

# INTERNATIONAL STANDARD

**ISO**  
**8458-2**

First edition  
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## **Steel wire for mechanical springs —**

### **Part 2: Cold-drawn carbon steel wire**

*Fils en acier pour ressorts mécaniques —  
Partie 2: Fils en acier au carbone étirés à froid*



Reference number  
ISO 8458-2 : 1989 (E)

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 8458-2 was prepared by Technical Committee ISO/TC 17, *Steel*.

ISO 8458 consists of the following parts, under the general title *Steel wire for mechanical springs*:

- *Part 1: General requirements*
- *Part 2: Cold-drawn carbon steel wire*
- *Part 3: Oil-hardened and tempered wire*

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# Steel wire for mechanical springs —

## Part 2:

### Cold-drawn carbon steel wire

#### 1 Scope

1.1 This part of ISO 8458 specifies requirements for cold-drawn carbon steel wire for the manufacture of mechanical springs for static duty and dynamic duty applications, complying with the general requirements of ISO 8458-1.

1.2 The wire diameter ranges and tensile strength grades normally available for the two types are as follows:

1.3 Class A tolerances on diameter apply to types SH, DM and DH while Class B tolerances apply to types SL and SM (refer to ISO 8458-1).

#### 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 8458. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 8458 are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 8457-2 : —<sup>1)</sup>, *Steel wire rod — Part 2: Quality requirements for unalloyed steel wire rods for conversion to wire.*

ISO 8458-1 : 1989, *Steel wire for mechanical springs — Part 1: General requirements.*

Table 1 — Tensile strength grades

Tensile strength grade		Wire diameter, mm			
Type designation	Name	Static duty		Dynamic duty	
		min.	max.	min.	max.
SL	Low strength	0,50	13,00	—	—
SM	Medium strength	0,08	20,00	—	—
SH	High strength	0,08	20,00	—	—
DM	Medium strength	—	—	0,08	20,00
DH	High strength	—	—	0,08	20,00

1) To be published.

### 3 Cast of the wire

The wire shall be uniformly cast. When a ring of wire is cut from the package and allowed to fall on a flat surface, the wire shall lie flat and not show a spiral cast.

By agreement, for sizes up to 5 mm, the cast requirements may be considered as being fulfilled if the following statement is satisfied:

An individual ring taken from the coil or bobbin and freely hung on a hook may show an axial displacement  $f$  at the ends of the ring (see the figure). This displacement  $f$  shall not exceed a value given by the following inequality:

$$f < \frac{0,2D}{\sqrt[4]{d}}$$

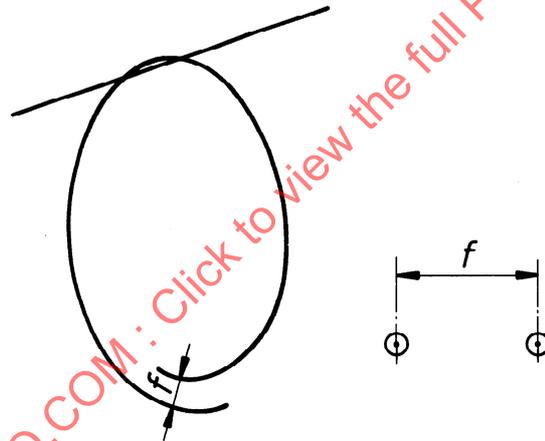


Figure — Cast of wire

where

$D$  is the mean diameter of the individual ring measured when lying horizontal;

$d$  is the nominal diameter of the wire.

### 4 Surface finish

The surface finish of the wire shall be either bright drawn (dry) phosphate treated, bright drawn (wet) grey or polished as agreed between the purchaser and the supplier.

### 5 Chemical composition

5.1 The chemical composition of the steel, as given by the cast analysis, shall be in accordance with table 2.

Chemical compositions by product analysis shall be in accordance with those prescribed in ISO 8457-2.

Table 2 — Chemical composition (cast analysis), % (m/m)

Type	Chemical composition <sup>1)</sup>				
	C	Si	Mn	P max.	S max.
SL, SM	0,40 to 0,85	0,10 to 0,35	0,30 to 1,50	0,040	0,040
SH	0,50 to 1,00	0,10 to 0,35	0,30 to 1,50	0,040	0,040
DM, DH	0,50 to 1,00	0,10 to 0,35	0,30 to 1,50	0,030	0,030

1) Maximum copper content is negotiable.

5.2 Product analysis shall be in accordance with table 3.

**Table 3 — Chemical composition  
(product analysis), % (m/m)**

Type	Chemical composition				
	C	Si	Mn	P max.	S max.
SL, SM	0,36 to 0,89	0,07 to 0,38	0,24 to 1,56	0,048	0,048
SH	0,46 to 1,04	0,07 to 0,38	0,24 to 1,56	0,048	0,048
DM, DH	0,46 to 1,04	0,07 to 0,38	0,24 to 1,56	0,038	0,038

## 6 Tensile strength

The tensile strength of the wire shall be in accordance with table 4 for the appropriate tensile strength grade, nominal wire diameter and type of spring use.

**Table 4 — Tensile strength requirements**

Nominal diameter <sup>2)</sup> mm	Tensile strength, N/mm <sup>2</sup> <sup>1)</sup>					
	Type SL		Types SM, DM		Types SH, DH <sup>3)</sup>	
	min.	max.	min.	max.	min.	max.
0,08	—	—	2 780	3 100	2 800	3 480
0,09	—	—	2 740	3 060	2 800	3 430
0,10	—	—	2 710	3 020	2 800	3 380
0,11	—	—	2 690	3 000	2 800	3 350
0,12	—	—	2 660	2 960	2 800	3 320
0,14	—	—	2 620	2 910	2 800	3 250
0,16	—	—	2 570	2 860	2 800	3 200
0,18	—	—	2 530	2 820	2 800	3 160
0,20	—	—	2 500	2 790	2 800	3 110
0,22	—	—	2 470	2 760	2 770	3 080
0,25	—	—	2 420	2 710	2 720	3 010
0,28	—	—	2 390	2 670	2 680	2 970
0,30	—	—	2 370	2 650	2 660	2 940
0,32	—	—	2 350	2 630	2 640	2 920
0,34	—	—	2 330	2 600	2 610	2 890
0,36	—	—	2 310	2 580	2 590	2 870
0,38	—	—	2 290	2 560	2 570	2 850
0,40	—	—	2 270	2 550	2 560	2 830
0,43	—	—	2 250	2 520	2 530	2 800
0,45	—	—	2 240	2 500	2 510	2 780
0,48	—	—	2 220	2 480	2 490	2 760
0,50	1 910	2 190	2 200	2 470	2 480	2 740
0,53	1 890	2 170	2 180	2 450	2 460	2 720
0,56	1 880	2 160	2 170	2 430	2 440	2 700
0,60	1 850	2 130	2 140	2 400	2 410	2 670
0,63	1 840	2 120	2 130	2 380	2 390	2 650
0,65	1 830	2 110	2 120	2 370	2 380	2 640
0,70	1 800	2 080	2 090	2 350	2 360	2 610
0,80	1 770	2 040	2 050	2 300	2 310	2 560
0,85	1 760	2 020	2 030	2 280	2 290	2 530
0,90	1 740	2 000	2 010	2 260	2 270	2 510
0,95	1 730	1 990	2 000	2 240	2 250	2 490
1,00	1 720	1 970	1 980	2 220	2 230	2 470
1,05	1 710	1 950	1 960	2 200	2 210	2 450
1,10	1 690	1 940	1 950	2 190	2 200	2 430
1,20	1 670	1 910	1 920	2 160	2 170	2 400
1,25	1 660	1 900	1 910	2 140	2 150	2 380
1,30	1 640	1 890	1 900	2 130	2 140	2 370
1,40	1 620	1 860	1 870	2 100	2 110	2 340
1,50	1 600	1 840	1 850	2 080	2 090	2 310
1,60	1 590	1 820	1 830	2 050	2 060	2 290
1,70	1 570	1 800	1 810	2 030	2 040	2 260
1,80	1 550	1 780	1 790	2 010	2 020	2 240
1,90	1 540	1 760	1 770	1 990	2 000	2 220

Table 4 — Tensile strength requirements (concluded)

Nominal diameter <sup>2)</sup> mm	Tensile strength, N/mm <sup>2</sup> <sup>1)</sup>					
	Type SL		Types SM, DM		Types SH, DH <sup>3)</sup>	
	min.	max.	min.	max.	min.	max.
2,00	1 520	1 750	1 760	1 970	1 980	2 200
2,10	1 510	1 730	1 740	1 960	1 970	2 180
2,25	1 490	1 710	1 720	1 930	1 940	2 150
2,40	1 470	1 690	1 700	1 910	1 920	2 130
2,50	1 460	1 680	1 690	1 890	1 900	2 110
2,60	1 450	1 660	1 670	1 880	1 890	2 100
2,80	1 420	1 640	1 650	1 850	1 860	2 070
3,00	1 410	1 620	1 630	1 830	1 840	2 040
3,20	1 390	1 600	1 610	1 810	1 820	2 020
3,40	1 370	1 580	1 590	1 780	1 790	1 990
3,60	1 350	1 560	1 570	1 760	1 770	1 970
3,80	1 340	1 540	1 550	1 740	1 750	1 950
4,00	1 320	1 520	1 530	1 730	1 740	1 930
4,25	1 310	1 500	1 510	1 700	1 710	1 900
4,50	1 290	1 490	1 500	1 680	1 690	1 880
4,75	1 270	1 470	1 480	1 670	1 680	1 840
5,00	1 260	1 450	1 460	1 650	1 660	1 830
5,30	1 240	1 430	1 440	1 630	1 640	1 820
5,60	1 230	1 420	1 430	1 610	1 620	1 800
6,00	1 210	1 390	1 400	1 580	1 590	1 770
6,30	1 190	1 380	1 390	1 560	1 570	1 750
6,50	1 180	1 370	1 380	1 550	1 560	1 740
7,00	1 160	1 340	1 350	1 530	1 540	1 710
7,50	1 140	1 320	1 330	1 500	1 510	1 680
8,00	1 120	1 300	1 310	1 480	1 490	1 660
8,50	1 110	1 280	1 290	1 460	1 470	1 630
9,00	1 090	1 260	1 270	1 440	1 450	1 610
9,50	1 070	1 250	1 260	1 420	1 430	1 590
10,00	1 060	1 230	1 240	1 400	1 410	1 570
10,50	1 050	1 210	1 220	1 380	1 390	1 550
11,00	1 040	1 200	1 210	1 370	1 380	1 530
12,00	1 020	1 170	1 180	1 340	1 350	1 500
12,50	1 010	1 160	1 170	1 320	1 330	1 480
13,00	1 000	1 150	1 160	1 310	1 320	1 470
14,00	—	—	1 130	1 280	1 290	1 440
15,00	—	—	1 110	1 260	1 270	1 410
16,00	—	—	1 090	1 230	1 240	1 390
17,00	—	—	1 070	1 210	1 220	1 360
18,00	—	—	1 050	1 190	1 200	1 340
19,00	—	—	1 030	1 170	1 180	1 320
20,00	—	—	1 020	1 150	1 160	1 300

1) 1 N/mm<sup>2</sup> ≡ 1 MPa  
 2) For interim values of the wire diameter the specifications given for the next larger diameter are applicable.  
 3) For SH and DH grades in the size range 0,08 mm to 0,18 mm, a restricted tensile strength range of 300 N/mm<sup>2</sup> within the specified range may be negotiated.

7 Torsion test

7.1 The torsion test shall be applied to wires with nominal diameter from 0,70 mm to 6,00 mm, and subject to negotiation for wires with nominal diameters over 6,00 mm and up to and including 10,00 mm.

7.2 The wire shall withstand being twisted without failure, the number of turns given in table 5, on a gauge length equivalent to 100 wire diameters. If the gauge length is greater or less than 100 wire diameters, the number of twists shall be adjusted in proportion to the gauge length. The gauge length shall be in accordance with table 6.

Table 5 — Torsion test requirements

Nominal diameter mm		Minimum number of twists in gauge length equivalent to 100 wire diameters
Over	Up to and including	
0,69	2,00	20
2,00	3,50	15
3,50	6,00	10
6,00	8,00	7 <sup>1)</sup>
8,00	10,00	5 <sup>1)</sup>

1) For guidance only.