

Deltalloy® 4032

Understanding Cold Finished Aluminum Alloys

Alcoa Deltalloy® 4032, a cold finished aluminum wrought product, is suggested for applications requiring wear and abrasion resistance. Because of its superior wear resistance, Deltalloy® 4032 eliminates the need for hard coat anodizing commonly required in applications using 6061 and 6262 alloys. Superior wear and abrasion resistance of this alloy is achieved through high silicon and nickel content.

Applications include brake master cylinders, transmission valves, copier parts, bushings for rack and pinion steering systems, sound recording devices, bearings, hydraulic applications and forged pistons.

Machining

Deltalloy® 4032 offers excellent machinability and drilling characteristics when using single-point or multi-spindle screw machines. Excellent surface finish has been obtained using polycrystalline or carbide tooling. Roll threading is recommended, but cut threading can be performed with appropriate tooling (special roll thread tooling may be required). The alloy is rated “B” on the Aluminum Association machinability rating system.

Wear Resistance

Due to the high silicon content of Deltalloy® 4032, superior wear resistance is obtained. The addition of nickel allows the formation of second phase particles which further enhances the wear resistance. This eliminates the need for hard coat anodizing typically used for 6XXX series alloys and the environmental issues associated with anodizing.

Deltalloy® 4032 non-anodized brake pistons were stoke tested for approximately 500K cycles. The maximum amount of wear on the lands was .0008 inches. This result shows that Deltalloy® 4032 is equal to or better than equally stroked, hard-coat anodized 6262 brake pistons. Testing method: SAE Stroke Test J1153.

The properties listed in this Alloy Data Sheet represent the best current information for this alloy. In each specific application, the user is expected to evaluate and test the alloy, temper and finishing method. Deltalloy® 4032-T651 complies with AMS 4319 material specifications. Consult the Material Safety Data Sheet (MSDS) for proper safety and handling precautions when using Deltalloy® 4032.

Deltalloy® 4032 Temper Designations and Definitions	
Standard Tempers	Standard Temper Definitions*
T6, T651	Solution heat-treated and artificially aged. Applies to products that are not cold worked after solution heat-treatment, or in which the effect of cold work in flattening or straightening may not be recognized in mechanical properties. Temper -T651 applies to products that are stress-relieved by stretching.

*For further details of definitions, see Aluminum Association’s [Aluminum Standards and Data](#) manual and [Temper for Aluminum and Aluminum Alloy Products](#).

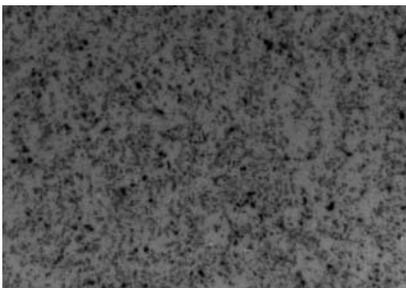


Figure 1. Composition of Alcoa Deltalloy® 4032 cold finished part exhibits exceptionally homogeneous structure. Fine size and evenly spaced silicon and nickel particles ensure in-service wear resistance while providing excellent screw machining productivity.

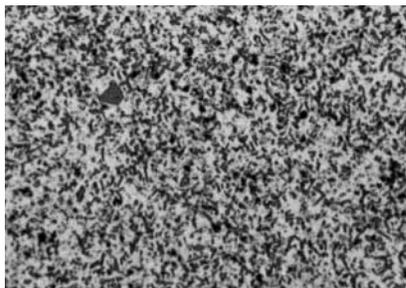


Figure 2. Conventional extruded 4XXX series aluminum characterized by large, coarse particles and a non-homogeneous structure. this situation results in inconsistent wear and productivity.

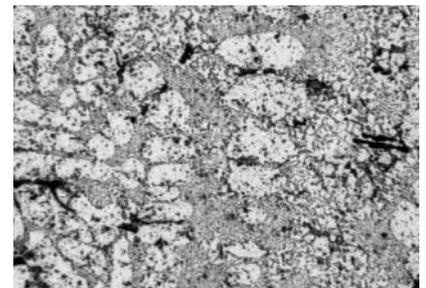


Figure 3. Typical heterogeneous structure of conventional cast 4XXX series aluminum part. The resultant “hard” and “soft” spots increase susceptibility to part fracture and tool damage.

Deltalloy® 4032 Chemical Analysis Liquidus Temperature: 1060°F Solidus Temperature: 990°F Density: 0.097 lb./in.³

Percent Weight	Elements											
	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Others Each	Others Total	Aluminum
Minimum	11.0	—	.50	—	.8	—	.50	—	—	—	—	—
Maximum	13.5	1.0	1.3	—	1.3	.10	1.3	.25	—	.05	.15	Remainder

Average Coefficient of Thermal Expansion (68° to 212° F) = 10.8×10^{-6} (inch per inch per °F)

Deltalloy® 4032 Global Cold Finished Products Capabilities and Mechanical Property Limits

Temper	Specified Section or Wall Thickness ² (inches)	Tensile Strength (ksi)		Elongation ³ Percent Min. in 2 inch or 4D ⁴	Typical Brinell Hardness (500 kg load/10 mm ball)	Typical Ultimate Shearing Strength (ksi)	Typical Electrical Conductivity (%IACS)
		Ultimate	Yield (0.2% offset)				
		Min.	Min.				
Standard Tempers¹							
T6	.500 – 4.00	52.0	48.0	4.0	121	32	35
T6	4.001 – 6.000	52.0	48.0	5.0	121	32	35
T651	.750 – 4.00	52.0	48.0	7.0	121	32	35
T651	4.001 – 6.000	52.0	48.0	5.0	121	32	35

① The mechanical property limits for standard tempers are listed in the “standards section” of the Aluminum Association’s Aluminum Standards and Data manual and Tempers for Aluminum and Aluminum Alloy Products. ② The thickness of the cross section from which the tension test specimen is taken determines the applicable mechanical properties. ③ For material of such dimensions that a standard test specimen cannot be obtained, or for shapes thinner than 0.062”, the test for elongation is not required. ④ D = Specimen diameter.

Deltalloy® 4032 - Suggested Machining Parameters

Speed:	330-550 SFM (Surface feet per minute)
Feed: Form Tools ¹	.002-.003 IPR
Drills ¹	.008-.010 IPR
Top Rake:	5-8 Degrees
Slide Rake:	2-2.5 Degrees
End Relief:	2-3 Degrees

① Suggested grade of carbide for tooling is C4. A coated carbide is preferred over uncoated carbide. (Diamond coatings, AlTi-N coatings)



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