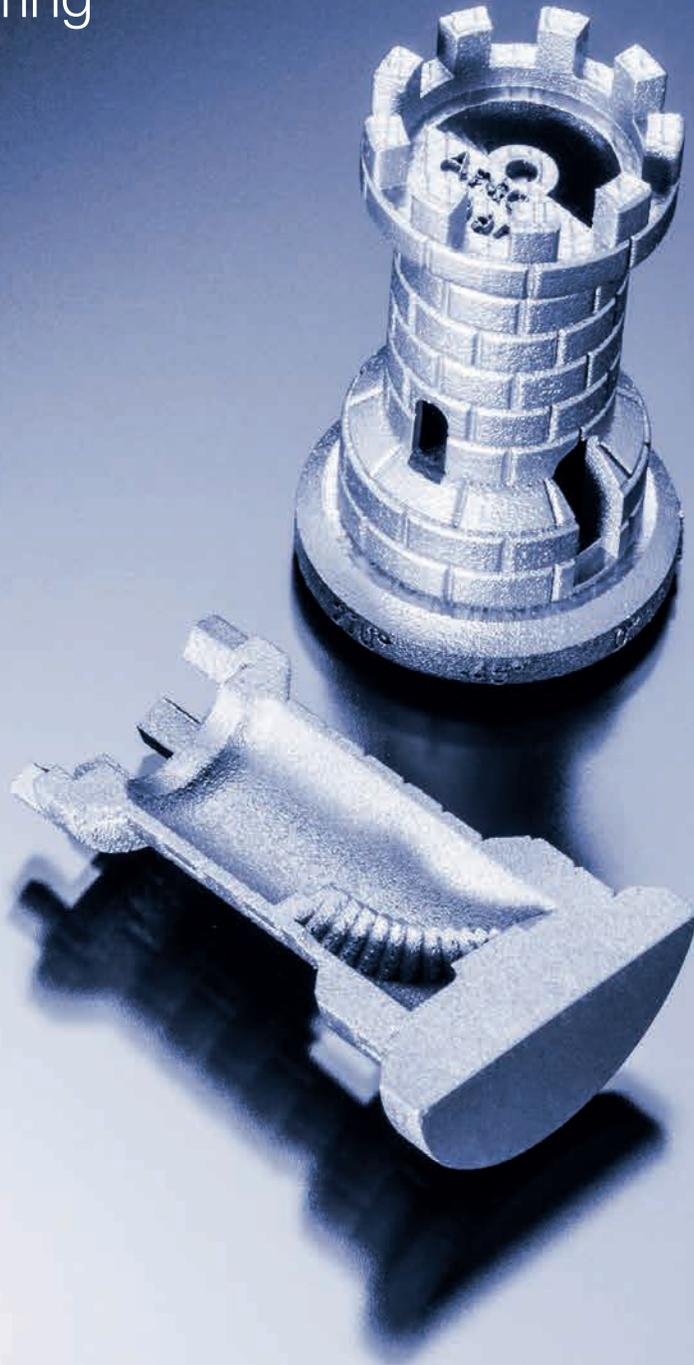


# Solutions for Additive Manufacturing



# Analytical methods for additive manufacturing

Anton Paar has the know-how for:

## Particle characterization ● ●

The better you know your particles, the better you can predict your material's behavior during manufacturing. The Litesizer and PSA series of particle size analyzers, the density analyzers UltraPyc and AutoTap, the gas adsorption analyzers NOVAtouch and the autosorb series, give you access to a great variety of results. All in all, Anton Paar offers the broadest particle characterization portfolio available from one single provider worldwide.

### Parameters:

Particle size distribution (measured dry or wet) | Pore size | Pore distribution | Zeta potential | Molecular mass | Surface area | Density | And more



## Powder rheology ●

Advanced true powder rheology, based on the renowned MCR rheometers, brings the full array of traditional and rheological methods, and decades of experience into the field of granular media. The versatile and powerful MCR powder rheometer offers high reproducibility, fully automated measurement modes, and multiple measurement modes for quality control as well as scientific purposes.

### Parameters:

Powder flow | Cohesion strength | Flowability | Compressibility | Bulk density | Permeability | Deaeration time | Pressure drop | Wall friction angle



## Surface characterization ● ●

Anton Paar offers measuring solutions for indentation testing, scratch testing, tribological tests, surface charge analysis, and atomic force microscopy. This variety allows the measurement of a wide range of properties. All instruments deliver highly accurate results and offer operation and software to support instrument operators.

### Parameters:

Hardness | Elastic modulus | Deformation | Adhesion | Scratch resistance | Friction | Wear | Roughness | Surface topography | Surface charge



### CHALLENGE

The granulate agglomerates and blocks the supply line of the printer.

The granulate shows different melting properties from batch to batch.

The melted polymer polycarbonate is too viscous/fluid which has a negative influence on the final component – its surface is uneven.

The flowability of the powder is not good enough and the product is inhomogeneous.

The sintered product is too fragile or porous.

The metal powder flow through the sinter nozzle is very inconsistent.

You want to reuse the excess metal powder from past productions and want to know if it is still usable.

You want to find out how resistant the final printed component is.

You want to know how a component behaves when in contact with other surfaces – without conducting extensive tests.

### SOLUTION

Measure the **surface charge** of your granulate with a **SurPASS 3 zeta potential analyzer** to optimize the inline flow.

Establish quality control of incoming raw materials: measure the **skeletal density** by helium pycnometry with instruments of the **UltraPyc** series and determine the **porosity** by gas adsorption with instruments of the **NOVAtouch**, **Quadrasorb**, and **autosorb iQ** series.

Find out about the **molecular weight** of your granulate with an **MCR rheometer**.

Use a **PSA particle size analyzer** to define the **distribution and the mean size of the particles**. The size distribution is an important parameter which influences the performance of the raw material and therefore the quality of the final product.

Use a **PSA particle size analyzer** to measure the **particle size distribution** – and therefore the **packing density** – of your raw powder or suspensions.

Determine rheological properties such as **powder flow** with an **MCR powder rheometer**.

Measure the **cohesion strength** with an **MCR powder rheometer** to find out the **flowability** of the recycled powder.

Measure the **critical load**, **adhesion**, **scratch resistance**, **roughness**, and **viscoelastic behavior** with a **NST<sup>3</sup> nano scratch tester** or a **NHT<sup>3</sup> nanoindenter**.

Find out about the **friction and wear** of your component with a **TRB<sup>3</sup> pin-on-disk tribometer**.

### YOUR BENEFITS

At just the touch of a button, you can investigate your sample – non-destructive and suitable for a variety of sample geometries. According to the results, you can then take measures to improve the material properties and avoid clogging of the lines in the future.

Simple and fast analysis of density, specific surface area, and pore volume provides ideal parameters for quality control and materials' optimization with respect to process parameters.

With the results of your measurements you are able to predict the melting behavior of the granulate depending on the temperature so you can adjust the settings of your sinter accordingly.

The size distribution gives insights into the homogeneity of the surface of the powder. It depends on the final product which size distribution is needed – with PSA you can ensure that your powder always has the grade of homogeneity you need.

The performance and homogeneity of a product depends on the packing density of the particles: The broader the size distribution, the better the packing of the particles and the more stable the sintered product.

Knowledge about the rheological properties of a powder enables you to find the optimal flow speed and thus select the ideal nozzle design. This has a positive influence on the final component's quality.

Knowing the flowability, you can calculate how much new powder you have to add to make the powder usable for high-quality end products.

Compliance with ISO 20502 and ASTM C 1624 ensures that your product always satisfies your customers.

The pin-on-disk method is a fast and accurate method that will give you results in a very short time – ideal for efficient quality control of final products.

# Customer service

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To us, customer service means more than just repairs. We support you in every way, before and after your purchase, with application know-how, user trainings, instrument service, workshops, seminars, and more – on the phone, online, or on-site directly in your lab or at your production line.

Decades of experience in various characterization and measuring technologies have made us experts, not only in our instrument solutions but also in meeting your challenges. You can benefit from this expertise:

## Application support

- Application-oriented portfolio presentations on-site
- Application consulting on the phone or via email
- Application-specific instrument setups and settings
- Access to a wide range of application reports
- Application-related trainings at one of our Anton Paar Technical Centers or in your country (on request)

## Access to Anton Paar knowledge base

- Workshops, seminars, and hands-on demos at Anton Paar Technical Centers
- Local seminars and talks on the basics as well as special topics (e.g. certain applications, technologies)
- Cooperation seminars with local experts and organizations
- Access to eLearnings, webinars, and technical literature
- Custom-tailored user trainings and user conferences, organized locally
- On-site trainings and seminars



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