

# TECHNICAL REPORT

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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.

The main task of ISO technical committees is to prepare International Standards. In exceptional circumstances a technical committee may propose the publication of a Technical Report of one of the following types:

- type 1, when the necessary support within the technical committee cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development, requiring wider exposure;
- type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports are accepted for publication directly by ISO Council. Technical reports of types 1 and 2 are subject to review within three years of publication, to decide if they can be transformed into International Standards. Technical reports of type 3 do not necessarily have to be reviewed until the data they provide is considered no longer valid or useful.

ISO/TR 4949, which is a technical report of type 2, was prepared by Technical Committee ISO/TC 17, *Steel*.

It was decided that it would be more appropriate to publish this document in the form of a Technical Report type 2 for the time being, so that the designation system described could be implemented on an experimental basis before being applied to all International Standards developed by ISO/TC 17.

Annex A of this Technical Report is for information only.

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## Introduction

### Historical background

The steel designations given in the various International Standards for steels were in the past established by the different sub-committees of ISO/TC 17, independently from one another, though a degree of cooperation and harmonization would have been useful.

### Explanation of the system

This International Technical Report is intended to serve as a basis for such cooperation and harmonization.

It covers a designation system which is applicable to all groups of steels and which has been developed taking particularly into consideration mnemotechnical aspects. This means that the designations — hereinafter called "steel names" — give direct information about the main characteristics of the type of steel concerned.

A further designation system for steels, particularly suitable for data processing, namely a numbering system, is in preparation as a part of ISO/TR 7003. The parallel application of both steel names and steel numbers in International Standards and in practice is recommended in order to minimize the danger of confusion between materials as a result of errors in the designation, and also to overcome the difficulties likely to occur when, in the future, it becomes necessary to modify a steel number or name.

The steel names in this system consist, as indicated in tables 1 to 3, of a code-letter for the steel group, a code-number for the main characteristics of the steel and additional code-letters and code-numbers. The sequence of these symbols is always the same. Therefore, it is possible to use any letter of the alphabet for the additional code-letters without using multi-letter codes, except in the case of the codes for the heat-treatment condition (see table 5).

### Future procedure

All international and national committees and groups for the standardization of steels are invited to examine in the coming years the feasibility of this new designation system and to apply it where appropriate when new designations are introduced or old ones altered.

In cases where, for some reason, steel designations not in accordance with this system are introduced, care should be taken that the letters B, C, D, E, G, H, L, M, P, R, S, T and X used in this system as the first letters of steel names are not applied in another sense as first letters (see also annex A, which lists all the code-letters in tables 1 to 3 in alphabetical order).

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# Steel names based on letter symbols

## 1 Scope

**1.1** This Technical Report establishes a system for the designation of internationally standardized steels on the basis of "steel names". It is felt that such a designation system supplies more direct information about the main characteristics of the type of steel concerned than a designation system based on "steel number" (see ISO/TR 7003, annex A).

**1.2** Because steel names are more readily understood, a designation system based on names is preferable in cases where the data-processibility of the designation is of no importance.

**1.3** The codes and rules given in this Technical Report are applicable to the formation of "steel names" of steels standardized or registered in national or regional steel standards or steel lists. In such cases, sub-clause 3.1 should be observed.

NOTE — It is intended at a later date to add an assigner code to the steel names to differentiate between steels registered in different countries.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1052 : 1982, *Steel for general engineering purposes*.

ISO/TR 7003 : —<sup>1)</sup>, *Unified format for the designation of metals*.

ISO 7778 : 1983, *Steel plate with specified through-thickness characteristics*.

## 3 General requirements

**3.1** Each particular type of steel shall have only one name and, conversely, a name assigned to an individual steel shall not be assigned to another, even if the steel is withdrawn.

An individual steel is a steel for which a particular set of specifications governing the **essential material characteristics** applies.

The essential characteristics may, for example, be defined on the basis of the specifications for the chemical composition ranges or the requirements on its characteristic properties or, in certain cases, special manufacturing procedures (e.g. remelted roller-bearing steels in comparison to non-remelted steel) or, in special cases, the end use. Where materials may be delivered in different treatment conditions (heat treatment or cold reduction), which will influence the material properties, these treatment conditions shall not be covered in the steel name itself, but in a suffix. Differences in delivery requirements which do not affect the material characteristics (such as the type of marking, the surface appearance and the amount of testing) shall not be a reason to assign a different steel name.

**3.2** The steel name shall be as short as possible without contravening the requirements specified in 3.1.

**3.3** The steel name shall not normally be changed. If, under exceptional circumstances, a change becomes unavoidable, it shall be done only after ensuring that the change does not contravene the requirements specified in 3.1.

## 4 Structure of international steel names and symbols used

**4.1** The structure of the international steel names and the symbols used shall be as specified in the following tables:

- table 1 for (unalloyed and low-alloy) steels which are primarily characterized by their minimum yield stress;
- table 2 for steels primarily characterized by their application or by properties other than minimum yield stress;

1) To be published.

— table 3 for steels primarily characterized by their chemical composition.

An alphabetical listing of all code-letters used is given in annex A.

## 5 Codes for treatment condition of the steel

**5.1** The codes used for the various treatment conditions of the steel are given in table 5.

## 6 Responsibilities

### 6.1 Responsibility for allocation of steel name

When a sub-committee proposes the international standardization of a steel, it should also make a proposal for the designation of this steel in accordance with this Technical Report. The sub-committee making the proposal shall inform the Secretariat of TC 17/SC 2 of its proposal, and sub-committee 2 shall check whether the rules of this Technical Report have been applied correctly and, in particular, that the proposed name is not identical with an already existing name.

### 6.2 Responsibility for administration of the designation system

The responsibility for the maintenance of lists of international steel names shall be that of the Secretariat of TC 17/SC 2, while the responsibility for the publication and sale of such lists shall be that of the ISO Central Secretariat.

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**Table 1 Structure of and symbols used in international steel names based primarily on the minimum yield stress**

1	2	3	4	5	6										
Structure of international steel name															
(ISN-) $\alpha$ $\alpha$ $\alpha$ $\alpha$ $\alpha$ $\alpha$	$\alpha$ $\alpha$ $\alpha$ $\alpha$ $\alpha$	$\alpha$ $\alpha$ $\alpha$ $\alpha$ $\alpha$	$\alpha$ $\alpha$ $\alpha$ $\alpha$ $\alpha$	$\alpha$ $\alpha$ $\alpha$ $\alpha$ $\alpha$	$\alpha$ $\alpha$ $\alpha$ $\alpha$ $\alpha$										
Explanation of symbols used ( ) means code-letter or number may not be necessary x = code-letter or number ISN = International steel name (see note to 1.3)															
G = cast steel (the symbol C is reserved for carbon steel — see table 3)															
Codes indicating the application															
<table border="1"> <thead> <tr> <th data-bbox="711 230 831 504">S</th> <th data-bbox="711 504 831 779">P</th> <th data-bbox="711 779 831 1055">L</th> <th data-bbox="711 1055 831 1330">B</th> <th data-bbox="711 1330 831 1480">E</th> </tr> </thead> <tbody> <tr> <td data-bbox="831 230 951 504">                             Structural steels (see also column 6)                              SD for bright drawing                              SB for flanging or bending                              SV for die forging                              SS for cold-rolling into sections                              SW for welded tubes                              SF for special formability<sup>1)</sup> applications                         </td> <td data-bbox="831 504 951 779">                             Steels for pressure purposes                              PL at low temperatures                              PH at high temperatures                              PLH at low and high temperatures                         </td> <td data-bbox="831 779 951 1055">                             Steels for pipelines                         </td> <td data-bbox="831 1055 951 1330">                             Steels for reinforcement of concrete                              BP Steels for prestressing of concrete                         </td> <td data-bbox="831 1330 951 1480">                             Steels for engineering purposes and bolted constructions (ISO 1052)                         </td> </tr> </tbody> </table>						S	P	L	B	E	Structural steels (see also column 6) SD for bright drawing SB for flanging or bending SV for die forging SS for cold-rolling into sections SW for welded tubes SF for special formability <sup>1)</sup> applications	Steels for pressure purposes PL at low temperatures PH at high temperatures PLH at low and high temperatures	Steels for pipelines	Steels for reinforcement of concrete BP Steels for prestressing of concrete	Steels for engineering purposes and bolted constructions (ISO 1052)
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<table border="1"> <thead> <tr> <th data-bbox="1054 230 1246 504">Main characteristic</th> </tr> </thead> <tbody> <tr> <td data-bbox="1054 504 1246 1749">                             Represented in the designation by the value of <math>0,1 \times R_{e, \min}</math>, in newtons per square millimetre, specified for the smallest thickness. If in special cases, e.g. in the case of sheet in the as cold-rolled condition, <math>R_{e, \min}</math> is not specified, the symbol T (tensile) followed by the value of <math>0,1 \times R_{m, \min}</math> (<math>R_m</math> = tensile strength, also in newtons per square millimetre) shall be given.                         </td> </tr> </tbody> </table>						Main characteristic	Represented in the designation by the value of $0,1 \times R_{e, \min}$ , in newtons per square millimetre, specified for the smallest thickness. If in special cases, e.g. in the case of sheet in the as cold-rolled condition, $R_{e, \min}$ is not specified, the symbol T (tensile) followed by the value of $0,1 \times R_{m, \min}$ ( $R_m$ = tensile strength, also in newtons per square millimetre) shall be given.								
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1) As achieved, for example, by the addition of elements to modify the sulfide structure or by other special metallurgical methods.															

Table 1 — Structure of and symbols used in international steel names based primarily on the minimum yield stress (continued)

1	2	3	4	5	6
(ISN-) $\alpha$ ( $\alpha$ ) ( $\alpha$ ) $mn$ ( $\alpha.xx$ )	Explanation of symbols used				
		Codes indicating additional properties and features of the manufacturing process			
<p style="text-align: center;">Additional codes</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>A, B, C, CC, D, DD, E } Quality class<sup>1)</sup></p> <p>R, X, K, F } See column 3</p> <p>W } Weather-resistant</p> <p>N } See column 3</p> <p>Q } See column 3</p> <p>-TM</p> </div> <div style="width: 45%;"> <p><math>T_{27J}</math> °C: 20, 0, -20, -50</p> <p><math>T_{40J}</math> °C: —, —, 0, -20</p> </div> </div>	<p style="text-align: center;">iTeh STANDARD PUBLISHING (standards.iteh.ai)</p> <p style="text-align: center;">ISO/TR 4949:1989</p> <p style="text-align: center;">https://standards.iteh.ai/catalog/standards/sist/c661e6c3-c092-4128-abc-5ec15df203/iso-tr-4949-1989</p> <p>Rimmed Semi-killed Non-rimmed (mixture) Killed (—fully killed) Fine-grained or <math>A_{\text{max}} &gt; 0,015</math> etc.</p> <p>X K F</p> <p>See column 3</p> <p>C Cold-worked H Hot-rolled Q Quenched + tempered</p> <p>-TM</p>				
<p>1) Where possible, the quality class is characterized by the impact-energy transition temperature <math>T_{27J}</math> or <math>T_{40J}</math> for longitudinal ISO V-notch test pieces and/or the requirements for the composition and de-oxidation of the steel.</p> <p>2) Treatment conditions N and Q are listed here mainly for the purpose of characterizing the steel group concerned. In neither case do they represent the actual treatment condition of the steel. It may for example occur that, with a view to subsequent hot-forming operations, a P 42 Q steel is ordered untreated, i.e. with the designation P 42 Q-TU as required by table 5.</p> <p>3) See table 5, footnote 3.</p>					



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**Table 1 — Structure of and symbols used in international steel names based primarily on the minimum yield stress (concluded)**

1	2	3	4	5	6
(ISN-) $\alpha$ ( $\alpha$ ) ( $\alpha$ ) $nm$ ( $\alpha$ $xx$ )	<b>Explanation of symbols used</b>				
	Codes indicating additional properties and features of the manufacturing process				
Additional codes	$Z\ nm$ (see column 3)	$Z\ nm$ Reduction of area in the direction of thickness > $nm$ % (see ISO 7778)			
		$Gx$	$Gx$ Grade $x$ ( $x = 0$ to $9$ or $A$ to $Z$ )		
		$-Txxx$			Treatment $xxx$ (see table 5)
Examples: ISN	S 23 B S 35 D S 42 EZ 25 S 42 Q	P 20 P 20 R PH 35 PH 42 PH 42 Q	L 23 L 23 F L 35 L 35-TM	B 50 B 50 C BP 157 C BP 157 Q	E 29 E 33 E 36

Table 2 – Structure of and symbols used in international steel numbers based primarily on the application

Example illustrating structure of international steel name		1	2	3		
		rails	Steels for or in form of flat products for drawing			
Explanation of symbols used		uncoated		metal-coated <sup>2)</sup>		
		ISN-R 68 C5		ISN-D H 2 R		ISN-D4TL - Z 275 M
Group codes	R Rail	D For drawing	H Hot-rolled and intended for cold rolling	D Hot-rolled and intended for direct drawing	No code — Cold-rolled	See column 2
	68 Minimum tensile strength $\approx 680 \text{ N/mm}^2$	1 Commercial quality	2 Drawing quality	3 Deep-drawing quality	4 Extra-deep drawing quality	Minimum mass of coating in $\text{g/m}^2$ according to the triple-spot test <sup>3)</sup>
	(C5) <sup>1)</sup> $C_{\text{mean}} \approx 0,50\%$ — If appropriate, additional codes for alloying elements	(R) <sup>1)</sup> Ageing (rimming)	(A) <sup>1)</sup> Al-killed (low Si) or corresponding non-ageing quality	Symbols for additional characteristics explained in the standard (M = minimum spangle)		
Additional codes		Gx Grade x (x = 0 to 9 or A to Z)		-Txxx Treatment xxx (see table 5)		

1) Codes given in brackets shall only be used where appropriate to differentiate between steel types.

2) A complete designation system for coatings, also covering chromium/chromium oxide and organic coatings, will be included when the work on an International Standard for organic-coated flat products has reached a more advanced stage.

3) In the case of electrolytic-coated flat products, the nominal coating thickness in  $\mu\text{m}$  is given instead of the minimum mass. In the case of differential coatings (e.g. a nominal thickness of 38  $\mu\text{m}$  on one side and 25  $\mu\text{m}$  on the other), the designation is structured as indicated in the following example: ZE 38/25.

Table 2 — Structure of and symbols used in international steel numbers based primarily on the application (concluded)

Example illustrating structure of international steel name		4	5	6			
		Steel for or in form of					
Explanation of symbols used		black plate or strip	tin plate or strip	electrical sheet or strip			
		Group codes	Main characteristic	ISN-T P 50 D	ISN-T P 50 D - E 5, 6/2, 8	ISN-M G 111 - 35	
T Thin flat products (tin plate and its substitutes and black plate and strip)	See column 4 (E) <sup>1)</sup> Electrolytic coated (H) <sup>1)</sup> Hot-dip coated						M Electrical (magnetic) sheet or strip G Grain-oriented No code — Non-grain-oriented
P50 Average proof stress (P) 500 N/mm <sup>2</sup> H50 Average hardness 50 HR 30T	Nominal coating mass 5,6 g/m <sup>2</sup> on one side and 2,8 g/m <sup>2</sup> on other side						111 The core loss at an induction of 1,5 tesla and a frequency of 50 Hz for the thickness given in the last code <sup>2)</sup> is about 0,01 × 111 W/kg
Additional codes		D Double-reduced No code — Single reduced		35 The nominal thickness is 0,01 × 35 mm			
		Gx Grade x (x = 0 to 9 or A to Z)					
Txxx Treatment xxx (see table 5)							

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1) Codes given in brackets shall only be used where appropriate to differentiate between steel types.

2) According to the present specifications, in the case of non-grain-oriented steel half of the sample mass shall be cut in the rolling direction and half perpendicular to the rolling direction. In the case of grain-oriented steel, all samples shall be cut in the rolling direction.