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⑤ JIS B 6914 : 2002
(HTTAJ/JSA)

**Process of carburizing and
carbonitriding, quenching and
tempering of iron and steel**

ICS 25.200; 77.140.01

Reference number : JIS B 6914 : 2002 (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 Heat Treatment Trade Association of Japan (HTTAJ)/the Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law. Consequently **JIS B 6914 : 1997** is replaced with this Standard.

In this revision, the title of Standard, scope, material for processing, types of processing, and the quality of processed goods have been revised, and newly the types and symbol of processing, environmental protection to the heat treatment oil and so on, and Annex (normative) : History of sintered ferritic material, and quality and test method of processed goods have been provided.

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Process of carburizing and carbonitriding, quenching and tempering of iron and steel

1 Scope This Japanese Industrial Standard specifies the process of carburizing and carbonitriding, quenching and tempering of iron and steel (hereafter referred to as "processing").

Remarks : This Standard shall not be applied to cast iron.

2 Normative references The standards listed in Attached Table 1 contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions of the standards (including amendments) shall be applied.

3 Definitions For the purposes of this Standard, the definitions given in **JIS B 6905** and the following definitions apply.

- a) **material for processing** The parts which become the object of processing. The materials for processing are machinery parts, jigs, apparatuses, or parts thereof which are iron and steel products under almost or nearly completed conditions.
- b) **processed goods** The material for processing having been processed according to this Standard.
- c) **single body** A unit or lot of processed goods.
- d) **atmospheric furnace** A heating furnace which is capable of controlling the oxidation or reduction, and decarburization or carburization of the atmosphere used for heating the material for processing so as to meet the purpose of processing.
- e) **hot bath vessel** An equipment which is capable of heating or quenching and cooling the material for processing in hot bath of oil, molten salt, molten metal, etc.
- f) **air furnace** A furnace for heating the material for processing in air or fuel burnt gas.
- g) **vacuum furnace** An equipment which is capable of carburizing and quenching or carbonitriding and quenching by heating the material for processing in the carburizing gas or inert gas with reduced pressure, as well as it is a heating furnace which is capable of regulating the pressure to meet the purpose of processing. For cooling, any one of water, oil or gas shall be used.
- h) **plasma carburizing furnace and plasma carbonitriding furnace** A furnace which is capable of carburizing or carbonitriding with plasma by glow discharge generated between a cathode of the material for processing and an anode, in carburizing or carbonitriding atmosphere with reduced pressure. Some furnaces provide cooling equipment for quench hardening.

4 Type and symbol of processing The type and the symbol of processing shall be as given in Table 1 according to the methods of processing.

Table 1 Type and symbol of processing

Type of processing		Symbol ⁽¹⁾
Carburizing	Gas carburizing, quenching and tempering	HCG—HQ—HT
	Vacuum carburizing, quenching and tempering	HCV—HQ—HT
	Plasma carburizing, quenching and tempering	HCP—HQ—HT
	Salt bath carburizing, quenching and tempering	HCL—HQ—HT
Carbonitriding	Gas carbonitriding, quenching and tempering	HCNG—HQ—HT
	Vacuum carbonitriding, quenching and tempering	HCNV—HQ—HT
	Plasma carbonitriding, quenching and tempering	HCNP—HQ—HT

Note ⁽¹⁾ The symbol is in accordance with **JIS B 0122**.

Remarks : Drip feed carburizing, quenching and tempering process is involved in gas carburizing, quenching and tempering process, and drip feed carbonitriding, quenching and tempering process is involved in gas carbonitriding, quenching and tempering process.

5 Material for processing

5.1 Grade of material for processing The grade of material for processing shall conform to Table 2, otherwise the quality of the processed goods shall conform to the requirements specified in 8, and 5 of Annex.

Table 2 Grade of material for processing

Standard number	Symbol of grade
a) Carbon and alloy steels for machine structural use JIS G 4051 S09CK, S15CK, S20CK JIS G 4052 SMn420H, SMnC420H, SCr415H, SCr420H SCM415H, SCM418H, SCM420H, SCM822H SNC415H, SNC815H, SNCM220H, SNCM420H JIS G 4102 SNC415, SNC815 JIS G 4103 SNCM220, SNCM415, SNCM420, SNCM616, SNCM815 JIS G 4104 SCr415, SCr420 JIS G 4105 SCM415, SCM418, SCM420, SCM421, SCM822 JIS G 4106 SMn420, SMnC420	
b) Steels for special use JIS G 4303 SUS316, SUS403, SUS420J1, SUS420J2	
c) Steel castings JIS G 5101 SC360	
d) Sintered metal materials for machine structural parts use JIS Z 2550 SMF2015, SMF2025, SMF2030, SMF7020, SMF7025	

5.2 History of material for processing With respect to the history of the material for processing, the items given in Table 3 shall have been made clear.

Table 3 History of material for processing

Item	Remarks
a) Material testing results of material for processing Grade of material for processing Chemical composition ⁽²⁾ Heat number ⁽²⁾ Tensile test result ⁽²⁾ Hardness test result ⁽²⁾ Hardenability test result ⁽²⁾ Metallographic test result ⁽²⁾ Density test result of sintered metal materials ⁽²⁾	Grain size, decarburized layer, nonmetallic inclusion, micro- and macro-structure
b) Type of method of manufacture of material for processing Casting Forging Rolling Extrusion Sintering ⁽³⁾ Machining Press working Drawing Form rolling Welding	Includes discrimination of hot and cold working. Forging ratio, as necessary. Includes discrimination of hot and cold working. Includes discrimination of hot and cold working. Includes discrimination of hot bending, cold bending and twisting. Includes discrimination of hot and cold working. Includes discrimination of hot and cold working. Welding part and welding methods
c) Whether applying preheat treatment or not and type of treatment method of material for processing Normalizing Annealing	Heating temperature, holding time and cooling method shall be made clear, as necessary.
d) Surface finish conditions of material for processing, and degree of rectification thereof⁽²⁾ Cutting method and its conditions Plastic working method and conditions Degree of rectification	Includes discrimination of hot and cold working.

Notes ⁽²⁾ It may be omitted when it does not interfere the processing.

⁽³⁾ Sintered ferritic material shall be in accordance with Annex.

5.3 Appearance, mass, shape, dimensions and accuracy of material for processing With respect to the appearance, mass, shape, dimensions and accuracy of the material for processing, the items given in Table 4 shall have been made clear in report.

Table 4 Appearance, mass, shape, dimensions and accuracy of material for processing

Item	Remarks
a) Appearance of material for processing	Cracks, flaws, rust, mill scale, etc.
b) Mass of material for processing⁽²⁾	
c) Shape of material for processing⁽²⁾ Irregular shape Uneven thickness Shape and positions of holes	
d) Dimensions and precisions of material for processing⁽²⁾ Dimensions Working allowance for carburizing and carbonitriding, quenching and tempering portion Total working allowance Surface roughness of carburizing and carbonitriding, quenching and tempering portion Accuracy of dimension Form deviation ⁽⁴⁾ Directional deviation ⁽⁴⁾ Locational deviation ⁽⁴⁾	 (Information) The form deviation means the straightness, flatness, circularity, cylindricity, profile of any line and profile of any surface. (Information) The directional deviation means the parallelism, perpendicularity and angularity. (Information) The locational deviation means the positional deviation, coaxiality, concentricity and symmetry.

Note (4) Each definition for deviation shall be in accordance with **JIS B 0621**.

5.4 Verifying material for processing On the occasion of acceptance of the material for processing, the items necessary for processing which are specified in **5.1**, **5.2** and **5.3** shall be identified between purchaser and supplier. The quality of the material for processing shall be made clear by the methods specified in **JIS G 0565**, **JIS G 0566**, **JIS Z 2501** and **JIS Z 2343** or by other suitable means, as necessary.

6 Processing equipment

6.1 Heating equipment for carburization The heating equipment for carburization shall be as given in the following.

- a) The heating equipment shall, irrespective of the kind of heat source, type of processing and discrimination of continuous or discontinuous operation, be capable of maintaining and regulating the holding temperature within the tolerance of holding temperature for each class of quality for processed goods given in Table 5 against the intended temperature when the material for processing is heated in the effective working zone or in the effective treating zone⁽⁵⁾.