UDC 669.14.018.27-422-122.4 : 62-272.3

November 1992

Hot rolled steel strip with rounded edges for the manufacture of springs

Dimensions, material and form of supply

DIN 4620

Federstahl, warmgewalzt, mit gerundeten Schmalseiten für Blattfedern; Maße, Grenzabmaße, Gewichte, statische Werte

Supersedes April 1954 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 and field of application

This standard specifies dimensions, material and form of supply for hot rolled steel strip with rounded edges and with the cross-sectional shape shown in figure 1, used for the manufacture of springs, and provides information on the second moment of area and the mass of such material per unit length.

2 Designation

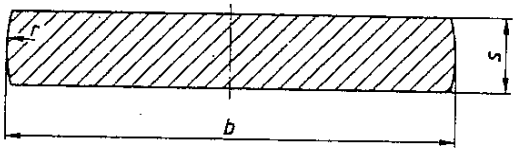

Figure 1

2.1 Standard designation

The standard designation shall give, in the following order:

a) name of product (spring steel);
b) DIN number (DIN 4620);
c) material designation or number;
d) nominal diameter × nominal thickness.

Example:

Hot rolled steel strip made of a material identified by material designation 50 CrV4 (material number 1.8159) as specified in DIN 17 221, with a nominal width, *b*, of 60 mm and a nominal thickness, *s*, of 10 mm, shall be designated:

Spring steel DIN 4620 – 50 CrV4 – 60 × 10
or Spring steel DIN 4620 – 1.8159 – 60 × 10

2.2 Designation to be used when ordering

The designation to be used when ordering shall include the standard designation, preceded by the desired number of items, and succeeded by the desired length.

Example of an order:

Using the example given in subclause 2.1, 10 t of steel strip to be supplied in lengths of 6000 mm shall be ordered as:

10 t spring steel DIN 4620 – 50 CrV4 – 60 × 10 × 6000
or **10 t spring steel DIN 4620 – 1.8159 – 60 × 10 × 6000**

3 Dimensions and tolerances

3.1 Cross-sectional shape

3.1.1 Steel strip shall have the nominal widths and thicknesses specified in table 1. Only those combinations of sizes for which a second moment of area and a mass have been specified are covered by this standard.

3.1.2 The edge radius, *r*, shall be approximately 20 mm (cf. figure 1).

3.1.3 The values of the second moment of area, *I*, are specified in table 1. They have been calculated using the following formula, for the nominal dimensions given:

$$I = \frac{s^3}{12} \cdot (b - 2r) - \frac{s}{16} \cdot (2r^2 - s^2) \cdot \sqrt{4r^2 - s^2} + \frac{r^4}{2} \cdot \arcsin \frac{s}{2r} \qquad (1)$$

Continued on pages 2 to 6

Table 1: Nominal width, nominal thickness, and second moment of area of hot rolled steel strip

Nominal thickness s [1]	Nominal width, b [1]							
	35	40	45	50	55	60	65	70
	Second moment of area, I, in mm^4 [2]							
3	78,59	89,84	101,09	112,34				
3,5	124,72	142,56	160,45	178,31	196,18	214,04		
4	186,02	212,69	239,36	266,02	292,69	319,36	346,02	372,69
4,5	264,62	302,59	340,56	378,53	416,50	454,46	492,43	530,40
5	362,62	414,71	466,79	518,87	570,96	623,04	675,12	727,21
5,5	482,10	551,42	620,75	690,07	759,39	828,71	898,04	967,36
6	625,1	715,1	805,1	895,1	985,1	1 075,1	1 165,1	1 255,1
6,5	793,7	908,1	1 022,6	1 137,0	1 251,4	1 365,8	1 480,3	1 594,7
7		1 132,8	1 275,8	1 418,6	1 561,5	1 704,4	1 847,4	1 990,3
8		1 686,0	1 899,4	2 112,7	2 326,0	2 539,4	2 752,7	2 966,0
9		2 392,7	2 696,5	3 000,2	3 304,0	3 607,7	3 911,5	4 215,2
10		3 270,1	3 686,8	4 103,5	4 520,1	4 936,8	5 353,5	5 770,1
11						6 552,9	7 107,5	7 662,1
12						8 481,9	9 201,9	9 921,9
13						10 748	11 664	12 579
14						13 376	14 519	15 663
15						16 388	17 794	19 200
16						19 805	21 511	23 218
17						23 647	25 694	27 741
18						27 933	30 363	32 793
19						32 679	35 537	38 395
20						37 901	41 234	44 567
21						43 611	47 470	51 329
22								58 694
23								66 677
24								75 288

For [1], see subclause 3.1.1.
For [2], see subclause 3.1.3.

(continued)

Table 1 (concluded)

Nominal thickness s [1]	Nominal width, b [1]							
	75	80	90	100	110	120	130	140
	Second moment of area, I, in mm^4 [2]							
3								
3,5								
4								
4,5								
5	779,3	831,4	935,5					
5,5	1 036,7	1 106,0	1 244,7					
6	1 345,1	1 435,1	1 615,1	1 795,1	1 975,1	2 155,1	2 335,1	2 515,1
6,5	1 709,1	1 823,5	2 052,4	2 281,3	2 510,1	2 739,0	2 967,8	3 196,7
7	2 133,2	2 276,2	2 561,9	2 847,3	3 133,6	3 419,4	3 705,3	3 991,1
8	3 179,4	3 392,7	3 819,4	4 246,0	4 672,7	5 099,4	5 526,0	5 953,7
9	4 519,0	4 822,7	5 430,2	6 037,7	6 645,2	7 252,7	7 860,2	8 467,7
10	6 187	6 603	7 437	8 270	9 103	9 937	10 770	11 603
11	8 217	8 771	9 880	10 990	12 099	13 208	14 317	15 426
12	10 642	11 362	12 802	14 242	15 662	17 122	18 562	20 002
13	13 495	14 410	16 241	18 072	19 903	21 733	23 564	25 395
14	16 806	17 949	20 236	22 523	24 809	27 096	29 383	31 689
15	20 607	22 013	24 825	27 638	30 450	33 263	36 075	39 688
16	24 925	26 631	30 045	33 456	36 571	40 285	43 698	47 111
17	29 783	31 835	35 929	40 023	44 118	48 212	52 306	56 400
18	35 223	37 653	42 513	47 373	52 233	57 093	61 953	66 813
19	41 253	44 111	49 826	55 542	61 258	66 974	72 690	78 406
20	47 901	51 234	57 901	64 587	71 234	77 901	84 567	91 234
21	55 187	59 046	66 764	74 481	82 199	89 916	97 634	105 351
22	63 131	67 567	76 441	85 314	94 187	103 061	111 934	120 807
23	71 747	76 816	86 955	97 094	107 234	117 373	127 512	137 651
24	81 048	86 808	98 325	109 848	121 368	182 888	144 408	155 923

For [1], see subclause 3.1.1.
For [2], see subclause 3.1.3.

3.1.4 Width and thickness shall be subject to the tolerances specified in table 2. The values specified in table 2 for the maximum permissible difference in thickness are based on the difference between the width measured at points M1 and M2 (cf. figure 2), these being located a maximum of 10 mm from each edge.

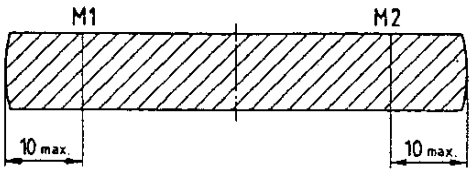

Figure 2

The shape of the product surface between points M1 and M2 shall not be convex, any concavity being within the tolerances on thickness specified in table 2.

3.2 Straightness

The tolerance on straightness shall be $0{,}002 \cdot l_1$ for q_1, and 2 mm for q_2 (cf. figure 3 and subclause 7.2).

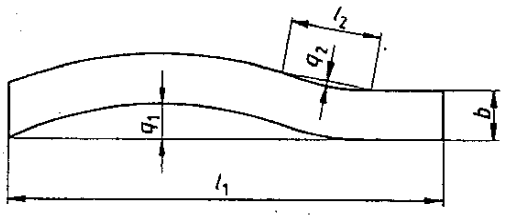

Figure 3

4 Materials

The steel used shall preferably be in compliance with DIN 17 221 or the subject of agreement.

The desired steel grade shall be given in the designation.

5 Mass

The values of mass specified in table 3 have been calculated, taking the density as 7,85 kg/dm^3, and the cross-sectional area, A, from the following equation:

$$A = 2r\left(r \cdot \arcsin\left(\frac{s}{2r}\right) - s\right) + s\left(b + 0{,}5 \cdot \sqrt{4r^2 - s^2}\right) \quad (2)$$

6 Form of supply and marking

6.1 Steel strip shall be supplied in the form of bars, their length and the tolerance on length being the subject of agreement.

6.2 Strip shall be supplied in batches, separated according to cast (cf. DIN 17 221). Marking of the bars (which shall indicate nominal size, steel grade and cast number) shall be in accordance with DIN 1599 and the subject of agreement.

7 Check of dimensional accuracy

7.1 The point at which the thickness is measured shall not fall in either edge zone (cf. subclause 3.1.5).

7.2 When checking straightness for compliance with subclause 3.2, dimension q_1 shall be measured along the entire length of the bar, l_1, whereas q_2 may be determined along any section of the bar, along a reference length, l_2, of 1000 mm.

Table 2: Tolerances on width and thickness

Nominal width, b	Tolerance on width	Tolerance on thickness, for a nominal thickness, s, of			Permissible difference in thickness [1]
		up to 12	over 12 up to 18	over 18	
From 35 up to 50	± 0,3	± 0,15	± 0,20	± 0,25	0,10
Over 50 up to 80	± 0,5	± 0,15	± 0,20	± 0,25	0,15
Over 80 up to100	± 0,6	± 0,20	± 0,25	± 0,30	0,20
Over 100 up to120	± 0,7	± 0,20	± 0,30	± 0,30	0,20
Over 120 up to140	± 1,0	± 0,25	± 0,30	± 0,30	0,20
For [1], see subclause 3.1.5.					

Table 3: Mass of hot rolled steel strip

Nominal thickness s [1]	Nominal width, b [1]															
	35	40	45	50	55	60	65	70	75	80	90	100	110	120	130	140
	Mass [2], in kg/m															
3	0,8	0,9	1,1	1,2												
3,5	1,0	1,1	1,2	1,4	1,5	1,6										
4	1,1	1,3	1,4	1,6	1,7	1,9	2,0	2,2								
4,5	1,2	1,4	1,6	1,8	1,9	2,1	2,3	2,5								
5	1,4	1,6	1,8	2,0	2,2	2,4	2,5	2,7	2,9	3,1	3,5					
5,5	1,5	1,7	1,9	2,2	2,4	2,6	2,8	3,0	3,2	3,4	3,9					
6	1,6	1,9	2,1	2,3	2,6	2,8	3,1	3,3	3,5	3,8	4,2	4,7	5,2	5,6	6,1	6,6
6,5	1,8	2,0	2,3	2,5	2,8	3,1	3,3	3,6	3,8	4,1	4,6	5,1	5,6	6,1	6,6	7,1
7		2,2	2,5	2,7	3,0	3,3	3,6	3,8	4,1	4,4	4,9	5,5	6,0	6,6	7,1	7,7
8		2,5	2,8	3,1	3,4	3,8	4,1	4,4	4,7	5,0	5,6	6,3	6,9	7,5	8,1	8,8
9		2,9	3,2	3,5	3,9	4,2	4,6	4,9	5,3	5,6	6,3	7,0	7,7	8,5	9,2	9,9
10		3,1	3,5	3,9	4,3	4,7	5,1	5,5	5,9	6,2	7,0	7,8	8,6	9,4	10,2	11,0
11						5,1	5,6	6,0	6,4	6,9	7,7	8,6	9,5	10,3	11,2	12,0
12						5,6	6,1	6,5	7,0	7,5	8,4	9,4	10,3	11,2	12,2	13,1
13						6,1	6,6	7,1	7,6	8,1	9,1	10,1	11,2	12,2	13,2	14,2
14						6,5	7,1	7,6	8,2	8,7	9,8	10,9	12,0	13,1	14,2	15,3
15						7,0	7,5	8,1	8,7	9,3	10,5	11,7	12,8	14,0	15,2	16,4
16						7,4	8,0	8,7	9,3	9,9	11,2	12,4	13,7	14,9	16,2	17,4
17						7,8	8,5	9,2	9,8	10,5	11,8	13,2	14,5	15,8	17,2	18,5
18						8,3	9,0	9,7	10,4	11,1	12,5	13,9	15,3	16,8	18,2	19,6
19						8,7	9,5	10,2	11,0	11,7	13,2	14,7	16,2	17,7	19,2	20,6
20						9,1	9,9	10,7	11,5	12,3	13,9	15,4	17,0	18,6	20,2	21,7
21						9,6	10,4	11,2	12,0	12,9	14,5	16,2	17,8	19,5	21,1	22,8
22								11,7	12,6	13,5	15,2	16,9	18,6	20,4	22,1	23,8
23								12,2	13,1	14,0	15,8	17,6	19,4	21,2	23,1	24,9
24								12,7	13,7	14,6	16,5	18,4	20,2	22,1	24,0	25,9

For [1], see subclause 3.1.1.
For [2], see clause 5.

Standards referred to

DIN 1599 Identification marking of steel

DIN 17 221 Hot rolled steel for the manufacture of hardenable springs; technical delivery conditions

Other relevant standards

DIN 59 145 Hot rolled steel strip with semi-circular edges for the manufacture of springs; dimensions, material and form of supply

DIN 59 146 Hot rolled steel strip of rectangular cross section, with rounded edges, for the manufacture of springs; dimensions, material and form of supply

Previous editions

DIN KrW 420 and 426: 02.31; DIN Kr 4151: 03.39; DIN 4620: 04.54.

Amendments

In comparison with the April 1954 edition, the following amendments have been made:

a) the range of nominal widths has been extended to include 130 mm, that of nominal thicknesses, to include from 20 to 24 mm;

b) the number of possible combinations for cross-sectional dimensions has been increased from 163 to 288;

c) some of the values specified for tolerance on thickness have been changed;

d) the static parameter specified is now the second moment of area (previously, the section modulus).

Explanatory notes

The major change made to the previous edition of this standard is the increase in number of standardized sizes of steel strip, which is particularly relevant for applications in the automotive industry. This standard now covers 288 sizes (as opposed to 163 in the previous edition) and, along with DIN 59 145, which covers 167 sizes (with semi-circular edges), and DIN 59 146, which covers 186 sizes (of rectangular cross section), a total of 641 standardized sizes are now available.

It should be noted that efforts at the European level to harmonize the requirements, types and number of available sizes of steel strip used in spring manufacturing have been unsuccessful. The responsible CEN committee discontinued its work in this regard several years ago, and has not yet resumed such work.

International Patent Classification

C 22 C 38/00
F 16 F 1/18
G 01 B 21/02