

KLD900 Series 3D Radar Level Sensor

3D RADAR LEVEL SENSOR

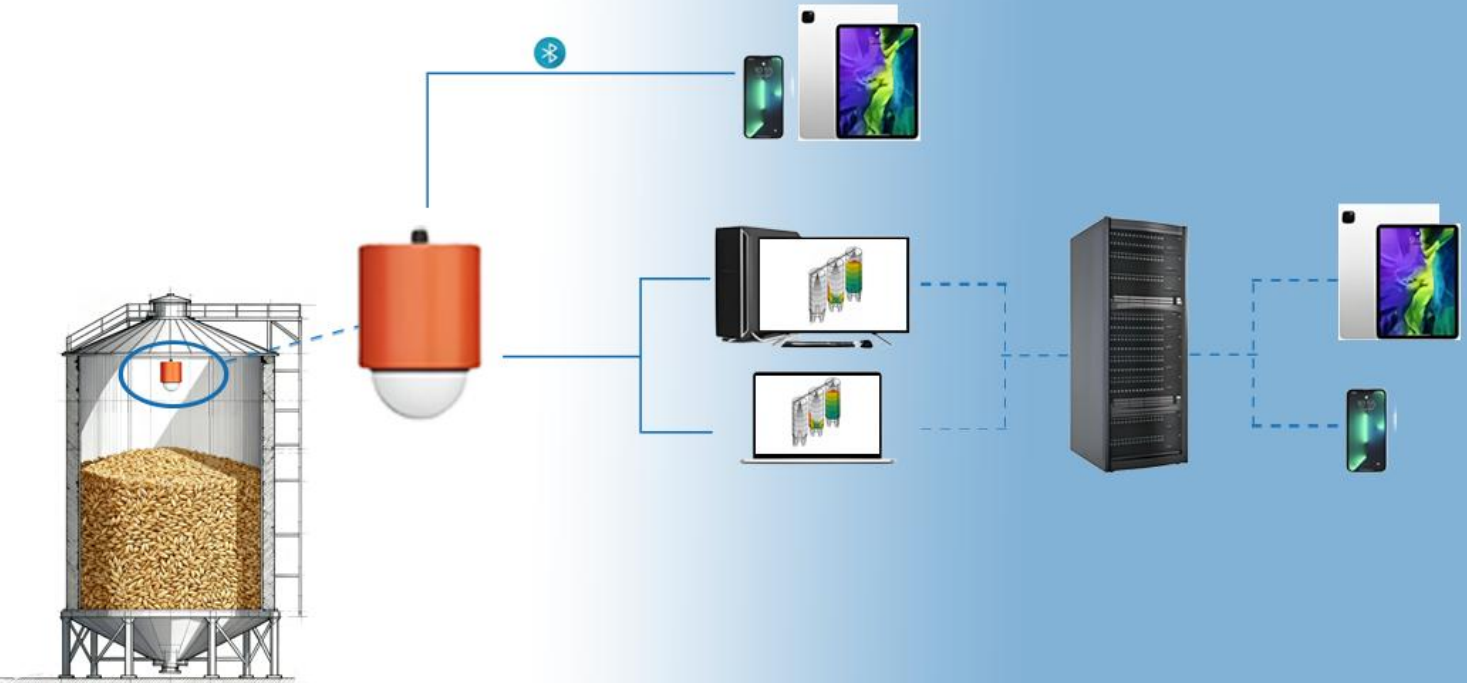


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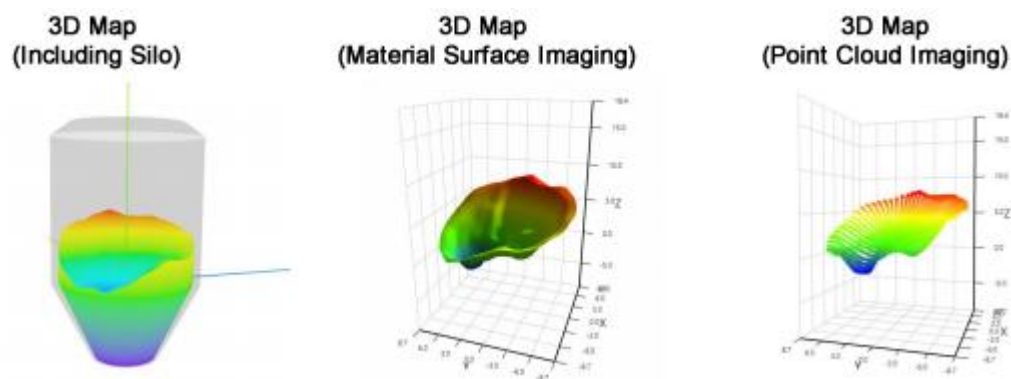
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1. Overview

Since solid materials inside a silo easily form an angle of repose, the material surface often has large height differences and frequently adheres to the silo walls. Traditional single-point radar level meters, regardless of installation position, cannot accurately reflect the true internal shape of the silo. Therefore, three-dimensional detection has become an inevitable trend and essential choice for certain industries in the industrial field.

This product can accurately detect the 3D information of solid materials. Based on terahertz FMCW radar technology, the radar sensor is driven by a rotating and pitching mechanism to perform 360° panoramic high-resolution scanning of the material surface. Combined with image processing, big data analysis, AI, machine learning, 3D point cloud conversion and modeling, cloud storage and computing, the system can operate automatically 24/7, measure rapidly, and obtain real-time, accurate 3D information of the material surface. It generates 3D visual images and calculates relevant parameters such as material level, volume, and weight.

The 3D Radar Level Sensor solves the key problems of material inventory and level detection, enabling intelligent and digital management of materials, visualization of production data, transparency of production processes, and unmanned/automated on-site operations. It elevates management capability, decision-making efficiency, and safety assurance to a new level.



2. Industry Applications

The 3D Radar Level Sensor uses a narrow beam with strong penetration capability, allowing it to adapt to complex working conditions. It is unaffected by harsh environments such as high temperature, heavy dust, corrosion, steam, rain, and fog. With excellent cost-performance, it is widely suitable for measuring solid materials stored in various locations, such as silos, containers, bulk solid warehouses, and more.

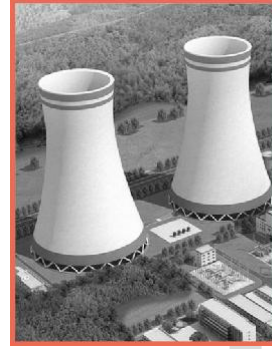
The applicable industrial sectors include:

grain processing, chemical industry, steel, energy, cement, food processing, power plants, plastics manufacturing, metal processing, glass manufacturing, and raw wood material processing, among others.



Grain Industry

Flat Warehouse
Shallow Circular Silo
Vertical Silo
Star Silo



Thermal Power Industry

Raw Coal Silo
Ash Silo
Gypsum Silo
Desulfurization Limestone Silo



Coal Industry

Raw Coal Silo
Auxiliary Coal Silo
Bulk Coal Pile



Cement Industry

Raw Meal Silo
Clinker Silo
Homogenizing Silo
Finished Product Silo

3.Advantages and Features

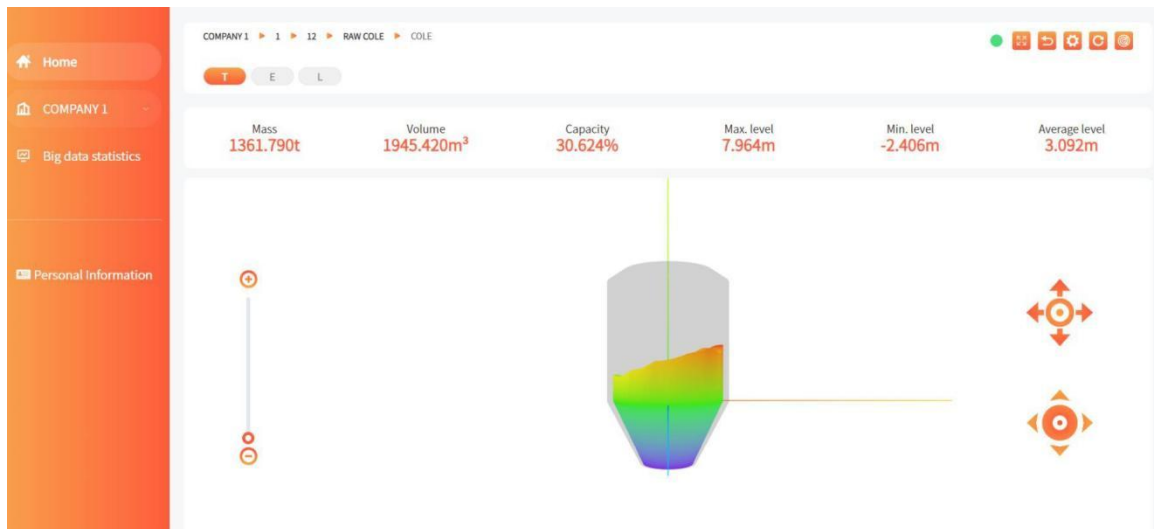
3D Imaging and Visualization

The 3D Radar Level Sensor scans both the material surface and the silo sidewalls. After processing by algorithms deployed on the cloud server, precise 3D information is obtained and used for 3D modeling. This allows the human-machine interface to accurately and intuitively reproduce the actual shape of the material surface and silo walls, generating a fully visualized 3D image.

High Computational Accuracy with Terahertz Radar Multidimensional Super-Resolution Reconstruction

The processing algorithms deployed on the cloud server incorporate machine learning, introducing a convolutional neural network–based mapping between radar echo information and the material stacking profile. This greatly improves the resolution of the 3D surface reconstruction.

In addition, advanced algorithms are used for 3D modeling—such as precise fitting, noise removal, and material segmentation—effectively enhancing the overall computational accuracy



Intelligent Inventory System – Replacing Manual Inspection and Stocktaking to Reduce Cost and Increase Efficiency

By using 3D data, information such as material level, volume, and mass can be accurately obtained. This prevents material overflow while providing real-time and precise inventory flow data, ensuring the accuracy of financial cost and profit calculations.

Measurement intervals can be configured as needed, enabling automatic inventory checks and volume measurement. This improves production traceability and operational efficiency, allowing real-time and convenient access to inventory levels. It unlocks the potential for optimized material management and enhances delivery and procurement planning to prevent insufficient stock from affecting production continuity or delivery schedules. It also avoids excessive material purchasing, which could tie up enterprise funds.

Real-Time Dynamic Monitoring for Enhanced Safety

Automatic calculation based on real-time 3D data replaces manual measurements, increasing measurement speed and accuracy while preventing human errors or false reports. Abnormal material reduction or disappearance can be detected or prevented in time.

The system continuously measures the material surface and silo walls, displays real-time 3D visual images, and provides immediate insight into material distribution and whether material adhesion exists on silo walls. Real-time monitoring of the material surface profile and silo-wall conditions helps prevent material collapse or uneven distribution that may lead to structural damage or even silo failure. It also facilitates early detection of potential faults for timely intervention and loss prevention. Additionally, it helps prevent inventory misjudgment caused by material buildup or adhesion on the silo walls and provides reference data for timely silo cleaning.

Fully automated, all-weather monitoring eliminates the need for manual intervention and effectively addresses major challenges such as high operational requirements, heavy labor intensity, low process efficiency, and insufficient digitalization. It improves material production organization and management while ensuring operator health and eliminating safety risks, without concerns about harsh measurement environments.

Unaffected by Working Conditions – Automatic Stitching and Registration for Accurate Measurement of Large Storage Facilities

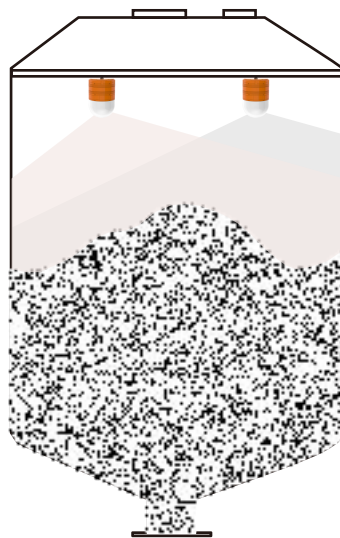
The 3D Radar Level Sensor is equipped with a powerful software system designed for ultra-large-scale measurement scenarios, such as mega silos, domed silos, and large open storage yards. It serves as

the optimal solution for these applications. By installing two or more 3D Radar Level Sensors simultaneously, the entire required measurement area of the silo can be fully covered.

The stitching and registration algorithms deployed on the cloud server integrate the 3D information collected by each radar, performing automatic alignment and fusion to generate a unified 3D dataset of the entire measurement area. The resulting data is presented as a single 3D visualized view of the full measurement region.

The 3D Radar Level Sensor also supports intelligent masking of non-critical areas to achieve smart management. Its radome is designed to prevent dust accumulation, and the enclosure adopts an innovative dust-proof sealed structure. The high-temperature-resistant wave-penetration material reduces radar signal attenuation and ensures data accuracy.

Multiple 3D Radar Level Sensors can be connected to the control bus simultaneously. Through the control bus, data is transmitted to the software system, allowing users to monitor and measure multiple silos at the same time through the visualized software interface.



Material Detection (Dual / Multiple Units)

Software System – Personalized, Flexible, and Highly Compatible

The software system features a well-structured architecture with strong compatibility and high scalability. Through automated scripts, it performs a complete workflow from 3D point cloud data acquisition, cropping, segmentation, transformation, measurement, and calculation, to database management, reporting, and web display.

By integrating with relevant modules such as ERP, it achieves comprehensive management of quantity, quality, input, consumption, and inventory, providing real-time, accurate data on material 3D information, stock levels, and usage. The results can be presented in multiple formats (3D visualized images, data reports, etc.), enabling full-process closed-loop management for efficiency analysis, procurement, and inventory control, thereby enhancing enterprise productivity and quality.

Real-time, accurate 3D visualized images provide mapping models and spatial coordinates to guide operational processes. For example, in blast furnace metallurgy, 3D visualized images allow operators to see the distribution and coordinates of materials inside the furnace, enabling adjustments to material placement processes to form an optimal material surface and ultimately improve furnace performance.

By integrating with operational control strategies and automated material in/out programs, the system enables fully automated, around-the-clock, unmanned operations. This standardizes, digitalizes, and automates material handling processes, reduces labor costs, and enhances safety.

Remote Cloud Processing – Multi-Terminal, Multi-Site Monitoring and Control

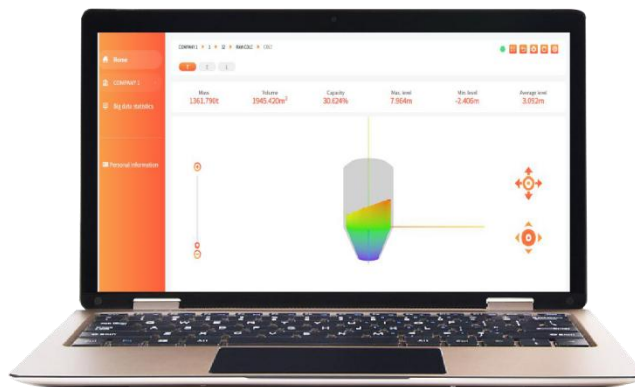
During scanning, measurement data can be transmitted to the cloud server, allowing users to collect real-time data from containers of any scale at different locations. The cloud server provides storage for historical data records and queries, and runs processing algorithms that integrate, compute, and generate 3D visualized images and output data reports in real time.

Cloud processing technology enables multi-terminal, multi-site real-time monitoring and remote control of multiple 3D Radar Level Sensors, providing centralized management and operational flexibility across locations.

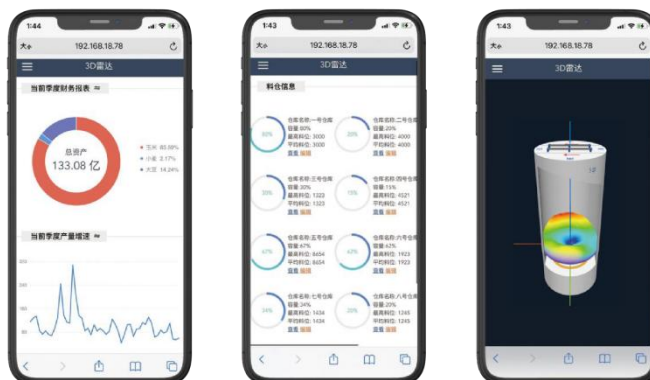
Unaffected by Working Conditions – Automatic Stitching and Registration for Accurate Measurement of Large Storage Facilities

By integrating remote cloud processing and Bluetooth wireless transmission technologies, the host device (desktop computer, laptop, digital production management LCD panel, etc.) or mobile devices such as smartphones and tablets can display the 3D visualized images, material level, volume, mass, and other related parameters obtained from the cloud server. These interfaces also allow for configuration and control of the 3D Radar Level Sensor.

Additionally, an optional standalone Android smartphone or tablet app via Bluetooth can be used for remote configuration and control of the 3D Radar Level Sensor, facilitating on-site maintenance without the need to climb silos or elevated platforms.



(Host Side)



(Mobile or Tablet Side)

4. Technical Specifications

Device	KLD901	KLD902
Operating Frequency	80 GHz	120–140 GHz
Material Type	Solid Material	Solid Material
Measuring Range	≤100 m	≤40 m
Beam Angle	≤3.5°	≤2°
Horizontal Angle	360°	360°
Pitch Angle	+85°	+85°
Scan Cycle	7 min	15 min
Power Supply	24 VDC	24 VDC
Power Consumption	20 W	20 W
Device Weight	8.32 kg	8.32 kg
Networking Method	Ethernet	Ethernet
Output Data (Customizable)	MODBUS TCP, WebAPI, 4–20 mA	MODBUS TCP, WebAPI, 4–20 mA
Operating Temperature	–35℃ to 70℃	–35℃ to 70℃
Transport Temperature	–40℃ to 100℃	–40℃ to 100℃
Process Pressure	0–1 bar	0–1 bar
IP Rating	IP67	IP67
Volume Accuracy	≤±3% FS	≤±2% FS
Installation Method	Customized	Customized