



Automatic headlamp levelling

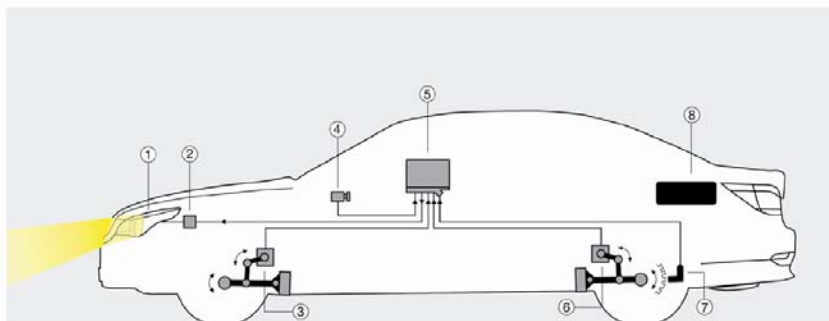
General points

Automatic headlamp levelling systems adapt the angle of inclination of the headlamp to the position of the vehicle on the road without the driver having to intervene. Such systems are required by law for xenon headlamps. Today, a distinction is made between two different headlamp levelling systems: semi-static and dynamic headlamp levelling.



Structure and function

Structure:



- | | |
|---------------------|--------------------|
| 1 Headlamp | 5 Control unit |
| 2 Actuator | 6 Rear axle sensor |
| 3 Front axle sensor | 7 Speed sensor |
| 4 Light switch | 8 Load |

The illustration shows a headlamp levelling system with an external control unit. On account of the different requirements of vehicle manufacturers, some of the systems used have the control electronics integrated in the axle sensor (see picture)





Semi-static headlamp levelling:

This headlamp levelling corrects only changes in inclination caused by changes in load. A control unit evaluates front and rear axle sensor data, compares these with the target data stored and, if necessary, triggers the servomotors on the headlamps accordingly. Usually, the same servomotors are installed as the ones for manual headlamp levelling. In the case of compact vehicles without long wheel overhangs, this system offers the possibility of doing without the front axle sensor, since changes in inclination usually occur on the rear axle only. The semi-static headlamp levelling also works with great damping, i.e. it only compensates for longer-term pitching of the body.



Inductive axle sensor with external control unit

Dynamic headlamp levelling

In the case of vehicles fitted with xenon headlamps, only dynamic headlamp levelling systems are usually installed today. These systems react to changes in inclination related to driving, e.g. acceleration and braking. The control unit calculates the target data, taking the driving state into consideration. In contrast to the semi-static headlamp levelling, the servomotors are then triggered within fractions of a second. To make these quick reaction times possible, stepper motors (see picture) are mainly used as actuators on the headlamps.



Effects of failure

If, when driving, an electrical fault occurs in the headlamp levelling, the headlamps will remain in this position. The next time the vehicle is started thereafter, the servomotors will move the headlamps to the lower end-position, so bringing the driver's attention to the fault. In some vehicles, a warning lamp also lights up on the dashboard.

Causes for failure of headlamp levelling can be:

- Servomotors on the headlamps faulty
- Headlamp levelling sensor for vehicle level faulty



- Control unit has been replaced and not coded
- Headlamps have not been adjusted (basic setting)
- Control unit faulty
- Interrupted data line

Troubleshooting

In connection with automatic headlamp levelling, a diagnostic tester is usually required for setting the headlamps. This can also be used to diagnose the headlamp levelling system. The headlamp levelling can also be checked without a diagnostic tester, however, with the aid of a multimeter and oscilloscope. It is always important however to have available a circuit diagram of the system to be checked.

Checking functional ability:

- Set the vehicle unladen on an even surface, switch the dipped beam on and check the correct cut-off line using the beamsetter.
- Place a load on the rear end of the vehicle, e.g. by loading the luggage compartment. In the case of semi-static headlamp levelling, readjustment of the headlamps will take place after a few seconds and can be followed on the beamsetter. In the case of dynamic headlamp levelling, the regulation can take place very quickly, so that the adjustment process is perceived only as a brief "twitch" on the beamsetter testing screen.

If the check shows that the headlamp levelling is not working, the first diagnostic steps are shown here using the example of a sensor-integrated headlamp levelling system.

Proceed as follows:

- Switch the dipped beam on



- Check the function of the two servomotors. To do this, remove the connector on the servomotors and check the voltage and ground supply. Pin 31 = ground, Pin 56b = 12V
- If one servomotor is working and the other is not, a faulty servomotor or a cable break must be assumed (replace the servomotor, measure the cable).
- Check the headlamp levelling electronics in the axle sensor. To do this, remove the connector on the sensor and check the voltage and ground supply. Pin 1 = ground, Pin 2 = 12V.
- If the measurement results are OK, measure the output signal at Pin 7. The measured value must be between 2 and 11.2 Volts, depending on the position of the lever.
- If the value remains constant despite lever movement (see picture) or if there is no output voltage, a fault in the electronics must be assumed.
- In this case the axle sensor must be replaced.

