Properties of Screws Made of Special Materials

● Mechanical Properties

Properties	Inconel* equiv. (NCF600) SNSI	Pure Molybdenum SNSM SNFCM	Hastelloy*C-276 equiv. (NW0276) SNSH-C276	Hastelloy*C-22 equiv. (NW6022) SNSH-C22	Monel 400 equiv. (UNS N0400) SNSMN	Nickel (NW2201) SNSN	Super Invar SNSIV
Tensile Strength (N/mm²)	548 - 695	515	690 or Higher	690 or Higher	517 - 620	343 - 411	470
0.2% Proof Stress (N/mm²)	205 - 352	380	283 or Higher	310 or Higher	172 - 345	68 - 166	333
Elongation (%)	35 - 55	15	40 or Higher	45 or Higher	35 - 60	40 - 60	43
Hardness	65 - 85 (HRB)	–	–	–	60 - 80(HRB)	75 - 100 (HB)	143 (HV)

Properties	Phosphor Bronze (C5191) SNSP	Aluminum Alloy (A5056) SNSA	Tantalum SNSTA	MAT21 (UNS N06210) SNSMT
Tensile Strength (N/mm²)	590 or Higher	294	271	690
0.2% Proof Stress (N/mm²)	–	245	189	310
Elongation (%)	8	12	51.2	45
Hardness	–	98 (HB)	–	–

● Values in chart are for reference only. They are not guaranteed values.

● Physical Properties

Properties	Inconel* equiv (NCF600) SNSI	Pure Molybdenum SNSM SNFCM	Hastelloy*C-276 equiv. (NW0276) SNSH-C276	Hastelloy*C-22 equiv. (NW6022) SNSH-C22	Monel 400 equiv. (UNS N0400) SNSMN	Nickel (NW2201) SNSN	Super Invar SNSIV
Specific Gravity	8.42	10.2	8.89	8.69	8.80	8.89	8.15
Longitudinal Elastic Modulus (GPa)	207	327	205	206	179	206	132
Thermal Conductivity (W/(m・K))	16.7	142	–	–	22	79.5	10.47
Linear ExpansionCoefficient (K^{-1})	13.4×10^{-6}	5.1×10^{-6}	11.2×10^{-6}	12.4×10^{-6}	14.2×10^{-6}(100℃)	13.4×10^{-6}	0.69×10^{-6}
Electric Resistance ($\mu\Omega$・m)	1.0	0.058	1.23	1.14	0.5	0.085	0.77

Properties	Phosphor Bronze (C5191) SNSP	Aluminum Alloy (A5056) SNSA	Tantalum SNSTA	MAT21 (UNS N06210) SNSMT	Tungsten SNCW
Specific Gravity	8.83	2.64	16.65	8.76	19.3
Longitudinal Elastic Modulus (GPa)	105	71.7	185	205	–
Thermal Conductivity (W/(m・K))	67	112	–	–	174
Linear ExpansionCoefficient (K^{-1})	18×10^{-6}	24.1×10^{-6}	6.4×10^{-6}	12.0×10^{-6}	4.36×10^{-6}
Electric Resistance ($\mu\Omega$・m)	0.13	0.064	–	1.274	0.054

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● Chemical Resistance of Inconel*, Hastelloy*, and Nickel Screws

Chemical Name	Temperature	Inconel*	Hastelloy*	Nickel
Dilute Sulfuric Acid	Room Temperature	A	AA	A
	Boiling Point	D	A	D
Concentrate Sulfuric Acid	Room Temperature	C	AA	C
	Boiling Point	D	D	D
Dilute Hydrochloric Acid	Room Temperature	B	AA	A
	Boiling Point	D	D	D
Concentrate Hydrochloric Acid	Room Temperature	D	AA	D
	Boiling Point	D	B	D
Dilute Nitric Acid	Room Temperature	D	AA	D
	Boiling Point	–	AA	D
Concentrate Nitric Acid	Room Temperature	A	AA	D
	Boiling Point	–	D	D
Dilute Phosphoric Acid	Room Temperature	AA	AA	AA
	Boiling Point	–	AA	D
Concentrate Phosphoric Acid	Room Temperature	AA	AA	AA
	Boiling Point	–	B	D
Sodium Hydroxide (Diluted)	Room Temperature	AA	–	AA
	Boiling Point	C	–	AA
Sodium Hydroxide (Diluted)	Room Temperature	AA	–	AA
	Boiling Point	C	–	AA

AA : Highly Excellent　　C : Limit
A : Very Good　　D : Not satisfactory
B : Satisfactory

*Inconel is a registered trademark of Special Metals Corporation.
Hastelloy is a registered trademark of Haynes International, Inc.

⚠ Important Information about Chemical Resistance Data

● A test piece was used to acquire the test data. Chemical resistance changes with performance conditions.Always carry out tests under performance conditions similar to actual conditions in advance.

● Magnetic Flux Density of Phosphor Bronze Screws

	Phosphor Bronze	SUSXM7(S.S. grade: A2)
Magnetic Flux Density (T)	0	5×10^{-5}

Measuring device : 5080 Gauss (Tesla) Meter by F.W.BELL
Measuring conditions : DC magnetic field measuring mode
Probe and sample separation distance: 5 mm

The Properties of Ceramic Screws

● Physical Properties

	Al_2O_3 (99.5% Alumina)
Specific Gravity	3.9 - 3.939
Flexural Strength (N/mm²)	360
Volume Resistivity (Ω・m)	$>10^{12}$
Thermal Conductivity (W/(m・K))	32 (20℃)
Linear Expansion Coefficient (K^{-1})	7.2×10^{-6} (40 - 400℃)
Vickers Hardness (GPa)	15.5
Maximum Duty Temperature (℃)	1500

● Values in chart are for reference only. They are not guaranteed values.

● Chemical Resistance

Chemical Name	Temperature	Hour	Effect
35% Hydrochloric Acid	Boiling	30 minutes	◎
70% Nitric Acid	Boiling	30 minutes	◎
98% Sulfuric Acid	Boiling	30 minutes	◎
90% Phosphoric Acid	Boiling	30 minutes	○
60% Hydrofluoric Acid	20℃	24 hours	△
10% Potassium Hydroxide	80℃	7 Days	◎
Potassium Hydroxide	500℃ (Boiling)	24 hours	△
Sodium Hydroxide	500℃ (Boiling)	24 hours	○
Sodium Carbonate	900℃ (Boiling)	24 hours	○
Sodium Sulfate	1000℃ (Boiling)	24 hours	◎
Potassium Fluoride	90℃(Boiling)	4 hours	×

◎ : No Corrosion　　△ : Moderate Corrosion
○ : Slight Corrosion　　× : Heavy Corrosion

⚠ Precautions for Ceramic Screws

● When tightening ceramic screws, use a torque driver or torque wrench and do not exceed the torsional torque.The recommended torque is 50% of the torsional torque.

M	Torsional Torque (N・m)
M3	0.04
M4	0.05
M5	0.10
M6	0.15
M8	0.30
M10	0.50

● Values in chart are for reference only. They are not guaranteed values.

● Heat resistance and chemical resistance change with performance conditions. Always carry out tests under performance conditions similar to actual conditions in advance.

● Ceramic screws may be damaged by impact. Take care when handling these screws.

● Also, ceramics screws with special specifications such as ventilation holes, dimensions, shapes, and cleanroom washing are available. Please contact us for details.