
**Hot-rolled twin-roll cast steel sheet of
structural quality and high strength
steel**

*Tôles en acier de construction et en acier à haute résistance laminées
à chaud par coulée entre cylindres*

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Contents

	Page
Foreword.....	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Dimensions	2
5 Conditions of manufacture	2
5.1 Steelmaking.....	2
5.2 Chemical composition.....	2
5.3 Chemical analysis.....	2
5.3.1 Heat analysis.....	2
5.3.2 Product analysis.....	3
5.4 Mechanical properties.....	4
5.5 Application.....	5
5.6 Weldability.....	5
5.7 Surface condition.....	5
5.8 Oiling.....	6
5.9 Skin passing.....	6
6 Dimensional and shape tolerances	6
7 Tensile test sampling	6
8 Tensile test	6
9 Retests	6
9.1 Machining and flaws.....	6
9.2 Elongation.....	6
9.3 Additional tests.....	6
10 Resubmission	6
11 Workmanship	7
12 Inspection and acceptance	7
13 Coil size	7
14 Marking	7
15 Information supplied by the purchaser	8
Bibliography	9

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 12, *Continuous mill flat rolled products*.

This second edition cancels and replaces the first edition (ISO 15179:2012), which has been technically revised.

The main changes are as follows:

- update of [Clause 3](#);
- modification of the title of [Clause 4](#).

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Hot-rolled twin-roll cast steel sheet of structural quality and high strength steel

1 Scope

This document specifies the requirements for hot-rolled twin-roll cast steel sheet of structural quality and high strength steel.

The product is intended for applications where specific mechanical properties are required. It is generally used in the delivered condition and is intended for bolted, riveted or welded structures, and it is produced on a wide strip mill, not a plate mill.

Structural quality twin-roll cast steel sheet is a carbon steel produced to specified mechanical properties and is available in a number of grades.

High strength hot-rolled twin-roll cast steel sheet, strengthened by microalloys is produced to specified mechanical properties and is available in a number of grades and classes.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature*

ISO 16160, *Hot-rolled steel sheet products — Dimensional and shape tolerances*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

hot-rolled twin-roll cast steel sheet

product resulting from the twin-roll process to obtain the required sheet thickness and tolerances

3.2

hot-rolled twin-roll cast descaled steel sheet

hot-rolled steel sheet from which oxide or scale has been removed, commonly by pickling in an acid solution

Note 1 to entry: Descaling can also be performed by mechanical methods such as grit blasting. Some change in properties can result from descaling.

3.3

mill edge

normal side edge without any definite contour produced in hot-rolling

Note 1 to entry: Mill edges can contain some irregularities, such as cracked or torn edges or thin (feathered) edges.

3.4

sheared edge

normal edge obtained by shearing, slitting, or trimming a mill edge product

Note 1 to entry: Normal processing does not necessarily provide a definite position of the slitting burr.

3.5

twin-roll cast steel sheet

steel sheet produced by casting to near final thickness directly from the liquid metal with minimal hot-rolling to achieve the final thickness

3.6

skin passing

light cold rolling of the product

Note 1 to entry: The purpose of skin passing is one or more of the following: to minimize the appearance of coil breaks, stretcher strains and fluting; to control the shape; or to obtain the required surface finish.

Note 2 to entry: Some increase in hardness and some loss in ductility will result from skin passing.

3.7

lot

up to a specified quantity of steel sheet of the same designation rolled to the same thickness and surface condition

4 Dimensions

4.1 Hot-rolled twin-roll cast steel sheet is commonly produced in thicknesses from 0,7 mm to 2,0 mm inclusive and in widths of up to 2 000 mm maximum in coils and cut lengths.

4.2 Hot-rolled twin-roll cast steel sheet less than 600 mm wide, slit from wide sheet, is considered as sheet.

5 Conditions of manufacture

5.1 Steelmaking

Unless otherwise agreed by the interested parties, the processes used in making the steel and in manufacturing hot-rolled twin-roll cast steel sheet are left to the discretion of the manufacturer. On request, the purchaser shall be informed of the steelmaking process being used.

5.2 Chemical composition

The chemical composition (heat analysis) shall conform to the requirements given in [Tables 1, 2 and 3](#).

5.3 Chemical analysis

5.3.1 Heat analysis

An analysis of each heat shall be made by the manufacturer in order to determine conformity with the requirements given in [Tables 1, 2 and 3](#). On request, a report of the heat analysis shall be made available to the purchaser or the purchaser's representative. Each of the elements listed in [Tables 1, 2 and 3](#) shall be included in the report of the heat analysis. When the amount of copper, nickel, chromium or molybdenum present is less than 0,02 %, the analysis may be reported as "<0,02 %".

5.3.2 Product analysis

A product analysis may be made by the purchaser in order to verify the specified analysis of the product and shall take into consideration any normal heterogeneity. The product analysis tolerances shall be in accordance with [Tables 3](#) and [4](#).

Table 1 — Chemical composition (heat analysis) for structural quality steel sheet

Mass fractions in percent

Grade designation	C max.	Mn max.	P max.	S max.	Si ^a
HR275	0,25	1,35	0,040	0,035	-
HR340					
HR380					
HR410					
HR480					
HR550					
^a “-” indicates that there is no requirement, but the analysis shall be reported.					

Table 2 — Chemical composition (heat analysis) for high strength steel sheet

Mass fractions in percent

Grade designation	Class	C max.	Mn max.	P max.	S max.	Si ^a	V ^d min.	Ti ^d min.	Nb ^d min.	N ^a
HSS 310	1 ^b	0,22	1,35	0,04	0,04	-	0,008	0,008	0,008	-
	2	0,15	1,35	0,04	0,04	-	0,008	0,008	0,008	-
HSS 340	1 ^b	0,23	1,35	0,04	0,04	-	0,008	0,008	0,008	-
	2	0,15	1,35	0,04	0,04	-	0,008	0,008	0,008	-
HSS 380	1 ^b	0,25	1,35	0,04	0,04	-	0,008	0,00	0,008	-
	2	0,15	1,35	0,04	0,04	-	0,008	0,008	0,008	-
HSS 410	1	0,26	1,50	0,04	0,04	-	0,008	0,008	0,008	-
	2	0,15	1,50	0,04	0,04	-	0,008	0,008	0,008	-
HSS 450	1	0,26	1,50	0,04	0,04	-	0,008	0,008	0,008	- ^c
	2	0,15	1,50	0,04	0,04	-	0,008	0,008	0,008	- ^c
HSS 480	1	0,26	1,65	0,04	0,04	-	0,008	0,008	0,008	- ^c
	2	0,15	1,65	0,04	0,04	-	0,008	0,008	0,008	- ^c
HSS 550	1	0,26	1,65	0,04	0,04	-	0,008	0,008	0,008	- ^c
	2	0,15	1,65	0,04	0,04	-	0,008	0,008	0,008	- ^c

^a “-” indicates that there is no requirement, but the analysis shall be reported.

^b For each reduction of 0,01 % below the specified carbon maximum, an increase of 0,06 % manganese above the specified maximum shall be permitted up to a maximum of 1,50 %.

^c The purchaser has the option of restricting the nitrogen content. It should be noted that, depending on the microalloying scheme (for example use of vanadium) of the producer, nitrogen is permitted as a deliberate addition. Consideration should be given to the use of nitrogen-binding elements (for example vanadium and titanium).

^d The producer shall add at least one or more of the elements V, Ti or Nb.

Table 3 — Limits on additional chemical elements for structural quality steel sheet

Mass fractions in percent

Element	Cu max.	Ni max.	Cr max.	Mo max.	Nb max.	V max.	Ti max.
Heat analysis	0,50	0,30	0,30	0,15	0,008	0,008	0,008
Product analysis	0,53	0,33	0,34	0,16	0,018	0,018	0,018

Table 4 — Product analysis tolerances

Mass fractions in percent

Element	Maximum of specified element	Tolerance over the maximum specified
C	0,26	0,04
Mn	1,65	0,05
P	0,04	0,01
S	0,04	0,01

NOTE The above maximum tolerance is the allowable excess over the requirements of the heat analysis specified in [Tables 1](#) and [2](#).

5.4 Mechanical properties

The mechanical properties shall, at the time that the steel is made available for shipment, satisfy the applicable requirements of [Tables 5](#) and [6](#), when they are determined on test pieces obtained in accordance with the requirements in [Clause 7](#).

Table 5 — Mechanical properties for structural quality steel sheet

Grade designation	R_{eL} ^a min. MPa	R_m min. MPa	A ^b min. %	
			$e \leq 2$ mm	
			$L_0 = 50$ mm	$L_0 = 80$ mm
HR275	275	380	15	14
HR340	340	340	9	8
HR380	380	380	8	7
HR410	410	410	7	6
HR480	480	480	6	5
HR550	550	550	5	4

Key

R_{eL} : lower yield strength

R_m : tensile strength

A : percentage elongation after fracture

L_0 : gauge length on original test piece

e : thickness of steel sheet, in millimetre(s)

NOTE 1 MPa = 1 N/mm²

^a The yield strength may be measured either by 0,5 % elongation proof stress, $R_{t0,5}$ (proof strength under load) or by 0,2 % offset, $R_{p0,2}$, where a definite yield strength phenomenon is not present.

^b Use either $L_0 = 50$ mm or $L_0 = 80$ mm to measure elongation. For materials up to and including 0,6 mm in thickness, the elongation values in this table shall be reduced by 2.

Table 6 — Mechanical properties for high strength steel sheet

Grade designation	Class	R_{eL} ^a min. MPa	R_m min. MPa	A ^b min. %	
				$e \leq 2$ mm	
				$L_0 = 50$ mm	$L_0 = 80$ mm
HSS 310	1	310	410	18	17
	2	310	380	18	17
HSS 340	1	340	450	15	14
	2	340	410	15	14
HSS 380	1	380	480	13	12
	2	380	450	13	12
HSS 410	1	410	520	11	10
	2	410	480	11	10
HSS 450	1	450	550	10	9
	2	450	520	10	9
HSS 480	1	480	585	8	7
	2	480	550	8	7
HSS 550	1	550	565	7	6
	2	550	620	7	6

Key

R_{eL} : lower yield strength
 R_m : tensile strength
 A : percentage elongation after fracture
 L_0 : gauge length on original test piece
 e : thickness of steel sheet, in millimetre(s)

NOTE 1 MPa = 1 N/mm²

^a The yield strength may be measured either by 0,5 % elongation proof stress, $R_{t0,5}$ (proof strength under load) or by 0,2 % offset, $R_{p0,2}$, where a definite yield strength phenomenon is not present.

^b For thicknesses up to 2 mm, use either $L_0 = 50$ mm or $L_0 = 80$ mm. In cases of dispute, however, only the results obtained on a 50 mm test piece shall be valid.

5.5 Application

It is desirable that hot-rolled twin-roll cast steel sheet be identified for fabrication by the name of the part or by the intended application. Proper identification of the part may include visual examination, prints or description, or a combination of these.

5.6 Weldability

This product is normally suitable for welding if appropriate welding conditions are selected. For non-descaled steel, it can be necessary to remove the scale or oxide depending upon the welding method. As the carbon increases above 0,15 %, spot welding becomes increasingly difficult.

5.7 Surface condition

Oxide or scale on hot-rolled twin-rolled cast steel sheet is subject to variations in thickness, adherence, and colour. Removal of the oxide or scale by pickling or grit blasting can disclose surface imperfections not readily visible to this operation.

5.8 Oiling

As a deterrent to rusting, a coating of oil is usually applied to hot-rolled twin-roll cast descaled steel sheet, but may be furnished not oiled, if required. The oil is not intended as a forming lubricant and should be easily removable using degreasing chemicals. Upon request, the manufacturer shall advise the purchaser which type of oil has been used. Hot-rolled twin-roll cast descaled steel sheet may be ordered not oiled; in which case, the manufacturer has limited responsibility if oxidation occurs.

5.9 Skin passing

The purchaser shall state whether skin passing is required.

6 Dimensional and shape tolerances

Dimensional and shape tolerances applicable to hot-rolled twin-roll cast steel sheet shall be as given in ISO 16160. These tolerances also apply to hot-rolled twin-roll cast descaled steel sheet.

7 Tensile test sampling

One representative sample for the tensile test required in [Tables 5](#) and [6](#) shall be taken from each lot of 50 t or less for shipment.

8 Tensile test

The tensile test shall be carried out in accordance with ISO 6892-1. Transverse test pieces shall be taken mid-way between the centre and the edge of the sheet as rolled.

9 Retests

9.1 Machining and flaws

If any test piece shows defective machining or develops flaws, it shall be discarded and another test piece shall be substituted.

9.2 Elongation

If the percentage elongation of any test piece is less than that specified in [Tables 5](#) and [6](#) and if any part of the fracture is outside the middle half of the gauge length as scribed before the test, the test shall be discarded and a retest shall be carried out.

9.3 Additional tests

If any test does not give the specified results, two additional tests shall be conducted on samples selected at random from the same lot. Both retests shall conform to the requirements of this document; otherwise the lot shall be rejected.

10 Resubmission

10.1 The manufacturer may resubmit for acceptance, the products that have been rejected during earlier inspection because of unsatisfactory properties, after the rejected products have been subjected to a suitable treatment (e.g. selection, heat treatment), which, on request, shall be indicated to the purchaser. In this case, tests shall be carried out as if they applied to a new lot.

10.2 The manufacturer shall have the right to subject the rejected products to a new examination for compliance with the requirements for another quality.

11 Workmanship

11.1 The surface condition shall be that normally obtained on a hot-rolled twin-roll cast steel sheet or hot-rolled twin-roll cast descaled steel sheet.

11.2 The steel sheet in cut lengths shall be free from amounts of laminations, surface flaws and other imperfections that are detrimental to the final product or to subsequent appropriate processing.

11.3 Processing for shipment in coils does not afford the manufacturer the opportunity to observe readily, or to remove non-conforming portions, as can be carried out on the cut length product. However, it is the responsibility of the manufacturer to provide a product that meets the requirement for surface condition that is normally obtained on a hot-rolled twin-roll cast steel sheet or hot-rolled twin-roll cast descaled steel sheet.

12 Inspection and acceptance

12.1 Although not usually required for products covered by this document, when the purchaser specifies that inspection and tests for acceptance must be observed prior to shipment from the manufacturer's works, the manufacturer shall afford the purchaser's inspector all reasonable facilities to determine whether the steel is being furnished in accordance with this document.

12.2 Steel that is reported to be defective after arrival at the user's works shall be set aside, properly and correctly identified, and adequately protected. The manufacturer shall be notified so that the reported non-conforming material is properly investigated.

13 Coil size

When steel sheet in accordance with this document is ordered in coils, a minimum or range of acceptable inside diameter(s) (ID) shall be specified. In addition, the maximum outside diameter (OD) and the maximum acceptable coil mass shall be specified.

14 Marking

Unless otherwise stated, the following minimum requirements for identifying the steel sheet shall be legibly stencilled on the top of each lift or shown on a tag attached to each coil or shipping unit:

- a) the manufacturer's name or identifying brand;
- b) a reference to this document, i.e. ISO 15179:2022;
- c) the grade and class designation;
- d) the order number;
- e) the product dimensions;
- f) the lot number;
- g) the mass;
- h) the coil or bundle number.