

Maintenance Instructions (US Model)

F 650 GS

F 650 GS Dakar



**BMW Motorrad
On-board
documentation**

consisting of
Rider's Manual
and Maintenance
Instructions



Please note



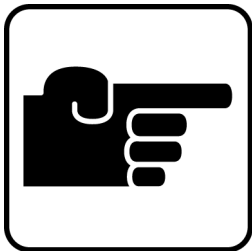
WARNING

This symbol indicates precautions and measures which are essential in protecting the rider or other persons from severe or fatal injury.



CAUTION

Specific instructions and safety precautions intended to prevent damage to the motorcycle. Disregarding them may render the warranty invalid.



NOTE

Specific instructions on how to operate, control, adjust or look after items of equipment on the motorcycle.

Dear motorcycle enthusiast

1

1

BMW Service

For safety reasons and to maintain the value of your motorcycle, regular maintenance intervals have been laid down. Always keep to the specified maintenance intervals. This is the only way to ensure that warranty claims are not invalidated. The contents of the maintenance schedules are subject to change, for reasons of safety, due to modifications in, among other things, materials. Your authorized BMW motorcycle retailer is best placed to provide information on the currently specified Service, Inspection and Annual Inspection work needed.

Important:

BMW refuses to accept liability for damage or consequential damage due to repairs or service work performed by other than BMW-authorized workshops.

Consequently, we advise you to have service and maintenance performed by your authorized BMW motorcycle retailer's specially trained, expert personnel, and confirmed by an entry in the Maintenance Instructions.

Authorized BMW motorcycle retailers are supplied with the latest technical information and have the necessary technical know-how and specially trained staff.

It is advisable to contact your authorized BMW motorcycle retailer if you have any questions regarding your motorcycle.

Authorized BMW motorcycle retailers are fully informed about all aspects of your motorcycle and will gladly advise and assist you.

Best wishes,

BMW Motorrad

Important safety information

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BMW Service

For your own safety, use only genuine BMW spare parts and accessories approved by BMW.

If you choose genuine BMW accessories and spare parts that have been tested and approved, you can be sure that BMW has performed the appropriate tests to confirm their suitability for use on your motorcycle. BMW accepts product liability only for these products.

Note, however, that BMW is unable to accept liability for spare parts and accessories which it has not approved.

BMW cannot assess every single product of outside origin in order to decide whether it can be used on or with a BMW vehicle without constituting a safety risk.

Nor is approval by an official technical inspection authority, or even the granting of a general operating permit necessarily a sufficient guarantee, since these test procedures are not always adequate.

Genuine BMW spare parts, accessories and other products which BMW has approved can be obtained from all authorized BMW motorcycle retailers, together with expert advice on their installation and use.

Maintenance is divided up into Service, Inspection and Annual Inspection.

BMW Inspection 1,000 km (600 miles)

BMW running-in check after the first 1,000 km (600 miles).

BMW Service

After the first 10,000 km (6,000 miles) and every further 20,000 km (12,000 miles) (30,000 km..., 50,000 km ..., 70,000 km...) (18,000 miles..., 30,000 miles..., 42,000 miles)

BMW Inspection

After the first 20,000 km (12,000 miles) and every further 20,000 km (40,000 km..., 60,000 km ..., 80,000 km...) (24,000 miles..., 36,000 miles..., 48,000 miles)

BMW Annual Inspection

Certain items of maintenance depend on elapsed time as well as the distance the motorcycle has covered. These tasks must therefore be performed at least once a year (e.g. changing the brake fluid).

If these items cannot be performed during a Service or an Inspection, an Annual Inspection must be performed.

NOTE

Every authorized BMW motorcycle retailer has a fixed scale of charges based on work times and carefully calculated hourly rates.

Fuel, lubricants and similar substances, filters, gaskets, etc. are charged separately.

Maintenance schedule

If you like, you can view the current maintenance schedule for your motorcycle on the Internet and download the file from www.bmw-motorrad.com/maintenance.

Confirmation of maintenance

1

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BMW Service

BMW Pre-delivery check

Performed in accordance with
manufacturer's instructions

Odometer reading _____

Date, stamp, signature

BMW Service 10,000 km (6,000 miles)

Performed in accordance with
manufacturer's instructions

Odometer reading _____

Date, stamp, signature

BMW Inspection, 1,000 km (600 miles)

Performed in accordance with
manufacturer's instructions

Odometer reading _____

Date, stamp, signature

BMW Inspection, 20 000 km (12,000 miles)

Performed in accordance with
manufacturer's instructions

Odometer reading _____

Date, stamp, signature

Confirmation of maintenance

BMW Service 30,000 km (18,000 miles)

Performed in accordance with
manufacturer's instructions

Odometer reading _____

Date, stamp, signature

BMW Service 50,000 km (30,000 miles)

Performed in accordance with
manufacturer's instructions

Odometer reading _____

Date, stamp, signature

BMW Inspection 40,000 km (24,000 miles)

Performed in accordance with
manufacturer's instructions

Odometer reading _____

Date, stamp, signature

BMW Inspection 60,000 km (36,000 miles)

Performed in accordance with
manufacturer's instructions

Odometer reading _____

Date, stamp, signature

Confirmation of maintenance

1

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BMW Service

BMW Service 70,000 km (42,000 miles)

Performed in accordance with
manufacturer's instructions

Odometer reading _____

Date, stamp, signature

BMW Service 90,000 km (54,000 miles)

Performed in accordance with
manufacturer's instructions

Odometer reading _____

Date, stamp, signature

BMW Inspection 80,000 km (48,000 miles)

Performed in accordance with
manufacturer's instructions

Odometer reading _____

Date, stamp, signature

BMW Inspection 100,000 km (60,000 miles)

Performed in accordance with
manufacturer's instructions

Odometer reading _____

Date, stamp, signature

Confirmation of maintenance

BMW Service 110,000 km (66,000 miles)

Performed in accordance with
manufacturer's instructions

Odometer reading _____

Date, stamp, signature

BMW Service 130,000 km (78,000 miles)

Performed in accordance with
manufacturer's instructions

Odometer reading _____

Date, stamp, signature

BMW Inspection 120,000 km (72,000 miles)

Performed in accordance with
manufacturer's instructions

Odometer reading _____

Date, stamp, signature

BMW Inspection 140,000 km (84,000 miles)

Performed in accordance with
manufacturer's instructions

Odometer reading _____

Date, stamp, signature

Confirmation of maintenance

1

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BMW Service

BMW Annual Inspection

Performed in accordance with manufacturer's instructions

Brake fluid changed:
yes no

Coolant changed:
yes no

Date, stamp, signature

BMW Annual Inspection

Performed in accordance with manufacturer's instructions

Brake fluid changed:
yes no

Coolant changed:
yes no

Date, stamp, signature

BMW Annual Inspection

Performed in accordance with manufacturer's instructions

Brake fluid changed:
yes no

Coolant changed:
yes no

Date, stamp, signature

BMW Annual Inspection

Performed in accordance with manufacturer's instructions

Brake fluid changed:
yes no

Coolant changed:
yes no

Date, stamp, signature

Confirmation of maintenance

BMW

Annual Inspection

Performed in accordance with manufacturer's instructions

Brake fluid changed:

yes no

Coolant changed:

yes no

Date, stamp, signature

BMW

Annual Inspection

Performed in accordance with manufacturer's instructions

Brake fluid changed:

yes no

Coolant changed:

yes no

Date, stamp, signature

BMW

Annual Inspection

Performed in accordance with manufacturer's instructions

Brake fluid changed:

yes no

Coolant changed:

yes no

Date, stamp, signature

BMW

Annual Inspection

Performed in accordance with manufacturer's instructions

Brake fluid changed:

yes no

Coolant changed:

yes no

Date, stamp, signature

Confirmation of maintenance

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BMW Service

BMW

Annual Inspection

Performed in accordance with manufacturer's instructions

Brake fluid changed:

yes no

Coolant changed:

yes no

Date, stamp, signature

BMW

Annual Inspection

Performed in accordance with manufacturer's instructions

Brake fluid changed:

yes no

Coolant changed:

yes no

Date, stamp, signature

BMW

Annual Inspection

Performed in accordance with manufacturer's instructions

Brake fluid changed:

yes no

Coolant changed:

yes no

Date, stamp, signature

BMW

Annual Inspection

Performed in accordance with manufacturer's instructions

Brake fluid changed:

yes no

Coolant changed:

yes no

Date, stamp, signature

Confirmation of service

Odometer replaced

Odometer reading is not total distance covered.

Odometer reading _____

Date, stamp, signature

Odometer replaced

Odometer reading is not total distance covered.

Odometer reading _____

Date, stamp, signature

Odometer replaced

Odometer reading is not total distance covered.

Odometer reading _____

Date, stamp, signature

Odometer replaced

Odometer reading is not total distance covered.

Odometer reading _____

Date, stamp, signature

Your motorcycle is equipped with a digital electronic engine management system and a high-power ignition system.

WARNING

When the engine is running or the ignition is switched on, do not touch electrically live components, terminals or wiring.

– Risk of fatal accident
Work on the electrical system only when the circuit has been interrupted (ignition switched off). For greater safety, disconnect and insulate the negative battery lead.

If you intend to perform the maintenance and general care work described in the following section yourself, you must possess the necessary knowledge of technical matters and mechanical skills.

Your motorcycle is built to high technological standards. Special tools and purpose-designed diagnosis and testing equipment, together with the appropriate knowledge, are needed to keep your motorcycle in optimum working order.

Your authorized BMW motorcycle retailer possesses the necessary technical know-how and employs company-trained staff. They can guarantee that your motorcycle is always maintained in a fault-free technical condition.

Remember: the safety and reliability of your motorcycle are the most important considerations.

You should therefore not attempt any complex repair or maintenance tasks.

Keep to the specified Inspection and Service intervals.

BMW refuses to accept liability for damage or consequential damage due to repairs or service work performed by other than BMW-authorized workshops.

Technical modifications

WARNING

The data stored in the electronic engine management system is the result of extensive experimental and testing work.

Tampering with the electronic engine management system represents an increased safety risk for the rider.

NOTE

Manipulation of the electronic engine management system voids the warranty in all instances of damage consequential to such manipulation.

Technical modifications are only allowable to a limited extent.

Whenever you are planning such modifications, comply with all the legal requirements. The motorcycle must not infringe your national road-vehicle construction and use regulations.

Your authorized BMW motorcycle retailer will gladly advise you on technical requirements, the manufacturer's recommendations and the overall benefit likely to be obtained.

Genuine BMW parts

For reasons of safety, use only genuine BMW parts and accessories.

Genuine BMW parts are identical with those fitted to your motorcycle as original equipment.

BMW Motorrad refuses to accept any liability whatsoever for other-make spare parts and accessories.



- Vehicle toolkit under the seat

Contents

- 1 case
- 1 screwdriver, reversible blade
- 1 cross-head screwdriver, small
- 4 open-ended wrenches,
 - 8 x 10 mm (0.39 in),
 - 14 x 19 mm (0.75 in),
 - 15 mm (0.59 in),
 - 24 mm (0.94 in)
- 1 spark plug wrench
- 1 Allen key
 - 8 mm (0.31 in)
- 4 Torx screwdrivers T25, T30, T40, T45
- 4 fuses 4 A, 7.5 A, 10 A, 15 A
- 1 puller for fuses

Troubleshooting chart

Fault: Engine does not start or is very difficult to start

Possible cause	Remedy	See ➡ Page
Wrong ignition key position	Operation	Rider's Manual ➡ Chapter 1
Kill switch is off	Operation	Rider's Manual ➡ Chapter 3
Power supply interrupted	Blown fuse	➡ 42
Gear engaged, clutch not disengaged	Select neutral or pull clutch lever	Rider's Manual ➡ Chapter 3
Side stand extended and gear engaged	Select neutral or retract side stand	Rider's Manual ➡ Chapter 3
No fuel in tank	Refuel	Rider's Manual ➡ Chapter 2
Fuel pump not working	Blown fuse	➡ 42
Incorrect operation of twistgrip	Operation	Rider's Manual ➡ Chapter 3

Troubleshooting chart

Fault: Engine does not start or is very difficult to start

Possible cause	Remedy	See ➞ Page
Blocked air filter element	Replace	➞ 53
Spark plug defective/wet	Replace	➞ 54
Spark plugs/leads or caps wet	Dry	➞ 54
Insufficient battery charge	Recharge battery	➞ 49
Electronic engine management system not initialized	Ignition off, wait for 3 seconds, switch ignition on and wait until warning light for coolant temperature stops flashing	Rider's Manual ➞ Chapter 3

NOTE

It is advisable to have other faults – not described on pages 14 ...62 – attended to by a specialized workshop, preferably an authorized BMW motorcycle retailer.

NOTE

More detailed technical information is available in the following publications:

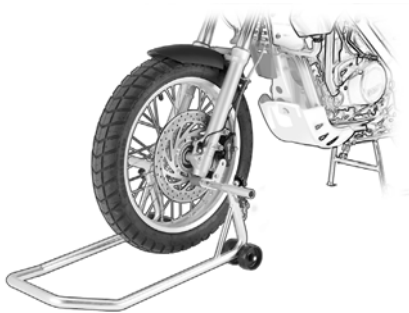
- Repair Manual
- Electrical circuit diagrams

Removing front wheel

2

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Maintenance and care



- Place the motorcycle on its main stand (Dakar: use auxiliary stand, BMW special tool number 00 1 610, or some other, suitable auxiliary stand)
 - Make sure the ground is level and firm.
- Raise the front wheel with front wheel stand, BMW special tool No. 36 3 970, or a suitable auxiliary stand

NOTE

Make sure that the front-wheel stand is set to the correct width and height.

CAUTION

When removing, avoid damage to brake pipes, brake disks, brake pads and the wheel rim (mask off with tape if necessary).

Do not scratch the rim when forcing back the brake pads or removing the calipers (apply masking tape if necessary).

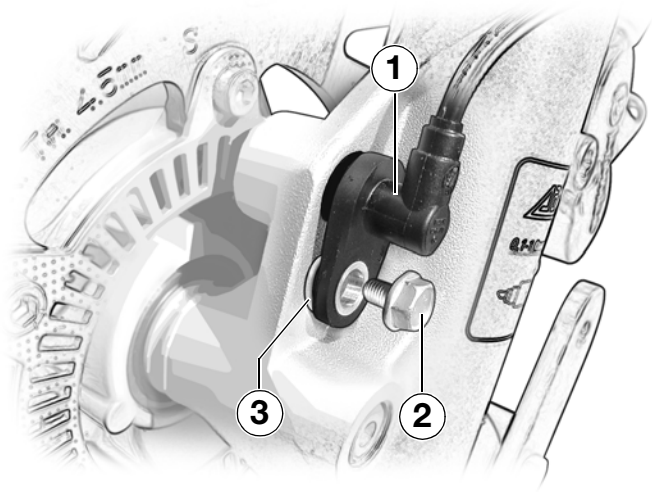
To prevent damage to the brake caliper and possible difficulty when assembling: never pull the brake lever when the brake calipers have been removed.

Motorcycle equipped with ABS^{OE}:

Do not damage the ABS sensor cable, the ABS sensor ring and the ABS sensor.

^{OE} Optional equipment

Removing front wheel



⚠ WARNING

Make sure that the motorcycle is standing firmly and cannot topple forward or to either side.

⚠ CAUTION

Remove ABS sensor^{OE} **1**, so that it cannot be damaged by the brake disk.

- Remove securing screw **2**, using 0.39 in (10 mm) open-ended wrench (➡ 17)

⚠ CAUTION

If a spacer **3** is installed to compensate component tolerances, make sure that it is reinstalled on reassembly.

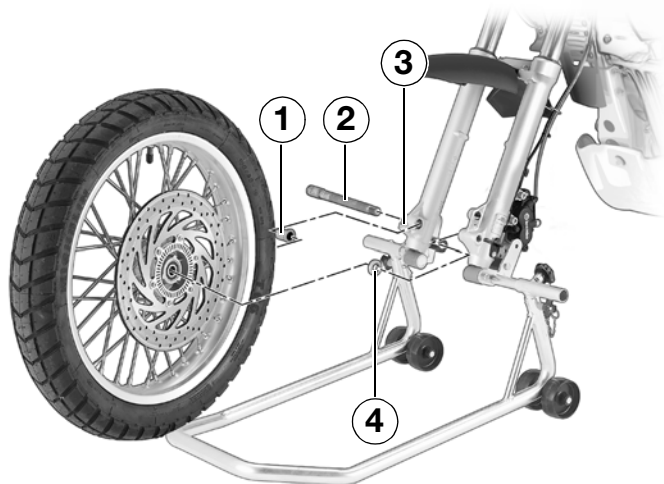
- Pull ABS sensor^{OE} **1** out of its bore in the front fork

Removing front wheel

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Maintenance and care



⚠ WARNING

Make sure that the motorcycle is standing firmly and cannot topple forward or to either side.

- Slacken axle clamp screw **3** with a Torx T25 bit (➡ 17)
- Remove quick-release axle **2** using 0.31 in (8 mm) Allen key (➡ 17)
- Roll the front wheel forward and out
- Remove spacer bushing **1** and spacer **4**

🔧 NOTE

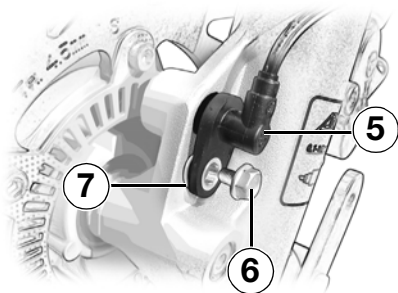
Check the brake pads (➡ 33) (have them replaced if necessary).

⚠ CAUTION

When setting down the front wheel, take care not to damage brake disks and the ABS sensor ring^{OE}. Keep dirt and moisture away from the wheel bearings.

^{OE} Optional equipment

Installing front wheel



NOTE

Note the installed position of the ABS sensor ring^{OE} or the direction-of-rotation arrow on the tire.

CAUTION

Do not damage the brake disk or pads when fitting the wheel. Motorcycle equipped with ABS^{OE}:

Do not damage the ABS sensor cable, the ABS sensor ring and the ABS sensor.

- Roll the front wheel between the forks and carefully position the brake disk in the brake caliper.

- Clean and grease spacer bushing **1** and spacer **4** and insert them into the wheel hub.

As viewed in forward direction of travel:

– left: spacer **4** on right:
spacer bushing **1** with collar toward the wheel hub

- Clean quick-release axle **2**, grease it and insert it from the right (raising the wheel slightly as necessary) and hand-tighten
- Insert ABS sensor^{OE} **5** until approx. 2/3 of its length are inside the bore
- Insert spacer **7** (if originally fitted)
- Install securing screw **6** and tighten to specified torque

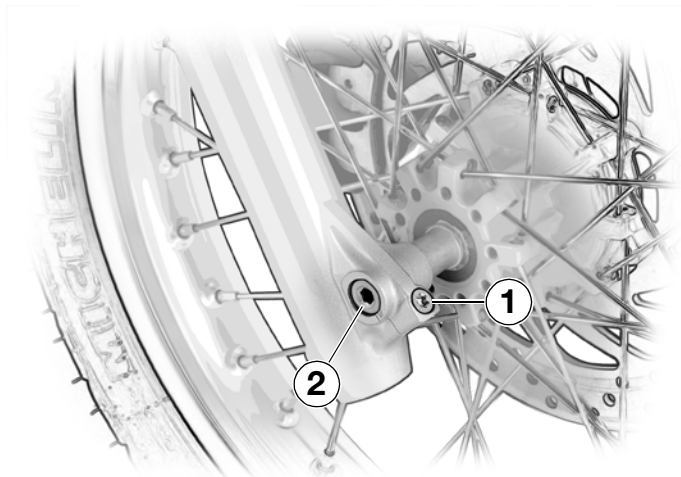
^{OE} Optional equipment

Installing front wheel

2

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Maintenance and care



- Remove front-wheel stand
- With the handbrake applied, compress the telescopic forks firmly several times
- Tighten quick-release axle **2** to the specified tightening torque
- Tighten axle clamping screws **1** to the specified tightening torque

CAUTION

Always have the security of the fasteners checked by a specialized workshop, preferably an authorized BMW motorcycle retailer.



Tightening torques

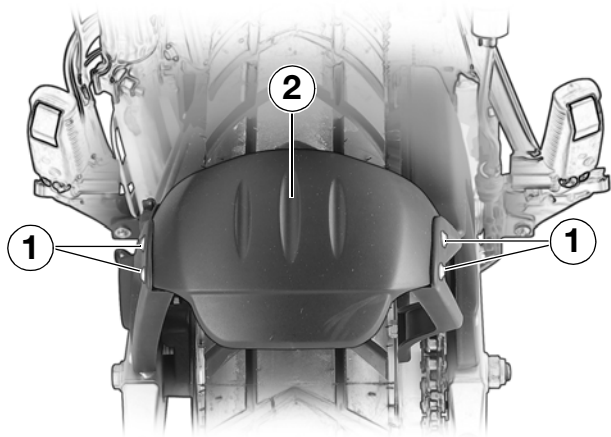
Quick-release axle **2** 45 Nm
Axle clamp screw **1** 23 Nm
Securing screw,
ABS sensor^{OE} 9 Nm

WARNING

When assembly work has been completed, pull the brake lever firmly several times to check that the front brake is operating correctly.

^{OE} Optional equipment

Removing rear wheel



CAUTION

Avoid damage to brake lines, disk and pads when removing the wheel.

Do not damage the ABS sensor cable^{OE}, ABS sensor ring^{OE} and the speedometer sensor.

Do not press the brake pedal down when the wheel is removed.

Keep dirt and moisture away from the wheel bearings.

WARNING

Make sure that the motorcycle is standing firmly and cannot topple forward or to either side.

- Place the motorcycle on its main stand (Dakar: use auxiliary stand, BMW special tool number 00 1 610, or some other, suitable auxiliary stand) – Make sure the ground is level and firm.
- Remove 4 retaining screws **1**
- Remove rear wheel cover **2**

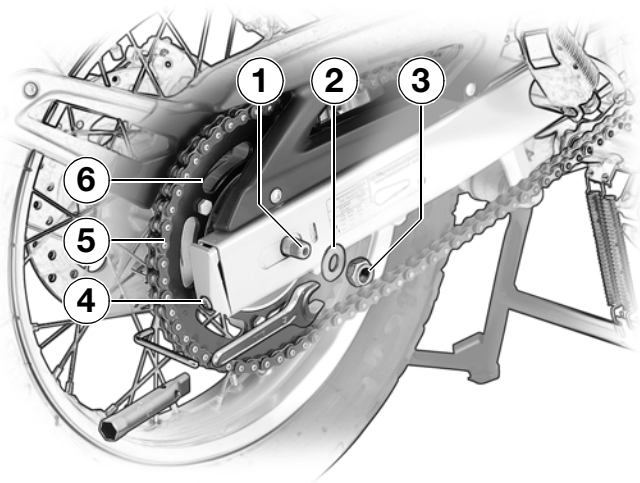
^{OE} Optional equipment

Removing rear wheel

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Maintenance and care



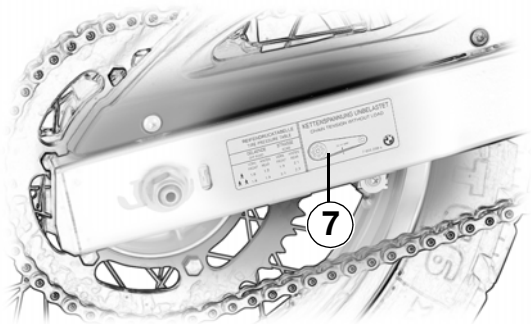
- Remove axle nut **3** using 0.94 in (24 mm) socket and spark-plug wrench as extension (➔ 17)
- Remove axle nut **3** with washer **2**
- Using Torx T45 bit, back off chain tensioning screws **4** on left and right a few turns
- Pull out quick-release axle **1**
- Lift chain **5** off sprocket **6**

- Hold the brake caliper and roll the wheel out toward the rear

⚠ CAUTION

Sprocket **6** sits loosely in the wheel. If the wheel is laid down, make sure that the brake disk and sprocket are not damaged. Do not damage the ABS sensor cable^{OE}, ABS sensor ring^{OE} and the speedometer sensor

^{OE} Optional equipment



CAUTION

When tensioning the chain, note correct wheel alignment (marks on swinging fork arms). To avoid damaging the chain or more extensive damage, always adjust the chain so that it has the correct amount of slack.

Do not damage the brake disk or pads when fitting the wheel. Do not damage the ABS sensor cable^{OE}, ABS sensor ring^{OE} and the speedometer sensor.

- Roll the rear wheel between the rear swinging arm forks and carefully position the brake disk in the brake caliper.
- Lift chain **5** onto sprocket **6**
- Grease quick-release axle **1** and insert it
- Install axle nut **3** with washer **2** and hand-tighten
- Set chain tensioning screws **4** on left and right such that chain sag is correct (setting \rightarrow 31) as stated on label **7**

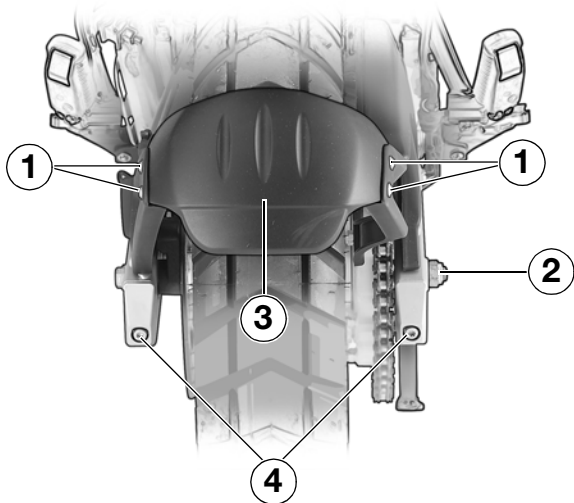
^{OE} Optional equipment

Installing rear wheel

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Maintenance and care



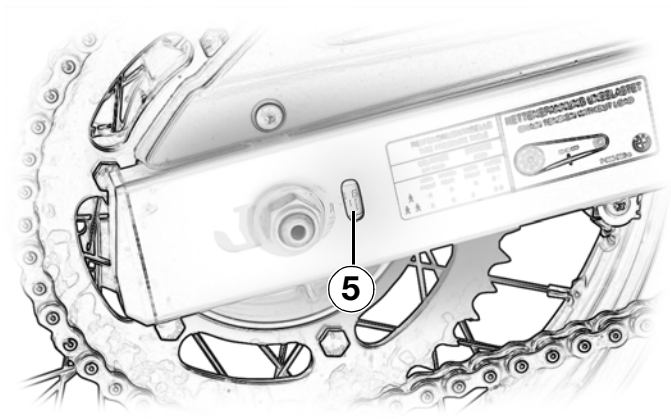
- Make sure that the same number of notches has been reached at marking point **5** on the left and right swinging fork arms
- Tighten axle nut **2** to the specified tightening torque
- Tighten chain tensioning screws **4** to the specified tightening torque

⚠ WARNING

Screws 1 of rear wheel cover are secured with Loctite. Before reinstalling, clean the screw threads and coat them with Loctite No. 243.

- Install rear wheel cover **3** with four securing screws **1**
- Tighten securing screws **1** to specified torque

Installing rear wheel



CAUTION

Always have the security of the fasteners checked by a specialized workshop, preferably an authorized BMW motorcycle retailer.



Tightening torque:

- Axle nut **3** 100 Nm
- Chain tensioning screws **4** 10 Nm
- Rear wheel cover 3 Nm

WARNING

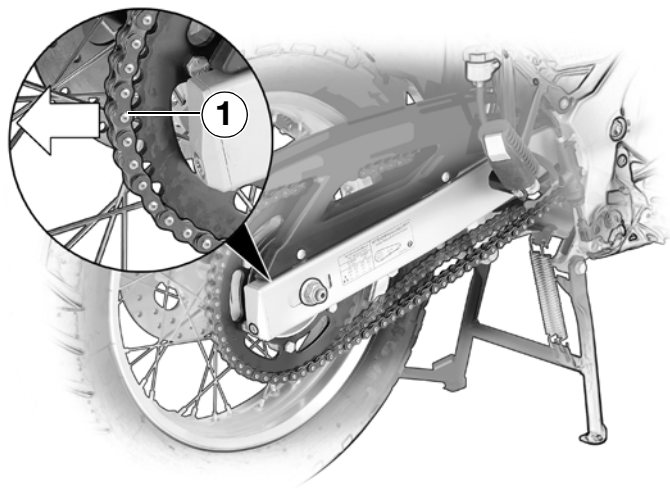
When assembly work has been completed, depress the brake pedal firmly several times to check that the rear brake is operating correctly.

Checking chain

2

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Maintenance and care



Checking chain for wear

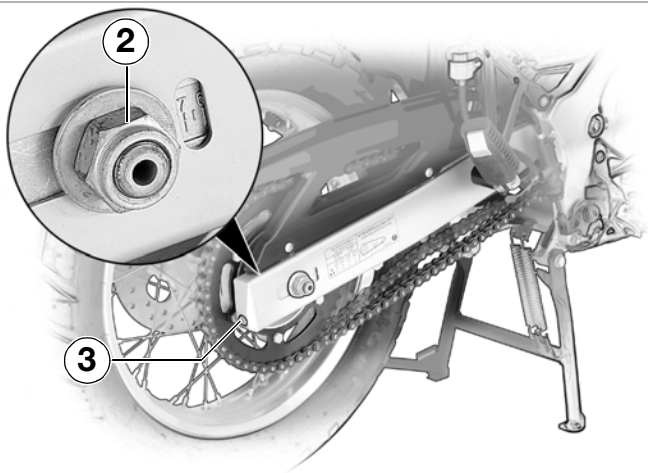
CAUTION

Always replace the chain, chainwheel and sprocket as a complete set.

- Place the motorcycle on its main stand [Dakar: side stand]
 - Make sure the ground is level and firm.
- Grip the chain at the rearmost point of sprocket **1** and pull the chain to the rear, away from the sprocket

- It should not be possible to lift the chain clear of the points of the sprocket teeth
- If the chain can be pulled clear of the points, replace the chain, sprocket and pinion

Have the chain, sprocket and pinion replaced by a specialized workshop, preferably an authorized BMW motorcycle retailer.



Adjusting chain

CAUTION

When tensioning the chain, note correct wheel alignment (notches in swinging fork arms). To avoid damaging the chain or more extensive damage, always adjust the chain so that it has the correct amount of slack.

Always make sure that there is no load on the motorcycle when you check the chain.

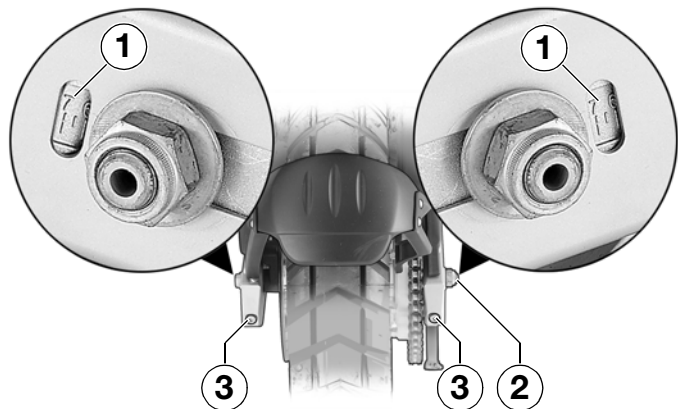
- Place the motorcycle on its main stand [Dakar: side stand]
 - Make sure the ground is level and firm.
- Slacken axle nut **2** using 0.94 in (24 mm) socket and spark-plug wrench as extension (► 17)
- Using Torx T45 bit, set chain tensioning screws **3** on left and right such that chain sag is 1.38...1.78 in (35...45 mm) [Dakar: 1.57...1.97 in (40...50 mm)] as stated on the label

Adjusting chain

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Maintenance and care



- Make sure that the same number of notches has been reached at marking point **1** on the left and right swinging fork arms
- Tighten axle nut **2**
- Tighten chain tensioning screws **3**

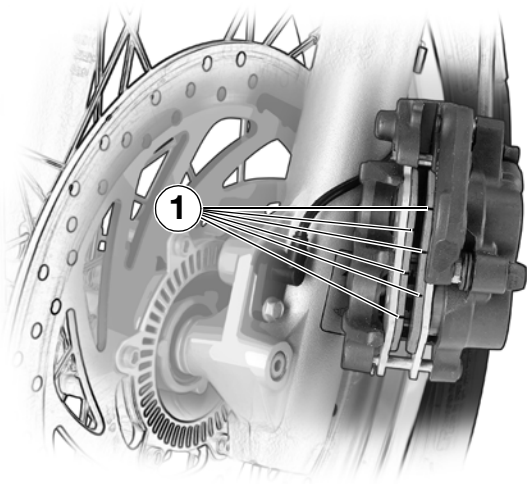
⚠ CAUTION

Always have the chain tension and the security of the fasteners checked by a specialized workshop, preferably an authorized BMW motorcycle retailer.



Tightening torques

Axle nut **2** 100 Nm
Chain tensioning screws **3** 10 Nm



Front brake

CAUTION

Have brake pads replaced before the minimum allowable thickness is reached.

NOTE

For your safety, we recommend having work on the brake system performed by a specialized workshop, preferably an authorized BMW motorcycle retailer.

- Visually inspect the brake pads from in front
- Check brake pad thickness

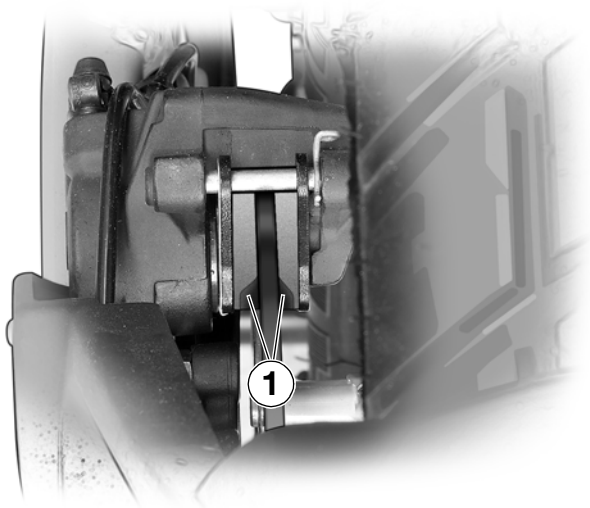
Minimum pad thickness:
Wear indicating marks 1 must be clearly visible on the pads.
– If the wear indicating mark is no longer clearly visible:
have the brake pads replaced by a specialized workshop, preferably an authorized BMW motorcycle retailer.

Checking brake pads

2

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Maintenance and care



Rear brake

CAUTION

Have brake pads replaced before the minimum allowable thickness is reached.

NOTE

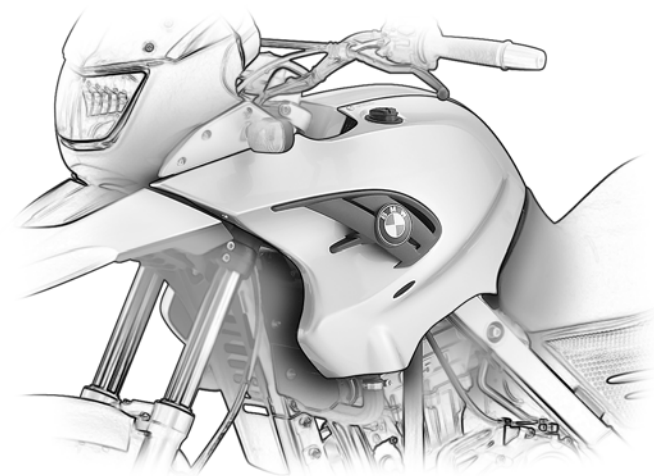
For your safety, we recommend having work on the brake system performed by a specialized workshop, preferably an authorized BMW motorcycle retailer.

- Visually inspect from behind and above

- Check brake pad thickness

Minimum pad thickness:
Angled wear indicating mark 1 must be clearly visible on the pads.

- If the wear indicating mark is no longer clearly visible:
have the brake pads replaced by a specialized workshop, preferably an authorized BMW motorcycle retailer.



▲ CAUTION

Use only nitrite-free antifreeze and corrosion inhibitor.

Check coolant level only when the engine is cold.

Top up the fluid in the expansion tank only if the loss of coolant is minor.

Mixing ratio:

- 50% antifreeze
- 50% water

Frost protection down to:
-25 °C (-13 °F)

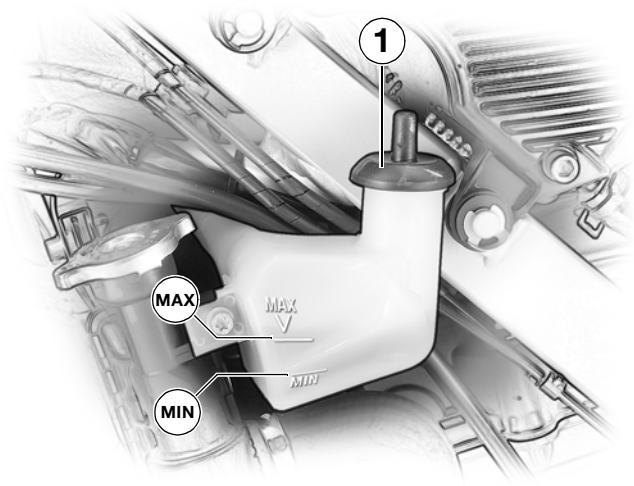
- Place the motorcycle on its main stand [Dakar: side stand]
 - Make sure the ground is level and firm.
- Remove the seat (➡ Rider's Manual)
- Remove the left side panel (➡ 44-45)

Adding coolant

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Maintenance and care



- Recheck the coolant level; correct if necessary
- Reinstall the cap of the expansion tank

NOTE

Engine cold: do not top up the coolant past the **MIN** mark

- Remove cap **1** from filler neck
- Top up coolant to **MIN** mark
- Place motorcycle on main (center) stand or hold it upright

NOTE

It is advisable to have the coolant changed by a specialized workshop, preferably your authorized BMW motorcycle retailer.

Your motorcycle is equipped with a digital electronic engine management system and a high-power ignition system.

WARNING

Work on the electrical system only when the circuit has been interrupted (ignition and lights switched off). For greater safety, disconnect and insulate the negative battery lead.

When the engine is running or the ignition is switched on, do not touch electrically live components, terminals or wiring.

– Risk of fatal accident

CAUTION

Your motorcycle has one bulb for the low-beam /high-beam headlight, one for the parking light, one for the brake light and one for the rear light, plus four bulbs for the turn indicators. If any of these bulbs should fail, you may have problems in seeing and being seen.

You should therefore always carry spare bulbs on the motorcycle.

NOTE

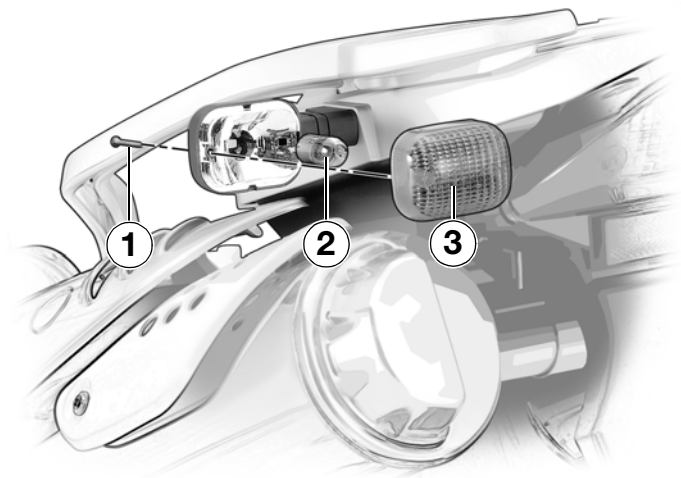
Do not touch the glass of new bulbs with your fingers. Use a clean, dry cloth to hold the bulbs when inserting them. Dirt deposits, in particular oil and grease, interfere with heat radiation from the bulb. This leads to overheating and shortens the bulb's operating life.

Changing bulbs

2

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Maintenance and care



Turn indicators

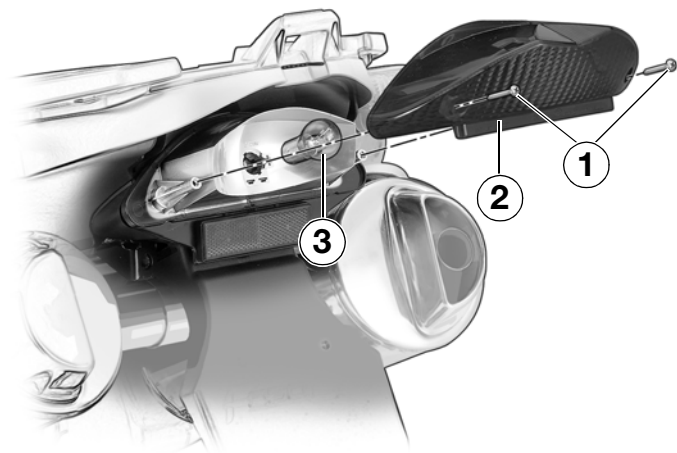
CAUTION

Switch off the ignition before changing a bulb.

NOTE

Avoid touching the glass of new bulbs with your fingers. Use a clean, dry cloth to hold the bulbs when inserting them.

- Place the motorcycle on its main stand [Dakar: side stand]
 - Make sure the ground is level and firm.
- Remove securing screw **1**
- Remove turn indicator glass **3**
- Press bulb **2** back, turn it counter-clockwise to disengage it and remove
- Installation is the reverse of the removal procedure
 - Bulbs for front/rear turn indicators:
12 V 10 W



Tail light/brake light

NOTE

The rear light is also the license plate light.

CAUTION

Switch off the ignition before changing a bulb.

NOTE

Avoid touching the glass of new bulbs with your fingers. Use a clean, dry cloth to hold the bulbs when inserting them.

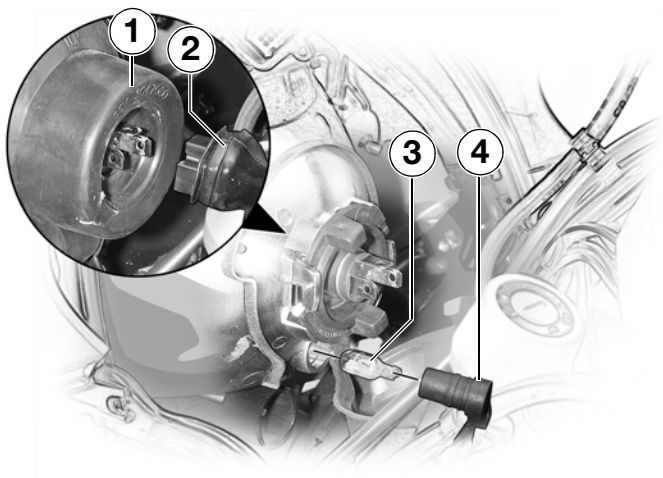
- Place the motorcycle on its main stand [Dakar: side stand]
 - Make sure the ground is level and firm.
- Remove retaining screws **1**
- Remove rear light glass **2**
- Press bulb **3** back, turn it counter-clockwise to disengage it and remove
- Installation is the reverse of the removal procedure
 - Brake/rear light bulb:
12 V 21/5 W

Changing bulbs

2

40

Maintenance and care



Parking light

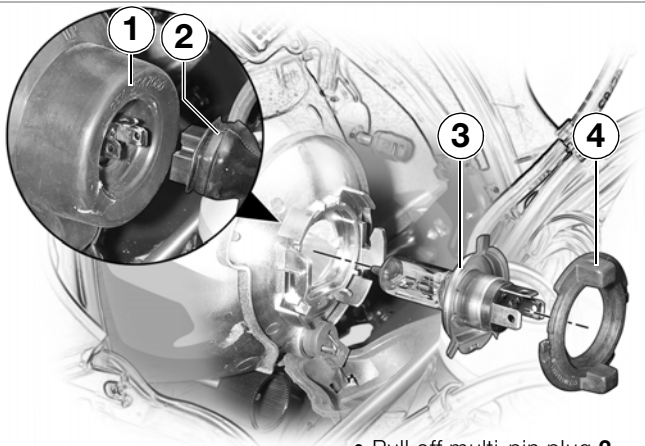
CAUTION

Switch off the ignition before changing a bulb.

NOTE

Avoid touching the glass of new bulbs with your fingers. Use a clean, dry cloth to hold the bulbs when inserting them.

- Place the motorcycle on its main stand [Dakar: side stand]
 - Make sure the ground is level and firm.
- Pull off multi-pin plug **2**
- Pull the rubber sleeve **1** to the rear to remove
- Pull bulb holder **4** to the rear and out of the headlight housing
- Pull bulb **3** out of bulb holder **4**
- Installation is the reverse of the removal procedure
 - Parking light bulb: **12 V 5 W**



High-beam/low-beam headlight

CAUTION

Switch off the ignition before changing a bulb.

NOTE

Avoid touching the glass of new bulbs with your fingers.

Use a clean, dry cloth to hold the bulbs when inserting them.

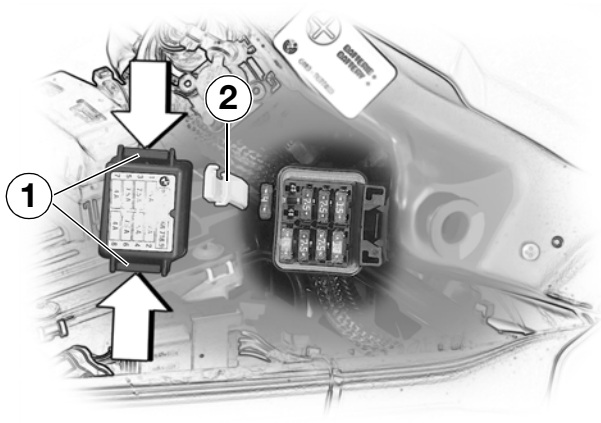
- Place the motorcycle on its main stand [Dakar: side stand]
 - Make sure the ground is level and firm.

- Pull off multi-pin plug **2**
- Pull rubber sleeve **1** to the rear to remove
- Turn retainer **4** counter-clockwise to disengage
- Remove bulb **3**
- Installation is the reverse of the removal procedure
 - Low/high beam headlight bulb: **H4 12 V 55/60 W**

NOTE

The retainer is easy to install if you hold it in the correct position.

- Insert: at approx. 11 o'clock position
- Lock: by turning to 12 o'clock position



Changing fuses

- Place the motorcycle on its main stand [Dakar: side stand]
 - Make sure the ground is level and firm.
- Remove the seat
- Squeeze clips **1** together and remove the cover of the fuse box
- Use puller **2** (► 17) to remove the blown fuse from its socket
- Insert a new fuse of the correct rating
- Close the fuse box lid
- Close and lock the seat

CAUTION

Before changing a fuse, switch off the ignition.

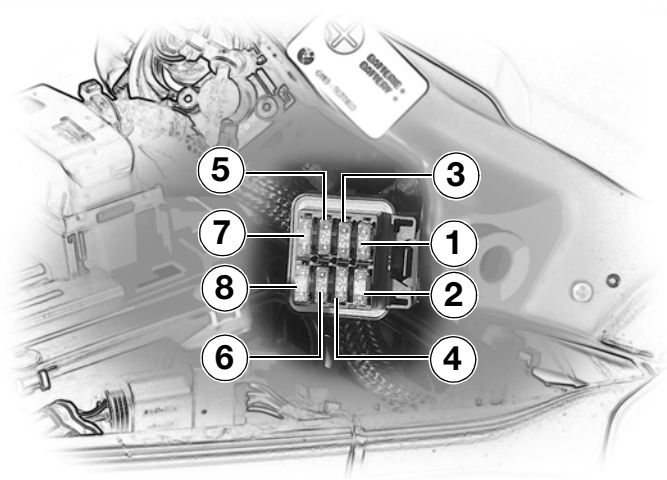
Never attempt to repair a blown fuse – risk of fire

For this reason, always carry a number of spare fuses in the toolkit (► 17).

Use only fuses of the specified rating and type.

NOTE

It is advisable to have the electrical system checked by a specialized workshop, preferably an authorized BMW motorcycle retailer, if fuses blow frequently.



Equipment connected to fuses

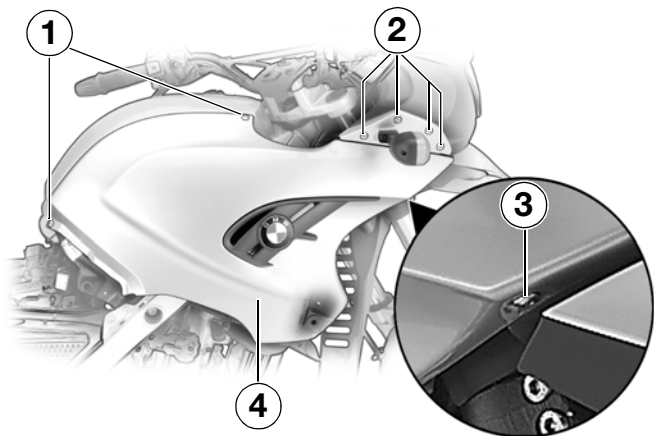
- | | |
|---|---|
| 1 Engine electronics 15 A | |
| 2 Instrument panel,
on-board socket,
diagnosis plug,
OA plug 10 A | |
| 3 Horn,
headlight flasher 7.5 A | |
| 4 Low-beam headlight .. 7.5 A | 6 Brake light,
turn indicators,
instrument panel,
instrument lighting 7.5 A |
| 5 High-beam headlight 7.5 A | 7 Parking light, tail light... 4 A |
| | 8 Heated handlebar grips 4 A |

Side panel

2

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Maintenance and care



Removing and installing side panel

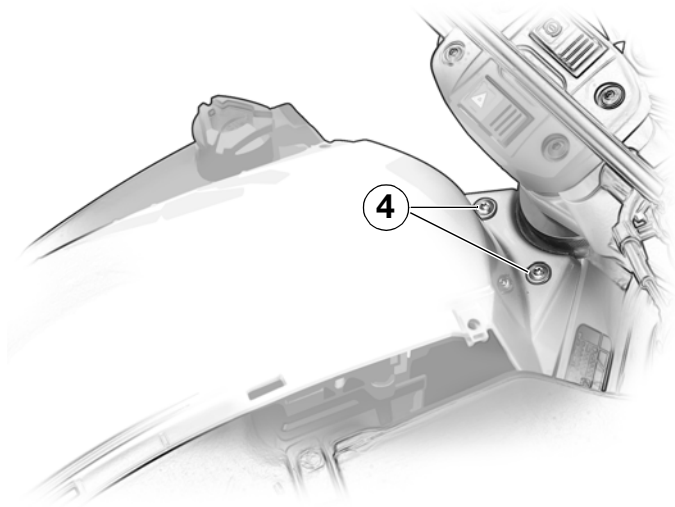
- Place the motorcycle on its main stand [Dakar: side stand]
 - Make sure the ground is level and firm.
- Remove the seat
(➔ Rider's Manual, Chapter 1)

Removing right side panel

- Remove the four securing screws **2** holding the turn indicator
- Remove 2 retaining screws **1**
- Slacken securing screw **3**
- Pull right side panel out of locator **4** at bottom and lift it clear of the center panel at the top

Installing right side panel

- Installation is the reverse of the removal procedure



Removing and installing left side panel

NOTE

The procedure for removing and installing the left side panel is analogous to that for the right side panel.

Remove the oil filler plug before removing the left side panel.

When installing the left side panel, note the air duct of the oil tank.

Removing and installing center panel

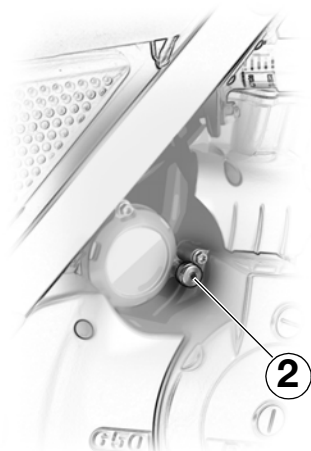
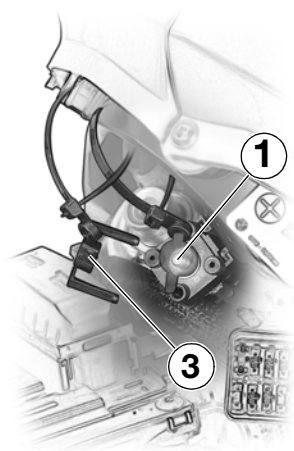
- Remove the remaining two securing screws **4**
- Remove the center panel
- Installation is the reverse of the removal procedure

Jump starting

2

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Maintenance and care



Battery adapter points

BMW calls an easily accessible battery positive terminal **1** and a defined grounding point **2** the battery adapter points.

The battery adapter points make it easy to recharge the battery and are also convenient for jump starting.

CAUTION

Never establish a direct connection between battery positive terminal **1** and earth (frame/drive).

– Risk of short-circuit

Jump starting

Do not use proprietary start-assist sprays to start the engine.

Use only jump leads fitted with fully insulated crocodile clips at both ends for jump starting.

CAUTION

If you switch on the ignition and the indicator lights fail to light up, the battery is completely flat. In this case, do not attempt to jump-start the motorcycle: recharge the battery instead. Risk of damaging the control units.

CAUTION

Do not attempt to jump-start the motorcycle using the on-board socket

– Risk of fire

The wires leading to the power socket do not have a load-capacity rating adequate for jump-starting the engine.

CAUTION

Make sure that the battery of the other vehicle has a voltage rating of 12 V

- On the BMW, battery adapter points **1** and **2** are the connection points for jump starting
 - Remove protective cap **3** from the positive terminal
 - Connect one end of a jump lead to positive terminal **1** of the discharged battery, and the other end to the positive terminal of the donor battery
 - Connect one end of the second jump lead to the negative terminal/grounding point of the donor battery and the other end to negative terminal/grounding point **2** of the discharged battery
 - Start the engine of the donor vehicle and allow it to run at fast idle
 - Start the engine of the vehicle with the discharged battery in the usual way
 - Allow both engines to idle for a few minutes
 - Disconnect the jump leads by reversing the connection sequence, and reinstall cap **3** on the positive terminal
- Switch off the ignition systems of both vehicles
 - Switch off all electrical consumers on both vehicles

Battery safety instructions

WARNING

Battery acid is highly caustic. Do not allow it to contact the eyes, face, hands, clothing or paint work.

KEEP OUT OF REACH OF CHILDREN

Never create sparks or bring a naked flame or a glowing cigarette near the battery. Batteries generate explosive gases.

Charge batteries only in well-ventilated areas. Be sure to open the plugs of all the battery cells.

WARNING

Always wear protective goggles and protective gloves when performing work associated with the battery.

If anyone comes into contact with battery acid or is exposed to toxic fumes from the battery, have them examined by a physician without delay.

First aid prior to treatment by a physician:

- Contact with skin: rinse with plenty of clean water
- Acid swallowed: victim must drink plenty of water or milk (into which a raw egg should be stirred). Do not cause the victim to vomit.
- Eyes attacked by battery acid or fumes from battery: Rinse the eyes out several times with plenty of clean water. The eyelid should be held open while doing so.
- Thoroughly rinse clothing wetted by battery acid immediately with water

If the motorcycle is to be stored for a lengthy period:

- Check battery acid level
- Store the battery in a cool, dry room

CAUTION

If the battery is not recharged at regular intervals while out of use it will self-discharge until it is completely flat, in which case the guarantee is voided.

- Trickle-charge the battery from time to time during the storage period
- The battery can be recharged with the BMW battery trickle charger^{OA}.
- Charge the battery prior to lay-ups and before returning to use – always comply with the instructions for charging.
- In case of doubt ask a specialist, preferably an authorized BMW motorcycle retailer, to prepare the vehicle for storing and to carry out the necessary battery maintenance and storage

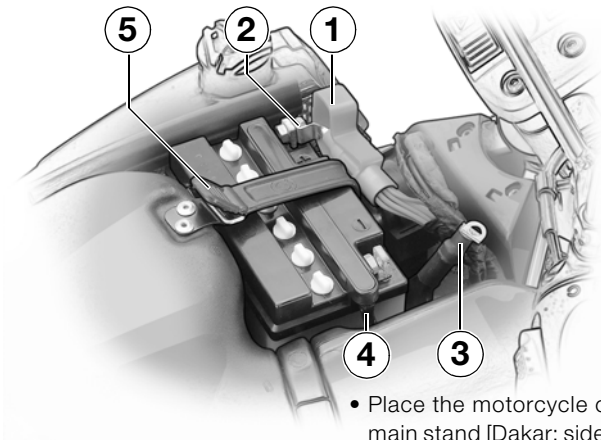
^{OA} Optional accessory

Removing battery

2

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Maintenance and care



⚠ WARNING

Do not damage cables and hoses when removing.

Before disconnecting the battery, switch off the ignition.

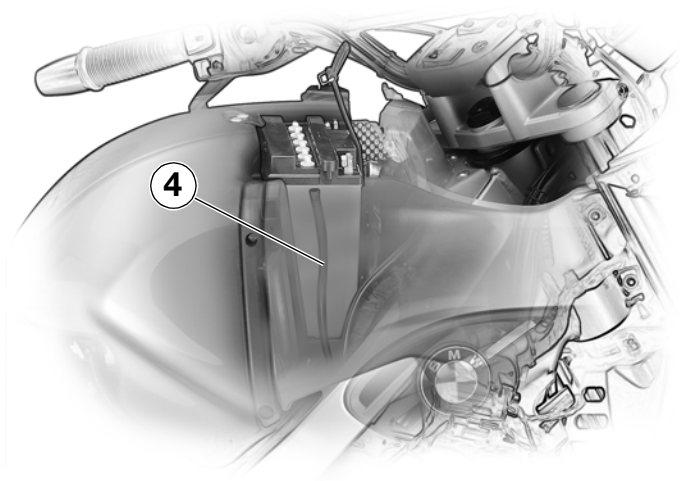
To avoid short-circuits:

- Disconnect **negative** battery lead (-) **3** first,
- then **positive** battery lead (+) **2**.

⚠ WARNING

Do not, under any circumstances, set the battery on the motorcycle.

- Place the motorcycle on its main stand [Dakar: side stand] – Make sure the ground is level and firm.
- Remove the seat
- Remove the side panel (➔ 44-45)
- Disconnect battery breather hose **4**
- Disconnect **negative** battery lead **3** and swing it away from the **negative** post of the battery or insulate it
- Push aside protective cap **1** for the positive terminal of the battery
- Disconnect **positive** battery lead **2**
- Release battery retaining strap **5**
- Take out the battery



⚠ WARNING

Before connecting the battery, make sure the ignition is switched off.

To avoid short-circuits:

- Connect positive battery lead (+) 2 first
- Seat protective cap 1 on the battery positive terminal
- Never install the battery without the protective cap
- Connect negative battery lead (-) 3

⚠ CAUTION

Make sure that breather hose 4 for the battery is routed free of kinks and is not clogged.

- Grease the battery posts
- Installation is the reverse of the removal procedure
- Install the side panel (➡ 44-45)
- Install the seat



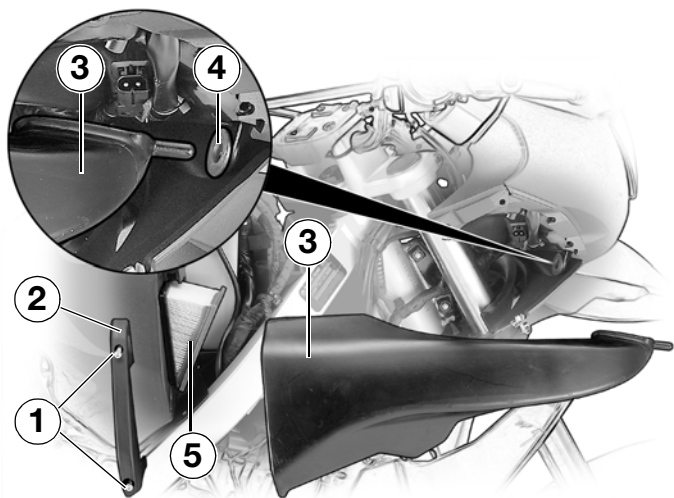
- Check the acid level at the MIN/MAX marks
MAX UPPER mark
MIN LOWER mark
- Top up with distilled water only as far as the **MAX** (UPPER) mark

Checking battery acid level

- Check the level of acid in the battery every three months or more frequently if ambient temperatures are high
- Remove the side panel (➡ 44-45)

⚠ CAUTION

Do not set the battery on the motorcycle when you are topping up the acid level. Use only distilled water: do not top up with battery acid.



- Place the motorcycle on its main stand [Dakar: side stand] – Make sure the ground is level and firm.
- Remove the seat
- Remove the right side panel (➔ 44-45)
- Remove two securing screws **1**
- Pull bow **2** of the connecting flange off intake stub **3**
- Pull intake stub **3** out of the connecting flange and front holder **4**
- Pull air filter element **5** out of the air filter housing
- Place the new filter element in position inside the air filter housing
- From this point on, installation is the reverse of the removal procedure

NOTE

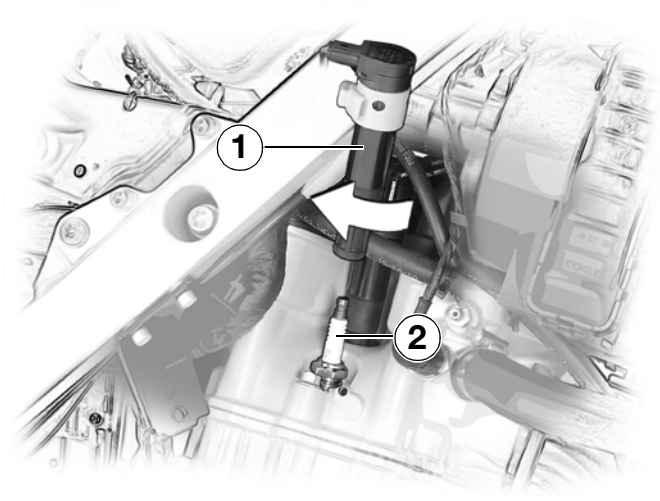
When installing intake stub **3**, begin by slipping the projection into front holder **4**.

Your motorcycle is equipped with a digital electronic engine management system and a high-power ignition system.

WARNING

When the engine is running or the ignition is switched on, do not touch electrically live components, terminals or wiring.

- Risk of fatal accident
- **Work on the electrical system only when the circuit has been interrupted (ignition and lights switched off). For greater safety, disconnect and insulate the negative battery lead.**



Changing secondary spark plug

- Turn direct ignition coil **1** as far as it will go clockwise (arrow)
- Pry direct ignition coil **1** up and off, using 0.59 in (15 mm) open-ended wrench (► 17)
- Remove spark plug **2**, using spark plug socket wrench (► 17)
- Installation is the reverse of the removal procedure

CAUTION

The direct ignition coils have different color codes: take care not to mix them up. Direct ignition coil of the primary spark plug: black
secondary spark plug: white



Tightening torques

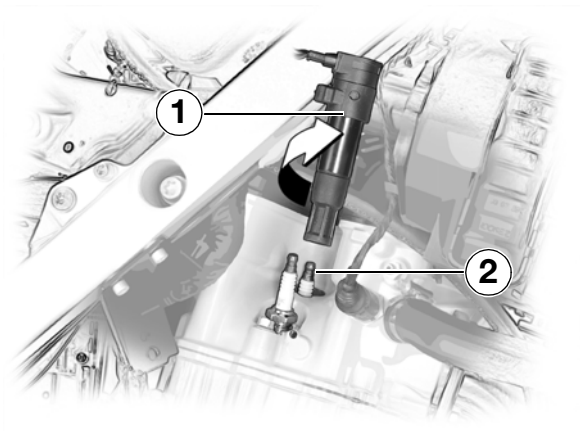
Secondary spark plug **2** 20 Nm

Spark plugs

2

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Maintenance and care



Changing primary spark plug

⚠ CAUTION

In order to prevent foreign matter from entering the combustion chamber, allow the secondary spark plug to remain in the cylinder head.

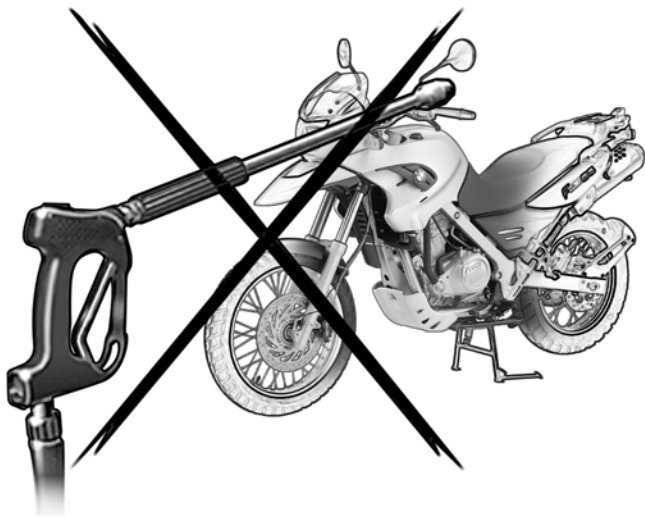
The direct ignition coils have different color codes: take care not to mix them up. Direct ignition coil of the primary spark plug: black
secondary spark plug: white

- Remove the direct ignition coil of the secondary spark plug
- Turn direct ignition coil **1** as far as it will go counter-clockwise (arrow)
- Pry direct ignition coil **1** up and off, using 0.59 in (15 mm) open-ended wrench (➡ 17)
- Remove spark plug **2**, using the spark plug socket wrench and extension (➡ 17)
- Installation is the reverse of the removal procedure



! Tightening torques

Primary spark plug **2** ... 20 Nm



▲ CAUTION

Do not use aggressive or penetrating cleaning agents or solvents, as they would cause damage to rubber and plastic parts.

Do not use a steam jet or high-pressure cleaning equipment. High water pressure can damage seals, the hydraulic brake system or the complete electrical system.

NOTE

Correct and regular cleaning is an important factor in maintaining the value of your motorcycle.

It also ensures that safety-relevant parts remain in full working order.



Washing motorcycle

⚠ WARNING

After cleaning and before starting a journey, always test the brakes.

- Place the motorcycle on its main stand [Dakar: side stand] – Make sure the ground is level and firm.
- Apply a mild cleaning agent to the wheels, engine block and swinging arm, in accordance with the manufacturer's instructions
- Thoroughly dry all wet surfaces
- Do not use solvents or cleaning products on the instrument group, switches or windshield
- Do not scratch the windshield.
- Remove tar splashes only with an approved product – rinse thoroughly with water afterwards.
- Clean dead flies and other insects or similar dirt deposits off the fork stanchions.
- Treat painted and chrome-plated surfaces regularly with the approved care products.



Removing road salt

- Wash the motorcycle down immediately with cold water at the end of the journey.

NOTE

Do not use warm water – this aggravates the effect of the salt.

- Thoroughly dry the motorcycle.
- Apply a wax-based corrosion inhibiting product to chrome-plated parts.
- After cleaning and drying the fairing and trim panels, apply a recommended wax polish.

Cleaning windshield

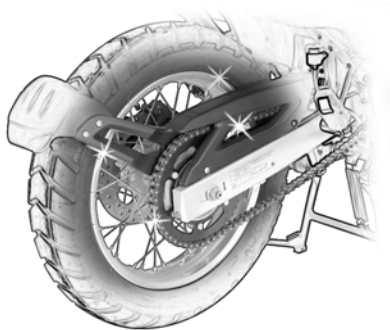
- Remove dirt and dead insects with a soft sponge and plenty of water

NOTE

Soften stubborn dirt or insects by soaking with a wet paper towel.

CAUTION

Do not use cleaning agents. Fuel or chemical solvents attack the windshield material.



Care of chain

- Regularly apply a spray lubricant to the chain; spray lubricants are available from your authorized BMW motorcycle retailer.

Care of muffler

- Changes in the appearance of the exhaust system during operation or as a result of environmental influences can be treated with a polish available from your authorized BMW motorcycle retailer.

Repairing damage to the paint work

- Minor damage caused by stones striking the painted surface can be touched up with a BMW touch-up pencil of the correct color

CAUTION

Comply with the manufacturer's working instructions and safety precautions.

NOTE

The correct color is stated on a label under the seat. It is advisable to have more extensive paint damage repaired by your authorized BMW motorcycle retailer.



Storing

- Clean the motorcycle (➡ 58)
- Remove the battery (➡ 50) comply with the maintenance instructions (➡ 49).
- Spray the brake and clutch lever pivots and the main and side stand pivots with a suitable lubricant
- Coat bright metal/chrome-plated parts with an acid-free grease (e.g. Vaseline)
- Place the motorcycle on its center stand in a dry place
- Support it under the engine so that both wheels are clear of the ground.

NOTE

Before storing the motorcycle, it is advisable to have the engine oil changed by your authorized BMW motorcycle retailer. Work needed in conjunction with storing or returning to use can best be combined with the Service or Inspection work performed when due by the authorized BMW motorcycle retailer.



Returning to use

- If necessary, remove protective wax coating
- Clean the motorcycle (➡ 58)
- Install a charged battery (➡ 51)
- Coat the battery terminals with grease suitable for battery posts
- Check/correct tire pressures (➡ Rider's Manual, Chapter 2)
- Check brakes (➡ Rider's Manual, Chapter 2)
- Run all safety checks (➡ Rider's Manual, Chapter 2)

	F 650 GS [37 kW]	F 650 GS [25 kW]
Type	Liquid-cooled single-cylinder four-stroke engine with 4 valves with bucket tappets, 2 overhead camshafts, dry-sump lubrication	
Displacement	652 cc	652 cc
Maximum rated output in accordance with DIN 70 020		
	37 kW	25 kW
	50 hp	34 hp
at engine speed	6,500 rpm	5,500 rpm
Maximum torque	60 Nm	51 Nm
at engine speed	4,800 rpm	4,000 rpm
Allowable speeds		
Maximum engine speed	7,400 rpm	7,400 rpm
Idle speed	1,500 rpm	1,500 rpm
Bore/stroke	3.94/3.27 in (100/83 mm)	3.94/3.27 in (100/83 mm)
Compression ratio	11.5 : 1	11.5 : 1
F 650 GS		
Fuel grade	Regular unleaded fuel to DIN 51607 or equivalent standard, min. octane number 91 (RON) or 81 (MON)	
Tank capacity (usable)	4.57 gal (17.3 l), including 1 gal (4 l) reserve	
Fuel consumption		
constant 90 km/h (55 mph)	73.5 mpg (3.2 l/100 km)	
constant 120 km/h (75 mph)	54.7 mpg (4.3 l/100 km)	

Power train

F 650 GS

Clutch	Multi-plate clutch running in oil bath
Primary transmission	$37/72 = 1:1.946$
Transmission	5-speed, with claw-action shift, integrated into engine block
Gear ratios in the transmission	1st gear = 2.75 2nd gear = 1.75 3rd gear = 1.31 4th gear = 1.05 5th gear = 0.88
Transmission from transmission to rear wheel drive	Secondary drive with O-ring chain 5/8 x 1/4
Number of chain links	112
Rear wheel drive	
Final drive ratio (pinion/sprocket)	$16/47 = 1:2.938$

Frame and suspension

F 650 GS

Frame

Bridge-type frame with bottom rail

Location
of type plate

On top rail of main frame, right

Location
of vehicle identification
number (VIN)

On right of steering head

Front brake

Hydraulically actuated single-disk
brake with 2-piston floating caliper

Rear brake

Hydraulic disk brake with
1-piston floating caliper

Frame and suspension

F 650 GS

Suspension

Front	Telescopic fork with stabilizer
Total suspension travel	6.69 in (170 mm)
Dakar version	8.27 in (210 mm)
Fixed tube diameter	1.61 in (41 mm)
Rear	Central suspension strut pivoted to lever system. Spring base point and rebound-phase damping continuously adjustable.
Total suspension travel (at wheel)	6.50 in (165 mm)
Dakar version	8.27 in (210 mm)
Swinging fork	Box swinging fork on each side.
Swinging arm length	22.20 in (564 mm)
Steering lock angle	40°
Front wheel castor	
in normal-load position (with rider)	4.45 in (113 mm)

Frame and suspension

Wheels and tires

F 650 GS

F 650 Dakar

Spoked wheel

NOTE

You can obtain detailed information on approved tire sizes and makes from your authorized BMW motorcycle retailer or by visiting www.bmw-motorrad.com on the Internet

Front wheel

Size and designation	2.50" x 19" MT	1.6" x 21"
Tire size and designation	100/90-19	90/90-21

Rear wheel

Size and designation	3.00" x 17" MT	
Tire size and designation	130/80 R 17	130/80-17

Tire pressures (tires cold)

One-up	Front	27.56 psi (1.9 bar)
	Rear	30.46 psi (2.1 bar)
Fully loaded	Front	30.46 psi (2.1 bar)
	Rear	33.36 psi (2.3 bar)

Recommended minimum tire tread depth

Front wheel	0.08 in (2 mm)
Rear wheel	0.12 in (3 mm)

WARNING

Comply with local legal requirements concerning minimum tread depth.

Fuel and lubricants

F 650 GS

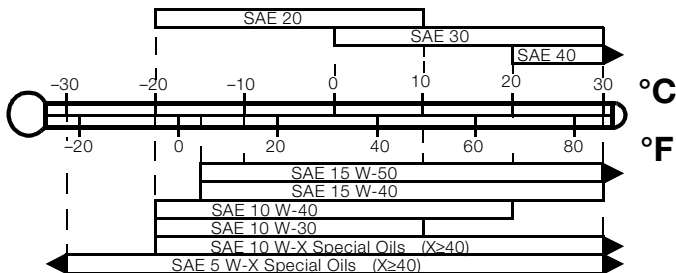
Engine oil

Brand-name HD oil of API classification SF, SG or SH; CD or CE amendments are permissible; or brand-name HD oil of CCMC classification G4 or G5; amendment PD2 is permissible.

3

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Technical data



The viscosity class depends on outside temperatures. Temperatures above or below the limits quoted for the individual SAE classifications are allowable for brief periods only. All engine oils supplied by BMW are subject to regular BMW quality assurance checks. BMW does not approve the use of any upper-cylinder lubricants or similar oil additives.

Engine capacities

With filter change 2.3 l

Maximum oil consumption 2,352 US miles/gal
(1 l/1000 km)

CAUTION

Do not use synthetic oils.

F 650 GS

Telescopic fork oil

Approved grades	BMW telescopic fork oil
Refill after disassembly	0.64 US quarts (0.61 l)
Dakar version	0.59 US quarts (0.56 l)
Oil change	0.63 US quarts (0.60 l)
Dakar version	0.58 US quarts (0.55 l)

Battery terminal corrosion protection

Acid-free grease,
e.g. Vaseline

Bearing lubrication and lubricating points

Brand-name anti-friction bearing grease, usable temperature range -22 °F ... +284 °F (-30 °C...+140 °C),
drip point 302 °F ... 446 °F (150 °C...230 °C),
high corrosion protection,
good resistance to water and oxidation; e.g. Staburags
NBU 30 PTM

Fuel and lubricants

3

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Technical data

Brake fluid

F 650 GS

DOT 4

We recommend BMW brake fluids

CAUTION

Use only new brake fluid to DOT 4 specification.

Coolant

Brand-name long-life antifreeze and corrosion inhibitor

CAUTION

Use only nitrite-free antifreeze and corrosion inhibitor.

Capacity

1.37 US quarts (1.3 l)

(0.1 US quart/

0.1 l in expansion tank)

F 650 GS

Spark plugs

Approved makes/types

NGK DR8 EB

Electrode gap

0.02 - 0.03 in
(0.6 - 0.7 mm)

Wear limit

0.0354 in
(0.9 mm)

Fuses

“Minifuse”
flat-socket fuses

Ratings

4 A, 7.5 A, 10 A and 15 A

Headlights

Halogen headlight

Bulbs

High-beam/low-beam
headlight

H4 halogen bulb, 12 V, 60/55 W

Parking light

12 V 5 W

Rear light

Brake/tail light

12 V 21/5 W

Turn indicators

12 V 10 W

Other warning/indicator lights
and instrument lighting

12 V 1.2 W

Dimensions and weights

F 650 GS

Overall length	86.02 in (2,185 mm)
Dakar version	86.18 in (2,189 mm)

Width

across mirrors	35.82 in (910 mm)
acr. handlebars (with weights)	31.69 in (805 mm)
Dakar version	35.24 in (895 mm)
across front footrests	22.36 in (568 mm)
across rear footrests	26.14 in (664 mm)

Overall height

(without mirr., at wet weight)	51.96 in (1,320 mm)
Dakar version	54.92 in (1,395 mm)

Seat height, wet weight

	30.71 in (780 mm)
Dakar version	34.25 in (870 mm)
Lowered suspension	29.53 in (750 mm)

Wheelbase

in normal-load position	59.06 in (1,500 mm)
-------------------------	---------------------

Ground clearance

at wet weight	5.75 in (146 mm)
Dakar version	7.72 in (196 mm)
Lowered suspension	4.56 in (116 mm)
in normal-load position	5.12 in (130 mm)
Dakar version	7.09 in (180 mm)
Lowered suspension	3.94 in (100 mm)

Dimensions and weights

F 650 GS

Wet weight

(ready to ride, tank full) 428 lbs (194 kg)

Maximum allowable weight

838 lbs (380 kg)

Allowable wheel loads

Front 273 lbs (124 kg)

Rear 564 lbs (256 kg)

Performance data

3

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Technical data

	F 650 GS [37 kW]	F 650 GS [25 kW]
Maximum speed		
acc. to type approval test	105 mph (170 km/h)	90 mph (145 km/h)
two-up	100 mph (162 km/h)	84 mph (135 km/h)
Power/weight ratio		
ready for road + rider (75 kg/165 lbs)	15.96 lbs/kW (7.24 kg/kW)	23.63 lbs/kW (10.72 kg/kW)
at gross weight limit	22.64 lbs/kW (10.27 kg/kW)	33.51 lbs/kW (15.20 kg/kW)
Flexibility		
4th gear 80-120 km/h (50-75 mph)	5.4 s	7.9 s
5th gear 80 -120 km/h (50 -75 mph)	6.9 s	10.2 s
4th gear 60-140 km/h (37-87 mph)	12.6 s	–
5th gear 60 -140 km/h (37 - 87 mph)	16.6 s	–
Ride-past noise level		
to 97/24-9/EC	79 dB (A)	79 dB (A)
Stationary noise level		
to 97/24-9/EC	86 dB (A)	86 dB (A)

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Motorcycle data

Model

Frame no.

Color no.

First registered on

Registration no.

Retailer data

Person to contact for Service work

Ms./Mr.

Tel. no.

Retailer's address with telephone no. (company stamp)

Maintenance Instructions (US Model)

F 650 GS

F 650 GS Dakar



**BMW Motorrad
On-board
documentation**

consisting of
Rider's Manual
and Maintenance
Instructions



Please note



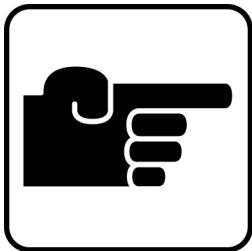
WARNING

This symbol indicates precautions and measures which are essential in protecting the rider or other persons from severe or fatal injury.



CAUTION

Specific instructions and safety precautions intended to prevent damage to the motorcycle. Disregarding them may render the warranty invalid.



NOTE

Specific instructions on how to operate, control, adjust or look after items of equipment on the motorcycle.

Details described or illustrated in this booklet may differ from the motorcycle's actual specification as purchased, the accessories fitted or the national-market specification.

No claims will be entertained as a result of such discrepancies. Dimensions, weights, fuel consumption and performance data are quoted to the customary tolerances.

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