Thermo Scientific ARL 4460 OES
Metals Analyzer

ultimate performance
in optical emission

Iron and steel • Non-ferrous metals and alloys •
Fine precious metals • Non-metallic inclusions

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ARL 4460 OES

ultimate performance
in metals analysis

The Thermo Scientific ARL 4460 combines several advanced technologies with the world's most famous spectrometer optics. It is the market reference regarding accuracy, performance and speed of analysis and it benefits from the quality and robustness that made the reputation of the optical emission spectrometers of the ARL brand. The ARL 4460 also enables ultra-fast inclusion analysis, which increases the capability of the instrument to help you guarantying the quality of your metal products. With more than 1,800 units operating in the world, the ARL 4460 is the benchmark for high-performance OES spectrometer.

The solution for increasing challenges

The ARL 4460 meets all metals analysis requirements, be it for routine analysis or for metals research. It allows compliance with a growing number of regulations, along with increasingly tighter specifications and higher customer expectations for more elements to analyze, wider concentration ranges, faster and more accurate analyses. Whether in stable laboratory conditions, or in a hostile environment, it offers outstanding analytical performance. The ARL 4460 helps you achieve your quality objectives or get your accreditation.

Advantages of OES

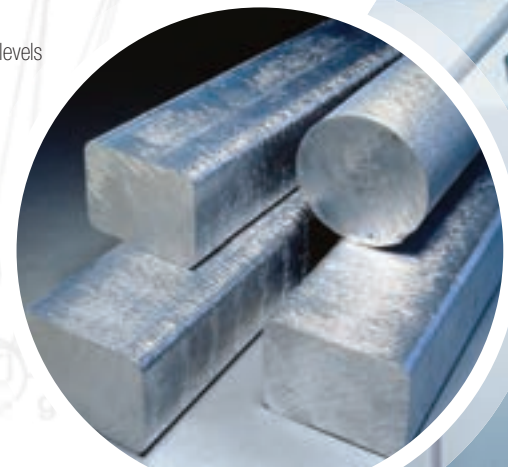
Optical emission spark analysis is, by far, the most widely used, industry accepted technique to provide chemical analysis for both alloying and trace elements in metals. The reasons are many:

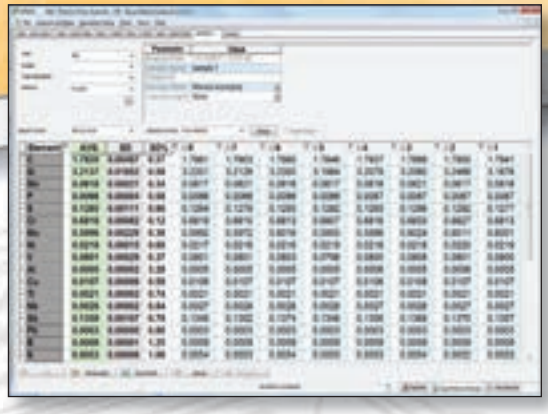
- Versatility: Analyze any metal in many shapes and forms
- Speed: Duplicate analysis in less than 50 seconds
- Range: From trace (sub-ppm) to alloy concentration levels
- Accuracy: With certified type standards - accuracy nominally better than 1% relative
- Simplicity: Easy sample preparation
- Savings: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

Unique attributes

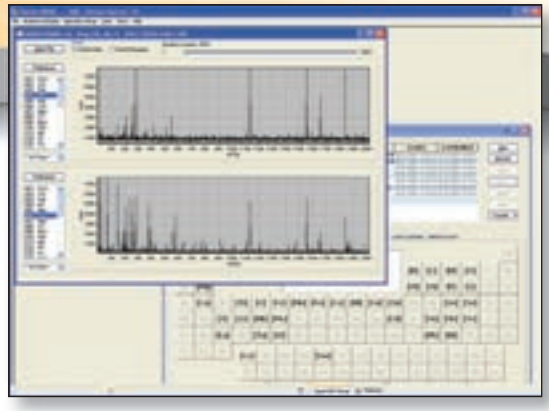
Many unique attributes allow the ARL 4460 to meet the most demanding customers' requirements, e.g.:

- Rugged construction that guarantees years of optimal instrument operation in the harshest environment
- Unmatched stability and reliability
- Speed and accuracy, even for ultimate trace analysis
- Ultra-fast inclusion analysis capability
- Real calibrations
- Widest range of metals analysis
- Most advanced software technology
- Easy operation
- Automatic sample manipulation systems (optional)
- Advanced technical/service support
- Continuous upgrade possibilities to improve performance and productivity





Example of a display of concentration analysis results



Spark-DAT recording of single sparks

Applications

Applications are available for most of the metals and alloys:

- Iron and steel
- Aluminum and its alloys
- Copper and its alloys
- Nickel and its alloys
- Cobalt and its alloys
- Zinc and its alloys
- Magnesium and its alloys
- Lead and its alloys
- Tin and its alloys
- Fine precious metals
- Small samples of various qualities

Comprehensive application notes are available for the major metals. Each note gives specific performance guarantees for detection limits, reproducibility and analysis time.

C, N and O analysis

The CNO option of the ARL 4460 offers outstanding analysis of carbon, nitrogen and oxygen in steels at ultra-low levels. It improves C, N and O detection limits and reproducibility below 100 ppm typically. A separate application note provides further details.

Ultra-fast inclusion analysis

The Spark-DAT option allows performing analysis of non-metallic inclusions, for example Al_2O_3, CaO, Al_2O_3-CaO and CaS in steel, or TiB_2, MgO and NaCl in aluminum. Inclusion and elemental analyses can be performed simultaneously, almost in the time of the elemental analysis alone, allowing inclusion analysis or control even during metal production.

The advanced Spark-DAT option allows quantitative size analysis and size distribution in steel. In killed steel, the method also permits the determination of oxygen concentrations much lower than 30 ppm. Separate application notes provide further details.

OXSAS software – So powerful and so easy

Thermo Scientific OXSAS analytical software outperforms the other programs existing for OES. It provides virtually unlimited analytical capacity and flexibility and will therefore meet your needs throughout the lifetime of your instrument:

- Triple navigation style, menus, tree and icons to fit with your preferences
- Simple one-click start of routine analysis
- 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
- Easy navigation and comfortable operation in the analysis screen
- Full traceability
- Key to Metals metals database (see dedicated product specification)
- Measurement uncertainty with every analysis to facilitate accreditation (see dedicated product specification)

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

Ultimate performance

The ARL 4460 includes two techniques that help extend its capability and performance. The Current Controlled Source (CCS) is a digital spark source that can be programmed for optimal sparking in every application. The Time Resolved Spectroscopy (TRS) allows the acquisition to be performed in a such a way that various noise and interference sources are reduced. Their combination significantly improves all aspects of analytical performance (accuracy, sensitivity, reproducibility and 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: 20, 25, 37.5, 50, 75, 100 µm
Photomultiplier tubes: Ø 28 mm, 10-stage side-on-type, MgF_2, 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 gr/mm or 1667 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: Microprocessor based system with Status Measuring Board. A/D converters and High Voltage attenuators included for each channel
Programmable attenuators: Up to 24, available as an option
Dynamic range: Proportional to measuring time, typically $2 \cdot 10^6$ 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 (5 kVA 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 in Fe and Al matrices). Optional argon purifier available and recommended for low carbon and nitrogen analysis. For VUV lines (carbon, nitrogen, oxygen, chlorine), 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:

- Various Spark-DAT (Spark Data Acquisition and Treatment) options for inclusion analysis
- CNO option for outstanding analysis of low carbon, nitrogen and oxygen in steel
- Small wire and pin samples analysis kit
- Argon purification system
- 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 range of OES spectrometers, please visit **www.thermoscientific.com/oes**

ISO 9001
Thermo Fisher Scientific (Ecublens) SARL, Switzerland is ISO certified.

www.thermoscientific.com

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