



ARL iSpark 8860 Optical Emission Spectrometers

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

ARL iSpark 8860

OES Spectrometers

Combining experience and innovation to meet the highest quality standards

For over 80 years, our company has set the standard of quality for spectrochemical analysis of metals. Throughout these years, performance, stability, reliability and longevity have been the key attributes of our optical emission spectrometers. The Thermo Scientific™ ARL iSpark™ metals analyzers combine these guiding principles with our experience and technical innovation to bring our customers the complete value based solution they have come to expect from our company.

The ARL iSpark 8860 spectrometer can analyze all the elements necessary in your current and future applications. It is the answer to your analytical needs, whether for incoming material or metal quality control and production analysis. Working 24/7, the ARL iSpark 8860 metals analyzers deliver reliable performance year after year.

Spark optical emission spectrometry (OES)

is the most widely used technique for elemental concentration analysis of solid metallic samples. With industry leading quality and performance, Thermo Scientific OES spectrometers excel in every aspect of this process with:

- Very fast elemental analysis of most metals and alloys
- Analysis of all necessary elements from trace to percent
- Outstanding accuracy, precision and stability
- Simple instrument operation and maintenance
- Low capital investment and operating costs

The ARL iSpark 8860

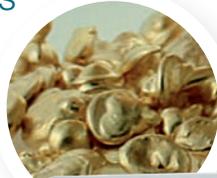
is a high performance OES spectrometer platform based on the best PMT (photomultiplier tube) optics. It features enhanced functionality and other innovative technologies, including:

- Unique PMT optics
- Revolutionary digital spark generator
- Innovative spark stand design
- Advanced signal acquisition technologies and processing algorithms
- Single Spark Acquisition with diffuse spark intensity removal algorithm to improve accuracy on PMTs
- Most advanced OES analysis of micro-inclusions
- Smart argon management with argon saving modes

Made-to-measure spectrometers to answer a variety of needs

The ARL iSpark 8860 OES spectrometers include several models meeting the needs of the industries and processes

Precious metals



Full automation



Small samples

Metals and alloys



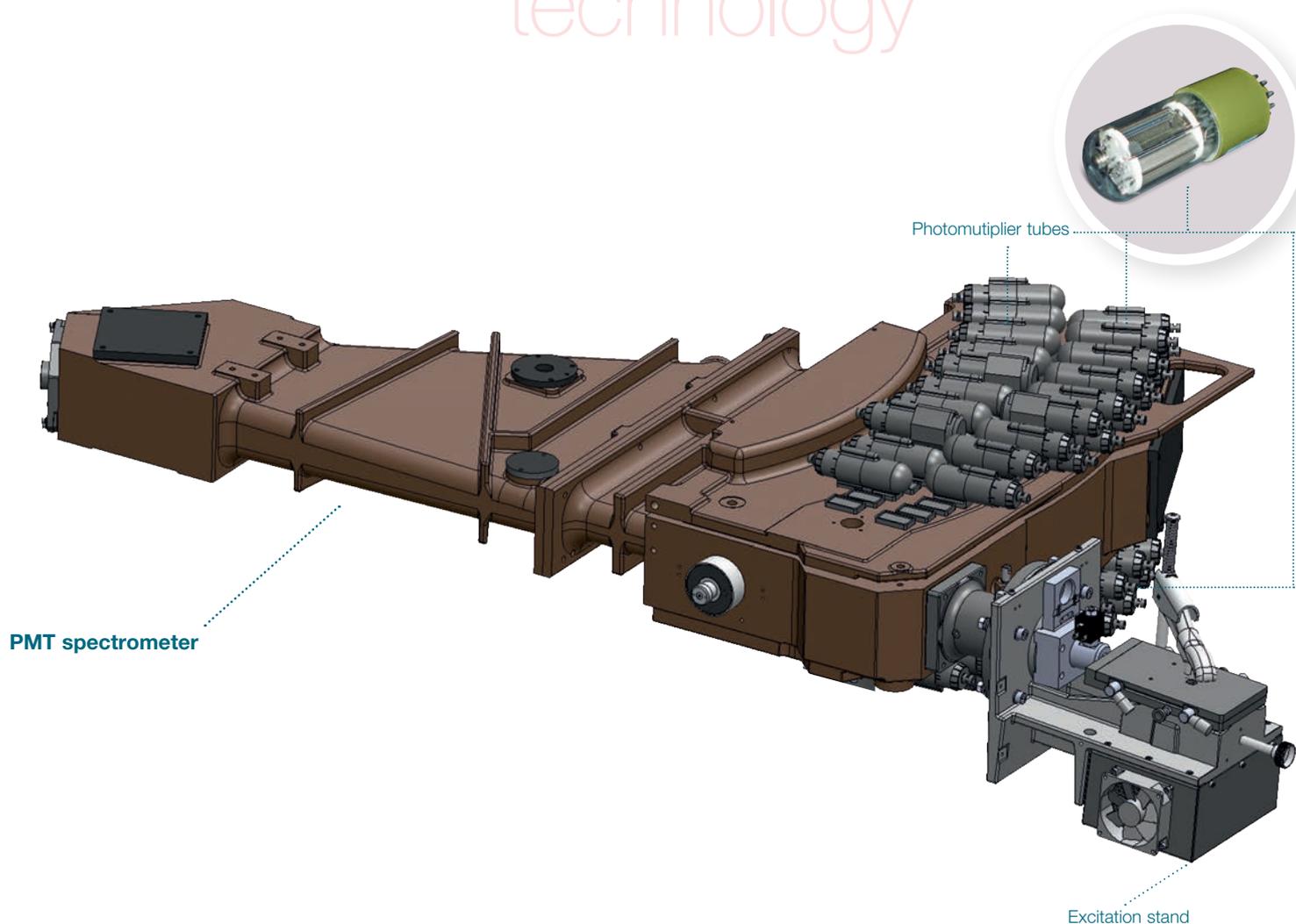
MgO
Al₂O₃-CaO
Al₂O₃
MnS
TiO₂
CaS

Non metallic micro-inclusions

Ultimate optical design offering the best solution to all your needs

The ARL iSpark 8860 OES spectrometer is designed around the world's most famous one-meter focal length PMT optics of the ARL 3460 and ARL 4460 OES spectrometers. The ARL iSpark 8860 addresses the requirements of all market and application segments. Its unique optical design concept offers an optimum solution for everyone looking for analytical excellence.

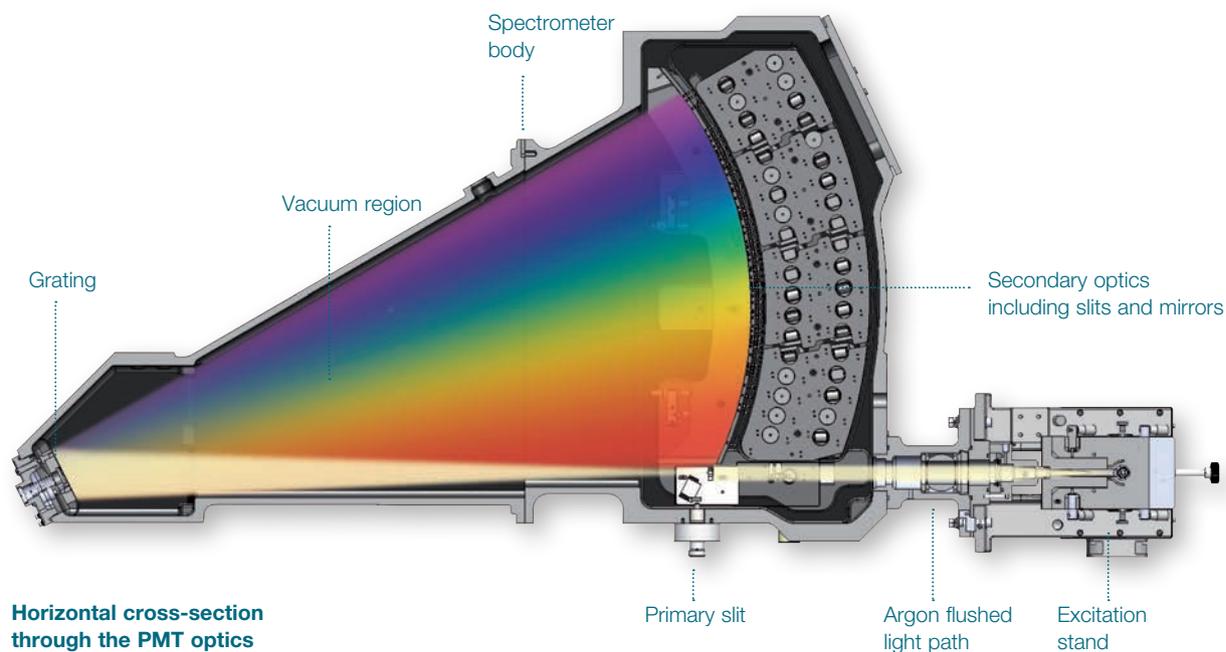
unmatched technology



PMT optics

The one-meter focal length spectrometer in Paschen-Runge mounting with PMT detection offers outstanding dispersion, resolving power for optimum element coverage in one optical cell, ideal for dedicated and multi-base applications. Direct light path view ensures highest possible sensitivity.

unmatched technology

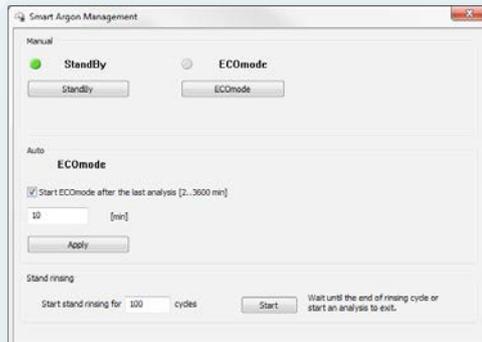


The spectrometer body is made of cast iron, operates under clean vacuum and is temperature controlled for ultimate stability, simplifying operation for users. PMT's with the most advanced signal acquisition and processing technologies offer the best possible performance available on the market. These attributes yield unmatched performances on all major, minor, and trace element constituents over short and long-term periods.

Technological breakthroughs to your benefit

The main modules of the spectrometer have been newly designed, leading to improved instrument performance, reliability, ease of use, as well as a reduction in maintenance and argon consumption.

outstanding design



Smart Argon Management (SAM) interface allowing starting or programming argon saving modes



Quick table changeover

IntelliSource

The Thermo Scientific IntelliSource is a double current controlled source (CCS) and the most innovative spark source on the market. More flexible and precise than the other digital sources, it allows discharge shapes to be tailored for most efficient sample surface preparation, material ablation and light emission in any metallic matrix.

Other innovative features contribute to the performance of this spark source. For example, superior trace element analysis is obtained thanks to DISC (Discharge Interrupt by Short-Circuit) technology which improves the spark repeatability at low current values.

Argon management

Thanks to an innovative computer controlled argon circuit design, the argon consumption has been significantly reduced.

- The argon flows are optimized for each phase of the analytical sequence (flush, pre-burn, integration), allowing best performance while requiring the minimum argon consumption
- Argon saving modes are user definable with the software tool SAM (Smart Argon Management) that allows significant savings when the instrument is idle. With ECOMode the standby flow in the stand is stopped or reduced to a minimum level (e.g. 0.1 L/min).

Spark stand

The design of the spark stand of the ARL iSpark 8860 spectrometers brings several important benefits:

- Optimized spark chamber design to achieve efficient sample ablation and repeatable spark plasma with reduced argon consumption
- Efficient air-cooling for high analytical throughput
- Robust, wear-resistant analysis table
- Tool-free system for simple and fast maintenance
- Optimum design and post-analysis argon pulses ensuring less frequent stand maintenance operations.

High degree of functionality delivering many advantages

The ARL iSpark 8860 was designed for increased safety, convenience and ease of use in daily operations:

- The stand cover allows simple operation with maximal operator security. A hydraulic cylinder makes the opening easy and acts as a braking system that allows a smooth and unassisted closing
- Samples to be analyzed, among other things, can be placed on the worktop located next to the stand
- The setting-up samples and other accessories can be placed in the storage compartment
- Front access to all modules of the instrument (e.g. vacuum pump, argon filter and electronics) facilitates maintenance and service
- Space saving: the housing cover requires very little clearance behind when opened
- Furthermore, all components being accessible from the front, the instrument can be installed against a wall or even in a corner
- The sample clamp with ergonomic design accommodates right- or left-handed operation
- Quick analytical table changeover and maintenance: no tools are needed



Space saving

Innovative signal acquisition and processing for unequalled performance

The ARL iSpark 8860 has several innovative signal acquisition and processing features that contribute to the superb performance and stability of the instrument, and make it a totally unique OES spectrometer.

unique attributes

Signal acquisition and processing

The PMT signal is integrated during TGA (Time Gated Acquisition) windows, i.e. time windows synchronized with the single sparks. TGA is an ultra-high precision version of TRS (Time Resolved Spectroscopy) that allows improving sensitivity and accuracy by collecting the signal with minimal noise, background emission and spectral interference.

In addition, PMT acquisition features include Single Spark Acquisition (SSA) and low noise integrator to suppress dark current and offset.

The following features also contribute to the quality and the reliability of the analysis:

- The FAST (Flexible Acquisition START and stop) algorithm allows acquiring an optimal subset of single spark intensities – the most stable and steady part of the signal data – on each channel for improved accuracy
- DISIRE (Diffuse Spark Intensities REMoval) is an algorithm that improves precision by discarding abnormally low intensity signals detected with the internal standard channel response
- Spark-DAT (Spark Data Acquisition and Treatment) algorithms enable the determination of the soluble/insoluble fraction of an element (e.g. Al, B, Ca and Ti in low alloy steel) or the characterization of micro-inclusions



Our quality system your best guarantee

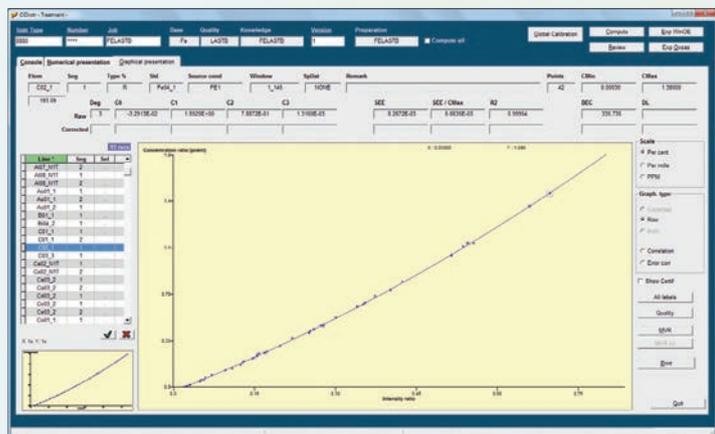
The quality of our instruments is recognized by thousands of customers around the world. This quality is ensured by our many comprehensive protocols and tools that compose our manufacturing process, some of which are outlined below.

Applications

The ARL iSpark 8860 spectrometers are delivered as turn-key systems with ready-to-use applications, pre-configured and calibrated in our factory. Analytical conditions, parameters and calibrations optimized by our specialists provide the best accuracy and performance at the highest speed with the lowest argon consumption. Element coverage and calibration ranges can be extended upon request. Comprehensive application notes for various metal matrices are available.

Calibration

Accuracy, which depends on the calibration of the instrument, is the most important figure of merit required for a spectrometer. The ARL iSpark 8860 metal analyzers are individually calibrated in our factory. The calibrations are performed using certified reference materials (CRMs) and reference materials (RMs) validated in the factory. The calibration curves are established with CARL (Calibration ARL), a highly sophisticated multi-variable regression (MVR) software tool that corrects for matrix effects and spectral interferences, all this ensuring the highest possible accuracy.



Calibration curve established with CARL

Quality Assurance

Every ARL iSpark 8860 instrument undergoes rigorous quality tests before and after calibration:

- Key figures of the instrument modules and components are checked to assure that the functions work according to specifications
- Performance figures are monitored in order to make sure that the instrument performs according to analytical specification
- Calibration accuracy is validated with CRMs and RMs

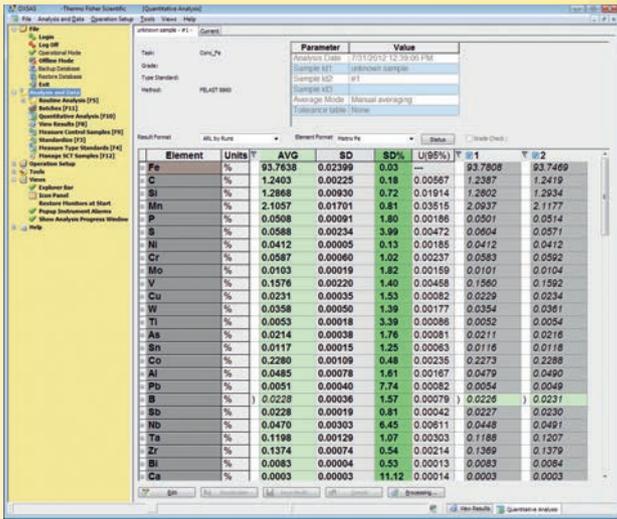
These steps are documented in the Quality Assurance Report delivered with the instrument.

Installation Qualification and Operational Qualification (IQ/OQ)

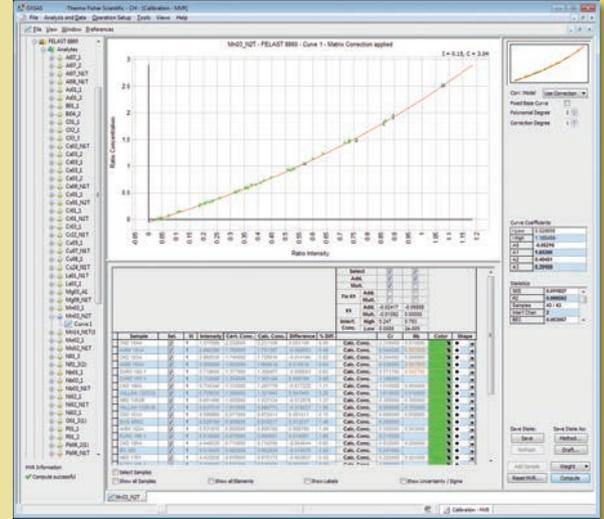
The Installation Qualification (IQ) performed by our service engineer demonstrates that the spectrometer is properly installed in a suitable environment.

The Operational Qualification (OQ) certifies that the instrument is working as specified. This comprehensive automated procedure based on instrument information is performed during the Quality Assurance process at the factory and on-site by our service engineer after the installation. It can be repeated anytime by the user who wants to check the state of his instrument.

Comprehensive software procedures allow performing and documenting these two important steps of the instrument validation.



Typical OXSAS display showing the result of a two-run analysis in concentration in terms of average, standard deviation, measurement uncertainty and the two individual runs



Display of a calibration curve using OXSAS MVR tool

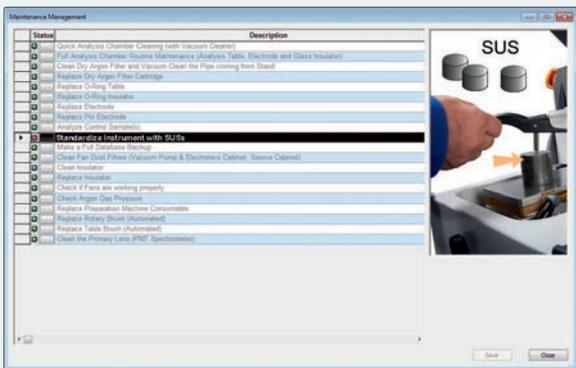
OXSAS analytical software simple, flexible and powerful

Thermo Scientific OXSAS analytical software provides virtually unlimited analytical capacity and flexibility, and includes all the features allowing data management, instrument control, calibration, instrument set-up and diagnostic.

OXSAS gives the ability to work at various functional levels from simple operations for routine analysis to a wider access for managers or users performing more critical operations (e.g. calibration or user account management).

OXSAS offers important features (e.g. measurement uncertainty and full traceability) for companies looking for accreditation of their analytical methods. It also includes a comprehensive set of tools for quality and maintenance management. The Maintenance Management module assists the operator in the management of routine and preventive maintenance. This simple and efficient tool helps to guarantee the performance all through the life of the instrument.

Thanks to regular free Internet software updates, OXSAS will continue to meet your requirements throughout the lifetime of your instrument. All features and details can be found in the separate OXSAS software product specification sheet.



Maintenance Management tool showing status of the maintenance tasks programmed in function of the instrument usage. The image on the right illustrates the operation to be performed.





Optical Emission Spectrometer

ARL iSpark 8860

TECHNICAL SPECIFICATIONS



The Thermo Scientific™ ARL iSpark 8860 is a high-performance optical emission spectrometer platform based on the famous Thermo Scientific one-meter vacuum PMT optics and innovative technologies. The ARL iSpark 8860 answers the needs of the different market segments of the metallurgy and brings an optimum solution for everyone. It offers high accuracy, sensitivity, precision, stability and reliability.

PMT optics

- One meter Paschen-Runge mounting vacuum spectrometer
- Special cast iron body, temperature controlled at $36\text{ °C} \pm 0.1\text{ °C}$
- Primary optics: heated focusing lens made of MgF_2 , CaF_2 or fused silica, depending on application
- Ruled gratings: 1080, 1667, 2160 or 3600 grooves/mm, appropriately selected for the analytical task
- Primary slit width: $20\text{ }\mu\text{m}$
- Secondary slit width: 25, 37.5, 50 or $75\text{ }\mu\text{m}$
- Up to 80 photomultiplier tubes (PMT) detectors
- PMTs: $\varnothing 28\text{ mm}$, side-on-type, 10-stage, windows: MgF_2 , UV glass, borosilicate glass or synthetic silica appropriately selected for the specific wavelength
- Wavelength range depending on grating and diffraction order, selected for optimum resolution and sensitivity

Spark stand

- Stand cover with ergonomic design for easy operation with maximal operator security
- Maximal sample size: 250 mm width x 250 mm depth x 150 mm height, maximal weight 10 kg

- Sample clamp with ergonomic design
- Wear-resistant stainless steel analysis table with quick fastening system; no tools needed for assembly and dismantling
- Design allowing argon savings and reduced maintenance
- Smart Argon Management (SAM) with programmable argon flows and argon saving ECOmode
- Argon flows can be different for each phase of the analytical sequence (flush, pre-burn, integration). Optimized for each application, between 2 to 5 l/min (typically 3 l/min) in analysis and 0.4 l/min in stand-by requiring the minimum argon consumption
- Argon pulses after analysis for improved dust evacuation and instrument autonomy
- Electrode: Ø 1.4, 4 mm or pin electrode according to application; 3 mm analytical gap

Control electronics

- Instrument master control board (IMC) controlling all spectrometer functions, data flows and communication with OXSAS analytical software

Spark generator

- IntelliSource, current controlled, double current source (i.e. a double CCS) for high shape flexibility and reproducibility
- Vectored spark shape definition, up to 200 A and 2500 µs single spark duration
- Spark short-circuit (DISC) to improve spark repeatability

Acquisition electronics and algorithmics

- Programmable high voltage settings: -300 to -1000 V for each channel
- For each channel:
 - Very low noise time gated differential integrator allowing PMT dark current and electronic offset subtraction
 - TGA (Time Gated Acquisition), a ultrahigh precision (100 ns) TRS from 2 to 6000 µs
 - ADC bit depth: 20 bits
 - SSA (Single Spark Acquisition) and storage
 - FAST (Flexible Acquisition START/stop) algorithm, for usage of optimal single sparks subsets
- DISIRE (Diffuse Spark Intensity Removal) algorithm for improved accuracy

- Spark-DAT methods for determination of soluble/insoluble concentration and for inclusion analysis

Vacuum system

- Rotary pump for wavelength range down to 170 nm with speed control for reduced electrical consumption
- Membrane pump combined with molecular pump for operation down to 119 nm

Dimensions and weight

- Dimensions: 1750 mm length x 860 mm width x 1200 mm height (inches: 68.9 x 33.9 x 47.3)
- Weight: approx. 500 kg net (1100 lbs), 570 kg with pallet (1260 lbs)

Requirements

- Ambient temperature: 16-30°C (62-86°F); maximum rate of change ±5°C/hour
- Relative humidity: 20-80%
- Voltage 230 V (+10% to -15%), single-phase with protective ground (2.5 kVA regulator required if fluctuations exceed +10%)
- Current: 10A, including PC, screen and printer
- Frequency: 50 or 60 Hz
- Grounding: < 1 Ohm
- Argon: > 99.998% 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, chlorine, hydrogen), argon purifier recommended

Consumption

- Electrical power: 1 kVA
- Argon: typically 3 l/min. during analysis, 0.4 l/min in stand-by and down to 0 l/min in ECOmode

Compliance to norms

- 2006/95/EC: Low Voltage Directive (LV)
- 2004/108/EC: Electromagnetic compatibility (EMC)
- 2011/65/EU: Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment (RoHS)
- 2012/19/EU: Waste Electrical and Electronic Equipment (WEEE)

A choice of automation solutions for unmatched productivity

The ARL iSpark OES spectrometers are not limited to manual operation: if you wish to achieve more, meet tighter and tighter product specifications and time schedules without increasing overhead costs, then our automation solutions will help you bringing your quality control operations a step ahead with fully automated sample preparation and analysis.

Thermo Scientific series of SMS automation solutions meet the range of industry requirements, from large aluminum smelters to modern steel works, including foundries and metals processors with varied capacities and needs.



Worldwide customer support

Excelling in optical emission spectrometry since 1934, we provide you the support of a major international corporation:

- A comprehensive worldwide after-sales service network assists with resolution of day to day queries and ensures that the ARL iSpark spectrometer achieves the very high standards of reliability and durability it is designed for
- Operational performance validation and possible online support with diagnostic help
- Application product teams can advise on analytical tasks from sample preparation to delivering the accurate result
- Dedicated training allows you to exploit the full capabilities of your ARL iSpark spectrometer



Find out more at thermofisher.com/ispark

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



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