

Flat Steel Products  
Cold Rolled Steel Strip  
Dimensions, Permissible Variations on Dimensions and Form

DIN  
1544

Flachzeug aus Stahl; Kaltgewalztes Band aus Stahl;  
Maße, zulässige Maß- und Formabweichungen

Dimensions in mm

1. Scope

1.1. This Standard applies to cold rolled flat products  $\geq 0.10 \leq 6$  mm thick without surface coatings, and in particular to cold rolled strip in rolling widths  $\leq 650$  mm and bars cut from such strip in the steels quoted in Section 5.

1.2. This Standard does not cover  
cold rolled thin sheet according to DIN 1540 (Preliminary Standard),  
cold rolled wide strip and sheet of unalloyed steels according to DIN 1541,  
cold rolled wide strip and sheet of stainless steels according to DIN 59382,  
cold rolled strip of stainless or heat-resistant steels according to DIN 59381.

2. Definitions

2.1. Flat products

See DIN 1623 Part 1.

2.2. Strip

See DIN 1623 Part 1.

Strip also includes bars  $< 600$  mm in width prepared by cutting to length from strip.

2.3. Cold rolled

See DIN 1623 Part 1.

3. Designations

3.1. For the complete designation, the following should be quoted in the sequence given:

Denomination (strip),

thickness in mm (if necessary to 2 decimal places),

code letter (F or P) where a fine or precision variation is required on the thickness (see Table 1 and Section 6.1),

width in mm,

code letters (NK, GK or SK) for the required edge condition (see Table 1 and Sections 4.2.1 and 4.2.2),

length in mm in the case of bars, followed where applicable by the code letters (F or P) in the case of bars in fixed length or exact length (see Table 1 and Sections 4.1 b) and 6.4),

code letter S where fine variation is required on straightness (see Table 1 and Section 6.5),

DIN number of the dimension standard,

code number or material number of the steel grade and any identification symbol for the surface condition as given in the quality standards.

3.1.1. Where an order is placed without special requirements as to permissible dimension and/or form variations (i.e. where delivery is required with normal variations or in the case of bars in manufacturing lengths) no code letters should be used in the designation.

3.1.2. Instead of the denomination "strip", the abbreviation "Bd" according to DIN 1353 Part 2 may be used.

3.2. Examples

Designation of a cold rolled strip of 1.50 mm thickness with fine variations (F) on nominal thickness, 200 mm width, with cut edges (GK) of steel St 2 (material number 1.0330), cold rolled to a tensile strength of 590 to 740 N/mm<sup>2</sup> (K 60):

Strip 1.50 F x 200 GK DIN 1544 - St 2 K 60

or Strip 1.50 F x 200 GK DIN 1544 - 1.0330 K 60

Designation of a cold rolled strip of 2.50 mm thickness with normal variations on nominal thickness, 125 mm width, with natural rolled edges (NK), as bars in manufacturing lengths of 3000 mm, with normal variations on straightness of the longitudinal edges, of steel St 4 (material number 1.0338), annealed (G):

Strip 2.50 x 125 NK x 3000 DIN 1544 - St 4 G

or Strip 2.50 x 125 NK x 3000 DIN 1544 - 1.0338 G

Designation of a cold rolled strip of 0.80 mm thickness with precision variations (P) on nominal thickness, 450 mm width, with cut edges (GK), as bars of 2150 mm exact length (P), with fine variations (S) on straightness of the longitudinal edges, of steel Ck 60 (material number 1.1221):

Strip 0.80 P x 450 GK x 2150 PS DIN 1544 - Ck 60

or Strip 0.80 P x 450 GK x 2150 PS DIN 1544 - 1.1221.

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4. Mode of delivery

4.1. Cold rolled flat products according to this Standard can be supplied as

- a) strip in coils (see Section 6.3),  
 b) bars cut to length from strip according to Section 4.1 a), in manufacturing lengths, fixed lengths (F) or exact lengths (P) (see Section 6.4). Any short lengths occurring in the manufacture of bars shall be included in the delivery unless otherwise agreed.

4.2. For cold rolled flat products according to Section 4.1 the modes of delivery quoted in Table 1 may also be supplied (edge condition, permissible dimension and form variations).

Table 1. Modes of delivery in which cold rolled flat products  $\leq 650$  mm wide may be ordered<sup>1)</sup>

Form of product	Edge condition <sup>2)</sup>	Thickness <sup>3)</sup>			Length <sup>4)</sup>			Straightness <sup>5)</sup>	
		Normal variation	Fine variation	Precision variation	Manufacturing length	Fixed length	Exact length	Normal variation	Fine variation
Strip	NK	X	F	P	-	-	-	X	S
	GK	X	F	P	-	-	-	X	S
	SK	X	F	P	-	-	-	X	S
Bar	NK	X	F	P	X	F	P	X	S
	GK	X	F	P	X	F	P	X	S
	SK	X	F	P	X	F	P	X	S

1) The normal variations indicated by a cross (X) are the normal modes of delivery (see Sections 3.1.1 and 4.3). Where delivery with fine or precision variations or of bars in fixed length or exact length is required, the code letters quoted should be used in the designation (see Section 3.1).  
 2) NK = natural rolled edges, GK = cut edges, SK = special edges (see Sections 4.2.1, 4.2.2 and 4.3).  
 3) See Section 6.1 and Table 2.  
 4) See Section 6.4 and Table 4.  
 5) See Section 6.5 and Table 5.

4.2.1. For flat products with cut edges (GK) thickness of  $\leq 4$  mm can normally be supplied in steels according to DIN 1624 and thickness  $\leq 3$  mm in the case of other steels.

4.2.2. By special agreement, and dependent on the technical facilities of the supplier, flat products with special edges (SK) can be supplied, e.g. rolled with sharp edges or having rounded edges.

4.3. If no information is given on the mode of delivery, flat products shall be supplied with normal variations and cut edges, and in the case of bars, in manufacturing lengths.

5. Material

Flat products according to this Standard are manufactured from all unalloyed and alloy steels with the exception of stainless and heat-resistant steels (see DIN 59381).

The required steel grade should be quoted in the designation.

6. Dimensions and permissible dimension and form variations6.1. Thickness

6.1.1. The preferred nominal thicknesses are given in Table 2. All other thicknesses in the range  $\geq 0.10 \leq 6.0$  mm may however also be supplied.

6.1.2. The permissible thickness variations in the case of normal variations, fine variations (F) and precision variations (P) are given in Table 2 (see also Section 7.1).

6.1.2.1. For strip offcuts with a length of 3 m each at the start and end of coils, twice the values according to Section 6.1.2 are permitted for thickness variations.

6.1.2.2. It can be agreed when ordering that only over size or only under size on nominal thickness will be supplied; in this case, the total margin of the permissible variations according to Sections 6.1.2 and 6.1.2.1 will apply.

6.2. Width

6.2.1. The values for the permissible oversize on nominal width in the case of flat products with natural rolled edges (NK) and with cut edges (GK) are given in Table 3. No undersize on nominal width is permitted.

6.2.2. For flat products with special edges (SK) special agreements as to permissible width variations should be made when ordering.

Table 2. Preferred nominal thicknesses and permissible thickness variations

Preferred nominal thicknesses	in the case of a nominal thickness		Permissible thickness variations <sup>1)</sup> in the case of nominal widths								
			< 125			IV 125 < 250			IV 250 ≤ 650		
			Normal variation	Fine variation (F)	Precision variation (P)	Normal variation	Fine variation (F)	Precision variation (P)	Normal variation	Fine variation (F)	Precision variation (P)
0,10; 0,12	0,10	0,15	±0,010	±0,008	±0,005	±0,020	±0,012	±0,010	±0,020	±0,015	±0,010
0,15; 0,20	0,15	0,25	±0,020	±0,012	±0,010	±0,020	±0,015	±0,010	±0,030	±0,020	±0,015
0,25; 0,30; 0,35	0,25	0,40	±0,020	±0,015	±0,010	±0,030	±0,020	±0,015	±0,030	±0,025	±0,015
0,40; 0,50	0,40	0,60	±0,030	±0,020	±0,015	±0,030	±0,025	±0,015	±0,040	±0,030	±0,020
0,60; 0,70; 0,80; 0,90	0,60	1,00	±0,030	±0,025	±0,015	±0,040	±0,030	±0,020	±0,050	±0,035	±0,025
1,00; 1,20	1,00	1,50	±0,040	±0,030	±0,020	±0,050	±0,035	±0,025	±0,060	±0,045	±0,030
1,50; 2,00	1,50	2,50	±0,050	±0,035	±0,025	±0,060	±0,045	±0,030	±0,080	±0,060	±0,040
2,50; 3,00; 3,50	2,50	4,00	±0,060	±0,045	±0,030	±0,070	±0,055	±0,035	±0,090	±0,070	±0,045
4,00; 4,50; 5,00; 6,00	4,00	6,00 <sup>2)</sup>	±0,080	±0,060	-	±0,090	±0,070	-	±0,100	±0,080	-

<sup>1)</sup> Observe Sections 6.1.2.1, 6.1.2.2, 7.1 and 7.1.1  
<sup>2)</sup> Including 6.00 mm

Table 3. Permissible oversize on nominal width

Permissible oversize on nominal width <sup>1)</sup>						
in the case of a nominal thickness:			in the case of nominal widths			
IV	<		< 125	IV 125 < 250	IV 250 < 400	IV 400 ≤ 650
Flat products with natural rolled edges (NK)						
0,3	6,00 <sup>2)</sup>		3,0	3,5	4,0	4,5
Flat products with cut edges (GK)						
0,10	0,40		0,3	0,4	0,6	0,6
0,40	1,50		0,4	0,6	0,8	0,8
1,50	2,50		0,6	0,8	1,0	1,0
2,50	6,00 <sup>2)</sup>		0,8	1,0	1,2	1,2

<sup>1)</sup> See Section 6.2.2.  
<sup>2)</sup> Including 6.00 mm.

**6.3. Diameter and weight of coils**

6.3.1. The inside diameter of the coils shall be ≈ 500 mm or ≈ 400 mm according to the order. In the case of strip thicknesses < 0,5 mm, smaller inside diameters (e.g. 300 or 250 mm) may also be agreed.

6.3.2. The weight of the coils is left to the choice of the manufacturer, unless special agreements have been made on the weight or the outside diameter.

**6.4. Length (in the case of bars)**

6.4.1. Where manufacturing lengths are supplied, according to the order or at the choice of the manufacturer, the dimensions shall be ≥ 1000 mm ≤ 4000 mm; shorter or longer lengths must be specially agreed. It is not possible to prescribe a defined permissible length variation.

6.4.2. The values applying for permissible oversize on nominal length, where fixed lengths (F) or exact lengths (P) are ordered, are given in Table 4. No undersize on the ordered length is permitted (see, however, Section 4.1 b)).

Table 4. Permissible length variations in the case of bars in fixed lengths and exact lengths

Nominal length $l$	Permissible oversize on nominal length in the case of	
	fixed lengths (F)	exact lengths (P)
$\leq 1000$	10	10
$> 1000 \leq 2500$	$0,01 \cdot l$	10
$> 2500$	$0,01 \cdot l$	$0,004 \cdot l$

6.5. Straightness of longitudinal edges

For the permissible variations from straightness of the longitudinal edges in the case of normal variations and fine variations (S) the values in Table 5 apply (see also Section 7.2).

6.6. Flatness (in the case of bars)

The permissible variations from flatness in the case of bars is 10 mm (see also Section 7.3). Flatness requirements going beyond this must be agreed when ordering.

7. Testing dimensional accuracy

7.1. The thickness may be measured at any arbitrarily chosen point on the product at least 20 mm distant from the edges. For products  $\leq 40$  mm wide, it shall be measured in the centre of the width of the product.

7.1.1. When ordering fine variations (F) or precision variations (P) it can be agreed that the permissible thickness variations shall apply over the whole width of the product. This does not apply to flat products with natural rolled edges.

7.2. The variation from straightness is taken as the maximum distance between a longitudinal edge and a straight line joining both ends of the measured length. It shall be measured on the concave side of the product. The measured length shall be 1000 mm. The testing shall be made at a distance of at least 3000 mm from the beginning or end of the strip.

7.3. The variation from flatness shall be taken as the maximum distance between the bar lying freely on a flat horizontal surface and a straightedge. The measured length shall be 1000 mm for thicknesses  $< 0.8$  mm and 2000 mm for thicknesses  $\geq 0.8$  mm.

Table 5. Perm. variations from straightness

Permissible variation from straightness <sup>1)</sup>			
in the case of a nominal width		Normal variation	Fine variation (S)
$\geq$	$<$		
10	25	5	2
25	40	3.5	1.5
40	125	2.5	1.25
125	650 <sup>2)</sup>	2	1

<sup>1)</sup> Valid for a gauge length of 1000 mm, see Section 7.2  
<sup>2)</sup> including 650 mm

Explanations

This issue of DIN 1544 was prepared in conjunction with the dimension specifications for other cold rolled flat steel products (see DIN 1541, DIN 59381 and DIN 59382) so as to ensure unified provisions as far as possible for these products. The most essential differences compared with the earlier August, 1954 version are given below.

The Standard covers cold rolled flat products in rolling widths  $\leq 650$  mm of all unalloyed and alloy steels with the exception of stainless and heat-resistant steels, for which there exists a dimension standard DIN 59381. Up to the present there have been no international conditions of delivery for these products which would have to be taken into account in the revision of the DIN standard.

The scope has been extended to cover thicknesses  $\leq 6.0$  mm. In addition to the normal and fine variations already standardized, it is now possible to order precision variations, the tolerances of which are only half as large as in the normal case (see Table 2).

The number of nominal dimension ranges has been reduced. As a result of this, in some cases the permissible thickness variations are now slightly higher than the previous values. This had to be accepted in order to achieve uniform steps. In most cases however the thickness tolerances have been reduced. In this connection it is also necessary to bear in mind that the values now apply to a single measurement point and not to the mean of three measurements.

The permissible width variations have also been arranged differently and, particularly in the case of the larger thicknesses and widths, have been reduced (see Table 3). A further change is that, for products with natural rolled edges, only *o v e r* sizes on nominal width are permitted.

For straightness of the longitudinal edges, it is possible to agree normal or fine variations when ordering. The values referred to a gauge length of 1 m (Table 5) have been slightly increased in the case of normal variations for small widths. International comparative tests by manufacturers have shown that the previous values could not be maintained for cold rolled strip.

The permissible variations from flatness in the case of bars, as previously, have been uniformly stipulated at 10 mm (Section 6.6). In a subsequent revision of the Standard consideration will be given to a more extensive subdivision of the specifications on the basis of product dimensions and, if necessary, of the strength of the steels.