PRINCIPIAMED®

Metal Material Selection Guide for Medical Devices

contact us: info@principiamed.com

Metal	Stainless Steel	Low Carbon Stainless Steel	Stainless Steel	Stainless Steel
Designation	304	304L	316	316L
Description	The most common chromium-nickel stainless steel Corrosion resistant	Lower carbon stainless steel Corrosion resistant, less suceptible to intergranular corrosion	Bio compatible steel	Bio compatible steel
Machinability	Good	Good	Good	Good
Corrosion Resistance	Good	Good	Good	Good
Wear Resistance	Average	Average	Average	Average
Ease of Welding	Good	Great	Good	Great
Implantable?	No	No	Yes	Yes
MRI Safe?	No	No	No	No
Properties	**Stainless Steel**	**Low Carbon Stainless Steel**	**Stainless Steel**	**Stainless Steel**
Hardness (Brinell)	123	151	149	149
Fatigue Limit	240 MPa 35 ksi	240 MPa 35 ksi	270 MPa 39 ksi	270 MPa 39 ksi
Yield Strength	215 MPa 31 ksi	210 MPa 30 ksi	240 MPa 35 ksi	205 MPa 30 ksi
Tensile Strength	505 MPa 73 ksi	564 MPa 82 ksi	550 MPa 80 ksi	515 MPa 75 ksi
Elastic Modulus	193-200 GPa 27,900-29,000 ksi	193-200 GPa 27,900-29,000 ksi	193 GPa 27,900 ksi	193 GPa 27,900 ksi
Density	8 g/cm^3 .29 lb/in^3	8 g/cm^3 .29 lb/in^3	8 g/cm^3 .29 lb/in^3	8 g/cm^3 .29 lb/in^3
Heat Capacity	.5 J/g C .12 BTU/lb F	.5 J/g C .12 BTU/lb F	.5 J/g C .12 BTU/lb F	.5 J/g C .12 BTU/lb F
Melting Point	1,400-1,455° C 2,552-2,651° F	1,400-1,455° C 2,552-2,651° F	1,370-1,400° C 2,500-2,550° F	1,375-1,400° C 2,510-2,550° F
Resistivity	$7.2x10^{-7}$ ohm-m	$7.3x10^{-7}$ ohm-m	$7.4x10^{-7}$ ohm-m	$7.4x10^{-7}$ ohm-m
Applications	Tools, Equipment	Heavy equipment requiring welds	Steel implants	Steel implants

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Metal	Titanium	Nitinol	Cobalt-Chrome Alloy	Platinum
Designation	Ti-6Al-4V	SE 508	ASTM F1537	
Description	Titanium alloy High hardness, heat resistant metal	Superelastic alloy Superelastic (Bendy), Shape memory	Non-toxic for medical applications	Low corrosion metal Low corrosion
Machinability	Poor	Poor	Challenging	Poor
Corrosion Resistance	Good	Good, when treated properly	Great	Great
Wear Resistance	Great	Good	Good	Good
Ease of Welding	Poor	Very Poor	Poor	Good
Implantable?	Yes	Yes	Yes	Yes
MRI Safe?	Yes	Yes	Yes	Yes
Properties	**Titanium**	**Nitinol**	**Cobalt-Chrome Alloy**	**Platinum**
Hardness (Brinell)	334	301-351	302	264
Fatigue Limit	580 MPa 84 ksi	n/a	n/a	n/a
Yield Strength	880 MPa 128 ksi	Low	585 MPa 85 ksi	125-165 MPa 18-24 ksi
Tensile Strength	950 MPa 138 ksi	> 1070 Mpa > 155 ksi	1,035 MPa 150 ksi	245 MPa 36 ksi
Elastic Modulus	114 GPa 16,500 ksi	41-75 GPa 5,900-10,800 ksi	241 GPa 35,000 ksi	171 GPa 24,800 ksi
Density	4.43 g/cm^3 .16 lb/in^3	6.5 g/cm^3 .23 lb/in^3	8.2 g/cm^3 .3 lb/in^3	21.45 g/cm^3 .77 lb/in^3
Heat Capacity	.5 J/g C .12 BTU/lb F	.46 J/g C .11 BTU/lb F	.39 J/g C .09 BTU/lb F	.77 J/g C .13 BTU/lb F
Melting Point	1,600-1,660° C 2,912-3,020° F	1,310° C 2,390° F	1,330° C 2,430° F	1,762° C 3,203° F
Resistivity	1.78x10^{-6} ohm-m	8.2x10^{-5} ohm-m	6x10^{-6} ohm-m	5.6x10^{-8} ohm-m
Applications	Implants, prostheses	Stents, wires, implants	Dental implants	Surgical intruments, implants, anticancer drugs