Materials

SHEATH MATERIALS						
Material	**Code**	**Type**	**A.K.A.**	**Max. Temp.**	**Specifications**	**Applications**
Stainless steel	**M1**	DIN 1.4301	AISI 304 (L)	450 °C	good resistance to inter-crystal corrosion, oil products, and vapor; high conductivity; excellent resistance to low temp. from -200°C; not recommended for long-term use from 425 to 860 °C	general purpose applications in machine and apparatus construction; cryogenic and non-aggressive food and chemical processing
Stainless steel	**M2**	DIN 1.4541	AISI 321	850 °C	good resistance to inter-crystal corrosion, oil products, vapor, exhaust gases, and oxidation; high conductivity	nuclear power and reactor construction; chemical apparatus & furnaces; paper, textile, crude oil, and petrochemical industry; food processing
Stainless steel	**M3**	DIN 1.4571	AISI 316 TI	850 °C	same as above plus: increased resistance to acids thanks to the addition of molybdenum; resistant to pitting, salt water, and other aggressive influences; high conductivity	nuclear power and reactor construction; furnace construction; chemical and pharmaceutical industries
Stainless steel	**M4**	DIN 1.4762 (1.4749)	AISI 446 (SS 2322)	1150 °C	extremely high resistance to sulfuric atmospheres; resistant to oxidation and corrosion caused by incinerator slag, copper, lead, and tin smelts	petrochemical industry; metallurgy; power technology; heat treatment kilns; vortex firing installations; waist incinerators
Stainless steel	**M5**	DIN 1.4841	AISI 310	1150 °C	good resistance to oxidation (carburizing, nitriding) and sulfurization (up to 650 °C); also resistant to hydrous solvents; resistant to chlorine-induced tension crack corrosion and cyanide	boilers and blast furnaces; cement and brick kilns; glass industry; crude oil and petrochemical industry; furnace construction; power plants
Stainless steel	**M6**	DIN 1.4845	AISI 310 S	1100 °C		
Nickel alloy	**M7**	DIN 1.4876	Incolloy 800	1100 °C	provides superior thermal stability thanks to the addition of titanium and aluminum; excellent resistance to carburization and renitrogenization	power stations; crude oil and petrochemical industry; furnace construction
Nickel alloy	**M8**	DIN 2.4816	Inconel 600	1100 °C	resistant to corrosion and tension crack corrosion; excellent resistance to oxidation; not recommended for CO_2 and sulfur gases above 550 °C, with sodium above 750 °C	power & nuclear power stations; furnace construction; fiber industry; heat treatment; paper and food processing; boilers; aircraft engines
Stainless steel	**M9**	DIN 1.4435 (1.4404)	AISI 316 (L)	850 °C	good resistance to inter-crystal corrosion, oil products, vapor, exhaust gases, and oxidation; resistance to mild acids and alkalies; high conductivity	food and diary industry; chemical apparatus & furnaces; paper, textile, crude oil, and petrochemical industry; grease, soap
Nickel alloy	**M10**	Ni84-Cr14 (+Nb+Mg)	Nicrobell®	1250 °C	superior resistance to high temperature corrosion atmospheres; the addition of niobium has the effect of improving the thermomechanical properties and ultimate tensile strength, rupture stress and ductility as a function of temperature to 1250 °C are superior to Inconel and AISI 310	boilers and blast furnaces; cement and brick kilns; glass industry; crude oil and petrochemical industry; furnace construction; power & nuclear power stations; heat treatment; paper and food processing; aircraft engines
Pure iron (Fe)	**M11**		ASTM A848	1300 °C	excellent malleability, weldability, and corrosion resistance; holds heat about 40% longer than mild steel; suitable for salt, cyanide, or chloride baths	chemical processes including molten salts treatment
Cast iron	**M12**	DIN GG-30	ASTM A48	700 °C	suitable for gas ducts and some chemical solutions; fair compatibility with molten aluminum	withstands sulphur and caustic solutions
Black steel	**M13**	DIN 1.0305	ASTM A105 (A106)	550 °C	suitable for non-aggressive and low-oxidation gaseous media; suitable for molten babbitt, tin, lead, and magnesium	low-cost general applications
FeCrAl alloy	**M14**	Cr22-Al6	Kanthal® A	1250 °C	supperior oxidation resistance in dry air up to 1300 °C; excellent oxidation resistance to CO, CO_2, N_2, SO_2, SO_3, and other sulfur-containing gases; very good resistance to cracked ammonia; also suitable for molten Cu, Zn, and Mg	high-temperature processes in metallurgy; power plants; chemical and petrochemical industry; furnace construction; heat treatment; cement and brick kilns, etc.
Duplex stainless steel	**M15**	DIN 1.4362	Alloy 2304	300 °C	excellent resistance to stress corrosion cracking and other forms of corrosion; high thermal conductivity; good weldability and easy fabrication; not suitable for long for applications over 300°C	heat exchangers, feedwater tubes, piping and instrumentation tubing for general service; coal handling, food and beverage, potash, waste water, and pulp and paper industries
Copper (Cu)	**M16**	EN 1057	ASTM B75 (B88)	450 °C	excellent thermal conductivity; high ductility; good toughness at sub-zero temperatures; non-magnetic and anti-bacterial; not suitable where high mechanical strength is required	fast temperature measurement systems; HVAC applications; refrigeration installations; non-aggressive food and chemical processing; heat exchangers and distillation apparatus
Brass (CuZn)	**M17**	DIN 17660	ASTM B16 (B124)	450 °C	same as Cu, but with good mechanical strength and easy fabrication	
NiCrMo alloy	**M18**	DIN 2.4602	Hastelloy C	1050 °C	provides an exceptional combination of oxidation resistance (carburizing, sulpurous, nitriding, chlorine), fabricability and high-temperature strength. It is also exceptionally resistant to stress-corrosion cracking in petrochemical applications	high-temperature processes in metallurgy; power plants; chemical and petrochemical industry; furnace construction; heat treatment (direct flame exposure), aircraft and spacecraft industries
	M19		Hastelloy X	1200 °C		
Titanium alloy	**M20**	DIN 3.70xx	ASTM B348	600 °C	very high tensile strength even at high temperatures; light weight, high corrosion resistance, and low toxity; suitable for high-aggressive chemical solvents and gas mixtures	chemical and electrochemical industry; pipes for power plants, armour plating; naval ships, aircraft, spacecraft and missiles; medicine and medical apparatus
NiCu alloy	**M21**	Monel® (Alloy 400)	ASTM B127	550 °C	high corrosion resistance to alkalis, bases and some non-oxidizing acida; stronger than steel; low temperature expansion	chemical industry, aircraft and spacecraft industries; musical instruments; ship building
Gas-tight alumina ceramic	**C1**	Al_2O_3 60%	Pythagoras 610	1500 °C	an irreplaceable material for usage above 1300 °C and depending on the purity of Al_2O_3 - up to 1750 °C; suitable for applications in atmospheres with CO_2 and sulfur gases; provides an excellent electric isolation; not suitable for non-gas media, increased vibrations, and shocks	glass and ceramic industries; black and color metallurgy; power stations; high-temperature furnaces and other high-temperature applications
	C2	Al_2O_3 95%	Oxal 710	1600 °C		
	C3	Al_2O_3 99.7%	Alsint 799	1700 °C		
Metal-ceramic	**C4**	Cr+Al_2O_3	Ucar®	1650 °C	excellent mechanical strength (like metal); suitable for ferrous metals baths (steels) and non-ferrous metal baths like brass, copper, zinc, and lead; not suitable for molten aluminum	black and color metallurgy; forging iron and steel; forging non-ferrous metals without aluminum
Silicon ceramic	**C5**	SiC + SiO_2	Silicon carbide	1380 °C	high temperature strength; suitable for aluminum and most of non-ferrous metal baths	aluminum industry; forging non-ferrous metals
	C6	SiC	Hexoloy®	1650 °C	very high temperature strength; high thermal conductivity - equal to metal, five times alumina; superior oxidation resistance; suitable for most corrosive and erosive environments	almost everywhere to protect thermocouples from corrosive and erosive influences except molten ferrous metals
	C7	Si_3N_4+ Al_2O_3	Syalon	1400 °C	high mechanical strength and thermal shock resistance; high corrosion resistance; suitable for aluminum and most of non-ferrous metal baths	aluminum industry; forging non-ferrous metals except pure copper
	C8	Si_3N_4	Silicon nitride	1400 °C		

PLASTIC TYPES AND OTHER MATERIALS							
Code	**Type**	**A.K.A.**	**Max. Temp.**	**Code**	**Type**	**A.K.A.**	**Max. Temp.**
AB	ABS	Acrylonitrile Butadiene Styrene	90 °C	**PI**	PBI	Polybenzimidazole (Celazole®)	350 °C
AC	POM	Polyoxymethylene (polyacetal)	90 °C	**PO**	PPO	Polyphenylene Oxide	130 °C
DF	PVDF	Polyvinylidene Fluoride	130 °C	**PP**	PP	Polypropylene	130 °C
EC	ECTFE	Ethylene Chlorotrifluoroethylene	160 °C	**PS**	PS	Polystyrene (Polystyrol®)	90 °C
EP	EPDM	Ethylene Propylene rubber	130 °C	**PU**	PUR	Polyurethane	110 °C
FE	FEP	Fluorinated Ethylene Propylene	200 °C	**PV**	PVC	Polyvinylchloride	75 °C
FP	FPM	Fluorine rubber (Viton®)	200 °C	**RB**	Rubber	Nitrile rubber	100 °C
NB	NBR	Acrylonitrile Butadiene rubber	100 °C	**SL**	Silicone	Silicone rubber	200 °C
NP	Neoprene	Polychloroprene	90 °C	**SU**	PSU	Polysulfone	160 °C
NY	Nylon	Nylon polyamide	100 °C	**TF**	PTFE	Polytetrafluorethylene (Teflon®)	260 °C
OF	POF(POE)	Polyolefin	110 °C	**CF**	Ceramic	Ceramic fiber	1200 °C
PA	PA	Polyamide, hardened	120 °C	**GL**	Glass	Glass fiber	400 °C
PB	PBT	Polybutylene Terephtalate	160 °C	**MF**	Mineral	Mineral fiber	950 °C
PC	PC	Polycarbonate	135 °C	**AL**	AL	Aluminum	
PE	HDPE	Polyethylene, high density	120 °C	**BR**	BR	Brass	
PF	PFA	Perfluoroalkoxyl	260 °C	**SS**	SS	Stainless steel	
PH	PPS	Polyphenylen Sulphide	220 °C				