

# 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  
Cleanness 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 1200 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 cleanness 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

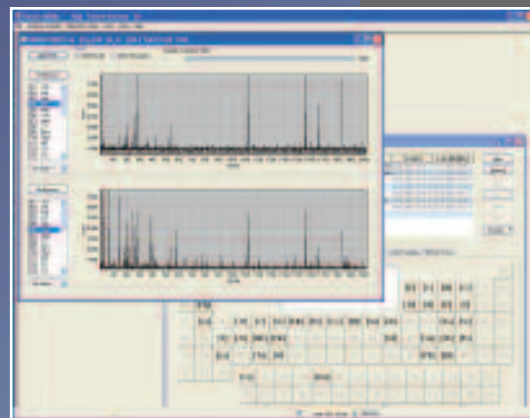
The Spark-DAT option measures intensities during each elemental spark, allowing ultra fast on-line counting of inclusions and identification of their type. Inclusion analysis includes  $Al_2O_3$ ,  $CaO$ ,  $Al_2O_3-CaO$ ,  $CaS$  and  $TiN$  in steels,  $TiB_2$ ,  $MgO$  and  $NaCl$  in aluminum. Metal cleanliness can be controlled in a few seconds during hot metal elaboration and in parallel with elemental analysis. A separate application note is available providing further details.

## OXSAS Software: the most powerful operations made easy

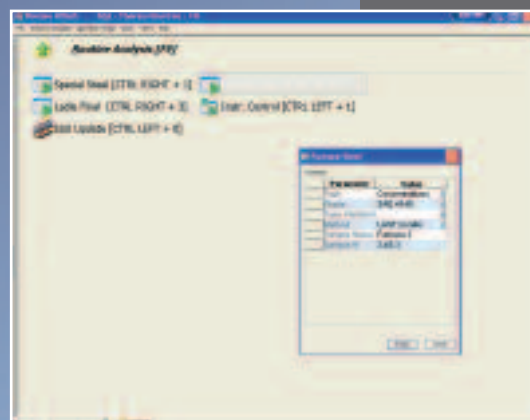
OXSAS software outperforms software that is currently available on the market today for metals analysis by OES. OXSAS provides virtually unlimited analytical capacity and flexibility and will therefore meet your needs throughout your instrument's lifetime:

- 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

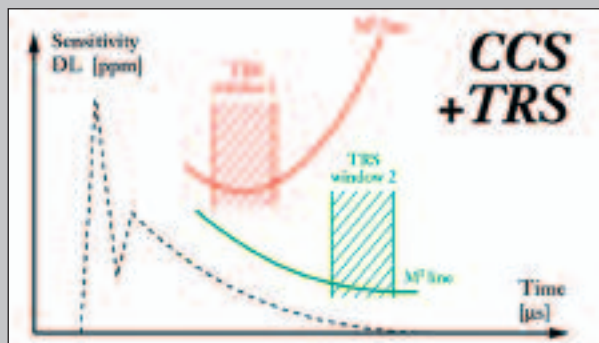
These are just a few of the many features contributing to the fast and easy routine operation of OXSAS.



Spark-DAT recording of individual sparks



Easy navigation and comfortable operation



CCS + TRS working principle

## 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 patented 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 $\pm 0.1^\circ$ at $38^\circ$ C. Maximum 60 channels.
Primary slit width:	20 $\mu$ m
Secondary slit width:	25, 37.5, 50, 75 $\mu$ m
Photomultiplier tubes:	$\varnothing$ 28 mm, 10-stage side-on-type, MgF <sub>2</sub> , 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 $2 \times 10^6$ 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 $5^\circ$ C/hour
Relative humidity:	20-80 %
Voltage:	230 V (+10 %/-15 %), single-phase with protective ground (5kVA regulator required if fluctuations exceed $\pm 10$ %)
Current:	12 A, including PC, screen and printer
Frequency:	50 or 60 Hz
Grounding:	< 1 $\Omega$
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
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In addition to these offices, Thermo Fisher Scientific maintains a network of representative organizations throughout the world.

## Africa

+43 1 333 5034 127 \* [analyze.emea@thermo.com](mailto:analyze.emea@thermo.com)

## Australia

+61 2 8844 9500 \* [analyze.au@thermo.com](mailto:analyze.au@thermo.com)

## Austria

+43 1 333 50340 \* [analyze.at@thermo.com](mailto:analyze.at@thermo.com)

## Belgium

+32 2 482 30 30 \* [analyze.be@thermo.com](mailto:analyze.be@thermo.com)

## Canada

+1 800 530 8447 \* [analyze.ca@thermo.com](mailto:analyze.ca@thermo.com)

## China

+86 10 5850 3588 \* [analyze.cn@thermo.com](mailto:analyze.cn@thermo.com)

## Denmark

+45 70 23 62 60 \* [analyze.dk@thermo.com](mailto:analyze.dk@thermo.com)

## Europe - Other

+43 1 333 5034 127 \* [analyze.emea@thermo.com](mailto:analyze.emea@thermo.com)

## France

+33 1 60 92 48 00 \* [analyze.fr@thermo.com](mailto:analyze.fr@thermo.com)

## Germany

+49 6103 408 1014 \* [analyze.de@thermo.com](mailto:analyze.de@thermo.com)

## India

+91 22 6742 9434 \* [analyze.in@thermo.com](mailto:analyze.in@thermo.com)

## Italy

+39 02 950 591 \* [analyze.it@thermo.com](mailto:analyze.it@thermo.com)

## Japan

+81 45 453 9100 \* [analyze.jp@thermo.com](mailto:analyze.jp@thermo.com)

## Latin America

+1 608 276 5659 \* [analyze.la@thermo.com](mailto:analyze.la@thermo.com)

## Middle East

+43 1 333 5034 127 \* [analyze.emea@thermo.com](mailto:analyze.emea@thermo.com)

## Netherlands

+31 76 587 98 88 \* [analyze.nl@thermo.com](mailto:analyze.nl@thermo.com)

## South Africa

+27 11 570 1840 \* [analyze.sa@thermo.com](mailto:analyze.sa@thermo.com)

## Spain

+34 914 845 965 \* [analyze.es@thermo.com](mailto:analyze.es@thermo.com)

## Sweden / Norway / Finland

+46 8 556 468 00 \* [analyze.se@thermo.com](mailto:analyze.se@thermo.com)

## Switzerland

+41 21 694 71 11 \* [analyze.ch@thermo.com](mailto:analyze.ch@thermo.com)

## UK

+44 1442 233555 \* [analyze.uk@thermo.com](mailto:analyze.uk@thermo.com)

## USA

+1 800 532 4752 \* [analyze.us@thermo.com](mailto:analyze.us@thermo.com)

[www.thermo.com](http://www.thermo.com)



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