# Mechanical properties of Ti-6Al-4V specimens produced by shaped metal deposition

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**Abstract.** Shaped metal deposition is a novel technique to build near net-shape components layer by layer by tungsten inert gas welding. Especially for complex shapes and small quantities, this technique can significantly lower the production cost of components by reducing the buy-to-fly ratio and lead time for production, diminishing final machining and preventing scrap. Tensile testing of Ti-6Al-4V components fabricated by shaped metal deposition shows that the mechanical properties are competitive to material fabricated by conventional techniques. The ultimate tensile strength is between 936 and 1014 MPa, depending on the orientation and location. Tensile testing vertical to the deposition layers reveals ductility between 14 and 21%, whereas testing parallel to the layers gives a ductility between 6 and 11%. Ultimate tensile strength and ductility are inversely related. Heat treatment within the α+β phase field does not change the mechanical properties, but heat treatment within the β phase field increases the ultimate tensile strength and decreases the ductility. The differences in ultimate tensile strength and ductility can be related to the α lath size and orientation of the elongated, prior β grains. The micro-hardness and Young's modulus are similar to conventional Ti-6Al-4V with low oxygen content.

*Keywords:* shaped metal deposition, Ti-6Al-4V, ultimate tensile strength, ductility

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