
Non-alloy steel wire rod for conversion to wire —

Part 3:
Specific requirements for rimmed and rimmed substitute, low-carbon steel wire rod

Fil-machine en acier non allié destiné à la fabrication de fils —

Partie 3: Exigences spécifiques au fil-machine en acier effervescent ou pseudo-effervescent à bas carbone

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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 16120-3 was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 17, *Steel wire rod and wire products*.

This second edition cancels and replaces the first edition (ISO 16120-3:2001), which has been technically revised.

ISO 16120 consists of the following parts, under the general title *Non-alloy steel wire rod for conversion to wire*:

- *Part 1: General requirements*
- *Part 2: Specific requirements for general-purpose wire rod*
- *Part 3: Specific requirements for rimmed and rimmed substitute, low-carbon steel wire rod*
- *Part 4: Specific requirements for wire rod for special applications*

Non-alloy steel wire rod for conversion to wire —

Part 3: Specific requirements for rimmed and rimmed substitute, low-carbon steel wire rod

1 Scope

This part of ISO 16120 is applicable to wire rod made of low-carbon, low-silicon, rimmed and rimmed substitute steel with high ductility intended for drawing and/or cold rolling.

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 377, *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing*

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

ISO 4885, *Ferrous products — Heat treatments — Vocabulary*

ISO 4948-1, *Steels — Classification — Part 1: Classification of steels into unalloyed and alloy steels based on chemical composition*

ISO 4948-2, *Steels — Classification — Part 2: Classification of unalloyed and alloy steels according to main quality classes and main property or application characteristics*

ISO/TS 4949, *Steel names based on letter symbols*

ISO 4967, *Steel — Determination of content of nonmetallic inclusions — Micrographic method using standard diagrams*

ISO 6929, *Steel products — Definitions and classification*

ISO 16120-1:2011, *Non-alloy steel wire rod for conversion to wire — Part 1: General requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 377, ISO 404, ISO 4885, ISO 4948-1, ISO 4948-2 and ISO 6929 and the following apply.

3.1

rimmed substitute steel

continuously cast steel designed to substitute the traditional rimming steel for drawability and formability

4 Designation

In the designation C##D1, C means non-alloy steel for wire-drawing (see ISO/TS 4949); ## is the indicative average content of carbon; D signifies that it is for wire-drawing; 1 means rimmed.

5 Requirements

5.1 General

For the general requirements, see ISO 16120-1.

Steels ordered according to this part of ISO 16120 are to be ordered by their chemical composition and the purchaser shall use the steel names as designated in Table 1, first column.

5.2 Chemical composition

For the heat analysis, the values shown in Table 1 apply. If a product analysis is required, the permissible deviations of the product analysis in rimmed substitute steels relative to the specified value of the heat analysis are given in Table 2; these deviations are not applicable for rimmed steel.

Table 1 — Chemical analysis (heat analysis)^a

Steel grade ^b	Heat analysis										
	C	Si ^c	Mn	P	S	Cr ^d	Ni ^d	Mo	Cu ^d	Al ^e	N
	max. %	max. %	%	max. %	max. %	max. %	max. %	max. %	max. %	max. %	max. %
C2D1	0,03	0,05	0,10 - 0,35	0,020	0,020	0,10	0,10	0,03	0,10	0,01	0,007
C3D1	0,05	0,05	0,20 - 0,40	0,025	0,025	0,10	0,10	0,03	0,15	0,05	—
C4D1	0,06	0,10	0,20 - 0,45	0,025	0,025	0,15	0,15	0,03	0,15	0,05	—

^a Elements not included in this table may not be added intentionally to the steel without the agreement of the purchaser, except those intended for finishing the heat.

^b Special non-alloy steel complying with ISO 4948-1 and ISO 4948-2.

^c A lower silicon maximum may be agreed upon between the supplier and purchaser.

^d The sum of the contents Cu + Ni + Cr shall not exceed the following:

- for steel grade C2D1, 0,25 %;
- for steel grade C3D1, 0,30 %;
- for steel grade C4D1, 0,35 %.

^e For steel grades C3D1 and C4D1, a lower maximum limit may be specified at the time of ordering.

**Table 2 — Permissible deviation in the product analysis
in relation to the specified value of the heat analysis**

Elements	Steel grade	Permissible deviation in product analysis
		%
C	C2D1	+0,01
	C3D1 to C4D1	+0,02
Si	C2D1 to C3D1	+0,02
	C4D1	+0,04
Mn	All grades	±0,05
P and S	All grades	+0,005

5.3 Internal soundness and surface quality

The wire rod shall have no internal and/or surface discontinuities, such as shrink holes, segregation, cracks, folds, incrustations, notches, scabs or rolling burrs, which may be detrimental to its correct use.

5.4 Depth of surface discontinuities

The wire rod shall not have any surface discontinuities with depths greater than those shown in Table 3.

These limit values apply for the test chosen in accordance with 9.4.3 and 9.5.3 of ISO 16120-1:2011.

Table 3 applies to round wire rod only. Maximum discontinuity levels for other shapes may be agreed upon.

Table 3 — Limit values for the depth of surface discontinuities of round wire rod

Dimensions in millimetres

Nominal diameter d_N	Maximum permissible depth of surface discontinuities — radial depth ^a	Maximum permissible actual length of surface discontinuities ^b
$5 \leq d_N \leq 12$	0,20	0,25
$d_N > 12$	0,25	0,30
^a The depth of surface discontinuities measured from the actual surface of the product in a radial direction. ^b The actual measured length of the discontinuity. See Annex B of ISO 16120-1:2011, for an explanation of terms.		

5.5 Non-metallic inclusions

The method for assessment of non-metallic inclusions and the assessment criteria shall be agreed at the time of ordering, as far as possible with reference to ISO 4967.

5.6 Tensile strength

Unless otherwise specified at the time of ordering, wire rod of diameter 5,5 mm and above shall have the maximum tensile strength values shown in Table 4.

Table 4 — Tensile strength values

Strength in megapascals

Steel grade	Maximum tensile strength
C2D1	360
C3D1	390
C4D1	By agreement
NOTE	1 MPa = 1 N/mm ² .

5.7 Scale characteristics

The scale characteristics may be agreed between the supplier and purchaser. These may be specified as the quantity of scale and/or descalability.

5.8 Mechanical damage

The wire rod shall have no abrasive damage (the consequence of frictional contact between wire rod and wire rod, wire rod and concrete, or wire rod and steel) detrimental to its subsequent processing and end use. Standards of acceptability relating to permissible levels of damage may be agreed between the supplier and purchaser. Illustrative examples of mechanical damage are shown in Annex C of ISO 16120-1:2011.

Annex A (informative)

Steel designations in accordance with ISO 16120-3 and designation of comparable steel grades in national or regional standards

This part of ISO 16120 will be adopted by CEN without changes. The equivalent European steel numbers are therefore listed in column 2 of Table A.1.

Table A.1

ISO 16120-3		JIS		YB/T 170.3:2002	
Steel designation	European material No.	Steel designation	n/nr/y ^a	Steel designation	n/nr/y ^a
C2D1	1.1185	—	—	C2D1	y
C3D1	1.1187	—	—	C3D1	y
C4D1	1.1188	—	—	C4D1	y

^a Deviation of the chemical analysis (heat analysis) from that given in ISO 16120-3: n = no; nr = not relevant; y = relevant.