TECHNICAL SPECIFICATION

# ISO/TS 4949

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# Steel names based on letter symbols

*Désignations des aciers fondées sur des lettres symboles*

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# Foreword

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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).

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For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 17, *Steel*.

This second edition cancels and replaces the first edition (ISO/TS 4949:2003), which has been technically revised.

# Steel names based on letter symbols

## 1 Scope

This document specifies rules for the designation of internationally standardized steel grades 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 steel grades.

NOTE 1 In order to avoid ambiguity, the principal symbols established according to this document can be supplemented 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, deoxidation.

NOTE 2 These rules can also be applied to nationally or regionally standardized steels.

## 2 Normative references

There are no normative references in this document.

## 3 Terms and definitions

For the purposes of this document, the terms and definitions in ISO 4948-1, ISO 4948-2 and ISO 6929 apply.

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

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

## 4 Principles

### 4.1 A unique steel name

There shall be one unique steel name for each steel.

### 4.2 Formulation of steel names

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

### 4.3 Allocation of steel names

For steels specified in International Standards, Technical Specifications or Technical Reports, steel names shall be allocated by the relevant subcommittee of ISO/TC 17.

## 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 structure 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 purpose of designation, steel names are classified into two main groups.

— Group 1: Steels designated according to their application and mechanical or physical properties. See 7.2.

— Group 2: Steels designated according to their chemical composition and further divided into four sub-groups. See 7.3.

## 7 Structure of steel names

### 7.1 Initial symbol for steel castings

Where a steel is specified in the form of a steel casting, its steel name as specified in 7.2 and 7.3 shall be preceded by the letter G.

### 7.2 Steels designated according to their application and mechanical or physical properties (group 1)

The coding shall comprise the following principal symbols.

a) S = structural steels.

*P* = steels for pressure purposes.

L = steels for linepipe.

E = engineering steels.

Each followed by a number being the specified minimum yield strength in MPa for the smallest thickness range.

NOTE 1 The term "yield strength" as used in this document refers to upper or lower yield strength, $R_{eH}$ or $R_{eL}$, proof strength, $R_p$, or proof strength total extension, $R_t$, depending on the requirement specified in the relevant product standard.

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

When the specified minimum tensile strength is used instead of the specified minimum yield strength, the letter T shall be added after the principal symbol, e.g. PT.

In order to distinguish structural steels of different regions an additional letter "G" may be added, e.g. steel grade SG345, see ISO 630-2.

b) B = steels for reinforcing concrete.

Followed by a number being the characteristic yield strength in MPa.

c) Y = steels for pre-stressing concrete.

Followed by a number being the specified nominal tensile strength in MPa.

d) R = steels for or in the form of rails.

Followed by a number being the specified minimum Brinell hardness (HBW).

e) H = cold rolled flat products of high strength steels for cold forming.

Followed by a number being the specified minimum yield strength in MPa or, where only the tensile strength is specified, the letter T followed by a number being the minimum specified tensile strength in MPa.

f) D = flat products for cold forming [except those in 7.2 (e)].

Followed by one of the following letters:

1) C for cold rolled products;

2) D for hot rolled products for direct cold forming;

3) X for products the rolled condition of which is not specified; and by two symbols characterizing the steel allocated by the responsible body. See 4.3.

g) T = tinmill products (steel products for packaging).

Followed by the following letters:

1) for batch annealed grades, the letter S followed by a number being the specified nominal yield strength in MPa;

2) for continuously annealed grades, the letter H followed by a number being the specified nominal yield strength in MPa.

NOTE 3 In the current version of International Standards for tinmill products ISO 11949:2016, ISO 11950:2016 and ISO 11951:2016, the steel names are designated not only according to the nominal yield strength, but also according to Rockwell HR30T hardness values. Since the last available techniques should be reflected in International Standards on packaging steels, the possibility of using the tensile test as the reference test for determining the mechanical properties would be considered during the next revision of these International Standards.

h) M = electrical steels.

Followed successively by the following:

1) a number being 100 × the specified maximum specific loss expressed in W/kg, corresponding to the nominal product thickness, for a magnetic polarization at 50 Hz of

   i) 1,5 Tesla for semi-finished, non-oriented and normal grain oriented steels,

   ii) 1,7 Tesla for reduced loss or high permeability grain oriented steels;

2) a number being 100 × the nominal thickness of the product in millimetres;

3) a letter indicating the type of electrical steel, i.e.

   i) A for non-oriented products,

   ii) D for non-alloy semi-finished (not finally annealed) products,

   iii) E for alloy semi-finished (not finally annealed) products,

   iv) N for normal grain oriented products,

   v) S for reduced loss grain oriented products,

   vi) P for high permeability grain oriented products.

NOTE 4 A hyphen is used to separate symbols (1) and (2).

NOTE 5 The symbols to be indicated after the letter M concern electrical steels for use at the industrial frequency of 50 Hz. For other uses such as steel products for relays and high frequency applications, the principal symbols are not yet established.

## 7.3 Steels designated according to chemical composition (group 2)

### 7.3.1 Non-alloy steels (except free-cutting steels) with an average manganese content < 1 % (sub-group 2.1)

The coding shall comprise successively the following symbols.

a) The letter C.

b) A number being 100 × the specified average percentage carbon content. Where the carbon content is not specified by a range, the subcommittee responsible for the relevant product standard shall select a suitably representative value.

NOTE To distinguish between two similar steel grades, the number indicating carbon content can be increased or decreased by one unit.

The coding should be supplemented as follows:

— E = with specified max sulfur content.

— R = with specified sulfur content range.

— D = for wire drawing.

— C = for cold forming, e.g. cold heading, cold extrusion.

— S = for springs.

— U = for tools.

— W = for welding rod.

— G = other characteristics followed where necessary, by 1 or 2 digits.

### 7.3.2 Non-alloy steels with an average manganese content ≥ 1 %, non-alloy free-cutting steels and alloy steels (except high speed steels) where the average content, by mass, of every alloying element is < 5 % (sub-group 2.2)

The coding shall comprise successively the following symbols.

a) A number being 100 × the specified average percentage carbon content. Where the carbon content is not specified by a range the subcommittee responsible for the relevant product standard shall select a suitably representative value.

NOTE To distinguish between two similar steel grades, the number indicating carbon content can be increased or decreased by one unit.

b) Chemical symbols indicating the alloying elements that characterize the steel. The sequence of symbols shall be in decreasing order of the value of their content; where the values of contents are the same for two or more elements, the corresponding symbols shall be indicated in alphabetical order.

c) Numbers indicating the values of contents of alloy elements. Each number represents the average percentage content of the element indicated multiplied by the factors given in Table 1 and rounded to the nearest integer. The numbers referring to the different elements shall be separated by hyphens.

However, in order to follow the principle of keeping names as short as practical, one or more of these digits may be omitted as long as there is no danger of confusion with a similar grade.

 

**Table 1 — Factors for alloying elements for steels in sub-group 2.2**

| Element | Factor |
|---|---|
| Co, Cr, Mn, Ni, Si, W | 4 |
| Al, Be, Cu, Mo, Nb, Pb, Ta, Ti, V, Zr | 10 |
| Ce, N, P, S | 100 |
| B | 1 000 |

#### 7.3.3 Alloy steels (except high speed steels) where the average content by mass of at least one alloying element is ≥ 5 % (sub-group 2.3)

The coding shall comprise successively the following symbols.

a) The letter X.

b) A number being 100 × the specified average percentage carbon content. Where the carbon content is not specified by a range the subcommittee responsible for the relevant product standard shall select a suitably representative value.

NOTE To distinguish between two similar steel grades, the number indicating carbon content can be increased or decreased by one unit.

c) Chemical symbols indicating the alloying elements that characterize the steel. The sequence of symbols shall be in decreasing order of the value of their content; where the values of contents are the same for two or more elements, the corresponding symbols shall be indicated in alphabetical order.

d) Numbers indicating the values of contents of alloying elements. Each number represents the average percentage content of the element indicated rounded to the nearest integer. The numbers referring to the different elements shall be separated by hyphens.

#### 7.3.4 High speed steel (sub-group 2.4)

The coding shall comprise successively the following symbols.

a) The letters HS.

b) Numbers indicating the values of percentage contents of alloying elements indicated in the following order:

1) tungsten (W);

2) molybdenum (Mo);

3) vanadium (V);

4) cobalt (Co).

Each number shall represent the average percentage content of the respective element rounded to the nearest integer; the numbers referring to the different elements shall be separated by hyphens.

## 8 Additional symbols

Additional symbols indicating special requirements, the type of coating and the treatment condition shall be used as specified in Tables A.1, B.1 and C.1 respectively.

# Annex A
(normative)

# Additional symbols indicating special requirements

**Table A.1 — Additional symbols indicating special requirements**

| Symbol | Meaning |
|---|---|
| +H | hardenability |
| +CH | core hardenability |
| +Z15 | through thickness property; minimum reduction of area = 15 % |
| +Z25 | through thickness property; minimum reduction of area = 25 % |
| +Z35 | through thickness property; minimum reduction of area = 35 % |
| NOTE Symbols are separated from preceding symbols by the plus sign (+). These symbols indicate special requirements that are normally characteristics of steel. However, for practical reasons they are dealt with as symbols for steel products. | |

# Annex B
(normative)

# Additional symbols indicating type of coating

**Table B.1 — Additional symbols indicating type of coating**

| Symbol | 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 |
| +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 |
| +ZM | hot dip zinc magnesium coating |
| NOTE Symbols are separated from preceding symbols by the plus sign (+). To avoid confusion with other symbols the letter S may be used to prefix these symbols, e.g. +SA. | |

# Annex C
(normative)

# Additional symbols indicating treatment condition

**Table C.1 — Additional symbols indicating treatment condition**

| Symbol | Meaning |
|---|---|
| +A | soft annealed |
| +AC | annealed to achieve spheriodized carbides |
| +AR | as rolled (without any special rolling and/or heat treatment conditions) |
| +AT | solution annealed |
| +C | cold work hardened |
| +Cnnn | cold work hardened with a minimum tensile strength of nnn MPa |
| +CR | cold rolled |
| +DC | delivery condition at manufacturer's discretion |
| +FP | treated to ferrite-pearlite structure and hardness range |
| +HC | hot rolled followed by cold hardening |
| +I | isothermically treated |
| +LC | skin passed (temper rolled or cold drawn) |
| +M | thermomechanically formed |
| +N | normalized or normalized formed |
| +NT | normalized and tempered |
| +P | precipitation hardened |
| +Q | quenched |
| +QA | air quenched |
| +QO | oil quenched |
| +QT | quenched and tempered |
| +QW | water quenched |
| +RA | recrystallization annealed |
| +S | treated for cold shearing |
| +SR | stress relieved |
| +T | tempered |
| +TH | treatment to hardness range |
| +U | untreated |
| +WW | warm worked |
| NOTE Symbols are separated from preceding symbols by the plus sign (+). To avoid confusion with other symbols the letter T may be used to prefix these symbols, e.g. +TA. | |

# Bibliography

[1] ISO 630-2, *Structural steels — Part 2: Technical delivery conditions for structural steels for general purposes*

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

[3] ISO 4948-2, *Steels — Classification — Part 2: Classification of unalloyed and alloy steels according to main quality classes and main property or application characteristics*

[4] ISO 6929, *Steel products — Vocabulary*

[5] ISO 11949:2016, *Cold-reduced tinmill products — Electrolytic tinplate*

[6] ISO 11950:2016, *Cold-reduced tinmill products — Electrolytic chromium/chromium oxide-coated steel*

[7] ISO 11951:2016, *Cold-reduced tinmill products — Blackplate*

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