Contents

1. Scope

This standard specifies requirements for ordering, manufacturing, and supplying hot-rolled steel coil, plates, and sheets for cold forming with thicknesses range from 1.50 mm to 20.00 mm. The steels specified in this Maxion Standard are applicable to flat products that have special requirements of mechanical properties, formability and weldability.

2. Normative references

ASTM A1011/A1011M - Standard specification for steel, sheet and strip, hot-rolled, carbon, structural, high-strength low-alloy, high-strength low-alloy with improved formability, and ultra-high strength.
ASTM A1018/A1018M - Standard specification for steel, sheet and strip, heavy-thickness coils, hot-rolled, carbon, commercial, drawing, structural, high-strength low-alloy, high-strength low-alloy with improved formability, and ultra-high strength.
ASTM A1079 - Standard specification for steel sheet, complex phase (CP), dual phase (DP) and transformation induced plasticity (TRIP), zinc-coated (galvanized) or zinc-iron alloy-coated (galvannealed) by the hot-dip process.
ASTM A283/A283M - Standard specification for low and intermediate tensile strength carbon steel plates.
ASTM A36 - Standard specification for carbon structural steel.
ASTM A572/A572M - Standard specification for high-strength low-alloy columbium-vanadium structural steel.
ASTM A573/A573M - Standard Specification for structural carbon steel plates.
EMS.ME.732 - Material specification (general).
EN 10025-2 - Hot-rolled products of structural steels - Part 2: Technical delivery conditions for non-alloy structural steels.
EN 10111 - Continuously hot rolled low carbon steel sheet and strip for cold forming - Technical delivery conditions.
EN 10149-1 - Hot-rolled flat products made of high yield strength steels for cold forming - Part 1: General technical delivery conditions.
EN 10149-2 - Hot-rolled products made of yield strength steels for cold forming - Part 2: Delivery conditions for thermomechanically rolled steels.
EN 10204 - Metallic products - Types of inspection documents.
EN 10338 - Hot rolled and cold rolled non-coated products of multiphase steels for cold forming - Technical delivery conditions.
FCA MS.50002 – Sheet steel for automotive application.
GMW2 - Low carbon sheet steel.
GMW3032 - High strength sheet steel, 180 MPa through 700 MPa yield strengths.
GMW3399 - Multi-phase and ultra-high strength sheet steel.
ISO 3573 - Hot-rolled carbon steel sheet of commercial and drawing qualities.
ISO 5951 - Hot-rolled steel sheet of higher yield strength with improved formability.
ISUZU ISC-C21-002 - Hot rolled steel sheets and strip for automobile uses.
JIS G 3101 - Rolled steels for general structure.
JIS G 3106 - Rolled steels for welded structure.
JIS G 3113 - Hot-rolled steel plates, sheet and strip for automobile structural uses.
JIS G 3131 - Hot-rolled mild steel plates, sheet and strip.
JIS G 3134 - Hot-rolled high strength steel plates, sheet and strip with improved formability for automobile uses.
NAVISTAR MPAPS A-43 - High strength low alloy (HSLA) steel plate/bar.
NBR 11888 - Sheet and coils of carbon and high strength alloy steel - General requirements.
NBR 11889 - Heavy thickness coils and plates of carbon and high strength low alloy steels - General requirements.
NBR 5906 - Hot rolled carbon steel sheet and coil, drawing quality - Specification.
NBR 6655 – Hot rolled killed steel plates and sheets with improved mechanical properties, drawability and weldability - Specification.
NBR 6656 - Steel plate, coil and sheet with special characteristic of mechanical properties, drawability and weldability - Requirements.
SAE J403 - Chemical compositions of SAE carbon steels.
VDA 239-100 - Sheet steel for cold forming.

3. Terms and definitions

3.1 Acronyms, abbreviations, designation, and symbols

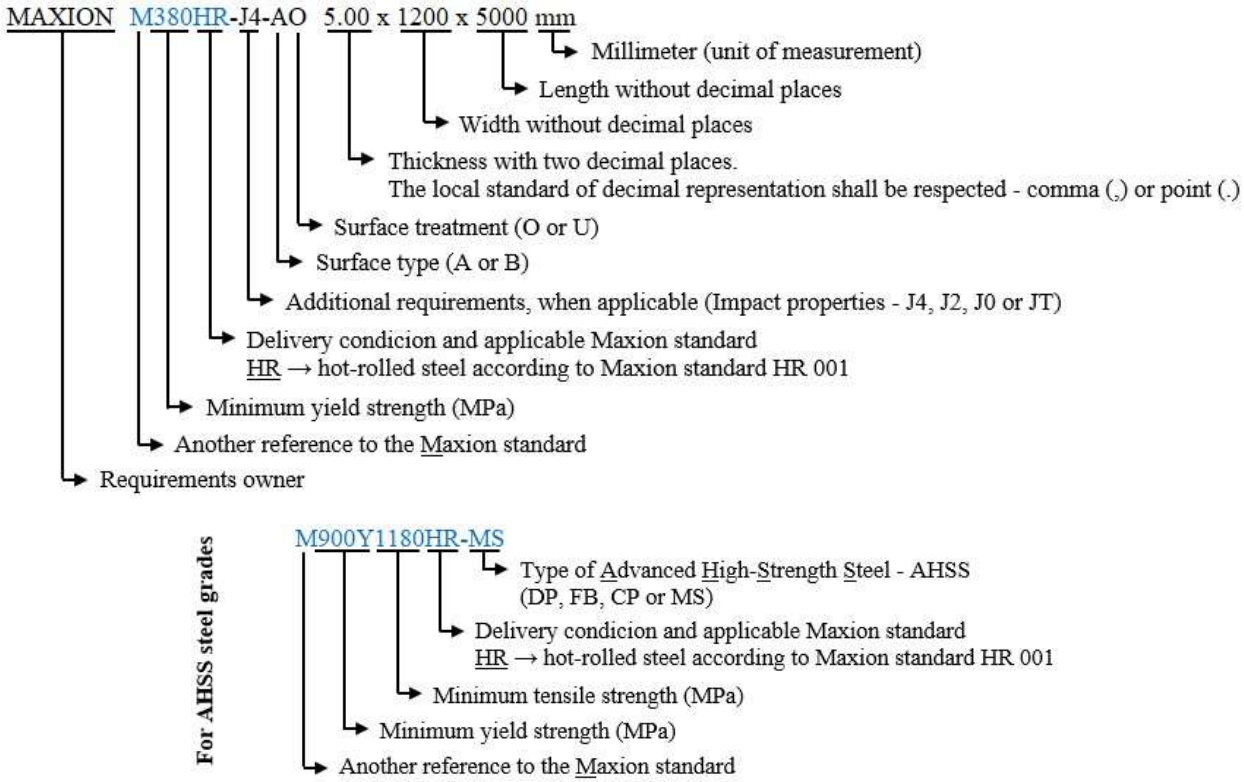
Dual-phase - DP
The microstructure of dual-phase steels consists mainly of ferrite matrix and a second dispersed microconstituent (martensite) responsible for the increase of the mechanical strength. These steels show a low YS/TS ratio, good formability, and strong work hardening capacity.

Complex-phase - CP
Complex-phase steels are characterized by a multiphase microstructure containing a ferritic-bainitic matrix with small amounts of martensite, tempered martensite, retained austenite, and pearlite. These steels combine high strength with relatively high ductility.

Ferritic-bainitic - FB
Ferritic-bainitic steels are similar to dual-phase steels, however, the second microconstituent used to increase the mechanical strength is the bainite. The ferritic-bainitic microstructure provides high hole expansion ratios and good edge stretch capabilities.

Martensitic - MS
Martensitic steels have a fully martensitic microstructure with small amounts of ferrite and/or bainite and thus a very high strength. These steel grades are more suited for bending processes like roll forming, considering their limited drawability.

This designation shall be referenced in other documents, drawing, etc., as follows example:



Minimum information must be described for each application or product:

Drawing	Steel grade + Thickness
Coil	Steel grade + Thickness + Width
Plates/Sheets	Steel grade + Thickness + Width + Length

E.g.: Coil M380HR-J4-AO 5.00 x 1200 mm

4. Requirements

4.1 Chemical composition

Chemical composition requirements for products (coil, plates, and sheets) determined by ladle analysis or ASTM A571 are shown in Table 1.

Table 1 – Chemical composition

Grade	%C max	%Mn max	%Si max	%P max	%S max	%Al min	%Nb max	%V max	%Ti max	%Cr max	%Mo max	%B max	Notes
M160HR	0.08	0.35	0.10	0.025	0.025	0.020	-	-	-	-	-	-	-
M170HR	0.08	0.40	0.10	0.030	0.030	0.020	-	-	-	-	-	-	-
M180HR	0.10	0.45	0.10	0.040	0.040	0.020	-	-	-	-	-	-	-
M200HR	0.12	0.60	0.10	0.025	0.025	0.015	0.12	0.12	0.20	-	-	-	a)
M230HR	0.12	0.80	0.10	0.025	0.025	0.015	0.12	0.12	0.20	-	-	-	a)
M235HR	0.17	1.40	0.10	0.025	0.025	0.015	-	-	-	-	-	-	c)
M240HR	0.15	1.00	0.10	0.025	0.015	0.015	0.12	0.12	0.20	-	-	-	a)
M260HR	0.15	1.00	0.10	0.025	0.015	0.015	0.12	0.12	0.20	-	-	-	a)
M270HR	0.15	1.00	0.10	0.025	0.015	0.015	0.12	0.12	0.20	-	-	-	a)
M275HR	0.18	1.50	0.10	0.025	0.025	0.015	-	-	-	-	-	-	c)
M280HR	0.15	1.00	0.10	0.025	0.015	0.015	0.12	0.12	0.20	-	-	-	a)
M300HR	0.12	1.10	0.10	0.025	0.015	0.015	0.12	0.12	0.20	-	-	-	a)
M315HR	0.12	1.10	0.10	0.025	0.015	0.015	0.12	0.12	0.20	-	-	-	a)
M340HR	0.12	1.10	0.10	0.025	0.015	0.015	0.12	0.12	0.20	-	-	-	a)
M355HR	0.12	1.10	0.10	0.025	0.015	0.015	0.12	0.12	0.20	-	-	-	b), c)
M360HR	0.12	1.10	0.10	0.025	0.015	0.015	0.12	0.12	0.20	-	-	-	b)
M380HR	0.12	1.10	0.10	0.025	0.015	0.015	0.12	0.12	0.20	-	-	-	b)
M400HR	0.12	1.20	0.10	0.025	0.015	0.015	0.12	0.12	0.20	-	-	-	b)
M420HR	0.12	1.20	0.10	0.025	0.015	0.015	0.12	0.12	0.20	-	-	-	b)
M450HR	0.12	1.60	0.10	0.025	0.015	0.015	0.12	0.12	0.20	-	-	-	b), c)
M460HR	0.12	1.20	0.10	0.025	0.015	0.015	0.12	0.12	0.20	-	-	-	b)
M500HR	0.12	1.60	0.10	0.025	0.015	0.015	0.12	0.12	0.20	-	-	-	b)
M550HR	0.12	1.70	0.30	0.025	0.015	0.015	0.12	0.12	0.20	-	-	-	b)
M560HR	0.12	1.70	0.30	0.025	0.015	0.015	0.12	0.12	0.20	-	-	-	b)
M600HR	0.12	1.90	0.50	0.025	0.015	0.015	0.12	0.12	0.20	0.50	0.50	0.005	b)
M650HR	0.12	2.00	0.50	0.025	0.015	0.015	0.12	0.12	0.20	0.50	0.50	0.005	b)
M700HR	0.12	2.10	0.50	0.025	0.015	0.015	0.12	0.12	0.20	0.60	0.50	0.005	b)
M900HR	0.20	2.20	0.60	0.025	0.010	0.015	0.12	0.20	0.25	0.60	1.00	0.005	-
M960HR	0.20	2.20	0.60	0.025	0.010	0.015	0.12	0.20	0.25	0.60	1.00	0.005	-
M330Y580HR-DP	0.23	3.30	2.00	0.090	0.015	0.010	-	-	-	-	-	0.006	d)
M340Y590HR-DP	0.14	2.20	1.00	0.085	0.015	0.015 – 0.100	-	0.20	-	-	-	0.005	d), e)
M380Y580HR-DP	0.10	1.40	1.50	0.025	0.004	0.010 – 0.060	-	-	-	-	-	-	-
M450Y780HR-DP	0.23	3.30	2.00	0.090	0.015	0.010	-	-	-	-	-	0.006	d)
M300Y450HR-FB	0.18	2.00	0.50	0.050	0.010	0.015 – 2.000	-	0.15	-	-	-	0.005	f)
M460Y580HR-FB	0.18	2.00	0.50	0.050	0.010	0.015 – 2.000	-	0.15	-	-	-	0.005	f)

Grade	%C max	%Mn max	%Si max	%P max	%S max	%Al min	%Nb max	%V max	%Ti max	%Cr max	%Mo max	%B max	Notes
M600Y780HR-FB	0.18	2.00	0.50	0.050	0.010	0.015	-	-	-	-	-	-	-
M660Y760HR-CP	0.18	2.50	1.00	0.080	0.015	0.015 – 2.000	-	0.20	-	-	-	0.005	g)
M680Y780HR-CP	0.25	2.20	2.00	0.050	0.015	0.010	-	-	-	-	-	-	d)
M720Y950HR-CP	0.25	2.20	2.00	0.050	0.015	0.010	-	-	-	-	-	-	d)
M900Y1180HR-MS	0.25	2.50	0.80	0.060	0.015	0.015 – 2.000	-	0.22	-	-	-	0.005	h)

a) %Nb+%V+%Ti = 0.20 max;
b) %Nb+%V+%Ti = 0.010 - 0.220;
c) %N = 0.012 max, and %Cu = 0.55 max;
d) %Cu = 0.20 max;
e) %Cr+%Mo = 1.40 max, and %Ti+%Nb = 0.15 max;
f) %Cr+%Mo = 1.00 max, and %Ti+%Nb = 0.15 max;
g) %Cr+%Mo = 1.00 max, and %Ti+%Nb = 0.25 max;
h) %Cr+%Mo = 1.20 max, and %Ti+%Nb = 0.25 max.

max = maximum
min = minimum

4.2 Mechanical properties

Mechanical properties in the delivery condition are given in Table 2. Tensile and bending tests shall be performed, according to ASTM A370 methodology, transversally to rolling direction, except for the cases indicated in the notes column. The sampling frequency shall be known and validated by the purchaser. Likewise, the mechanical properties obtained by mathematical methods can also be considered if previously approved.

Table 2 - Mechanical properties

Grade	Yield Strength - YS [MPa]	Tensile Strength - TS [MPa]	Elongation - EL [%] min			Bending 180° min	Notes
			L_0 = 50 mm	L_0 = 80 mm	$L_0 = 5.65\sqrt{S_0}$ mm		
M160HR	160 - 280	260 - 380	36	34	36	-	-
M170HR	170 - 300	270 - 400	34	30	34	-	-
M180HR	180 - 320	270 - 420	30	28	30	-	-
M200HR	200 - 330	280 - 410	-	-	35	0.0t	-
M230HR	230 - 360	330 - 460	-	-	30	0.0t	-
M235HR	235 min	360 - 510	-	-	26	0.0t	-
M240HR	240 - 380	360 - 510	-	-	30	0.0t	-
M260HR	260 - 390	370 - 500	-	-	30	0.0t	-
M270HR	270 - 350	330 min	32	27	-	0.0t	-
M275HR	275 min	410 - 560	-	-	23	0.0t	-
M280HR	280 - 420	410 - 520	-	-	28	0.0t	-
M300HR	300 - 400	400 - 500	-	-	26	0.0t	-
M315HR	315 - 415	400 - 500	-	-	26	0.0t	-
M340HR	340 - 420	410 - 530	-	-	25	0.0t	-
M355HR	355 - 510	470 - 550	-	-	25	0.0t	-
M360HR	360 - 520	450 - 620	-	-	25	0.0t	-
M380HR	380 - 530	460 - 600	-	-	23	0.0t	-

Grade	Yield Strength - YS [MPa]	Tensile Strength - TS [MPa]	Elongation - EL [%] min			Bending 180° min	Notes
			$L_0 = 50$ mm	$L_0 = 80$ mm	$L_0 = 5.65\sqrt{S_0}$ mm		
M400HR	400 - 520	520 - 620	-	-	23	0.0t	-
M420HR	420 - 520	520 - 620	-	-	22	0.5t	-
M450HR	450 min	550 - 720	-	-	17	0.5t	-
M460HR	460 - 560	540 - 670	-	-	20	0.5t	-
M500HR	500 - 620	560 - 700	-	-	18	1.0t	-
M550HR	550 - 670	600 - 750	-	-	15	1.0t	-
M560HR	560 - 670	600 - 750	-	-	15	1.0t	-
M600HR	600 - 720	650 - 800	-	-	14	1.5t	-
M650HR	650 - 780	700 - 850	-	-	12	2.0t	-
M700HR	700 - 850	750 - 950	-	-	12	2.0t	-
M900HR	900 min	930 - 1200	-	-	8	8.0t	-
M960HR	960 min	980 - 1250	-	-	7	9.0t	-
M330Y580HR-DP	330 - 450	580 - 700	-	19	-	-	a), b)
M340Y590HR-DP	340 - 450	590 - 700	-	19	-	-	a), b)
M380Y580HR-DP	380 - 550	580 - 750	21	-	-	-	b)
M450Y780HR-DP	450 - 610	780 - 900	-	14	-	-	a), b)
M300Y450HR-FB	300 - 400	450 - 600	-	24	-	-	a), b)
M460Y580HR-FB	460 - 600	580 - 700	-	15	-	-	a), b)
M600Y780HR-FB	600 - 760	780 - 900	-	12	-	-	a), b)
M660Y760HR-CP	660 - 830	760 min	-	10	-	-	a), b)
M680Y780HR-CP	680 - 820	780 - 900	-	10	-	-	a), b)
M720Y950HR-CP	720 - 920	950 - 1100	-	9	-	-	a), b)
M900Y1180HR-MS	900 - 1150	1180 min	-	4	-	-	a), b)

a) Requirements for longitudinal test pieces;
b) Increase in proof strength after heating - BH_2 = 30 MPa min.

max = maximum
min = minimum
1 [MPa] = 1 [N/mm^2]
YS or Y - Yield Strength at 0.20% offset

4.3 Impact properties

Impact energy value shall be carried out in accordance with ASTM A370 and ASTM E23. The impact strength by Charpy test in the delivery condition to different temperatures is given in Table 3.

Table 3 - Impact strengths by Charpy test

Simbol	Temperature [°C]	Notch Type	Direction	Energy - Joule [J] min					
				Specimens Size [mm^2]					
				10 x 10	10 x 7.5	10 x 6.7	10 x 5.0	10 x 3.3	10 x 2.5
J4	-40	V	Longitudinal	27	20	18	14	10	7
J2	-20	V	Longitudinal						
J0	0	V	Longitudinal						
JT	20	V	Longitudinal						
The notch shall be perpendicular to the nominal thickness.									

4.4 Surface quality

The surface of the material shall be free from coarse defects that affect its structural application. Defects that have impact on surface appearance, especially after painting, are also not acceptable. In this way, defects such as: rolled-in scale, marks, siliceous scale, slip bands or stretcher-strain marks (caused by Lüders bands) shall be avoided.

4.4.1 Surface type

The classification of surface types depending on the application of the material is given in Table 4.

Table 4 - Surface types

Surface Type	Quality	Description
A	Best Surface	The surface for exposed parts shall be free of defects which might affect the uniform appearance of the paint or an electrolytic coating. The steel sheet shall meet the surface aspect for critical exposed applications.
B	Commercial Surface	The surface for semi-exposed or internal parts shall be free of any coarse defects or reworks that may compromise the processing and/or application of the steel. Special surface conditions can be negotiated and noted at the time of enquiry and order.
When not informed in the order, consider surface type B.		

4.4.2 Surface treatment

Applicable surface treatments are shown in Table 5. Details such as oil type and its quantity are given in the engineering specification or provided by the purchaser at the time of enquiry and order.

Table 5 - Surface treatments

Surface Treatment	Quality
O	Pickled and Oiled
U	Unpickled and Unoiled
When not informed in the order, consider surface treatment U.	

4.5 Microstructure

The microstructure shall be suitable to the application of the material.

4.6 Grain size

Grain size shall be determined to ASTM E112 or by another previously validated method. Uniform and fine grain size (ASTM grain size number > 7) are desired for materials in this standard.

4.7 Inclusions

The material shall be free from coarse inclusions and thin inclusion shall not exceed a ranting of 2.0, according to ASTM E45. Furthermore, the inclusions present cannot compromise the application of the material. To characterize the inclusions another methodology can be used, however, prior validation is required.

4.8 Tolerances on dimensions and shape

The tolerance requirements are those given in the engineering specification or provided by the purchaser at the time of enquiry and order.

4.9 Quality document

An inspection document, inspection certificate or quality certificate shall be supplied to prove the conformity of the supplied product. This document must include the methodology of tests and analysis, as well as the results obtained for the fundamental specifications, according to EN 10204.

4.10 Delivery

4.10.1 Information to be supplied by the purchaser

In order to allow the manufacture to supply conform products, the following information shall be provided by the purchaser at the time of enquiry and order:

- Part number;
- Full designation of the material as given in item 3.1;
- Nominal dimensions and its tolerances, or normative reference related to dimensions;
- Application of the products;
- Surface type and treatment;
- Type of edge;
- Oil type and quantity (when applicable);
- Package;
- Limits on the mass and the sizes of the coils, plates, and sheets;
- Additional requirements;
- Additional inspection documents.

Note: The producer must develop and supply the material in order to meet the performance and application desired by the purchaser.

4.10.2 Identification of batches

The batches supplied shall be identified from the labels containing at least the following information:

- Client name;
- Full designation of the material as given in item 3.1;
- Invoice number;
- Batch identification;
- Mass;

Additional information must be negotiated by the purchaser at the time of enquiry and order.

5. Rules and regulations

The products shall be produced and supplied in accordance with applicable international and local legislations. The supplier shall create the Material Data Sheets (MDS) and/or Conflict Minerals Declarations (CMD) and send them to their customer at no cost. If requested by the customer, this registration must be done through platforms that collect, maintain, analyze, and archive information about the materials across all levels of your supply chain (e.g. IMDS and/or CDX). The producer must supply products according to initial approvement or equivalent. Any changes in material or manufacturing process is not permitted without prior notification and approval. Lack of notification by the supplier constitutes grounds for rejection of any shipment.

6. Equivalences

See Table 6 of annex A.

7. Release and revisions

Issue	Edition	Date	Description	Responsible
0	12-2021	12/15/2021	Initial publication	Dr. Paulo H. O. M. Alves Quality Dept.

Annex A
Table 6 - Equivalence relationship between different designations of steels

MAXION	STEEL NUMBER	BRAZIL ABNT NBR	EUROPE 'EN'	GERMANY DIN, SEW, VDA	USA ASTM, SAE	JAPAN JIS	ITALY UNI	FRANCE AFNOR	ENGLAND BS	SPAIN UNE	SWEDEN SS	INTER 'ISO'	GM	SCANIA	VOLVO	NAVISTAR MPAPS A-43	FIAT FCA
M160HR	1.0389	NBR 5906 EPA	EN 10111 DD14	-	-	-	-	3CT	-	-	-	-	GMW2M-ST-S-HR3 QS 10102O (QS 10102W) GM6409M-HR3	-	-	-	
M170HR	1.0398 1.0335	NBR 5906 EP	EN 10111 DD12 EN 10111 DD13	StW23 RRStW23 StW24 HR2	1006 A621DQ A622DQ DS	SPHF SPHE SPHE-AK	FEP12 FEP13	3C	HR2 HR1	-	-	-	GMW2M-ST-S-HR2 QS 10102O (QS 10102W) GM6409M-HR2	-	-	-	
M180HR	1.0332 1.0398	NBR 5906 EM	EN 10111 DD11 EN 10111 DD12	StW22 StW23 RRStW23 HR2	1008 A621CQ A621DQ CS	SPHD SPHE SPHC SAPH310	FEP11	1C 3C	HR3 HR2	-	-	-	GMW2M-ST-S-HR1 QS 10102O (QS 10102W) GM6409M-HR1	-	-	-	HR12 HR13
M200HR	- -	NBR 6655 LN200 NBR 6656 LNE200	-	-	1010 SS 30 CS TYPE A CS TYPE B GRADE C	SPHC SAPH310	-	-	HR4 HR14	-	-	-	-	-	-	-	HR11
M230HR	-	NBR 6656 LNE230	-	HR0	SS 33 GRADE D	SS-330 SAPH370 SAPH370	-	-	-	-	-	-	EMS.ME.732 LNE230	-	-	-	LAH210Y310T
M235HR	1.0037 1.0036 1.0038 1.0114 1.0116 1.0117	NBR 6655 LN240	EN 10025-2 S235JR EN 10025-2 S235J0 EN 10025-2 S235J2	St37-2 USt37-2 RSt37-2 St37-3U St37-3N	-	-	FE360B FE360C FE360D	E 24-2 E 24-3 E 24-4	40 B 40 C 40 D	AE235B-FU AE235B-FN AE235C AE235D	1311-00 1312-00	-	-	-	STD 311-0018 VSS235NA+U	-	STH235Y360T STH235Y360T-FG
M240HR	-	NBR 6655 LN240	-	HR0	SS 36-1 SS 36-2	SS-400 SM-400A SM-400B	-	-	-	-	-	-	GMW3032M-ST-S-HR240LA	-	-	-	LAH240Y320T
M260HR	-	NBR 6656 LNE260	-	-	SS 36-1 SS 36-2 A36	SS-400 SM-400A SM-400B	FEE275TM	-	40F30	-	-	-	EMS.ME.732 LNE260	STD755 CLASSE 26	-	-	LAH240Y320T
M270HR		NBR 6655 LN280 NBR 6656 LNE280	-	-	SS 40 A36	-	-	-	-	-	-	-	GMW3032M-ST-S-HR270LA	-	-	-	LAH270Y340T
M275HR	1.0044 1.0143 1.0144 1.0145	NBR 6655 LN280 NBR 6656 LNE280	EN 10025-2 S275JR EN 10025-2 S275J0 EN 10025-2 S275J2	St44-2 St44-3U St44-3N	A36	-	FE430B FE430C FE430D	E 28-2 E 28-3 E 28-4	43 B 43 C 43 D	AE 275 B AE 275 C AE 275 D	1412-00 1414-00 1414-01	-	-	-	STD 311-0018 VSS275NA+U	-	STH270Y430T STH270Y430T-FG

Annex A

Table 6 - Equivalence relationship between different designations of steels (cont.)

MAXION	STEEL NUMBER	BRAZIL ABNT NBR	EUROPE 'EN'	GERMANY DIN, SEW, VDA	USA ASTM, SAE	JAPAN JIS	ITALY UNI	FRANCE AFNOR	ENGLAND BS	SPAIN UNE	SWEDEN SS	INTER 'ISO'	GM	SCANIA	VOLVO	NAVISTAR MPAPS A-43	FIAT FCA
M280HR	-	NBR 6655 LN280 NBR 6656 LNE280	-	-	GRADE 42-1 A36	SS-490 SAPH440	-	-	-	-	-	-	EMS.ME.732 LNE280	STD755 CLASSE 28	-	42X	LAH270Y340T
M300HR	-	NBR 6656 LNE315	-	HR300LA	GRADE 42-1 SS 45-1	SS-490 SAPH440	-	-	-	-	-	-	EMS.ME.732 LNE300	-	-	42X 45X	LAH270Y340T LAH300Y370T
M315HR	1.0972	NBR 6656 LNE315	EN 10149-2 S315MC	QStE300TM H300LA	1392 SS 45-1 HSLAS GR 45-1 HSLAS GR 45-2	SPFH490 SM-490A SM-490B SAPH440	-	E315D E335D	43F30 43F35 HR43F35	AE275HC	-	-	EMS.ME.732 LNE300 EMS.ME.732 LNE320	STD755 CLASSE 32	-	45X	LAH300Y370T
M340HR	-	-	-	H300LA H340LA	GRADE 050 XLF SS 50	-	-	E335D	-	-	-	-	EMS.ME.732 LNE340 GMW3032M-ST-S-HR240LA	-	-	50X	LAH300Y370T LAH340Y410T
M355HR	1.0976 1.0045 1.0553 1.0570 1.0577 1.0595 1.0596	NBR 6656 LNE355	EN 10149-2 S355MC EN 10025-2 S355JR EN 10025-2 S355J0 EN 10025-2 S355J2 EN 10025-2 S355K2	QStE360TM St52-3U St52-3N H340LA	GRADE 50 GRADE 050 XLF HSLAS GR 50-1 HSLAS GR 50-2	SS-540 SPFH540	FEE355TM FE510-B FE510-C FE510-D	E355D E390D E 36-2 E 36-3 E 36-4	46F35 46F40 50 B 50 C 50 D 50 DD	AE390HC AE355B AE355C AE355D	2642	FEE355	-	STD755 CLASSE 35	STD 311-0018 VSS355+N VSS355IS+N VSS355NA+N VSS355NA+U VSS355NAIS+N	50X 50A 50R 50F	LAH340Y410T STH350Y510T STH350Y510T-FG
M360HR	-	NBR 6655 LN360	-	HR340LA	-	SM-520B SM-520C	-	-	-	-	-	-	-	-	STD 311-0018 VSS355+N VSS355IS+N VSS355NA+N VSS355NA+U VSS355NAIS+N	-	LAH340Y410T
M380HR	-	NBR 6656 LNE380	-	QStE380TM H380LA	SS 55 HSLAS GR 55-1 HSLAS GR 55-2	SM-520B SM-520C	-	-	-	-	-	-	EMS.ME.732 LNE380 GMW3032M-ST-S-HR380LA	-	STD 311-0018 VSS390+N VSS390IS+N	-	LAH380Y450T
M400HR	-	NBR 6656 LNE400	-	HR380LA	GRADE 060 XLF SS60	SS-540	-	-	-	-	-	-	-	-	-	60X	LAH380Y450T
M420HR	1.0980	NBR 6656 LNE420	EN 10149-2 S420MC	QStE420TM H420LA	GRADE 60 GRADE 060 XLF SS60 HSLAS GR S60-1 HSLAS GR S60-2	SPFH590	FEE420TM	E420D	HR50F45	-	2652	FEE420	EMS.ME.732 LNE420 GMW3032M-ST-S-HR420LA	STD755 CLASSE 40	STD 311-0018 VSS420+N VSS420IS+N VSS420+TM VSS420IS+TM	60X 60F	LAH420Y480T
M450HR	1.0590 1.0982	NBR 6656 LNE460	EN 10025-2 S450J0 EN 10149-2 S460MC	HR420LA	-	-	-	-	55 C	-	-	-	EMS.ME.732 LNE460	-	-	-	LAH420Y480T
M460HR	1.0590 1.0982	NBR 6656 LNE460	EN 10025-2 S450J0 EN 10149-2 S460MC	QStE460TM H460LA	GRADE 65 HSLAS S65-1 HSLAS S65-2	-	-	E445D	55 C 50F45	AE440HC	-	-	EMS.ME.732 LNE460	STD755 CLASSE 45	-	65X	LAH420Y480T

Annex A

Table 6 - Equivalence relationship between different designations of steels (cont.)

MAXION	STEEL NUMBER	BRAZIL ABNT NBR	EUROPE 'EN'	GERMANY DIN, SEW, VDA	USA ASTM, SAE	JAPAN JIS	ITALY UNI	FRANCE AFNOR	ENGLAND BS	SPAIN UNE	SWEDEN SS	INTER 'ISO'	GM	SCANIA	VOLVO	NAVISTAR MPAPS A-43	FIAT FCA
M500HR	1.0984	NBR 6656 LNE500	EN 10149-2 S500MC	QStE500TM HR460LA HR500LA	GRADE 70 070 XLF S570 HSLAS S70-1 HSLAS S70-2	-	FEE490TM	E490D	-	-	2662	FEE490	EMS.ME.732 LNE500 GMW3032M-ST-S-HR500LA	STD755 CLASSE 50	-	70X 70F	LAH500Y560T
M550HR	1.0986	NBR 6656 LNE550	EN 10149-2 S550MC	QStE550TM HR500LA HR550LA	GRADE 80	-	FEE560TM	E560D	60F45 60F55 60F56	-	-	FEE560	EMS.ME.732 LNE560 GMW3032M-ST-S-HR550LA	STD755 CLASSE 55	-	80F	LAH500Y560T LAH550Y620T MCH550Y600T
M560HR	1.0986	NBR 6656 LNE550	EN 10149-2 S550MC	QStE550TM HR550LA	GRADE 80	-	FEE560TM	E560D	60F45 60F55 60F56	-	-	FEE560	EMS.ME.732 LNE560 GMW3032M-ST-S-HR550LA	-	-	80F	LAH500Y560T LAH550Y620T MCH550Y600T
M600HR	1.0988 1.8969	NBR 6656 LNE600	EN 10149-2 S600MC	QStE600TM	-	-	-	E620D	68F62 HR68F62	-	-	-	EMS.ME.732 LNE600	LAC300Y360T	-	-	LAH550Y620T MCH550Y600T MCH600Y650T
M650HR	1.0989 1.8976	NBR 6656 LNE650	EN 10149-2 S650MC	QStE650TM	GRADE 90	-	-	-	-	-	-	-	GMW3032M-ST-S-HR650LA	STD755 CLASSE 65	-	90XF	MCH600Y650T MCH650Y700T
M700HR	1.0966 1.8974	NBR 6656 LNE700	EN 10149-2 S700MC	QStE690TM HR700LA	A514 GRADE 100	-	FEE690TM	E690D	75F70	-	-	-	GMW3032M-ST-S-HR700LA	STD755 CLASSE 70	-	100XF 110XF	MCH650Y700T MCH700Y730T
M900HR	1.8798	-	EN 10149-2 S900MC	-	-	-	-	-	-	-	-	-	-	-	-	-	
M960HR	1.8799	-	EN 10149-2 S960MC	-	-	-	-	-	-	-	-	-	-	-	-	-	
M330Y580HR-DP	-	-	-	HR330Y580T-DP	-	-	-	-	-	-	-	-	GMW3399M-ST-S HR580T/330Y DP	-	-	-	DPH330Y580T
M340Y590HR-DP	1.0936	-	EN 10338 HDT580X	HR330Y580T-DP	-	-	-	-	-	-	-	-	-	-	-	-	DPH330Y580T
M380Y580HR-DP	-	-	-	HR330Y580T-DP	-	-	-	-	-	-	-	-	GMW3399M-ST-S HR580T/330Y-DP	-	-	-	DPH330Y580T
M450Y780HR-DP	-	-	-	-	-	-	-	-	-	-	-	-	GMW3399M-ST-S HR780T/450Y-DP	-	-	-	-
M300Y450HR-FB	1.0961	-	EN 10338 HDT450F	HR300Y450T-FB	-	-	-	-	-	-	-	-	GMW3399M-ST-S HR450T/300Y-FB	-	-	-	
M460Y580HR-FB	1.0994	-	EN 10338 HDT580F	HR440Y580T-FB	-	-	-	-	-	-	-	-	GMW3399M-ST-S HR580T/440Y-FB	-	-	-	FBH440Y580T
M600Y780HR-FB	-	-	-	HR600Y780T-FB	-	-	-	-	-	-	-	-	GMW3399M-ST-S HR780T/600Y-FB	-	-	-	-
M660Y760HR-CP	1.0998	-	EN 10338 HDT760C	HR660Y760T-CP	-	-	-	-	-	-	-	-	-	-	-	-	MPH660Y760T
M680Y780HR-CP	-	-	-	HR660Y760T-CP	-	-	-	-	-	-	-	-	GMW3399M-ST-S HR760T/660Y-MP	-	-	-	MPH660Y760T
M720Y950HR-CP	-	-	-	-	-	-	-	-	-	-	-	-	GMW3399M-ST-S HR950T/720Y-MP	-	-	-	MPH780Y980T
M900Y1180HR-MS	1.0969	-	EN 10338 HDT1180G1	HR900Y1180T-MS	-	-	-	-	-	-	-	-	-	-	-	-	MTH900Y1200T