

# **BMW Diagnose**

## **Testing Instructions for K Models**



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# Instructions for Handling Engine Electronics

1. Always turn off the ignition (or disconnect the battery) for all jobs on the ignition or fuel injection systems, to avoid accidents – **danger!**

Such jobs include:

- Connecting and disconnecting adapter leads and BMW diagnosis tester
- Replacement of ignition or fuel injection components (for example: hall transmitter, ignition coil, ignition leads, ignition control unit, injection control unit, etc.)

2. Always replace all components only with Genuine BMW Parts to guarantee complete operational safety of the engine electronics and the control units in particular.

3. The following points are important on ignition coils.

- Never connect a shielded capacitor on terminals 1 and 15.
- Never connect terminal 1 on ground for the burglar alarm.
- Never connect battery positive (+) on terminal 1.
- Never disconnect the ignition leads while the engine is running.

4. Checking resistance:

- Only with the ignition turned off.
- Never on components, which comprise electronic components such as transistors etc., as well as hall transmitters and control units.

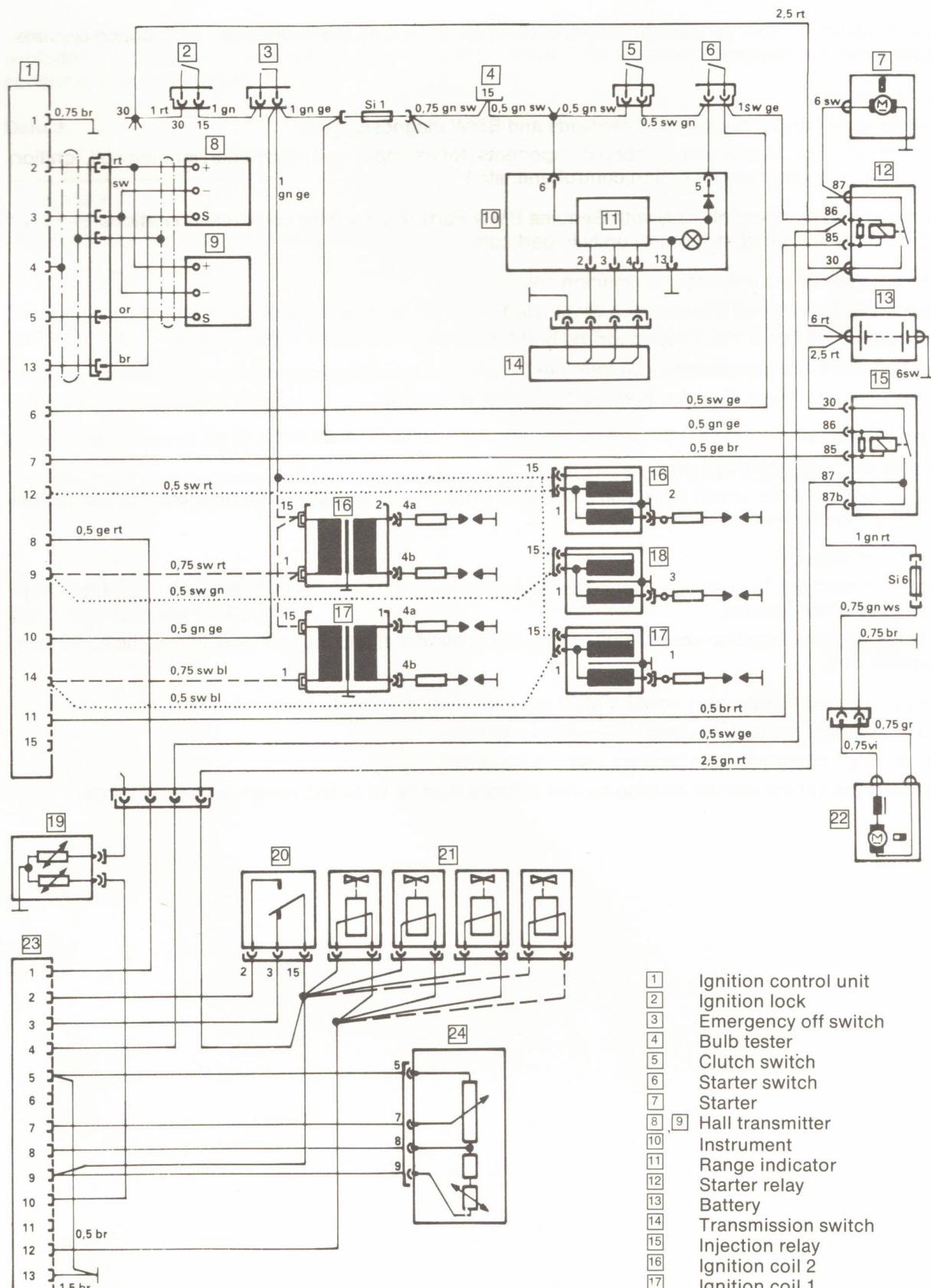
5. Checking compression:

- Disconnect terminal 15 positive supply wire (green/yellow) on the ignition coils to shut down the high voltage side of the ignition.
- Pull plug out of the injection control unit to stop injection of fuel into the cylinders (if not, the oil film will be washed out).

6. The following points concerning power supply are important to exclude destruction of control units.

- Never disconnect the battery while the engine is running.
- Never mix up battery pole connections (not even briefly!).
- Never start the engine with an outside source of more than 16 volts and never use a fast charger!

# General Wiring Diagram – Engine Electronics



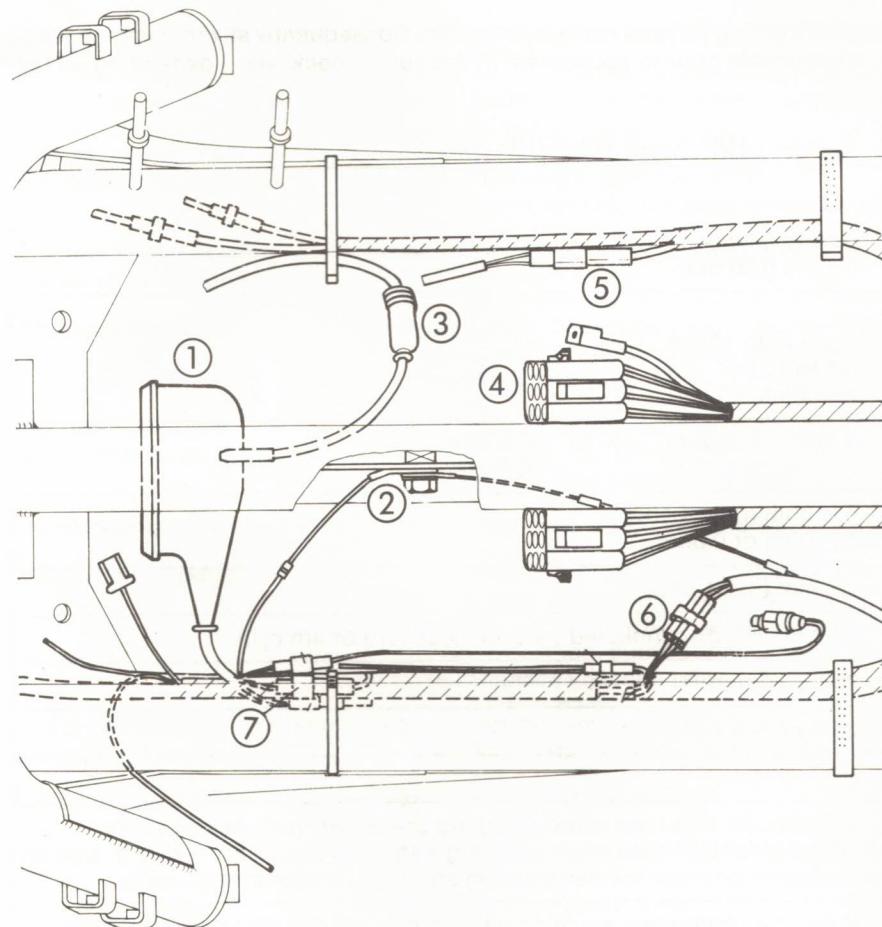
## Colour codes:

|             |             |
|-------------|-------------|
| br = brown  | or = orange |
| rt = red    | ws = white  |
| gn = green  | bl = blue   |
| ge = yellow | vi = violet |
| sw = black  | gr = grey   |

— all K models  
 - - - - K 100  
 ..... K 75

- 1 Ignition control unit
- 2 Ignition lock
- 3 Emergency off switch
- 4 Bulb tester
- 5 Clutch switch
- 6 Starter switch
- 7 Starter
- 8 Hall transmitter
- 9 Instrument
- 10 Range indicator
- 12 Starter relay
- 13 Battery
- 14 Transmission switch
- 15 Injection relay
- 16 Ignition coil 2
- 17 Ignition coil 1
- 18 Ignition coil 3
- 19 Engine temperature sensor
- 20 Throttle valve switch
- 21 Fuel injectors
- 22 Fuel pump
- 23 Ignition control unit
- 24 Air flow sensor

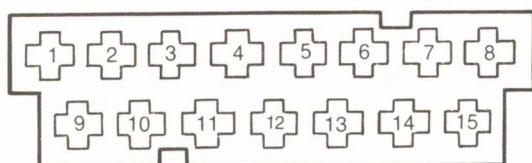
# Arrangement of Most Important Plug Connections



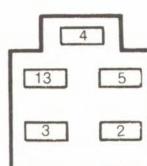
- ① Ignition control unit plug
- ② Frame ground screw connection
- ③ Hall transmitter plug
- ④ Right combination plug
- ⑤ Ignition lock plug
- ⑥ Wire harness plug
- ⑦ Clutch plug

## Terminal Designations (Top View of Wire Harness End)

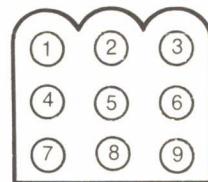
① Ignition control unit plug



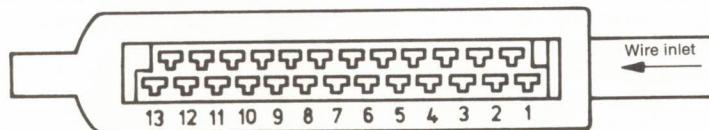
③ Hall transmitter plug



④ Right combination plug



⑧ Injection control unit plug



⑨ Instrument cluster plug

|       |    |    |       |
|-------|----|----|-------|
| br    | 13 | 1  | rt ws |
| ws bl | 14 | 2  | ge ws |
| ws    | 15 | 3  | ge sw |
| sw bl | 16 | 4  | ge bl |
| bl sw | 17 | 5  | sw gn |
| br    | 18 | 6  | gn sw |
| bl rt | 19 | 7  | br ns |
| —     | 20 | 8  | br sw |
| bl gn | 21 | 9  | bl    |
| ge    | 22 | 10 | vi sw |
| br    | 23 | 11 | br gn |
| gr bl | 24 | 12 | vi ws |

### Colour codes:

|             |             |
|-------------|-------------|
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# Instructions for Application of BMW Diagnosis

The tester can only be used to check voltage (V), timing (%) and resistance (ohms). Consequently all other engine technical data has to be checked separately, if applicable prior to application of the quick checklists – depending on the condition.

|   |   |                               |
|---|---|-------------------------------|
| Ignition timing, static                           | 6° before TDC $\triangleq$ 0.24 mm BTDC   |                               |
| Valve clearance of cold engine<br>(max. 35 °C)    |   |                               |
| Intake valve                                      | 0.15 to 0.20 mm   |                               |
| Exhaust valve                                     | 0.25 to 0.30 mm   |                               |
| Compression                                       |   |                               |
| Good  | more than 10 bar  |                               |
| Normal  | 8.5 to 10 bar   |                               |
| Poor  | less than 8.5 bar   |                               |
| Ignition coil<br>Secondary                        | K 100<br>~2.2 ohm<br>~10 k-ohm  | K 75<br>~0.8 ohm<br>~10 k-ohm |
| Spark plug connectors                             | 5 K-ohm (only K 100)  |                               |
| Ignition coil shielded connectors                 | 1 K-ohm or 0 ohm  |                               |
| Spark plug electrode gap                          | 0.6 mm (+ 0.1 mm)   |                               |
| Fuel pressure                                     | 2.5 bar with disconnected vacuum hose (3rd or 4th cyl.)   |                               |
| Idle speed  | 950 $\pm$ 50 rpm  |                               |
| CO value  | 2.0 to 2.5 % by volume  |                               |
| Synchronization                                   |   |                               |
| Intake leak test                                  | <ul style="list-style-type: none"><li>– Speed (or CO) rises when clamping crankcase vent: engine leaks.</li><li>– Speed (or CO) rises when spraying a small (!) amount of fuel (e.g. with an oil can) on throttle valve housing and shaft: intake system leaks.</li></ul> |                               |
| Ti signal on fuel injector<br>(pulse duty factor) | Pulse duty factor test made direct on a fuel injector via two-pin adapter connection, choke in stage 1, ignition turned on, starter operated. Specified values at approx. 15 °C engine temperature:   |                               |

|       | Engine does not start          | Idle speed (= 950 rpm) |
|-------|--------------------------------|------------------------|
| K 100 | ~4 % . . . (10 sec) . . . ~2 % | ~6.5 %                 |
| K 75  | ~7 % . . . (10 sec) . . . ~3 % | ~7.5 %                 |

# Troubleshooting

| Condition   | Check  |
|---|--|
| Transmission in neutral, ignition turned on: indicator lamps on? (including idle control)   | <p>no →</p> <ul style="list-style-type: none"> <li>Battery, connections and charged condition</li> <li>Fuse no. 1 (cause ??)</li> <li>Transmission switch, plugs, leads</li> <li>Test steps: ignition 1 and 6</li> <li>Instrument cluster: plug connections and range indicator printed circuit board</li> </ul>   |
| yes ↓ Operate starter button: starter relay working?  | <p>yes ↓</p> <p>no →</p> <ul style="list-style-type: none"> <li>Test steps: ignition 1, 6, 7 and 8</li> </ul>  |
| yes ↓ Starter working?  | <p>yes ↓</p> <p>no →</p> <ul style="list-style-type: none"> <li>Leads: battery positive – starter relay terminal 87 – starter relay terminal 30</li> <li>– starter, starter bolting on transmission</li> <li>Replace starter relay</li> </ul>  |
| but only erratically (one hall signal missing)  | <p>no →</p> <ul style="list-style-type: none"> <li>Leads: hall transmitter – ignition control unit terminals 5 and 13</li> <li>Replace hall transmitter</li> <li>Replace ignition control unit</li> </ul>  |
| yes ↓ Injection relay working?  | <p>yes ↓</p> <p>no →</p> <ul style="list-style-type: none"> <li>Test steps: ignition 2 and 14</li> </ul>   |
| yes ↓ Fuel pump working?  | <p>yes ↓</p> <p>no →</p> <ul style="list-style-type: none"> <li>Fuse no. 6 (cause ??), tank plug</li> <li>Leads: battery positive (red) – fuel injection relay terminal 30, injection relay terminal 87b (green/red) – fuse no. 6 – fuse no. 6 (green/white) – tank plug, pump connections (approx. ~3 ohms)</li> <li>Replace injection relay</li> </ul>   |
| but does not continue running (approx. ~1 second)   | <p>no →</p> <ul style="list-style-type: none"> <li>Hall transmitter plug</li> <li>Test steps: ignition 10, 11, 15 and 16</li> </ul>  |
| yes ↓ Cold engine starts?   | <p>yes ↓</p> <p>no →</p> <ul style="list-style-type: none"> <li>Sufficient fuel in tank</li> <li>ti signal approx. ~6 to 3 %, if not: <ul style="list-style-type: none"> <li>• Test steps: LE-Jetronic (all), ignition 17</li> <li>• Replace injection control unit (if test steps are okay)</li> </ul> </li> <li>Ignition spark, if not: <ul style="list-style-type: none"> <li>• Test steps: ignition 3, 4, 5, 18 through 27</li> </ul> </li> <li>Fuel pressure, if not: <ul style="list-style-type: none"> <li>• Leakage on hoses and filter (in tank)</li> <li>• Pressure regulator</li> <li>• Return flow plugged (→ excessive fuel pressure)</li> </ul> </li> <li>Data in "Instructions for Application of BMW Diagnosis"</li> <li>Fuel injectors dirty</li> </ul> |
| yes ↓ Warm engine starts?   | <p>yes ↓</p> <p>no →</p> <ul style="list-style-type: none"> <li>Sufficient fuel in tank</li> <li>Fuel pressure</li> <li>Test steps: LE-Jetronic 4 through 7</li> </ul>   |
| yes ↓ Engine running in all cylinders?  | <p>yes ↓</p> <p>no →</p> <ul style="list-style-type: none"> <li>Temperature comparison on exhaust manifold: non-working cylinders</li> <li>Spark plugs: broken insulators, electrode gaps</li> <li>Ignition spark: stroboscope lamp and trigger clips</li> <li>Fuel injectors: no leakage and equivalent flowrates</li> <li>Test steps: LE-Jetronic 10 and ignition 15 through 27</li> </ul>   |
| yes ↓ Engine running without misfiring?   | <p>yes ↓</p> <p>no →</p> <ul style="list-style-type: none"> <li>Spark plugs and spark plug connectors</li> <li>Ignition (primary and secondary)</li> <li>Loose contact on plugs, relays and leads</li> <li>Test steps: LE-Jetronic 4 through 9</li> <li>Data in "Instructions for Application of BMW Diagnosis"</li> </ul>   |
| yes ↓ Engine power okay?  | <p>yes ↓</p> <p>no →</p> <ul style="list-style-type: none"> <li>Fuel pressure</li> <li>Test steps: LE-Jetronic 4 through 9</li> <li>Data in "Instructions for Application of BMW Diagnosis"</li> </ul>   |
| but . . . when there is a different condition, check the tank volume and data in "Instructions for Application of BMW Diagnosis" depending on the type of trouble. When in doubt, check the complete motorcycle. Also check the complete motorcycle in case of conditions, which occur only occasionally or in conjunction with certain driving conditions, whereby plugs and leads must be simultaneously loaded mechanically and moved. |  |

# Checklist for Fuel Injection

| Test Step | Tested Terminals | Tested Item  | V Switch Position | Ω Switch Position | LCD Display (Button) Connections * | Ignition On | Starter Operated | Nominal Value K 100 | Nominal Value K 75 | Actual Value | Remarks   |
|-----------|------------------|--|-------------------|-------------------|------------------------------------|-------------|------------------|---------------------|--------------------|--------------|---|
| 1         | 9/1              | TD signal  | 5                 | —                 | —                                  | X           | X                | ≈20 %               | ≈34 %              |              | X = yes<br>— = no   |
| 2         | 5/9              | Injection relay, power supply for injection control unit | 6                 | —                 | V                                  | X           | X                | ≈10 V               | ≈10 V              |              | with info on battery charge   |
| 3         | 5/4              | Start signal Terminal 86                                 | 7                 | —                 | V                                  | X           | X                | ≈ 8 V               | ≈ 8 V              |              | starting enrichment   |
| 4         | 5/8              | Air flow sensor  | ↓                 | 11                | Ω                                  | —           | —                | ≈300 Ω              | ≈300 Ω             |              | yellow plug on left Ω-jack, remove fuse no. 6   |
| 5         | 5/7              | Air flow sensor / potentiometer                          | ↓                 | 12                | V/Ω                                | X           | X                | ≈1...3 V            | ≈1...3 V           |              | voltage checked via blue ohm jacks (!), whereby yellow plug on left ohm jack. Value rises up to approx. 3 V when opening throttle valves. |
| 6         | 5/10             | Temperature sensor                                       | ↓                 | 13                | Ω                                  | —           | —                | →                   | →                  |              | Nominal value for engine at operating temperature: 200 Ω ... 500 Ω; at ambient temperature: 2 kΩ ... 6 kΩ                                 |
| 7         | 5/13             | Ground connection  | ↓                 | 14                | Ω                                  | —           | —                | <0.5 Ω              | <0.5 Ω             |              | zero balance, see below!  |
| 8         | 2/9              | Throttle valve sw. Idle contact                          | ↓                 | 16                | Ω                                  | —           | —                | <0.5 Ω              | <0.5 Ω             |              | throttle twist grip in idle position  |
| 9         | 3/9              | Throttle valve sw. Full throttle contact                 | ↓                 | 17                | Ω                                  | —           | —                | <0.5 Ω              | <0.5 Ω             |              | throttle twist grip operated in full throttle range   |
| 10        | 12/9             | Fuel injectors   | ↓                 | 18                | Ω                                  | —           | —                | ≈4 Ω                | ≈5.6 Ω             |              |   |
| 11        |                  | Air flow sensor  | —                 | —                 | Ω                                  | —           | —                | ≈200 Ω              | ≈200 Ω             |              | Remove fuse no. 6; resistance tested (without adapter) direct on plug for injection control unit between terminals 8 and 9                |
| 12        |                  | Central ground   | —                 | —                 | Ω                                  | —           | —                | <0.05 Ω             | <0.05 Ω            |              | Check between central screw underneath tank and battery ground.   |

## \* Connections

— Pulse duty factor (  $\boxdot \triangle %$  ):

— Voltage test (V):

— Resistance test (Ω):

Yellow plug on jack 1, green plug on red jack

Yellow plug on red jack, green plug on black jack

Test leads on blue ohm jacks.

## Zero balance required before testing.

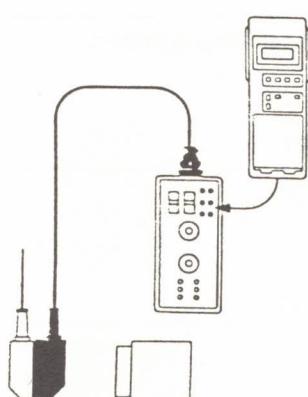
This requires the following points on the universal test adapter:

- Volt switch in position ↓,
- Ohm switch in position 9,
- Button 5 pressed,
- Ohm button on motorcycle tester pressed simultaneously until 0 ohm is displayed digitally. Release this button first.

**Repeat the zero balance** as soon as a different LCD display (button) is selected or as soon as the display is cancelled.

## Zero balance for resistance test without Adapter:

- Both test points pressed next to each other on blank metal (e.g. engine block)
- Ohm button on motorcycle tester pressed simultaneously until 0 ohm is displayed digitally.



# Corrective Measures for LE-Jetronic

| Test Step         | Tested Terminals | Repair the following wires or replace the mentioned components when there is considerable deviation from the nominal value (more than 15 %).  |                   |   |    |    |                 |       |       |      |
|-------------------|------------------|---|-------------------|---|----|----|-----------------|-------|-------|------|
| 1                 | 9/1              | <p>Terminal 9 (green/red) wire harness plug ⑥</p> <ul style="list-style-type: none"> <li>– Wire harness plug (green/red) socket for injection relay</li> <li>– Terminal 87 injection relay terminal 30</li> <li>– Socket for injection relay (red) battery positive</li> <li>– Terminal 1 (yellow/red) – wire harness plug ⑥</li> <li>– Wire harness plug (yellow/red) plug for ignition control unit ①, terminal 8, this requiring that actual values of test steps 17 for ignition and 2 for LE-Jetronic are okay.</li> </ul>   |                   |   |    |    |                 |       |       |      |
| 2                 | 5/9              | <p>Terminal 5 (brown) frame ground ②</p> <ul style="list-style-type: none"> <li>– Ground connection frame/drive unit/battery ground</li> <li>– Terminal 9 (green/red) – wire harness plug ⑥</li> <li>– Wire harness plug (green/red) socket for injection relay</li> <li>– Socket for injection relay (red) battery positive, if wires are okay:<br/>if injection relay does not produce an operating noise, see test steps 2 and 14 of ignition; otherwise replace the injection relay</li> </ul>  |                   |   |    |    |                 |       |       |      |
| 3                 | 5/4              | <p>Terminal 4 (black/yellow) wire harness plug ⑥</p> <ul style="list-style-type: none"> <li>– Wire harness plug (black/yellow) starter relay plug, requiring actual value of ignition test step 6 to be correct</li> </ul>  |                   |   |    |    |                 |       |       |      |
| 4                 | 5/8              | <p>Two possible causes:</p> <ul style="list-style-type: none"> <li>– Engine wire harness, wires terminal 8 (white/red) or terminal 5 (brown) with breaks</li> <li>– Air flow sensor defective</li> </ul>  |                   |   |    |    |                 |       |       |      |
| 5                 | 5/7              | <p>First apply the following test method (with the same adapter settings):<br/>Use an instrument tester (even better: stroboscope lamp) for the voltage test, connecting positive pole of test lead on left ohm jack and negative pole on right ohm jack. Pull off plug on starter relay and remove fuse no. 6 (for fuel pump) to protect the battery during the test. Operate the start button and simultaneously open the sensor plate of the air flow sensor slowly by hand (air filter removed): voltage rises continuously (without interruptions) from approx. 1 to approx. 8 volts; sensor plate must move without hesitation.</p> <p>Three possible causes for defect:</p> <ul style="list-style-type: none"> <li>– Engine wire harness, breaks in wires terminal 7 (white/gray), terminal 9 (green/red) or terminal 5 (brown)</li> <li>– Ground out on wire terminal 7 (white/gray)</li> <li>– Air flow sensor defective (mechanically or electrically), break in slip contact occasionally</li> </ul> |                   |   |    |    |                 |       |       |      |
| 6                 | 5/10             | <p>Three possible causes:</p> <ul style="list-style-type: none"> <li>– Engine wire harness, breaks in wires terminal 10 (violet/green) or terminal 5 (brown)</li> <li>– Ground out in wire terminal 10 (violet/green)</li> <li>– Temperature sensor defective; nominal values:</li> </ul> <table border="1" style="margin-left: 100px;"> <tr> <td>Temperature (°C):</td> <td>0</td> <td>20</td> <td>90</td> </tr> <tr> <td>Resistance (Ω):</td> <td>~5500</td> <td>~2500</td> <td>~250</td> </tr> </table>  | Temperature (°C): | 0 | 20 | 90 | Resistance (Ω): | ~5500 | ~2500 | ~250 |
| Temperature (°C): | 0                | 20  | 90                |   |    |    |                 |       |       |      |
| Resistance (Ω):   | ~5500            | ~2500   | ~250              |   |    |    |                 |       |       |      |
| 7                 | 5/13             | Wire harness, breaks in wires terminal 13 or terminal 5 (brown)   |                   |   |    |    |                 |       |       |      |
| 8                 | 2/9              | <p>Three possible causes:</p> <ul style="list-style-type: none"> <li>– Throttle valve switch maladjusted</li> <li>– Engine wire harness, breaks in wire terminal 2 (white/black) or terminal 9 on plug for injection control unit ⑦ to terminal 18 on throttle valve switch (green/red)</li> <li>– Throttle valve switch defective</li> </ul>   |                   |   |    |    |                 |       |       |      |
| 9                 | 3/9              | <p>Two possible causes:</p> <ul style="list-style-type: none"> <li>– Engine wire harness, break in wire terminal 3 (white/brown), requiring that actual value of test step 8 is okay.</li> <li>– Throttle valve switch defective</li> </ul>   |                   |   |    |    |                 |       |       |      |
| 10                | 12/9             | <p>Two possible causes:</p> <ul style="list-style-type: none"> <li>– Engine wire harness, breaks in wires terminal 12 (yellow/green) or terminal 9 (green/red) to one or more fuel injectors</li> <li>– One or more fuel injectors defective (electrically)</li> </ul>  |                   |   |    |    |                 |       |       |      |
| 11                | 8/9              | <p>Two possible causes:</p> <ul style="list-style-type: none"> <li>– Engine wire harness, breaks in wires terminal 8 (white/red) or terminal 9 (green/red)</li> <li>– Air flow sensor defective</li> </ul>  |                   |   |    |    |                 |       |       |      |

# Checklist for Ignition

| Test Step | Tested Terminals | Tested Item   | Ignition Control Unit Connected | V-Switch Position | LCD Display Connections* (Button) | Ignition On    | Starter Operated | Engine Running | Nominal Value K 100          | Nominal Value K 75           | Actual Value | Remarks   |
|-----------|------------------|---|---------------------------------|-------------------|-----------------------------------|----------------|------------------|----------------|------------------------------|------------------------------|--------------|---|
| 1         | 1/10             | Power supply for ignition control unit                      | —                               | 1                 | V                                 | X              | —                | —              | $\approx U_B$                | $\approx U_B$                |              | X = yes<br>— = no   |
| 2         | 7                | Control voltage for injection relay (positive)              | —                               | 2                 | V                                 | X              | —                | —              | $\approx U_B$                | $\approx U_B$                |              | Only $U_B$ will be displayed due to $\frac{1}{2}$ resistor in test adapter. |
| 3         | 14               | Power supply for ignition coil 1                            | —                               | 3                 | V                                 | X              | —                | —              | $\approx \frac{U_B}{2}$      | $\approx \frac{U_B}{2}$      |              |   |
| 4         | 9                | Power supply for ignition coil 2                            | —                               | 4                 | V                                 | X              | —                | —              | $\approx \frac{U_B}{2}$      | $\approx \frac{U_B}{2}$      |              | K 75: ignition coil 3   |
| 5         | 12               | Power supply for ignition coil 3                            | —                               | 5                 | V                                 | X              | —                | —              | $\approx \frac{U_B}{2}$      | $\approx \frac{U_B}{2}$      |              | K 75: ignition coil 2   |
| 6         | 6                | Starter switch  | —                               | 6                 | V                                 | X              | X                | —              | $\approx 10$ V               | $\approx 10$ V               |              | Starter not working   |
| 7         | 11               | Control voltage for starter relay (pos.)                    | —                               | 7                 | V                                 | X              | X                | —              | $\approx 10$ V               | $\approx 10$ V               |              | Starter not working   |
| 8         | 11               | Ignition control unit (control for starter relay, negative) | X                               | 7                 | V                                 | X              | X                | —              | $<2$ V                       | $<2$ V                       |              | Pull plug out of injection control unit.                                    |
| 9         | 4                | Hall transmitter shield                                     | X                               | 8                 | V                                 | X              | —                | —              | 0 V                          | 0 V                          |              |   |
| 10        | 3                | Power supply for hall transmitter (neg.)                    | X                               | 9                 | V                                 | X              | —                | —              | 0 V                          | 0 V                          |              |   |
| 11        | 2                | Power supply for hall transmitter (pos.)                    | X                               | 10                | V                                 | X              | —                | —              | $\approx 11$ V               | $\approx 11$ V               |              |   |
| 12        | 15               | Vacuum switch (open)  | X                               | 11                | V                                 | X              | —                | —              | $\approx 11$ V               |                              |              |   |
| 13        | 15               | Vacuum switch (closed)                                      | X                               | 11                | V                                 | X              | —                | —              | 0 V                          |                              |              | Pull off vacuum hose (cyl. 1) build up vacuum (app. 500 mbar)               |
| 14        | 7                | Ignition control unit (control for injection relay, neg.)   | X                               | 2                 | V                                 | X              | X                | X              | $<2$ V                       | $<2$ V                       |              | Starter speed sufficient (for test steps 14 . . . 20)                       |
| 15        | 5                | Hall transmitter 1 outlet                                   | X                               | 12                | $\boxdot \triangle %$             | X              | —                | X              | $\approx 10$ %               | $\approx 23$ %               |              |   |
| 16        | 13               | Hall transmitter 2 outlet                                   | X                               | 13                | $\boxdot \triangle %$             | X              | —                | X              | $\approx 10$ %               | $\approx 23$ %               |              |   |
| 17        | 8                | TD signal   | X                               | 14                | $\boxdot \triangle %$             | X              | —                | X              | $\approx 20$ %               | $\approx 34$ %               |              |   |
| 18        |                  | Primary signal for ignition coil 1                          | X                               | 15                | $\boxdot \triangle %$             | X              | —                | X              | $\approx 10$ %               | $\approx 5$ %                |              | Test at engine idle speed   |
| 19        |                  | Primary signal for ignition coil 2                          | X                               | 16                | $\boxdot \triangle %$             | X              | —                | X              | $\approx 10$ %               | $\approx 5$ %                |              | Test at engine idle speed   |
| 20        |                  | Primary signal for ignition coil 3                          | X                               | 17                | $\boxdot \triangle %$             | X              | —                | X              |                              | $\approx 5$ %                |              | Test at engine idle speed   |
| 21        |                  | Closed loop shutoff final stage 1                           | X                               | 15                | V                                 | $\overline{X}$ | —                | —              | $\approx \frac{U_B}{2}$      | $\approx \frac{U_B}{2}$      |              | Ignition off/ignition on  |
| 22        |                  | Closed loop shutoff final stage 2                           | X                               | 16                | V                                 | $\overline{X}$ | —                | —              | $\approx \frac{U_B}{2}$      | $\approx \frac{U_B}{2}$      |              | Ignition off/ignition on  |
| 23        |                  | Closed loop shutoff final stage 3                           | X                               | 17                | V                                 | $\overline{X}$ | —                | —              |                              | $\approx \frac{U_B}{2}$      |              | Ignition off/ignition on  |
| 24        |                  | Primary side of ignition coils                              | —                               | —                 | $\Omega$                          | —              | —                | —              | $\approx 2,2 \Omega$         | $\approx 0,8 \Omega$         |              | Resistance checked between terminals 1 + 15 of each coil.                   |
| 25        |                  | Secondary side of ignition coils                            | —                               | —                 | $\Omega$                          | —              | —                | —              | $\approx 10 \text{ k}\Omega$ | $\approx 10 \text{ k}\Omega$ |              | Check between terminal 4a and 4b (K 100) or 4 and 1 (K 75)                  |
| 26        |                  | Ignition coil 1 and ignition lead (cyl. 1 and 4)            | —                               | —                 | $\Omega$                          | —              | —                | —              | $\approx 20 \text{ k}\Omega$ |                              |              | Check resistance from cyl. 1 plug connector to cyl. 4 plug connector.       |
| 27        |                  | Ignition coil 2 and ignition lead (cyl. 2 and 3)            | —                               | —                 | $\Omega$                          | —              | —                | —              | $\approx 20 \text{ k}\Omega$ |                              |              | Check resistance from cyl. 2 plug connector to cyl. 3 plug connector.       |

The ohm switch is not required in this test plan.

\* **Connections:**

- Voltage test (V): Yellow plug on red jack, green plug on black jack
- Pulse duty factor ( $\boxdot \triangle %$ ): Yellow plug on jack 1, green plug on red jack

## Corrective Measures for Ignition

| Test Step | Tested Terminals | Check and, if applicable, repair the following wires or replace the mentioned components in case of considerable deviation from the nominal value (more than 15 %).  |
|-----------|------------------|--|
| 1         | 1/10             | Terminal 1 (brown) frame ground ②<br>– Ground connection frame/drive unit/battery negative<br>Terminal 10 (green/yellow) right combination plug ④ terminal 2<br>– (green/yellow) emergency off switch (green)<br>– Right combination plug terminal 9 (green) ignition lock plug ⑤<br>– (green) ignition lock (red)<br>– Ignition lock plug (red) battery positive  |
| 2         | 1/7              | Terminal 7 (yellow/brown) socket for injection relay<br>– Terminal 85 injection relay (coil $\sim 75$ ohms) terminal 86<br>– Socket for injection relay (green/yellow) right combination plug ④ terminal 2, requiring that actual value of test step 1 is okay   |
| 3         | 1/14             | Terminal 14 (black/blue) ignition coil 1<br>– Terminal 1 primary coil ( $\sim 2.2 \Omega$ or $\sim 0.8 \Omega$ ) terminal 15<br>– Ignition coil 1 (green/yellow) – right combination plug ④ terminal 2, requiring that actual value of test step 1 is okay   |
| 4         | 1/9              | K 100: terminal 9 (black/red) ignition coil 2<br>– Terminal 1 primary coil ( $\sim 2.2 \Omega$ ) terminal 15<br>– Ignition coil 2 (green/yellow) right combination plug ④ terminal 2, requiring that actual value of test step 1 is okay<br>K 75: terminal 9 (black/green) ignition coil 3<br>– Terminal 1 primary coil ( $\sim 0.8 \Omega$ ) terminal 15<br>– Ignition coil 3 (green/yellow) right combination plug ④ terminal 2, requiring that actual value of test step 1 is okay  |
| 5         | 1/12             | Terminal 12 (black/red) ignition coil 2<br>– Terminal 1 primary coil ( $\sim 0.8 \Omega$ ) terminal 15<br>– Ignition coil 2 (green/yellow) right combination plug ④ terminal 2, requiring that actual value of test step 1 is okay   |
| 6         | 1/6              | If idle control lamp does not come on, pull the clutch. If actual value still deviates, check the following wires.<br>– Terminal 6 (black/yellow) right combination plug ④ terminal 1<br>– (black/yellow) starter switch (black/green)<br>– Right combination plug terminal 6 (black/green) clutch plug ⑦<br>– Clutch switch<br>– Clutch plug (green/black) fuse plate, fuse no. 1<br>– Fuse plate (green/yellow) right combination plug terminal 2<br>If actual value is okay when clutch is pulled, check the following wires.<br>– Right combination plug terminal 6 (black/green) instrument cluster plug ④ terminal 5<br>– Plug contacts on and in instrument cluster<br>– Instrument cluster plug terminal 6 (green/black) fuse plate, requiring that transmission switch and wire leading to instrument cluster as well as range indicator printed circuit board are okay |
| 7         | 1/11             | Terminal 11 (brown/red) plug for starter relay<br>– Terminal 85 starter relay (coil $\sim 20 \Omega$ ) terminal 86<br>– Plug for starter relay (black/yellow) right combination plug ④ terminal 1, requiring that actual value of test step 6 is okay  |
| 8         | 1/11             | Ignition control unit defective, requiring that actual values of test step 1 through 7 are okay  |
| 9         | 1/4              | Ignition control unit defective, requiring that actual value of test step 1 is okay  |
| 10        | 1/3              | Ignition control unit defective, requiring that actual value of test step 1 is okay  |

## Corrective Measures for Ignition

| Test Step | Tested Terminals |   |
|-----------|------------------|---|
|           |                  | Check and, if applicable, repair the following wires or replace the mentioned components in case of considerable deviation from the nominal value (more than 15 %).   |
| 11        | 1/2              | Three possible causes:<br>– Disconnect plug for hall transmitter ③<br>– Actual value still deviating: wire of terminal 2 (red) grounded out or ignition control unit defective<br>– Actual value now okay: hall transmitter defective   |
| 12        | 1/15             | Three possible causes:<br>– Vacuum switch does not open (closed permanently, defective)<br>– Wire terminal 15 (violet/gray) to vacuum switch grounded out<br>– Ignition control unit defective  |
| 13        | 1/15             | Three possible causes:<br>– Vacuum hose leaks<br>– Vacuum switch does not close (defective)<br>– Break in wire: terminal 15 (violet/gray) – wire harness plug ⑥ (violet/gray) vacuum switch   |
| 14        | 1/7              | Ignition control unit defective, requiring that actual values of test steps 1 through 8 are okay  |
| 15        | 1/5              | Three possible causes:<br>– Breaks in wires of terminals 2, 3 or 5 (red, black, orange) from plug for ignition control unit ① to hall transmitter plug ③<br>– Hall transmitter defective<br>– Ignition control unit defective   |
| 16        | 1/13             | Three possible causes:<br>– Breaks in wires of terminals 2, 3 or 13 (red, black, brown) from plug for ignition control unit ① to hall transmitter plug ③<br>– Hall transmitter defective<br>– Ignition control unit defective   |
| 17        | 1/8              | Three possible causes, requiring that actual values of test steps 1, 15 and 16 and LE-Jetronic test step 2 are okay:<br>– Break in wire: terminal 8 (yellow/red) wire harness plug ⑥ (yellow/red) plug for injection control unit ⑧ terminal 1<br>– Ignition control unit defective<br>– Injection control unit defective |
| 18        |                  | Ignition control unit defective, requiring that actual values for test steps 1, 3, 4, 5, 15 and 16 are okay   |
| 19        |                  |   |
| 20        |                  |   |
| 21        |                  | Ignition control unit defective, requiring that actual values for test steps 3 through 5 are okay   |
| 22        |                  |   |
| 23        |                  |   |