

# Effect of heat treatment on the properties of laser-beam welded rheo-cast F357 aluminum

M. Theron<sup>a, \*</sup>, R.D. Knutsen<sup>b, \*</sup>, L.H. Ivanchev<sup>a, \*</sup>, H.P. Burger<sup>a, \*</sup>

<sup>a</sup> National Laser Centre, Council for Scientific and Industrial Research (CSIR), PO Box 395, Pretoria 0001, South Africa

<sup>b</sup> Centre for Materials Engineering, University of Cape Town (UCT), Private Bag X3, Rondebosch 7701, South Africa

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## Abstract

Semi-solid metal rheo-cast F357 aluminum plates were joined by autogenous Nd:YAG laser welding and were welded in either the as-cast (F) condition, T4 temper or T6 temper condition. The weldability of this age-hardenable Al–7%Si–0.6%Mg casting alloy was characterized by assessment of the microstructure in the fusion and heat-affected zones and by measurement of the weld-plate tensile and hardness properties. The low heat input provided by the laser welding process resulted in high cooling rates (450–600 K/s) within the fusion and adjacent heat affected zones. This thermal cycle closely resembles quenching practice for standard solution treatments (500–700 K/s) and as a result the T4 condition was maintained during the welding process. Tensile properties equivalent to the parent metal T6 condition were obtained after exposing welded T4 plates to conventional artificial ageing treatment.

**Keywords:** Semi-solid metal; F357 aluminum; Laser welding; Heat treatment; Strength properties