



# **SP SERIES MAGNETOSTRICTIVE DENSITY PROBE**

**User Manual**

**ZHENGZHOU WINDBELL MEASUREMENT AND CONTROL TECHNOLOGY CO., LTD**

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## INTRODUCTION

Welcome to choose Automatic Tank Gauging (ATGs) System of Windbell. You are strongly recommended to read this manual before installation.

The installation and maintenance for the products must be done by the qualified technicians.

### **Safety Instruction**

- The ATG system is installed in gas station and oil depot, please read safety instructions for explosion protection.
- No power during installation.
- The cable from probe must be connected to Windbell GSB03 safety barrier.
- The products are prohibited to be installed in explosion proof area over its own Ex level.
- The console and printer must be installed in safe area, such as office.



### **Safety Warning**

The tank must have earth bus-bar; the earth must be safe and reliable.

ATG system must share the same earthing with tank.

### **Unpack and Check**

Please check all the materials according to the list. If anything missed, please contact the local representative or distributor directly. You can also find the contact information of Windbell in this manual.

### **Quality Track Card**

After installation, please post the Warranty card to Service Department of Windbell for timely and rightly service in future. Thank you very much!

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## 1. Brief Introduction

Windbell SP series magnetostrictive probe take advantages of Wiedemann effect, Villari effect and ultrasonic effect of intelligence material, convert displacement information to time value which most easily to be measured with high-precision, so achieve high accuracy measuring for liquid level. Because of few mechanical parts, magnetostrictive probe have distinct features as high reliability, easy installation and wide application, etc.

Magnetostrictive probe is mainly composed of probe head, temperature sensors, protection steel pipe, magnetostrictive waveguide wire and floaters with magnet inside. Install probe into the riser pipe of oil tank, insert protection steel rod into liquid in underground tank, floaters float on the liquid surface, and slides up and down on rod according to the changes of liquid level. Processing measured data of product level, water level and average temperature of five-points, then transmit these data to smart console by digital communication port.

Control board of probe is composed of CPU, instrumentation amplifier circuit and communication circuit. CPU adopts high-frequency processor, to ensure the instantaneity and reliability of data sampling. High-accuracy instrumentation amplifier circuit guarantee the authenticity of sampled data waveform. And digital communication guarantee the reliability and anti-jamming of data remote transmission.

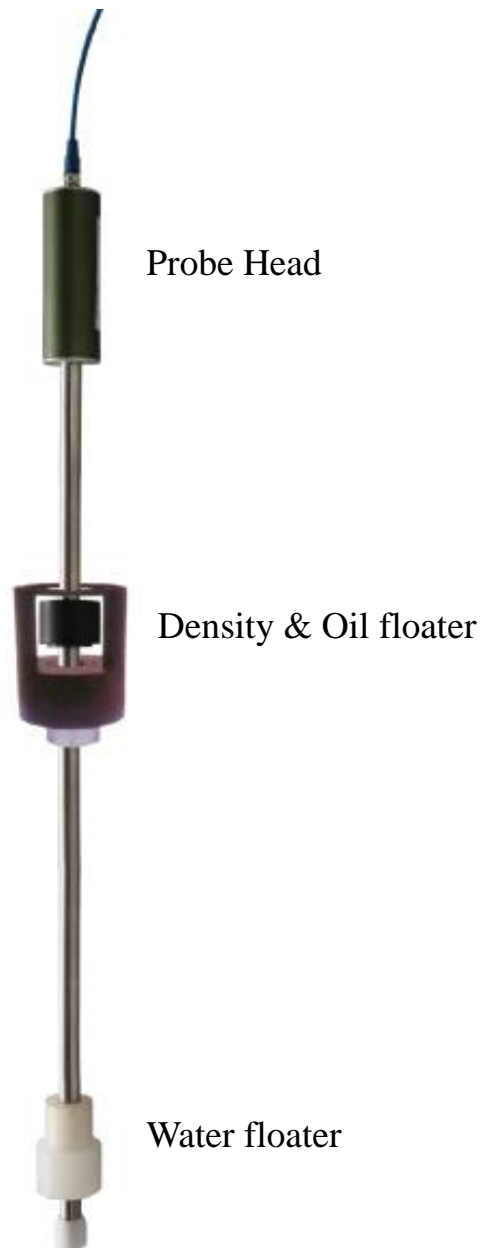
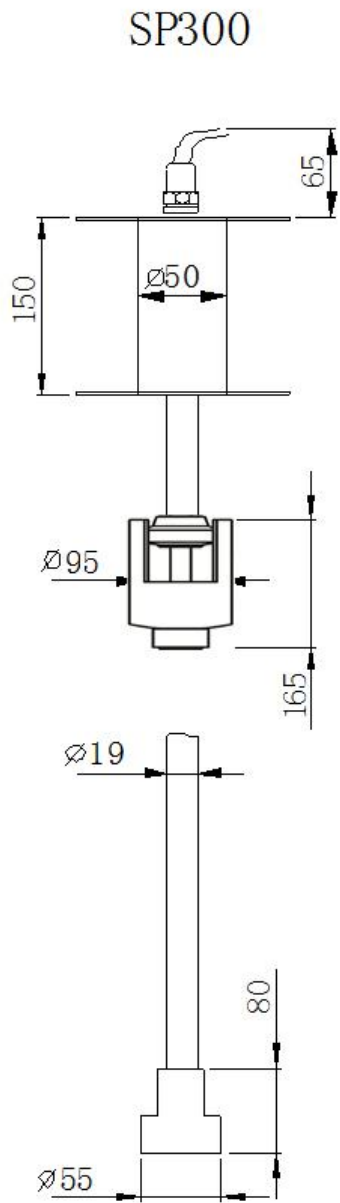


## 2. Technical Parameters

### 2.1 Electrical parameters of probe

Power supply	DC12V, 50mA
Precision	±0.5mm;
Repeatability	±0.2mm
Resolution of product level	0.01mm
Resolution of temperature	0.0625°C
Resolution of water level	0.01mm
Operating temperature range	-40°C ~ 60°C (-40 to 140°F)
Points of temperature measured	5
Maximum communication distance	1200m
Communication mode	RS485
Intrinsic safety parameter	Power port: $U_i = 15V, I_i = 400mA, P_i = 1.5W, C_i = 4.85\mu F, L_i = 0;$
	Signal port: $U_i = 7.14V, I_i = 147mA, P_i = 0.26W, C_i = 50\mu F, L_i = 0;$
Mark of explosion proof	Exia II AT4 Ga
Protection grade	IP67
Associated apparatus	Windbell GSB03 safety barrier
Definition of power cable	BLUE – POWER+ BROWN–RS-485A WHITE–RS-485B BLACK – POWER-
Applicable medium	Gasoline, kerosene, diesel, light oil, alcohol mixture
Communication address	6 digits, please see “Manufacturing Code ” on nameplate of probe = Probe ID

2.2 Outline Dimension



Oil floater



Water floater



Density floater

### 2.3 Density measurement

#### Technical of Density floater and oil floater kits

Technical parameters	Measure range	Accuracy	Resolution	Size
Value	690Kg/m <sup>3</sup> ~ 900 Kg/m <sup>3</sup>	3 Kg/m <sup>3</sup>	0.1 Kg/m <sup>3</sup>	95mm

Density floater is made of light nitrile rubber foam; surface area is 7829 mm<sup>2</sup>(except upper openings).

We add a layer of oil resistant epoxy antistatic coating on floater surface, the surface resistance is range from 105 to 110 MΩ after dried, completely accords with the antistatic demand of non-metal materials.

The main component of this coating is epoxy resin, epoxy toughening agent, conductive powder, and rust resisting pigments, fillers and additives modified amine.

This coating have remarkable advantages, stability, acid and salt resisting, resistance to water, organic solvents, crude oil, gasoline, diesel, kerosene, lubricating oil, soybean oil and oil residue,

### 3. Installation and Construction in Petrol Station

The installation quality of ATG system and its accessories have a close bearing on safety, service quality, measuring accuracy and lifetime.

In order to operate safely, please comply with this manual. If it is out of accord with local regulation, please install and operate according to local regulation.

#### 3.1 Attention and requirement during installation

The probe should keep away from the delivery pipe and suction pipe at least 1 meter. Otherwise, the oil flow will have an influence on the probe performance, even bend and damage the probe.

During the installation, the outlet direction of delivery pipe should be opposite the probe.

Riser pipe must be welded vertically (vertical to horizontal line not the manhole cover), insert into manhole cover but not more than 100mm. Inner wall of riser pipe must be smooth and no welding slag. Correct installation please see Fig. 1 as below.

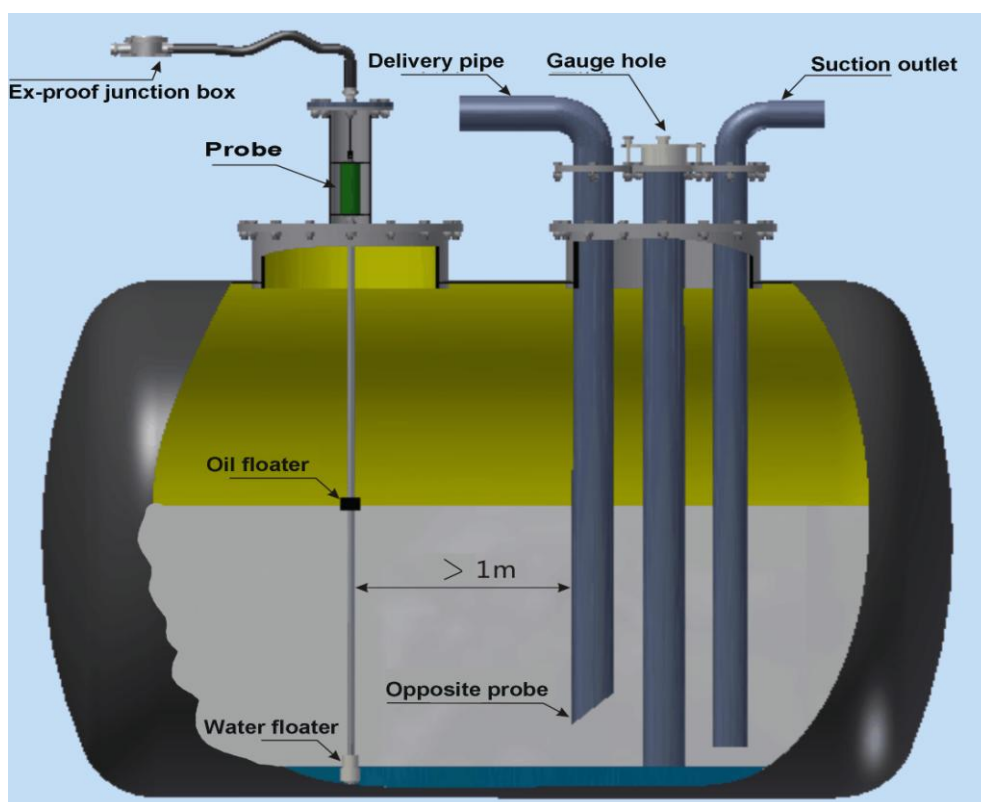


Fig. 1



### 3.2 Installation of riser pipe and its flange

For Windbell probe, inner diameter of riser pipe is 100mm (4"). Length of the riser pipe should be more or equal to 350mm, design please refer to Fig. 2.

Open a cable hole on the center of blind flange, fix G1/2 screw for cable pass and seal. Flange design please refer to Fig. 3.

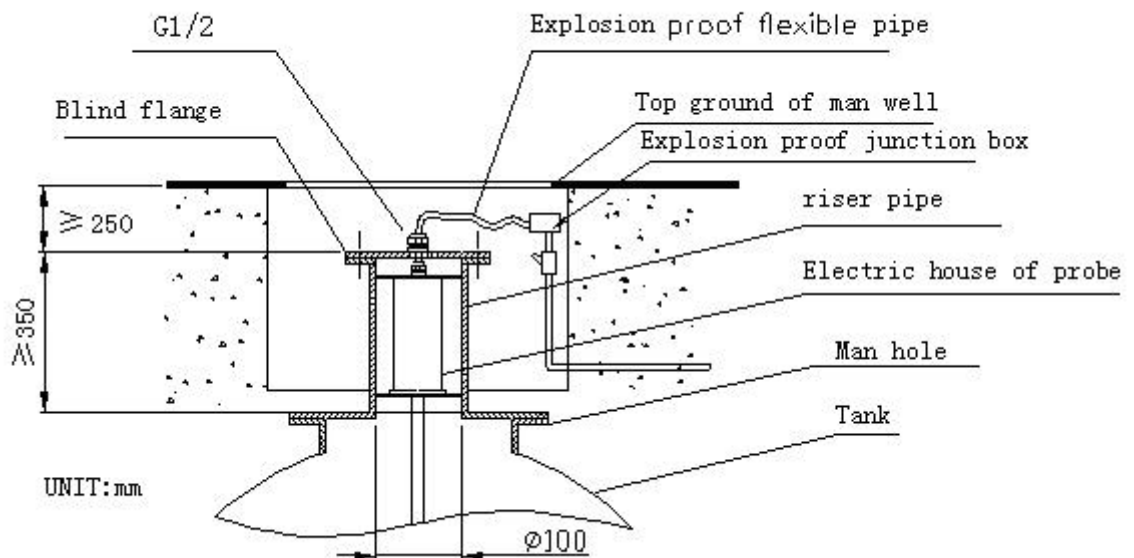


Fig. 2

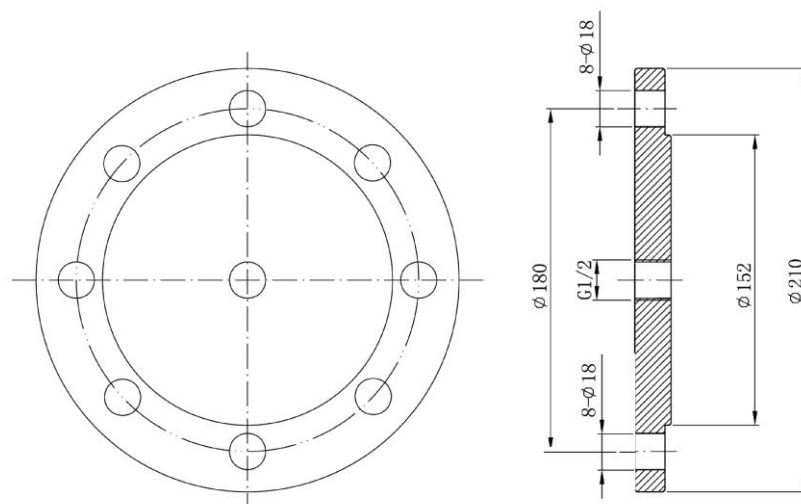


Fig. 3

### 3.3 Construction requirements of manhole

- Man-well opening should be larger than 800×800mm, convenient for construction and equipment installation.
- Man-well opening must have a enclosing wall higher than 300mm, to avoid outside water penetrating into man-well. Man-well also has cover above.
- The distance between man well opening and blind flange of riser pipe should be more than 250mm, for the installation of explosion proof flexible pipe.
- There must be asbestos pad between riser pipe flange and blind flange, and do not forget to joint the two flanges with sheet copper.
- Grounding sheet iron must be reliable connected to the earth system of underground tanks, earth resistance should less than 1 Ω.
- Earth wire should be larger than 6 mm<sup>2</sup>, and connect to grounding iron reliably.

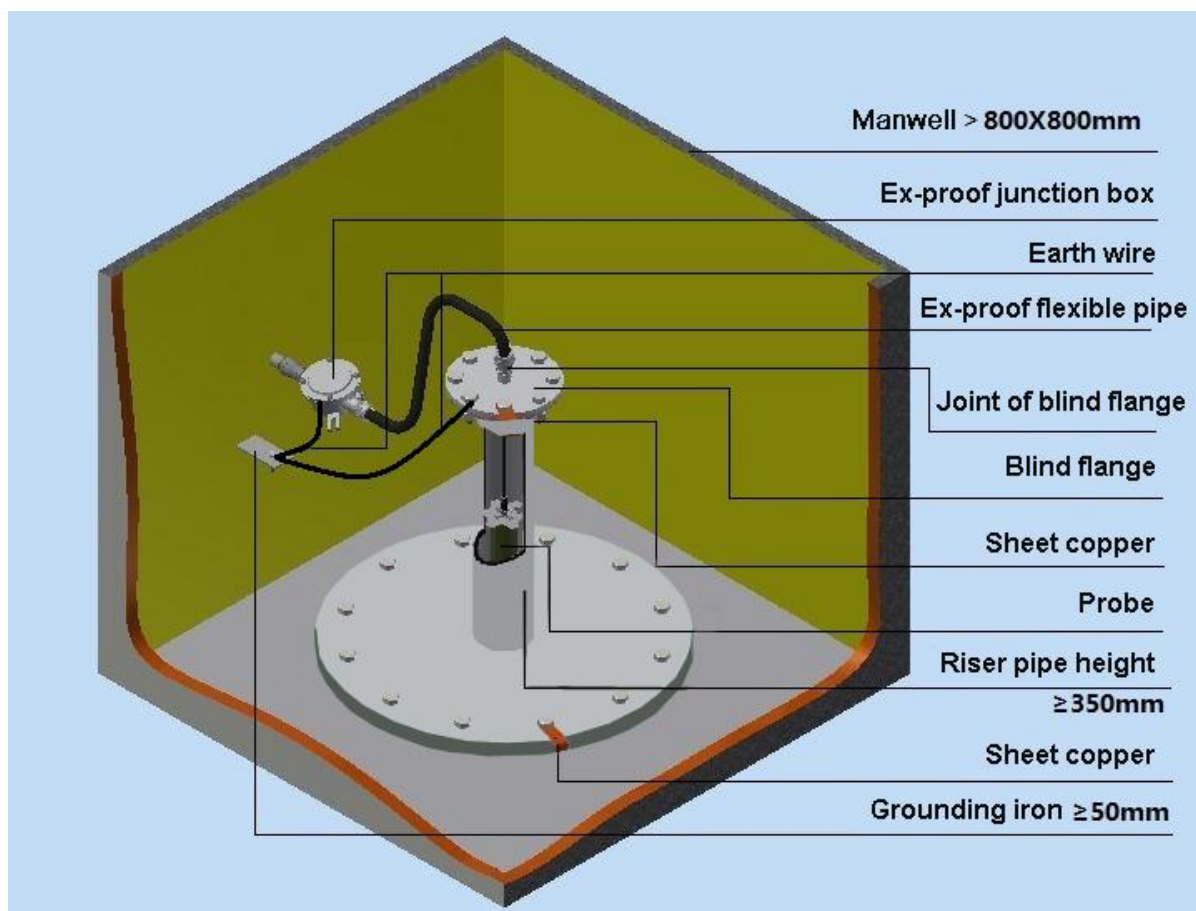


Fig 4.

### 3.4 Layout of protection steel pipe and communication cable

Please see Fig. 5 as below.

- All communication cables must go through protection steel pipe.
- When lying, protection steel pipe must be put under ground at least 300mm depth. Spacing distance between pipes must be at least 200mm.
- Corner of protection steel pipe must be one-round turn for cable to through easily.
- Each cable of probe must be put in separate pipe.
- The cable from smart console to probe must be complete one, shouldn't have any joint.
- For safety, we recommend use RVVP4×0.5 (or larger) shield cable and must accord with the requirement of capacitance per foot not more than 100pF, length of cable should be less than 300m. Shielding layer of cable from probe must be coupled with PE port of console, the shielding layer of cable in explosion proof junction box should be wrap up well by insulating tape,
- There should be a grounding terminal on the protection steel pipe, and must reliably connect with the earth system of gas station.
- The end of pipe which inside control room must be injected into explosion proof sealant, to ensure reliable sealing and avoid vapor going into room.

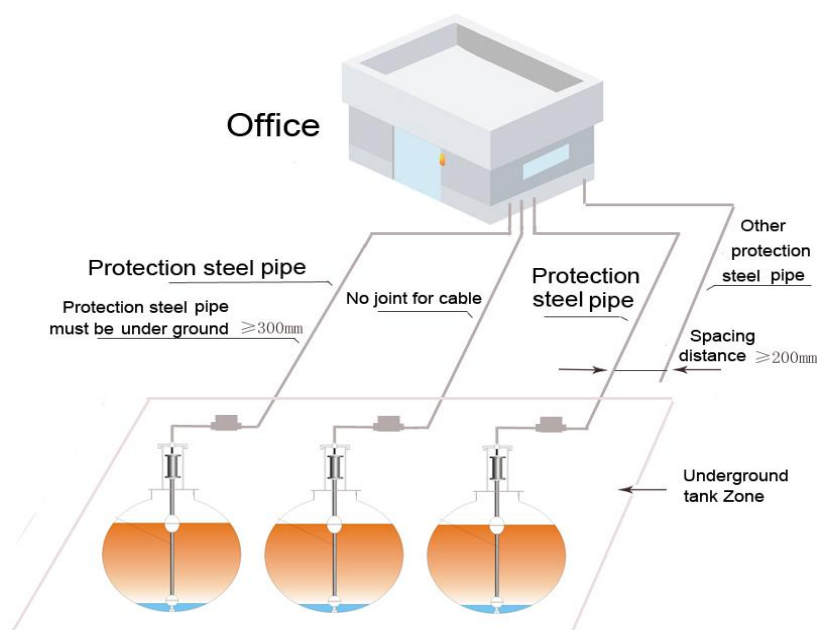


Fig 5.

 **Safety warning**

To ensure the safety of gas station and guarantee the normal work of the system, the anti-lightning system of gas station should be able to protect the whole ATG system, and should reserve earth port for the anti-lightning system.

**Notice**

- For probe is high-precision product, please handle gently during move and installation.
- During installation, please keep vertical of probe, otherwise will affect the accuracy of measurement.
- Don't draw-off communication cable of probe when installation.

- Take probe out of package box.
- Record "Manufacturing Code" on nameplate of probe, later communication setting will use it.
- Remove foam package of probe.
- Install fixed plate at both ends of electric house.
- Plug communication cable into the socket at top of electric house and screw it tightly.
- Carefully put oil floater and water floater at the bottom of probe.
- Put probe into oil tank carefully by two hands, then hold fixed plate and adjust probe to be vertical, installation position please see Fig. 6.

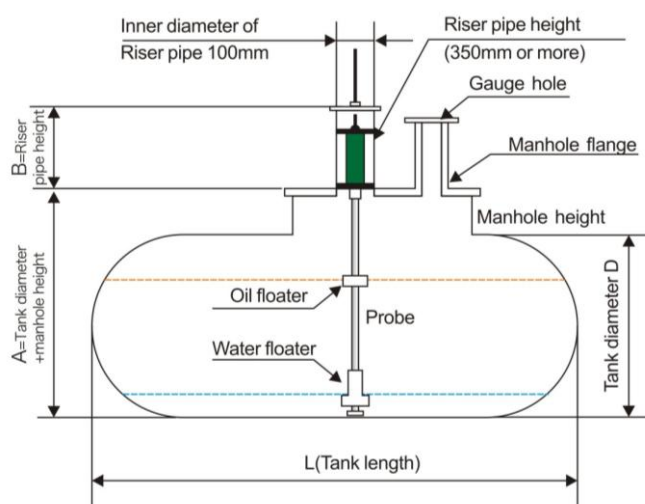


Fig. 6

 **Safety warning**

Must use anti-static tools, like copper spanner, screwdriver when installation.

### 3.6 Installation of explosion proof flexible pipe and explosion proof junction box

Details please see Fig. 7 as follows.



#### Safety warning

- Every accessory must be installed in order and the order cannot be reversed.
- Explosion-proof isolation sealed tube joint must be full filled with explosion proof daub, to prevent oil gas enters into control house through protection steel pipe.
- Cables must be tightly compressed by sealing element, to prevent the infiltration of oil and gas.
- All accessories must be screwed tightly.

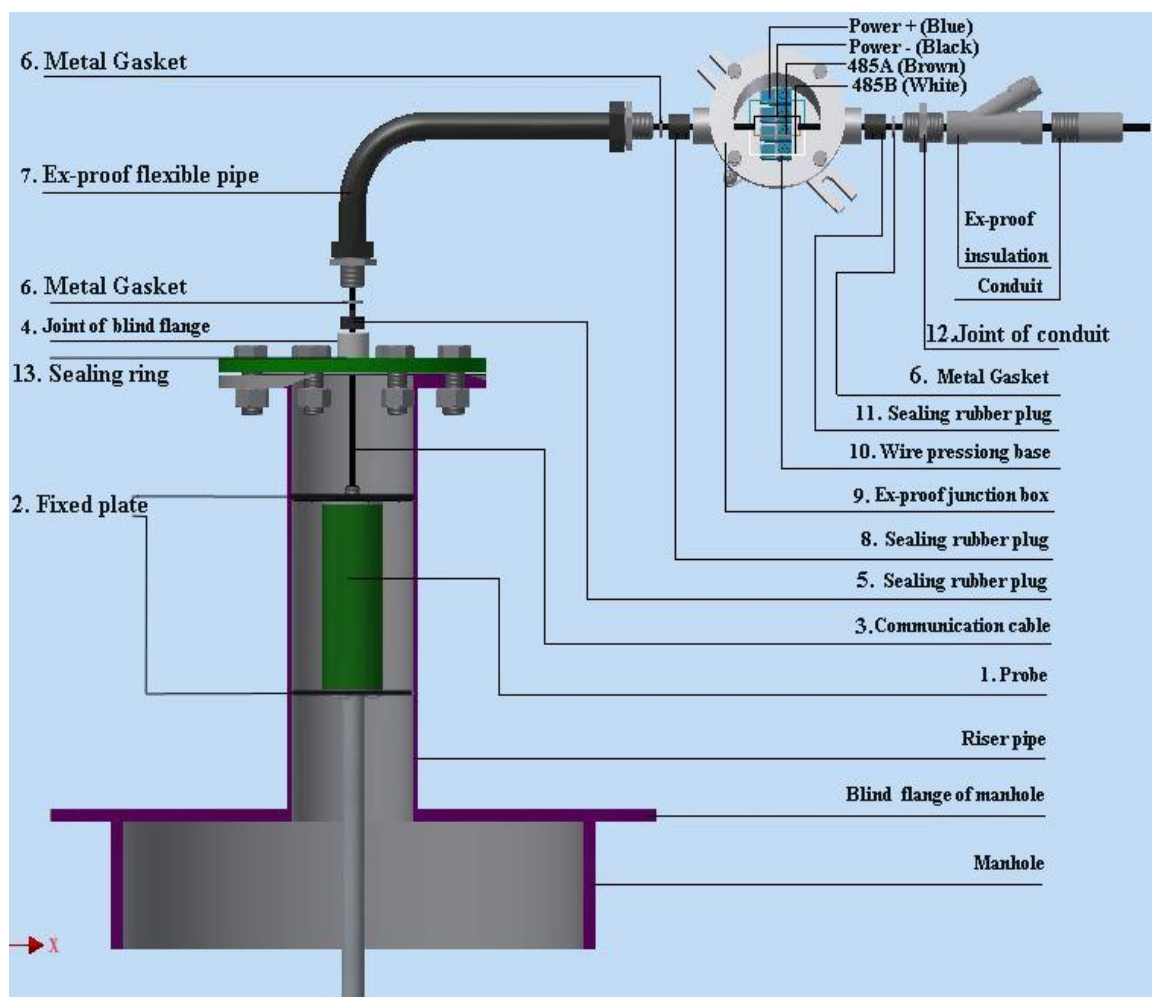


Fig. 7

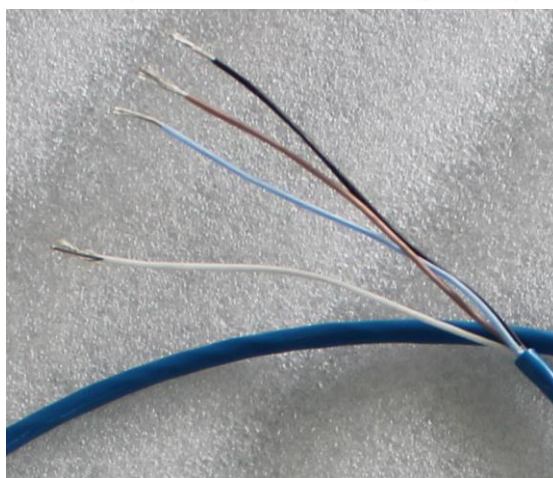
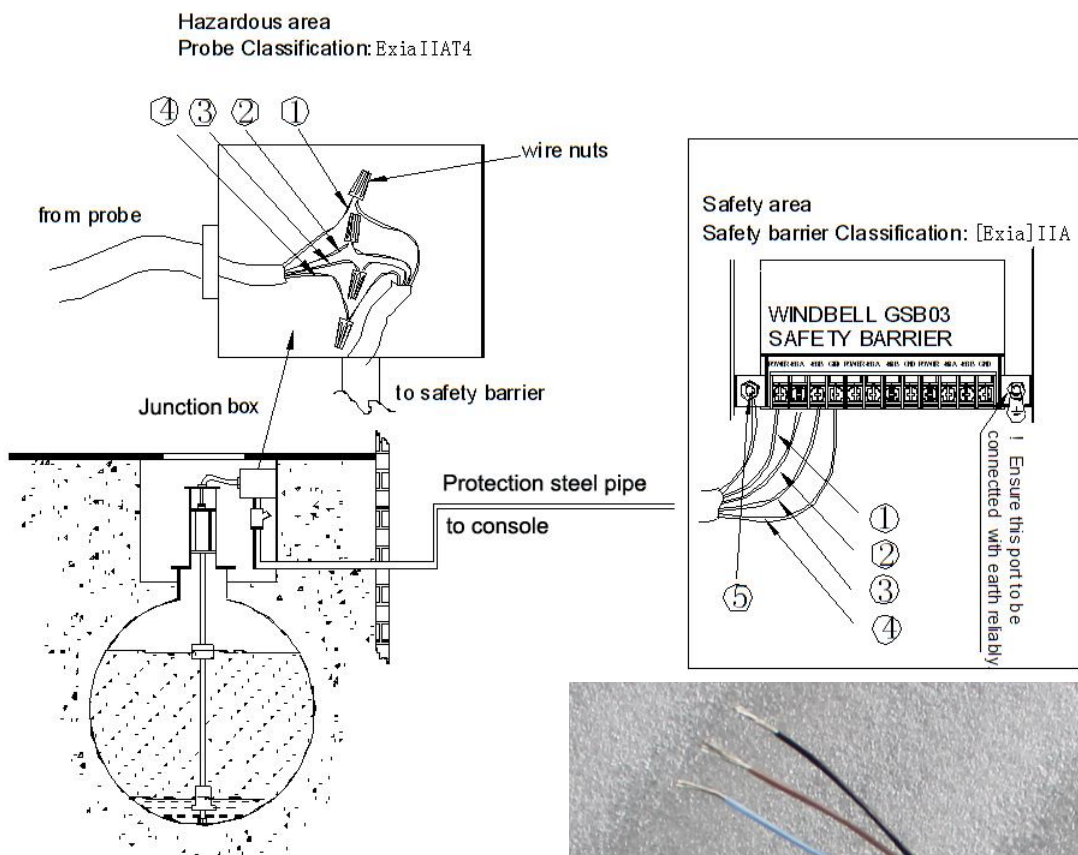
**Auxiliary material**

<b>Item</b>	<b>Name</b>	<b>Specification</b>	<b>Qty.</b>	<b>Remark</b>
1	<b>Fixed plate</b>		2	For probe fixing inside riser pipe
2	<b>Cable</b>	RS485, 4 wires	1	Communication cable
3	<b>Joint of blind flange</b>	G1/2 Male – G1/2 Female	1	For cable seal and connection with blind flange
4	<b>Sealing rubber plug</b>	Φ18×Φ5×10	1	For Ex-proof flexible pipe and joint of blind flange connection
5	<b>Metal gasket</b>	Φ18×Φ10×1	3	For sealing rubber plug
6	<b>Explosion proof flexible pipe</b>	G1/2 ×0.7 Length about 1.5m	1	Each pipe contains one group parts ( one joint and one seal gasket)at each end
7	<b>Sealing rubber plug</b>	Φ18×Φ5×18	1	For connection between Ex-proof flexible pipe and junction box
8	<b>Explosion proof junction box</b>		1	
9	<b>Water proof wire pressing base</b>		4	4 pc for each probe
10	<b>Sealing rubber plug</b>	Φ18×Φ10×18	1	For shielding cable RVVP4x0.5
11	<b>Joint of protection steel pipe</b>	G1/2 Male – G3/4 Female	1	Connect between protection steel pipe and explosion proof junction box
12	<b>Sealing ring</b>	Φ29×Φ19×2.2	1	For joint of blind flange

Table.1

### 3.7 ATG system electrical wiring diagram

The cable from probe must correctly connect to relevant safety barrier inside console. The shielding layer of cable must connect to PE of safety barrier. The safety barrier also must connect to earth reliably. As Fig.8 shown.



Cable connection table

No.	Power wires	Port of safety barrier
	Blue wire	Power (Power +)
	Brown wire	485A
	White wire	485B
	Black wire	GND (Power-)
	Shielded wire	

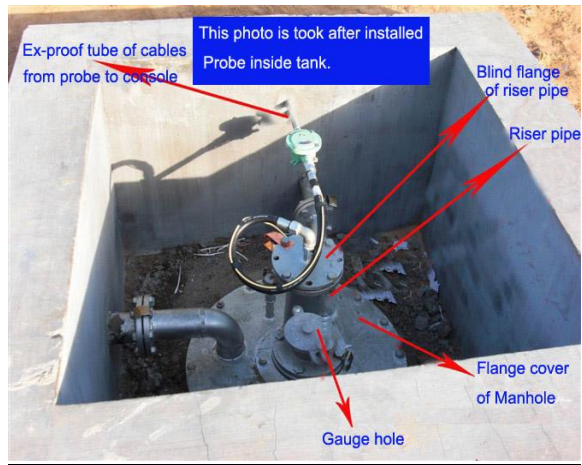
Fig 8

#### Safety warning

- Earth terminal of safety barrier should reliable connect to ground by more than 6 mm<sup>2</sup> multi-core copper cable.
- No power before right wiring.
- ATG system must share the same earthing with tank.



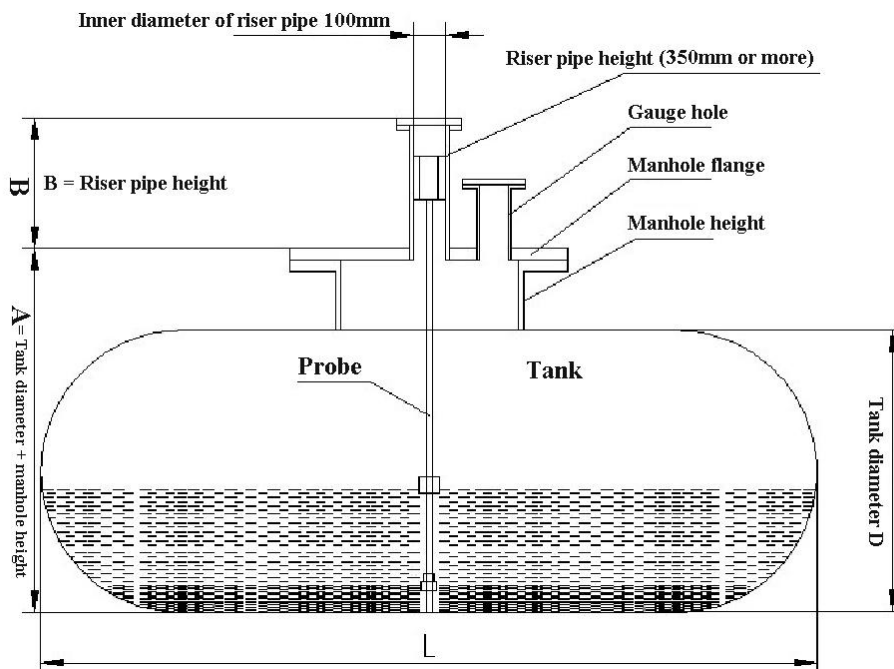
### 3.8 Tank area after installation



## 4. Selection of Probe Specification

For SP300 probe, different lengths mean different specification. For example SP300-2870, which means the model is SP300, length of probe rod (below probe head) is 2870mm. The selection of probe length as below, Probe length = A + 100mm

A = Tank diameter (height) + manhole height, so it is the height from manhole cover to tank bottom.





# **WINDBELL**

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