

Metal Plates Property Table

Metal Plate Materials

Property Comparison of Metal Plate Materials

*Data below are not guaranteed values but standard values.

Type	Material Code	Heat Treatment (°C)	Representative Values of Mechanical Properties				Representative Values of Physical Properties			
			Tensile Strength (N/mm ²)	Proof Stress (N/mm ²)	Elongation	Hardness	Specific Gravity (at 20°C) (g/cm ³)	Conductivity (20°C) IACS	Thermal Conductivity (at 20°C)(CGS)	Linear Expansion Coefficient (20-100°C) (x10 ⁻⁶ /°C)
Structural Steel	1018 Carbon Steel	-	400-510	215 or More	21% or More	-	7.87	-	-	11.7
Carbon Steel	1049 Carbon Steel	Normalized 810-860 Air-cooled	610 or More	365 or More	18% or More	179-235HB	7.87	-	-	11.7
		Annealed Approx. 800 Furnace-cooled	-	-	-	143-187HB				
	1055 Carbon Steel (Normalized)	Hardened 810-860 Water-cooled	740 or More	540 or More	15% or More	212-277HB	7.87	-	-	11.7
		Tempered 550-650 Quenched	700 or More	370 or More	25% or More	210HB				
Special Steel	SKS93 Tool Steel (JIS)	Hardened 820 Oil-cooled	-	-	-	63HRC or More	7.87	-	-	11.7
		Tempered 180 Air-cooled	-	-	-	58-63HRC				
	O1 Tool Steel	Hardened 800-850 Oil-cooled	-	-	-	58-63HRC	7.85	-	0.083	12.2
		Tempered 150-200 Air-cooled	-	-	-	58-63HRC				
	D2 Tool Steel	Hardened 1000-1050 Air-cooled	-	-	-	58-63HRC	7.8	-	0.07	12
		Tempered 150-200 Air-cooled	-	-	-	56-63HRC				
	DC53 Die Steel	Hardened 1020-1040 Air-cooled	-	-	-	56-63HRC	7.87	-	0.057	12.2
		Tempered 180-200 Air-cooled	-	-	-	56-63HRC				
	4140 Alloy Steel	Normalized 850-1050 Air-cooled	980 or More	835 or More	12% or More	285-352HB	7.85	-	-	-
		Annealed 830-880 Furnace-cooled	-	-	-	255HB or Less				
M2 Tool Steel	Hardened 830-880 Oil-cooled	-	-	-	63HRC or More	8.16	-	-	11.9	
	Annealed 800-880 Slow-cooled	-	-	-	63HRC or More					
Stainless Steel	303 Stainless Steel	Solution Treatment Heat Treatment 1010-1150 Quenched	520 or More	205 or More	40% or More	187HB or Less	7.93	-	0.039	17.3
	304 Stainless Steel	Solution Treatment Heat Treatment 1010-1150 Quenched	520 or More	205 or More	40% or More	187HB or Less	7.93	-	0.039	17.3
	316 Stainless Steel	Solution Treatment Heat Treatment 1010-1150 Quenched	520 or More	205 or More	40% or More	187HB or Less	7.98	-	0.039	15.9
	316L Stainless Steel	Solution Treatment Heat Treatment 1010-1150 Quenched	481 or More	177 or More	40% or More	187HB or Less	7.98	-	0.039	15.9
	430 Stainless Steel	Annealed 780-850 Air-cooled	450 or More	205 or More	22% or More	183HB or More	7.7	-	0.063	10.4
	440C Stainless Steel	Hardened 1010-1070 Oil-cooled	-	-	-	58HRC or More	7.7	-	0.058	10.2
Pre-Hardened Steel	G-STAR	-	1060	855	16%	33-37HRC	7.78	-	0.06	10.3
	PX5	-	990	880	20%	30-33HRC	7.85	-	0.101	12.7
Aluminum Alloy	NAK55 Pre-Hardened Tool Steel (JIS)	-	1255	981	15%	37-43HRC	7.8	-	0.093	12.5
	5052-H112 Aluminum Alloy	-	225	125	18%	65HB	2.68	35%	0.33	23.8
	5052-H112 Aluminum Alloy (Precision Rolled Type)	-	215	120	21%	58HB	2.68	35%	0.33	23.8
	6061 Aluminum Alloy-T651	-	309	274	12%	95HB	2.7	43%	0.52	23.6
	2017-T351 Aluminum Alloy	-	390	250	13%	105HB	2.79	34%	0.32	23.6
	ANP79 Aluminum Alloy (JIS-T651)	-	560	500	12%	165HB	2.77	32%	0.31	22.1
Rolled Copper	7075-T651 Aluminum Alloy	-	550	490	12%	160HB	2.8	33%	0.31	23.6
	Tough Pitch Copper C1100P	-	215-275	49-343	25% or More	87HB or Less	8.89	97% or More	0.93	16.8
	Oxygen Free Copper C1020P	-	245-315	49-343	15% or More	112HB or Less	8.89	97% or More	0.93	16.8
	Chromium Copper Z3234	-	380 or More	-	15% or More	125HB	8.89	70% or More	0.8	-
	Brass Board C28000 Brass	-	355-440	-	25% or More	-	8.43	-	-	-
Pure Titanium Class 2	TP340H Titanium (JIS)	Annealed	340-510	215 or More	23% or More	-	4.51	3-4%	0.04	8.4

Property Comparison of Aluminum Alloy

CGS: Cal/°C-cm-sec

Type	Material Code	Part Number	Corrosion Resistance	Weldability (Argon)	Machinability	Solderability	Anodize Finish
Al-Mg Alloy	5052-H112 Aluminum Alloy	ALN-PN	Good	Good	Average	Average	Good
	5052-H112 Aluminum Alloy (Precision Rolled Type)	ALA-PH	Good	Good	Average	Average	Good
Al-Mg-Si Alloy	6061 Aluminum Alloy-T6	A6061	Average	Good	Average	Good	Good
Al-Cu Alloy (Duralmin)	2017-T351 Aluminum Alloy	ALD-ALJ PD	Inferior	Not for Practical Use	Good	Inferior	Inferior
Al-Zn-Mg Alloy (Ultra super Duralmin)	ANP79 Aluminum Alloy (JIS)-T651	P79	Inferior	Inferior	Very Good	Inferior	Inferior
	7075-T651 Aluminum Alloy	ALP-PP	Inferior	Not for Practical Use	Good	Inferior	Inferior

High Precision Plates, ALA_ / ANP79 Aluminum Alloy (JIS) Plates, P79_ are internal stress relieved during cold rolling process. Since residual stress is little, machining distortion will smaller compared to general 5052 Aluminum Alloy / 7075 Aluminum Alloy materials.

Characteristics Comparison of Metal Plate Materials

Structural Steel	1018 Carbon Steel	The most general steel grade. Widely used as it has strength and high machinability and is low price.		
	1018 Carbon Steel (Annealed)	1018 Carbon Steel is annealed to relieve its internal stress. It is effective for prevention of warp by machining.		
Carbon Steel	1049 Carbon Steel	Carbon steel with adequate level of toughness and durability.		
	1055 Carbon Steel (Normalized)	Normalized 1055 Carbon Steel, which relieves its internal stress. Added free-cutting elements enhance its machinability. It has higher mechanical strength than S50.		
Chrome Molybdenum Steel	4140 Alloy Steel	A chrome steel with a small amount of molybdenum. Increased temper softening resistance and higher toughness.		
Special Steel	SKS93 Tool Steel (JIS)	Carbon steel for oil hardening which excels in toughness and abrasion resistance.		
	O1 Tool Steel	It has good machinability as spheroidizing annealing is applied. Has higher hardenability and less heat-treating distortion than SKS93 Tool Steel (JIS).		
	D2 Tool Steel	Can be air or vacuum hardened due to its high hardenability. Very little heat treat distortion and has high abrasion resistance.		
	DC53 Die Steel	Tougher than D2 Tool Steel. Good in milling and grinding. Strength equal to D2 Tool Steel is obtained by low-temperature annealing; strength equal to 62HRC is obtained by high-temperature annealing.		
	M2 Tool Steel	Excels in toughness and abrasion resistance. Very little heat-treatment distortion.		
Stainless Steel	Austenite	303 Stainless Steel	Has better machinability than 304 Stainless Steel. However, corrosion resistance is somewhat inferior. No magnetic permeability.	
		304 Stainless Steel	The most general stainless steel. Excels in corrosion resistance and is widely used. No magnetic permeability.	
		303 Stainless Steel Annealed Material	303 Stainless Steel is treated with stress-relief heat-treatment to relieve internal stress. It is effective for prevention of warp by machining. Has somewhat inferior corrosion resistance compared to 303 Stainless Steel. No magnetic permeability.	
		304 Stainless Steel (Annealed)	304 Stainless Steel is treated with stress-relief heat-treatment to relieve internal stress. It is effective for prevention of warp by machining. Has somewhat inferior corrosion resistance compared to 304 Stainless Steel. No magnetic permeability.	
		316 Stainless Steel	304 Stainless Steel to which Molybdenum is added. Superior in corrosion resistance and acid resistance to 304 Stainless Steel. No magnetic permeability.	
	Ferrite	316L Stainless Steel	316 Stainless Steel ultra-low carbon stainless steel categorized within austenitic stainless steel.	
		430 Stainless Steel	A stainless steel with excellent corrosion resistance. Recommended as a counter measure for bows when milling. Its tempering hardenability is low. Magnetically permeable.	
		Martensite	440C Stainless Steel	Has high strength and hardness because of the heat treatment applied. Has high abrasion resistance and is hardest in stainless steel. Magnetically permeable.
			G-STAR	Has corrosion resistance and excels in machinability. Has high hardness because of the heat treatment applied. (1030°C Hardened Hardness 48HRC)
		Pre-Hardened Steel	SCM	PX5
Precipitation Hardened	NAK55 Pre-Hardened Tool Steel (JIS)		Excels extremely in machinability. Smooth machined surfaces facilitate grinding machining afterward.	
Aluminum Alloy	A5000	5052 Aluminum Alloy	The most general aluminum alloy. Excels in corrosion resistance and weldability.	
	A2000 (Duralmin)	2017 Aluminum Alloy	Though it inferior in corrosion resistance and weldability, it has high strength and forging is possible.	
	A6000	6061 Aluminum Alloy	Heat-treatable alloy, excelling in strength and corrosion resistance.	
	A7000 (Ultra super Duralmin)	ANP79 Aluminum Alloy (JIS)	Compared with Iron 15C, it is harder and its machinability is at least 10 times higher. Compared with 7075 material, it has about the same hardness, higher uniformity and lower internal stress.	
		7075 Aluminum Alloy	Has the highest strength in aluminum alloy. Extremely strong and be widely used for aircrafts or mechanical parts.	
Rolled Copper	Tough Pitch Copper	C1100P	The most widely used copper, and excellent in electrical and thermal conductivity.	
	Oxygen Free Copper	C1020P	Highest purity copper commercially available. The oxygen free nature prevents hydrogen embrittlement.	
	Chromium Copper	Z3234	Excellent in mechanical strength and abrasion resistance at high temperature.	
	Brass Board	C28000 Brass	Excellent in strength and ductile.	
Pure Titanium Class 2	TP340H Titanium (JIS)	Most common titanium material categorized into Pure Titanium Class 2, and well-balanced in machinability and strength. Light weight (Specific gravity 4.51) and excellent corrosion resistance.		