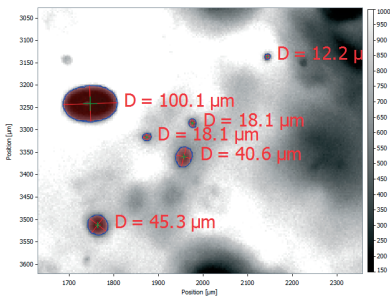


ParticleMaster Software

for imaging of particles,
droplets or bubbles

Individual particle properties

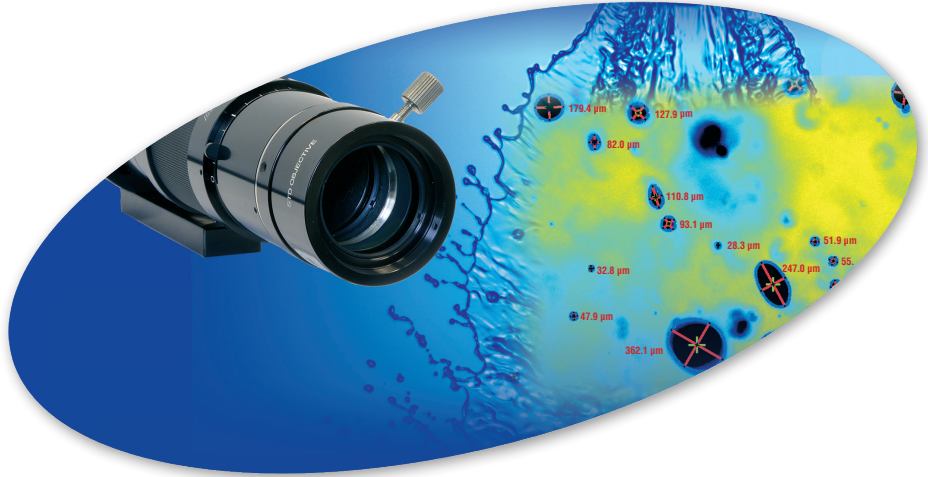


Particle velocity

Absolute mass volume fraction

Particle list export

The **ParticleMaster** software analyses high magnification shadow images from particles, droplets or bubbles. Direct imaging of individual particles gives you trust into the measurement method.



- The image processing algorithm detects **individual particles** and measures
- ▶ size
 - ▶ shape information - long/short axis
 - ▶ perimeter
 - ▶ orientation
 - ▶ velocity from dual frame images

The software corrects for bias from size dependent Field-of-View (FOV) and Depth-of-Field (DOF) to reveal **true statistical information** about

- ▶ size D_{10} , D_{32}
- ▶ volume percentiles 10%, 50%, 90%
- ▶ mass and number weighted mean velocity
- ▶ mass flux
- ▶ mass volume fraction

Velocity measurements are carried out by a double exposure using dual frame cameras. For absolute mass volume fraction and flux the detection volume is measured using the **DOF calibration** feature.

With the optional **Depth-of-Field (DOF) calibration kit**, the absolute particle density, mass volume fraction and mass flux is derived. The DOF calibration is performed scanning a calibration target through the measurement volume. This determines the detection volume the particles are recognized from.

- ▶ absolute mass density (mg/cm^3)
- ▶ absolute number density ($\text{particles}/\text{cm}^3$)
- ▶ absolute mass flux ($\text{g}/\text{cm}^2\text{s}$)

All particles found by the **ParticleMaster** software are internally handled in a database. This **particle list** can be exported and is available for further analysis.

LaVisionUK Ltd

2 Minton Place / Victoria Road
Bicester, Oxon / OX26 6QB / United Kingdom
E-Mail: sales@lavisoin.com / www.lavisoinuk.com
Phone: +44-(0)-870-997-6532 / Fax: +44-(0)-870-762-6252

LaVision GmbH

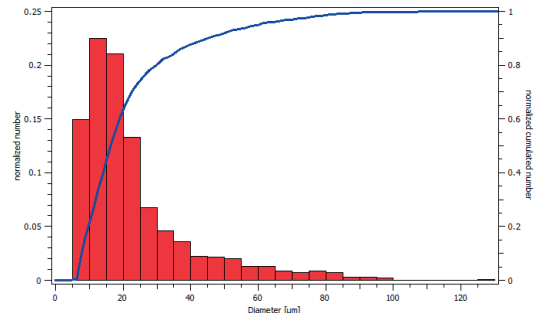
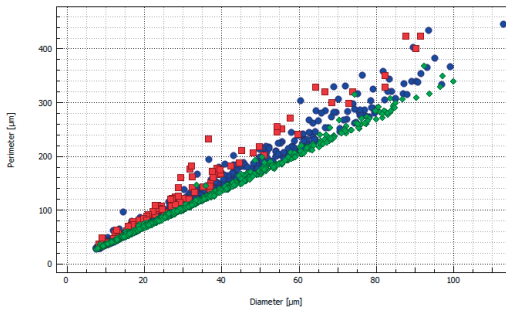
Anna-Vandenhoeck-Ring 19
D-37081 Göttingen / Germany
E-Mail: info@lavisoin.com / www.lavisoin.com
Tel. +49-(0)551-9004-0 / Fax +49-(0)551-9004-100

LaVision Inc.

211 W. Michigan Ave. / Suite 100
Ypsilanti, MI 48197 / USA
E-mail: sales@lavisoininc.com / www.lavisoininc.com
Phone: (734) 485 - 0913 / Fax: (240) 465 - 4306

Statistics analysis tools

The **scatterplot** feature allows plotting any pair of values in a 2D diagram. An additional coloring function highlights correlations to a third value. For example size can be plotted against shape information and colored by velocity.



The **histogram** supports linear and log scales, and integration by particle number, size, surface or volume.

Flexible multi window layout

The **ParticleMaster** software allows to arrange the information needed in a split window view to concentrate on the information you need. If more screen space is required, a tabbed view gives you even more flexibility.

Table of particle attributes:

X position [µm]	Y position [µm]	Diameter [µm]	Long axis [µm]	Short axis [µm]	A _v [µm ³]
2156.1	450.7	127.8	136.2	120.5	120.5
1448.8	307.7	14.2	16.8	12.5	12.5
2459.9	520.1	42.5	47.3	38.5	38.5
2545.8	576.0	49.9	57.8	44.0	44.0
3966.0	643.4	120.0	128.6	117.5	117.5
3957.8	659.2	57.2	60.7	54.4	54.4
1410.0	643.0	10.3	12.9	8.6	8.6
322.7	934.6	107.3	107.2	109.0	109.0
1360.5	1052.0	199.8	203.5	181.5	181.5
1011.2	1114.9	30.4	35.5	26.6	26.6
824.6	1189.8	96.2	102.3	90.8	90.8
1779.5	1386.9	55.8	56.6	55.2	55.2
4213.3	1345.5	12.8	12.9	12.9	12.9
407.4	1448.4	10.3	12.9	8.6	8.6
1251.4	1705.9	206.0	214.2	200.5	200.5
4920.0	1628.5	43.9	44.8	43.7	43.7
80.7	1650.7	25.9	33.2	22.3	22.3
164.8	1699.0	35.1	36.5	34.3	34.3
2096.7	1939.0	115.8	124.8	101.1	101.1
1764.9	1887.9	21.6	24.0	19.7	19.7
1892.0	1965.4	36.4	38.2	34.8	34.8
1185.1	1977.1	21.8	23.9	20.2	20.2
638.1	2032.6	34.7	35.1	34.6	34.6
2474.1	2281.5	98.7	99.6	98.0	98.0
860.7	2413.6	158.6	175.5	143.7	143.7
503.7	2412.2	63.6	64.7	62.7	62.7

Cumulated statistics for 6337 particles:

Statistic	Value
1 D10	65.1 µm
2 D32	205.5 µm
3 Dv10	112.0 µm
4 Dv50	275.0 µm
5 Dv90	466.6 µm
6 VP	(nan) m/s
7 VM	(nan) m/s
8 Mvel	(0) g m/s
9 Mabs	---
10 MVF	---

Instantaneous result feedback

The user interface gives instantaneous feedback while changing processing parameters. A reduction to a well-defined minimum set of processing parameters simplifies the finding of proper settings.

Computation speed

The **ParticleMaster** software makes use of all processing kernels in a modern PC up to dual processor multi-core systems. Optimized image processing algorithms improve the processing speed by a factor of up to 50 compared to earlier versions.

Images are being processed while they are acquired with the camera. This **live processing capability** reveals instantaneous size distribution information and potentially replaces a phase-doppler particle analyzer, without having a restriction to spherical transparent particles.

Data provided by LaVision are believed to be true. However, no responsibility is assumed for possible inaccuracies or omissions. All data are subject to change without notice.

Aug-16

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