

ELTRA

# QUALITY CONTROL OF RAW MATERIAL & FINISHED PRODUCT

ELTRA offers innovative solutions for quality assurance in additive manufacturing. Our combustion analyzers are used in important process steps such as incoming goods inspection and outgoing goods inspection by C/S & O/N/H analysis.

**INCOMING GOODS INSPECTION**

- Checking suppliers' specifications
- Contribute to avoiding potential misproduction and ensure high quality of incoming materials.

**OUTGOING GOODS INSPECTION**

- Inspection of manufactured components to ensure that they meet specific requirements. Minimization of the risk of damage to the user.

**ADVANTAGES OF ELTRA SOLUTIONS**

- Efficient control of material quality in all process steps
- Optimization of production processes by avoiding production errors
- Compliance with legal requirements and standards
- Improvement of overall quality and safety of components

**ELEMENTAL ANALYZER ELEMENTRAC ONH-p 2**

- Inert gas fusion analyzer for O/N/H analysis.
- Easy and fast analysis of pins, powders and granulates
- Optional autocleaner
- Optional autoloader with 32 positions



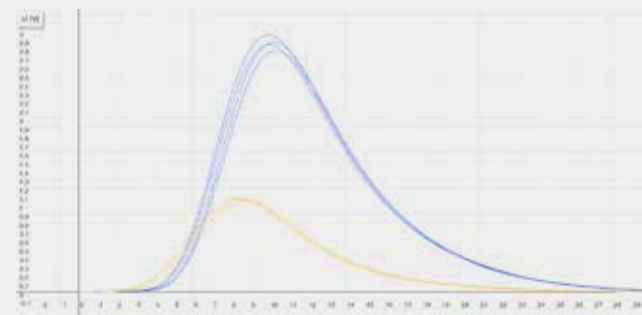
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**ANALYSIS OF IRON/NICKEL FEEDSTOCK**

<b>Analysis</b>	Oxygen, nitrogen with ONH-p 2	
<b>Sample</b>	Customer sample: iron/nickel powder	
<b>Sample preparation</b>	Sample filled in nickel capsule	
<b>Settings</b>	Standard steel analysis with 4500 W (ON)	

Weight (mg)	Oxygen (ppm)	Nitrogen (ppm)
158	479	327
154	473	328
152	455	330
157	457	330
<b>Mean value</b>	466	329
<b>Deviation</b>	11.8	1.47
<b>Relative deviation</b>	2.5%	0.4%



**blue peak** oxygen signal  
**x-axis** time (sec)

**yellow peak** nitrogen signal  
**y-axis** intensity (voltage)

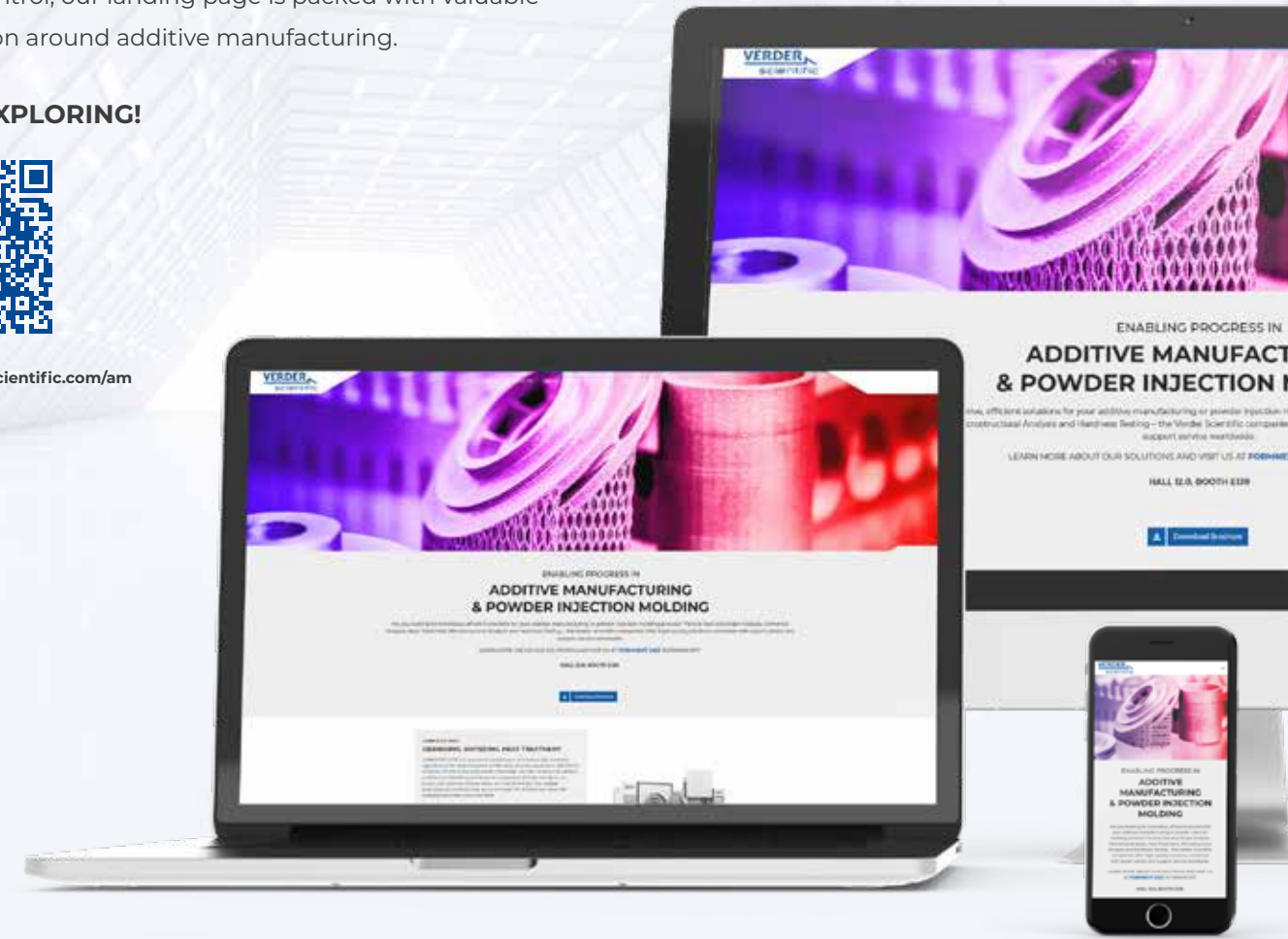
# SOLUTIONS FOR ADDITIVE MANUFACTURING AT A GLANCE!

Whether you are an engineer, researcher, or involved in quality control, our landing page is packed with valuable information around additive manufacturing.

START EXPLORING!



www.verder-scientific.com/am



ENABLING PROGRESS

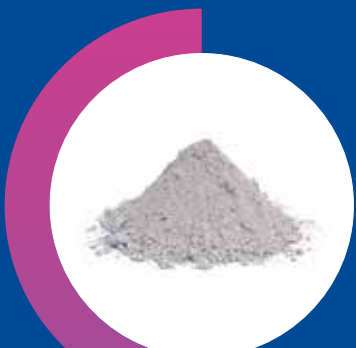
# IN ADDITIVE MANUFACTURING

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**QUALITY CONTROL  
RAW MATERIAL**  
ELEMENTAL ANALYSIS  
PARTICLE  
CHARACTERIZATION



**POST-PROCESSING**  
DEBINDING & SINTERING  
STRESS RELIEVING



**QUALITY CONTROL  
FINISHED PRODUCT**  
ELEMENTAL ANALYSIS

# WE CARE FOR DETAIL!

In the Additive Manufacturing process, attention to detail is crucial - from the initial powder to the final product. CARBOLITE GERO, ELTRA, QATM, MICROTRAC, and RETSCH equipment assists in optimizing the numerous production steps required to achieve the desired results.

Verder Scientific companies offer top-quality solutions for Particle Size and Shape Analysis, Elemental Analysis, Heat Treatment, Microstructural Analysis, and Hardness Testing. We provide expert advice and service support worldwide, ensuring that our customers have access to the best possible solutions for their individual needs. Whether you require assistance with quality control, process optimization, or product development, we are here to provide the highest level of service and expertise.

## MICROTRAC

# QUALITY CONTROL OF RAW MATERIAL

Microtrac's solutions start where it all begins - with the raw material. Our particle analyzers, which work on the basis of different measurement techniques, can be used to comprehensively characterize metal, ceramic or plastic powders: in addition to particle size and shape, density and porosity also play an important role.

**PARTICLE SIZE ANALYSIS (DYNAMIC IMAGE ANALYSIS)**  
I Determination of the size distribution of the powder particles used in additive manufacturing → Early detection of potential problems such as agglomeration or undesirable variations in product properties.

**PARTICLE SHAPE ANALYSIS**  
I Detection of irregularities that could lead to errors in material supply (flow properties) or the formation of voids (packing density) in printed components.

**DENSITY, SURFACE, POROSITY**  
I Important characteristics for the suitability of metal powders in additive manufacturing are also density, specific surface area and pore size distribution. For quality control in particular, Microtrac's BEL series analyzers enable fast and precise measurements even in a robust production environment.

**ADVANTAGES OF MICROTRAC SOLUTIONS**  
I Fast measurement times → efficient quality control  
I Early detection of potential problems  
I Improved process stability → optimized quality of subsequently printed components

## DYNAMIC IMAGE ANALYZER CAMSIZER X2

- Particle size and particle shape analysis from 0.8 µm to 8 mm with Dynamic Image Analysis (ISO 13322-2)
- Precise analysis of wide size distributions
- Excellent resolution of narrow or multimodal size distributions
- Reliable detection of smallest amounts of undersize and oversize

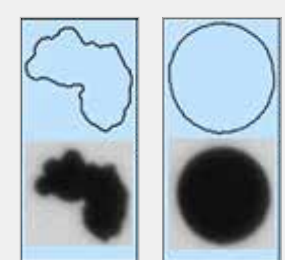


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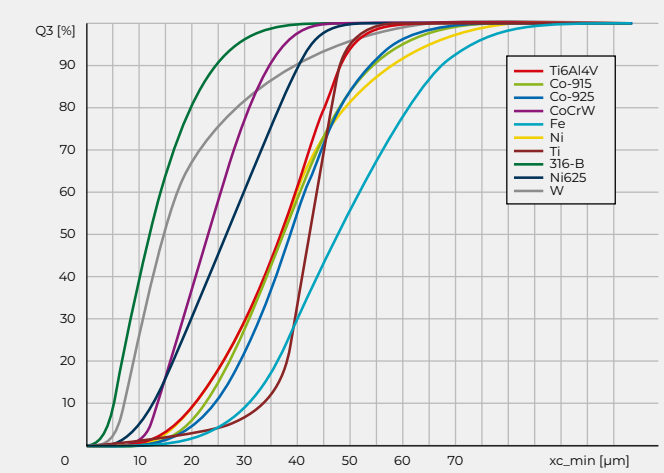


## IDENTIFYING DEFECTIVE PARTICLES

The example shows a range of CAMSIZER X2 analyses of various metal powders which are reliably characterized for their suitability to be used in powder metallurgical processes. Non-spherical, oversize, undersize, fused or broken particles are reliably detected and quantified. Analysis of metal powders with a mean particle size < 10 µm, which are utilized for Metal Injection Moulding (MIM), is also possible with the CAMSIZER X2.



CAMSIZER X2 image (left) showing an irregular (defective) metal powder particle. The width of the particle is 32 µm, the length is 56 µm and the roundness value is 0.62. The right image shows a spherical particle with a diameter of 58 µm. The roundness value is 0.98 (a perfect sphere has a roundness of 1). Based on the shape values, good and defective particles can be clearly distinguished.



CAMSIZER X2 size analysis

## CARBOLITE GERO

# POST-PROCESSING

CARBOLITE GERO develops high-temperature furnaces specifically tailored to the requirements of additive manufacturing. We offer users comprehensive support in the post-processing of additively printed components - regardless of whether they were produced via direct or indirect methods.

**DEBINDING**  
I Efficient and precise release of components from the binder matrix to expose the metal, ceramic or glass structure of the component → Preparation of components for the sintering process.

**SINTERING**  
I Precise temperature control and uniform heating of components to fuse powder particles together so that components increase in strength and density and acquire their final structure.

**ADVANTAGES OF CARBOLITE GERO SOLUTIONS**  
I Large product portfolio (→ material-furnace match)  
I Low energy requirements, low cost production  
I Efficient production processes and first-class results due to process know-how  
I Demo center for conducting pre-tests by CG experts and creating customized process solution



## HTK VACUUM FURNACES

- Up to 2200°C
- 8 to 320 litres volume
- Nitrogen, Argon, Hydrogen, Fine or high vacuum
- Suitable for all materials



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## ENHANCING DEBINDING AND SINTERING FOR PRECISE 3D PRINTING RESULTS

Once the binder-containing parts are 3D-printed, they require debinding either with nitric acid, inert gas, hydrogen, or vacuum means to extract the organic material from the sample. This process results in a shrinkage of the part. Nevertheless, the backbone binder continues to stabilize the structure of the brown part until it is sintered into the final product. The shrinkage can be as much as 20 %, and accurately predicting this transformation is crucial in achieving parts with precise dimensions and high quality.

