17 Superfinishing (shortstroke honing)

The superfinishing method, also called superhoning or shortstroke honing, is a precision finishing process in which a workpiece rotates and an abrasive wheel, which is pressed against the workpiece, simultaneously performs a rapid longitudinal vibration of only few millimetres (Figure 17.1).

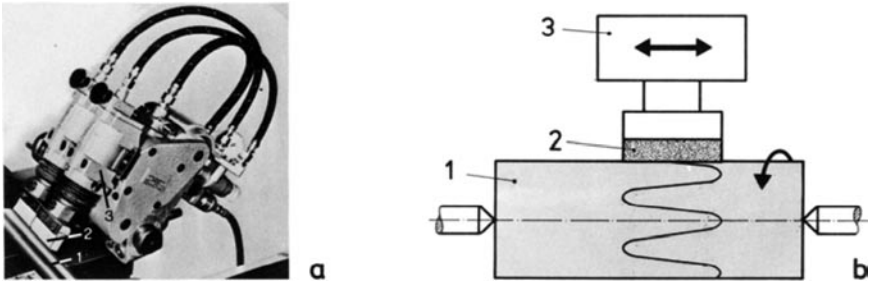

Figure 17.1
Superfinishing 1 workpiece, 2 abrasive wheel, 3 vibrating head, a) machine, b) principle

The abrasive wheel is similar to the honing stone. Sometimes the wheel or wheels is/ are fixed on a tool carrier, which carries out the oscillating motion. The slide on which the tool carrier is based generates the feed motion.

The overlapping of the two motions (the rotary motion of the workpiece and the oscillating – and feed motions of the tool) causes the grinding grains to pass over the workpiece surface on always different trajectories that are never the same. This results in particularly high surface qualities.

Due to the short longitudinal motion of the abrasive wheel, which is similar to honing, the method is also called “shortstroke honing“.

Since the abrasive wheel carries out a vibrational motion (back and forth motion), the technique is also called “superhoning“.

In lieu of the term “superfinishing“, the terms “precision honing“ or “superfine honing” are also used. The German equivalent of these terms is derived from honing.

17.1 Application of superfinishing

This method is used when, in addition to the best possible surface quality, the structure of the machined workpiece, up to the outermost load-bearing layer, needs to be totally heterogeneous. If the part’s microstructure has to fulfil high requirements, then a superfinishing technique is indicated. Requirements like these occur, for example, in the case of bearing yokes, heavily loaded bearing pins on shafts and heavily loaded anti-friction bearings.

As a result of superfinishing, in these elements, the surface structure is refined by removing the surface layer, which is dispersed by the machining procedure to such an extent that, for instance, breaking in of rotating machine parts is unnecessary. Moreover, the elements machined this way have good wear characteristics.

With superfinishing, peak-to-valley heights from 0,1 to 0,4 µm can be achieved, the measuring accuracy ranges from IT 3 to IT 4. Allowances from 0,002 to 0,003 mm are sufficient.