

JIS

JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS G 4202 : 2005

(JISF)

**Aluminium chromium molybdenum
steels**

ICS 77.140.10 ; 77.140.20

Reference number : JIS G 4202 : 2005 (E)

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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 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 4202 : 1979** is replaced with this Standard.

This revision has been made based on **ISO 683-10 : 1987** *Heat-treatable steels, alloy steels and free-cutting steels — Part 10 : Wrought nitriding steels* for the purpose of making it easier to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard; and to propose a draft of an International Standard which is based on Japanese Industrial Standard.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

Date of Establishment: 1953-10-20

Date of Revision: 2005-08-20

Date of Public Notice in Official Gazette: 2005-08-22

Investigated by: Japanese Industrial Standards Committee
Standards Board
Technical Committee on Iron and Steel

JIS G 4202 : 2005, First English edition published in 2006-02

Translated and published by: Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

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Printed in Japan

Contents

	Page
Introduction	1
1 Scope	1
2 Normative references	1
3 Designation of grade	2
4 Method of manufacture	2
5 Chemical composition	2
6 Appearance, shape, dimension and dimensional tolerance	3
6.1 Hot rolled steel bar and wire rod	3
6.2 Hot rolled steel plate, sheet and strip	6
6.3 Hot rolled flat steel	8
6.4 Other steels	8
7 Test	8
8 Inspection	8
8.1 Inspection	8
8.2 Other inspections	8
9 Marking	9
10 Report	9
Annex (informative) Comparison table between JIS and corresponding International Standard	10

Aluminium chromium molybdenum steels

Introduction This Japanese Industrial Standard has been prepared based on the second edition of **ISO 683-10** *Heat-treatable steels, alloy steels and free-cutting steels—Part 10 : Wrought nitriding steels* published in 1987 with some modifications of the technical contents.

The portions given sidelines or dotted underlines are the matters modified from the original International Standard. A list of modifications with the explanations is given in Annex (informative).

1 Scope This Standard specifies aluminium chromium molybdenum steel mainly for machine structural use manufactured by hot forming such as hot rolling and forging, ordinarily used after further process of forging, cutting, and heat treatment (hereinafter referred to as the "steel").

Remarks : The International Standard corresponding to this Standard is as follows.

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

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

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 0321 *Product analysis and its tolerance for wrought steel*
- JIS G 0404 *Steel and steel products—General technical delivery requirements*
- JIS G 0415 *Steel and steel products—Inspection documents*
- JIS G 0551 *Methods of austenite grain size determination for steel*
- JIS G 0553 *Macrostructure detecting method for steel*
- 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 *Methods of measuring decarburized depth for steel*
- JIS G 0561 *Method of hardenability test for steel*
- JIS G 0565 *Method for magnetic particle testing of ferromagnetic materials and classification of magnetic particle indication*

JIS G 0901	<i>Classification of structural rolled steel plate and wide flat for building by ultrasonic test</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 strip</i>
JIS G 3194	<i>Dimensions, mass and permissible variations of hot rolled flat steel</i>
JIS Z 2201	<i>Test pieces for tensile test for metallic materials</i>
JIS Z 2241	<i>Method of tensile test for metallic materials</i>
JIS Z 2242	<i>Method of impact test for metallic materials</i>
JIS Z 2243	<i>Brinell hardness test—Test method</i>
JIS Z 2245	<i>Rockwell hardness test—Test method</i>
JIS Z 2344	<i>General rule of ultrasonic testing of metals by pulse echo technique</i>

3 Designation of grade The steel shall be classified into 1 grade and the symbol shall be as given in table 1.

Table 1 Designation of grade

Designation of grade	Application
SACM 645	This class is used for nitriding

4 Method of manufacture

4.1 The steel shall be manufactured from killed steel ingot.

4.2 Unless otherwise specified, the steel shall be rolled or forged from steel ingot to forging ratio not less than 4 S. However, the forging ratio of the billet for forging or rolling may be less than 4 S if agreed between the purchaser and the manufacturer.

4.3 Unless otherwise specified, the steel shall be left in the state as rolled or as forged. However, heat treatment may be applied according to the agreement between the purchaser and the manufacturer.

5 Chemical composition The chemical composition of the steel shall be determined by the test in clause 7 and the ladle analysis value shall be as given in table 2.

Table 2 Chemical composition

Unit : %

Symbol of class	C	Si	Mn	P	S	Cr	Mo	A1
SACM 645	0.40 to 0.50	0.15 to 0.50	0.60 max.	0.030 max.	0.030 max.	1.30 to 1.70	0.15 to 0.30	0.70 to 1.20

Remarks 1 As impurities, Ni and Cu shall not exceed 0.25 % and 0.30 %, respectively, throughout all classes.

2 When the product analysis on steel is requested by the purchaser, the test shall be performed in accordance with clause 7, and the permissible tolerance on the value given in table 2 shall be as given in attached table 4 of **JIS G 0321**.

6 Appearance, shape, dimension and dimensional tolerance

6.1 Hot rolled steel bar and wire rod

6.1.1 Appearance The appearance of the hot rolled steel bar and wire rod shall be well finished and free from harmful defects in use. However, for the steel which is supplied in coil, generally it is difficult to detect defects through its entire length by inspection, and since there is no chance for removing defects, it may include some abnormal parts. Therefore, the matter related to abnormal parts shall be subjected to the agreement between the purchaser and the manufacturer.

6.1.2 Reference of flaw dressing and permissible depth of remaining flaw

a) **Steel bar for general forging** The flaw dressing of the steel bar for general forging shall be made smoothly and the permissible depth of flaw to be reduced from the nominal size shall be not exceeding 4 % of the nominal size (provided the maximum value is 5 mm), and the total width not exceeding 1/4 of the circumferential length of the same section. If the dressed portions are within the permissible tolerance, they shall not be considered as the portions dressed.

The permissible depth of remaining flaw shall be as agreed upon between the purchaser and the manufacturer.

b) **Round bar for direct machining** The flaw dressing of round bar for direct machining is not normally performed. When it is performed, the reference of flaw dressing shall be subjected to the agreement between the purchaser and the manufacturer. The permissible depth of flaw of round bar for direct machining shall conform to the value given in table 3 deducted from the nominal size.

**Table 3 Permissible depth of flaw of round bar
for direct machining (Hot rolled steel bar)**

Diameter mm	Permissible depth of flaw
Under 16	Not exceeding 4 % of nominal size with the maximum of 0.5 mm
16 or over to and excl. 50	Not exceeding 3 % of nominal size with the maximum of 1.0 mm
50 or over to and excl. 100	Not exceeding 2 % of nominal size with the maximum of 1.5 mm
100 and over	Not exceeding 1.5 % of nominal size with the maximum of 3.0 mm