# Designation systems for steels —

Part 1: Steel names

The European Standard EN 10027-1:2005 has the status of a British Standard

ICS 77.080.20



## National foreword

This British Standard is the official English language version of EN 10027-1:2005. It supersedes BS EN 10027-1:1992 and PD 6622:1998 which are withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ISE/5, Technical delivery conditions, classification and designation of steels, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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

#### **Cross-references**

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#### Summary of pages

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# EUROPEAN STANDARD NORME EUROPÉENNE EUROPÄISCHE NORM

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Supersedes CR 10260:1998, EN 10027-1:1992

#### English version

# Designation systems for steels - Part 1: Steel names

Systèmes de désignation des aciers - Partie 1: Désignation symbolique

Bezeichnungssysteme für Stähle - Teil 1: Kurznamen

This European Standard was approved by CEN on 27 June 2005.

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.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION COMITÉ EUROPÉEN DE NORMALISATION EUROPÄISCHES KOMITEE FÜR NORMUNG

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#### **Foreword**

This European Standard (EN 10027-1:2005) has been prepared by Technical Committee ECISS/TC 7 "Conventional designation of steel", the secretariat of which is held by UNI.

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 February 2006, and conflicting national standards shall be withdrawn at the latest by February 2006.

This European Standard supersedes CR 10260:1998 and EN 10027-1:1992.

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

#### 1 Scope

**1.1** This European Standard specifies rules for designating steels by means of symbolic letters and numbers to express application and principal characteristics, e.g. mechanical, physical, chemical, so as to provide an abbreviated identification of steels.

NOTE In the English language the designations covered by this European Standard are known as "steel names"; in the French language as "designation symbolique"; in the German language as "Kurznamen".

- **1.2** This European Standard applies to steels specified in European Standards (EN), Technical Specifications (TS), Technical Reports (TR) and CEN member's national standards.
- **1.3** These rules may be applied to non-standardized steels.
- 1.4 A system of numerical designation of steels known as steel numbers is specified in EN 10027-2.

#### 2 Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 10020:2000, Definition and classification of grades of steel

EN 10027-2, Designation systems for steels - Part 2: Numerical system

EN 10079:1992, Definition of steel products

#### 3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 10020:2000 and EN 10079:1992 apply.

#### 4 Principles

#### 4.1 A unique steel name

There shall be one unique steel name for each steel.

#### 4.2 Formulation of steel names

Steel names allocated in accordance with this European Standard shall comprise principal symbols as specified in 7.1.

In order to avoid ambiguity, it may be necessary to supplement these principal symbols by additional symbols identifying additional characteristics of the steel or steel product, e.g. suitability for use at high or low temperatures, surface condition, treatment condition, de-oxidation. These additional symbols are given in 7.2.

Unless otherwise specified in this European Standard the symbols used in the steel name shall be written without spaces.

#### 4.3 Allocation of steel names

**4.3.1** For steels specified in European Standards (EN), Technical Specifications (TS) and Technical Reports (TR), steel names shall be allocated by the ECISS Technical Committee concerned.

**4.3.2** For steels specified in CEN member's national standards and for other steels, steel names shall be allocated by or under the responsibility of the national standards body concerned.

So as to avoid a variety of steel names being assigned to essentially the same steel, the European Registration Office as provided for in EN 10027-2 shall, when a steel number is applied for, cooperate with the national standards body concerned to ensure uniform steel names.

#### 4.4 Consultation

Where there are difficulties or disputes in establishing steel names ECISS/TC7 shall be consulted and shall advise accordingly.

#### 5 Reference to product standards

The complete designation of a steel product where quoted in orders or similar contractual documents shall include, in addition to the steel name, an indication of the technical delivery requirement in which the steel is specified. For steels specified in standards this shall be the reference number of the relevant product standard.

Details of the structures of the steel name for the steel or steel product shall be provided in the relevant product or dimensional standard.

#### 6 Classification of steel names

For the purposes of designation, steel names are classified into two main categories:

- Category 1: steels designated according to their application and mechanical or physical properties (see 7.3).
- Category 2: steels designated according to their chemical composition (see 7.4).

#### 7 Structure of steel names

#### 7.1 Principal symbols

Principal symbols for steels designated according to steel application and its mechanical and physical properties shall be assigned in accordance with 7.3.

Principal symbols for steels designated according to the chemical composition of the steel shall be assigned in accordance with 7.4.

Where a steel is specified in the form of a steel casting, its name as specified in Tables 1 to 15 shall be preceded by the letter G.

Where a steel is produced by powder metallurgy, its name as specified in Tables 14 and 15 shall be preceded by the letters PM.

#### 7.2 Additional symbols

Additional symbols may be added to the principal symbols and assigned in accordance with 7.3 and 7.4.

Additional symbols are divided into two groups, i.e. group 1 and group 2 (see 7.3 and 7.4). If the symbols for group 1 are inadequate to describe the steel fully, then additional symbols from group 2 may be added. Symbols of group 2 shall only be used in conjunction with and follow symbols of group 1.

Further additional symbols for steel products may follow the additional symbols of group 1 and group 2 and shall be selected in accordance with 7.3 and 7.4 from tables 16, 17 and 18. These symbols shall be separated from preceding symbols by the plus sign (+).

NOTE Additional symbols selected from Tables 16, 17 and 18 may be added to steel numbers allocated in accordance with EN 10027-2 and, when used, separated from the steel number by the plus sign (+).

#### 7.3 Steels designated according to their application and mechanical or physical properties

The designation of steel according to their application and mechanical or physical properties shall be made in accordance with Table 1 to Table 11.

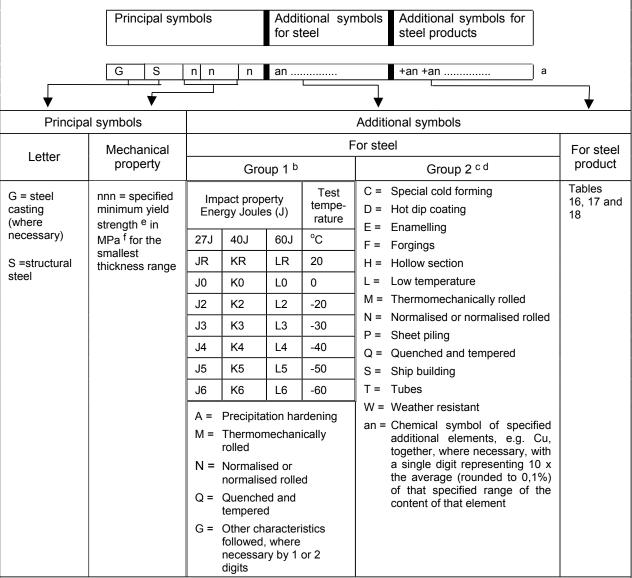


Table 1 — Structural steels

a n = numerical characters, a = alpha characters, an = alphanumeric characters.

<sup>&</sup>lt;sup>b</sup> Symbols A, M, N and Q in Group 1 apply to fine grain steels.

<sup>&</sup>lt;sup>c</sup> Symbols of Group 2, other than chemical symbols, may be suffixed by one or two digits in order to distinguish between qualities in accordance with the relevant product standard.

d If two of the symbols of this Group are needed the chemical symbol shall be the last one.

<sup>&</sup>lt;sup>e</sup> The term "yield strength" refers to upper or lower yield strength ( $R_{eH}$ ) or ( $R_{eL}$ ) or proof strength ( $R_p$ ), or proof strength total extension ( $R_t$ ) depending on the requirement specified in the relevant product standard.

 $f 1 MPa = 1 N/mm^2$ .

Table 1 (continued)

Examples of steel names for structural steels		
Standard	Steel name according to EN 10027-1	
	S235JR	
	S355JR	
EN 10025-2	S355J0	
LIN 10023-2	S355J2	
	S355K2	
	S450J0	
EN 10025-3	S355N	
LIN 10023-3	S355NL	
EN 10025-4	S355M	
EN 10025-4	S355ML	
	S235J0W	
	S235J2W	
	S355J0WP	
EN 10025-5	S355J2WP	
	S355J0W	
	S355J2W	
	S355K2W	
	S460Q	
EN 10025-6	S460QL	
	S460QL1	
EN 10149-2	S355MC	
EN 10149-3	S355NC	
EN 10210-1	S355J2H	
EN 10248-1	S355GP	
EN 10326	S350GD	
	S350GD+Z	

Additional symbols Additional symbols for Principal symbols for steel steel products +an + an ..... an ..... а Principal symbols Additional symbols For steel Mechanical For steel Letter property products Group 1<sup>b</sup> Group 2c G = steel nnn = specified B = Gas bottles High temperature Tables 16, 17 and 18 casting (where minimum yield M = Thermomechanically rolled strenath d in Low temperature necessary) MPa e for the N = Normalised or normalised P = steels for R= Room temperature smallest rolled pressure thickness range High and low temperature X = purposes Q = Quenched and tempered S = Simple pressure vessels G = Other characteristics followed, where necessary, by 1 or 2 digits

Table 2 — Steels for pressure purposes

 $e \, 1 \, MPa = 1 \, N/mm^2$ .

Examples of steel names		
Standard	Steel name according to EN 10027-1	
EN 10028-2	P265GH	
EN 10028-3	P355NH	
EN 10028-5	P355M P355ML1	
EN 10028-6	P355Q P355QH P355QL1	
EN 10120	P265NB	
EN 10207	P265S	
EN 10213-2	GP240GR GP240GH	

<sup>&</sup>lt;sup>a</sup> n = numerical characters, a = alpha characters, an = alphanumeric characters.

<sup>&</sup>lt;sup>b</sup> Symbols M, N and Q in group 1 apply to fine grain steels.

<sup>&</sup>lt;sup>c</sup> Symbols of group 2, other than chemical symbols, may be suffixed by one or two digits in order to distinguish between qualities in accordance with the relevant product standard.

<sup>&</sup>lt;sup>d</sup> The term "yield strength" refers to upper or lower yield strength ( $R_{eH}$ ) or ( $R_{eL}$ ) or proof strength ( $R_p$ ), or proof strength total extension ( $R_f$ ) depending on the requirement specified in the relevant product standard.

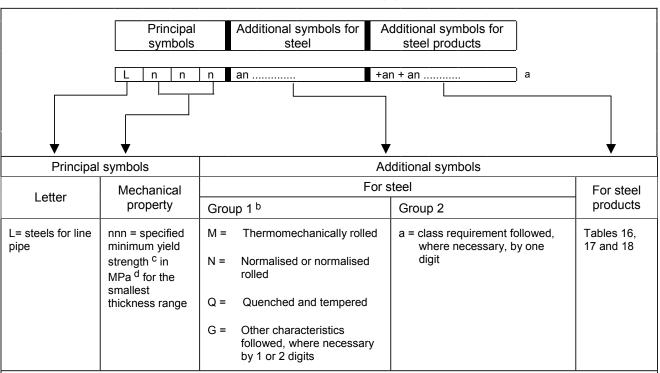


Table 3 — Steels for line pipe

Examples of steel names	
Standard	Steel name according to EN 10027-1
EN 10208-1	L360GA
EN 10208-2	L360NB L360QB L360MB

<sup>&</sup>lt;sup>a</sup> n = numerical characters, a = alpha characters, an = alphanumeric characters.

<sup>&</sup>lt;sup>b</sup> Symbols M, N and Q in group 1 apply to fine grain steels.

<sup>&</sup>lt;sup>c</sup> The term "yield strength" refers to upper or lower yield strength ( $R_{eH}$ ) or ( $R_{eL}$ ) or proof strength ( $R_p$ ), or proof strength total extension ( $R_t$ ) depending on the requirement specified in the relevant product standard.

 $d 1 MPa = 1 N/mm^2$ .

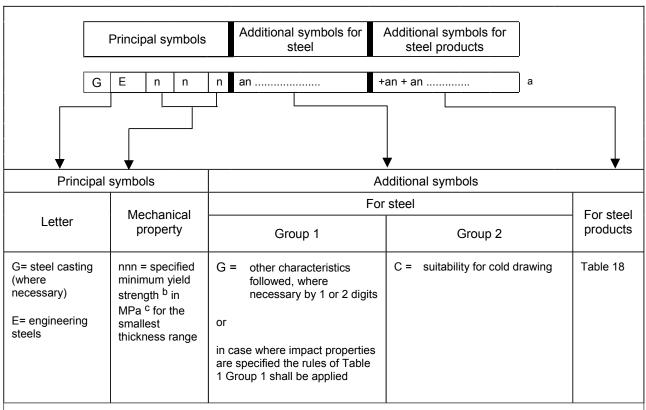


Table 4 — Steels for engineering

 $<sup>^{</sup>c}$  1 MPa = 1 N/mm<sup>2</sup>.

Examples of steel names		
Standard	Steel name according to EN 10027-1	
EN 10025-2	E295 E295GC E335 E360	
EN 10293	GE240	
EN 10296-1	E355K2	

<sup>&</sup>lt;sup>a</sup> n = numerical characters, a = alpha characters, an = alphanumeric characters.

<sup>&</sup>lt;sup>b</sup> The term "yield strength" refers to upper or lower yield strength ( $R_{eH}$ ) or ( $R_{eL}$ ) or proof strength ( $R_{\rho}$ ), or proof strength total extension ( $R_t$ ) depending on the requirement specified in the relevant product standard.

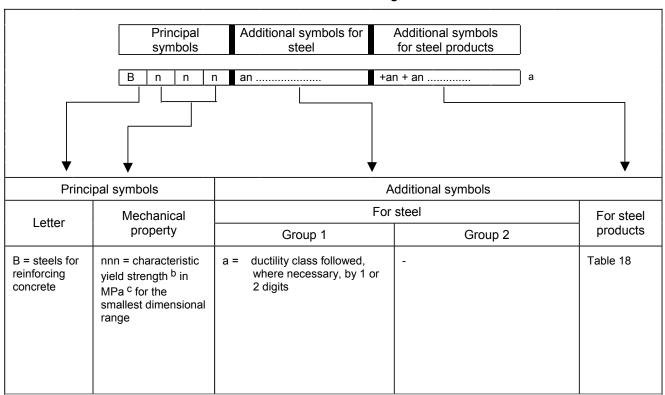


Table 5 —Steels for reinforcing concrete

 $<sup>^{</sup>c}$  1 MPa = 1 N/mm<sup>2</sup>.

Examples of steel names	
Standard	Steel name according to EN 10027-1
No standard available	B500A

<sup>&</sup>lt;sup>a</sup> n = numerical characters, a = alpha characters, an = alphanumeric characters.

<sup>&</sup>lt;sup>b</sup> The term "yield strength" refers to upper or lower yield strength ( $R_{eH}$ ) or ( $R_{eL}$ ) or proof strength ( $R_p$ ), or proof strength total extension ( $R_t$ ) depending on the requirement specified in the relevant product standard.

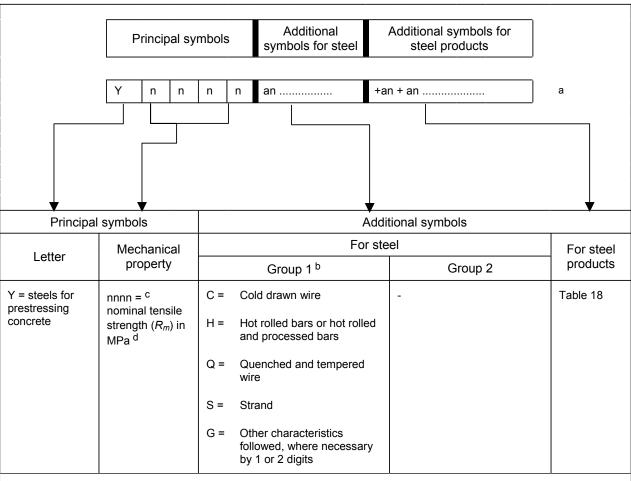


Table 6 — Steels for prestressing concrete

Examples of steel names		
Standard	Steel name according to EN 10027-1	
prEN 10138-2	Y1770C	
prEN 10138-3	Y1770S7	
prEN 10138-4	Y1230H	

<sup>&</sup>lt;sup>a</sup> n = numerical characters, a = alpha characters, an = alphanumeric characters.

<sup>&</sup>lt;sup>b</sup> Symbols of group 1 may be suffixed by one or two digits in order to distinguish between qualities in accordance with the relevant product standard.

<sup>&</sup>lt;sup>c</sup> Where tensile strength is specified by 3 digits the first digit shall be zero.

 $d = 1/Nmm^2$ .

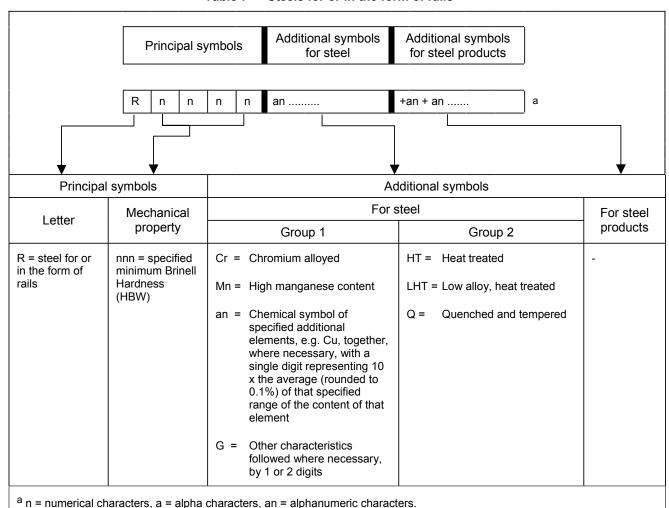
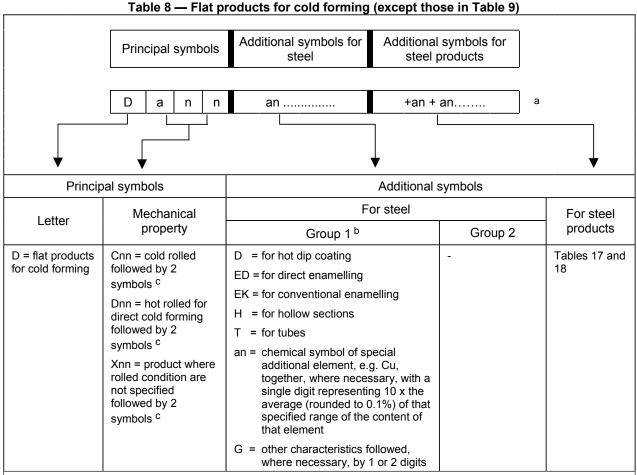


Table 7 — Steels for or in the form of rails

Examples of steel names	
Standard	Steel name according to EN 10027-1

R320Cr

EN 13674-1



<sup>a</sup> n = numerical characters, a = alpha characters, an = alphanumeric characters.

<sup>&</sup>lt;sup>c</sup> These symbols are assigned by the responsible body (see 4.3) in order to characterize the steel.

Examples of steel names		
Standard	Steel name according to EN 10027-1	
EN 10111	DD14	
EN 10130	DC04	
EN 10152	DC03+ZE	
EN 10209	DC04EK	
EN 10327	DX51D+Z	

<sup>&</sup>lt;sup>b</sup> Symbols of group 1, other than chemical symbols, may be suffixed by one or two digits in order to distinguish between qualities in accordance with the relevant product standard.

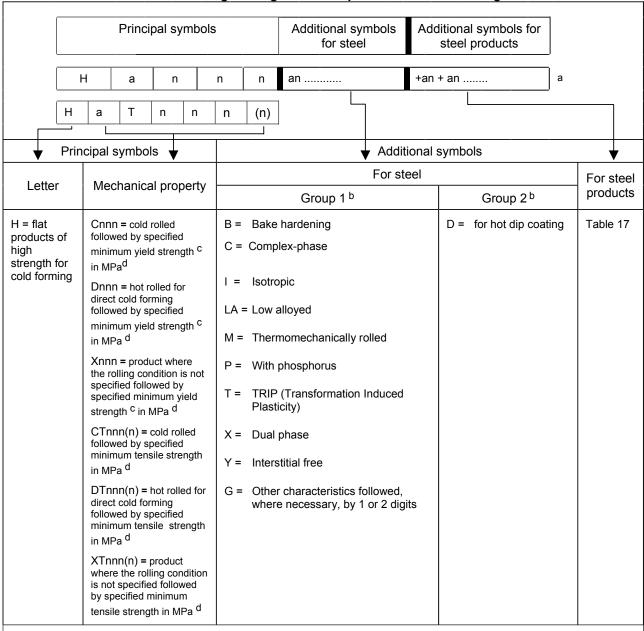


Table 9 — High strength steel flat products for cold forming

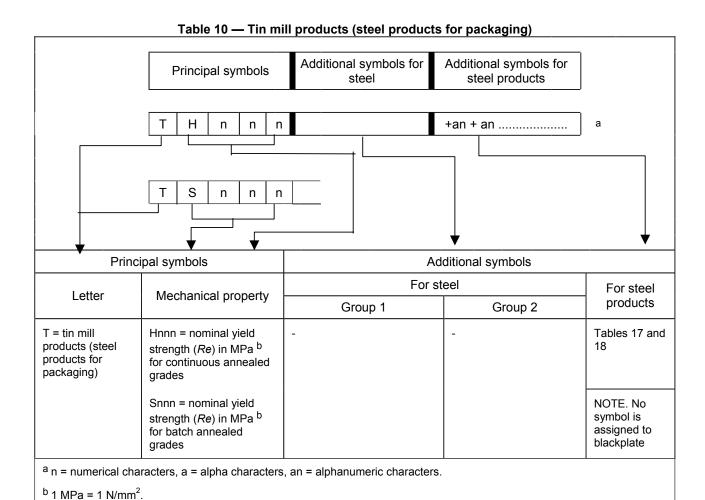
 $d = 1 \text{ MPa} = 1 \text{ N/mm}^2$ .

Examples of steel names	
Standard	Steel name according to EN 10027-1
	HC400LA
prEN 10336	HXT450X

<sup>&</sup>lt;sup>a</sup> n = numerical characters, a = alpha characters, an = alphanumeric characters.

<sup>&</sup>lt;sup>b</sup> symbols of group 1 and 2, may be suffixed by one or two digits in order to distinguish between qualities in accordance with the relevant product standard.

<sup>&</sup>lt;sup>c</sup> The term "yield strength" refers to upper or lower yield strength ( $R_{eH}$ ) or ( $R_{eL}$ ) or proof strength ( $R_p$ ), or proof strength total extension ( $R_t$ ) depending on the requirement specified in the relevant product standard.

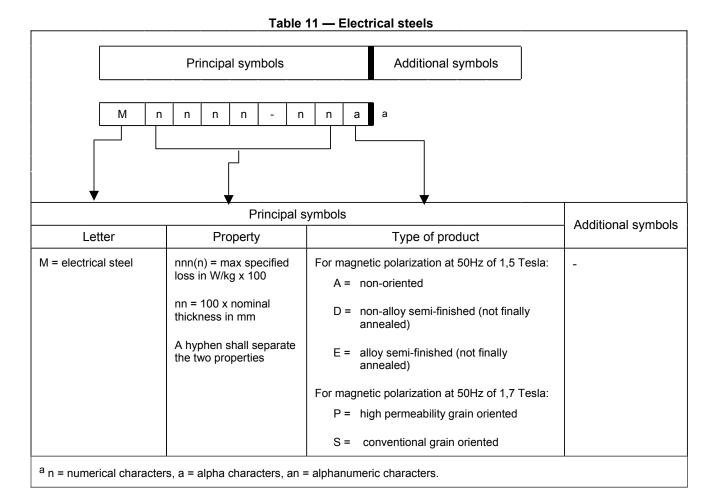


Examples of steel names

Standard

Steel name according to EN 10027-1

TH550 TS550



Example	es of steel names
Standard	Steel name according to EN 10027-1
EN 10106	M400-50A
EN 10107	M140-30S
EN 10126	M660-50D
EN 10165	M390-50E

#### 7.4 Steels designated according to chemical composition

The designation of steel according to their chemical composition shall be made in accordance with Table 12 to Table 15.

In order to keep the steel names of alloy steels as short as practical, some digits or symbols may be omitted as long as there is no risk of confusion with a similar grade.

Table 12 - Non-alloy steels (except free cutting steels) with an average manganese content < 1 %

	Pri	ncipal sy	mbols		Additional symbols for steel	Additional symbols for steel products		
	G C	n	n	n	an	+an +an	а	
<b>V</b>								•
Principa	al symbols				Ado	litional symbols		
Lottor	O a who a sa	-44 h			For s	teel		For steel
Letter	Carbon co	Carbon content <sup>b</sup>			Group 1 <sup>c d</sup>	Group 2		products
casting (where necessary)  C = carbon  c s a r s t t	ann = 100 x s average carb bercentage c Where the ca content is not specified by a a suitably representative shall be selec- the responsibe (see 4.3)	on ontent rbon range, e value ted by	D = E = R = S = U = W =	for with seconted with seranger for specific to for we other	specified sulphur content orings ols elding rod characteristics followed e necessary by, 1 or 2	content of that elemen	sary, ,1%) of the	Table 18

a n = numerical characters, a = alpha characters, an = alphanumeric characters.

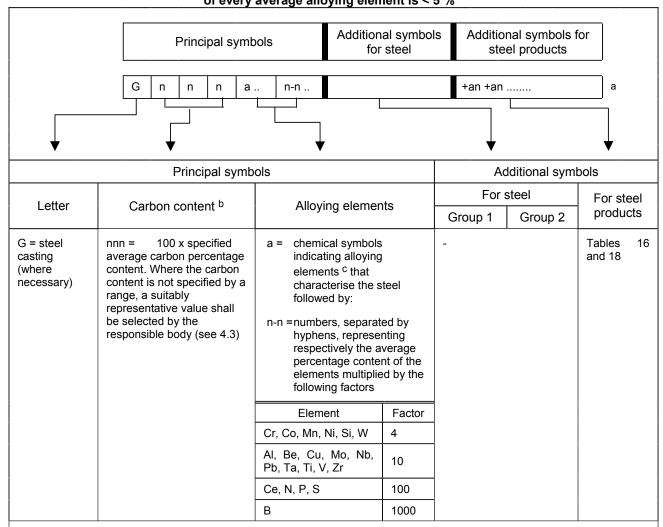
<sup>&</sup>lt;sup>d</sup> The symbols E and R of group 1 may be followed by 1 digit representing 100 x the maximum or average sulphur content rounded to the nearest 0,01 %.

Exar	nples of steel names
Standard	Steel name according to EN 10027-1
EN 10016-2	C20D
EN 10016-3	C2D1
EN 10016-4	C20D2
EN 10083-1	C35E C35R
EN 10083-2	C35
EN 10132-4	C85S
EN 10263-2	C8C

<sup>&</sup>lt;sup>b</sup> To distinguish between two similar steel grades, the number indicating carbon content may be increased by 1.

<sup>&</sup>lt;sup>c</sup> Symbols of group 1, other than E and R, may be suffixed by one or two digits in order to distinguish between qualities in accordance with the relevant product standard.

Table 13 — Non-alloy steels with an average manganese content ≥ 1 %, non-alloy free-cutting steels and alloy steels (except high speed steels) where the content, by weight, of every average alloying element is < 5 %



<sup>&</sup>lt;sup>a</sup> n = numerical characters, a = alpha characters, an = alphanumeric characters.

<sup>&</sup>lt;sup>c</sup> The sequence of symbols shall be in decreasing order of the values of the average percentage content; where the values of contents are the same for two or more elements, the corresponding symbols shall be indicated in alphabetical order.

Example	es of steel names
Standard	Steel name according to EN 10027-1
EN 10028-2	13CrMo4-5
EN 10028-4	13MnNi6-3
EN 10083-1	28Mn6
EN 10083-3	27MnCrB5-2
EN 10087	11SMnPb30

<sup>&</sup>lt;sup>b</sup> To distinguish between two similar steel grades, the number indicating carbon content may be increased by 1.

Table 14 — Stainless steels and other alloy steels (except high speed steels) where the average content by weight of at least one alloying element is ≥ 5 %

	gg	,	ing cicincin is			
	Principal symbols		Additional sym for steel		dditional syr or steel prod	
	G X n n n	a n-n	an	+a	n +an	а
<b></b>	PM X n n n	a n-n		•	ļ	
	Principal symbols			Ac	dditional syr	mbols
Letter	Carbon content <sup>b</sup>	Alloying	elements	For s Group 1	teel <sup>d</sup> Group 2	For steel products
G = steel casting (where necessary)  PM = powder metallurgy (where necessary for tool steel)  X = the average content of at least one alloying element ≥ 5 %	nnn = 100 x specified average carbon percentage content. Where the carbon percentage content is not specified by a range, a suitable representative value shall be selected by the responsible body (see 4.3)	indicati elemen charact followe  n-n = numbe hyphen respect averag the elei	al symbols ng alloying its <sup>c</sup> that terize the steel d by:  rs, separated by is representing tively the e percentage of ments rounded hearest integer	hypheindication indication alloyin that charaction steel a conterrange up to	ated by a n, ing an g element eterizes the end whose at is in the of 0,20 % followed eecified entent for	Tables 16 and 18

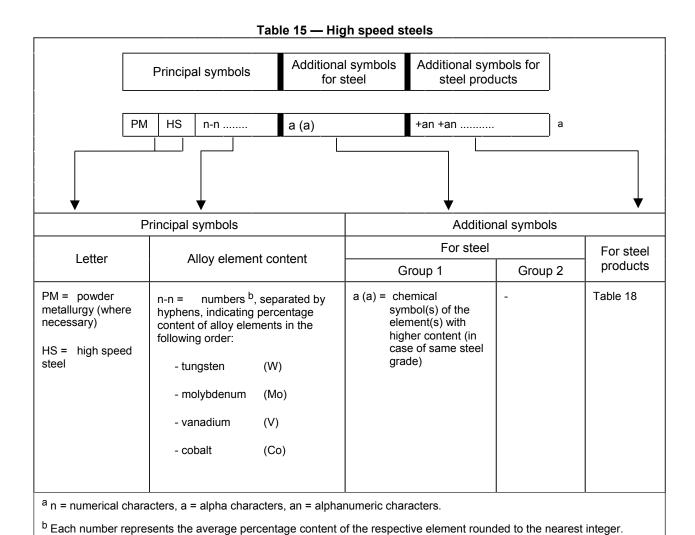
<sup>&</sup>lt;sup>a</sup> n = numerical characters, a = alpha characters, an = alphanumeric characters.

<sup>&</sup>lt;sup>d</sup> An example is given for a steel having high nitrogen content (see below).

Example	es of steel names
Standard	Steel name according to EN 10027-1
EN ISO 4957	X100CrMoV 5
EN 150 4957	X38CrMoNb16
	X10CrNi18-8
EN 10088-2	X6CrMoNb17-1
	X5CrNiCuNb16-4
No standard available	X30NiCrN15-1-N5

<sup>&</sup>lt;sup>b</sup> To distinguish between two similar steel grades, the number indicating carbon content may be increased by 1.

<sup>&</sup>lt;sup>c</sup> The sequence of symbols shall be in decreasing order of the values of the average percentage content; where the values of contents are the same for two or more elements, the corresponding symbols shall be indicated in alphabetical order.



Example	es of steel names
Standard	Steel name according to EN 10027-1
EN ISO 4957	HS2-9-1-8 HS6-5-2 HS6-5-2C

Table 16 — Symbols for steel products indicating special requirements

MEANING
core hardenability
hardenability
through thickness property; minimum reduction of area = 15 %
through thickness property; minimum reduction of area = 25 %
through thickness property; minimum reduction of area = 35 %

<sup>&</sup>lt;sup>a</sup> Symbols are separated from preceding symbols by the plus sign (+). See 7.2 These symbols indicate special requirements which are normally characteristics of steel. However, for practical reasons they are dealt with as symbols for steel products.

Table 17 — Symbols for steel products indicating type of coating

SYMBOL <sup>a</sup>	MEANING
+A	hot dip aluminium coating
+AS	aluminium silicon alloy coating
+AZ	aluminium zinc alloy (> 50 % Al) coating
+CE	electrolytic chromium/chromium oxide coating (ECCS)
+CU	copper coating
+IC	inorganic coating
+OC	organic coating
+S	hot dip tin coating
+SE	electrolytic tin coating
+T	hot dip lead tin alloy (terne) coating
+TE	electrolytic lead tin alloy (terne) coating
+Z	hot dip zinc (galvanised) coating
+ZA	hot dip zinc aluminium (> 50 % Zn) coating
+ZE	electrolytic zinc coating
+ZF	hot dip zinc iron (galvannealed) coating
+ZN	electrolytic zinc nickel alloy coating
<sup>a</sup> Symbols are sepa	rated from preceding symbols by the plus sign (+). See 7.2.

Table 18 — Symbols for steel products indicating treatment condition

SYMBOL <sup>a</sup>	MEANING
-A	soft annealed
AC	annealed to achieve spheriodised carbides
AR	as rolled (without any special rolling and/or heat treatment conditions)
AT	solution annealed
<b>C</b>	cold work hardened
Cnnn	cold work hardened with a minimum tensile strength of nnn MPa b
Pnnn	cold work hardened with a minimum 0.2% proof strength of nnn MPa b
R	cold rolled
C	delivery condition at manufacturer's discretion
:P	treated to ferritic-pearlite structure and hardness range
HC .	hot rolled followed by cold hardening
	isothermically treated
_C	skin passed (temper rolled or cold drawn)
1	thermomechanically formed
I	normalised or normalised formed
IT	normalised and tempered
ı	precipitation hardened
)	quenched
ΩA.	air quenched
)O	oil quenched
!T	quenched and tempered
QW	water quenched
RA.	recrystallisation annealed
3	treated for cold shearing
R	stress relieved
	tempered
Н	treatment to hardness range
J	untreated
VW	warm worked

 $<sup>^{</sup>b}$  1 MPa = 1 N/mm<sup>2</sup>.

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