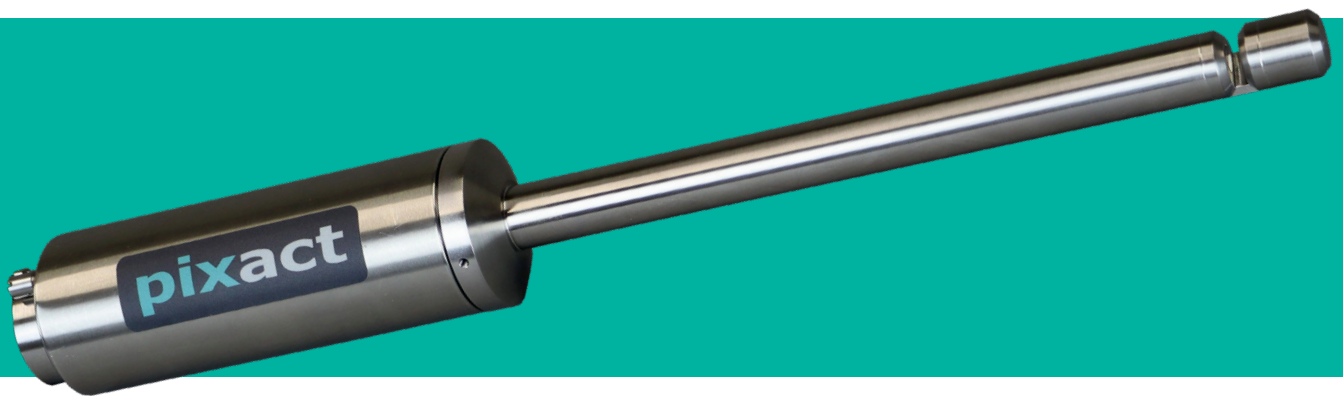




Pixact Crystallization Monitoring

The Pixact Crystallization Monitoring (PCM) technology is designed for the inline analysis and control of batch and continuous crystallization processes. The technology combines inline process microscopy with advanced image analysis techniques.

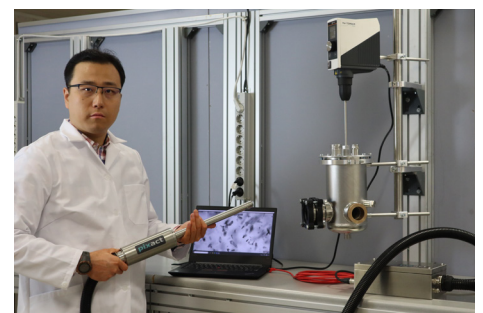
PCM offers high-quality live view and real-time crystal analysis even in high color and concentration crystal suspensions. Measurement data produced by PCM helps you to optimize, control and troubleshoot your crystallization process.



Experiences of plant managers

“We have been able to decrease batchwise variation and reduce the number of out-of-spec batches from a **few to zero**.”

Same equipment from laboratory...



“PCM enables **more accurate control** of metastable state than any other method in our factory.”

“In the six months we have had the Pixact system installed we have **learned as much as in the past decade**.”



... to manufacturing scale

Features

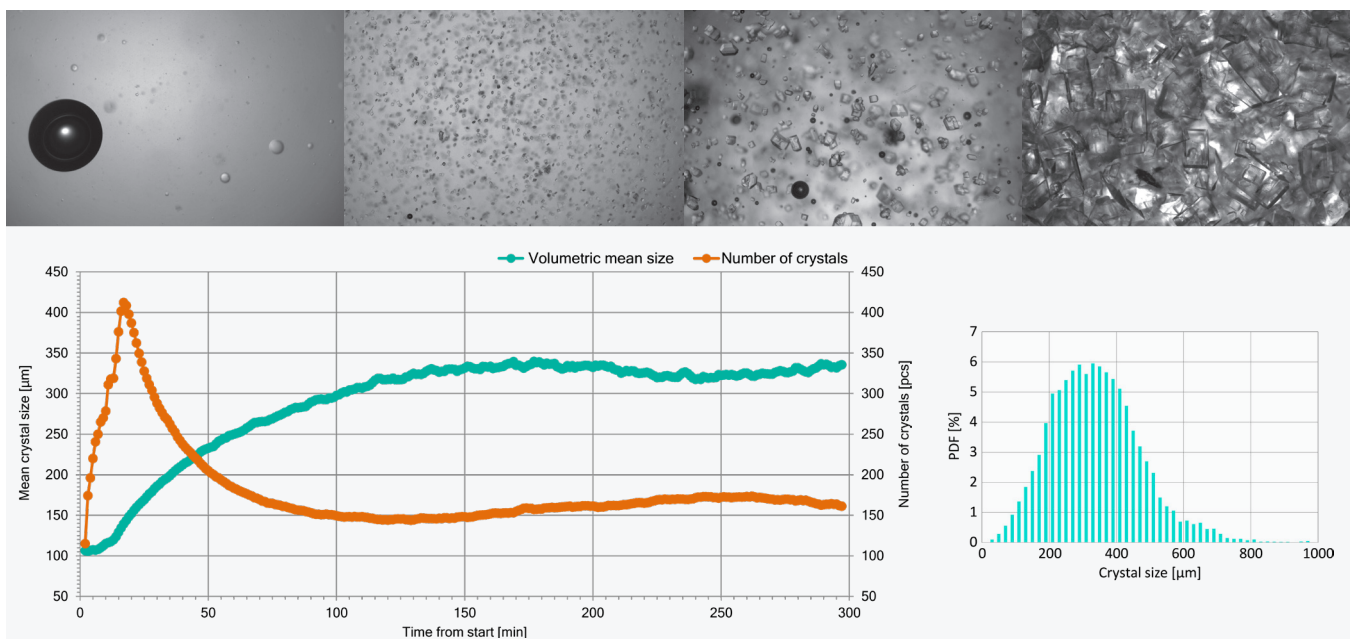
Pixact system provides excellent features to optimize your process:

- **Superior image quality** even in high color and dense crystal suspensions
- **Real-time crystal sizing** from the seeding phase until the end of the batch
- Batchwise report of the measurement results in Excel or csv format
- Transmission of the measurement results to the factory DCS (e.g. mA, Modbus-TCP or OPC-UA)
- **Fully configurable** user interface and data reporting
- Robust imaging unit **without any moving parts**, equipped with automatically operating washing nozzle

Measurement results

PCM provides a live camera view of the process and **detailed measurement data** on crystal characteristics:

- Crystal size distribution and related statistics (mean and standard deviation; number and volume fraction of fines and crystals in user specified bins)
- Crystal growth rate
- Number of crystals and nucleation rate
- Crystal morphology, aspect ratio and surface texture
- Detection of impurities, agglomerates, droplets and bubbles
- Suspension flowability and light transmittance



Benefits

In batch crystallization

Immediate evaluation of seeding phase:

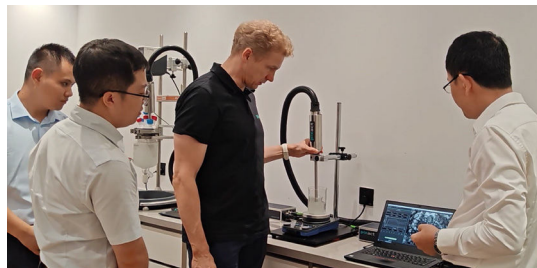
- Optimization of seed crystal quality and dosage
- Improved repeatability

Enabling accurate control of the crystal population in growth phase:

- Real-time monitoring of fines formation enables washing optimization
- Narrow crystal size distribution enhances screening
- Improves crystal quality and purity
- Leads to smaller recirculation rates
- Increases capacity due to shorter boiling time
- Decreases energy consumption

In continuous crystallization

- Real-time detection of variations in the feed quality and other disturbances
- Enables fast and accurate control of the metastable state by monitoring nucleation
- Better control of the crystal size distribution results in better runnability of the centrifuges



Pixact Solution for research and development

The Pixact measurement systems consist of a Pixscope imaging unit and a Pixstation main unit running the Pixact measurement software.



Pixscope imaging unit produces microscope quality image data directly from the process



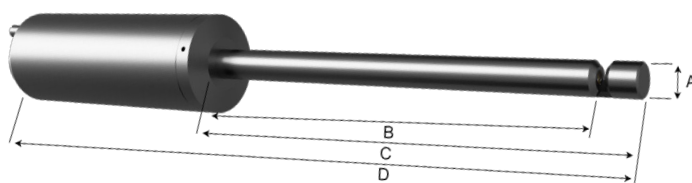
Pixstation LAB main unit houses the main components



Live image from the process & Pixact analysis results displayed on a laptop for mobile use

Pixscope Imaging Unit

Pixscope imaging units produce microscope-quality image data from the process. The smallest versions of the Pixscope product family are designed for laboratory use and they fit to a variety of laboratory equipment, such as reactors and beakers. Combined with Pixstation LAB main unit they are portable and can be used for multi-location work or as a shared device for user groups.

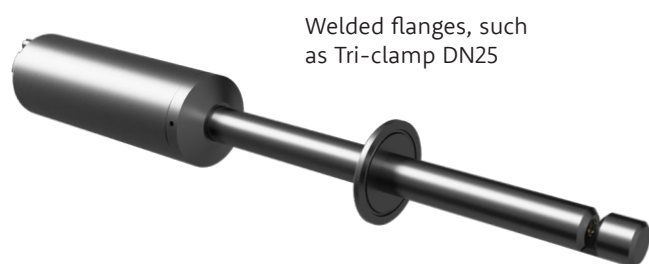


Process & Environment specification	
Process temperature [°C]	Standard: 10-120 Ext. temp : -70-120
Process pressure [Bar]	Standard: 6 Optional: 30
Ambient temperature [°C]	0-45
Laser class	3R
Housing protection	IP65

Pixscope models	14	19	24
A Wet part diameter [mm]	14	19	24
B Wet part length to measurement gap [mm]	252	260	268
C Wet part total [mm]	270	284	295
D Total length [mm]	452	466	480

Pixscope 14/19/24 models can be installed to the reactor through standard and custom inlets.

Mechanical specification	
Measurement gap [mm]	3 or 5
Wet part material	Hastelloy C22
Window material	Sapphire
Sealing material	PTFE, FFKM
Probe weight [kg]	1.4-1.5



Welded flanges, such as Tri-clamp DN25



1" Ingold fitting



DN40p



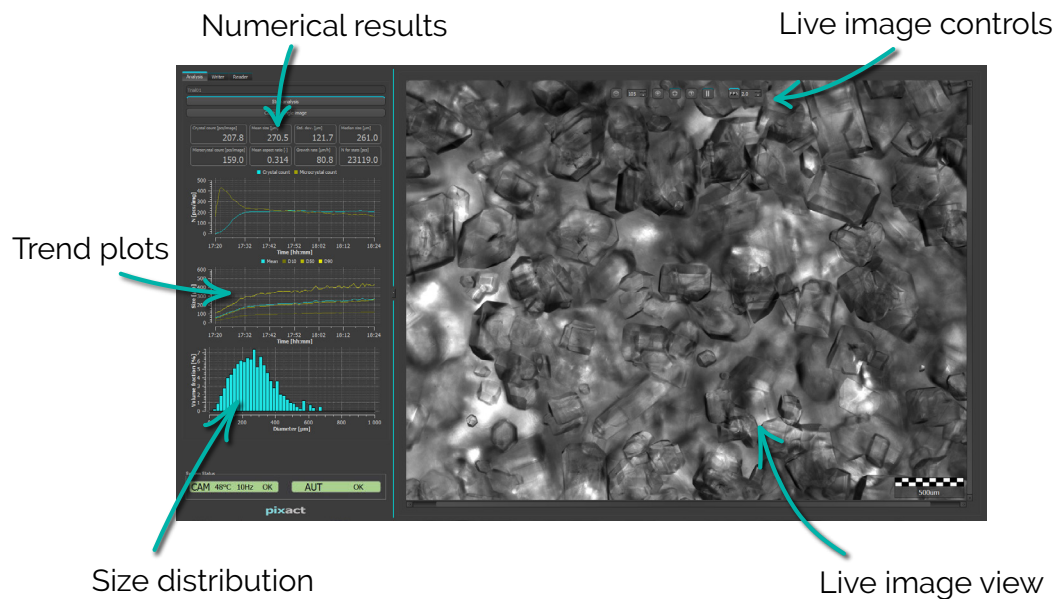
PTFE lining for glass reactors

Optical specification	14	19	24
Image resolution [μm]	1.2	1.7	1.7
Image area [mm]	1.7 x 1.2	3.9 x 3.3	4.2 x 3.5
Measurement range [μm]	3-1000	5-1500	3-2000

Examples of installation accessories available to Pixscope 14/19/24

Pixact Software

Pixact software **controls the entire measurement procedure**, including the hardware, data acquisition, image analysis, and results post processing. Depending on the system specification, the operation varies from a fully automated online measurement to a manually controlled data collection and analysis. Pixact software can be configured from a robust online analysis software to an effective R&D tool, giving access to all required settings.



Key features of Pixact Software

User-friendly adjustment of imaging parameters

- Automatic camera controls to optimize the image quality in varying process conditions
- Adjustable image refresh frequency with zoom and pause features
- Image recording capabilities with time stamps for later inspection or analysis

Powerful analysis algorithms

- High-performance image analysis techniques to produce real-time quantitative measurement information from the image stream
- In-house developed image analysis modules available for several application analyses - customized analysis features on request
- Interface for AI models to detect and classify all kinds of crystals

Flexible reporting tools

- Image data storing to internal or external hard drive
- Internal database for the measurement results
- Export results in the Microsoft Excel®, CSV, or ASCII format
- From systems equipped with an automation interface, results can be transmitted to external data collection using OPC-UA, Profinet or another standard protocol

Connectivity

- From systems equipped with an automation interface, results can be transmitted to external data collection using OPC-UA, Profinet or another standard protocol
- Integration to mixers, heat baths etc.

