Sheath Material Data Sheet

Name	**Mild Steel**
Peak Sensors Colour Code	**Black**
Application Notes	**Ceramic support tube (Plated) Occasional sensor protection use**
Basic Composition	**Fe, C**
Temperature Limits	**550 °C**
International Standards	**Seamless Pipe**
Properties Density	**7.9 g/cm^3**
Melting Range	
Specific Heat	
Coefficient of Expansion	
Thermal Conductivity	

Name	**321 SS**
Peak Sensors Colour Code	**Silver**
Application Notes	**Commonly called 18/8. Excellent corrosion resistance and remains ductile. Used for MI sheathing for type J and Pt 100's. Withstands hot crude oil products, steam and combustion gases. Carbon dioxide to 650 °C. Air up to 900 °C without temperature variation.**
Basic Composition	**Cr 18%, Ni 9%, Mn 2%, Si 1%, C 0.1%, Bal Fe**
Temperature Limits	**800 °C**
International Standards	**BS 970 321 S31, W No 1.4541**
Properties Density	**7.9 g/cm^3**
Melting Range	**Approx 1400 °C**
Specific Heat	**500 J/Kg °C**
Coefficient of Expansion	**17 x10^{-6} /°C**
Thermal Conductivity	**14.7 W/m °C**

Name	**310 SS**
Peak Sensors Colour Code	**Silver**
Application Notes	**Commonly called 25/20. Good oxidation resistance and resistant to sulphur and reducing atmospheres. High temperature sheathing. Carbon dioxide to 900 °C. Continuous operation in air up to 1150°C, without temperature variation. Not recommended for use continuously between 550 °C and 850 °C.**
Basic Composition	**Cr 25%, Ni 20%, Mn 2%, Si 2%, C 0.02%, Bal Fe.**
Temperature Limits	**1100 °C**
International Standards	**BS 970 Grade 310 S31, W No 1.4841**
Properties Density	**7.9 g/cm^3**
Melting Range	**Approx 1400 °C**
Specific Heat	**500 J/Kg °C**
Coefficient of Expansion	**16.5 x10 m °$^{-6}$ /°C**
Thermal Conductivity	**14.7 W/ C**

Name	**316 SS**
Peak Sensors Colour Code	**Silver**
Application Notes	**Excellent corrosion and pitting resistance. Similar to 321 SS but with better acid resistance. Usually used in chemical plants and many other industrial applications.**
Basic Composition	**Cr 17.5%, Ni 12.5%, Mn 2%, Si 1%, Mo 2-2.5%, C 0.03%, Bal Fe.**
Temperature Limits	**800 °C**
International Standards	**BS 970 Grade 316, W No 1.4401**
Properties Density	**7.9 g/cm^3**
Melting Range	**Approx 1400 °C**
Specific Heat	**500 J/Kg °C**
Coefficient of Expansion	**17 x10^{-6} /°C**
Thermal Conductivity	**14.7 W/m °C**

Name	**4C54, Ferritic, 446 SS**
Peak Sensors Colour Code	**Blue**
Application Notes	**Very good resistance to sulphurous gases and salts. Good resistance to oxidation in air. Good resistance to oil ash**

Sheath Material Data Sheet

	corrosion, molten copper, lead, tin. In sulphurous reducing atmosphere 446 performs better than austenitic steels, although Nitrogen concentrations can result in early failure. Hot gasses containing hydrocarbons and carbon monoxide can cause carburisation, if Oxygen is present for an oxide layer to form 446 performs well, otherwise failure occurs quickly.
Basic Composition	**Cr 26.5%, Mn 0.8%, Si 0.5%, N 0.2%, C 0.2% Max, P 0.03 Max, S 0.15 Max, Bal Fe**
Temperature Limits	**1100°C in air and oxidising conditions**
International Standards	**1.4749, 446-1**
Properties Density	**7.6 g/cm^3**
Melting Range	
Specific Heat	**460 rising to 670 J/Kg °C**
Coefficient of Expansion	**13.5 x10^{-6} /°C**
Thermal Conductivity	**17 rising to 28 W/m °C**

Name	**353 MA**
Peak Sensors Colour Code	
Application Notes	**Very good resistance to oxidation, combustion gasses and carburisation. Good resistance to nitriding gasses. Excellent in petrochemical furnaces including cracked ammonia.**
Basic Composition	**Cr 25%, Ni 35%, Si 1.6%, Mn 1.5% Max, N 0.16%, C 0.05, P 0.04 Max, S 0.03 Max, Ce 0.05, Bal Fe**
Temperature Limits	**1175 °C**
International Standards	**UNS S 35315**
Properties Density	**7.89 g/cm^3**
Melting Range	
Specific Heat	**450 rising to 670 J/Kg °C**
Coefficient of Expansion	**18.5 x10^{-6} /°C**
Thermal Conductivity	**11 rising to 28 W/m °C**

Name	**Sanicro 31 HT**
Peak Sensors Colour Code	
Application Notes	**Performs well in salt baths for heat treatment, cyanide or neutral salt baths.**
Basic Composition	**Cr 21%, Ni 31%, Si 0.6%, Mn 0.6%, Ti 0.5%, Al 0.5%, C 0.7, S 0.03, P 0.015 Max, S 0.01 Max, Bal Fe**
Temperature Limits	**1100 °C Max in air or oxidation gases**
International Standards	**N 08811/N08810, W Nr 1.4959 (W 1.4876)**
Properties Density	**7.9 g/cm^3**
Melting Range	
Specific Heat	**460 rising to 680 J/Kg °C**
Coefficient of Expansion	**18.5 x10^{-6} /°C**
Thermal Conductivity	**11.6 rising to 31 W/m °C**

Name	**253 MA**
Peak Sensors Colour Code	**Pink**
Application Notes	**Very good resistance to oxidation, combustion gasses and carburisation.**
Basic Composition	**Cr 21%, Ni 11%, Si 1.7%, Mn 0.8% Max, N 0.17%, C 0.08, P 0.04, S 0.03, Ce 0.05, Bal Fe**
Temperature Limits	**1150 °C Max in Air, oxidation and carburisation.**
International Standards	**1.4835, S 30815, W Nr 1.4893**
Properties Density	**7.8 g/cm^3**
Melting Range	
Specific Heat	**440 rising to 690 J/Kg °C**
Coefficient of Expansion	**16 rising to 24 x10^{-6} /°C**
Thermal Conductivity	**14.5 rising to 29 W/m °C**

Name	**Alloy 600 (Inconel)**
Peak Sensors Colour Code	**Red**
Application Notes	**A strong oxidation resistant material at high temperatures particularly with cycling. Good resistance to carburisation. Resists Sulphur compounds and carbon dioxide to moderate temperatures only. Excellent neutral and alkaline salt bath**

Sheath Material Data Sheet

	resistance Good in many acid salt baths. Good for nitriding atmospheres.
Basic Composition	**Ni 72% Min, Cr 14-17%, Fe 6-10%.**
Temperature Limits	**1100 °C**
International Standards	**W No 2.4816, UNS N06600**
Properties Density	**8.472 g/cm^3**
Melting Range	**1354 to 1413 °C**
Specific Heat	**444 J/Kg °C**
Coefficient of Expansion	**10 rising to 16 x10^{-6} /°C**
Thermal Conductivity	**15 rising to 27 W/m °C**

Name	**Alloy 800 HT (Incoloy)**
Peak Sensors Colour Code	**None**
Application Notes	**Resistance to high temperature corrosion. Excellent oxidation and carburisation resistance. Reasonable sulphur resistance at moderate temperatures Alloy 800 and Alloy 800 H are very similar but they have lower creep rupture strength at temperature.**
Basic Composition	**Ni 30-35%, Cr 19-23%, Fe 39.5% Max,**
Temperature Limits	**1100 °C**
International Standards	**W No 1.4876, UNS N08811**
Properties Density	**7.945 g/cm^3**
Melting Range	**1357 to 1385 °C**
Specific Heat	**460 J/Kg °C**
Coefficient of Expansion	**14 rising to 18 x10^{-6} /°C**
Thermal Conductivity	**11 rising to 32 W/m °C**

Name	**Pyrosil**
Peak Sensors Colour Code	**None**
Application Notes	**MI Thermocouple types K and N sheathing. Better oxidation resistance than Alloy 600**
Basic Composition	**Ni Cr Si**
Temperature Limits	**1250 °C**
International Standards	
Properties Density	
Melting Range	
Specific Heat	
Coefficient of Expansion	
Thermal Conductivity	

Name	**Platinum**
Peak Sensors Colour Code	**None**
Application Notes	**Direct contact with molten glass**
Basic Composition	**Pt**
Temperature Limits	**Depends on expected lifetime**
International Standards	
Properties Density	**21.45 g/cm^3**
Melting Range	**1769**
Specific Heat	
Coefficient of Expansion	**9.1 x10^{-6} /°C**
Thermal Conductivity	**74 W/m °C at 20 °C**

Name	**Platinum 10% Rhodium**
Peak Sensors Colour Code	**None**
Application Notes	**Direct contact with molten glass. Higher strength at elevated temperature**
Basic Composition	**Pt 90%, Rh 10%**
Temperature Limits	**1700 ***
International Standards	
Properties Density	**20.00 g/cm^3**
Melting Range	**1840 to 1870**
Specific Heat	
Coefficient of Expansion	**8.6 x10^{-6} /°C**
Thermal Conductivity	**31 W/m °C at 20 °C**

Name	**Platinum Grain Stabilised**

Sheath Material Data Sheet

Peak Sensors Colour Code	**None**
Application Notes	**Direct contact with molten glass. As Platinum but with higher stress rupture strength and creep behaviour. Grain stabilisation reduces degradation at temperature and allows for a thinner wall. Avoids Rhodium inclusion which can discolour glass.**
Basic Composition	**Pt**
Temperature Limits	**1700 ***
International Standards	
Properties Density	**21.45 g/cm^3**
Melting Range	**1769**
Specific Heat	
Coefficient of Expansion	**9.1 x10^{-6} /°C**
Thermal Conductivity	**74 W/m °C at 20 °C**

Name	**Platinum 10% Rhodium Grain Stabilised**
Peak Sensors Colour Code	**None**
Application Notes	**Direct contact with molten glass. As Platinum 10% Rhodium but with higher stress rupture strength and creep behaviour. Grain stabilisation reduces degradation at temperature and allows for a thinner wall.**
Basic Composition	**Pt 90%, Rh 10%**
Temperature Limits	**1700 ***
International Standards	
Properties Density	**19.80 g/cm^3**
Melting Range	**1840 to 1870**
Specific Heat	
Coefficient of Expansion	**8.6 x10^{-6} /°C**
Thermal Conductivity	**31 W/m °C at 20 °C**

Name	**Kanthal AF, Kanthal APM**
Peak Sensors Colour Code	**None**
Application Notes	**High resistance to attack by sulphur. Resists carburisation at temperature. Very little scaling reduces furnace contamination. Better heat transfer than ceramic.**
Basic Composition	**Cr 22%, Al 4-6%, Fe Balance.**
Temperature Limits	**1400 °C**
International Standards	
Properties Density	**7.1 g/cm^3**
Melting Range	
Specific Heat	
Coefficient of Expansion	**12 rising to 16 x10^{-6} /°C**
Thermal Conductivity	**12 rising to 32 W/m °C**

Name	**Kanthal Super**
Peak Sensors Colour Code	**None**
Application Notes	**Less brittle than ceramics. Excellent in corrosive furnaces. Suppresses electromagnetic oscillations.**
Basic Composition	**Moloybdenum disilicade $MoSi_2$**
Temperature Limits	**1700 °C**
International Standards	
Properties Density	
Melting Range	
Specific Heat	
Coefficient of Expansion	
Thermal Conductivity	

Name	**Recrystalised Alumina (Alsint)**
Peak Sensors Colour Code	**None**
Application Notes	**A pure and tough ceramic exhibiting hardness and vacuum tightness. Excellent in oxidising and reducing atmospheres. Fair thermal shock resistance. Used with R, S and B thermocouples.**
Basic Composition	**Al_2O_3 99.7%**
Temperature Limits	**1750 °C**
International Standards	**DIN VDE 0335 C799**
Properties Density	**3.9 g/cm^3**

Sheath Material Data Sheet

Melting Range	**2072**
Specific Heat	
Coefficient of Expansion	**8 x10^{-6} /°C**
Thermal Conductivity	**26 W/m °C**

Name	**Pythagoras**
Peak Sensors Colour Code	**None**
Application Notes	**Good thermal shock resistance. Used with J, K, N and E conductors.**
Basic Composition	**Al_2O_3 60%**
Temperature Limits	**1500 °C**
International Standards	**DIN VDE 0335 C610**
Properties Density	**2.6 g/cm^3**
Melting Range	
Specific Heat	
Coefficient of Expansion	**6 x10^{-6} /°C**
Thermal Conductivity	**2 W/m °C**

Name	**Sillimanite 60**
Peak Sensors Colour Code	**None**
Application Notes	**Very good thermal shock resistance. Porous**
Basic Composition	**Al_2O_3 73 to 75%**
Temperature Limits	**1600 °C**
International Standards	**DIN VDE 0335 C530**
Properties Density	**2.35 g/cm^3**
Melting Range	
Specific Heat	
Coefficient of Expansion	**5.7 x10^{-6} /°C**
Thermal Conductivity	**1.4 W/m °C**

Name	**Silicon Carbide (Clay Bonded)**
Peak Sensors Colour Code	**None**
Application Notes	**Excellent thermal shock resistance. Tends to have thick wall to improve strength. A porous material that usually has a lining refractory for Platinum sensors. High thermal conductivity. Not suitable for highly oxisising atmospheres.**
Basic Composition	**SiC 70 – 90 %**
Temperature Limits	**1400 °C**
International Standards	
Properties Density	**2.4 g/cm^3**
Melting Range	
Specific Heat	
Coefficient of Expansion	**5.0 x10^{-6} /°C**
Thermal Conductivity	**28.0 W/m °C**

Name	**Silicon Carbide (Recrystalised)**
Peak Sensors Colour Code	**None**
Application Notes	**Excellent thermal shock resistance. A porous material that usually has a lining refractory for Platinum sensors. High thermal conductivity.**
Basic Composition	**SiC ≥ 99%**
Temperature Limits	**1600°C in oxidising atmosphere, 2000°C in protected atmosphere**
International Standards	
Properties Density	**2.6 to 2.7 g/cm^3**
Melting Range	
Specific Heat	
Coefficient of Expansion	**4.5 x10^{-6} /°C**
Thermal Conductivity	**30.0 W/m °C**

Name	**Syalon 101**
Peak Sensors Colour Code	**None**
Application Notes	**A strong and thermal shock resisting material for use in molten metals with little wetting or dross build up. Good in molten aluminium or salt baths. Fairly expensive**
Basic Composition	**Silicon Nitride, Aluminium Oxide**

Sheath Material Data Sheet

Temperature Limits	**1000°C (1250°C in controlled conditions)**
International Standards	
Properties Density	**3.26 g/cm^3**
Melting Range	
Specific Heat	
Coefficient of Expansion	**3.2 x10^{-6} /°C**
Thermal Conductivity	**16.7 W/m °C**

Name	**Quartz**
Peak Sensors Colour Code	**None**
Application Notes	**Low coefficient of expansion, High thermal shock resistance. Very Brittle.**
Basic Composition	**SiO_2**
Temperature Limits	**1500 °C (Then flows under own weight)**
International Standards	
Properties Density	**2.2 g/cm^3**
Melting Range	**1683**
Specific Heat	**670 J/Kg °C**
Coefficient of Expansion	**5.5 x10^{-7} /°C**
Thermal Conductivity	**1.4 W/m °C**

Name	**Monel 400**
Peak Sensors Colour Code	
Application Notes	**Resists sea water, steam, Salt and caustic solutions, Used in heat exchangers Other Monel materials available**
Basic Composition	**Ni 67%, Cu 28%, F3 3%, Mn 2%**
Temperature Limits	**0 to 480°C**
International Standards	**UNS N00440**
Properties Density	**8.84g/cm^3**
Melting Range	**1320°C**
Specific Heat	**430 J/Kg °C**
Coefficient of Expansion	**14 x10^{-6} /°C**
Thermal Conductivity	**High**

Name	**Hastelloy C276**
Peak Sensors Colour Code	
Application Notes	**Corrosion resistance in reducing and oxidising atmospheres. Severe environments, Maintains corrosion resistance after welding.**
Basic Composition	**Ni 57%, Mo 16%, Cr 15.5%, Fe 5.5%, W 3.8%**
Temperature Limits	**1040 °C**
International Standards	**UNS N10276**
Properties Density	**8.9g/cm^3**
Melting Range	**1325 - 1370°C**
Specific Heat	
Coefficient of Expansion	**12.8 x10^{-6} /°C**
Thermal Conductivity	**High**

Name	**Hastelloy B2**
Peak Sensors Colour Code	
Application Notes	**Significant resistance to reducing environments, and many acids**
Basic Composition	**Ni 68%, Mo 28%, Fe 2%, Co 1%, Cr 1%.**
Temperature Limits	**815 °C**
International Standards	**UNS 10665**
Properties Density	
Melting Range	
Specific Heat	
Coefficient of Expansion	
Thermal Conductivity	**High**

Name	**Cast Iron**
Peak Sensors Colour Code	
Application Notes	**Inexpensive material used in molten Aluminium. It has a relatively short life due to oxidation but other materials also have their drawbacks in this application. Brittle metal**

Sheath Material Data Sheet

Basic Composition	**Fe, C (3 to 3.5%)**
Temperature Limits	**900 °C in Aluminium**
International Standards	
Properties Density	**7.9 g/cm^3**
Melting Range	
Specific Heat	
Coefficient of Expansion	
Thermal Conductivity	**High**

Name	**Brass**
Peak Sensors Colour Code	
Application Notes	**Inexpensive engineering material. Easily machined to complex shapes. Readily available. Becomes brittle with heat**
Basic Composition	**Cu 85%, Zn 15%.**
Temperature Limits	
International Standards	
Properties Density	**8.8 g/cm^3**
Melting Range	
Specific Heat	
Coefficient of Expansion	
Thermal Conductivity	**High**