PAMAS
Partikelmess- und Analysesysteme

PAMAS HCB-LD

Optical sensors for the analysis of particles between 1 and 8000 µm

Light blockage sensors for standardised fluid contamination analysis

Application:

- Particle contamination control of fluids (hydraulic fluids, lubricating oil, pharmaceutical liquids, etc.)
- Condition Monitoring and Cleanliness Control
- Filter testing and filter definition
- Component Cleanliness Control

Optical particle counters work with the help of light. In optical measurement proceedings, the light beams through the liquid. The electromagnetic waves may be deflected or absorbed when meeting the particles in the measuring cell. The light effect on the particles is analysed with the help of a previously calibrated optical electronic hardware.

Contamination analysis with the help of a PAMAS particle counter determines the quantity and the size of particles in a liquid. There are two basic principles of contamination analysis: the principle of Light Extinction (according to which particle sensors of the series PAMAS HCB-LD proceed) and the principle of Light Scattering (according to which the particle sensor PAMAS SLS-25/25 works).

DESIGNED DEVELOPED MADE PAMAS IN GERMANY

REV 10/2020

IN THE WORLD OF PARTICLES PAMAS COUNTS

PAMAS HCB-LD

Advanced sensor technology for precise fluid contamination control

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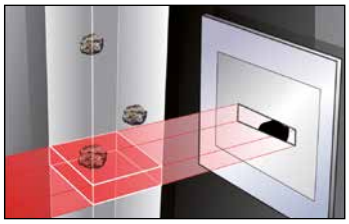
Principle of Light Extinction

According to the principle of Light Extinction, the liquid flows through the measuring cell of the sensor. The size of the measuring cell is different for each application. On one side of the measuring cell, there is a light beam, on the other side there is a photo-detector.



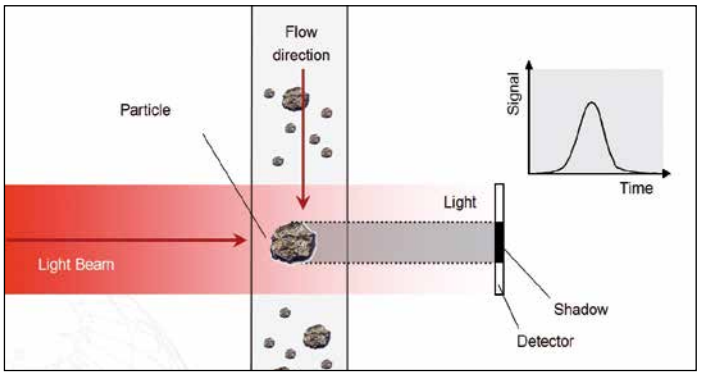
Particle counting with light blockage sensors

If the liquid is pure and clean and does not contain any particles, then the light would beam unhamperedly through the cell. However, if there are particles in the liquid, then the light beam hits the particles and as a result, the shadow of the particle is shown on the photo-detector. The surface of the shadow causes a voltage change on the photo-detector and indicates the size of the particle flowing through the sensor cell. The particle counter transfers the number of shadows on the photo-detector into the quantity of particles in the liquid. Furthermore, the particle sizes are distributed in different size classes.

The sensors differ in the size of their measuring cell and therefore illuminate different liquid volumes. They also have different flow rates. The sensor specification tells us the flow rate of the sensor and the correspondent liquid volume. With the help of this specific flow rate, a calibrated particle counter indicates the particle concentration of the liquid and provides information about the number of particles in different size classes. The particle measurement results are reported according to the cleanliness class standards which are relevant for the specific application (e.g. ISO 4406).

Calibration of sensor

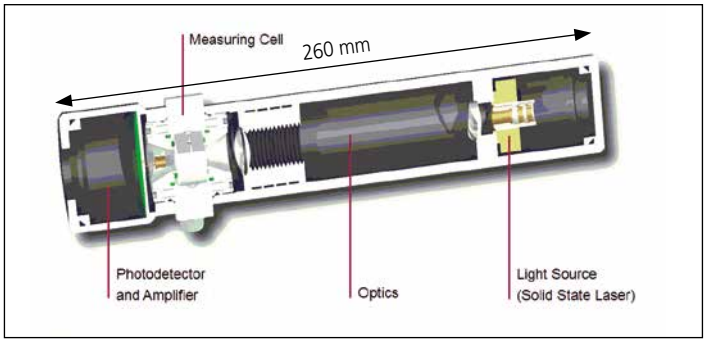
For oil applications, light extinction sensors are calibrated with ISO MTD (Medium Test Dust) whose size distribution is defined and certified by the NIST (National Institute of Standards and Technology). For other applications, the sensors are calibrated with monodisperse latex particles whose diameter is also traceable to the NIST.



The principle of light extinction

PAMAS sensor range

Eight different sensors are offered in the series PAMAS HCB-LD. All of them work according to the principle of light extinction, but they differ regarding cell size, flow rate, maximum particle concentration and potential interval of detection. The abbreviation HCB-LD stands for High Concentration Blockage - Laser Diode, i.e. for a sensor using an integrated laser diode as light source. The integrated laser diode has a wavelength of 670 nm. The numbers integrated in the sensor name refer to the size of the measuring cell: the sensor PAMAS HCB-LD-15/25 for instance has a cell size of 150 x 250 µm².



Simplified illustration of the PAMAS HCB-LD sensor design

Sensor type *	Cell size in µm	Nominal flow rate in millilitre per minute (ml/min)	Maximum concentration of particles per millilitre (P/ml) including a coincidence rate of 7.8 %	Flow rate range in ml/min	Potential interval of detection in µm (calibration based on ISO 21501)	Potential interval of detection in µm(c) (calibration based on ISO 11171)
HCB-LD-25/15	250 x 150	10	200000 P/ml	5 – 25	1 – 100	4 – 70
HCB-LD-25/25	250 x 250	10 / 25	120000 P/ml	5 – 50	1 – 200	4 – 70
HCB-LD-50/50	500 x 500	25	24000 P/ml	5 – 150	1 – 400	4 – 70
HX **	500 x 500	25	24000 P/ml	5 – 50	[for oil only]	4 – 70
HCB-LD-100	1 000 x 1000	25	1200 P/ml	25 – 500	5 – 800	5 – 150
HCB-LD-250	2 500 x 2500	200 / 500	180 P/ml	200 – 500	20 – 2000	[oil calibration on request]
HCB-LD-900	9 000 x 9000	500	10 P/ml	500 – 2000	30 – 8000	[oil calibration on request]
HCB-25/25 ***	250 x 250	10	24000 P/ml	5 – 50	1.5 – 200	4 – 170

* The sensors of the HCB-LD series are also available for corrosive liquids.
** The sensor HX is designed for the online particle counter PAMAS S50.
*** The sensor HCB-25/25 works with white light instead of laser light.

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