Benefits

- Maximize throughput and availability
- Optimize recovery
- Effective use of energy and reagents
- Minimize dewatering costs
- Optimal product quality

Advanced on-line slurry particle size analyzer
- Essential view to process operation

Grinding circuit reduces particle size to a desired distribution. It is important to measure the grinding product particle size for grinding circuit monitoring and control. On-line particle size measurement is the industry practice today.

PSI® 500i provides real-time particle size information, which can significantly improve operations. Particle size based monitoring and controlling improves average grinding circuit capacity and availability while maintaining the target grind. Additionally, grinding control improves downstream process performance by minimizing reagent consumption, increasing recoveries and making thickening and filtration more effective. Correct Fe concentrate particle size distribution is essential for good quality pellet production.
Outotec PSI 500i features

Particle size control

PSI 500i Particle Size Analyzer provides real-time and accurate particle size distribution measurements. The analyzer is not sensitive to entrained air in the sample, therefore PSI 500i can also be used in regrind circuits.

PSI 500i is used in:
- Monitoring grinding circuit products with wide or bimodal distributions
- Monitoring regrind circuits
- Grinding control for Fe and FeCr pellet production can provide specific surface area measurements (Blaine)
- Controlling thickeners for optimal water recovery
- Monitoring mine backfill and tailings disposal
- Monitoring feed to slurry pipeline
- Product quality measurement for industrial minerals

Laser diffraction particle size measurement

Laser diffraction gives a consistent volumetric particle size analysis result without any external calibration, which is a significant advantage. There is a small difference to the particle size analysis measured by other methods, such as sieve analysis. However, the repeatability and precision over a wide particle size range are the most important features in process control applications.

Furthermore, the speed, non-contact nature and robustness of the method against ambient conditions make laser diffraction fit for on-line mineral slurry applications. If plant operating practice requires, laser diffraction volumetric distribution measurement results can be correlated to a reference method, for example sieve and sedigraph.

The optical measuring head is designed and manufactured by Malvern Instruments in cooperation with Outotec. It is based on the proven industry standard laser diffraction particle sizing technology, which is routinely used in most laboratories.

Laser diffraction advantages:
- Direct size measurement based on first principles of physics, robust calibration.
- Measurement is not affected by air bubbles in the primary sample, flaky particles, sample temperature or sample viscosity
- Can measure specific surface area (Blaine)

Laser diffraction, has been known as a laboratory particle size measurement technique since the 1960's. The size analysis is based on the intensity distribution measurement of coherent laser light scattered by particles. When the laser beam interacts with particles, their size distribution can be calculated from the scattered light distribution based on Mie theory. Mineral processing plant slurry sample is diluted to 0.1 to 0.5% ww solids content to pass through the laser beam.
Primary sampler extracts 50 - 120 l/min primary sample from the process stream. Representative sample is essential for dependable size analysis. The primary sampler is selected from a range of proven designs to suit process characteristics. One PSI 500i analyzer can measure samples from 1-3 sampling points.

Sample line to the analyzer is an essential part of the sampling system. The line has to be routed according to Outotec instructions so that the analyzer receives a consistent and representative uniform sample flow.

Larger primary sample flow rates in long sample lines can be used with optional adjustable sample divider.

Sampling of undiluted primary sample for calibration and laboratory composite samples.

Interactive touch screen PC calculates and displays analysis results, alarms and configuration data. Proprietary multiple scatter algorithm compensates for diluted sample opaqueness variations. Measured data is sent to the plant DCS system. Primary sample return to process.

Sample valves control water flushing of the sample cutter and sample line. The valves are controlled by the analyzer so that the programmed flushing does not disturb measurements.

Secondary sampler cuts representative 3 - 5 cc samples from the measured sample stream for diluter unit. Diluted sample opacity is automatically controlled by the frequency of the cuts to best suit the measurement requirements.

Optional demagnetizer/dispersion unit for magnetite minerals.

Diluter unit reduces sample solids content to 0.1 - 0.5% level so that laser beam can penetrate the diluted sample.

Optical sensor head measures the diffraction pattern of laser beam produced by the particles in the sample.

Sample returns to process. Most of the primary sample (>90%) is not diluted.
Outotec PSI® 500i specifications for analyzers with PCS 4722 Probe Control Set

### Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of sample lines</td>
<td>1-3</td>
</tr>
<tr>
<td>Primary sample flowrate</td>
<td>50-120 l/min</td>
</tr>
<tr>
<td>Maximum sample solids content</td>
<td>sample has to flow</td>
</tr>
<tr>
<td>Sample temperature</td>
<td>5-50°C (70°C with options)</td>
</tr>
<tr>
<td>Size range (optimized by optics focal length)</td>
<td>0.5-1000 µm</td>
</tr>
<tr>
<td>Precision</td>
<td>1-2% abs, Dv50</td>
</tr>
<tr>
<td>Measurement interval</td>
<td>3 min/sample line</td>
</tr>
<tr>
<td>Plant DCS connections</td>
<td>Modbus TCP (slave), Modbus RTU (slave), OPC (server), Profibus DP</td>
</tr>
<tr>
<td>Remote service connection</td>
<td>Internet through VPN firewall</td>
</tr>
</tbody>
</table>

### Utilities

- **Analyzer unit** - single phase AC 115-230 VAC +/-10% at 2-4A 50/60Hz
- **Dilution water pump** - single phase AC 115-230 VAC/-10% at 6-12A 50/60Hz
- **Recommended UPS** - 1 kW/10min
- **Water consumption** - 10 l/min, max. 30 l/min. for 10 sec
- **Water temperature and quality** - max 40°C sand filtered
- **Oil free instrument air pressure** - 5-10 bar
- **Air consumption** - 7 Nl/min

### Environment

- **Classification** - IP 66
- **Ambient temperature** - 5-50°C
- **Installation altitude** - up to 5000 m
- **Corrosion resistance** - AISI 316/304 or equivalent
- **Moisture** - up to 85%, non condensing

### Standards

- **European Union, CE marked**
- **Machine directive**
- **Low voltage directive**
- **EMC directive**
- **Laser** - Class II

Multiple scatter correction algorithm and dilution system design are protected by international patents.

The technical data is subject to change without notice. Please see PSI 500i datasheet and installation instructions for more information.

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Outotec provides leading technologies and services for the sustainable use of Earth’s natural resources.

As the global leader in minerals and metals processing technology, Outotec has developed over decades many breakthrough technologies. The company also provides innovative solutions for industrial water treatment, the utilization of alternative energy sources and the chemical industry.

Outotec shares are listed on NASDAQ OMX Helsinki.