INTERNATIONAL STANDARD

ISO 23717

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Steel wire and wire products — Hose reinforcement wire

Fils et produits tréfilés en acier — Fil d'armature pour flexibles

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 23717 was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 17, *Steel wire rod and wire products*.

Steel wire and wire products — Hose reinforcement wire

1 Scope

This International Standard specifies the composition, dimensions and mechanical properties of steel wire with a high mass fraction of carbon, generally brass coated, for reinforcing high-pressure hoses. It is applicable to multiple parallel wires, braided or spirally wrapped for reinforcement in a rubber or synthetic hose which is made to withstand a relatively high bursting pressure.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 404:1992, *Steel and steel products — General technical delivery requirements*

ISO 6892:1998, *Metallic materials — Tensile testing at ambient temperature*

ISO 7800:2003, *Metallic materials — Wire — Simple torsion test*

ISO 7801:1984, *Metallic materials — Wire — Reverse bend test*

ISO/TR 9769:1991, *Steel and Iron — Review of available methods of analysis*

ISO 10474:1991, *Steel and steel products — Inspection documents*

ISO 16120-1:2001, *Non-alloy steel wire rod for conversion to wire — Part 1: General requirements*

ISO 16120-2:2001, *Non-alloy steel wire rod for conversion to wire — Part 2: Specific requirements for general purpose wire rod*

ISO 16120-4:2001, *Non-alloy steel wire rod for conversion to wire — Part 4: Specific requirements for wire rod for special applications*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
nominal diameter
d
value of the diameter by which the wire is designated and specified by the purchaser

NOTE 1 The nominal diameter is expressed in millimetres.

NOTE 2 This is the basis on which the values of all relevant characteristics are determined for the acceptance of the wire.

3.2
actual diameter
arithmetic mean of two measurements of the diameter at right angles determined at any cross-section

3.3
out of roundness
arithmetic difference between the maximum and minimum diameter measured in a transverse cross-section perpendicular to the wire axis

4 Classification

Hose wire is classified according to tensile strength. It is supplied in three classes of tensile strength:

— NT: Normal tensile strength;

— HT: High tensile strength;

— ST: Super tensile strength.

5 Designation and ordering

5.1 Designation

For hose wire supplies in accordance with this International Standard, the designation shall state, in the following order:

— the term: hose wire;

— the coating: see 6.1.4;

— the number of this International Standard;

— the tensile strength class (see Clause 4) and the nominal tensile strength;

— the nominal diameter.

EXAMPLE Brass coated hose wire, 0,30 mm, high tensile strength HT2 in accordance with ISO 23717 shall be designated:

Hose wire brass coated ISO 23717-HT2-0,30.

5.2 Information to be supplied by the purchaser and items to be agreed upon

The purchaser shall clearly state the following information concerning the product in his enquiry or order:

— the required nominal diameter;

— the desired quantity;

— the coating material;

— the type of inspection document.

EXAMPLE 20 t hose wire brass coated ISO 23717-HT2-0,30 on spools of 30 kg doc ISO 10474 - “3.1.B.”

6 Requirements

6.1 Material

6.1.1 Steel

The wire shall be manufactured from steel rod conforming to ISO 16120-1 and ISO 16120-2 for tensile strength NT, and conforming to ISO 16120-4 for tensile strengths HT and ST.

6.1.2 Chemical composition

The chemical composition according to the heat analysis shall conform to the limit values given in Table 1. The permissible deviation of the product analysis from the heat analysis shall be in accordance with ISO 16120-2 and ISO 16120-4.

Table 1 — Chemical composition, % (mass fraction)

Type	C	Si	Mn	P max.	S max.
NT	0,60 to 0,80	0,15 to 0,30	0,40 to 0,70	0,035	0,035
HT and ST	0,75 to 0,90	0,15 to 0,30	0,40 to 0,60	0,020	0,025

Unless otherwise agreed at the time of enquiry and order, the choice of a suitable physical or chemical method of analysis for the determination of the product analysis shall be at the discretion of the supplier.

In cases of dispute, the analysis shall be carried out by a laboratory approved by the two parties. The method of analysis to be applied shall be agreed upon, if possible, in accordance with ISO/TR 9769.

6.1.3 Wire

The wire shall be patented and cold drawn in order to provide the required mechanical properties.

6.1.4 Coating material

If not otherwise stipulated by the purchaser at the time of enquiry or order (see 5.2), the coating material shall be brass with a chemical composition of Cu: (60 to 77) %.

The maximum range of mass fraction of copper shall be 5,0 %. A tighter range may be agreed upon.

In the case of other coatings, the specification shall be agreed between the purchaser and supplier at the time of enquiry or order.

6.2 Mechanical properties

6.2.1 Tensile strength and elongation

When tested in accordance with 7.3.1 before and after the braiding operation, the wire shall conform to the tensile strength values and have an elongation at rupture as specified in Table 2.

6.2.2 Reverse bend test

When tested in accordance with 7.3.2, the wire shall withstand the minimum number of reverse bends (N_b), as specified in Table 2 without rupture.

6.2.3 Torsion test

When tested in accordance with 7.3.2, the wire shall withstand the minimum number of torsions (N_t), as specified in Table 2 without fracture.

Table 2 — Mechanical properties

Diameter, d [a] mm	**Tensile strength** MPa[b]			**Elongation at rupture** [c, d] A_t, %, min.	**Reverse bends** (N_b) **on** r **2,5 mm** [c, d] min.	**Torsion** (N_t) (l = 200d) [e] min.
	NT1	**NT2**				
0,25	2 100 to 2 450	2 450 to 2 750		1,6	125	41
0,28	2 100 to 2 450	2 450 to 2 750		1,6	110	40
0,30	2 100 to 2 450	2 450 to 2 750		1,6	95	39
0,34	2 100 to 2 450	2 450 to 2 750		1,6	80	36
0,38	2 100 to 2 450	2 450 to 2 750		1,6	65	35
0,40	2 100 to 2 450	2 450 to 2 750		1,6	60	34
0,45	1 800 to 2 450	2 450 to 2 750		1,8	50	32
0,50	1 800 to 2 450	2 450 to 2 750		1,9	35	31
0,56	1 800 to 2 450	2 450 to 2 750		2,0	30	29
0,60	1 800 to 2 450	2 450 to 2 750		2,0	28	28
0,65	1 600 to 2 450	2 450 to 2 750		2,2	27	27
0,71	1 600 to 2 450	2 450 to 2 750		2,2	25	25
0,80	1 600 to 2 150	2 150 to 2 450		2,2	22	24
1,00	1 600 to 2 150	—		2,2	14	23
1,20	1 600 to 2 150	—		2,2	14	22
1,40	1 600 to 2 150	—		2,2	14	21
1,60	1 600 to 2 150	—		2,2	13	20
1,80	1 600 to 2 150	—		2,2	12	19
2,00	1 600 to 2 150	—		2,2	11	18
2,20	1 600 to 2 150	—		2,2	10	17
2,40	1 600 to 2 150	—		2,2	10	16
	HT1	**HT2**	**HT3**			
0,20	2 500 to 2 750	2 750 to 3 050	3 050 to 3 300	1,3	160	41
0,25	2 500 to 2 750	2 750 to 3 050	3 050 to 3 300	1,6	120	40
0,28	2 500 to 2 750	2 750 to 3 050	3 050 to 3 300	1,6	100	39
0,30	2 500 to 2 750	2 750 to 3 050	3 050 to 3 300	1,6	85	38
0,34	2 500 to 2 750	2 750 to 3 050	3 050 to 3 300	1,6	70	35
0,35	2 500 to 2 750	2 750 to 3 050	3 050 to 3 300	1,6	70	32
0,38	2 500 to 2 750	2 750 to 3 050	3 050 to 3 300	1,6	60	32
0,40	2 500 to 2 750	2 750 to 3 050	3 050 to 3 300	1,6	50	30
0,45	2 200 to 2 750	2 750 to 3 050	—	1,8	40	27
0,50	2 200 to 2 750	2 750 to 3 050	—	1,9	25	25

Table 2 (*continued*)

Diameter, d [a] mm	Tensile strength MPa[b]			Elongation at rupture [c, d] A_t, %, min.	Reverse bends (N_b) on r 2,5 mm [c, d] min.	Torsion (N_t) (l = 200d) [e] min.
	HT1	HT2	HT3			
0,56	2 200 to 2 750	2 750 to 3 050	—	2,0	25	24
0,60	2 200 to 2 750	2 750 to 3 050	—	2,0	20	23
0,70	2 200 to 2 750	2 750 to 3 050		2,0	15	20
0,80	2 200 to 2 750	2 750 to 3 050		2,0	15	20
	ST2					
0,20	3 050 to 3 350			1,3	110	33
0,25	3 050 to 3 350			1,6	80	32
0,30	3 050 to 3 350			1,6	60	32
0,38	3 050 to 3 350			1,6	40	26

NOTE For intermediate diameters, the values of elongation at rupture, reverse bends and torsion shall be agreed upon at the time of enquiry and order.

[a] The tensile strength range shall be agreed within 300 N/mm^2 between the interested parties.

[b] 1MPa = 1N/mm^2;

[c] The values of elongation at rupture and reverse bend given in this table is specified for NT2, HT2 and ST2. These requirements are mandatory but the verifications are optional.

[d] For NT1, HT1 and HT3, no requirements for elongation and reverse bends will be specified in this table, but they may be agreed together with their verification.

[e] For NT1, HT1 and HT3, no requirements for torsion will be specified in this table, but they may be agreed together with their verification.

6.3 Surface quality

6.3.1 General

The surface of the wire shall be smooth and free from grease and other contaminants. The surface of the wire shall provide good adhesion between the wire surface and the rubber.

6.3.2 Coating mass

The mass of coating on the wire shall be in accordance with the values listed in Table 3.

Table 3 — Coating mass

Diameter, d mm	Coating mass g/kg
d [a] $\leqslant$ 0,34	5 ± 2
0,34 < d	4 ± 2

[a] For those diameters, a coating mass of 5 ± 3 g/kg can be applied following an agreement between the parties concerned.