TITANIUM INDUSTRIES

Specialty metals supply solutions

ALLOY DATASHEET GUIDEBOOK

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2018

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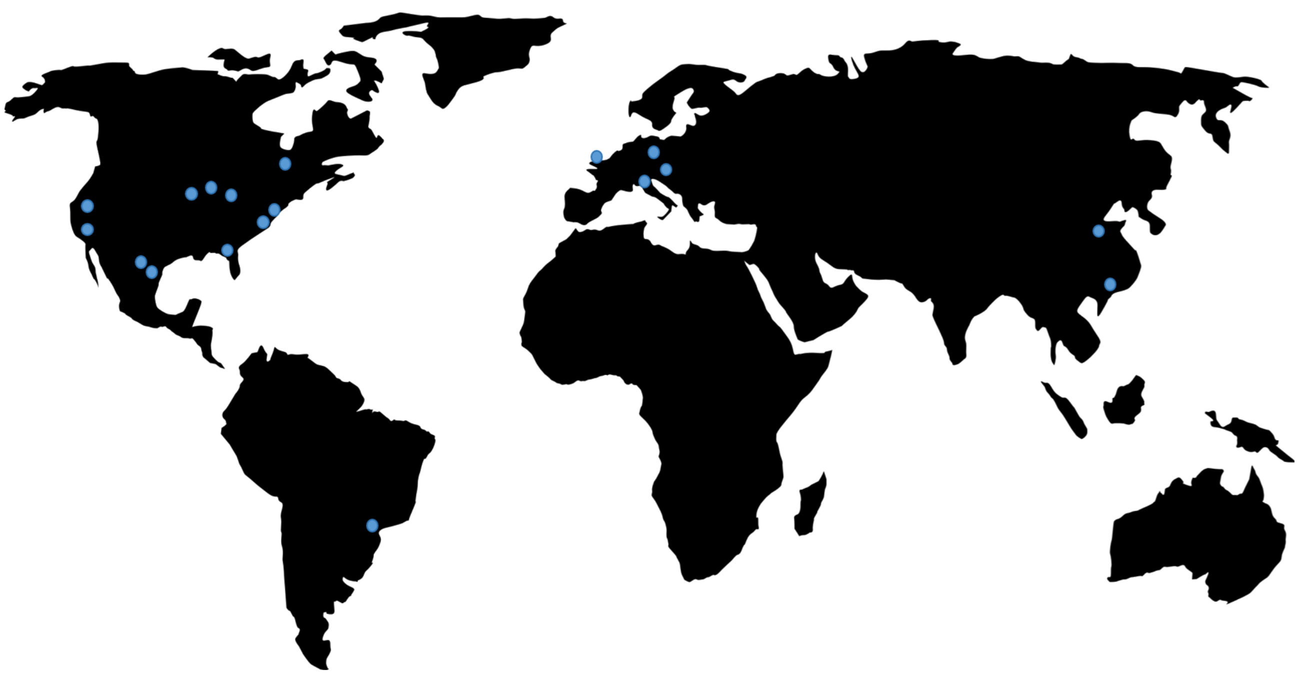

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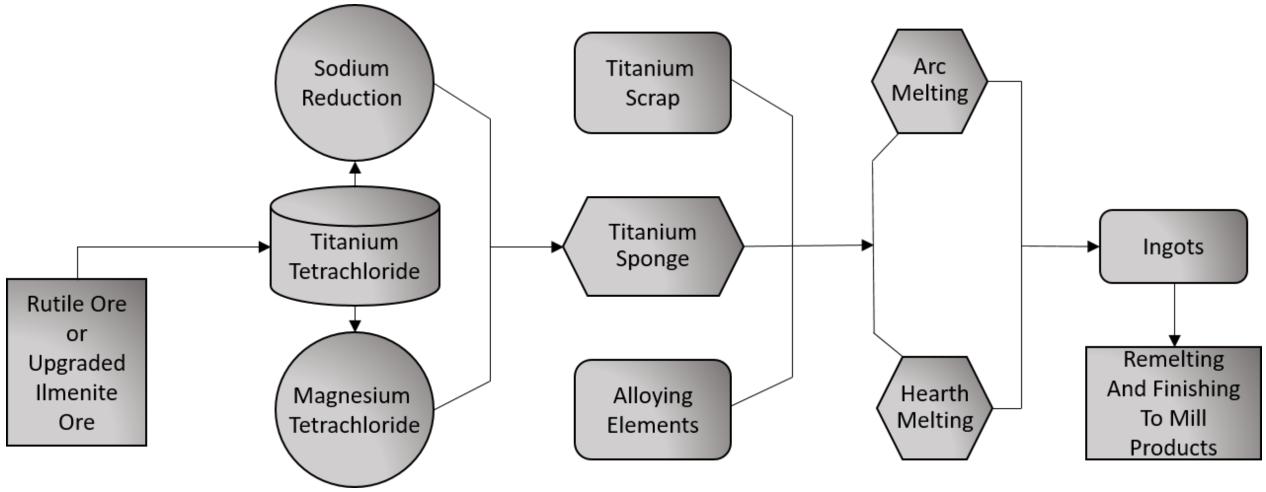
TITANIUM & TITANIUM ALLOYS

Metallic titanium was first isolated in impure form in 1887 and with a higher purity in 1915 however, it was not until the 1950's that it began to come into use as a structural material. This was initially stimulated by aircraft applications. Although the aerospace industry still provides the major market, titanium and titanium alloys are finding increasingly widespread use in other industries due to their many desirable properties. Notable among these are their low densities, which fall between those of aluminum and iron and give very attractive strength to weight ratios. In addition, titanium and titanium alloys readily form stable protective surface layers which give them excellent corrosion resistance in many environments, including oxidizing acids and chlorides, and good elevated temperature properties up to about 440 degrees C (1022 degrees F) in some cases.

Titanium metal is abundant in the earth's crust and is extracted commercially from the ore minerals rutile (titanium dioxide) and ilmenite (iron-titanium oxide). The commercial extraction process involves treatment of the ore with chlorine gas to produce titanium tetra chloride, which is purified and reduced to a metallic titanium sponge by reaction with magnesium or sodium. The sponge, blended with alloying elements (and reclaimed scrap) as desired, is then vacuum melted. Several meltings may be necessary to achieve a homogeneous ingot which is ready for processing into useful shapes, typically by forging followed by rolling. For many applications the cost of titanium alloys can be justified on the basis of desirable properties.

TITANIUM PRODUCTION

Titanium, the fourth most abundant metallic element in the earth's crust, occurs chiefly as an oxide ore. The commercially important forms are rutile (titanium oxide) and ilmenite (titanium-iron oxide) the former being richest in titanium content. Titanium is produced in the following manner.



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100A CP

Titanium

Trade Name: Unknown

Trade References

UNS:	-	EU:	-

Chemical Composition

Ti 100%	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.163	Melting Point (°F)	-
Thermal conductivity (BTU-in/hr-ft^2-°F)	-	Specific heat (BTU/lb-°F)	-
Thermal expansion (1/°F)	-	Electrical conductivity (% IACS)	-

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	Unknown	-
Tensile Strength Range (R_m) (ksi)	Unknown	-
Elongation (AL=5 x Ø)	Unknown	-
Brinell Hardness (H)	Unknown	-

Modulus of Elasticity (ksi) (E)	16300	Machineability General Index	Unknown

Applicable Specifications

AMS

Unknown	-	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

Unknown	-	-	-	-
-	-	-	-	-
-	-	-	-	-





Technical Alloy Data Sheet

Ti 10V-2Fe-3Al

Titanium

Trade Name: Unknown

Trade References	
UNS: -	EU: -

Chemical Composition

Ti 84.8%	V 10%	Al 3%	Fe 1.9%	O <=0.13%
C <=0.050%	N <=0.050%	H <=0.015%	Other <=0.30%	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.168	Melting Point (°F)	2990
Thermal conductivity (BTU-in/hr-ft^2-°F)	54	Specific heat (BTU/lb-°F)	0.125
Thermal expansion (1/°F)	0.00000539	Electrical conductivity (% IACS)	1.15

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	131	174
Tensile Strength Range (R_m) (ksi)	140	191.5
Elongation (AL=5 x Ø)	8.0%	10.0%
Brinell Hardness (H)	304	381

Modulus of Elasticity (ksi) (E)	15500	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-4983	AMS-4984	AMS-4986	AMS-4987	-
-	-	-	-	-
-	-	-	-	-

ASTM

Unknown	-	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

TI 3Al-2.5V

Titanium

Trade Name: TI 3Al-2.5V

Trade References

UNS:	R56320	EU:	EN 3.7195

Chemical Composition

Ti 94.13%	Al 3.0%	V 2.5%	Fe <=0.20%	O <=0.15%
C <=0.050%	N <=0.030%	H <=0.015%	Other <=0.30	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.162	Melting Point (°F)	3090
Thermal conductivity ($BTU\text{-}in/hr\text{-}ft^2\text{-}°F$)	58	Specific heat (BTU/lb-°F)	0.125
Thermal expansion (1/°F)	0.00000534	Electrical conductivity (% IACS)	1.36

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	72.5	105
Tensile Strength Range (R_m) (ksi)	75	140
Elongation (AL=5 x Ø)	8.0%	16.0%
Brinell Hardness (H)	-	256

Modulus of Elasticity (ksi) (E)	14500	Machineability General Index	40%

Applicable Specifications

AMS

AMS-4943	AMS-4944	AMS-4945	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-337	ASTM-B-338	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

TI 6Al-4V

Titanium

Trade Name: Titanium Grade 5

Trade References

UNS:	R56400	EU:	EN 3.7165

Chemical Composition

Al 6.125%	V 4.00%	C <=0.8%	N<=0.05%	O <=0.20%
H <=0.0125%	Fe <=0.30%	Y <=0.005%	Other 0.40%	Ti remainder
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.16	Melting Point (°F)	2920
Thermal conductivity (BTU-in/hr-ft^2-°F)	47	Specific heat (BTU/lb-°F)	0.1258
Thermal expansion (1/°F)	0.00000478	Electrical conductivity (% IACS)	0.97

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	120	160
Tensile Strength Range (R_m) (ksi)	125	174
Elongation (AL=5 x Ø)	10.0%	18.0%
Brinell Hardness (H)	326	379

Modulus of Elasticity (ksi) (E)	16500	Machineability General Index	21%

Applicable Specifications

AMS

AMS-4928	AMS-4930	AMS-4965	AMS-4967	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-T-9047	ASTM-F-367	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

Ti Gr 2 CP 40

Titanium

Trade Name: Unknown

Trade References

UNS:	R50400	EU:	EN 3.7035

Chemical Composition

C <=0.10%	H <=0.015%	Fe <=0.30%	N <=0.030%	O <=0.25%
Ti 99.2%	Other <=0.30%	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.163	Melting Point (°F)	3030
Thermal conductivity (BTU-in/hr-ft^2-°F)	114	Specific heat (BTU/lb-°F)	0.125
Thermal expansion (1/°F)	0.00000478	Electrical conductivity (% IACS)	3.32

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	40	
Tensile Strength Range (R_m) (ksi)	50	
Elongation (AL=5 x Ø)	20.0%	37.0%
Brinell Hardness (H)	150	200

Modulus of Elasticity (ksi) (E)	15200	Machineability General Index	40%

Applicable Specifications

AMS

AMS-4902	AMS-4941	AMS-4942	AMS 4951	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-265	ASTM-B-337	ASTM-B-348	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

Ti Gr 4

Titanium

Trade Name: Titanium Grade 4 CP 1

Trade References			
UNS:	R50700	EU:	EN 3.7065

Chemical Composition				
C <=0.10%	H <=0.015%	Fe <=0.50%	N <=0.050%	O <=0.40%
Ti 98.635%	Other <=0.30%	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.163	Melting Point (°F)	3020
Thermal conductivity (BTU-in/hr-ft^2-°F)	119	Specific heat (BTU/lb-°F)	0.127
Thermal expansion (1/°F)	0.00000478	Electrical conductivity (% IACS)	2.87

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	70	
Tensile Strength Range (R_m) (ksi)	80	
Elongation (AL=5 x Ø)	15.0%	29.0%
Brinell Hardness (H)	200	265

Modulus of Elasticity (ksi) (E)	15200	Machineability General Index	40%

Applicable Specifications

AMS

AMS-4901	AMS-4921	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-265	ASTM-B-337	ASTM-B-348	-	-
-	-	-	-	-
-	-	-	-	-





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Ti Gr 4 CP 70

Titanium

Trade Name: Unknown

Trade References

UNS:	R50700	EU:	EN 3.7065

Chemical Composition

C <=0.08%	N <=0.05%	Fe <=0.50%	O <=0.40%	H <=0.0125%
Other 0.30%	Ti balance	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.163	Melting Point (°F)	3020
Thermal conductivity (BTU-in/hr-ft^2-°F)	119	Specific heat (BTU/lb-°F)	0.129
Thermal expansion (1/°F)	0.00000480	Electrical conductivity (% IACS)	2.87

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	16	70
Tensile Strength Range (R_m) (ksi)	27	80
Elongation (AL=5 x Ø)	15.0%	29.0%
Brinell Hardness (H)	Unknown	-

Modulus of Elasticity (ksi) (E)	15100	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-4901	AMS-4921	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-381	ASTM-B-265	ASTM-B-348	ASTM-B-367	-
-	-	-	-	-
-	-	-	-	-





Technical Alloy Data Sheet

Ti Gr 1 CP

Titanium

Trade Name: Titanium Grade 1 CP 4

Trade References			
UNS:	R50250	EU:	EN 3.7025

Chemical Composition				
C <=0.08%	H <=0.015%	Fe <=0.2%	N <=0.03%	O 0.18%
Ti balance	-	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.163	Melting Point (°F)	3040
Thermal conductivity ($BTU\text{-}in/hr\text{-}ft^2\text{-}°F$)	111	Specific heat (BTU/lb-°F)	0.124
Thermal expansion (1/°F)	0.00000478	Electrical conductivity (% IACS)	4.11

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	25	
Tensile Strength Range (R_m) (ksi)	35	
Elongation (AL=5 x Ø)	24.0%	29.0%
Brinell Hardness (H)	-	120

Modulus of Elasticity (ksi) (E)	15200	Machineability General Index	40%

Applicable Specifications

AMS

AMS-4940	-	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-265	ASTM-B-337	ASTM-B-348	-	-
-	-	-	-	-
-	-	-	-	-





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Ti Gr 3

Titanium

Trade Name: Titanium Grade 3 CP 2

Trade References

UNS:	R50550	EU:	EN 3.7055

Chemical Composition

C <=0.10%	H <=0.015%	Fe <=0.30%	N <=0.050%	O <=0.35%
Ti 98.885%	Other <=0.30%	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.163	Melting Point (°F)	3020
Thermal conductivity (BTU-in/hr-ft^2-°F)	138	Specific heat (BTU/lb-°F)	0.125
Thermal expansion (1/°F)	0.00000478	Electrical conductivity (% IACS)	3.19

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range (Rp$_{0.2\ Offset}$) (ksi)	55	
Tensile Strength Range (R$_m$) (ksi)	65	
Elongation (AL=5 x Ø)	18.0%	35.0%
Brinell Hardness (H)	225	266

Modulus of Elasticity (ksi) (E)	15200	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-4900	AMS-4902	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-265	ASTM-B-337	ASTM-B-348	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

600

Nickel

Trade Name: Special Metals INCONEL® Alloy 600

Trade References

UNS:	N06600	EU:	EN 10095

Chemical Composition

Cr 15.5%	Fe 8%	Mn <=1%	Cu <=0.5%	Si <=0.5%
C <=0.15%	S <=0.015%	Ni remainder	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.306	Melting Point (°F)	2470
Thermal conductivity (BTU-in/hr-ft^2-°F)	103	Specific heat (BTU/lb-°F)	0.106
Thermal expansion (1/°F)	0.00000739	Electrical conductivity (% IACS)	1.67

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	26.1	45
Tensile Strength Range (R_m) (ksi)	79.8	135
Elongation (AL=5 x Ø)	40.0%	45.0%
Brinell Hardness (H)	120	290

Modulus of Elasticity (ksi) (E)	30000	Machineability General Index	22%

Applicable Specifications

AMS

AMS-5540	AMS-5665	AMS-5580	AMS-5587	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-166	ASTM-B-167	ASTM-B-168	ASTM-B-366	ASTM-B-564
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

625

Nickel

Trade Name: Special Metals INCONEL® Alloy 625

Trade References			
UNS:	N06250	EU:	EN 2.4816

Chemical Composition				
C <=0.10%	Cr 21.5%	Co <=1.0%	Fe <=3.0%	Mo 9.0%
Ni 65.05%	Nb 3.65%	Ti <=0.50%	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.305	Melting Point (°F)	2295
Thermal conductivity (BTU-in/hr-ft^2-°F)	68	Specific heat (BTU/lb-°F)	0.098
Thermal expansion (1/°F)	0.00000711	Electrical conductivity (% IACS)	1.34

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	42.1	66.7
Tensile Strength Range (R_m) (ksi)	100	136
Elongation (AL=5 x Ø)	50.0%	55.0%
Brinell Hardness (H)	116	240

Modulus of Elasticity (ksi) (E)	29200	Machineability General Index	12%

Applicable Specifications

AMS

AMS-5581	AMS-5599	AMS-5666	AMS-5837	AMS-5879
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-366	ASTM-B-443	ASTM-B-444	ASTM-B-446	ASTM-B-564
ASTM-B-704	ASTM-B-705	ASTM-B-829	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

718

Nickel

Trade Name: Special Metals INCONEL® Alloy 718

Trade References			
UNS:	N07718	EU:	EN 2.4668

Chemical Composition				
Ni 52.5%	Cr 19.0%	Mo 3.05%	C <=0.45%	Nb 5.035%
Mn <=0.35%	Si <=0.35%	P <=0.010%: S <=0.010	Cu <=0.230%	Co <=1.00%
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.296	Melting Point (°F)	2300
Thermal conductivity (BTU-in/hr-ft²-°F)	77	Specific heat (BTU/lb-°F)	0.104
Thermal expansion (1/°F)	0.00000722	Electrical conductivity (% IACS)	1.38

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	80	150
Tensile Strength Range (R_m) (ksi)	14	220
Elongation (AL=5 x Ø)	18.0%	27.0%
Brinell Hardness (H)	102	331

Modulus of Elasticity (ksi) (E)	29600	Machineability General Index	12%

Applicable Specifications

AMS

AMS-5596	AMS-5662	AMS-5663	AMS-5832	AMS-5962
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-637	ASTM-B-670	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

750

Nickel

Trade Name: Special Metals INCONEL® Alloy X-750

Trade References

UNS:	N07750	EU:	EN 2.4669

Chemical Composition

Cr 15.5%	Fe 7%	Ti 2.50%	Mn <=1%	Nb 0.95%
Cu <=0.5%	Si <=0.5%	Al 0.7%	C <=0.08%	S >=0.01%
Ni remainder	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.3	Melting Point (°F)	2530
Thermal conductivity (BTU-in/hr-ft^2-°F)	83	Specific heat (BTU/lb-°F)	0.103
Thermal expansion (1/°F)	0.00000700	Electrical conductivity (% IACS)	1.41

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	100	123
Tensile Strength Range (R_m) (ksi)	130	181
Elongation (AL=5 x Ø)	15.0%	40.0%
Brinell Hardness (H)	300	400

Modulus of Elasticity (ksi) (E)	31000	Machineability General Index	12%

Applicable Specifications

AMS

AMS-5542	AMS-5598	AMS-5667	AMS-5668	AMS-5670
AMS-5671	AMS-5747	-	-	-
-	-	-	-	-

ASTM

ASTM-B-637	-	-	-	-
-	-	-	-	-
-	-	-	-	-





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HAYNES 242

Nickel Alloy

Trade Name: Haynes 242® alloy

Trade References

UNS:	N10242	EU:	EN 10228-3

Chemical Composition

Ni 58%	Mo 25%	Cr 8%	Co 2.50%	Fe 2%
Mn 0.80%	Si 0.80%	Cu 0.50%	Al 0.50%	C 0.030%
B 0.0060%	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.327	Melting Point (°F)	2350
Thermal conductivity (BTU-in/hr-ft^2-°F)	78	Specific heat (BTU/lb-°F)	0.0923
Thermal expansion (1/°F)	0.00000600	Electrical conductivity (% IACS)	1.413

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	28	113
Tensile Strength Range (R_m) (ksi)	41	184
Elongation (AL=5 x Ø)	38.0%	66.0%
Brinell Hardness (H)	-	257

Modulus of Elasticity (ksi) (E)	32600	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-2154	-	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-E-2375	-	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

Rene 41

Nickel Alloy

Trade Name: ATI Allvac® Rene 41® Nickel Superalloy

Trade References			
UNS:	N07041	EU:	EN 2.4973

Chemical Composition				
Al 1.6%	B 0.0070%	C 0.060%	Cr 19%	Co 11%
Fe 3.0%	Mo 9.75%	Ni 52%	Ti 3.15%	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.298	Melting Point (°F)	2400
Thermal conductivity (BTU-in/hr-ft^2-°F)	80	Specific heat (BTU/lb-°F)	0.108
Thermal expansion (1/°F)	0.00000670	Electrical conductivity (% IACS)	1.33

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range (Rp$_{0.2\ Offset}$) (ksi)	84	119
Tensile Strength Range (R$_m$) (ksi)	103	183
Elongation (AL=5 x Ø)	11.0%	21.0%
Brinell Hardness (H)	-	334

Modulus of Elasticity (ksi) (E)	31600	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-5545	AMS-5712	AMS-5713	AMS-5800	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-638	-	-	-	-
-	-	-	-	-
-	-	-	-	-





4% Ni-Cr-Mo S82

Nickel Chrome Moly

Trade Name: Unknown

Trade References

UNS:	-	EU:	EN 2767

Chemical Composition

C 0.16%	Si 0.275%	P <=0.025%	S 0.020%	Cr 1.2%
Mo 0.25%	Ni 4.05%	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.284	Melting Point (°F)	-
Thermal conductivity (BTU-in/hr-ft^2-°F)	-	Specific heat (BTU/lb-°F)	-
Thermal expansion (1/°F)	-	Electrical conductivity (% IACS)	-

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	Unknown	-
Tensile Strength Range (R_m) (ksi)	191.5	220.5
Elongation (AL=5 x Ø)	8.0%	-
Brinell Hardness (H)	-	277

Modulus of Elasticity (ksi) (E)	Unknown	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-6264	-	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

Unknown	-	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

Carp49

Nickel Iron Alloy

Trade Name: CarTech® High Permeability "49"® Alloy

Trade References

UNS:	K94840	EU:	-

Chemical Composition

C 0.02%	S 0.35%	Mn 0.5%	Ni 48.00%	Fe balance
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.295	Melting Point (°F)	2600
Thermal conductivity ($BTU\text{-}in/hr\text{-}ft^2\text{-}°F$)	90.2	Specific heat (BTU/lb-°F)	0.12
Thermal expansion (1/°F)	0.00000460	Electrical conductivity (% IACS)	3.59

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	22	80
Tensile Strength Range (R_m) (ksi)	70	130
Elongation (AL=5 x Ø)	5.0%	45.0%
Brinell Hardness (H)	Unknown	-

Modulus of Elasticity (ksi) (E)	24000	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-7718	-	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-596	ASTM-A-753	-	-	-
-	-	-	-	-
-	-	-	-	-





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Carp80

Nickel Iron Molybdenum

Trade Name: CarTech® HyMu "80"® Alloy

Trade References			
UNS:	-	EU:	-

Chemical Composition				
C 0.02%	S 0.35%	Mn 0.5%	Ni 80.00%	Mo 4.20%
Fe balance	-	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.316	Melting Point (°F)	2670
Thermal conductivity (BTU-in/hr-ft^2-°F)	240	Specific heat (BTU/lb-°F)	0.118
Thermal expansion (1/°F)	0.00000683	Electrical conductivity (% IACS)	2.97

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	32	44
Tensile Strength Range (R_m) (ksi)	77	135
Elongation (AL=5 x Ø)	-	40.0%
Brinell Hardness (H)	104	240

Modulus of Elasticity (ksi) (E)	33600	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-7701	-	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-753	-	-	-	-
-	-	-	-	-
-	-	-	-	-





Technical Alloy Data Sheet

S156

Ni-Cr-Mo Steel

Trade Name: Unknown

Trade References

UNS:	-	EU:	EN 1.6722

Chemical Composition

C 0.16%	Si 0.225%	Mn 0.40%	P <=0.015%	S <=0.12%
Cr 1.2%	Mo 0.25%	Ni 0.405%	Fe balance	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.284	Melting Point (°F)	-
Thermal conductivity (BTU-in/hr-ft^2-°F)	108	Specific heat (BTU/lb-°F)	-
Thermal expansion (1/°F)	-	Electrical conductivity (% IACS)	-

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	-	149.4
Tensile Strength Range (R_m) (ksi)	191.5	220.5
Elongation (AL=5 x Ø)	8.0%	11.0%
Brinell Hardness (H)	-	277

Modulus of Elasticity (ksi) (E)	Unknown	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-6723	-	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

Unknown	-	-	-	-
-	-	-	-	-
-	-	-	-	-

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Technical Alloy Data Sheet

301

Stainless Steel

Trade Name: 301

Trade References			
UNS:	S30100	EU:	EN 1.4310

Chemical Composition

C <=0.15%	Mn <=2.00%	Si <=1.00%	Cr 17.00%	Ni 7.00%
Al <=0.75%	P <=0.040%	S <=0.030%	Cu <=0.75%	Ni <=0.10%
Fe balance	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.29	Melting Point (°F)	2550
Thermal conductivity (BTU-in/hr-ft^2-°F)	113	Specific heat (BTU/lb-°F)	0.12
Thermal expansion (1/°F)	0.00000920	Electrical conductivity (% IACS)	2.4

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	40	140
Tensile Strength Range (R_m) (ksi)	16	340
Elongation (AL=5 x Ø)	4.5%	60.0%
Brinell Hardness (H)	165	382

Modulus of Elasticity (ksi) (E)	30700	Machineability General Index	45%

Applicable Specifications

AMS

AMS-5901	AMS-5518	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-240	ASTM-A-666	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

302

Stainless Steel

Trade Name: UGI® S4310-6

Trade References

UNS:	S30200	EU:	EN 1.4325

Chemical Composition

Cr 18%	Ni 9%	Mn 2%	Si 1.00%	C 0.15%
S 0.03%	P 0.045%	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.284	Melting Point (°F)	2550
Thermal conductivity (BTU-in/hr-ft^2-°F)	112	Specific heat (BTU/lb-°F)	0.12
Thermal expansion (1/°F)	0.00000940	Electrical conductivity (% IACS)	2.4

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	34.8	140
Tensile Strength Range (R_m) (ksi)	75	210
Elongation (AL=5 x Ø)	3.0%	60.0%
Brinell Hardness (H)	139	261

Modulus of Elasticity (ksi) (E)	28000	Machineability General Index	40%

Applicable Specifications

AMS

AMS-5515	AMS-5516	AMS-5636	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-666	STM-A-240 ASTM-A-1	ASTM-A-478	-	-
-	-	-	-	-
-	-	-	-	-





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303

Stainless Steel

Trade Name: UGI® 4305

Trade References

UNS:	S30300	EU:	EN 1.4305

Chemical Composition

C <=0.15%	Cr 18%	Fe 69%	Mn <=2.0%	Mo 0.60%
Ni 9.0%	P <=0.20%	Si <=1.0%	S >=0.15%	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.289	Melting Point (°F)	2550
Thermal conductivity (BTU-in/hr-ft^2-°F)	112	Specific heat (BTU/lb-°F)	0.12
Thermal expansion (1/°F)	0.00000930	Electrical conductivity (% IACS)	2.4

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	34.8	60.2
Tensile Strength Range (R_m) (ksi)	72.5	108.8
Elongation (AL=5 x Ø)	35.0%	40.0%
Brinell Hardness (H)	187	262

Modulus of Elasticity (ksi) (E)	28000	Machineability General Index	75%

Applicable Specifications

AMS

AMS-5635	AMS-5638	AMS-5640	AMS-5641	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-320	ASTM-A-484	ASTM-A-582	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

304

Stainless Steel

Trade Name: 304

Trade References

UNS:	S30400	EU:	EN 1.4301

Chemical Composition

C <=0.080%	Cr 19%	Fe 70.173%	Mn <=2.0%	Ni 9.25%
P <=0.045%	Si <=1.0%	S <=0.030%	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.29	Melting Point (°F)	2550
Thermal conductivity ($BTU\text{-}in/hr\text{-}ft^2\text{-}°F$)	112	Specific heat (BTU/lb-°F)	0.12
Thermal expansion (1/°F)	0.00000961	Electrical conductivity (% IACS)	2.4

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	31.2	140
Tensile Strength Range (R_m) (ksi)	73.2	95
Elongation (AL=5 x Ø)	55.0%	70.0%
Brinell Hardness (H)	92	215

Modulus of Elasticity (ksi) (E)	28000	Machineability General Index	40%

Applicable Specifications

AMS

AMS-5513	AMS-5511	AMS-5647	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-240	-	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

310

Stainless Steel

Trade Name: 310

Trade References

UNS:	S31000	EU:	EN 1.4845

Chemical Composition

C <=0.25%	Cr 25%	Fe 52.59%	Mn <=2.0%	Ni 20.5%
P <=0.045%	Si <=1.5%	S <=0.030%	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.289	Melting Point (°F)	2650
Thermal conductivity ($BTU\text{-}in/hr\text{-}ft^2\text{-}°F$)	99	Specific heat (BTU/lb-°F)	0.12
Thermal expansion (1/°F)	0.00000878	Electrical conductivity (% IACS)	2.21

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	12.2	35
Tensile Strength Range (R_m) (ksi)	74.7	90.7
Elongation (AL=5 x Ø)	40.0%	52.0%
Brinell Hardness (H)	160	170

Modulus of Elasticity (ksi) (E)	29000	Machineability General Index	36%

Applicable Specifications

AMS

AMS-5577	AMS-5651	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-240	ASTM-A-276	ASTM-A-312	ASTM-A-479	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

316

Stainless Steel

Trade Name: 316

Trade References

UNS:	S31600	EU:	EN 1.4401

Chemical Composition

C <=0.080%	Cr 17%	Fe 66.9%	Mn <=2.0%	Ni 12%
P <=0.045%	Si <=1.0%	S <=0.030%	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.289	Melting Point (°F)	2500
Thermal conductivity (BTU-in/hr-ft^2-°F)	113	Specific heat (BTU/lb-°F)	0.12
Thermal expansion (1/°F)	0.00000889	Electrical conductivity (% IACS)	2.33

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	30	42.1
Tensile Strength Range (R_m) (ksi)	69.6	89.9
Elongation (AL=5 x Ø)	40.0%	50.0%
Brinell Hardness (H)	149	190

Modulus of Elasticity (ksi) (E)	28000	Machineability General Index	36%

Applicable Specifications

AMS

AMS-5524	AMS-5507	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-167	ASTM-A-240	ASTM-F-138	ASTM-F-899	-
-	-	-	-	-
-	-	-	-	-

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Technical Alloy Data Sheet

321

Stainless Steel

Trade Name: UGI® 4541Q

Trade References

UNS:	S32100	EU:	EN 1.4541

Chemical Composition

C <=0.080%	Cr 18%	Fe 69.53%	Mn <=2.0%	Ni 10.5%
P <=0.045%	Si <=1.0%	S <=0.030%	Ti 0.40%	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.289	Melting Point (°F)	2550
Thermal conductivity (BTU-in/hr-ft^2-°F)	112	Specific heat (BTU/lb-°F)	0.12
Thermal expansion (1/°F)	0.00000928	Electrical conductivity (% IACS)	2.4

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	30	34.8
Tensile Strength Range (R_m) (ksi)	74.7	89.9
Elongation (AL=5 x Ø)	40.0%	55.0%
Brinell Hardness (H)	187	215

Modulus of Elasticity (ksi) (E)	28000	Machineability General Index	36%

Applicable Specifications

AMS

AMS-5510	AMS-5557	AMS-5559	AMS-5570	AMS-5576
AMS-5645	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-167	ASTM-A-240	ASTM-A-193	ASTM-A-276	ASTM-A-314
ASTM-A-320	ASTM-A-479	ASTM-A-484	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

347

Stainless Steel

Trade Name: UGI® 4550Q

Trade References

UNS:	S34700	EU:	EN 1.4550

Chemical Composition

C <=0.080%	Cr 17%	Fe 68%	Mn <=2.0%	Nb+Ta 0.80%
Ni 11%	P <=0.045%	Si <=1.0%	S <=0.030%	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.289	Melting Point (°F)	2600
Thermal conductivity (BTU-in/hr-ft^2-°F)	113	Specific heat (BTU/lb-°F)	0.12
Thermal expansion (1/°F)	0.00000961	Electrical conductivity (% IACS)	2.36

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	30	65.3
Tensile Strength Range (R_m) (ksi)	75	100
Elongation (AL=5 x Ø)	40.0%	45.0%
Brinell Hardness (H)	187	230

Modulus of Elasticity (ksi) (E)	28300	Machineability General Index	36%

Applicable Specifications

AMS

AMS-5512	AMS-5646	AMS-5680	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-262	ASTM-A-269	ASTM-A-276	ASTM-A-193	ASTM-A-479
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

355

Stainless Steel

Trade Name: 355

Trade References

UNS:	S35500	EU:	-

Chemical Composition

Al 92.2%	Cr <=0.25%	Cu 1.25%	Fe <=0.60%	Mg 0.50%
Mn <=0.50%	Si 5.0%	Ti <=0.25%	Zn <=0.35%	Other <=0.15%
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.29	Melting Point (°F)	-
Thermal conductivity (BTU-in/hr-ft^2-°F)	105	Specific heat (BTU/lb-°F)	0.11
Thermal expansion (1/°F)	0.00000830	Electrical conductivity (% IACS)	0.36

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	142	155
Tensile Strength Range (R_m) (ksi)	169.7	220
Elongation (AL=5 x Ø)	12.0%	19.0%
Brinell Hardness (H)	344	451

Modulus of Elasticity (ksi) (E)	32000	Machineability General Index	42%

Applicable Specifications

AMS

AMS-5547	AMS-5549	AMS-5743	AMS-5744	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-564	ASTM-A-579	ASTM-A-693	ASTM-A-705	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

403

Stainless Steel

Trade Name: 403

Trade References

UNS:	S40300	EU:	EN 56B

Chemical Composition

Fe 86%	Cr 12.3%	Mn 1.0%	Si 0.50%	C 0.15%
P 0.040%	S 0.030%	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.282	Melting Point (°F)	2700
Thermal conductivity (BTU-in/hr-ft^2-°F)	173	Specific heat (BTU/lb-°F)	0.11
Thermal expansion (1/°F)	0.00000550	Electrical conductivity (% IACS)	3.03

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	30	84
Tensile Strength Range (R_m) (ksi)	70.3	120
Elongation (AL=5 x Ø)	12.0%	25.0%
Brinell Hardness (H)	139	167

Modulus of Elasticity (ksi) (E)	29000	Machineability General Index	54%

Applicable Specifications

AMS

AMS-5611	AMS-5612	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-176	ASTM-A-276	ASTM-A-473	ASTM-A-314	ASTM-A-479
ASTM-A-511	ASTM-A-580	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

410

Stainless Steel

Trade Name: UGI® 4006A

Trade References

UNS:	S41000	EU:	EN 1.4006

Chemical Composition

C <=0.15%	Cr 12.5%	Fe 86.4%	Mn <=1.0%	P <=0.040%
Si <=1.0%	S <=0.030%	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.282	Melting Point (°F)	2700
Thermal conductivity (BTU-in/hr-ft^2-°F)	173	Specific heat (BTU/lb-°F)	0.11
Thermal expansion (1/°F)	0.00000550	Electrical conductivity (% IACS)	3.03

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	30	60.2
Tensile Strength Range (R_m) (ksi)	65.3	200
Elongation (AL=5 x Ø)	20.0%	25.0%
Brinell Hardness (H)	258	330

Modulus of Elasticity (ksi) (E)	29000	Machineability General Index	54%

Applicable Specifications

AMS

AMS-5504	AMS-5613	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-240	ASTM-A-276	ASTM-A-493	ASTM-F-899	-
-	-	-	-	-
-	-	-	-	-





416

Stainless Steel

Trade Name: 416

Trade References			
UNS:	S41600	EU:	EN 1.4005

Chemical Composition				
C <=0.15%	Cr 13%	Fe 84%	Mn 1.25%	Mo <=0.60%
P <=0.060%	Si <=1.0%	S >=0.15%	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.282	Melting Point (°F)	2700
Thermal conductivity (BTU-in/hr-ft^2-°F)	173	Specific heat (BTU/lb-°F)	0.11
Thermal expansion (1/°F)	0.00000550	Electrical conductivity (% IACS)	3.03

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	39.9	85
Tensile Strength Range (R_m) (ksi)	74.7	109.9
Elongation (AL=5 x Ø)	11.0%	30.0%
Brinell Hardness (H)	180	385

Modulus of Elasticity (ksi) (E)	29000	Machineability General Index	75%

Applicable Specifications

AMS

AMS-5610	-	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-194	ASTM-A-314	ASTM-A-473	ASTM-A-581	ASTM-A-582
ASTM-A-895	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

420

Stainless Steel

Trade Name: UGI® 4028

Trade References

UNS:	S42000	EU:	EN 1.4021

Chemical Composition

C >=0.15%	Cr 13%	Fe 85%	Mn <=1.0%	P <=0.040%
Si <=1.0%	S <=0.030%	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.282	Melting Point (°F)	2650
Thermal conductivity (BTU-in/hr-ft^2-°F)	173	Specific heat (BTU/lb-°F)	0.11
Thermal expansion (1/°F)	0.00000572	Electrical conductivity (% IACS)	3.14

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	40	195
Tensile Strength Range (R_m) (ksi)	85	230
Elongation (AL=5 x Ø)	8.0%	25.0%
Brinell Hardness (H)	195	594

Modulus of Elasticity (ksi) (E)	29000	Machineability General Index	50%

Applicable Specifications

AMS

AMS-5506	AMS-5620	AMS-5621	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-176	ASTM-A-276	ASTM-A-473	ASTM-A-484	ASTM-A-314
ASTM-A-580	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

430

Stainless Steel

Trade Name: Unknown

Trade References

UNS:	S43000	EU:	EN 1.4016

Chemical Composition

C <=0.12%	Cr 16%	Fe 83%	Mn <=1.0%	P <=0.040%
Si <=1.0%	S <=0.030%	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.282	Melting Point (°F)	2600
Thermal conductivity (BTU-in/hr-ft^2-°F)	181	Specific heat (BTU/lb-°F)	0.11
Thermal expansion (1/°F)	0.00000578	Electrical conductivity (% IACS)	2.87

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	29.7	70.1
Tensile Strength Range (R_m) (ksi)	65.3	76.9
Elongation (AL=5 x Ø)	22.0%	25.0%
Brinell Hardness (H)	155	190

Modulus of Elasticity (ksi) (E)	29000	Machineability General Index	66%

Applicable Specifications

AMS

AMS-5627	AMS-5503	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-276	ASTM-A-314	ASTM-A-479	ASTM-A-484	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

440

Stainless Steel

Trade Name: Unknown

Trade References

UNS:	S44000	EU:	EN 1.4112

Chemical Composition

C 0.675%	Cr 17%	Fe 80.9%	Mn <=1.0%	Mo <=0.75%
P <=0.040%	Si <=1.0%	S <=0.030%	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.282	Melting Point (°F)	2700
Thermal conductivity (BTU-in/hr-ft^2-°F)	180	Specific heat (BTU/lb-°F)	0.11
Thermal expansion (1/°F)	0.00000567	Electrical conductivity (% IACS)	2.87

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	50	150
Tensile Strength Range (R_m) (ksi)	100	180
Elongation (AL=5 x Ø)	4.0%	14.0%
Brinell Hardness (H)	269	615

Modulus of Elasticity (ksi) (E)	29000	Machineability General Index	40%

Applicable Specifications

AMS

AMS-5630	AMS-5631	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-276	-	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

455

Stainless Steel

Trade Name: 455

Trade References

UNS:	S45500	EU:	EN 10204

Chemical Composition

Fe 73%	Cr 11.8%	Ni 8.5%	Nb 2%	Cu 2%
Ti 1.1%	Mn 0.50%	Mo 0.50%	Si 0.50%	C 0.050%
P 0.040%	S 0.030%	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.282	Melting Point (°F)	-
Thermal conductivity (BTU-in/hr-ft^2-°F)	125	Specific heat (BTU/lb-°F)	0.11
Thermal expansion (1/°F)	0.00000590	Electrical conductivity (% IACS)	1.9

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	115	195.1
Tensile Strength Range (R_m) (ksi)	145	250
Elongation (AL=5 x Ø)	10.0%	14.0%
Brinell Hardness (H)	297	472

Modulus of Elasticity (ksi) (E)	29000	Machineability General Index	28%

Applicable Specifications

AMS

AMS-5578	AMS-5617	AMS-5672	AMS-5860	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-313	ASTM-A-564	ASTM-A-693	ASTM-A-705	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

465

Stainless Steel

Trade Name: Unknown

Trade References

UNS:	S46500	EU:	-

Chemical Composition

Fe 74.35%	Cr 11.75%	Ni 11.0%	Ti 1.65%	Mo 2.05%
Mn <=0.25%	Si <=0.25%	C <=0.020%	P <=0.015%	N <=0.010%
S 0.010%	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.2822	Melting Point (°F)	-
Thermal conductivity (BTU-in/hr-ft^2-°F)	97	Specific heat (BTU/lb-°F)	0.107
Thermal expansion (1/°F)	0.00000572	Electrical conductivity (% IACS)	2.05

Mechanical Properties

Property	**Minimum**	**Maximum**
Yield Strength Range (Rp$_{0.2\ Offset}$) (ksi)	170	270
Tensile Strength Range (R$_m$) (ksi)	190	280
Elongation (AL=5 x Ø)	2.3%	14.0%
Brinell Hardness (H)	271	560

Modulus of Elasticity (ksi) (E)	32000	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-5936	-	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-564	ASTM-A-693	ASTM-F-899	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

13-8

Stainless Steel

Trade Name: PH 13-8 Mo

Trade References

UNS:	S13800	EU:	EN 1.4548

Chemical Composition

Cr 12.75%	Ni 8.0%	Mo 2.25%	Al 1.125%	Mn <=0.10%
Si <=0.10%	C <=0.05%	N <=0.01%	P <=0.010%	S <=0.008%
Fe balance	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.282	Melting Point (°F)	2560
Thermal conductivity (BTU-in/hr-ft^2-°F)	97	Specific heat (BTU/lb-°F)	0.11
Thermal expansion (1/°F)	0.00000589	Electrical conductivity (% IACS)	1.72

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	85	210
Tensile Strength Range (R_m) (ksi)	130	235
Elongation (AL=5 x Ø)	7.0%	13.0%
Brinell Hardness (H)	301	451

Modulus of Elasticity (ksi) (E)	28300	Machineability General Index	36%

Applicable Specifications

AMS

AMS-5864	AMS-5629	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-564	ASTM-A-693	ASTM-A-705	-	-
-	-	-	-	-
-	-	-	-	-





DISCLAIMER: This alloy data sheet is for reference only, not for design purposes.

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Technical Alloy Data Sheet

15-5

Stainless Steel

Trade Name: 15-5

Trade References

UNS:	S15500	EU:	EN 1.4545

Chemical Composition

Fe 75%	Cr 14.48%	Ni 4.5%	Cu 3.5%	Mn <=1%
Si <=1%	Nb+Ta 0.3%	C <=0.07%	P <=0.04%	S <=0.03%
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.282	Melting Point (°F)	2560
Thermal conductivity (BTU-in/hr-ft^2-°F)	124	Specific heat (BTU/lb-°F)	0.1
Thermal expansion (1/°F)	0.00000578	Electrical conductivity (% IACS)	2.24

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	140	200
Tensile Strength Range (R_m) (ksi)	115	210
Elongation (AL=5 x Ø)	7.6%	12.0%
Brinell Hardness (H)	294	432

Modulus of Elasticity (ksi) (E)	29000	Machineability General Index	45%

Applicable Specifications

AMS

AMS-5659	AMS-5826	AMS-5862	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-564	ASTM-A-693	ASTM-A-698	ASTM-A-705	-
-	-	-	-	-
-	-	-	-	-

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Technical Alloy Data Sheet

17-4

Stainless Steel

Trade Name: 17-4 PH

Trade References

UNS:	S17400	EU:	EN 1.4542

Chemical Composition

Cr 16.25%	Ni 4%	Cu 4%	Si <=1%	Mn <=1%
Nb 0.30%	C <=0.07%	P <=0.04%	S <=0.03%	Fe remainder
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.282	Melting Point (°F)	2560
Thermal conductivity (BTU-in/hr-ft^2-°F)	124	Specific heat (BTU/lb-°F)	0.11
Thermal expansion (1/°F)	0.00000611	Electrical conductivity (% IACS)	2.24

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	75	185
Tensile Strength Range (R_m) (ksi)	115	200
Elongation (AL=5 x Ø)	5.0%	10.0%
Brinell Hardness (H)	311	421

Modulus of Elasticity (ksi) (E)	28600	Machineability General Index	45%

Applicable Specifications

AMS

AMS-5342	AMS-5604	AMS 5622	AMS-5643	AMS-5825
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-564	ASTM-A-693	ASTM-A-705	-	-
-	-	-	-	-
-	-	-	-	-





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17-4PH

Stainless Steel

Trade Name: 17-4 PH

Trade References

UNS:	S17400	EU:	EN 1.4542

Chemical Composition

Cr 16.25%	Ni 4%	Cu 4%	Si <=1%	Mn <=1%
Nb 0.30%	C <=0.07%	P <=0.04%	S <=0.03%	Fe remainder
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.282	Melting Point (°F)	2560
Thermal conductivity ($BTU\text{-}in/hr\text{-}ft^2\text{-}°F$)	124	Specific heat (BTU/lb-°F)	0.11
Thermal expansion (1/°F)	0.00000611	Electrical conductivity (% IACS)	2.24

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	75	185
Tensile Strength Range (R_m) (ksi)	115	200
Elongation (AL=5 x Ø)	5.0%	10.0%
Brinell Hardness (H)	311	421

Modulus of Elasticity (ksi) (E)	28600	Machineability General Index	45%

Applicable Specifications

AMS

AMS-5342	AMS-5604	AMS 5622	AMS-5643	AMS-5825
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-564	ASTM-A-693	ASTM-A-705	-	-
-	-	-	-	-
-	-	-	-	-





Technical Alloy Data Sheet

17-7

Stainless Steel

Trade Name: 17-7 PH

Trade References

UNS:	S17700	EU:	EN 1.4568

Chemical Composition

Fe 72.5%	Cr 17.0%	Ni 7.125%	Si 1.0%	Mn 1.0%
Al 1.125%	C 0.090%	S 0.040%	P 0.040%	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.282	Melting Point (°F)	2550
Thermal conductivity (BTU-in/hr-ft^2-°F)	114	Specific heat (BTU/lb-°F)	0.11
Thermal expansion (1/°F)	0.00000611	Electrical conductivity (% IACS)	2.08

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	65	231
Tensile Strength Range (R_m) (ksi)	130	239
Elongation (AL=5 x Ø)	2.0%	35.0%
Brinell Hardness (H)	400	498

Modulus of Elasticity (ksi) (E)	29600	Machineability General Index	45%

Applicable Specifications

AMS

AMS-5528	AMS-5529	AMS-5568	AMS-5644	AMS-5673
AMS-5678	AMS-5824	-	-	-
-	-	-	-	-

ASTM

ASTM-A-313	ASTM-A-564	ASTM-A-579	ASTM-A-693	ASTM-A-705
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

21-6-9

Stainless Steel

Trade Name: ISI Type S21900

Trade References

UNS:	S21900	EU:	-

Chemical Composition

C <=0.08%	Cr 20.25%	Mn 9%	Ni 6.5%	N 0.275%
P <=0.06%	Si <=1%	S 0.03%	Fe balance	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.282	Melting Point (°F)	-
Thermal conductivity (BTU-in/hr-ft^2-°F)	96	Specific heat (BTU/lb-°F)	0.12
Thermal expansion (1/°F)	0.00000930	Electrical conductivity (% IACS)	2.36

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	48	169
Tensile Strength Range (R_m) (ksi)	93	204
Elongation (AL=5 x Ø)	24.0%	48.0%
Brinell Hardness (H)	185	210

Modulus of Elasticity (ksi) (E)	29000	Machineability General Index	30%

Applicable Specifications

AMS

AMS-5561	AMS-5562	AMS-5656	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-269	ASTM-A-276	ASTM-A-312	ASTM-A-314	ASTM-A-412
ASTM-A-479	ASTM-A-580	ASTM-A-813	ASTM-A-814	-
-	-	-	-	-





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Technical Alloy Data Sheet

303SE

Stainless Steel

Trade Name: Unknown

Trade References

UNS:	S30323	EU:	EN 1.4625

Chemical Composition

Cr 18%	Ni 9%	Mn 2%	Si 1.00%	C 0.15%
S 0.06%	P 0.2%	Se >=0.15%	Fe balance	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.289	Melting Point (°F)	2550
Thermal conductivity (BTU-in/hr-ft^2-°F)	112	Specific heat (BTU/lb-°F)	0.12
Thermal expansion (1/°F)	0.00000956	Electrical conductivity (% IACS)	2.4

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	34.8	60.2
Tensile Strength Range (R_m) (ksi)	87	100
Elongation (AL=5 x Ø)	12.0%	50.0%
Brinell Hardness (H)	160	235

Modulus of Elasticity (ksi) (E)	28000	Machineability General Index	78%

Applicable Specifications

AMS

AMS-5640	AMS-5641	AMS-5738	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-194	ASTM-A-314	ASTM-A-320	ASTM-A-581	ASTM-A-582
ASTM-A-276	ASTM-A-473	-	-	-
-	-	-	-	-

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304L

Stainless Steel

Trade Name: UGI® 4307Q

Trade References

UNS:	S30403	EU:	EN 1.4306

Chemical Composition

C 0.030%	Si 0.75%	Mn 2.00%	P 0.045%	S 0.030%
Cr 19.00%	Ni 10.00%	N 0.10%	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.29	Melting Point (°F)	2550
Thermal conductivity (BTU-in/hr-ft^2-°F)	112	Specific heat (BTU/lb-°F)	0.12
Thermal expansion (1/°F)	0.00000940	Electrical conductivity (% IACS)	2.4

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	30.5	140
Tensile Strength Range (R_m) (ksi)	70	185
Elongation (AL=5 x Ø)	40.0%	58.0%
Brinell Hardness (H)	160	201

Modulus of Elasticity (ksi) (E)	28500	Machineability General Index	40%

Applicable Specifications

AMS

AMS-5511	AMS-5569	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-240	ASTM-A-666	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

316L

Stainless Steel

Trade Name: UGIPURE® 4909

Trade References

UNS:	S31603	EU:	EN 1.4435

Chemical Composition

C <=0.03%	Cr 17.25%	Ni 12%	Mo 2.5%	Mn <=2%
Si <=1%	P <=0.045%	S <=0.03%	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.289	Melting Point (°F)	2510
Thermal conductivity (BTU-in/hr-ft^2-°F)	112	Specific heat (BTU/lb-°F)	0.12
Thermal expansion (1/°F)	0.00000890	Electrical conductivity (% IACS)	2.33

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	25	170
Tensile Strength Range (R_m) (ksi)	70.3	90
Elongation (AL=5 x Ø)	35.0%	60.0%
Brinell Hardness (H)	146	217

Modulus of Elasticity (ksi) (E)	28000	Machineability General Index	36%

Applicable Specifications

AMS

AMS-5507	AMS-5524	AMS-5584	AMS-5653	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-240	ASTM-A-276	ASTM-A-666	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

440A

Stainless Steel

Trade Name: Unknown

Trade References

UNS:	S44002	EU:	EN 1.4040

Chemical Composition

Cr 17%	Mn 1%	Si 1%	Mo 0.75%	C 0.675%
S 0.03%	P 0.04%	Fe remainder	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.282	Melting Point (°F)	2700
Thermal conductivity (BTU-in/hr-ft^2-°F)	168	Specific heat (BTU/lb-°F)	0.11
Thermal expansion (1/°F)	0.00000560	Electrical conductivity (% IACS)	2.87

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	60.2	239
Tensile Strength Range (R_m) (ksi)	100	260
Elongation (AL=5 x Ø)	5.0%	20.0%
Brinell Hardness (H)	210	595

Modulus of Elasticity (ksi) (E)	30400	Machineability General Index	40%

Applicable Specifications

AMS

AMS-5631	AMS-5632	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-240	ASTM-A-276	ASTM-A-314	ASTM-A-473	ASTM-A-511
STM-A-580 ASTM-A-9	-	-	-	-
-	-	-	-	-





440C

Stainless Steel

Trade Name: Unknown

Trade References

UNS:	S44004	EU:	EN 1.4023

Chemical Composition

Fe 79.15%	Cr 17%	C 1.1%	Mn 1%	Si 1%
Mo 0.75%	-	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.282	Melting Point (°F)	2700
Thermal conductivity (BTU-in/hr-ft^2-°F)	168	Specific heat (BTU/lb-°F)	0.11
Thermal expansion (1/°F)	0.00000567	Electrical conductivity (% IACS)	2.87

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	60.9	276
Tensile Strength Range (R_m) (ksi)	110	286
Elongation (AL=5 x Ø)	2.0%	15.0%
Brinell Hardness (H)	240	580

Modulus of Elasticity (ksi) (E)	30400	Machineability General Index	40%

Applicable Specifications

AMS

AMS-5618	AMS-5630	AMS 5880	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-276	ASTM-A-314	ASTM-A-473	ASTM-A-493	ASTM-A-580
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

A286

Stainless Steel

Trade Name: Unknown

Trade References

UNS:	S66286	EU:	EN 1.4980

Chemical Composition

Ni 52.5%	Cr 19%	Nb 5.125%	Mo 3.05%	Co <=1%
Ti 0.90%	Si <=0.35%	Mn <=0.35%	Cu <=0.30%	Al 0.50%
C <=0.08%	Ta <=0.05%	B <=0.006%	P <=0.015%	S <=0.015%
Fe balance	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.286	Melting Point (°F)	2500
Thermal conductivity (BTU-in/hr-ft^2-°F)	104	Specific heat (BTU/lb-°F)	0.11
Thermal expansion (1/°F)	0.00000917	Electrical conductivity (% IACS)	1.9

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	50	95
Tensile Strength Range (R_m) (ksi)	90	171
Elongation (AL=5 x Ø)	11.0%	24.0%
Brinell Hardness (H)	279	327

Modulus of Elasticity (ksi) (E)	29000	Machineability General Index	28%

Applicable Specifications

AMS

AMS-5525	AMS-5732	AMS-5737	AMS-5804	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-240	ASTM-A-276	ASTM-A-638	ASTM-A-453	ASTM-A-959
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

XD15NW

Stainless Steel

Trade Name: Unknown

Trade References			
UNS:	S42025	EU:	-

Chemical Composition				
C 0.41%	Si <=0.60%	Cr 15.75%	Mo 1.70%	V 0.30%
N 0.205%	Ni <=0.30%	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.284	Melting Point (°F)	-
Thermal conductivity (BTU-in/hr-ft^2-°F)	-	Specific heat (BTU/lb-°F)	-
Thermal expansion (1/°F)	-	Electrical conductivity (% IACS)	-

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range (Rp$_{0.2\ Offset}$) (ksi)	Unknown	-
Tensile Strength Range (R$_m$) (ksi)	118.9	-
Elongation (AL=5 x Ø)	Unknown	-
Brinell Hardness (H)	207	634

Modulus of Elasticity (ksi) (E)	Unknown	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-5925	AMS-5618	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-604	ASTM-E-45	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

4130

Alloy Steel

Trade Name: AISI 4130

Trade References			
UNS:	G41300	EU:	EN 1.7218

Chemical Composition				
Fe 97%	Cr 1%	Mn 0.5%	C 0.3%	Si 0.25%
Mo 0.2%	S .05%	P 0.05%	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.284	Melting Point (°F)	2610
Thermal conductivity (BTU-in/hr-ft^2-°F)	296	Specific heat (BTU/lb-°F)	0.114
Thermal expansion (1/°F)	0.00000620	Electrical conductivity (% IACS)	7.73

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	52.3	63.3
Tensile Strength Range (R_m) (ksi)	81.2	150
Elongation (AL=5 x Ø)	25.5%	28.2%
Brinell Hardness (H)	156	331

Modulus of Elasticity (ksi) (E)	29700	Machineability General Index	72%

Applicable Specifications

AMS

AMS-6370	AMS-S-6758	AMS-2301	AMS-6348	AMS-2304
AMS-6346	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-331	ASTM-A-322	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

4140

Alloy Steel

Trade Name: AISI 4140

Trade References

UNS:	G41400	EU:	EN 1.7225

Chemical Composition

Fe 97%	Cr 1%	Mn 0.9%	C 0.4%	Si 0.25%
Mo 0.2%	S 0.05%	P 0.04%	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.284	Melting Point (°F)	2580
Thermal conductivity ($BTU\text{-}in/hr\text{-}ft^2\text{-}°F$)	296	Specific heat (BTU/lb-°F)	0.113
Thermal expansion (1/°F)	0.00000678	Electrical conductivity (% IACS)	7.84

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	60.2	95
Tensile Strength Range (R_m) (ksi)	95	107.3
Elongation (AL=5 x Ø)	17.7%	25.7%
Brinell Hardness (H)	197	578

Modulus of Elasticity (ksi) (E)	29700	Machineability General Index	66%

Applicable Specifications

AMS

AMS-6382	AMS-6349	AMS-2301	AMS-2304	AMS-S-5626
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-331	ASTM-A-332	-	-	-
-	-	-	-	-
-	-	-	-	-





Technical Alloy Data Sheet

4142

Alloy Steel

Trade Name: AISI 4142

Trade References			
UNS:	G41420	EU:	EN 1.3563

Chemical Composition				
Fe 97%	Cr 1%	Mn 1%	C 0.5%	Si 0.25%
Mo 0.25%	S 0.05% Max	P 0.04% Max	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.283	Melting Point (°F)	-
Thermal conductivity (BTU-in/hr-ft^2-°F)	296	Specific heat (BTU/lb-°F)	0.113
Thermal expansion (1/°F)	-	Electrical conductivity (% IACS)	6.56

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	80	110
Tensile Strength Range (R_m) (ksi)	95	145
Elongation (AL=5 x Ø)	Unknown	-
Brinell Hardness (H)	187	380

Modulus of Elasticity (ksi) (E)	29900	Machineability General Index	65%

Applicable Specifications

AMS

Unknown	-	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-322	ASTM-A-331	ASTM-A-505	ASTM-A-519	ASTM-A-547
ASTM-A-29	ASTM-A-372	ASTM-A-711	ASTM-A-752	ASTM-A-829
-	-	-	-	-





Technical Alloy Data Sheet

4150

Alloy Steel

Trade Name: AISI 4150

Trade References			
UNS:	G41500	EU:	EN 1.7228

Chemical Composition				
Fe 97%	Cr 1%	Mn 0.9%	C 0.5%	Si 0.25%
Mo 0.2%	S 0.04%	P 0.05%	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.284	Melting Point (°F)	2600
Thermal conductivity ($BTU\text{-}in/hr\text{-}ft^2\text{-}°F$)	309	Specific heat (BTU/lb-°F)	0.114
Thermal expansion (1/°F)	0.00000650	Electrical conductivity (% IACS)	7.04

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	55	106.5
Tensile Strength Range (R_m) (ksi)	106	190
Elongation (AL=5 x Ø)	11.7%	20.2%
Brinell Hardness (H)	197	375

Modulus of Elasticity (ksi) (E)	29700	Machineability General Index	55%

Applicable Specifications

AMS

AMS-2301	-	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-322	ASTM-A-331	ASTM-A-505	ASTM-A-519	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

4330

Alloy Steel

Trade Name: AISI 4330

Trade References

UNS:	J24045	EU:	-

Chemical Composition

Fe 97%	Ni 1.3%	Mn 1% Max	Si 0.8% Max	Cr 0.5%
Mo 0.5%	C 0.3%	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.283	Melting Point (°F)	2600
Thermal conductivity (BTU-in/hr-ft^2-°F)	309	Specific heat (BTU/lb-°F)	0.116
Thermal expansion (1/°F)	0.00000660	Electrical conductivity (% IACS)	7.73

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	150	160
Tensile Strength Range (R_m) (ksi)	-	125
Elongation (AL=5 x Ø)	Unknown	-
Brinell Hardness (H)	285	-

Modulus of Elasticity (ksi) (E)	Unknown	Machineability General Index	57%

Applicable Specifications

AMS

AMS-6411	AMS-6427	AMS-2300	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-646	-	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

4340

Alloy Steel

Trade Name: AISI 4340

Trade References

UNS:	G43400	EU:	EN 24

Chemical Composition

Fe 96%	Ni 1.9%	Cr 0.8%	Mn 0.7%	C 0.4%
Mo 0.25%	Si 0.25%	S 0.04%	P 0.04%	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.284	Melting Point (°F)	2600
Thermal conductivity (BTU-in/hr-ft^2-°F)	309	Specific heat (BTU/lb-°F)	0.114
Thermal expansion (1/°F)	0.00000683	Electrical conductivity (% IACS)	6.95

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	68.5	125
Tensile Strength Range (R_m) (ksi)	108	161
Elongation (AL=5 x Ø)	12.2%	22.0%
Brinell Hardness (H)	217	388

Modulus of Elasticity (ksi) (E)	27800	Machineability General Index	57%

Applicable Specifications

AMS

AMS-6359	AMS-6409	AMS-6414	AMS-6415	AMS-6454
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-331	ASTM-A-711	ASTM-A-29	ASTM-A-506	ASTM-A-752
ASTM-A-320	ASTM-A-519	ASTM-A-829	ASTM-A-322	ASTM-A-646
-	-	-	-	-

    

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Technical Alloy Data Sheet

6150

Alloy Steel

Trade Name: AISI 6150

Trade References			
UNS:	G51500	EU:	EN 1.8159

Chemical Composition				
Fe 97%	Cr 1%	Mn 0.8%	C 0.5%	Si 0.25%
V 0.15% Min	S 0.04% Max	P 0.04% Max	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.284	Melting Point (°F)	-
Thermal conductivity ($BTU\text{-}in/hr\text{-}ft^2\text{-}°F$)	323	Specific heat (BTU/lb-°F)	0.114
Thermal expansion (1/°F)	0.00000678	Electrical conductivity (% IACS)	7.37

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	59.8	89.3
Tensile Strength Range (R_m) (ksi)	97.2	170
Elongation (AL=5 x Ø)	21.8%	23.0%
Brinell Hardness (H)	170	363

Modulus of Elasticity (ksi) (E)	29700	Machineability General Index	60%

Applicable Specifications

AMS

AMS-6450	AMS-7301	AMS-6448	AMS-6455	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-29	ASTM-A-322	ASTM-A-331	ASTM-A-519	ASTM-A-752
ASTM-A-829	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

8620

Alloy Steel

Trade Name: AISI 8620

Trade References

UNS:	G86200	EU:	EN 1.6523

Chemical Composition

Fe 97%	Mn 0.8%	Ni 0.6%	Cr 0.5%	C 0.2%
Si 0.3%	Mo 0.2%	S 0.04% Max	P 0.04% Max	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.284	Melting Point (°F)	2600
Thermal conductivity ($BTU\text{-}in/hr\text{-}ft^2\text{-}°F$)	323	Specific heat (BTU/lb-°F)	0.114
Thermal expansion (1/°F)	0.00000678	Electrical conductivity (% IACS)	7.37

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	51.8	55.9
Tensile Strength Range (R_m) (ksi)	76.9	168
Elongation (AL=5 x Ø)	26.3%	31.3%
Brinell Hardness (H)	149	438

Modulus of Elasticity (ksi) (E)	29700	Machineability General Index	65%

Applicable Specifications

AMS

AMS-6274	AMS-6276	AMS-6277	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-322	ASTM-A-331	ASTM-A-505	ASTM-A-530	-
-	-	-	-	-
-	-	-	-	-





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9310

Alloy Steel

Trade Name: AISI 9310

Trade References

UNS:	G93100	EU:	EN 36A

Chemical Composition

Fe 94%	Ni 3.25%	Cr 1.2%	Mn 0.6%	Si 0.28%
Mo 0.12%	C 0.10%	P 0.03% Max	S 0.025% Max	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.284	Melting Point (°F)	2600
Thermal conductivity (BTU-in/hr-ft^2-°F)	360	Specific heat (BTU/lb-°F)	0.115
Thermal expansion (1/°F)	0.00000683	Electrical conductivity (% IACS)	9.91

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	82.8	63.8
Tensile Strength Range (R_m) (ksi)	155	187
Elongation (AL=5 x Ø)	18.8%	17.3%
Brinell Hardness (H)	241	363

Modulus of Elasticity (ksi) (E)	29000	Machineability General Index	49%

Applicable Specifications

AMS

AMS-6260	AMS-2300	AMS-2301	AMS-2304	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-322	ASTM-A-519	ASTM-A-711	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

300M

Alloy Steel

Trade Name: AISI 300M

Trade References

UNS:	K44220	EU:	-

Chemical Composition

Fe 94%	Ni 1.8%	Si 1.6%	Cr 0.8%	Mn 0.8%
C 0.4%	P 0.04%	Mo 0.4%	V 0.05%	S 0.04%
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.284	Melting Point (°F)	2590
Thermal conductivity (BTU-in/hr-ft^2-°F)	-	Specific heat (BTU/lb-°F)	0.107
Thermal expansion (1/°F)	0.00000630	Electrical conductivity (% IACS)	-

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range (Rp$_{0.2\ Offset}$) (ksi)	180	230
Tensile Strength Range (R$_m$) (ksi)	270	300
Elongation (AL=5 x Ø)	7.0%	-
Brinell Hardness (H)	-	311

Modulus of Elasticity (ksi) (E)	29700	Machineability General Index	57%

Applicable Specifications

AMS

AMS-6417	AMS-6419	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-579	ASTM-A-646	-	-	-
-	-	-	-	-
-	-	-	-	-





Technical Alloy Data Sheet

4330M

Alloy Steel

Trade Name: AISI 4330M

Trade References

UNS:	K23080	EU:	EN 24

Chemical Composition

Fe 97%	Ni 1.9%	Cr 0.9%	Mn 0.9%	Mo 0.45%
Si 0.25%	V 0.08%	P 0.03% Max	S 0.01% Max	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.283	Melting Point (°F)	-
Thermal conductivity (BTU-in/hr-ft^2-°F)	-	Specific heat (BTU/lb-°F)	0.16
Thermal expansion (1/°F)	-	Electrical conductivity (% IACS)	-

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	100	185
Tensile Strength Range (R_m) (ksi)	Unknown	-
Elongation (AL=5 x Ø)	Unknown	-
Brinell Hardness (H)	Unknown	-

Modulus of Elasticity (ksi) (E)	Unknown	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-6411	AMS-6427	AMS-2300	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-646	-	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

4340M

Alloy Steel

Trade Name: AISI 4340M

Trade References			
UNS:	K44220	EU:	-

Chemical Composition				
Fe 95%	Ni 1.9%	Si 1.6%	Cr 0.8%	Mn 0.8%
C 0.4%	P 0.04%	Mo 0.4%	V 0.05%	S 0.04%
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.284	Melting Point (°F)	-
Thermal conductivity (BTU-in/hr-ft^2-°F)	260	Specific heat (BTU/lb-°F)	0.107
Thermal expansion (1/°F)	0.00000630	Electrical conductivity (% IACS)	-

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	180	230
Tensile Strength Range (R_m) (ksi)	270	300
Elongation (AL=5 x Ø)	7.0%	-
Brinell Hardness (H)	-	311

Modulus of Elasticity (ksi) (E)	Unknown	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-6257	AMS-6417	AMS-6419	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-579	ASTM-A-646	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

Aermet

Alloy Steel

Trade Name: Carpenter AerMet® 100

Trade References

UNS:	K92580	EU:	-

Chemical Composition

Fe 71%	Co 13%	Ni 11%	Cr 3%	Mo 1.2%
C 0.2%	-	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.285	Melting Point (°F)	-
Thermal conductivity (BTU-in/hr-ft^2-°F)	172	Specific heat (BTU/lb-°F)	-
Thermal expansion (1/°F)	0.00000552	Electrical conductivity (% IACS)	4.01

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	235	250
Tensile Strength Range (R_m) (ksi)	280	310
Elongation (AL=5 x Ø)	-	14.0%
Brinell Hardness (H)	Unknown	-

Modulus of Elasticity (ksi) (E)	28200	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-6532	AMS-6478	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

Unknown	-	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

AERMET 100

Alloy Steel

Trade Name: Carpenter AerMet® 100

Trade References

UNS:	K92580	EU:	-

Chemical Composition

Fe 71%	Co 13%	Ni 11%	Cr 3%	Mo 1.2%
C 0.2%	-	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.285	Melting Point (°F)	-
Thermal conductivity (BTU-in/hr-ft^2-°F)	172	Specific heat (BTU/lb-°F)	-
Thermal expansion (1/°F)	0.00000552	Electrical conductivity (% IACS)	4.01

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	235	250
Tensile Strength Range (R_m) (ksi)	280	310
Elongation (AL=5 x Ø)	-	14.0%
Brinell Hardness (H)	Unknown	-

Modulus of Elasticity (ksi) (E)	28200	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-6532	AMS-6478	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

Unknown	-	-	-	-
-	-	-	-	-
-	-	-	-	-





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BG42

Alloy Steel

Trade Name: Latrobe Lescalloy® BG42 VIM-VAR High Performance Be

Trade References

UNS:	S42700	EU:	-

Chemical Composition

Fe 78%	Cr 15%	Mo 4%	V 1.2%	C 1.2%
Mn 0.5%	Si 0.3%	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.28	Melting Point (°F)	-
Thermal conductivity (BTU-in/hr-ft^2-°F)	-	Specific heat (BTU/lb-°F)	0.11
Thermal expansion (1/°F)	0.00000613	Electrical conductivity (% IACS)	-

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	Unknown	-
Tensile Strength Range (R_m) (ksi)	Unknown	-
Elongation (AL=5 x Ø)	56.0%	65.0%
Brinell Hardness (H)	Unknown	-

Modulus of Elasticity (ksi) (E)	32000	Machineability General Index	57%

Applicable Specifications

AMS

AMS-5749	-	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

Unknown	-	-	-	-
-	-	-	-	-
-	-	-	-	-





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HP9-4-30

Alloy Steel

Trade Name: Latrobe Lescalloy® HP 9-4-30 VAC-ARC

Trade References

UNS:	K91283	EU:	-

Chemical Composition

Fe 85%	Ni 7.8%	Co 4.5%	Cr 1%	Mo 1%
C 0.3%	Mn 0.2%	V 0.1%	Si 0.05%	P 0.01%
S 0.01%	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.28	Melting Point (°F)	-
Thermal conductivity (BTU-in/hr-ft^2-°F)	-	Specific heat (BTU/lb-°F)	-
Thermal expansion (1/°F)	0.00000630	Electrical conductivity (% IACS)	-

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	180	230
Tensile Strength Range (R_m) (ksi)	86.6	240
Elongation (AL=5 x Ø)	14.0%	15.0%
Brinell Hardness (H)	-	389

Modulus of Elasticity (ksi) (E)	Unknown	Machineability General Index	45%

Applicable Specifications

AMS

AMS-6524	AMS-6526	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-E-399	-	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

Ni135M

Alloy Steel

Trade Name: Latrobe LSS™ 135M Nitriding Steel

Trade References

UNS:	-	EU:	EN 10204

Chemical Composition

Fe 96%	Cr 1.6%	Al 1.2%	Mn 0.6%	C 0.4%
Mo 0.4%	Si 0.3%	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.284	Melting Point (°F)	-
Thermal conductivity (BTU-in/hr-ft^2-°F)	360	Specific heat (BTU/lb-°F)	-
Thermal expansion (1/°F)	0.00000649	Electrical conductivity (% IACS)	-

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	84	100
Tensile Strength Range (R_m) (ksi)	110.2	134.9
Elongation (AL=5 x Ø)	15.0%	16.0%
Brinell Hardness (H)	229	285

Modulus of Elasticity (ksi) (E)	Unknown	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-6470	AMS-6472	AMS-2301	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-A-370	ASTM-A-29	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

1100

Aluminum

Trade Name: Aluminum 1100

Trade References			
UNS:	A91100	EU:	EN AW-1100

Chemical Composition				
Al 99.0% Min	Si 1%	Cu 0.13%	Zn 0.1% Max	Mn 0.05% Max
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.0979	Melting Point (°F)	1200
Thermal conductivity (BTU-in/hr-ft^2-°F)	1540	Specific heat (BTU/lb-°F)	0.216
Thermal expansion (1/°F)	0.00001310	Electrical conductivity (% IACS)	57.47

Mechanical Properties

Property	**Minimum**	**Maximum**
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	1.6	26
Tensile Strength Range (R_m) (ksi)	2.1	34
Elongation (AL=5 x Ø)	5.0%	35.0%
Brinell Hardness (H)	23	55

Modulus of Elasticity (ksi) (E)	10000	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-4062	AMS-T-700	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-210	ASTM-B-221	ASTM-B-241	-	-
-	-	-	-	-
-	-	-	-	-





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1145

Aluminum

Trade Name: Aluminum 1145

Trade References

UNS:	A91145	EU:	-

Chemical Composition

Al 99% Min	Si 0.6% Max	Cu 0.05% Max	Mg 0.05% Max	Mn 0.05% Max
V 0.05% Max	Zn 0.05% Max	Ti 0.03% Max	Other 0.03%	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.0975	Melting Point (°F)	1200
Thermal conductivity (BTU-in/hr-ft^2-°F)	1600	Specific heat (BTU/lb-°F)	0.216
Thermal expansion (1/°F)	0.00001310	Electrical conductivity (% IACS)	61.58

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	5	17
Tensile Strength Range (R_m) (ksi)	7	13
Elongation (AL=5 x Ø)	-	25.0%
Brinell Hardness (H)	21	45

Modulus of Elasticity (ksi) (E)	10000	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-4011	-	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-373	ASTM-B-479	-	-	-
-	-	-	-	-
-	-	-	-	-





Technical Alloy Data Sheet

2014

Aluminum

Trade Name: Aluminum 2014

Trade References

UNS:	A92014	EU:	EN AW-2014

Chemical Composition

Al 93%	Cu 4.5%	Si 0.9%	Mn 0.8%	Fe 0.7% Max
Mg 0.5%	Zn 0.3% Max	Ti 0.2% Max	Cr 0.1% Max	Other 0.2%
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.1	Melting Point (°F)	1060
Thermal conductivity (BTU-in/hr-ft^2-°F)	1340	Specific heat (BTU/lb-°F)	0.21
Thermal expansion (1/°F)	0.00001250	Electrical conductivity (% IACS)	49.4

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	14	61
Tensile Strength Range (R_m) (ksi)	28	72
Elongation (AL=5 x Ø)	-	13.0%
Brinell Hardness (H)	45	135

Modulus of Elasticity (ksi) (E)	10600	Machineability General Index	30%

Applicable Specifications

AMS

AMS-4028	AMS-4029	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-210	ASTM-B-211	ASTM-B-221	ASTM-B-241	ASTM-B-247
-	-	-	-	-
-	-	-	-	-





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2024

Aluminum

Trade Name: Aluminum 2024

Trade References

UNS:	A92024	EU:	EN AW-2024

Chemical Composition

Al 93%	Cu 4.4%	Mg 1.5%	Mn 0.6%	Fe 0.5% Max
Si 0.5% Max	Zn 0.2% Max	Ti 0.2% Max	Cr 0.1% Max	Other 0.1%
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.1	Melting Point (°F)	1060
Thermal conductivity (BTU-in/hr-ft^2-°F)	1340	Specific heat (BTU/lb-°F)	0.209
Thermal expansion (1/°F)	0.00001270	Electrical conductivity (% IACS)	49.4

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	14	41
Tensile Strength Range (R_m) (ksi)	21	70
Elongation (AL=5 x Ø)	-	20.0%
Brinell Hardness (H)	47	135

Modulus of Elasticity (ksi) (E)	10600	Machineability General Index	30%

Applicable Specifications

AMS

AMS-4037	AMS-4120	AMS-4192	AMS-7223	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-209	ASTM-B-210	ASTM-B-211	ASTM-B-221	ASTM-B-241
ASTM-B-316	ASTM-F-467	ASTM-F-468	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

2219

Aluminum

Trade Name: Aluminum 2219

Trade References

UNS:	A92219	EU:	EN AW-2219

Chemical Composition

Al 93%	Cu 6.3%	Mn 0.3%	Fe 0.3% Max	Si 0.2% Max
Zr 18%	Zn 0.1% Max	V 0.1%	Ti 0.1%	Mg 0.02% Max
Other 0.2%	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.103	Melting Point (°F)	1100
Thermal conductivity (BTU-in/hr-ft^2-°F)	1190	Specific heat (BTU/lb-°F)	0.207
Thermal expansion (1/°F)	0.00001240	Electrical conductivity (% IACS)	43.21

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	16	46
Tensile Strength Range (R_m) (ksi)	24.7	69
Elongation (AL=5 x Ø)	-	10.0%
Brinell Hardness (H)	46	130

Modulus of Elasticity (ksi) (E)	10600	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-4066	AMS-4068	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-209	ASTM-B-211	ASTM-B-221	ASTM-B-241	ASTM-B-247
ASTM-B-316	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

4032

Aluminum

Trade Name: Aluminum 4032

Trade References

UNS:	A94032	EU:	EN AW-4032

Chemical Composition

Al 85%	Si 12%	Mg 1%	Fe 1% Max	Cu 0.9%
Ni 0.9%	Zn 0.3%	Cr 0.1%	Other 0.2%	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.0968	Melting Point (°F)	1030
Thermal conductivity (BTU-in/hr-ft^2-°F)	1070	Specific heat (BTU/lb-°F)	0.203
Thermal expansion (1/°F)	0.00001080	Electrical conductivity (% IACS)	39.91

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	-	46
Tensile Strength Range (R_m) (ksi)	54	-
Elongation (AL=5 x Ø)	-	6.1%
Brinell Hardness (H)	-	120

Modulus of Elasticity (ksi) (E)	29000	Machineability General Index	70%

Applicable Specifications

AMS

AMS-4145	AMS-4318	AMS-4319	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-247	-	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

5052

Aluminum

Trade Name: Aluminum 5052

Trade References

UNS:	A95052	EU:	EN AW-5052

Chemical Composition

Al 97%	Mg 2.5%	Fe 0.4% Max	Cr 0.3% Max	Si 0.3% Max
Cu 0.1% Max	Mn 0.1% Max	Zn 0.1% Max	Other 0.2%	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.101	Melting Point (°F)	1160
Thermal conductivity (BTU-in/hr-ft^2-°F)	960	Specific heat (BTU/lb-°F)	0.21
Thermal expansion (1/°F)	0.00001320	Electrical conductivity (% IACS)	34.55

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	28.3	42.1
Tensile Strength Range (R_m) (ksi)	28.3	42.1
Elongation (AL=5 x Ø)	25.0%	30.0%
Brinell Hardness (H)	47	88

Modulus of Elasticity (ksi) (E)	10200	Machineability General Index	30%

Applicable Specifications

AMS

AMS-4004	AMS-4017	AMS-4175	AMS-4178	AMS-4348
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-209	ASTM-B-210	ASTM-B-211	ASTM-B-221	ASTM-B-234
ASTM-B-241	ASTM-B-316	ASTM-B-313	ASTM-B-404	ASTM-B-483
ASTM-B-547	ASTM-B-548	-	-	-





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Technical Alloy Data Sheet

6061

Aluminum

Trade Name: Aluminum 6061

Trade References

UNS:	A96061	EU:	EN AW-6061

Chemical Composition

Al 97%	Mg 1%	Fe 0.7% Max	Si 0.6%	Cu 0.3%
Zn 0.3% Max	Cr 0.2%	Mn 0.2% Max	Ti 0.2%	Other 0.2%
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.0975	Melting Point (°F)	1140
Thermal conductivity (BTU-in/hr-ft^2-°F)	1250	Specific heat (BTU/lb-°F)	0.214
Thermal expansion (1/°F)	0.00001310	Electrical conductivity (% IACS)	47.11

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	8	39
Tensile Strength Range (R_m) (ksi)	16	45
Elongation (AL=5 x Ø)	12.0%	25.0%
Brinell Hardness (H)	30	123

Modulus of Elasticity (ksi) (E)	10000	Machineability General Index	30%

Applicable Specifications

AMS

AMS-4117	AMS-4150	AMS-4173	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-209	ASTM-B-211	ASTM-B-221	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

6063

Aluminum

Trade Name: Aluminum 6063

Trade References

UNS:	A96063	EU:	EN AW-6063

Chemical Composition

Al 98% Max	Mg 0.7%	Si 0.4%	Fe 0.4% Max	Cr 0.1% Max
Cu 0.1% Max	Mn 0.1% Max	Ti 0.1% Max	Zn 0.1%	Other 0.2%
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.0975	Melting Point (°F)	1180
Thermal conductivity (BTU-in/hr-ft^2-°F)	1510	Specific heat (BTU/lb-°F)	0.215
Thermal expansion (1/°F)	0.00001300	Electrical conductivity (% IACS)	57.66

Mechanical Properties

Property	**Minimum**	**Maximum**
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	2	39
Tensile Strength Range (R_m) (ksi)	21	35
Elongation (AL=5 x Ø)	18.0%	33.0%
Brinell Hardness (H)	25	105

Modulus of Elasticity (ksi) (E)	10000	Machineability General Index	30%

Applicable Specifications

AMS

AMS-4156	-	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-221	ASTM-B-241	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

7050

Aluminum

Trade Name: Aluminum 7050

Trade References			
UNS:	A97050	EU:	EN AW-7050

Chemical Composition				
Al 88.8%	Zn 6.2%	Cu 2.3%	Mg 2.25%	Fe <0.15%
Si 0.12%	Zr 0.115%	Mn <0.10%	Ti <0.06%	Cr <0.04%
Other <0.15%	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.102	Melting Point (°F)	1140
Thermal conductivity (BTU-in/hr-ft^2-°F)	1090	Specific heat (BTU/lb-°F)	0.206
Thermal expansion (1/°F)	0.00001280	Electrical conductivity (% IACS)	41.45

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	61	71
Tensile Strength Range (R_m) (ksi)	70	80
Elongation (AL=5 x Ø)	11.0%	13.0%
Brinell Hardness (H)	132	147

Modulus of Elasticity (ksi) (E)	10400	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-4108	AMS-4201	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-247	ASTM-B-316	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

7075

Aluminum

Trade Name: Aluminum 7075

Trade References			
UNS:	A97075	EU:	EN AW-7075

Chemical Composition				
Al 89.25%	Zn 5.6%	Mg 2.5%	Cu 1.6%	Fe <0.50%
Si <0.40%	Mn <0.30%	Cr 0.23%	Ti <0.20%	Other <0.15%
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.102	Melting Point (°F)	1030
Thermal conductivity (BTU-in/hr-ft^2-°F)	1200	Specific heat (BTU/lb-°F)	0.229
Thermal expansion (1/°F)	0.00001300	Electrical conductivity (% IACS)	45.37

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	15.2	68
Tensile Strength Range (R_m) (ksi)	63	83
Elongation (AL=5 x Ø)	11.0%	13.0%
Brinell Hardness (H)	60	150

Modulus of Elasticity (ksi) (E)	10400	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-4044	AMS-4045	AMS-4048	AMS-4049	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-209	ASTM-B-210	ASTM-B-211	ASTM-B-221	ASTM-B-241
ASTM-B-247	ASTM-B-316	ASTM-B-468	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

7085

Aluminum

Trade Name: Aluminum 7085

Trade References

UNS:	-	EU:	EN AW-7085

Chemical Composition

Al 89.02%	Zn 7.5%	Cu 1.65%	Mg 1.6%	Zr 0.115% Fe <0.08%
Si <0.06%	Ti <0.06%	Cr <0.04%	Mn <0.04%	Other 0.15%
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.103	Melting Point (°F)	1480
Thermal conductivity (BTU-in/hr-ft^2-°F)	1200	Specific heat (BTU/lb-°F)	-
Thermal expansion (1/°F)	0.00001280	Electrical conductivity (% IACS)	-

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	71	73
Tensile Strength Range (R_m) (ksi)	Unknown	-
Elongation (AL=5 x Ø)	4.0%	11.0%
Brinell Hardness (H)	Unknown	-

Modulus of Elasticity (ksi) (E)	Unknown	Machineability General Index	Unknown

Applicable Specifications

AMS

AMS-4329	AMS-4470	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-557	ASTM-E-34	ASTM-E-607	ASTM-E-716	ASTM-E-1251
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

C623

Aluminum Bronze

Trade Name: Aluminum Bronze 9%

Trade References

UNS:	C62300	EU:	CW306G

Chemical Composition

Cu 86%	Al 10%	Fe 3%	Mn 0.6% Max	Sn 0.5% Max
Si 0.3% Max	Other 0.5%	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.276	Melting Point (°F)	1900
Thermal conductivity (BTU-in/hr-ft^2-°F)	378	Specific heat (BTU/lb-°F)	0.0896
Thermal expansion (1/°F)	0.00000900	Electrical conductivity (% IACS)	12

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	27	65
Tensile Strength Range (R_m) (ksi)	14	113
Elongation (AL=5 x Ø)	10.0%	46.0%
Brinell Hardness (H)	155	180

Modulus of Elasticity (ksi) (E)	16700	Machineability General Index	50%

Applicable Specifications

AMS

AMS-4635	-	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-150	ASTM-B-124	ASTM-B-283	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

C624

Aluminum Bronze

Trade Name: Aluminum Bronze 11%

Trade References

UNS:	C62400	EU:	-

Chemical Composition

Cu 85%	Al 11%	Fe 3%	Mn 0.3% Max	Si 0.3% Max
Sn 0.2% Max	Other 0.5%	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.269	Melting Point (°F)	1890
Thermal conductivity (BTU-in/hr-ft^2-°F)	407	Specific heat (BTU/lb-°F)	0.0896
Thermal expansion (1/°F)	0.00000917	Electrical conductivity (% IACS)	8

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	47.9	52
Tensile Strength Range (R_m) (ksi)	90.1	105
Elongation (AL=5 x Ø)	12.0%	18.0%
Brinell Hardness (H)	150	240

Modulus of Elasticity (ksi) (E)	16700	Machineability General Index	50%

Applicable Specifications

AMS

Unknown	-	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-150	-	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

C630

Aluminum Nickel Bronze

Trade Name: CDA 630

Trade References			
UNS:	C63000	EU:	CW307G

Chemical Composition				
Cu 82%	Al 10%	Ni 5%	Fe 3%	Mn 2% Max
Zn 0.3% Max	Sn 0.2% Max	Other 0.5%	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.274	Melting Point (°F)	1915
Thermal conductivity (BTU-in/hr-ft^2-°F)	262	Specific heat (BTU/lb-°F)	0.0896
Thermal expansion (1/°F)	0.00000900	Electrical conductivity (% IACS)	7

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	42.5	68
Tensile Strength Range (R_m) (ksi)	14	126
Elongation (AL=5 x Ø)	5.0%	10.0%
Brinell Hardness (H)	187	248

Modulus of Elasticity (ksi) (E)	16700	Machineability General Index	30%

Applicable Specifications

AMS

AMS-4640	-	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-150	ASTM-B-124	ASTM-B-171	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

C642

Aluminum Silicon Bronze

Trade Name: CDA 642

Trade References

UNS:	C64200	EU:	CW301G

Chemical Composition

Cu 91%	Al 7%	Si 2%	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.285	Melting Point (°F)	1820
Thermal conductivity (BTU-in/hr-ft^2-°F)	312	Specific heat (BTU/lb-°F)	0.09
Thermal expansion (1/°F)	0.00001000	Electrical conductivity (% IACS)	8

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	35	45
Tensile Strength Range (R_m) (ksi)	75	102
Elongation (AL=5 x Ø)	9.0%	15.0%
Brinell Hardness (H)	70	100

Modulus of Elasticity (ksi) (E)	16000	Machineability General Index	60%

Applicable Specifications

AMS

AMS-4631	AMS-4634	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-150	ASTM-B-249	-	-	-
-	-	-	-	-
-	-	-	-	-





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Technical Alloy Data Sheet

C954

Aluminum Bronze

Trade Name: CDA 954

Trade References

UNS:	C95400	EU:	-

Chemical Composition

Cu 83%	Al 10.75%	Fe 4.0%	Ni 1.5%	Mn 0.5%
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

Properties

Physical Properties

Density (lb/in^3)	0.269	Melting Point (°F)	1890
Thermal conductivity (BTU-in/hr-ft^2-°F)	409	Specific heat (BTU/lb-°F)	0.1
Thermal expansion (1/°F)	0.00000900	Electrical conductivity (% IACS)	13

Mechanical Properties

Property	Minimum	Maximum
Yield Strength Range ($Rp_{0.2\ Offset}$) (ksi)	29.7	45
Tensile Strength Range (R_m) (ksi)	74.7	105
Elongation (AL=5 x Ø)	-	12.0%
Brinell Hardness (H)	170	195

Modulus of Elasticity (ksi) (E)	16000	Machineability General Index	60%

Applicable Specifications

AMS

AMS-4871	AMS-4873	-	-	-
-	-	-	-	-
-	-	-	-	-

ASTM

ASTM-B-505	ASTM-B-271	-	-	-
-	-	-	-	-
-	-	-	-	-





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