

BRITISH STANDARD

**BS EN
10221 : 1996**

Specification for

**Surface quality classes for
hot-rolled bars and rods –
Technical delivery conditions**

The European Standard EN 10221 : 1995 has the status of a
British Standard

ICS 77.140.60 77.140.70

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee ISE/31, Wrought Steels, upon which the following bodies were represented:

British Chain Manufacturers' Association
British Engineers Cutting Tools Association
British Forging Industry Association
British Industrial Fasteners Federation
British Iron and Steel Producers' Association
British Stainless Steel Association
Department of Trade and Industry (National Physical Laboratory)
Lloyds Register of Shipping
Ministry of Defence
National Association of Steel Stockholders
Road Vehicle Spring Society
Society of Motor Manufacturers and Traders Limited
Spring Research and Manufacturers' Association

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National foreword

This British Standard has been prepared by Technical Committee ISE/31 and is the English language version of EN 10221 *Surface quality classes for hot-rolled bars and rods – Technical delivery conditions*, published by the European Committee for Standardization (CEN).

Cross-reference

Publication referred to	Corresponding British Standard
EN 10079 : 1992 ¹⁾	BS EN 10079 : 1993 Definition of steel products

Compliance with a British Standard does not of itself confer immunity from legal obligations.

¹⁾ prEN 10079 is published as EN 10079 : 1992.

EUROPEAN STANDARD

EN 10221

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 1995

ICS 77.140.60; 77.140.70

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English version

Surface quality classes for hot-rolled bars and rods — Technical delivery conditions

Classes de qualité de surface des barres et fils
machine laminés à chaud — Conditions techniques
de livraison

Oberflächengüteklassen für warmgewalzten
Stabstahl und Walzdraht — Technische
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Comité Européen de Normalisation
Europäisches Komitee für Normung

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Ref. No. EN 10221 : 1995 E

Foreword

This European Standard has been drawn up by a joint working group of ECISS/TC 15, Wire rod — Qualities, dimensions, tolerances and specific tests, (Secretariat: Italy) and ECISS/TC 23, Steels for heat treatment, alloy steels and free-cutting steels — Qualities, (Secretariat: Germany).

This European Standard replaces:

prEN 10 163-4 *Delivery requirements for surface quality of hot rolled steel products — Part 4: Round bars and wire rod*

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 1996, and conflicting national standards shall be withdrawn at the latest by may 1996.

According to the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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1 Scope

1.1 This European Standard specifies the requirements for the surface quality of hot rolled round bars and rods with nominal diameters of $5 \text{ mm} \leq d_N \leq 150 \text{ mm}$.

1.2 By agreement between the manufacturer and purchaser, this European Standard may be applied also for squares, hexagons and octagons.

1.3 This European Standard applies particularly for steels for engineering applications, but may by agreement also be applied for general structural steels or tool steels.

1.4 This European Standard does not include any requirements for the permissible depth of surface decarburization.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

prEN 10079 *Definition of steel products*

ISO 7800 *Metallic materials — Wire — Simple torsion test*

3 Definitions

For the purposes of this European Standard the following definitions apply:

3.1 delivery lot

Unless otherwise specified in the order or in the appropriate product standard, a quantity of steel of the same type and the same diameter ordered with the same requirements for the surface quality, delivered at the same time.

3.2 bars, rod

See prEN 10079.

3.3 discontinuities

Surface discontinuities are geometric irregularities projecting inwards.

3.3.1 imperfections

Discontinuities with a depth equal to or less than the specified limiting value.

3.3.1.1 sharp discontinuities

All discontinuities which may act as a notch as, for example, laps, seams and cracks.

3.3.1.2 shallow discontinuities

Discontinuities which have a less notchlike effect and which have a more shallow aspect such as rolled-in scale and slivers.

3.3.2 defects

Discontinuities with a depth greater than the specified limiting value.

4 Requirements

4.1 General

The surface requirements are subdivided into the classes according to table 1 and figure 1. If the appropriate European Standard or EURONORM specifying the quality requirements for the material does not contain exact specifications, the required surface quality class and the admissible portion of defective material shall be stated in the order as indicated in 4.2.

4.2 ordering

The following indications shall be given in the order:

a) the surface quality class (see table 1)

and either:

b1) if the original depth of the surface discontinuities can still be determined after the processing of the material, the maximum admissible portion, z_a , of defective material in the total delivery lot found during or after further processing (see notes 1 and 2);

or

b2) if the total delivery lot can be checked before processing, the maximum admissible portion, z_b , of defective material in the total delivery lot found before processing (see notes 1 and 2);

or

b3) if it is not possible to check the total delivery lot, special agreements shall be made with regard to the maximum admissible portion, z , of defective material;

and

c) the type of proof, e.g. by sampling inspection giving the AQL and inspection plan, proof of quality level by statistical process control.

NOTE 1. In view of the limitations of continuous inspection equipment for rod relative to the exactness of imperfection depth measurements it is normally only possible to inspect the ends of the coils. Therefore, it cannot be proved that no value greater than the specified value is to be found in the coil as a whole.

NOTE 2. Additionally, the handling of defective material, e.g. whether it shall be sent back to the manufacturer or scrapped etc. should (also for cases where the total delivery lot is accepted) be agreed at the time of enquiry and order.

4.3 Designation

The required surface finish shall be designated at the time of enquiry and order. a) and b) below give examples of possible designations based on the sampling method specified by the purchaser, e.g. test plan, statistical process control, etc.

a) Example for case b1 (see 4.2)

Agreed is surface quality class C and a maximum admissible portion $z_a = 2,5\%$ of defective material in the total delivery lot found during or after further processing, corresponding to the agreed AQL of $2,5\%$.

Designation:

Surface quality EN 10221 – Class C – $z_a 2,5$ – AQL $2,5\%$

b) Example for case b2 (see 4.2)

Agreed is surface quality class C and a maximum admissible portion $z_b = 0,5\%$ of defective material in the total delivery lot found before processing; proof corresponding to separate specification.

Designation:

Surface quality EN 10221 – Class C – $z_b 0,5$

Proof ...

5 Testing

5.1 General

5.1.1 The manufacturer takes under his own responsibility and according to his own judgement suitable measures to supervise his production in view of the specified surface quality requirements.

NOTE. At the present state of the development, facilities for continuous measuring of the depth of defects at high temperatures have serious limitations. The rod manufacturer can normally, after rolling, only check the end of the coils for their compliance with the requirements for surface quality.

5.1.2 The purchaser has total freedom to check the surface quality of the delivered material by methods he regards as suitable. However, disputes shall be resolved using depth discontinuities measured by techniques specified in 5.2.3.2.

5.2 Test methods

5.2.1 General

5.2.1.1 The methods used for detecting discontinuities and measuring the depth of discontinuities shall be sufficiently accurate and shall give reproducible results.

5.2.1.2 Non-destructive methods (see 5.2.2.1 and 5.2.3.1) and also technological methods (see 5.2.2.2) are permitted.

5.2.1.3 In cases of dispute, the measures which are carried out in accordance with 5.2.3.2 on products in the delivery condition shall be decisive.

5.2.2 Methods for the detection of discontinuities

The following or other suitable methods can be used for the detection of surface discontinuities.

5.2.2.1 Non-destructive methods

- visual examination;
- magnetic flux method: for example magnetic particle inspection or probe methods;
- inductive methods (eddy currents);
- dye penetrant;
- thermography.

5.2.2.2 Technological test methods

The following tests may be taken into consideration:

- warm compression tests;
- cold compression tests;
- torsion tests (see ISO 7800).

5.2.3 Methods for measuring the depth of discontinuities

5.2.3.1 Non-destructive test methods such as:

- magnetic flux measurement with rotating or stationary probes;
- inductive methods;
- potential probe method using direct current;
- ultrasonic tests
- can only determine the depth of discontinuities approximately.

5.2.3.2 The exact determination of the depth of a discontinuity is to be carried out either by grinding the discontinuity down to its root or by examining a metallographic specimen. In both cases, the depth is measured in the radial direction (see also footnote 2 to table 1).

5.2.4 Production tests on trial batches

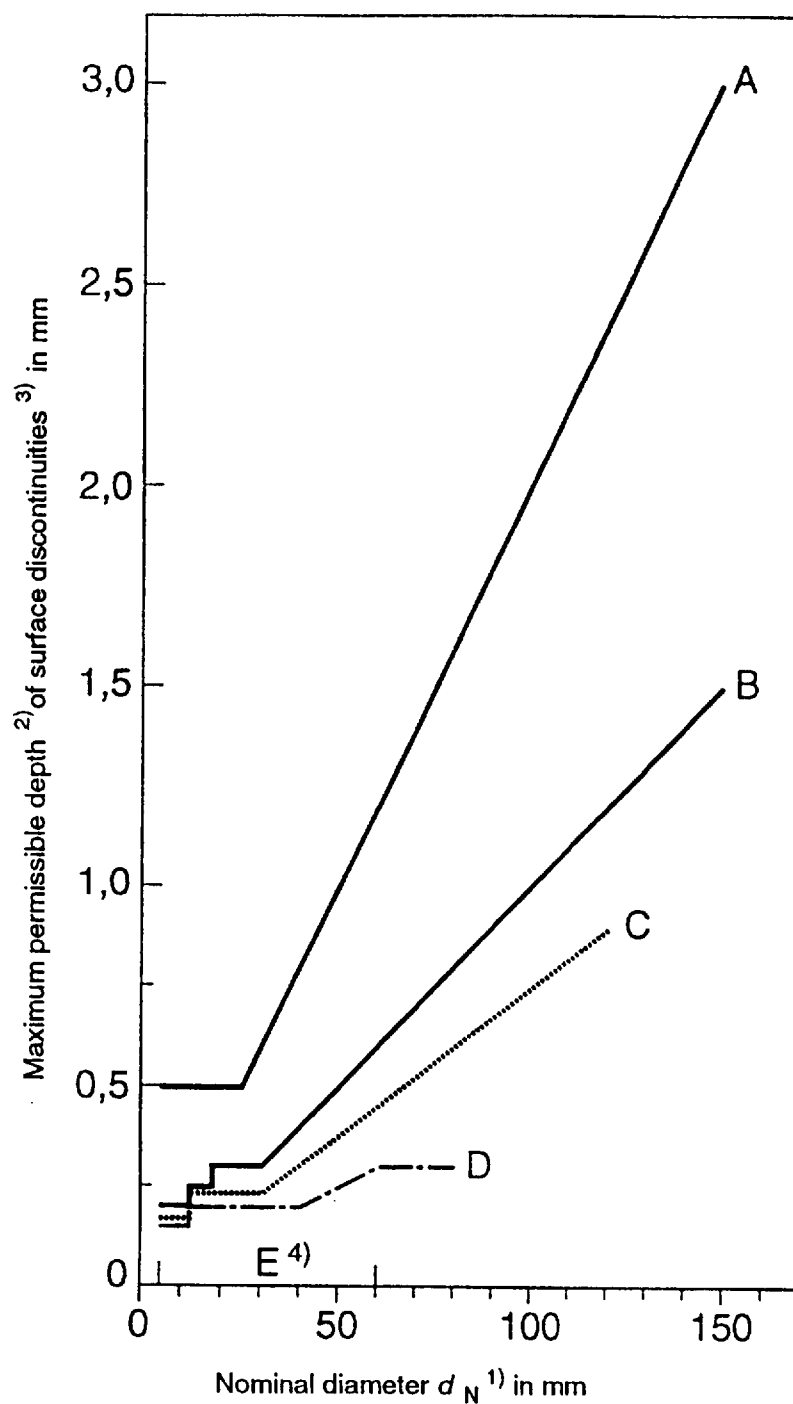
When incoming inspection reveals questionable quality, the processing of a trial batch may be agreed upon in order to reveal whether the material is acceptable for the intended application. In this case, the size of the trial batch shall be agreed upon.

6 Repairs

6.1 Local imperfections may be removed and defects shall be smoothly removed by grinding within the limits specified in table 1 (note, however, footnote 2 to table 1).

6.2 Repair by welding is only permitted if agreed by the purchaser. No impairment of the material properties (e.g. excessive hardening, crack formation) shall result from this.

Table 1. Surface quality classes		
Class	Nominal diameter $d_N^{1)}$ mm	Maximum permissible depth ²⁾ of surface discontinuities ³⁾ mm
A	$5 \leq d_N \leq 25$	0,50
	$25 < d_N \leq 150$	$0,02 \cdot d_N$
B	$5 \leq d_N \leq 12$	0,20
	$12 < d_N \leq 18$	0,25
	$18 < d_N \leq 30$	0,30
	$30 < d_N \leq 150$	$0,01 \cdot d_N$
C	$5 \leq d_N \leq 12$	0,17
	$12 < d_N \leq 30$	0,23
	$30 < d_N \leq 120$	$0,0075 \cdot d_N$
D	$5 \leq d_N \leq 12$	0,15
	$12 < d_N \leq 40$	0,20
	$40 < d_N \leq 60$	$0,005 \cdot d_N$
	$60 < d_N \leq 80$	0,30
E	$5 \leq d_N \leq 60$	4)
¹⁾ The maximum rod diameter is between 30 and 60 mm depending on the manufacturer's method of rolling. Bars are generally not rolled in diameters of less than 15 mm approximately depending on the manufacturer's direction of rolling. ²⁾ The depth of surface discontinuities is measured from the actual surface of the product in radial direction. The dimensional tolerance shall also be considered when determining the section of the finished part which is assured to be free of discontinuities/defects. ³⁾ If the products are ordered for drawing, no shallow discontinuities or local repairs are permitted which cannot be eliminated by drawing. ⁴⁾ This surface quality class shall be better than class D. The requirements and the method of control shall be agreed upon between the parties.		



1), 2), 3), 4) see table 1

Figure 1. Surface quality classes

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