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Round spring wire

Dimensions, masses, permissible deviations

DIN 2076

Runder Federdraht; Masse, Gewichte, zulässige Abweichungen

Supersedes March 1964x 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 Field of application

This standard applies to round spring wire made from the materials specified in clause 4. The technical delivery conditions relating to the individual materials give the wire diameters available within the specified diameter range from 0,07 up to and including 20 mm.

2 Designation

2.1 Standard designation

The standard designation shall give in the following order:

- the term (wire);
- the number of this DIN Standard;
- the material designation or material number (if necessary) of the steel grade and, if necessary, the symbol identifying the condition on delivery (see DIN 17 224 and DIN 17 682);
- the nominal diameter.

Example 1:

Standard designation of a grade C steel spring wire as specified in DIN 17 223 Part 1, of 2,5 mm nominal diameter:

Wire DIN 2076 – C 2,5

Example 2:

Standard designation of a wrought copper alloy spring wire as specified in DIN 17 682, identified by material designation CuZn36F70 and material number 2.0335.39, of 0,20 mm nominal diameter:

Wire DIN 2076 – CuZn36F70 – 0,20

or Wire DIN 2076 – 2.0335.39 – 0,20

Note. The term 'wire' may be replaced by the letter symbol 'Dr' as specified in DIN 1353 Part 2.

2.2 Designation to be used on ordering

In addition to the standard designation, the order designation shall specify the quantity to be supplied and, if necessary, the surface finish (see DIN 17 223 Part 1 and DIN 1653) and also any other particular details agreed upon.

Example 3:

The order designation for 1000 kg of grade C steel spring wire as specified in DIN 17 223 Part 1, of 2,5 mm nominal diameter, with bright dry drawn, phosphatized surface (tr bk phr as specified in DIN 1653) shall be as follows:

1000 kg wire DIN 2076 – C – 2,5 – bright dry drawn, phosphatized

or **1000 kg wire DIN 2076 – C – 2,5 – tr bk phr**

Example 4:

The order designation for 50 kg of wrought copper alloy spring wire as specified in DIN 17 682, identified by material designation CuZn36F70 and material number 2.0335,39, of 0,20 mm nominal diameter shall be as follows:

50 kg wire DIN 2076 – CuZn36F70 – 0,20

or **50 kg wire DIN 2076 – 2.0335.39 – 0,20**

Continued on pages 2 to 5

3 Dimensions, permissible dimensional deviations and ovality

3.1 The nominal diameters and permissible deviations specified for accuracy grades B and C are shown in table 1. The correlation of the permissible deviations specified for accuracy grades B and C to the spring wire grades is given in the relevant technical delivery conditions (see clause 4) and also in footnotes 1 and 2 of table 1.

3.2 The ovality, i.e. the difference between the maximum and minimum diameters of the wire at the same cross section shall not exceed 50 % of the permissible total deviations shown in table 1.

4 Material

Round spring wire complying with this standard shall preferably be made from the steels specified in
DIN 17 223 Part 1,
DIN 17 223 Part 2 and
DIN 17 224
and from the wrought copper alloys specified in DIN 17 682.

5 Mass

The masses specified in table 1 have been calculated from the cross sections of the materials on the basis of a density of

7,85 kg/dm^3 for the steels complying with DIN 17 223 Part 1 and Part 2;
7,90 kg/dm^3 for steels X12CrNi17 7 (1.4310) and X7CrNiAl17 7 (1.4568) complying with DIN 17 224;
7,95 kg/dm^3 for steel X5CrNiMo 1810 (1.4401) complying with DIN 17 224 (cf. footnote 5 of table 1);
8,3 kg/dm^3 for wrought copper alloy CuBe2 (2.1247);
8,4 kg/dm^3 for wrought copper alloy CuZn36 (2.0335);
8,8 kg/dm^3 for wrought copper alloys CuSn6 (2.1020), CuSn8 (2.1030) and CuCo2Be (2.1285);
8,7 kg/dm^3 for wrought copper alloy CuNi18Zn20 (2.0740).

The masses of other materials shall be calculated on the basis of their density.

6 Form in which supplied

Spring wires are normally supplied in coil or wound onto spools. The masses and dimensions of the coils or spools shall be agreed at the time of ordering and written in full.

7 Testing

The accuracy to size shall be tested using "Go" and "Not Go" gap gauges or micrometers.

8 Marking

Every coil and every spool shall be provided with a label on which at least the following information shall be shown:
- nominal diameter;
- material designation or material number;
- manufacturer's mark.

Table 1. **Dimensions and permissible deviations** (see clause 3)

Diameter *d*			Cross section [3]	Mass of wire made from [4]					
Nominal size	Permissible deviation for accuracy grade			steel as in DIN 17 223 Parts 1 and 2	steel as in DIN 17 224 [5]	CuBe 2	CuZn36	CuNi18Zn20	CuSn6, CuSn8, CuCo2Be
	B [1]	C [2]	mm²	kg/1000 m ≈	kg/1000 m ≈	kg/1000 m ≈	kg/1000 m ≈	kg/1000 m ≈	kg/1000 m ≈
0,07			0,003848	0,0302	0,0304	0,0319	0,0323	0,0335	0,0339
0,08			0,005027	0,0395	0,0396	0,0417	0,0422	0,0437	0,0442
0,09			0,006362	0,0499	0,0503	0,0528	0,0534	0,0534	0,0560
0,10			0,007854	0,0617	0,0620	0,0652	0,0660	0,0683	0,0691
0,11		± 0,004	0,009503	0,0746	0,0750	0,0789	0,0798	0,0827	0,0839
0,12			0,01131	0,0888	0,0893	0,0939	0,0950	0,0984	0,0995
0,14			0,01539	0,121	0,122	0,128	0,129	0,134	0,135
0,16			0,02011	0,158	0,159	0,167	0,169	0,175	0,177
0,18			0,02545	0,200	0,201	0,211	0,214	0,221	0,224
0,20			0,03142	0,247	0,248	0,261	0,264	0,273	0,276
0,22			0,03801	0,298	0,300	0,315	0,319	0,331	0,334
0,25			0,04909	0,385	0,388	0,407	0,412	0,427	0,432
0,28		± 0,008	0,06158	0,483	0,486	0,511	0,517	0,536	0,542
0,30			0,07069	0,555	0,558	0,557	0,594	0,615	0,622
0,32			0,08042	0,631	0,635	0,667	0,676	0,700	0,708
0,34			0,09079	0,713	0,717	0,754	0,763	0,790	0,799
0,36			0,1018	0,799	0,804	0,845	0,855	0,886	0,896
0,38	± 0,015		0,1134	0,890	0,896	0,941	0,953	0,987	0,998
0,40			0,1257	0,985	0,993	1,04	1,06	1,09	1,11
0,43			0,1452	1,14	1,15	1,21	1,22	1,26	1,28
0,45			0,1590	1,25	1,26	1,32	1,34	1,38	1,40
0,48			0,1810	1,42	1,43	1,50	1,52	1,57	1,59
0,50			0,1963	1,54	1,55	1,63	1,65	1,71	1,73
0,53		± 0,010	0,2206	1,73	1,74	1,83	1,85	1,92	1,94
0,56			0,2463	1,93	1,95	2,04	2,07	2,14	2,17
0,60			0,2827	2,22	2,23	2,35	2,37	2,46	2,49
0,63	± 0,020		0,3117	2,45	2,46	2,59	2,62	2,71	2,74
0,65			0,3318	2,60	2,62	2,75	2,79	2,89	2,92
0,70			0,3848	3,02	3,04	3,19	3,23	3,35	3,39
0,75			0,4416	3,47	3,49	3,66	3,71	3,84	3,89
0,80			0,5027	3,95	3,97	4,17	4,22	4,37	4,42
0,85			0,5657	4,46	4,47	4,70	4,75	4,92	4,98
0,90			0,6362	4,99	5,03	5,28	5,34	5,53	5,60
0,95			0,7088	5,56	5,60	5,88	5,95	6,17	6,24
1,00			0,7854	6,17	6,20	6,52	6,60	6,83	6,91
1,05	± 0,025	± 0,015	0,8659	6,80	6,84	7,19	7,27	7,53	7,62
1,10			0,9503	7,46	7,51	7,89	7,98	8,27	8,36
1,20			1,131	8,88	8,93	9,39	9,50	9,84	9,95
1,25			1,227	9,63	9,69	10,18	10,31	10,67	10,80
1,30			1,327	10,42	10,48	11,01	11,15	11,54	11,68
1,40			1,539	12,08	12,16	12,77	12,93	13,39	13,54
1,50			1,767	13,9	14,0	14,7	14,8	15,4	15,5
1,60			2,011	15,8	15,9	16,7	16,9	17,5	17,7
1,70			2,270	17,8	17,9	18,8	19,1	19,7	20,0
1,80			2,545	20,0	20,1	21,1	21,4	22,1	22,4
1,90			2,835	22,3	22,4	23,5	23,8	24,7	24,9
2,00			3,142	24,7	24,8	26,1	26,4	27,3	27,6
2,10	± 0,035	± 0,020	3,464	27,2	27,4	28,8	29,1	30,1	30,5
2,25			3,976	31,2	31,4	33,0	33,4	34,6	35,0
2,40			4,524	35,5	35,7	37,5	38,0	39,4	39,8
2,50			4,909	38,5	39,8	40,7	41,2	42,7	43,2
2,60			5,309	41,7	41,9	44,1	44,6	46,2	46,7
2,80			6,158	48,3	48,6	51,1	51,7	53,6	54,2
3,00			7,069	55,5	55,8	58,7	59,4	61,5	62,2
3,20			8,042	63,1	63,5	66,7	67,6	70,0	70,8

For [1] to [5], see page 4.

Table 1. (continued)

Diameter d			Cross section[3]	Mass of wire made from[4]					
Nominal size	Permissible deviation for accuracy grade			steel as in DIN 17 223 Parts 1 and 2	steel as in DIN 17 224[5]	CuBe 2	CuZn36	CuNi18Zn20	CuSn6, CuSn8, CuCo2Be
	B[1]	C[2]	mm²	kg/1000 m ≈	kg/1000 m ≈	kg/1000 m ≈	kg/1000 m ≈	kg/1000 m ≈	kg/1000 m ≈
3,40	± 0,045	± 0,025	9,079	71,3	71,7	75,4	76,3	79,0	79,9
3,60			10,18	79,9	80,4	84,5	85,5	88,6	89,6
3,80			11,34	89,0	89,6	94,1	95,3	98,7	99,8
4,00			12,57	98,6	99,3	104	106	109	111
4,25			14,19	111	112	118	119	123	125
4,50			15,90	125	126	132	134	138	140
4,75			17,72	139	140	147	149	154	156
5,00			19,63	154	155	163	165	171	173
5,30			22,06	173	174				
5,60			24,63	193	195				
6,00	± 0,060	± 0,035	28,27	222	223				
6,30			31,17	245	246				
6,50			33,18	260	262				
7,00			38,48	302	304				
7,50			44,18	347	349				
8,00			50,27	395	397				
8,50			56,57	445	447				
9,00	± 0,070	± 0,050	63,62	499	503				
9,50			70,88	556	560				
10,00			78,54	617	621				
10,50	± 0,090	± 0,070	86,59	680					
11,00			95,03	746					
12,00			113,1	888					
12,50			122,7	963					
13,00			132,7	1042					
14,00			153,9	1208					
15,00			176,7	1387					
16,00	± 0,12	± 0,080	201,1	1578					
17,00			226,9	1782					
18,00	± 0,15	± 0,100	254,3	1998					
19,00			283,4	2225					
20,00			314,0	2466					

[1] Accuracy grade B now includes the previous accuracy grade A. Accuracy grade B applies for wire grades A and B specified in DIN 17 223 Part 1 and for spring wire specified in DIN 17 223 Part 2.

[2] Applies for wire grades C and D specified in DIN 17 223 Part 1, wire for valve springs specified in DIN 17 223 Part 2 and for all materials specified in DIN 17 224 and DIN 17 682.

[3] Cross section $S \approx 0{,}785 \cdot d^2$.

[4] See clause 5 for calculation of mass.

[5] The values given shall apply for steels X12CrNi17 7 (1.4310) and X7CrNiAl17 7 (1.4568); they shall be multiplied by factor 1,0063 for steel X5CrNiMo18 10 (1.4401).

Standards referred to

DIN 1353 Part 2	Abbreviations of terms for semi-finished products
DIN 1653	Surface condition of commercial steel wires; terms and abbreviations
DIN 17 223 Part 1	Round steel wire for springs; patented drawn unalloyed steel wire for springs; technical delivery conditions
DIN 17 223 Part 2	Round steel wire for springs, quality specifications; quenched and tempered unalloyed steel wire for springs and valve springs
DIN 17 224	Stainless steel wire and strip for springs; technical delivery conditions
DIN 17 682	Round wrought copper alloy wire for springs; strength properties, technical delivery conditions

Previous editions

DIN 2076: 02.44, 03.64x

Amendments

The following amendments have been made in comparison with the March 1964x edition:

a) The upper limit of the nominal diameter range has been increased from 17 mm to 20 mm.

b) Details relating to ovality have been included.

c) The 'Designation to be used on ordering' subclause has been included.

d) The 'Material' clause has been extended to include the stainless steels specified in DIN 17 224.

e) In addition to the coils, spools have been included in the 'Form in which supplied' clause.

f) The 'Marking' clause has been included as featured in other standards.

g) Translator's note: This text is only of relevance to the German original and has thus been omitted from this translation.

h) The permissible deviations in diameter have been reduced, the previous accuracy grades A and B having been combined to form the new accuracy grade B.

i) The masses of the steels specified in DIN 17 224 and the wrought copper alloys specified in DIN 17 682 have been included.

j) The following table compares examples for the standard designation given in the March 1964 edition with those in the revised edition of DIN 2076:

Previous designation	New designation
Wire 2,5 A DIN 2076 – A	Wire DIN 2076 – A – 2,5
Wire 2,5 A DIN 2076 – 1.0500	Wire DIN 2076 – A – 2,5
Wire 2,5 C DIN 2076 – C	Wire DIN 2076 – C – 2,5
Wire 2,5 C DIN 2076 – 1.1200	Wire DIN 2076 – C – 2,5
Wire 0,20 C DIN 2076 – CuBe2 F125	Wire DIN 2076 – CuBe2F125 – 0,20
Wire 0,20 C DIN 2076 – 2.1247.75	Wire DIN 2076 – 2.1247.75 – 0,20