Precision Enterprise Foundry & Machine
1000 E. Precision Drive
Somonauk, Illinois 60552
815.797.1000

Engineering Guide to Alloy Selection

Most Popular Aluminum Alloys and their characteristics

Precision Enterprise Foundry & Machine

1000 E. Precision Drive
Somonauk, Illinois 60552
815.797.1000

ANSI AA 308.0-F
(Permanent Mold)

Former Numbers

Former AA:	A108	UNS:	A03080
Former ASTM:		FedSpec:	
Former SAE:		MilSpec:	

Elemental Composition (%)

Aluminum	(Al):		Nickel	(Ni):	
Beryllium	(Be):		Silicon	(Si):	5.0-6.0
Cobalt	(Co):		Silver	(Ag):	
Chromium	(Cr):		Tin	(Sn):	
Copper	(Cu):	4.0-5.0	Titanium	(Ti):	0.25
Iron	(Fe):	1.0	Vanadium	(V):	
Magnesium	(Mg):	0.10	Zinc	(Zn):	1.00
Manganese	(Mn):	0.50	Zirconium	(Zr):	
Other:					

Physical Properties

Specific Gravity:	2.79
Density:	0.101 lb/in^3
Melting Temperature:	970-1140 °F
Electrical Conductivity (% IACS):	37
Thermal Conductivity (@ 25 °C, SI units):	0.34
Coef. of Thermal Expansion (68-212 °F):	11.9/°F x 10^{-6}

Mechanical Properties

Modulus of Elasticity:	
Tensile Strength (Ultimate):	28 ksi
Tensile Strength (Yield):	16 ksi
Compressive Strength (Yield):	17 ksi
Shear Strength:	22 ksi
Endurance Limit:	13 ksi
Elongation (% in 2 inches):	2.0
Hardness (BHN)	70

Heat Treatment (Temper)

F - AS CAST
Cool from mold in still air at roome temperature

Important Characteristics

Typical Applications

General purpose permanent mold castings, ornamental grilles and reflectors

ANSI AA 319.0-F
(Sand)

Former Numbers

Former AA:	319 Allcast	UNS:	A03190
Former ASTM:	SC64D	FedSpec:	319
Former SAE:	326	MilSpec:	

Elemental Composition (%)

Aluminum	(Al):		Nickel	(Ni):	0.35
Beryllium	(Be):		Silicon	(Si):	5.5-6.5
Cobalt	(Co):		Silver	(Ag):	
Chromium	(Cr):		Tin	(Sn):	
Copper	(Cu):	3.0-4.0	Titanium	(Ti):	0.25
Iron	(Fe):	1.0	Vanadium	(V):	
Magnesium	(Mg):	0.10	Zinc	(Zn):	1.0
Manganese	(Mn):	0.50	Zirconium	(Zr):	
Other:					

Physical Properties

Specific Gravity:	2.79
Density:	0.101 lb/in^3
Melting Temperature:	970-1120 °F
Electrical Conductivity (% IACS):	27
Thermal Conductivity (@ 25 °C, SI units):	0.27
Coef. of Thermal Expansion (68-212 °F):	12.0/°F x 10^{-6}

Mechanical Properties

Modulus of Elasticity:	10.7 x 10^6 psi
Tensile Strength (Ultimate):	27 ksi
Tensile Strength (Yield):	18 ksi
Compressive Strength (Yield):	19 ksi
Shear Strength:	22 ksi
Endurance Limit:	10 ksi
Elongation (% in 2 inches):	2.0
Hardness (BHN)	70

Heat Treatment (Temper)

F - AS CAST
Cool from mold in still air at room temperature

Important Characteristics

Typical Applications

Engine crankcases, gas and oil tanks, engine oil pans, typewriter frames, engine parts

Precision Enterprise Foundry & Machine

1000 E. Precision Drive
Somonauk, Illinois 60552
815.797.1000

ANSI AA 356.0-T6
(Sand)

Former Numbers

Former AA:	356	UNS:	A03560
Former ASTM:	SG70A	FedSpec:	356
Former SAE:	323	MilSpec:	

Elemental Composition (%)

Aluminum	(Al):		Nickel	(Ni):	
Beryllium	(Be):		Silicon	(Si):	6.5-7.5
Cobalt	(Co):		Silver	(Ag):	
Chromium	(Cr):		Tin	(Sn):	
Copper	(Cu):	0.25	Titanium	(Ti):	0.25
Iron	(Fe):	0.6	Vanadium	(V):	
Magnesium	(Mg):	0.20-0.45	Zinc	(Zn):	0.35
Manganese	(Mn):	0.35	Zirconium	(Zr):	
Other:					

Physical Properties

Specific Gravity:	2.68
Density:	0.097 lb/in^3
Melting Temperature:	1040-1140 °F
Electrical Conductivity (% IACS):	39
Thermal Conductivity (@ 25 °C, SI units):	0.36
Coef. of Thermal Expansion (68-212 °F):	11.9/°F x 10^{-6}

Mechanical Properties

Modulus of Elasticity:	10.5 x 10^6 psi
Tensile Strength (Ultimate):	33 ksi
Tensile Strength (Yield):	24 ksi
Compressive Strength (Yield):	25 ksi
Shear Strength:	26 ksi
Endurance Limit:	8.5 ksi
Elongation (% in 2 inches):	3.5
Hardness (BHN)	70

Heat Treatment (Temper)

T6 - SOLUTION HEAT TREAT, QUENCH, AGE ARTIFICIALLY
Heat to 1000 °F and hold for 12 hours; quench in water at 150-212 °F; age at 310 °F for 3-5 hours

Important Characteristics

If iron content exceeds 0.45%, manganese content shall not be less than one-half the iron content

Typical Applications

Flywheel castings, automotive transmission cases, oil pans, pump bodies

ANSI AA 356.0-T6
(Permanent Mold)

Former Numbers

Former AA:	356	UNS:	A03560
Former ASTM:	SG70A	FedSpec:	356
Former SAE:	323	MilSpec:	

Elemental Composition (%)

Aluminum	(Al):		Nickel	(Ni):	
Beryllium	(Be):		Silicon	(Si):	6.5-7.5
Cobalt	(Co):		Silver	(Ag):	
Chromium	(Cr):		Tin	(Sn):	
Copper	(Cu):	0.25	Titanium	(Ti):	0.25
Iron	(Fe):	0.6	Vanadium	(V):	
Magnesium	(Mg):	0.20-0.45	Zinc	(Zn):	0.35
Manganese	(Mn):	0.35	Zirconium	(Zr):	
Other:					

Physical Properties

Specific Gravity:	2.68
Density:	0.097 lb/in^3
Melting Temperature:	1040-1140 °F
Electrical Conductivity (% IACS):	41
Thermal Conductivity (@ 25 °C, SI units):	0.37
Coef. of Thermal Expansion (68-212 °F):	11.9/°F x 10^{-6}

Mechanical Properties

Modulus of Elasticity:	10.5 x 10^6 psi
Tensile Strength (Ultimate):	38 ksi
Tensile Strength (Yield):	27 ksi
Compressive Strength (Yield):	27 ksi
Shear Strength:	30 ksi
Endurance Limit:	13 ksi
Elongation (% in 2 inches):	5.0
Hardness (BHN)	80

Heat Treatment (Temper)

T6 - SOLUTION HEAT TREAT, QUENCH, AGE ARTIFICIALLY
Heat to 1000 °F and hold for 4-12 hours; quench in water at 150-212 °F; age at 310 °F for 2-5 hours

Important Characteristics

If iron content exceeds 0.45%, manganese content shall not be less than one-half the iron content

Typical Applications

Machine tool parts, aircraft wheels, airframe castings, bridge railings

Precision Enterprise Foundry & Machine

1000 E. Precision Drive
Somonauk, Illinois 60552
815.797.1000

ANSI AA 535.0-F
(Sand)

Former Numbers

Former AA:	Almag 35	UNS:	A05350
Former ASTM:	GM70B	FedSpec:	Almag 35
Former SAE:		MilSpec:	

Elemental Composition (%)

Aluminum	(Al):		Nickel	(Ni):	
Beryllium	(Be):	0.003-0.007	Silicon	(Si):	0.15
Cobalt	(Co):		Silver	(Ag):	
Chromium	(Cr):		Tin	(Sn):	
Copper	(Cu):	0.15	Titanium	(Ti):	0.25
Iron	(Fe):	0.50	Vanadium	(V):	
Magnesium	(Mg):	3.5-4.5	Zinc	(Zn):	0.15
Manganese	(Mn):	0.35	Zirconium	(Zr):	
Other:	Boron (B):	0.0005 max			

Physical Properties

Specific Gravity:	2.62
Density:	0.095 lb/in^3
Melting Temperature:	1020-1165 °F
Electrical Conductivity (% IACS):	23
Thermal Conductivity (@ 25 °C, SI units):	0.23
Coef. of Thermal Expansion (68-212 °F):	13.1/°F x 10^{-6}

Mechanical Properties

Modulus of Elasticity:	
Tensile Strength (Ultimate):	35 ksi
Tensile Strength (Yield):	18 ksi
Compressive Strength (Yield):	
Shear Strength:	
Endurance Limit:	
Elongation (% in 2 inches):	9.0
Hardness (BHN)	60-90

Heat Treatment (Temper)

F - AS CAST
Cool naturally from mold in still air at room temperature

Important Characteristics

Typical Applications

ANSI AA 535.0-T5
(Sand)

Former Numbers

Former AA:	Almag 35	UNS:	A05350
Former ASTM:	GM70B	FedSpec:	Almag 35
Former SAE:		MilSpec:	

Elemental Composition (%)

Aluminum	(Al):		Nickel	(Ni):	
Beryllium	(Be):	0.003-0.007	Silicon	(Si):	0.15
Cobalt	(Co):		Silver	(Ag):	
Chromium	(Cr):		Tin	(Sn):	
Copper	(Cu):	0.15	Titanium	(Ti):	0.25
Iron	(Fe):	0.50	Vanadium	(V):	
Magnesium	(Mg):	3.5-4.5	Zinc	(Zn):	0.15
Manganese	(Mn):	0.35	Zirconium	(Zr):	
Other:	Boron (B):	0.0005 max			

Physical Properties

Specific Gravity:	2.62
Density:	0.095 lb/in^3
Melting Temperature:	1020-1165 °F
Electrical Conductivity (% IACS):	23
Thermal Conductivity (@ 25 °C, SI units):	0.23
Coef. of Thermal Expansion (68-212 °F):	13.1/°F x 10^{-6}

Mechanical Properties

Modulus of Elasticity:	
Tensile Strength (Ultimate):	35 ksi
Tensile Strength (Yield):	18 ksi
Compressive Strength (Yield):	
Shear Strength:	
Endurance Limit:	
Elongation (% in 2 inches):	9.0
Hardness (BHN)	60-90

Heat Treatment (Temper)

T5 - COOL NATURALLY FROM MOLD; AGE ARTIFICIALLY
Cool naturally from the mold at room temperature; age artificially at 750 °F for 5 hours; cool outside the furnace in still air; no quench is required

Important Characteristics

The T5 temper imparts improved mechanical properties and dimensional stability. Mechanical properties are the same for both the F and T5 tempers

Typical Applications

Applications where dimensional stability is important, such as instrument parts

Precision Enterprise Foundry & Machine
1000 E. Precision Drive
Somonauk, Illinois 60552
815.797.1000

ANSI AA B535.0-F
(Sand)

Former Numbers

Former AA:	B218	UNS:	
Former ASTM:		FedSpec:	
Former SAE:		MilSpec:	

Elemental Composition (%)

Aluminum	(Al):		Nickel	(Ni):	
Beryllium	(Be):		Silicon	(Si):	0.15
Cobalt	(Co):		Silver	(Ag):	
Chromium	(Cr):		Tin	(Sn):	
Copper	(Cu):	0.10	Titanium	(Ti):	0.10-0.25
Iron	(Fe):	0.15	Vanadium	(V):	
Magnesium	(Mg):	6.5-7.5	Zinc	(Zn):	
Manganese	(Mn):	0.05	Zirconium	(Zr):	
Other:					

Physical Properties

Specific Gravity:	2.62
Density:	0.095 lb/in^3
Melting Temperature:	1020-1170 °F
Electrical Conductivity (% IACS):	24
Thermal Conductivity (@ 25 °C, SI units):	0.23
Coef. of Thermal Expansion (68-212 °F):	13.6/°F x 10^{-6}

Mechanical Properties

Modulus of Elasticity:	
Tensile Strength (Ultimate):	
Tensile Strength (Yield):	
Compressive Strength (Yield):	
Shear Strength:	
Endurance Limit:	
Elongation (% in 2 inches):	
Hardness (BHN)	

Heat Treatment (Temper)

F - AS CAST
Cool naturally from mold in still air at room temperature

Important Characteristics

Typical Applications

ANSI AA 705.0-F
(Sand)

Former Numbers

Former AA:	603, Ternalloy 5	UNS:	A07050
Former ASTM:	ZG32A	FedSpec:	Ternalloy 5
Former SAE:	311	MilSpec:	

Elemental Composition (%)

Aluminum	(Al):		Nickel	(Ni):	
Beryllium	(Be):		Silicon	(Si):	0.20
Cobalt	(Co):		Silver	(Ag):	
Chromium	(Cr):	0.20-0.40	Tin	(Sn):	
Copper	(Cu):	0.20	Titanium	(Ti):	0.25
Iron	(Fe):	0.8	Vanadium	(V):	
Magnesium	(Mg):	1.4-1.8	Zinc	(Zn):	2.7-3.3
Manganese	(Mn):	0.40-0.6	Zirconium	(Zr):	
Other:					

Physical Properties

Specific Gravity:	2.76
Density:	0.100 lb/in^3
Melting Temperature:	1110-1180 °F
Electrical Conductivity (% IACS):	25
Thermal Conductivity (@ 25 °C, SI units):	0.25
Coef. of Thermal Expansion (68-212 °F):	13.1/°F x 10^{-6}

Mechanical Properties

Modulus of Elasticity:	
Tensile Strength (Ultimate):	30 ksi
Tensile Strength (Yield):	17 ksi
Compressive Strength (Yield):	
Shear Strength:	
Endurance Limit:	
Elongation (% in 2 inches):	5.0
Hardness (BHN)	50-80

Heat Treatment (Temper)

F - AS CAST
Cool naturally from mold in still air at room temperature

Important Characteristics

Typical Applications

Precision Enterprise Foundry & Machine

1000 E. Precision Drive
Somonauk, Illinois 60552
815.797.1000

ANSI AA 712.0-T5
(Sand)

Former Numbers

Former AA:	D712.0	UNS:	A07120
Former ASTM:	ZG61A	FedSpec:	40E
Former SAE:	310	MilSpec:	

Elemental Composition (%)

Aluminum (Al):		Nickel (Ni):	
Beryllium (Be):		Silicon (Si):	0.30
Cobalt (Co):		Silver (Ag):	
Chromium (Cr):	0.40-0.6	Tin (Sn):	
Copper (Cu):	0.35-0.65	Titanium (Ti):	0.15-0.25
Iron (Fe):	0.50	Vanadium (V):	
Magnesium (Mg):	0.5-0.65	Zinc (Zn):	5.0-6.5
Manganese (Mn):	0.10	Zirconium (Zr):	
Other:			

Physical Properties

Specific Gravity:	2.82
Density:	0.102 lb/in^3
Melting Temperature:	1110-1180 °F
Electrical Conductivity (% IACS):	40
Thermal Conductivity (@ 25 °C, SI units):	0.38
Coef. of Thermal Expansion (68-212 °F):	13.1/°F x 10^{-6}

Mechanical Properties

Modulus of Elasticity:	
Tensile Strength (Ultimate):	34 ksi
Tensile Strength (Yield):	25 ksi
Compressive Strength (Yield):	
Shear Strength:	
Endurance Limit:	
Elongation (% in 2 inches):	4.0
Hardness (BHN)	60-90

Heat Treatment (Temper)

T5 - COOL NATURALLY FROM MOLD; AGE NATURALLY
Cool naturally from mold in still air at room temperature; age at room temperature for 21 days.

Important Characteristics

The T5 temper imparts improved mechanical properties and dimensional stability. Mechanical properties are the same for both the F and T5 tempers.

Typical Applications

ANSI AA 713.0-F
(Sand)

Former Numbers

Former AA:	613, Tenzalloy	UNS:	A07130
Former ASTM:	ZC81A	FedSpec:	Tenzalloy
Former SAE:	315	MilSpec:	

Elemental Composition (%)

Aluminum (Al):		Nickel (Ni):	0.15
Beryllium (Be):		Silicon (Si):	0.25
Cobalt (Co):		Silver (Ag):	
Chromium (Cr):	0.35	Tin (Sn):	
Copper (Cu):	0.40-1.0	Titanium (Ti):	0.25
Iron (Fe):	1.1	Vanadium (V):	
Magnesium (Mg):	0.20-0.50	Zinc (Zn):	7.0-8.0
Manganese (Mn):	0.6	Zirconium (Zr):	
Other:			

Physical Properties

Specific Gravity:	2.84
Density:	0.104 lb/in^3
Melting Temperature:	1100-1170 °F
Electrical Conductivity (% IACS):	37
Thermal Conductivity (@ 25 °C, SI units):	0.37
Coef. of Thermal Expansion (68-212 °F):	13.3/°F x 10^{-6}

Mechanical Properties

Modulus of Elasticity:	
Tensile Strength (Ultimate):	32 ksi
Tensile Strength (Yield):	22 ksi
Compressive Strength (Yield):	
Shear Strength:	
Endurance Limit:	
Elongation (% in 2 inches):	3.0
Hardness (BHN)	60-90

Heat Treatment (Temper)

F - AS CAST
Cool naturally from mold in still air at room temperature

Important Characteristics

The T5 temper imparts improved mechanical properties and dimensional stability. Mechanical properties are the same for both the F and T5 tempers.

Typical Applications

Automotive parts, trailer parts, pumps, mining equipment