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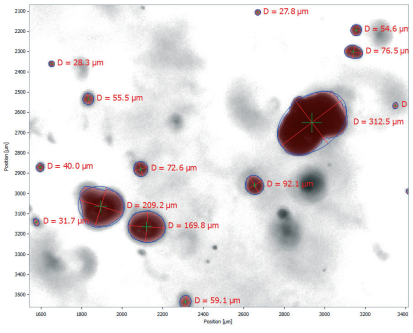
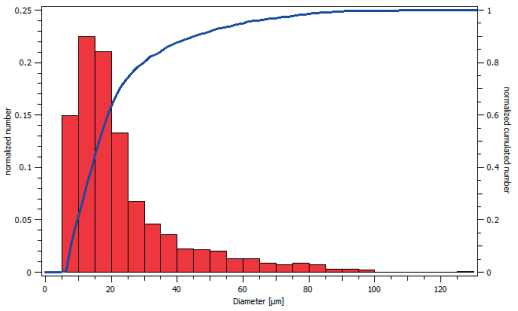
ParticleMaster System

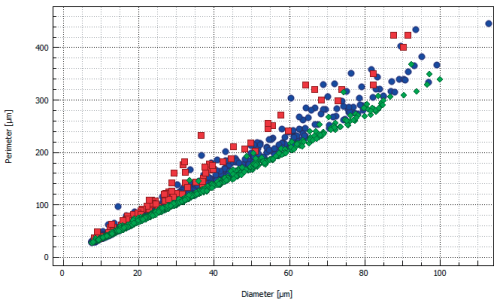
particle characterization by high-magnification shadow imaging

The **ParticleMaster** system detects and analyses high magnification shadow images from particles, droplets or bubbles. The system measures the size, shape and velocity of individual particles, and derives cumulated ensemble statistics from it. **Direct imaging** of **individual particles** gives you confidence in the measurement method, as you can directly see the result of the image processing.

Cumulated statistics are size histograms, scatterplots and weighted averages, like Sauter Mean Diameter (D_{32}), mean diameter (D_{10}), volume percentiles (10, 50, 90%) and more.







In addition to particle size and shape, the **double exposure** option measures **velocity** of individual particles. This is obtained by quickly capturing two subsequent snapshots onto a **double frame camera** illuminated by a corresponding double pulse light source.

The **ParticleMaster** does not need any sample preparation. It is designed for **in-situ measurements** directly inside the dispersed particles (spray, powder, etc.). Out of focus particles are detected automatically and are rejected depending on their level of defocusing. The particles can be of almost **any material** - opaque, transparent or even bubbles.

Absolute particle density measurements are carried out by the **Depth-of-Field calibration** option. This includes a dedicated calibration kit to measure the absolute probe volume of the system in the applied configuration. After being calibrated in such way, the **ParticleMaster** can deliver absolute number density, volume fraction and - together with the double exposure velocity option - **absolute mass flux.**

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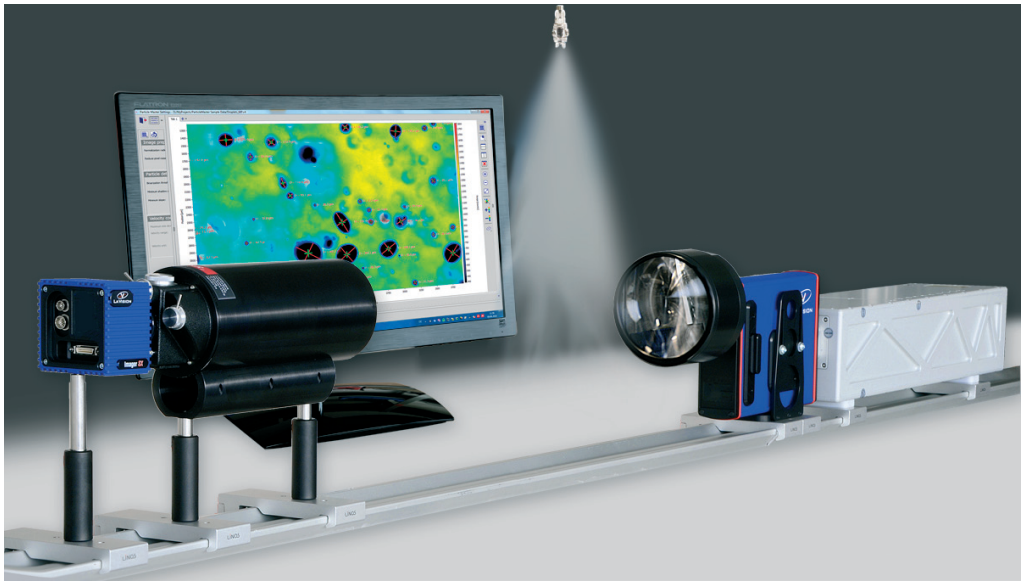
System components



Cameras

The camera size (number of pixels) is relevant for the number of particles which can be captured in a single image. Together with the frame rate and the interface speed, this determines the total data rate of the measurement systems. **Cost effective** single frame USB-3 or Gig-E cameras are for basic systems, while **high performance double frame** Camera Link cameras enable the velocity measurement of particles.

Lens

A **high magnification lens** resolves the shadow images of tiny particles down to 10 µm diameter. The working distance, magnification and optical resolution are the parameters to select the most appropriate lens for your application. For larger particles, like rain droplets or granulate material, a telephoto camera lens might be used.

Illumination

A **high efficient LED spotlight** is an easy to handle light source for the **ParticleMaster** system capturing particles at moderate speed. For smaller and faster particles a pulsed laser delivers the shortest light flashes to avoid motion blur. LaVision provides a **high efficiency diffusor** to convert the laser light into a speckle free homogeneous backlight. Selecting **double pulse light sources** allows measuring the **velocity** of individual particles.

Computer

The computer needs to be selected to the amount of data being processed. For most monitoring applications a **laptop computer** is sufficient. Once Camera Link cameras are used, a PC is the best choice. High-end systems can make use of the **highly parallelized** computation on a **dual-CPU** computer.

Calibration

A calibration target for the particle size is standard for every system. A more sophisticated absolute calibration is optionally offered by the **Depth-of-Field (DOF) calibration kit**. This consists of a device to measure the probe volume of the instrument, which then reveals **absolute density** and volume fraction. Absolute mass flux is obtained in combination with the velocity measurement capability of double exposure systems.

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