Designation: B880 – 14

Standard Specification for General Requirements for Chemical Check Analysis Limits for Nickel, Nickel Alloys and Cobalt Alloys[1]

This standard is issued under the fixed designation B880; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This specification covers limits of variation for determining acceptability of the chemical composition of cast or wrought nickel, nickel alloy, and cobalt alloy parts and/or material supplied by a producer. Check analysis limits for elements or for ranges of elements not currently listed herein shall be as specified in the applicable material specification or as agreed upon by purchaser and supplier.

1.2 In case of any conflicting requirements, the requirements of the purchase order, the individual material specification, and this general specification shall prevail in the sequence named.

1.3 When specifically referenced in the material specification, the buyer may elect to apply check analysis limit to determine acceptability at his final acceptance or verification procedures. Check analysis limits are not permitted or are to be used by the producer for their own ladle or ingot analysis acceptance testing.

1.4 *This standard does not purport to address all of the safety concerns if any, associated with its use. It is the responsibility of the user of this standard to become familiar with all hazards including those identified in the appropriate Material Safety Data Sheet (MSDS) for this product/material as provided by the manufacturer, to establish appropriate safety and health practices, and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E55 Practice for Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition

E88 Practice for Sampling Nonferrous Metals and Alloys in Cast Form for Determination of Chemical Composition

E1473 Test Methods for Chemical Analysis of Nickel, Cobalt, and High-Temperature Alloys

2.2 *SAE Standards:*

AMS 2269 Chemical Check Analysis Limits Nickel, Nickel Alloys and Cobalt alloys

3. Terminology

3.1 *Definitions:*

3.1.1 *check (product or verification) analysis, n*—analysis made by buyer of parts and materials to verify conformity to specification, or to determine variations in compositions within a heat or lot.

3.1.1.1 *Discussion*—Heat or lot acceptance or rejection of parts and materials may be made by applying check limits as described in 3.1.2. Check limits of finished parts or material do not apply to elements whose percentage can be varied by fabricating techniques employed unless the sample is taken in such a manner as to exclude such variations.

3.1.2 *variation limit, under minimum or over maximum, n*—it is the amount of variation for a specified element, which may vary either under or over the specified composition limit during an individual check analysis.

3.1.2.1 *Discussion*—In no case shall the reported determinations of any element in a heat, using the same analytical procedure, vary both above and below the specified range.

3.1.3 *remainder or balance, n*—refers to main element, which forms the basis of that particular alloy and from which the alloy is made.

3.1.3.1 *Discussion*—It is assumed to be present in an amount approximately equal to the difference between 100 % and the sum percentage of the alloying elements and listed impurities or residual elements. It need not be analyzed or need an actual percentage figure for reporting purposes.

3.1.4 *residual elements, n*—specified or unspecified elements, not intentionally added, which may be present, due to their presence in starting raw materials or manufacturing processes.

3.1.4.1 *Discussion*—Producers will not normally analyze for such elements, unless specifically asked for in the specification or purchase order.

[1] This specification is under the jurisdiction of Committee B02 on Nonferrous Metals and Alloys and is the direct responsibility of Subcommittee B02.07 on Refined Nickel and Cobalt and Their Alloys.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

***A Summary of Changes section appears at the end of this standard**

3.1.4.2 *Discussion*—Reporting analyses of unspecified elements is permitted.

3.1.5 *remainder or balance, n*—the element comprising the major portion of an alloy's composition, determined by subtracting the sum of the amounts of all analyzed elements (specified elements, and when measured, unspecified elements) from 100 %.

3.1.5.1 *Discussion*—It is not the intention of 3.1.5 that an analysis is required for any unspecified element.

3.1.5.2 *Discussion*—A chemical analysis for the remainder or balance element is not required. The manufacturer is permitted to report the analysis of the element as "balance" or "remainder" and need not report the result of the actual arithmetic calculation, unless requested by the purchaser in the purchase order.

4. Technical Requirements

4.1 *Analytical Procedures*—Referee analysis shall be by any method acceptable to purchaser and vendor.

4.2 *Check Analysis Limits*—Shall be as shown in Table 1.

TABLE 1 Check Analysis Variation

Element	Limit or Maximum of Specified Element, %	Variation Under min or Over max
Carbon	Up to 0.02, incl	0.005
	Over 0.02 to 0.20, incl	0.01
	Over 0.20 to 0.60, incl	0.02
	Over 0.60 to 1.00, incl	0.03
Manganese	Up to 1.00, incl	0.03
	Over 1.00 to 3.00, incl	0.04
	Over 3.00 to 6.00, incl	0.07
	Over 6.00 to 10.00, incl	0.10
Silicon	Up to 0.05, incl	0.01
	Over 0.05 to 0.25, incl	0.02
	Over 0.25 to 0.50, incl	0.03
	Over 0.50 to 1.00, incl	0.05
	Over 1.00 to 4.50, incl	0.10
Phosphorus	All	0.005
Sulfur	Up to 0.02, incl	0.003
	Over 0.02 to 0.06, incl	0.005
Chromium	Up to 5.00, incl	0.10
	Over 5.00 to 15.00, incl	0.15
	Over 15.00 to 25.00, incl	0.25
	Over 25.00 to 35.00, incl	0.30
	Over 35.00 to 45.00, incl	0.40
	Over 45.00 to 50.00, incl	0.50
Nickel	Up to 1.00, incl	0.05
	Over 1.00 to 5.00, incl	0.10
	Over 5.00 to 10.00, incl	0.15
	Over 10.00 to 20.00, incl	0.20
	Over 20.00 to 30.00, incl	0.25
	Over 30.00 to 40.00, incl	0.30
	Over 40.00 to 60.00, incl	0.35
	Over 60.00 to 80.00, incl	0.45
	Over 80.00 to 99.00, incl	0.60
Cobalt	Up to 0.10, incl	0.01
	Over 0.10 to 0.20, incl	0.02
	Over 0.20 to 1.00, incl	0.03
	Over 1.00 to 5.00, incl	0.05
	Over 5.00 to 10.00, incl	0.10
	Over 10.00 to 15.00, incl	0.15
	Over 15.00 to 20.00, incl	0.20
	Over 20.00 to 25.00, incl	0.25
	Over 25.00 to 30.00, incl	0.30
	Over 30.00 to 35.00, incl	0.35
	Over 35.00 to 50.00, incl	0.50
Molybdenum	Up to 1.00, incl	0.03
	Over 1.00 to 3.00, incl	0.05
	Over 3.00 to 5.00, incl	0.10
	Over 5.00 to 20.00, incl	0.15
	Over 20.00 to 30.00, incl	0.25
	Over 30.00 to 40.00, incl	0.35
Tungsten	Up to 1.00, incl	0.04
	Over 1.00 to 3.00, incl	0.10

TABLE 1 *Continued*

Element	Limit or Maximum of Specified Element, %	Variation Under min or Over max
	Over 3.00 to 5.00, incl	0.15
	Over 5.00 to 10.00, incl	0.20
	Over 10.00 to 20.00, incl	0.25
Columbium (Nb) and/or Tantalum	Up to 1.50, incl	0.05
	Over 1.50 to 3.00, incl	0.10
	Over 3.00 to 5.00, incl	0.15
	Over 5.00 to 7.00, incl	0.20
	Over 7.00 to 10.00, incl	0.25
	Over 10.00 to 13.00, incl	0.30
Titanium	Up to 0.10, incl	0.02
	Over 0.10 to 0.50, incl	0.03
	Over 0.50 to 1.00, incl	0.04
	Over 1.00 to 2.00, incl	0.05
	Over 2.00 to 3.50, incl	0.07
	Over 3.50 to 5.00, incl	0.10
	Over 5.00 to 10.00, incl	0.20
Aluminum	Up to 0.10, incl	0.02
	Over 0.10 to 0.50, incl	0.05
	Over 0.50 to 2.00, incl	0.10
	Over 2.00 to 5.00, incl	0.20
	Over 5.00 to 10.00, incl	0.25
	Over 10.00 to 15.00, incl	0.30
Boron	Up to 0.01, incl	0.002
	Over 0.01 to 0.05, incl	0.005
	Over 0.05 to 0.15, incl	0.010
Iron	Up to 0.20, incl	0.02
	Over 0.20 to 0.75, incl	0.03
	Over 0.75 to 2.50, incl	0.05
	Over 2.50 to 5.00, incl	0.07
	Over 5.00 to 10.00, incl	0.10
	Over 10.00 to 15.00, incl	0.15
	Over 15.00 to 30.00, incl	0.30
	Over 30.00 to 50.00, incl	0.45
Copper	Up to 0.20, incl	0.02
	Over 0.20 to 0.50, incl	0.03
	Over 0.50 to 5.00, incl	0.04
	Over 5.00 to 10.00, incl	0.05
	Over 10.00 to 20.00, incl	0.10
	Over 20.00 to 30.00, incl	0.15
	Over 30.00 to 40.00, incl	0.20
	Over 40.00 to 50.00, incl	0.25
Vanadium	Up to 0.50, incl	0.04
	Over 0.50 to 1.50, incl	0.05
Yttrium	Up to 0.050, incl	0.005
	Over 0.050 to 0.10, incl	0.010
	Over 0.10 to 0.20, incl	0.015
Zirconium	Up to 0.10, incl	0.01
	Over 0.10 to 0.20, incl	0.02
Lanthanum	Up to 0.20, incl	0.01
Cerium	Up to 0.050, incl	0.005
	Over 0.050 to 0.10, incl	0.010
	Over 0.10 to 0.20, incl	0.015
Hafnium	Up to 1.50, incl	0.05
	Over 1.50 to 3.00, incl	0.10
Rhenium	Up to 1.50, incl	0.05
	Over 1.50 to 3.00, incl	0.10
	Over 3.00 to 5.00, incl	0.15
	Over 5.00 to 7.00, incl	0.20
Platinum	Up to 0.50, incl	0.03

TABLE 1 *Continued*

Element	Limit or Maximum of Specified Element, %	Variation Under min or Over max
Oxygen	Up to 0.010, incl	0.005
Nitrogen	Up to 0.02, incl	0.005
	Over 0.02 to 0.19, incl	0.01
	Over 0.19 to 0.25, incl	0.02
	Over 0.25 to 0.35, incl	0.03
	Over 0.35 to 0.45, incl	0.04
	Over 0.45 to 0.60, incl	0.05
Magnesium	Up to 0.10, incl	0.01
Lead	Up to 0.01, incl	0.002
Tin	Up to 0.01, incl	0.002
	Over 0.01 to 0.05, incl	0.005
Zinc	Up to 0.01, incl	0.002
	Over 0.01 to 0.05, incl	0.005

5. Quality Assurance Provisions

5.1 *Sampling*—For the purpose of determining conformance to the chemical composition requirement, each heat or lot in a shipment shall be considered separately. All samples shall be taken from finished part or material in the condition in which it is received, except that all protective surface treatments shall be removed before sampling. Sample material shall be free from scale, grease, dirt, and other foreign materials and shall be taken in such a manner as to prevent alteration of the chemical composition of the sample. Sampling shall be in accordance with Practice E55 for wrought material or Practice E88 for cast material, as applicable, insofar as practicable.

6. Keywords

6.1 cobalt alloys; nickel alloys; product check analysis

SUMMARY OF CHANGES

Committee B02 has identified the location of selected changes to this standard since the last issue (B880–03(2008)) that may impact the use of this standard. (Approved October 1, 2014.)

(1) Revised paragraphs 3.1.4 and 3.1.5 to clarify definitions for residual elements and remainder (or balance).