

**AMT** Material Table



Your Strategic Partner in Manufacturing Innovation

# Material Table

Ferrous

Low Alloy Steels					Soft Magnetic Alloy				
Common Designation	Fe-2Ni	Fe-2Ni-0.5C	Fe-2Ni-0.5C-HT	Fe-8Ni	Fe-3Si	Alloy 52	Permendur	Permalloy 80	
Standard		AISI 4605	AISI 4605-HT		Fe-3Si	Fe-50Ni	Fe-50Co-2V		
MPIF Standard / ASTM (B883)	MIM-2200	MIM-4605	MIM-4605-HT	MIM-2700	MIM-Fe-3%Si	MIM-Fe-50%Ni	MIM-Fe-50%Co		
DIN Standard						1.3926			
JIS Standard									
Typical Applications	Structural Strength Applications				Soft Magnetic Properties				
Nominal Composition	%C	0.1 max	0.4 - 0.6	0.4 - 0.6	0.1 max	0.05 max	0.05 max	0.05 max	
	%Mo	0.5 max	0.2 - 0.5	0.2 - 0.5	0.5 max				3.5 - 4.2
	%Si	1.0 max	1.0 max	1.0 max	1.0 max	2.5 - 3.5	1.0 max	1.0 max	
	%Cr								
	%Ni	1.5 - 2.5	1.5 - 2.5	1.5 - 2.5	6.5 - 8.5		49.0 - 51.0		79.0 - 81.0
	%Cu							Co 48.0 - 50.0	
	%Others							V 2.5 max	
	%Fe	Bal	Bal	Bal	Bal	Bal	Bal	Bal	Bal
Mechanical Properties (Typical)									
Ultimate Strength, 1000 psi (MPa)	42 (290)	60 (415)	239 (1650)	60 (415)	77 (530)	66 (455)	30 (205)	79 (545)	
Yield Strength (0.2%), 1000 psi (MPa)	18 (125)	30 (205)	215 (1480)	30 (205)	57 (390)	23 (160)	20 (140)	39 (270)	
Elongation, % [in 1 in (25 mm)]	40	15	2	26	20	30	< 1.0	25	
Hardness	45 HRB	62 HRB	48 HRC	69 HRB	80 HRB	50 HRB	80 HRB	70 HRB	
Density, g/cm <sup>3</sup>	7.6	7.5	7.5	7.6	7.4	7.7	7.7	7.8	
Magnetic Properties (Typical)									
Max permeability, $\mu$ max	2300				6000	27000	5200	77000	
He, Oe (A/m)	1.5 (120)				1.0 (80)	0.2 (16)	1.5 (120)	0.1 (8)	
Br, kG (T)	8 (0.8)				12 (1.2)	10 (1.0)	14 (1.4)	4.8 (0.48)	
B at 1,990 kG (T)	14.5 (1.45)				14.5 (1.45)	14 (1.4)	20 (2)	6.5 (0.65)	
B at 39,780 kG (T)	20 (2)				19 (1.9)	15 (1.5)	22 (2.2)	7 (0.7)	

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Stainless Steels								BASF Catamold			
Common Designation	316L	430L	440C	440C-HT	17-4PH	17-4PH-HT	HK 30	316L	17-4PH	17-4PH-HT	
Standard	AISI 316L	AISI 430L	AISI 440C	AISI 440C-HT	AISI 630	AISI 630-HT	equivalent to AISI 310	AISI 316L	AISI 630	AISI 630	
MPIF Standard / ASTM (B883)	MIM-316L	MIM-430L			MIM-17-4PH	MIM-17-4PH-HT					
DIN Standard	1.4404	1.4016	1.4125	1.4125-HT	1.4542	1.4542-HT		1.4404	1.4542	1.4542	
JIS Standard	SU 316L	SU 430L	SU 440C	SU 440C-HT	SU 630	SU 630-HT		SU 316L	SU 630	SU 630	
Typical Applications				Corrosion Resistance							
Nominal Composition	%C	0.03 max	0.05 max	0.95 - 1.20	0.95 - 1.20	0.07 max	0.07 max	0.4 - 0.5	0.03 max	0.07 max	0.07 max
	%Mo	2.0 - 3.0						0.10 max	2.0 - 3.0		
	%Si	1.0 max	1.0 max	1.0	1.0	1.0 max	1.0 max	1.25 - 1.75	1.0 max	1.0 max	1.0 max
	%Cr	16.0 - 18.0	16.0 - 18.0	16.0 - 18.0	16.0 - 18.0	15.5 - 17.5	15.5 - 17.5	23.0 - 27.0	16.0 - 18.0	15.0 - 17.5	15.0 - 17.5
	%Ni	10.0 - 14.0		0.75	0.75	3.0 - 5.0	3.0 - 5.0	19.0 - 22.0	10.0 - 14.0	3.0 - 5.0	3.0 - 5.0
	%Cu					3.0 - 5.0	3.0 - 5.0			3.0 - 5.0	3.0 - 5.0
	%Others	Mn 2.0 max	Mn 1.5 max			Nb+ Ta 0.15 - 0.45, Mn 1.0 max		Nb 1.2 - 1.5	Mn 2.0 max	Nb+ Ta 0.15 - 0.45, Mn 1.0 max	
	%Fe	Bal	Bal	Bal	Bal	Bal	Bal	Bal	Bal	Bal	Bal
Mechanical Properties (Typical)											
Ultimate Strength, 1000 psi (MPa)	75 (520)	60 (415)	90 (620)	242 (1670)	130 (900)	172 (1185)	95 (650)	74 (510)	138 (950)	160 (1100)	
Yield Strength (0.2%), 1000 psi (MPa)	25 (175)	35 (240)	59 (410)	234 (1615)	106 (730)	158 (1090)	37 (250)	26 (180)	104 (720)	138 (950)	
Elongation, % [in 1 in (25 mm)]	50	25	10	2	8	6	30	50	6	5	
Hardness	67 HRB	65 HRB	90 HRB	50 - 55 HRC	27 HRC	33 HRC	90 HRB	67 HRB	32 HRC	38 HRC	
Density, g/cm <sup>3</sup>	7.6	7.5	7.5	7.5	7.5	7.5	7.5	7.9	7.6	7.6	

# Material Table

## Ferrous

## Non Ferrous

Low Expansion Alloy			Super Alloy				
Common Designation	Kovar	Invar	Inconel 718	Inconel 625	Nimonic 90	F75	
Standard	ASTM F-15					ASTM F75	
MPIF Standard / ASTM (B883)							
DIN Standard							
JIS Standard							
Typical Applications	Metal to Glass Sealing		High Temperature Strength			Biocompatibility	
Nominal Composition	%C	0.05 max	0.1 max		0.1	0.13 max	0.35 max
	%Mo			2.0	8.0 - 10.0		5.0 - 7.0
	%Si	0.3 max	0.5 max		0.5	1.0 max	1.0 max
	%Cr	0.5 max		18.3	20.0 - 23.0	18.0 - 21.0	27.0 - 30.0
	%Ni	29.0 - 30.0	35.5 - 36.5	54.7	58 min	Bal	1.0 max
	%Cu						
	%Others	Co 16.0 - 17.0	Mn 0.5 max	Nb 4.60, Ti 0.83	Nb 3.15 - 4.15, Ti 0.4	Co 15 - 21, Ti 2 - 3, Mn 1 max, Al 1 - 2	Co Bal
	%Fe	Bal	Bal	18.9	5	1.5 max	0.75 max
Mechanical Properties (Typical)							
Ultimate Strength, 1000 psi (MPa)	65 (450)	62 (425)	192 (1330)	120 (850)	160 (1100)	99 (680)	
Yield Strength (0.2%), 1000 psi (MPa)	41 (280)	35 (240)	163 (1130)	65 (450)	102 (705)	80 (550)	
Elongation, % [in 1 in (25 mm)]	30	30	14	40	19	4	
Hardness	60 HRB	65 HRB	40 HRC	190 HRB	28 HRC	25 HRC	
Density, g/cm <sup>3</sup>	7.9	7.7	8.1	8.1	8.1	8.8	
Magnetic Properties (Typical)							
CTE $\mu\text{m/m}$ , 25°C - 400°C	4.6 - 5.2	2.3 - 4.1	13	12.8	13	13.18	
Thermal Conductivity (W/mK, 25°C)	13	10	11.4	9.8	11.5	12.66	

# Material Table

## Non Ferrous

## Ceramic

Conductive Material		Heavy Alloy			Ceramic				
Common Designation	Copper	W-15Cu	90W-Fe-Ni	92W-Fe-Ni	95W-Fe-Ni	Alumina	Zirconia	ZTA	
Standard			90W-Fe-Ni	92W-Fe-Ni	95W-Fe-Ni				
MPIF Standard / ASTM (B883)									
DIN Standard									
JIS Standard									
Typical Applications	Heat Dissipation		High Density / Low Thermal Expansion Coefficient			Wear Resistance / Heat Insulation			
Nominal Composition	%C			0.1 max	0.1 max	0.1 max			
	%Mo								
	%Si								
	%Cr								
	%Ni			7.5 max	5.0 max	3.0 max			
	%Cu	99 min	15.0 max						
	%Others		W 85.0 max	W 90.0	W 92.0	W 95.0	Al <sub>2</sub> O <sub>3</sub>	ZrO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub> , ZrO <sub>2</sub>
	%Fe			4.0 max	5.0 max	3.0 max			
Mechanical Properties (Typical)									
Ultimate Strength, 1000 psi (MPa)	25 (170)	90 (620)	102 (700)	116 (800)	73 (500)	50 (350)*	102 (700)*	(400)*	
Yield Strength (0.2%), 1000 psi (MPa)	9 (62)	77 (530)	58 (400)	73 (500)	44 (300)				
Elongation, % [in 1 in (25 mm)]	25	1	25	20	15	0	0	0	
Hardness	44 HRB	25 HRC	20 HRC	25 HRC	30 HRC	1500 (HV300gf)	1200 (HV300gf)	1600 (HV300gf)	
Density, g/cm <sup>3</sup>	8.7	16.2	17	17.5	17.9	3.9	5.6	4.1	
Magnetic Properties (Typical)									
CTE μm/m, 25°C - 400°C	16.5	7	4.8	4.6	4.6				
Thermal Conductivity (W/mK, 25°C)	320	180	18	20	26				

- Actual property values depend on product specifications, including density, microstructure, purity, and processing, which in turn vary with specific components.
- Materials are not restricted to those mentioned above. Please contact us for more details.

- HT denotes heat treatment
- \* Rupture strength (MPa)



## Design Handbook

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