

Super High-Strength Al Alloy 7042

A UES PRODUCT

Super Strong and Tough Cast-and-Wrought Aluminum Alloy

TECHNOLOGY HIGHLIGHTS

- The alloy 7042 in T6 temper (7042-T6) has excellent strength and toughness in the temperature range from -450°F to 250°F
- Direct chill cast 7042-T6 has mechanical properties which are similar to the properties of 7075-T6 or 7050-T74 forgings, at superior stress-corrosion resistance
- Extruded 7042-T6 products have ~30% higher specific strength than Ti alloys
- Forged products made of 7042-T6 are 25-35% stronger and tougher than similar forgings made of 7075-T6 and 7050-T74

7042

➤ **Currently available in two conditions:**

- **Direct chill cast billets (F temper)**
- **Extruded bars (T6 temper)**

➤ **Requests for forged or rolled products can also be negotiated on individual basis**

7042-T6: Typical Tensile Properties of DC Cast Products

Product	Temperature °F	Ultimate ksi	Yield ksi	Elongation %
3.0-inch diameter billets	-321	102.2	91.3	7
	73	86.2	73.9	12
7.0-inch diameter billets	-321	99.3	89.9	3
	73	85.5	73.0	12

7042-T6: Typical Tensile Properties (Longitudinal) of Extruded Products

Extrusion Ratio	Diameter inches	Tensile				Fatigue	Toughness	Hardness
		Temperature °F	Ultimate ksi	Yield ksi	Elongation %	Endurance Limit, ¹ ksi	K _{1C} , ksi√in	Rockwell C
16:1	0.75	-321	132.3	128.2	9	-	37.3	-
		73	104.2	96.4	15	42.8	43.6	20
6:1	3.0	-321	128.1	121.4	9			-
		73	101.6	93.5	15			15
11:1	6.0	-321	120.0	108.1	13			-
		73	97.2	88.6	14			15
19:1	Tubing 0.752 ID x 0.937 OD	-321	126.2	118.0	9			
		73	101.2	94.5	12	Burst Pressure = 27,000 psig		

¹ In 10⁷ cycles, R=0.1, axially loaded specimens

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Chemical Composition Limits

Weight %	Main Elements									Others	
	Si	Fe	Cu	Mn	Mg	Zn	Cr	Sc	Zr	Each	Total
Minimum	0.01	0.01	1.3	0.20	2.0	6.5	0	0.18	0.11	-	-
Maximum	0.20	0.20	1.9	0.40	2.8	7.9	0.05	0.50	0.20	0.05	0.15

7042-T6: Typical Mechanical Properties of Forged Product (15 to 27 lb)

Temperature °F	Tensile			Fatigue	Toughness	Hardness
	Ultimate ksi	Yield ksi	Elongation %	Endurance Limit, ¹ ksi	K _{1C} , ksi√in	Rockwell B
-452	116.7	103.6	6	-	21.7	-
-321	102.9	91.3	6	50.7	21.7	-
73	87.2	76.1	13	46.4	31.7	94

¹ In 10⁷ cycles, R=0.1, axially loaded specimens

7042-T6: Typical Tensile Properties of Small Forgings (up to 4.5 lbs)

Temperature °F	Ultimate ksi	Yield ksi	Elongation %
-321	113.0	100.0	8
73	90.9	81.9	12

7042-T6: Physical and Elastic Properties

Characteristic	Temperature °F / K	Value (British Units)	Value (Metric Units)
Nominal Density	73 / 296	176.0 lb ft ⁻³	2.82 g cm ⁻³
Melting Range	950-1175 / 783-908	968-1175 °F	793 K-908 K
Coefficient of Thermal Expansion	-369 / 50	5.56x10 ⁻³ °F ⁻¹	10x10 ⁻³ K ⁻¹
	-234 / 125	8.33x10 ⁻³ °F ⁻¹	15x10 ⁻³ K ⁻¹
	-117 / 190	11.1x10 ⁻³ °F ⁻¹	20x10 ⁻³ K ⁻¹
	45-85 / 280-303	13.0x10 ⁻³ °F ⁻¹	23.4x10 ⁻³ K ⁻¹
Thermal Conductivity	-274 / 103	39.3 BTUhr ⁻¹ ft ⁻¹ °F ⁻¹	68 W m ⁻¹ K ⁻¹
	-96 / 202	58.9 BTUhr ⁻¹ ft ⁻¹ °F ⁻¹	102 W m ⁻¹ K ⁻¹
	82 / 301	76.3 BTUhr ⁻¹ ft ⁻¹ °F ⁻¹	132 W m ⁻¹ K ⁻¹
Young's Modulus	-452 / 4	12,082 ksi	83.3 GPa
	-321 / 77	11,864 ksi	81.8 GPa
	-119 / 189	11,327 ksi	78.1 GPa
	73 / 296	10,747 ksi	74.1 GPa
Shear Modulus	-452 / 4	4,482 ksi	30.9 GPa
	-321 / 77	4,409 ksi	30.4 GPa
	-119 / 189	4,235 ksi	29.2 GPa
	73 / 296	4,032 ksi	27.8 GPa
Poisson's Ratio	-452 / 4	0.347	0.347
	-321 / 77	0.346	0.346
	-119 / 189	0.337	0.337
	73 / 296	0.331	0.331



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