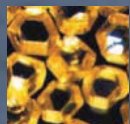


# ZEPHYR LDA

*Laser Diffraction Alternative*

+ µm — 3000 µm





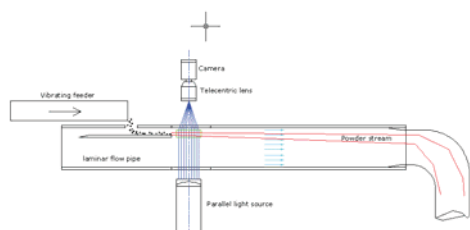
# ZEPHYR LDA: New particle size analyzer

**OCCHIO SA: Since 2001, your partner in imaging particle analysis**

Since 2001, through the efforts of an international and multidisciplinary **team of engineers**, **OCCHIO** offers you a **complete range of imaging particle analyzers**, starting from **200 nanometers up to several centimeters**. Whether it is for laboratory instrumentation, « AT LINE » or even « ON LINE » solutions, OCCHIO is prepared to be your partner in high-level powder characterization. OCCHIO bring you accuracy, profit and innovation.

## ZEPHYR LDA Technology

**Based upon a combination of mechanical and vacuum dispersion, ZEPHYR LDA provides for fast and accurate size and shape analysis. It is used to substitute manual sieves analysis. Associated with the software CALLISTO, it is easy to use and carries out rapid analyses in few minutes.**



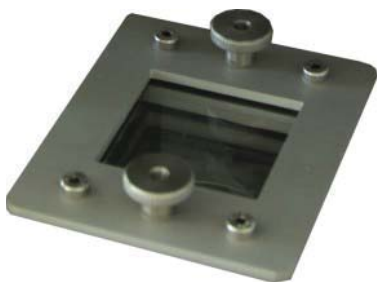
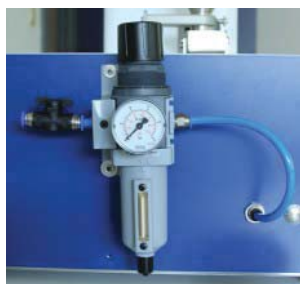
### Dry dispersion by air flow

Dry powders, which fall from a vibratory feeder, are introduced into a pipe and are dispersed by means of an aspiration system. Laminar air flow allows having all particles in focal plane.

High resolution camera associated with telecentric lens allows taking perfect pictures.

### High resolution camera

OCCHIO Instruments develops ZEPHYR LDA with one high resolution camera in order to obtain perfect correlation with other particle size technique as manual sieve analysis or laser diffraction.



### Substitute manual sieve analysis



Manual sieves analysis is long and need a full time operator.

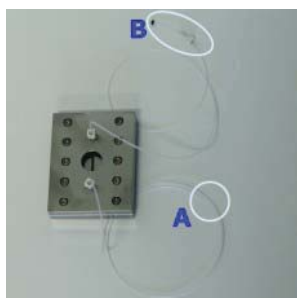
ZEPHYR LDA is working alone. Just put powder in feeder than ZEPHYR LDA measures.

### Glass cleaning

New principle to have an automatic cleaning of glass plates.

No stucked particles during analysis

No need to clean optics after analysis



## DRY & WET ANALYSIS

Sieves distribution

Particle size and shape

Particle counting with Flowcell (WET option)

Kinetic mode

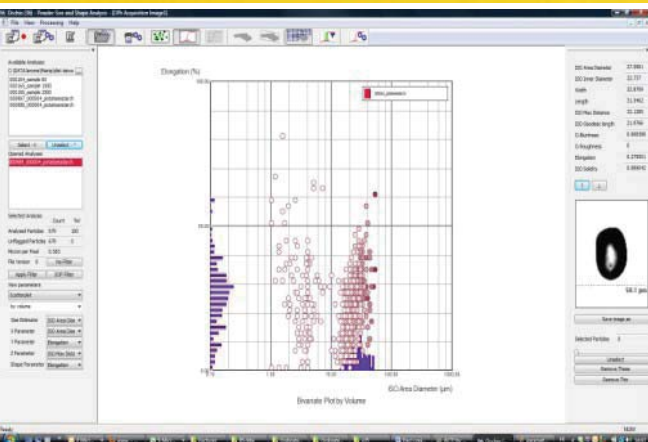
**Applications: Sugar, Coffee, Chocolate, Fiber, Tobacco, Sand, Diamond, PTFE, Ceramics, Fertilizers...**

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# ZEPHYR LDA: CALLISTO™

## CALLISTO™ : Software for particle analysis



Since 2001, OCCHIO develops revolutionary systems by image analysis technique to study all particles types (powders, suspensions, emulsions and foams). These new systems, associated to the **powerful software CALLISTO™**, allow particle size measurements, shape analysis & particle counting. Now , more than 50 parameters are available ...

### PARTICLE SIZE PARAMETERS

Area diameter

Inner diameter - Length

Width - Geodesic length - Mean diameter

### PARTICLE SHAPE PARAMETERS

**O. Aspect Ratio and Elongation:** The Elongation is defined as  $1 - \text{AspectRatio}$  with  $\text{AspectRatio}$  being the ratio between the width and the length of the particle

**ISO Straightness:** For very elongated particles, the straightness is ratio between the maximal distance and the Feret Length

**ISO Compactness and ISO Roundness :** Compactness and roundness are related to the degree to which the particle is similar to a disc. Roundness is less robust than compactness

**ISO Circularity:** Degree to which the particle (or its projection area) is similar to a circle

**ISO Solidity:** Solidity is the object area divided by the area enclosed by the convex hull (perfect to detect aggregates )

**O. Bluntness :** The Bluntness Index is the expression of a “maturity in the abrasion process”

**O- Roughness:** Amount of material to be removed from the shape before getting a smooth surface

**Luminance:** The luminance is the mean greyscale level of the particle

**O-Porosity;** Porosity estimator

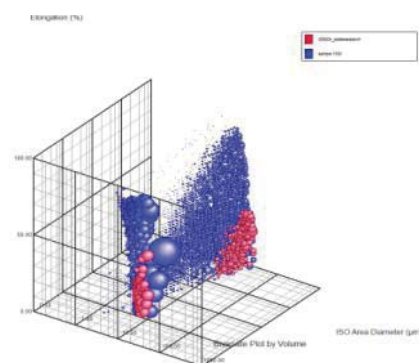


**SCATTERPLOT:** Possibility of **having a representation of the particle size**

**parameters** versus morphologic estimators. According to the particle size classes chosen by the operator, all plots are corresponding to particles. Operator can visualize each particle in clicking on each plot.

**MICROSCOPE MODE:** Display of each parameters and picture for selected particle on Scatterplot or live pictures. Operator can save picture for individual particle in Bitmap format.

(Particle size & shape distribution, trends, Excel export, sieves correlation...)



## ZEPHYR LDA Options

WET Analysis

Autosampler

Do not hesitate to contact us for other idea...

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# Data sheet

Model	ZEPHYR LDA
Particle size range	7 microns – 5000 microns
Measurement time	2 up to 10 minutes (sample depending)
Parameters	<b>ISO 9276-6; 7; 8 norms + OCCHIO parameters</b> <b>SIZE:</b> ISO Area diameter; ISO Inner diameter; Mean diameter; Perimeter diameter; Crofton diameter; Half Crofton diameter; Width; Length; Ellipse Width; Ellipse Length; ISO Max Distance; ISO Geodesic Length; <b>SHAPE:</b> Occhio Bluntness; Occhio Roughness; Elongation; ISO Aspect Ratio; Ellipsoid Elongation; Ellipsoid Roundness; Ellipse Ratio; ISO Eccentricity ISO Straightness; ISO Roundness; ISO Compactness; ISO Extent; ISO Solidity; Convexity; ISO Circularity, Luminance mean Luminance var.
Dimensions and weight	89.5(L) x 47 (l) x (H)38cm, 28 kg
Disperser	Vibrating feeder + vacuum principle
Optics and imaging device	Camera 5Mpixels Gigabit Ethernet
Validation	IQ,OQ,PQ in option
Option	Wet module, autosampler
Computer specifications	Windows 7, Intel Core i5-650 @3.2GHz, 4MB cache ; 4 GB @ 1156MHz , HD 500GB Thanks to contact OCCHIO to check computer specifications
Power supply	110-240 V 50/60 Hz
Working conditions	Temperature 5 °C – 45 °C, HR 35-80 %
Images format	Bitmap
Data storage	‘.oph’ binary Occhio files format contains: Full size distribution values Shape and size percentiles Outline and greyscale levels of each particle
Statistics tools (distribution in number & volume)	Acquisition info (short overview of the used SOP) ; Size distribution; Size percentiles; Shape percentiles; Shape distribution; Mean shape by size; 2D scatter-plot (fully selectable particles map); 3D scatter-plot (include animation); Percentiles sample images; Sample images (BMP exportable format); Id card for each particle (BMP exportable format); Morphological and size filtering procedure ; Raw data export (text format); Table distribution export (text format); Table distribution and percentile export (Excel format); Automatic or custom reporting; Full image export (bmp format); Single particle image export (bmp format); Figure and graph export (bmp format)

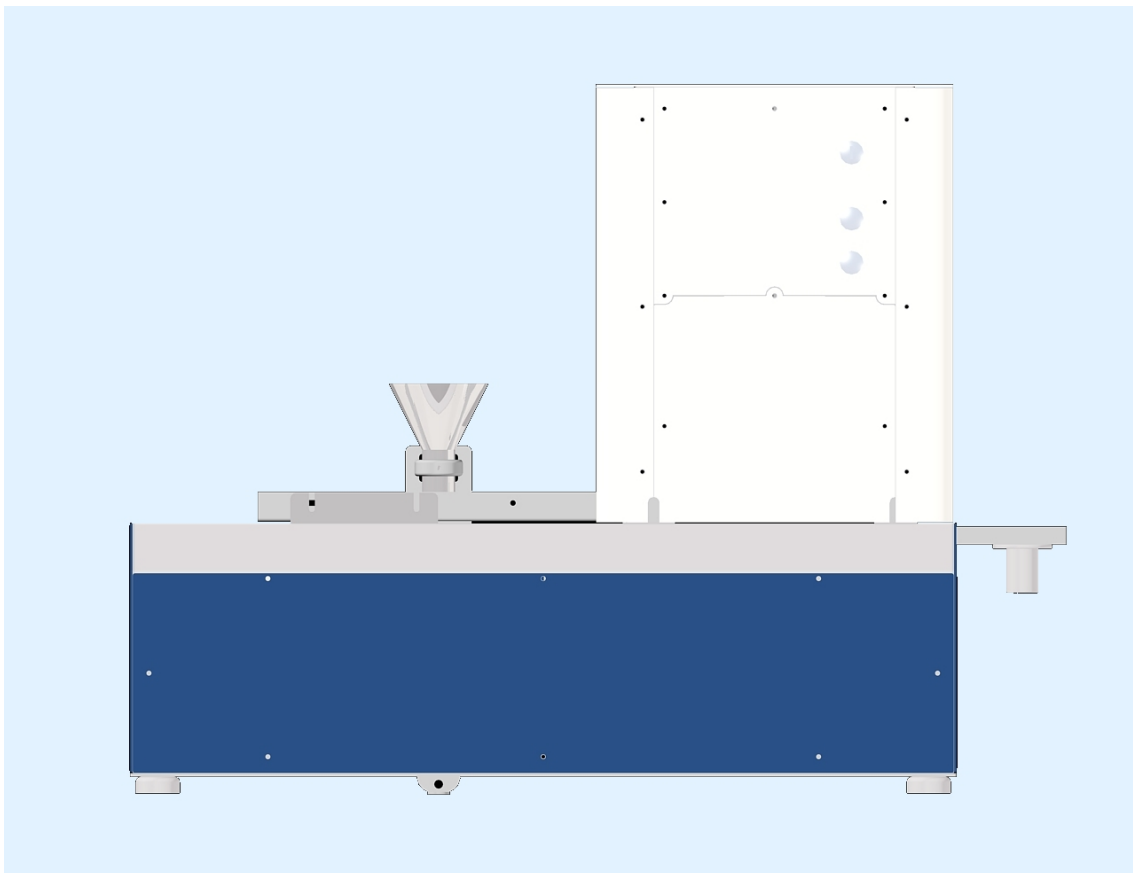
Do not hesitate to contact us for more informations and to know about new developments

YOUR DISTRIBUTOR

\* specification can be changed

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Reference code: OCC164 Occhio LDA



### Technical specifications

#### Working conditions

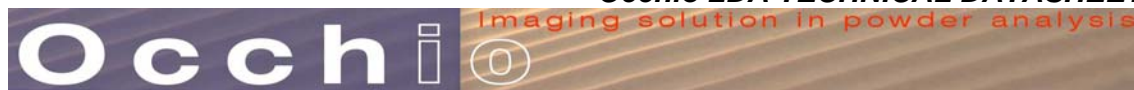
	Description
Working temperature	Temperature 5°C – 45°C Humidity 35% - 80% non condensing
Power Supply	100 or 220 Vac 50-60Hz (auto-switching is not available please ask to Occhio to set power supply)

#### Computer (supplied by Occhio)

	Description
Processor	Intel Core i7-2600 @3.4GHz, 4MB cache
Ram	4 GB @ 1600MHz
Hard Disk	500MB
Display	LCD, FullHD, 22"
Mouse, keyboard	USB (English)
Operating system	Windows Seven professional

#### Optics and imaging device

	Description
Standard camera type	Camera 5Mpixels Gigabit Ethernet 2/3" interline progressive scan CCD
Camera resolution	5.0 Millions of pixels 2448 x 2050 pixels
Pixel size	3.45 µm

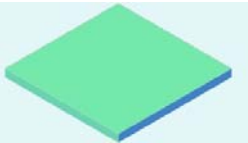


Lens type	Telecentric lens
Lens resolution (standard lens) (lens code 164-120-R1)	Calibration : 10 $\mu\text{m}$ /Pixel
Field of view (standard lens) (lens code 164-120-R1)	24480 x 20500 $\mu\text{m}$ @10 $\mu\text{m}$ /pixel
Lens resolution (Optional lens) (lens code 164-121-R1)	Calibration : 7 $\mu\text{m}$ /Pixel
Field of view (Optional lens) (lens code 164-121-R1)	17136 x 14350 $\mu\text{m}$ @7 $\mu\text{m}$ /pixel
Light source	Back light collimated monochromatic light source (wavelength 440nm)
Light wavelength	440 nm (blue light)

#### Dimensions and weight

	Description
Dimensions	85 x 64 x 47 cm (Width x Height x Deep)
Weight	52 kg

#### Starting kit parts (these parts are included in the packing box at the delivery)

Part number	Description	Quantity
164-081-R1 	Glass plate	2
999-0014-R1*	Vacuum cleaning (220VAC-240VAC)	1
999-0015-R1*	Vacuum cleaning (110VAC)	1
999-0015-R1	Vacuum cleaning filter	1
164-500-R1	Zephyr and Zephyr ESR communication cable A	1
164-501-R1	Zephyr and Zephyr ESR communication cable B	1
999-0003-R1	Power supply cable North America	3
999-0004-R1	Power supply cable Europe	3
999-0013-R1**	Computer + LCD, FullHD, 21.5" + Mouse + Keyboard US	1
999-0010-R1	Keyboard USB (FR)	1
999-1016-R1	Calibrated quartz sand (Fr B 600 $\mu\text{m}$ 1180 $\mu\text{m}$ ) Net weight 500g	1 bottle

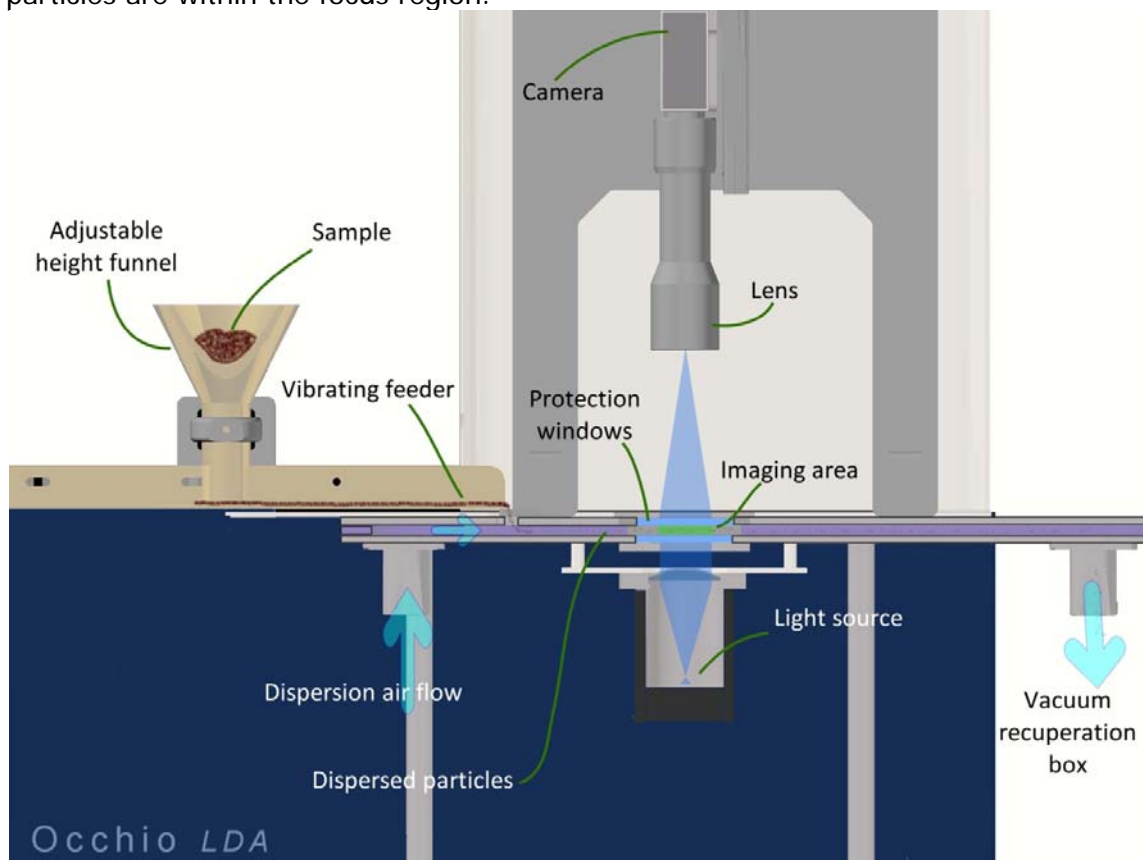
#### Option 164108 external wet dispersion module

	Description
Dispersion beaker volume	max 600 ml
Flow type	Circulation
Cell thickness	1mm; 3mm; 6mm

### Occhio LDA short instrument overview

Based upon a combination of mechanical and vacuum dispersion, the Occhio LDA provided, for a fast and accurate size and shape analysis of sieveable powders. The instrument combines, high quality imaging system with a robust mechanical design for at-line and on-line process control.

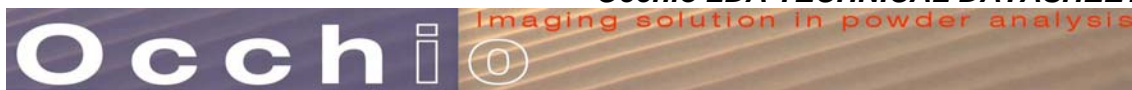
The powder is dispersed by means a vacuum system, different layers of air flow inside the pipe are maintained in laminar conditions. The area of image capture is close to the powder entry point to avoid differential speed. The system uses a unique combination of telecentric lens and collimated monochromatic light; therefore all particles are within the focus region.



### Sampling

The sample is feed directly onto the Occhio LDA vibrating feeder and thanks to standard operation procedure analysis duration and cleaning time are automatically set, the measurement starts. Within a few seconds, results are displayed and database is generated.

This instrument is able to analyze a large quantity of sample in just a few minutes due to the high-speed air flow. Typically, for plastic pellets 0.5-2.5 mm, sample flow is 500 grams/min.



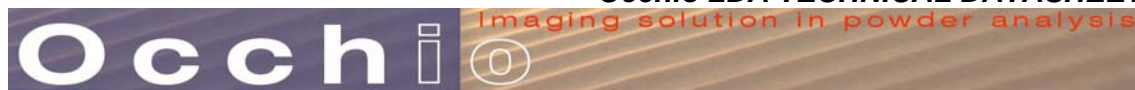
All Occhio instruments are based upon specific optical technology, using high quality lenses with low distortion and mounted on a precision, robust mechanical system suitable for industrial working conditions.

### **Sample analysis**

Model	Occhio LDA
Sample dispersion	Vibrating feeder combined with air flow
Sample particles size range	From 7 $\mu\text{m}$ to 5 mm
Time measurement	1-3 minutes (sample et quantity dependent)
Sample analysis	Size distribution cumulate and proportional curve Number distribution or volume weighted distribution Sieves correlation (according with OCCHIO)
Standard Operating Procedure includes	Maximum number of particles Control on vibrating feeder (initial speed, acceleration, max) Particles per picture Light intensity calibration Background calibration Creation of a particle database Image storage Filtering procedure Automatic reporting generation

### **Software mains features**

Model	Callisto Software for Flowcell FC200M
Size parameters (Iso 9276-6; 7; 8) All the size parameters are displayable or not according with the customer setting preference	ISO Area diameter ISO Inner diameter Mean diameter Perimeter diameter Crofton diameter Half Crofton diameter Width Length Ellipse Width Ellipse Length ISO Max Distance ISO Geodesic Length
Shape parameters (Iso 9276-6; 7; 8) All the shape parameters are displayable or not according with the customer setting preference	Occhio Bluntness Occhio Roughness Elongation ISO Aspect Ratio Ellipsoid Elongation Ellipsoid Roundness Ellipse Ratio ISO Eccentricity ISO Straightness ISO Roundness



	ISO Compactness ISO Extent ISO Solidity Convexity ISO Circularity Luminance mean Luminance var. Porosity
Advanced shape parameters	Developed in function of customer specifications
Image format	Bitmap
Data storage	'.oph' binary Occhio files format contains: Full size distribution values Shape and size percentiles Outline and greyscale levels of each particle
Data comparisons	Open and compare more analysis on the same plots include 'trends graphic'
Plots and figure (By number or volume weighted values)	Acquisition info (short overview of the used SOP) Size distribution Size percentiles Shape percentiles Shape distribution Mean shape by size 2D scatter-plot (fully selectable particles map) 3D scatter-plot (include animation) Percentiles sample images Sample images (BMP exportable format) Id card for each particle (BMP exportable format)
Statistics tools	Morphological and size filtering procedure
Reporting and data export	Raw data export (text format) Table distribution export (text format) Table distribution and percentile export (Excel format) Automatic or custom reporting Full image export (bmp format) Single particle image export (bmp format) Figure and graph export (bmp format)
Microscope mode pane	Real time images acquisition without analyzing
External images analysis	Possibility to analyse images coming from others acquisition sources (bmp greyscale format)

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[www.occhio.be](http://www.occhio.be)

**Reference code: OCC169 LDA WET**

LDA WET allows making particle size, shape and counting analysis in WET mode.

**Particle size range (1  $\mu\text{m}$  – 3000  $\mu\text{m}$ )****Working conditions**

	Description
Working temperature	Temperature 5°C – 45°C Humidity 35% - 80% non condensing
Power Supply	100 or 220 Vac 50-60Hz (auto-switching is not available please ask to Occhio to set power supply)

**Computer (supplied by Occhio)**

	Description
Processor	Intel Core i7-2600 @3.4GHz, 4MB cache
Ram	4 GB @ 1600MHz
Hard Disk	500MB
Display	LCD, FullHD, 22"
Mouse, keyboard	USB (English)
Operating system	Windows Seven or 8

**Instrument dimensions, weight and power supply**

Dimensions (WxDxH)	700mm x 420mm x 440mm (H include upper stirrer)
Weight	26 Kg
Power supply type	External power supply module (delivered with the instrument) Input 100 to 240 VAC – 50 to 60 Hz Output 5 – 12 – 24 VDC 200W

**Optical configuration and sample size range**

Camera résolution	5 megapixels
Lens type	Bitelecentric <u>motorized</u> zoom
Lens resolution	Position 1 : 13.8 $\mu\text{m}$ /pixel

	Position 2 : 6.9 $\mu\text{m}/\text{pixel}$ Position 3 : 3.45 $\mu\text{m}/\text{pixel}$ Position 4 : 1.725 $\mu\text{m}/\text{pixel}$
Image size (WxL @ resolution)	33.8 x 28.3 mm @ 13.8 $\mu\text{m}/\text{pixel}$ 16.9 x 14.1 @ 6.9 $\mu\text{m}/\text{pixel}$ 8.4 x 7.1 @ 3.45 $\mu\text{m}/\text{pixel}$ 4.2 x 3.5 @ 1.725 $\mu\text{m}/\text{pixel}$
Back light wavelengt	440 nm

**Sample size range, sample dispersion and flow-cell size**

Sample dispersion	In water or ethanol (for others solvents please contact Occhio)
Sample type	Suspension or emulsion
Sample size range	1 $\mu\text{m}$ to 3000 $\mu\text{m}$ (sample and sample preparation dependent)
Beaker material	Stainless steel
Beaker volume	Min 500 ml Max 700ml
Flow mode	Circulation with centrifugal pump
Pump speed (rpm)	Min 200 Max 3000
Flow-cell material	Stainless steel
Flow-cell thickness	Spacer 1: 1mm thickness x 40.5 mm large Spacer 2: 2mm thickness x 40.5 mm large Spacer 4: 4mm thickness x 40.5 mm large
Spacers material	Stainless steel
Stirrer type	Upper brushless stirrer
Stirrer speed (rpm)	Min: 100 Max: 500

**Software mains features**

Model	Callisto Software
Size parameters (Iso 9276-6; 7; 8) All the size parameters are displayable or not according with the customer setting preference	ISO Area diameter ISO Inner diameter Mean diameter Perimeter diameter Crofton diameter Half Crofton diameter Width Length Ellipse Width

	Ellipse Length ISO Max Distance ISO Geodesic Length
Shape parameters (Iso 9276-6; 7; 8) All the shape parameters are displayable or not according with the customer setting preference	Occhio Bluntness Occhio Roughness Elongation ISO Aspect Ratio Ellipsoid Elongation Ellipsoid Roundness Ellipse Ratio ISO Eccentricity ISO Straightness ISO Roundness ISO Compactness ISO Extent ISO Solidity Convexity ISO Circularity Luminance mean Luminance var. Porosity
Advanced shape parameters	Developed in function of customer specifications
Image format	Bitmap
Data storage	'.oph' binary Occhio files format contains: Full size distribution values Shape and size percentiles Outline and greyscale levels of each particle
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	Figure and graph export(bmp format)
Microscope mode pane	Real time images acquisition without analyzing
External images analysis	Possibility to analyse images coming from others acquisition sources (bmp greyscale format)

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