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April 1989

Steel stampings

General tolerances

DIN 6930 Part 2

Stanzteile aus Stahl; Allgemeintoleranzen

Supersedes January 1983 edition.

In keeping with current practice in standards published by the International Organization for Standardization (ISO), a comma has been used throughout as the decimal marker.

Dimensions in mm

1 Scope

This standard is intended to simplify drawings. It specifies general tolerances on linear and angular dimensions and on coaxiality and symmetry in four accuracy grades comprising f (fine), m (medium), g (coarse) and sg (very coarse). When selecting a defined accuracy grade, the respective workshop accuracy is to be taken into account.

If smaller tolerances are required or if larger tolerances are permitted and more economical, these shall be indicated adjacent to the relevant basic size.

2 Field of application

General tolerances as specified in this standard intended for use cold and hot stampings made from steel flat products. They shall apply whenever reference is made to this standard on drawings or relevant documents (e.g. in delivery conditions).

General tolerances for parts made by fine blanking (see VDI 3345) are not covered in this standard.

If, by way of exception, it is intended to apply this standard also to components made from semi-finished products other than flat products, or from materials other than steel, this shall be particularly agreed.

It is recommended that this standard be applied in conjunction with the specifications given in DIN 6932.

The technical delivery conditions for stampings are coverd by DIN 6930 Part 1.

Guidelines relating to general tolerances indicated on existing drawings are given in clause 5.

3 General tolerances

3.1 General

The general tolerances specified in this standard take account of the particular conditions of stamping practice including allowance for die wear.

In the case of blanked stampings, the tolerances apply to the cut band (see figure 1).

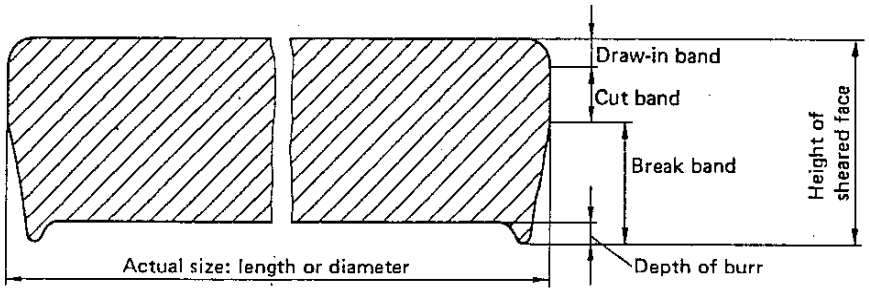

Figure 1. Determination of actual size

Note. Where the position and size of the draw-in band, break band and burr may affect the functioning of the stamping, a corresponding agreement shall be reached between manufacturer and purchaser, details of which are to be entered in the drawing.

In the case of stampings produced by nibbling (cf. DIN 8588), the actual size is the dimension measured over the peaks of the undulating sheared face (see figure 2).

Figure 2. Determination of actual size of stampings produced by nibbling

The actual size of a stamping may possibly be influenced by the tolerance on thickness of the flat product used. In this connection, it is to be considered that the thickness of the flat product may alter when subjected to bending or deep drawing.

Continued on pages 2 to 9

3.2 General tolerances for flat stampings

Flat stampings are to be made exclusively from flat products by cutting (using a shear or blanking tool). Cf. DIN 8588 for definition of cutting processes.

3.2.1 General tolerances for linear dimensions of flat stampings

The limit deviations specified in table 1 shall apply to all linear dimensions including the diameters of flat stampings except for the radii of curvature, which are specified in subclause 3.2.2.

Table 1. Limit deviations for linear dimensions of flat stampings excluding radii of curvature

Nominal size range	Accuracy grade	Limit deviations for thicknesses				
		from 0,1 to 1	over 1 up to 3	over 3 up to 6	over 6 up to 10	over 10
From 1 to 6	f	± 0,05	± 0,08	± 0,1	± 0,2	± 0,4
	m	± 0,1	± 0,15	± 0,2	± 0,3	± 0,4
	g	± 0,2	± 0,3	± 0,4	± 0,6	± 0,8
	sg	± 0,5	± 0,5	± 0,8	± 1,2	± 1,5
Over 6 up to 10	f	± 0,08	± 0,1	± 0,15	± 0,2	± 0,4
	m	± 0,15	± 0,2	± 0,25	± 0,4	± 0,4
	g	± 0,3	± 0,4	± 0,5	± 0,8	± 0,8
	sg	± 0,8	± 1	± 1	± 1,5	± 1,5
Over 10 up to 25	f	± 0,1	± 0,1	± 0,15	± 0,2	± 0,4
	m	± 0,2	± 0,25	± 0,3	± 0,4	± 0,6
	g	± 0,4	± 0,5	± 0,6	± 0,8	± 1
	sg	± 1	± 1	± 1,5	± 1,5	± 2
Over 25 up to 63	f	± 0,1	± 0,15	± 0,2	± 0,3	± 0,4
	m	± 0,25	± 0,3	± 0,4	± 0,5	± 0,6
	g	± 0,5	± 0,6	± 0,8	± 1	± 1,2
	sg	± 1	± 1	± 1,5	± 2	± 3
Over 63 up to 160	f	± 0,15	± 0,15	± 0,2	± 0,3	± 0,4
	m	± 0,3	± 0,4	± 0,5	± 0,6	± 0,8
	g	± 0,6	± 0,8	± 1	± 1,2	± 1,6
	sg	± 1,5	± 1,5	± 2	± 3	± 3
Over 160 up to 400	f	± 0,2	± 0,3	± 0,3	± 0,4	± 0,5
	m	± 0,5	± 0,6	± 0,6	± 0,8	± 1,0
	g	± 1	± 1,2	± 1,2	± 1,6	± 2
	sg	± 1,5	± 2	± 2,5	± 3	± 3
Over 400 up to 1000	f	± 0,4	± 0,4	± 0,5	± 0,5	± 0,8
	m	± 0,8	± 0,8	± 1	± 1	± 1,5
	g	± 1,6	± 1,6	± 2	± 2	± 3
	sg	± 2,5	± 2,5	± 3	± 4	± 4
Over 1000 up to 6300	f	± 0,8	± 0,8	± 0,8	± 1	± 1
	m	± 1,2	± 1,5	± 1,5	± 2	± 2
	g	± 2,5	± 2,5	± 3	± 4	± 4
	sg	± 4	± 4	± 4	± 4	± 4

3.2.2 General tolerances for radii of curvature of flat stampings

See table 2.

Table 2. Limit deviations for radii of curvature

Nominal size range	Accuracy grade	Limit deviations for thicknesses				
		from 0,1 to 1	over 1 up to 3	over 3 up to 6	over 6 up to 10	over 10
From 1 to 6	f, m,	± 0,2	± 0,3	± 0,5	-	-
	g, sg	± 0,4	± 0,6	± 1,0	-	-
Over 6 up to 10	f, m,	± 0,3	± 0,4	± 0,5	± 0,6	-
	g, sg	± 0,6	± 0,8	± 1,0	± 1,2	-
Over 10 up to 25	f, m,	± 0,4	± 0,5	± 0,6	± 0,8	± 1,0
	g, sg	± 0,8	± 1,0	± 1,2	± 1,6	± 2,0
Over 25 up to 63	f, m,	± 0,5	± 0,6	± 0,8	± 1,0	± 1,2
	g, sg	± 1,0	± 1,2	± 1,6	± 2,0	± 2,4
Over 63 up to 160	f, m,	± 0,8	± 1,0	± 1,2	± 1,4	± 1,6
	g, sg	± 1,6	± 2,0	± 2,4	± 2,8	± 3,2
Over 160 up to 400	f, m,	± 1,0	± 1,2	± 1,5	± 1,8	± 2,0
	g, sg	± 2,0	± 2,4	± 3,0	± 3,6	± 4,0
Over 400	f, m,	± 1,6	± 2,0	± 2,2	± 2,5	± 3,0
	g, sg	± 3,2	± 4,0	± 4,4	± 5,0	± 6,0

3.2.3 General tolerances for angular dimensions of flat stampings

General tolerances for angular dimensions of flat stampings shall apply irrespective of the actual linear dimensions, i.e. the angular deviations are permitted both for workpieces with maximum material sizes and for those with minimum material sizes. The limit deviations do not affect the tolerances of form of the legs or faces enclosing an angle.

Table 3. Limit deviations for angular dimensions of flat stampings

Accuracy grade	Limit deviations for a nominal size of the shorter leg, in angular units							
	From 1 to 6	Over 6 up to 10	Over 10 up to 25	Over 25 up to 63	Over 63 up to 160	Over 160 up to 400	Over 400 up to 1000	Over 1000 up to 2500
f	± 1°	± 1°	± 30′	± 30′	± 20′	± 10′	± 5′	± 5′
m	± 1° 30′	± 1° 30′	± 50′	± 50′	± 25′	± 15′	± 10′	± 10′
g, sg	± 3°	± 3°	± 2°	± 2°	± 1°	± 30′	± 20′	± 20′

3.2.4 General tolerances on coaxiality and symmetry of flat stampings

See ISO 1101 for the definitions of 'coaxiality tolerance' and 'symmetry tolerance' and the corresponding indications on drawings.

3.2.4.1 Coaxiality

The nominal size of the largest of the related form elements is the size to be considered for the coaxiality tolerance. On the basis of this nominal size, the coaxiality tolerance results from the difference between the upper and lower deviations specified in table 1 for the accuracy grade concerned and the given thickness of the flat product.

Example:

Concentric arrangement of outer and inner contours of a pierced disc (see figure 3).

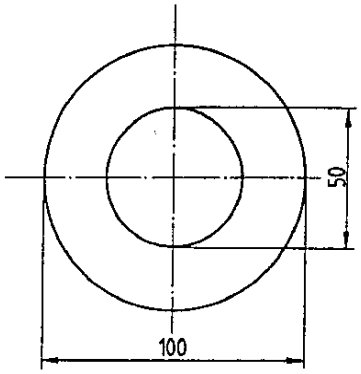

Figure 3. Nominal size to be considered for the coaxiality tolerance

Assuming a product thickness of 2 mm and accuracy grade m, the coaxiality tolerance is found from table 1 to be 0,8 mm.

3.2.4.2 Symmetry

The nominal size of the largest of the related form elements is the size to be considered for the symmetry tolerance. On the basis of this nominal size, the symmetry tolerance results from the difference between the upper and lower deviations specified in table 1 for the accuracy grade concerned and the given thickness of the flat product.

Example:

Symmetrical arrangement of two notches and of a hole relative to the sides of a rectangular strip (see figure 4).

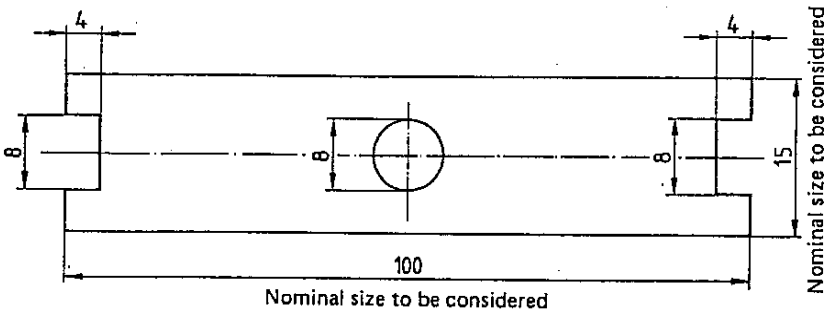

Figure 4. Nominal size to be considered for the symmetry tolerance

Assuming a thickness of 1 mm for the flat product and accuracy grade g, the following tolerances are found from table 1:

symmetry tolerance for hole axis in the longitudinal direction: 1,2 mm;

symmetry tolerance for hole axis and the mid-line of the notches in the transverse direction: 0,8 mm.

3.3 General tolerances for stampings made by forming

Stampings manufactured by forming are those which have undergone at least one forming operation (e.g. forming by bending or deep drawing) and thus are not flat. As a rule, stampings manufactured by forming also exhibit features produced by cutting.

Note. Stampings manufactured by forming may also feature flat (cut) form elements whose dimensions are not affected by the forming operation, since, for example, they are produced at a distance from the formed section of the workpiece or subsequent to the forming operation. However, as it is not always possible for the designer to tell in advance when manufacturing will produce such results, such cases have not been dealt with here.

If the tolerances for particular form elements on stampings produced by forming are too large for the required function, the appropriate tolerances for such cases shall be specified individually. This shall also apply, if necessary, to dimensions across elements manufactured by different processes (e.g. an element manufactured by bending and one, by cutting).

3.3.1 General tolerances for linear dimensions of stampings manufactured by forming

The limit deviations specified in table 4 shall apply to all linear dimensions, including the diameters of stampings manufactured by forming, except for the radii of curvature, which are specified in subclause 3.3.2. The nominal sizes to be considered may have been produced either by cutting or by a forming operation (see also note in subclause 3.3).

Table 4. **Limit deviations for linear dimensions of stampings manufactured by forming, excluding radii of curvature**

Nominal size range	Accuracy grade	Limit deviations for thicknesses				
		from 0,1 to 1	over 1 up to 3	over 3 up to 6	over 6 up to 10	over 10
From 1 to 6	f	± 0,1	± 0,16	± 0,2	± 0,4	± 0,8
	m	± 0,2	± 0,3	± 0,4	± 0,6	± 0,8
	g	± 0,4	± 0,6	± 0,8	± 1,2	± 1,6
	sg	± 1,0	± 1,0	± 1,6	± 2,0	± 3,0
Over 6 up to 10	f	± 0,16	± 0,2	± 0,3	± 0,4	± 0,8
	m	± 0,3	± 0,4	± 0,5	± 0,8	± 0,8
	g	± 0,6	± 0,8	± 1,2	± 1,6	± 1,6
	sg	± 1,6	± 2,0	± 2	± 3	± 3
Over 10 up to 25	f	± 0,2	± 0,2	± 0,3	± 0,4	± 0,8
	m	± 0,4	± 0,5	± 0,6	± 0,8	± 1,2
	g	± 0,8	± 1,0	± 1,2	± 1,6	± 1,8
	sg	± 2,0	± 2,0	± 3	± 3	± 4
Over 25 up to 63	f	± 0,2	± 0,3	± 0,4	± 0,6	± 0,8
	m	± 0,5	± 0,6	± 0,8	± 1,0	± 1,2
	g	± 1,0	± 1,2	± 1,6	± 2	± 2,4
	sg	± 2,0	± 2,0	± 3	± 4	± 6
Over 63 up to 160	f	± 0,3	± 0,3	± 0,4	± 0,6	± 0,8
	m	± 0,6	± 0,8	± 1,0	± 1,2	± 1,6
	g	± 1,2	± 1,6	± 2	± 2,4	± 3,2
	sg	± 3,0	± 3,0	± 4	± 6	± 6
Over 160 up to 400	f	± 0,4	± 0,6	± 0,6	± 0,8	± 1,0
	m	± 1,0	± 1,2	± 1,2	± 1,6	± 2
	g	± 2	± 2,4	± 2,4	± 3,2	± 4
	sg	± 3	± 4	± 5	± 6	± 6
Over 400 up to 1000	f	± 0,8	± 0,8	± 1	± 1	± 1,6
	m	± 1,6	± 1,6	± 2	± 2	± 3
	g	± 3,2	± 3,2	± 4	± 4	± 6
	sg	± 5	± 5	± 6	± 8	± 8
Over 1000 up to 2500	f	± 1,6	± 1,6	± 1,6	± 2	± 2
	m	± 2,4	± 3	± 3,0	± 4	± 4
	g	± 5	± 5	± 6	± 8	± 8
	sg	± 8	± 8	± 8	± 8	± 8

3.3.2 General tolerances for radii of curvature of stampings manufactured by forming

The limit deviations specified in table 5 shall apply to radii of curvature produced by cutting or by a forming operation.
Note. See also note in subclause 3.3.

Table 5. **Limit deviations for radii of curvature (produced by cutting, bending or deep drawing) of stampings manufactured by forming**

Nominal size range	Accuracy grade	Limit deviations for thicknesses				
		from 0,1 to 1	over 1 up to 3	over 3 up to 6	over 6 up to 10	over 10
From 1 to 6	f	± 0,2	± 0,3	± 0,6	–	–
	m	± 0,4	± 0,6	–	–	–
	g	± 0,6	–	–	–	–
	sg	–	–	–	–	–
Over 6 up to 10	f	± 0,4	± 0,6	± 0,8	± 1	–
	m	± 0,6	± 1	± 1,2	± 1,5	–
	g	± 1,2	± 2	± 2,5	–	–
	sg	± 1,6	± 2	± 2,5	–	–
Over 10 up to 25	f	± 0,6	± 0,8	± 1	± 1,2	± 1,5
	m	± 1	± 1,2	± 1,5	± 2	± 2,5
	g	± 2	± 2,5	± 4	–	–
	sg	± 2,5	± 4	± 4	–	–
Over 25 up to 63	f	± 0,8	± 1	± 1,2	± 1,5	± 2
	m	± 1,2	± 1,5	± 2	± 2,5	± 4
	g	± 2,5	± 4	± 6	–	–
	sg	± 4	± 6	± 6	–	–
Over 63 up to 160	f	± 1	± 1,2	± 1,5	± 2	± 2,5
	m	± 1,5	± 2	± 2,5	± 4	± 6
	g	± 4	± 6	± 10	± 15	± 25
	sg	± 6	± 10	± 10	± 15	± 25
Over 160 up to 400	f	± 1,2	± 1,5	± 2	± 2,5	± 3
	m	± 2	± 2,5	± 4	± 6	± 10
	g	± 6	± 10	± 15	± 25	± 40
	sg	± 10	± 15	± 15	± 25	± 40
Over 400 up to 1000	f	± 1,6	± 2	± 2,5	± 3	± 4
	m	± 2,5	± 4	± 6	± 10	± 15
	g	± 10	± 15	± 25	± 40	± 60
	sg	± 15	± 25	± 25	± 40	± 60

3.3.3 General tolerances for angular dimensions of stampings manufactured by forming

General tolerances for angular dimensions of stampings manufactured by forming shall apply irrespective of the actual linear dimensions, i.e. the angular deviations are permitted both for workpieces with maximum material sizes and those with minimum material sizes. The limit deviations do not affect the tolerances of form of the legs or faces enclosing an angle.

For angles produced by bending, the limit deviations specified in DIN 6935 for cold bent angles shall apply to all accuracy grades.

Note. Since the present standard also covers hot formed stampings, the angular deviations specified in DIN 6935 apply to these products as well.

3.3.4 General tolerances on coaxiality and symmetry of stampings manufactured by forming

The nominal size of the largest of the related form elements is the size to be considered for the coaxiality and symmetry tolerances. On the basis of this nominal size, the coaxiality and symmetry tolerances result from the difference between the upper and lower deviations specified in table 4 for the accuracy grade concerned and the given thickness of the flat product.

Example:

Symmetrical arrangement of a hole in a bent channel (see figure 5).

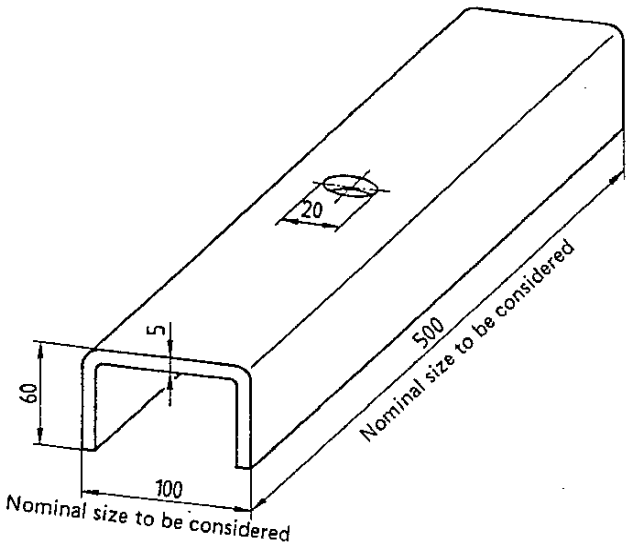

Figure 5. Nominal sizes to be considered for the symmetry tolerance

Assuming a product thickness of 5 mm and accuracy grade g, the symmetry tolerances for the hole axis are found from table 4 to be 0,8 mm in the longitudinal direction and 4,0 mm in the transverse direction.

Table 4 does not apply if the form elements for which a coaxial or symmetrical position is required are located in different planes of the stamping.

4 Indication on drawings

Whenever general tolerances as specified in this standard are to be applied, the following indication shall be made on a drawing in the box provided for the purpose, e.g., when accuracy grade 'medium (m)' is chosen:

General tolerance DIN 6930 – m

5 General tolerances in existing drawings

General tolerances as specified in this standard shall apply to new drawings. It is recommended that existing drawings be amended by substituting previous tolerance indications by those specified in this standard. If this is not possible and if the previous indication 'Tolerance as in DIN 6930' is retained, then the limit deviations specified in the previous editions of DIN 6930 Parts 2 to 4 shall apply.

6 Special cases

The specifications made in this clause shall apply to all accuracy grades.

6.1 Straightness tolerance for strip and sections

For strip cut by shears and for sections bent from strip, the straightness tolerance shall not exceed the values specified in table 6, this requirement being based on a minimum ratio of strip width, b, to flat product thickness, s, of 25 : 1. For sections bent from strip, the tolerance given in table 6 shall apply for each longitudinal axis of the section.

Table 6. **Straightness tolerance, n, for strip cut by shears and for sections bent from strip**

Strip length or section length, l	Straightness tolerance, n
Up to 2000	1
Over 2000 up to 3000	2,25
Over 3000 up to 4000	4
Over 4000 up to 5000	6,25
Over 5000 up to 6000	9

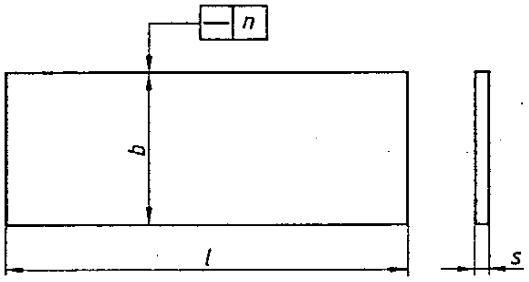

Figure 6. Straightness of strip

6.2 Warping of strip and sections

The warping, α/l, of strip cut by shears and of sections bent from strip shall not exceed 0,5° per 1000 mm of length (see figure 7), this requirement being based on a minimum ratio of strip width, b, to flat product thickness, s, of 25 : 1.

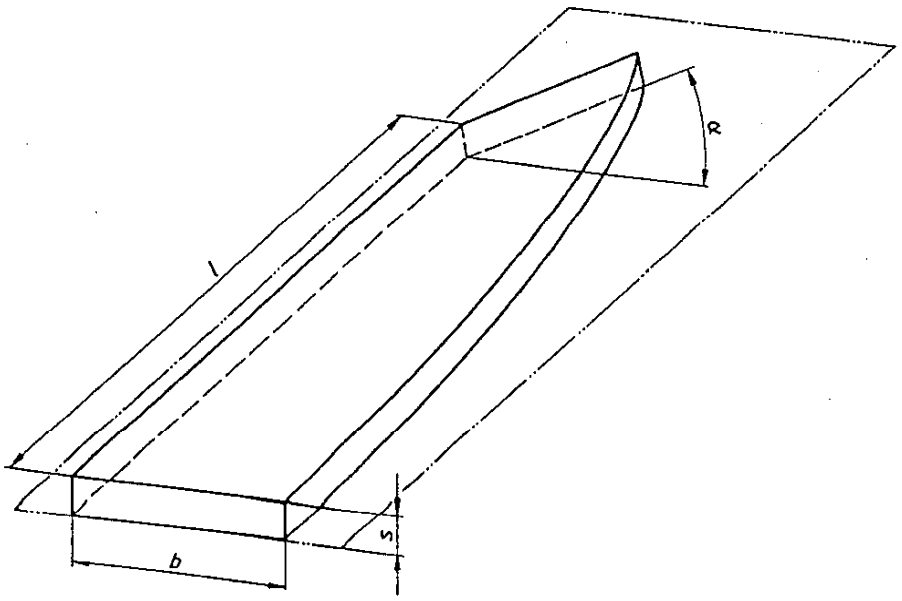

Figure 7. Warping of strip

Standards and other documents referred to

DIN 6930 Part 1	Steel stampings; technical delivery conditions
DIN 6932	Rules for designing steel stampings
DIN 6935	Cold bending of steel flat products
DIN 8588	Separating manufacturing processes; classification and concepts
ISO 1101	Technical drawings; geometrical tolerancing; tolerances of form, orientation, location and run-out; generalities, definitions, symbols and indications on drawings
VDI 3345	*Feinschneiden* (Fine blanking)

Previous editions

DIN 6934: 08.59; DIN 6936: 01.55x, 07.69; DIN 6937: 01.55, 10.68; DIN 6938: 01.55, 10.68; DIN 6939: 01.55, 10.68; DIN 6940: 01.55x; DIN 6941: 01.55, 07.55x; DIN 6942: 01.55, 07.59; DIN 6943: 01.55x; DIN 6944: 01.55; DIN 6945: 01.55; DIN 6946: 07.61; DIN 6947: 07.61; DIN 6948: 07.61, 10.68; DIN 6949: 07.61, 10.68; DIN 6930 Part 3: 10.71; DIN 6930 Part 4: 10.71; DIN 6930 Part 2: 04.72, 01.83.

Amendments

The following amendments have been made to the January 1983 edition.

a) Some of the values specified in tables 4 and 5 have been amended.

b) The standard has been editorially revised.

Explanatory notes

For converting the angular dimensions specified in table 3 to linear dimensions for measurement purposes, table 7 below gives tangent values.

Table 7. **Angles and associated tangents**

Angle	Tangent	Angle	Tangent	Angle	Tangent
5′	0,0015	25′	0,0073	1° 30′	0,0262
10′	0,0029	30′	0,0087	2°	0,0349
15′	0,0044	50′	0,0145	3°	0,0524
20′	0,0058	1°	0,0175		

International Patent Classification

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B 26 F 1/38