thermoscientific

# Taking inclusion analysis to the next level

Our exclusive portfolio and capability for advanced inclusion analysis

**ThermoFisher**
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# Complementary techniques for inclusion analysis

Controlling non-metallic inclusions during the steel making process is a key skill for the efficient production of modern steels demanded by today's customers. To be competitive in today's steel making requires knowledge and real time monitoring of the many parameters that control the formation and modification of non-metallic inclusions in steel.

## Our Solutions

Thermo Scientific™ Explorer™ 4 Analyzer with Metals Quality Analyzer™ software provides the most exhaustive data on non-metallic inclusions at the lowest cost per inclusion, allowing the steel producer to gain deep insight into the steel making processes. Thermo Scientific™ ARL™ iSpark™ Optical Emission Spectrometer with Spark-DAT provides the fastest access to data on non-metallic inclusions, allowing the steel producer to make timely decisions.

Together, the two instruments give the most powerful solution to control non-metallic inclusions, and solve or prevent cost and quality problems caused by inclusions in steel.

### Explorer 4 Analyzer with Metals Quality Analyzer (MQA) software

The Explorer 4 Analyzer with MQA software provides fast information for the inclusion size, shape, image, and composition on lollipop, as cast, and final product samples. Compare inclusion morphology and composition across different heats or different grades to optimize process flow, saving cost by improved energy management, improved raw material consumption, reduced nozzle clogging and remelts.

Modern steel-making practices can now rely on the Explorer 4 Analyzer with MQA software not only for process optimization but also non-metallic inclusion cleanliness ratings to make critical decisions. Metals Cleanliness Rating (MCR) software affords the operator the ability to rapidly scan polished steel samples and characterize inclusions for their morphology and chemistry.

### ARL iSpark OES with Spark-DAT

Thermo Fisher is the undisputed industry leader in the high performance spark Optical Emission Spectrometry (OES) technique universally used in the steel industry for fast chemical composition analysis, especially for controlling the steel making process. The ARL iSpark with Spark-DAT is an all-in-one OES spectrometer, providing data on non-metallic inclusions in addition to the elemental concentrations in a combined analysis.

In-process access to data such as size, number, and inclusion type (e.g., oxides, aluminates and sulfides) allows taking immediate actions for example in order to prevent nozzle clogging and steel mechanical property problems. ARL iSpark with Spark-DAT provides quantitative inclusion results, and determination of oxygen concentration is possible down to a few ppm in killed steels.

# Your true benefits

Together the ARL iSpark with Spark-DAT and the Explorer 4 Analyzer with MQA software make clean steel more accessible than ever. The combination of ARL iSpark with Spark-DAT and Explorer 4 Analyzer with MQA software provides you both knowledge of your day-to-day variability in steel making and the timeliness to make in-process decisions. Whether you are looking to upgrade or to bring your steel making processes to the next level, the combination of ARL iSpark with Spark-DAT and Explorer 4 Analyzer with MQA software is the undisputed leader.

Complementary Techniques for Inclusion Analysis
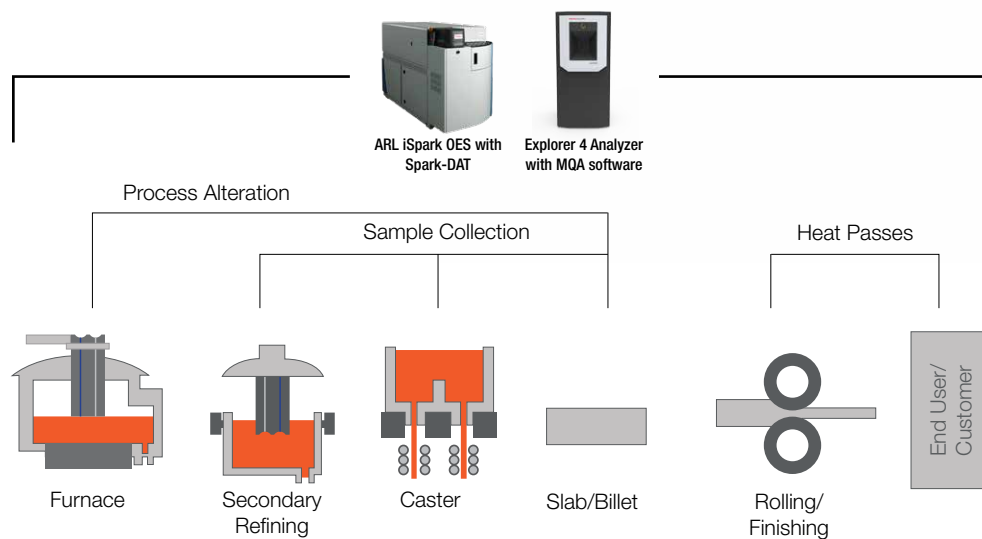


| Features | Explorer 4 Analyzer with MQA software | ARL iSpark with Spark-DAT |
|---|---|---|
| Excitation | Scanning electron beam | Spark |
| Non destructive technique | ✔ | |
| Sample prepared in < 2 minutes | | ✔ |
| Data available in < 10 minutes after taking sample | | ✔ |
| Localization, size, shape and composition per inclusion | ✔ | |
| Trending and post processing of data | ✔ | |
| Average size and size distribution | ✔ | ✔ |
| Average composition | ✔ | ✔ |
| Number of inclusions by type | ✔ | ✔ |
| Dimensionality of the technique | 2D (surface technique) | 3D (volume technique) |
| Distribution of the inclusions over sample volume | | ✔ |
| Fast sample screening | | ✔ |
| Supported industry standards for rating non-metallic inclusions in steel | ASTM E2142, ASTM E45, JIS G0555, ISO 4967, DIN 50 602, EN 10247 | |
| Bulk chemical analysis of sample | | ✔ |
| Total (insoluble) oxygen determination | | ✔ |

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## Electron microscopy solutions

We offer the broadest range of high-performance microscopy workflows that provide images and answers in the micro-, nano-, and picometer scales. We combine hardware and software expertise in electron, ion, and correlative microscopy with deep application knowledge in the materials science, life sciences, semiconductor, and oil and gas markets.

## Spectrocemical solutions

For over 80 years, the Thermo Fisher Scientific Ecublens, Switzerland site has been a worldwide supplier of spectrochemical instrumentation to such major industries as steel, transportation, cement, construction, food, pharmaceuticals, chemicals, academic research, petroleum and electronics. We offer unsurpassed capabilities in the areas of optical emission spectrometry (OES), X-ray fluorescence (XRF), X-ray diffraction (XRD) and automation of spectrometers.

## About Thermo Fisher Scientific

Thermo Fisher Scientific Inc. is the world leader in serving science, with revenues of $18 billion and more than 55,000 employees globally. Our mission is to enable our customers to make the world healthier, cleaner and safer. We help our customers accelerate life sciences research, solve complex analytical challenges, improve patient diagnostics and increase laboratory productivity. Through our premier brands – Thermo Scientific, Applied Biosystems, Invitrogen, Fisher Scientific and Unity Lab Services – we offer an unmatched combination of innovative technologies, purchasing convenience and comprehensive support.

Certified System ™

ISO 9001
QMI-SAI Global

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