pixact

a brighter picture of your process

Are you looking to increase productivity, minimize quality variations or simply gain a better understanding of your process?

To help you achieve this and more, Pixact develops inline measurement technology based on optical imaging and real-time image analysis.

Customer references

"With the information produced during an eight-week campaign in our pilot-facilities, we were able to gain a remarkable increase in the capacity of our production plant."

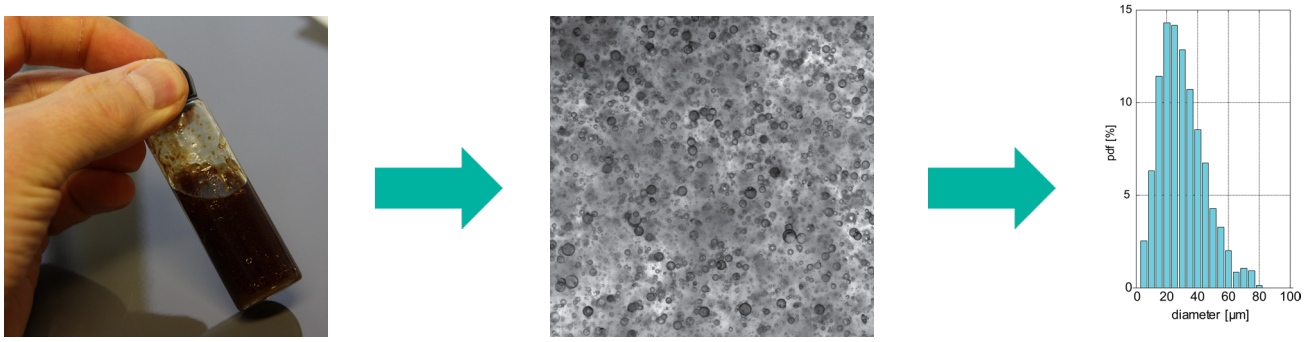
"With the help of the data produced by Pixact we have been able to decrease batchwise variation and reduce the number of out-of-spec batches from a few to zero per week in just six months."

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

Introduction

Pixact delivers inline measurement systems for the real-time diagnostics of industrial process suspensions. Mounted directly on process lines, reactors or tanks, the Pixact technology is able to capture highly detailed measurement data in real process conditions.

Our technology can be applied to suspensions including for example particles, crystals, droplets or bubbles as the dispersed phase. The real-time analysis of the properties of the suspensions is the key to controlling and optimizing the processes.



In addition to the inline measurement solutions, Pixact provides technology evaluation and measurement services. Our services range from short-term troubleshooting tasks to in-depth collaboration in process development. With statistical analysis and data mining techniques our analysis team can study the characteristics of the process and estimate its optimization potential.

We support our customers in the introduction of new inline measurement technology in their processes from the evaluation phase to the roll-out in mill scale.

Our commitment is to build partnerships with our customers.

Company

Pixact started in 2006 as a university spin-off motivated by industrial measurement needs. Our core team comprises of professionals in process technology, optical measurement, image analysis and software solutions.

Our customers include both innovative SMEs and blue chip companies in all the industries served. We have delivered hundreds of measurement systems, trials and campaigns in over 20 countries – and counting.

Key competences

- Unique performance in inline process diagnostics
- Superior image quality even in dense and dark process suspensions
- Advanced image analysis algorithms for real-time data processing
- In-depth knowledge in process technology
- Providing tailor-made solutions

Benefits

With Pixact technology you can increase the yield and capacity of your process and minimize quality variations in the final product.

R&D activities in laboratory and pilot scale

- Understanding fundamental process phenomena and reaction mechanisms
- Acquiring detailed measurement data supporting the development of new formulations, recipes, and processes
- Analysis of manually collected samples
- Using the same tools from the laboratory to pilot-scale streamlines in scale-up work
- Producing detailed measurement data to optimize process parameters and control schemes

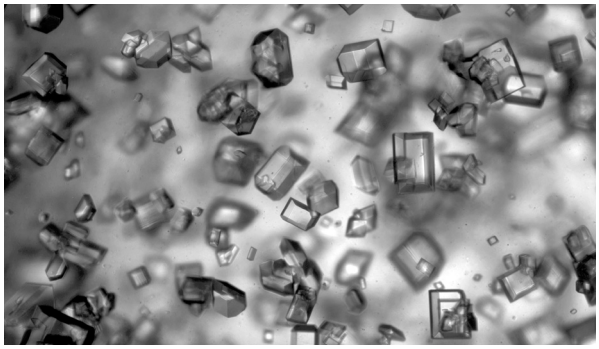
Production and mill scale

- Visual examination of the process suspension with a live camera view
- Providing detailed, real-time measurement data for process control
- Replacing manual sampling and analysis procedures in quality control
- Analysing process variations with online measurements
- Documenting and reporting of the production quality
- Benchmarking recipes, reactors, process lines, sites, etc. to promote Best Practice Methods
- Providing means for troubleshooting
- Collection a production database to help with troubleshooting in case of disturbances

Applications

Our references include applications in the in the chemical and pharmaceutical, food and feed, mineral processing, water treatment, bioprocess, and pulp and paper industries.

Crystals



Crystallization is a separation and purification technique widely used in the process industry.

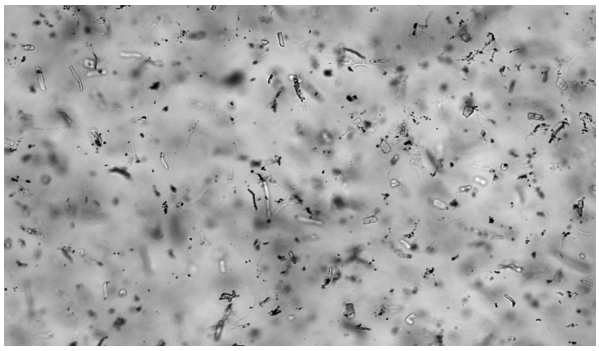
The Pixact technology can be used to:

- Analyze the seeding phase
- Follow and control crystal growth
- Indicate spontaneous nucleation
- Measure the final crystal size distribution

Examples of applications

- Optimization of seeding in boiling crystallization
- Analysis of batchwise variation and benchmarking of individual reactors
- Visualization of crystal morphology in the development of new products

Particles



Particles are inherent in most industrial processes, either as final products or contaminants.

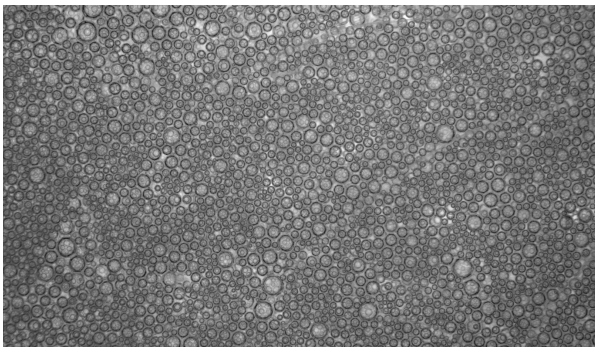
The Pixact technology can be used to:

- Analyze the properties of the particles (size, shape and color)
- Classify particles based on their visual properties

Examples of applications

- Particle diagnostics in quality control to ensure that the product requirements have been met
- Measurement of particle growth rate in granulation, coating and polymerization processes
- Analysis of flocculation efficiency and optimization of flocculant dosage before filtration

Bubbles



Bubble suspensions are commonly used in foam, flotation and mass transfer processes in the chemical industry.

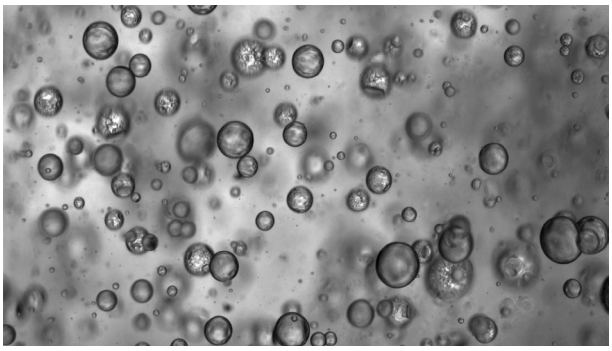
The Pixact technology can be used to:

- Measure bubble size distribution
- Analyze suspension homogeneity
- Optimize gas dispersion (foaming/anti-foaming agent dosage, mixing and gas feed)

Examples of applications

- Optimization of the performance of flotation cells in water treatment and mineral processing
- Controlling foam coating and foam forming processes
- Controlling bubble size distribution in mass transfer processes

Droplets



Droplets are found in sprays, emulsions and other liquid-liquid systems. Sprays are often used in coating processes, and emulsions in chemical synthesis and extraction processes.

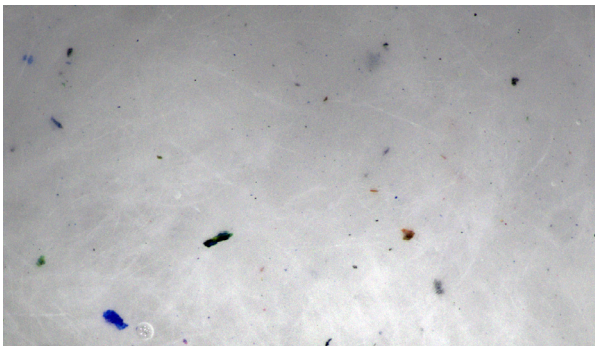
The Pixact technology can be used to:

- Measure droplet size distribution
- Optimize and control process parameters (such as temperature, pressure and mixing energy) and chemical dosages

Examples of applications

- Spray diagnostics
- Analysis of emulsion homogeneity

Stock



Impurities in pulp suspension create both visual defects in the final product and runnability issues in paper machine and printing.

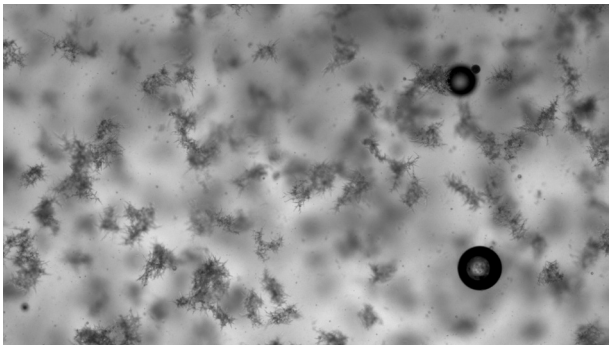
The Pixact technology can be used to:

- Detect impurities from flowing pulp suspension (shives and other uncooked components, bark, soot, silica particles, rubber, resins, precipitated chemicals etc.)
- Measure the color of the pulp

Examples of applications

- Analyse uncooked components in pulp mill starting from brown stock
- Monitoring of the final pulp quality in pulp mill
- Monitoring of pulp quality in stock preparation

Bioprocess



Bioprocesses utilize living cells such as fungi to produce and modify various chemical components such as enzymes and food ingredients.

The Pixact technology can be used to:

- Analyze the size and morphology of cells, such as fungi filaments
- Estimate the homogeneity and structure of the suspension
- Measure bubble size distribution in the reactor

Examples of applications

- Monitoring of the culture growth phase
- Detect anomalies in the culture such as agglomeration
- Early warning of potential contamination
- Analysis of downstream operations

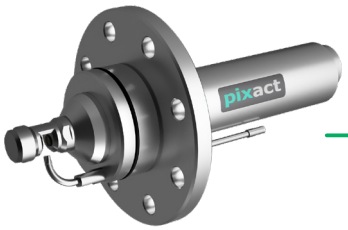
Technology

Pixact technology is based on direct optical imaging.

Pixact measurement systems are based on the direct optical imaging of process suspensions in pipelines, reactors, and tanks. The image acquisition is followed by image analysis with proprietary algorithms to detect dispersed phase elements, such as particles, bubbles and crystals. As a result, detailed statistics for these elements, including size, shape, velocity, and color are obtained.

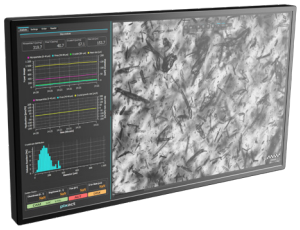
Pixact Solution

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 ONLINE main unit houses the main components



Live image from the process & Pixact analysis results displayed in the oprator station located in the control room etc.

Application-specific analysis modules can be combined with any type of imaging unit.

Imaging units
Pixscope probe
Pixcell flow-through cuvette

Main units
Pixstation LAB
Pixstation ONLINE

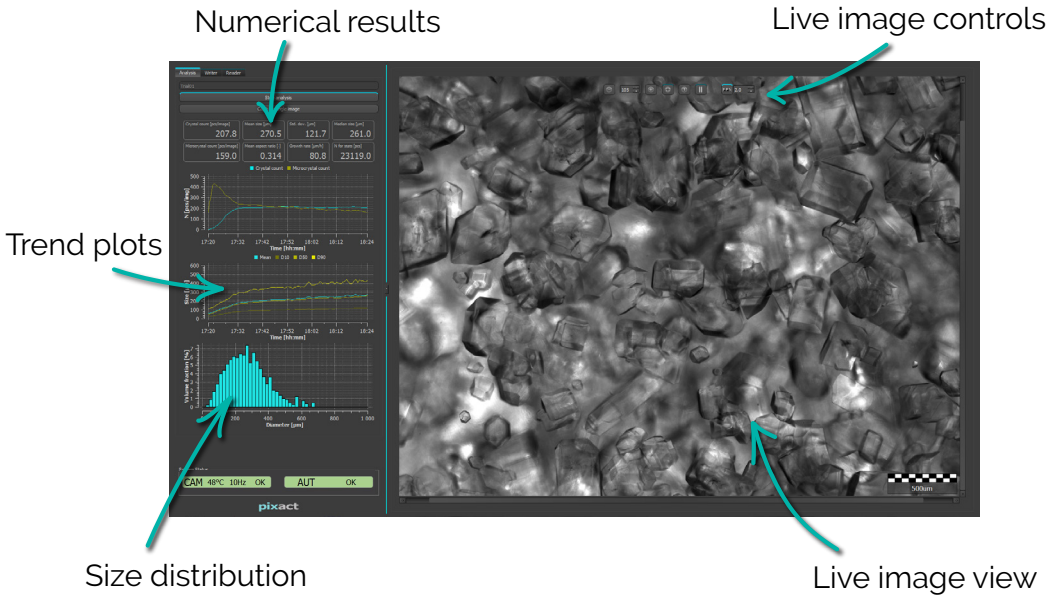
Features

Pixact measurement systems provide a multitude of beneficial features that help you control and 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, Profinet, 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

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

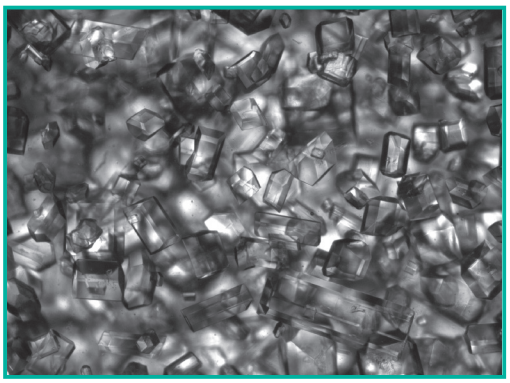
- Automatic camera controls to optimize the image quality in varying process conditions
- Adjustable image refresh frequency with zoom and pause features
- Image recording capabilities with time stamps for later inspection or analysis

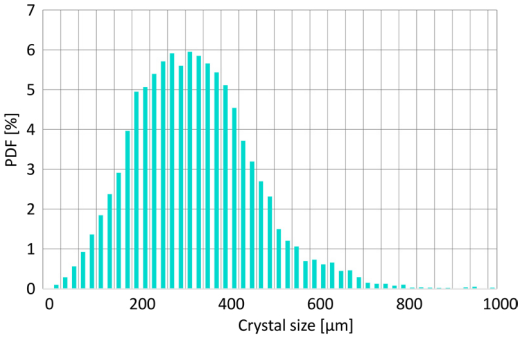
Powerful analysis algorithms

- 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

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





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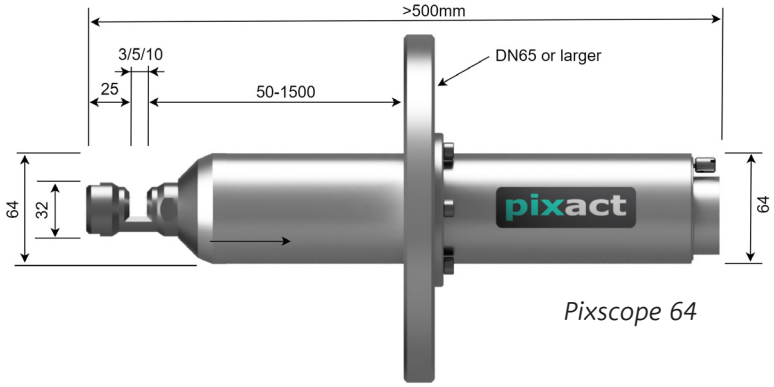
Pixscope Imaging Units for Industrial Use

The imaging unit flange type and probe wet length are **customizable**, allowing installation for a variety of industrial process equipment. Below are presented some typical installation options, but the designs are fully customizable. The imaging unit can also be equipped with a **washing nozzle** to flush the measurement gap when needed.

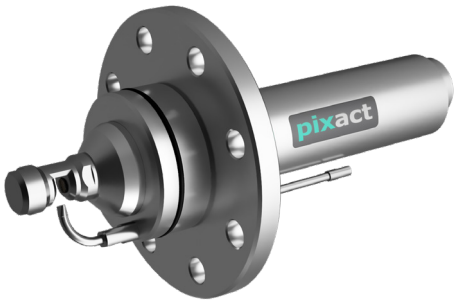


Pixscope 64

Installation

Preferred **installation location** for the *Pixscope* imaging unit is a flange on the reactor or tank side wall. Longer version of *Pixscope* can be built to install on a flange on top of the reactor.

The imaging unit can also be equipped with a washing nozzle to flush the measurement gap when needed.



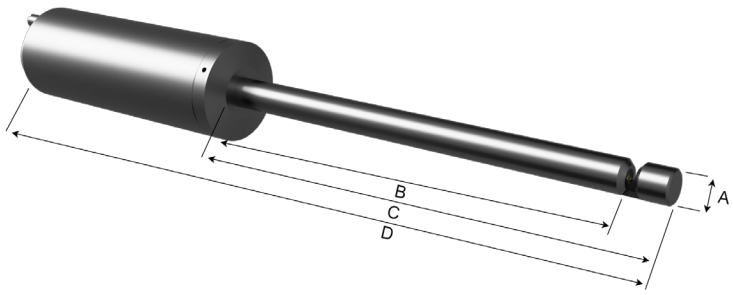
Mechanical specification	
Wet part diameter [mm]	64
Wet part length to measurement gap [mm]	Pixscope 64-S: 50-150 Pixscope 64-L: 150-1500
Measurement gap [mm]	3, 5 or 10
Wet part material	AISI316L/1.4401 AISI904L/1.4539 Super duplex/1.4410 Hastelloy C22
Window material	Sapphire
Sealing material	Standard: EPDM, FFKM, PTFE Ext. temp: PTFE
Probe weight [kg]	3-8

Process & Environment specification	
Process temperature [°C]	Standard: 10-85 / 120 short term Ext temp: -70-120
Process pressure [Bar]	Standard: 6 Optional: 30
Ambient temperature [°C]	0-45
Housing protection	IP65

Optical specification	
Image resolution [µm]	M10: 3.5 M20: 1.7
Image area [mm]	M10: 8.4 x 7.1 M20: 4.2 x 3.5
Mesurement range [µm]	M10: 4-4000 M20: 2-2000

Pixscope Imaging Units for Laboratory Use

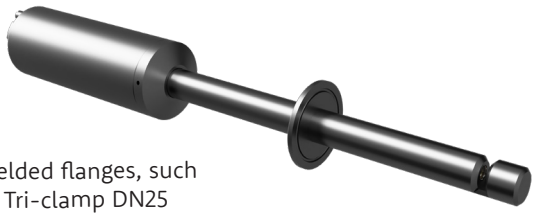
Pixscope imaging units produce microscope-quality image data from the process. The smallest versions of the Pixscope product family are designed for laboratory use and they fit to a variety of laboratory equipment, such as reactors and beakers. Combined with Pixstation LAB main unit they are portable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



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

Installation

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



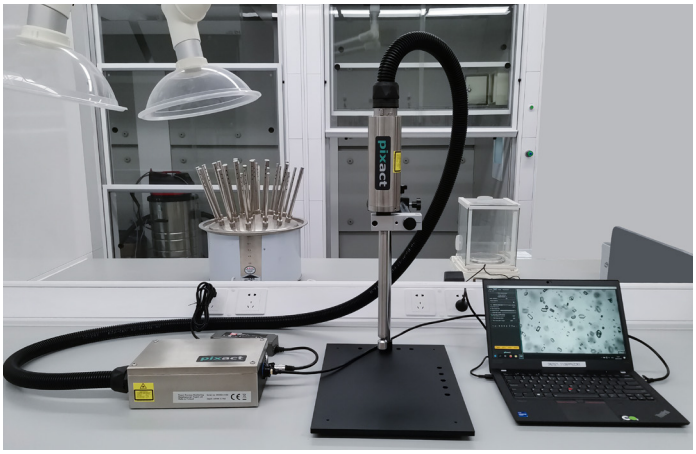
Welded flanges, such as Tri-clamp DN25

1" Ingold fitting

DN40p

PTFE lining for glass reactors

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



Mechanical specification	
Measurement gap [mm]	3 or 5
Wet part material	AISI316L/1.4404 Hastelloy C22
Window material	Sapphire
Sealing material	PTFE
Probe weight [kg]	1.4-1.5

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

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

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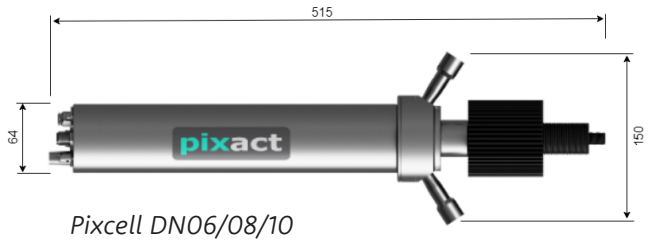
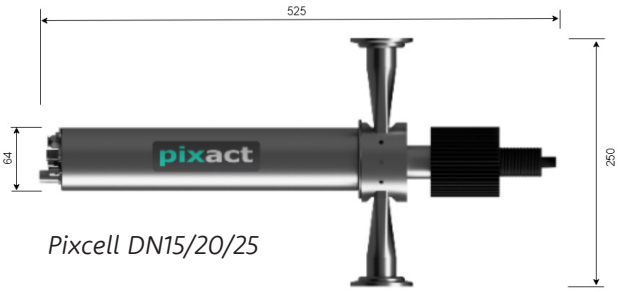
Pixcell Imaging Units

Pixcell imaging units produce microscope quality image data from the process. The imaging unit is essentially a flow-through section in the sampling line in which images of the process suspension are captured. Flow-through sections with various inlet sizes, optical paths and fittings are available



Pixcell DN06/08/10



Pixcell DN15/20/25

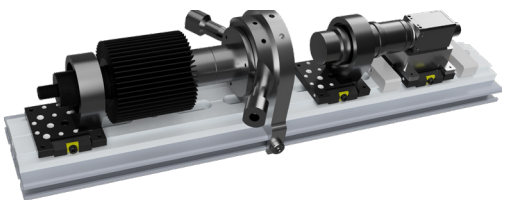
Installation

The Pixcell imaging units can be installed directly on process lines as inline installation or dedicated sampling lines as bypass installation. Pixcell concept is also available as a benchtop version for laboratory use and integration to field cabinets and cases.

The imaging unit can also be equipped with a washing nozzle or back-flush system to clean the measurement gap when needed.

Inline installation to a process line

Installation to sampling / by-pass line



Bench-top installation for laboratory use

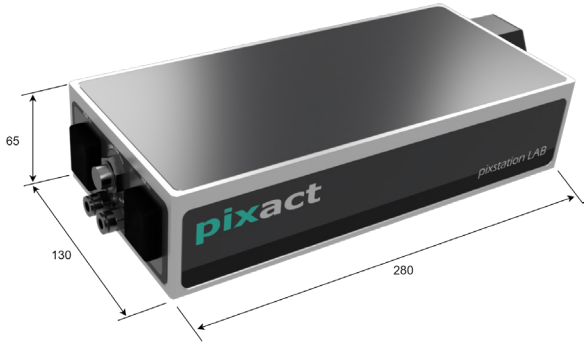
Mechanical specification	
Nominal i.d., std optical path, flange or thread size	DN06: 6mm, 1mm, 1/8" or Tri-c 1/2" DN08: 8mm, 2mm, 1/4" or Tri-c 1/2" DN10: 10mm, 3mm, 3/8" or Tri-c 1/2" DN15: 15mm, 5mm, DN15 or Tri-c 2" DN20: 20mm, 8mm, DN20 or Tri-c 2" DN25: 25mm, 10mm, DN25 or Tri-c 2" DN50: 50mm, 48mm, DN50
Wet part material	AISI316L/1.4404 , AISI904L/1.4539* Super duplex/1.4410*, Hastelloy C22*
Window material	Borosilicate, Sapphire
Sealing material	Std temp: EPDM, FFKM, PTFE Ext. temp: PTFE
Imaging unit weight [kg]	DN06/08/10: 2-3 DN15/20/25: 3-4 DN50: 9

Process & Environment specification	
Process temperature [°C]	Std: 10-85 / 120 short term Ext. temp: -70-120
Process pressure [Bar]	Standard: 6 Optional: 30
Ambient temperature [°C]	0-45
Housing protection	IP65

Optical specification	
Image resolution [µm]	M05*: 6.9 M10: 3.5 M20: 1.7
Image area [mm]	M05*: 16.9 x 14.1 M10: 8.4 x 7.1 M20: 4.2 x 3.5
Mesurement range [µm]	M05*: 8-8000 M10: 4-4000 M20: 2-2000

Pixstation LAB Main Unit

Pixstation LAB is a portable main unit to the Pixact measurement system. It is designed for R&D use in laboratories and pilot facilities where the measurement location may change frequently. Portability also allows the system to be shared between user groups and even different locations.



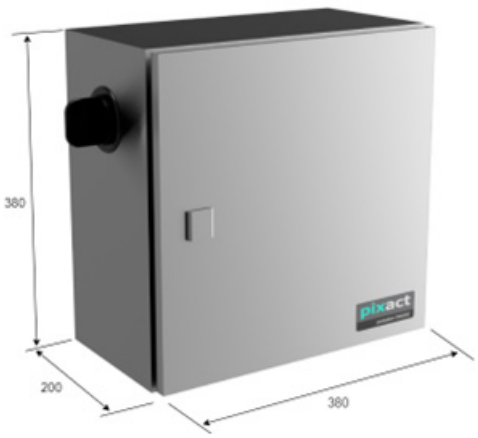
Connections	
Power supply / PWR	100-240 VAC, 3.0A, 50/60 Hz
Camera connection / CAM COM	M12
USB connection / USB	USB 2.0 A
Air purge / AIR IN	6mm pneumatic hose, p_{max}= 0.1 Bar
N2 purge / N2 IN (optional)	6mm pneumatic hose, p_{max}= 0.1 Bar
Thermocouple / TC (optional)	Type-K
Air or N2 purge out / AIR OUT	¼" thread for muffler or pipe fitting

Through a flexible communication interface, signals from thermocouples and pressure sensors can be logged in the Pixact system. The system is also able to control selected stirrers and poultices enabling real-time automated process control and optimization based on measurement data of particle size, morphology and concentration.

Environment	
Ambient temperature [°C]	0-45
Housing protection	IP65 (w/o TC connector)

Pixstation ONLINE Main Unit

Pixstation ONLINE is the Pixact main unit for industrial online use. It houses the measurement computer, automation gateway, power supply and all connection terminals to external systems. The cabinet can be equipped with a local or a remote display to view the Pixact software user interface. Thanks to IP65 level protection, the cabinet can be installed directly on the field next to the imaging unit.



Connections	
Power supply / PWR	100-240 VAC, 3.0A, 50/60 Hz
Automation interface / AUT	According to customer spec: OPC-UA, Profinet, Profibus, Modbus-TCP, mA etc.
Internet connection / NET	RJ45 for LAN or optional 4G modem
Service connection / SRV	Local VNC for service laptop
Cooling air / AIR IN	6mm pneumatic hose p_{max}= 0.1 Bar. Optional vortex cooler, p=1-4 Bar

Materials & Environment	
Cabinet material	AISI304/1.4301
Ambient temperature [°C]	0-45
Housing protection	IP65

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