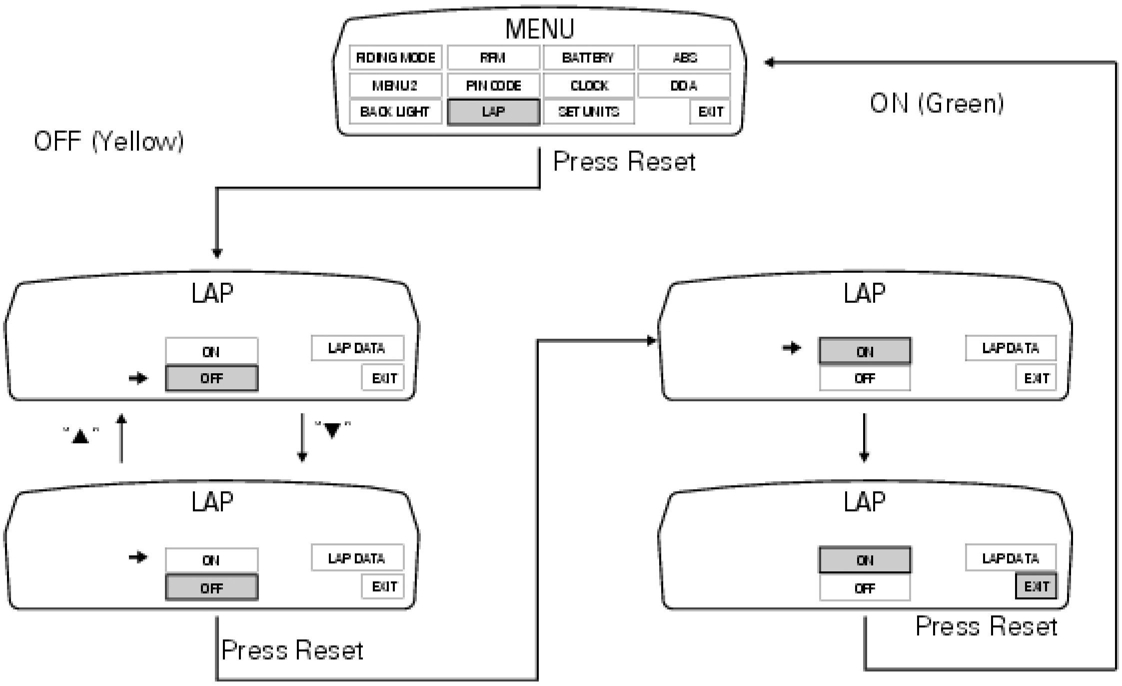
This function activates and deactivates the LAP function (lap time).
To access the function it is necessary to view the "“Setting” menu", using buttons (1) “s” or (2) “t” select the “LAP” function and press the reset button (3) to enter the following page.
Function state is highlighted on the display (ON in green or OFF in yellow); use button (1) “s” or (2) “t” to shift the arrow to the left onto the new setting and confirm by pressing the reset button (3).
To exit the setting function, press the reset button (3) when “EXIT” is highlighted.

Storing the “OFF” condition disables the LAP function.
Storing the “ON“ condition enables the LAP function (see “LAP registration” paragraph).

Note

While the “LAP” function is active, the flash headlight button (6) both flashes the high beam headlight and Starts/Stops the lap timer.

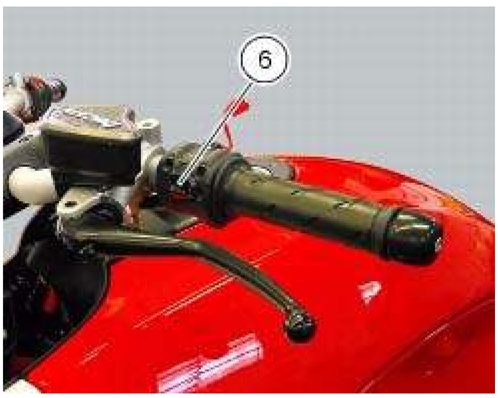


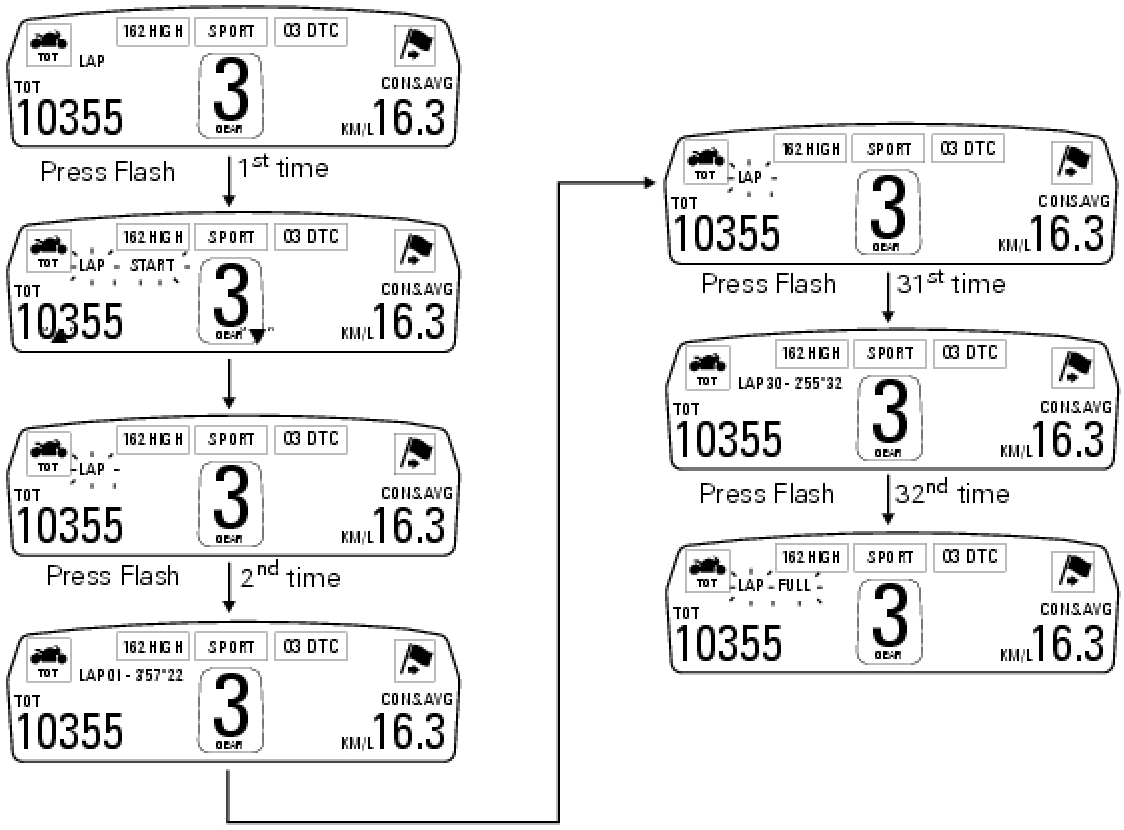


LAP registration function

This function describes the “LAP“ time registration.
If the function is activated (see “LAP activation/deactivation description), the lap time can be registered as follows: pressing the flash headlight button (6) the first time starts the “lap timer” for the first lap, and the dashboard shows the message “LAP-START” flashing for 4 seconds, and then returns to the “previous“ display;
from this moment, each time that the flash (6) is pressed the display automatically shows the lap number and lap time for 10 seconds and then returns to the “previous“ display.

You can save a maximum of 30 laps in the memory.
Once the memory is full, the dashboard no longer stores lap times when the flash headlight button (6) is pressed, and the flashing message “LAP-FULL” is shown on the display for 4 seconds until the times are reset.
When the LAP function is set disabled, the current “lap“ is not stored.
If the LAP function is active and suddenly the motorcycle is suddenly turned off (Key-Off), the function will be automatically disabled (even if the lap timer was active, the current “lap“ is not stored).
If the time is never “stopped“, it will roll over upon reaching 9 minutes, 59 seconds and 99 hundredths; the lap timer starts counting from 0 (zero) and will keep running until the function is disabled.
If however the LAP function is switched on and the memory has not been cleared, but fewer than 30 laps have been saved (e.g. 18 laps), the dashboard will store any remaining laps until the memory is full (in this case, it will store an additional 12 laps).
This function only displays the times for the lap being registered; but other data are also saved (MAX speed and MAX rpm) for viewing at a later date in the “LAP DATA” function (stored LAP display).





Stored LAP display function

This function displays the stored LAPs.
To access the function it is necessary to view the "“Setting” menu", using buttons (1) “s” or (2) “t” select the “LAP” function and press the reset button (3) to enter the following page.
Use button (1) “s” or (2) “t” to select “LAP DATA” indication and press the reset button again (3) to enter the page showing the previously recorded lap times.

The dashboard displays the information as follows:
at top left, the number of the displayed lap (ex.: LAP N.01);
at bottom left, a rectangle inside which is the lap time (TIME), top speed in that lap (SPEED MAX) and top rpm in the same lap (RPM MAX);
on the right, use button (1) “s” or (2) “t” to select “NEXT” (so that every time the reset button is pressed (3) the next lap is displayed) or “PREV” (so that every time the reset button is pressed (3) the previous lap is displayed);

To exit, select “EXIT” and press the reset button (3).

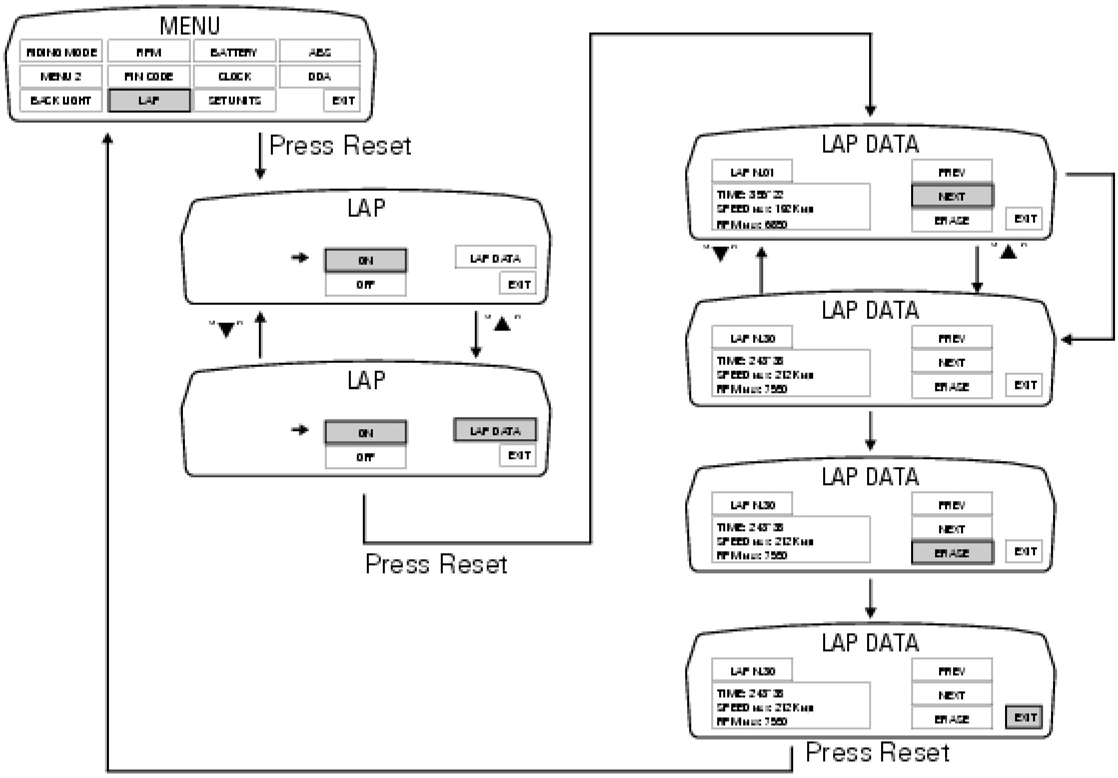
Note

The MAX stored speed is indicated on the display (increased by 5%).

If no lap times are saved in memory, “NO LAP” indication is displayed and lap timer will indicate “-.- -.- -”, MAX rpm will be = - - - - - - and MAX speed = - - - - -.

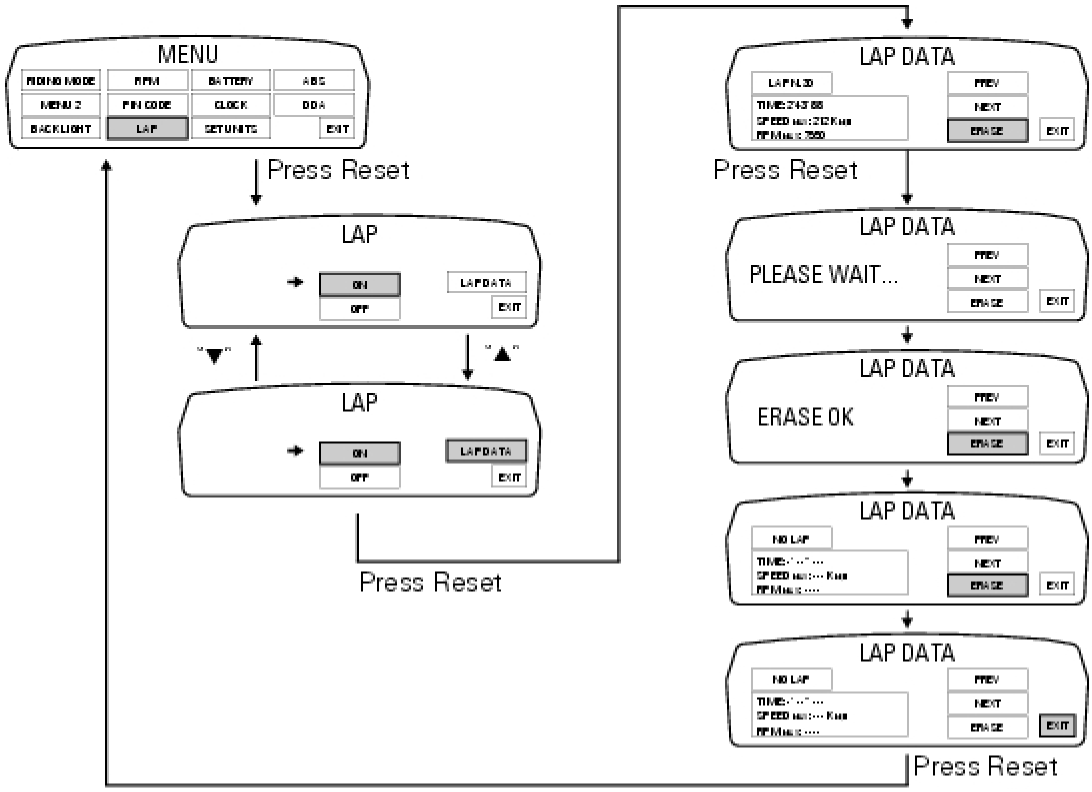
Note

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



Stored LAP erase function

This function erases the stored LAPs.
To access the function it is necessary to view the “Setting” menu”, using buttons (1) “s” or (2) “t” select the “LAP” function and press the reset button (3) to enter the following page.
Use button (1) “s” or (2) “t” to select “LAP DATA” indication and press the reset button again (3) to enter the page showing the previously recorded lap times.
Highlight the “ERASE” item, use button (1) “s” or (2) “t” to scroll through the stored LAPs to erase and press the reset button (3) for 3 seconds. Now, on the left-hand side of the display you have “PLEASE WAIT...” and then, to confirm deletion, “ERASE OK” appears for 2 seconds.
You will notice that no stored data will be present any more and “NO LAP” message will be displayed.
To exit, select “EXIT” and press the reset button (3).



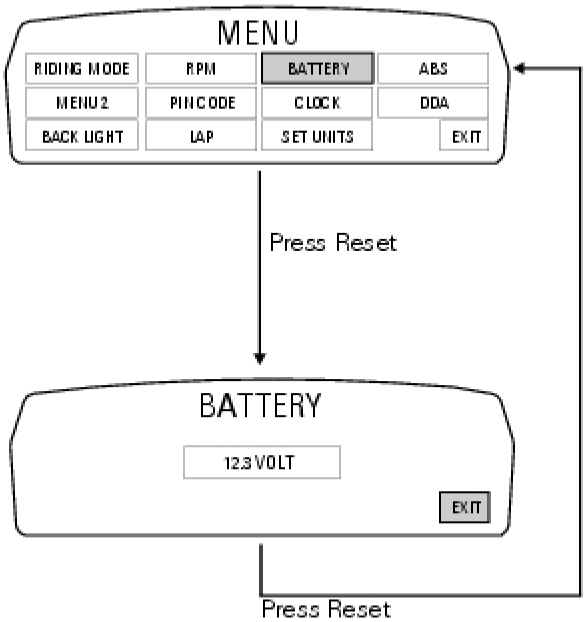
Battery voltage indicator (BATTERY)

This function describes the battery voltage indicator.
To access the function it is necessary to view the "“Setting” menu", using buttons (1) “s” or (2) “t” select the “BATTERY” function and press the reset button (3) to confirm.
The information will be displayed as follows:

if battery voltage is between 11.8 and 14.9 Volt the reading will be displayed steady;
if battery voltage is between 11.0 and 11.7 Volt the reading will be displayed flashing;
if battery voltage is between 15.0 and 16.0 Volt the reading will be displayed flashing;
if battery voltage is equal to or less than 10.9 Volt, “LOW“ is shown flashing and the “Vehicle/Engine Diagnosis - EOBD“ light comes on;
if battery voltage is equal to or higher than 16.1 Volt, “HIGH“ is shown flashing and the “Vehicle/Engine Diagnosis - EOBD“ light comes on;

Note

Dashes “- - -“ appear if the reading is not available.



Clock setting function

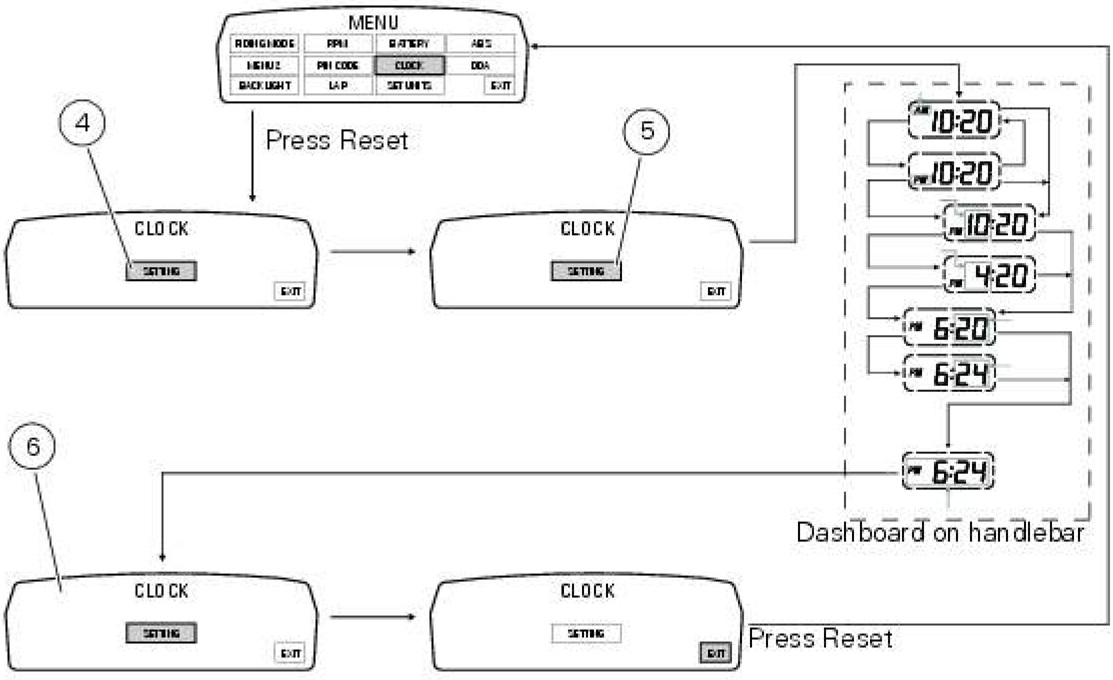
This function sets the clock.
To access the function it is necessary to view the "“Setting” menu", using buttons (1) "s" or (2) "t" select the "CLOCK" function and press the reset button (3) to confirm.
In the following screen the message "SETTING" is highlighted in green (4); now, press the reset button (3) for 3 seconds to edit the time displayed on the handlebar dashboard, and the "SETTING" indication highlighting becomes grey (5).

Clock setting

On entering this mode, the message "AM" will flash;
press button (2) "t", the message "PM" starts flashing;
press button (2) "t" to return to the previous step (if the current time is 00:00, 12:00 will be displayed when switching from "AM" to "PM");
press button (1) "s“ to access the hour setting mode; the hour value starts to flash;
each time button (2) "t“ is pressed increases the digit by 1 hour; pressing and holding button (2) "t", the digit increases by 1 hour every second (the hour value does not flash while the button is kept pressed).
pressing button (1) "s“ gives access to the minute setting mode; minutes start to flash.
each time button (2) "t" is pressed increases the digit by 1 minute; pressing and holding button (2) "t", the digit increases by 1 minute each second;
pressing and holding the button (2) "t" for more than 5 seconds, the value increases by 1 every 100 m (the second value does not flash while button (2) "t" is kept pressed).
If you press button (1) "s" setting is completed and the tank dashboard display "SETTING" item is again highlighted in green (6).
To exit, select "EXIT" and press the reset button (3).

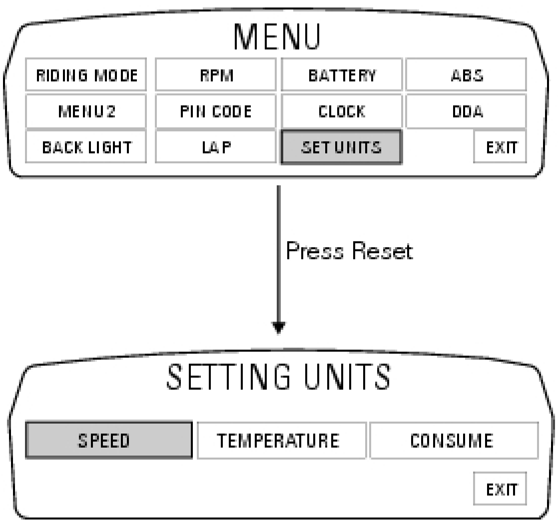
Note

In case of a battery is cutoff, when the voltage is restored and at the next Key-On, the clock is always reset (it starts automatically from 00:00).



Units of measurement modification function

This function allows you to change the units of measurement of the displayed values.
To access the function it is necessary to view the "“Setting” menu", using buttons (1) “s” or (2) “t” to select the “SET UNITS” function and press the reset button (3) to enter the following page.
Use button (1) “s” or (2) “t” to select the value relative to the unit of measurement to be changed and press the reset button again (3).
The dashboard displays the values that can be modified; select the parameter to be modified by pressing buttons (1) “s“ or (2) “t” and then pressing the reset button (3) again.



“SPEED” setting

This function allows to change the units of measurement of speed (and hence even the ones of distance travelled).
Currently set unit of measurement is highlighted in green on the display; use button (1) “s” or (2) “t” to shift the arrow to the left onto the new setting and confirm by pressing the reset button (3).
Save the setting and, when coming back to main screen, any new unit of measurement set will be present.
1 Km/h: by setting this condition the following values will have the same units of measurement:
-TOT, TRIP1, TRIP2, TRIP FUEL: Km

-Vehicle speed and AVERAGE speed (SPEED AVG): Km/h
2 mph: by setting this condition the following values will have the same units of measurement:
-TOT, TRIP1, TRIP2, TRIP FUEL: miles
-Vehicle speed and AVERAGE speed (SPEED AVG): mph.
To exit the setting function, press the reset button (3) when “EXIT” is highlighted.

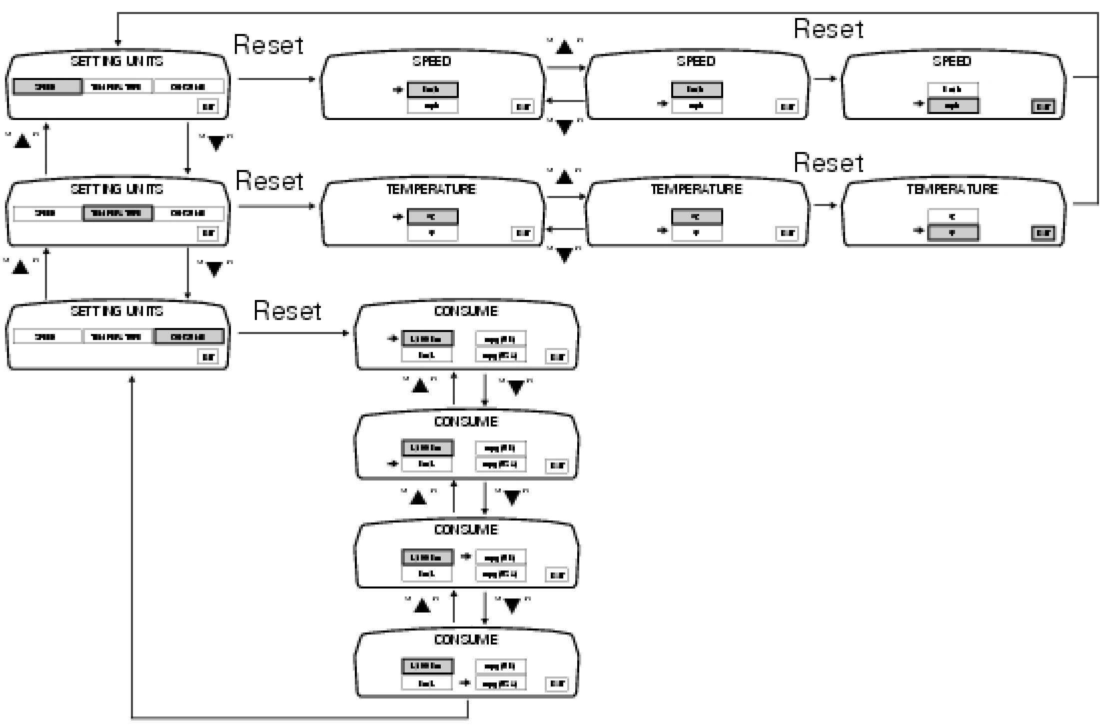
“TEMPERATURE” setting

This function allows you to change the units of measurement of the temperature.
Currently set unit of measurement is highlighted in green on the display; use button (1) “s” or (2) “t” to shift the arrow to the left onto the new setting and confirm by pressing the reset button (3).

Save the setting and, when coming back to main screen, any new unit of measurement set will be present.
3 °C: by setting this condition the following values will have the same units of measurement:
-Engine coolant temperature and T_AIR: °C
4 °F: by setting this condition the following values will have the same units of measurement:
-Engine coolant temperature and T_AIR: °F
To exit the setting function, press the reset button (3) when “EXIT” is highlighted.

“CONSUME” setting

This function allows to change the units of measurement of the Average and Instantaneous fuel consumption.
Currently set unit of measurement is highlighted in green on the display; use button (1) “s” or (2) “t” to shift the arrow to the left onto the new setting and confirm by pressing the reset button (3).
Save the setting and, when coming back to main screen, any new unit of measurement set will be present.
5 Km/l: by setting this condition the following values will have the same units of measurement:
-CONS. and CONS. AVG. : Km/L
6 l/100: by setting this condition the following values will have the same units of measurement:
-CONS. and CONS. AVG: l/100
7 UK mpg: by setting this condition the following values will have the same units of measurement:
-CONS. and CONS. AVG: UK mpg
8 USA mpg: by setting this condition the following values will have the same units of measurement:
-CONS. and CONS. AVG: USA mpg
To exit the setting function, press the reset button (3) when “EXIT” is highlighted.



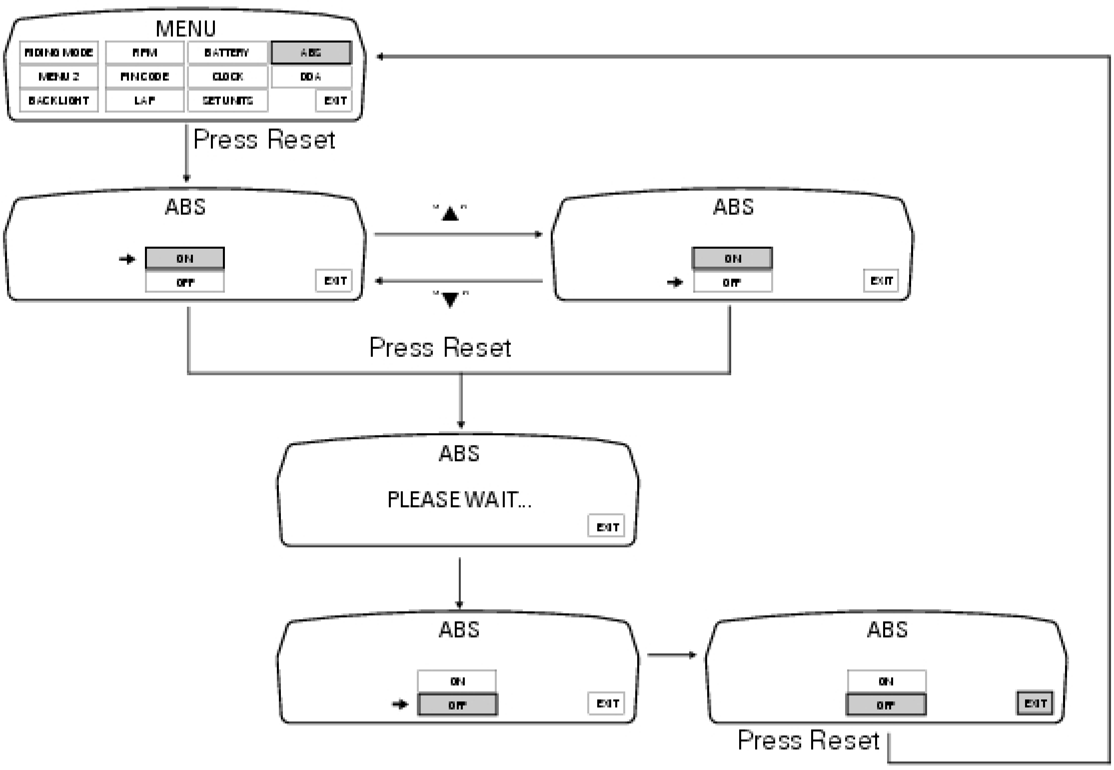
ABS disabling function

This function disables or enables the ABS.
To access the function it is necessary to view the “[“Setting” menu]”, using buttons (1) “s” or (2) “t” to select the “ABS” function and press the reset button (3) to enter the following page.
Function state is highlighted on the display (ON in green or OFF in yellow); Use button (1) “s” or (2) “t” to shift the arrow on the left onto the new setting and confirm by pressing the reset button (3) for 3 seconds.
After these 3 seconds the system checks whether the request was actually complied with; during the check the display will show the message “PLEASE WAIT...”.
The new condition will be displayed after check time.

Note

If the disabling request was not met, it is recommended to repeat the procedure. If the problem persists, contact your Ducati dealer or Authorised Service Centre.

To exit the setting function, press the reset button (3) when “EXIT” is highlighted.



Immobilizer override procedure

This procedure makes it possible to “temporarily“ turn on the motorcycle if the HF (Hands Free) System is not working.

Note

The PIN CODE function must be activated by entering your 4 digit PIN in the dashboard, otherwise the vehicle cannot be turned on temporarily in the case of a malfunction.

Warning

The motorcycle owner must activate (store) the PIN code; if there is already a stored PIN, contact an Authorised Ducati dealer to have the function “reset“. To perform this procedure, the Authorised Ducati Dealer may ask you to demonstrate that you are the owner of the motorcycle.
PIN CODE activation function
To access the function it is necessary to view the “setting”menu, using buttons (1) “s” or (2) “t” to select the “PIN CODE” function and press the reset button (3) to enter the following page.

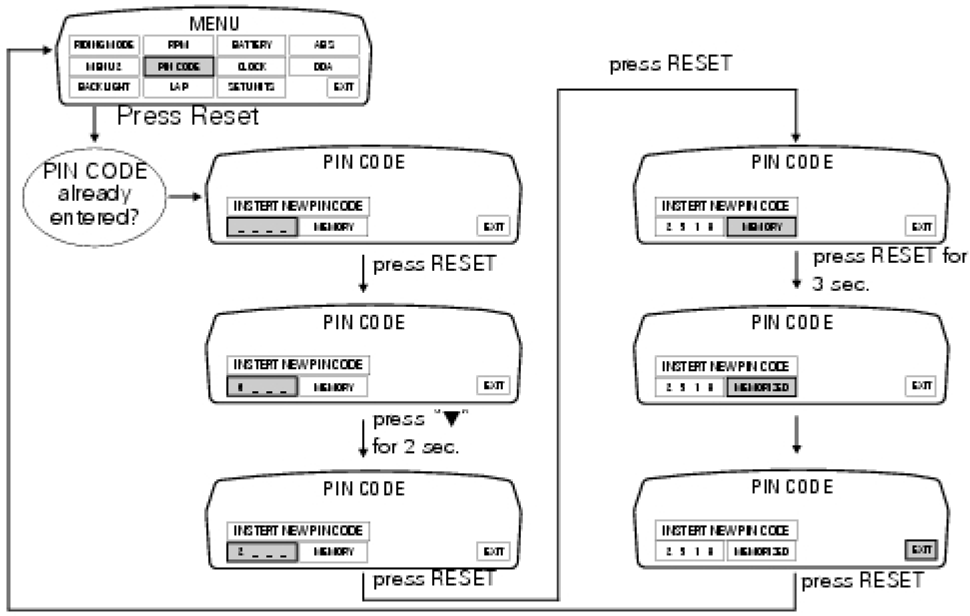
Note

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

When accessing the function, “INSERT NEW PIN CODE” with four dashes “- - - -“ in the bottom line will appear on the display highlighted in green; now enter a 4 digit code.

Entering the code:
press the reset button (3).
Pressing button (2) “t” repeatedly cycles the highlighted number from “0” to “9” and then back to “0”;
to confirm the number, press the reset button (3).
Repeat the procedure until inserting the fourth digit.
To highlight the “MEMORY” indication, press the reset button (3) again.
To store the entered PIN, press the reset button (3) for 3 seconds with “MEMORY” indication highlighted in green.
As a confirmation of PIN storage, the display will show the message “MEMORIZED” for about 2 seconds and then automatically highlight “EXIT” option.
From this moment, “MODIFY PIN CODE” will be displayed when accessing the “PIN CODE” function and the PIN can be

changed again as many times as necessary (without limits).
To exit the setting function, press the reset button (3) when “EXIT” is highlighted.



PIN CODE change function

This function changes your four number PIN CODE.
To access the function it is necessary to view the “setting”menu, using buttons (1) “s” or (2) “t” to select the “PIN CODE” function and press the reset button (3) to enter the following page.

Note

If “INSERT NEW PIN CODE” and the dashes “- - - -” appear when accessing this function, this means that the function was not active as the PIN CODE was never entered. Enter your PIN as described in the previous paragraph “PIN CODE activation function”.

When accessing the function, “MODIFY PIN CODE”, “OLD PIN” with four dashes “- - - -“ in the bottom line will appear on the display highlighted in green; now enter the 4 digit code.

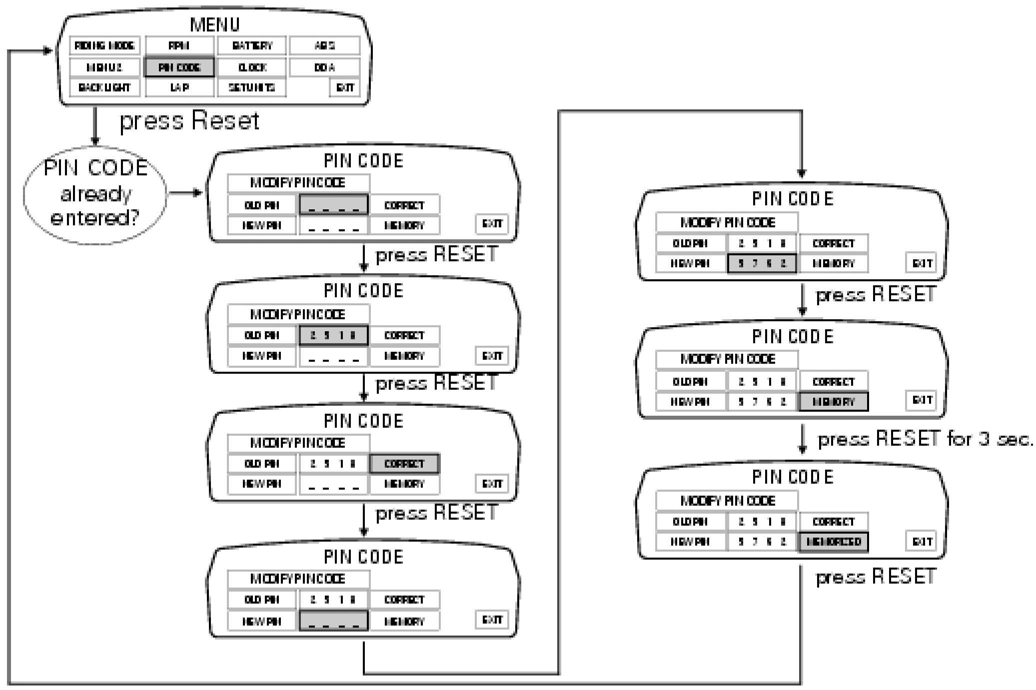
Note

To change the PIN, you must know the currently stored PIN.

Now you shall enter the “old” PIN code (OLD PIN).
Press the reset button (3); pressing button (2) “t” repeatedly cycles the highlighted number from “0” to “9” and then back to “0”;
to confirm the number, press the reset button (3);
repeat the procedure until inserting the fourth digit;
press the reset button (3) again to confirm.
If the entered code is incorrect, the dashboard will return to the four dashes “ - - - - “ in order to enter the code again.
If the entered code is correct, “CORRECT” is automatically highlighted in green for about 2 seconds and then the four dashes
“ - - - - “ next to “NEW PIN” indication are automatically highlighted; now enter the “new“ 4 digit code.
Press the reset button (3); pressing button (2) “t” repeatedly cycles the highlighted number from “0” to “9” and then back to “0”;
to confirm the number, press the reset button (3);
repeat the procedure until inserting the fourth digit;
press the reset button (3) again to confirm.
Item “MEMORY” is automatically highlighted.
To store the entered new PIN, press the reset button (3) for 3 seconds with “MEMORY” indication highlighted in green.
As a confirmation of the new PIN storage, the display will show message “MEMORIZED” for about 2 seconds and then “EXIT” is automatically highlighted.
To exit the setting function, press the reset button (3) when “EXIT” is highlighted.

Note

There is no limit to the amount of times you can change your PIN CODE.



8 -The Hands Free system

Introduction to the “Hands Free“ system

The Hands free system allows the rider to start the engine without physically using the ignition key. The ignition key merely has to be in the vicinity of the motorcycle, such as in the rider's pocket, for example, in order to use the vehicle. Compared to the standard ignition switches the Hands Free system allows having the hands completely free during usual actions (i.e. engine ignition/stop, dashboard switch on/off) and engaging/disengaging the steering lock.

The electric steering lock used with the Hands free system locks the handlebar either in the fully right or fully left position, offering greater versatility when parking.

The Hands free system consists of the following components:
- Hands free system with integrated button for switching the dashboard on and off and for locking and releasing the electric steering lock (henceforth indicated as “On/off button or switch”)
- Antenna
- Electric steering lock (integrated into Hands free system)
- Active key (with internal battery and transmitter) and passive key (with internal transponder)
- Button on handlebar for switching dashboard on and off and for locking and releasing the electric steering lock

The Hands free system is connected to the other computers (nodes) on the motorcycle and to the dashboard via the CAN line. Through this connection, the system can either enable (key detected and recognised) or disable (key not detected or not recognised – immobilizer function) engine start. Any relevant information messages, such as battery key low warning or no key warning, are displayed on the tank dashboard.

Operating principle

Introduction

The Hands free system features two separate on/off buttons, either one of which may be used as preferred by the rider. For practical reasons, we recommend using the button on the handlebar rather than the button located underneath the plastic shield covering the Hands free system (in front of the tank).

In order to be able to turn the motorcycle on, the active key (which may be kept in the pocket, for instance) must be within 1.5 metres from the antenna located inside the document compartment under the seat. In case the active key charge is low or ignition by means of the passive key it is necessary to start the bike while keeping the key against the antenna.

If the steering lock is locked and the key is recognised, pressing the on/off button automatically disengages the lock.

Pressing and holding one of the two on/off buttons causes the Hands free system to send a radio signal to the key commanding it to “wake up” its internal electronic circuit. This function prevents the battery inside the key from draining when not in use, in other terms, when out of range or when the motorcycle is switched off. In these conditions, the internal circuit goes into a standby state. When the key receives the “wake up” signal, it activates its internal circuit and begins transmitting the unlock code to the Hands free by radio. If the unlock code received by the Hands free system is correct, engine start is enabled and the dashboard switches on.

The procedure for using the passive key (or for using the active key in transponder mode) is similar to the procedure with the active key. However, the passive key has no internal battery providing power for transmission, and the power necessary is received from the Hands free system antenna instead. For this reason, the passive key must be aligned perfectly with and placed close to the antenna to ensure that it is powered and recognised. When the electronic circuit inside the key receives power from the antenna, it begins to transmit the unlock code to the Hands free system. If the unlock code is correct, engine start in enabled and the dashboard switches on.

Two keys are provided with the motorcycle: one active key and one passive key. The active key has its own battery and communicates remotely with the Hands free system, whereas the passive key, which is only used if the active key is not working, must be placed over the antenna (transponder mode – emergency start). The mechanical part of the key is used to open the saddle and fuel cap locks (if the vehicle is not equipped with electric locks). The two keys are shown below.

Warning
Never ride the vehicle with either of the keys (active or passive) inserted in the fuel cap or saddle lock as this may damage the mechanical part of the key or its internal electronic circuits.

Warning
Never leave the key on the vehicle when washing the vehicle itself as the key is not watertight and may be damaged.

This photo shows the active and passive keys. From top to bottom:

1 Active key with mechanical part unfolded;
2 Active key with mechanical part folded;
3 Passive key

How to turn the motorcycle on

In order to switch the dashboard on and start the engine, the active key must be within 1.5 metres from the bike seat covering the receiver antenna.

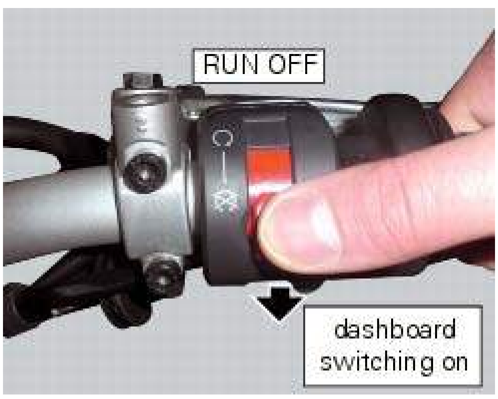
How to switch the dashboard on

The dashboard may switched on either from the on/off switch on the handlebar or from the button on the Hands free system.

With the engine off, the on/off switch is turned to "RUN OFF".

With the motorcycle and dashboard off, the on/off switch is turned to "RUN OFF".

To switch the dashboard on, press the on/off switch on the handlebar downward. When released, the switch automatically returns to the "RUN OFF" position. If the key is detected, the dashboard switches on and the electric steering lock is disengaged (if engaged previously).



Press the on/off switch on the handlebar downward. When released, the switch automatically returns to the "RUN OFF" position. If the key is detected, the dashboard switches on and the steering lock is disengaged (if engaged previously).

The dashboards may also be switched on with the on/off button on the Hands free system. In this case you just have to press once the button located in the tank front side.

Note

In the USA version the door (1) is not present.

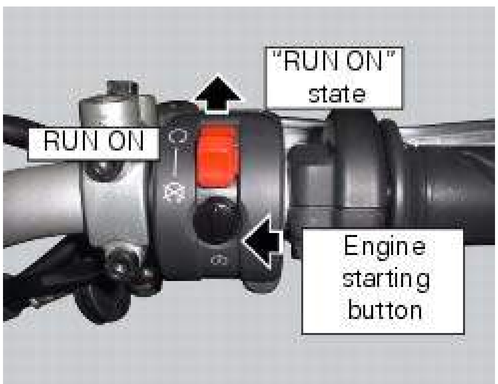
If the key is not detected within 10 seconds of switching the dashboard on, the dashboard switches off automatically.

How to start the engine

With the motorcycle off and the dashboard on, the on/off switch is turned to “RUN OFF”

With the motorcycle and dashboard on, the on/off switch is turned to “RUN OFF”.

To start the engine, simply push the on/off switch up to “RUN ON” and press the black start button.



How to start the motorcycle if the active key is not working

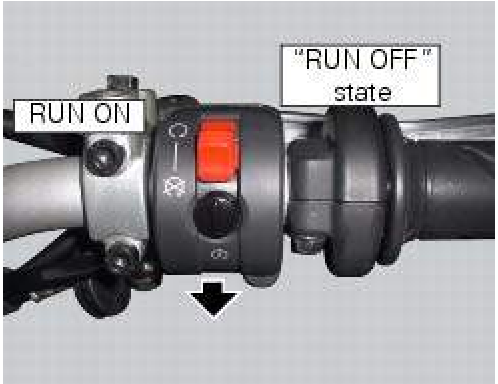
If no keyboard is detected, the dashboard does not switch on. Ensure that the active key is within the operating range of 1.5 metres and that the key battery is charged. If the state of charge of the key battery is not known, place either the active or passive key on the seat and start the motorcycle normally while keeping the key in this position.
The photo illustrates where to place the passive key or the active key, if its battery is flat.

How to start the motorcycle without keys

To start the motorcycle when necessary with no active or passive key, switch the dashboard on by pressing the button on the Hands free system (located under the plastic shield at the front of the tank). The dashboard switches on and remains active for 2 minutes after the button is pressed to allow entry of the PIN code for starting the engine. For further information consult chapters “Recovery and emergency procedures - Start procedure with PIN code (no keys)” of this section.

How to turn the motorcycle off

To turn the motorcycle off, turn the switch from “RUN ON” to “RUN OFF”. The engine stops. To switch the dashboard off, push the on/off switch downwards. When released, the switch automatically returns to the “RUN OFF” position.



Push the switch downwards to switch the engine off and enter "RUN OFF" state.

Push the switch downwards to switch off the dashboard. The dashboard can only be switched off if the vehicle is stationary (speed = 0 Km/h).

If the vehicle is still in motion, the dashboard remains on (for example, if the motorcycle is coasting downhill with the engine off).

To force dashboard power off, even with the vehicle in motion, press the on/off button on the Hands free module once.

After the dashboard is switched off, the system remains active for 60 seconds awaiting a request to engage the steering lock or open the electric fuel tank cap (optional).

How to engage and disengage the steering lock

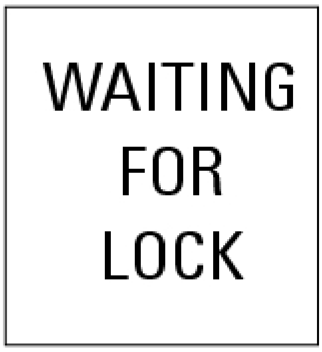
The steering lock may be engaged within 60 seconds of switching the dashboard off. If more than 60 seconds have elapsed since switching the dashboard off, the dashboard must be switched on and off again (the key must be detected and recognised).

Turn the handlebar completely to the left or right. Push the on/off switch on the handlebar downward or press the button on the Hands free system; the steering lock audibly engages.

If, for any reason, the steering lock does not work correctly, the lock pin is automatically retracted (and the steering lock disengaged) after a few seconds.

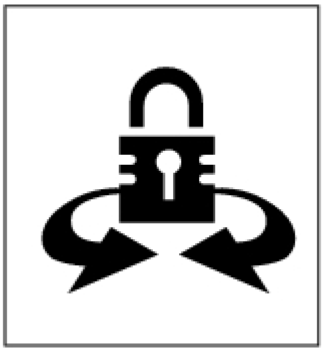
To disengage the steering lock, simply push the on/off switch on the handlebar downward or press the button on the Hands free system with the key within operating range. The dashboard switches on and the steering lock is automatically disengaged.

When the vehicle is switched off (engine and dashboard) and with the handlebar positioned correctly for steering lock activation (turned fully right or fully left), the following icon is shown on the dashboard for 5 seconds to indicate that the steering lock may be disengaged. To engage the steering lock, simply push the on/off switch on the handlebar downward or press the button on the Hands free system.



The following image shows the icon appearing on the tank dashboard: this indicates that the steering is correctly positioned for activating the steering lock.

When the steering lock is engaged, the following icon is shown on the display for 5 seconds:



The following image shows the icon appearing on the tank dashboard: this indicates that the steering lock has been engaged.

Warning

The steering lock cannot be engaged or disengaged if the vehicle battery is flat. In this case, replace the vehicle battery or connect an external battery using jump leads.

How to open the electric fuel tank cap (optional)

The electric fuel tank cap may be opened within 60 seconds of switching off the dashboard. If more than 60 seconds have elapsed since switching the dashboard off, the dashboard must be switched on and off again (the key must be detected and recognised).

Note

Once the steering lock is engaged it will no longer be possible to open the filler plug provided with electronic lock (optional). To open the filler plug it will be necessary to switch on and off the dashboard (the key must be present and acknowledged) without engaging the steering lock.

Recovery and emergency procedures

The following are the recovery procedures implemented by the Hands free system in the event of malfunction or fault and the emergency procedures to be used if, for example, a key is lost or does not work.

Recovery procedure with no key

When the dashboard is on and the key has been recognised, the Hands free attempts to detect the key every 60 seconds.

If the engine is off and the on/off switch on the handlebar is turned to “RUN OFF”, if no key is detected within 10 seconds, the dashboard switches off automatically.

If the engine is running and no key is detected upon exceeding a speed of 5 Km/h after setting off from an initial standstill (speed = 0 Km/h), the Hands free system displays the no key symbol on the dashboard (if the key has been accidentally left in the garage, for example).

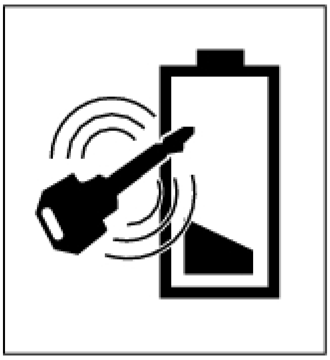
In the former case, the vehicle continues to function normally until it is switched off again. Once switched off, the vehicle cannot be started again without the key (key left behind, lost or no longer functioning correctly). In this case it is possible to start the bike only with the PIN Code (see the procedure described in chapter “Start procedure with PIN code (no keys)” of this section).

The following image shows the icon appearing on the tank dashboard: this icon indicates that no key is detected.

If the motorcycle has been started using the passive key or using the active key in transponder mode (no battery or flat battery), it is normal for the 'no key' icon to be displayed. In fact, once the vehicle has been started and the key detached from the antenna placed in the document compartment under the seat the bike will remain on until the following switch off with the dashboard displaying that the key is not available. Once both engine and dashboard have been switched off, the key must be placed over the antenna again to restart the vehicle.

Recovery in the event of flat active key battery

If the active key battery is running low or is flat, the Hands free system shows the relative icon on the dashboard.



The following image shows the icon appearing on the circular area of the dashboard: this indicates that the active key battery is flat.

For the replacement procedure of the active key battery refer to paragraph “Active key” - “Replacing the battery in the active key“ of this chapter.
The active key still works even if its battery is flat. In this case, however, it functions in exactly the same way as the passive key. During the dashboard switch on procedure, the key must be physically placed on the antenna. To reach the antenna remove the seat (Sect. 5 - 3, “Removal of the seat“).

Note

After the active battery key is replaced, the low battery icon may still be displayed the next time the dashboard is switched on. This icon will disappear after a few seconds.

Recovery procedure in the event of electric steering lock fault

If any fault occurs during activation of the electric steering lock: for example, if the pin jams, if the handlebar is moved while the pin is deployed or if there is excessive strain on the electric pin actuator motor, the electric steering lock is automatically disengaged and the Hands free system displays the relative icon on the dashboard.

If any fault occurs during disengagement of the electric steering lock (if the pin is not retracted, for example), the following icon is shown on the tank dashboard:

The following image shows the icon appearing on the tank dashboard: this indicates that the steering lock has not been correctly disengaged

Recovery procedure in the event of Hands Free system fault

If the Hands free system can no longer communicate with the other control units over the CAN network (with the dashboard or engine on), the following icon is shown on the tank dashboard:

The following image shows the icon appearing on the tank dashboard: this indicates that the Hands free system is not connected to the CAN network or that it cannot communicate over the CAN network

In the event of a Hands free system fault, the following icon is displayed on the tank dashboard:

The following image shows the icon appearing on the tank dashboard: this indicates a Hands free system fault

If the engine was off before the fault occurred, starting the engine may not be possible.
If the engine was running before the fault occurred, the Hands free system will not switch the engine off. Once the engine is switched off, however, starting the engine may no longer be possible.

Start procedure with PIN code (no keys)

The motorcycle may be started without keys with a special procedure using the dashboard and the switches on the handlebar.

Note

This procedure is only possible if the PIN code has been enabled previously. For security reasons, the PIN code is disabled by default when the vehicle leaves the factory.

To switch on the dashboards without having the key and start the procedure with the PIN code (provided that the PIN code is active) it is necessary to press once the ON/OFF button on the Hands free system.

Once vehicle speed exceeds 5 Km/h after starting the motorcycle with the PIN code, the no key message is displayed on the dashboard. This is normal.

After switching both the engine and the dashboards off, the PIN code entry procedure has to be repeated in order to use the motorcycle again.

How to enable engine start with PIN code

See the paragraph relevant to the dashboard for entering and using the PIN code Immobilizer override procedure in Sect. 6 - 7.

How to enable the PIN code

See the paragraph relevant to the dashboard for enabling the PIN code Immobilizer override procedure in Sect. 6 - 7.

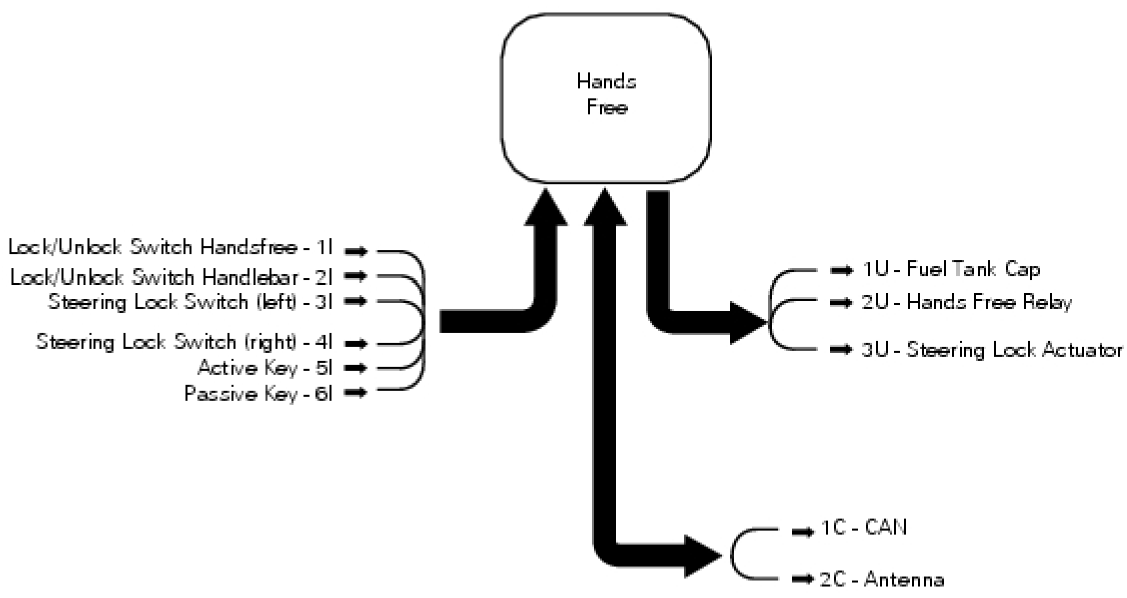
How to reset the PIN code

The Pin Code can be reset with the DDS, i.e. it can be brought to the same condition it was in when the bike came out the factory. It is possible to complete the procedure with the relevant Pin Code Reset function.
Once the Pin Code has been reset it will be necessary to store a new one. In case the Pin Code is not stored it will not be possible to start the vehicle without the passive or active key.

Start procedure with passive key or with active key with flat battery.

To start the motorcycle with the passive key, or with the active key with a flat battery, place the key (active or passive) in contact with the antenna. To reach the antenna remove the seat (Sect. 5 - 3, "Removal of the seat"). While holding the key in this position, the dashboard may be switch on and the engine started using the standard procedure described previously. The key may be removed from this position once the engine is running. When the key is removed and the vehicle speed exceeds 5 Km/h, the no key message will be displayed on the dashboard. This is normal.

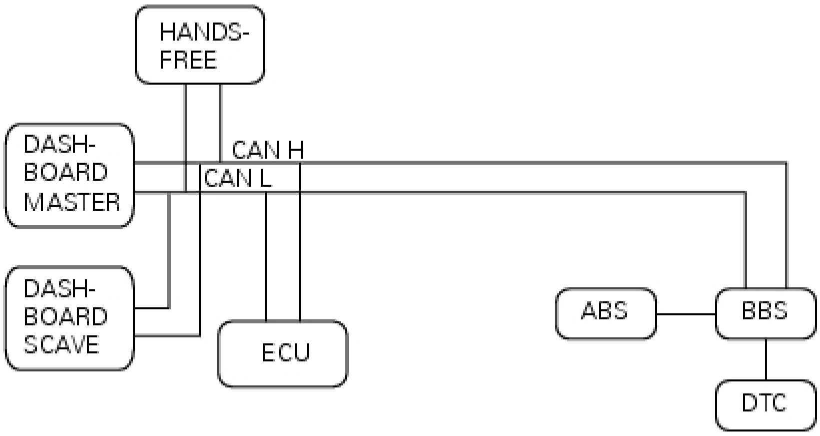
Wiring diagram of the Hands Free system



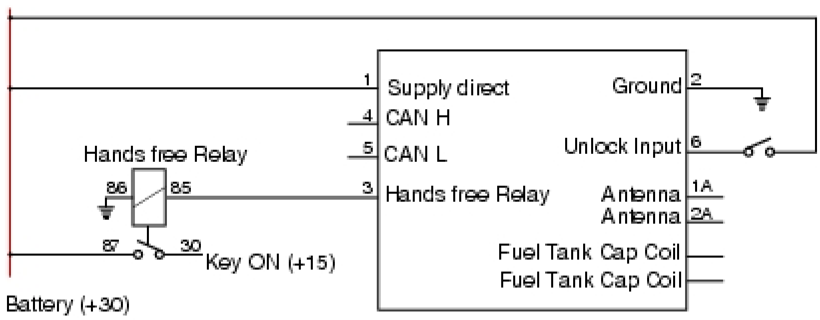
The diagram illustrates the inputs, outputs and communication lines used by the Hands Free system.
1I - ON/OFF button placed on the Hands free system (located below the plastic cover)
2I - ON/OFF button placed on the bike handlebar RH side
3I - Steering position micro-switch
4I - Steering position micro-switch
5I - Active key (signals remote transmission)
6I - Passive key (it transmits signals only if leant on the antenna)
1U - Electric filler plug (optional)
2U - Hands free relay (it replaces the ignition switch function)

3U - Steering lock actuator
1C - CAN line
2C - Communication line via antenna (radio-frequency)

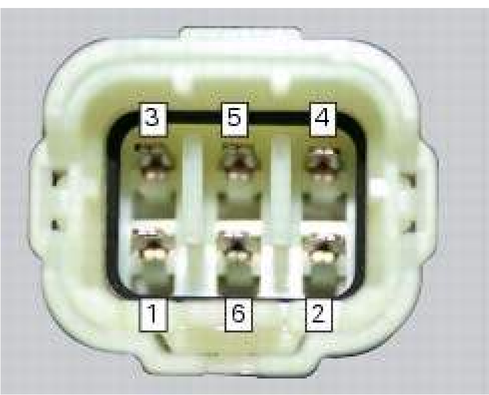
The following is the overall layout of the motorcycle network:



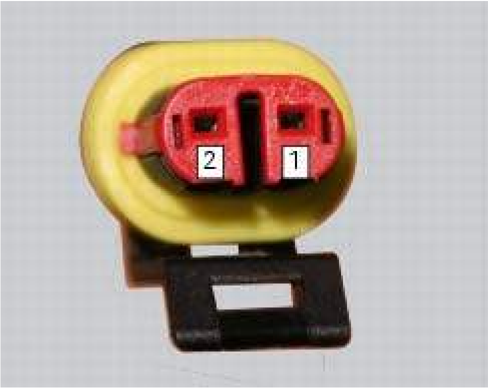
The following is the general electrical system diagram and pinout of the Hands free system. Note that the components relative to the electric steering lock are not included as they are not integrated into the Hands free module.



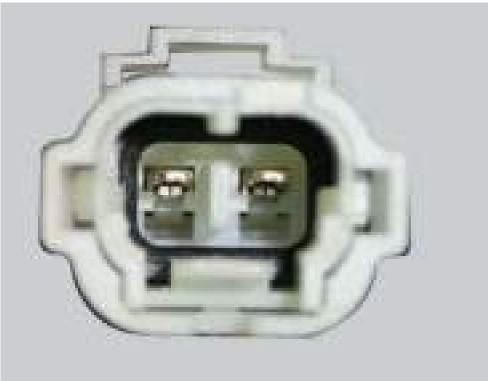
1 Direct supply from battery - Red (R);
2 Hands free system ground – Black (BK);
3 Hands free relay coil command – Red/Yellow (R/Y);
4 CAN H line – Grey/Black (Gr/Bk);
5 CAN L line – Grey/Green (Gr/G);
6 Input for system on/off button on handlebar – Light Blue (Lb);
1A, 2A Antenna – Key communication antenna connection – Blue/Black (B/Bk) and Red/Yellow (R/Y);
Fuel Tank Cap Coil – Fuel tank cap coil command



The photo shows the pinout for the Hands free side connection
Location of Hands free system connection



The photo shows the pinout for the Hands free side antenna connection



The photo shows the pinout for the Hands free side electric fuel tank cap connection

The Hands free system is located in front of the fuel tank and is covered by a plastic shield. The on/off button built into the system is visible under the plastic shield. This button has the same functions as the button on the handlebar, but should only be used if the latter is not working or when starting the motorcycle without keys.
The plastic shield covering the Hands free system is visible in the photo.

Note

In the USA version the door (1) is not present.

The Hand free system on/off button is shown in the photo, with the plastic shield removed

The antenna used by the Hands free system to communicate with the keys is placed in the document compartment under the seat.

This image shows the location of the Hands free system antenna, behind the clear Plexiglas windscreen

The Hands free relay, which ideally replaces the function of the ignition switch of the traditional bikes, supplies +15 with key turned to on, and is positioned on its supporting bracket.

This image shows the location of the Hands free relay (A). It is located on the relay supporting bracket.

Possible faults of the Hands Free system components

The Hands Free module

Introduction

The Hands free module incorporates the control unit communicating with the other nodes on the motorcycle, the on/off button, the microswitches detecting full lock steering angle (for enabling steering lock engagement) and the steering lock. The module is sealed and its individual components cannot be accessed for diagnosis, repair or replacement.

Wiring diagram

No wiring diagram is available for the components integrated into the Hands free module. For the main electric wiring see chapter (“Wiring diagram of the Hands Free system”) of this section.

Error codes

“Hands free diagnosis” error: “Steering lock”: a fault has been detected in the electric steering lock system. The following icon appears on the tank dashboard:

- If the error occurred while engaging or disengaging the steering lock, check that the handlebar is fully turned to the left or right and try to engage or disengage the steering lock again.
- If the error occurred while engaging or disengaging the steering lock, check that the lock pin can move freely and is unobstructed, then try to engage or disengage the steering lock again.
- If none of the tests described above identifies the problem, replace the Hands free system.

“Hands free diagnosis” error: “EEPROM state”: fault detected in the internal Hands free system memory. The following icon appears on the tank dashboard:

-Replace the Hands free system

Electrical characteristics and checking component

No electrical characteristics or checking procedures are given for the Hands free system as all components are integrated in the module and cannot be accessed for diagnosis, repair or replacement.
The module receives direct 12 Volt battery power over PIN 1 and via the main 30 A fuse.
Ground is on PIN 2.

In the event of fault

In the event of any Hands free system fault, the engine may switch off or engine start may not be possible.
In the event of a fault in the steering lock integrated into the Hands free system occurring during either engagement or disengagement, the system will attempt to automatically retract the lock pin. If this fails, a low volume alarm signal is emitted by the Hands free system.

Installation location

The plastic shield covering the Hands free system is visible in the photo.

The Hands free system on/off button is shown in the photo, with the plastic shield removed.

The lock pin of the electric steering lock is visible in the lower portion of the Hands free system.

The photo shows the Hands free system removed from the motorcycle fuel tank. One of the two switches detecting the full lock handlebar steering position is indicated in the photo.

Component replacement methods

No special measures or reprogramming are necessary in order to replace the Hands free system. However, the motorcycle keys must be reprogrammed after replacement. See chapter "Programming/reprogramming keys"

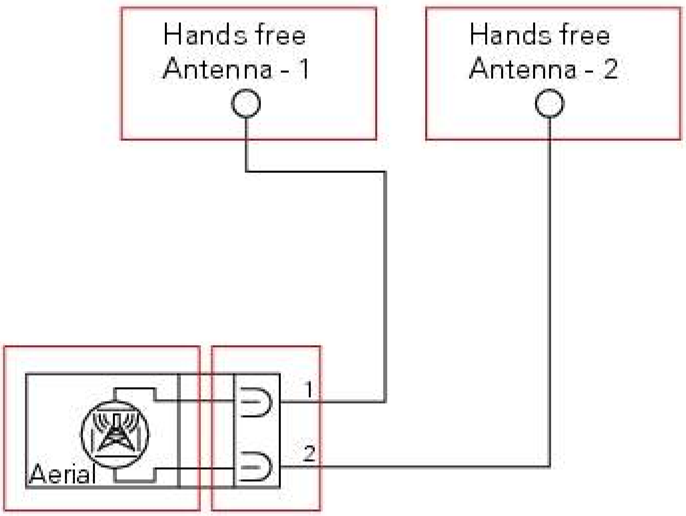
Communication antenna

Introduction

The communication antenna enables the Hands free system to detect and communicate with the active or passive key. The active key is detectable within a range of 1.5 metres, whereas the passive key (or active key with flat battery) can only be detected if placed in contact with the lower part of the clear Plexiglas windscreen covering the antenna.

An antenna fault will compromise correct key detection.

Wiring diagram



The communication antenna is connected to the Hands free system by two cables and a dedicated connection.
1 Blue/Black (B/BK)
2 Red/Yellow (R/Y)

Error codes

"Hands free diagnosis" error: "Antenna": antenna not detected (open circuit) or antenna short circuited. The following icon appears on the tank dashboard:

- Check that the antenna is in working condition by measuring its electrical resistance.
- Check the integrity of the electrical circuit and the relative connections.

Note

Checking the integrity of the electrical circuit entails the following actions:
- Check the wires for continuity and check the state and integrity of the connections.
- Check that the wires are not short circuited to one another, to Vdc or to ground.
  Short circuit to Vdc: with the dashboard on, use a voltmeter to measure the voltage between the wire being tested and ground.
  Short circuit to ground: with the battery cables disconnected, use an ohmmeter to check for continuity between the wire being tested and ground.
  Open circuit: with the battery cables disconnected, use an ohmmeter to check that there is no continuity between the two ends of the wire being tested.

- If none of the tests described above identifies the problem, replace the Hands free system.

Electrical characteristics and checking component

The resistance between the two terminals of the component side connection must be approximately 2 Ohm.

In the event of fault

In the event of a component fault, the Hands free system can no longer detect and recognise the keys. The PIN code procedure must be used to start the motorcycle.

Installation location

The image shows the location of the Hands free system antenna.
Location of Hands free system antenna on antenna side.

Component replacement methods

No special measures are necessary in order to replace the Hands free system communication antenna.

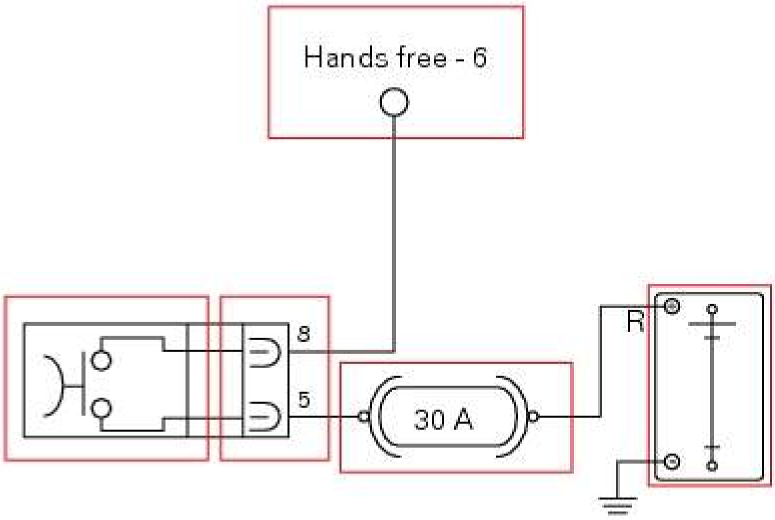
On/off switch on handlebar

Introduction

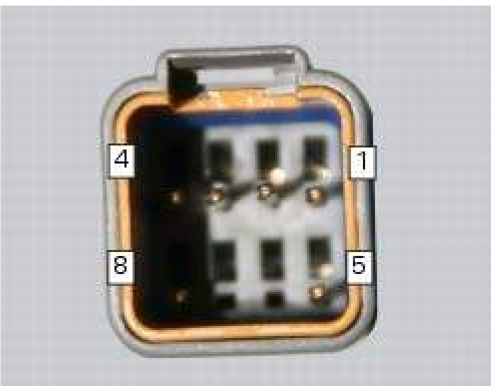
The on/off switch on the handlebar is used to switch the dashboard on and off, if a key has been detected, and start the engine.

With the switch turned to “RUN OFF” (centre position), pushing downwards switches the dashboard on or off (activating the button inside the switch).

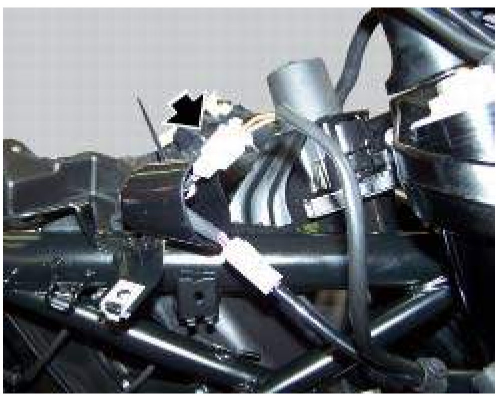
Wiring diagram



The button inside the on/off switch receives 12 Volt power directly from the battery via the main 30 A fuse. When pressed, it sends the 12 Volt power to the Hands free system, which detects activation of the button. On/off switch PIN 8, light blue wire (Lb), on/off switch PIN 5, red wire (R).



Pinout of right hand handlebar switch connection, wiring harness side.



Location of the right hand handlebar switch connection.

Error codes

The Hands free system generates no fault code in the event of a fault of the on/off switch on the handlebar.

Electrical characteristics and checking component

The switch receives 12 Volt power directly from the battery via the main 30 A fuse.

Check for 12 Volts on PIN 5 of the switch.

Check for 12 Volts on PIN 6 of the Hand free system side connector with the switched pressed. The voltage measured must be 0 Volts when the switch is not pressed.

In the event of fault

In the event of a fault of the on/off switch on the handlebar, the button integrated into the Hands free system may be used instead.

Installation location

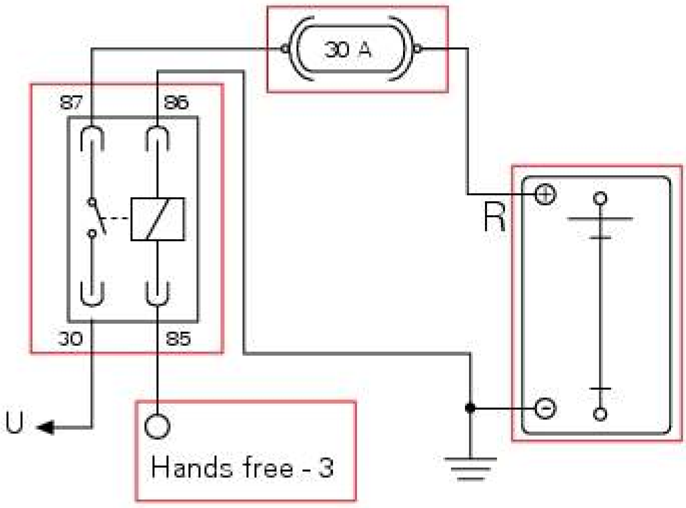
The image shows the location of the on/off switch, near the throttle grip on the right hand side of the handlebar.

The Hands free relay

Introduction

This relay provides Key ON +15 power to all the devices on the motorcycle. Functionally, it replaces the conventional ignition switch.

Wiring diagram



The Hands free relay receives +12 Volt power directly from the battery via the main 30 A fuse. Hands free – 3: PIN 3 on Hands free system connection. “U”: Current consumers requiring +12 Volt in key on state (KEY ON +15). PIN 30 Red/White wire (R/W), PIN 86 Black wire (Bk), PIN 87 Red wire (R), PIN 85 Red/Yellow wire (R/Y)

Error codes

The Hands free system generates no fault code in the event of a Hands free relay fault.

Electrical characteristics and checking component

The relay contact must close (continuity between PIN 87 and PIN 30) when the internal electric winding is powered with 12 Volts (PIN 86 and PIN 85).

In the event of fault

In the event of a Hands free relay fault, the engine stops (if running) or will not start. The relay is not commanded by the Hands free system.

Installation location

This image shows the location of the Hands free relay (A). It is located on the relay supporting bracket.

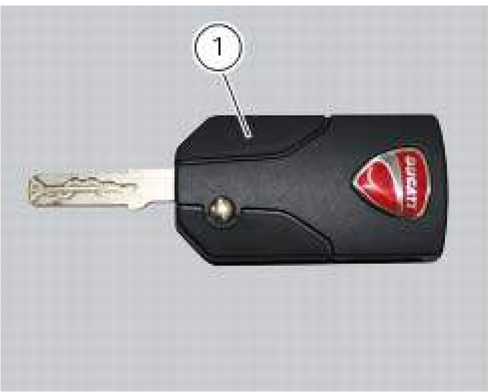
Component replacement methods

No special measures are necessary in order to replace the Hands free relay.

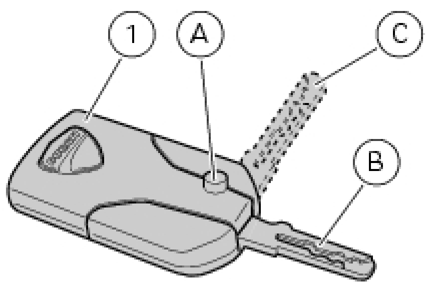
Active key

Introduction

The active key (1) communicates with the Hands free system by radio. In order to function, the key must be within a 1.5 metre radius from the antenna (located in the document compartment under the seat).
In the event of a flat key battery or of an internal transmitter circuit fault, the active key may be used in transponder mode (exactly like the passive key). In this mode, the key must be physically placed on the antenna in order to work correctly.



By pressing button (A) of the active key (1) the metallic part (2) opens completely - position (B).
Hold depressed button (A) to move the metal part (2) and set it to the middle position (C); once in place, release button to lock. This function facilitates the opening of the tank plug.
The metal part returns inside the grip by pushing it in.



Wiring diagram

No wiring diagram is available for the component

Error codes

“Key diagnosis” error: “Wrong Key”. The key has been detected but is not associated with the Hands free system. The fault can only be viewed from the DDS after switching the dashboard on with the PIN code.
- Check that the key is correct.
- Reprogramme the key
- If none of the tests described above identifies the problem, replace the Hands free system.

“Key diagnosis” error: “Encryption error”. The encrypted code stored in the key is not recognised by the Hands free system. The fault can only be viewed from the DDS after switching the dashboard on with the PIN code.
- Check that the key is correct.
- Check that the key is not damaged.
- Check that the battery key is charged.
- Check that the antenna is working correctly.
- Try to use the active key as a transponder with the antenna. To reach the antenna remove the seat (Sect. 5 - 3, “Removal of the seat“).
- Reprogramme the key.
- If none of the tests described above identify the problem, contact Ducati.

Electrical characteristics and checking component

The active key is fitted with a CR 2032 type 3 Volt lithium ion battery. Use only batteries with the same code and the same electrical characteristics.

In the event of fault

A specific message is displayed on the dashboard if the key battery is flat. Replace the battery.

If the active key does not work or is not detected, it may still be used in transponder mode, placing the key itself against the lower part of the clear Plexiglas windscreen.

Replacing the battery in the active key

Only use 3 Volt CR 2032 lithium ion batteries.

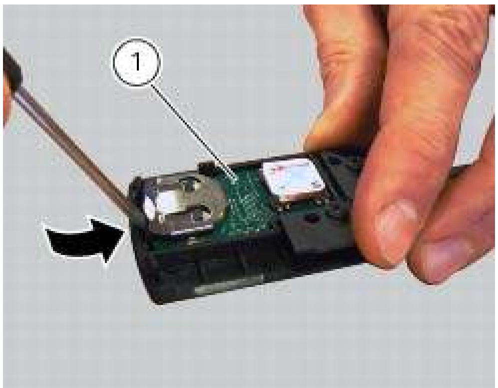
Note
The keys do not need to be reprogrammed after replacing the battery.

Unfold the mechanical part of the active key.
Use a large sized coin to open the plastic shells of the grip (2 D coin) as shown in the figure.

Important
Insert the coil only in the indicated point. Do not other use other objects inserted in points that are different than what is shown, as it could damage the integrated circuit and/or the protective gasket.

Once the plastic shells have been separated, remove the printed circuit board (1) prying it up gently with a small flat screwdriver, as shown in the figure.

Important
Insert the point of the flat screwdriver just under the printed circuit board, being very careful not to damage it. Do not apply force on the battery or battery holder.

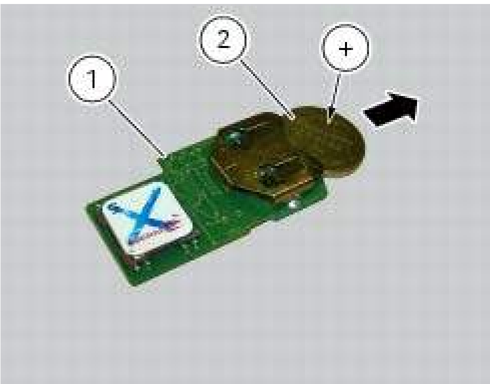


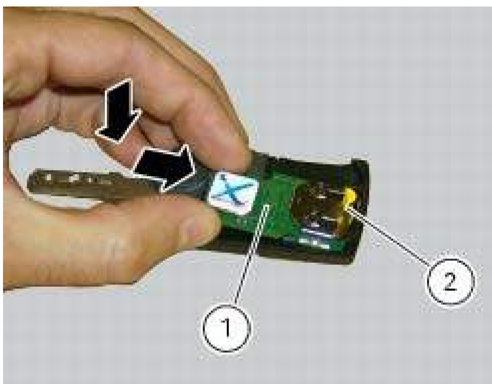
Remove the battery (2) from the printed circuit board (1) and replace it with a new one.
Pay attention to polarity: the positive pole (+) must face upward.

Important

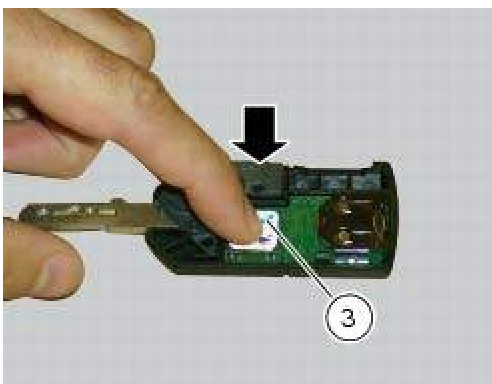
Use only batteries of the recommended type (CR 2032).

Reinsert the printed circuit board (1) from the side with the battery (2) into the plastic shell.

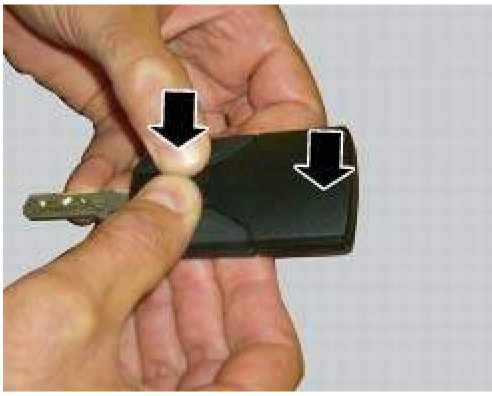




Apply slight pressure on the antenna (3) of the printed circuit board until you hear a click.



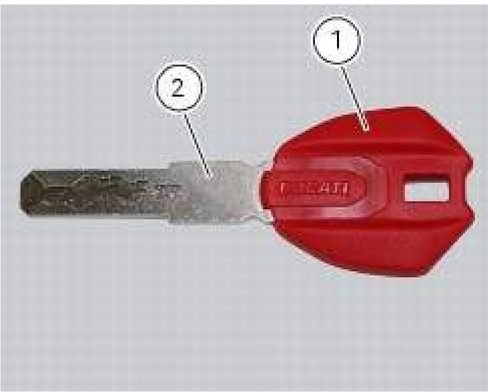
Align the two shells of the grip and press on the area indicated by the arrows to close them.
Make sure that you hear a “click” upon closing and that the key is well closed.



Passive key

Introduction

The passive key (1) is used when the active key is not working correctly or is not available.
The passive key works as a transponder, and must therefore be placed physically onto the antenna to work.
The mechanical part (2) of the key is used to open the seat or the tank plug.



Wiring diagram

No wiring diagram is available for the component

Error codes

“Key diagnosis” error: “Wrong Key”. The key has been detected but is not associated with the Hands free system. The fault can only be viewed from the DDS after switching the dashboard on with the PIN code.
- Check that the key is correct.
- Reprogramme the key
- If none of the tests described above identify the problem, replace the Hands free system

“Key diagnosis” error: “Encryption error”. The encrypted code stored in the key is not recognised by the Hands free system. The fault can only be viewed from the DDS after switching the dashboard on with the PIN code.
- Check that the key is correct.
- Check that the key is not damaged.
- Check that the antenna is working correctly.
- Reprogramme the key
- If none of the tests described above identify the problem, contact Ducati

Electrical characteristics and checking component

The component has no specific electrical characteristics and requires no special checks.

In the event of fault

In the event of a fault, try reprogramming the key.

Component replacement methods

The component does not require replacement.

Programming/reprogramming keys

The DDS diagnosis instrument is required in order to programme/reprogramme the keys. The key programming procedure is launched from this instrument.
To start the key programming/reprogramming procedure it is necessary to have at least one of the keys that start the vehicle available (i.e. it must be possible to start the bike with both the key and the PIN CODE). If none of such keys is available it will be necessary to replace the whole Hands Free system.

It is not possible to start the key programming/reprogramming procedure using only the PIN CODE.
It is possible to programme maximum 3 keys, no matter which type (active or passive).
During the procedure all keys that you want to use with the bike must be programmed. The keys unavailable during the procedure will thus no longer be able to start the vehicle (they might be reprogrammed afterwards by repeating the whole key programming/reprogramming procedure).
During the procedure the DDS diagnosis instrument will request to place the keys to be programmed in succession on the antenna, also the active one. The active key will be acknowledge only through a transponder (with key leant on the antenna) to avoid interferences of other active keys within 1.5 meters from the antenna.
The new detected keys will not be saved in the Hands Free system memory until pressing the “F2“ icon on the DDS diagnosis instrument. For this reason, in case the procedure is interrupted before pressing “F2“ the keys previously stored in the Hands Free system will not be modified
Once the procedure is started with the DDS diagnosis instrument, thoroughly follow the displayed instructions to complete it.

9 -Introduction to the engine control system

The engine control system used on the Diavel consists of the following elements:
- Ride-by-wire system (motorised throttle valves with electric actuator, throttle grip position sensor and throttle valve position sensor)
- One injector per cylinder installed downstream of throttle valve
- One coil per cylinder, in spark plug bore
- Two oxygen sensors (one per cylinder, installed on each exhaust manifold)
- Two absolute pressure (MAP) sensors installed downstream of throttle valve (one per cylinder connected to each intake duct)
- One three-way catalytic converter for exhaust gas post-treatment

The system also includes conventional sensors for water and air temperature, engine speed-timing etc.

Specific operating strategies

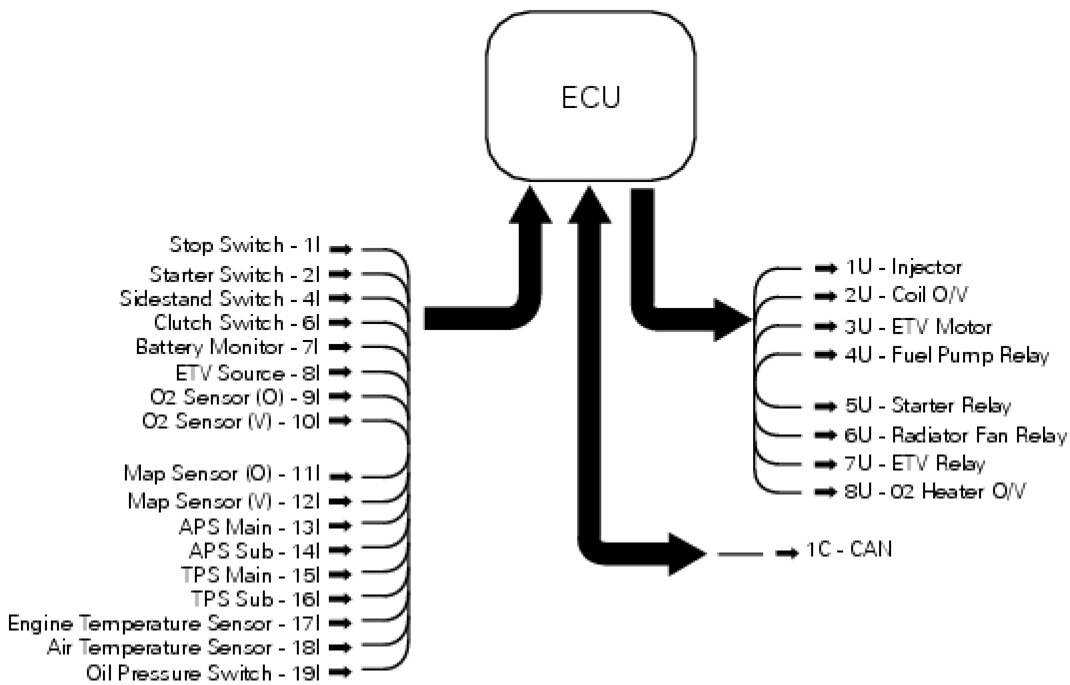
Idle speed

No electric motor is used for idle speed regulation (bypass is modulated instead with the throttle valve), as idle speed control is effected by the ride-by-wire system. Idle speed is maintained by the control unit when the speed drops below a specific threshold and when the clutch lever is operated and/or the gearbox is in neutral. The “clutch lever operated” signal is generated by a button on the lever itself, which interacts directly with the engine control unit. The “gearbox in neutral” signal is generated by the gear sensor connected to the BBS, and is transmitted to the engine control unit via the CAN line (target idle speed with engine stabilised at operating temperature is 1,350 rpm). The CO value for each cylinder, always with engine stabilised at operating temperature, must be within 0.4 and 1.4 in volume percentage.

Throttle valve aperture regimens

The rider may select between four different riding modes (Sport, Touring, Urban) from the tank dashboard and via the handlebar controls. Each riding mode contains three configurable throttle valve opening strategies (the engine control calibration parameters, in other terms the maps for quantity of fuel injected and ignition timing advance, are the same for all). This allows the rider to adapt power delivery and maximum power as follows to suit personal preferences:
- 162 HIGH (torque delivery tuned to give the bike a sports character, with maximum power of 162 hp available (HIGH for French and Japanese market))
- 162 LOW (torque delivery tuned to give the bike a tourist character, with maximum power of 162 hp available (MIDDLE for French and Japanese market))
- 100 HP (softened torque delivery with maximum power limited to 100 HP (LOW for French and Japanese market))

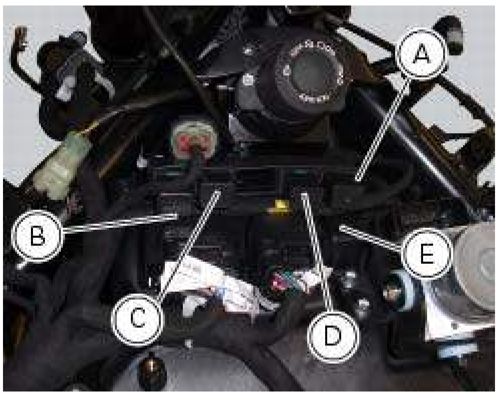
Inputs and outputs of engine control unit and connection to CAN network



The diagram illustrates the inputs and outputs for the engine control unit. The signals from the brake buttons, the exhaust By-pass valve command signal and the gear sensor signal are transmitted over the CAN line.

1I Emergency engine cutout switch
2I Start button
4I Side stand button
6I Clutch button
7I Battery voltage for congruence verification
8I Power from ride-by-wire relay (ETV)
9I Oxygen sensor for horizontal cylinder
10I Oxygen sensor for vertical cylinder
11I MAP sensor for horizontal cylinder
12I MAP sensor for vertical cylinder
13I Main throttle grip position sensor
14I Secondary throttle grip position sensor
15I Main throttle valve position sensor
16I Secondary throttle valve position sensor
17I Engine temperature sensor
18I Air temperature sensor
19I Oil pressure switch (has no effect on any engine control strategy, but information is sent to dashboard via CAN line)
1U Vertical and horizontal cylinder fuel injector
2U Vertical and horizontal cylinder coil
3U Electric ride-by-wire
4U Injection relay (powers fuel pump, injectors and coils)
5U Starter motor relay command
6U Radiator fan relay command
7U Ride-by-wire relay command
8U Oxygen sensor heater for vertical and horizontal cylinder
1C Connection with CAN network

Layout of engine control system and other components

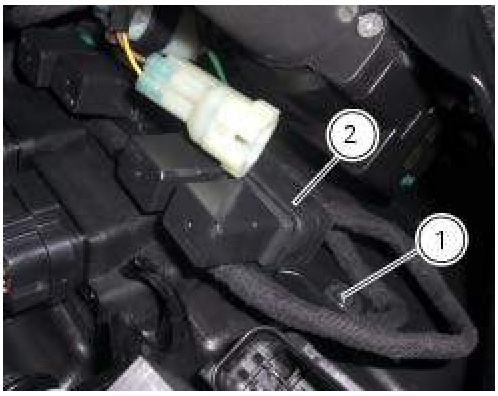


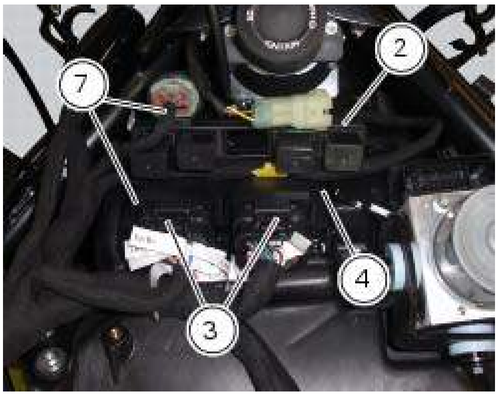
A Injection relay
B ETV relay (throttle valve operating engine)
C fan radiator relay
D Hands Free relay
E ECU

Removal of the control unit

Operations	Section reference
Remove the seat	5 - 3, Removal of the seat
Remove the tank covers	5 - 2, Removal of the fuel tank fairings
Remove the fuel tank	8 - 2, Removal of the fuel tank

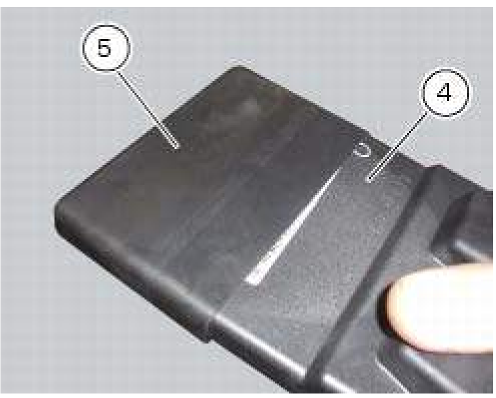
Loosen the screws (1) and remove the relay supporting bracket (2), disconnect the connectors (3) and remove the control unit (4) from the vehicle.



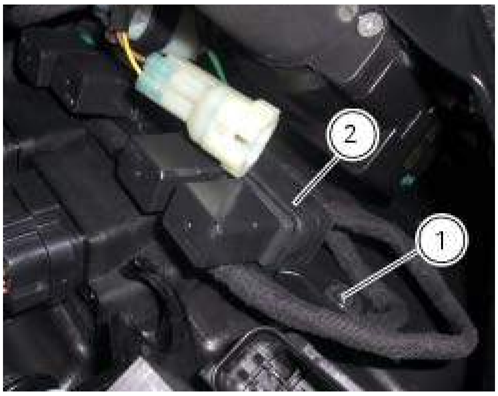


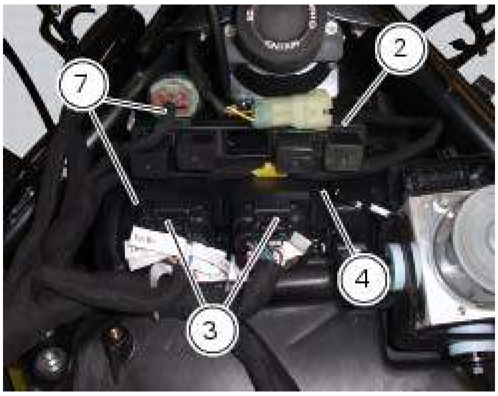
Reassembly of the control unit

Insert the control unit (4) into the protecting sheath (5) and position it on the airbox.



Position the relay supporting bracket (2) by starting and tightening the screws (1) to a torque of 6 Nm ± 10% (Sect. 3 - 3, Frame torque settings), and connect the control unit connectors (3).



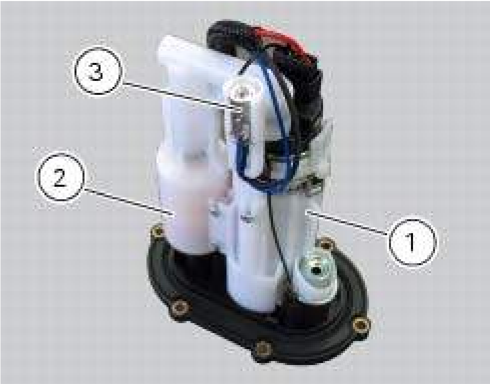


Operations	Section reference
Refit the fuel tank	8 - 2, Refitting the fuel tank
Refit the fuel tank covers	5 - 2, Refitting the fuel tank fairings
Refit the seat	5 - 3, Refitting the seat

Fuel system circuit

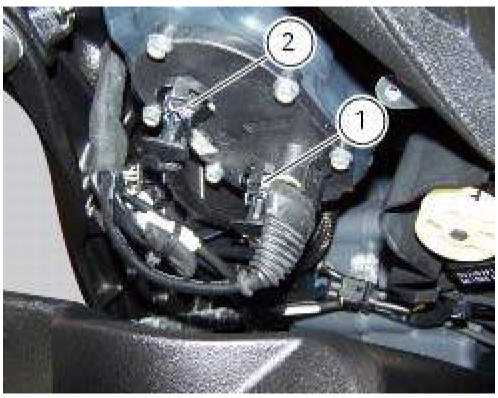
The fuel system circuit consists of:
- an electric pump, driven by the injection relay, which is in turn controlled by the ECU (engine control unit)
- a fuel filter
- a pressure regulator
- two injectors (one per cylinder, located downstream of throttle valve)

The plastic mounting shown in the figure and mounted in the tank contains the electric fuel pump (centre), the fuel filter (2) and the pressure regulator (3).

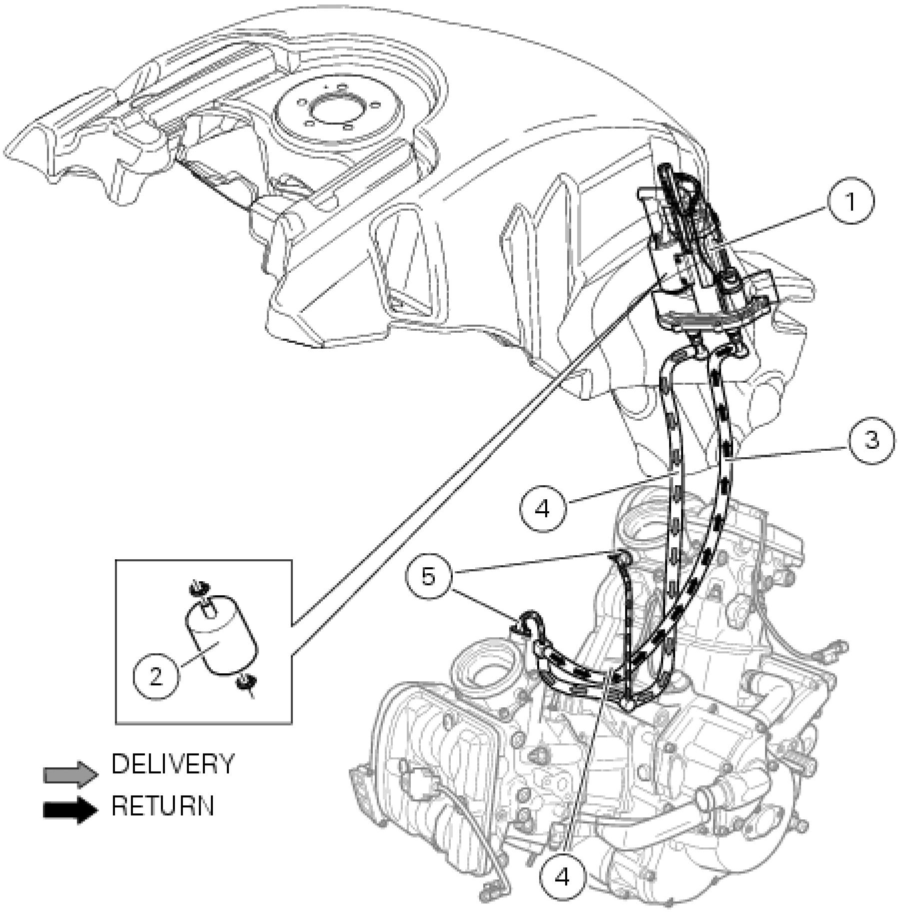


The image shows the housing at the bottom of the fuel tank in which the plastic mounting containing the electric pump, fuel filter and pressure regulator is installed.

The two pipes of the fuel circuit are connected to the bottom of the tank with quick connectors. The connector (1) on the right is for the fuel delivery line (OUT), the connector (2) on the left is for the fuel return line (IN). Always check carefully that the connectors are fitted correctly and that there are no leaks.
The electric connection for the fuel pump is located under the housing for the plastic mounting for the fuel pump, fuel filter and pressure regulator.



Each cylinder is fed by a single injector with a 12-hole atomiser nozzle. These injectors are installed downstream of the throttle valve.



The drawing shows the layout for the fuel system circuit. The pipes (4) with grey arrows are the delivery lines of the electric pump, which carry fuel to the injectors. The pipe (3) with black arrows is the fuel return line. The fuel return line is connected to the pressure regulator, which is submerged in the tank with the pump and the filter. As a result, the pressure in the fuel delivery and return lines is the same.

1 Fuel electric pump
2 Fuel filter
3 Return line
4 Delivery line
5 Injectors

The image shows the pipes in the fuel supply circuit.

Checking regulated fuel pressure and fuel flow rate

The pressure regulator, submerged in the fuel tank together with the pump and the filter, maintains the same pressure of 3 bar in both the delivery and the return lines. This pressure may be checked by connecting a pressure gauge to a T union connected to one of the two connectors on the tank. To measure this value, the engine must be running or the pump activated from the DDS. The T union means that the both injectors and the fuel gauge receive fuel pressure simultaneously. The regulated fuel pressure is 3 bar.

To measure the fuel flow rate, disconnect the return line from the tank, place the free end of the line in a graduated container and start the engine or activate the electric pump from the DDS.

Warning

When checking fuel pressure and flow rate by activating the pump from the DDS, check that the battery is fully charged to ensure correct operation of the pump itself.

An incorrect fuel flow rate and/or pressure may cause engine malfunction, resulting in variation in the self-adaptive parameters defined by the engine control unit. Fuel flow rate and/or pressure values deviating substantially from the rated values will result in an incorrectly generated fuel-air mixture that is too rich or too lean and, as a result, compromise the measurements made by the oxygen sensors. After changing the fuel pump and/or fuel pressure regulator, always reset the self-adaptive parameters with the DDS and then use the motorcycle (even by simply running at idle speed) to allow the parameters themselves to recalibrate correctly.

Injection and ignition

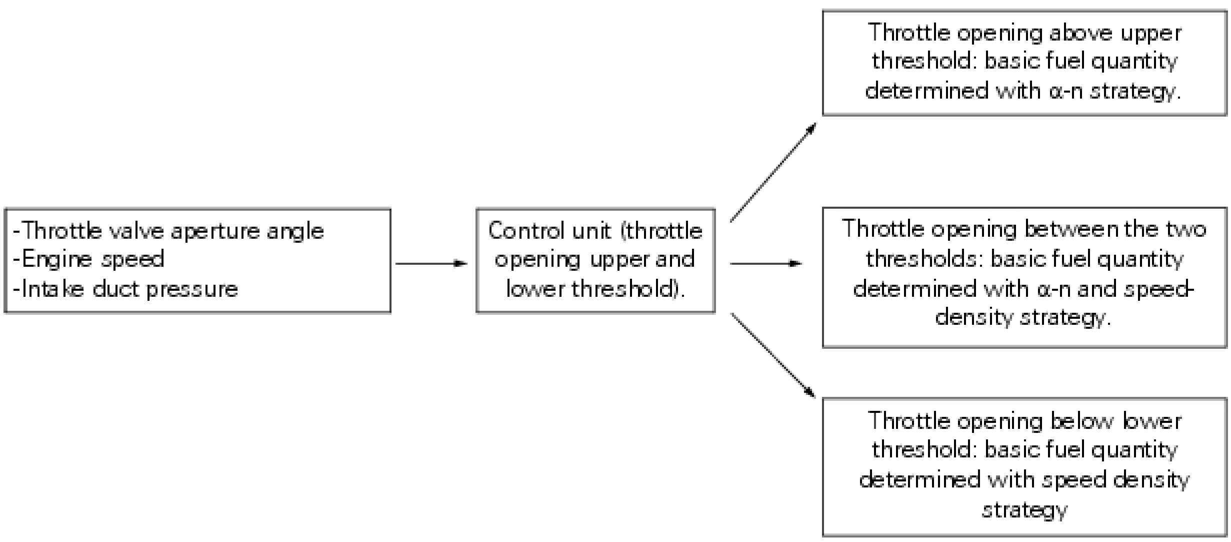
Introduction

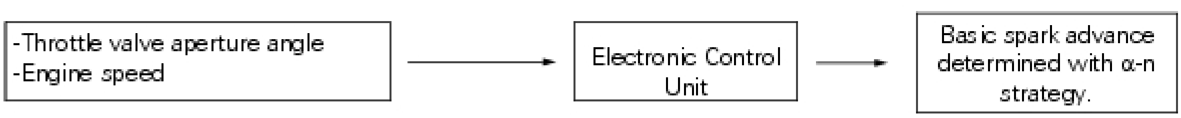
Ignition is via a single stick coil per cylinder installed in the spark plug well. Each thermal unit is supplied by a single injector, placed under the throttle valve. The amount of fuel injected and the ignition advances are determined by the control unit specifically for each cylinder. These basic measures are then corrected by the control unit, according to the information supplied by different sensors fitted on the engine and applying certain strategies, in order to obtain the definitive signals of activation. The DTC function (Ducati Traction Control, integrated in the BBS) acts on throttle valve aperture only to control traction as necessary. The DTC function integrated in the BBS communicates with the engine control unit via the CAN network.

Determination of quantity of fuel injected and ignition advance

The base quantity of fuel injected (defined by the base maps) is determined by the engine control unit using one of two different strategies depending on the operating conditions of the engine:
- If the throttle valve aperture is below a specific threshold, the base quantity of fuel injected is determined using a strategy denominated 'speed-density' (engine speed-intake manifold pressure). There is therefore one base fuel quantity map with coordinates correlating the quantity of fuel injected with engine speed-pressure for cylinder 1 (horizontal) and another for cylinder 2 (vertical)
- If the throttle valve aperture is over a specific threshold, the base quantity of fuel injected is determined using a strategy denominated α-n (throttle valve aperture angle-engine speed). There is therefore one base fuel quantity map with coordinates correlating the quantity of fuel injected with engine speed-throttle valve aperture for cylinder 1 (horizontal) and another for cylinder 2 (vertical)
- At intermediate throttle valve apertures between the two thresholds described above, the base quantity of fuel injected is determined by applying the two strategies simultaneously

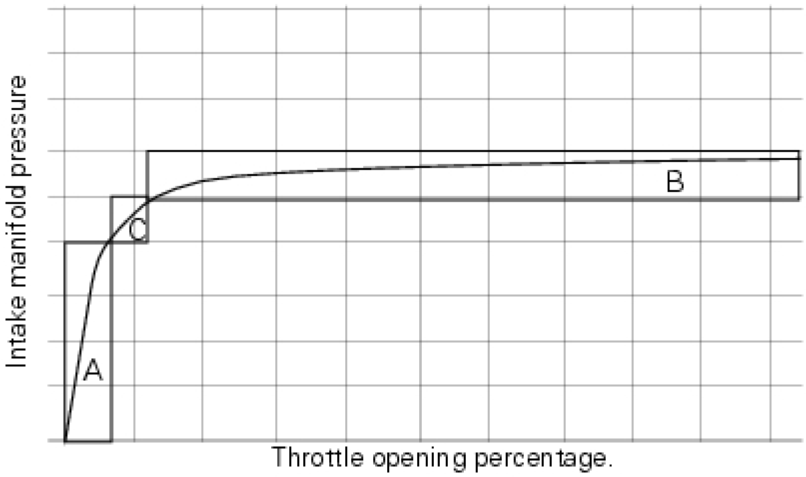
The base ignition advance (defined by the base maps), is determined by the engine control unit using the α-n (throttle valve aperture angle-engine speed) strategy. There is therefore one base ignition advance map with coordinates correlating the quantity of fuel injected with engine speed-throttle valve aperture for cylinder 1 (horizontal) and another for cylinder 2 (vertical).





The two diagrams illustrate how the engine control unit determines the base quantity of fuel injected and the base ignition advance.

During the progression stage - at throttle valve aperture angles immediately above idle speed angles - using the speed-density strategy allows more precise determination of engine load (air aspirated by engine), resulting in smoother power delivery.



The diagram quantitatively illustrates how pressure in the intake duct varies in relation to increases in throttle valve aperture angle. At small aperture angles, the pressure varies considerably (zone A). As a result, the speed-density strategy is used as it allows engine load to be determined more precisely. At larger aperture angles, pressure varies by little (zone B). As a result, the α-n strategy is used to determine engine load more precisely. Both strategies are used in the transitional zone C.

Specific strategies applied to injection and ignition: transitional pickup acceleration, cut-off and rev limiter

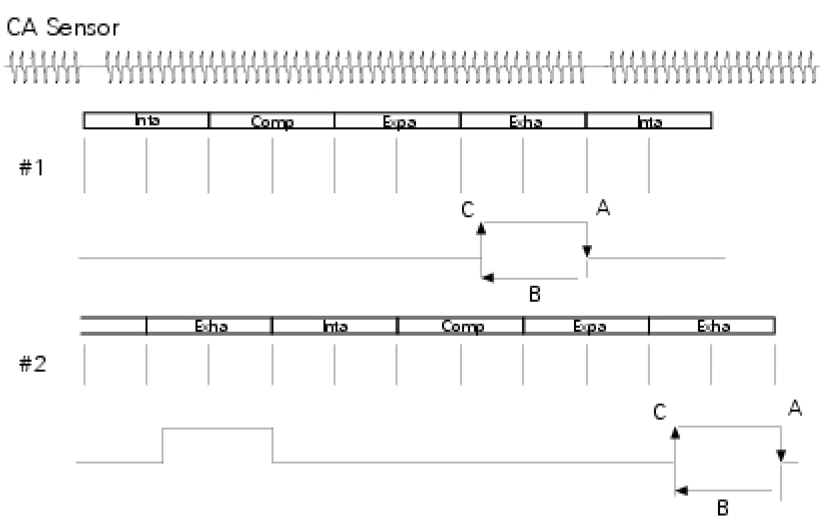
During sudden acceleration (high throttle valve apertures), the engine control unit implements the transitional pickup acceleration function (serving a function similar to the accelerator pump used in carburettors) that enriches the mixture to ensure the necessary fluid power delivery.

When the throttle valves are closed abruptly, the engine control unit implements the cut-off function, which reduces the quantity of fuel injected to reduce consumption and emissions. At engine speeds approaching idle, the injection quantity and throttle valve aperture are managed appropriately to prevent stalling.

The rev limiter is implemented progressively, reducing the quantity of fuel injected and ignition advance increasingly as the engine speed approaches the maximum limit. Upon reaching the rev limit, no fuel is injected and ignition is disabled.

The injection phase

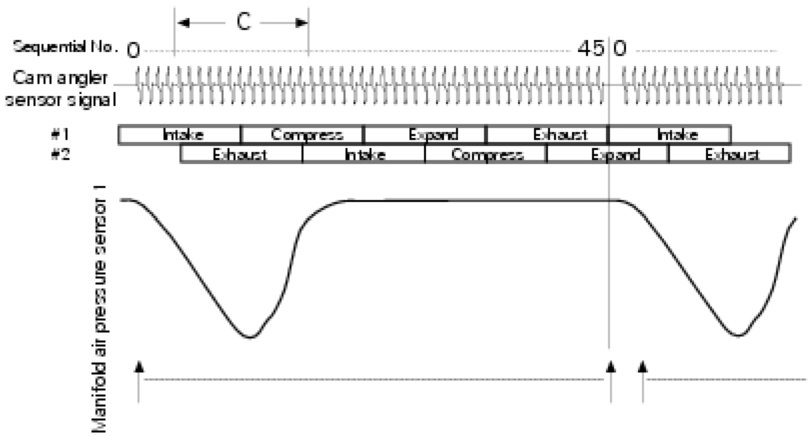
The injection system is phased, meaning that the engine control unit activates the injectors during the exhaust stroke of each cylinder, so that the air-fuel mixture fills the cylinder correctly during the subsequent intake stroke. The precise instant in which the injector opens is determined by calculating the closure time and the time interval during which the injector is required to remain open (injection time). The injection phase is defined by two maps containing the crankshaft angles at which the injectors must be closed. One of these maps is for the horizontal cylinder, the other is for the vertical cylinder. These maps contain coordinates correlating throttle valve opening-engine speed (α-n).

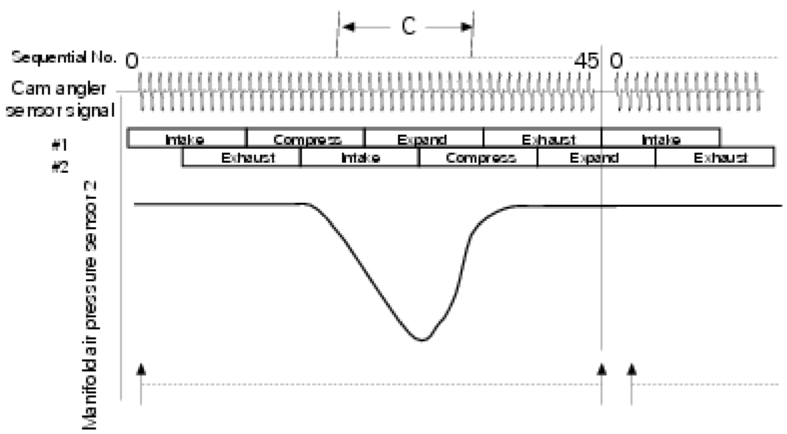


The diagram illustrates the strategy used to determine the injection phase for each cylinder. The map contains the value A, which varies in relation to engine speed and throttle valve opening (α-n). After calculating the injection time (which equates to an angle B correlated to engine speed), the engine control unit may determine the injection start time - in other terms the injection phase C - by subtraction.

Absolute pressure sensor readings

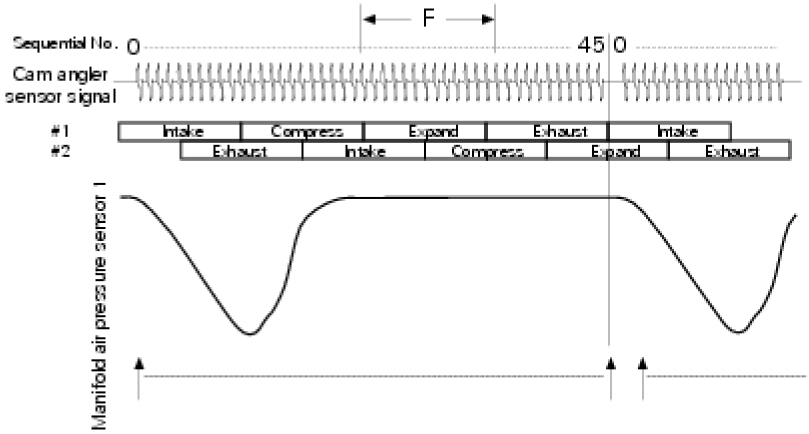
As the signals generated by the two absolute pressure (MAP) sensors connected to the two intake manifolds are fundamental for the speed-density strategy, it is important to understand how the engine control unit reads these signals. Absolute pressure sensor 1 is connected to the intake duct for cylinder 1 (MAP 1, cylinder 1 - horizontal), whereas absolute pressure sensor 2 is connected to the intake duct for cylinder 2 (MAP 2, cylinder 2 - vertical). Therefore, MAP 1 is associated with the base injection map for cylinder 1 (horizontal) and MAP2 is associated with the base injection map for cylinder 2 (vertical).





The two diagrams compare the engine speed-timing sensor signal with the signals generated by the sensors MAP1 and MAP2. As can be seen, the intake pressure is measured during the intake stroke for each cylinder (zone C).

The MAP 1 sensor is also used to measure atmospheric pressure. This measurement is taken during the combustion stage of cylinder 1 (horizontal). In the event of a fault in MAP 1, atmospheric pressure is measured by MAP 2. Information relative to atmospheric pressure is used by the engine control unit to make the corrections necessary to the fuel-air mixture in relation to altitude.



The diagram relative to the MAP1 sensor compares the engine speed-timing signal with the signal generated by the MAP1 sensor itself. As can be seen, atmospheric pressure is measures during the combustion stroke for cylinder 1 (horizontal) (zone F).

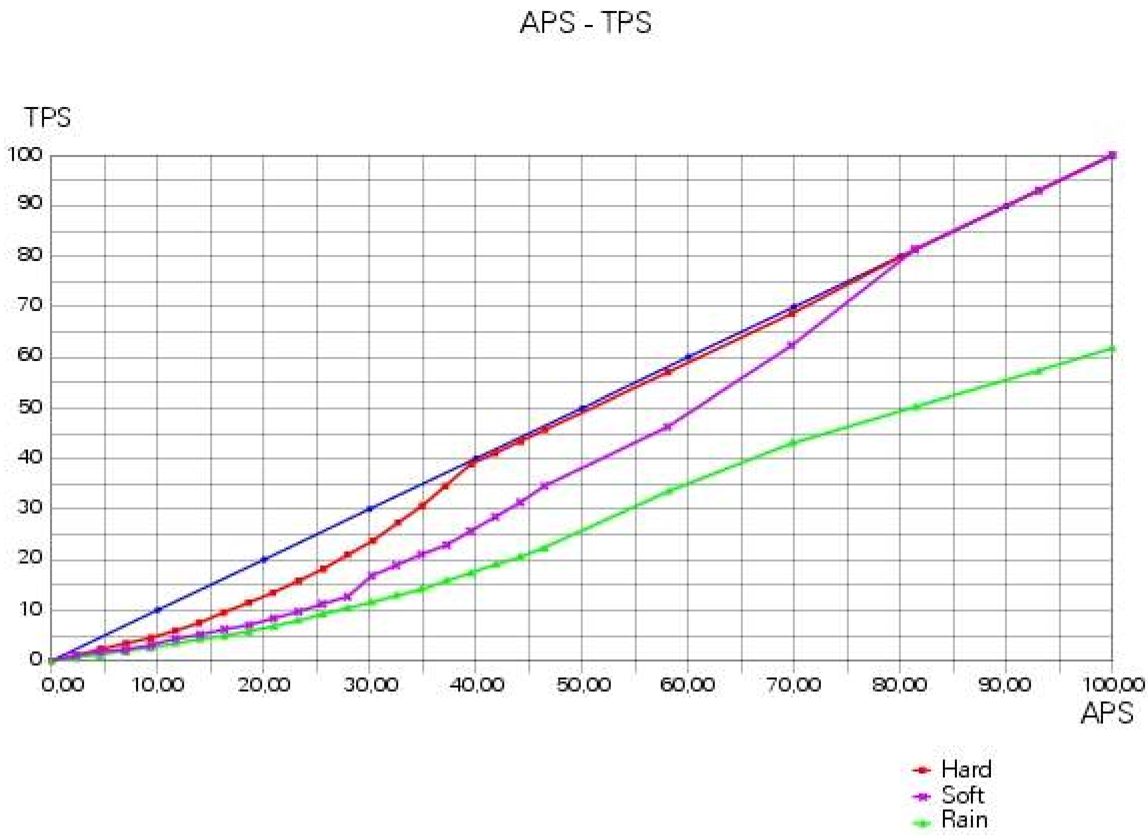
Note

With coolant temperature above 80 °C and air temperature within 19 °C and 35 °C, the CO value on each cylinder shall be comparable and comprised within 0.4% Vol. and 1.4% Vol.. Under these conditions the idle must correspond to 1350 rpm +/- 100 rpm.
The temperatures and engine rpm values can be read with the DDS.
To detect the CO level screw the threaded adapters, where to insert the gas sampling probe, on the two exhaust manifolds.
Before reading the value displayed by the exhaust gas analyser wait at least one minute for the measurement to stabilise.

Operating principle and characteristics of the ride-by-wire system

The engine control system of the Diavel uses a ride-by-wire system with motorised throttle valves. This eliminates all direct connection with metal cables between the throttle grip and the throttle valves themselves. Cables are used to rotate the APS potentiometer, which generates an electric signal that is sent to the engine control unit. The engine control unit uses this signal to determine the throttle grip position and the throttle opening dynamics, in other terms, the torque demand made by the rider. The ride-by-wire system enables the following:

- smooth torque delivery, as the ECU filters the signal received from the APS. As there is no direct connection with metal cables between the throttle grip and the throttle valve, any spurious movement of the throttle grip itself due, for example, to unevenness in the road surface straining the arms and hands of the rider, have no direct or immediate effect on engine delivery.
- improved management of different engine operating states. As the ECU controls the aperture of the throttle valves, the ECU itself can determine the air flow into the engine independently of the actual throttle grip position set by the rider. This strategy defines three different regimens for throttle valve aperture (150 hp Hard, 150 hp Soft and 100 hp) that may be selected by the user without modifying the calibration of the engine control unit (in other terms, the quantity of fuel injected and the ignition advance, which are defined solely in relation to the 150 hp Hard throttle valve aperture regimen).



The three curves show the relationship between the throttle valve aperture regimens and the angle of the throttle grip. Different curves for different engine speed bands are stored in the engine control unit. Each one of these is activated by the rider in relation to the selected riding mode. On a conventional mechanical system there is only one throttle valve aperture regimen, which is determined by the profile of the control roller mounted on the spindle of the valves themselves and actuated by a metal cable that moves as the throttle grip is twisted. With the 150 hp Hard setting selected (red curve with maximum power of 150 hp available), with the exception of the initial zone, the relationship between percentage throttle grip aperture and percentage throttle valve aperture is practically linear (direct). Therefore, high throttle grip aperture angles correspond to identical high throttle valve aperture angles. This linear relationship, however, does not apply at small throttle grip aperture angled (a small throttle valve aperture angle is achieved with a slightly higher throttle grip rotation angle). With the 150 hp Soft setting (purple curve with maximum power of 150 hp available), throttle valve opening is “softer“. Therefore, a given aperture angle of the throttle grip corresponds to a lower throttle valve aperture angle. However, this setting still allows the maximum throttle valve opening to be attained when the throttle grip is fully rotated (100% throttle grip rotation corresponds to a throttle valve opening angle α equal to 90°). With the 100 hp setting (green curve with maximum power restricted to 100 hp), throttle valve aperture is significantly attenuated, and rotating the throttle grip fully (100%) does not achieve full throttle valve aperture (throttle valves reach a maximum angle of less than 90°. restricting maximum power). The blue line represents a direct relationship between throttle grip opening angle and throttle valve opening angle, whereby a given throttle grip rotation angle corresponds to an identical opening of the throttle valves.

TPS

The position of the throttle valves is monitored by the engine control unit via a sensor (TPS) integrated into the electric motor, fixed onto the spindle of the vertical cylinder throttle valve.

For maximum reliability, the sensor consists of two integrated Hall effect sensing elements (MAIN and SUB), which measure the position of the throttle valve.

The TPS uses a single power supply voltage and a single ground.

The two signals generated, also denominated MAIN and SUB, are monitored using a diagnostic algorithm by the ECU (engine control unit), which constantly compares the signals against each other and verifies their consistency. In the event of inconsistency or a fault, the error is indicated and the throttle valve actuator motor is disabled.

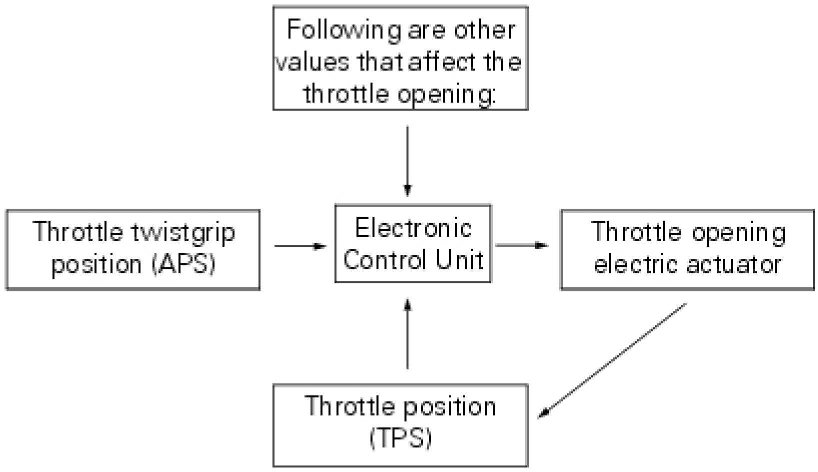
APS

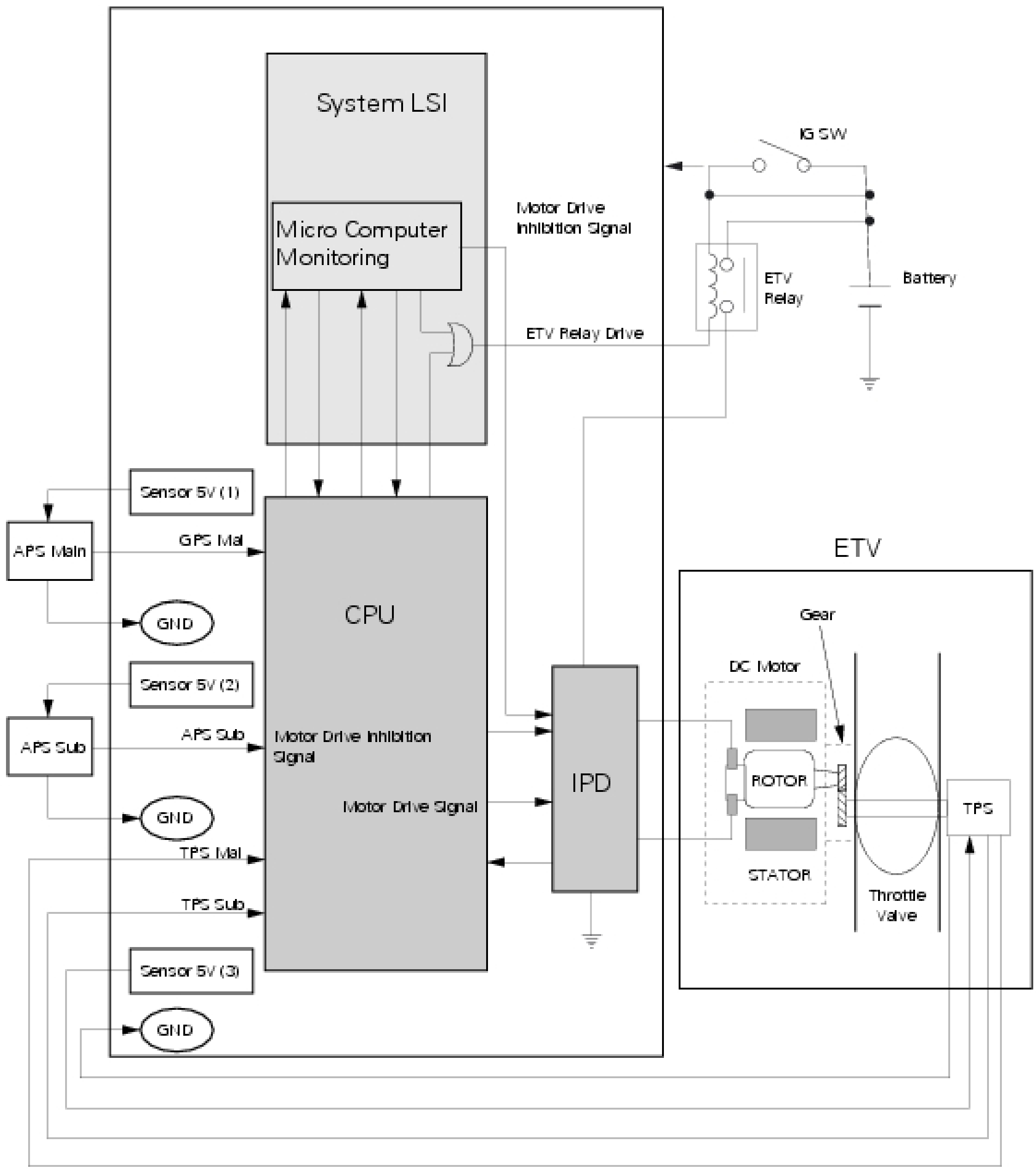
The position of the throttle grip is measured by a sensor (APS) mounted on the throttle body and consisting of two resistance potentiometers (MAIN and SUB), integrated into a single element.

Each of the two resistance potentiometers has its own dedicated power supply and ground.

The two signals generated, also denominated MAIN and SUB, are monitored using a diagnostic algorithm by the ECU (engine control unit), which constantly compares the signals against each other and verifies their consistency. In the event of inconsistency or a fault, the error is indicated and the throttle valve actuator motor is disabled.

The information provided by the APS is used by the engine control unit to determine what is known as the “torque request” made by the rider - in other terms, the performance required of the engine by the rider.





The two diagrams illustrate the operating principle of the ride-by-wire system and the monitoring and control functions performed by the internal ECU circuits. As can be seen, the APS consists of a potentiometer with two elements (MAIN and SUB), with independent power supply and ground. The TPS also has a potentiometer with two elements (also MAIN and SUB), but with common power supply and ground. The CPU is the processing core of the control unit, the IPD (integral-proportional-derivative controller) is the control circuit and the LSI is a Large Scale Integrated Circuit that controls the power relay on the exterior of the actuator. When necessary (in the event of malfunction), this circuit and the CPU generate a signal that inhibits the electric throttle valve actuator motor. In this case, the throttle valves are returned to the closed position by a spring on the throttle body.

The image shows the throttle body seen from the intake side. The accelerator sensor (APS) is visible on the left, while the electric actuator (motor driving the throttle valves), which also incorporates the throttle valve sensor (TPS), is on the right. The electric actuator operates the vertical cylinder throttle valve directly, and operates the horizontal cylinder throttle valve via a link rod.

When removing the airbox, the throttle body remains fixed to the bottom of the air box itself.

The throttle body is fastened to the rubber intake pipes with metal clamps.

Important

In the event of a fault of the electric throttle valve actuator motor, the TPS throttle valve position sensor (integrated into the electric motor) or the APS accelerator position sensor, the entire throttle body must be replaced.
In the event of a fault in the ride-by-wire system (throttle valve actuator motor, throttle valve actuator motor relay and APS and TPS sensors), the command to actuate the throttle valves is immediately cancelled and the valves close automatically.
The ECU implements no recovery measure in the event of a ride-by-wire system fault. The engine either continues running at idle speed or switches off. The motorcycle can therefore not be ridden (there is no limp-home strategy for taking the vehicle to a service centre).
When replacing the throttle body, no adjustment procedures and no special initialisation procedures using the DDS are necessary.
NEVER ALTER THE SETTING OF THE BY-PASS SCREWS ON EACH OF THE THROTTLE VALVES.
NEVER ALTER THE SETTING OF THE THROTTLE VALVE SYNCHRONISATION SCREW

Explanation of the function of the ride-by-wire system

Mechanism

Via metal cables, the throttle grip operates a roller mounted on one end of a spindle located near the horizontal cylinder throttle valve spindle.
The APS sensor, which measures the position of the throttle grip itself, is mounted on the opposite end of this spindle.
A mechanical stop on the roller limits throttle valve travel via a special system of levers.

Normal ride-by-wire system function

The throttle valves rotate through an arc ranging from completely closed (mechanical end-stop) and the aperture set by the throttle valve, which is determined by the ECU from the information received from the APS sensor, and delimited by the stop position on the roller, but without actually reaching the stop position itself.
The stop on the roller does NOT therefore mechanically delimit the travel of the throttle valves
When the throttle grip is completely released (idle speed condition), there is an angle of approximately 5° between the stop on the roller and the mechanical end-stop of the throttle valves. The throttle valves rotate within this angle to automatically regulate idle speed (target idle speed is 1350 rpm with the engine stabilised at operating temperature)

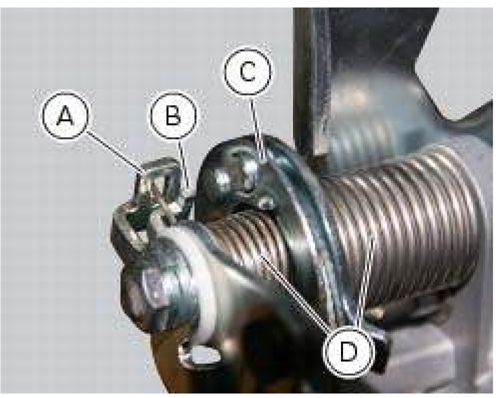
Ride-by-wire system function in the event of a fault

In the event of a fault of any of the components of the ride-by-wire system, whether electrical or mechanical, the ECU cuts off power to the electric motor normally actuating the throttle valves.
A spring gradually closes the throttle valves against the mechanical end-stop.
If the throttle grip is also closed during this stage, the stop on the roller connected to the throttle grip via metal cables, closes the horizontal cylinder throttle valve with a system of levers.
As the horizontal cylinder throttle valve is connected to the vertical cylinder throttle valve by a link rod, this also closes the vertical cylinder throttle valve.

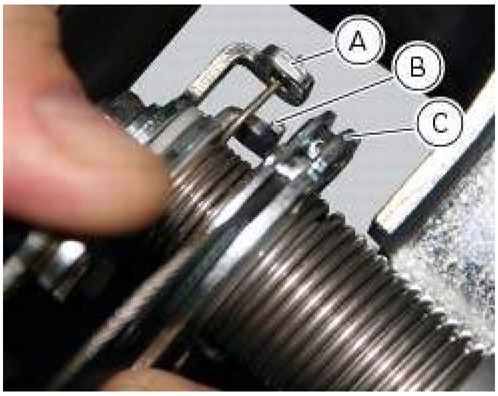
It is impossible for the throttle to remain stuck open as a result of a ride-by-wire system fault.

Warning

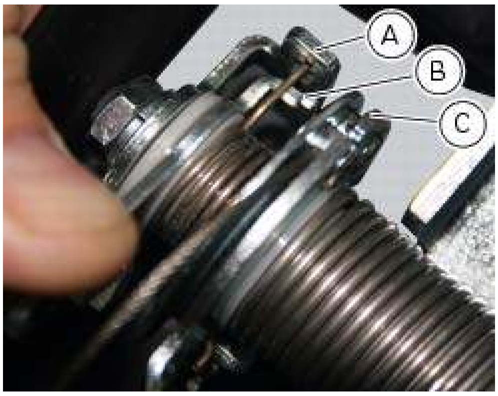
Upon ride-by-wire activation through DDS, the twistgrip must be completely turned so that the electric actuator can activate the throttles (their movement is not obstacled by the mechanical stop on the pulley which is connected with the twistgrip, through the metallic flexible wires).



A mechanical stop connected to roller (rotates together with roller), B tang connected to throttle valves (rotates with throttle valves), C roller operated by cables connected to throttle grip, D roller and throttle valve return spring.



The following is visible in the photo:
A The mechanical stop that rotates together with the pulley;
B the tooth that rotates together with the throttles;
C pulley operated by cables connected to throttle grip.
In this case (ride-by-wire is working), the mechanical stop (A), driven by the rotation of the twistgrip, is NOT resting against the tooth (B).



The following is visible in the photo:
A The mechanical stop that rotates together with the pulley;
B the tooth that rotates together with the throttles;
C pulley operated by cables connected to throttle grip.
In this case (ride-by-wire system malfunctioning), the mechanical stop A, driven by the rotation of the throttle grip as the rider closes the grip itself, is in contact with the tang B, which forces the throttle valves closed.

Anti-pollution system and auto-adaptive strategy

Efficacy of the catalytic converter and oxygen sensors

To comply with current emissions legislation, the Diavel is equipped with a trivalent catalytic converter, which oxidises CO (carbon monoxide) and HC (unburnt hydrocarbons) and reduces NOx (nitrogen oxides).

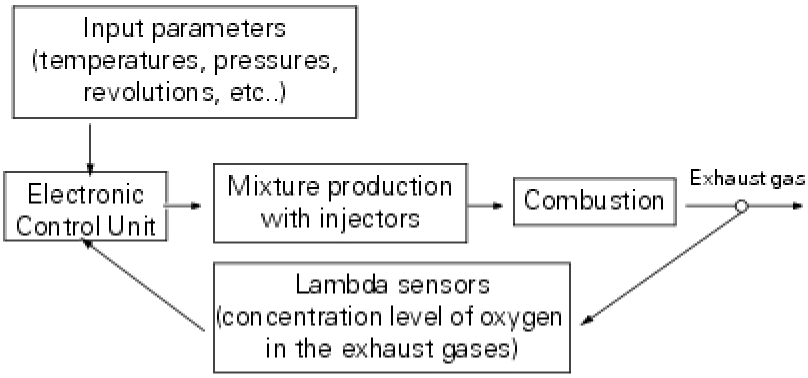
The image shows the exhaust system. The oxygen sensor for the horizontal cylinder (1) is visible on the right, the oxygen sensor for the vertical cylinder (2) is on the left. The catalytic converter is contained within the silencer, while the By-pass valve is installed in the section of pipe connecting the silencer to the twin tailpipes.

An oxygen sensor is mounted on the exhaust manifold for the vertical cylinder and on the exhaust manifold for the horizontal cylinder. The signal generated by these two sensors is processed by the engine control unit within the engine operating ranges included in the test cycle defined by emissions legislation (typically idle speed, the progression stage immediately above idle speed and low load conditions). By using these signals together with others from different sensors, the engine control unit generates a stoichiometric fuel-air mixture with the injectors (one part fuel for every 14.7 parts of aspirated air). The exhaust gases produced by the combustion of this mixture can be treated extremely efficiently

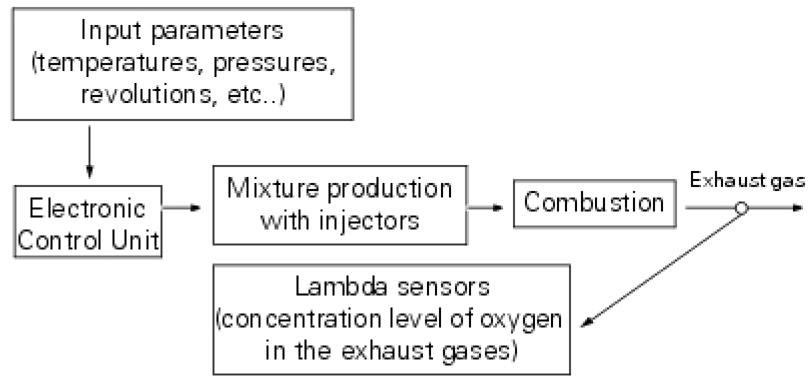
by the catalytic converter. This means that the catalytic converter reduces NOx and oxidises CO and HC by the maximum amount possible. If the engine and fuel system are functioning correctly, the signals generated by the oxygen sensors should oscillate between 0 V and 1 V in the engine operating ranges mentioned above:
-Lean fuel-air mixture -> high oxygen levels in exhaust gases -> oxygen sensor voltage approaching 0V.
-Rich fuel-air mixture -> low oxygen levels in exhaust gases -> oxygen sensor voltage approaching 1V.

Therefore, on the basis of the signals received from the two oxygen sensor, the ECU continuously corrects the air-fuel mixture to keep it near the stoichiometric ratio, and the average electric signal generated by the two oxygen sensors is approximately 0.5 V. When the fuel system functions as described above, it is said to operating in a “closed loop”. There are engine operating states in which the engine control system is in an “open loop”, where the mixture is generated without processing the signals received from the two oxygen sensors. Typically, these are:
-Warm-up
-Transitional states (acceleration and mild or severe deceleration - severe deceleration causes fuel cut-off).
-States resulting from lambda sensors fault.
-States not included in the test cycle defined by emissions legislation.

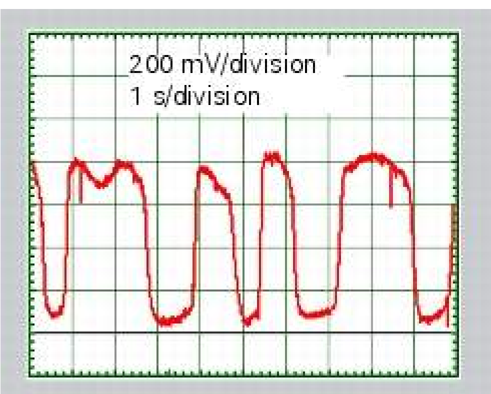
During acceleration or deceleration, where the mixture must be altered significantly by modifying the quantity of fuel injected, the oxygen sensor detects an excessive variation in oxygen levels in the exhaust gases, caused by the combustion of the altered mixture. If the engine control system were to operate in a closed loop in these conditions, the electric signal from the oxygen sensor would cause the fuel-air mixture to be corrected continuously, resulting in irregular engine function. For this reason, engine control switches to open loop operation during transitory acceleration or deceleration states. Therefore, when the engine is running at constant speed, engine control functions primarily in a closed loop, whereas in other conditions it functions primarily in an open loop.



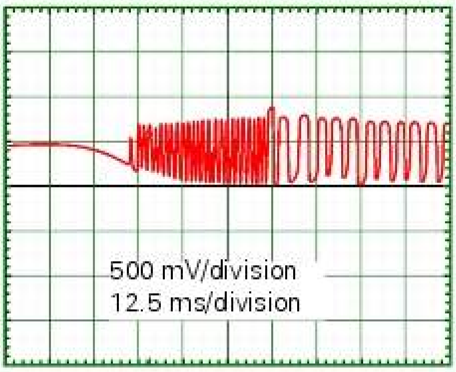
The drawing illustrates the closed loop operation of the injection system.



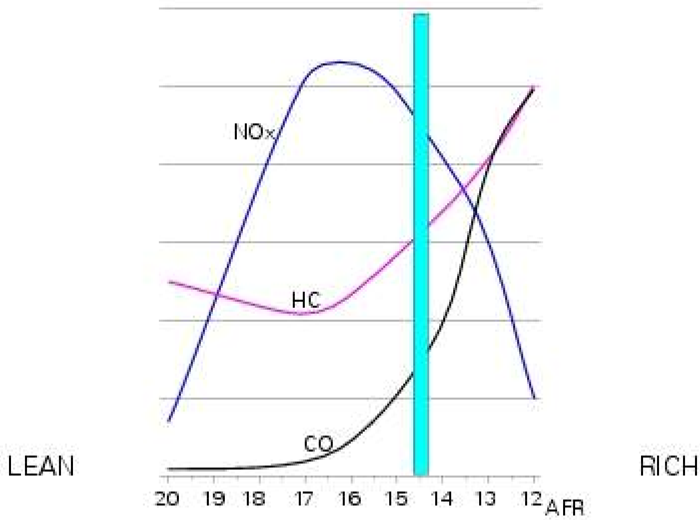
The drawing illustrates the open loop operation of the injection system.



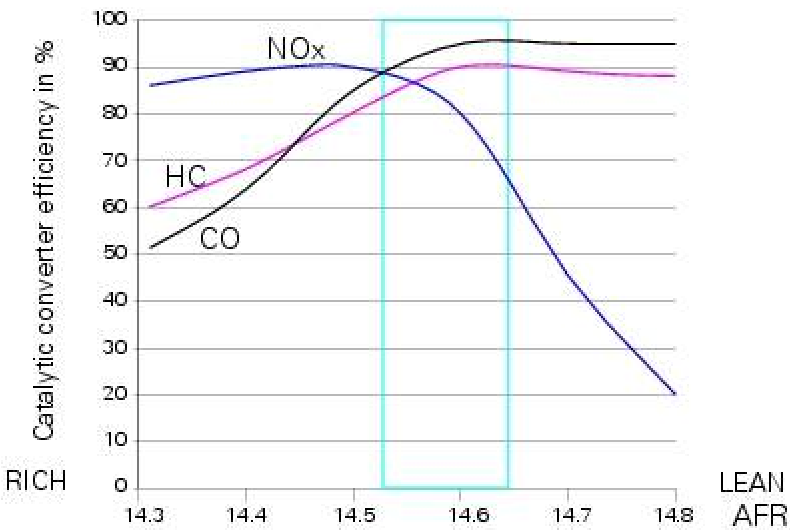
Typical pattern for the signal generated by the oxygen sensor within the engine operating ranges included in the test cycle defined by emissions legislation. The signal oscillates between 0 V and 1 V.



Typical pattern of the signal generated by the oxygen sensor during sensor heating stage (the operating temperature range for the sensor starts at approximately 300°C).



With fuel-air mixtures close to stoichiometric, the concentration of CO, HC and NOx contained in the exhaust gases is minimal. Untreated, however, these levels still exceed the limits permitted by emissions legislation. For this reason, the exhaust system includes a catalytic converter and two oxygen sensors, the latter ensuring optimum conditions for the efficiency of the catalytic converter.



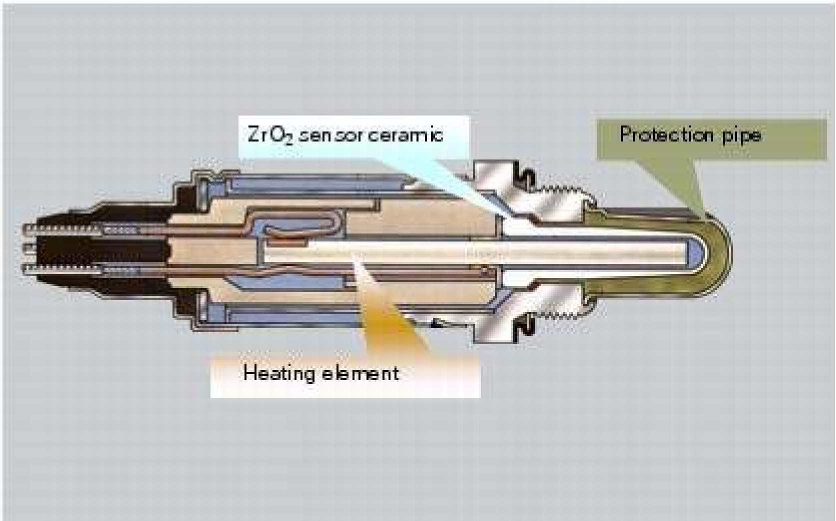
When passed through by exhaust gases produced by the combustion of a near-stoichiometric fuel-air mixture, the catalytic converter can reduce NOx and oxidise CO and HC with an efficiency approaching 100%.

Operating principle of the zirconium dioxide (ZrO_2) oxygen sensor

The external surface of the element in zirconium dioxide implemented in the two lambda sensors used on the Diavel is in direct contact with the exhaust gases, while the internal surface is in contact with atmospheric air. Both surfaces are coated with a thin layer of platinum, which becomes electrically charged as a result of the difference in oxygen concentration between the two parts of the sensor (the part exposed to atmospheric air and the part in contact with exhaust gases), generating a voltage. This voltage may assume values within the following range:
-Combustion with lean mixture -> high oxygen levels in exhaust gases -> oxygen sensor voltage is low (approaching 0 V)

- Combustion with rich mixture -> low oxygen levels in exhaust gases -> oxygen sensor voltage is high (approaching 1 V)

This electrical signal is transmitted to the ECU via the sensor output connection. The oxygen sensor only starts functioning correctly at temperatures of at least 300°C. At these temperatures, the zirconium dioxide element becomes permeable to oxygen ions, meaning that it can be crossed by the ions themselves, generating a difference in potential between the two platinum surfaces. To reach operating temperature more rapidly, there is an electric heating element inside the sensor itself, which receives 12V power and has a ground connection controlled by the ECU in PWM (Pulse Width Modulation) mode. The PWM percentage is modified by the ECU in relation to engine temperature, to heat the oxygen sensor to operating temperature rapidly after a cold start. Heater element control is disabled in KEY ON state with the engine off and during starting (ECU does not provide connection to ground in these conditions).

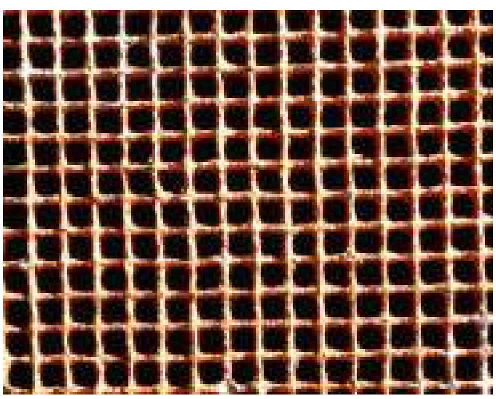


To allow the oxygen sensor to reach operating temperature rapidly, a heating element is included within its housing, which receives 12 V power and has a ground connection controlled as required by the ECU. The signal generated by the sensor switches from a voltage close to 1V to a voltage approaching 0V when the fuel-air mixture reaches a near-stoichiometric ratio (air-fuel ratio of 14.7).

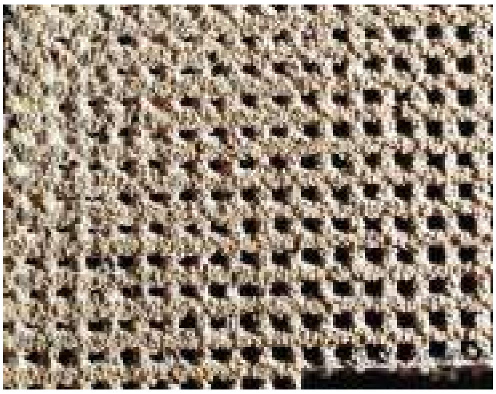
Operating principle of the catalytic converter

The catalytic converter consists of a monolith metallic core with a honeycomb structure. It therefore has hundreds of small channels, which are covered with a layer of aluminium oxide washcoat. The exhaust gases are passed through this honeycomb structure. The catalyst substances (noble metals), such as platinum, rhodium and palladium, with which the products of combustion come into contact, are deposited on the washcoat layer. The principle reactions taking place in a three-way catalytic converter oxidising CO and HC and reducing NOx are as follows:
- CO reacts with oxygen to produce water (H_2O) and carbon dioxide (CO_2)
- HC compounds react with oxygen to produce water (H_2O) and carbon dioxide (CO_2)
- NOx compounds react with CO to produce nitrogen (N_2) and carbon dioxide (CO_2)

These reactions only begin to develop once the catalytic converter reaches a temperature of at least approximately 300°C. This exhaust post-treatment device does not have an unlimited lifespan, and its effectiveness is reduced with increasing mileage. The lifespan of the catalytic converter is significantly reduced if it comes into contact with high quantities of unburnt fuel. As a result, never attempt to push-start the motorcycle if starting is impeded by a mechanical or electrical fault. Furthermore, the ignition system must always be in perfect working order. Only use engine oil specified by Ducati, as it has a low ash content (ash obstructs the tiny catalytic converter channels over time).



The image shows a monolith core in excellent condition.



The image shows a monolith core that has deteriorated as a result of using engine oil not recommended by Ducati.

Self-adaptive parameters

Within the engine operating ranges included in the test cycle defined by emissions legislation, the ECU corrects the fuel-air mixture to maintain the average signals received from the oxygen sensors close to a value of approximately 0.5 V. This ensures that the combustion process produces exhaust gases that can be treated highly efficiently by the catalytic converter. Obviously, fuel-air mixture correction capability of the ECU is limited. As a result, a number of self-adaptive parameters are used in the ECU software, which modify the base maps for the quantity of fuel injected. These parameters make it possible to exploit the full mixture correction range and, therefore, to recover from deviations from the desired average value for the oxygen sensor signals of approximately 0.5 V. These deviations may be due to the following causes:

- ageing of the components of the cylinder unit, resulting in deviation from rated specifications (valve clearance, encrustation in combustion chamber and on valves, cylinder-piston seal integrity, variations in intake and exhaust gas flow)
- ageing of the elements of the engine control system (variations in electrical characteristics of sensors and actuators)
- fault of one or more elements influencing the combustion process or mixture production process (such as induction anomalies, injector malfunction, non-conforming fuel pressure etc.)

The ECU defines specific self-adaptive parameters for each cylinder correlated to ten different functional zones of the engine. There are two separate auto-adaptive parameters - denominated “long term” and “real time” - for each zone and for each cylinder.

- When the engine is switched off, the ECU remains powered for a predetermined number of seconds (power latch or self-shut down function), during which the real time self-adaptive parameters are memorised in the ECU, updating the long term parameters.
- When the engine is switched on, the ECU retrieves the long term parameters from its memory and uses them, updating them continuously. These therefore become the real time parameters.

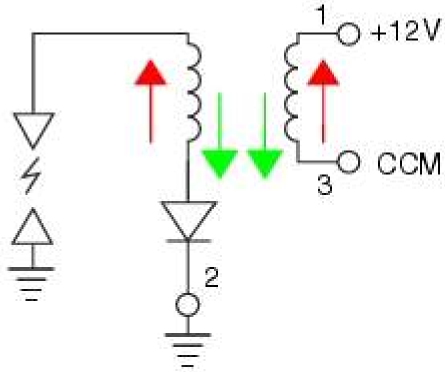
Reading the self-adaptive parameters with the DDS diagnostic instrument makes it possible to ascertain whether the two cylinder units of the engine are functioning correctly (the DDS displays the self-adaptive parameters only when engine control is in a closed loop with the oxygen sensors). In the event of malfunction, these parameters approach one of the two limits defining their range of possible values (the ECU is continuously correcting the base maps). In this case, the following is necessary:

- Identify and rectify the fault
- Reset the self-adaptive parameters with the DDS
- Ride the motorcycle normally or simply leave running at idle speed, to allow the ECU to recalculate the new self-adaptive parameters

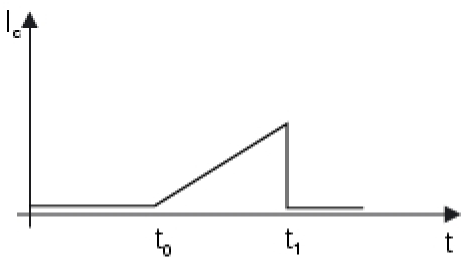
Ignition coils

Introduction

The engine control system of the Diavel includes two ignition coils: one for the horizontal cylinder and one for the vertical cylinder. These coils are installed directly in the spark plug wells. A diode is installed on the secondary winding inside the coil, which prevents the unintentional generation of a spark at the spark plug as a result of variations in voltage induced on the secondary winding itself when the primary winding charge phase starts. During this phase, the diode is inversely polarised and does not allow current to pass. Conversely, during the phase in which the ECU annuls the current circulating in the primary winding, the diode is directly polarised and allows spark generation on the spark plug.



The image shows the internal electric configuration of the coil. During the primary coil phase, the polarities of the two voltages inversely polarise the diode (red arrows). When the ECU interrupts power to the primary circuit, the diode is polarised directly (green arrows), allowing spark generation on the spark plug. PINs 1, 2 and 3 are located on the primary connection of the coil.

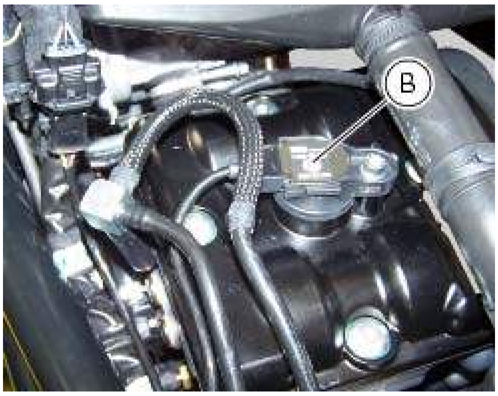


The diagram illustrates the qualitative variation over time of the charge current for the primary coil winding. The ECU determines the instant t1 (in relation to this time and engine speed, the ignition advance value in degrees is calculated), in which the connection to ground on PIN3 is interrupted, triggering the spark on the spark plug. At t0, the ECU grounds coil PIN 3, and current begins to circulate in the primary winding. The instant t0 is calculated by the ECU to allow the necessary time interval (t1 - t0) to charge the primary coil winding correctly. Typically, the interval t1 - t0 increases with increasing engine speed.

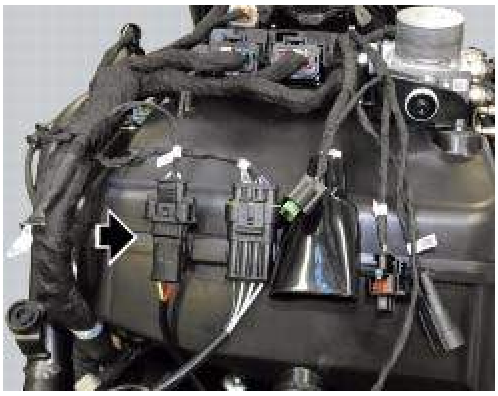
Component assembling position

Installation location of horizontal cylinder coil (A).

Location of horizontal cylinder coil connection.

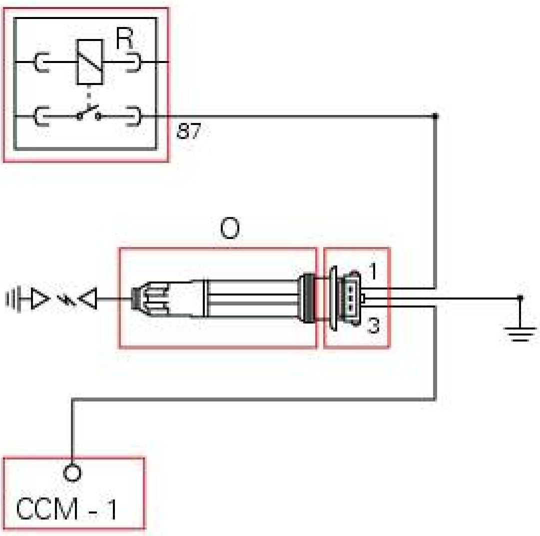


Installation location of vertical cylinder coil (B).

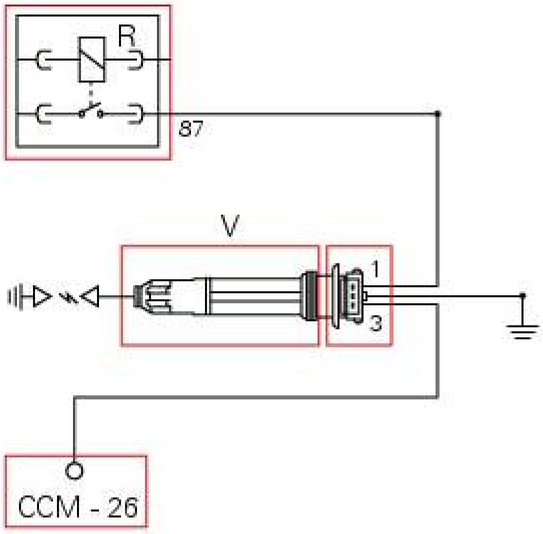


Location of vertical cylinder coil connection.

Connection wiring diagram



O Horizontal cylinder coil, R Injection relay. CCM engine control connection, 1 power connection (12V) via injection relay (brown/white – Bn/W), 3 connection to control unit (grey/black – Gr/Bk), 2 ground (black/Bk).



V Vertical cylinder coil, R injection relay. CCM engine control connection, 1 power connection (12V) via injection relay (brown/white – Bn/W), 3 connection to control unit (grey/yellow – Gr/Y), 2 ground (black - Bk).

In the event of fault

The cylinder associated with the faulty coil does not function. The injector associated with the faulty coil is disabled.
Fault codes generated and possible correlated faults
Fault codes generated by engine control unit and displayed by DDS (Vertical ignition diagnosis (coil 2), Horizontal ignition diagnosis (coil 1)):

- Coil 1 (cylinder 1 - horizontal) and/or Coil 2 (cylinder 2 - vertical), open circuit: check integrity of electric circuit and electrical connections.
- Coil 1 (cylinder 1 - horizontal) and/or Coil 2 (cylinder 2 - vertical), short circuit to Vdc: check integrity of electric circuit and electrical connections.
- Coil 1 (cylinder 1 - horizontal) and/or Coil 2 (cylinder 2 - vertical), short circuit to ground: check integrity of electric circuit and electrical connections.

Note

Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

The dashboard service display shows the error “Coil” and the EOBD warning light activates.

Possible correlated faults:

- If the engine does not start and the primary coil windings are not receiving 12V power, check injection relay function (see paragraph “Injection relay“) of this section.
- If the engine runs on one cylinder only and there is no spark at one of the two spark plugs, try swapping the coils. If the fault (no spark) follows the coil, the coil itself is faulty. If the fault does not follow the coil, the relative control circuit is faulty.
- If the engine runs unevenly (backfires and torque delivery is uneven), check that PIN 2 on the primary coil winding is grounded correctly. If necessary, replace the coils as the respective internal diode may be damaged (short circuited).

The coils may be activated from the DDS to check for sparking across the spark plug electrodes (during the test, the spark plug threads must be correctly grounded)

If none of the aforementioned tests identify the problem and the coils are in proper working order, replace the engine control unit.

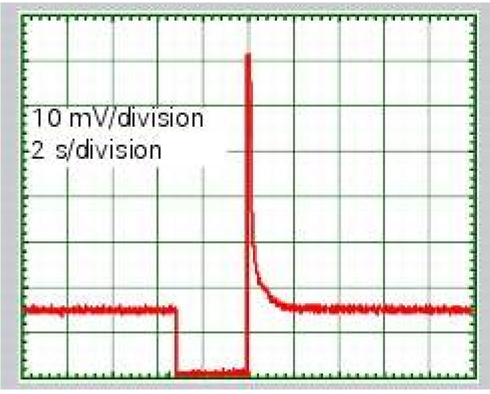
Component replacement methods

The coils replacement do not foresee particular measures, proceed as described in Sect. 4-3, Spark plugs replacement.

Injectors

Introduction

The injectors used on the Diavel are TOP FEED units, meaning that fuel is fed into the top of the injector itself. The injectors contain a winding which raises a needle when electrically energised. This opens the atomiser nozzle, through which pressurised fuel is dispensed, generating the spray that mixes with the air aspirated by the engine. To ensure that the spray consists of perfectly atomised fuel, the atomiser nozzle has twelve holes. Each cylinder has an injector, located underneath the respective throttle valve. The injector aperture time is determined by the engine control unit to ensure that the correct quantity of fuel is injected (carburation).

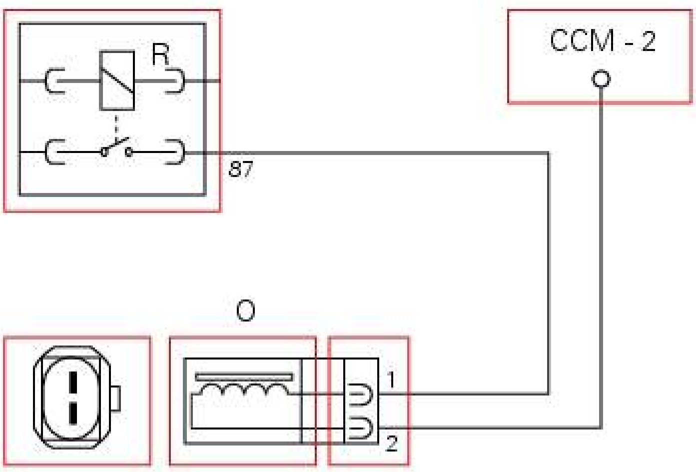


The graph shows the quantitative variation in the signal sent to the injector by the ECU in relation to time. The ECU commands injector aperture by creating a connection to ground at one of the terminals of the injector's electric winding. The other terminal receives 12V power supply voltage.

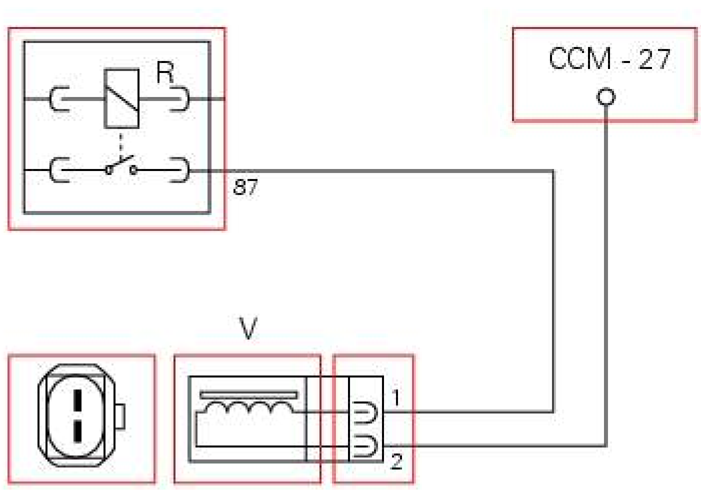
Component assembling position

The injectors are located on the intake ducts, underneath the throttle valve. The respective electrical connection is integrated into the injector body.

Connection wiring diagram



O Horizontal cylinder injector, R injection relay. CCM engine control connection, 1 power connection (12V) via injection relay (brown/white – Bn/W), 2 connection to control unit (pink/yellow – P/Y).



V Vertical cylinder injector, R injection relay. CCM engine control connection, 1 power connection (12V) via injection relay (brown/white – Bn/W), 2 connection to control unit (green/yellow – G/Y).

In the event of fault

The cylinder associated with the faulty injector does not function.

Fault codes generated and possible correlated faults

Fault codes generated by engine control unit and displayed by DDS (Vertical injector diagnosis (inj. 2), Horizontal injector diagnosis (inj. 1)):
- Injector 1 (cylinder 1 - horizontal) and/or Injector 2 (cylinder 2 - vertical), open circuit: check integrity of electric circuit and electrical connections.
- Injector 1 (cylinder 1 - horizontal) and/or Injector 2 (cylinder 2 - vertical), short circuit to Vdc: check integrity of electric circuit and electrical connections.
- Injector 1 (cylinder 1 - horizontal) and/or Injector 2 (cylinder 2 - vertical), short circuit to ground: check integrity of electric circuit and electrical connections.

Note

Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

The dashboard service display shows the error “Injector” and the EOBD warning light activates.

Possible correlated faults:
- If the engine does not start and the injectors are not supplied with 12 V, check the injection relay operation (see paragraph “Injection relay”) of this section.
- If the engine is running on once cylinder only and one of the injectors does not open, try swapping the injectors. If the fault (no injector opening) follows the injector, the injector itself is faulty. If the fault does not follow the injector, the relevant control circuit is faulty.
- If the engine runs irregularly, check the pressure and flow rate in the fuel circuit (see paragraph “Fuel system circuit“ of this section) and check that the injectors atomise the fuel correctly.

The injectors may be actuated from the DDS to check that they function correctly.
If none of the aforementioned tests identify the problem and the injectors are in proper working order, replace the engine control unit.

Component replacement methods

The injectors replacement do not foresee particular measures, proceed as described in Sect. 8 - 6, Removal of the fuel injectors. With the fuel system pressurised, check that there are no fuel leaks from the connector. After replacement of one or both of the injectors, reset the self-adaptive parameters relative to carburation with the DDS.

Throttle valve operation engine

Introduction

The electric motor actuating the throttle valve for the vertical cylinder is mounted on the throttle body of the Diavel, while a link rod connects the vertical cylinder throttle valve to the horizontal cylinder throttle valve. In the electric motor, the throttle valve position sensor (TPS) is integrated.

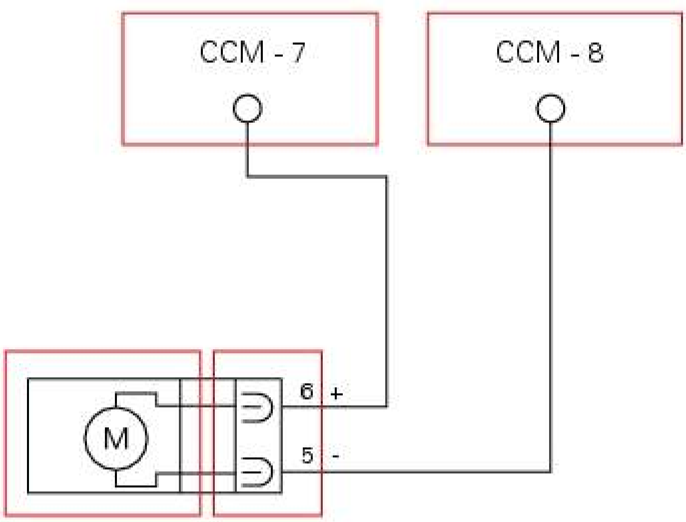
The electric motor, which also incorporates the throttle valve position sensor (TPS), is visible on the right, on the throttle body. The accelerator position sensor (APS) is visible on the left.

Component assembling position

The image shows the throttle valve actuator motor. Inside of it, it is also placed the throttle valve position sensor (TPS).

Location of electric connection for throttle valve actuator motor – TPS (throttle valve position sensor).

Connection wiring diagram



CCM engine control connection, M throttle valve actuator motor. 5 light blue/red – Lb/R, 6 light blue/black- Lb/Bk.

In the event of fault

In the event of a throttle valve actuator fault, motor power is cut off and the throttle valves close (see chapter relative to ride-by-wire system).
Fault codes generated and possible correlated faults
Fault codes generated by the engine control unit and displayed by the DDS (ETV motor diagnosis):
-Open circuit (feedback error): check integrity of electric circuit and electrical connections.
-Short circuit to Vdc: check integrity of electric circuit and electrical connections.
-Short circuit to ground: check integrity of electric circuit and electrical connections.

Note

Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

The dashboard service display shows the error “ETV motor” (throttle valve actuator motor) and the EOBD warning light activates.

Possible correlated faults: The engine does not start, cuts out or remains running at idle speed and will not accelerate.
Check:
-Functionality of throttle valve actuator motor relay (see paragraph “Throttle valve actuator relay”)

The throttle valve actuator motor may be actuated into three preset positions (0%, 50%, 100%) using the DDS.

If none of the tests described above identify the problem and the throttle valve actuator is in proper working order, contact Ducati.

Component replacement methods

The throttle valve actuator motor incorporates the throttle valve position sensor (TPS) and cannot be replaced as an individual component. In case it brakes down it will be necessary to fit a new throttle body (refer to Sect. 6 - 8, Operating principle and characteristics of the ride-by-wire system). After replacement of the throttle body, reset the self-adaptive parameters relative to carburation with the DDS. Adjust the cables connecting the throttle grip to the throttle grip position sensor.

Engine start button

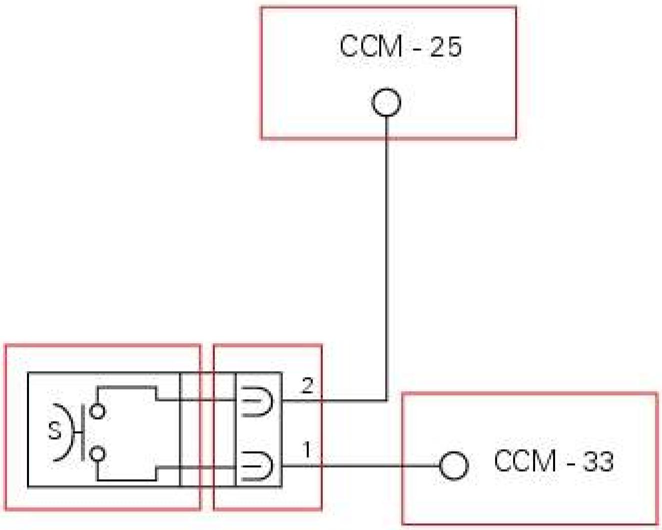
Introduction

The engine start button is located on the right hand handlebar switchgear set and is used to turn the engine on.
Component assembling position

The engine start button is included in the switchgear set on the right hand handlebar.

Location of right hand handlebar switchgear set connection.

Connection wiring diagram



CCM engine control connection, S engine start button. 1 pink/black - P/Bk, 2 white/blue – W/B.

In the event of fault

In the event of a start button fault, the engine cannot be started.

Fault codes generated and possible correlated faults

The engine control unit generates no fault code in the event of an engine start button fault.

No errors are indicated on the dashboard

Possible correlated faults: the starter motor cannot be operated. Check:
- Battery charge.
- Integrity of the electric circuit (open circuit, short circuit to ground and toward Vdc) and electrical connections of the start button.
- Integrity of the start button. In the button's two different positions, the resistance at its contacts (PIN 1 and PIN 2) must be zero (depressed - continuity) or infinite (released - open circuit).
- The integrity of the engine starter motor relay and its circuit.
- Integrity of the starter motor and that the motor is correctly connected to the electrical system (also check ground connection on engine, see Sect. 6 - 3“Starter motor“).
- The integrity of the side stand switch, the clutch lever switch, the gear position sensor and their respective circuits
- Integrity of Stop Engine switch.

Note

Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

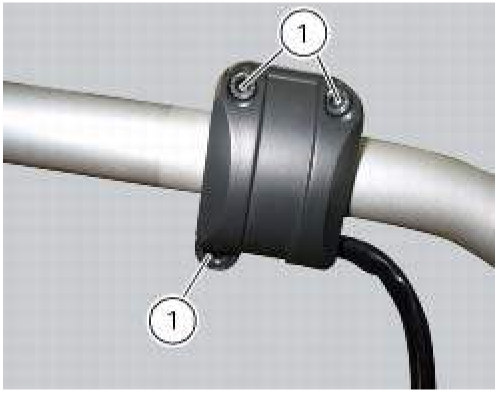
The DDS instrument can be used to display the activation state of the engine start button.
If none of the tests described above identifies the problem and the power supply and ground for the engine control unit are in correct working order, replace the engine control unit.

Component replacement methods

No special measures are necessary in order to replace the starter button.

Checking the right-hand handlebar switch

To remove the right-hand handlebar switch, undo the retaining screws (1) and disconnect the wiring connector from the electric system.
Refitting is the reverse of removal; tighten the screws (1) to a torque of 1.3 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



Clutch lever button

Introduction

The clutch button is located on the clutch lever. Together with the signal from the side stand button and the neutral signal generated by the gear sensor (transmitted to the engine control unit over the CAN line), the clutch lever position signal is used to enable or disable engine start.

The following table indicates the only conditions in which starter motor activation and, as a result, engine start, are permitted:

Gearbox in neutral – any side stand and clutch lever position	The starter motor may be operated
Gear engaged – side stand retracted – clutch lever pulled	The starter motor may be operated

If a gear is engaged with the side stand down, however, the engine switches off.

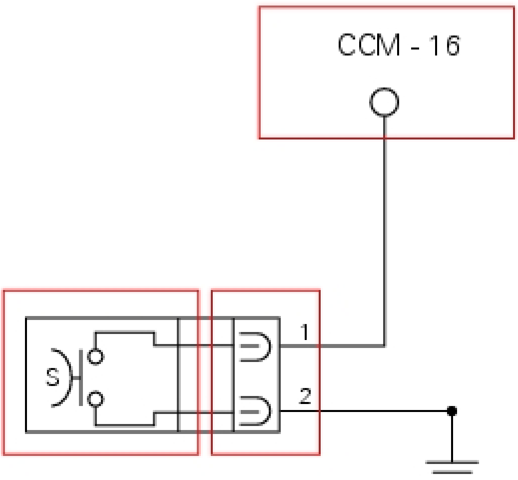
The engine control unit recognises the idle speed state when engine speed drops below a certain threshold and when the ECU itself receives the clutch lever pulled and/or gearbox in neutral signal (generated by gear sensor).

Component assembling position

The clutch button is located under the lever.

Location of clutch button connection.

Connection wiring diagram



CCM engine control connection, S clutch button. 2 ground, black - Bk, 1 white - W.

In the event of fault

In the event of a clutch button fault, the operating conditions described in the introduction are not met.

Fault codes generated and possible correlated faults

The engine control unit generates no fault code in the event of a clutch button fault.

No errors are indicated on the dashboard.

Possible correlated faults: the safety conditions required to enable engine start are not met, incorrect idle speed (target idle speed is 1350 rpm with engine stabilised at operating temperature). Check:
- Integrity of electric circuit (open circuit, short-circuit to ground and toward Vdc) and of the electrical connections.
- Integrity of the clutch button. When the clutch lever is operated (pulled and released), the resistance on the button contacts (PIN 1 and PIN 2) must be zero in one position (continuity) and infinite in the other (open circuit).

Note

Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

The DDS instrument can be used to display the activation state of the clutch button.

If none of the aforementioned tests identify the problem and the clutch button is in proper working order, replace the engine control unit.

Component replacement methods

No special measures are necessary in order to replace the clutch button.

Side stand button

Introduction

The side stand button is located on the side stand. Together with the signal from the clutch button and the neutral signal generated by the gear sensor (transmitted to the engine control unit over the CAN line), the side stand position signal is used to enable or disable engine start.

The following table indicates the only conditions in which starter motor activation and, as a result, engine start, are permitted:

Gearbox in neutral – any side stand and clutch lever position	The starter motor may be operated
Gear engaged – side stand retracted – clutch lever pulled	The starter motor may be operated

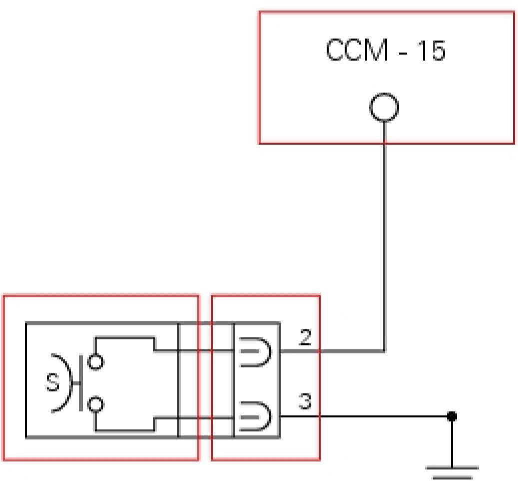
If a gear is engaged with the side stand down, however, the engine switches off.

Component assembling position

The side stand button is integrated in the rotation pivot area of the side stand itself.

Location of side stand connection.

Connection wiring diagram



CCM engine control connection, S side stand button. 3 black – Bk, 2 white/black – W/Bk.

In the event of fault

In the event of a side stand button fault, the safety conditions described in the introduction are not met.

Fault codes generated and possible correlated faults

The engine control unit generates no fault code in the event of a side stand button fault.

No errors are indicated on the dashboard.
Possible correlated faults: the safety conditions required to enable engine start are not met. Check:
- Integrity of electric circuit (open circuit, short-circuit to ground and toward Vdc) and of the electrical connections
- Integrity of the side stand button. When the side stand is used (extended and retracted), the resistance on the button contacts (PIN 2 and PIN 3) must be zero in one position (continuity) and infinite in the other (open circuit)

Note

Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

The DDS instrument can be used to display the activation state of the side stand button.

If none of the aforementioned tests identify the problem and the side stand button is in proper working order, replace the engine control unit.

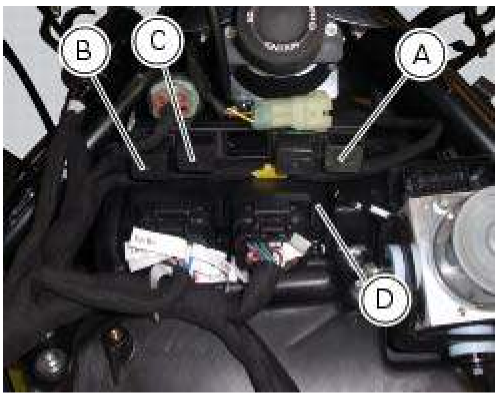
Component replacement methods

No special measures are necessary in order to replace the side stand button.

Injection relay

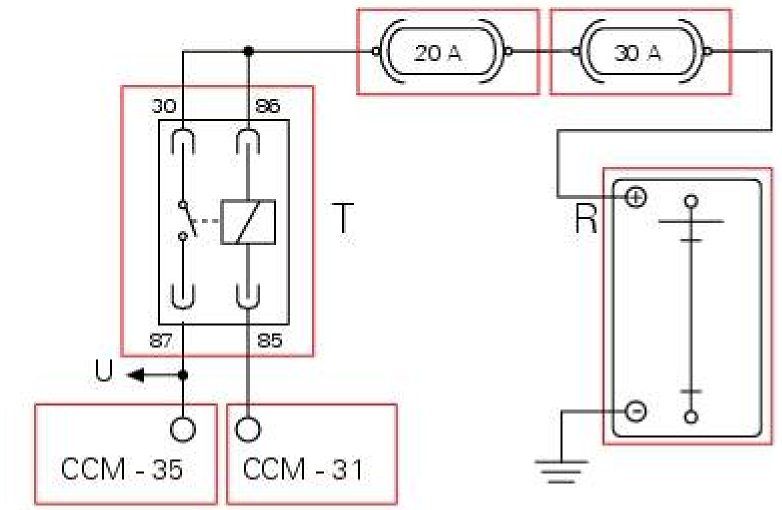
Introduction

The fuel pump, injectors and ignition coils are all powered via the injection relay. The relay also sends voltage to the engine control unit, which enables activation of the relay itself.
Component assembling position



A injection relay; B ETV relay (throttle valve actuator motor), C radiator fan relay, D engine control unit.

Connection wiring diagram



CCM engine control connection, T injection relay. 85 brown/black – Bn/Bk injection relay activation, 87 brown/white-Bn/W ECU input voltage, U direct power to injectors, ignition coils and fuel pump, R battery power (+30), 30 and 86 brown - Bn.

In the event of fault

In the event of an injection relay fault, the engine stops (if running) or will not start. The relay is not commanded by the ECU.

Fault codes generated and possible correlated faults

Fault codes generated by the engine control unit and displayed by the DDS (Fuel injection relay diagnosis):
- Open circuit: check integrity of fuses, electrical circuit and electrical connections.
- Short circuit to ground: check integrity of fuses, electrical circuit and electrical connections.
- Short circuit to Vdc: check integrity of electric circuit and electrical connections.

Note

Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

The dashboard service display shows the error “Fuel Injection” and the EOBD warning light activates.

Possible correlated faults: the engine stops (if running) or will not start. Check:
- Integrity of fuses
- Relay function. After removing from its mounting, apply 12 V power to PIN 85 and PIN 86 of the relay and check that PIN 87 and PIN 30 close (continuity between pins)

Using the DDS, activate the ignition coils, the fuel pump or the injectors. The injection relay is driven and its contacts (PIN 87 and PIN 30) should close.

If none of the aforementioned tests identify the problem and the relay is in proper working order, replace the engine control unit.

Component replacement methods

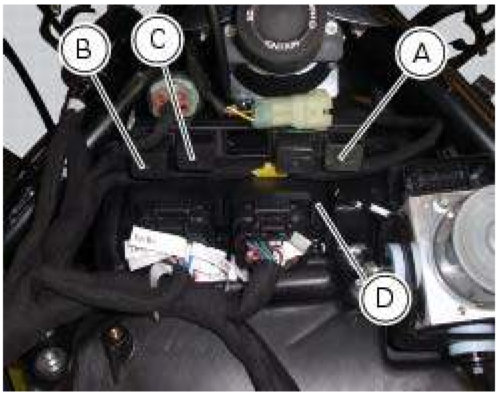
No special measures are necessary in order to replace the injection relay.

Throttle valve actuator motor relay

Introduction

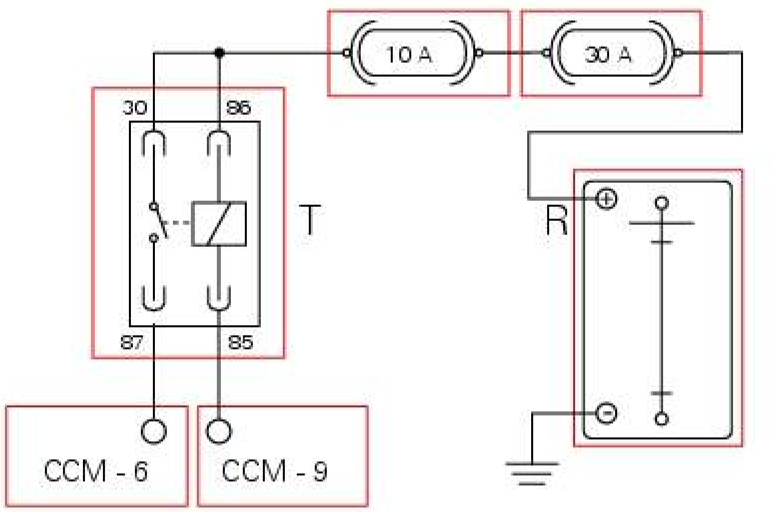
The throttle valve actuator motor is powered by the engine control unit. The engine control unit receives the necessary power from a specific relay.

Component assembling position



A injection relay; B ETV relay (throttle valve actuator motor), C radiator fan relay, D engine control unit.

Connection wiring diagram



CCM engine control connection, T throttle valve actuator motor relay. 85 throttle valve actuator motor relay activation, light blue/green – Lb/G, 87 ECU power input for throttle valve actuator motor, red/brown R/Bn, 30 and 86 red/purple – R/V, R battery positive (+30).

In the event of fault

In the event of a throttle valve actuator relay fault, the ECU cuts motor power and the throttle valves close (see chapter Operating principle and characteristics of the ride-by-wire system in this section).

Fault codes generated and possible correlated faults

Fault codes generated by the engine control unit and displayed by the DDS (ETV relay diagnosis):
- Throttle valve actuator motor relay malfunction (no specific fault indicated by DDS): check integrity of the fuses, electrical circuit and electrical connections and check relay function. After removing from its mounting, apply 12 V power to PIN 85 and PIN 86 and check that PIN 87 and PIN 30 close (continuity between pins).

Note

Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

The dashboard service display shows the error “ETV relay” (throttle valve actuator motor relay) and the EOBD warning light activates.

Possible correlated faults: The engine does not start, cuts out or remains running at idle speed and will not accelerate.
Check:
- Integrity of fuses.
- Relay function.

The throttle valve actuator motor may be actuated into one of the three preset positions (0%, 50%, 100%) using the DDS. During motor actuation, the throttle valve actuator motor relay is driven.

If none of the tests described above identify the problem and the throttle valve actuator relay is in proper working order, contact Ducati.

Component replacement methods

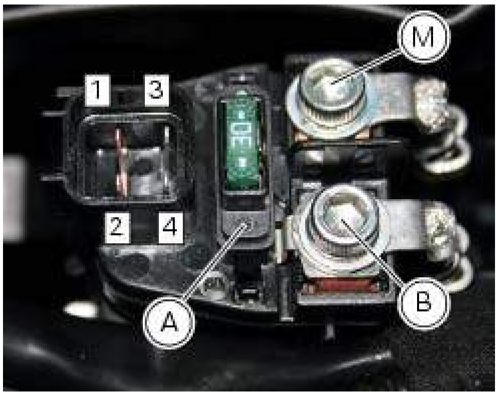
No special measures are necessary in order to replace the throttle valve actuator motor relay.

Starter motor relay

Introduction

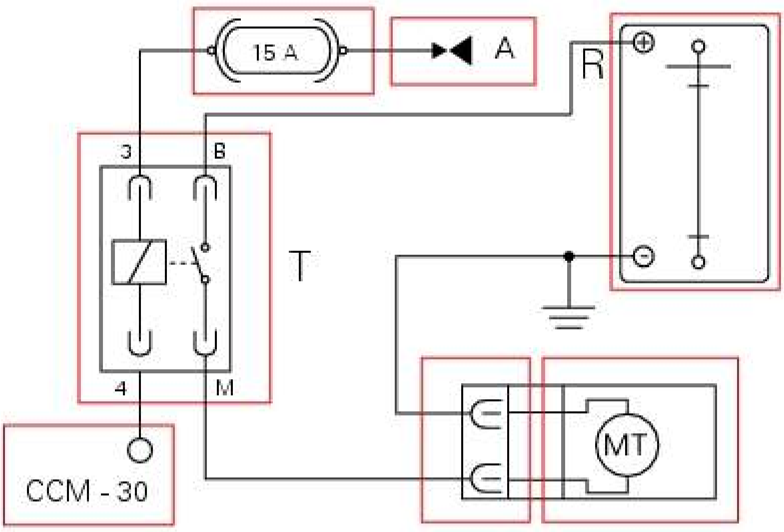
When the rider presses the start button, with all the safety conditions required to enable engine start met, the engine control unit enables the relay that activates the starter motor.

Component assembling position



Connection on starter motor relay.

Connection wiring diagram



MT starter motor, CCM engine control connection. 4 starter motor relay activation, blue/black - B/Bk, A KEY ON power (+15 from Hands free relay 30), R battery power (+30), 3 red/black – R/Bk, M black – Bk, B black - Bk.

In the event of fault

In the event of a starter motor relay fault, the engine will not start.

Fault codes generated and possible correlated faults

The engine control unit generates no fault code in the event of a starter motor relay fault.

No errors are indicated on the dashboard.

Possible correlated faults: the starter motor cannot be operated. Check:
- Battery state of charge
- If power supply voltage (12 V - KEY-ON) is present on PIN 3 of the starter motor relay (if not, consult the paragraph "Hands free") and check the integrity of the 15A fuse
- Integrity of the electrical circuit and electrical connections of the starter motor relay
- Integrity of the starter motor relay. After removing the relay, when 12 V power is applied to PIN 3 and PIN 4, the contacts should close (continuity between PIN B and PIN M)
- Integrity of the starter motor and that the motor is correctly connected to the electrical system (also check ground

connection on engine, see Sect. 6 - 3“Starter motor“)
- The integrity of the engine start button and its circuit
- The integrity of the side stand switch, the clutch lever switch, the gear position sensor and their respective circuits
- Integrity of Stop Engine switch

Note

Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

If none of the tests described above identifies the problem and the power supply and ground for the engine control unit are in correct working order, replace the engine control unit.

Component replacement methods

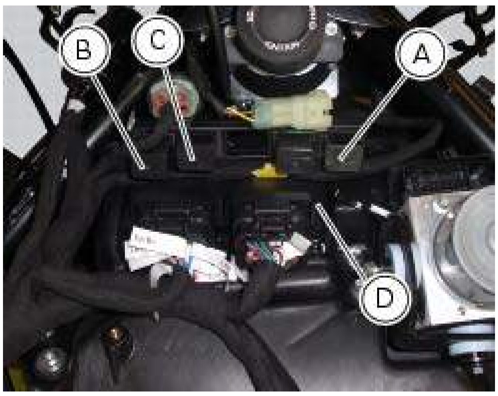
No special measures are necessary in order to replace the starter motor relay.

Radiator fan relay

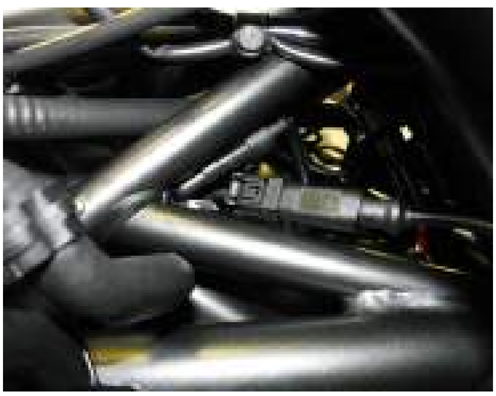
Introduction

The radiator fans are powered via a specific relay, which is enabled by the engine control unit.

Component assembling position



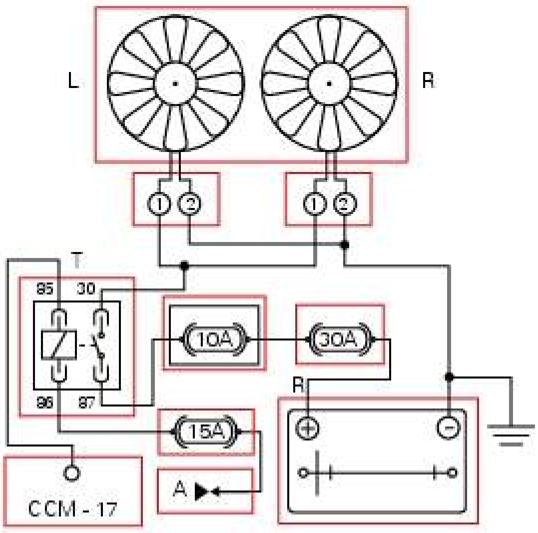
A injection relay; B ETV relay (throttle valve actuator motor), C radiator fan relay, D engine control unit.



Location of right hand fan connection.

Location of left hand fan connection.

Connection wiring diagram



CCM engine control connection, T radiator fan relay, A KEY ON power (+15 from Hands free relay 30), R battery power (+30), L left hand fan, R right hand fan, 85 light blue/black - Lb/Bk, 30 red/green – R/G, 86 red/black – R/Bk, 87 red/grey – R/Gr.

In the event of fault

In the event of a radiator fan relay fault, the radiator fans themselves do not work. The relay is not commanded by the ECU.
Fault codes generated and possible correlated faults
Fault codes generated by the engine control unit and displayed by the DDS (Fan relay diagnosis):
- Open circuit: check integrity of fuses, electrical circuit and electrical connections
- Short circuit to ground: check integrity of fuses, electrical circuit and electrical connections

Note

Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

The dashboard service display shows the error “Fan relay” and the EOBD warning light activates.

Possible correlated faults: coolant reaches boiling point but radiator fans not working. Check:
- Integrity of fuses.
- If power supply voltage (12 V – KEY ON) is present on PIN 86 of the radiator fan relay (if not, consult the paragraph “Hands free”).
- Radiator fan function. After removing from its mounting, apply 12 V power to PIN 85 and PIN 86 and check that PIN 87 and PIN 30 close (continuity between pins).
- Integrity of the connections and electrical circuit between the relay and the radiator fans.
- The engine temperature sensor (see “Engine temperature sensor of this section”).
- State of cooling circuit (fluid must be filled to correct level and there must be no air in the circuit).

The radiator fan relay may be actuated from the DDS to check radiator fan function.

The fans are normally activated at 103° and switched off at 101°C.
If none of the aforementioned tests identify the problem and the radiator fan relay is in proper working order, replace the engine control unit.

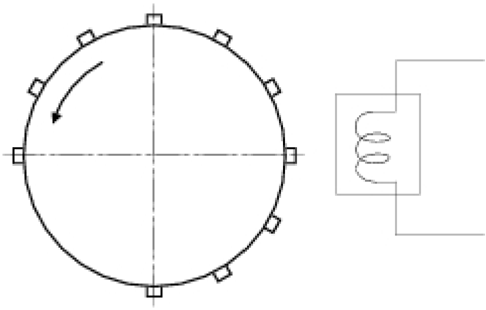
Component replacement methods

No special measures are necessary in order to replace the radiator fan relay.

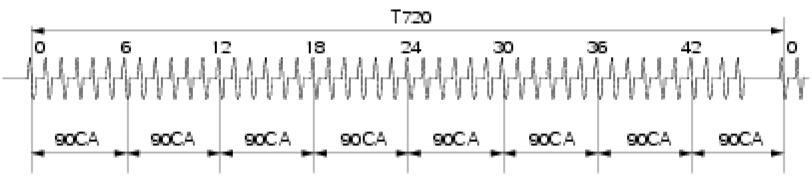
Engine speed-timing sensor

Introduction

The engine control system of the Diavel is equipped with an inductive sensor that allows the ECU to determine the speed and timing phase of the engine. The sensor faces a phonic wheel with 48 teeth minus 2.



The engine speed-timing sensor is an inductive sensor and faces a 48 tooth phonic wheel with 2 teeth missing.



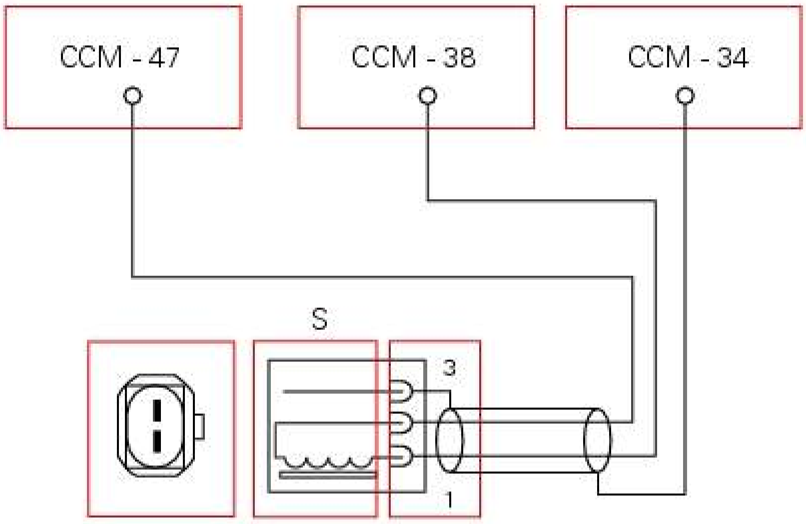
The drawing shows the signal generated by the engine speed-timing sensor. The phonic wheel facing the sensor turns once for every two turns of the crankshaft, as it is integrated into the crown gear on the auxiliary shaft driving the camshafts. As a result, 360° of phonic wheel rotation corresponds to 720° of crankshaft rotation.

Component assembling position

The engine speed-timing sensor is mounted on the flywheel side of the crankshaft. The black aluminium cap on the crankcase covering the hole for checking the air gap with a feeler gauge, is visible on the right.

Location of engine speed-timing sensor connection.

Connection wiring diagram



CCM engine control connection S engine speed-timing sensor, 3 shielding connected to PIN 34 of the ECU, black - Bk, 1 and 2 electrical terminals of the winding inside the sensor.

In the event of fault

The engine stops (if running) or will not start and the injectors and ignition coils are no longer commanded by the ECU.

Fault codes generated and possible correlated faults

Fault codes generated by the engine control unit and displayed by the DDS (Pick-up diagnosis):
- Engine speed sensor malfunction (no specific fault indicated by DDS): check the integrity of the electric circuit and check that the resistance between PIN 1 and PIN 2 of the winding is between 774 and 946 Ohm at an ambient temperature of 20°C.

Warning
even if the sensor resistance measured is correct, the internal magnet may be damaged, compromising the function of the sensor itself.

Note
Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

The dashboard service display shows the error “Pick-up” (engine speed sensor) and the EOBD warning light activates.
Possible correlated faults: the engine stops (if running) or will not start (the starter motor functions normally) and the ignition coils and injectors are not driven.

Check:
- That the sensor is correctly installed. That the air gap between the sensor and the phonic wheel is 0.6 mm +/- 0.3 mm.
- The integrity of the phonic wheel facing the sensor.

If none of the aforementioned tests identify the problem and the engine speed sensor is in proper working order, replace the engine control unit.

Component replacement methods

No special measures are necessary in order to replace the engine speed-timing sensor. Check the air gap between the sensor and one of the teeth of the phonic wheel, inserting a feeler gauge through the hole on the left hand crankcase half (covered by a cap). The air gap must measure 0.6 mm +/- 0.3 mm and is non-adjustable.

Accelerator position sensor (throttle grip)

Introduction

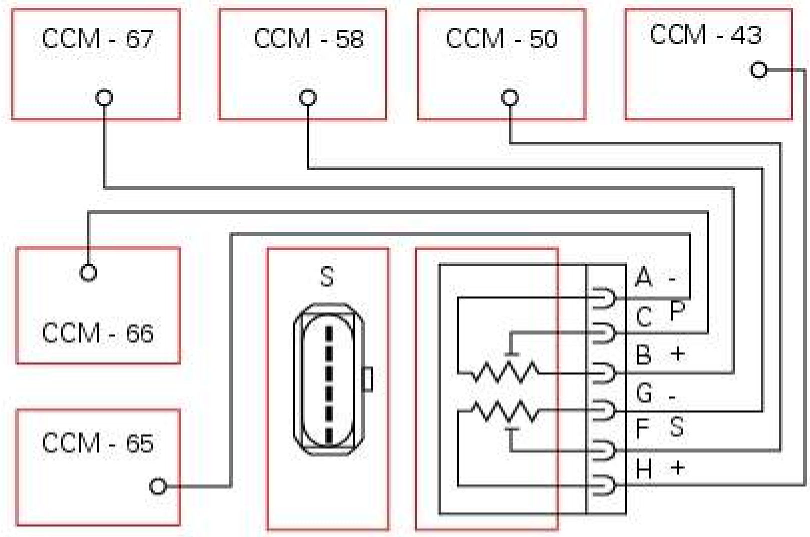
An accelerator position sensor (APS) is mounted on the throttle body of the Diavel, which measures the degree of aperture of the throttle grip.
- The throttle grip is connected to the sensor via two metal cables.
- The sensor transmits information to the ECU relative to the “torque demand” made by the rider by twisting the throttle grip.
- For safety reasons, the sensor contains two potentiometers (a main potentiometer – MAIN – and a secondary potentiometer – SUB) with independent 5V power and ground.

Component assembling position

The accelerator position sensor is mounted on the throttle body and is held in place by two screws.

Location of accelerator position sensor connection.

Connection wiring diagram



CCM engine control connection, S accelerator position sensor.
Main potentiometer (P):
C orange signal - O,
B supply (5V) brown/red - Bn/R,
A ground black/orange - Bk/O.
Secondary potentiometer (S):
F signal, green/black - G/Bk,
H supply (5V) brown/black - Bn/B,
G ground, black/white Bk/W.
The two central PINs D and E of the APS connector are not connected.

In the event of fault

In the event of an accelerator position sensor fault, the ECU disables the ride-by-wire system and the engine will not start, remains running at idle or stops.

Fault codes generated and possible correlated faults

Fault codes generated by the engine control unit and displayed by the DDS (Accelerator position sensor diagnosis):
- Short circuit to Vdc: check integrity of electric circuit and electrical connections.
- Short circuit to ground: check integrity of electric circuit and electrical connections.
- Open circuit: check integrity of electric circuit and electrical connections.
- Incorrect electrical characteristics: check integrity of electric circuit and electrical connections. If the above measures do not resolve the fault, contact Ducati.

Note

Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

The dashboard service display shows the error “Accelerator position” and the EOBD warning light activates.

Possible correlated faults: inadequate engine power, incorrect idle speed (target idle speed is 1350 rpm with engine stabilised at operating temperature).
Check:
- That the metal cables operating the roller connected to the accelerator position sensor are correctly adjusted so that the roller can reach both the fully closed (throttle grip released) and fully open (throttle grip fully twisted) positions.

Throttle grip aperture may be checked using the DDS.

If none of the tests described above identify the problem and the accelerator position sensor is in proper working order, contact Ducati.

Component replacement methods

The APS sensor cannot be replaced individually. In case of fault it will not be necessary to replace the whole throttle body (see “Operating principle and characteristics of the ride-by-wire system“ of this section).
Correctly adjust the cables connecting the throttle grip to the throttle grip position sensor

Throttle valve position sensor

Introduction

The throttle valve position sensor (TPS) of the Diavel is mounted on the throttle body.

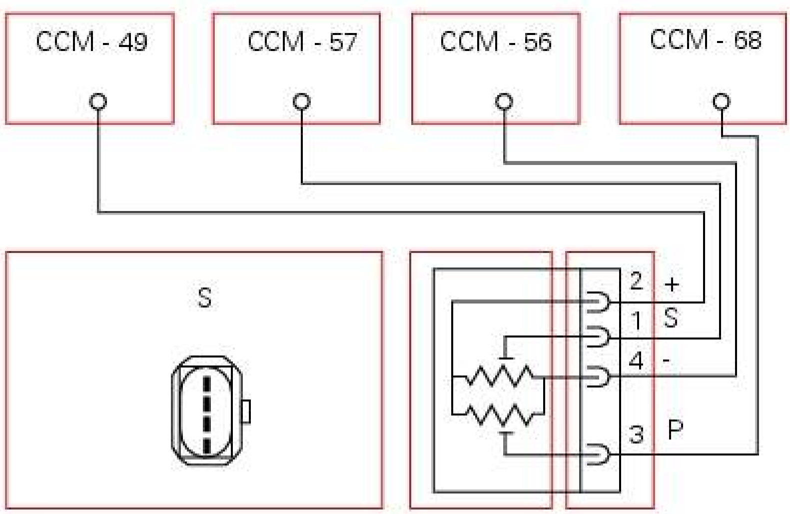
- The sensor is integrated into the throttle valve actuator motor, which turns the spindle of the vertical cylinder throttle valve directly.
- The sensor sends information to the engine control unit relative to the position of the vertical cylinder throttle valve and, as a consequence, of the horizontal cylinder throttle valve, which is connected to the former by a link rod.
- For safety reasons, the sensor contains two Hall effect sensing elements (a main element – MAIN – and a secondary element – SUB). The two potentiometers share the same power and ground.

Component assembling position

The throttle valve position sensor is integrated in the throttle valve actuator motor.

Location of electric connection for throttle valve actuator motor – TPS (throttle valve position sensor).

Connection wiring diagram



CCM engine control connection, S throttle valve position sensor. Main potentiometer P: 3 signal, orange/blue – O/B, Secondary potentiometer S: 1 signal, orange/green – O/G, 4 common ground, black/yellow Bk/Y, 2 common power (5V), brown/yellow – Bn/Y.

In the event of fault

In the event of a throttle valve position sensor fault, the ECU disables the ride-by-wire system and the engine will not start, remains running at idle or stops.

Fault codes generated and possible correlated faults

Fault codes generated by the engine control unit and displayed by the DDS (Throttle position sensor diagnosis):
- Short circuit to Vdc: check integrity of electric circuit and electrical connections.
- Short circuit to ground: check integrity of electric circuit and electrical connections.
- Open circuit: check integrity of electric circuit and electrical connections.
- Incorrect electrical characteristics: check integrity of electric circuit and electrical connections. If the above measures do not resolve the fault, contact Ducati.
- Drop in power supply voltage: check integrity of electric circuit and electrical connections. If the above measures do not resolve the fault, contact Ducati.

Note

Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

The dashboard service display shows the error “Throttle position” and the EOBD warning light activates.

Possible correlated faults: The engine does not start, cuts out or remains running at idle speed and will not accelerate.
Check:
- The operation of the throttle activation motor relay (see “Throttle valve actuator motor relay” of this section);
- The operation of the throttle activation motor (see paragraph “Throttle valve operation engine” of this section);

The throttle valve actuator motor may be actuated into three preset positions (0%, 50%, 100%) using the DDS.
The DDS may be used to read the throttle valve position value.

If none of the tests described above identify the problem and the throttle valve position sensor is in proper working order, contact Ducati.

Component replacement methods

The throttle valve position sensor is integrated into the throttle valve actuator motor and cannot be replaced as an individual component. In case it brakes down it will be necessary to fit a new throttle body (refer to this section Operating principle and characteristics of the ride-by-wire system). After replacement of the throttle body, reset the self-adaptive parameters relative to carburation with the DDS. Adjust the cables connecting the throttle grip to the throttle grip position sensor.

Air temperature sensor

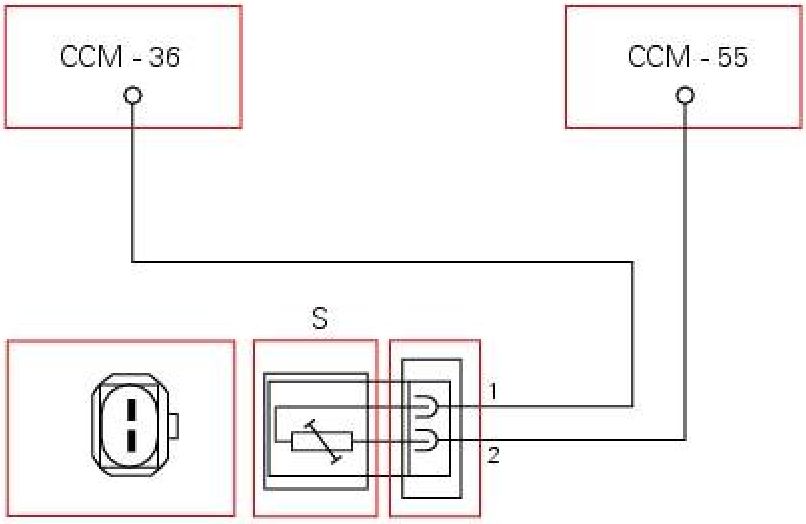
Introduction

The engine control system on the Diavel uses a sensor that measures air temperature. This sensor has a resistance of NTC type (Negative Temperature Coefficient), that reduces its own value when the temperature increases. The air temperature sensor allows the engine control unit to modify the fuel-air mixture and ignition advance in relation to the atmospheric air temperature.

Components assembling position

The air temperature sensor is mounted on the right hand air intake (the image also shows the location of the connection).

Wiring diagram



CCM engine control connection, S air temperature sensor. 1 green/blue – G/B, 2 black/purple – Bk/V.

In the event of fault

In the event of an air temperature sensor fault, the engine control unit implements a recovery value of 25°C.

Fault codes generated and possible correlated faults

Fault codes generated by the engine control unit and displayed by the DDS (Intake air temperature sensor diagnosis):
- Short circuit to Vdc: check integrity of electric circuit and electrical connections.
- Short circuit to ground: check integrity of electric circuit and electrical connections.
- Open circuit: check integrity of electric circuit and electrical connections.

Note

Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

The dashboard service display shows the error “Air temperature” and the EOBD warning light activates.

Possible correlated faults: inadequate engine power, irregular idle speed (target idle speed is 1350 rpm with engine stabilised at operating temperature), the engine does not start easily. Check:
- Sensor resistance, which must be approximately 2 kOhm at 25 °C.

The air temperature value may be checked using the DDS. Check that the value given is plausible.

If none of the aforementioned tests identify the problem and the air temperature sensor is in proper working order, replace the engine control unit.

Component replacement methods

No special measures are necessary in order to replace the air temperature sensor.

Engine temperature sensor

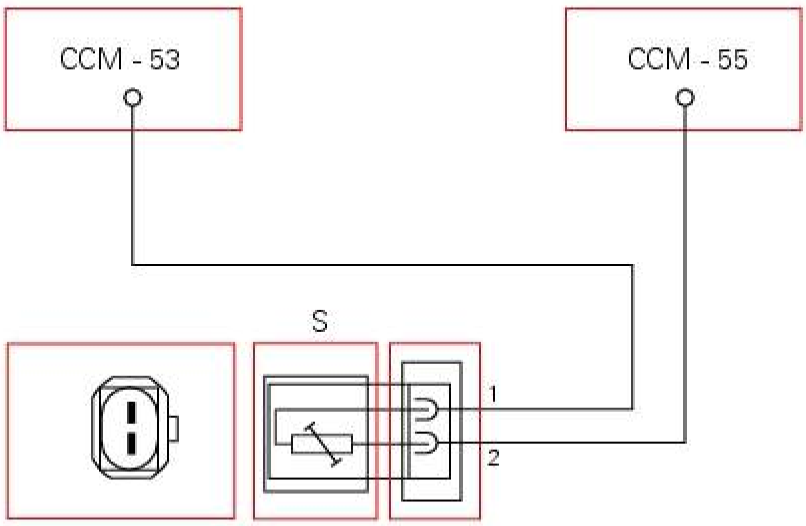
Introduction

The engine control system on the Diavel uses a sensor that measures the temperature of the coolant (engine temperature). This sensor has a resistance of NTC type (Negative Temperature Coefficient), that reduces its own value when the temperature increases. The engine temperature sensor, allows the control unit to manage correctly the cold starting and the heating phases.

Components assembling position

The engine temperature sensor is mounted on the left hand side of the vertical cylinder.
Location of engine temperature sensor connector.

Wiring diagram



CCM engine control connection, S engine temperature sensor. 1 green/white – G/W, 2 black/purple – Bk/V.

In the event of fault

In the event of an engine temperature sensor fault, the engine control unit implements a recovery value of 70°C and activates the radiator fans.

Fault codes generated and possible correlated faults

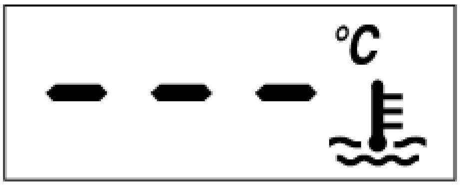
Fault codes generated by the engine control unit and displayed by the DDS (Engine temperature sensor diagnosis):
- Short circuit to Vdc: check integrity of electric circuit, check integrity of electrical connections
- Short circuit to ground: check integrity of electric circuit, check integrity of electrical connections
- Open circuit: check integrity of electric circuit, check integrity of electrical connections

Note

Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

The tank dashboard shows the error “Engine temperature” and the EOBD warning light activates.

When the dashboard receives the “Engine temperature” error, flashing dashes are displayed instead of the temperature reading. If the dashboard does not receive engine temperature information from the CAN line, the error “Engine temperature” is not shown on the display, but flashing dashes are still displayed instead of the temperature reading.



Possible correlated faults: inadequate engine power, irregular idle speed (target idle speed is 1350 rpm with engine stabilised at operating temperature), the engine does not start easily, radiator fans not activated correctly or not activated at all, causing the coolant to reach boiling point.
Check:
- Sensor resistance, which must be approximately 10 kOhm at 25°C and approximately 1270 Ohm at 90°C

The engine temperature value may be checked using the DDS. Check that the value given is plausible.

If none of the aforementioned tests identify the problem and the engine temperature sensor is in proper working order, replace the engine control unit.

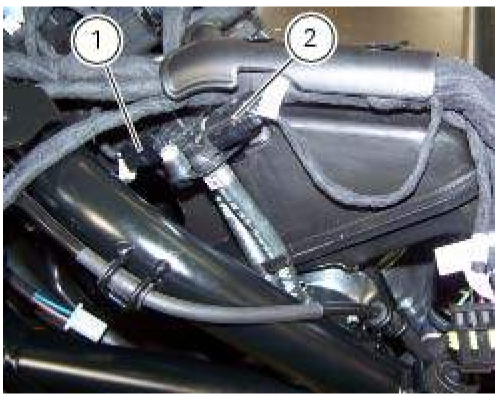
Component replacement methods

No special measures are necessary in order to replace the engine temperature sensor. After replacement of the engine temperature sensor, reset the self-adaptive parameters relative to carburation with the DDS.

Absolute pressure sensors

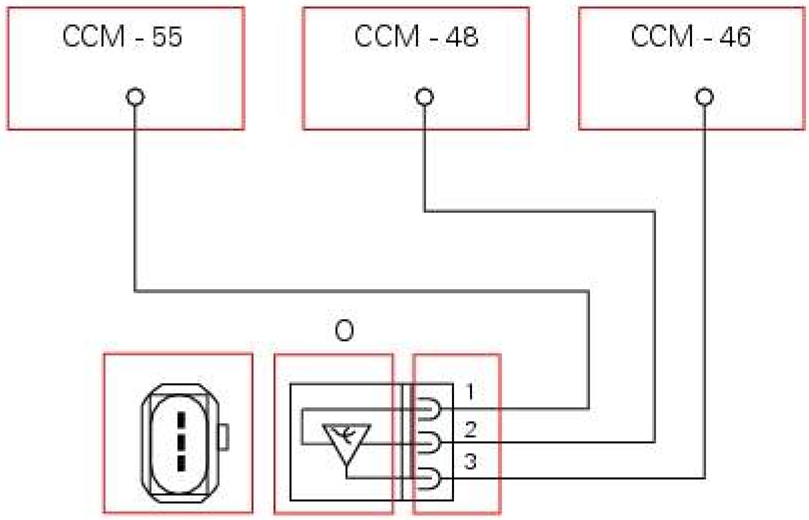
Introduction

The engine control system of the Diavel is equipped with two absolute pressure sensors, with one connected to the intake duct of each cylinder (MAP 1 cylinder 1 – horizontal - MAP 2 cylinder 2 – vertical). They are used by the control unit to determine the quantity of fuel to be injected according to the speed-density strategy and to determine the atmospheric pressure (necessary information to correct the carburation in accordance with the altimetric measurement).
Components assembling position

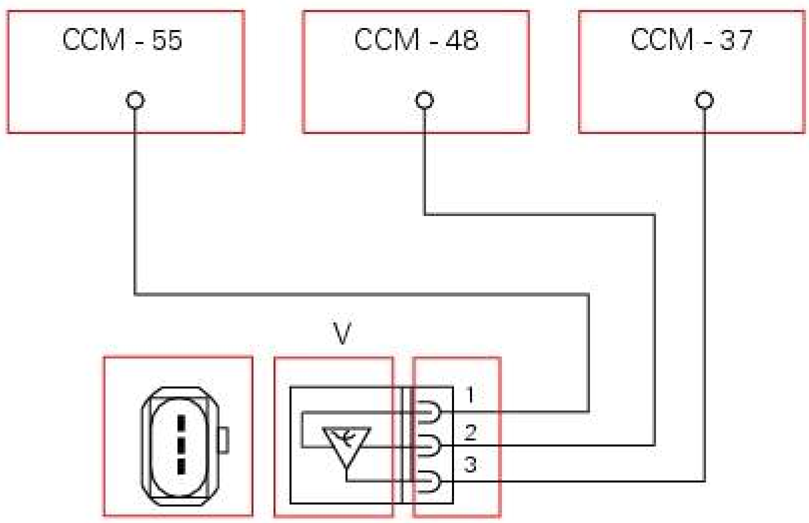


The absolute pressure sensors of the vertical (1) and horizontal (2) cylinders are fixed near the airbox (the image shows also the position of the sensor connection).

Wiring diagram



O Absolute pressure sensor 1, horizontal cylinder. CCM engine control connection, 1 ground, black/purple - Bk/V, 2 power (5V), brown/purple – Bn/V, 3 signal generated, green/white – G/W.



V Absolute pressure sensor 2 vertical cylinder. CCM engine control connection, 1 ground, black/purple - Bk/V, 2 power (5V), brown/purple – Bn/V, 3 signal generated, green/white – G/W.

In the event of fault

In the event of a fault of absolute pressure sensor 1, the engine control unit uses the information from absolute pressure sensor 2 instead.
In the event of a fault of absolute pressure sensor 2, the engine control unit uses the information from absolute pressure sensor 1 instead.
In the event of a fault of both absolute pressure sensor 1 and absolute pressure sensor 2:
- The engine control unit implements an atmospheric pressure value of 1.013 bar.
- The fuel quantity injected is determined using the α-n strategy only.

Fault codes generated and possible correlated faults

Fault codes generated by the engine control unit and displayed by the DDS (MAPS 1 sensor diagnosis - MAPS 2 sensor diagnosis):
- Absolute pressure sensor 1 (cylinder 1 - horizontal) and/or Absolute pressure sensor 2 (cylinder 2 - vertical), open circuit: check integrity of electric circuit and electrical connections.
- Absolute pressure sensor 1 (cylinder 1 - horizontal) and/or Absolute pressure sensor 2 (cylinder 2 - vertical), short circuit to Vdc: check integrity of electric circuit and electrical connections.
- Absolute pressure sensor 1 (cylinder 1 - horizontal) and/or Absolute pressure sensor 2 (cylinder 2 - vertical), short circuit to ground: check integrity of electric circuit and electrical connections.

Note

Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

The dashboard service display shows the error “Pressure” and the EOBD warning light activates.

Possible correlated faults: inadequate engine power, irregular idle speed (target idle speed is 1350 rpm with engine stabilised at operating temperature). Check:
- That the sensors are connected securely to the intake ducts and check the integrity of the pipe.
- That valve clearance is correct.
- Cylinder compression.
- That there is no anomalous air infiltration into the intake duct.

The DDS may be used to read the absolute pressure value within the two intake ducts.
If none of the aforementioned tests identify the problem and the absolute pressure sensors are in proper working order, replace the engine control unit.

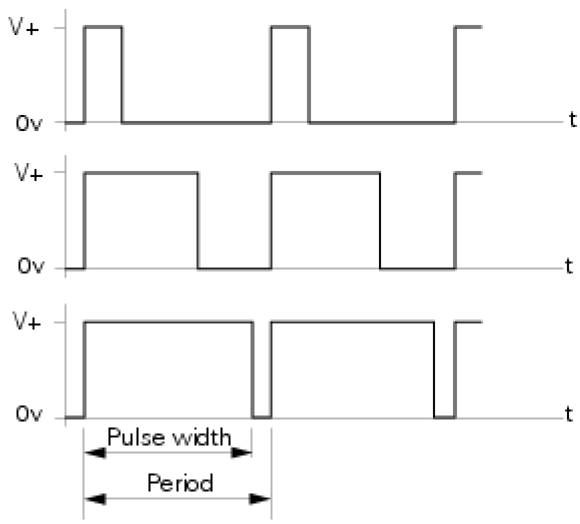
Component replacement methods

No special measures are necessary in order to replace absolute pressure sensor 1 and absolute pressure sensor 2, (check integrity of the rubber pipes via which they are connected to the two intake ducts). After replacing one or both of the pressure sensors, reset the self-adaptive parameters relative to carburation with the DDS.

Oxygen sensors

Introduction

An ON-OFF type oxygen sensor (in normal operating conditions, the voltage generated by the sensors switches between a value close to 1V and a value close to 0V) is mounted on each of the exhaust manifold of the Diavel.
Each oxygen sensor has its own internal heater, which receives 12V and has a ground connection controlled by the engine control unit with a PWM (Pulse Width Modulation) signal.



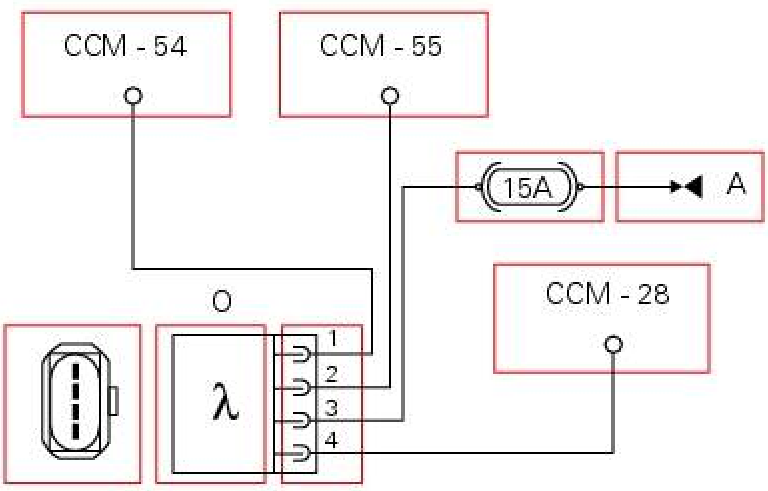
Example of a PWM signal used by the engine control unit to control the oxygen sensor heater. While the signal period is constant, the duration of the part of the signal at 0V (ground) changes, varying the time during which the heater remains electrically powered (if the ground period is close to the signal period, the heater functions continuously, if the ground period is short, the heater functions in short intervals, whereas if the ground period is zero, the heater is not functional).

Component assembling position

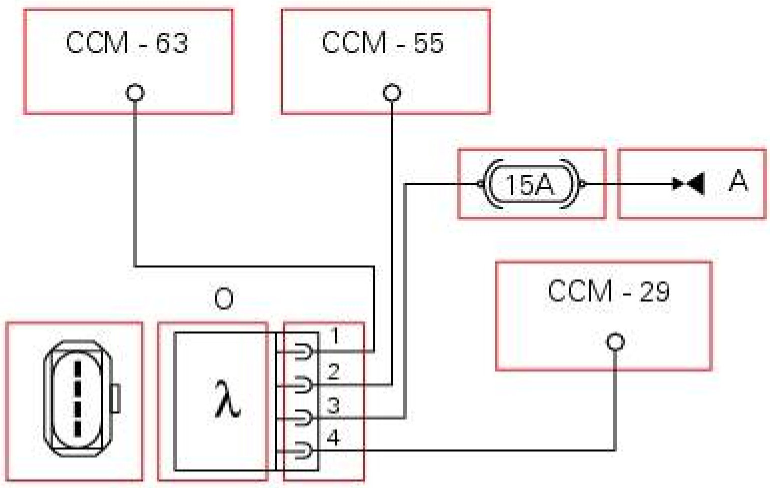
The two images show the oxygen sensor mounted on the exhaust manifold for the vertical cylinder and the sensor mounted on the exhaust manifold for the horizontal cylinder.

Location of vertical and horizontal cylinder oxygen sensor connections.

Connection wiring diagram



O horizontal cylinder oxygen sensor, CCM engine control connection. 1 green/yellow – G/Y and 2 black/purple – Bk/V horizontal cylinder oxygen sensor signal input into ECU, 4 PWM signal for controlling horizontal cylinder oxygen sensor heater, light blue/yellow – Lb/Y, A KEY ON positive (+15 from Hands free relay 30) powering horizontal cylinder oxygen sensor heater.



V vertical cylinder oxygen sensor, CCM engine control connection. 1 green/purple – G/V and 2 black/purple – Bk/V vertical cylinder oxygen sensor signal input into ECU, 4 PWM signal for controlling vertical cylinder oxygen sensor heater, light blue/grey – Lb/Gr, A KEY ON positive (+15 from Hands free relay 30) powering vertical cylinder oxygen sensor heater.

In the event of fault

In the event of a fault of one or both oxygen sensors or their respective heaters:
- the engine control unit ceases to control the oxygen sensor heater
- the fuel system no longer functions in a closed loop (the engine control unit disables analysis of the signal received from the oxygen sensor and therefore functions in an open loop)
- self-adaptive functionality is suspended (self-adaptive parameters not updated).

Fault codes generated and possible correlated faults

Fault codes generated by the engine control unit and displayed by the DDS (Vertical O2 sensor diagnosis – Horizontal O2 sensor diagnosis – Vertical O2 heater diagnosis – Horizontal O2 heater diagnosis):
- Oxygen sensor for cylinder 1 - horizontal and/or oxygen sensor for cylinder 2 - vertical, open circuit: check integrity of electric circuit and electrical connections.
- Oxygen sensor for cylinder 1 - horizontal and/or oxygen sensor for cylinder 2 - vertical, short circuit to Vdc: check integrity of electric circuit and electrical connections.
- Oxygen sensor for cylinder 1 - horizontal and/or oxygen sensor for cylinder 2 - vertical, short circuit to ground: check integrity of electric circuit and electrical connections.
- Oxygen sensor heater for cylinder 1 - horizontal and/or oxygen sensor heater for cylinder 2 - vertical, short circuit to ground: Check integrity of fuse, electrical circuit and electrical connections.
- Oxygen sensor heater for cylinder 1 - horizontal and/or oxygen sensor heater for cylinder 2 - vertical, open circuit: Check integrity of fuse, electrical circuit and electrical connections.

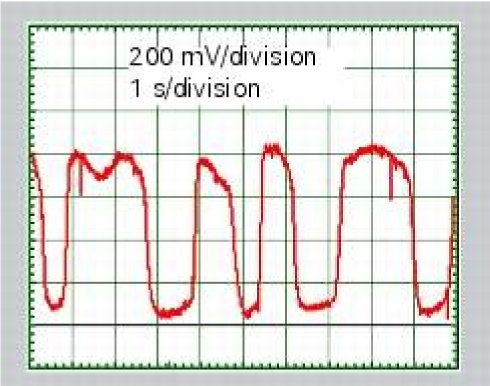
Note

Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

The dashboard service display shows the error “Lambda“ (Lambda sensor) and/or the error “Lambda heater” (lambda sensor heater).

Possible correlated faults: power delivery uneven when exiting idle speed state, irregular idle speed (target idle speed is 1350 rpm with engine stabilised at operating temperature). Check:
- 15 A fuse.
- If power supply voltage (12 V – KEY ON) is present on PIN 3 of the lambda sensor (if not, consult Sect. 6 - 7 “The Hands Free system).
- The seal integrity of the exhaust system upstream of the oxygen sensor installation location.
- If there is any air infiltration into the intake system (influences oxygen sensor function, bringing self-adaptive parameters to the permissible limits).
- Fuel pressure in fuel supply system (influences oxygen sensor function, bringing self-adaptive parameters to the permissible limits, see section Fuel system circuit.
- Cylinder compression and valve clearance (influences oxygen sensor function, bringing self-adaptive parameters to the permissible limits)

If the DDS displays the self-adaptive parameters, this indicates that the engine control system is operating in a closed loop with the oxygen sensors. The DDS also displays the voltages generated by the oxygen sensors (which must oscillate on average between approximately 0.1 V and approximately 0.8 V). Note that the self-adaptive parameters should not approach the upper and lower extremes of this range as this would indicate that the fuel-air mixture is too rich or too lean.



The graph shows the typical pattern for the voltage generated by the oxygen sensor with the engine at idle speed and at operating temperature. This voltage may be tested with an oscilloscope or even with a voltmeter, as it oscillates at low frequency.

If none of the aforementioned tests identify the problem and the oxygen sensors are in proper working order, contact Ducati.

Component replacement methods

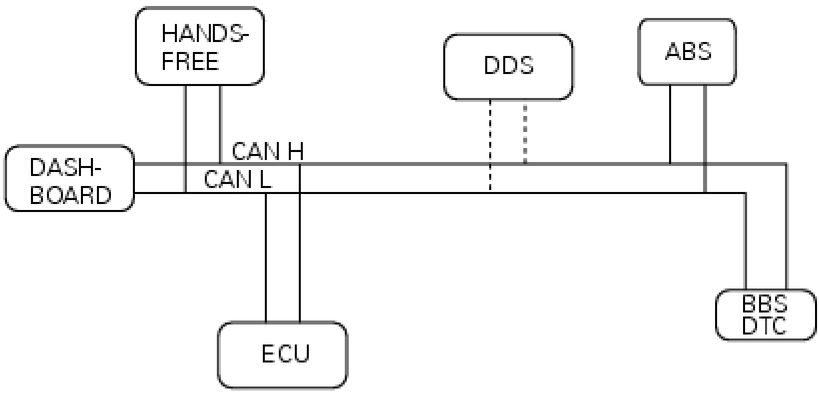
No special measures are necessary in order to replace the oxygen sensors. After replacing one or both of the oxygen sensors, reset the self-adaptive parameters relative to carburation with the DDS.

10.1 - Introduction to the electrical system of the Diavel

On-board computers and the CAN line

The following on-board computers make up the electrical system of the Diavel and are connected with each other via the CAN line (or network):

- Master Dashboard
- Slave Dashboard
- Hands Free (facilitated keyless start system)
- ECU (engine control unit)
- BBS (Black Box System or central electronics with integrated DTC traction control system.
- ABS (antilock braking system).

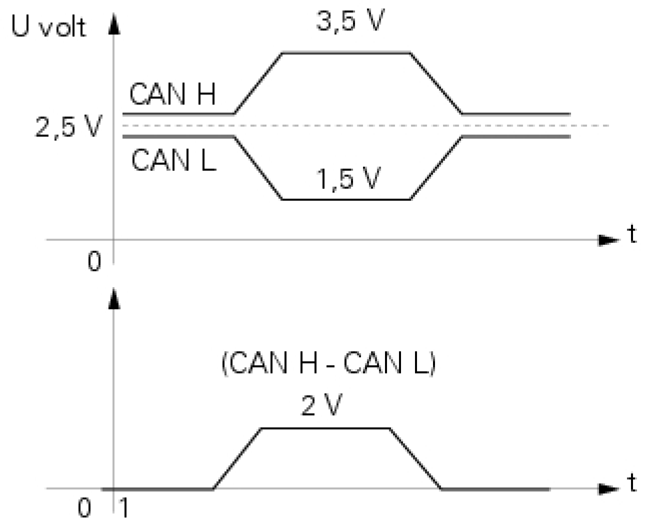


The drawing illustrates the network connecting the different computers ('nodes') on the Diavel. The DTC system is not a separate unit and is integrated in the BBS.

The main characteristics of the computers used on the Diavel are described as follows:
- The (Master and Slave) Dashboard units not only display specific information of use to the rider, but are also connected to the sensors and actuators installed on the motorcycle. These units make the information received from the sensors available over the network and control the actuators, also in response to orders received from other computers connected to the network. The units' service displays also visualise any vehicle electronic system faults
- The Hands Free unit allows the rider to start the engine without inserting a conventional key into the ignition switch. This makes starting the motorcycle easier and quicker. The system also offers increased theft protection
- The ECU manages the functions of the engine and also controls the ride by wire system. The ride by wire system modulates throttle valve aperture via an electric actuator coordinated by the ECU. The ECU receives a “torque demand” signal from a potentiometer linked to the throttle grip. Three different throttle valve aperture regimens are stored in the ECU, which make different maximum power values and different torque curves possible.
- Like the Dashboard units, the BBS is connected to sensors and actuators installed on the vehicle. The unit makes the information received from the sensors available over the network and controls the actuators, also in response to orders received from other computers connected to the network. It also has another fundamental function, as it gathers all the errors registered by the other computers due to specific faults. The software in the BBS also performs the DTC function, which regulates engine torque delivery to prevent wheelspin under acceleration.

The networked connection of the individual computers (nodes) creates a distributed system in which the nodes may communicate with one another and coordinate their actions by exchanging messages. This offers the following advantages:
- A distributed system needs less sensors, substantially simplifying the electrical system, as information provided by certain sensors may be shared, rendering it unnecessary to provide duplicate sensors for each node.
- Each node is capable of complex control functions on the basis of the information received from the other nodes connected to the network
- Reducing the number of connections and electrical wires makes the system more reliable.

The network allowing communication between the different nodes on the Diavel is a serial (bus) type CAN (Controller Area Network) network. Each node contains a circuit that can transmit and receive data to and from the network in accordance with priorities defined by specific bits included within the data itself (the message travelling over the network is always the one with the highest priority). As a result, the CAN bus network does not need to be managed with a specific centralised arbitration procedure that defines the priorities with which the elements connected to the network must communicate. Each message travelling over the CAN network consists of a “train” of electrical impulses containing, as mentioned previously, the priority - in other terms the type of message - the data itself, the confirmation of reception and other data necessary for correct transmission and reception. The train of impulses is transmitted to the bus, which consists of two wires - CAN H and CAN L. Each node extrapolates the message and, as a result, the data contained, processing the sequences of impulses received from on the CAN H and CAN L wires independently. This ensures superior reliability, as any interference in the electrical signals is effectively subtracted and eliminated.



One drawing shows the typical voltages on the CAN H and CAN L wires for each electrical impulse contained in the train “transporting” information shared by the nodes connected to the network. The other drawing shows the signal extrapolated by each node from the difference between the two former signals.

In short, the advantages of using the CAN bus are as follows:
- Only two wires are used (CAN H and CAN L)
- The architecture of the network independent from the configuration of the system or, in other terms, the number of nodes (computers) connected to the network itself
- The network is highly fault-tolerant
- The network is capable of handling node errors and/or faults effectively
- The network ensures reliable message delivery times by applying a priority system

Note that the control function for the electrical impulses travelling over the CAN network has no validity for diagnostic purposes, as the information contained in the trains themselves cannot be identified.

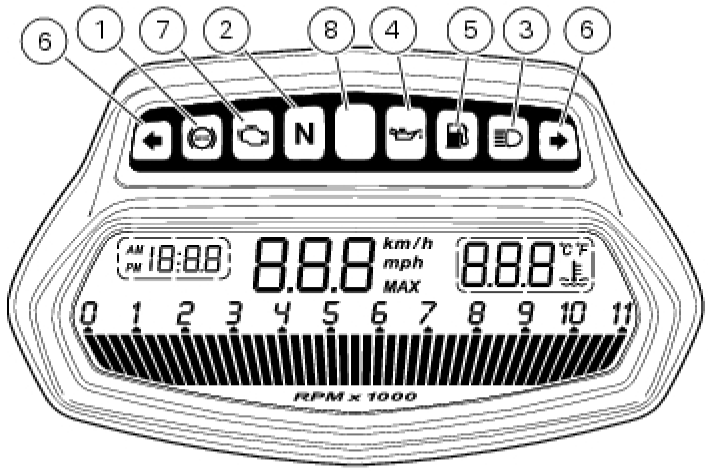
Fault indication

The DDS (Diagnosis Ducati System) indicates all active errors and all inactive but stored errors gathered by the BBS. A simplified summary of the active errors is also shown in the Master dashboard service display when the dashboard is switched on. Simultaneously, the EOBD warning light is also activated, independently of the types of the errors themselves. In the event of more than one active error, the errors are shown cyclically on the service display for 3 seconds each.

In the event of a CAN line fault (CAN OFF), the dashboard cannot transmit data and the electrical system behaves as follows:
- The dashboard service display shows the message “CAN error”
- All lights on the handlebar dashboard must light up and flash
- The turn indicators are flashing
- The DDS shows the message “CAN diagnosis BUS off”

If the CAN line fault is no longer present (fault resolved), normal operation is resumed and the CAN error disappears from the tank dashboard.

Other faults relative to the CAN line and indicated on the tank dashboard and by activation of the EOBD warning light, are described as follows:
- DEVICE ECU the ECU node (engine control unit) is not recognised by the network or is not communicating with the network. In this case, the DDS may display the following messages relative to ECU function diagnosis: ECU counter, ECU no frame, ECU not compatible
- DEVICE DASHBOARD (there are two Dashboards: Master and Slave Dash Boards) the Dashboard node is not recognised by the network or is not communicating with the network. In this case, the DDS may display the following messages relative to Dashboard function diagnosis: Dashboard counter, Dashboard no frame, Dashboard not compatible
- DEVICE HANDS FREE the Hands Free node (facilitated keyless start system) is not recognised by the network or is not communicating with the network. In this case, the DDS may display the following messages relative to Hands Free function diagnosis: Hands free counter, Hands free no frame, Hands free not compatible
- DEVICE ABS ERROR
- BBS/DTC DEVICE this message is transmitted by the engine control unit to the dashboard and indicates that the BBS is not recognised by the network or is not communicating with the network. In this case, the DDS may display the following messages relative to BBS/DTC function diagnosis: BBS/DTC counter, BBS/DTC no frame
- DEVICE SW COMPATIBILITY ERROR-UNKNOWN DEVICE the BBS detects an incompatible device



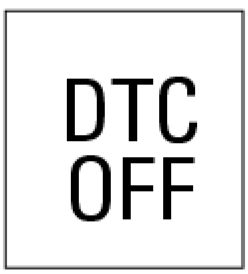
Dashboard warning and indicator light key (some of these are used to indicate faults in the electric - electronic system):
1 ABS light;
2 neutral warning light;
3 high beams;
4 oil pressure warning light;
5 fuel range;
6 turn indicator light;
7 EOBD warning light;
8 Over rev light (DTC intervention).

Warning
when diagnosing one of more elements in the electric – electronic system, also check that there are no error codes indicating CAN line faults. If any error codes relative to CAN line faults are noted, the relative fault must always be resolved as it may be correlated with other specific faults.

Operating principle of DTC

The BBS receives the front and rear speed information from the ABS over the CAN. Then, the BBS sends the vehicle speed information to be displayed on the dashboard over the CAN.
If the tangential speed of the rear wheel exceeds the tangential speed of the front wheel by a given percentage, this indicates that the rear wheel is wheelspinning excessively. At this point the DTC intervenes, requesting the ECU to reduce engine torque. A number of other sensors are also included inside the BBS to determine if the vehicle is wheeling, in which case the DTC will not intervene until a predetermined vehicle speed is reached. To ensure that the Ducati Traction Control functions correctly, never fit tyres other than those authorised by Ducati. On the Diavel there are 8 different DTC levels (from 1 to 8):
1 - Sporty riding on a road for expert users and on track. It is the default setting of the SPORT RIDING MODE.
2 - Riding on a road for expert users (SPORT-TOURING).
3 - Normal riding on a road It is the default setting of the TOURING RIDING MODE.
4 - Normal riding on a road for less expert users (TOURING 2).
5 - Riding in town It is the default setting of the URBAN RIDING MODE.
6 - Riding in town for less expert users (URBAN 2).
7 - Riding with moderately wet ground (WET).
8 - Riding with wet ground (RAIN).

The DTC may be disabled by the rider.



The dashboard specifically indicates if DTC is enabled or if it has been disabled by the rider.

In the event of internal BBS faults relative to the DTC function, the DDS shows the following messages relative to BBS/DTC diagnosis:

- Self test accelerometer error / AccY offset error
- Run time accelerometer error
- Pin state accelerometer error
- Sensor power supply error

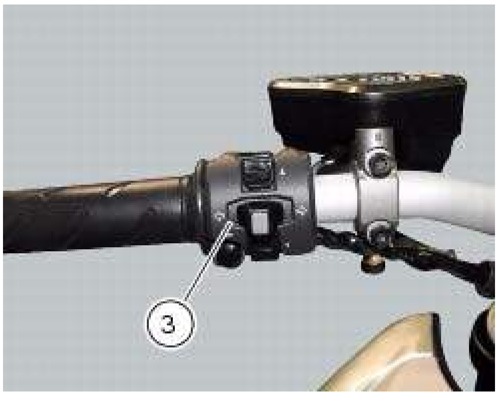
Warning
Faults relative to DTC are only detected if DTC is enabled. In the event of any wheel speed sensor faults or internal BBS faults, DTC is disabled.

Riding Modes

The rider may select between four different riding modes (Sport, Touring, Urban and Enduro) from the dashboard and via the “turn indicator reset” button (3). Each riding mode contains settings for the following:
- The DTC set-up (Sect. 6 - 7 “DTC (Ducati Traction Control) setting function”)
- One of the three different maps of throttle opening (Sect. 6 - 9, Operating principle and characteristics of the ride-by-wire system)

The rider may modify the parameter settings of each riding mode or restore the default settings. The default settings are summarised in the following table.

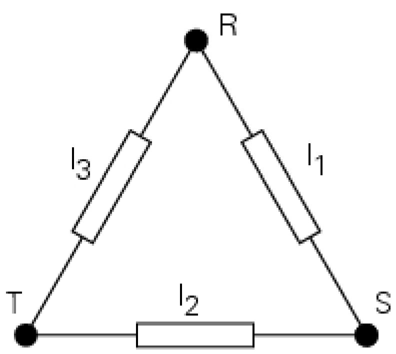
	Range	DEFAULT	SPORT	TOURING	URBAN
DTC Default	[1÷8]		1	3	5
ENGINE (*) Default			SPORT	TOURING	URBAN



The battery charging circuit and power distribution

On the Diavel, the +15V (KEY ON power) voltage does not come from a conventional ignition key, but from PIN 30 of the Hands Free relay. This relay is switched to closed state by the Hands Free unit when the latter enables power on for the ignition and engine. The Hands Free relay receives +30V voltage (battery voltage), protected by a general 30A fuse.

The three phase alternator has three windings (I1, I2, I3), connected to one another in a “triangle” or “delta” configuration. The electrical terminals R, S and T are connected to the voltage regulator.



The drawing illustrates the “triangle” or “delta” configuration connection of the three windings of the three phase alternator.

The voltage regulator is constructed with specific electronic circuits (using MOSFET instead of SCR diodes) which limit operating temperature and, as a result, improve reliability. The regulator can withstand a maximum current of 50A (maximum current for the regulator used on SBK models is 35A) and has integrated waterproof electrical connections.

In the event of incorrect battery voltage (too low or too high), the message “Battery” is shown in the service display. The DDS also indicates if an excessively low or high battery voltage is detected (Battery voltage diagnosis: High voltage, Low voltage).

In the event of a battery charging circuit fault, check the following in the order given:
- Check the integrity of the electrical circuit connecting the alternator to the regulator and the regulator to the battery (to carry out these tests, disconnect the battery cables and check the state of the electrical connections and cables and check for short circuits). Also check the ground connection of the circuit on the engine
- At an engine speed of 2,500 rpm, the alternating charging voltage measured between T – R, T – S and R – S with the alternator disconnected from the voltage regulator (“zero load”) must be between 40V and 50V. This measurement must only be made with a cold engine, and the alternator must only be disconnected from the voltage regulator in KEY OFF state. Replace the alternator if the voltage measured is incorrect.
- Check the insulation relative to ground of each of the three terminals (the resistance between R - Ground, T - Ground and S - Ground must be infinite). If insulation is compromised, change the alternator windings
- The battery state of charge must be checked first before checking the function of the voltage regulator. Battery state of charge is ideal if the voltage measured between the battery poles is between 12.2V and 12.7V. The battery must be disconnected from the motorcycle electrical system for this measurement. After reconnecting the battery to the motorcycle electrical system, turn the engine on and maintain an engine speed of 3,000 rpm. At this engine speed, the voltage measured at the battery poles must be between 14V and 15V. If the battery voltage measured is incorrect, replace the voltage regulator

Ground connection locations

The negative cable, which is normally connected to the negative pole of the battery, is fastened to the crankcase. From here, the cable branches off and splits up within the electrical system to carry the ground connection to the different elements in the system.

The image shows the ground connection on left side of the engine crankcase.

Electrical power for lighting and signalling devices

The front and rear running lights consist of LED units with light conduits. As a result, the light source is not visible as the light is diffused through the surface of the light conduit.

These two images illustrate the front and rear running lights with light conduits.

The figure shows the locations of the low beam bulbs (LO), high beam bulbs (HI) and the parking light LED light unit (1).

Rear view of the headlight showing the high and low beam light connections and the connection for the LED power module at the centre, with the connector cable.

To access the tail light - turn indicators unit, remove the seat as described in Sect. 5 - 3, “Removal of the seat” and the tool tray cover as described in Sect. 7-17, “Removal of the tool tray“.

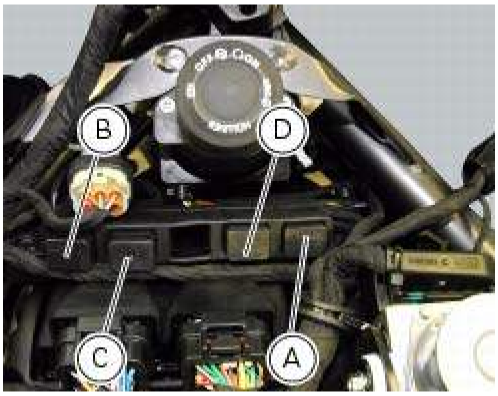
The BBS and the Dash Board unit provide electric power to the lighting and signal devices, which therefore have no conventional power supply passing via a fuse and no electric switchgear set on the handlebar. Commands for the lights and signals are in fact sent to the control units, which then activate the relative lighting devices. The following table indicates the types of devices used, the type of power supply and whether or not the devices are testable.

Device type	Power type	Function
Front LED turn indicators, commanded directly from Dash Board	PWM without specific fuse	Not testable
Rear turn indicators with incandescent bulbs, commanded directly from BBS	12V without specific fuse	Bulb function may be tested
Number plate light with incandescent bulb commanded directly from Dash Board	PWM without specific fuse	Bulb function may be tested
Low beam lights with incandescent bulbs	12V with fuse	Bulb PWM
High beam lights with incandescent bulbs	12V with fuse	Bulb function may be tested
Front and rear LED running lights, commanded directly from BBS	12V without specific fuse	Device function may be tested using an external 12V power source
LED stop light, commanded directly	12V without specific fuse	Device function may be tested using an

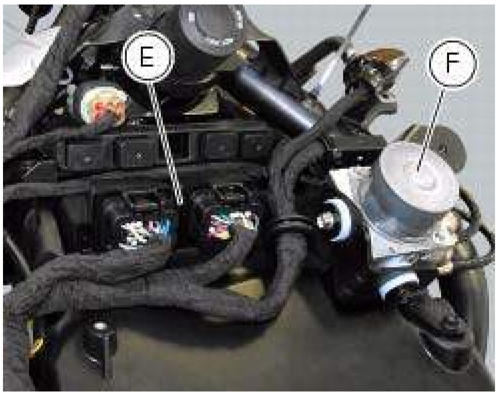
from BBS	external 12V power source

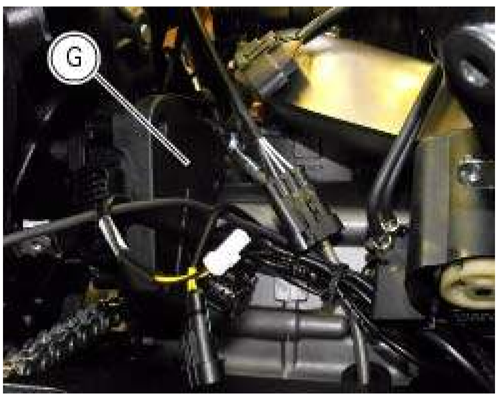
As soon as you start the engine the low beam turns on automatically. In KEY-ON condition and engine off it is possible to turn on the high and low beams that will switch off after 60 seconds if the engine is not started: in Key-ON condition the headlights are off, in Key-ON and engine running the headlights turn on automatically and in Key-ON it is possible to turn them on with the LH switch.

Location of elements on motorcycle

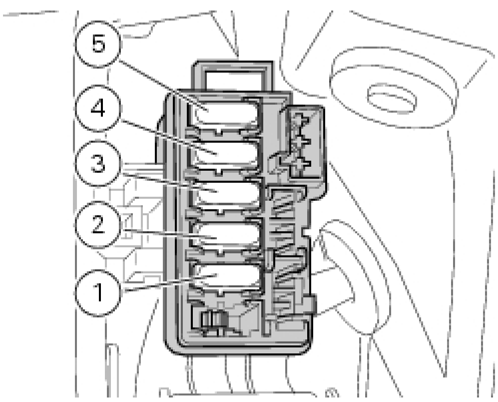


(A) Injection relay; (B) ETV relay (throttle valve operating engine); (C) Radiator fan relay; (D) Hands free relay.

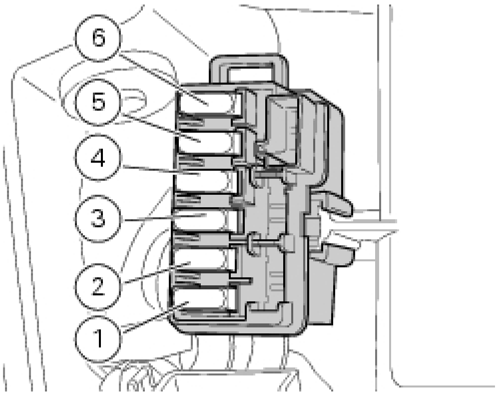




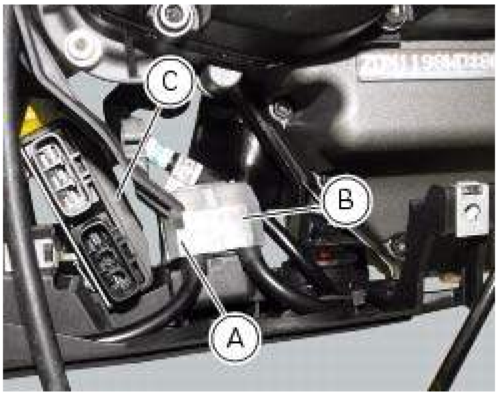
(E) ECU; (G) BBS (Black Box System or Central electronics); (F) ABS hydraulic unit with integrated control unit.



Fuses located at the rear left of the vehicle.
(1) 10A dashboard; (2) 5A engine control unit; (3) 15A key-sense; (4) 20A injection relay; (5) 15A throttle opening relay (ETV).



Fuses located at the rear right of the vehicle.
(1) 7.5A Black Box System (BBS); (2) Navigator; (3) 25A ABS 2; (4) 30A ABS 1; (5) 10A fans; (6) 7.5A Diagnosis/Recharge



(A) Starter motor relay; (B) Main fuse (30A).
The voltage regulator (C) is mounted on the electrical components support.

10.2BBS and DB faults

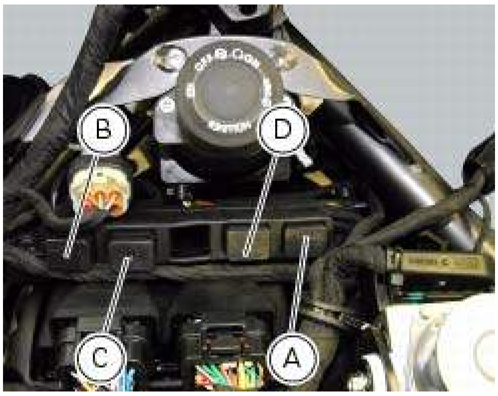
High beam lights not working

Fault codes

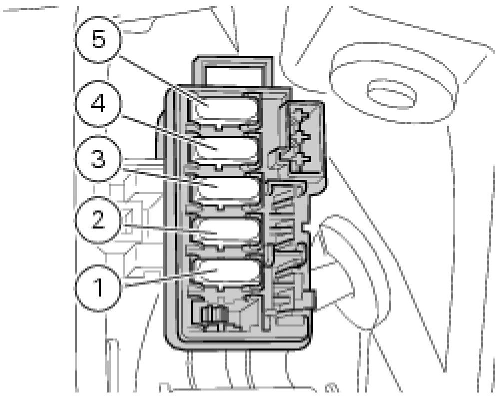
The HI BEAM light on the (Slave) Dashboard flashes at 1Hz frequency.

Wiring diagram

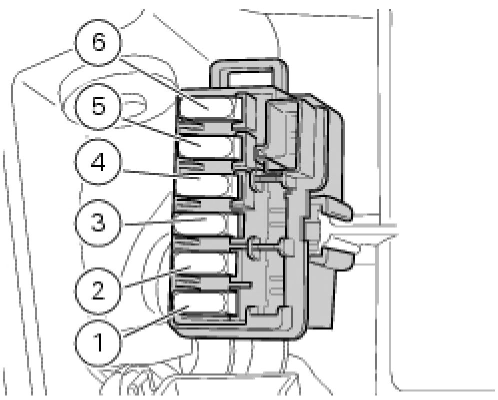
Location of elements on motorcycle



(A) Injection relay; (B) ETV relay (throttle valve operating engine); (C) Radiator fan relay; (D) Hands Free relay.



Fuses located at the rear left of the vehicle.
(1) 10A dashboard; (2) 5A engine control unit; (3) 15A key-sense; (4) 20A injection relay; (5) 10A throttle opening relay (ETV).



Fuses located at the rear right of the vehicle.
(1) 7.5A Black Box System (BBS); (2) 7.5A Navigator/Alarm; (3) 25A ABS 2; (4) 30A ABS 1; (5) 10A fans; (6) 7.5A Diagnosis/Recharge.

(A) low / high beam and parking light connections


Location of left hand handlebar switchgear set connection.

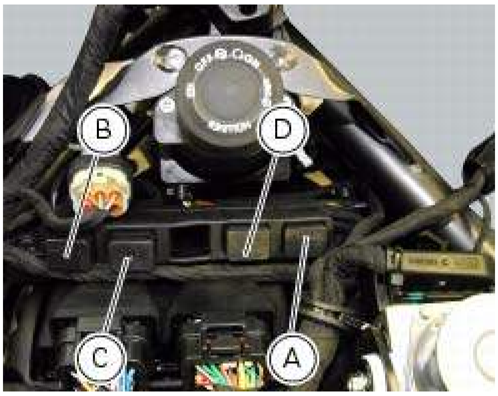
PIN numbering for wiring harness side dashboard connector.

Note

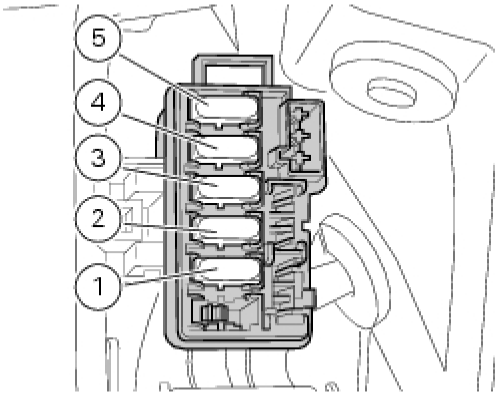
Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

Low beam lights not working

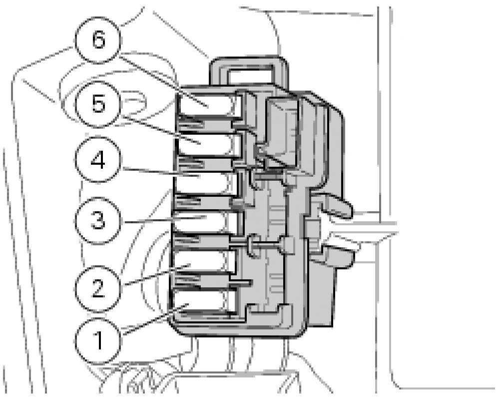
Location of connections and components



(A) Injection relay; (B) ETV relay (throttle valve operating engine); (C) Radiator fan relay; (D) Hands Free relay.



Fuses located at the rear left of the vehicle.
(1) 10A dashboard; (2) 5A engine control unit; (3) 15A key-sense; (4) 20A injection relay; (5) 10A throttle opening relay (ETV).



Fuses located at the rear right of the vehicle.
(1) 7.5A Black Box System (BBS); (2) 7.5A Navigator/Alarm; (3) 25A ABS 2; (4) 30A ABS 1; (5) 10A fans; (6) 7.5A Diagnosis/Recharge.

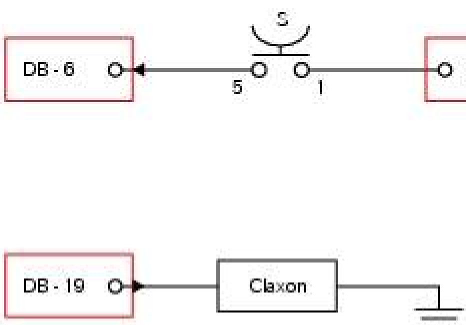
(A) low / high beam and parking light connections

Horn not working

Fault codes

DDS: Horn diagnosis -> Short circuit to ground (S.C. GND).
Dashboard: the error “Claxon” (horn) is shown on the service display. The EOBD warning light activates.

Wiring diagram



DB Dashboard connection, S horn button. 5 blue/white – B/W, 1 red/blue – R/B, DB 19 purple/black – V/Bk.

Location of connections and components

Location of left hand handlebar switchgear set connection.

Location of horn with relative connection.

PIN numbering for wiring harness side dashboard connector.

Note

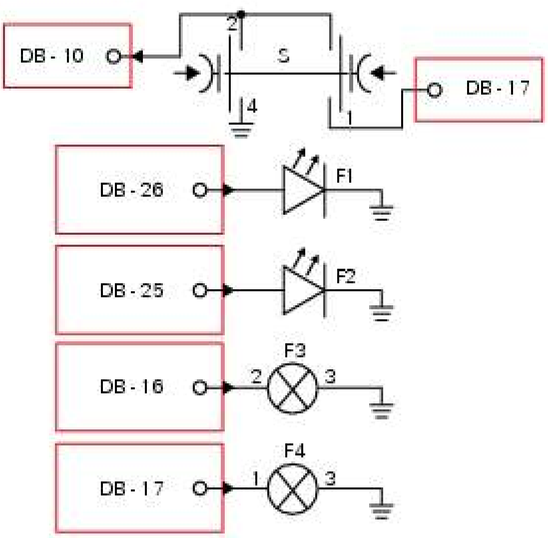
Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

Turn indicators not working

Fault codes

DDS: no fault code displayed.
Dashboard: no fault code displayed.

Wiring diagram



DB Dashboard connection, BBS BBS unit connection, S turn indicator button, F1 front left turn indicator, F2 front right turn indicator, F3 rear left turn indicator, F4 rear right turn indicator. 2 on grey button – Gr, 1 on red/blue button – R/B, 4 on black button – Bk, DB 26 white/black W/Bk, DB 25 green/black – G/Bk, BBS 16 white/green – W/G, BBS 17 white/black W/Bk.

Location of connections and components

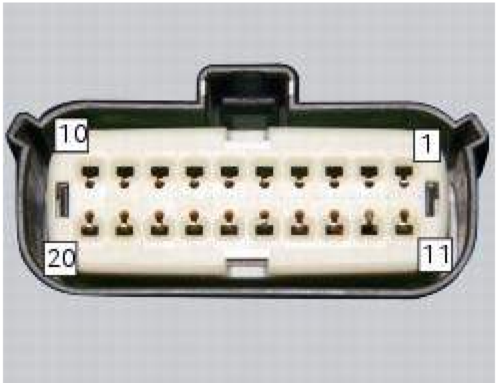
Location of rear turn indicator and number plate light connection.

Location of left hand handlebar switchgear set connection.

Location of front right turn indicator connection.

Location of front left turn indicator connection.

PIN numbering for wiring harness side dashboard connector.



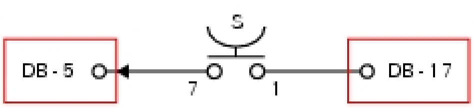
PIN numbering of wiring harness side BBS unit connection.

High beam flash not working - start/stop lap function not working

Fault codes

DDS: no fault code displayed.
Dashboard: no fault code displayed.

Wiring diagram



DB Dashboard connection, S high beam flash button. 7 orange – O, 1 red/blue – R/B.

Location of connections and components

Location of left hand handlebar switchgear set connection.

PIN numbering for wiring harness side dashboard connector.

Number plate light not working

Fault codes

DDS: no fault code displayed.
Dashboard: no fault code displayed.

Location of connections and components

Location of rear turn indicator and number plate light connection.

PIN numbering for wiring harness side dashboard connector.

Checks

The number plate light receives PWM power supply from the dashboard. If necessary, power the number plate light with a 12 V external power supply to test function (connect correctly as indicated in the wiring diagram).
Check congruence of the ground connection on the number plate light.
Check the integrity of the electrical circuit and connections (short-circuits to ground, short-circuits to Vdc, open circuits).
If none of the aforementioned tests identifies the problem, replace the dashboard.

Note

Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

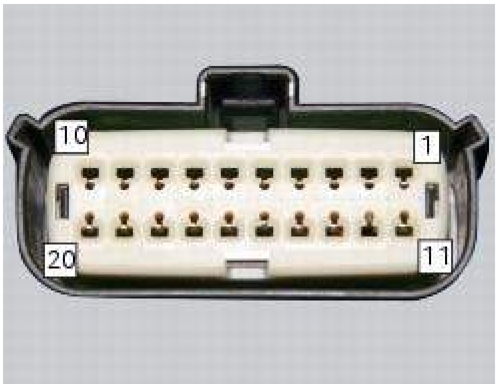
Running lights not working

Fault codes

DDS: no fault code displayed.
Dashboard: no fault code displayed.

Location of connections and components

(A) low / high beam and parking light connections
Rear running light and stop light connection.



PIN numbering of wiring harness side BBS unit connection.

Checks

The front and rear parking lights use LED light units and receive a 12 V power supply. Power the parking lights with an external 12 V power supply to test function (connect correctly as indicated in the wiring diagram).
Check congruence of the ground connection on the running lights.
Check that the parking lights receive 12V arriving from PIN 7 of the BBS.
Check the integrity of the electrical circuit and connections (short-circuits to ground, short-circuits to Vdc, open circuits).
If none of the aforementioned tests identifies the problem, replace the BBS.

Note
Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

Dashboard menu option scrolling not possible

Fault codes

DDS: no fault code displayed
Dashboard: no fault code displayed

Location of connections and components

Location of left hand handlebar switchgear set connection.

PIN numbering for wiring harness side dashboard connector.

Resetting turn indicators not possible - accessing dashboard menu not possible

Fault codes

DDS: no fault code displayed
Dashboard: no fault code displayed

Location of connections and components

Location of left hand handlebar switchgear set connection.

PIN numbering for wiring harness side dashboard connector.

Checks

Test turn indicator reset button function. When the button is pressed, there must be continuity between its two electric terminals (PIN 3 and PIN 1).
Check that there is a voltage of 5V on PIN 1 of the turn indicator reset button arriving from dashboard PIN 17.
Check the integrity of the electrical circuit and connections (short-circuits to ground, short-circuits to Vdc, open circuits).
If none of the aforementioned tests identifies the problem, replace the dashboard.

Note

Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

Gear indicator display on dashboard shows dashes, engaged gear not displayed correctly, idle speed irregular with gearbox in neutral.

Fault codes

DDS: Gear sensor diagnosis -> Short circuit to ground or open circuit (S.C. GND or C.O.) – Short circuit to Vdc (S.C. Vdc) – Congruence (Generic error – signal not correct).
Dashboard: The error “Gear sensor” is shown on the service display. The EOBD warning light activates.

Fault indication

If the dashboard receives the “Gear” error information via the CAN line:
- The error is indicated on the dashboard service display.
- The dashboard shows dashes in the gear indicator display instead of the gear engaged.

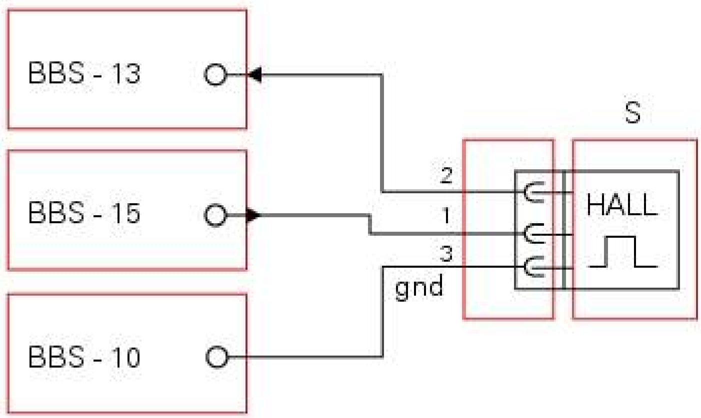
If the dashboard does not receive the gear or neutral engaged information via the CAN line:
- The error “Gear sensor” is not indicated on the dashboard service display.
- The dashboard causes the neutral indicator to flash.

If the dashboard receives incorrect gear engaged information (flashing dashes) via the CAN line with the engine running:
- The dashboard shows flashing dashes in the gear indicator display.

Warning

It is possible that the gear engaged or neutral engaged information is not being generated because the gear position self-acquisition procedure has not been performed (gear sensor not initialised).

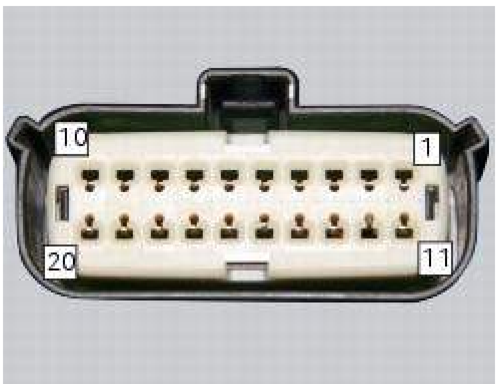
Wiring diagram



BBS BBS unit connection, S gear position sensor. BBS 15 brown/red – Br/R (5V), BBS 13 yellow/green Y/G, BBS 10 black/blue – Bk/B.

Location of connections and components

Location of gear sensor connection.



PIN numbering of wiring harness side BBS unit connection.

Checks

The gear sensor is a Hall effect unit. Ground is on PIN 10 of the BBS unit, 5 V power is on PIN 15 of the BBS unit, PIN 13 of the BBS is the input for the signal generated by the sensor. Check that the sensor receives 5 V power.
Check the integrity of the electrical circuit and connections (short-circuits to ground, short-circuits to Vdc, open circuits).
Perform the gear self-acquisition procedure.
If none of the aforementioned tests identify the problem, replace the gear sensor then perform the gear self-acquisition procedure. If the fault has not been resolved, replace the BBS unit.

Warning

The engine control unit uses the neutral engaged signal generated by the gear sensor, together with the clutch lever pulled signal, to manage idle speed.

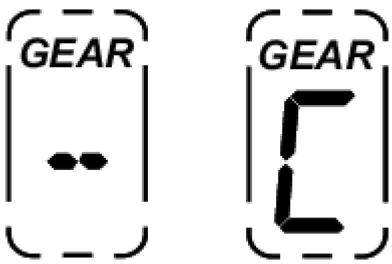
Note

Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.

Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

Gear self-acquisition procedure

The gear self-acquisition procedure must be launched from the DDS instrument. This ensures that the data stored previously is deleted and enables the BBS to run a new gear acquisition procedure. With the engine running and the motorcycle in motion:
- Select neutral, pulling the clutch lever completely, dashes "- -" appear in the gear indicator display. Release the clutch, the letter "C" appears in the display. Keep the motorcycle in this gear for at least five seconds. Then, engage first gear.
- Repeat the above procedure through all the gears, up to sixth gear.
- Downshift through the gears from sixth to first, pulling the clutch lever completely before and releasing after each gear change.
- Reselect neutral and keep in neutral for at least five seconds, repeatedly pulling the clutch lever completely and releasing.
- Shift up through the gears from first to sixth, pulling the clutch lever completely.
- Downshift through all gears to neutral and switch off the motorcycle.
- The self-acquisition procedure is complete.



Dashes shown instead of speed indication or indicated speed is incorrect.

Fault codes

DDS: Speed sensor diagnosis -> Max. speed (Max. speed error – signal not correct) – Minimum speed (Min speed error – signal not correct) – Congruence (Correlation speed error – signal not correct).
Dashboard: the error "Speed sensor" is shown on the service display. The EOBD warning light activates.

Fault indication

If the dashboard does not receive "Vehicle speed" information via the CAN line:
- The error is not indicated on the service display.
- The speed indicator on the dashboard displays fixed dashes.

If:
- DTC is enabled and the ABS detects an error on at least one wheel speed sensor (ABS fault indicator light lit and ABS disabled).

or
- An error occurs on at least one wheel speed sensor with no ABS.

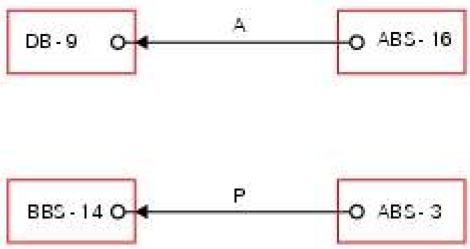
The error "Speed sensor" is shown on the dashboard service display.

Warning
The dashboard speed indicator also displays fixed dashes if vehicle speed exceeds 299 Km/h.

Warning

DTC is disabled in the event of a wheel speed sensor error.

Wiring diagram



BBS BBS unit connection, DB Dashboard connection, ABS ABS connection. BBS 14 green/purple – G/V, DB 9 blue – B.

PIN numbering for wiring harness side dashboard connector.

PIN numbering of wiring harness side BBS unit connection.

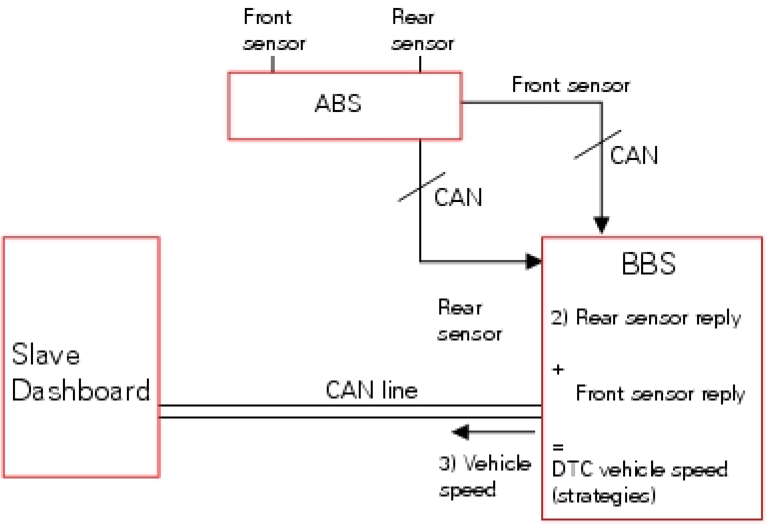
Checks

For diagnosing wheel speed sensors, consult the section relative to diagnosing the ABS unit.
Check the integrity of the electrical circuit and connections (short-circuits to ground, short-circuits to Vdc, open circuits).
If the above test did not identify the problem, contact Ducati.

Note

Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

Propagation of wheel speed signals and generation of vehicle speed signal



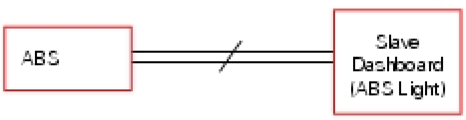
The diagram illustrates how the vehicle speed information is generated and how it is transmitted to the dashboard.
Using the replicated rear wheel speed signal and the circumference of the wheel itself, the BBS unit calculates the vehicle speed (2 in diagram). This parameter is used by the Ducati Traction Control (DTC) function together with the front wheel speed and the circumference of the front wheel itself, in order to implement engine torque limiting strategies when required.
The vehicle speed calculated by the BBS is transmitted over the CAN line (3 in diagram) and acquired by the dashboard, which displays the speed information accordingly.

ABS fault indicator not working

Fault codes

DDS: displays a fault code described in the description of the ABS system.
Dashboard: no fault code displayed.

Wiring diagram



Checks

The ABS fault indicator indicates the occurrence of one or more faults in the antilock brake system, or if the system itself has been disabled by the rider, using the relative control. The signal causing activation of the ABS fault indicator in the event of an antilock brake system malfunction, comes directly from the ABS control unit, and the information is transmitted over the CAN line, so that it may be acquired by the dashboard, where the indicator itself is located.
Diagnose the ABS unit.
Check the integrity of the electrical circuit and connections (short-circuits to ground, short-circuits to Vdc, open circuits).
If the above test did not identify the problem, contact Ducati.

Note

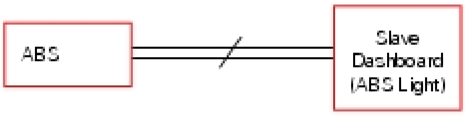
Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested)

ABS disabled information not displayed.

Fault codes

DDS: displays a fault code described in the description of the ABS system.
Dashboard: no fault code displayed.

Wiring diagram



Checks

The ABS fault indicator indicates the occurrence of one or more faults in the antilock brake system, or if the system itself has been disabled by the rider, using the relative control. The signal causing activation of the ABS fault indicator when the antilock brake system is disabled, comes directly from the ABS unit, and the information is transmitted over the CAN line by the BBS unit, so that it may be acquired by the dashboard, where the indicator itself is located.
Diagnose the ABS unit.
Check the integrity of the electrical circuit and connections (short circuits to ground, short circuits to Vdc, open circuits).
If the above test did not identify the problem, contact Ducati.

Note

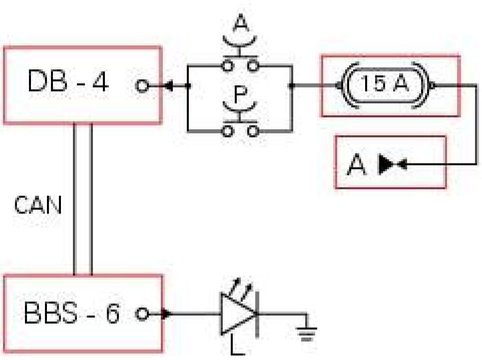
Check integrity of electric circuit – short-circuit to Vdc = with dashboard on, using a voltmeter, a voltage is measured between the wire tested and ground.
Check integrity of electric circuit – short-circuit to ground = with the battery cables disconnected, using an ohmmeter, continuity is detected between the wire tested and ground.
Check integrity of electric circuit – open circuit = with the battery cables disconnected, using an ohmmeter, no continuity is detected between the two ends of the wire tested.

Stop light not working

Fault codes

DDS: Stop light diagnosis -> Stop light error (generic stop light malfunction indication).
Dashboard: the error “Stop light” is shown on the service display. The EOBD warning light activates.

Wiring diagram



DB Dashboard connection, BBS BBS unit connection, A front brake button, P rear brake button, L stop light. A KEY ON power (+15 from Hands free relay 30), DB 4 grey/red – Gr/R, the switch cable connected to A via the fuse is black – Bk, BBS 6 grey/red – Gr/R, ground on stop light, black – Bk.

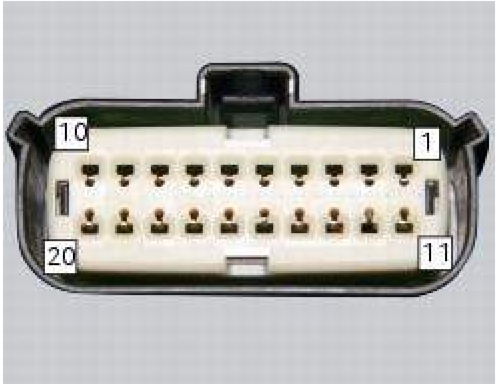
Location of connections and components

Rear running light and stop light connection.

Front brake button mounted near lever operating brake pump.

Rear brake button mounted near lever operating brake pump. The button is normally closed (when the brake lever does not press on the button because it has been pressed by enough to cause a braking effect, the contacts close, short circuiting the contacts).

PIN numbering for wiring harness side dashboard connector.



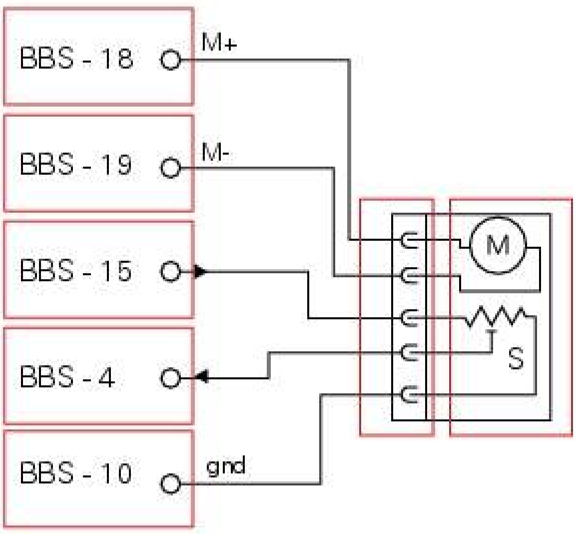
PIN numbering of wiring harness side BBS unit connection.

Exhaust By-pass valve not working correctly

Fault codes

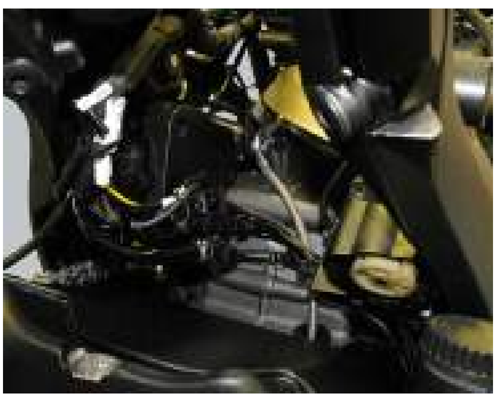
DDS: EXVL diagnosis -> Position error, Potentiometer, Short circuit to ground or open circuit (S.C. GND or C.O.), Potentiometer short circuited to Vdc (Potentiometer S.C Vdc).
Dashboard: the error “EXVL” (exhaust bypass valve) is shown on the service display. The EOBD warning light activates.

Wiring diagram



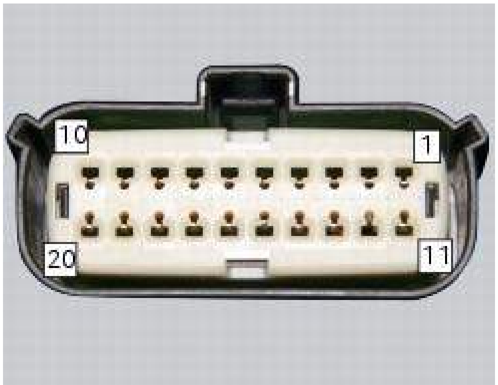
M exhaust bypass valve motor with potentiometer S for position detection, BBS BBS unit connection. 10 BBS black/blue – Bk/B, 15 BBS brown/red – Bn/R, 4 BBS yellow/blue – Y/B, 18 BBS black/orange – Bk/O, 19 BBS black/white – Bk/W.

Location of connections and components



Exhaust bypass valve connection.

The image shows the exhaust system. The oxygen sensor for the horizontal cylinder (1) is visible on the right, the oxygen sensor for the vertical cylinder (2) is on the left. The catalytic converter is contained within the silencer, while the By-pass valve is installed in the section of pipe connecting the silencer to the twin tailpipes. A metal cable, controlled by an actuator with electric motor and a position sensor, branches off from the exhaust bypass valve.



PIN numbering of wiring harness side BBS unit connection.

11 - Diagnostic instruments

Using a multimeter to check the electrical systems

Introduction

This instrument allows you to measure resistance, voltages, and current values. Multimeters can be divided into two basic types: analogue and digital display multimeter. An analogue multimeter has a pointer display. The dial is marked with the scales to be used for measurement of the various parameters. Digital units are equipped with a dial that displays numbers corresponding to the values of the measured parameters. The type of measurement to be carried out (voltage, current or resistance) is set by means of a selector or by means of several different sockets in which to insert the two test probe connector terminals. In certain cases it is essential to set the full scale value before proceeding. For example, in order to measure a 12 V signal, you need to set a full scale that is close to this value (e.g. 15 V or 20 V). It would be illogical to set a full scale value of 10 V; the same applies when setting current (Amperes) or resistance (Ohms). Sometimes the instrument can set the required full scale value automatically. Never exceed the maximum value allowed by the tester when measuring voltage or current signals.

Note

The DDS diagnosis instrument (Sect. 6 -13, DDS diagnosis instrument) can fulfil the function of digital multimeter.

Voltage measurement

Voltage measurements must be carried out by connecting the terminals of the tester in parallel to the load (e.g. to the wires feeding a light bulb or a relay, the two battery terminals, or the two wires supplying power to a control unit). Voltages can be constant over time (DC voltage) or variable over time (AC voltage). In the first case, it is important to consider the negative and positive polarity of the application. It is therefore necessary to select on the multimeter the type of voltage you intend to measure. (DC voltage is shown by the symbol = while AC voltage is denoted by ~).

Current measurement

Current measurements must be made by connecting the multimeter terminals in series with the load (e.g. disconnect one of the wires feeding power to a light bulb and connect one terminal of the multimeter to the free end of wire and the other terminal to the light bulb. When the lights switch is set to ON, the bulb will illuminate normally and the tester will show the absorbed current, i.e. the amount of current passing through the wire. Warning: connections in series must be made and removed only when the power is switched off. Never attempt to make or break a series connection when a device is powered. Always make sure that the connection in series of the tester terminals on the electrical device is made is a safe manner in such a way that it cannot be broken accidentally.

Measurement of resistance values and electrical continuity

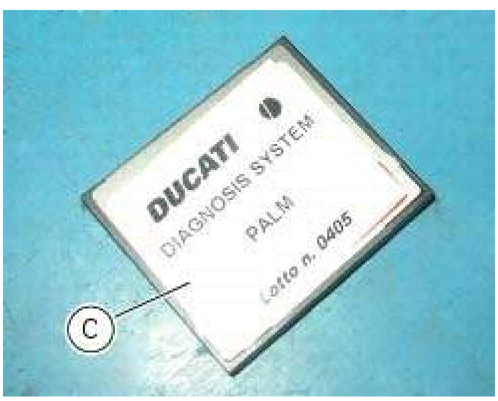
Resistance measurements must be taken only when the electrical device or section of the circuit is not powered and isolated from the main electric system (i.e. not connected to the main electrical system). These measurements can be utilised to check the resistance value across several sensors. For example, after disconnecting the electrical wiring to the rpm/ignition-injection system timing sensor (on the camshaft drive gear) the relative internal resistance can be checked by connecting a multimeter to its terminals. This makes it possible to check the electrical continuity of the winding inside the sensor (a reading of infinite resistance indicates that the winding is interrupted). Resistance measurement can also be used to check the continuity of sections of the electrical circuit or relay type switches. For example, to check the condition of a section of the electrical circuit between two connections, disconnect the connections and connect the terminals of the multimeter to the ends of the electrical cable in question to check that the specified resistance value is present. If this value is close to zero (i.e. lower than approximately 0.3 ohm) this means that the cable is not interrupted. Some instruments feature an audible signal that is emitted when the resistance approaches a value of zero. The same procedure must be adopted to check whether, for example, two contacts of a switch (relay or manual type) are making the contact correctly when closed. In this case the terminals of the multimeter must be connected to the switch terminals, checking that the resistance value is close to zero (or listening for the audible signal) when the switch is closed. To check that the multimeter is functioning correctly in “electrical continuity test” mode, short out the two test probes. The resistance value indicated must be almost nil and the audible signal must be activated.

Protections and precautions

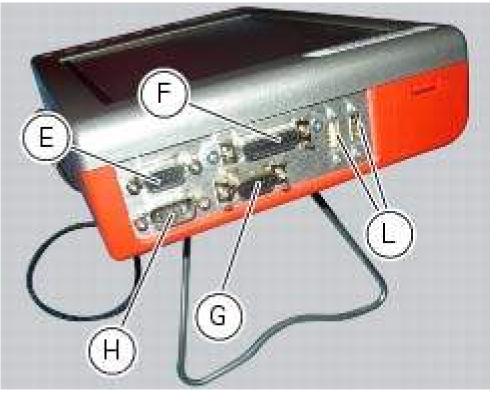
The multimeter is equipped with protective fuses and batteries. These components must always be in perfect condition to ensure that the instrument is functioning correctly. When making electrical measurements always use the maximum caution to avoid short circuits, which can otherwise cause irreparable damage to the electric system and constitute a personal injury hazard. All maintenance work must be performed exclusively when the system is not live (disconnect the battery in advance). NEVER connect the multimeter in parallel to make current measurements, and NEVER connect it in series to carry out voltage measurements.

Description of the diagnosis instrument (DDS)

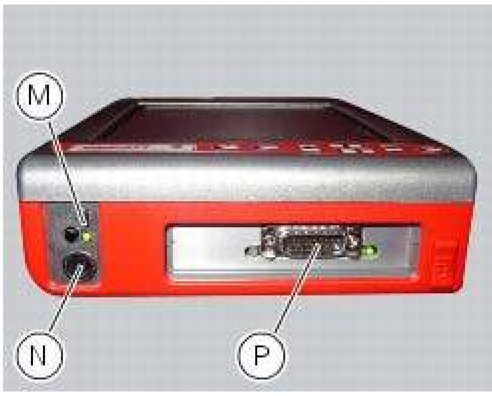
The “DDS” diagnostic system lets you diagnose any faults in the injection-ignition system via a serial port. The system is also equipped with functions to test various devices on the motorcycle. The DDS diagnosis instrument can be used to measure current and voltage on any electrical device, to perform tests on individual components and to measure pressure and temperature values.
The DDS (1) part number **97900.0215** consists of a palmtop display (A), a BBAD self-diagnosis module (B) and a display memory card (C).



The touch-screen display unit (A) serves for both data display and input, using the stylus housed on the side of the unit.
The self-diagnosis module (B) enables communication between the DDS diagnosis instrument (1) and the motorcycle's on-board electronic control unit (ECU).
The user interface software resides in the display memory card (C) which is housed in the Palmtop display unit (A).
The display unit is equipped with two connection panels: one at the top of the instrument and one at the bottom.
The top connection panel has 6 connection sockets with the following functions:
- one VGA output (E);
- one port for connection of the measurement module (F);
- one RS232 serial port for connection of peripheral devices (COM1) (G);
- a second RS232 serial port for connection of peripheral devices (COM2) (H);
- two generic USB ports (USB1 and USB2) (L).



The bottom connection panel has 3 connection sockets with the following functions:
- one USB port (M);
- one power connection socket (N);
- one diagnostics connection socket (P).



You can connect a printer to the DDS diagnosis instrument (1) to print test reports: connect the printer to the serial port (COM1) (G) located on the top connection panel of the tester (1).

Technical data

Power supply:
- from the mains - **220** V;
- from the vehicle battery - **12** V.

Components supplied with the DDS diagnosis instrument

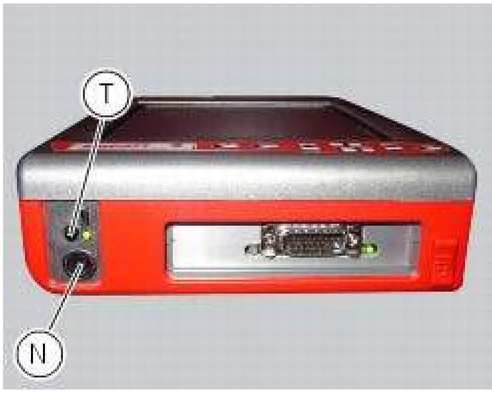
The DDS diagnosis instrument (1) is supplied in a kit together with the following items:
- Rechargeable DDS battery
- Battery charger
- Mains power adapter
- USB memory card reader
- Power and diagnostic cable complete with fuse
- CD containing DDS installation software for PC
- USB cable
- Belt tension sensor

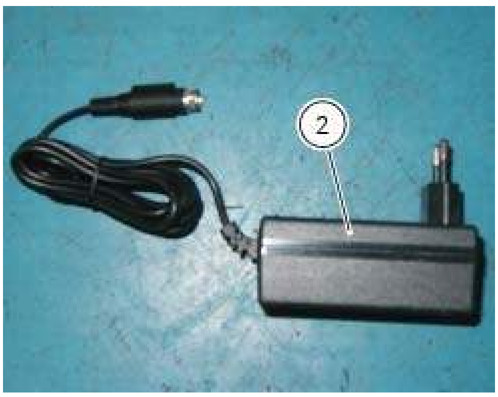
Tester power supply

The DDS (1) part number **97900.0215** can be powered from the vehicle as follows:

- from the mains power supply: by connecting the power supply connector (N) to the network power supply (2) part no. **97900.0224**;
- from the motorcycle: connecting the corresponding cables (see paragraph “Connection to the motorcycle”);
- from the tester's internal battery: the battery (Q) is housed in the top part of the tester. To operate the tester (1) using the internal battery and to recharge the battery, refer to the “User Manual” supplied with the DDS diagnosis instrument.

To switch on the display, press the button (T).

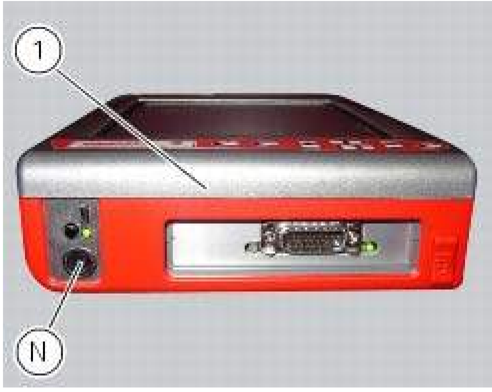


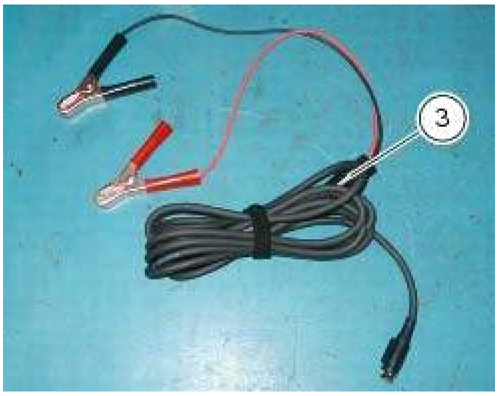


Connection to the motorcycle

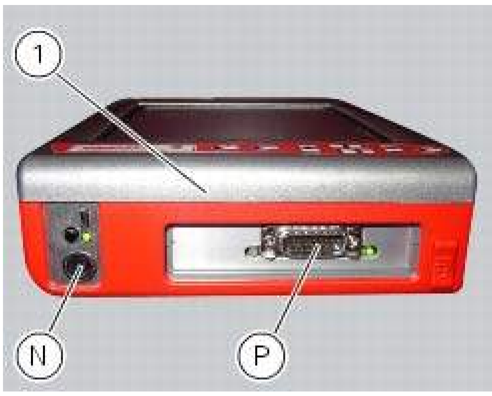
The tester requires a power supply voltage within **9** and **16** Volts D.C.
Make sure voltage never drops below this limit during operation: this situation could occur during engine starting and idling on motorcycles in which the battery is not in perfect working order. If the tester detects a power supply voltage lower than **9** Volts, the current procedures will be reset; when the voltage returns to the acceptable tolerance limits the procedure must start again from the beginning.
The DDS diagnosis instrument (1) may be powered from the motorcycle in any one of the following ways:

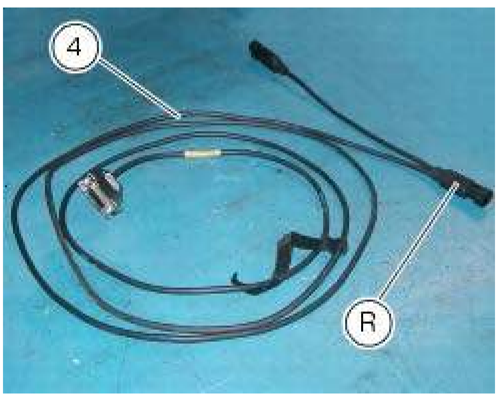
- by connecting the instrument power connector (N) to the battery connector (3) part no. **97900.0230** and the latter to the vehicle battery;

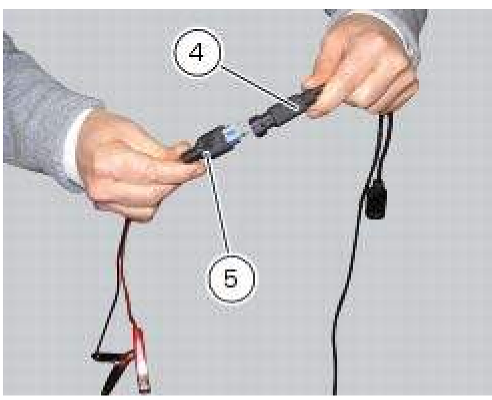




- by connecting the instrument diagnosis connector (P) with the power supply and diagnosis cable (4) part no. **97900.0227S**; then connect the supply and diagnosis cable outlet (R) with the battery adaptor (5) part no. **97900.0228** and the adapter to the bike battery.







Note

For connection of the various devices required for self-diagnostic procedures, consult the instruction handbook supplied with the tester.

DDS diagnosis instrument

The main functions of the DDS diagnosis instrument can be summarised as follows:

- Retrieval of errors (faults) of the ignition-injection system stored in the engine control unit memory and their subsequent deletion, if required.
- Reading of engine parameters (rpm, coolant and air temperature, atmospheric pressure, throttle opening, battery voltage, injection times and ignition advance, etc.).
- Active diagnostics. Activation of ignition-injection system transducers to test functionality and control signals (fuel pump, ignition coils, rev counter, injectors, etc.). With this function it is also possible to enter the code to override the immobilizer.
- Road test. Allows the technician to store engine parameters recorded within a previously specified engine speed range interval. The resulting parameters can then be analysed and displayed once they have been acquired.
- With specific sensors connected, the DDS diagnosis instrument can read electrical voltages, current, temperature, timing belt tension, and pressure values (lubrication and fuel supply circuits for example).

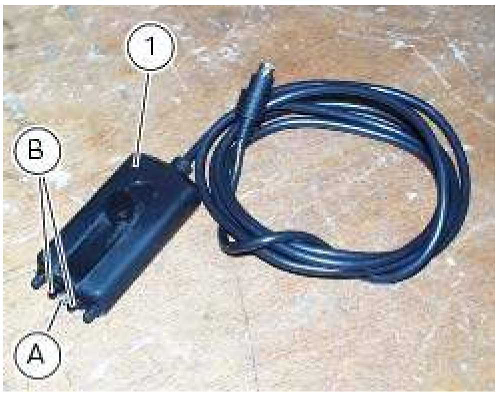
Checking and adjusting timing belt tension

Note

The on-screen icons used during this procedure are explained in a table at the end of this section.

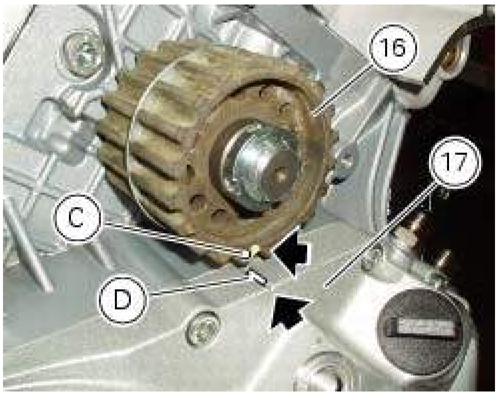
Note

This operation, which is performed using the DDS diagnosis instrument, has the advantage that it can be carried out on both timing belts with the engine still installed on the frame. The DDS shall be connected with an optical reader (1) part no. **88765.1371**. The optical reader has a green LED that serves to determine that the reader is correctly positioned in front of the belt to be tested. It is also equipped with an infrared transmitter (A) and receiver (B) designed to detect oscillations of the belt when caused to vibrate with the flick of a finger.

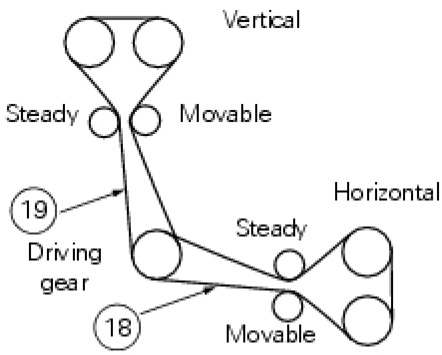


Operations	Section reference
Remove the timing belt covers	9 - 4.2, Removal of the timing belt covers

Position the crankshaft so that the piston of the horizontal cylinder is at TDC of its power stroke.
This is achieved by aligning the timing mark (C) of the timing driveshaft pulley (16) with the reference notch (D) on the clutch cover (17).



Measure the horizontal timing belt on the section (18) as described in paragraph "Measuring the timing belt tension values".
Turn the crankshaft by 270° in the engine rotation direction (vertical cylinder TDC, in the combustion stroke) and repeat the procedure used for the horizontal cylinder, measuring the voltage on branch (19) of the vertical belt.

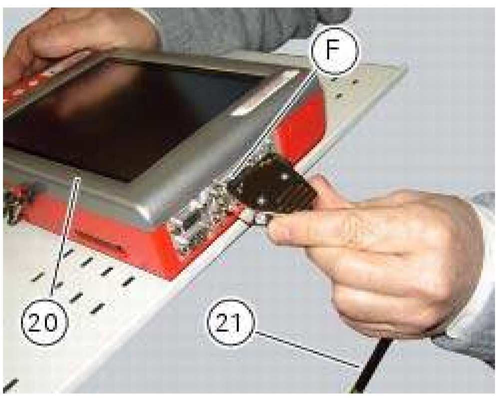


Remove the belt tension sensor and disconnect the DDS diagnosis instrument from the motorcycle.

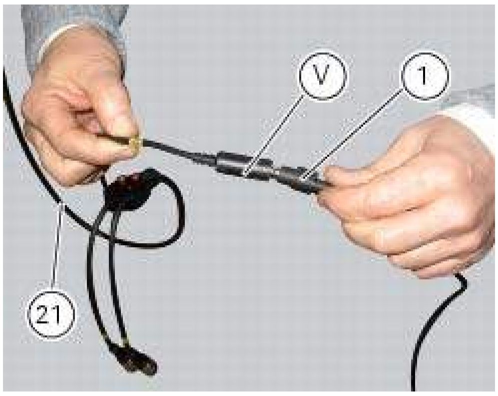
Operations	Section reference
Refit the timing belt covers	9 - 4.2, Refitting the timing covers

Measuring the timing belt tension values

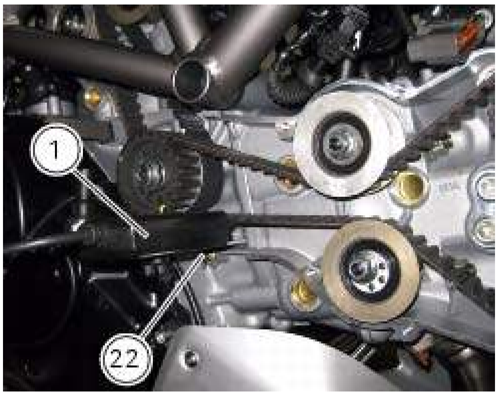
Switch on the DDS (20) part no. **97900.0215** referring to paragraph "Tester power supply".
Connect the power and diagnosis cable (Measurement Module) (21) part no. **97900.0222** to measurement module connector (F) of the DDS (20).



Connect the belt tension sensor (1) part no. **88765.1371** to the outlet (V) of the supply and diagnosis cable (Measurement Module) (21) part no. **97900.0222**.

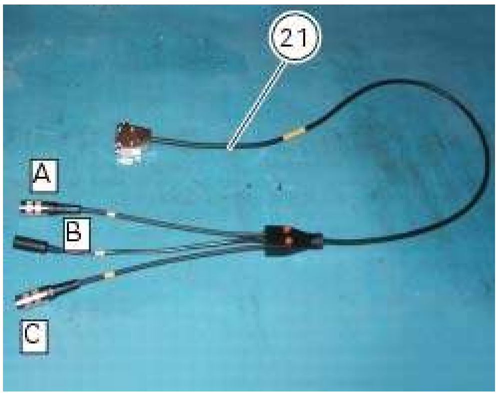


Fix the mounting bracket of the belt tension sensor (1) using the chain guard retaining screw (22).
Direct the central green LED of the sensor (1) at the midpoint of the belt section, placing sensor (1) parallel to the belt and at a distance of about **1**-**1.5** cm from it.



On the DDS diagnosis instrument (20), select the “Measurement module” function by pressing the corresponding icon; then press the “Belt Tension” icon followed by the “Start” icon to access the “Mechanical belt tension” screen.

The socket to which the cable (Measurement Module) (21) is to be connected is indicated on the screen with a capital letter: A, B or C.



Flick the belt lightly with your finger and read the frequency value (Hz) on the DDS diagnosis instrument.

Note

Do not stress the belt several times repeatedly, since the necessary minimum time for the DDS diagnosis instrument to take a reading is **1** second.

The tension values are those detailed in Sect. 3 - 1.1, Timing system/valves and must be checked when the engine is cold: assembly values must be applied with when installing a new belt, while service values must be applied when belt tension reaches **70** Hz.

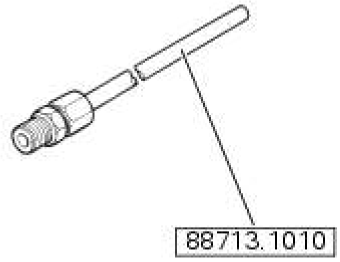
Warning

The timing belts can become slack during normal operation. When checking belt tension, if the reading is less than **70 Hz**, retension the belt to restore the specified nominal values (Sect. 3 - 1.1, Timing system/valves).

If the tension value is incorrect, increase or reduce belt tension, moving the adjustable tensioner pulley (23), loosening the nut (24): to tension the belt use the tool with part no. **88713.3497**.
Tighten the nut (24) securing the tensioner pulley.
Recheck the timing belt tension.
Repeat the above procedure until the correct belt tension is obtained.
Once the belts are correctly tensioned, ensure that the fixing nut (24) of the tensioner pulley (23) is tightened to a torque of 25 Nm (Min. 22 Nm - Max. 28 Nm) (Sect. 3 - 3, Engine torque settings).

Checking the idle speed

Check that the bike is provided with electronic control unit, OEM intake and exhaust systems, otherwise fit original components.
Connect the inserts of the exhaust gas analyser code **88713.1010** to the outlets on the exhaust pipes, using the fittings (1).



Warning

Make sure that the throttle body pulley is completely against the anti-stitching screw.
Make sure that the throttle cable free play is correctly adjusted.

Check the idle and the CO amount with warm engine

1 start the engine;
2 Switch on the DDS and check that it does not signal any error (otherwise consult the relevant paragraph of this manual to reset the error and proceed with the idle check);
3 Enter the “SELF DIAGNOSIS“ menu by selecting the DIAVEL model in the available vehicle version. Enter the “ENGINE ELECTRONICS“ system and check the default parameters.
See list below:
A RPM
B Engine temperature
C Air temperature
D Throttle valve aperture
E MAP1 pressure sensor
F MAP2 pressure sensor
4 Wait for the engine temperature to exceed 80 °C displayed on the DDS, and then adjust only the by-pass screw of the vertical cylinder until the “MAP2 pressure sensor“ parameter displayed on the DDS is nearly -52KPa;
5 make sure that the system automatically keeps the idle between 1350 +- 100 rpm; in case the idle is too high check for no cuts in the pressure sensor wires, cracks or cuts in the intake manifolds, make sure that the latter are well fixed to the engine, and so on.
6 wait that the engine temperature exceeds 90°C displayed on the DDS; if the air temperature detected by the DDS ranges between 19 °C and 40 °C the CO in these engine temperature conditions must be within 0.4% and 2% on both cylinders; if this check is not successful try to replace the lambda sensor of the faulty cylinder and, in case the problem still occurs, inspect the faulty cylinder (clearance, strokes, valve sealing, etc.).

Warning

If the engine is shut off during the CO level check, wait three minutes after starting for the after-starting enrichment phase to be finished and the lambda sensors to start operating.

Check the engine oil pressure

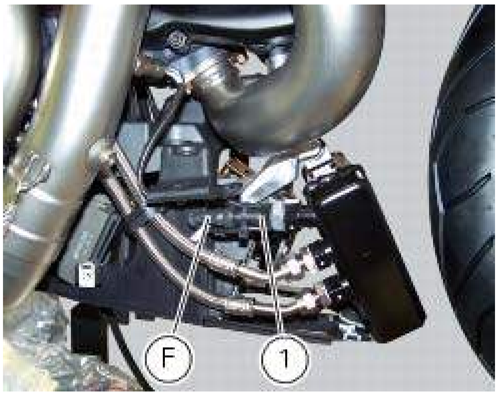
Note

The on-screen icons used during this procedure are explained in a table at the end of this section.

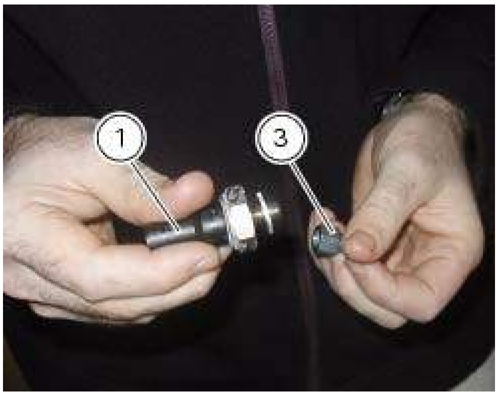
To measure the pressure of the lubrication circuit, use the engine oil pressure test point (19) as described below.

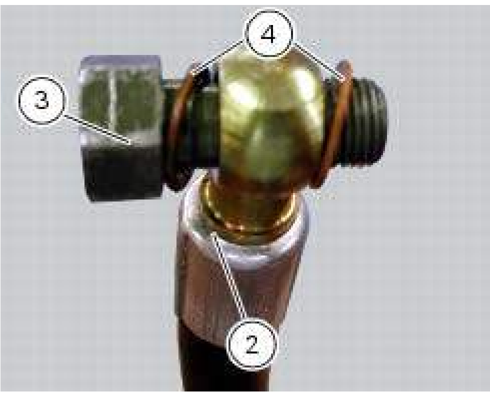
Operations	Section reference
Remove the right belly fairing	5 - 5, Removal of belly fairing

Disconnect the wiring connector (F) of pressure switch (1) and remove it taking care to recover the seal.

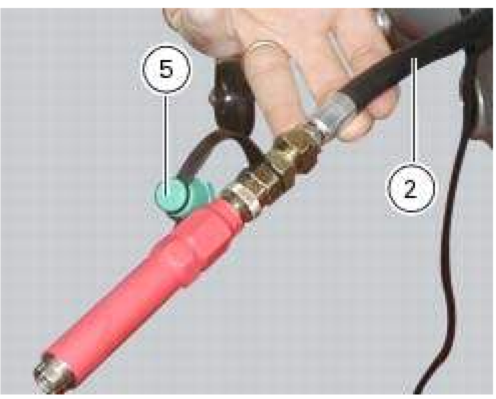


Insert in the pipe union fitting (2) part no. **875.1.065.1A** the fitting (3) part no. **814.1.114.1A**, by putting the two copper gaskets (4). Fit in the threaded hole the fitting (3) of pipe (2), by tightening it fully home. Refit on fitting (3) the pressure switch (1), with the relevant gasket and reconnect it to connector (F) of the electric system.

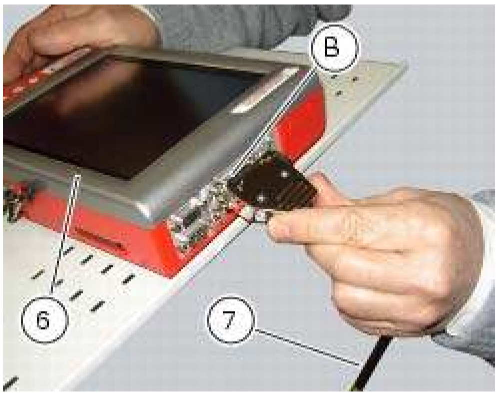




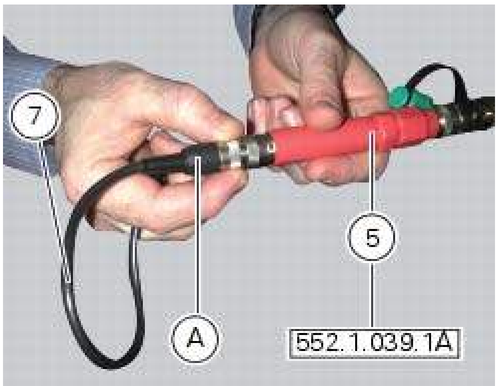
Connect the pressure sensor (5), part no. **552.1.039.1A**, to the hose (2), in order to convert the pressure reading into an electric signal.

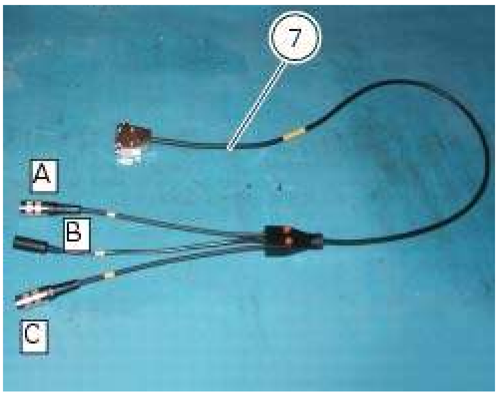


Turn on the DDS diagnosis instrument (6) referring to the paragraph "Tester power supply".
Connect the power and diagnosis cable (Measurement Module) (7) part no. **97900.0222** to the measurement module connector (B) of the DDS (6).

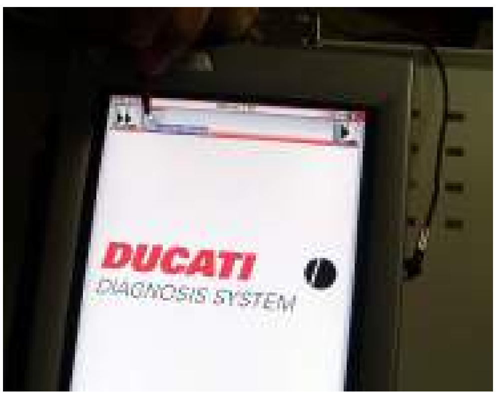


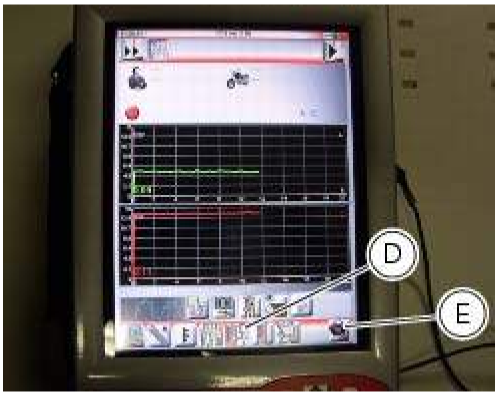
Connect the pressure sensor (5) to socket (A) or (C) of the cable (7).





On the DDS diagnosis instrument (1), select the “Measurement module” function by pressing the corresponding icon; then press the “Pressure Test” icon (D) followed by the “Start” icon (E).





The socket to which the cable (Measurement Module) (7) is to be connected is indicated on the screen with a capital letter: A, B or C.

Start the engine.
The values may be displayed in three different ways: in one numeric form and in two graphic forms; to select the desired display type, press the “Value display” icon.
The measured value is indicated alongside the letter (A) or (C) identifying the cable used for the measurement: i.e. if you used connector (A) of the cable (3), the value measured will displayed next to the letter (A) on the screen.

Oil pressure test values:
Warm engine
(Minimum oil temperature = **80** °C)

1100-**1300** min^{-1}
greater than **0.8** bar.

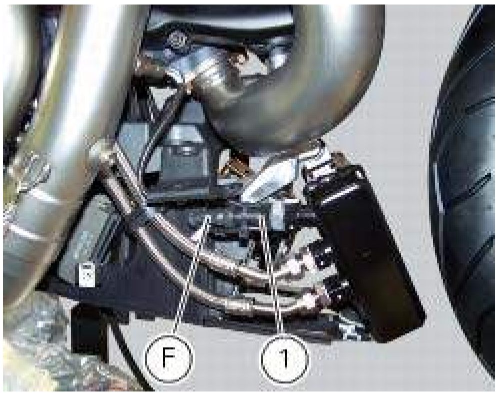
3500-**4000** min^{-1}
greater than **4** bar.

Important

The maximum pressure must never exceed **6.0** bar.

Excessively high pressure may indicate that the relief valve is stuck. Excessively low pressure, on the other hand, may be caused by the relief valve being stuck in the open position, the relief valve spring being too weak, or a faulty oil pump. Other causes are excessively worn seals and gaskets or a badly worn engine.

Remove the gauges and refit the pressure switch (1) with its seal. Tighten it to a torque of 19 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Connect the electrical system connector (F) to the pressure switch.



Disconnect the DDS diagnosis instrument.

Operations	Section reference
Reassemble the right belly fairing	5 - 5, Reassembly of belly fairing

Cylinder compression test

Note

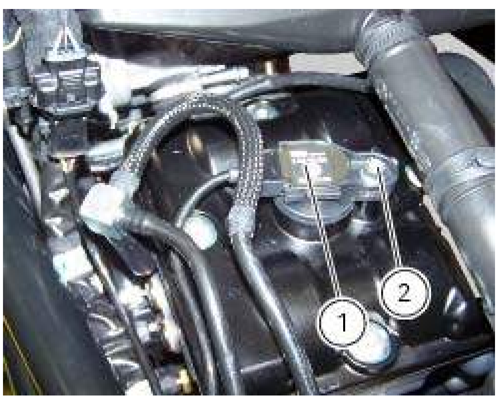
The on-screen icons used during this procedure are explained in a table at the end of this section.

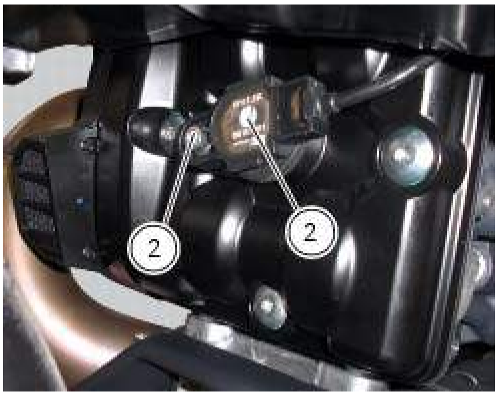
Engine performance is directly correlated to the pressure that can be measured in the combustion chambers of the two cylinders. Pressure which is too high/low or an excessive difference between the two cylinders will cause a drop in engine performance and can cause engine breakdowns.

Operations	Section reference
Remove the seat	5 - 3, Removal of the seat
Remove the tank fairing	5 - 2, Removal of the fuel tank fairings

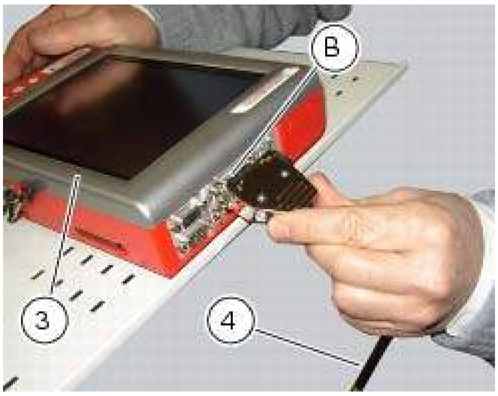
To reach the vertical head spark plug lift the tank up as specified under the Section 8 - 2 “Removal of the fuel tank” and fit a drift under it.

Run the engine so that it warms up to the point that the fan is tripped at least once.
Open the throttles completely.
Remove the HT leads (1), unscrewing the nuts (2) of both spark plugs.
Remove the spark plug from the cylinder to be tested.





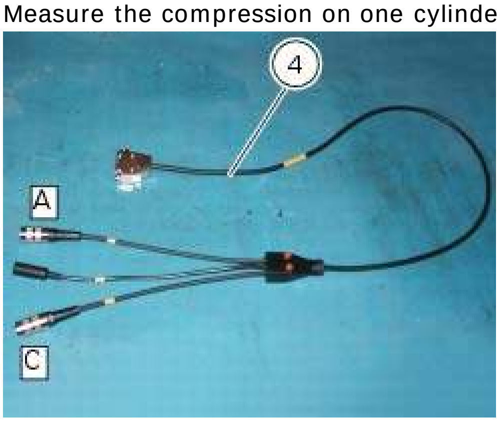
Connect the HT lead to earth to prevent sparking.
Screw the cylinder compression cable part no.**552.1.038.1A** into the spark plug compartment.
Connect the pressure sensor part no. **552.1.039.1A** to the cable with part no. **552.1.038.1A**..
Turn on the DDS diagnosis instrument (3) referring to the paragraph "Connection to the motorcycle".
Connect the power and diagnosis cable (Measurement Module) (4) part no. **97900.0222** to the measurement module connector (B) of the DDS (3).



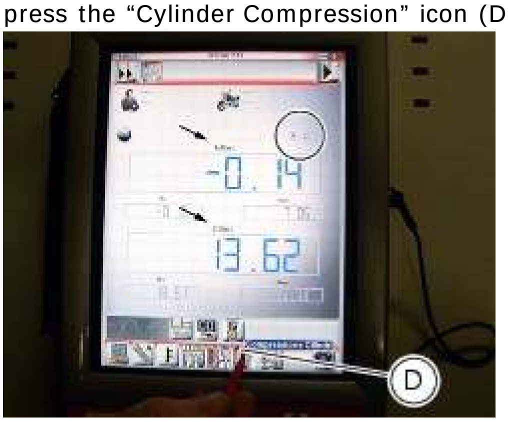
Connect the pressure sensor part no. **552.1.039.1A** to the outlet (A) or (C) of cable (4) part no. **97900.0222**.

Note

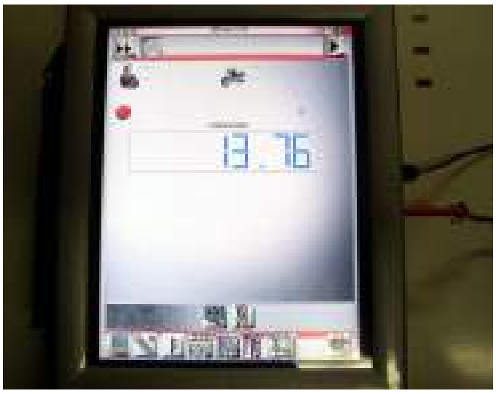
Measure the compression on one cylinder at a time.



On the DDS diagnosis instrument (**3**), select the "Measurement module" function by pressing the corresponding icon; then press the "Cylinder Compression" icon (D) followed by the "Start" icon (E).



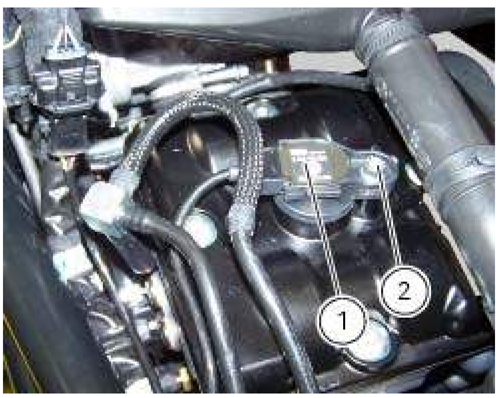
The socket to which the cable (Measurement Module) (**4**) is to be connected is indicated on the screen with a capital letter: A, B or C.
Turn over the engine with the starter motor until the pressure stops rising.
Check the pressure in each cylinder:
- standard value: **11** to **12** bar;
- minimum value: **10** bar;
- maximum permissible difference between cylinders: **2** bar.

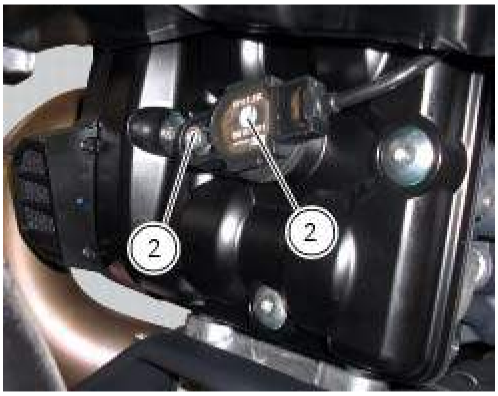


An excessively high pressure value can be caused by:
- build up of deposits in the combustion chamber.

An excessively low pressure value can be caused by:
- gas escaping between the cylinder head and the barrel;
- worn valve seats;
- bent valve stems;
- incorrect valve clearances;
- worn cylinder or piston rings.

Refit the spark plugs and position the coil-spark plugs wires (1) in the corresponding compartments and tighten the nuts (2) to a torque of 10 Nm (Min. 9 Nm Max. 11 Nm) (Sect. 3 - 3, Frame torque settings).





Refit the tank as indicated in section 8 - 2 “Refitting the fuel tank”.

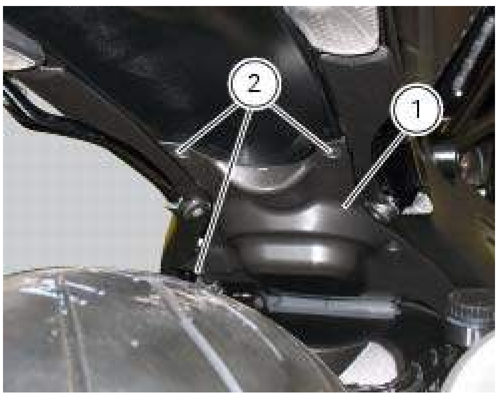
Operations	Section reference
Refit the tank fairings	5 - 2, Refitting the fuel tank fairings
Refit the seat	5 - 3, Refitting the seat

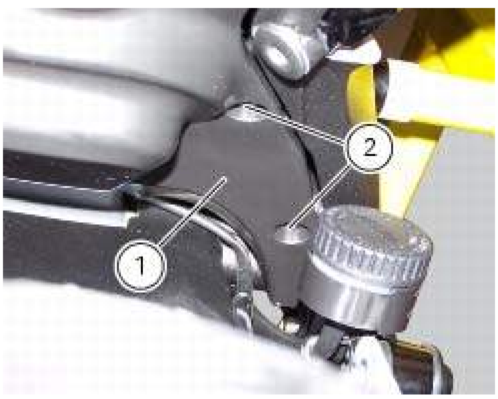
Fuel pressure test

Note

The on-screen icons used during this procedure are explained in a table at the end of this section.

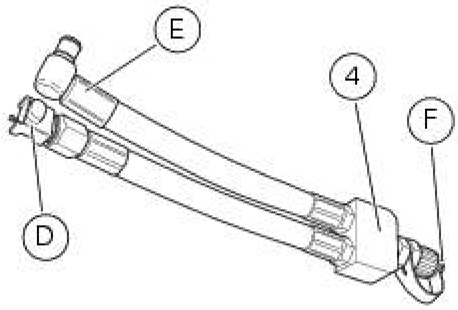
Undo the screws (2) and remove the flange cover (1).



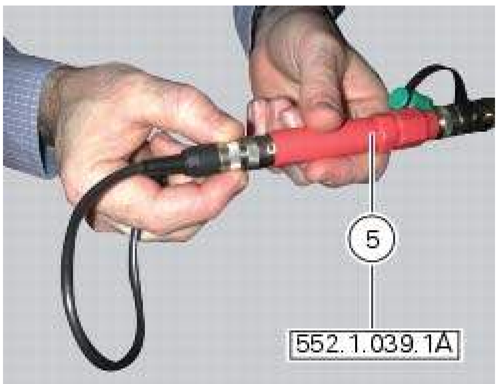


Remove one of the two pipes of the fuel system (3).

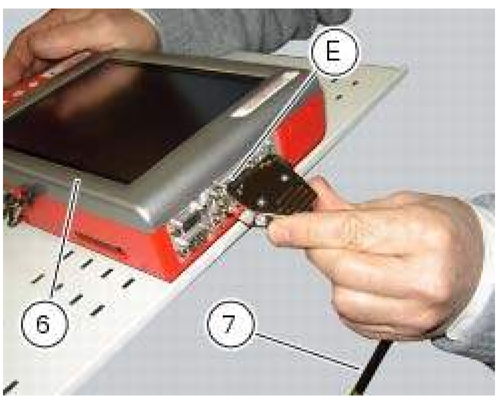
Use the fuel pressure pipe (4) part no. **590.1.189.1A** by connecting one end (D) to the coupling of the delivery pipe to the tank and the other end (E) to the fuel system pipe (3): in this way you create a pressure pick-up socket (F).



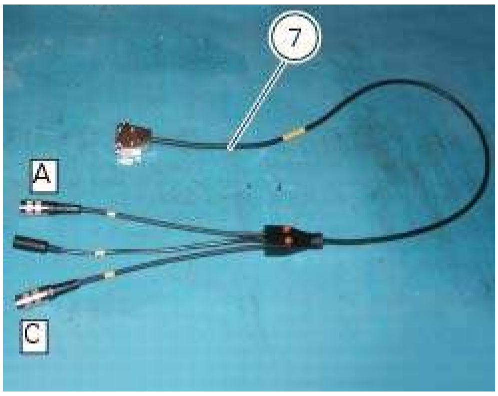
Connect the pressure sensor (5) part no. **552.1.039.1A** to the outlet (F) of hose (4), in order to convert the pressure reading into an electric signal.



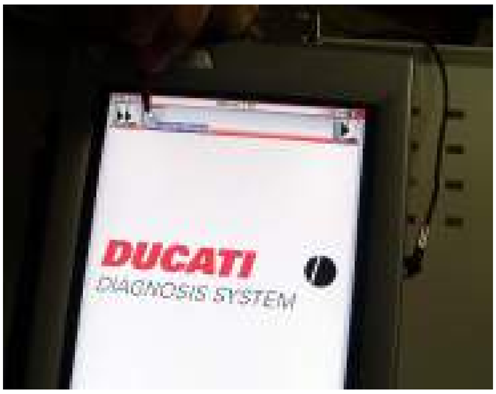
Turn on the DDS diagnosis instrument (6) referring to the paragraph "Tester power supply".
Connect the power and diagnosis cable (Measurement Module) (7) part no. **97900.0222** to the measurement module connector (E) of the DDS (1).



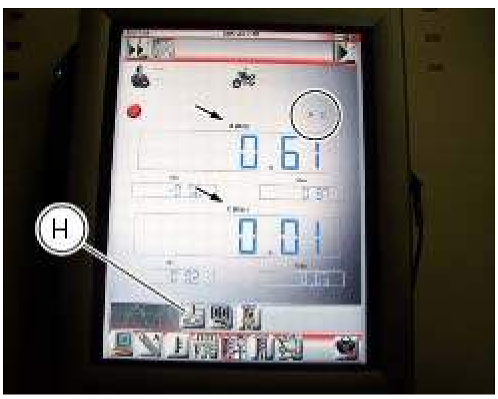
Connect the pressure sensor (6) part no. **552.1.039.1A** to outlet (A) or (C) of the cable (7).



On the DDS diagnosis instrument (6), select the “Measurement module” function by pressing the corresponding icon; then press the “Pressure Test” icon (F) followed by the “Start” icon (G).

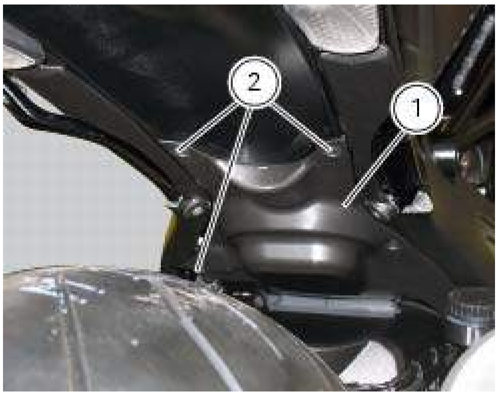


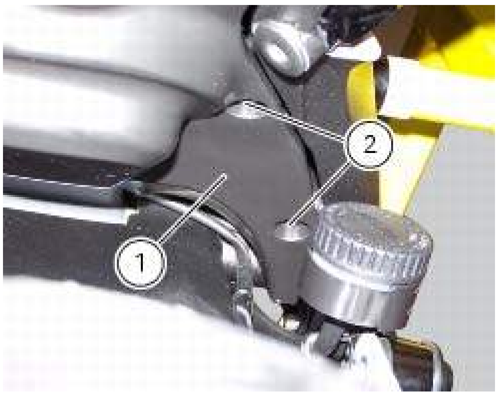
The socket to which the cable (Measurement Module) (**7**) is to be connected is indicated on the screen with a capital letter: A, B or C.
The values may be displayed in three different ways: in one numeric form and in two graphic forms; to select the desired display type, press the “Value display” icon (H).



The measured value is indicated alongside the letter (A) or (C) identifying the cable used for the measurement: i.e. if you used socket (A) of the cable (**7**), the value measured will be displayed next to the letter (A) on the screen.
The maximum pressure must be equal **3** bar (nominal).
Once the test is over, remove all the components of the test instrument and refit the fuel system pipe (3).

Refit the flange cover (1) by tightening the screws (2) to a torque of 4 Nm ± 10% (Sect. 3 - 3, Frame torque settings).





Guided diagnosis

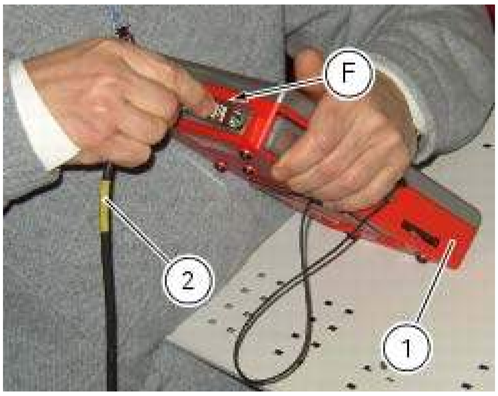
Note

The on-screen icons used during this procedure are explained in a table at the end of this section.

The DDS diagnosis instrument guides the operator step-by-step through the various diagnostic procedures, providing descriptions and documentation for motorcycle components, wiring diagrams for the electronic systems and information on the locations of specific components.

Operations	Section reference
Remove the seat	5 - 3, Removal of the seat

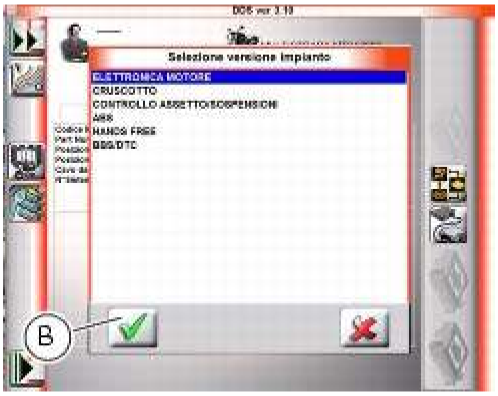
Turn on the DDS diagnosis instrument (1) referring to the paragraph "Tester power supply".
Connect the power and diagnosis cable (2) part no. **97900.0227** to the diagnosis connector (F) to the diagnosis socket (3) of the motorcycle.



Enter the general functions menu by pressing the icon “Menu 1” (A).

Press the “Select vehicle” icon and, on the next screen, press the “Select motorcycle” icon; select the motorcycle model and confirm, then select the version and confirm.
Press the icon “Select system” to display a list of the bike’s systems that can be analysed.

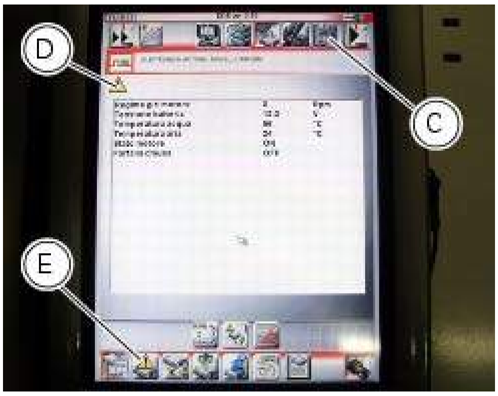
Select one of the options shown in the following picture and press icon “Confirm“ (B) to confirm it.



Press the “Guided diagnosis” icon (C) to access the corresponding function.

A series of screens are displayed indicating the operations required for correct diagnosis.

To determine whether the system has any internal problems, you can access the “Self-diagnosis” function by pressing the corresponding icon. If any errors are present, the symbol (D) will be displayed. To determine the type of errors present, press the “Errors” icon (E). Once errors are detected, it is possible to solve them using the Step-by-step diagnosis; press “Step-by-step diagnosis“ icon (C).



The DDS diagnosis instrument will interrogate the electronic control unit and display the parameters analysed with their relative values.

Operations	Section reference
Refit the seat	5 - 3, Refitting the seat

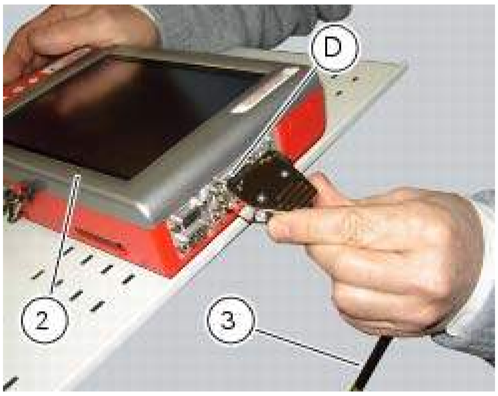
Testing the battery charging system

Note
The on-screen icons used during this procedure are explained in a table at the end of this section.

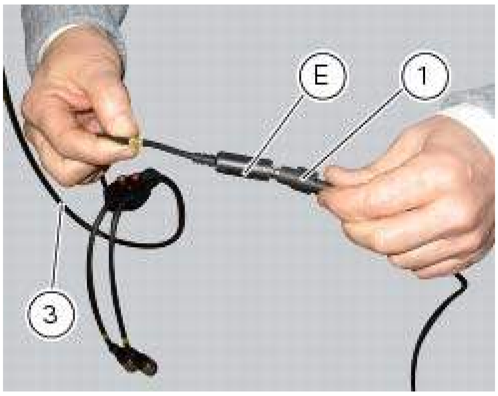
You can determine the engine rpm required for generator to produce just enough current to charge battery, feed the injection ignition system and all electric items fitted to motorcycle. When applied to a cable, the clamp-type amperemeter (1) part no. **88765.1126V** detects the magnetic field generated by the current passing through that cable.

Operations	Section reference
Remove the left belly fairing	5 - 5, Removal of belly fairing

Turn on the DDS diagnosis instrument (2) referring to the paragraph "Tester power supply".
Connect the power and diagnosis cable (Measurement Module) (3) part no. **97900.0222** to the measurement module connector (D) of the DDS (2).



Connect the clamp-type amperemeter (1) to the connector (E) of the power and diagnosis cable (Measurement Module) (3).



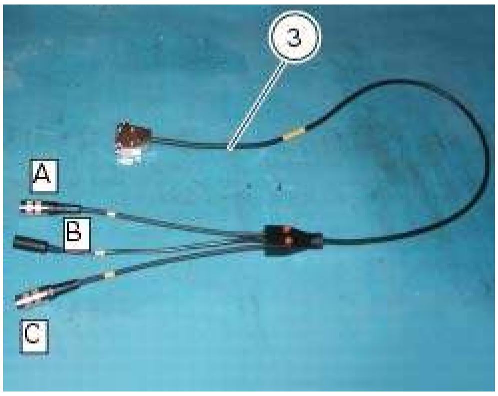
Warning

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

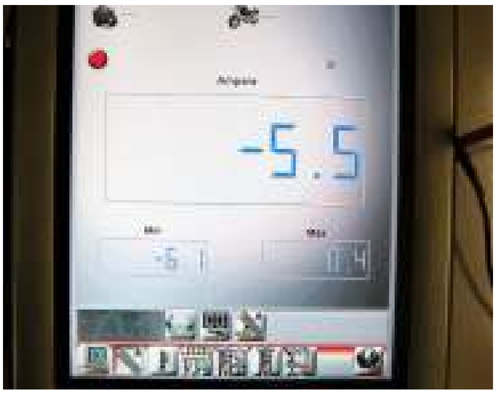
Insert the clamp-type amperemeter into the battery positive terminal lead with the arrow on the clamp pointing towards the battery positive terminal (+).

On the DDS diagnosis instrument (2), select the “Measurement module” function by pressing the corresponding icon; then press the “Ammeter” icon (F) followed by the “Start” icon.

The socket to which the cable (Measurement Module) (3) is to be connected is indicated on the screen with a capital letter: A, B or C.



If the measured current is a positive quantity, it means that generator is feeding all electric items and charging battery at the same time. If the current has a negative sign, this means that the charging system is not able to power the electrical loads and a significant amount of the current required must be supplied by the battery, which is therefore discharging.



Important

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

Operations	Section reference
Reassemble the left belly fairing	5 - 5, Reassembly of belly fairing

Deactivating the “service” indication on the dashboard

The message “SERV” is displayed on the dashboard, indicating that the motorcycle should be serviced in accordance with the programmed maintenance plan. This indication is activated after the first **1000** km and thereafter at intervals of **12000** km.

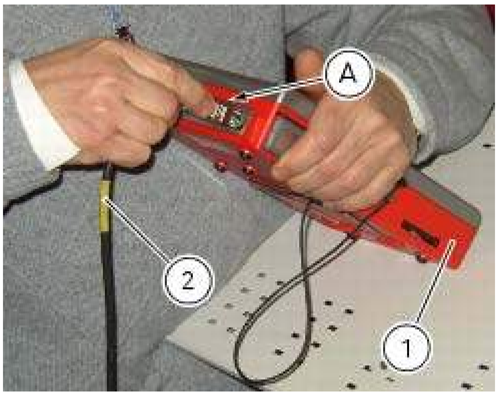
After the scheduled service has been carried out, the indication must be switched off as follows:

Note

The on-screen icons used during this procedure are explained in a table at the end of this section.

Operations	Section reference
Removing the rider seat	5 - 3, Removal of the seat

Turn on the DDS diagnosis instrument (1) referring to the paragraph "Tester power supply".
Connect the power and diagnosis cable (2) part no. **97900.0222** to the diagnosis connector (A) and the latter to the diagnosis socket (3) of the motorcycle.



Enter the general functions menu, pressing "Menu Key 1" icon (B).

Press the "Vehicle selection" icon and press "Vehicle selection" icon in the following page; select the motorcycle model and confirm, then select the version and confirm.Press the "Select system" icon.

A list of the motorcycle's systems that can be analysed will appear on the display.

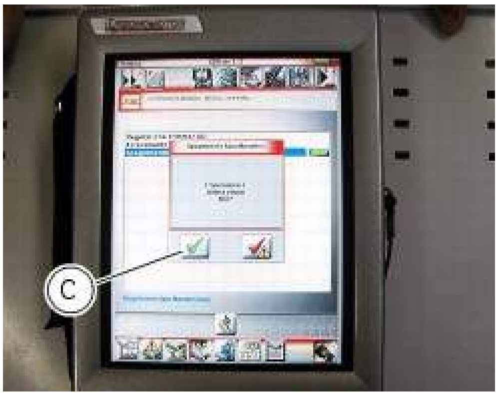
Select the icon “DASHBOARD“.

Press the “Confirm” icon (C). Next, press the “Self-diagnosis” icon to access the corresponding function.

The DDS diagnosis instrument will interrogate the electronic control unit and display the parameters analysed with their relative values.
Press the “Settings” icon to display the special parameters.

Select “Service light OFF“ and press “Execute“.

On completion of the operation, the message “Was the operation completed successfully?” will appear; press “Confirm” (C).



If any problems were encountered during the operation, the tester will display the relative error messages: you need to confirm or reject each message by pressing “Confirm“ (C) or “Exit“ (D), respectively.

Note

Once the “service“ light has been reset with the DDS diagnosis instrument, set the ignition switch to OFF and wait for at least **30** seconds before switching it ON again.

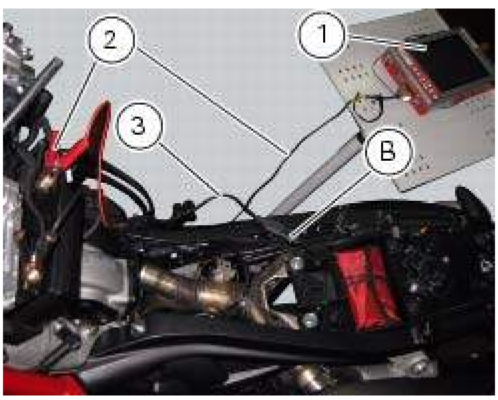
Operations	Section reference
Refit the rider seat	5 - 3, Refitting the seat

ABS diagnosis

Note

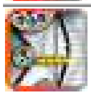
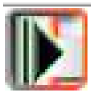
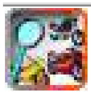
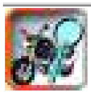
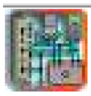
The on-screen icons used during this procedure are explained in a table at the end of this section.

If the ABS system is not working correctly, system diagnosis is possible through the DDS diagnosis instrument.
Turn on the DDS diagnosis instrument (1) referring to the paragraph “Tester power supply”: use the power cord (2) part no. **97900.0230**.
Connect the power supply cable (3) part no.**97900.0227** tot he power cord (2) part no. **97900.0230** and to the ABS diagnosis connector (B) on the frame.

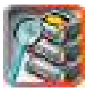


Icons table

Diagnostic instruments

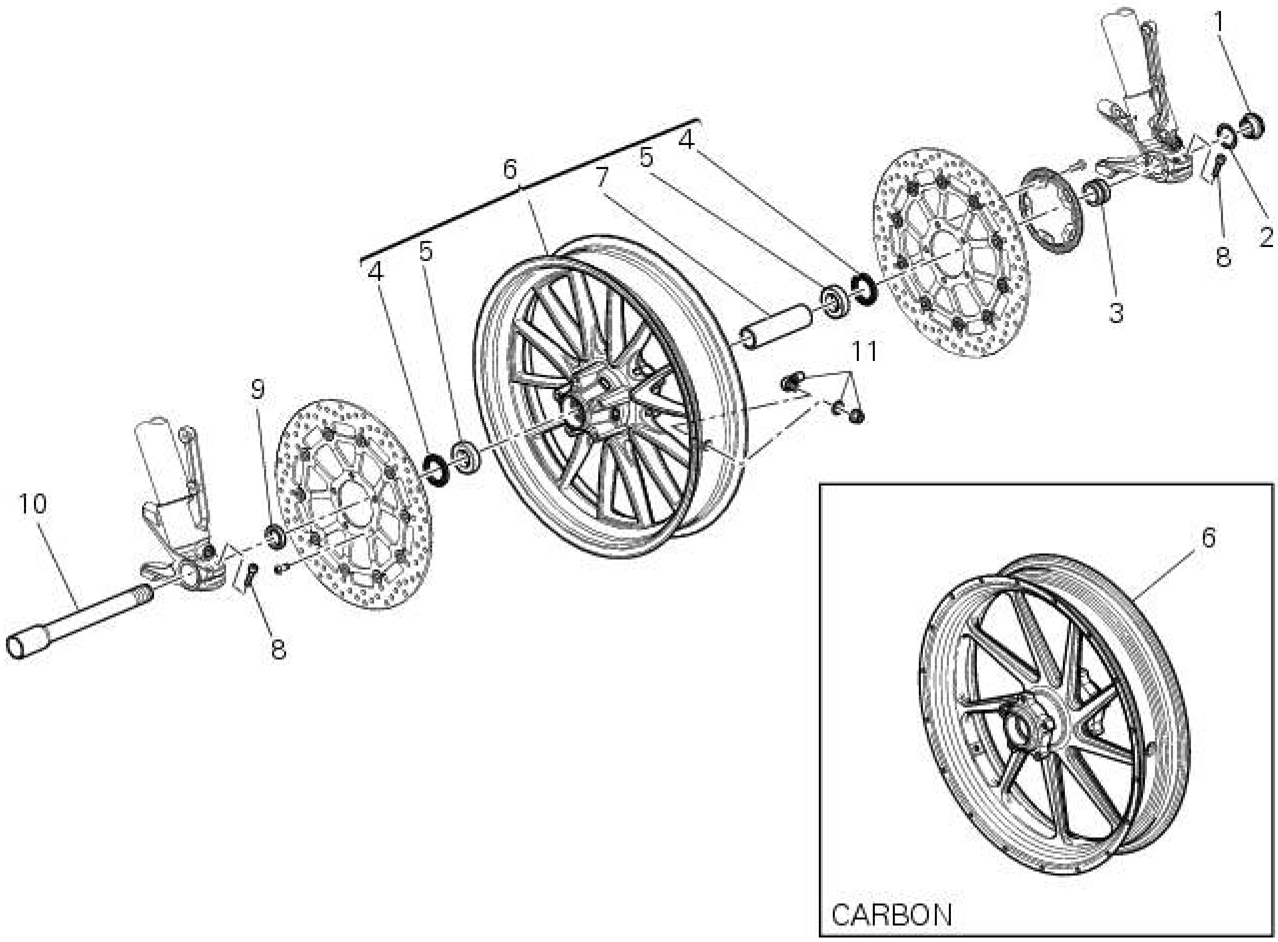
Symbol	Description
	Confirm
	Exit
	Measurement module
	Belt tension
	Start/stop
	Menu 1
	Select vehicle
	Select motorcycle
	Self-diagnosis
	Settings
	Apply
	Cylinder synchronisation
	Value display
	Reset
	Pressure test
	Cylinder compression
	Actuators
	Guided diagnosis

Diagnostic instruments

	Select system
	Errors
	Clamp-type amperemeter

07 - Impianto elettrico

1 -Front wheel



1 Nut
2 Washer
3 Left spacer
4 Sealing ring
5 Bearing
6 Front wheel rim
7 Inner spacer
8 Screw
9 Right spacer
10 Front wheel shaft
11 Valve

Spare parts catalogue

Diavel ABS	FRONT AND REAR WHEELS
Diavel Carbon ABS	FRONT AND REAR WHEELS

Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Removal of the front wheel

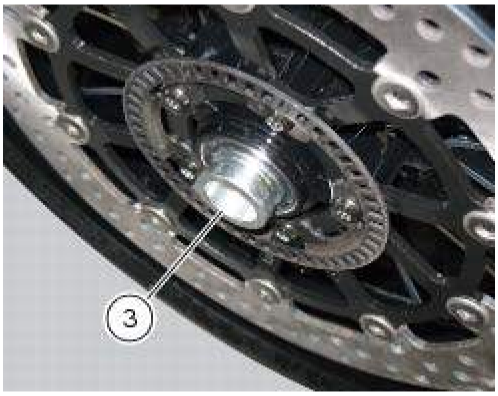
Support the bike so that the front wheel is raised from the ground.
Remove the front brake calliper (B) by unscrewing the two screws (A) securing the calliper to the fork leg; do not disconnect the calliper from the hose.

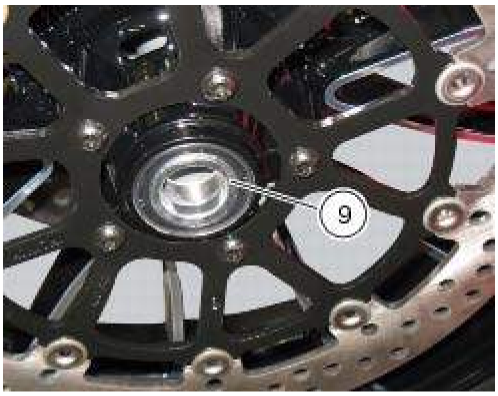
Warning
Do not operate the brake lever when the callipers are removed. This can cause the brake pistons to be expelled.

Loosen and remove the nut (1) on left side of the wheel shaft.
Recover the washer (2).

Loosen the wheel shaft screws (8) on the fork legs.
Working from the left-hand side, use a plastic mallet to drive the axle (10) out from the opposite side and remove it.

Remove the wheel and recover the spacers (3) and (9).



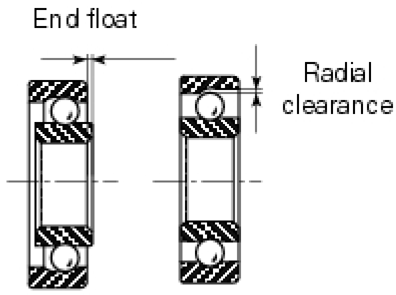


Working from both sides, remove the oil sealing ring (4).

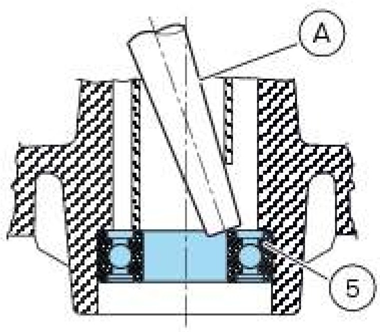
Overhauling the front wheel

Wheel bearings

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



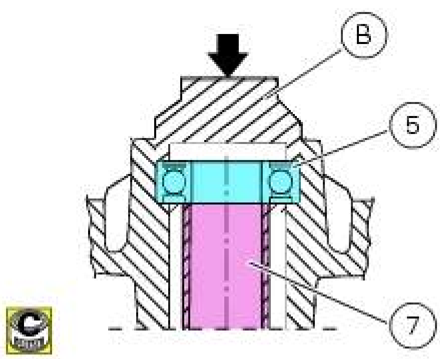
To remove the bearings (5) and the sealing rings (4) from the wheel hub follow the instructions below.
Position a drift (A) against the inner race of the bearing (5).
Tap with a hammer until knocking out the bearing (5).
Apply the drift at different points to keep the bearing square during removal.



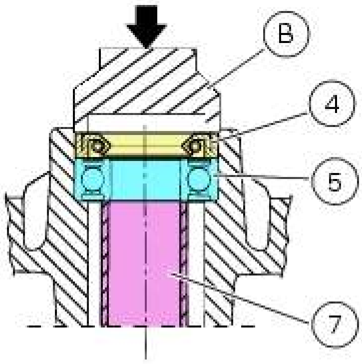
Important

Once removed, the used bearings and sealing rings must not be refitted.
Before fitting new bearings, check that the housing is clean and free from scoring and damage.

Grease the bearing seat and then push the new bearing into its seat.
Using a tubular drift (B) that only bears on the outer race of the bearing, drive the bearing (5) fully into its seat.



Use the same method to install the sealing rings (4).
Ensure that spacer (7) is fitted between the two wheel bearings.

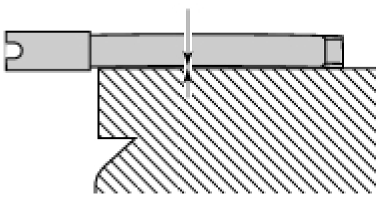


Note

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

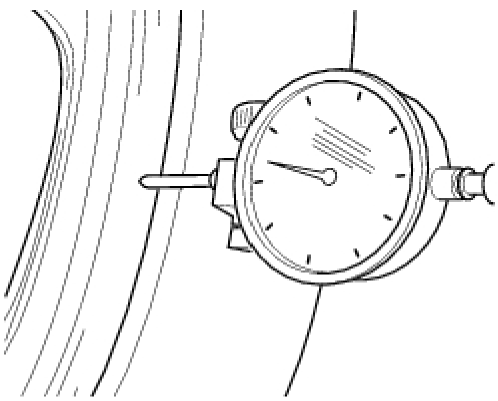
Inspecting the wheel axle

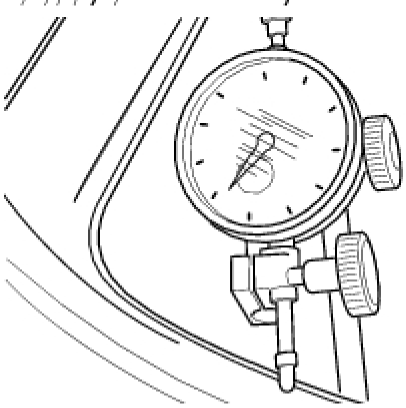
Check the wheel shaft for straightness.
Turn the pin on a reference surface and measure maximum distortion using a feeler gauge (see Sect. 3 - 1.1, Front wheel).



Overhauling the wheel

After you have checked the bearings, check the rim as follows.
Visually inspect the wheel for cracks, scoring and deformation; change the wheel if damaged.
Insert the shaft in the wheel and mount it on two fixed reference blocks.
Using a dial gauge, measure rim run-out and out-of-round relative to the pin axle (see Sect. 3 - 1.1, Front wheel).

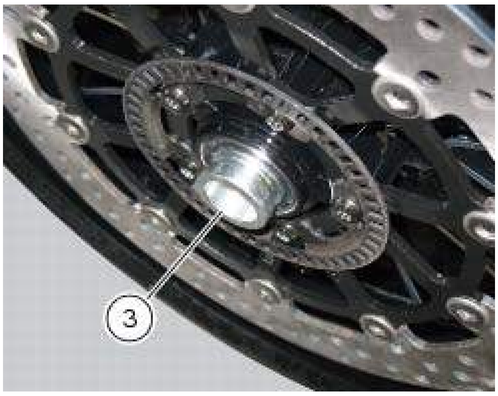


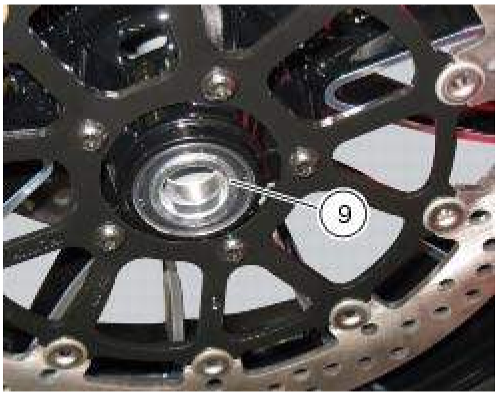


If the values measured are not within the tolerance limits, renew the wheel.

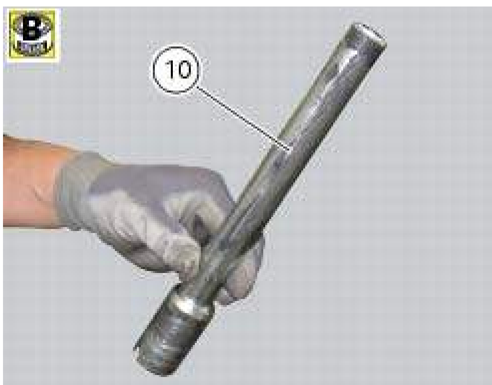
Refitting the front wheel

When all the necessary inspections have been completed, refit the wheel as follows.
Fit the spacers (3) and (9) to the seal rings on the sides of the wheel hub.





Install the complete wheel between the fork legs.
Lubricate the shank and thread of the wheel axle (10).

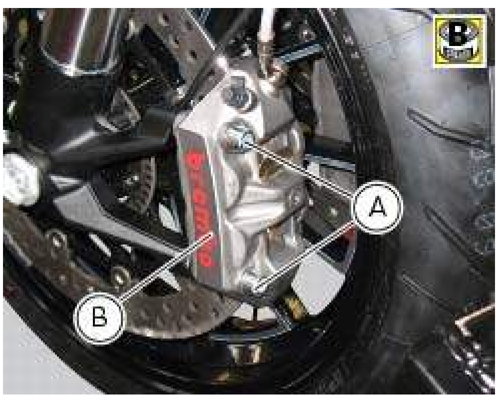


Take the pin (10) fully into the wheel hub.

Fit the washer (2) on the end of the axle.
Grease the thread and the underside of the head of the axle lock nut (1), then screw it on.

Tighten the nut (1) to the torque of 63 Nm ± 5% (Sect. 3 - 3, Frame torque settings).

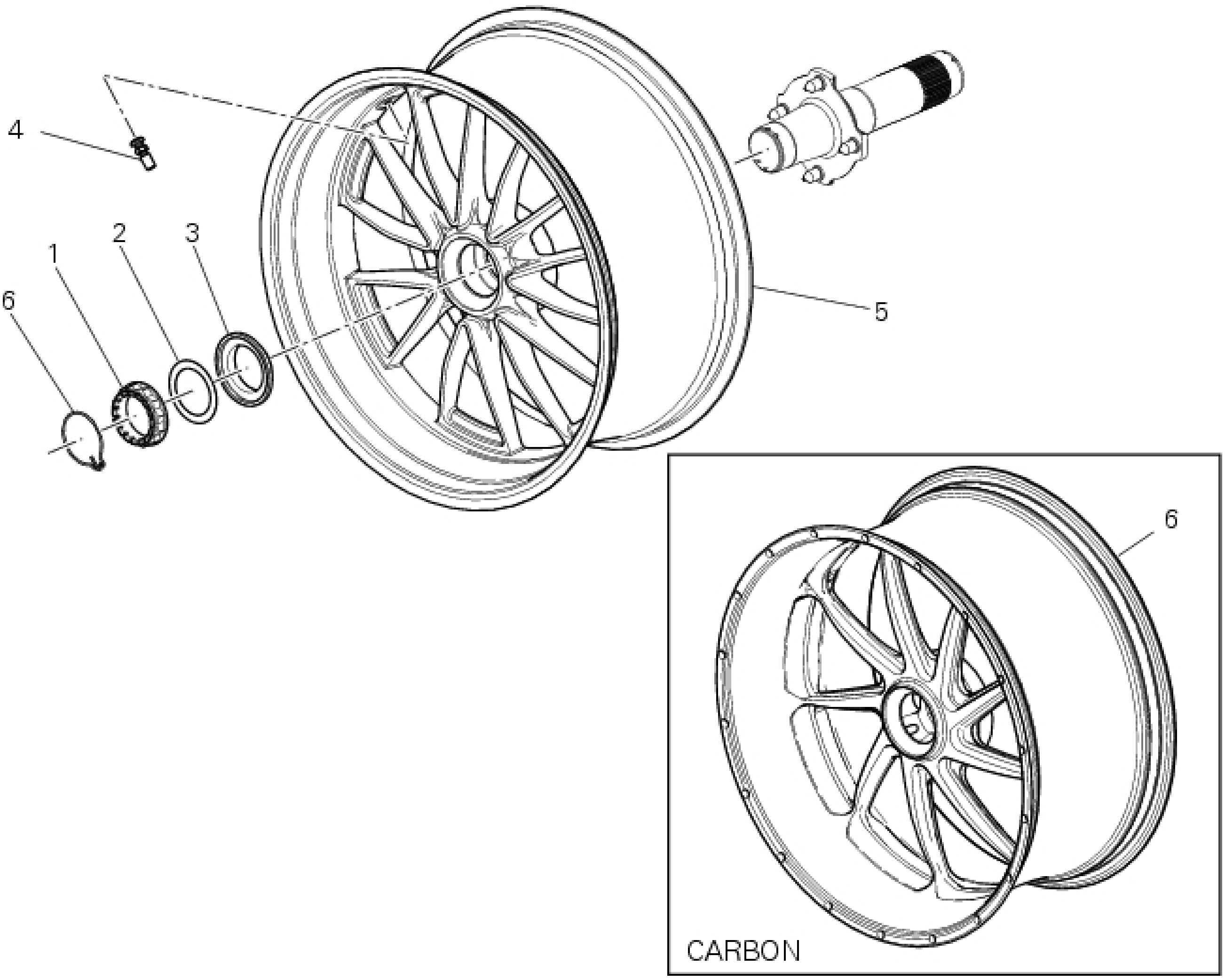
Grease the threads and undersides of the heads of screws (A).
Tighten the two retaining screws (A) of the brake callipers (B) to a torque of 2 Nm ± 10%. (Sect. 3 - 3, Frame torque settings)
Operate the front brake lever two or three times.
Hold the lever pulled towards the handgrip and simultaneously tighten the screws (A) to a torque of 44 Nm ± 5%(Sect. 3 - 3, Frame torque settings).



Before tightening the screws (8), lower the bike to the ground and push up and down on the handlebar to load the suspension; so the fork legs will become properly seated onto the wheel shaft.
Tighten the screws (8) to a torque of 10 Nm ± 5% (Sect. 3 - 3, Frame torque settings), proceeding in a 1-2-1 sequence.

Front wheel

2 -Rear wheel



1 Right-hand wheel nut
2 Washer
3 Spacer
4 Valve
5 Wheel
6 Circlip

Spare parts catalogue

Diavel ABS	FRONT AND REAR WHEELS
Diavel Carbon ABS	FRONT AND REAR WHEELS

Important
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Removing of the rear wheel

Operations	Section reference
Remove the silencer	8 - 8, Removal of the exhaust system

Place the motorcycle on the rear service stand and engage the 1st gear.
Remove the clip (6).

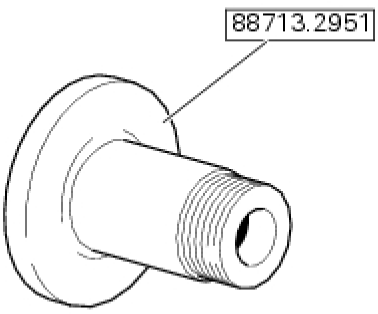
Using a suitable socket wrench, loosen the wheel nut (1).
Fully unscrew the nut (1), then remove the washer (2) and the spacer (3).
Remove the rear wheel from the motorcycle.

Overhauling the rear wheel

Inspect the condition of the rear wheel.
As the wheel rim has no bearings, it should be supported using the service tool code **88713.2951**.

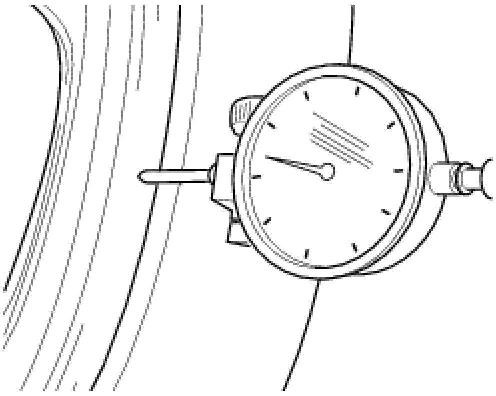
Note

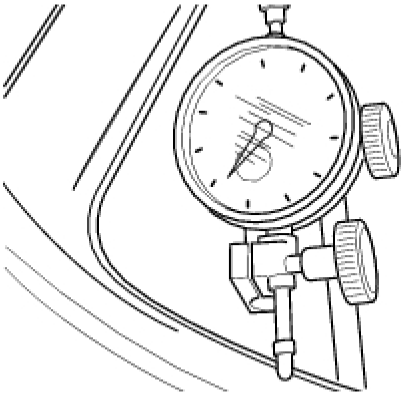
This service tool can also be used to install the wheel on a balancing machine.



Overhauling the wheel

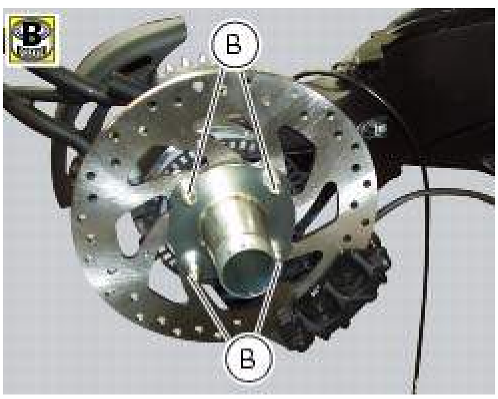
Inspect the wheel as described below.
Visually inspect the wheel for cracks, scoring and deformation; change the wheel if damaged.
Fit the wheel rim on service tool code **88713.2951** using the original fasteners.
Using a dial gauge, appropriately supported, measure wheel rim run-out and out-of-round according to the wheel axle (Sect. 3 -1.1, Rear wheel).
If the values measured are not within the tolerance limits, renew the wheel.





Refitting the rear wheel

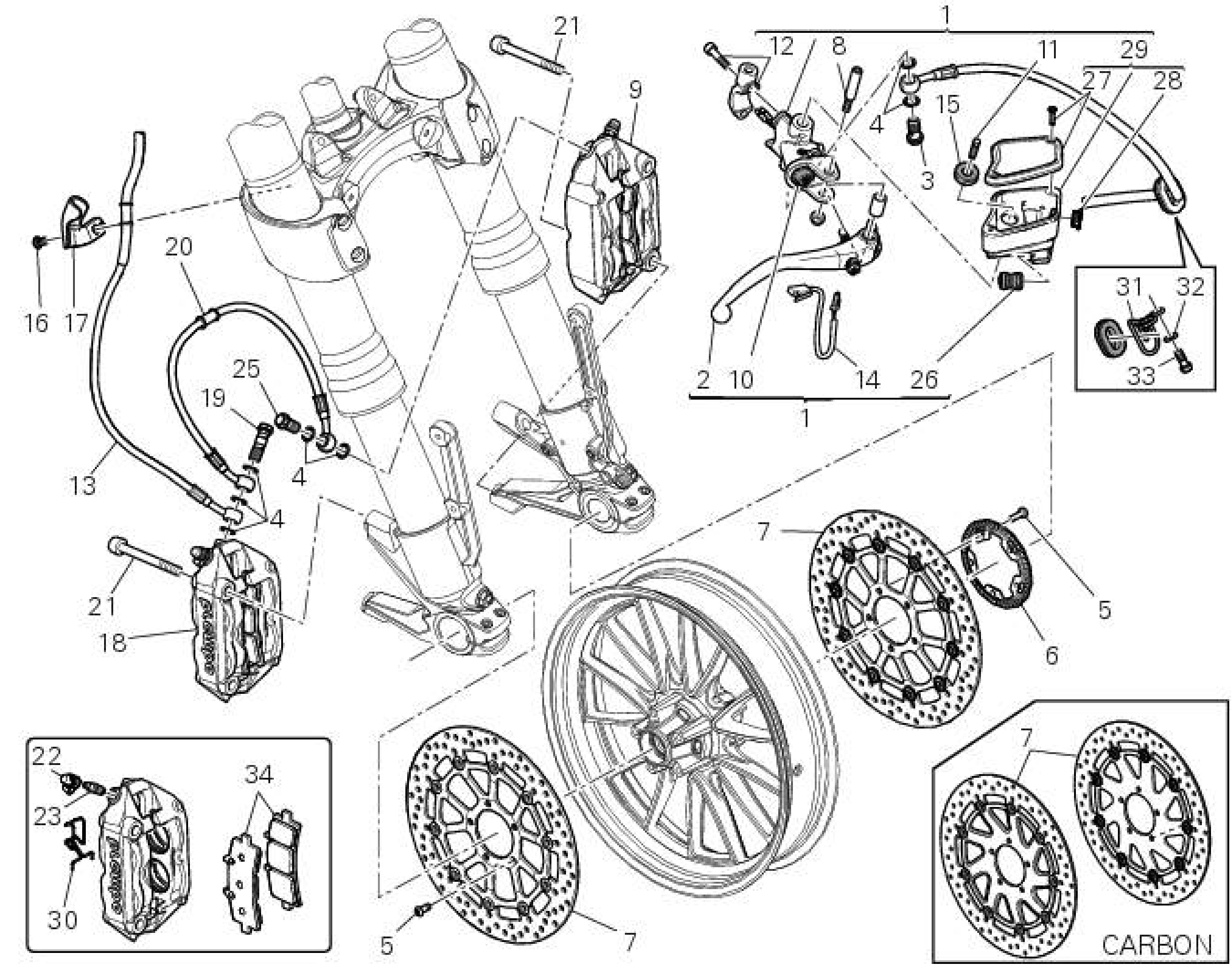
Lubricate the wheel shaft threaded end with prescribed grease.
Insert the wheel shaft by matching (A) with pins (B).



Install spacer (3) with the conical surface faced to the wheel conical surface, washer (2), apply prescribed grease to nut (1) and insert it by hand (1).
Tighten the nut (1) to a torque of 230 Nm ± 10% (Sect. 3 - 3, Frame torque settings) checking that the hole on the nut is aligned with those in the wheel axle.
Fit the clip (6), inserting the end of one of the holes in the axle, orienting it a shown.

Rear wheel

3 -Front brake control



1 Front brake master cylinder
2 Brake lever
3 Special screw
4 Sealing washer
5 Screw
6 Phonic wheel
7 Brake disc
8 Pin
9 Left brake calliper
10 Boot
11 Bleed valve
12 Spare stand
13 Control unit - front callipers pipe
14 Microswitch
15 Oil duct union
16 Screw
17 Hose clip
18 Right brake calliper
19 Special screw
20 Front brake hose
21 Screw
22 Dust cap
23 Bleed valve
24 Front pump - control unit pipe
25 Special screw
26 Union
27 Plug
28 Inspection plug (replacement part)
29 Fluid reservoir assembly
30 Clip
31 Hose clip
32 Washer

33 Screw
34 Pair of brake pads

Spare parts catalogue

Diavel ABS	FRONT BRAKE
Diavel ABS	FRONT AND REAR WHEELS
Diavel Carbon ABS	FRONT BRAKE
Diavel Carbon ABS	FRONT AND REAR WHEELS

Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Removal of the front brake master cylinder

Warning

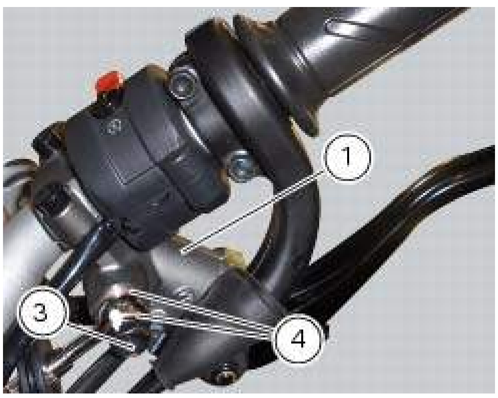
The brake master cylinder manufacturer advises against servicing the brake master cylinder due to the safety critical nature of this component. Incorrect overhaul of these critical safety components can endanger rider and passenger safety. Maintenance operations on these units are limited to renewal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

Operations	Section reference
Drain the braking system	4 - 3, Changing the brake fluid
Remove the rear-view mirrors	5 - 1, Removal of the rear-view mirrors

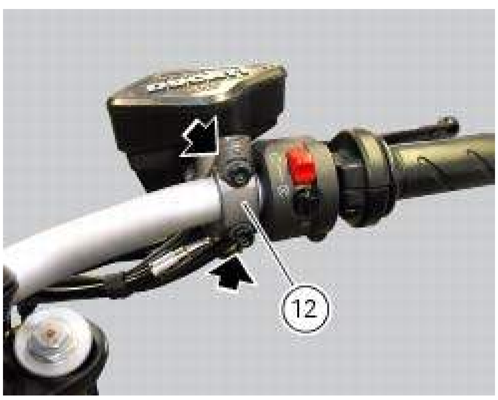
Note

For the ABS front braking system, also refer to Sect. 7 - 5, ABS system operating information, Sect. 7 - 6, System components, Sect. 7 - 7, ABS components maintenance.

Undo the special screw (3), collect the sealing washers (4), and release the front brake master cylinder assembly (1) from the pipe.



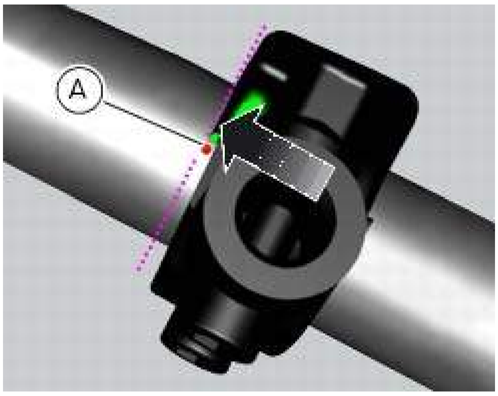
Loosen the screws securing the terminal (12) and then remove the front brake master cylinder assembly (1) from the handlebar.



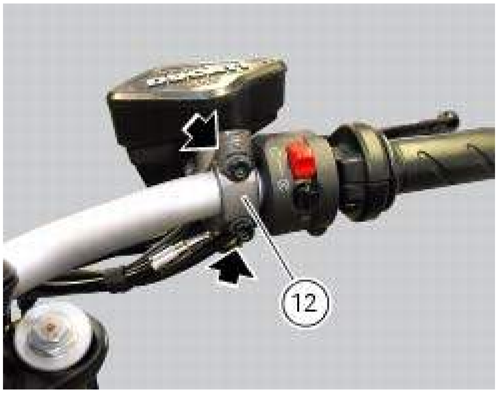
For disassembly of components of the master cylinder assembly (1), refer to the exploded view at the beginning of this chapter.

Refitting the front brake master cylinder

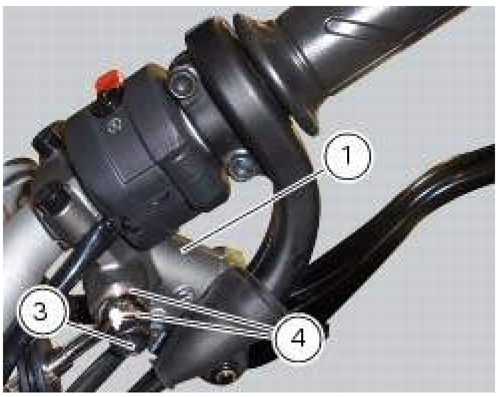
Insert the front brake master cylinder unit (1) on the right side of the handlebar to bring the terminal internal edge in correspondence to the bolted joints (A).



Fit the terminal (12) on the handlebar inserting the screws (15).
Tighten the terminal (12) retaining screws to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings) following the sequence 1-2-1 starting from the upper screw.



Locate the pipe with sealing washers (4) on the master cylinder assembly (1) and secure it with the special screw (3), without tightening it.



Warning

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

Orientate the pipe (24) as illustrated in the figure and then tighten the special screw (3) to a torque of 23 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
In order to fit the pipe (24) and the retaining clips, follow instructions in Sect. 7 - 6, Flexible wiring/hoses positioning.

Operations	Section reference
Refit the rear-view mirrors	5 - 1, Refitting the rear-view mirrors
Fill the brake circuit	4 - 3, Changing the brake fluid

Maintenance operations

Warning
Brake fluid is corrosive and will damage paintwork. Avoid contact with eyes and skin. In case of accidental contact, wash the affected area with abundant running water and consult a doctor if necessary.

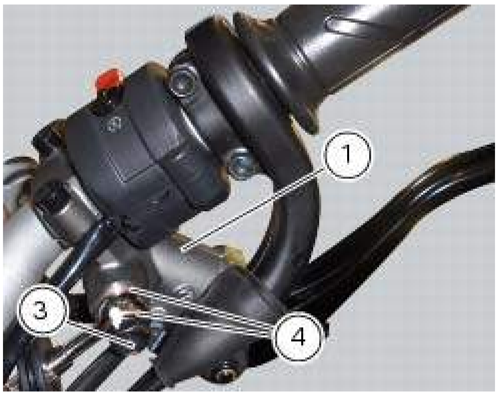
For all the maintenance operations (wear check and replacement of brake pads and brake fluids, etc.) see Sect. 4 - 3, Maintenance operations.

Removal of the front brake system

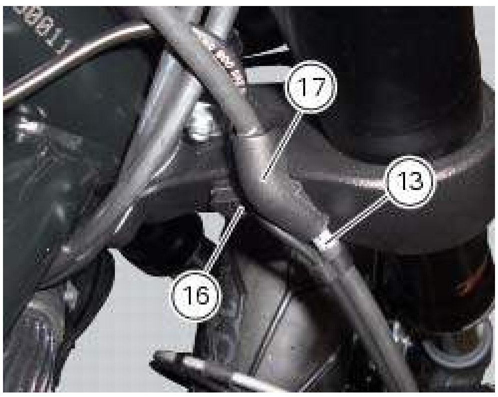
Operations	Section reference
Empty the front braking system	4 - 3, Changing the brake fluid

Note
For the ABS front braking system, also refer to Sect. 7 - 5, ABS system operating information, Sect. 7 - 6, System components, Sect. 7 - 7, ABS components maintenance.

Undo the special screw (3), collect the sealing washers (4), and release the front brake master cylinder assembly (1) from the pipe.

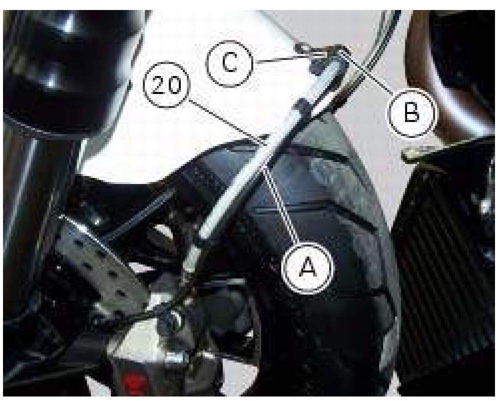


Tighten the screw (16) and slide the front brake pipe (13) from the bracket (17) on the yoke base.

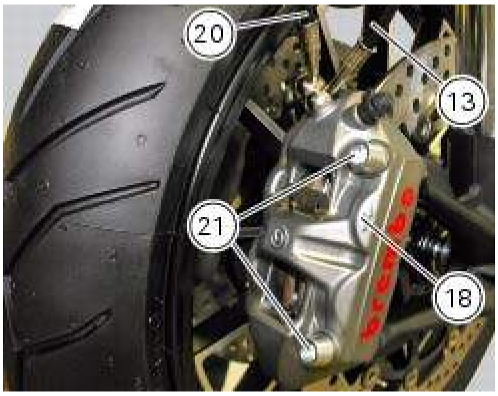


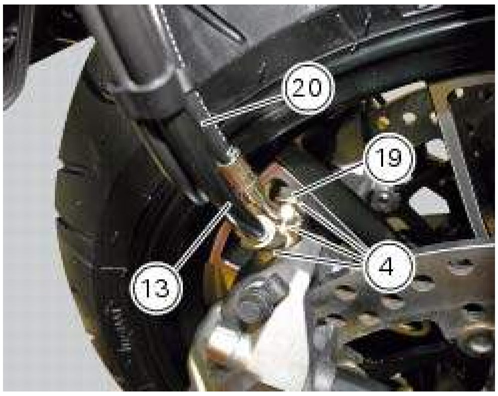
Loosen screw (C) to remove front brake hose (20) and the ABS sensor cable (A) from hose clip (B).

Warning
While removing the front brake hose, if you damage the hose clip (B) you shall renew it (Sect. 5 - 4, Removal of the front mudguard).
If hose is not fastened by hose clip (B), it might interfere with tyre under braking and provoke accidents.



Unscrew the two fixing screws (21) of the left front brake calliper (9) to the fork leg.
Repeat the operation for the right brake calliper (18).
Undo the special screws (19) and (25) and collect, from both callipers, the sealing washers (4).
Detach the front brake callipers from the pipe (13) and (20).





Removal of the brake discs

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

Remove the front wheel (Sect. 7 - 1, Removal of the front wheel).
Undo the retaining screws (5) of the disc to the wheel, remove the disc (7) and, on its left side, slide out the phonic wheel (6).

Overhauling the front brake components

Important

Critical safety components. The brake calliper manufacturer recommends that you do not attempt to service the internal components of the brake callipers. Incorrect overhaul of this component could endanger rider safety.

Operations should be limited to renewal of the pads, fasteners and the bleed valve assembly.
Refer to the exploded view at the beginning of this section for indications on renewal of the above components.
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 disks follow the data detailed in Sect. 3 - 1.1, Hydraulic brakes.

Refitting the brake disks

Before refitting the brake disc to the wheel, clean all contact surfaces thoroughly and smear a medium strength threadlocker on the threads of retaining screws (5).
Operating on the left side, fit the phonic wheel (6).
Tighten the fixing screws (5) of the brake disk (7) to the wheel following this sequence: 1-3-5-2-4.

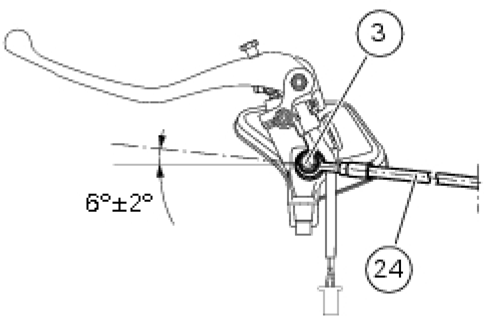
Tighten the screws (5) to the torque of 25 Nm ± 5% (Sect. 3 - 3, Frame torque settings).
Refit the wheel on the motorcycle (Sect. 7 - 1, Refitting the front wheel).

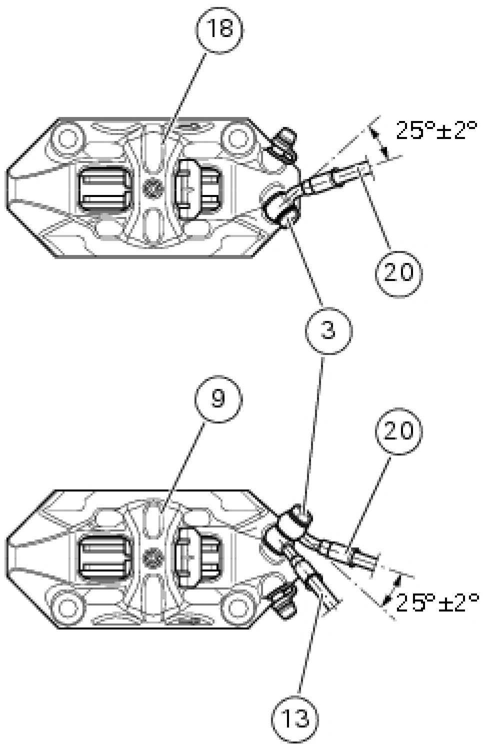
Refitting the front brake system

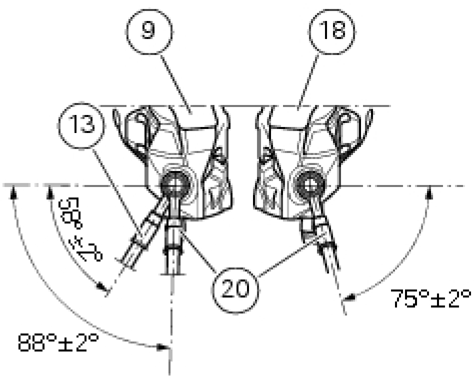
While refitting the system, pay special attention to the orientation of the pipe couplings (24) on the pump and the pipes (13) and (20) on the callipers (9) and (18).

Warning

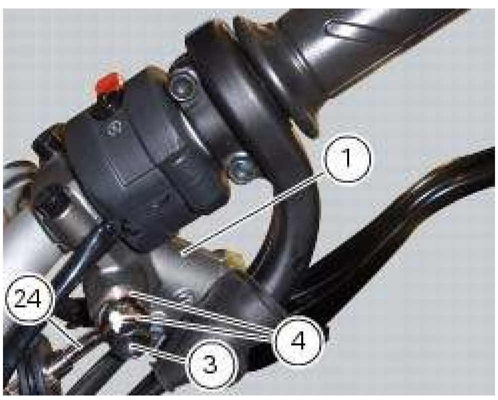
If incorrectly positioned, the hose can affect brake operation and foul moving parts. Position the hose as shown in the figure.







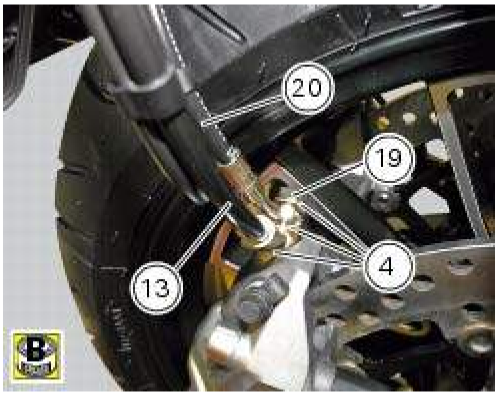
When reconnecting the brake hose to the calliper or master cylinder, make sure to install the sealing washers (4) either side of the hose end fitting.
After having oriented the pipe fitting (24) tighten the screw (3) to a torque of 23 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

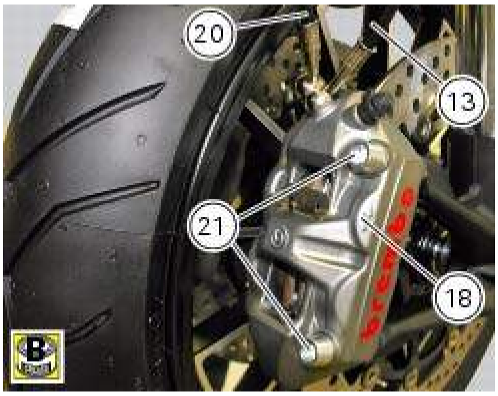


After having oriented the pipes (13) and (20) in the front brake callipers (18) and (9) tighten the special screws (19) and (25) to a torque of 23 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

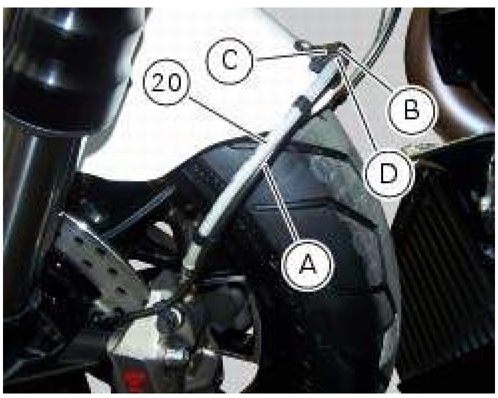
Note
Make sure that internal pipe fitting (13) and the external pipe fitting (20) are installed in the left brake calliper (9).

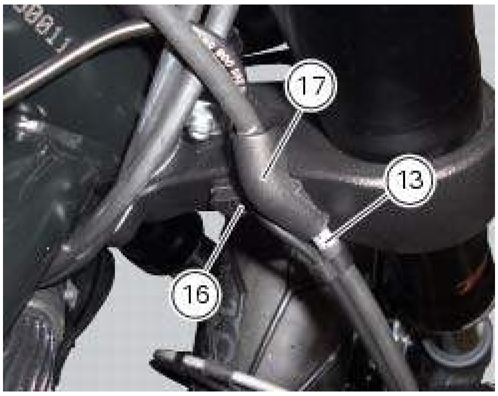
Fit the left calliper (9) over the disk.
Apply the recommended grease to the screws (21).
Hand tighten the screws (21) to secure the callipers to the fork legs.
Operate the brake lever two or three times until the circuit is pressurised and force the pads against the brake disc.
Repeat the operation for the right brake calliper (18).





Hold the lever pulled towards the twistgrip and tighten the calliper screws (21) to the torque of 45 Nm ± 5% (Sect. 3 - 3, Frame torque settings).
Insert brake rubber block (D) into grommet (B) and ensure it is centred.
Fold hose clip (B) and fasten it by starting the screw (C) in its thread.
Insert hose (13) in bracket (17) and tighten screw (16) to a torque of 8 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

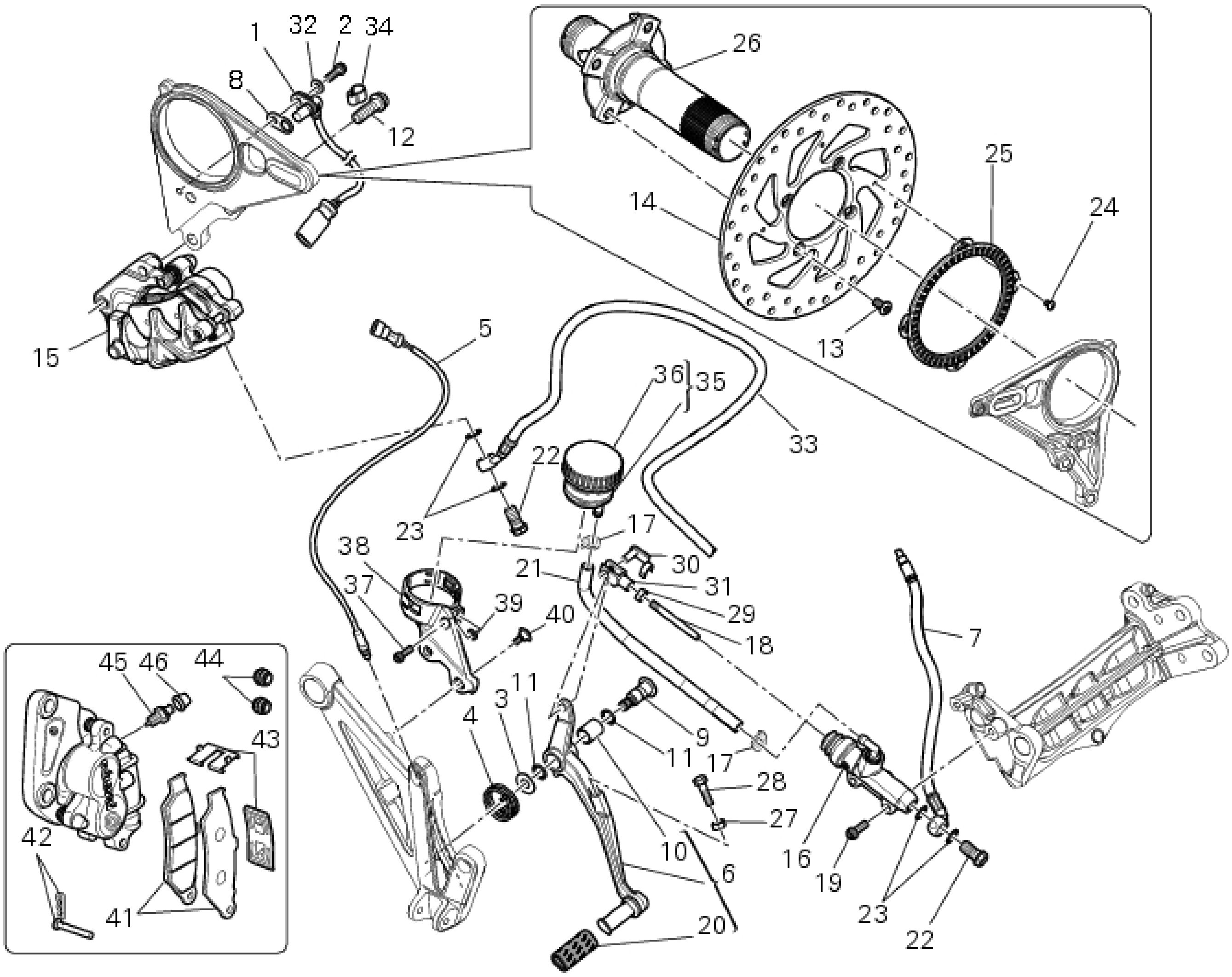




For correct position of the ties fastening the ABS sensor cable (A) to front brake lines (20), please refer to Sect. 7 - 6, Flexible wiring/hoses positioning.

Operations	Section reference
Filling of the front braking system	4 - 3, Changing the brake fluid

4 -Rear brake



1 Rear speed sensor (ABS)
2 Screw
3 Washer
4 Spring
5 Brake switch (rear)
6 Brake lever (rear)
7 Rear pump - control unit pipe
8 Sealing washer
9 Pin
10 Bush
11 O-ring
12 Screw
13 Screw
14 Rear brake disc
15 Rear brake calliper
16 Rear brake master cylinder
17 Hose clip
18 Pushrod
19 Screw
20 Rubber pad
21 Hose
22 Special screw
23 Sealing washer
24 Screw
25 Phonic wheel
26 Rear wheel shaft
27 Nut
28 Screw
29 Nut
30 Quick-release fastener
31 Fork
32 Washer

33 Control unit - rear calliper pipe
34 Cable grommet
35 Fluid reservoir assembly
36 Plug
37 Screw
38 Support
39 Spacer
40 Screw
41 Pair of brake pads
42 Spare clip pins
43 Clip spring
44 Boot
45 Bleed valve
46 Dust cap

Spare parts catalogue

Diavel ABS	REAR BRAKE
Diavel ABS	ANTILOCK BRAKING SYSTEM (ABS)
Diavel ABS	REAR WHEEL AXLE
Diavel Carbon ABS	REAR BRAKE
Diavel Carbon ABS	ANTILOCK BRAKING SYSTEM (ABS)
Diavel Carbon ABS	REAR WHEEL AXLE

Important
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Removing of the rear brake control

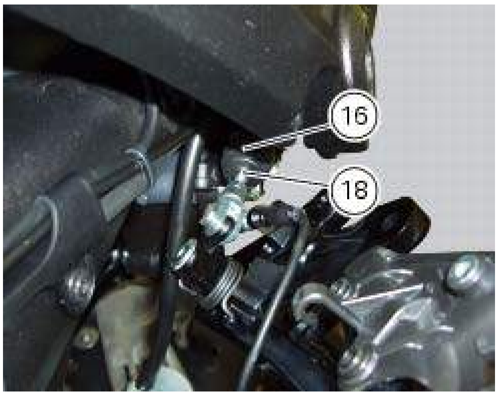
Warning
The brake master cylinder manufacturer advises against servicing the brake master cylinder due to the safety critical nature of this component.
Incorrect overhaul can endanger the rider and passenger.

Maintenance operations on these units are limited to renewal of the following parts: control lever, fluid reservoir assembly and relative fasteners and master cylinder fasteners.

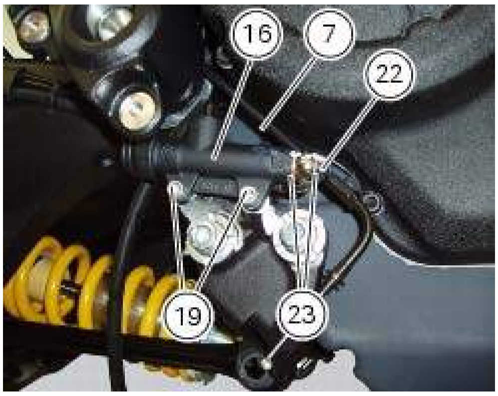
Operations	Section reference
Empty the rear braking system	4 - 3, Changing the brake fluid
Disconnect the rear stop switch from the main wiring	6 - 1, Routing of wiring on frame
Remove the RH footrest bracket	7 - 15, Removing of the rear footrests

Note
For the ABS front braking system, also refer to Sect. 7 - 5, ABS system operating information, Sect. 7 - 6, System components, Sect. 7 - 7, ABS components maintenance.

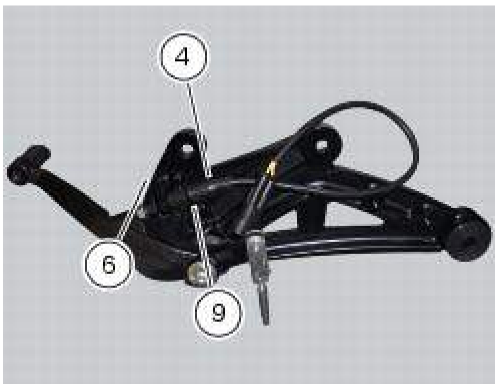
Slide the adjusting rod (18) out of the rear brake master cylinder (16).



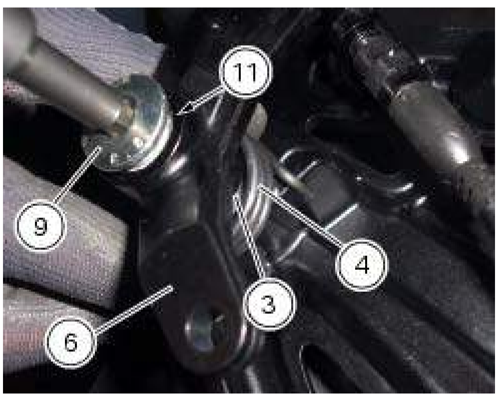
Loosen the special screw (22) from the master cylinder (16); slide out the hose (7) and recover the sealing washers (23).
Loosen the rear brake master cylinder (16) retaining screws (19) and remove it from the vehicle.



Undo the fixing pin (9) of the brake lever (6), collecting the spring (4).

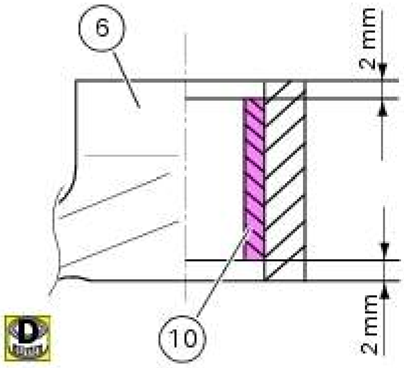


Remove the brake lever (6) and collect the pin (9), the washer (3), the bush (**10**) and the O-ring (11).



Disassembly of the rear brake control

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



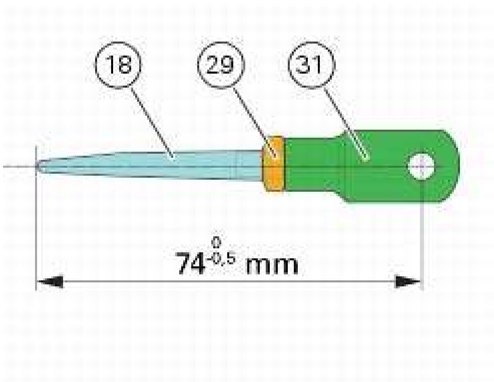
To disassemble the various parts of the system, refer to the exploded view at the beginning of this chapter.

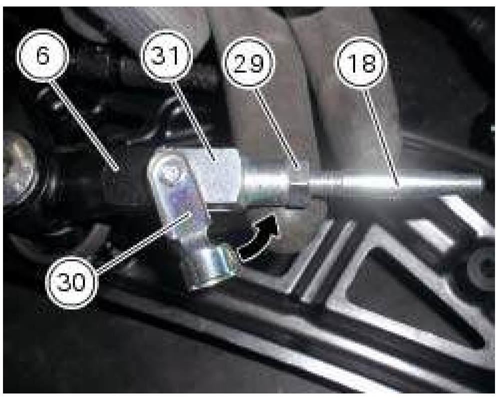
Warning

After performing an operation on the rear brake control, check the brake pedal position following the instructions detailed in Sect. 4 - 3, Adjusting the position of the gear change and rear brake pedals.

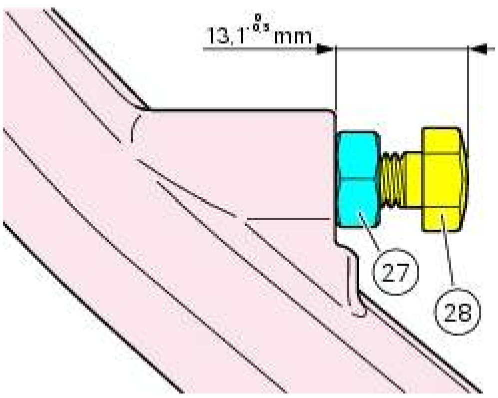
Refitting the rear brake control

If the pushrod (18), clip (30) and fork (31) assembly has been dismantled, reassemble it by screwing the nut (29) onto the rod (18) and then screw the rod into the fork (31) to obtain the measurement indicated in the figure.
Block the rod and tighten to a torque of 7.5 Nm ± 10% (Sect. 3 - 3, Frame torque settings) the nut (29) on the fork (31).
Fit the pushrod assembly (18) on the lever (6) fixing it with the quick-release fastener (30).



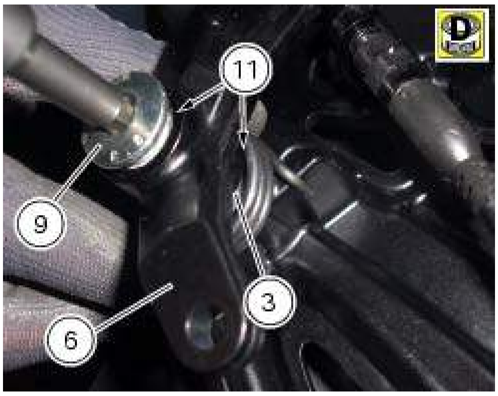


Check that the adjuster screw (27) and nut (28) are positioned at the distance apart shown.



Apply specific grease to the non-threaded surface of the pin (9).
Fit the first O-ring (11) in the pin (9).

Insert the pin (9) on the brake lever (6), apply the recommended grease to the seat of the second O-ring (11) of the lever (6) and place the other O-ring (11) and the washer (3).

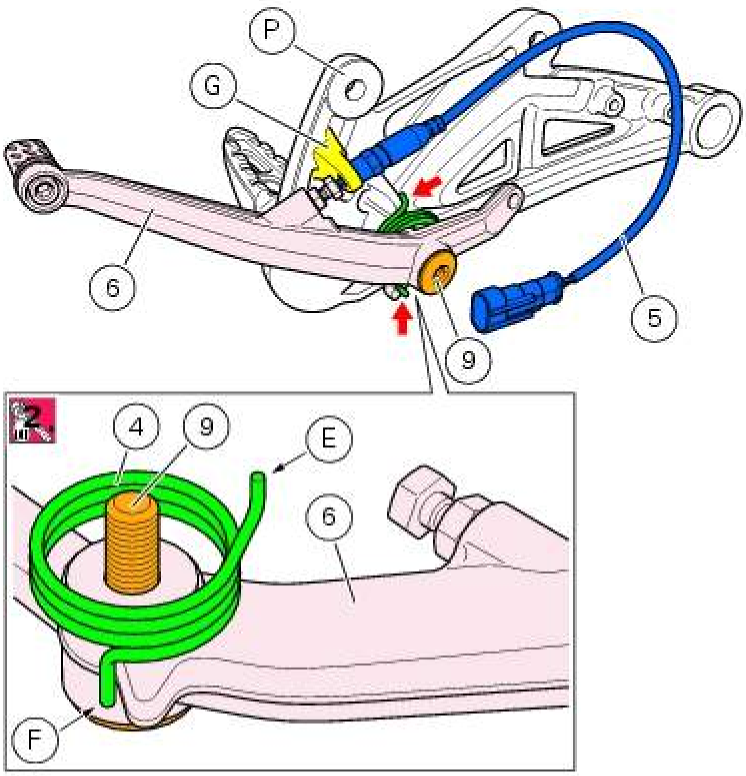


Fit the spring (4) on the rear brake lever (6) observing the orientation shown.
Apply the recommended threadlocker to the threaded side of the pin (9).
Fit the brake lever (6) on the footrest bracket (P) inserting the pin (9).

Note

On refitting, place the end (E) of the spring against the suitable rib of the bracket (P), making sure the other end (F) of the spring remains in place as shown.

Fit the rear stop sensor wire (5) tightening it manually onto bracket (G) and then to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

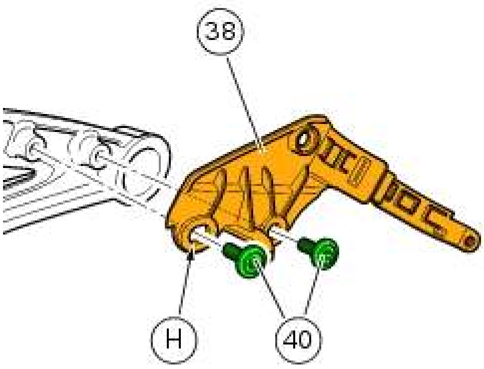


If removed, refit the master cylinder (38) on the bracket by starting the screws (40).

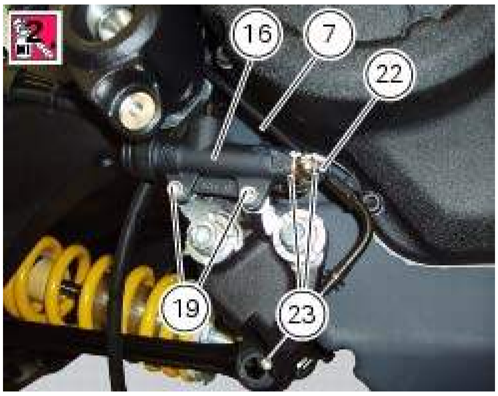
Note

Start the screw (40) first; this is the screw that sits in the slot (H).

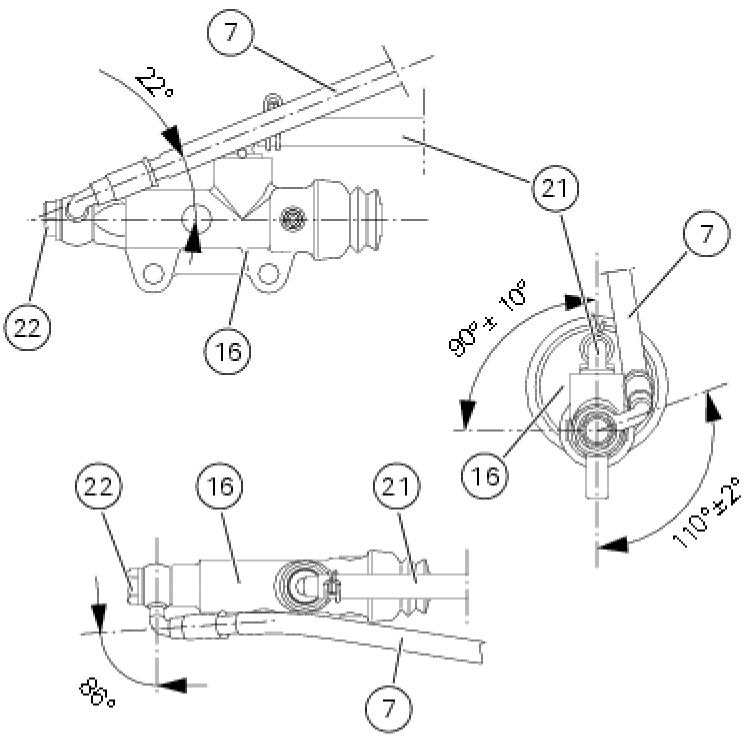
Tighten the screws (40) to a torque of 4 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



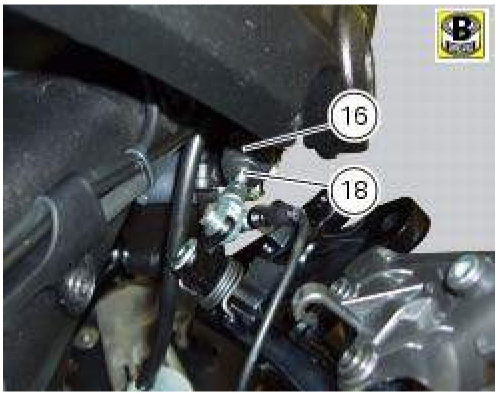
Reconnect the hose (7), locating the sealing washers (23) on both sides of the hose end fitting, and secure it with the special screw (22).
Tighten the special screw (22) to a torque of 23 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



Note
Pay special attention to the pipes (7) and (21) orientation on the rear brake master cylinder (16).



Insert the rod (18) inside the pump (16), after applying the recommended grease.



Operations	Section reference
Refit the RH footrest bracket	7 - 15, Refitting the rear footrests
Connect the rear stop switch to the main wiring	6 - 1, Routing of wiring on frame

Removal of the rear brake calliper

Important

The brake manufacturer advises against any servicing of the internal components of brake callipers or the master cylinder. Incorrect overhaul of these critical safety components can endanger rider and passenger safety.

Before removing the parts in question, you must first carry out the following operations:

Operations	Section reference
Drain the rear brake circuit	4 - 3, Changing the brake fluid

Note

For the ABS front braking system, also refer to Sect. 7 - 5, ABS system operating information, Sect. 7 - 6, System components, Sect. 7 - 7, ABS components maintenance.

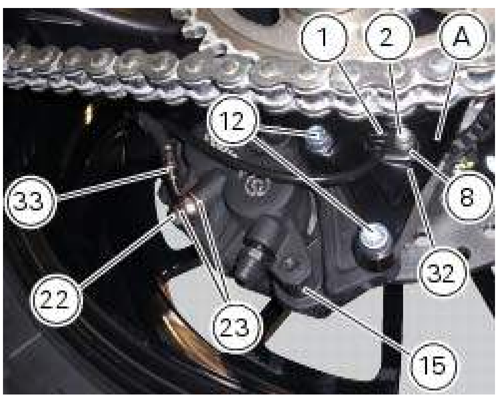
Unscrew and remove the special screw (22) fixing the pipes (33) to the rear brake calliper and the corresponding couplings (23).
Remove tube (33).

Undo the two fixing screws (12) of the rear brake calliper (15) to the calliper holder bracket and remove the brake calliper (15).
If it is necessary to remove the calliper holder bracket (A) refer to Sec. 7 - 13, Removal of the rear wheel eccentric hub and rear wheel shaft.

Note

To replace the brake pads follow instructions in the paragraph “Checking brake pad wear and changing brake pads” (Sec. 4 - 3).

To remove the speed sensor (1), undo the retaining screw (2), having care not to damage the airgap spacer (8) and the washer (32).



Only the following parts should be renewed:

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

Refer to the exploded view at the beginning of this section for indications on renewal of the above components.

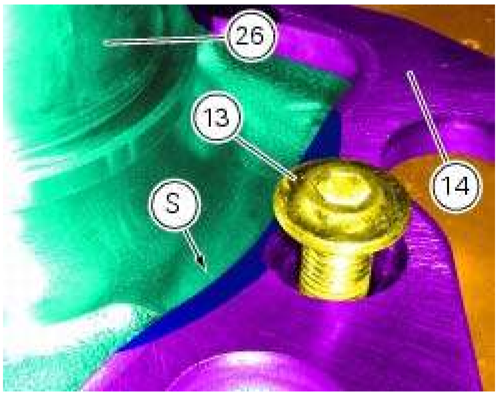
Removal of the rear brake disc

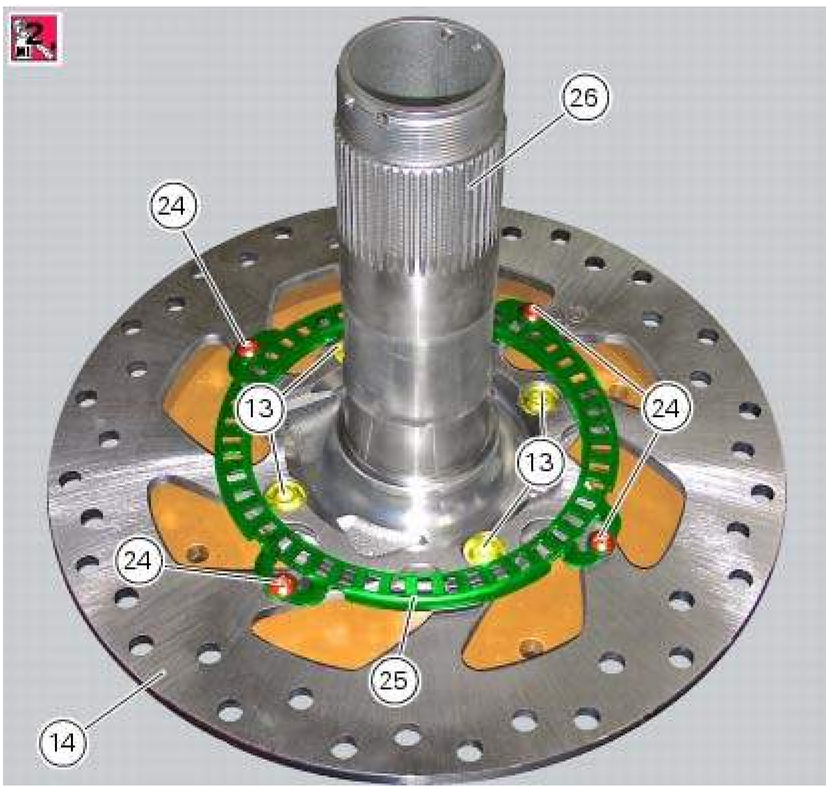
Remove the rear eccentric hub (Sec. 7 - 13, Removal of the rear wheel eccentric hub and rear wheel shaft).
Undo and remove the four fixing screws (13) of the brake disk to the wheel axle and remove the rear brake disk (14).
Loosen the four screws (24) and remove the rear phonic wheel (25).
The brake disc must be perfectly clean, with no rust, oil, grease or other dirt and no deep scoring.
To check the wear limit of the brake disk refer to Sec. 3 - 1.1, Hydraulic brakes.
Place the rear brake disc (14) on the rear wheel shaft (26), by orienting the bevelled edges (S) faced upwards.
Fix the disc by starting the screws (13) with prescribed threadlocker.

Note

Make sure to centre the screw heads in the relevant seats on the brake discs.

Tighten the screws (13) to a torque of 27 Nm ± 10% (Sect. 3 - 3, Frame torque settings), in the sequence 1-2-3-4.
Position the phonic wheel (25) on the brake disc (14) by orienting it as shown in figure.
Fix the phonic wheel (25) by starting the screws (24) with the recommended threadlocker.
Tighten the screws (24) to a torque of 5 Nm ± 10% in a crossed-pattern sequence.
Refit the rear eccentric hub as described in Sec. 7 - 13, Removal of the rear wheel eccentric hub and rear wheel shaft.



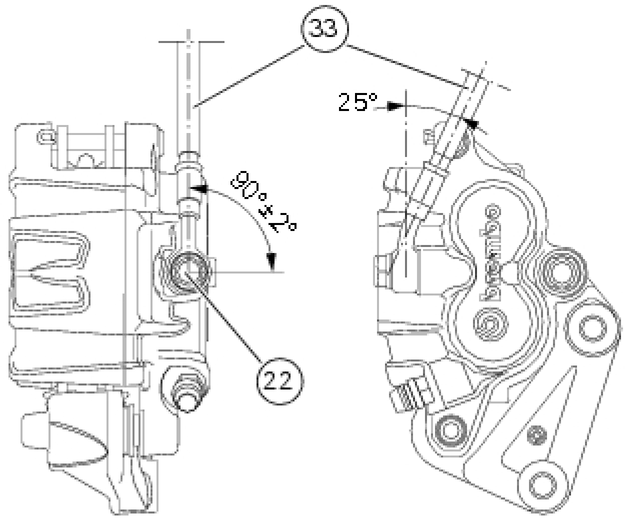


Refitting the rear brake calliper

When replacing the brake pipes (33) or removing one of the rear braking system components, pay special attention to the position of the couplings on the pump and the calliper.

Warning

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



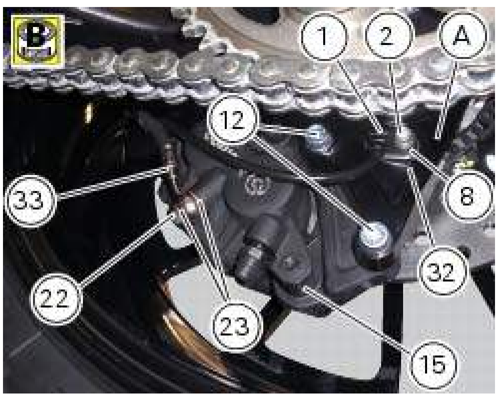
Remember to fit the copper faced sealing washers (23) to the hose end fitting when reconnecting the brake pipe to the brake calliper (15).

After orientating the fitting, lock the special screw (22) to a torque of 23 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
If the speed sensor (1) was removed, fit it on the calliper holder bracket (A) with the spacer (8) and the washer (32) and tighten the screw (2) to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

Note

The gap between the sensor (1) and the brake disc fixing screw must be within **0.6** to **2.2** mm.

If it is necessary to remove the calliper holder bracket (A) in order to refit it, see Sec. 7 - 13, Refitting the rear wheel eccentric hub and rear wheel shaft.
Insert the rear brake calliper (15) on the brake disk, aligning it with the holes of the calliper mounting bracket (A).
Grease the screws (12) and tighten to the torque of 25 Nm ± 5% (Sect. 3 - 3, Frame torque settings).



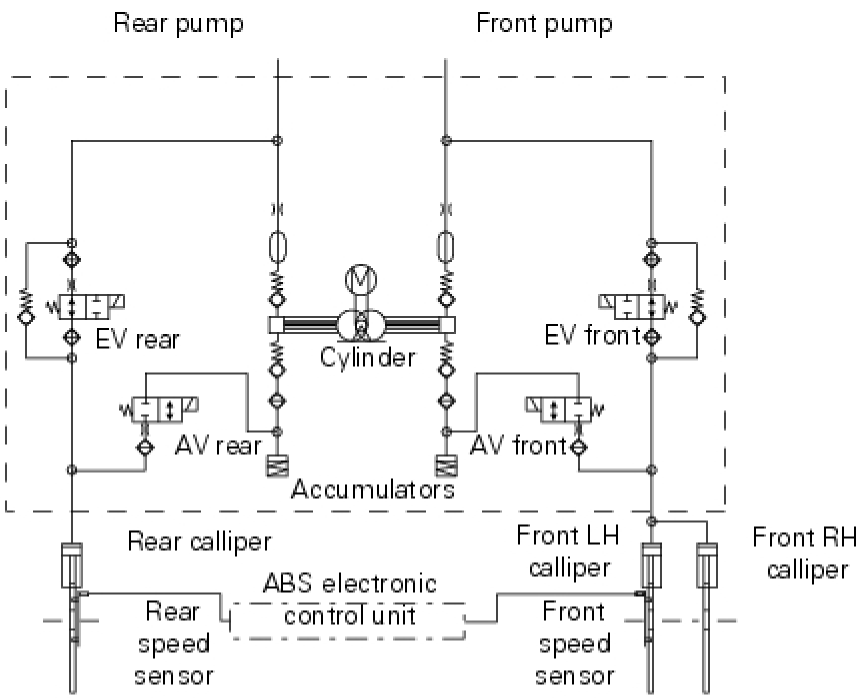
In order to fit the pipe (33), the speed sensor (1) and the retaining clamps follow instructions in Sect. 7-6, Flexible wiring/hoses positioning.

Operations	Section reference
Fill the rear brake circuit	4 - 3, Changing the brake fluid

5 -ABS system information

Operating principle

The Ducati ABS brake system manages the front and rear brakes separately. A pulse generator (phonic wheel), with a ring of slots, is fixed onto each wheel. On the left calliper mounting bracket of the front fork and on the rear brake calliper holder plate are HALL effect sensors which detect the full sections and voids on the phonic wheel as the vehicle moves, providing and instantaneous wheel speed reading. These sensors transmit the data to the ABS control unit, which contains software implementing a specific control algorithm developed by Ducati. The software compares the average speed of the vehicle against the instantaneous wheel speed values to determine the degree of skidding. If the pressure applied to the calliper by the rider causes the control limits to be exceeded, the control unit intervenes in the braking circuit relative to the wheel for which incipient lock-up is detected. The ABS modulates the calliper pressure with a system of solenoid valves that initially prevents any further increase in hydraulic pressure (EV valve closed), and then reduces pressure (AV valve opened). The AV valve is opened in a series of pulses (with less than 10 milliseconds between successive pulses), to reduce pressure in steps. When the wheel begins to rotate again in response to the diminished braking force applied and the wheel speed reaches the reference value, the AV release valve is closed.
Simultaneously, the EV inlet valve is reopened, restoring normal operation of the brake system. The ABS control unit can monitor and modulate brake force accordingly in the three following different conditions: dry road surface (high grip), wet or greasy road surface (poor grip) and uneven road surface. ABS functionality is disabled at vehicle speeds lower than 5 km/h.
A diagram illustrating how the ABS system functions is given below.



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). The hydraulic layout of the ABS system is given below.

Key for ABS hydraulic system layout

EV rear	Rear calliper inlet valve
AV rear	Rear calliper outlet valve
EV front	Front calliper inlet valve
AV front	Front calliper outlet valve

ABS system operating information

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

Note
In the event of the ABS control unit detecting a fault in the ABS electronic management system, it activates the specific fault warning indicator on the dashboard and restores conventional braking functionality without ABS.

Hydraulic faults in the brake system and faults not directly related to the ABS system (e.g.: worn brake pads) cannot be detected by the ABS control unit.

Important

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

ABS diagnosis

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

Select the function “View parameters and states”

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

Viewable parameters

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

Viewable states

Hydraulic pump motor state	Indicates if the electric motor of the hydraulic pump inside the ABS unit is functioning or not.
Valve relay state	Displays the state of the main valve relay inside the ABS unit.
Rear input valve state	Displays the state of the normally open EV1 rear inlet valve (OFF if open, ON if closed).
Front input valve state	Displays the state of the normally open EV4 rear inlet valve (OFF if open, ON if closed).
Front output valve state	Displays the state of the normally closed AV4 rear outlet valve (OFF if closed, ON if open).
ABS switch state	Displays state of the analogue input of the ABS unit for the strategy switch off request (1 state to Uz, 0 state to GND).

Select the function “View errors”

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

Note

While ATT indicates that the error has been diagnosed 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 reopening communication between the diagnostic instrument and the ABS control unit before checking the updated ABS error list again.

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

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

Select the function “ABS system information”

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

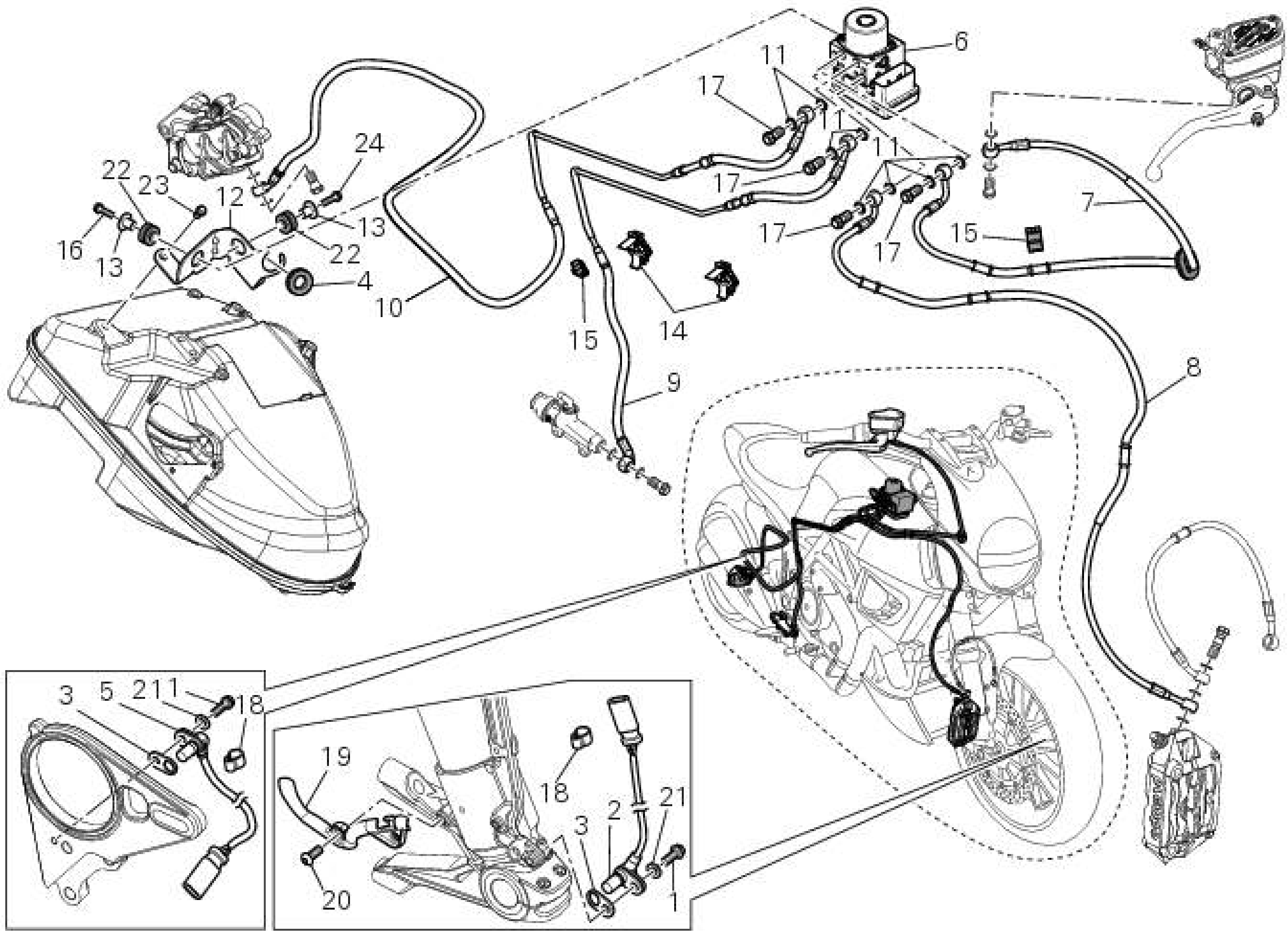
ABS system deactivation

Carry out the procedure described in section Sec. 6 - 7, ABS disabling function.

Warning

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

6 -System components



1 Screw
2 ABS front speed sensor
3 Sealing washer
4 Hose grommet
5 ABS rear speed sensor
6 ABS control unit
7 Front pump - control unit pipe
8 Control unit - front callipers pipe
9 Rear pump - control unit pipe
10 Control unit - rear calliper pipe
11 Sealing washer
12 Support
13 Spacer
14 Hose clip
15 Rubber mounting
16 Screw
17 Special screw
18 Cable grommet
19 Cable grommet
20 Screw
21 Washer
22 Vibration damper mount
23 Screw
24 Screw

Spare parts catalogue

Diavel ABS	ANTILOCK BRAKING SYSTEM (ABS)
Diavel Carbon ABS	ANTILOCK BRAKING SYSTEM (ABS)

Important

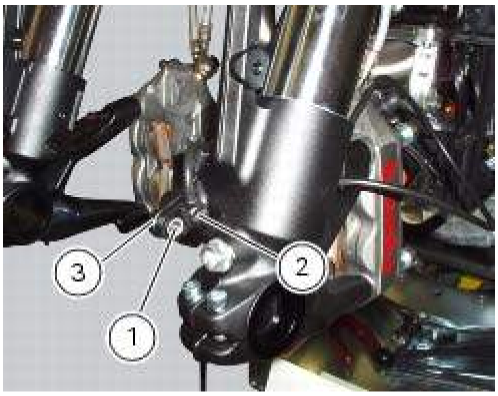
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Replacing the front phonic wheel sensor

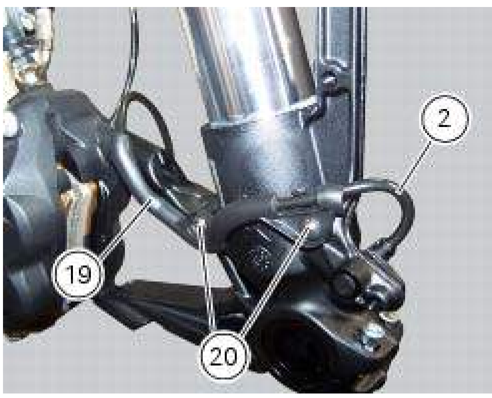
Operations	Section reference
Remove the front wheel	7 - 1, Removal of the front wheel

Disconnect the front ABS sensor (2) connector (A) from the main electric wiring.
Open all the retainer clamps of the front ABS sensor cable (2): refer to table of Sect. 7 - 6, Flexible wiring/hoses positioning.

Loosen retaining screw (1) and remove the front ABS sensor (2) with calibrated gasket (3).



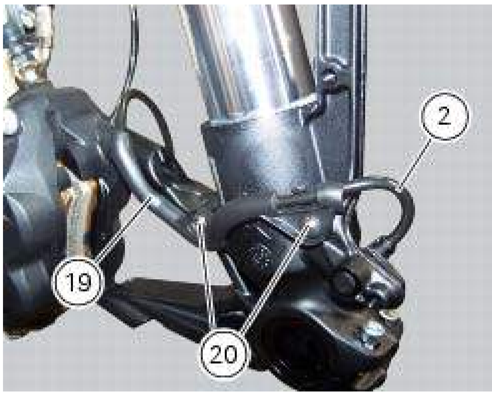
Undo the screws (20), remove the guide (19) and slide out the front ABS sensor cable (2).



Before refitting, make sure that the contact parts between the front ABS sensor (2) and its seat are not damaged and are perfectly clean.

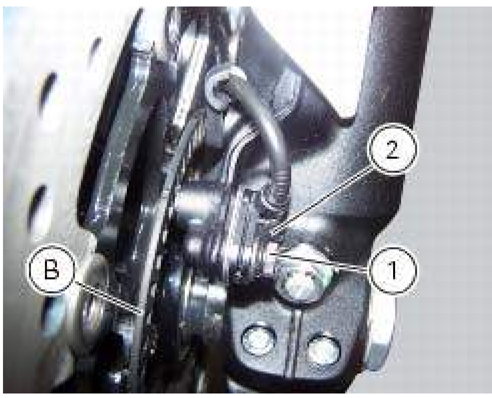
Fit the new front ABS sensor (2) in the relevant seat.

Insert the front ABS sensor cable (2) in the guide (19) and fix it on the LH fork leg by starting the screws (20).
Tighten the screws (20).



Refit the front wheel as indicated in Sect. 7 - 1, Refitting the front wheel.
Connect the connector (A) to the main wiring.
Restore all the retainer clamps of the front ABS sensor cable (2): refer to table of Sect. 7 - 6, Flexible wiring/hoses positioning.

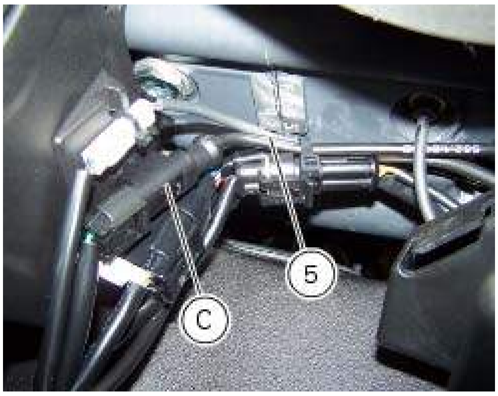
Check the air gap between the front ABS sensor (2) and the front phonic wheel (B) as indicated in Sect. 7 - 7, Adjusting of the AIR-GAP phonic wheel sensor.
Tighten the screw (1) to the torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



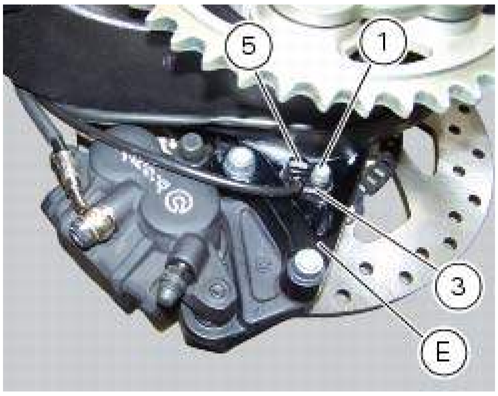
Replacing the rear phonic wheel sensor

Operations	Section reference
Remove the rear mudguard	5 - 4, Removal of the front mudguard
Remove the silencer	8 - 8, Removal of the exhaust system
Remove the rear wheel	7 - 2, Removing of the rear wheel

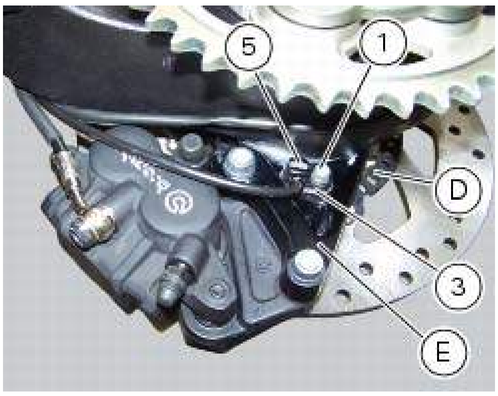
Disconnect the rear ABS sensor (5) connector (C) from the main electric wiring.
Open all the retainer clamps of the rear ABS sensor cable (5): refer to table of Sect. 7 - 6, Flexible wiring/hoses positioning.



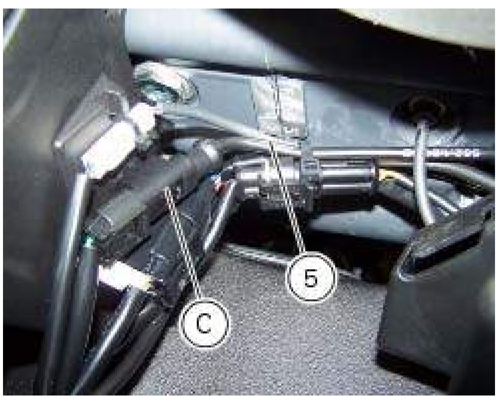
Remove the rear ABS sensor (5) from its seat on the rear calliper mounting bracket (E), undoing the retaining screw (1) and collect the calibrated gasket (3).



Before refitting, make sure that the contact parts between the rear ABS sensor (5) and its seat are not damaged and are perfectly clean.
Fit the new rear ABS sensor (5) on its seat inserting the screw (1).
Check the air gap between the new rear ABS sensor (5) and the rear phonic wheel (D) as indicated in Sect. 7 - 7, Adjusting of the AIR-GAP phonic wheel sensor.
Fix the sensor to the calliper holder bracket tightening the screw (1) to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



Connect the connector (C) to the main wiring.
Restore all the retainer clamps of the rear ABS sensor cable (5): refer to table of Sect. 7 - 6, Flexible wiring/hoses positioning.



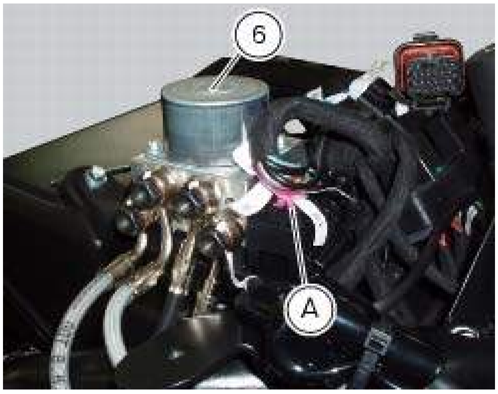
Operations	Section reference

Refit the rear mudguard	5 - 4, Refitting the front mudguard
Refit the rear wheel	7 - 2, Refitting the rear wheel
Refit the silencer	8 - 8, Refitting the exhaust system

Removing of the ABS control unit

Operations	Section reference
Remove the saddles	5 - 3, Removal of the seat
Remove air conveyor covers	8 - 7, Removal of the air filters
Remove the tank half covers	5 - 2, Removal of the fuel tank fairings
Remove the fuel tank	8 - 2, Removal of the fuel tank

Drain the hydraulic fluid that is inside the front and rear braking system tubes by disconnecting them from the master cylinder and the calliper (Sect. 4 -3, Changing the brake fluid).
Disconnect the connector (A) of the ABS control unit (6).

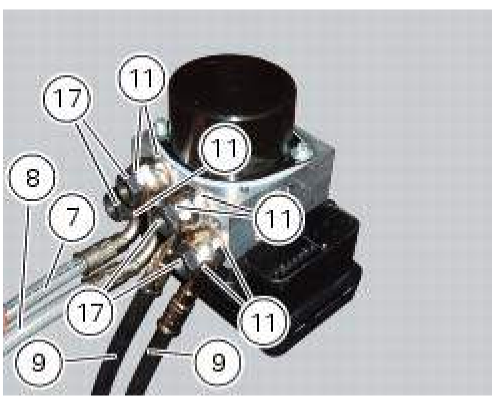


Loosen the screws (16) that retain the ABS control unit support (12) and remove it from the vehicle.

Undo the four special screw (17) fixing the pipes (10), (9), (8) and (7), on the ABS control unit (6), removing the gaskets (11).

Warning

Every time that gaskets (11) are removed, they must be replaced with new gaskets (11).



Important

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

Note

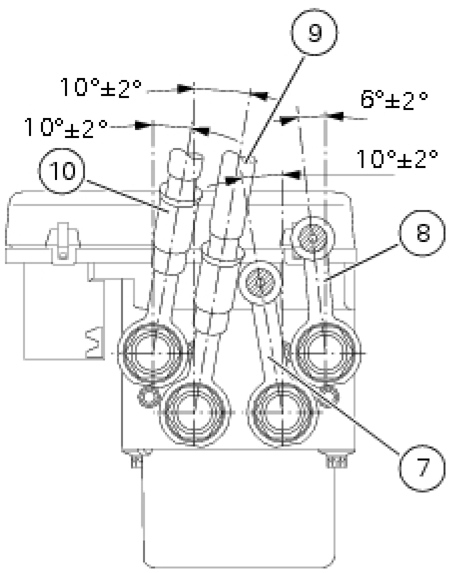
If it is necessary to replace one or more pipes, follow the instructions indicated in paragraph "Flexible wiring/hoses positioning" of this section.

Refitting the ABS control unit

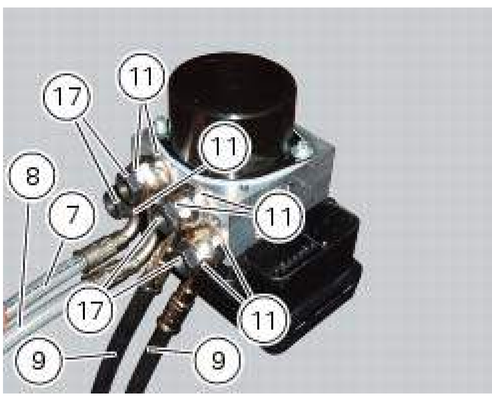
If the brake hoses (7), (8), (9) and (10) on the ABS control unit are changed or removed, ensure that the fittings on the control unit are positioned correctly.

Warning

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



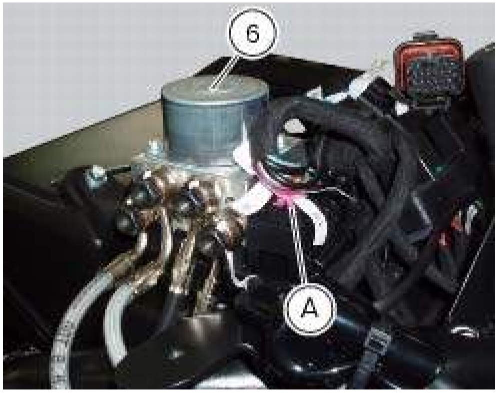
Pipes (7), (8), (9) and (10) fixing must be carried out by placing new gaskets (11) between the couplings.
Tighten the screws (17) to the torque of 23 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



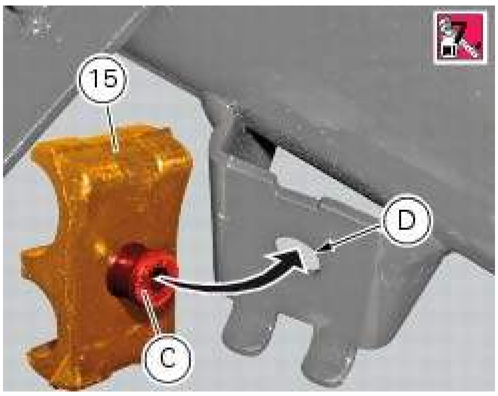
Check that there are vibration dampers (22) and spacers (13) on the ABS supporting bracket (12).

Refit the ABS control unit (6) on the supporting bracket (12), and fix it by starting and tightening the retaining screws (16) to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

Connect the connector (A) of the ABS control unit (6).



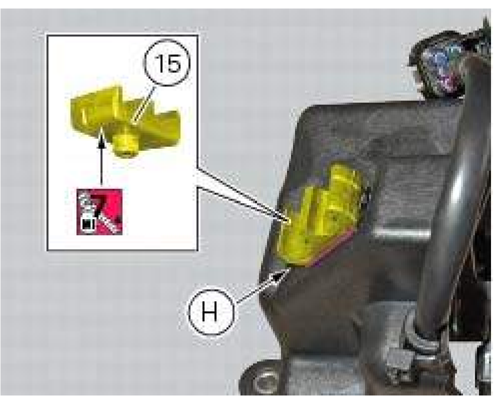
If removed, refit the front rubber pad (15) applying the recommended threadlocker to the pin (C) and the rear face of the pad. Fit the pad inserting pin (C) into the corresponding hole (D).



If removed, refit the rear rubber pad (15) applying the recommended threadlocker to the cover of the exhaust valve motor until achieving engagement.

Note

The rubber pad (15) must be aligned with the corresponding reference notch (H) as shown.



To fill up the system, carry out the instructions for replacement of fluid of the front and rear braking system master cylinder or calliper to which the pipe is connected (Sect. 4 - 3, Changing the brake fluid).

Important

If the ABS control unit is replaced, this must be supplied with secondary circuit already full of fluid; the control unit must be fitted and the system filled and bleeded as a traditional system.

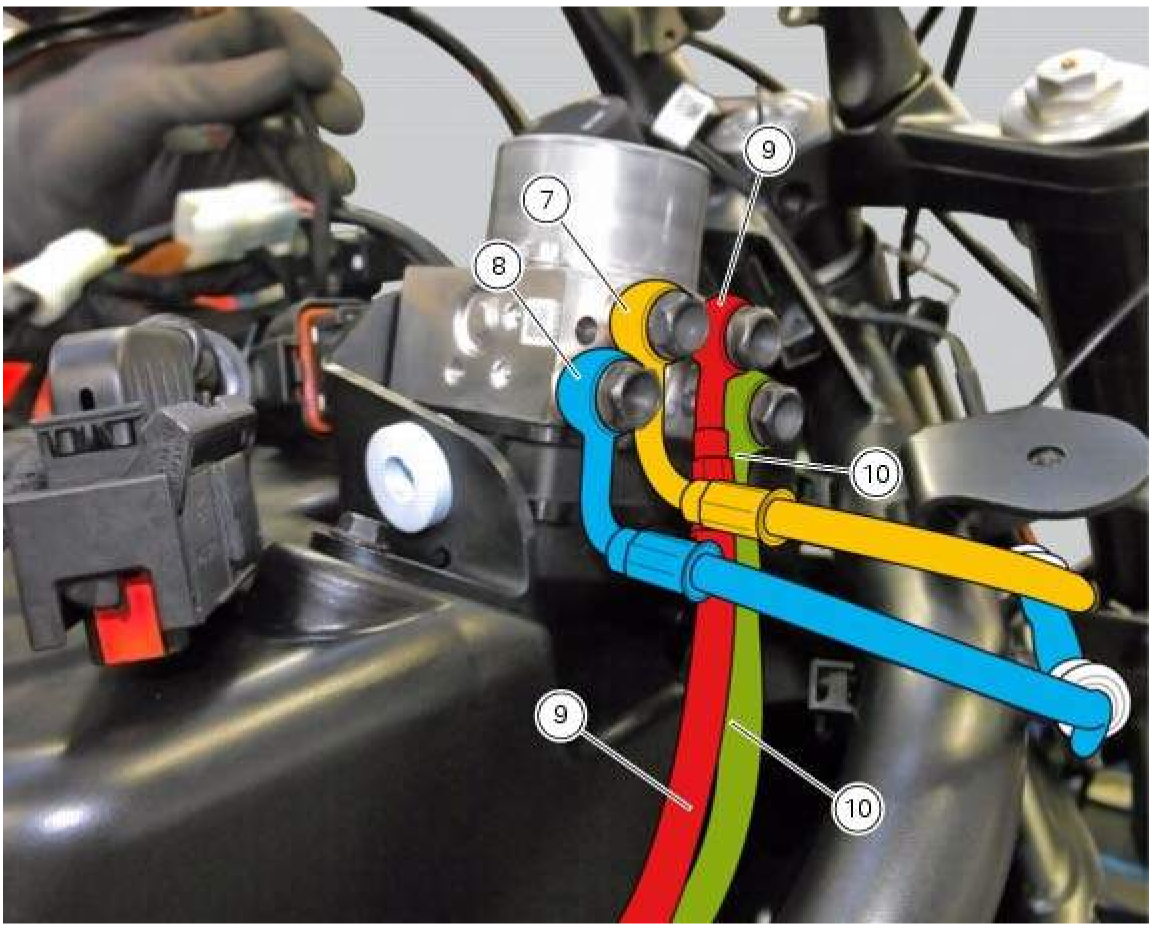
Operations	Section reference
Refit the fuel tank	8 - 2, Refitting the fuel tank
Reassemble the tank half covers	5 - 2, Refitting the fuel tank fairings
Reassemble air conveyor covers	8 - 7, Refitting the air filters
Refit the saddles	5 - 3, Refitting the seat

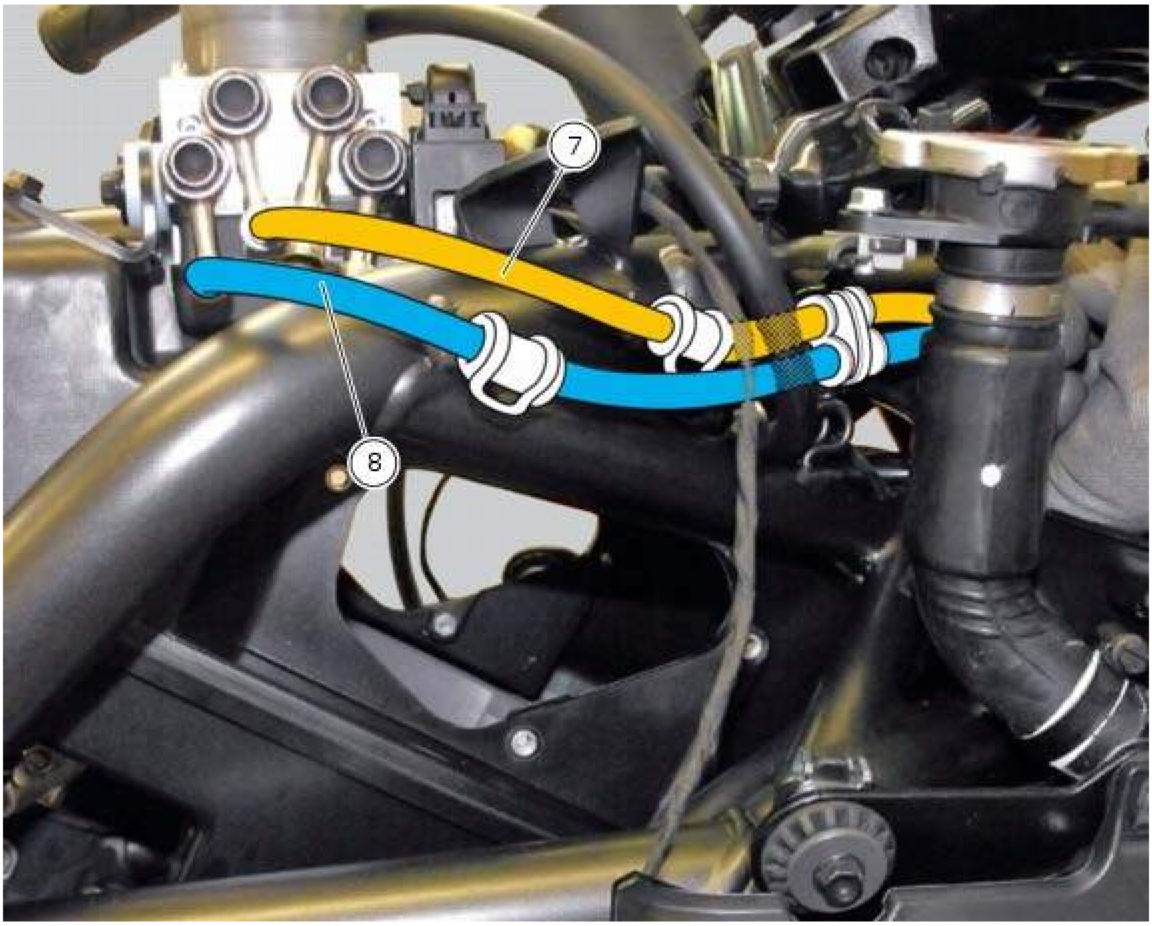
Flexible wiring/hoses positioning

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

Table	Position	Description
Table B	2	Front ABS speed sensor
Table C	5	Rear ABS speed sensor
Table A	6	ABS control unit
Table A - Table B	7	Front pump - control unit pipe
Table A - Table B	8	Control unit - front calliper pipe
Table A - Table C	9	Rear pump - control unit pipe
Table A - Table C	10	Control unit - rear calliper pipe
Table B	T	RH - LH calliper front brake pipe

Table A





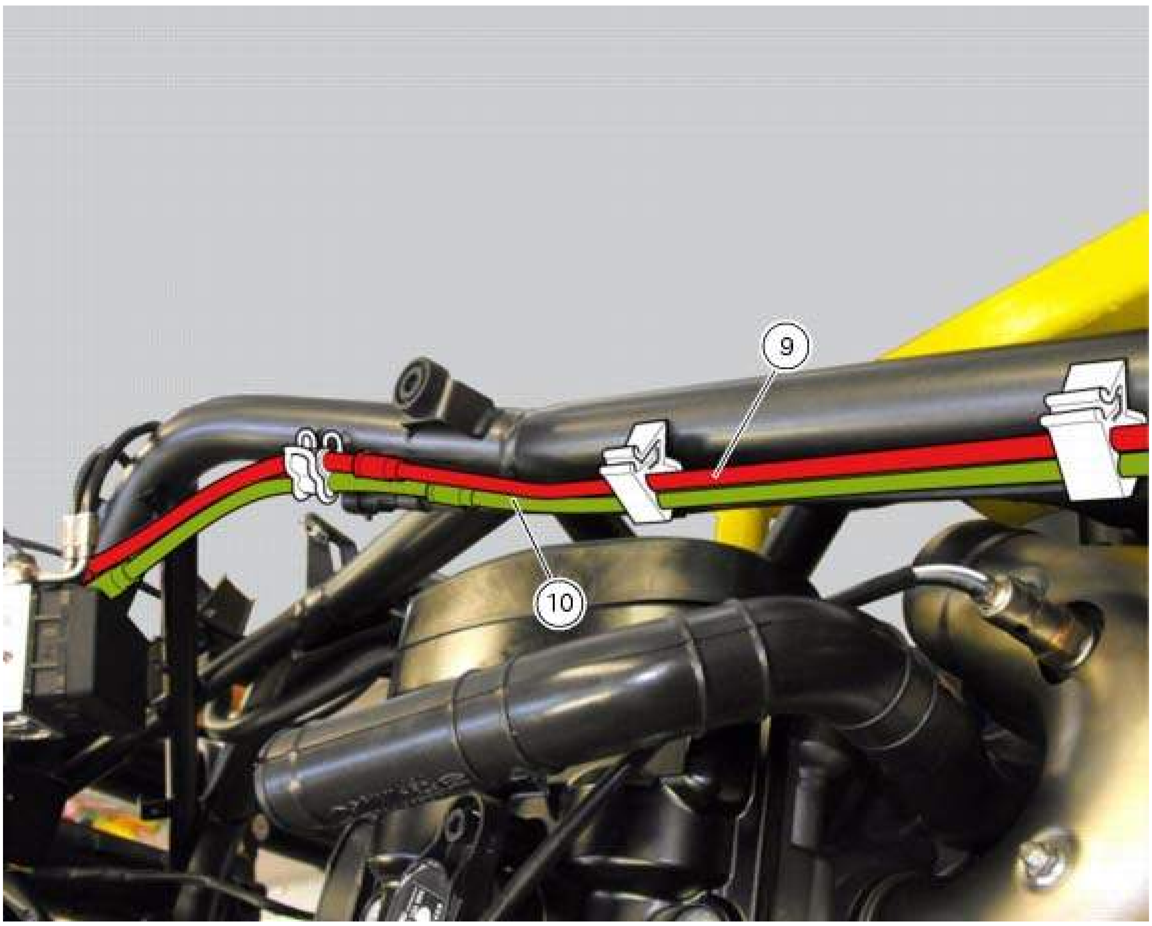
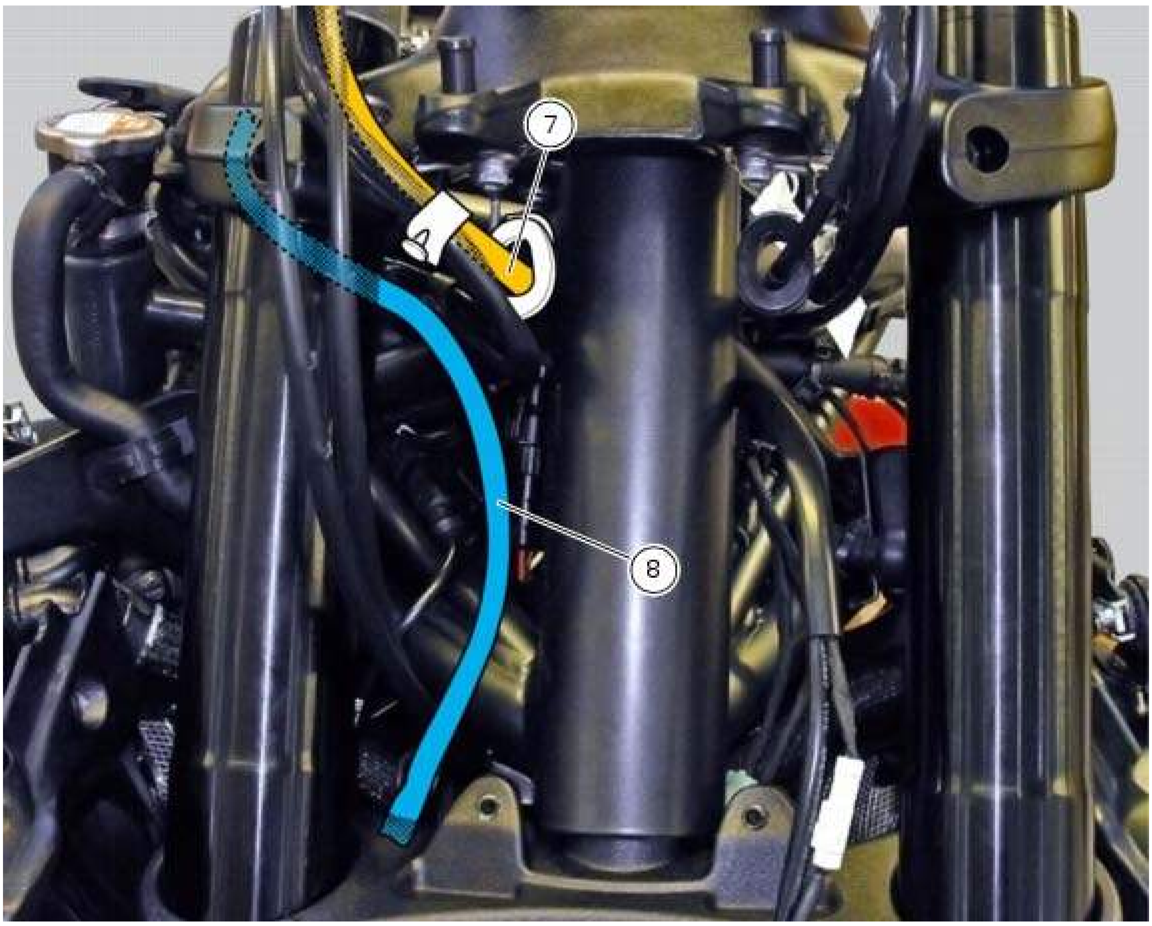


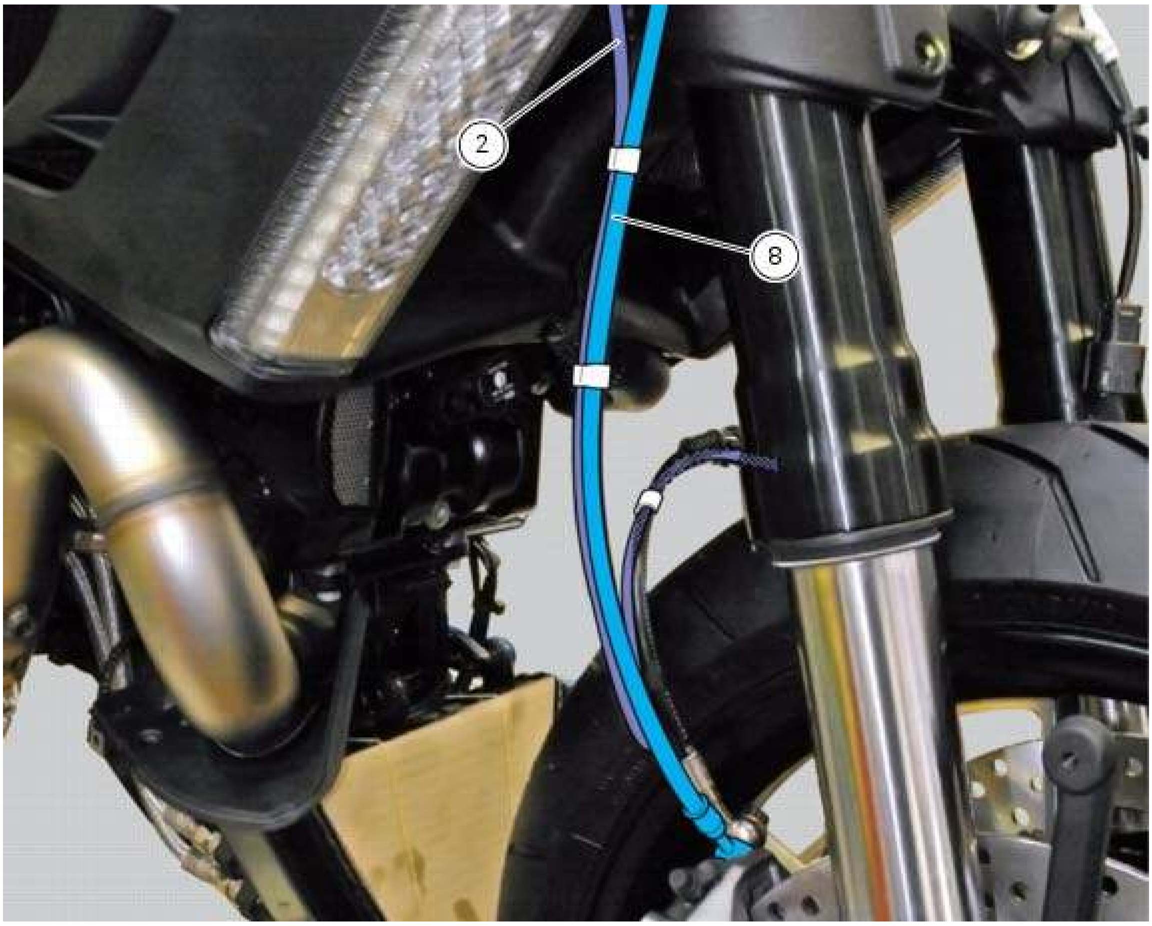
Table B

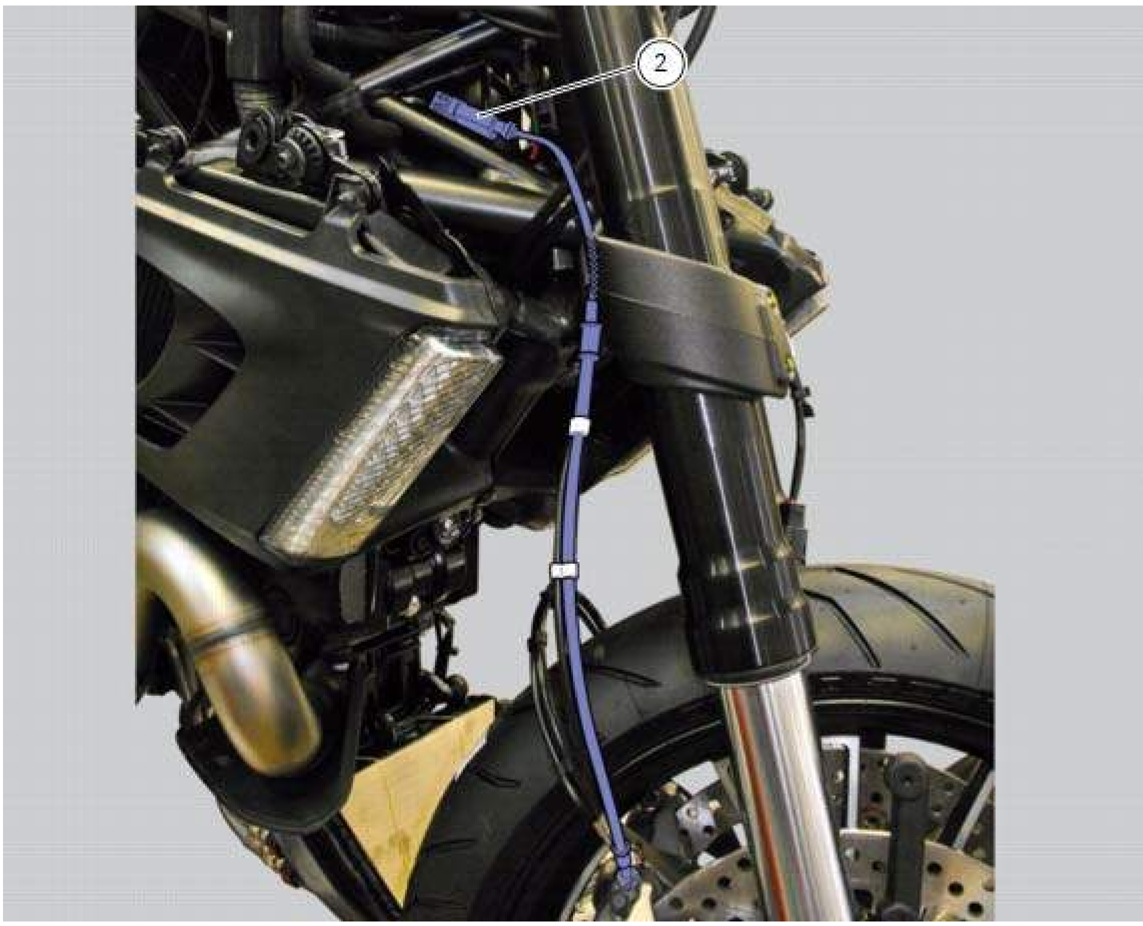
System components



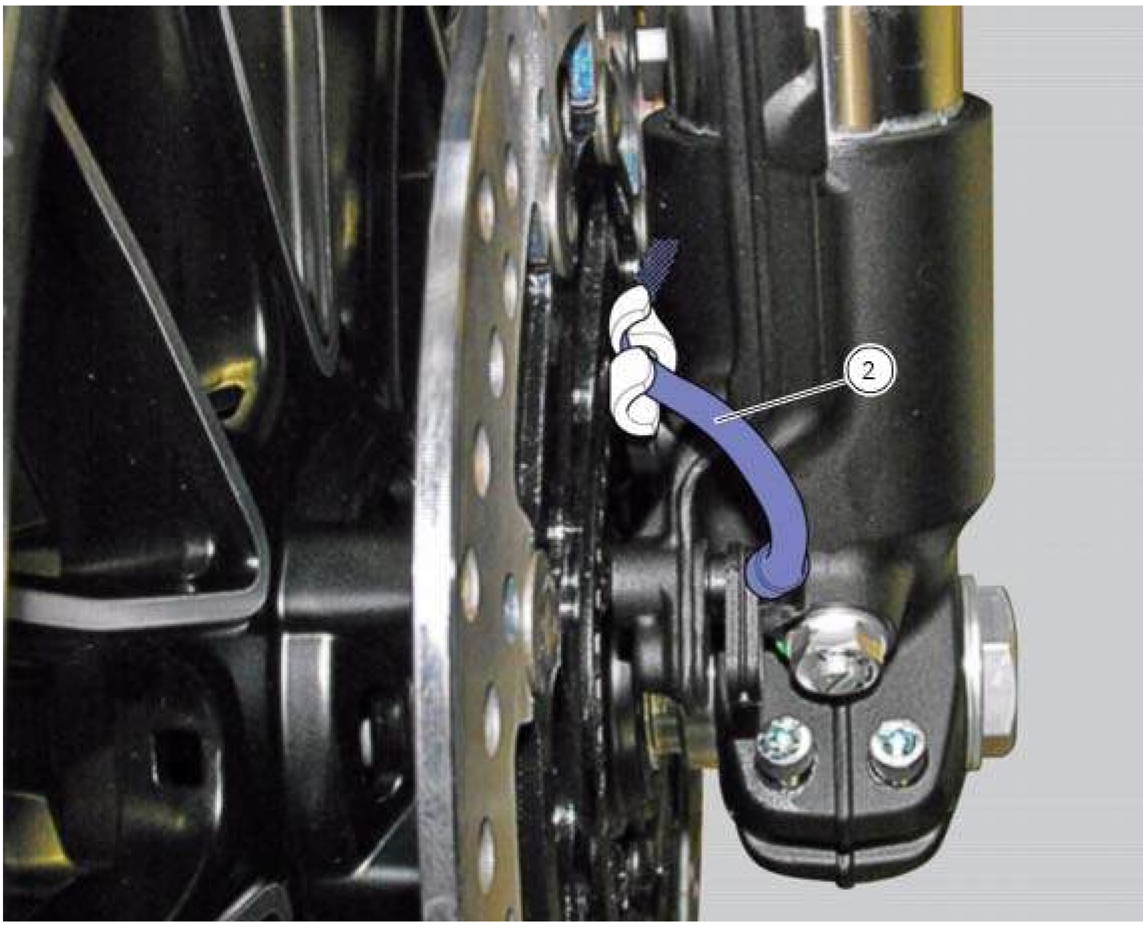
System components

System components





System components



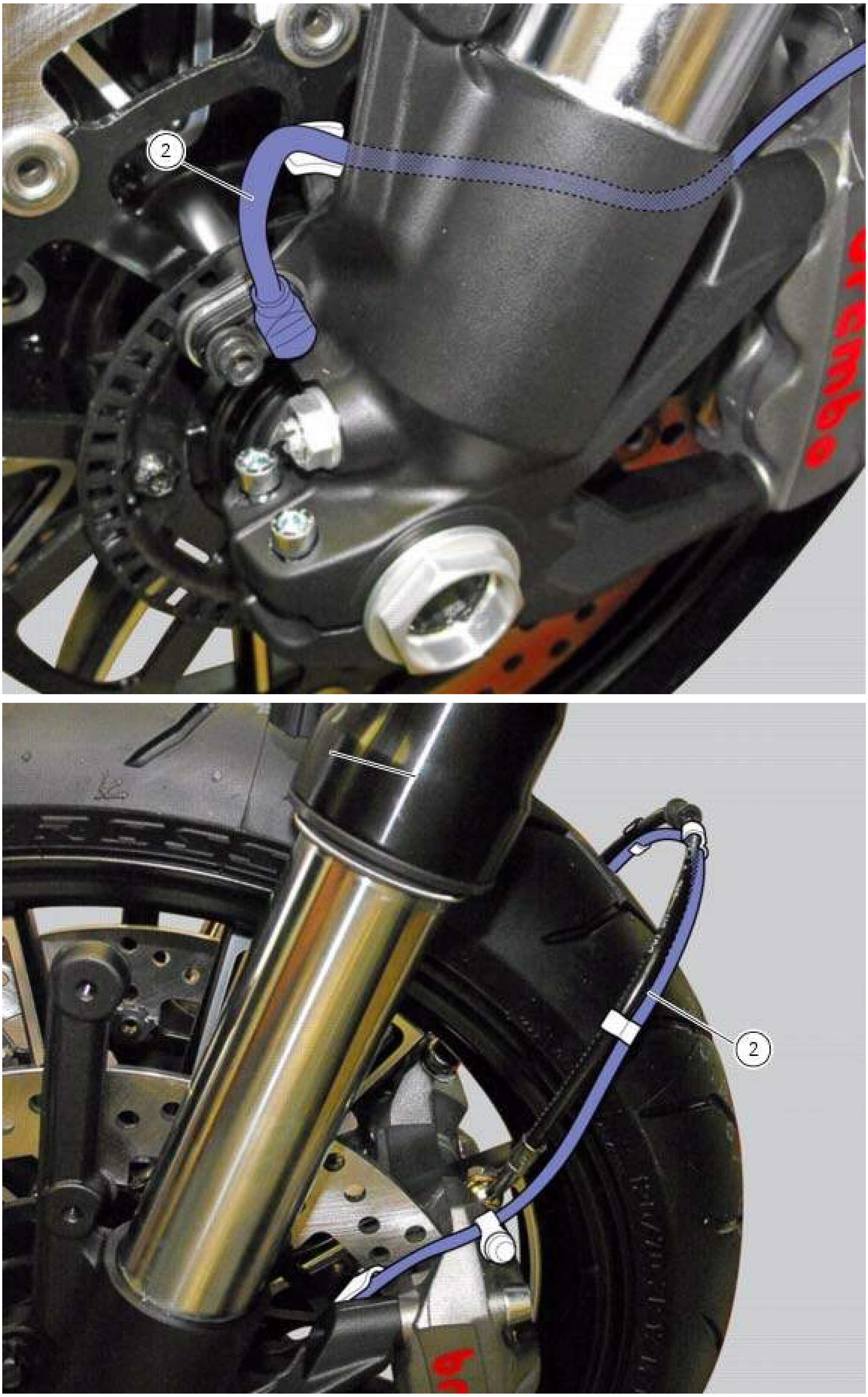
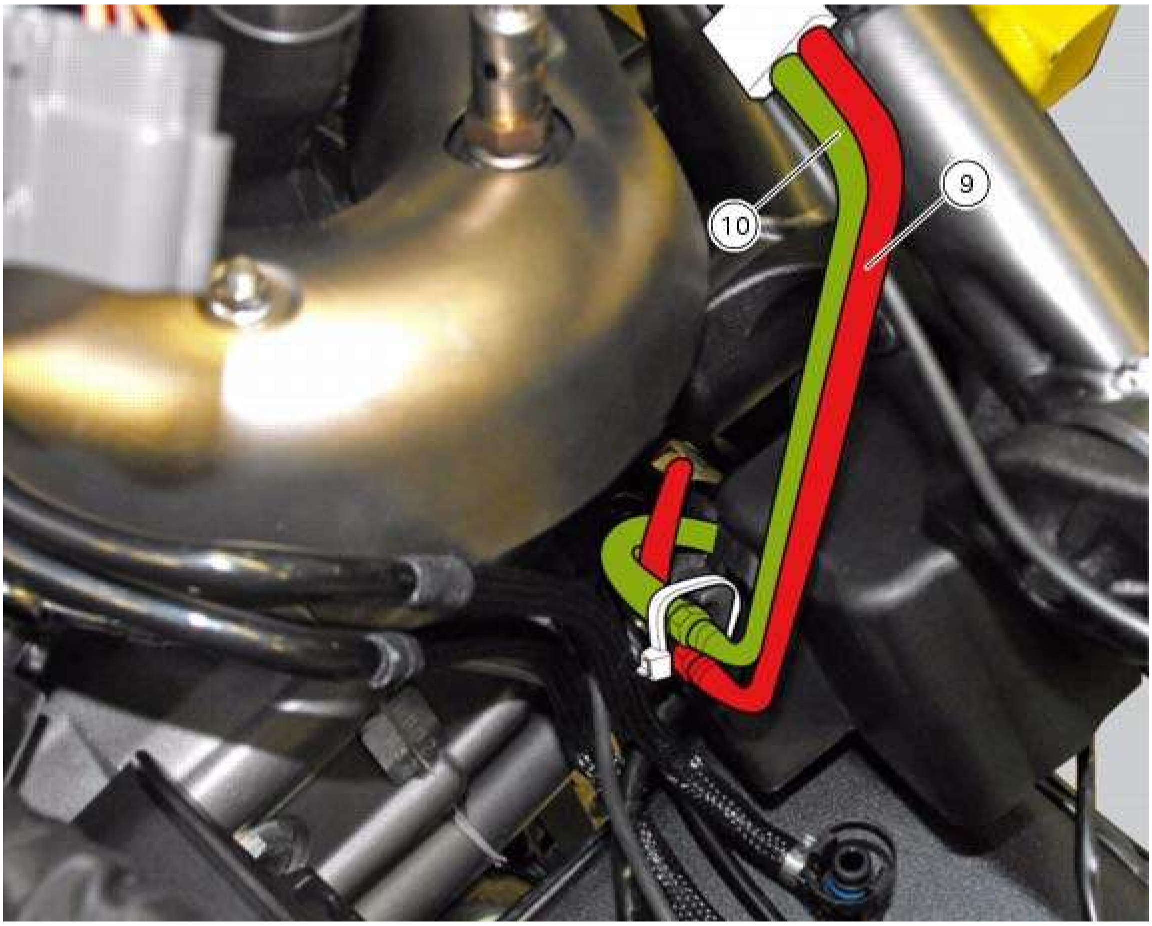


Table C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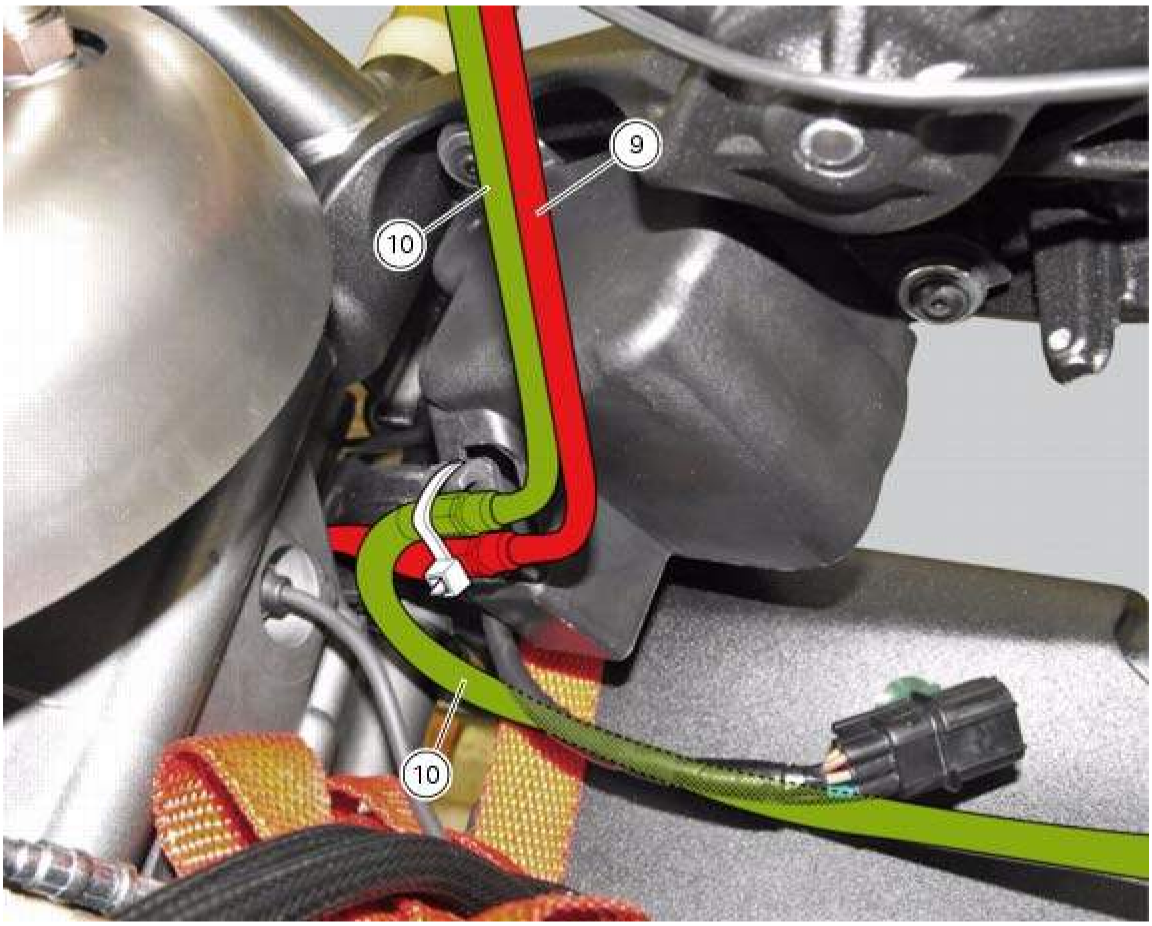
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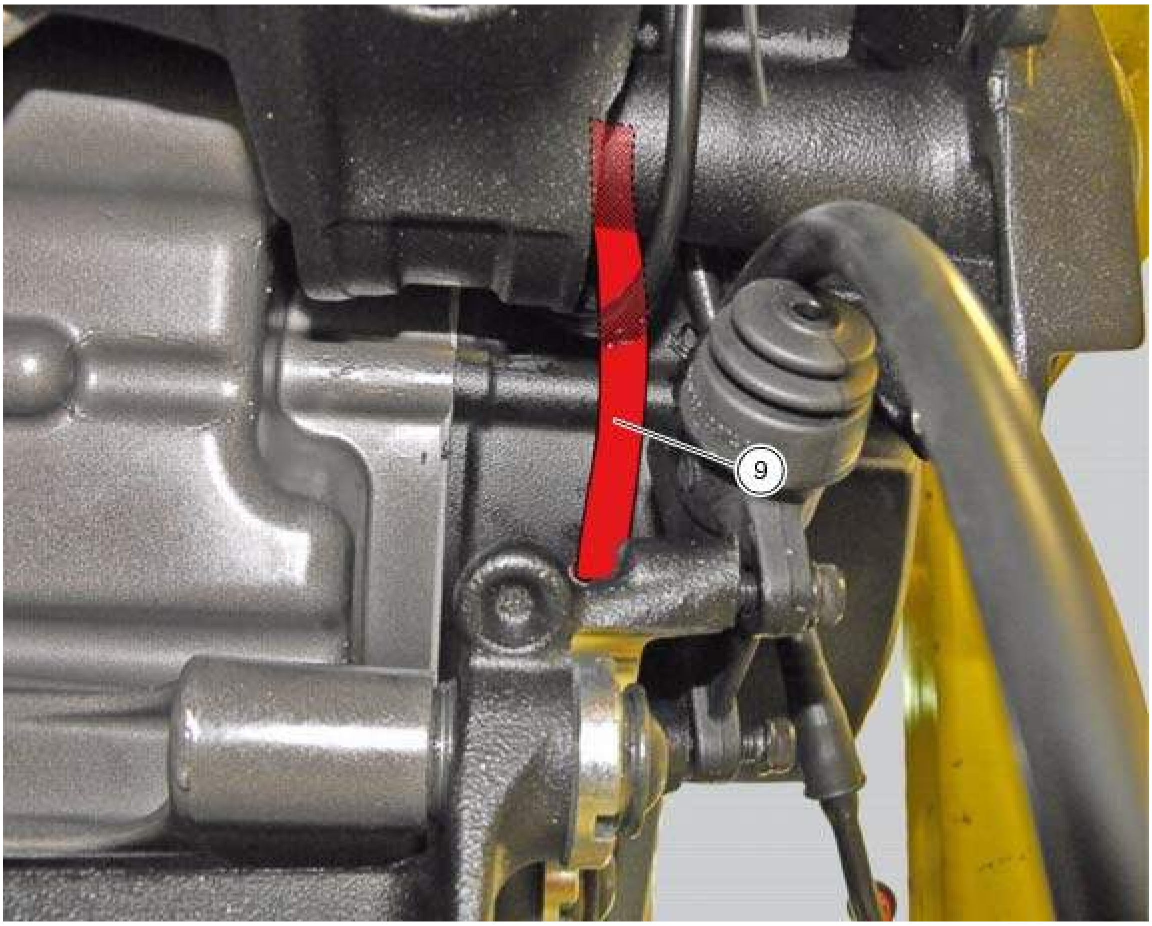
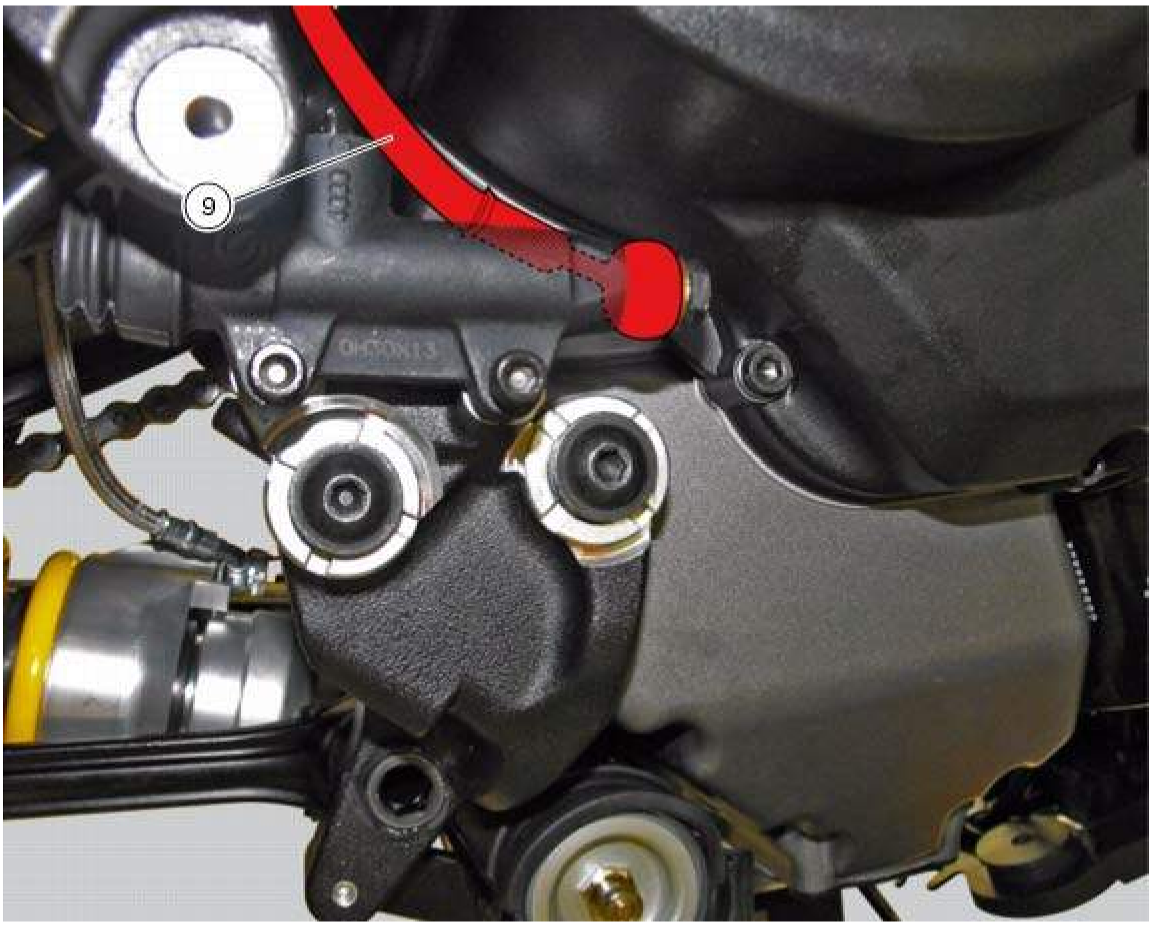
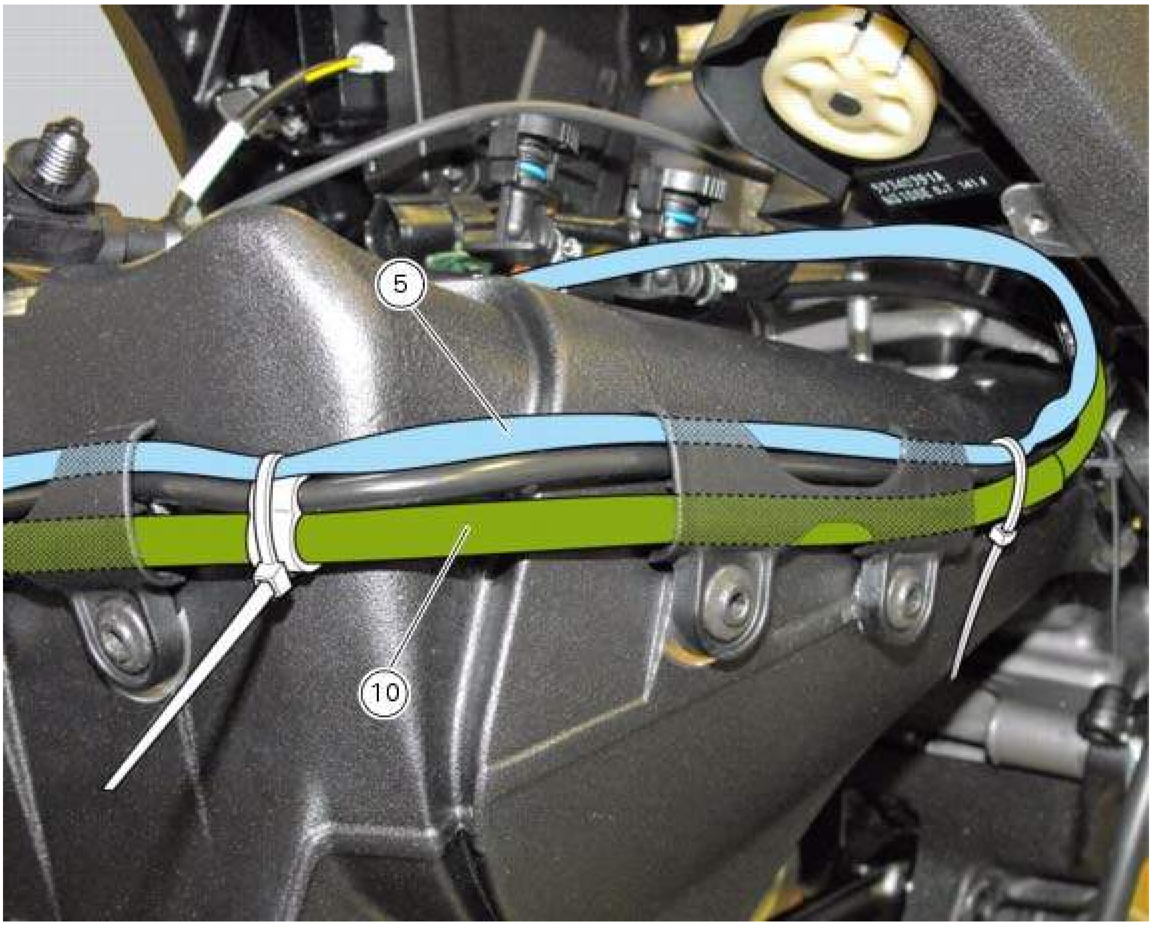
System components





System components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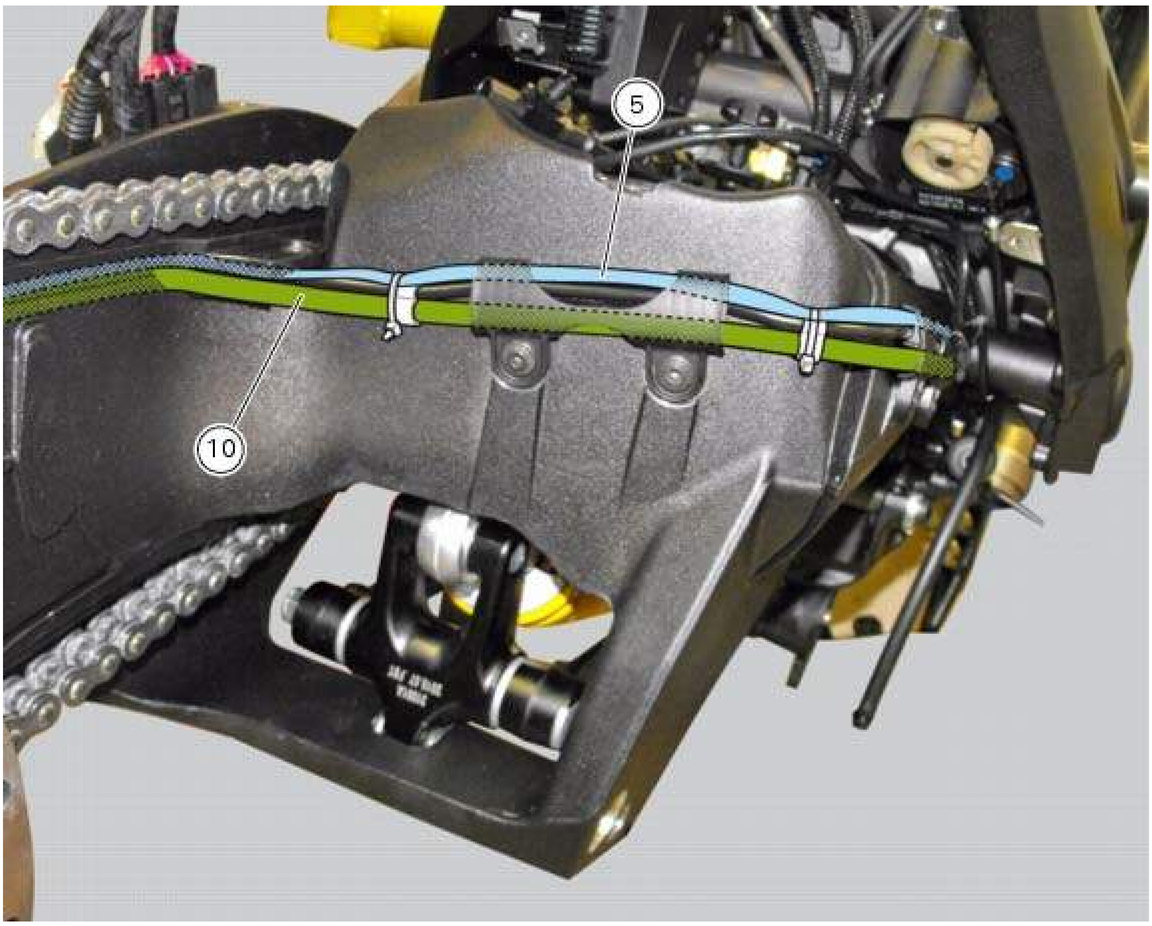
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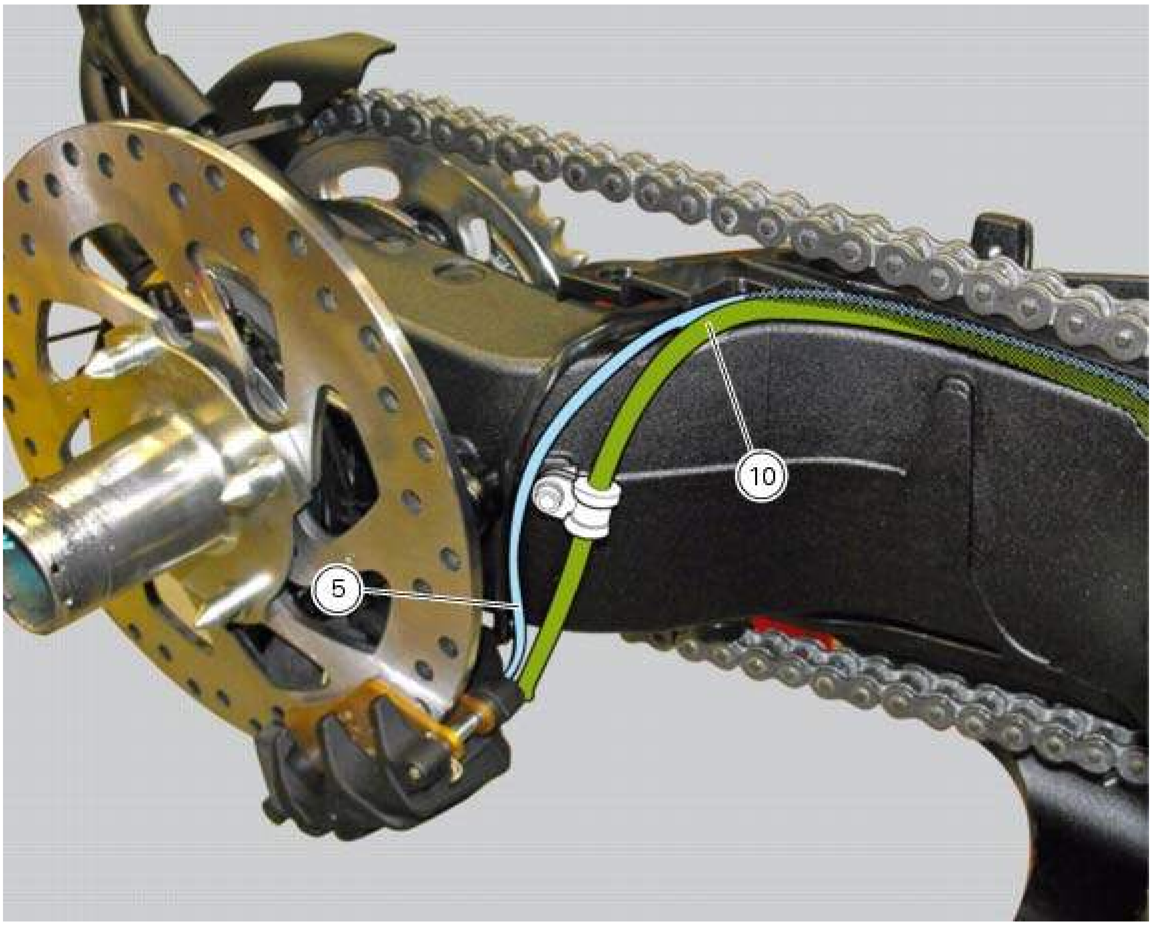
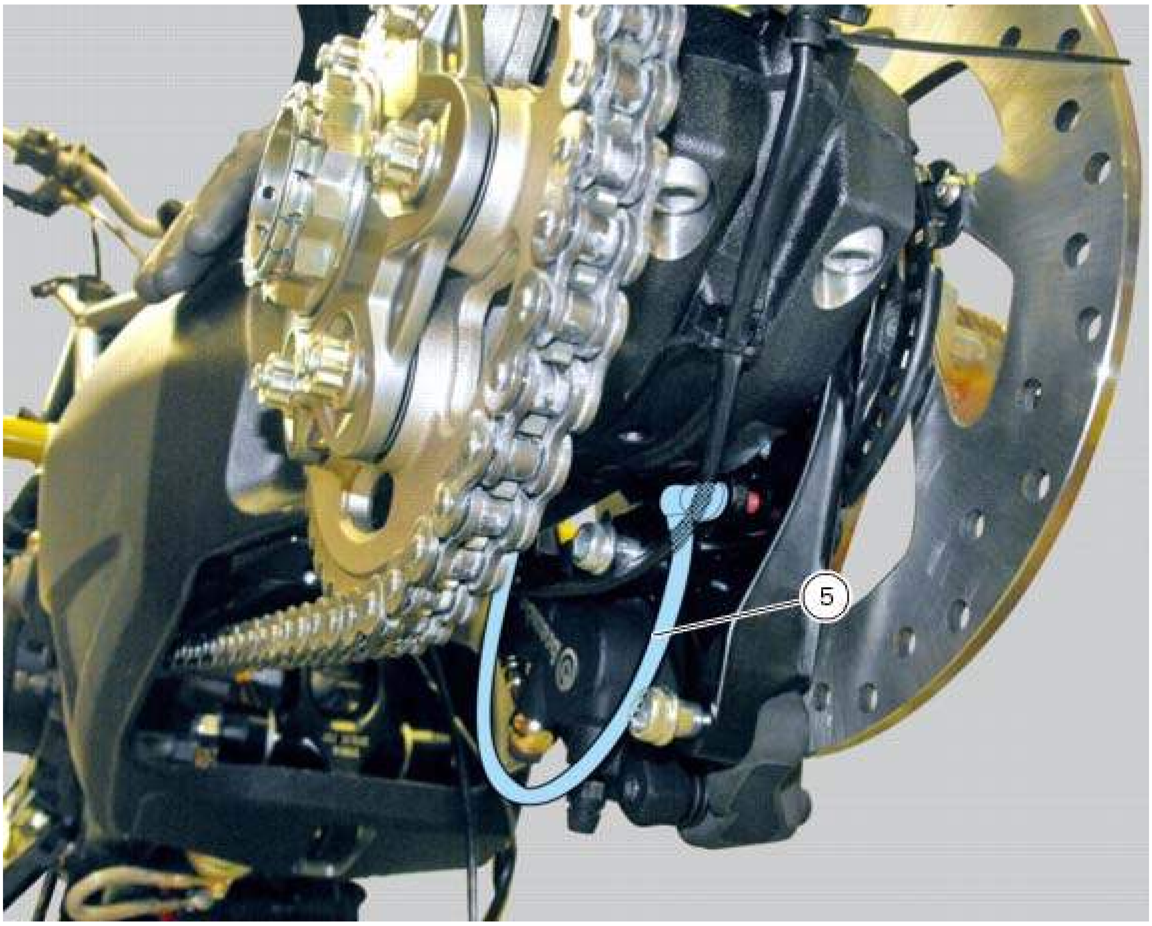
System components



System components

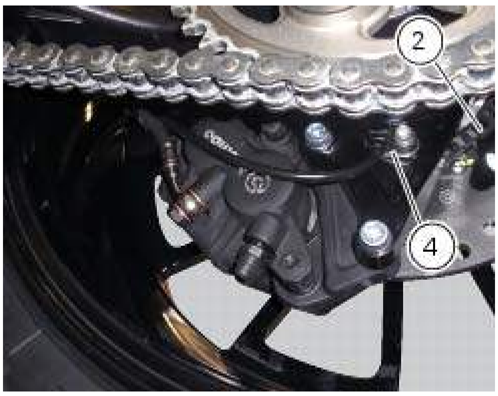


7 -ABS components maintenance

Adjusting of the AIR-GAP phonic wheel sensor

(For front as well as rear sensor) In each case of maintenance that foresees:
- replacement or refitting of the wheel
- replacement or refitting of the phonic wheel (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 bracket

it is necessary to check the air-gap between the speed sensor and the phonic wheel, once the components are refitted. Place the appropriate number of shims (B) under the ABS sensor so as to achieve **1.3** to **1.9** mm air-gap between ABS sensor and phonic wheel. When shimming is correct, a **1.3** mm feeler gauge will fit between ABS sensor and phonic wheel, whereas a **1.9** mm will not.



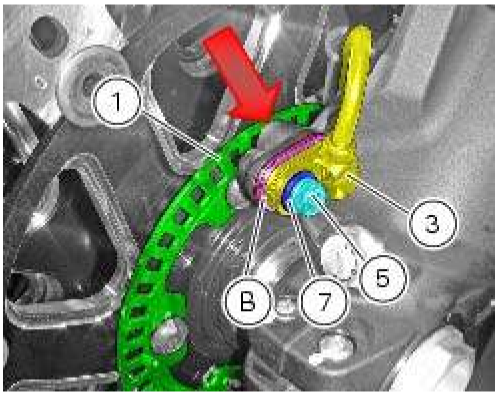
Check at three equally spaced locations (spaced about 120° apart) of the phonic wheels (1) and (2). Shims (B) come in two sizes: 0.2 mm and 0.5 mm. Combine the shims as required to achieve correct shimming.
When checking with the 1.3 mm feeler gauge (go gauge) and the 1.9 mm feeler gauge (no-go gauge), the ABS sensors (3) and (4) must be firmly secured in their seats. This means you need to loosen and retighten the sensor retaining screw fully home with its washer each time you add or remove any shims.

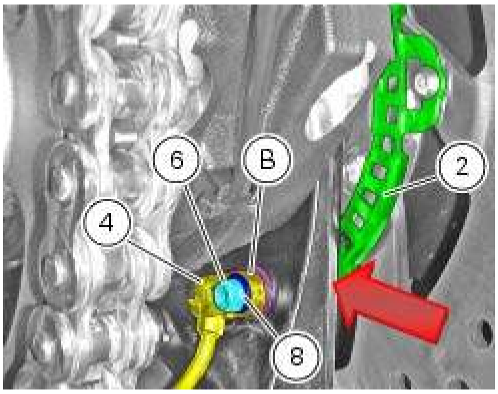
Warning

For the front wheel ABS sensor (3), total shims used must never exceed **3** mm on the BASE version and **3.7** mm on the CARBON version.
For the rear wheel ABS sensor (4), total shims used must never exceed **3** mm.

After shimming, tighten the retaining screws (5) and (6) of the sensors (3) or (4) to a torque of 10 Nm ± 10% (Sect. 3 -

3, Frame torque settings) placing washers (7) and (8) in-between and check again using the **1.3** mm feeler gauge (go gauge) and the 1.9 mm feeler gauge (no-go gauge).





Phonic wheels cleaning

It is important to check that both phonic wheels (21) and (20) are always clean.
Otherwise: gently remove any possible dirt deposits with a cloth or metal brush. Avoid using solvents, abrasives and air or water jets directly on the phonic wheel (21) or (20).

Bleeding of the ABS hydraulic system

If some “sponginess” is detected on the brake control, due to air bubbles in the system, bleed the system, as indicated in Sect. 4 - 3, Changing the brake fluid.
Before bleeding a brake pump, move back the calliper pistons, as indicated in (Sect. 4 - 3, Changing the brake fluid) to

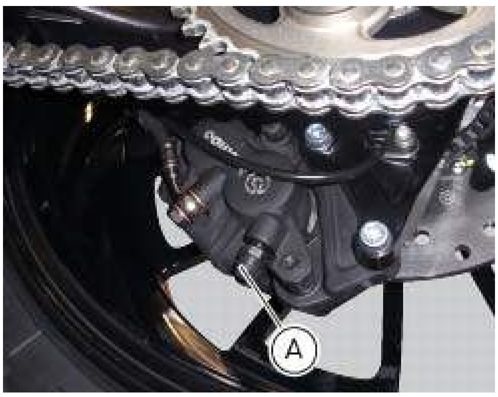
drain in the pump the air collected near the ABS control unit
Purge must be carried out by means of the corresponding joints (A) placed near the callipers and the brake pumps.

Important

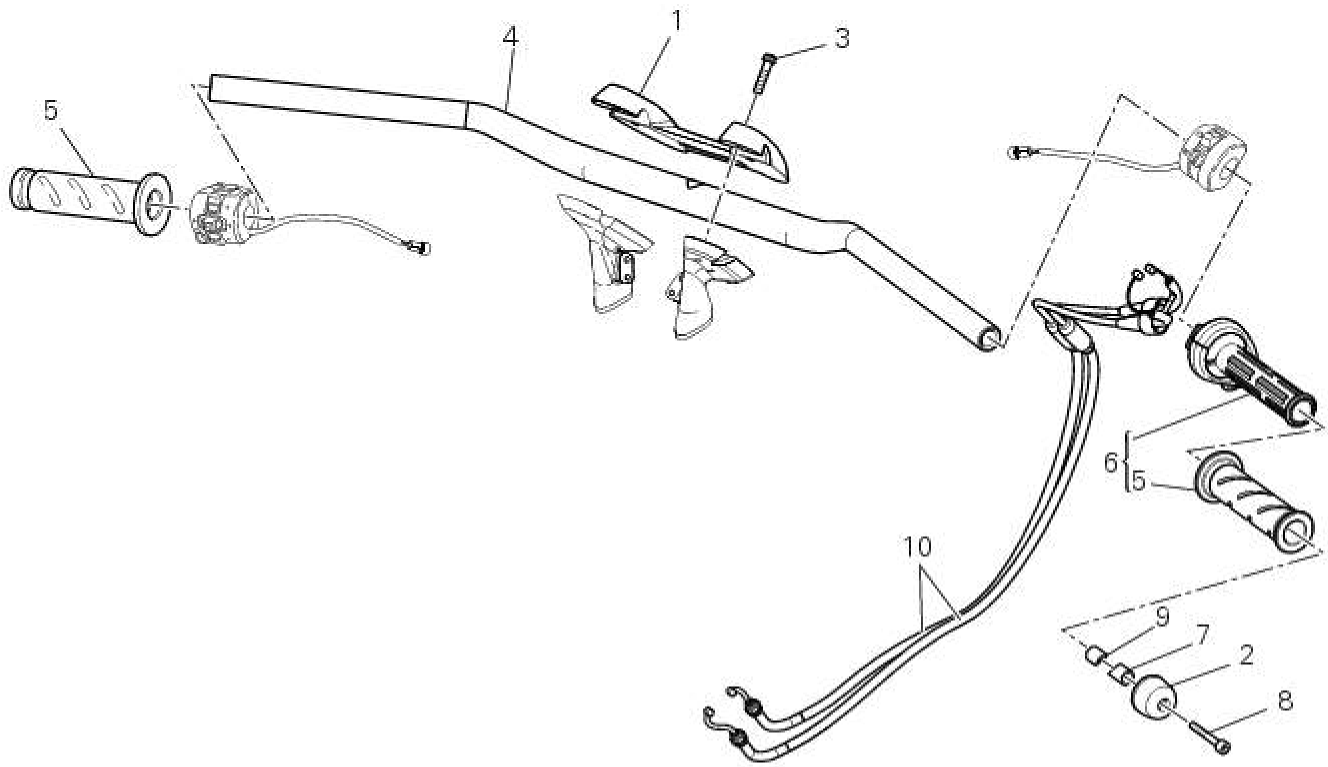
Do not undo the fixing screws of the joints of the pipes on the ABS hydraulic control unit, unless control unit replacement is necessary.

Important

If the ABS control unit is replaced, this must be supplied with secondary circuit already full of fluid; the control unit must be fitted and the system filled and bleeded as a traditional system.



8.1 -Handlebar unit: Throttle twistgrip



1 Upper clamp
2 Counterweight
3 Screw
4 Handlebar
5 Grips
6 Throttle twistgrip
7 Bush
8 Screw
9 Bush
10 Throttle cables

Spare parts catalogue

Diavel ABS	HANDLEBAR AND CONTROLS
Diavel Carbon ABS	HANDLEBAR AND CONTROLS

Important

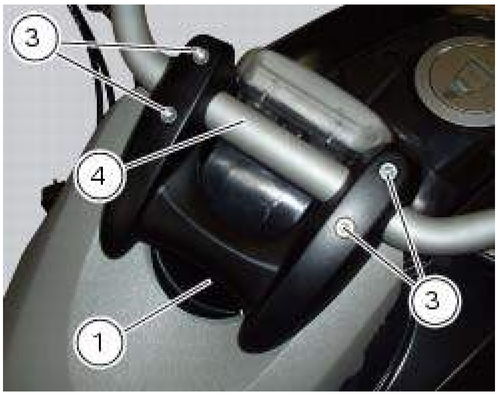
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

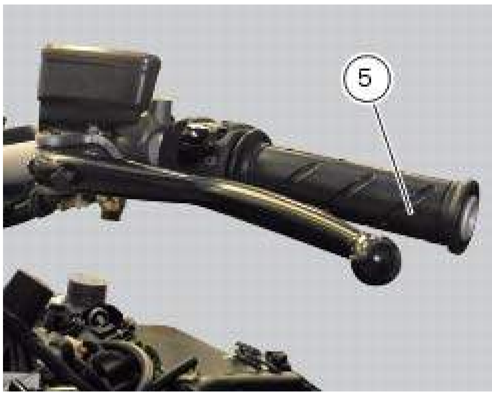
Removal of the handlebar

Operations	Section reference
Remove the throttle twistgrip	7 - 8.1, Removal of the throttle twistgrip
Remove the RH and LH handlebar switches	6 - 5, Checking the indicating devices

Remove the front brake lever	7 - 3, Removal of the front brake master cylinder
Remove the clutch lever	7 - 8.2, Removal of the clutch master cylinder assembly

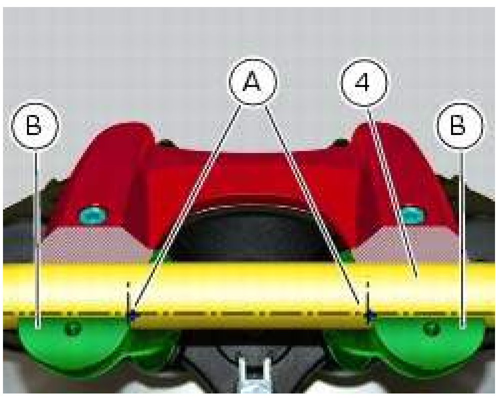
Unscrew and remove the screws (3) securing the upper clamp (1).
Remove the upper clamp (1).
Remove the handlebar (4) from its seat on the steering head.
To remove the grips (5), refer to the exploded view at the beginning of this chapter.





Refitting the handlebar

Position the handlebar (4) so that the external lower corner of the marks (A) on the handlebar matches the upper internal corner of the lower U-bolts (B) as shown.

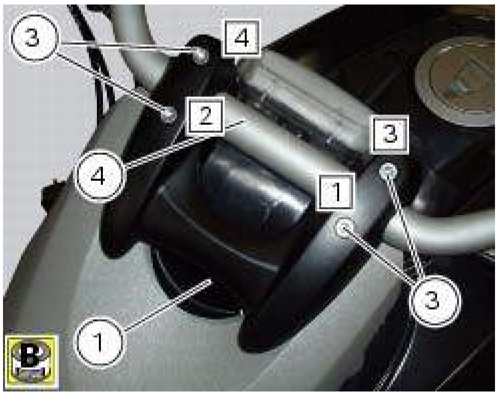


Apply the recommended grease to the threads and undersides of the heads of the screws (3).

Important

Position the upper U-bolt (1) as shown.

Refit the upper clamp (1) and insert the screws (3).
Tighten the screws (3) to a torque of 25 Nm ±5% (Sect. 3 - 3, Frame torque settings), applying the sequence 1-2-3-4-3, as indicated in the figure.



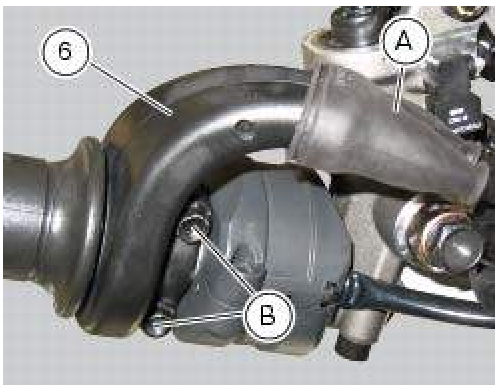
Operations	Section reference
Refit the front brake lever	7 - 3, Refitting the front brake master cylinder
Refit the right-hand and left-hand handlebar switches	6 - 5, Checking the indicating devices
Refit the throttle twistgrip	7 - 8.1, Refitting the throttle twistgrip
Refit the clutch lever	7 - 8.2, Refitting the clutch master cylinder assembly

Adjusting the throttle cable

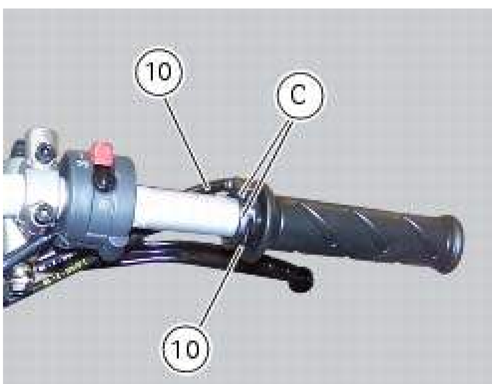
To operate on the set screws of the throttle grip cables, consult Sect. 4 - 3, Adjusting the throttle cable.

Removal of the throttle twistgrip

Peel back the rubber sleeve (A) protecting the throttle control cables.
Undo the screws (B) of the throttle grip (6) and open the command.



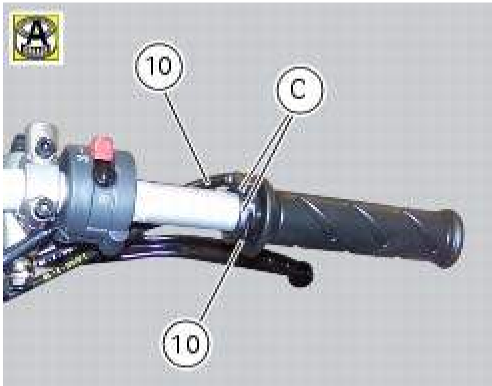
Disconnect the throttle grip cables (10) by unhooking the cable ends (C) from their seats.
Remove the throttle twistgrip (6) from the handlebar.



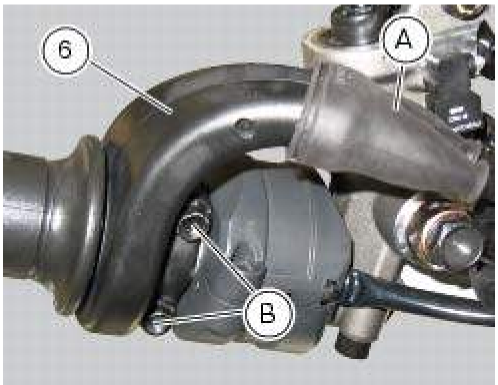
To replace the throttle grip cables, it is necessary to remove it from the throttle body (Sect. 8 - 6, Removal the airbox and throttle body).
Replacement throttle cables are supplied complete with adjusters.

Refitting the throttle twistgrip

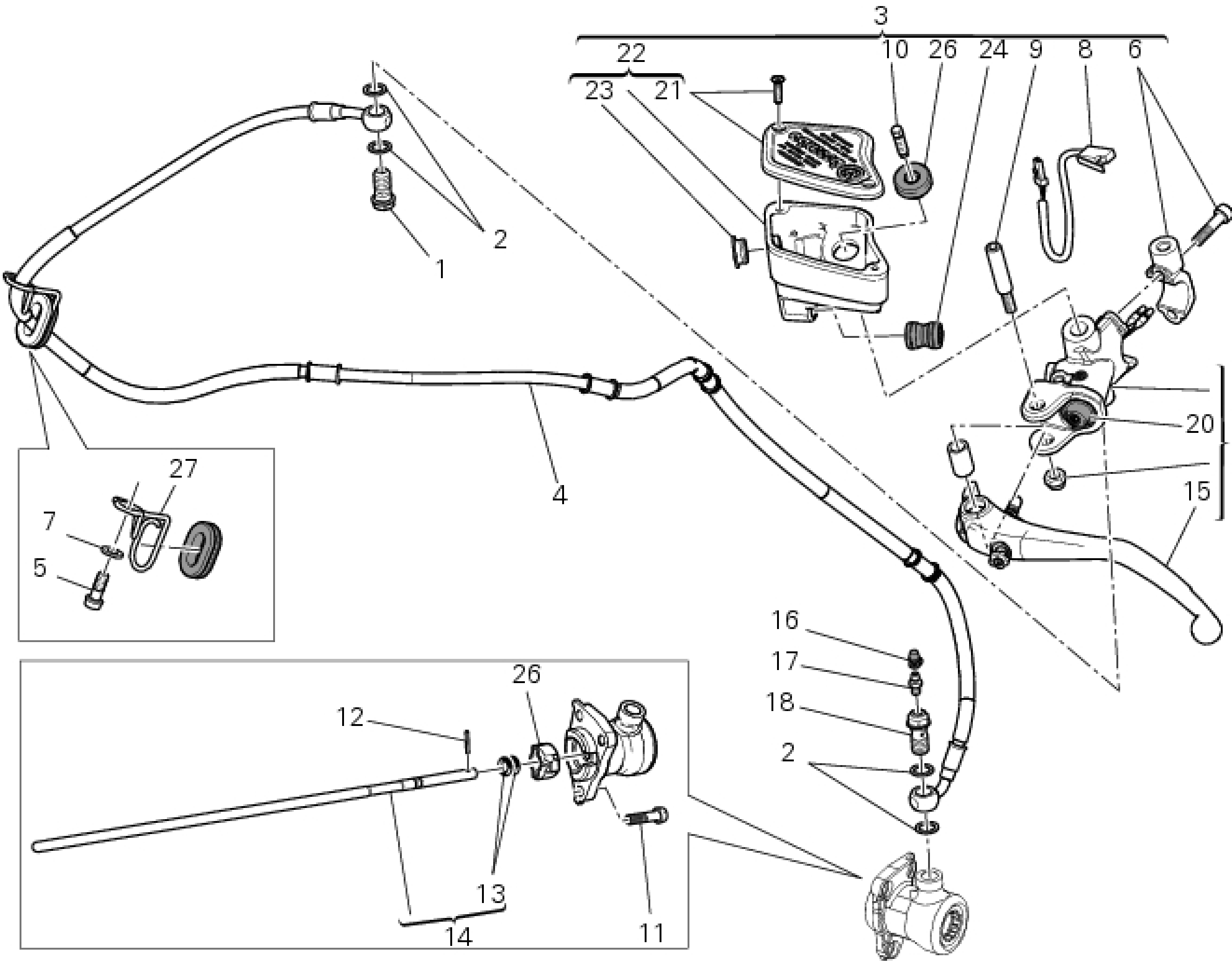
Lubricate the ends of the throttle grip cables (10) and the twistgrip race with the recommended grease.
The closing cable (10) features a writing on the yellow tube, whereas the opening one (10) features such writing on the white tube.



To refit the throttle control components, proceed in inverse order to the removal procedure, making sure that the twistgrip housings locate in the reference hole in the handlebar.
Tighten the screws (B) of throttle twistgrip (6) to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



8.2 -Handlebar unit: Hydraulic clutch control



1 Special screw
2 Sealing washer
3 Clutch master cylinder
4 Clutch hydraulic pipe (metal braid)
5 Screw
6 Spare stand
7 Washer
8 Microswitch
9 Pin
10 Bleed valve
11 Screw
12 Roller
13 O-ring
14 Clutch control rod
15 Clutch lever
16 Dust cap
17 Bleed valve
18 Special screw
19 Sealing washer
20 Boot
21 Plug
22 Fluid reservoir assembly
23 Inspection plug (replacement part)
24 Union
25 Oil duct union
26 Insert
27 Hose clip

Spare parts catalogue

Diavel ABS CLUTCH CONTROL

Diavel ABS	CLUTCH
Diavel Carbon ABS	CLUTCH CONTROL
Diavel Carbon ABS	CLUTCH

Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Removal of the clutch master cylinder assembly

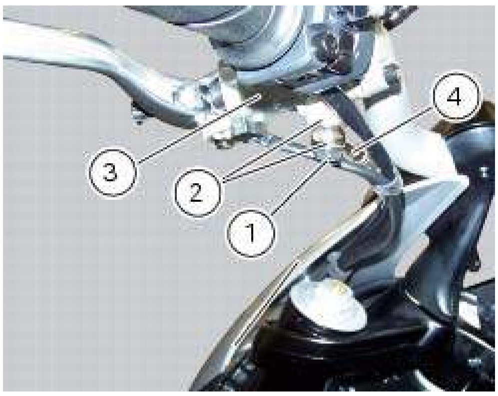
Warning

The clutch master cylinder manufacturer advises against servicing of the clutch master cylinder (1) due to the safety-critical nature of this component. Incorrect overhaul of this component could endanger rider safety.

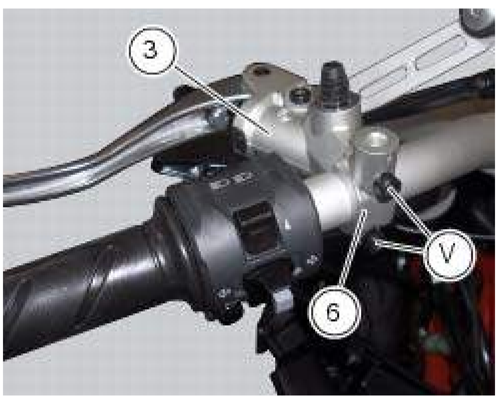
Maintenance operations of the master cylinder are limited to replacing the following parts: control lever, reservoir unit, and master cylinder fasteners.

Operations	Section reference
Drain the clutch system	4 - 3, Draining the clutch hydraulic circuit
Remove the LH mirror	5 - 1, Removal of the rear-view mirrors

Loosen the special screw (1) by collecting the seals (2), to release the clutch master cylinder assembly (3) from the clutch control pipe (4).



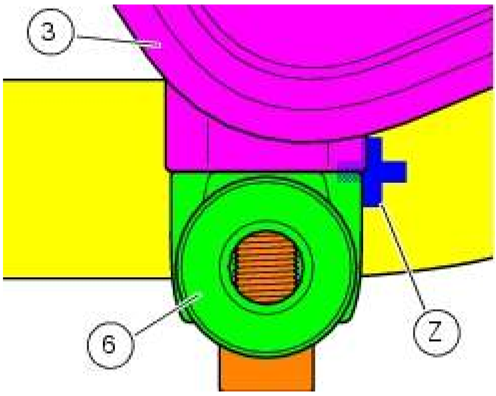
Undo the fixing screws (V) of the mounting U-bolt (6) and then remove the clutch master cylinder unit (3) from the handlebar.

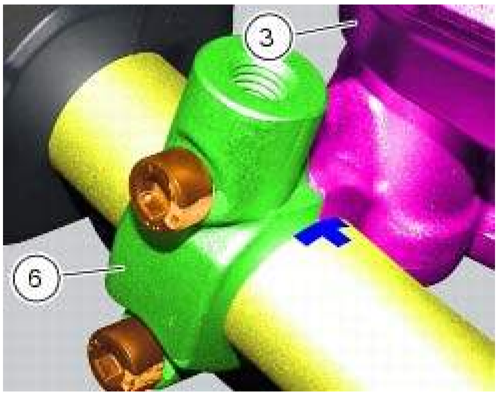


Refer to the exploded view at the beginning of this section for indications on disassembly and replacement of the master cylinder components.

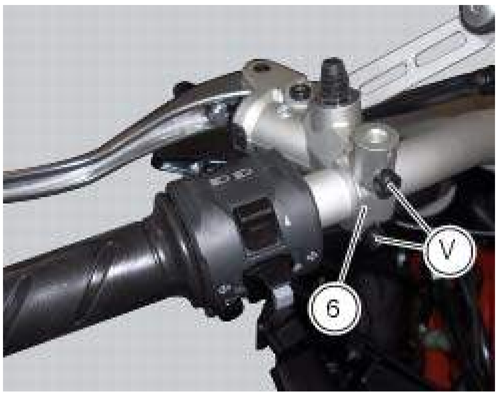
Refitting the clutch master cylinder assembly

Insert the clutch master cylinder assembly (3) and the clamp (6) on the left handlebar, so that the top mating faces match the mark (Z) on the handlebar as shown.

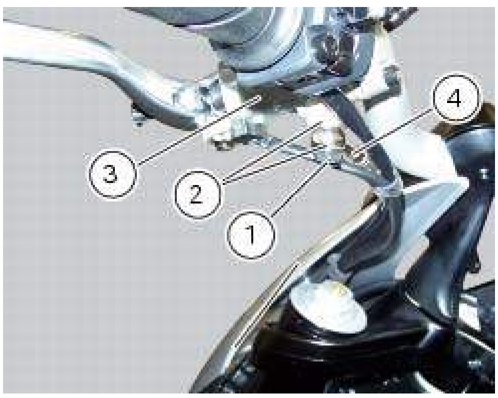




Couple terminal (6) to the clutch master cylinder control and fix them with the screws (V).
Tighten the retaining screws (V) to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings) following the sequence 1-2-1 starting from the upper screw.



Locate the pipe (4) and seals (2) on the master cylinder assembly (3) and secure it with the special screw (1), without tightening it.



Warning

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

For the positioning of the clutch hose (4) and retaining clips, see the illustration at the end of this section.
Tighten the special screw (1) to the torque of 23 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

Operations	Section reference

Refit the LH mirror	5 - 1, Refitting the rear-view mirrors
Fill the clutch circuit	4 - 3, Filling the clutch circuit

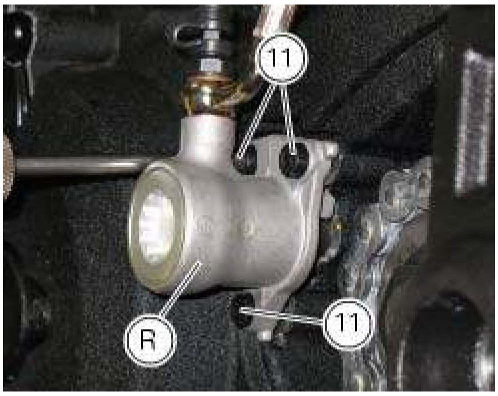
Removal of the clutch transmission unit

Warning

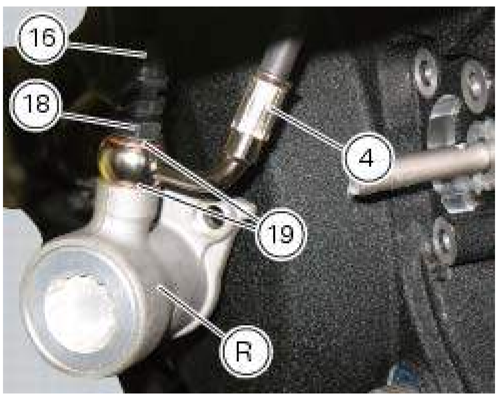
The manufacturer of the clutch transmission unit (15) advises against servicing of its internal parts due to the safety-critical nature of this component.
Incorrect overhaul of these critical safety components can endanger rider and passenger safety.
The only components that should be renewed are the complete clutch transmission unit, the bleed valve, the seals and the complete clutch pushrod assembly.

Operations	Section reference
Drain the clutch system	4 - 3, Draining the clutch hydraulic circuit

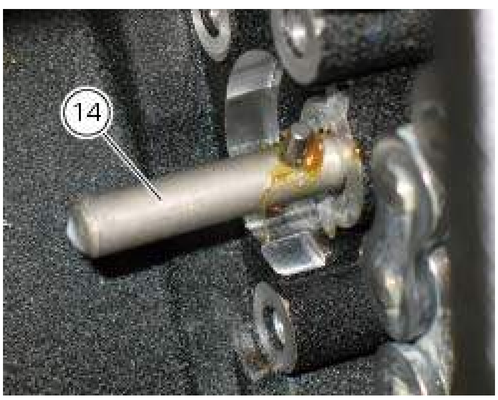
Undo the screws (11) and slide out the clutch slave cylinder (R).



Remove the dust gaiter (16) and the bleed valve (17) and unscrew the screw (18), taking care to recover the gaskets (19): the unit (R) is now disconnected from the pipe (4).
Push in the piston to force out all the fluid from inside the cap.



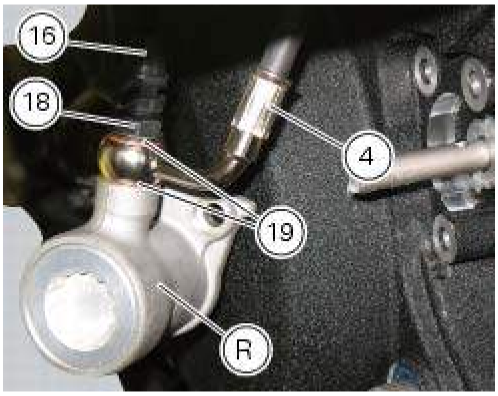
At this point, it is possible to slide also the clutch gear rod (14).



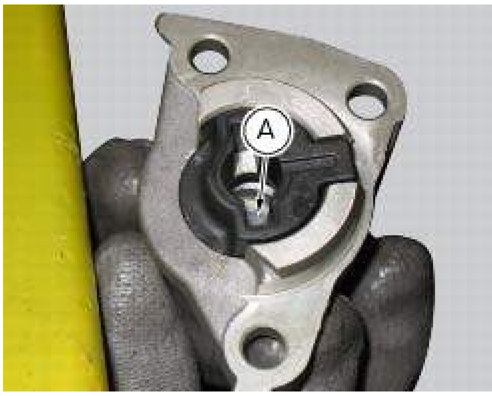
Refitting the clutch transmission unit

Position pipe (4) on the clutch slave cylinder (R).

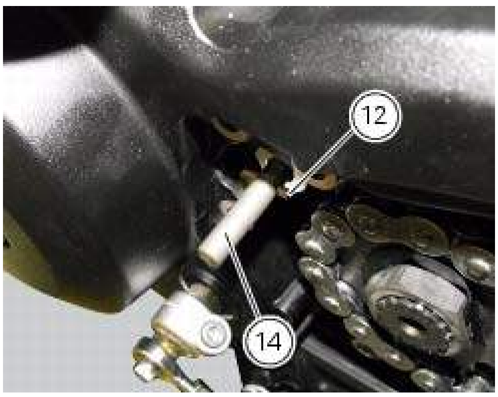
Position the two seals (19) and tighten the screw (18) to a torque of 23 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Refit the bleed valve (17) and the dust gaiter (16).
To position the pipe retaining clamps (4) refer to the table on the following page.



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



Make sure the anti-rotation pin (12) is fitted on the clutch pushrod (14).

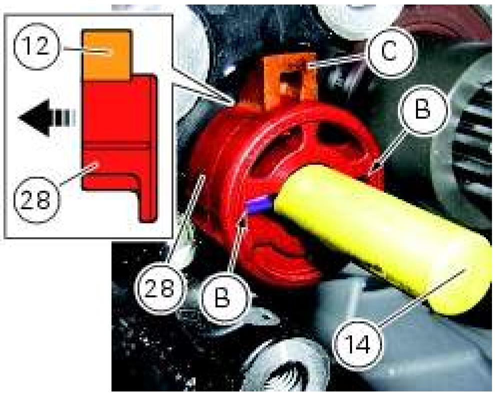


Proceed as follows in case the anti-rotation pin (12) has been removed from the clutch pushrod (14).
Turn the clutch pushrod (14) until the axis of the anti-rotation pin (12) positioning hole is horizontal, as shown in the figure;
Grease the anti-rotation pin (12) and insert it into the clutch pushrod (14) hole.

Insert the anti-rotation insert (28) fully home into the clutch pushrod (14) by matching the anti-rotation pin (12) with the slots (B) on the insert (28).

Note

The tab (C) of insert (28) must be inwards (casing side).



Turn the clutch pushrod (14) counter clockwise until the hole axis of the anti-rotation pin (12) is aligned with the centreline of the casing cover machined surface (D), as shown in the figure.
Insert the clutch actuator (R) into the pushrod (14) and bring it fully home on the anti-rotation insert (28).

Note

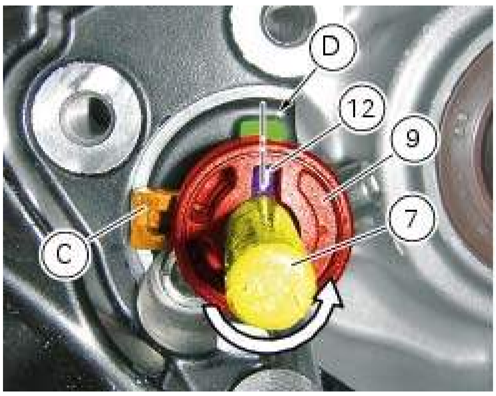
Upon insertion of the clutch actuator (R), make sure that the tab (C) of insert (28) matches with the actuator slot (E).

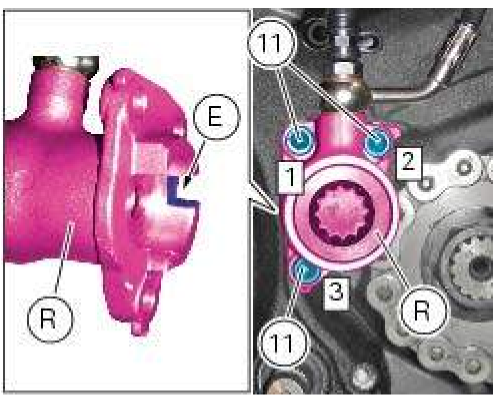
Fix the clutch actuator (R) by starting the screws (11).

Note

To bring the clutch slave cylinder (6) internal surface near the casing cover as uniformly as possible, screw and tighten the screws (11) alternatively.

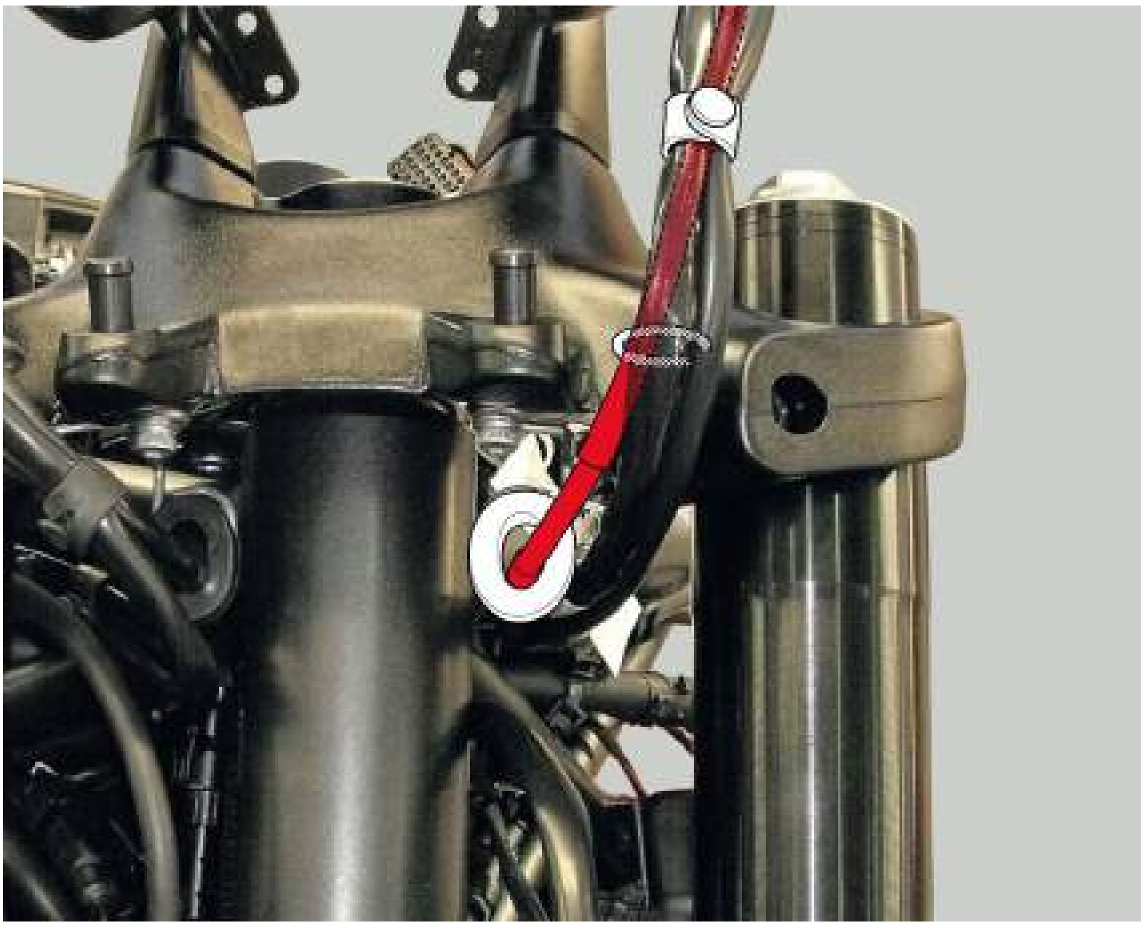
Tighten the screws (11) to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings), by following the sequence 1 - 2 - 3 - 1.

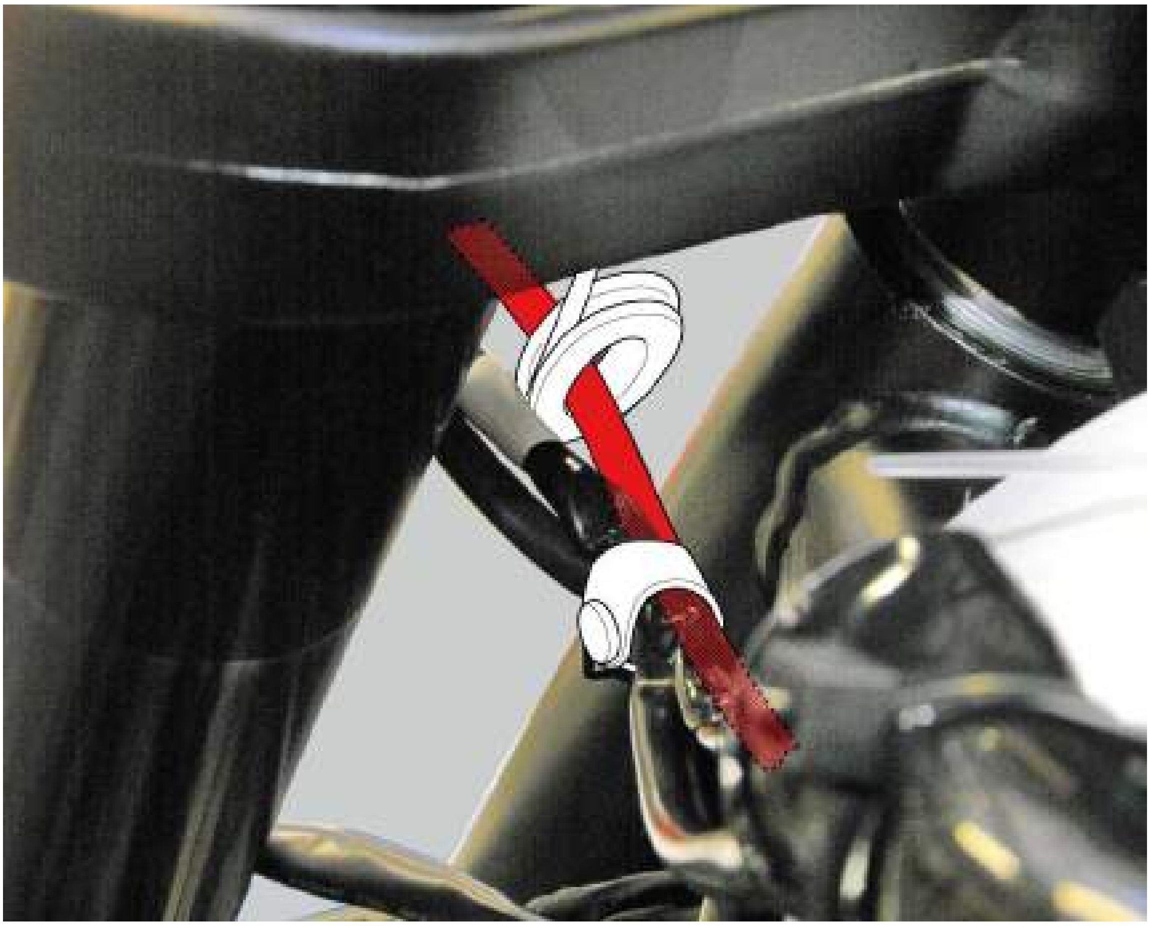


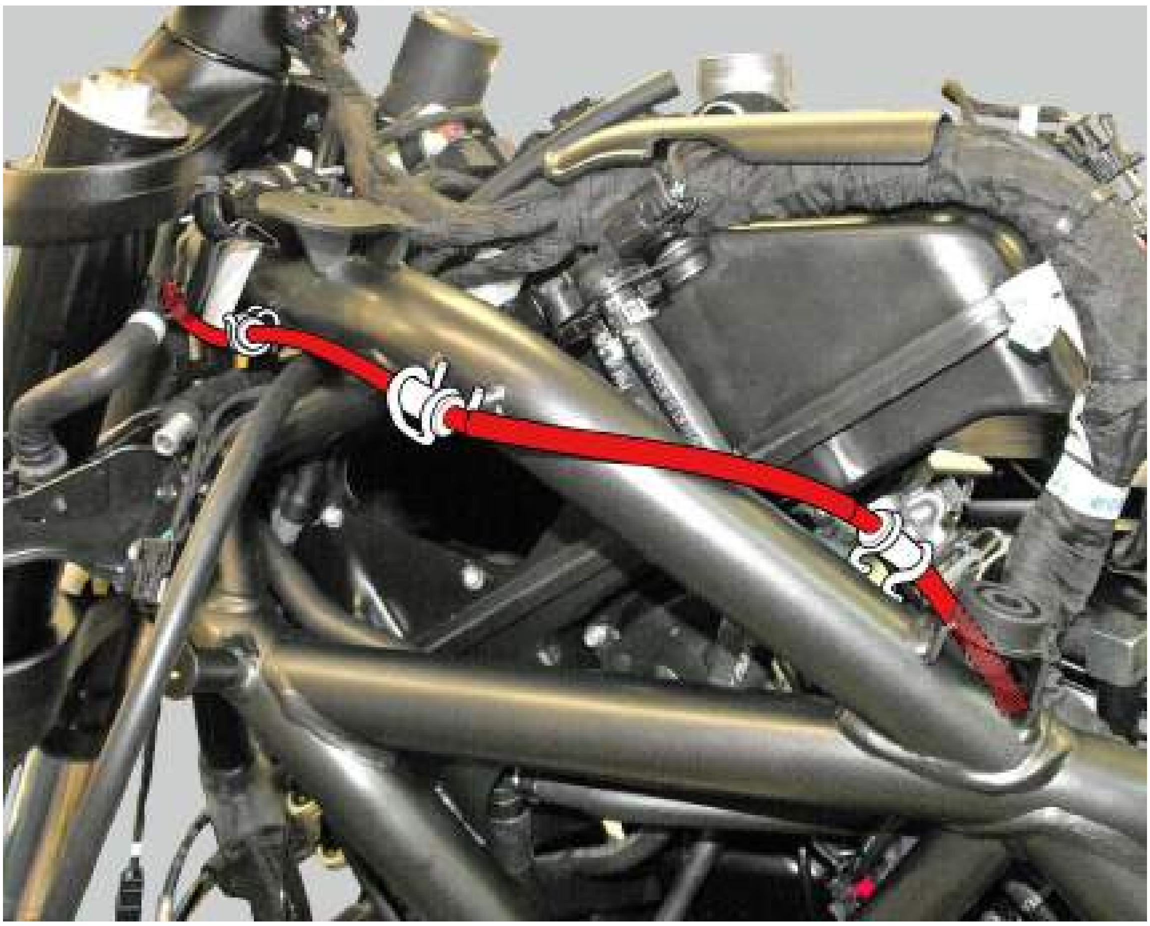


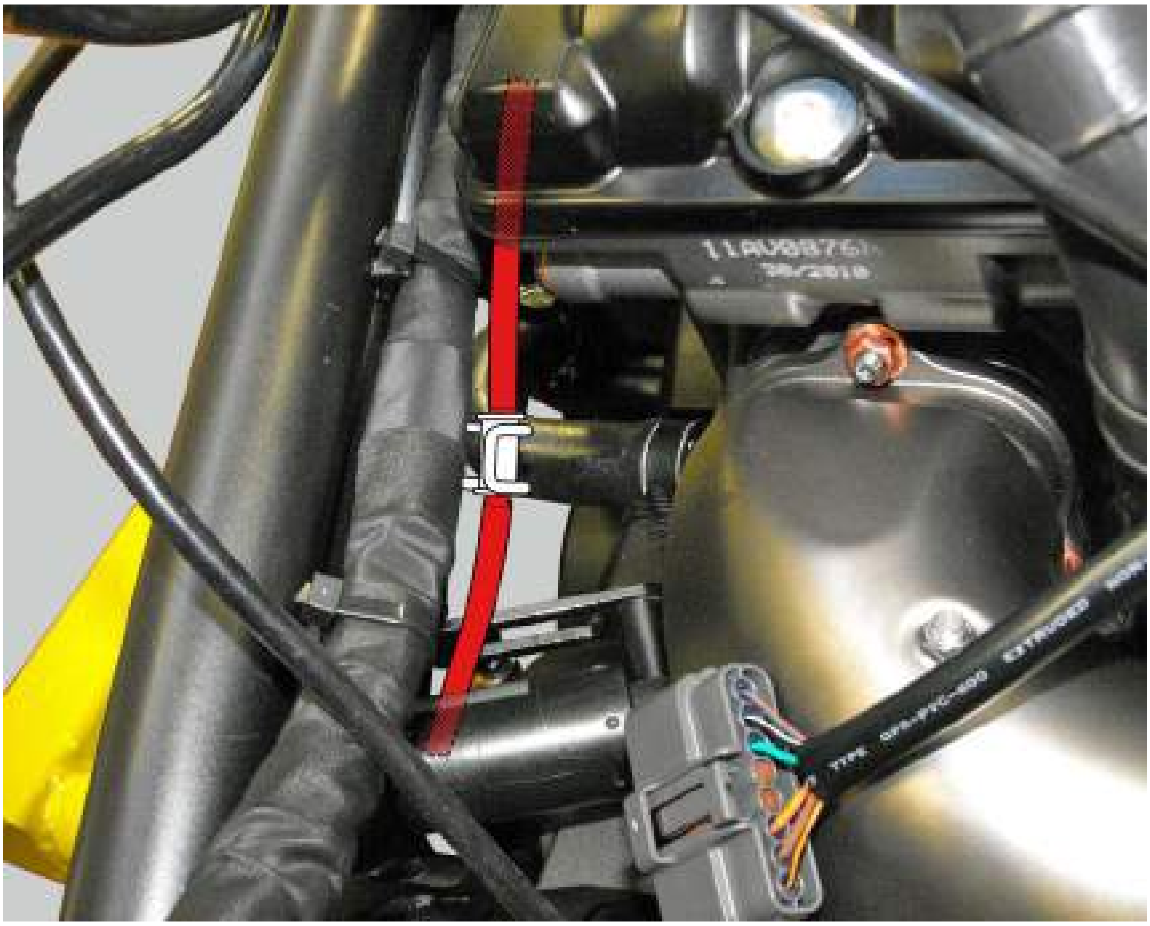
Operations	Section reference
Fill the clutch circuit	4 - 3, Filling the clutch circuit

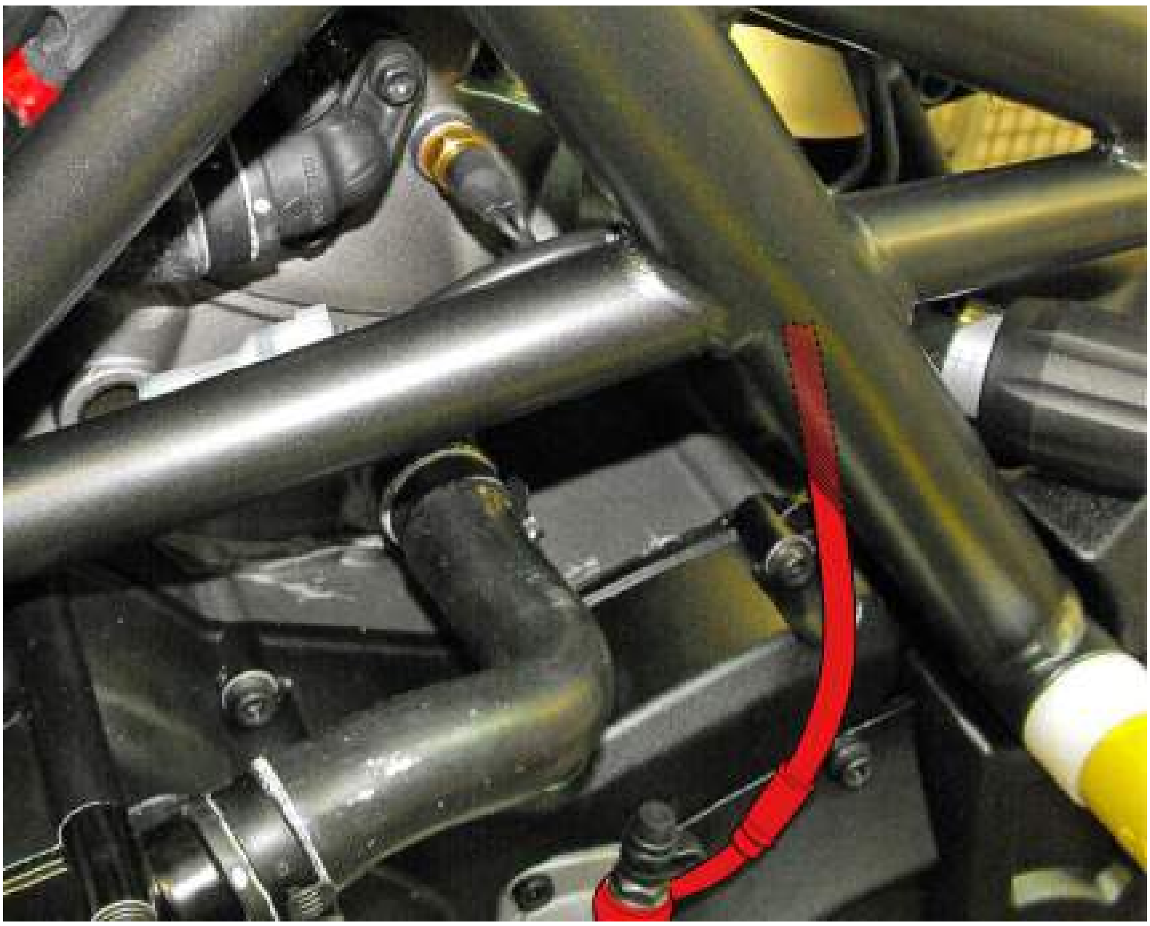
Positioning of the clutch hose

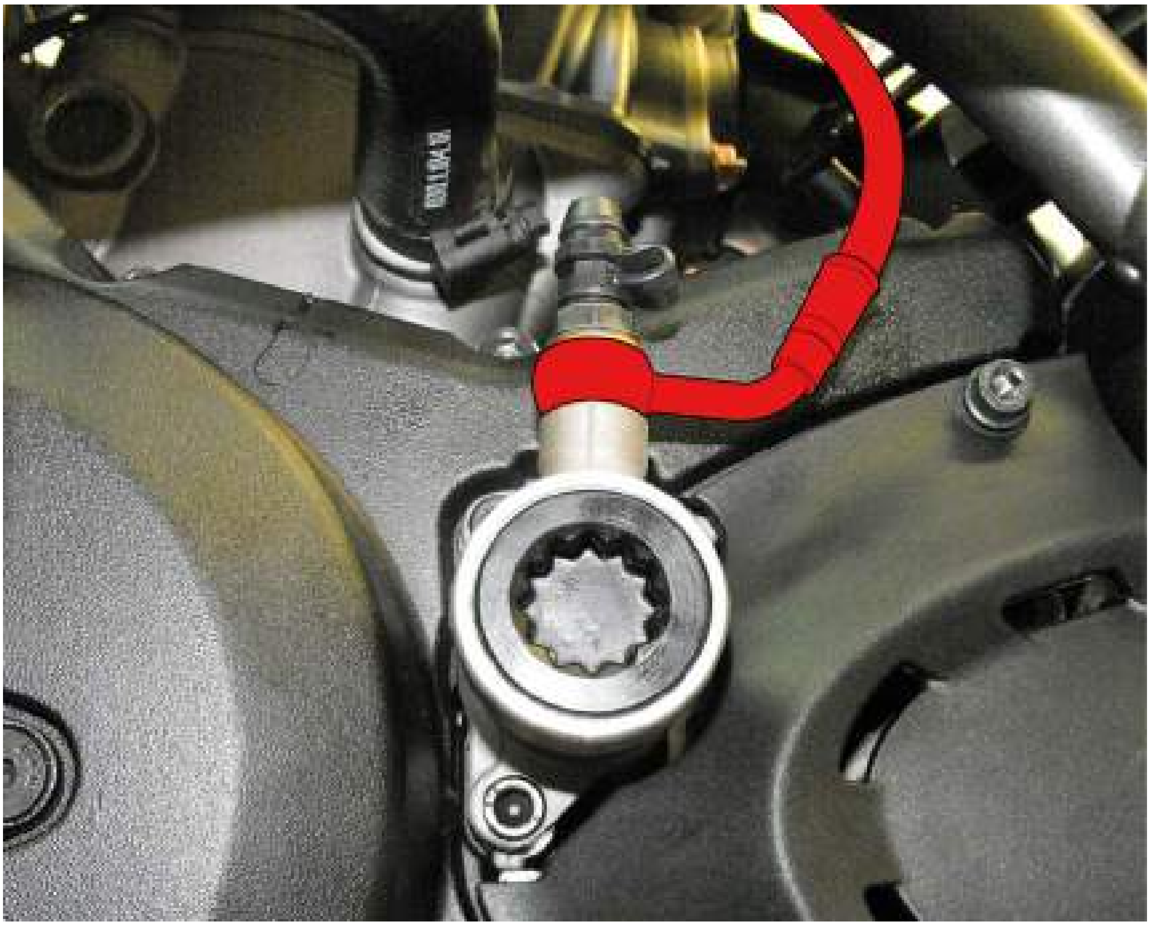




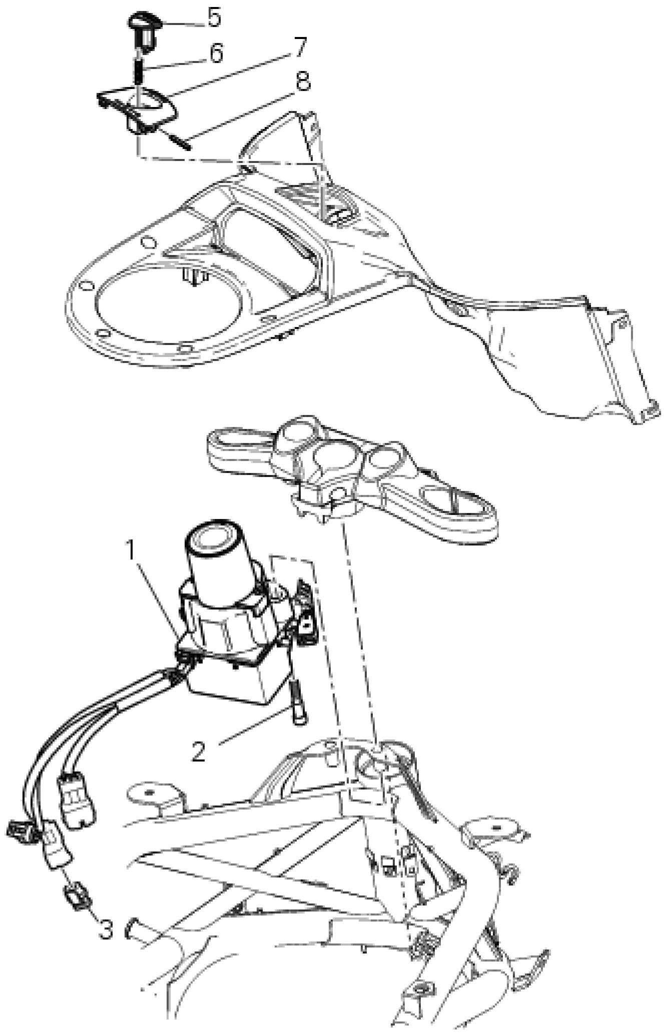


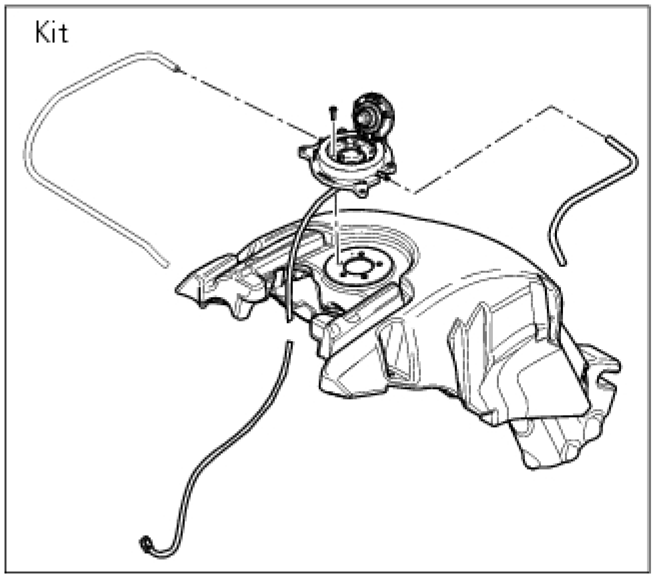






8.3 -Handlebar unit: Hands free





1 Hands free
2 Special screw
3 Plug
4 Electric fuel plug
5 Button
6 Spring
7 Frame
8 Elastic pin

Spare parts catalogue

Diavel ABS	HANDLEBAR AND CONTROLS
Diavel Carbon ABS	HANDLEBAR AND CONTROLS

Important

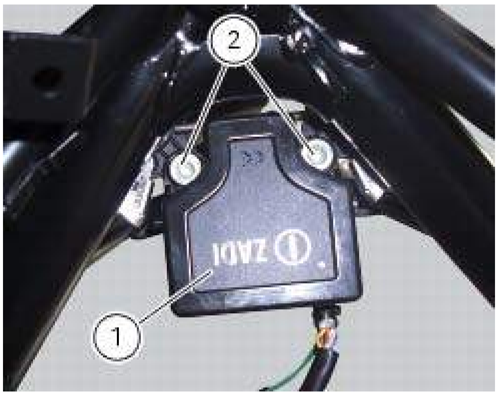
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Removing the Hands Free

Operations	Section reference
Remove the saddles	5 - 3, Removal of the seat
Remove air conveyor covers	8 - 7, Removal of the air filters
Remove the tank half covers	5 - 2, Removal of the fuel tank fairings
Remove the fuel tank	8 - 2, Removal of the fuel tank

Remove air conveyors	8 - 7, Removal of the air filters
Disconnect the throttle cable	7 - 8.1, Removal of the throttle twistgrip
Remove the airbox and the throttle body	8 - 6, Removal the airbox and throttle body

Loosen the screws (2) and remove the Hands Free system (1) from the frame.



Refitting the Hands Free

Reassembly is a reversal of the removal procedure: in particular apply prescribed threadlocker to screws (2) and tighten them to a torque of 20 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

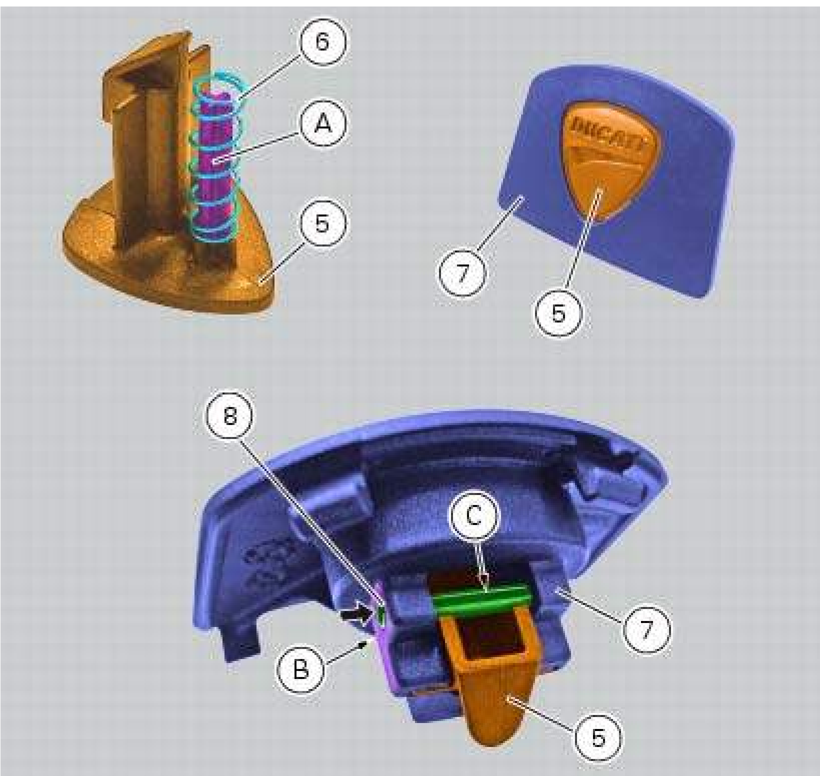
If the Hands free button has been previously removed, when refitting it insert the spring (6) on pin (A) of button (5).
Introduce button (5) with spring (6) into the opening on the frame (7).
Lock the button (5) by means of a pin (8), by inserting it until reaching the surface (B) of the frame (7).

Note

Upon insertion of the pin (8), keep button (5) pressed in the direction indicated by the yellow arrow.

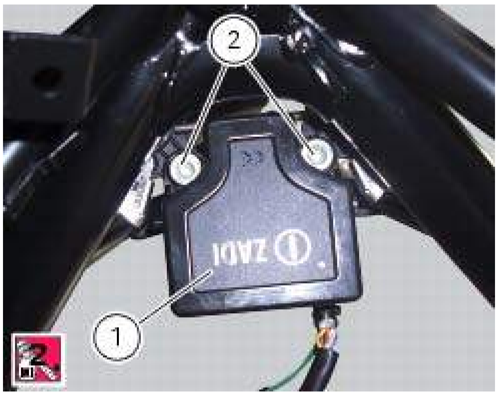
Warning

The opening (C) of the pin (8) must be on the opposite side of the of the surface touched by the button (5) when sliding (as shown in the figure).

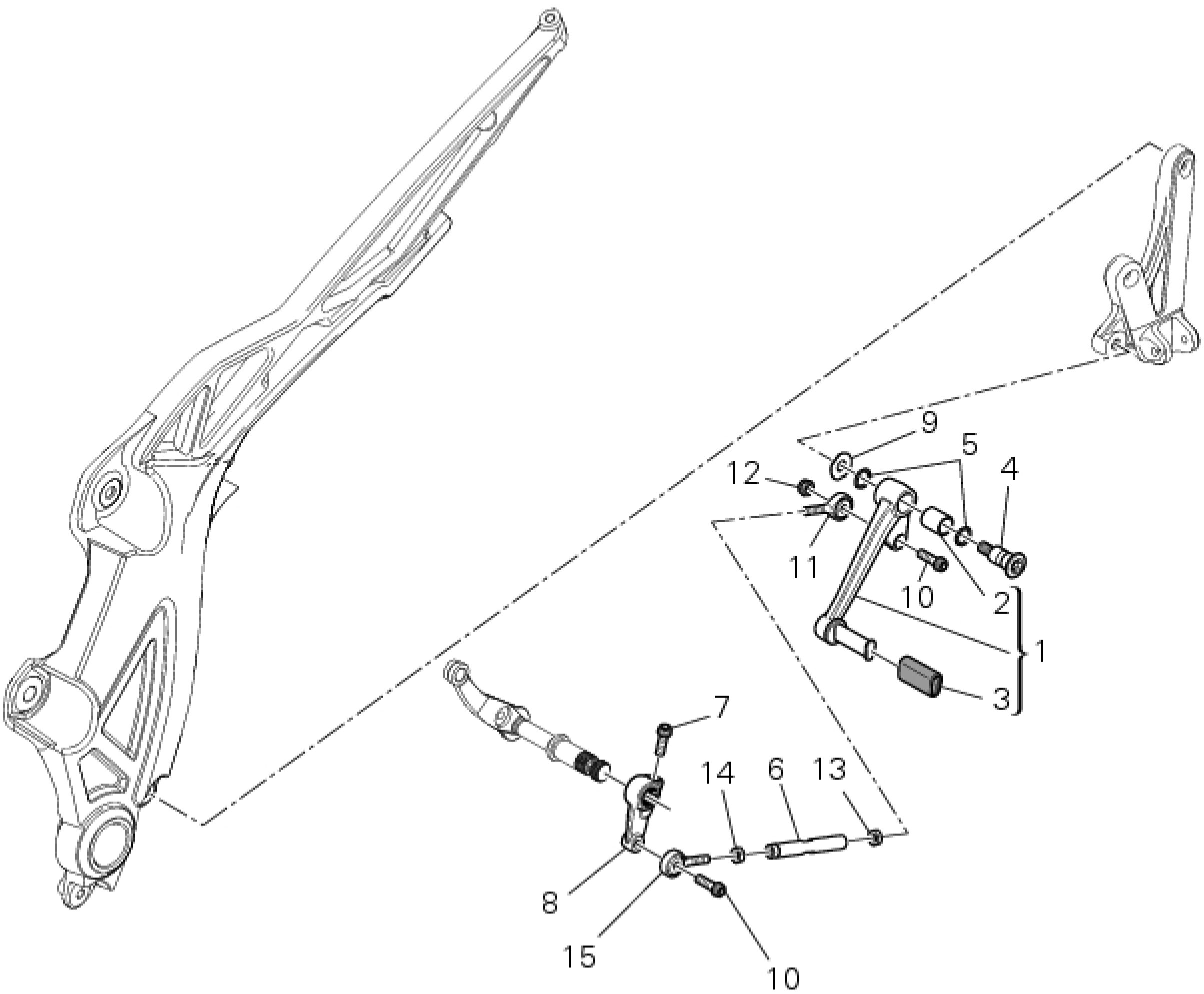


To reposition the wiring refer to Sect. 6 - 1, Routing of wiring on frame.

Handlebar unit: Hands free



9 -Gearchange mechanism



1 Gearchange pedal
2 Bush
3 Rubber pad
4 Pin
5 O-ring
6 Gearchange lever tie-rod
7 Screw
8 Gearchange lever
9 Washer
10 Screw
11 Ball joint
12 Nut
13 Nut
14 Nut with left-hand thread
15 LH ball joint

Spare parts catalogue

Diavel ABS	L.H. FOOTRESTS
Diavel Carbon ABS	L.H. FOOTRESTS

Important
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

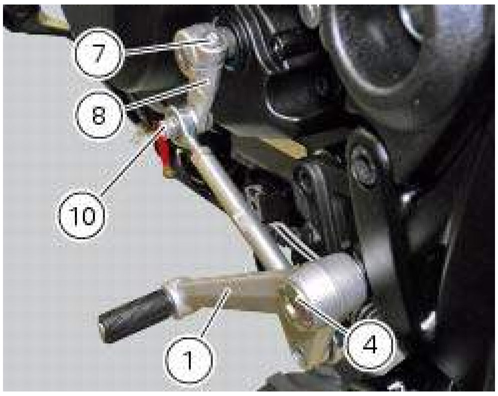
Removal of the gearchange control

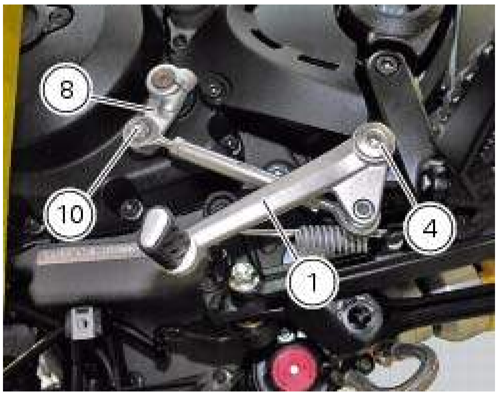
Loosen and remove the pivot screw (4) securing the gearchange pedal (1) and recover the washer (**9**) and the O-ring

seals (**5**).
Loosen and remove the screw (7) securing the gearchange lever (8) to the gear selector shaft.
Withdraw the lever (8) complete with the gearchange control assembly.

Note
Mark the position of lever (8) relative to the gear selector shaft.

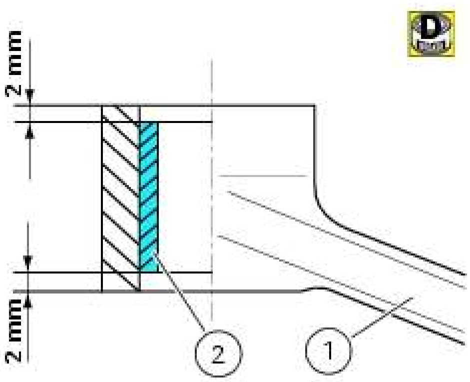
To remove the lever (8) from the gearchange assembly, remove the screw (10) and slide the lever (8) out.





Disassembly of the gearchange mechanism

Refer to the exploded view at the beginning of this section for indications on disassembly and renewal of gearchange components.
If the bushing (2) inside the pedal (1) needs replacing, grease the external surface and drive the new bushing into place using a press. The bushing must be seated **2** mm below the outer face of the pedal.

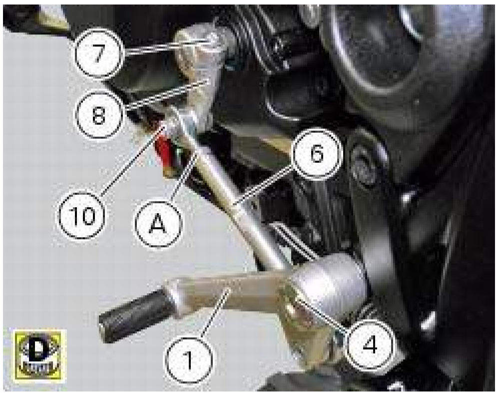


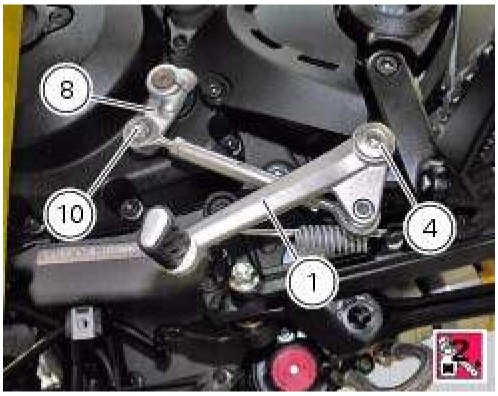
Warning
After working on the gearchange control, check the position of the gearchange pedal.
To adjust the gearchange pedal position, follow the instructions indicated in Sec. 4 - 3, Adjusting the position of the gear change and rear brake pedals.

Refitting the gearchange mechanism

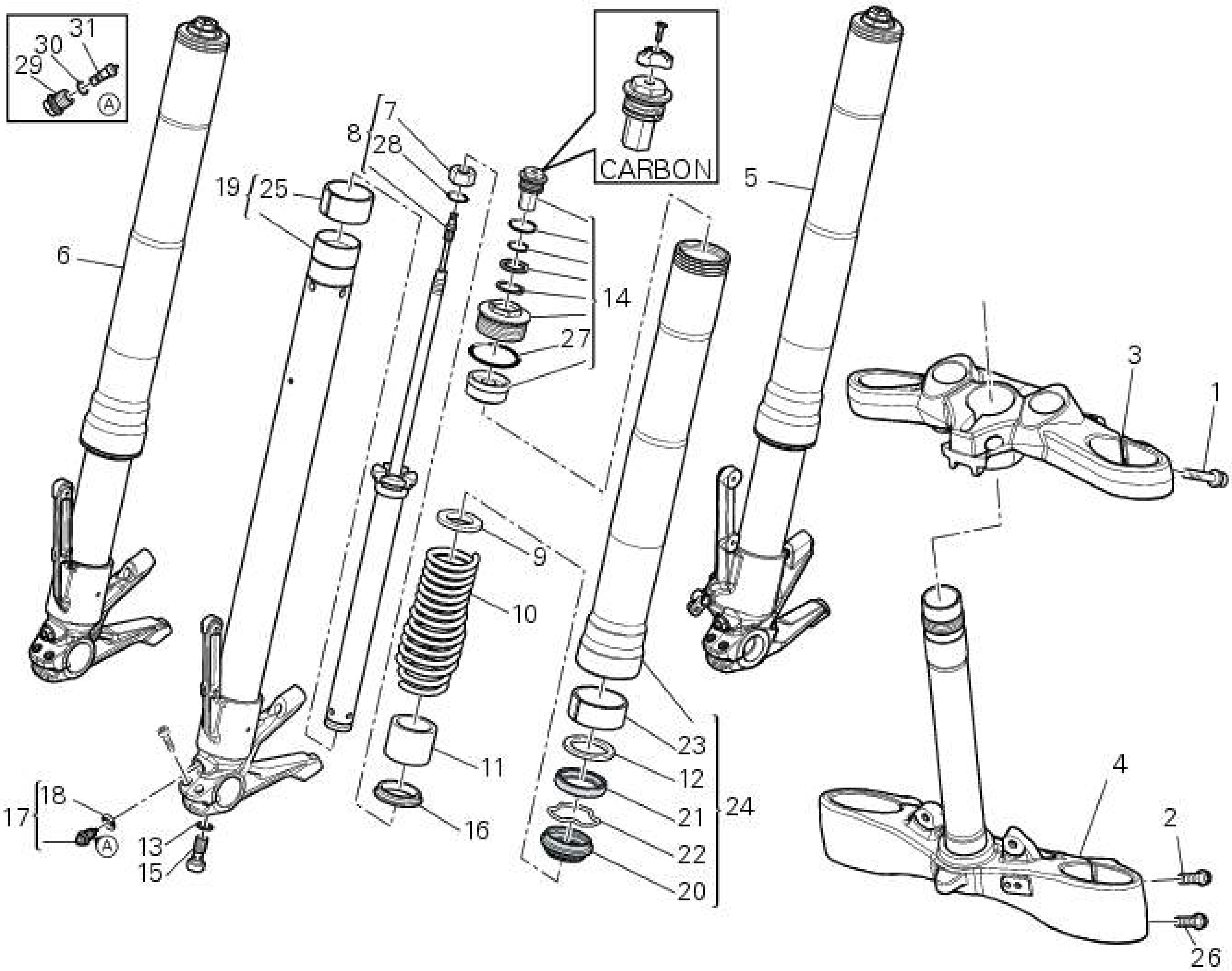
Make sure that the gearchange linkage assembly (6) is installed with the ball joint with a left-hand thread (A) facing the lever (8).
Apply the recommended grease to the non-threaded surface of the pin (4).
Fit the first O-ring (5) in the pin (4).
Start the pin (4) in the gearchange lever (1). Smear recommended grease on the second O-ring (**5**). Insert the second O-

ring (**5**) and the washer (**9**).
Apply the recommended threadlocker to the threaded side of the pin (4). Fit the gearchange lever (1) on the footrest bracket and tighten the pin (4) to a torque of 23 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Fit the lever (8) on the gearchange control assembly, and start the screw (10).
Tighten the screw (10) to the torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Fit the gear control unit inserting the lever (8) on the gear control pin, apply threadlocker on the screw (7) and insert it on the lever (8).
Tighten the screw (7) to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).





10.1 Fork - Steering head: front fork



1 Screw
2 Screw
3 Steering head
4 Bottom yoke
5 Left fork leg assembly
6 Right fork leg assembly
7 Counter nut
8 Damper assembly
9 Bush
10 Spring
11 Preload tube
12 Collar
13 Washer
14 Top cap assembly
15 Screw
16 Washer
17 Adjuster screw
18 Special washer
19 Fork tube + calliper unit
20 Dust cap
21 Sealing ring
22 Circlip
23 Upper bush
24 Outer tube
25 Lower bush
26 Screw
27 O-ring
28 O-ring
29 Special screw
30 O-ring
31 Adjuster

Spare parts catalogue

Diavel ABS	FRONT FORKS
Diavel ABS	HANDLEBAR AND CONTROLS
Diavel Carbon ABS	FRONT FORKS
Diavel Carbon ABS	HANDLEBAR AND CONTROLS

Important

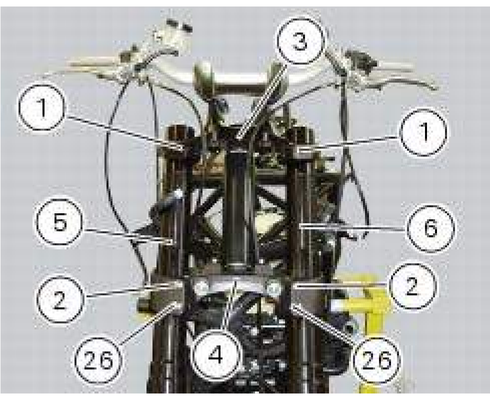
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Removal of the front forks

Before removing the front forks, it is first necessary to remove the following parts:

Operations	Section reference
Remove the front brake callipers	7 - 3, Removal of the front brake system
Remove the front mudguard	5 - 4, Removal of the front mudguard
Remove the front wheel	7 - 1, Removal of the front wheel

Loosen the clamp screws (1) holding the fork legs to the steering head (3).
Loosen the clamp screws (2) and (26) securing the fork legs to the bottom yoke (4).
Withdraw the fork legs (5) and (6) downwards in order to carry out to all the necessary overhaul operations.



Overhauling the front forks

Note

It is advisable to loosen the top cap (14) when the fork is still fitted to the motorcycle.

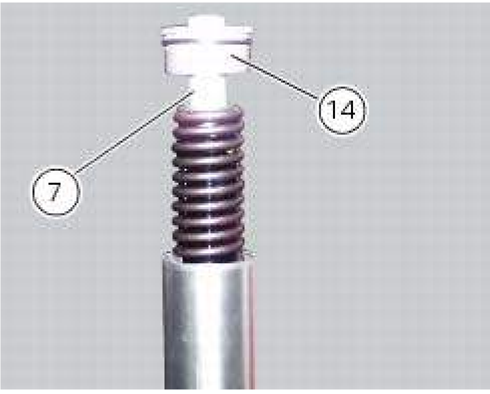
Note

The specific tools for the revision of the fork, are described in Sect. 3 - 4, Specific tools for the frame.

Loosen the spring preload adjuster before unscrewing the plug (14).
Unscrew the top cap (14) complete with the rebound damping adjuster.

Disassembly of the front fork

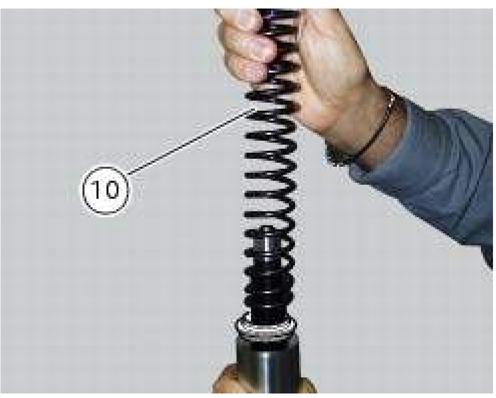
Restrain the counter nut (7) with a hex wrench.
Using another hex wrench, unscrew and remove the plug (14), with its seal, from the cartridge (8).



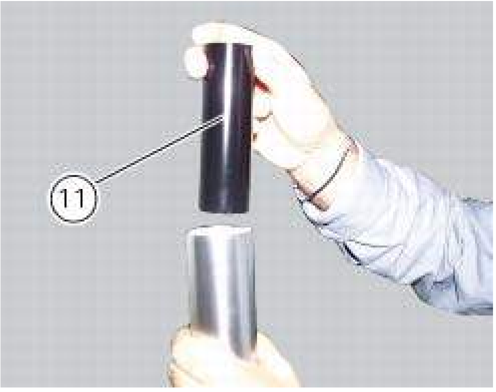
Unscrew the counter nut (7) up to the final threads on the damper (8).

While restraining the spring (10) with one hand, withdraw the bush (9) sideways and then slowly release spring (10).

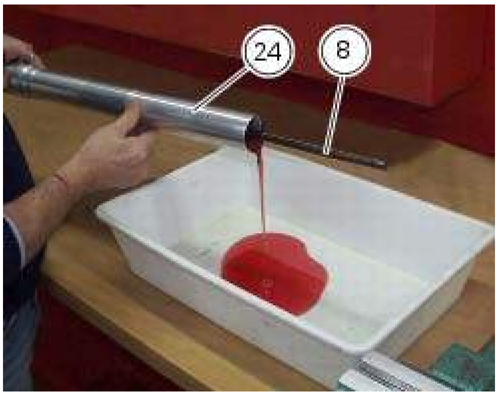
Slide off the spring (10).



Slide off the preload tube (11) and recover the washer (16).



Drain the oil from inside the leg by pumping with the outer tube (24) and the damper cartridge (8).

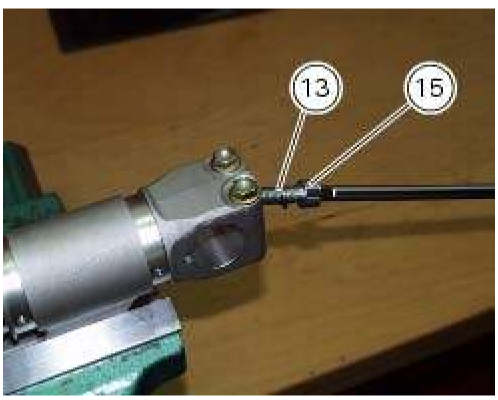


Warning

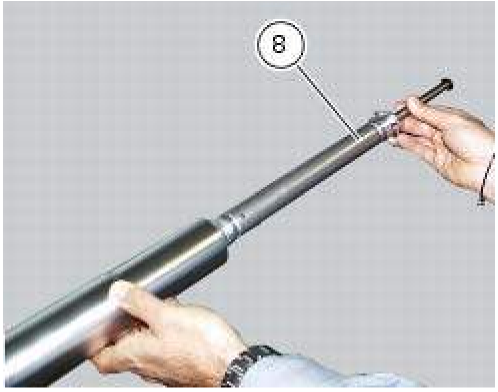
This movement generates pressure so that the oil will be rapidly expelled from the fork leg.
Aim the jet of oil into a previously prepared container and avoid contact with fork oil.

Block the fork tube/calliper unit (19) with a vice provided with protection jaws.

Unscrew the compression damping adjuster (15).
Remove the adjuster screw (15) and recover the seal (13).

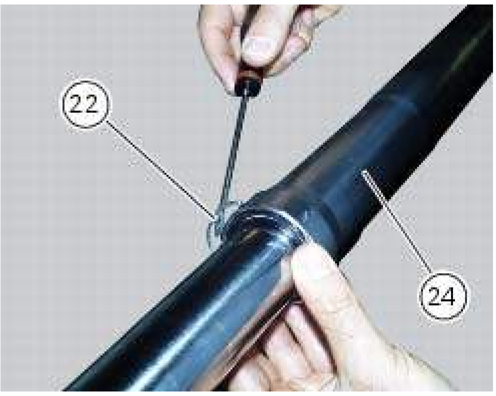


Withdraw the damper assembly (8).



Slip the dust seal (20) off the outer tube (24), prising it off with a screwdriver.

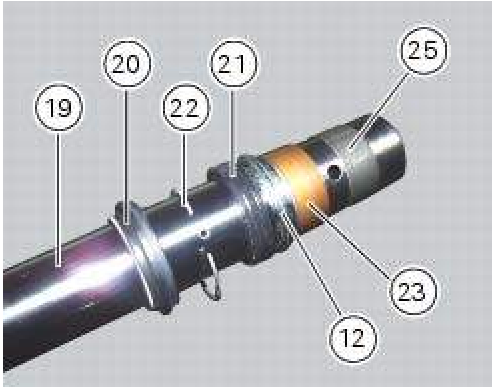
Remove the circlip (22).



Important

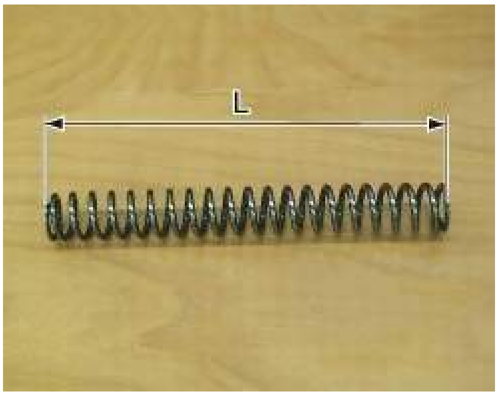
Take care not to damage the fork tube - calliper unit (19) and the seat of snap ring (22) in the outer tube (24).

To separate the outer tube (24) from the fork tube - calliper unit (19), pull sharply outwards repeatedly to gradually displace the bottom bush (23).
Insert the tip of a screwdriver in the slit in the bush (25) and open it up sufficiently to slide the bush off the fork tube - calliper unit.
Remove the following parts from the inner fork tube:
- bottom bush (23);
- collar (12);
- sealing ring (21);
- circlip (22);
- dust seal (20).

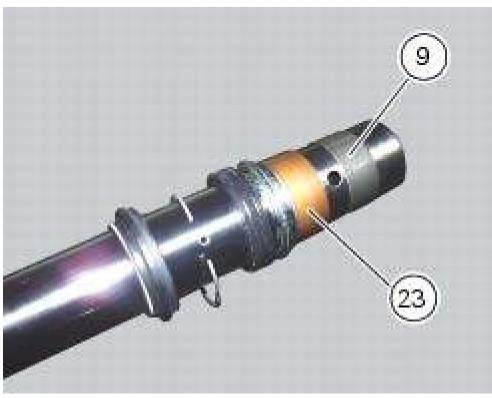


Inspection of the front fork

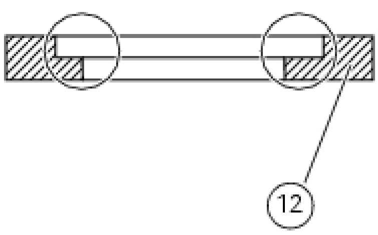
Place the spring on a flat surface and measure the free length (L).
Service limit:
270 mm.



Renew the spring if the length is not within the specified limit.
Inspect the outer surfaces of both fork inner tubes and the internal surfaces of both outer tubes. They must be free from scoring, steps, or dents.
Check that the outer tubes are straight:
maximum allowed error **0.10** mm.
Whenever the inner tube is removed from the sleeve it is good practice to renew the bottom bushes (9) and (23).



Check the collar (12) for distortion in the area indicated. Renew if distorted.



Reassembly of the front fork

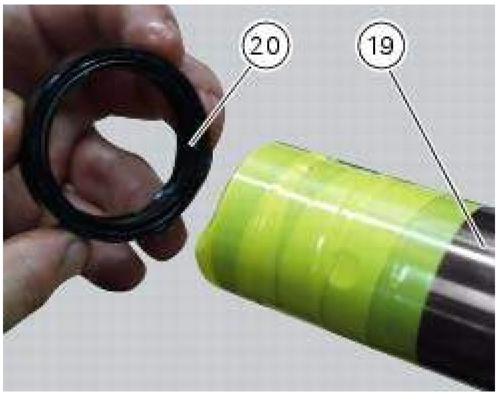
Lock the fork tube - calliper unit.

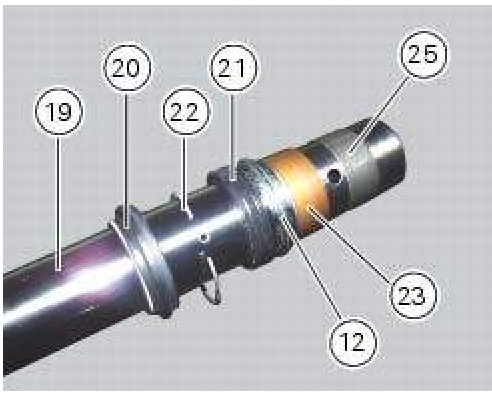
Protect the end of the unit with tape.

Important

Before installation, smear the sliding edges of sealing ring (21) with fork oil or oil seal grease.
Install the sealing ring (21) with the marked surface facing the dust seal (20).

Install the following components in the fork tube - calliper unit (19):
- dust seal (20);
- circlip (22);
- sealing ring (21);
- collar (12);
- bottom bush (23);
- bottom bush (25).





Note

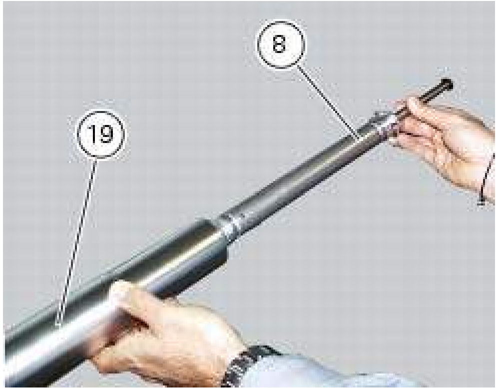
Before assembling the fork tube - calliper unit with the outer tube, lubricate the bush sliding surfaces with fork oil.

Push the bottom bush (23) and the cap (12) into the external sleeve (24) using the sealing ring tool (F, part no. **88713.3204**).
Drive the oil sealing ring (21) into the outer tube using the same tool.
Fit the circlip (22) and the dust seal (20).

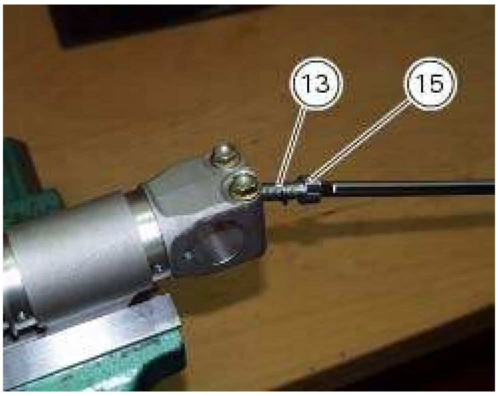
Important

The outer tube must freely slide on the fork tube - calliper unit. Only support the sliders and the outer sleeve with your hands to avoid damaging the sealing rings and the bottom bushes.

Insert the cartridge assembly (8) in the fork tube - calliper unit (19), screwing the tool **88713.3203** onto the cartridge.



Install the gasket (13) and the compression set screw (15) and tighten to the torque (Sect. 3 - 3, Frame torque settings).



Insert half of the prescribed quantity of oil in each fork leg (Sect. 3 - 2, Fuel, lubricants and other fluids).
Pump with tool **88713.3203** to force the oil to fill internal volume completely.
Slide both the damper and outer tube fully down the inner tube.
Pour the remaining oil into the fork leg and measure the oil level.

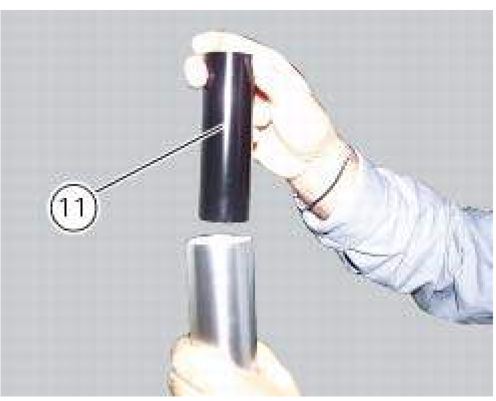
Important

Keep the fork leg vertical when measuring the oil level. Make sure the oil level is the same in both fork legs.

Recommended oil:
SHELL ADVANCE FORK 7.5 or DONAX TA
Standard capacity:
0.480 dm^3 for each fork leg.
Standard oil level:
104 mm.

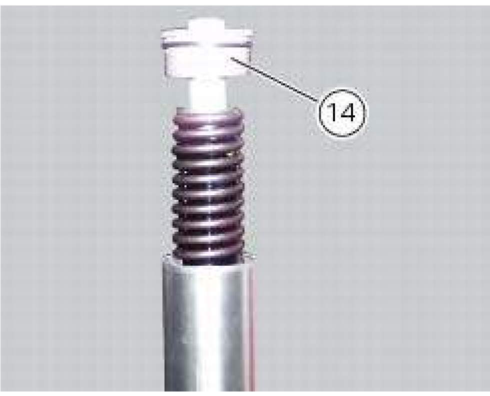
The quantity of oil affects fork response during the final part of the compression stroke.
High oil level increases compression loading, low oil level will decrease it.
Clean off any oil from the spring (**10**) and the counter nut (**7**) before refitting.

Fit the following components:
the washer (**16**) and the preload tube (11).
Insert the spring (10), bush (26) and counter nut (7), with the conical side facing counter nut (23) and washer (8).



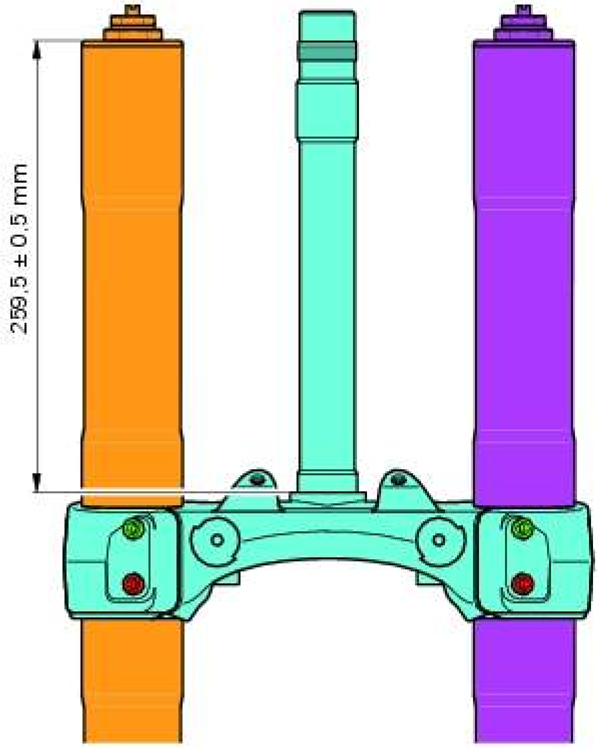
Screw the counter nut (7) onto the damper (8) with a wrench.

Using the same wrench, restrain the counter nut and screw the top cap (14) complete with the O-ring onto the damper (8).
Tighten the upper plug (14) to the specified torque (Sect. 3 - 3, Frame torque settings).



Refitting the front forks

Refit the fork legs, positioning them at the height shown in the figure relative to the upper surface of the bottom yoke.



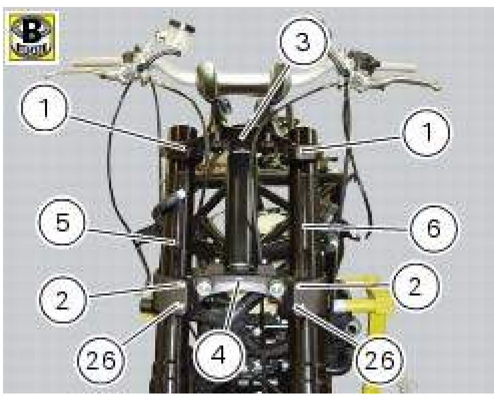
Warning

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

Position the fork legs (5) and (6) on the yoke base (4) and on the steering head (3).
Lock the fork legs by tightening the screws (1) to the torque of 20 Nm ± 5%, the screws (2) to the torque of 22 Nm ± 5%, and the screws (26) to 12 Nm ± 5% (Sect. 3 - 3, Frame torque settings) that secure the bottom yoke (4) and the steering head (3): tighten one fork leg at a time.

Important

If the screws (1) (2) and (26) were removed on disassembly, smear the threads with the specified grease before tightening.



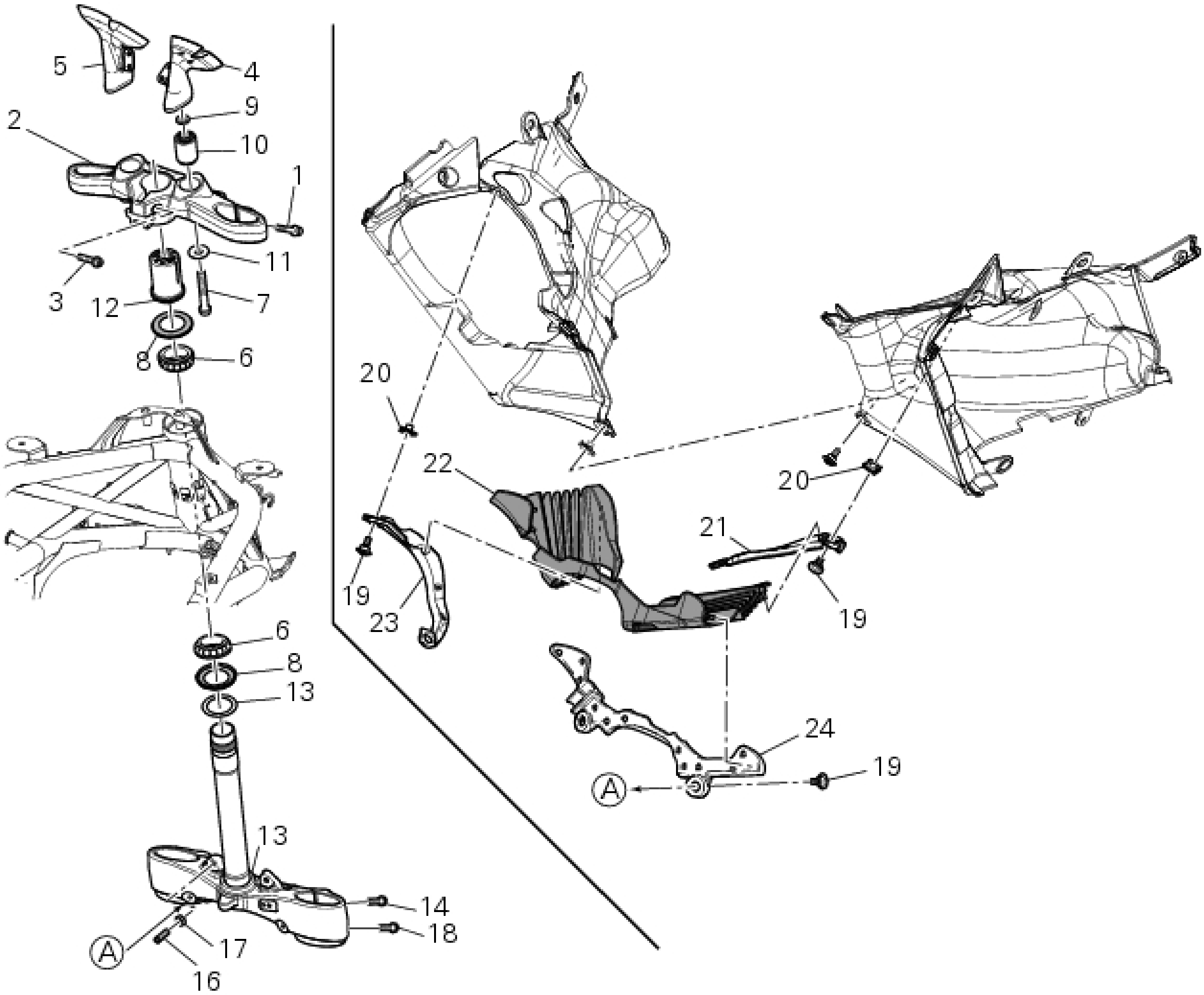
Refit any parts removed from the frame:

Operations	Section reference
Refit the front mudguard	5 - 4, Refitting the front mudguard
Refit the front wheel	7 - 1, Refitting the front wheel
Refit the front brake callipers	7 - 3, Refitting the front brake system

Warning

Do not ride with the front mudguard removed. The brake hoses are retained to the front mudguard to keep them from touching the wheel under braking.

10.3 Fork - steering head: Steering



1 Screw
2 Steering head
3 Screw
4 Lower RH U-bolt
5 Lower LH U-bolt
6 Bearing
7 Screw
8 Sealing ring
9 Washer
10 Spacer
11 Washer
12 Nut
13 Washer
14 Screw
15 Bottom yoke
16 Dowel
17 Nut
18 Screw
19 Special screw
20 Clip nut
21 Left-hand support
22 Front splashguard
23 Right-hand support
24 Front support

Spare parts catalogue

Diavel ABS	HANDLEBAR AND CONTROLS
Diavel ABS	HALF FAIRING
Diavel Carbon ABS	HANDLEBAR AND CONTROLS

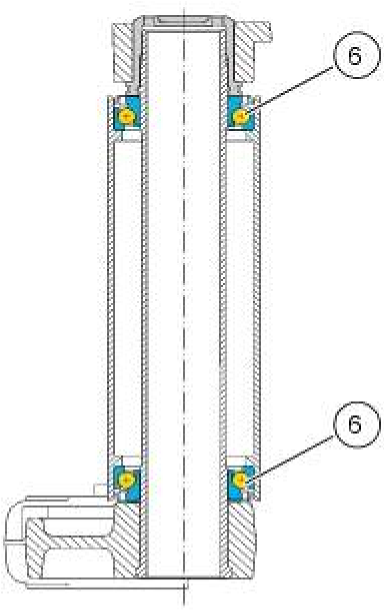
Diavel Carbon ABS   HALF FAIRING

Important
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Adjusting the steering head bearings

Note
To adjust the steering bearing clearance, follow what is described in Sect. 4 - 3, Adjusting the steering head bearings.

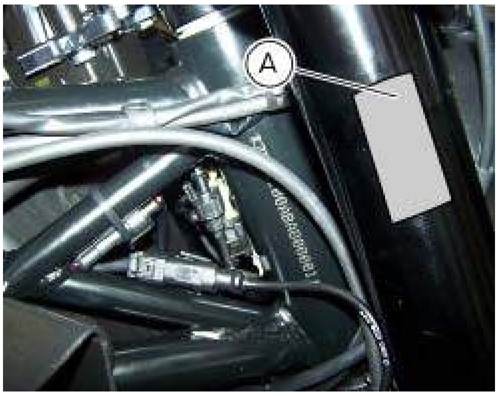
If the problems found are not solved, check the wear of steering bearings (6) and replace them, if necessary, as described in paragraph "Removal of the steering head components" of this section.



Steering angle adjustment

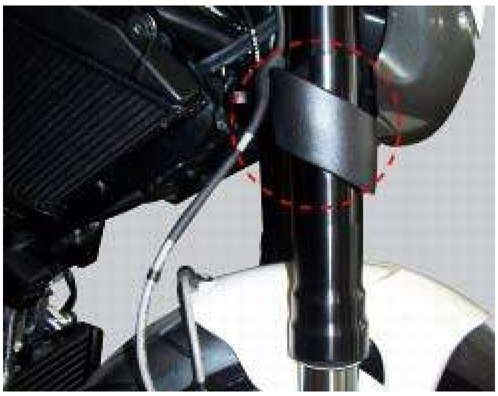
Loosen the nuts (17) and adjuster screws (16) on both sides of the bottom yoke.

Use a **6 to 6.5** mm spacer (A) fitted to the fork outer tube, or use a gauge.



Turn the front forks to the right until the spacer (A) is seated against the frame top tube.
Tighten the adjuster screw (16) to bring it into contact with the stop on the steering head.
Apply threadlocker to the thread of nut (17). Hold the adjuster screw (16) firm and tighten the nut (17). Turn the forks to the opposite side: and repeat the process to adjust the other dowel and tighten the relative lock nut.

Once adjusted, set handlebar completely turned right and ensure that the gap between front brake line and lower frame trellis is at least **1** mm. If it is not so, decrease steering angle by working the right-hand adjuster.



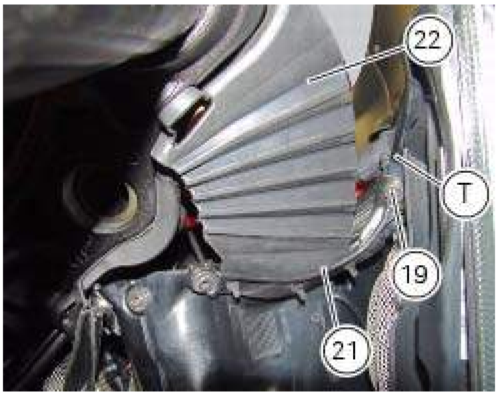
Removal of the steering head components

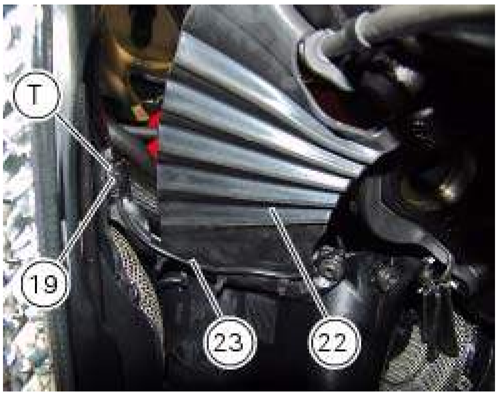
Operations	Section reference
Remove the headlight	6 - 4, Renewal of the headlight
Removal of the front mudguard	5 - 4, Removal of the front mudguard
Removal of the front wheel	7 - 1, Removal of the front wheel
Remove the fork legs	7 - 10.1, Removal of the front forks
Disassembling the handlebar from the steering head	7 - 8.1, Removal of the handlebar

Note

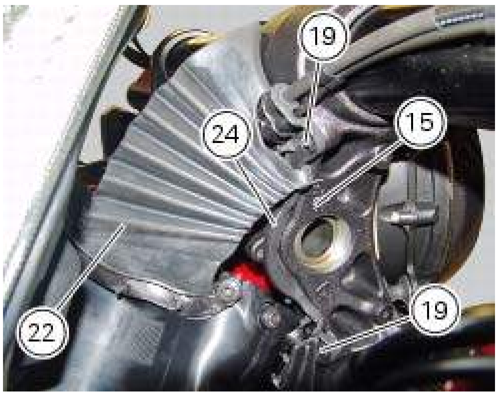
All parts fitted to the top and bottom yokes, including the wiring and control cables, can remain on the motorcycle provided they do not hinder the following operations.

Loosen the screws (19) securing the supports (21) and (23) of splashguard (22) to the air conveyors (T).

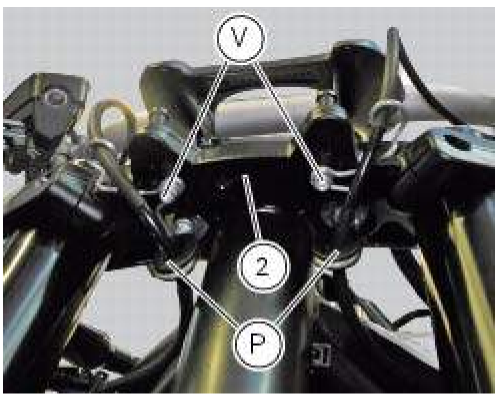




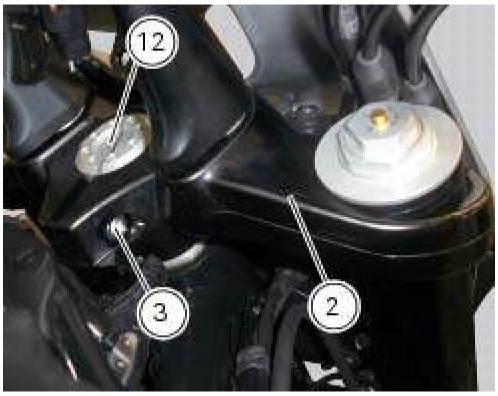
Loosen the screws (19) securing the front support (24) of the splashguard (22) to the bottom yoke (15).



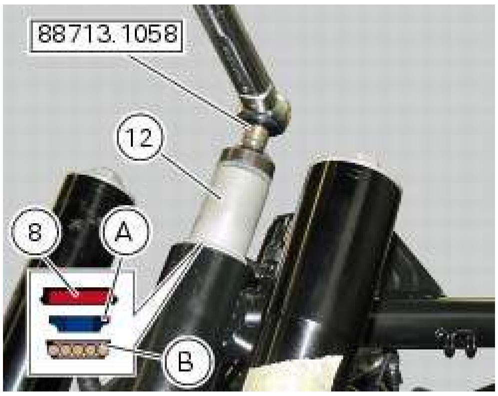
Loosen the screws (V) to free the cable grommets (P) from the steering head (2).



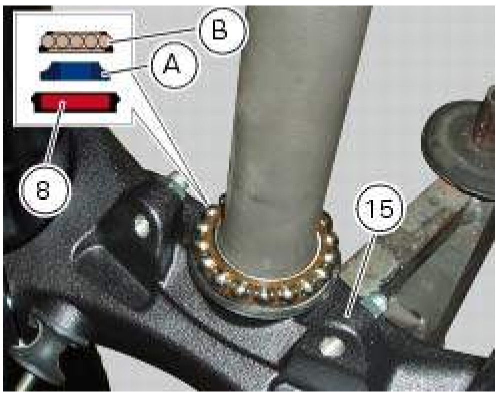
Loosen the screw (3) securing the steering head (2) to the steering head nut (12).
Remove the steering head (2).



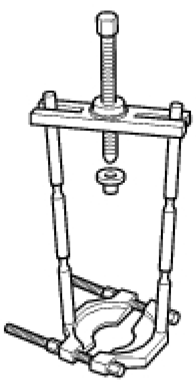
With the service tool no. **88713.1058** loosen the nut (12) and unscrew it from the steering shaft.
Slide the seal (8), the inner ring (A) and the ball race (B) of the upper bearing (**6**) off the steering shaft.



Remove the bottom yoke (15) complete with the steering shaft from the frame tube.
Remove the ball race (B) of the lower bearing (**6**).
The inner race (A) of the lower bearing (**6**) and the relative oil seal (8) will remain on the steering shaft.



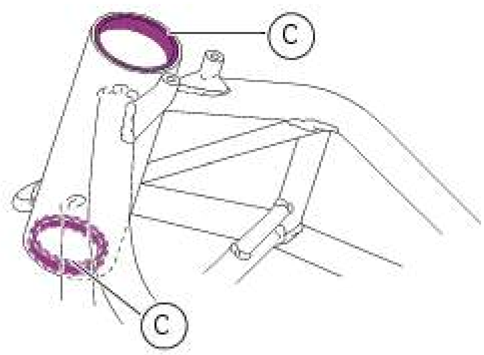
Using a universal puller (see figure) remove the inner race (A) and the spacer (13) from the steering shaft, taking care not to damage the seat.



Important

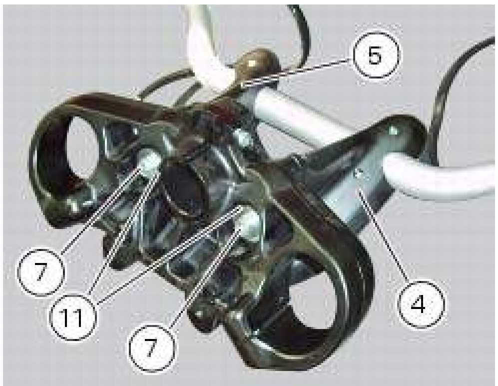
Once removed, the seals (**8**) and the bearings (**6**) must not be refitted.

Using a suitable punch, remove the outer bearing races (C) from the steering head. Proceed with extreme care to avoid damaging the seats.



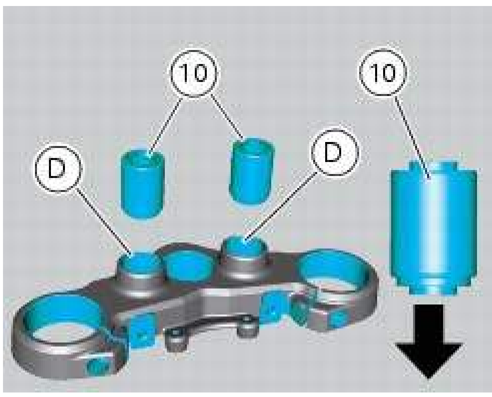
Disassembly of the steering head

Loosen and remove the screws (7), washers (11) and the lower U-bolts (4) and (5) from the steering head.



Reassembly of the steering head

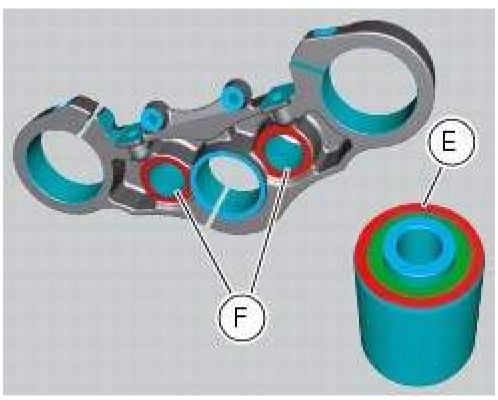
If the spacers (10) were removed from the steering head, lubricate with silicone spray.
Seat the spacers (10) square in the bores (D) in the steering head, orienting them as shown in the figure.



Important

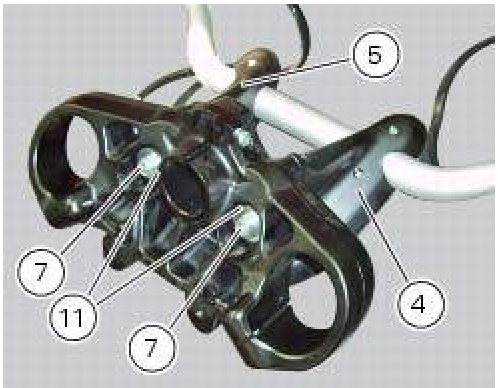
To drive in the spacers (10), use a drift that bears only on the outer ring (E) while applying a counterforce on zone (F) on the underside of the steering head.

On completion of the operation, clean all excess lubricant from the components.



Locate the lower U-bolts (4) and (5) on the steering head.
Fit the screws (7) complete with the washers (11 in the lower U-bolts (4) and (5).

Tighten the screws (7) to a torque of 45 Nm ±5% (Sect. 3 - 3, Frame torque settings).



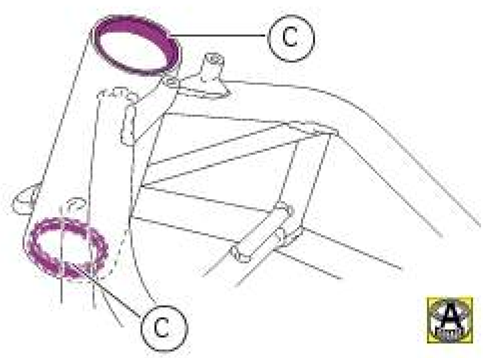
Refitting the steering head components

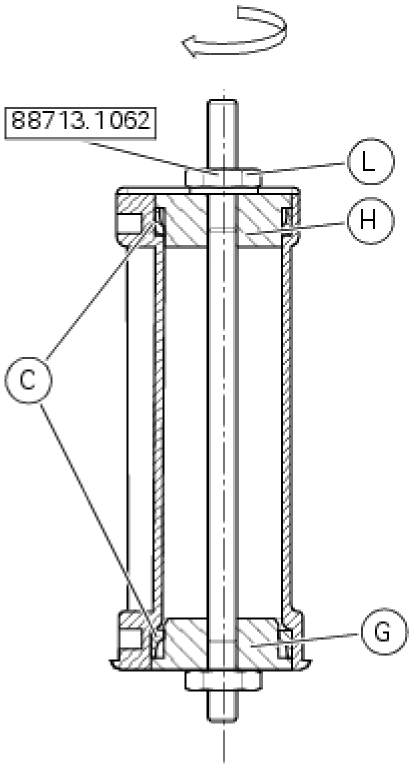
Important

The steering tube bearings (**6**) are identical but in no case may their components be swapped around during reassembly.

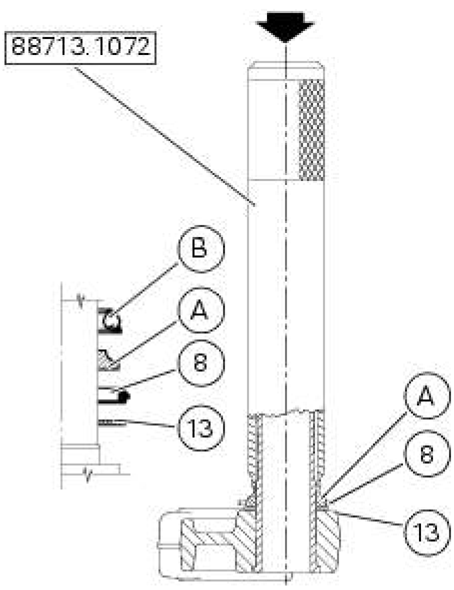
Clean all contact surfaces and lubricate with the recommended grease.
To fit the external rings (C) of the bearings (**6**) to the steering tube, use the tool with part no. **88713.1062** and proceed as follows:

- heat the steering head to **150** °C;
- fit the outer races (C) in their seats on the steering head;
- fit the fixed bush (G, with threaded hole) of the tool into the lower race;
- fit the other movable bush (H) into the upper end of the tool and drive it fully home against the upper bearing race;
- tighten the nut (L) and use a wrench to seat the outer races (C) fully in the steering head;
- leave the tool assembled until the steering head has cooled down to ensure that bearings are properly seated.

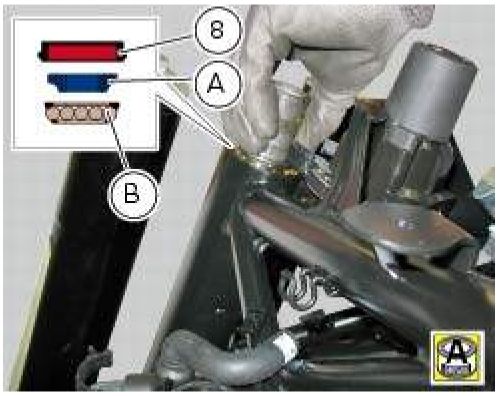




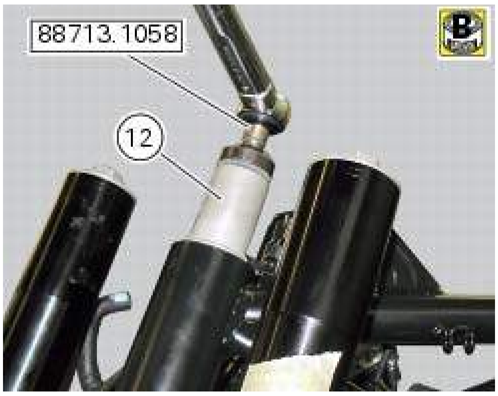
Insert the washer (13), seal (8) (with the rim facing upwards) and inner ring (L) of bottom bearing (**6**) onto the steering shaft after heating it for about 10 minutes to **120°**C.
Insert drift part no. **88713.1072** onto steering shaft. Push the inner ring (L) on the sealing ring (8), manually pushing for at least 10-15 seconds.
Lubricate the inner bearing race (L) with the recommended grease.
Fit the ball race (M) on the steering shaft with the smaller diameter of the cage facing upwards and grease the ball race.



Insert the steering shaft in steering head and push it in until it is axially seated.
Fit the bottom yoke assembly to frame.
Grease the ball race (B) and fit it to frame top outer race (**C**).
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 (8) with the flat side facing upwards.

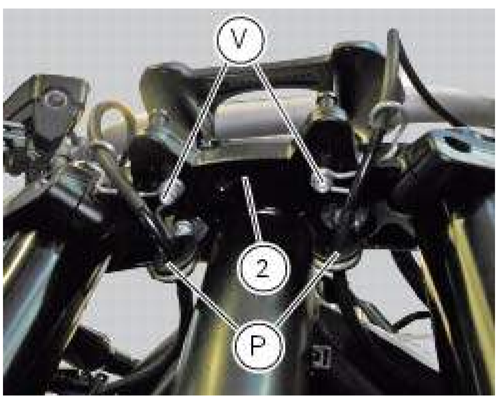


Grease the nut (12).
Tighten the steering shaft nut (12) by hand until it seats against the sealing ring (**8**).
Fit service bush no. **88713.1058** to the steering shaft nut (12) and fit the torque wrench to the bush.
Tighten the adjuster ring nut (12) to a torque of 30 Nm ±5% (Sect. 3 - 3, Frame torque settings).



Fit the steering head (2) on the steering head nut (12), aligning the fork leg bores with the corresponding bores on the bottom yoke. Relocate the fork legs as described in Section 7 - 10.1, Refitting the front forks.
Grease the screw (3).
Tighten the screw (3) on the steering head to a torque of 24 Nm ±5% (Sect. 3 - 3, Frame torque settings).

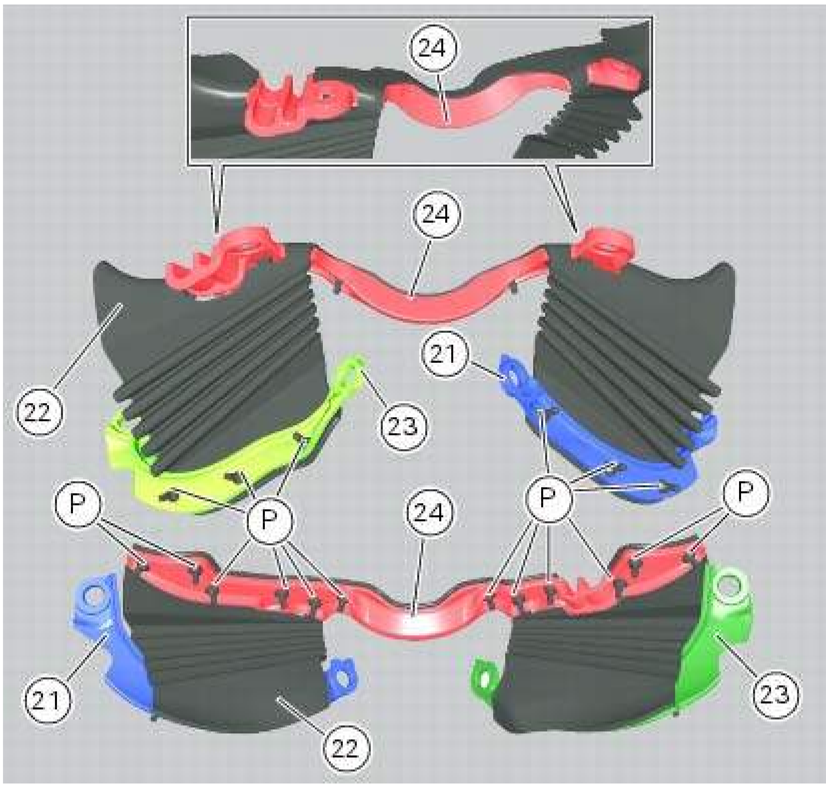
Refit the cable grommet (P) on the steering head and tightening the screws (V) to a torque of 8 Nm ±10% (Sect. 3 - 3, Frame torque settings).



Mount the front support (24) on the right support (23) and the front splashguard (22) on the left support (21), inserting the splashguard pins (P) into the holes in the supports.

Note

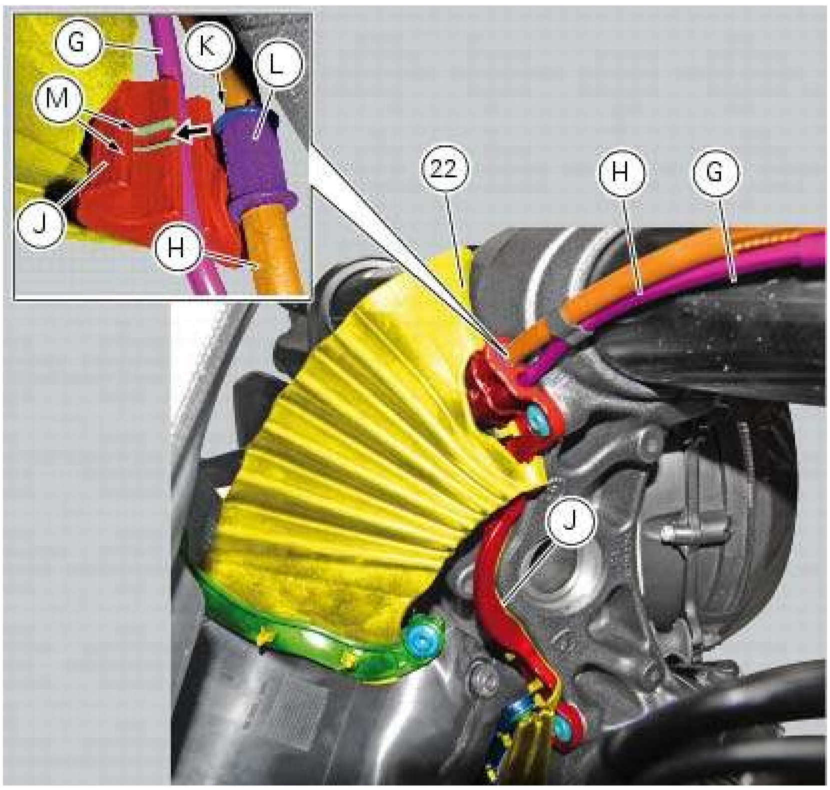
For the supports (21), (23) and (24) to be installed correctly, the pins (P) must be fully out at the side opposite to insertion site.



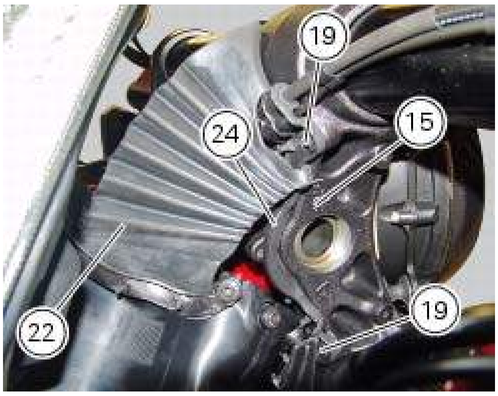
Position the front speed cable (G) and the brake hose (H) in the suitable seats provided by the front support (J) of the splashguard (22) as shown.

Note

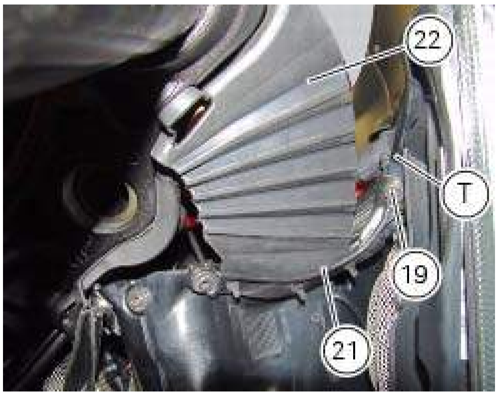
To position the brake hose (H) correctly, insert collar (K) of rubber (L) into the guides (M) on the front support (J).

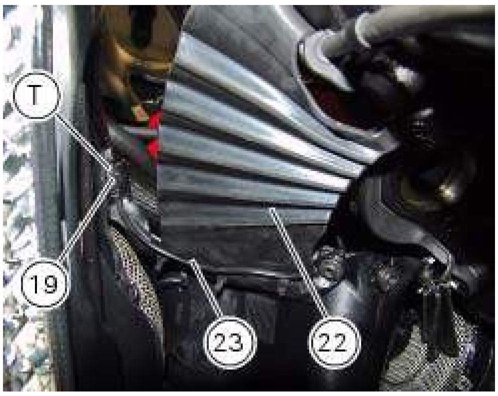


Place the front support (24) of the splashguard (22) on the bottom yoke (15) by tightening the screws (19) to a torque of 4 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



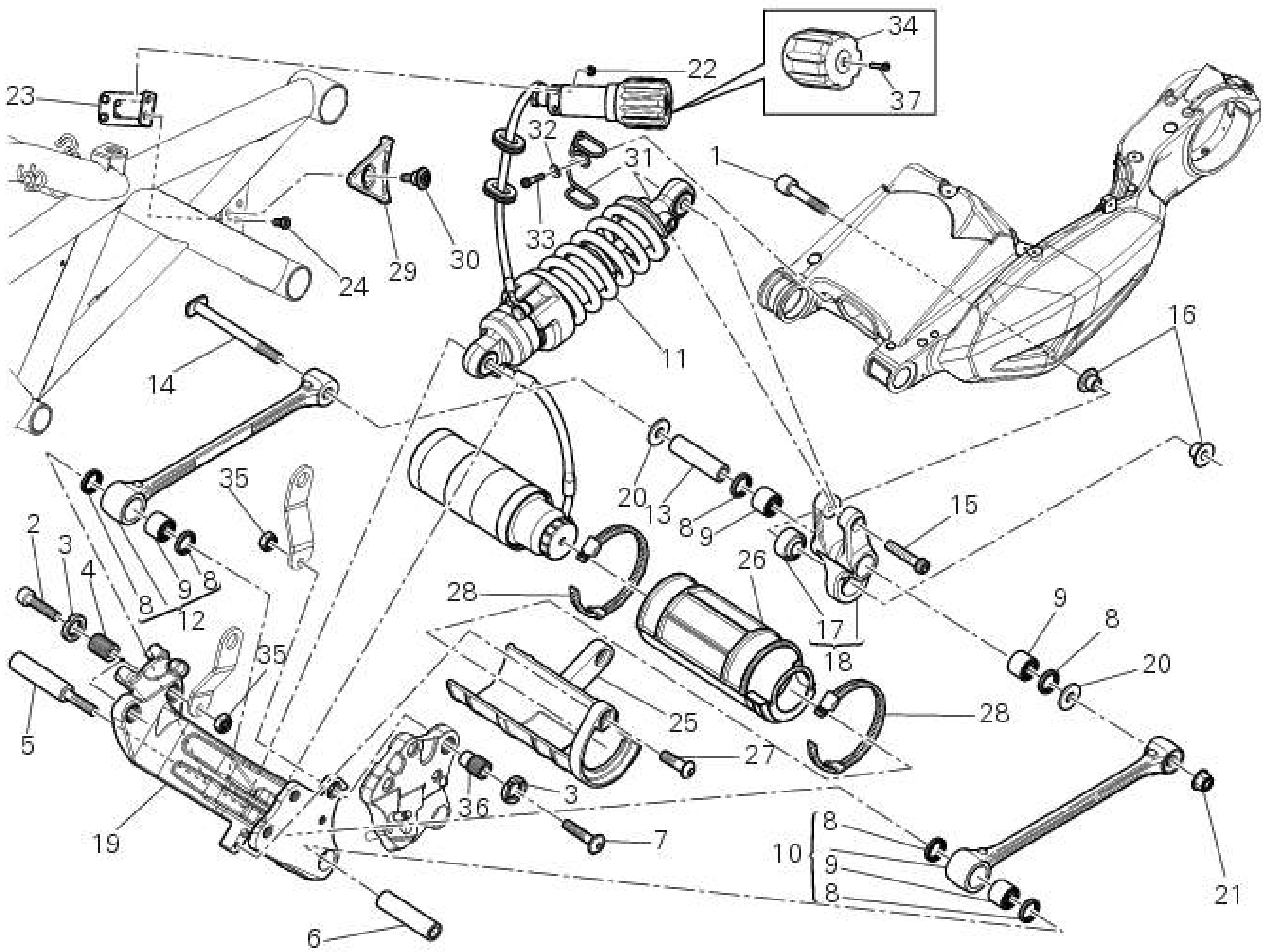
Fix supports (21) and (23) of the splashguard (22) to the air conveyors (T) by tightening the screws (19) to a torque of 4 Nm ± 10% (Sect. 3 - 3, Frame torque settings).





Operations	Section reference
Refit the fork legs	7 - 10.1, Refitting the front forks
Reassembling the handlebar on the steering head	7 - 8, Refitting the handlebar
Refit the front wheel	7 - 1, Refitting the front wheel
Refit the front mudguard	5 - 4, Refitting the rear mudguard
Refit the headlight	6 - 4, Renewal of the headlight

12 Rear shock absorber assembly



1 Special screw
2 Screw
3 Nut
4 Grub screw
5 Bush (right)
6 Bush (left)
7 Screw
8 Sealing ring
9 Roller bearing
10 Linkage (left)
11 Shock absorber (rear)
12 Linkage (right)
13 Spacer
14 Special screw
15 Screw
16 Bush
17 Ball joint
18 Rocker arm assembly
19 Support
20 Washer
21 Nut
22 Screw
23 Shock absorber adjuster support
24 Screw
25 Support
26 Rubber pad
27 Screw
28 Clamp
29 Plate
30 Screw
31 Hose clip
32 Washer

33 Screw
34 Knob
35 Nut
36 Grub screw
37 Screw

Spare parts catalogue

Diavel ABS	REAR SUSPENSION
Diavel Carbon ABS	REAR SUSPENSION

Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Rear suspension system

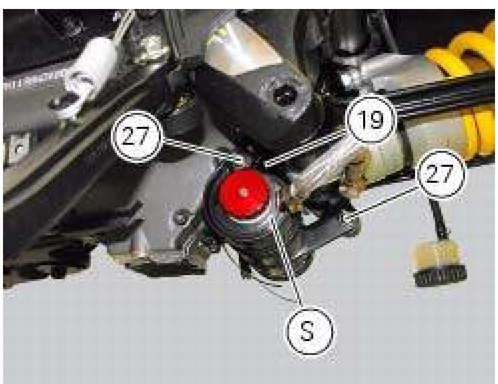
The rear suspension system uses a hydraulic mono-shock absorber (11) with rebound and spring preload adjustment.
This system consists of a rocker arm (18) and two linkages (10) and (12) fixed to the swingarm and the engine.
The shock absorber is pivot-mounted to the swingarm at the lower end and to the engine at the upper end. This system gives the motorcycle excellent stability.
To adjust the rear shock absorber refer to Sect. 4 - 3, Adjusting the rear shock absorber.

Removal of the rear shock absorber

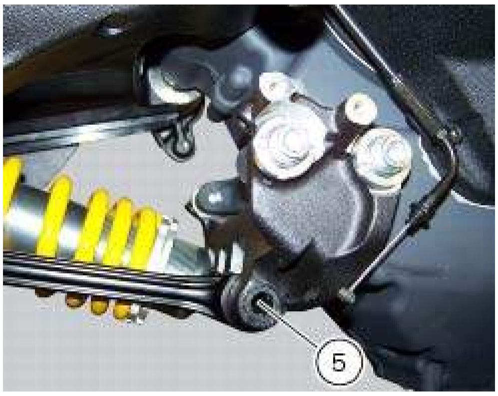
Operations	Section reference
Remove the silencer	8 - 8, Removing the silencer

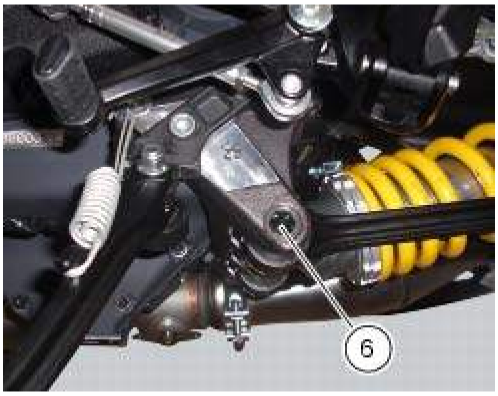
Loosen the screws (22) and remove the assembly (34) from the frame.

Loosen the screws (27) and remove the tank unit (S) of the shock absorber from the support (19).

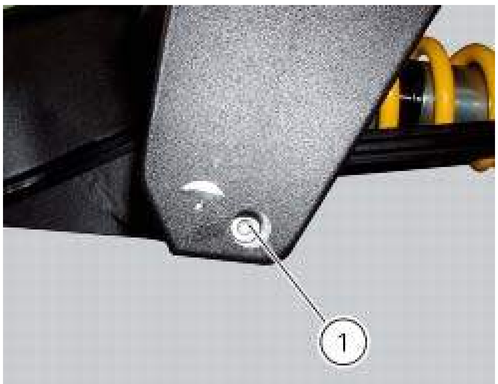


Hold the LH bush (6) and loosen the RH bush (5) to release the front side of the shock absorber assembly.





Undo the special screw (1) and remove the shock absorber assembly from the vehicle.



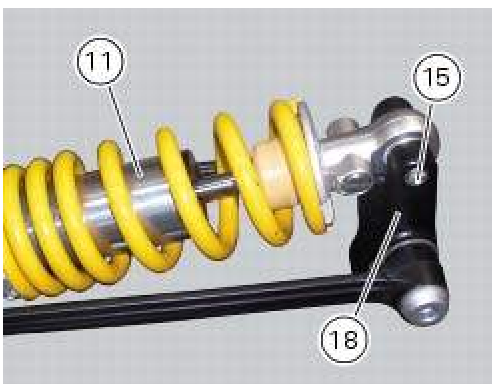
Overhauling the rear shock absorber

Important

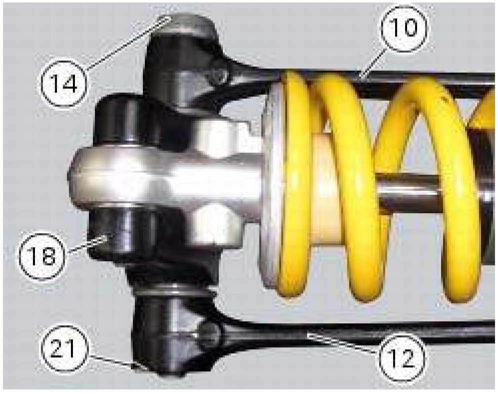
Contact an authorised SACHS Service Centre in case of problems with the shock absorber.

Disassembly of rear shock absorber - rocker arm - linkage assembly

Undo the screw (15) and remove the rear shock absorber (11) from the rocker arm (18).



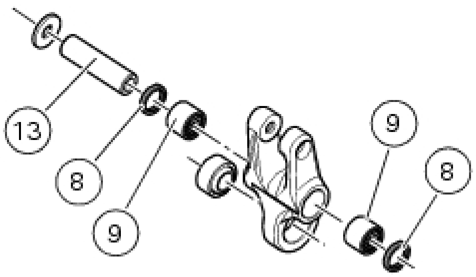
Undo the screw (14) and the nut (21) and remove the linkages (10) and (12) from the rocker arm (18).



The rocker arm movement is obtained by needle roller bearings (9) rotating on a spacer (13); two seals (8) are placed at the outer ends and keep the lubricant inside the roller cages.
Remove the inner spacer (13), the seals (8) and the needle roller bearings (9) using a suitable punch.

Important

Take care not to damage the bearing housings on the rocker arm while driving out the bearings. Once removed, the seals (8) and needle roller bearings (9) may not be refitted.

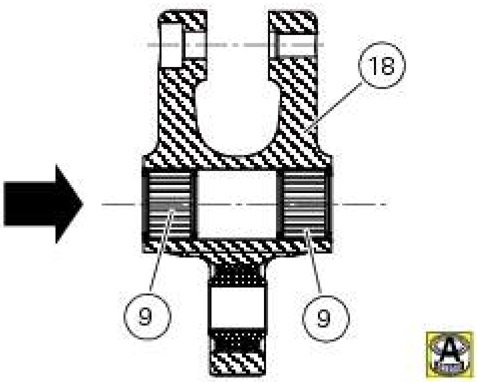


Reassembly of rear shock absorber - rocker arm - linkage assembly

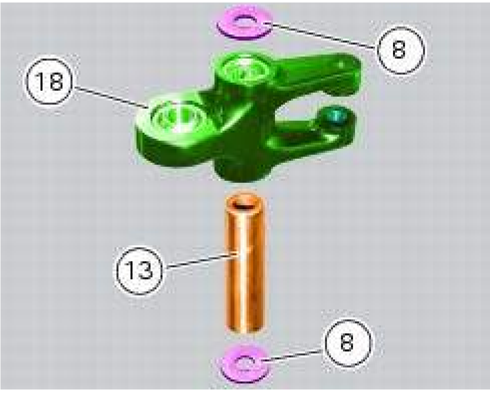
Once the needle roller bearings (9) have been removed from the rocker arm (18), upon reassembly fit a new needle roller bearing (9) on drift part no. **88713.1071** and lubricate with recommended grease.
Support the rocker arm and drive the needle roller bearings into the rocker arm bore until the tool seats against rocker arm.

Important

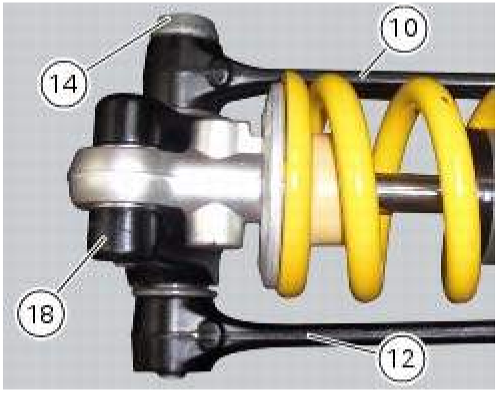
Introduce the needle roller bearings aligned with the hole to avoid any sticking: Use a press, if necessary.

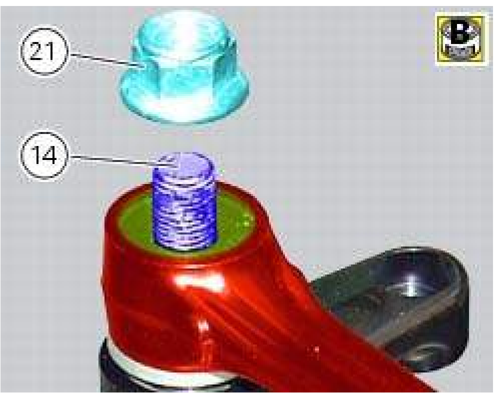


Insert one new seal (8) (with the metallic side faced outwards) into the drift and bring it fully home on the previously mounted roller bearing.
Repeat the above procedure for the other roller bearing (9) and the other seal (8).
Insert the inner spacer (13).

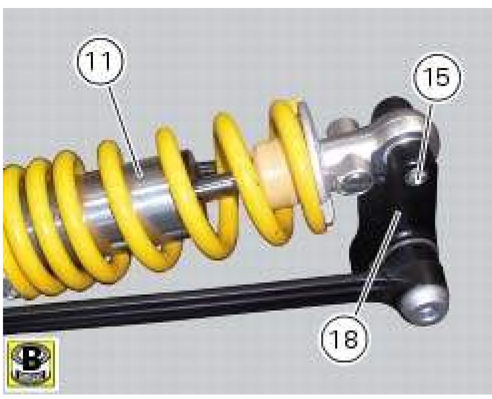


Position the linkages (10) and (12) on the rocker arm (18) by starting the screw (14).
Apply grease to the threaded side of the screw (14) and to the contact face of the nut (21).
Start the nut (21) on the screw (14).
Tighten the nut (21) to a torque of 45 Nm ± 5% (Sect. 3 - 3, Frame torque settings).





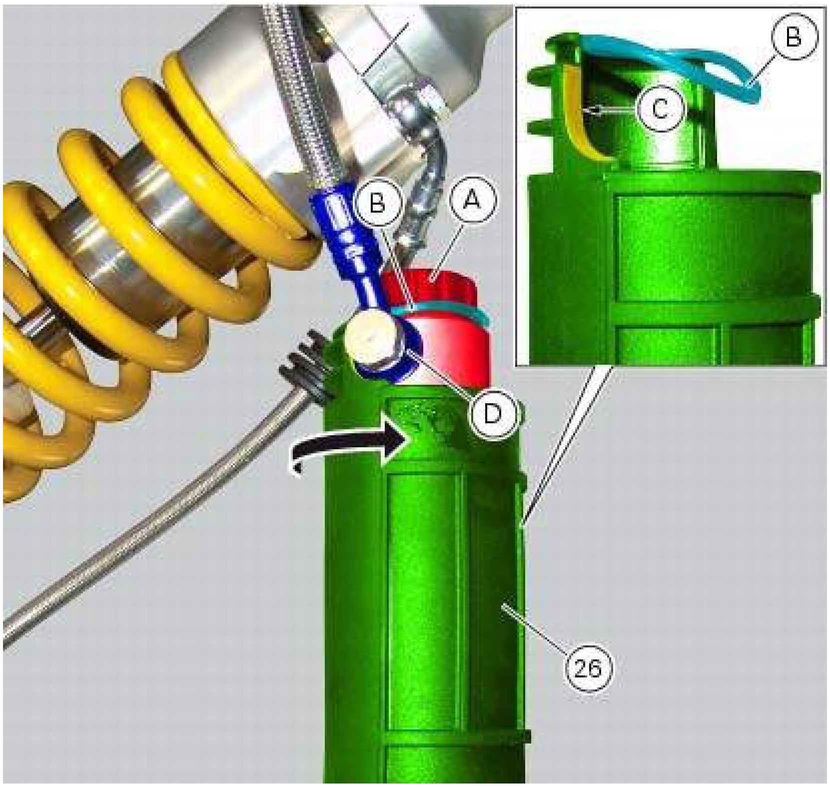
Apply grease to the thread and under the head of the screw (15) that secures the upper part of the shock absorber (11) and insert it in the rocker arm. Tighten the screw (15) to a torque of 45 Nm ± 5% (Sect. 3 - 3, Frame torque settings).



If the shock absorber reservoir covers have been removed, apply lubricant specific for rubber on the inner surface of the rubber cover (26). Fit the cover (26) on the shock absorber reservoir (A) and engage tab (B).

Note

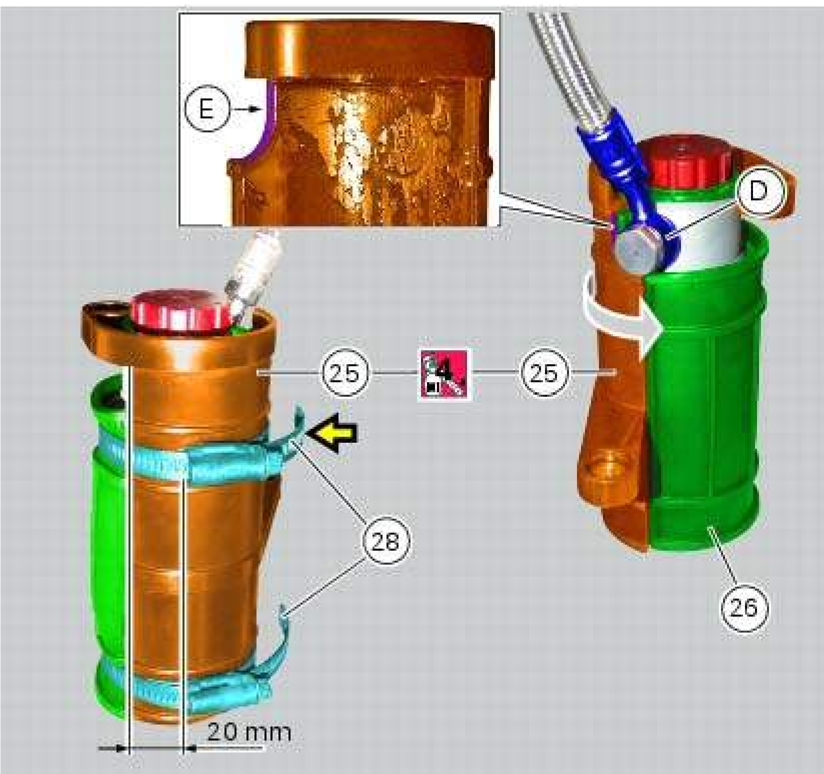
Rotate the cover (26) until face (C) nearly contacts the fitting (D).



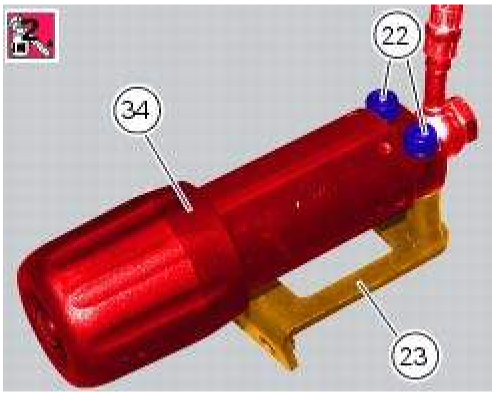
Apply recommended lubricant on the internal surface of the reservoir (25) support.
Position support (25) on the cover (26) and rotate support until face (E) nearly contacts the fitting (D).
Fix cover (26) and support (25) using ties (28), and position the ties so that the external profile of the retainers is about 20 cm away from the edge of support (25).

Note

The top tie (28) (yellow arrow) needs to be fully open in order to be positioned in its seat.

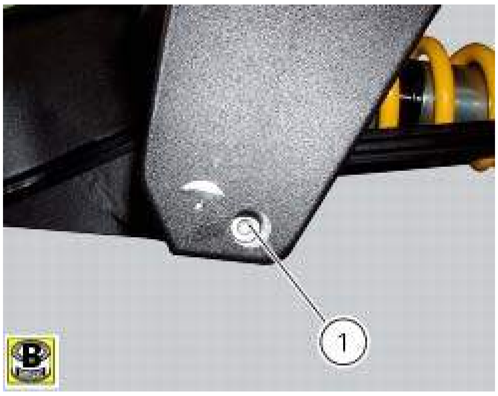


Fit the plate (23) on the preload adjusting knob (34) starting the screws (22) with the recommended threadlocker.
Tighten the screws.

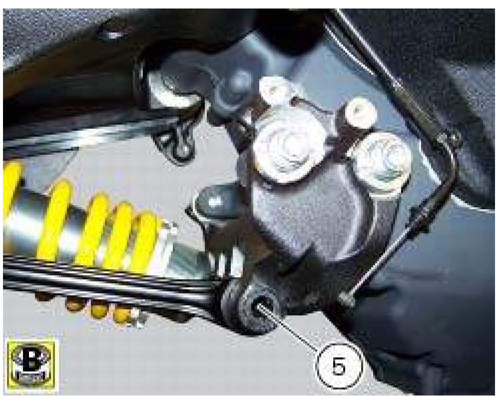


Refitting the rear suspension

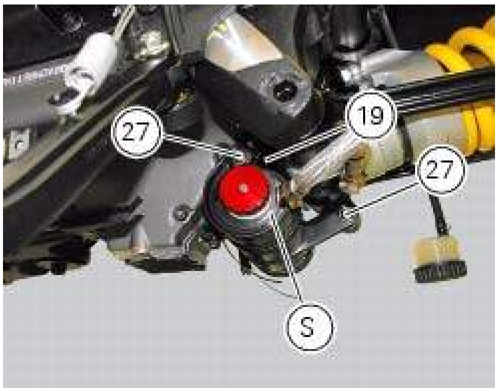
Lubricate the thread and underside of the special screw (1).
Insert the lower side of the shock absorber into the swingarm and insert the screw (1).
Tighten the screw (1) to a torque of 45 Nm ± 5% (Sect. 3 - 3, Frame torque settings).



Lubricate bushes (5) and (6) with recommended grease.
Position the upper part of the shock absorber assembly on the supporting plate and fit bush (6) on the LH side of the vehicle, and bush (5) on the right side.
Tighten the bush (5) to a torque of 45 Nm ± 10% (Sect. 3- 3, Frame torque settings) while holding the bush (6).



Refit the tank assembly (S) of the shock absorber on support (19) and tighten the screws (27) to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



Reposition the assembly (34) on the frame and tighten the screws (22) to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

Operations	Section reference
Refit the silencer	8 - 8, Refitting the silencer

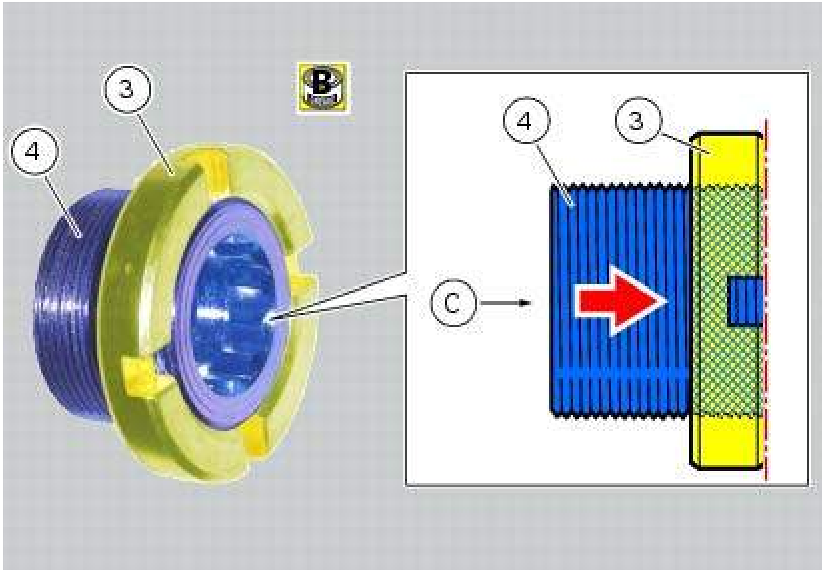
Removal of the shock absorber support

Remove the rear brake master cylinder (Sect. 7 - 4, Removing of the rear brake control).
Remove the rear shock absorber (see Removal of the rear shock absorber of this section).
Loosen the screws (2) and (7) and their nuts (**35**).

Remove the side stand (Sect. 7 - 16, Removing of the side stand).

Refitting the shock absorber support

If you had removed them, apply recommended grease on the threads of the adjusters (4) and the ring nuts (3) having care not to have grease on the surface (C) of the adjusters.
Tighten the adjusters on the ring nut side opposite to that featuring flats until bringing the surfaces as close as possible as shown.

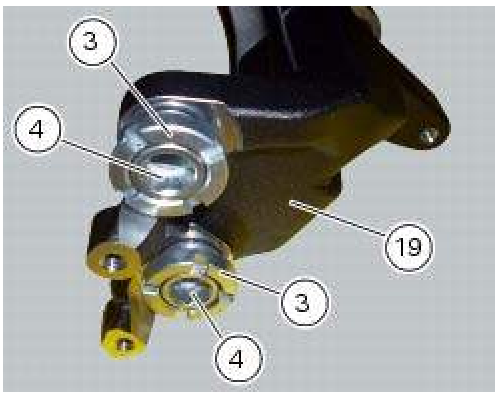


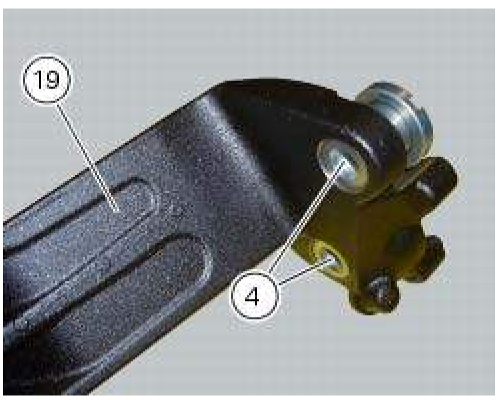
Start (form the external side of the support) the adjusters (4) in the bushes on the support.
Tighten the adjusters (4) to a torque of 0.6 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

Note

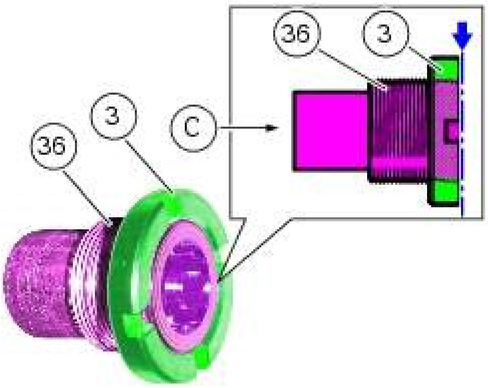
If at the specified torque the adjusters should not tighten properly, maybe the support or the adjusters could be non-conforming.

Loosen the adjusters (4) until bringing the surfaces as close as possible to the internal profiles of the support bushes.





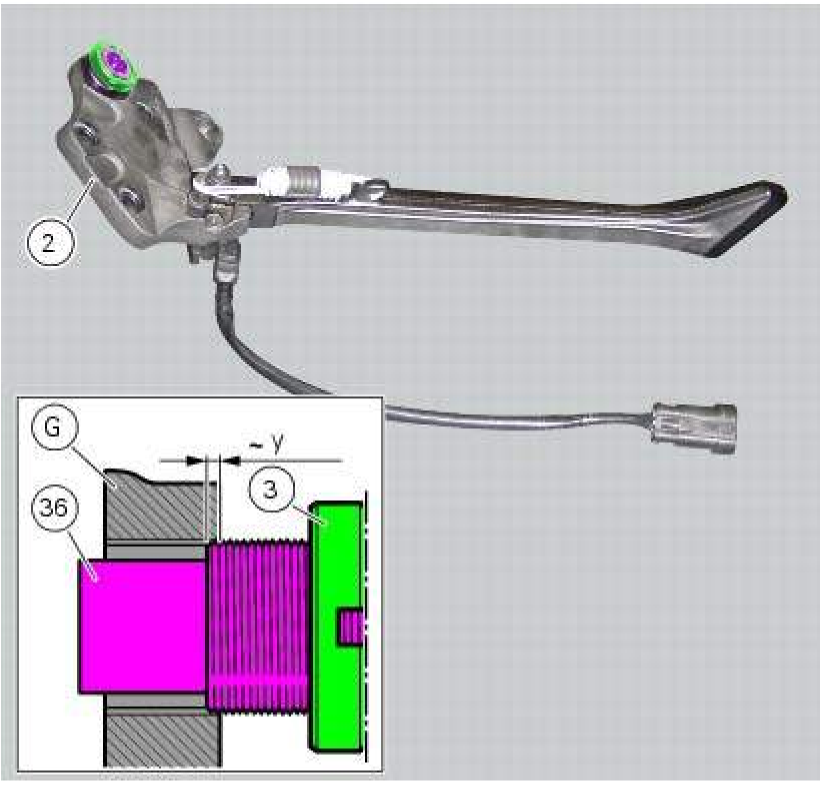
If you had removed the adjuster (36), apply recommended grease on the threads of the adjusters and the ring nut (3) having care not to have grease on the surface (C) of the adjuster.
Tighten the adjuster on the ring nut side opposite to that featuring flats until bringing the surfaces as close as possible as shown.



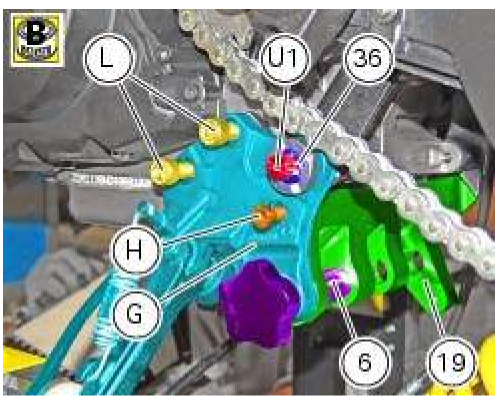
Start the adjuster (36) and tighten it manually (y is equal to about 2 threads) on the external side of the plate of the side stand assembly (G).

Note

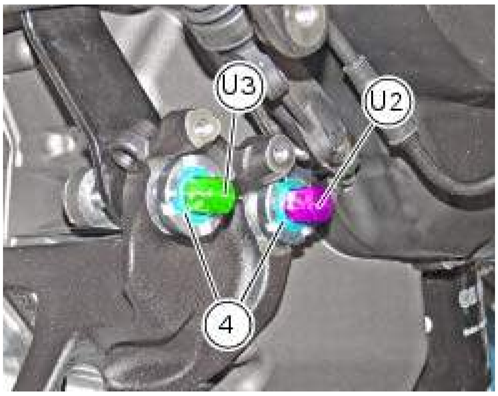
During this operation, be sure to keep ring nut (3) in position, i.e. flush with the external surface of the clearance adjuster (36).



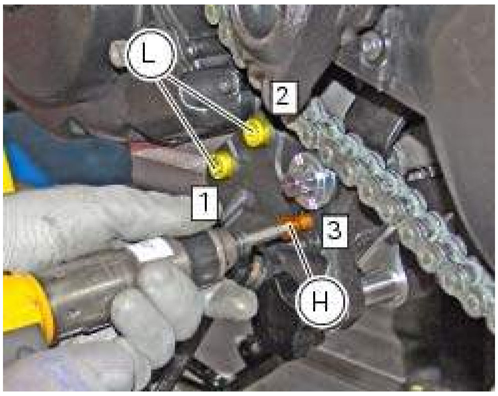
Apply the recommended grease to the threads and undersides of the heads of the screws (L) and (H).
Position the shock absorber support (19) and the side stand assembly (G) on the left-hand side of the engine and start the screws (L) and (H).
Insert a suitable centring pin (U1) on the adjuster (36), making sure that the pin hexagon fits properly into the hexagon socket of the adjuster.
Insert the bush (6) to keep the components in place.



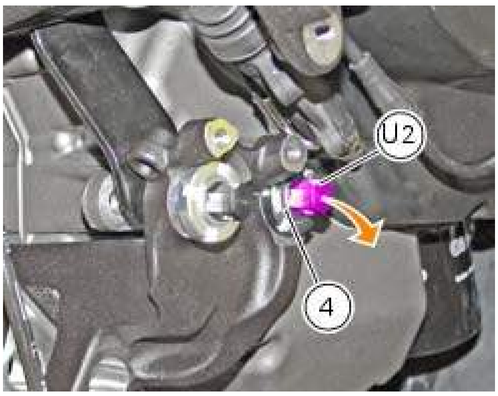
On the right side, insert a suitable centring pin (U2) on the front adjuster (4) and a suitable centring pin (U3) on the rear adjuster (4), making sure that the pin hexagons fit properly into the hexagon sockets of the adjusters.



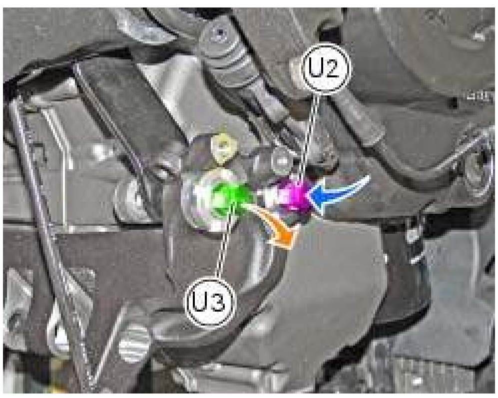
Tighten the screws (L) and (H) to a torque of 7 Nm ± 10% (Sect. 3 - 3, Frame torque settings), by following the sequence 1-2 -3.



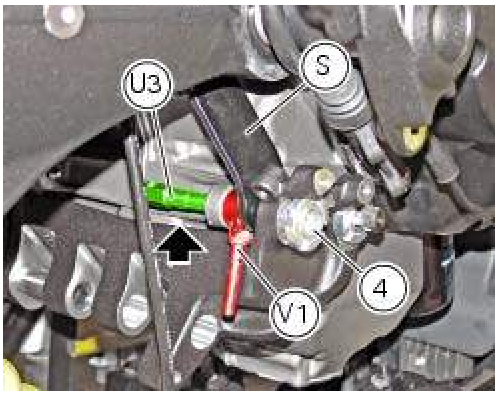
On the right side, extract the front centring pin (U2).
Tighten the front adjuster (4) to a torque of 0.6 Nm ± 10% (Sect. 3 - 3, Frame torque settings) and then make sure it is fully home on the crankcase.



Again on the right side, refit the front centring pin (U2) making sure that the pin hexagon fits properly into the hexagon socket of the adjuster.
Extract the rear centring pin (U3).



On the right side, insert the rear centring pin (U3) from the internal side of the crankcase, placing a suitable spacer (V1) between crankcase and RH rear suspension support bracket (S).
Tighten the rear adjuster (4) to a torque of 0.6 Nm ± 10% (Sect. 3 - 3, Frame torque settings) and then make sure it is fully home on the bracket (S).

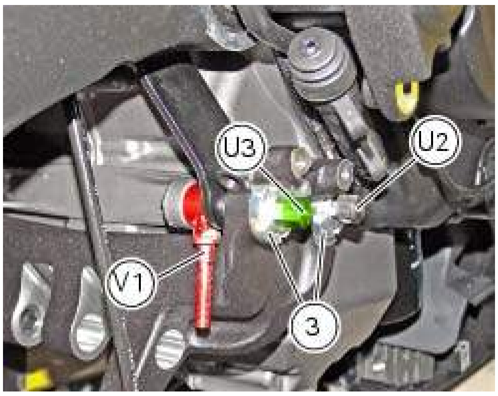


On the right side, extract the rear centring pin (U3) from the internal side and refit it on the outside, while keeping the right spacer (V1) in place.

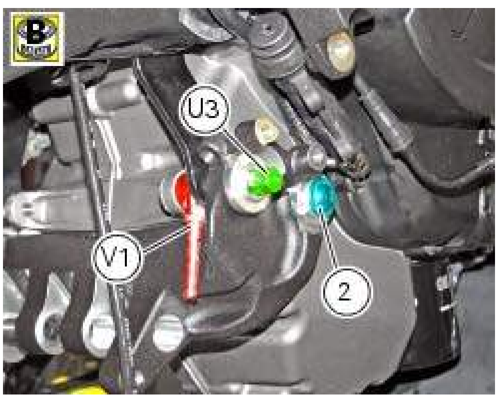
Warning

Make sure that the pin hexagon fits properly into the hexagon socket of the adjuster.

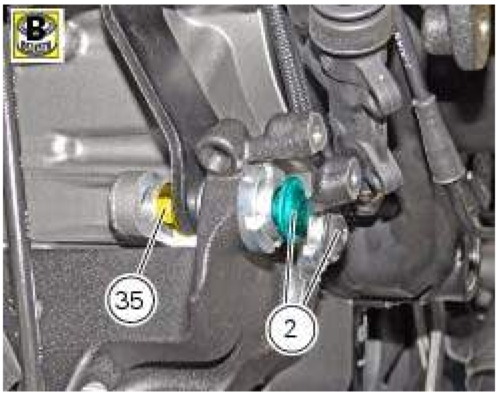
Locate service tool no. **88713.3166** on the front ring nut (3) and fit the torque wrench to the tool. Tighten the front ring nut (3) of the front adjuster to a torque of 100 Nm ± 5% (Sect. 3 - 3, Frame torque settings) while holding the adjuster using centring pin (U2).
Then locate service tool no. **88713.3166** on the rear ring nut (3) and fit the torque wrench to the tool. Tighten the rear ring nut (3) of the rear adjuster to a torque of 100 Nm ± 5% (Sect. 3 - 3, Frame torque settings) while holding the adjuster using centring pin (U3).



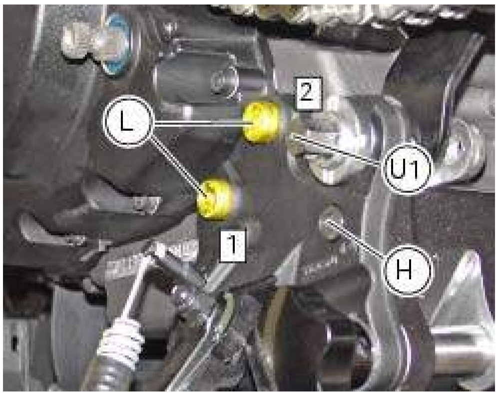
Apply the recommended grease to the thread and the underside of the front screw (2).
On the right side, extract the front centring pin and start the front screw (2) at the same position, tightening it manually until fully home.
Extract the rear centring pin (U3) and the right spacer (V1).



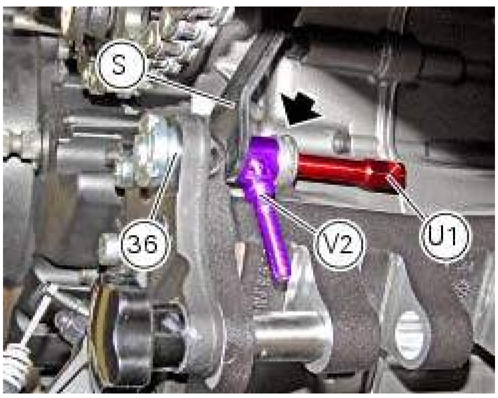
Apply the recommended grease to the thread and the underside of the rear screw (2).
Start the rear screw (2) and, on the opposite side, tighten the nut (35).
Tighten the front screw (2) to a torque of 45 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Tighten the rear screw (2) to a torque of 45 Nm ± 10% (Sect. 3- 3, Frame torque settings) while holding the nut (35).



On the left side, tighten the screws (L) to a torque of 45 Nm ± 10% (Sect. 3 - 3, Frame torque settings), by following the sequence 1-2.
Then tighten the screw (H) securing the side stand plate to the shock absorber support to a torque of 45 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Extract the centring pin (U1).



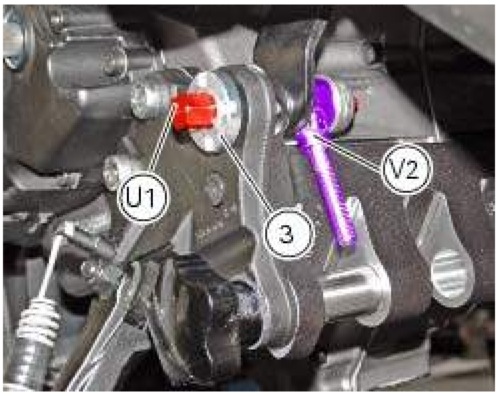
Insert the centring pin (U1) from the internal side of the crankcase, placing a suitable spacer (V2) between crankcase and rear left suspension support bracket (S).
On the left side, tighten the adjuster (36) to a torque of 0.6 Nm ± 10% (Sect. 3 - 3, Frame torque settings) and then make sure it is fully home on the rear left suspension support bracket (S).



Extract the centring pin (U1) from the internal side and refit it on the outside, while keeping the left spacer (V2) in place.

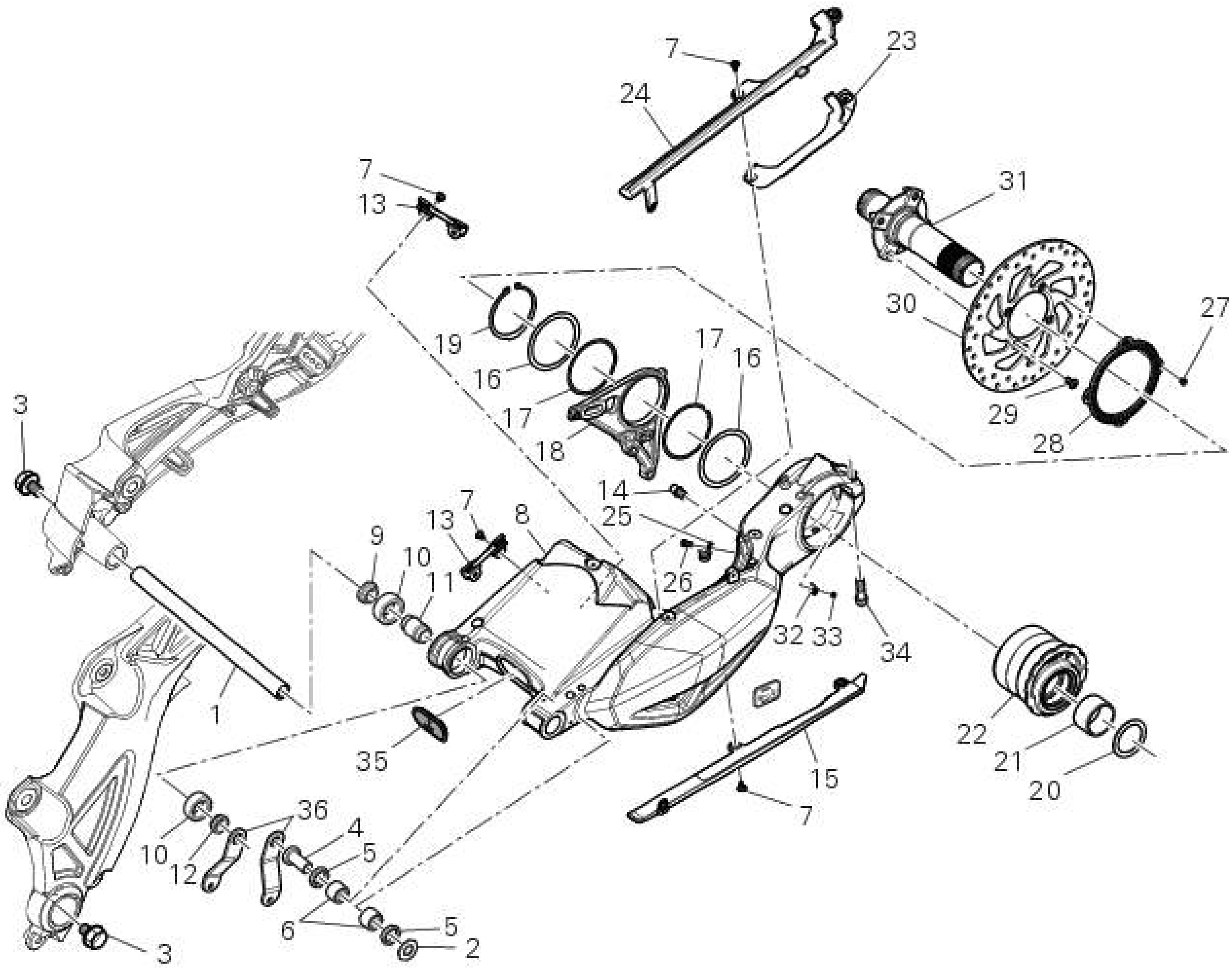
Warning
Make sure that the pin hexagon fits properly into the hexagon socket of the adjuster.

Locate service tool no. **88713.3166** on the ring nut (3) and fit the torque wrench to the tool.
Tighten the ring nut (3) to a torque of 100 Nm ± 5% (Sect. 3 - 3, Frame torque settings) while holding the adjuster using the centring pin (U1) located inside the adjuster.
Extract the centring pin (U1) and the spacer (V2).



Apply the recommended grease to the thread and the underside of the left-side screw (7).
On the left side, start the screw (7) and, on the opposite side, tighten the nut (35).
Tighten screw (7) to a torque of 45 Nm ± 10% (Sect. 3 - 3, Frame torque settings) while holding the nut (35).
Extract the bush (6).

13 Swingarm



1 Swingarm pivot
2 Washer
3 Special screw
4 Bush
5 Sealing ring
6 Roller bearing
7 Special screw
8 Rear swingarm
9 Spacer
10 Bearing
11 Spacer
12 Spacer
13 Hose clip
14 Pin
15 Chain slider (lower)
16 Washer
17 O-ring
18 Calliper mounting bracket
19 Circlip
20 Spacer
21 Inner ring
22 Hub
23 Cable grommet
24 Chain slider (upper)
25 Cable grommet
26 Screw
27 Screw
28 Phonic wheel (rear)
29 Screw
30 Brake disc (rear)
31 Wheel axle (rear)
32 Base

33 Screw
34 Screw
35 Plug
36 Bracket

Spare parts catalogue

Diavel ABS	REAR WHEEL AXLE
Diavel ABS	SWINGARM
Diavel Carbon ABS	REAR WHEEL AXLE
Diavel Carbon ABS	SWINGARM

Important

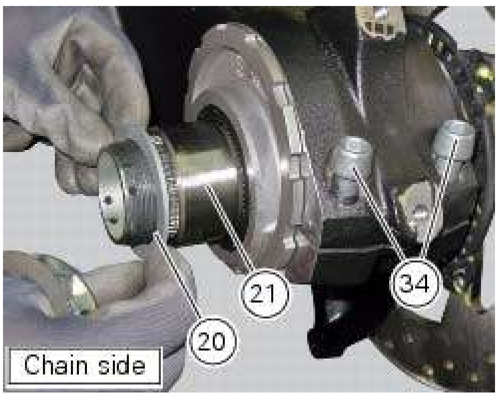
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

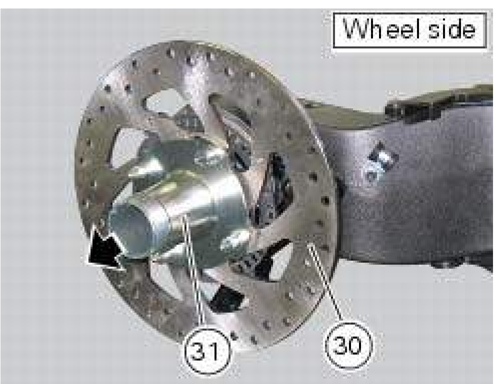
Removal of the rear wheel eccentric hub and rear wheel shaft

Before removing the eccentric hub, you must first remove the parts listed below.

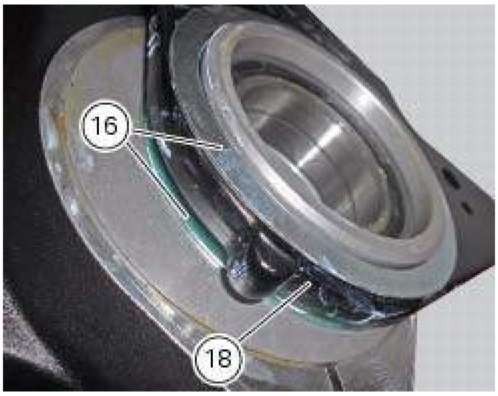
Operations	Section reference
Remove the exhaust silencers	8 - 8, Removal of the exhaust system
Remove the rear wheel	7 - 2, Removing of the rear wheel
Remove the rear sprocket	7 - 14, Replacing of the rear sprocket
Remove the rear brake calliper	7 - 4, Removal of the rear brake calliper

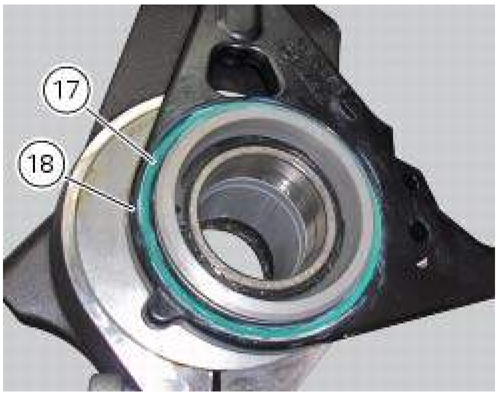
Slacken off the screws (34).
Remove the spacer (20) and the inner ring (21) on the chain side and remove the wheel shaft (31) with the brake disc (30) from the opposite side.



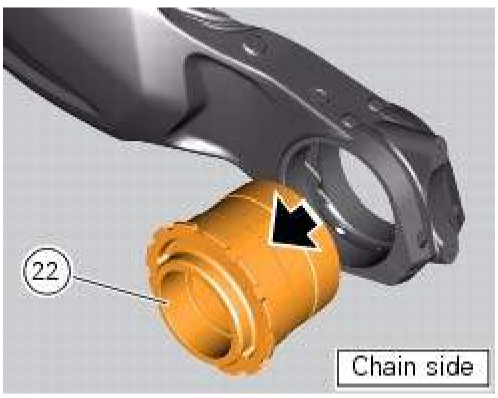


Remove the circlip (19) on the wheel side of the eccentric hub.
Remove washers (16), the O-ring (17) and the calliper holding plate (18) with the other O-ring (17).





Withdraw the eccentric hub (22) from the chain side of the swingarm.

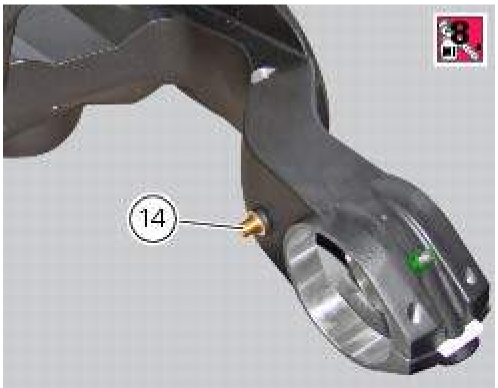


Note

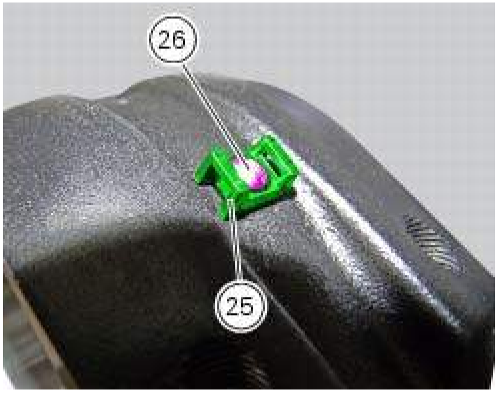
The rear hub is a component particularly critical to the dynamic safety of the motorcycle; under no circumstances may the internal components of the hub be serviced or repaired. The hub may be ordered as a complete assembly, spare part No. **756.2.013.1A**.

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 (14) was removed, apply the recommended threadlocker on reassembly.
Tighten the pin (14) to the torque of 33 Nm ± 5% (Sect. 3 - 3, Frame torque settings).



If previously removed, refit the cable grommet (25) as shown in the figure and tighten the screw (26) to a torque of 1 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

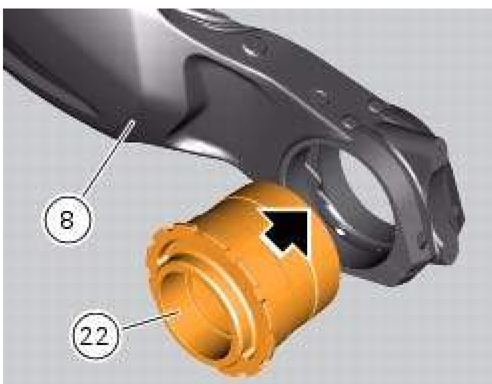


Before refitting apply some recommended grease to the eccentric hub (22) external surface.

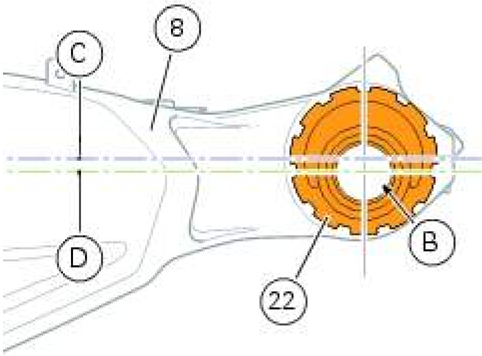
Insert the hub (22) fully home on the swingarm (8).

Note

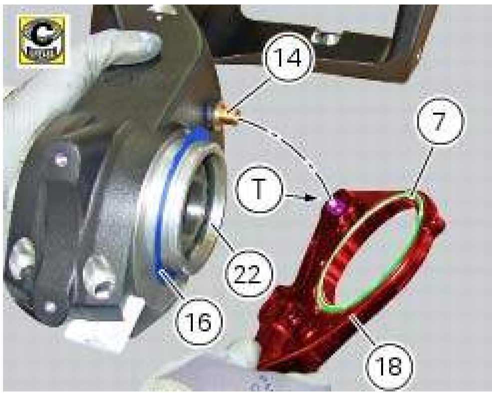
During this operation force the hub seat open on the swingarm enough to fit the hub (22).

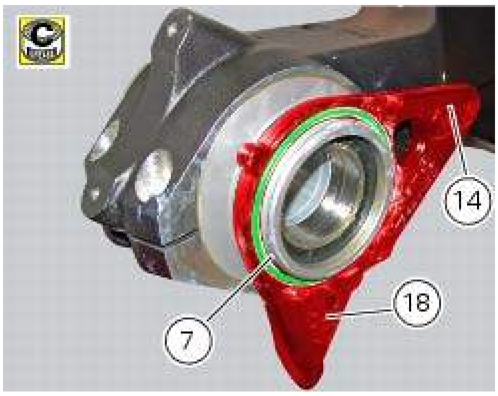


Check that the eccentric hub (22) with respect the swing arm (8) features the horizontal axis (D) of the hub bore (B) under the horizontal axis (C) of the hub seat.



Apply grease on rings (17) and place them in their seat of the plate (18). Fit the washer (16) on the eccentric hub (22).
Place the plate (18) on the swingarm: the pin (14) must match with the blind slot (T) on the plate (18).

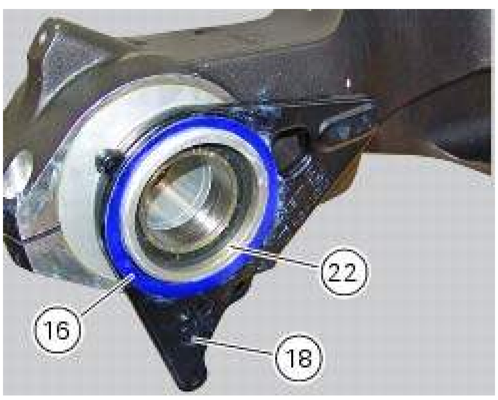


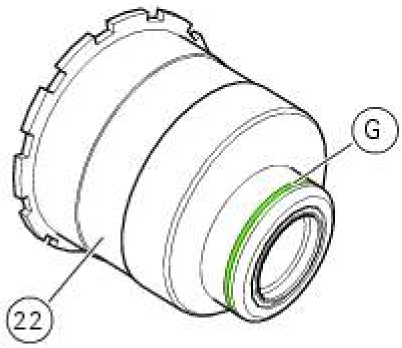


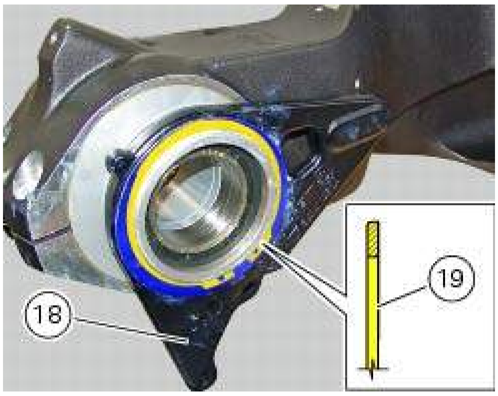
Refit the other washer (16) on the eccentric hub (22).
Block the plate (18) after installing circlip (19) in its groove (G) on hub (22), and setting it with its square edge outward.

Note

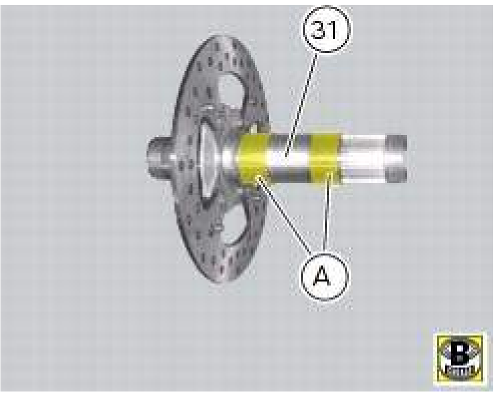
After this operation visually check that the circlip is perfectly inserted in the groove (G).



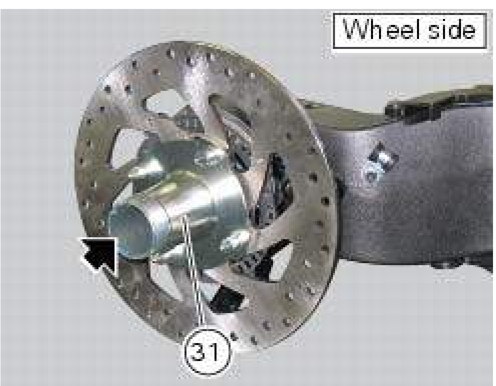


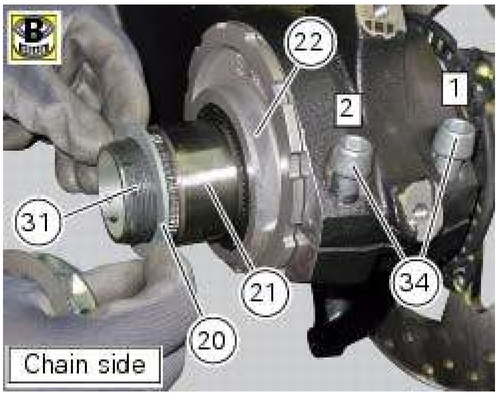


Apply an even coating of the recommended grease in the areas (A) of the axle (31).



Insert the rear wheel shaft (31) in the hub (22).
Ensure the stub axle (31) is seated in the hub.
Fit the inner ring (21) on the wheel shaft (31).
Insert the inner ring (21) in the hub.
Apply the recommended grease to the screws (A) and tighten to the torque of 35 Nm±5%(Sect. 3 - 3, Frame torque settings) following the sequence 1-2-1.





Operations	Section reference
Refit the rear brake calliper	7 - 4, Refitting the rear brake calliper
Refit the rear sprocket	7 - 14, Refitting the rear sprocket
Refit the rear wheel	7 - 2, Refitting the rear wheel
Refit the exhaust silencers	8 - 8, Refitting the exhaust system

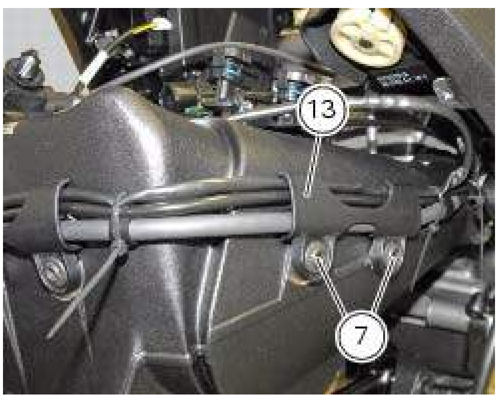
Set the chain tension as described in Sect. 4 - 3, “Adjusting the chain tension”.

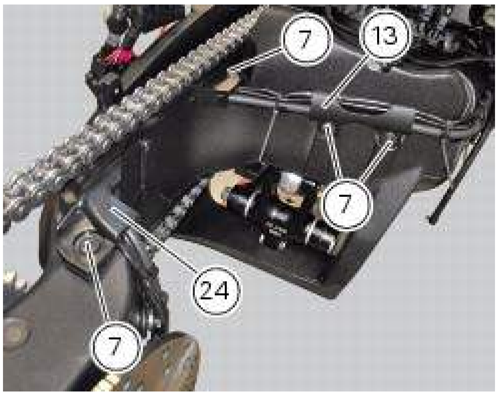
Removal of the swingarm

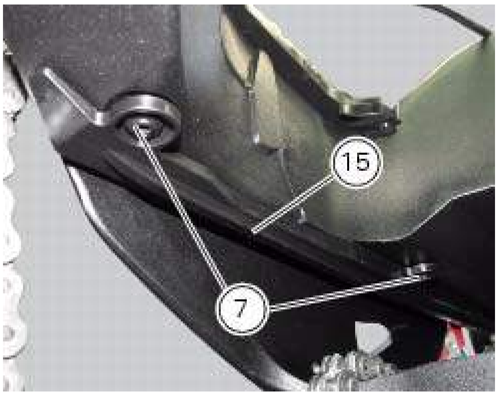
Before removing the parts in question, you must first carry out the following operations:

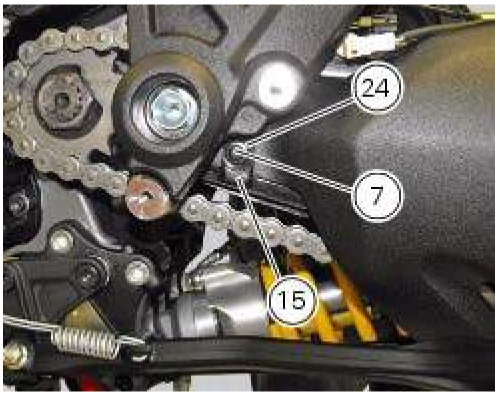
Operations	Section reference
Remove the exhaust silencers	8 - 8, Removal of the exhaust system
Remove the rear wheel	7 - 2, Removing of the rear wheel
Remove the sprocket	7 - 14, Replacing of the rear sprocket
Remove the rear brake calliper	7 - 4, Removal of the rear brake calliper
Remove the shock absorber from swinging arm	7 - 12, Removal of the rear shock absorber
Removing the rear mudguard	5 - 4, Removal of the front mudguard

Remove the rear wheel eccentric hub as described in chapter “Removal of the rear wheel eccentric hub and rear wheel shaft” of this section.
Loosen screws (7) and remove the hose grommets (13), (15) and (24).



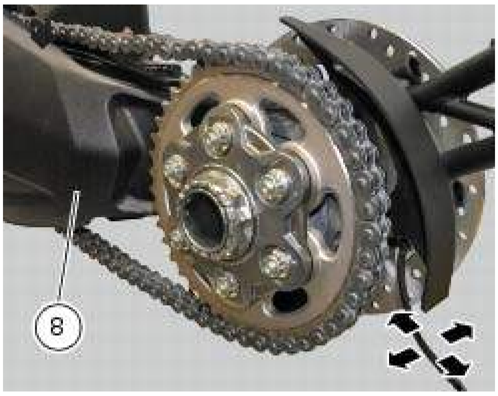






Release the rear brake hose, the rear speed sensor cable, and the rear wiring from the swingarm, by loosening the screws (26) and retrieving the cable grommets (25).

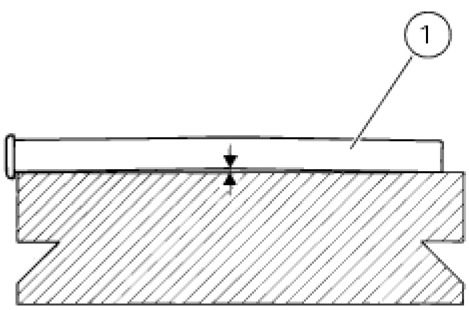
You can check the play in the swingarm bearings while the swingarm (8) still installed on the motorcycle frame.
Grasp the rear of the swingarm (8) and try to move it in the four directions shown by the arrows.



Any abnormal movement is a sign of worn bearings that could cause instability when riding.
To check the free play of the support bearings, refer to Sect. 7 - 1, Wheel bearings.
Once the play in the swingarm bearings has been checked, the swingarm (8) may be removed from the motorcycle.
Keep the swingarm shaft (**1**) blocked with the screws (3) on the bike LH side and loosen at the same time the screw (3) on the opposite side: keep washer (**2**).
Using the punch **88713.1074**, fully extract the swingarm pivot.
Remove the swingarm (8) assembly from the frame.

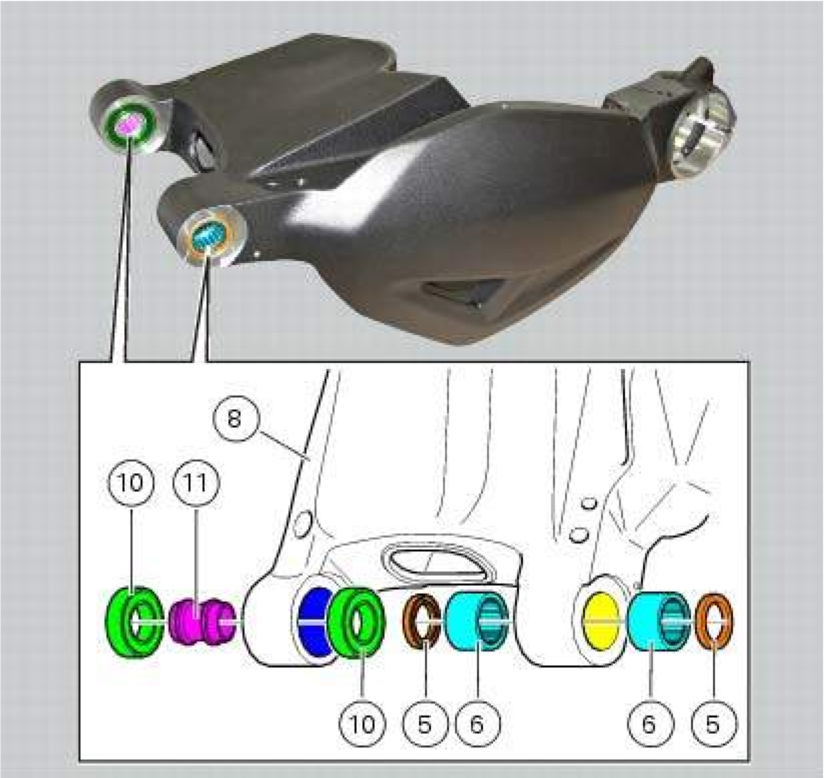
Inspecting the swingarm pivot

Before refitting the swingarm pivot shaft (1), check it carefully for distortion.
Roll the pin on a reference surface and measure maximum distortion using a feeler gauge (Sect. 3 - 1.1, Rear wheel).



Overhauling the rear swingarm

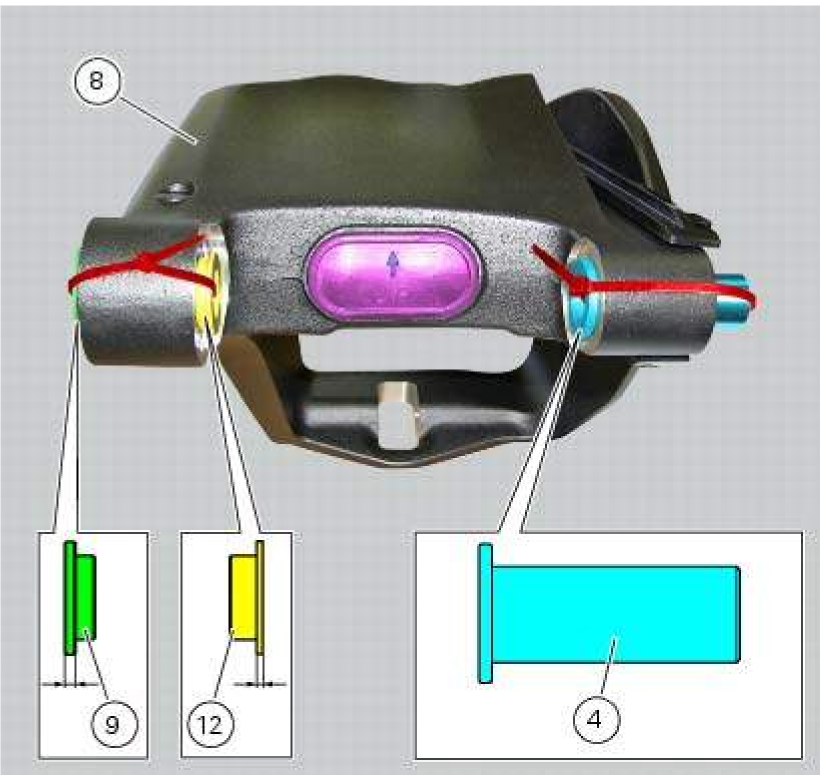
Inside the swingarm (8), in correspondence with the pivot point on the frame, there is a pair of ball bearings (10) and a spacer (11) on the RH side, and a pair of roller bearings (6), with sealing rings (5), on the LH side.



To change the bearings, proceed as follows.
Remove the shims (12) and (9) from the right-hand side of the swingarm (8) and refit the bush (4) from the left-hand side.
Remove the ball bearings (10), sealing rings (5) and roller bearings (6) with a suitable punch and press. Support the swingarm and take care not to damage the bearing bores.

Important

Once removed, the bearings (10), sealing rings (5) and roller bearings (6) must not be reinstalled.

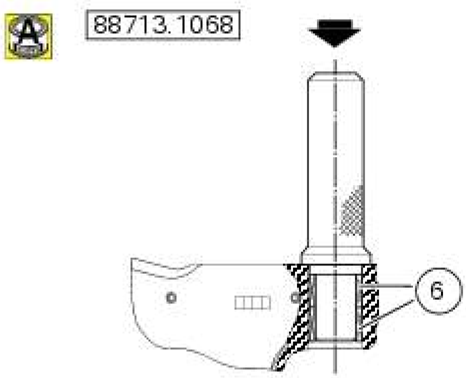


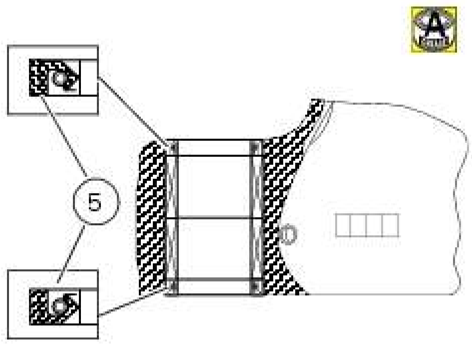
Heat the entire swingarm up to **150** °C while supporting its weight adequately.
Apply recommended grease to the swingarm bearings seat.

Note

Upon reassembly the seals (5) must be oriented so that the plane side is faced outwards and the writings on the roller bearings (6) must be faced up.

Insert the new roller bearings (6) in the punch tool with code **88713.1068** and install them into the bore on the left-hand side of the swingarm, working from the outside.
Drive them in until the tool is fully seated against the swingarm.
Use the same tool to fit the new sealing rings (5), positioned as shown in the sectional view, so that they seat against the newly installed roller bearings.





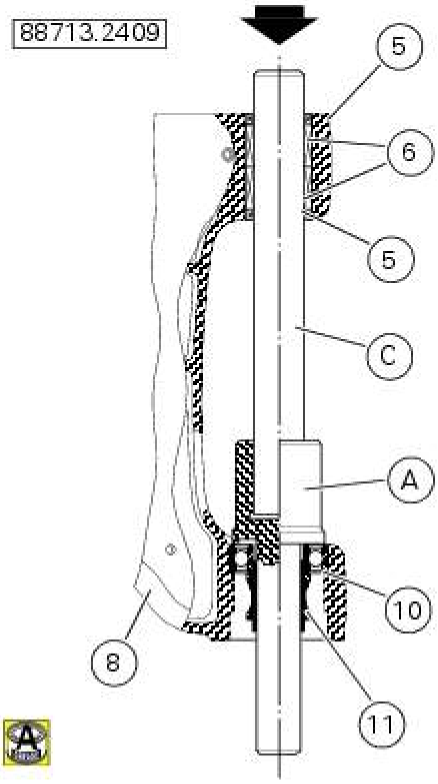
To install the ball bearing (10) you will need the tool with part no. 88713.2409 with:
(A) – drift for internal bearings;
(B) – drift for external bearings;
(C) – guide pin.

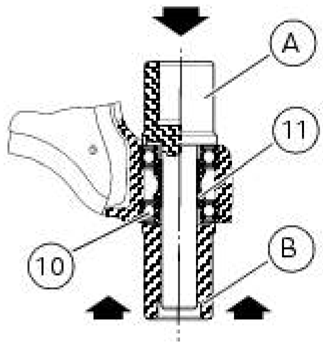
Apply recommended grease to the swingarm bearings seat.

Note

Upon bearings (10) reassembly they must be feature the writings outwards.

Fit a new bearing (10) and the internal spacer (11) onto the punch tool (A) and install it on the inner side of the swingarm RH mounting.
Insert the guide pin (C) into the previously mounted roller bearings and insert the other end in the bore in the tool (A).
Drive the bearing (10) fully into the swingarm.
Fit the other new bearing (10) at the outer end of tool (A).
Using tool (A) as a stop, use tool (B) to drive the external bearing up against spacer (11): remove the tools.

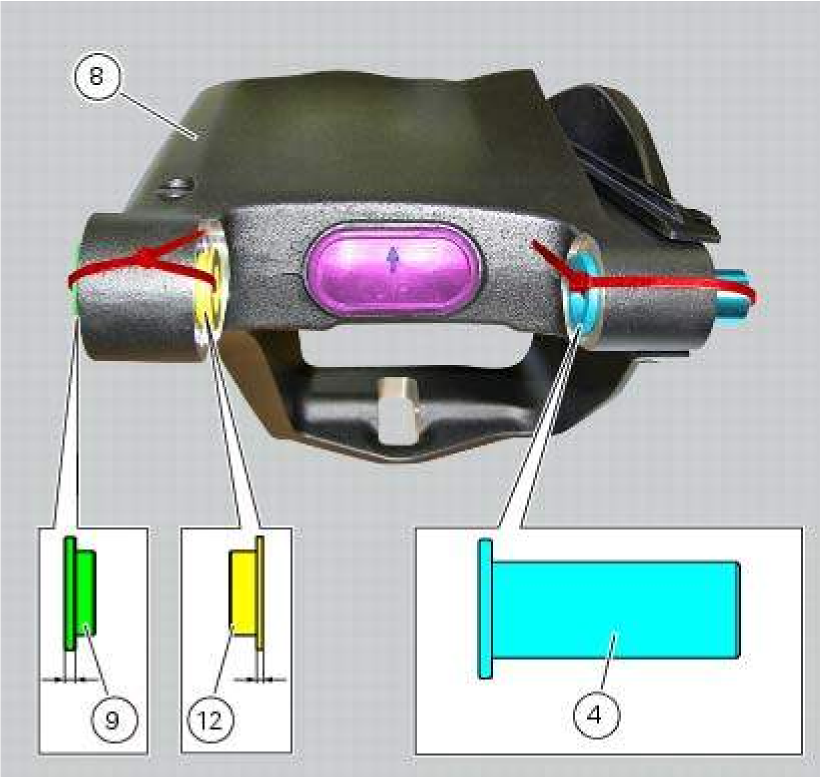




Refit the shims (12) and (9) from the right-hand side of the swingarm (8) and refit the bush (4) from the left-hand side.

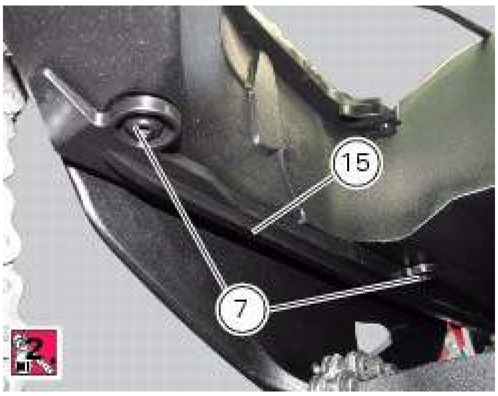
Note

The spacer (9) with the larger external collar goes on the external side of the swingarm, whereas the spacer (12) with the smaller external collar goes on the inside.

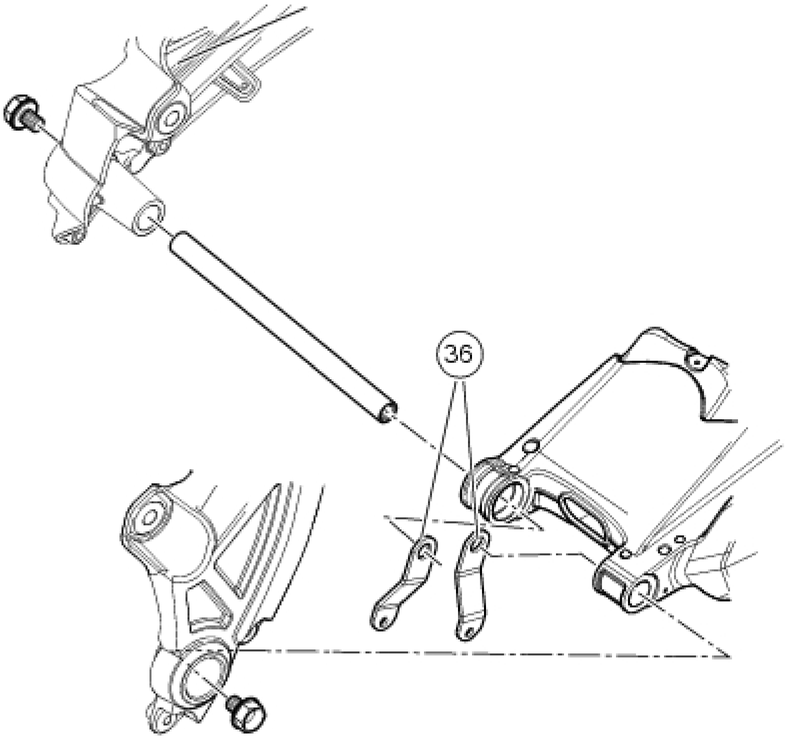


Refitting the swingarm

Apply the recommended threadlocker to the screws (7).
Install the lower chain guard (15) on the swingarm (8), fastening it with the screws (7): tighten the screws (7) to a torque of 4 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

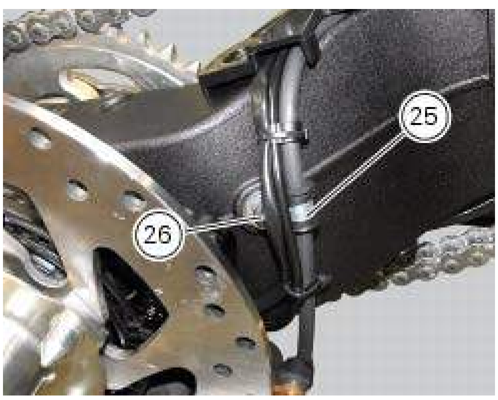


Locate the swingarm (8) on the frame.
Lubricate with recommended grease the swingarm shaft (1) with the screw (3) and insert it fully home on the frame and through the brackets (36).

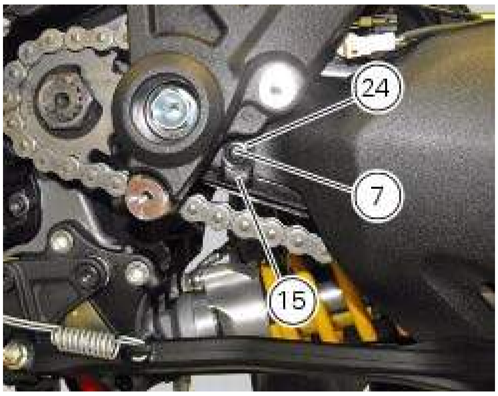


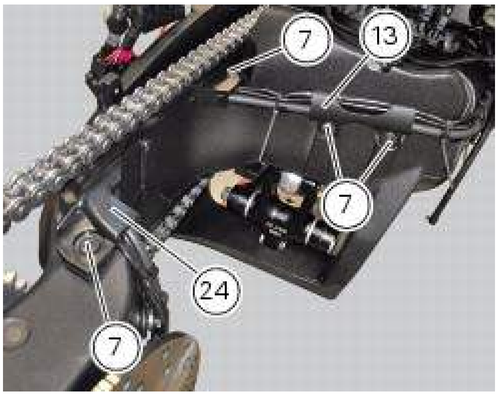
On the bike opposite side fix the swingarm shaft (**1**) with the screw (3) after having lubricated it with recommended grease, and fit the washer (**2**) between frame and swingarm.
Tighten the screw (3) to the torque of 72 Nm ± 5% (Sect. 3 - 3, Frame torque settings).

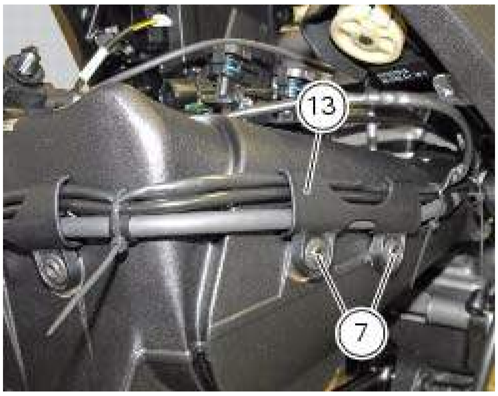
Position the rear brake hose, the rear speed sensor cable, and the rear wiring on the swingarm, by starting the screws (26) of the cable grommet (25).
Tighten the screw (26) to a torque of 8 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



Refit the upper chain slider (24) and the hose guide (13) and tighten the screws (7) to a torque of 4 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



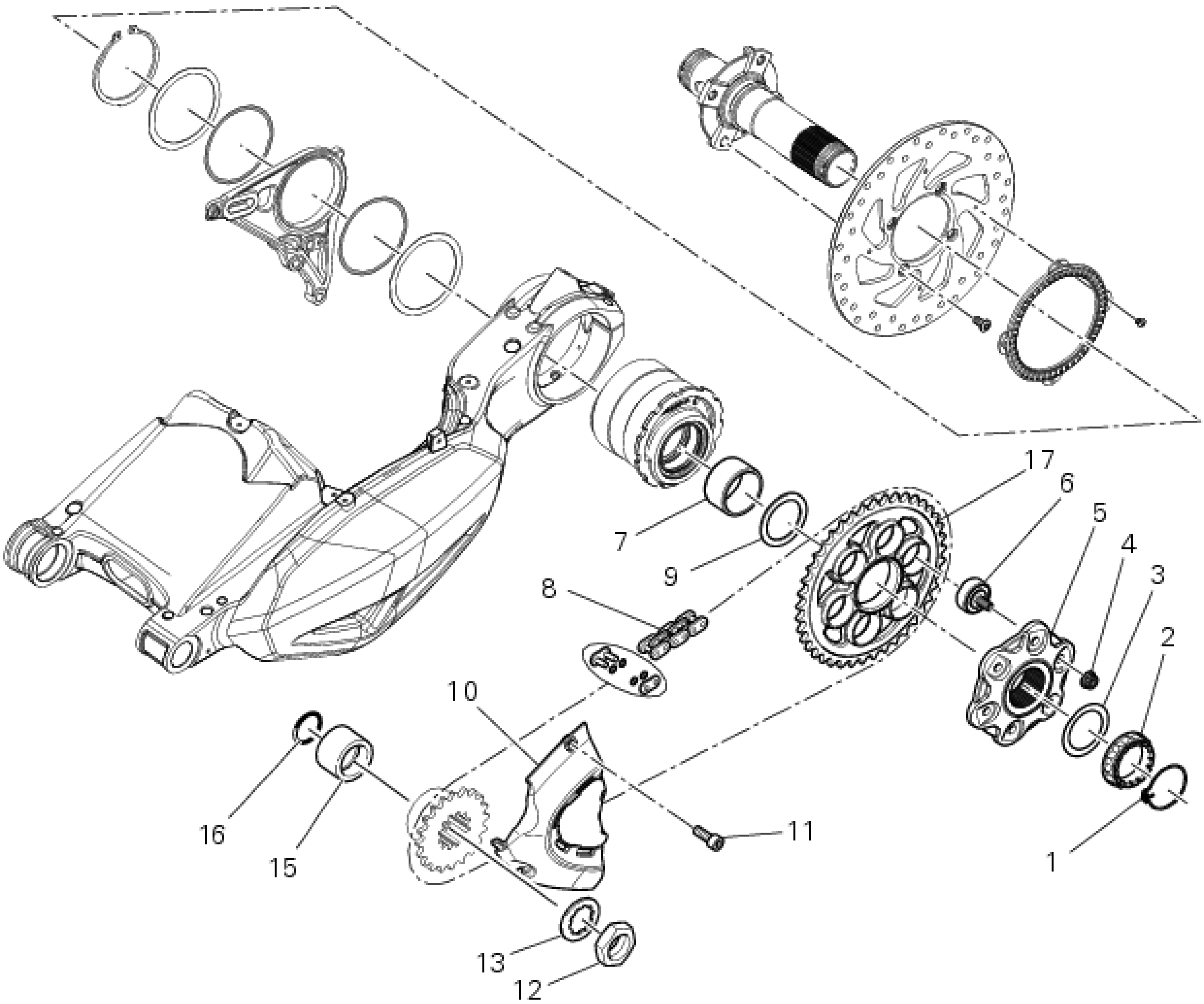




Refit the rear wheel eccentric hub as described in chapter “Refitting the rear wheel eccentric hub and rear wheel shaft” of this section.

Operations	Section reference
Refitting the rear mudguard	5 - 4, Refitting the rear mudguard
Reconnect the shock absorber	7 - 12, Refitting the rear suspension
Refit the rear brake calliper	7 - 4, Refitting the rear brake calliper
Refit the sprocket	7 - 14, Refitting the rear sprocket
Refit the rear wheel	7 - 2, Refitting the rear wheel
Refit the exhaust silencers	8 - 8, Refitting the exhaust system

14 Final drive



1 Circlip
2 Nut
3 Washer
4 Nut
5 Rear sprocket flange
6 Cush drive bush
7 Inner ring
8 Chain
9 Spacer
10 Chain cover
11 Screw
12 Nut
13 Lock washer
14 Front sprocket
15 Spacer
16 O-ring
17 Rear sprocket

Spare parts catalogue

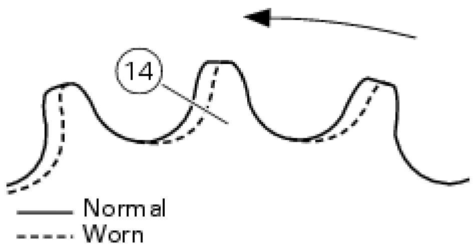
Diavel ABS	GEARBOX
Diavel ABS	REAR WHEEL AXLE
Diavel Carbon ABS	GEARBOX
Diavel Carbon ABS	REAR WHEEL AXLE

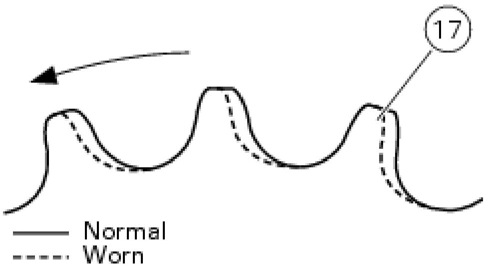
Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Inspecting the final drive

To check the wear of the final drive, visually check the pinion (14) and sprocket (17). If the teeth are found to worn as shown in the figure (dotted line), the sprocket must be renewed.

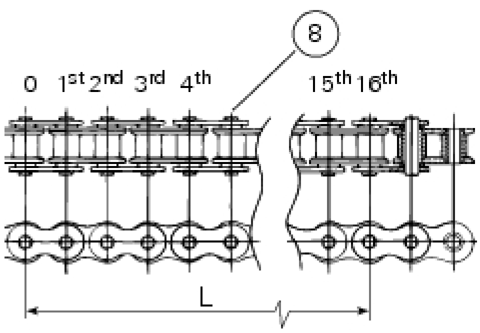




To check the amount of wear on the chain (8), keep the chain taut and measure **16** links.
If the length (L) is greater than **256.5** mm, the chain should be replaced.

Important

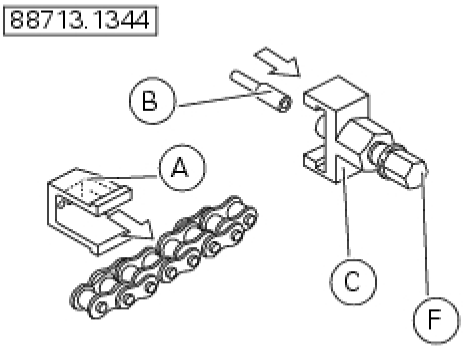
The sprocket (17), engine pinion (14) and chain (8) must all be replaced together as a set.

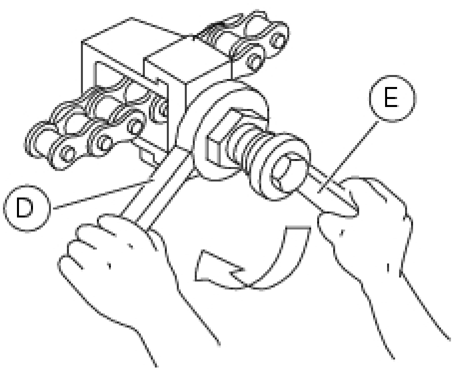


Removing of the front sprocket

Undo the screws (11) and remove the chain cover (10).
Loosen the chain (Sect. 4 - 3, Adjusting the chain tension).

Remove the chain with the tool code **88713.1344**.
The tool is composed of a holder (A), punch (B), body (C) and two wrenches (D) and (E).
Fit the link to be opened into the holder (A).
Fit a punch (B) into the body (C) and manually unscrew the screw until the punch no longer protrudes.
Fit the holder (A) and link into the body (C).
Manually turn the screw (F) on body (C) so that the punch (B) locates against the pin, taking care that they are aligned with each other.
Fit hex wrench (D) into the hexagonal part of the body (C) and wrench (E) onto the bolt.
Turn the bolt (F) clockwise to push out the pin.



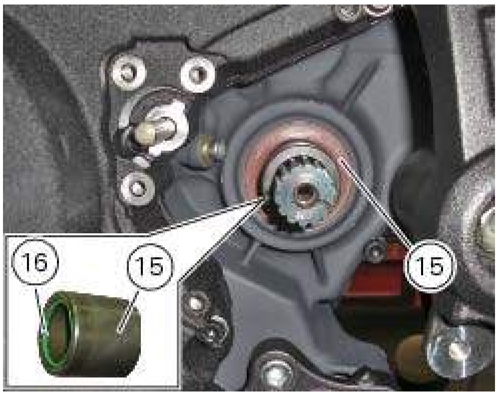


Remove the chain.
Engage a low gear and unscrew the nut (12).
Remove the nut (12) and the safety washer (13) on the pinion.
Remove the engine pinion (14) from the gearbox secondary shaft.

Remove the spacer (15) with O-ring (16) from the gearbox secondary shaft.

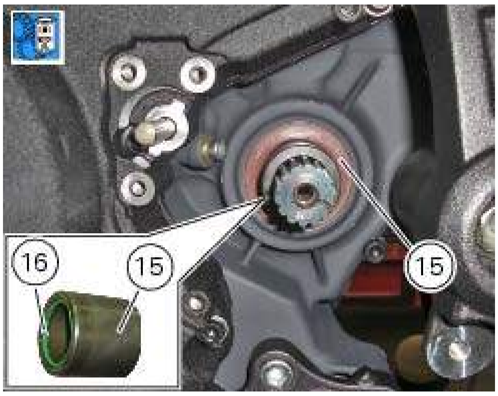
Important

The O-ring (16) must be renewed on reassembly.

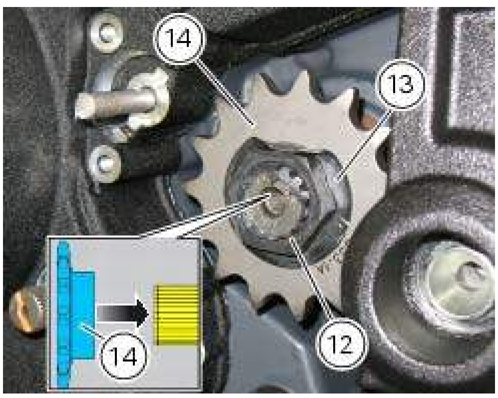


Refitting the front sprocket

Grease the O-ring (16) and install it on the front sprocket spacer (15).
Fit the spacer, from the O-ring side, on the secondary shaft and drive it fully home against the inner ring of the bearing.



Check that the splines of the gearbox secondary shaft and the sprocket are in perfect condition.
Fit the engine pinion (14) on the gearbox secondary shaft by orienting it as indicated. Install the safety washer (13).
Tighten the nut (12) to the torque of 186 Nm ± 5% (Sect. 3 - 3, Frame torque settings).
Bend the washer (13).



Fit the chain and close it using the tool with code **88713.1344** that was used to open the chain.
The tool is composed of a holder (A), punch (B), body (C) and two wrenches (D) and (E) and link plate holder (F).
Connect the two halves of the chain with the external link and manually fit the plate onto the pins.

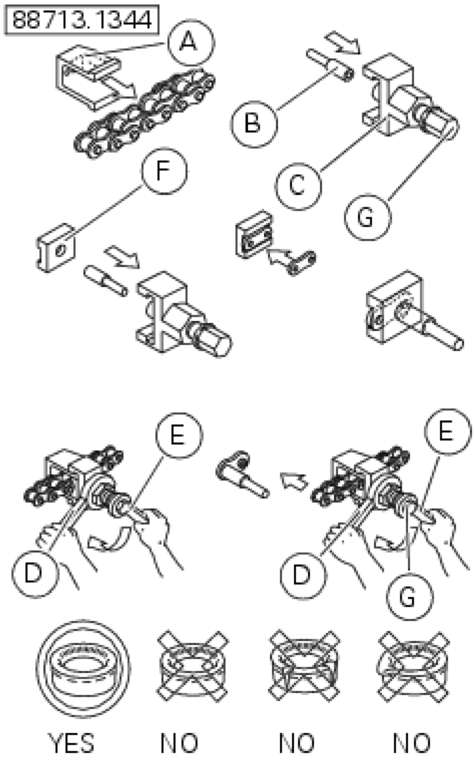
Warning

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) locates against the pin, taking care that they are aligned with each other.
Use wrenches (D) and (E) to turn the bolt clockwise until the punch (B) is seated against the chain plate.
To complete reassembly, repeat the entire procedure with the second pin.

Warning

Carefully check the two pins: the figure shows the correct result of the procedure.

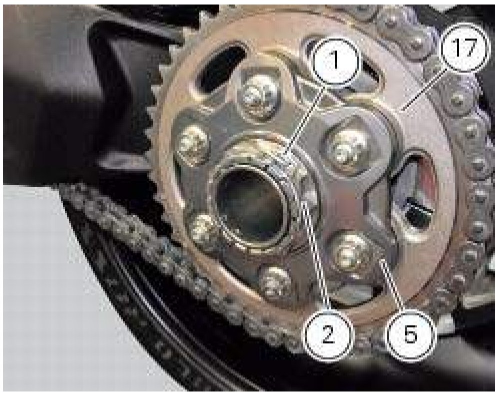


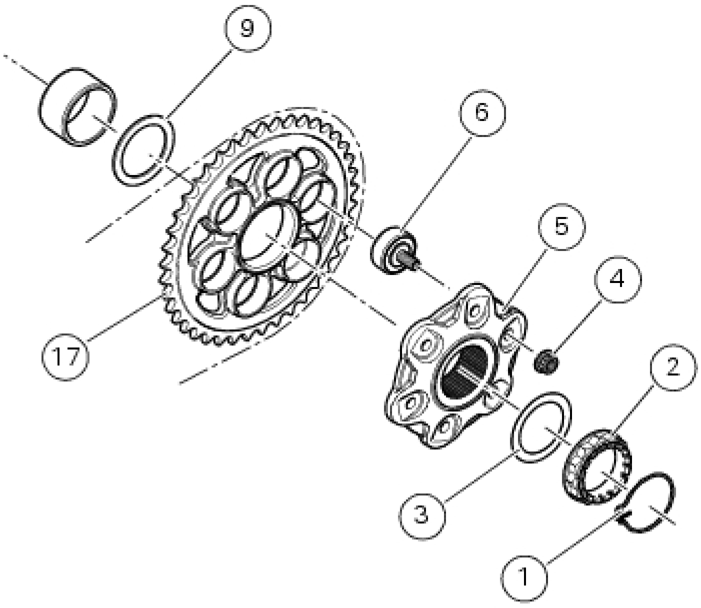
Adjust the chain tension (Sect. 4 - 3, Adjusting the chain tension).
Apply the recommended threadlocker to the screws (11).
Fit the sprocket cover (10) tightening the screws (11) to the torque of 6 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

Replacing of the rear sprocket

Operations	Section reference
Slacken the chain	4 - 3, Adjusting the chain tension
Remove the exhaust silencers	8 - 8, Removal of the exhaust system
Remove the rear wheel	7 - 2, Removing of the rear wheel

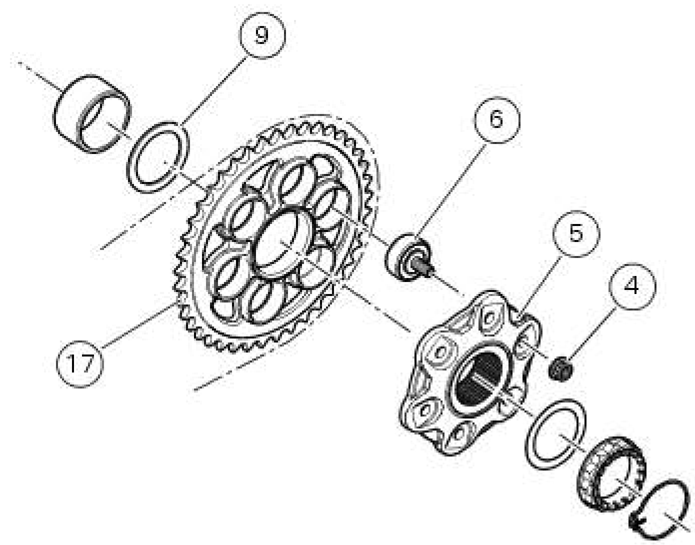
Lock the wheel axle rotation.
Remove the clip (1).
Loosen the locking nut (2) with a socket wrench.
Fully unscrew the nut (2) and remove the washer (3) and the flange (5) with the sprocket (17).
Collect the spacer (9).
Using a mallet, tap the flange (5) with the cush drive damper (6) off the sprocket (17).



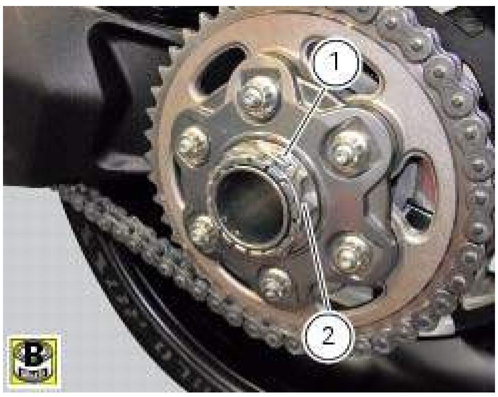


Refitting the rear sprocket

Check the cush drive bushes (6) condition and, if necessary, replace them by removing them from the flange.
Refitting is the reverse of removal.
Apply recommended grease on the rear sprocket flange (5) external diameter.
Place the rear sprocket flange (5) on sprocket (17) by inserting it on cush drive damper pins (6).
Apply prescribed threadlocker on the nut threads (4).
Start the nuts on the cush drive damper pins (6) threaded side.
Tighten the nuts (4) to a torque of 44 Nm ± 10% (Sect. 3 - 3, Frame torque settings), following a cross-pattern sequence.



Check for wear following the instructions given at the beginning of this section.
To refit the nut (2) follow the specifications for the wheel fixing nut, in Sect. 7 - 2, Refitting the rear wheel.
Position the clip (1) as shown.



Operations	Section reference
Refit the rear wheel	7 - 2, Refitting the rear wheel
Refit the exhaust silencers	8 - 8, Refitting the exhaust system
Adjust the chain tension	4 - 3, Adjusting the chain tension

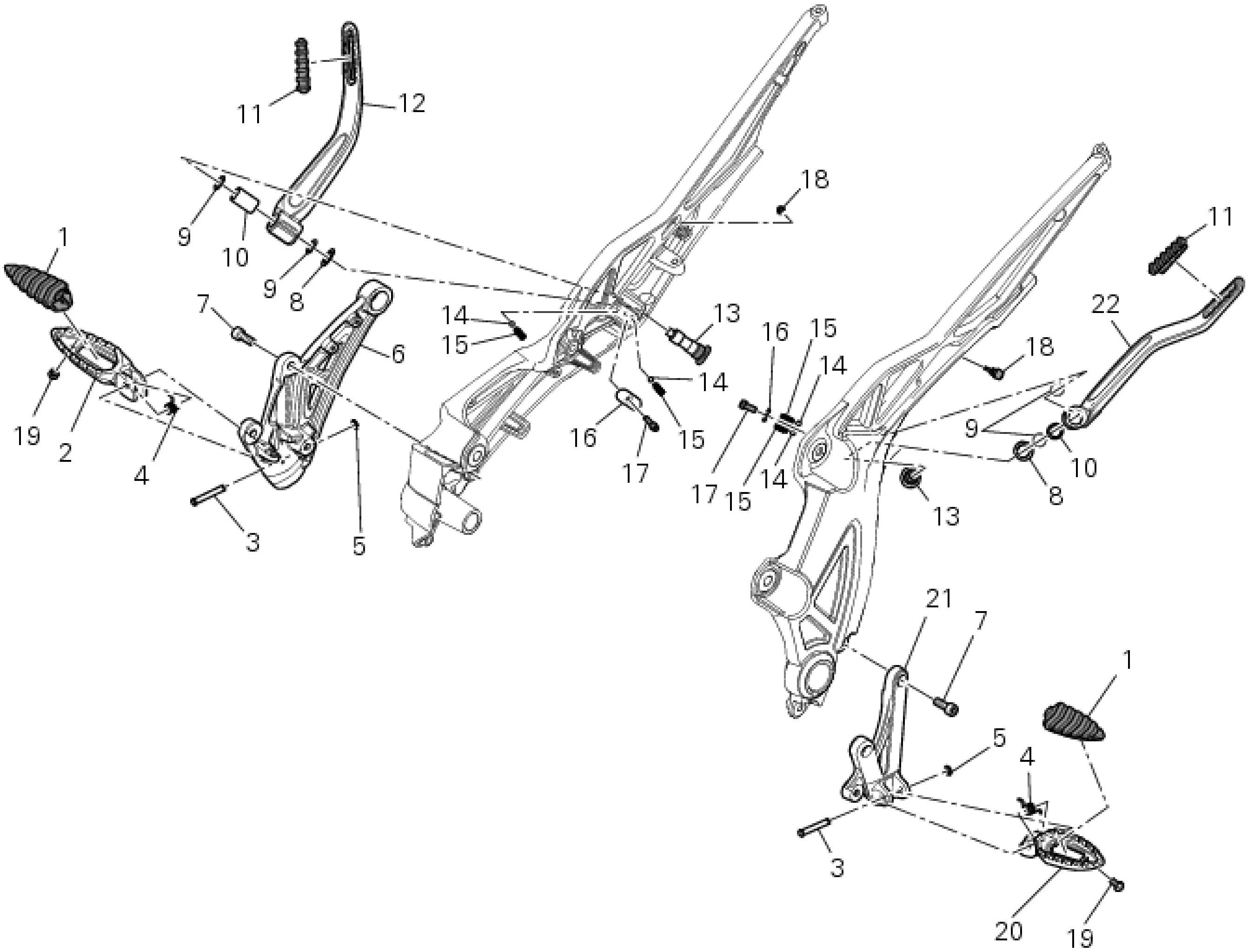
Washing the chain

Chains with O-rings must be washed in oil, diesel fuel or paraffin (kerosene).
Do not use fuel, trichloroethylene or other solvents which will damage the rubber O-rings. For the same reason use only sprays specifically formulated for use with O-ring chains.

Lubricating the chain

O-ring chains have sealed, life-lubed link studs and bushes. However, these chains need lubricating 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 (Sec. 3 - 2, Fuel, lubricants and other fluids).

15 Footrest brackets



1 Rubber footrest
2 Right front footrest
3 Pin
4 Spring
5 Circlip
6 Right footrest bracket
7 Screw
8 Washer
9 O-ring
10 Bush
11 Rubber pad
12 Right rear footrest
13 Pin
14 Ball
15 Spring
16 Plate
17 Screw
18 Vibration damper mount
19 Special screw
20 Front LH footrest
21 Left footrest bracket
22 Left rear footrest

Spare parts catalogue

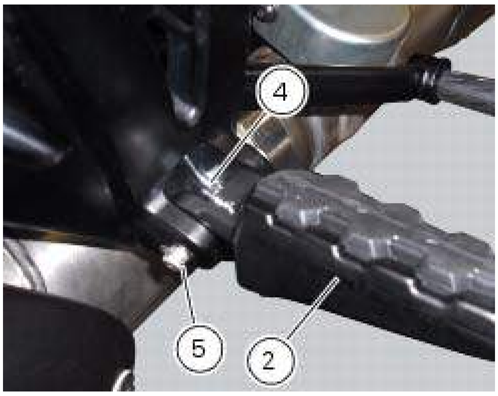
Diavel ABS	R.H. FOOTRESTS
Diavel ABS	L.H. FOOTRESTS
Diavel Carbon ABS	R.H. FOOTRESTS
Diavel Carbon ABS	L.H. FOOTRESTS

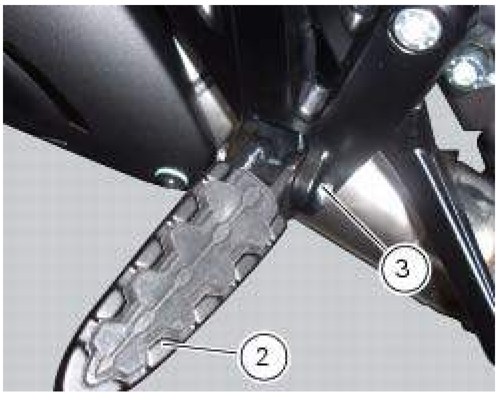
Important
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Removal of the front footrests

Note
The removal of the front footrests is described only for the right one (2) but it is the same also for the left one.

Remove the circlip (5) by releasing the pin (3).
Slide the pin (3) off the frame by supporting the footrest (2).
Slide off the footrest (2) from its seat and collect the spring (4).

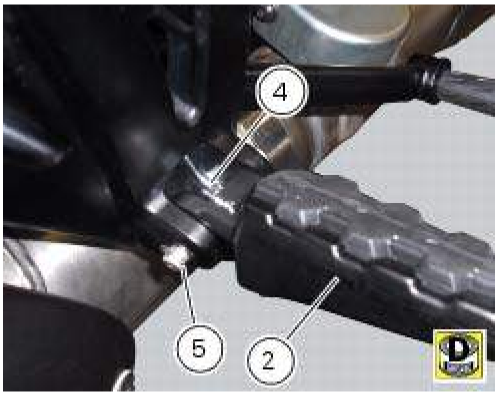


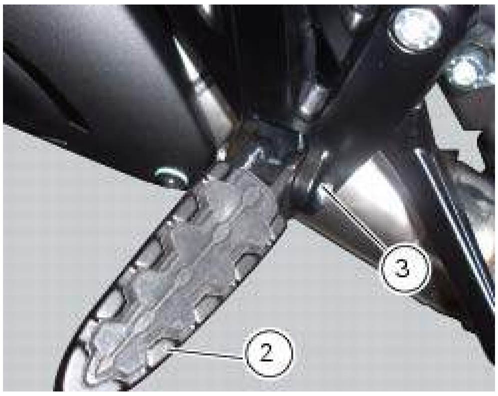


Refitting the front footrests

Note
The assembly of the front footrests is described only for the right one (2) but it is the same also for the left one.

Place the spring (4) bringing the end (A) onto the footrest (2).
Place the footrest (2) in the correct position, by inserting the end (C) of the spring (4) in the hole (D) of the frame plate.
Apply the recommended grease to the pin (3).
Insert pin (3) orienting it as illustrated.
Lock the pin by inserting the circlip (5).



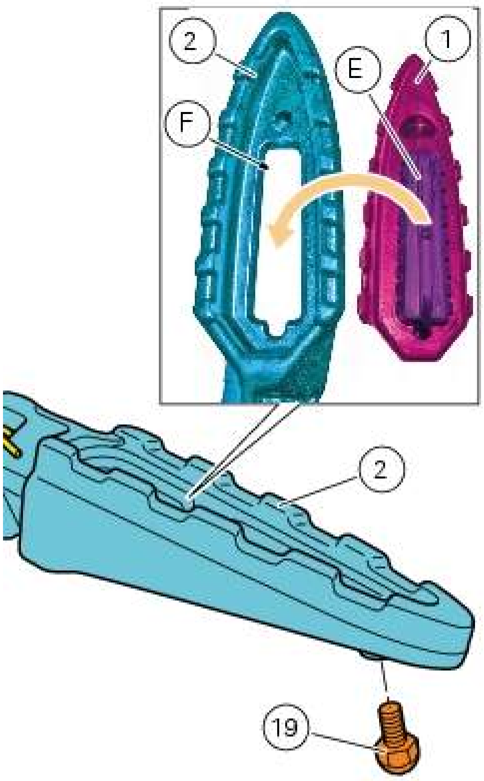


If previously removed, refit the rubber footrest (1) on the footrest (2), inserting pad (E) into the seat (F) in the footrest (2) until it becomes engaged.

Note

To better insert the rubber footrest (1) use lubricant specific for rubber.

Start the screw (19) on the bottom side of the footrest (2) and tighten to the specified torque.



Removing the front footrest brackets

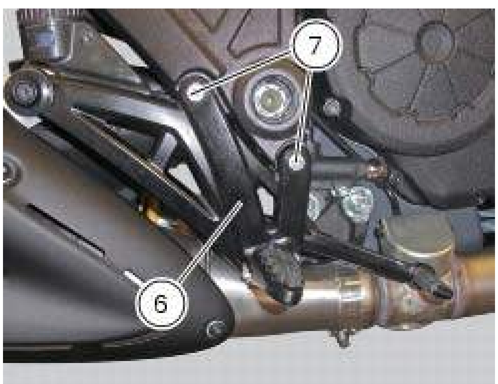
To remove the front RH footrest bracket (6) it is necessary to remove the rear brake master cylinder reservoir (by leaving it connected to the braking system), and the rear brake lever from the bracket (Sect. 7 - 4, Removing of the rear brake control).

To remove the front RH footrest bracket (6) it is also necessary to remove the RH silencer support from the bracket

(Sect. 8 - 8, Removal of the exhaust system).
To remove the front LH footrest bracket (21) it is necessary to remove the gearchange lever from the bracket (Sect. 7 - 9, Removal of the gearchange control).
Loosen the screws (7) and remove the brackets (6) and (21).

Reassembling the front footrest brackets

To reassemble the brackets (6) and (21) carry out the removal procedure in the reverse order; tighten the screws (7) to a torque of 25 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

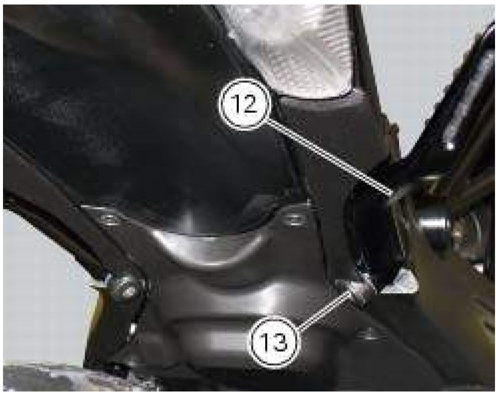


Removing of the rear footrests

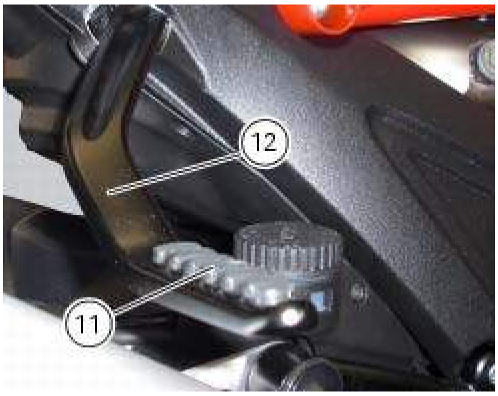
Note

The removal of the rear footrests is described for the right side but it is the same for both.

Undo the pin (13) and remove the RH rear footrest (12) from the frame.
Recover washer (8) and the O-rings (**9**).



If necessary remove the rubber footrest (11) of the footrest (12).



Refitting the rear footrests

Note

The refitting of the rear footrests is described for the right side but it is the same for both.

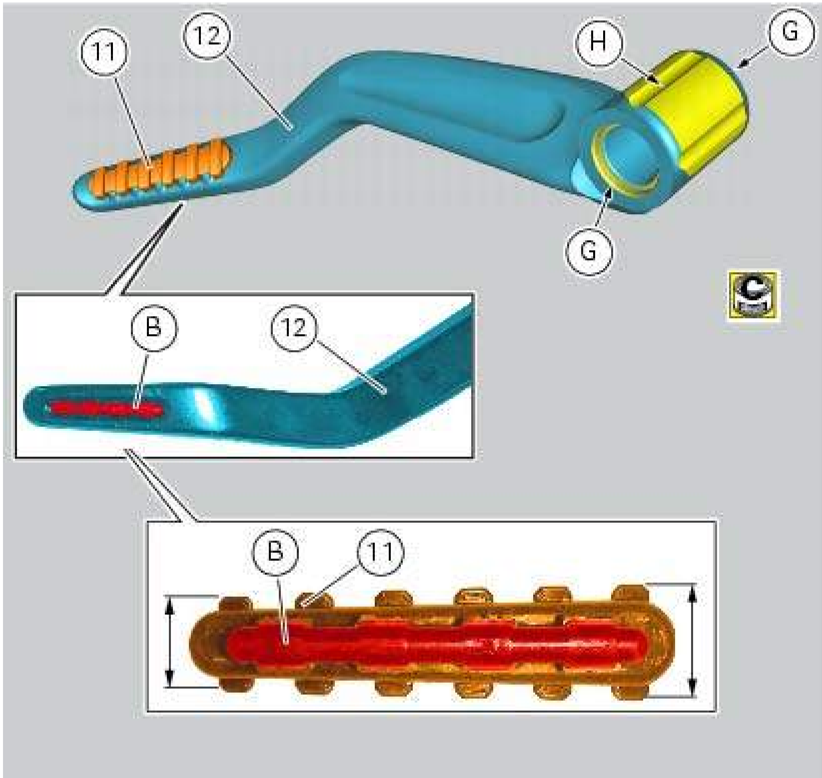
If previously removed, refit the rubber footrest (11) on the rear RH footrest (6), by pushing it until pad (B) engages in the other side.

Note

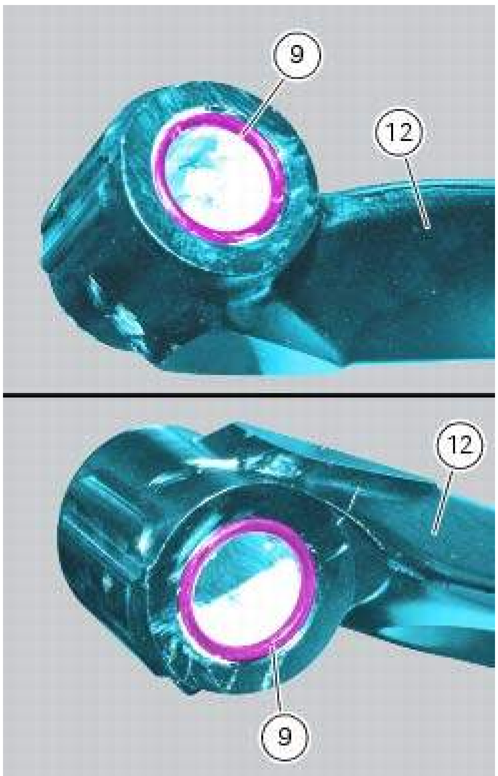
The rubber footrest (11) side featuring the least width must be faced to the outer side of the footrest (12).

Apply recommended grease to the seats (G) of the O-rings and in area (H) on the rear RH footrest (12).

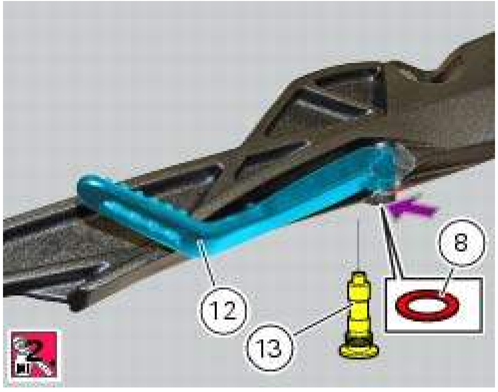
Footrest brackets

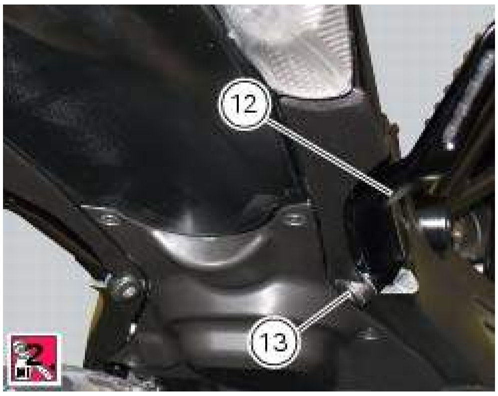


Place O-rings (9) in the relevant seats of the footrest (12).

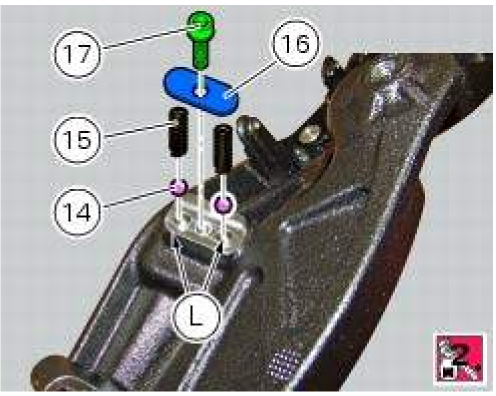


Position footrest (12) as shown, on the rear subframe RH bracket; make sure that the previously fitted O-rings do not come out of the relevant seats on the footrest (12).
Fit washer (8) between footrest (12) and the rear subframe RH bracket.
Fix the footrest (12) by starting the pin (13) smeared with specified threadlocker.
Tighten the pin (13) to a torque of 30 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

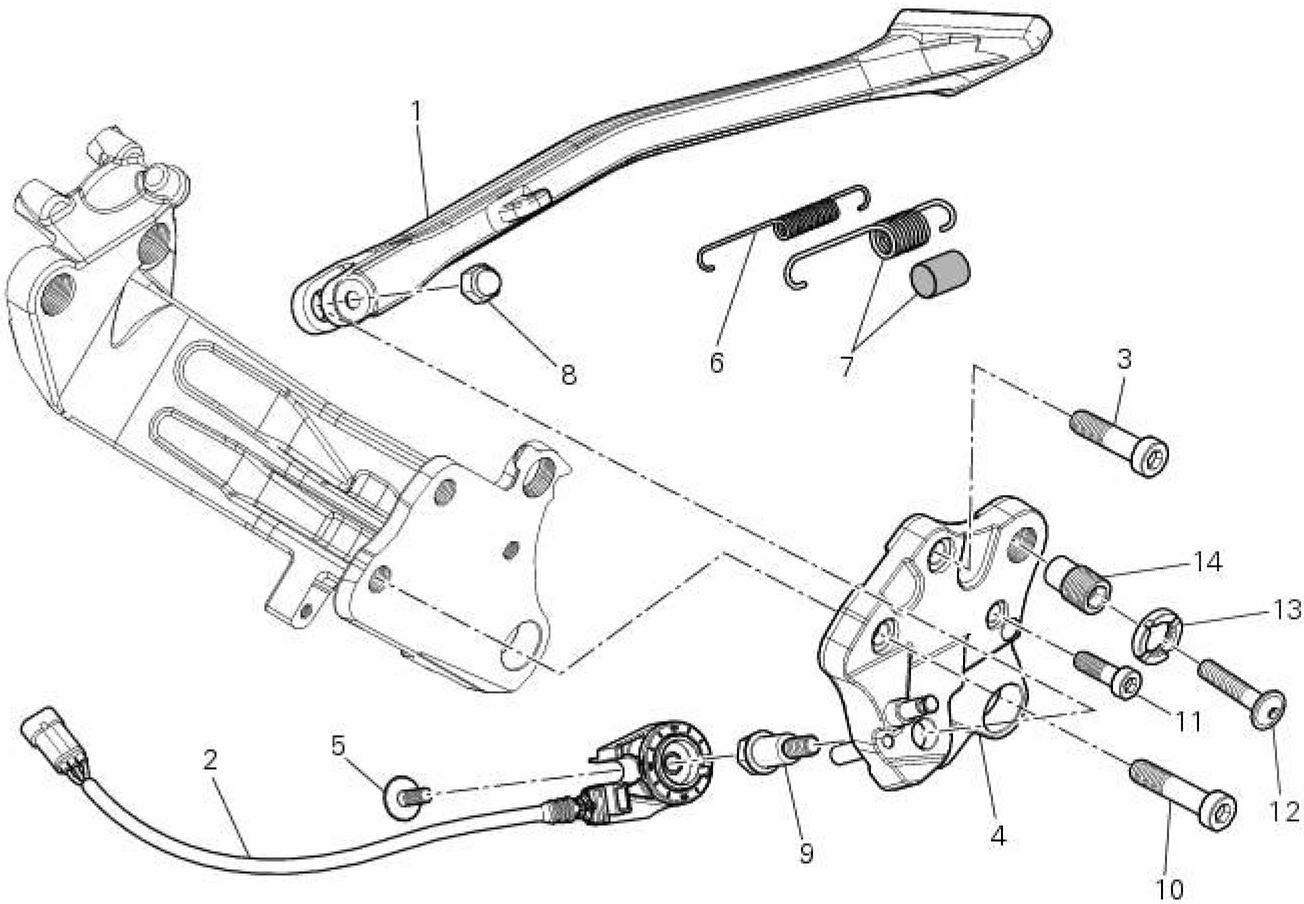




If previously removed, apply recommended grease into the holes (L) and insert balls (14) and springs (15) into the relevant holes of the rear subframe RH bracket.
Apply prescribed threadlocker on the screw thread (17).
Fit the cap (16) and tighten the screw (17) to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings)



16 Stands



1 Side stand
2 Side stand switch
3 Screw
4 Plate
5 Screw
6 Inner spring
7 Outer spring
8 Nut
9 Rotation pivot
10 Screw
11 Screw
12 Screw
13 Nut
14 Clearance adjuster

Spare parts catalogue

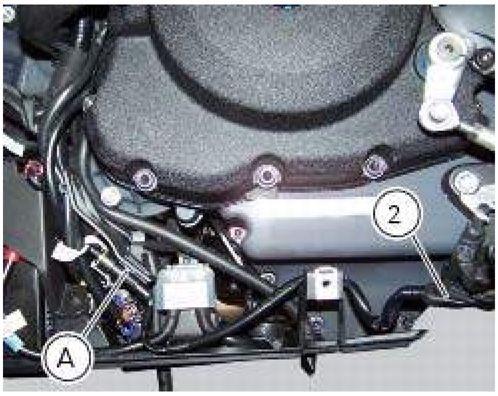
Diavel ABS	STAND
Diavel Carbon ABS	STAND

Important
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

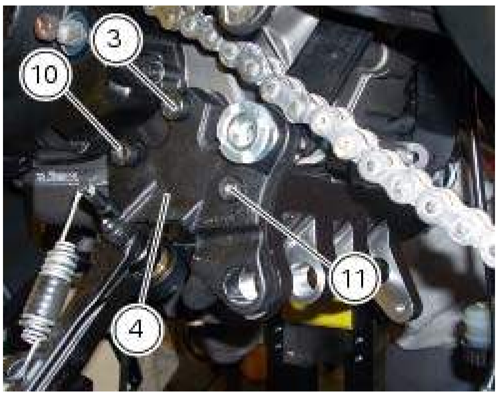
Removing of the side stand

Operations	Section reference
Remove the right undersump	5 - 5, Removal of belly fairing

Disconnect connector (A) of the stand switch (2) from the main wiring.

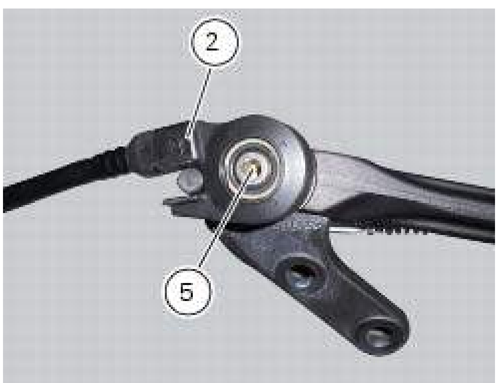


Loosen the screws (3), (10), (11) and (12) securing the stand bracket (4) to the engine and remove the complete side stand assembly.

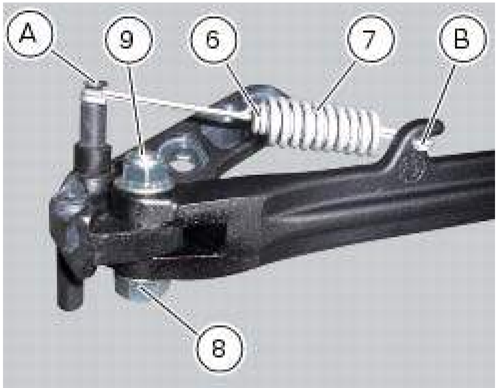


Disassembly of the side stand

Undo the fixing screw (5) and remove the side stand switch (2).

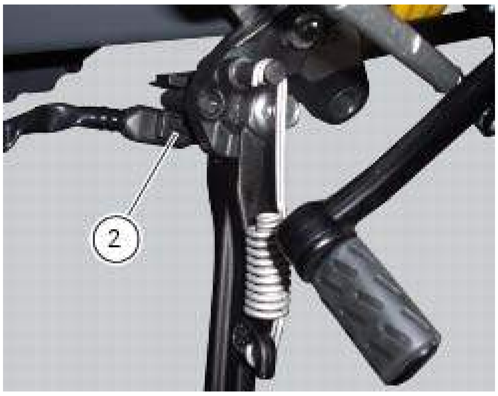


Release the side stand return springs (6) and (7) of the fasteners (A) and (B).
Undo the stand fixing pin (9) to the bracket and remove the side stand (1) and the nut (8).



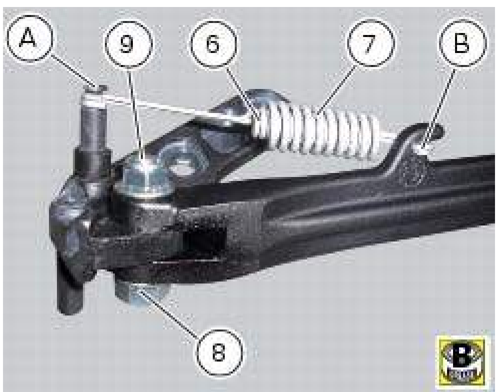
Inspecting the side stand

Fit the side stand leg to the bracket and check that there is no excessive clearance. Ensure that the ends of the side stand are not bent with respect to the shank.
A side stand which shows signs of cracking must be renewed immediately.
To check the switch (2) refer to Sec. 6 - 6, Checking the side stand switch.

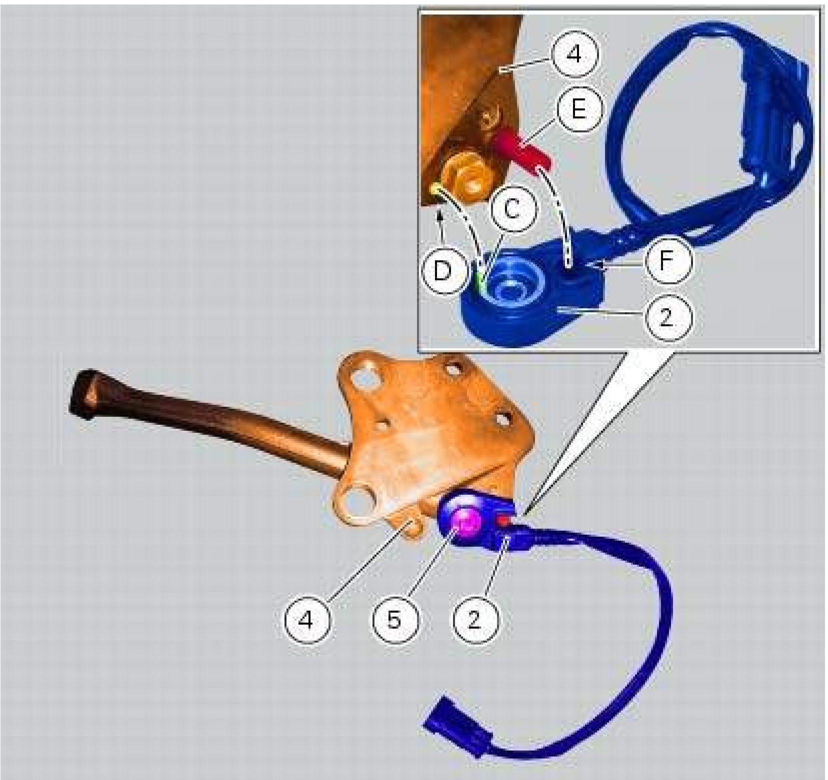


Reassembling of the side stand

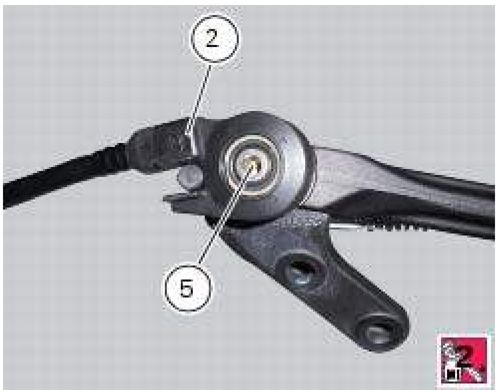
Insert the side stand (1), properly greased, in the bracket (4) and fix it with the pivot (9) and the nut (8).
Tighten the nut (8) to the torque of 20 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Position the side stand return springs (6) and (7) and fix them to the fasteners (A) and (B) on the bracket and on the stand.



Set switch (2) to plate (4) by inserting sensor pin (C) into side stand hole (D) and making sure side stand pin (E) matches with groove (F) on sensor.

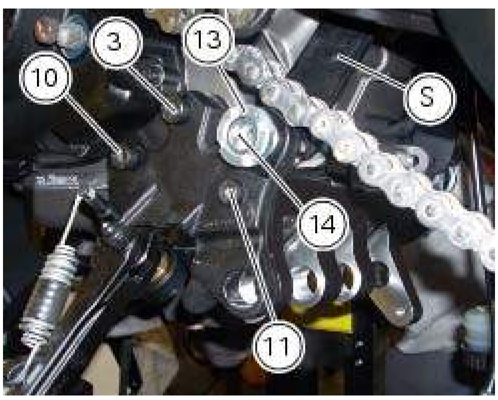


Fit the retaining screw (5) with recommended threadlocker and tighten it to a torque of 5 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

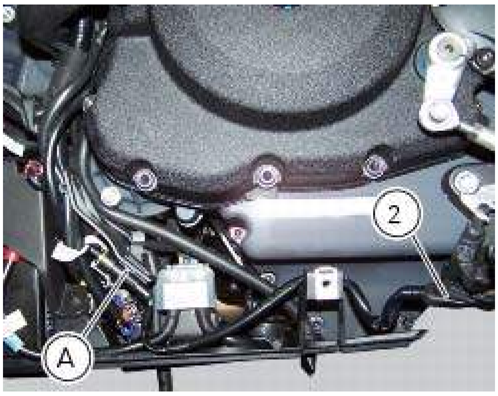


Refitting the side stand

Place the stand plate on the rear shock absorber support; bring adjuster (14) in line with bracket (S) and start the screw (12) in the nut behind the bracket (S).
Insert the screws (11), (3) and (10) fully home in this order, but do not tighten.
Loosen the screw (12) with the relative nut, tighten the adjuster (14) to a torque of 0.6 Nm ± 10% (Sect. 3 - 3, Frame torque settings) and tighten the screw (12) to a torque of 2 Nm ± 10% (Sect. 3 - 3, Frame torque settings) while holding the nut.
Locate service tool no. **88713.3166** on the ring nut (13) and fit the torque wrench to the tool. While holding the adjuster (14), tighten the ring nut (13) to a torque of 100 Nm ± 5% (Sect. 3 - 3, Frame torque settings).
Tighten screws (11), (3) and (10) in this order to a torque of 44 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Finally, tighten the screw (12) to a torque of 45 Nm ± 10% (Sect. 3 - 3, Frame torque settings) while holding the nut.

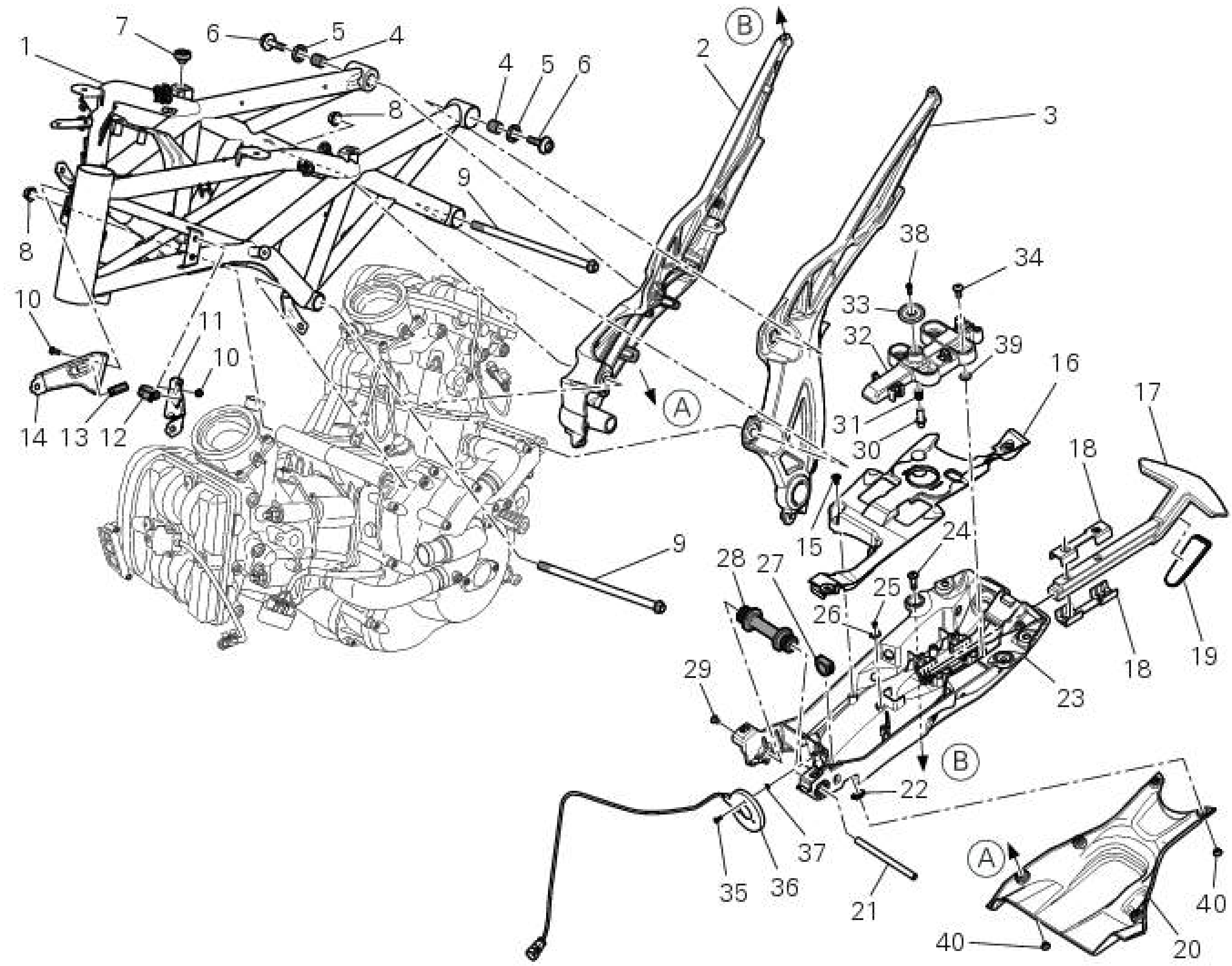


Connect connector (A) of the side stand switch to the main wiring harness.
To place the stand switch wiring refer to the table (Sect. 6 - 1, Routing of wiring on frame).



Operations	Section reference
Refit the right oil undersump	5 - 5, Reassembly of belly fairing

17 Frame inspection



1 Frame
2 RH subframe
3 LH subframe
4 Grub screw
5 Nut
6 Special screw
7 Rubber pad
8 Nut
9 Special screw
10 Screw
11 Left-hand bracket
12 Hose clip
13 Hose clip
14 Right-hand bracket
15 Special screw
16 Cover
17 Handgrab
18 Slider
19 Reflector (rear)
20 splashguard
21 Pin
22 Clip nut
23 Tool tray
24 Screw
25 Screw
26 Base
27 Cable grommet
28 Rubber support
29 Screw
30 Pin
31 Spring
32 Block

33 Nut
34 Screw
35 Screw
36 Immobilizer antenna
37 Nut
38 Screw
39 Washer
40 Screw

Spare parts catalogue

Diavel ABS	FRAME
Diavel ABS	REAR SUBFRAME
Diavel Carbon ABS	FRAME
Diavel Carbon ABS	REAR SUBFRAME

Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Disassembly of structural components and the frame

Before carrying out dimensional checks on the frame, you must remove all the superstructures fitted, referring to the removal procedures outlined in the sections of this manual.
The rear subframes (2) and (3) are structural components of the frame (1).
Both serve to support motorcycle superstructures and must therefore be in perfect condition.
The following flow chart illustrates the logical sequence in which the parts are to be removed from the motorcycle and a reference to the section where the removal procedure is described.

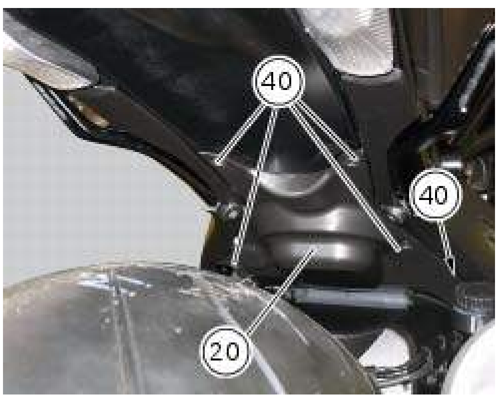
Operations	Section reference
Remove the saddles	5 - 3, Removal of the seat
Remove air conveyor covers	8 - 7, Removal of the air filters
Remove the tank half covers	5 - 2, Removal of the fuel tank fairings
Remove the fuel tank	8 - 2, Removal of the fuel tank
Remove air conveyors	8 - 7, Removal of the air filters
Remove the handlebar RH and LH switchgear set	6 - 5, Checking the indicating devices
Remove the front brake lever	7 - 3, Removal of the front brake master cylinder
Remove the hydraulic clutch control	7 - 8.2, Removal of the clutch master cylinder assembly
Remove the handlebar	7 - 8.1, Removal of the handlebar
Remove the headlight support	6 - 4, Renewal of the headlight
Remove the front mudguard	5 - 4, Removal of the front mudguard
Remove the front fork	7 - 10.1, Removal of the front forks
Remove the front wheel	7 - 1, Removal of the front wheel
Disconnect the throttle cable	7 - 8.1, Removal of the throttle twistgrip
Remove the airbox, the throttle body, the blow by and the oil breather tube	8 - 6, Removal the airbox and throttle body
Remove the fuel system and the injectors from the intake manifolds	8 - 6, Removal of the fuel injectors
Disconnect the cables from the coils	6 - 9, Ignition coils
Remove the oil cooler covers	5 -5, Removal of belly fairing
Remove the oil cooler	9 - 2.2, Removal of the lubrication system
Disconnect the starter	6 - 3, Removing the starter motor

motor/solenoid cable	
Remove the support of the battery and of the electrical components	5 - 6, Removing the electrical components support
Remove the exhaust unit	8 - 8, Removal of the exhaust system
Remove the side stand	7 - 16, Removing of the side stand
Remove the footrests	7 - 15, Removal of the front footrests
Bleed the lubrication system	4 - 3, Changing the engine oil and filter cartridge
Remove the oil pipes of the oil radiator from the engine block	9 - 2.2, Removal of the lubrication system
Empty the coolant out of the cooling system	4 - 3, Changing the coolant
Remove the water radiators	9 - 3.2, Removing the water radiators
Remove the gearchange control	7 - 9, Removal of the gearchange control
Remove the clutch transmission unit	7 - 8.2, Removal of the clutch transmission unit
Remove the front sprocket	7 - 14, Removing of the front sprocket
Remove the rear brake control and the rear braking system	7 - 4, Removing of the rear brake control
Remove the rear wheel	7 - 2, Removing of the rear wheel
Remove the rear shock absorber support from the engine block	7 - 12, Rear suspension system
Remove the rear swingarm	7 - 13, Removal of the swingarm
Remove the number plate holder	7 - 18, Removal of the licence plate holder
Disconnect wiring connectors on the frame	6 - 1, Routing of wiring on frame

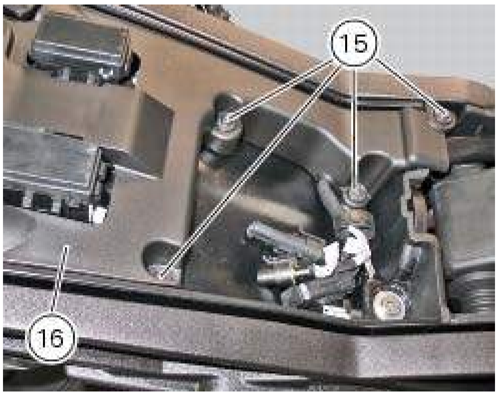
Refitting is the reverse of removal.

Removal of the tool tray

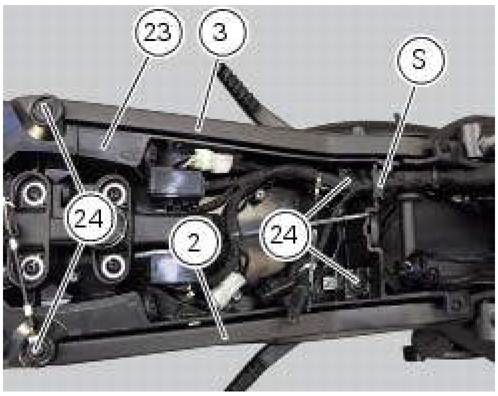
To remove the tool tray unit from the lateral footrests, loosen the screws (40) and remove the splashguard (20).



Undo the screws (15) and remove the cover (16).

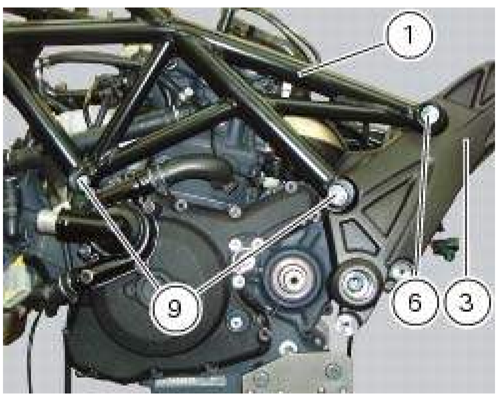


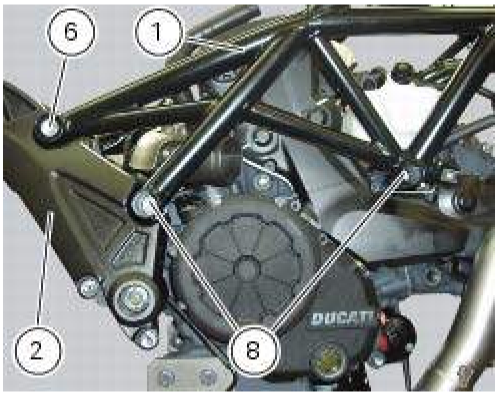
Move the wiring branch from the seat (S) on the tool tray.
Loosen the screws (24) to remove the tool tray unit (23) from the lateral brackets (2) and (3).



Removing the frame and the lateral footrests

Loosen the two special screws (6) to separate the frame (1) from the lateral brackets (2) and (3).
On the left side of the vehicle block retaining pins (9) and loosen the nuts (8) on the right side at the same time.
Slide out the retaining pins (9) and remove the frame (1) from the lateral brackets and the engine block.





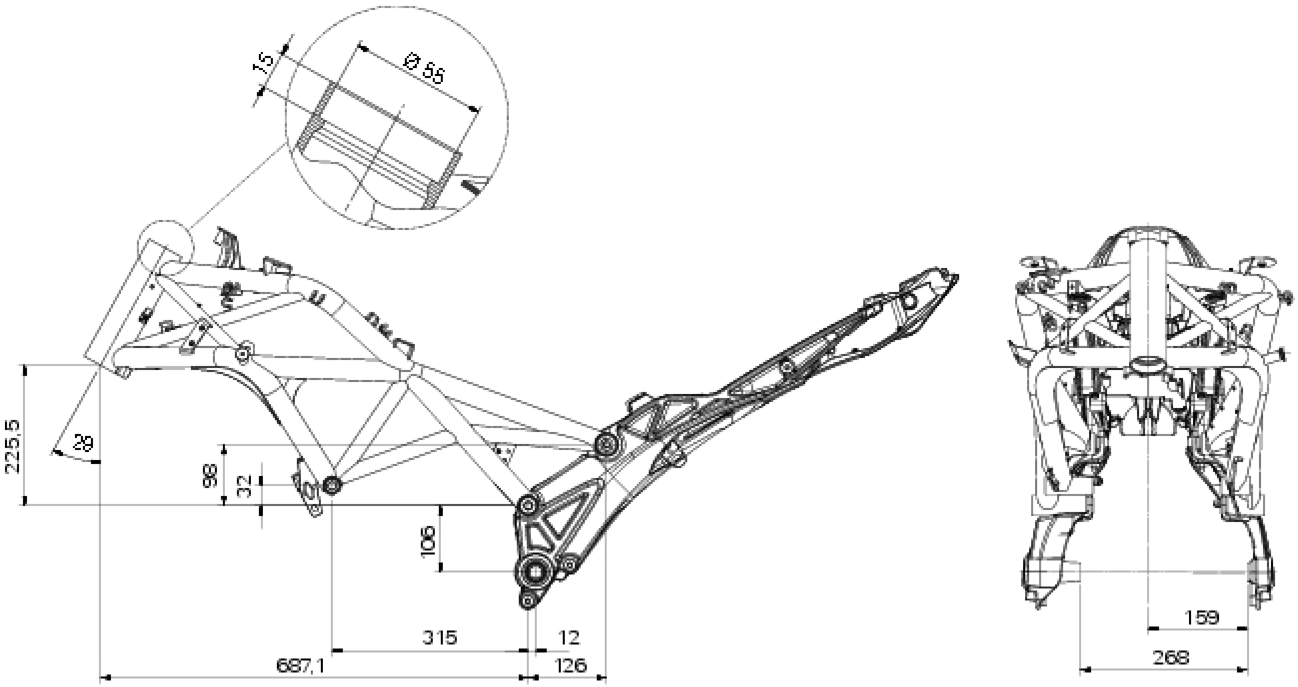
Checking the frame

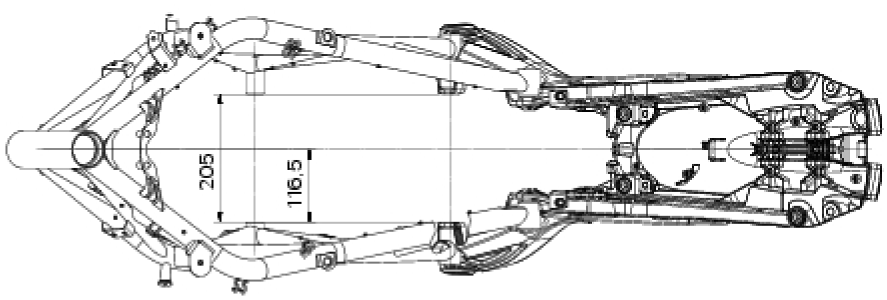
Check the dimensions of the frame against the dimensions shown here to determine whether it needs to be realigned or renewed.

Important

Damaged frames must be changed, not repaired. Any work carried out on the frame can give rise to potential danger, infringing the requirements of EC directives concerning manufacturers' liability and general product safety.

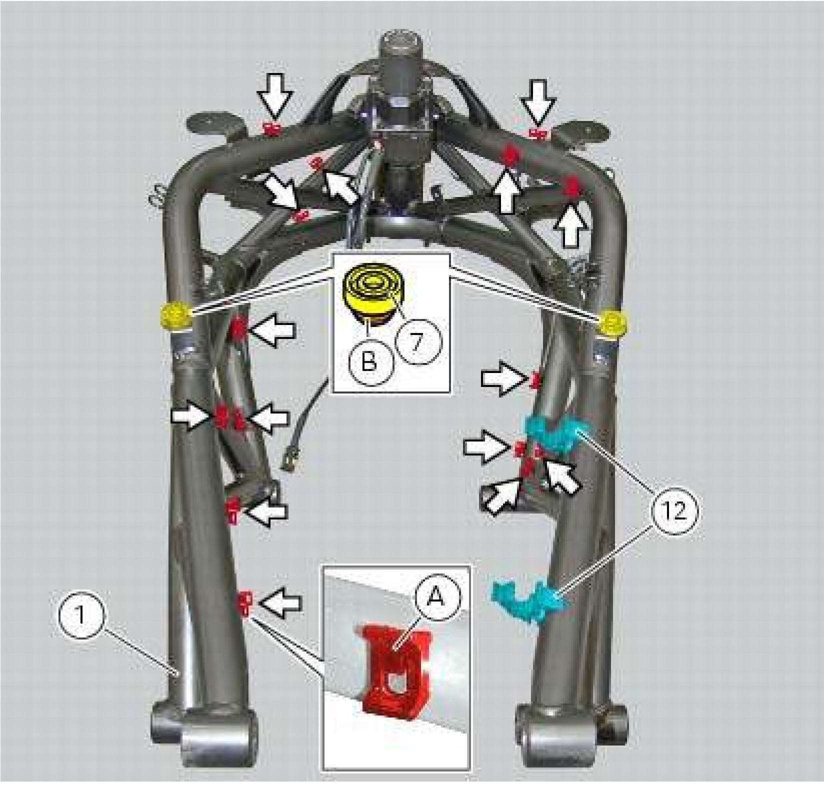
Frame general dimensions (mm)



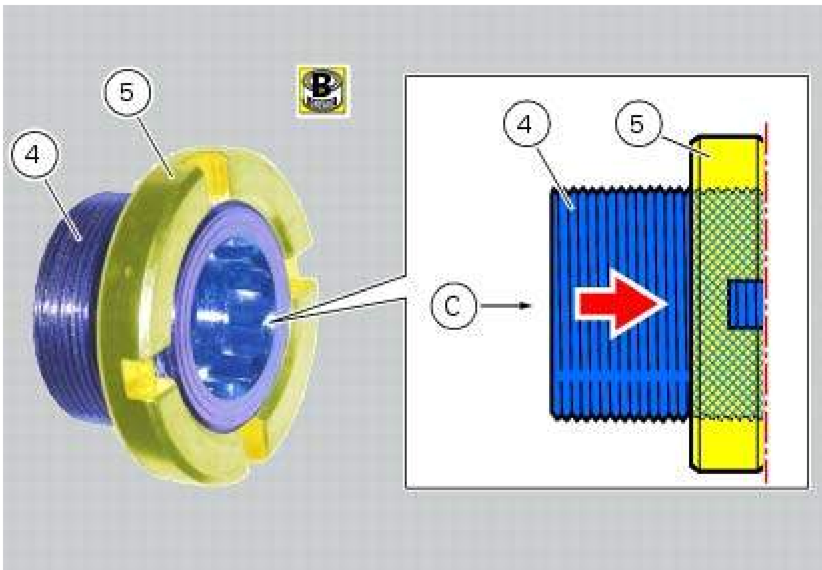


Reassembly of structural components and the frame

Check for the nuts with clips (8).



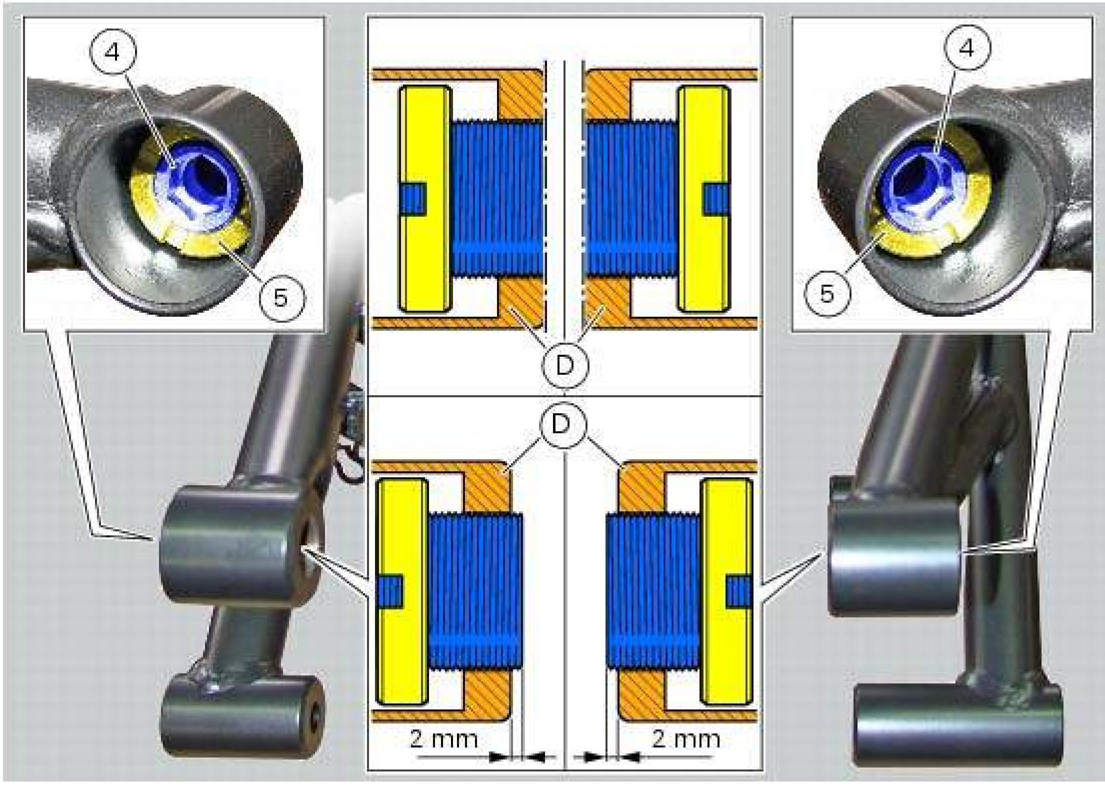
Apply recommended grease on the threads of the adjusters (4) and the ring nuts (5) having care not to have grease on the surface (C) of the adjusters.
Tighten the adjusters on the ring nut side opposite to that featuring flats until bringing the surfaces as close as possible as shown.



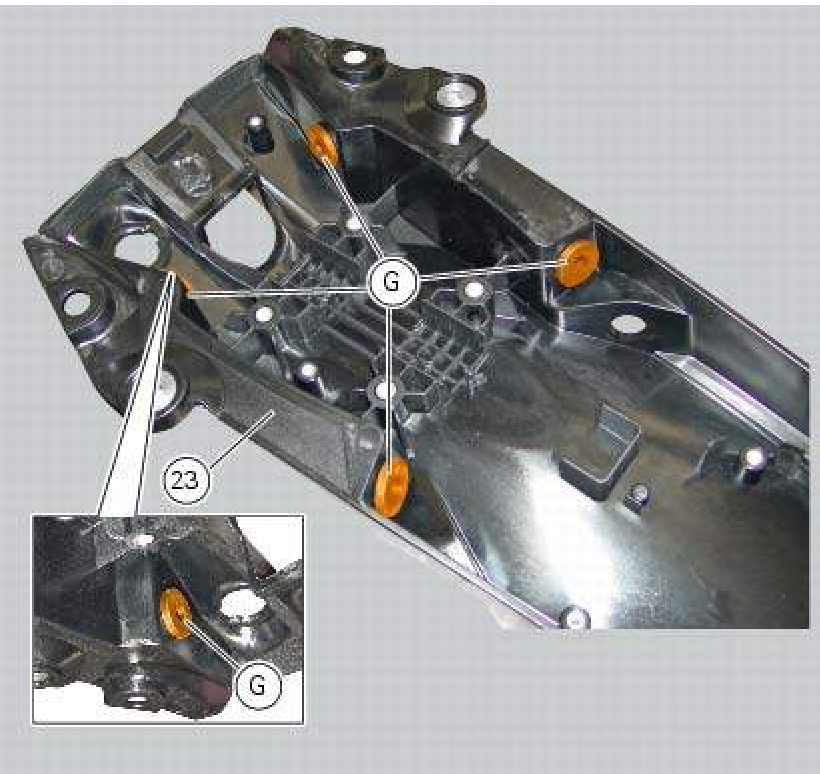
Start (form the frame external side) the adjusters (4) in the bushes (D) on frame (1).
Tighten to torque of 0.6 Nm ± 10% (Sect. 3 - 3, Frame torque settings) the adjusters (4), until they come out (on the opposite side) of at least 2 mm, as indicated.

Note
If at the specified torque the adjusters should not tighten properly, maybe the adjusters or the frame could be non-conforming.

Loosen the adjusters (4) until bringing the surfaces as close as possible to the bushes internal profiles (D), as shown.



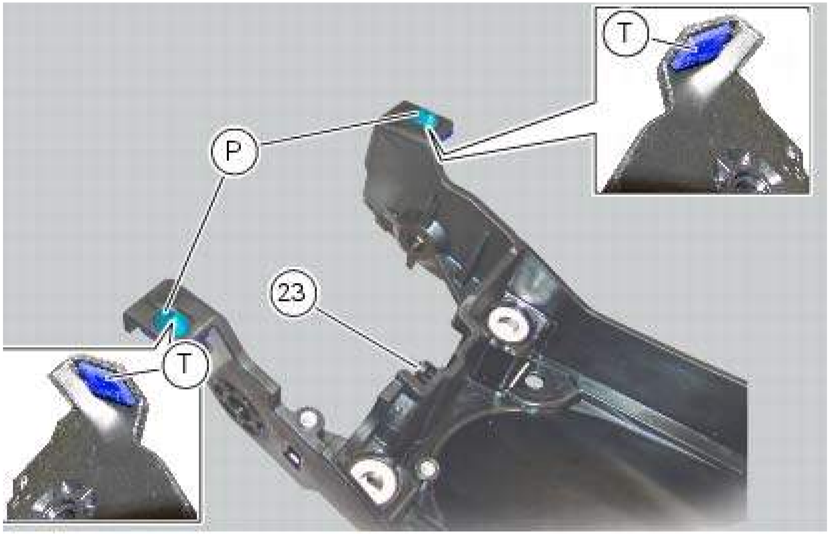
Check for the presence of rubber blocks (G) on the tray (23).

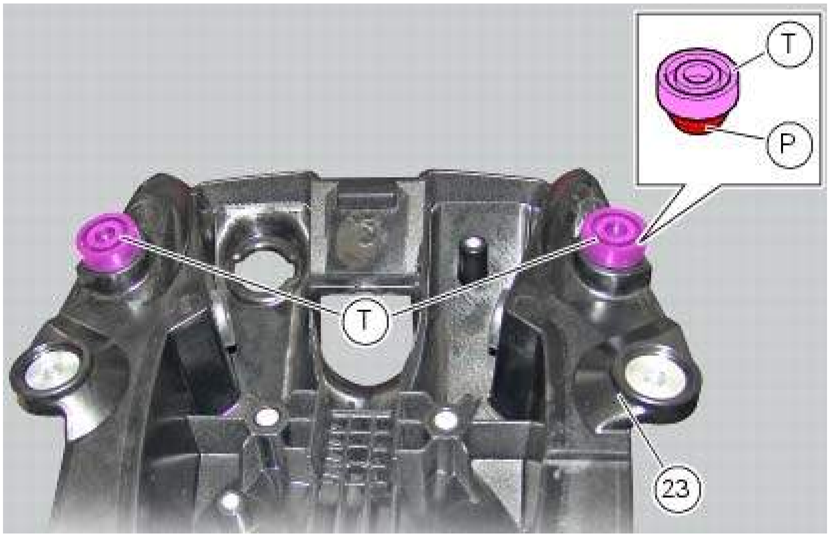


Note

In case of difficulties upon reassembly of the vibration damping pads (G), it is recommended to use specific lubricant suitable for rubber.

Check for the presence of the rubber pads (T) on the tray (23).
The pads are correctly fitted if the protrusions (P) come out completely on the insertion opposite side.

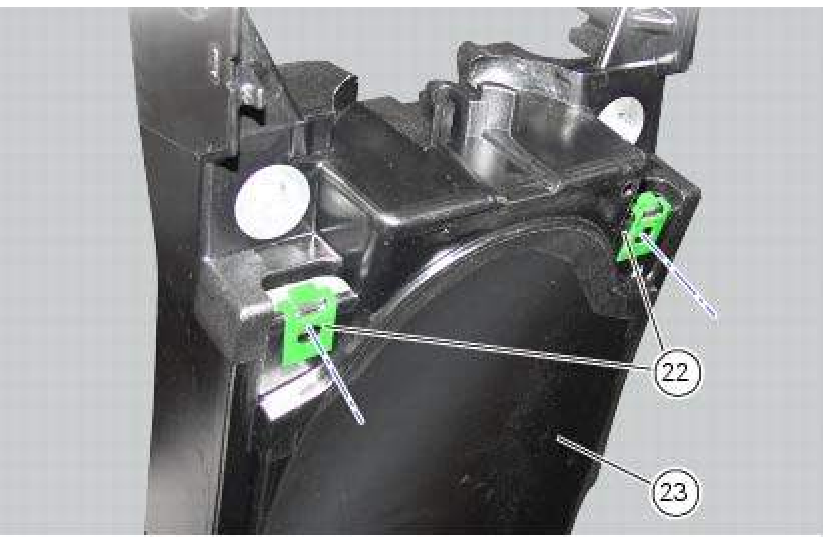




Check for the presence of clips (22) and make sure they are fitted aligned with the holes in the gloves compartment (23) front side, as shown in the figure.

Note

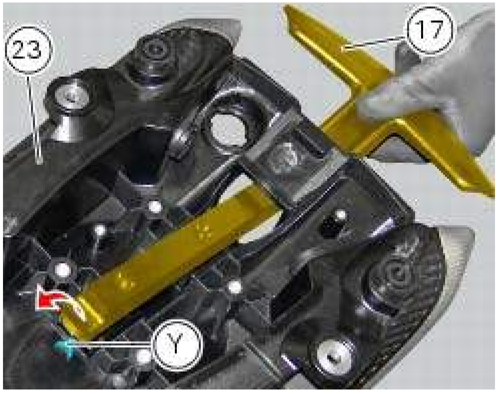
The threaded holes of the clips (22) must be perfectly aligned with the holes on the gloves compartment.



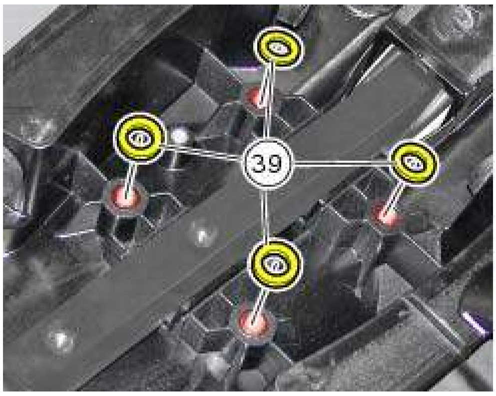
If removed, insert the rear handgrab (17) fully home through the opening in the gloves compartment (23) as shown.

Note

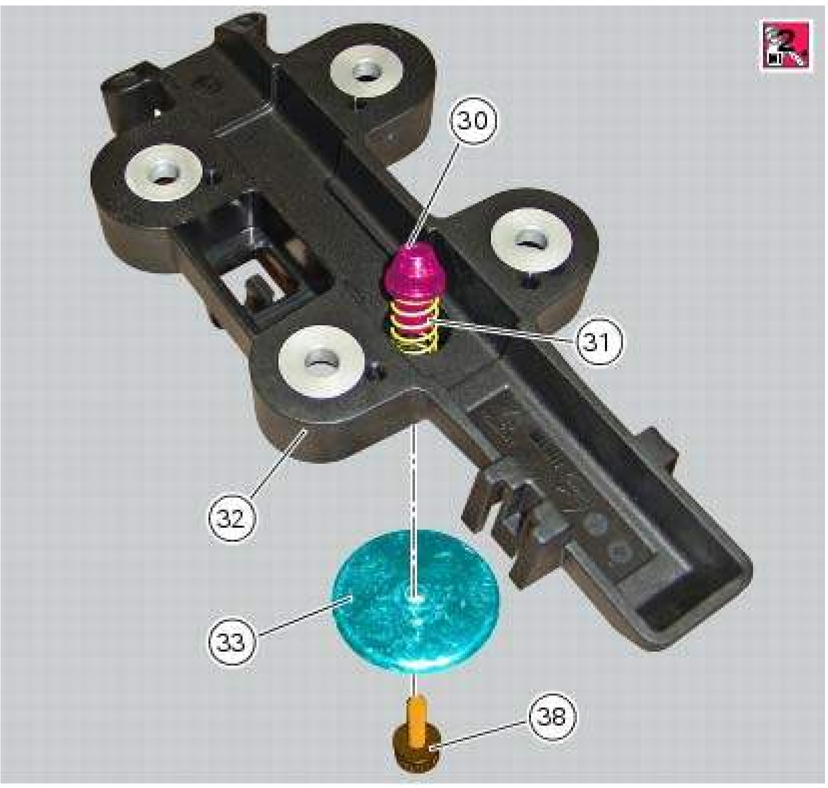
While inserting the component, make sure to push it past the stop tab (Y) without hitting it.



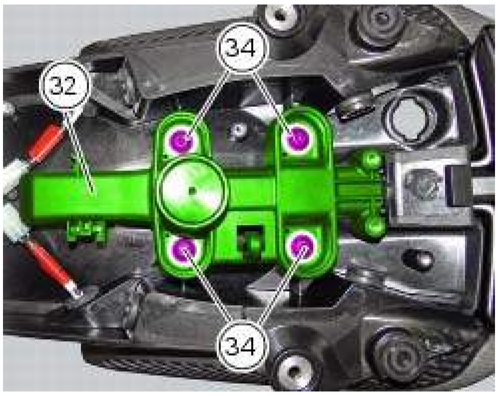
Position the spacers (39) at the threaded inserts of the gloves compartment (23).



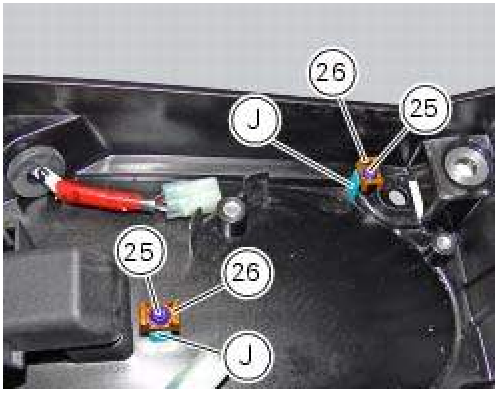
If previously removed, insert pin (30) on spring (31); position the spring (31), together with the pin (30), in the specific seat of the handle (32) guide as indicated.
Insert the screw (38) on knob (33), by orienting the latter as indicated.
Apply prescribed threadlocker on the screw thread (38).
Push down the pin (30) and start the screw (38) on the opposite side.
Tighten the screw (38) to a torque of 5 Nm ± 10% (Sect. 3 -3, Frame torque settings).



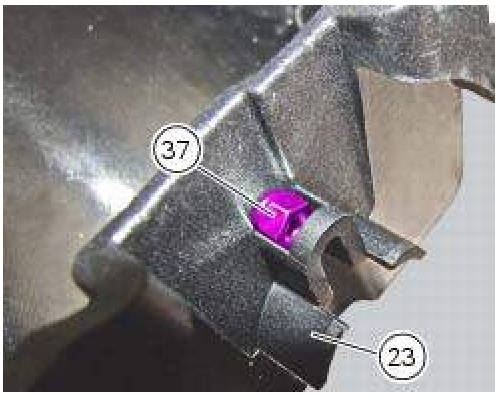
Fit block (32) starting the screws (34) and making sure that the spacers (39) stay in place, centred with the relative threaded inserts.
Tighten the screws (34) to a torque of 20 Nm ± 5% (Sect. 3 - 3, Frame torque settings), following a cross-pattern sequence.

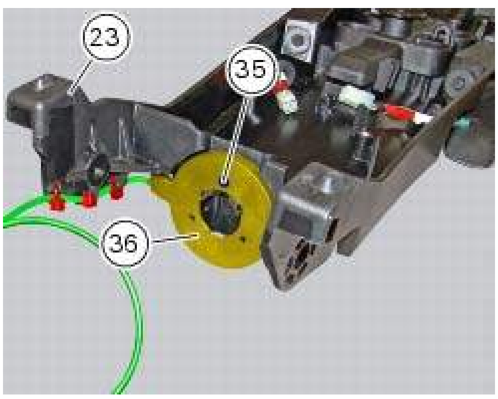


Place the clips (26) on the tabs (J), fix them starting the screws (25) and tighten the screws to the torque of 2 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

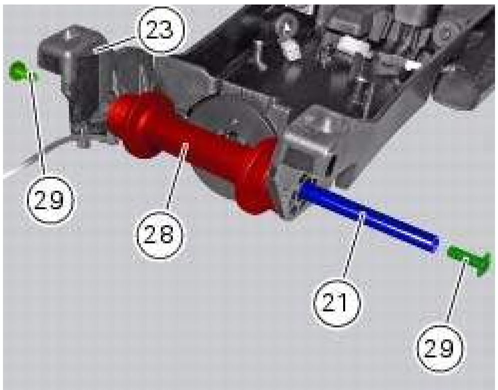


Position the nut (37) in the suitable seat on the compartment (23).
Fit the Immobilizer antenna (36) as shown and tighten the screw (35) on nut (37) to the torque of 2 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Fix the immobilizer antenna wire to the compartment using the three self-locking tie wraps.

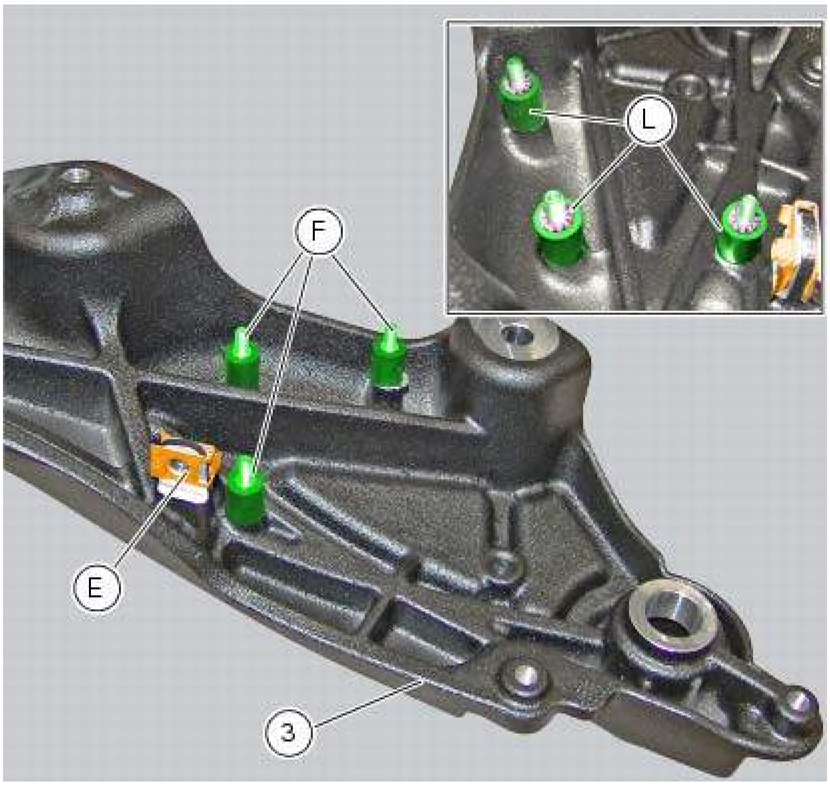




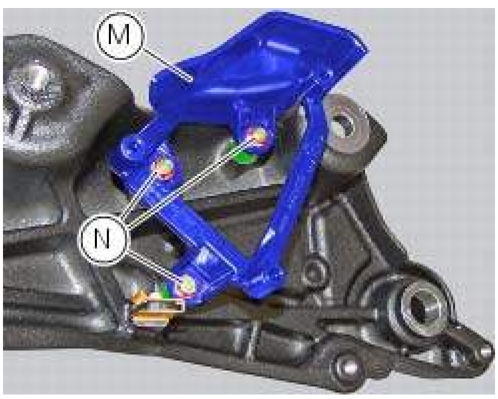
Start the screw (29) on the pin (21).
Place the tank supporting pad (28) in its seat on the gloves compartment (23) and insert the pin until bringing the screw (29) you started before fully home against the compartment (23).
Start the other screw (29) on the free end of the pin (21) and tighten the screw to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings) holding the screw (29) on the opposite side.



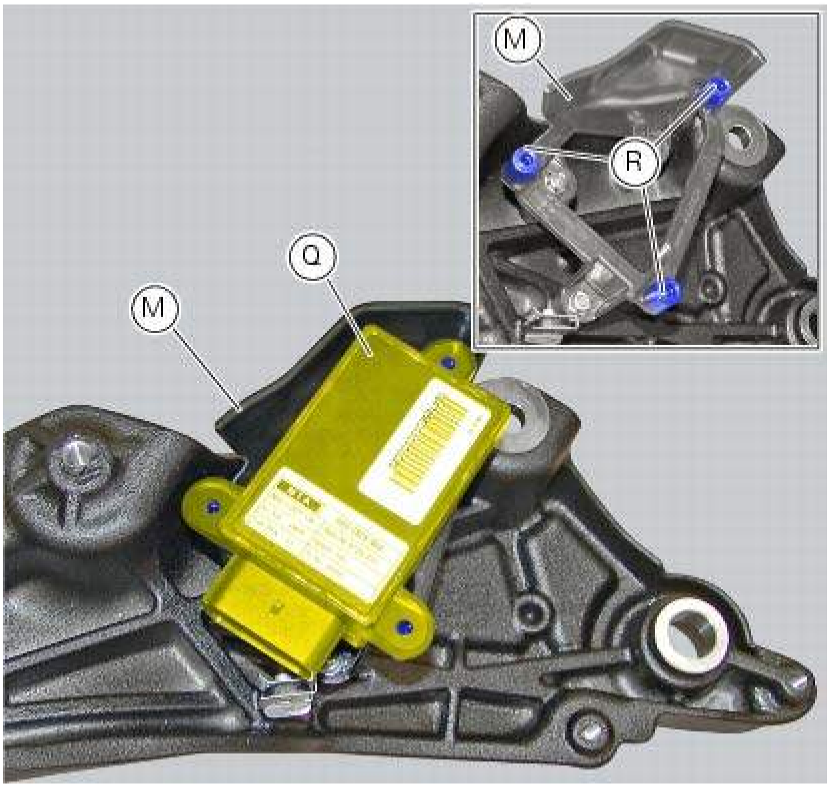
Check the presence of the clip (E) on the left plate of the rear subframe (3).
If the blackbox had been removed from the left plate of the rear subframe (3), on refitting start the silent blocks (F) on the plate (3) and tighten them until fully home. Insert the safety washers (L) on the threaded pins of the silent blocks (F).



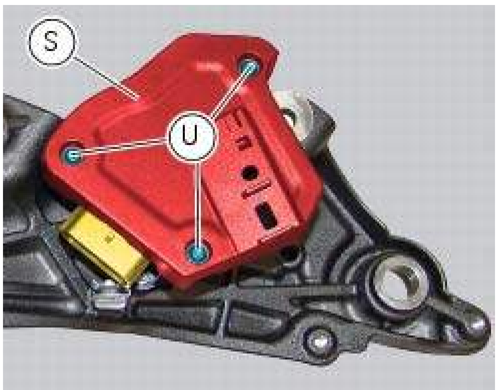
Fit the blackbox supporting bracket (M) starting the nuts (N). Tighten the nuts (N) to a torque of 2 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



Set the blackbox (Q) on the stud bolts (R) of the blackbox supporting bracket (M).

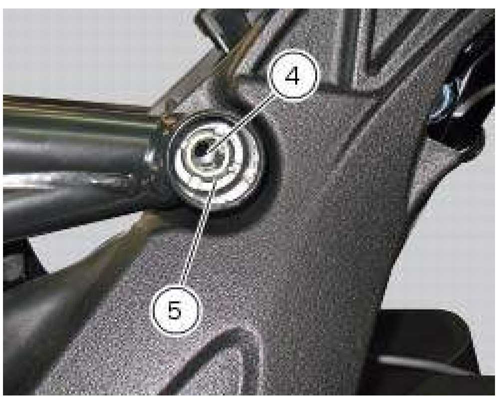


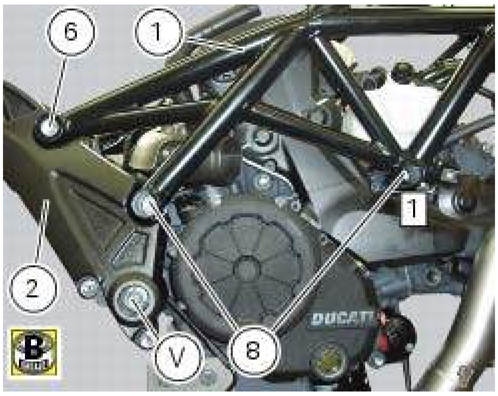
Fit the blackbox cover (S) starting the screws (U) and tighten the screws (U) to the torque of 3 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

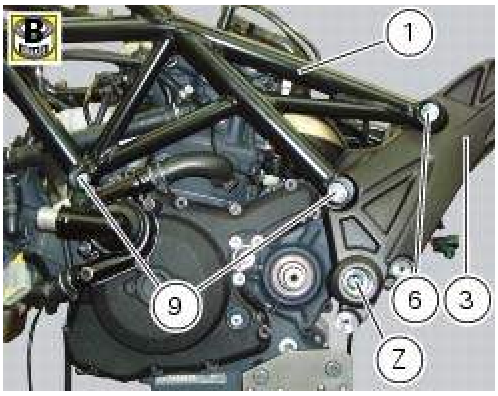


Reassembling the frame and the lateral footrests

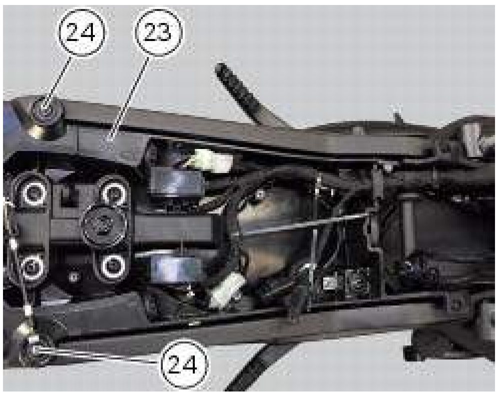
Apply the recommended grease to the thread of the pins (9) and of the nuts (8).
Place the frame (1) and the brackets (2) and (3) on the engine block. Start the pins (9) by holding the nuts (8) and insert without tightening the screws (6) into the adjusters (4).
Position and fix the rear shock absorber support to the engine crankcases and the swingarm brackets (Sect. 7 - 12, Refitting the shock absorber support).
Tighten the screw (V) on the swingarm shaft right side to a torque of 72 Nm ± 5% (Sect. 3 - 3, Frame torque settings), by holding the screw (Z) on the left side.
Tighten the indicated front nut (8) to a torque of 60 Nm ± 5% (Sect. 3 - 3, Frame torque settings), by holding the pin (9) on the left side.



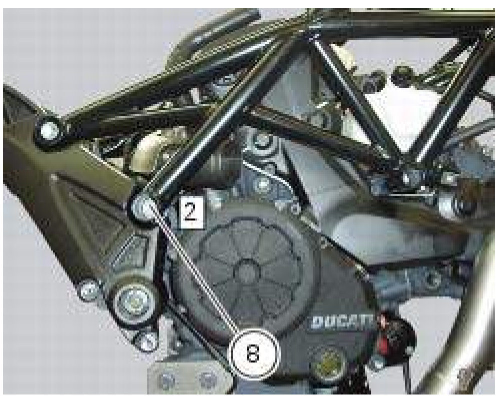


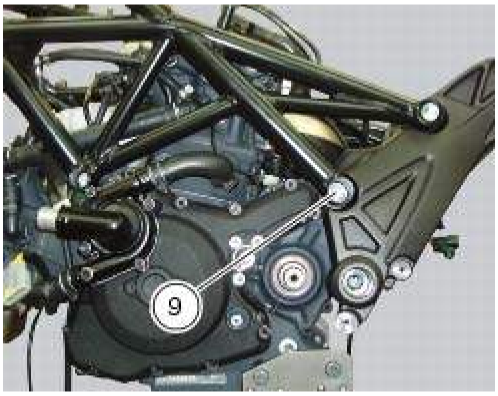


Reassemble the tool tray (23), as described in the following paragraph, by tightening the rear screws (24) to 14 Nm ± 5% (Sect. 3 - 3, Frame torque settings).

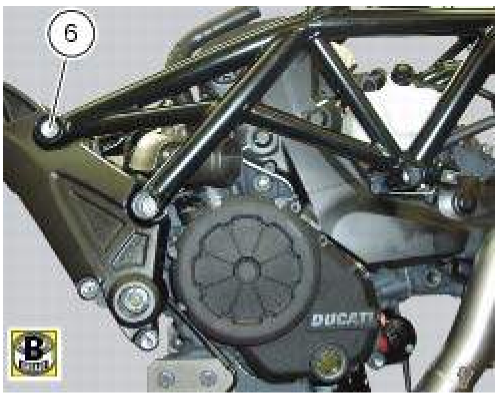


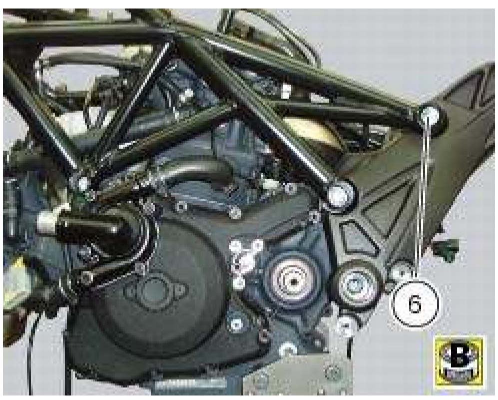
Tighten the indicated rear nut (8) to a torque of 60 Nm ± 5% (Sect. 3 - 3, Frame torque settings), by holding the pin (9) on the left side.



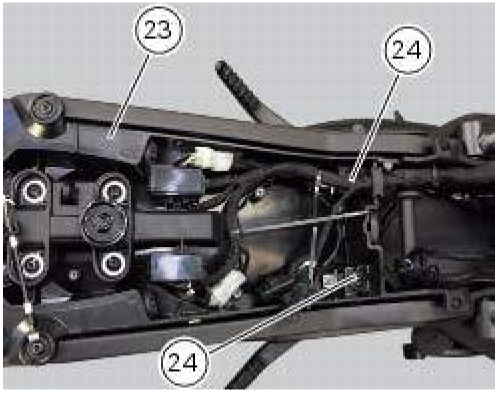


Work first on the left side and then on the right one, remove the special screws (6) and tighten to a torque of 0.5 Nm ± 10% (Sect. 3 - 3, Frame torque settings) the adjusters (4) and make sure they are fully home on the rear plates of the rear subframe.
Locate service tool no. **88713.3166** on the ring nut (5) and fit the torque wrench to the tool.
Hold the clearance adjusters (4) and tighten the ring nuts (5) to a torque of 100 Nm ±5% (Sect. 3 - 3, Frame torque settings).
Lubricate thread and underside of special screws (6), then start them on the frame, and tighten them to a torque of 55 Nm ±5% (Sect. 3 - 3, Frame torque settings).



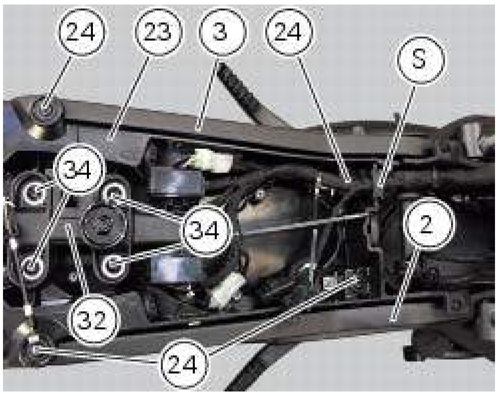


Tighten the front screws (24) to a torque of 14 Nm ± 5% (Sect. 3 - 3, Frame torque settings) that retain the tool tray (23).



Reassembly of the tool tray

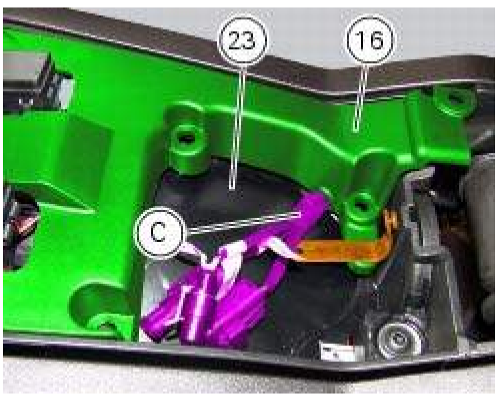
Place the tool tray unit (23) on the lateral brackets (2) and (3) by tightening the screws (24) to 14 Nm ± 5% (Sect. 3-3, Frame torque settings).
If the handle guide (32) has been previously removed, position it on the tray (23) and tighten the screws (34) to 20 Nm ± 5% (Sect. 3-3, Frame torque settings).
Reposition the wiring branch in the seat (S) in the tray (23).

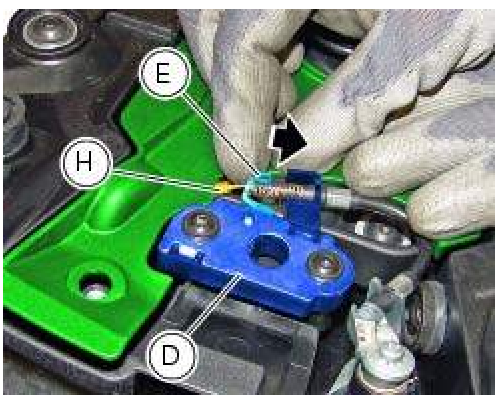


Place the gloves compartment cover (16) on gloves compartment (23), inserting wiring (C) into the suitable recess in the cover (16).

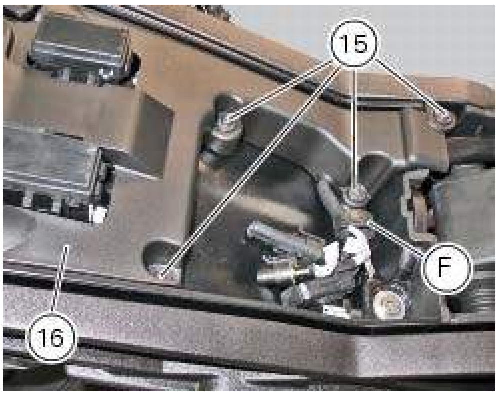
Warning

While positioning the cover (16) on the compartment (23), push bracket (E) of the lock latch (D) in the direction shown by the arrow, to prevent the lock wire terminal (H) from being squeezed under the cover.

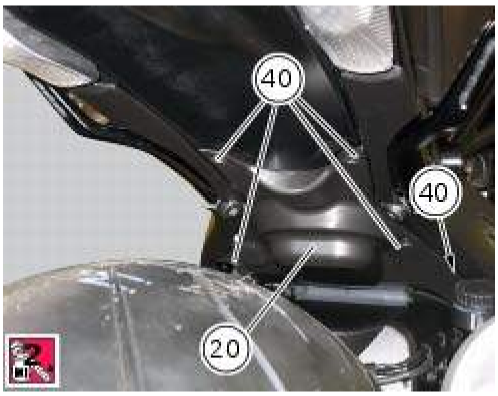




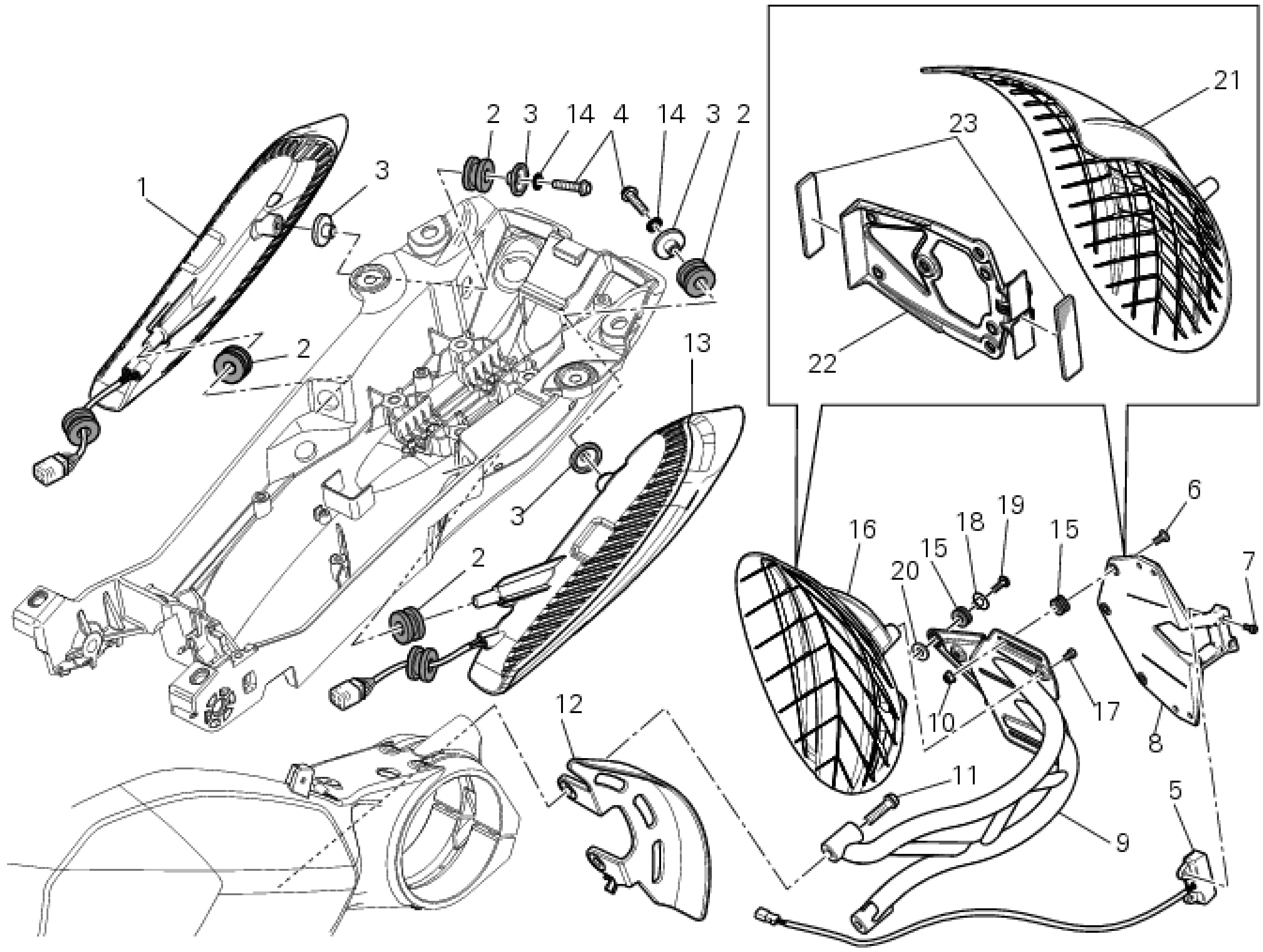
Check the presence of the clip (F) on the cover (16).
Fix the cover (16) by tightening the screws (15) to a torque of 4 Nm ± 10% (Sect. 3 -3, Frame torque settings).



Apply the recommended threadlocker to the screws (40).
Reposition the splashguard (20) and tighten the screws (40) to a torque of 4 Nm ± 10% (Sect. 3 -3, Frame torque settings).



18 Tail light - number plate holder



1 RH tail light
2 Vibration damper mount
3 Spacer
4 Screw
5 Number plate light
6 Screw
7 Screw
8 Plate
9 Number Plate Holder
10 Nut
11 Screw
12 Rear chain guard
13 LH tail light
14 Spring washer
15 Vibration damper mount
16 splashguard
17 Screw
18 Spacer
19 Screw
20 Washer
21 Splashguard (Europe - Australia)
22 Plate (Europe - Australia)
23 Reflector (Europe - Australia)

Spare parts catalogue

Diavel ABS	NUMBER PLATE HOLDER - TAIL LIGHT
Diavel Carbon ABS	NUMBER PLATE HOLDER - TAIL LIGHT

Important

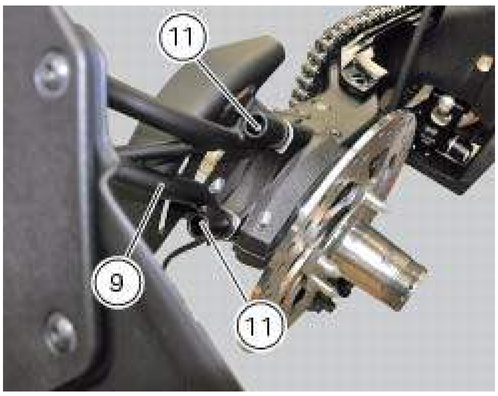
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

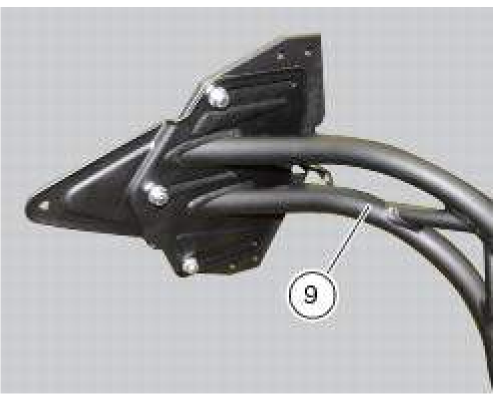
Removal of the licence plate holder

Operations	Section reference
Remove the rear wheel	7 - 2, Removing of the rear wheel

Disconnect connector (5) of the number plate holder wiring from the main one.
Release the number plate holder light cable from the ties and the cable grommets as indicated in Sect- 7 - 6, Flexible wiring/hoses positioning, since the cable is together with the rear ABS sensor cable.

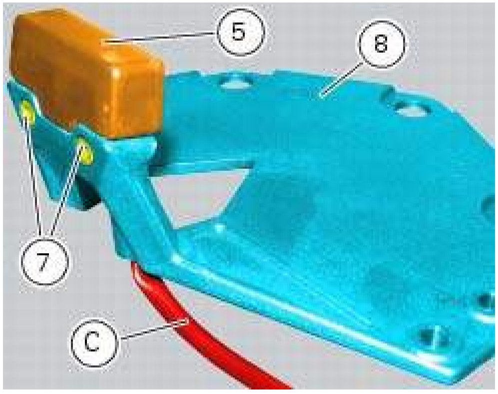
Undo the screws (11) and remove the number plate holder assembly (9) from the swingarm.

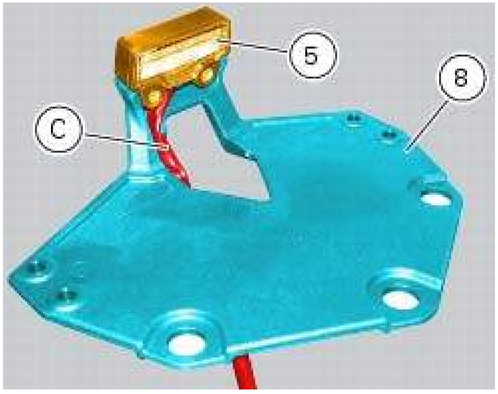




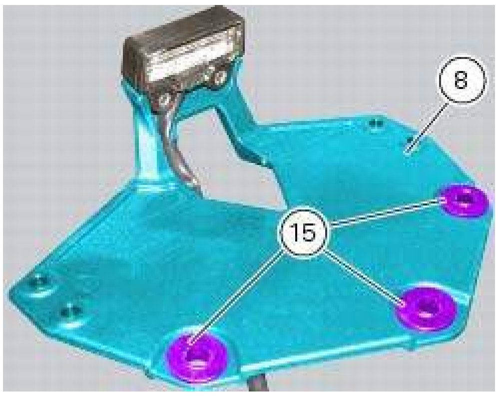
Refitting the number plate holder

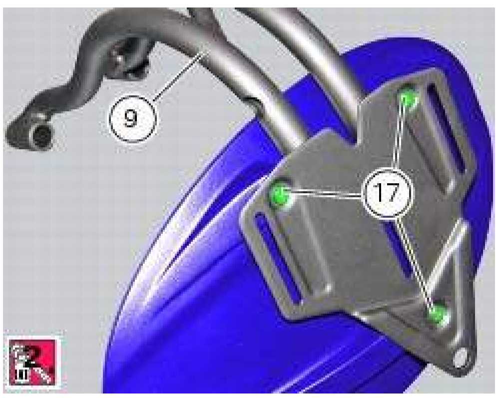
Place the number plate light (5), as indicated, on the number plate holder plate (8) and tighten the screws (7) to a torque of 2 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Thread the number plate light wiring (C) into the opening in the number plate holder plate as shown.



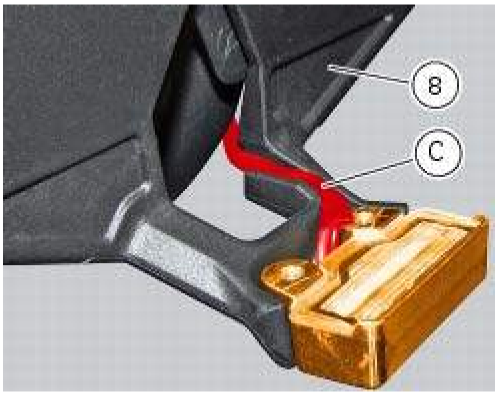


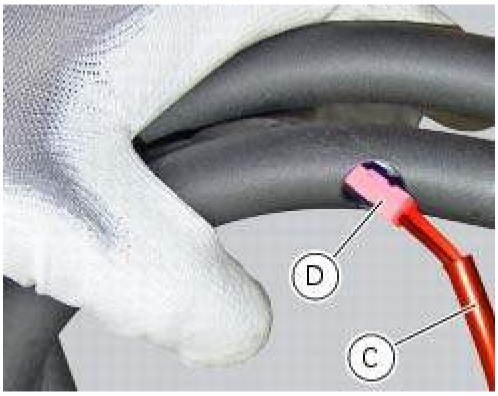
Fit the vibration dampers (15) in the corresponding holes of the number plate holder plate (8). Position the splashguard (16) on the number plate support subframe (9).
Apply prescribed threadlocker on the screw threads (17).
Fix the splashguard (16) by tightening the screws (17) to a torque of 5 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

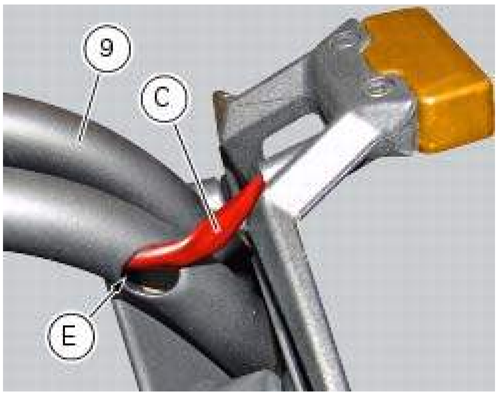




Position the number plate light wiring (C) into the seat in the number plate holder plate (8) as shown.
Insert the connector (D) of the number plate light wiring (C) into the hole (E) in the number plate support subframe (9), threading it out of the hole on the opposite side.





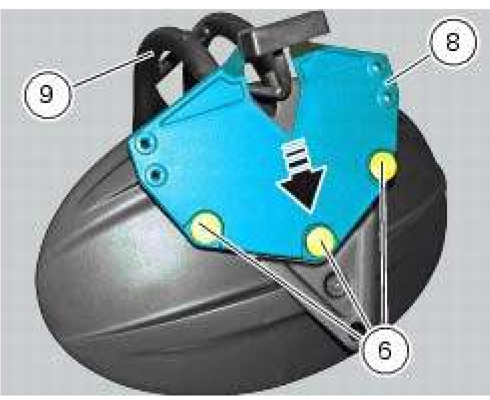


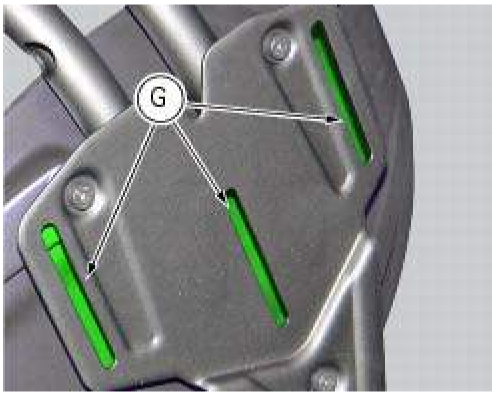
Fit the number plate holder plate (8) to the number plate support subframe (9), fitting the special screws (6) into the vibration dampers and starting the nuts (10) on the opposite side.

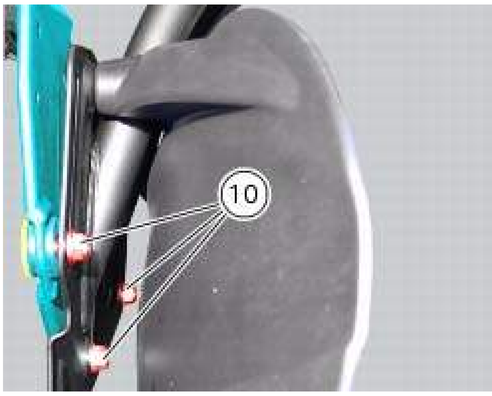
Note

Slide the plate (8) along the slots (G) in the subframe (9) until bringing it all the way towards the bottom side.

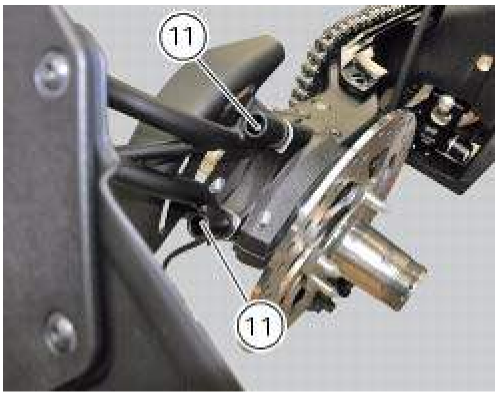
Tighten the special screws (6) to a torque of 5 Nm ± 10% (Sect. 3 - 3, Frame torque settings), by holding the nuts (10) on the opposite side.







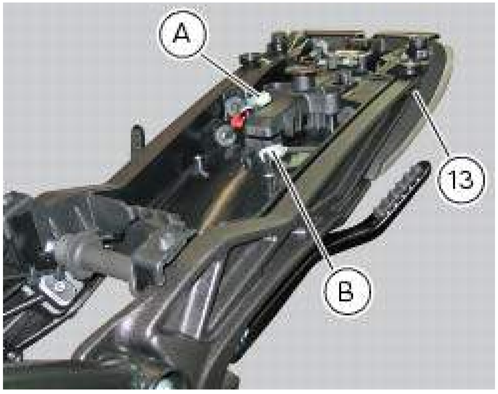
Reposition the assembly on the swingarm and tighten the screws (11) to a torque of 25 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

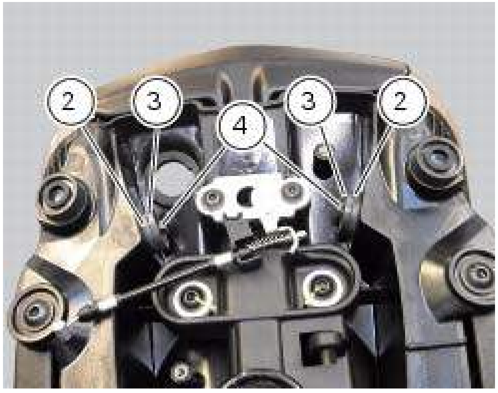


Removal of the tail light

Operations	Section reference
Remove the saddles	5 - 3, Removal of the seat
Remove the cover of the tool tray	7 - 17, Removal of the tool tray

Disconnect the connectors (A) and (B) of the tail lights (1) and (13).
Loosen the screws (4) and slide the tail lights (1) and (13) to the rear side; recover the four spacers (3) and the washers (**14**).



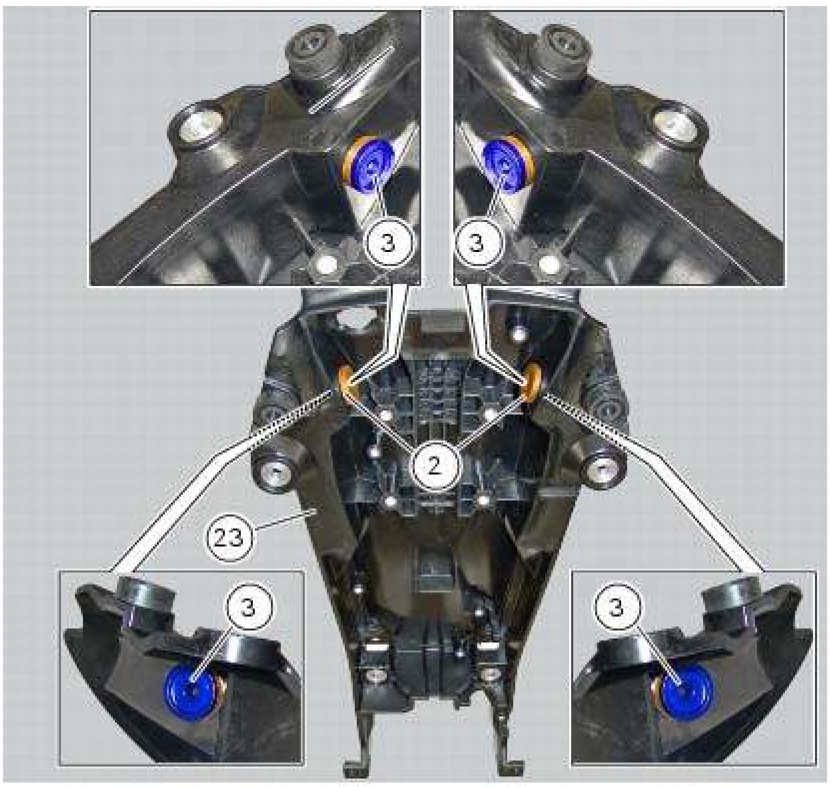


Refitting the tail light

Fit the spacers with collar (3) into the rear vibration dampers (2) located on the gloves compartment (23).

Note

Two spacers (3) must be inserted inside and outside on the right side and two spacers (3) must be inserted inside and outside on the left side.

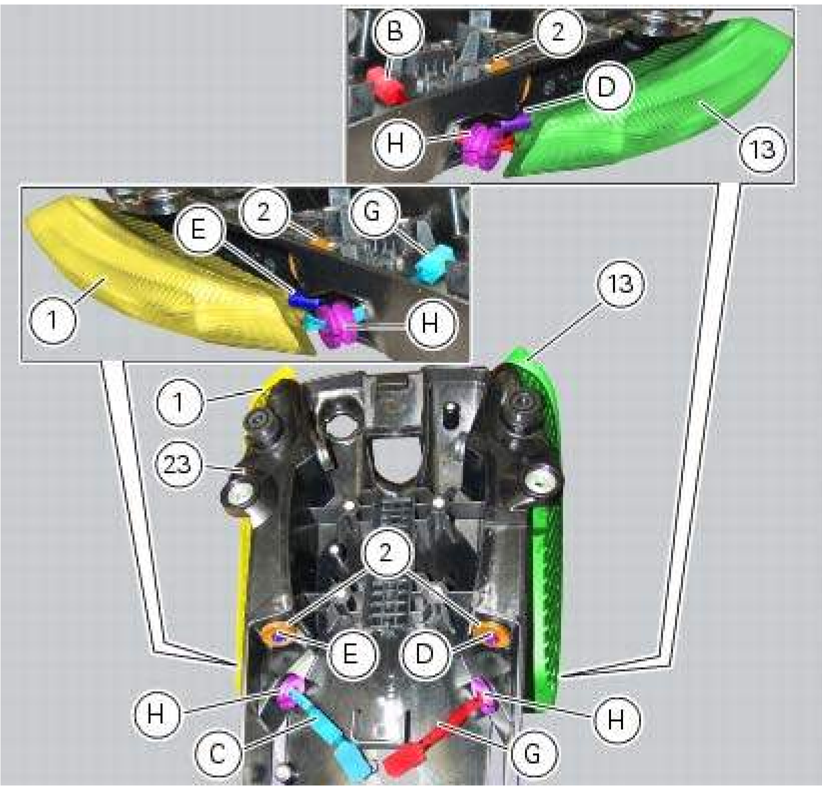


Insert the split vibration damper (H) on the wiring (G) of the left optical unit (13) and the split vibration damper (H) on the wiring (C) of the right optical unit (1).

Note

The USA version uses red optical units (13) and (1).

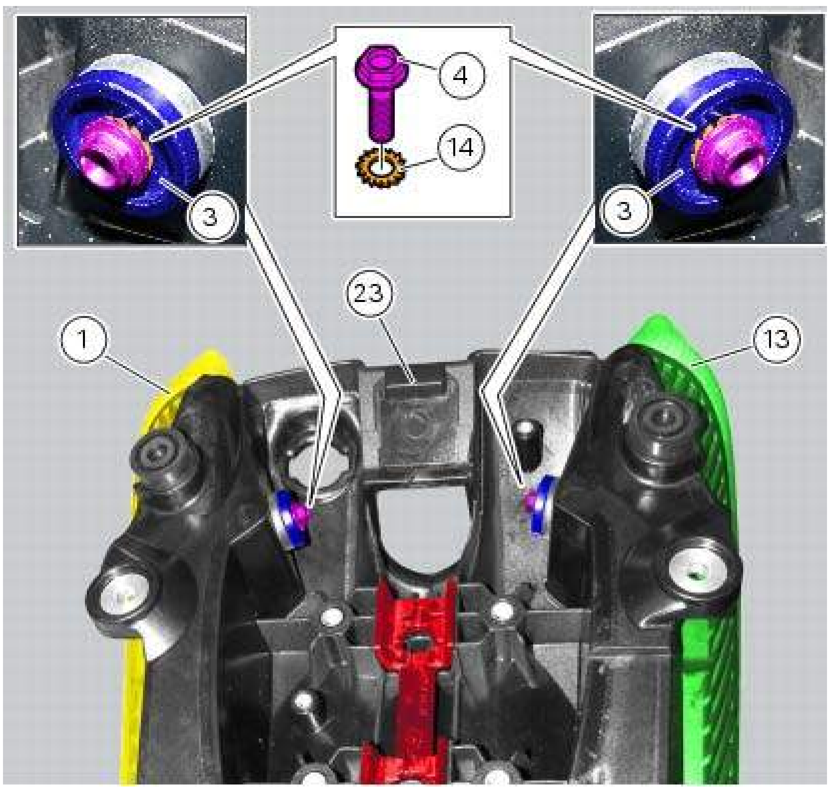
Fit the left optical unit (13) and the right optical unit (1) on the compartment (23), inserting their pins (D) and (E) into the vibration dampers (2).
Fit the split vibration dampers (H) into the corresponding holes of the compartment (23).



Fit the washers (14) on the screws (4).
Fix the optical units (13) and (1) to the compartment (23) starting the screws (14).

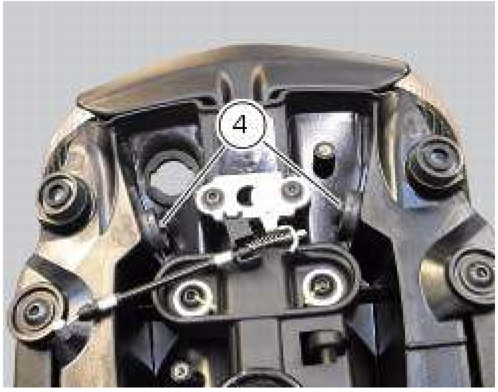
Note

The screws (14) must be inserted into the internal spacers (3) fitted previously.



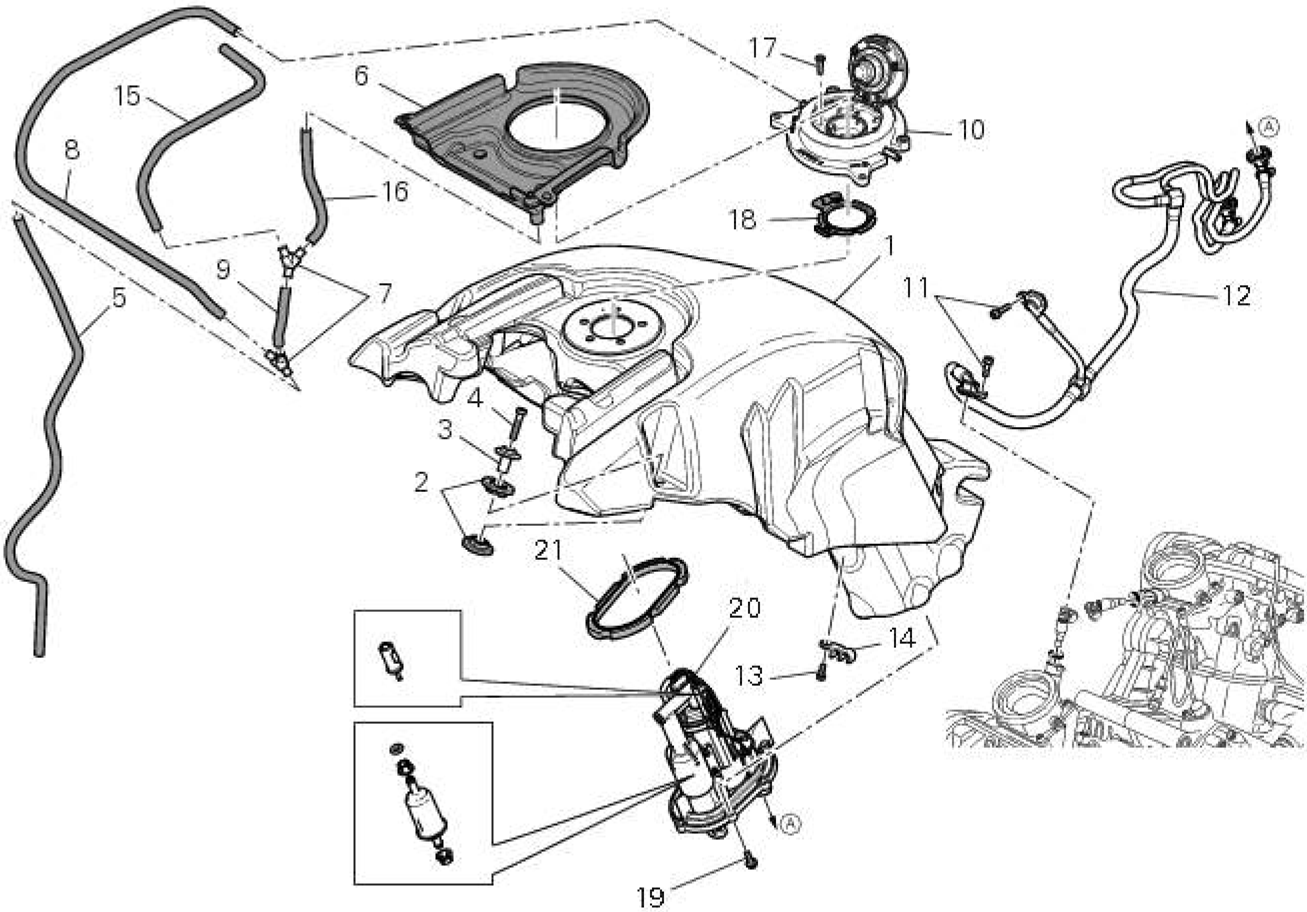
Tighten the screws (4) to a torque of 6 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

Tail light - number plate holder



08 - Impianto elettrico

2 -Fuel tank



1 Fuel tank
2 Rubber pad
3 Spacer
4 Screw
5 Hose
6 Tray
7 Y-fitting
8 Hose
9 Hose
10 Filler cap
11 Screw
12 Complete hose guide
13 Screw
14 Hose clip
15 Hose
16 Screw
17 Screw
18 Sealing washer
19 Screw
20 Flange
21 Sealing washer

Spare parts catalogue

Diavel ABS	FUEL TANK
Diavel ABS	FUEL SYSTEM
Diavel Carbon ABS	FUEL TANK
Diavel Carbon ABS	FUEL SYSTEM

Important

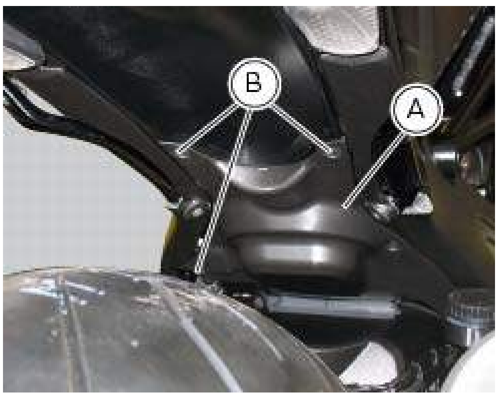
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

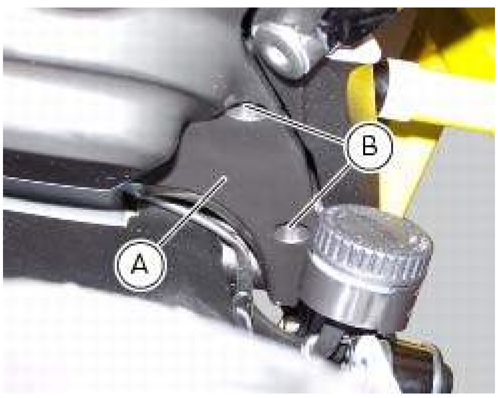
Removal of the fuel tank

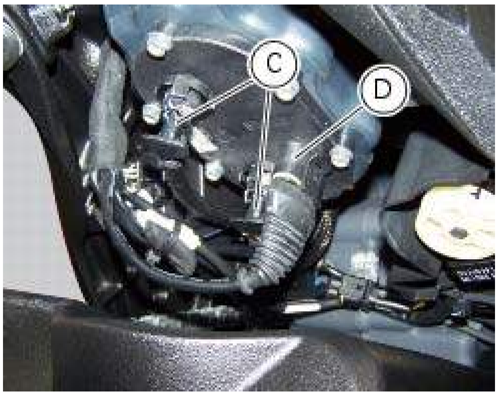
Operations	Section reference
Remove the seat	5 - 3, Removal of the seat
Remove the tank covers	5 - 2, Removal of the fuel tank fairings

On the USA version remove the Canister filter as indicated in Sect. 8 - 10, "Removal of the evaporative emissions canister".
Loosen and remove the front retaining screw (4)

Remove the flange cover (A) by loosening the screws (B), disconnect the quick-release fittings (C) from the flange, and connector (D) of the fuel level sensor from the main wiring.





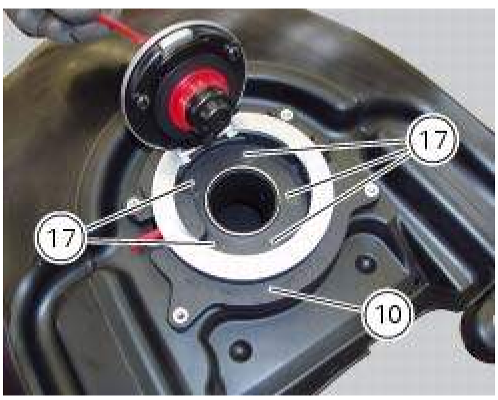


On both sides of the tank plug, paying attention not to damage them, slide out the two breather pipes (8) and (15).
Remove the tank (1).

Removal of the fuel tank filler cap

Remove tank covers (Sect. 5 - 2, Removal of the fuel tank fairings).
Remove hoses (8) and (15) from the filler cap assembly (10).
Open the filler cap.

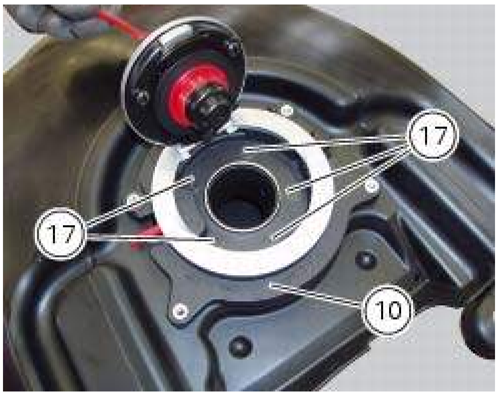
Unscrew the outer screws (17) securing the ring nut to the filler cap recess.
Remove the filler cap assembly (10).



Refitting the filler cap

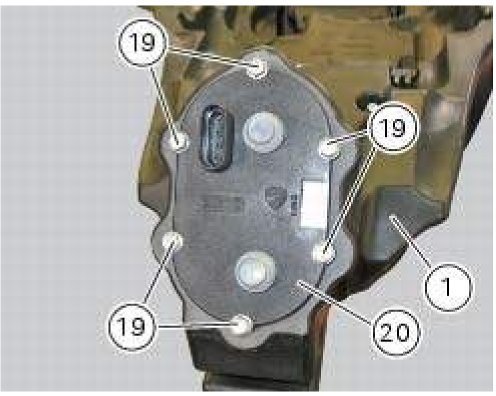
Position seal (18) in tank cap (10) as shown and reassemble following the removal procedure in the reverse sequence.

In particular tighten the screws (17) to a torque of 3 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



Replacing the tank flange and fuel sensor.

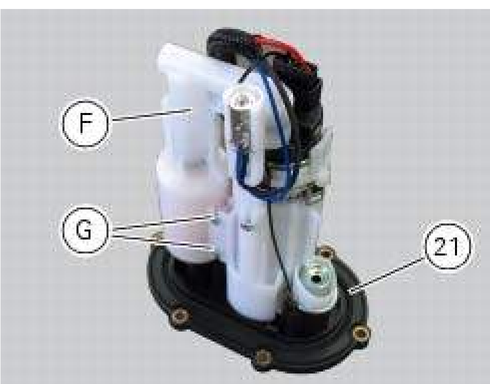
Loosen the screws (19) securing the fuel tank flange (20).
Remove the flange (20) from the tank (20).



Recover the seal (21).
Undo and remove the two fixing screws (G) and move the protection (F).
Before reassembly, carefully remove any deposits or scale from all parts.

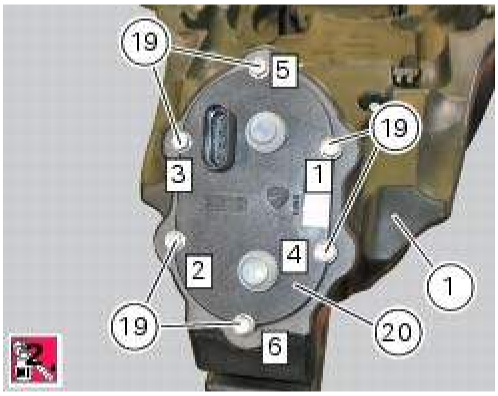
Note

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.



Refitting the fuel tank flange

Insert the flange (20) in its housing in the fuel tank.
Apply prescribed threadlocker to the screws (9) and tighten to a torque of 6 Nm ± 10% (Sect. 3 - 3, Frame torque settings), following the indicated order.

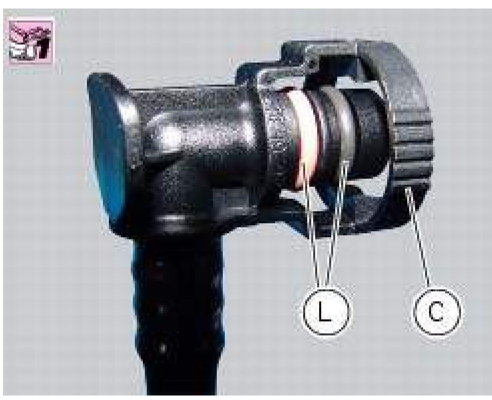


Refitting the fuel tank

If the fuel tank has been disassembled into its component parts, reposition all the parts as shown in the exploded view.
In particular:
tighten the screws (13) to a torque of 5 Nm ±10% (Sect. 3 - 3, Frame torque settings).

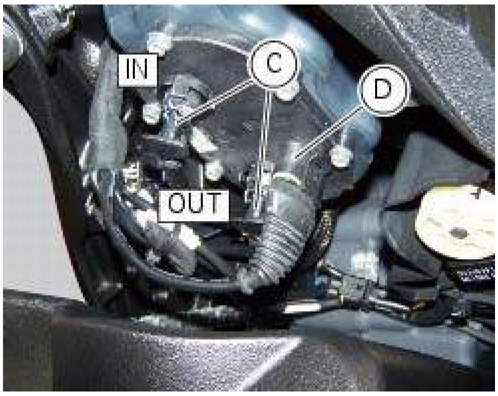
Refit the tank by inserting its rear side into the pin on the frame, as shown in the figure.

Smear the O-rings (L) installed on fuel hose couplings (C) with rubber lubricant.

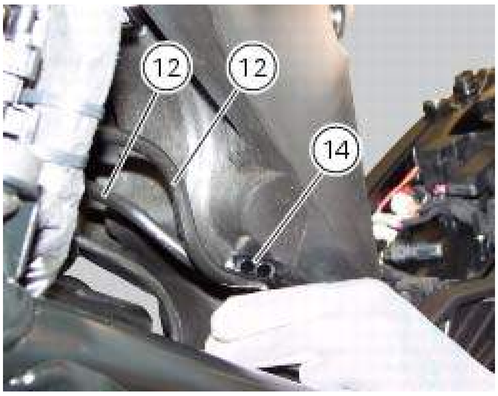


Connect the two quick-release fittings (C) of the fuel pipes following the removal order, paying attention to insert the

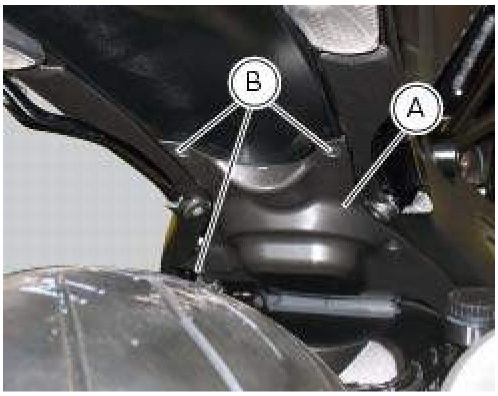
delivery on the filler marked with OUT and the return on the filler marked with IN.
Connect connector (D) of the fuel level sensor to the main wiring.

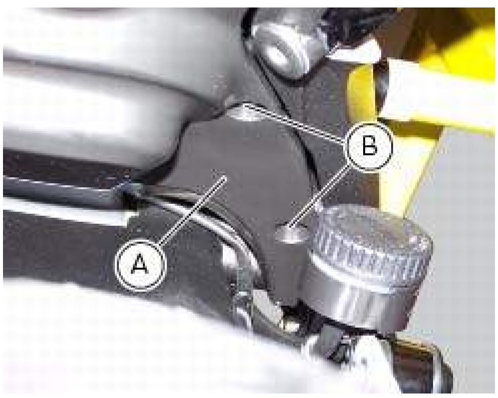


Attach the fuel hoses (12) to the hose clips (14).



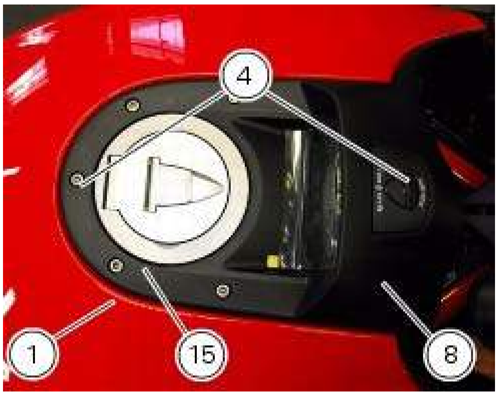
Refit the flange cover (A) by tightening the screws (B) to a torque of 4 Nm ± 10% (Sect. 3 - 3, Frame torque settings).





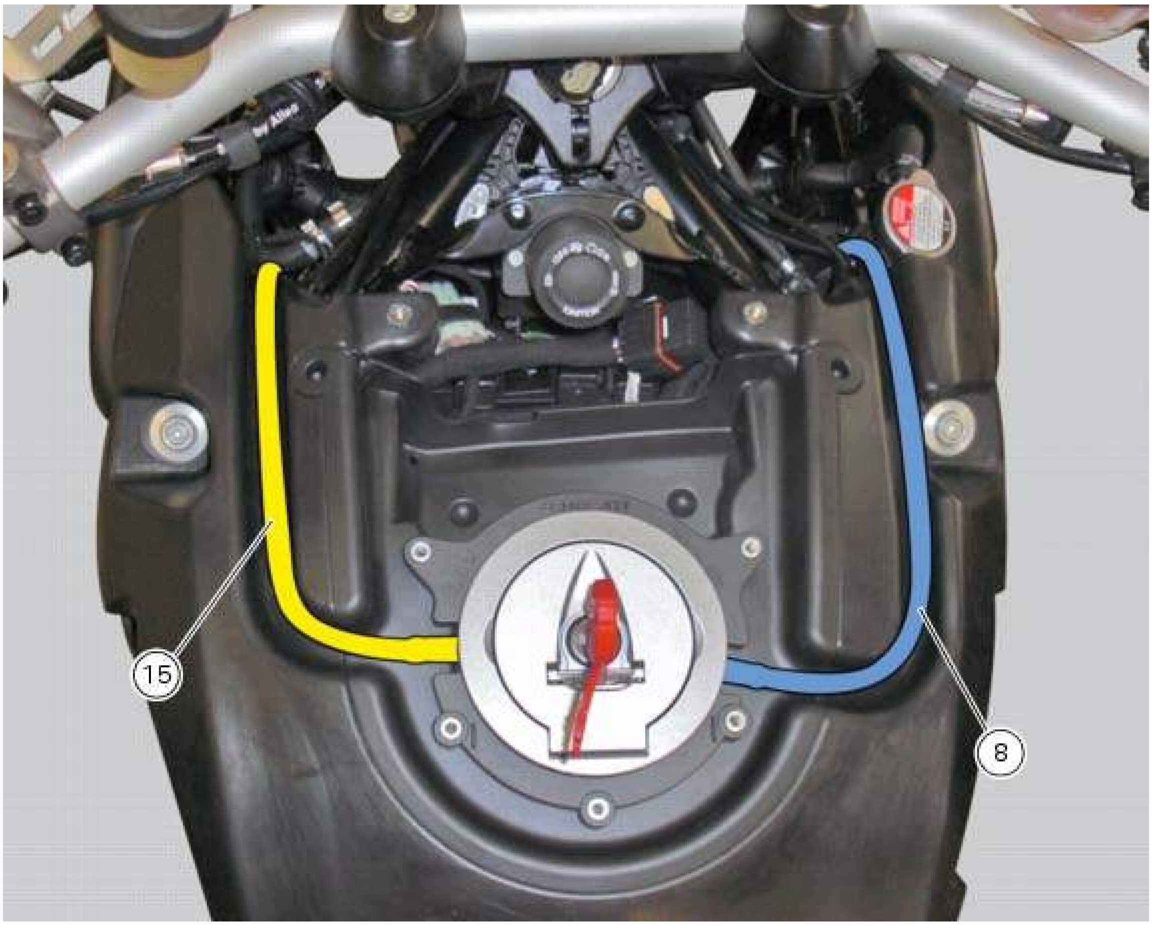
Position, without tightening, the front retaining screw (4).
On both sides of the tank plug, place the two breather pipes (8) and (15) and insert them on the plug.
Check correct position of the tank (1) and tighten the two front retaining screws (4) to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

Fuel tank

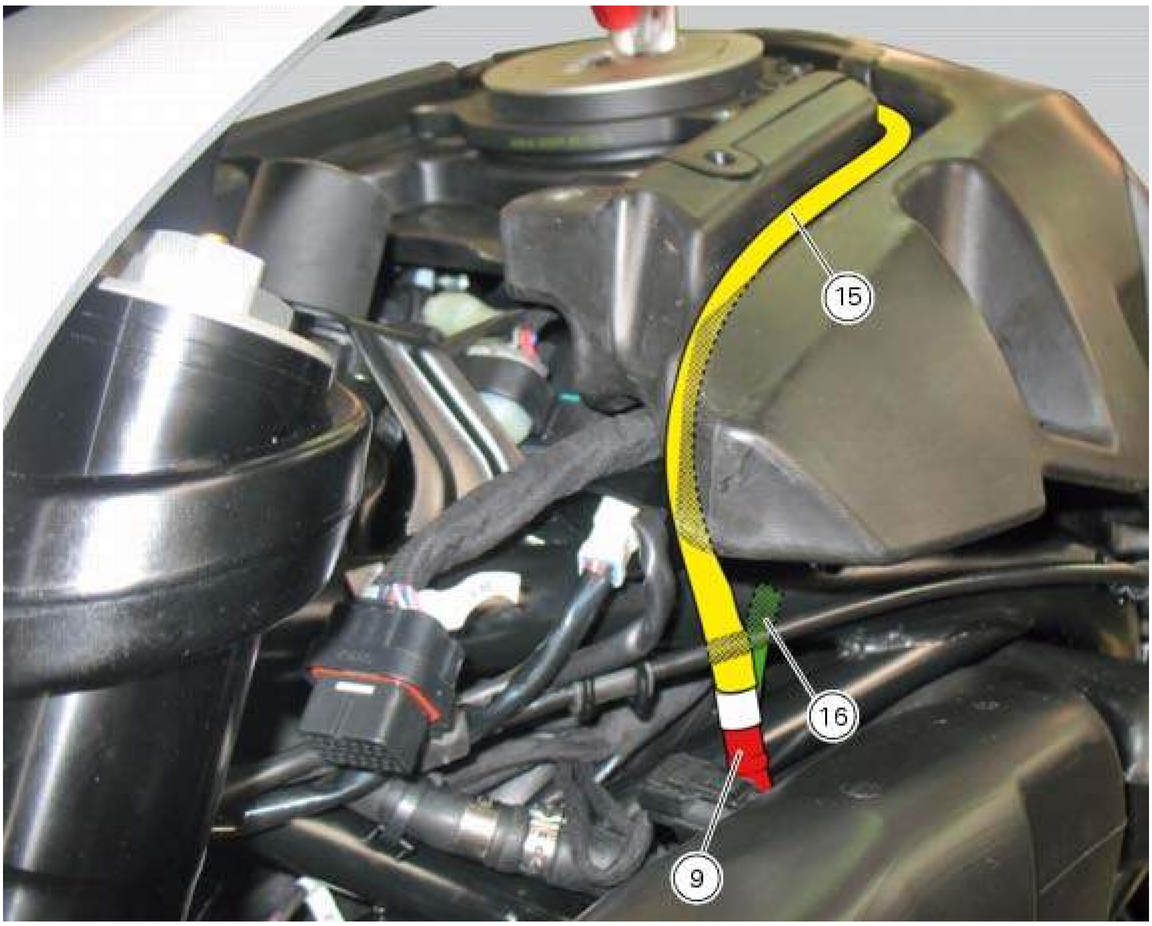


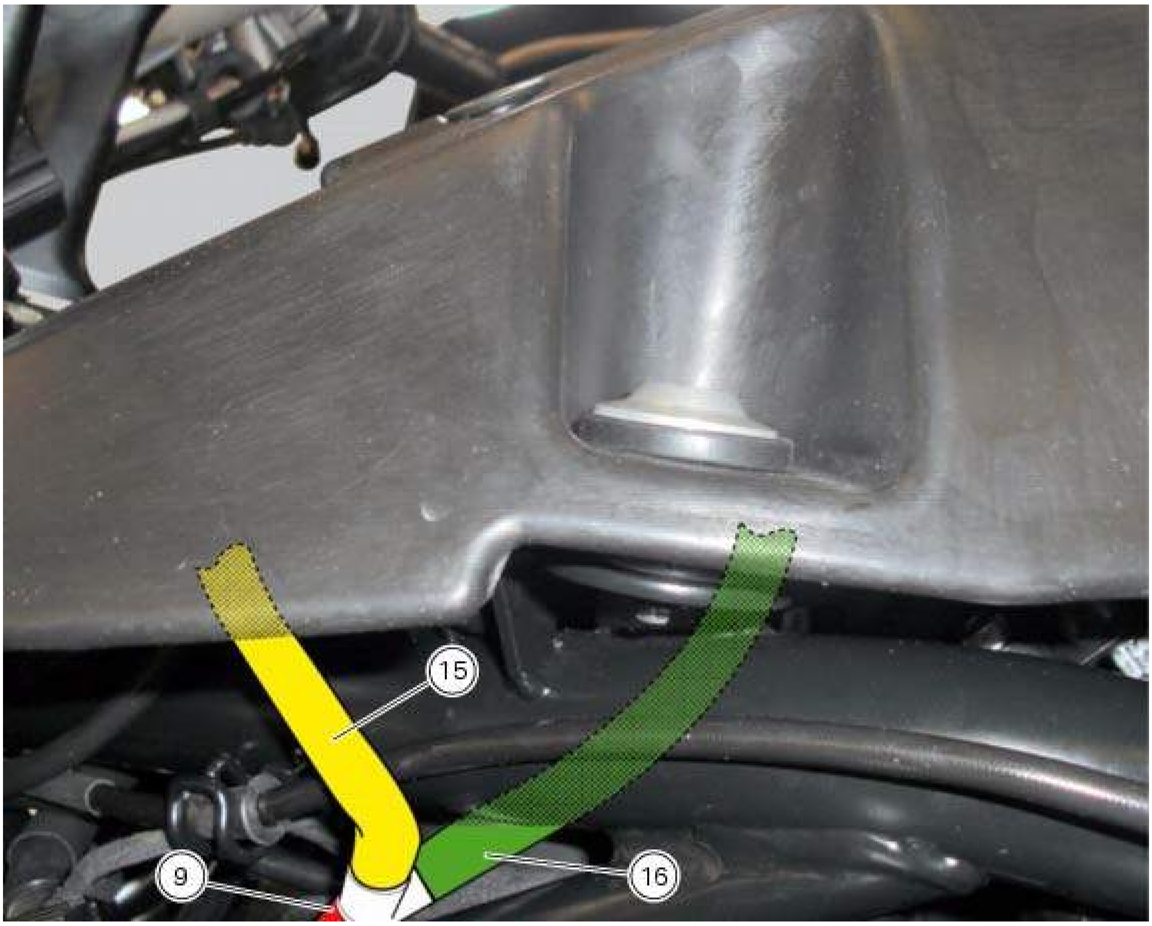
Operations	Section reference
Refit the fuel tank covers	5 - 2, Refitting the fuel tank fairings
Refit the seat	5 - 3, Refitting the seat

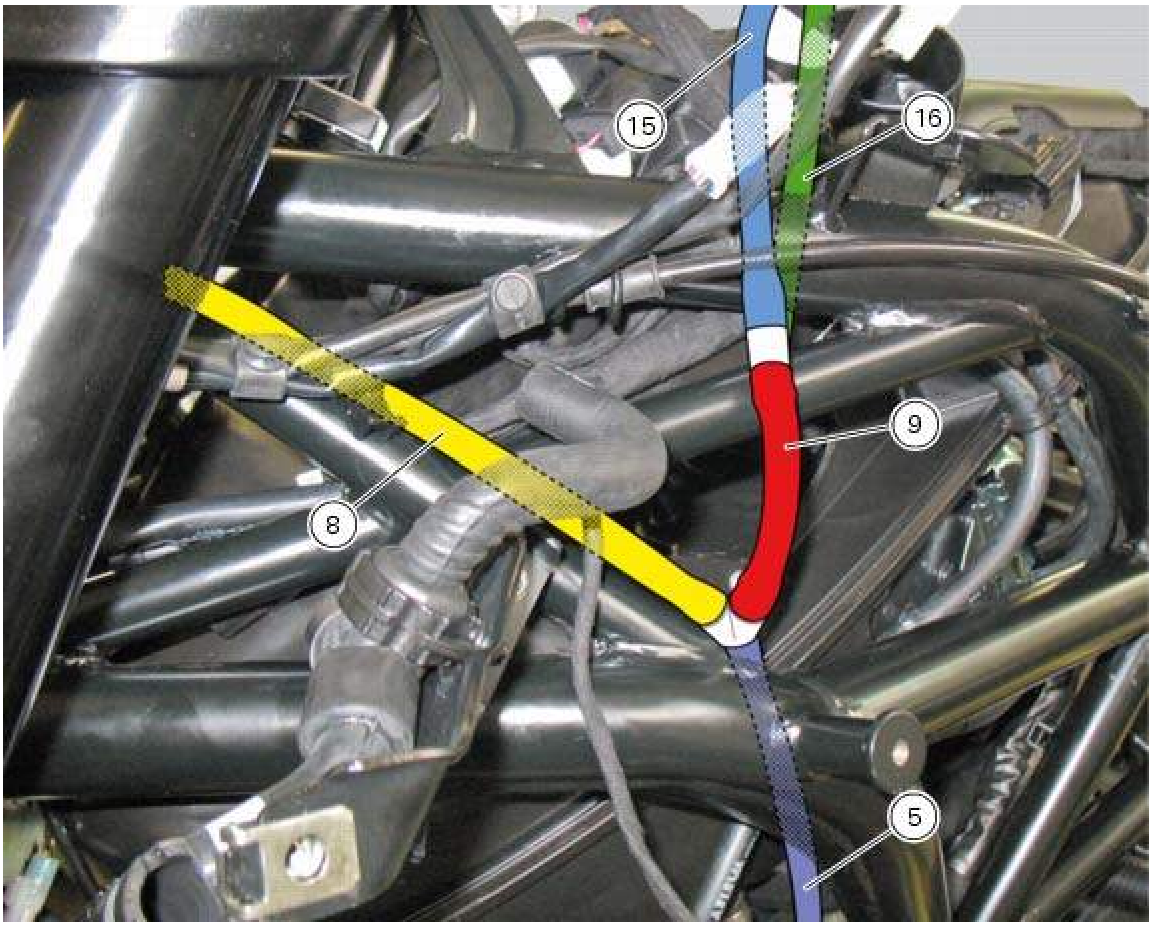
Positioning of the fuel tank breather and drain hoses

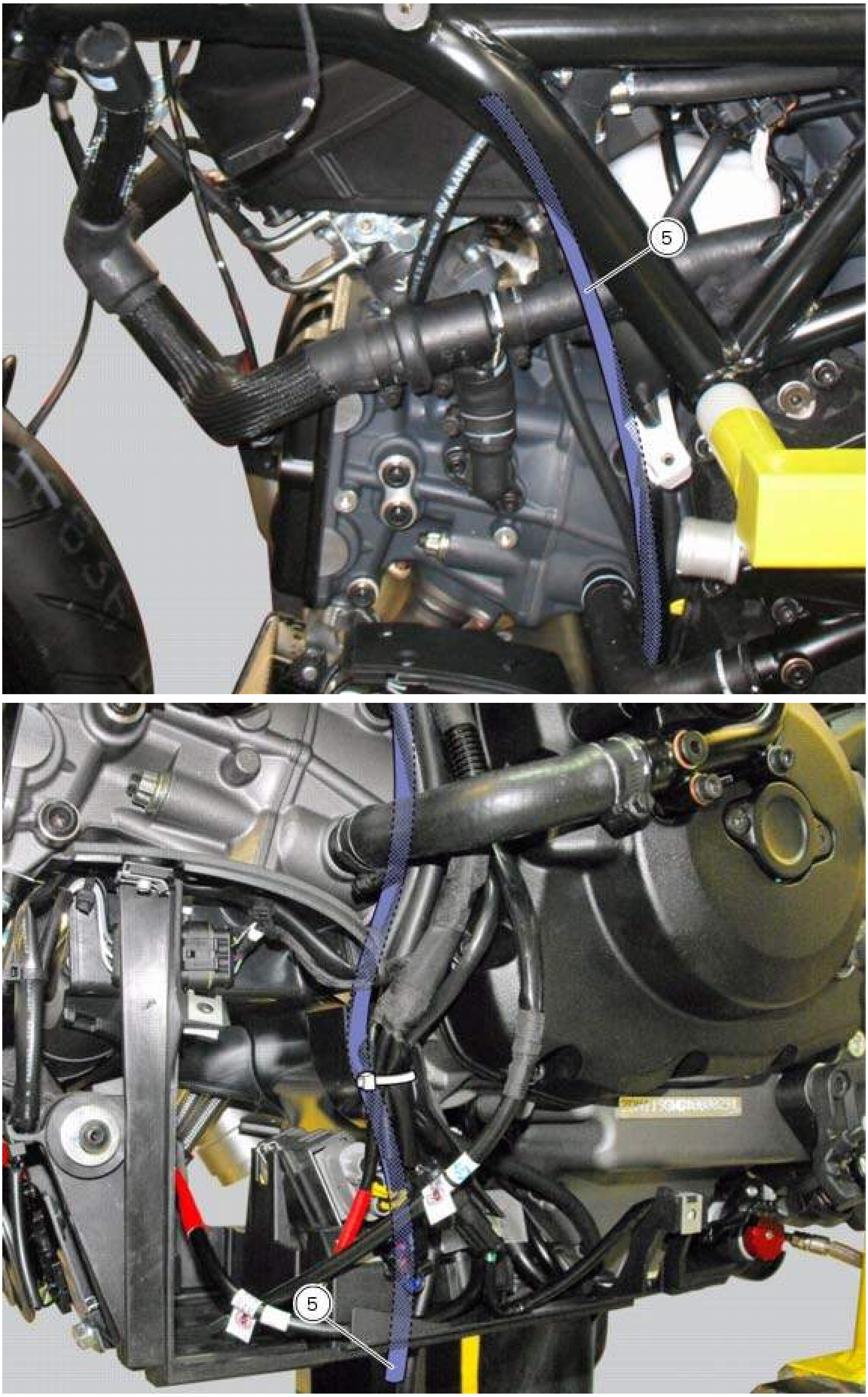



8

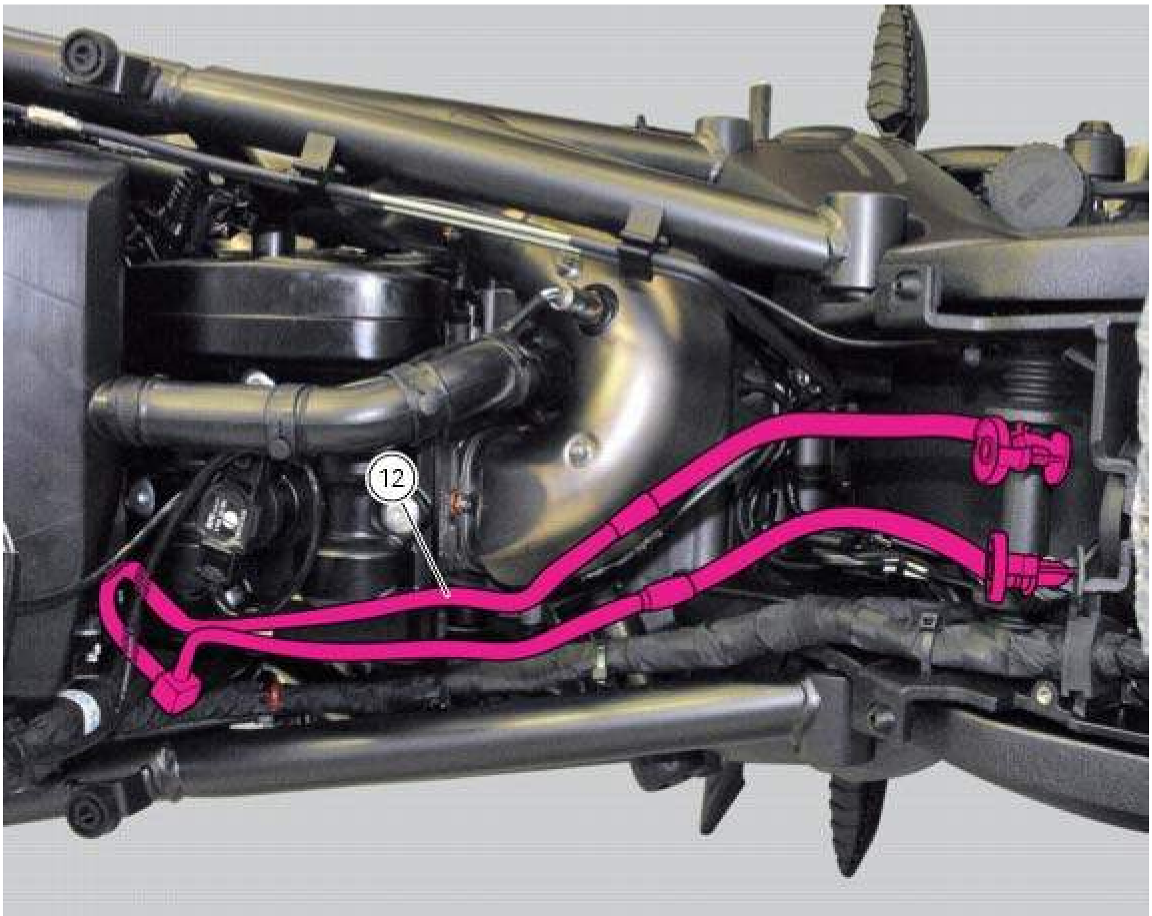

15
16
9

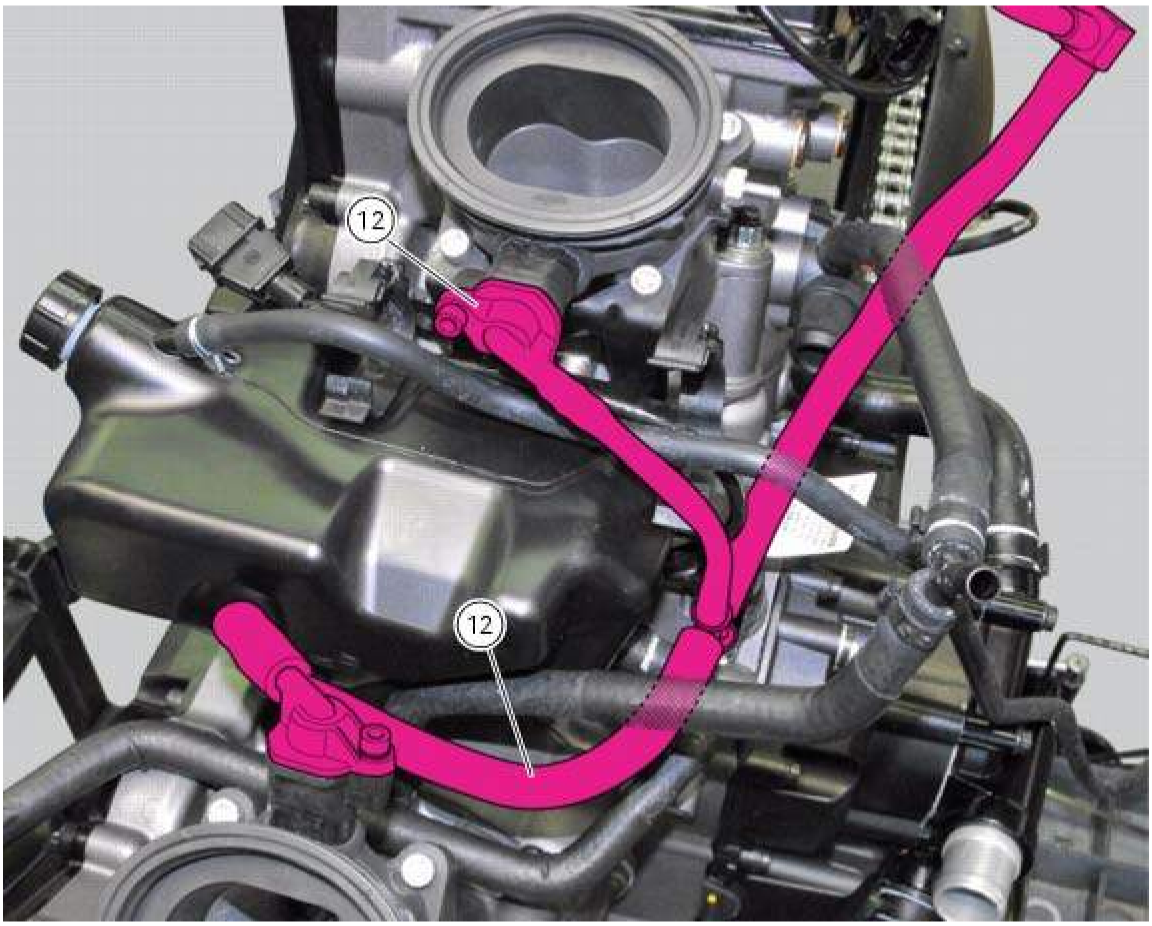

15
9
16


15
16
9
8
5

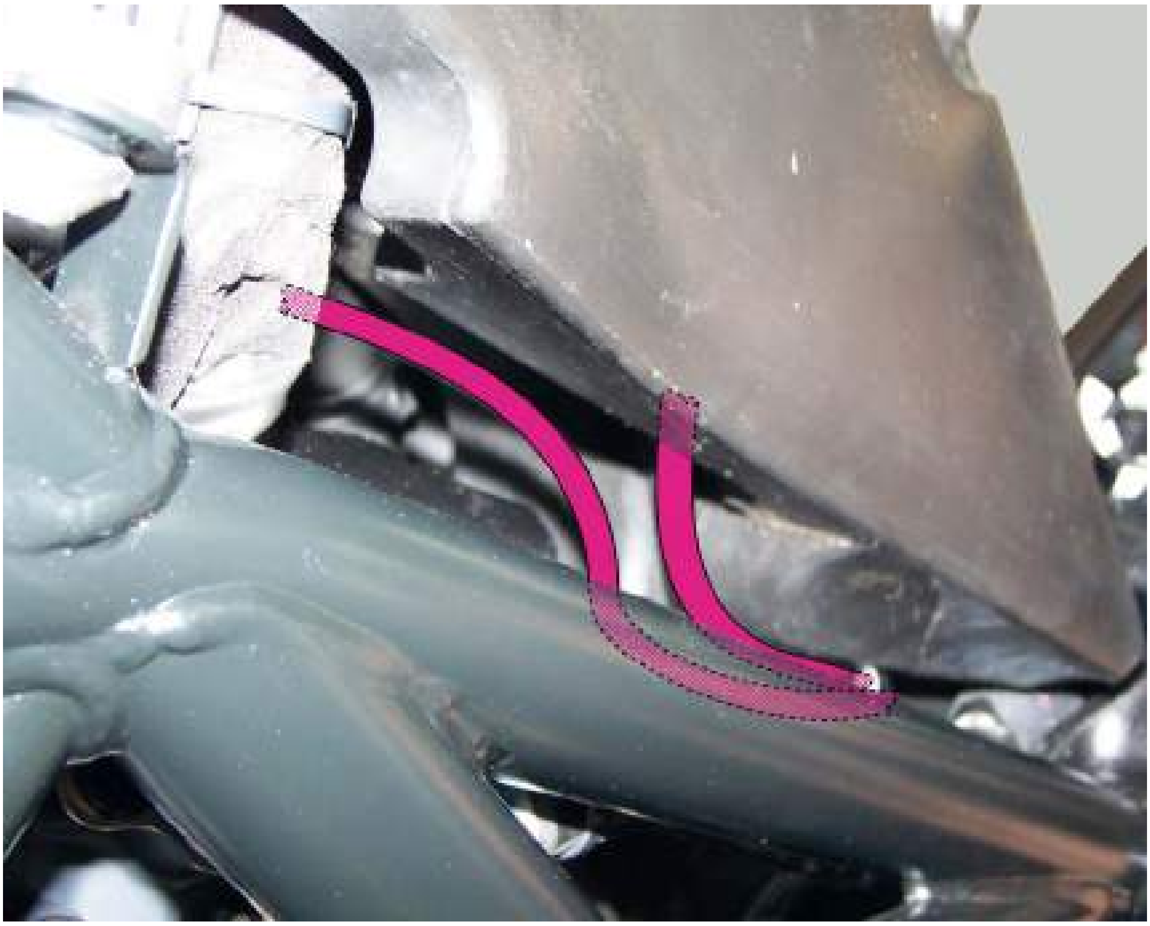


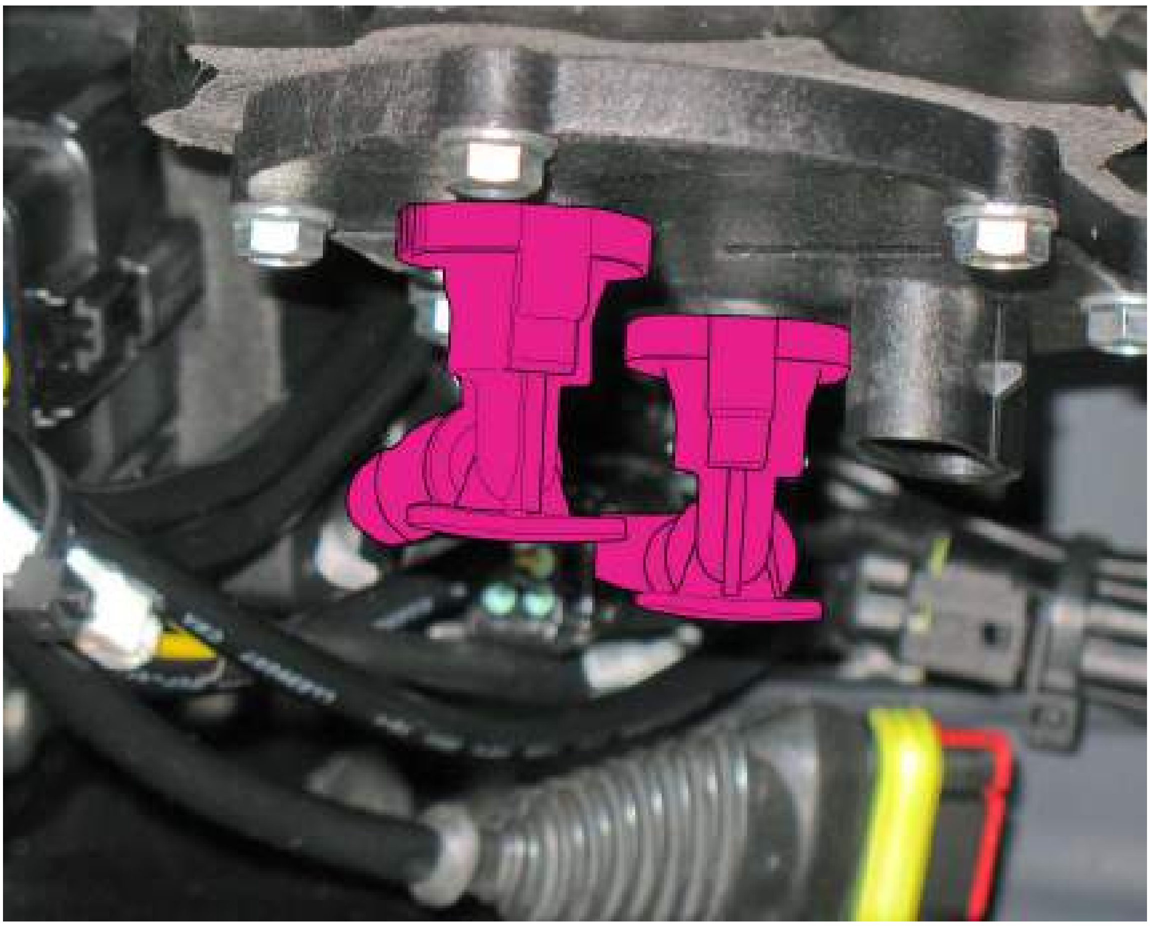
Positioning of the fuel hoses


12

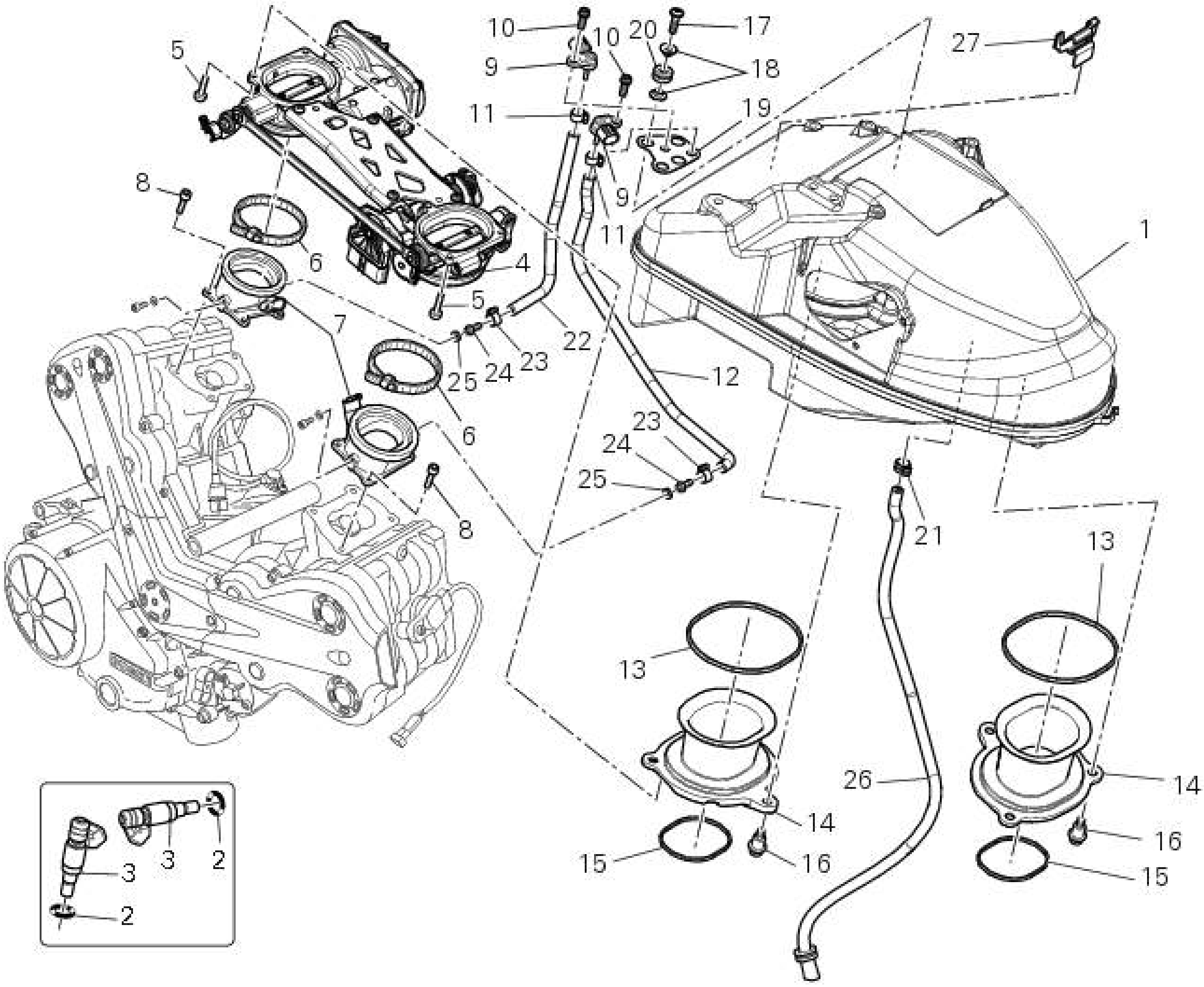

12
12

Fuel tank





6 -Airbox – Throttle Body



1 Airbox
2 O-ring
3 Injector
4 Throttle body assembly
5 Screw
6 Clamp
7 Intake manifold
8 Screw
9 Pressure sensor
10 Screw
11 Clamp
12 Hose
13 Sealing washer
14 Intake manifold
15 Sealing washer
16 Screw
17 Screw
18 Spacer
19 Bracket
20 Rubber pad
21 Clamp
22 Hose
23 Clamp
24 Union
25 Washer
26 Hose
27 Cable grommet

Spare parts catalogue

Diavel ABS	THROTTLE BODY
Diavel ABS	

	AIR INTAKE - OIL BREATHER
Diavel ABS	FUEL SYSTEM
Diavel Carbon ABS	THROTTLE BODY
Diavel Carbon ABS	AIR INTAKE - OIL BREATHER
Diavel Carbon ABS	FUEL SYSTEM

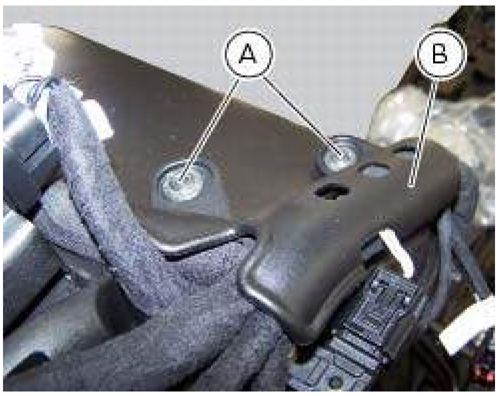
Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

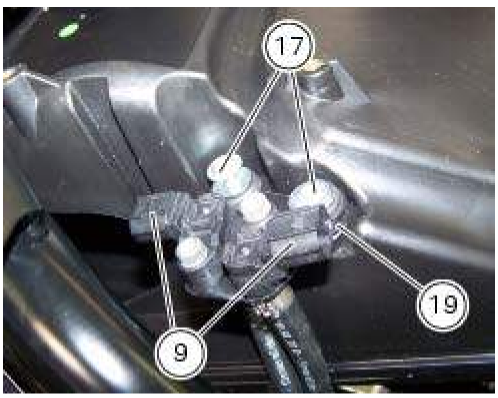
Removal the airbox and throttle body

Operations	Section reference
Remove the seat	5 - 3, Removal of the seat
Remove the tank covers	5 - 2, Removal of the fuel tank fairings
Remove the fuel tank	8 - 2, Removal of the fuel tank
Remove air conveyors	8 - 7, Removal of the air filters
Remove the control unit and its support	6 - 9, Removal of the control unit
Remove the ABS control unit	7 - 6, Removing of the ABS control unit

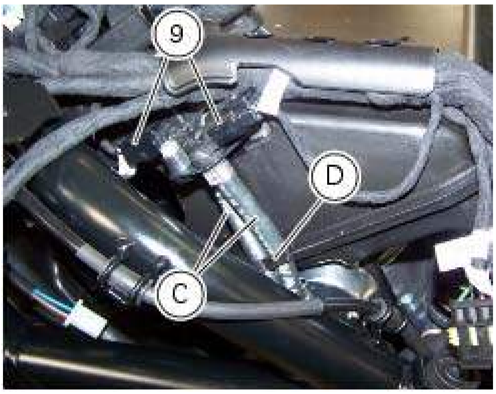
Loosen the screws (A) and remove the plate (B) that fixes the main wiring to the airbox.



Undo the screws (17) and remove the air pressure sensors (9) with the support (19).



Release the hoses (C) of the air pressure sensors (9) from the tab (D) on the airbox.

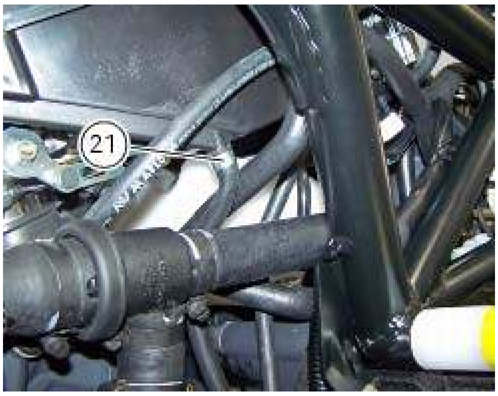


Operating on the right side of the vehicle, disconnect connector (E) from the APS sensor.

Operate on the vehicle LH side, disconnect connector (F) of the TPS/ETV motor.

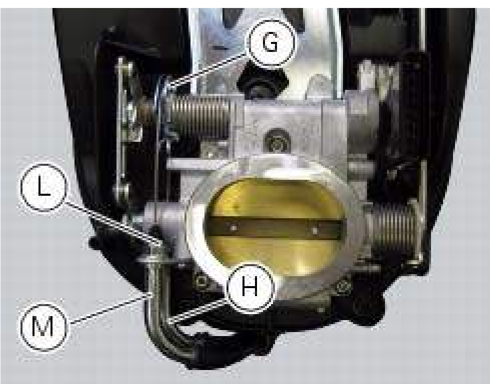
Loosen the clamp (6) that retains the blow-by pipe to the airbox.

Loosen the clamp (21) that retains the drain hose to the airbox.



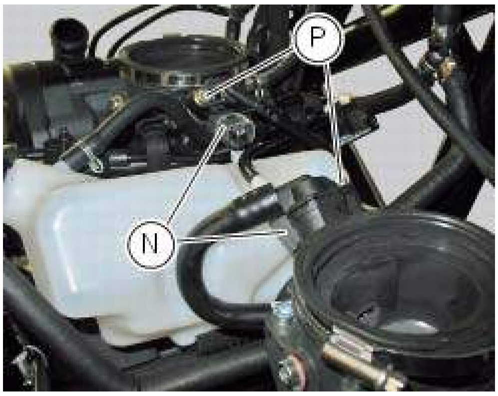
Loosen the clamps (6) that retain the airbox to the intake manifolds, and slide it out of its housing.

Operating on both throttle grip cables (H) and (M), loosen the nuts (L) and, turning the throttle body pulley (G), slide the two throttle grip cables (H) and (M).



Removal of the fuel injectors

Operating on both intake manifolds, disconnect the connectors (N) that connect the main wiring to the injectors, loosen the fuel pipe retaining screws (P) and slide out the two injectors (3).

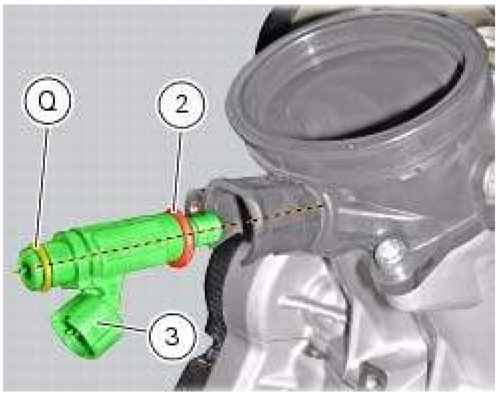


Refitting the injectors

Operate on both intake manifolds, check the presence of the O-rings (2) and (Q) on injectors (3). Apply prescribed grease on O-rings (2) and (Q) of injectors (3).
Insert the injectors in the relevant seats on the intake manifolds.

Important

To avoid damaging the O-rings, insert the injectors fully home on the intake manifolds by keeping them in line with the relevant seat.



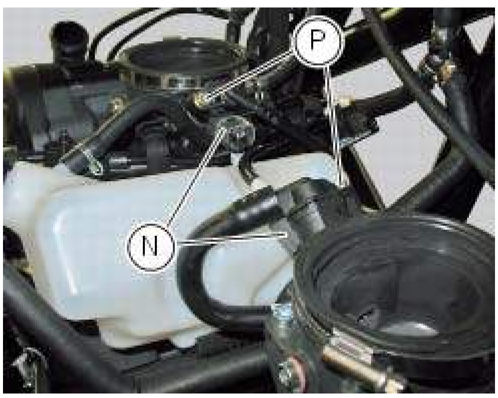
Operate on both intake manifolds, position the fuel pipes fittings on the injectors.

Important

To avoid damaging the injectors O-rings insert the fittings by holding them in line with the injectors.

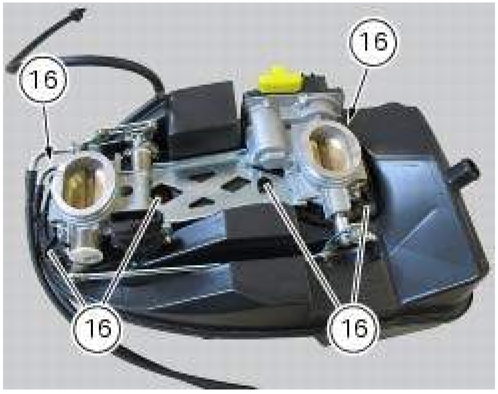
Keep the fittings pressed on the injectors, then start and tighten the screws (P) fully home.

Tighten the retaining screw (P) to a torque of 5 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Connect the main wiring connectors (N) to the injectors.

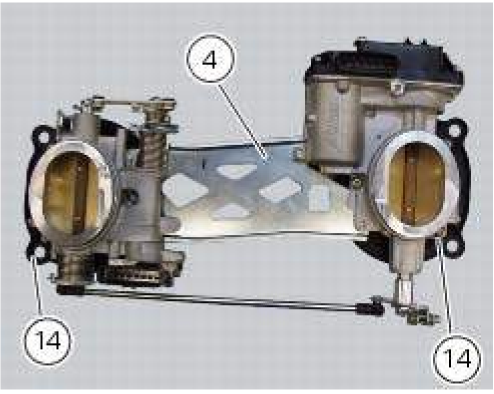


Disassembly of the airbox – throttle body

Undo the six screws (16).



Remove the throttle body (4) from the filter box (1) with the intake manifolds (14).

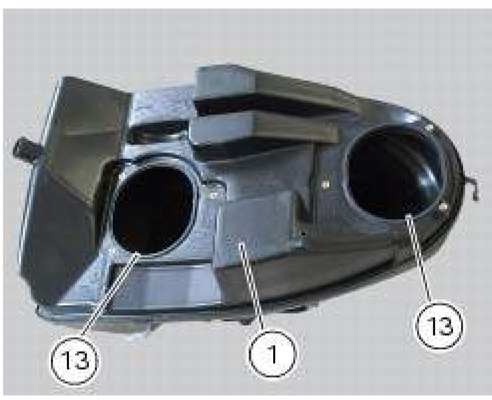


Reassembly of the airbox – throttle body

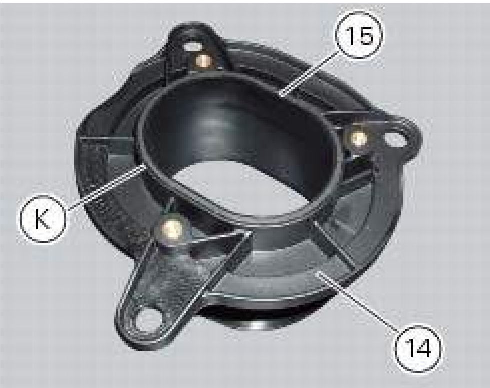
If removed, fit the seals (13) in the seats on the filter housing (1).

Note

To better insert the seals (13) use lubricant specific for rubber.



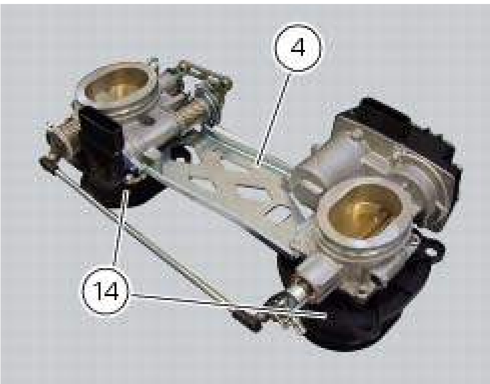
If removed, insert the gaskets (15) in the seats (K) of the intake ducts (26).

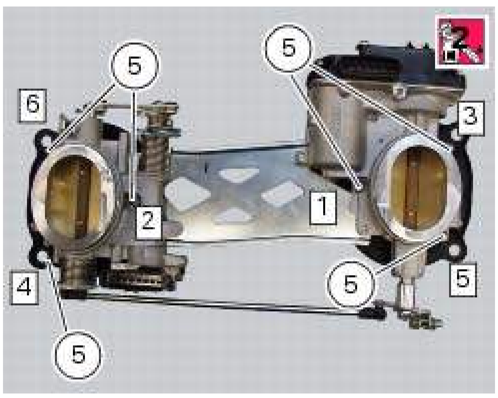


If removed, refit the intake ducts (14) on throttle body (4) and apply prescribed threadlocker to the screws (5) and tighten them to a torque of 3.5 Nm ± 10% (Sect. 3 - 3, Frame torque settings) following the sequence indicated in figure.

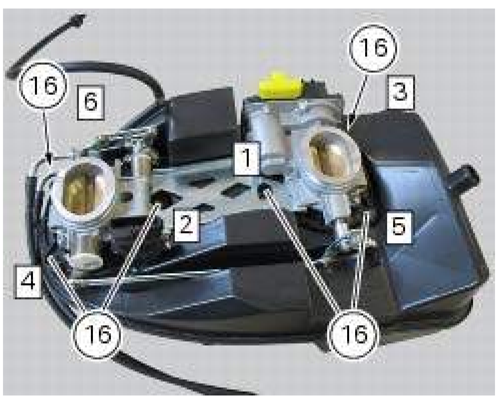
Important

After tightening, visually check that the seals (15), previously fitted on the intake funnels, are still in their seats, and that the intake funnels are perfectly coupled with the throttle body.





Fasten the throttle body (4) to the airbox (1).
Position and tighten the fixing screws (16) and tighten them to the torque of 5 Nm ± 10% (Sect. 3 - 3, Frame torque settings), following the sequence indicated in figure.



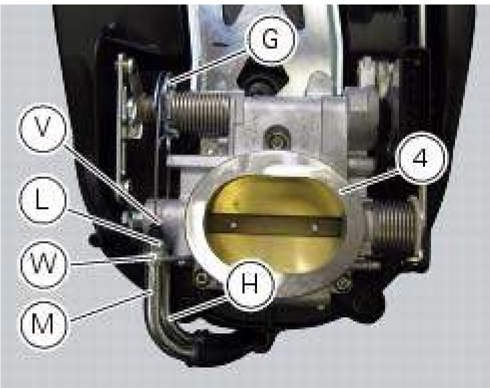
If removed, refit the throttle grip cable as indicated: insert the opening cable (M) and the closing cable (H) in the corresponding plate seats (W) on the throttle body (4) as shown in figure.

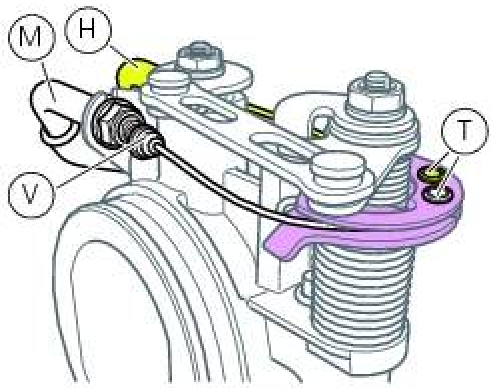
Note

The throttle cables are distinguished by the writings in different colours on them:

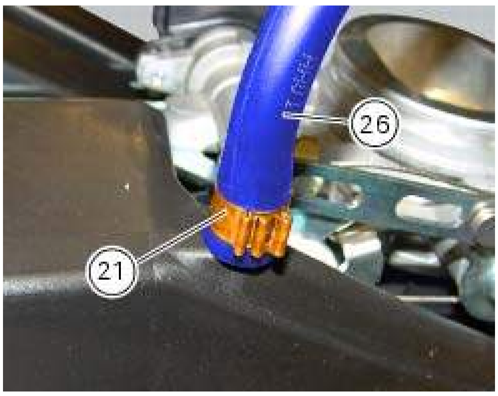
- on the opening throttle cable is a white writing;
- on the closure throttle cable is a yellow writing.

Insert the bolts (T) in the corresponding seats of the pulley. Keep oriented as shown in figure, fasten the cables (M) and (H) inserting the nuts (L).
Tighten the nuts (L) to a torque of 2.5 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Fit the dust caps (V) on the throttle cable sheaths terminals.





Check that the clip (21) of hose (26) is positioned as shown.



Refitting the airbox and throttle body

Position the filter box (1).
Operate on the vehicle LH side, connect connector (F) of the TPS/DIV motor.

Operating on the right side of the vehicle, connect connector (E) from the APS sensor.

Check for the vibration dampers (20) on the MAP sensor supporting bracket (19).
Insert the spacers with collar (18) fully home onto the vibration dampers (20).

Note

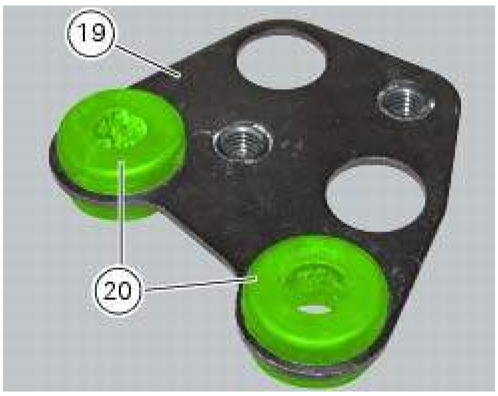
Two spacers with collar (18) must be fitted on the upper side of the bracket (19) and the other two spacers with collar (18) must be fitted on the lower side of bracket (19).

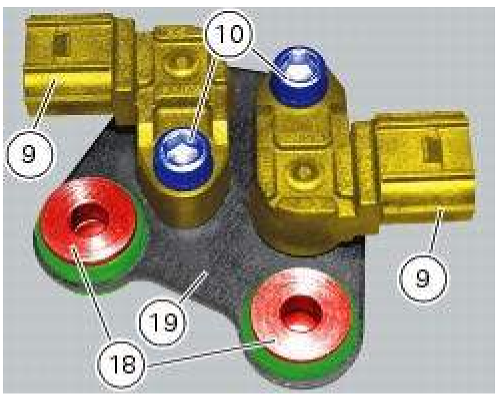
Set the MAP sensors (9) as shown on bracket (19) and fix them starting the screws (10).

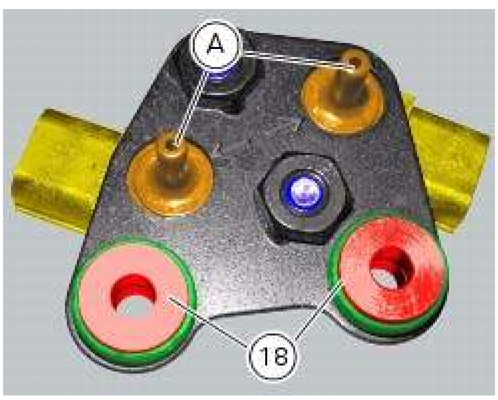
Note

When fitting the MAP sensors, make sure to insert sensors (A) correctly into their seats in bracket (19) as shown.

Tighten the screws (10) to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

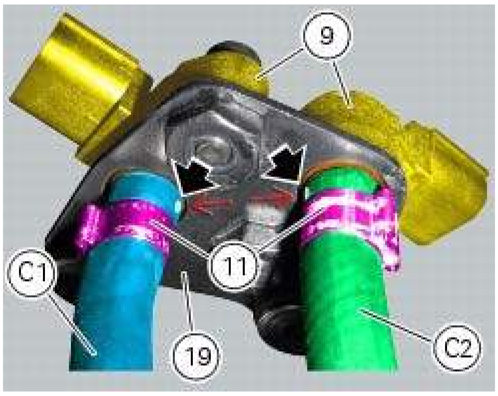




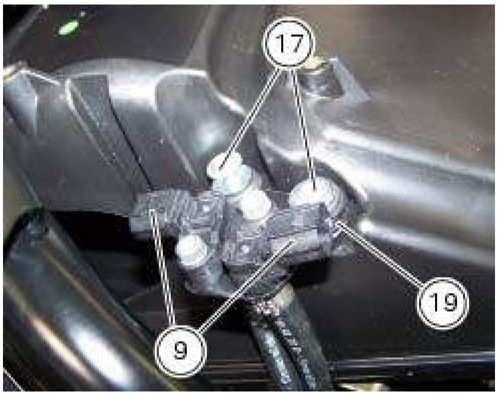


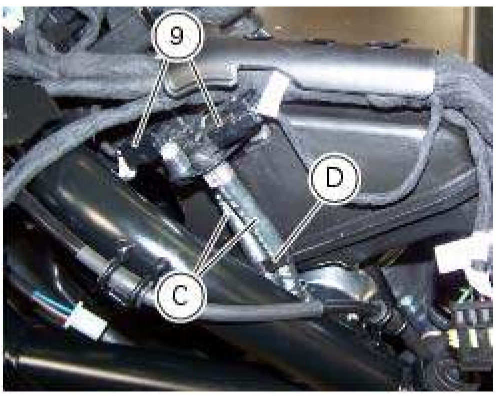
Insert a clip (11) on the longer hose (C1) and a clip (11) on the shorter hose (C2).

Fit the longer hose (C1) and the shorter hose (C2) on the MAP sensors (9) and position them so as to match the marks on longer hose (C1) and shorter hose (C2) with the arrows on the MAP sensor supporting bracket (19).
Fix the hoses (C1) and (C2) with the clips (11).



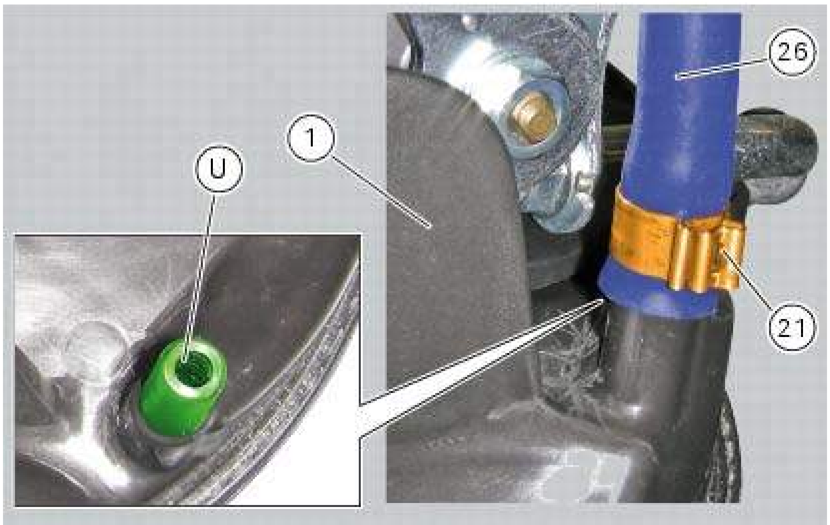
Refit the air pressure sensors (9) with the support (19) by starting and tightening the screws (17) to a torque of 5 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Block the hoses (C) of the air pressure sensors (9) with the tab (D) on the airbox.

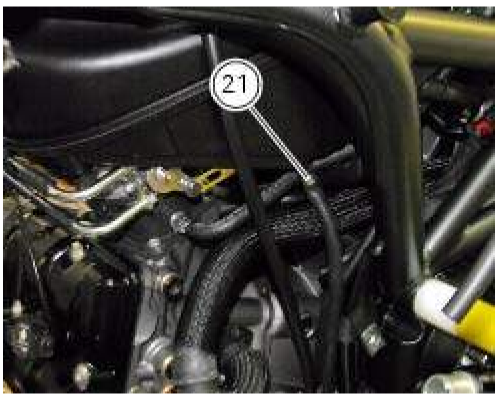




Position and tighten the clamps (6), as indicated, to the torque of 2.5 Nm ± 10% (Sect.3 - 3, Frame torque settings).

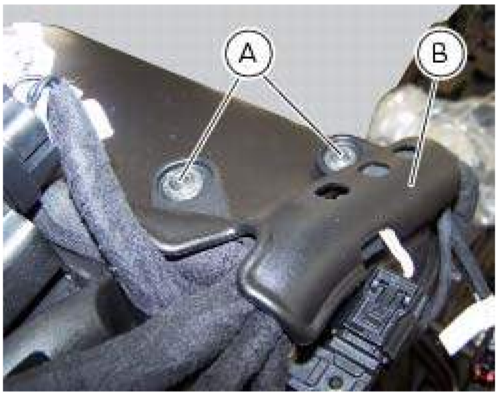
If the drainage pipe has been removed, fit clamp (21) onto drainage pipe (26).
Fit the drainage pipe (26) by inserting it fully home on fitting (U) on the filter box (1).
Orient the clamp (21) as indicated.
Fix the drainage pipe (26) by tightening the clamp (21).





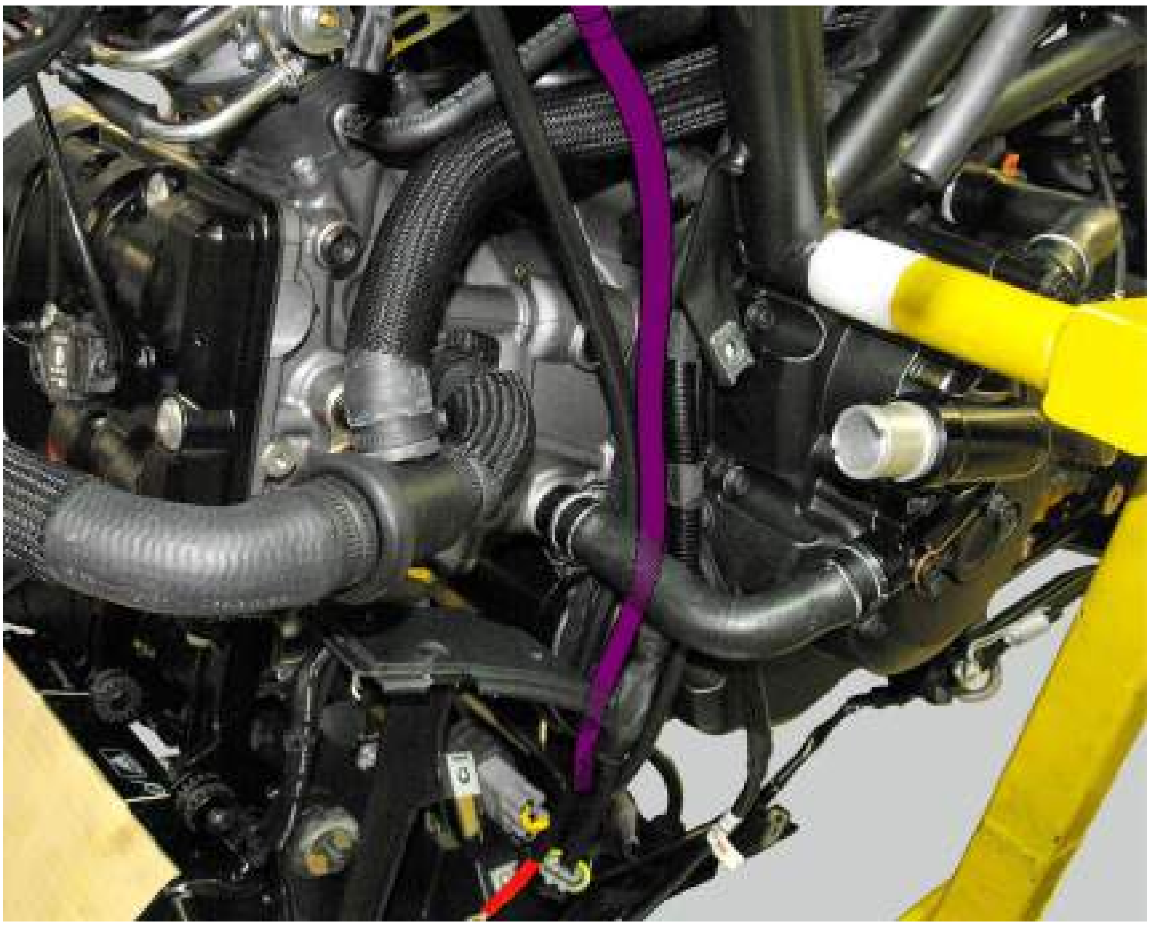
Refit the blow-by pipe to the airbox by tightening the clamp (Z) to a torque of 5 ± 10% (Sect. 3 - 3, Frame torque settings).

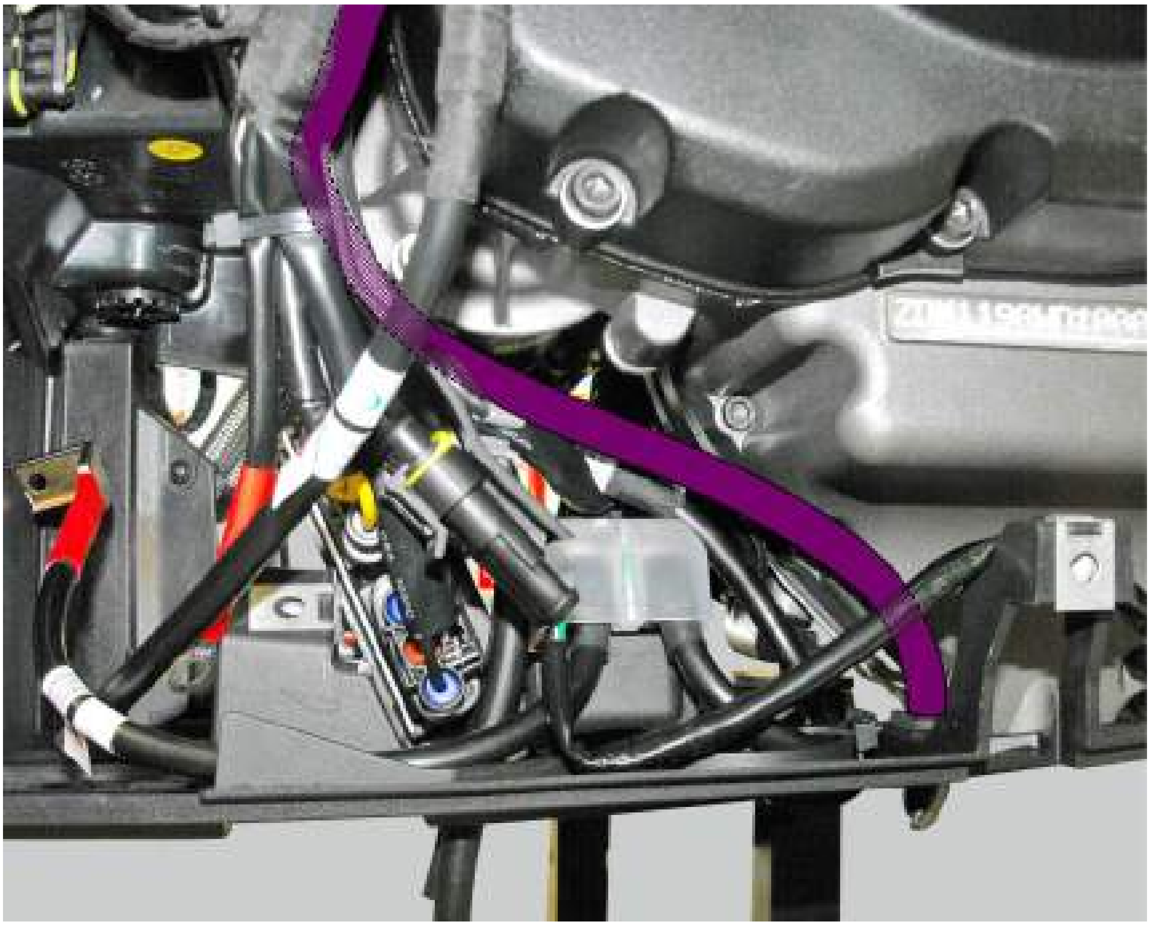
Refit the plate (B) retaining the main wiring to the airbox by tightening the screws (A) to a torque of 5 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



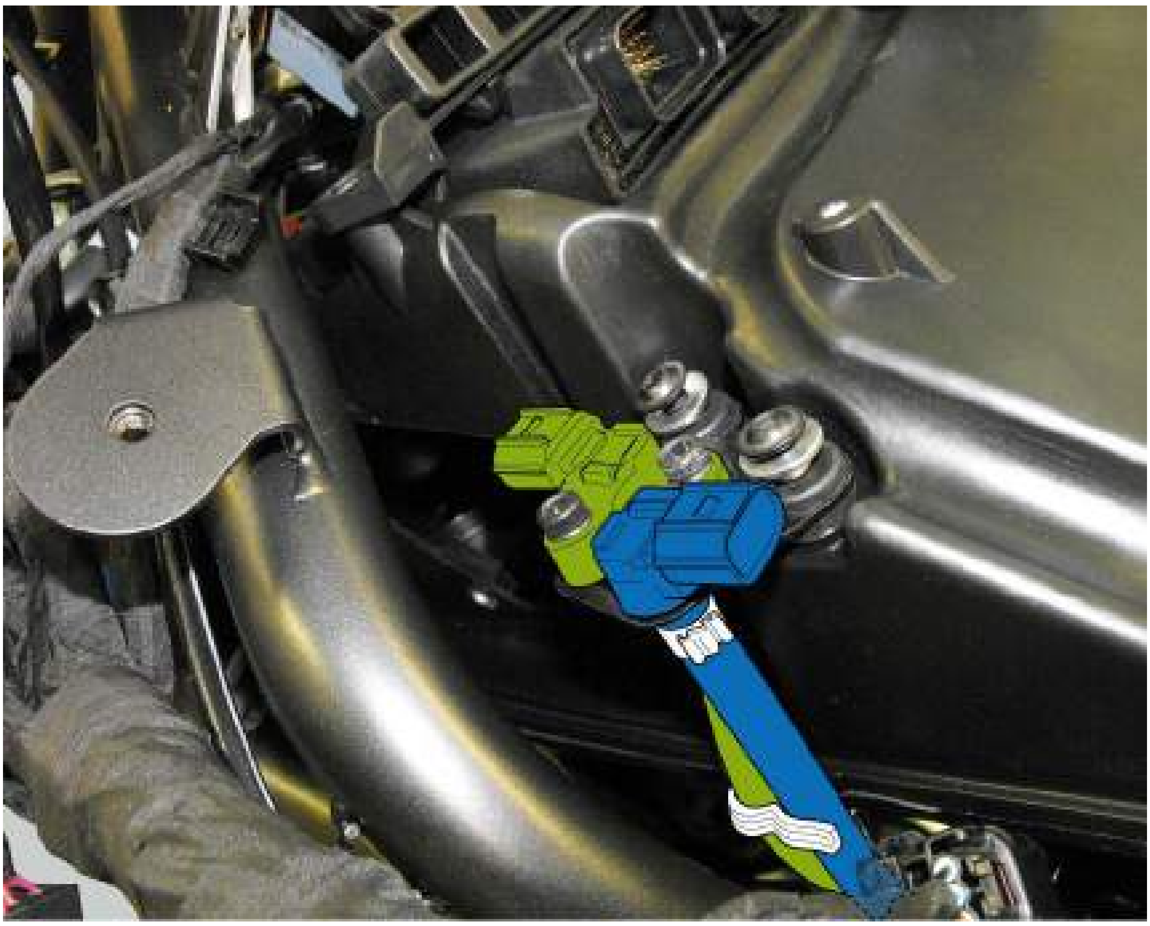
Operations	Section reference
Refit the control unit	7 - 6, Refitting the ABS control unit
Refit the control unit and its support	6 - 9, Reassembly of the control unit
Refit air conveyors	8 - 7, Refitting the air filters
Refit the fuel tank	8 - 2, Refitting the fuel tank
Refit the fuel tank covers	5 - 2, Refitting the fuel tank fairings
Refit the seat	5 - 3, Refitting the seat

Positioning of the airbox drain hose

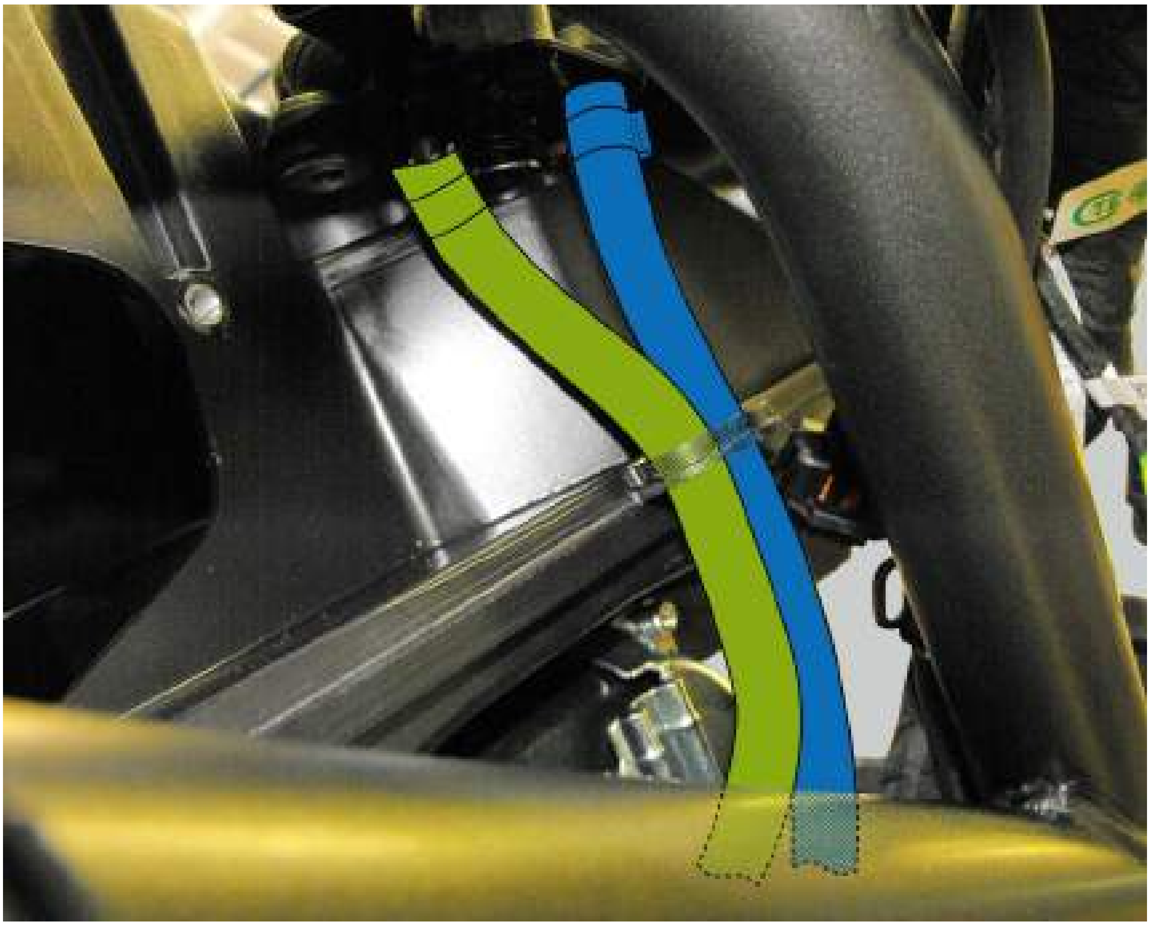


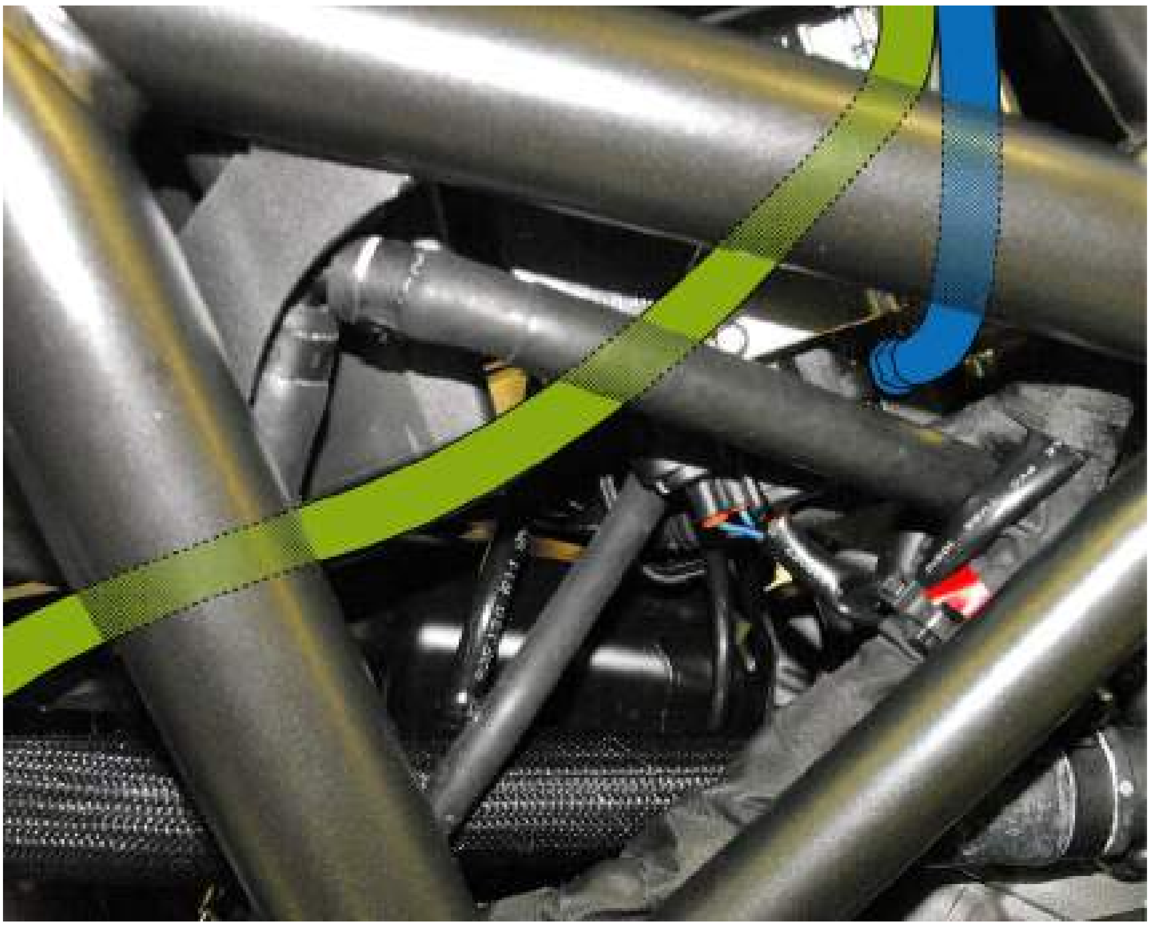


Positioning of the horizontal and vertical head air sensor hoses



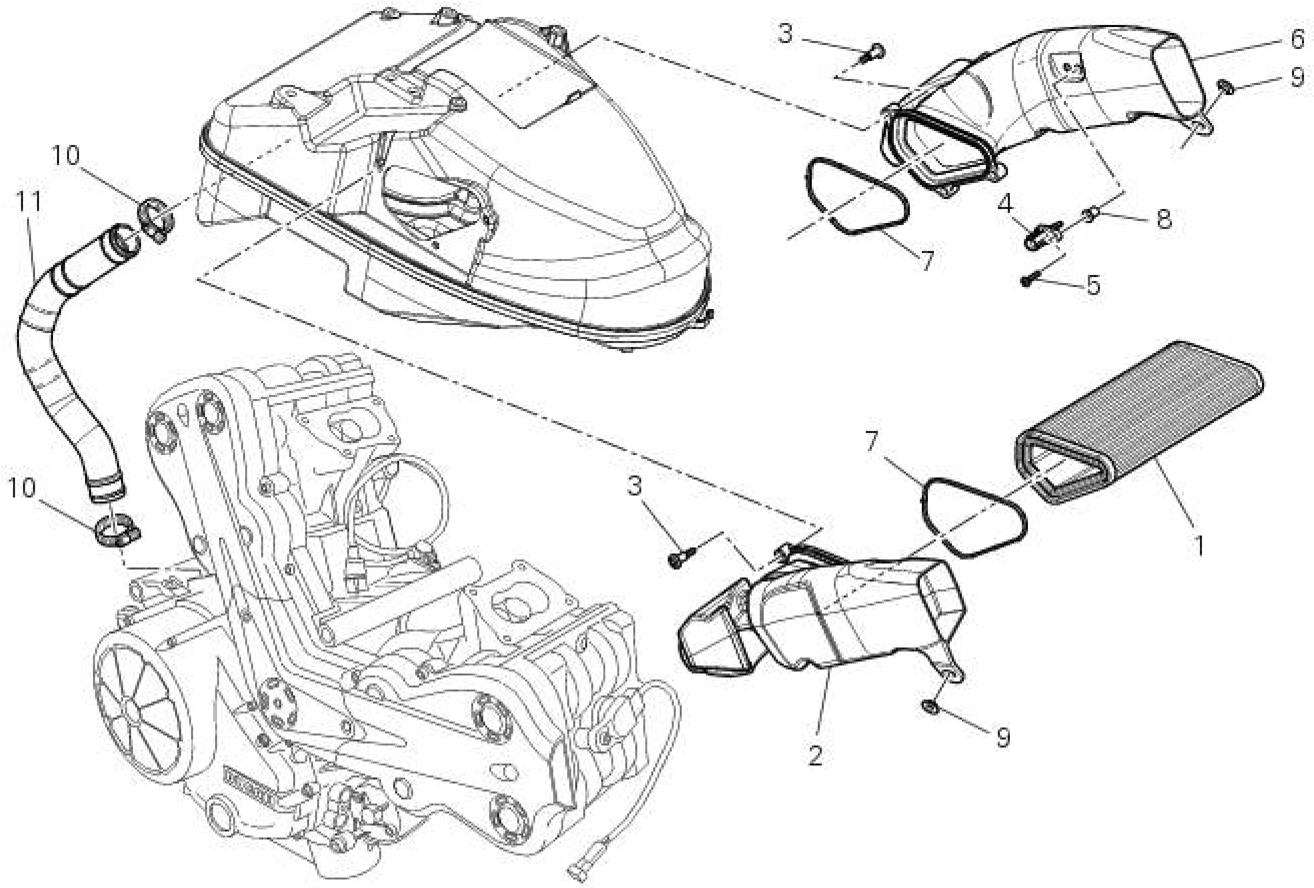
Airbox – Throttle Body





Airbox – Throttle Body

7 -Air intake



1 Air filter
2 Right air duct
3 Screw
4 Air temperature sensor
5 Screw
6 Left air duct
7 Sealing washer
8 Threaded insert
9 Spacer
10 Clamp
11 Breather hose

Spare parts catalogue

Diavel ABS	AIR INTAKE - OIL BREATHER
Diavel Carbon ABS	AIR INTAKE - OIL BREATHER

Important

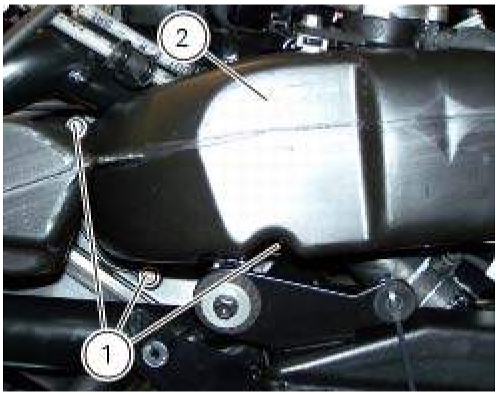
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

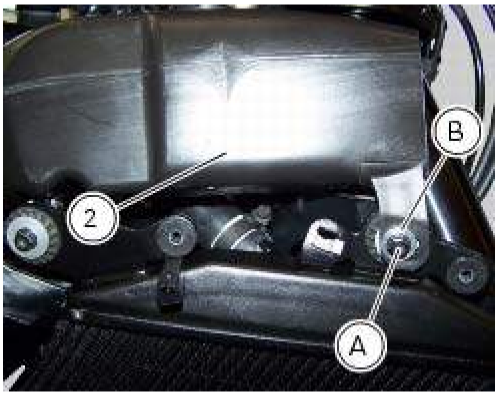
Removal of the air filters

Operations	Section reference
Remove the seat	5 - 3, Removal of the seat
Remove the front half-fairings	5 - 2, Disassembly of the front half-fairings

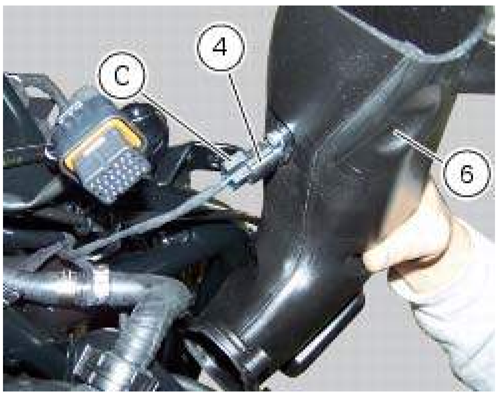
Remove the fuel tank	8 - 2, Removal of the fuel tank

Work on the vehicle right side, loosen screws (3) that secure the intake duct (2) to the airbox, and the radiator retaining screw (A); recover the washer (B).
Remove the intake duct (2).





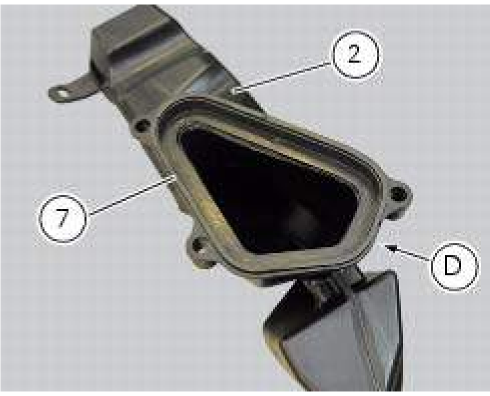
Proceed in the same way to remove the LH intake duct (6), and disconnect the connector (C) of the air temperature sensor (4).



Pull out the filter cartridge (1) from the seat in the airbox.

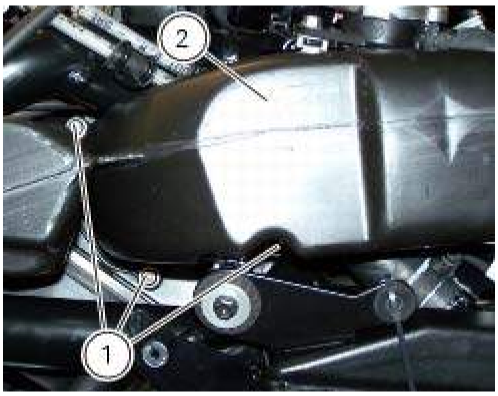
Refitting the air filters

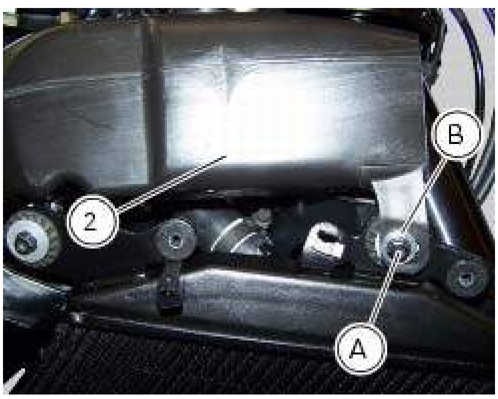
Apply universal sealant in the air duct (2) and (6) groove (D).
Fit seal (7) in the groove (D) having care to place it correctly in the relevant seat so as to avoid abnormal wrinkles.



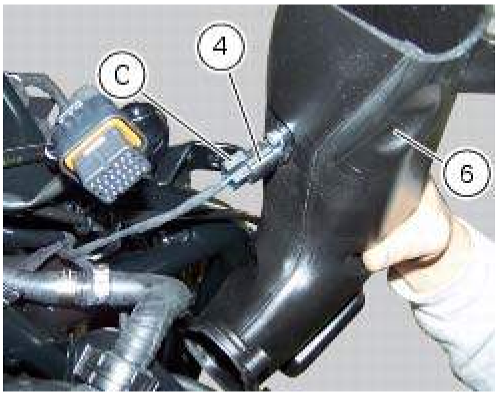
Pull out the filter cartridge (1) from the seat in the airbox.

Position the RH air duct (2).
Start the screws (1) and the screw (A) with washer (B).
Tighten the screws (1) to a torque of 3.5 Nm ± 10% (Sect. 3 - 3Frame torque settings) and screw (B) to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

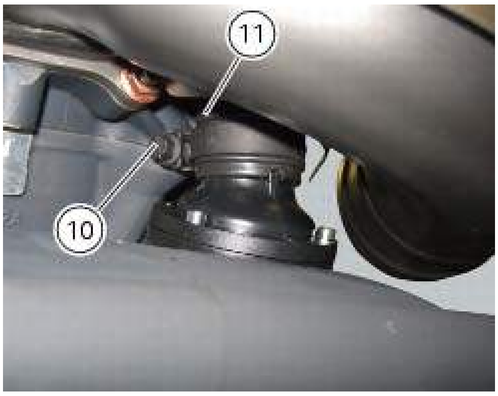


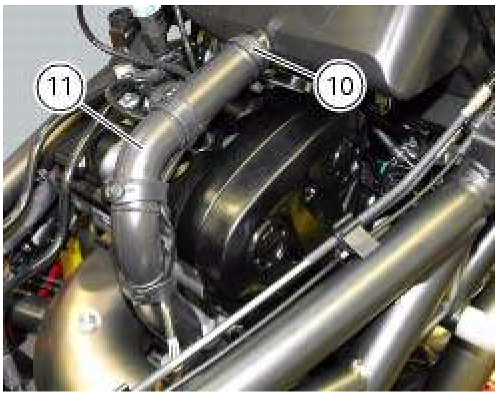


Proceed in the same way to refit the LH intake duct (5), and connect the connector (C) of the air temperature sensor (4).



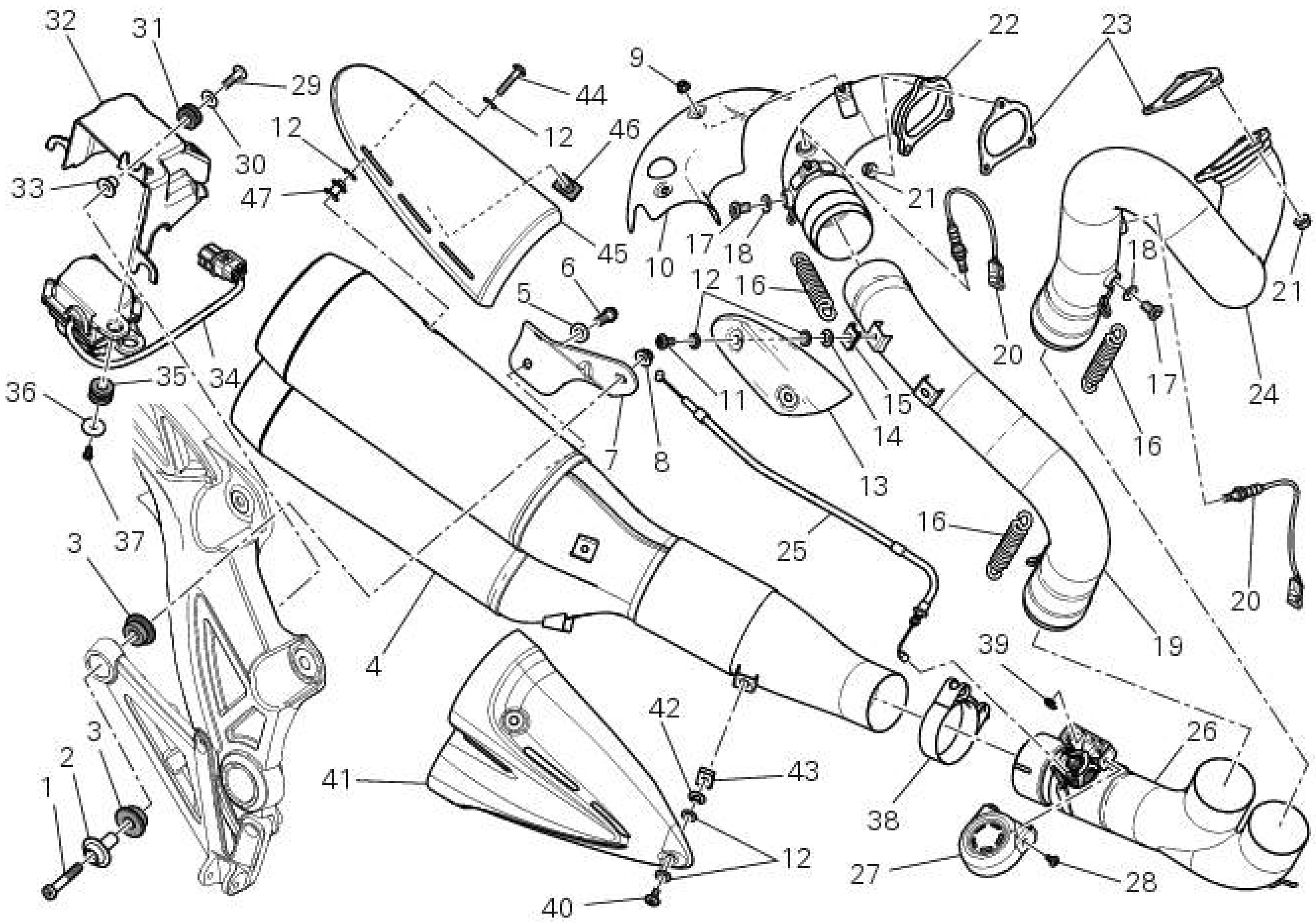
Check that the clips (10) securing hose (11) are positioned as shown.





Operations	Section reference
Refit the fuel tank	8 - 2, Refitting the fuel tank
Refit the fuel tank covers	5 - 2, Refitting the fuel tank fairings
Refit the seat	5 - 3, Refitting the seat

8 -Exhaust system



1 Screw
2 Bush
3 Vibration damper mount
4 Silencer
5 Washer
6 Screw
7 Bracket
8 Nut
9 Nut
10 Upper heat guard
11 Screw
12 Washer
13 Central heat guard
14 Spacer
15 Clip nut
16 Long exhaust spring
17 Plug
18 Sealing washer, thickness 1
19 Vertical exhaust pipe
20 Lambda sensor
21 Nut
22 Vertical flange
23 Exhaust gasket
24 Horizontal flange
25 Flexible cable
26 Central exhaust pipe
27 Exhaust protection
28 Screw
29 Screw
30 Washer
31 Rubber pad
32 Support

33 Spacer
34 Exhaust valve motor
35 Rubber pad
36 Washer
37 Screw
38 Clamp
39 Circlip
40 Screw
41 Lower heat guard
42 Spacer
43 Quick-release fastener
44 Screw
45 Upper heat guard
46 Rubber mounting
47 Spacer

Spare parts catalogue

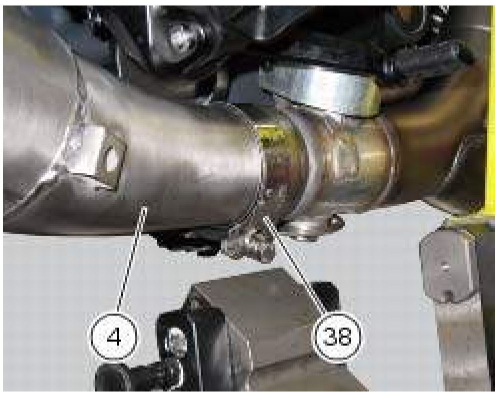
Diavel ABS	EXHAUST SYSTEM
Diavel Carbon ABS	EXHAUST SYSTEM

Important

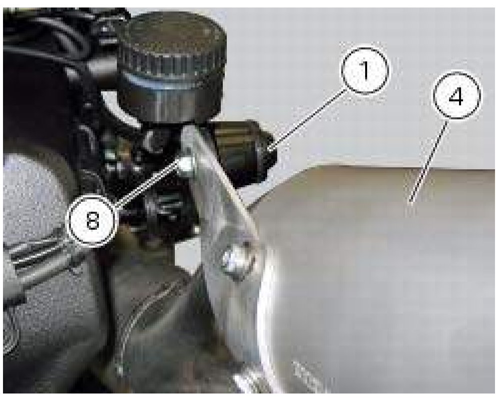
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Removing the silencer

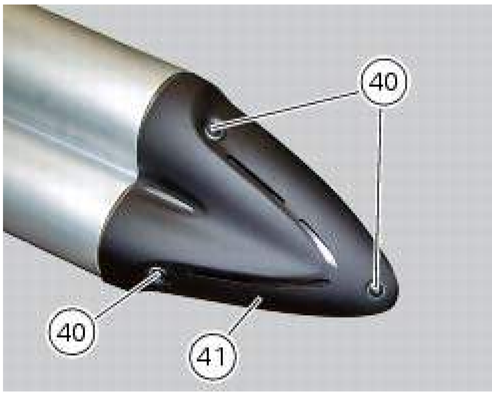
Loosen the clamp (38) that retains the silencer (4) to the complete exhaust system.



While holding the nut (8), loosen the screw (1) and remove the silencer (4) from the motorcycle.

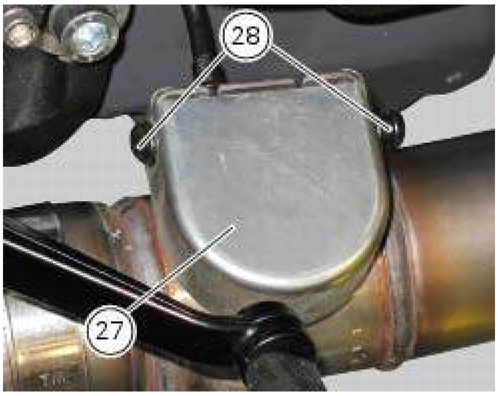


Loosen the screws (40) and remove the silencer guard (41).

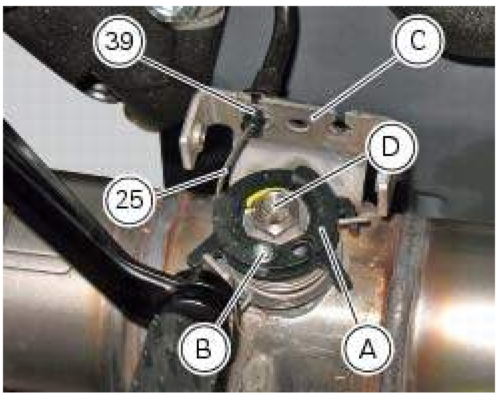


Removal of the exhaust system

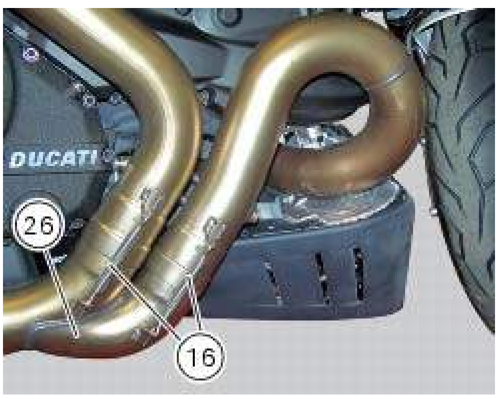
Remove the silencer, as described in the paragraph "Removing the silencer" of this section.
Loosen the screws (28) and remove the exhaust by-pass valve cover (27).



Turn the exhaust valve pulley (A) to facilitate the throttle cable (25) output.
Release the end fitting (B) of the cable (25) from the exhaust valve (D) and remove the circlip (39).
Release the control cable (25) from the plate (C).

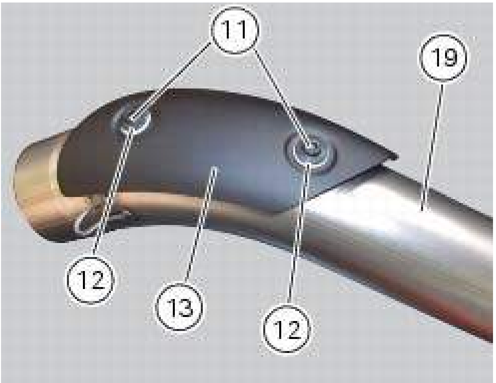


Remove the two retaining springs (16) and remove the central exhaust pipe (26).



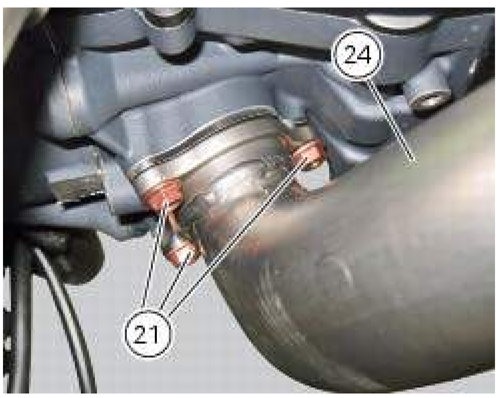
Remove the retaining spring (16) and the upper exhaust pipe (19).

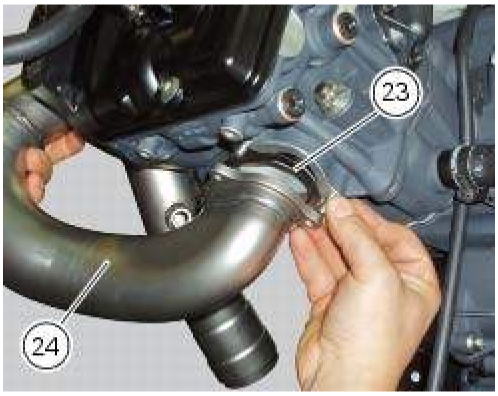
Loosen the screws (11) and remove the heat guard (13) from the upper exhaust pipe (19); keep the spacers (12).



Undo and remove the horizontal cylinder lambda probe (20).

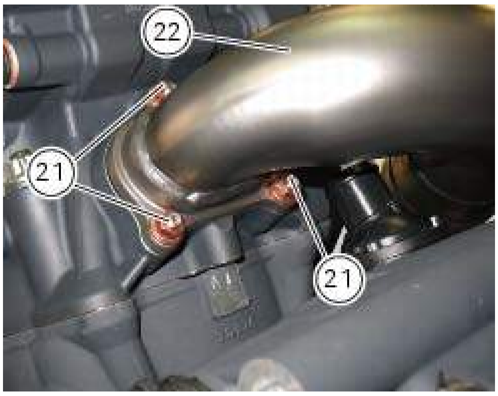
Undo and remove the three fixing nuts (21) and remove the horizontal manifold (24) with the gasket (23).



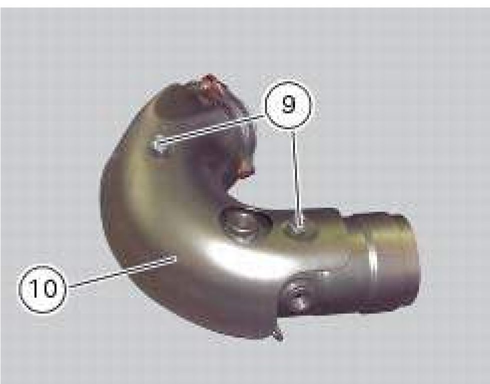


Undo and remove the vertical cylinder lambda probe (20).

Undo and remove the three fixing nuts (21) and remove the manifold (22) with the gasket (**23**).

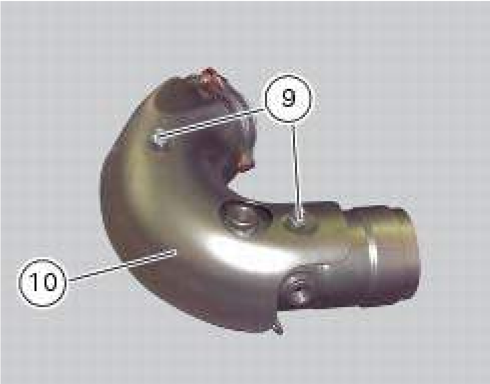


Unscrew the nuts (9) and remove the heat guard from the manifold (10).

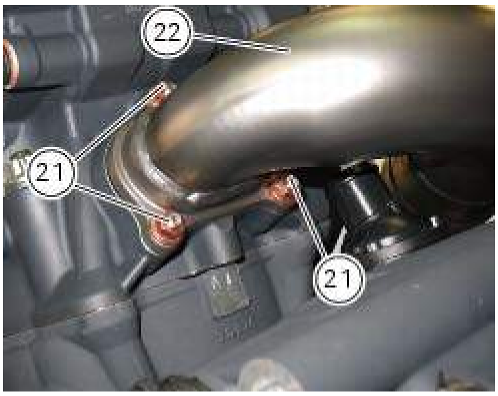


Refitting the exhaust system

Refit the heat guard on the manifold (10) by tightening the nuts (9) to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

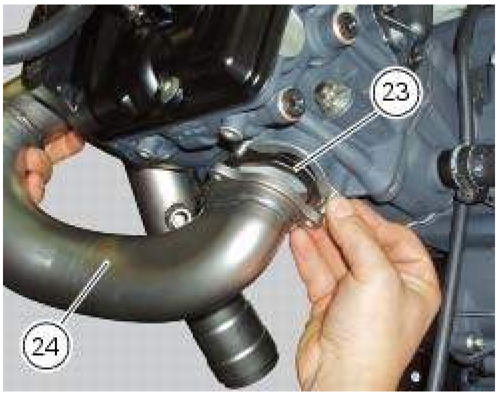


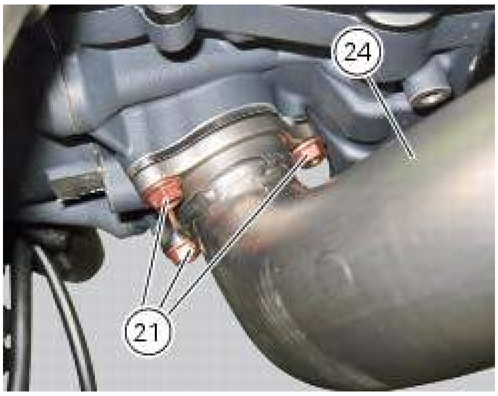
Position the vertical exhaust manifold (22) on the vertical cylinder head with the gasket (23).
Tighten the fixing nuts (21) to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



If removed, tighten the vertical lambda sensor (20) to a torque of 25 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

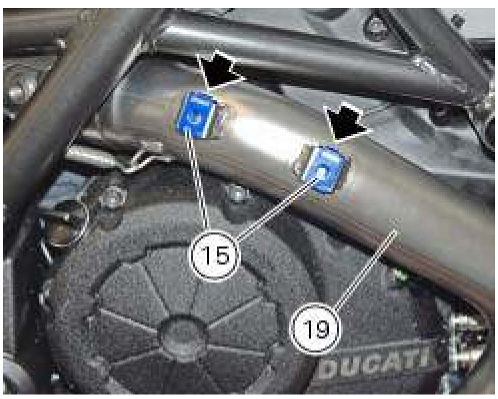
Position the horizontal exhaust manifold (24) on the horizontal cylinder head with the gasket (23).
Tighten the fixing nuts (21) to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).





If removed, tighten the horizontal lambda sensor (20) to a torque of 25 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

Check the presence of clips (15) on the upper exhaust pipe (19).

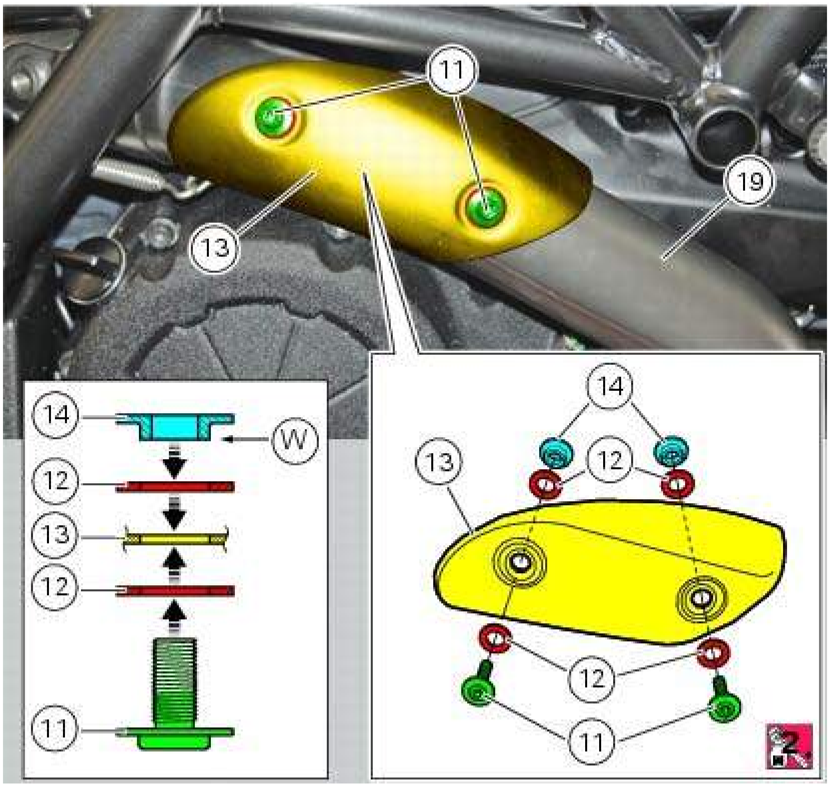


Fit the aramid washers (12) on the screws (11) using the recommended threadlocker.
Insert the screws (11) in the holes of the heat guard (13).
Insert the other two washers (12) and the spacers with collar (14) on the protruding ends of the screws (1).

Note

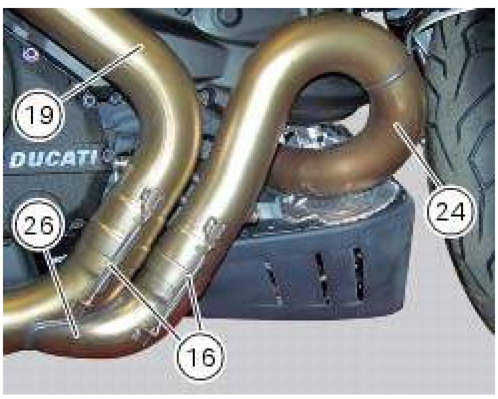
The two spacers (14) must be oriented with the collar (W) facing the heat guard (13) as shown.

Fit the heat guard (13) starting the screws (11) and tighten the screws (11) to the torque of 8 Nm ± 10% (Sect. 3 - 3, Frame torque settings), making sure the washers (12) are centred to the collars (W) of the spacers (14).

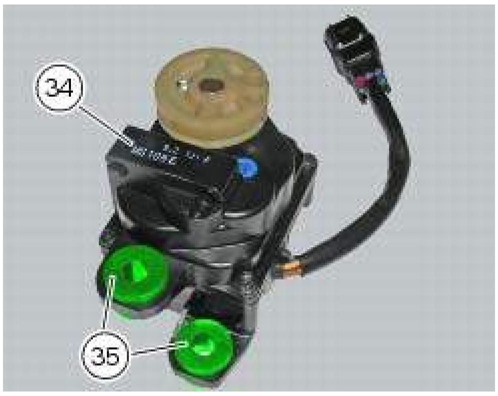


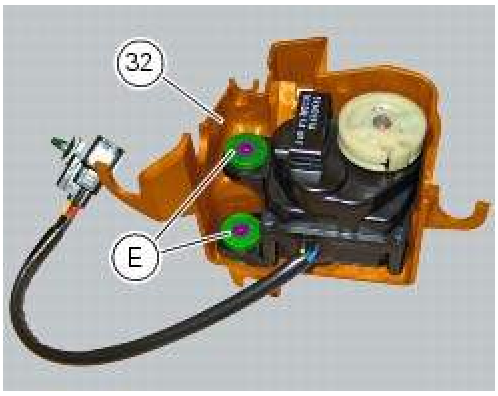
Insert the upper exhaust pipe (19) into the vertical exhaust pipe (22) and block it with the spring (16).

Insert the central exhaust pipe (26) in the upper exhaust pipe (19) and the horizontal flange (24), and fix them with the springs (16).

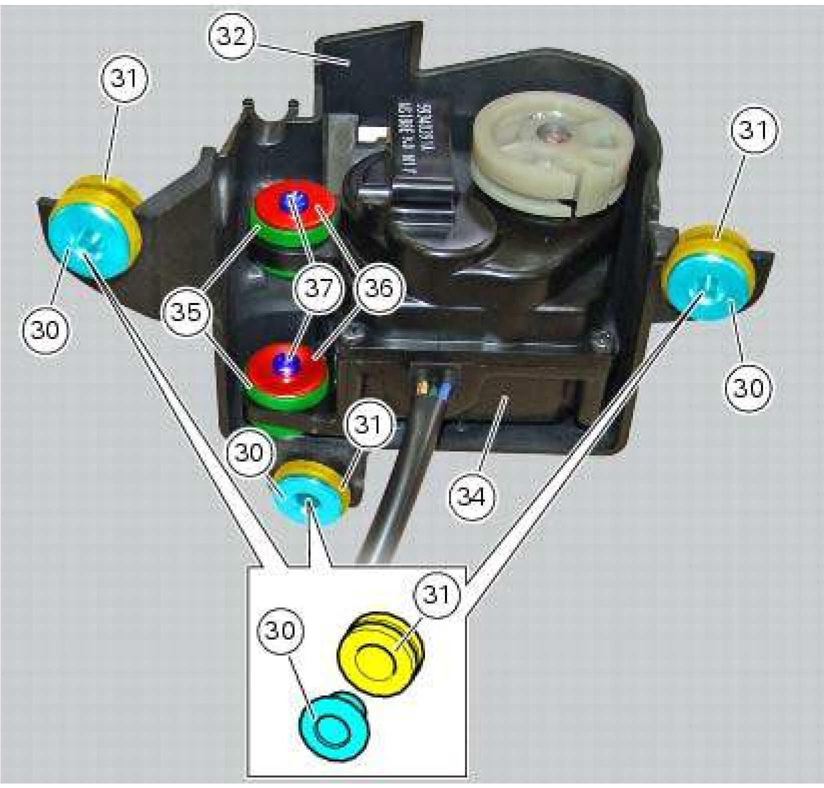


If the exhaust valve motor had been removed, fit the vibration dampers (35) into the suitable holes of the exhaust valve (34) on refitting. Fit the exhaust valve motor (34) and position it as shown on the cover (32), bringing its vibration dampers (35) fully home on the stud bolts (E).





Fix the exhaust valve motor (34) to cover (32) starting the screws (37) with washers (36) in the vibration dampers (35) installed previously. Tighten the screws (37) to a torque of 3 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Fit the vibration dampers (31) on the cover (32) at the positions shown.
Insert the spacers with collar (30) into the vibration dampers (31) as shown.



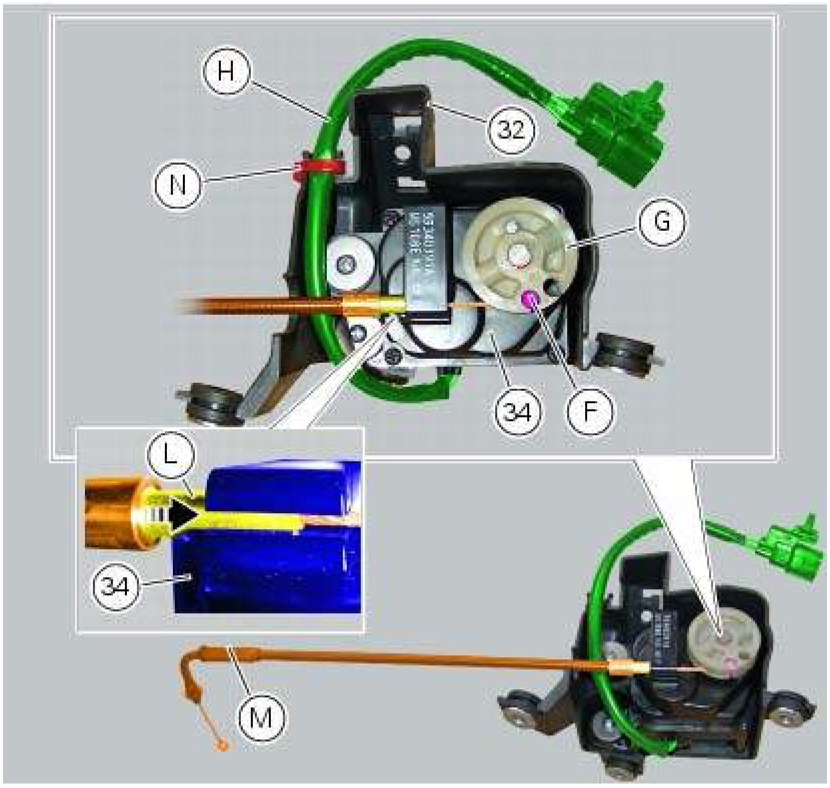
Fit the exhaust valve motor cable (M) inserting the end fitting (F) in the suitable hole of pulley (G).

Note
The exhaust valve motor cable (M) must be positioned above the wiring (H) of the exhaust valve motor (34).

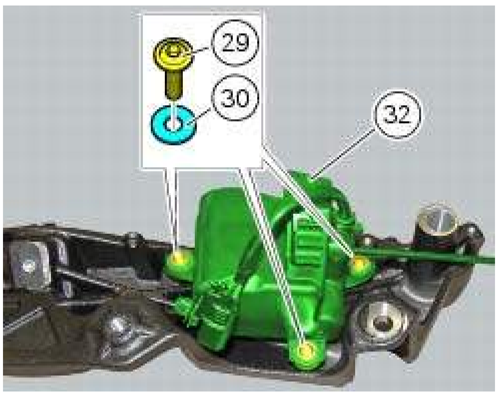
Insert the cylindrical terminal (L) into the suitable seat of the exhaust valve motor (34) and make sure to bring it fully home.

Note
If it proves difficult to insert the terminal (L) fully home into its seat, apply LUBRICANT FOR RUBBER to the terminal.

Tie the wiring (H) using a large self-locking tie wrap (N) in the area of the cover (32) shown.



If previously removed, place the exhaust valve motor assembly (32) on the right plate of the rear subframe, start the screws (29) with washers (30) and tighten them to a torque of 10 Nm ± 10 % (Sect. 3 - 3, Frame torque settings).

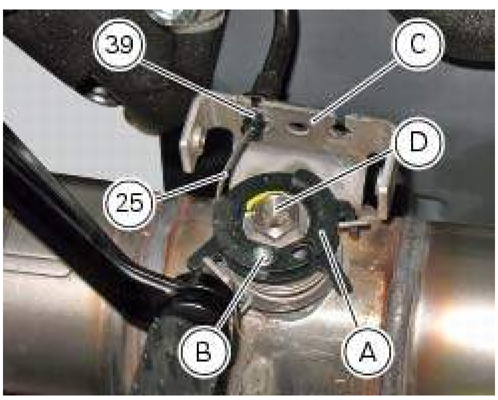


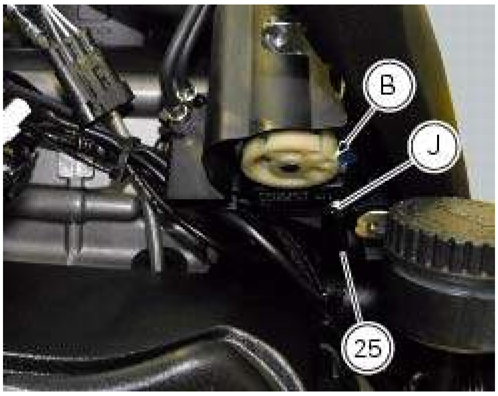
Position the control cable (25) in the plate (C).
Insert the end fitting (B) on the exhaust valve (D) and block it with the circlip (39).

Warning

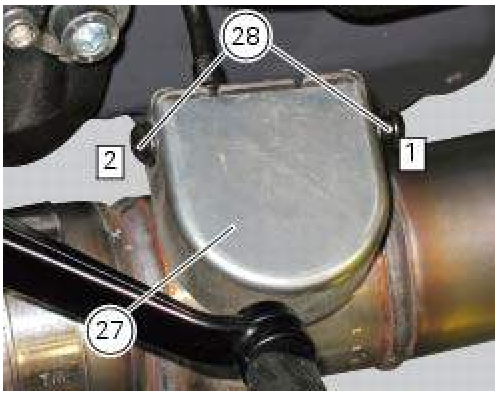
Make sure the end fittings (B) at cable ends are properly fitted onto the pulleys of the exhaust valve and of its motor.
Check that the cylindrical terminal (L) is fully inserted (fully home) into the suitable seat of the exhaust valve motor.

After assembly, the cable (25) on exhaust valve and exhaust valve motor is adjusted automatically by dashboard software, that causes the valve to open fully at the first key-on, and then goes back to rest position with the valve fully closed.

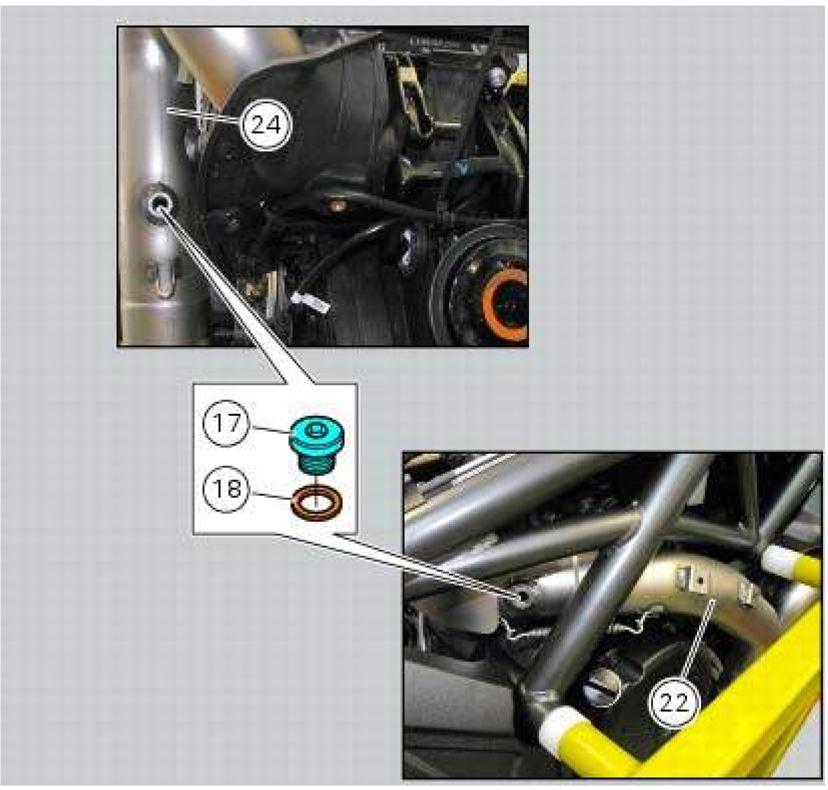




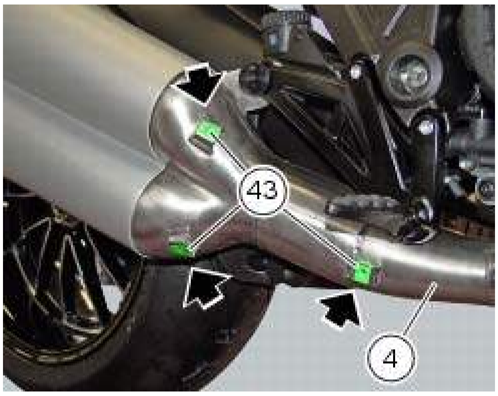
Refit the exhaust by-pass valve cover (27) by starting and tightening the screws (28) to a torque of 8 Nm ± 10% (Sect. 3 - 3, Frame torque settings), starting with the front one.
Refit the silencer, as described in the paragraph “Refitting the silencer“ of this section.



If removed, fit the copper washers (18) to the plugs (17), start the plugs into the vertical (22) and horizontal (24) head exhaust manifolds and tighten them to the torque of 25 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



If the silencer heat guard had been removed, check the presence of clips (43) on the silencer (4).



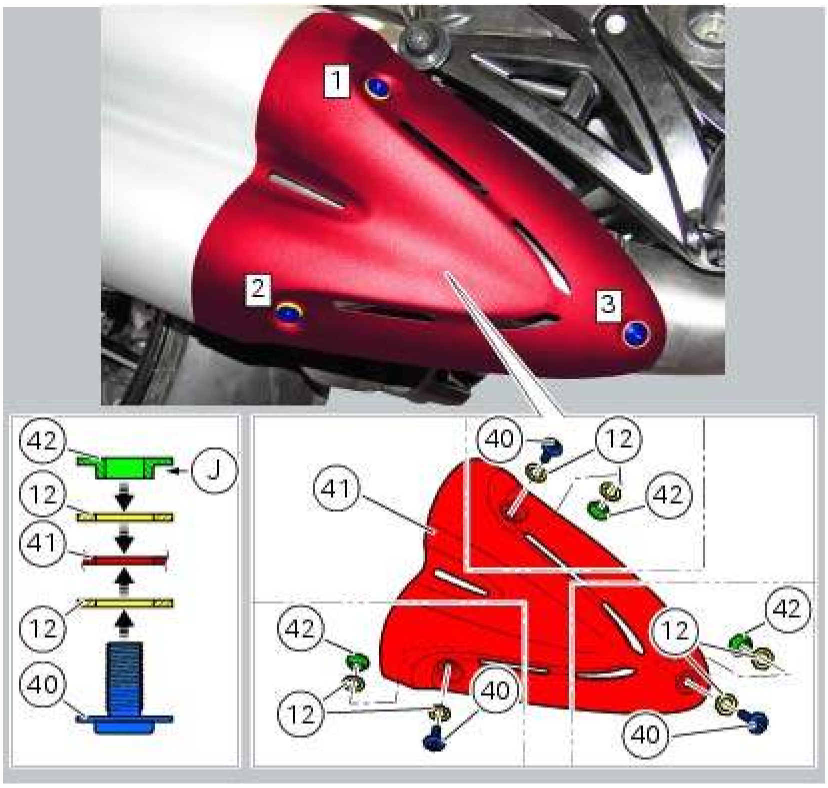
Important

Assembly operations described below must be performed following sequence X - Y - Z.
Fit the washers (12) on the screws (40).
Insert the screws (40) in the holes of the heat guard (41).
Insert the other three washers (12) and the spacers with collar (42) on the protruding ends of the screws (40).

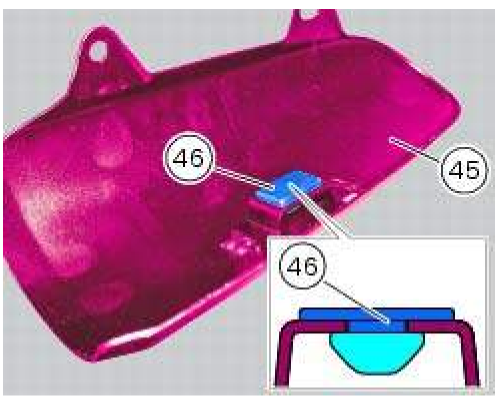
Note

The spacers (42) must be oriented with the collar (J) facing the heat guard (41) as shown.

Fit the heat guard (41) by starting the screws (40).
Tighten the screws (40) to a torque of 5 Nm ± 10% (Sect. 3 - 3, Frame torque settings), following sequence Z - X - Y and making sure the washers (12) are centred to the collars (J) of the spacers (42).



Check the presence of the rubber pad (46) on the heat guard (45).

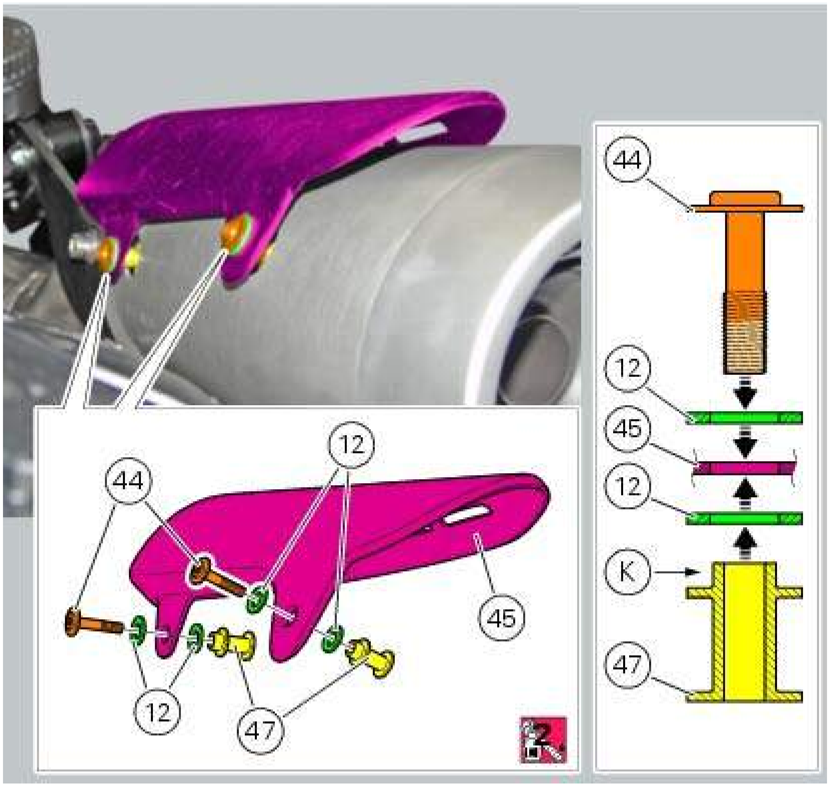


Fit the washers (12) on the screws (44) using the recommended threadlocker.
Insert the screws (44) in the holes of the rear heat guard (45).
Insert the other two washers (12) and the spacers with collar (47) on the protruding ends of the screws (44).

Note

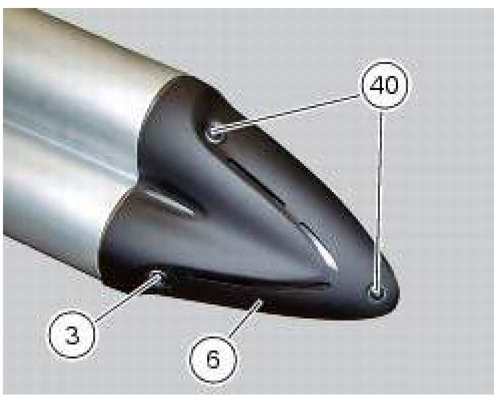
The spacers (47) must be oriented with the collar (K) facing the heat guard (45).

Fit the heat guard (45) by starting the screws (44).
Tighten the screws (44) to a torque of 8 Nm ± 10% (Sect. 3 - 3, Frame torque settings), making sure the washers (12) are centred to the collars (K) of the spacers (47).

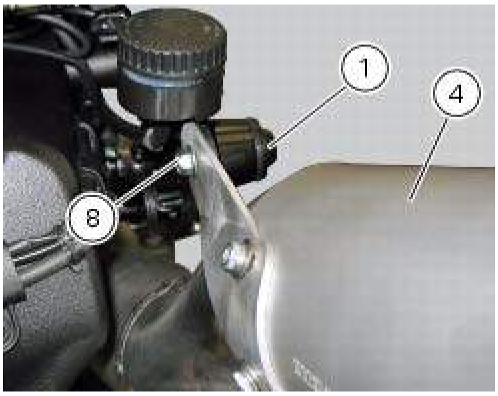


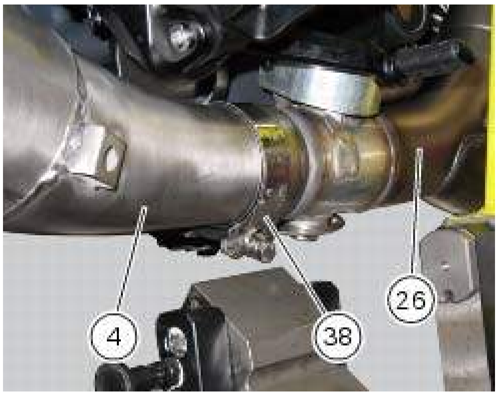
Refitting the silencer

Position the silencer guard (41) and fix it by starting the screws (40).
Tighten the screws (40) to a torque of 8 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

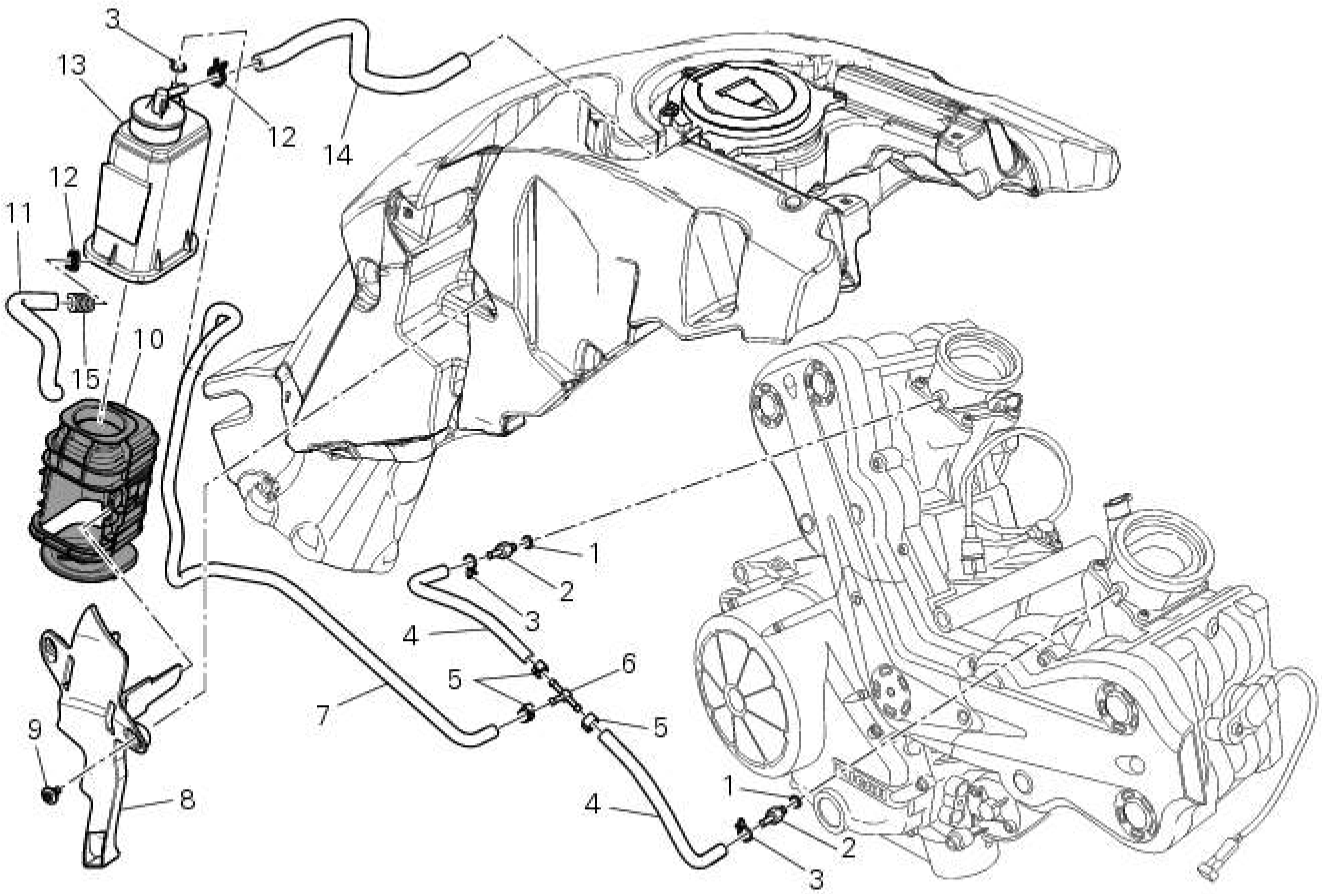


Insert the silencer (4) into the central exhaust pipe (26), and fix it to the vehicle by starting the screw (1).
Hold the nut (8) and tighten the screw (1) to a torque of 25 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Orient and tighten the clamp (38) to a torque of 16 Nm ± 10% (Sect. 3 - 3, Frame torque settings).


1
4
8


4
38
26

10 Evaporative emissions canister



1 Sealing washer
2 Union
3 Hose clip
4 Hose
5 Clamp
6 “T” fitting
7 Hose
8 Support
9 Special screw
10 Rubber mounting
11 Hose
12 Hose clip
13 Evaporative emissions canister
14 Hose
15 Spring

Spare parts catalogue

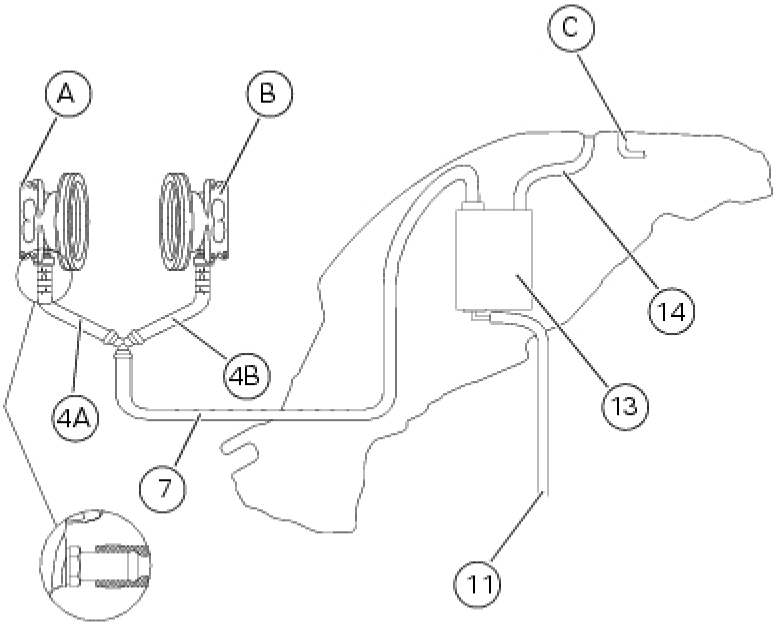
Diavel ABS	EVAPORATIVE EMISSIONS CANISTER
Diavel Carbon ABS	EVAPORATIVE EMISSIONS CANISTER

Important
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Evaporative emissions canister system (USA versions only)

USA models are equipped with an additional system with an evaporative emissions canister that prevents fuel fumes from being discharged into the atmosphere.

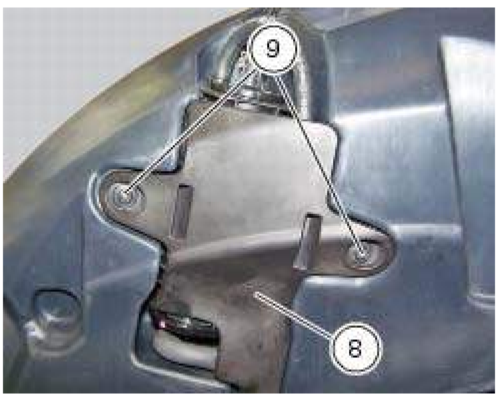
The breather hose (4) is connected to the Canister filter (1); when the fuel has been filtered, it is returned through the hose (2) to the horizontal (A) and vertical (B) intake manifolds via the hoses (2A) and (2B). Drainage pipe (C) and the hose (5) vent to the ground.
For correct positioning of the connection hoses consult the indications given below.



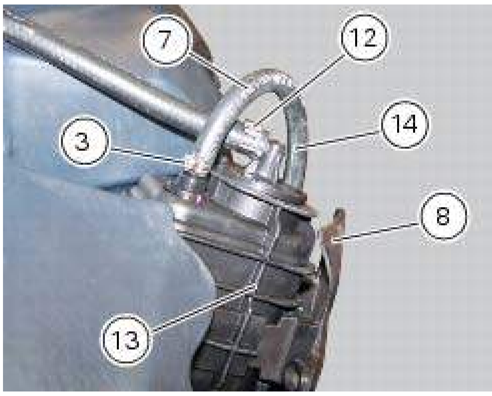
Removal of the evaporative emissions canister

Operations	Section reference
Remove the seat	5 - 3, Removal of the seat
Remove the tank covers	5 - 2, Removal of the fuel tank fairings

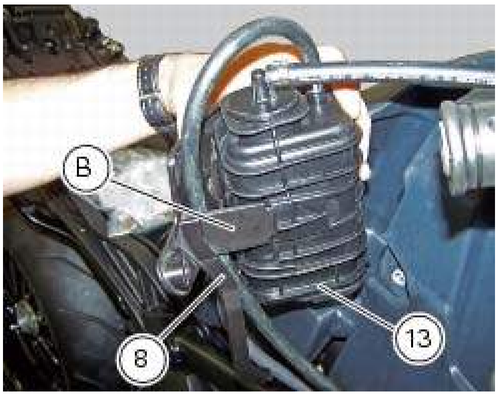
Loosen the screws (9) securing the plate (8) to the tank.

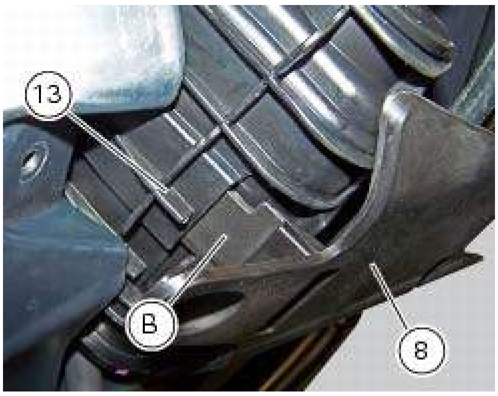


Slightly pull the plate (8) with the canister (13), remove the clamps (3) and (12) and connect hoses (7) and (14).

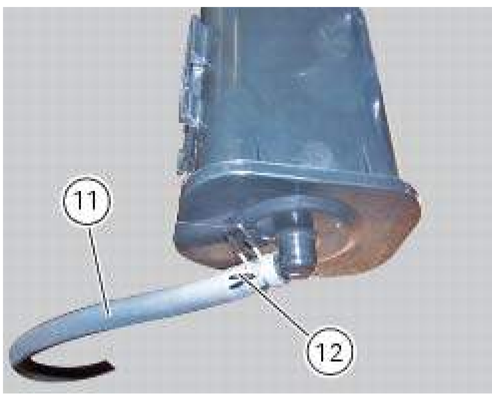


Release the retainers (B) of the plate (8) to remove it from the canister (13).





Disconnect the hose (11), removing the clamp (12).

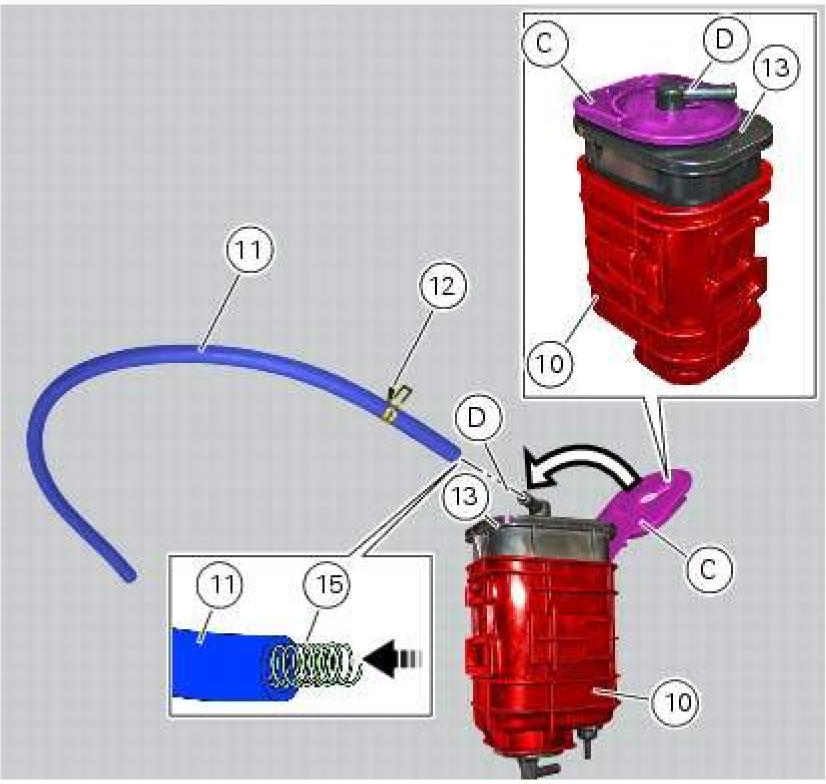


Should it be necessary to replace one or more hoses, follow the procedure outlined in the paragraph "Positioning the hoses / clamps and Canister filter" of this section to determine the hose routing on the vehicle.

If removed, refit the rubber cover (10) on canister (13) using lubricant specific for rubber.
Fix cover (10) by positioning the tab (C) as indicated.
Introduce the spring (15) inside the hose (11) and reinsert the hose on fitting (D).

Note

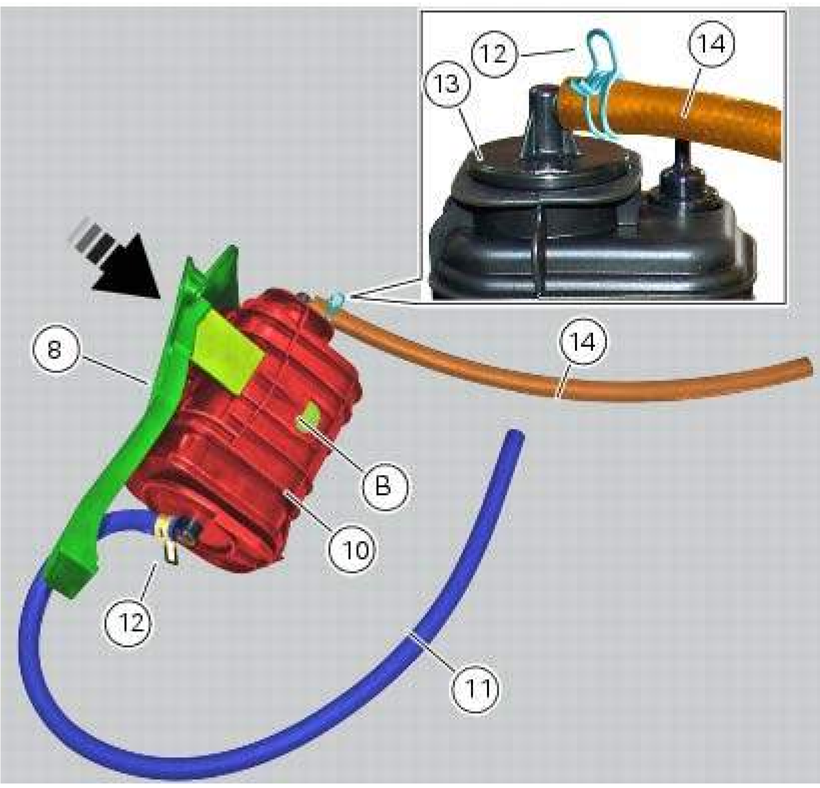
The spring (15) must be introduced on the side of hose (11) which will be introduced inside the fitting (D).



Fix the hose (11) with the clamp (12).
Fit the clamp (7) on the hose (14).
Mount the hose (14) on the upper fitting of the canister (13) and fix the hose (14) by means of the clamp (7).
Fit the plate (8) as indicated by inserting its lateral brackets (B) (on the right and left side) completely inside the slots on the rubber cover (10).

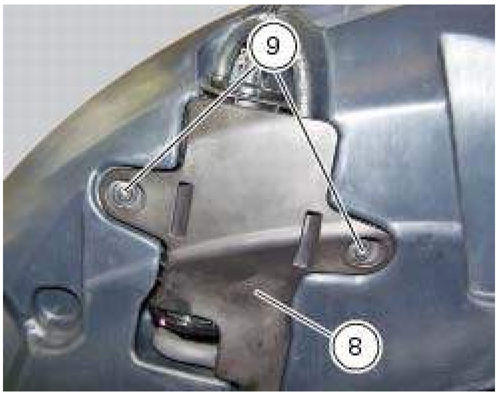
Note

In case of difficulties upon reassembly of the plate (8) we recommend to apply lubricant specific for rubber to the lateral brackets (B).



Place the plate (8) with the relevant canister on the tank and tighten the screws (9) to a torque of 4 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

Evaporative emissions canister

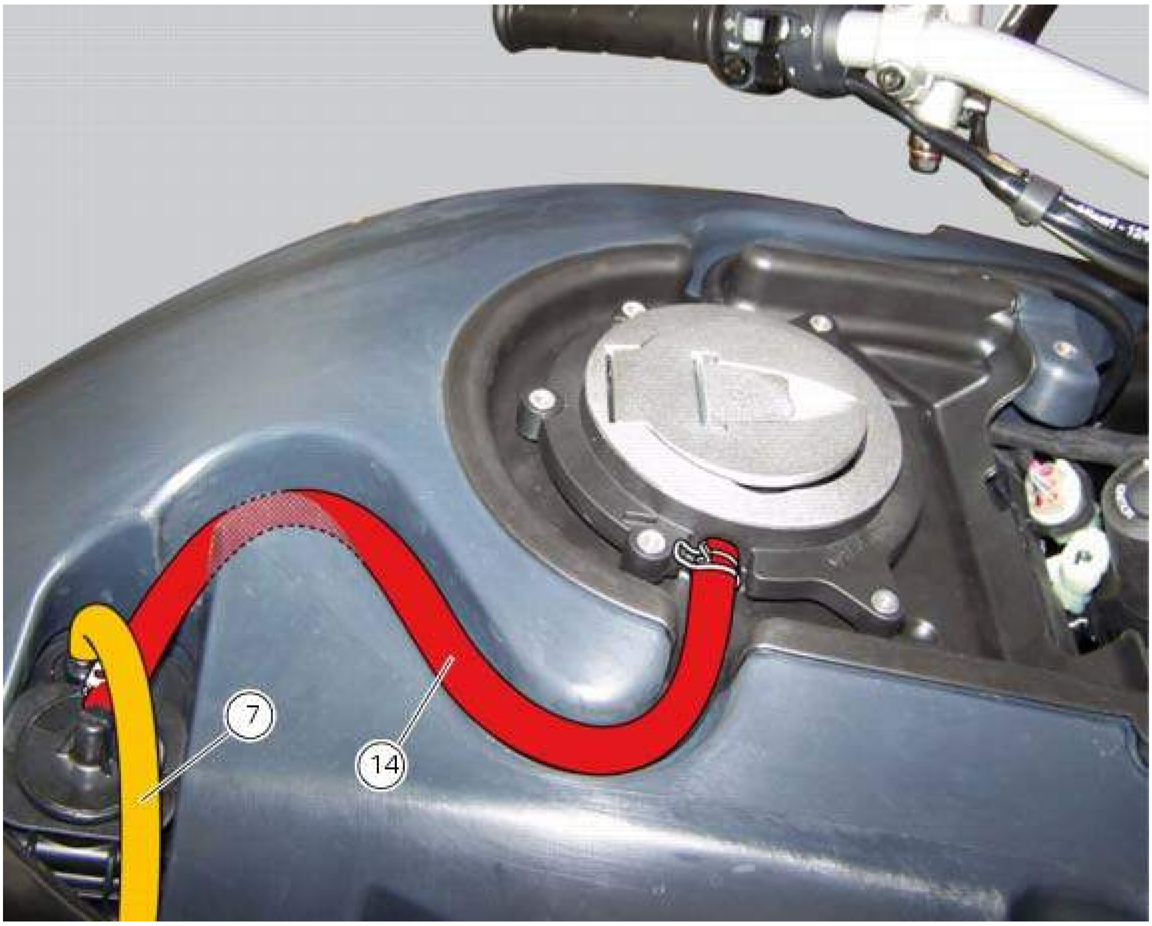


Refitting the evaporative emissions canister

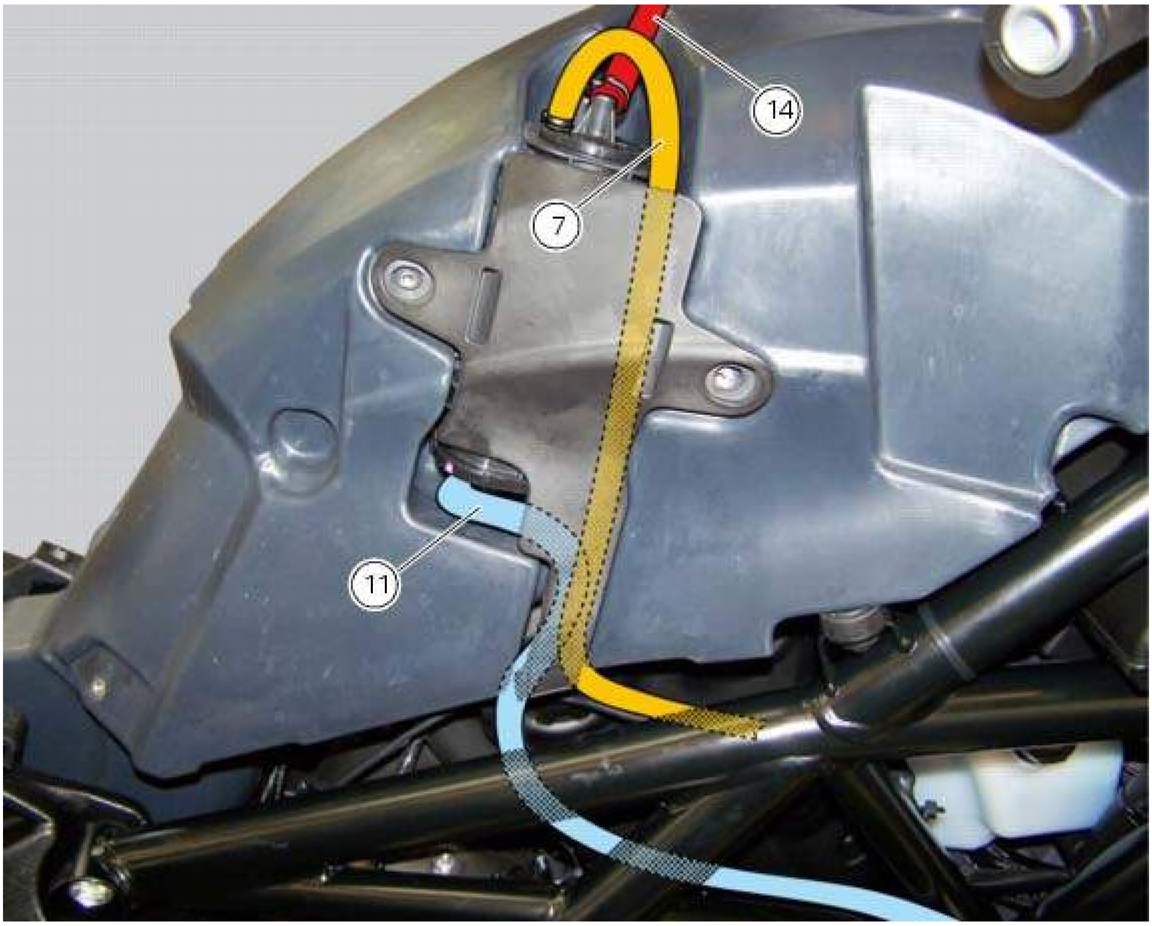
To refit, carry out the removal operations in reverse order, making sure to locate the hoses as shown in the figures at the end of the chapter.

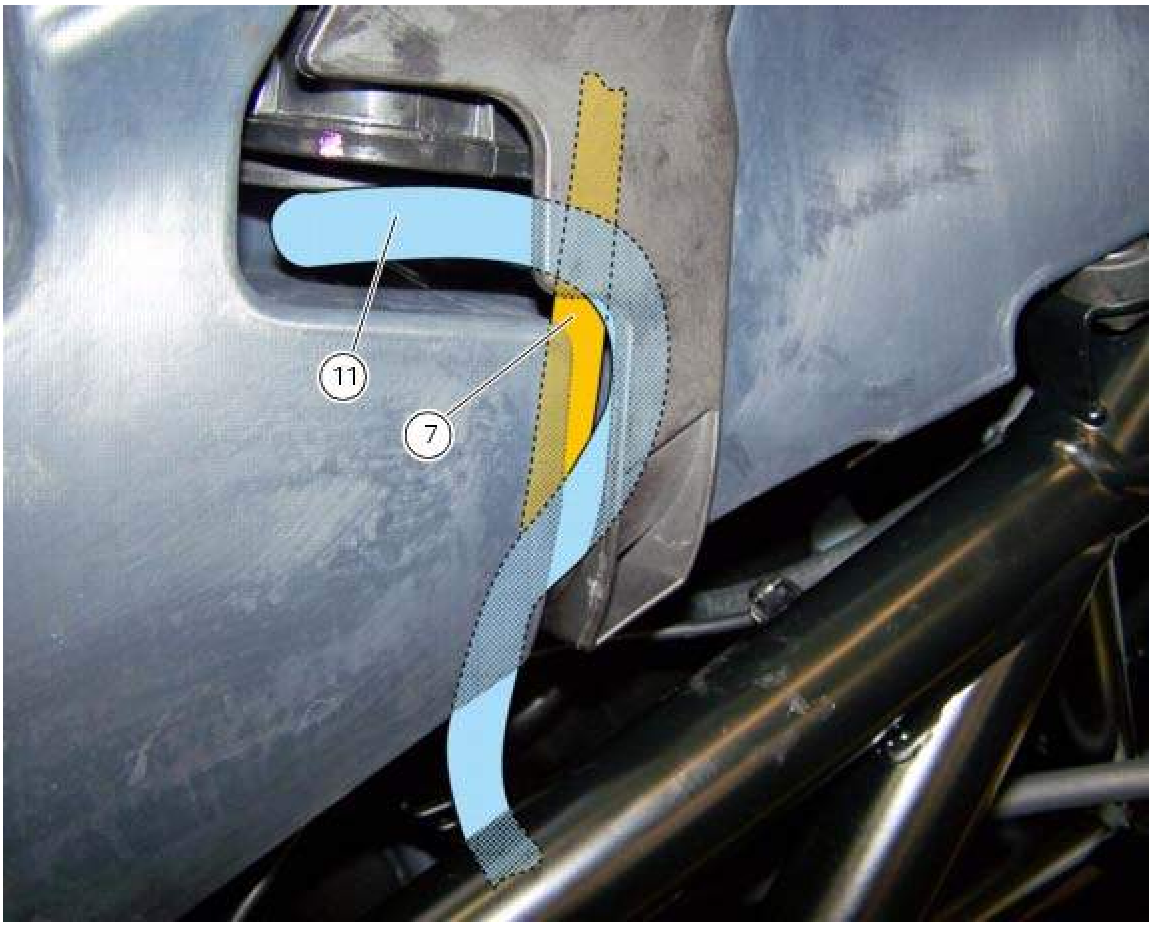
Operations	Section reference
Refit the fuel tank covers	5 - 2, Refitting the fuel tank fairings
Refit the seat	5 - 3, Refitting the seat

Positioning the hoses / clamps and Canister filter

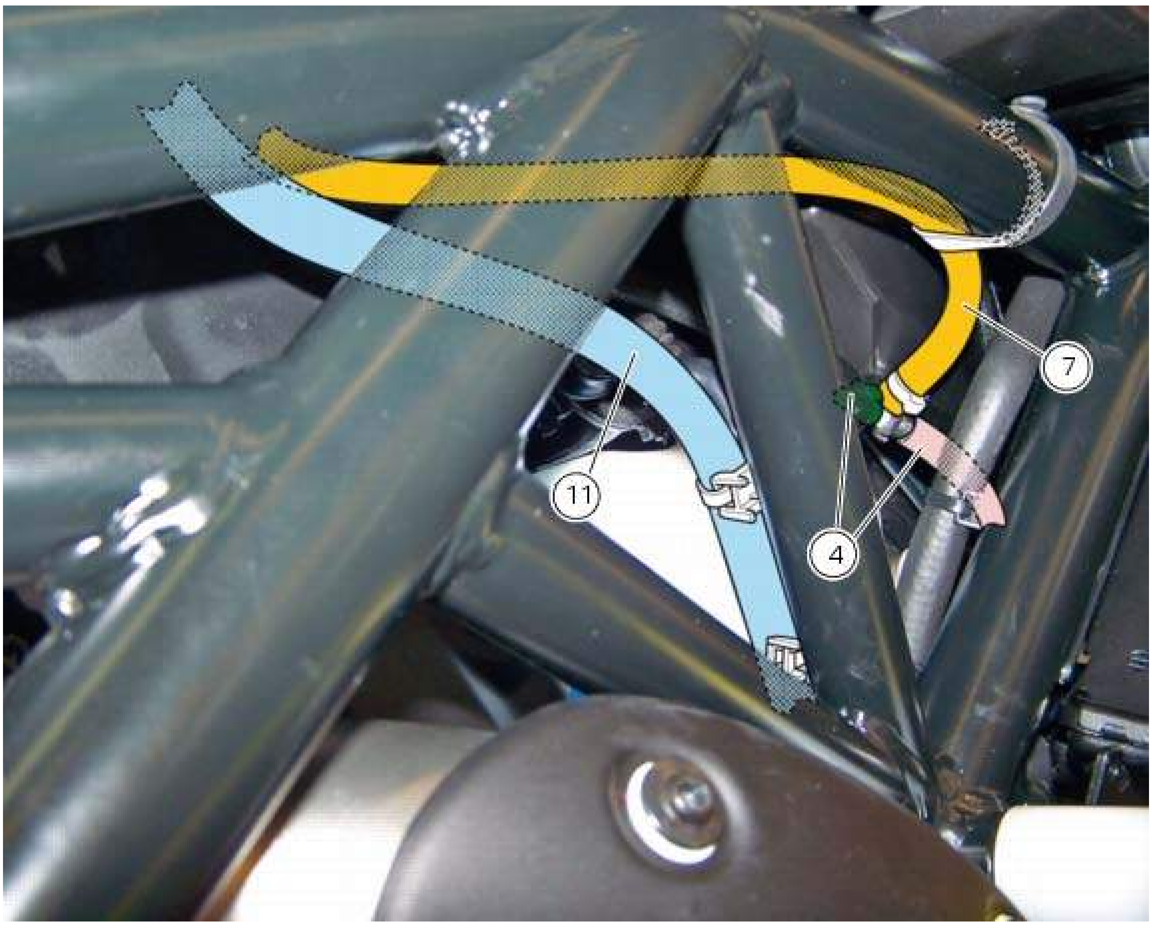


Evaporative emissions canister

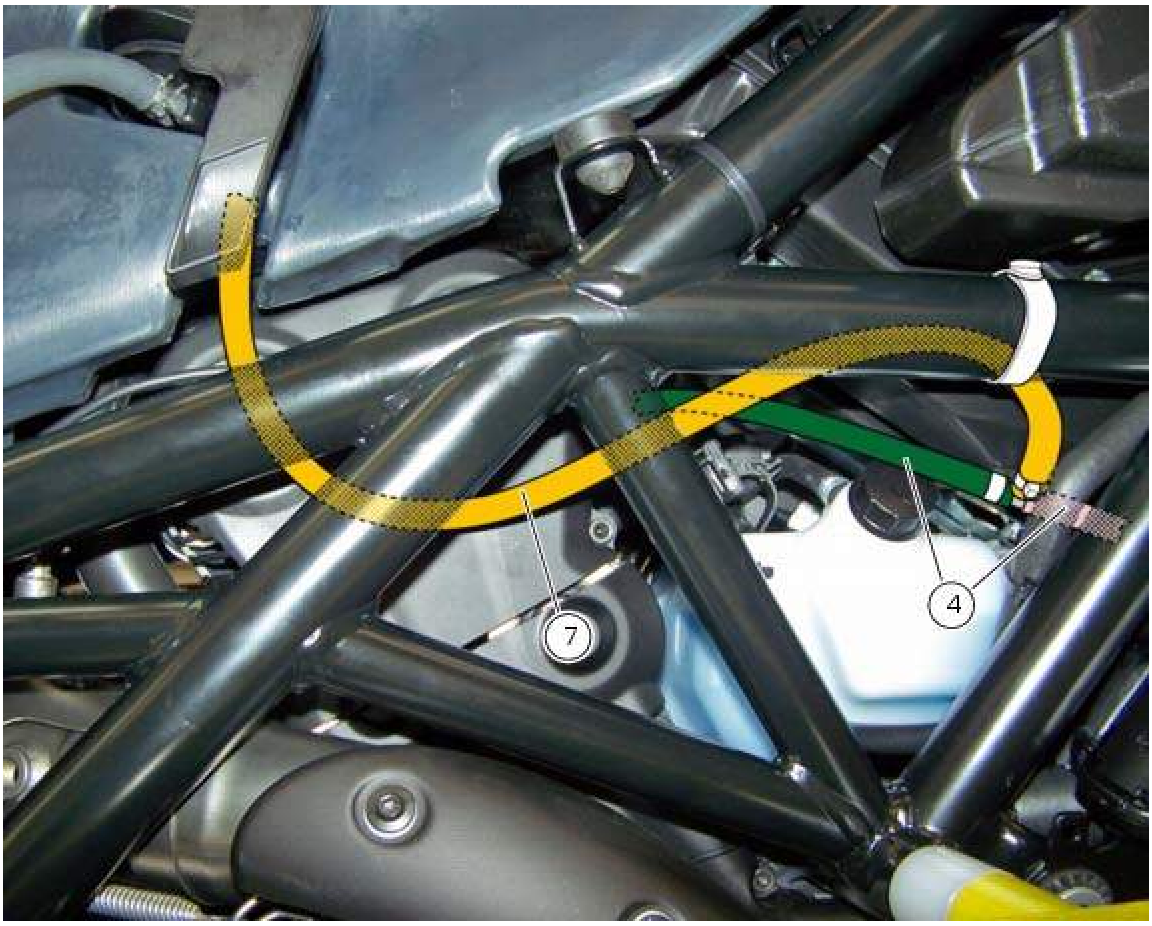


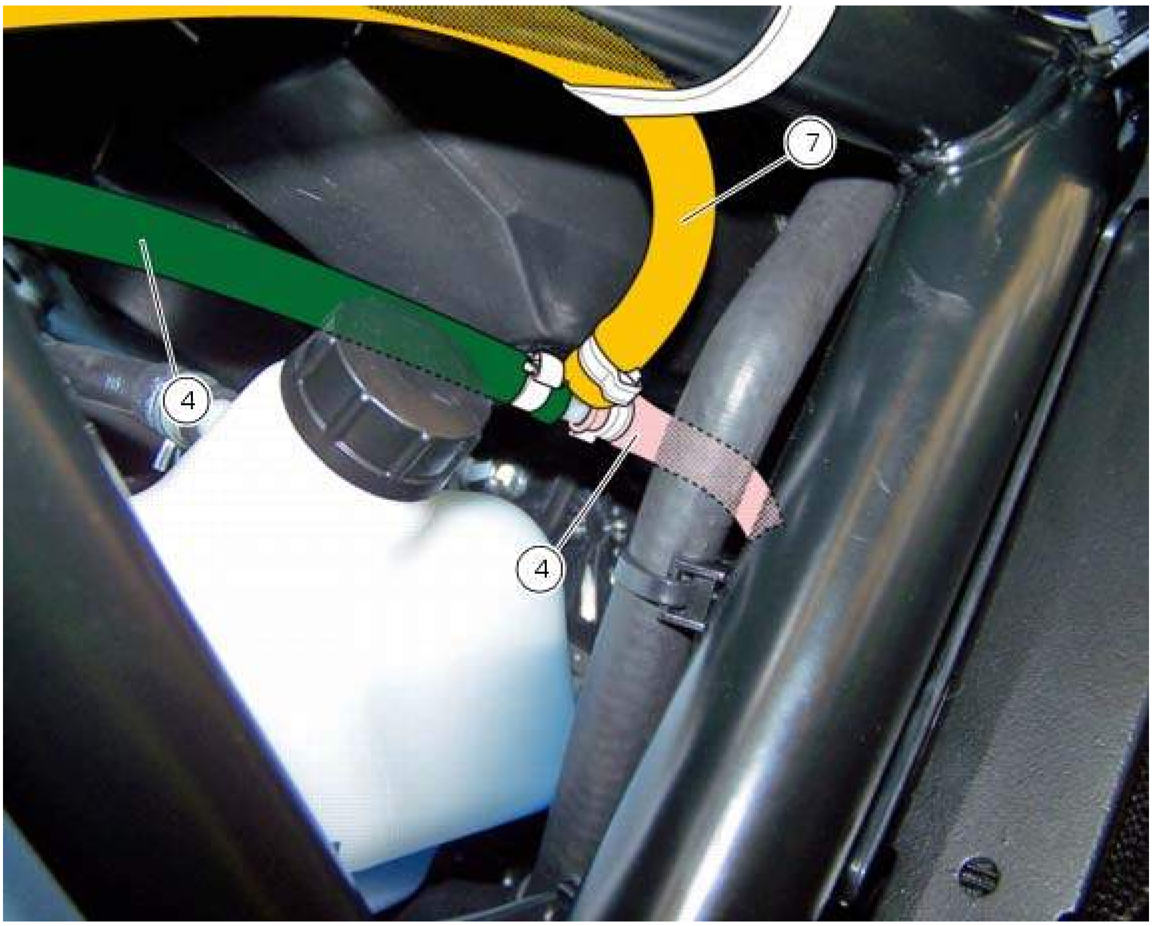


Evaporative emissions canister

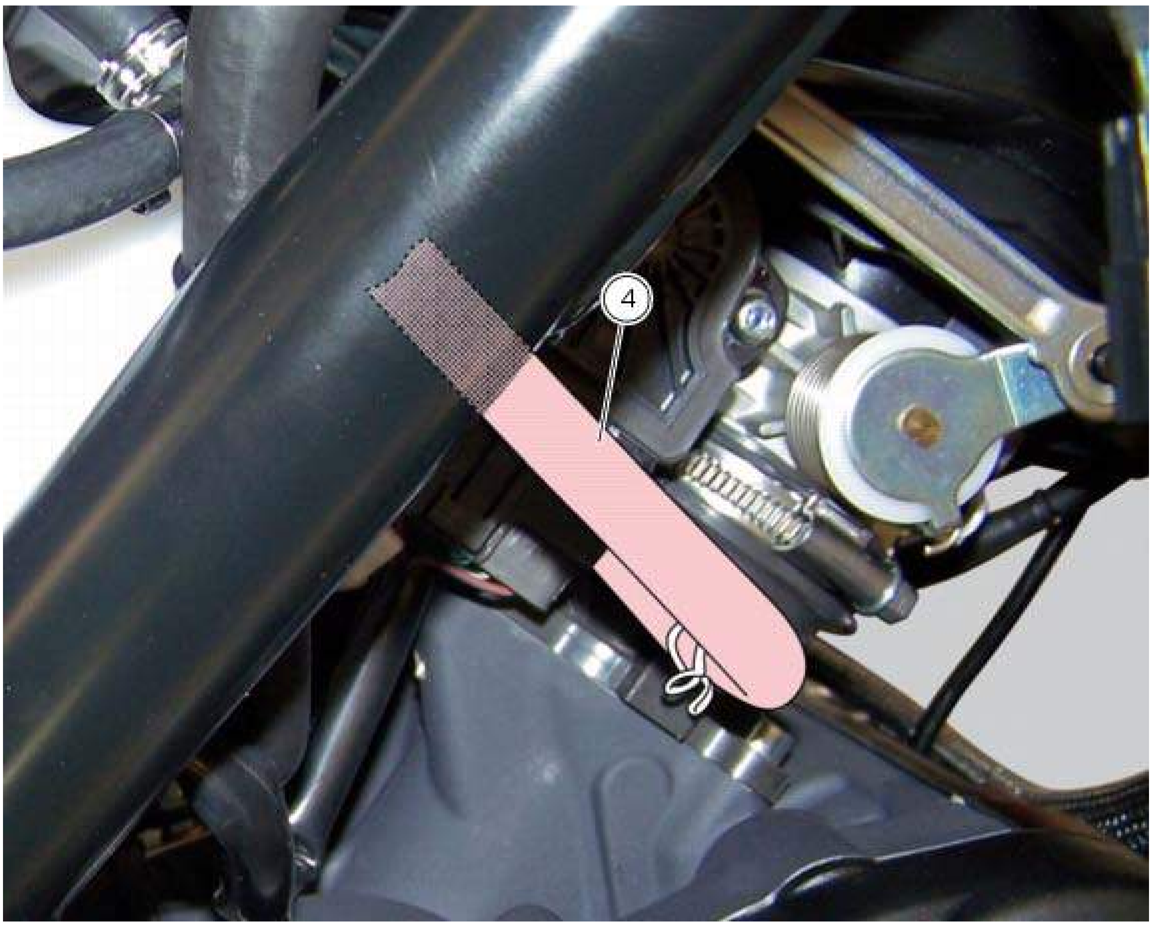


Evaporative emissions canister



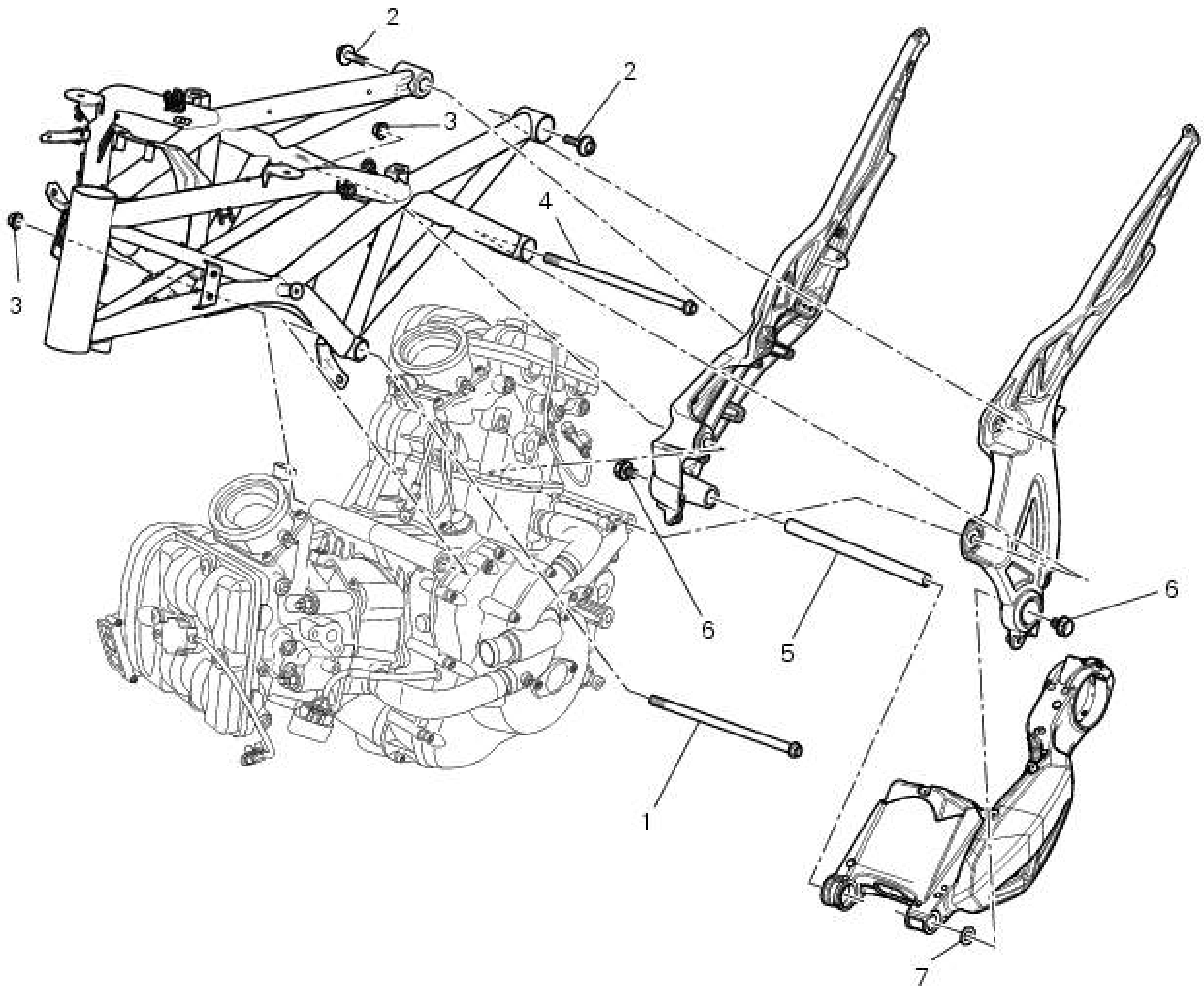


Evaporative emissions canister



09 - Impianto elettrico

1 -Removal–refitting of the engine assembly



1 Screw
2 Special screw
3 Nut
4 Screw
5 Swingarm pivot
6 Special screw
7 Washer

Spare parts catalogue

Diavel ABS	FRAME
Diavel ABS	SWINGARM
Diavel Carbon ABS	FRAME
Diavel Carbon ABS	SWINGARM

Important

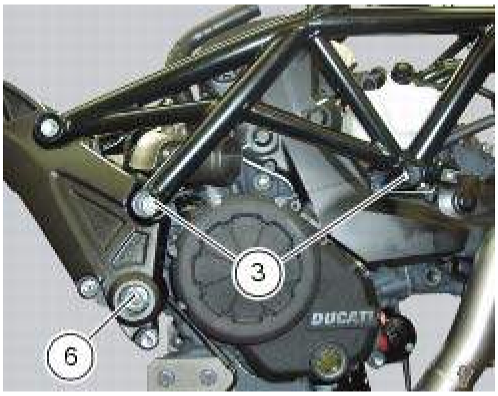
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

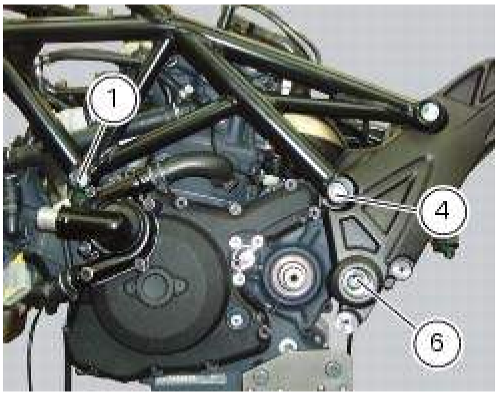
Removal of the engine

In order to remove engine you must first remove a series of other components from the motorcycle.
Most of these removal procedures are described in the relative sections of this manual.
The following flow chart illustrates the logical sequence in which the parts are to be removed from the motorcycle and a reference to the section where the removal procedure is described.
This section describes only the operations to be carried out after having removed all the parts listed in the flow chart.

Operations	Section reference
Remove the saddles	5 - 3, Removal of the seat
Remove air conveyor covers	8 - 7, Removal of the air filters
Remove the tank half covers	5 - 2, Removal of the fuel tank fairings
Remove the fuel tank	8 - 2, Removal of the fuel tank
Remove air conveyors	8 - 7, Removal of the air filters
Disconnect the throttle cable	7 - 8.1, Removal of the throttle twistgrip
Remove the airbox, the throttle body, the blow by and the oil breather tube	8 - 6, Removal the airbox and throttle body
Remove the fuel system and the injectors from the intake manifolds	8 - 6, Removal of the fuel injectors
Disconnect the cables from the coils	6 - 9, Ignition coils
Remove the oil cooler covers	5 - 5, Removal of belly fairing
Remove the oil cooler	9 - 2.2, Removal of the lubrication system
Disconnect the starter motor/solenoid cable	6 - 3, Removing the starter motor
Remove the support of the battery and of the electrical components	5 - 6, Reassembling the electrical components support
Remove the exhaust unit	8 - 8, Removal of the exhaust system
Bleed the lubrication system	4 - 3, Changing the engine oil and filter cartridge
Remove the oil pipes of the oil radiator from the engine block	9 - 2.2, Removal of the lubrication system
Empty the coolant out of the cooling system	4 - 3, Changing the coolant
Remove the pipes and the cooling system joints from the engine block	9 - 3.1, Removal of the cooling system hoses and unions
Remove the expansion reservoir	9 - 3.1, Removal of the expansion tank
Remove the gearchange control	7 - 9, Removal of the gearchange control
Remove the clutch transmission unit	7 - 8.2, Removal of the clutch transmission unit
Remove the front sprocket	7 - 14, Removing of the front sprocket
Remove the rear shock absorber support from the engine block	7 - 12, Removal of the rear shock absorber
Disconnect wiring connectors on the engine block	6 - 1, Routing of wiring on frame

Place a stand beneath the engine to support it during removal from the frame.
Loosen the nuts (3) on the right side of the frame, in correspondence to the engine upper supporting screws (1) and (4).
Block the special screw (6) of the swingarm shaft on the left side of the frame and at the same time undo the other special screw (6) on the right side.
Using the drift **88713.1074**, fully extract the swingarm shaft: from the LH side and recover the washer (**7**).
In this way the swingarm is not fixed to the engine any more, leave it connected to the frame.
Remove the upper supporting screws (1) and (4).





Withdraw the complete engine assembly from the frame by lowering it and pushing it forwards.

Refitting the engine

Refitting is the reverse of removal.

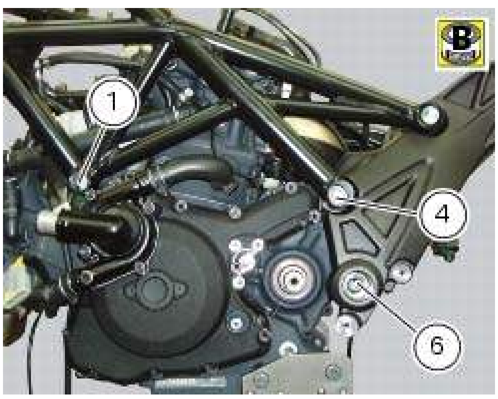
Important

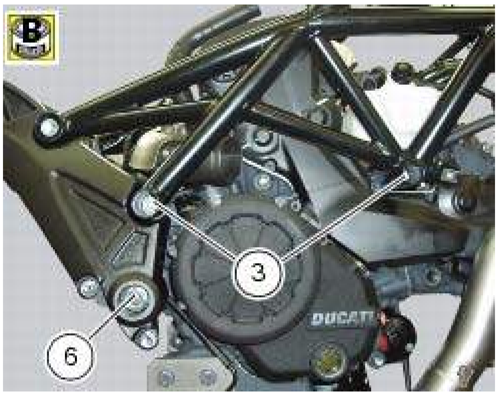
Apply recommended grease and tighten the special screws (6) to a torque of 60 Nm ± 5% (Sect. 3 - 3, Frame torque settings).

Tighten the nuts (3) to a torque of 48 Nm ± 5% (Sect. 3 - 3, Frame torque settings).

Warning

For the assembly sequence of nuts and screws refer to Sect. 7 - 17, Reassembling the frame and the lateral footrests.

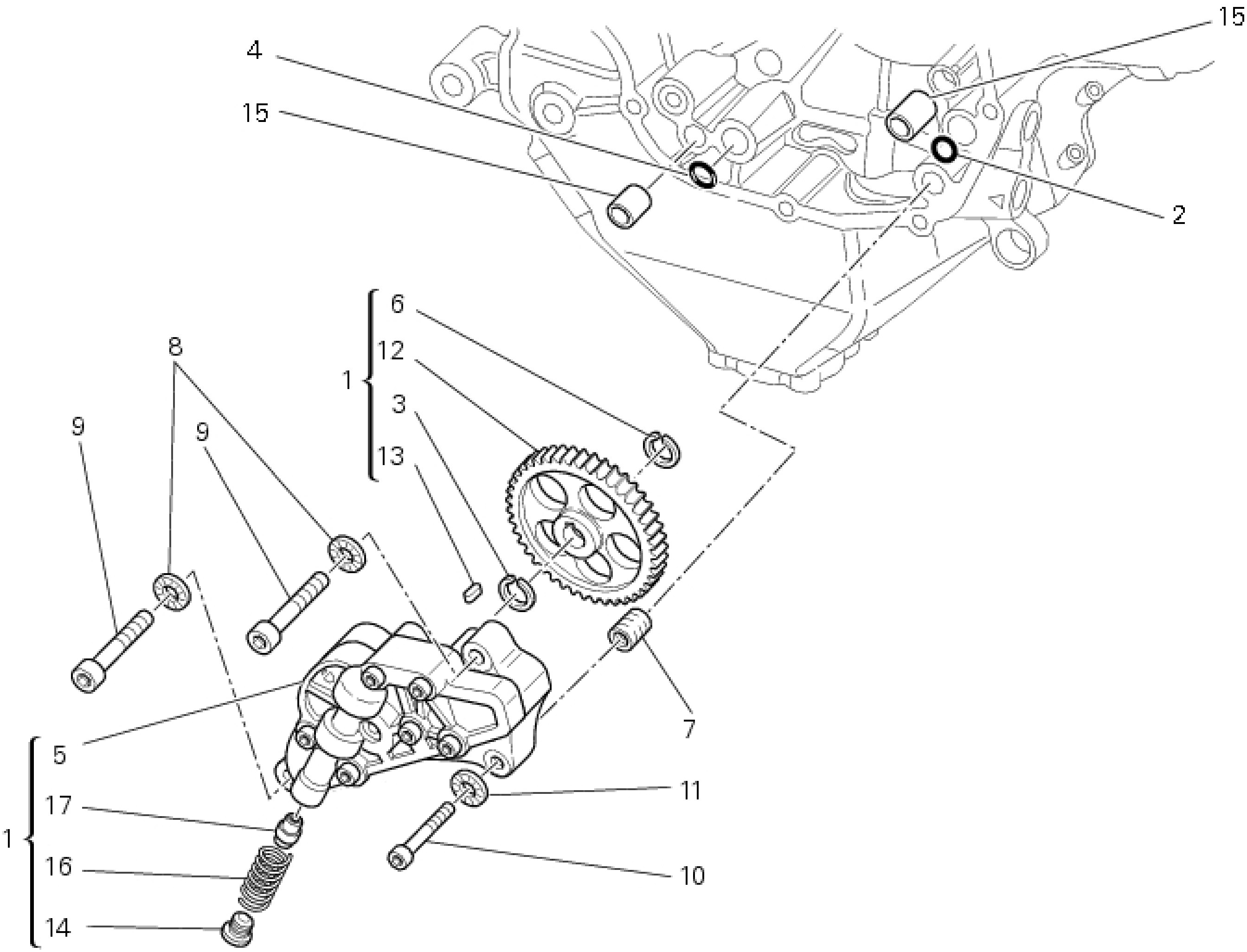




Refit the removed parts by performing the steps shown in the table and in the specific sections of the manual in reverse order.

Operations	Section reference
Connect wiring connectors on the engine block	6 - 1, Routing of wiring on frame
Refit the rear shock absorber support on the engine block	7 - 12, Refitting the rear suspension
Refit the front sprocket cover	7 - 14, Refitting the front sprocket
Refit the clutch transmission unit	7 - 8.2, Refitting the clutch transmission unit
Refit the gearchange control	7 - 9, Refitting the gearchange mechanism
Refit the water expansion reservoir	9 - 3.1, Refitting the expansion tank
Refit the pipes and the cooling system joints on the engine block	9 - 3.2, Refitting the cooling system hoses and unions
Refill the cooling system	4 - 3, Changing the coolant
Refit the oil pipes of the oil radiator on the engine block	9 - 2.2, Refitting the lubrication system
Refill the lubrication system	4 - 3, Changing the engine oil and filter cartridge
Refit the exhaust unit	8 - 8, Refitting the exhaust system
Refit the battery support with all electrical elements	5 - 6, Reassembling the electrical components support
Connect the starter motor/solenoid cable	6 - 3, Refitting the starter motor
Refit the oil cooler	9 - 2.2, Refitting the lubrication system
Refit the oil cooler covers	5 -5, Reassembly of belly fairing
Connect the cables of the coils	6 - 9, Ignition coils
Refit the injectors on the intake manifolds and reassemble the supply system	8 - 6, Refitting the injectors
Refit the oil breather pipe, the blow by, the throttle body and the airbox	8 - 6, Refitting the airbox and throttle body
Connect the throttle cable	7 - 8.1, Refitting the throttle twistgrip
Refit air conveyors	8 - 7, Refitting the air filters
Refit the fuel tank	8 - 2, Refitting the fuel tank
Reassemble the tank half covers	5 - 2, Refitting the fuel tank fairings
Reassemble air conveyor covers	8 - 7, Refitting the air filters
Refit the saddles	5 - 3, Refitting the seat

2.1 -Lubrication system: oil pump



1 Complete oil pump assembly
2 O-ring
3 Circlip
4 O-ring
5 Pump body
6 Circlip
7 Reducer bush
8 Spring washer
9 Screw
10 Screw
11 Spring washer
12 Pump drive gear
13 Key
14 By-pass plug
15 Locating bush
16 By-pass spring
17 By-pass valve

Spare parts catalogue

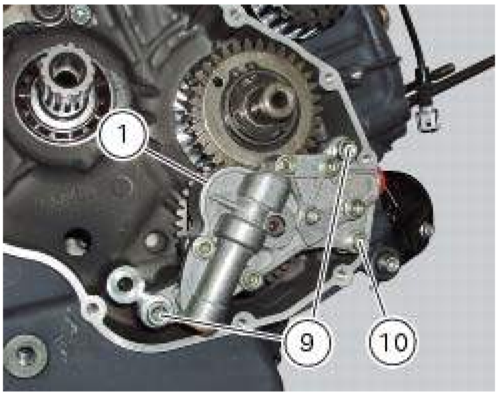
Diavel ABS	FILTERS AND OIL PUMP
Diavel Carbon ABS	FILTERS AND OIL PUMP

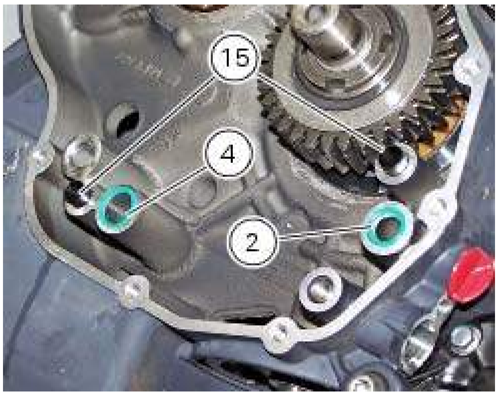
Important
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Removal of the oil pump

Operations	Section reference
Drain the oil from the lubrication system	4 - 3, Changing the engine oil and filter cartridge
Remove the clutch cover	9 - 6.2, Removal of the clutch-side crankcase cover

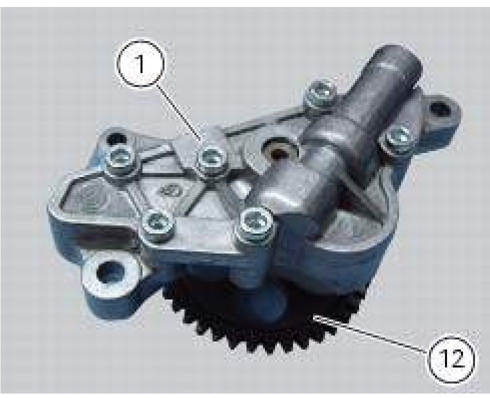
Undo and remove the screws (9) and (10) securing the pump assembly.
Remove the oil pump assembly (1) and extract the O-rings (2) and (4) from the crankcase half together with two locating bushes (15).





Disassembly of the oil pump

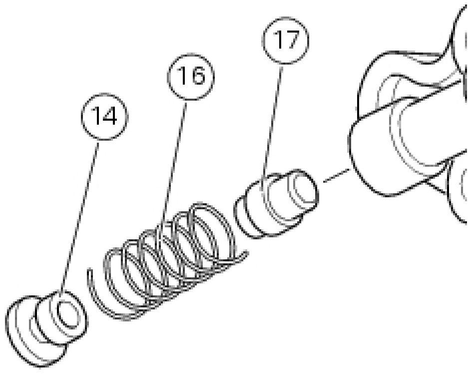
Hold the oil pump (1) in a vice taking care not to damage the drive gear (12).



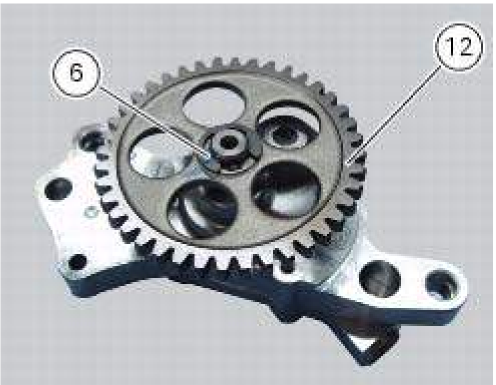
Warning

Make sure that vice jaws are faced with soft material.

Remove the plug (14) and extract the spring (16) and by-pass valve (17).

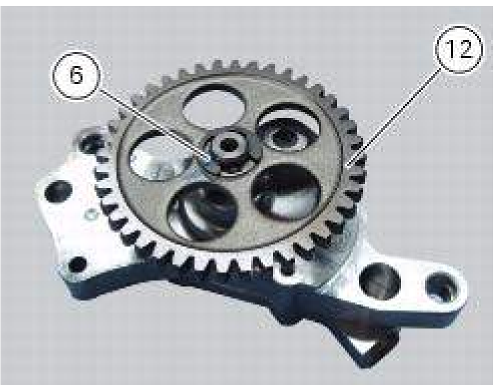


Check the condition of the above components.
Remove the circlip (6) and withdraw the pump drive gear (12).

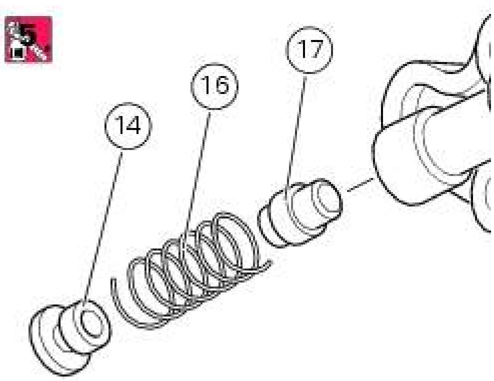


Reassembly of the oil pump

Check that the circlip (**3**) and tongue (**13**) are present on the pump.
Fit the pump drive gear (12) on to the oil pump and secure it by installing the circlip (6) in its groove.

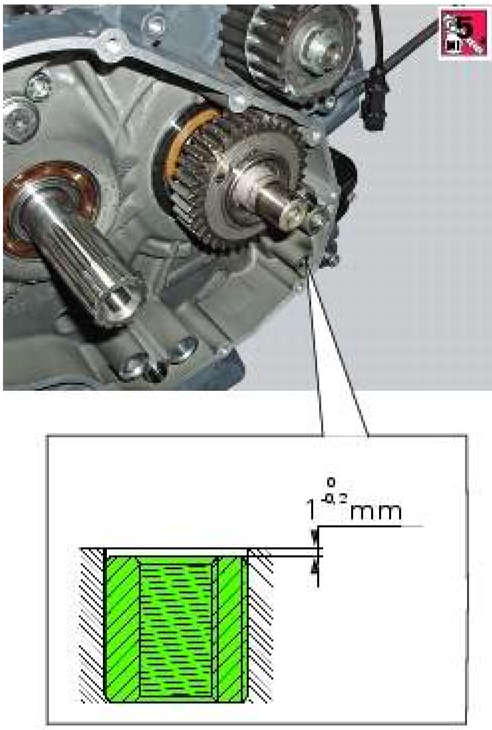


Insert the by-pass valve pump (17), the spring (16) and screw the plug (14). Tighten the plug (14) to a torque of 17 Nm (Min. 15 Nm - Max. 19 Nm) (Sect. 3 - 3, Engine torque settings) applying a medium strength threadlocker.

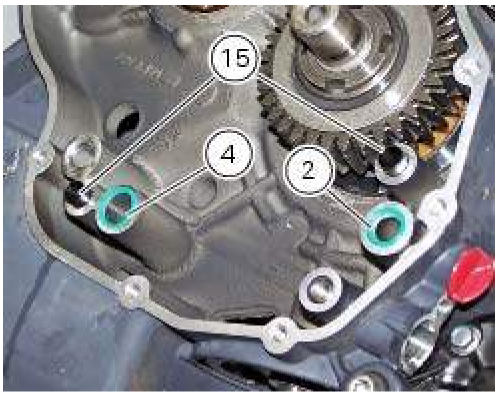


Refitting the oil pump

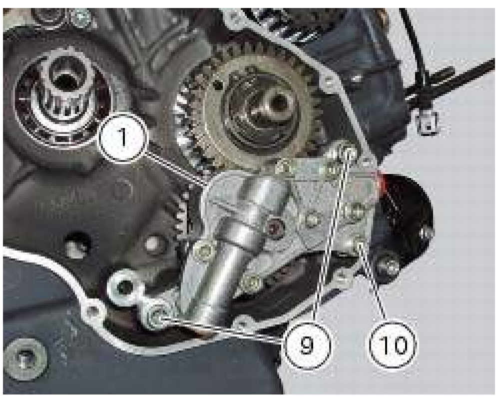
If removed, apply specific threadlocker on the bushing (7) outer thread, and screw it in the crankcase half, observing the height.



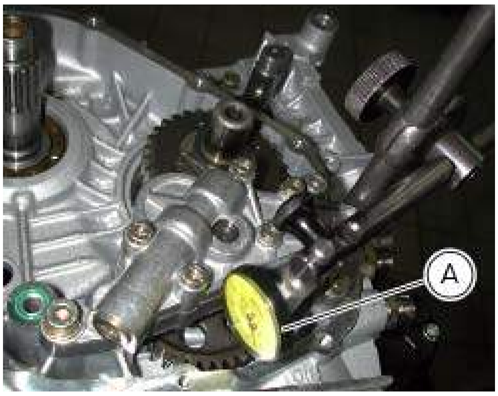
Position the reference bushings (15) and the oil sealing O-rings (2) and (4) according to the crankcase lubrication channels.



Position the oil pump on the crankcase and tighten screws (9) to a torque of 26 Nm (Min. 23 Nm - Max. 29 Nm) and the screw (10) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings).

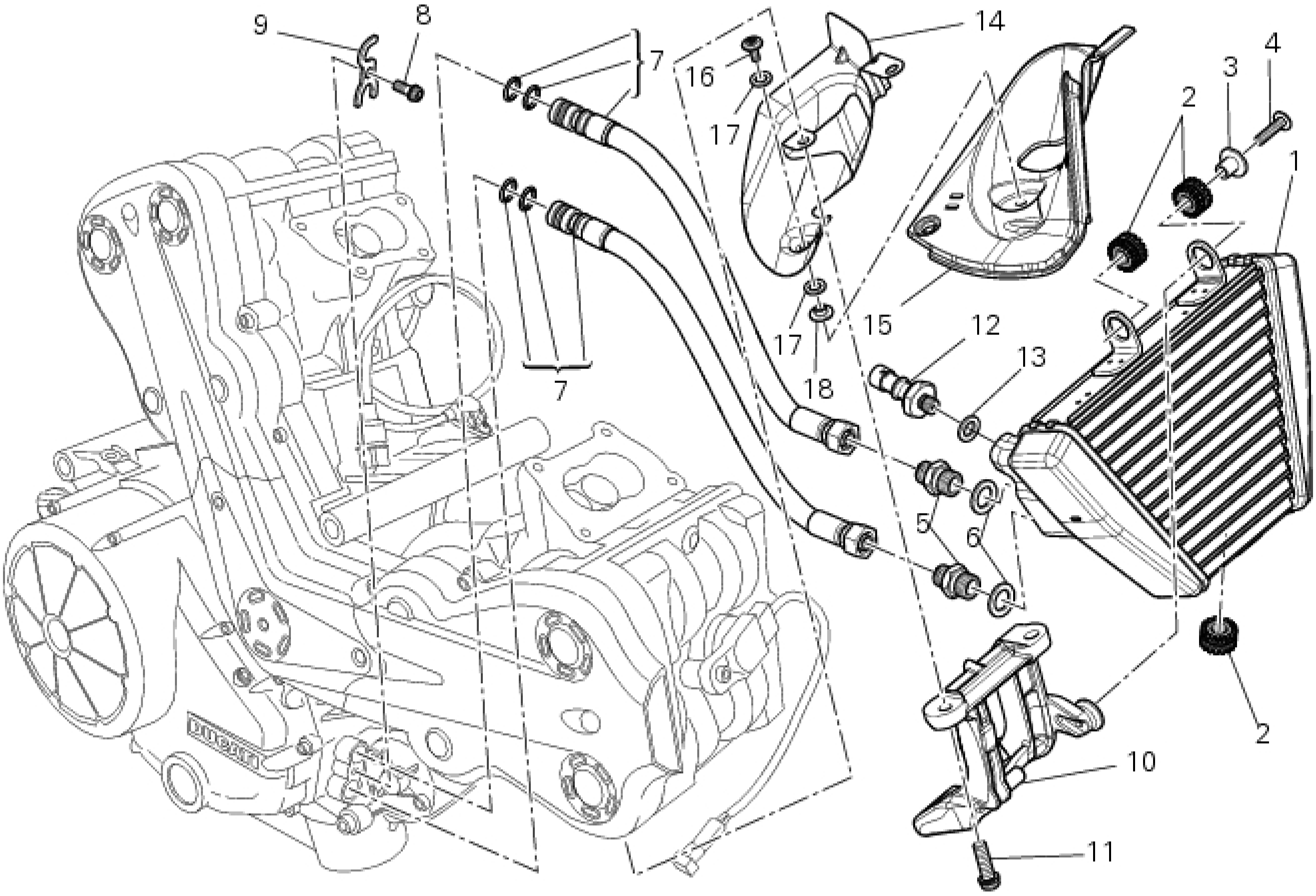


Check the gear clearance with the driving pinion by fixing a dial gauge (A), equipped with the appropriate traces, to the crankcase half.
Position the dial gauge stylus on one tooth of oil pump gear and set the gauge to zero in this position.
Move the gear slightly to measure the backlash; take four readings in diametrically opposed positions of the gear.
The clearance should be 0.10 mm.



Operations	Section reference
Refit the clutch cover	9 - 6.2, Refitting the clutch-side crankcase cover
Fill the lubrication system with oil	4 - 3, Changing the engine oil and filter cartridge

2.2 -Lubrication system: oil cooler



1 Oil cooler
2 Vibration damper mount
3 Spacer
4 Screw
5 Nipple
6 Aluminium gasket
7 Oil delivery hose
8 Screw
9 Plate
10 Bracket
11 Screw
12 Engine oil pressure sensor
13 Sealing washer
14 Heat guard
15 Exhaust protection
16 Screw
17 Washer
18 Spacer

Spare parts catalogue

Diavel ABS	OIL COOLER
Diavel Carbon ABS	OIL COOLER

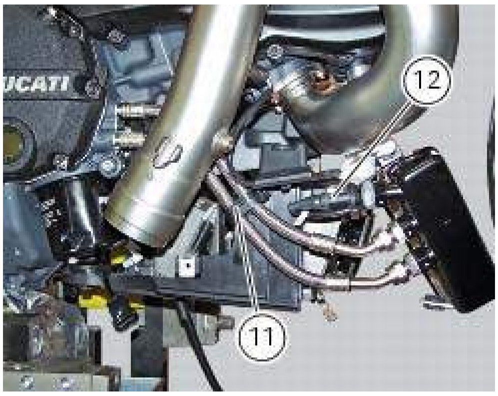
Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

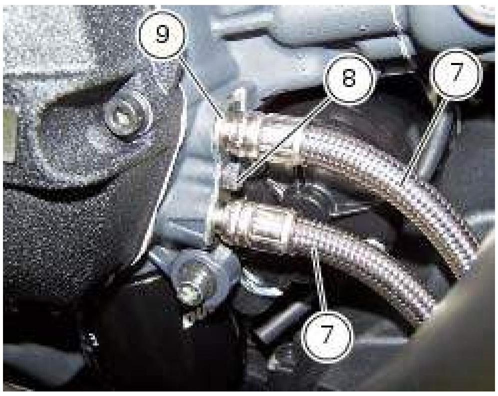
Removal of the lubrication system

Operations	Section reference
Remove the oil cooler covers	5 - 5, Removal of belly fairing
Drain the oil from the lubrication system	4 - 3, Changing the engine oil and filter cartridge

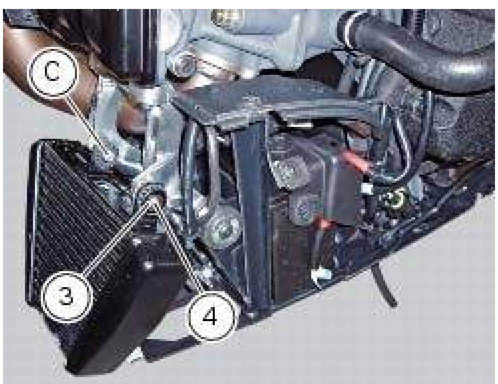
Disconnect the sensor (12) of the main wiring.
Open the pipe grommet (11).

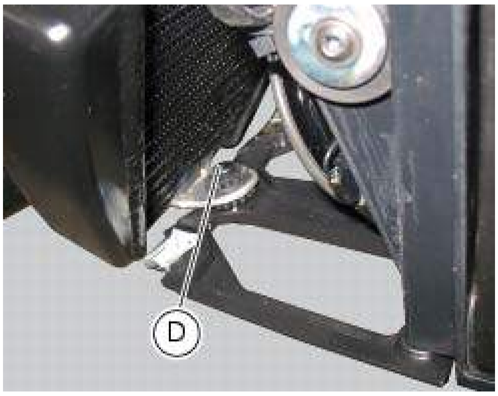


Undo the screw (8) and slide out the plate (9).
Slide the tubes (7) out of the half-casing having care not to damage the tubes O-rings (A) that guarantee the coupling sealing.

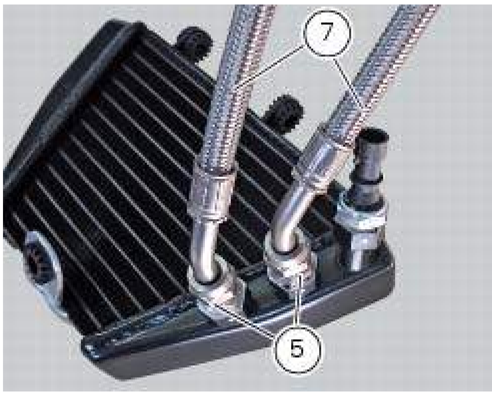


Undo and remove the screw (4) with the spacer (3). Remove the radiator by sliding it out of pins (C) and (D).





Loosen the nuts (G) of the pipes (7) from the nipples (5) and disconnect it from the radiator.
Loosen the nipples (5) on the radiator and collect the gaskets (**6**).



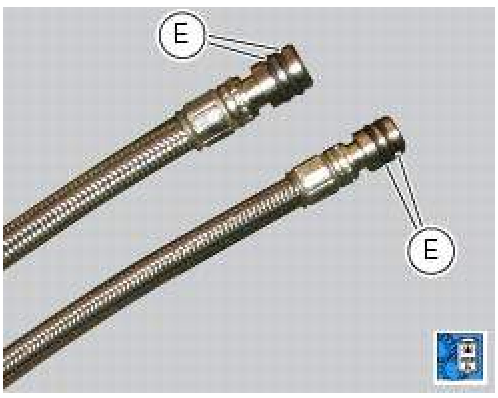
Oil cooler inspection

Visually inspect the oil cooler. Renew the cooler at any sign of damage or leaks.

Refitting the lubrication system

Note

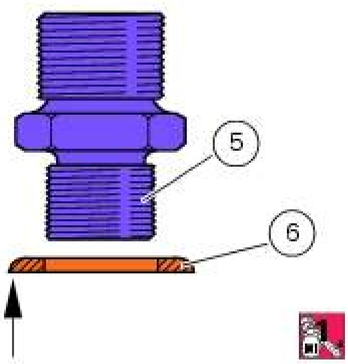
Before fitting the pipes (7), it is recommended to check the presence of the O-rings (E). Lubricate them by using engine oil.



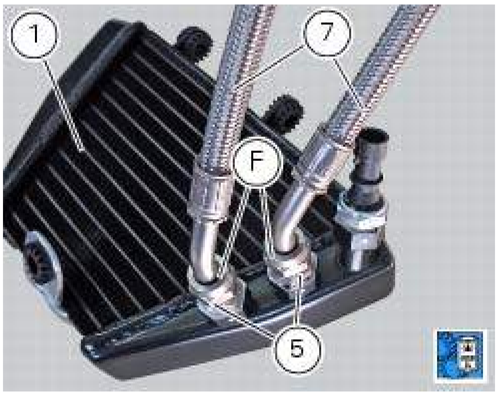
If the nipples (5) have been removed from the radiator insert a washer (6) on each nipple (5) and apply specific threadlocker on threads on the radiator side.

Note

The washers (6) must be inserted on the side of the nipples (5) which represent the thread with the smaller diameter, and must be oriented with the cutting edge to the radiator.



Start the nipples (5) on the oil cooler (1) and tighten them to a torque of 23 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Lubricate the nipples threads (5) with engine oil.
Attach the hoses to the nipples (5), finger-tightening the ring nuts (F) of the hoses on the nipples.
Tighten the ring nuts (F) to a torque of 18 Nm ± 5% (Sect. 3 - 3, Frame torque settings).

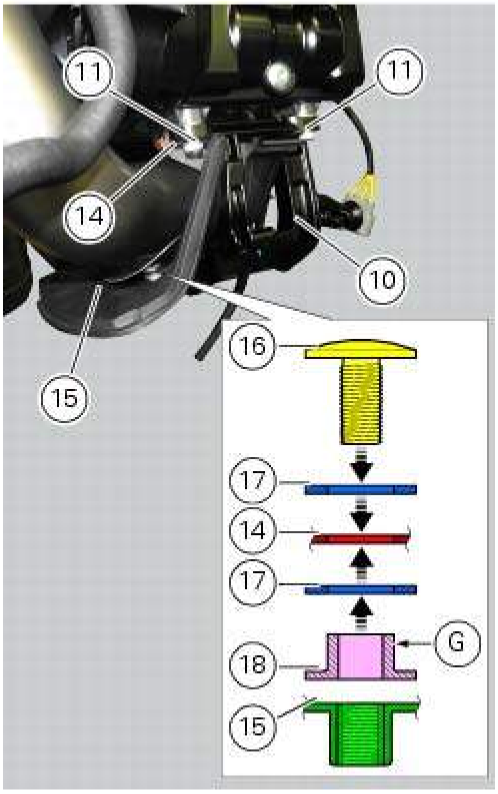


If the horizontal exhaust heat guard assembly was removed, on refitting insert the screw (16) with a washer (17) in heat guard (14) to join it to the exhaust protection (15), and then fit the other washer (17) with spacer (18) on the protruding end of the screw.

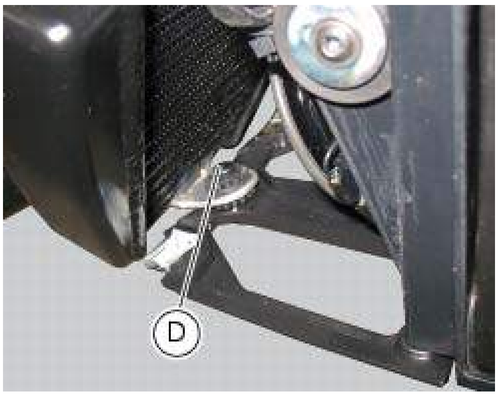
Note
The spacer (18) must be oriented with the collar (G) facing the heat guard (14).

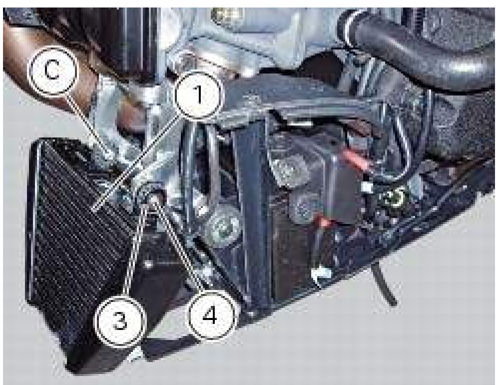
Fit the heat guard (14) on the exhaust protection (15) by tightening the screw (16) to a torque of 3 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

Fit the heat guard (14) and heat protection (15) assembly on the horizontal cylinder head with support (10) by tightening the screw (11) to a torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

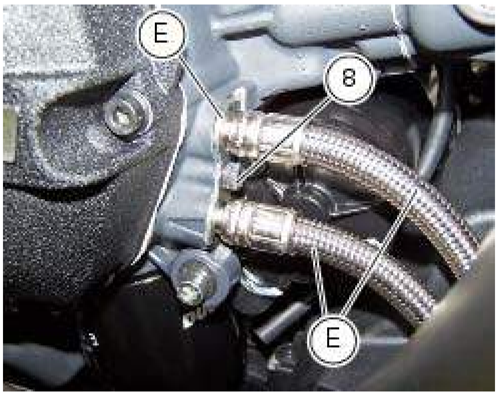


Check that the vibration damper mounts are present on the oil cooler (2).
Fit the oil cooler (1) by inserting it first into pins (C) and (D) of the supporting bracket.
If you encounter any difficulties, apply lubricant for rubber to the pin (D).
Insert the spacer (3), the screw (4) and start the screw (4).

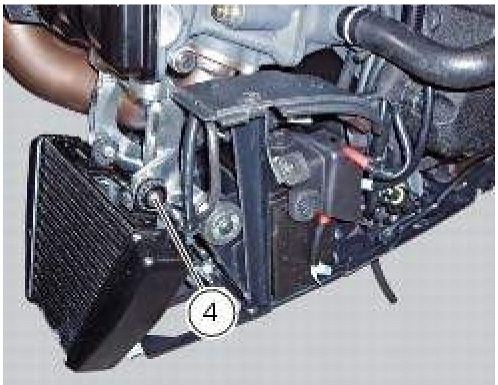




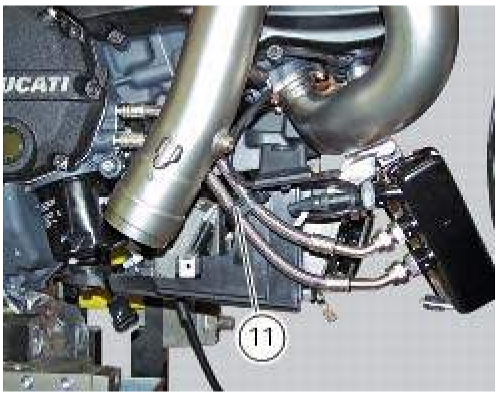
Position the pipes (7) in the crankcase half. Position the plate (9).
Tighten the screw (8) to the torque of 10 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



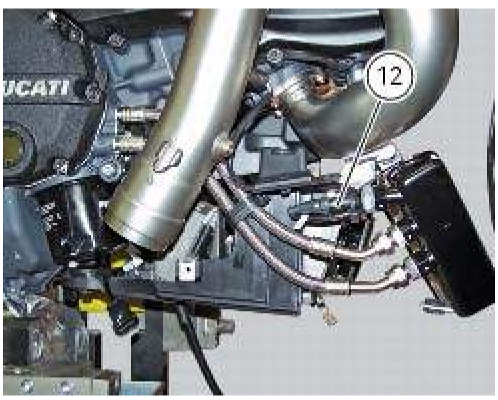
Tighten the screw (4) to the torque of 6 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



Close the pipe grommet (11).

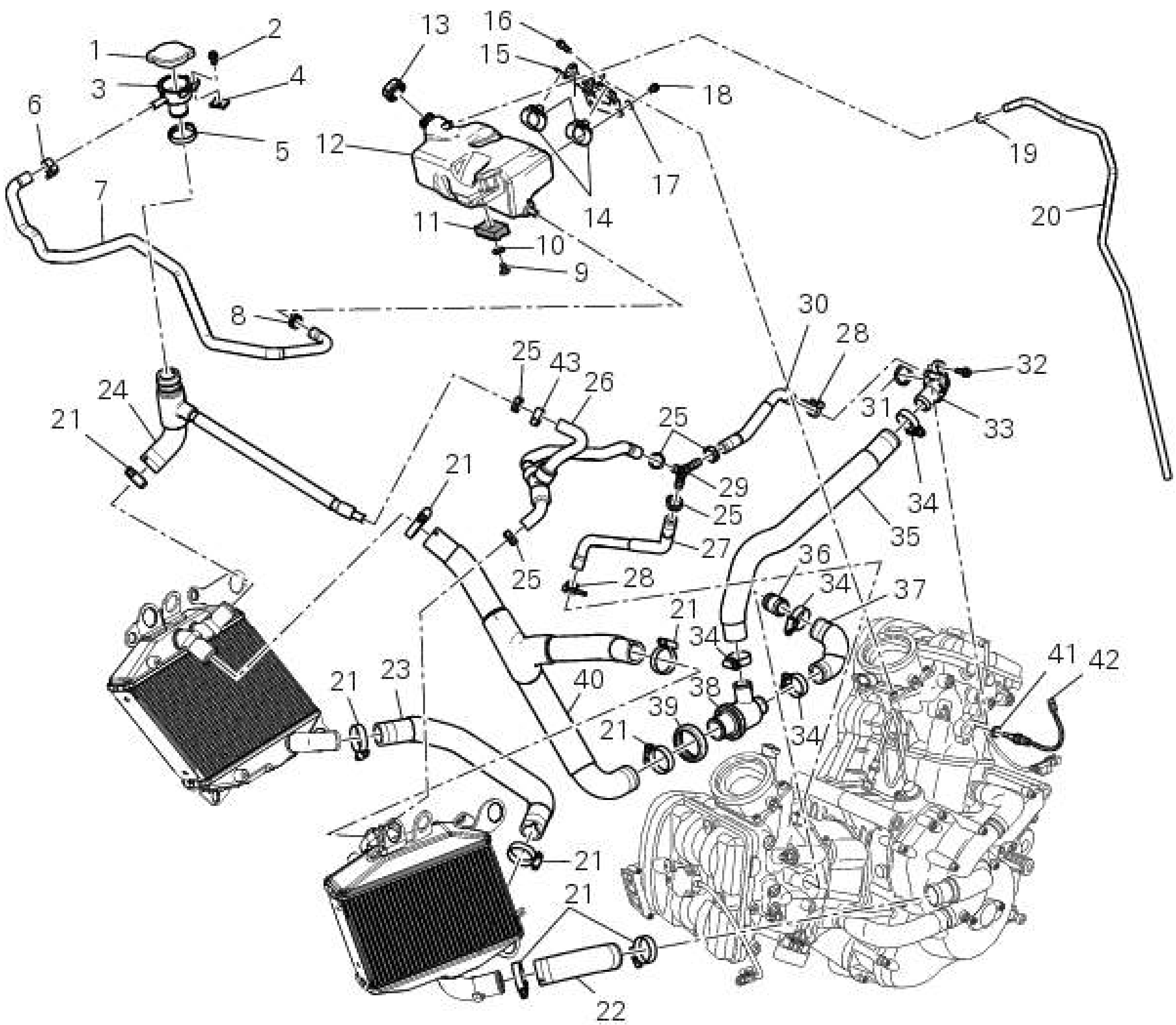


If previously removed, place the sensor (12) with washer (**13**) on cooler and tighten it to a torque of 19 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Connect the sensor (12) to the main wiring.



Operations	Section reference
Fill the lubrication system	4 - 3, Changing the engine oil and filter cartridge
Refit the oil cooler covers	5 - 5, Reassembly of belly fairing

3.1 -Cooling system: coolant expansion tank



1 Plug
2 Screw
3 Fuel filler flange
4 Clip nut
5 Clamp
6 Hose clip
7 Valve/tank hose
8 Clamp
9 Screw
10 Spacer
11 Rubber mounting
12 Expansion reservoir
13 Filler cap
14 Hose clip
15 Support
16 Screw
17 Washer
18 Screw
19 Hose clip
20 Breather hose
21 Clamp
22 Pump/radiator sleeve
23 Radiator/radiator sleeve
24 Radiator/plug sleeve
25 Clamp
26 Breather pipe (front)
27 Breather pipe (lower)
28 Hose clip
29 Y-fitting
30 Breather pipe (rear)
31 O-ring
32 Screw

33 Water outlet fitting (vertical)
34 Clamp
35 Thermostat/cylinder head sleeve (vertical)
36 Fuel filler flange
37 Thermostat/cylinder head sleeve (horizontal)
38 Thermostat
39 Thermostat protection ring
40 Radiator/thermost. sleeve
41 Copper gasket
42 Temperature sensor
43 Clamp

Spare parts catalogue

Diavel ABS	COOLING SYSTEM
Diavel ABS	EXPANSION RESERVOIR
Diavel Carbon ABS	COOLING SYSTEM
Diavel Carbon ABS	EXPANSION RESERVOIR

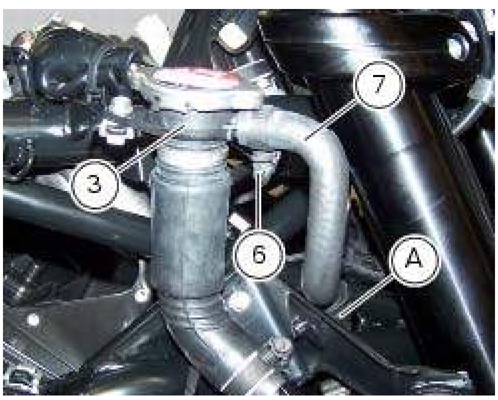
Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

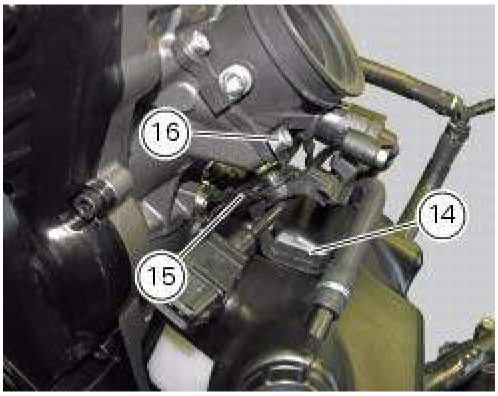
Removal of the expansion tank

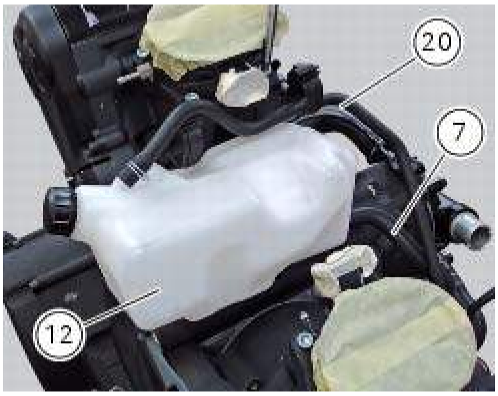
Operations	Section reference
Remove the saddles	5 - 3, Removal of the seat
Remove air conveyor covers	8 - 7, Removal of the air filters
Remove the tank half covers	5 - 2, Removal of the fuel tank fairings
Remove the fuel tank	8 - 2, Removal of the fuel tank
Remove air conveyors	8 - 7, Removal of the air filters
Disconnect the throttle cable	7 - 8.1, Removal of the throttle twistgrip
Remove the airbox, the throttle body, the blow by and the oil breather tube	8 - 6, Removal the airbox and throttle body
Remove the fuel system and the injectors from the intake manifolds	8 - 6, Removal of the fuel injectors
Empty the coolant out of the cooling system	4 - 3, Changing the coolant

Loosen the clamp (6), open the hose guide (A) and slide the hose (7) out of the radiator.

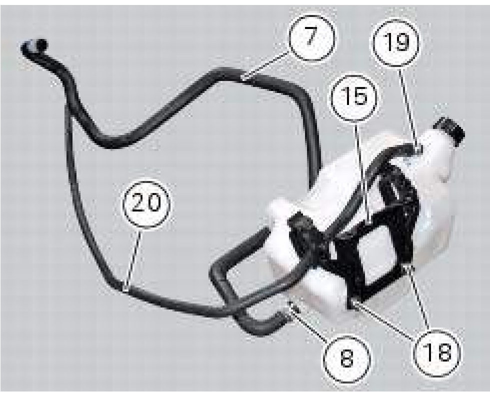


Open clamps (14) and release the hoses that pass through them.
Loosen the screws (16).
Remove the tank (12) with its hoses (7) and (20) and the support (15).



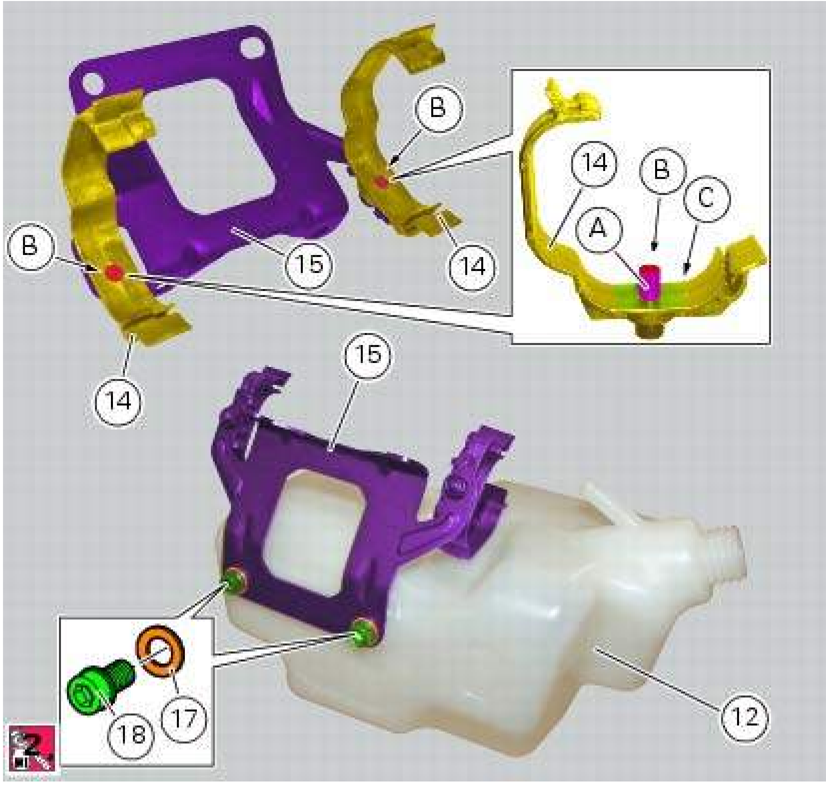


Loosen the clamp (19) to remove the hoses (7) and (20) from the tank.
Loosen the screws (18) and remove the supporting plate (15).



Refitting the expansion tank

If the support (15) has been removed, place the hose clamps (14) on the bracket (15) orienting them as indicated.
Fully press the pins (A) to block the clamps (14) until pins surfaces (B) are at the same level of the clamps (14) surfaces.
Apply recommended threadlocker to the thread of the screws (18) and insert them into washers (17).
Place the bracket (15), as indicated, on the expansion reservoir (12) and tighten the screws (18) to a torque of 5 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

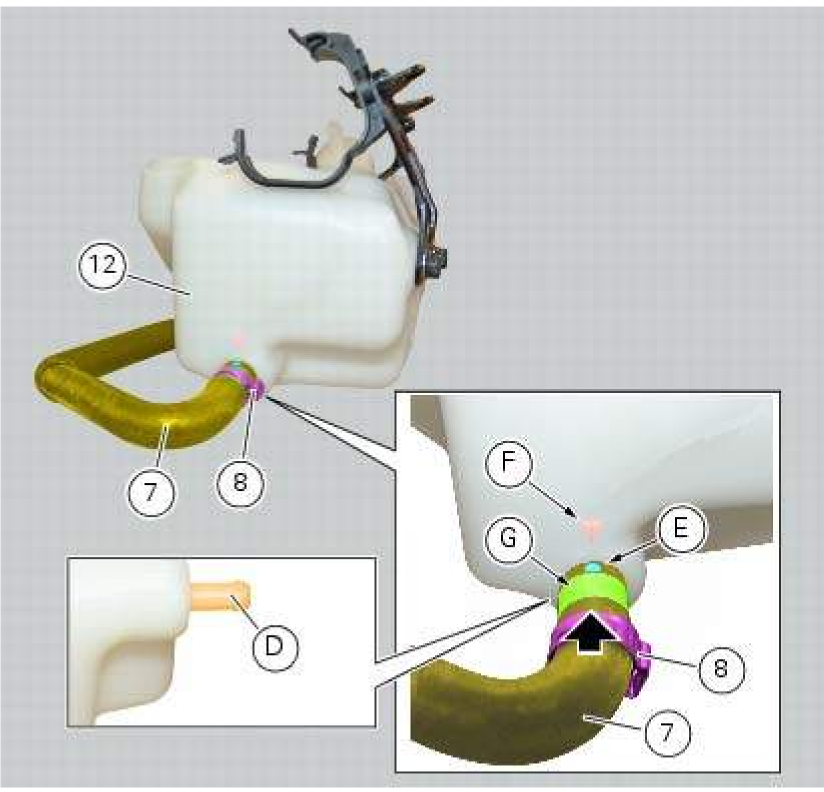


Fit the clip (8) on the hose (7).
Insert completely the hose (7) into the lower fitting (D) of the expansion reservoir (12), by orienting it so as the reference (E) of the hose matches with the arrow in relief (F) on the expansion reservoir.

Note

In case of difficulties during insertion of the hose (7) into the fitting (D) it is recommended to apply lubricant suitable for rubber to the fitting.

Orient the clamp (8) as indicated and bring it in correspondence with the area (G) of the hose (7).
Tighten the clip (7).



Fit the clip (19) on the hose (20).
Insert completely the hose (20) on the upper fitting (H) of the expansion reservoir (5), so that the straight part (I) of the hose is parallel to the bracket (2) as highlighted by the axes (L) and (M).

Note

The hose (20) side to be inserted in the fitting (H) features the white padprinting (N).

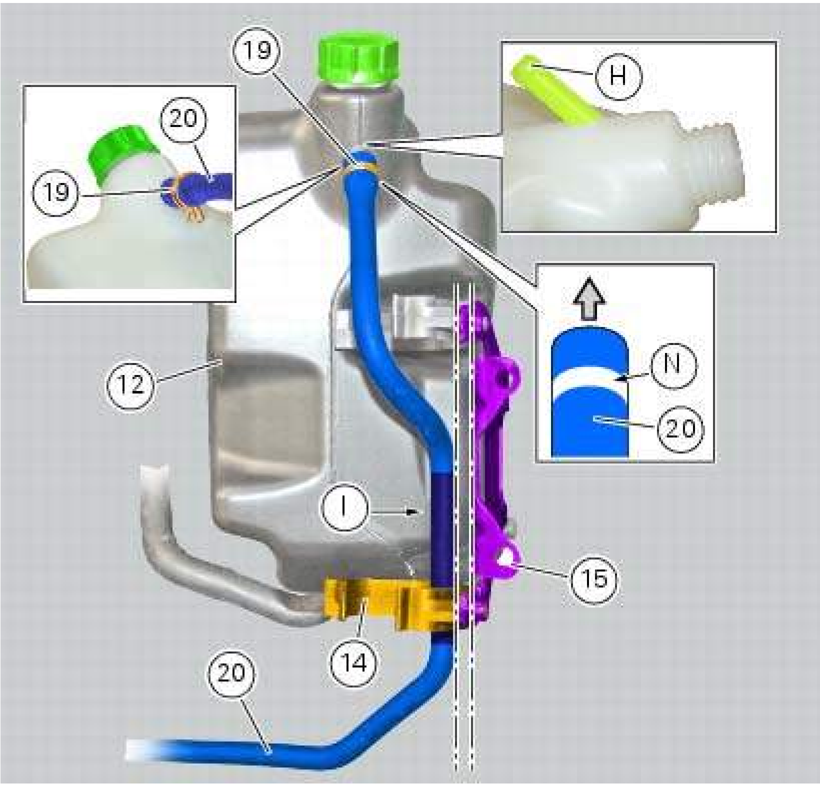
Important

Once the assembly is completed, the hose (20) must be in contact with the internal surface of the hose clamp (1) as indicated.

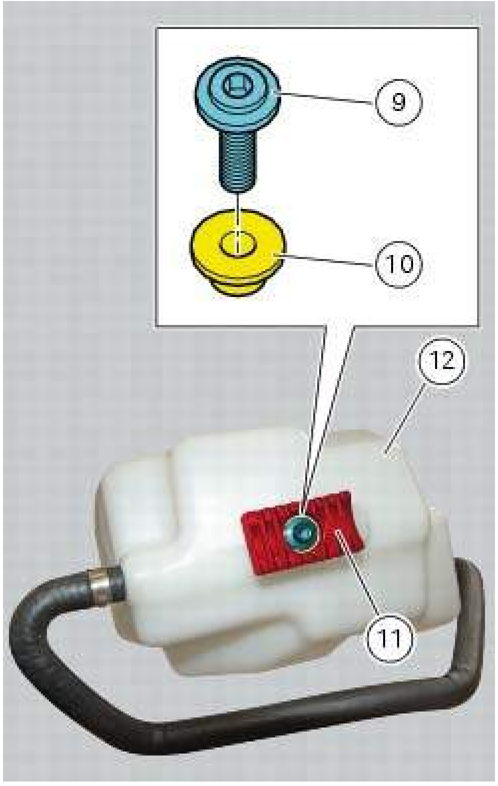
Note

In case of difficulties during insertion of the hose (20) into the fitting (H) it is recommended to apply lubricant suitable for rubber to the fitting.

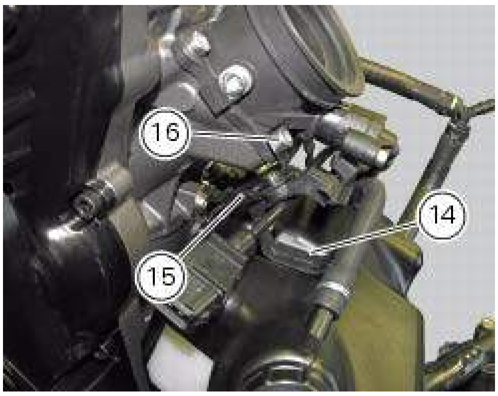
Block the hose (20) by means of the clip (19), by orienting it as shown.



Insert the spacer with the collar (10) into the hole of the rubber mounting (11).
Fit the rubber mounting (11) as shown, by starting the screw (9).
Tighten the screw (9) to a torque of 8 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



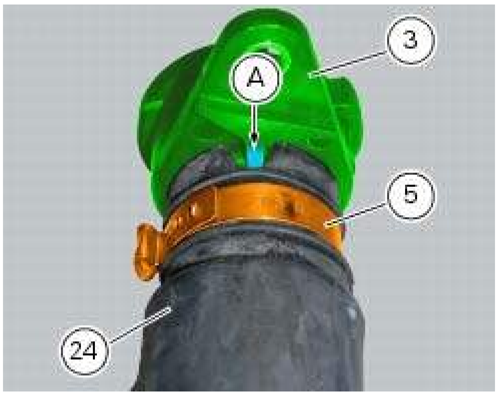
Position the tank (12) with its hoses (7) and (20) and the support (15).
Position the pipes inside the clamps (14) and close them.
Tighten the screws (16) to the torque of 8 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



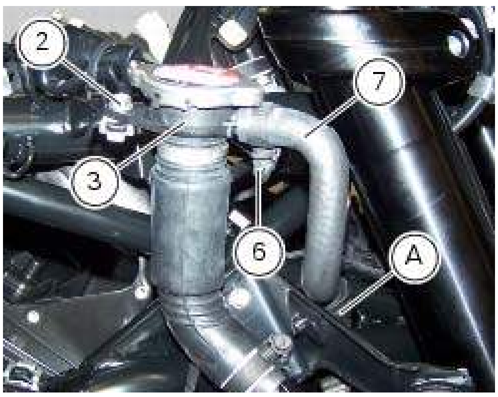
If hose (24) had been removed, insert the clip (5) on the hose (24) at the position shown.
Fit the union (3) on the hose (24) and secure it using the clamp (5).

Note
The union (3) must be oriented so that the groove on hose (24) matches the tab (A) on the hose. Orient the clamp (5) as indicated.

Refit the coolant circuit remote filler (4).



Position the union (3) on the frame by tightening the screw (2) to a torque of 5 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Place hose (7) on the union (3) with clip (6) and tighten the latter to a torque of 1 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Insert the hose (7) inside the hose guide (A).



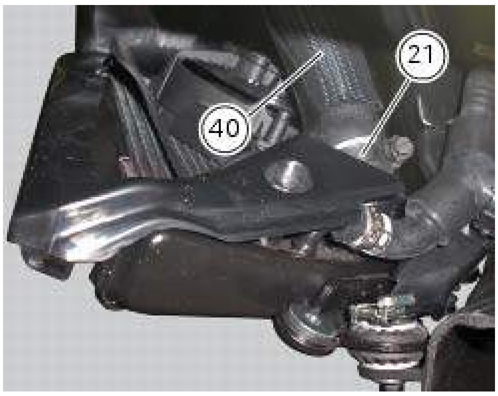
Operations	Section reference
Refill the cooling system	4 - 3, Changing the coolant
Refit the injectors on the intake manifolds and reassemble the supply system	8 - 6, Refitting the injectors
Refit the oil breather pipe, the blow by, the throttle body and the airbox	8 - 6, Refitting the airbox and throttle body
Connect the throttle cable	7 - 8.1, Refitting the throttle twistgrip
Refit air conveyors	8 - 7, Refitting the air filters
Refit the fuel tank	8 - 2, Refitting the fuel tank
Reassemble the tank half covers	5 - 2, Refitting the fuel tank fairings
Reassemble air conveyor covers	8 - 7, Refitting the air filters
Refit the saddles	5 - 3, Refitting the seat

Removal of the cooling system hoses and unions

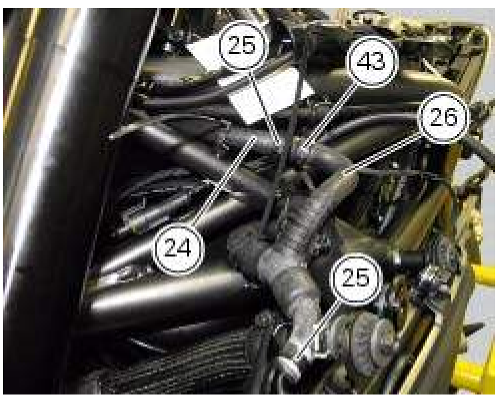
Operations	Section reference

Remove the saddles	5 - 3, Removal of the seat
Remove air conveyor covers	8 - 7, Removal of the air filters
Remove the tank half covers	5 - 2, Removal of the fuel tank fairings
Remove the fuel tank	8 - 2, Removal of the fuel tank
Remove air conveyors	8 - 7, Removal of the air filters
Disconnect the throttle cable	7 - 8.1, Removal of the throttle twistgrip
Remove the airbox, the throttle body, the blow by and the oil breather tube	8 - 6, Removal the airbox and throttle body
Empty the coolant out of the cooling system	4 - 3, Changing the coolant

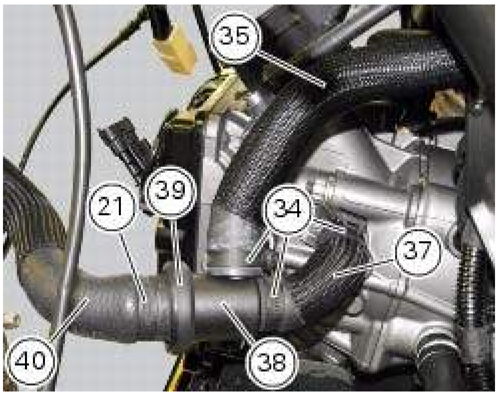
Loosen the clips (21) that secure the radiator/thermostat sleeve (40) and the radiator/plug sleeve (24) to the water radiators.



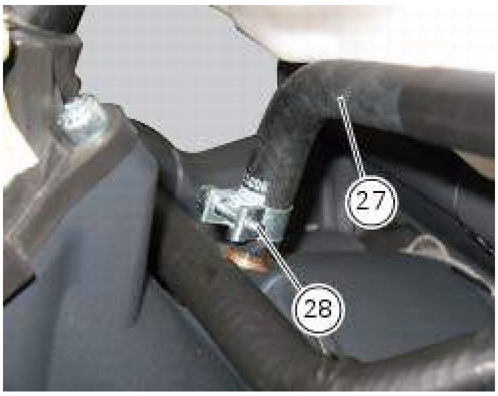
Loosen clips (25) and (43) that secure the breather pipe (26) to the radiator/plug sleeve (24) and to the left radiator.



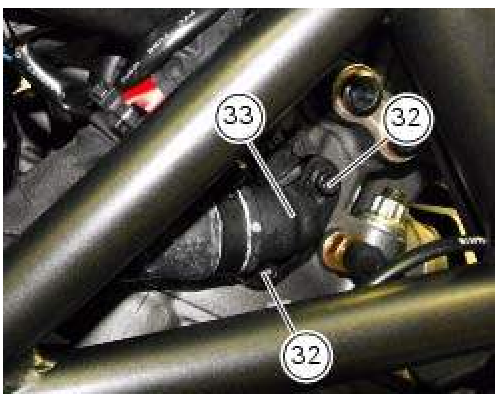
Loosen the clips (34) securing the thermostat assembly (38) - thermostat-cylinder head sleeve (35) - thermostat/cylinder head sleeve (37) to the cylinder heads.
Loosen the clip (28) to release the breather pipe (30) from the vertical head.
Loosen the clips (21) and (34) to disassemble the thermostat unit (38) - thermostat/head sleeve (35) - thermostat/head sleeve (37) - radiator/thermostat sleeve (40).



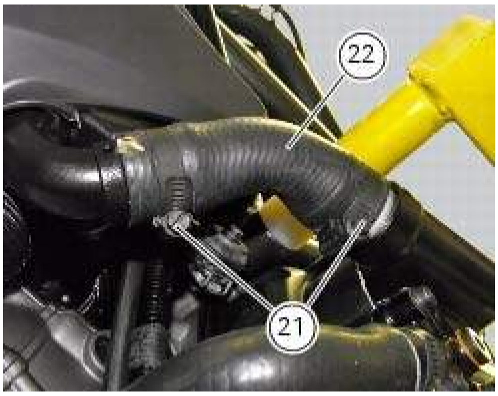
Loosen the clip (28) to release the breather pipe (27) from the half-casing.



Loosen the screws (32) and remove the fitting (33).
Recover the O-ring gasket (**31**) located between the retainer and the vertical head.



Loosen the clips (21) that secure the pump/radiator sleeve (22) and the radiator/radiator sleeve (23).



Important

Periodically check the connection hoses for leaks.
Hoses that are cracked, swollen, or hardened should be renewed.

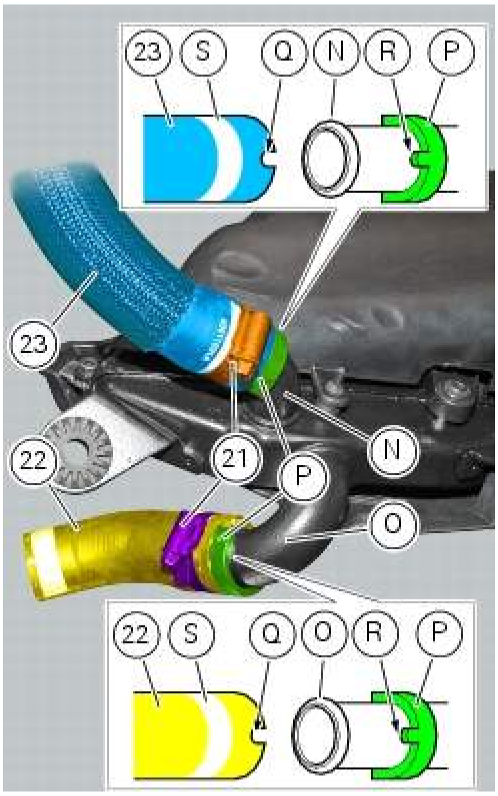
Refitting the cooling system hoses and unions

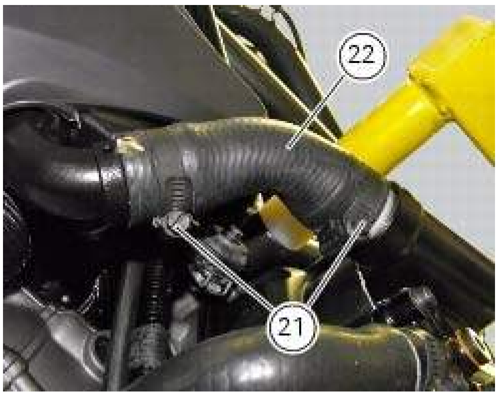
Position the pump/radiator sleeve (22) and the radiator/radiator sleeve (23).
Fit sleeve (23) and sleeve (22) to their corresponding fittings (N) and (O), and bring them fully home on collars (P).

Note

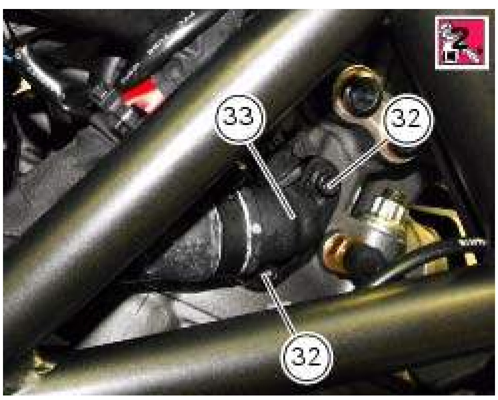
Sleeves (23) and (22) must be oriented so that the grooves (Q) match the tabs (R) on fittings (N) and (O).

Insert the clip (21) on sleeve (23) and the clip (21) on sleeve (22), bringing them to the position of the white marks (S) on the sleeves.
Orient the clamps (21) as shown and tighten them to a torque of 2.5 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Tighten the clamps (21) to a torque of 2.5 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

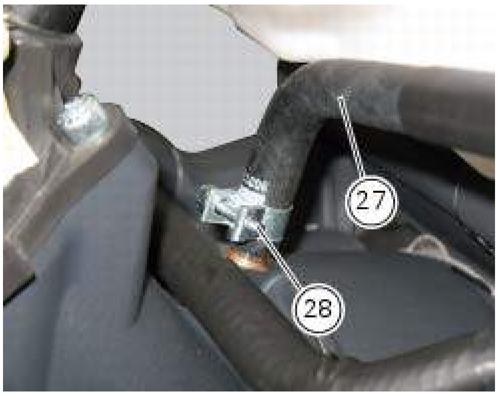




Install one gasket (**31**) into the seat of the vertical head fitting (33).
Fix the fitting (33) on the vertical head by means of the screws (32) with prescribed threadlocker, and tighten them to a torque of 6 Nm (Min. 5 Nm - Max. 7 Nm) (Sect. 3 - 3, Engine torque settings).

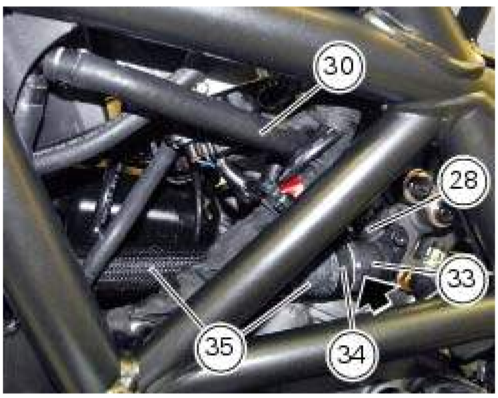


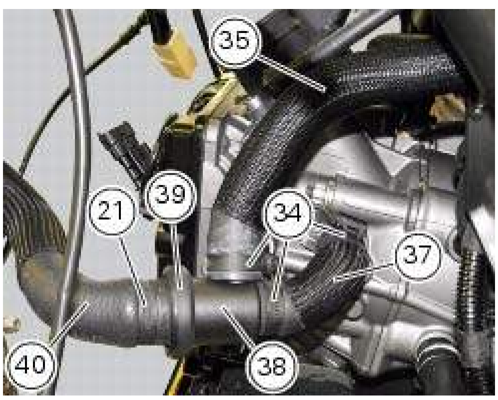
Place the breather pipe (27) on the half-casing fitting and tighten the clip (28).



If removed, fit the coolant union (36) on the horizontal cylinder head and tighten it to a torque of 20 Nm (Min. 18 Nm - Max. 22 Nm) (Sect. 3 - 3, Frame torque settings).

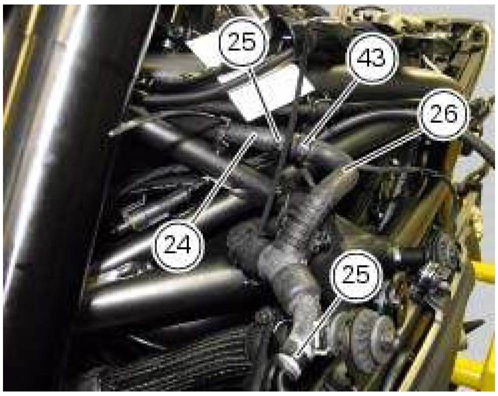
Assemble the thermostat (38) - thermostat/head sleeve (35) assembly by coupling and tightening them to a torque of 2.5 Nm ± 10% (Sect. 3 - 3, Frame torque settings) - and the thermostat/head sleeve (37) - radiator/thermostat sleeve (40) by tightening the clamps (21) and (34).
Place breather pipe (30) on the vertical head and tighten the clip (28) to a torque of 2.5 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Fit the clamp (34) on the union (33) matching to dots.
Position the thermostat unit (38) - thermostat/head sleeve (35) - thermostat/head sleeve (37) with the clips (34) and tighten the clips (34) to a torque of 2.5 Nm ± 10% (Sec. 3 - 3, Frame torque settings).



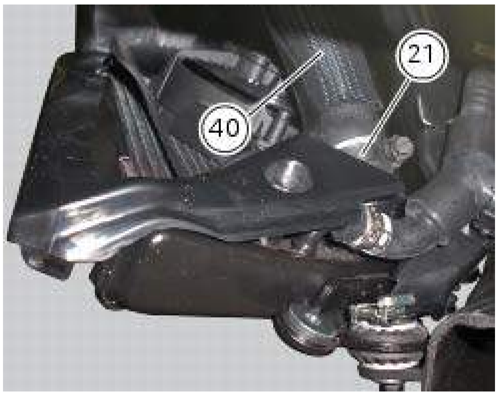


Fix the breather pipe (26) to the radiator/plug sleeve (24) and to the left radiator by tightening the clips (25) and (43) to a torque of 1 ± 10% (Sect. 3 - 3, Frame torque settings).

Cooling system: coolant expansion tank



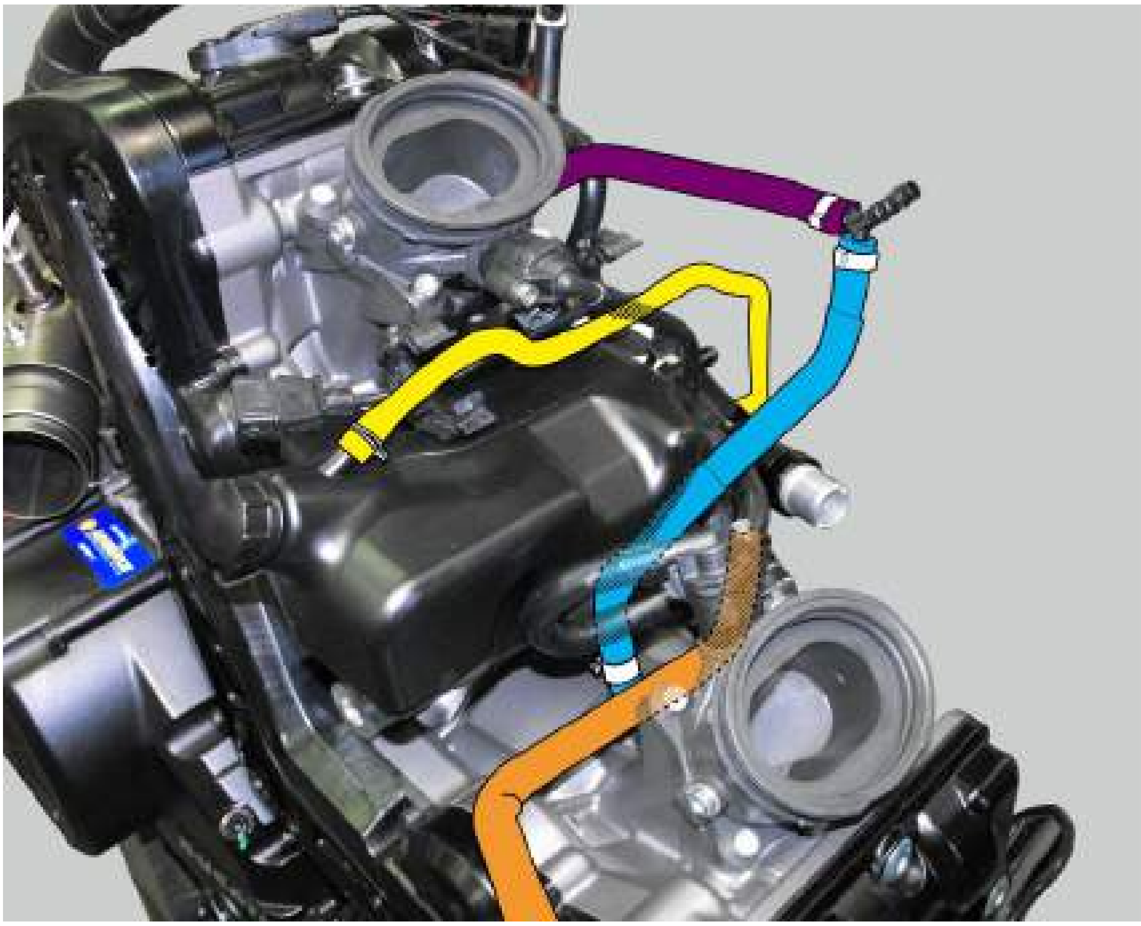
Position the radiator/thermostat sleeve (40) with the clips (21) and the radiator/plug sleeve (24) on the radiators and tighten the clips to a torque of 2.5 ± 10% (Sect. 3 - 3, Frame torque settings).

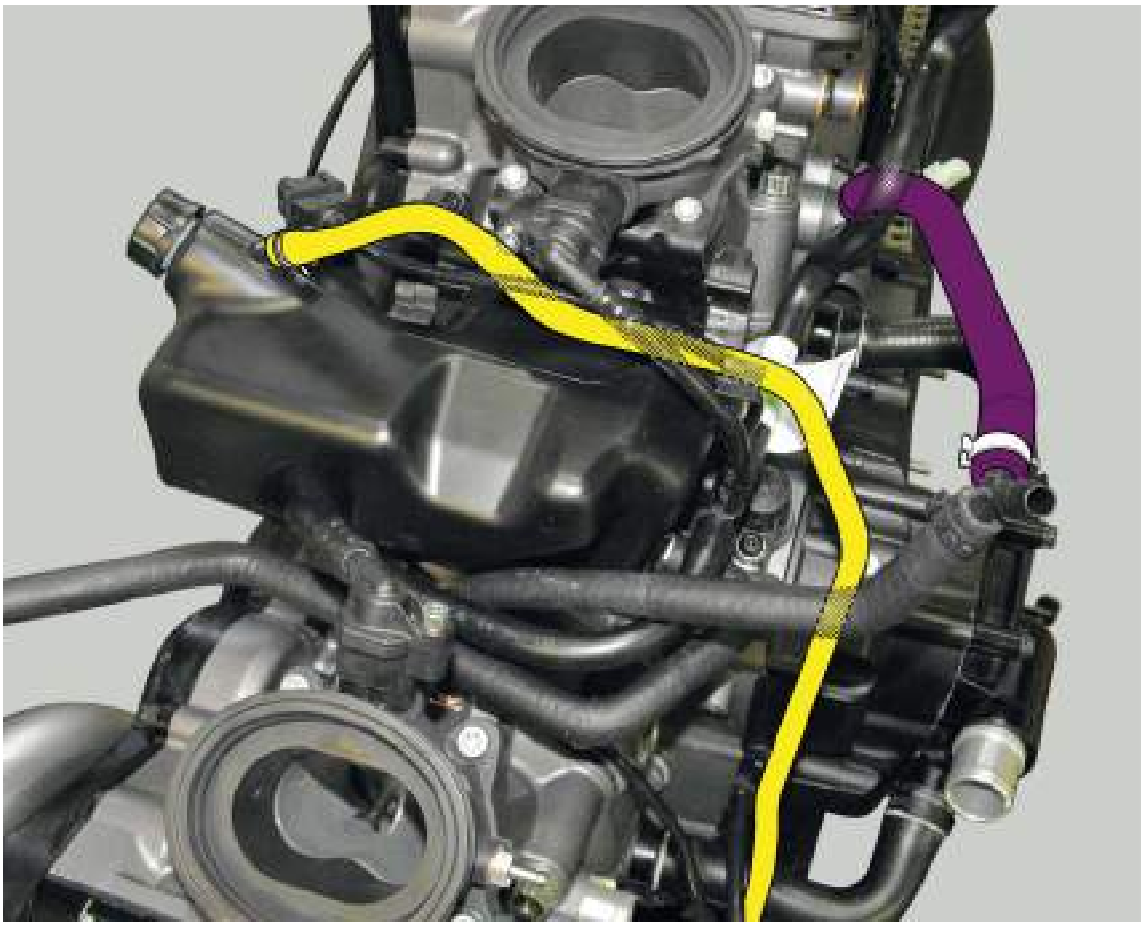


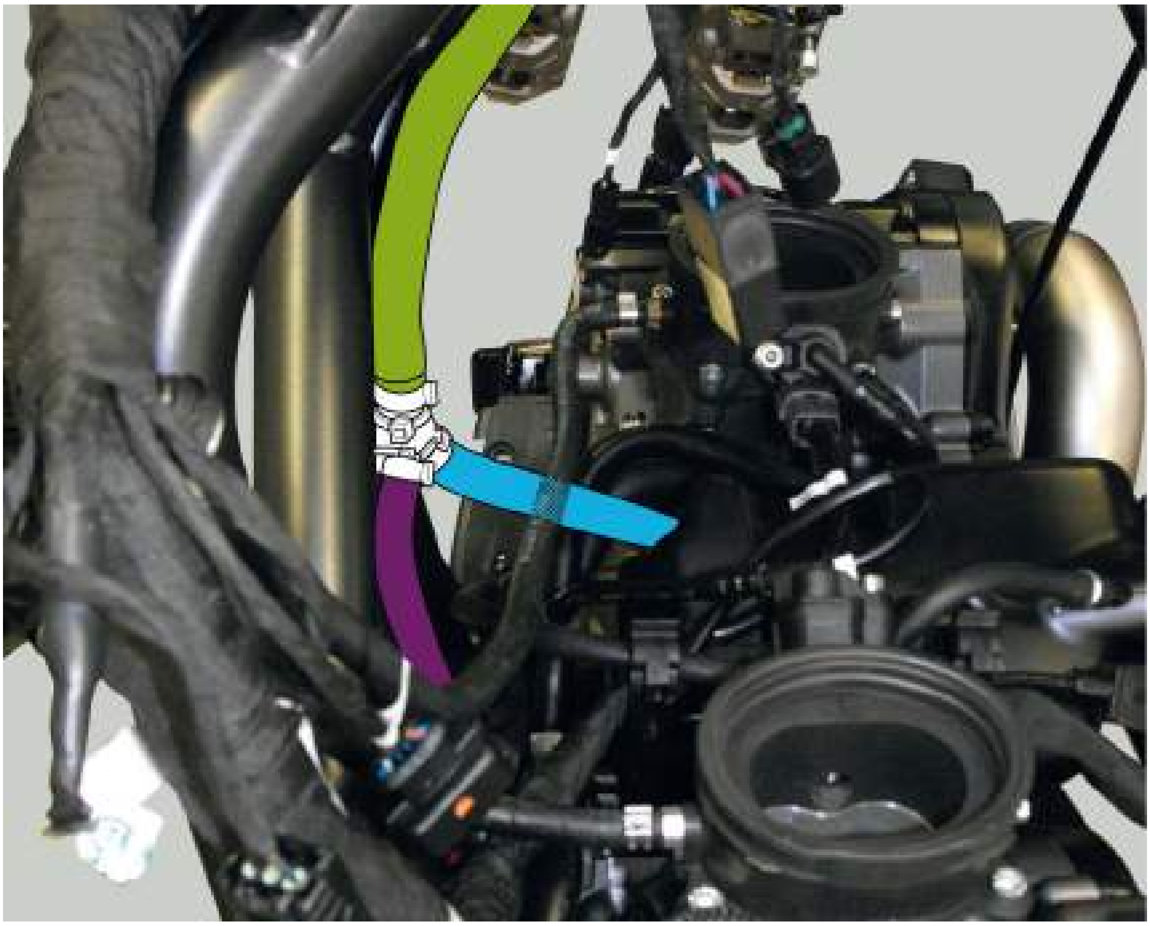
Operations	Section reference
Refill the cooling system	4 - 3, Changing the coolant
Refit the oil breather pipe, the blow by, the throttle body and the airbox	8 - 6, Refitting the airbox and throttle body
Connect the throttle cable	7 - 8.1, Refitting the throttle twistgrip
Refit air conveyors	8 - 7, Refitting the air filters
Refit the fuel tank	8 - 2, Refitting the fuel tank
Reassemble the tank half covers	5 - 2, Refitting the fuel tank fairings
Reassemble air conveyor covers	8 - 7, Refitting the air filters
Refit the saddles	5 - 3, Refitting the seat

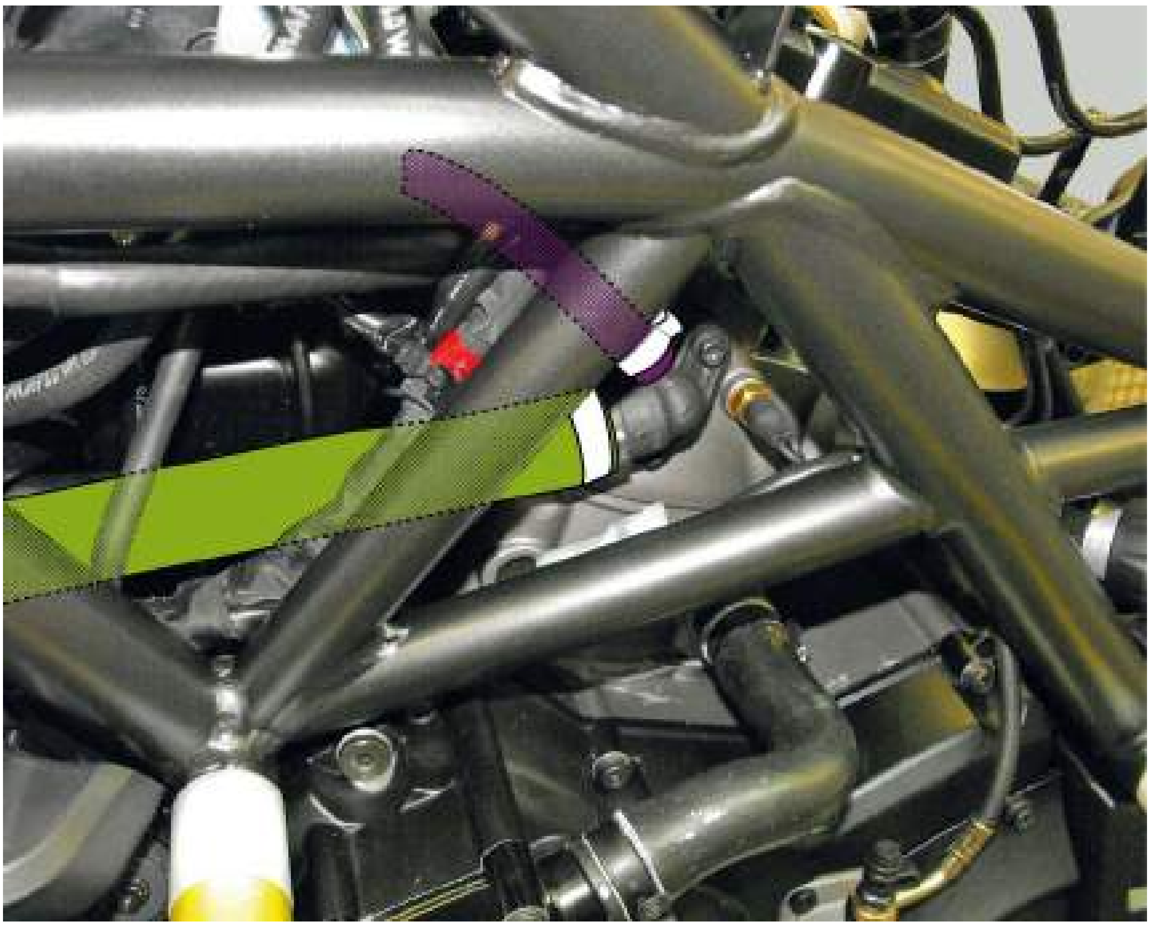
Positioning the cooling system tubes

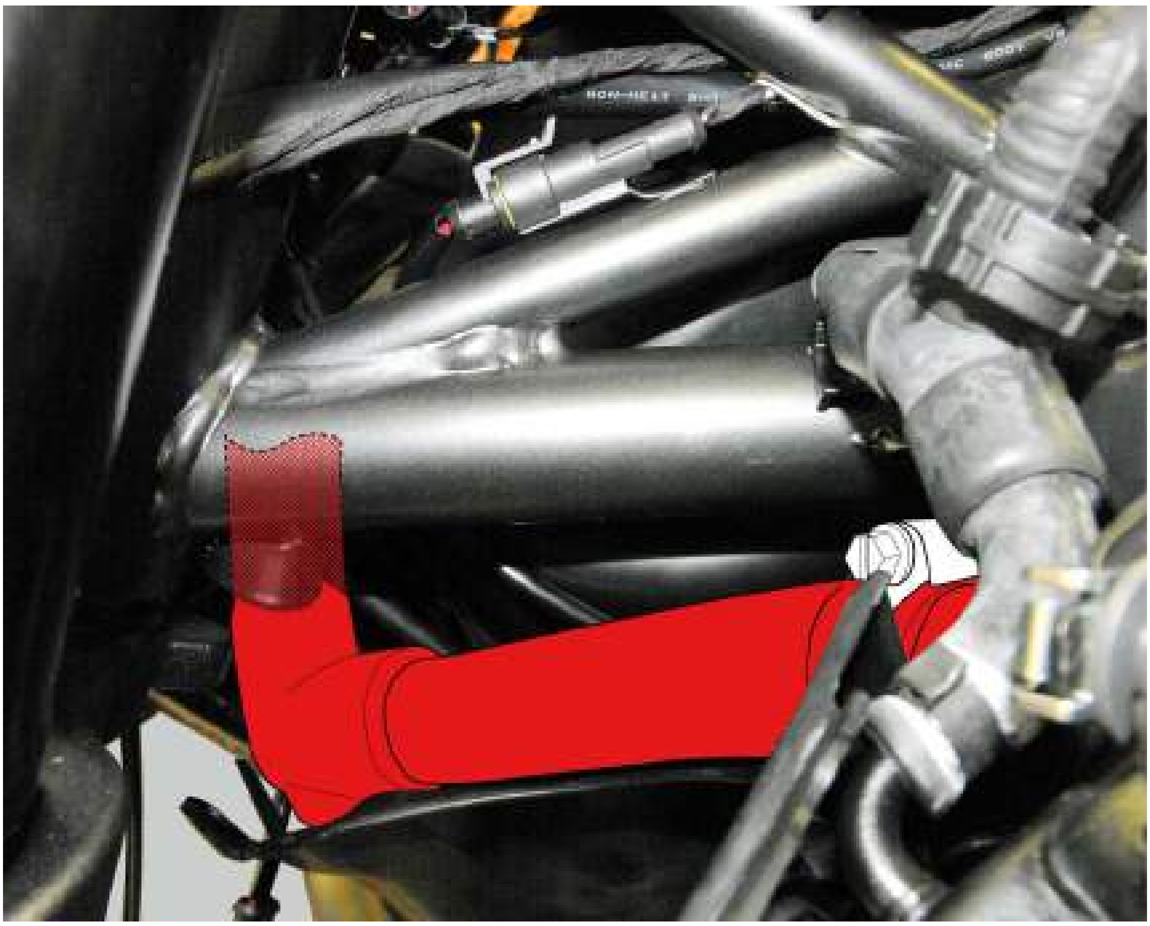
Cooling system: coolant expansion tank

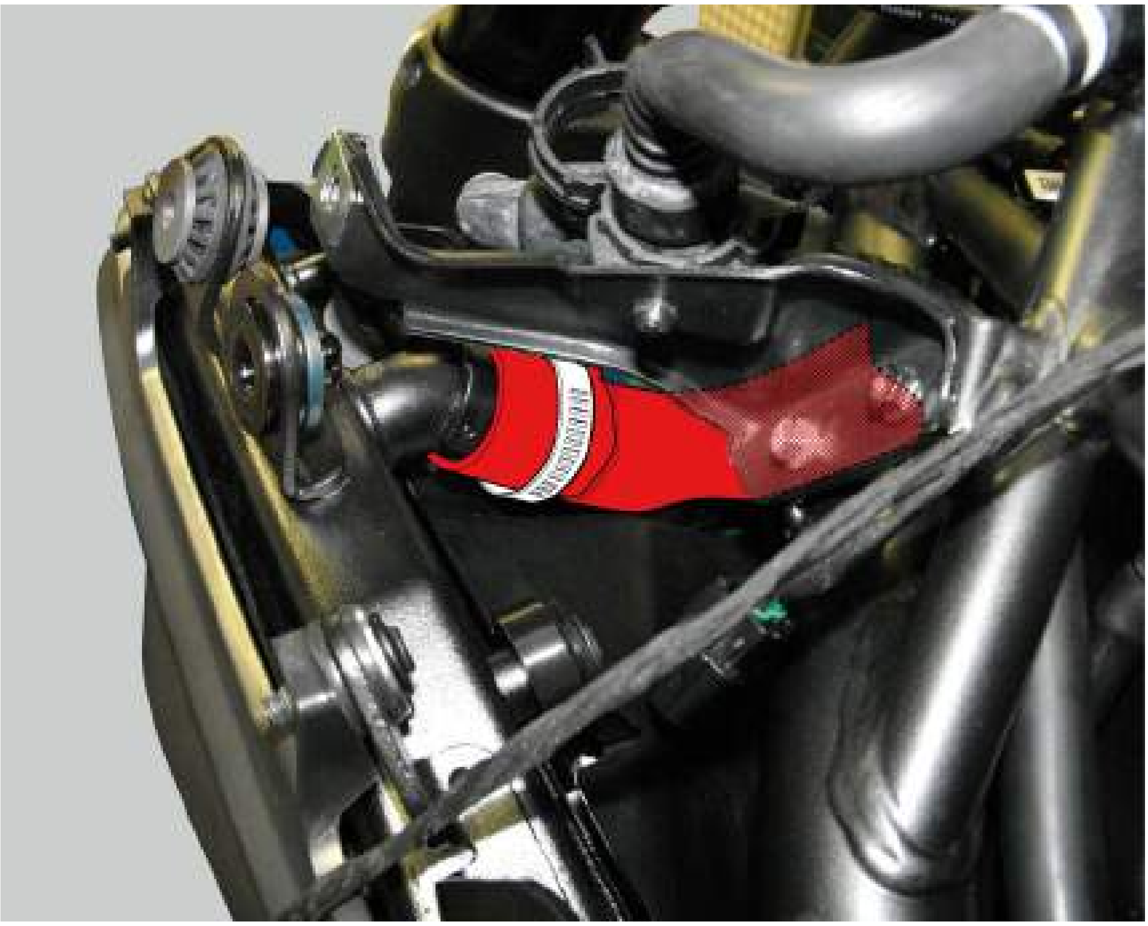


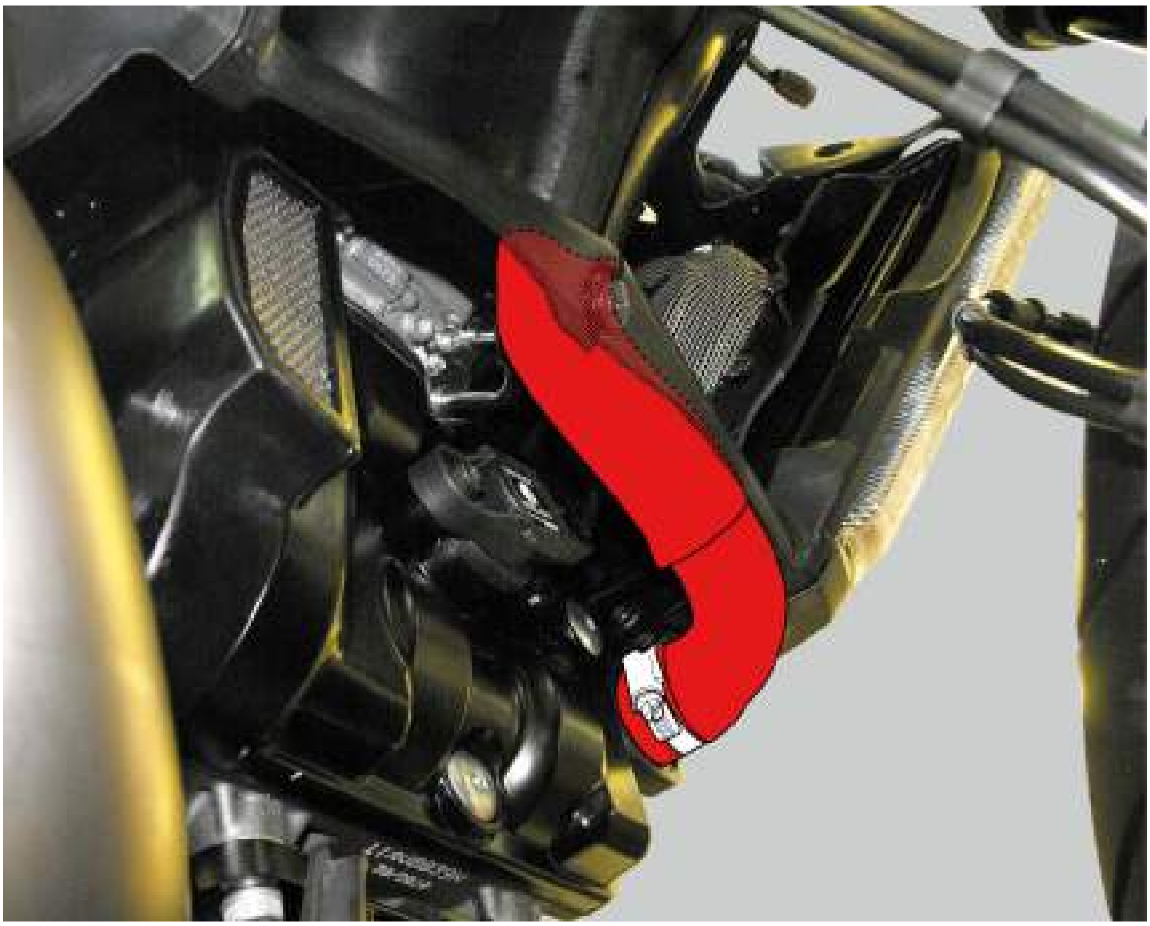


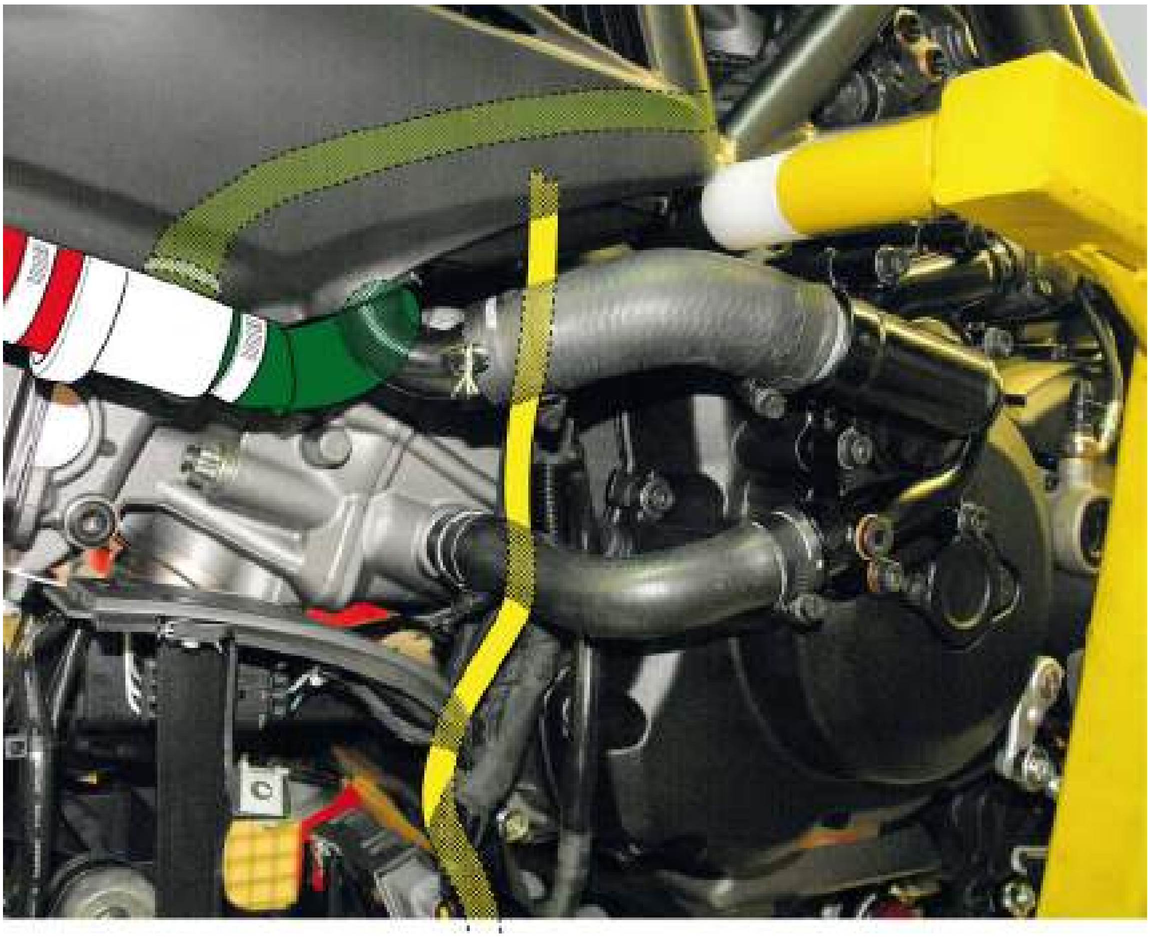


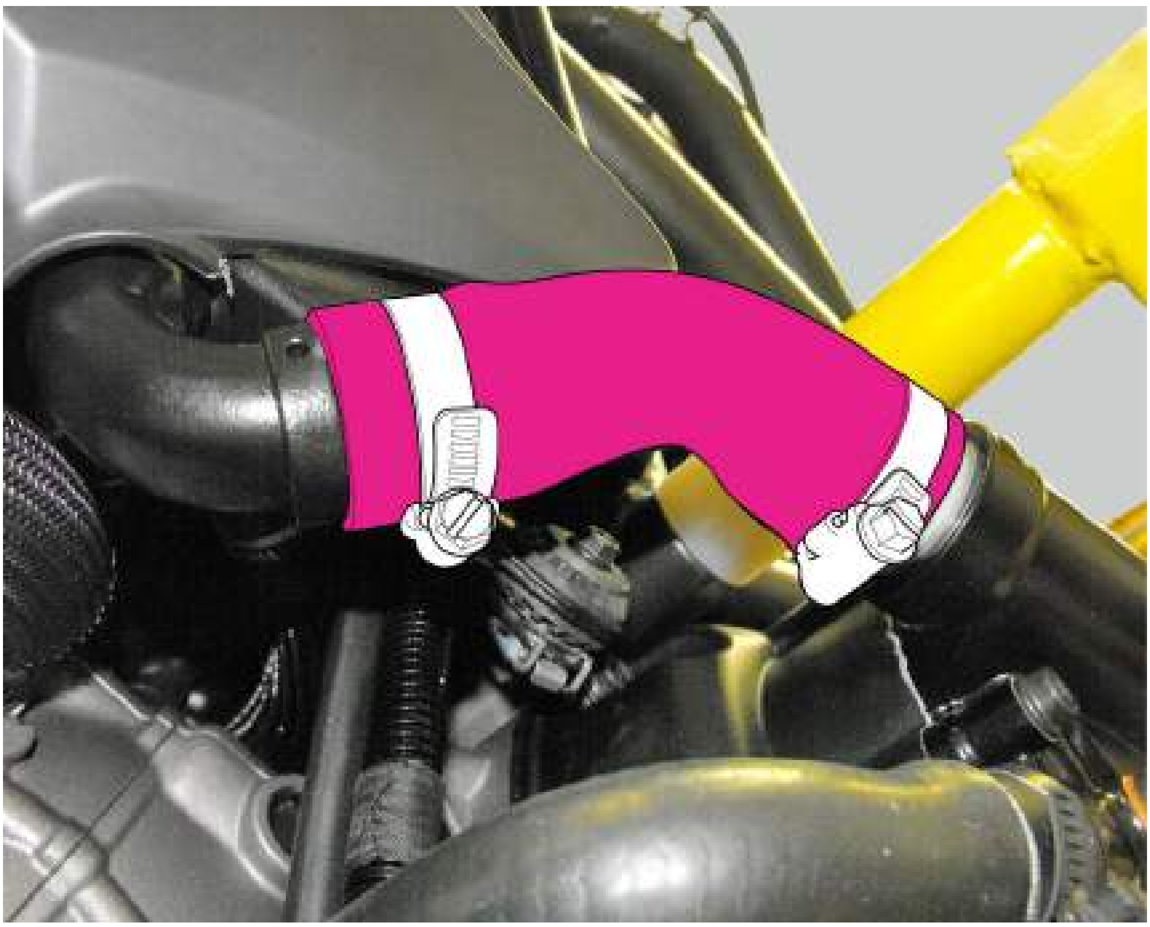




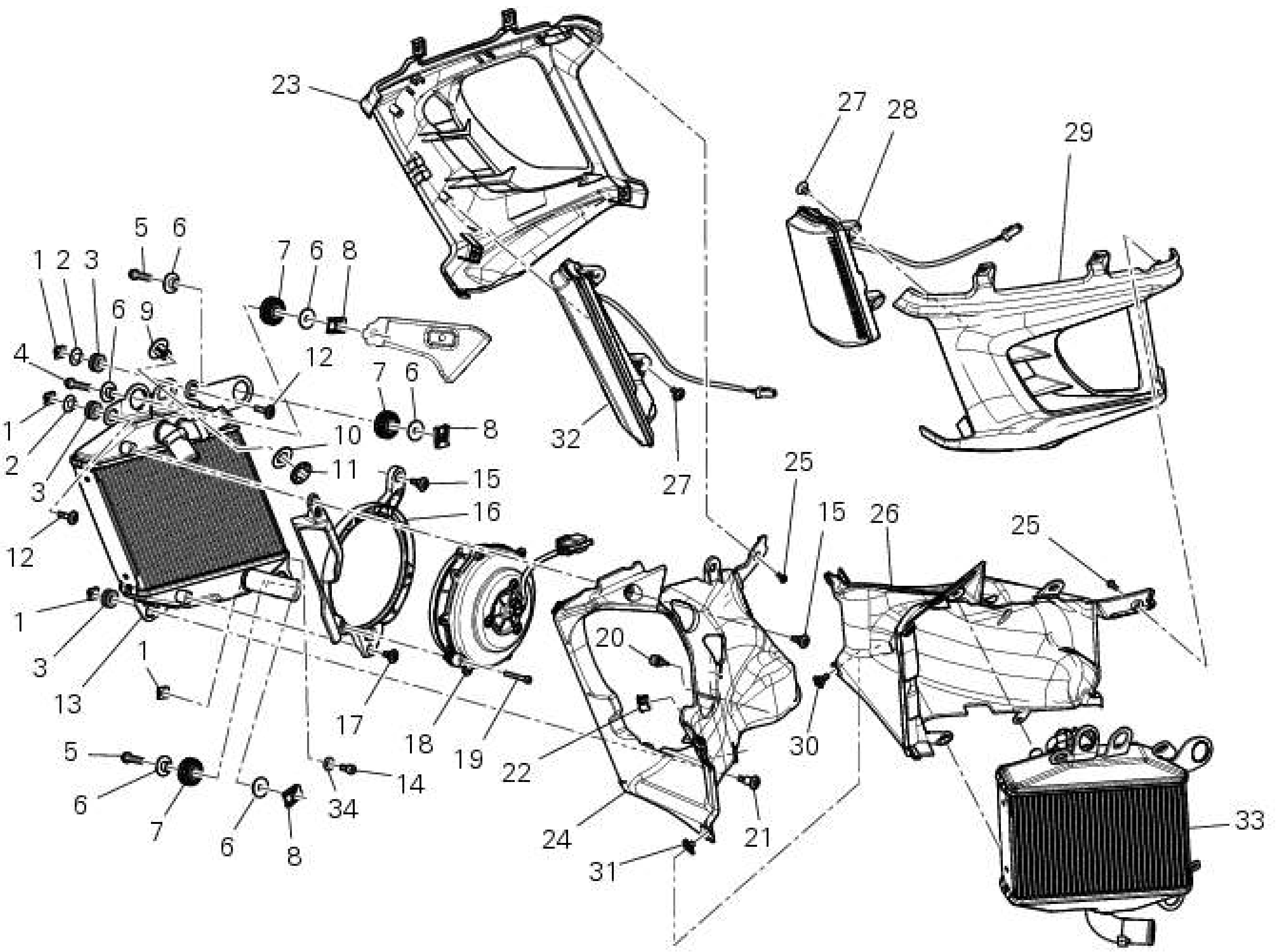








3.2 -Cooling system: water radiators



1 Clip nut
2 Spacer
3 Vibration damper mount
4 Screw
5 Screw
6 Spacer
7 Vibration damper mount
8 Clip nut
9 Bush
10 Spacer
11 Rear sprocket
12 Screw
13 Water radiator (right)
14 Screw
15 Screw
16 Air deflector (right)
17 Special screw
18 Electro-fan
19 Screw
20 Vibration damper mount
21 Screw
22 Plug
23 Half-fairing (right)
24 Internal air duct
25 Screw
26 Internal air duct
27 Screw
28 Front turn indicator
29 Half-fairing (left)
30 Special screw
31 Clip nut
32 Front turn indicator

33 Water radiator (left)
34 Washer
35 Screw

Spare parts catalogue

Diavel ABS	RADIATOR (RIGHT)
Diavel ABS	RADIATOR (LEFT)
Diavel ABS	HALF FAIRING
Diavel Carbon ABS	RADIATOR (RIGHT)
Diavel Carbon ABS	RADIATOR (LEFT)
Diavel Carbon ABS	HALF FAIRING

Important

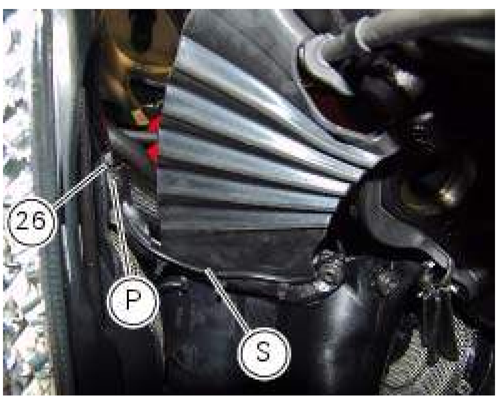
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

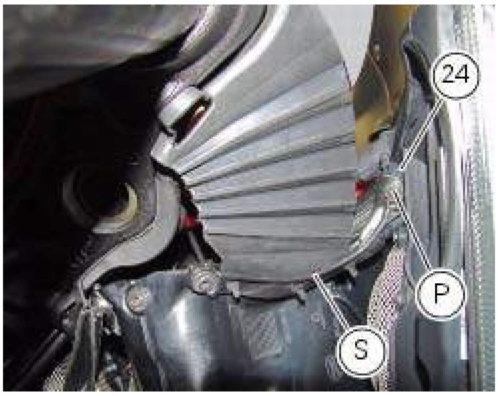
The exploded view shows only the RH water radiator since the left one features the same components except the plug (22).

Removing the water radiators

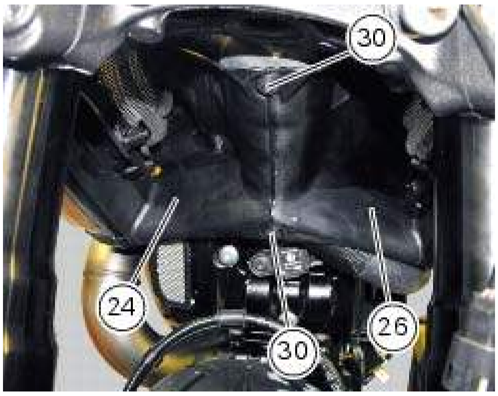
Operations	Section reference
Remove the saddles	5 - 3, Removal of the seat
Remove air conveyor covers	8 - 7, Removal of the air filters
Remove the tank half covers	5 - 2, Removal of the fuel tank fairings
Remove the fuel tank	8 - 2, Removal of the fuel tank
Remove air conveyors	8 - 7, Removal of the air filters
Disconnect the throttle cable	7 - 8.1, Removal of the throttle twistgrip
Remove the airbox, the throttle body, the blow by and the oil breather tube	8 - 6, Removal the airbox and throttle body
Empty the coolant out of the cooling system	4 - 3, Changing the coolant
Loosen the clamps of the hose that connects the two radiators and the hose that connects the RH radiator to the union	9 - 3.1, Removal of the cooling system hoses and unions

Loosen the screws (P) that retain the supports (S) of the front splashguard to the air ducts (24) and (26).

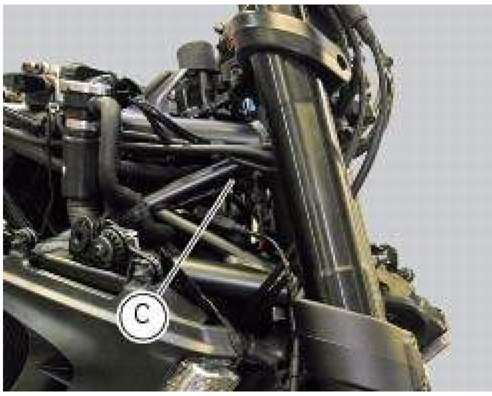




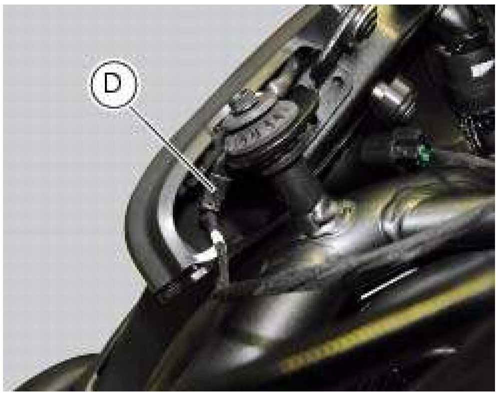
Loosen the screws (30), to separate the two internal air ducts (24) and (26).



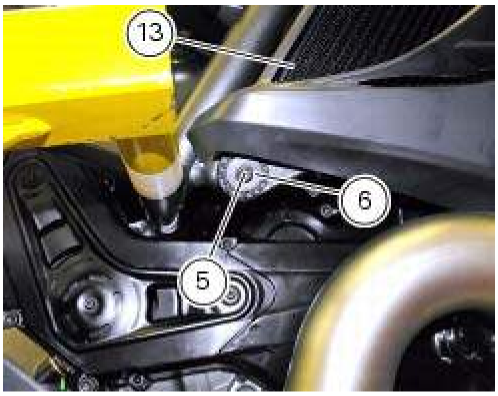
Disconnect the wiring connectors of the main wiring loom (C) from both fans.

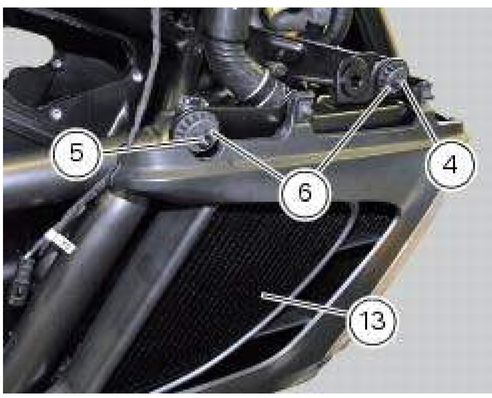


Disconnect the connections of wiring (D) from the front turn indicators.



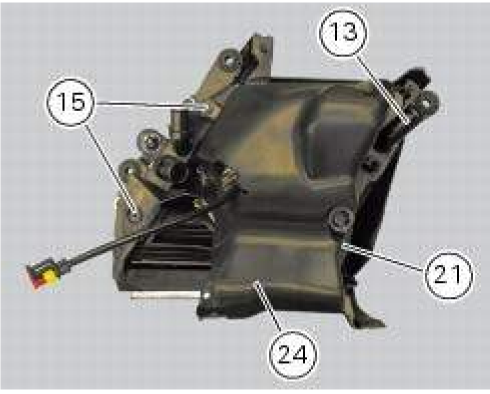
Loosen the screws (4) and (5) with spacer (6) securing the water radiator to the frame.
Remove the RH radiator (13) from the frame.
Follow the same procedure for the left radiator.

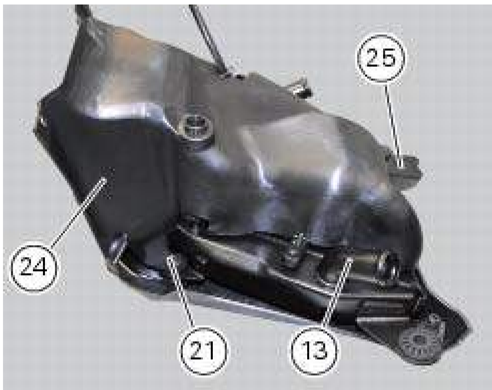




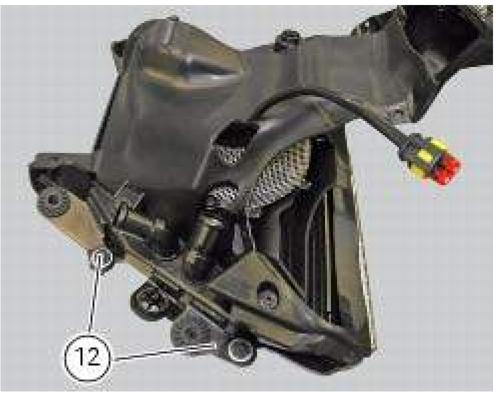
Disassembling the water radiator unit

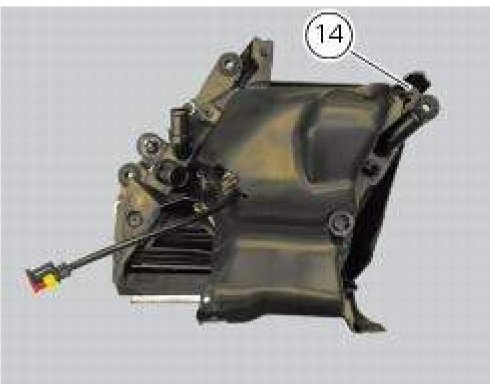
The procedure is the same for both radiators.
Loosen the screws (15), (21) and (25) to remove the air duct (24) from the right radiator (13).





Undo the screws (12) and (14) to remove the half-fairing (23) from the radiator.





Radiator inspection

Visually inspect the oil cooler. If it shows signs of damage or leaks, the radiator must be renewed.
Check also that the air flow through the radiator core is not obstructed by leaves, insects, mud, etc.

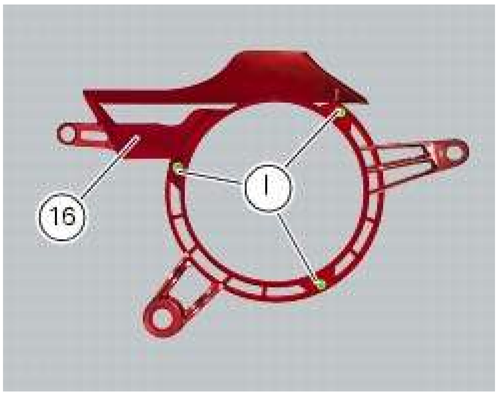
Important

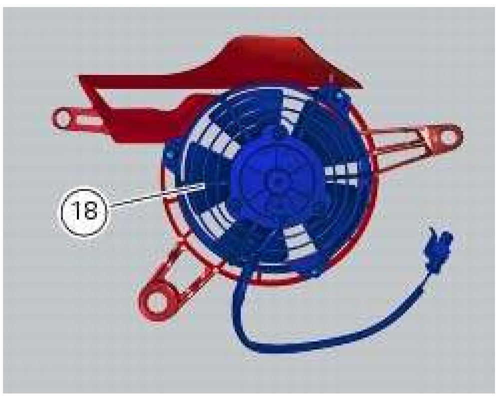
Excessive cooling temperatures can be caused by a partial obstruction of the radiator core.

Carefully check the condition of the radiator core.

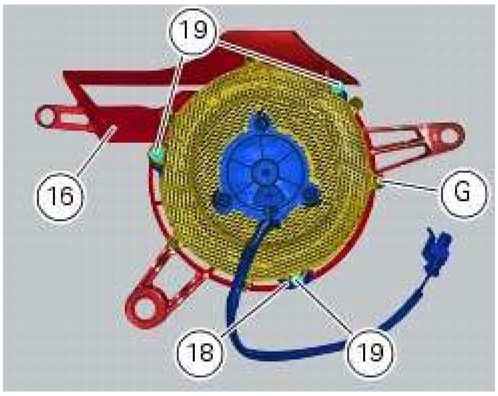
Renewal of the cooling fan

Loosen the electro-fan retaining screws (15) and (17) and remove the electro-fan (18) from the radiator.
Carry out the same procedure for the other radiator's electro-fan.
On refitting, position the coolant radiator fan (18) as shown on the fan support (16), so that the three fan holes match the three threaded inserts (I) of the support (16).

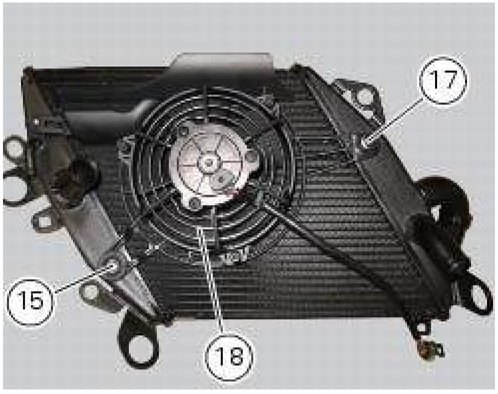




Position the grille (G) as shown on the coolant radiator fan (18), threading the fan cable out of the opening in the grille.
Assemble grille (G), fan (18) and fan support (16).
Tighten the screws (19) to a torque of 1 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



Tighten screws (15) and (17) to a torque of 5 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



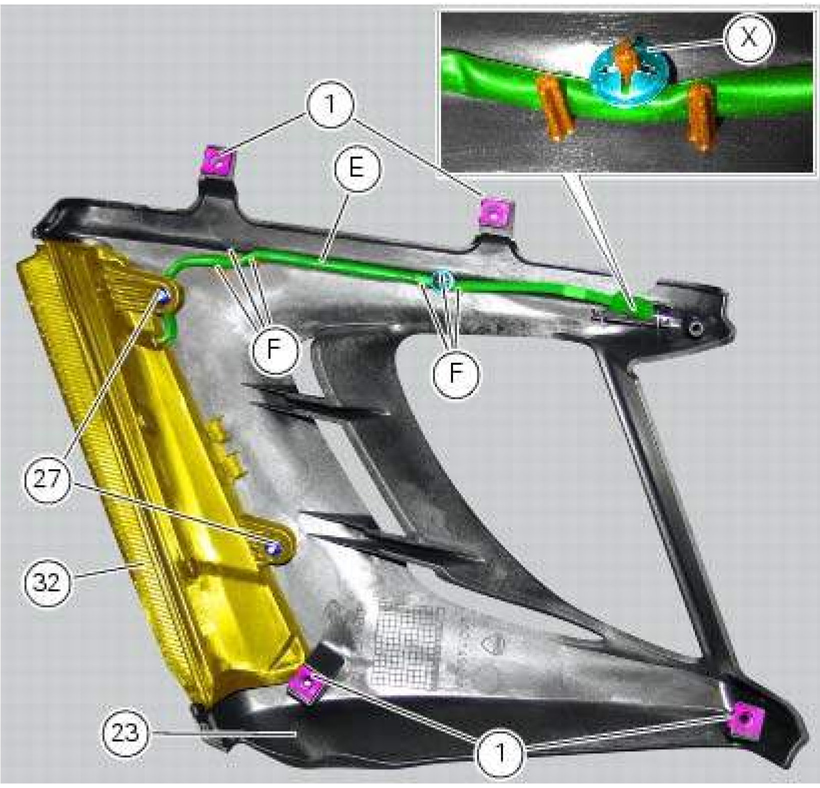
Reassembling the water radiator unit

The procedure is the same for both radiators.
Check the presence of clips (1) at the positions of the external coolant radiator cover (23).
If removed, fit the front turn indicator (32) on the cover (23) and tighten the screws (27) to 2 Nm ± 10% (Sect. 3 - 3, Frame torque settings).

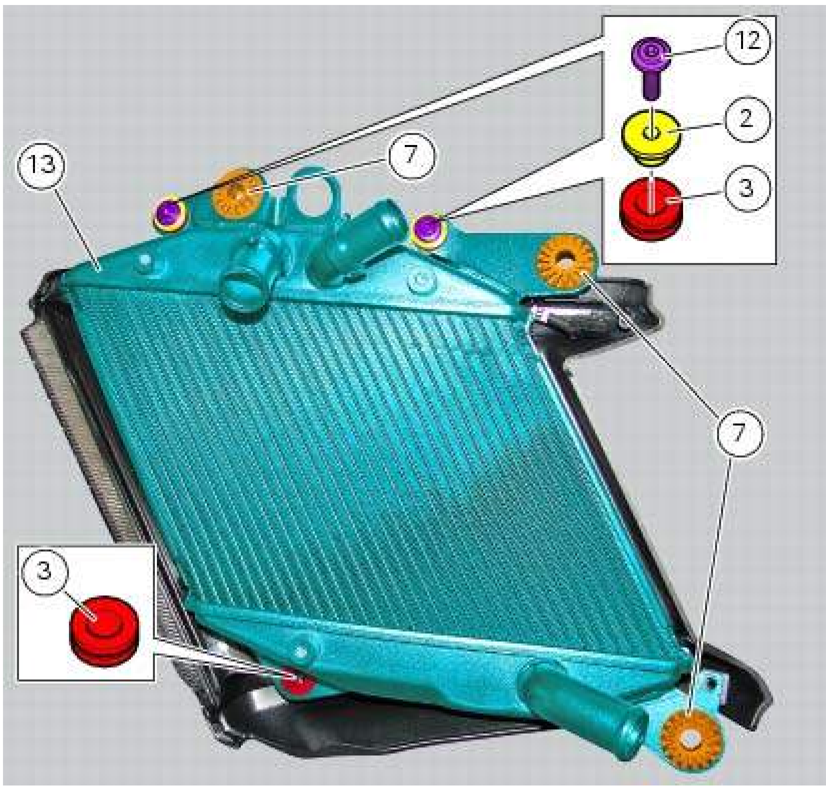
Note
When fitting the turn indicator (32), make sure to arrange the indicator cable (E) behind the indicator retaining stud bolt.

Arrange the right turn indicator cable (E) fitting it between the suitable pins (F) on the cover (23).
Fix the cable (E) inserting a retainer (X) on the pin (F) shown.

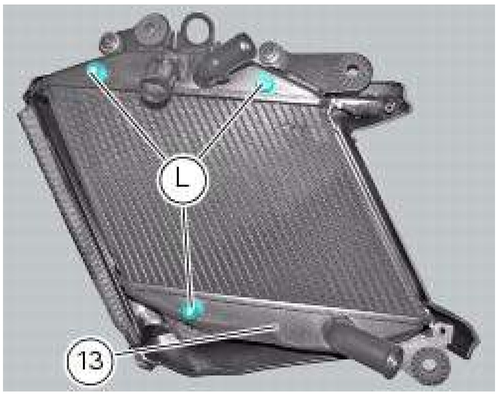
Note
Make sure to orient the retainer (X) as shown.
Fit the vibration dampers (7) and the vibration dampers (3) on the right coolant radiator (13) at the positions shown.

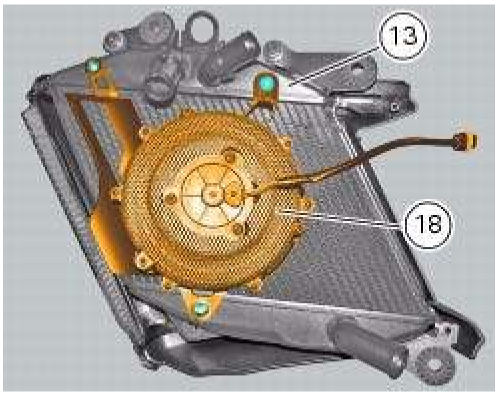


Insert the spacers with collar (2) onto the “upper” vibration dampers (3).
Fix the right coolant radiator (13) by starting the screws (12).



Position the right fan assembly (18) on the right coolant radiator (13), so that the holes in the assembly (18) match the protrusions (L) on the radiator (13).





Fit a rubber pad (U) as shown into the suitable hole in the internal cover of the right coolant radiator (24).

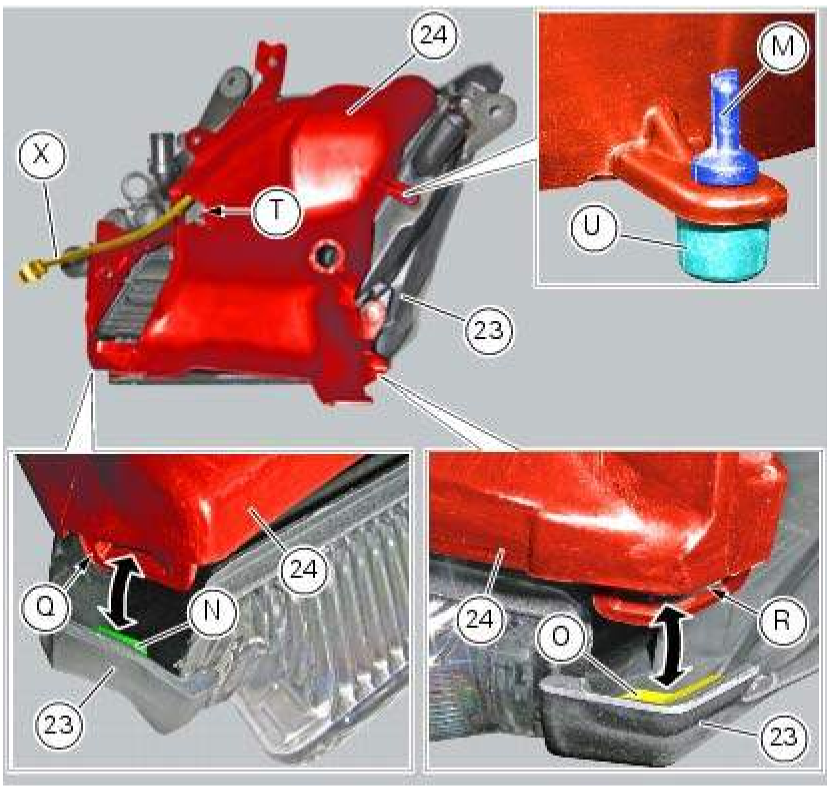
Note

For the rubber pad (U) to be installed correctly, the pin (M) must be fully out at the side opposite to insertion site.

Position the internal cover (24) as shown, making sure the tabs (N) and (O) of the right coolant radiator (23) external cover become engaged in the slots (Q) and (R) of the internal cover (24).

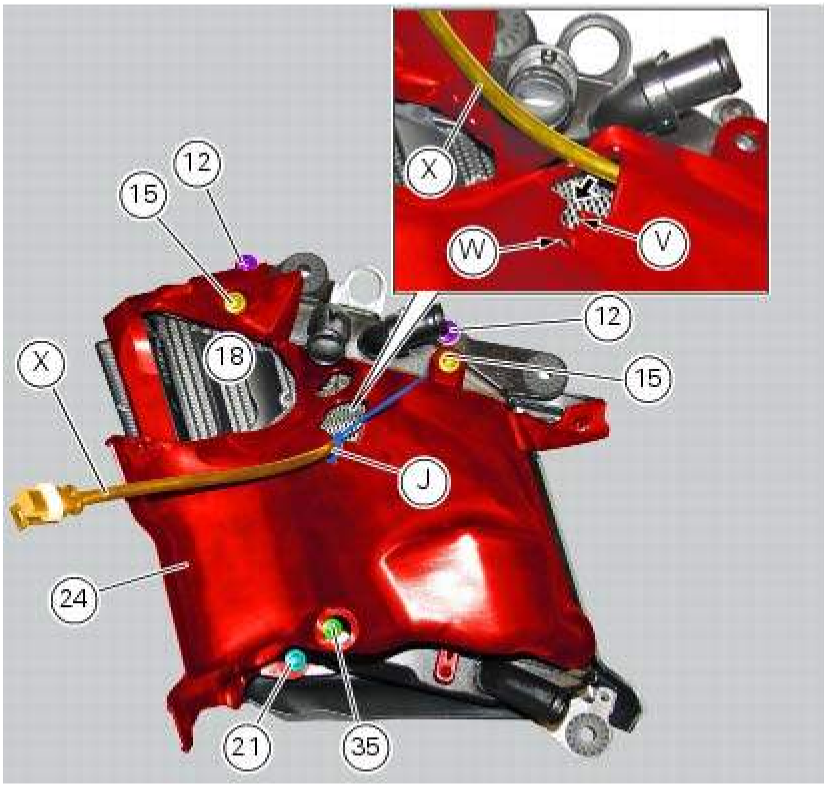
Note

While positioning the internal cover (24), make sure to thread the right fan cable (X) into the opening (T) in the cover as shown.

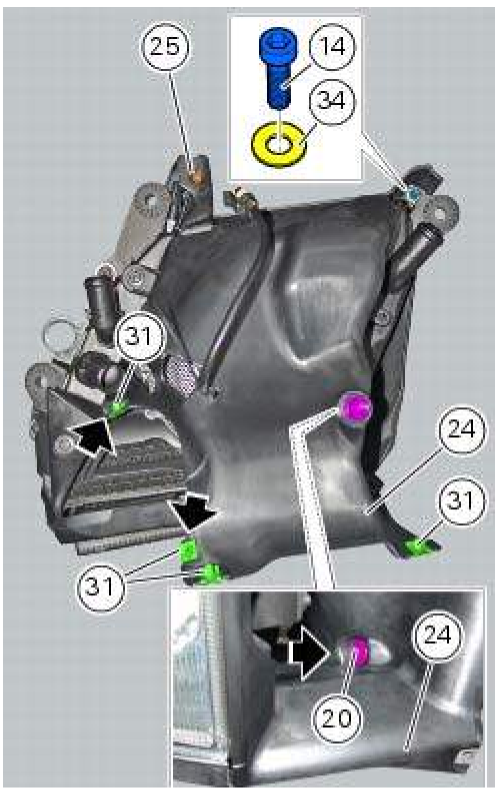


Insert the right fan cable (X) into the recess (V) in the right coolant radiator internal cover (24).

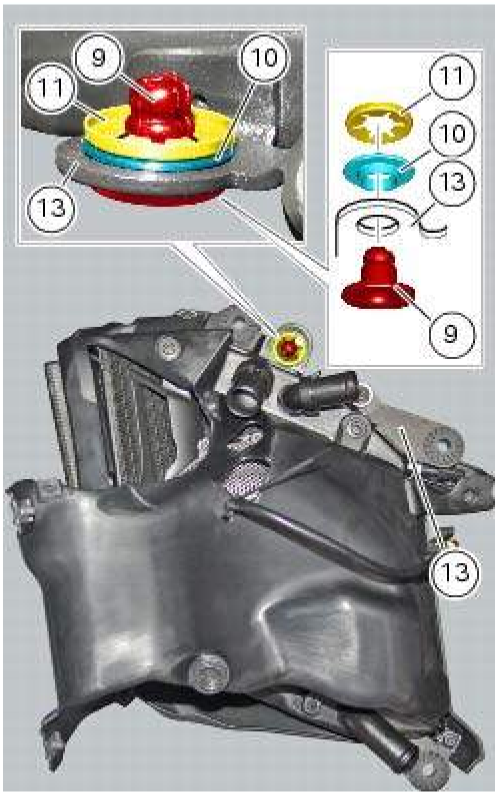
Insert the small self-locking tie wrap (J) into the hole (W) in the cover (24) and use it to fix the cable (X).
Start the screw with a shorter collar (35), the screws with medium collar (15) and the screw with a taller collar (21) at the positions shown.
Tighten the screws (35), (15) and (21) and the screws (12) installed previously to a torque of 5 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



Start the screw (14) with washer (34) and tighten to a torque of 5 Nm ± 10% (Sect. 3 - 3, Frame torque settings).
Tighten the screw (25).
Check the presence of four clips (31) on the internal cover (24) of the right radiator; the left radiator has two clips (31) only (shown).
On the right radiator only, check the presence of the plug (20) inserted from the internal side of the internal cover (24).



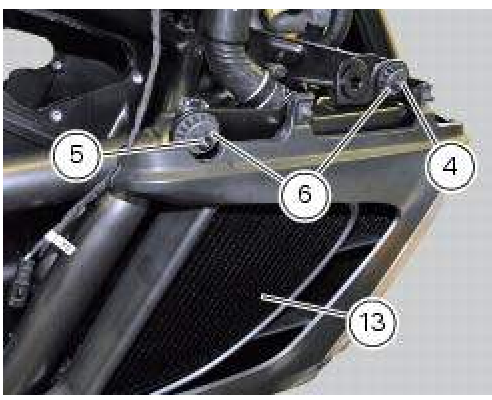
Insert the spacer with the collar (10) into the suitable hole in the right coolant radiator (13).
On the opposite side, insert the pin receptacle (9) into the spacer with collar (10) and fix it using the retainer (11) oriented as shown.

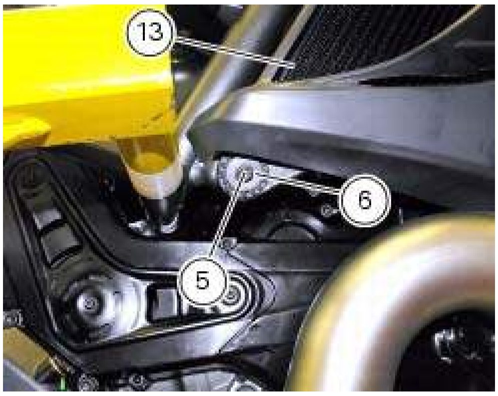


Refitting the radiator

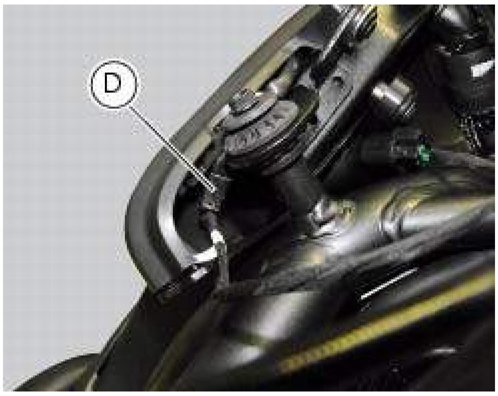
The reassembly procedure is the same for both radiators.
Check for the nuts with clips (8).

Refit the RH radiator (13) on the frame and tighten the screws (4) and (5) with the spacers (6) to a torque of 10 Nm ±10% (Sect. 3 - 3, Frame torque settings).

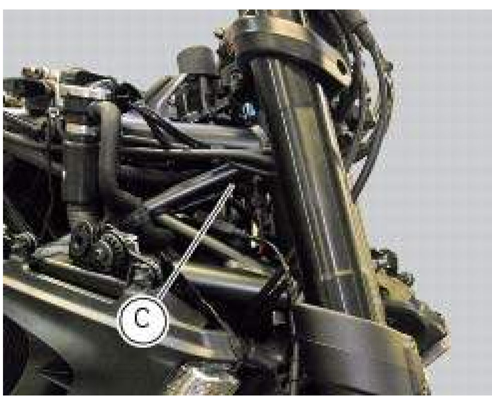




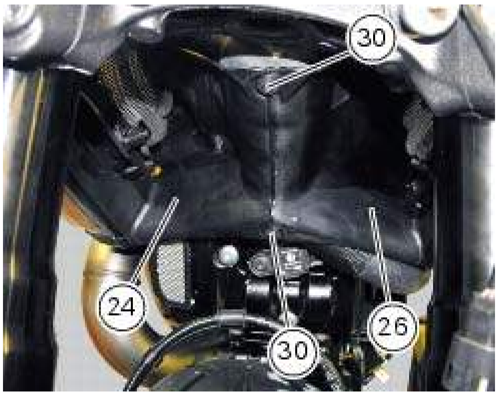
Connect the connections of wiring (D) to the front turn indicators.



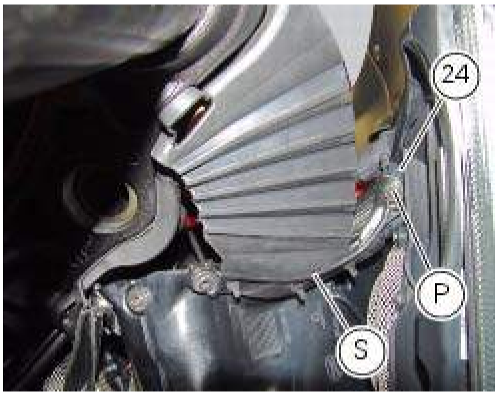
Reconnect the electro-fan wiring of the radiators to the main wiring (C).

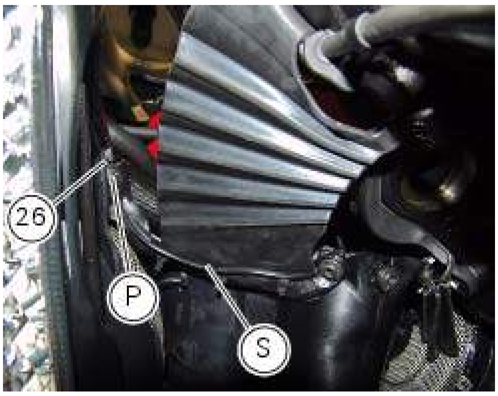


Once both radiators have been mounted, join the two internal air ducts (24) and (26) by tightening the screws (30) to a torque of 4 Nm ± 10% (Sect. 3 - 3, Frame torque settings).



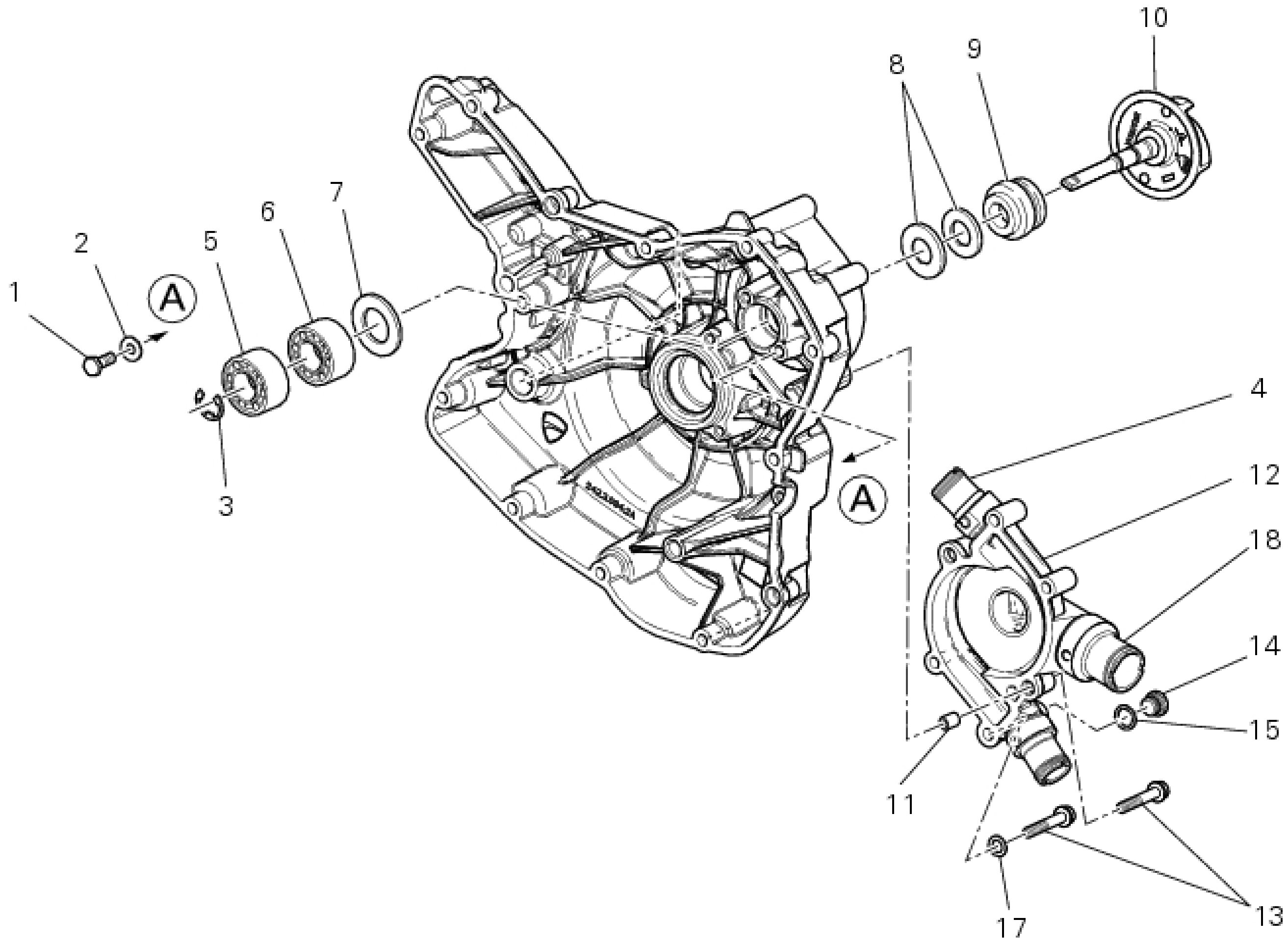
Fix supports (S) of the front splashguard to the air ducts (24) and (26) by tightening the screws (P) to a torque of 4 Nm ± 10% (Sect. 3 - 3, Frame torque settings).





Operations	Section reference
Tighten the clamps of the hose that connects the two radiators and the hose that connects the RH radiator to the union	9 - 3.1, Refitting the cooling system hoses and unions
Refill the cooling system	4 - 3, Changing the coolant
Refit the oil breather pipe, the blow by, the throttle body and the airbox	8 - 6, Refitting the airbox and throttle body
Connect the throttle cable	7 - 8.1, Refitting the throttle twistgrip
Refit air conveyors	8 - 7, Refitting the air filters
Refit the fuel tank	8 - 2, Refitting the fuel tank
Reassemble the tank half covers	5 - 2, Refitting the fuel tank fairings
Reassemble air conveyor covers	8 - 7, Refitting the air filters
Refit the saddles	5 - 3, Refitting the seat

3.3 -Cooling system: water pump



1 Screw
2 Washer
3 Circlip
4 Water pump outlet union
5 Bearing
6 Bearing
7 Spacer
8 Aluminium gasket
9 Mechanical seal
10 Water pump impeller
11 Bush
12 Water pump cover assembly
13 Screw
14 Plug
15 Sealing washer
16 Generator cover
17 Special washer
18 Fuel filler flange

Spare parts catalogue

Diavel ABS	WATER PUMP-ALTR-SIDE CRANKCASE COVER
Diavel Carbon ABS	WATER PUMP-ALTR-SIDE CRANKCASE COVER

Important

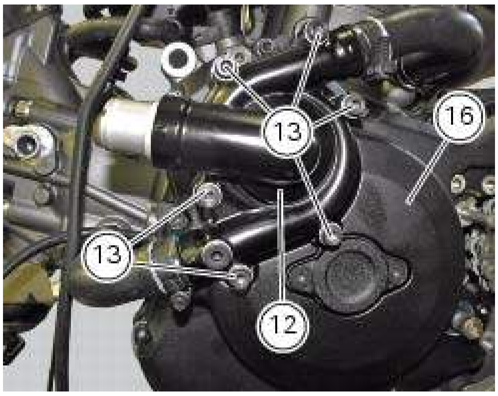
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Removal of the water pump

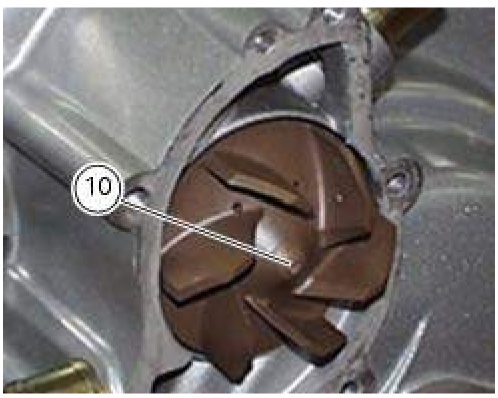
Operations	Section reference
Drain the cooling system	4 - 3, Changing the coolant
Remove the cooling system pipe from the water pump cover	9 - 3.1, Removal of the cooling system hoses and unions
Remove the front sprocket cover	7 - 14, Removing of the front sprocket
Remove the gearchange control	7 - 9, Removal of the gearchange control
Drain the engine oil	4 - 3, Changing the engine oil and filter cartridge
Remove the clutch pushrod	7 - 8.2, Removal of the clutch transmission unit
Remove the pump-cylinder hoses	9 - 5, Removal of the cylinder/piston assembly
Remove the generator cover	9 - 8, Removal of the generator cover

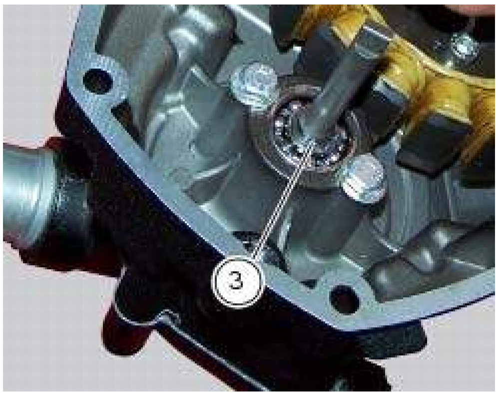
Note
For clarity, the figures show the engine removed from the frame.

Loosen and remove the water pump cover (12) fixing screws (13) to the generator cover (16).
Remove the water pump cover (12).

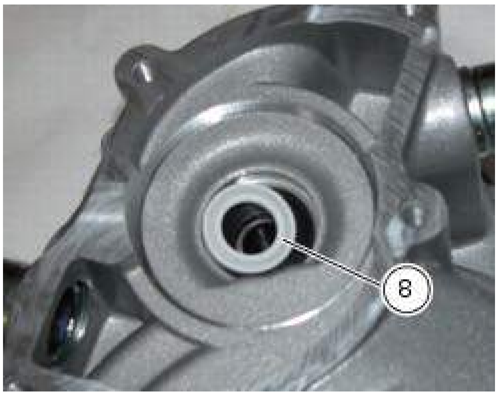


Clean the pump housing of any scale. Check the bearings wear by turning the impeller shaft (10); in case of excessive clearance, it is necessary to replace them by operating as follows.
Remove the circlip (3) on the impeller shaft.
Slide off the rotor (10) with the sealing ring (9) from the outside.

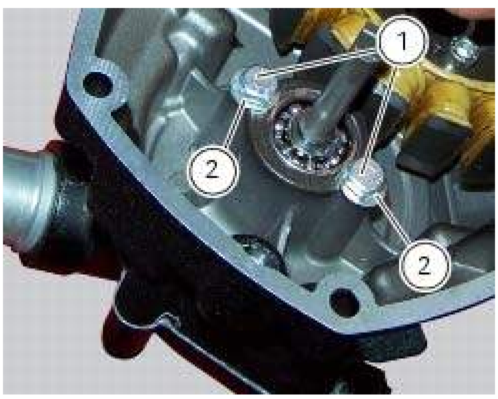




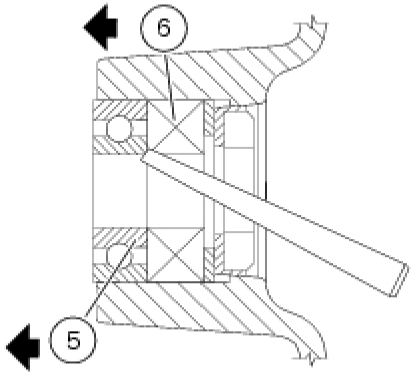
Recover the ceramic washer - seal unit (8) placed on the internal side.

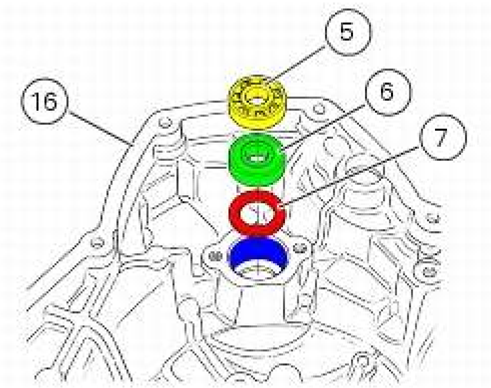


Undo and remove the screws (1) with the washer (2).



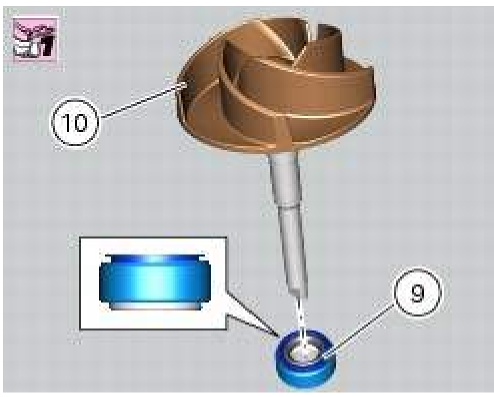
Working from the generator cover (16) internal side, use a suitable punch to press on the inner race of end bearing (5) until it can be extracted from the cover.
Use the same technique to remove the other bearing (6).
Remove the inner spacer (7).
Check the condition of the components of the mechanical seal: there should be no signs of deformation, cracking, or excessive wear. In the case of damage, both components must be renewed.



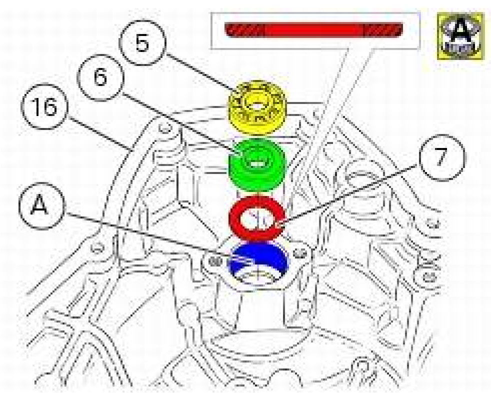


Refitting the water pump

Clean the seat on the cover, any parts you intend to reuse, and the impeller shaft. Then refit as follows.
Fit on the impeller (10) shaft the mechanical seal (9) as indicated in the figure.
Apply specified lubricant to facilitate the insertion.
Bring the mechanical seal fully home on the impeller.

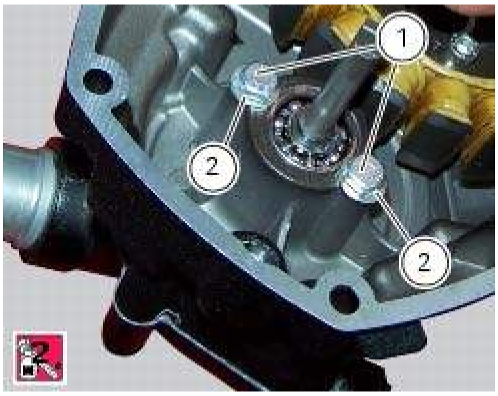


Grease the seat (A) of the bearings for the impeller on the generator cover (12).
Insert spacer (7) fully home into the generator cover by orienting it so that the round edge is faced down.
Fit bearing (6) completely into the spacer.
Fit bearing (5) completely on the bearing (6).

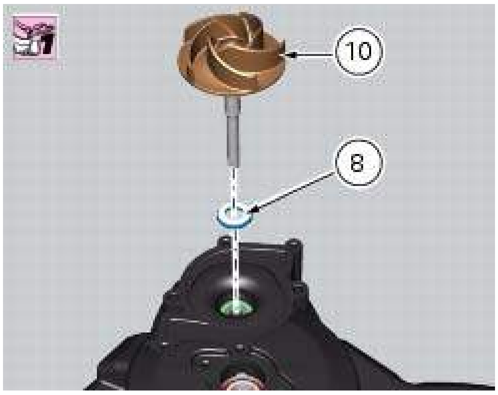


Fit the washers (2) on the screws (1).
Orient the washers so that the knurled side is faced to the screw head.
Apply recommended threadlocker to the screws.
Fit the two screws (1) and tighten them to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque

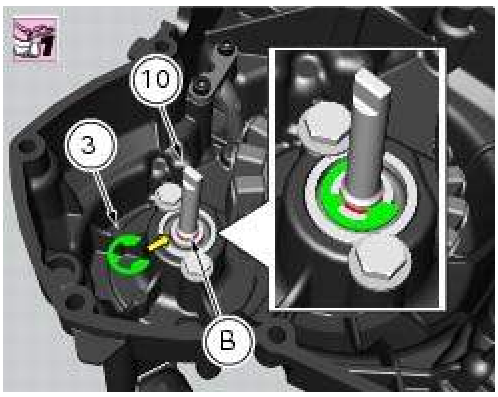
settings).



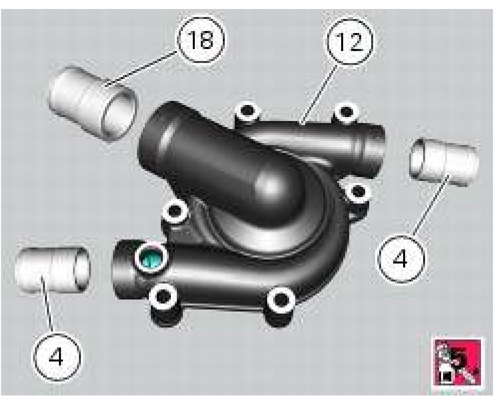
Turn the cover upside down.
Introduce the counterface (8) completely into the generator cover.
The counterface must be oriented so that the white side is faced upwards.
Apply specified lubricant to facilitate the counterface insertion.
Clean the counterface from exceeding lubricant.
Install the water pump impeller (10) and bring completely against the counterface.



Use the special tools to install the snap ring (3) into the proper groove (B), on the impeller (10) shaft, as shown in figure.

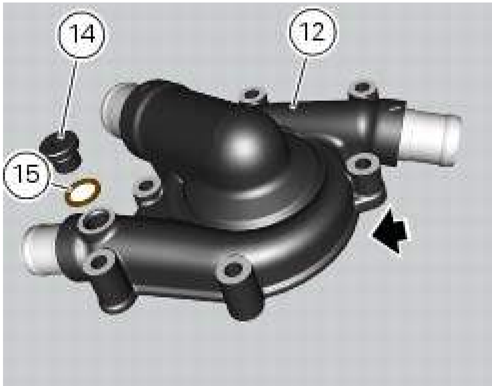


If previously removed, apply specified threadlocker on the threads of the water pump delivery unions (4).
Fit the unions on the water pump cover (12) and tighten them to a torque of 25 Nm (Min. 23 Nm - Max. 27 Nm) (Sect. 3 - 3, Engine torque settings).
Apply recommended threadlocker on the thread of the water pump intake union (18).
Fit the union on the water pump cover (12) and tighten it to a torque of 25 Nm (Min. 23 Nm - Max. 27 Nm) (Sect. 3 - 3, Engine torque settings).

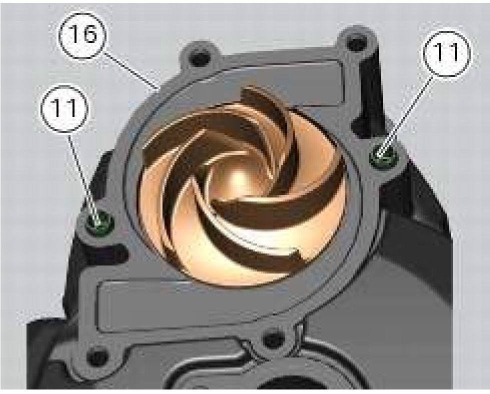


If previously removed, insert washer (14) into the plug of the water pump cover (15).

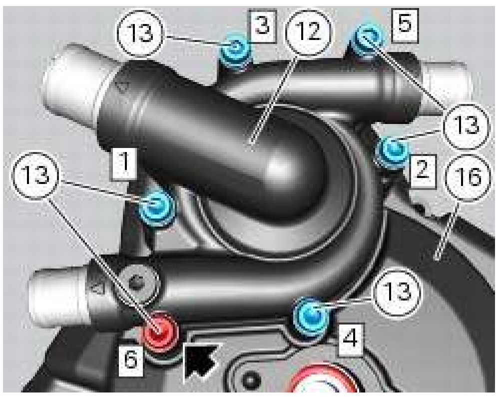
Fit the plug on the water pump cover (12) and tighten it to a torque of 20 Nm (Min. 18 Nm - Max. 22 Nm) (Sect. 3 - 3, Engine torque settings).



Clean the mating surfaces thoroughly on the pump cover and on the alternator-side crankcase cover.
If previously removed, install the two centring bushes (11) completely into the generator cover.
Apply a bead of fluid gasket on the generator cover (16).



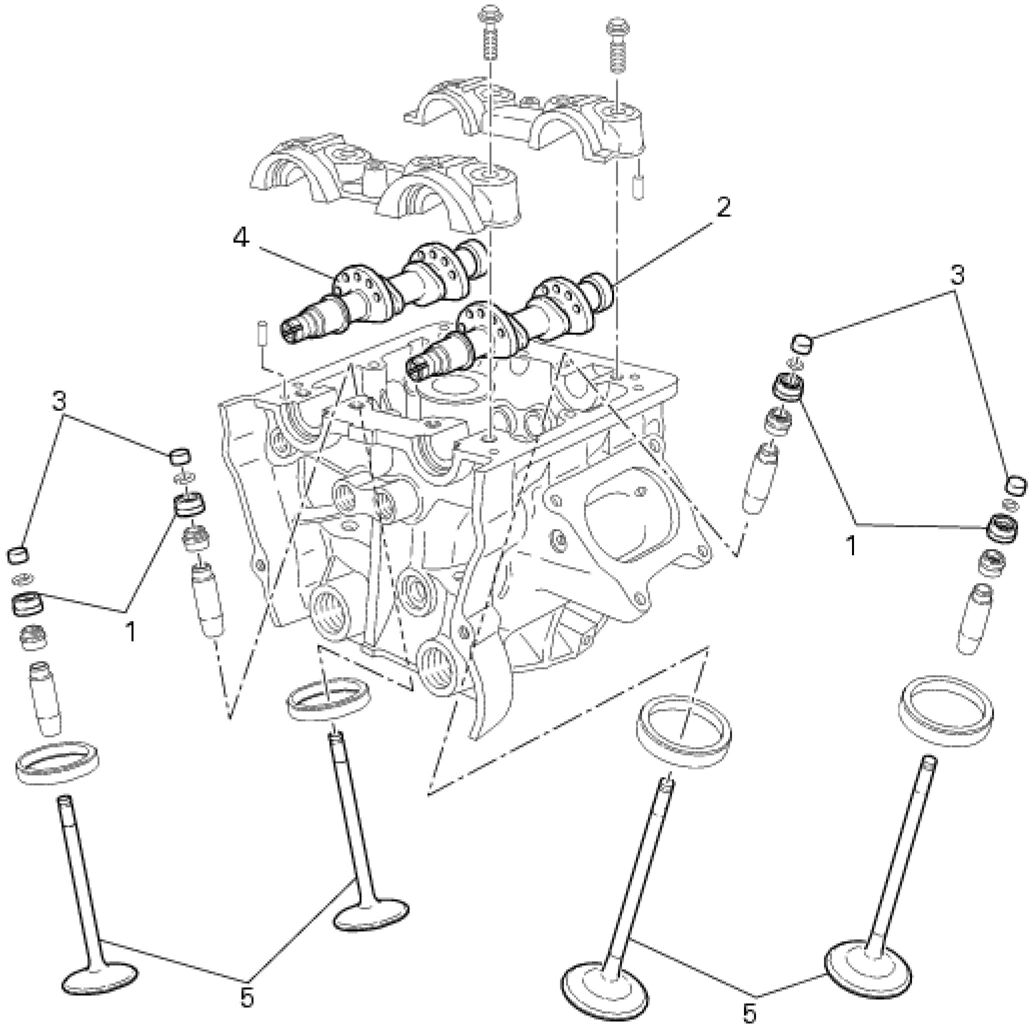
Insert the fixing screws (13) and (18) of the cover.
Tighten the screws (13) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings).
Tighten the screws (13) to a torque of 13.5 Nm (Min. 12.5 Nm - Max. 14.5 Nm) (Sect. 3 - 3, Engine torque settings) following the indicated sequence.
Refit the components removed in the procedure.



Operations	Section reference
Install the alternator cover	9 - 8, Refitting the alternator-side crankcase cover
Refit the pump-cylinder hoses	9 - 5, Refitting the cylinder/piston assembly
Refit the clutch control piston	7 - 8.2, Refitting the clutch transmission unit
Refill the system with engine oil	4 - 3, Changing the engine oil and filter cartridge
Refit the gearchange control	7 - 9, Refitting the gearchange mechanism
Refit the sprocket cover	7 - 14, Refitting the front sprocket
Fit the cooling system hose on the water pump cover	9 - 3.1, Refitting the cooling system hoses and unions

Fill the cooling system	4 - 3, Changing the coolant

4.1 -Cylinder head assemblies: checks and adjustments



1 Closing shim
2 Intake side camshaft
3 Opening shim
4 Exhaust side camshaft
5 Valve

Spare parts catalogue

Diavel ABS	CYLINDER HEAD: TIMING SYSTEM
Diavel ABS	VERTICAL CYLINDER HEAD
Diavel ABS	HORIZONTAL CYLINDER HEAD
Diavel Carbon ABS	CYLINDER HEAD: TIMING SYSTEM
Diavel Carbon ABS	VERTICAL CYLINDER HEAD
Diavel Carbon ABS	HORIZONTAL CYLINDER HEAD

Important
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Checking and adjusting the valve clearances

Operations	Section reference
Remove the saddles	5 - 3, Removal of the seat
Remove air conveyor covers	8 - 7, Removal of the air filters

Remove the tank half covers	5 - 2, Removal of the fuel tank fairings
Remove the fuel tank	8 - 2, Removal of the fuel tank
Remove air conveyors	8 - 7, Removal of the air filters
Disconnect the throttle cable	7 - 8.1, Removal of the throttle twistgrip
Remove the airbox, the throttle body, the blow by and the oil breather tube	8 - 6, Removal the airbox and throttle body
Empty the coolant out of the cooling system	4 - 3, Changing the coolant
Loosen the clamps of the hose that connects the two radiators and the hose that connects the RH radiator to the union	9 - 3.1, Removal of the cooling system hoses and unions
Remove the water radiators leaving them connected to the cooling system	9 - 3.2, Removing the water radiators
Remove the exhaust unit	8 - 8, Removal of the exhaust system
Loosen the timing belt covers	9 - 4.2, Removal of the timing belt covers
Remove the coils	6 - 9, Ignition coils
Remove the cylinder head cover	9 - 4.4, Removal of the camshafts

Note

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

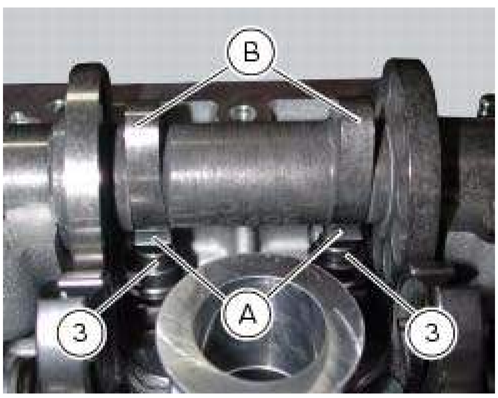
Move the piston of the cylinder being checked to TDC of the power stroke: in this condition, all the valves are closed and the timing shafts come in neutral position and, therefore, free to rotate; check to the valve clearance on the cylinder head on which it operates.

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), taking care not to compress the rocker arm return spring.
The value must be within the specified ones (Sect. 3 - 1.1, Timing system/valves).
If not, remove the opening adjuster (3), as described in paragraph “Removing the valves” (Sect. 9 - 4.5), 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 replacement parts: the size is punched on the shim.

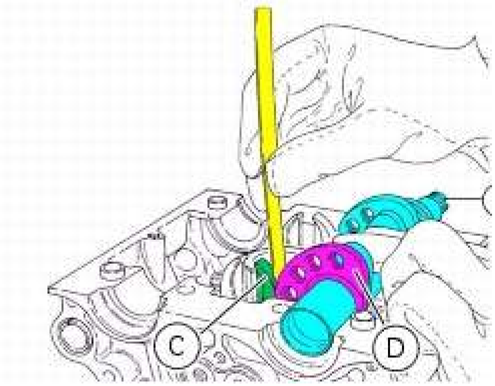


Checking the closing clearance

Using a feeler gauge, check the clearance between the closing rocker arm (C) and the highest point of the camshaft lobe (D).
The value must be within the specified ones (Sect. 3 - 1.1, Timing system/valves).
If not, remove the closing adjuster (1), as described in paragraph “Removing the valves” (Sect. 9 - 4.5), and replace it with one of suitable height to obtain the prescribed clearance.

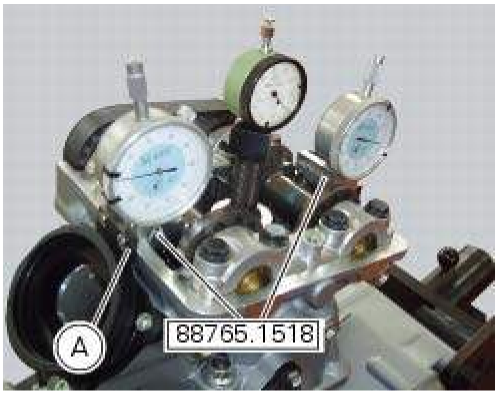
Note

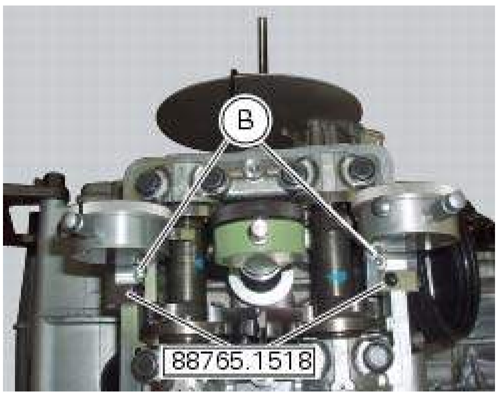
Closing rocker arm shims measuring from 2.2 to 4.5 are available as replacement parts: the size is punched on the shim.



Checking valve lift

Set the engine to the configuration described for the "Checking and adjusting the valve clearances", previously indicated.
Position the tool **88765.1518** 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 plate (A) and tighten the screws (B).





Set the opening valve clearance to zero when the camshaft is in its rest position by fitting a feeler gauge between the upper rocker arm and the opening shim.
Lock the dial gauge into the seat of the stand marked "A" and position the 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 (Sect. 3 -1.1, Timing system/valves).
Repeat the same operation for the exhaust valves, using the dial gauge in the support seat 88765.1518 with the marking "S".
Refit the components by carrying out the same operations indicated in chapter "Checking and adjusting the valve clearances", previously described.
Refit the components removed in the procedure.

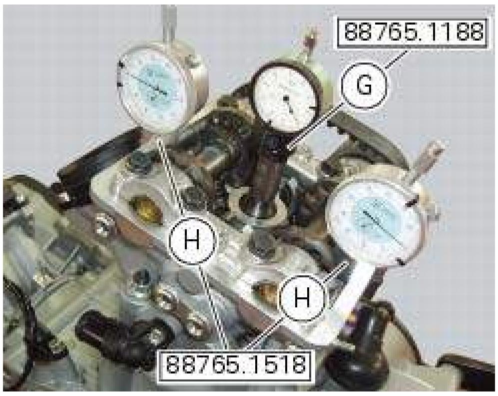
Operations	Section reference
Refit the cylinder head cover	9 - 4.4, Refitting the camshafts
Refit the coils	6 - 9, Ignition coils
Refit the exhaust unit	8 - 8, Refitting the exhaust system

Fasten the timing belt covers	9 - 4.2, Refitting the timing covers
Reassemble the water radiators on the frame	9 - 3.2, Refitting the radiator
Tighten the clamps of the hose that connects the two radiators and the hose that connects the RH radiator to the union	9 - 3.1, Refitting the cooling system hoses and unions
Refill the cooling system	4 - 3, Changing the coolant
Refit the oil breather pipe, the blow by, the throttle body and the airbox	8 - 6, Refitting the airbox and throttle body
Connect the throttle cable	7 - 8.1, Refitting the throttle twistgrip
Refit air conveyors	8 - 7, Refitting the air filters
Refit the fuel tank	8 - 2, Refitting the fuel tank
Reassemble the tank half covers	5 - 2, Refitting the fuel tank fairings
Reassemble air conveyor covers	8 - 7, Refitting the air filters
Refit the saddles	5 - 3, Refitting the seat

Checking the engine timing

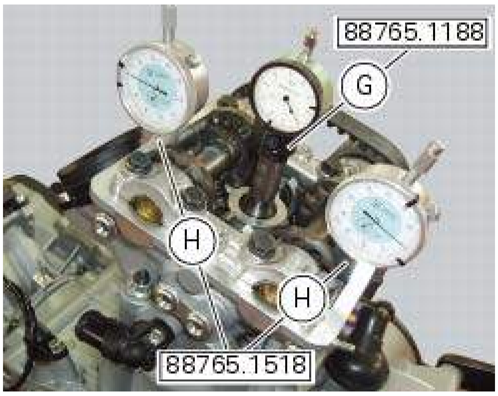
Operations	Section reference
Remove the saddles	5 - 3, Removal of the seat
Remove air conveyor covers	8 - 7, Removal of the air filters
Remove the tank half covers	5 - 2, Removal of the fuel tank fairings
Remove the fuel tank	8 - 2, Removal of the fuel tank
Remove air conveyors	8 - 7, Removal of the air filters
Disconnect the throttle cable	7 - 8.1, Removal of the throttle twistgrip
Remove the airbox, the throttle body, the blow by and the oil breather tube	8 - 6, Removal the airbox and throttle body
Empty the coolant out of the cooling system	4 - 3, Changing the coolant
Loosen the clamps of the hose that connects the two radiators and the hose that connects the RH radiator to the union	9 - 3.1, Removal of the cooling system hoses and unions
Remove the water radiators leaving them connected to the cooling system	9 - 3.2, Removing the water radiators
Remove the exhaust unit	8 - 8, Removal of the exhaust system
Loosen the timing belt covers	9 - 4.2, Removal of the timing belt covers
Remove the coils	6 - 9, Ignition coils
Remove the cylinder head cover	9 - 4.4, Removal of the camshafts

Set the engine to the configuration described for the "Checking and adjusting the valve clearances", previously indicated.
Install tool **88765.1188** (G) in the spark plug bore to determine the piston TDC, the gauges (H) on the tool **88765.1518** and the timing check tool (degree wheel (L) **88713.0123** with graduated disk).

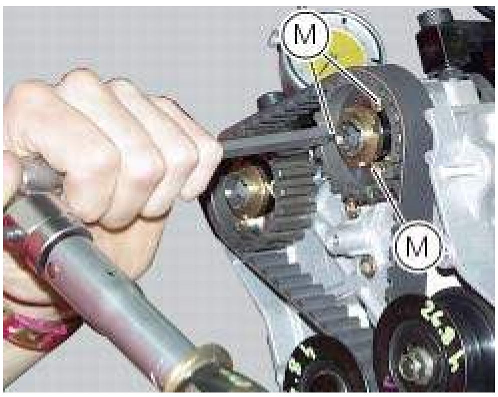


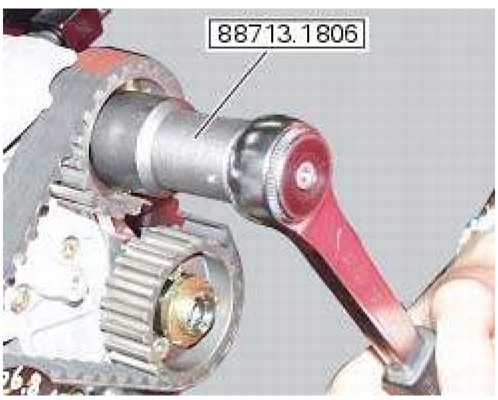
Set the opening valve clearance to zero when the camshaft is in its rest position by fitting a feeler gauge between the upper rocker arm and the opening shim.
Check that in this condition the camshaft can rotate. If it moves stiffly, use a thinner feeler gauge.

In this condition, with the piston of the horizontal cylinder at TDC with the valves fully closed as confirmed by the reading on gauge (G), set the gauges (H) to zero.
Set the tension value of the belts as described at Sect. 6 - 11, Checking and adjusting timing belt tension.
Turn the degree wheel (L) counter clockwise until the gauge dial (H), on the exhaust side, shows a lift of **1** mm. Check that the value of the angular displacement read on the degree wheel (L) is as specified in (Sect. 3 - 1.1, Timing system/valves).
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 (H), during closure of the valve for the compression stroke. Check the angular value with the prescribed one (Sect. 3 - 1.1, Timing system/valves).
Continue to rotate the degree wheel (L) counter clockwise until you obtain a lift of **1** mm of the exhaust valve, when opening or closing the valve.
Check the angular displacement value against the specified value.
Repeat the procedure for the vertical cylinder.
A tolerance of **± 3°** is allowed in the values detected with the described procedure regarding the prescribed ones (Sect. 3 - 1.1, Timing system/valves).



Remove the installed tools to check timing. Then tension the belts to the value of the prescribed operation, as described at Sect. 6 - 11, Measuring the timing belt tension values.
In case of values different from the described ones (Sect. 3 - 1.1, Timing system/valves), loosen the fixing screws (M) of the timing pulley and correct the value detected by turning the ring nut of the timing shaft with the supplied wrench with code **88713.1806**.
Lock the three retaining screws (M) of the timing pulley to the specified torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings) and mark the new position of the components.



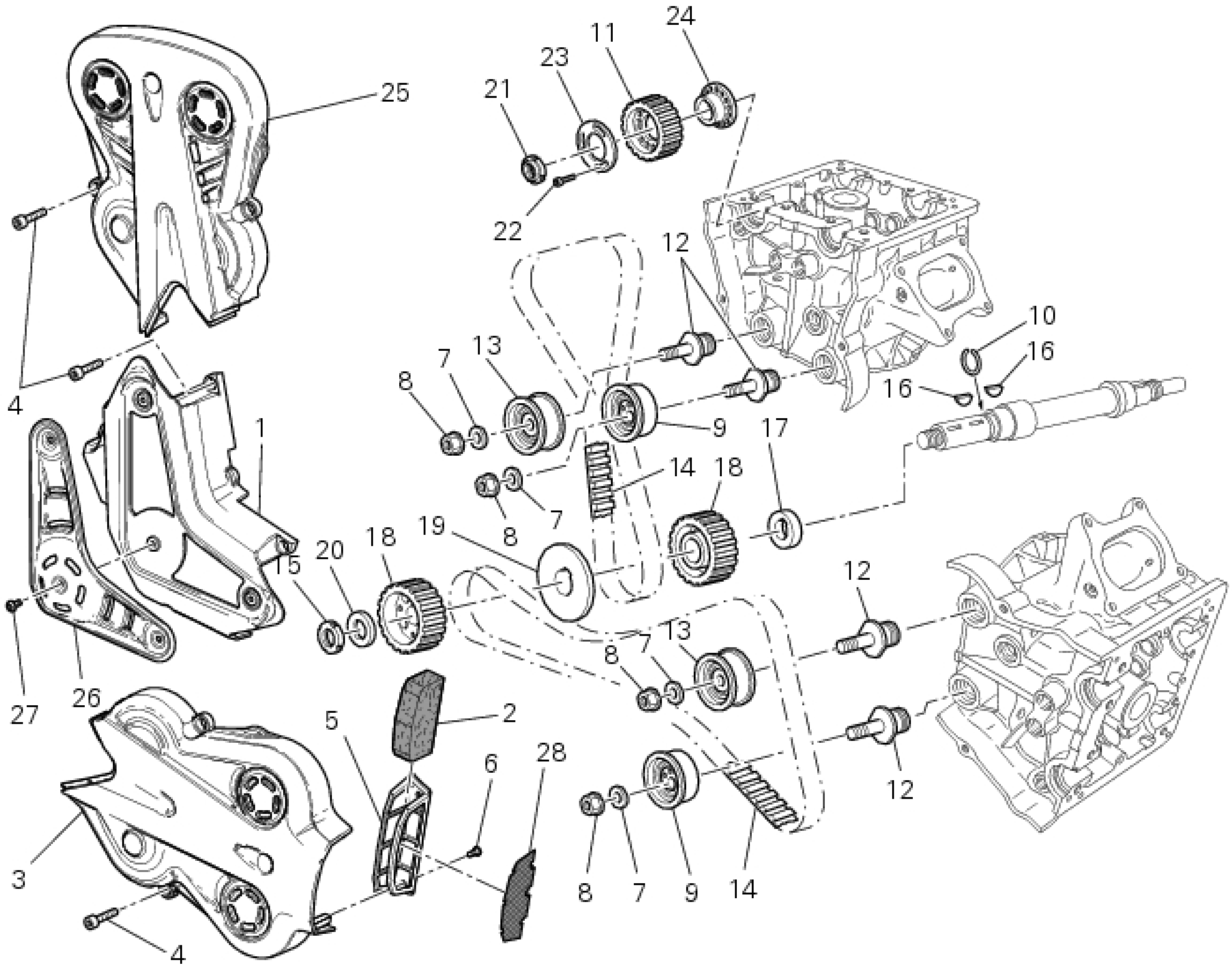


Refit the components removed in the procedure.

Operations	Section reference
Refit the cylinder head cover	9 - 4.4, Refitting the camshafts
Refit the coils	6 - 9, Ignition coils
Refit the exhaust unit	8 - 8, Refitting the exhaust system

Fasten the timing belt covers	9 - 4.2, Refitting the timing covers
Reassemble the water radiators on the frame	9 - 3.2, Refitting the radiator
Tighten the clamps of the hose that connects the two radiators and the hose that connects the RH radiator to the union	9 - 3.1, Refitting the cooling system hoses and unions
Refill the cooling system	4 - 3, Changing the coolant
Refit the oil breather pipe, the blow by, the throttle body and the airbox	8 - 6, Refitting the airbox and throttle body
Connect the throttle cable	7 - 8.1, Refitting the throttle twistgrip
Refit air conveyors	8 - 7, Refitting the air filters
Refit the fuel tank	8 - 2, Refitting the fuel tank
Reassemble the tank half covers	5 - 2, Refitting the fuel tank fairings
Reassemble air conveyor covers	8 - 7, Refitting the air filters
Refit the saddles	5 - 3, Refitting the seat

4.2 -Cylinder head assemblies: timing system



1 Central external cover
2 Air filter
3 Horizontal cylinder timing belt cover
4 Screw
5 Filter support
6 Screw
7 Washer
8 Nut
9 Tensioner pulley assembly
10 Circlip
11 Camshaft pulley
12 Tensioner pin
13 Idler pulley assembly
14 Timing belt
15 Nut
16 Key
17 Spacer
18 Camshaft pulley
19 Driveshaft pulley spacer
20 Spacer
21 Nut
22 Screw
23 Washer
24 Spacer flange
25 Vertical cylinder belt external cover
26 Central protection
27 Screw
28 Mesh

Spare parts catalogue

Diavel ABS

	TIMING SYSTEM
Diavel ABS	CYLINDER HEAD: TIMING SYSTEM
Diavel Carbon ABS	TIMING SYSTEM
Diavel Carbon ABS	CYLINDER HEAD: TIMING SYSTEM

Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Note

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

To work with the engine installed, first proceed as follows:

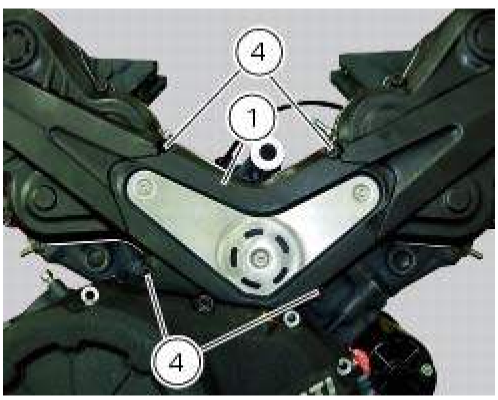
Operations	Section reference
Remove the saddles	5 - 3, Removal of the seat
Remove air conveyor covers	8 - 7, Removal of the air filters
Remove the tank half covers	5 - 2, Removal of the fuel tank fairings
Remove the fuel tank	8 - 2, Removal of the fuel tank
Remove air conveyors	8 - 7, Removal of the air filters
Disconnect the throttle cable	7 - 8.1, Removal of the throttle twistgrip
Remove the airbox, the throttle body, the blow by and the oil breather tube	8 - 6, Removal the airbox and throttle body
Empty the coolant out of the cooling system	4 - 3, Changing the coolant
Loosen the clamps of the hose that connects the two radiators and the hose that connects the RH radiator to the union	9 - 3.1, Removal of the cooling system hoses and unions
Remove the water radiators	9 - 3.2, Removing the water radiators
Remove the exhaust unit	8 - 8, Removal of the exhaust system

Note

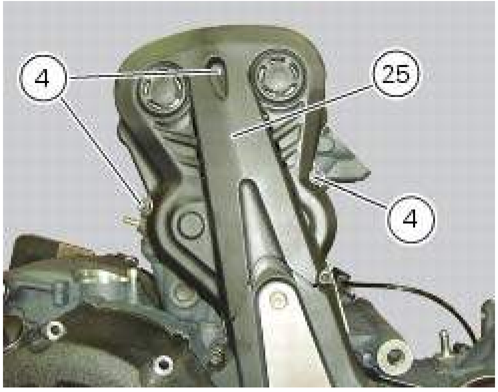
Remove also any parts which may impede the procedure in any way.

Removal of the timing belt covers

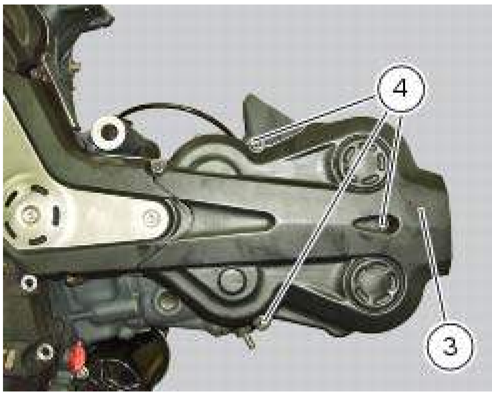
Loosen the screws (4) securing the central external cover (1) and remove it from the central side.



Undo the fixing screws (4) of the external cover (25) and remove it from the vertical thermal unit.



Undo the fixing screws (4) of the external cover (3) and remove it from the horizontal thermal unit.



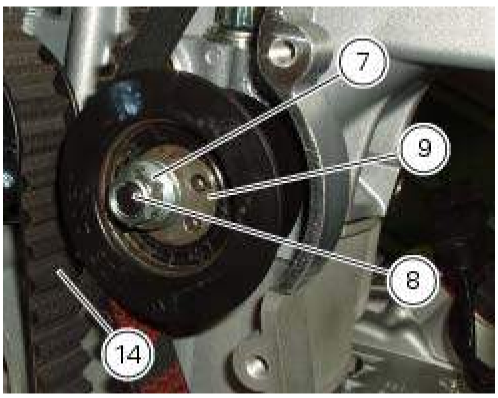
Removal of the movable tensioner/timing belt

Loosen the nut (8) and remove the washer (7) and the tensioner pulley (9) from the pin (**12**) on the cylinder head. Remove the timing belt (14) from the horizontal cylinder assembly.

Important

If the belts are to be re-used, mark the direction of rotation with an arrow and also mark the cylinder they belong to.

Repeat the procedure for the other cylinder.



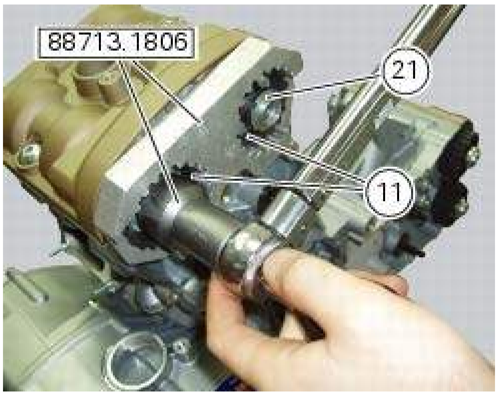
Removing of the cylinder head pulley/fixed tensioner

Insert the tool code **88713.1806** in the pulleys to lock their rotation and use the bush supplied to loosen the fixing nuts (21) of the pulleys.

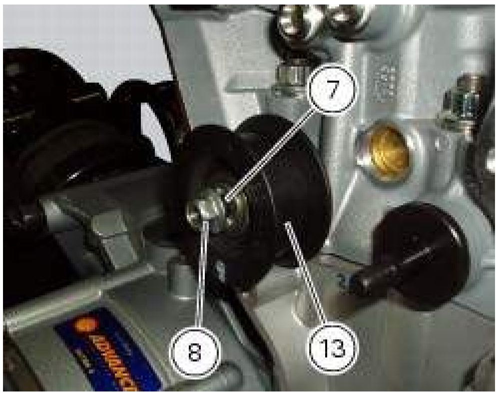
Important

On reassembly, always use new nuts.

Remove the nuts (21) and the pulleys (11) from the camshafts.

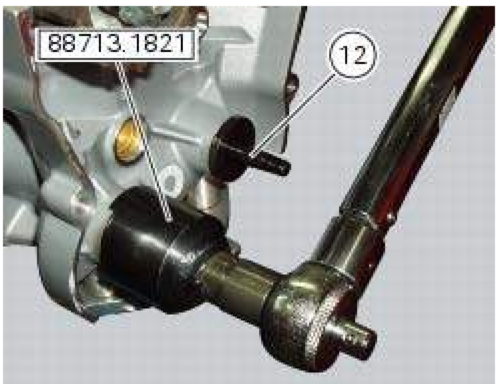


Loosen the nut (8), and remove the washer (7) and the fixed tensioner (13).
Repeat the same procedure to remove the other pulley.



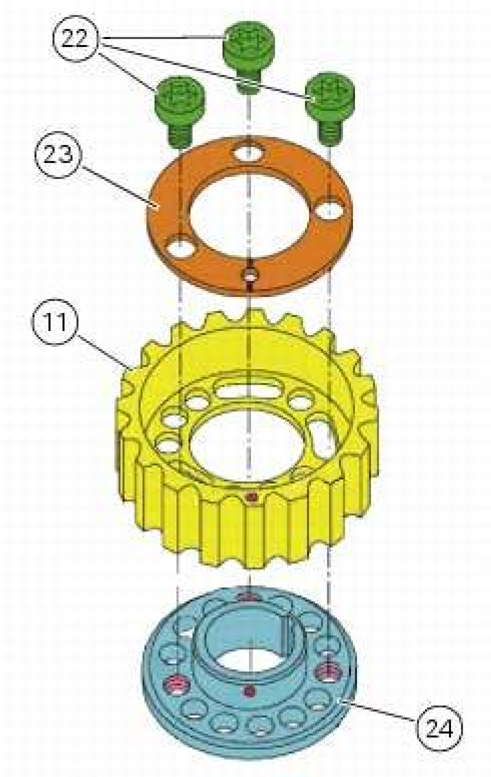
Removal of the tensioner and idler pulley mounting studs

Using the tool code **88713.1821**, remove the tensioner pins (12) from the cylinder heads.



Disassembly of the camshaft pulleys

Unscrew and remove the screws (22).
Slide off the washer (23).
Withdraw the camshaft pulley (11) from the spacer flange (24).



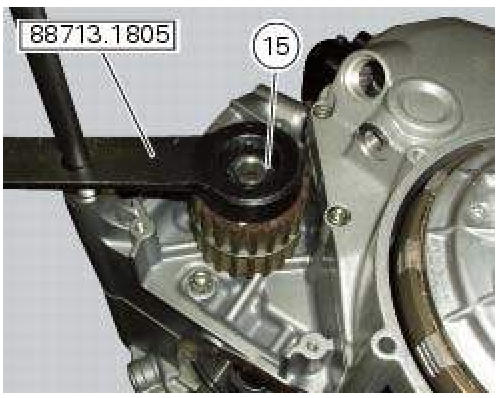
Removing the timing belt driveshaft pulleys

Use the tool code **88713.1805** to hold the driving pulley on the engine crankcase against rotation.

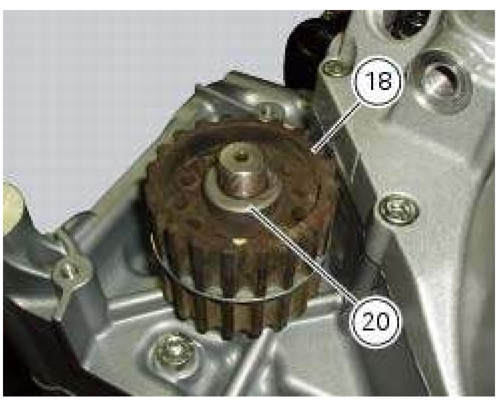
Important

If this operation is carried out with the engine installed in the frame, hold the driveshaft pulleys against rotation using the tool code **88713.2011** mounted on the alternator cover.

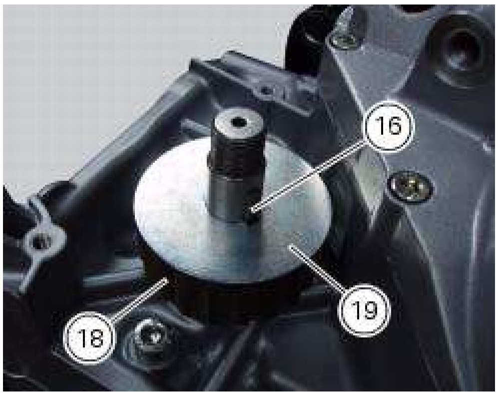
Loosen the nut (15) using the socket supplied with the service tool.



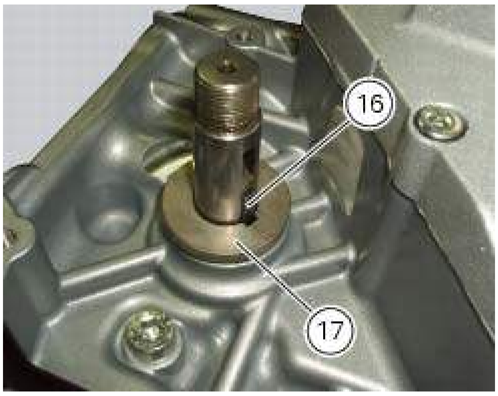
Remove the nut (15), the spacer (20) and the outer pulley (18).



Remove the first Woodruff key (16) from the timing belt driveshaft.
Remove the intermediate spacer (19) and the inner pulley (18).



Remove the inner spacer (17) and second Woodruff key (16) on the timing belt driveshaft.



It is now possible to remove the circlip (10) on the driveshaft.

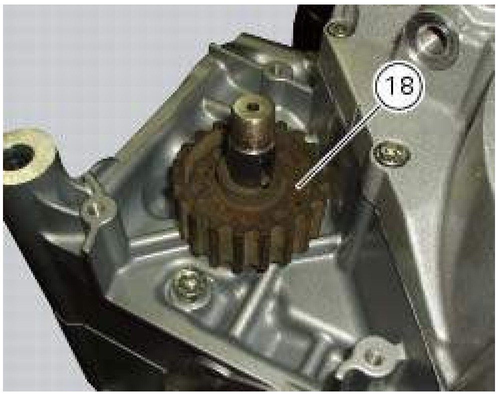
Refitting the timing belt driveshaft pulleys

To fit the circlip (10) in the driveshaft seat, use the tool code **88713.2834**.

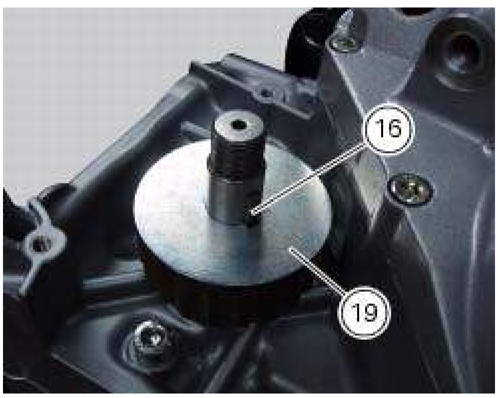
Install the inner spacer (17) on the driveshaft, taking care to align the notch in the spacer with the slot for the Woodruff key.

Fit the first Woodruff key (16) on the timing belt driveshaft.

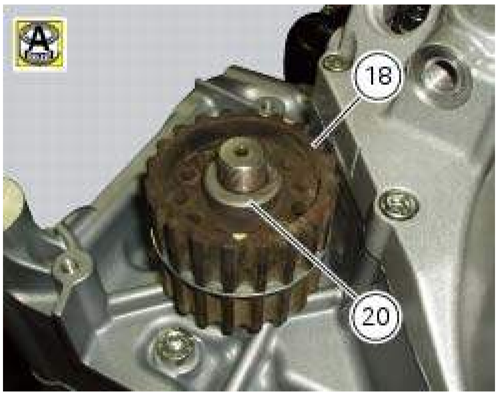
Locate the inner pulley (18).



Refit the second tongue (16) and the washer (19).



Locate the outer pulley (18) and the spacer (20).
Apply the recommended grease to the threads on the end of the driveshaft.

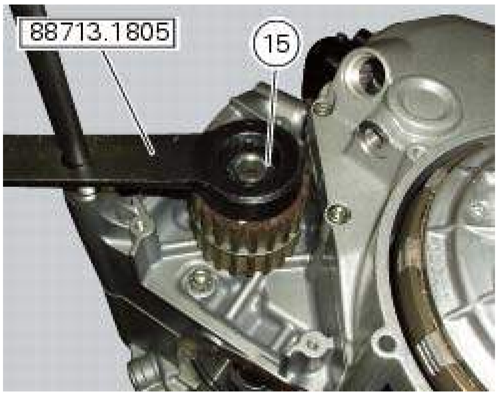


Fit the nut (15).

Important

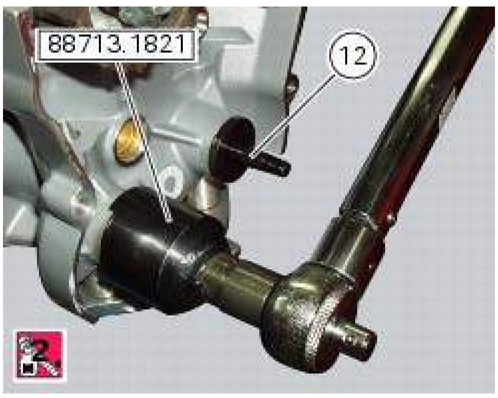
To prevent the nuts working loose and consequent serious engine damage, always use new self-locking nuts on all the timing belt pulleys on reassembly.

Lock rotation of the pulleys by means of the tool part no. **88713.1805** and, using the insert supplied with the wrench together with a torque wrench, tighten the self-locking nut to the torque of 71 Nm (Min. 64 Nm - Max. 78 Nm) (Sect. 3 - 3, Engine torque settings).



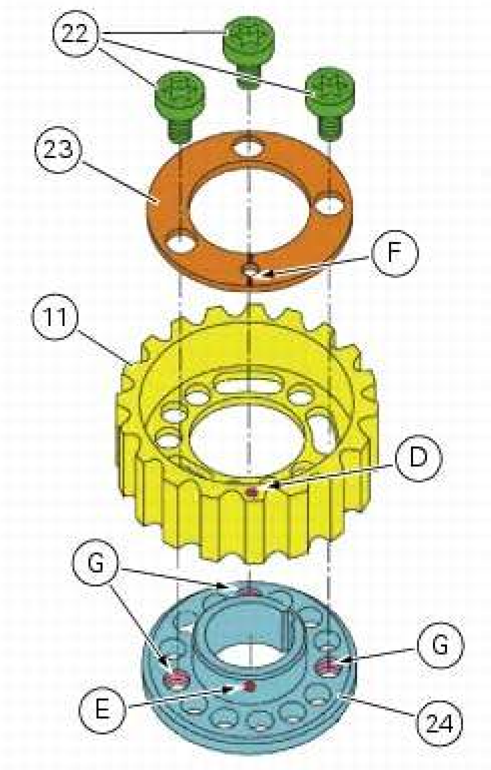
Refitting the idler and tensioner pulley mounting studs

Apply the recommended threadlocker to the threads of the studs.
Insert the tensioner pins (12) on the cylinder heads, and tighten them using the tool code **88713.1821**.
Tighten the tensioner pins to a torque of 50 Nm (Min. 45 Nm - Max. 55 Nm) (Sect. 3 - 3, Engine torque settings).



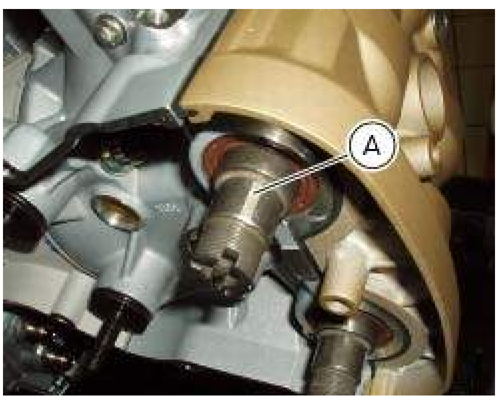
Reassembly of the timing pulleys

Fit the pulley (11) on the flange (24), aligning the timing mark (D) on the pulley with the timing mark on the (E) on the flange.
Install the washer (23) up against the pulley, aligning the timing notch (F) with the timing marks on the pulley and the flange.
Insert the three screws (22) in the threaded holes (G) of the flange.
Tighten the screws (22) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings).

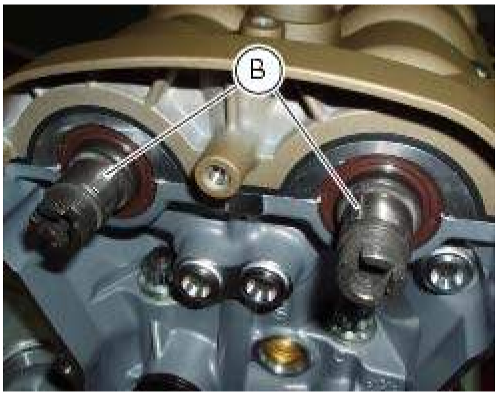


Refitting the cylinder heads pulleys/fixed tensioners

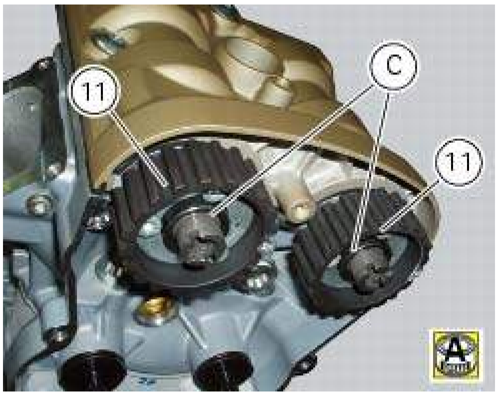
Check that the keyway on the end of the camshaft is in good condition and without burrs.



Fit a Woodruff key (B) in the keyway of each camshaft.

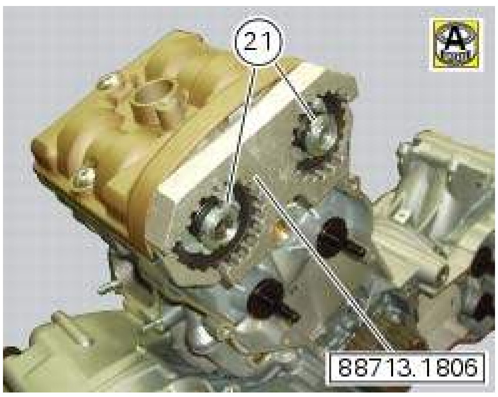


Fit the pulley (11) on the camshaft, inserting the Woodruff key in the in the slot (C) in the pulley.
Apply the recommended grease to the threads on the end of the camshaft.
Repeat the procedure on the other camshaft.

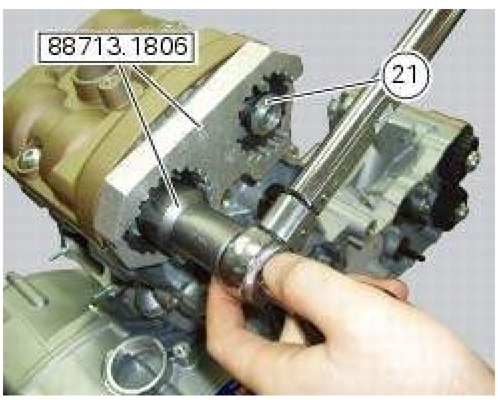


Insert the tool code **88713.1806** into the pulleys to prevent rotation.
Apply the recommended grease to the mating face of the nut (21).
Fit the nut (21).
Carry out the same operations on the other camshaft.

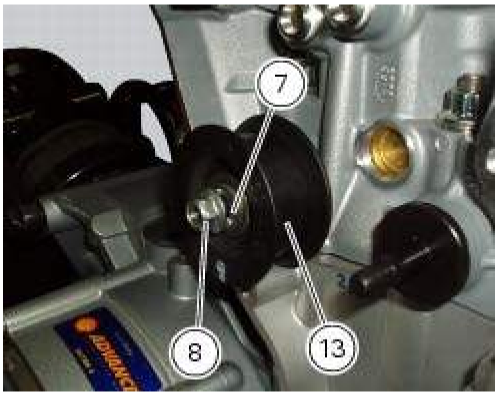
Important
Always fit new nuts on reassembly.



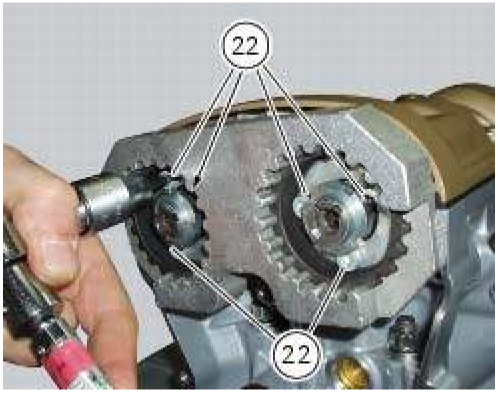
Using the bush supplied with tool with part no. **88713.1806** and a torque wrench, tighten the ring nuts (21) to the specified torque of 71 Nm (Min. 64 Nm - Max. 78 Nm) (Sect. 3 - 3, Engine torque settings).



Insert the fixed tensioners (13), with bearings and washers (7), into the cylinder head pins and tighten the nuts (8) to a torque of 25 Nm (Min. 22 Nm - Max. 28 Nm) (Sect. 3 - 3, Engine torque settings).



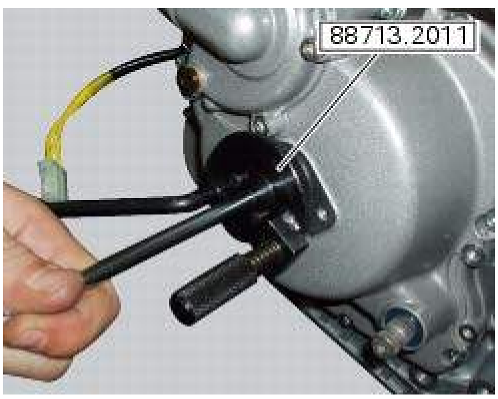
Undo the locking screws (22) of the pulleys, turning them anti-clockwise through 90° ± 5°.
Check that the pulleys have no end float and can rotate freely at all points along the full length of the slots.



Refitting the timing belts

Rotate the pulleys on the timing belt driveshaft until the timing mark on the outer roller is aligned with the mark on the clutch-side crankcase cover.
In this condition, the horizontal cylinder piston will be at top dead centre.

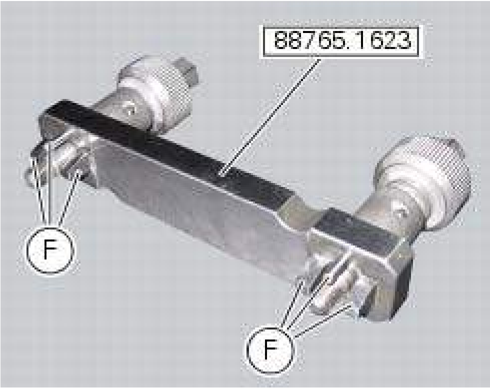
Install in the alternator cover seat the tool code **88713.2011** to prevent crankshaft rotation and lock it with the corresponding pin, tighten the M8 screw of the tool to the torque of **20** Nm.

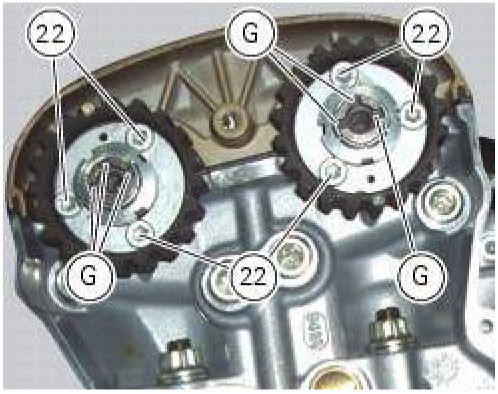


Important

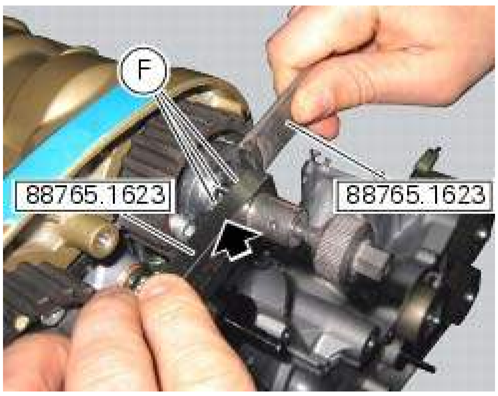
To achieve correct timing, the screws (22) securing the pulleys to the hubs must be loose and positioned in the centres of their slots.
First carry out timing on the vertical cylinder head.

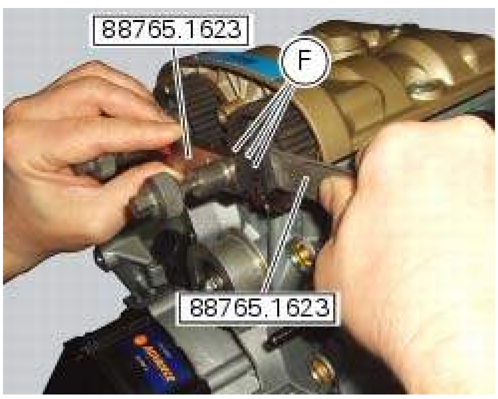
Approach the tool code **88765.1623** to insert the pins (F) in the timing shaft seats (G).



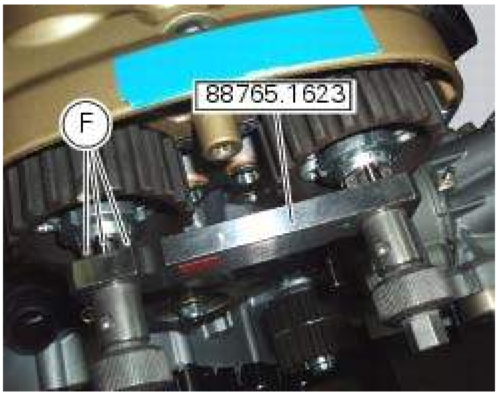


Position the tool code **88765.1623** with legend “UP” and the arrow facing the cylinder head cover.
First place the pins (F) of the tool with part no. **88765.1623** in the intake side pulley with the wrench of tool with part no. **88765.1623**.



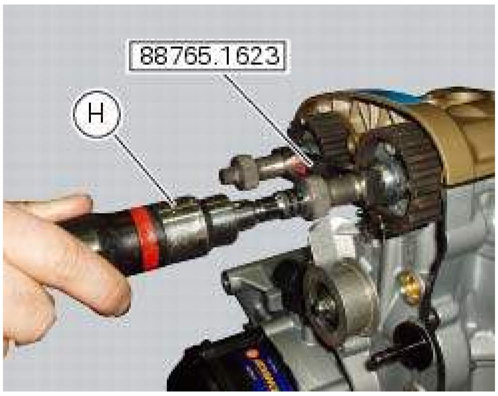


Place the pins (F) of tool code **88765.1623** in the exhaust side pulley manually.



Tighten manually the knobs with tool code **88765.1623** until they stop.

With a torque screwdriver (H) tighten the knob nuts of the tool with part no. **88765.1623** to the torque of **2** Nm **± 10**%.

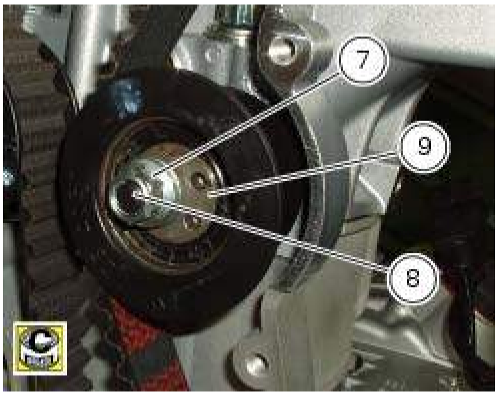


Fit the vertical cylinder timing belt around the camshaft pulleys and pass it behind the idler pulley.

Note

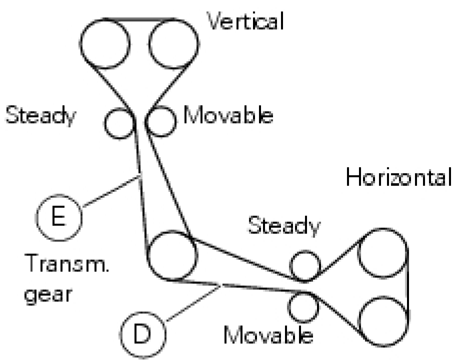
If the used belts are to be refitted, position them in their original direction of rotation and on their original cylinder.

Fit the tensioner pulley (9) and the washer (7) on the pin of the cylinder head.
Apply grease to the tensioner pulley pin threads and to the contact face of the nut (8).
Start the nut (8).

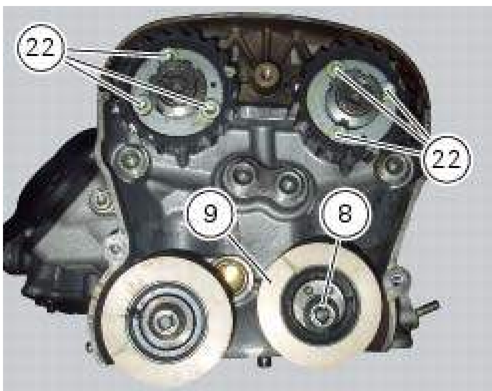


Check the timing belt tension and adjust if necessary as described in the paragraph Measuring the timing belt tension values (Sect. 6 - 11) of the vertical cylinder head belt.

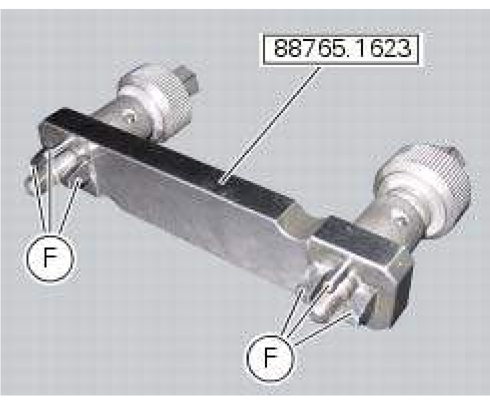
Warning
Check the tension on the belt sections (D) and (E) shown in the figure.



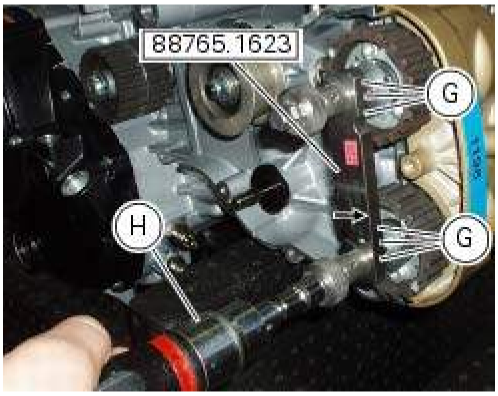
Once the required tension has been reached make sure that the nut (8) retaining the tensioner (9) is tightened to a torque of 25 Nm (Min. 22 Nm - Max. 28 Nm) and the screws (22) of the vertical head are tightened to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings).



Remove the timing shaft locking tool code **88765.1623** of the vertical cylinder head.
Carry out timing on the horizontal cylinder head.
Approach the tool code **88765.1623** to insert the pins (F) in the timing shaft seats (G).



Position the tool code **88765.1623** with legend “UP” and the arrow facing the cylinder head cover.
Place the pins of tool **88765.1623** in the exhaust side pulley seat (G) manually.
Manually tighten the knobs with tool code **88765.1623** until they stop.
With a torque screwdriver (H) tighten the knob nuts of the tool with part no. 88765.1623 to the torque of **2** Nm ± **10**%.

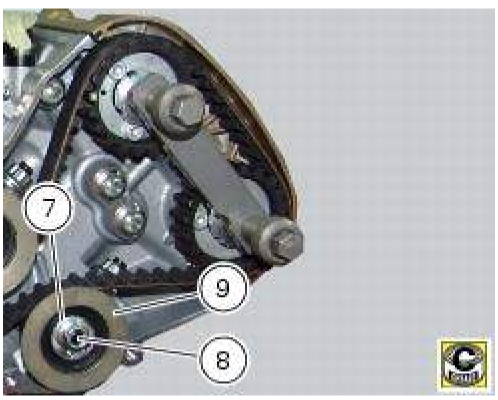


Fit the horizontal cylinder timing belt around the camshaft pulleys and pass it behind the idler pulley.

Note

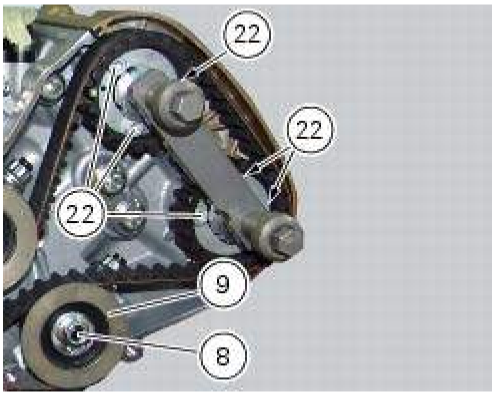
If the used belts are to be refitted, position them in their original direction of rotation and on their original cylinder.

Fit the tensioner pulley (9) and the washer (7) on the pin of the cylinder head.
Apply grease to the tensioner pulley pin threads and to the contact face of the nut (8).
Start the nut (8).



Check the timing belt tension and adjust if necessary as described in the paragraph Measuring the timing belt tension values (Sect. 6 - 11) of the horizontal cylinder head belt.
Once the required tension has been reached make sure that the nut (8) retaining the tensioner (9) is tightened to a

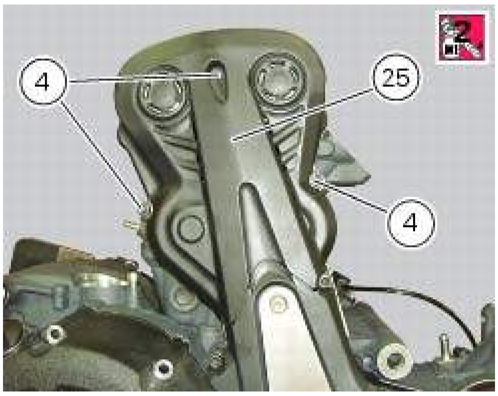
torque of 25 Nm (Min. 22 Nm - Max. 28 Nm) and the screws (22) of the horizontal head are tightened to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings).

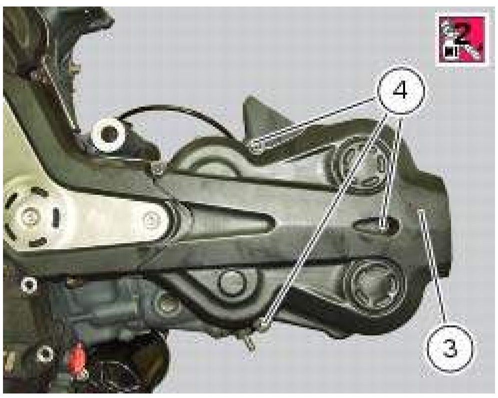


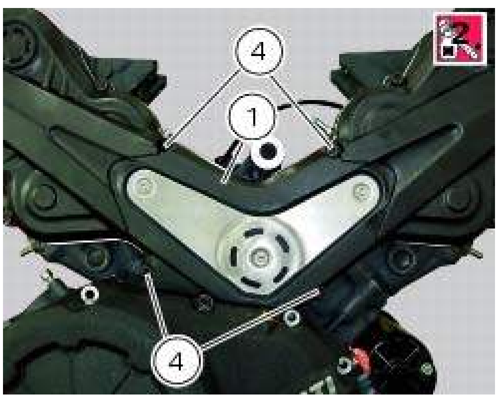
Remove the timing shaft locking tool **88765.1623** of the horizontal cylinder head.

Refitting the timing covers

Locate vertical cylinder external cover (25), horizontal cylinder external cover (3) and central external cover (1) by starting the screws (4).
Apply the recommended threadlocker to the screws (4).
Tighten the screws (4) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings).





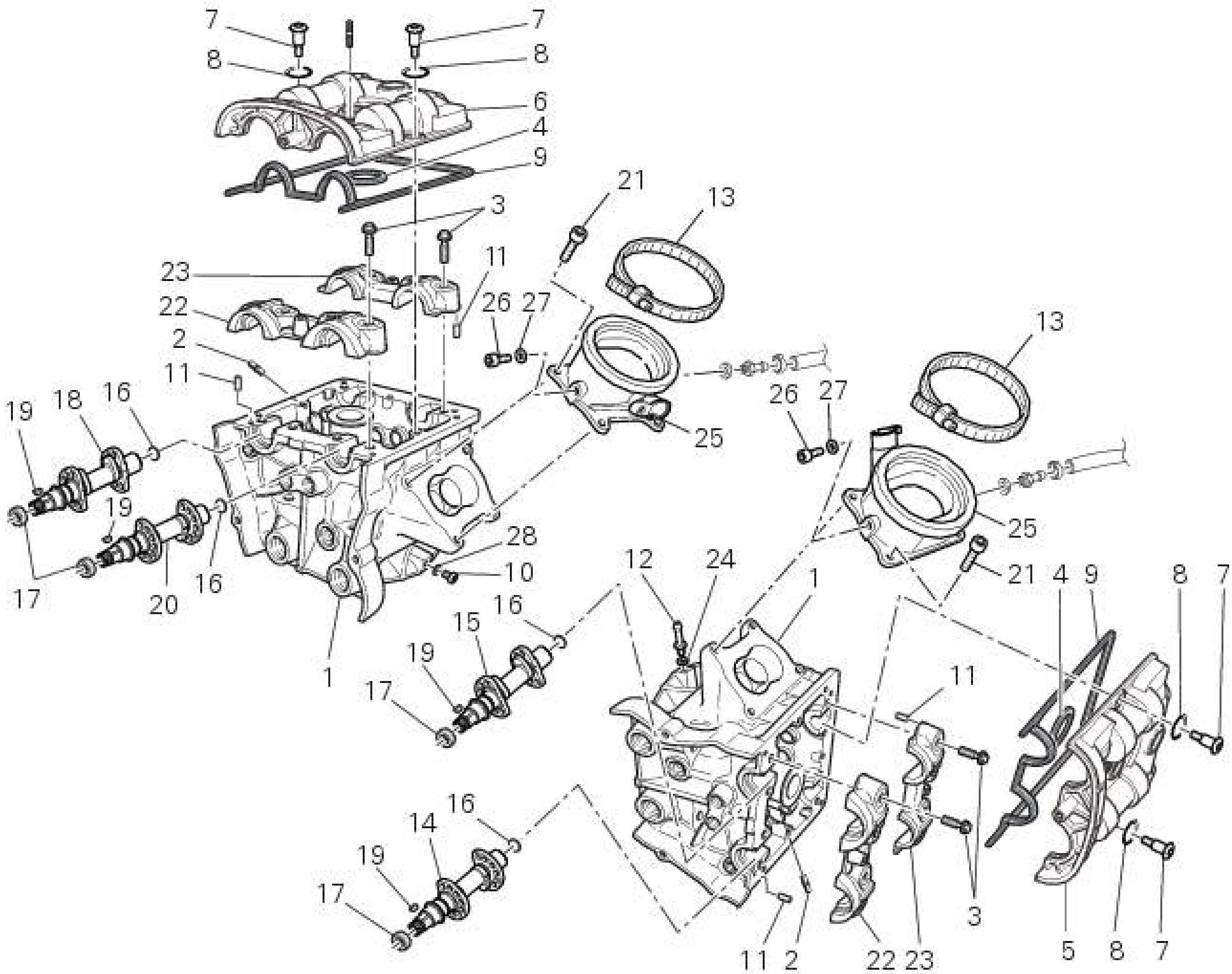


Note

If the above operations have been carried out with the engine installed in the frame, refit the previously removed parts.

Operations	Section reference
Refit the exhaust unit	8 - 8, Refitting the exhaust system
Refit the water radiators	9 - 3.2, Refitting the radiator
Tighten the clamps of the hose that connects the two radiators and the hose that connects the RH radiator to the union	9 - 3.1, Refitting the cooling system hoses and unions
Refill the cooling system	4 - 3, Changing the coolant
Refit the oil breather pipe, the blow by, the throttle body and the airbox	8 - 6, Refitting the airbox and throttle body
Connect the throttle cable	7 - 8.1, Refitting the throttle twistgrip
Refit air conveyors	8 - 7, Refitting the air filters
Refit the fuel tank	8 - 2, Refitting the fuel tank
Reassemble the tank half covers	5 - 2, Refitting the fuel tank fairings
Reassemble air conveyor covers	8 - 7, Refitting the air filters
Refit the saddles	5 - 3, Refitting the seat

4.4 -Cylinder head assemblies: camshafts



1 Head
2 Stud bolt
3 Special screw
4 Sealing washer
5 Horizontal cylinder head cover
6 Vertical cylinder head cover
7 Special screw
8 O-ring
9 Head gasket
10 Screw
11 Pin
12 Union
13 Clamp
14 Horizontal cylinder exhaust camshaft
15 Horizontal cylinder intake camshaft
16 Plug
17 Sealing ring
18 Vertical cylinder exhaust camshaft
19 Key
20 Vertical cylinder intake camshaft
21 Screw
22 Timing side support
23 Opposite side support
24 Sealing washer
25 Intake manifold
26 Screw
27 Sealing washer
28 Sealing washer

Spare parts catalogue

Diavel ABS	CYLINDER HEAD: TIMING SYSTEM
Diavel ABS	VERTICAL CYLINDER HEAD

Diavel ABS	HORIZONTAL CYLINDER HEAD
Diavel ABS	THROTTLE BODY
Diavel Carbon ABS	CYLINDER HEAD: TIMING SYSTEM
Diavel Carbon ABS	VERTICAL CYLINDER HEAD
Diavel Carbon ABS	HORIZONTAL CYLINDER HEAD
Diavel Carbon ABS	THROTTLE BODY

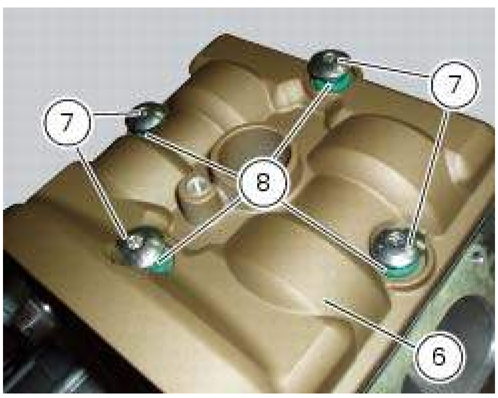
Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Removal of the camshafts

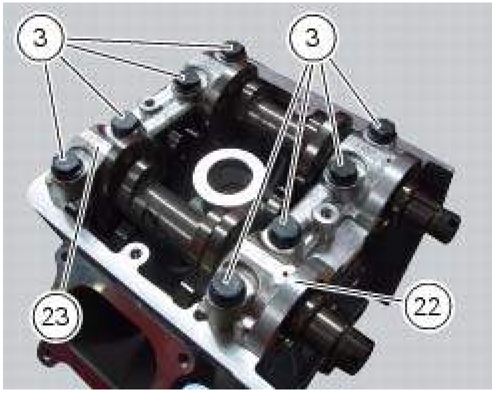
Operations	Section reference
Remove the saddles	5 - 3, Removal of the seat
Remove air conveyor covers	8 - 7, Removal of the air filters
Remove the tank half covers	5 - 2, Removal of the fuel tank fairings
Remove the fuel tank	8 - 2, Removal of the fuel tank
Remove air conveyors	8 - 7, Removal of the air filters
Disconnect the throttle cable	7 - 8.1, Removal of the throttle twistgrip
Remove the airbox, the throttle body, the blow by and the oil breather tube	8 - 6, Removal the airbox and throttle body
Empty the coolant out of the cooling system	4 - 3, Changing the coolant
Loosen the clamps of the hose that connects the two radiators and the hose that connects the RH radiator to the union	9 - 3.1, Removal of the cooling system hoses and unions
Remove the water radiators leaving them connected to the cooling system	9 - 3.2, Removing the water radiators
Remove the exhaust unit	8 - 8, Removal of the exhaust system
Loosen the timing belt covers	9 - 4.2, Removal of the timing belt covers
Remove the coils	6 - 9, Ignition coils
Remove the cylinder head cover	9 - 4.4, Removal of the camshafts

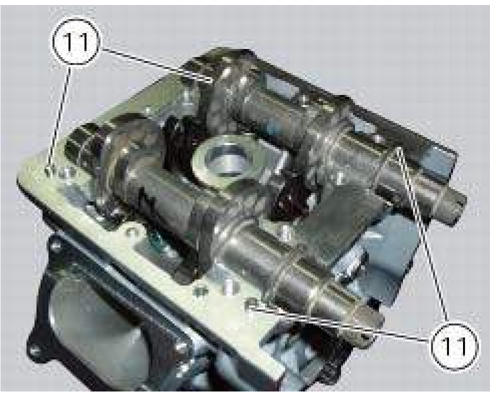
Unscrew and remove the screws (7) and the O-rings (8) from the cylinder head covers.
Remove the cylinder head cover (6).



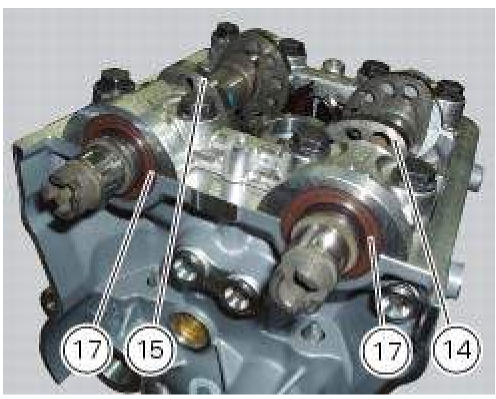
Remove the gaskets (4) and (9).

Repeat the same procedure for the other cylinder head cover. Unscrew the screws (3) securing the camshaft supports. Withdraw the camshaft supports (22) and (23) straight out from the cylinder head, taking care not to damage the machined faces and locating dowels (11).

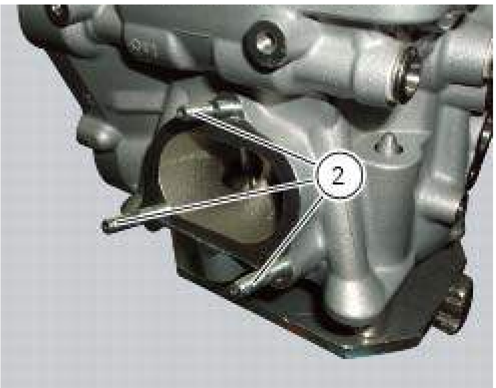




Remove the exhaust camshaft (14) and the intake camshaft (15), and slide off the sealing rings (17) on their ends. Repeat the same procedure for the other cylinder head.



If necessary, unscrew the stud bolts (2) from the cylinder heads.



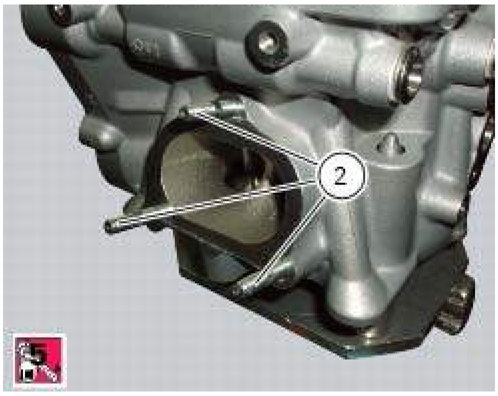
Checking the camshafts and supports

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 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 renewed.
If you find scoring or excessive wear, check the operation of the engine lubrication circuit.

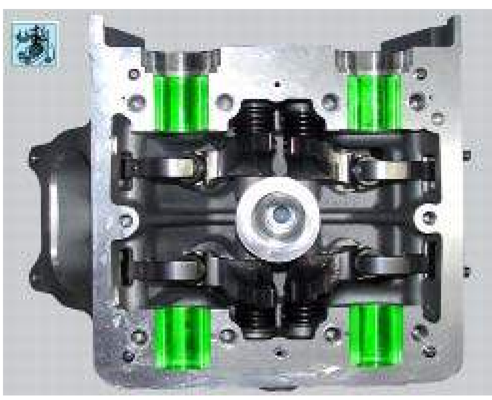
Refitting the camshafts

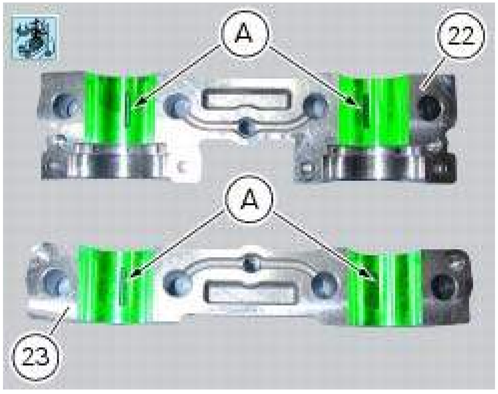
If the stud bolts (2) were removed, apply the recommended threadlocker to the short end of the stud bolts (2), i.e. the end that is to be screwed into the cylinder head. Tighten the stud bolts (2) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings).



Check that the camshafts (marked “VA” and “VS” for the vertical cylinder head and “OS” and “OA” for the horizontal cylinder 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.

Lubricate with the specified lubricant (Molykote M55 Plus), the camshaft seats on both the cylinder head and the supports (22) and (23) (green zone). Fill the reservoirs (A) with the recommended lubricant (Molykote M55 Plus).

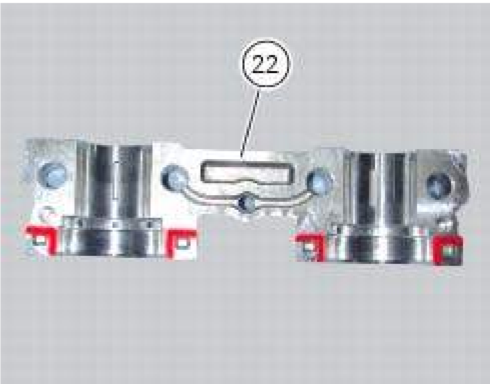




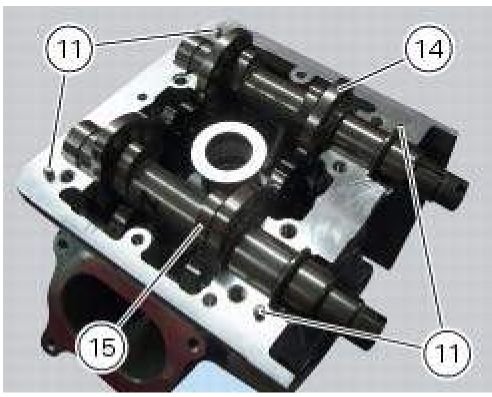
Apply sealant (Three Bond 1215 liquid gasket) at the four points of the support (22) shown in red in the photo. Clean off any excess sealant.

Note

Only apply sealant to the timing side support (22): do not apply to support (23).



Install the camshafts (14) and (15) in the cylinder head, and rotate them to distribute the lubricant evenly.
Check that the locating dowels (11) are present.

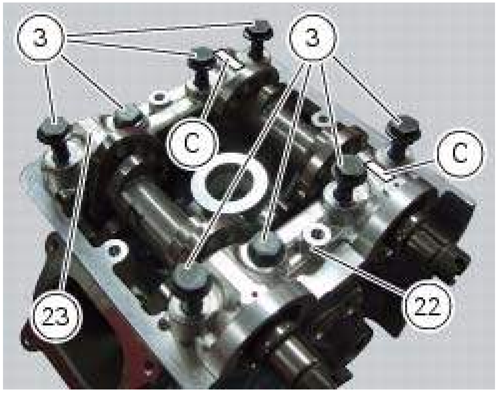


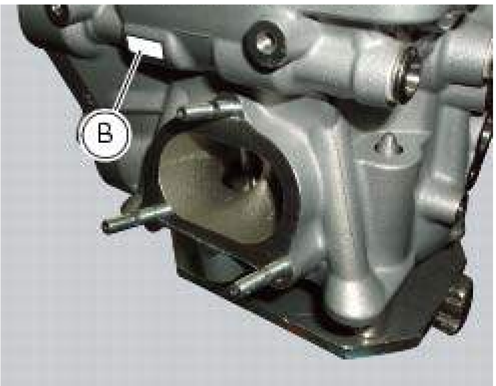
Fit the supports (22) and (23) so they are perfectly seated on the cylinder head, checking that the number stamped in zone (B) of the cylinder head is the same as the number stamped in zone (C) of the support.

Important

The support (22) must be installed on the timing side.

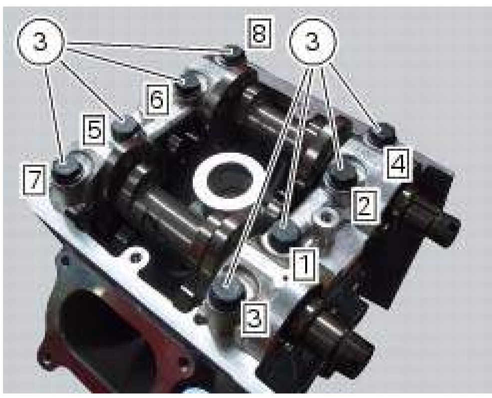
Bed down the supports.
Apply engine oil to the threads and undersides of the heads of the screws (3).
Insert the screws (3).





Pre-tighten the screws (3) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings).
Pre-tighten one support at a time, working in the sequence 1-2-3-4-5-6-7-8.
Then tighten the screws to a torque of 22.5 Nm (Min. 21 Nm - Max. 25 Nm) (Sect. 3 - 3, Engine torque settings).
Tighten one support at a time, working in the sequence 1-2-3-4-5-6-7-8.
Remove any excess sealant from between the cylinder head and the support.
Turn the camshafts by hand to check that they rotate freely.

Note
The screw (3) in position 1 must always be installed on the intake and timing side.



Important
Check lifted valve as explained (Sect. 9 - 4.1, Checking valve lift).

Sealing rings

Lubricate the sealing rings (17) with denatured alcohol.
Fit the installation tool code **88713.2861** on the camshaft and install the sealing ring on the cylinder head with the spring side.

Important
Always fit new sealing rings on reassembly.

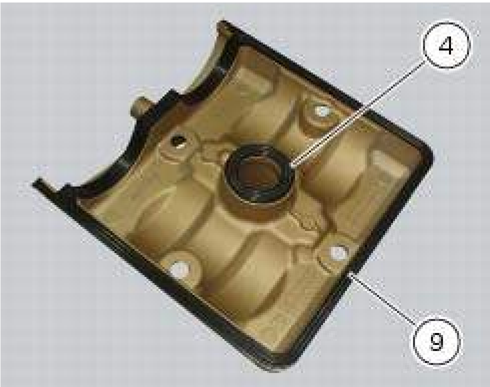
Use the drift provided with the tool and a mallet to seat the sealing rings.

When correctly installed, the sealing ring should be flush with the bevel of the cylinder head bore.

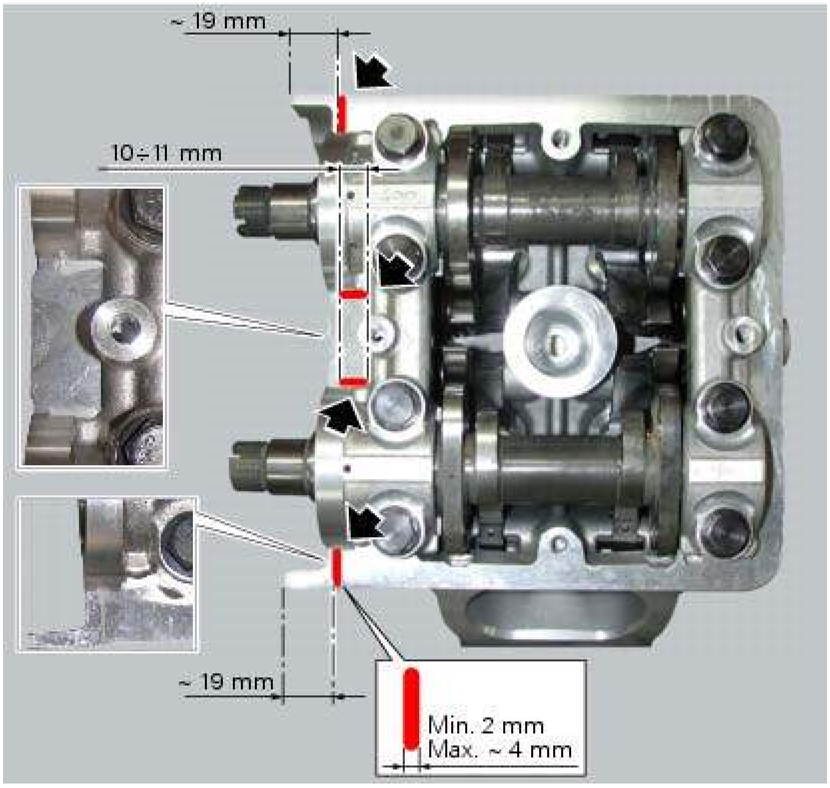
Cylinder head cover

Apply sealant (Three Bond 1215 liquid gasket) at the four points of the cylinder head cover shown in red in the photo.

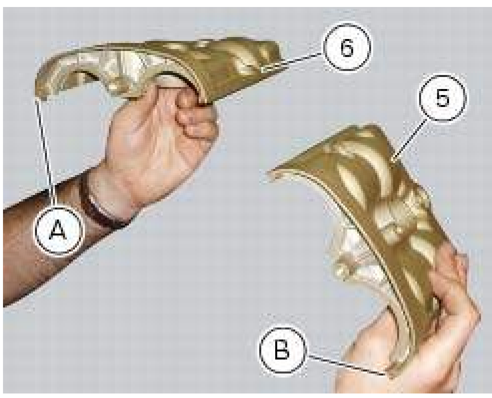
Fit the gaskets (4) and (9) on the cylinder head cover, as shown in the figure.



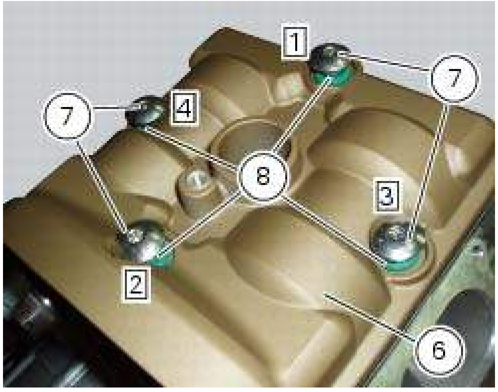
Apply in the four areas of the cylinder heads surface a strip of about 2 mm (MAX. about 4 mm) of sealant (liquid sealant Three Bond 1215), observing the heights and position indicated in figure.



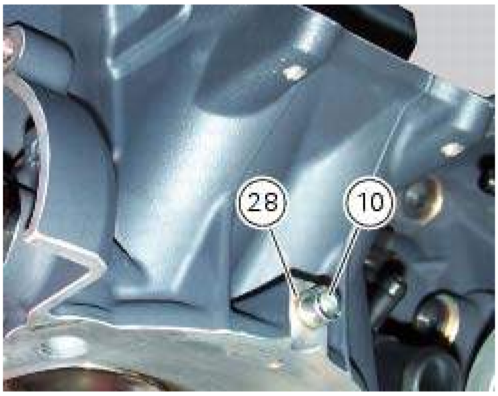
Cylinder head cover identification: The vertical head rocker cover (6) has a nib (A) on the left-hand side (exhaust side), whereas rocker cover (5) has a nib (B) on the right-hand side (exhaust side).



Locate the cover (6) on the cylinder head, aligning the four fixing holes.
Start the screws (7) with the O-rings (8).
Tighten the screws (7) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings) following the sequence above.



Remove excess sealant from the area of application.
Repeat the same procedure for the other cylinder head.
If the screw (10) has been removed, upon reassembly apply specified threadlocker, insert the seal (28) and tighten the screw (10) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings).



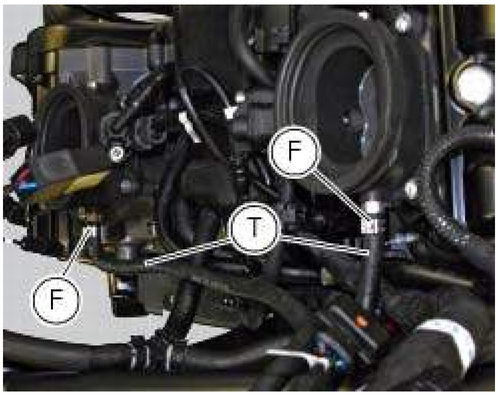
Refit all the components removed in the procedure.

Operations	Section reference
Refit the cylinder head cover	9 - 4.4, Refitting the camshafts
Refit the coils	6 - 9, Ignition coils
Refit the exhaust unit	8 - 8, Refitting the exhaust system
Fasten the timing belt covers	9 - 4.2, Refitting the timing covers
Reassemble the water radiators on the frame	9 - 3.2, Refitting the radiator
Tighten the clamps of the hose that connects the two radiators and the hose that connects the RH radiator to the union	9 - 3.1, Removal of the cooling system hoses and unions
Refill the cooling system	4 - 3, Changing the coolant
Refit the oil breather pipe, the blow by, the throttle body and the airbox	8 - 6, Refitting the airbox and throttle body
Connect the throttle cable	7 - 8.1, Refitting the throttle twistgrip
Refit air conveyors	8 - 7, Refitting the air filters
Refit the fuel tank	8 - 2, Refitting the fuel tank
Reassemble the tank half covers	5 - 2, Refitting the fuel tank fairings
Reassemble air conveyor covers	8 - 7, Refitting the air filters
Refit the saddles	5 - 3, Refitting the seat

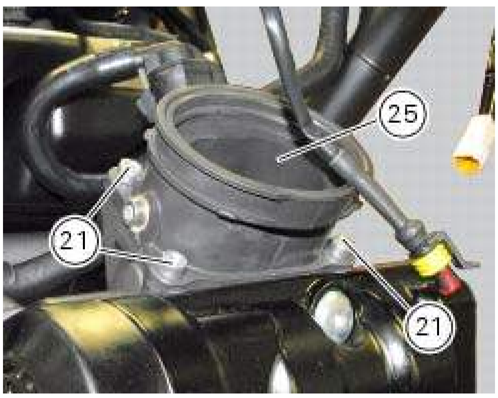
Removal of the intake manifold and coolant union

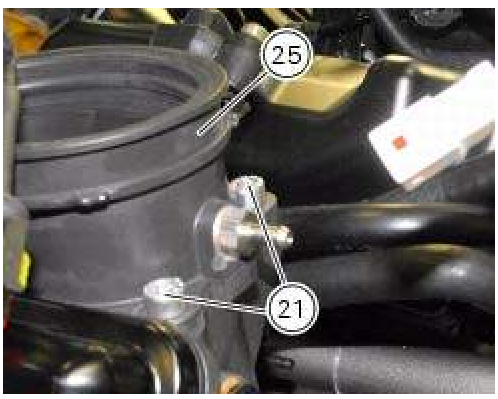
Operations	Section reference
Remove the saddles	5 - 3, Removal of the seat
Remove air conveyor covers	8 - 7, Removal of the air filters
Remove the tank half covers	5 - 2, Removal of the fuel tank fairings
Remove the fuel tank	8 - 2, Removal of the fuel tank
Remove air conveyors	8 - 7, Removal of the air filters
Disconnect the throttle cable	7 - 8.1, Removal of the throttle twistgrip
Remove the airbox, the throttle body, the blow by and the oil breather tube	8 - 6, Removal the airbox and throttle body
Remove the fuel system and the injectors from the intake manifolds	8 - 6, Removal of the fuel injectors
Empty the coolant out of the cooling system	4 - 3, Changing the coolant
Remove the expansion reservoir tank	9 - 3.1, Removal of the expansion tank

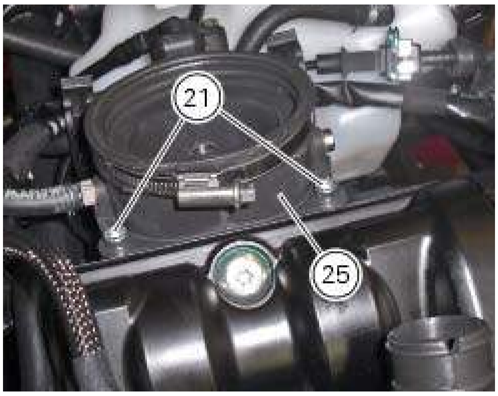
Loosen the clips (F) and remove the hoses (T).



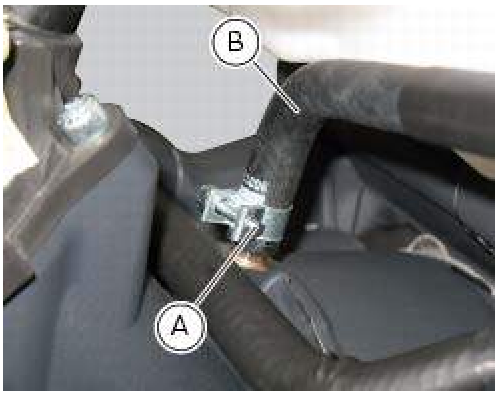
Remove the manifolds (25) undoing the screws (21).

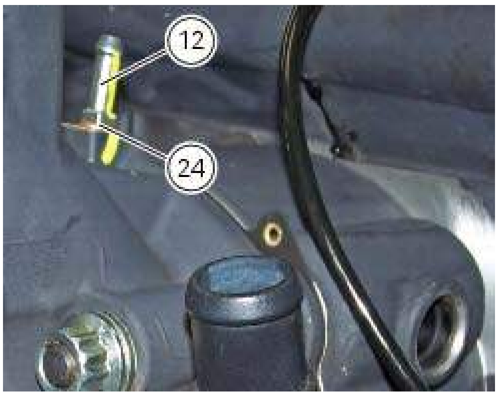






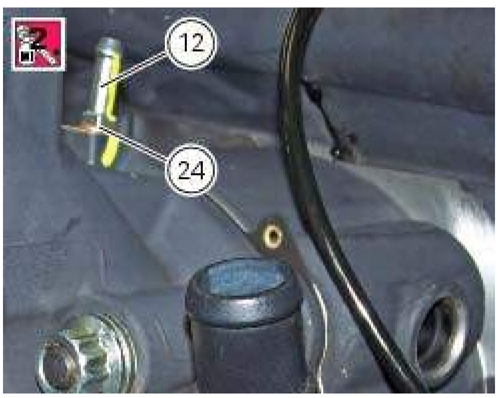
Loosen the clamp (A) and remove the hose (B). Remove the union (12) and recover the seal (24).

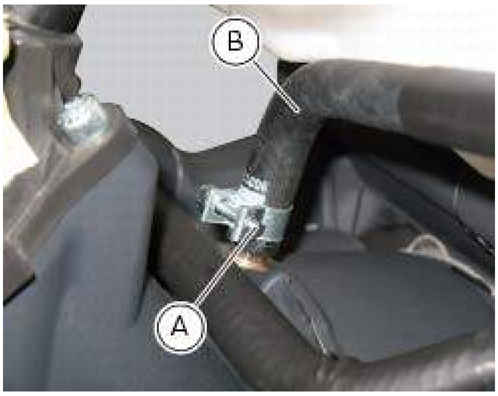




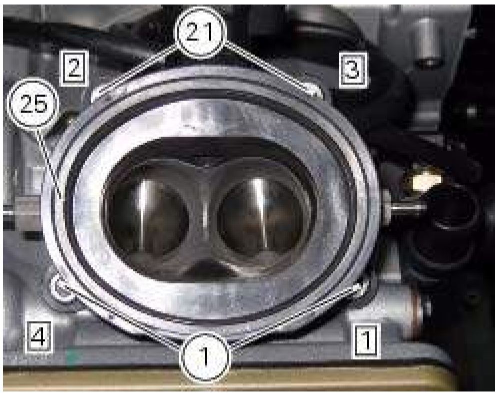
Refitting the intake manifold and coolant union

Apply prescribed threadlocker to the fitting (12), start it with seal (24) and tighten it to a torque of 2.5 Nm (Min. 2 Nm - Max. 3 Nm) (Sect. 3 - 3, Frame torque settings).
Install the pipe (B) and tighten the clamp (A) to the torque of 1 Nm ± 10% (Sect. 3 - 3, Engine torque settings).



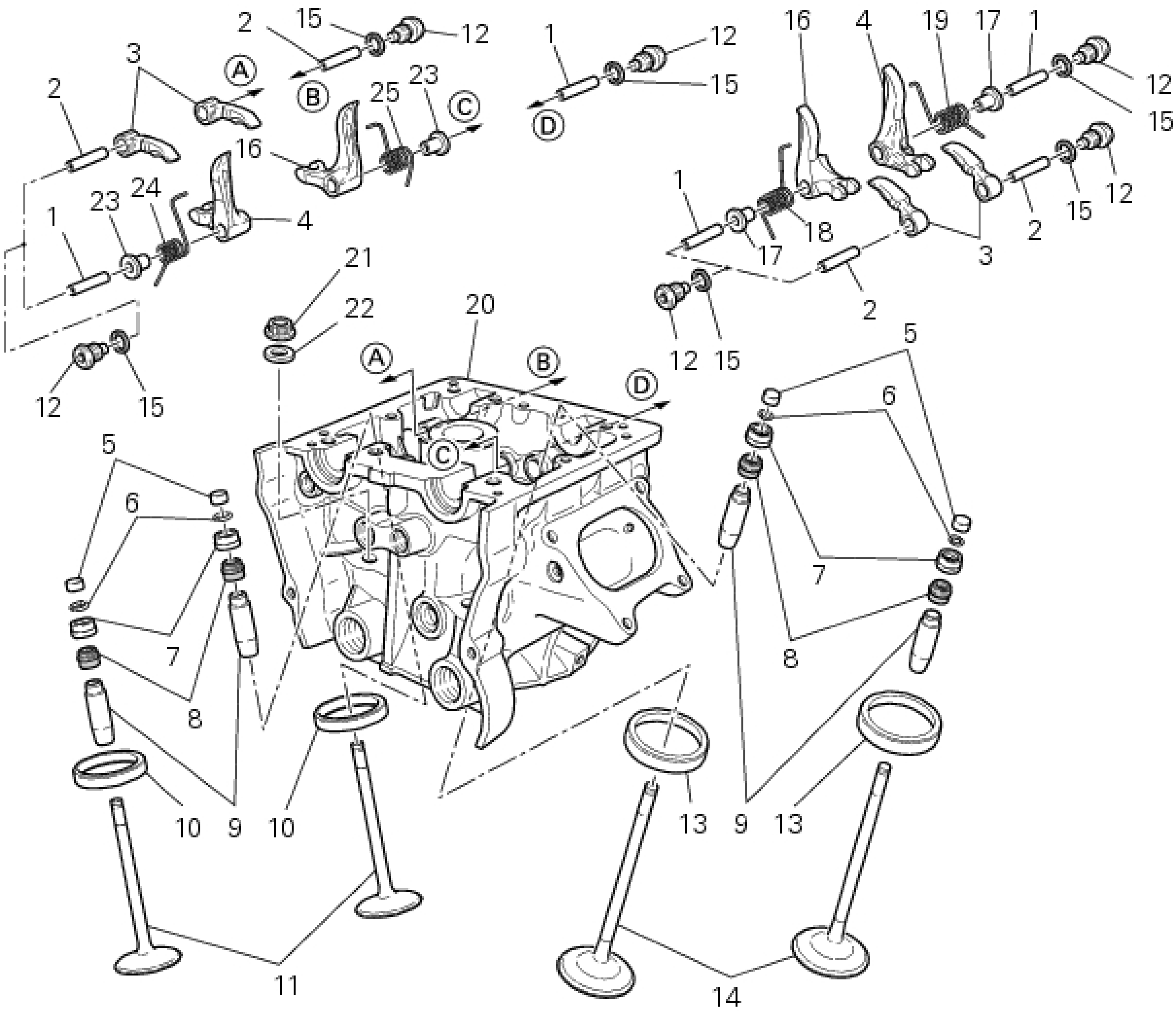


Check that the mating surfaces of the cylinder head and manifold are perfectly flat and clean and install the intake manifold (25) on the cylinder head.
Lock the fixing screws (21) to the torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings) in a cross-pattern sequence (1-2-3-4).



Operations	Section reference
Refit the water expansion reservoir	9 - 3.1, Refitting the expansion tank
Refill the cooling system	4 - 3, Changing the coolant
Refit the injectors on the intake manifolds and reassemble the supply system	8 - 6, Refitting the injectors
Refit the oil breather pipe, the blow by, the throttle body and the airbox	8 - 6, Refitting the airbox and throttle body
Connect the throttle cable	7 - 8.1, Refitting the throttle twistgrip
Refit air conveyors	8 - 7, Refitting the air filters
Refit the fuel tank	8 - 2, Refitting the fuel tank
Reassemble the tank half covers	5 - 2, Refitting the fuel tank fairings
Reassemble air conveyor covers	8 - 7, Refitting the air filters
Refit the saddles	5 - 3, Refitting the seat

4.5 -Cylinder head assemblies: valves - rocker arms



1 Closing rocker arm shaft
2 Opening rocker arm shaft
3 Opening rocker arm
4 Closing rocker arm (left)
5 Valve opening shim
6 Half rings
7 Valve closing shim
8 Sealing ring
9 Valve guide
10 Exhaust valve seat
11 Exhaust valve
12 Plug
13 Intake valve seat
14 Intake valve
15 Aluminium gasket
16 Closing rocker arm (right)
17 Spacer
18 Valve return spring (right)
19 Valve return spring (left)
20 Head
21 Cylinder head nut
22 Washer
23 Spacer
24 Valve return spring (right)
25 Valve return spring (left)

Spare parts catalogue

Diavel ABS	CRANKCASE HALVES
Diavel ABS	VERTICAL CYLINDER HEAD
Diavel ABS	HORIZONTAL CYLINDER HEAD

Diavel Carbon ABS	CRANKCASE HALVES
Diavel Carbon ABS	VERTICAL CYLINDER HEAD
Diavel Carbon ABS	HORIZONTAL CYLINDER HEAD

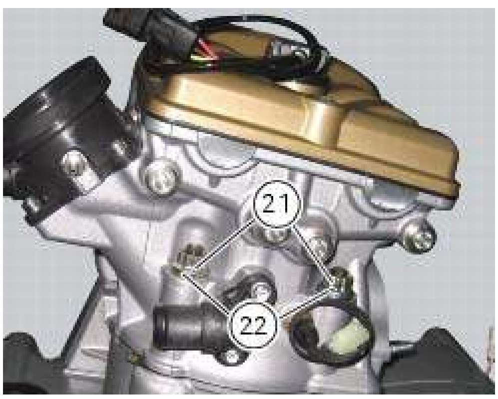
Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Removal of the cylinder heads

Operations	Section reference
Remove the saddles	5 - 3, Removal of the seat
Remove air conveyor covers	8 - 7, Removal of the air filters
Remove the tank half covers	5 - 2, Removal of the fuel tank fairings
Remove the fuel tank	8 - 2, Removal of the fuel tank
Remove air conveyors	8 - 7, Removal of the air filters
Disconnect the throttle cable	7 - 8.1, Removal of the throttle twistgrip
Remove the airbox, the throttle body, the blow by and the oil breather tube	8 - 6, Removal the airbox and throttle body
Remove the fuel system and the injectors from the intake manifolds	8 - 6, Removal of the fuel injectors
Empty the coolant out of the cooling system	4 - 3, Changing the coolant
Loosen the clamps of the hose that connects the two radiators and the hose that connects the RH radiator to the union	9 - 3.1, Removal of the cooling system hoses and unions
Remove the water radiators	9 - 3.2, Removing the water radiators
Remove the exhaust unit	8 - 8, Removal of the exhaust system
Remove the cooling system pipe from the horizontal head	9 - 3.1, Removal of the cooling system hoses and unions
Remove the timing belt covers and the timing belts	9 - 4.2, Removal of the timing belt covers
Remove the intake manifolds	9 - 4.4, Removal of the intake manifold and coolant union

Using the tool code **88713.2676**, undo the nuts (21) on the cylinder head stud bolts.
Remove the cylinder head nuts (21) and special washers (22).

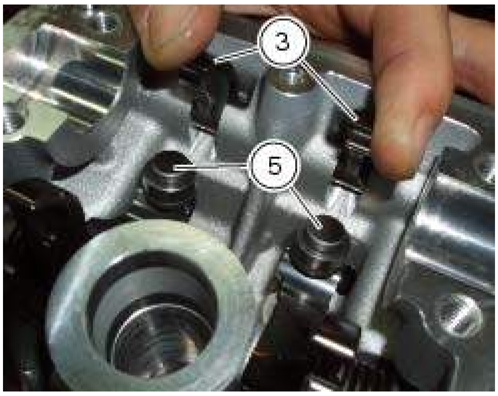


Remove the cylinder head assembly by lifting it off the engine studs.
Repeat the same procedure for the other cylinder head.

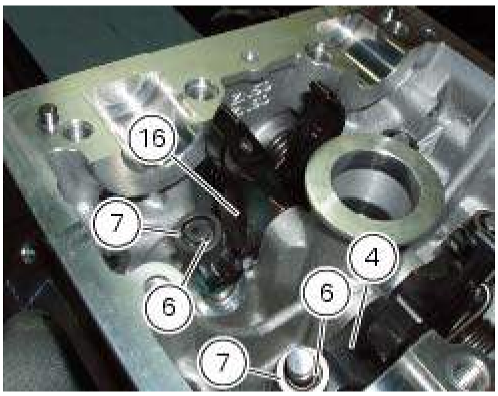
Removing the valves

Operations	Section reference
Remove the cylinder head assembly from the engine	9 - 4.5, Removal of the cylinder heads
Remove the timing belt pulleys	9 - 4.2, Removing of the cylinder head pulley/fixed tensioner
Remove the coils	6 - 9, Ignition coils
Remove the cylinder head covers, the timing shaft supports and the timing shafts	9 - 4.4, Removal of the camshafts

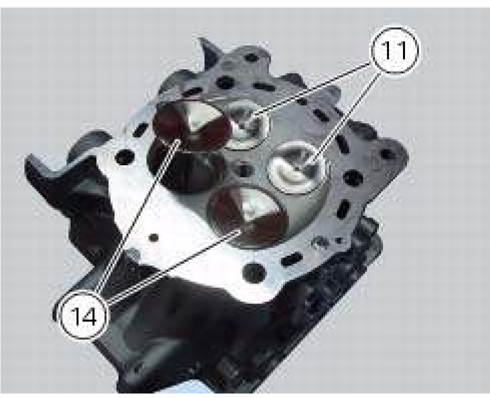
Raise the rocker arm (3) and remove the opening shim (5) from the valves with a pair of pliers.



Push down the closing rocker arms (16) and (4) and the closing shim (7).
Remove the half rings (6) from the valves with a magnetic screwdriver. Extract the closing shims (7) from the valve using a pair of pliers.



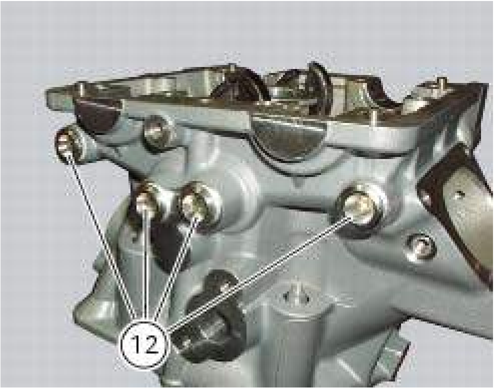
Withdraw the valves (14) and (11) from underside of the cylinder head.

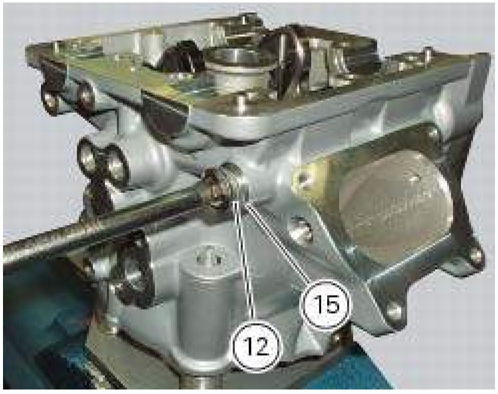


Repeat the same procedure for the other cylinder head.

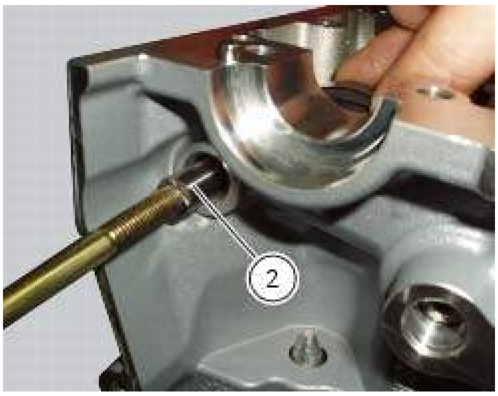
Removing the valve rocker arms

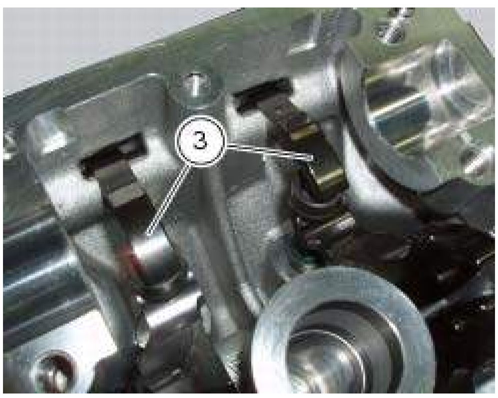
With the cylinder head in the condition described in the previous paragraph, remove the rocker arms.
Unscrew the eight plugs (12) and recover the seals (15).



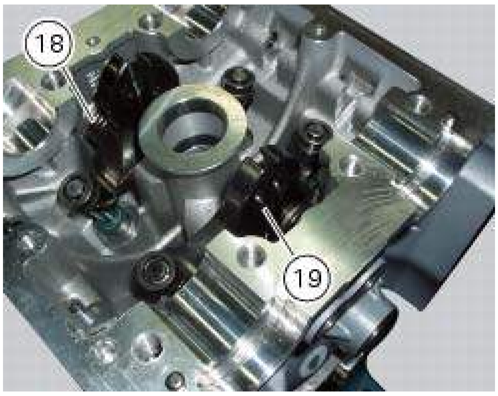


Using an M6 screw, withdraw the shafts (2) of the opening rocker arms (3) on the exhaust and intake sides.
Remove the opening rocker arms (3).



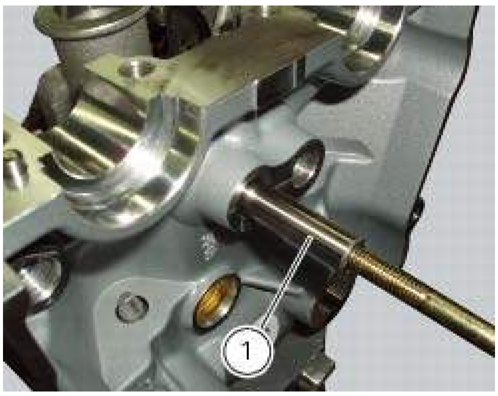


Using the claw of the rocker arm spring tensioning kit **88713.2069** installed between the spring and the inner wall of the cylinder head, move the straight end of the rocker arm return spring (19) and (18) and insert it in the drilled shaft.

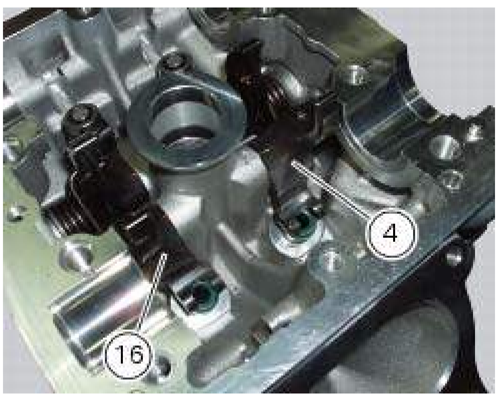


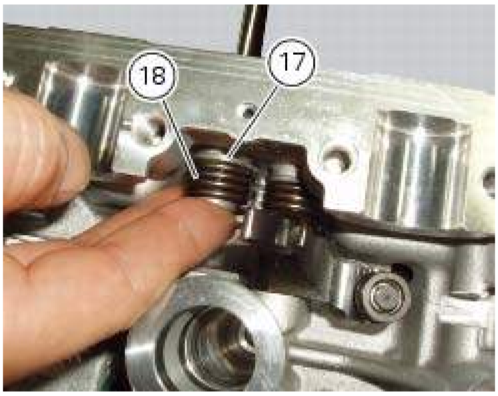
Use the shaft to slide the end of the spring into its final position.

Using an M6 screw, withdraw the shafts (1) of the closing rocker arms on the exhaust and intake sides.

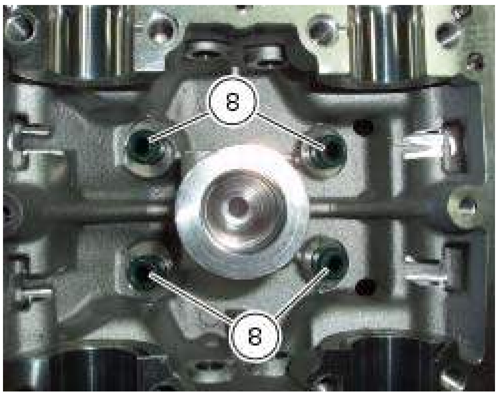


Remove the closing rocker arms (4) and (16), the springs (18) and (19) with the spacers (17).





Carry out the same operation to remove the closing rocker arms (4) and (16), the springs (**24**) and (**25**) with the spacers (**23**).
Remove the sealing rings (8) from the ends of the valve guides.

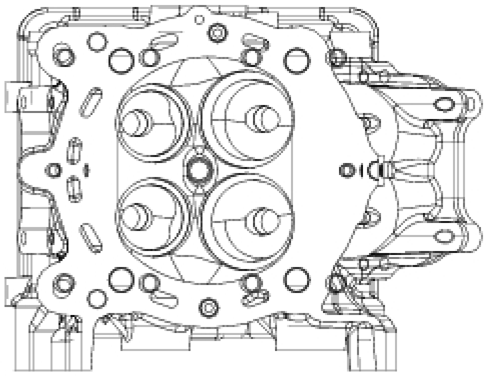


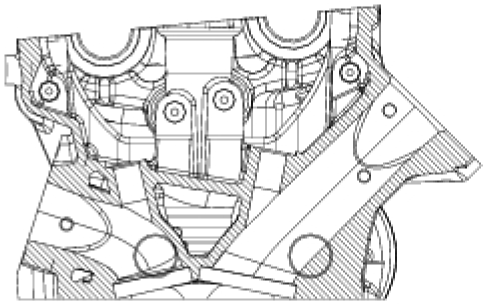
Repeat the same procedure for the other cylinder head.

Overhaul of cylinder head components

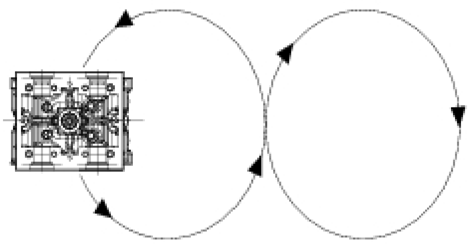
Cylinder heads

Remove any carbon deposits from the combustion chamber and its ducts.
Remove any scale from the coolant ducts.
Check for cracking and inspect the sealing surfaces for scoring, ridges or other damage.





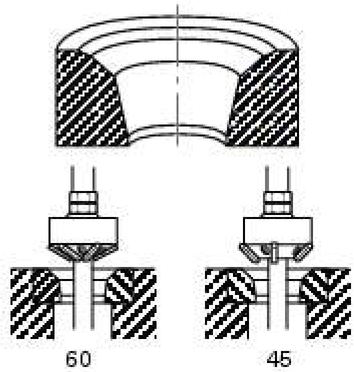
Check that the cylinder barrel mating surfaces of the cylinder head are free of carbon deposits and scale. If this is not the case, spread diamond dressing compound (6 to 12 micron thickness) on a reference surface and slide the cylinder head on the surface as shown in the figure until a flat finish is obtained.



Valve seats

Visually inspect the valve seats: for cracking or pitting.

Minor damage can be repaired by grinding with special 45° and 60° single-blade grinders. Grind the valves and check the seal.

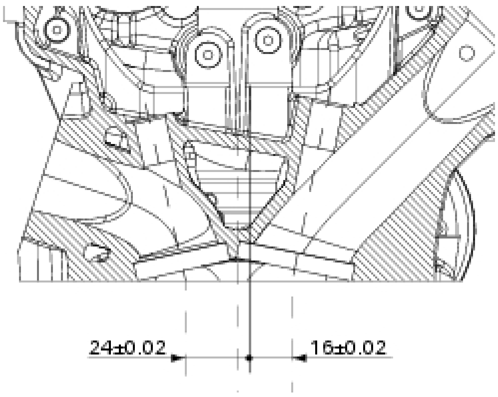


If the valve seats are excessively damaged, fit oversize seats. Replacement seats are available with **0.03** and **0.06** mm oversized outside diameters.

Important

When you change the valve seats, change the valve guides as well.

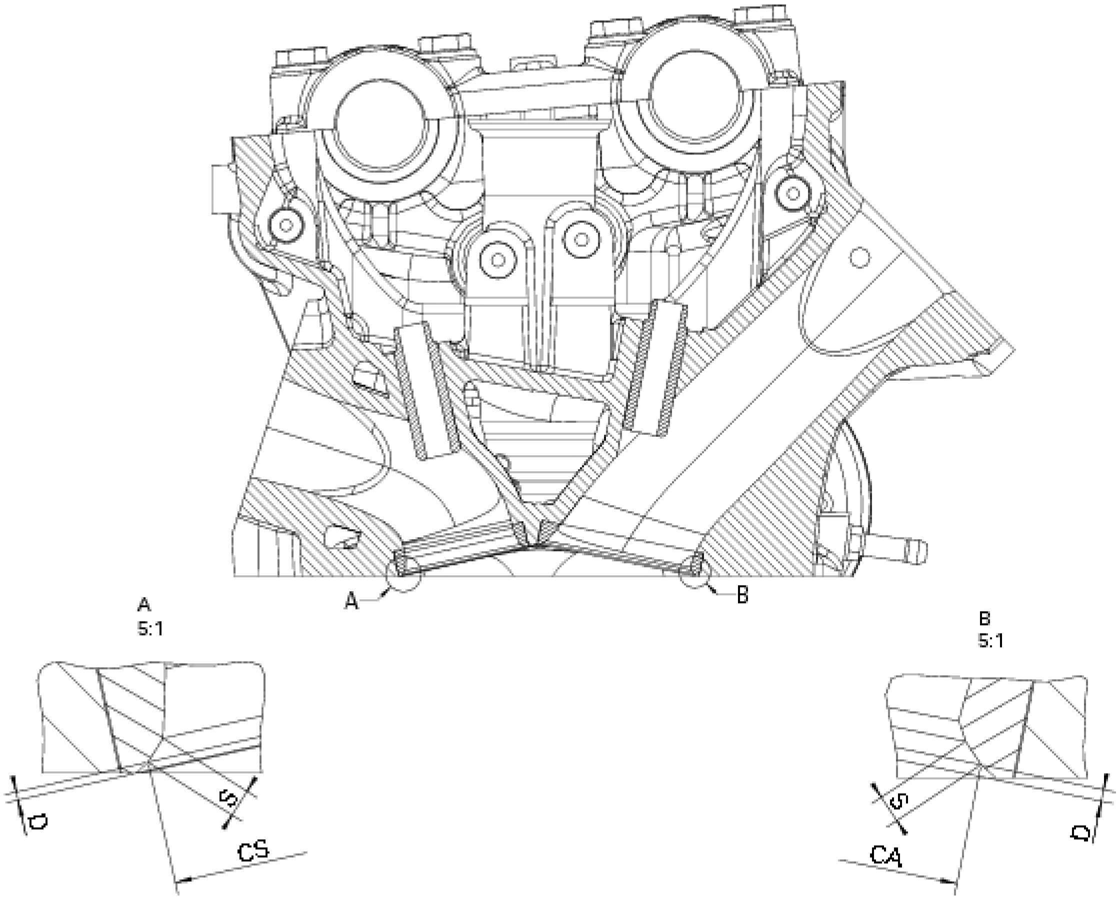
Proceed as follows.
Remove the worn seats, grinding carefully to avoid any damage to cylinder head bores.
Check the diameter of head bores and choose the oversized valve seat that will give an interference fit of **0.04 to 0.10** mm.



Heat the cylinder head gradually and evenly up to **150** °C and chill the new valve seats in dry ice.
Drive the seats perfectly square into the head bores using the appropriate valve guide seat installer **88713.2846** and **88713.2847**.
Allow the cylinder head to cool down and grind the seats to the following dimensions:
CA = Ø 41.6 ± 0.025 mm.
CS = Ø 33.6±0.025 mm.
S = 1.2 mm.
D = 0.2 to 0.4 mm.

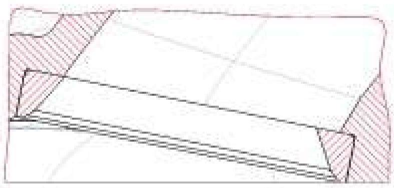
Important

Do not use any lapping compound after final grinding.

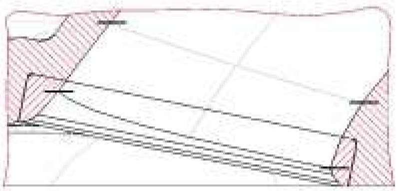


It is advisable to smooth the joint between the intake valves seats and the intake ducts (F = before; G = after).

F



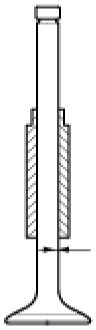
G



Valve guides

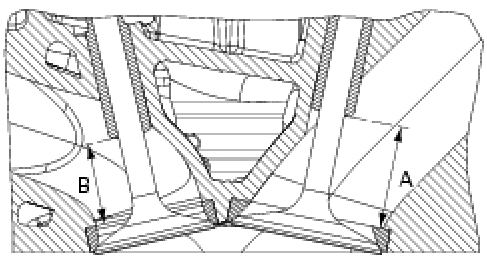
Check internal surface of the valve guides: for cracking or distortion.

Thoroughly check the dimensions of the inner surface of the valve guide. Measure the inside diameter with a bore diameter gauge.
Measure the diameter at different positions of the valve guide.



The assembly clearance must be:
highest measured value – lowest measured value = **0.03 to 0.045** mm;
the maximum permissible wear limit is **0.08** mm.
Change the valve guides when the ovality exceeds permissible limit or the clearance to the valve stem 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 bores in the cylinder head and install the valve guides using the appropriate service tools and in reference to the dimensions given in the figure;

A= 22.4±0.15 mm.
B= 28.45±0.15 mm.
Hone the mating surface with a reamer.

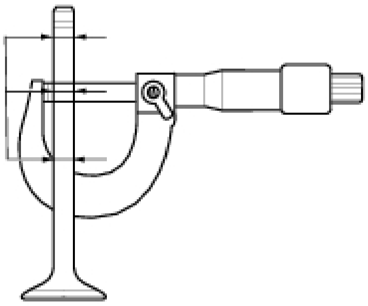


Checking the valve

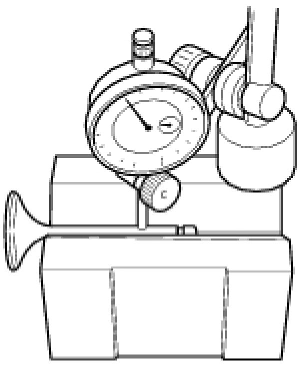
Check that the stem and the valve seat contact surface are in good condition.
There must be no pitting, cracks, deformations or signs of wear.

Warning
The valves cannot be ground.

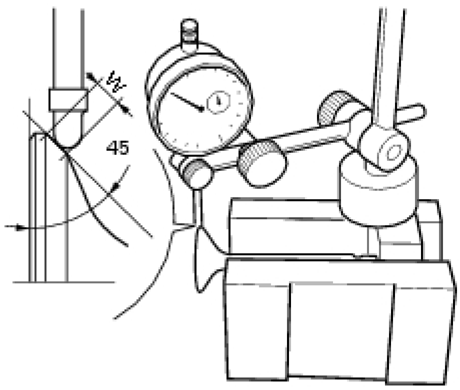
Perform the following checks.
Measure the diameter of the valve stem at various points along the section that runs in the valve guide.

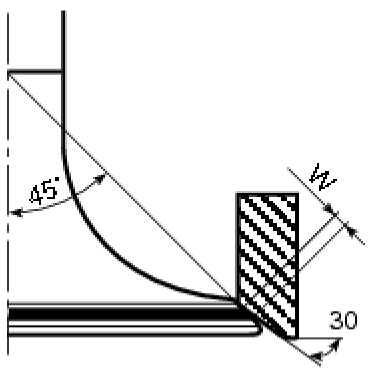


Check the valve stem for buckling. Place it on a “V” block and measure deformation with a dial gauge.
Service limit: **0.053** mm.
Check the valve stem for buckling. Place valve on a "V" block, set a dial gauge perpendicular to head and measure run-out of valve face at 45°.
- nominal concentricity: **0.01** mm;
- service limit: **0.03** mm.



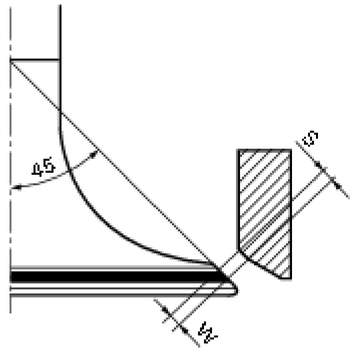
Use Prussian blue or a mixture of minimum and oil to check that the contact surface (W) between the valve and seat is **1.4** to **1.6** mm (**1.05** to **1.35** mm when new). Grind the seat if the dimension measured is greater than the above limit.





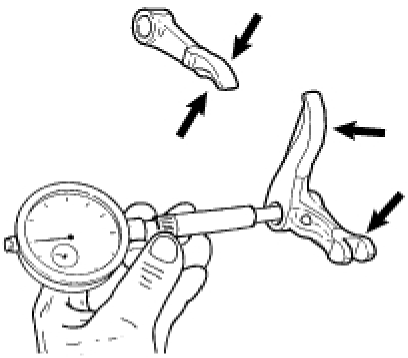
Checking the valve seal

After grinding the seats it is important to check the seal between the valve face and the seat: if the seat contact area (S) on the valve is wider than the 45° band (W) this could lead to poor sealing.



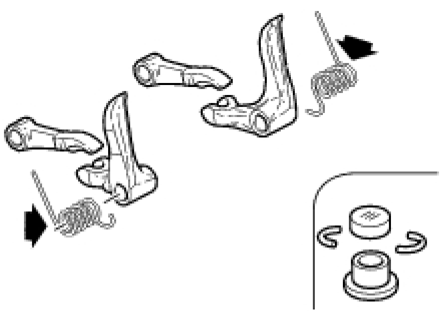
Checking the rocker arms

Check for signs of wear, grooves or chrome flaking off.
Check the condition of rocker arm bore and shaft.
Assembly clearance: **0.025** to **0.049** mm.
Wear limit: **0.08** mm.



Opening and closing shims - Springs

Check the condition of the contact surfaces of the valve opening and closing shims: there must be no signs of wear.
Check the condition of the closing rocker arm return springs: check for cracking, distortion, or loss of elasticity.



Reassembly of the cylinder head

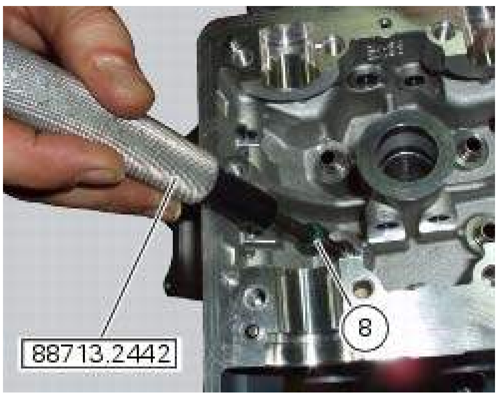
The exhaust side can be identified by the three threaded holes on the flange.

The intake side can be identified by the presence of four threaded holes on the flange.

All the photos in this chapter refer to a vertical cylinder head.

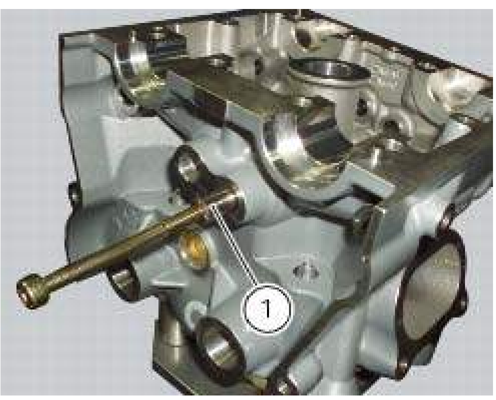
Valve guide sealing rings

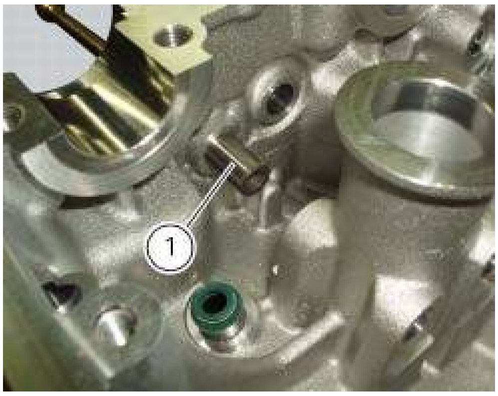
Position the cylinder head on the appropriate support **88713.2103**.
Lubricate the valve guides seal rings (8) with engine oil and insert them from the spring side onto tool **88713.2442**.
Fit the end of the tool into the valve guide and use a mallet to tap the sealing rings (8) home into the valve guides.



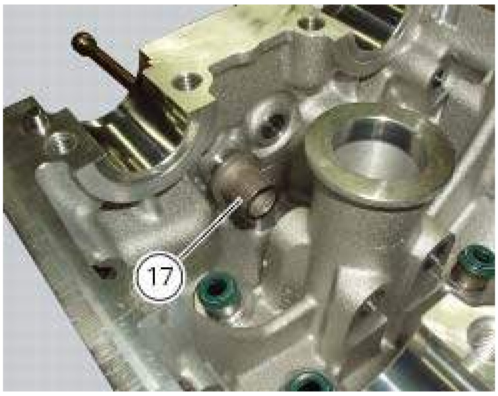
Reassembly of the closing rocker arms

Check that the rocker arms are not scored or show signs of breakage in the area of contact with the camshaft and shim.
The closing rocker arm shafts are 10 mm in diameter, whereas the opening rocker arm shafts are 9 mm in diameter.
Using an M6 screw, position the closing rocker shaft (1) towards the exhaust side of the cylinder head.

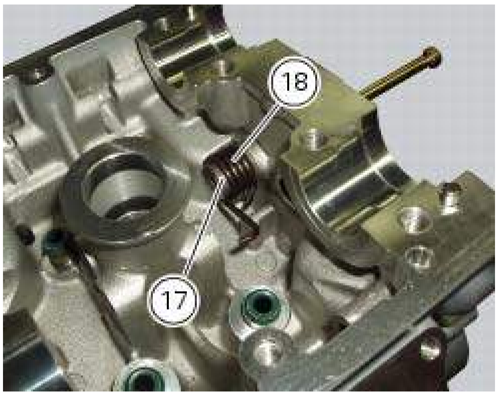


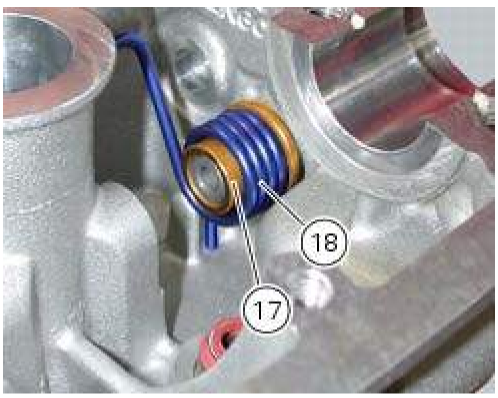


Locate the spacer (17) on the shaft.

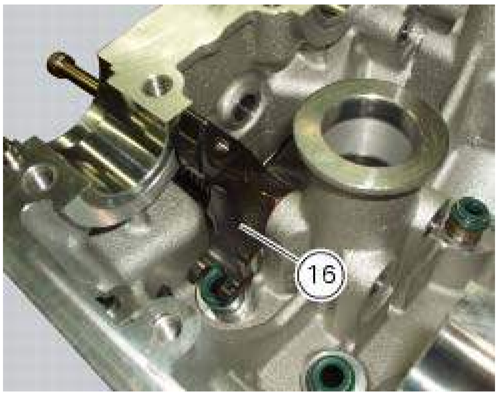


Locate the spring (18) on the spacer (17) as shown, fitting one end of the spring in its seat in the cylinder head.

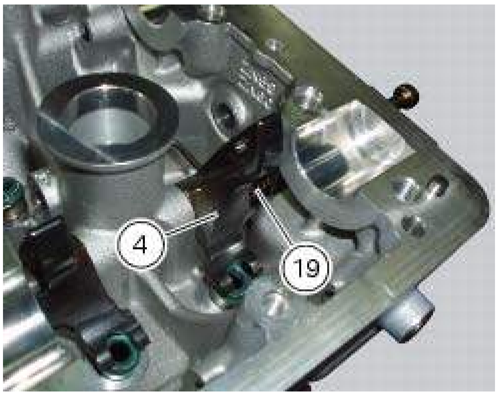




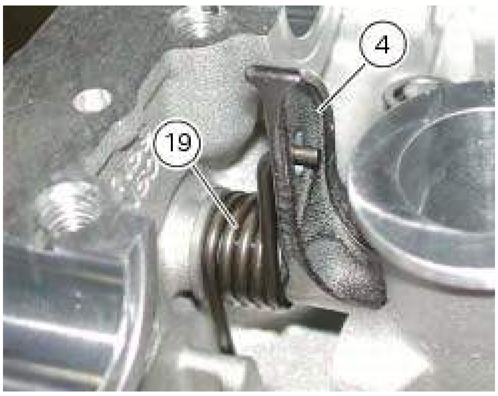
Locate the closing rocker arm (16) into its seat, making sure that the through hole is in line with the closing rocker arm shaft and drive the shaft home.

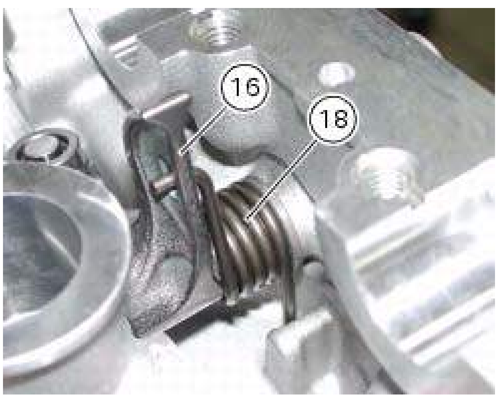


Proceed in a similar manner to install the closing rocker arm (4) with the spring (19).



Load the springs (18) and (19) on the closing rocker arms (16) and (4) respectively using the tool **88713.2069**.





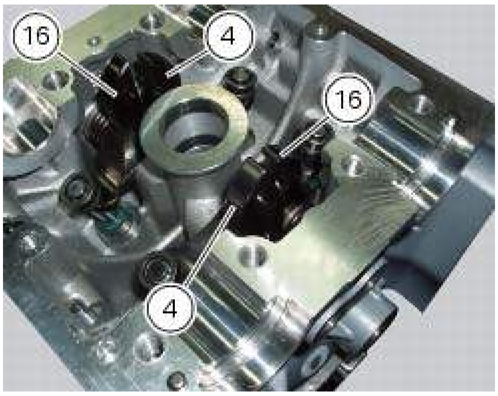
Proceed to install the closing rocker arms (4) and (16), the springs (**24**) and (**25**), the relative pins on the exhaust side in the same manner as described for the intake side.

Note

Always install the closing rocker arms on the exhaust side before those on the intake side.

Warning

Take care not to damage the shoe of the closing rocker arm with the intake spring during assembly.

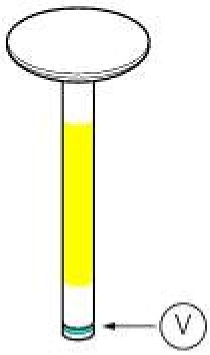


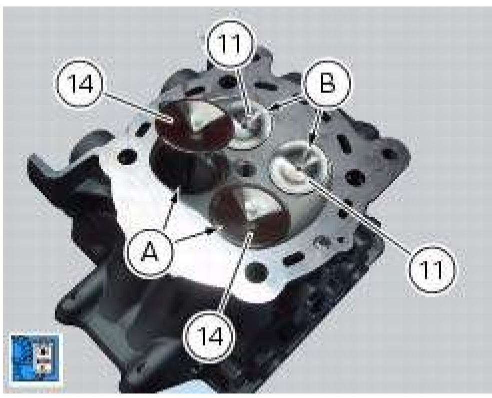
Refitting the valves, closing shims and half rings

Carefully clean the two intake valve seats (A) and the two exhaust valve seats (B).
Lubricate the stems of the two intake valves (14) and of the two exhaust valves (11) with engine oil.

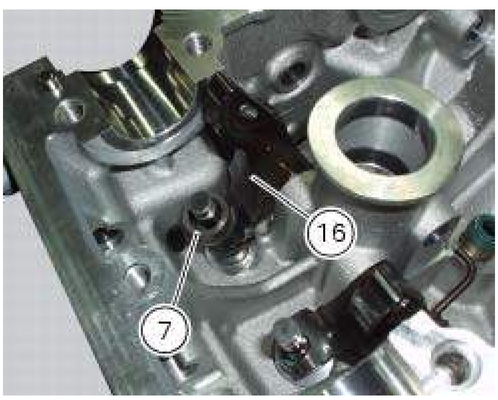
Warning
Apply engine oil to the valve stems, however only in the area shown, making sure not to smear the grooves (V).

Install the valves in respective seats in the cylinder head.

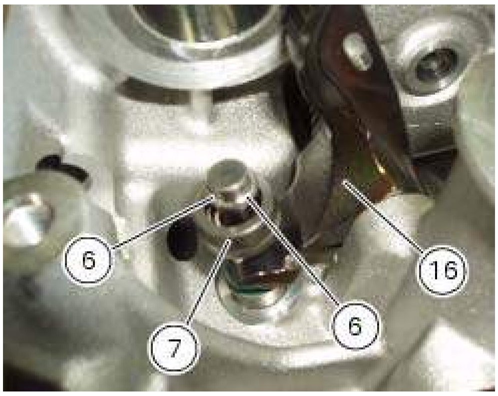


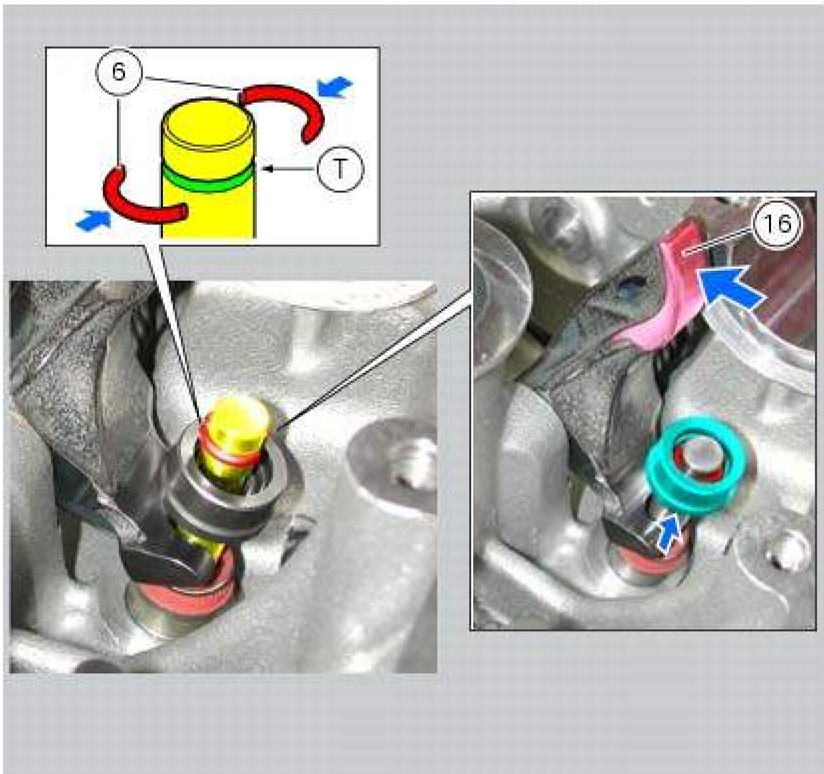


Hold the closing rocker arm (16) pushed downwards and fit the closing shim (7) on the valve stem up to reach the rocker arm. If using the old cylinder head, start by fitting the original shim.



Insert the new half rings (6) in the valve groove (T) and release the rocker arm to obtain shim (7) internal position. Turn the closing rocker arm (16), and compress the spring as much as possible while holding the valve, the shim and the half rings in the valve closed position. Release the rocker arm with a rapid motion, so that the half rings seat in the shim.



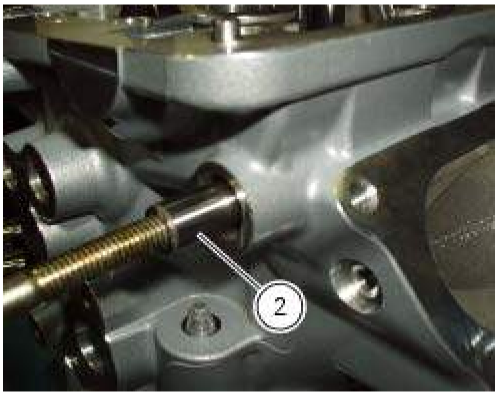


Repeat the procedure with the opposite valve and check that the top of the valve stem is aligned with the surface of the shim (7); if it is not, repeat the half ring installation procedure.

Install the closing shims on the intake valves (14) using the method described above for the exhaust valves.
Refit the timing shafts (Sect. 9 - 4.4, Refitting the camshafts) to check the valve clearance when closed (Sect. 9 - 4.1, Checking and adjusting the valve clearances).

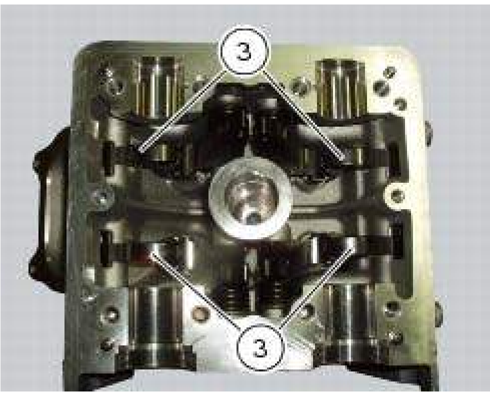
Refitting the opening shims and opening rocker arms

Using an M6 screw, position the opening rocker arm shaft (2) (diameter 9 mm).

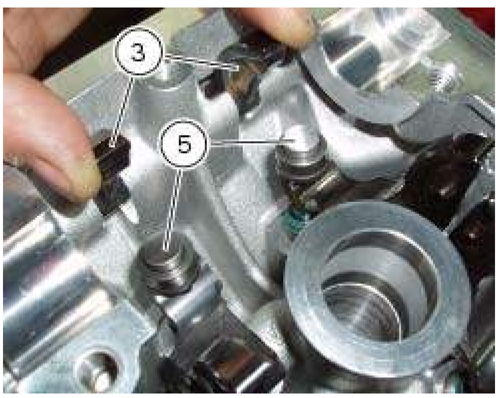


Locate the opening rocker arm (3) and drive the shaft home.

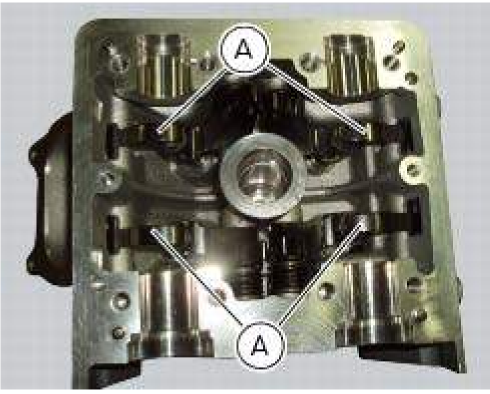
Install the four rocker arms (3) in the manner described above.



Raise the opening rocker arm (3) and install the opening shim (5) so it seats against the valve stem.



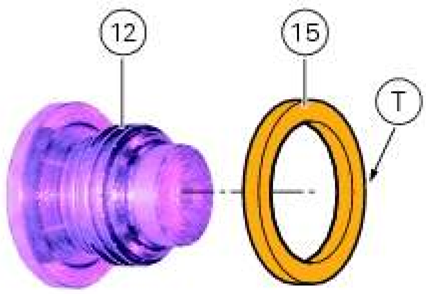
Release the rocker arm so that it rests against the shim.
Ensure the shim is correctly seated by lightly tapping the rocker arm shoe (A) with plastic mallet.
Refit the timing shafts (Sect. 9 - 4.4, Refitting the camshafts) to check the valve clearance when open (Sect. 9 - 4.1, Checking and adjusting the valve clearances).

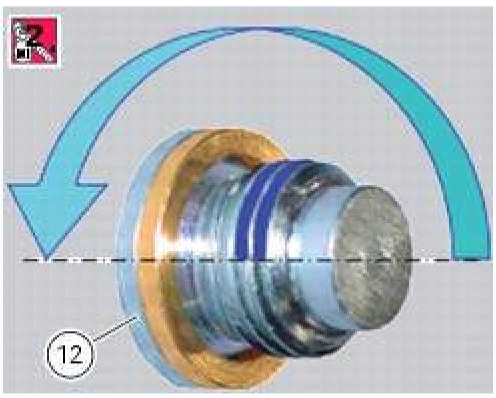


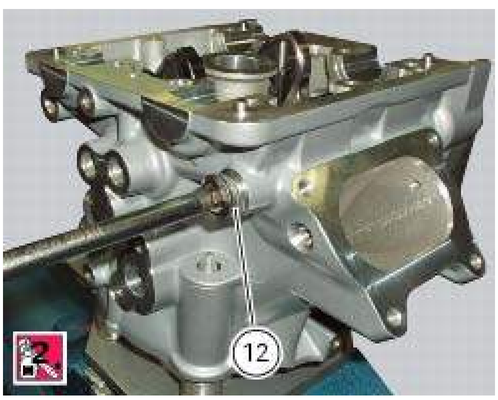
Insert the gaskets (15) on the plugs (12), orienting them (preferably) with the square edge side (T) facing the cylinder head.
Apply prescribed threadlocker on the plug threads (12): apply the product on the first two plug threads, spreading it for the half circumference (about 180°).

Tighten the plugs to a torque of 15 Nm (Min. 14 Nm - Max. 16 Nm) (Sect. 3 - 3, Engine torque settings).

Note
After tightening, remove any excess of product.







Operations	Section reference
Refit the camshaft supports	9 - 4.4, Refitting the camshafts
Refit the timing belt pulleys	9 - 4.2, Refitting the cylinder heads

	pulleys/fixed tensioners
Refit the cylinder head covers	9 - 4.4, Refitting the camshafts
Refit the coils	6 - 9, Ignition coils
Refit the cylinder head assembly	9 - 4.5, Refitting the cylinder head assemblies

Refitting the cylinder head assemblies

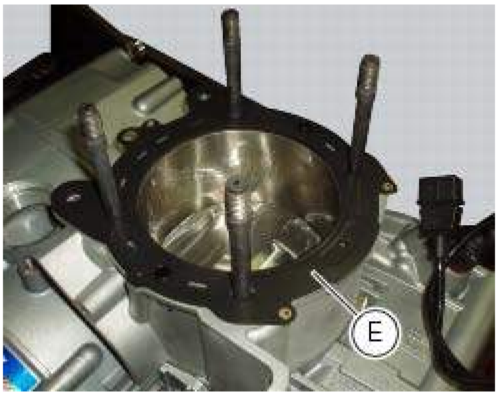
Warning

To prevent oil leaks past 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 spoiled gaskets and O-rings and apply again liquid sealant (Sect. 9 - 5, Refitting the cylinder/piston assembly).

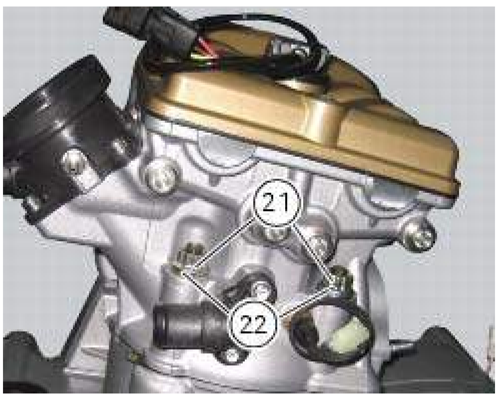
Before fitting the head, check that the seal is fitted on the mating surface between head and cylinder (Sect. 9 - 5, Refitting the cylinder/piston assembly).

Note

When fitting the gasket, side (E) with the stamped code must be in contact with the cylinder head.



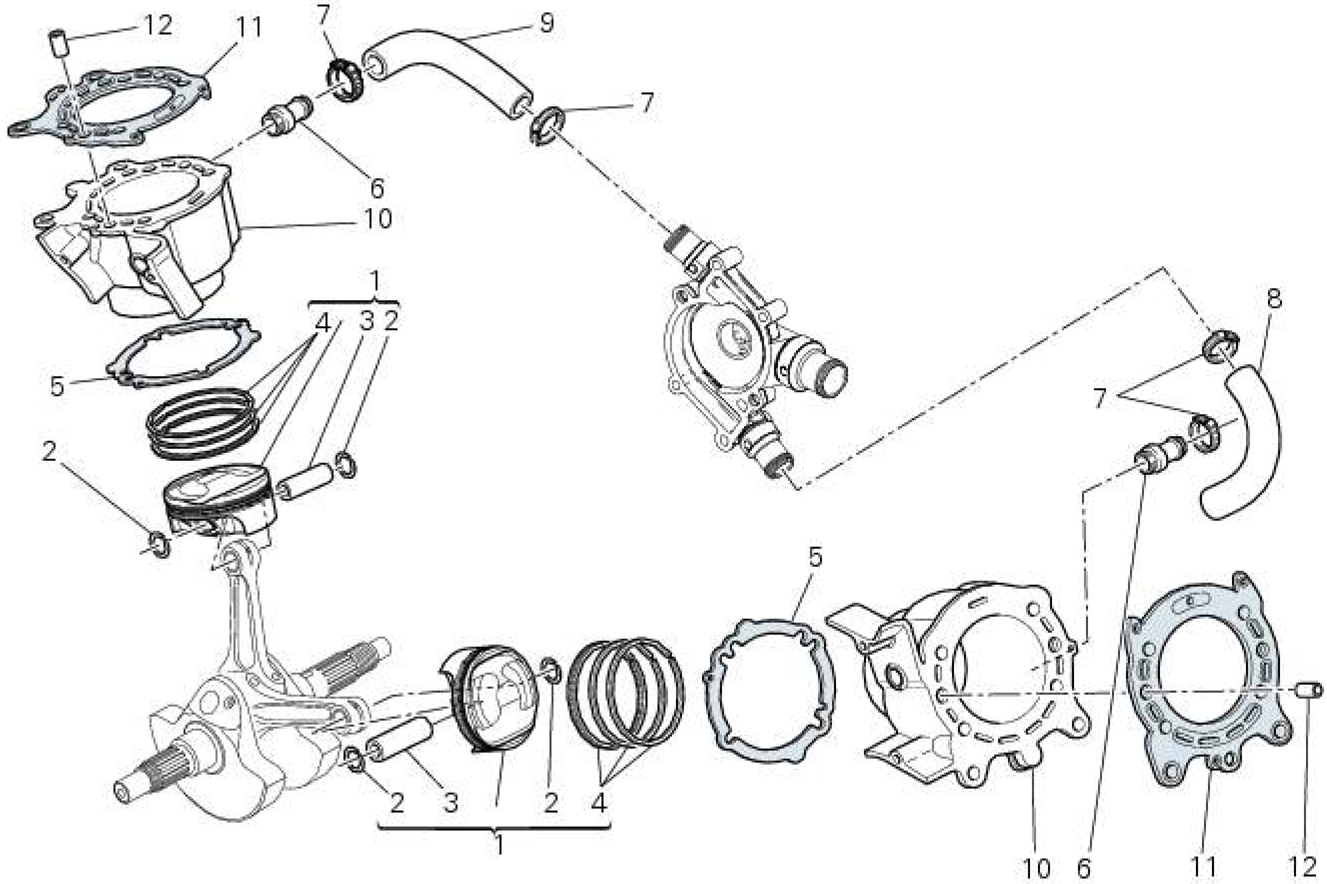
Lower the cylinder head carefully over the studs. Take care not to damage the threads.
Fit the special washers (22) and nuts (21) onto the cylinder head studs.
Tighten the nuts (21) on the stud bolts evenly and gradually in a crosswise pattern using tool **88713.2676** in conjunction with a torque wrench.
Temporary tighten the nuts (21) to a torque of 20 Nm; pre-tightening to a torque of 40 Nm (Min. 38 Nm - Max. 48 Nm); one tightening to a torque of 60 Nm (Min. 57 Nm - Max. 63 Nm) (Sect. 3 - 3, Engine torque settings).



Operations	Section reference
Refit the intake manifolds	9 - 4.4, Refitting the intake manifold and coolant union
Refit the timing belts and covers	9 - 4.2, Refitting the cylinder heads pulleys/fixed tensioners
Refit the cooling system pipe on the horizontal head	9 - 3.1, Refitting the cooling system hoses and unions
Refit the exhaust unit	8 - 8, Refitting the exhaust system
Refit the water radiators	9 - 3.2, Refitting the radiator
Tighten the clamps of the hose that connects the two radiators and the	9 - 3.1, Refitting the cooling system hoses and unions

hose that connects the RH radiator to the union	
Refill the cooling system	4 - 3, Changing the coolant
Refit the injectors on the intake manifolds and reassemble the supply system	8- 6, Refitting the injectors
Refit the oil breather pipe, the blow by, the throttle body and the airbox	8 - 6, Refitting the airbox and throttle body
Connect the throttle cable	7 - 8.1, Refitting the throttle twistgrip
Refit air conveyors	8 - 7, Refitting the air filters
Refit the fuel tank	8 - 2, Refitting the fuel tank
Reassemble the tank half covers	5 - 2, Refitting the fuel tank fairings
Reassemble air conveyor covers	8 - 7, Refitting the air filters
Refit the saddles	5 - 3, Refitting the seat

5 -Cylinder/piston assemblies



1 Piston
2 Gudgeon pin circlip
3 Gudgeon pin
4 Set of piston rings
5 Cylinder-crankcase gasket
6 Water pump outlet union
7 Hose clip
8 Horizontal cylinder coolant inlet hose
9 Vertical cylinder coolant inlet hose
10 Cylinder barrel
11 Cylinder head gasket
12 Bush

Spare parts catalogue

Diavel ABS	CYLINDERS - PISTONS
Diavel Carbon ABS	CYLINDERS - PISTONS

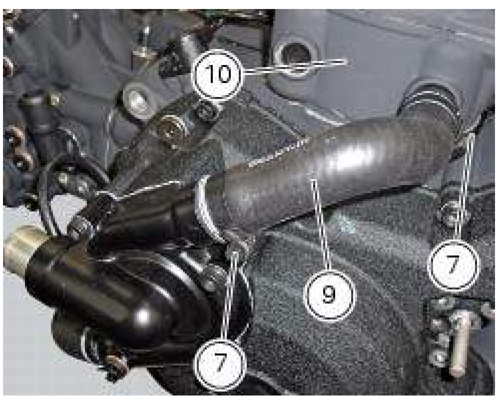
Important
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Removal of the cylinder/piston assembly

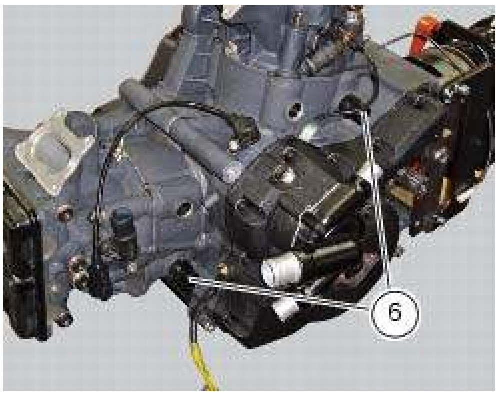
Operations	Section reference
Remove the saddles	5 - 3, Removal of the seat
Remove air conveyor covers	8 - 7, Removal of the air filters

Remove the tank half covers	5 - 2, Removal of the fuel tank fairings
Remove the fuel tank	8 - 2, Removal of the fuel tank
Remove air conveyors	8 - 7, Removal of the air filters
Disconnect the throttle cable	7 - 8.1, Removal of the throttle twistgrip
Remove the airbox, the throttle body, the blow by and the oil breather tube	8 - 6, Removal the airbox and throttle body
Remove the fuel system and the injectors from the intake manifolds	8 - 6, Removal of the fuel injectors
Empty the coolant out of the cooling system	4 - 3, Changing the coolant
Loosen the clamps of the hose that connects the two radiators and the hose that connects the RH radiator to the union	9 - 3.1, Removal of the cooling system hoses and unions
Remove the water radiators	9 - 3.2, Removing the water radiators
Remove the exhaust unit	8 - 8, Removal of the exhaust system
Remove the cooling system pipe from the water pump	9 - 3.1, Removal of the cooling system hoses and unions
Remove the timing belt covers and the timing belts	9 - 4.2, Removal of the timing belt covers
Remove the intake manifolds	9 - 4.4, Removal of the intake manifold and coolant union
Remove the heads from the engine block	9 - 4.5, Removal of the cylinder heads

Loosen the clamps (7) and remove the hoses (8) and (9) from the cylinder barrels (10) and from the alternator-side crankcase cover.

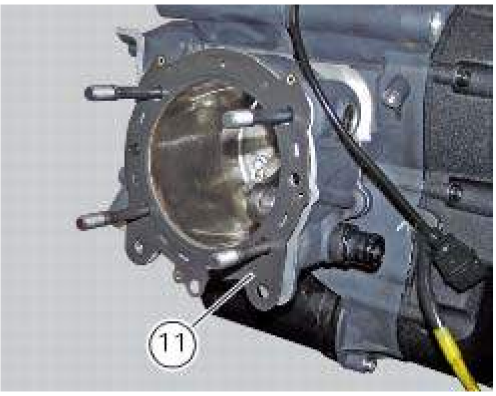


If damaged, unscrew the unions (6).

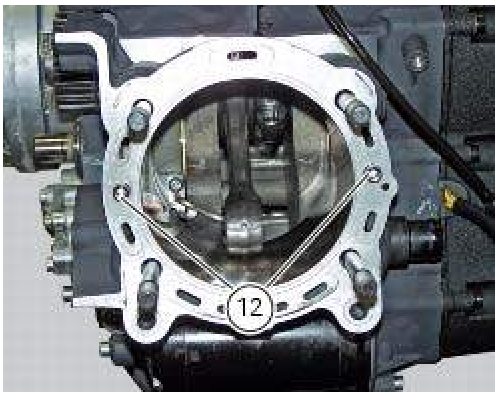


Note

The following procedure is described with the engine removed from the frame and the cylinder head removed from the engine (Sect. 9 - 4.5, Removal of the cylinder heads).
Remove the gasket (11) from the horizontal thermal unit.



Remove the bushes (12).



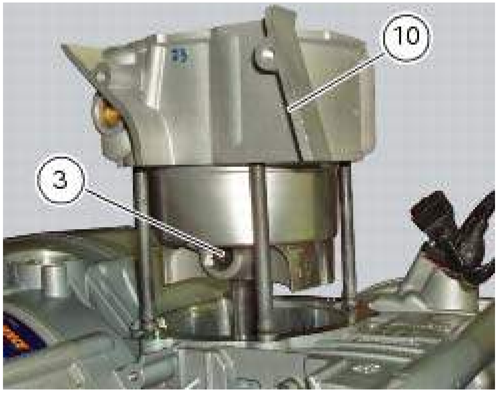
Use the tool **88765.1523** to bring the piston of the horizontal cylinder near the TDC.

Carefully lift the cylinder barrel (10) 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 (3).

Note

For better sealing the piston ring gaps should be positioned at 180° intervals.

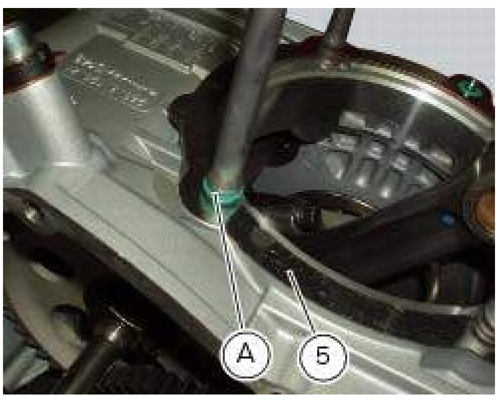
Since insertion of piston in the barrel is a difficult operation to perform at the time of reassembly, remove the piston together with the barrel as described below.
Stuff the crankcase opening with a rag or soft paper to prevent foreign material from falling in.



Remove the circlip (2) from the gudgeon pin (3) on the clutch side.

Working from the opposite side, drive out the gudgeon pin sufficiently to release the connecting rod.
Lift the barrel-piston assembly clear of the crankcase studs. If work is to be carried out on the piston, carefully withdraw it from the cylinder.

Remove the four O-rings (A) located on the crankcase studs between the barrel and the base gasket (5).



To remove the vertical barrel-piston assembly, bring the vertical piston to TDC and proceed as for removal of the horizontal cylinder barrel.

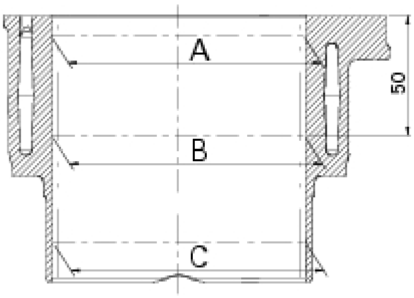
Important

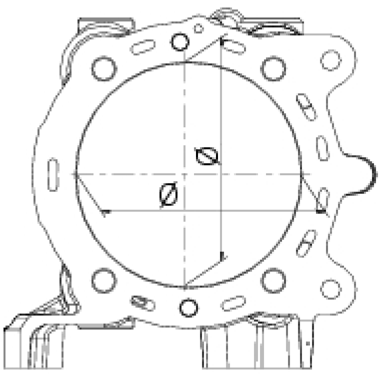
Mark the pistons to show from which cylinder they were removed:
V= Vertical - H= Horizontal.

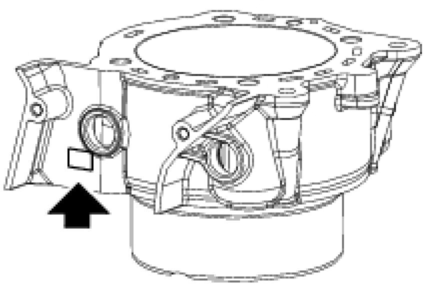
Overhaul of the cylinder barrel/piston components

Overhauling the cylinder

Check that the walls of the cylinder bore are perfectly smooth. Measure the cylinder bore 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. 3 - 1.1Cylinder/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 direction at 90° between them; check that the measurements of taper and ovality in the bore fall within the range specified in Sect. 3 - 1.1, Cylinder/Piston.
In the event of damage or excessive wear the barrel must be renewed as it has a silicon carbide coating (which provides the cylinder walls with excellent anti-friction and anti-wear properties) and therefore cannot be rebored.
The cylinder barrels are marked with letters (stamped between two oil return ways) indicating their size class.
Always match cylinders with pistons from the same size class.

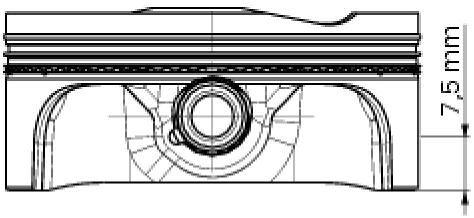






Overhaul of the piston

Clean the piston crown and piston ring grooves, removing any carbon deposits.
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 pin axis.
The pistons must always be renewed as a pair.

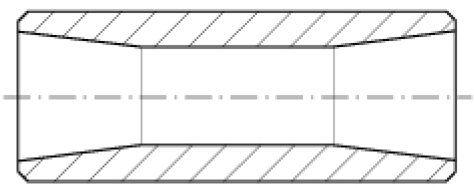


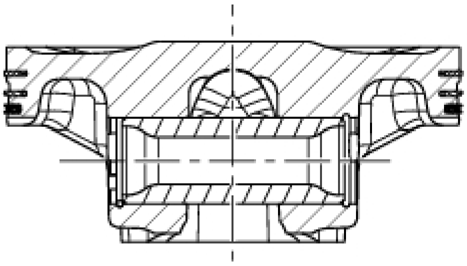
Checking the piston-cylinder clearance

The pistons are marked with a letter (punched into the piston crown) that indicates the size class to which they belong.
Always match cylinders with pistons from the same size class.
The prescribed values are given in Sect. 3 - 1.1, 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.
Coupling clearance values with the piston and the connecting rod, see Sec. 3 -1.1, Cylinder/Piston.
If a new gudgeon pin is fitted, you must also change the connecting rod small end bush.



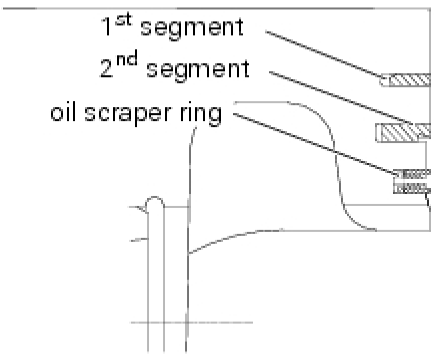


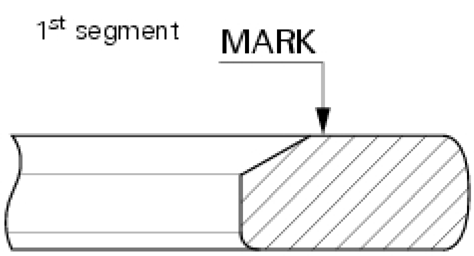
Overhauling the piston rings

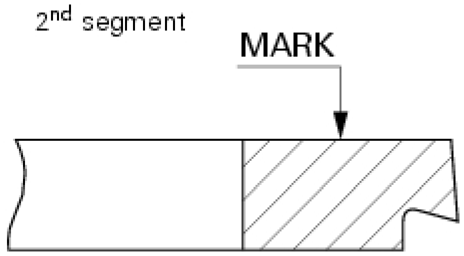
The piston rings must not show any signs of scuffing or scoring. Replacement pistons are supplied complete with piston rings and gudgeon pin.

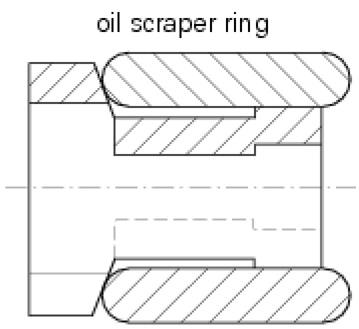
Checking the piston ring-grooves clearance

The maximum permissible wear limit is **0.15** mm for the top segment (1st) and **0.10** mm for the others (2nd and oil scraper ring).
The piston rings must always be installed with markings facing upwards.





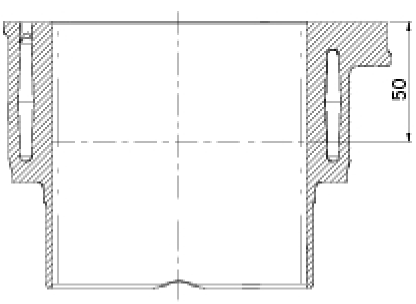


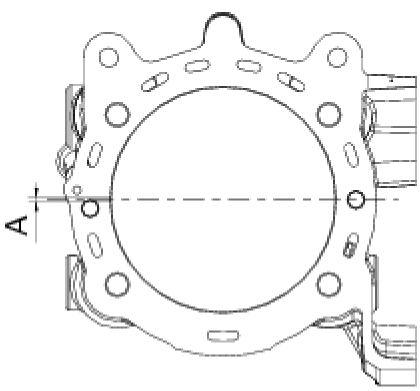


Checking the piston ring/cylinder clearance

Insert the ring in the cylinder bore so that it is positioned 50 mm from the top face of the cylinder barrel; make sure that the ring is positioned perfectly square to the cylinder walls by checking with a gauge at several points around the ring that the top surface of the ring is exactly 50 mm from the top face of the cylinder barrel.
Measure the piston ring gap (A):

	Distance (A) mm	Wear limit
Top compression ring	0.2 to 0.4	0.8
Second compression ring	0.3 to 0.5	0.8
Oil control ring	0.2 to 0.7	1.0





Refitting the cylinder/piston assembly

If new units are used, it is necessary to couple the cylinders and pistons of the same selection (see paragraph "Overhaul

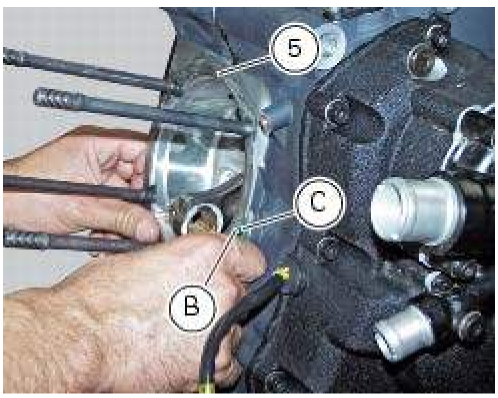
of the cylinder barrel/piston components" of this section).
If the pistons have been separated from their cylinders, before reassembling these components, position the piston ring gaps at 120° from one another (the markings must always face the piston crown).

Note

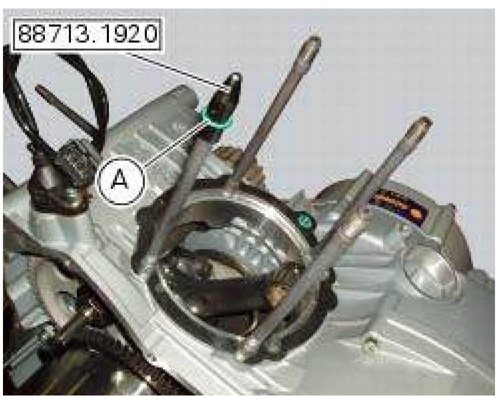
For better sealing the piston ring gaps should be positioned at 180° intervals.

Use a universal tool to carefully insert the piston into the cylinder (first lubricate the inside of the cylinder with engine oil). Position the cylinder with the smallest valve recess is on the side of the exhaust port.

Remove any deposits and degrease the contact surfaces of the crankcase half and the cylinders.
Check for the presence of the cylinders centring dowels (B) and the O-ring (C) on the base.
Apply sealant to the gasket (5) then locate the gasket on the crankcase.



Using the cap **88713.1920**, fit the O-rings (A) on each stud bolt and guide them into their seats in the crankcase.



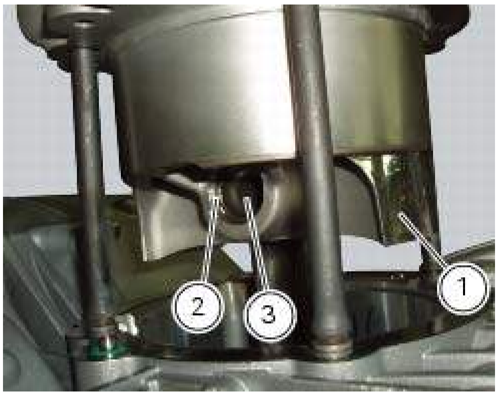
Bring the connecting rod small end close to TDC and slide the barrel-piston assembly (1-10) onto the crankcase studs.
Push the connecting rod small end into the piston close to the gudgeon pin (3) bore. Lubricate and insert the gudgeon

pin.

The gudgeon pin (3) must slide smoothly in the connecting rod small end bush and in the piston (1).
Close the crankcase opening with a cloth to prevent foreign objects from falling inside and then fit the retainer ring (2) as shown in the figure.

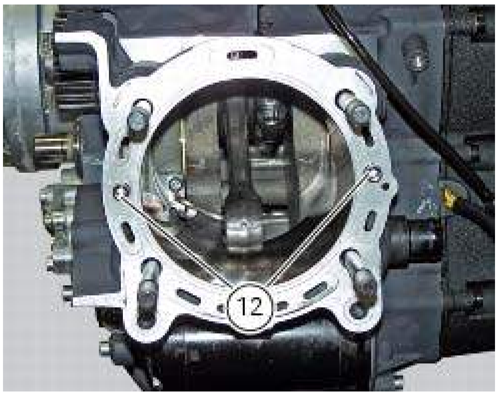
Important

Always fit new circlips (2) on reassembly.



Push the cylinder barrel (10) down until it seats against the crankcase.

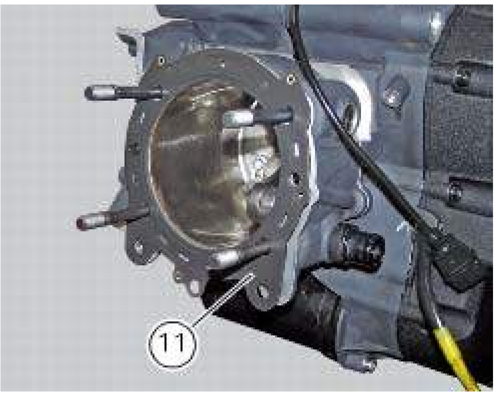
Refit the bushes (12).



Fit the cylinder head gasket (11) over the studs. The side marked with the part number must be facing the cylinder head.

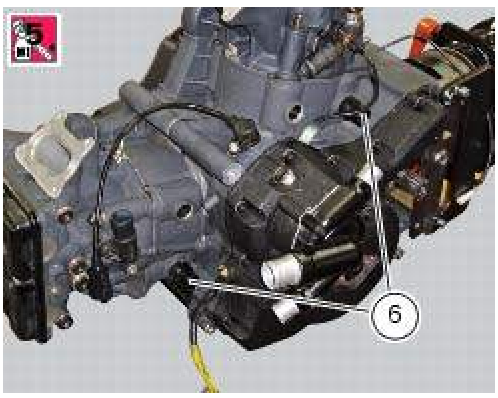
Note

The shape of the gasket prevents incorrect fitting, provided that the coolant flow holes are aligned with those on the cylinder.

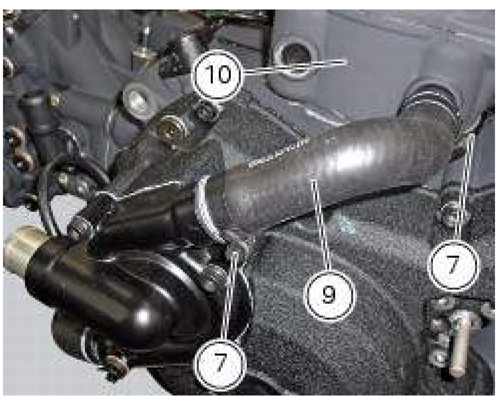


Repeat the procedure for the other cylinder and refit the cylinder heads (Sect. 9 - 4.5, Refitting the cylinder head assemblies).

In case they have not been assembled, apply prescribed threadlocker to unions (6) and tighten them to a torque of 25 Nm (Min. 23 Nm - Max. 27 Nm) (Sect. 3 - 3, Engine torque settings).

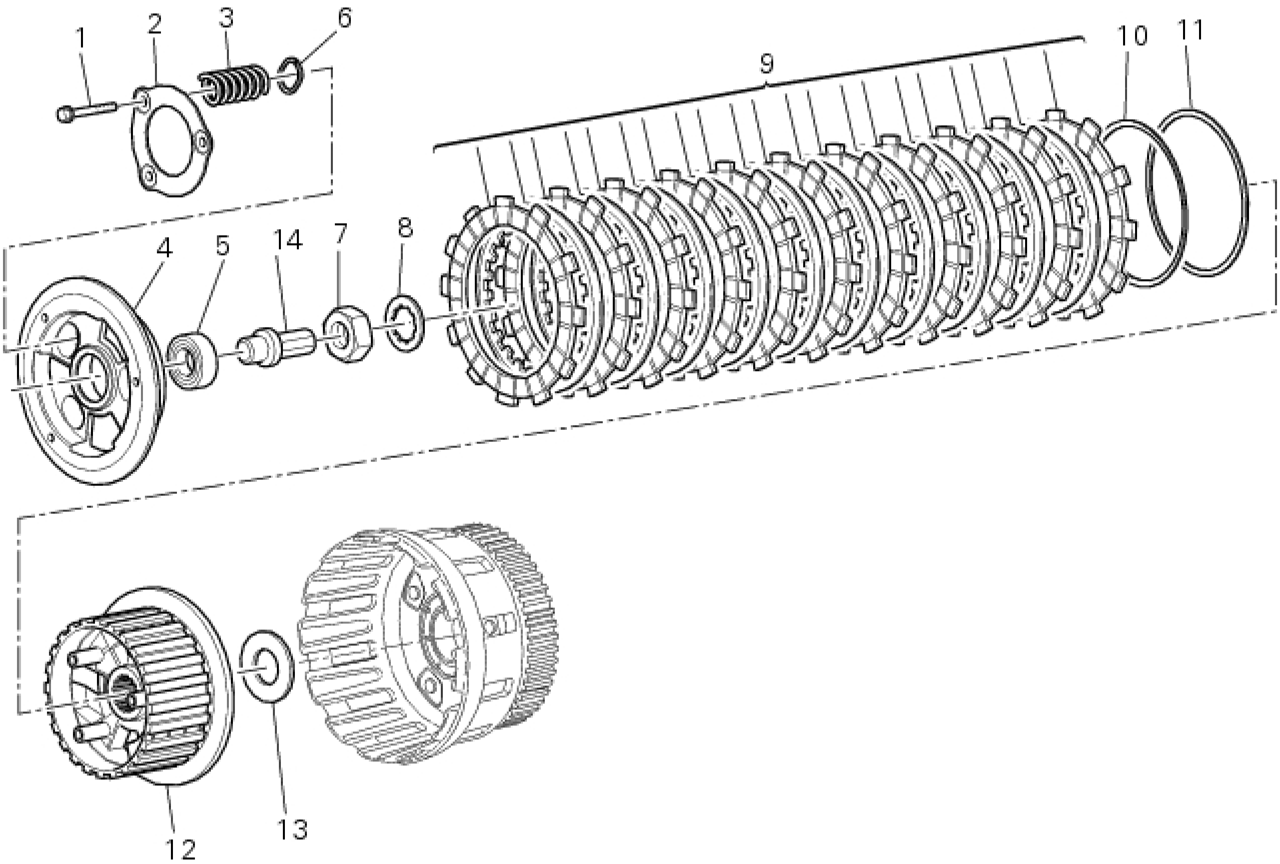


Fit the tubes (8) and (9) and tighten clamps (7) to a torque of 2.5 Nm (Min. 2 Nm - Max. 3 Nm) (Sect. 3 - 3, Engine torque settings).



Operations	Section reference
Refit heads on the engine block	9 - 4.5, Refitting the cylinder head assemblies
Refit the intake manifolds	9 - 4.4, Refitting the intake manifold and coolant union
Refit the timing belt external covers and the timing belts	9 - 4.2, Refitting the timing covers
Refit the cooling system pipe on the water pump	9 - 3.1, Refitting the cooling system hoses and unions
Refit the exhaust unit	8 - 8, Refitting the exhaust system
Refit the water radiators	9 - 3.2, Refitting the radiator
Tighten the clamps of the hose that connects the two radiators and the hose that connects the RH radiator to the union	9 - 3.1, Refitting the cooling system hoses and unions
Refill the cooling system	4 - 3, Changing the coolant
Refit the injectors on the intake manifolds and reassemble the supply system	8- 6, Refitting the injectors
Refit the oil breather pipe, the blow by, the throttle body and the airbox	8 - 6, Refitting the airbox and throttle body
Connect the throttle cable	7 - 8.1, Refitting the throttle twistgrip
Refit air conveyors	8 - 7, Refitting the air filters
Refit the fuel tank	8 - 2, Refitting the fuel tank
Reassemble the tank half covers	5 - 2, Refitting the fuel tank fairings
Reassemble air conveyor covers	8 - 7, Refitting the air filters
Refit the saddles	5 - 3, Refitting the seat

6.1 -Clutch assembly: clutch



1 Screw
2 Ring
3 Clutch spring
4 Pressure plate
5 Bearing
6 Circlips
7 Nut
8 Belleville washer
9 Clutch plates
10 Belleville washer
11 Flat ring
12 Clutch centre
13 Spacer
14 Clutch lifter

Spare parts catalogue

Diavel ABS	CLUTCH
Diavel Carbon ABS	CLUTCH

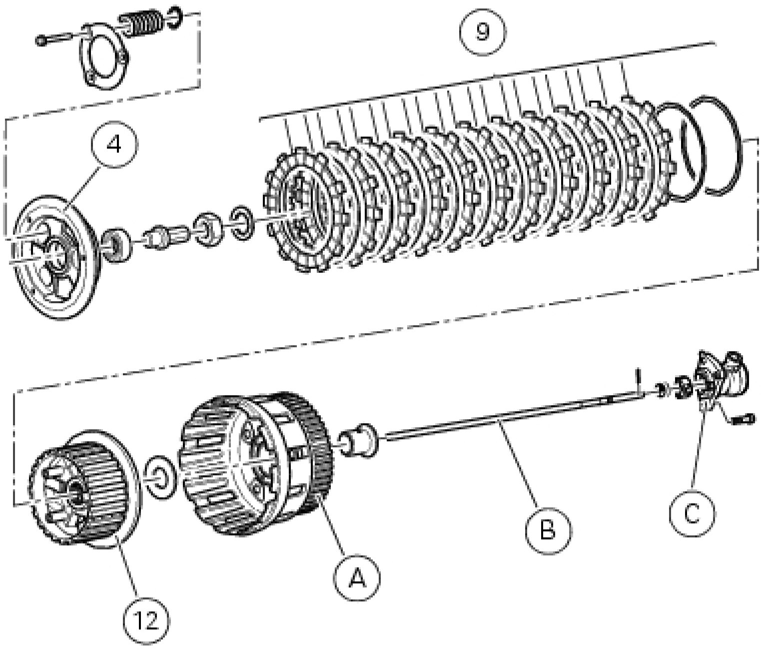
Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Description of the clutch assembly

The clutch is disengaged by a drive unit consisting of a thrust piston (C) accommodated inside a small cap mounted to the generator cover. This piston (C) pushes a pushrod (B), which runs through gearbox primary shaft and operates the

pressure plate (4) located on top of the clutch plate pack (9).
Drive is transmitted from the crankshaft to the gearbox primary shaft by a gear integrated with the clutch housing/primary drive gear pair (A).
Accommodated in the clutch housing is a set of drive and driven plates (9). When the clutch is operated, the driven plates push away a drum (12) which is splined onto the gearbox primary shaft.
Before working on the internal clutch parts, check that the clutch operates correctly. Then deal with the problem in a systematic manner.



The following is a list of possible causes of clutch malfunctions.

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 drum.

A clutch which slips may be caused by:
- insufficient play of the control lever;
- worn clutch plates;
- weakened springs;
- faulty clutch release mechanism;
- excessive wear of the hub or clutch drum.

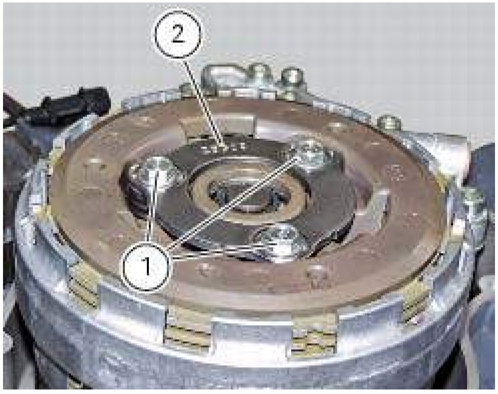
A noisy clutch may be caused by:
- excessive backlash between the primary drive gears;
- damaged primary drive gear teeth;
- excessive play between friction plate tabs and the clutch drum;
- worn gear/clutch drum bearings;
- the presence of metal particles (filings) on the gear teeth.

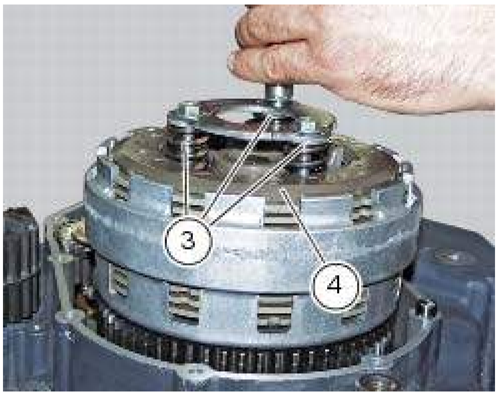
Removal of the clutch

Operations	Section reference
Drain the engine oil	4 - 3, Changing the engine oil and filter cartridge
Remove the clutch cover	9 - 6.2, Removal of the clutch-side crankcase cover

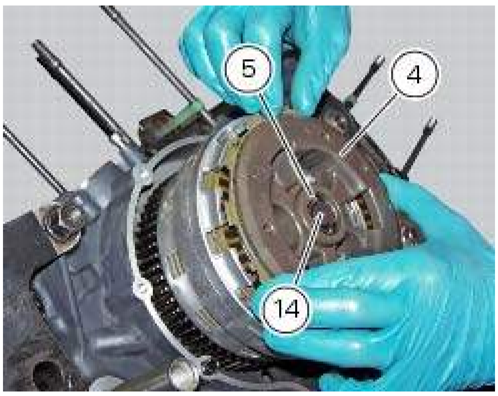
Note
For clarity, the figures show the engine removed from the frame.

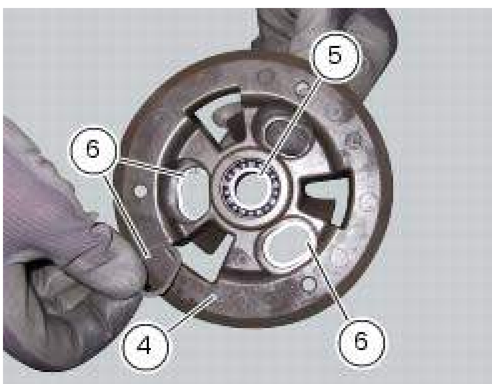
Undo the fixing screws (1) and remove the ring (2) and the springs (3) from the pressure plate (4).



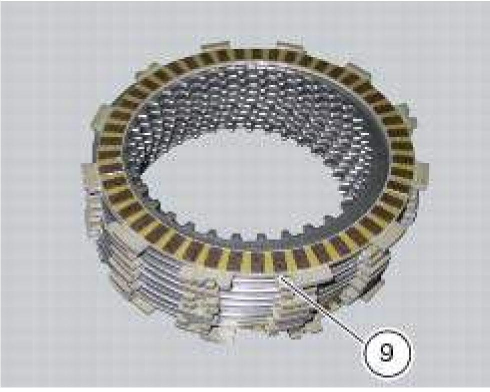


Slide the pressure plate (4) paying attention to the circlips (6).
Remove the clutch control pin (14) and the bearing (5).

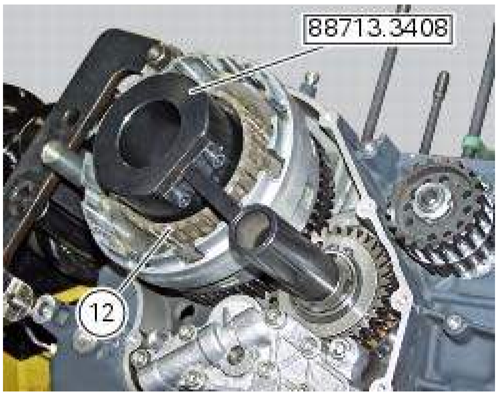


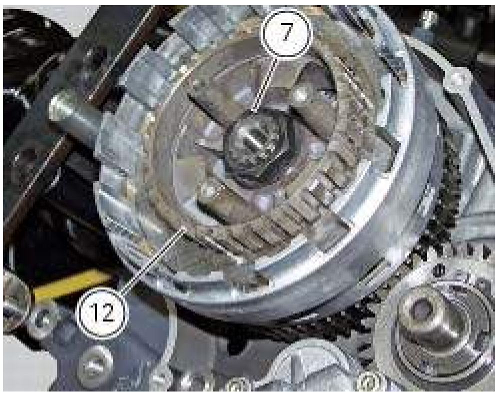


Remove the clutch plates. When removing the discs (9), keep them paired in the assembly order and set them aside tied together, if necessary.

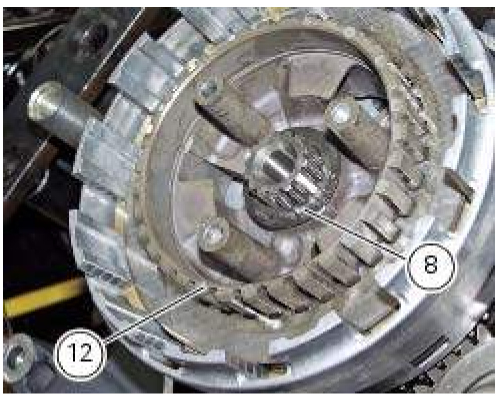


Restrain the clutch centre (12) using service tool **88713.3408** and remove the centre nut (7).

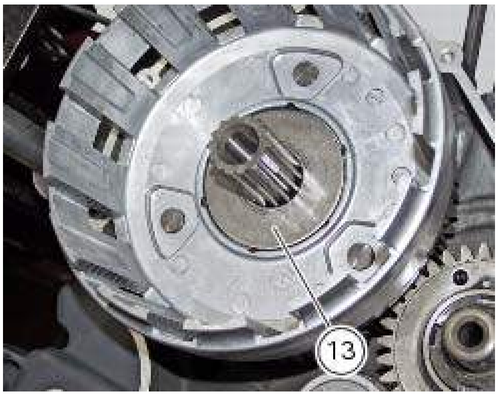




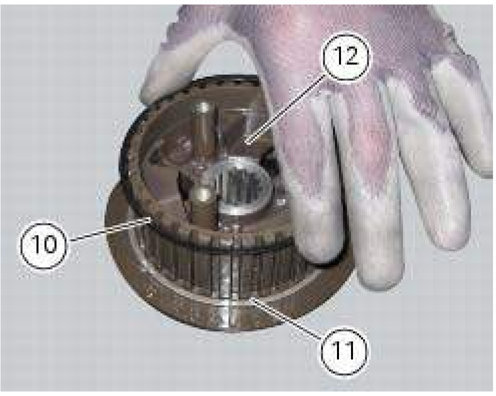
Withdraw the Belleville washer (8) and slide out the clutch drum (12).



Slide the spacer (13).



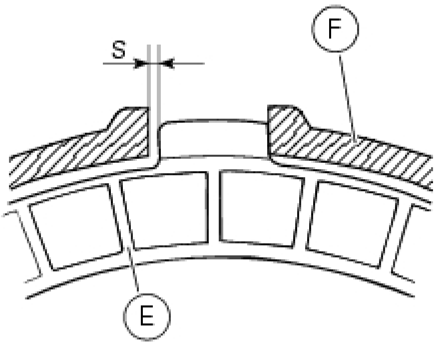
Withdraw the Belleville washer (10) and flat ring (11) from the clutch centre (12).



Checking and overhauling the components

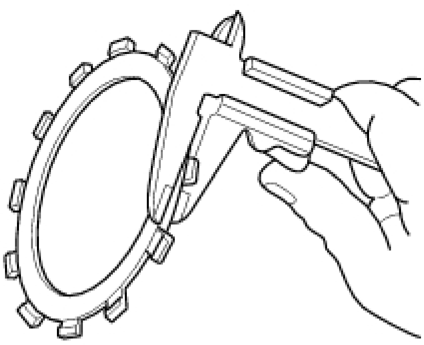
Clearance between the clutch drum and friction plates

Insert a friction plate (E) in the clutch drum (F) and measure the clearance (S) with a feeler gauge.
Clearance “S” must not exceed **0.6** mm.
If it does, renew the plates and, if necessary, the clutch drum.



Overhaul of the clutch plates

The clutch plates must not show any signs of blackening, grooves or deformation.
Measure the thickness of the friction plates; it should not be less than **2.6** mm.



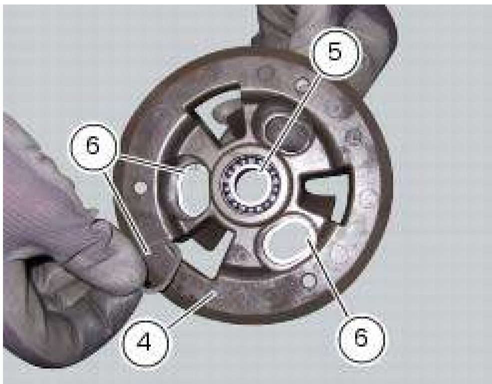
Important

The total thickness of the discs pack must not be less than **46.1** mm.

Place the plate on a flat surface and check the amount of deformation with a feeler gauge.
Max. flatness error: **0.2** mm.

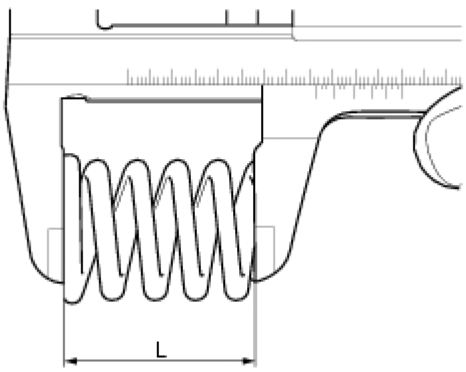
Overhaul of the pressure plate

Check bearing (5) condition; renew the bearing if the play is excessive.
Check the contact surfaces of the last friction plate; if extremely scored, polish it in the same manner as described previously for the cylinder head surface (Sect. 9 - 4.5, Overhaul of cylinder head components).
Check conditions of the spring guide bucket tappet (G) of the pressure plate (4) and of the circlips (6).



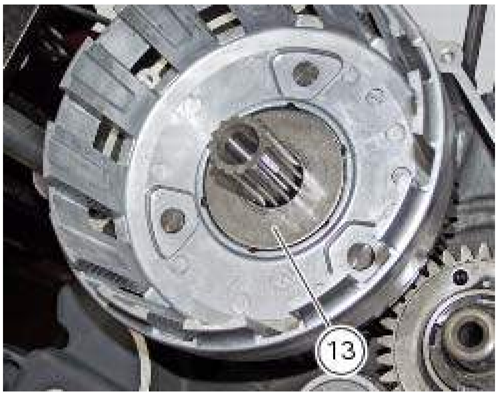
Overhauling the pressure plate springs

Measure the length “L” of each spring (3).
Minimum length: **41** mm.
Renew any springs that are shorter than the above limit value.

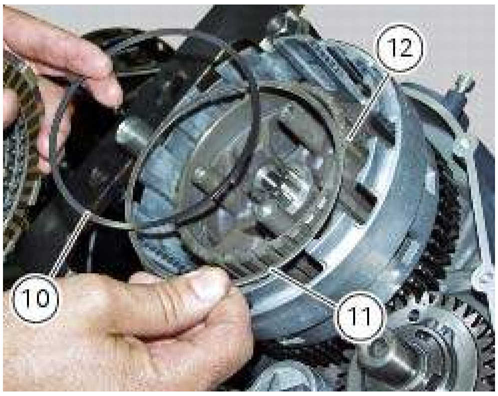


Reassembling the clutch

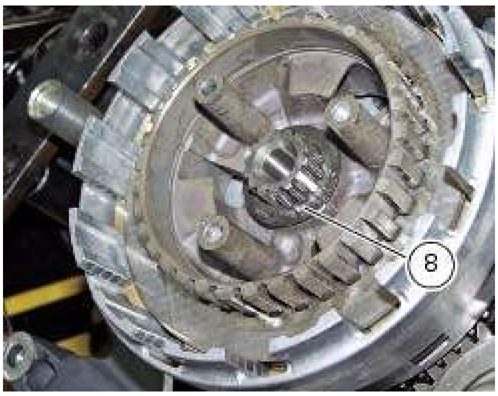
Position the spacer (13).



Fit the flat ring (11) and the Belleville washer (10) on the clutch center (12), so that the convex side faces the clutch drum.

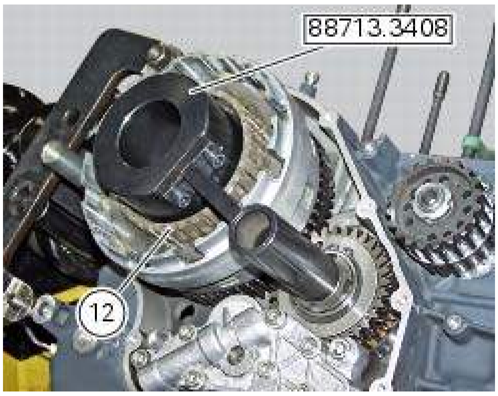


Locate the Belleville washer (8).

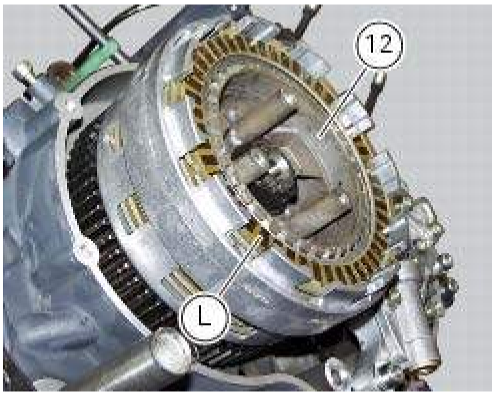


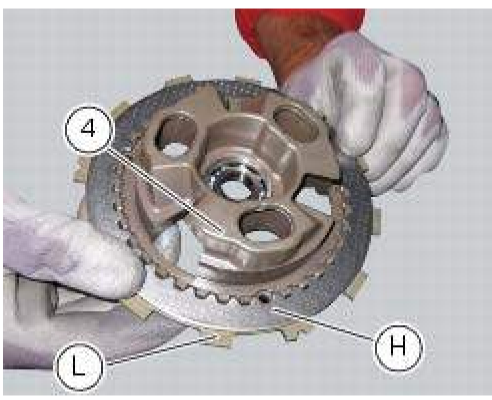
Apply the prescribed grease to the thread of the gearbox primary shaft and the mating surface of nut (7), and fit it over Belleville washer (8).

Lock the clutch center (12) by means of tool number **88713.3408** and tighten the retaining nut (7) to a torque of 190 Nm (Min. 180 Nm - Max. 200 Nm) (Sect. 3 - 3, Engine torque settings).

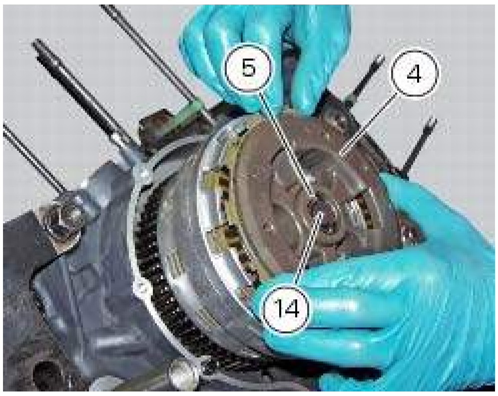


Install the clutch plates (9) in the following order:
on the drum (12):
- a series of ten driving discs (L) alternately to new driven discs (I) thickness 2 mm;
on the pressure plate (4):
- one driven disc (H), 2 mm thick;
- a driving disc (L).

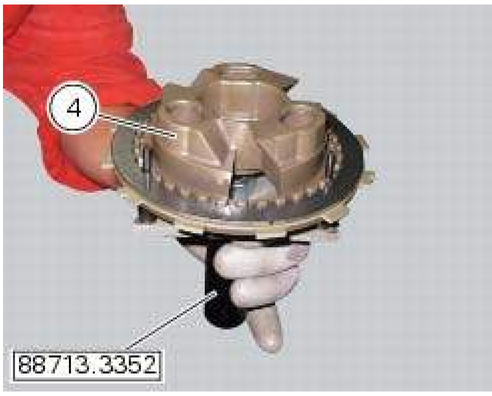




Insert the control pin (14) in the bearing (5) and the latter in the gearbox primary shaft.

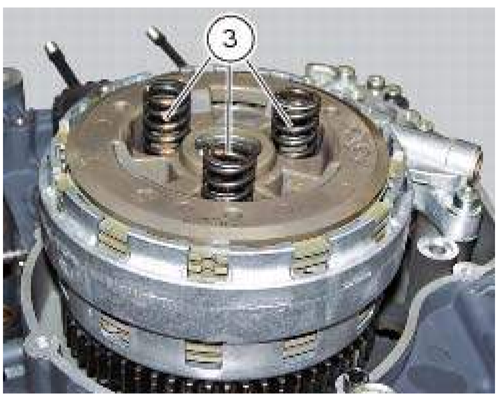


Place the pusher plate (4) with the two discs on the centring tool part no. **88713.3352**.

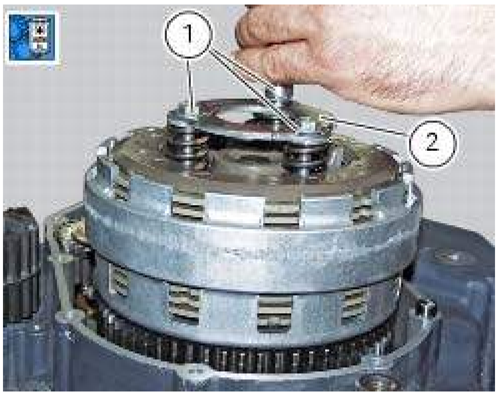


Fit the pressure plate (4).

Insert a spring (3) in each slot.



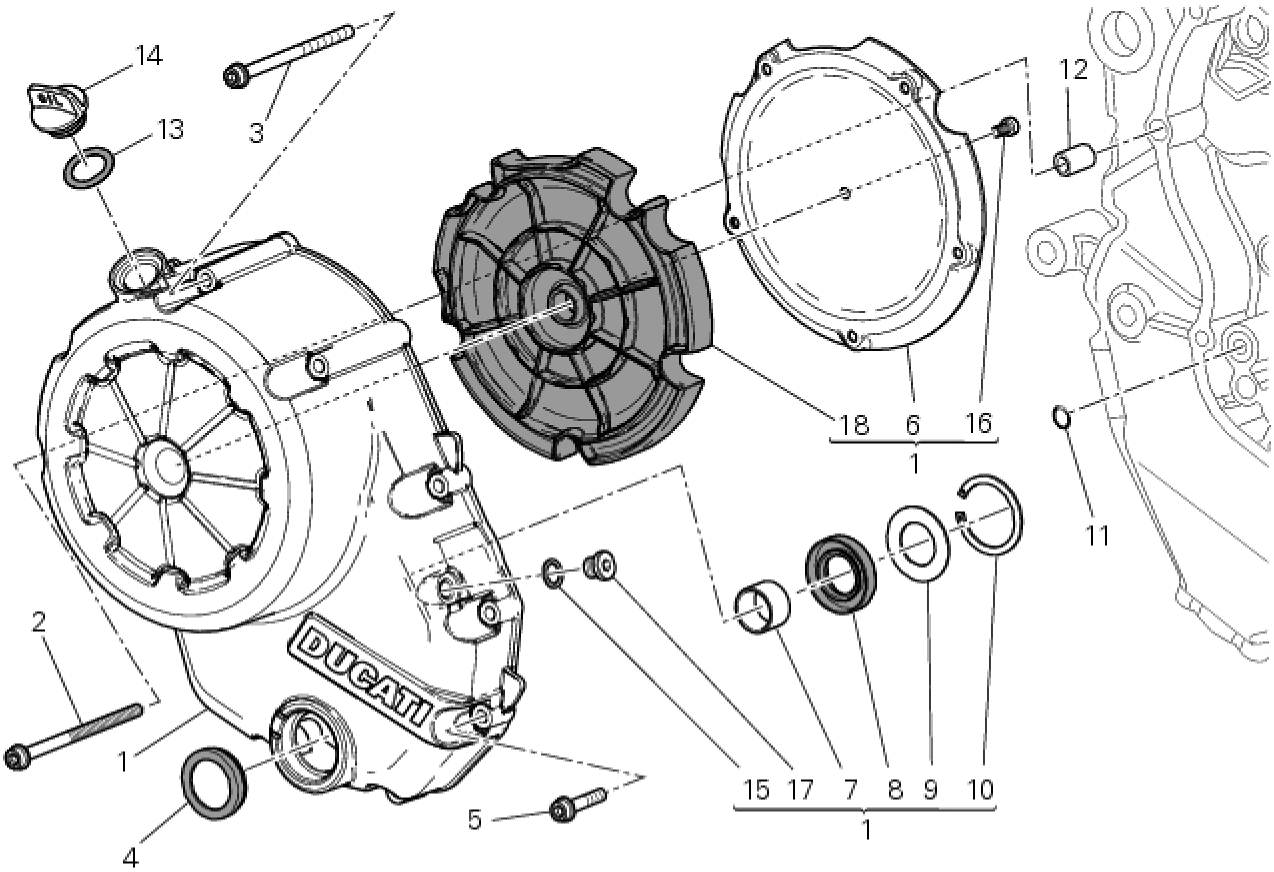
Position the O-ring (2).
Lubricate the thread of the screws (1) with oil.
Insert the screws (1).



Tighten the screws (1) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings).

Operations	Section reference
Refit the clutch cover	9 - 6.2, Refitting the clutch-side crankcase cover
Top up the engine oil	4 - 3, Changing the engine oil and filter cartridge

6.2 -Clutch assembly: clutch cover



1 Clutch-side crankcase cover
2 Screw
3 Screw
4 Oil level sight glass
5 Screw
6 Plate
7 Bush
8 Sealing ring
9 Shim washer
10 Circlip
11 O-ring
12 Locating bush
13 O-ring
14 Plug
15 Sealing washer
16 Screw
17 Plug
18 Panel

Spare parts catalogue

Diavel ABS	CLUTCH-SIDE CRANKCASE COVER
Diavel Carbon ABS	CLUTCH-SIDE CRANKCASE COVER

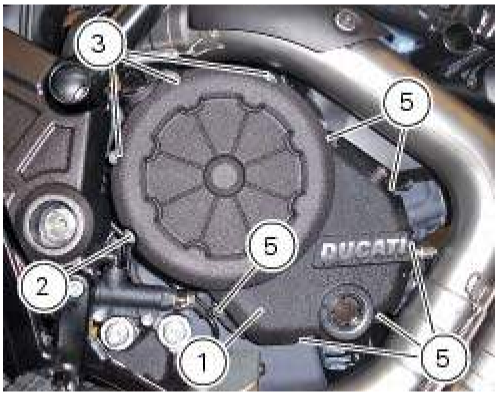
Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

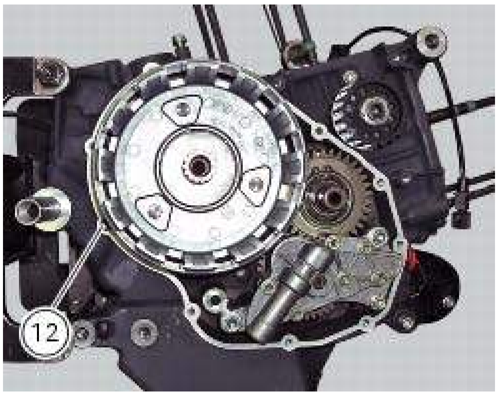
Removal of the clutch-side crankcase cover

Operations	Section reference
Drain the engine oil	4 - 3, Changing the engine oil and filter cartridge

Unscrew the screws (2), (3) and (5) securing the clutch-side crankcase cover (1).

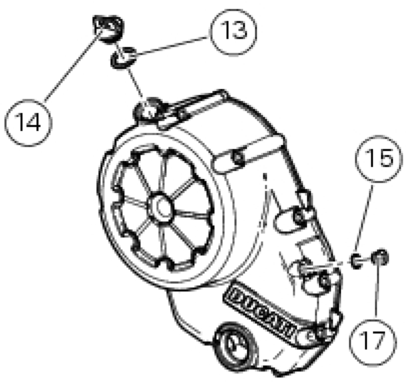


Tap around the edge of the cover with a plastic mallet to detach it from the crankcase half.
Remove the clutch cover (1) paying attention to the centring bushing (12).
Check the condition of the centring bushing (12) and replace if deformed.

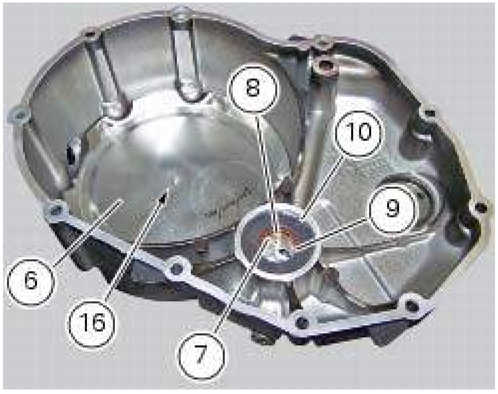


Disassembly of the clutch cover

Remove the plug (14) and its O-ring (13), the plug (17) and its O-ring (15) from the cover.

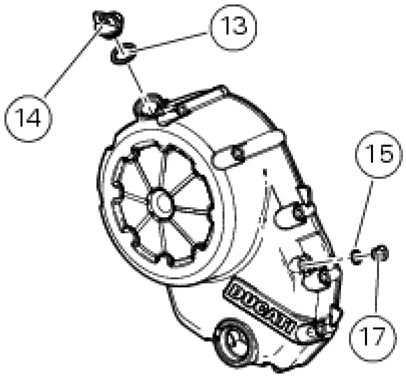


Undo the fixing screw (16) of the inner cover (19).
Remove the inner cover (6) and soundproofing panel (**18**).
Remove the circlip (10) and withdraw the shim (9) and the sealing ring (8).
The drilled bush (7) is mounted to the cover by a forced interference fit. Remove it using a suitable puller.
Inspect the sealing ring (8) and renew it if necessary.



Reassembly of the clutch-side crankcase cover

Fit the plug (14) and the gasket (13). Fit the plug (17) and the gasket (15).

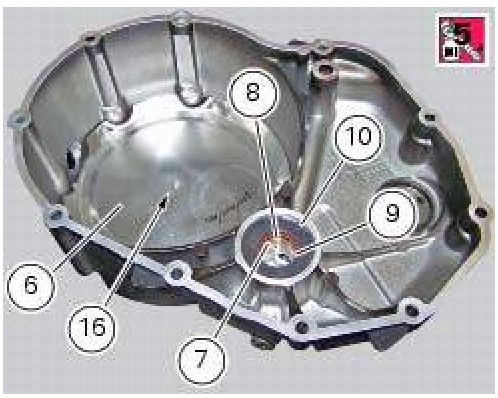


If the bush has been replaced, fully seat the new bush (7) in the slot in the cover using a suitable drift and a press.
If the sealing ring (8) needs to be renewed, fit the new seal into the crankcase cover, positioning it so the side without a spring is facing the circlip (10).
Before fitting, check 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 (10).

Important

In order for the sealing ring (8) to function correctly, it must have an assembly clearance that allows the circlip (10) to rotate.

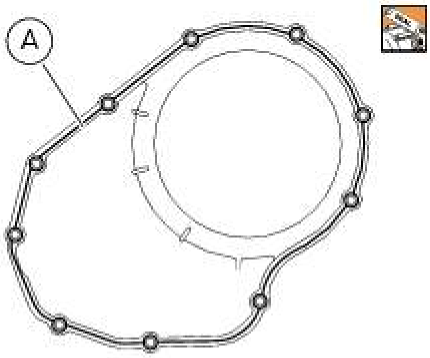
Place the soundproofing panel (**18**) inside the clutch cover (1).
Position the inner cover (19) on the panel (**18**), aligning it with the pin (D).
Apply the recommended threadlocker to the screw (16)
Tighten the retaining screw (16) to a torque of 24 Nm (Min. 22 Nm - Max. 26 Nm) (Sect. 3 - 3, Engine torque settings).



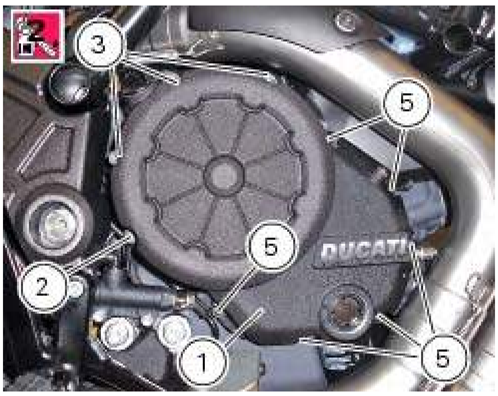
Refitting the clutch-side crankcase cover

Clean and degrease mating surfaces on the clutch-side crankcase half cover and crankcase and ensure that locating bush (12) and the O-ring (11), located in correspondence with the oil way, are installed in the crankcase.

Apply an even, regular bead of DUCATI liquid gasket (A) on the mating surface of the crankcase half and around all holes.

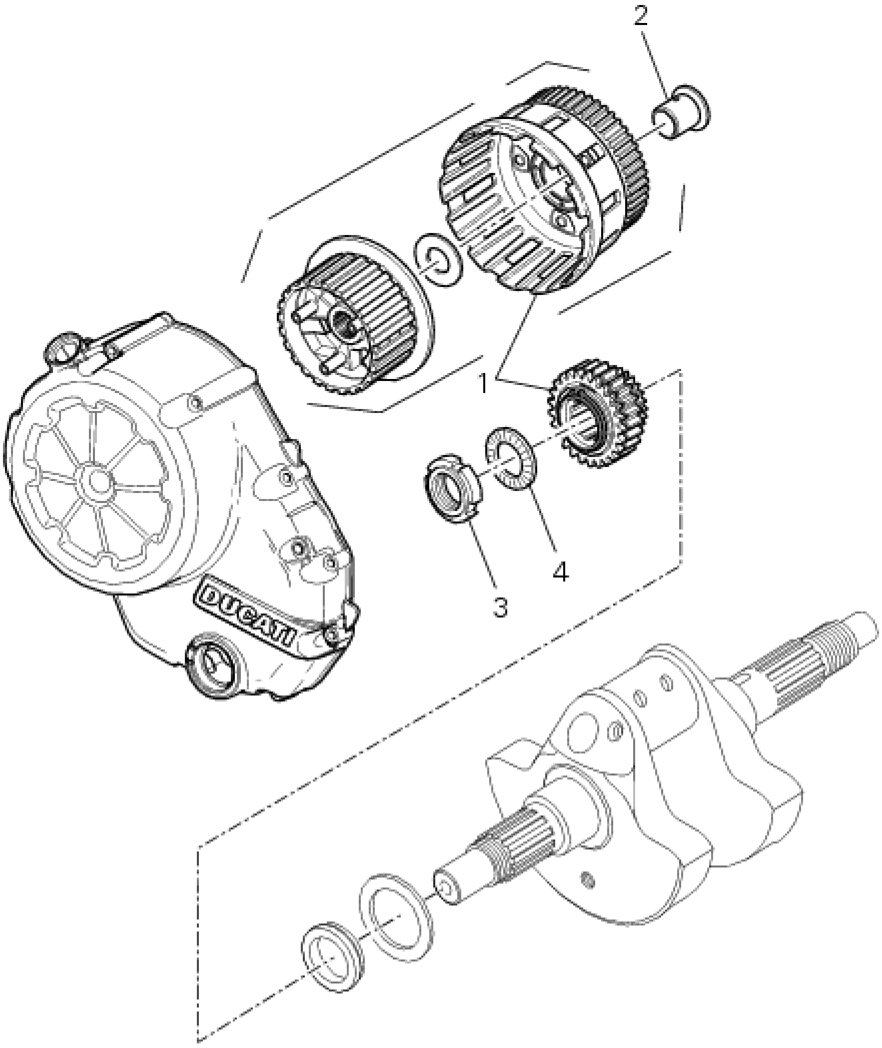


Fit the cover assembly (1) to the crankcase half and insert the retaining screws.
Apply recommended threadlocker to the screws (2), (3) and (5).
Lock the screws (2), (3) and (5) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings) in a cross-pattern sequence.



Operations	Section reference
Top up the engine oil	4 - 3, Changing the engine oil and filter cartridge

6.3 -Clutch assembly: primary drive gears



1 Clutch drum/Primary drive gears
2 Spacer
3 Threaded ring nut
4 Lock washer

Spare parts catalogue

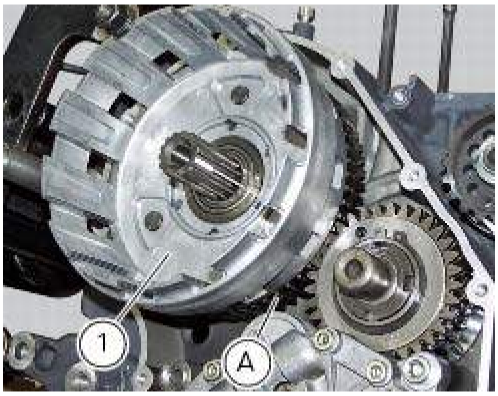
Diavel ABS	CLUTCH
Diavel ABS	CONNECTING RODS
Diavel Carbon ABS	CLUTCH
Diavel Carbon ABS	CONNECTING RODS

Important
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Removal of the primary drive gear

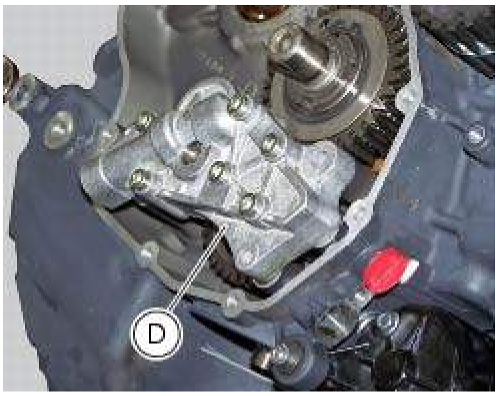
Operations	Section reference
Drain the engine oil	4 - 3, Changing the engine oil and filter cartridge
Remove the clutch cover	9 - 6.2, Removal of the clutch-side crankcase cover
Remove the clutch assembly	9 - 6.1, Removal of the clutch

Withdraw the clutch housing (1) complete with driven gear of the primary pair (A).

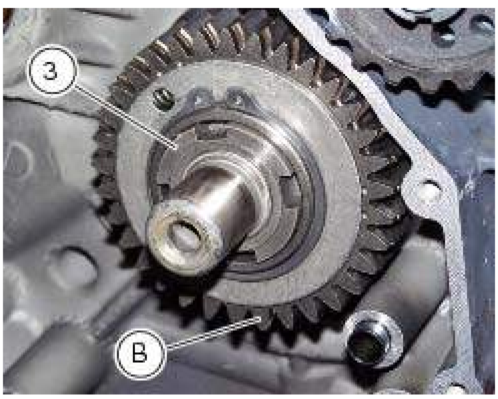


Remove the inner spacer (2).

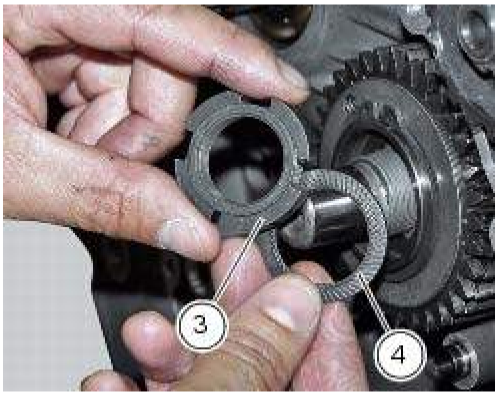
Remove the oil pump (D) (Sect. 9 - 2.1, Removal of the oil pump).



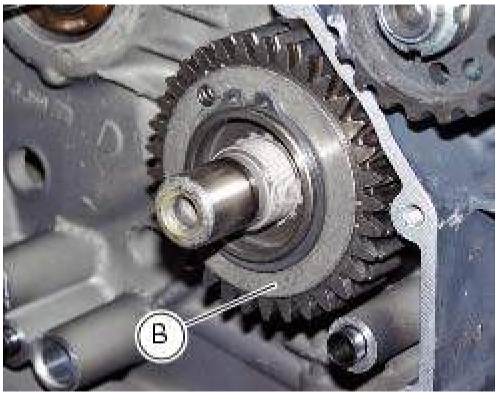
Lock the primary pinion (B) with the holding tool **88713.3417** and loosen the threaded ring nut (3) using the bush part no. **88713.3406**.



Remove the nut (3) and safety washer (4).



Remove the complete primary drive gear (B) using a commercial puller and placing a brass or aluminium pad between the end of the crankshaft and the puller screw.

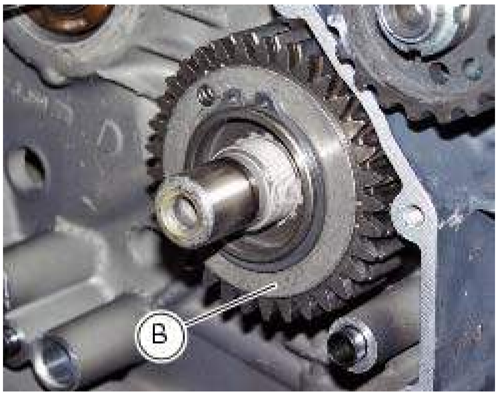


Remove the spacer (C).

Refitting the primary drive gears and checking backlash

Fully degrease the crankshaft splined end and the corresponding spline on the primary drive gear.
Position the spacer (C) onto the crankshaft.

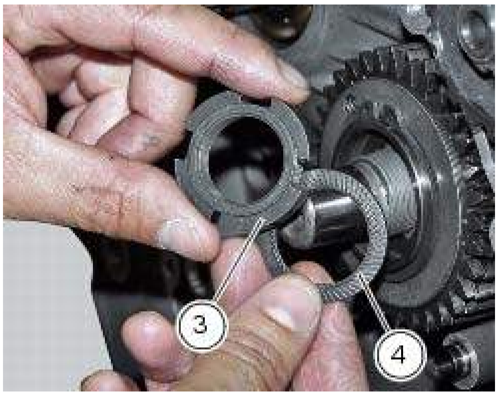
Fit the driving gear (B) onto the crankshaft with the oil pump drive sprocket facing the crankcase.



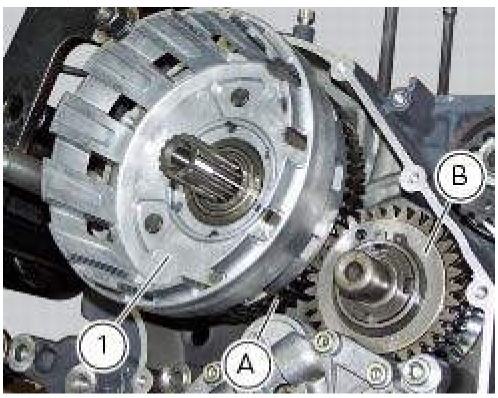
Temporarily secure the gear with the washer (4) and nut (3).

Important

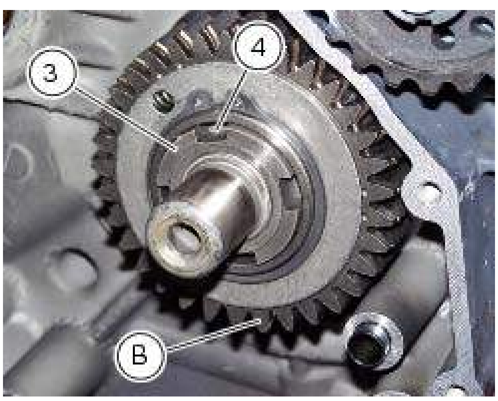
If fitting a new primary driving gear (B), check the backlash.



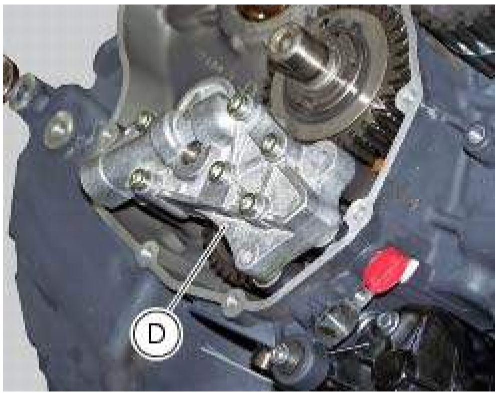
To check the clearance, temporarily fit the clutch bell (1) complete with the primary driven gear (A) on the gearbox primary shaft. Fix a dial gauge to the engine crankcase, positioning the stylus against a gear tooth.
Turn the driven gear (A) to mesh the teeth and check that clearance ranges between **0.05** and **0.07** mm.
Repeat the check at 16 different points of the driven gear.
If the measured values are outside the permissible tolerance limits, try changing the position of driven gear (A) on the primary shaft, leaving the driving gear (B) on the crankshaft. If still outside tolerance values, renew the whole primary drive gear pair.



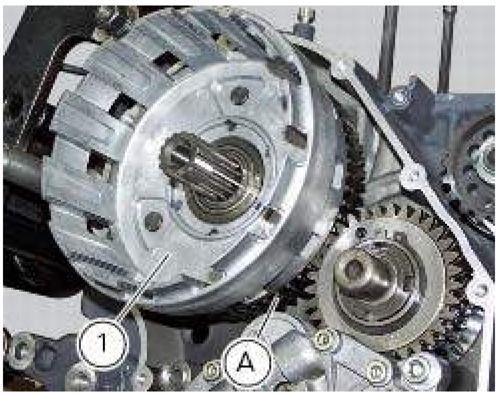
After checking backlash, fit the bush **88713.3406** on a torque wrench, lock the pinion (B) with the holding tool **88713.3417**.
Position the washer (4) and the ring nut (3). Use the special tool **88713.3406** to tighten the ring nut (3) to a torque of 190 Nm (Min. 171 Nm - Max. 209 Nm) (Sect. 3 - 3, Engine torque settings).



Refit the oil pump (D) and check the clearance between the oil pump gear and primary drive gear on the crankshaft (Sect. 9 - 2.1, Refitting the oil pump).

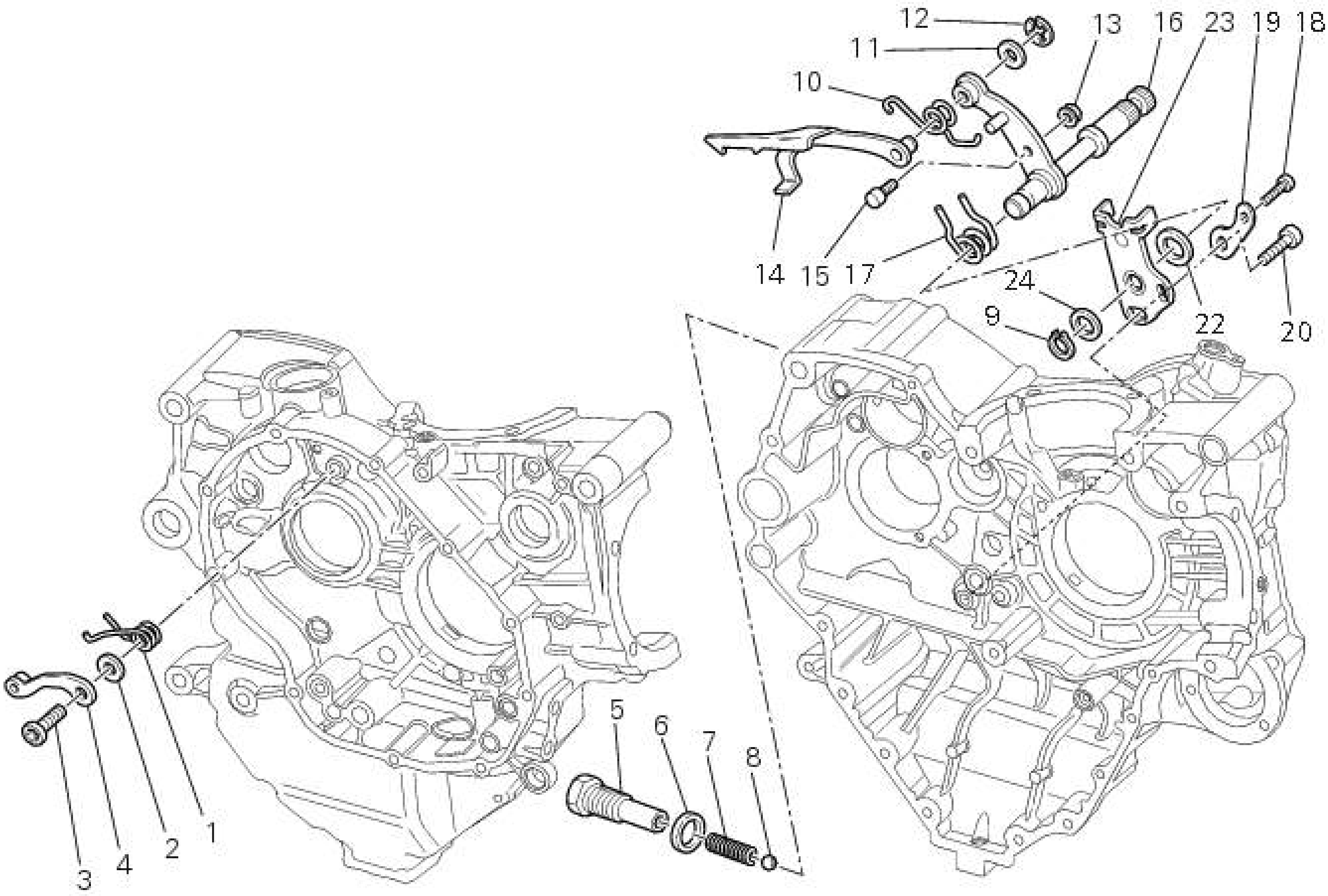


Thoroughly degrease the mating surfaces of the clutch bell (1).
Fit the spacer (2) onto the primary shaft. Fit the clutch housing (1) along with the driven gear (A).



Operations	Section reference
Refit the complete clutch assembly	9 - 6.1, Reassembling the clutch
Refit the clutch cover	9 - 6.2, Refitting the clutch-side crankcase cover
Refill the engine with oil	4 - 3, Changing the engine oil and filter cartridge

7.1 -Gearbox assembly: gearchange mechanism



1 Return spring
2 Washer
3 Special screw
4 Gear pawl assembly
5 Interlock plunger holder
6 Sealing washer
7 Detent ball spring
8 Ball
9 Circlip
10 Selector claw return spring
11 Shim washer
12 Ring
13 Nut
14 Selector drum control fork
15 Gearchange lever pin
16 Shaft with gearchange lever arm
17 Gearchange lever arm return spring
18 Screw
19 Spacer
20 Screw
21 Gearchange mechanism
22 Locating ring
23 Stop plate
24 Shim washer

Spare parts catalogue

Diavel ABS	GEARCHANGE CONTROL
Diavel Carbon ABS	GEARCHANGE CONTROL

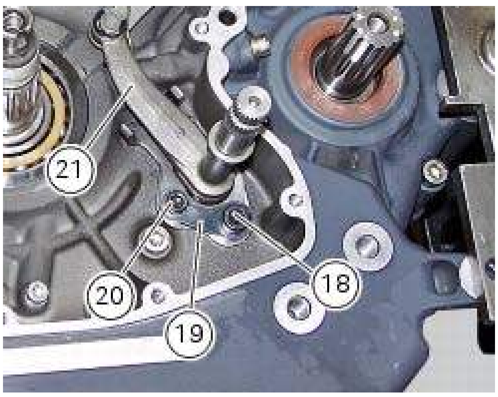
Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Removal of the gear selector lever

Operations	Section reference
Drain the engine oil	4 - 3, Changing the engine oil and filter cartridge
Remove the front sprocket cover	7 - 14, Removing of the front sprocket
Remove the clutch pushrod	7 - 8.2, Removal of the clutch transmission unit
Remove the gearchange control	7 - 9, Removal of the gearchange control
Empty the coolant out of the cooling system	4 - 3, Changing the coolant
Remove the pump-cylinder hoses	9 - 5, Removal of the cylinder/piston assembly
Remove the water pump-LH water radiator hose	9 - 3.1, Removal of the cooling system hoses and unions
Remove the generator cover and flywheel-generator assembly	9 - 8, Removal of the generator cover

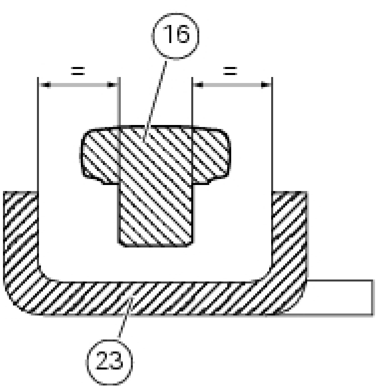
Unscrew and remove the fixing screws (18) and (20) of the complete gear selector lever (21) and collect the spacer (19). Remove the gearchange mechanism complete with the shaft, spring, and stop plate.



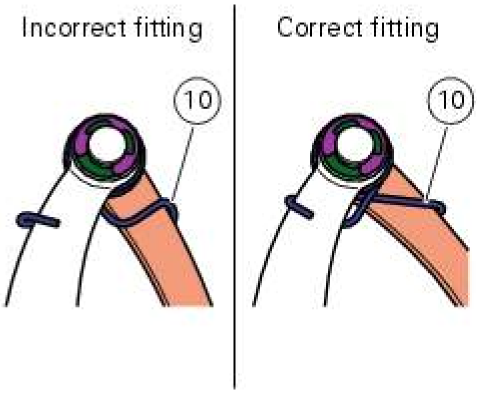
Important

Visually inspect the gear selector claw (14) for wear, particularly around the area where it contacts the selector drum.

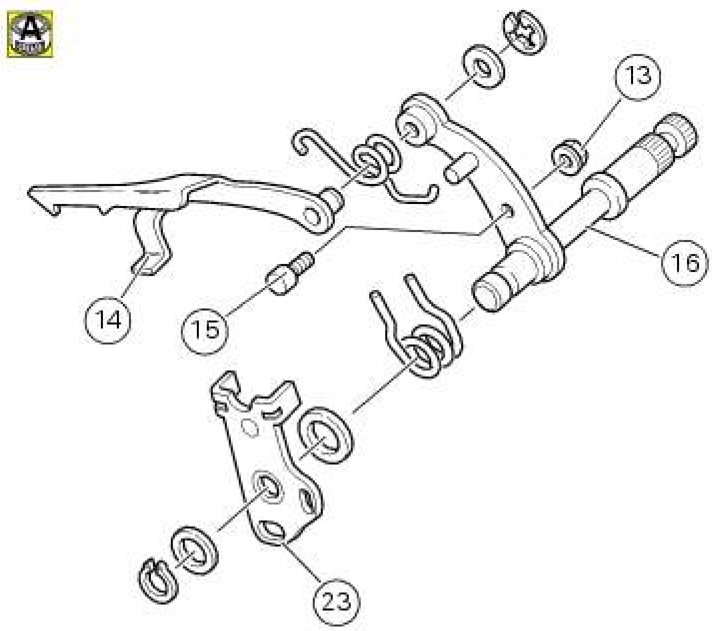
If it proves necessary to change components, disassemble the gear selector lever as shown in the exploded view. Reassemble the gear selector lever orienting the eccentric pin (15), suitably lubricated, in such a way that the lever arm (16) is positioned centrally with respect to the shoulders of the stop plate (23).



Check that the spring (10) is installed correctly as shown in the figure.



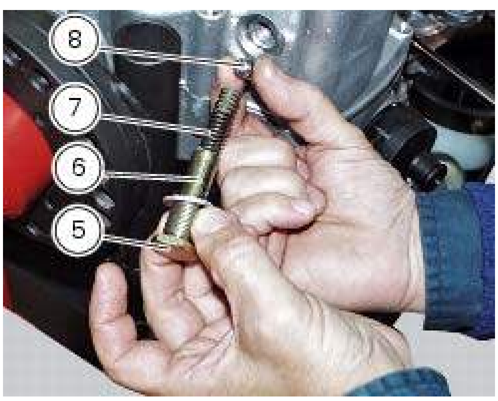
Tighten the nut (13) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings).



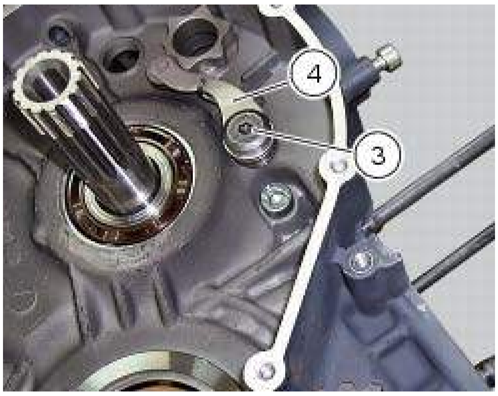
Disassembly of gear interlock plunger and pawl assembly

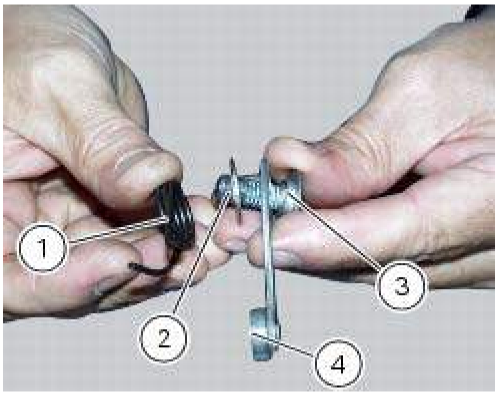
Operations	Section reference
Drain the engine oil	4 - 3, Changing the engine oil and filter cartridge
Remove the clutch cover	9 - 6.2, Removal of the clutch-side crankcase cover
Remove the clutch assembly	9 - 6.1, Removal of the clutch
Remove the primary gear	9 - 6.3, Removal of the primary drive gear

Unscrew the interlock plunger screw (5) and remove the seal (6), spring (7) and the detent ball (8).



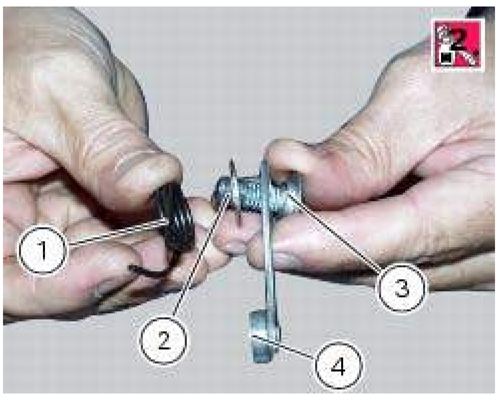
Unscrew the clutch-side crankcase half screw (3) and remove the pawl (4), washer (2) and spring (1).

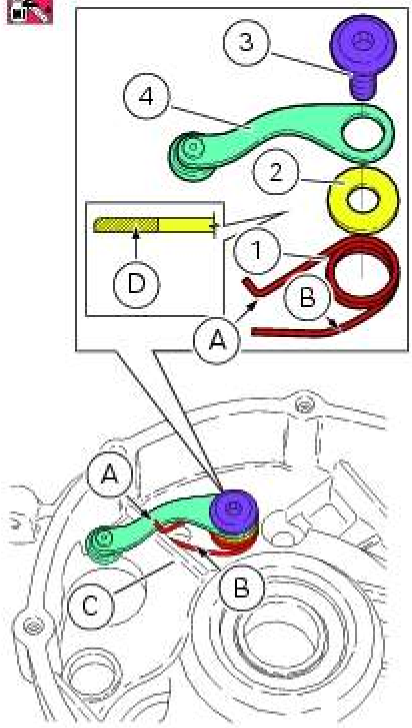


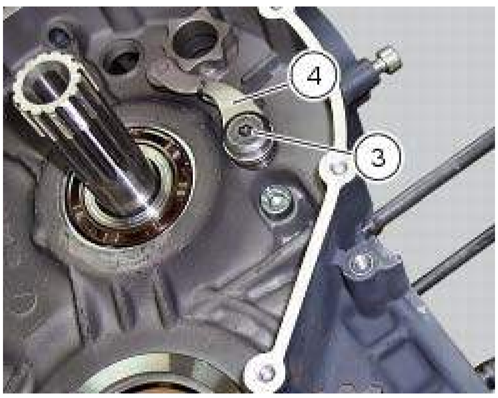


Refitting the gear interlock plunger and pawl assembly

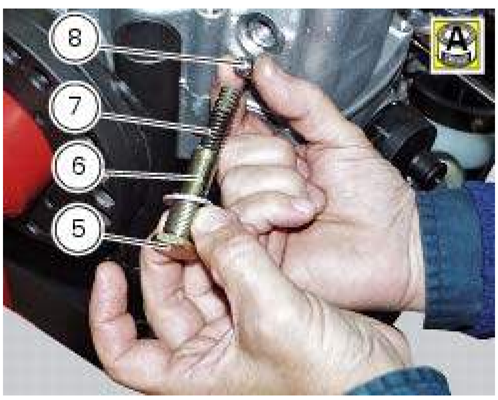
On the special screw (3), fit the gear pawl lever (4), orienting it as shown in the figure, the washer (2) with the square edge side (D) facing the clutch-side crankcase half, and the spring (1), positioning it so that the hook end (A) is facing the gear pawl lever. Locate the hook end (A) of the spring on the gear pawl lever 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 the screw (3) to a torque of 18 Nm (Min. 16 Nm - Max. 20 Nm) (Sect. 3 - 3, Engine torque settings). Manually move the gear stopper to check for proper spring operation.







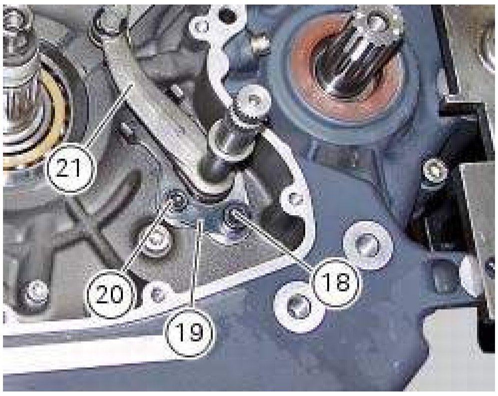
Grease and then fit the ball (8), spring (7), and seal (6) to the gear interlock plunger (5).
Lock the plunger (5) to a torque of 30 Nm (Min. 27 Nm - Max. 33 Nm) (Sect. 3 - 3, Engine torque settings).



Operations	Section reference
Refit the primary gear	9 - 6.3, Refitting the primary drive gears and checking backlash
Refit the complete clutch assembly	9 - 6.1, Reassembling the clutch
Refit the clutch cover	9 - 6.2, Refitting the clutch-side crankcase cover
Refill the system with engine oil	4 - 3, Changing the engine oil and filter cartridge

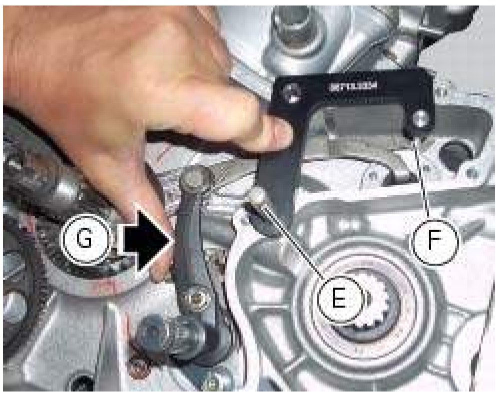
Refitting the gear selector lever

Position the gearbox drum selector fork in the centre of the gear rollers.
Position the gear selector lever (21) together with control shaft, spring and plate into the chain-side crankcase half.
Insert the screws (18) and (20) with the spacer (19).
Temporarily fit gear change lever (or a service lever) and engine pinion and shift to neutral gear.



Place the tool **88713.3334** on the gear claw.

Place the tool **88713.3334** inserting the clutch rod (E) into the tool hole, block the pin (F) of the tool in the gear claw pressing with the hand in the point (G) (claw stroke lock plate) towards the right, as shown in photo.

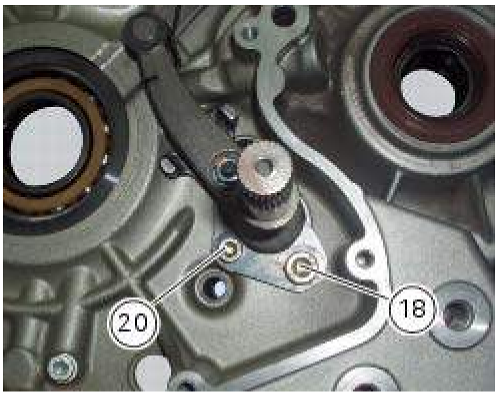


Tighten the screw (18) in this position to a torque of 36 Nm (Min. 34 Nm - Max. 38 Nm) and screw (20) to a torque of 16 Nm (Min. 15 Nm - Max. 17 Nm) (Sect. 3 - 3, Engine torque settings).

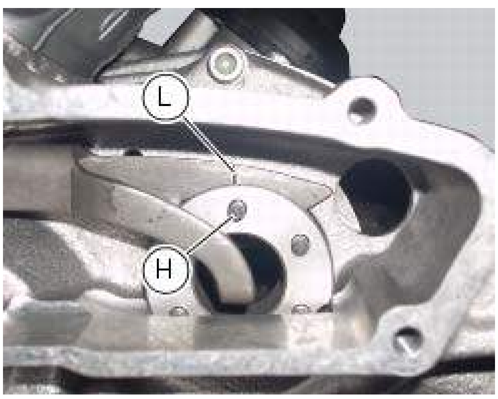
Warning

Make sure that the gear selector lever fixing screws (18) and (20) are those indicated in our spare parts catalogue. They must be screws of class 12.9 in order to respect the tightening torque indicated above (Sect. 3 - 3, Engine torque settings).

Start tightening the first screw (18), and continue with screw (20).



Remove service tool no.
Check that the pin (H) placed on the gear drum is axially to the notch (L) on the gear claw (with gear in neutral).

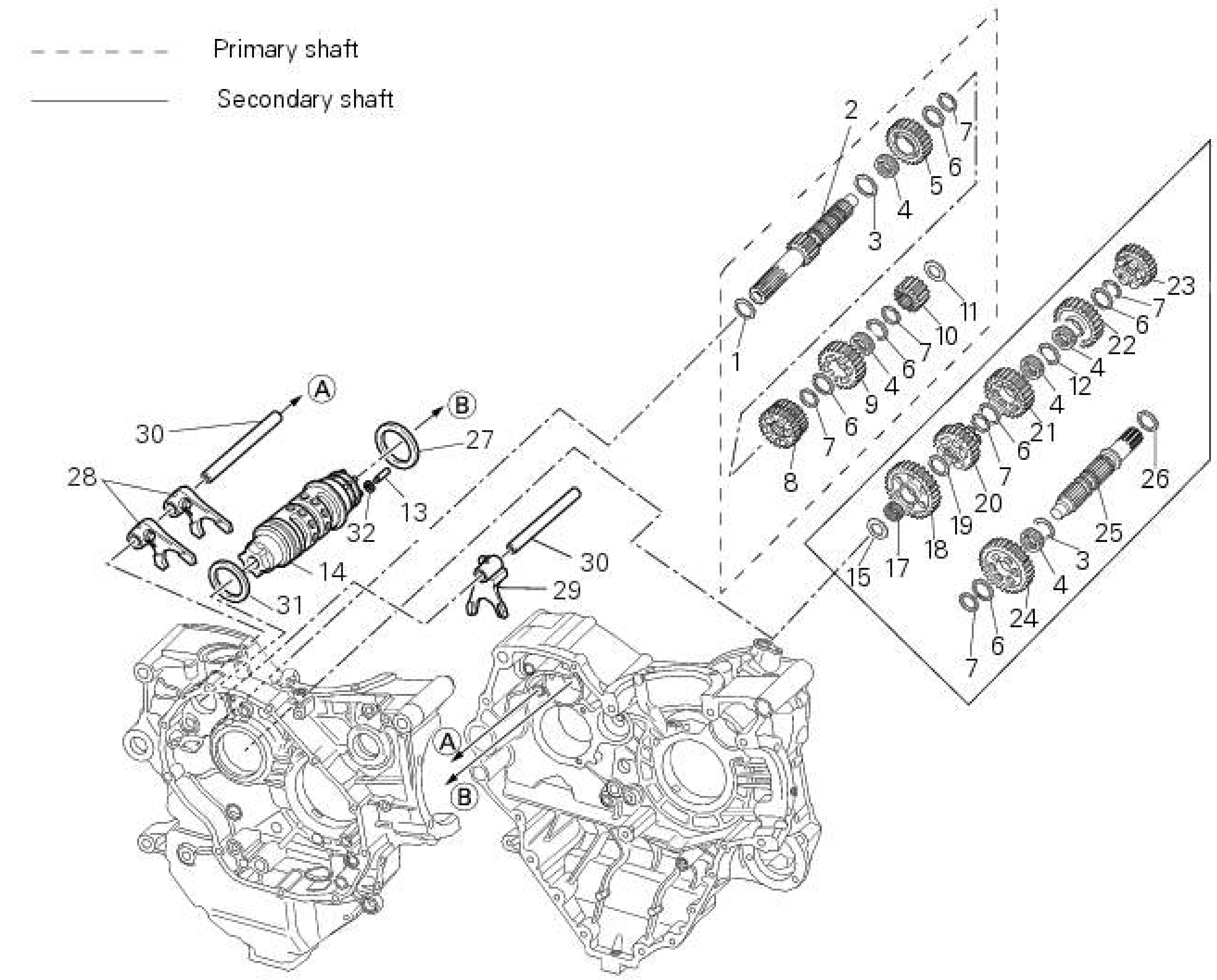


With the gearbox in neutral, check that the lever travel is the same when shifting up and down. The same should apply when a gear is engaged.
Operate the gearchange lever and turn the front sprocket at the same time to check that all the gears engage when shifting up and down.
Remove the previously installed lever and sprocket.

Operations	Section reference
Refit the flywheel/alternator	9 - 8, Refitting the flywheel-

assembly. and alternator side crankcase cover	alternator assembly
Refit the water pump-LH water radiator hose	9 - 3.1, Refitting the cooling system hoses and unions
Refit the pump-cylinder hoses	9 - 5, Refitting the cylinder/piston assembly
Refill the cooling system	4 - 3, Changing the coolant
Refit the gearchange control	7 - 9, Refitting the gearchange mechanism
Refit the clutch control piston	7 - 8.2, Refitting the clutch transmission unit
Refit the sprocket cover	7 - 14, Refitting the front sprocket
Refill the system with engine oil	4 - 3, Changing the engine oil and filter cartridge

7.2 -Gearbox assembly: gearbox shafts



1 Shim, thickness 1
2 Gearbox primary shaft
3 Shim, thickness 0.5
4 Needle roller bearing
5 5^{th} speed driving gear
6 Splined washer, thickness 0.5
7 Circlip
8 3^{rd}- 4^{th} speed driving gear
9 6^{th} speed driving gear
10 2^{nd} speed driving gear
11 Shim, thickness 1.8
12 Splined washer, thickness 0.5
13 Special needle roller (square cross-section)
14 Selector drum
15 Shim washer
16 Selector drum assembly
17 Needle roller bearing
18 1^{st} speed driven gear
19 Shim, thickness 1
20 5^{th} speed driven gear
21 4^{th} speed driven gear
22 3^{rd} speed driven gear
23 6^{th} speed driven gear
24 2^{nd} speed driven gear
25 Gearbox secondary shaft
26 Shim washer
27 Shim, thickness 1
28 1^{st}, 4^{th}- 2^{nd}, 3^{rd} speed selector fork

29 5th, 6th speed selector fork
30 Selector fork shaft
31 Shim, thickness 1
32 Needle roller retaining circlip (square cross-section)

Spare parts catalogue

Diavel ABS	GEARCHANGE CONTROL
Diavel ABS	GEARBOX
Diavel Carbon ABS	GEARCHANGE CONTROL
Diavel Carbon ABS	GEARBOX

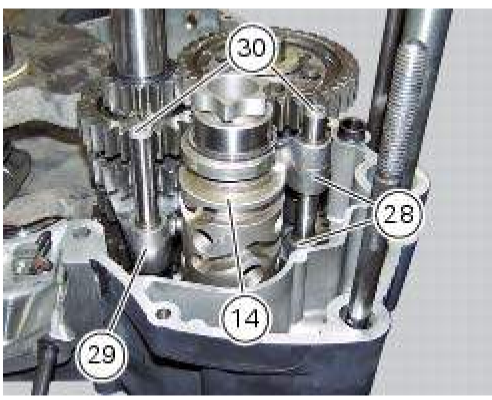
Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

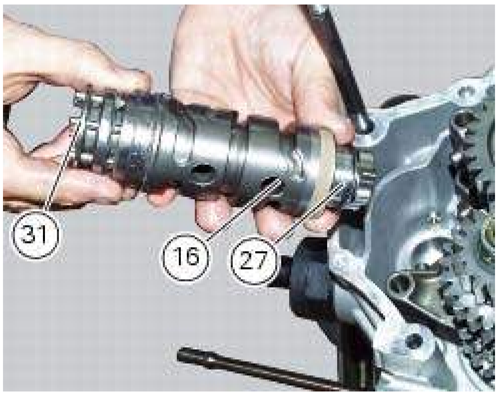
Removal of the gearbox assembly

Operations	Section reference
Remove the engine from the frame	9 - 1, Removal of the engine
Remove the timing components	9 - 4.2, Removal of the timing belt covers
Remove the timing shaft unit	9 - 4.4, Removal of the camshafts
Remove the complete cylinder head unit	9 - 4.5, Removal of the cylinder heads
Remove the cylinder barrel/piston assemblies	9 - 5, Removal of the cylinder/piston assembly
Remove the alternator-side crankcase cover and the alternator assembly	9 - 8, Removal of the generator cover
Remove the oil pump	9 - 2.1, Removal of the oil pump
Remove the starter motor	6 - 3, Starter motor
Remove the clutch cover, drum and bell	9 - 6.1, Removal of the clutch
Remove the clutch cover	9 - 6.2, Removal of the clutch-side crankcase cover
Remove the primary gear	9 - 6.3, Removal of the primary drive gear
Separate the crankcase halves	9 - 9.2, Separation of the crankcase halves

Withdraw the selector fork shafts (30).
Move the forks (28) and (29) to disengage them from the slots in the selector drum (14).



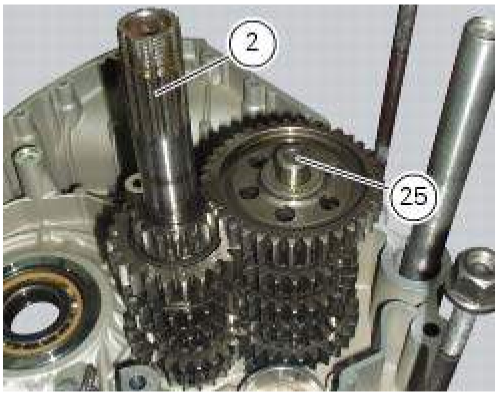
Withdraw the selector drum (16) taking care not to lose shims (31) and (27) mounted on the shaft. Note that the positions of the shims must not be inverted.

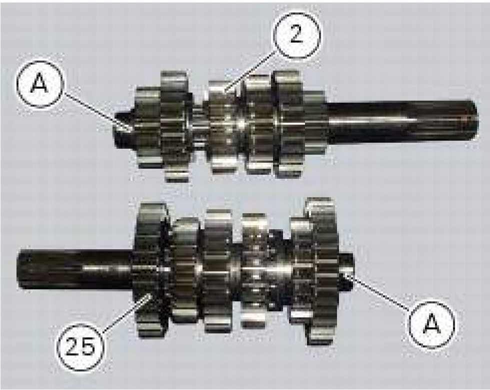


Once removed, it is possible to replace the special rollers (13).

Remove gear selector forks (29) and (28).

Remove the gearbox primary (2) and secondary (25) shafts complete with gears, taking care to recover the spacers 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 (2) and secondary (25) shafts (Sect. 9 - 9.2, Separation of the crankcase halves).





Disassembly of the gearbox shafts

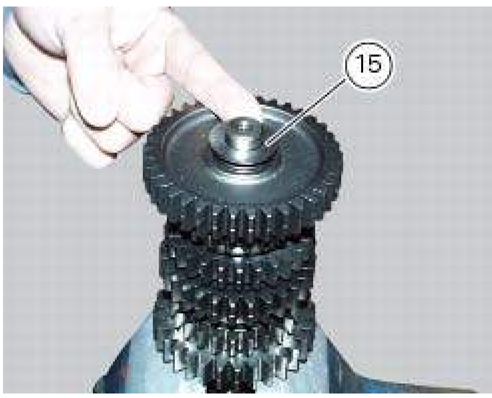
Place the shaft in a vice in such a way as to facilitate the disassembly operations.

Important

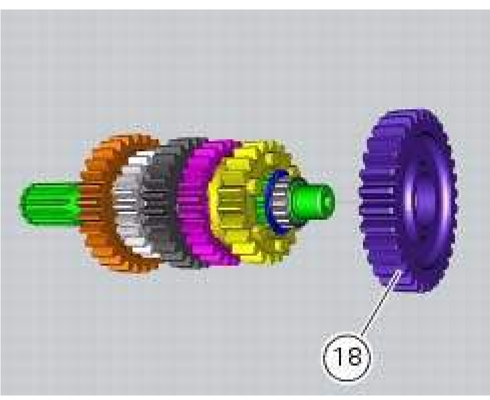
Take care not to invert the positions of the shims on reassembly:
this would potentially lead to jamming when using the gear selector control, making it necessary to reopen the engine crankcase.

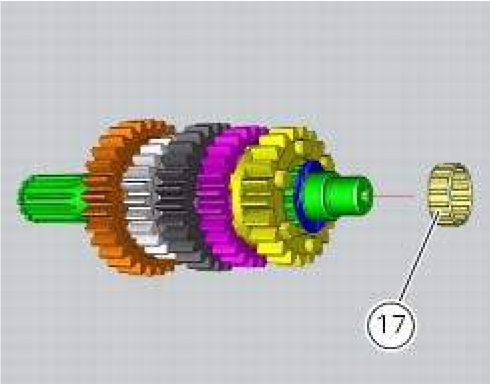
Disassembly of the gearbox secondary shaft

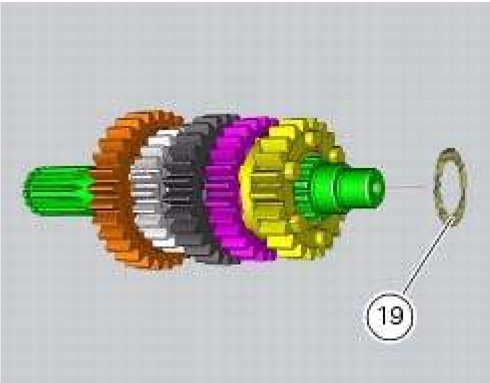
Remove the chain-side shim washer (**26**) and clutch-side shim washer (**15**) from the secondary shaft.



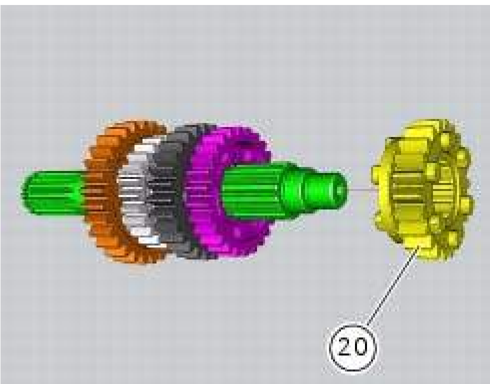
Withdraw the first speed driven gear (18) with the roller cage (17) and the shim (19).



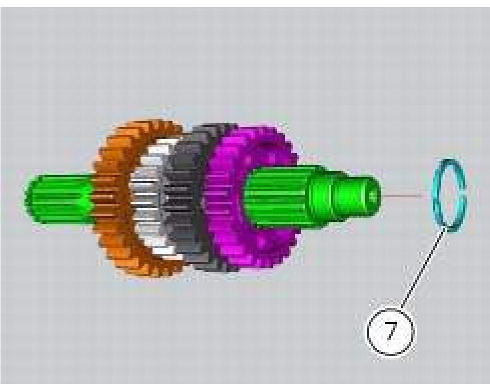


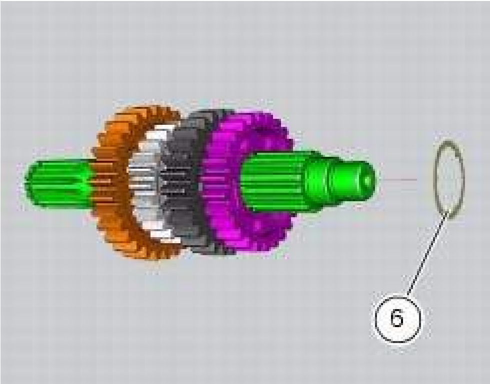


Remove the fifth speed driven gear (20).

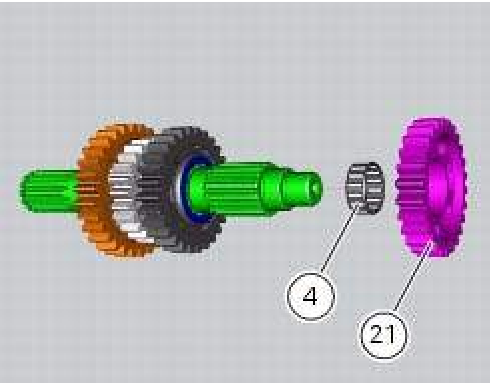


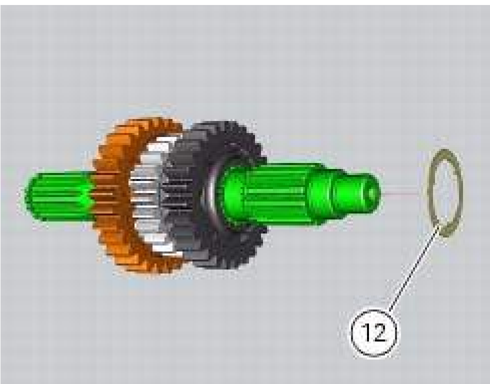
Use two flat blade screwdrivers to remove the circlip (7) taking care not to damage the shaft surface.
Remove the circlip (7) and the splined washer (6).



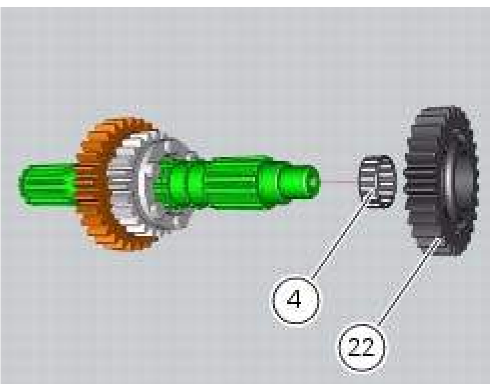


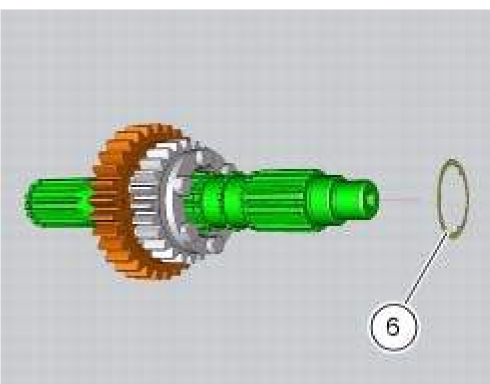
Withdraw the fourth speed driven gear (21) with the roller cage (4) and splined washer (12).



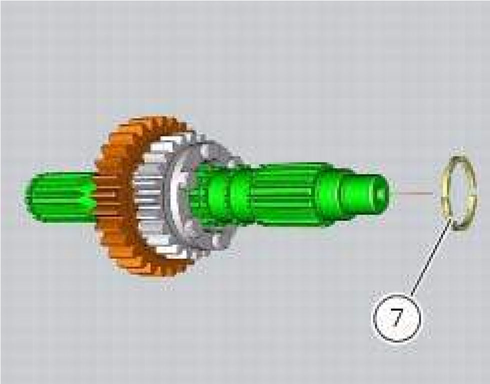


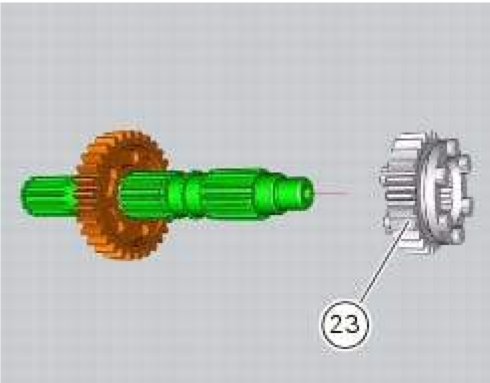
Remove the third speed driven gear (22) with the roller cage (4) and the splined washer (6).



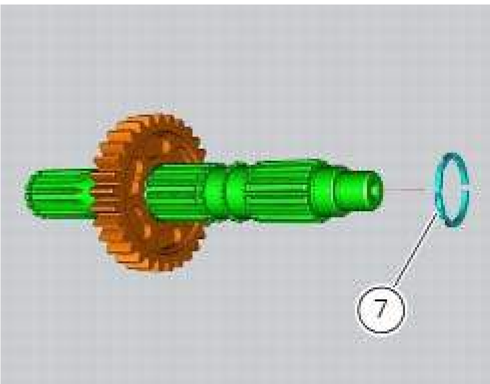


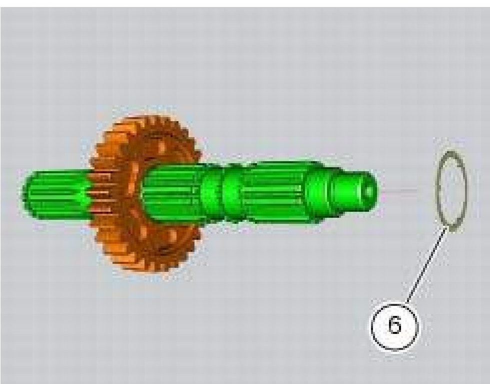
Remove the circlip (7) and remove the sixth speed driven gear (23).

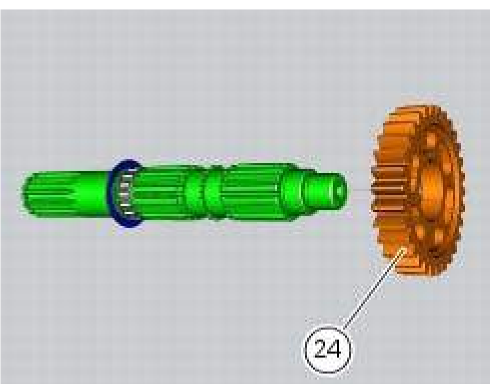




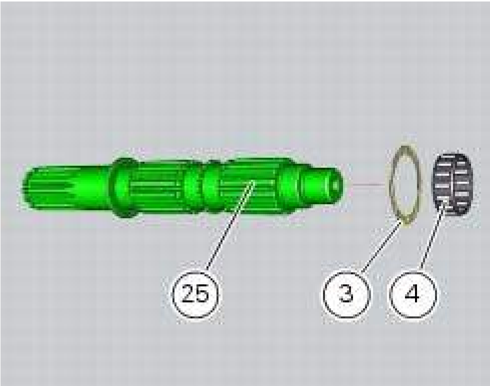
Remove the circlip (7) and withdraw the splined washer (6) and the second speed driven gear (24).

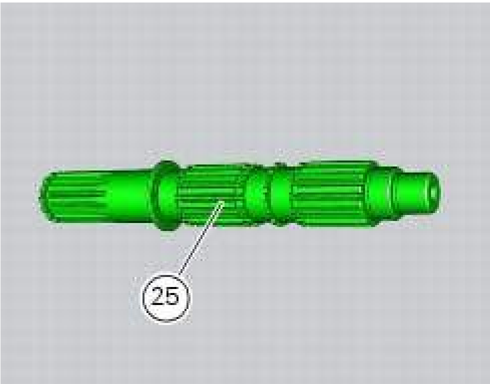






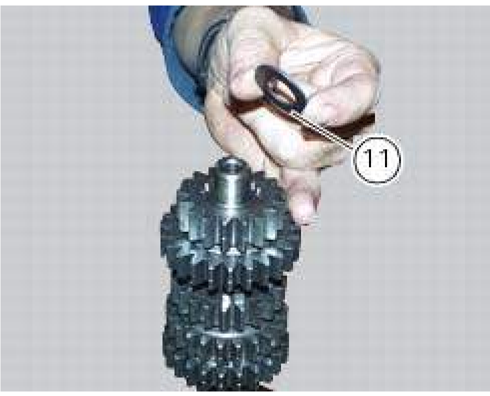
Withdraw the roller cage (4) and the shim (3). All the components have thus been removed from gearbox secondary shaft (25).





Disassembly of the gearbox primary shaft

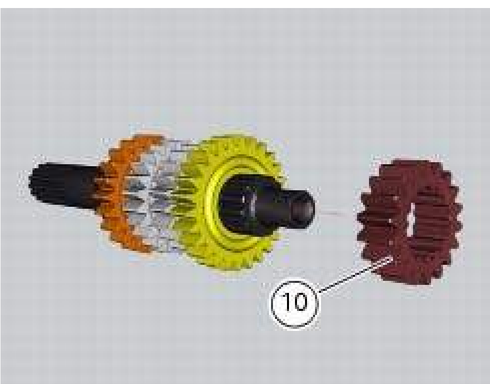
Remove the chain-side shim washer (11) and the clutch-side shim washer (**1**) from the primary shaft.

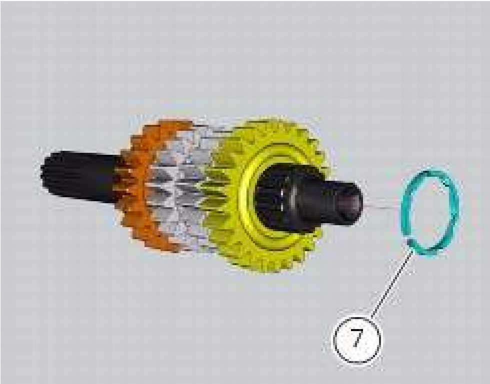


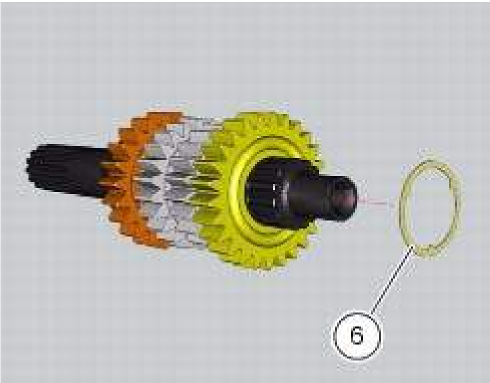
Remove the second speed driving gear (10). Use two screwdrivers to prise out the circlip (7) and the splined washer (6).

Important

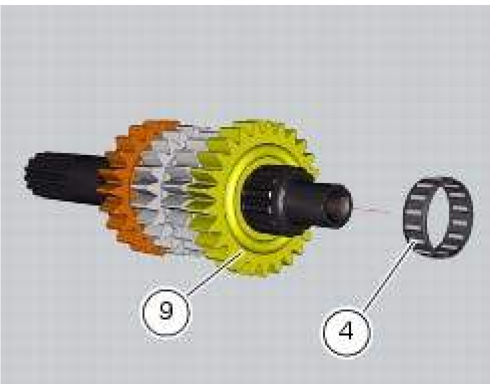
Take care to avoid damaging the surface of the shaft while removing circlip (7).

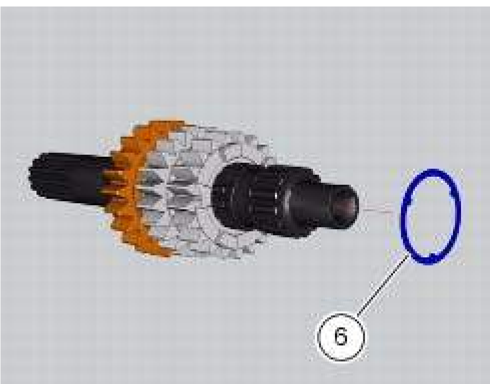


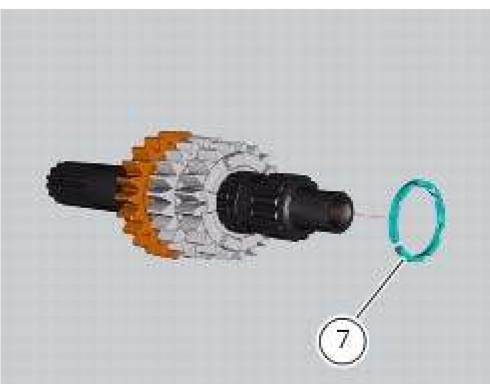




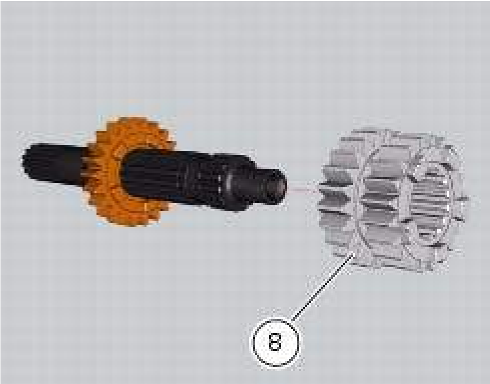
Remove the sixth speed driving gear (9) with its roller cage (4). Remove the splined washer (6) and the circlip (7).



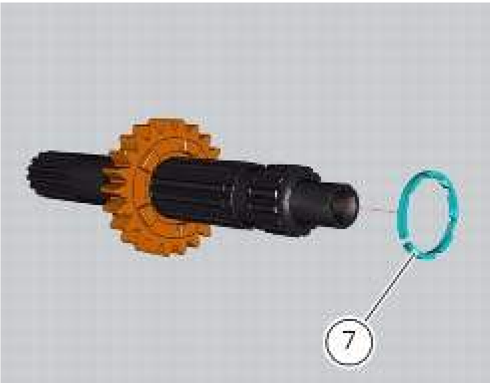


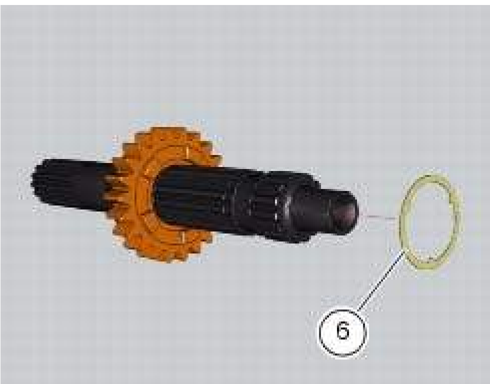


Withdraw the third and fourth speed driving gear (8).

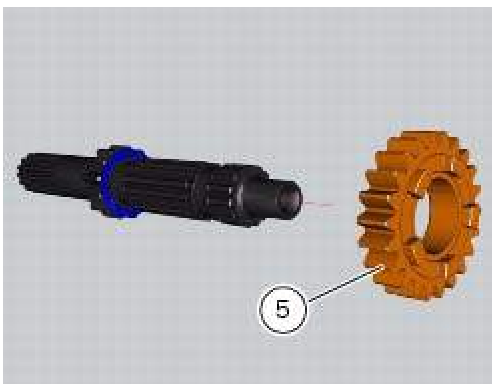


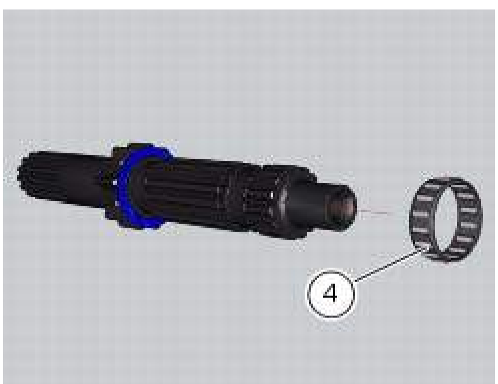
Remove the circlip (7) and the splined washer (6).



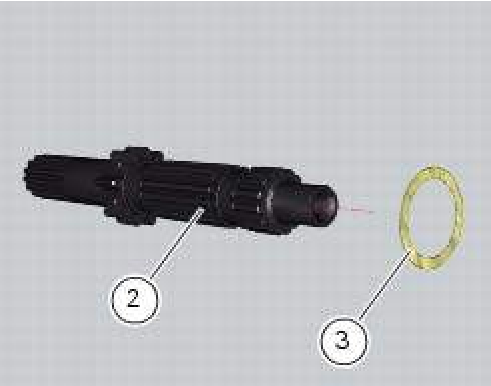


Remove the fifth speed driving gear (5) with the roller cage (4).



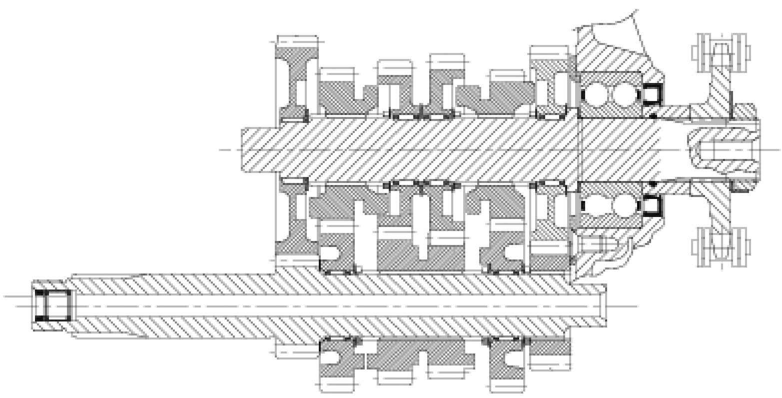


Slide the shim (3) off the primary shaft (2).



Overhaul of the gearbox

Check the condition of the front coupling dogs of the gears. They must be in perfect condition and with no sign of wear on the edges of the teeth.
The idler gears must rotate freely on their shafts.
When refitting, make sure the circlips are correctly positioned.
Check the needle roller bearings for wear.
The threads and splines of the shafts must be in perfect condition.
Also check that the component parts of the gear selector mechanism are in good condition.



Engage the gears and check that the gearchange mechanism does not stick (selector fork - gear groove, and fork pin - desmodromic drum groove) due to incorrect end float. Restore the correct 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 Sect. 3 - 1.1, Gearbox.

Inspection of the gear selector forks

Visually inspect the gear selector forks. Bent forks must be renewed as they may lead to difficulties in gear changing or may suddenly disengage when under load.
Use a feeler gauge to check the clearance of each fork in its gear groove.
If the service limit has been exceeded, check whether or not it is necessary to replace the gear or the fork by referring to the limits specified for each part (Sect. 3 - 1.1, Gearbox).

Inspection of the gear selector drum

Use a gauge to measure the clearance between fork pin and the slot on the selector drum.
If the service limit is exceeded, determine which part must be replaced by comparing these dimensions with those of new components (Sect. 3 - 1.1, 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.

Reassembly of the gearbox shafts

Figure 1 shows all the parts to be reassembled on the gearbox primary shaft (2), with the calculated end shims (1) and (11) (Sec. 9 - 9.2, Reassembly of the crankcase halves).

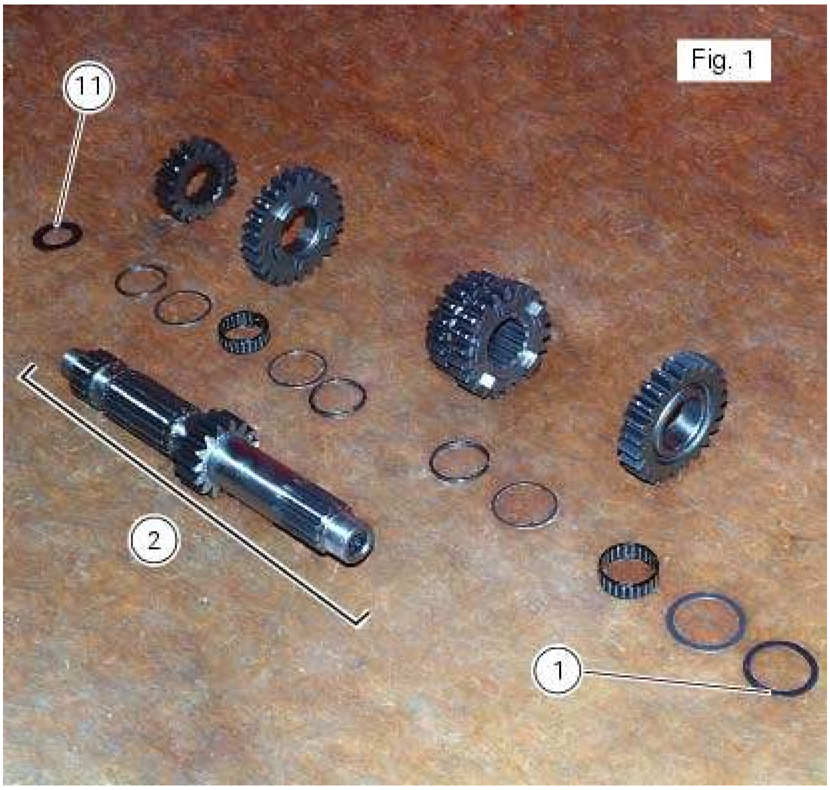
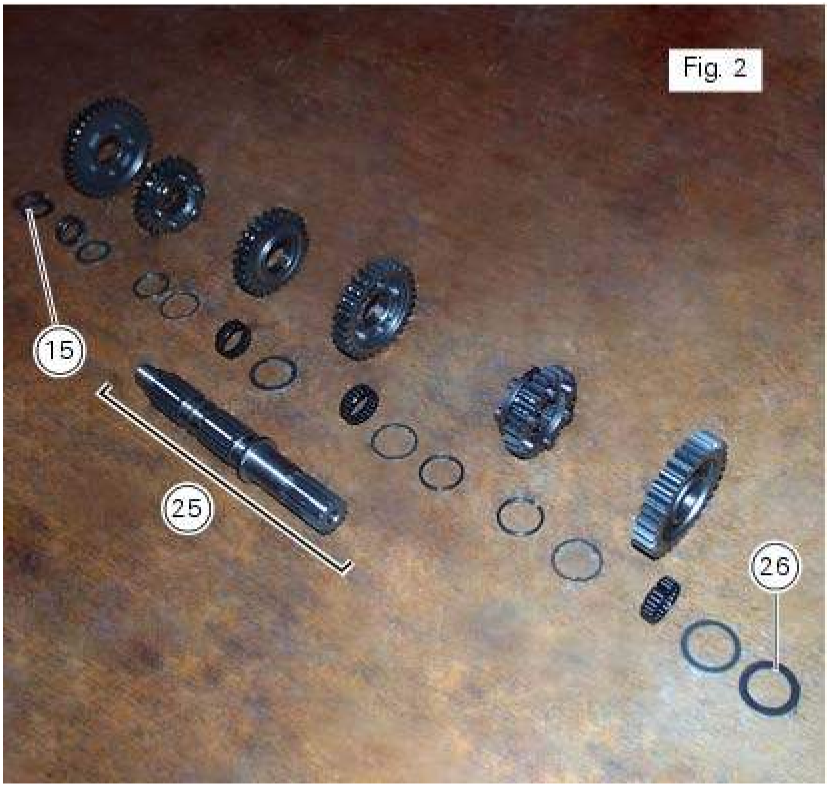


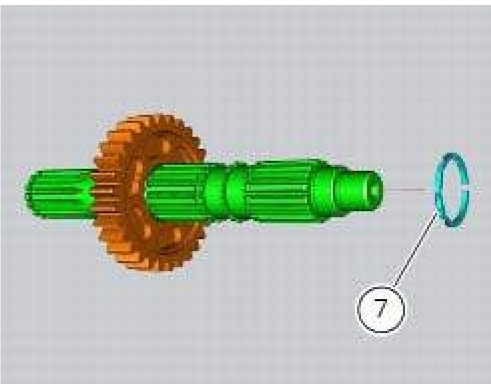
Figure 2 shows all the parts to be installed on the gearbox secondary shaft (25), with calculated end shims (15) and (26) (Sec. 9 - 9.2, Reassembly of the crankcase halves).



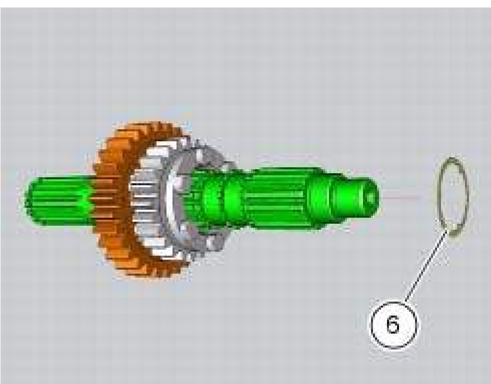
Reassemble the gears on the gearbox shafts by reversing the disassembly procedure.

Take particular care when installing the idler gears. The assembly of the 3rd and 4th speed gears and the relative fixing components on the secondary shaft is given as an example.

Fit the circlip (7), checking that it is fully inserted into its groove on the shaft. Push the circlip into position with a suitable size tubular drift.

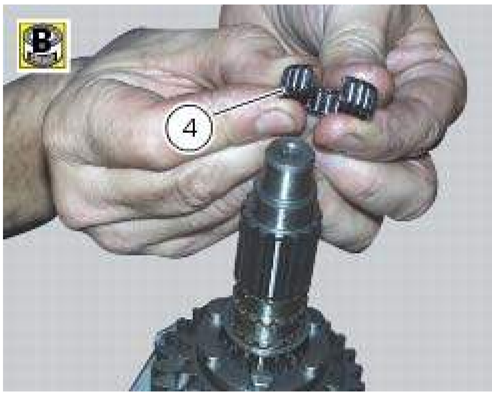


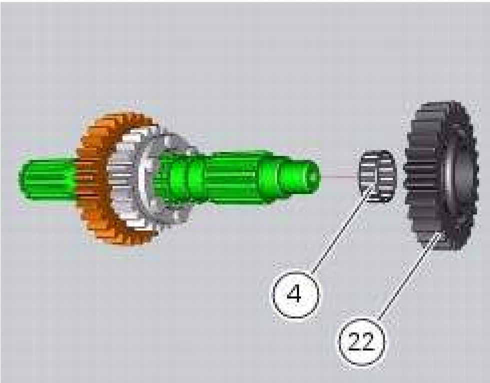
Slide the washer with three internal points (6) over the shaft until it locates against the circlip you have just fitted.



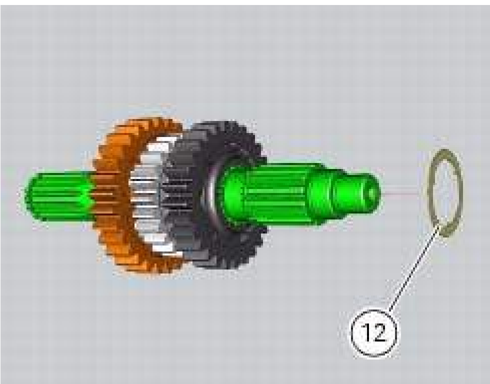
To fit the needle roller cage (4) onto the shaft, first lubricate it with plenty of grease (of recommended type) and then open it slightly to make it easier to slide on to the shaft.

Fit the 3rd speed gear (22).

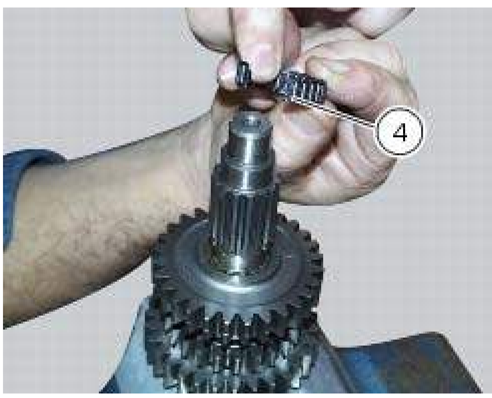


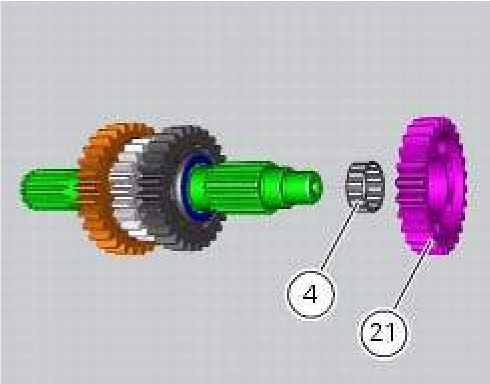


Fit on the gear the three-pointed washer (12), which can be distinguished from its counterpart (**6**) by its bigger outside diameter.

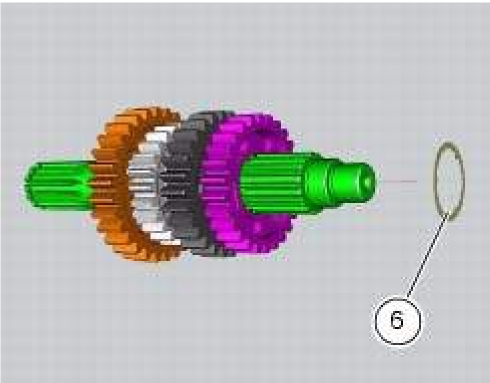


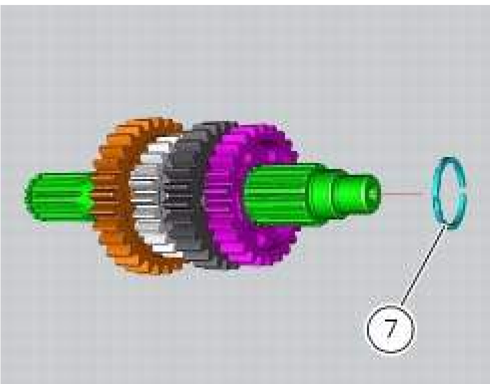
Fit another needle roller cage (4) using the method already described.
Fit the 4th speed gear (21).





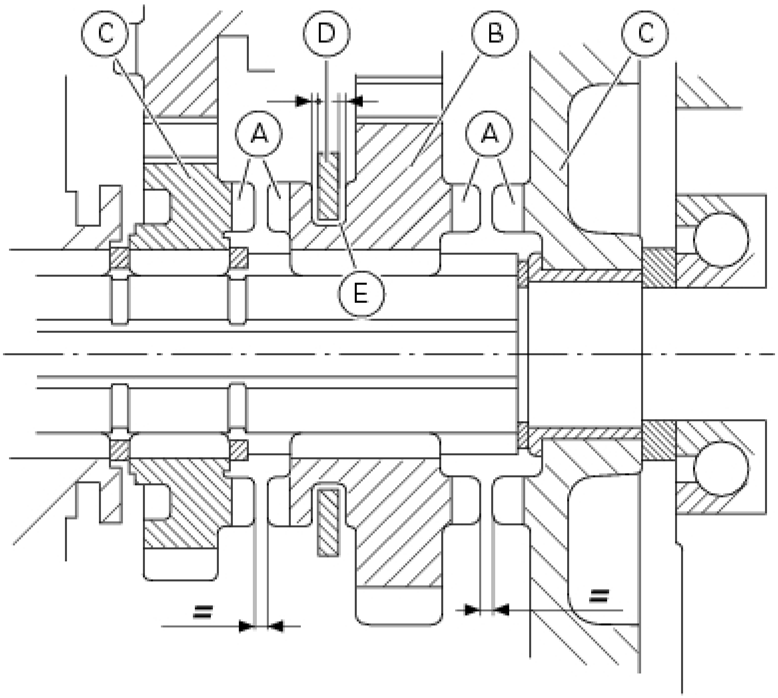
Fit another safety washer (6) and another circlip (7) into the shaft. Push it inside its seat using the previously used pad.





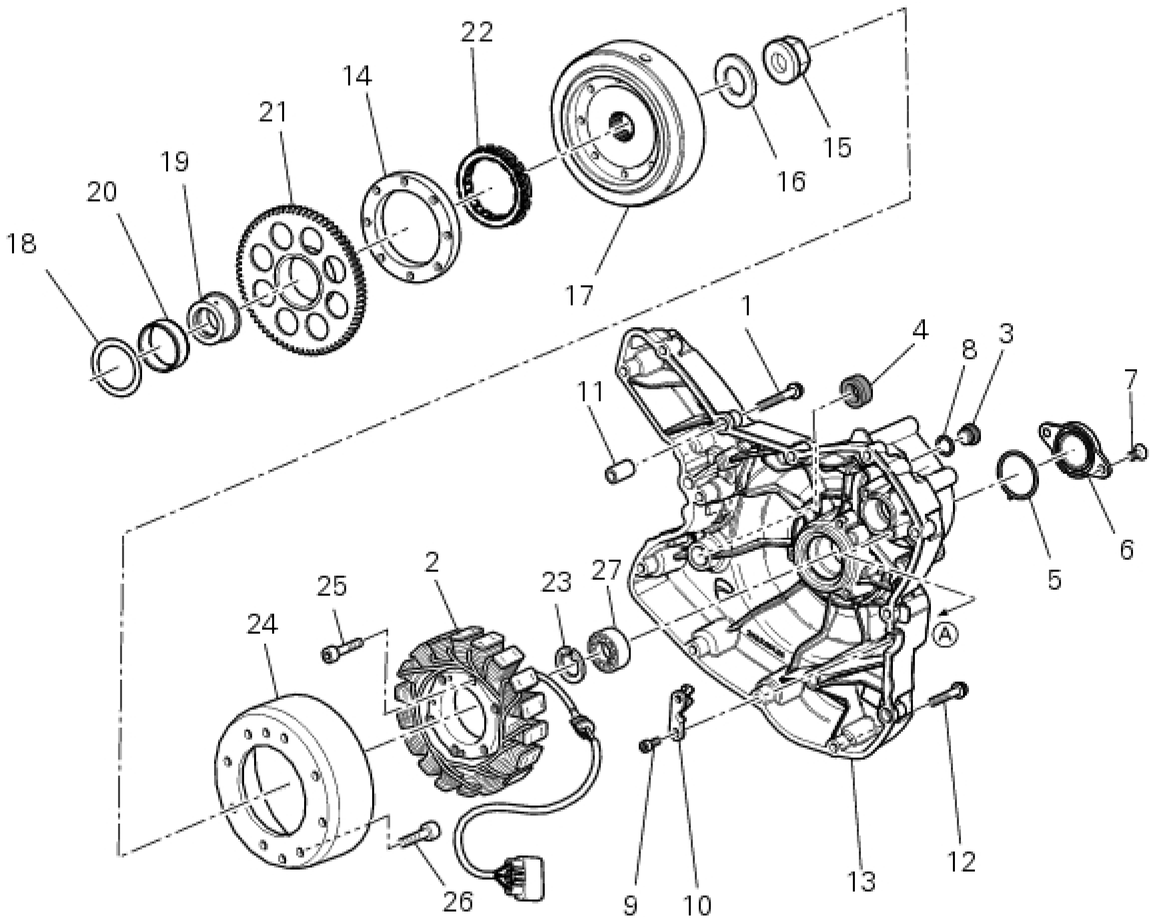
Reassembly of the gearbox

To refit the gearbox components follow the procedure under Sect. 9 - 9.2, Reassembly of the crankcase halves, relating to 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.



Operations	Section reference
Reassemble the engine crankcase halves	9 - 9.2, Reassembly of the crankcase halves
Refit the primary gear	9 - 6.3, Refitting the primary drive gears and checking backlash
Refit the clutch cover	9 - 6.2, Refitting the clutch-side crankcase cover
Refit the clutch cover, drum and bell	9 - 6.1, Reassembling the clutch
Refit the starter motor	6 - 3, Starter motor
Refit the oil pump	9 - 2.1, Refitting the oil pump
Refit the alternator-side crankcase cover and alternator assembly	9 - 8, Refitting the flywheel-alternator assembly
Refit the cylinder barrel/piston assemblies	9 - 5, Refitting the cylinder/piston assembly
Refit the complete cylinder head unit	9 - 4.5, Reassembly of the cylinder head
Refit the timing shaft unit	9 - 4.4, Refitting the camshafts
Refit the timing components	9 - 4.2, Refitting the cylinder heads pulleys/fixed tensioners
Fit the engine to the frame	9 - 1, Refitting the engine

8 -Flywheel - alternator



1 Screw
2 Alternator stator
3 Plug
4 Sealing ring
5 O-ring
6 Cover
7 Screw
8 Aluminium gasket
9 Screw
10 Bracket
11 Locating bush
12 Screw
13 Generator cover
14 Flange
15 Flanged nut
16 Plane washer
17 Flywheel
18 Washer
19 Inner ring
20 Needle roller bearing
21 Electric starter driven gear
22 Starter clutch
23 Circlip
24 Alternator rotor
25 Screw
26 Screw
27 Bearing

Spare parts catalogue

Diavel ABS	WATER PUMP-ALTR-SIDE CRANKCASE COVER
Diavel ABS	ELECTRIC STARTING AND IGNITION

Diavel ABS	CONNECTING RODS
Diavel Carbon ABS	WATER PUMP-ALTR-SIDE CRANKCASE COVER
Diavel Carbon ABS	ELECTRIC STARTING AND IGNITION
Diavel Carbon ABS	CONNECTING RODS

Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

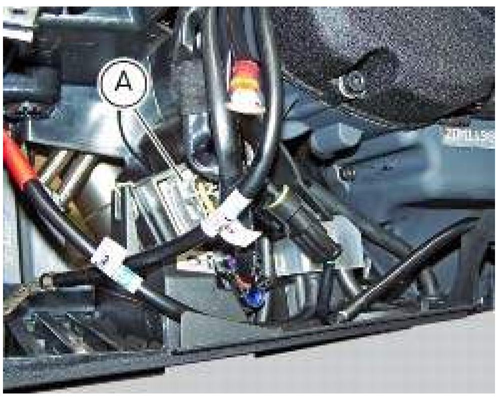
Removal of the generator cover

Operations	Section reference
Drain the cooling system	4 - 3, Changing the coolant
Remove the front sprocket cover	7 - 14, Removing of the front sprocket
Drain the engine oil	4 - 3, Changing the engine oil and filter cartridge
Remove the clutch pushrod	7 - 8.2, Removal of the clutch transmission unit
Remove the gearchange control	7 - 9, Removal of the gearchange control
Remove the pump-cylinder hoses	9 - 5, Removal of the cylinder/piston assembly
Remove the water pump-LH water radiator hose	9 - 3.1, Removal of the cooling system hoses and unions

Note

This operation is described for an engine removed from the frame since all reassembly procedures are easier with the engine on the bench.

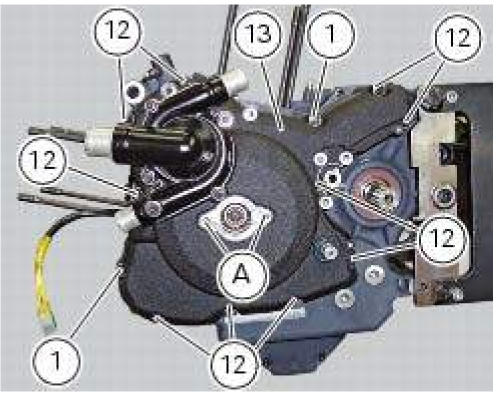
Disconnect the connector (A) from the generator cable.



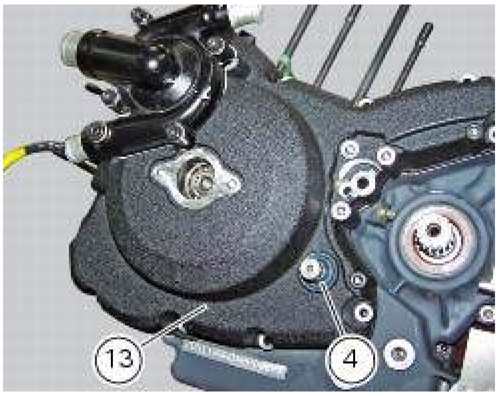
Unscrew the two retaining screws (7) of the centre cap (6) over the end of the crankshaft.

Loosen the screws (1) and (12) securing the generator cover (13).
Use tool number **88713.1749** and fix it to the holes (A) of the previously removed screws (7).

Turn the tool shaft slowly to separate the cover (13) from the LH crankcase half.

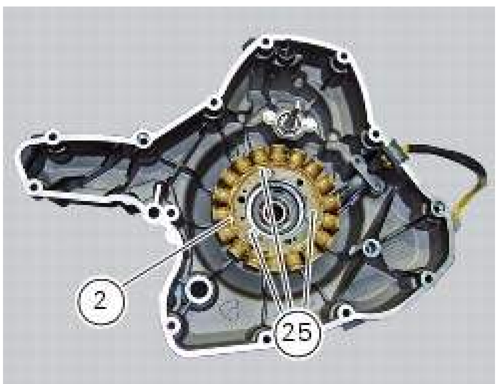


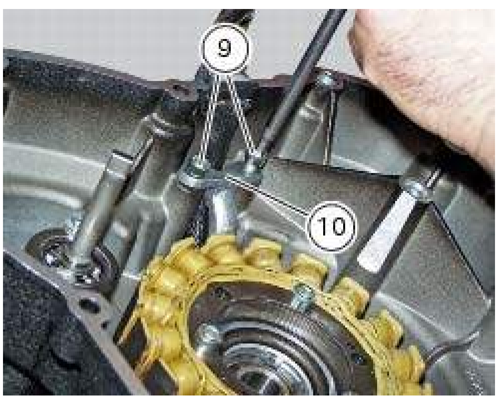
There is a seal (4) on the cover (13) in correspondence with the gearchange lever shaft that may be damaged when removing the generator cover.
Always check the condition of this sealing ring and renew it if damaged.



Disassembly of the generator cover

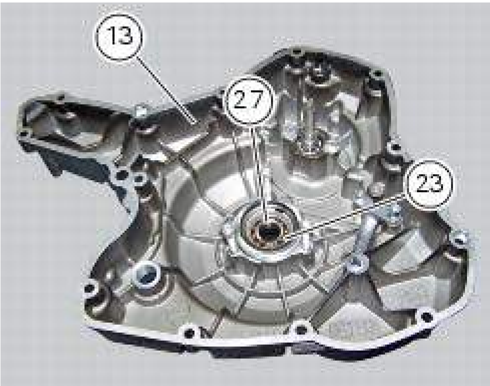
Undo the three stator retaining screws (25) and the two retaining screws (9) of the two cable grommet bracket (10) from inside the generator cover.
Remove the stator (2) and the cable grommet bracket (10).





The generator-side crankcase cover is fitted with a bearing (27), held in place by circlip (23), which is located on the end of the crankshaft.
Remove the circlip (23) with circlip pliers.
Remove the bearing (27) using a universal puller.
Be careful when fitting the new bearing (27) to ensure it is positioned with the shielded side facing away from the cover.
Secure the bearing with the circlip (23), ensuring that it is correctly fitted in its seat in the generator cover (13).

Remove the water pump components as described in Sect. 9 - 3.3, Removal of the water pump.

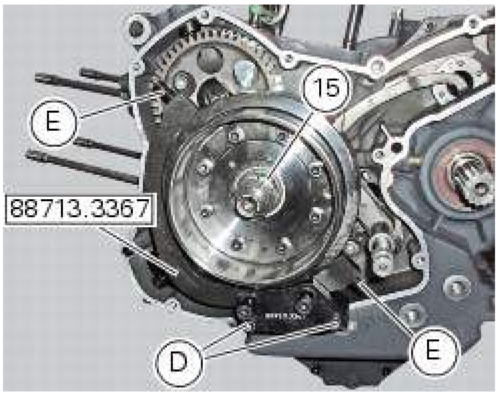


Removing the flywheel - generator assembly

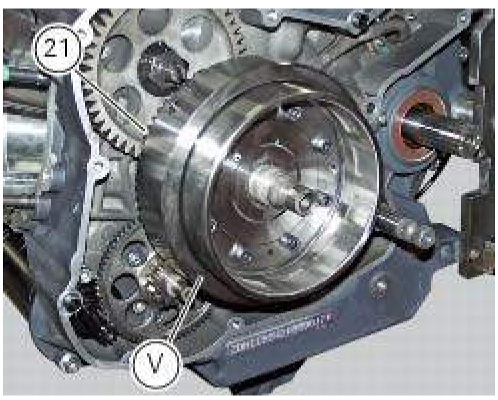
Use the tool **88713.3367** fixed to the M10 side stand fixing holes (D).
Secure the tool to the flywheel with the screws (E).
Unscrew the alternator-flywheel retaining nut (15).

Warning

While unscrewing the nut, apply axial pressure to the socket to avoid damage or injury in the event of the wrench suddenly slipping off the nut.



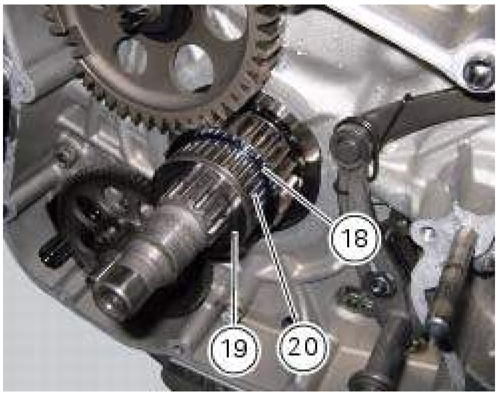
Remove the nut (15), the washer (16) and the flywheel assembly (V) with the driven gear (21) from the crankshaft.



Remove the inner race (19), the needle roller bearing (20) and the washer (18).

Important

Check the race (19), the needle roller bearing (20) and the inner washer (18) for wear. Renew if worn.



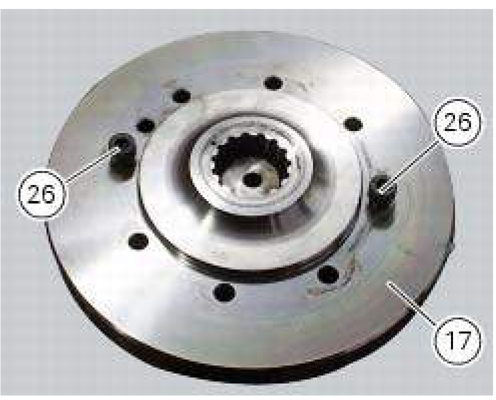
Overhaul of the flywheel-alternator assembly

Examine the inner part of alternator rotor (24) for signs of damage. Check that the starter clutch is working properly and that the needle races do not show signs of wear or damage of any kind. If there is any malfunction, remove the whole assembly.

Disassembling the generator flywheel

Unscrew the 8 screws (26) and remove the rotor (24) from the flywheel.

Insert two of the screws (26) just removed from the flywheel rotor-side in their holes in order to remove the flange (14) and the starter clutch (22) from the flywheel (17). The starter clutch is a slight interference fit on the flange. To remove it, use a suitable drift.

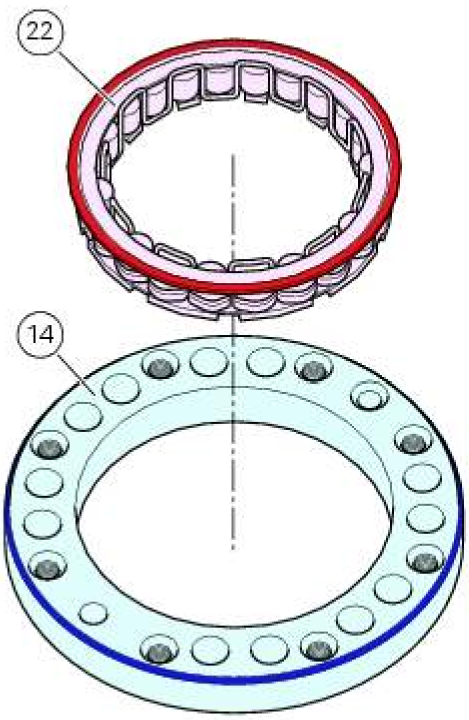


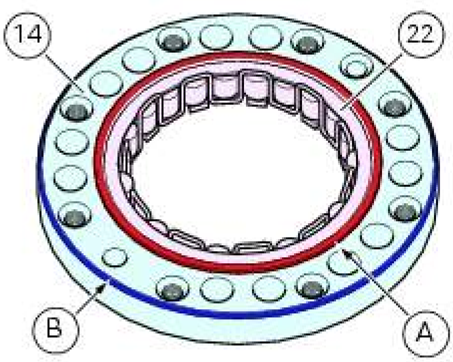
Reassembling the flywheel - generator assembly

Install the starter clutch (22) in the flange (14) to bring the edge (A) of the clutch up against the flange.

Important

Assemble the components (starter clutch and flange) so that the edge (A) of the starter clutch is positioned on side of the flange with the bevelled edge (B).





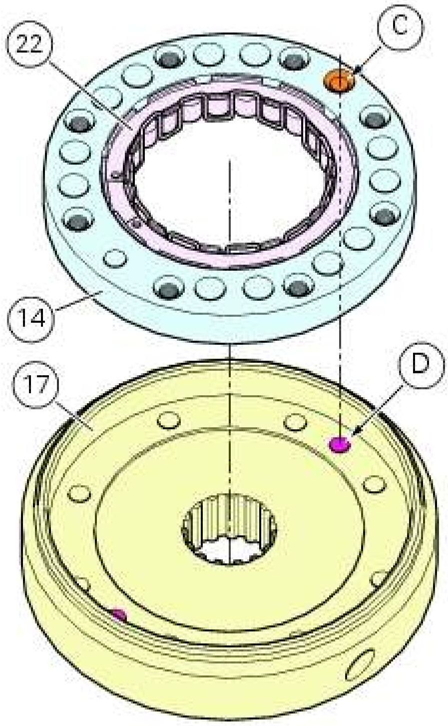
Seat the flange (14) with the starter clutch (22) in the flywheel (17), aligning the flange locating hole (C) with the flywheel locating hole (D).

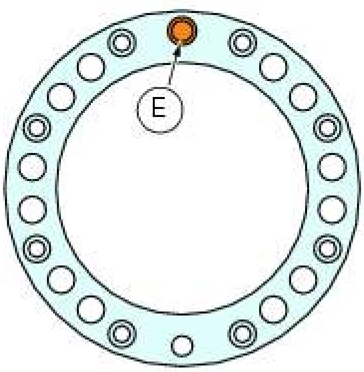
Note

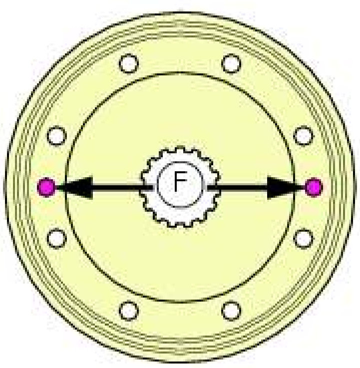
The flange locating hole (C) is the hole with the countersunk lead-in (E).

Note
The locating hole (D) of the flywheel can be either one of the two holes (F).

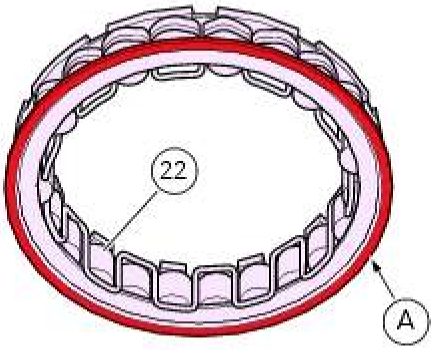
Note
Use suitable tools to align the locating holes.







Important
Assemble the components (flange and flywheel) so that edge (A) of the starter clutch (22) is enclosed between the flange and flywheel.

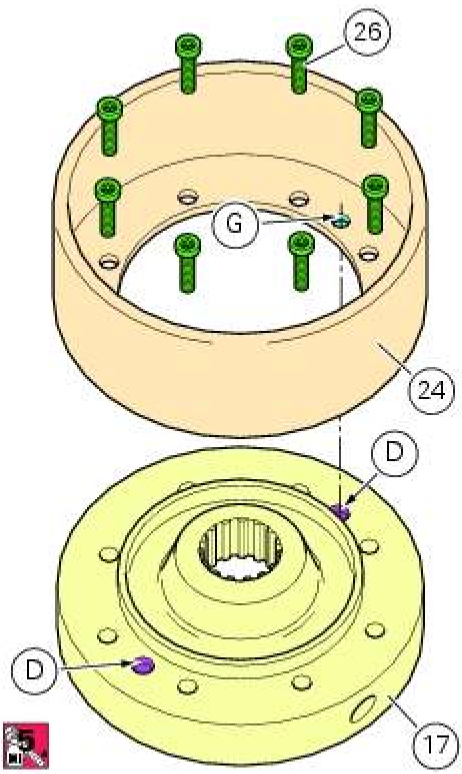


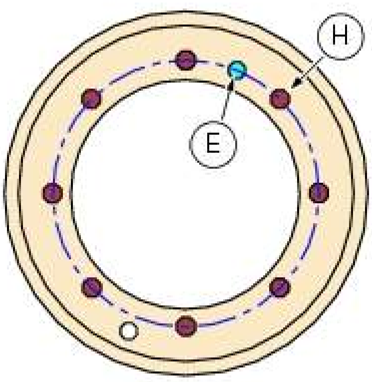
Install the rotor (24) on the flywheel (17), aligning one of the flywheel locating holes (D) with the rotor locating hole (G).

Note
The rotor locating hole (G) is the hole positioned on the same diameter as the fixing holes (H).

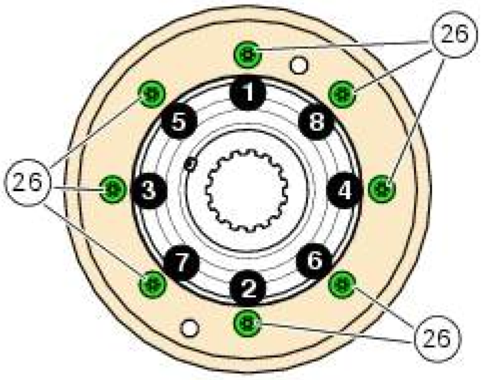
Note
Use suitable tools to align the locating holes.

Apply threadlocker to the rotor-flywheel fixing screws (26) and start them in their threads.





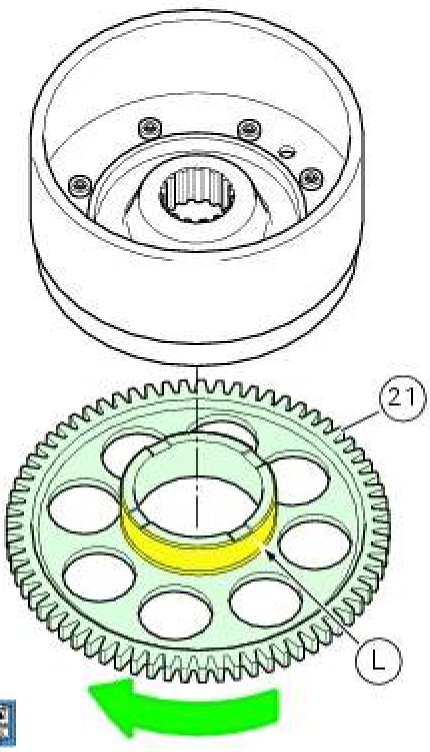
Tighten the screws (26) to a torque of 13 Nm (Min. 11 Nm - Max. 15 Nm) (Sect. 3 - 3, Engine torque settings) following the sequence above.

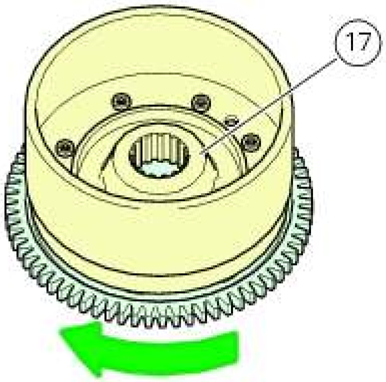


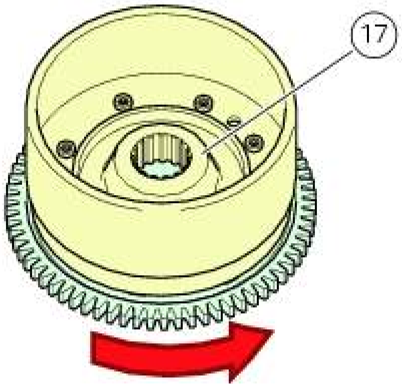
Lubricate the surface (L) of the driven gear (21) with engine oil.
Install the driven gear on the starter clutch, ensuring it is properly seated.

Note
To facilitate installation, rotate the driven gear in the direction of the green arrow.

Hold the flywheel (17) 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 installed correctly.



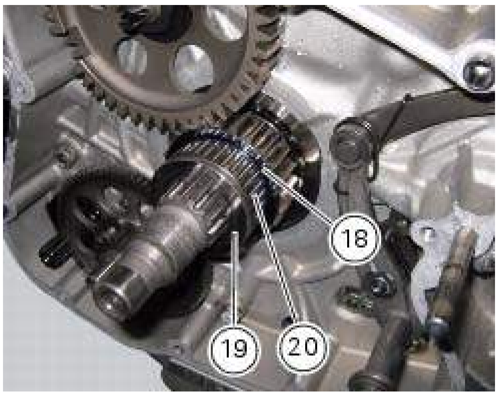




Refitting the flywheel-alternator assembly

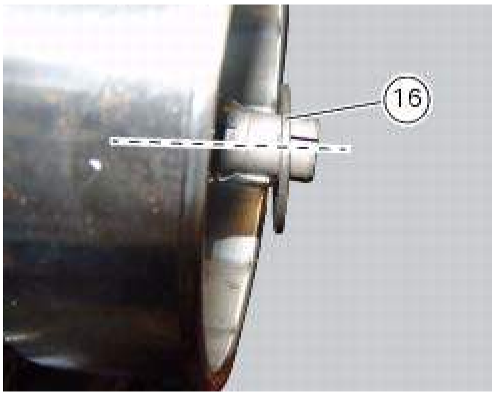
Fit the roller cage unit (20) with washer (18) and internal ring (19), applying prescribed grease on the washer (18).

Install the roller cage assembly (20) with the washer (18) and inner race (19).

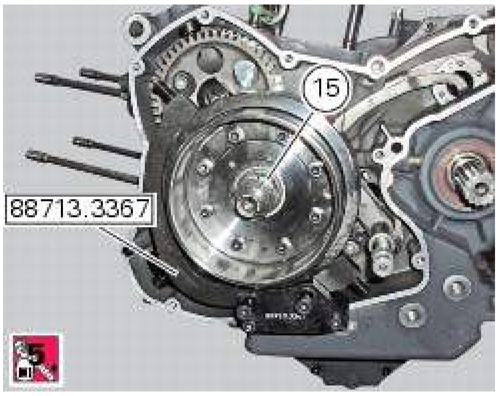


Install the flywheel assembly (V) with the gear (21), aligning the notches as shown in the photo.

Fit the washer (16) on the end of the crankshaft.

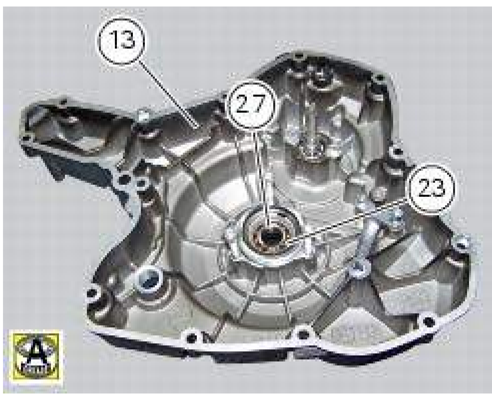


Apply the recommended threadlocker to the thread on the end of the crankshaft and the nut (15).
Start the nut (15) on the crankshaft.
Lock the flywheel rotation by means of tool number **88713.3367** and tighten the nut (15) to a torque of 330 Nm (Min. 313 Nm - Max. 346 Nm) (Sect. 3 - 3, Engine torque settings).

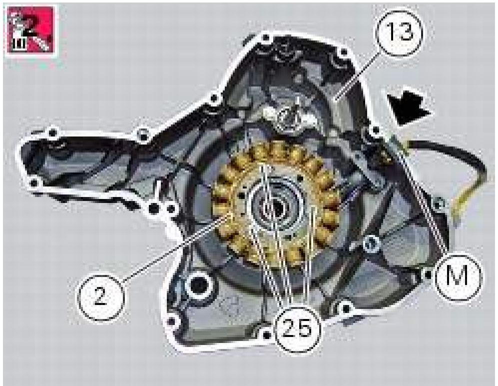


Refitting the alternator-side crankcase cover

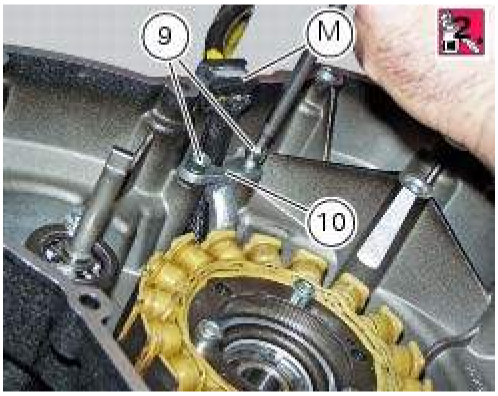
Before the assembly make sure that the water pump unit is fitted on the generator cover (Sect. 9 - 3.3, Refitting the water pump).
If bearing (27) has been removed, lubricate its seat with specified grease to fit it on the generator cover (13).
Fit bearing completely in its seat and orient it so that the closed side of the plastic cage is upwards.
Install the circlip (23) in the suitable seat of the generator cover above the bearing (27).



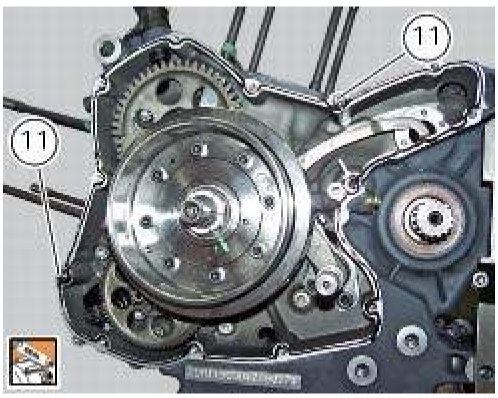
If the stator (2) has been removed, upon reassembly fit it inside the generator cover (13) so that the stator cable is faced downwards in correspondence with the cover slot.
Insert the rubber block (M) in the cover slot.
Apply the recommended threadlocker to the screws (25).
Match the stator fixing holes with the threaded ones of the generator cover, then start the screws and tighten them to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings).



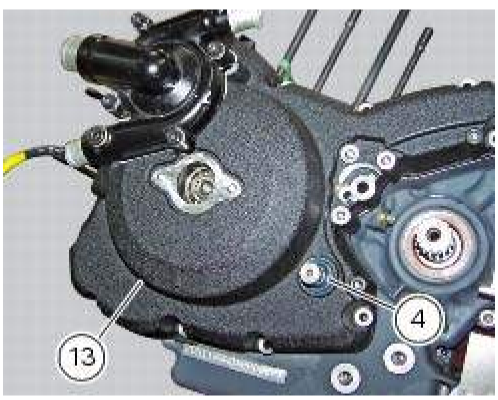
If the bracket (10) has been removed, upon reassembly check that the rubber block (M) of the cable is correctly inserted in the relevant seat on the generator cover (13).
Fit the bracket (10) on the stator cable.
Apply the recommended threadlocker to the screws (9) and start them on the cover.
Check that the stator cable is correctly positioned under the bracket and tighten the screws to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings).



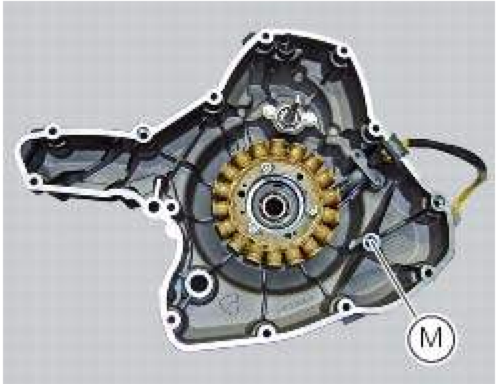
Remove any scale and grease from the mating surfaces of the left-hand crankcase half and the generator cover.
Fit the two locating bushes (11).
Spread a continuous uniform bead of DUCATI liquid gasket on the cover mating surface, ensuring continuity around the holes for the retaining screws and bushes.

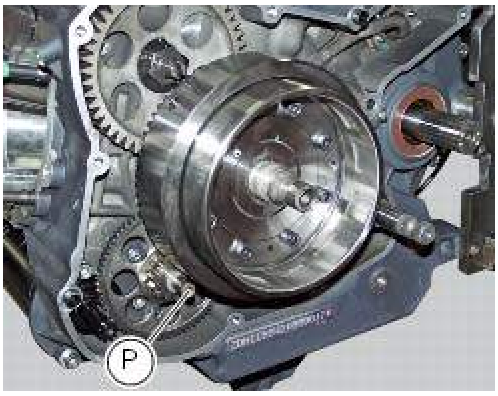


Grease the end of the crankshaft and the gearchange shaft to facilitate installation of the cover and to prevent the sealing ring (4) from being damaged, if already installed in the cover.
While positioning the cover (13) on the crankcase half, slightly turn the timing belt drive shaft pulleys to facilitate insertion of the pump control shaft.



The notch (M) on the alternator cover must be inserted on the starter motor gear pin (P).





Tap the cover at different positions with a rubber mallet to facilitate its location on the shafts and locating bushes.

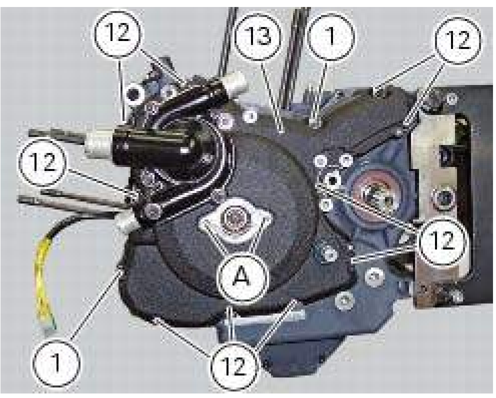
Note

Should it be necessary to remove the cover again, fit the puller **88713.1749** located in the threaded holes in correspondence with the crankshaft.

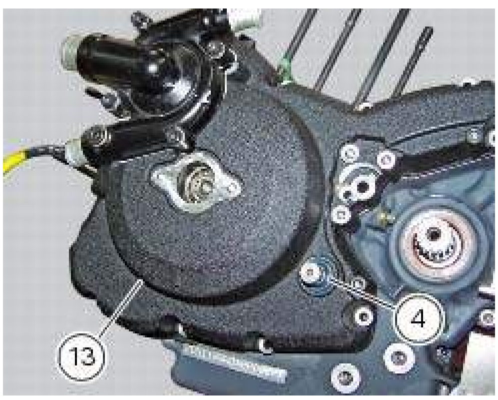
Insert the fixing screws in their holes following the indications given in the table.

Ref	Qty	Description
12	8	M6x35 mm screws
1	2	M6x30 mm screws

Tighten the retaining screws to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings).

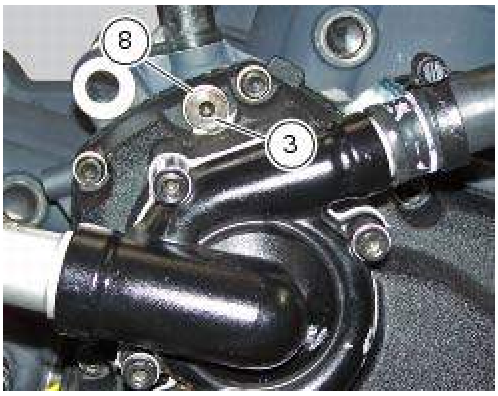


Damp the seal (4) with alcohol and install it on the generator cover (13), in correspondence with the gearchange lever.



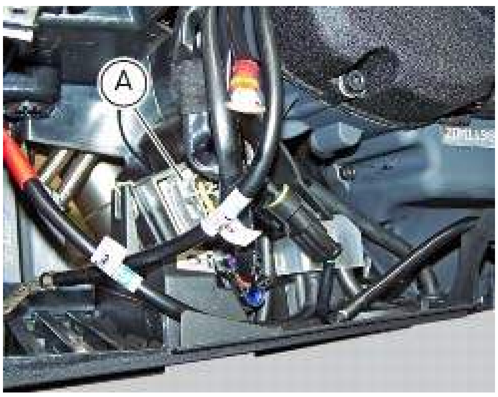
If plug (3) has been previously removed, upon reassembly insert the washer (8) on the pick-up inspection plug (3).
Apply prescribed threadlocker on the plug thread (3), start it in the generator cover (13) and tighten it to a torque of 15

Nm (Min. 13 Nm - Max. 17 Nm) (Sect. 3 - 3, Engine torque settings).



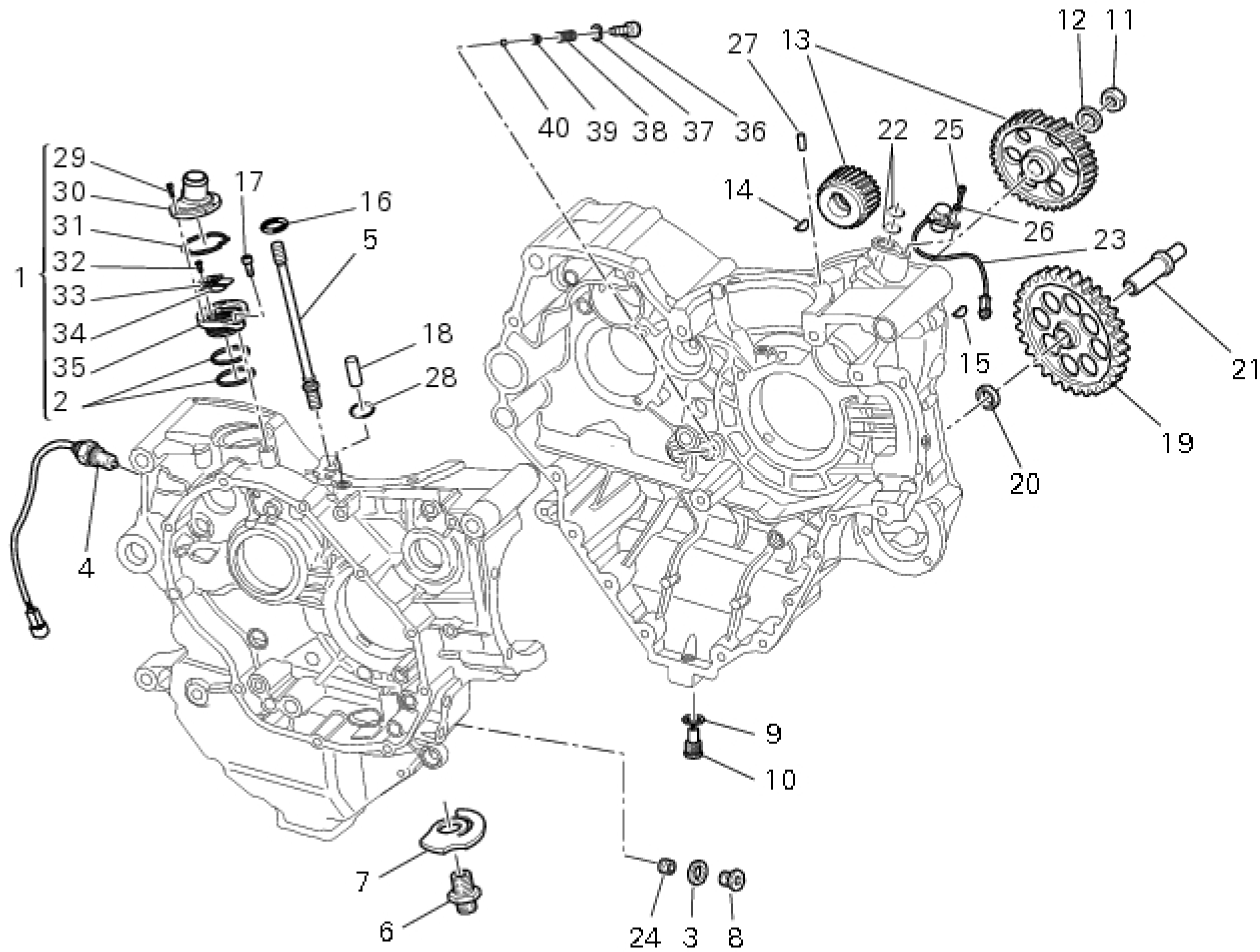
Make sure that the O-ring (**5**) is installed in the cover (6).
Apply threadlocker to the screws (7).
Tighten the two screws (7) that retain cover (6) with the engine crankcase to the torque of 5 Nm (Min. 4.5 Nm - Max. 5.5 Nm) (Sect. 3 - 3, Engine torque settings).

Connect the connector (A) to the generator cable.



Operations	Section reference
Refit the water pump-LH water radiator hose	9 - 3.1, Refitting the cooling system hoses and unions
Refit the pump-cylinder hoses	9 - 5, Refitting the cylinder/piston assembly
Refit the gearchange control	7 - 9, Refitting the gearchange mechanism
Fit the clutch pushrod	7 - 8.2, Refitting the clutch transmission unit
Refit the sprocket cover	7 - 14, Refitting the front sprocket
Top up the engine oil	4 - 3, Changing the engine oil and filter cartridge
Refill the cooling system	4 - 3, Changing the coolant

9.1 -Crankcase assembly: external components



1 Oil breather valve
2 O-ring
3 Sealing washer
4 Gear position sensor
5 Cylinder barrel/head stud
6 Nipple
7 By-pass spring
8 Plug
9 Plug
10 Aluminium gasket
11 Nut
12 Lock washer
13 Timing gear pair
14 Key
15 Key
16 O-ring
17 Screw
18 Locating dowel
19 Starter idler gear
20 Washer
21 Gear shaft
22 O-ring
23 Engine sensor
24 Grub screw
25 Screw
26 Washer
27 Locating dowel
28 O-ring
29 Screw
30 Upper shield
31 Sealing washer
32 Screw

33 Spacer
34 Reed
35 Lower shield
36 Special screw
37 Washer
38 Spring
39 Cap
40 Ball

Spare parts catalogue

Diavel ABS	GEARCHANGE CONTROL
Diavel ABS	TIMING SYSTEM
Diavel ABS	CRANKCASE HALVES
Diavel ABS	CRANKCASE HALVES
Diavel ABS	ELECTRIC STARTING AND IGNITION
Diavel Carbon ABS	GEARCHANGE CONTROL
Diavel Carbon ABS	TIMING SYSTEM
Diavel Carbon ABS	CRANKCASE HALVES
Diavel Carbon ABS	CRANKCASE HALVES
Diavel Carbon ABS	ELECTRIC STARTING AND IGNITION

Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

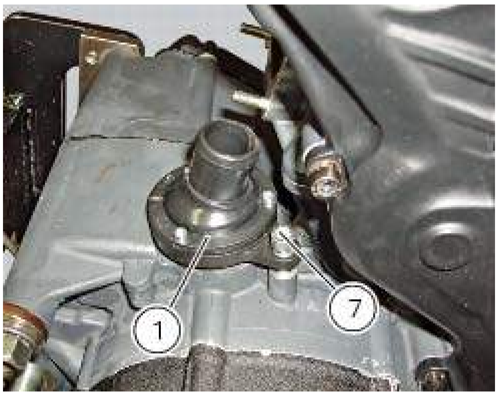
Removing outer components

Operations	Section reference
Remove the engine from the frame	9 - 1, Removal of the engine
Remove the timing components	9 - 4.2, Removal of the timing belt covers
Remove the timing shaft unit	9 - 4.4, Removal of the camshafts
Remove the complete cylinder head unit	9 - 4.5, Removal of the cylinder heads
Remove the cylinder barrel/piston assemblies	9 - 5, Removal of the cylinder/piston assembly
Remove the alternator-side crankcase cover and the alternator assembly	9 - 8, Removal of the generator cover
Remove the starter motor	6 - 3, Starter motor
Remove the clutch cover	9 - 6.2, Removal of the clutch-side crankcase cover
Remove the clutch assembly	9 - 6.1, Removal of the clutch
Remove the oil pump	9 - 2.1, Removal of the oil pump
Remove the primary gear	9 - 6.3, Removal of the primary drive gear
Remove the mesh filter	4 - 3, Changing the engine oil and filter cartridge

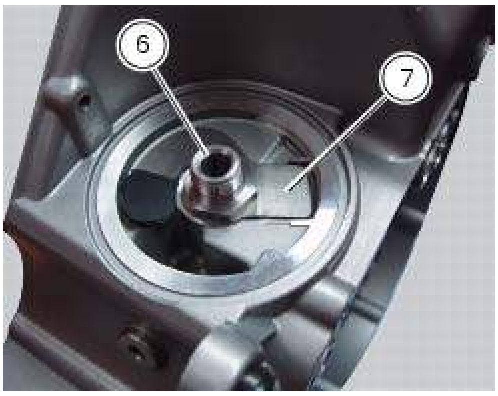
Note

The following removal operations are required in order to renew and/or clean the crankcase halves. If the original crankcase halves are to be reused, then the removal of these components is not essential.

Unscrew the screw (17) and remove the oil breather valve (1) with the O-rings (2). Check the condition of O-rings (2) and renew them if necessary.

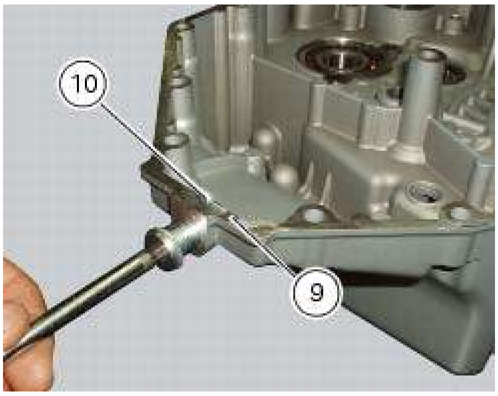


Unscrew and remove the oil filter support nipple (6) and remove also by-pass spring (7).

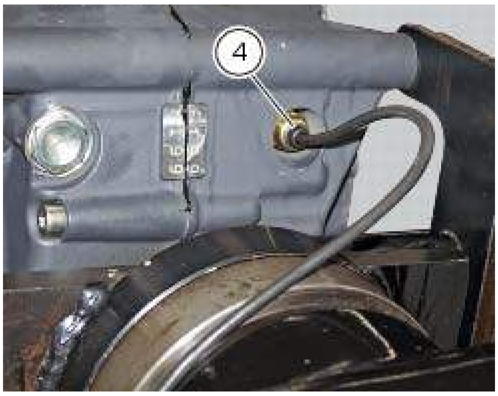


Remove the mesh filter (A) from the clutch crankcase half (Sect. 4 - 3, Changing the engine oil and filter cartridge).

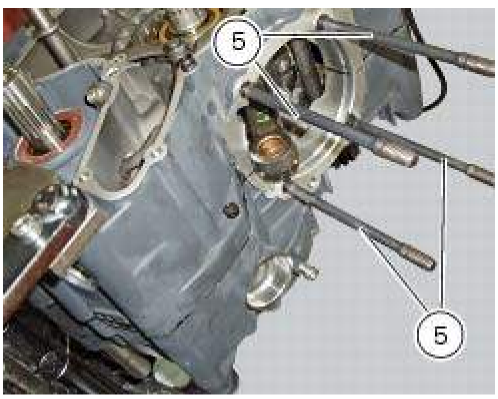
Remove the drain plug (10) with its seal (9).

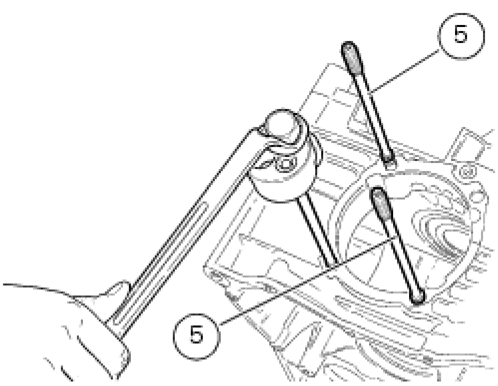


Remove gear position sensor (4) by means of the tool number **88713.3407**.

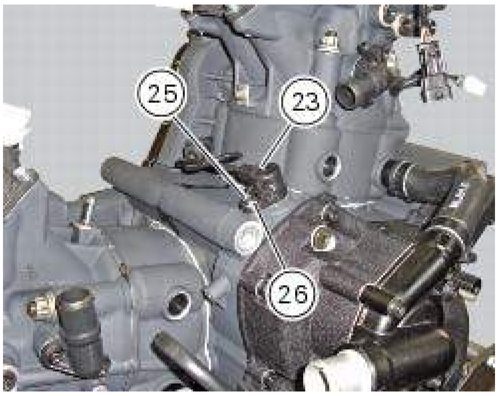


Remove the cylinder head studs (5) with the aid of the appropriate tool.

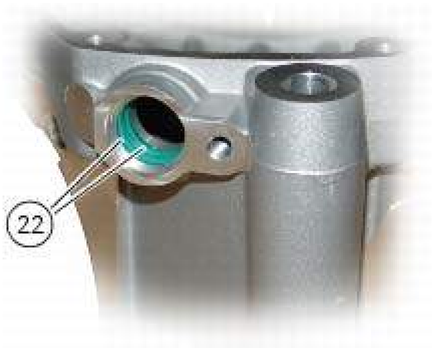




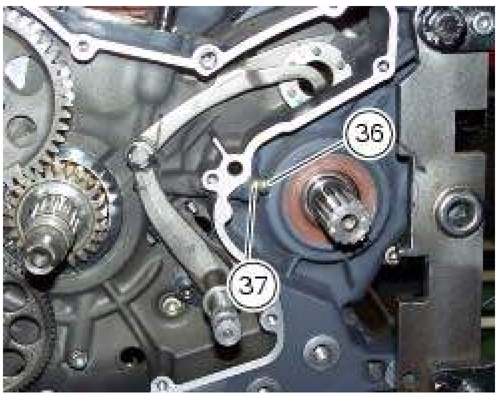
To remove the engine sensor (23), unscrew the screw (25) and recover the washer (26).



Check the condition of O-rings (22) and renew them if necessary.



Loosen the clutch fluid flow rate adjusting valve (36) and remove the washer (37), the spring (**38**), the cap (**39**) and the ball (**40**).



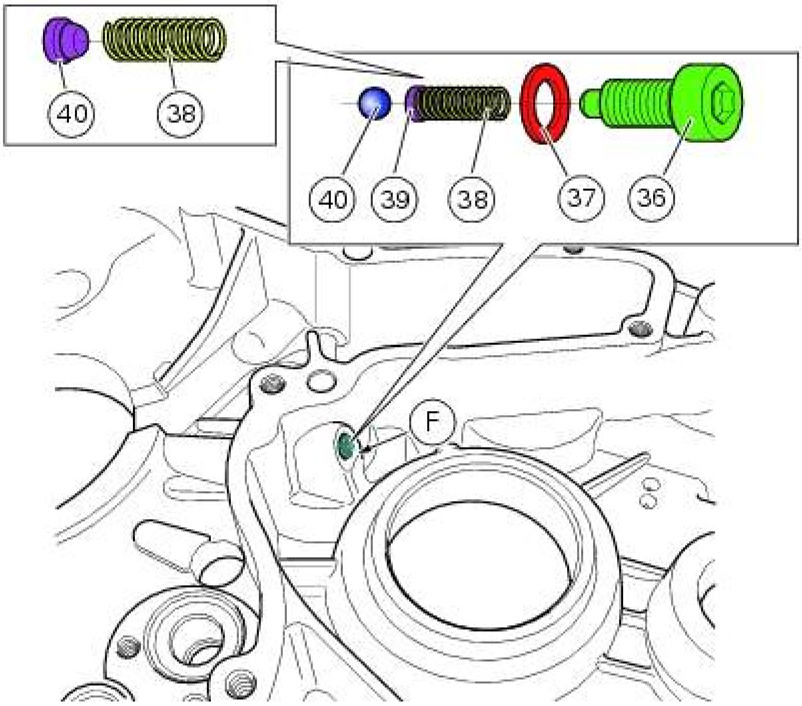
Refitting the external components

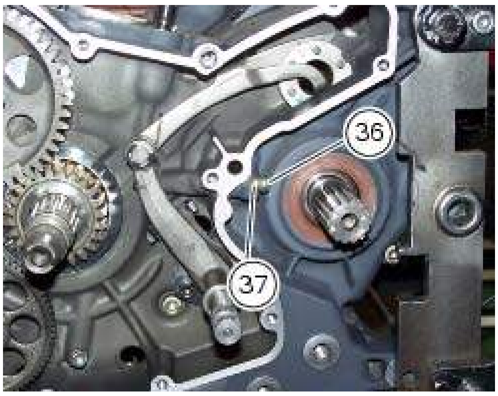
Fit the cap (39) on spring (38) until it engages.
Mount ball (40), spring (38) with cap (39), washer (37) and screw (36) on the chain side half-casing by starting the screw into hole (F).

Note

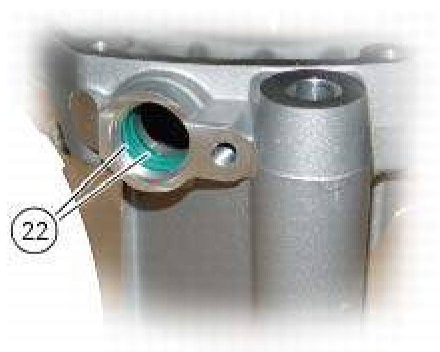
The spring (38), with cap (39), must be oriented as shown.

Tighten the screw fully home to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).

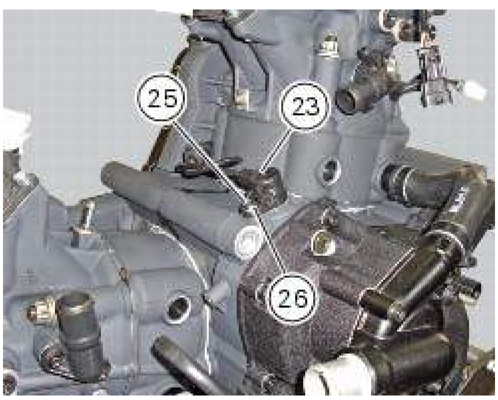




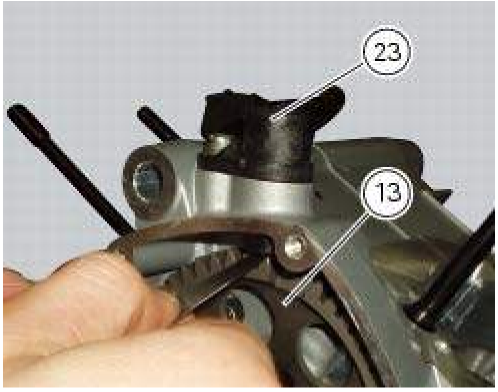
Make sure that the O-rings (22) are fitted on the crankcase.



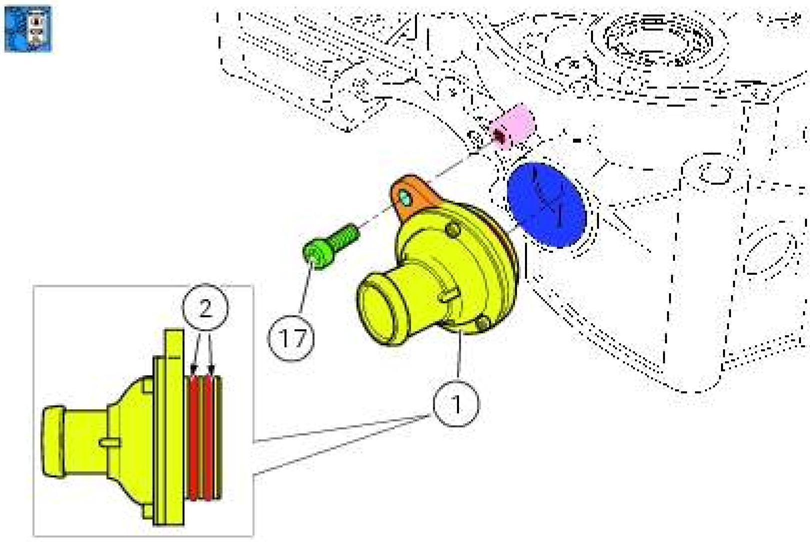
Fit the engine pickup (23) in its seat in the crankcase half.
Start the screw (25) with washer (26), and tighten it to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings).



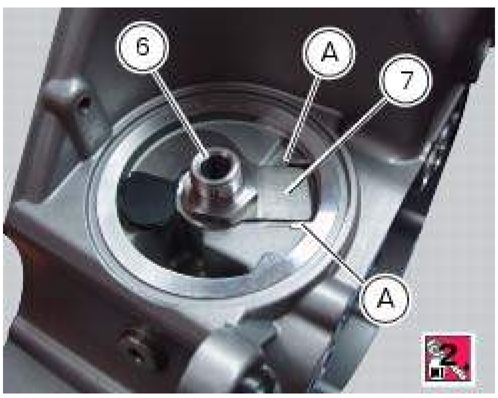
Use a feeler gauge to check the clearance between the engine sensor (23) and the timing gear (13). The value must be between **0.6** and **0.8** mm.



Check the condition of O-rings (2) and renew if necessary.
Install the oil vapour breather valve (1) in the crankcase along with O-rings (2), previously lubricated.
Tighten the screw (17) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings).

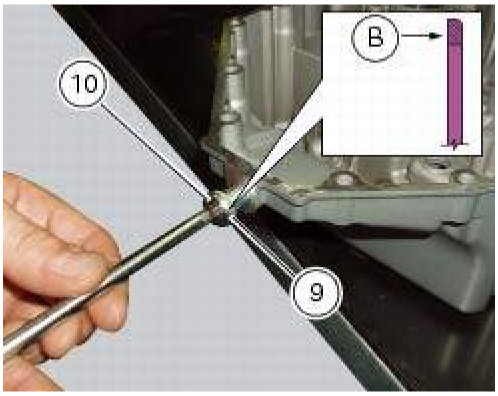


Position the by-pass spring (7) on the nipple (6) and apply the recommended threadlocker to the end of the nipple to be screwed in the crankcase half. Screw oil filter cartridge fitting (6) fully into the crankcase half, positioning the spring in the seat between the two notches (A). Tighten the nipple to a torque of 42 Nm (Min. 38 Nm - Max. 46 Nm) (Sect. 3 - 3, Engine torque settings).

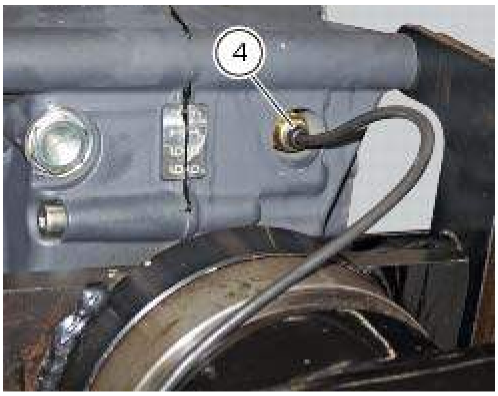


Fit the seal (9) on the oil drain plug (10). Position the seal that the side with the square edge (B) is facing the chain side crankcase half.
Clean the plug thread, apply a string of THREE BOND TB1215 along the plug thread spreading it by the entire circumference (360°).
Screw the exhaust plug (10) with relevant washer (9), and tighten it to a torque of 20 Nm (Min. 18 Nm - Max. 22 Nm) (Sect. 3 - 3, Engine torque settings).

Note
After tightening, remove any excess sealant.

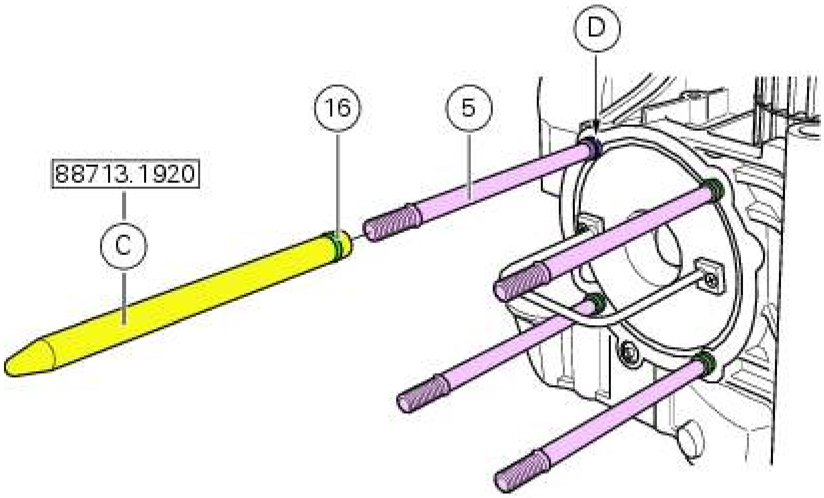


Refit idle gear position sensor (4) by means of the tool number **88713.3407**.

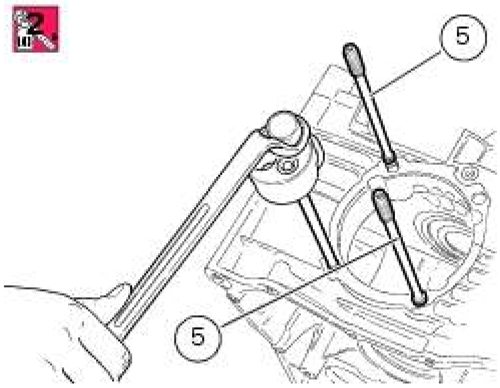


Refit the mesh filter (A) (Sec. 4 - 3, Changing the engine oil and filter cartridge).

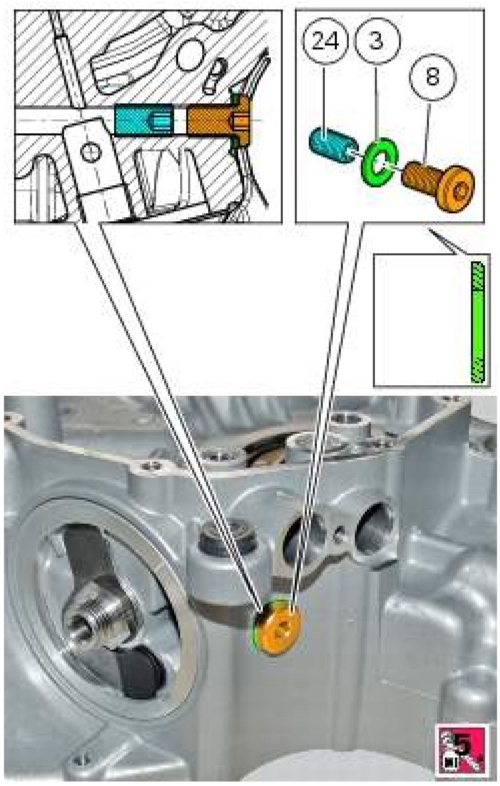
Check the condition of O-rings (16) of the stud bolts (5) and replace them if necessary.
Fit, using the tool (C), the O-rings (16) in the corresponding seats (D) of the stud bolts (5).



Fit the stud bolts (5) on crankcase half, by applying sealant on the thread and tightening them to a torque of 30 Nm (Min. 28 Nm - Max. 32 Nm) (Sect. 3 - 3, Engine torque settings). Use the appropriate commercial tool for this operation.



If removed, apply prescribed threadlocker on the dowel (24), tighten the latter to the torque of 15 Nm (Min.13.5 - Max.16.5) (Sect.3 - 3, Engine torque settings), insert the seal (3) on the service plug (8): the seal must be oriented so that the square edge faces the clutch-side crankcase half. Apply prescribed threadlocker on the plug thread (8), start it in the crankcase half and tighten it to a torque of 15 Nm (Min. 13 Nm - Max. 17 Nm) (Sect. 3 - 3, Engine torque settings).

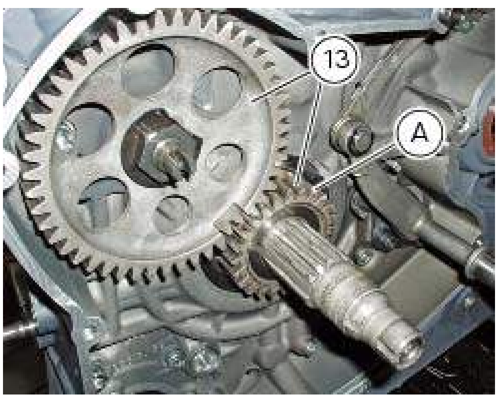


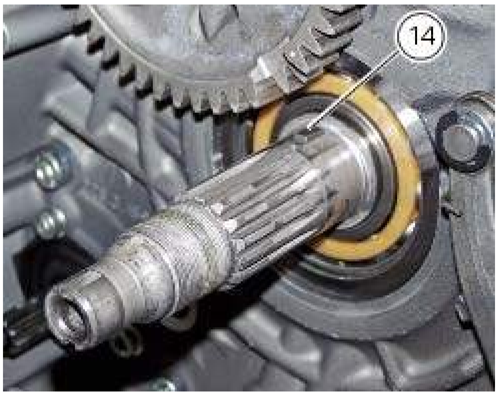
Operations	Section reference
Refit the mesh filter	4 - 3, Changing the engine oil and filter cartridge
Refit the primary gear	9 - 6.3, Refitting the primary drive gears and checking backlash
Refit the oil pump	9 - 2.1, Refitting the oil pump
Refit the complete clutch assembly	9 - 6.1, Reassembling the clutch
Refit the clutch cover	9 - 6.2, Refitting the clutch-side crankcase cover
Refit the starter motor	6 - 3, Starter motor
Refit the alternator-side crankcase cover and alternator assembly	9 - 8, Refitting the flywheel-alternator assembly
Refit the cylinder barrel/piston assemblies	9 - 5, Refitting the cylinder/piston assembly
Refit the complete cylinder head unit	9 - 4.5, Reassembly of the cylinder head
Refit the timing shaft unit	9 - 4.4, Refitting the camshafts
Refit the timing components	9 - 4.2, Refitting the cylinder heads pulleys/fixed tensioners
Refit the engine to the frame	9 - 1, Refitting the engine

Removal of the timing gears

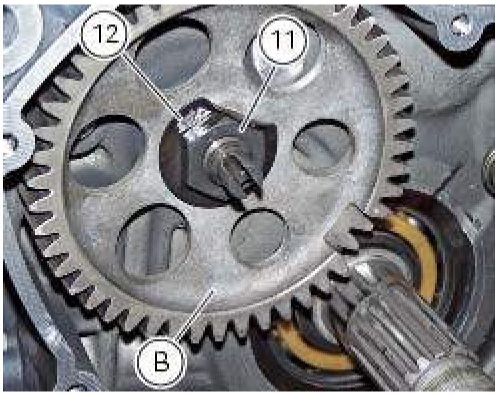
Operations	Section reference
Drain the engine oil	4 - 3, Changing the engine oil and filter cartridge
Remove the front sprocket cover	7 - 14, Removing of the front sprocket
Remove the clutch pushrod	7 - 8.2, Removal of the clutch transmission unit
Remove the gearchange control	7 - 9, Removal of the gearchange control
Empty the coolant out of the cooling system	4 - 3, Changing the coolant
Remove the pump-cylinder hoses	9 - 5, Removal of the cylinder/piston assembly
Remove the water pump-LH water radiator hose	9 - 3.1, Removal of the cooling system hoses and unions
Remove the generator cover and flywheel-generator assembly	9 - 8, Removal of the generator cover

Slide out driving gear (A) of timing gear pair (13) and remove the Woodruff key (14).





Relieve the staking on the lock washer (12) of the nut (11).
Restrain the driven timing gear by inserting a pin in one of the holes, and unscrew the nut (11).
Remove the nut (11), washer (12), driven timing gear (B) and Woodruff key (15) from the timing belt driveshaft shaft.



Refitting the timing gears

Before reassembling the removed parts, check timing gears (13) for wear. Change, if necessary.

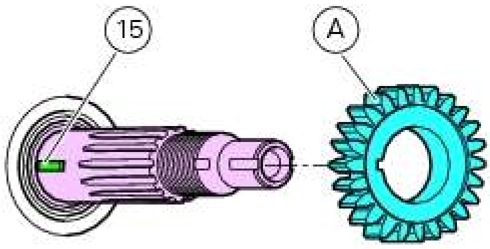
Important

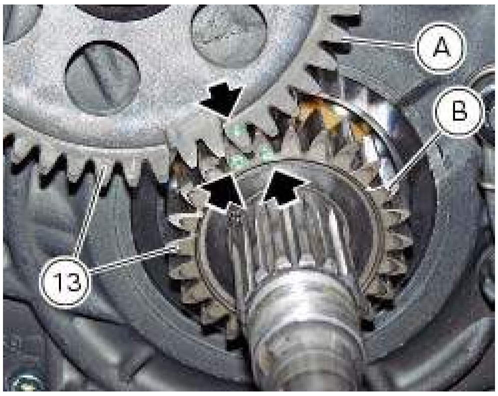
The timing gears (13) must always be renewed as a pair.

Refitting is the reverse of removal.

Warning

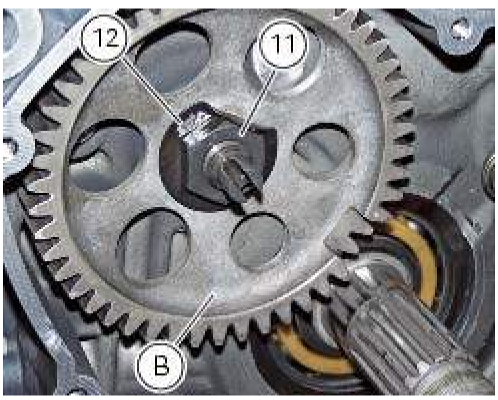
When introducing the driven gear (B) check that the tongue (15) is correctly fitted on the timing system shaft, align the gear slot with the tongue matching the driving gear timing mark (A) with the gear (B).





Important

On completion of the refitting operations, check that tab washer (12) is staked against nut (11) in such a way as to prevent the nut from working loose.



Operations	Section reference
Refit the flywheel/alternator assembly. and alternator side crankcase cover	9 - 8, Refitting the flywheel-alternator assembly
Refit the water pump-LH water radiator hose	9 - 3.1, Refitting the cooling system hoses and unions
Refit the pump-cylinder hoses	9 - 5, Refitting the cylinder/piston assembly

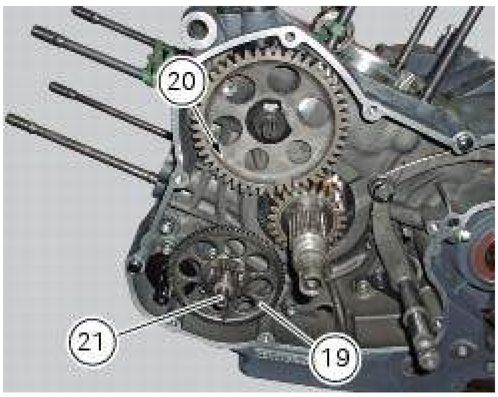
Refill the cooling system	4 - 3, Changing the coolant
Refit the gearchange control	7 - 9, Refitting the gearchange mechanism
Refit the clutch control piston	7 - 8.2, Refitting the clutch transmission unit
Refit the sprocket cover	7 -14, Refitting the front sprocket
Refill the system with engine oil	4 - 3, Changing the engine oil and filter cartridge

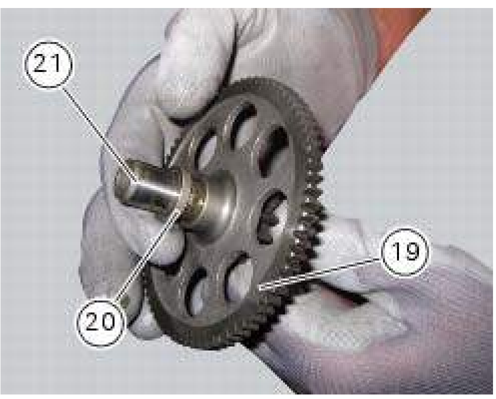
Removal of the starter motor idler gear

Operations	Section reference
Drain the engine oil	4 - 3, Changing the engine oil and filter cartridge
Remove the front sprocket cover	7 -14, Removing of the front sprocket
Remove the clutch pushrod	7 - 8.2, Removal of the clutch transmission unit
Remove the gearchange control	7 - 9, Removal of the gearchange control
Empty the coolant out of the cooling system	4 - 3, Changing the coolant
Remove the pump-cylinder hoses	9 - 5, Removal of the cylinder/piston assembly
Remove the water pump-LH water radiator hose	9 - 3.1, Removal of the cooling system hoses and unions
Remove the generator cover and flywheel-generator assembly	9 - 8, Removal of the generator cover

Slide the gear pin (21) complete with the gear (19) and washer (20).

Warning
Pay attention to the washer (20) since it may fall inside the crankcase half.

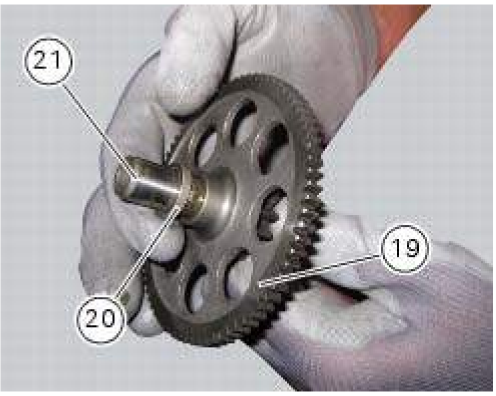


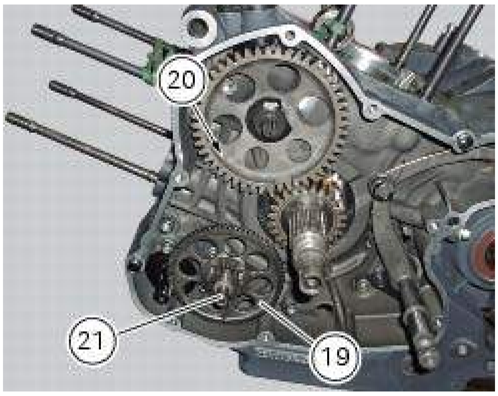


At this point, it is possible to remove the starter motor as described in Sect. 6 - 3, Starter motor.

Refitting the starter motor gear

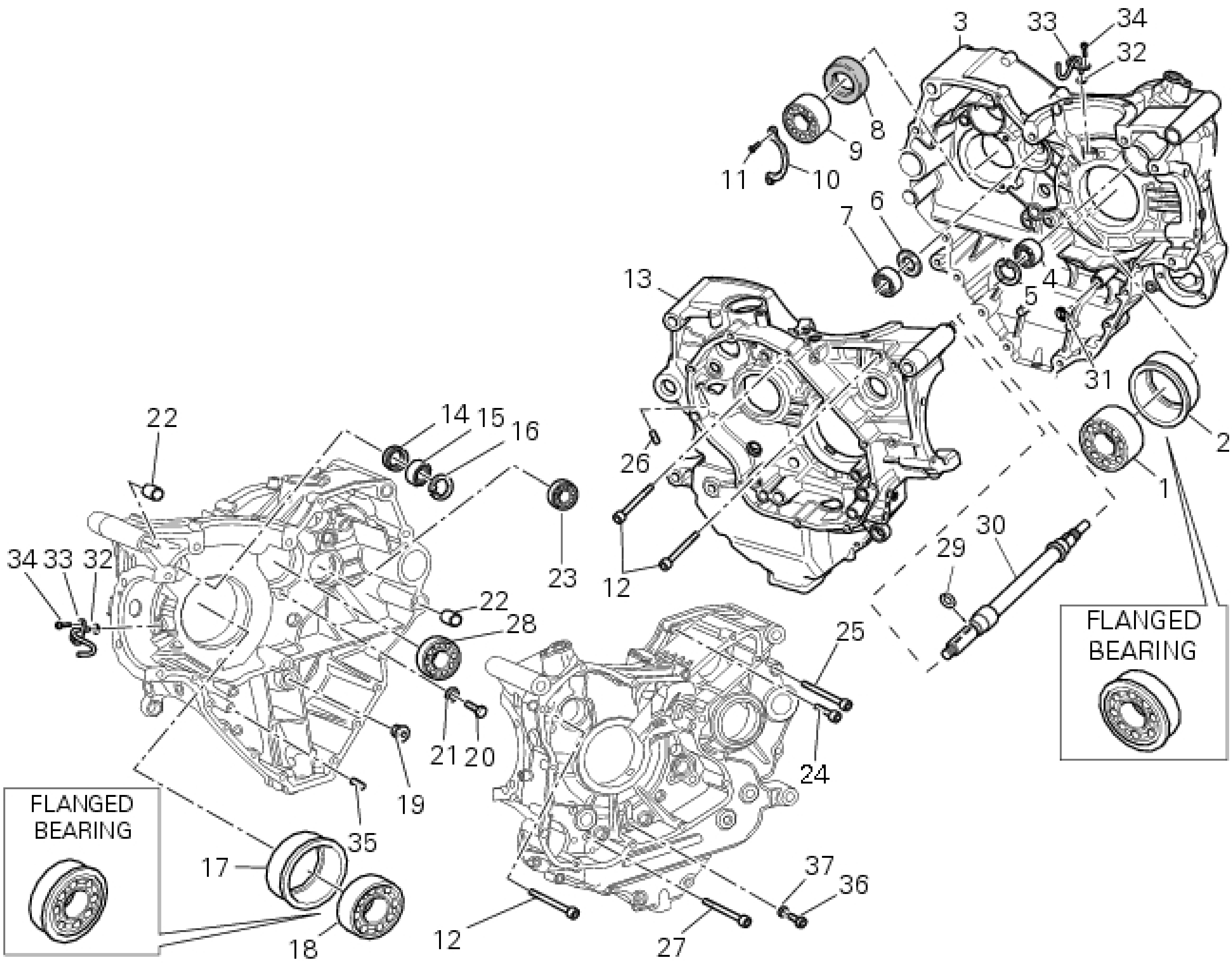
Position the washer (20) and the gear (19) in the pin (21) and take the pin into contact with the crankcase half.





Operations	Section reference
Refit the flywheel/alternator assembly. and alternator side crankcase cover	9 - 8, Refitting the flywheel-alternator assembly
Refit the water pump-LH water radiator hose	9 - 3.1, Refitting the cooling system hoses and unions
Refit the pump-cylinder hoses	9 - 5, Refitting the cylinder/piston assembly
Refill the cooling system	4 - 3, Changing the coolant
Refit the gearchange control	7 - 9, Refitting the gearchange mechanism
Refit the clutch control piston	7 - 8.2, Refitting the clutch transmission unit
Refit the sprocket cover	7 -14, Refitting the front sprocket
Refill the system with engine oil	4 - 3, Changing the engine oil and filter cartridge

9.2 -Crankcase assembly: crankcase halves



1 Bearing
2 Bearing holder bushing
3 Alternator-side crankcase half
4 Bearing
5 Circlip
6 Washer
7 Bearing
8 Sealing ring
9 Bearing
10 Retaining plate
11 Screw
12 Screw
13 Clutch-side crankcase half
14 Sealing ring
15 Bearing
16 Circlip
17 Bearing holder bushing
18 Bearing
19 Plug
20 Screw
21 Spacer
22 Bush
23 Bearing
24 Screw
25 Screw
26 Grub screw
27 Screw
28 Screw
29 Circlip
30 Timing belt driveshaft
31 O-ring
32 O-ring

33 Hose
34 Screw
35 Grub screw
36 Screw
37 Sealing washer

Spare parts catalogue

Diavel ABS	TIMING SYSTEM
Diavel ABS	CRANKCASE HALVES
Diavel ABS	CRANKCASE HALVES
Diavel Carbon ABS	TIMING SYSTEM
Diavel Carbon ABS	CRANKCASE HALVES
Diavel Carbon ABS	CRANKCASE HALVES

Important

Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Separation of the crankcase halves

Operations	Section reference
Remove the engine from the frame	9 - 1, Removal of the engine
Remove the timing components	9 - 4.2, Removal of the timing belt covers
Remove the timing shaft unit	9 - 4.4, Removal of the camshafts
Remove the complete cylinder head unit	9 - 4.5, Removal of the cylinder heads
Remove the cylinder barrel/piston assemblies	9 - 5, Removal of the cylinder/piston assembly
Remove the alternator-side crankcase cover and the alternator assembly	9 - 8, Removal of the generator cover
Remove the starter motor	6 - 3, Starter motor
Remove the clutch cover	9 - 6.2, Removal of the clutch-side crankcase cover
Remove the clutch assembly	9 - 6.1, Removal of the clutch
Remove the oil pump	9 - 2.1, Removal of the oil pump
Remove the primary gear	9 - 6.3, Removal of the primary drive gear
Remove the mesh filter	4 - 3, Changing the engine oil and filter cartridge

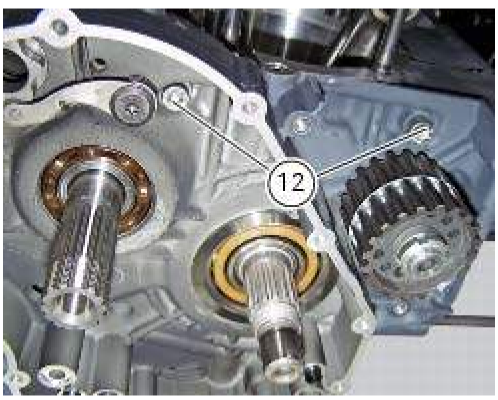
Use two screwdrivers to remove the circlip (29) from the timing belt driveshaft shaft (30) on the clutch-side crankcase half.

Note

Take care to avoid scoring the surface of the shaft while removing the circlip.

Unscrew the crankcase half screws on the chain side.

Unscrew the two screws (12) on the clutch side near the vertical cylinder.

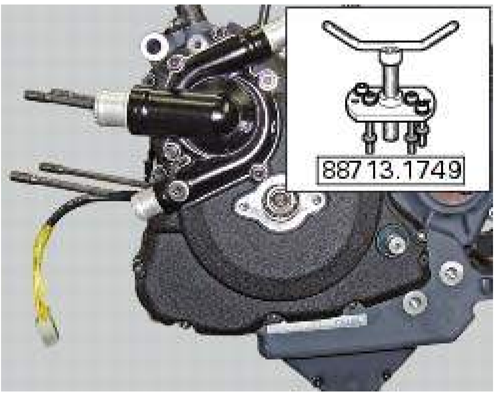


Reuse the alternator cover or a service cover with puller **88713.1749** fitted. Secure cover to crankcase half with some of the original screws and begin separation by turning the central pin of the tool.

Tap the end of the gearbox secondary shaft with a plastic mallet to separate the crankcase halves.

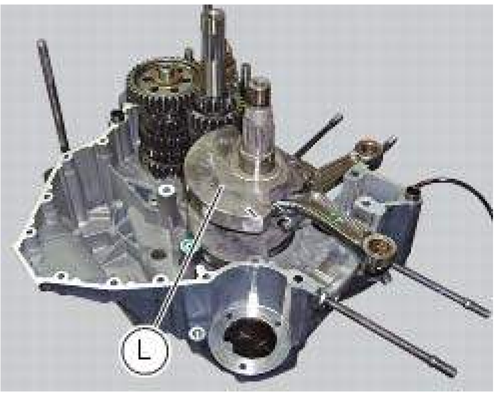
Note

Take care not to lose the shims on the shafts and on the selector drum.



Remove gearbox shafts and gearbox selector drum from the crankcase halves (Sect. 9 - 7.2, Removal of the gearbox assembly.

Drive out the crankshaft (L) using a plastic mallet, taking care not to lose the shims.



Remove the timing belt driveshaft (30).

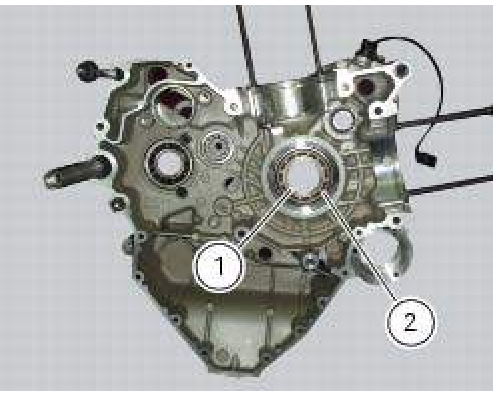
Remove the screws (34), remove the pipes (33) and collect the O-rings (32).

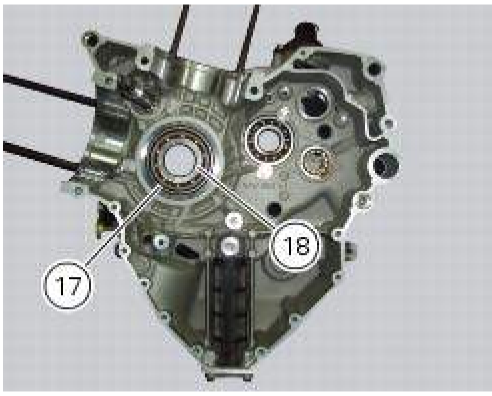
Overhaul of the crankcase halves

Carefully examine the engine crankcase halves.

Check that the surfaces of the crankcase halves are perfectly flat using a reference surface.

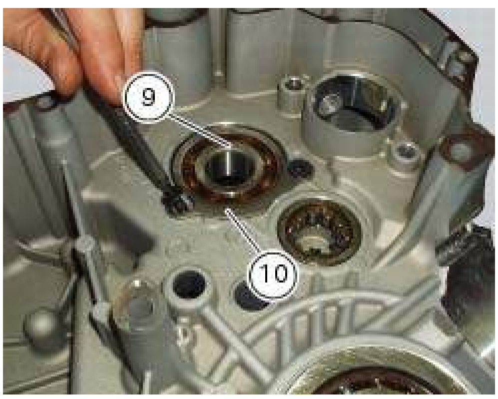
Check that the bearings (1) and (18), and the bushings (2) and (17) are in optimum conditions. Note that the main bearings must always be changed in pairs (refer to the procedure below in “Main bearings”).





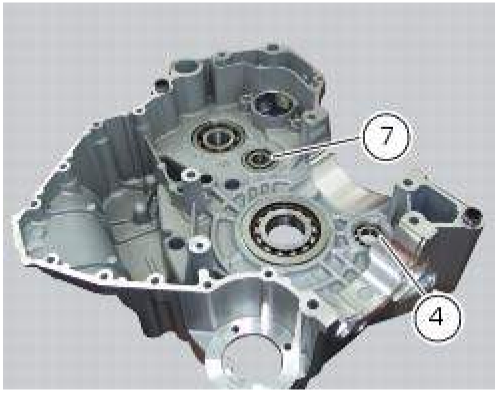
Note

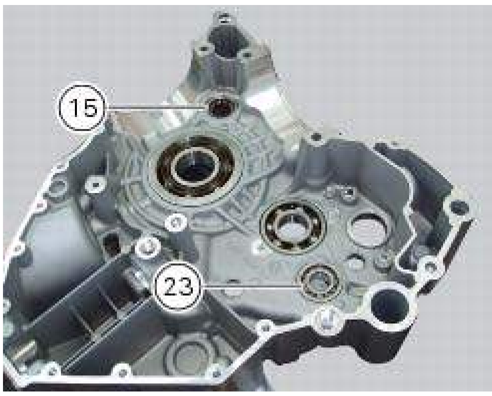
When overhauling an engine it is good practice to renew all the crankcase half bearings.
After having renewed the gearbox shaft bearings (28) and (9), secure them in the crankcase half with the spacers (21) and the retaining plate (10).



At each overhaul it is recommended to renew also the seal (8) on the outside of bearing (**9**).

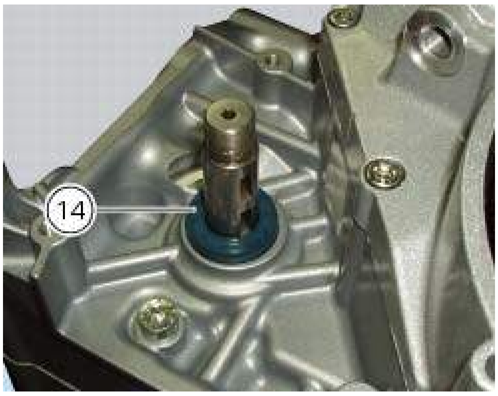
Renew the bearings (7) and (23) on the ends of the gearbox shafts and timing belt driveshaft bearings (4) and (15).





Take care not to lose the shim (6) interposed between the bearing (**7**) on the end of the gearbox primary shaft and the chain side crankcase half.

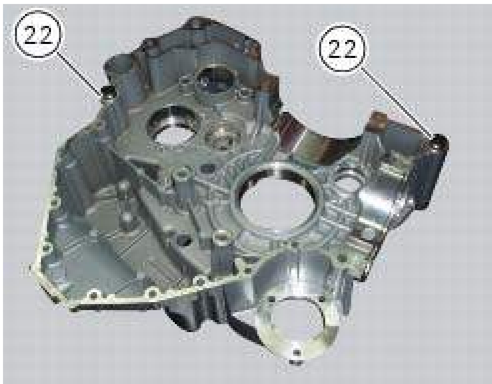
The seal (14) on the external side of the roller bearing (**15**) must be renewed at each engine overhaul.



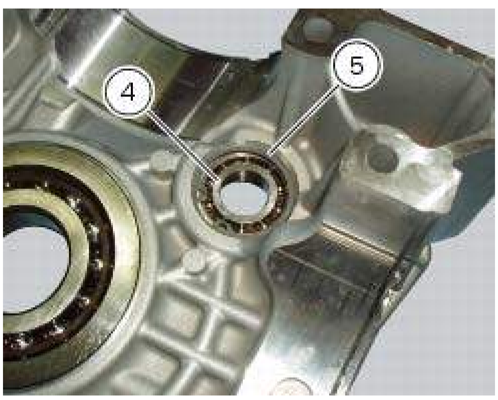
Check that the oilways are free of restrictions or clogging. Check the condition of locating bushes (22). If apparently distorted or loose in their seats, change them using proper tools. When the locating bushes (22) are hard to remove from casing, use a left-hand tap to force bushes out.

Important

The bushes (22) must always be renewed when they have been removed using the above procedure.



Remove the bearing (23), the circlip (5) and the roller bearing (4).



Main bearings

The main bearings have are of the angular contact type with offset inner races so that the balls transmit loads from one groove to the other along straight lines at an angle to the axis of the bearing. The angle-contact ball bearings are designed for bearing combined loading (radial-axial loads).
Bearings of this type can bear thrust loads in one direction only. In fact, under the action of a radial load inside the bearing, an axial force is created that must be counterbalanced by an axial force acting in the opposite direction; that is

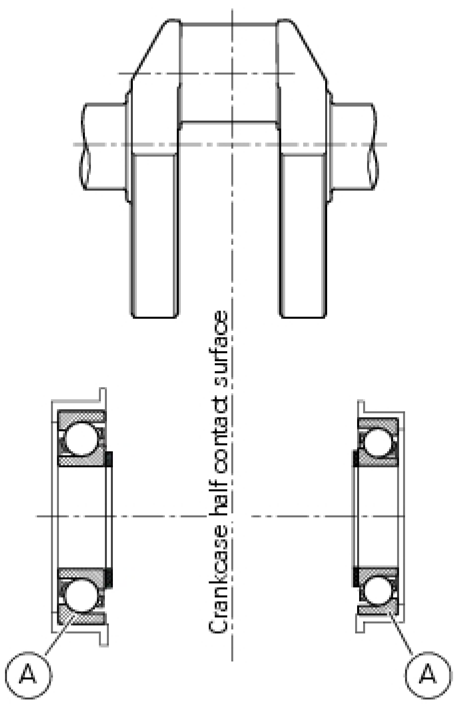
why these bearings are generally fitted back to back in pairs.

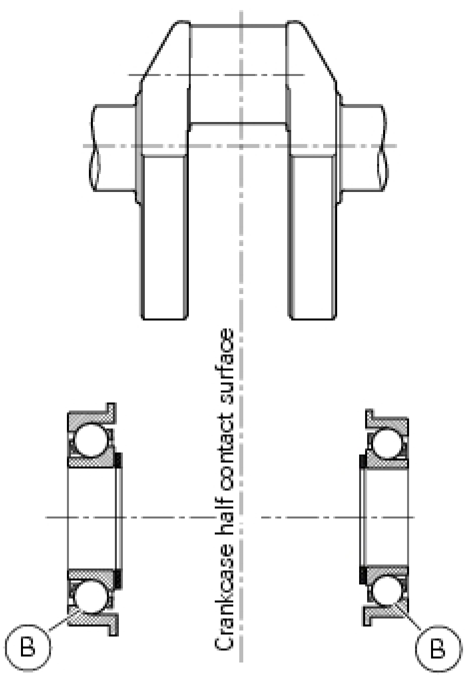
Note

The main bearings supplied can be bearings with bushing (A) or flanged bearings (B) with the bushing integrated in the external ring of the bearing.

To renew the bearings proceed as follows:

- heat the crankcase in an oven to **100** °C;
- remove the bearing using a drift and hammer;
- install the new bearing (while the crankcase is still hot) keeping it perfectly square in its seat using a tubular drift that only bears on the outer ring of the bearing;
- allow the parts to cool and check that the bearing is securely seated in the crankcase half.





Bearings with bushing

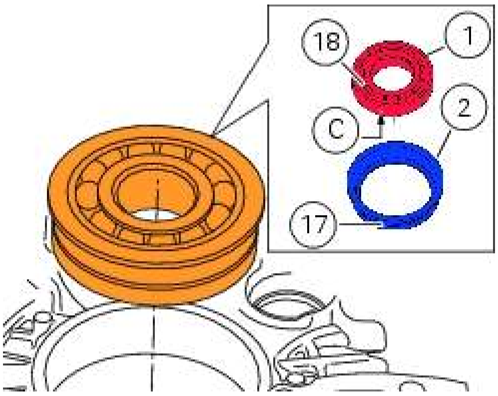
Important

On worn engines, the bearing holder may no longer be a tight fit in the crankcase half.

After having removed the bushing, check that the interference fit between the crankcase and the bushing, with bearing fitted, is no less than 0.03 mm, otherwise, replace the crankcase halves.

Note

Fit the bearings (1) and (18) orienting them so that the side with the “letter” (C) is facing the bushings (2) and (17).

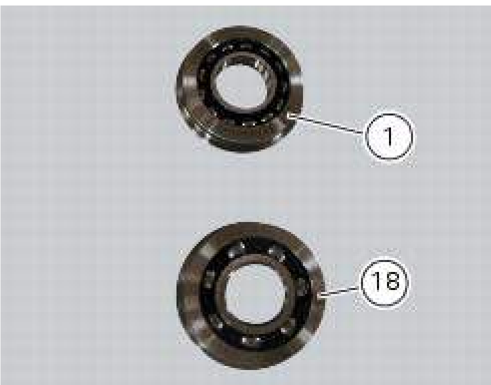


Flanged bearings

Important

On badly worn engines, bearing outer rings may have developed clearance in the crankcase halves - normally, bearing outer rings are interference-fit in the casing.

Check that the interference fit between the crankcase and the bearings (1) and (18) installed, is not less than **0.03** mm, otherwise, replace the crankcase halves.



Important

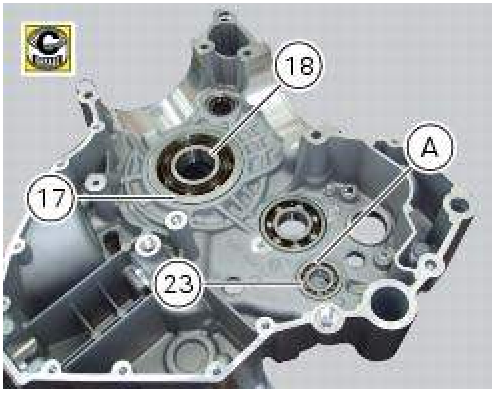
After installing new main bearings, shim the crankshaft as described in the paragraph “Shimming the shafts” and “Reassembly of the crankcase halves“ of this section.

Reassembly of the crankcase halves

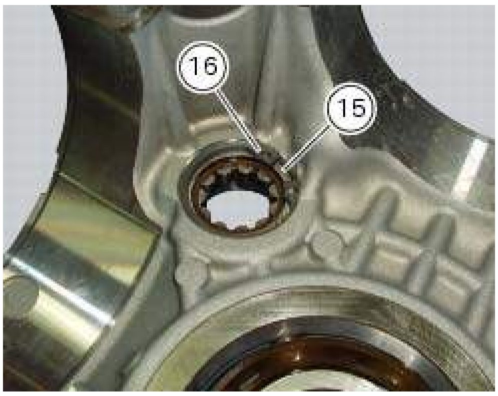
The crankcase halves must be in good condition and perfectly clean. The mating surfaces must be perfectly flat and free from burrs.

Overhauling the alternator-side crankcase half

The following parts must be present on the internal side of the crankcase half:
- gearbox secondary shaft bearing (23): apply grease to the bearing rollers. Fit the inner race (A) removed previously from the bearing. Apply grease to the inner ring;
- the primary shaft bearing (28), secured with screws (20) and retaining spacer (21): Apply prescribed threadlocker to the screws (20) and tighten them to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings);
- the main bearing (18) with the corresponding bushing (17) (if present).



The roller bearing (15) with retaining circlip (16) installed in correspondence with the end of the timing belt driveshaft.
Insert the circlip (5) in the crankcase half installing it in its seat on the bearing (4).



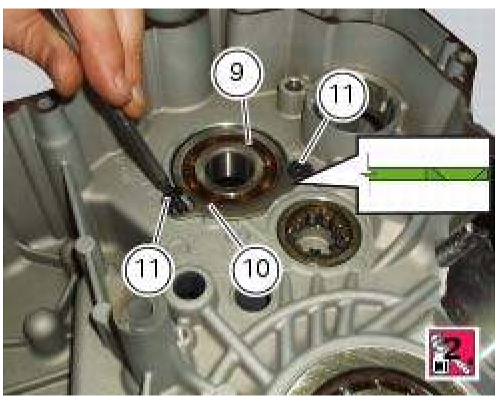
Refitting the alternator-side crankcase half

The following parts must be present on the internal side of the crankcase half:
the double race ball bearing (9) supporting the selector fork shaft. Apply threadlocker to the screws (11). Fit the retaining plate (10) to the gearbox secondary shaft bearing (9) screwing the screws fully into the chain-side crankcase half (11).

Note

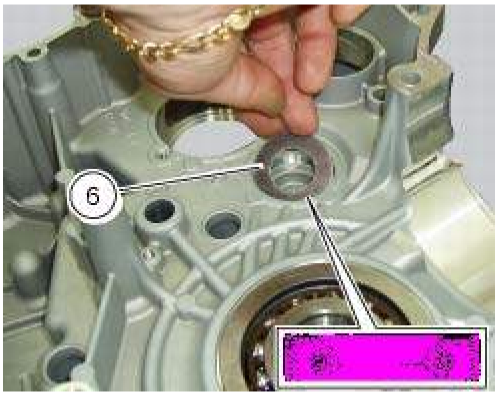
The bearing retaining plate must be positioned so that the countersunk side is facing upwards.

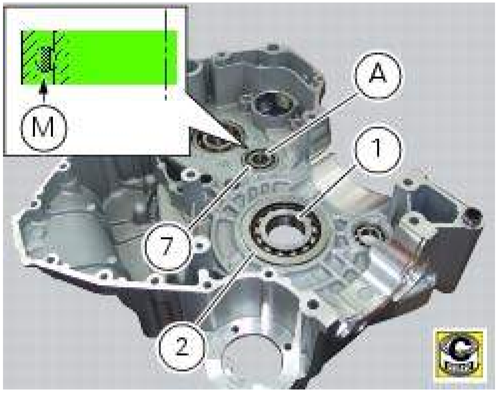
Tighten the screws (11) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm) (Sect. 3 - 3, Engine torque settings).



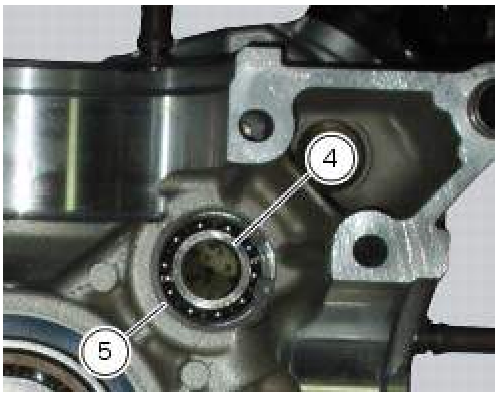
Lubricate the ring (6) with denatured alcohol, drive it fully home against the crankcase half, and orient it as shown.
The primary shaft bearing (7) with internal spacer (6), oriented so that the closed side of the plastic roller cage (M) faces

the crankcase half: apply grease to the bearing rollers. Fit the inner race (A) removed previously from the bearing. Apply grease to the inner race.
The main bearing (1) with the corresponding bushing (2) (if present).





The bearing (4) with the retaining circlip (5) installed in correspondence with the timing belt driveshaft.
Insert the circlip (5) in the crankcase half installing it in its seat in the crankcase half on the bearing (4).



Note

Bearings do not have a specific mounting position (except main bearings); however it is good practice to install the bearings so that side bearing the writing is facing upwards.

Fit the mesh filter as described in Sect. 4 - 3, Changing the engine oil and filter cartridge.

Important

To avoid damaging the filter, insert it by hand only. Do not use hammers or other metal tools.

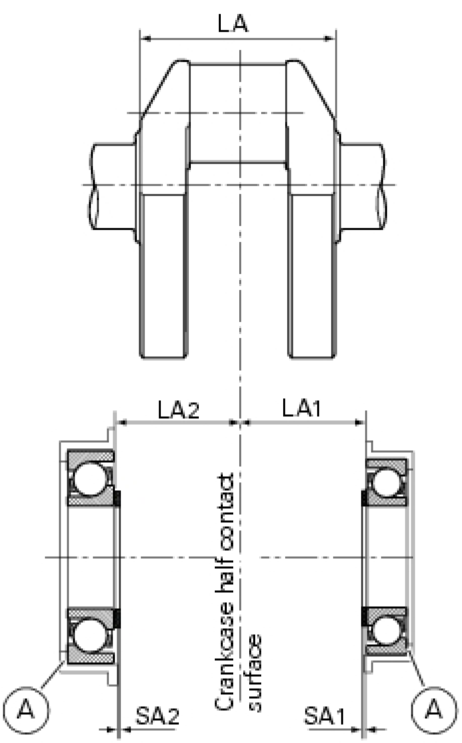
Above the mesh filter seat there is a plug (19) which closes off the lubrication oilway. If it is to be renewed, apply the prescribed threadlocker to its threads.
Tighten the plug to a torque of 24 Nm (Min. 21 Nm - Max. 27 Nm) (Sect. 3 - 3, Engine torque settings).

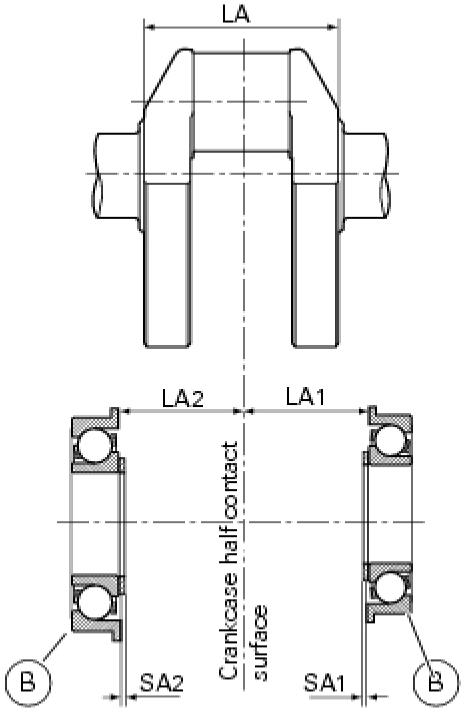
Shimming the shafts

Before assembling the crankcase halves, calculate the shims required to obtain the correct end float of the crankshaft and gearbox shafts.
To determine the correct shim thickness proceed as follows.

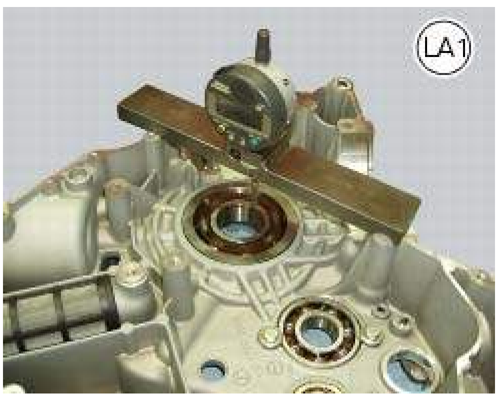
Shimming the crankshaft

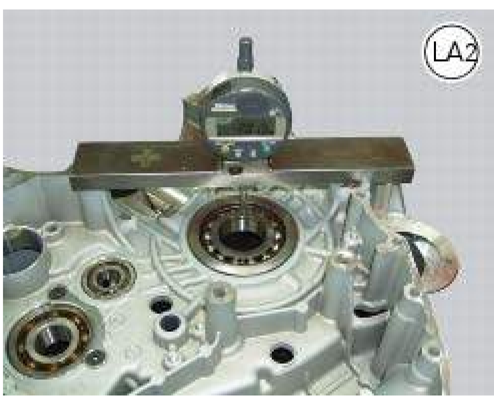
After having installed the new main bearings (with bushing (A) or flanged bearings (B)) proceed as follows to determine the total “SA” height of the shimming:
- measure the distance “LA” between the bearing contact surfaces on the crankshaft;
- measure the depths “LA1” and “LA2” corresponding to the distance between contact surface of the crankcase half and the contact surface of the inner race of the bearings.



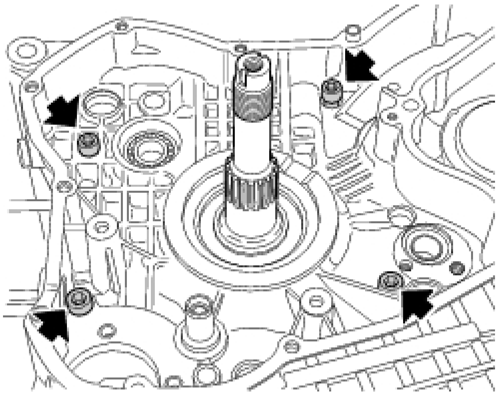


Add **0.30** mm preload for crankshaft axial bearings to bed in correctly into their seats (inner rings seated inside outer ring).
Thus, we obtain:
SA=LA1+LA2+0.30-LA.
To calculate the thickness of each shim note that:
SA=SA1+SA2
where “SA1” and “SA2” represent the shims for the clutch-side crankcase half 1 and the alternator-side crankcase half 2.
Considering the alignment of the shaft, this gives:
SA1=LA1+0.15-LA/2;
and finally, the second shim thickness: SA2=SA-SA1.

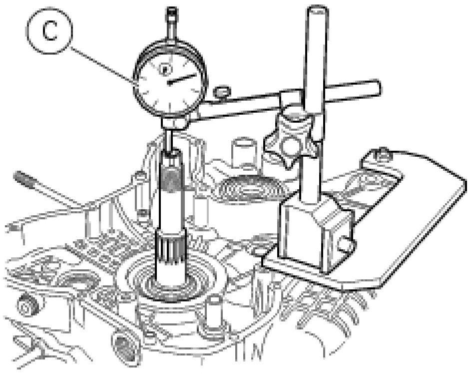




In addition to the above procedure, the following is a practical shimming method, providing a guide on how to calculate the crankshaft shim thickness accurately.
Install a shim of minimum thickness (**1.90** mm) on each side of the crankshaft to prevent contact between the crankshaft web and the crankcase.
Install the crankshaft and assemble the two crankcase halves.
Fit four M8 screws in the seats indicated in figure and tighten them to a torque of 19 Nm (Min. 17 Nm - Max. 21 Nm) (Sect. 3 - 3, Engine torque settings).

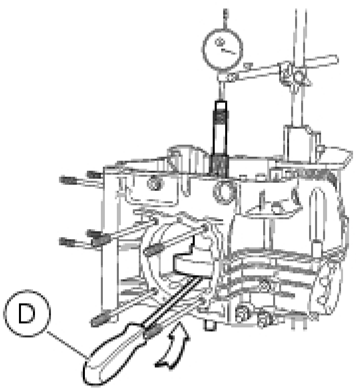


Place a dial gauge (C) with magnetic base on a support plate fixed to crankcase.
Bring the stylus into contact with the end of the crankshaft and set the dial gauge to zero in this position.



Place a lever (D) between crankcase and crank web of the crankshaft pushing towards dial gauge.
Note on the dial gauge the total clearance and add a preload of (**0.30** mm) plus the thickness of the shims used (**1.90x2=3.8** mm).
Divide the resulting value by two to obtain the thickness of the shim packs to be installed at either end of the crankshaft.

Note
After assembling the crankcase halves, the crankshaft should turn with some interference in the new bearings.



Shimming the gearbox shafts

The following thickness spacers are supplied as spare parts.

Position	Clutch side (mm)	Chain side (mm)
Gearbox primary shaft	1.2	1.6
Gearbox secondary shaft	3.15	0.8

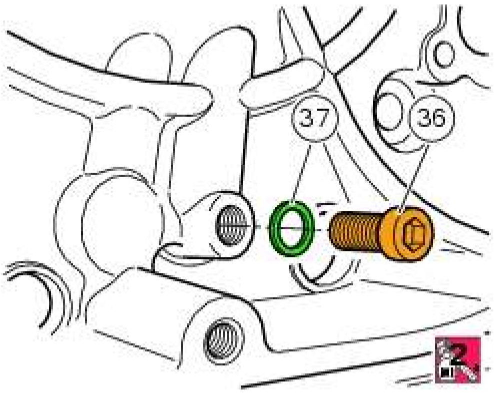
Shimming the gearbox selector drum

The following thickness spacers are supplied as spare parts.

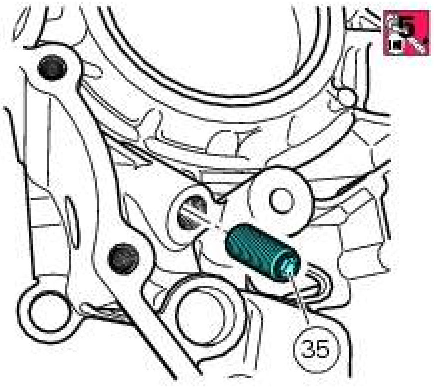
Position	Clutch side (mm)	Chain side (mm)
Gear control drum	1.0	0.9

Reassembly of the crankcase halves

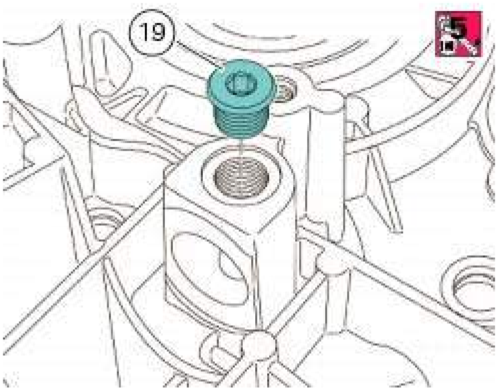
If removed, apply threadlocker on the screw (36), insert it with the washer (37) on the crankcase half and tighten it to the torque of 8 Nm (Min. 7 Nm - Max. 9 Nm) (Sect. 3 - 3, Engine torque settings).



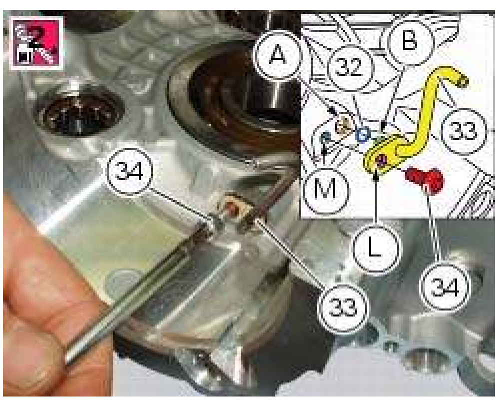
If removed, apply threadlocker on the dowel thread (35), tighten it to a torque of 20 Nm (Min. 18 Nm - Max. 22 Nm) (Sect. 3 - 3, Engine torque settings).



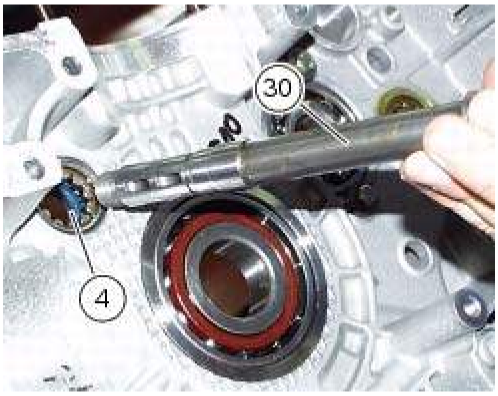
If removed, apply threadlocker on the plug (19), and tighten it to a torque of 24 Nm (Min. 21 Nm - Max. 27 Nm) (Sect. 3 - 3, Engine torque settings).

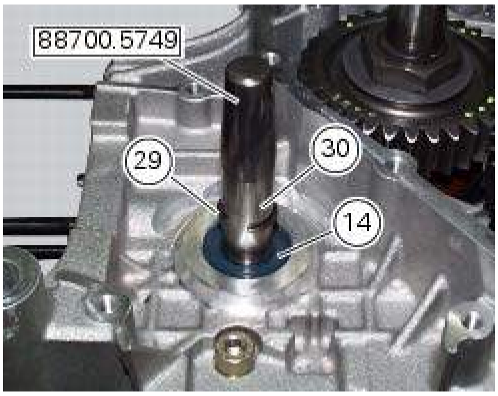


Install the O-ring (32) on its seat (A) in the crankcase half. Fit the pipe (33) in the crankcase half, inserting the end (B) fully in the O-ring. Align the hole (L) of the pipe with the threaded hole (M) in the crankcase half. Apply threadlocker to the screw (34) and start it in the threaded hole (M). Tighten the screw to a torque of 8 Nm (Min. 7 Nm - Max. 9 Nm) (Sect. 3 - 3, Engine torque settings).



Install the timing belt driveshaft (30) in the roller bearing (4) in the clutch-side crankcase half.
To avoid damaging the oil seal (14) on the timing belt driveshaft, protect the threaded end of the shaft with the special protective cap **88700.5749**. Dampen oil seal (14) with alcohol and fit it on the timing layshaft. Push seal until it contacts the roller bearing (4).
Fit the circlip (29) in the groove on the shaft and remove the protective cap.





Note

When refitting used components, before installing the gearbox assembly in the crankcase half, make sure that the inner races (C) of the gearbox shaft bearings are fitted into the correct bearings and have not been left on the shafts.

Match gearbox shafts, fit the shims and fit them to the clutch-side crankcase half.

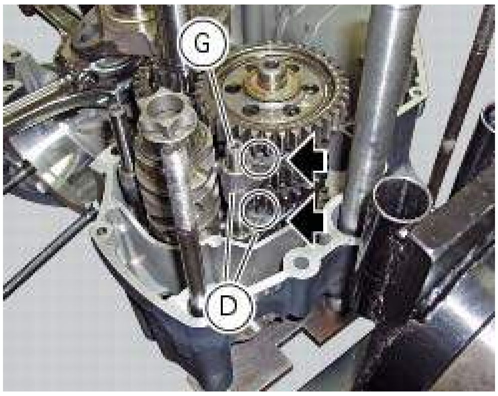
Note

A table and a list of the gearbox components appear in Sect. 9 - 7.2, Reassembly of the gearbox shafts.

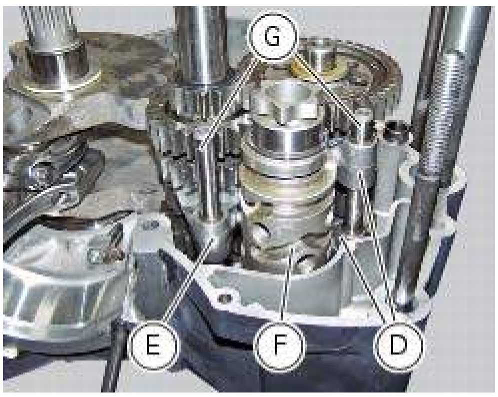
Insert the forks of 1^{st}- 4^{th} and 2^{nd}- 3^{rd} speed (D) in the corresponding sliding slots of the secondary shaft driven gears and insert the pin (G) in the forks: the two forks must be fitted with the number that indicates the gear facing upwards.

Note

The two selector forks are identical.



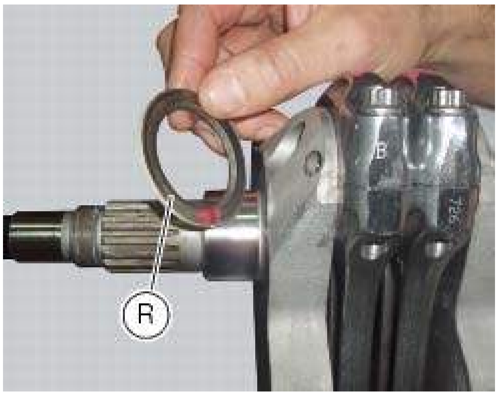
Insert the fork of 5^{th}- 6^{th} speed (E) in the primary shaft driven gear and the pin (G) in the fork (E): the fork must be fitted with the number indicating the gear facing the crankcase half.
Position the pin (G) of the forks (D) in the crankcase half. Holding the gear lever claw, position the gear drum (F) in the crankcase half.
Position the pin (G) of the fork (E) in the crankcase half.

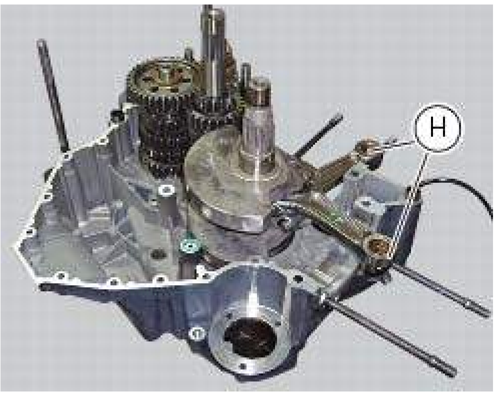


Install the crankcase with calculated shims in the crankcase half bearing: the shims (R) of the shaft must be placed with the chamfering facing the shaft. Position the connecting rods (H) matching the corresponding seats of the cylinder.

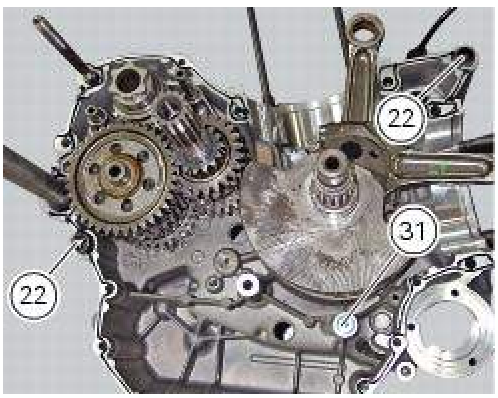
Important

Make sure that the connecting rods (H) are correctly positioned in the cylinders. Incorrect positioning of the connecting rods at this stage will inevitably lead to the need to re-open the crankcase halves.

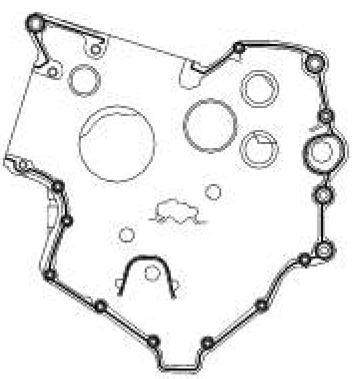




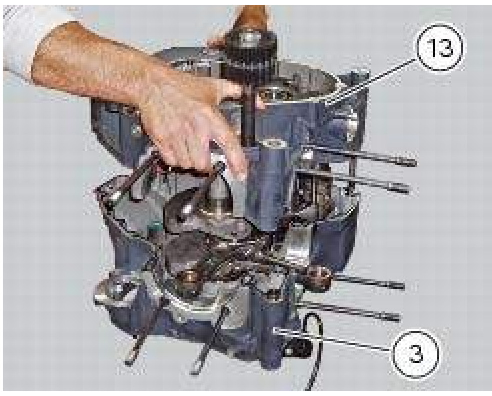
Check that the two locating bushes (22) are correctly fitted.
Grease the O-ring (31) to hold it in position and install it.
Apply a uniform and continuous bead of DUCATI liquid gasket to the mating surfaces of the crankcase halves, going around all the holes as shown in the figure.



Crankcase assembly: crankcase halves



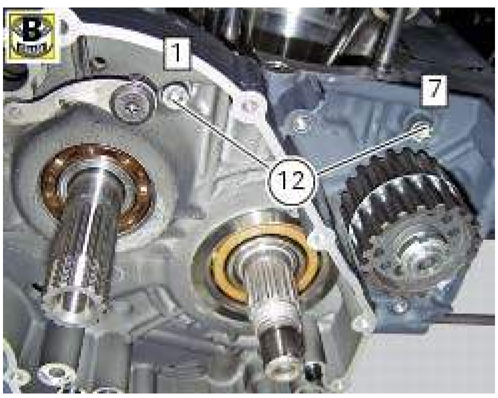
Bring the crankcase halves (3) and (13) together, tapping with a rubber mallet in the area of the shafts if necessary.

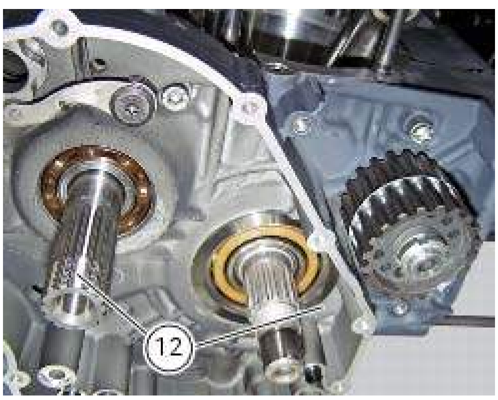


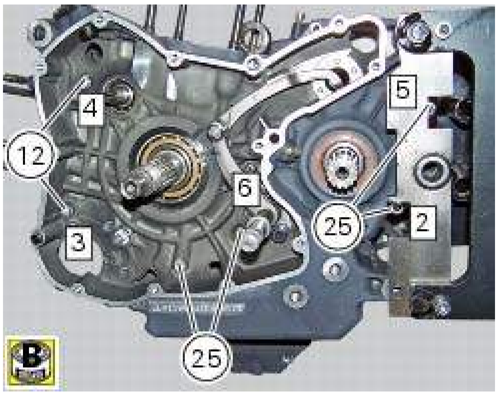
Apply the recommended grease to the screws and insert them in the crankcase halves (note that the screws are different lengths). Start with the larger diameter screws (M8), and follow the order indicated.

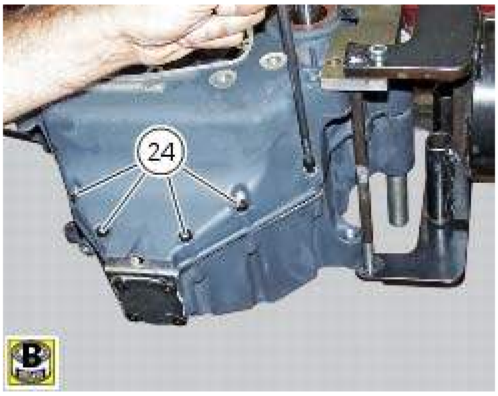
Ref.	Qty	Description
12	4	M8x90 mm screws
25	3	M8x75 mm screws
24	8	M6x35 mm screws
27	2	M6x75 mm screws

Tighten all screws to the torque indicated below (Sect. 3 - 3, Engine torque settings):
- screws (12) and (25) to a preload of 19 Nm (Min. 17 Nm - Max. 21 Nm) and then a torque of 25 Nm (Min. 22 Nm - Max. 28 Nm);
- screws (24) and (27) to a torque of 10 Nm (Min. 9 Nm - Max. 11 Nm).

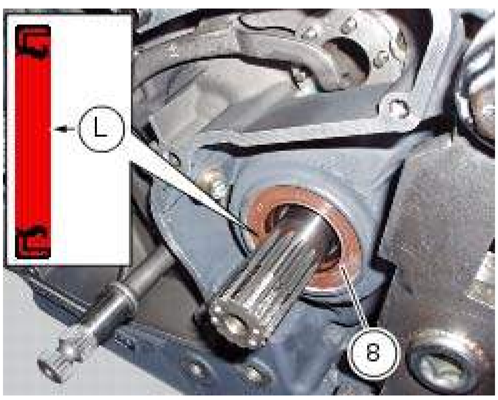








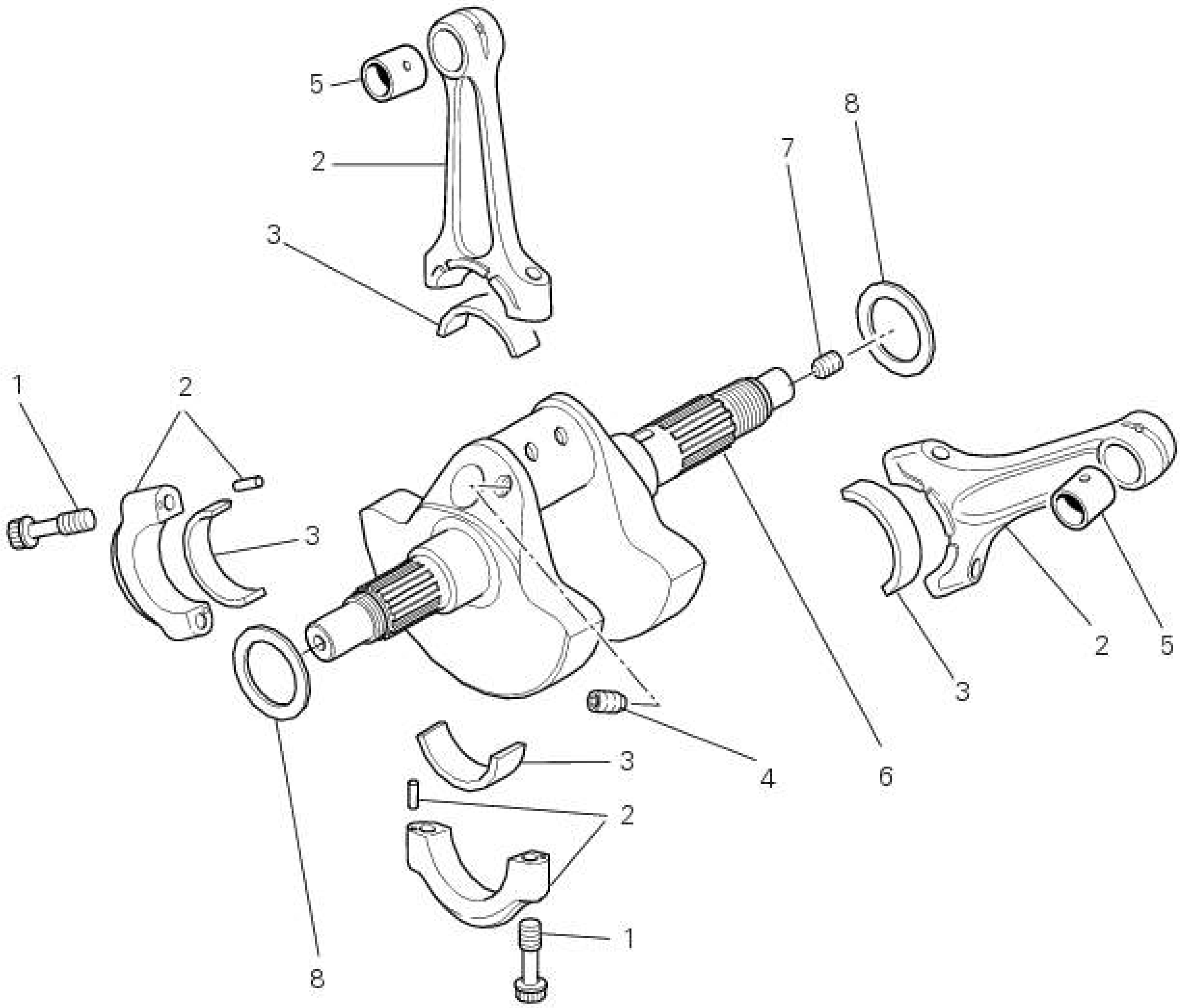
Check that the crankshaft can be turned with a certain amount of interference with the main bearings (the crankshaft should have a pre-load of **0.20** to **0.30** mm); check also that all the parts you have fitted are free to rotate or move correctly.
Install the cover to reach the mesh filter (Sect. 4- 3, Changing the engine oil and filter cartridge).
Install the cartridge filter (Sect. 4 - 3, Changing the engine oil and filter cartridge).
Fit the sealing ring (8) on the gear secondary shaft with side (L) to the engine side.



Install the bushing of the tool with code **88713.2060** on the secondary shaft. Lubricate the new ring (8) and seat it. Using the tool's drift, drive the sealing ring fully home so it seats against the crankcase half bearing.

Operations	Section reference
Refit the mesh filter	4 - 3, Changing the engine oil and filter cartridge
Refit the primary gear	9 - 6.3, Refitting the primary drive gears and checking backlash
Refit the oil pump	9 - 2.1, Refitting the oil pump
Refit the complete clutch assembly	9 - 6.1, Reassembling the clutch
Refit the clutch cover	9 - 6.2, Removal of the clutch-side crankcase cover
Refit the starter motor	6 - 3, Starter motor
Refit the alternator-side crankcase cover and alternator assembly	9 - 8, Refitting the flywheel-alternator assembly
Refit the cylinder barrel/piston assemblies	9 - 5, Refitting the cylinder/piston assembly
Refit the complete cylinder head unit	9 - 4.5, Reassembly of the cylinder head
Refit the timing shaft unit	9 - 4.4, Refitting the camshafts
Refit the timing components	9 - 4.2, Refitting the cylinder heads pulleys/fixed tensioners
Install the engine in the frame	9 - 1, Refitting the engine

9.3 -Crankcase assembly: crankshaft/connecting rods assembly



1 Special screw
2 Connecting rod assembly
3 Half bearing
4 Grub screw
5 Bushes
6 Crankshaft
7 Grub screw
8 Shim washer

Spare parts catalogue

Diavel ABS	CONNECTING RODS
Diavel Carbon ABS	CONNECTING RODS

Important

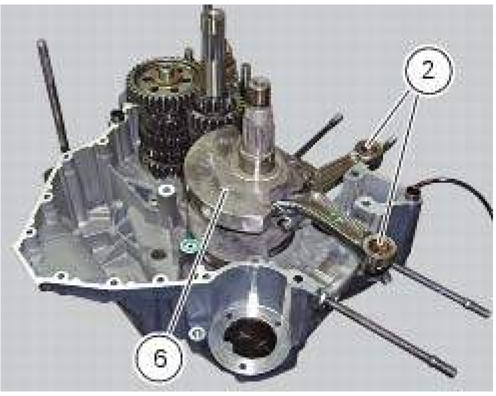
Bold reference numbers in this section identify parts not shown in the figures alongside the text, but which can be found in the exploded view diagram.

Removal of the crankshaft/connecting rods assembly

Operations	Section reference
Remove the engine from the frame	9 - 1, Removal of the engine
Remove the timing components	9 - 4.2, Removal of the timing belt covers
Remove the timing shaft unit	9 - 4.4, Removal of the camshafts
Remove the complete cylinder head	9 - 4.5, Removal of the cylinder

unit	heads
Remove the cylinder barrel/piston assemblies	9 - 5, Removal of the cylinder/piston assembly
Remove the alternator-side crankcase cover and the alternator assembly	9 - 8, Removal of the generator cover
Remove the starter motor	6 - 3, Starter motor
Remove the clutch cover	9 - 6.2, Removal of the clutch-side crankcase cover
Remove the clutch assembly	9 - 6.1, Removal of the clutch
Remove the oil pump	9 - 2.1, Removal of the oil pump
Remove the primary gear	9 - 6.3, Refitting the primary drive gears and checking backlash
Remove the mesh filter	4 - 3, Changing the engine oil and filter cartridge
Separate the crankcase halves	9 - 9.2, Separation of the crankcase halves

After separating the crankcase halves, withdraw the crankshaft (6) complete with connecting rods (2).

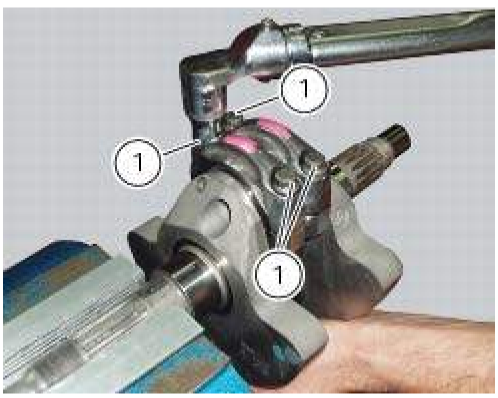


Disassembly of the crankshaft/connecting rods assembly

Unscrew the screws (1) and separate the connecting rods from the crankshaft.

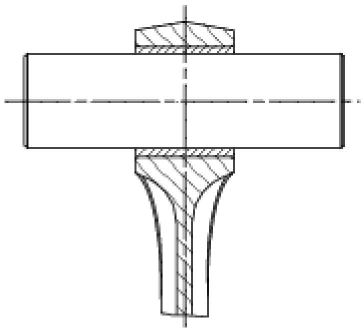
Important

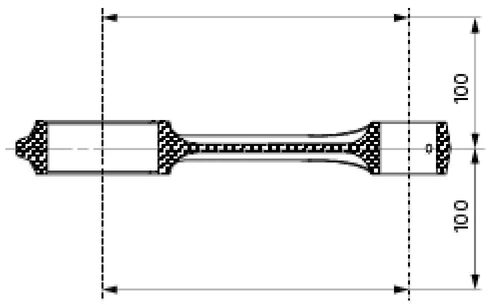
Take care not to mix up components of different connecting rods and maintain the original orientation.



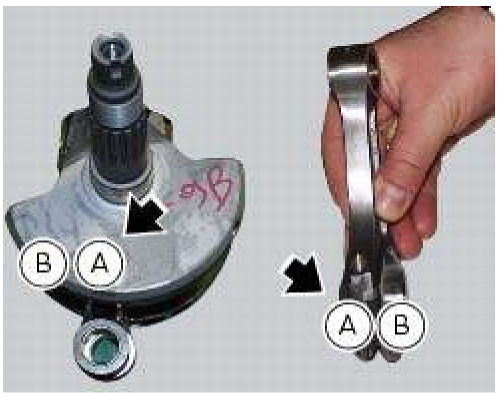
Overhaul of the connecting rods

Make the following dimensional checks on the connecting rods:
-clearance with gudgeon pin on assembly.
In the event of excessive wear (Sect. 3 - 1.1, Crankshaft), replace the connecting rod.
The small end bushing must be in good condition and firmly driven into its seat.
Check for parallelism error measured at **100** mm from the connecting rod longitudinal axis: the value must be **H-h** less than **0.02** mm; otherwise, renew the connecting rod.



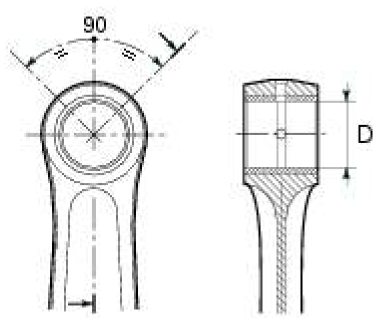


The connecting rod is supplied in two size classes **A** and **B** relative to the big end diameter (Sect. 3 - 1.1, Crankshaft) as punch marked on the side of the cap.
It is preferable to use crankshafts and connecting rods of the same size class.



Renewal of the small end bushing

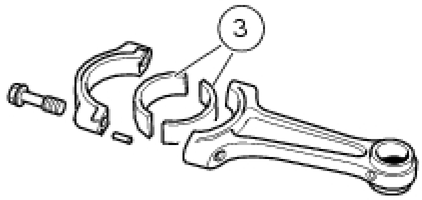
To remove the worn bushing, use a suitable punch and a press.
Drill lubrication holes into the new bushing in correspondence with the existing lubrication holes on the connecting rod small end.
Now ream out the bushing until the inside diameter (D) is **20.035** to **20.045** mm.

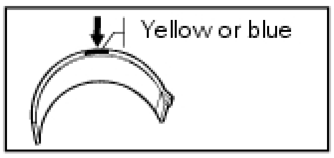


Connecting rod bearings

It is good practice to renew the bearings (3) each time the engine is overhauled.
Replacement bearings are supplied ready for assembly and they must not be reworked with scrapers or emery cloth.
The bearings may belong to two different size classes, each identified by a specific colour (YELLOW and BLUE).
The bearings are comprised of an external steel ring, the inner face of which is electroplated with a lead-based compound.
The table shows the appropriate bearings to be fitted according to the size class of the crankshaft and connecting rod.

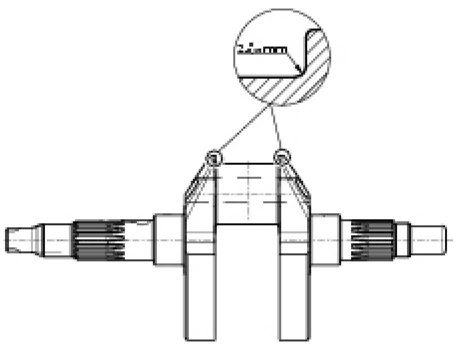
Crankshaft class	Connecting rod class	Bearings colour
B	B	BLUE/YELLOW
B	A	YELLOW/YELLOW
A	B	BLUE/BLUE
A	A	BLUE/YELLOW



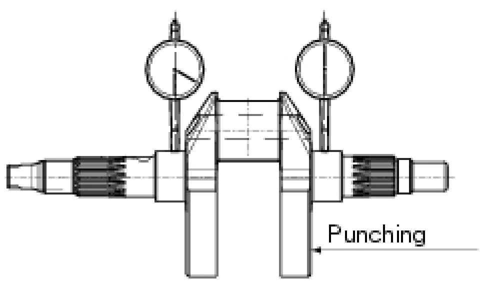


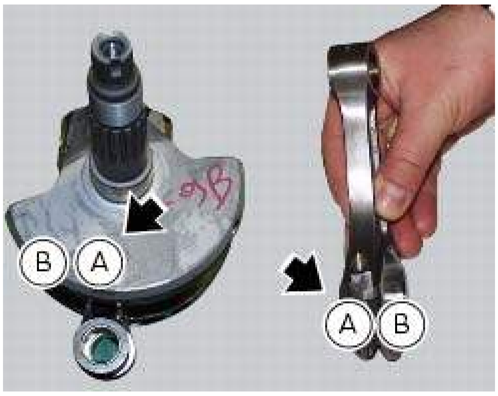
Crankshaft

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: 2 mm.

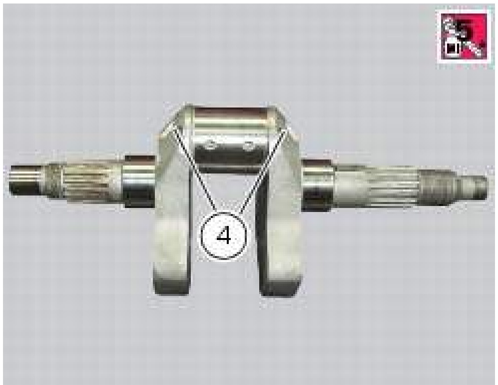


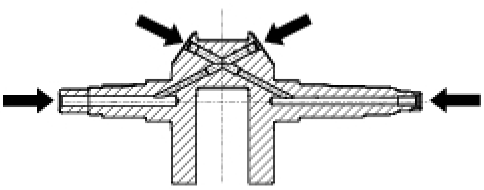
Use a micrometer to measure oval and taper of the crank pin. Measure oval and taper in several different directions.
Use a dial gauge to measure the alignment of the main journals by setting the crankshaft between two opposing centres.
At each overhaul, it is advisable to clean the crankshaft's internal oilways.
The prescribed values are given in Sect. 3 - 1.1, Crankshaft.
The crankshaft is supplied in two size classes (connecting rod pin) A and B, as punch marked on the side of the crank web on the pinion side.





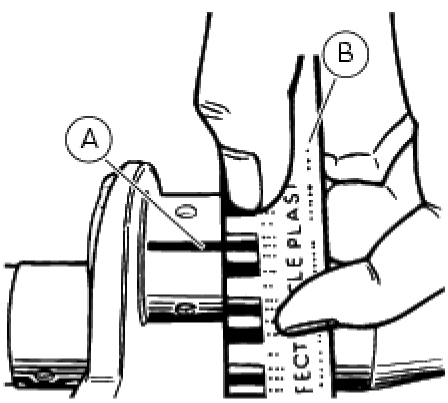
Loosen all crankshaft plugs (4) and (**7**); heating the crankshaft, if necessary, to remove the threadlocker applied at the time of assembly.
Clean all the oilways using suitable diameter metal brushes and then blow with compressed air to remove any residues that have accumulated and are restricting the oil flow.
Apply prescribed threadlocker to the plugs thread (4) and (**7**) and then refit them.
Tighten all plugs to a torque of 13 Nm (Min. 11 Nm - Max. 15 Nm) (Sect. 3 - 3, Engine torque settings).





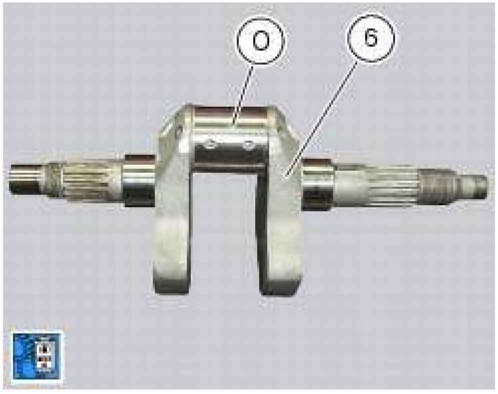
Big-end bearing shell-journal clearance

To check the assembly clearance between the bearing shells and crankshaft journals you will lay a strip (A) of GREEN “Plastigage PG-1” on the journal. Fit the connecting rod with the original bearings and tighten the screws to a torque of **50** Nm.
Remove the connecting rod and compare the thickness of the Plastigage strip to the scale (B).
If the width measured corresponding to the existing clearance is not within the prescribed limit (Sect. 3 - 1.1, Crankshaft), either the bearings or the crankshaft must be replaced.



Reassembly of the connecting rods

Before starting, check that the crankshaft main bearing journals and big-end journals are free of burrs or evident signs of machining: if necessary, clean the surfaces with very fine emery cloth and oil.
Check that the grooves are in perfect condition with no signs of forcing.
Clean the crank pin (O) on the crankshaft (6) thoroughly and lubricate.

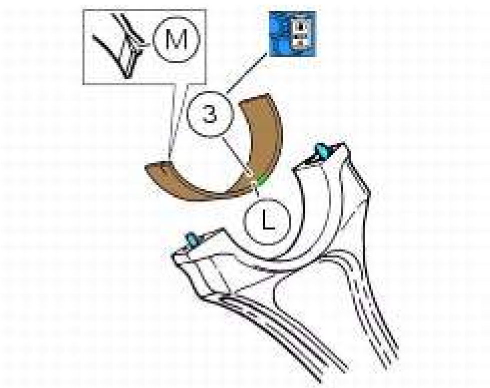


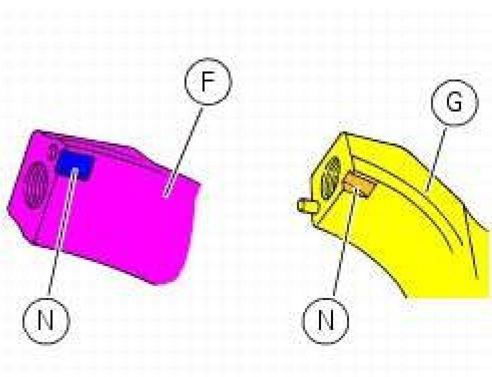
Take the bearings (3) necessary to shaft/connecting rod coupling, following the indications provided (Sect. 3 - 1.1, Cylinder/Piston).
Insert the bearings in the connecting rod seats matching the tooth (M) of the bearings with the corresponding marks (N) on the connecting rod cap (F) and on the connecting rod small end (G). It is essential that the tooth (M) adheres perfectly with its own mark (N).

Warning

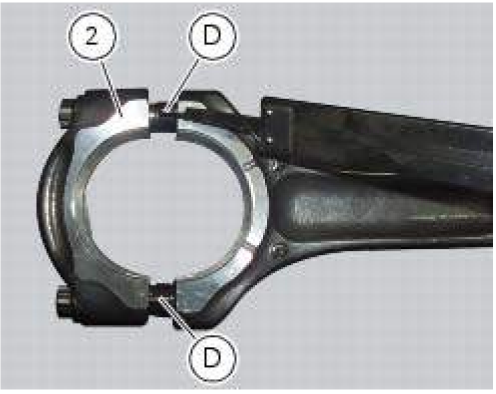
In the case of BLUE and YELLOW bearing coupling, fit the YELLOW on the connecting rod and the BLUE on the connecting rod cap.

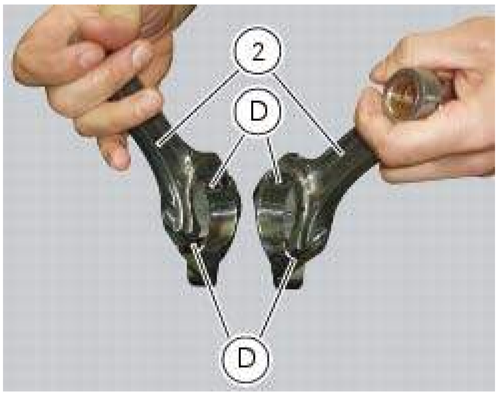
Lubricate the bearing (3) fitted on the connecting rod small end.



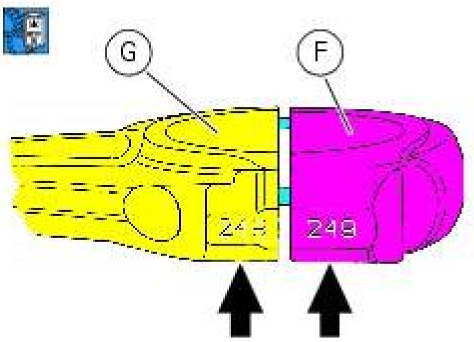


Check that each connecting rod (2) and cap are fitted with their locating pins (D).
Wash the pins and dry them with compressed air.
Fit the connecting rod on the crankshaft, in the same position in which it was removed.
Insert the connecting rod in the crankshaft, so that the centring pins face the internal side.





Join the connecting rod cap (F) with the corresponding connecting rod small end (G), checking 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 next to 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 (1) and the thread of the shaft.

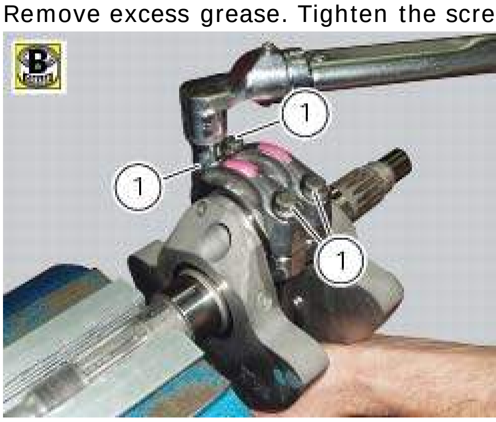
Warning

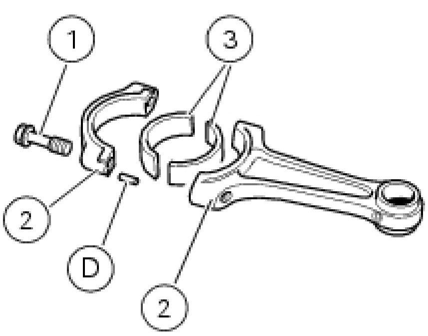
The grease utilised is an irritant in contact with the skin. Wear protective gloves.

Important

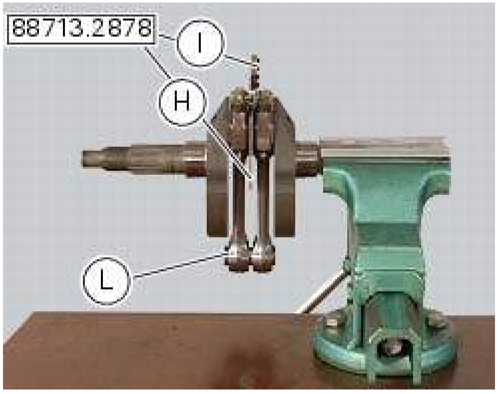
Lubrication of big-end cap screws is essential to obtain the correct coupling and to prevent breakage of the parts.
The big-end cap screws may only be used **for one tightening**.

Tighten the screws (1) by hand.
If this proves difficult or if the screws jam, undo them and lubricate them again.
Remove excess grease. Tighten the screw by hand until the head seats against the connecting rod.





Fit the spacer (H) of the tool **88713.2878** between the connecting rods and take up residual axial clearance with the fork feeler gauge (I) of the tool **88713.2878** which is available in the following thicknesses:
0.1 mm - **0.2** mm - **0.3** mm.
Temporarily fit the gudgeon pin (L) to align the connecting rods, and then tighten the screws.

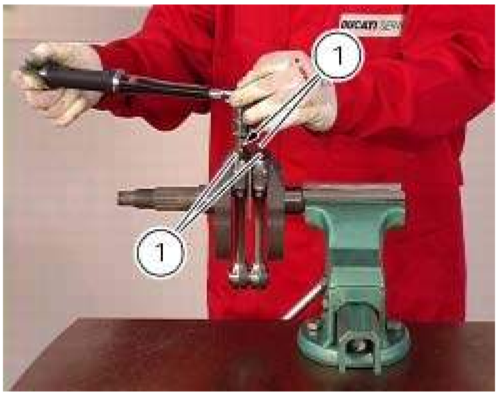


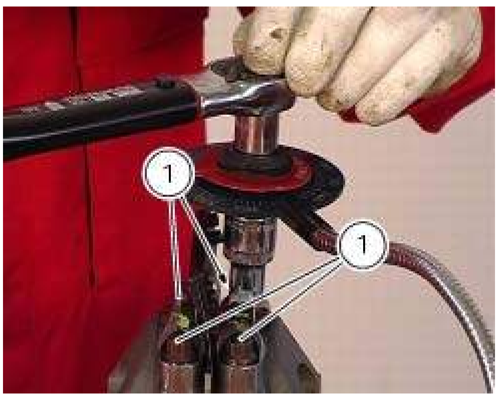
Tighten the screws (1) with a torque wrench and angle reading (degree wheel) in accordance with the procedure described below (observe the same tightening sequence at each step as that of the previous step):

1. first torque each screw to a value of **20** Nm;
2. now carry out a second tightening stage applying a torque of **35** Nm on each screw;
3. now tighten each screw, reading the angle of rotation, to **70** Nm, checking that the final angle is between **55°** and **75°**.

Important

If the final angle is less than **55°** or greater than **75°**, repeat the procedure using two new screws.





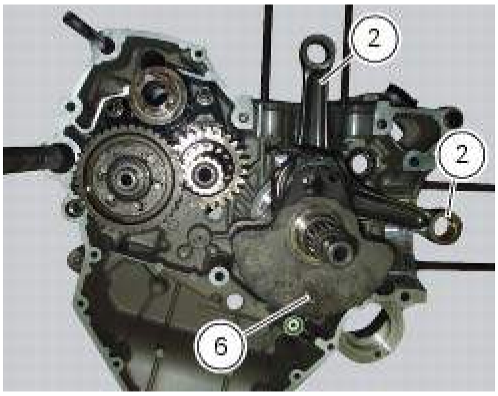
Refitting the crankshaft/connecting rod assembly

Install the connecting rod assembly (6) and (2) in the crankcase, carry out the shimming and crankcase half reassembly procedure as described in Sect. 9 - 9.2, Reassembly of the crankcase halves.

Important

Make sure that the connecting rods (2) are correctly positioned in the cylinders. Incorrect positioning of the connecting rods at this stage will inevitably lead to the need to re-open the crankcase halves.

Crankcase assembly: crankshaft/connecting rods assembly



Operations	Section reference
Crankcase halves closure	9 - 9.2, Reassembly of the crankcase halves
Refit the mesh filter	4 - 3, Changing the engine oil and filter cartridge
Refit the primary gear	9 - 6.3, Removal of the primary drive gear
Refit the oil pump	9 - 2.1, Refitting the oil pump
Refit the complete clutch assembly	9 - 6.1, Reassembling the clutch
Refit the clutch cover	9 - 6.2, Refitting the clutch-side crankcase cover
Refit the starter motor	6 - 3, Starter motor
Refit the alternator-side crankcase cover and alternator assembly	9 - 8, Refitting the flywheel-alternator assembly
Refit the cylinder barrel/piston assemblies	9 - 5, Refitting the cylinder/piston assembly
Refit the complete cylinder head unit	9 - 4.5, Reassembly of the cylinder head
Refit the timing shaft unit	9 - 4.4, Refitting the camshafts
Refit the timing components	9 - 4.2, Refitting the cylinder heads pulleys/fixed tensioners
Install the engine in the frame	9 - 1, Refitting the engine