

### Company Profile

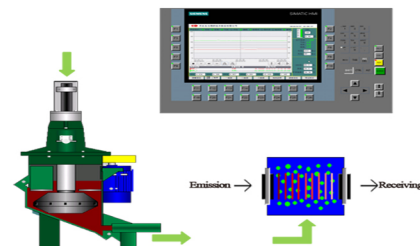
Situated in Dandong, one of the most beautiful border cities in China, Dongfang Measurement & Control Technology Co., Ltd., hereinafter referred to as DFMC, is one specialized mine automation engineering company as well as a large instrument manufacturer which is the largest in China, occupies over 90% market share in the field of mineral processing automation that has been implemented. At present, we have over 1,000 engineers all over the world.

Since established in 1996, we already have 12 kinds of internationally advanced online measuring analyzers and more than 100 measurement and control systems which were independently researched and developed. With the technologies covering GPS guidance, PGNA, XRF, ultrasound, infrared, micro-wave, radar, etc. DFMC utilized hundreds of applications in metallurgical, mine, cement, building materials, chemical, coal and other industries.

DFMC is committed to helping clients to realize high quality, high output, energy-saving and consumption reduction to achieve sustainable development for a better world.

### Product Principle

DF-PSM Online Ultrasonic Particle Size Monitor generates a relatively stable and representative slurry flow through the sample conditioning unit, which is degassed. After degassing, the slurry is detected by ultrasonic attenuation measurement unit with ultrasonic transducer as the core component, and finally the slurry sample returns to the original process pipeline. During the measurement period, the probe transmits ultrasonic energy pulses at various frequencies through the sample and obtains multiple attenuation parameters from the received ultrasonic pulses. These parameters are directly related to the particle size distribution density of slurry samples. In the calibration model of each particle size, these parameters are used as variables to calculate the slurry concentration and particle size.



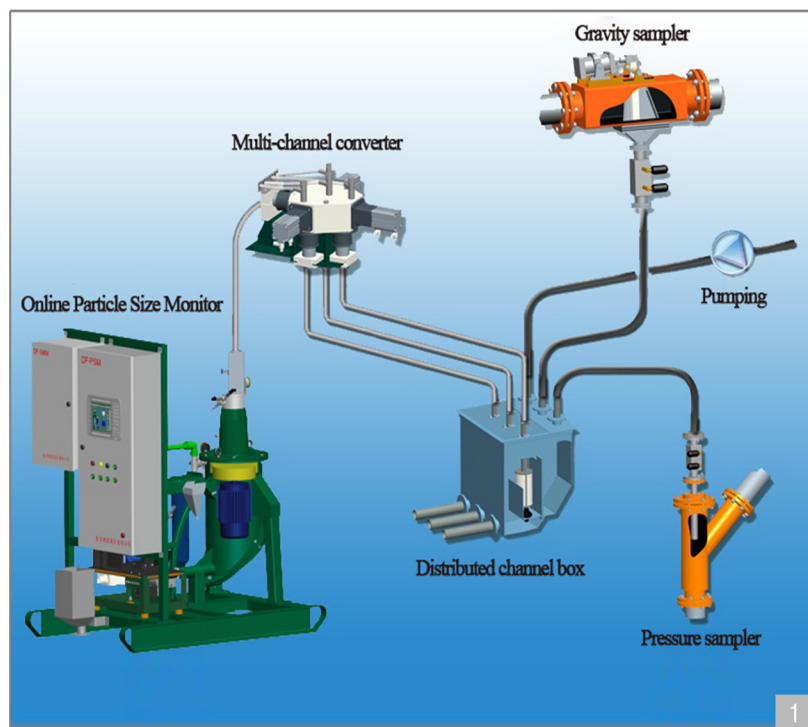
### Product Overview

DF-PSM Online Ultrasonic Particle Size Monitor is an on-line slurry particle size analyzer. It can provide accurate and real-time on-line particle size analysis of slurry and is suitable for measuring particle size distribution from 25 μm to 295 μm in accordance with P80 standard. By using the feedback information of the instrument, the grinding circuit can be optimized, so as to improve the product quality, improve the recovery rate and reduce the energy consumption.



### Technical Application

DF-PSM Online Ultrasonic Particle Size Monitor system mainly includes: DF-PSM Online Ultrasonic Particle Size Monitor (standard configuration) and multi-channel converter. At the same time, according to the on-site process pipeline layout, slurry distribution boxes with different channels (including drainage and return pipes) are to be selected.



### Application

**The application fields of grinding and separation processes for nonferrous metals and ferrous metals mainly include:**

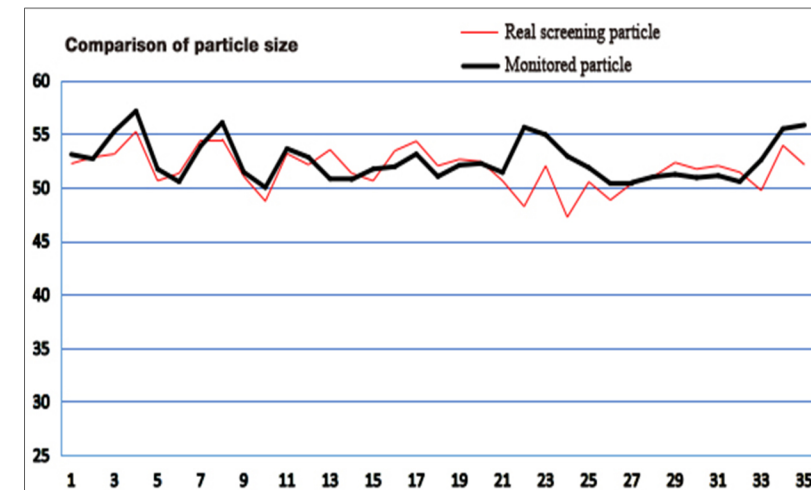
1. Iron ore, magnetite and other black mines;
2. Nonferrous mine fields such as gold mine, copper mine, molybdenum mine, lead-zinc mine, etc;

### Case 1

In the upgrading project of ball mill automation in a concentrator of Angang Mining Group, DF-PSM Online Ultrasonic Particle Size Monitor has realized closed-loop control, and the on-line measurement accuracy of primary overflow particle size - 200 mesh is less than 2%, which meets the requirements of on-site production. According to the primary overflow particle size change, the real-time optimization of swirl-er pressure, water supplement of each part and mill table can ensure the primary overflow particle size to reach the standard. On the basis of this, the maximum time is increased, the cost is effectively reduced, and the economic benefit is obvious.

### Case 2

In 2018, DF-PSM Online Ultrasonic Particle Size Monitor of Dandong Dongfang Measurement & Control Co., Ltd. achieved excellent application effect in the largest steel group in Far East region, and successfully completed the commissioning, calibration and acceptance. Up to now, the instrument runs stably, and the accuracy of on-line concentration and particle size measurement is within 2%, which fully meets the production requirements. And realize the real-time data transmission and remote control function with the control center, which can monitor, diagnose, operate and control the running state of the equipment itself, reduce the requirements of the technical professional level of the operation and maintenance personnel to the greatest extent, at the same time, it also ensures to assist the user to solve the faults found in the operation of the equipment in the shortest time, so as to make the system maintenance more convenient and ensure the real-time operation. The detection instrument has higher reliability, stability and accuracy in operation, and maximizes user benefits.



**Advantages**

- DF-PSM uses six frequencies of ultrasound to measure the ultrasonic attenuation of slurry. These operating frequencies are determined according to the concentration and particle size range of the slurry to be tested and according to the specific patent method. The calibration model is made up of the ultrasonic attenuation coefficients at these six frequencies, which can reflect not only the coarse components but also the fine components in the slurry, so that each particle size measured is real and independent. DF-PSM can accurately express the size distribution of slurry by measuring 5 different size fractions of each slurry.
- The measurement of sound attenuation is the result of the interaction of a large number of particles in the slurry; the measurement speed is fast, and it can measure hundreds of times per second, so the consistency and representativeness of the measurement are good. When the grinding process changes, the measurement results can truly reflect this change, which is very beneficial to use the particle size measurement results to guide the grinding production.
- Overflow concentration of hydro cyclone in grinding classification system is a very important process parameter. DF-PSM measures the concentration while measuring the particle size, and the output concentration value is calibrated as the particle size, with the same accuracy. This is very useful for grinding optimization control and does not require additional expenses of users.
- High accuracy: DF-PSM uses logarithmic amplifier with large dynamic range for direct measurement of ultrasonic attenuation value, the particle size detection accuracy can be more accurate, reaching the international advanced level, and its accuracy is unmatched by the mechanical particle size instrument.
- High representativeness of samples: different sampling methods can be adopted according to different application site process points, and multiple sampling methods can be adopted, such as fractional sampling station and sampling blade, to ensure the representativeness, circulation and reliability of pulp sampling.

- High reliability / Maintainability: all electronic units adopt modular design, and all structural components are designed and manufactured independently. The mechanical seal, the core component, can be disassembled for many times to avoid functional failure; the turbine is made of special materials with good dynamic balance and wear resistance, which can extend the maintenance cycle and reduce the cost.
- The best closed-loop control effect: with the strong automation team of DFMC, and the high precision, high reliability and high sampling representativeness of DF-PSM, the automatic closed-loop control of grinding and dressing process system is more refined. This is incomparable to other automation manufacturers.
- Continuous upgrading of products: in order to meet the needs of the site and customers, our company continuously improves and upgrades DF-PSM Particle Size Monitor, and improves the product performance.



**Technical Parameters:**

<b>Physical Parameters</b>	
Principle	Multi-frequency ultrasonic attenuation measurement
<b>Functions</b>	
Auto	Circulate according to the user-defined measurement sequence and measurement time
Manual	Select the measurement channel through the control panel, human-machine interface or remote control
Medium measured	Iron ore slurry, molybdenum ore slurry, copper ore slurry, gold ore slurry, lead-zinc ore slurry and other solid-liquid two-phase suspension slurry
Output	Each channel can analyze up to 5 particle size fractions and 1 concentration. Weight percentage output, on or off screen, consistent with laboratory screening.
<b>Performance</b>	
Application of multi-channel 1-3 channel, (2-channel or 3-channel equipment, additional multiplexer is needed)	
<b>Particle</b>	
Range	The particle size is not more than 1 mm. P80 has a 295 to 25 micron distribution
Accuracy	For single sample cycle detection, the absolute error is less than 1.0% (1σ) For online detection, absolute error ≤ 2.0% (1σ)
<b>Concentration</b>	
Range	Slurry concentration 4-60% W.T (1-70% vol, related to dry ore density)
Accuracy	For single sample cycle detection, the absolute error is less than 1.0% (1σ) For online detection, absolute error ≤ 2.0% (1σ)
Data refresh	<4s
<b>Output</b>	
Analog output	4 ~ 20mA
Communication	PROFIBUS
<b>Conditions Installation</b>	
Platform	3.5m × 2.8m horizontal base space, 2.5m vertical space, and can support 1500kg weight
<b>Environment</b>	
Temperature	-10 ~ +50°C
Humidity	0 ~ 98% relative humidity (non-condensing)
Vibraton	<10g,20Hz
<b>Plant</b>	
Common water	Standard of common industrial water, 2.5 ~ 3.0 m3 / h, pressure 350 ~ 550 kPa
Standard water	Drinkable standard, about 12 L / day
Gas	Clean, dry gas source: 0.1 ~ 0.15 m3 / h, pressure: 550 ~ 700KPA
Corrosive	Corrosive slurry, pH < 12.5
<b>Design</b>	
Material	All parts in contact with slurry are engineering polymer or rubber coated mild steel.
Protection	IP65 is used for external electronic device protective housing and external executive parts
Weight	About 880kg
Size	1800mm (L) × 1200mm (W) × 1800mm (H)
<b>Display and control</b>	
Display	Industrial human machine configuration interface
Display mode	Real-time data, curve trend, status display, parameter setting and alarm information
Power supply	380V AC; 50/60 Hz; 3 phases; 6kW