



Atlas Chemical Vapor Environment Products

Atlas Technologies has specialized in aluminum vacuum technology since its beginnings in 1992 when the company developed the Atlas bimetallic flange that brought aluminum to the forefront of UHV and XHV vacuum regimes. www.atlasuhv.com

The most recent advance at Atlas is the development of a 6000 series alloy that incorporates nanotechnology which Atlas fabricates into a variety of vacuum components. One of these components is the Atlas AL-unite™ CF flange specializing in a low CTE. The result is an all-aluminum flange that can mate to any stainless steel flange. The rugged knife edge of the AL-unite™ flange seals to copper and aluminum gaskets without damage to the knife edge.

In chemical vapor environments AL-unite™ performs similarly to 6061 aluminum. Atlas vacuum components for chemical environments can be welded to aluminum alloys using all aluminum welding techniques.

Chambers vacuum sealed using AL-unite™ flanges have the following materials specifications:

- Low nuclear activation. Aluminum has a short neutron activated half-life measured on a scale of hours—significant when compared to the scale of stainless steel which is measured in thousands of years. This offers huge disposal savings and a priceless reduction in potential exposure to staff.
- Aluminum UHV chambers have low magnetic permeability and no measurable disruption to electron and ion optics.
- Coefficient of Thermal Expansion (CTE) matched close to stainless steel: (18.0 SS, 18.1 All Aluminum).
- Young's Modulus (88.5GPa) of elasticity (1/3 that of stainless steel; 207GPa). Aluminum offers outstanding vibration dampening, making it the material of choice for precision synchrotron, semiconductor, and physics applications where excess vibration can have disastrous consequences. Poisson's ratio: 0.3 Density : 2.87 [g/cc].
- Fluorine gas is a common cleaning agent in aluminum chambers. Aluminum chambers and aluminum gas delivery lines are far more resistive to fluorine than those made of stainless steel.
- Aluminum is 1/3 the weight of stainless steel.
- Thermal conductivity 20 ppm/°C 10x of SS: 21x the thermal diffusivity of stainless and extremely low thermal emissivity rates. Aluminum chambers bakeout quickly and evenly. The surface properties of aluminum allow full bakeout at 150°C — much lower than SS.

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- AL-unite™ CF flanges: ALU-CF-0133-01 thru ALU-CF-0100-01 flanges. Rotatable and Non-rotatable
- Quick Release Flange: AL-unite QRCF -0133-01 thru AL-unite QRCF -0133-01 "Eliminates Chain Clamps"
- AL-unite™ CR Fitting mates with Swagelok VCR™ fittings
- ALL-Seal gasket (replaces O-ring seals)



Atlas AL-unite Alloy Description

Description

AL-unite™ is a high performance aluminum alloy based on 6000 series chemistry. AL-unite™ chemical properties match those of 6000 series aluminum alloys. AL-unite™ offers a high level of vacuum properties while keeping machinability similar to conventional aluminum alloys. Vacuum flanges can be assembled by welding with this alloy.

Vacuum Properties

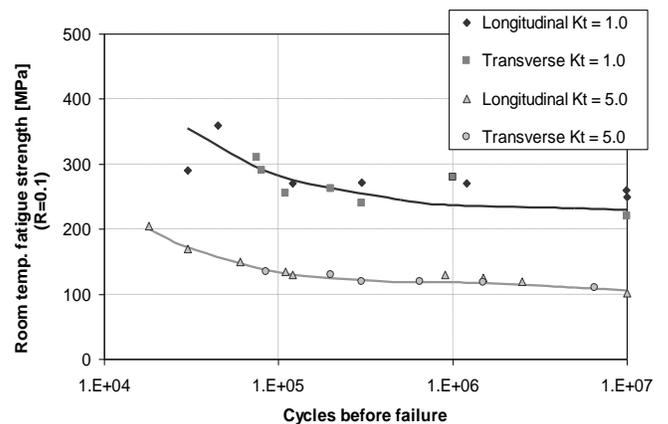
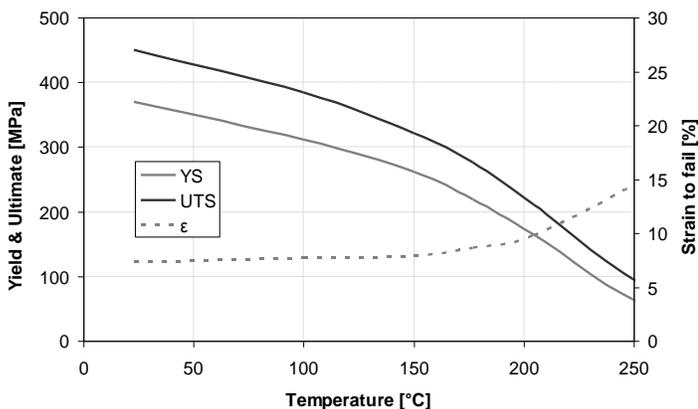
Leak < 1x10⁻¹³
Operating temperature -200C to 250C

Physical Properties (at 20C)

▪ Density:	2.87 [g/cc]
▪ Young's Modulus:	88.5 [GPa]
▪ Poisson's ratio:	0.3
▪ Thermal conductivity:	153 [W/mK]
▪ Thermal expansion (from 20°C to 100°C):	20 [ppm/°C]

Mechanical properties

	20C	150C	200C
0.2% Yield Strength [MPa]	370	320	165
Ultimate Tensile Strength [MPa]	450	346	193
Fatigue Strength [MPa at 1E+07]	230		
Strain to fail [%]	7.3	11	13.5
Hardness [HRB]	78		



Alloy matrix chemical composition [wt%] :

Si	Fe	Cu	Mg	Zn	Oxygen	Others Each	Others total
0.40 - 0.8	< 0.3	0.7 - 1.0	0.8 - 1.2	< 0.25	0.05 - 1.2	< 0.05	< 0.15

All information in this data sheet is based on discrete testing and is stated to the best of our knowledge and belief.