

Welcome to the third and probably most interesting lesson. Here you will learn everything about the tire technology of Continental industrial pneumatic tires. This lesson should answer the following questions for you:

- How is the pneumatic tire constructed?
- What determines the load-carrying capacity of the tire?
- What functions does air in the tire have?
- How is the industrial tire labelled?
- Which Continental industrial pneumatic tires are there?

The following knowledge informs you about the technology of industrial pneumatic tires.

In principle, a differentiation is made between two kinds of tire:

- **Radial tires**
- **Cross-ply tire**

As shown in the illustration, cross-ply and radial tires have a different structure.

The most important components of both tires are:

### **Carcass**

The carcass is the **essential component** of the load-bearing

**tire body. It ensures the cohesion of the tire** and gives it **strength**. A distinction is made between the radial-ply and cross ply design.

### **Radial carcass**

Here the cord plies run diagonally to the running direction from heel to heel. A **steel cord belt** for reinforcement is located between carcass and running surface, the **steel cord plys** of which lie crosswise to the running direction in the apex angle. This ensures that the tire is subjected to much **less friction** and, thanks to the **soft side wall**, is much more **comfortable**.

### **Diagonal carcass**

It consists of several rubberised textile cord plies. The cords are at an angle of about 40° to the running direction, crosswise from ply to ply. This results in a **stronger side wall** and thus gives **increased protection**. The wear of the tire is, however, substantially greater than in the case of the radial tire.

### **Running strip**

The running strip contains the profile, consists of a **wear-resistant rubber mixture** and is **located on the carcass**. It transmits forces that occur between vehicle and road.

### **Side wall**

The side wall consists of a **highly flexible rubber mixture** for the **protection** of the carcass into which the **text** is heat embossed.

### **Heel**

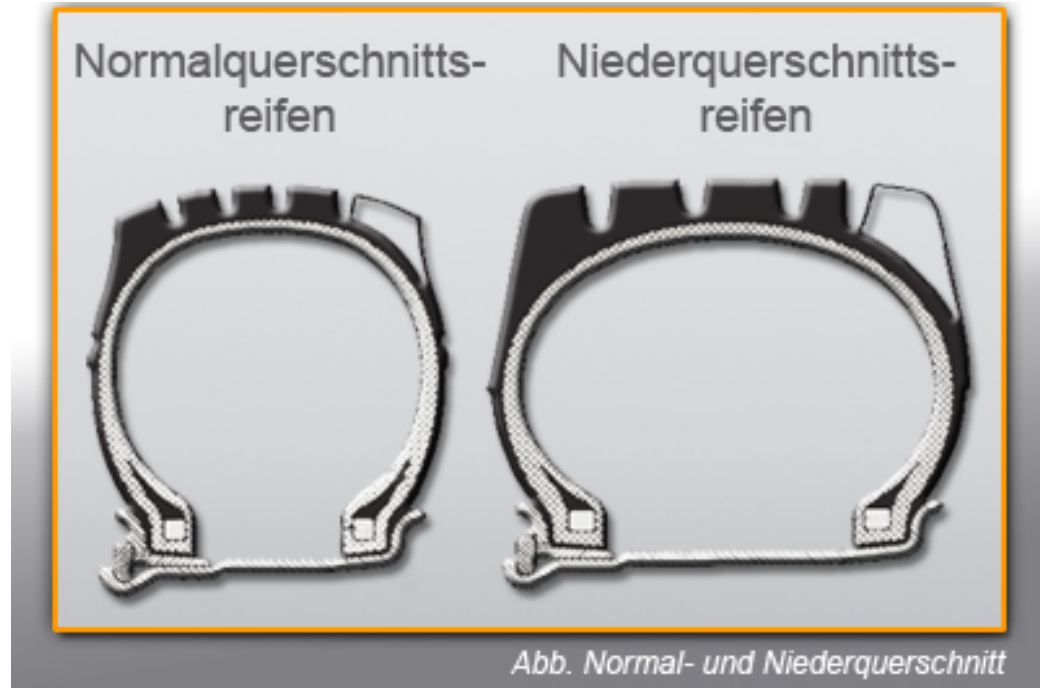
The heel consists of a **steel wire core** around which the ends of the carcass cord is put. It ensures that the **tire sits safely** on the wheel rim.



The **air volume** in a tire determines its **load-carrying capacity**. Consequently, **the greater the air volume the greater the load-carrying capacity**. There are two possibilities for accommodating a greater air volume

- **by higher filling pressure**
- **by larger tire dimensions**

In the illustration you can see a **normal tire** and a **low cross-section tire** (wide-base tire). With same outer diameter and air pressure, the low cross-section tire has a greater volume thanks to the greater tire width, and therefore a greater load-carrying capacity. Dual fitment tires are often replaced by low cross-section tires and vice versa according to vehicle manufacturer specifications.



*Abb. Normal- und Niederquerschnitt*

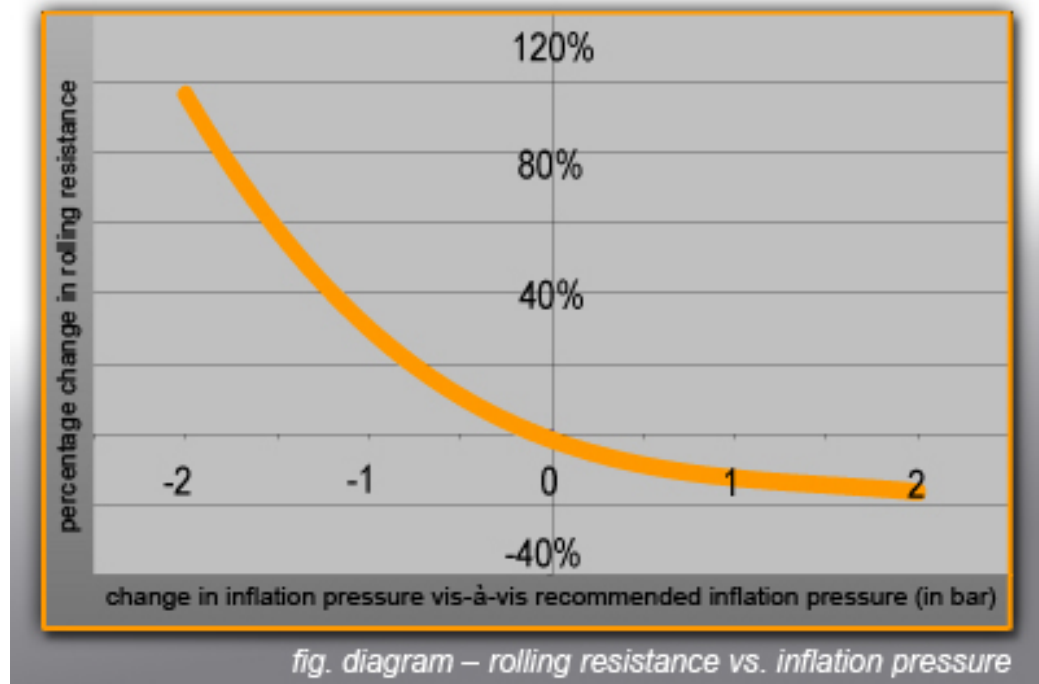
The **cross-section ratios** of Continental industrial pneumatic tires are **65 — 100%** (the ratio of tire height to tire width). The same load-carrying capacity can thus also be realised at **various filling pressures**. On unsecured roadways, **large volume tires with low pressure** achieve **optimum performance** with low filling pressure through low surface pressure. With secured roadways, **tires with high pressure** and therefore **lower rolling resistance** achieve optimum performance.

**Air** in the industrial tire has the following **functions**:

- to carry the load of the industrial truck
- to transmit driving, braking and transverse forces
- to absorb oscillations and unevenness

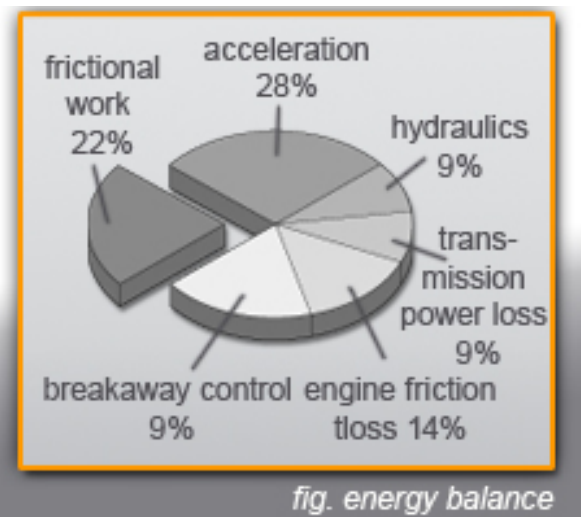
If the air pressure is too low, the **rolling resistance** increases, i.e. the force required to transport a load increases.

**The more load that is loaded, the greater the rolling resistance.**



The **energy consumption** is an important factor. The following overview is intended to show what stake the tire has in it.

The **rolling resistance** of a tire therefore has a considerable influence on **energy requirements**. **22% is lost through wiping action**. **5%** of this could have been saved by choosing a **Continental industrial pneumatic tire**. The lower the **rolling resistance**, the lower the **energy requirements** and the higher the operating efficiency.



## Tire fillings

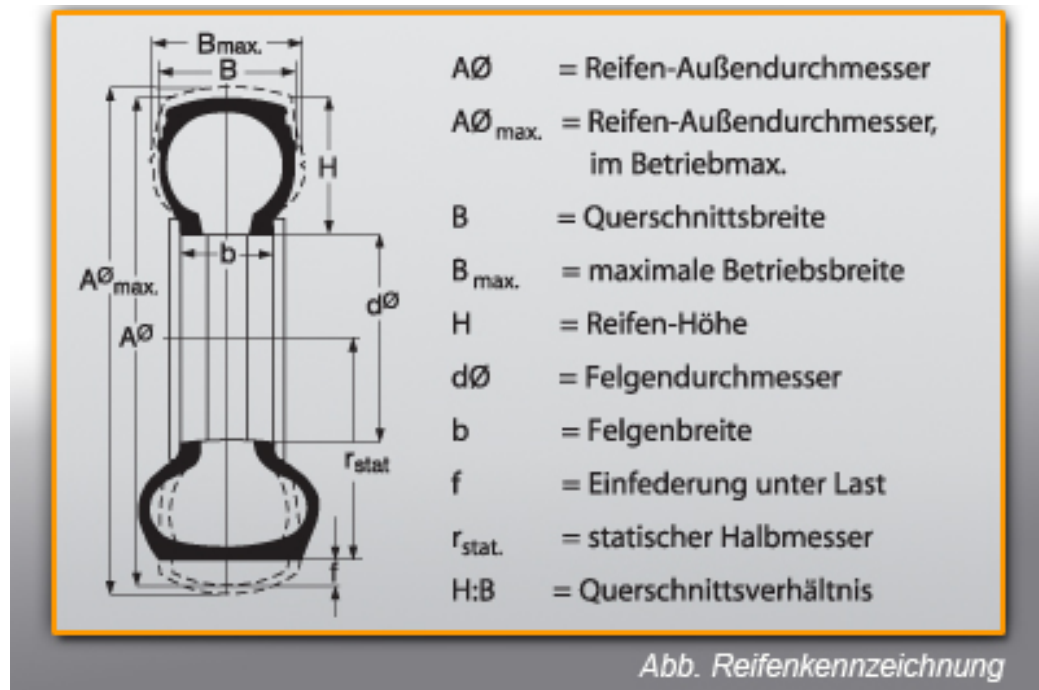
Radial and cross-ply tires can be filled with **two liquid components**, which polymerise to turn into a **polyurethane**. These materials are pumped through the valve into the tire and after 24 hours harden to a synthetic similar to rubber. The degree of hardness can be defined by dosing the components.

The filled tire has the advantage of higher **puncture resistance** during the life of a pneumatic tire. Damage caused by sharp objects does not cause any **pressure loss**. The disadvantages are lower deflection, higher rolling resistance and greater temperature rise in relation to the air-filled equivalent.

In order to guarantee the operating efficiency of this expensive filling, only **new tires** with a long running tire life should be used.

There have been various types of identification for pneumatic tires in the course of their development. Even today, different types of identification are used alongside each other.

**Outer diameters (A), tire width (B) and rim diameter (D)** are given, either in inch or in millimetres. The **cross-section** ratio (H:B) is indicated as a percentage.



In the past, tire capacity was shown only by a **PR number**. Today, an **alphanumeric code** is increasingly being used to indicate **load-carrying capacity** and **reference speed**.

The load-carrying capacity is indicated as **load index** at an assigned **reference speed**.

Reference speed is indicated as a **speed symbol(GSY)**

Continental radial-ply tires have the following characteristics

- extremely good mileage performance
- low rolling resistance
- good riding comfort
- good traction
- electrical conductivity

As previously mentioned, there are **standard** and **deep tread patterns**. The following illustration is intended to make the difference clear to you.

The noticeably **stronger profile** of the deep tire ensures a **higher friction volume**. The radial construction brings about **good suspension** and **low rolling resistance**. The belt positions made of steel cord lead to the **effective**

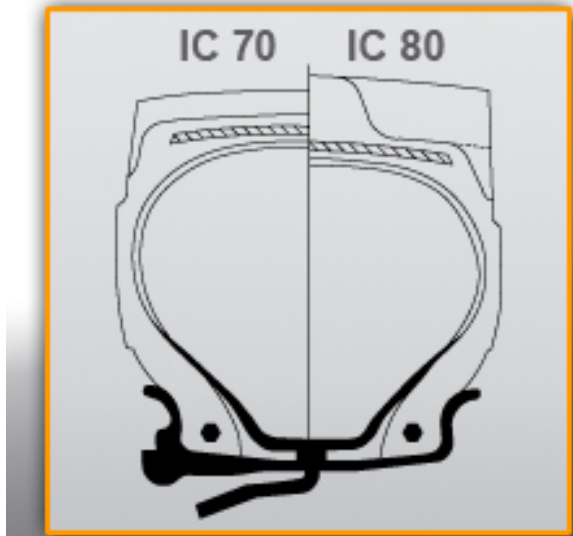


Abb. Deep-, Normalreifen

**reinforcement** of the running surface and therefore **better mileage performance**. The greater side wall deflection leads to **lower tilting stability** in the case of great stacking heights. Radial-ply tires are **generally antistatic**.

How do the deep and standard variants now perform comparatively? As shown in the diagram, the strengths of the deep tire lie in **mileage performance** and **resistance to injuries**. However, the standard tire scores higher points for **traction**, **rolling resistance** and **suitability for higher speeds**.

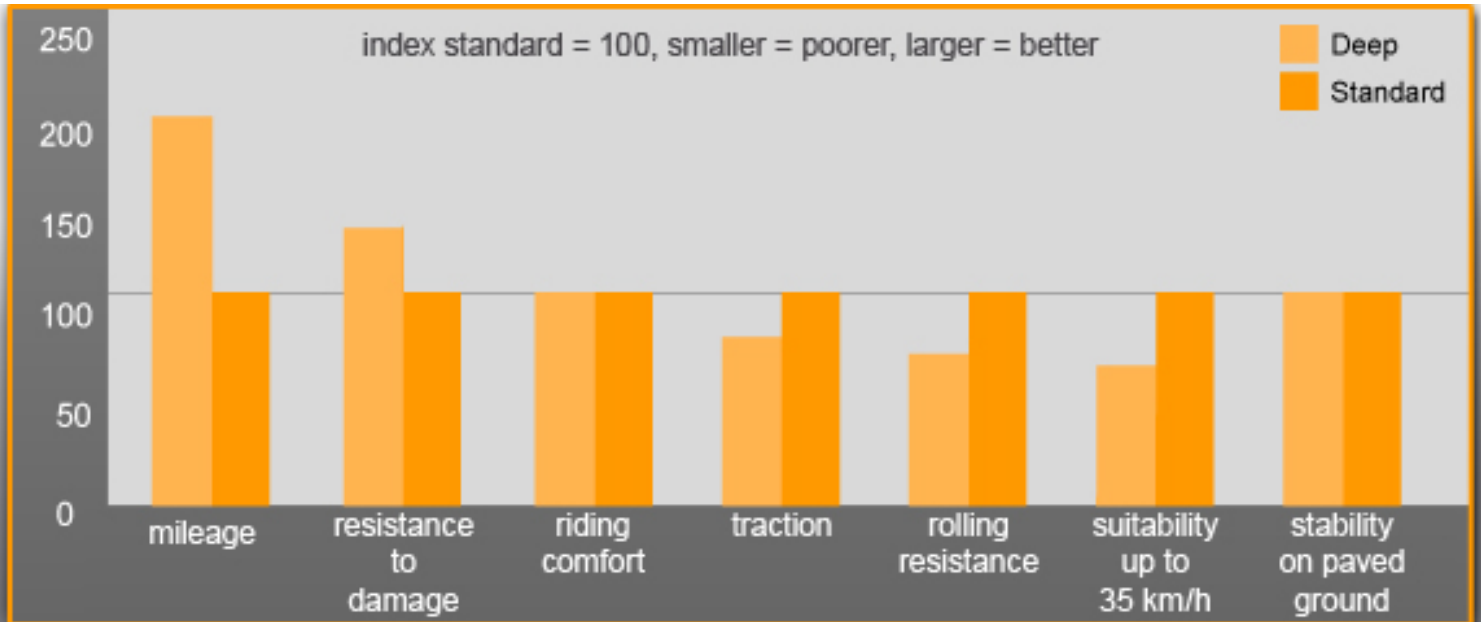


fig. deep tire, normal tire

The Continental cross-ply tire has the following characteristics:

- **high lateral stability**
- **high resistance to injuries**
- **good traction**
- **good riding comfort**
- **good ride performance in universal use**
- **high damping capability**

Like the radial tire, the **cross-ply** also has **standard** and **deep tread pattern** designs.

The IC 40, a tire with a deep profile, has a noticeably **higher friction** volume and a **stronger side wall**. It therefore has **better mileage performance** and **greater puncture resistance**. The standard tire, on the other hand,

has **better riding comfort**, **lower rolling resistance** and is **suitable for higher speeds**. This is clearly shown in the table.

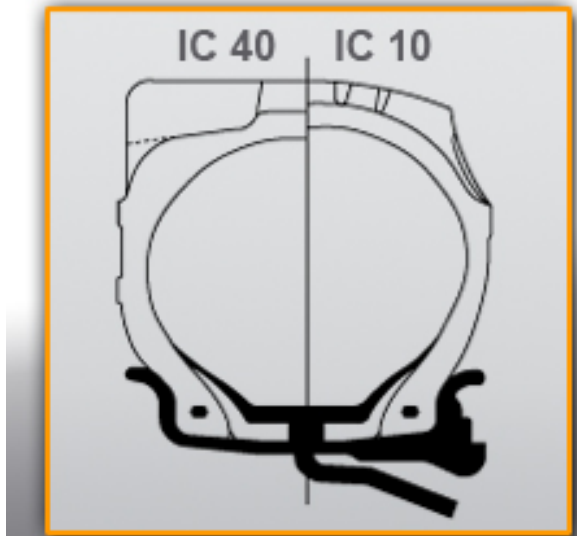


Abb. Deep-, Normalreifen

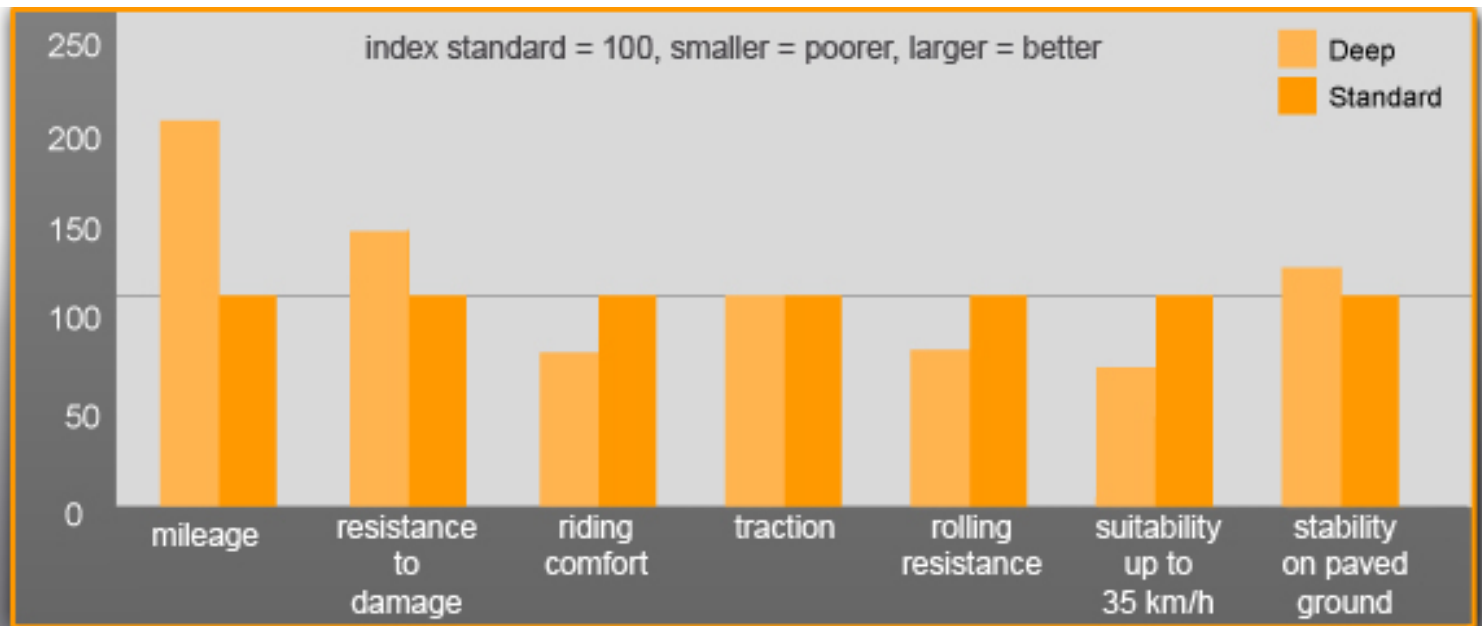


fig. deep tire, normal tire

Deep cross-ply tires have a substantially increased number of operating hours and are therefore noticeably **more economical** than standard cross-ply tires.

Continental cross-ply industrial pneumatic tires are also available in **anti-static** on request.

## How can the rolling resistance of industrial vehicles be reduced?

by using radial tire

by using the right inflation pressure

by decreasing the load

- **The air in the tire carries the vehicle**
- **Pneumatic tires are available in radial-ply and cross-ply design.**
- **The pneumatic tire consists of the carcass (radial-ply or cross-ply) heel with core, running surface and side wall.**
- **Broad tires with the same outer diameter have a greater load-carrying capacity.**
- **The lower the rolling resistance, the lower the energy consumption.**
- **Pneumatic tires are available in standard and deep tread designs.**
- **Radial-ply tires have the following advantages:**
  - **excellent riding comfort**
  - **extraordinary mileage performance**
  - **high operating efficiency**
- **Cross-ply tires have the following advantages:**
  - **high stability**
  - **good traction**
  - **resistant side wall**