

NAS303AM (SUS303, UNS S30300)

Free-machining Stainless Steel

NAS303AM (SUS303, UNS S30300) is a high free-machining austenitic stainless steel in which machinability is improved by adding sulfur to Type 304. Although sulfur is an alloying element that reduces corrosion resistance, the corrosion resistance of NAS303AM is close to that of Type 304 in mildly corrosion atmosphere. Nippon Yakin supplies this product in plate form.

Steel Grade / Standard

Nippon Yakin Grade	JIS G 4304	ASTM A895
NAS303AM	SUS303	UNS S30300

Chemical Composition

	C	Si	Mn	P	S	Ni	Cr	Mo
Specification (SUS303)	≦0.15	≦1.00	≦2.00	≦0.20	≧0.15	8.00~10.00	17.00~19.00	(1)
Specification (UNS S30300)	≦0.15	≦1.00	≦2.00	≦0.20	≧0.15	8.00~10.00	17.00~19.00	

(1) Mo must not exceed 0.60%.

Physical Properties

Density	[g/cm ³]	7.93
Specific heat	[J/kg · K]	502
Electrical resistivity	[μΩ · cm]	72
Thermal conductivity	[W/m · K]	25 °C 16.3
Average coefficient of thermal expansion	[10 ⁻⁶ /°C]	0~100 °C 17.3
Magnetism		None
Melting range	[°C]	1405~1454



NIPPON YAKIN KOGYO CO., LTD.

Mechanical Properties

			0.2% proof stress [N/mm ²]	Tensile strength [N/mm ²]	Elongation [%]	Hardness		
Specification (SUS303)			≥ 205	≥ 520	≥ 35	[HBW]	[HRBW]	[HV]
Specification (UNS S30300)						≤ 202		
Example	Plate	20mm ^t	287	610	56	183	—	—
	Plate	50mm ^t	262	576	61	166	—	—

Machinability

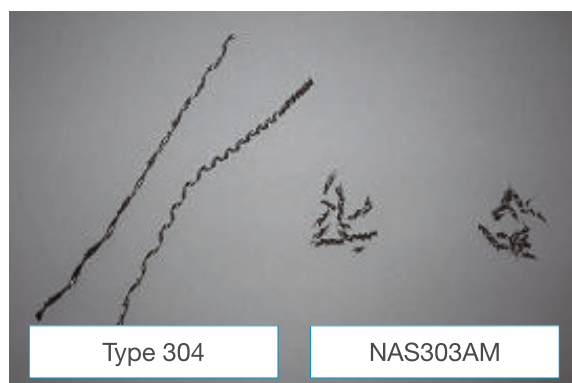
This material's machinability is controlled by dispersed sulfides. NAS303AM has excellent machinability. NAS303AM's excellent machinability enables remarkable extension of tool life, good surface finish, and other advantages during machining operations.

1. Drill speed test

<Test conditions>

- (1) Test sheet thickness: 3mm
- (2) Drill diameter: 1.2mm
- (3) Drill speed: 890rpm
- (4) Weight: 2.0kg
- (5) Water cooling

Alloy	Cutting speed [mm/sec]
NAS303AM	0.67
Type 304	0.30



Shape of cutting chips with NAS303AM and Type 304

As the result of the drill speed test, a much higher cutting speed can be obtained with NAS303AM in comparison with that of Type 304. The shapes of the cutting chips are shown in the photograph. As the chips of NAS303AM are extremely small and brittle in comparison with those of Type 304. Load of the drill is also smaller in case of NAS303AM.

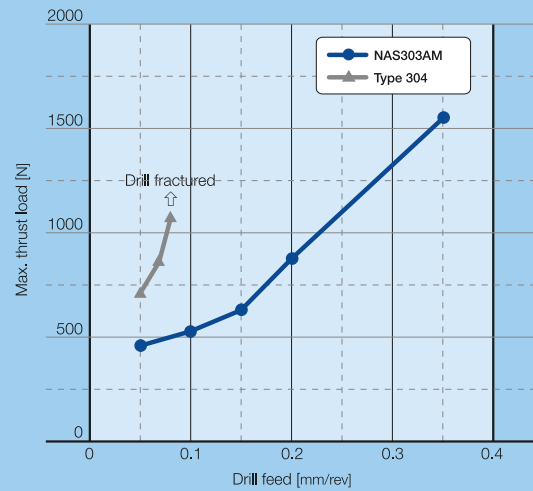
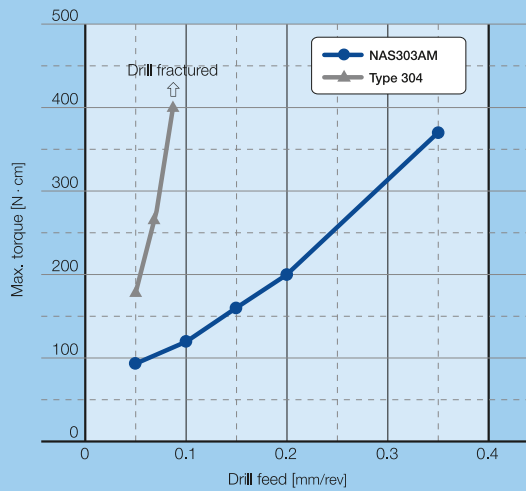
2. Drill cutting resistance test

<Test conditions>

- (1) Test plate thickness: 10mm
- (2) Drill diameter: 5mm
- (3) Drill speed: 1500rpm (constant)
- (4) Drill feed : 0.05–0.35mm/rev
- (5) Water soluble cutting fluid was used.
- (6) Measurement item: Cutting resistance of drill (Torque and thrust load)

Alloy	Feed [At 0.05mm/rev]		Max. feed [mm/rev]
	Max. torque [N · m]	Max. thrust load [N]	
NAS303AM	93	443	0.35 or more
Type 304	185	704	Drill fractured at 0.08

Results of cutting resistance test of NAS303AM and Type 304
Plate thickness: 10mm, drill speed: 1,500rpm



In the results of the drill cutting resistance test, at the same feed rate, the maximum torque and the maximum thrust load of NAS303AM are both much lower in comparison with those of Type 304, and drilling is also possible at a far faster drill feed rate than that at which the drill fractured with Type 304. Thus, the productivity of NAS303AM in cutting work is greatly improved.

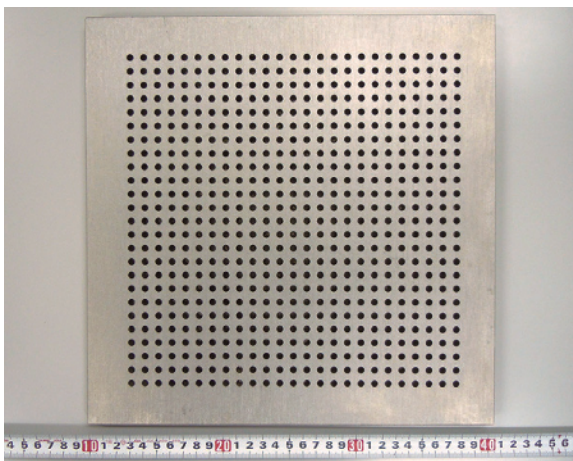
3. Drill life test

<Test conditions>

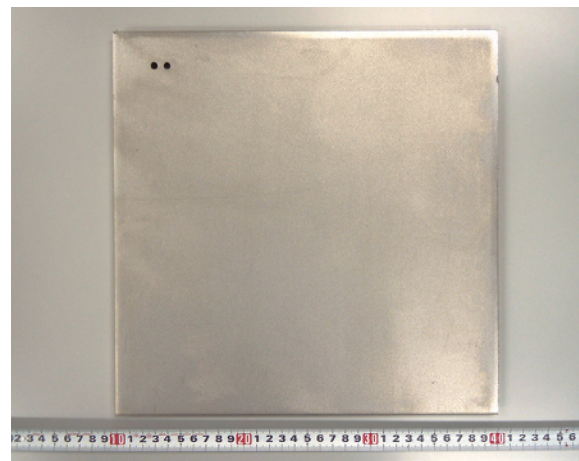
- (1) Test plate thickness: 10mm
- (2) Drill diameter: 5mm
- (3) Drill speed: 1500rpm
- (4) Drill feed : 0.07mm/rev
- (5) Water soluble cutting liquid was used.
- (6) Measurement item: Number of holes that can be drilled with one drill (up to max. 625)

The number of holes that can be drilled with one drill under these test conditions with Type 304 is 1 hole (the drill fractured while drilling 2nd hole). In contrast, with NAS303AM, the maximum number of 625 holes are drilled without drill fracture.

With NAS303AM, tool life is greatly improved thanks to the low load on the cutting tool.



NAS303AM



Type 304

Corrosion Resistance

1. Salt Spray Test (SST)

<Test conditions> JIS Z 2371,
“Methods of salt spray testing”
(1) Spraying with 5% NaCl aqueous solution
(2) 35 °C
(3) 72hr test

Alloy	Test result
NAS303AM	No rust
Type 304	No rust

In the salt spray test, rust is not observed with NAS303AM.

2. Pitting potential measurement

<Test conditions> JIS G 0577, “Method of pitting
potential measurement for stainless steels”
(1) 3.5% NaCl aqueous solution (method B)
(2) 30 °C
(3) Test surface: Polished to 600 grit
(4) Measurement of pitting potential $V_c'100$.

Alloy	Pitting potential $V_c'100$ [V vs. SCE]
NAS303AM	0.19
Type 304	0.32
Type 430	0.08

In the pitting potential measurements, the pitting potential of NAS303AM shows a lower value than Type 304 but a higher value than Type 430, indicating that NAS303AM has comparatively high pitting corrosion resistance.

Bending Formability

NAS303AM is not suitable for bending forming and similar processing, as its ductility is lower than that of Type 304 due to its high sulfur content.

Weldability

NAS303AM is not recommended for applications requiring welding.

Heat Treatment

Because NAS303AM is an austenitic stainless steel, heat treatment is equivalent to that with the standard austenitic stainless steels. The following heat treatment conditions are normally used :

Solution heat treatment: 1,010–1,150°C ; Water cooling

Pickling

A mixed acid of nitric acid and hydrofluoric acid is used in pickling. Please avoid over-pickling. In some cases surface roughening may occur.

For more information, please contact:

Nippon Yakin Kogyo Co., Ltd.

Material Solutions Sales Department

San-Ei Bldg., 5-8, 1-chome Kyobashi, Chuo-ku,

Tokyo 104-8365 Japan

TEL: +81-3-3273-4649 FAX: +81-3-3273-4642

URL: <https://www.nyk.co.jp/en/>

Note regarding the handling of property data:

The technical information contained in this product guide is representative values obtained in property tests and other items used to explain the performance of the product. With the exception of items specifically mentioned as provisions of a “Standard,” the contents do not represent guaranteed upper limit or lower limit values. The respective data given on this technical information are typical examples and may be different in some cases from the data obtained from the actual product. No responsibility shall, therefore, be assumed for damages arising from using the technical information data. This information is also subject to change in the future without notice. To obtain the most recent information, please contact Nippon Yakin.

No part of this document may be copied or reproduced in any form without the consent of Nippon Yakin.