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Process of nitriding and nitrocarburizing of iron and steel

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently **JIS B 6915 : 1993** is replaced with **JIS B 6915 : 1999**.

Scope, definitions, classification of processing and symbol, material to be processed, processing equipment, processing method, quality of processed product, etc. are altered in this revision.

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.

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Process of nitriding and nitrocarburizing of iron and steel

1 Scope This Japanese Industrial Standard specifies the process of nitriding, nitrocarburizing and acid nitrocarburizing of iron and steel (hereafter referred to as "processing").

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 listed shall be applied.

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

- a) **material to be processed** The parts which are subjected to the processing, including mechanical apparatus, jigs, equipment or any of their components, and these parts are finished or almost finished iron and steel products.
- b) **processed product** In materials to be processed, those which have undergone the processing as defined in this Standard.
- c) **single body** A piece or set of processed products.
- d) **heating equipment** In heating equipment for metals heat treatment use, the device to heat materials to be processed for the purpose of heat treatment.
- e) **gas nitriding equipment** The equipment to perform nitriding by heating the material to be processed in an atmosphere consisting mainly of gaseous ammonia.
- f) **plasma nitriding equipment** The equipment to perform nitriding using the plasma generated by glow discharge taking place between the material to be processed acting as a cathode and an anode in a nitriding atmosphere under reduced pressure.
- g) **gas nitrocarburizing equipment** The equipment to perform nitrocarburizing by heating the material to be processed in a nitrocarburizing atmosphere.
- h) **plasma nitrocarburizing equipment** The equipment to perform nitrocarburizing using the plasma generated by glow discharge taking place between the material to be processed acting as a cathode and an anode in a nitrocarburizing atmosphere under reduced pressure.
- i) **salt-bath nitrocarburizing equipment** The equipment to perform nitrocarburizing by heating the material to be processed in a nitrocarburizing salt bath.
- j) **gas acid nitrocarburizing equipment** The equipment to perform acid nitrocarburizing by heating the material to be processed in an acid nitrocarburizing atmosphere.
- k) **plasma acid nitrocarburizing equipment** The equipment to perform acid nitrocarburizing using the plasma generated by glow discharge taking place between the material to be processed acting as a cathode and an anode in an acid nitrocarburizing atmosphere under reduced pressure.
- l) **gas ratio** The volumetric ratio of the gas which constitutes the atmosphere in such processes as nitriding and nitrocarburizing.
- m) **glow discharge** Sustaining discharge taking place on the surface of the material to be processed which comes in contact with the cathode in plasma nitriding, plasma nitrocarburizing and other equipment.

4 Classification of processing and symbol The classification of processing and symbol shall be as shown in **Table 1** according to the method of processing used:

Table 1 Classification of processing and symbol

Classification of processing	Symbol
Gas nitriding	HNT-G
Plasma nitriding	HNT-P
Gas nitrocarburizing	HNC-G
Plasma nitrocarburizing	HNC-P
Salt-bath nitrocarburizing	HNC-S
Gas acid nitrocarburizing	HON-G
Plasma acid nitrocarburizing	HON-P

5 Material to be processed

5.1 Classification of materials to be processed The types of materials to be processed shall be as defined in **Table 2** or the quality of processed products conforming to the requirements of 8.

Table 2 Classification of materials to be processed

Standard number	Applicable classification symbol
a) Carbon and alloy steels for machine structural use	
JIS G 4051	S10C, S12C, S15C, S17C, S20C, S22C, S25C, S28C, S30C, S33C, S35C, S38C, S40C, S43C, S45C, S48C, S50C, S53C, S55C, S58C, S09CK, S15CK, S20CK
JIS G 4052	SCM415H, SCM418H, SCM420H, SCM435H, SCM440H, SCM445H, SCM822H SNCM220H, SNCM420H SMn420H, SMn433H, SMn438H, SMn443H SMnC420H, SMnC443H SCr415H, SCr420H, SCr430H, SCr435H, SCr440H SNC415H, SNC631H, SNC815H
JIS G 4102	SNC236, SNC415, SNC631, SNC815, SNC836
JIS G 4103	SNCM220, SNCM240, SNCM415, SNCM420, SNCM431, SNCM439, SNCM447, SNCM616, SNCM625, SNCM630, SNCM815
JIS G 4104	SCr415, SCr420, SCr430, SCr435, SCr440, SCr445
JIS G 4105	SCM415, SCM418, SCM420, SCM421, SCM430, SCM432, SCM435, SCM440, SCM445, SCM822
JIS G 4106	SMn420, SMn433, SMn438, SMn443
JIS G 4202	SMnC420, SMnC443 SACM645
b) Steel for special use	
JIS G 4303, JIS G 4304	SUS201, SUS202, SUS301, SUS302, SUS303, SUS303Se, SUS304, SUS304L, SUS304N1, SUS304N2, SUS304LN, SUS305, SUS309S, SUS310S, SUS316, SUS316L, SUS316N, SUS316LN, SUS316J1, SUS316J1L, SUS317, SUS317L, SUSJ1, SUS321, SUS347, SUSXM7, SUSXM15J1, SUS329J1, SUS405, SUS410L, SUS430, SUS430F, SUS343, SUS447J1, SUSXM27, SUS403, SUS410, SUS410J1, SUS416, SUS420J1, SUS420J2, SUS420F, SUS429J1, SUS431, SUS440A, SUS440B, SUS440C, SUS440F, SUS630, SUS631
JIS G 4311	SUH31, SUH35, SUH36, SUH37, SUH38, SUH309, SUH310, SUH330, SUH660, SUH61, SUH446, SUH1, SUH3, SUH4, SUH11, SUH600, SUH616, SUS304, SUS309S, SUS310S, SUS316, SUS317, SUS347, SUSXM15J1, SUS403, SUS410, SUS410J1, SUS431, SUS405, SUS410L, SUS430
JIS G 4312	SUS403, SUS410
JIS G 4313	SUS420J2-CSP
JIS G 4401	SK1, SK2, SK3, SK4, SK5, SK6, SK7
JIS G 4403	SKH2, SKH3, SKH4, SKH10, SKH51, SKH52, SKH53, SKH54, SKH55, SKH56, SKH57, SKH58, SKH59
JIS G 4404	SKS11, SKS2, SKS21, SKS5, SKS51, SKS7, SKS8, SKS4, SKS41, SKS43, SKS44, SKS3, SKS31, SKS93, SKS94, SKS95, SKD1, SKD11, SKD12, SKD4, SKD5, SKD6, SKD61, SKD62, SKD7, SKD8, SKT3, SKT4
JIS G 4801	SUP3, SUP6, SUP7, SUP9, SUP9A, SUP10, SUP11A
JIS G 4802	S50C-CSP, S55C-CSP, S60C-CSP, S70C-CSP SK5-CSP, SK4-CSP
JIS G 4804	SUM11, SUM12, SUM21, SUM22, SUM22L, SUM23, SUM23L, SUM24L, SUM25, SUM31, SUM31L, SUM32, SUM41, SUM42, SUM43
JIS G 4805	SUJ1, SUJ2, SUJ3, SUJ4, SUJ5

Table 2 Classification of materials to be processed (concluded)

Standard number	Applicable classification symbol
c) Steel bar, section, plate and sheet and coil	
JIS G 3101	SS330, SS400, SS490, SS540
JIS G 3113	SAPH310, SAPH370, SAPH400, SAPH440
JIS G 3131	SPHC, SPHD, SPHE
JIS G 3141	SPCC, SPCD, SPCE
JIS G 3445	STKM11A, STKM12A, STKM13A, STKM14A, STKM15A, STKM16A, STKM17A, STKM18A, STKM19A, STKM20A
JIS G 3472	STAM290GA, STAM290GB, STAM340G, STAM390G, STAM440G, STAM470G, STAM500G, STAM440H, STAM500H, STAM540H
d) Casting and forging	
JIS G 3201	SF340A, SF390A, SF440A, SF490A, SF540A, SF590A, SF540B, SF590B, SF640B
JIS G 3221	SFCM590S, SFCM640S, SFCM690S, SFCM740S, SFCM780S, SFCM830S, SFCM880S, SFCM930S, SFCM980S
JIS G 3222	SFNCM690S, SFNCM740S, SFNCM780S, SFNCM830S, SFNCM880S, SFNCM930S, SFNCM980S, SFNCM1030S, SFNCM1080S
JIS G 5101	SC360, SC410, SC450, SC480
JIS G 5111	SCC3, SCC5 SCMn1, SCMn2, SCMn3, SCMn5 SCSiMn2 SCMnCr2, SCMnCr3, SCMnCr4, SCMnM3 SCCrM1, SCCrM3 SCMnCrM2, SCMnCrM3 SCnCrM2
JIS G 5501	FC100, FC150, FC200, FC250, FC300, FC350
JIS G 5502	FCD370, FCD400, FCD450, FCD500, FCD600, FCD700, FCD800
JIS G 5704	FCMP440, FCMP490, FCMP540, FCMP590, FCMP690

5.2 Past record of material to be processed The past records of the material to be processed shall be identified with respect to the items given in **Table 3**.

Table 3 Past record of material to be processed

Items	Remarks
a) Results of material test for material to be processed Classification of materials to be processed Chemical composition (1) Heat number (1) Results of tensile test (1) Results of hardness test (1) Results of metallographic test (1)	Grain size, decarburized layer, nonmetallic inclusions, microstructure and macrostructure
b) Manufacturing method of material to be processed (1) Casting Forging Rolling Extruding Sintering Machining Press-forming Drawing Rolled-threading Welding	Includes distinction of hot and cold workings and, if necessary, forged shaping ratio. Includes distinction of hot and cold workings. Includes distinction of hot and cold workings. Where there exists the surface film generated at the time of pretreatment, its type and composition shall be clarified. Includes distinction of hot and cold bending and twisting. Includes distinction of hot and cold workings. Includes distinction of hot and cold workings. Existence of welds
c) Pre-heat treatment of material to be processed and its method Normalizing Annealing Quenching and tempering Carburizing, and quenching and tempering High-frequency quenching and tempering Solution treatment Aging treatment	Heating temperature, holding time and cooling method shall be clarified, when necessary.
d) Surface finish condition and straightening of material to be processed (1) Machining method and its conditions Grinding method and its conditions Straightening	Includes distinction of hot and cold workings.

Note (1) May be omitted when there is no hindrance to processing.

5.3 Appearance, mass, shape, dimensions and precision of material to be processed For the appearance, mass, shape, dimensions and precision of material to be processed, the items given in **Table 4** shall be clarified.