

Size designation and true size

# Shoe size – a game of chance

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**Owing to the existence of a number of different width tables, the formal length and width designation of shoes provides no guarantee of agreement in the measurements serving as criteria for shoe size. Moreover, last shape, fit, and dress conventions also exert an influence. Conventional attitudes should therefore be thought over in the interests of better shoe fit.**

**The last – basis for shoe manufacture**

The last is the basis for shoe manufacture. It determines the volume and the external shape of the shoe to be produced. Since the shoe industry has the task of providing properly fitting shoes, the dimensions of the last have to correspond to the average foot measurements of the population served. Hence last development requires consideration of the following points:

- anatomy and function of the foot
  - physiological processes occurring in the foot
  - average measurements of the consumer population
  - technical and technological demands
  - aesthetic and fashion aspects.
- Last development and production is a special area of shoe produc-

tion which is generally regarded as an ancillary industry. Thus many shoe manufacturers consider last development to have reached a state of maturity. In spite of all theoretical and constructional tools, it remains a personal, creative, empirically derived product of the last designer, comprising anatomical, functional, and aesthetic components, in keeping with contemporary taste. From a medical standpoint, minimum recommendations have been issued for last sole construction /1,2,3/ and the angle of pitch. Various attempts have also been made to introduce a quality classification for true shape of last /4/, and this was actually practised for a time.

**Designation of length and width**

Size designation of lasts and shoes is accomplished by stating the length and the width, where the width stands for the girth at the joint. Only in the Mondopoint system is the length given as the directly measured length in mm. In the commoner shoe length designation systems, viz. in centimetres, French size, and English size, the nominal size is made up of the foot length plus a certain allowance. For the above size designation systems, the joint girth determines the stated width. It is indicated by a combination of letters of numbers. In the Mondopoint system the actual foot width is given in mm.

As a rule, girth designation is based on the technical joint girth; the method of determination may differ from one last manufacturer to another. The numerical values of the girth designation are apparent from the width ta-

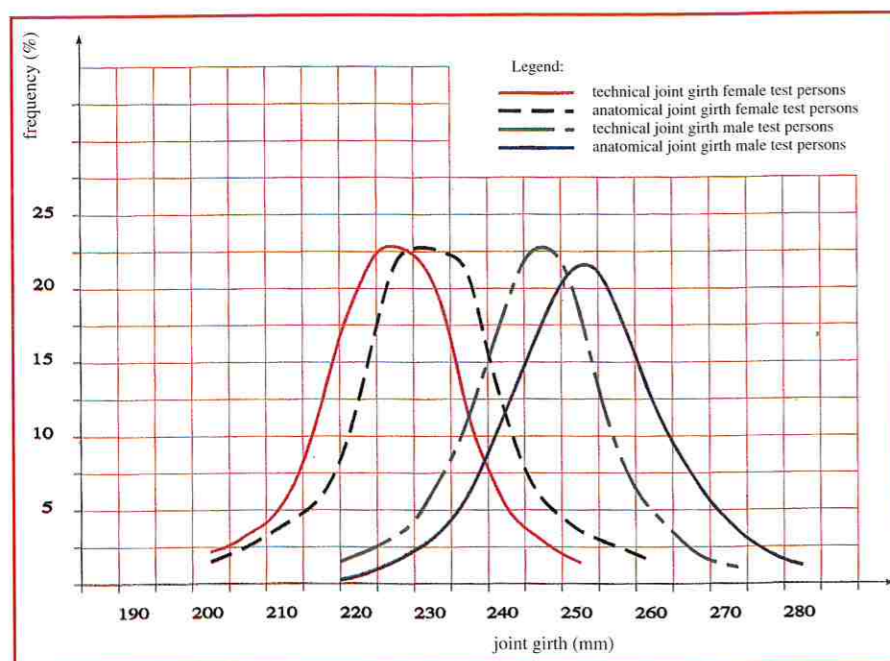


Fig. 1: Frequencies of joint girths for average foot lengths of female and male subjects

bles of the last manufacturers. The width tables used are large based on empirical values derived both from foot measurements and from observations made during shoe retailing /5/.

**Differing size tables**

At the turn of the century over 100 width tables were used in shoe production. In 1920 the development of a measuring point marking device by Friedrich Warnecke /6/ paved the way for a uniform designation of the measuring points for the joint girth on a last; however, this device was not used by all last producers with the result that slight variations in last width were still possible. Even with the same measurements, the use of differing width tables with the same width designation can lead to differences in determination of joint girths. For example, in Besching's width Table 3 /12/ width F is given as 220 mm, whereas Fagus' Table 9 gives a value of 225 for the same length and width designation. Nearly all last manufacturers use several width tables.

**Divergent to this day**

As long ago as in the 1970s, the ISO Committee "TC 137" attempted to introduce a uniform shoe size designation in conjunction with the Mondopoint shoe size system /7/. On the basis of anthropometric differences in measurements between the peoples of ISO member states no uniform width table was adopted, just a uniform length designation of the shoes was recommended, paying due attention to the SI system, according to the direct foot length (mm), as was the width of the foot measured in mm.

Only few countries consistently complied with these ISO recommendations /8/. Thus the Mondopoint designation system as defined in DIN 66074 has not been adopted in the civilian sector in Germany. Thanks to the untiring efforts of Prof. Dr. E. Maier and the Children's Shoe Working

Group, a uniform size designation known as the WMS system has been introduced in Germany for children's shoes.

**Advantages of a uniform width table**

For the customer it is desirable that, once having found a shoe that fits really well, he can find another one that fits equally well when he makes his next purchase with the aid of the same size designation. A prerequisite would be a uniform length and width determination and the use of uni-

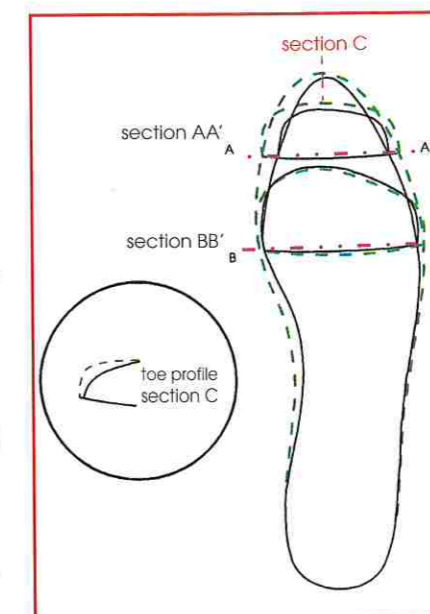


Fig. 2: Last soles and last cross sections of two lasts of the same size designation

form size tables in last and shoe production.

Use of standardised constructional, testing, and evaluation criteria would also be favourable. Such an approach would provide the basis for the assessment of the trueness of fit of shoes.

In the interest of improving customer service, the shoe trade should be interested in a uniform width table. Given a knowledge of the foot measurements of the population of the area in which they are located, it would be easier for shoe retailers to deduce the numbers of shoes required in the various widths. In view of European unity, the existence of on-

ly one valid width table would have a favourable influence on the creation of a European width table. Shoe dealers, futurologists, and of course also the consumers should therefore be protagonists of a uniform width table. On the other hand, shoe importers would also be compelled to take more account of the anthropometric facts of the German population.

**A multiple width system is required**

In order to maximise the availability of a given shoe in the population, the scatter of the joint girth for a give foot length makes it necessary to produce the shoe in a range of widths (Fig. 1). Both for the manufacturer and for the retailer this is more expensive than production and distribution of shoes in a single width. However, the availability of several widths testifies to the quality and comfort-consciousness of the supplier. Apart from offering each shoe model in a range of widths, the availability of different models in different widths can also contribute to a multiple width shoe supply. However, in such cases the consumer has to weigh up the relative merits of comfortable fit and aesthetic choice of shoe.

**Fit is also shape-dependent**

The fit of a shoe for a given foot depends not only on the length and width of a shoe but also on its shape. Thus the shape of a last may correspond better to the shape of one individual foot rather than another one since different cross sections may have the same girth at the joint. The volume distribution in other parts of the last also contributes to the sensation of fit experienced by the wearer (Fig. 2). Moreover, the shape of the last influences not only the fit but also, by virtue of the volumes exiting between the foot and the shoe, the microclimate in the shoe and hence also the comfort in wear /10/.

The pitch and the waist of the

shoe in turn affect the shape of the foot and to a considerable degree the load on the foot and leg and thus also the sense of well-being and the performance of the foot.

The sensation of fit also varies widely from one individual to another. Findeisen reported the threshold of the sensation of fit as 7.0 mm /9/ and the fluctuation of foot volume according to time of day and performance level as 3.5 mm /11/. These findings warrant attention in determining width increments.

### Foot representatives for checking size designation

The internal dimensions of a shoe depend not only upon the dimensions of the last but also upon method of manufacture and especially upon the relaxation behaviour of the upper materials and the stabilisation effect attained. If the properties and processing of the materials have not been properly considered at the design stage then the dimensions will be adversely affected and there will be deviations from the designated size. Thus the fit of the shoe cannot be formally derived from the designation of the last but the trueness of fit must be examined on the shoe. If a difference becomes apparent between the actual and the designated size then this technical de-

viation can be corrected by a last factor. Fitting checks on sizes at the limits of the usual assortment /14/ can also be useful because any (gradation) errors that may have crept in during product development can be identified and corrected prior to series production.

Since there is still a lack of measuring devices suitable for determining the internal volume of a shoe /13/, checks on true fit are based on the subjective assessments of foot representatives. A foot representative is a person whose foot measurements (length, girth at joint) correspond to average anthropometric values of the population to be supplied (selected width, selected constitutional type, and appropriate foot health group).

Differences between the designation and the actual internal dimensions of the shoes are often found in the lower price range. Inadequate stabilisation of the shoe construction is often observed, e.g. in excessive toe spring or poor reproduction of contours.

A shoe should not only be aesthetically appealing but also possess intrinsic values because it serves to clothe a sensitive organ.

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