UDC 669.14-42 : 621.753.1

January 1976

Cold Rolled Steel Sections
Permissible Variations on Dimensions, Form and Weight

DIN 59413

Kaltprofile aus Stahl; Zulässige Maß-, Form- und Gewichtsabweichungen

Dimensions in mm

1 Scope

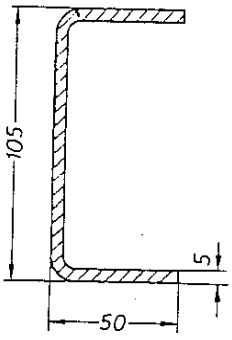
This Standard applies to cold rolled sections manufactured on section rolling mills in the form in which they are customarily supplied in commercial practice, and made from the steels listed in Section 4.

This Standard does not apply to drawn, extruded or chamfered cold rolled sections.

2 Designation

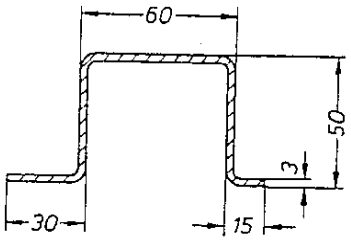
2.1 For complete designation of rectangular cold rolled sections, the following should be quoted in the sequence given:

a) The denomination (abridged form, e.g. L, U, Z, C, hat),
b) all the side lengths in sequence around the section in mm (for unequal flange or leg lengths of the section, the longest length shall be given first; see Examples in Figures 1 to 5),
c) the wall thickness in mm (separated by a horizontal cross (x) from the values for the side length),
d) where applicable, the code letters for the required edge condition (see Section 6.3),
e) the DIN number of the dimension standard,
f) the code number or material number of the steel grade.



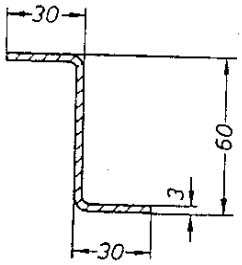
U 50/105/50 x 5

Figure 1.



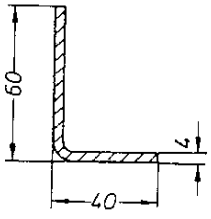
Hat 30/50/60/50/15 x 3

Figure 2.



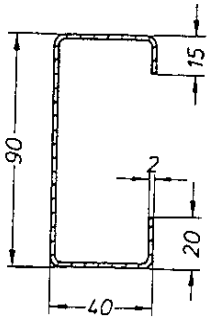
Z 30/60/30 x 3

Figure 3.



L 60/40 x 4

Figure 4.



C 20/40/90/40/15 x 2

Figure 5.

Figures 1 to 5. Examples of cold rolled sections and their designation

Continued on pages 2 to 4
Explanations on page 4

2.2 Examples of designation

Designation of a channel (U section) according to Figure 1 in a steel with the code number St 37-3 and the material number 1.0116:

U 50/105/50 × 5 DIN 59413 - St 37-3

or U 50/105/50 × 5 DIN 59413 - 1.0116

Designation of a cee (C section) according to Figure 5 with natural edges in a steel with the code number USt 37-2 and the material number 1.0036:

C 20/40/90/40/15 × 2 NK DIN 59413 - USt 37-2

or C 20/40/90/40/15 × 2 NK DIN 59413 - 1.0036

2.3 Cold rolled sections of other cross-sectional forms which cannot be unambiguously designated according to Section 2.1 should be defined by a drawing giving the required form.

3 Permissible dimension and form variations

3.1 Cross-section

3.1.1 Because of the large number of forms and dimensions in which cold rolled sections are manufactured, there are no standardized preferred dimensions. The dimensions shall in each case be agreed when ordering. This applies also to permissible variations on the cross-sectional dimensions, unless the provisions of Section 3.1.2 apply.

3.1.2 The permissible variations given in Sections 3.1.3 to 3.1.5 for the cross-sectional dimensions apply to angles, channels, zeds, cees and hat sections with the following characteristic features:

Guaranteed minimum yield point of the steel	$\leqq 500$ N/mm^2
Bending angle at all bends	90°
Bending radius	according to Table 4
External dimensions with a radius at either end (web)	$\geqq 10 \times$ the wall thickness
External dimensions with a radius at one end and a free edge at the other (flange, leg)	$\geqq 4 \times$ the wall thickness (for steel grade St 52-3 $\geqq 6 \times$ the wall thickness)
Ratio of the lengths of both free legs (flanges)	$\leqq 2$

3.1.3 For external dimensions of the cold rolled section with a radius at either end (e.g. the web of a channel), the permissible variations according to Table 1 apply.

3.1.4 For external dimensions with a radius at one end and a free edge at the other (e.g. the flange of a channel) the permissible variations according to Table 2 apply.

3.1.5 Smaller permissible variations than those according to Tables 1 and 2 can be agreed when ordering, particularly in the case of cold rolled sections made from cold rolled strip of small thickness or from hot rolled strip with cut edges.

3.1.6 For the permissible variations on nominal wall thickness s in the unformed parts of the cross-section of cold rolled sections, the normal variations for the nominal thickness of the strip or sheet serving as the initial product apply. The values are stipulated in the currently valid issues of

DIN 1016 Hot rolled strip, hot rolled sheet under 3 mm thickness,

DIN 1541 Cold rolled wide strip and sheet of unalloyed steels,

DIN 1544 Cold rolled strip,

DIN 59381 Cold rolled strip of stainless steels,

DIN 59382 Cold rolled wide strip and sheet of stainless steels.

3.1.6.1 In the bending zones (radii) of cold rolled sections, a reduction in wall thickness in accordance with DIN 6935 is to be expected.

3.1.7 The permissible variation on the bend angle must not exceed the values given in Table 3.

Table 1.

Wall thickness s	Permissible variations on external dimensions		
	$\leqq 50$	$> 50 \leqq 100$	$> 100 \leqq 220$
$< 3{,}0$	± 0,75	± 1,00	± 1,00
$\geqq 3{,}0 < 5{,}0$	± 1,00	± 1,00	± 1,25
$\geqq 5{,}0 \leqq 8{,}0$	± 1,00	± 1,25	± 1,50

Table 2.

Wall thickness s	Permissible variations on external dimensions[1]		
	$\leqq 40$	$> 40 \leqq 80$	$> 80 \leqq 120$
$< 3{,}0$	± 1,20	± 1,50	± 1,50
$\geqq 3{,}0 < 5{,}0$	± 1,50	± 1,50	± 2,00
$\geqq 5{,}0 \leqq 8{,}0$	± 2,00	± 2,00	± 2,00

[1] The larger of the two flanges or legs is the relevant one for determining the variations.

Table 3.

Length of the shorter leg		Permissible variation on bend angle
above	up to	in degree
	10	± 3,0
10	40	± 2,0
40	80	± 1,5
80		± 1,0

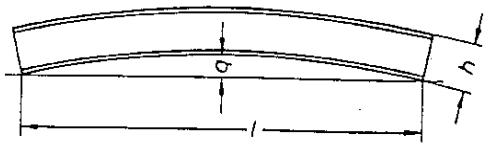
3.1.8 Table 4 gives reference values for the bending radii (inside radii) generally used. Smaller bending radii can be agreed. The inside radii shall be maintained with a variation of ±20 %.

Table 4.

Steel grades according to DIN 17100 and comparable grades of hot rolled and cold rolled strip[1])	Inside radii for wall thicknesses s	
	≤ 6,0	> 6,0 ≤ 8,0
St 33-2	2,0 *s*	2,0 *s*
St 34-2, St 37-2, St 37-3	1,0 *s*	1,5 *s*
St 42-2, St 42-3	1,5 *s*	2,0 *s*
St 52-3	2,0 *s*	2,5 *s*
[1]) See Explanations		

3.2 Straightness

The permissible variation q from straightness is a maximum of 0.0025 · *l*.



3.3 Twist

The twist shall not normally exceed 1° per m. With unfavourable (e.g. asymmetric) forms of cold rolled section, the values should be agreed.

4 Material

Cold rolled sections according to this Standard are manufactured for preference from the steel grades quoted in DIN 17118.

Other steel grades must be specially agreed when ordering.

The required steel grade should be quoted when ordering.

5 Calculation of weight

The theoretical weight of cold rolled sections of unalloyed steels should be calculated from the cross-sectional area, using a density of 7.85 kg/dm³. When other steel grades are used, the density values should be taken from the information given in the appropriate quality standards.

6 Mode of delivery

6.1 For delivery of cold rolled sections, the information on lengths given in Table 5 applies.

6.2 When fixed lengths are ordered, short lengths, which must not however be less than 1500 mm, may be supplied up to 6 % of the delivered weight.

6.3 Cold rolled sections are normally supplied, at the choice of the manufacturer, with cut edges, in which case a slight burr is permissible, or with natural edges. If, in special cases, a particular edge condition is required, the appropriate code letters NK (natural edges) or GK (cut edges) should be quoted in the designation (see Section 2.1).

Other edge conditions (e.g. rounded or chamfered edges) must be specially agreed.

Table 5.

Type of length	Length		Information on length to be given in order
	Range	perm. var.	
Fixed length	6000 [1])	+ 50 0	none[1])
Exact length	≤ 2000	± 1	required exact length in mm
	> 2000 ≤ 6000	± 2	
	> 6000 ≤ 10000	± 3	

[1]) Smaller or larger fixed lengths (up to approximately 15000 mm) can be agreed; in this case, the required fixed length in mm should be quoted when ordering.

6.4 Cold rolled sections should normally be cut at right angles at the ends. Slight variations from a right angle and also a burr consistent with the method of cutting and the form of the section are permissible as also is minor deformation in the area of the cut.

7 Delivery quantity

Over and under deliveries of up to 10 % of the ordered quantity are permissible. Where the customer is not prepared to accept any under delivery of the ordered quantity, the delivered quantity may exceed the ordered quantity by a maximum of 20 %. Where no excess above the ordered quantity will be accepted, the delivered quantity may be up to 20 % less than the ordered quantity.

8 Testing for dimensional accuracy

8.1 Extent of test

The number of cold rolled sections on which dimensional accuracy is to be determined in an acceptance testing shall be agreed when ordering.

8.2 Testing procedure

8.2.1 Checking of dimensions should be carried out at a distance of at least 250 mm from the ends of the cold rolled sections, because during cutting it is impossible to prevent the ends springing outwards or inwards to some extent.

8.2.2 When testing for straightness and twist (see Sections 3.2 and 3.3) the measurement is made over the whole length of the cold rolled section with the latter lying freely on a plane surface.

Further standards

DIN 6935	Cold bending of flat steel products
DIN 6930 Part 3	Stamped steel parts; formed parts from flat products, dimensions and permissible variations

Explanations

This issue of DIN 59413 replaces the October 1969 version of DIN 59413 Part 1. The change in the number of the standard was regarded as desirable since Parts 2 and 3 of DIN 59413 (October 1969 issues) had been withdrawn and not replaced and there is no likelihood of a new issue of the provisions on preferred dimensions of cold rolled sections. It has been found that it is not feasible to restrict the use of these products to a limited number of standard sections. On the contrary, designers and users expect to be supplied with the most useful cold rolled section, i.e. that most closely matching their particular application. Manufacturers have been prepared to comply with these requirements. One reason why this has been possible is that less time is involved in modifying production parameters for normal commercial cold rolled sections so that these have less influence on production costs than in the case of hot rolled sections.

DIN 59413, like the earlier Part 1, contains provisions on permissible dimension variations of the cross-section of currently available cold rolled sections with the characteristics according to Section 3.1.2, and in addition specifications for permissible form and weight variations for all types of cold rolled sections. At the same time, the scope has been extended to cover steels with a guaranteed minimum yield point of up to 500 N/mm^2. Apart from deletion of the references to the other follow-up parts of the standard, there are the following amendments compared with DIN 59413 Part 1.

1) The permissible dimension variations on outside dimensions bounded by one radius and one free edge, have in some cases been reduced (Table 1).

2) Section 3.1.6 contains more extensive information on the dimension standards applicable for permissible variations on wall thickness for the types of strip used as the initial product.

3) The values in Table 3 for permissible variations on the bend angle have been modified.

4) It was intended also to change the reference values for the bending radii in Table 4. The general structural steels of quality group 1 have already been removed from this Table since they are no longer suitable for manufacture of flat products and hence for production of cold rolled sections. In the planned revision of DIN 17100 (present version September 1966) further changes are likely in the subdivision of grades which, after the new issue comes into force, will have an effect on the choice of steels for cold rolled sections. Thus it is possible that grade St 34-2 will be deleted and hence no longer available in the near future for cold rolled sections. In addition, it is intended to replace steels St 42-2 and St 42-3 by a grade having a yield point of at least 275 N/mm^2 (St 44), for which however the bending radii will remain the same as for St 42.

5) The permissible length variations in the case of fixed lengths have been reduced (Table 5).

6) In accordance with normal practice for ordering and delivery, the choice of edge condition is in general left to the manufacturer. It is however still possible in particular cases to agree a special edge condition (Section 6.3).