Repair Manual

R 850 C
R 1200 C
Introduction

This repair manual will help you to perform all the main maintenance and repair work correctly and efficiently. It should be consulted regularly by workshop personnel as an addition to the practical and theoretical knowledge obtained in Training School courses. It is a contribution towards achieving even higher Service quality.

A new issue of this repair manual will be published if amendments or additions (supplements) are needed. The latest issue date is shown in the header of the microfiche. Microfiches rendered invalid by the new issue should be destroyed without delay.

All information in both text and illustrations refers to motorcycles in standard condition or with Original BMW accessories installed, and not to motorcycles which have been modified in any way to depart from the manufacturer’s specification.

- The repair manual is structured in the logical sequence of the work to be performed: Removal, Dismantling, Repair, Assembly, Installation.
- The entire contents are divided into individual chapters, corresponding to the Construction Groups.

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- Work to be performed during an Inspection is described in Group 00. The various Inspection routines are numbered I, II, III and IV. This numbering is repeated in the work descriptions which follow, so that work can take place without interruption.
- Use of the BMW special tools needed for certain tasks is described in the work instructions.

If the need arises, repair instructions are also issued in the form of Service Information. This information is of course incorporated into the next issue of the repair manual. We also recommend you to consult the detailed illustrations on the Parts microfiches as an additional source of information.

BMW AG Motorcycle Division
After Sales
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<th>BMW Inspection every 1000 km (600 miles)</th>
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<td>Read the fault code memory with the MoDiTeC</td>
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<tr>
<td>Change oil while at regular operating temperature and renew the oil filter element if motorcycle is used only for short journeys or at outside temperatures under 0°C (32 °F), every 3 months, but at least every 3 000 km (1 800 miles) *)</td>
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<tr>
<td>Change oil in gearbox while at operating temperature at least every 2 years *)</td>
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<tr>
<td>Change oil in rear wheel drive while at regular operating temperature; if necessary, clean inductive sensor on rear wheel every 40 000 km (24 000 miles) or at least every 2 years *)</td>
<td></td>
<td>40 000 (24 000)</td>
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<tr>
<td>Renew fuel filter *) normally every 40 000 km (24 000 miles), if fuel quality is poor every 20 000 km (12 000 miles)</td>
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<td>40 000 (24 000)</td>
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<tr>
<td>Check battery acid level, if necessary add distilled water Clean and grease the battery terminals, if necessary</td>
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<td>Renew intake air filter element in very dusty or dirty operating conditions, renew the intake air filter element every 10 000 km (6 000 miles) or even more often if necessary *)</td>
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<tr>
<td>Renew Poly-V belt *) renew Poly-V belt every 60 000 km (36 000 miles); do not adjust</td>
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<td>60 000 (36 000)</td>
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<tr>
<td>Check brake fluid level at front and rear and top up if necessary *)</td>
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<tr>
<td>Check operation of brake system and freedom from leaks; repair/replace items if nec. *)</td>
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<td>Examine brake pads and discs for wear, renew if necessary *)</td>
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<td><strong>Change the brake fluid annually</strong></td>
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<td>Check clutch fluid level</td>
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<td>Change the clutch fluid every 40 000 km (24 000 miles) or at least every 2 years *)</td>
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<td>40 000 (24 000)</td>
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<td>Check rear wheel bearing play by tilting wheel</td>
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<td>Check swinging arm bearings (zero play); adjust if necessary *)</td>
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<td>Renew spark plugs *)</td>
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<td>Check security of cylinder head nuts</td>
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<td>Check throttle cable for free movement, abrasion and kinking; renew if necessary *)</td>
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<td>Check cable play</td>
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<td>- Instruments</td>
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<td>- If necessary, test ride</td>
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<td>*) Charged as an additional item</td>
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## BMW Pre-delivery check

### Customer Licence plate No.

<table>
<thead>
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<th>Mechanic’s signature</th>
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### BMW Pre-delivery check

1. **Check the shipping crate for damage**

2. **Motorcycle:**
   - unpack
   - install remaining items
   - inspect for damage
   - check that delivery is complete:
     - tools
     - documentation
     - keys
     - correct optional extras

3. **Fill and charge the battery** (mark with charging date)

4. **Check engine oil level** when cold; add oil if necessary

5. **Check clutch operating fluid level and brake fluid levels at front and rear**

6. **Check headlight beam angle, adjust if necessary**

7. **Check security of rear wheel studs**
   (comply with correct tightening torque)

8. **Check tyre pressures**

9. **Fill fuel tank**

10. **Final inspection as functional check:**
    - Clutch, gear shift
    - Front and rear brakes
    - Lights and signalling equipment, telltale and warning lights, instruments
    - Check operation of optional extras, ABS
    - If necessary, test ride

11. **Confirm pre-delivery check in Service and Technical Booklet**

12. **Final cleaning**

13. **Motorcycle handed over on:**

---

**Customer Licence plate No.**

**Order No.**

**Mechanic’s signature**

---

**BMW AG Motorcycle Division**

**Pre-delivery check**

**R 1100 S / R 850/1200 C / R 1150 GS**

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**Order No. 01 71 0 008 872**

**UX-VS-2, 06.99**

**Printed in Germany**
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<td></td>
</tr>
<tr>
<td>1. Tighten cylinder head nuts (oiled) crosswise</td>
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<td></td>
</tr>
<tr>
<td>1.1 Tighten all nuts to correct torque for joint</td>
<td>20</td>
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<tr>
<td>1.2 Tighten all nuts to correct angle</td>
<td>90°</td>
<td></td>
</tr>
<tr>
<td>1.3 Tighten all nuts to correct angle</td>
<td>90°</td>
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<td>2. M 10 bolt</td>
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<td></td>
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<tr>
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<tr>
<td>After 1000 km (600 miles), tighten cylinder head nuts crosswise:</td>
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<td></td>
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<tr>
<td>1. Unfasten one nut</td>
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<td>2. Tighten one nut to initial value</td>
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<td>3. Tighten nut to wrench angle</td>
<td>180°</td>
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<td>Bearing cap on rocker shaft</td>
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<td>Locknut, valve adjusting screw</td>
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<tr>
<td>Cylinder head cover to cylinder head</td>
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<td>Camshaft end cover to cylinder head</td>
<td>9</td>
<td></td>
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<tr>
<td>Air intake connection to cylinder head</td>
<td>9</td>
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<tr>
<td>Camshaft</td>
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<td>Chain sprocket to camshaft</td>
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<tr>
<td>Camshaft bearing cap</td>
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<td>Rotary breather</td>
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<td>Vent line to alternator mount cover</td>
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<td>Alternator mount cover</td>
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<td>M 6 screw</td>
<td>9</td>
<td></td>
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<tr>
<td>M 8 screw</td>
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<td>Model</td>
<td>Connection</td>
<td>R 850/1200 C</td>
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<tr>
<td>------------------------</td>
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<tr>
<td><strong>11 Engine</strong></td>
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<tr>
<td><strong>Oil filter</strong></td>
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<tr>
<td>Oil filter</td>
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<td>11</td>
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<tr>
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<td><strong>Oil pump</strong></td>
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<tr>
<td>Mesh filter basket to engine block</td>
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<tr>
<td>Screw-in union for oil cooler connection at engine block</td>
<td>35 (clean threads and apply Loctite 603 to inner and outer threads and in the contact face area)</td>
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<td>2. M 8 screw (oiled)</td>
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<td></td>
</tr>
<tr>
<td>Clutch line to handlebar fitting</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Model</td>
<td>R 850/1200 C</td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------</td>
<td></td>
</tr>
<tr>
<td><strong>Connection</strong></td>
<td>Nm</td>
<td></td>
</tr>
<tr>
<td><strong>23 Transmission</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil filler plug</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Oil drain plug</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Gearbox to engine block</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Gear shift pedal to rear frame</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>Selector lever to selector shaft</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Gearbox cover to gearbox housing</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td><strong>31 Front fork</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed tube to fork bridge</td>
<td>35 (free from oil and grease)</td>
<td></td>
</tr>
<tr>
<td>Slider tube bridge to slider tube</td>
<td>22 (clean thread + Loctite 243)</td>
<td></td>
</tr>
<tr>
<td>Quick-release axle clamp screws</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Threaded journal to frame</td>
<td>130 (clean thread + Loctite 243)</td>
<td></td>
</tr>
<tr>
<td>Ball joint to fork slider bridge</td>
<td>230 (apply light coat of Never Seez to thread)</td>
<td></td>
</tr>
<tr>
<td>Leading link to ball joint</td>
<td>130 (clean thread + Loctite 2701)</td>
<td></td>
</tr>
<tr>
<td>Leading link to engine</td>
<td>right 73</td>
<td></td>
</tr>
<tr>
<td>Screw cap at leading link</td>
<td>left 42 (apply light coat of Never Seez to thread)</td>
<td></td>
</tr>
<tr>
<td>Spring strut to frame</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Spring strut to leading link</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td><strong>32 Steering</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handlebar at fork bridge</td>
<td>21 (apply light coat of Never Seez to thread)</td>
<td></td>
</tr>
<tr>
<td>Twistgrip to handlebar</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td><strong>33 Rear wheel drive</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil filler plug</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Oil drain plug</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Threaded ring</td>
<td>118 (Hylomar SQ 32 M)</td>
<td></td>
</tr>
<tr>
<td>Hexagon nut, input bevel gear</td>
<td>200 (clean thread + Loctite 2701)</td>
<td></td>
</tr>
<tr>
<td>Cover at rear-wheel drive housing</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Rear-wheel drive to swinging arm</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Swinging arm bearing journal to rear frame</td>
<td>right 9</td>
<td></td>
</tr>
<tr>
<td>Swinging arm bearing journal to rear frame</td>
<td>left 7 (clean thread + Loctite 2701)</td>
<td></td>
</tr>
<tr>
<td>Locknut at swinging arm bearing journal</td>
<td>160</td>
<td></td>
</tr>
<tr>
<td>Suspension strut to rear frame</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Suspension strut to rear swinging arm</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>
### 34 Brakes

<table>
<thead>
<tr>
<th>Component</th>
<th>Torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brake caliper at fork slider tube</td>
<td>40</td>
</tr>
<tr>
<td>Brake caliper to rear wheel drive</td>
<td>40</td>
</tr>
<tr>
<td>Brake disc to front wheel</td>
<td>24 (clean thread + Loctite 2701)</td>
</tr>
</tbody>
</table>

### 34 Brakes

<table>
<thead>
<tr>
<th>Component</th>
<th>Torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brake disc to rear wheel drive</td>
<td>21 (clean thread + Loctite 2701)</td>
</tr>
<tr>
<td>Master cylinder to footrest assembly</td>
<td>8</td>
</tr>
<tr>
<td>Brake pedal to footrest assembly</td>
<td>37</td>
</tr>
<tr>
<td>Brake lines/brake hose to brake components</td>
<td>18</td>
</tr>
<tr>
<td>ABS sensor</td>
<td>4 (handtight)</td>
</tr>
<tr>
<td>Front brake caliper bleed screw</td>
<td>7</td>
</tr>
<tr>
<td>Rear brake caliper bleed screw</td>
<td>4</td>
</tr>
<tr>
<td>Pressure modulator bleed screw</td>
<td>9</td>
</tr>
</tbody>
</table>

### 36 Wheels and tyres

<table>
<thead>
<tr>
<th>Component</th>
<th>Torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick-release axle clamp screws</td>
<td>20</td>
</tr>
<tr>
<td>Quick-release axle threaded connection</td>
<td>30</td>
</tr>
<tr>
<td>Rear wheel to rear wheel drive</td>
<td></td>
</tr>
<tr>
<td>Screw wheel studs in handtight, then tighten in a crosswise pattern</td>
<td></td>
</tr>
<tr>
<td>Initial tightening</td>
<td>50</td>
</tr>
<tr>
<td>Final tightening</td>
<td>105</td>
</tr>
<tr>
<td>Model</td>
<td>R 850/1200 C</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Connection</td>
<td>Nm</td>
</tr>
</tbody>
</table>

### 46 Frame

<table>
<thead>
<tr>
<th>Connection</th>
<th>Torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame to engine</td>
<td>82</td>
</tr>
<tr>
<td>M12 pin</td>
<td></td>
</tr>
<tr>
<td>M10 screw</td>
<td>58</td>
</tr>
<tr>
<td>Rear frame</td>
<td></td>
</tr>
<tr>
<td>to engine</td>
<td>41</td>
</tr>
<tr>
<td>to gearbox</td>
<td>71</td>
</tr>
<tr>
<td>Side (prop) stand pivot mount to engine</td>
<td>21</td>
</tr>
<tr>
<td>Side (prop) stand to pivot mount</td>
<td>42 (clean thread + Loctite 243)</td>
</tr>
<tr>
<td>Footrest assembly to engine</td>
<td></td>
</tr>
<tr>
<td>M12 screw</td>
<td>71</td>
</tr>
<tr>
<td>M8 screw</td>
<td>21</td>
</tr>
<tr>
<td>Pillion footrest holder to rear frame</td>
<td>21</td>
</tr>
<tr>
<td>Pillion seat mount</td>
<td>21</td>
</tr>
<tr>
<td>Mudguard to slider tube bridge</td>
<td>8</td>
</tr>
</tbody>
</table>

### 51 Equipment

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mirrors</td>
<td>15</td>
</tr>
<tr>
<td>Ignition/steering lock to fork bridge</td>
<td>15 (shear bolt)</td>
</tr>
</tbody>
</table>

### 61 General electrical equipment

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horn to holder</td>
<td>13</td>
</tr>
<tr>
<td>Ground (earth) strap to engine block</td>
<td>10</td>
</tr>
</tbody>
</table>

### 63 Lights

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headlight to holder</td>
<td>15</td>
</tr>
</tbody>
</table>
### Table of operating fluids

<table>
<thead>
<tr>
<th>Item</th>
<th>Use</th>
<th>Order number</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lubricant</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optimoly MP 3</td>
<td>High-performance lubricating paste</td>
<td>07 55 9 062 476</td>
<td>100 g tube</td>
</tr>
<tr>
<td>Optimoly TA</td>
<td>High-temperature assembly paste</td>
<td>18 21 9 062 599</td>
<td>100 g tube</td>
</tr>
<tr>
<td>Silicone grease 300, heavy</td>
<td>Damping grease</td>
<td>07 58 9 058 193</td>
<td>10 g tube</td>
</tr>
<tr>
<td>Retinax EP2</td>
<td>Wheel, steering head and taper roller bearing grease</td>
<td>83 22 9 407 845</td>
<td>100 g tube</td>
</tr>
<tr>
<td>Contact spray</td>
<td>Contact spray</td>
<td>81 22 9 400 208</td>
<td>300 ml aerosol</td>
</tr>
<tr>
<td>Chain spray</td>
<td>Drive chain</td>
<td>72 60 2 316 676</td>
<td>50 ml spray</td>
</tr>
<tr>
<td></td>
<td></td>
<td>72 60 2 316 667</td>
<td>300 ml spray</td>
</tr>
<tr>
<td><strong>Sealants</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-Bond 1110 B</td>
<td>Surface sealant</td>
<td>07 58 9 056 998</td>
<td>5 g tube</td>
</tr>
<tr>
<td>3-Bond 1209</td>
<td>Surface sealant</td>
<td>07 58 9 062 376</td>
<td>30 g tube</td>
</tr>
<tr>
<td>omni VISC 1002</td>
<td>Surface sealant</td>
<td>07 58 1 465 170</td>
<td>90 g tube</td>
</tr>
<tr>
<td>Loctite 574</td>
<td>Surface sealant</td>
<td>81 22 9 407 301</td>
<td>50 ml tube</td>
</tr>
<tr>
<td>Curil K 2</td>
<td>Heat-conductive sealant</td>
<td>81 22 9 400 243</td>
<td>250 g can</td>
</tr>
<tr>
<td>Hylomar SQ 32 M</td>
<td>Permanently elastic sealant</td>
<td>81 22 9 400 339</td>
<td>100 g tube</td>
</tr>
<tr>
<td><strong>Adhesives and retaining agents</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loctite 648</td>
<td>Joint adhesive (low clearance)</td>
<td>07 58 9 067 732</td>
<td>5 g bottle</td>
</tr>
<tr>
<td>Loctite 638</td>
<td>Joint adhesive (greater clearance)</td>
<td>07 58 9 056 030</td>
<td>10 ml bottle</td>
</tr>
<tr>
<td>Loctite 243</td>
<td>Thread retainer, medium-strength</td>
<td>07 58 9 056 031</td>
<td>10 ml bottle</td>
</tr>
<tr>
<td>Loctite 270</td>
<td>Thread retainer, strong</td>
<td>81 22 9 400 086</td>
<td>10 ml bottle</td>
</tr>
<tr>
<td>Loctite 2701</td>
<td>Thread retainer, strong</td>
<td>33 17 2 331 095</td>
<td>10 ml bottle</td>
</tr>
<tr>
<td>Loctite 454</td>
<td>Cyanacrylate adhesive (gel)</td>
<td>07 58 9 062 157</td>
<td>20 g tube</td>
</tr>
<tr>
<td><strong>Cleaner</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brake cleaner</td>
<td>Brake cleaner</td>
<td>83 11 9 407 848</td>
<td>600 ml aerosol</td>
</tr>
<tr>
<td>Metal Polish</td>
<td>Polish for chromium plated parts</td>
<td>82 14 9 400 890</td>
<td>100 g tube</td>
</tr>
<tr>
<td><strong>Testing agent</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penetrant MR 68</td>
<td>Crack testing agent for aluminum housings</td>
<td>83 19 9 407 855</td>
<td>500 ml spray</td>
</tr>
<tr>
<td>Entwickler MR 70</td>
<td>Crack testing agent for aluminum housings</td>
<td>81 22 9 407 495</td>
<td>500 ml spray</td>
</tr>
</tbody>
</table>
Key to maintenance intervals

- BMW Inspection
  1000 km/600 miles   I
- BMW Service        II
- BMW Inspection     III
- BMW Annual Service IV

Reading out MoDiTeC fault memory
(Inspections I, II, III and IV)

- Remove the left air cleaner trim panel.
- Connect MoDiTeC to diagnostic plug.
- Read out the fault memory.
- Perform any repair work indicated.

Checking throttle cable play, adjusting if necessary
(Inspections I and III)

- Check throttle cable for free movement and freedom from abrasion or kinking; renew if necessary.
- With the steering turned to various angles, open the throttle twistgrip fully and allow it to close again.
- When released, the twistgrip must return to the closed position by itself.

- Pull back the protective cap.
- Preset throttle cable play with the engine cold to 1.5 mm (0.06 in).
- Warm the engine up to its regular operating temperature.
- Adjust throttle cable play to 0.5 mm (0.02 in).

Adjusting value:
Initial throttle cable play setting (engine cold) ......................... 1.5 mm (0.06 in)
Throttle cable play (engine warm) .. 0.5 mm (0.02 in)
Changing engine oil, renew oil filter element

(Inspections I, II, III and IV)

Note:
If the motorcycle is ridden only for short distances or outside temperatures are below 0°C (32°F): change the oil and renew the oil filter element every 3 months, but at least every 3 000 km (1 800 miles).

- Change the oil while it is at regular operating temperature.

- Remove screw plug.

- Unscrew oil drain plug and drain off oil.
- Fit new seal and screw in drain plug.

- Use oil filter wrench, BMW No. 11 4 650, to unscrew and remove the oil filter.
- Coat sealing ring on new oil filter element with oil and screw in.
- Add oil.
- Insert and tighten the screw plug.
- Check engine oil level with the motorcycle in a horizontal position; use the auxiliary stand, BMW No. 00 1 550.

Caution:
Never add engine oil above the MAX mark.

 Tightening torque:
Oil filter.................................................................. 11 Nm
Oil drain plug..................................................... 32 Nm

Fill quantity for engine:
With oil
filter change ........................................... 3.75 l (6.6 Imp. pints/3.96 US quarts)
Without oil
filter change ........................................... 3.50 l (6.2 Imp. pints/3.69 US quarts)
Oil volume between MIN and
MAX marks........................................... 0.50 l (0.88 Imp. pint/0.52 US quart)

Engine oil grade:
Brand-name HD oil for four-stroke spark-ignition engine, API classifications SE, SF, SG; combination with CC or CD specification.
Changing oil in gearbox

(Inspections III and IV)
or at least every 2 years

- Change the gearbox oil while at regular operating temperature.
- Loosen clip/trim (1) at right silencer and turn downwards.
- Take out oil filler plug (3) and oil drain plug (2) and allow the oil to drain out.
- Clean the magnet in the oil drain plug.
- Insert the oil drain plug again.

Note:
Add oil to the gearbox up to the lower edge of the filler hole, then place the motorcycle on its side (prop) stand and add the remaining 0.2 litre (0.35 Imp. pint, 0.21 US quart).

- Add gearbox oil.
- Insert oil filler plug with new seal.

Tightening torque:
- Oil drain plug: 55 Nm
- Oil filler plug: 23 Nm
- Exhaust pipe clip at silencer (muffler): 55 Nm

Fill quantity:
- Initial filling: 1.0 l (1.76 Imp. pints/1.06 US quart)
- During oil changes: 1.0 l (1.76 Imp. pints/1.06 US quart)

Oil grade for gearbox:
Brand-name hypoid gear oil, SAE 90, API class GL 5

Changing oil in rear wheel drive;
cleaning inductive signal transmitter
at rear wheel

(Inspections I, III and IV)
Every 40 000 km (24 000 miles) or at least every 2 years

- Change the gearbox oil while at regular operating temperature.
- Slacken off oil drain plug (4) so that the pressure drops.
- Unscrew and remove oil filler plug (5).
- Unscrew and remove oil drain plug (4) and allow the oil to drain out.
- Fit new seal and screw in drain plug.
- Add gearbox oil.
- Insert oil filler plug with new seal.
- Release the fastening, pull out inductive signal transmitter (6) and clean it.

Caution:
Note that the interior of the gearbox is slightly pressurised.

Tightening torque:
- Oil drain plug: 23 Nm
- Oil filler plug: 23 Nm

Fill quantity:
- Initial filling up to lower edge of filler hole: app. 0.20 l (0.35 Imp. pint/0.21 US quart)
- Oil change up to lower edge of filler hole: app. 0.20 l (0.35 Imp. pint/0.21 US quart)

Oil grade for rear wheel drive:
Brand-name hypoid gear oil, SAE 90, API class GL 5
Renewing fuel filter

(Inspection III)
In normal operating conditions every 40 000 km (24 000 miles); if fuel quality is poor every 20 000 km (12 000 miles)

- Remove seat.
- Remove right air cleaner trim panel.
- Remove left and right trim panels.

⚠️ Caution:
Fuel is flammable and a hazard to health. Observe relevant safety regulations.

- Pull the plug connector off the fuel pump assembly.
- Lift off fuel tank.

- Take off the fuel tank.
- Seal the fuel feed and return lines with a hose clip, BMW No. 13 3 010, detach and pull off.
- Drain fuel tank.
- Remove fuel pump assembly.
- Detach hoses from fuel filter (1).

⚠️ **Caution:**
Note correct direction of flow through fuel filter. Use only an O-ring seal (2) in good condition. After installing, check fuel pump assembly for leaks.

- Fit new fuel filter.
- Secure non-reusable hose clips with pliers, BMW No. 13 1 500.

### Tightening torque:
- Fuel pump unit: 5 Nm

### Installing:
- Note:
  - Note correct path of vent lines.
Checking battery acid level/topping up if necessary, cleaning/greasing battery posts

(Inspections III and IV)
- Release the rubber strap holding the battery.
- Raise the battery and check its acid level.
- Top up battery acid level with distilled water as far as the MAX mark.

Protective battery-post grease: ..............e.g. Bosch Ft 40 V1

Renewing intake air cleaner element

(Inpection III)
In very dirty and dusty operating conditions, renew every 10 000 km (6 000 miles) or even more frequently if necessary
- Detach and raise the upper part of the air cleaner housing.
- Renew air cleaner element.
- Install the fuel tank.
- Note correct path of vent lines.
- Install the left/right trim panels.

 Tightening torque:
Fuel tank to rear frame .................................. 10 Nm
Renewing Poly-V belt
(every 60 000 km/36 000 miles)
(Inspection III)

- Remove the cover.
- Use the spark plug cap assembly tool from the toolkit to pull off the spark plug caps.
- Use spark plug wrench, **BMW No. 12 3 510**, to unscrew and remove the spark plugs.

- Remove the horn with its mount.
- Remove front cover.
- Remove vent line (1).

- Slacken off alternator mounting screws (1,3,4) and install a new Poly-V belt if necessary.

**Poly-V belt adjusting procedure:**
**Poly-V belt installation procedure:**
- Place the Poly-V belt in position, tension it and turn the engine over once, then release belt tension.

**Poly-V belt tensioning procedure:**
1. Screw hex nut (1) on adjusting screw (2) up handtight (no tools to be used)
2. Tighten adjusting screw (2) with a torque wrench and keep it under tension.
3. Tighten upper retaining nut (3), then release the tension at the adjusting screw.
4. Tighten all screws and nuts.

**Tightening torque:**
Poly-V belt preload................................. 8 Nm
Alternator to alternator support cover........ 20 Nm
Vent line at generator mount cover:
Banjo screw........................................... 25 Nm
Machine screw........................................ 10 Nm

⚠ **Caution:**
Install the vent line with new O-ring seals.
Checking brake system for correct operation and freedom from leaks; repairing/renewing if necessary (Inspection III)

- Checking brake system for leaks.

Checking brake fluid level

**Note:**
The brake fluid volume (between MIN and MAX) is sufficient for the complete range of pad wear from new to the wear limit.
It is not normally necessary to add fluid to compensate for pad wear.
If the level drops below the minimum mark, this indicates some other fault.

(Inspections I, II and III)

**Front brake**

- Make sure that the specified setting (distance between handlebar and fuel tank 30-50 mm/1.2-2 in) is correct.
- Check with the motorcycle on its side (prop) stand.
- Turn the handlebar fully to the left.
- The brake fluid must not drop below the minimum level 2 mm (0.08 in) below the ring mark (arrow).

**Brake fluid grade** ..................................................DOT 4

**Rear brake**

- Position the motorcycle horizontally with auxiliary stand, BMW No. 001550.
- Brake fluid must not drop below the minimum level (arrow).

**Brake fluid grade** ..................................................DOT 4
Checking brake pads and discs for wear/renewing

(Inspections II and III)

Checking front brake pad wear

- Examine the wear limit marks (arrows).

⚠️ Caution:
Brake pad thickness must not fall below the minimum value.
Change pads only as a complete set.

Minimum lining thickness: .......... 1.5 mm (0.06 in)

Checking rear brake pad wear

It should not be possible to see the brake disc through the hole (arrow) in the inner brake pad.
If the brake disc is visible, the wear limit has been reached and the pads must be renewed.

Checking brake disc wear

- Examine the brake discs carefully for cracks, damage, distortion, wear and score-marks.

Brake disc wear limit:
front: ............................................. 4.5 mm (0.177 in)
rear: ............................................. 4.6 mm (0.181 in)
Renewing brake pads

Front brake

- Detach/remove brake caliper from mounting (arrow).
- Remove the split-pin keeper (1) from the retaining pin (2).
- Drive out retaining pin (2).
- Remove brake pads by pulling downwards.
- Install by following the above work instructions in the reverse order.
- Before installing the brake caliper, force the pistons fully back with resetting tool, BMW No. 34 1 500.

Tightening torque:
Brake caliper at fork slider tube.................. 40 Nm

Rear brake

- Loosen the rear wheel.
- Unfasten/remove brake caliper.
- Remove circlip (arrow) at retaining pin.
- Drive the retaining pin out towards the wheel side.
- Remove brake pads.
- Install by following the above work instructions in the reverse order.
- Before installing the brake caliper, depress the piston fully.

Tightening torque:
Brake caliper to rear wheel drive............... 40 Nm
Screw the rear wheel studs in handtight, then tighten them in a crosswise pattern.
Initial tightening........................................ 50 Nm
Final tightening......................................... 105 Nm
Renewing brake fluid and bleeding brake system

Renew the brake fluid annually (Inspection IV)

[ABS Inspection II and III]

Bleeding front brake circuit/renewing brake fluid

Note:
This description applies to brake filling and bleeding devices with vacuum extraction of the brake fluid at the brake caliper. If other devices are used, comply with their manufacturers’ instructions.

- Turn the steering to the left.

Caution:
When bleeding the brakes, always start on the right side.

- Take off the brake caliper.
- Remove the brake pads.

- Force the pistons fully back with resetting tool, BMW No. 34 1 500.

Caution:
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid destroys paint.

- Take off reservoir cover with rubber diaphragm.
- Release the right handlebar switch.
- Loosen the clamp screw for the handbrake fitting and turn the fitting until the brake fluid reservoir is horizontal.

Caution:
When adding brake fluid, do not allow it to enter the holes for the reservoir lid screws.

- Add brake fluid up to the MAX mark (arrow).
- Connect the brake bleeding device to the bleed screw on the right brake caliper.
- Open the bleed screw by half a turn.
- Draw off brake fluid until it emerges clear and free from air bubbles.
- Close the bleed screw on the right brake caliper.
- Repeat the bleeding process at the left brake caliper.

When installing:

Note:
Clean the rim of the reservoir, the rubber gaiter and the cover to remove brake fluid, and re-assemble the components with great care.

Caution:
Next check brake fluid level with the motorcycle on its side (prop) stand and the handlebar turned to the left, and ensure that no air bubbles are visible in the sight glass.
Additionally with [ABS]

- Connect the brake bleeding device to the pressure modulator for the front brake (arrow); this is marked VR.
- Open the bleed screw by half a turn.
- Draw off brake fluid until it emerges clear and free from air bubbles.
- Close the bleed screw.
- Bleed the left brake caliper in precisely the same way as on the right.
- If necessary, repeat the brake bleeding procedure at the right/left.

**Tightening torque:**
Bleed screw on pressure modulator.............. 9Nm

- Take out the resetting tool and insert spacer, BMW No. 34 1 520, in its place.
- Press the pistons back in the second brake caliper, but do not remove the resetting tool.
- Fill and bleed the front brake circuit.
- Installation takes place in the reverse order of removal.

**Brake fluid grade**.................................DOT 4

**Tightening torque:**
Brake caliper to fork tube......................... 40 Nm
Bleed screw at brake caliper..................... 7 Nm
Bleeding rear brake circuit/renewing brake fluid

Note:
On motorcycles with ABS, start at the pressure modulator.

- Use the auxiliary stand, BMW No. 00 1 550.
- Loosen the rear wheel studs.
- Remove the cover for the line at the swinging arm.
- Take off the brake caliper.
- Remove the inner brake pad.

Caution:
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid destroys paint.

- Move the brake caliper to a horizontal position.
- Connect the bleed line and open the bleed screw.
- Force the pistons fully back with resetting tool, BMW No. 34 1 500.
- Press the brake pedal down several times until brake pressure is felt to build up.
- Fill the rear brake circuit and bleed it.
- Take off the reservoir cover.

Add brake fluid up to the MAX mark (arrow).
- Connect the brake bleeding device to the bleed screw on the brake caliper.
- Open the bleed screw by half a turn.

Caution:
During brake bleeding, make sure that the fluid replenishing hole is always below the level of the brake fluid, or else air will be drawn into the brake system. If this occurs, repeat the bleeding operation.

- Draw off brake fluid until it emerges clear and free from air bubbles.
- Close the bleed screw.
- Installation takes place in the reverse order of removal.

Tightening torque:
Brake caliper to rear wheel drive .................. 40 Nm
Rear wheel to rear wheel drive
Initial tightening ............................................ 50 Nm
Final tightening ........................................... 105 Nm
Bleed screw at brake caliper ..................... 4 Nm
Additionally with [ABS]

• Connect the brake bleeding device to the bleed screw on the pressure modulator for the rear brake (arrow); this is marked HR.
• Open the bleed screw by half a turn.

⚠️ Caution:
During brake bleeding, make sure that the fluid replenishing hole is always below the level of the brake fluid, or else air will be drawn into the brake system. If this occurs, repeat the bleeding operation.

• Draw off brake fluid until it emerges clear and free from air bubbles.
• Close the bleed screw.
• If necessary, repeat the bleeding procedure.

Brake fluid grade ............................................DOT 4

⚠️ Tightening torque:
Bleed screw at pressure modulator.............9 Nm

Checking clutch operating fluid level

(Inspections I, II and III)

⚠️ Caution:
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid destroys paint.

• Place the motorcycle on the auxiliary stand, BMW No. 00 1 550.
• Turn the steering to the right.

⚠️ Caution:
With the clutch lining in new condition the surface of the fluid (arrow) must be up to the lower edge of the ring mark; it must not be below normal.

⚠️ Note:
As the clutch lining wears, the fluid level in the reservoir rises.

• If necessary, take off reservoir cover with insert.
• Correct the fluid level. Mark in reservoir: as for brake circuit.
• Re-attach the reservoir cover with insert.
• Tighten the reservoir cover without using force.

Brake fluid grade ............................................DOT 4
Checking tightness of rear wheel studs
(Inspection I)

- Tighten the rear wheel studs with a torque wrench.

\[ \text{Tightening torque:} \]
Rear wheel studs ....................................... 105 Nm

Checking rear wheel bearing play by tilting wheel
(Inspection III)

- Tilt the rear wheel to and fro across its axle.
- If play is detected, fit new shims to rear wheel drive or renew bearings.

Checking swinging arm bearings, adjusting if necessary
(Inspections I and III)

- Grip rear tyre and try to move it sideways, bracing against the frame.

Greasing the side (prop) stand pivot
(Inspections I, II and III)

- Check free movement of side (prop) stand and grease if necessary.
- Grease pivot point (arrow).

Lubricant:
For side (prop) stand pivot........... Shell Retinax EP2

Checking function of side (prop) stand contact switch
(Inspections I, II, III and IV)

- Place the motorcycle on the auxiliary stand, BMW No. 00 1 550.
- Select a gear and switch on the ignition.
- Slowly extend the side (prop) stand and watch the neutral indicator light.

\[ \text{Note:} \]
As the stand is extended, the neutral indicator light should come on briefly.
Tightening cylinder heads

(Inspection I)

- Remove cylinder head cover.

⚠️ **Caution:**
Trap escaping oil.

Select a gear and turn the rear wheel, or set the piston to TDC on the ignition stroke by turning the belt pulley.

**Top dead centre on ignition stroke:**
- The OT (TDC) mark is visible and the inlet and exhaust valves in the cylinder concerned are closed.
- Tighten cylinder head nuts.

**Tightening procedure after 1 000 km (600 miles)**
1. Tighten the cylinder head nuts one after the other in a crosswise pattern
   1.1. Slacken off one nut at a time
   1.2. Tighten nut to initial torque................. 20 Nm
   1.3. Tighten nut to specified wrench angle...... 180°
2. Unfasten/retighten M10 screw ............ 40 Nm

Checking/adjusting valve operating clearances

(Inspections I, II and III)

- Check valve clearance with feeler gauge and, if necessary, correct with adjusting nut/lock.

**Adjust valve clearances with the engine cold (max. 35 °C/95 °F):**
- Inlet.............................. 0.15 mm (0.006 in)
- Exhaust.................................. 0.30 mm (0.012 in)

⚠️ **Tightening torque:**
- Locknut.................................................. 8 Nm
- After adjusting, check valve operating clearances again; it should be possible to pull the correct feeler gauge through between the valve stem and the adjusting screw with only slight resistance.
- Assemble in reverse order.

⚠️ **Caution:**
Make sure that gasket is correctly seated. Gaskets and sealing faces must be free from oil or grease.

**Tightening torque:**
- Cylinder head cover ............................... 8 Nm
Checking/renewing spark plugs

(Inspection II)/renewing (Inspection III)

- Unscrew and remove spark plugs with the spark plug wrench, **BMW No. 12 3 510**.

⚠️ Caution:
Do not bend electrodes - risk of breakage!

Electrode gap: ......................... 0.8 mm (0.031 in)
Gap wear limit: ......................... 1.0 mm (0.039 in)

📍 Tightening torque:
Spark plug: ........................................ 20 Nm

Check synchronising

(Inspections I, II and III)

- The engine must be at regular operating temperature.

- Connect the **BMW Synchrotester** hose to the vacuum stub pipe (arrow) and the lines to the **MoDiTeC**.

⚠️ Note:
If the left/right readings differ by more than 30 millibars (0.42 psi), check the air intake system for leaks.
Final inspection with road safety and functional check
(Inspections I, II, III and IV)

Road safety check
- Check wheels and tyres.
- Check/correct tyre pressures.
- Wait at least 10 minutes after the trial run/road test before checking/correcting engine oil level.

Tyre pressures:
- Solo ..................................... front 2.2 bar (31.3 psi)
  ............................................. rear 2.5 bar (35.6 psi)
- With pillion passenger ........ front 2.5 bar (35.6 psi)
  ............................................. rear 2.7 bar (38.4 psi)
- With pillion passenger + luggage............ front 2.5 bar (35.6 psi)
  ............................................. rear 2.9 bar (41.2 psi)

Roadworthiness check
- Lights
- Telltale/warning lights
- Horn
- Instruments
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- Clutch
- Gear shift
- Steering
- Foot brake and handbrake
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<td></td>
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<td>848</td>
<td>1170</td>
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<td>10.3 : 1</td>
<td>10.0 : 1</td>
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<td>45 (61)/5000</td>
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<td>71/4750</td>
<td>98/3000</td>
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<td>7000</td>
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<td>750^-150</td>
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<td>Clockwise, looking at ignition system</td>
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<td>normal 8.5...10 (121...142)</td>
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<td>30 (6.60/7.93)</td>
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## Technical data

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<td>Seat dia. in cyl. head (oversize +0.2 mm/+0.008 in)</td>
<td>mm (in)</td>
<td>34.500...34.525</td>
</tr>
<tr>
<td>Inlet</td>
<td></td>
<td>(1.3583...1.3592)</td>
</tr>
<tr>
<td>Exhaust</td>
<td>mm (in)</td>
<td>30.000...30.025</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.1811...1.1821)</td>
</tr>
<tr>
<td>Technical data</td>
<td>R 850 C</td>
<td>R 1200 C</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------------------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td><strong>Valve guide</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valve guide</td>
<td>Extl. dia. mm (in)</td>
<td></td>
</tr>
<tr>
<td>Bore in cylinder head</td>
<td>12.533...12.544 (0.4934...0.4939)</td>
<td></td>
</tr>
<tr>
<td>Overlap</td>
<td>0.015...0.044 (0.0006...0.0017)</td>
<td></td>
</tr>
<tr>
<td><strong>Repair stages</strong></td>
<td></td>
<td></td>
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<tr>
<td>Replacement valve guide</td>
<td>Extl. dia. mm (in)</td>
<td></td>
</tr>
<tr>
<td>Oversize valve guide</td>
<td>12.550...12.561 (0.4941...0.4945)</td>
<td></td>
</tr>
<tr>
<td>Extl. dia.</td>
<td>12.733...12.744 (0.5013...0.5017)</td>
<td></td>
</tr>
<tr>
<td><strong>Valve guide</strong></td>
<td>Intl. dia. mm (in)</td>
<td>5.0...5.012 (0.1969...0.1973)</td>
</tr>
<tr>
<td>Radial clearance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inlet</td>
<td>0.020...0.046 (0.0008...0.0018)</td>
<td></td>
</tr>
<tr>
<td>Wear limit</td>
<td>0.15 (0.006)</td>
<td></td>
</tr>
<tr>
<td>Exhaust</td>
<td>0.030...0.056 (0.0012...0.0022)</td>
<td></td>
</tr>
<tr>
<td>Wear limit</td>
<td>0.17 (0.007)</td>
<td></td>
</tr>
<tr>
<td><strong>Valve spring</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring length, off-load</td>
<td>mm (in) 41.0 (1.62)</td>
<td></td>
</tr>
<tr>
<td>Wear limit</td>
<td>mm (in) 39.0 (1.54)</td>
<td></td>
</tr>
<tr>
<td><strong>Rocker</strong></td>
<td></td>
<td></td>
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<tr>
<td>Bore dia.</td>
<td>mm (in) 16.016...16.027 (0.6306...0.6310)</td>
<td></td>
</tr>
<tr>
<td>Rocker shaft dia.</td>
<td>mm (in) 15.973...15.984 (0.6289...0.6293)</td>
<td></td>
</tr>
<tr>
<td>Radial clearance</td>
<td>mm (in) 0.032...0.054 (0.0016...0.0021)</td>
<td></td>
</tr>
<tr>
<td>Wear limit</td>
<td>mm (in) 0.1 (0.004)</td>
<td></td>
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<tr>
<td>Axial play</td>
<td>min. mm (in) 0.05 (0.002)</td>
<td></td>
</tr>
<tr>
<td>max.</td>
<td>mm (in) 0.40 (0.016)</td>
<td></td>
</tr>
<tr>
<td><strong>Camshaft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opening angle, inlet/exhaust cams</td>
<td>256°/256°</td>
<td></td>
</tr>
<tr>
<td>Cam spread, inlet/exhaust</td>
<td>106°/109°</td>
<td></td>
</tr>
<tr>
<td>Marking</td>
<td>Marking in position 2</td>
<td></td>
</tr>
<tr>
<td>Inlet valve lift</td>
<td>mm (in) 8.23 (valve clearance = 0)</td>
<td></td>
</tr>
<tr>
<td>Exhaust valve lift</td>
<td>mm (in) 8.23 (valve clearance = 0)</td>
<td></td>
</tr>
<tr>
<td>Camshaft bearing bore dia.</td>
<td>mm (in) 21.02...21.04 (0.8276...0.8284)</td>
<td></td>
</tr>
<tr>
<td>Camshaft dia.</td>
<td>mm (in) 20.97...21.00 (0.826...0.827)</td>
<td></td>
</tr>
<tr>
<td>Radial clearance</td>
<td>mm (in) 0.02...0.07 (0.0008...0.0028)</td>
<td></td>
</tr>
<tr>
<td>Wear limit</td>
<td>mm (in) 0.15 (0.006)</td>
<td></td>
</tr>
<tr>
<td>Width of guide bearing</td>
<td>mm (in) 15.92...15.95 (0.6268...0.6280)</td>
<td></td>
</tr>
<tr>
<td>Width of camshaft bearing</td>
<td>mm (in) 16.0...16.05 (0.630...0.632)</td>
<td></td>
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<tr>
<td>Axial play</td>
<td>mm (in) 0.08...0.13 (0.0031...0.0051)</td>
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</tr>
<tr>
<td>Wear limit</td>
<td>mm (in) 0.25 (0.010)</td>
<td></td>
</tr>
<tr>
<td>Technical data</td>
<td>R 850 C</td>
<td>R 1200 C</td>
</tr>
<tr>
<td>----------------</td>
<td>---------</td>
<td>----------</td>
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<tr>
<td><strong>Bucket-type tappet</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extl. dia.</td>
<td>mm (in)</td>
<td>23.947...23.960 (0.9428...0.9433)</td>
</tr>
<tr>
<td>Bore dia. in cylinder head</td>
<td>mm (in)</td>
<td>24.000...24.021 (0.9449...0.9457)</td>
</tr>
<tr>
<td>Radial clearance</td>
<td>mm (in)</td>
<td>0.040...0.074 (0.0016...0.0029)</td>
</tr>
<tr>
<td></td>
<td>Wear limit</td>
<td>0.18 (0.007)</td>
</tr>
<tr>
<td><strong>Auxiliary shaft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bore dia. in crankcase</td>
<td>mm (in)</td>
<td>25.020...25.041 (0.9851...0.9859)</td>
</tr>
<tr>
<td>Auxiliary shaft dia.</td>
<td>mm (in)</td>
<td>24.959...24.980 (0.9827...0.9835)</td>
</tr>
<tr>
<td>Radial clearance</td>
<td>mm (in)</td>
<td>0.040...0.082 (0.0016...0.0032)</td>
</tr>
<tr>
<td></td>
<td>Wear limit</td>
<td>0.17 (0.007)</td>
</tr>
<tr>
<td><strong>Crankshaft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marking of main bearing and crankpin on front crank web</td>
<td></td>
<td></td>
</tr>
<tr>
<td>no paint mark</td>
<td>Grinding stage 0</td>
<td></td>
</tr>
<tr>
<td>paint mark</td>
<td>Grinding stage 1 (-0.25 mm/-0.010 in)</td>
<td></td>
</tr>
<tr>
<td>Grinding stage 0</td>
<td></td>
<td>(grinding stage 1 = –0.25 mm/—0.010 in)</td>
</tr>
<tr>
<td>Guide bearing bore dia.</td>
<td>mm (in)</td>
<td>64.949...64.969 (2.5571...2.5579)</td>
</tr>
<tr>
<td>Guide bearing dia.</td>
<td>mm (in)</td>
<td>Green: 59.964...60.003 (2.3609...2.3624)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yellow: 59.974...60.013 (2.3612...2.3628)</td>
</tr>
<tr>
<td>Main bearing journal dia.</td>
<td>mm (in)</td>
<td>Green: 59.939...59.948 (2.3598...2.3602)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yellow: 59.949...59.958 (2.3602...2.3606)</td>
</tr>
<tr>
<td>Radial clearance</td>
<td>mm (in)</td>
<td>0.016...0.064 (0.0006...0.0025)</td>
</tr>
<tr>
<td></td>
<td>Wear limit</td>
<td>0.1 (0.004)</td>
</tr>
<tr>
<td>Main bearing bore dia.</td>
<td>mm (in)</td>
<td>60.000...60.019 (2.3622...2.3629)</td>
</tr>
<tr>
<td>Main bearing dia.</td>
<td>mm (in)</td>
<td>Green: 54.998...55.039 (2.1653...2.1669)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yellow: 55.008...55.049 (2.1657...2.1673)</td>
</tr>
<tr>
<td>Main bearing journal dia.</td>
<td>mm (in)</td>
<td>Green: 54.971...54.980 (2.1643...2.1646)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yellow: 54.981...54.990 (2.1646...2.1650)</td>
</tr>
<tr>
<td>Radial clearance</td>
<td>mm (in)</td>
<td>0.018...0.068 (0.0007...0.0028)</td>
</tr>
<tr>
<td></td>
<td>Wear limit</td>
<td>0.13 (0.0051)</td>
</tr>
<tr>
<td>Width of guide bearing</td>
<td>mm (in)</td>
<td>24.890...24.940 (0.9799...0.9819)</td>
</tr>
<tr>
<td>Bearing width of main bearing journal</td>
<td>mm (in)</td>
<td>25.020...25.053 (0.9851...0.9864)</td>
</tr>
<tr>
<td>Axial play</td>
<td>mm (in)</td>
<td>0.080...0.163 (0.0031...0.0064)</td>
</tr>
<tr>
<td></td>
<td>Wear limit</td>
<td>0.2 (0.008)</td>
</tr>
<tr>
<td>Grinding stage 0</td>
<td></td>
<td>(grinding stage 1 = –0.25 mm/—0.010 in)</td>
</tr>
<tr>
<td>Crankpin dia.</td>
<td>mm (in)</td>
<td>47.975...47.991 (1.8888...1.8894)</td>
</tr>
<tr>
<td>Bearing width of crankpin</td>
<td>mm (in)</td>
<td>22.065...22.195 (0.8687...0.8738)</td>
</tr>
</tbody>
</table>
## Technical data

<table>
<thead>
<tr>
<th>Connecting rod</th>
<th>R 850 C</th>
<th>R 1200 C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bore dia. for big end bearing</td>
<td>51.000...51.013 (2.0079...2.0084)</td>
<td>51.010...51.013 (2.0084...2.0086)</td>
</tr>
<tr>
<td>Big end bearing dia.</td>
<td>48.016...48.050 (1.8904...1.8918)</td>
<td>48.010...48.050 (1.8906...1.8918)</td>
</tr>
<tr>
<td>Radial clearance</td>
<td>0.025...0.075 (0.0010...0.0030)</td>
<td>0.025...0.075 (0.0010...0.0030)</td>
</tr>
<tr>
<td>Wear limit</td>
<td>0.13 (0.0051)</td>
<td>0.13 (0.0051)</td>
</tr>
<tr>
<td>Width of big end bearing eye</td>
<td>21.883...21.935 (0.8616...0.8636)</td>
<td>21.900...21.935 (0.8638...0.8668)</td>
</tr>
<tr>
<td>Conrod end float</td>
<td>0.130...0.312 (0.0051...0.0123)</td>
<td>0.130...0.312 (0.0051...0.0123)</td>
</tr>
<tr>
<td>Wear limit</td>
<td>0.5 (0.02)</td>
<td>0.5 (0.02)</td>
</tr>
<tr>
<td>Small end bearing bore dia.</td>
<td>22.015...22.025 (0.8667...0.8671)</td>
<td>22.015...22.025 (0.8667...0.8671)</td>
</tr>
<tr>
<td>Radial clearance</td>
<td>0.015...0.030 (0.0006...0.0012)</td>
<td>0.015...0.030 (0.0006...0.0012)</td>
</tr>
<tr>
<td>Wear limit</td>
<td>0.06 (0.002)</td>
<td>0.06 (0.002)</td>
</tr>
<tr>
<td>Distance between centers</td>
<td>125 (4.92)</td>
<td>125 (4.92)</td>
</tr>
<tr>
<td>Max. deviation from parallel of conrod bores at 150 mm (5.90 in) spacing</td>
<td>0.07 (0.003)</td>
<td>0.07 (0.003)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cylinders</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bore</td>
<td>(20 mm/0.79 in from top edge)</td>
</tr>
<tr>
<td>A</td>
<td>87.492...87.500 (3.4446...3.4449)</td>
</tr>
<tr>
<td>Wear limit</td>
<td>87.550 (3.4468)</td>
</tr>
<tr>
<td>B</td>
<td>87.500...87.508 (3.4449...3.4452)</td>
</tr>
<tr>
<td>Wear limit</td>
<td>87.558 (3.4471)</td>
</tr>
<tr>
<td>Total wear clearance of piston and cylinder</td>
<td>0.12 (0.005)</td>
</tr>
<tr>
<td>Permitted out-of-roundness of cylinder bore</td>
<td></td>
</tr>
<tr>
<td>20 mm (0.79 in) from the top edge</td>
<td>0.03 (0.0012)</td>
</tr>
<tr>
<td>100 mm (3.94 in) from the top edge</td>
<td>0.04 (0.0016)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pistons</th>
<th>(Measuring plane A – see Checking pistons and cylinders)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piston dia.</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>87.465...87.477 (3.4435...3.4440)</td>
</tr>
<tr>
<td>Wear limit</td>
<td>87.390 (3.4405)</td>
</tr>
<tr>
<td>B</td>
<td>87.477...87.485 (3.4440...3.4443)</td>
</tr>
<tr>
<td>Wear limit</td>
<td>87.400 (3.4409)</td>
</tr>
<tr>
<td>AB</td>
<td>87.473...87.481 (3.4438...3.4441)</td>
</tr>
<tr>
<td>Wear limit</td>
<td>87.395 (3.4407)</td>
</tr>
<tr>
<td>Installed clearance</td>
<td>0.011...0.035 (0.0004...0.0013)</td>
</tr>
<tr>
<td>Total wear clearance of piston and cylinder</td>
<td>0.12 (0.005)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weight classes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Piston pin bore dia.</td>
<td>22.005...22.011 (0.8664...0.8666)</td>
</tr>
<tr>
<td>Weight difference in one class</td>
<td>10 (0.353) (complete with pins and rings)</td>
</tr>
</tbody>
</table>

**Direction of installation**

- Arrow on piston crown pointing to exhaust side
- Production locating point towards exhaust side (see Installing piston)
<table>
<thead>
<tr>
<th>Technical data</th>
<th>R 850 C</th>
<th>R 1200 C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Piston rings</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st groove Piston ring</td>
<td>Asymmetrical, convex oval</td>
<td></td>
</tr>
<tr>
<td>Height mm (in)</td>
<td>1.170...1.190 (0.0461...0.0469)</td>
<td>1.170...1.190 (0.0461...0.0469)</td>
</tr>
<tr>
<td>Wear limit mm (in)</td>
<td>1.1 (0.043)</td>
<td>1.1 (0.043)</td>
</tr>
<tr>
<td>Gap clearance mm (in)</td>
<td>0.1...0.3 (0.004...0.012)</td>
<td>0.1...0.3 (0.004...0.012)</td>
</tr>
<tr>
<td>Wear limit mm (in)</td>
<td>0.8 (0.031)</td>
<td>0.8 (0.031)</td>
</tr>
<tr>
<td>Side clearance mm (in)</td>
<td>0.030...0.070 (0.0012...0.0027)</td>
<td>0.030...0.070 (0.0012...0.0027)</td>
</tr>
<tr>
<td>Wear limit mm (in)</td>
<td>0.15 (0.0006)</td>
<td>0.15 (0.0006)</td>
</tr>
<tr>
<td>2nd groove Micro-taper compression ring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height mm (in)</td>
<td>1.170...1.190 (0.0461...0.0469)</td>
<td>1.170...1.190 (0.0461...0.0469)</td>
</tr>
<tr>
<td>Wear limit mm (in)</td>
<td>1.1 (0.043)</td>
<td>1.1 (0.043)</td>
</tr>
<tr>
<td>Gap clearance mm (in)</td>
<td>0.2...0.4 (0.008...0.016)</td>
<td>0.2...0.4 (0.008...0.016)</td>
</tr>
<tr>
<td>Wear limit mm (in)</td>
<td>1.0 (0.040)</td>
<td>1.0 (0.040)</td>
</tr>
<tr>
<td>Side clearance mm (in)</td>
<td>0.030...0.070 (0.0012...0.0027)</td>
<td>0.030...0.070 (0.0012...0.0027)</td>
</tr>
<tr>
<td>Wear limit mm (in)</td>
<td>0.15 (0.0006)</td>
<td>0.15 (0.0006)</td>
</tr>
<tr>
<td>3rd groove Equal-chamfer ring + tubular spring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height mm (in)</td>
<td>1.970...1.990 (0.0776...0.0783)</td>
<td>1.970...1.990 (0.0776...0.0783)</td>
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<tr>
<td>Wear limit mm (in)</td>
<td>1.9 (0.075)</td>
<td>1.9 (0.075)</td>
</tr>
<tr>
<td>Gap clearance mm (in)</td>
<td>0.30...0.55 (0.012...0.022)</td>
<td>0.30...0.55 (0.012...0.022)</td>
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<tr>
<td>Wear limit mm (in)</td>
<td>1.20 (0.047)</td>
<td>1.20 (0.047)</td>
</tr>
<tr>
<td>Side clearance mm (in)</td>
<td>0.020...0.060 (0.0008...0.0024)</td>
<td>0.020...0.060 (0.0008...0.0024)</td>
</tr>
<tr>
<td>Wear limit mm (in)</td>
<td>0.15 (0.0006)</td>
<td>0.15 (0.0006)</td>
</tr>
<tr>
<td><strong>Installed direction of piston rings</strong></td>
<td><em>“Top” marking uppermost</em></td>
<td></td>
</tr>
<tr>
<td><strong>Piston pin</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piston pin dia. mm (in)</td>
<td>21.995...22.000 (0.8660...0.8662)</td>
<td>21.995...22.000 (0.8660...0.8662)</td>
</tr>
<tr>
<td>Wear limit mm (in)</td>
<td>21.960 (0.8646)</td>
<td>21.960 (0.8646)</td>
</tr>
<tr>
<td>Bore dia. in piston mm (in)</td>
<td>22.005...22.011 (0.8664...0.8666)</td>
<td>22.005...22.011 (0.8664...0.8666)</td>
</tr>
<tr>
<td>Radial clearance in piston mm (in)</td>
<td>0.005...0.016 (0.0002...0.0006)</td>
<td>0.005...0.016 (0.0002...0.0006)</td>
</tr>
<tr>
<td>Wear limit mm (in)</td>
<td>0.070 (0.0027)</td>
<td>0.070 (0.0027)</td>
</tr>
</tbody>
</table>
Sectioned drawing of engine
Lubricating oil circuit
Removing engine

**Note:**
Auxiliary shaft, timing chains, chain tensioner/guide rails and crankshaft can only be dismantled after the engine has been removed. All other components can be dismantled while the engine is still installed.

- Drain engine oil.
- Drain the brake system completely.
- Drain the clutch operating system completely.

- Attach auxiliary stand, **BMW No. 00 1 550**, to the motorcycle.

- Attach stand, **BMW No. 00 1 520**, to motorcycle.
- Remove seat.
- Remove side trim.
- Remove fuel tank.
- Remove the battery.

**Caution:**
Disconnect negative terminal first, then positive terminal.

- Use pull rod, **BMW No. 00 8 581**, and impact weight, **BMW No. 00 8 582**, to pull out the swinging arm bearing.
- Remove the left swinging arm bearing.

## Note:
Press the upper suspension strut to the rear.

- Remove rear wheel drive unit.
- Detach brake hose holder at rear frame.

- Press off the left swinging arm bearing cap.

**Caution:**
When installing, make sure the O-ring is in good condition. Install with the drain hole pointing down.

- Loosen the left swinging arm bearing.
- Loosen the screws at the right swinging arm bearing.

- Loosen the left swinging arm bearing.
- Loosen the screws at the right swinging arm bearing.

- Remove rear wheel.
- Detach the rear brake caliper.
- Detach the ABS sensor.
- Detach the speedometer sensor.
- Remove exhaust manifold.
- Remove silencer (muffler).
- Separate oxygen sensor plug.
- Remove line protection from swinging arm.
- Tie the swinging arm up to the rear frame with a strap.
- Remove suspension strut.
• Remove rear swinging fork.

• Press off drive shaft.
• Remove the air intake stub pipe.
• Remove brake fluid reservoir from holder.
• Remove the holder.
• Take off the right plug retaining plate.
• Pull the air temperature plug off the air cleaner cover.
• Detach the gear lever at the pivot.
• Remove the gear lever.
• Separate the plug for the throttle angle potentiometer and the throttle positioner at the left plug retaining plate.
• Disconnect both fuse boxes at the plug retaining plate.
• Separate the side (prop) stand safety switch plug.
• Separate the neutral indicator plug.
• Detach the left plug retaining plate.
• Remove the injector nozzles.
• Pull the plug off the injector line.
• Separate the plug for the rear brake light switch and detach the wire.
• Detach the vent hose at the air cleaner housing.
• Disconnect the throttle cable at the twistgrip.
• Remove rear section of frame.
• Remove the auxiliary stand.
• Remove the footrest holder.
• Remove the starter motor cover.
• Detach cable from starter motor.
• Remove the starter motor.
• Separate the clutch line where it passes through the frame.
• Remove the clutch slave cylinder with line.
• Pull out the thrust rod.

• Detach the gearbox.

• When removing the gearbox, pull it out on guide pins, BMW No. 23 1 820.
• Remove the Motronic control unit.
• Disconnect the wires in the central electrical equipment box.
  – Instruments
  – Right combined switch
  – Left combined switch
  – Front brake light switch
  – Clutch switch
  – Front ABS sensor
• Undo the cable straps at the wiring.
• Detach the central electrical equipment box.
• Remove the brake lines from the pressure modulator to the front junction box.

• Detach the lines at the pressure modulator.
• Remove the ABS unit.

Caution:
Comply exactly with the instructions in the Repair Manual.

Group 34

• Remove battery carrier.
• Remove the horn.
• Remove the ignition coil.
• Pull off the plug cap with special puller, BMW No. 12 3 520, and remove the ignition lead.
• Open the headlight housing.
• Detach the headlight cable.
• Detach the flashing turn indicator wires.
• Detach the oil pressure switch wire.
• Detach the alternator cables.
• Detach the central earth (ground) wire at the engine block.
• Remove the left air intake pipe at the cylinder head.
• Heat the ball joint mount at the leading link to max. 120 °C (248 °F) and detach it.

⚠️ Caution:
Do not scratch the surface of the leading link.

• Detach the line for the front brake caliper at the junction block/frame.
• Remove the caps from the threaded connections on the fixed tubes.
• Separate the fixed tube from the fork bridge at the threaded connections.
• Remove the telescopic fork.
• Remove the cover plate over the upper suspension strut mount on the frame.
• Remove suspension strut.
• Remove the leading link caps.
• Remove the left screw cap.
• Remove the circlip at the right and the safety cap.
• Take out the screw at the right and pull the shaft out to the left.
• Remove the leading link.
• Detach the hose for the oil cooler at the engine.
• Remove frame.
• Install by following the above work instructions in the reverse order.
Dismantling engine

- Attach engine mount, **BMW No. 11 0 630**, to the engine block.
- Transfer engine to assembly frame.

- Drain engine oil.
- Remove the oil filter, using oil filter wrench, **BMW No. 11 4 650**.
Removing cylinder head cover

- Unscrew and remove spark plug with the spark plug wrench, **BMW No. 12 3 510**.
- Remove cylinder head cover.

⚠️ **Caution:**
Trap escaping oil.
Locking the engine in the TDC position

- Remove front cover.
- Turn the belt pulley to move the piston to TDC on the ignition stroke.

**Top dead centre on ignition stroke:**
1. TDC mark is visible, and
2. The inlet and exhaust valves in the cylinder in question are closed.

- Prevent the clutch housing from moving with locking device, BMW No. 11 5 640.

---

**Note:**
The engine can be correctly positioned at TDC with locating pin, BMW No. 11 2 650, through the hole in the clutch housing and the engine block.
Removing and installing chain tensioner

**Caution:**
Do not accidentally confuse the chain tensioner pistons. When installing, fit a new gasket.

**Assembly specification for timing chain tensioner:**
Removal:
- Remove timing chain tensioner, then remove camshaft sprocket from camshaft.
Installing:
- First install camshaft sprocket, then timing chain tensioner.

**Caution:**
Failure to observe this sequence can cause the chain tensioner piston to fall into the left side of the timing chain cavity.

**Tightening torque:**
Chain tensioner ............................................. 32 Nm
Removing valve gear holder

- Remove camshaft sprocket cover.
- Unscrew/press off camshaft sprocket.

**Note:**
If the camshaft sprocket (1) is not removed after loosening, it must be held firmly and prevented from falling into the engine block (e.g. with a cable strap).

- Remove valve gear holder.
- Secure rockers with a rubber band (2).

---

**Note:**
If no work is carried out on the valve gear holder, remove it together with the cylinder head.
Dismantling/reassembling valve gear holder

- Remove bearing cap.
- Insert a suitable drift into the bore (arrow) of the rocker shaft, and pull the shaft out of the mount by twisting it in both directions.
- Remove pushrods.

⚠️ **Caution:**
Do not accidentally confuse rocker shafts and pushrods.
- Remove camshaft bearing cap (1).
- Remove camshaft and bearings (2).
- Remove bucket-type tappets.

⚠️ **Caution:**
Do not accidentally confuse the bucket-type tappets.

- Reassemble in the reverse order of work.

⚠️ **Caution:**
Note direction of installation (3) for camshaft bearing cap. The cutout on the rocker shafts must be aligned with the retaining holes.

**Note:**
Locate pushrods in ball cups on rockers and hold the rockers together with a rubber band to secure the pushrods in position.

⚠️ **Tightening torque:**
- M 8 screw, rocker shaft bearing cap .......... 15 Nm
- M 8 screw for camshaft bearing cap .......... 15 Nm

- Reposition the bearings until minimum endplay is obtained.

**End float of rocker:**
- min. ............................................ 0.05 mm (0.002 in)
- max. ......................................... 0.40 mm (0.016 in)
Removing cylinder head
Dismantling, checking, repairing and re-assembling cylinder head

**Removing and installing valves**

**Caution:**
Do not scratch sealing face on cylinder head. Place the head on a clean, scratch-free surface.

- Attach valve spring tensioner, **BMW No. 115 690**, to cylinder head.
- Clamp the valve springs.
- Separate valve collet from spring plate by striking the valve head gently.
- Remove valve collet sections.
- Relieve tension on valve springs.
- Remove top/bottom spring plates, valve springs and valves.

**Removing valve stem seals**
- Pull off valve stem seal with pliers, **BMW No. 111 250**.

**Note:**
If a valve is removed, the valve stem seal must be renewed.
Checking valves for wear
- Clean combustion residue from valves.
- Check valve dimensions.

Remachining valve seat

![Diagram of valve seat with dimensions D and B]

⚠️ Caution:
Width (B) and diameter (D) must always be maintained when remachining the valve seat.

Checking and repairing cylinder head
- Remove combustion residues from combustion chamber.
- Check sealing face for damage/distortion, and skim flat if necessary.

Skimming sealing face: max. 0.2 mm (0.008 in) metal removal

Checking valve guide for wear
- Check valve guide bore.
Replacing valve guides

- Heat cylinder head slowly and uniformly to 200 °C (392 °F) in a suitable oven.

⚠️ Caution:
Wear protective gloves when handling heated parts.

- Drive out valve guides with 5 mm (0.20 in) dia. extractor pin, BMW No. 11 5 674, from the combustion chamber side.
- Allow cylinder head to cool down to room temperature (app. 20 °C/68 °F).
- Examine valve guide bore for:
  - wear,
  - widening taper and
  - correct dimensions in H7 tolerance range (12.500...12.518 mm/0.4921...0.4928 in).

💡 Note:
Valve guides are installed in the cylinder head with an interference fit of 0.015...0.044 mm (0.0006...0.0017 in).

If valve guide bore is undamaged and dimensions are within correct 12.5 H7 tolerance range:

- Use original 12.5 U6 (12.533...12.544 mm/0.4934...0.4939 in) valve guide.
- Measure valve guides with micrometer.

If valve guide bore is undamaged but slightly larger than the 12.5 H7 tolerance range:

- Use replacement valve guide 12.550...12.561 mm (0.4941...0.4945 in).

If valve guide bore is damaged or not to correct dimensions in 12.5 H7 tolerance range:

- Use an oversize 12.7U6 (12.733...12.744 mm/0.5013...0.5017 in) valve guide.

Repair method 1 – ream out the bore (if bore is damaged or not to correct dimensions)

- Determine actual diameter of valve guide using micrometer.
- Open out bore with Ø12.7 H7 mm (12.700...12.718 mm/0.5000...0.5007 in) reamer.

Repair method 2 – lathe-turn the valve guide (bore must not be damaged)

- Determine actual diameter of bore with internal measuring tool.
- Calculate the nominal diameter of the valve guide:
  Nominal diameter of valve guide = bore dia. + interference-fit value (0.015...0.044 mm/0.0006...0.0017 in).
- Use an oversize 12.7 U6 (12.733...12.744 mm/0.5013...0.5017 in) valve guide.
- Turn down oversize valve guide to nominal dimension.

- Slowly heat cylinder head to 200 °C (392 °F) in a suitable oven.
- Immerse valve guide in liquid grinding paste.
- Freeze valve guide with dry ice.

⚠️ Caution:
Immediately before pressing in, the temperature must be –40 °C (–40 °F).

- Place heated cylinder head flat on workbench or a similar surface.
- After cooling, place the valve guide on driving-in pin, driving-in pin, Ø 5mm (0.20 in), BMW No. 11 5 673.
- Insert valve guides into cylinder head with no delay.
- Allow cylinder head to cool down to room temperature, app. 20 °C (68 °F).
- Inspect bore in valve guide.

💡 Note:
Valve guides for repair purposes are produced with an internal diameter of 5.01 mm (0.1972 in) H7. In most cases, the bore is within the 5.00 mm (0.1969 in) H7 tolerance range after pressing in. If the bore is too narrow, ream it out to size.
Installing valve and valve stem seal

Note:
If a valve was removed, the valve stem seal must be renewed.

- Oil the stem when installing the valve.
- Shrink a short length of tube (arrow) on to the end of the valve stem.
- Install the valve stem seal with a 5 mm (0.20 in) dia. drift, BMW No. 11 5 602.

Caution:
Remove the shrunk-on tube.

- Fit lower spring plate, valve spring and upper spring plate.
- Compress the valve springs with the valve spring clamp, BMW No. 11 5 690.

Note:
Insert the taper valve collets using grease (to simplify assembly).

Caution:
Ensure that valve collets are correctly seated in the valve stem grooves.

- Relieve tension on valve springs.
- Check valves for leakage (blow-by).
Removing cylinder barrel

- Unscrew and remove guide rail bearing screw (1).
- Unscrew and remove cylinder retaining screws, and remove cylinder.

⚠️ **Caution:**
When removing cylinder, ensure that the piston does not strike the engine block.

Removing/dismantling piston

- Remove both retaining rings on piston pin.
- Press out piston pin by hand.
- Remove piston.
- Carefully remove piston rings with piston ring pliers.
- Remove carbonized oil from base of piston/clean the piston.

⚠️ **Caution:**
Do not accidentally confuse pistons, piston pins or piston rings.
Checking pistons and cylinders

Reference temperature for measurements: ......20 °C (68 °F)

• Measure cylinder bore with internal probe at 20 mm (0.79 in) and 100 mm (3.94 in) from the top in direction of piston pin, and again at a right angle to the first measurement.

→ ............................................See Technical data

Measuring plane A: ...................... 6 mm (0.24 in)

→ ............................................See Technical data

• Install piston rings in cylinder.

Assembling pistons

• Carefully fit piston rings to piston in the following sequence, using piston ring pliers:
  3rd groove - equal chamfer ring
  2nd groove - micro-chamfer ring
  1st groove - asymmetric, convex oval-section

→ ............................................See Technical data

Caution:
The tubular-spring ring gap must be at 180° to the equal-chamfer ring gap.
Install with "Top" uppermost.
Removing/installing conrod

- Turn crankshaft to TDC position.
- Lock the clutch housing with special tool BMW No. 11 5 640.
- Remove conrod.

**Note:**
Conrods can also be removed/installed with the crankshaft removed.

**Caution:**
Do not accidentally interchange conrods or bearing shells.

- Install conrods.

**Installed direction of conrods:** Lettering facing up

**Caution:**
Oil the bearings.

- Screw the big end bolts in by hand, then tighten them with a tightening angle indicator, BMW No. 11 2 500.

**Caution:**
Use big end bolts once only.

**Tightening torque:**
Big end bolts oiled
Joint torque: .................................................. 20 Nm
Wrench angle: .................................................. 80 °
Removing and installing alternator cover with engine installed

**Caution:**
Disconnect earth (ground) lead from battery. Insulate earth (ground) lead.

- Detach the horn.
- Remove the oil cooler line.
- Separate the Hall-effect signal transmitter plug.
- Remove the starter motor.
- Remove rear leading link mount.

Removing alternator mount cover

- Detach the alternator.
- Remove rotary breather line (1).
- Lock the clutch housing with special tool **BMW No. 11 5 640**.
- Remove pulley (2).
- Remove magnetic gate (3).

**Note:**
If complete alternator mount cover is removed, leave magnetic gate (3) installed.

- Remove alternator mount cover (4).
Renewing radial shaft seal in alternator mount cover

- Carefully lever radial shaft seal out, using a screwdriver.
- Drive in the new radial shaft seal with drift and sliding sleeve, **BMW No. 11 5 680**.

**Note:** Slide new radial shaft seal over taper on sliding sleeve, pre-shape and pull off.

Renewing radial shaft seal for rotary breather

- Carefully lever radial shaft seal out, using a screwdriver.
- Carefully pre-form the lip of the radial shaft seal by hand.
- Oil the new radial shaft seal lightly and drive it in with handle, **BMW No. 00 5 550**, and drift, **BMW No. 11 5 650**.
Removing auxiliary shaft drive

- Align markings (arrows) on timing pinion and chain sprocket.
- Unscrew and remove cooling oil pipe (1)/swing the pipe forwards.
- Remove chain tensioner (2).
- Remove chain tensioning rail (3).
- Remove chain guide rail (4).
- Lock clutch housing with special tool BMW No. 11 5 640.
- Unscrew and remove chain sprocket retaining bolt (5).
- Remove rotor (6) with chain sprocket (7) and timing chain (8).
- If necessary, remove chain sprocket (9).
Removing oil pump

- Remove oil pump cover (1).
- Remove complete oil pump (2) together with cooling oil pipe (3), and dismantle.

⚠️ Caution:
Check installed positions of parts which have already been run together.
Removing radial shaft seal on crankshaft with engine installed

- Lock clutch housing with special tool BMW No. 11 5 640.
- Remove the clutch.

- Carefully lever radial shaft seal out, using a screwdriver.

⚠️ Caution:
Avoid damaging the sealing faces on the housing and the crankshaft.

🔥 Note:
When the crankcase is dismantled, the radial shaft seal can be taken out.
Dismantling crankcase

- Turn engine on to its side.
- Remove screws on right side.
• Turn engine on to its side.
• Remove screws on left side.
• Remove upper section of crankcase.
Removing crankshaft, auxiliary shaft and timing chain tensioning and slide rails
Removing and installing oil pick-up basket

Tightening torque:
M 6 screw ...................................................... 9 Nm

Caution:
Make sure that the O-ring is not omitted, and is installed undamaged.

Replacing oil level sight glass

- Pierce the plastic disc with a large screwdriver and lever out the oil level sight glass.
- Coat the sealing face of the new oil level sight glass with engine oil and drive it in with drift, BMW No. 00 5 550.

Removing conrods

- Clamp crankshaft in a vise provided with protective jaws.
- Remove conrod.

Caution:
Do not accidentally confuse the conrods.

Checking conrods

- Check conrod dimensions.
  ...........................................................................See Technical data

Caution:
Sintered-metal conrods must never be straightened – risk of fracture.
Measuring main and big end bearing play

**Measuring radial bearing play**
- Measure main bearing journal with an external micrometer crosswise in two planes, A and B.
- Enter measured values on record sheet.
  ➔ See Technical data

⚠️ **Caution:**
The crankshaft can only be reground in grinding stage 0; after this it must be rehardened and finished. Grinding stages are identified by a paint mark on the front crank web.

➔ See Technical data
If the bearing shells have to be replaced, note colored marks on crankpins and big end bearings.
Installing main bearing
- Insert tensioner rail/slide rail pivot pin (1) for centering purposes.
- Tighten M8 and M10 housing screws.

Tightening torque/tightening order:
1. M 10 screw (oiled) ..................................... 45 Nm
2. M 8 screw (oiled) ..................................... 20 Nm

- Measure main bearings front/back in the load direction.
- Enter measured values on record sheet and determine main bearing play values.
- See Technical data

Measuring axial bearing play
- Place crankshaft in engine block.
- Insert tensioner rail/slide rail pivot pin (1) for centering purposes.
- Tighten housing screws.

- Screw measuring device, BMW No. 00 2 500, with dial gauge, BMW No. 00 2 510, into tapped hole for alternator carrier cover.
- Move crankshaft forwards and backwards and read off play at dial gauge.
- See Technical data
Measuring big end bearing play

- Measure crankpin with an external micrometer in the thrust direction and offset through 90°.

- Install bearing shells and assemble conrods.
- Using tightening angle gauge, BMW No. 11 2 210, tighten the big end bolt.

**Tightening torque:**

Big end bolts oiled
Joint torque .................................................. 20 Nm
Wrench angle ............................................... 80°

- Measure big end bearing with internal gauge in thrust direction.
- Enter measured values on record sheet and determine big end bearing clearances.

See Technical data
Assembling engine

Installing conrod

- Clamp crankshaft in a vise provided with protective jaws.
- Oil the big end bolts, screw them in by hand and tighten with angle gauge, BMW No. **11 2 210**.

⚠️ Caution:
Oil the bearings.
Do not accidentally confuse conrods or bearing shells.
Always use new big end bolts.

Installed direction of conrods: ..lettering facing up

 principio de conrods:

- **Tightening torque:**
  - Big end bolts (oiled)
  - Joint torque: .................................................. 20 Nm
  - Wrench angle: ............................................... 80°
Installing crankshaft

⚠️ **Caution:**
Oil the bearings.

Installing timing chain tensioning and slide rails

- Seal pivot pin for tensioning rail/slide rail at clutch side (arrow) with **3-Bond 1209**.
  Insert pivot screw (1) into chain tensioner rail, using a new seal.

⚠️ **Tightening torque:**
Chain guide rail pivot pin ....................... 18 Nm

Installing auxiliary shaft/timing chains

⚠️ **Caution:**
Timing chains (2) must mesh fully with auxiliary shaft sprockets.
Assembling engine block

- Coat clean, grease-free sealing faces (arrow) with 3-Bond 1209.
- Secure the timing chain with rubber band (1) to the timing chain tensioning and slide rail.
Bolt the crankcase sections together.

**Tightening torque/tightening order:**
1. M10 screw (oiled) ........................................... 45 Nm
2. M8 screw (oiled) .......................................... 20 Nm
3. M6 screw .................................................. 9 Nm
Installing the crankshaft radial seal

- Pre-form the lip of the radial shaft seal carefully by hand (1).
- Oil the radial shaft seal at the sealing/contact surface.
- Place radial seal over sliding sleeve (2)/remove sliding sleeve (3).
- Drive the radial shaft seal in with handle, **BMW No. 00 0 500**, and drift with sliding sleeve, **BMW No. 11 5 660** (4).
Installing clutch housing

**Caution:**
Always use new bolts for housing and cover.

- Install clutch housing with mark (1) aligned with crankshaft mark (2).
- Lock the clutch housing with special tool BMW No. 11 5 640.
- Insert all screws by hand and tighten down.

**Tightening torque:**
Clutch housing to crankshaft (screw threads oiled) .......... 40 Nm
Additional wrench angle ........................................ 32°
Installing oil pump

⚠️ Caution:
Oil the sliding-contact faces.

- Install outer rotor (1) of oil pump in pump housing.
- Install oil pump housing with cooling oil pipe (2).

⚠️ Caution:
O-ring (3) must be in good condition.

- Install Woodruff key (4), outer rotor (5) and inner rotor (6) in cooling oil pump.
- Screw housing cover (7) on to oil pump.

⚠️ Caution:
Note different lengths of screw.

🪨 Tightening torque:
M 6 screw ...................................................... 9 Nm
Pressure relief valve ....................................... 35 Nm
Oil pressure switch....................................... 30 Nm
Installing auxiliary shaft drive

- Set crankshaft mark against mark on auxiliary shaft.

⚠️ **Caution:**
Adjust according to the adjusting instructions.
See “Installing cylinder head”.

- Lock the clutch housing with special tool BMW No. 11 5 640.
- Install chain sprocket (1).

**Tightening torque:**
M 6 screw .................................................... 10 Nm

- Install drive-shaft chain with chainwheel (2) and rotor (3).

**Tightening torque:**
Retaining screw at chainwheel ...................... 70 Nm

- Install/secure chain guide rail (4).
- Install/secure chain tensioner rail (5).
- Install chain tensioner housing (6) with piston and spring.

**Tightening torque:**
M 6 screw .................................................... 9 Nm

- Tighten down cooling oil line (7).

⚠️ **Caution:**
Use a new sealing ring.

**Tightening torque:**
M 6 screw .................................................... 10 Nm
Banjo screw for cooling oil line with oil vent valve ........................................... 25 Nm
Installing piston

- Turn joint in oil scraper ring (arrow) so that it faces upwards.
- Install piston ring gap offset by 120° in each case.

Production locating point X = install on exhaust side.

⚠️ Caution:
Ensure that retaining rings are properly seated on piston pin.
Oil the sliding-contact faces.
Always use pistons of the same weight class in any one engine.

Markings: .............................................. + or –
↔ .............................................. See Technical data

⚠️ Caution:
Always install pistons and cylinders in pairs.
Do not accidentally confuse pistons or piston pins.

Piston size identification:
On piston crown A, B, AB (for either A or B cylinder), and on cylinder A, B.
Installing cylinder

- Apply 3-Bond 1209 to the cylinder base sealing face (arrow), which must be clean and free from grease.
- Oil the cylinder wall.
- Compress the piston rings with a clamping strap, BMW No. 11 2 900.
- Install the cylinder and at the same time pass the timing chain and the tensioning and guide rail through the timing case cavity.
- Tighten cylinder down firmly.
- Fit new seal to pivot pin for chain guide rail (1).
- Install chain sprocket.

⚠️ Tightening torque/tightening order:
1. M 8 screw ................................................ 20 Nm
2. M 6 screw .................................................. 9 Nm
3. Pivot screw for chain guide rail ..................... 18 Nm
Installing cylinder head

- Install cylinder head gasket.
- Fit cylinder head/insert correctly positioned camshaft chain sprocket (1) and timing chain into chain cavity.
- Install valve gear support (2).
- Tighten cylinder head down.

⚠️ Caution:
Install collar (arrow) of cylinder head nut towards cylinder head.

⚠️ Tightening torque/tightening order:
1. Tighten cylinder head nuts (oiled) crosswise
   1.1 Tighten all nuts................................. 20 Nm
   1.2 Tighten all nuts to correct angle ............ 90°
   1.3 Tighten all nuts to correct angle ............ 90°
2. M 10 bolt.............................................. 40 Nm
3. M 6 screw ............................................. 9 Nm

⚠️ Tightening torque:
Take up slack after 1000 km (app. 600 miles)
Tighten cylinder head nuts in a crosswise pattern
1. Unfasten one nut
2. Tighten one nut to initial value ............... 20 Nm
3. Tighten nut to wrench angle ................. 180°
4. Unfasten/retighten M10 screw ............. 40 Nm

- Fit camshaft chain sprocket in accordance with adjustment specification.
- Lock clutch housing with special tool
  BMW No. 11 5 640.
- Tighten camshaft chain sprocket.

⚠️ Tightening torque:
Camshaft sprocket retaining screw ............ 65 Nm

- Insert the left-side camshaft sprocket with pin into the camshaft and set the left cylinder to TDC on the ignition stroke.
- Fit camshaft chain sprocket in accordance with adjustment specification.
- Tighten camshaft chain sprocket.
- Install chain tensioner.
- Check that marks on camshaft sprockets are in accordance with adjustment specification.

⚠️ Tightening torque:
Chain tensioner........................................ 32 Nm
Adjusting valve clearances

- Set piston to TDC on the ignition stroke.
- Measure valve clearance with feeler gauge.
- Correct valve clearance with adjusting screw and lock into position.

**Valve clearances with engine cold (max. 35 ºC/95 ºF):**
- Inlet........................................... 0.15 mm (0.006 in)
- Exhaust ..................................... 0.30 mm (0.012 in)

**Tightening torque:**
- Locknut.......................................................... 8 Nm

- Check valve clearance again; it must be possible to insert the feeler gauge between valve stem and rocker with only slight resistance to movement.
Installing right cylinder head

Adjustment specification

⚠️ Caution:
When assembling, always start with the right cylinder.

Right cylinder = at TDC on ignition stroke:
marks (arrows) on chainwheel/auxiliary shaft and
chain sprocket/crankshaft are aligned.

- Locate ignition-stroke TDC with insert pin,
  BMW No. 11 2 650, at hole in clutch housing
  and engine block.

>Note:
With the engine installed, adjust TDC with dial gauge
holder, BMW No. 00 2 650, and dial gauge,
BMW No. 00 2 510.

Right cylinder = at TDC on ignition stroke:
Locating pin (arrow) on right camshaft sprocket
points downwards.
Mark (R or arrow) and tip of tooth on right camshaft
sprocket is precisely aligned with mark X on timing
gear carrier.

- Check setting again with timing chain tensioner
  installed.
Installing left cylinder head

Adjustment specification

⚠️ Caution:
When installing, *always* begin with the *right* cylinder.

Left cylinder = TDC on ignition stroke: marks (arrows) on chain sprocket/auxiliary shaft and chain-wheel/crankshaft face down

- Locate ignition-stroke TDC with insert pin, *BMW No. 11 2 650*, at hole in clutch housing and engine block.

⚠️ Note:
With engine installed, adjust to TDC with dial gauge holder, *BMW No. 00 2 650*, and dial gauge, *BMW No. 00 2 510*.

Left cylinder = at TDC on ignition stroke:
Locating pin (arrow) on left camshaft sprocket points upwards.
Mark (R or *arrow*) and tip of tooth at left camshaft sprocket is aligned *precisely* with mark X on timing gear carrier.

- Check setting again with timing chain tensioner installed.
• Install the end cover with an O-ring which is in good condition.

  **Tightening torque:**
  M 6 screw ...................................................... 9 Nm

• If necessary, reduce end play to a minimum by repositioning the bearings.

  **Rocker end float:**
  min. ...................................................... 0.05 mm (0.002 in)
  max. .................................................... 0.40 mm (0.016 in)

• Install cylinder head cover.

  **Caution:**
  Ensure that gaskets are properly seated. Gaskets and sealing face must be free from oil and grease.

  **Tightening torque:**
  Cover screw ................................................... 8 Nm

• Tighten air intake stub pipe.

  **Tightening torque:**
  M 6 screw ...................................................... 9 Nm
Installing alternator mount cover

- Place sliding sleeve, **BMW No. 11 5 680**, on crankshaft.
- Apply **3-Bond 1209** to the sealing face (arrow), which must be clean and free from grease.
- Install alternator mount cover.

**Tightening torque:**
- M 8 screw .................................................... 20 Nm
- M 6 screw ...................................................... 9 Nm

Installing magnetic gate/belt pulley

- Install Hall-effect trigger plate (1).
- Lock clutch housing with special tool **BMW No. 11 5 640**.
- Secure rotor (2) of Hall-effect gate to the Poly-V belt pulley (3) with, for example, **Loctite instant adhesive**.
- Install the Poly-V belt pulley.

**Caution:**
Install retainer for Hall-effect gate rotor (4) at groove in crankshaft (5).

**Tightening torque:**
- Retaining screw for belt pulley....................... 50 Nm

...
Timing the ignition
- Using TDC locating pin, BMW No. 11 2 650, lock the clutch housing.
- Connect BMW MoDiTeC with adapter cable to Hall-effect gate plate.
- Adjust in accordance with tester guidance.
- Remove the TDC locating pin.
Installing alternator

- Install alternator.

**Poly-V belt adjusting procedure:**

Poly-V belt installation procedure:

- Screw hex nut (1) on adjusting screw (2) up handtight *(no tools to be used)*
- Tighten adjusting screw (2) with a torque wrench, fully tighten retaining nut (3), slacken adjusting screw and tighten screws fully.

**Tightening torque:**

- Pre-tension Poly-V belt with adjusting screw ......................... 8 Nm
- Alternator to alternator support cover ............ 20 Nm

- Install front cover.
Installing engine

- Work in reverse order to that stated for removal.

- Install oil filter with oil filter wrench, BMW No. 11 4 650.
- Insert and tighten oil drain plug with a new seal.

  **Tightening torque:**
  - Oil filter (sealing face lightly oiled) ............... 11 Nm
  - Oil drain plug........................................... 32 Nm

- Install spark plugs with spark plug socket wrench, BMW No. 12 3 510.

  **Tightening torque:**
  - Spark plug.............................................. 20 Nm
# 12 Engine electrics

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<td></td>
</tr>
<tr>
<td>Type</td>
<td>Permanent-magnet motor with planetary gear drive</td>
</tr>
<tr>
<td>Gear ratios</td>
<td>Planetary gears 5.5 : 1</td>
</tr>
<tr>
<td>Power rating</td>
<td>kW 1.1</td>
</tr>
<tr>
<td><strong>Alternator</strong></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Three-phase alternating-current generator with integrated all-electronic voltage regulator</td>
</tr>
<tr>
<td>Drive</td>
<td>Poly-V belt</td>
</tr>
<tr>
<td>Gear ratios</td>
<td>1 : 1.5</td>
</tr>
<tr>
<td>Maximum output rating</td>
<td>W/V 700/14</td>
</tr>
<tr>
<td>Maximum current at engine speed 4000 min⁻¹</td>
<td>A 50</td>
</tr>
<tr>
<td>Nominal current at engine speed 1000 min⁻¹</td>
<td>A 18</td>
</tr>
<tr>
<td>Max. operating speed</td>
<td>min⁻¹ 20 000</td>
</tr>
<tr>
<td><strong>Spark plug</strong></td>
<td></td>
</tr>
<tr>
<td>Bosch</td>
<td>FR 6 DDC</td>
</tr>
<tr>
<td>Electrode gap</td>
<td>mm (in) 0.8 (0.03)</td>
</tr>
<tr>
<td>Wear limit</td>
<td>mm (in) 1.0 (0.04)</td>
</tr>
<tr>
<td>Thread</td>
<td>metric M 14 x 1.25</td>
</tr>
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<td><strong>Ignition</strong></td>
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<td>Motronic (mapped characteristic control)</td>
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<td>Two magnetic gates (Hall-effect transmitters) driven from crankshaft</td>
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<td>°CS 0° ... + 43° before OT</td>
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<td>Twin-spark coil</td>
<td></td>
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<tr>
<td>Resistance: Primary</td>
<td>Ω ~0.5</td>
</tr>
<tr>
<td>between terminals 15 and 1</td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td>kΩ ~7.5</td>
</tr>
<tr>
<td>between terminals 4a and 4b</td>
<td></td>
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</table>
Removing and installing coil and ignition lead

- Remove fuel tank.

⚠️ **Caution:**
Switch off ignition. Disconnect ground (earth) cable at battery and insulate it.

- Pull off spark plug cap with special puller, **BMW No. 12 3 520**.
- Release threaded connection for central electrical equipment box.
- Remove ignition leads.

Check ignition coil resistance

- Test with **BMW MoDiTeC**.
Removing and installing alternator

- Remove seat.
- Remove fuel tank.

⚠️ Caution:
Switch off ignition. Disconnect ground (earth) cable at battery and insulate it.

- Remove horn with holder.
- Remove front cover from engine.
- Remove alternator retainers (1, 2, 3).
- Remove rotary breather tube.
- Remove Poly-V belt.
- Remove the starter motor.
- Lock clutch housing with special tool BMW No. 11 5 640.
- Remove Poly-V belt pulley with rotor gate at crankshaft.
- Remove the left exhaust pipe.
- Drain engine oil.
- Remove the oil cooler return line.
- Pull the rear of the motorcycle down to the hoist platform and secure it with a strap or similar.
- Detach the left air intake flange.

⚠️ Caution:
Mask off the leading link to prevent it from being scratched.

- Release the threaded connection for the lower suspension strut mount.
- Release the leading link shaft at the right and remove it to the left.
- Pull the leading link forwards.

- Place sliding sleeve, BMW No. 11 5 680, on the crankshaft and remove the alternator support cover.
- Detach the central electrical equipment box and raise it as far as possible.
- Detach the connecting leads at the alternator.
- Remove the alternator.
- Install by following the above work instructions in the reverse order.

**Poly-V belt adjusting procedure:**
**Poly-V belt installation procedure:**
- Place the Poly-V belt in position, tension it and turn the engine over once, then release belt tension.

**Poly-V belt tensioning procedure:**
- Loosen alternator mount (1, 2, 3).
- Screw up hex nut (1) at adjusting screw (4) lightly by hand (using no tools).
- Tighten adjusting screw (4) using torque wrench; fully tighten retaining nut (3), slacken off adjusting screw and tighten down screws.

⚠️ Note:
See also Service Information 12 020 95 (700).

** Tightening torque:**
- Poly-V belt preload................................. 8 Nm
- Alternator to alternator support cover........... 20 Nm
- Positive lead to alternator........................... 15 Nm
- Belt pulley at alternator............................ 50 Nm
Dismantling/reassembling alternator

- Take out the cover retaining screws (1).
- Release clips (2) and remove the cover.
- Remove voltage regulator (3).
- Remove the Poly-V belt pulley.
- Install by following the above work instructions in the reverse order.

Tightening torque:
Belt pulley at alternator: 50 Nm

Checking alternator
- Test with BMW MoDiTeC.

Checking armature for short to ground (earth)
- Test with BMW MoDiTeC.
Removing and installing starter motor

**Caution:**
Disconnect earth (ground) lead from battery. Insulate earth (ground) lead.

- Release starter motor cover (1).
- Remove the cover.
- Detach lead (2).
- Release starter motor retainer (3).
- Remove the starter motor.
- Install by following the above work instructions in the reverse order.

**Tightening torque:**
Starter motor to engine ......................... 20 Nm
Starter motor cover to gearbox housing ....... 7 Nm
Positive lead to starter motor ................... 10 Nm
Dismantling/reassembling starter motor

- Detach lead (1).
- Remove retaining screws (2).
- Remove flange (3).
- Remove solenoid switch (4) after taking out the retaining screws (5).
- Remove release lever (6) and spring (7) from solenoid switch (8).
- Remove retaining ring (9) and take starter motor gear assembly (10) off shaft.
- Install by following the above work instructions in the reverse order.
- Coat the helical thread and pull-in ring with grease.

Lubricant: ......................... Bosch PZ 2 V 3 silicone grease or equivalent

Renewing carbon brushes

- Detach lead (1).
- Remove cover (11).
- Remove holder (12) for carbon brushes.
- Lift up retaining springs (13) and remove carbon brushes (14).
- Install carbon brushes with retaining plate.
- Slide short lead (15) on to threaded pin.
- Install cover (11).
- Attach lead (1).

Checking starter motor

- Test with MoDiTeC.

Checking starter relay

- Test with MoDiTeC.
Removing and installing magnetic gate

- Remove seat.
- Unscrew fuel tank mount.
- Pull fuel tank to the rear and support it at the front with a piece of wood or similar.

⚠️ Caution:
Avoid scratching any components, for instance by inserting a piece of cloth between the fuel tank and the frame.

- Remove the horn with its holder.
- Remove front cover from engine.
- Unscrew alternator mount (1).
- Remove rotary breather tube (2).
- Remove Poly-V belt (3).

⚠️ Caution:
Disconnect ground (earth) lead from battery. Insulate the ground (earth) lead!

- Remove the starter motor.
- Lock clutch housing with special tool BMW No. 11 5 640.
- Remove Poly-V belt pulley (4) with rotor gate at crankshaft.
- Separate the plug connection for the magnetic trigger in the central electrical equipment box.

⚠️ Note:
If necessary, mark position of magnetic trigger for later installation.

- Remove magnetic trigger (5).
- Install in reverse order of work.
- Attach rotor (6) of Hall-effect gate with adhesive to the Poly-V belt pulley (4).

Adhesive: Loctite instant adhesive or equivalent

⚠️ Caution:
Install retainer for Hall-effect rotor at groove/crankshaft (7).
Carefully dismantle magnetic trigger lead. Tension Poly-V belt according to installation procedure.

⚠️ Tightening torque:
Pre-tension of Poly-V belt ................. 8 Nm
Alternator to alternator mount cover .......... 20 Nm
Belt pulley to crankshaft ...................... 50 Nm
Timing the ignition

- Screw dial gauge holder, **BMW No. 00 2 650**, and dial gauge, **BMW No. 00 2 510**, into right or left spark plug hole.
- Turn the engine over until the piston is at TDC.
- Set the dial gauge pointer to zero.
- Check the dial gauge reading.
- Turn the engine over until the piston is at TDC.
- The dial gauge pointer must be at zero.
- Connect **BMW MoDiTeC** with adapter lead to the Hall-effect gate plate.
- Adjust as stated in the tester guide.
## 13 Fuel preparation and control

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<th>R 1200 C</th>
</tr>
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<tr>
<td>Fuel grade</td>
<td>Super (premium), unleaded, 95 octane (RON)</td>
<td></td>
</tr>
<tr>
<td>Mixture preparation</td>
<td>Motronic MA 2.4</td>
<td></td>
</tr>
<tr>
<td>Throttle stub pipe int. dia.</td>
<td>mm (in) 35 (1.38)</td>
<td></td>
</tr>
<tr>
<td>Throttle angle in rest position</td>
<td>depending on throttle positioner</td>
<td></td>
</tr>
<tr>
<td>Air cleaner</td>
<td>Flat-pattern paper element</td>
<td></td>
</tr>
</tbody>
</table>
Removing and installing air cleaner

See Group 46 (Removing/installing rear frame)

Removing and installing throttle stub pipe

- Remove throttle stub pipe (1).

Removing and installing throttle potentiometer

- Remove throttle potentiometer (2).
- Adjusting throttle potentiometer with **BMW MoDiTeC** after installing.
- Mark screws with a paint spot.
Removing and installing throttle positioner

- Remove the throttle positioner (3).

**Caution:**
The throttle positioner operates at the control unit voltage of 5 V. It must not be connected directly to the motorcycle’s electrical system.

**Tightening torque:**
Throttle positioner retaining screw (clean thread + Loctite 2701)

Removing and installing throttle potentiometer

- When a new throttle potentiometer is installed, it must be adjusted in accordance with the BMW MoDiTeC reading.

- Mark the retaining screws (arrows) with a paint spot.

Removing and installing injectors

- Press in the spring catch at the injector plug (1) and pull off the plug.
- Unfasten retainer (2) for fuel pipe and pull off the pipe.
- Remove injector.
- Install by following the above work instructions in the reverse order.

**Caution:**
The keeper (2) must be inserted from the inside outwards. It then prevents the injector from turning. Make sure that the keeper (2) engages correctly. Make sure that O-rings at the injector are in good condition.
Removing and installing Motronic control unit

- Remove fuel tank.

⚠️ Caution:
Switch off ignition; disconnect earth (ground) lead at battery and insulate it.

- Remove Motronic control unit.
- Remove connector strip.
- Install by following the above work instructions in the reverse order.
# 16 Fuel tank and lines

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## 16.1 Technical data

- **Fuel tank and lines**
- **Removing and installing fuel tank**
- **Removing and installing fuel filter, fuel pump and fuel level sensor**
- **Removing and installing fuel filter**
- **Removing and installing fuel pump and fuel level sensor**
- **Checking fuel pump pressure**
- **Removing and installing fuel distributor and pressure regulator**
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<th>R 1200 C</th>
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<td><strong>Fuel tank</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tank capacity</td>
<td>l (Imp. gal/US gal)</td>
<td>17 (3.74/4.50)</td>
</tr>
<tr>
<td>including reserve of</td>
<td>l (Imp. gal/US gal)</td>
<td>4 (0.88/1.06)</td>
</tr>
<tr>
<td><strong>Fuel pump</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Gear-type</td>
<td></td>
</tr>
<tr>
<td>Make</td>
<td>VDO</td>
<td></td>
</tr>
<tr>
<td>Operating voltage</td>
<td>V</td>
<td>12</td>
</tr>
<tr>
<td>Fuel pressure</td>
<td>bar (psi)</td>
<td>3±0.2 (42.69±2.85)</td>
</tr>
<tr>
<td>Delivery volume</td>
<td>l/h (Imp.gal/h, US gal/h)</td>
<td>110 (24.21, 29.06)</td>
</tr>
</tbody>
</table>
Removing and installing fuel tank

- Seal the fuel feed and return lines with a hose clip, BMW No. 13 3 010, detach and pull off.

⚠️ **Tightening torque:**
Fuel tank to rear frame ......................... 22 Nm
Removing and installing fuel filter, fuel pump and fuel level sensor

**Caution:**
Fuel is flammable and a hazard to health. Observe relevant safety regulations.

- Drain fuel tank.
- Remove fuel pump unit (1) and detach hoses (2).

Removing and installing fuel filter

- Release hose clips at fuel filter (3).

**Caution:**
Note direction of fuel flow at filter.

- Secure non-reusable hose clips with pliers, BMW No. 13 1 500.
Removing and installing fuel pump and fuel level sensor

- Detach the electrical connections at the fuel pump (4).
- Release the hose clip at the fuel pump.
- Remove fuel pump.
- Install by following the above work instructions in the reverse order.
- Secure non-reusable hose clips with pliers, BMW No. 13 1 500.

⚠️ Caution:
Use only an O-ring (5) in good condition. After installing, check fuel pump assembly for leaks.

 Tightening torque:
Fuel pump assembly to tank......................... 6 Nm

Checking fuel pump pressure

- Connect test pressure gauge, BMW No. 16 1 500, at the pressure side.
- Run engine at idle speed.

Fuel pressure:
Desired value .................. 3±0.2 bar (42.69±2.85 psi)

⚠️ Note:
If fuel pressure is low, check pump, fuel filter, pressure regulator and fuel line.

Removing and installing fuel distributor and pressure regulator

- Remove fuel tank.
- Remove the battery.
- [ABS] Remove the ABS unit.
- Remove the battery carrier.

- Remove the fuel distributor with pressure regulator (1) from the holder.
- Install by following the above work instructions in the reverse order.
- [ABS] Bleed the brake system.
18 Exhaust system

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Removing and installing exhaust system .................................................................3
Removing and installing silencer (muffler) .............................................................3
Removing and installing front exhaust pipes .........................................................3
Removing and installing exhaust system

Removing and installing silencer (muffler)

- Unscrew fuel tank and pull to the rear.
- Separate the plug connection for the oxygen sensor and detach the wire.

**Caution:**
Do not pull the oxygen sensor cable.

- Loosen the retaining clips.
- Pull off the silencer (muffler).
- Install by following the above work instructions in the reverse order.
- When installing, align the hole (arrow) on the clip with the embossed dot (arrow) on the silencer (muffler).

**Caution:**
Note position of wiring for oxygen sensor.

- Secure the oxygen sensor with special socket wrench insert, **BMW No.11 7 020**.

**Caution:**
After a trial run, read out Motronic fault memory.

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<td>Oxygen sensor (coat thread with Never Seez)</td>
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Removing and installing front exhaust pipes

- When installing, align the hole (arrow) in the clip with the embossed dot (arrow) on the silencer (muffler).

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<td>Clip at silencer (muffler) (coat clip contact face with Never Seez)</td>
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- Remove/install the oxygen sensor (1).
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<td><strong>R 850 C</strong></td>
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<td>-----------------------------------</td>
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</tr>
<tr>
<td>Type of clutch</td>
<td>single dry plate with increased-leverage dia-phragm spring</td>
</tr>
<tr>
<td>Operation</td>
<td>hydraulic, with master and slave cylinders</td>
</tr>
<tr>
<td>Master cylinder piston Ø</td>
<td>mm (in)</td>
</tr>
<tr>
<td>Slave cylinder piston Ø</td>
<td>mm (in)</td>
</tr>
<tr>
<td>Clutch fluid</td>
<td>DOT 4 brake fluid</td>
</tr>
<tr>
<td>Clutch plate dia.</td>
<td>mm (in)</td>
</tr>
<tr>
<td>Wear dimension</td>
<td>mm (in)</td>
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</table>
Removing and installing clutch

Removing clutch

- Preparatory work is as for “Removing gearbox” (see Group 23)
- Lock the clutch housing with special tool BMW No. 11 5 640.
- Remove the clutch.

Installing clutch

- Install clutch housing with mark (1) aligned with crankshaft mark (2).
- Lock the clutch housing with special tool BMW No. 11 5 640.

Caution:
Always use new bolts for housing and cover.

- Insert all screws by hand and tighten down.

 Tightening torque:
Clutch housing to crankshaft (oil screw threads lightly)
Initial tightening ............................................ 40 Nm
Wrench angle ................................................... 32°

- Secure the clutch with the retaining screws.
- Center the clutch plate with centering pin, BMW No. 21 2 673.
- Tighten retaining screws alternately in a crosswise pattern.

Lubrication points:
Splines on clutch plate and gearbox input shaft.
Diaphragm spring contact surface on clutch housing.
Diaphragm spring contact surface on pressure plate.

 Tightening torque:
Housing cover to flywheel ............................. 12 Nm

Caution:
Offset the color marks on the clutch housing, driven plate and housing cover through 120° in each case.
Removing and installing clutch hydraulic line

- Remove fuel tank.
- Remove the battery.
- [ABS] Drain the brake system.

⚠️ **Caution:**
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid destroys paint.

- [ABS] Remove the ABS unit.
- Remove battery carrier.
- Drain the clutch operating system.

⚠️ **Caution:**
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid destroys paint.

- Detach the clutch line at the separating point (1).
- Detach the clutch slave cylinder and pull it to the rear with the line.
- Detach the lines at the clutch slave cylinder.
- Install by following the above work instructions in the reverse order.
- Fill the clutch operating system.
- [ABS] Add fluid to brake system.

⚠️ **Note:**
When installing, fit new sealing rings.

**Tightening torque:**
Clutch line to handlebar fitting ................. 18 Nm

Removing and installing clutch slave cylinder

- Remove fuel tank.

⚠️ **Caution:**
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid destroys paint.

- Detach clutch line at separating point (1).
- Detach and raise the central electrical equipment box at the left.
- Detach the clutch slave cylinder and pull it to the rear with the line.
- Detach lines at clutch slave cylinder.
- Remove clutch slave cylinder.
- Install by following the above work instructions in the reverse order.
- Fill the clutch operating system.

⚠️ **Note:**
When installing, fit new sealing rings.

**Tightening torque:**
Clutch slave cylinder to gearbox ................. 9 Nm
Filling/bleeding clutch line

⚠️ Caution:
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid destroys paint.

⚠️ Caution:
With the clutch lining in new condition the surface of the fluid (arrow) must be up to the lower edge of the ring mark; it must not be below normal.

⚠️ Caution:
During the bleeding operation the brake fluid must not drop below the MIN mark or else air will be drawn into the clutch operating system. If this occurs, repeat the bleeding operation.

Note:
The description applies to a brake system filling and bleeding device with vacuum extraction of brake fluid at the bleed line. If other devices are used, comply with their manufacturers’ instructions.

- Take off reservoir cover with rubber diaphragm.
- [Standard handlebar/Police] Raise motorcycle on auxiliary stand, BMW No. 00 1 560, and swing handlebar fully to right.
- [Optional handlebar/Easy Rider] Prop motorcycle on side stand and turn handlebar fully to right.

- Top up the brake fluid.
- Bleed the clutch line through bleed screw (2).

Note:
As the clutch lining wears, the fluid level in the reservoir rises.

- Replace the reservoir lid with rubber diaphragm in position.
- Tighten the reservoir cover without using force.

Operating materials
Brake fluid..........................................................DOT 4

Operating materials
Brake fluid..........................................................DOT 4
23 Gearbox

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<td>1st gear</td>
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</tr>
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<td>3rd gear</td>
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<td>1.962</td>
</tr>
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<tr>
<td>Oil grade (all the year round)</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>1.0 (1.76/1.06)</td>
<td></td>
</tr>
<tr>
<td>(up to the lower edge of the filler hole)</td>
<td></td>
</tr>
<tr>
<td>During oil changes</td>
<td></td>
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Removing and installing gear pedal

Removing gearbox

**Caution:**
Switch off ignition.
Disconnect earth (ground) lead from battery.
Insulate earth (ground) lead.

- Attach stand, BMW No. 00 1 520, to motorcycle.
- Remove seat.
- Remove side trim.
- Remove fuel tank.
- Remove rear wheel.
- Detach rear brake caliper.
- Detach ABS sensor.
- Detach speedometer signal sensor.
- Detach wire protection at swinging arm.
- Tie up swinging arm with a suitable strap.
- Remove suspension strut.

**Note:**
Press to rear at top.

- Pull swinging arm upwards with strap.
- Removing exhaust manifold.
- Remove silencer (muffler).
- Detach plug at oxygen sensor.
- Remove rear wheel drive unit.

**Caution:**
When installing again, make sure that the O-ring is in good condition.
The opening must face down so that water can drain out.

- Loosen the left swinging arm.
- Take out the screws at the right swinging arm bearing.

- Using pull rod, BMW No. 00 8 581, and impact weight, BMW No. 00 8 582, pull out the swinging arm bearing.
- Remove the left swinging arm bearing.
- Remove rear swinging fork.
- Remove the rubber intake pipe sleeves.
- Remove brake fluid reservoir from holder.
- Remove the holder.
- Detach the right plug holder plate.
- Pull off the NTC air plug.
- Detach the gear pedal at the pivot.
- Separate the throttle potentiometer and throttle angle positioner plugs at the left plug holder plate.
- Disconnect both fuse boxes at the plug holder plate.

Tightening torque:
Gear pedal to frame ............................... 41 Nm
• Separate the side (prop) stand switch plug.
• Separate the neutral indicator plug.
• Detach the left plug holder plate.
• Remove the injectors.
• Pull the plugs off the injector lines.
• Disconnect the brake light switch plug and detach the cable.
• Detach the breather hose at the air cleaner casing.
• Detach the throttle cable at the twistgrip.
• Remove rear section of frame.
• Detach the footrest assembly.
• Remove the starter motor cover.
• Detach the positive lead from the starter motor.
• Remove the battery.
• Unscrew rear battery mount.
• Raise the battery holder at the rubber mount.
• Detach the clutch slave cylinder mount and pull out of the gearbox.
• Pull out the thrust rod.
• Detaching the gearbox

When removing, pull the gearbox out on guide pins, BMW No. 23 1 820.

Install by following the above work instructions in the reverse order.
Renewing the shaft sealing rings in the gearbox housing and gearbox cover

**Note:**
All shaft sealing rings can be renewed with the gearbox installed, apart from the input-side shaft sealing ring on the input shaft. If the gearbox is dismantled completely, all shaft sealing rings must be renewed. Before installing shaft sealing rings, oil their sealing lips lightly.

Renew the input shaft sealing ring at the input end

- Lever the shaft sealing ring out with a screwdriver.
- Drive the new sealing ring in with the sealing lips facing inwards, using slip-over sleeve, **BMW No. 23 4 712**, and drift, **BMW No. 23 7 711**.

Renewing output shaft sealing ring

**Caution:**
Never use a sharp tool to remove the output shaft sealing ring, or the plastic washer on the deep-groove ball bearing behind the shaft sealing ring could be damaged.

- Pull the shaft sealing ring out with puller, **BMW No. 00 8 590**.
- Install the sealing ring with the sealing lips facing inwards, using slip-over sleeve, **BMW No. 23 4 732**, and drift, **BMW No. 23 4 731**.
Renewing input shaft sealing ring at output side

- Pierce the shaft sealing ring with piercing tool, BMW No. 00 8 583.
- Screw the pull rod, BMW No. 00 8 581, into the pierced hole and use impact weight, BMW No. 00 8 582, to remove the shaft sealing ring.
- Install the new sealing ring with the sealing lips facing inwards, using guide pin, BMW No. 23 4 722, and impact driver, BMW No. 23 4 721.

Renewing shaft sealing ring for selector drum

- Lever the shaft sealing ring out with a screwdriver.
- Install the new sealing ring with the sealing lips facing inwards, using impact driver, BMW No. 23 4 750.

Renewing sealing ring for selector shaft

- Lever the shaft sealing ring out with a screwdriver.
- Install the new sealing ring with the sealing lips facing inwards, using slip-over sleeve, BMW No. 23 4 612, and impact driver, BMW No. 23 4 740.
Dismantling gearbox

Removing gearbox housing

- Take out oil filler/level check screw (2).
- Take out oil drain plug (7) and drain the oil out of the gearbox into a suitable tray.
- Remove breather (1).
- Unclip cable (3) for neutral indicating switch (4).
- Compress spring (5) and take off neutral indicating switch (4).
- Remove selector lever (6).
- Carefully press back centering pins (arrows), working from the back of the gearbox.
- Remove screws (8) securing cover to housing.

- Set the gearbox down on its cover.

⚠️ **Caution:**
Avoid damage to the housing cover and painted surfaces.

- Heat the bearing points in the housing to 80 °C... 100 °C (176 °F...212 °F).
- Strike lightly with a plastic-faced hammer to release the gearbox.
Removing selector drum

- Pull the selector shafts (1) out of the selector forks.
- Swing the selector forks (3/8) out towards the edge of the cover (arrows).
- Remove locking pin (9).
- Press guide plate (5) in the opposite direction to the spring loading (arrow).
- Swing locking lever (6) towards input shaft (7), hold it there and pull out the selector drum (4), turning it slightly at the same time.
- Remove the thrust washers and spacing washer.
- Release the locking lever (6).
- Remove the selector shaft (7) with spacing washer.
- Remove selector forks (3).
- Selector fork (8) remains in the intermediate shaft (10).

Dismantling/assembling selector shaft

- Remove torsion spring (5) with locking lever (4) from selector shaft (2).
- Remove torsion spring (1).
- Remove coil spring (6) and take off together with sliding plate (3).
- Assemble in the opposite order of work.
Removing gearbox shafts

- Remove breather tube (3).
- Heat bearing points in gearbox cover to 80 °C ... 100 °C (176 °F ... 212 °F).
- Take off input shaft (4), output shaft (1) and intermediate shaft (5) together from the cover.
- Remove selector fork (2) from intermediate shaft.

Renewing deep-groove ball bearing on intermediate shaft

Caution:
If the deep-groove ball bearings are renewed, the fully-compressed length must be re-adjusted.

- Pull off the deep-groove ball bearings with a universal puller, BMW No. 00 7 500.
- Press the output-side deep-groove ball bearing on to the intermediate shaft.
- Check/adjust fully-compressed length (23.17).
- Place the spacing washer of the determined thickness in position and press on the input-side deep-groove ball bearing.
Dismantling/assembling input shaft

Dismantling input shaft

- Clamp the input shaft into the vise, using soft jaws.
- Use universal puller, **BMW No. 00 7 500**, and pressure head (arrow) to pull off deep-groove ball bearing (9) with spacing washer (8).
- Note the thickness of spacing washer (8).

- Remove guide ring (7).
- Compress spring cluster (4) and remove split segment washer (6).
- Remove support disc (5), spring cluster (4), anti-rattle disc (3), thrust block (2) and constant-speed gear (1).
- Transfer input shaft (10) to a different position.
- Use universal puller, **BMW No. 00 7 500**, and pressure head (arrow) to pull off deep-groove ball bearing (11).