

ELLWOOD QUALITY STEELS COMPANY

A PENNSYLVANIA BUSINESS TRUST
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CERTIFIED TEST REPORT

Date: **4/23/24**

Report of Tests of: **(3), 6" x 50" - Grade Invar 36 Ingot(s)**

For Company: **Re-Steel Supply**
Specialty Metals Division
Denver, CO 80206

Customer's Order: **5820**
Date of Order: **2/22/24**
Our Shop Order: **H000290428**
Specification: **Boeing D33028-2 Rev.AF, Table 1 chem only**

CHEMICAL ANALYSIS

| Heat # | C | Mn | P | S | Si | Ni | Cr | Mo | V | Cu | Al | Ti | Co | Zr |
|--------|-----------|-----------|------|------|-----|-------|-----|-----|------|-----|------|------|------|------|
| FC711 | .02 | .32 | .002 | .002 | .30 | 36.23 | .05 | .03 | .003 | .19 | .020 | .003 | .027 | .007 |
| | Se | Mg | | | | | | | | | | | | |
| | .005 | <.001 | | | | | | | | | | | | |

The material was melted using the electric furnace-ladle refined-vacuum degas process and was subsequently bottom poured.

P+S = .004

Al + Mg + Ti + Zr < .031

Fe Balance = 63

Material meets the chemistry requirements of Boeing D33028-2 Rev. AF, Table 1 for Invar 36 and ASTM F1684-06 (reapproved 2021) table 1 UNS No K93603.

Coefficient of Thermal Expansion = 1.58×10^{-5} in/in/°F (77-400 F).

The material was produced in accordance with the EQS Quality Manual dtd. 02/02/24, Rev.7, which meets the intent of the latest revisions of ISO 10012-1, MIL-I-45208, NCA-3300 (formerly NCA 3800), and 10-CFR-50 App. B for quality assurance, inspection and calibration systems. EQS QMS is certified to AS9100D and ISO 9001:2015.

The material was melted in the U.S.A.

Forged to a 7.5" x 50" from a 22" x 57" ingot. Reduction Ratio: 3.19:1. Subsequently ground to 6" x 50" slab.

I certify that the reported results and statements of the certificate represent the actual attributes of the material furnished and are in full compliance with all purchase order/ specification requirements. Note: The recording of false, fictitious or fraudulent statements or entries on this document may be punishable as a felony under Federal Statute. During the manufacturing process, tests, and inspections, the material did not come in direct contact with mercury or any of its compounds nor with any mercury containing device employing a single boundary of containment. No welding or weld repair was performed on this material. The material was produced free of radioactive elements.


Chris McVay
Quality Assurance Manager

Electronic Signature