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Tabular layouts of article characteristics for iron and steel

DIN 4000 Part 23

Sachmerkmal-Leisten für Werkstoffe; Stahl und Eisen

Supersedes October 1981 edition and Supplement 1 to DIN 4000 Part 23, October 1981 edition.

In keeping with current practice in standards published by the International Organization for Standardization (ISO), a comma has been used throughout as the decimal marker.

1 Field of application

This standard specifies tabular layouts, in accordance with DIN 4000 Part 1, for standardized and non-standardized steel and ferrous materials.

2 Tabular layouts

The following materials are covered here, grouped according to the corresponding tabular layout number:

Tabular layout no. 1: (cf. subclause 3.1)
base and high-grade steel;
structural steel;
stainless steel;
cast iron.

Tabular layout no. 2: (cf. subclause 3.2)
steel with elevated temperature properties;
high-temperature steel.

Tabular layout no. 3: (cf. subclause 3.3)
non-magnetizable steel;
steel with particular thermal expansion;
properties.

Tabular layout no. 4: (cf. subclause 3.4)
steel with magnetic properties.

Tabular layout no. 5: (cf. subclause 3.5)
cold work steel;
hot work steel;
high speed steel;
steel for rolling bearings;
wear-resistant steel;
hard metals.

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3 Tabular layouts

3.1 Tabular layout no. 1 (for base and high-grade steel, structural steel, stainless steel and cast iron)

Tabular layout DIN 4000 – 23 – 1									
Code letter	A	B	C	D	E	F	G	H	J
Designation of article characteristic	Minimum proof stress	Minimum tensile strength	Minimum elongation at fracture, L_0	Impact energy in accordance with DIN 50 115, at the following temperatures, in °C: 20	n	Minimum elevated temp. proof stress, at 300 °C	Elevated temp. proof stress, at n °C, or rupture stress after 1000 h	Maximum hardness	Other properties
Symbol									
Unit	N/mm²	N/mm²	%	J	J	N/mm²	N/mm²	–	–

Note. In the column identified by the code letters D and E, the mean values and the test piece shape are to be given; in column H, the unit shall be HB in the case of materials in the annealed condition, HR or HV and, where necessary, the heat treatment condition is to be given; in column J, additional properties (e. g. weldable, suitable for deep drawing, weatherproof, stainless) are to be given.

3.2 Tabular layout no. 2 (for steel with elevated temperature properties and high-temperature steel)

Tabular layout DIN 4000 – 23 – 2									
Code letter	A	B	C	D	E	F	G	H	J
Designation of article characteristic	Minimum proof stress	Minimum tensile strength	Minimum elongation at fracture, L_0	Impact energy as in DIN 50 115, at 20 °C	Minimum elevated temperature proof stress, at 300 °C	500 °C	Elevated temp. proof stress, at n °C, or rupture stress after 10 000 h	Maximum hardness	Maximum service temperature
Symbol									
Unit	N/mm²	N/mm²	%	J	N/mm²	N/mm²	N/mm²	–	°C

Note. In the column identified by the code letter D, the mean values and the test piece shape are to be given; in column H, the unit shall be HB, HRC or HV and, if necessary, the heat treatment condition is to be given.

3.3 Tabular layout no. 3 (for non-magnetizable steel and steel with particular thermal expansion properties)

Tabular layout DIN 4000 – 23 – 3									
Code letter	A	B	C	D	E	F	G	H	J
Designation of article characteristic	Minimum proof stress	Minimum tensile strength	Minimum elongation at fracture, L_0	Impact energy as in DIN 50 115, at 20 °C	Coeff. of l. th. ex.*), between 20 °C and n °C			Maximum hardness	Maximum permeability
Symbol									
Unit	N/mm²	N/mm²	%	J	$10^{-6}K^{-1}$	–	–	–	H/m

Note. In the column identified by the code letter D, the mean values and the test piece shape are to be given; in column E, the temperature range may be between 20 °C and 600 °C, for example; in column H, the unit shall be HB, HRC or HV and, if necessary, the heat treatment condition is to be given.

*) Coefficient of linear thermal expansion.

3.4 **Tabular layout no. 4** (for steel with magnetic properties)

Tabular layout DIN 4000 – 23 – 4									
Code letter	A	B	C	D	E	F	G	H	J
Designation of article characteristic	Hysteresis loss			Minimum magnetic induction, at a field strength, H, in A/m, of			Coercive force	Maximum hardness	Resistivity
	P 1,0	P 1,5	P 1,7	100	500	5000			
Symbol									
Unit	W/kg			T			A/m	–	$\Omega\,mm^2/m$

Note. In the column identified by the code letter H, the unit shall be HV or HRB.

3.5 **Tabular layout no. 5** (for cold work steel, hot work steel, high speed steel, steel for rolling bearings, wear-resistant steel and hard metals)

Tabular layout DIN 4000 – 23 – 5									
Code letter	A	B	C	D	E	F	G	H	J
Designation of article characteristic	Elevated temperature strength after quenching to 1500 N/mm² at		Thickness after hardening at		Hardness after hardening and tempering at				Maximum hardness, in HB
	300 °C	600 °C	62 HRC	52 HRC	100 °C	300 °C	500 °C	n °C	
Symbol									
Unit	N/mm^2		mm		–				–

Note. In the column identified by the code letters E, F, G and H, the unit shall be HB, HRC or HV; in column J, the values shall represent material in the softened condition.

Standards referred to

DIN 4000 Part 1 Tabular layouts of article characteristics; concepts and principles

DIN 50 115 Notched bar impact testing of metallic materials using test pieces other than ISO test pieces

Previous editions

DIN 4000 Part 23: 10.81; Supplement 1 to DIN 4000 Part 23: 10.81.

Amendments

In comparison with the October 1981 editions of this standard and of the Supplement, the following amendments have been made.

a) The information contained in Supplement 1 has been incorporated into this standard.

b) The standard has been editorially revised.

Explanatory notes

The tabular layouts of article characteristics of the materials covered here are different from those used for other standard parts. One reason is that numbered illustrations cannot be used, another is the wider variety of characteristics which such materials can have.

At the planning stage of this standard, the responsible technical committee first made the decision to use material groups (e.g. steels for quenching and tempering, free-cutting steels) instead of numbered illustrations, and to include as many characteristics as possible, in several different tables. This proved unfeasible, however, due to the lack of clarity which resulted in the documentation.

Therefore, in keeping with the principles set out in DIN 4000 Part 1, and with an eye toward the data used by VDEh (which keeps on record all iron and steel characteristics as specified in the tables of DIN Standards and of *Stahl-Eisen-Werkstoffblätter* (Iron and steel materials sheets)), the decision was made to include only principal material characteristics. After listing all possible characteristics, VDEh, together with the *Normenausschuß Eisen und Stahl* (Steel and Iron Standards Committee), devised a list of only those characteristics which are most relevant to users. These are used in the tabular layouts specified here, encoded with the letters A to H and J. (A listing of all characteristics stored in the data bank at present is obtainable from the *Betriebsforschungsinstitut, VDEh-Institut für angewandte Forschung GmbH*, Sohnstraße 65, D-4000 Düsseldorf 1. The data bank will be extended at a later date to include characteristics other than those covered in standards.)

Given this restriction, the present standard specifies only five different tabular layouts for the entire range of standardized steel and ferrous materials, which may mean that more than one tabular layout is suitable for a particular material. The ranges of material numbers given below may assist users in assigning one tabular layout to a particular material (although this list is also not complete):

Tabular layout no. 1

Material numbers 0.60 . . to 0.99 . .
1.00 . . to 1.07 . .
1.09 . .
1.11 . . to 1.12 . .
1.40 . . to 1.45 . .
1.50 . . to 1.89 . .

Tabular layout no. 2

Material numbers 1.47 . . to 1.49 . .

Tabular layout no. 3

Material numbers 1.38 . . to 1.39 . .

Tabular layout no. 4

Material numbers 1.03 . .
1.08 . .
1.10 . .
1.36 . . to 1.39 . .

Tabular layout no. 5

Material numbers 1.15 . . to 1.18 . .
1.20 . . to 1.29 . .
1.31 . . to 1.35 . .

The number of places available for each characteristic used in a tabular layout is specified in the table below, which has been taken from DIN 4000 Part 1.

Code letter / Tabular layout no.	A	B	C	D	E	F	G	H	J	
	Maximum number of places per code letter (column)									
1	6	6	4	4	4	5	11	5	12	57
2	6	6	4	4	6	6	11	5	6	54
3	6	6	4	4	6	1	1	5	6	39
4	6	6	6	7	7	7	5	5	5	54
5	6	6	6	6	5	5	5	5	5	49

The number of places specified for each code letter represents the shortest possible entry which can be made for any item in an article characteristics list.

International Patent Classification

C 22 C 38/00