

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	EN 1.0038 Equiv.	-	400~510	215 or More	21% or More	-	7.87	-	-	11.7		
Carbon Steel	EN 1.1206 Equiv.	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						
		Hardened 810 ~ 860 Water-cooled	740 or More	540 or More	15% or More	212~277HB						
		Tempered 550 ~ 650 Quenched	-	-	-	-						
EN 1.1203 (normalized) Equiv.	EN 1.1203 (normalized) Equiv.	Normalized (At the Time of Delivery)	700 or More	370 or More	25% or More	210HB	7.87	-	-	11.7		
		Hardened 850 Oil-cooled	810 or More	540 or More	25% or More	250HB						
		Tempered 600 Air-cooled	-	-	-	-						
		Hardened 820 Oil-cooled	-	-	-	63HRC or More						
Special Steel	JIS-SKS93	Tempered 180 Air-cooled	-	-	-	63HRC or More	7.87	-	-	11.7		
		Hardened 800 ~ 850 Oil-cooled	-	-	-	58~63HRC	7.85	-	0.083	12.2		
	EN 1.2510 Equiv.	EN 1.2510 Equiv.	Tempered 150 ~ 200 Air-cooled	-	-	-	58~63HRC	7.85	-	0.083	12.2	
			Hardened 1000 ~ 1050 Air-cooled	-	-	-	58~63HRC	7.8	-	0.07	12	
	EN 1.2379 Equiv.	EN 1.2379 Equiv.	Tempered 150 ~ 200 Air-cooled	-	-	-	56~63HRC	7.87	-	0.057	12.2	
			Hardened 1020 ~ 1040 Air-cooled	-	-	-	56~63HRC	7.87	-	0.057	12.2	
	DC 53 @ (Daido)	DC 53 @ (Daido)	Tempered 180 ~ 200 Air-cooled	-	-	-	56~63HRC	7.87	-	0.057	12.2	
			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	8.16	-	-	11.9	
			Hardened 830 ~ 880 Oil-cooled	-	-	-	63HRC or More					
EN 1.7220 Equiv.	EN 1.7220 Equiv.	Annealed 800 ~ 880 Slow-cooled	-	-	-	255HB or Less	8.16	-	-	11.9		
		Hardened 1220 ~ 1240 Oil (Hot Bath)	-	-	-	63HRC or More						
		Tempered 550 ~ 570 Air-cooled	-	-	-	-						
		Normalized 850 ~ 1050 Air-cooled	980 or More	835 or More	12% or More	285~352HB						
EN 1.3343 Equiv.	EN 1.3343 Equiv.	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	8.16	-	-	11.9		
		Hardened 830 ~ 880 Oil-cooled	-	-	-	63HRC or More						
		Tempered 550 ~ 570 Air-cooled	-	-	-	-						
		EN 1.4305 Equiv.	EN 1.4305 Equiv.	Solution Treatment 1010 ~ 1150 Quenched	520 or More	205 or More	40% or More	187HB or Less	7.93	-	0.039	17.3
				Heat Treatment	520 or More	205 or More	40% or More	187HB or Less	7.93	-	0.039	17.3
				Solution Treatment 1010 ~ 1150 Quenched	520 or More	205 or More	40% or More	187HB or Less	7.98	-	0.039	15.9
				Heat Treatment	520 or More	205 or More	40% or More	187HB or Less	7.98	-	0.039	15.9
				Solution Treatment 1010 ~ 1150 Quenched	481 or More	177 or More	40% or More	187HB or Less	7.98	-	0.039	15.9
				Heat Treatment	481 or More	177 or More	40% or More	187HB or Less	7.98	-	0.039	15.9
EN 1.4016 Equiv.	EN 1.4016 Equiv.	Annealed 780 ~ 850 Air-cooled	450 or More	205 or More	22% or More	183HB or More	7.7	-	0.063	10.4		
		Hardened 1010 ~ 1070 Oil-cooled	-	-	-	58HRC or More	7.7	-	0.058	10.2		
EN 1.4125 Equiv.	EN 1.4125 Equiv.	Tempered 100 ~ 180 Air-cooled	-	-	-	58HRC or More	7.7	-	0.058	10.2		
		Normalized 850 ~ 1050 Air-cooled	980 or More	835 or More	12% or More	285~352HB	7.85	-	-	-		
Pre-Hardened Steel	Pre-Hardened Steel	G-Star® (Daido)	1060	855	16%	33~37HRC	7.78	-	0.06	10.3		
		PX5® (Daido)	990	880	20%	30~33HRC	7.85	-	0.101	12.7		
		NAK55® (Daido)	1255	981	15%	37~43HRC	7.8	-	0.093	12.5		
Aluminum Alloy	Aluminum Alloy	EN AW-5052-H112 Equiv.	225	125	18%	65HB	2.68	35%	0.33	23.8		
		EN AW-5052-H112 Equiv. (Precision Rolled Type)	215	120	21%	58HB	2.68	35%	0.33	23.8		
		A6061P-T651	309	274	12%	95HB	2.7	43%	0.52	23.6		
		EN AW-2017-T351 Equiv.	390	250	13%	105HB	2.79	34%	0.32	23.6		
Rolled Copper	Rolled Copper	ANP79-T651	560	500	12%	165HB	2.77	32%	0.31	22.1		
		EN AW-7075-T651 Equiv.	550	490	12%	160HB	2.8	33%	0.31	23.6		
		Tough Pitch Copper EN CW004A Equiv.	215~275	49~343	25% or More	87HB or Less	8.89	97% or More	0.93	16.8		
		Oxygen Free Copper EN CW008A Equiv.	245~315	49~343	15% or More	112HB or Less	8.89	97% or More	0.93	16.8		
Pure Titanium Class 2	Pure Titanium Class 2	Chromium Copper Z3234	380 or More	-	15% or More	125HB	8.89	70% or More	0.8	-		
		Brass Board EN CW505L Equiv.	355~440	-	25% or More	-	8.43	-	-	-		
		EN 3.7035 Equiv.	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	EN AW-5052-H112 Equiv.	ALN□ PN□□□□	Good	Good	Average	Average	Good
	EN AW-5052-H112 Equiv. (Precision Rolled Type)	ALA□ PH□□□□	Good	Good	Average	Average	Good
Al-Mg-Si Alloy	A6061P-T6	A6061□□□□	Average	Good	Average	Good	Good
	A6061P-T651	A6061□□□□	Average	Good	Average	Good	Good
Al-Cu Alloy (Duralmin)	EN AW-2017-T351 Equiv.	ALD□ ALJ PD□□□□	Inferior	Not for Practical Use	Good	Inferior	Inferior
Al-Zn-Mg Alloy (Ultra super Duralmin)	ANP79-T651	P79□□□□	Inferior	Inferior	Very Good	Inferior	Inferior
	EN AW-7075-T651 Equiv.	ALP□ PP□□□□	Inferior	Not for Practical Use	Good	Inferior	Inferior

High Precision Plates, ALA□ / ANP79 (AlZnMgCu-Alloy) Plates and P79□□□□ are internal stress relieved during cold rolling process. Since residual stress is little, machining distortion will smaller compared to general EN AW-5052 Equiv. / EN AW-7075 Equiv. materials.

Characteristics Comparison of Metal Plate Materials

Structural Steel	EN 1.0038 Equiv.	The most general steel grade. Widely used as it has strength and high machinability and is low price.	
	EN 1.0038 Equiv. Annealed Material	EN 1.0038 Equiv. is annealed to relieve its internal stress. It is effective for prevention of warp by machining.	
Carbon Steel	EN 1.1206 Equiv.	Carbon steel with adequate level of toughness and durability	
	EN 1.1203 (normalized) Equiv.	Normalized EN 1.1203 Equiv., which relieves its internal stress. Added free-cutting elements enhance its machinability. It has higher mechanical strength than S50.	
Chrome Molybdenum Steel	EN 1.7220 Equiv.	A chrome steel with a small amount of molybdenum. Increased temper softening resistance and higher toughness.	
Special Steel	JIS-SKS93	Carbon steel for oil hardening which excels in toughness and abrasion resistance.	
	EN 1.2510 Equiv.	It has good machinability as spheroidizing annealing is applied. Has higher hardenability and less heat-treating distortion than JIS-SKS93.	
	EN 1.2379 Equiv.	Can be air or vacuum hardened due to its high hardenability. Very little heat treat distortion and has high abrasion resistance.	
	DC 53 @ (Daido)	Tougher than EN 1.2379 Equiv. Good machinability and grindability. Hardness equal to EN 1.2379 Equiv. is obtained by low-temperature tempering, and hardness equal to 62HRC is obtained by high-temperature tempering.	
	EN 1.3343 Equiv.	Excels in toughness and abrasion resistance. Very little heat-treatment distortion.	
Stainless Steel	Austenite	EN 1.4305 Equiv.	Has better machinability than EN 1.4301 Equiv. However, corrosion resistance is somewhat inferior. No magnetic permeability.
		EN 1.4301 Equiv.	The most general stainless steel. Excels in corrosion resistance and is widely used. No magnetic permeability.
		EN 1.4305 Equiv. Annealed Material	EN 1.4305 Equiv. 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 EN 1.4305 Equiv. No magnetic permeability.
		EN 1.4301 Equiv. Annealed Material	EN 1.4301 Equiv. 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 EN 1.4301 Equiv. No magnetic permeability.
		EN 1.4401 Equiv.	EN 1.4301 Equiv. to which Molybdenum is added. Superior in corrosion resistance and acid resistance to EN 1.4301 Equiv. No magnetic permeability.
	Ferrite	EN 1.4404 Equiv.	EN 1.4401 Equiv. ultra-low carbon stainless steel categorized within austenitic stainless steel. Suitable for the operations requiring corrosion resistance or good weldability.
		EN 1.4016 Equiv.	A stainless steel with excellent corrosion resistance. It is effective for prevention of warp by machining. Its tempering hardenability is low. Magnetically permeable.
		EN 1.4125 Equiv.	Has high strength and hardness because of the heat treatment applied. Has high abrasion resistance and is hardest in stainless steel. Magnetically permeable.
		EN 1.4305 Equiv.	Has corrosion resistance and excels in machinability. Has high hardness because of the heat treatment applied. (1030°C Hardening Hardness 48HRC)
		EN 1.4301 Equiv.	Excels in machinability and has toughness. Good weldability.
Martensite	EN 1.4016 Equiv.	Excels extremely in machinability. Smooth machined surfaces facilitate grinding machining afterward.	
	EN 1.4125 Equiv.	Excels extremely in machinability. Smooth machined surfaces facilitate grinding machining afterward.	
Pre-Hardened Steel	Martensite Free-Cutting Stainless Steel	G-Star® (Daido)	Has corrosion resistance and excels in machinability. Has high hardness because of the heat treatment applied. (1030°C Hardening Hardness 48HRC)
	SCM	PX5® (Daido)	Excels in machinability and has toughness. Good weldability.
	Precipitation Hardening	NAK55® (Daido)	Excels extremely in machinability. Smooth machined surfaces facilitate grinding machining afterward.
Aluminum Alloy	A5000	EN AW-5052 Equiv.	The most general aluminum alloy. Excels in corrosion resistance and weldability.
	A2000 (Duralmin)	EN AW-2017 Equiv.	Though it inferior in corrosion resistance and weldability, it has high strength and forging is possible.
	A6000	EN AW-6061 Equiv.	Heat-treatable alloy, excelling in strength and corrosion resistance.
	A7000 (Ultra super Duralmin)	ANP79 (AlZnMgCu-Alloy)	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.
		EN AW-7075 Equiv.	Has the highest strength in aluminum alloy. Extremely strong and be widely used for aircrafts or mechanical parts.
Rolled Copper	Tough Pitch Copper	EN CW004A Equiv.	The most widely used copper, and excellent in electrical and thermal conductivity.
	Oxygen Free Copper	EN CW008A Equiv.	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	EN CW505L Equiv.	Excellent in strength and ductile.
Pure Titanium Class 2	EN 3.7035 Equiv.	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.	