

ThermoFisher SCIENTIFIC

Thermo Scientific ARL SMS-3300 System

Automation of OES and XRF spectrometers

thermo scientific

Introduction: Thermo Scientific ARL SMS-3300 System

The Thermo Scientific™ ARL™ SMS-3300 System is a turnkey laboratory workflow automation solution to drive process control laboratories efficiencies in the metals, cement and mining industries. The automation of multiple spectrometers offers new opportunities for users requiring more comprehensive and integrated automation solutions.



An evolution of existing automation solutions

Thermo Scientific™ robotized spectrometers have been continuously enhanced since the early 90's as a result of customer's feedback and experience. With over 800 systems installed in metals, cement and mining applications around the world, we have an undisputed reputation of performance and durability.

The ARL SMS-3300 system builds on this success and shows:

- Our commitment to look beyond the footprint of stand-alone laboratory instrumentation and focus on complete workflow solutions
- Our capacity to use a variety of competences and products such as larger and more powerful robots to deliver new automation solutions at the leading edge of technology
- Our desire to provide our customers with "in-the-field" easily upgradable systems from single to dual instruments with the lowest cost and upgrade work as well as the smallest footprint possible

Single source – One partner, one competence, one responsibility

We are unique in designing and manufacturing X-ray fluorescence (XRF) and optical emission spectrometers (OES) with their automation system.

Our competence is not merely limited to one analytical technique or automation but covers complete systems delivered with sample preparation as turnkey packages.

Exceptional performance at an affordable cost

Single instrument configuration: ARL SMS-3300 Single System

This is typically for customers who want to anticipate a future increase in their analytical needs. The ARL SMS-3300 Single System is easily upgradable in the field into a double instrument system ARL SMS-3300 Dual System.

Double OES configuration: ARL SMS-3300 Dual System

This is typical of primary metals producer's laboratories where two instruments are necessary to permanently provide analysis services and ensure fast response times when several urgent samples must be processed at the same time.

High sample throughput and analysis dependability

In metals applications, this permits to cope with heavy sample workloads. The ARL SMS-3300 system is an affordable alternative to the higher cost of two fully duplicate and separate automated lines, each with its own robot. It simplifies sample handling by providing a single introduction location for all samples with an optional magazine storage function of up to 32 production samples to free the introduction.

Combined XRF and OES analysis

In high alloy and stainless steel, specific aluminum or copper, brass and bronze applications, a single sample analysis is produced with high concentration alloy elements from the Thermo Scientific™ ARL™ X900 XRF Spectrometer and trace and light elements from the Thermo Scientific™ iSpark™ Plus OES Metal Analyzer.

Very short response times

Just a few seconds are needed for the ARL SMS-3300 robot to move samples between the system components.

Increased uptime and speed

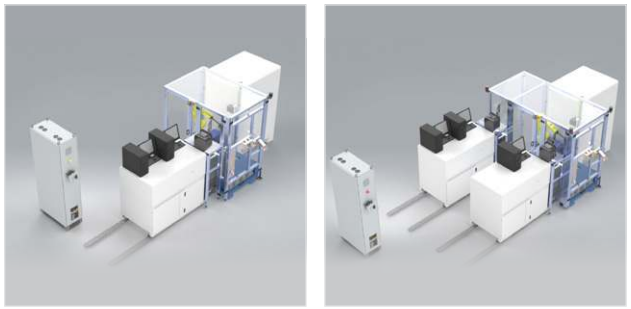
Complex and time consuming electro-mechanical transfer systems are eliminated. The results are available much faster, which improves production turnover. This is indeed more significant than productivity gains related to labor savings.

Latest industrial robotics technology with intelligent ARL SMS software

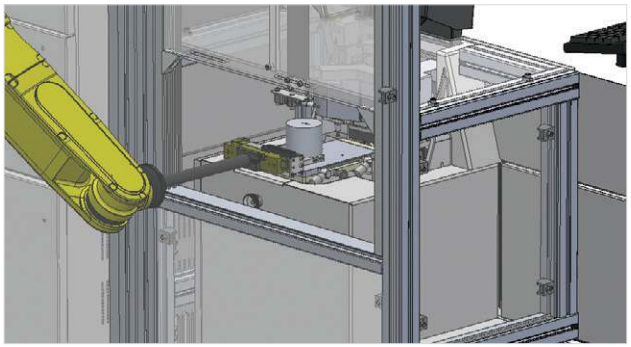
The ARL SMS-3300 system uses our SMS software with enhancements and intelligence to drive simultaneously two spectrometers and one preparation machine. It is equipped with a FANUC™ Robot, the number 1 supplier of industrial robots worldwide.

The ARL SMS-3300 system uses a medium pedestal standing industrial robot with an arm length with gripper of 1320 mm and 6 moving axes. This larger work volume allows the two spectrometers to be installed side by side. Minimum floor space is necessary for the complete system and short distances between the various components ensure fast operation without any compromise on accessibility for service and maintenance. This also provides increased flexibility in the positioning and interfacing of the sample preparation machine.

The ARL SMS-3300 heavy duty robot has an impressive max payload of 7 kg suited for twin spectrometers automation. Given usual production sample weights, this means less solicitation and reduced wear, increased reliability and longer lifetime. Minimum maintenance is required as the ARL SMS-3300 robot uses high-precision, brushless AC-Servo motors and internal cabling. Absolute encoder technology establishes the mechanical origin once forever when the unit is first turned on.



ARL SMS-3300 with single or dual OES instrument configuration



Thermo Scientific™ ARL™ iSpark™ Plus Auto Stand

An automation product designed with its users in mind

Simplicity of operation

The ARL SMS-3300 automation software is based on the same platform than our Thermo Scientific™ OXSAS™ Analytical Software for OES and XRF spectrometers. This common ground provides a unique and standardized software environment which supports automated OES and XRF workflows or simplifies automated operation. In addition, a single SMS system monitoring screen provides access to the full range of sample tracking and automation user functions.

Flexible instrument integration and comprehensive analysis modes

When two equivalent spectrometers are used, the samples can be analyzed simultaneously for optimum sample throughput; sample cross transfer is standard: the samples can be prepared by the preparation machine and analyzed by any of the two spectrometers to reduce response times and to ensure optimum availability around the clock and 365 days per year.

Sequential processing applies to twin XRF and OES configurations when the same sample has to be measured by XRF and OES. Each spectrometer can be used off-line for analytical method development and tests. The instrument accesses for operator and robot are automatically controlled by the SMS software; a simple software command allows switching equipment between automated workflow and manual modes.

Full compliance with security regulations

The ARL SMS-3300 safety enclosure is designed according to the applicable CE conformity standards. The system is also compatible with robotics application and electromagnetic norms and recommendations. A separate control box is used to temporarily pause the robot operation and unlock the access doors for an operator intervention inside the system. The automatic operation can then be quickly resumed without having to restart the system.

Easy service and maintenance

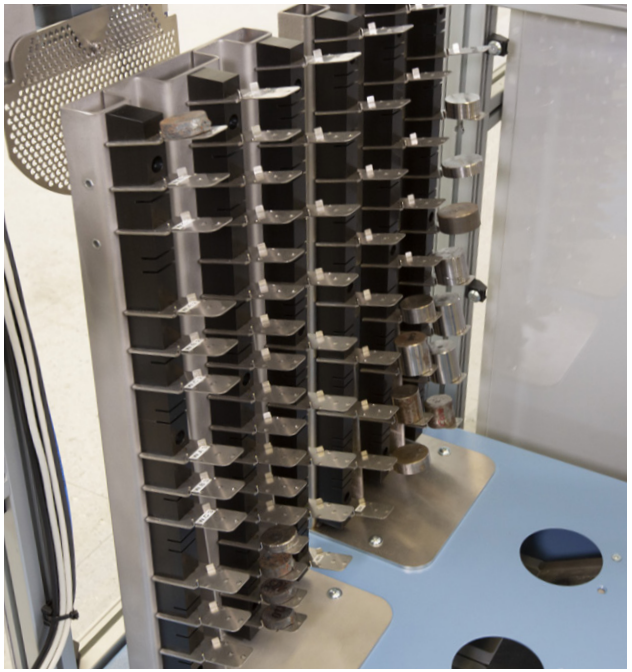
Each instrument or preparation machine can be quickly disconnected without interrupting the automatic system operation. In addition, the spectrometers support automated operation while allowing manual service and operation when needed. No interruption of the SMS system is needed; the spectrometers' supplies need not be disconnected. Sliding the spectrometer back in the SMS and resuming the automatic operation is done in just a few minutes.



ARL iSpark Plus robot access for automatic analysis



ARL iSpark Plus analyzer access for manual analysis

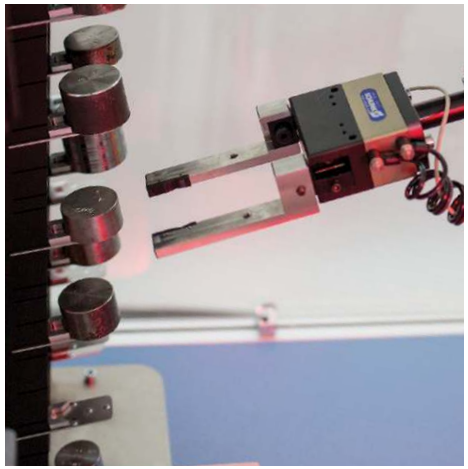


Thermo Scientific™ SCT Samples Magazine

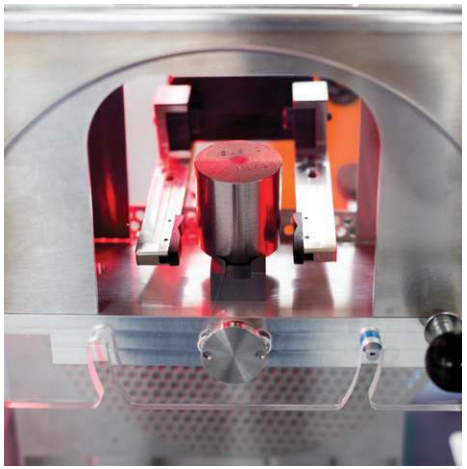
Material analysis is our job, quality our strength and automation our commitment

The ARL SMS-3300 system features as standard

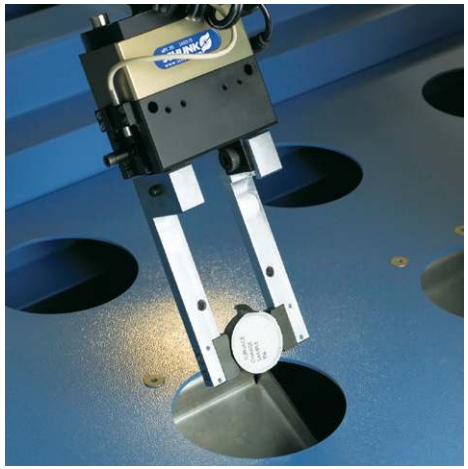
- Complete safety enclosure with computer-controlled operator access doors and control box
- Color lamps showing the status of the system and of the instruments
- Comprehensive instrument monitoring procedures to ensure that the spectrometers permanently deliver quality results, avoiding scrap and rework in production
- Early detection of sample presence
- Waiting positions for the temporary storage of prepared samples waiting for analysis to further optimize throughput
- A large magazine for up to 153, control samples and type standards which can be shared between the two spectrometers or dedicated to a specific instrument. Sections of the magazine can also be used for temporary storage of incoming samples
- Support of conditioning samples for OES stand cleaning purpose
- Rotation of standards by the robot before re-preparation to avoid any bias in the prepared surface over time
- Filing of selected samples on a chute (e.g., bad samples)
- Sample sorting and filing in 8 boxes
- Inverting device to invert standards and samples upside down before/after preparation, if necessary
- Automated sample handling with manual introduction/removal options



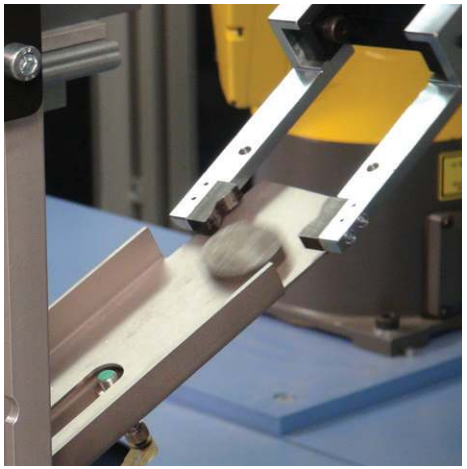
Fixed magazine for standards



Manual introduction position



Production or SCT Sample filing in a box



Production or SCT Sample filing on a chute

Scalable solution to meet your specific needs

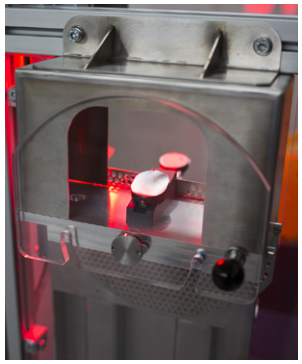
Easy in-field upgradability from single to dual instrument automatic system

A full range of options including:

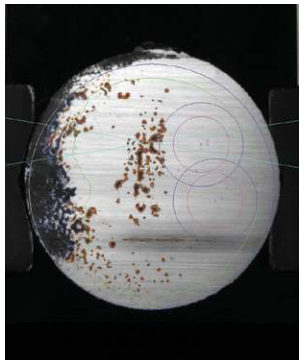
- A sample introduction magazine function for processing of up to 32 production samples by priority
- Choice of the sample preparation machine to obtain high quality, reproducible sample analysis surfaces
- Support of oxides associated with metal production (mineral ores, sinters, baths, slags and blast furnace slags)
- Up to 5 production sample shapes
- Sample registration via terminal or network
- Registration from the list of production samples announced by other computers
- Registration using sample identification parameters recorded on a network disk
- Labeling of production samples on the analysis surface or on their back
- Dot-peen printer to mark “soft” samples
- Vision system to evaluate prepared sample surface quality and reject bad samples without analysis trials. For OES, selection of the best spark positions in case of difficult samples
- Sample collections and batches; to facilitate the registration and processing of repetitive series of samples (for instance, samples from aluminum electrolytic baths)
- Remote control of the automated ARL OES and XRF spectrometers
- Additional digital signals to those supplied as standard for communication of alarms to external visual or acoustic devices
- Automatic re-preparation of samples which cannot be analyzed
- Sample radioactivity detection (RMS)
- Chronological filing of production samples on 3 chutes in addition to the chute supplied as standard
- Local or remote manual sample introduction door
- Handling and cooling of hot samples (Max. 850°C) using air or/and water media
- SMS Scheduler allows for automatic analysis of control and standardization samples at predetermined time and intervals
- Integrated barcode reader for auto sample registration, allowing for faster sample identification and less potential error in manually entering sample information prior to analysis



Vision system



Manual sample introduction door



Spark position evaluation with vision system



Labeling system



SMS cooling



Temporary storage of incoming samples

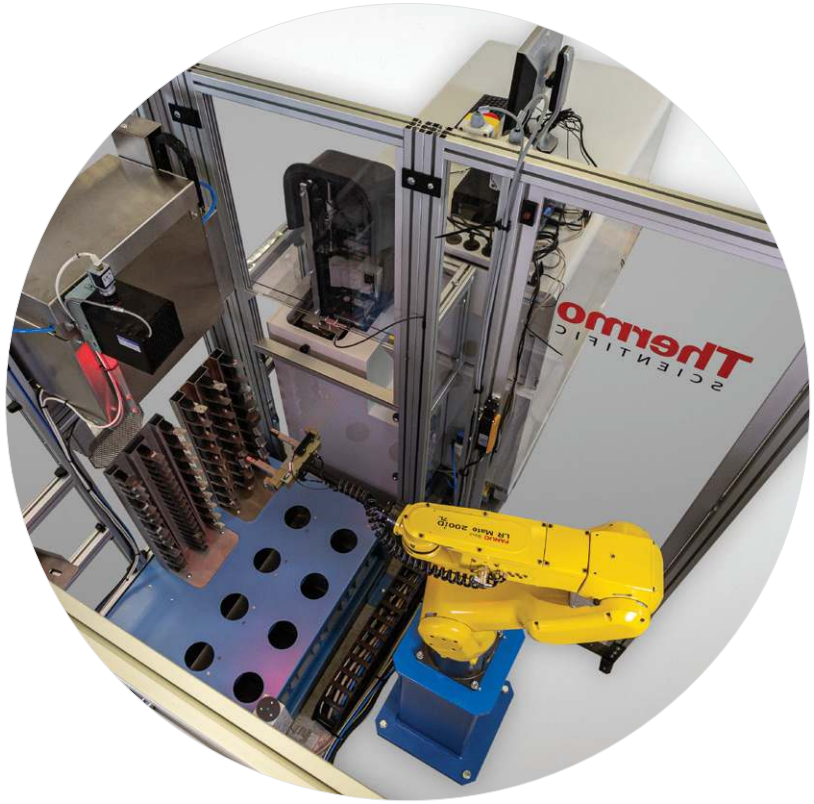
Top class sample preparation solutions

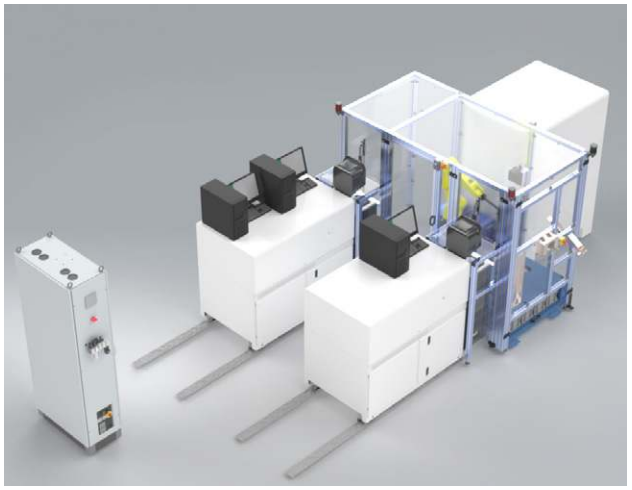
Tightly integrated sample preparation machine support

The ARL SMS-3300 system robot has a direct access to the milling machine to save sample preparation time. This is done via a separate access side door avoiding extra hardware to bring samples and standards in and out of the milling machine.

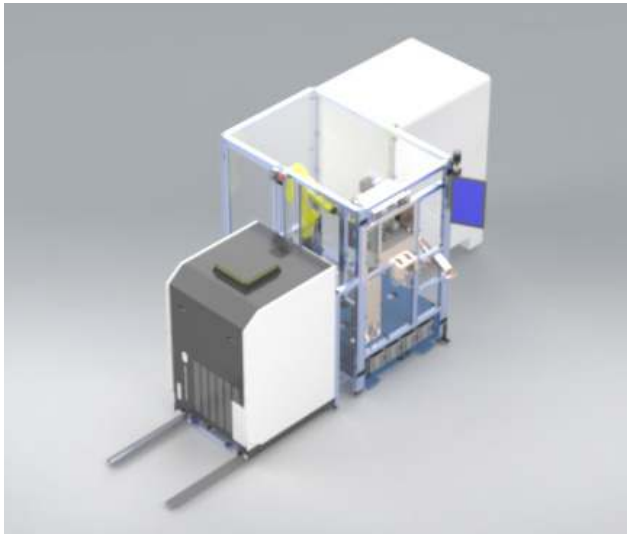
An open architecture for sample preparation

High quality, reproducible and reliable sample preparation is an essential component of the automated spectrometer system which contributes directly to the analytical performance and the system uptime.





SMS-3300 Dual with two ARL iSpark Plus metal analyzers



SMS-3300 Single with a single ARL X900 XRF spectrometer

Built-in intelligence to manage your samples and avoid mistakes and delays

A unique laboratory productivity enhancement tool for metals and mining applications

The ARL SMS-3300 system is a great step forward in advancing process control in the metals, cement and mining industries.

Best use of your resources

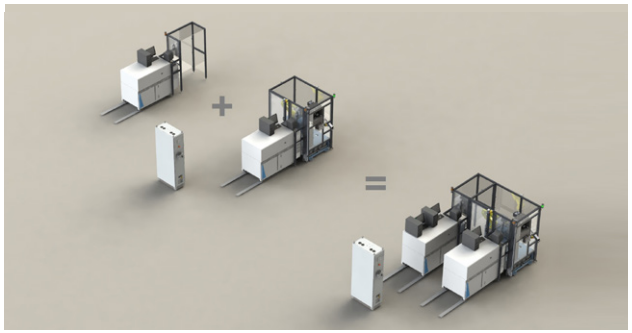
The ARL SMS-3300 system is designed to manage your samples to help ensure the shortest response times given their priorities and the sample preparation, and analysis resources available at any time. With a single sample introduction position, it reduces operator interaction by automating equipment selection to process a sample. Efficient back-up procedures are automatically applied when necessary to avoid any discontinuity in the analytical services.

An affordable automation solution

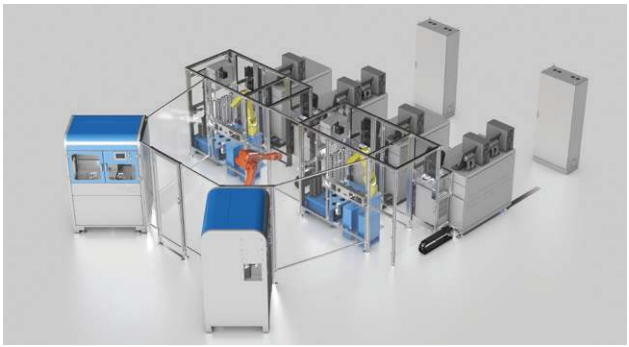
Expensive peripherals like vision or sample labeling can be shared between two instruments. A single set of up to 90 standards is necessary for the monitoring of two OES or OES-XRF instruments. A single robot and SMS automation workstation are necessary. Expensive electromechanical sample transfer devices are not needed anymore to provide cross transfer between any of the two spectrometers.

The right automation solution for your specific application

The family of Thermo Scientific™ SMS™ automation solutions sets new standards for manually operated instruments to match and makes automation even more indispensable to advance your quality control capabilities. You can now choose the automation solution best suited to your needs.



Field upgrade from SMS-3300 Single to Dual



ARL SMS-3300 systems with multiple XRF or OES spectrometers and minimal footprint can be connected to a central preparation cell (possibly supplied by local providers)

Upgradability from ARL SMS-3300 Single to ARL SMS-3300 Dual System

Thanks to its modular design, the ARL SMS-3300 Single instrument can easily be upgraded into an ARL SMS-3300 Dual instrument with low impact on the existing equipment and no waste.

More efficient laboratory automation

The integration of separate sample preparation and analysis systems in one or more compact ARL SMS-3300 cells streamlines full laboratory automation. Samples received via automated air tubes can be immediately processed leading to major cost and significant response time savings. These samples can also be temporarily stored and processed by priority.

The ARL SMS systems are true products manufactured and maintained according to ISO 9001-2000 procedures alongside our reputed metals analyzers and XRF spectrometers. As designers of the spectrometers producing the analyses, the only deliverable of the process, we are best able to supply and support instrument and laboratory workflow automation solutions, as single source.

Our automation specialists are available to evaluate your application and to advise on solutions. Furthermore, cost-justification tools are available to evaluate the savings and estimate how quickly your investments will pay back.

A generic automation solution

Even more capabilities than the other ARL SMS systems

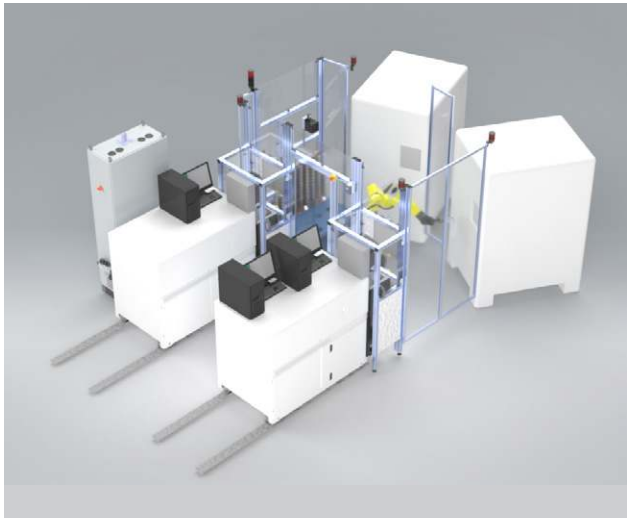
The family of ARL SMS automation products consists of:

- The Thermo Scientific™ ARL™ SMS Omega XRF Instrument for use with the Thermo Scientific™ ARL OPTIM'X™ Entry Level WDXRF Spectrometer
- The Thermo Scientific™ PFX System for the Thermo Scientific™ ARL PERFORM'X™ WDXRF Spectrometer
- The Thermo Scientific™ SMS™ XY Manipulator Based System for XRF applications
- The Thermo Scientific™ ARL™ SMS 2300 Robotized System for single OES or XRF spectrometer and sample preparation automation
- The ARL SMS-3300 Single robotized system for single OES or XRF spectrometer and sample preparation automation, easily upgradable into a double instrument system
- The ARL SMS-3300 Dual system for the automation of twin OES or XRF-OES spectrometers with single preparation machine support and standard cell layout
- The Thermo Scientific™ ARL™ SMS 3500 System system for the automation of twin OES and/or XRF spectrometers with double preparation machine support and flexible cell layout

The same set of core SMS software sources is used to generate any of these versions. This maximizes the synergy between applications, reduces development and testing efforts and facilitates maintenance work. Most important, it permits supplying the same software to all customers irrelevant of the specific hardware configuration. This unique strategy assures full maintainability and upgradeability to protect the installed base from obsolescence and allow customers to keep pace with the fast evolution of the technology, at minimum cost.



ARL SMS-2300 system



ARL SMS-3500 system

Specifications

Spectrometers supported	
Optical Emission (OES)	ARL iSpark Plus metals analyzer
X-Ray Fluorescence (XRF)	ARL X900 series of XRF spectrometers

Samples		
Robot payload	Max 7 kg	
Production samples – Metals	Shape	Lollypop single and dual thickness, oval (spemis), disks, cylindrical or slightly conical. ASTM aluminum. Parallel surfaces required for XRF
	Dimensions	Tolerance within ± 1 mm
	Thickness	8-60 mm for OES, 8-30 mm for XRF (8 mm minimum after preparation)
Production samples – Powder	Shape	Pellets in steel rings (51.5 x 8 mm or 40 x 14 mm) – Fused beads on metallic supports
Setting-up samples, control samples, type standards (SCT). Conditioning samples	Shape	Metals: disks, cylindrical or conical (max. 3° cone angle) Powder: pellets in steel rings, fused beads on metallic supports
	Dimension	32-52 mm in diameter for XRF; smaller samples (> 25 mm in diameter) by OES only
	Height	8-60 mm for OES, 8-30 mm for XRF (8 mm minimum after preparation)
	Storage magazine	51 Samples (3 sectors of 17, 13, or 9 positions each with respectively up to 25, 35, or 60 mm height standards). Option for up to 3 storage magazines.
Sample introduction magazine (option)	For the storage of up to 32 production samples before processing	

Sample preparation	
For ferrous samples	Milling – Cup wheel and belt grinding
For non-ferrous samples	Milling or sawing and milling
For powder samples	Crusher, grinding mill, pelletizing press. Fusion machine / Sample introduction systems available as options

Typical production sample manipulation times	
Loading in the milling machine (from the SMS sample introduction slide or door)	8 sec
Transfer from the milling machine to the metals analyzer stand or XRF lift	7 sec
Sample shifting for another spark (OES)	5 sec
Sample filing and robot move to the next sample	6 sec
Sample labeling (option)	8 sec
Sample surface analysis by a vision system (option)	2 sec
Stand and electrode cleaning (OES)	The cleaning before or after the sample analysis is done in hidden time (the cleaning operates in parallel and independently of the robot)

Power, weight and size	
Power*	400 V + 10% 3-phases with neutral and earth / 50-60 Hz + 2% / Earth < 1 Ohm /16 A switch breaker / 4.5 kVA
Compressed air	1 m^3/hour maximum at 6-10 bar (not applicable if using SMS Cooling)
Typical weight*	~800 kg
Typical size* (LxWxH)	ARL SMS-3300 Single: 3830 mm x 2235 mm x 1905 mm ARL SMS-3300 Dual: 3830 mm x 2725 mm x 1905 mm

* Varies depending on the configuration. Without the spectrometers and sample preparation.

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Thermo Scientific spectrometers can be automated

Our company provides a full range of optical emission spectrometers (OES), X-ray fluorescence (WDXRF, EDXRF, XRF with full XRD) and X-ray diffraction instrumentation (XRD) that cover every aspect of materials analysis from routine process control to highly specialized research applications. Among them, the following models can be automated with Thermo Scientific™ automation systems described in this brochure.



ARL iSpark Plus OEA Metal Analyzers



Thermo Scientific™ ARL™ iSpark™ Plus Fire Assay Analyzer



ARL X900 XRF-XRD analyzer

Find out more at **thermofisher.com/sms3300**

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