

KLD900 Series 3D Radar Level Sensor User Manual



Warning

Electrostatic Protection Measures

This instrument contains electronic components sensitive to static electricity. Therefore, when disassembling or installing internal circuit boards or components, appropriate and effective electrostatic protection measures must be taken according to the following principles:

1. Power must be disconnected from the instrument before any disassembly!
2. Before touching, disassembling, installing, or adjusting the printed circuit board (PCB) or its components, operators must wear an anti-static wrist strap or use another safe and reliable grounding method to ensure rapid and smooth discharge of static electricity.
3. PCBs must be transported and stored in conductive bags or other conductive containers. They may only be removed from the electrostatic protection package during on-site installation. Replaced PCBs must be immediately placed in containers with electrostatic protection and must not be left casually for transport or storage.

Transport and Storage

The instrument is packaged in cardboard or wooden boxes. Handle with care during transport—rough handling is prohibited. Storage locations must be rainproof, moisture-proof, and free from mechanical shocks or impacts.

Unpacking and Inspection

After unpacking, strictly check the items against the packing list. If any errors, missing items, or damage are found, contact our company or local agent immediately.

Instrument Installation and Adjustment

1. Read the manual carefully and strictly follow the installation and adjustment requirements.
2. Ensure the instrument is reliably grounded.
3. After wiring, ensure good sealing at the cable outlet and no water accumulation in the protective conduit.
4. After commissioning, tighten the instrument cover.

Environmental Protection

The packaging meets environmental protection requirements. After unpacking, users should hand it over to local recycling agencies. When the instrument is scrapped, it should be delivered to an electronics disposal unit for proper handling.

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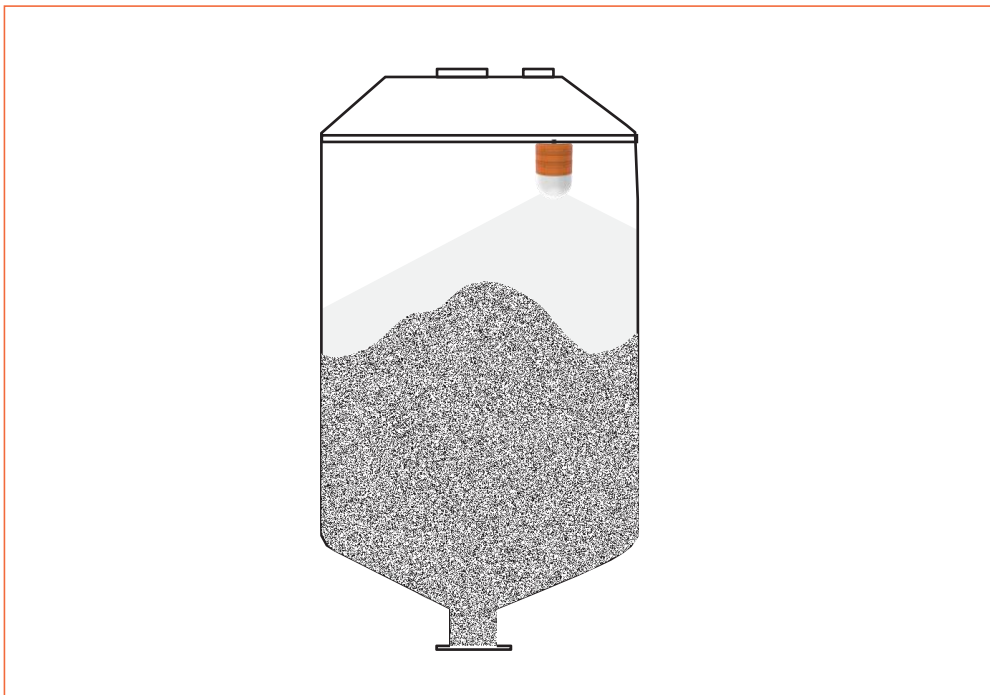
1. Overview

1.1 Product Overview

Solid materials in silos tend to form an angle of repose, resulting in uneven material surfaces. Traditional single-point radar level meters, regardless of installation position, cannot accurately reflect the true internal shape of the silo. Therefore, 3D detection has become an inevitable trend and choice for certain industries in the industrial sector.

The 3D Radar Level Sensor can accurately detect the three-dimensional information of solid materials. The radar sensor is driven by rotating and tilting mechanisms to perform 360° high-resolution scanning of the material surface. By combining technologies such as image processing, big data analysis, AI, machine learning, 3D point cloud conversion and modeling, cloud storage, and computing, it can operate automatically 24/7, quickly and accurately capturing 3D information of the material. It generates 3D visual images and calculates related parameters such as material level, volume, and weight.

The 3D Radar Level Sensor addresses critical issues such as material inventory and level monitoring, enabling intelligent and information-based material management, visualized production data, transparent production processes, and unmanned/automated on-site operations. It elevates management, decision-making, and safety capabilities to a new level.



1.2 Features and Advantages

- 3D imaging and visualization
- Multiple display terminals and control modes
- Real-time dynamic monitoring for enhanced safety
- Flexible, customizable, and highly compatible software system
- Continuous rotation for faster scanning refresh rate and longer product lifespan
- Intelligent inventory management system, replacing manual inspections or measurements to reduce costs and increase efficiency
- Remote cloud processing technology enabling multiple operating terminals, multi-site monitoring, and control
- Unaffected by operating conditions, automatically stitching and aligning to achieve precise measurement of large storage facilities

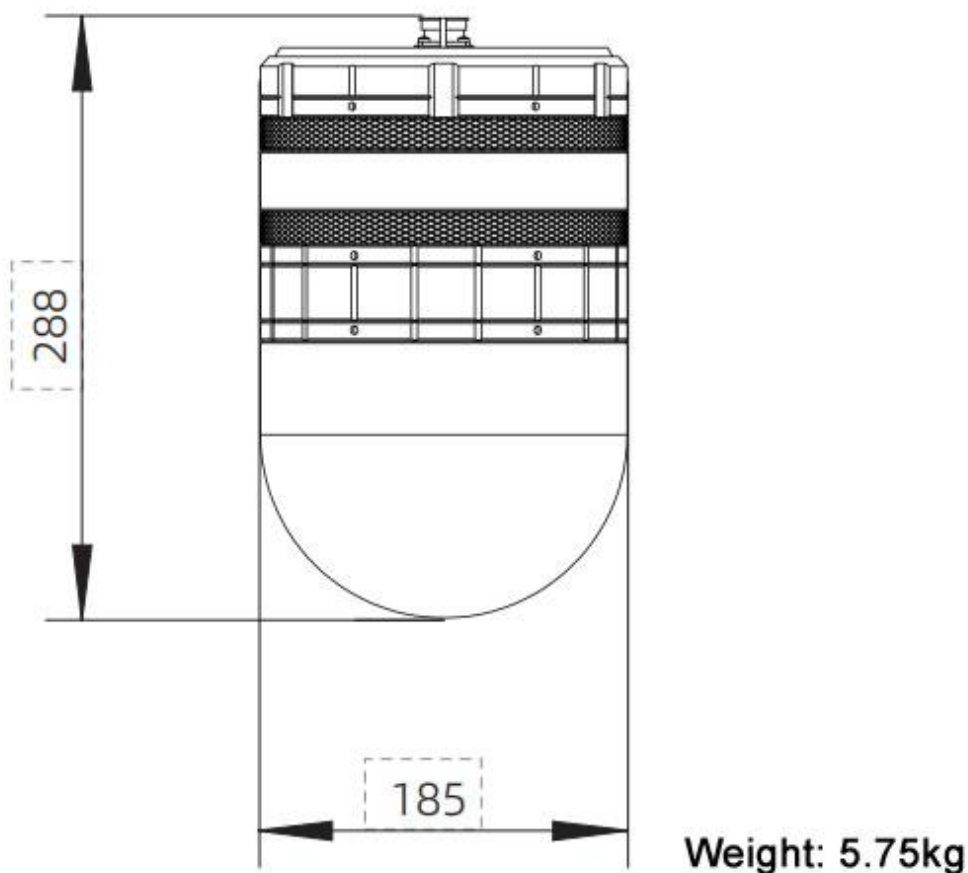
1.3 Industry Applications

- Grain industry: flat silos, shallow round silos, vertical silos, star silos
- Coal industry: raw coal silos, coal blending silos, bulk coal stockpiles
- Cement industry: raw material silos, homogenizing silos, finished product silos
- Thermal power industry: raw coal silos, fly ash silos, gypsum silos, desulfurization limestone silos

2 Instrument Overview

Parameter	KLD901	KLD902
Operating Frequency	80 GHz	120 GHz ~ 140 GHz
Material	Solid material	Solid material
Measuring Range	≤100 m	≤40 m
Beam Angle	≤3.5°	≤2°
Horizontal Angle	360°	360°
Tilt Angle	+85°	+85°
Scanning Cycle	7 minutes	15 minutes
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 (Other customizable)	MODBUS TCP, WebAPI, 4...20 mA	MODBUS TCP, WebAPI, 4...20 mA
Operating Temperature	-35℃ ~ 70℃	-35℃ ~ 70℃
Transport Temperature	-40℃ ~ 100℃	-40℃ ~ 100℃
Process Pressure	0...1 bar	0...1 bar
IP Rating	IP67	IP67
Volume Accuracy	≤±3% FS	≤±2% FS
Installation Method	Customized	Customized

3 Dimensions



4 Installation Guide

4.1 Unboxing and Inspection

4.1.1

The instrument is packaged in a cardboard or wooden box. Handle with care during transport—rough handling is prohibited. The storage location should meet the following conditions:

Protected from rain and moisture

Free from mechanical vibration or impact

Temperature range: $-40^{\circ}\text{C} \sim 75^{\circ}\text{C}$

Relative humidity $\leq 80\%$

Environment free of corrosive gases

4.1.2

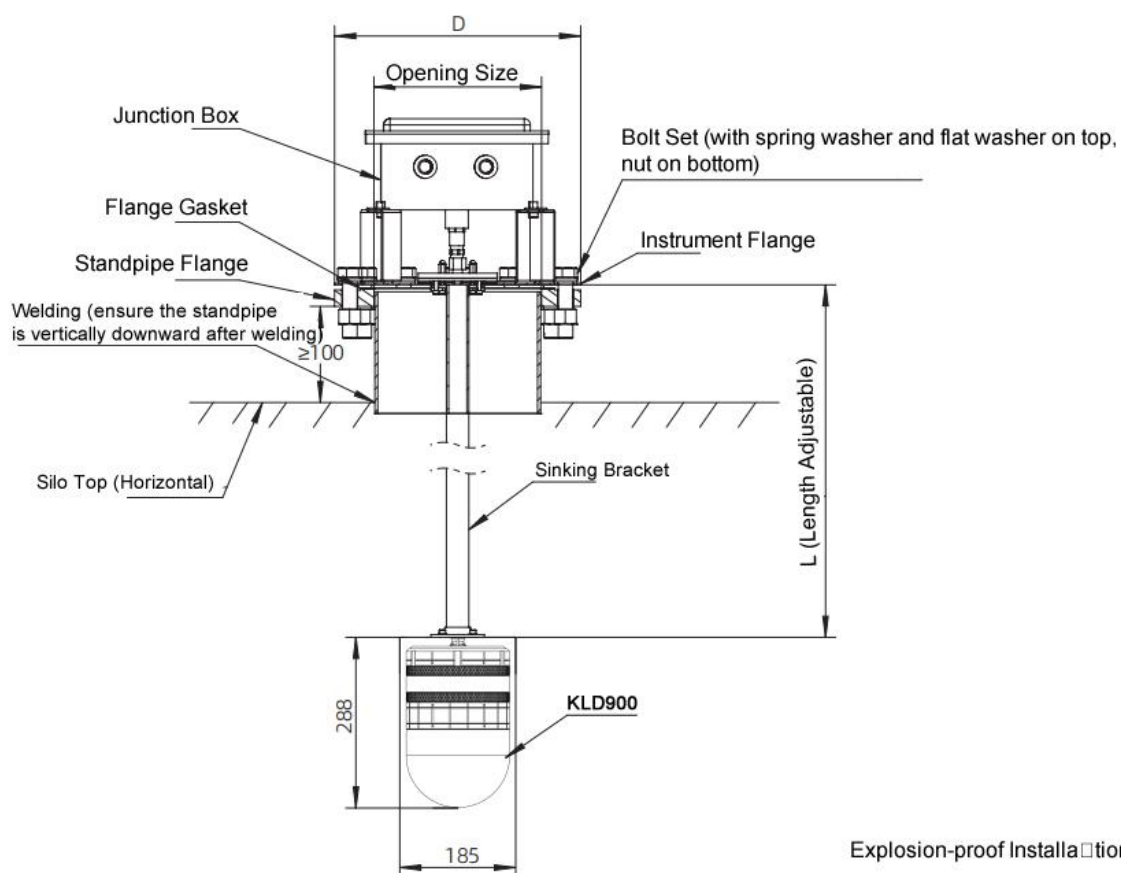
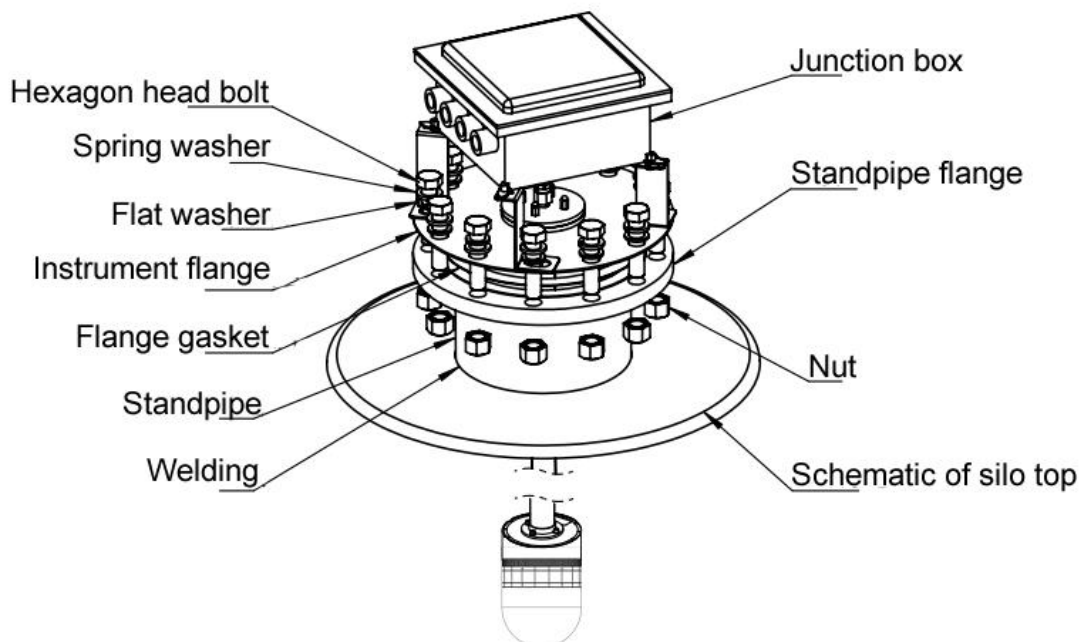
Carefully open the packaging and remove internal padding. Verify all items on the packing list, including instrument model and quantity, installation accessories, manuals, etc. If any errors, shortages, or damages are found, contact our company or local agent immediately.

The packaging box is not to be returned.

4.2 Installation

4.2.1 Flat Top Silo

- 1) If the flat silo top is made of steel plate, drill an opening at the top of the silo, then directly weld and fix the riser pipe before installation.

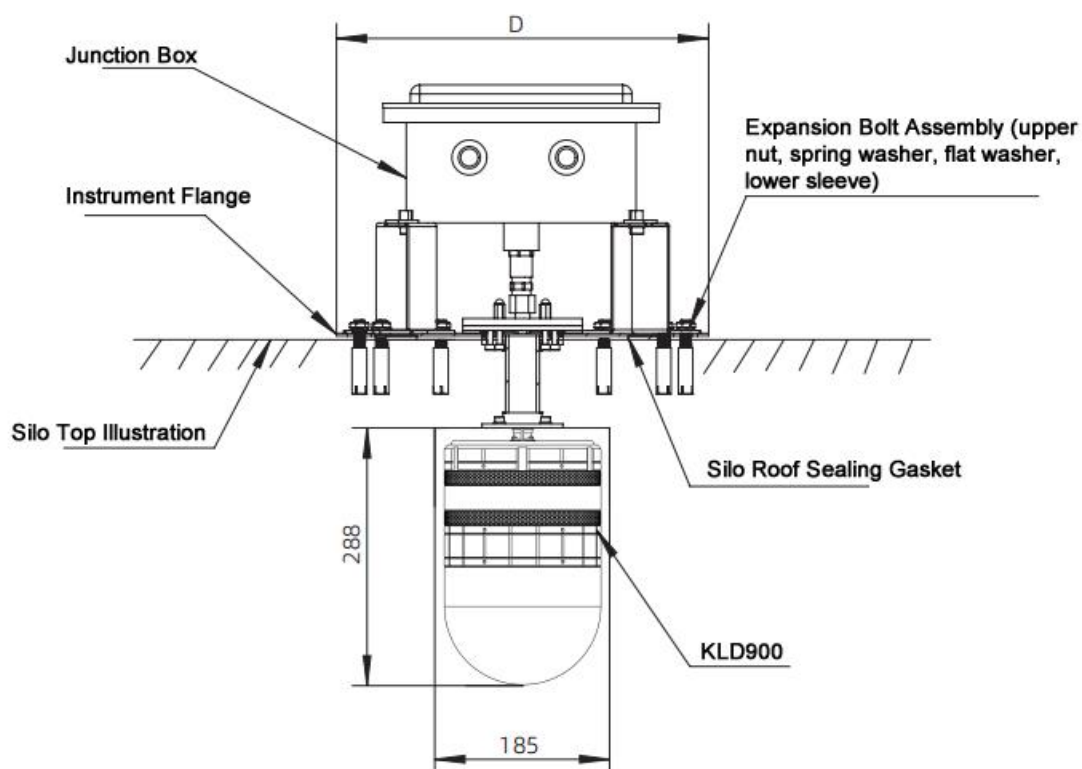
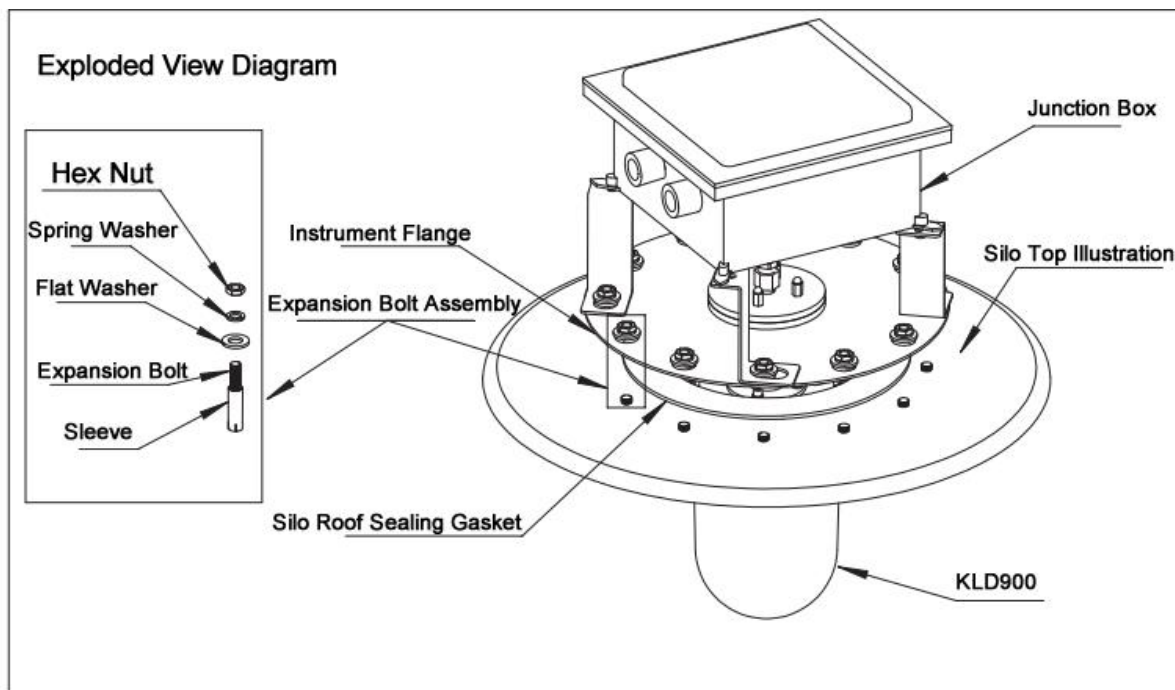


Explosion-proof Installation Scheme

Flange Type	Flange Outer Diameter D	Exposed Standpipe Height	Silo Top Opening Size	Matching Bolts		Installation Steps
DN300	460mm	≥100mm	328mm	Galvanized hexagon head bolts M24X100, with spring washers and flat washers on the top, and nuts on the bottom	Quantity: 12 sets	1. Weld the standpipe with flange to the opening of the silo top, and ensure the standpipe is vertically downward after welding; 2. Tighten the standpipe flange, flange gasket and instrument flange with bolt sets.
DN350	520mm	≥100mm	381mm		Quantity: 16 sets	

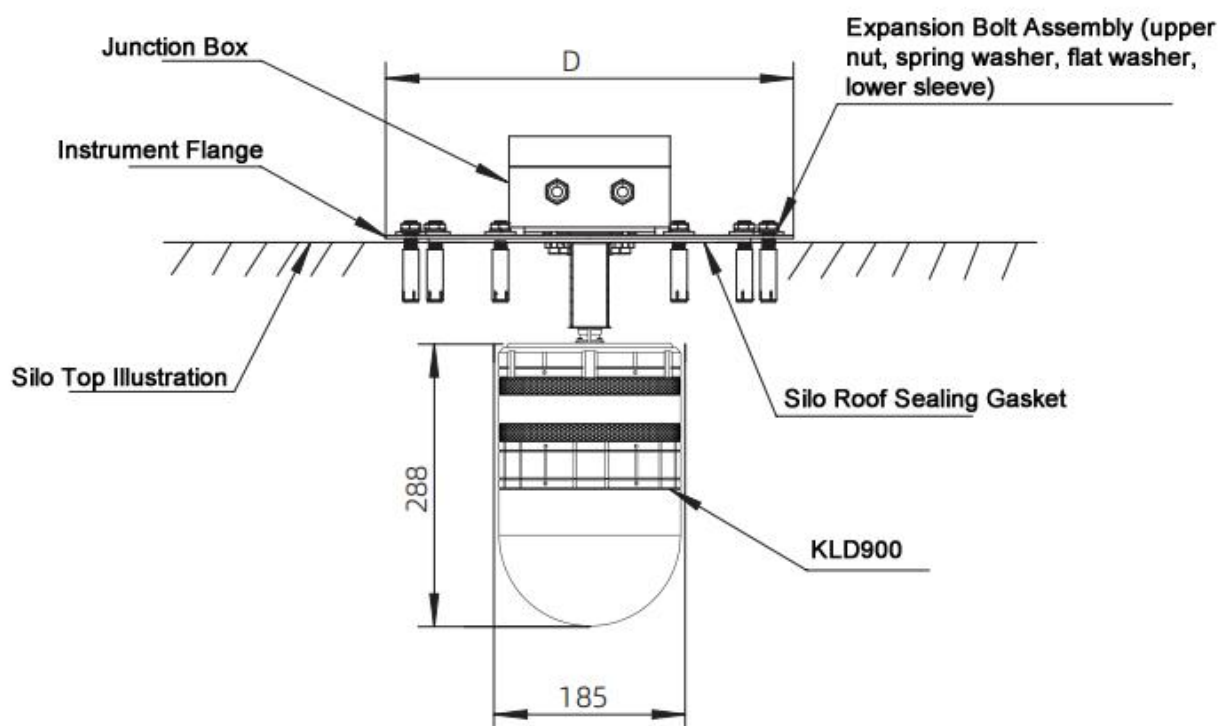
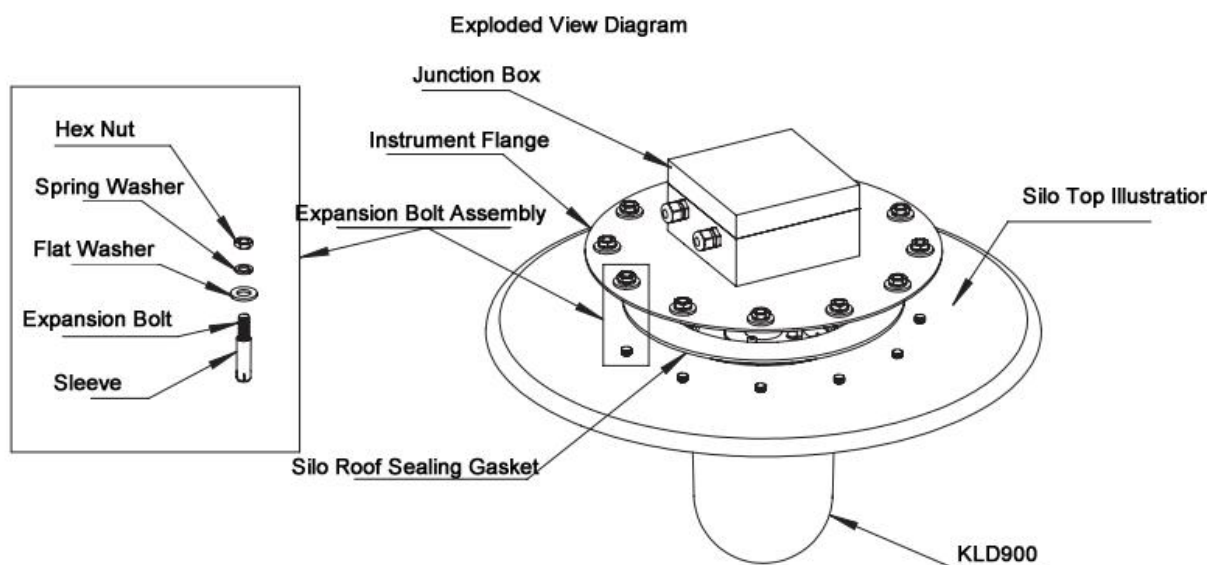
- 2) For flat silo roofs made of steel plate or concrete, after opening a hole in the silo top, the instrument flange can be directly bolted for installation and fixation.

Note: This installation method requires consideration of the sealing between the instrument flange and the silo roof.



Explosion-Proof Installation Diagram

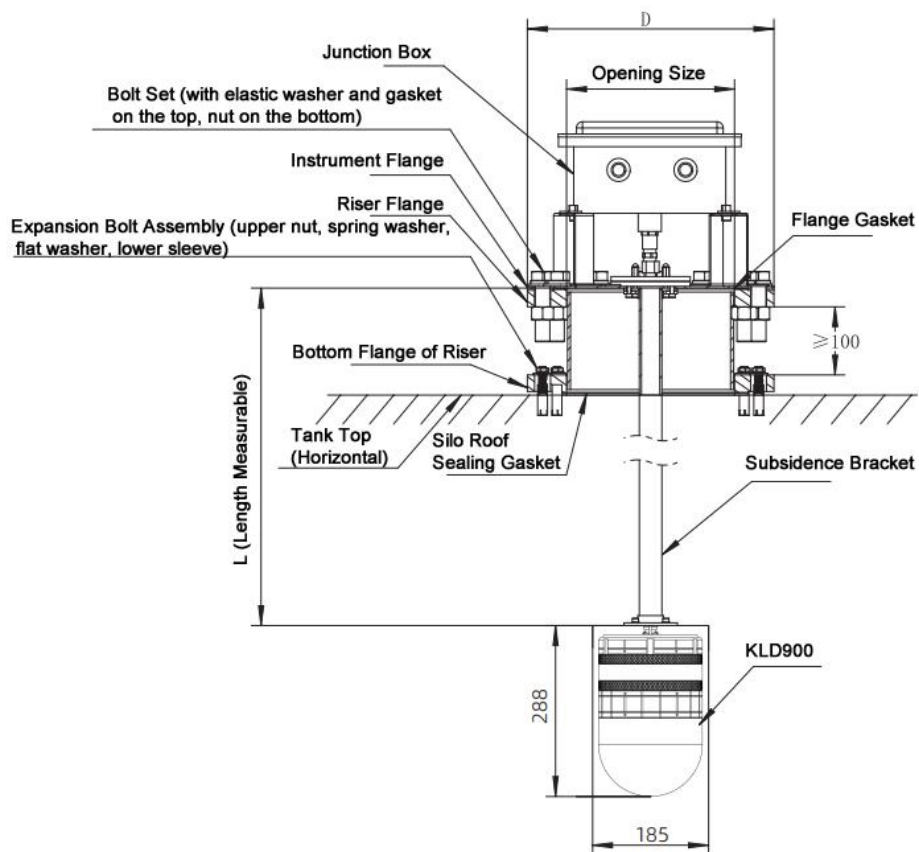
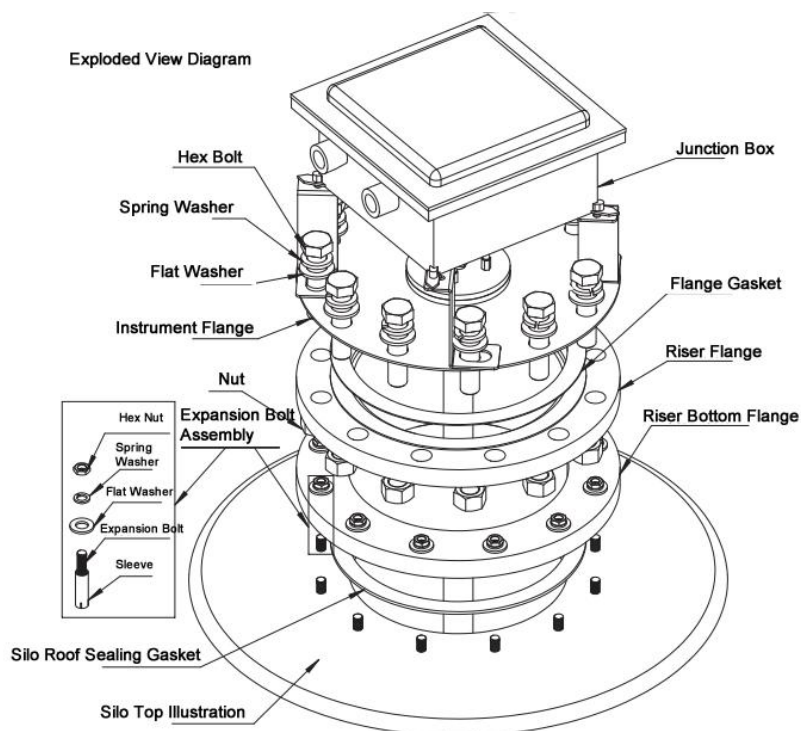
Flange Type	Flange Outer Diameter (D)	Silo Top Opening Size	Matching Bolts		Installation Steps
DN300	460 mm	328 mm	M12X80 expansion bolt, with hex nut, spring washer, and flat washer	Quantity: 12 sets	1. Weld the standpipe with flange to the silo opening, ensuring the standpipe is vertically downward after welding. 2. Tighten the standpipe flange, flange gasket, and instrument flange together using the bolt assembly.
DN350	520 mm	381 mm	(M16X30X3) on top, and sleeve on the bottom.	Quantity: 16 sets	



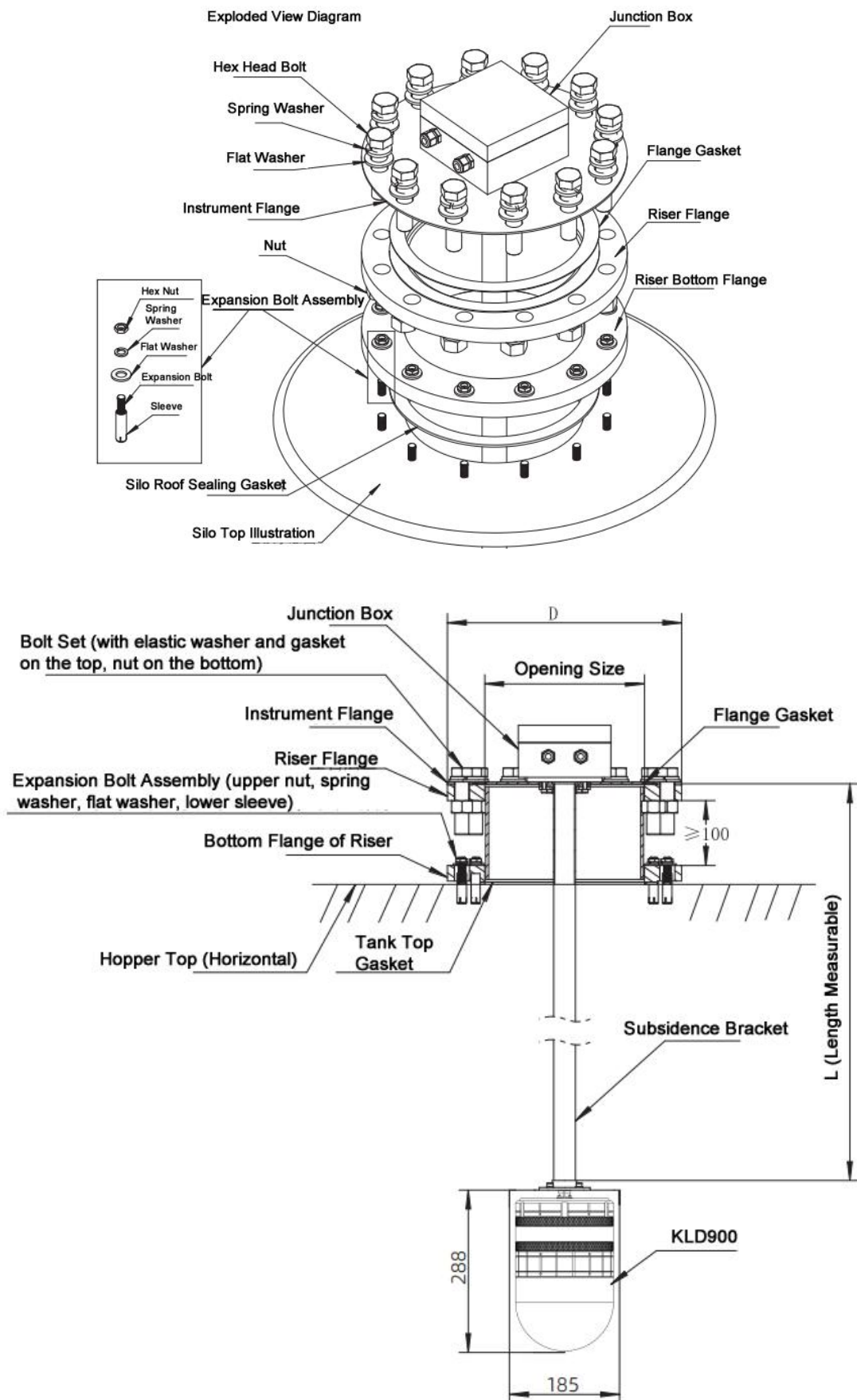
Flange Type	Flange Outer Diameter (D)	Silo Top Opening Size	Matching Bolts		Installation Steps
DN300	460 mm	328 mm	M12X80 expansion bolt, with hex nut, spring washer, and flat washer	Quantity: 12 sets	1. Weld the standpipe with flange to the silo opening, ensuring the standpipe is vertically downward after welding. 2. Tighten the standpipe flange, flange gasket, and instrument flange together using the bolt assembly.
DN350	520 mm	381 mm	(M16X30X3) on top, and sleeve on the bottom.	Quantity: 16 sets	

- 3) For flat silo roofs made of steel plate or concrete, after opening a hole in the silo roof, the standpipe bottom flange can be directly bolted for installation and fixation.

Note: For this installation method, the sealing between the standpipe bottom flange and the silo roof must be considered.



Flange Type	Flange Outer Diameter (D)	Exposed Riser Height	Tank Top Opening Size	Matching Bolts			Matching Expansion Screws		Installation Steps
DN300	460mm	≥100mm	328mm	Galvanized Hex Bolt M20×100	With elastic washer and gasket on top, nut on bottom	Quantity 12 sets	M12X80 expansion bolt, with hex nut, spring washer, and flat washer (M16X30X3) on top, and sleeve on the bottom.	Quantity 12 sets	1. Drilling: Use a drill bit matching the diameter of the expansion screw sleeve to drill holes. 2. Installing expansion screws: Gently tap the expansion screw sleeve into the drilled hole with a small hammer. 3. Fasten the bottom flange of the riser and the tank top with expansion screws.
DN350	520mm	≥100mm	381mm	Galvanized Hex Bolt M24×100		Quantity 16 sets		Quantity 16 sets	

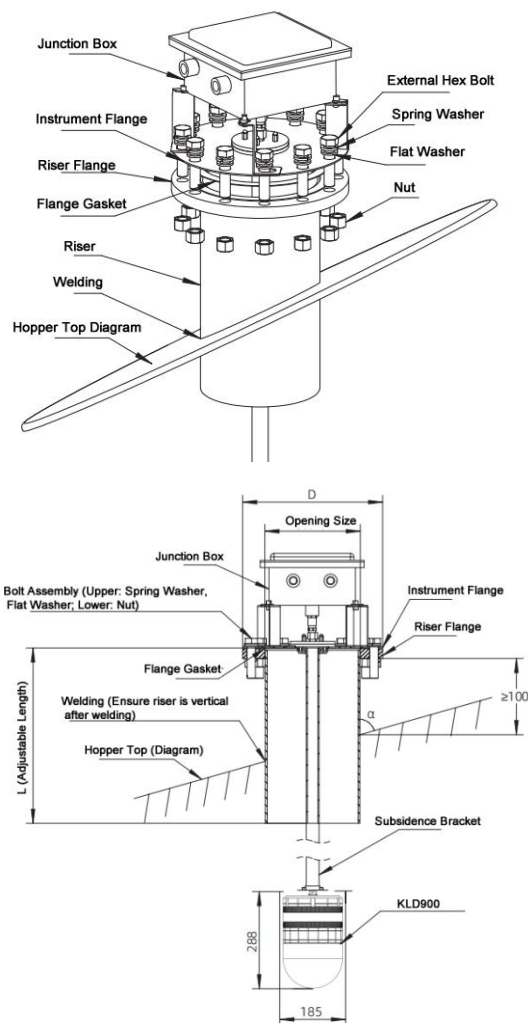


Flange Type	Flange Outer Diameter (D)	Exposed Riser Height	Tank Top Opening Size	Matching Bolts			Matching Expansion Screws		Installation Steps
DN300	460mm	≥100mm	328mm	Galvanized Hex Bolt M20×100	With elastic washer and gasket on top, nut on bottom	Quantity 12 sets	M12X80 expansion bolt, with hex nut, spring washer, and flat washer (M16X30X3) on top, and sleeve on the bottom.	Quantity 12 sets	1. Drilling: Use a drill bit matching the diameter of the expansion screw sleeve to drill holes. 2. Installing expansion screws: Gently tap the expansion screw sleeve into the drilled hole with a small hammer. 3. Fasten the bottom flange of the riser and the tank top with expansion screws.
DN350	520mm	≥100mm	381mm	Galvanized Hex Bolt M24×100		Quantity 16 sets		Quantity 16 sets	

4.2.2 Hopper Top with Inclined Surface

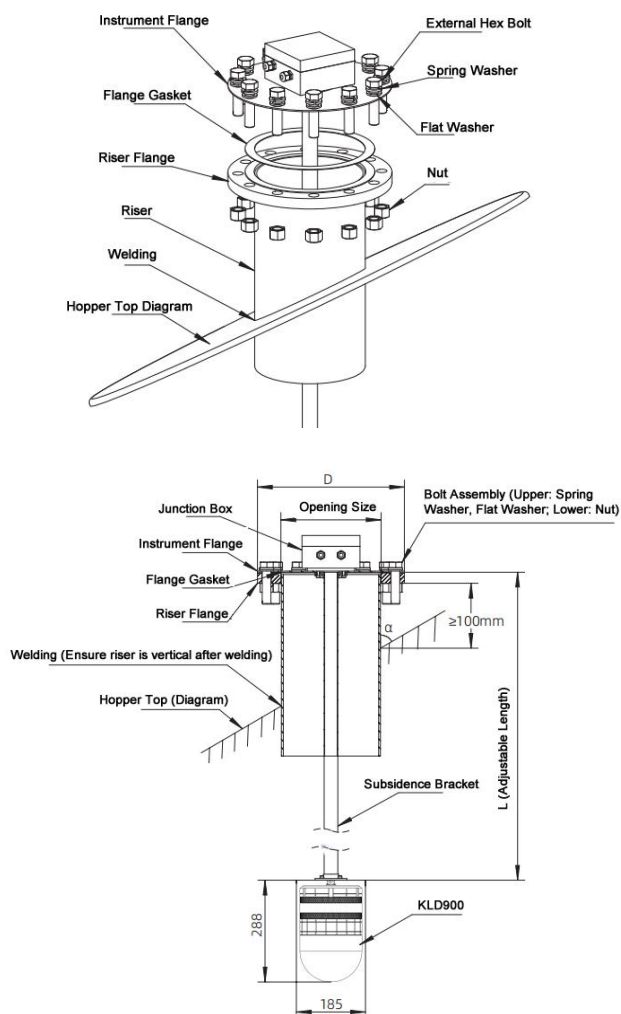
- 1) After cutting the opening on the hopper top, weld the riser directly in place and secure it for installation.

Exploded View Diagram



Flange Type	Flange Outer Diameter	Exposed Riser Height	Tank Top Opening Size	α	Matching Bolts		Installation Steps
DN300	460mm	≥ 100 mm	328mm	(Angle between Tank Slope and Vertical Direction)	Galvanized Hex Bolt M24×100 With elastic washer and gasket on top, nut on bottom	Quantity: 12 sets	1. Weld the riser of the flange to the opening of the tank top, and then verify that the riser is vertically downward; 2. Fasten the riser bottom flange, flange gasket and instrument flange with matching bolt sets.
DN350	520mm	≥ 100 mm	381mm			Quantity: 16 sets	

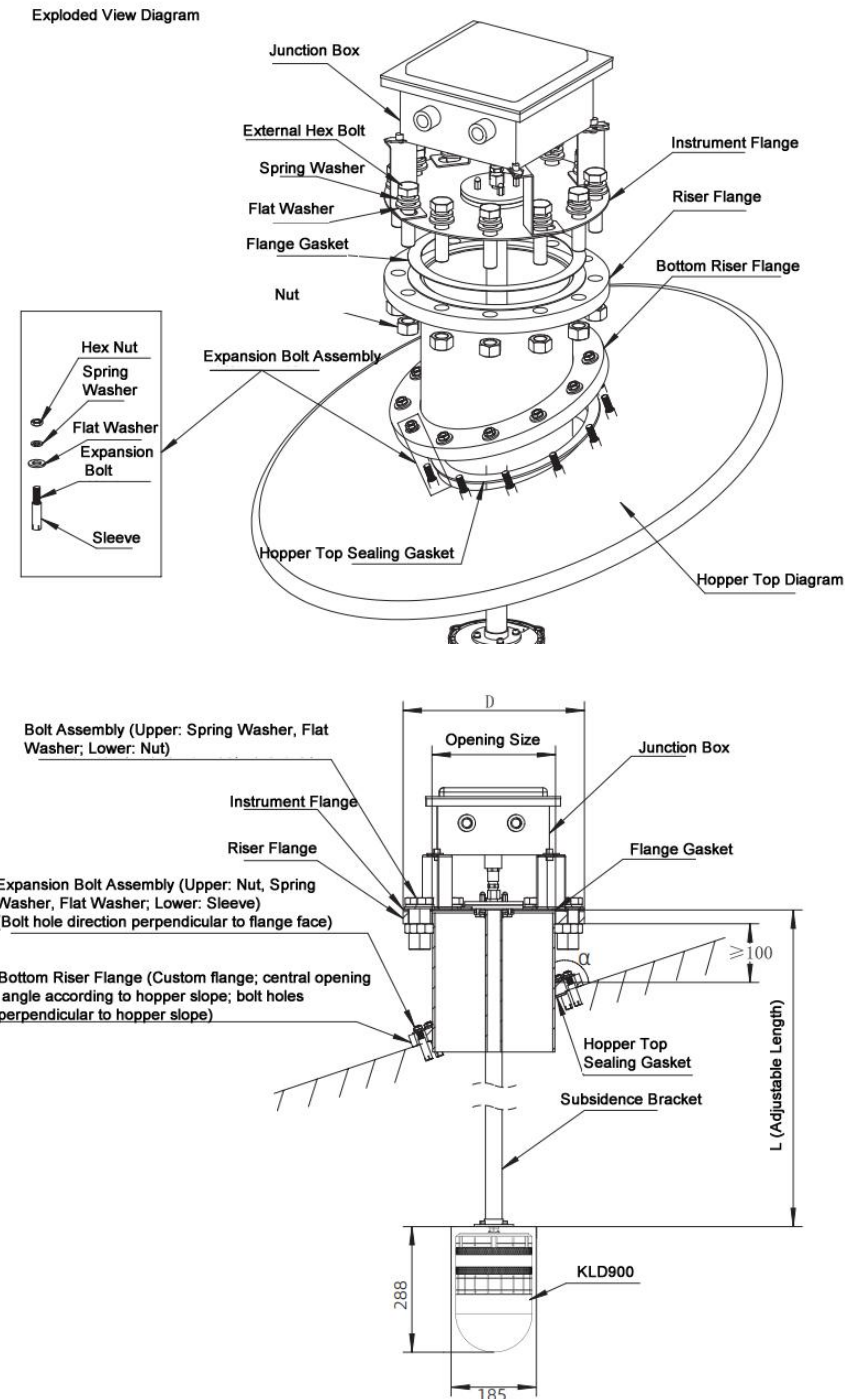
Exploded View Diagram



Flange Type	Flange Outer Diameter	Exposed Riser Height	Tank Top Opening Size	α	Matching Bolts		Installation Steps
DN300	460mm	≥100mm	328mm	(Angle between Tank Slope and Vertical Direction)	Galvanized Hex Bolt M24×100 With elastic washer and gasket on top, nut on bottom	Quantity: 12 sets	1. Weld the riser of the flange to the opening of the tank top, and then verify that the riser is vertically downward; 2. Fasten the riser bottom flange, flange gasket and instrument flange with matching bolt sets.
DN350	520mm	≥100mm	381mm			Quantity: 16 sets	

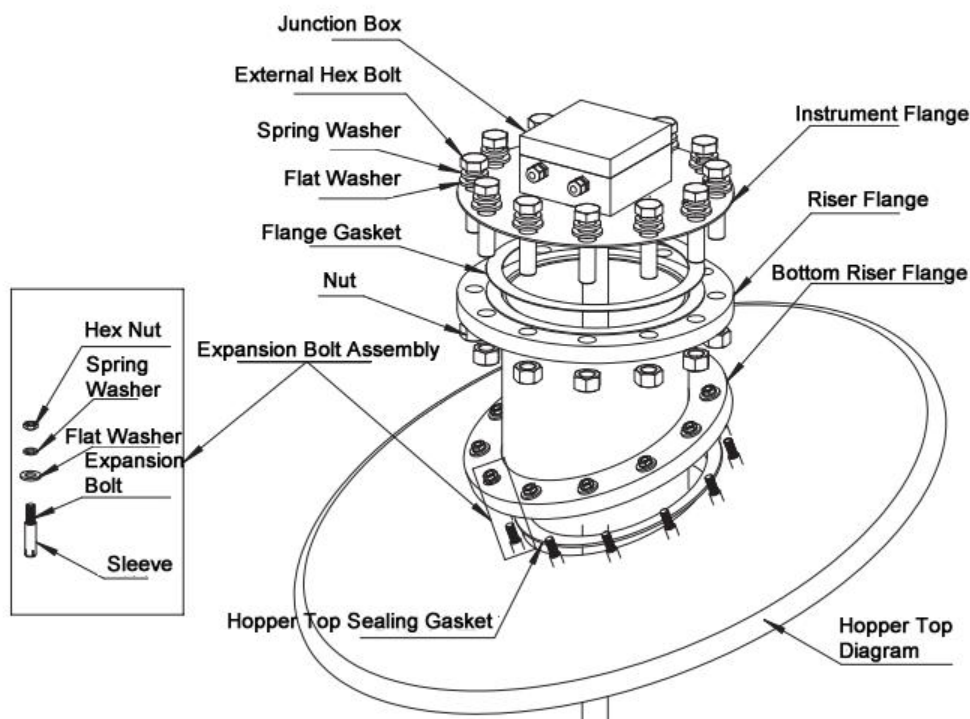
- 2) For a sloped silo roof made of steel plate or concrete, after opening the roof, the bottom flange of the standpipe can be directly fixed to the roof using bolts.

Note: For this installation method, the sealing between the standpipe bottom flange and the silo roof must be considered.

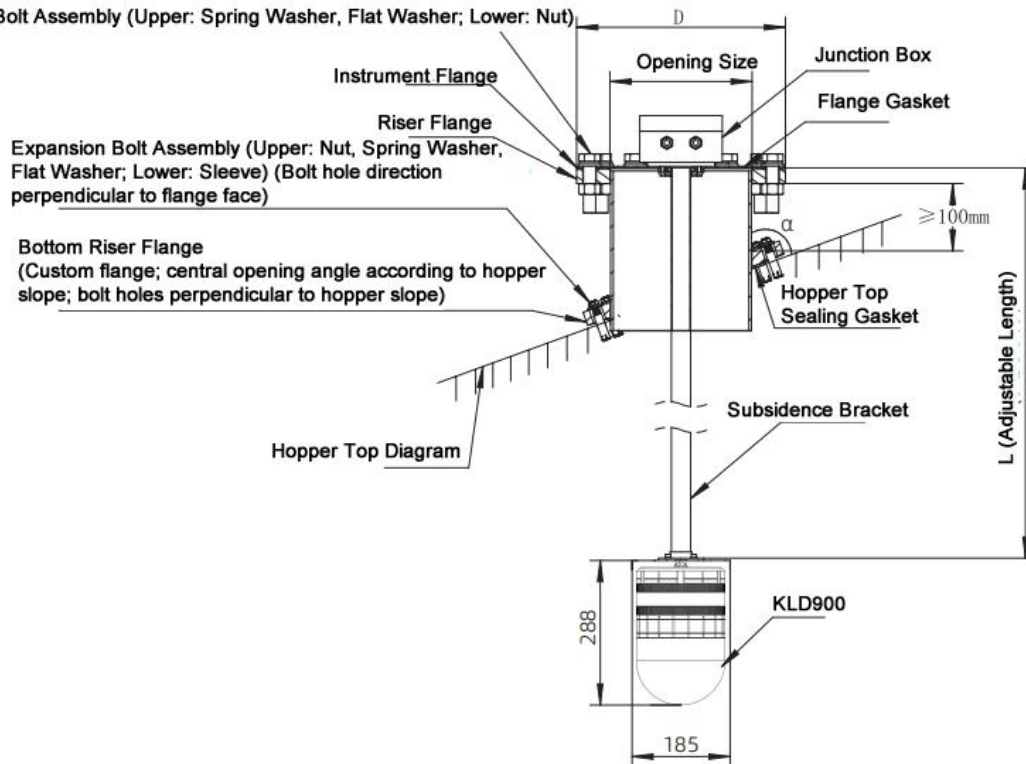


Flange Type	Flange Outer Diameter	Exposed Riser Height	Tank Top Opening Size	α	Matching Bolts		Matching Expansion Screws		Installation Steps
DN300	460mm	$\geq 100\text{mm}$	328mm	(Angle between Tank Slope and Vertical Direction)	Galvanized Hex Bolt M24×100 With elastic washer and gasket on top, nut on bottom	Quantity 12 sets	Expansion Screw M12×80 With hex nut, elastic washer, flat washer (M16×30×3) on top, sleeve on bottom	Quantity 12 sets	1. Drill holes at the marked positions using a drill bit matching the diameter of the expansion screw sleeve; 2. Install the expansion screw sleeve by gently tapping it into the drilled hole with a small hammer; 3. Fasten the riser bottom flange and the tank top with expansion screws.
DN350	520mm	$\geq 100\text{mm}$	381mm			Quantity 16 sets		Quantity 16 sets	

Exploded View Diagram



Bolt Assembly (Upper: Spring Washer, Flat Washer; Lower: Nut)



Flange Type	Flange Outer Diameter	Exposed Riser Height	Tank Top Opening Size	α	Matching Bolts		Matching Expansion Screws		Installation Steps
DN300	460mm	$\geq 100\text{mm}$	328mm	(Angle between Tank Slope and Vertical Direction)	Galvanized Hex Bolt M24×100 With elastic washer and gasket on top, nut on bottom	Quantity 12 sets	Expansion Screw M12×80 With hex nut, elastic washer, flat washer (M16×30×3) on top, sleeve on bottom	Quantity 12 sets	2. Drill holes at the marked positions using a drill bit matching the diameter of the expansion screw sleeve; 2. Install the expansion screw sleeve by gently tapping it into the drilled hole with a small hammer; 3. Fasten the riser bottom flange and the tank top with expansion screws.
DN350	520mm	$\geq 100\text{mm}$	381mm			Quantity 16 sets		Quantity 16 sets	

4.3 Installation Instructions

The installation methods and dimensions listed in 4.2 Installation are the standard options. If the above methods or dimensions do not fit the actual site conditions, the customer may consult with the manufacturer's technical personnel, and the installation plan provided after such communication shall prevail.

Whether a lowering bracket is required and the length of the bracket depend on the structure of the silo and the installation location. If there are beams or other obstructions inside the silo at the installation location that may interfere with the measurement signal, the 3D Radar Level Sensor must be lowered into the silo to avoid these obstacles and improve measurement reliability and accuracy. In addition, if there are no beams or other obstructions at the installation location inside the silo, and after installation the bottom end of the 3D Radar Level Sensor can protrude at least 20 cm into the silo, the lowering bracket may be omitted.

3D Radar Level Sensor has a measurement blind zone; materials entering this zone cannot be detected, potentially leading to material submerging the radar or even overflowing the silo. Therefore, after installation, the highest material level (generally directly below the feed inlet) must be controlled to be below the bottom of the 3D Radar Level Sensor. Furthermore, because the 3D Radar Level Sensor's pitch angle is too large (greater than 45 degrees), the echo signal reflected from the material surface is often not well received, reducing measurement accuracy or even preventing measurement altogether. Therefore, the 3D Radar Level Sensor's pitch angle is generally set to -45° to $+45^\circ$. Based on the

relative position of the 3D Radar Level Sensor to the feed inlet and the angle of repose of solid materials, it is recommended that the distance between the highest material level and the bottom of the 3D Radar Level Sensor be >1m. The closer the feed inlet is to the 3D Radar Level Sensor, the greater the distance between the highest material level and the bottom of the radar needs to be to ensure stable and reliable measurement.

5. Wiring Diagram for the Top of the Silo

Because different sites may have different requirements for wiring and the placement of the electrical control box—such as requiring cable routing through grooves on the silo roof, routing along the trestle, or placing the control box only in the centralized control room on one side of the silo—different top-of-silo wiring diagrams may be needed. Several typical wiring diagrams are provided below. If they cannot meet the on-site requirements, please contact the manufacturer to obtain a wiring diagram based on the actual site conditions.

Notes:

1) Two types of junction boxes are shown in the top-of-silo wiring diagrams:

When the junction box is labeled in **black**, it indicates a standard model with a smaller size.

When the junction box is labeled in **red**, it indicates that a switch is installed inside the junction box. This type is larger and used for network signal aggregation and extending network transmission distance.

2) Specification for 220 VAC power cables:

At least 3-core $\times$ 3 mm² shielded cable, outer diameter 7 mm – 10 mm.

3) Specification for 24 VDC power cables:

At least 2-core $\times$ 1.5 mm² shielded cable, outer diameter 7 mm – 10 mm.

4) Specification for network cables:

Category 6A or above, dual-shielded network cable, outer diameter 7 mm – 10 mm.