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## Worm Gear - Helical Wheel Pairs: Interchangeability Standards

### Foreword

Cylindrical gears with involute teeth have tooth profiles which are manufactured to precise specifications. We are able to produce these elements when we receive the production drawings with all the necessary technical information.

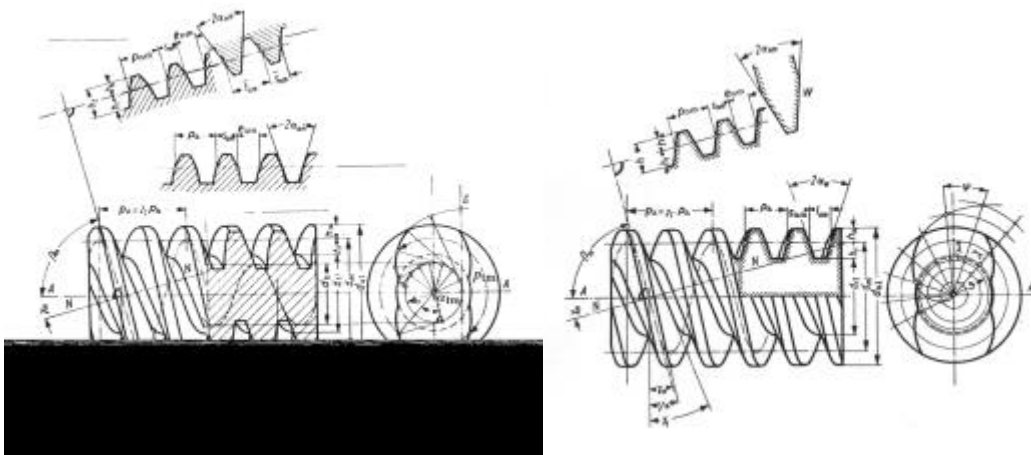
The manufacture of the single elements of the **worm gear-wheel pairs** is difficult because the profile of the teeth is not specified.

### Technical and Manufacture Variables

In the worm-wheel pairs the teeth present profiles with approximate geometric curves: **the drive profiles are very variable and the drawings cannot be precise enough. In addition each manufacturer uses his own “personalised” profiles on the basis of the available equipment.**

The variables, which are taken into account in the manufacture of these sets, are many and, besides the data which are specified in the drawings, there are other factors which interact on the worm-wheel drive:

- **Type of profile (A, K, N, I) determined by the method of cutting or grinding the worm.**



- **Diameter of the tool which cuts the helical wheel:** the diameter of the tool decreases after sharpening and this produces a new profile.



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- **Diameter of the grinding wheel used to grind the worm** : also in this case the tool after sharpening produces a different profile. This effect is more important on larger helix angles.
  - **Method used for sharpening the grinding wheel**: the manufacturers of grinding machines used for the manufacture of worm gears, shape the grinding wheel with diamond tools. The trajectories of the shaping tools are different from one manufacturer to the other. Grinding wheels with the same diameters produce profiles which may differ one from the other.
  - **In addition there may be technical factors due to different production systems, which change the drive point and are chosen by the manufacturer as a function of the final use of the worm gear.**

### Management Suggestions

In view of the above clarifications, we suggest:

- The work of the manufacturer is made simpler when the drawings of the worm gear-wheel pairs show the real centre distance and the number of starts of the worm as well as the number of teeth of the wheel.
- **The manufacturer of the worm gear must manufacture also the helical wheel and guarantee as well as certify the proper conjugate drive.**
- **The worm-wheel pairs are interchangeable only if they belong to the same manufacture lot.** For a proper management of the stock, the sets of the same production lot must be clearly identified.
- **In case of substitution of one part (worm or wheel) it is not always economic to manufacture one part only.** When it is necessary to manufacture one item only, it is compulsory to send to the manufacturer the part which shall be kept in use, so that the correct conjugate fit be realized.
- **To avoid possible problems with the teeth profiles, we suggest that the complete pair, worm gear-wheel, be substituted.** At a later date the item to be rebuilt may be manufactured without urgency.

### Conclusion

The production of worm-wheel pairs must be entrusted to manufacturers, who possess the right technology of designing and building these sets. In this way you know that they have the know-how to act when precise technical data are not available.