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Spring Steel
Round, Hot Rolled
Dimensions, Permissible Deviations on Dimension and Form

DIN 2077

Federstahl, rund, warmgewalzt; Masse, zulässige Mass- und Formabweichungen

Dimensions in mm

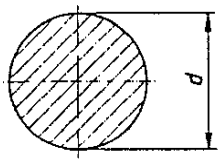
1 Scope

This Standard applies to hot rolled spring steel of the steel grades stated in Section 5, intended for the production of hot formed springs and supplied in the form of rods (with diameters from 7 to 80 mm) or wire (with diameters from 7 to 30 mm).

2 Other relevant standards

DIN 17 221 Hot rolled steels for quenched and tempered springs; quality specifications

3 Designation



3.1 Standard designation

3.1.1 The standard designation is to be stated in the following sequence:

The denomination (Round),

DIN number of this dimension standard,

Code number or material number for the steel grade,

Treatment condition of the steel,

Nominal diameter in mm.

3.1.2 Example of the standard designation

Designation of hot rolled round spring steel in steel 50 CrV4, annealed (G) (material number 1.8159.02) with a nominal diameter d = 20 mm:

Round DIN 2077 – 50 CrV 4 G – 20

or Round DIN 2077 – 1.8159.02 – 20

3.1.3 Instead of the denomination "Round", the abbreviation "Rd", according to DIN 1353 Part 2, may be used.

3.2 Designation in order

3.2.1 For the satisfactory handling of an order, the standard designation is to be supplemented by the following data:

a) Quantity or number of pieces ordered (statement before the standard designation)

b) Length (for rods),
Desired permissible length deviation (for rods of fixed length or exact length, see Table 2),
Coil weight in kg (for wire),
Supplementary data on the requirement class *) for the steel grade (see DIN 17 221).
(These data are given after the standard designation).

3.2.2 Examples of the designation in order

10 t spring steel in rods with the standard designation according to Section 3.1.2 in exact lengths of 5000 mm, permissible length deviation ± 10 mm; requirement class 1 *) according to DIN 17 221:

10 t Round DIN 2077 – 50 CrV 4 G – 20 x 5000 ± 10, requirement class 1

or

10 t Round DIN 2077 – 1.8159.02 – 20 x 5000 ± 10, requirement class 1.

5 t spring steel in coils (wire) with the standard designation according to Section 3.1.2, coil weight 500 kg, requirement class 3 a *) according to DIN 17 221:

5 t Round DIN 2077 – 50 CrV 4 G – 20 – coil 500 kg, requirement class 3 a

or

5 t Round DIN 2077 – 1.8159.02 – 20 – coil 500 kg, requirement class 3 a.

4 Dimensions and permissible deviations on dimension and form

4.1 Diameter

4.1.1 The diameters covered by this Standard as well as their permissible deviations are stated in Table 1.

4.1.2 The difference between the greatest and smallest diameter, measured in the same cross-sectional plane, may not exceed 80 % of the total span of the permissible diameter deviations according to Table 1 (e.g., not more than 0.4 mm with d = 25 mm).

Further requirements must be agreed when ordering.

*) At present still called "mode of delivery" in DIN 17 221, December 1972 issue.

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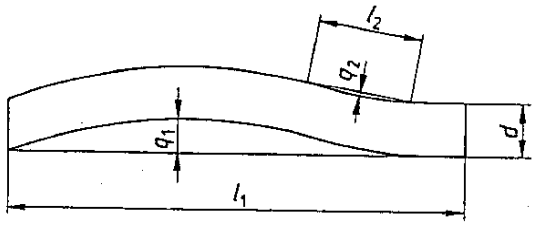
Table 1. **Diameters and permissible deviations**

Diameter d		Steps in diameters which can be ordered	Permissible deviations of d
≧	≦		
7	11,5	0,5	±0,15
12	21,5	0,5	±0,2
22	29,5	0,5	±0,25
30	39	1,0	±0,3
40	50	2,0	±0,4
52	60	2,0	±0,5
65 [1]	80	5,0	±0,01 · d [1]

[1] For the diameter 65 mm, the permissible variation is ± 0.5 mm

4.2 Straightness (with rods)



For the deviation from straightness of hot rolled, untreated rods (for testing, see Section 8.2.2), the following applies:

$q_1 \leqq 0.004 \cdot l_1$

$q_2 \leqq 0.004 \cdot l_2$

The application of this provision to heat-treated rods is to be specially agreed.

5 Material

Products according to this Standard will usually be produced from steels according to DIN 17 221 with the exception of grades 38 Si 7 and 51 Si 7. The desired steel grade and the treatment condition are to be stated in the designation (see Section 3).

6 Weight

When calculating the weight, the density is to be taken as 7.85 kg/dm^3.

7 Mode of delivery

7.1 Round spring steel according to this Standard can be supplied:

a) in straight rods (in all nominal diameters) with the types of length and permissible length deviations stated in Table 2,

b) as wire in coils (generally with diameters ≦ 30 mm). The coil weights as well as the dimensions (inside diameter, outside diameter) of the coils are to be agreed when ordering.

7.2 When rods are ordered by weight, the length may vary between the maximum and minimum dimensions stated in Table 2 for the manufacturing lengths.

7.3 Rods will be delivered combined in bundles.

7.4 For the delivery of wire, the coils are to be wound clockwise.

7.5 The bundles and coils must be securely bound several times and must be adequately marked.

Table 2. **Types of length and permissible length deviations (with rods)**

Type of length	Length		Ordering data for length
	Range [1]	Permissible deviation	
Manufacturing length [2]	2000 to 8000	See Section 7.2	None [2]
Fixed length	2000 to 10 000	± 100 [3]	Desired fixed length in mm
Exact length	2000 to 10 000	± 50, ± 25, ± 10 or ± 5 [3]	Desired exact length and permissible deviations in mm

[1] Enquiries should be made to the manufacturer as to whether shorter or greater lengths can be supplied.

[2] Round spring steel can also be supplied in limited manufacturing lengths with a length range to be stated when ordering. The span between the shortest and greatest length of this range must be at least 2000 mm (e.g. 6000 to 8000).

[3] When ordering the total spans for the permissible deviations may, by agreement, be arranged entirely on the plus side, e.g. $^{+200}_{0}$ mm (instead of ± 100 mm) in the case of fixed lengths or $^{+20}_{0}$ mm (instead of ± 10 mm) in the case of exact lengths.

8 Testing for accuracy to size

8.1 If an acceptance testing is agreed, the number of rods or coils which shall be tested for accuracy to size by measurements at the manufacturer's works, shall also be agreed when ordering.

8.2 Testing procedure

8.2.1 The diameter and the deviations from the nominal diameter can be measured at any desired point over the total length of the rod or coil.

8.2.2 When testing the straightness according to Section 4.2, the dimension q_1 shall be measured over the total length l_1 of the rod. The deviation q_2 on shorter measurement distances l_2 can be tested at any desired point of the rod, while the measurement distance l_2 must be at least 500 mm.

Further standards

Dimension standards for hot rolled round steel rods

DIN 488 Part 2	Reinforcing steel; reinforcing steel bar; dimensions
DIN 1013 Part 1	Steel bars; hot rolled round steel for general purposes; dimensions, permissible variations for dimension and form
DIN 1013 Part 2	Steel bars; hot rolled round steel for special purposes; dimensions, permissible variations for dimension and form
DIN 59 130	Steel bars; hot rolled round steel for bolts and rivets; dimensions, weights, permissible variations

Dimension standards for round rolled wire

DIN 59 110	Steel wire rod; dimensions, permissible variations, weights
DIN 59 115	Steel wire rod for bolts, nuts and rivets; dimensions, permissible variations, weights

Dimension standards for hot rolled spring steel

DIN 1570	Hot rolled, ribbed and grooved spring steel; dimensions, weights, permissible variations, static values
DIN 4620	Spring steel; hot rolled for the production of laminated springs
DIN 59 145	(at present circulating as draft) Spring steel; hot rolled, for leaf springs; dimensions, weights, permissible variations, static values

Explanations

The present successor issue of DIN 2077 replaces the April 1956 version, the contents of which have become technically obsolete. In agreement with the Ausschuss Federn (Committee on Springs) in the DIN, the Normenausschuss Eisen und Stahl (Standards Committee on Iron and Steel) took over the administrative control for this successor issue, the Ausschuss Federn being named as jointly responsible.

The significant amendments, as compared with the April 1956 issue of the DIN Standard are stated below.

1. The scope has been extended to diameters up to 80 mm (previously 50 mm) and the total number of nominal diameters which can be ordered has been increased to 71 (previously 31) (see Table 1). Up to a diameter of approximately 30 mm, spring steel according to this Standard can be supplied in the form of rods or wire (in coils), while with larger diameters only the supply of rods is feasible.

2. For nominal diameters up to 50 mm, the permissible deviations have been matched to the values in DIN 59 130 for bolt and rivet steels resp. in DIN 1013 for tolerance Class p (precision deviations), and for the range above 50 mm they have been matched to the value, which is to be incorporated in the ISO Standards in future as the best tolerance class for hot rolled round steel.

3. The ovality, i.e., the difference between the largest and smallest diameter within the same cross-sectional plane, has been limited to 80 % of the total permissible span for the diameter deviations in each case. The users had advocated a maximum value of 50 %, but according to the data from the manufacturers this cannot be generally maintained with hot rolled round steel. The Standard leaves the possibility open, for stricter requirements to be agreed when ordering (see Section 4.1.2).

4. The new issue has been amplified by the addition of specific provisions for permissible deviations on the ordered length (see Table 2) as well as for the permissible deviations on straightness (see Section 4.2).

5. The editorial structure of the Standard corresponds to that of the other new dimension standards for hot rolled steel bars.