

HIGHER STRENGTH

LIGHT WEIGHT

# ALLOY 7068

A New Higher Strength, Light Weight Aluminum  
Replacement for Alloys 7075, 7050 & 7049



ISO 9001: 2015  
**CERTIFIED**  
AS 9100D: 2016



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During the mid-90's, the Ordnance Industry requested a **higher strength, light weight, lead-free aluminum alloy** with corrosion resistance equal to 7075 in the T6511 temper.

Kaiser Aluminum Alloy 7068-T6511 is registered in the handbook *Metallic Materials Properties Development and Standardization (MMPDS-04)* which is known to be used by the Federal Aviation Administration (FAA) and all departments and agencies of the Department of Defense (DOD) and the National Aeronautics and Space Administration (NASA).

## MMPDS-04 1 April 2008

Table 3.7.6.0(b) Design Mechanical and Physical Properties of 7068 Aluminum Alloy				
Specification	AMS 4331			
Form	Extrusions			
Temper	T6511			
Thickness or Diameter, (in.)	0.250 - 0.749		0.750 - 3.000	
Basis	A	B	A	B
<b>Mechanical Properties</b>				
$F_{tu}$ , ksi:				
L	99	102	99	102
LT	88	91	88	91
ST	87	89	87	89
$F_{ty}$ , ksi:				
L	95	98	95	98
LT	81	83	81	83
ST	78	81	78	81
$F_{cy}$ , ksi:				
L	-	-	95	98
LT	-	-	90	93
ST	-	-	86	89
$F_{su}^a$ , ksi:				
L-S	-	-	50	51
T-S	-	-	50	51
S-L	-	-	50	52
$F_{bru}^b$ , ksi:				
L, LT (e/D = 1.5) <sup>c</sup>	-	-	122	125
L, LT (e/D = 2.0) <sup>c</sup>	-	-	158	163
ST (e/D = 1.5)	-	-	123	127
ST (e/D = 2.0)	-	-	159	164
$F_{brv}^b$ , (e/D = 1.5) ksi:				
L, LT (e/D = 1.5) <sup>c</sup>	-	-	107	110
L, LT (e/D = 2.0) <sup>c</sup>	-	-	129	133
ST (e/D = 1.5)	-	-	107	111
ST (e/D = 2.0)	-	-	130	134
e, percent (S-Basis):				
L	5	-	5	-
LT	-	-	-	-
ST	-	-	-	-
$E$ , 10 <sup>3</sup> ksi:				
L		10.6		
LT		10.5		
ST		10.1		
$E_c$ , 10 <sup>3</sup> ksi:				
L, LT, & ST		10.7		
G, 10 <sup>3</sup> ksi:				
$\mu$				
Physical Properties				
$\omega$ , lb./in. <sup>3</sup>		0.103 (at 68 °F)		
C, BTU/(lb)(°F)		0.25 (at 212 °F)		
K, and $\alpha$		-		

### Notes

Issued: Apr. - 2008, MMPDS-04

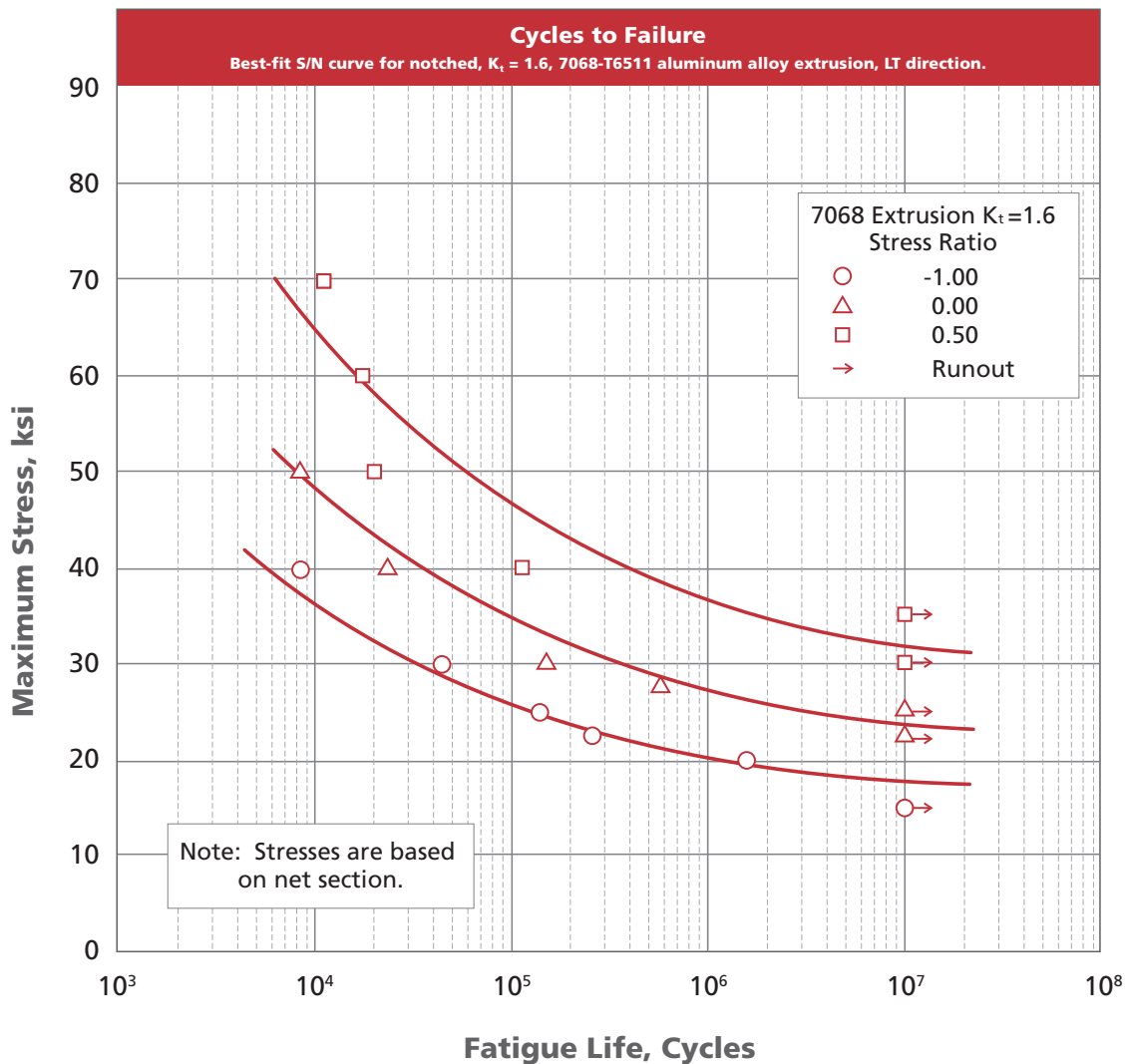
a. Grain orientation and loading direction per ASTM B769

b. Bearing values are "dry pin" values per Section 1.4.7.1

c. Lowest reduced ratio of L and LT used to generate minima

Fatigue testing was done at room temperature in accordance with ASTM E466 on polished specimens machined in the LT orientation with a theoretical stress concentration of 1.60 and at stress ratios of -1.00, 0.00 and 0.50. The fatigue tests were conducted with servo-hydraulic test equipment employing a 60 hertz sinusoidal waveform. The run-out (discontinued test) condition was defined as 10,000,000 cycles.

## Maximum Stress vs. Fatigue Life



This chart illustrates the properties of Alloy 7068 products in a limited number of tests. Users shall conduct their own development testing to determine the fitness for the intended end use.

### Correlative Information

#### Properties:

UTS = 93.0 ksi,  
TYS = 85.7 ksi,  
Elongation = 8.0%,  
Gage length = 1.40 in.

#### Specimen Details:

Notched, 2 in. x 4.5 in.  
rectangular bar

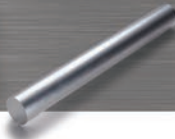
#### Test Parameters:

Loading – Axial  
Frequency – 60 Hertz  
Temperature – RT  
Atmosphere – Air

#### Equivalent Stress Equation:

$\log N_f = 9.101 - 3.498 \log (S_{eq} - 19.71)$   
 $S_{eq} = S_{max} \times (1 - R)^{0.424}$   
Std. Error of Estimate,  $\log (\text{Life}) = 10.6 \times 1/S_{eq}$   
Std. Deviation,  $\log (\text{Life}) = 0.970$   
 $R^2 = 90.7\%$

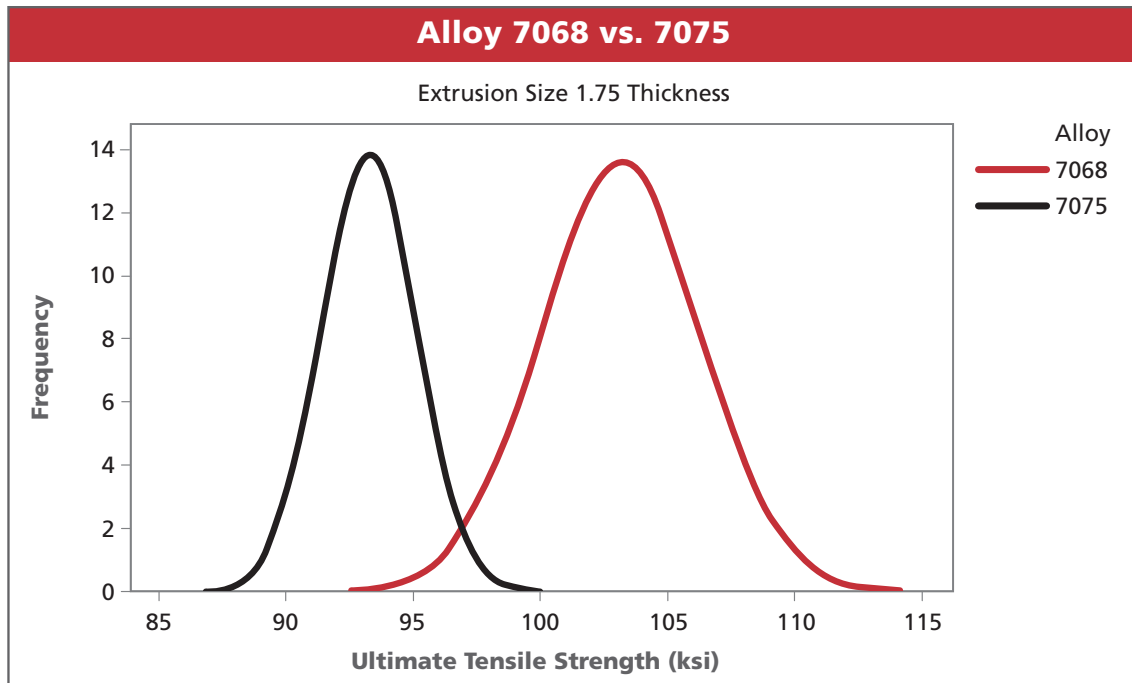
# ALLOY 7068



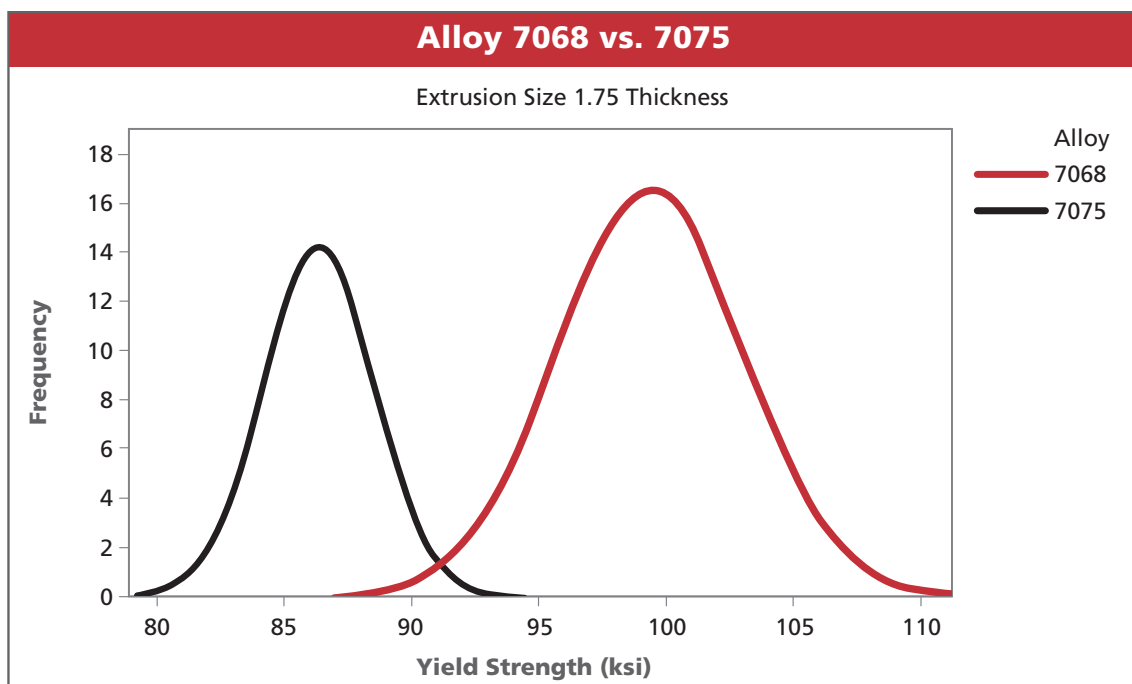
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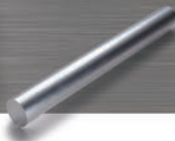
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Documented industry data shows that 7068-T6511 has a typical ultimate tensile strength of 103 ksi versus a similar product produced from 7075-T6511 that would have a typical ultimate tensile strength of 93 ksi.



Typical yield strength for alloy 7068-T6511 is 99 ksi versus 86 ksi for a similar product produced from 7075-T6511.

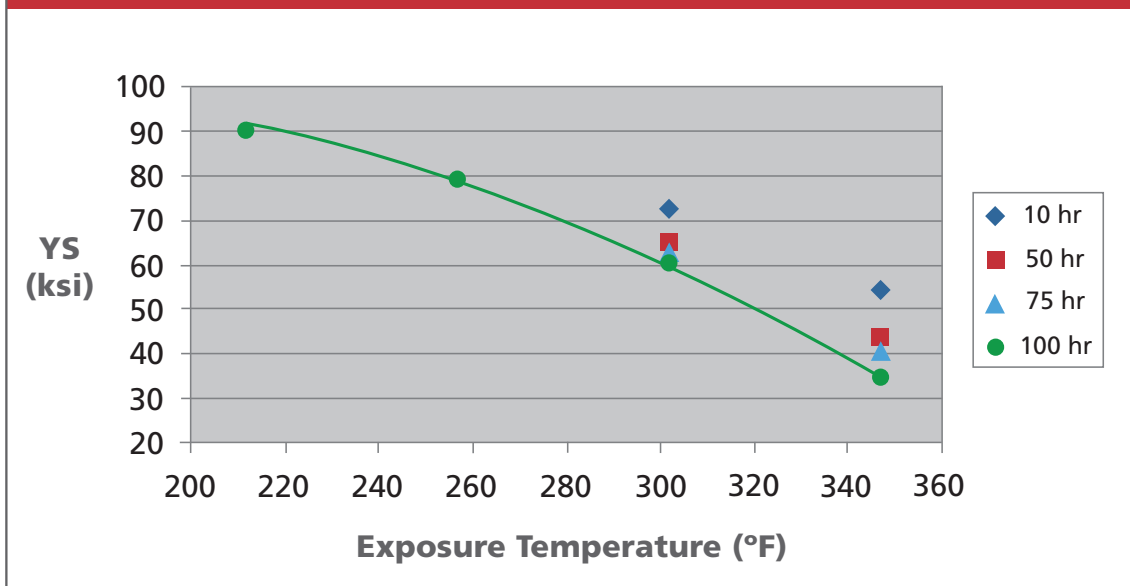




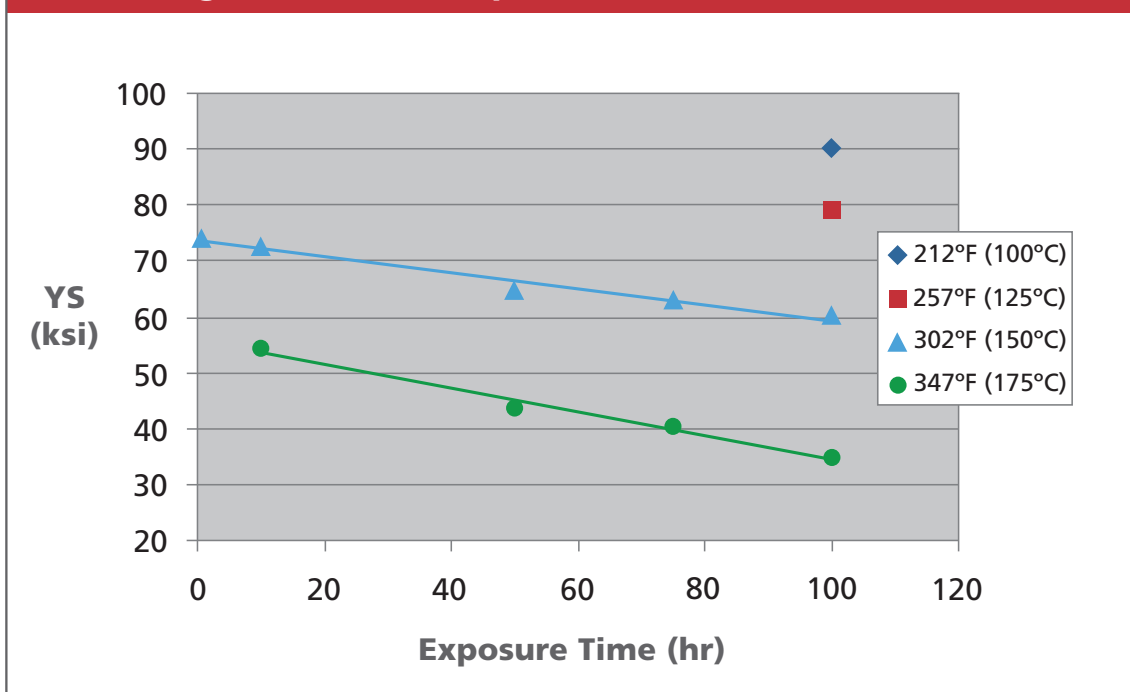
## ELEVATED TEMPERATURE PROPERTIES

The figures below show the effects of time and temperature (all testing was done at temperature) for 1.75" diameter 7068-T6511 extrusions having a room temperature yield strength of 93.5 ksi.

**Fig 1. Isochronal Exposure Curves for 7068-T6511**



**Fig 2. Isothermal Exposure Curves for 7068-T6511**





## APPLICATIONS

Primarily developed for Ordnance applications, Alloy 7068 is now being used or considered for various markets like Aerospace and Automotive (valve body and connecting rod applications), as well as Recreational Products (bicycles).

In addition to rectangles, Alloy 7068 is produced in squares and rounds, all readily available in production quantities.

## Technical Data – Alloy 7068

Chemical Composition Limits										Others	
Weight %	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Zr	Each	Total
Minimum			1.60		2.20		7.30		0.05		
Maximum	0.12	0.15	2.40	0.10	3.00	0.05	8.30	0.10	0.15	0.05	0.15

Typical Physical Properties				
Characteristic		English		Metric
Nominal Density (68 °F / 20 °C)		0.103 lbs./in. <sup>3</sup>		2.85 Mg/m <sup>3</sup>
Melting Range		890 °F - 1175 °F		476 °C - 635 °C
Specific Heat (212 °F / 100 °C)		0.25 BTU/lb. - °F		1050 J/kg - °K
Electrical Conductivity (68 °F / 20 °C)	Equal Volume	T6, T6511	31% IACS	18.0 MS/m
		T76, T76511	38% IACS	22.0 MS/m
Electrical Resistivity (68 °F / 20 °C)	T6, T6511			49.4 nano ohm meter

*This information illustrates the properties of Alloy 7068 products in a limited number of tests. Users must conduct their own development testing to determine the fitness for the intended end use.*