

INFO - SHEET No. 4

Selected Properties of NiTi-based Alloys

The following numbers are only rough estimates covering the wide range of properties which can be achieved by either a special thermo-mechanical treatment or a slightly different chemical composition. In addition most of the properties depend strongly on the testing temperature. We normally supply materials with data sheets that include a lot of informations about the processing of the alloys. However, we do not measure all the properties listed below except on special request by our customers.

Transformation temperatures and strains:

Transformation temperature range	.....	-200* - + 110 °C
Transformation enthalpy	.....	0,47 - 0,62 kJ/Kg K
Transformation strains		
up to	1 cycle	..... up to 8 %
up to	100 cycles	..... up to 5 %
up to	100.000 cycles	..... up to 3 %
above	100.000 cycles	..... ca. 2 %
Thermal hysteresis**	.....	30 - 80 °C

Physical properties:

Melting point	.....	ca. 1310 °C
Density	.....	6,45 kg/dm ³
Thermal conductivity of the Martensite	.....	ca. 9 W/m K
Thermal conductivity of the Austensite	.....	ca. 18 W/m K
electrical resistivity	.....	50 - 110 μΩcm
lin. thermal expansion factor α of the Martensite	.....	ca. 6,7 x 10 ⁻⁶ 1/K
lin. thermal expansion factor α of the Austenite	.....	10 - 11 x 10 ⁻⁶ 1/K
Corrosion properties and biocompatibility	.....	excellent
Magnetic permeability	.....	<1,002
Magnetic susceptibility	.....	3,0 x 10 ⁶

Mechanical Properties:

Youngs modulus*** of the Austenite	.....	ca. 70 - 80 GPa
Youngs modulus*** of the Martensite	.....	ca. 23 - 41 GPa
Ultimate tensile strength (cold worked condition)	.....	up to 1.900 MPa
Ultimate tensile strength (fully annealed condition)	.....	ca. 900 MPa
Plateau stress („Pseudo“-Yield stress) Martensite	.....	70 - 200 MPa
Plateau stress Austenite	.....	200 - 650 MPa
„conventional“ Yield stress Austenite	.....	550 - 700 MPa
Transversal contraction factor	.....	0,33
Tensile strain (fully annealed)	.....	20 - 60 %
Tensile strain (cold worked)	.....	5 - 20 %
Hot workability	.....	reasonable
Cold workability	.....	difficult (work hardening)
Machinability	.....	very poor

*: Very low transformation temperatures can easily be achieved by alloying, but the material are getting very brittle!

** : Numbers for complete transformation cycles. Stress hysteresis decreases in case of incomplete transformation cycles

*** Very critical figure! Don't use for design purposes due to the pronounced non-linearity of the σ-g

behaviour and strong dependence on the temperature!