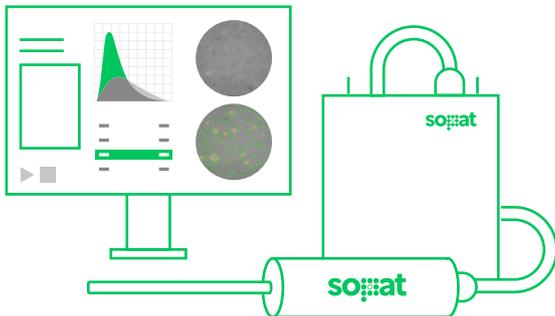


# An image is worth more than a thousand words.

Discover our photo-optical inline technology

MADE IN GERMANY



**so:at**

Make every detail count

# Make every detail count

With SOPAT's photo-optical and image-based particle analysis measurement technology



**SOPAT** is an expert in the field of particle measurement technology. It develops and markets an image-based, photo-optical analysis tool that enables quantitative real-time characterization of particles in multiphase systems. The analysis of particle shape and size distribution as well as characteristic parameters is achieved by the innovative **SOPAT** software.

Since its founding at the Technical University of Berlin, **SOPAT** has been able to expand its customer base beyond Germany and established an international network of sales partners. The focus of this cooperation is the development of an individual customized measurement technology to ensure process optimization.



## THE BENEFITS OF SOPAT PARTICLE MEASUREMENT TECHNOLOGY



Inline  
Measurement



Real-Time Process  
Monitoring



Simultaneous Analysis  
of different particle  
types



Process  
Optimization



Quality  
Control

# Innovative Particle Measurement Technology

## SOPAT SYSTEM



SOPAT offers a highly customizable product range suitable for a wide range of different industrial applications.

We offer 9 different product models to measure particle sizes between 0.5 and 50,000 µm. Each measurement range comes with its own challenges for which we can offer different solutions.

Customization is important. We can adapt to your specific requirements. We can vary probe length, temperature/pressure limits, the wetted material of the productive tube, and many more. For the preponderant part of our portfolio, we can also offer an ATEX solution.

Thus, the SOPAT particle measurement technology can be individualized optimally for your process.

## SOPAT SERVICE



Take advantage of a variety of possibilities to test the SOPAT particle measurement technology, and choose one of the following service options:

**Sample Testing:** Send us your samples for a feasibility test, and have the entire range of SOPAT probes available.

**On-site Demo:** We visit your premises to test the SOPAT system inline - directly in your process - to demonstrate the technology's full potential.

**Rental:** Test the SOPAT system over an extended period of time at your facility and learn about the variety of ways your process can benefit from the SOPAT technology. We support you during installation and with software training courses.

**Try and Buy:** Avoid missing out on a financial advantage, and purchase the SOPAT system after a successful rental period.

## SOPAT SUPPORT



Even after the purchase, we are there for you and support you as a reliable partner.

If you have a problem, we offer different ways to report those problems and we will get in touch to solve the issues. We will support you in image analysis, connection to your process control system, and offer training for our software and hardware.



CIP/SIP

MADE IN GERMANY

# Optimize Your Process

In almost all cases, the quality of a product depends on the properties of the individual particles and their size/shape distribution.

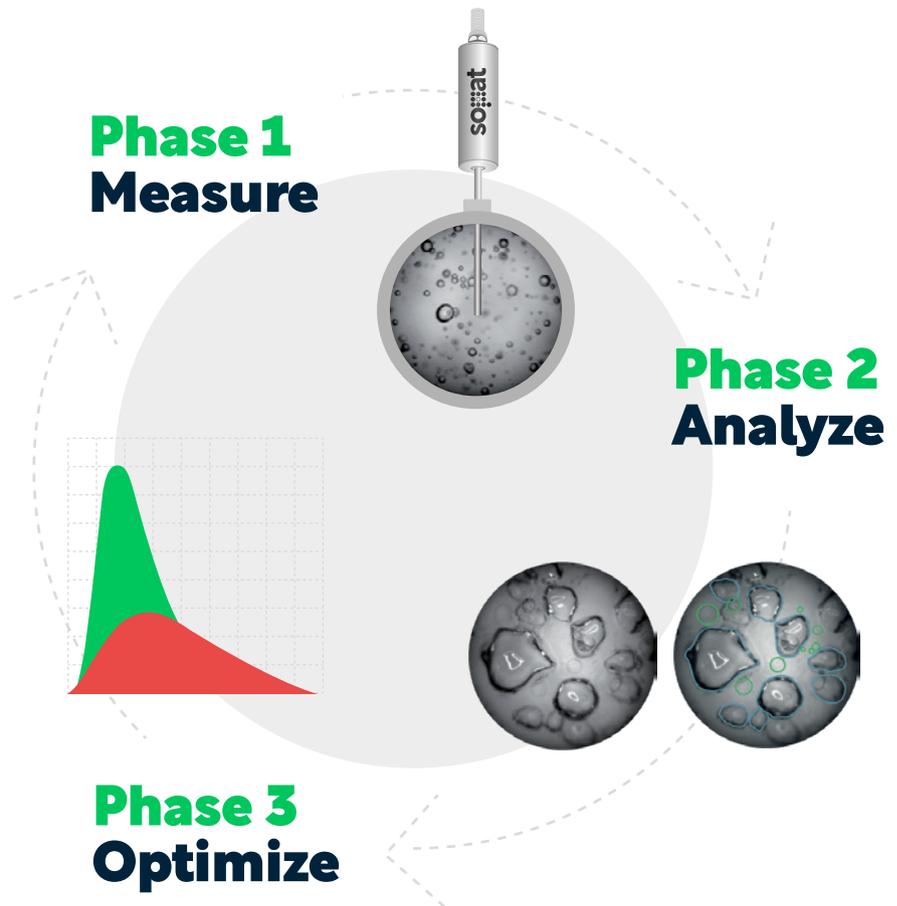
Inline determination of the particle size distribution is crucial for effectively monitoring a process and being able to react more quickly in the event of a deviation. These measures can reduce production losses and downtime.

The SOPAT technology enables inline measurement during the running process. No sampling or dilution is required. Direct optical access to the product allows different particle types (e.g. bubbles, droplets, solids, biological cells or crystals) to be distinguished and thus analyzed in a differentiated manner.

Our image analysis software is powerful and versatile. It is expertly tailored to the needs of your application. The SOPAT system provides characteristic values and parameters of the particle size distribution.

It will give you essential information such as the density and cumulative distributions based on number and volume ( $q_0$ ,  $q_3$ ,  $Q_0$ ,  $Q_3$ ) as well as various parameters ( $d_{1,0}$ ,  $d_{3,2}$ ,  $d_{4,3}$ , etc.) and percentiles ( $dv_{10}$ ,  $dv_{50}$ ,  $dv_{90}$ , etc.).

The transmission of data to your process control system (PCS) and the control of the SOPAT probes is done via common protocols (e.g. Modbus TCP/IP or OPC UA).



# Anti-Fouling: Cleaning Without Process Interruption

## THE PROBLEM

Fouling and deposits are a challenge for all inline probes. The performance of optical measuring instruments can be particularly affected by contamination.

In the worst case, the measurement has to be interrupted and suspended until the next cleaning, causing a considerable loss of time and high costs. SOPAT offers its customers two solutions to these challenges:

## SOPAT ANTI-FOULING SOLUTION

This add-on is currently available for the Ma, Pl, Sc, and Pa inline probes. Deposits are removed by a tangentially directed fluid jet. This purging process can be used with either gases or liquids at a maximum pressure of 14 bar.

In addition, the built-in circulation of a cooling medium allows the temperature range for the inline probes to be extended from 120°C to 450°C.



● Extension tube for cooling and purging

## RETRACTABLE FITTINGS PROVIDED BY KNICK

Our partner Knick offers a fully automatic cleaning tool with its retractable fitting Ceramat WA155. The WA155 can be equipped with 12mm probes in 320mm length and thus enables their automated cleaning even in corrosive, high-temperature, toxic or pressurized process media.



● KNICK CERAMAT WA155



## CERAMAT HIGHLIGHTS

- Unique ceramic seal
- Possibility of cleaning the probe outside of the process
- Sensor switching without process interruption
- Can be combined with the 320 mm SOPAT probes with 12 mm diameter (Ma, Pl, Sc, Pa)
- ATEX version available. 

# Benefit from our Know-how

With the goal of enabling our customers to better monitor and control the quality of processes, SOPAT offers a customizable particle measurement system for a wide variety of applications and industries.

The possible applications of the SOPAT technology are manifold. From R&D to pilot plants to production processes, there are countless possibilities for using SOPAT particle measurement system. Take advantage of the benefits for your

application and benefit from our extensive know-how, innovative technology and individual support.



## Industries in which we are active



Chemical Industries



Oil & Gas



R & D



Water Treatment



Food and Beverages



Agriculture



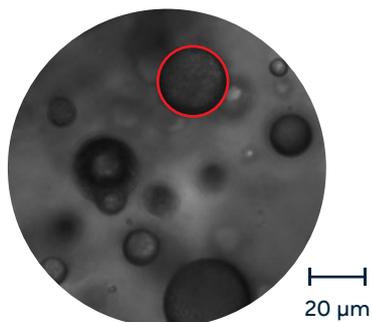
Pharma Biochemistry



## BENEFIT FROM OUR EXPERTISE ON:

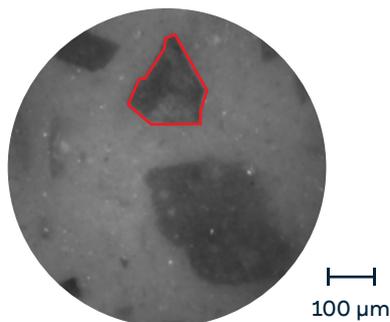
- Process Engineering
- Measurement Technology
- Software Development
- Technical Physics
- Optics
- Material Sciences

## Our Focus on Your Details



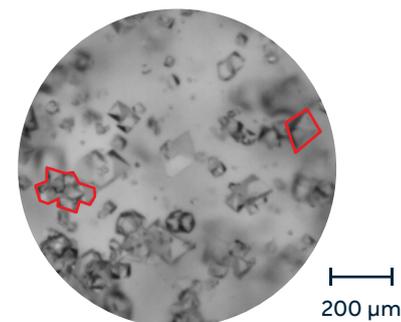
### Bubbles and Droplets

The droplet size distribution in multiphase systems (e.g., oil in water or also water in oil) influences separation efficiency as well as energy and mass transfer rates. Inline measurements help to maximize output and minimize energy costs.



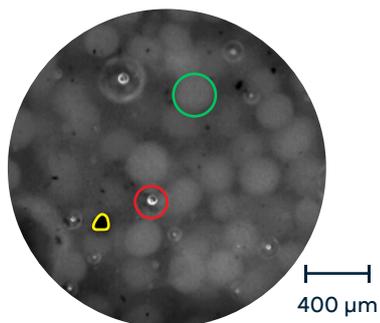
### Suspensions, Powders, and Granules

Unwanted particles in grains, granulates, or powders can lead to costly downtime, machine damage, or a reduction in filtration strength. Real-time monitoring provides you with more time to react in an adequate manner and avoid such complications.



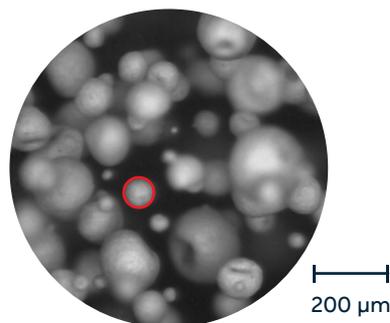
### Crystallization

Characterizing particles during crystallization is a challenge. The SOPAT particle measurement technology detects structures using innovative software and can analyze them thanks to individualized algorithms.



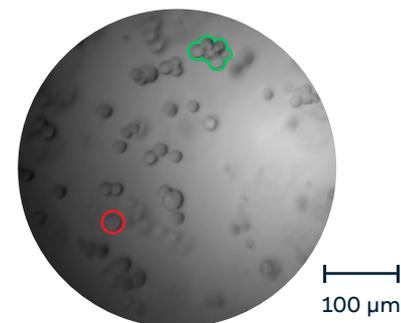
### Differentiation of Particle Types

In real processes, particles often appear dissimilar and in different phases, i.e., gas, liquid, or solid. Our intelligent software differentiates between particle types and phases simultaneously, and analyzes their size distribution.



### Granulation

Sampling for offline analysis is often costly and time-consuming, and there is a high probability that samples will change in the time between sampling and analysis. Automate this workflow and measure inline and save time to reduce costs.



### Biological Systems

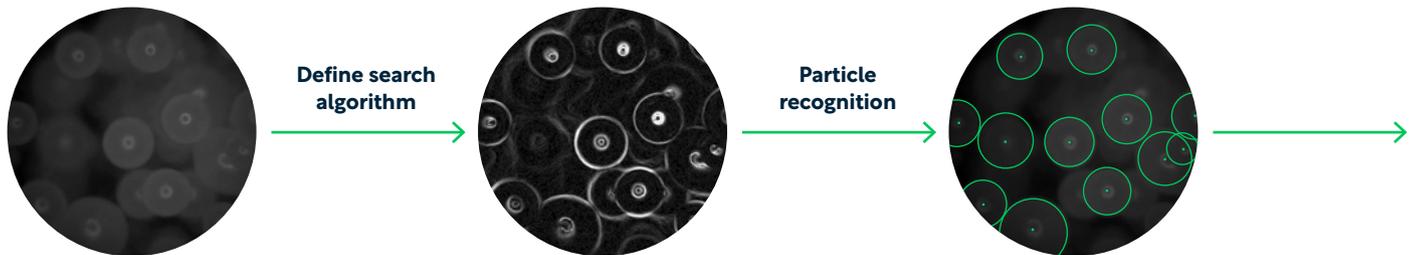
The quality of a product often depends on the size and shape of the particles. Thanks to our software, you are not limited to circular objects, but can also identify more complex, irregular objects. Knowledge of the characteristic shape distributions of particles enables more reliable quality control.

# Intelligent Measuring: Object Classification in Three Steps

The SOPAT particle measurement system can measure particles between 0.5 and 50,000  $\mu\text{m}$ . Combined with our innovative software, our system allows you to better understand the process and provides valuable information about the particles and their size distribution for more efficient, cost-saving quality control.

To obtain a reliable size distribution, a sufficient number of particles must be measured. The SOPAT workflow starts with the collection of several raw data sets in

the form of images. The subsequent image analysis consists of several steps:



## 1. Original picture

Pattern recognition through correlation of prefiltered pictures with a search pattern.

## 2. Prefilter, normalize

Preselection of plausible particle coordinates.

## 3. Object classification

Classification of objects through exact edge testing. The processing time is proportional to the pixel amount and is up to 500 times quicker than manual counting.

# 5 Steps to Your Own SOPAT Particle Measurement System



**Define your problem and your process/application with the help of our checklist.**



**Get to know the SOPAT System:**

- a) On-site measurements.
- b) In-house laboratory measurements of small samples.



**Monitor your process thanks to an optimal SOPAT measurement system tailored to your needs.**



**Profit from all the different ways to test the SOPAT system:**

- a) Measurement as a Service
- b) Renting
- c) Try and Buy
- d) Direct Purchase.



**Take advantage of our knowledge.**

We support you during the installation of our system and also offer comprehensive support during system operation.



# SOPAT probes. From 0.5 to 50,000 $\mu\text{m}$

MM-2



VI Probe



MicroBubbleScope



ChocoScope



InView



The picture may differ from the actual product.

Product Category	Microscopic	Mesoscopic				Special		Macroscopic	
Product Model	MM-2	VI Ma	VI Pl	VI Sc	VI Pa	CS*	$\mu\text{BS}^*$	Kr	InView
Measurement Range [ $\mu\text{m}$ ]	0.5 – 75	1.5 – 250	2 – 300	9 – 1,100	15 – 2,300	2 – 320	9 – 1,100	30 – 7,700	50 – 50,000**
Field of View (diag.) [mm]	0.17	0.58	0.71	2.6	5.45	0.75	2.6	18	customizable
Tube Length [mm]	734	220 – 2,000				220		220-2,000	n/A
Tube Diameter [mm]	76	12						20	n/A
Pressure Range [bar]	0.5 – 3	0.01 – 320				0.01 – 10		0.01 – 250	n/A
Process Temperature [ $^{\circ}\text{C}$ ]	0 – 200	-10 – 450				-10 – 130		-10 – 450	n/A
Ambient Temperature [ $^{\circ}\text{C}$ ]	0-40								-10 – 50
Probe Window Material	Quartz	Sapphire							
Probe Housing Material	1.4404 (316L)								
Probe Tube Material	1.4404 (316L)***								n/A
Weight (w/o cable) [kg]	8	4.5				3.2		4.5	3.6
Focus	Manual	Electronic							Manual
Frame Rate [Hz]	15								
Image Resolution [MP]	5								
Power Input [VA]	141 (50-60 Hz)								
Certifications	CE, CIP/SIP, IP65	CE, CIP/SIP, IP65/IP68, ATEX				CE, CIP/SIP, IP65		CE, CIP/SIP, IP65/IP68	CE, IP52, ATEX

\* CS: ChocoScope,  $\mu\text{BS}$ : MicroBubbleScope

\*\* Depending on used camera lens

\*\*\* On request, the following materials are also available: 1.4571 (316Ti), 2.4602 (C22 Hastelloy), 3.7165 (Titanium)

# SOPAT ATEX probes



Product Category	Mesoscopic				Macroscopic	
Product Model	Ma	PI-VI ex	Sc-VI ex	Pa-VI ex	Kr	InView
Measurement Range [μm]	1.5 – 250	2 – 300	9 – 1,100	18 – 2,200	30 – 7,700	50 – 50,000
Field of View (diag.) [mm]	0.58	0.71	2.75	5.2	18	customizable
Tube Length [mm]	320				320	n/A
Tube Diameter [mm]	12				20	n/A
Pressure Range [bar]	0.01 – 320				0.01 – 250	n/A
Process Temperature [°C]	-10 – 450				-10 – 450	n/A
Ambient Temperature [°C]	0-40					-10 – 50
Probe Window Material	Sapphire					
Probe Housing Material	1.4404 (316L)					
Probe Tube Material	1.4404 (316L)					n/A
Weight (w/o cable) [kg]	4.5	37 (including Electronic Junction Box)			4.5	3
Focus	Electronic					Manual
Frame Rate [Hz]	19					15
Image Resolution [MP]	6.1					5
Power Input [VA]	141 (50-60 Hz)					
Additional Equipment	Gönnheimer Overpressure Control Set				Gönnheimer Overpressure Control Set	
ATEX Certification	II 3G Ex pz op pr [op is] IIB T4 Gc; II (2D) [Ex op is IIIC Db]	II 2G Ex db op pr [op is IIB+H2] IIB T4 Gb 0 °C ≤ Ta ≤ +50 °C II (2D) [Ex op is IIIC Db]			II 3G Ex pz op pr [op is] IIB T4 Gc; II (2D) [Ex op is IIIC Db]	II 3D Ex tc IIIB T 100°C Dc

# R & D An Essential Part of Our Company's Philosophy

New approaches are constantly being tested to improve the SOPAT system. We maintain many cooperations with universities and are active in many research projects. In addition, we support the next generation of young scientists.

SOPAT sees itself as a research partner, system supplier and employer for young people and maintains a close relationship with a number of international research institutes. SOPAT is proud to work with the new generation of emerging scientists.



# Globally Active Thanks to a Strong Sales Network



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**sopat**

Make every detail count