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Steel wire for mechanical springs —

Part 1: General requirements

*Fils en acier pour ressorts mécaniques —
Partie 1: Caractéristiques générales*



Reference number
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Foreword

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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 8458-1 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 1: General requirements

1 Scope

1.1 This part of ISO 8458 specifies general requirements for uncoated steel spring wire of round cross-section, suitable for the manufacture of mechanical springs, supplied in coiled form.

1.2 This part of ISO 8458 is not applicable to uncoated steel spring wire intended for use in upholstery springs or automotive valve springs.

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 377 : 1985, *Wrought steel — Selection and preparation of samples and test pieces.*

ISO 404 : 1981, *Steel and steel products — General technical delivery requirements.*

ISO 3887 : 1976, *Steel, non-alloy and low-alloy — Determination of depth of decarborization.*

ISO 6892 : 1984, *Metallic materials — Tensile testing.*

ISO 7438 : 1985, *Metallic materials — Bend test.*

ISO 7800 : 1984, *Metallic materials — Wire — Simple torsion test.*

ISO 7802 : 1983, *Metallic materials — Wire — Wrapping test.*

3 Definitions

For the purposes of this part of ISO 8458, the following definitions apply.

3.1 cast; helix; pitch: The way in which a single ring of wire behaves when cut from the coil.

NOTES

1 Well-cast wire will lie flat on itself in uniform circles. Spiral cast denotes the tendency of the rings to spring out from the coil in spirals. Straight cast wire runs out approximately straight when unwound from the coil.

2 The terms spool, spool-less core and cheese are synonymous with coil.

3.2 cold-drawn wire: Carbon steel wire drawn with a relatively high reduction of cross-sectional area from a heat-treated (patented or similar process) base.

3.3 oil-hardened and tempered wire: High-carbon and low-alloy steel wire produced by heating above the transformation range, quenching in oil and reheating or tempering to relieve the quench hardness.

3.4 static duty: Applications where springs are subjected to static stresses or infrequent dynamic loading, or a combination of both.

NOTE — This does not apply to situations of low frequency/high stress.

3.5 dynamic duty: Qualifies applications where springs are subjected to frequent dynamic loading.

3.6 ring: One turn of wire from a coil, that is, one complete circle of wire.

NOTE — A ring wire does not imply any specific length of wire or diameter of wire.

3.7 patenting: A heat treatment by which wire rods or wire is cooled from a temperature above the austenitizing temperature at a rapid rate to a temperature above the martensitic formation temperature. The purpose of the rapid cooling is to produce a pearlitic structure particularly suited to high percentage reduction in area during subsequent cold working.

NOTE — The appropriate structure may be obtained through heat treatment of the rods or as a direct result of controlled cooling conditions subsequent to hot rolling.

4 Ordering

The purchaser shall state in his enquiry and order

- a) the number of this part of ISO 8458;
- b) the wire type;
- c) the nominal diameter of the wire and diameter tolerance class;
- d) the coil size required;
- e) the surface finish required;
- f) the quantity required and delivery instructions;
- g) type of acceptance document (see 7.10).

NOTE — Any special or supplementary requirements of this part of ISO 8458 should be subject to agreement between the purchaser and the supplier at the time of enquiry and/or order.

5 Condition of finished wire

The wire shall be free from internal or surface defects likely to have an adverse effect on its subsequent processing and end use.

6 Dimensional tolerances

The tolerances on wire diameters and maximum ovality shall be in accordance with table 1.

7 Inspection and testing

7.1 General

When agreed at the time of inquiry or order, one of the documents according to ISO 404 may be submitted. Where specific inspection and testing are required, the requirements of 7.2 to 7.10 apply.

7.2 Selection and preparation of samples and test pieces

The general conditions given in ISO 377 for the selection and preparation of samples and test pieces shall apply.

Samples for all required tests shall be taken from the end of the coil, as appropriate.

7.3 Chemical analysis

In cases of dispute, chemical analysis shall be carried out in accordance with appropriate International Standards.

If no International Standards are available, the methods shall be agreed upon at the time of enquiry and order.

7.4 Tensile test

The tensile test shall be carried out in accordance with ISO 6892. The tensile strength shall be calculated using the actual wire diameter.

7.5 Reduction in area

The reduction in area test shall be carried out in accordance with ISO 6892.

7.6 Wrapping test

The wrapping test shall be carried out in accordance with ISO 7802.

Table 1 — Diameter tolerances and permissible ovality

Nominal diameter mm		Class A tolerances		Class B tolerances	
Over	Up to and including	Diameter tolerance ± mm	Maximum ovality ¹⁾ mm	Diameter tolerance ± mm	Maximum ovality ¹⁾ mm
0,07	0,18	0,004	0,004	0,008	0,008
0,18	0,35	0,008	0,008	0,015	0,015
0,35	0,80	0,010	0,010	0,020	0,020
0,80	1,40	0,015	0,015	0,025	0,025
1,40	3,15	0,020	0,020	0,035	0,035
3,15	5,60	0,030	0,030	0,045	0,045
5,60	8,50	0,040	0,040	0,060	0,060
8,50	10,00	0,050	0,050	0,070	0,070
10,00	15,00	0,060	0,060	0,090	0,090
15,00	17,50	0,080	0,080	0,120	0,120
17,50	20,00	0,100	0,100	0,150	0,150

1) Difference between the maximum and minimum diameters of the same cross-section.

7.7 Torsion test

The torsion test shall be carried out in accordance with ISO 7800.

7.8 Bend test

The bend test shall be the single bend test carried out in accordance with figure 1 of ISO 7438.

7.9 Diameter measurement

The maximum and minimum diameters shall be measured by micrometer readings at the same section on a straight piece of wire.

7.10 Surface quality test methods**7.10.1 Deep-etch test for detection of surface defects**

The deep-etch test shall be applied to wires of 1,0 mm nominal diameter and over. Test pieces from cold-drawn wire shall be given a stress-relieving treatment prior to the deep-etching test. The cold test pieces shall be immersed in a solution of 50 % (V/V) of concentrated hydrochloric acid and 50 % (V/V) of water at a temperature of 75 °C minimum. The etching shall be finalized after a reduction in diameter of about 1 %.

In cases of dispute, metallographic examination shall be used (see 7.10.3).

7.10.2 Metallographic examination for measurement of decarburization

Cross-sections of test pieces from coil shall be tested for decarburization in accordance with clause 4.1 of ISO 3887. The cross-section shall be examined at a magnification of at least X 100. Decarburization is specified only for wires greater than 0,75 mm in diameter.

7.10.3 Metallographic examination for measurement of surface defects

Cross-sections of test pieces from coil shall be tested for the presence of surface defects by metallographic examination, and the method to be used shall be subject to agreement between the purchaser and the supplier.

7.11 Retests

For retests, ISO 404 shall apply.

7.12 Certification of tests

ISO 404 is valid, acceptance documents being

- a) statement of compliance with the order, or
- b) inspection certificate, or
- c) inspection report, or
- d) test report.

8 Marking

8.1 The general conditions for identification and marking contained in ISO 404 shall apply.

8.2 Unless otherwise stated in the order, the following information shall be shown on a tag securely attached to each coil:

- a) the manufacturer's name or identifying brand;
- b) the number of this part of ISO 8458;
- c) the wire type;
- d) the nominal diameter.

9 Complaints

The condition for dealing with complaints laid down in ISO 404 shall apply.

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