A20X Powder

Materials Data Sheet

A205/F1 GAS ATOMISED POWDER

A205 is a lightweight aluminium powder derived from the aerospace approved (MMPDS) A20X™ alloy, developed and patented by AMT Ltd. With a unique mode of solidification that is an important feature of this patented Al-Cu-TiB_2 alloy, A205 is ideal for Additive Manufacturing (AM). The high cooling rates achieved during Additive Manufacture, produces a high density, crack-free and non-dendritic microstructure. This makes A205 one of the leading high strength aluminium alloys for Laser Powder Bed Fusion (LPBF) with exceptional high temperature and fatigue properties.

A205/F1 has been formulated to comply with current FIA regulations concerning the use of metal matrix composites (MMC), and is compatible all the leading metal LPBF equipment suppliers. This innovative alloy has already been investigated in several applications within the motorsport sector, and shares much the same properties as the original A205 parent alloy.

- ***High strength***
- ***High temperature performance***
- ***Gas atomized***
- ***20-63µm***

Particle Size Distribution

A205 powder is supplied, as standard, with a D_{10} of 20 micron and a D_{90} of 63 micron. The particle size distribution has been developed specifically to meet the requirements of laser powder bed fusion machines.

Composition

The composition is derived from the general alloy specification AMS 4471, with the relevant adjustments to achieve a 2% TiB_2 content. The nominal weight percentages are shown in the table below, and the composition of each powder batch is determined by wet chemical methods in accordance with ASTM E 34, and by spectrochemical methods in accordance with ASTM E 1251.

Al	Cu	Mg	Ag	Ti	B	Si	Fe	Others, each	Others max.
Bal.	4.2 - 5.0	0.2 0 - 0.33	0.6 - 0.9	2.00 - 2.54	0.82 - 1.03	0.1 max.	0.08 max.	0.08 max.	0.17 max.

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Properties

Density

Bulk density of A205 standard alloy : 2.86 g/cm^3

Density achieved in Laser Powder Bed Fusion >99.7% without addition HIP operation.

Tensile Properties (room temperature)

The following table shows preliminary results following initial trials on a single LPBF machine platform.

	As built	Heat Treated[1]
Tensile Strength (MPa)	370 – 400	***445 – 475***
Yield Stress (MPa)	310 – 325	***345 – 405***
Elongation (%)	18 –20	***9 – 12***

All mechanical testing at room temperature to ASTM B557. Test bars machined prior to testing. NONE OF THE TEST BARS HAVE BEEN HIP TREATED.

(1) AMT Proprietary Heat Treatment, involving solution treatment, quench and then precipitation hardening, to T7 condition

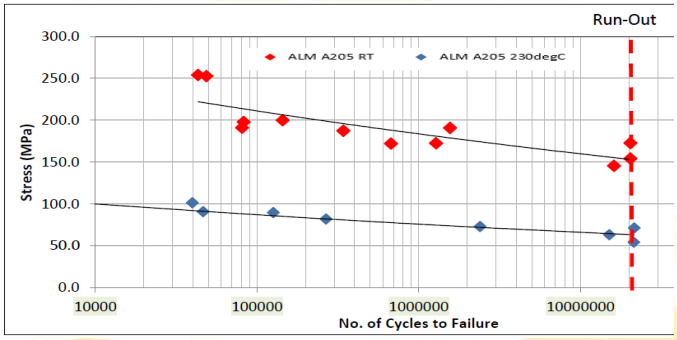
Elevated temperature tensile Properties

It is expected that the F1 grade should behave in a similar way to the parent A205 alloy (properties shown in the table below), indicating that potentially there would not be a significant loss in mechanical properties at operating temperatures above 125°C.

Temp.	Tensile Strength	Yield Stress	Elongation
20°C	511MPa	445MPa	11%
100°C	423MPa	375MPa	10%
150°C	369MPa	354MPa	20%
200°C	331MPa	311MPa	15%
250°C	224MPa	215MPa	12%

Fatigue

Fatigue properties are expected to be similar to the standard A205 alloy, shown below for illustration, and comparing test data at room temperature and 230°C.



Courtesy of Rolls Royce (NATEP, HighSAP programme)

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