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National Standard

of the People's Republic of China

GB/T 3639-2009

Replacing GB/T 3639-2000

Seamless cold-drawn or cold-rolled steel tubes for precision application

Issued on: October 30, 2009 **Implemented on: May 1, 2010**

Issued by: General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China;

Standardization Administration Committee.

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Foreword

This Standard modifies and adopts EN 10305-1:2002 “Steel tubes for precision applications - Technical delivery conditions - Part 1: Seamless cold drawn tubes” (English version).

This Standard was re-drafted according to EN 10305-1:2002. A table is given in Annex A about the comparison of chapter and article numbers between this Standard and EN 10305-1:2002.

When adopting EN 10305-1:2002, this Standard has made some modifications. The relevant technical differences have been integrated in the main-text and marked with vertical single-lines at the page-margin of the articles involved. A table is given for reference in Annex B about these technical differences and reasons.

For ease of use, this Standard has made the following editorial changes to EN 10305-1:2002:

a) CHANGE “the European standard” INTO “this Standard”;

b) USE decimal point “.” To replace the “,” that is acted as decimal point;

c) DELETE the foreword of EN 10305-1:2002; ADD the foreword of this Standard.

This Standard replaces GB/T 3639-2000 “Cold-drawn or cold-rolled precision seamless steel tubes”. Compared with GB/T 3639-2000, the main changes of this Standard are as follows:

— MODIFY the classification code;

— ADD the order content;

— MODIFY the curvature of steel-tubes;

— DELETE the example of marks;

— ADD the steel grades;

— MODIFY the smelting method of steel;

— DELETE the manufacturing method of tube blank;

— MODIFY the mechanical property of tube blank;

— ADD the flattening test;

— ADD the drift expanding test;

— ADD the magnetic flux leakage inspection of steel tubes;

— ADD Annex A, Annex B, Annex C, Annex D of this Standard.

Annex A, B, C, D of this Standard are informative.

This Standard was proposed by the China Iron and Steel Association.

This Standard shall be under the jurisdiction of the National Steel Technical Committee.

Responsible drafting organization of this Standard: Baoshan Iron & Steel Co., Ltd.

Participating drafting organizations of this Standard: Jiangsu Fengli Precision Tube Co., Ltd., and Jiangyin Jieda Shaped Tube Co., Ltd..

Main drafters of this Standard: Luo Yuqing, Zhang Yaofei, Liu Cailing, Wu Yueming, Xue Jianliang, and Chen Weichi.

The previous editions replaced by this Standard are as follows:

— GB/T 3639-1983, and GB/T 3639-2000.

Seamless cold-drawn or cold-rolled steel tubes for precision application

1 Scope

This Standard specifies classification, code, dimension, shape, weight, permissible deviations, technical requirements, test methods, inspection rules, packaging, marking, and quality certificate of cold-drawn or cold-rolled precision seamless steel tubes.

This Standard is applicable to cold-drawn or cold-rolled precision seamless steel tubes that require special dimensional accuracy and high surface quality, and that are used for manufacturing mechanical structure, hydraulic equipment, auto parts, etc.

2 Normative references

The provisions in following documents become the provisions of this Standard through reference in this Standard. For dated references, the subsequent amendments (excluding corrigendum) or revisions do not apply to this Standard, however, parties who reach an agreement based on this Standard are encouraged to study if the latest versions of these documents are applicable. For undated references, the latest edition of the referenced document applies.

GB/T 222 Permissible Tolerances for Chemical Composition of Steel Products

GB/T 223.5 Steel and iron - Determination of acid-soluble silicon and total silicon content - Reduced molybdosilicate spectrophotometric method (GB/T 223.5-2008, ISO 4829-1:1986, ISO 4829-2:1988, MOD)

GB/T 223.12 Methods for chemical analysis of iron, steel and alloy - The sodium carbonate separation-diphenyl carbazide photometric method for the determination of chromium content

GB/T 223.23 Iron steel and alloy - Determination of nickel content - The dimethylglyoxime spectrophotometric method

GB/T 223.26 Iron steel and alloy - Determination of molybdenum content - The thiocyanate spectrophotometric method

GB/T 223.53 Methods for chemical analysis of iron, steel and alloy - The flame atomic absorption spectrophotometric method for the determination of copper

content

GB/T 223.59 Iron steel and alloy - Determination of phosphorus content - Bismuth phosphomolybdate blue spectrophotometric method and antimony phosphomolybdate blue spectrophotometric method

GB/T 223.63 Methods for chemical analysis of iron, steel and alloy - The sodium (potassium) periodate photometric method for the determination of manganese content

GB/T 223.68 Methods for chemical analysis of iron, steel and alloy - The potassium iodate titration method after combustion in the pipe furnace for the determination of sulfur content

GB/T 223.69 Iron steel and alloy - Determination of carbon contents - Gas-volumetric method after combustion in the pipe furnace

GB/T 228 Metallic materials - Tensile testing at ambient temperature (GB/T 228-2002, ISO 6892:1998, EQV)

GB/T 242 Metallic materials - Tube - Drift-expanding test (GB/T 242-2007, ISO 8493:1998, IDT)

GB/T 246 Metal materials - Tube - Flattening test (GB/T 246-2007, ISO 8492:1998, IDT)

GB/T 699 Quality carbon structural steels

GB/T 1031 Surface roughness parameters and their values

GB/T 1591 High strength low alloy structural steels

GB/T 2102 Acceptance packing, marking and quality certification of steel pipe

GB/T 4336 Standard test method for spark discharge atomic emission spectrometric analysis of carbon and low-Alloy steel (routine method)

GB/T 7735-2204 Steel tubes - The inspection method on eddy current test (GB/T 7735-2004, ISO 9304:1989, MOD)

GB/T 12606 Steel tubes - The testing method of magnetic flux leakage (GB/T 12606-1999, eqv ISO 9402:1989, ISO 9598:1989)

GB/T 17395 Dimensions, shapes, masses and tolerances of seamless steel tubes (GB/T 13795-2008, ISO 1127:1992, ISO 4200:1991, ISO 5252:1991, NEQ)

GB/T 20066 Steel and Iron - Sampling and preparation of samples for the determination of chemical composition (GB/T 20066-2006, ISO 14284:1996, IDT)

incision margin according to the following specifications:

a) Outer diameter≤159mm: 5mm~10mm;

b) Outer diameter>159mm: 10mm~15mm.

5.2.3 According to the requirements of the buyer, through both parties' mutual negotiation, and indicated in the contract, it can supply the steel-tubes of other length and permissible deviations.

5.3 Curvature

5.3.1 Curvature of steel-tube shall not be greater than 3.0mm/m.

5.3.2 The total length (*L*) curvature of steel-tube whose outer diameter is greater than 16mm shall comply with the following specifications:

a) R_{eH}≤500 MPa, ≤0.15%L;

b) R_{eH}>500 MPa, ≤0.20%L.

5.3.3 According to the requirements of the buyer, through both parties' mutual negotiation, and indicated in the contract, the steel-tubes' curvature per meter and total length can adopt other specifications.

5.4 End shape

The end surfaces of steel-tubes' both ends shall be perpendicular to the axis. Incision burr shall be removed.

5.5 Out-of-roundness and wall thickness unevenness

5.5.1 The out-of-roundness of the steel-tubes shall not be greater than 80% of the outer diameter' tolerance.

5.5.2 According to the requirements of the buyer, the wall thickness unevenness of steel-tubes can be negotiated by both buyer and supplier.

5.6 Delivery weight

The steel-tubes are delivered according to the actual weight, or they can be delivered according to the theoretical weight. Theoretical weight per meter shall be in accordance with the specification of GB/T 17395 (the steel density is 7.85/dm^3).

According to the requirements of the buyer, through both parties' mutual negotiation, and indicated in the contract, the permissible deviations of the actual weight and the theoretical weight of the delivered steel-tubes shall comply with the following

specifications:

a) Single steel-tube: $^{+10}_{-8}$%;

b) Each batch of steel-tubes of which the minimum weight is 10 tons: ±7.5%.

6 Technical requirements

6.1 Steel grades and chemical composition

6.1.1 The steel-tubes shall be made by steel 10, 20, 35, 45, Q345B. The chemical composition of steel 10, 20, 35, 45 shall comply with the specifications in GB/T 699. The chemical composition (smelting analysis) of steel Q345B shall comply with the specifications in GB/T 1591. In which, the content of P, S shall not be greater than 0.030%.

6.1.2 When the buyer requires product analysis, it shall be indicated in the contract. The permissible deviations of the chemical composition of finished steel-tubes shall comply with the specifications in GB/T 222.

6.1.3 According to the requirements of the buyer, through both parties' mutual negotiation, the supplier can provide steel-tubes of other grades.

6.2 Manufacturing methods

6.2.1 Smelting method of steel-tubes

The steel shall be fully killed steel smelted by electric furnace and oxygen converter.

6.2.2 Manufacturing method of steel-tubes

The tubes shall be manufactured by seamless cold drawing or cold rolling method. When the buyer specifies a certain method to manufacture steel-tubes, it shall be indicated in the contract.

6.3 Delivery conditions

The steel-tubes shall be delivered at one of the conditions listed in Table 3.

Table 3 Delivery conditions

Delivery conditions	Symbol	Description
Cold-finished / hard	+C	After the final cold-finished process, there is no heat treatment.
Cold-finished / soft	+LC	After the final heat treatment, there is a suitable cold-finished process.
Stress-relieving	+SR	After the final cold-finished process, the tubes are

$$H = \frac{(1+\alpha)S}{\alpha + S/D} \qquad \cdots\cdots(1)$$

Where:

S — Specified wall thickness, in mm;

D — Specified outside diameter, in mm;

a — Deformation coefficient per unit length. The value of steel 10, 20 is 0.09; the value of steel Q345B is 0.07.

After flattening test, the specimen shall be free from cracks or breaks.

6.5.2 Drift expanding test

According to the requirements of the buyer, through both parties' mutual negotiation, and indicated in the contract, the steel 10, 20, Q345B at +A, +N conditions, of which outside diameter is ≤150mm and wall thickness is ≤10mm, can be conducted with drift expanding test. After drift expanding test, the drift expanding position of specimen shall be free from cracks or breaks.

Table 5 Drift expanding rate of steel-tubes' drift expanding test

Grade	Drift expanding rate/%	
	Wall thickness≤4mm	Wall thickness>4mm
10	20	15
20	18	12
Q345B	15	10

6.6 Leak tightness

According to the requirements of the buyer, through both parties' mutual negotiation, and indicated in the contract, the steel-tubes at heat treatment (+SR, +A, +N) condition can be conducted with leak tightness inspection. It shall conduct eddy current inspection according to acceptable level A in GB/T 7735-2004, or magnetic flux leakage inspection according to acceptable level L4 in GB/T 12606 for the leak tightness inspection.

6.7 Surface roughness

When buyers have roughness requirements for steel-tube surface, it shall be indicated in the contract. The surface roughness parameter is measured according to profile arithmetic mean deviation *Ra* in GB/T 1031. The values of surface roughness and sampling length when measuring shall be negotiated by both buyer and supplier.

6.8 Surface quality

	test			steel-tube, for each batch
5	Leak tightness inspection	GB/T 7735 or GB/T12606	-	One by one
			-	One by one
6	Surface roughness inspection	GB/T 1031	GB/T 1031	TAKE one specimen on two steel-tubes respectively, for each batch

8 Inspection rules

8.1 Inspection and acceptance

Inspection and acceptance of steel-tubes shall be conducted by the supplier's quality and technical supervision department.

8.2 Batching rules

Steel-tubes are inspected and accepted in batches. A batch consists of the steel-tubes of the same steel grade, same furnace number, same specification, and same heat treatment system (furnace) or same delivery condition. The quantity of each batch of steel-tubes shall not be more than 500 tubes.

8.3 Re-inspection and determination rules

The re-inspection and determination rules of steel-tubes shall comply with the specifications in GB/T 2102.

9 Packaging, marking, and quality certificate

The packaging, marking, and quality certificate of steel-tubes shall comply with the specifications in GB/T 2102.

Annex A

(Informative)
Comparison of chapter and article numbers between this Standard and EN 10305-1:2002

Table A.1 gives the comparison of chapter and article numbers between this Standard and EN 10305-1:2002.

Table A.1 Comparison of chapter and article numbers between this Standard and EN 10305-1:2002

Chapter and article number of this Standard	Corresponding chapter and article number of EN 10305-1:2002
1	1
2	2
-	3
3.1	7.2.2
4	6
5.1.2	8.5.1.2
5.1.4	8.5.1.4
5.3	8.5.3
5.4	8.5.4
6.2.1	7.1
6.2.3	7.2.1
6.3	7.2.2
6.4	8.3
6.5.1	11.2
6.5.2	11.3
6.6	11.7
6.7	8.4.1.5 and 11.5
6.8	8.4.1.1~8.4.1.4
7.3	9.3
8.2	10.1
8.3	11.8
9	12,13
Annex A	-
Annex B	-
Annex C	Table B.1 of Annex B
Annex D	-

Annex B

(Informative)
Technical differences between this Standard and EN 10305-1:2002 and the reasons

Table B.1 gives the technical differences between this Standard and EN 10305-1:2002 and the reasons.

Table B.1 Technical differences between this Standard and EN 10305-1:2002 and the reasons

Chapter and article number of this Standard	Technical differences	Reasons
1	DELETE the scope and application areas in EN 10305-1:2002; ADD the scope of this Standard.	DESCRIBE the scope of standard according to requirements of Chinese standard.
2	CITE the Chinese standards that adopt international standards, rather than international standards. ADD citing of GB/T 222, GB/T 223.5, GB/T 223.23, GB/T 223.27, GB/T 223.53, GB/T 223.59, GB/T223.63, GB/T 223.68, GB/T 223.69, GB/T 242, GB/T 246, GB/T 699, GB/T 1031, GB/T 1591, GB/T 2102, GB/T 4336, GB/T 20066	To suit the standard system of China
3	DELETE “terms and definitions”, “symbols” and “classification and code” in EN 10305-1:2002; ADD “classification and code” in this Standard	To suit the standard preparation requirements of China
4	DELETE “information to be supplied by the purchaser” in EN 10305-1:2002; ADD “order content” in this Standard	To suit the standard preparation requirements of China
5.2	For the length requirements in EN 10305-1:2002, PROVIDE the length specifications according to the requirements in original standard	COMPLY with the actual situation of China and in line with the original standards
5.6	ADD the delivery weight of steel-tubes	To suit the standard preparation requirements of

Annex D

(Informative)
Comparison of grades between this Standard and EN 10305-1

Table D.1 gives the comparison of grades between this Standard and EN 10305-1.

Table D.1 Comparison of grades between this Standard and EN 10305-1

Grades of this Standard	Grades of EN 10305-1:2002
10	E215
20	E255 (EN 10305-1 Annex A)
35	C35E (EN 10305-1 Annex A)
45	C45E (EN 10305-1 Annex A)
Q345B	E355

END

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