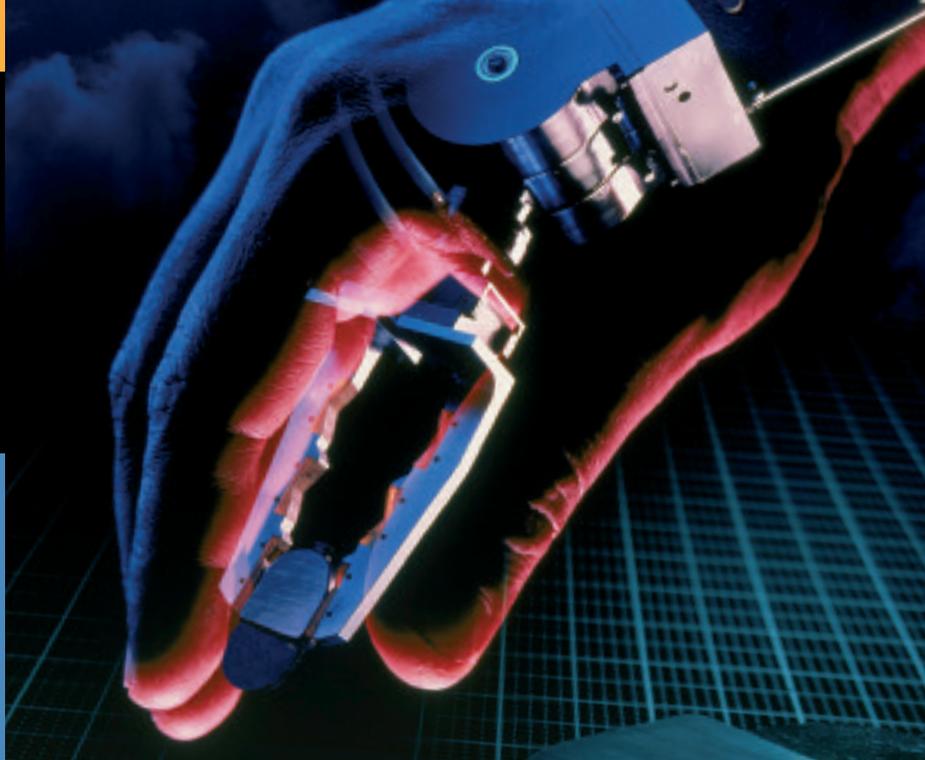


Thermo Scientific ARL SMS-2000 Automated Metals Analyzer



The Intelligent Solution



Better quality analyses available faster



Ultimate analytical performance



Short and constant response times



Increased efficiency, reduced manual labor

ARL SMS-2000

A third generation product at the leading edge of technology

An opportunity to seize

Our company identified very early the importance of automating sample analyses to improve quality control operations in the metals industry. In the mid 80's, we were first in introducing a fully automatic version of our optical emission spectrometers. Since then, the automated Thermo Scientific ARL 3460 and ARL 4460 metals analyzers with SMS (Sample Manipulation System) have established a high standard of excellence in the most demanding applications such as the iron and steel industry. They are recognized today as the reference in terms of reliability, life time and performance.

The latest Thermo Scientific ARL SMS-2000 version sets new performance standards in speed, precision and capacity to meet the most sophisticated applications.

Major productivity gains

With the ARL SMS-2000, the samples are prepared and analyzed at a very rapid, fully sustainable and perfectly predictable rate without operator intervention. Operating and analysis costs are cut significantly:

- The results are available faster to improve production turnover
- More samples can be processed, so frequently eliminating production bottlenecks
- Qualified laboratory personnel can be released from routine duties
- Automatic instrument monitoring functions ensure that instrument performance is permanently under control
- A better usage of standards reduces operating costs even further. Their analysis surface is fully sparked before their automatic re-preparation

Better analysis dependability and quality

Automation with ARL SMS-2000 reduces chemical analysis variation, eliminates many of the causes of measurement errors and fully exploits the analytical performance of modern Thermo Scientific process control spectrometers.

All samples are processed under rigorously identical and reproducible conditions following procedures defined and set up in advance.

Human variables, mistakes, subjective factors influencing analysis results and down times are eliminated. Results are more accurate and more reproducible; difficult samples can be analyzed without performance compromise; less time is lost with sample repeats.

Spectrometer monitoring and control form an integral part of the automatic system. The most complex analysis procedures are applied systematically without the need for any operator intervention.

A very fast payback

- More dependable and less expensive analyses makes for a rapid return on investment (typically less than one year), not only for the automatic system but also for the spectrometer itself
- Smoother production flows with more efficient quality control tools cut manufacturing costs
- The critical phases of production are monitored more effectively, so enabling commitments to be given for compliance with still more stringent product specifications

Proven and recognized technology

Launched in the early 2000's, the ARL SMS-2000 is the trustworthy successor to the previous generations of SMS systems and a serious challenge to beat for manually operated instruments. Continuously enhanced as a result of customer's feedback and experience, the ARL SMS-2000 satisfies the full range of metals production control requirements, from large aluminum smelters to the most modern steel works, including foundries with varied capacities and needs.

They are used successfully over years by many well-known companies who rely entirely on our ability to supply reliable automation solutions and to support them efficiently for many years following installation.

Powerful, multi-purpose and entirely customizable

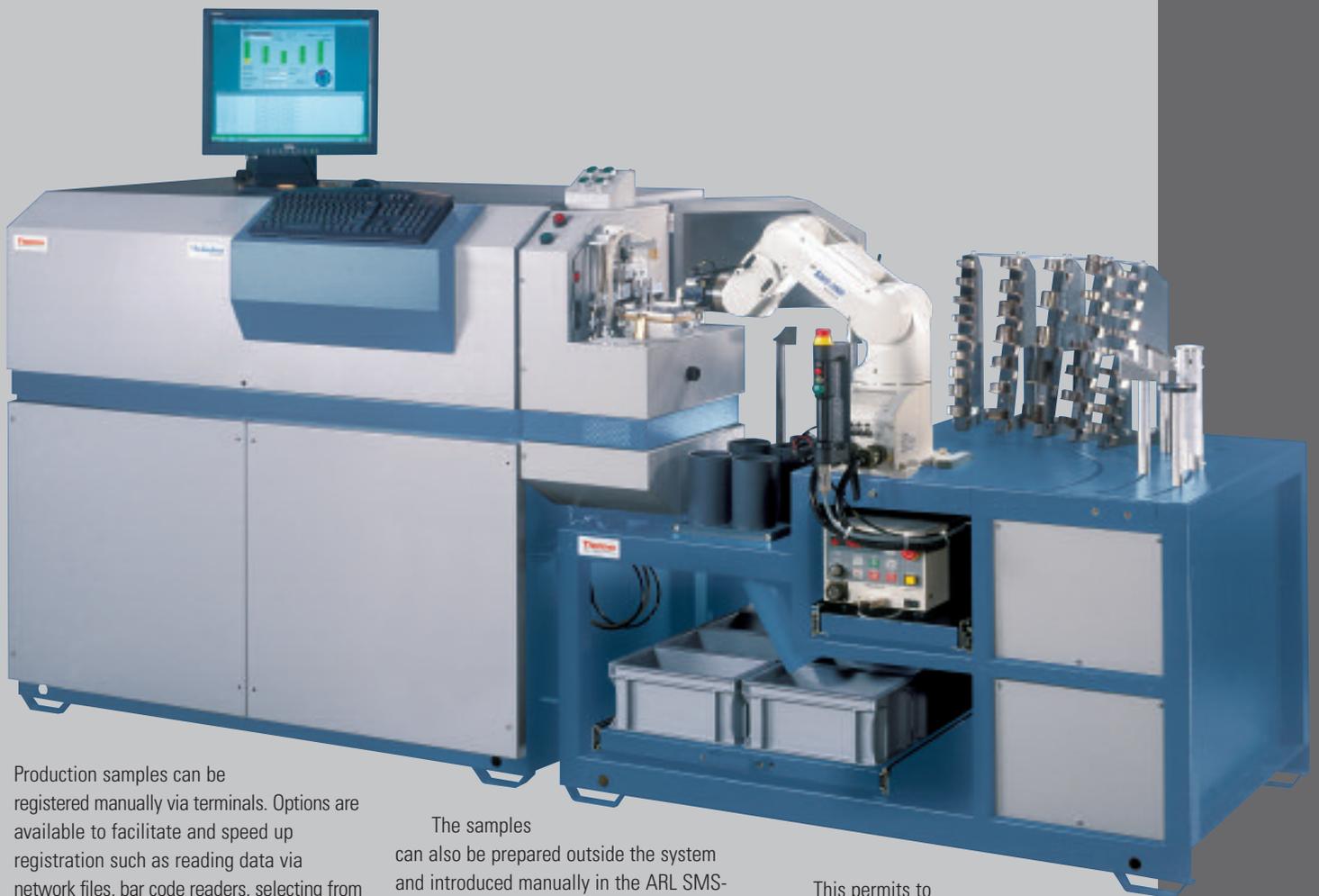
The remarkable quality and speed of the ARL SMS-2000 industrial robot combined with the unique ARL SMS automation software provide an almost unlimited operational flexibility to cover all possible applications. This avoids having to redesign the system each time and guarantees optimum support and evolution.

Personalized configuration

This single product strategy does not limit the choice of the configuration best suited for your specific application and needs.

Options are available to simplify sample registration and introduction as well as for further sample processing such as radioactivity measurement and sample labeling.





Production samples can be registered manually via terminals. Options are available to facilitate and speed up registration such as reading data via network files, bar code readers, selecting from sample lists. On-line registration via network by means of other computers (process computers, laboratory management systems) is also possible to avoid errors and save time.

We offer fully automatic machines for the preparation of metallic samples to provide the surface quality required for reliable analysis by optical emission (iron and steel, cast iron, aluminum, copper, magnesium, zinc, etc). Many options are available such as magazines for sample introduction. High quality, reproducible and reliable sample preparation is an essential component of the automated metals analyzer which influences directly the analytical performance and the system uptime.

The samples can also be prepared outside the system and introduced manually in the ARL SMS-2000 system for automatic analysis.

The analysis results are immediately and automatically transmitted to addressees according to their specific needs.

This permits to optimize the performance of large automated laboratories and reduces commissioning times to a strict minimum.

Laboratory applications

The system is fully compatible with centralized laboratories equipped with one or more preparation and analysis lines and linked to sampling locations via air tube systems for sample transport.

Simple and normalized interfaces ease communication with other laboratory and process computers while providing all the necessary functionality.

In-situ analysis

When the analysis must be closer to the process, the ARL QuantoShelter is the ideal solution. Also called the lab in a box, it is a container specially designed for housing the automated Thermo Scientific metals analyzer with sample preparation; it is used when no protected premises are available in production to install the system. The system operates very much like a process sensor or an on-stream analyzer. The sample transport times are then reduced to a minimum as the laboratory is brought to the samples rather than the other way around.



Automation tailored to your needs

A simple, efficient and very fast system designed for easy maintenance

The automated metals analyzer with ARL SMS-2000 is designed to minimize response time and to optimize sample throughput. Each component of the system (spectrometer – SMS system – preparation machine) has its own intelligence and works simultaneously and independently of the other. This distributed processing concept, with each component working at its optimum rate, maximizes the system efficiency; tasks are performed in parallel rather than purely sequentially.

For instance, samples are prepared while other samples are analyzed; the instrument stand cleaning is performed in hidden time by the spectrometer, independently of the SMS robot.

Each system component can also be used manually as a stand-alone device when necessary for maintenance or for back-up purposes.

The SMS system has its own “brain” in the form of an autonomous automation software running in parallel with the analytical software. This distribution of tasks increases the modularity of the software and simplifies testing, diagnostics and maintenance; very few spectrometer extensions are required for automation.

The SMS robot stands on a chassis linked to the ARL metals analyzer. The robot control unit, with its digital signals interface, performs all hardware monitoring functions, which simplifies considerably the automation. It is located under the chassis with the SMS power supplies, electronics and the sample sorting and filing recipients.

High precision brushless AC-servo motors provide for an almost maintenance free robot operation. Integrated absolute encoder technology is used to achieve a

position repeatability of ± 0.02 mm. The origin is established once for ever when the unit is powered for the first time and there is no need for complex, time-consuming reference traverses. The arm length is 0.5 m and the maximum speed of 2.1 m per second provide for a sample handling speed no manually operated instrument can cope with.

Waiting positions are also used to further optimize throughput when several production samples have to be processed: prepared samples can be stored temporarily to free the preparation machine for the processing of subsequent samples.

More reliable, accurate and reproducible analyses

The global system reliability being no better than that of the weakest link of the line, each component of the automatic system has been selected based on very strict quality criteria, including the sample preparation machine. The SMS software is subject to the most comprehensive tests ever done by our company.

At the heart of the system is the ARL 3460 or ARL 4460 metals analyzer with its analytical software. The prepared samples are transferred directly by the SMS robot to the spectrometer stand. Their presence is

automatically detected. The sample is then automatically clamped onto the stand table during the measurements.

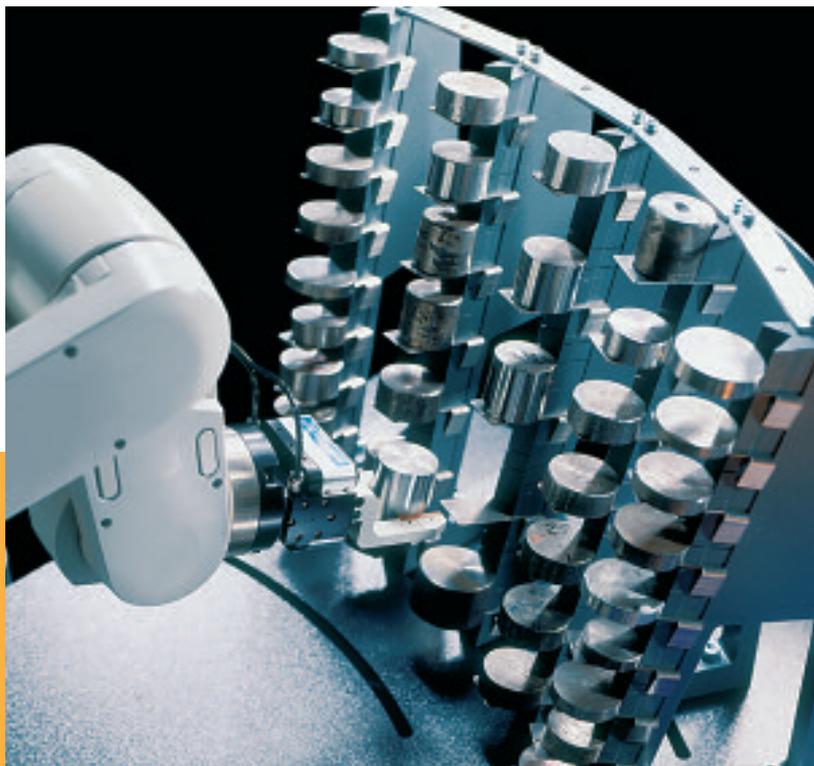
The ARL SMS-2000 robot automatically and very precisely shifts the sample between sparks as necessary to obtain a result representative of the sample.

Bad sparks are automatically rejected. To reduce the processing times for difficult samples, bad burns can be detected early during the pre-integration with the ARL 4460 metals analyzer.

The production samples are automatically sorted and filed. Eight containers are available for this purpose. Production samples can also be returned to the preparation system in large automated applications (for instance for centralized sorting and filing).

The cleaning of the stand table and of the electrode is performed in hidden time before or after analysis, thus ensuring a perfect cleaning and the best analysis cadence. The electrode can also be cleaned between sample sparks.

A command panel is available to operate the automatic stand when the spectrometer is used manually.



Automated unattended instrument monitoring and verification procedures

Ensuring that the automated metals analyzer permanently delivers quality results is essential to prevent scrap and rework in production.

Control samples are regularly analyzed and processed by statistical evaluation techniques (SPC) to detect eventual anomalies.

Automatic instrument standardization is triggered by the system when necessary and alarms are produced when manual interventions are required to prevent the system going out-of-control.

For certification purposes, the instrument analytical performance can be permanently recorded and visualized in the form of control charts (SPC-Full option) without operator intervention. The SPC-Full software is not merely limited to instrument monitoring; it can be applied automatically to production control as well for quick review of the performance and identification of possible process improvements.

Type standards can also be used to correct response differences between instrument calibration and the composition of particular alloys.

Conditioning samples can be measured to remove eventual stand contamination when trace elements must be measured following alloys samples or for conditioning of sample preparation grinding belts.

The ARL SMS-2000 magazine for standards is fixed and universal. It can store as many as 45 cylindrical and/or conical setting-up, control samples and type standards of variable diameter. Higher storage capacities are available as options.

When a preparation machine is available, the setting-up, control samples and type standards can be re-prepared

automatically in idle time, immediately before analysis or at the request of an operator. A specific preparation program is used to reduce standards consumption and system operating costs.

A rotation device turns the samples by about 45° to avoid any bias in the re-preparation over time and prevent any sample inclination problems.

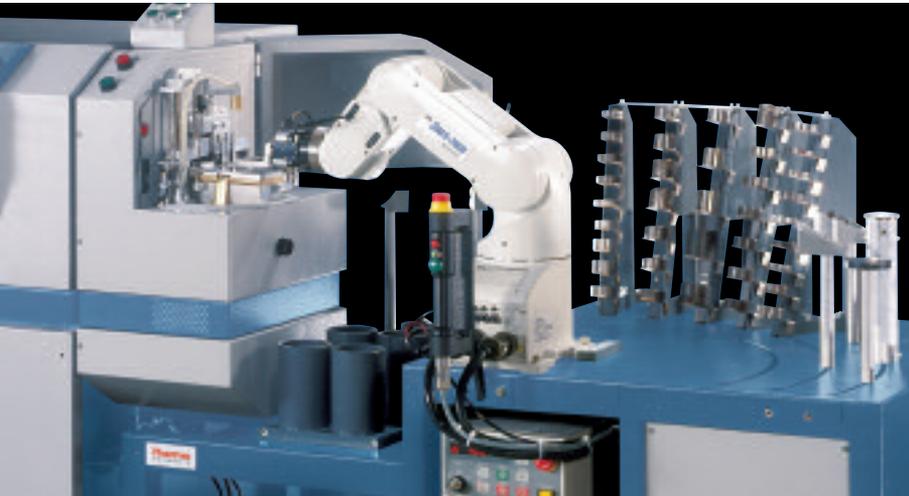
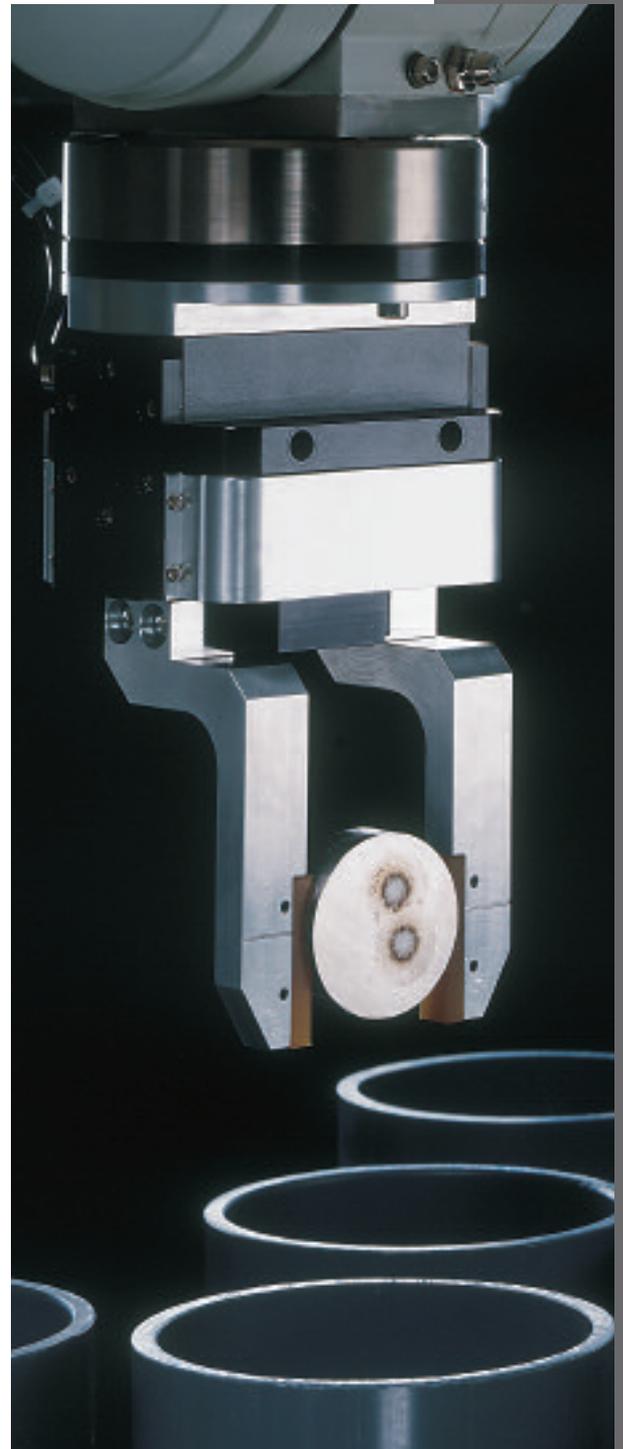
Full traceability of quality control activities

In addition to the analytical performance, events of interest can be recorded and communicated to other computers. These functions are fully automatic and do not affect system performance.

Greater availability for processing production samples

Authorized users can perform various tasks without interfering with the automatic processing of the production samples:

- Synoptic sample monitoring to display their position and the status of each system component
- Registration of manual samples introduced directly in the ARL SMS-2000
- Examination of the recorded system activities
- Request to run a control sample or to standardize the instrument
- Pre-prepared samples can be introduced manually into the SMS system
- SPC control charts can be displayed and printed
- Analyses or the latest standardization can be examined
- User accounts allocate the system resources and protect the system against unauthorized changes



Sample surface management

The analysis surface of every standard is managed to perform a maximum number of sparks before having to re-prepare (saving on expensive reference samples and making more time available for the processing of production samples).

Automation to advance quality control capabilities

Selective standardization

Only the instrument channels 'out of control' are then corrected. The number of samples to analyze is reduced.

Simplified and efficient maintenance

Many on-line diagnosis tools enable system and component tests to be performed to reduce breakdown times. Remote diagnoses are available as a standard facility. The system can be checked via telephone line under the supervision of our specialists and the software can be quickly updated.

Simple restart procedures guide the operator to start the system up again.

To ensure optimum sample manipulation reliability, every type of production, setting-up and control sample is gripped and handled by the robot as a specific sample.

The spark positions are specific to every sample; they can be easily and quickly changed by the user to provide for the best analysis conditions.

Options

A wide range of options is available to satisfy your individual needs:

- Support of up to 5 different production sample shapes
- Labeling of production samples on the analysis surface or on their back
- A vision system to select the best spark positions for difficult samples and reject them without analysis trial when they cannot be measured
- Sample collections and batches software to facilitate the registration and processing of repetitive series of production samples (for instance, samples from aluminum electrolytic baths)
- Security system compliant with ISO safety norms
- Remote control of the automated Thermo Scientific metals analyzer
- Digital signals for communication with external customers devices
- Automatic re-preparation of samples which cannot be analyzed
- Sample radioactivity detection
- Larger standards magazine capacity
- Sample registration via terminal or network
- Registration from the list of production samples announced by other computers or using sample identification parameters recorded on a network disk
- Chronological filing of production samples on slide(s)

An open and evolving product

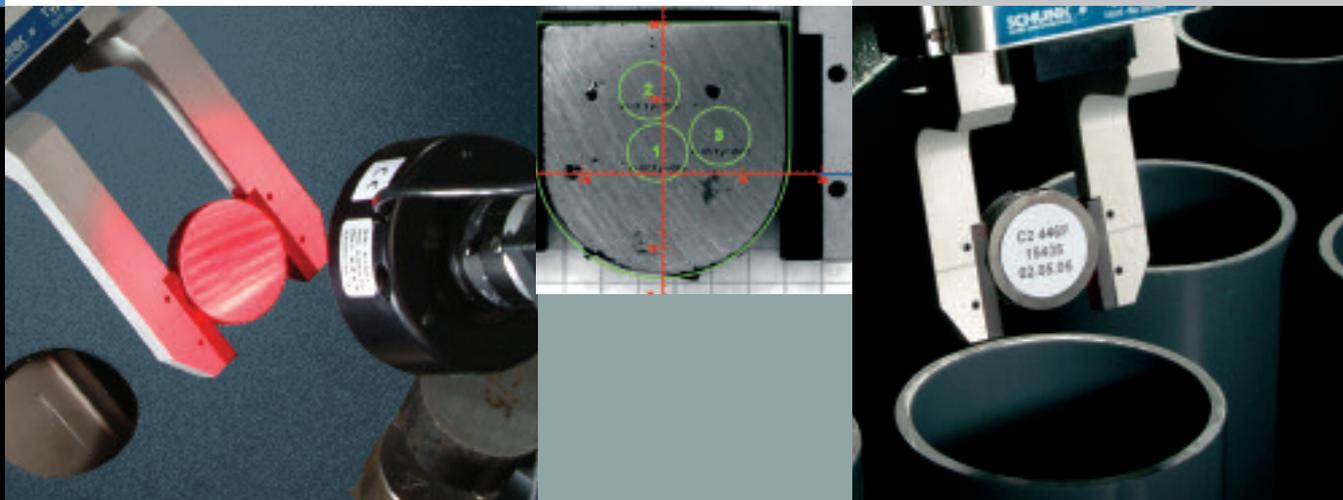
A flexible and extremely powerful automation tool

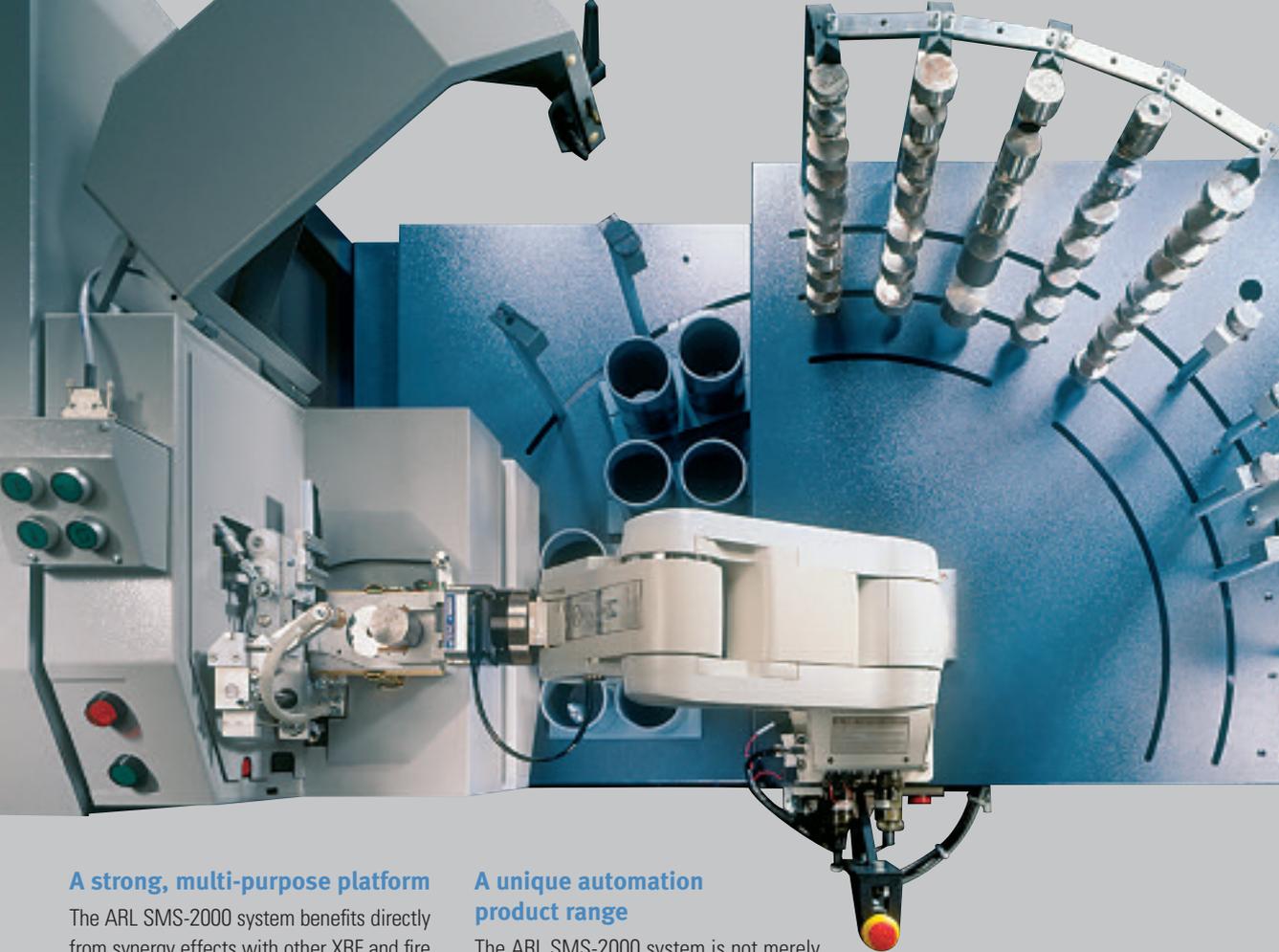
To satisfy the requirements of the most varied applications with a standard solution, very comprehensive functionality and total operational flexibility are incorporated into the automated metals analyzer software. This permits us:

- To propose, with the ARL SMS-2000, the first generic spectrometer automation solution and concentrate on testing a single software version for all customers
- To release the most thoroughly verified software components ever produced for spectrometer automation applications requiring high reliability and uptime
- To ensure the full durability of the customer investment and simplify after-sales support of a product strictly identical for all applications
- To permit short installation and commissioning times

We configure and customize every SMS system according to your particular needs before delivery.

Additionally, all the functions and operating flexibility of the system remain accessible after its installation. The ARL SMS-2000 can be further fine-tuned to take advantage of your experience in using it and to handle changing or new requirements which are difficult to anticipate. This greatly reduces dependency on the supplier once the system is commissioned.





A strong, multi-purpose platform

The ARL SMS-2000 system benefits directly from synergy effects with other XRF and fire assay applications. It is designed, industrialized, documented, manufactured and maintained according to ISO 9001-2000 procedures. The result is unmatched features and performance with the most advanced automation system available today.

Updates are regularly made available by our company, as and when new possibilities arise. This expandability protects the ARL SMS-2000 system from obsolescence and keeps it in pace with the fast evolution of the technology.

A unique automation product range

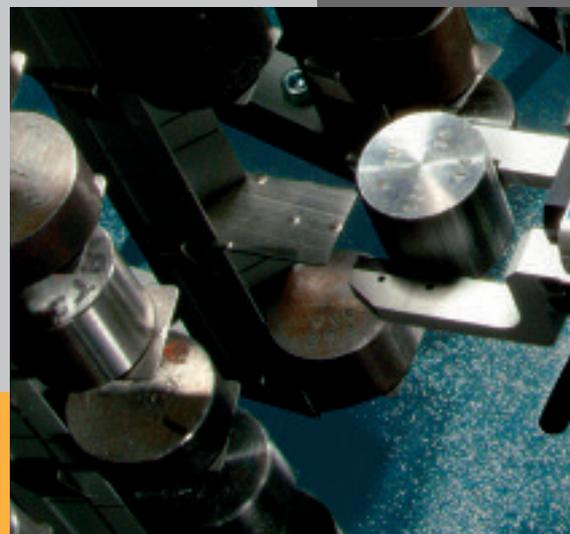
The ARL SMS-2000 system is not merely limited to optical emission applications. The same system is used for the automation of X-ray fluorescence spectrometers (XRF) and fire assay analyzers (FAA):

- ARL SMS-2000 XRF version for the ARL 9800 and ARL 9900 XRF spectrometers
- ARL SMS-2000 for the ARL Fire Assay Analyzers

The other Thermo Scientific automation products include:

- The ARL SMS-Omega and SMS-XY entry level systems for XRF spectrometer automation
- The ARL SMS-3000 for twin OES and XRF spectrometer automation

To keep you informed about our latest developments, please visit www.thermo.com/oes or www.thermo.com/xray.



New perspectives for users of Thermo Scientific automated spectrometers:

- One single partner and sole responsibility for metallurgical applications requiring different analysis techniques (optical emission and X-ray fluorescence)
- Standardization of production monitoring tools to reduce the complexity of automatic laboratories and supervisor training needs
- Automation expertise, support and services worldwide

Specifications

Metals analyzers supported	Models ARL 3460 and ARL 4460	
Sample weight	Max.	900 grams
Production samples	Shape:	Lollipop single and dual thickness, spemis, disks, cylindrical or conical (max. 3° cone angle)
	Dimension:	Within ± 1 mm
	Height:	8 mm minimum (after preparation)
Setting-up, control, conditioning samples and type standards	Shape:	Disks, cylindrical or conical (max. 3° cone angle)
	Dimension:	30-50 mm in diameter
	Height:	8-64 mm.
Magazine for setting-up, control, conditioning samples and type standards	Capacity of 45 samples:	5 columns of 5, 7 or 9 positions each with respectively up to 64, 45 or 30 mm thick standards
Sample preparation system	For ferrous samples:	Milling Dual belt grinding Cup wheel and belt grinding
	Options:	Sample introduction systems
	For non-ferrous samples:	Dual milling or cutting and milling
	Options:	Sample introduction systems
Sample preparation time and transfer to the ARL SMS-2000	Depends on the type of sample preparation (25-75 sec)	

Typical Production Sample Manipulation Times:

Transfer to the metals analyzer stand	7 sec
Sample shifting for another spark	5 sec (6 sec for the ARL 3460)
Sample filing and robot move to the next sample	8 sec (10 sec for the ARL 3460)
Sample labeling (option)	8 sec
Sample surface analysis by a vision system (option)	2 sec
Stand and electrode cleaning	In hidden time (except for the cleaning between sparks – programmable – about 5 sec) Operates in parallel and independently of the robot

Response time and cadence

Typical response time (ARL 4460) with two sparks of 24 seconds each (including the result calculation time)	60 sec (62 sec with vision)
Maximum analysis cadence per hour (ARL 4460 without sample preparation)	60 production samples without marking and vision 51 production samples with marking and vision

Various

Floor space requirements including the ARL SMS-2000 (in mm) without security system	Length	2800
	Width	840 (1170 with optional extension table)
	Max. height	1350-1600 (with vertical robot arm)

ARL SMS-2000:

Weight	200 kg
Supplies	0,2 m ³ air per hour at 6-10 bar
Power	230 VAC ± 10 %, 50/60 Hz ± 2 %, earth < 1 Ohm, 1.5 – 2.5 KVA
Operating conditions	Laboratory (except for the sample preparation machine)

In addition to these offices, Thermo Fisher Scientific maintains a network of representative organizations throughout the world.

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