

## Steel Pin Certified Reference Material

**Product No: AR645****Lot No: 240208**

### Material and Use

AR645 is a Certified Reference Material (CRM) traceable to the listed primary reference standards. All reference materials should be verified as fit for purpose prior to use. The intended use of this CRM is for the verification and calibration of inert gas fusion (or other appropriate) analyzers for the determination of oxygen and nitrogen. Typical sample size for analytical testing is dependent upon the test method and instrumentation used, however, a minimum sample size of one pin is recommended. This product comes as nominal 1.0 g pins and should be kept sealed tight and stored under normal laboratory conditions. Certified values are valid for 15 years from the initial date of certification.

| Element    | Value  | (+/-)  | Method & Detection  | n  | k   |
|------------|--------|--------|---------------------|----|-----|
| % Oxygen   | 0.0053 | 0.0012 | Inert Gas Fusion/TC | 48 | 2.0 |
| % Nitrogen | 0.0056 | 0.0007 | Inert Gas Fusion/TC | 48 | 2.0 |

Note: (+/-) indicates expanded uncertainty.

### Traceability

Certified values are metrologically traceable to the SI derived unit of mass fraction expressed as a percent. The reported values were validated using the following primary reference standards:

|                 |                      |
|-----------------|----------------------|
| <b>NIST SRM</b> | 1099, 1096, 12h, 163 |
| <b>ZRM</b>      | 027-1, 026-2         |
| <b>AR</b>       | 646-417C, 645-1212F  |

### Methods and References

ARI-LAB-622 – Alpha Resources Method, Oxygen and Nitrogen Analysis by Inert Gas Fusion

ASTM E1019-18 – Standard Test Methods for Determination of Carbon, Sulfur, Nitrogen, and Oxygen in Steel, Iron, Nickel, and Cobalt Alloys by Various Combustion and Inert Gas Fusion Techniques

ISO/IEC 17025:2017 – General requirements for the competence of testing and calibration laboratories

ISO 17034:2016 – General requirements for the competence of reference material producers

ISO 33401:2024 – Reference materials – Contents of certificates, labels, and accompanying documentation

ISO Guide 30:2015 – Terms and definitions used in connection with reference materials

ISO Guide 35:2017 – Reference materials – General and statistical principles for certification

### Calculation of Reported Values

Analytical values are accredited under Alpha Resources, LLC ISO/IEC 17025 and ISO 17034 accreditation issued by ANSI National Accreditation Board (ANAB). Please refer to certificates and scopes of accreditation AT-1200 and AR-1920. Sampling and calculation of reported values for each analyte are performed in compliance with guidance found in ISO 17034, ISO 33401, and ISO Guide 35. Material homogeneity, uncertainty of primary reference standards, characterization uncertainty from contributing laboratories, and other factors are considered in the assessment of overall measurand uncertainty. Analysis of variance is used in the calculation of uncertainty between contributing labs and between samples. Expanded uncertainty is calculated by application of a coverage factor to the combined uncertainty value.

**Dustin Jenkins, Ph.D.****Global Technical Director****Certification Date:** August 02, 2024

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