SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS2281 | REV. B

Issued 1989-04
Revised 2002-08
Reaffirmed 2007-04
Stabilized 2013-01

Superseding AMS2281A

Trace Element Control
Nickel Alloy, Cobalt Alloy, and Iron Alloy Wrought Products for High-Temperature, High-Stressed Applications

RATIONALE

AMS2281B stabilizes this document because a review of nickel, cobalt and iron alloy wrought product AMS has determined that AMS2281 is not invoked in any other AMS, and controls of trace elements are imposed by individual alloy AMS.

STABILIZED NOTICE

AMS2281B has been declared "Stabilized" by AMS Committee F and will no longer be subjected to periodic reviews for currency. This document will no longer be updated and may no longer represent standard industry practice. The last technical update of this document occurred in August, 2002. Users of this document should refer any certification issues (e.g. exceptions listed on the certification report) to the cognizant engineering organization for their disposition. CAUTION: In many cases the purchaser is not the cognizant engineering organization (i.e. purchaser may be a sub tier supplier).

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http://www.sae.org/technical/standards/AMS2281B

1. SCOPE:

1.1 Purpose:

This specification establishes maximum permissible limits for elements not normally specified but which may occur in trace amounts in wrought nickel, cobalt, and iron alloy products.

1.2 Application:

Control provided by this specification has been used typically for highly-stressed rotating parts, such as turbine discs, where control of trace elements is required to maintain elevated-temperature tensile, stress-rupture, creep, and low-cycle fatigue properties, but usage is not limited to such applications.

1.2.1 It is intended that this specification be invoked only for selected applications by stipulation on drawings, purchase orders, or other documentation supplementing the material specification, or in material specifications.

1.3 Classification:

This specification covers four classes of trace element control (See 8.2), defined by the elements to be controlled as follows:

Class 1 Lead, Bismuth
Class 2 Lead, Bismuth, Selenium
Class 3 Lead, Bismuth, Selenium, Silver, Tin
Class 4 Lead, Bismuth, Selenium, Silver, Tin, Thallium, Tellurium, Arsenic

1.3.1 When trace element control is required, the elements to be controlled shall be indicated by this specification number and the appropriate class number. For example, AMS 2281B, Class 1 will indicate that control of lead and bismuth is required.

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, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or www.sae.org.

ARP1313 Determination of Trace Elements in High Temperature Alloys

3. TECHNICAL REQUIREMENTS:

3.1 When this specification is invoked, the elements for which control is required shall not exceed the following percentages by weight as applicable to the class specified. These requirements supplement those of the applicable material specification. No check analysis limits apply to these elements. The elements requiring control and the limit for each shall be as shown in Table 1:

TABLE 1 – Composition Limits

Class	Element	Limit, Percent	(ppm)
1	Lead	0.0005	(5)
	Bismuth	0.00003	(0.3)
2	Lead	0.0005	(5)
	Bismuth	0.00003	(0.3)
	Selenium	0.0003	(3)
3	Lead	0.0005	(5)
	Bismuth	0.00003	(0.3)
	Selenium	0.0003	(3)
	Silver	0.0005	(5)
	Tin	0.0050	(50)
4	Lead	0.0005	(5)
	Bismuth	0.00003	(0.3)
	Selenium	0.0003	(3)
	Silver	0.0005	(5)
	Tin	0.0050	(50)
	Thallium	0.0001	(1)
	Tellurium	0.00005	(0.5)
	Arsenic	0.0025	(25)

3.2 Analytical Procedures:

The analytical procedures for determining conformance of a product to the requirements of this specification and the methods of obtaining or producing standards on which the analytical results are based, shall be established industry techniques acceptable to purchaser (See 8.3). ARP1313 details methods which may be used for determining the trace elements.