

of a tire due to squeezing caused by fast driving at low tire pressure will be avoided. 85 % of the cases in which a tire bursts are the consequence of slow pressure losses.

In the case of a sudden puncture during driving, the driver will be given a warning immediately. If a puncture occurs when the vehicle is at a standstill, the driver will be given a warning when starting.

If a car is equipped with special emergency tires, the driver will not have to stop in the case of a puncture, but may continue for a limited distance at reduced speed. In such cases, however, the lateral traction of the tires will deteriorate. There is the possibility that the driver does not notice the pressure loss and continues for a too long

distance or at an excessive speed. For this reason, such tires must under all circumstances be equipped with a tire pressure monitoring system. Optionally, the tire pressure monitoring system can be combined with a warning system which will be activated if somebody tries to damage the tire.

#### ■ Comfort

At present, the driver's manual give the advice to check the tire pressure every fortnight. The permanent control of the tire pressure reduces the frequency of checks. The tiresome handling of the filling equipment at the service stations and the removal of the valve caps is to be carried out only when it is actually required.

The properly adjusted tire pressure

guarantees optimum driving comfort in respect to the rolling noise, susceptibility to vertical shocks and to the influence of transverse grooves.

After a change of wheels (e.g. winter tires) the system is able to recognize the new wheels automatically and to assign their mounting position.

As an option, the spare tire can be included into this control system.

#### ■ Service Life and Economy

The correct tire pressure will minimize the wear of the tire. A pressure reduction of 0.3 bar will reduce the service life of tires by up to 25 %.

The fuel consumption will be reduced.





## 2.2 Tire pressure control during driving

The main function of this system is the permanent control of the tire pressure during driving. The tire pressure to be controlled will either be set by the driver and transmitted to the system by pressing a button, or it exists as a specific default pressure. The default pressure is checked by the system for plausibility before accepting this value (comparison of the rated pressure at each axle). If the tire pressure is correct, the new pressures will be used as the basis for the control process. If not, the driver is called to carry out a correction.

During service under normal conditions, the tire pressure changes only slowly. Typically, the pressure gradually decreases as a consequence of diffusion which is reliably recognized by the system when the values fall below the respective warning thresholds. In general, tires burst as a consequence of predamage which takes effect in combination with insufficient pressure. There are only very few cases in which the pressure loss occurs in an extremely short period, e. g. when the tire bursts. In this case, the driver will first notice the reactions of the vehicle before he will be able to react on even the fastest realizable control system.

## 2.3 Warning

In the calculation of the warning limits, the isochoric relation between pressure and temperature is used. A continuous warning precision can thus be maintained throughout a wide temperature range. The system calculates the applicable limit values for the current tire temperature from the rated pressure and the calibration temperature. If the values fall below the respective limits, the control unit will transmit the corresponding signals to the driver information system in dependence on the pressure difference.

There are two types of warning at insufficient pressure:

### ■ „Remind“ (soft warning)

The characteristic feature of the operating condition „remind“ is a reduced tire pressure which, however, still allows safe driving. The driver will be asked to correct the pressure when the opportunity arises, either when ignition is turned on or during driving.

### ■ „Puncture“ (hard warning)

The characteristic feature of the opera-

ting condition „puncture“ is for the impossibility of guaranteeing driving safety. The driver is asked to stop and to check the state of the tires. The decision whether to continue until the next repair station or to change the wheel or whether the on-site application of a power spray (sealant) is required lies in his responsibility.

## 2.4 Independent Wheel Recognition and Assignment of Wheel Position

An important function of the system is

