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**Low-alloyed steels for machine
structural use**

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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 results of proposal for 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 4053** : 2003 is replaced with this Standard. Moreover, **JIS G 4202** : 2005 is withdrawn and replaced with this Standard.

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Low-alloyed steels for machine structural use

Introduction

This Japanese Industrial Standard has been prepared based on the first editions of **ISO 683-1** and **ISO 683-11** and the second edition of **ISO 683-10** published in 1987 with some modifications of the technical contents. In addition, aluminium chromium molybdenum steels specified as **JIS G 4202** : 2005 is integrated to this Standard at this time revision because it is positioned as steels for machine structural use.

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

1 Scope

This Standard specifies the low-alloyed steels for machine structural use (hereafter referred to as "steels"), which are manufactured by hot forming such as hot rolling and hot forging. Steels are normally used after further forming such as forging and cutting and heat treatment or nitriding.

NOTE 1 Depending on the thickness, steel plates and steel strip may include those subjected to cold rolling in addition to those manufactured by hot forming.

NOTE 2 The International Standards corresponding to this Standard are as follows.

ISO 683-1 : 1987 *Heat-treatable steels, alloy steels and free-cutting steels—Part 1: Direct-hardening unalloyed and low-alloyed wrought steel in form of different black products*

ISO 683-10 : 1987 *Heat-treatable steels, alloy steels and free-cutting steels—Part 10: Wrought nitriding steels*

ISO 683-11 : 1987 *Heat-treatable steels, alloy steels and free-cutting steels—Part 11: Wrought case-hardening steels* (Overall evaluation : MOD)

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standards and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21**.

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	<i>Standard test methods for heat analysis of steel products</i>
JIS G 0321	<i>Product analysis and its tolerance for wrought steel</i>
JIS G 0404	<i>Steel and steel products—General technical delivery requirements</i>
JIS G 0415	<i>Steel and steel products—Inspection documents</i>
JIS G 0551	<i>Steels—Micrographic determination of the apparent grain size</i>
JIS G 0553	<i>Steel—Macroscopic examination by etching</i>
JIS G 0555	<i>Microscopic testing method for the non-metallic inclusions in steel</i>
JIS G 0556	<i>Method of macro-streak-flaw test for steel</i>
JIS G 0558	<i>Steels—Determination of depth of decarburization</i>
JIS G 0561	<i>Method of hardenability test for steel (End quenching method)</i>
JIS G 0901	<i>Classification of structural rolled steel plate and wide flat for building by ultrasonic test</i>
JIS G 3141	<i>Cold-reduced carbon steel sheets and strips</i>
JIS G 3191	<i>Dimensions, mass and permissible variations of hot rolled steel bars and bar in coil</i>
JIS G 3192	<i>Dimensions, mass and permissible variations of hot rolled steel sections</i>
JIS G 3193	<i>Dimensions, mass and permissible variations of hot rolled steel plates, sheets and strips</i>
JIS G 3194	<i>Dimensions, mass and permissible variations of hot rolled flat steel</i>
JIS Z 2241	<i>Method of tensile test for metallic materials</i>
JIS Z 2242	<i>Method for Charpy pendulum impact test of metallic materials</i>
JIS Z 2243	<i>Brinell hardness test—Test method</i>
JIS Z 2244	<i>Vickers hardness test—Test method</i>
JIS Z 2245	<i>Rockwell hardness test—Test method</i>
JIS Z 2320-1	<i>Non-destructive testing—Magnetic particle testing—Part 1 : General principles</i>
JIS Z 2344	<i>General rule of ultrasonic testing of metals by pulse echo technique</i>

3 Classification and symbol

Steels shall be classified into 40 types and their symbols shall be as given in table 1.

Table 1 Classification symbol

Classification symbol	Group	Classification symbol	Group
SMn420 SMn433 SMn438 SMn443	Manganese steel	SNC236 SNC415 SNC631 SNC815 SNC836	Nickel chromium steel
SMnC420 SMnC443	Manganese chromium steel	SNCM220 SNCM240 SNCM415 SNCM420 SNCM431 SNCM439 SNCM447 SNCM616 SNCM625 SNCM630 SNCM815	Nickel chromium molybdenum steel
SCr415 SCr420 SCr430 SCr435 SCr440 SCr445	Chromium steel	SACM645	Aluminium chromium molybdenum steel
SCM415 SCM418 SCM420 SCM421 SCM425 SCM430 SCM432 SCM435 SCM440 SCM445 SCM822	Chromium molybdenum steel		
NOTE 1 SMn420, SMnC420, SCr415, SCr420, SCM415, SCM418, SCM420, SCM421, SCM425, SCM822, SNC415, SNC815, SNCM220, SNCM415, SNCM420, SNCM616 and SNCM815 are mainly used for case hardening.			
NOTE 2 SACM645 is used for surface nitriding.			

4 Manufacturing method

The manufacturing method shall be as follows.

- Steels shall be manufactured from killed steel.
- Steels shall be rolled or forged as the forming ratio of 4S or over unless otherwise specified. The case where the forming ratio of steels for rolling or forging is under 4S shall be upon the agreement between the purchaser and the manufacturer.
- Steels shall be as hot rolled or hot forged unless otherwise specified. For steel plates and steel strip, cold rolling and/or heat treatment may be performed upon the agreement between the purchaser and the manufacturer.

5 Chemical composition

Steels shall be tested in accordance with 7.1, and the heat analysis values shall be as given in table 2.