
Structural steels —

Part 5:

**Technical delivery conditions for
structural steels with improved
atmospheric corrosion resistance**

Aciers de construction —

*Partie 5: Conditions techniques de livraison pour aciers de
construction à résistance améliorée à la corrosion atmosphérique*

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

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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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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 3, *Steels for structural purposes*.

This second edition cancels and replaces the first edition (ISO 630-5:2014), which has been technically revised.

The main changes are as follows:

- grades S295W, S355WSE, S420W, S460W, S500W, S550W and pertaining requirements have been added;
- applicable thickness ranges have been added in the scope;
- terms and definitions concerning heat treatments have been deleted because defined in ISO 630-1;
- quality E (impact testing at -40 °C) has been added;
- list of options has been integrated in ISO 630-1;
- test units have been updated;
- Bibliography has been updated;
- the content of the document has been updated to harmonize with the other parts of the ISO 630 series.

A list of all parts in the ISO 630 series can be found on the ISO website.

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.

Structural steels —

Part 5:

Technical delivery conditions for structural steels with improved atmospheric corrosion resistance

1 Scope

This document specifies qualities for flat and long products of hot-rolled structural steels with improved atmospheric corrosion resistance in the as-rolled, normalized/normalized rolled, thermomechanical control processed and quenched and tempered delivery conditions. It is applicable to steel plates rolled on a reversing mill, wide flats, hot-rolled sections and bars, which are intended for use in welded or bolted structures.

This document covers 14 grades and 5 qualities. Grades S235, S295, S355, S420, S460, S500 and S550 are covered in [Annex A](#). Grades SG245, SG345, SG365, SG400, SG460, SG500, and SG700 are covered in [Annex B](#). Not all grades are available in all qualities, and some qualities have Charpy V-notch requirements.

The steels specified in this document are applicable to hot-rolled plates, wide flats, sections and bars with a maximum nominal thickness of 150 mm for grades S235W, S295W, S355W, S420W, S460W, S500W and S550W, with a maximum nominal thickness of 200 mm for grades SG245, SG345, SG365, SG400, SG460, SG500, and SG700.

The steels specified in this document are applicable to hot-rolled plates with a maximum nominal thickness of 20 mm for grades S295WP and S355WP.

The steels specified in this document are applicable to hot-rolled wide flats, sections and bars with a maximum nominal thickness of 40 mm for grades S295WP and S355WP.

The steels specified in this document are applicable to hot-rolled plates with a maximum nominal thickness of 80 mm for grade S355WSE.

This document does not include the following structural steels, some of which are covered by other International Standards.

- sheet and strip, e.g. ISO 4995 or ISO 4996;
- tubular products, e.g. ISO 12633-1, ISO 12633-2.

NOTE In this document, the term of "thickness" is considered as "nominal thickness", unless otherwise stated.

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 630-1, *Structural steels — Part 1: General technical delivery conditions for hot-rolled products*

ISO 643, *Steels — Micrographic determination of the apparent grain size*

ISO 4948-1, *Steels — Classification — Part 1: Classification of steels into unalloyed and alloy steels based on chemical composition*

ISO 10474, *Steel and steel products — Inspection documents*

ASTM G101, *Standard Guide for Estimating the Atmospheric Corrosion Resistance of Low-Alloy Steels*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 630-1 and the following 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

fine-grain steel

steel with fine grain structure with an equivalent index of ferritic grain size ≥ 6 determined in accordance with specific requirements

Note 1 to entry: The requirements shall be in accordance with ISO 643.

Note 2 to entry: See [6.1](#).

3.2

steel with improved atmospheric corrosion resistance

steel in which a certain number of alloying elements, such as P, Cu, Cr, Ni, etc., have intentionally been added in order to increase its resistance to atmospheric corrosion, by forming an auto-protective oxide layer on the base metal

Note 1 to entry: These steels are commonly known as “weathering steels”.

Note 2 to entry: For additional information for the use of steel with improved atmospheric corrosion resistance, see [Annex D](#).

4 Classification and designation

4.1 Classification

The steel grades specified in this document shall be classified as unalloyed or alloy steels in accordance with ISO 4948-1.

4.2 Designation (grades and qualities)

Steel grades and qualities differ in their specified mechanical properties and impact energy requirements.

Grades S295 and SG345 are subdivided into classes W and WP, which differ primarily in their phosphorus contents; grade S355 is subdivided into classes W, WP and WSE, which differ primarily in phosphorus content and alloying element requirements for Sn, Cr, Mo and Cu; grades SG245, SG365, and SG460 are subdivided into classes W1 and W2, which differ primarily in alloying element requirements for Si, Cr, Cu and Ni (see [Table B.1](#)). Class W denotes weathering steel; class WP denotes weathering steel with higher levels of phosphorus; class WSE denotes weathering steel with an improved resistance to saline environments.

- Quality A: no impact testing
- Quality B: impact testing at +20 °C

- Quality C: impact testing at 0 °C
- Qualities D and D1: impact testing at –20 °C
- Quality E: impact testing at –40 °C

NOTE Quality D1 specifies a higher minimum impact energy than D.

5 Information to be supplied by purchaser

5.1 Mandatory information

The information that shall be supplied by the purchaser at the time of the order is specified in ISO 630-1.

5.2 Options

The options of ISO 630-1 may apply.

6 Requirements

6.1 Steelmaking process

The steel making process shall be in accordance with ISO 630-1.

If a special steelmaking process has been specified, this shall be reported in the inspection document.

The steels shall contain sufficient amounts of nitrogen-binding elements and shall be fine-grain steel.

The steels specified in this specification shall be fully killed.

6.2 Delivery condition

Grades S235, S295 and S355 are delivered in the as-rolled, normalized rolled, normalized, thermomechanical controlled processed or quenched and tempered condition. Grades S420, S460, S500 and S550 are delivered in the thermomechanical controlled processed or quenched and tempered condition. The delivery condition shall be indicated in the inspection document.

Grades SG245, SG345, SG365, SG400 and SG460 are delivered in the as-rolled, normalized rolled, normalized, thermomechanical controlled processed or quenched and tempered condition. Grades SG500 and SG700 are delivered in the thermomechanical controlled processed or quenched and tempered condition. The delivery condition shall be indicated in the inspection document.

6.3 Chemical composition

6.3.1 Heat analysis

The chemical composition determined by heat analysis shall conform with the values given in [Table A.1](#) or [Table B.1](#).

6.3.2 Product analysis

The product analysis of grades S235, S295, S355, S420, S460, S500 and S550 shall conform with the values given in [Table A.2](#).

The permitted deviation of product analysis of SG245, SG345, SG365, SG400, SG460, SG500, and SG700 shall conform with the values given in [Table B.2](#).

6.3.3 Carbon equivalent value

The maximum carbon equivalent value (C_{EV}) for grades S235, S295, S355, S420, S460, S500 and S550 shall be in accordance with [Table A.1](#).

The carbon equivalent value (C_{EV}) shall be determined using the IIW (International Institute for Welding) formula, given as [Formula \(1\)](#):

$$C_{EV} = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15} \quad (1)$$

6.4 Mechanical properties

6.4.1 Tensile properties

The tensile properties at room temperature shall conform with the values given in [Table A.3](#) or [Table B.3](#) depending on the steel grade.

6.4.2 Charpy V-notch impact properties

The impact properties of Charpy V-notch test pieces shall conform with the values given in [Table A.4](#) or [Table B.4](#) depending on the steel grade. The orientation of the specimens shall be longitudinal unless transverse orientation is agreed between purchaser and manufacturer (see [5.2](#) and ISO 630-1).

The impact values for grades S295WP, S355WP shall be verified if agreed at the time of the order (see [Table A.4](#)).

6.5 Surface conditions

Surface conditions shall be in accordance with ISO 630-1.

6.6 Internal soundness

Internal soundness shall be in accordance with ISO 630-1.

6.7 Dimensions, tolerances on dimensions and shape and mass

Dimensions, tolerances on dimensions and shape and mass shall be in accordance with ISO 630-1.

7 Inspection

The type of inspection (specific or non-specific) and the type of inspection document in accordance with ISO 10474 shall be specified at the time of the order. Inspection shall be in accordance with ISO 630-1.

8 Sampling — Frequency of testing

8.1 Verification

The verification of mechanical properties shall be by heat. Verification by lot shall be by agreement between the producer and purchaser.

8.2 Test units

8.2.1 Test units for grades S235, S295, S355, S420, S460, S500, S550

The test unit shall contain products of the same form, grade quality and delivery condition, and the same thickness range as specified in [Table A.3](#) for the yield strength and shall be taken by heat:

- 60 tonnes or part thereof;
- 80 tonnes or part thereof for heavy sections with a mass > 200 kg/m;
- 80 tonnes or part thereof for all sections if the mass of the heat exceeds 200 tonnes.

By agreement at time of order, two tests by heat can be used.

8.2.2 Test units for grades SG245, SG345, SG365, SG400, SG460, SG500, SG700

The test unit shall contain products of the same form, grade, quality and delivery condition, and the same thickness range as specified in [Table B.3](#) for the yield strength, and shall be 50 tonnes or part thereof. By agreement at time of ordering, two tests by heat can be used.

9 Test methods

Test methods shall be in accordance with ISO 630-1.

10 Marking

Marking shall be in accordance with ISO 630-1.

11 Information about technological properties

11.1 Weldability

See [Annex C](#) for additional information about weldability.

11.2 Use of steel with improved corrosion resistance

See [Annex D](#) for additional information about the use of steel with improved corrosion resistance.

Annex A
(normative)

Steel grades S235, S295, S355, S420, S460, S500, S550: Chemical composition and mechanical properties

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Table A.1 — Chemical composition % by mass (heat analysis)

Designation	Grade	C % max.	Si % max.	Mn %	P % max. a	S % max. a	N % max.	Addition of nitrogen bind- ing elements b	Cr %	Cu %	Others	CEV % max.
S235W	C	0,13	0,40	0,20 to 0,60	0,035	0,035	0,009 c,f	—	0,40 to 0,80	0,25 to 0,55	d	0,44
	D											
	E											
S295W	C	0,15	0,50	0,30 to 1,00	0,035	0,030	0,009 c,f	—	0,40 to 0,80	0,25 to 0,55	d,e	0,48
	D											
	E											
S295WLP	C	0,12	0,40	0,20 to 0,50	0,07 to 0,12	0,030	0,009 c,f	—	0,30 to 0,65	0,25 to 0,55	d	0,48
	D											
	E											
S355W	C	0,16	0,50	0,50 to 1,50	0,035	0,035	0,009 c,f	—	0,40 to 0,80	0,25 to 0,55	d,e	0,52
	D											
	D1											
	E											
S355WLP	C	0,12	0,75	1,0 max.	0,06 to 0,15	0,035	0,009 f	—	0,30 to 1,25	0,25 to 0,55	d	0,52
	D											
	E											

a For long products, the P and S content can be 0,005 % higher.

b The steels shall contain at least one of the following elements: Al total $\geq 0,020$ %, Nb: 0,015 % to 0,060 %, V: 0,02 % to 0,12 %, Ti: 0,02 % to 0,10 %. If these elements are used in combination, at least one of them shall be present with the minimum content indicated.

c It is permissible to exceed the specified values provided that for each increase of 0,001 % N, the maximum P content shall be reduced by 0,005 %; the N content of the ladle analysis, however, shall not be more than 0,012 %.

d The steels can show a Ni content of max. 0,65 %.

e The steels can contain max. 0,30 % Mo and max. 0,15 % Zr.

f The maximum value for nitrogen does not apply if the chemical composition shows a minimum total Al content of 0,020 %, or if sufficient, other N binding elements are present. The N binding elements shall be mentioned in the inspection document.

g The steel shall contain 0,1 % to 1,0 % of Sn and 1,2 % max. of Sn+Cr+Mo+Cu.

Table A.1 (continued)

Designation	Grade	C % max.	Si % max.	Mn %	P % max. a	S % max. a	N % max.	Addition of nitrogen bind- ing elements b	Cr %	Cu %	Others	CEV % max.
S355WSE	C	0,12	0,75	2,0 max.	0,035	0,035	—	yes	0,80 max.	0,15 to 0,55	d, e, g	0,52
	D				0,030							
	E				0,025							
S420W	C	0,12	0,65	1,10 max.	0,030	0,025	—	yes	0,30 to 1,25	0,25 to 0,55	d, e	0,52
	D				0,025							
	E				0,015							
S460W	C	0,12	0,65	1,50 max.	0,030	0,025	—	yes	0,30 to 1,25	0,25 to 0,55	d, e	0,52
	D				0,025							
	E				0,020							
S500W	C	0,12	0,65	2,0 max.	0,030	0,025	—	yes	0,30 to 1,25	0,25 to 0,55	d, e	0,55
	D				0,025							
	E				0,020							
S550W	C	0,16	0,65	2,0 max.	0,030	0,025	—	yes	0,30 to 1,25	0,25 to 0,55	d, e	0,57
	D				0,025							
	E				0,020							

a For long products, the P and S content can be 0,005 % higher.

b The steels shall contain at least one of the following elements: Al total $\geq 0,020$ %, Nb: 0,015 % to 0,060 %, V: 0,02 % to 0,12 %, Ti: 0,02 % to 0,10 %. If these elements are used in combination, at least one of them shall be present with the minimum content indicated.

c It is permissible to exceed the specified values provided that for each increase of 0,001 % N, the maximum P content shall be reduced by 0,005 %; the N content of the ladle analysis, however, shall not be more than 0,012 %.

d The steels can show a Ni content of max. 0,65 %.

e The steels can contain max. 0,30 % Mo and max. 0,15 % Zr.

f The maximum value for nitrogen does not apply if the chemical composition shows a minimum total Al content of 0,020 %, or if sufficient, other N binding elements are present. The N binding elements shall be mentioned in the inspection document.

g The steel shall contain 0,1 % to 1,0 % of Sn and 1,2 % max. of Sn+Cr+Mo+Cu.

Table A.2 — Chemical composition % by mass (product analysis) based on Table A.1

Grade	Designation Quality	C % max.	Si % max.	Mn %	P % max. ^a	S % max. ^a	N % max.	Addition of ni- trogen binding elements ^b	Cr %	Cu %	Others	
S235W	C	0,16	0,45	0,15 to 0,70	0,040	0,040	0,010 c, f	—	0,35 to 0,85	0,20 to 0,60	d	
	D											0,035
	E											0,030
S295W	C	0,18	0,55	0,25 to 1,10	0,040	0,035	0,010 c, f	—	0,35 to 0,85	0,20 to 0,60	d, e	
	D											0,035
	E											0,025
S295WP	C	0,15	0,45	0,15 to 0,60	0,06 to 0,13	0,035	0,010 c, f	—	0,25 to 0,70	0,20 to 0,50	d	
	D											0,030
	E											0,025
S355W	C	0,19	0,55	0,45 to 1,60	0,040	0,040	0,010 c, f	—	0,35 to 0,85	0,20 to 0,60	d, e	
	D											0,035
	D1											0,035
	E											0,030
S355WP	C	0,15	0,80	1,10 max.	0,05 to 0,16	0,040	0,010 f	—	0,25 to 1,35	0,20 to 0,60	d	
	D											0,035
	E											0,030
S355WSE	C	0,15	0,80	2,10 max.	0,040	0,040	—	—	0,85	0,10 to 0,60	d, e, g	
	D											0,035
	E											0,030

^a For long products, the P and S content can be 0,005 % higher.

^b The steels shall contain at least one of the following elements: Al total $\geq 0,020$ %, Nb: 0,010 % to 0,065 %, V: 0,01 % to 0,14 %, Ti: 0,01 % to 0,12 %. If these elements are used in combination, at least one of them shall be present with the minimum content indicated.

^c It is permissible to exceed the specified values provided that for each increase of 0,001 % N, the maximum P content shall be reduced by 0,005 %; the N content of the product analysis, however, shall not be more than 0,013 %.

^d The steels can show a Ni content of max. 0,70 %.

^e The steels can contain max. 0,35 % Mo and max. 0,17 % Zr.

^f The maximum value for nitrogen does not apply if the chemical composition shows a minimum total Al content of 0,020 %, or if sufficient, other N binding elements are present. The N binding elements shall be mentioned in the inspection document.

^g The steel shall contain 0,05 % to 1,05 % of Sn and 1,25 % max. of Sn+Cr+Mo+Cu.

Table A.2 (continued)

Grade	Designation Quality	C % max.	Si % max.	Mn %	P % max. ^a	S % max. ^a	N % max.	Addition of ni- trogen binding elements ^b	Cr %	Cu %	Others
S420W	C	0,15	0,75	1,20 max.	0,035	0,030	—	yes	0,25 to 1,30	0,15 to 0,60	d, e
	D				0,030	0,025					
	E				0,025	0,020					
S460W	C	0,15	0,75	1,60 max.	0,035	0,030	—	yes	0,25 to 1,30	0,15 to 0,60	d, e
	D				0,030	0,025					
	E				0,025	0,020					
S500W	C	0,15	0,75	2,10 max.	0,035	0,030	—	yes	0,25 to 1,30	0,15 to 0,60	d, e
	D				0,030	0,025					
	E				0,025	0,020					
S550W	C	0,20	0,75	2,10 max.	0,035	0,030	—	yes	0,25 to 1,30	0,15 to 0,60	d e
	D				0,030	0,025					
	E				0,025	0,020					

^a For long products, the P and S content can be 0,005 % higher.

^b The steels shall contain at least one of the following elements: Al total $\geq 0,020$ %, Nb: 0,010 % to 0,065 %, V: 0,01 % to 0,14 %, Ti: 0,01 % to 0,12 %. If these elements are used in combination, at least one of them shall be present with the minimum content indicated.

^c It is permissible to exceed the specified values provided that for each increase of 0,001 % N, the maximum P content shall be reduced by 0,005 %; the N content of the product analysis, however, shall not be more than 0,013 %.

^d The steels can show a Ni content of max. 0,70 %.

^e The steels can contain max. 0,35 % Mo and max. 0,17 % Zr.

^f The maximum value for nitrogen does not apply if the chemical composition shows a minimum total Al content of 0,020 %, or if sufficient, other N binding elements are present. The N binding elements shall be mentioned in the inspection document.

^g The steel shall contain 0,05 % to 1,05 % of Sn and 1,25 % max. of Sn+Cr+Mo+Cu.

Table A.3 — Tensile properties at room temperature

Designation	Nominal thickness mm						Position of test pieces ^a	Nominal thickness mm								
	≤16	>16 ≤40	>40 ≤63	>63 ≤80	>80 ≤100	>100 ≤150		>1,5 ≤2	>2,5 ≤2,5	>2,5 ≤3	>40 ≤63	>63 ≤100	>100 ≤150			
	Minimum yield strength, R_{eH} ^a							Minimum elongation after fracture ^a								
Grade	MPa ^b						%									
S235W	235	225	215	215	215	195	360 to 510	360 to 510	350 to 500	21	20	21	26	25	24	22
S295W	295	285	275	255	255	255	430 to 560	430 to 560	430 to 560	19	20	21	26	25	24	24
S295WP ^c	295	285	—	—	—	—	430 to 560	430 to 560	—	19	20	21	26 ^e	—	—	—
S355W	355	345	335	325	315	295	510 to 680	470 to 630	450 to 600	16	17	18	22	21	20	18
S355WP ^c	355	345	—	—	—	—	510 to 680	470 to 630 ^e	—	14	15	16	20 ^e	19	18	18
S355WSE	355	345	335	325	—	—	510 to 680	470 to 630	—	16	17	18	22	21	20	18
S420W	420	400	390	380	370	365	520 to 680	500 to 660	460 to 620	15	15	15	19	18	17	16

^a For plate and wide flats with widths ≥ 600 mm, the direction transverse (t) to the rolling direction applies. For all other products, the values apply for the direction parallel (l) to the rolling direction.

^b 1 MPa = 1 N/mm².

^c For plate, applicable up to 20 mm; for wide flats, bars, and sections, applicable up to 40 mm.

Table A.4 — Longitudinal Charpy V-notch properties ^a

Designation		Temperature °C	Minimum energy ^a J
Grade	Quality		
S235W	C	0	27
	D	-20	27
	E	-40	27
S295W	C	0	34
	D	-20	34
	E	-40	27
S295WP ^b	C	0	34
	D	-20	34
	E	-40	27
S355W	C	0	27
	D	-20	27
	D1 ^d	-20	40 ^c
	E	-40	27
S355WP ^b	C	0	27
	D	-20	27
	E	-40	27
S355WSE	C	0	34
	D	-20	34
	E	-40	27
S420W	C	0	34
	D	-20	34
	E	-40	27
S460W	C	0	34
	D	-20	34
	E	-40	27
S500W	C	0	34
	D	-20	34
	E	-40	27
S550W	C	0	34
	D	-20	34
	E	-40	27

^a For nominal thicknesses ≤12 mm, see ISO 630-1.

^b The impact values shall be verified if agreed at the time of the order.

^c This value corresponds to 27 J at -30 °C.

^d See [4.2](#).

Annex B
(normative)

**Steel grades SG245, SG345, SG365, SG400, SG460, SG500, SG700:
Chemical composition and mechanical properties**

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Table B.1 — Chemical composition % by mass (heat analysis) ^a

Designation	Grade	C % max.	Si %	Mn %	P % max.	S % max.	Cr %	Cu %	Ni %	Mo %	V %	N % max.	B % max.	
SG245W1	A to C	0,18	0,15 to 0,65	1,45 max.	0,035	0,035	0,45 to 0,75	0,30 to 0,50	0,05 to 0,30	—	—	—	—	—
SG245W2	A to C	0,18	0,55 max.	1,25 max.	0,035	0,035	0,30 to 0,55	0,20 to 0,35	—	—	—	—	—	—
SG345W	A to D	0,20	0,15 to 0,65	0,75 to 1,35	0,04	0,05	0,40 to 0,70	0,20 to 0,40	0,50 max.	—	0,01 to 0,10	—	—	—
SG345WP ^b	A to D	0,15	—	1,00 max.	0,15	0,05	—	0,20 min.	—	—	—	—	—	—
SG365W1	A to C	0,18	0,15 to 0,65	1,40 max.	0,035	0,035	0,45 to 0,75	0,30 to 0,50	0,05 to 0,30	—	—	—	—	—
SG365W2	A to C	0,18	0,55 max.	1,40 max.	0,035	0,035	0,30 to 0,55	0,20 to 0,35	—	—	—	—	—	—
SG400W	B	0,15	0,15 to 0,55	2,00 max.	0,020	0,006	0,45 to 0,75	0,30 to 0,50	0,05 to 0,30	—	—	0,006	—	—
SG460W1	C	0,18	0,15 to 0,65	1,40 max.	0,035	0,035	0,45 to 0,75	0,30 to 0,50	0,05 to 0,30	—	—	—	—	—
SG460W2	C	0,18	0,55 max.	1,40 max.	0,035	0,035	0,30 to 0,55	0,20 to 0,35	—	—	—	—	—	—
SG500W	C	0,11	0,15 to 0,55	2,00 max.	0,020	0,006	0,45 to 0,75	0,30 to 0,50	0,05 to 0,30	—	—	0,006	—	—
SG700W	D	0,11	0,15 to 0,55	2,00 max.	0,015	0,006	0,45 to 1,20	0,30 to 1,50	0,05 to 2,00	0,60 max.	0,05 max.	0,006	0,006	0,005

Any element other than those listed in this table that is added intentionally shall be indicated to the purchaser.

^a These steels shall contain at least one of the following grain-refining elements in the proportions indicated below:

- Al_{total} ≥ 0,020 % or Al_{sol} ≥ 0,015 %;
- Nb = 0,015 % to 0,060 %;
- V = 0,02 % to 0,10 %;
- Ti = 0,02 % to 0,10 %.

If these elements are used in combination, at least one of them shall be present in the steel in the minimum specified quantity.

^b The atmospheric corrosion-resistance index, calculated on the basis of the heat analysis of the steel, as described in ASTM G101—Predictive Method Based on the Data of Larabee and Coburn, shall be 6,0 or higher.

Table B.2 — Permitted deviation of product analysis (% by mass) based on [Table B.1](#)

Element	Range of specified element %	Permissible deviation over maximum specified %
Carbon	≤0,15	0,03
	Over 0,15 to 0,21	0,04
Silicon	≤0,65	0,06
Manganese	≤2,00	0,10
Phosphorus	≤0,04	0,01
	Over 0,04 to 0,15	a
Sulfur	≤0,05	0,01
Vanadium	≤0,10	0,01
Niobium	≤0,06	0,01
Vanadium + Niobium	≤0,15	0,01
Titanium	≤0,10	0,01
Copper	≤1,00	0,03
	Over 1,00 to 1,50	0,05
Nickel	≤1,00	0,03
	Over 1,00 to 1,50	0,05
Chromium	≤0,90	0,04
	Over 0,90 to 1,20	0,06
Molybdenum	≤0,20	0,01
	Over 0,20 to 0,40	0,03
	Over 0,40 to 0,65	0,04
Nitrogen	≤0,030	0,005
Boron	any	a

^a Product analysis not applicable.

Table B.3 — Tensile properties

Designation	Nominal thickness ^a mm												Minimum elongation after fracture ^b				
	Yield strength min., R_{eH}			Yield strength min., R_{eH}			Tensile strength, R_m			Tensile strength, R_m			Gauge length = 50 mm	Gauge length = 200 mm			
	>16 to ≤40	>40 to ≤65	>65 to ≤100	>100 to ≤125	>125 to ≤200	>16 to ≤40	>40 to ≤65	>65 to ≤100	>100 to ≤125	>125 to ≤200	>16 to ≤40	>40 to ≤65			>65 to ≤100	>100 to ≤125	>125 to ≤200
Grade	MPa						MPa						%				
SG245W1	245	235	215	215	215	205	195	400 to 540	400 to 540	400 to 540	400 to 540	400 to 540	400 to 540	400 to 540	18	23	17
SG245W2	245	235	215	215	215	205	195	400 to 540	400 to 540	400 to 540	400 to 540	400 to 540	400 to 540	400 to 540	18	23	17
SG345W	345	345	345	345	345	315	290	485 min. _c	485 min. _c	485 min. _c	485 min. _c	485 min. _c	485 min. _c	485 min. _c	17	21 ^d	18
SG-345WP	345	315	290	290	290	—	—	480 min.	460 min.	435 min.	435 min.	—	—	—	15	18	21
SG365W1	365	355	335	325	305	305	295	490 to 610	490 to 610	490 to 610	490 to 610	490 to 610	490 to 610	490 to 610	17	21	15
SG365W2	365	355	335	325	305	305	295	490 to 610	490 to 610	490 to 610	490 to 610	490 to 610	490 to 610	490 to 610	17	21	15
SG400W	400	400	400	400	—	—	—	490 to 640	490 to 640	490 to 640	490 to 640	—	—	—	17	21	15
SG460W1	460	450	430	420	—	—	—	570 to 720	570 to 720	570 to 720	570 to 720	—	—	16	20	—	—

1 MPa = 1 N/mm².

^a Manufacturer should be contacted for possible thickness limits.

^b Only one of the three requirements is required. Unless specified on the order, the manufacturer may use either a proportional or fixed gauge length specimen. When the test value is reported, the specimen used shall be reported.

^c For all thicknesses of sections.

^d For sections with flange thickness over 75 mm, elongation in 50 mm of 18 % minimum applies.

Table B.3 (continued)

Designation		Nominal thickness ^a mm													
		Yield strength min., R_{eH}						Tensile strength, R_m						Minimum elongation after fracture ^b	
		≤16	>16 to ≤40	>40 to ≤65	>65 to ≤100	>100 to ≤125	>125 to ≤200	≤16	>16 to ≤40	>40 to ≤65	>65 to ≤100	>100 to ≤125	>125 to ≤200	$L_0 = 5,65\sqrt{S_0}$	Gauge length = 50 mm
Grade	Quality	MPa						MPa						%	
SG460W2	C	460	450	430	420	—	570 to 720	570 to 720	570 to 720	570 to 720	570 to 720	—	16	20	—
SG500W	C	500	500	500	500	—	570 to 720	570 to 720	570 to 720	570 to 720	570 to 720	—	16	20	—
SG700W	D	700	700	700	—	—	780 to 930	780 to 930	780 to 930	—	—	—	14	16	—

1 MPa = 1 N/mm².

^a Manufacturer should be contacted for possible thickness limits.

^b Only one of the three requirements is required. Unless specified on the order, the manufacturer may use either a proportional or fixed gauge length specimen. When the test value is reported, the specimen used shall be reported.

^c For all thicknesses of sections.

^d For sections with flange thickness over 75 mm, elongation in 50 mm of 18 % minimum applies.

