



BSI Standards Publication

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

Part 3: Technical delivery conditions for
normalized or normalized rolled steels

National foreword

This British Standard is the UK implementation of EN 10149-3:2013. It supersedes BS EN 10149-3:1996 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ISE/103, Structural Steels Other Than Reinforcements.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Hot rolled flat products made of high yield strength steels for cold forming - Part 3: Technical 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 techniques de livraison des aciers à l'état normalisé ou laminage normalisant

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

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Foreword

This document (EN 10149-3:2013) has been prepared by Technical Committee ECISS/TC 103 “Structural steel other than reinforcements”, the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by March 2014, and conflicting national standards shall be withdrawn at the latest by March 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 10149-3:1995.

In comparison with EN 10149-3:1995, the following significant technical change was made:

— subclause 7.5.3 was completely revised.

The titles of the other Parts of this European Standard are:

— *Part 1: General technical delivery conditions;*

— *Part 2: Technical delivery conditions for the thermomechanical rolled steels.*

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard, in addition to EN 10149-1, 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 normalised or normalised 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 ≤ 20 mm.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 10029, *Hot-rolled plates 3 mm thick or above - Tolerances on dimensions and shape*

EN 10051, *Continuously hot-rolled strip and plate/sheet cut from wide strip of non-alloy and alloy steels - Tolerances on dimensions and shape*

EN 10149-1:2013, *Hot rolled flat products made of high yield strength steels for cold forming - Part 1: General technical delivery conditions*

EN ISO 14713-2:2009, *Zinc coatings – Guidelines and recommendations for the protection against corrosion of iron and steel in structures – Part 2: Hot dip galvanizing (ISO 14713-2:2009)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 10149-1:2013 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 EN 10149-1.

For hot rolled plate tolerances, the basic requirements shall be in accordance with EN 10029, including thickness tolerances to class A, unless otherwise agreed at the time of the order.

For plates cut from continuously hot rolled strip, the thickness tolerances shall be in accordance with EN 10051.

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 and grades

All steel grades of EN 10149-3 are alloy quality steels according to EN 10020.

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

6.2 Designation

The designation shall comply with EN 10149-1.

7 Technical requirements

7.1 Steel manufacturing process

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

See EN 10149-1:2013, Clause 11, option 1).

7.2 Delivery condition

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

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

See EN 10149-1:2013, 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 EN 10149-1:2013, 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 order, the verification of the impact energy value shall be carried out in accordance with EN 10149-1.

See EN 10149-1:2013, 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

7.5.2.1 General

NOTE Recommendations regarding hot and cold forming are laid down in CEN/TR 10347.

7.5.2.2 Cold forming

7.5.2.2.1 General

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

7.5.2.2.2 Flangeability

The products are suitable for flanging without cracking.

7.5.2.2.3 Roll forming

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

See EN 10149-1:2013, Clause 11, option 6).

7.5.3 Hot-dip zinc-coating

EN ISO 1461 should be used to specify coating requirements. EN ISO 14713-2 provides further guidance, including information on the influence of various factors, including steel chemical composition, on the coating formation.

Option 7) (see EN 10149-1:2013, Clause 11) can be used to order steels with a chemical composition required for hot-dip zinc coating. When option 7) is implemented, the purchaser and manufacturer shall agree with a steel composition (ladle analysis) of silicon and phosphorous according to either Category A (or steels satisfying the formula $Si \leq 0,03 \%$ and $Si+2.5P \leq 0,09 \%$) or Category B (limited to $0,14 \% < Si \leq 0,25 \%$) or Category D (limited to $0,25 \% < Si \leq 0,35 \%$) with required values as cited by the ranges given in EN ISO 14713-2:2009, Table 1, column 2.

Table 1 of EN ISO 14713-2:2009 gives guidance on typical coating characteristics associated with certain steel compositions on the basis of the surface composition of silicon and phosphorous.

7.6 Surface finish

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

See EN 10149-1:2013, Clause 11, option 8).

7.7 Internal soundness

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

See EN 10149-1:2013, Clause 11, option 9).

8 Inspection and testing

8.1 General

The products shall be supplied in accordance with EN 10149-1:2013, 8.1.

See EN 10149-1:2013, 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 EN 10149-1:2013, Clause 11, option 4).

8.5 Preparation of samples and test pieces

8.5.1 General

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

8.5.2 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 ≥ 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 order, see EN 10149-1:2013, 7.4.2.1).

See EN 10149-1:2013, 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 EN 10149-1:2013, Clause 11, option 11).

10 Disputes

In case of dispute, EN 10149-1 applies.

11 Options

See EN 10149-1:2013, Clause 11, options 1) to 11).

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

Table 1 — Chemical composition of the ladle analysis for normalised or normalised rolled steels

Designation of steel grade		C	Mn	Si	P	S	Al	Nb	V	Ti
		% max.	% max.	% max.	% max.	% max. a	total % min. b	% max. c	% max. c	% max. c
Steel name	Steel 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

^a If agreed at the time of the order the sulphur content shall be max. 0,010 % (ladle analysis). See EN 10149-1:2013, Clause 11, option 12).

^b If sufficient N-binding elements are present, the minimum total Al content does not apply.

^c The sum of Nb, V and Ti shall be max. 0,22 %.

Table 2 — Mechanical properties for normalised or normalised rolled steels

Designation of steel grade		Minimum yield strength R_{eH} MPa ^{a, d}	Tensile strength R_m MPa ^{a, d}	Minimum percentage elongation at fracture A % ^a Nominal thickness in mm		Bending at 180° minimum mandrel diameter ^{b, c}
Steel name	Steel number			< 3 $L_o = 80$ mm	≥ 3 $L_o = 5,65 \sqrt{S_o}$	
S260NC	1.0971	260	370 - 490	24	30	0t
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

^a 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.

^b The values for the bend test apply to transverse test pieces.

^c t = thickness in mm of test piece for bend test.

^d 1MPa = 1N/mm².

Annex A (normative)

Location of test pieces

This annex gives the location of test pieces.

Table A.1 — Location of test pieces

Dimensions in millimetres

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	
^a Rolled surface.				

Annex B
 (informative)

Minimum inside bend radii for cold forming

Table B.1 — Minimum inside bend radii for cold forming

Designation of steel grade		Minimum recommended inside bend radii for nominal thicknesses (<i>t</i>) in mm		
Steel name	Steel number	^a		
		$t \leq 3$	$3 < t \leq 6$	$t > 6$
S260NC	1.0971	0,25 <i>t</i>	0,5 <i>t</i>	1,0 <i>t</i>
S315NC	1.0973	0,25 <i>t</i>	0,5 <i>t</i>	1,0 <i>t</i>
S355NC	1.0977	0,25 <i>t</i>	0,5 <i>t</i>	1,0 <i>t</i>
S420NC	1.0981	0,5 <i>t</i>	1,0 <i>t</i>	1,5 <i>t</i>

^a The values are applicable for bend angles $\leq 90^\circ$.

Bibliography

- [1] CEN/TR 10347, *Guidance for forming of structural steels in processing*
- [2] EN 10020, *Definition and classification of grades of steel*
- [3] EN ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods (ISO 1461)*

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