

BeVision D2



HIGH PRECISION

- 2 high speed CCD cameras (120 pic/s) with different magnification levels
- online capture 10,000 particles/min
- exact analysis of broadly and narrowly distributed particle systems

VERSATILE

- ideal adjustment to the particle size due to a mutable camera system
- large scope: powders, suspensions and emulsions
- evaluation with different size models and shape parameters

...AND MUCH MORE

- standard operation procedures
- modular system for dry and wet dispersion
- simple and fast conversion
- best price-performance ratio

PARTICLE SIZE & SHAPE

by means of dynamic image analysis
for wet and dry measurement

PARTICLE SIZE

PARTICLE SHAPE



Characterization of
particles • powders • pores

BEVISION D2 IMAGE ANALYSIS FOR PARTICLE SIZE AND SHAPE DETERMINATION

BeVision D2 is a dynamic image analysis measurement tool equipped with two high speed cameras. These two cameras possess different and to distinct applications adjustable magnification levels to record images and analyze large and small particles of a powder or dispersion at the same time. Samples can be optionally measured in dry form with a falling shaft system, or in wet form in a closed circuit with a separate dispersion module including ultrasound and centrifugal pump.

The BeVision D2 operates according to ISO 13322-2.

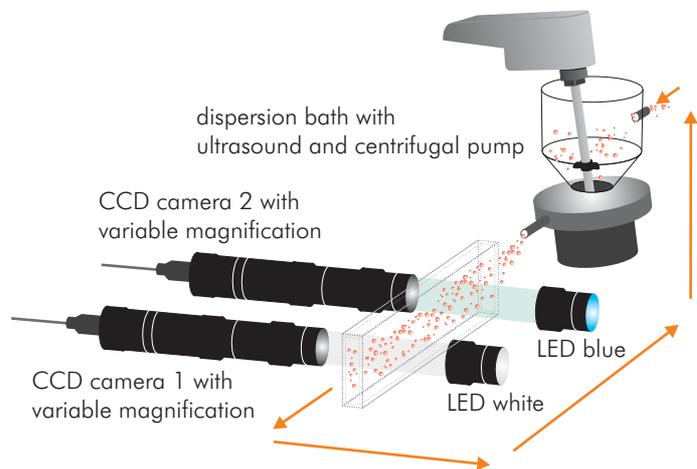
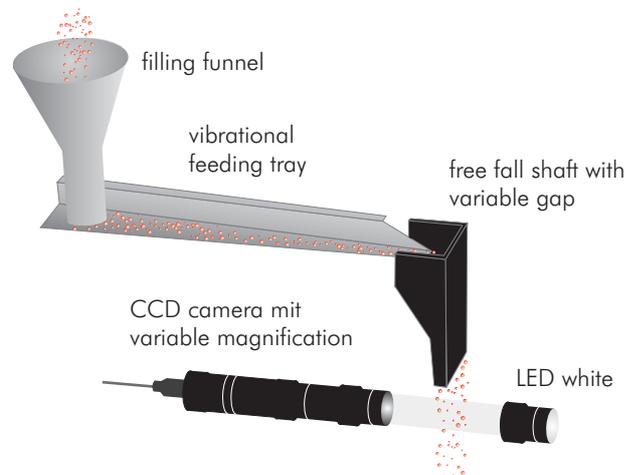


MEASUREMENT PRINCIPLE AND TECHNOLOGY

Dry dispersion - free fall

To measure dry and pourable powders, the samples are transported through a funnel onto a vibrational feeding tray and subsequently a shaft. Via a second funnel the particles fall in one plane through the shaft into a collecting vessel; meanwhile images are recorded simultaneously. The slit width of the falling shaft is adjustable, so the falling particles can be held in the focus plane of the camera.

The free fall measurement is suitable for pourable, weakly agglomerated powders, granulated materials, rough grains, fibers, and sensitive samples. In contrast to a wet measurement, this procedure is non-destructive, i.e. the sample falls into a collecting vessel and can be reused.



Wet dispersion

Using a stirrer, the sample is put into the external dispersion bath, e.g. with water or an alcohol, and dispersed with internal ultrasound if necessary.

A centrifugal pump transports the dispersed sample through the measurement cell, in which the particles are captured by two CCD cameras. With that, the particles are part of a closed circuit.

Measurements with a wet dispersion cell are suitable for suspensions, emulsions, fine and often difficult to disperse, and agglomerates powders.

Camera technology

The included CCD cameras possess an extremely high image rate and ultrashort exposure time. With that, more than 10,000 particles per minute can be captured with very high quality, i.e. with immense edge definition and without shadowing.

High-class LEDs (white and blue) provide an outstanding image quality and sharp particle contrasts even for fine, fluently dispersed particles (no diffuse reflectance).

Via variable lenses, the magnification of the camera system can be adjusted individually and thus ideally to the sample.

LED white	magnification lens	dispersion	min. resolution (μm)
	2x	dry, wet	3.75
	1x	dry, wet	7.5
	0.5x	dry, wet	15
	0.3x	dry, wet	25
	0.123x	dry, wet	56.81
LED blue	magnification lens	dispersion	min. resolution (μm)
	3x	wet	2.5
	4x	wet	1.875
	10x	wet	0.8

MAIN ADVANTAGES

- ✓ particle size and shape analysis between 2 and 10,000 μm
 - dry dispersion: 30 - 10000 μm
 - wet dispersion: 2 - 3500 μm
- ✓ precise and fast single particle detection
 - over- und under grain detection
 - exact measurement of very narrow and broad distributions
- ✓ online calculation of fundamental size and shape parameters

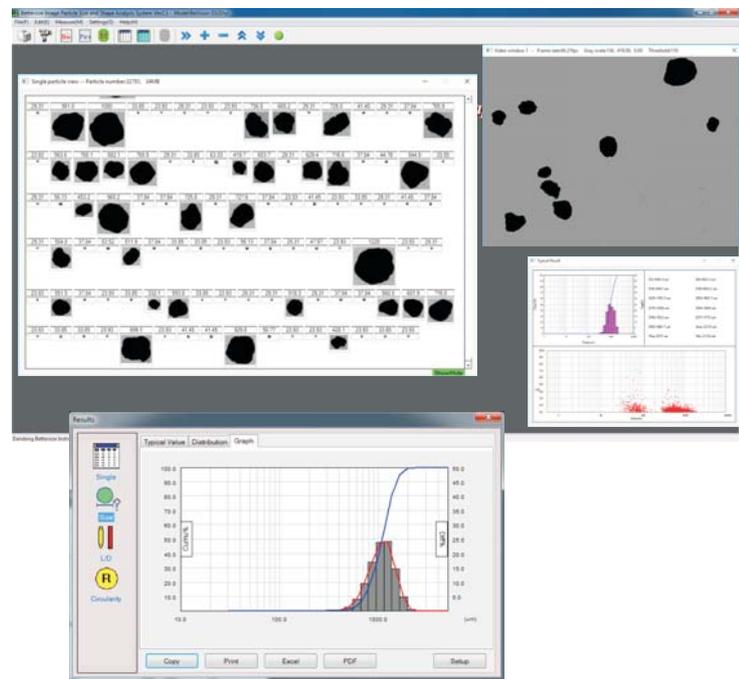


PARTICLE SIZE MEASUREMENT

The evaluation of particle sizes and shape parameters happens in real-time during the measurement via wet as well as via dry dispersion. Depending on the measurement properties (organized via Standard Operation Procedures, SOPs), agglomerated or blurred particles are sorted out automatically. This allows a fast, simple, and reproducible measurement, e.g. for quality examinations of known materials.

If using both cameras simultaneously (wet dispersion), all recorded particles are automatically scaled and merged into one distribution.

The software enables the determination of different particle qualities, for example the CE area equivalent diameter, or the minimum and maximum FERET diameter. Besides the ideal evaluation even of shape anisotropic particles regarding particle size (e.g. for fibers or platelets), a comparison to other measurement techniques like sieving or laser diffraction is entirely possible.



PARTICLE SHAPE ANALYSIS

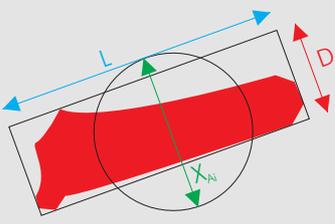
In addition to a fitting particle size determination, the BeVision D2 allows the calculation of a variety of shape parameters.

A multitude of important powder and dispersion properties like fluidity, compression behavior, rheological properties or other highly specific problems can be described perfectly with the aid of these additional parameters.

An excerpt of the most common parameters provided by the software is shown in the figure on the right hand side. All values are determined for every single particle and can be displayed in a statistic for all particles or individually.

Further parameters include for example convexity, solidity, compactness, excentricity.

important equivalent diameter



- X_{Ai} = area equivalent diameter
- L = maximum Feret diameter
- D = minimum Feret diameter

common shape parameters



D/L=1, C=1, P=62,07 mm



D/L=0,28, C=0,47,
P=52,65 mm

- C = circularity (shape factor): this is the ratio of the perimeter of a circle with the same area A as the particle, divided by the perimeter P of the particle
- D/L= aspect ratio: this is the ratio of the minimum to the maximum Feret
- P = perimeter of a particle

APPLICATIONS

building materials



personal care cosmetics



soils and sediments



glass and ceramics



carbon and oil



food and beverages



paints and inks



pharmaceuticals



polymers and metals



electronic



SPECIFICATIONS

Measurement principle		dynamic image analysis (ISO 13322-2)
Applications		suspensions, emulsions, dry powder
Size range	wet dispersion system	2 - 3500 μm
	dry dispersion system	30 - 10000 μm
Number of cameras		1 (dry dispersion), 2 (wet dispersion)
camera system		CCD, image speed 120 images/s
Time of measurement		< 10 min (depending on the application)
Measurement speed		up to 10000 particles/min
Accuracy		< 1 % (GBRM D50)
Repeatability		< 1 % (GBRM D50)
Magnification		9 - 300 fold
Measurement parameters	particle size	CE-equivalent diameter, Feret max, Feret min and others
	particle shape	circularity, aspect ratio, convexity and others
Device dimension (L x D x H), weight		440 x 610 x 300 mm, 26 kg
PC-configuration		Windows 7 or higher, CPU i7 or higher, 500GB HD
interface		USB 2.0 or higher