

NAS254N (UNS S32053)

High Corrosion Resistant Super Stainless Steel

NAS254N (SUS836L, UNS S32053) is a high corrosion resistance austenitic stainless steel with a high nickel, high chromium, high molybdenum alloy design, and provides excellent corrosion resistance in severe corrosion environments such as high temperature seawater. Depending on the environment, this stainless steel offers high economy combined with corrosion resistance comparable to that of Nickel alloy and pure titanium. Nippon Yakin supplies this product in plate, sheet and strip form.

Steel Grade/Standard

| Nippon Yakin Grade | JIS G 4304/4305 | ASTM A240 | EN |
|--------------------|-----------------|------------|----|
| NAS254N | SUS836L | UNS S32053 | — |

Chemical Composition

| | C | Si | Mn | P | S | Ni | Cr | Mo | N |
|----------------------------|--------|-------|-------|--------|--------|-------------|-------------|-----------|-----------|
| Specification (SUS836L) | ≤0.030 | ≤1.00 | ≤2.00 | ≤0.045 | ≤0.030 | 24.00~26.00 | 19.00~24.00 | 5.00~7.00 | ≤0.25 |
| Specification (UNS S32053) | ≤0.030 | ≤1.00 | ≤1.00 | ≤0.030 | ≤0.010 | 24.0~26.0 | 22.0~24.0 | 5.0~6.0 | 0.17~0.22 |

[wt %]

Physical Properties

| | | |
|---|----------------------|------------------------|
| Density | [g/cm ³] | 8.06 |
| Specific heat | [J/kg · K] | 457 |
| Electrical resistivity | [μΩ · cm] | 94.7 |
| Thermal conductivity | [W/m · K] | 11.9 |
| Average coefficient of thermal expansion [10 ⁻⁶ /[°C]] | 30~100°C | 14.6 |
| | 30~200°C | 15.2 |
| | 30~300°C | 15.5 |
| | 30~400°C | 15.8 |
| Young's modulus | [MPa] | 19.7 × 10 ⁴ |
| Magnetism | | None |
| Melting range | [°C] | 1330~1390 |



NIPPON YAKIN KOGYO CO., LTD.

Mechanical Properties

Mechanical Properties at Room Temperature

| | | 0.2% proof stress [MPa] | Tensile strength [MPa] | Elongation [%] | Hardness [HBW] | Hardness [HRBW] | Hardness [HV] |
|----------------------------|------------------------------------|----------------------------|---------------------------|-------------------|-------------------|--------------------|------------------|
| Specification (SUS836L) | | ≥275 | ≥640 | ≥40 | ≤217 | ≤96 | ≤230 |
| Specification (UNS S32053) | | ≥295 | ≥640 | ≥40 | ≤217 | ≤96 | — |
| Example | Cold-rolled sheet 2mm ^t | 385 | 760 | 46 | — | 86 | — |
| | Hot-rolled plate 16mm ^t | 336 | 725 | 56 | 172 | — | — |

Corrosion Resistance

NAS254N is a high Cr, high Mo stainless steel which provides excellent pitting corrosion resistance and crevice corrosion resistance in high Cl environments. As a high Ni steel, it also offers excellent stress corrosion cracking resistance.

Pitting Corrosion Resistance

| Alloy | ASTM G48 Method A | | ASTM G48 Method C |
|-----------|-------------------|------|---|
| | 22°C | 50°C | Critical pitting corrosion temperature CPT (°C) |
| NAS255 | ○ | × | 50 |
| NAS329J3L | ○ | × | 50 |
| NAS64 | ○ | ○ | 55 |
| NAS254N | ○ | ○ | 80 |

- Test conditions
- ASTM G48 Method A (○: No pitting corrosion, ×: Pitting corrosion)
 - Test solution: 6%FeCl₃
 - Test temperature: 22°C, 50°C (Recommended temperature in this test)
 - Test time: 72h
- ASTM G48 Method C
 - Test solution: 6%FeCl₃ + 1%HCl
 - Test time: 72h

Crevice Corrosion Resistance

| Alloy | ASTM G48 Method D |
|-----------|---|
| | Critical crevice corrosion temperature CCT (°C) |
| NAS255 | 10 |
| NAS329J3L | 25 |
| NAS64 | 30 |
| NAS254N | 45 |

- Test conditions
- ASTM G48 Method D
 - Test solution: 6%FeCl₃ + 1%HCl
 - Test time: 72h

Stress Corrosion Cracking Resistance

| Alloy | MgCl ₂ concentration (boiling point (°C) are in brackets) | | | | | | | |
|-----------|--|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| | 45% (155°C) | 42% (143°C) | 40% (138°C) | 38% (134°C) | 35% (126°C) | 30% (115°C) | 25% (110°C) | 20% (108°C) |
| NAS255 | × | × | × | × | ○ | ○ | ○ | ○ |
| NAS329J3L | × | × | × | × | × | × | ○ | ○ |
| NAS64 | × | × | × | × | × | × | ○ | ○ |
| NAS254N | × | × | × | ○ | ○ | ○ | ○ | ○ |

Test conditions

- Immersion in boiling MgCl₂ solution
- Test time: 300h
- U-bend test specimen is used.

○: No stress corrosion cracking
×: Stress corrosion cracking

Acid Resistance

| Alloy | Corrosion rate in sulfuric acid at 80°C (mm/y) | | | | | |
|-----------|--|-------|------|-------|------|-------|
| | 5% | 10% | 20% | 40% | 60% | 80% |
| NAS255 | <0.01 | <0.01 | 0.78 | 2.95 | 0.48 | 5.01 |
| NAS329J3L | 0.01 | 0.17 | 4.65 | 365.9 | 1456 | 106.4 |
| NAS64 | <0.01 | 0.02 | 1.07 | 191.9 | 1054 | 60.72 |
| NAS254N | 0.02 | 0.05 | 1.02 | 2.11 | 2.16 | 7.76 |

Test time: 24h

| Alloy | Corrosion rate in hydrochloric acid at 80°C (mm/y) | | | |
|-----------|--|------|-------|-------|
| | 0.1% | 1% | 2% | 3% |
| NAS255 | <0.01 | 0.01 | 2.70 | 3.72 |
| NAS329J3L | 0.02 | 0.03 | 31.10 | 60.62 |
| NAS64 | 0.01 | 0.01 | 12.94 | 30.51 |
| NAS254N | 0.01 | 0.02 | 0.01 | 9.14 |

Test time: 24h

(Reference)

| Alloy | JIS | UNS No. | Chemical composition |
|-----------|-----------|---------|------------------------|
| NAS255 | SUS890L | N08904 | 20Cr-24Ni-4.3Mo-1.5Cu |
| NAS329J3L | SUS329J3L | S32205 | 22Cr-5.3Ni-3.2Mo-0.16N |
| NAS64 | SUS329J4L | S32506 | 25Cr-6.5Ni-3.3Mo-0.17N |
| NAS254N | SUS836L | S32053 | 23Cr-25Ni-5.5Mo-0.2N |

Workability

The hot and cold workability of NAS254N is basically the same as that of standard austenitic stainless steels such as Type 304, Type 316, etc. However, the fact that this is a high strength material must be considered in both cold and hot working.

Weldability

Various welding methods are applicable in the same manner as with the standard austenitic stainless steels, including shielded metal arc welding, TIG welding, and plasma welding. Alloy 276 welding consumable should be used.

Machinability

As a feature of high Ni stainless steels, although machining is difficult in comparison with the standard austenitic stainless steels, it is easier than with Ni-based alloys. A ultrahard tool should be used in machining if at all possible. It is also advisable to use a slower feed rate and deeper cutting depth.

Heat Treatment

Solution annealing of NAS254N should be performed at the temperature range from 1130 to 1180°C followed by being quenched in water or rapidly cooled by other means. (Conditions provided in ASTM A480/A480M)

Pickling

A mixture of nitric acid and hydrofluoric acid is used in pickling. However, due to the high corrosion resistance of NAS254N, scale is somewhat difficult to remove in comparison with Type 304. Therefore, the material should be immersed in an alkaline solution before pickling, or if possible, shot blasting is extremely effective.

Applications

Food manufacturing plants, Salt manufacturing plants, Pharmaceutical plants, Chemical plants, Flue gas desulfurization plants, Marine structures, Environment-related equipment, Heat exchangers, Various types of bleaching equipment.

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.