

# NAS36

## NAS Controlled Expansion Material

NAS36 is an alloy with nickel (36%) and iron as its main components. Because its coefficient of thermal expansion is extremely low, at about 1/10 that of 18-8 stainless steel, thermal stress caused by temperature changes can be held to a very low level, and complex shapes (wave, bellows, etc.) like those required with other low-temperature materials are not necessary. NAS36 also shows high toughness at low temperatures and provides excellent weldability. Nippon Yakin supplies NAS36 in sheet and strip forms.

### Steel Grade/Standard

| NAS   | JIS | ASTM | EN |
|-------|-----|------|----|
| NAS36 | —   | —    | —  |

### Chemical Composition

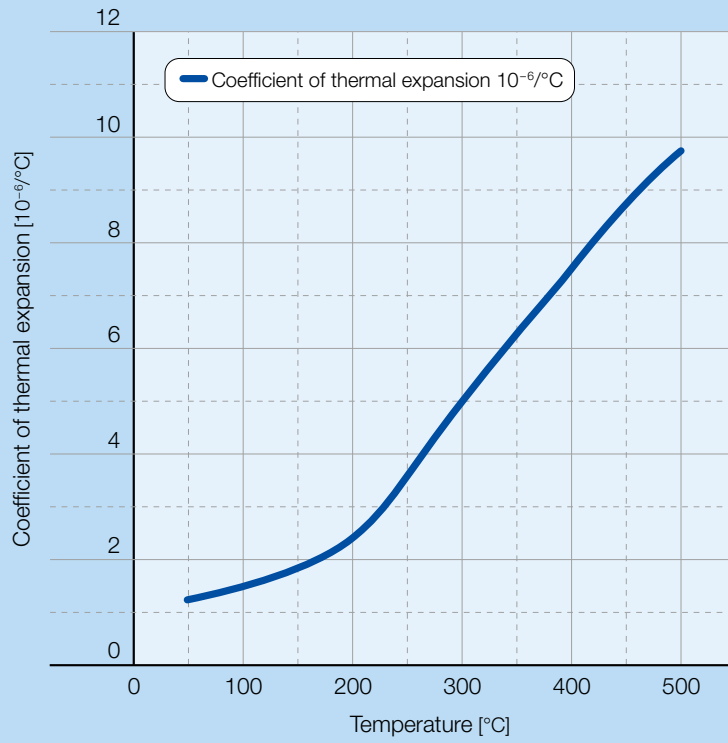
| C     | Si    | Mn    | Ni        | Fe   |
|-------|-------|-------|-----------|------|
| ≤0.05 | ≤0.30 | ≤0.80 | 35.0~37.0 | bal. |

[wt %]

### Physical Properties

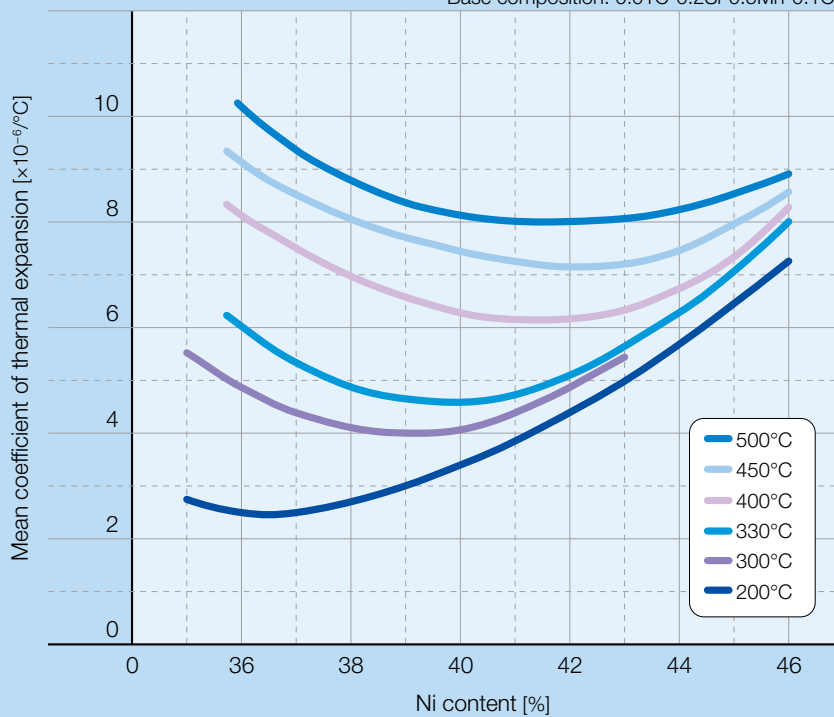
|  |                        |           |                        |
|--|------------------------|-----------|------------------------|
| Density                                  | [g/cm <sup>3</sup> ]   |           | 8.14                   |
| Specific heat                            | [J/kg · K]             | -196~20°C | 385                    |
| Electrical resistivity                   | [μΩ · cm]              | at 20°C   | 78                     |
| Thermal conductivity                     | [W/m · K]              | at 20°C   | 10.5                   |
|  |                        | at 50°C   | 5.4                    |
| Average coefficient of thermal expansion | [10 <sup>-6</sup> /°C] | 25~100°C  | 1.5±0.5                |
| Young's modulus                          | [MPa]                  |           | 14.5 × 10 <sup>4</sup> |
| Curie point                              | [°C]                   |           | 240~260                |
| Melting range                            | [°C]                   |           | 1415~1465              |

Coefficient of Thermal Expansion



Mean coefficient of thermal expansion of Ni-Fe alloys

Base composition: 0.01C-0.2Si-0.5Mn-0.1Cr



Mechanical Properties

Annealed Condition

|         |                   |                    | 0.2% proof stress<br>[MPa] | Tensile strength<br>[MPa] | Elongation<br>[%] | Hardness  |
|---------|-------------------|--------------------|----------------------------|---------------------------|-------------------|-----------|
| Example | Hot-rolled plate  | 22mm <sup>t</sup>  | 241                        | 430                       | 44                | 115 (HBW) |
|         | Cold-rolled sheet | 1.3mm <sup>t</sup> | 292                        | 477                       | 37                | 132 (Hv)  |

Weldability

NAS36 has good weldability. Joints of thin sheet materials can be welded by TIG welding without a filler, even in seam welding.

Applications

Bimetals, LNG tankers, molds, parts requiring low coefficient of thermal expansion.

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