

**General Information—Chemical Compositions, Mechanical and Physical  
Properties of SAE Aluminum Casting Alloys**

**Foreword**—This Document has not changed other than to put it into the new SAE Technical Standards Board Format.

**1. Scope**—The SAE Standards for aluminum casting alloys cover a wide range of castings for general and special use, but do not include all the alloys in commercial use. Over the years, aluminum alloys have been identified by many numbering systems as shown in Table 1. Presently, SAE is recommending the use of the UNS Numbering System to identify these materials. The castings are made principally by sand cast, permanent mold, or die cast methods; however, shell molding, investment casting, plaster cast, and other less common foundry methods may also be used. If the alloys listed do not have the desired characteristics, it is recommended that the manufacturers of aluminum castings be consulted.

**2. References**

**2.1 Applicable Publications**—The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated the latest revision of SAE publications shall apply.

**2.1.1 ASTM PUBLICATIONS**—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM E 29—Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

ASTM E 34—Test Method for Chemical Analysis of Aluminum and Aluminum Alloys

ASTM E 117—Method for Spectrographic Analysis of Pig Lead by the Point-to-Plane Technique

ASTM B 557—Methods of Tension Testing Wrought and Cast Aluminum and Magnesium Alloy Products

**3. Casting Types—General**—There are two general types of cast aluminum alloys: nonheat treatable and heat treatable. The nonheat treatable alloys normally are used in the as-cast condition (F), but may be annealed—temper designation (O)—to relieve casting stresses or to reduce the possibility of distortion during machining.

The heat treatable alloys usually are used in a heat treated condition because of the increased strengths resulting from the heat treatment. These treatments generally consist of a high temperature solution treatment, followed by quenching in water, and a low temperature aging treatment (T6).

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**SAE J452 Revised DEC2003**

**TABLE 1—TYPICAL USES OF SAE ALUMINUM CASTING ALLOYS AND SIMILAR SPECIFICATIONS**

Alloy Designations			Type of Casting (1)	Similar Specifications			Typical Uses and General Data
UNS	ANSI	Former SAE		ASTM	Federal	AMS	
A02010	201.0	382	S	B26	—	—	Very high strength at room and elevated temperature; good impact strength and ductility; high cost premium casting alloy.
			PM	—	—	4229	
A02060	206.0	—	S	—	—	4237	High tensile and yield strength with moderate ductility; good fracture toughness in T4 temper, structural parts for automotive and aerospace applications.
			PM	—	—	—	
A02080	208.0	380	S	B26	QQ-A-601	—	Manifolds, valve bodies, and similar castings requiring pressure tightness.
			PM	B108	—	—	
A02220	222.0	34	S	B26	QQ-A-601	—	Primarily a piston alloy, but also used for aircooled cylinder heads and valve tappet guides.
			PM	B108	QQ-A-596	—	
A02420	242.0	39	S	B26	QQ-A-601	4222	Used primarily for aircooled cylinder heads, but also for pistons in high performance gasoline engines.
			PM	B108	QQ-A-596	—	
A02950	295.0	38	S	B26	QQ-A-601	4231	General structural castings requiring high strength and shock resistance.
A02960	296.0	—	PM	B108	QQ-A-596	4282	Modification of alloy 295.0 for use in permanent molds.
A03190	319.0	326	S	B26	QQ-A-601	—	General purpose low-cost alloy; good foundry characteristics.
			PM	B108	QQ-A-596	—	
A23190	B319.0	329	S	—	—	—	General purpose alloy similar to 319.0, but with lower ductility and improved machinability.
			PM	—	—	—	
A03280	328.0	327	S	B26	QQ-A-601	—	Similar to alloys 355.0 and 356.0, but lower ductility.
A03320	332.0	332	PM	B108	QQ-A-596	—	Primarily used for automotive and compressor pistons.
A03330	333.0	331	PM	B108	QQ-A-596	—	General purpose low-cost permanent mold alloy used for engine parts, motor housings, flywheel housings, and regulator parts.
A03360	336.0	321	PM	B108	QQ-A-596	—	Piston alloy having low expansion.
A03390	339.0	334	PM	—	—	—	Piston alloy.
A03540	354.0	—	PM	B108	—	—	High strength premium quality casting alloy.
				B686	—	—	
A03550	355.0	322	S	B26	QQ-A-601	4210	General use where high strength, medium ductility, and pressure tightness are required, such as pump bodies and liquid-cooled cylinder heads.
			PM	B108	QQ-A-596	4212	
				—	—	4214	
				—	—	4280	
				—	—	4281	
A33550	C355.0	335	S	B26	QQ-A-601	4215	Similar to alloy 355.0, but has greater ductility.
			PM	B108	QQ-A-596	—	
				B686	—	—	
A03560	356.0	323	S	B26	QQ-A-601	4217	For intricate castings requiring good strength and ductility.
			PM	B108	QQ-A-596	4284	
				—	—	4286	
A13560	A356.0	336	S	B26	QQ-A-601	4218	Similar to alloy 356.0, but has greater ductility.
			PM	B108	QQ-A-596	—	
				B686	—	—	
A03570	357.0	—	S	—	—	—	Similar to alloy A357.0, but has greater ductility.
			PM	B108	QQ-A-596	—	
A13570	A357.0	—	S	—	—	4219	High strength structural alloy with good ductility.
			PM	B108	—	—	
A03590	359.0	—	S	—	—	—	High strength structural alloy with good ductility.
			PM	B108	—	—	

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Alloy Designations			Type of Casting (1)	Similar Specifications			Typical Uses and General Data
UNS	ANSI	Former SAE		ASTM	Federal	AMS	
A03600	360.0	—	D	B85	—	—	Very good casting characteristics; good corrosion resistance; used in place of alloy 413 where higher mechanical properties are required.
A13600	A360.0	309	D	B85	QQ-A-591	4290	Excellent casting characteristics; suited for use in thin-walled or intricate castings produced in cold-chamber casting machine; high corrosion resistance; slightly higher mechanical properties than alloy 360.0.
A03800	380.0	308	D	B85	QQ-A-591	—	Similar to alloy A380.0, but suitable for use in either cold-chamber or gooseneck machines.
A13800	A380.0	306	D	B85	QQ-A-591	4291	Good casting characteristics and fair resistance to corrosion; not especially suited for thin sections; limited to cold-chamber machines.
A03830	383.0	383	D	B85	QQ-A-591	—	Similar to alloy 380.0, but with improved castability.
A03840	384.0	303	D	B85	QQ-A-591	—	General purpose alloy with high fluidity; used for thin-walled castings or castings with large areas.
A03900	390.0	—	D	—	—	—	High wear resistance; used for cylinder blocks, transmission pump and air compressor housings, small engine crankcases, and air conditioner pistons.
A13900	A390.0	—	S	—	—	—	Similar to 390.0, but formulated for sand and permanent mold casting.
A23900	B390.0	—	PM	—	—	—	
A04130	413	—	D	—	—	—	Similar to alloy 390.0.
A04130	413	—	D	B85	—	—	Good for large thin-wall die castings, difficult to machine and finish.
A14130	A413.0	305	D	B85	QQ-A-591	—	High corrosion resistance; excellent castability; used for complicated castings with thin sections, also difficult to machine and finish.
A24430	B443.0	35	S	B26	QQ-A-601	—	Used for intricate castings having thin sections; good corrosion resistance; fair strength and good ductility.
A24430	B443.0	35	PM	B108	QQ-A-596	—	
A34430	C443.0	304	D	B85	QQ-A-591	—	Good casting characteristics and resistance to corrosion.
A14440	A444.0	—	S	—	—	—	Good castability; excellent ductility for impact absorption; used for bridge railing posts and turbocharger compressor housings.
A05140	514.0	320	S	B26	QQ-A-601	—	Moderate strength; very high corrosion resistance.
A05200	520.0	324	S	B26	QQ-A-601	4240	High strength structural alloy; requires special foundry and heat treat practice; susceptible to stress corrosion failure.
A05350	535.0	—	S	B26	QQ-A-601	—	Excellent shock and corrosion resistance, dimensional stability, and machinability; used in computer components, frame sections, optical equipment, and applications where stress rupture is a factor.
A07050	705.0	311	S	B26	QQ-A-601	—	High strength general purpose alloy; excellent machinability and dimensional stability; high corrosion resistance; can be anodized.
A07050	705.0	311	PM	B108	QQ-A-596	—	
A07070	707.0	312	S	B26	QQ-A-601	—	Similar to alloy 705.0, but higher strength and lower ductility.
A07070	707.0	312	PM	B108	QQ-A-596	—	
A07100	710.0	313	S	B26	QQ-A-601	—	High strength general purpose alloy similar to alloys 705.0 and 707.0; easily polished.
A07120	712.0	310	S	B26	QQ-A-601	—	General purpose structural castings developing strengths equivalent to alloy 295.0 without requiring heat treatment, but casting characteristics slightly poorer than alloy 295.0.
A07130	713.0	315	S	B26	QQ-A-601	—	Similar to alloy 710.0.
A07130	713.0	315	PM	B108	QQ-A-596	—	

1. S—sand cast; PM—permanent mold; D—die cast.