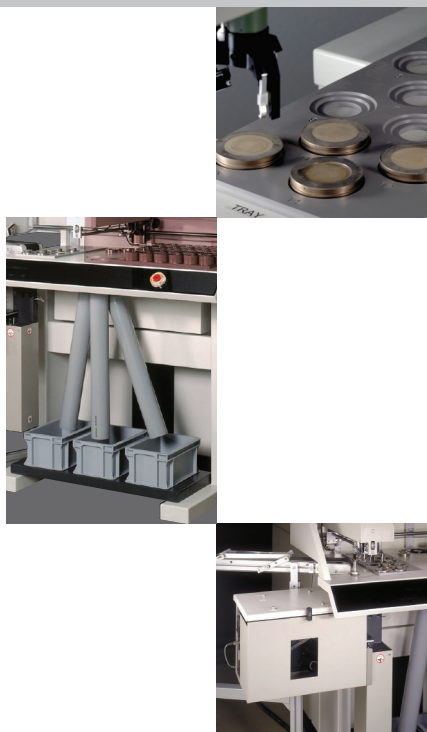


Automated XRF Spectrometer with ARL SMS-XY

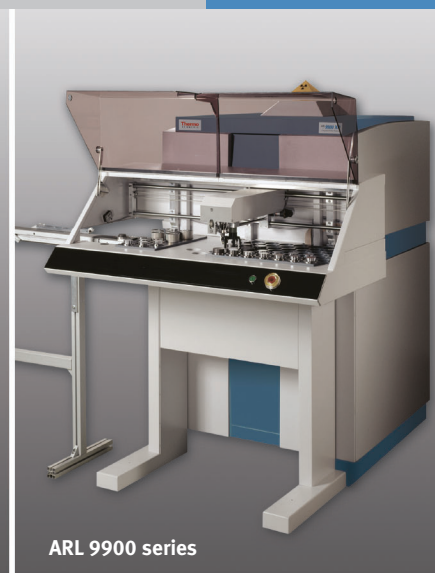
ARL 9900 series X-ray Spectrometers

ARL ADVANT'X series XRF Spectrometers

Enhance your Thermo Scientific XRF spectrometer with XY sample magazine and powerful automation software. Increased automation with reduced labor involvement and qualification means lower analysis cost, increased analysis dependability and quality, a more sustainable analysis cadence with predictable and reproducible response times and a shorter payback period.



ARL ADVANT'X series



ARL 9900 series

Partners in productivity

X-ray fluorescence spectrometers have been fitted with systems for automatic sample loading since the 1960s.

For industrial production control applications, the large capacity XY magazine introduced with the latest series of XRF spectrometers has proven to be an extremely reliable and simple solution to automate sample handling for analysis.

The Thermo Scientific ARL SMS-XY Sample Manipulation System is an easy step into full automation. The addition of the SMS automation software to this XY magazine provides for unattended routine production control including automatic sample preparation and analysis.

With the ARL SMS-XY, production samples are processed fully automatically and the instrument performance is permanently controlled, without the need of shift operators. This comprises:

- The simplest operations such as loading a sample on the XRF for analysis
- More complex and time consuming procedures such as instrument control and monitoring to keep the spectrometer in optimum working condition; instrument standardization and type standardization

And even when dedicated to on-line process control applications, the system remains available for other jobs: manual samples can be registered and introduced via the XY magazine any time, without having to wait for an instrument operation to be completed.



Large capacity XY sample magazine for ARL 9900 series XRF Spectrometers

Communication and work with the external world

Standard and proven interfaces with very comprehensive and adaptable configuration features provide for an easy integration of the automated ARL XRF spectrometer into your specific quality control and production process environment.

- **Sample registration:**

This can be done manually via terminal(s). Options are available to facilitate and speed up registration such as reading data via network files, bar codes 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.

The ARL SMS sample registration is a powerful and customizable process for the generation of all details on the processing to apply. It is at the heart of the automation operation and intelligence. It is tailored and fine tuned to your exact needs to avoid mistakes, simplify the operators' job and automate the selection of all operational parameters such as preparation and analytical programs, etc.

- **Result transmission:**

Analyses are immediately and automatically transmitted following sample analysis; a variety of different transmission methods are available. The relevant destinations (computers, terminals) are automatically selected to avoid delays and mistakes. Up to 18 different destinations can receive results transmitted via network and serial lines

The automated Thermo Scientific XRF spectrometers with ARL SMS-XY can be installed in centralized laboratories or on the production shop floors without need of any significant changes.

For in-situ automatic analysis, the complete system including the Thermo Scientific XRF spectrometer and the preparation machine can be housed in a container, the ARL QuantoShelter, also called the lab in a box.

Automatic sample preparation

Rapid, reliable and reproducible sample preparation is essential for an on-line unattended operation. Our company offers a complete range of fully automatic machines for the preparation of:

- Metallic samples (ferrous and non-ferrous)
- Oxides associated with metal production (mineral ores, sinters, baths, slags and blast furnace slags)
- Oxides associated with minerals and cement

Up to two sample transfer systems can be used to link the sample preparation system to the ARL SMS-XY.

When automatic sample preparation is not available, the prepared samples can be introduced manually in the system. The ARL SMS-XY can be easily upgraded any time following installation to an on-line version with full control of the preparation machine and on-line sample transfer for analysis.

Unattended instrument monitoring

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



A metal control sample is loaded to verify the instrument performance (ARL 9900 XRF version)

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.

Selective standardization

To save time and avoid unnecessary element fluctuations, only the instrument channels that are 'out of control' can be corrected.

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.

The ARL SMS-XY provides storage capacity for up to 49 standards and manual samples. Additional 14 positions are used for waiting positions and sample holders.

Another standard feature is automatic type standardization; known reference or type standards analyzed regularly allow correcting any differences between the instrument calibration and the composition of particular alloys.

The equivalent of two instruments

The priority usually given to the processing of automatic production samples does not mean that manual samples cannot be analyzed. Other samples prepared outside the system can be registered and introduced any time.

The XY magazine is well suited for quick and safe introduction of series of samples. An optional collections and batches software is available to facilitate the registration and processing of repetitive series of production samples.

A true multi-tasking system

The system is permanently available for users to perform other tasks, i.e.:

- Sample tracking and system monitoring via a synoptic display showing the samples position in the system and the status of every system component
- Consulting the audit trail of recorded system activities
- Examination, update and transmission of stored results
- Evaluation of standardization results
- Display and printing of SPC charts for evaluation of the performance of the instrument and of production (requiring SPC-Full)
- Request to run one or more control samples to verify the instrument
- Request to standardize the instrument for all or only specific channels

Automatic analysis

To speed up the system and eliminate mechanical components, no closed cassette is used by the ARL SMS-XY for the analysis of automatic production samples. Holders (ARL 9800 or 9900 XRF series) or cassettes (ARL ADVANT'X) are used for the storage of standards and manual samples in the XY magazine and for loading in the instrument.

The ARL 9900 XRF instrument automatically rejects samples of non-conforming sizes and measures the sample height to ensure precise positioning for analysis in the primary chamber.

Different ARL SMS-XY versions are available for processing oxide samples or metallic and oxide samples associated with metal production, minerals and cement.

Oxides version

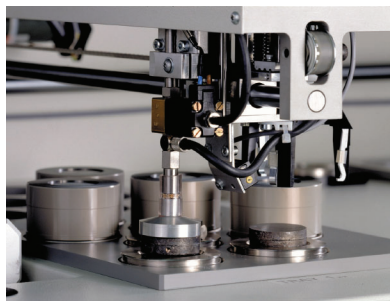


Loading of a pellet sample using the gripper (ARL 9900 XRF version)

A gripper manipulates pressed pellets and fused beads on holders. In this example, the production samples are introduced manually using any free magazine position.

Metals and oxides version

A suction device is used in addition to the gripper for handling metal samples as shown in the picture below:



A pig iron sample is loaded on a holder for analysis (ARL 9900 XRF version)

Better traceability of quality control activities

In addition to recording the analytical performance over time, audit trail functions permit to log the history of the activities in the form of events, warnings and alarms with time stamps. All or only selected events, alarms and warnings can be sorted, printed and distributed to other computers. The audit trail can be used to record the system activities for diagnostics purposes and identification of eventual causes of problems.

Open system with easy customization

Every ARL SMS-XY system is configured and customized in the factory according to your particular needs before delivery.

Additionally, the system can be further fine-tuned following installation to take advantage of your experience in using the system and to handle changing or new requirements which are difficult to anticipate.

Many options to meet individual needs

Cassettes for manual introduction of other samples

Samples of variable or non-compatible shapes and dimensions (e.g., final product samples) can be introduced in the system using cassettes. A specific ARL 9900 XRF instrument calibration is used for samples in cassettes.



Loading of a cassette for analysis using the gripper (ARL 9900 XRF version)

Remote control via network

The automated ARL 9900 can be controlled from a remote location without having to walk to the instrument. All of the on-line user activities can then be done via a network PC.

Radioactivity measurements

Following analysis, all or selected samples can be transferred via a transport belt to an external radioactivity measurement system.

Marking of production samples

Metallic samples can be labeled to facilitate their subsequent identification. With the ARL 9900 XRF, the marking can be done before or after analysis. Labeling on the back of the samples allows to re-analyze any sample without having to remove its identification. With the ARL ADVANT'X, the marking is done on the analysis surface following analysis.



Automatic labeling of a metal sample on the reverse side before analysis (ARL 9900 XRF version)

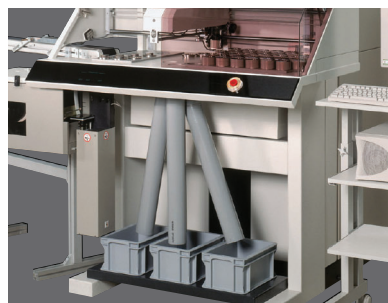
Sample management following analysis

The production samples can be returned to the preparation system:

- For recycling of the supports (steel rings for pellets, metal supports for beads)
- For centralized sorting and filing (metals)
- For complementary analysis by other instruments (e.g., by optical emission for stainless and highly alloyed metals)

Following analysis, metals samples can also be sorted and filed locally in three containers as shown by the next picture.

Samples in cassettes and oxide samples introduced manually are returned to their magazine position following analysis. Specific storage systems can be proposed upon request.



Filing of metals samples following analysis (ARL 9900 XRF version)

A generic automation solution

The ARL SMS software is a unique product providing full automation of Thermo Scientific optical emission and X-ray fluorescence spectrometers.

The ARL SMS-XY automation software is an adaptation of the high end ARL SMS robotics version, a milestone in OES and XRF automation when full flexibility to handle different production sample shapes or the highest speed of operation is needed. This single product strategy in automation is unique and allows us to concentrate on testing a single ARL SMS software version for all applications and to release the most thoroughly verified software components ever produced for spectrometer automation applications requiring high reliability and uptime.

The ARL SMS is also designed, industrialized, documented, manufactured and maintained according to ISO 9001 procedures. This assures top system quality, reliability and comprehensive user documentation and simplifies after-sales support.

Easy upgrade to fully automated operation

The ARL SMS-XY can be easily added to any existing ARL 9800, ARL 9900 and ARL ADVANT[™]X series XRF instruments in the field. The ARL SMS-XY automation

represents a small investment leading to a huge productivity increase:

- Tighter and automated instrument control
- Increased efficiency, performance and analysis dependability
- Increased instrument availability and capacity to handle more samples
- Labor savings and lower analysis costs

The ARL SMS-XY is another example of our commitment to supply not just instrumentation but global solutions helping your efficiency and productivity.

For further information on our X-ray products, consult our WEB site www.thermo.com/x-ray.

Technical Specifications

XRF spectrometers supported	ARL 9800 and ARL 9900 series XRF with WinXRF or OXSAS Analytical Software. ARL ADVANT [™] X XRF series		
Sample weight	Max. 200 grams for on-line metals samples received automatically from a preparation machine Max. 500 grams for all other samples		
Production sample forms (*)	Shape:	Powder: Pellets in large steel rings (51.5mm x 8mm), fused beads on large metallic support Metal: Lollipop single and dual thickness, spemis, disks, cylindrical or conical with parallel surfaces following preparation. Minimum diameter or smallest dimension: 34 mm	
	Dimension:	Within ± 1 mm	Height: 3-25 mm (after preparation)
	Orientation:	With the prepared analysis surface up for analysis by the ARL 9900 XRF With the prepared analysis surface down for analysis by the ARL ADVANT [™] X	
Setting-up, control samples and type standards (*)	Shape:	Disks, pellets in steel rings, fused beads on metallic support, cylindrical or conical	
	Dimension:	32-52 mm in diameter	Height: 3-25 mm
Magazine capacity	For setting-up, control samples, type standards and manual samples (*): 49 positions For sample holders and waiting samples: 14 positions		
Sample preparation system	For ferrous samples: Options:	Cup wheel grinding. Cup wheel and belt grinding. Milling. Sample introduction systems	
	For non-ferrous samples: Options:	Dual milling or cutting and milling Sample introduction systems	
	For powder samples: Options:	Grinding mill and pelletizing press. Fusion machine Crusher, sample introduction systems	
Sample preparation time and transfer to the ARL SMS-XY	Depends on the type of sample preparation. For metals: 35-90 sec. For powder: several minutes		

Typical times in seconds (*)

	PELLETS IN STEEL RINGS		METAL SAMPLE [S] FUSED BEADS ON HOLDER [S]	
	ARL 9900	ARL ADVANT [™] X	ARL 9900	ARL ADVANT [™] X
Sample transfer to XRF spectrometer loading position (**)	12	12	12	12
Loading in the spectrometer and preparation for analysis (***)	22	23	18	21
Result calculation and transmission	3	3	3	3
Remaining sample unloading by the spectrometer (done during calculation)	5	14	5	14
Sample filing (metals) or sample return to the preparation system (pellets)	11	11	8	8
Sample labeling (option)	--	--	8	8

Sample analysis cadence per hour (assuming excellent quality pellets)

With 30 seconds XRF measurement time (depends on instrument configuration)
Up to 43 pellets production samples per hour
Up to 47 metals production samples per hour without marking
Up to 42 metals production samples per hour with marking

Floor space requirements

ARL 9900 X-ray series with SMS-XY (in mm) Length: 1210 Width: 1648 (without the PC)
Max. Height: 1242/1602 (with magazine cover close/open)

ARL ADVANT[™]X XRF series with SMS-XY (in mm) Length: 1260 Width: 1069 (without the PC)
Max. Height: 1320/1602 (with magazine cover close/open)

ARL SMS-XY weight

ARL SMS-XY power, including the PC

Operating conditions

(*) The ARL SMS-XY compatibility with production samples and standards of various shapes and sizes depend on a number of factors including the type and size of the smallest automatic production sample. Therefore, please provide the exact description of your samples to your Thermo Fisher Scientific sales representative to get a proposal specific to your application.

(**) This assumes that the same holder will be used on the instrument lift than for the previous sample or standard analyzed. Otherwise 10 seconds have to be added to change or remove the sample holder before loading the sample or the standard

(***) Pumping time depends on sample type and quality

