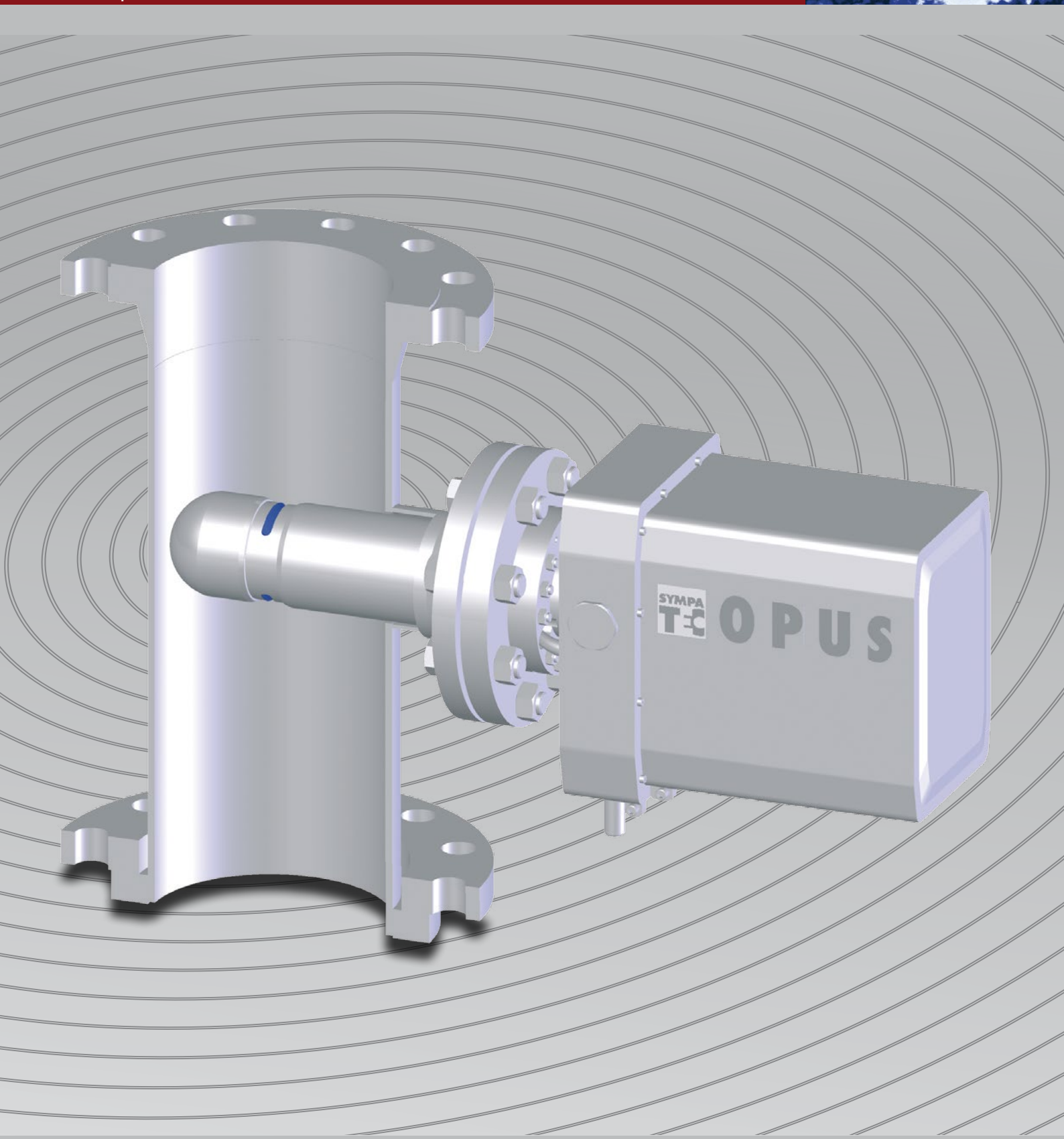
OPUS | Ultrasonic Extinction

Particle Measurement | Process | Wet

Size and Concentration | < 0.1 µm to 3,000 µm

Technical Specifications



Sympatec develops, manufactures, sells, services and supports a range of best instruments for particle size and shape analysis in laboratory and process applications to customers worldwide. With continuous innovations Sympatec makes a prominent contribution to ❱ laser diffraction, ❱ image analysis, ❱ ultrasonic extinction and ❱ photon cross-correlation spectroscopy.

Technical Specifications

Ultrasonic Extinction Sensor for Particle and Droplet Size Analysis

Technology | Adapters | Materials | Evaluation | Quality

Sensor		
Label	OPUS	
Overall measuring range	< 0.1 - 3,000 µm	
Concentration	< 1 - 70 % by volume[1]	

Measuring principle		
Ultrasonic extinction	Discrete digital frequency sweep	
	- classic sound absorption spectroscopy at constant path length (ISO 20998-1:2006)	
	- probe design with flow-through measuring zone	

Sound source		
Piezo element	Frequency range	100 kHz ... 200 MHz
	precise receiver alignment by micro hydraulics	
	Power output	P_{out} < 0.25 mW
Field of sound	Diameter	30 mm
	Path length (software controlled)	1 - 10 mm

Sample feeding and process coupling[2]		
For installation	Flow-through	Analysed sample volume
in pipes[3]		
FT | flow-through adapter	up to 2,000 l/h	10 - 1,000 l/h
DN10 to DN25		
BP | bypass adapter	up to 10,000 l/h	10 - 1,000 l/h
DN50 to DN200		
AF | flange adapter	> 10,000 l/h	10 - 1,000 l/h
≥ DN200 (customer specific)		
in vessels[3]		
AF | flange adapter		10 - 1,000 l/h
Flanges DN100, DN150, DN200		
at up to 4 production lines		
FT | Multiplexer	> 20,000 l/h (4 x 5,000 l/h)	max. 1,000 l/h
	(min. 2,000 l/h for continuous operation per line)	

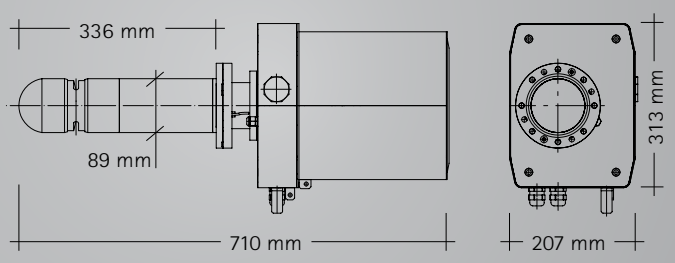
Material in contact with media	
Acoustic window	SIGRADUR® (glassy carbon)
Measuring zone	Stainless steel type 1.4571
and body	Stainless steel type 1.4539[4] or
	Hastelloy®-C22 type 2.4602[4]
Gaskets	PTFE (TEFLON®)
	FFKM (KALREZ®)
Adapters	Stainless steel type 1.4571
	Stainless steel type 1.4539[4] or
	Hastelloy®-C22 type 2.4602[4]

Detector and data acquisition		
Data logging	Dynamic range	160 dB
	Accuracy	0.1 dB
	Frequency resolution	31 sampling points
	duration	2 - 3 sec/frequency
Analysis time (typical)	60 ... 120 s	

Evaluation modes	
Extinction function	Calculation of a particle size distribution based on a
KSIGMA	semi-empirical approach of product specific sound
	absorption for long-wave regime (viscous losses)
	and short-wave regime (scattering)
	Library containing extinction functions for more
	than 900 products
Theoretical	Calculation model based on viscous losses for solid
evaluation	particles < 10 µm (long-wave regime)
Emulsion model	Calculation model for non-soluble liquid droplets
	in continuous liquid phases based on absorption
	coefficients, densities, and speed-of-sound of both
	phases

Quality of measuring results		
Repeatability[5]	σ < 0.5 %	typical (repeated measuring)
	σ < 1.0 %	typical (riffled sample)
Comparability[6]	σ < 5 %	mean relative standard deviation (x_{10}|x_{50}|x_{90})

Quality assurance system	
Certification	Standardised test procedure
Reference material	SiC-P600 (x_{50} = 27 µm)
Validation	compliant to FDA regulations



Dimension sheet

1) Stated concentration ranges are application dependent. 2) Stated ranges are application dependent. 3) Pressure rating PN40. 4) optional 5) The given values are valid for measurements with reference material SiC-P600 related to the x_{50}-value. 6) System-to-system reproducibility.

in Suspensions and Emulsions of High Concentration

Software | Operational Conditions | Specifications

Software	
PAQXOS	PC or remote control of application in terms of sensor and peripherals
Control and evaluation software for particle size analysis	Communication interface for process control system and its peripherals (e.g., valves, pumps)
	Evaluation
	- Calculation of a particle size distributions based on KSIGMA
	- theoretical evaluation
	- emulsion model
	- mean values and standard deviations
	Presentation of results based on user-defined reports and templates
	- diagrams (distribution curves, trend graphs)
	- tables
	- characteristic values
	Step-by-step wizard for quick and successful measurements
	Intuitive SOP management
	User-friendly, individual user interface
KSIGMA[7]	Calculation of material-specific extinction functions based on measured ultrasonic attenuation data and reference particle size distributions

Operational conditions	
Acid/Base resistance	pH-value 1 to 14
Mechanical durability	Enduring even in abrasive product streams
Pressure resistance	up to 40 bar (580 psi)
Temperature range	-20° to 120°C (-4° to 248°F)
Protection classes	IP65
	Explosive Atmospheres[7]
	Pressurisation unit according to ATEX
	Classification Ex II 2G EEx p II T5

System specifications	Dimensions L / W / H[8] (mm)	Weight (kg)
OPUS	710/207/313	31
OPUS EX (ATEX)	710/336/394	36
FT adapter (FT10 - FT25)	90-115/120/300	5.1 -6.3
BP adapter (BP50)	165/165/300	10.1
AF adapter (AF100)	235/235/24	6.4

Supply voltage	90 - 250 V AC @ 50-60 Hz
Consumption	17 W (standard) | 36 W (ATEX) in operation
Peak power consumption	42 W short-term

Compliance	
ISO 20998-1	The ISO standard requirements concerning "Measurement and characterization of particles by acoustic methods – Part 1: Concepts and procedures in ultrasonic attenuation spectroscopy" are met.
FDA 21 CFR Part 11	The compliance to FDA rule standards concerning electronic records and electronic signatures is provided.

Computer specifications	
Operating system[9]	Microsoft® Windows® 10 Professional (64 Bit)
Hardware specifications[10]	Up-to-date desktop PC, e.g., Intel® Core™ i7-8700, min. 3.2 GHz, 8 GB RAM, 12 MB Cache, SSD PCIe 512 GB, Intel® HD Graphics 630, DVD±RW
Display	27" Full HD (2.560 x 1.440 px)
Interfaces	Ethernet LAN connection (100 MBit/s), min. CAT5
Connectivity to distributed control system	Modbus® RTU, Modbus® TCP, Profibus®, OPC, TCP/IP, FTP, analogue SPS signals, MQTT

OPUS/AF side view

OPUS/BP with optional rack

OPUS/FT with Stand-by- Rack

OPUS/FT with Multiplexer

7) optional 8) Overall dimensions including sensor and probe. Probe length L=336 mm, probe diameter Ø=89 mm.
9) Microsoft® Windows® 7 Professional (64 Bit) also supported.
10) Sympatec reserves the right to supply equivalent or better specified personal computers.

Particle Measurement and Know-how from Pulverhaus

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At Particle Professionals Worldwide

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