

Inline particle sizing for process control

IPP 70-S - Rugged Industrial Solution

The new Parsum Particle Probe IPP 70-S/Se uses the established technique of Spatial Filter Velocimetry to make size and velocity measurements of gravity-fed, pneumatically flowing or fluidized particles from 50-6000 µm, directly in the process line. The Parsum

Probes are small compact and robust. IP65 dust-proof and waterproof, and with an intrinsically safe option, the IPP 70-Se, available, it is suitable for any industrial environment - and is already proven in a

wide range of processing applications. Weighing just 1.5 kg, the probe is easily installed directly in the process line, eliminating the need for sampling. The IPP can be integrated into new or existing process facilities to provide real-time analysis for full feedback control. A range of accessories extends its use into high concentration and fluidized bed applications.



Cost-benefit ratio

Continuous monitoring of particle-size distribution increases process transparency, shortens response times in the event of process disturbances, makes continuous quality control possible, precludes charging errors, makes new automated solutions possible, avoids the need to spend time

and money on taking and transporting samples and laboratory analysis. IPP probes secure your product quality and, by saving on resources, lower your production costs.

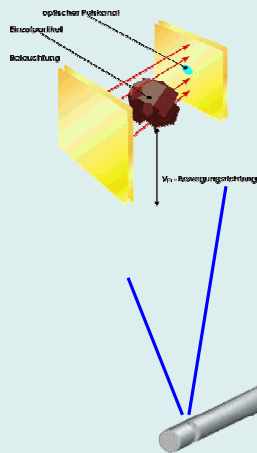
Inline particle-size measurement with IPP probes enables production processes to be monitored continuously. The output signals are available to the process management system online. Any deviation from set product specifications is detected immediately. This ensures the maintenance of consistently high product quality with production costs minimised. Manual sampling and laboratory analysis require by comparison much more time. The cost savings are produced not only by the saving on time for laboratory analysis but also by direct prevention of batching errors, remedial work, recycling volumes and the benefits of optimised process control.





Measurement Principle Spatial Filter Velocimetry

The Parsum Probes use the technique of Spatial Filter Velocimetry to measure particles. The sensor works on a fiber optic patented measurement principle and simultaneously measures the size and velocity of individual particles. Statistical techniques associated with the technique allow calculation of chord length distributions.

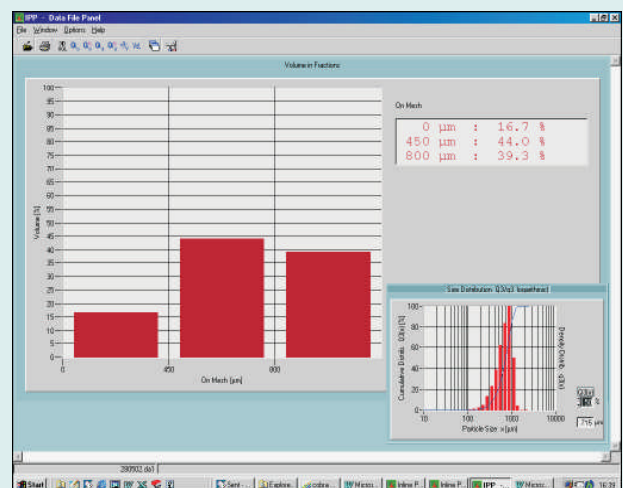


It requires no process calibration, allows constant measurement with no time gaps in the data. Using Spatial Filter Velocimetry, size and velocity can be extracted from particles as they pass through a laser beam and cast shadows on to a linear array of optical fibers. A signal is generated due to the particle crossing fiber bundles. The frequency of this signal is measured by photodetectors and is proportional to the particle velocity. Knowing the spatial filter constant, the velocity can be calculated. As the particle passes through the beam, a secondary "pulse" signal is generated by a single optical fiber. Knowing the time of the pulse signal, and the velocity v of the moving particle, the chord length of the particle can be calculated.

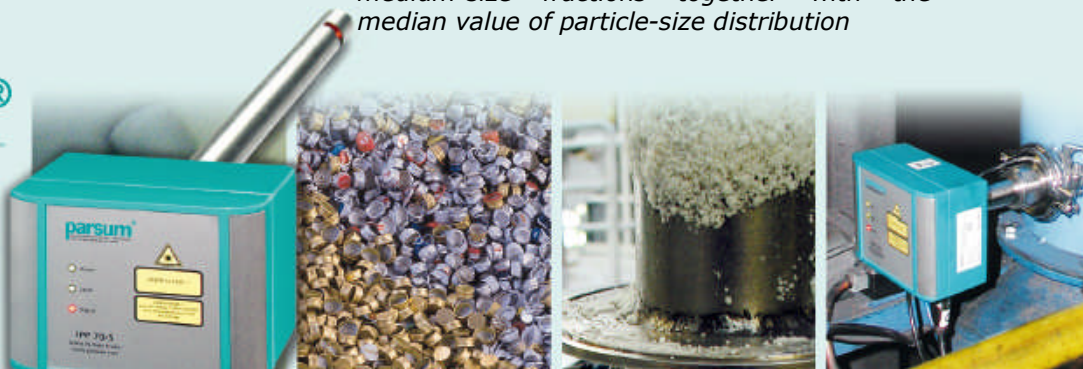
By accumulating results from individual particles (typically 10,000-500,000 particles over a period of 1-180 seconds), the chord length and velocity distributions are calculated. Parameters derived from the chord length distribution e. g. x_{10} , x_{50} and x_{90} , can be correlated against other particle size analyzer results.

Process interface

To make the IPP probes serviceable even under complicated process conditions (e.g. particle materials which are damp, sticky, abrasive or contain fine dust) a system of accessories has been developed which can be used with all probes designated "-S" and "-Se". By feeding compressed air to the sensing volume, the optical windows are kept clear using different purge cells. Additional equipment for dispersing particle flow enables the measurement process to be adapted to different conditions at the measuring point.



Customisable On-screen display of over-, under- and medium-size fractions and of particle-size distribution. Time history of over-, under- and medium-size fractions together with the median value of particle-size distribution



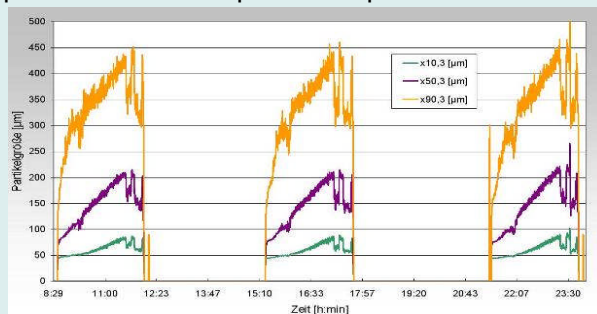
Monitoring of batch processes

In transient processes such as batch fluidised bed granulation the conventional methods of particle-size determination often come up against their limits, since laboratory analyses are sometimes to hand only after process end.



IPP70-S during a batch granulation process

However, real-time measurement of particle-size distributions enables even these batch processes to be modelled in such a way that growth can be captured continuously and the data is available in time to be utilised for optimum process control. The operator thus has available to him while the process is running not just copious process data but product-specific data too.



X_{10} , X_{50} , X_{90} of 3 granulation batches

The costs of manual intervention, batching errors and remedial work can in many cases be considerably reduced. Optimised process control enables process time to be shortened. The costs of manual intervention, batching errors and remedial work can in many cases be considerably reduced.

Direct measurement in the Fluidised Bed

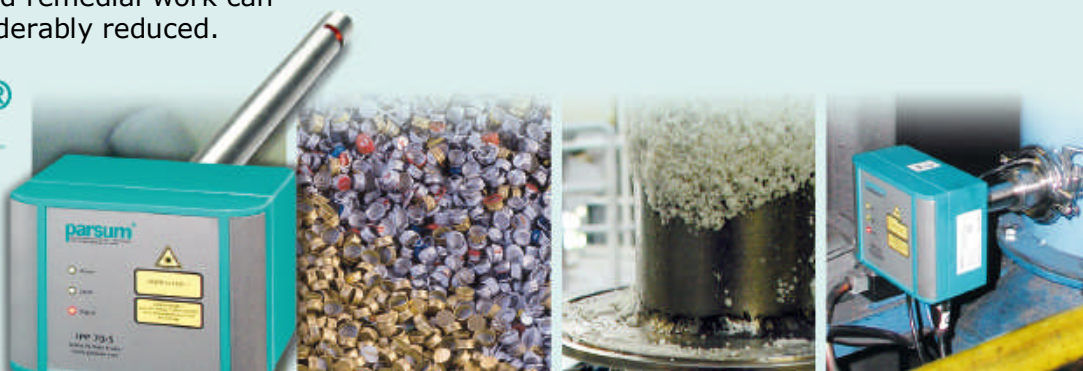
Direct measurement in the fluidised bed makes it possible in the event of deviation from the set particle size to take actions such as changing spray pressure and spray volume, adjusting airflow or altering the process temperature automatically. The means thus exist for implementing automated processes by incorporating particle-size measurement in new process-control schemes and/or assistance systems to help the plant operator.

Measurement in the High-Shear Mixing Process

The long probe IPP 70-SL allows the installation in large scaled process vessels like high-shear mixer.

IPP 70-SL installed in a high shear mixer

X_{10} , X_{50} , X_{90} of a High-Shear Mixing Process





Long Probe IPP 70-SL

Just like the smaller IPP 70-S standard models, the IPP 70-SL provides the complete particle size distribution within a range from 50 μm through 6,000 μm in real time. In large mixers, granulators or fluidized bed systems, measurements can be made in various representative spots. For very deep process vessels, this means the measurement does not have to be made near the surface or wall any more. The design principle of the probe facilitates its design in various lengths, tailored to the intended application. The range of length is from 40 cm to approximately 4 m.



IPP 70-SL

System Configuration

A complete measurement system comprises one IPP 70 probe and an measurement computer at process level. The measurement system works continuously, without user intervention. Up to 4 individual IPP probes may be connected to a measurement computer simultaneously. Several measuring points far removed from one be linked at a central control-room computer via Ethernet (TCP/IP) by web-server technology, OPC protocol or 4...20 mA interfaces. The interfaces are freely settable to characteristic particle properties x_{10} , x_{50} , x_{90} ...

Pharma-Options

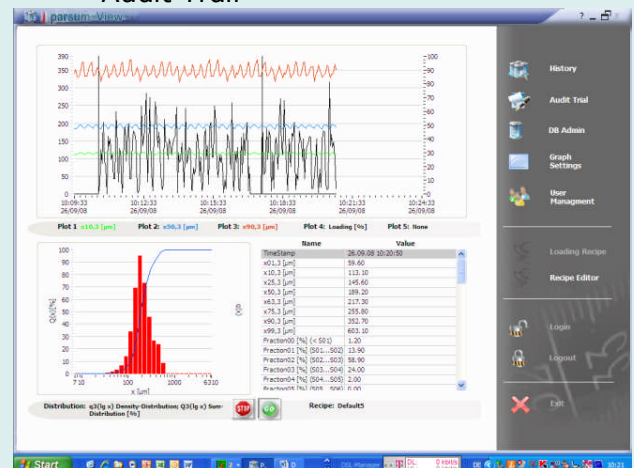
The IPP 70-S, -Se, -SL are available with options to support their use in the pharmaceutical industry.

Pharma-Option 1: „Verification Kit“
a test device that allows operators to check the basic function of the probe to ensure that installation performance can be maintained. The software/hardware interface makes it possible to perform a one-click calibration of the whole measurement system that can be stored. (With instruction guide for OQ/IQ).

Pharma-Option 2: „Material Traceability“
All the documents necessary to ensure the material traceability of all contact components. For each 316L contact part a 3.1 certificate is supplied. Polished surfaces for the probe's contact areas ($R_a < 0.5$) to aid cleaning/sterilization.

Pharma-Option 3: „ParsumView“
Parsum View is a new designed user interface for the measurement software, which helps to fulfill the GMP-requirements of pharmaceutical production. The most important features are:

- It works in a network (Ethernet) or stand-alone
- Detailed user access control with flexible user levels
- User and Password Management
- Safe storing of measurement values and settings in SQL-database
- Audit-Trail

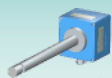


Screenshot ParsumView

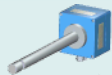




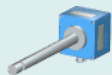
Parsum IPP 70 - The standard unit



for all types of Granulate materials,



for all Fluid Bed Processes



for Mixing, Milling, Grinding and a lot more

Main Features in brief:

- Real-time sensor
- Measures particles with average size 50 - 6000 µm and velocity up to 50 m/s
- Easily installed directly into gravity-fed, fluidized bed or pneumatic lines
- Automatic feedback to central control room or computer by 4...20 mA Interface and by Web-Server technology over Ethernet (TCP/IP) or by OPC-Server
- Minimal installation effort
- No alignment required, no field calibration needed
- Strong stainless steel construction
- Window cleaning eliminated
- operation of Spatial Filter Velocimetry
- Pharma Options available

Technical Data:

Materials	316L SS for In-line probe, Sapphire, epoxy resin optics Pressure-cast aluminium for electronics enclosure
Data rate:	Up to 20,000 particles per second, dependent on process conditions
Max Operating Pressure	4 bar
Operating Temp	-20°C to 100°C at measuring point, -10°C to 60°C on housing
Dimensions	Tube length = 280 mm (11 in), diameter = 25 mm (1 in) for IPP 70-S and -Se Tube length = 0,4 ...4 m, diameter = 50 mm (2 in) for IPP 70-SL
Air Supply	adjustable air flow meters, Pulse flow with adjustable timer or continuous air, Flow Requires instrument grade compressed air
Maximum cable length:	100 m

ATEX-Certification for IPP 70-Se

EC-Type Examination Certificate:

IBExU02ATEX1009

Labeling of the Probe IPP 70-Se:



II 1/2 G Ex ib op is IIB T4



II 1/2 D Ex tD A20/A21 IP65 T 80°C

Labeling of feeding device:



II (2) GD [Ex ib] IIB

(according to EN60079-0, EN60079-11, EN60079-26,
EN60079-28, EN61241-0, EN61241-1)

Sales Contact:

Germany, Austria and Switzerland:

Parsum GmbH, Germany
www.parsum.de info@parsum.de

All other countries:

Malvern Instruments Worldwide
Sales and service centers in over 50 countries. For details visit www.malvern.com/contact

