Thermo Scientific
ARL 4460 Metals Analyzer

The Ultimate Performance in Optical Emission

- The most advanced instrument for quick quantitative metals analysis from alloys to ultra-pure metals
- Ultimate sensitivity and reproducibility
  Excellent accuracy, stability and reliability
- Best detection limits for carbon, nitrogen and oxygen in steels
  Best detection limit for phosphorus in aluminum
- Ultra-fast analysis of non-metallic inclusions
- Cleanliness assessments
- Lowest costs of ownership
- Highest user’s benefits
**ARL 4460**
The Ultimate Performance for Spark Emission Metals Analysis

The Thermo Scientific ARL 4460 combines several advanced technologies into the world’s best established optical emission spectrometer to bring your metals analysis to the tightest specifications. Launched in 1994, the ARL 4460 has undergone continuous improvements to provide enhanced analytical performance and shorter analysis time. With more than 1600 units operating in the field, the ARL 4460 is truly the most advanced instrument in the market for high performing metal analysis.

**Your Best Partner to Stay within Specifications**
The ARL 4460 has been designed to meet all metals analysis requirements from routine use to metals research. In varying laboratory conditions or in a hostile environment, this Thermo Scientific spectrometer is the solution for outstanding analytical performance.

Increasing regulations require new partnerships in quality control. Proficiency testing and laboratory accreditation are becoming mandatory. Continually improving capabilities to allow rapid, reliable quality control of metals, we can provide guidance to a program that will meet these demanding requirements and help you to stay within specifications, even the most demanding.

**Stable, Reliable and Accurate**
Rugged construction guarantees years of instrument stability, reliability and accurate analysis in any metals laboratory or foundry operation. User demands are providing ever increasing challenges for applications development - wider elemental concentration ranges, more accurate analyses and tighter controls.

To meet these product demands, the total system concept of the ARL 4460 has embodied critical success factors:
- Speed and accuracy, even for ultimate trace analysis
- Capability to identify and count inclusions and to calculate cleanliness indexes
- Unmatched stability and reliability
- World class factory calibration
- Widest range of metals analysis
- Most advanced software technology
- Easy operation
- Automatic sample manipulation systems (optional capability)
- Advanced technical/service support
- Continuous upgrade possibilities to optimize performance and productivity

**Cost-effective and Fast**
Optical emission spark analysis is, by far, the most widely used, industry accepted technique to provide chemical analysis for both alloying and trace elements in metals.

The reasons are many:
- Versatility: Analyze any metal in many shapes and forms
- Speed: Duplicate analysis in less than 50 seconds
- Range: From trace (sub-ppm) to alloy concentration levels
- Accuracy: With certified type standards - accuracy nominally better than 1% relative
- Simplicity: Easy sample preparation
- Savings: Low capital investment and operating costs
Proven Applications

Thanks to several years of application development work, the ARL 4460 has been improved enhancing the ease and accuracy of analysis for all metal products. Comprehensive application notes are available separately for all major metals. Each note gives specific performance guarantees for detection limits, reproducibility, stability and analysis time.

Some examples of common products analyzed with the ARL 4460 are:

- Low alloy steel with ultra low concentrations of carbon, nitrogen and oxygen for the automotive industry
- Stainless steel: Food and pharmacology handling equipment
- Super alloys: Jet turbine blades
- Cast iron: Auto engines
- Magnesium: Aerospace and automotive
- Aluminum: Aerospace and food industry
- Copper: Tubing and wire
- Lead: Batteries and radiation shielding
- Zinc: Galvanizing
- Precious metals: Jewellery

C, N, O Analysis

The ARL 4460 is capable of determining carbon, nitrogen and oxygen in steels at ultra low levels using the CNO option. This option offers better C, N and O detection limits as well as reproducibility in the range of ultra-low concentration. A separate application note provides further details.

Spark-DAT Option

The Spark-DAT option measures intensities during each elemental spark, allowing ultra fast on-line counting of inclusions and identification of their type. Inclusion analysis includes for example Al₂O₃, CaO, Al₂O₃-CaO, CaS and TiN in steels, TiB₂, MgO and NaCl in aluminum. Metal cleanliness can be controlled in a few seconds during hot metal elaboration. Inclusions can be analyzed in parallel with elemental analysis requiring just a few additional seconds. A separate application note is available providing further details.

OXSAS Software: the most powerful operations made easy

OXSAS software outperforms software that is currently available on the market today for metals analysis by OES. OXSAS provides virtually unlimited analytical capacity and flexibility and will therefore meet your needs throughout your instrument’s lifetime:

- Triple navigation style: menus, tree and icons to accommodate individual preferences
- Simple one-click routine analysis launch
- Quantitative analysis using tasks with analysis parameter template
- Access to various functional levels through password protected user accounts allowing for secured operation
- One click access to recent analyses results, readily available for comparison in the analysis screen
- Full traceability
- Key to Metals, the world’s most comprehensive metals database. A separate product specification is available for further details.

These are just a few of the many features contributing to the fast and easy routine operation of OXSAS.

Two Techniques for Ultimate Performance

Our company has always set the standard for excellence of instrument design and analytical performance. The Thermo Scientific ARL 4460 continues that tradition with its two innovative techniques: the Current Controlled Source (CCS) and Time Resolved Spectroscopy (TRS), which extend the range of capabilities. Their combination significantly improves all facets of analytical performance (accuracy, sensitivity, reproducibility, analysis time).
ARL 4460 Specifications

**Spectrometer**

Spectrometer design: One meter, Paschen-Runge vacuum polychromator made of special cast iron and temperature controlled to ± 0.1° at 38°C. Maximum 60 channels.

Primary slit width: 20 µm

Secondary slit width: 25, 37.5, 50, 75 µm

Photomultiplier tubes: Ø 28 mm, 10-stage side-on-type, MgF2, UV glass, borosilicate glass or synthetic silica windows

Grating type: Spectrometer provided with one of the following gratings, appropriately selected for the analytical task: 1080, 1667 or 2160 gr/mm

Resolution: Dependent on grating, secondary slit and spectral order

Sample stand: With self contained, recirculating coolant system. Argon flushed table. Argon pulsed regime after analysis for improved dust evacuation and instrument autonomy

CCS and TRS: Current Controlled Source (CCS) and Time Resolved Spectroscopy (TRS) to extend the range of analysis capabilities

**Electronics**

Spectrometer control: ARL MMB 386 Microprocessor utilizing CMOS technology with Status Measuring Board. A/D converters and attenuators included for each channel.

Programmable attenuators: Up to 24, available as an option

Dynamic range: Proportional to measuring time, typically 2 x 10^6 counts/sec

Enclosure: Built-in dust protection with high capacity cooling fans

**Requirements**

Ambient temperature: 16-30°C (62-86°F); maximum rate of change 5° C/hour

Relative humidity: 20-80 %

Voltage: 230 V (+10 %/-15 %), single-phase with protective ground (5kVA regulator required if fluctuations exceed ±10 %)

Current: 12 A, including PC, screen and printer

Frequency: 50 or 60 Hz

Grounding: < 1 Ω

Argon: > 99.996 % maximum 5 ppm oxygen (maximum 2 ppm oxygen for samples with high Si content). Optional argon purifier available and recommended for low carbon analysis. For VUV lines (carbon, nitrogen, oxygen, chloride), argon purifier included

**Consumption**

Electrical power: 2.6 kVA

Argon: 5 l/min during analysis, 0.7 l/min in stand-by (1.5 l/min with CNO option)

Compliance to norms: 98/37/EEC Machinery

73/23/EEC Low voltage material

89/336/EEC Electromagnetic compatibility

**Dimensions and weight**

Overall dimensions: 169 x 91 x 122 cm or 67 x 36 x 48 inches, including excitation stand

Weight: 540 kg or 1190 lb approximately

Accessories and options: Spark-DAT, single Spark Data Acquisition and Treatment

CNO for best measurement of low carbon, nitrogen and oxygen in steels

Small wire and pin samples analysis kit

Argon purification systems

Voltage stabilization systems

Uninterruptible Power Supply (UPS)

Suction device accessory to exhaust toxic fumes

Stand upgrade for semi-automatic operation

Data communication software options

Analytical results processing software options

To see our complete range of OES spectrometers, please visit **www.thermoscientific.com/oes**