

Machine elements

Components of a technical application that fulfil certain functions in structures are known as machine elements. Machine elements can be both single components and assemblies:

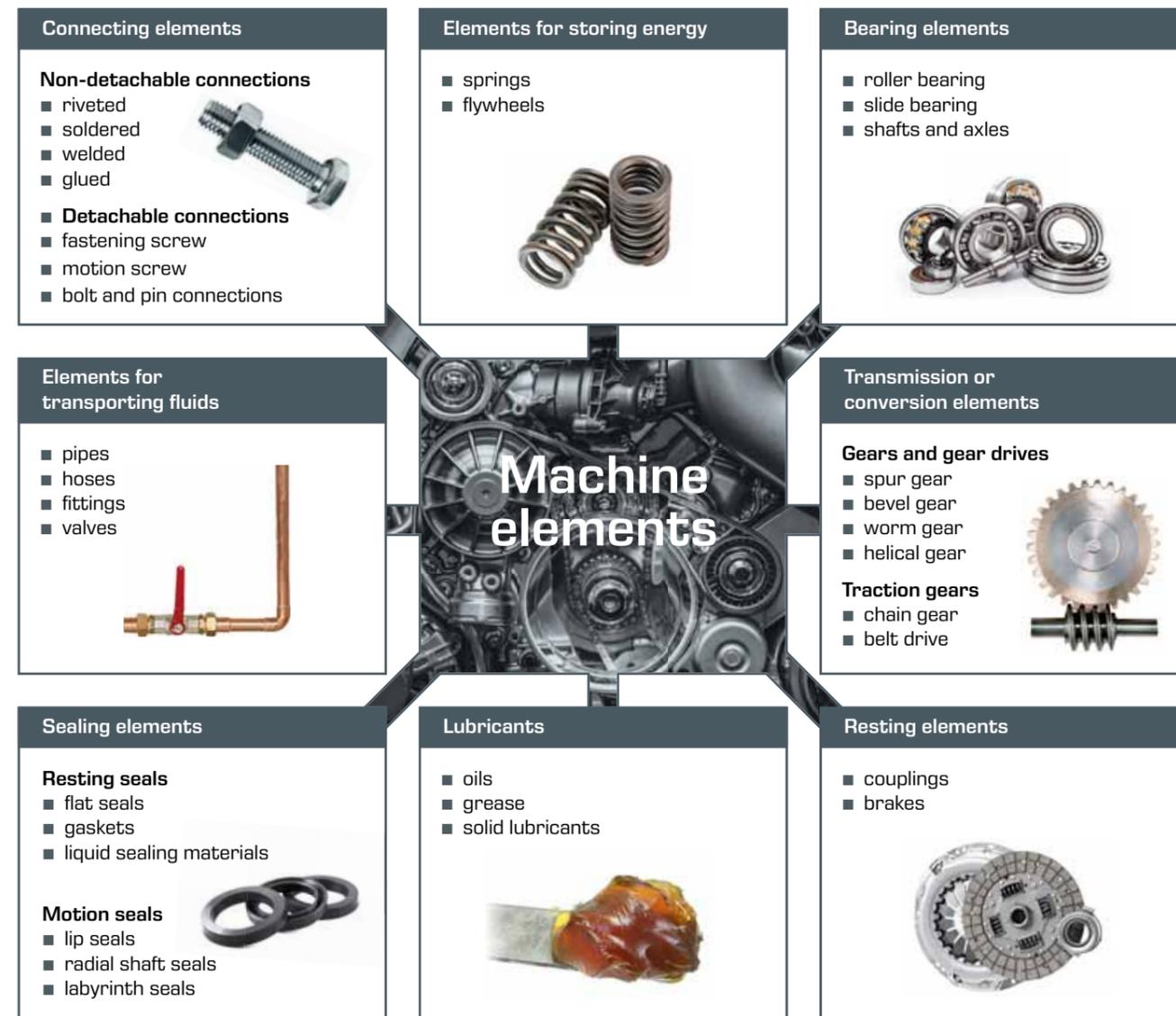
- individual parts such as screws, bolts or gears
- assemblies consisting of individual machine elements, such as couplings, ball bearings, transmissions or valves

An individual machine element always performs the same function, even though it is used in very different structures.

Simple machine elements such as screws, cylinder pins, feather keys or seals are defined according to standards and therefore can be exchanged without difficulty. More complex machine elements such as bearings, couplings, gears or shafts are standardised in only certain important properties, such as main dimensions or flanges, and as such are not fully interchangeable.

Classification of machine elements

Some machine elements can perform different tasks. For example, couplings can be used as linking and/or transmission elements and shafts can be used for bearing and/or transmission.



This section presents the following machine elements:

- various connecting elements
- roller bearings
- various types of gears

Connecting elements



Connecting elements are used when the components in the machine are intended to be fixed firmly to each other. Fixing screws, rivets and studs are discrete elements that are usually detachable and can be reused.

Screws are the most commonly used machine elements and are classified according to their function: **fastening screws** connect two or more parts firmly to each other and can be detached. **Motion screws** convert rotary motion into linear motion and are used under load following assembly.

Bearing elements



Bearing elements can absorb and divert forces, secure rotary motion of shafts and axles, and allow axial guiding of shafts. A distinction is made between slide bearings and roller bearings depending on the design. In **slide bearings**, the opposing, movable parts are in contact with each other. This sliding is usually facilitated by a lubricating film. Slide bearings allow an optimum transfer of force over the entire area of the touching surfaces.

With **roller bearings**, components move by rolling, which therefore reduces friction. In roller bearings, an outer race and an inner race roll against each other. Typical rolling elements are cylinders and spheres. So that the rolling elements do not touch each other, cages are used to keep the cylinders or spheres separate.

Transmission or conversion elements



Complex machine elements used to alter the motion variables of path, velocity and acceleration are known as conversion elements or gears. In a gear drive, positively locking **gears** transfer the rotary motion from one shaft to another. In a traction drive, the rotary motion is transferred between two shafts by

means of a traction gear. Here, a distinction is made between non-positive traction drives (**belt drive**) and positive traction drives (**chain or toothed belt drive**).