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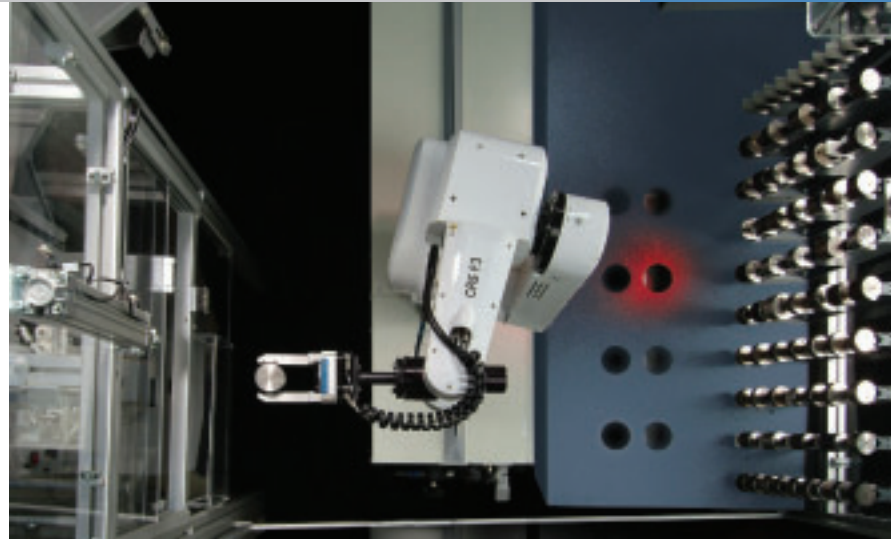
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ARL SMS-3000

Automation of twin OES
and XRF Spectrometers

The Thermo Scientific ARL SMS-3000 is a high-end, affordable alternative to single spectrometer automation solutions. The automation of multiple spectrometers and preparation machines offers new opportunities for users requiring more comprehensive and integrated automation solutions in the metals and mining industries.

Product Specifications



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. Today, the automated spectrometers with ARL SMS-2000 have established a very high standard of excellence in the most demanding environments such as the iron and steel industry.

The new ARL SMS-3000 builds on this success and shows:

- Our commitment to focus at customer applications and respond to their expectations
- Our capacity to use a variety of internal competences and products to deliver new products

Single source – One partner, one competence, one responsibility

Our company is unique in designing and manufacturing X-Ray Fluorescence spectrometers (XRF), Optical Emission Spectrometers (OES) and Fire Assay Analyzers (FAA) with their automation system including the robot.

Our competence is not merely limited to one analytical technique or automation but covers complete systems.



Thermo Scientific CRS F3 robot

An affordable solution to double your analytical power

Combined XRF and OES analysis

In high alloy and stainless steel or copper, brass and bronze applications, a single analysis is produced with high concentration alloy elements from the ARL ARL 9800 or 9900 XRF spectrometer and trace and light elements from the ARL 4460 metals analyzer.

- **Very short response times**

Just a few seconds are needed for the ARL SMS-3000 robot to move samples between the system components.

- **Increased reliability**

Complex and time consuming electro-mechanical transfer systems are eliminated. In addition to significant productivity gains related to labor savings, the results are available much faster, which improves production turnover.

Double OES configuration

This is typical of iron and steel laboratories where two instruments are necessary to permanently provide analysis services and assure fast response times when several urgent samples have to be processed simultaneously.

- **High sample throughput and analysis dependability**

In metals applications, this permits to cope with heavy sample workloads. The ARL SMS-3000 is an affordable alternative to the higher cost of two fully duplicate and separate automated lines, each with its own robot.

Double sample preparation machine support

This reduces response times, increases sample processing cadence and improves the availability of automatic sample preparation in highly critical production control environments.

Latest Thermo Scientific robotics technology with proven SMS software

The ARL SMS-3000 uses the latest version of Thermo Scientific SMS software with enhancements to work simultaneously with two spectrometers and two preparation machines. It is equipped with one of the best industrial robots available today.

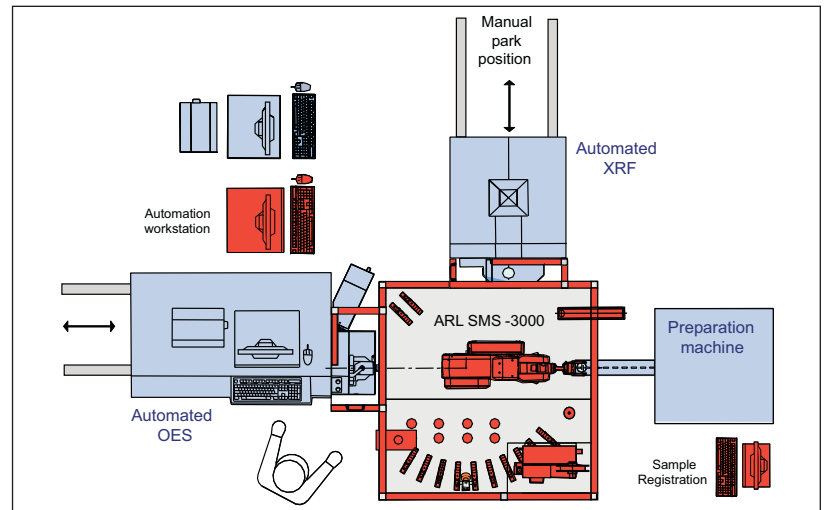
This high end Thermo Scientific CRS F3 robot has an impressive potential and is ideally suited for twin spectrometers automation:

- Its large work volume with an arm length of 0.84 m and 6 or 7 degrees of freedom permits direct access of twin OES and XRF spectrometers.
- Samples of up to 1.2 kg are moved at speed up to 4 m/s. Given usual production sample weights, this means less solicitation and reduced wear, increased reliability and longer lifetime.
- Minimum maintenance is required as the Thermo CRS F3 uses high-precision, brushless AC-servo motors and internal cabling. Absolute encoder technology establishes the mechanical origin once for ever when the unit is first turned on.

An automation product designed with its users in mind

- **Simplicity of operation**

The same analytical software is used for the XRF and OES applications and automation is based on the proven and reputed ARL SMS software. One screen provides access to the full range of sample tracking and automation user functions. A single registration device and introduction location is necessary, the production samples being automatically dispatched to the relevant system components.



ARL SMS-3000 stationary version





ARL 4460 robot access for automatic analysis



ARL 4460 access for manual analysis

- Flexible instrument integration and comprehensive analysis modes**

When two equivalent spectrometers are used with two preparation machines, the samples can be prepared and analyzed simultaneously; to ensure optimum availability around the clock and 365 days per year, they can also be processed by any of the two preparation machines and spectrometers.

Sequential processing applies to twin XRF and OES configurations.

Any spectrometer can be used off-line for analytical method development and tests, or simply for the analysis of product samples with irregular shapes.

The instrument accesses for operator and robot are automatically controlled by the SMS software; a simple software command allows switching equipments between automatic and manual modes.

- Increased work volume with a linear track robot version**

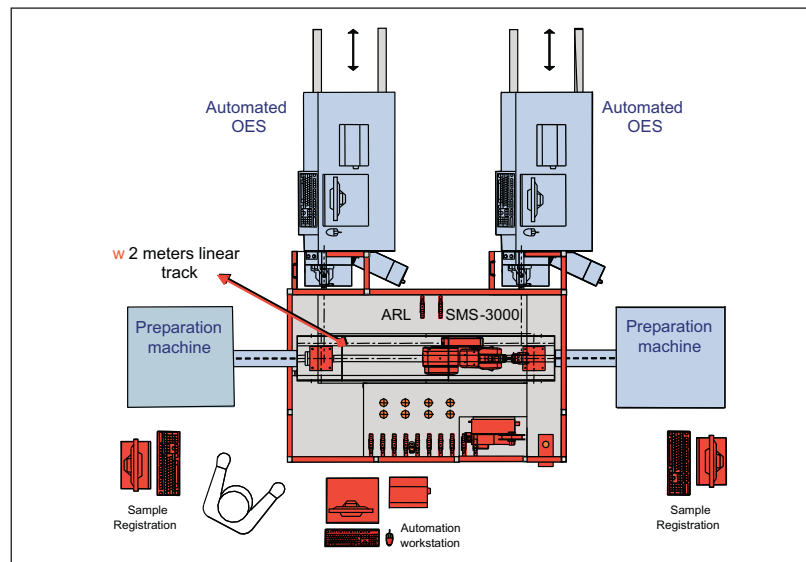
And the choice is not merely limited to a single stationary version where the robot stands on a chassis; a 2 meters linear track permits to increase the ARL SMS-3000 robot working range by adding a 7th degree of freedom. The two spectrometers can then be installed aside each other rather than at 90°. This simplifies also sample transfer to and from the sample preparation machines.

- Full compliance with security regulations**

The ARL SMS-3000 safety enclosure is designed according to the applicable CE conformity standards. The system is also compatible with robotics and electromagnetic norms. A separate control box is used to temporarily interrupt the robot operation and unlock the access doors for a manual intervention in the system. The automatic operation can then be quickly resumed without having to restart the system.

- Easy service and maintenance**

The system provides easy and direct access to the various components for maintenance purposes or manual work. Each instrument or preparation machine can be quickly disconnected without interruption of the automatic operation. In addition, the spectrometers can slide to a separate park position for service or for manual operation over longer time periods. This is done without having to disconnect the spectrometers supplies.



ARL SMS-3000 linear track version

An affordable solution to double your analytical power

Even more features and capabilities than the other ARL SMS versions

With the new ARL SMS-3000 system, the family of ARL SMS automation products consists of:

- The ARL SMS-XY and ARL SMS-Omega manipulator based systems for XRF applications
- The ARL SMS-2000 EL entry level for OES applications
- The ARL SMS-2000 robotized system for single OES or XRF spectrometer automation and sample preparation
- The ARL SMS-3000 for the automation of twin OES and XRF spectrometers with double preparation machine support

The same set of core ARL SMS-2000 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. This strategy assures full maintainability and upgradeability to protect the system from obsolescence and keep pace with the fast evolution of the technology. The result is the most advanced automation solution with unmatched features, performance and reliability.

The ARL SMS-3000 shares the same options than the other ARL SMS-2000 versions, namely:

- 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 different production sample shapes
- Sample registration via terminal or network

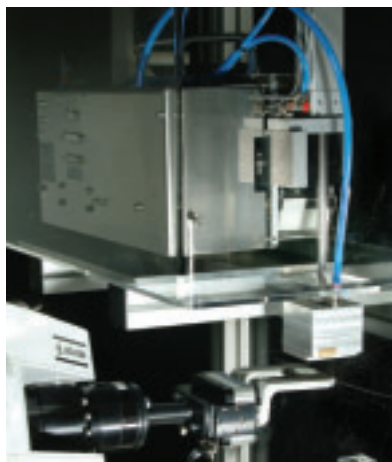


ARL SMS-XY for X-ray spectrometer

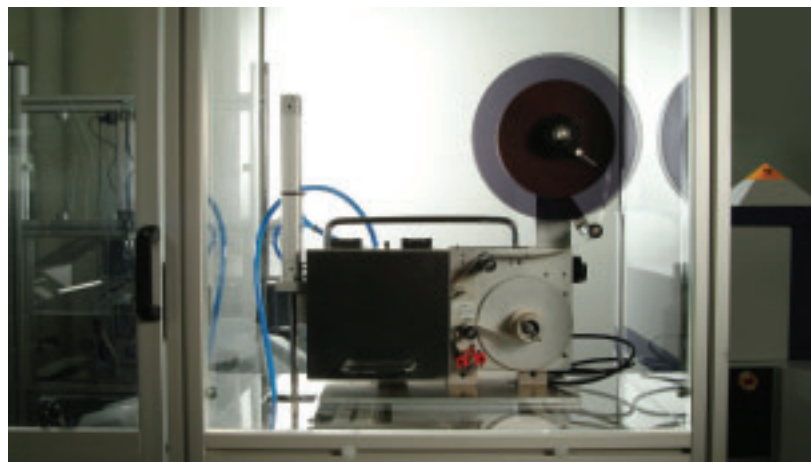
- Registration from the list of production samples announced by other computers
- Registration using sample identification parameters recorded on a network disk
- Labeling of production samples on the analysis surface or on their back
- Vision system to evaluate prepared sample surface quality and reject 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 OES and XRF spectrometers
- Digital signals for communication of alarms to external visual or acoustic devices
- Automatic re-preparation of samples which cannot be analyzed
- Sample radioactivity detection
- Chronological filing of production samples on slide(s)
- Manual single sample introduction slide
- Manual sample introduction magazine for systems without automatic sample preparation

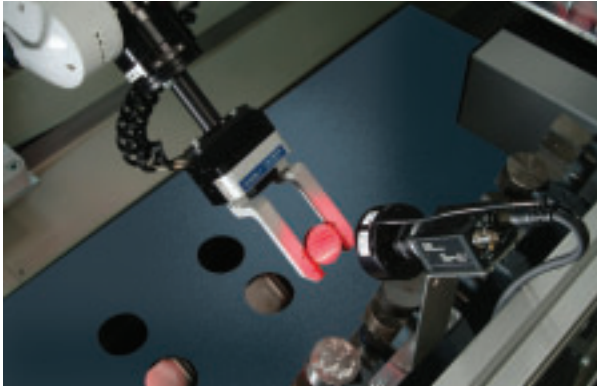
In addition, the ARL SMS-3000 provides as standard:

- Complete safety enclosure with computer controlled operator access doors and control box
- 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 samples to further optimize throughput
- A large magazine for up to 90 setting-up, 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 manual sample introduction
- Support of conditioning samples for cleaning purposes
- Rotation of standards before re-preparation using any of the two preparation machines, to avoid any bias in the prepared surface over time
- UPS for the ARL SMS-3000 automation system including the robot; with computer controlled shut-down procedure when the power holding time is elapsed



Sample labeling system





Vision system



ARL SMS-3000 magazine for standards

A unique productivity enhancement tool for metals and mining applications

The ARL SMS-3000 is an opportunity to apply productivity enhancement tools at the leading edge of technology to advance production Quality Control solutions.

With nearly 400 robotized Thermo Scientific spectrometers installed around the world, our company has an undisputed reputation of performance and durability.

- **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 the two instruments. A single robot and SMS automation workstation are necessary. Expensive electro-mechanical sample transfer devices are not needed anymore

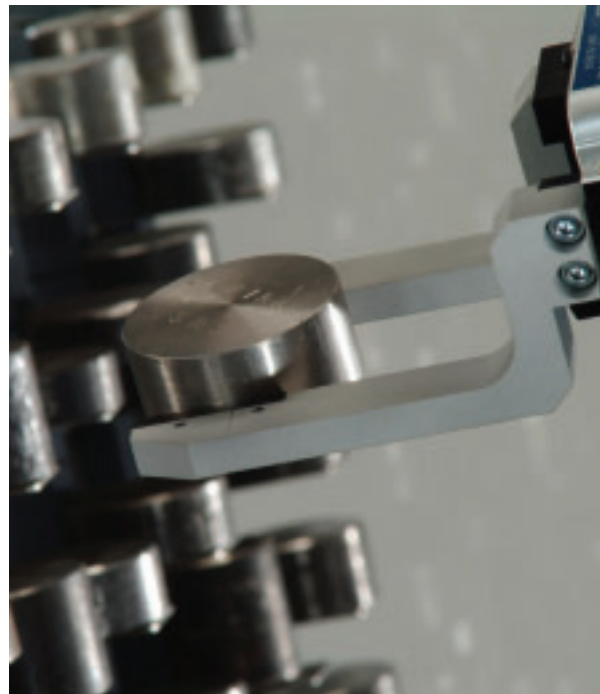
The right automation solution for your specific application

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. Thermo automation specialists are available to evaluate your application and to advise on solutions.

This is another example of our continuous commitment to help customers improve productivity.



ARL SMS-3000 sample filing



Return of a standard sample to the magazine

SPECTROMETERS

Optical Emission Spectrometer (OES) supported	ARL 4460 metals analyzer
X-Ray Fluorescence (XRF) spectrometer supported	ARL 9800 and ARL 9900 series XRF

SAMPLES

Sample weight	Max. 1'200 grams	
Production samples - Metals	Shape :	Lollypop single and dual thickness, oval (spemis), disks, cylindrical or slightly conical. Parallel surfaces required for XRF
	Dimension :	Within ± 1 mm
	Height :	8-55 mm for OES, 8-30 mm for XRF (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
	Shape :	Metals: disks, cylindrical or conical (max. 3° cone angle) Powder: Pellets in steel rings, fused beads on metallic supports
Setting-up samples, control samples, type standards (SCT). Conditioning samples	Dimension :	32-52 mm in diameter, smaller samples (>25 mm) by OES only
	Height :	8-60 mm for OES, 8-30 mm for XRF
	Storage magazine:	Capacity of 90 samples (10 columns of 5, 7 or 9 positions each with respectively up to 60, 45 or 30 mm thick standards)

SAMPLE PREPARATION

For ferrous samples	Grinding: Cup wheel - Cup wheel and belt - double belts grinding. Milling
Options	Sample introduction systems
For non-ferrous samples	Dual milling or cutting and milling
Options	Sample introduction systems
For powder samples	Grinding mill, pelletizing press. Fusion machine
Options	Crusher, sample introduction systems
Preparation time including transfer to the ARL SMS	Depends on the type of sample preparation

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