



AEROSPACE MATERIAL SPECIFICATION

AMS7030™

Issued

2024-08

Aluminum Alloy, 10.0Si - 0.35Mg Stress Relieved, Hot Isostatic Pressed (HIP), Solution Treated and Artificially Aged, Produced by Laser Powder Bed Fusion (L-PBF)

RATIONALE

This Aerospace Material Specification is intended to provide technical requirements and quality assurance provisions and to reference additional required specifications for precursor materials, processes, and all secondary operations for the laser powder bed fusion (L-PBF) processing of the AlSi10Mg alloy.

1. SCOPE

1.1 Form

This specification covers an AlSi10Mg alloy produced by laser powder bed fusion (L-PBF) additive manufacturing and subjected to stress relief, hot isostatic press (HIP), solution treat, and artificial aging.

1.2 Application

1.2.1 Typically, this material is used for complex-shaped, low criticality aerospace products made to near net shape dimensions. These products have been used typically for components requiring moderate strength, but usage is not limited to such applications.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2771	Heat Treatment of Aluminum Alloy Castings
AMS7002	Process Requirements for Production of Metal Powder Feedstock for Use in Additive Manufacturing of Aerospace Parts
AMS7003	Laser Powder Bed Fusion Process
AMS7018	Aluminum Alloy Powder 10.0Si - 0.35Mg
AMS2750	Pyrometry

SAE Executive Standards Committee Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be revised, reaffirmed, stabilized, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2024 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, or used for text and data mining, AI training, or similar technologies, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
<http://www.sae.org>

SAE WEB ADDRESS:

Full document details: SAE AMS7030

For more information on this standard, visit
<https://www.sae.org/standards/content/AMS7030/>

Documents

Standard, visit Sharing Hub

AS7766 Terms Used in Aerospace Metals Specifications

ARP7500 Minimization of High Temperature Oxidation, Aluminum Alloy Heat Treatment

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B311 Standard Test Method for Density of Powder Metallurgy (PM) Materials Containing Less Than Two Percent Porosity

ASTM E3 Standard Guide for Preparation of Metallographic Specimens

ASTM E8/E8M Tension Testing of Metallic Materials

ASTM E29 Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

ASTM E562 Standard Test Method for Determining Volume Fraction by Systematic Manual Point Count

ASTM E1245 Standard Practice for Determining the Inclusion or Second-Phase Constituent Content of Metals by Automatic Image Analysis

ASTM E1251 Standard Test Method for Analysis of Aluminum and Aluminum Alloys by Spark Atomic Emission Spectrometry

ASTM E1417 Standard Practice for Liquid Penetrant Testing

ASTM E1570 Standard Practice for Fan Beam Computed Tomographic (CT) Examination

ASTM E1742 Standard Practice for Radiographic Examination

ASTM E2033 Standard Practice for Radiographic Examination Using Computed Radiography (Photostimulable Luminescence Method)

ASTM E2736 Standard Guide for Digital Detector Array Radiography

ASTM E3061 Standard Test Method for Analysis of Aluminum and Aluminum Alloys by Inductively Coupled Plasma Atomic Emission Spectrometry (Performance Based Method)

2.3 ISO Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ISO/ASTM 52900:2015 Additive manufacturing - General principles - Terminology (ISO/ASTM 52900:2015)

ISO/ASTM 52921 Standard Terminology for Additive Manufacturing - Coordinate Systems and Test Methodologies

2.4 Definitions

2.4.1 This specification is intended to be used in concert with AMS7002, AMS7003, and AMS7018 to produce additively manufactured AlSi10Mg parts. Terms used in AMS7030 are clarified in AS7766, ISO/ASTM 52900:2015, and as follows:

2.4.1.1 ACCEPTABLE TO CEO

Does not require prior written approval from the CEO prior to implementation into production. Any changes require notification to the CEO prior to part shipment. This allows the supplier to decide and the CEO the right to approve the decision.

2.4.1.2 AUTHORIZED BY CEO

Requires prior written approval from the CEO.

2.4.1.3 KEY PROCESS VARIABLES

Aspects of the manufacturing process that may impact the capability to meet the specified requirements. These include physical, chemical, metallurgical, mechanical property, or dimensional requirements (see 3.3.2).

2.4.1.4 LASER POWDER BED FUSION (L-PBF)

Additive manufacturing process in which thermal energy supplied by one or more laser(s) selectively fuses regions of a powder bed.

2.4.1.5 PROCESS CONTROL DOCUMENTATION (PCD)

A collection of procedures and requirements that are used to document and to control variation of the product.

2.4.1.6 PRODUCER

Source that provides product manufactured and certified in accordance with this specification.

2.4.1.7 TECHNICAL DATA PACKAGE (TDP)

A technical description of an item adequate for supporting an acquisition, production, engineering, and logistics support (e.g., engineering data for provisioning, training, and technical manuals). The description defines the required design configuration or performance requirements and procedures required to ensure adequacy of item performance. It consists of applicable technical data such as models, drawings, associated lists, specifications, standards, performance requirements, QAP, software documentation, and packaging details.

2.4.1.8 WITNESS SPECIMEN

A test specimen produced during the build cycle with representative feedstock materials and process parameters that is used to determine if a specific build yields similar mechanical properties compared to the original qualification build cycle.

3. TECHNICAL REQUIREMENTS

3.1 Composition of Parts

Shall conform to the following percentages by weight as shown in Table 1, determined by chemical analysis in accordance with ASTM E3061 or ASTM E1251 or by other analytical methods acceptable to the purchaser.

Table 1 - Composition in wt%

Element	Min	Max
Silicon	9.0	11.0
Magnesium	0.20	0.45
Iron	--	0.40
Titanium	--	0.15
Manganese	--	0.10
Zinc	--	0.10
Copper	--	0.03
Nickel	--	0.05
Tin	--	0.05
Lead	--	0.05
Oxygen (see 3.1.1)	--	0.10
Beryllium	--	0.002
Other Elements, each (see 3.1.2)	--	0.05
Other Elements, total (see 3.1.2)	--	0.15
Aluminum		remainder

3.1.1 Oxygen

Oxygen is not required for routine lot acceptance but shall conform to Table 1 when measured (see 8.3).

3.1.2 Other Elements

Determination not required for routine acceptance except Co, Cr, Zr, Ga, V, and Sr, which shall be measured but reported collectively, with any other measured elements, as "Other Elements, total."

3.2 Condition

L-PBF produced parts shall be supplied in the stress-relieved, hot isostatically pressed, solution-treated, and artificially aged condition.

3.3 Processing

3.3.1 The manufacturing process shall be in accordance with AMS7003. Powder feedstock shall be in accordance with AMS7018, Class A or Class D. Following consolidation, parts shall be subjected to the following additional processes, in the following sequence:

- Powder removed
- Stress relieved
- Hot isostatic pressed (HIP)
- Solution treated and quenched
- Precipitation hardened (age)