

Analysis of Nickel and its Alloys by Optical Emission

ARL 3460 Metals Analyzer

Key Words

- ARL 3460
- Metals Analyzer
- Nickel
- Optical Emission



Introduction

The Thermo Scientific ARL 3460 Metals Analyzer is designed to meet the specific requirements of a wide range of customers from the smallest cast iron foundries to the largest steel plants. Thermo Electron Corporation's long experience in metals analysis comes from an installed base of over 10,000 spectrometers worldwide. The ARL 3460 satisfies all your metallurgical analysis needs; whether they be incoming material control or metal QC and production analysis. Working 24 hours a day, 7 days a week, the ARL 3460 delivers dependable performance year after year.

Nickel and nickel alloys

Nickel is mainly used for making stainless steels (>60 %), nickel alloys including so-called super-alloys (>10 %) and other steels (>10 %). Other major uses are electroplating (~8 %), coins and chemicals (e.g. catalysts).

In nickel alloys, the most important alloying elements are Fe, Cr, Cu, Co and Mo.

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The ARL 3460 Metals Analyzer can determine up to 60 elements simultaneously. The HiRep source has the flexibility to customize the excitation parameters providing the best analytical conditions for a wide variety of sample types. The source uses the HEPS (High Energy Pre-Spark) technique to minimize the metallurgical effects and produce consistently accurate results. The printout of average concentration for the required elements from a repeat analysis is obtained in typically less than one minute.

Sample preparation

The sample is generally prepared by using a grinding machine. Milling machines can be beneficial for some critical qualities.

Sample analysis time

The analysis time is taken between the start of the analysis and the display of the result. The ARL 3460 needs 25s for one measurement in all the nickel qualities. A typical analysis (average of two measurements) is performed in less than one minute.

Calibrations

Our company provides a general sorting Ni calibration that covers the analysis of various nickel alloys. Specific calibrations for pure Ni and the most important Ni alloys (e.g. Inconel, Incoloy and Hastelloy) are also available.

Factory calibration (CARL)

Thermo Scientific optical emission spectrometers can be factory calibrated for nickel and its alloys utilizing CARL, a very sophisticated multi-variable regression tool that corrects for matrix effects as well as spectral interferences. CARL provides an immediate "turnkey" system which gives the user the highest accuracy possible. The calibrations are available for the different qualities listed above. We use certified reference material for the calibration of each quality. The necessary setting-up samples are delivered with the instrument to maintain the accuracy of the calibration.

Performance guarantee

Our company guarantees the values shown in Table 1 using homogeneous samples and recommended sample preparation. The precision is calculated from the formula:

$$SD(1\sigma) = \pm \sqrt{\frac{\sum_{i=1}^n (X_i - \bar{X})^2}{n-1}}$$

where:
 \bar{X}_i the individual readings
 \bar{X} the arithmetic mean of the individual readings
 n the number of determinations

The precision given in Table 1 is typical performance; guaranteed values are 1.5 times higher.

The DL (Detection Limit) is defined as three times the standard deviation of the background expressed in concentration units.

Stability

Stability of the instrument is of the utmost importance when doing routine analysis. The long-term stability measured over 15 days without any intermediate drift correction is in the order of two times the precision value, which is excellent.

Conclusion

The ARL 3460 has all the total system features which meet the critical needs of the metals analysis markets:

- Unmatched hardware for stability and reliability
- Excellent performance in detection limits, precision, accuracy, stability and analysis time
- Most advanced software technology
- Easy operation by unskilled worker or research chemist
- Widest range of metals analysis
- Adaptable to the automatic OES Sample Manipulation System (ARL SMS-2000)
- Advanced technical/service support

All these features allow you to optimize your productivity and to achieve the shortest payback times:

- Your investment costs are reduced thanks to the rugged design platform for an above-average instrument lifetime and to the continuous upgrade possibilities (software and hardware)
- Your production costs are reduced by the fact that more accurate and reproducible analyses are available faster
- Your production costs are reduced by the increased instrument availability thanks to its high stability and drift corrections being less frequently required
- Your operating and maintenance costs are reduced through low consumption of drift correction samples, and through simple maintenance
- Your overall cost management is reduced by optimum utilization of materials and extremely low running costs compared to other methods

With its over 70 years of experience and history of innovative technology, our company has become the world leader in OE metals analysis. We work with our customers to improve the efficiency of their analytical tasks and thereby increase productivity.

In addition to these offices, Thermo Fisher Scientific maintains a network of representative organizations throughout the world.

Africa
+43 1 333 5034 127

Australia
+61 2 8844 9500

Austria
+43 1 333 50340

Belgium
+32 2 482 30 30

Canada
+1 800 530 8447

China
+86 10 5850 3588

Denmark
+45 70 23 62 60

Europe-Other
+43 1 333 5034 127

France
+33 1 60 92 48 00

Germany
+49 6103 408 1014

India
+91 22 6742 9434

Italy
+39 02 950 591

Japan
+81 45 453 9100

Latin America
+1 608 276 5659

Middle East
+43 1 333 5034 127

Netherlands
+31 76 587 98 88

South Africa
+27 11 570 1840

Spain
+34 914 845 965

**Sweden/Norway/
Finland**
+46 8 556 468 00

Switzerland
+41 21 694 71 11

UK
+44 1442 233555

USA
+1 800 532 4752

www.thermo.com



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