TECHNICAL SPECIFICATION

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Steel names based on letter symbols

Désignations des aciers fondées sur des lettres symboles

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

— an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;

— an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TS 4949 was prepared by Technical Committee ISO/TC 17, *Steel*.

This first edition cancels and replaces the Technical Report (ISO/TR 4949:1989), which has been technically revised and upgraded.

Steel names based on letter symbols

1 Scope

This Technical Specification sets out 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, it may be necessary to supplement the principal symbols established according to this Technical Specification 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 may also be applied to nationally or regionally standardized steels.

2 Normative references

The following referenced documents are indispensable for the application 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 4948-1, *Steels — Classification — Part 1: Classification of steels into unalloyed and alloy steels based on chemical composition*

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

ISO 6929, *Steel products — Definitions and classification*

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.

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 Technical Specification, 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 4 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 linepipes
E = engineering steels

} followed by a number being the specified minimum yield strength[1] in MPa[2] for the smallest thickness range;

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.

b) B = steels for reinforcing concrete
followed by a number being the characteristic yield strength in MPa;

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1) The term “yield strength” as used in this Technical Specification 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.

2) 1 MPa = 1 N/mm^2.

c) Y = steels for prestressing 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 rolling 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:

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

2) for continuously annealed grades the letter S
followed by a number being the specified nominal yield strength in MPa;

h) M = electrical steels
followed successively by:

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:

— 1,5 T for semi-finished, non oriented and normal grain oriented steels;

— 1,7 T 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.:

— A for non-oriented products;

— D for non-alloy semi-finished (not finally annealed) products;

— E for alloy semi-finished (not finally annealed) products;

— N for normal grain oriented products;

— S for reduced loss grain oriented products;

— P for high permeability grain oriented products.

NOTE 1 A hyphen shall separate symbols (1) and (2).

NOTE 2 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[3]. 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 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[3]. Where the carbon content is not specified by a range the Subcommittee responsible for the relevant product standard shall select a suitably representative value;

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.

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[3] To distinguish between two similar steel grades, the number indicating carbon content may be increased or decreased by one unit.

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[3]. Where the carbon content is not specified by a range the Subcommittee responsible for the relevant product standard shall select a suitably representative value;

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:

— tungsten (W);

— molybdenum (Mo);

— vanadium (V);

— cobalt (Co).

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

Table 1 — Factors for alloying elements for steels in 7.3.2

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

8 Additional symbols

Additional symbols indicating special requirements, the type of coating and the treatment condition are given in Tables A.1, B.1 and C.1 respectively.