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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry, through deliberations at the Japanese Industrial Standards Committee as the result of proposal of revision of Japanese Industrial Standard submitted by the Japan Iron and Steel Federation (JISF) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS G 4401**:2006 is replaced with this Standard.

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Carbon tool steels

Introduction

This Japanese Industrial Standard has been prepared based on the second edition of **ISO 4957** published in 1999 with some modifications of the technical contents.

The portions with continuous sidelines are the matters in which the contents of the corresponding International Standard have been modified. A list of modifications with explanations is given in Annex JC.

1 Scope

This Standard specifies the carbon tool steels (hereafter referred to as “steels”) manufactured by hot-rolling or hot-forging.

Depending on the thickness, steel plates and steel strips may include those subjected to cold rolling in addition to those manufactured by hot rolling.

NOTE : The International Standard corresponding to this Standard and the symbol of degree of correspondence are as follows:

ISO 4957: 1999 *Tool steels* (MOD)

The symbols which denote the degree of correspondence in the contents between **JIS** and the corresponding International Standard are IDT (identical), MOD (modified) and NEQ (not equivalent) according to **ISO/IEC Guide 21-1**.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS G 0320 *Standard test methods for heat analysis of steel products*

JIS G 0404 *Steel and steel products— General technical delivery requirements*

JIS G 0415 *Steel and steel products— Inspection documents*

JIS G 0553 *Steel— Macroscopic examination by etching*

JIS G 0555 *Microscopic testing method for the non-metallic inclusions in steel*

JIS G 0556 *Method of macro-streak-flaw test for steel*

JIS G 0558 *Steels— Determination of depth of decarburization*

JIS G 3141 *Cold-reduced carbon steel sheets and strips*

JIS G 3191 *Dimensions, mass and permissible variations of hot rolled steel bars and bar in coil*

JIS G 3193 *Dimensions, mass and permissible variations of hot rolled steel plates, sheets and strips*

JIS G 3194 *Dimensions, mass and permissible variations of hot rolled flat steel*

JIS Z 2243 *Brinell hardness test— Test method*

JIS Z 2244 *Vickers hardness test— Test method*

JIS Z 2245 *Rockwell hardness test— Test method*

JIS Z 2320-1 *Nondestructive testing— Magnetic particle testing—Part I: General principles*

JIS Z 2344 *General rule of ultrasonic testing of metals by pulse echo technique*

3 Grade and designation

Steels shall be classified into 11 grades and the designations shall be as given in table 1.

4 Manufacturing method

The manufacturing method shall be as follows.

- a) Steels shall be made of killed steels.
- b) Unless otherwise specified, steels shall be rolled or forged with a forming ratio of 4S or over. However, if this forming ratio is under 4S owing to the dimension of steels, it may be overcome by upset forging.
- c) Steel plates, sheets and strips, as a rule, shall be subjected to annealing after hot-rolling, or hot-forging.
- d) The steels shall be, unless otherwise specified, as hot-rolled. Where the steels are cold-rolled upon agreement between the purchaser and the manufacturer, they shall be annealed.

NOTE : For the symbols of forming ratio for steel forging, see JIS G 0701.

5 Chemical composition

The chemical composition of steels shall be determined by the test of 9.1 and the values obtained by heat analysis shall conform to table 1.

Table 1 Designation of grade and chemical composition of steels

Unit: %

Designation of grade	Chemical composition ^{a)}						Example of application (informative)
	C	Si	Mn	P	I	S	
SK140 (SK1)	1.30 to 1.50	0.10 to 0.35	0.10 to 0.50	0.030 max.	0.030 max.		Knife file and papyraceous file
SK120 (SK2)	1.15 to 1.25	0.10 to 0.35	0.10 to 0.50	0.030 max.	0.030 max.		Drill, small punch, razor, file, cutting tool, hacksaw and spiral spring
SK105 (SK3)	1.00 to 1.10	0.10 to 0.35	0.10 to 0.50	0.030 max.	0.030 max.		Hacksaw, bit, gauge, spiral spring, die for press, jig and tool and cutting tool
SK95 (SK4)	0.90 to 1.00	0.10 to 0.35	0.10 to 0.50	0.030 max.	0.030 max.		Drill for wood working, hatchet, bit, spiral spring, pen nib, chisel, slitters knife, die for press, gauge and latch needle
SK90	0.85 to 0.95	0.10 to 0.35	0.10 to 0.50	0.030 max.	0.030 max.		Die for press, spiral spring, gauge and needle
SK85 (SK5)	0.80 to 0.90	0.10 to 0.35	0.10 to 0.50	0.030 max.	0.030 max.		Steel stamp, die for press, spiral spring, band saw, jig and tool, cutting tool, circular saw, gauge and needle

Table 1 (concluded)

Unit: %

Designation of grade	Chemical composition ^{a)}					Example of application (informative)
	C	Si	Mn	P	S	
SK80	0.75 to 0.85	0.10 to 0.35	0.10 to 0.50	0.030 max.	0.030 max.	Steel stamp, die for press and spiral spring
SK75 (SK6)	0.70 to 0.80	0.10 to 0.35	0.10 to 0.50	0.030 max.	0.030 max.	Steel stamp, snap, circular saw, spiral spring and die for press
SK70	0.65 to 0.75	0.10 to 0.35	0.10 to 0.50	0.030 max.	0.030 max.	Steel stamp, snap, spiral spring and die for press
SK65 (SK7)	0.60 to 0.70	0.10 to 0.35	0.10 to 0.50	0.030 max.	0.030 max.	Steel stamp, snap, die for press and knife
SK60	0.55 to 0.65	0.10 to 0.35	0.10 to 0.50	0.030 max.	0.030 max.	Steel stamp, snap and die for press
NOTE : (SKx) in parentheses indicates the designation of grade of the old JIS. These shall be deleted at the next revision of this Standard. Designations of grades in JIS and corresponding designations in ISO are shown in Annex JB. Note ^{a)} The contents of Cu, Cr and Ni for each grade shall not exceed 0.25 %, 0.30 % and 0.25 %, respectively, as the impurities.						

6 Hardness

6.1 Annealed hardness of steels other than steel plates, sheets and strips

The hardness of steels, excluding steel plates, sheets and strips, which have been annealed after hot-rolling or hot-forging, shall be tested in accordance with **9.2**, and the results shall satisfy table 2. Pertaining to steels for which the measurement by Brinell hardness is difficult, however, it may be made by Rockwell B hardness or Vickers hardness. In this case, the value of hardness shall be agreed upon between the purchaser and the manufacturer.

Table 2 Annealed hardness of steels (other than steel plates, sheets and strips)

Designation of grade	Annealing temperature °C	Annealed hardness HBW
SK140	750 to 780 slow cooling	217 max.
SK120	750 to 780 slow cooling	217 max.
SK105	750 to 780 slow cooling	212 max.
SK95	740 to 760 slow cooling	207 max.
SK90	740 to 760 slow cooling	207 max.
SK85	730 to 760 slow cooling	207 max.
SK80	730 to 760 slow cooling	192 max.
SK75	730 to 760 slow cooling	192 max.
SK70	730 to 760 slow cooling	183 max.
SK65	730 to 760 slow cooling	183 max.
SK60	730 to 760 slow cooling	183 max.