Specification for

# Hot-rolled flat products made of high yield strength steels for cold forming

## Part 3. Delivery conditions for normalized or normalized rolled steels

The European Standard EN 10149-3 : 1995 has the status of a British Standard

ICS 77.140.10; 77.140.50

# Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee ISE/10, Flat rolled steel products, upon which the following bodies were represented:

British Railways Board
British Steel Industry
Cold Rolled Sections Association
Society of Motor Manufacturers and Traders Ltd.

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

British Welded Steel Tube Association
Coated Metals Limited
Department of the Environment (Property Services Agency)
International Tin Research Institute
Metal Roof Deck Association
National Association of Steel Stockholders
National Centre of Tribology
Paintmakers' Association of Great Britain Ltd.
Zinc Development Association

This British Standard, having been prepared under the direction of the Engineering Sector Board, was published under the authority of the Standards Board and comes into effect on 15 April 1996



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Committee reference ISE/10
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# National foreword

This British Standard has been prepared under the direction of Technical Committee ISE/10 and is the English language version of EN 10149-3 : 1995, *Hot-rolled flat products made of high yield strength steels for cold forming — Part 3: Delivery conditions for normalized or normalized rolled steels*, published by the European Committee for Standardization (CEN).

This British Standard supersedes BS 1449 : Section 1.4 : 1991 and BS 1449 : Section 1.10 : 1991 which are withdrawn.

Cross-references

| Publication referred to – | Corresponding British Standard |
|---|---|
| EN 10149 : | BS EN 10149 Specification for hot-rolled flat products made of high yield strength steels for cold forming |
| EN 10149-1 : 1995 | Part 1 : 1996 General delivery conditions |

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 10149-3

September 1995

ICS 77.140.10; 77.140.50

Descriptors: iron and steel products, hot rolled products, high yield strength steels, cold-working, metal rolling, designation, classifications, grades:quality, chemical composition, mechanical properties, inspection, tests, marking

English version

# Hot-rolled flat products made of high yield strength steels for cold forming — Part 3: Delivery conditions for normalized or normalized rolled steels

Produits plats laminés à chaud en aciers à haute limite d'élasticité pour formage à froid —
Partie 3: Conditions de livraison des aciers à l'état normalisé ou laminage normalisant

Warmgewalzte Flacherzeugnisse aus Stählen mit hoher Streckgrenze zum Kaltumformen —
Teil 3: Lieferbedingungen für normalgeglühte oder normalisierend gewalzte Stähle

This European Standard was approved by CEN on 1995-08-06. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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**CEN**
European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

**Central Secretariat: rue de Stassart 36, B-1050 Brussels**



Ref. No. EN 10149-3 : 1995 E

## Foreword

This European Standard was prepared by the Technical Committee ECISS/TC 10, Structural steels — Qualities, of which the secretariat is held by NNI.

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 March 1996, and conflicting national standards shall be withdrawn at the latest by March 1996.

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

## Contents

# 1 Scope

Part 3 of this European Standard, in addition to Part 1, specifies requirements for flat products made of weldable, hot-rolled, high yield strength steels for cold forming.

The grades are given in table 1 (chemical composition) and table 2 (mechanical properties) and are supplied in the normalized or normalized rolled delivery condition as given in **7.2**.

The steels specified in this European Standard are applicable to hot-rolled flat products in the thickness range of $\geq$ 1.5 mm and $\leq$ 20 mm.

# 2 Normative references

The normative references as given in EN 10149-1 shall apply.

# 3 Definitions

The definitions given in EN 10149-1 shall apply.

# 4 Information to be supplied by the purchaser

## 4.1 General

The information to be supplied by the purchaser shall be in accordance with EN 10149-1.

## 4.2 Options

The options given in EN 10149-1 and clause **11** shall apply.

# 5 Dimensions, mass and tolerances

## 5.1 Dimensions and tolerances

The dimensions and tolerances shall be in accordance with EN 10149-1.

## 5.2 Mass of steel

The calculated mass of steel shall be determined in accordance with EN 10149-1.

# 6 Classification and designation

## 6.1 Classification

### 6.1.1 *Classification*

All steel grades of Part 3 of this European Standard are alloy quality steels according to EN 10020.

### 6.1.2 *Grades*

The subdivision of steel grades shall comply with EN 10149-1.

## 6.2 Designation

The designation shall comply with EN 10149-1.

NOTE. For a list of corresponding former national designations and the former designation from EURONORM 149 (1980) see annex B, table B.1.

# 7 Technical requirements

## 7.1 Steel manufacturing process

The steel manufacturing process shall be in accordance with EN 10149-1.

See clause **11**, option 1.

## 7.2 Delivery conditions

The products shall be supplied in the normalized or normalized rolled delivery condition.

The delivery condition of descaled surfaces shall be in accordance with EN 10149-1.

See clause **11**, option 2.

## 7.3 Chemical composition

The requirements of EN 10149-1 shall apply.

The chemical composition determined by ladle analysis shall comply with the specified values of table 1.

See clause **11**, option 3.

## 7.4 Mechanical properties

### 7.4.1 *General*

Under the inspection and testing conditions as specified in clause **8** and in the delivery condition as specified in **7.2** the mechanical properties shall comply with the values given in table 2.

### 7.4.2 *Impact energy*

If agreed at the time of the enquiry and order the verification of the impact energy value shall be carried out in accordance with EN 10149-1.

See clause **11**, option 5.

## 7.5 Technological properties

### 7.5.1 *Weldability*

Weldability shall be in accordance with EN 10149-1.

### 7.5.2 *Formability*

NOTE. Recommendations regarding hot and cold forming are laid down in ECSC IC 2.

#### 7.5.2.1 *Cold forming*

Annex C contains indicative values for the inside bend radii for cold forming.

##### 7.5.2.1.1 *Flangeability*

The products are suitable for flanging without cracking.

##### 7.5.2.1.2 *Roll forming*

The suitability for roll forming shall be in accordance with EN 10149-1.

See clause **11**, option 6.

### 7.5.3 *Other requirements*

If agreed at the time of enquiry and order all grades of this European Standard shall be suitable for hot-dip zinc-coating and shall comply with the relevant product quality requirements.

See clause **11**, option 7.

### 7.6 Surface finish

The surface finish shall be in accordance with EN 10149-1.

See clause **11**, option 8.

### 7.7 Internal soundness

The internal soundness shall be in accordance with EN 10149-1.

See clause **11**, option 9.

## 8 Inspection and testing

### 8.1 General

The products shall be supplied in accordance with **8.1** of EN 10149-1.

See clause **11**, option 10.

### 8.2 Sampling

Sampling shall be in accordance with EN 10149-1.

### 8.3 Test units

The test unit shall be in accordance with EN 10149-1.

### 8.4 Verification of chemical composition

The verification of the chemical composition shall be in accordance with EN 10149-1.

See clause **11**, option 4.

### 8.5 Preparation of samples and test pieces

The preparation of samples and test pieces shall be in accordance with EN 10149-1.

#### 8.5.1 *Preparation of samples*

The following samples shall be taken from one sample product of each test unit:

- one sample in the longitudinal direction in the case of product widths; $< 600$ mm and in the transverse direction in the case of product widths $\geq 600$ mm for tensile testing;
- one sample in the transverse direction for the bend test;
- one sample sufficient for one set of six impact test pieces (if an impact test is agreed at the time of the enquiry and order, (see **7.4.2.1** in EN 10149-1).

See clause **11**, option 5. (See annex A).

### 8.6 Test methods

The test methods shall be in accordance with EN 10149-1.

### 8.7 Retests and resubmission for testing

The retests and resubmission for testing shall be in accordance with EN 10149-1.

### 8.8 Inspection documents

The inspection documents shall comply with EN 10149-1.

## 9 Marking

The marking shall comply with EN 10149-1.

See clause **11**, option 11.

## 10 Disputes

In case of disputes EN 10149-1 applies.

## 11 Options

See options 1 to 11 of EN 10149-1.

12) The sulfur content shall be max. 0,010 % (ladle analysis) (see table 1).

**Table 1. Chemical composition of the ladle analysis for normalized or normalized rolled steels**

| Designation of steel grade | | C % max. | Mn % max. | Si % max. | P % max. | S % max.[1)] | Al total % max.[2)] | Nb % max.[3)] | V % max.[3)] | Ti % max.[3)] |
|---|---|---|---|---|---|---|---|---|---|---|
| Name | Material number | | | | | | | | | |
| S260NC | 1,0971 | 0,16 | 1,20 | 0,50 | 0,025 | 0,020 | 0,015 | 0,09 | 0,10 | 0,15 |
| S315NC | 1,0973 | 0,16 | 1,40 | 0,50 | 0,025 | 0,020 | 0,015 | 0,09 | 0,10 | 0,15 |
| S355NC | 1,0977 | 0,18 | 1,60 | 0,50 | 0,025 | 0,015 | 0,015 | 0,09 | 0,10 | 0,15 |
| S420NC | 1,0981 | 0,20 | 1,60 | 0,50 | 0,025 | 0,015 | 0,015 | 0,09 | 0,10 | 0,15 |

[1)]If agreed at the time of the enquiry and order the sulfur content shall be max. 0,010 % (ladle analysis). See clause **11**, option 12.

[2)]If sufficient N-binding elements are present the minimum total Al content does not apply.

[3)]The sum of Nb, V and Ti shall be max. 0,22 %.

**Table 2. Mechanical properties for normalized or normalized rolled steels**

| Designation of steel grade | | Minimum yield strength $R_{eH}$ | Tensile strength $R_m$ | Minimum percentage elongation at fracture A %[1)] Nominal thickness in mm | | Bending at 180° minimum mandrel diameter[2)] |
|---|---|---|---|---|---|---|
| Name | Material number | | | < 3 | ≥ 3 | |
| | | N/mm² [1)] | N/mm² [1)] | $L_o$ = 80 mm | $L_o$ = 5.65 $\sqrt{S_o}$ | |
| S260NC | 1.0971 | 260 | 370 - 490 | 24 | 30 | $0t$[3)] |
| S315NC | 1.0973 | 315 | 430 - 550 | 22 | 27 | $0,5t$ |
| S355NC | 1.0977 | 355 | 470 - 610 | 20 | 25 | $0,5t$ |
| S420NC | 1.0981 | 420 | 530 - 670 | 18 | 23 | $0,5t$ |

[1)]The values for the tensile test apply to longitudinal test pieces for product widths < 600 mm and to transverse test pieces for product widths ≥ 600 mm.

[2)]The values for the bend test apply to transverse test pieces.

[3)]$t$ = thickness in mm of test pieces for bend test.

## Annex A (normative)
## Location of test pieces

This annex gives the location of test pieces.

Dimensions in mm

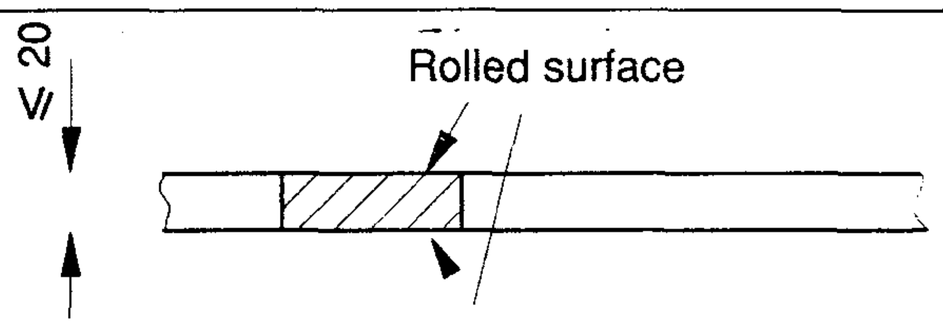
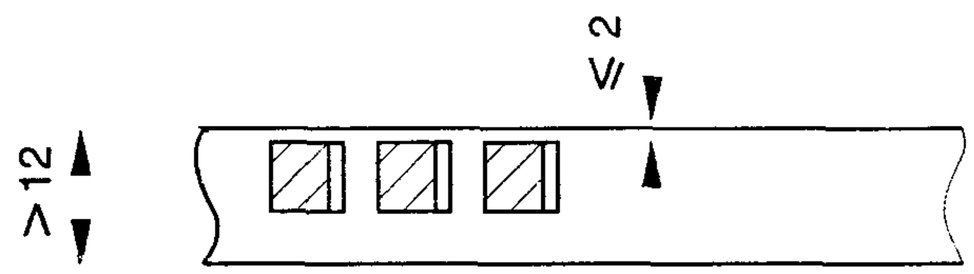
| Type of test | Thickness of product | Orientation of the test pieces for widths of | | Distance of the test piece from the rolled surface |
|---|---|---|---|---|
| | | < 600 | ≥ 600 | |
| Tension | ≤ 20 | longitudinal | transverse |   |
| Bend | ≤ 20 | transverse | transverse | |
| Impact | > 12 | longitudinal | longitudinal |   |

**Figure A.1 Location of test pieces**

## Annex B (informative)
## List of corresponding former designations

**Table B.1 List of corresponding former designations**

| Designation of steel grade | | Equivalent former designations in | | | |
|---|---|---|---|---|---|
| Name | Material number | EU 149 Part 2 1980 | Germany SEW 92-75 | France | United Kingdom |
| S260NC | 1.0971 | | QStE 260 N | | |
| | | Fe E 275-TD | | | |
| S315NC | 1.0973 | | QStE 300 N | | 40/30 |
| S355NC | 1.0977 | Fe E 355-TD | QStE 360 N | no equivalent | 43/35<br>45/40 |
| S420NC | 1.0981 | Fe E 420-TD | QStE 420 N | | |
| | | | QStE 460 N | | 50/45 |
| | | Fe E 490-TD | QStE 500 N | | 60/55 |

## Annex C (informative)
## Minimum inside bend radii for cold forming

**Table C.1 Minimum inside bend radii for cold forming**

| Designation of steel grade | | Minimum recommended inside bend radii for nominal thicknesses (t) in mm | | |
|---|---|---|---|---|
| Name | Material number | $t \leq 3$ | $3 < t \leq 6$ | $t > 6$ |
| S260NC | 1.0971 | 0,25 $t$ | 0,5 $t$ | 1,0 $t$ |
| S315NC | 1.0973 | 0,25 $t$ | 0,5 $t$ | 1,0 $t$ |
| S355NC | 1.0977 | 0,25 $t$ | 0,5 $t$ | 1,0 $t$ |
| S420NC | 1.0981 | 0,5 $t$ | 1,0 $t$ | 1,5 $t$ |

[1)]The values are applicable for bend angles $\leq 90°$.

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BSI
389 Chiswick High Road
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