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**Surface Quality Classes for Hot-Rolled
Bars and Rods Technical Delivery Conditions**

热轧棒材和盘条表面质量等级交货技术条件

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Table of Contents

Foreword.....	3
1 Scope	4
2 Normative References.....	4
3 Terms and Definitions.....	4
4 Codes.....	6
5 Requirements.....	6
6 Test.....	10
7 Grinding.....	12
Appendix A (Informative) Description of Discontinuities on Common Hot-Rolled Bars and Rods	13
Appendix B (Informative) Clause No. Comparison between this Standard and EN 10221:1995.....	16
Appendix C (Informative) Technical Differences and Causes between this Standard and EN 10221:1995	17
Bibliography	18

Foreword

This Standard was drafted as per the rules specified in GB/T 1.1-2009.

This Standard adopts the re-drafting method to modify and use EN 10221:1995 *Surface Quality Classes for Hot-Rolled Bars and Rods Technical Delivery Conditions* (English Version).

Compared with EN 10221:1995, this Standard has the structural adjustment; the Appendix B lists the clause comparison list between this Standard and EN 10221:1995.

There are technical differences between this Standard and EN 10221:1995; the clauses of these difference involved have been marked by a vertical single line (|) in the blank positions of the outer margin; Appendix C gives the corresponding technical differences and their causes.

This Standard was proposed by China Iron and Steel Association.

This Standard shall be under the jurisdiction of National Technical Committee for Standardization of Steel (SAC/TC 183).

Drafting organizations of this Standard: Shougang Corporation, China Metallurgical Information and Standardization Institute, and Jiangsu Shagang Group Co., Ltd.

Chief drafting staffs of this Standard: Tang Mu, Xie Ruiping, Wang Liping, Luan Yan, Dai Qiang, and Huang Zhengyu.

Surface Quality Classes for Hot-Rolled Bars and Rods Technical Delivery Conditions

1 Scope

This Standard specifies the terms and definitions, code, requirements, test, modification, etc. for the surface quality of hot-rolled bars and rods.

This Standard is applicable to the surface quality classes of hot-rolled bars and rods with nominal dimension of 5mm ~ 150mm. The hot-rolled bars and rods with nominal dimension greater than 150mm can also be applicable through the negotiation between the supplier and the purchaser.

This Standard is applicable to the engineering steel; can also be used for structural steel or tool steel through the negotiation between the supplier and the purchaser.

This Standard doesn't include the depth requirements of surface decarburization layer.

2 Normative References

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this document.

GB/T 239 Metallic Materials Wire Torsion Test (GB/T 239-1999, eqv ISO 7800:1984; ISO 9649:1990)

YB/T 5293 Metallic Materials - Forging Test

3 Terms and Definitions

The following terms and definitions are applicable to this document.

3.1 Delivery lot

Unless otherwise specified in the ordering list and product standard; the delivery lot indicates the steel with the same grade, specification and delivery state; ordered by the same surface quality class; and delivered at the same time.

3.2 Bar

3.2.1 Rounds

The bar with cross-section of round shape, and general diameter of no less than 8mm.

[GB/T 15574-1995, definition 6.2.1.2.1.1]

3.2.2 Squares

The bar with cross-section of square shape, and general side length of no less than 8mm.

[GB/T 15574-1995, definition 6.2.1.2.1.2a)]

3.2.3 Hexagons

The bar with cross-section of hexagon shape, and the opposite side distance of no less than 8mm.

[GB/T 15574-1995, definition 6.2.1.2.1.2b)]

3.2.4 Octagons

The bar with cross-section of octagon shape, and the opposite side distance of no less than 8mm.

[GB/T 15574-1995, definition 6.2.1.2.1.2c)]

3.3 Rod

The finished product after hot-rolling is delivered in disk. Generally, the cross-section shall be round, oval, square, rectangular, hexagonal, octagonal, semi-circular, and other shapes; the nominal dimension of the wire rod shall be no less than 5mm. The surface of the wire rod is smooth, it can be used for further processing deformation.

3.4 Discontinuities

Irregular shape of convex and concave.

NOTE: the description for the discontinuities of the common hot-rolled bars and rods can refer to Appendix A.

3.4.1 Imperfections

The discontinuities with depth and height no greater than the specified limit.

3.4.2 Defects

5.2 Ordering

The following contents shall be indicated in the contract:

- a) Surface quality classes (see Table 2);
- b) Maximum allowable number of defects;
 - 1) If the original depth of the discontinuities still can be measured after the material processing, then the maximum allowable number of defects z_a for the whole delivery lots shall be confirmed during or after the material processing (see NOTE 1 and NOTE 2);
 - 2) If the whole delivery lots can be inspected before processing, then the maximum allowable number of defects z_b for the whole delivery lots shall be confirmed before the material processing (see NOTE 1 and NOTE 2);
 - 3) If it is impossible to inspect the whole delivery lot, then special agreement shall be concluded to confirm the maximum allowable number of defects z .
- c) The type of test, for instance: inspect and give the Acceptance Quality Limit (AQL) and inspection plan through sampling; obtain quality level inspection through the statistical process control. ¹⁾

NOTE 1: Due to the limit of the continuous inspection equipment of the wire rod, against the measurement value of the depth or height accuracy of imperfections, generally it can only inspect the end of the coil. Therefore, it can't be proved that there are no discontinuous defects beyond the specified value in the entire coil.

NOTE 2: The treatment method against the defective materials shall be confirmed through negotiated when inquiring and ordering; for instance: whether return the products to the factory or abandoned or other treatment. Similarly, the treatment method against the defective materials that have passed the acceptance in the whole delivery lots shall also be confirmed through negotiation when inquiring and ordering.

5.3 Marking

The requirements for surface quality shall be indicated when inquiring and ordering. The following Items a) and b) are the marking examples based on the user-specified sampling methods (for instance: test plan, statistical process control, etc.).

- a) The situation example of Item b) 1) in 5.2

¹⁾ Refer to GB/T 2828.1-2003 Sampling Procedures for Inspection by Attribute – Part 1: Sampling Schemes Indexed by Acceptance Quality Limit(AQL) for Lot-By-Lot Inspection, and GB/T 13393-2008 Guide to Acceptance Sampling Inspection

6.2.2 Inspection method of discontinuities

The following methods or other suitable methods are applicable for inspecting the discontinuities.

6.2.2.1 Non-destructive method, for instance:

- Visual examination of appearance;
- Magnetic flux method; for instance, magnetic particle testing method or probe method;
- Inductance method (eddy current);
- Penetration test;
- Heat phase method.

6.2.2.2 Destructive method

The following test can be considered:

- Hot upset test (as per YB/T 5293);
- Cold upset test (as per YB/T 5293);
- Torsion Test (as per GB/T 239).

6.2.3 Test method of depth or height of discontinuities

6.2.3.1 Non-destructive method, for instance:

- Magnetic flux test method; use rotated or fixed probe;
- Inductance method;
- DC potential probe method;
- Ultrasonic test.

These methods can only measure the approximate values for the depth or height of discontinuities.

6.2.3.2 To accurately measure the depth or height of discontinuities, it can be only realized through grinding the discontinuities to the root, and checking the metallographic specimens. These two methods' measurement against the depth or height is only radial.

6.2.4 Inspection lot

Appendix A

(Informative)

Description of Discontinuities on Common Hot-Rolled Bars and Rods ²⁾

A.1 Cracks

The cracks are in the linear shape appeared on the surfaces of bars and rods along the rolling direction; most of them are in straight line shape, but also some in “Y” shape; some has no obvious gaps, their distributions have no fixed positions; while others appear on the whole length of the product. The surfaces of bars and rods also appear transverse cracks in the curve or zigzag, fish scales shape, etc. On the cross-section of bars and rods, the cracks have sharp root; their surrounding areas generally have serious decarbonization phenomenon.

A.2 Folding

The folding is the metal overlapping phenomenon appeared on the steel surface along the length direction. It is generally in the straight-line shape. It is also in curve or zigzag shape; some appears on the whole length of the product; others distributed locally or discontinuously. Folding has obvious regularity against the common fixed positions of certain product; its root is connected with the metal body; the gap tilts at certain angle against the steel surface.

A.3 Scars

The scars indicate the scarred metal thin-block on the surfaces of bars and rods. They are generally in the tongue, nail, block, fish scale shapes, etc.; their appearances are irregular. The size and depth of scars are different; their distribution on the steel is irregular; there are generally non-metallic inclusions below them.

A.4 Ears

The ears are the strip-shaped metal protrusion appeared on the surface of bars and rods corresponding to the live hole along the rolling direction. Some appears on one side of the bars and rods (single-side ears); some appears on two sides of the bars and rods (dual-side ears); some appear on the whole length of the product; others distribute locally, discontinuously or periodically.

²⁾ Extracted from *Iron & Steel Products Quality Defects Map*.

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Accountable person and shareholder: Wayne Zheng

About Us (Goodwill, Policies, Fair Trading...): <https://www.chinesestandard.net/AboutUs.aspx>

Contact: Wayne Zheng, Sales@ChineseStandard.net

Linkin: <https://www.linkedin.com/in/waynezhengwenrui/>

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