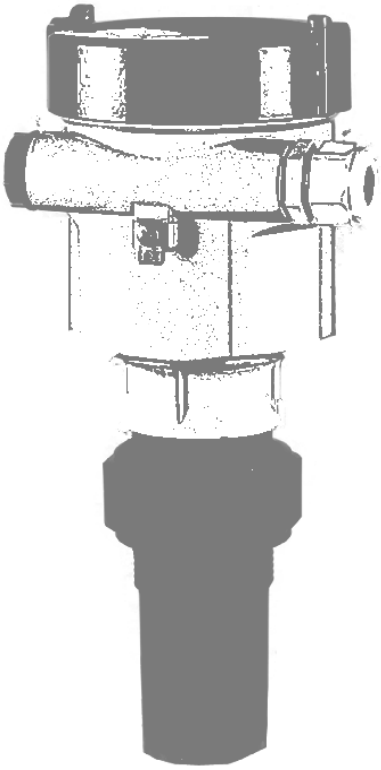
TEKSENS

ULTRASONIC LEVEL INSTRUMENT



TEKSENS

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1. Measurement Principle

Principle

Ultrasonic pulses generated by the transducer（antenna）system,which travel at the speed of soundtoward the target medium,are reflected by the surface of medium and received by the transducer system again. Due to the fact that the measurable time lapse between pulse emission and receptionby antenna is proportional to the distance between antenna and highest level of target medium, the principle of ultrasonic level instrument can be illustrated as the following equation:S=CxT/2,S:distance,C:velocity of sound,T: time lapse.

Features

Because of the certain bandwidth of pulses,the unidentifiable overlap between pulse emissionand reception arises in specified zone extending downward from transducer face, which leads to thelevel measurement malfunction.Therefore this specified zone is called measurement blanking zone.The size of measurement blanking zone differs for different models of ultrasonic level instruments.

Thanks to the advanced microprocessor and unique EchoDiscovery echo processing technology,the ultrasonic level instruments can be used under various complex conditions.

The false echo storage function assures that the instrument can detect the right echo even withthe presence of multiple false echoes and present accurate measurement results eventually.

The built-in temperature sensor inside transducer can complete temperature compensation for measurement results.

Ultrasonic transducer has adopted best patented sonic matching technology,which helps it strengthen its emission power,enhance the signal intensity and eventually achieve accurate measurement.

2 Product Overview

	ULS 6100	ULS 6200
		
Application:	Level measurement in various industrial fields,especially water treatment industry	Level measurement in various industrial fields,especially water treatment industry
Measurement Range:	Liquid: (0. 25～4)m	Liquid: (0. 4～8)m
Process Connection:	G1½A	G2A
Material for Transducer Housing:	PTFE、PU/PC	PTFE、PU/PC
Process Temperature:	(-40～70)℃	(-40～70)℃
Process Pressure:	(-0.02～0. 1)MPa	(-0.02～0. 1)MPa
Signal output:	(4～20)mA/HART	(4～20)mA/HART
Power:	2-Wire (DC24V) 4-Wire (DC24V/AC220V)	2-Wire (DC24V) 4-Wire (DC24V/AC220V)

	ULS 6300
	
Application:	Level measurement in various industrial fields
Measurement Range:	Liquids version: (0. 5～15)m
Process Connection:	Flange or swivelling holder
Material for Transducer Housing:	PU/PC
Process Temperature:	(-40～70)℃
Process Pressure:	(-0.02～0. 1)MPa
Signal output:	(4～20)mA/HART
Power:	2-Wire (DC24V) 4-Wire (DC24V/AC220V)

3. Mounting Requirement

- Basic Requirement

There is a certain existing beam angle while transducer radiating ultrasonic pulses. There should be no barriers between the lower edge of transducer and surface of target medium. Therefore it is highly recommended to avoid facilities inside vessels, such as ladders, limit switches, heating spirals, struts and etc, during the mounting process. A false echo storage must be carried out during the installation in this case.Furthermore, ultrasonic waves must not intersect the filling streams.

Be cautions during the installation when: the highest level of target medium must Not enter into blanking zone; the instrument must keep certain distance to vessel walls; every possible measure needs to be taken to positionthe instrument so that the direction of transducer emission is perpendicular to the surface of measured medium.The installation of instruments in explosion proof area must abide by relevant local or federal safety regulations.Aluminium housing should be used for intrinsically safe explosion proof version, which is also applicable in explosion proof areas. The instrument must be connected with ground in this case.

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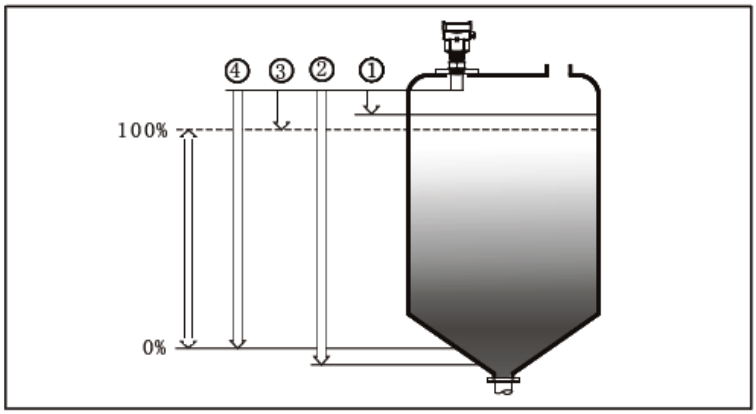
- Illustration

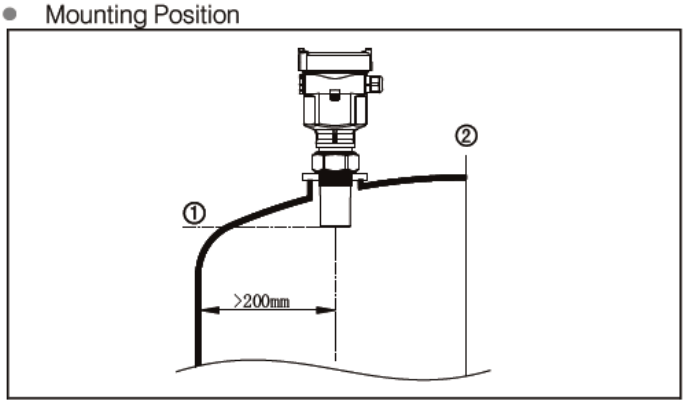


The lower edge of probe is the reference plane for measurement.

1. Blanking Zone(menu1.9)
2. Empty(menu1.8)
3. Max. Adjustment(menu1.2)
4. Min. Adjustment(menu1.1)

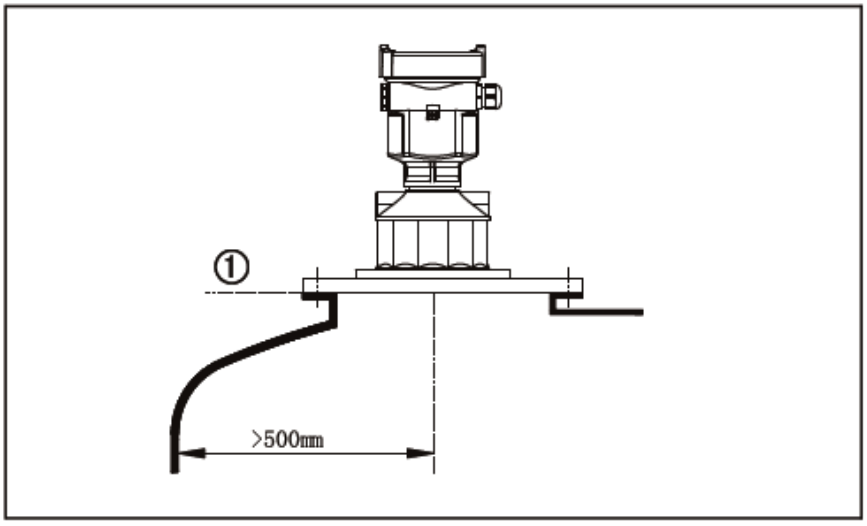
Note: The highest level of measured medium must not enter into blanking zone while ultrasonic level instrument is in operation.

- Mounting Position



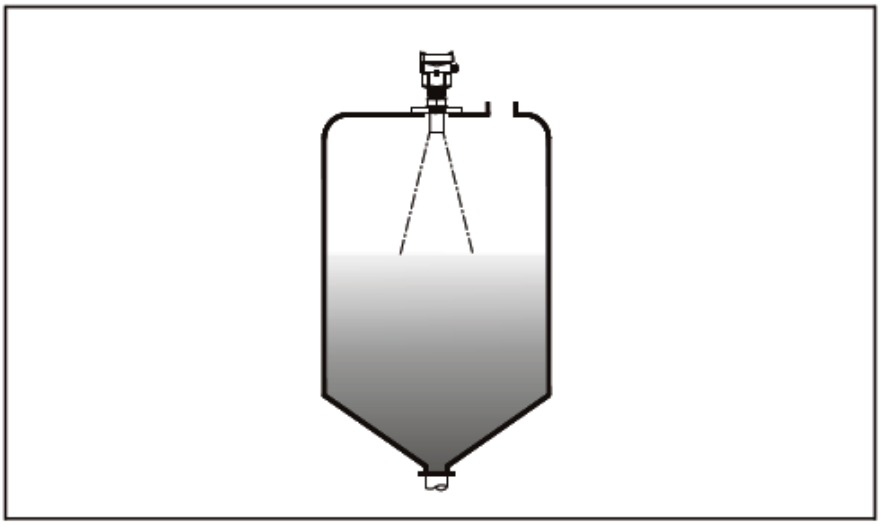
Minimum distance of 200mm between instrument and vessel wall must be assured while mounting ULS 6100 or ULS 6200

1.Reference Plane
2.Center of Vessel or Symmetrical Axis



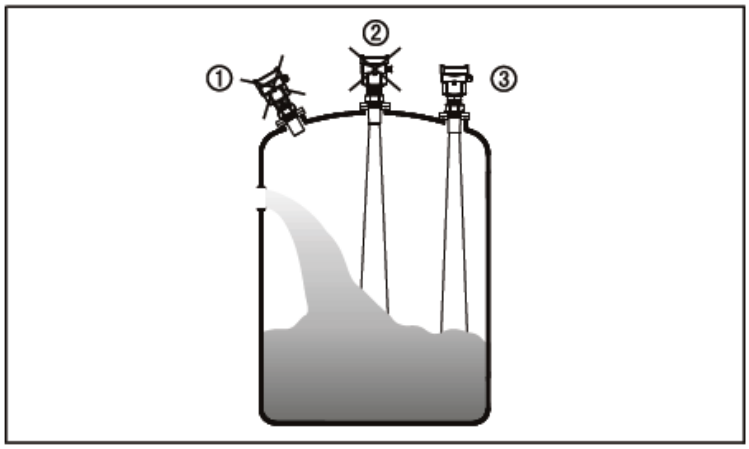
Minium distance of 500mm between instrument and vessel wall must be assured while mounting ULS 6300

1 Reference Plane

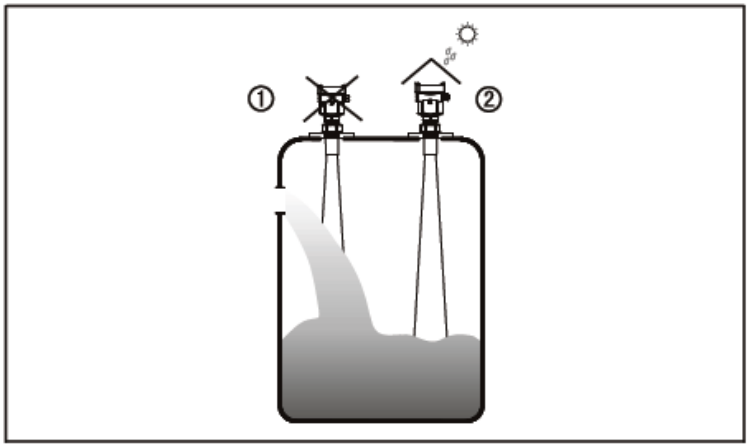


The best mounting position for a conical vessel with flat top is the center of its top, as the effective measurement can reach the bottom of vessel.

- Illustrative Diagram on Installation

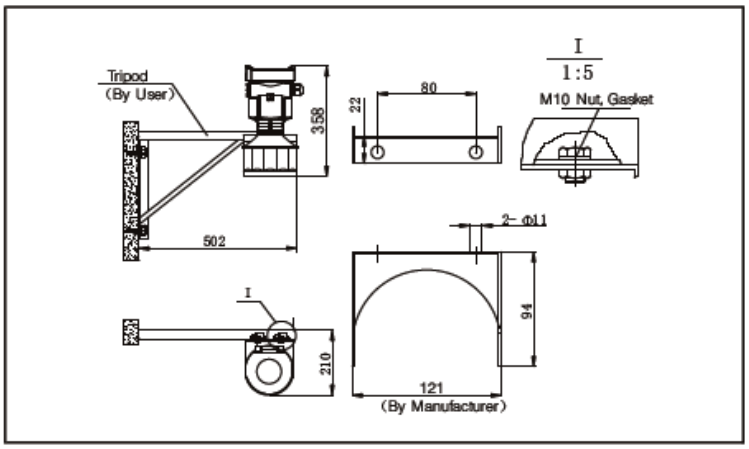


1 Wrong: Fail to turn the antenna perpendicular to the surface of target medium.
2 Wrong: Instruments are mounted in the center of concave or arched vessel tops, which results in multiple echoes.
3 Correct



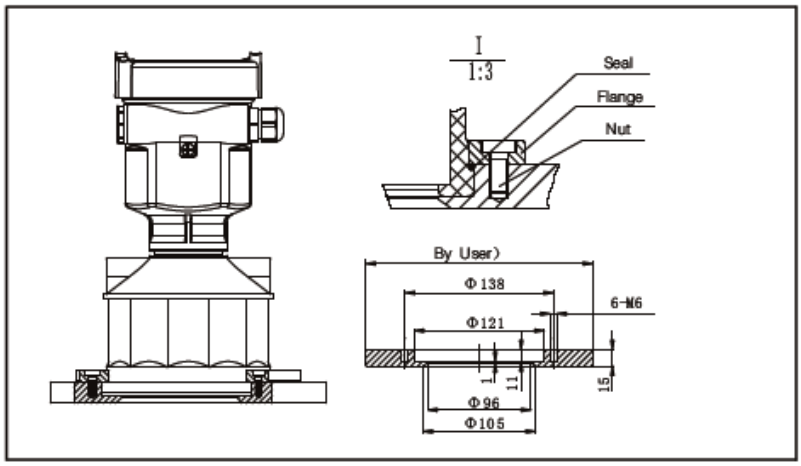
1 Wrong: Mount the instrument in/above filling stream, which results in the measurement of filling stream not the target medium
2 Correct
Note: Sun shield or rain-proof is required for outdoor mounting

- Installation Methods



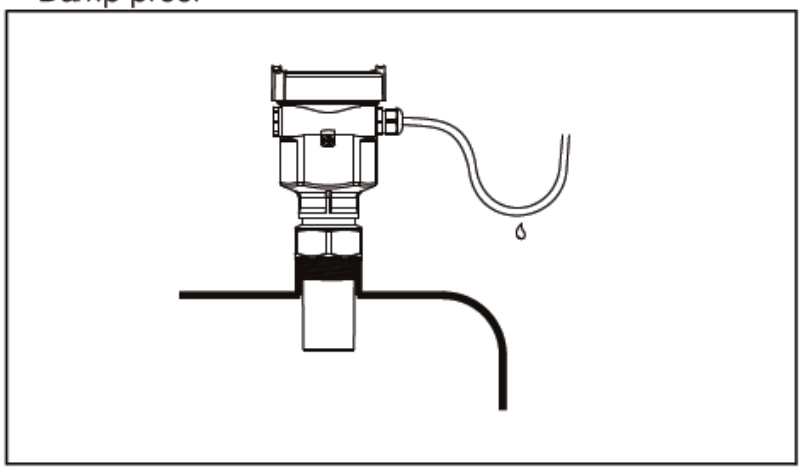
Installation with Swivelling Holder

Mount ULS 6300 with swivelling holder



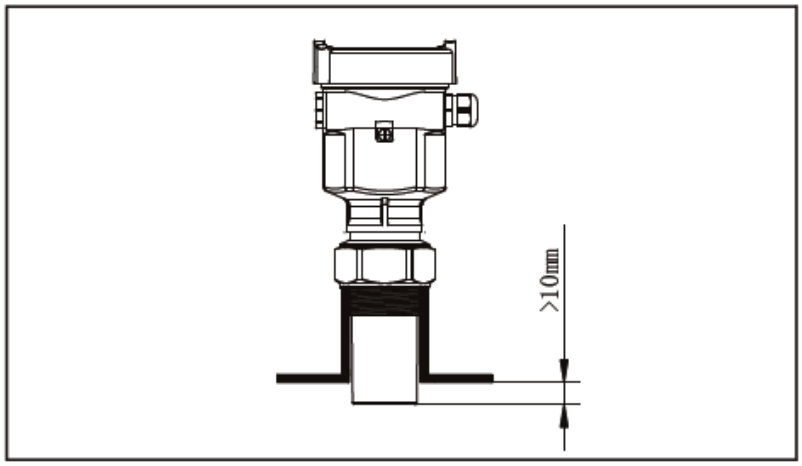
Use flange to mount ULS 6300

- Damp-proof

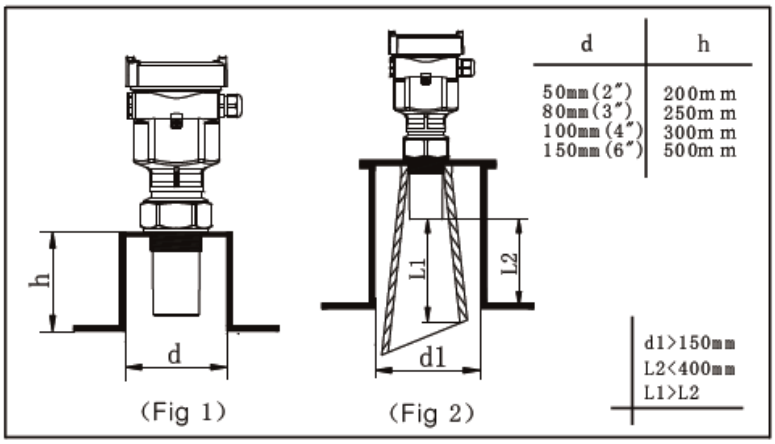


In order to avoid dampness under outdoor or humid indoor conditions or for those instruments mounted on cooling/heating vessels, seal rings used on cables should be screwed tight, plus the cable must be bended downward outside cable entry, indicated on the diagram below:

- Socket

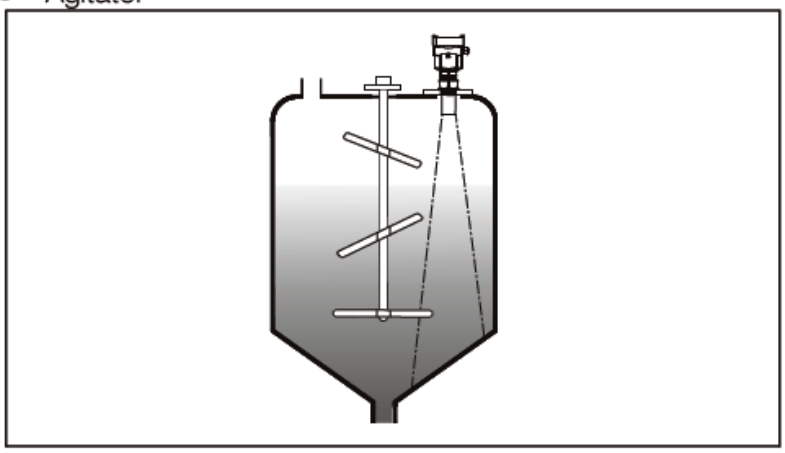


The transducer end must at least protrude 10mm out of socket.



In case of strong reflective properties of target medium (Fig 1) and big socket diameter, you can mount instruments on sockets higher than the antenna length. The recommended values for socket heights are shown in the illustration below. The socket end should be smooth and burr-free, if possible also rounded.Moreover, false echo storage must be carried out afterwards. On the contrary, if the reflective properties of medium are weak(Fig 2), you are advised to heighten the mounting position of instruments and also use a standpipe(optional) to reduce the influence caused by socket.

- Agitator



If there are agitators in vessels, instrument must be mounted as far away from agitators as possible. Once installationcompleted, a false echo storage should be carried out while agitators in motion to eliminate negative influence caused by false echo of agitators. You are advised to opt for installation with standpipe if foam or wave is generated due to the action of agitators.

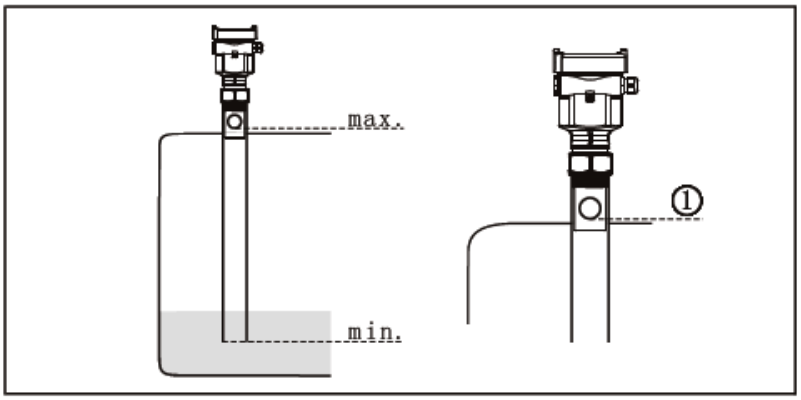
- Foam

Due to the action of filling, stirring or other processes inside vessels, dense foams are formed on the surface of some liquid medium, which could attenuate emitting signals considerably. You are advised to mount the instrument inside a standpipe or opt for a radar level instrument if the generation of foam incurs measurement errors. Guided wave radar level instrument is the best option for similar applications thanks to the fact that it is unaffected by foam generation.

- Airflow

you are advised to mount the instrument inside a standpipe or opt for a low frequency radar level instrument or radar level instrument with guided microwaves in the event of strong airflow presence in vessels, e.g., outdoor installation with gusty wind or presence of vortex inside vessels.

- Installation with Standpipe



Note: You must NOT mount instrument inside standpipe while measuring adhesive medium.

1 Vent hole of diameter（5～10）mm

You are advised to opt for installation with standpipe (or bypass tube) to avoid the influence on measurement caused by barriers inside vessels, foam generation or air vortex.
If the measurement is undertaken by ULS 6000 inside the standpipe the inner diameter of standpipe should be at least bigger than the outside diameter of transducer. Please see Dimensional Drawings for actual sizes. Avoid large cracks or welding seam when connecting standpipe. False echo storage must be carried out as well in this case.

4 Electrical Connection

● Power Supply

20mA/HART(2-Wire)

Power supply and current signal are carried by the same two-wire connection cable. See the Technical Specifications of this guide for detailed requirement on power supply. A safety barrier should be placed between power supply and instrument for intrinsically safe version.

20mA/HART(4-wire)

Power supply and current signal are carried by two 2-wire connection cables respectively. See the Technical Specifications of this guide for detailed requirement on power supply. Earth-connected current output can be used for standard version of level instruments, while the explosion proof version must be operated with a floating current output. Both instruments and earth terminals should be connected with ground firmly and securely. Normally you can either choose to connect with the earth terminal on vessel or adjacent ground in case of plastic vessels.

● Cable Connection

General Introduction

4~20mA/HART

Standard 2-wire cable with outside diameter of 5...9mm, which assures the seal effect of cable entry, can be used as feeder cable. You are recommended to use screened cables in the event of electromagnetic Connection cable with special earth wire can be used as feeder cable.

Connection cable with special earth wire can be used as feeder cable.

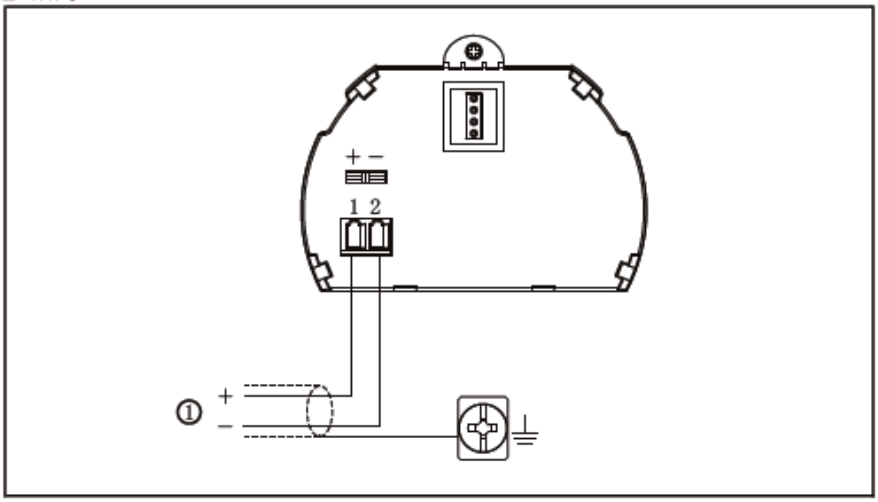
20mA/HART(4-wire)

Shielding & Grounding

The two ends of shielded cable must be connected with earth terminal. The shielded cable must be connected with inner earth terminal directly inside the transducer, while the outside earth terminal on housing must be connected with ground. In the event of earth-connected current, the shielding side of shielded cable must be connected to ground potential via a ceramic capacitor (e.g. : 1μF 1500V) in order to dampen the low frequency grounding current and avoid the disturbance caused by high frequency signal

● Wiring Diagram

2-wire

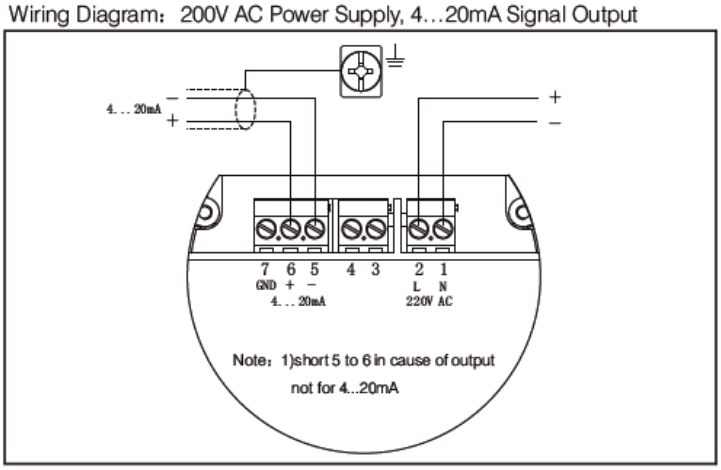


2-wire wiring used for HART

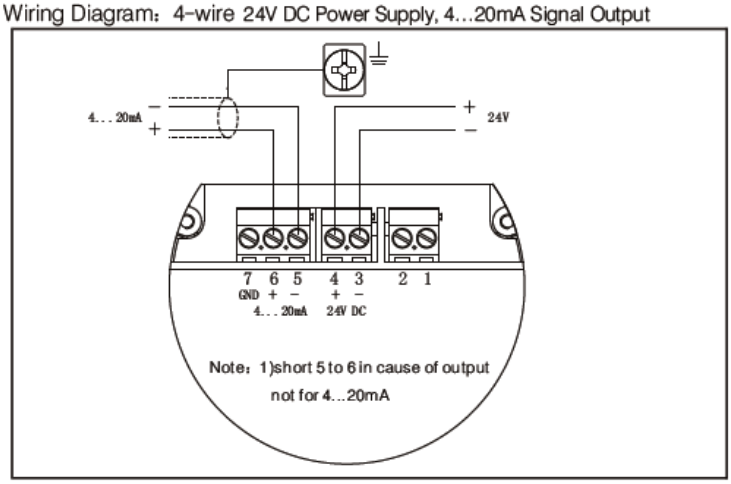
1）Power Supply and Signal Output

4-wire/2-chamber

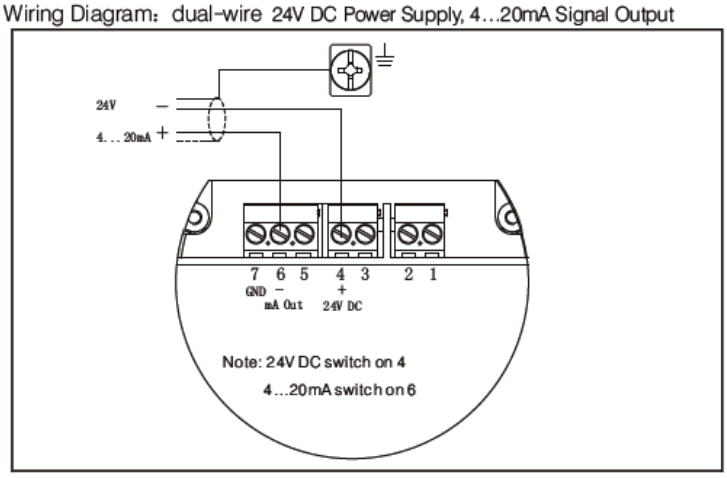
Wiring Diagram：200V AC Power Supply, 4…20mA Signal Output



Wiring Diagram：4-wire 24V DC Power Supply, 4…20mA Signal Output



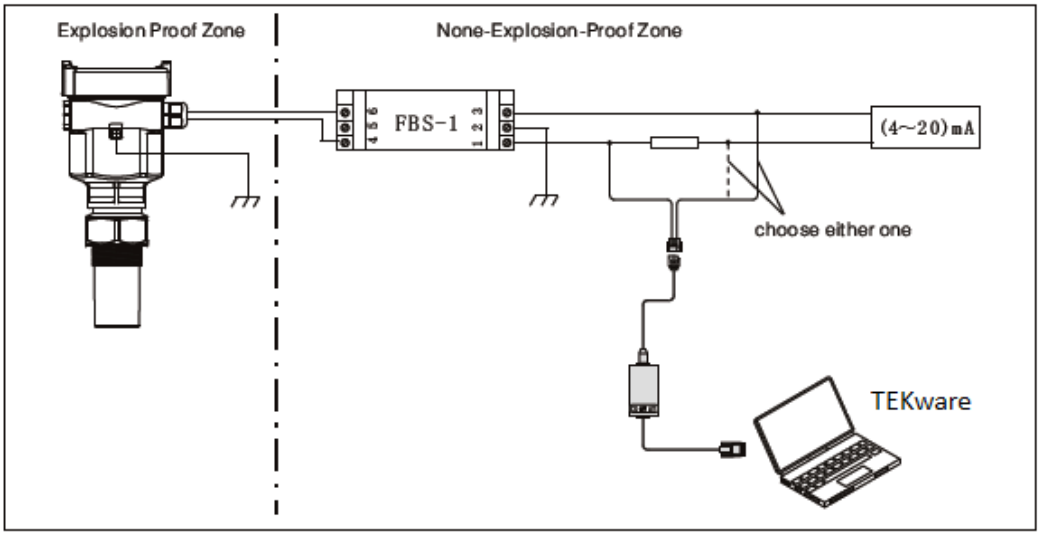
Wiring Diagram：dual-wire 24V DC Power Supply, 4…20mA Signal Output



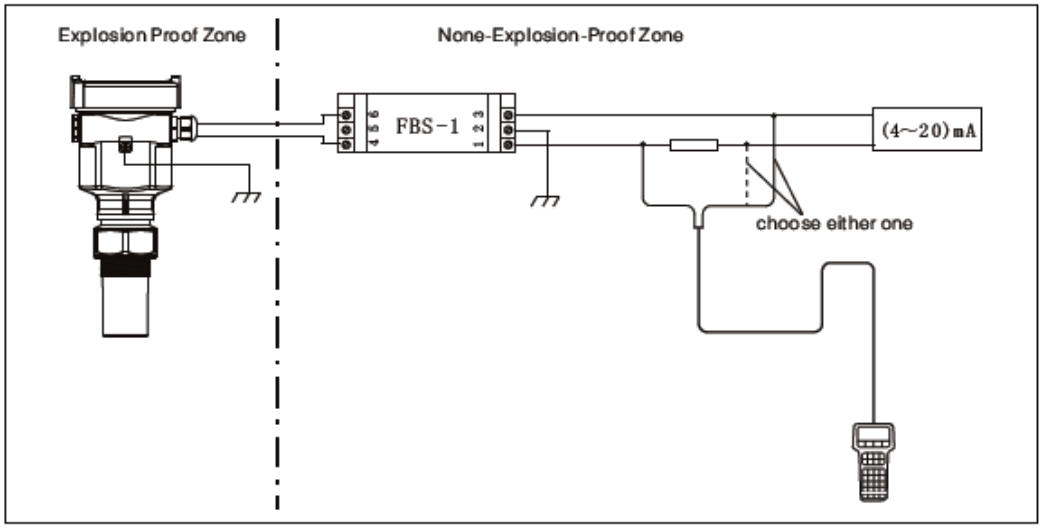
- Explosion Proof Connection

This product is an intrinsic safety explosion proof version (Exia ⅡB T6) with aluminium housing and plastic-encapsulated internal structure aimed to prevent sparks resulted from transducer and circuit malfunction from leaking out. It is applicable for the non-contact continuous level measurement of flammable medium under the level of explosion proof inferior to Exia ⅡB T6.If the measurement is undertaken by ULS 6000 inside the standpipe the inner diameter of standpipe should be at least bigger than the outside diameter of transducer. Please see Dimensional Drawings for actual sizes. Avoid large cracks or welding seam when connecting standpipe. False echo storage must be carried out as well in this case.Note: You must NOT mount instrument inside standpipe while measuring adhesive medium.You are required to use FBS-1 series (intrinsic safety explosion proof: [Exia] ⅡB, voltage of power supply: 24V DC±5%, short-circuit current: 100mA, operating current: 4...20mA) of safety barriers, which are supplementary to this product, for the power supply of this product.

All connection cables must be screened with max. Length of 500m. Stray capacitor≤0.1μF/Km,stray inductance ≤1mH/Km. Ultrasonic level measurement instrument must be connected to ground potential and unapproved supplementary devices are not allowed to use.



Adjust with TEKware



Adjust with HART handheld programmer

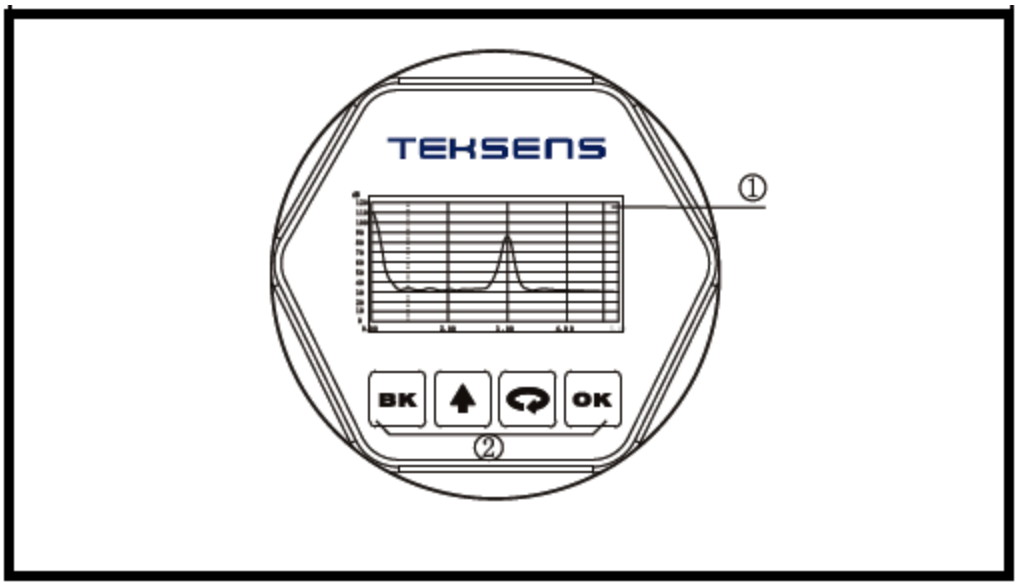
5 Adjustment Instructions

Adjustment Methods

Three adjustment methods available for ULS 6000

1. Display/Adjustment Module
2. Adjustment software TEKware
3. HART handheld programmer

ViewPoint is a pluggable display/adjustment module. The adjustment can be done through operating with four buttons on ViewPoint. Optional menu operation languages are available for selection. ViewPoint is only used for display after adjustment in that the measurement results can be seen clearly through the glass window.



1 LCD 2 Adjustment Keypad

[OK]Keypad
-Enter programming mode;
-Confirm programming options;
-Confirm modifications to parameters.

[↩]Keypad
-Choose programming options;
-Choose the digit of parameters to edit;
-Display the contents of parameters.

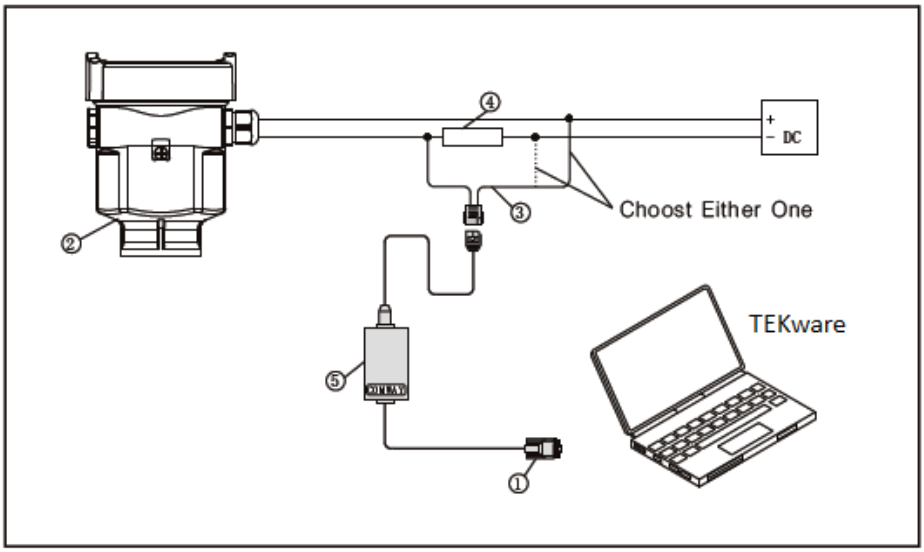
[▲]Keypad
-Modify parameter values.

[BK]Keypad
-Programming mode exit;
-Return to higher menu level.

Shortcut
[BK]Display Echo wave

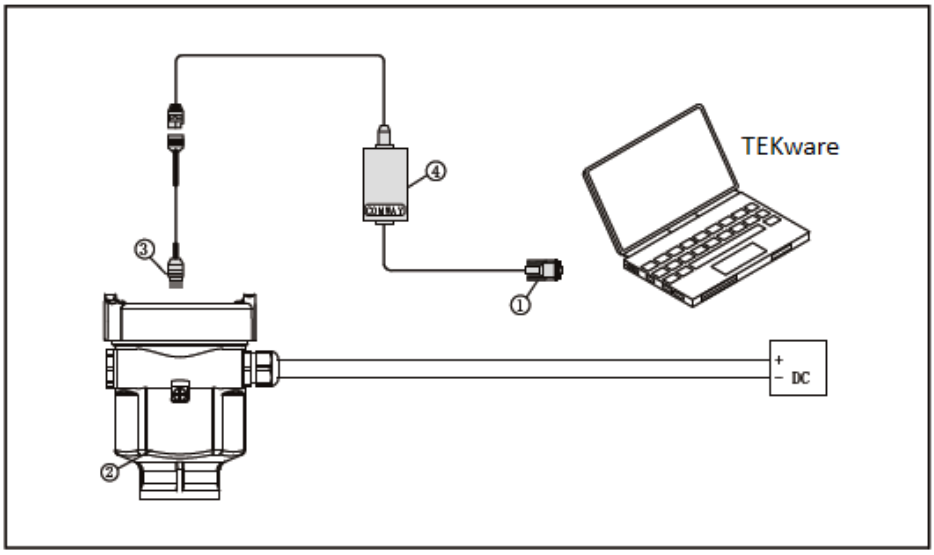
TEKware

Connect with another unit throuth HART.



1 RS232 Connect Cable/USB port
2 ULS 6000
3 HART pont adapter used on COMWAY convertor
4 250 ohm Resistance
5 COMWAY Convertor

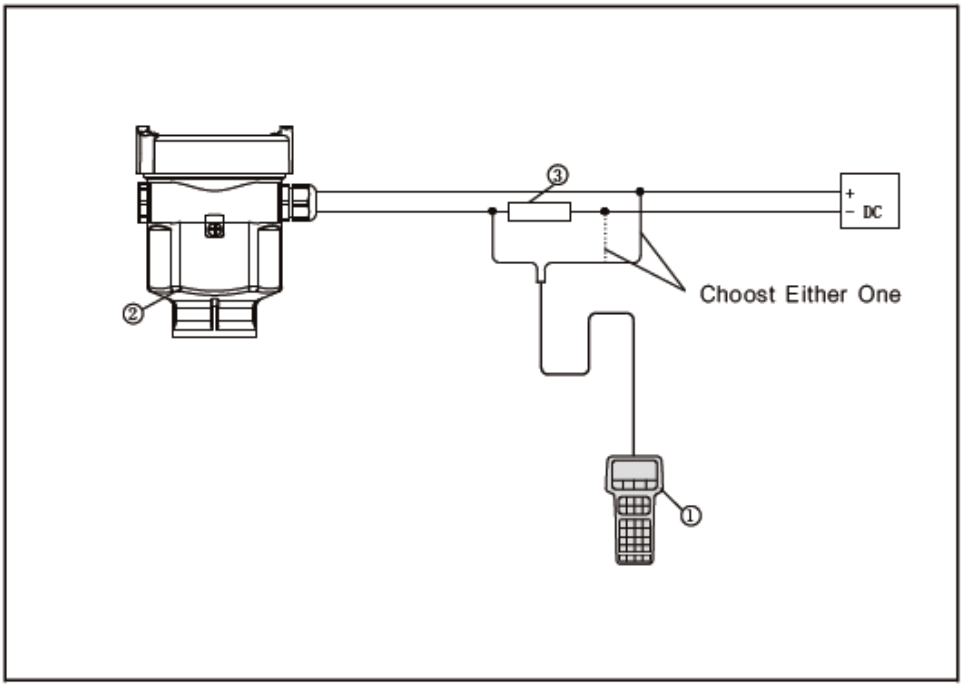
Connect with another unit throuth I²C.



1 RS232 Connect Cable/USB port
2 ULS 6000
3 I²C adapter pont used on MOMWAY convertor
4 COMWAY Convertor

HART Handheld Programmer

Adjust ULS 6000 with HART Handheld Programmer

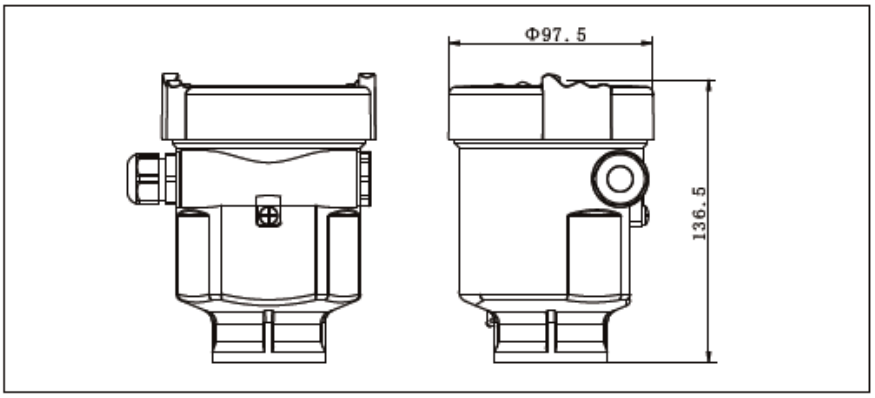


1 HART Handheld Programmer

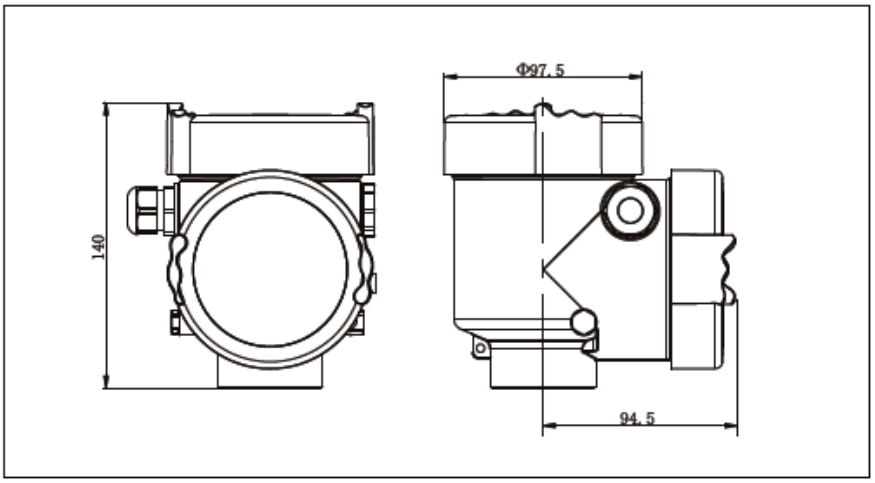
2 ULS 6000

3 250 ohm Resistance

6 Dimension（Unit：mm）

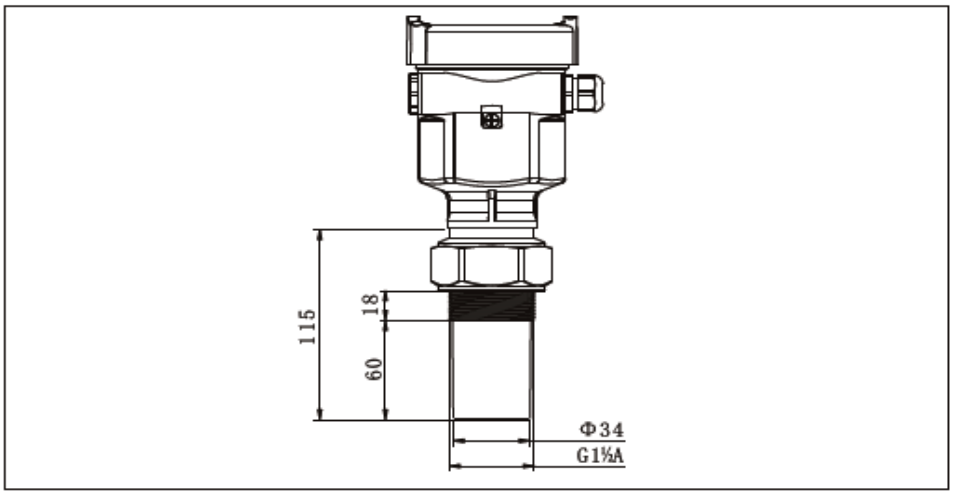


Housing
Material：PBT/AL/316L

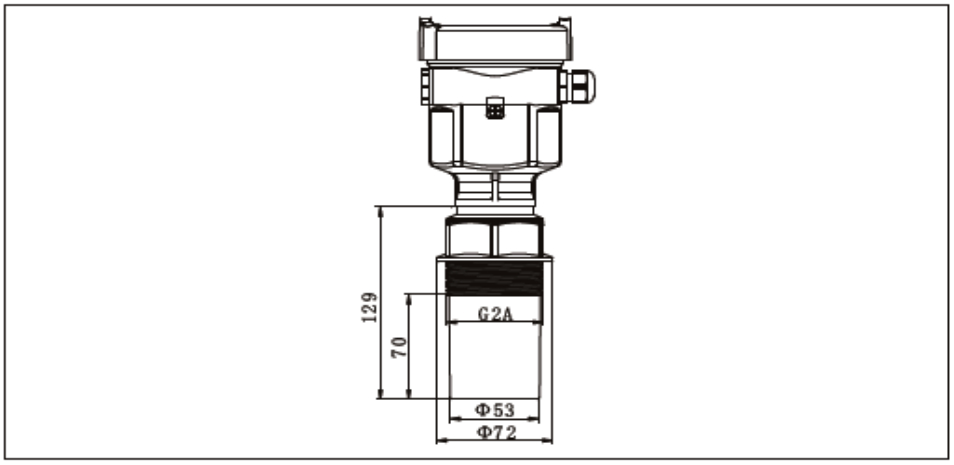


Material：two-chamber

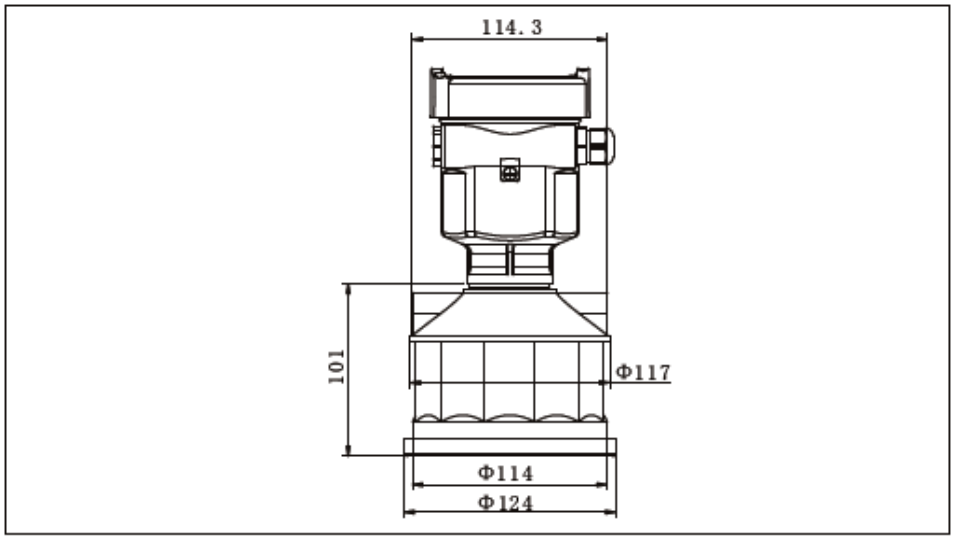
ULS 6100



ULS 6200



ULS 6300



TEKSENS

7 Technical Specifications

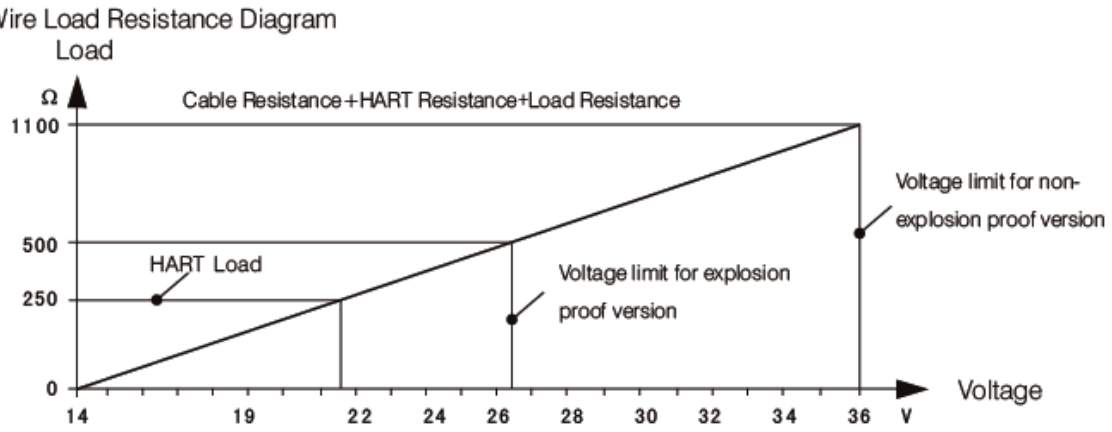
- General Parameters

Process Connection		
—Process Connection ULS6100		Silicone G1½A
—Process Connection ULS6200		Silicone G2A
—Process Connection ULS6300		Stainless Steel 316L、Swivelling Holder/ Flange
Material		
—Transducer	PVDF、PU/PC	
—Transducer Seal	Silicone	
—Housing	Plastic PBT-FR；Aluminium	
—Seal ring between housing and housing cover	Silicone	
—ViewPoint window on housing	Polycarbonate	
—Swivelling holder	Stainless Steel	
Weight		
—ULS6100/6200	3 kg（Depend on process connection and housing）	
—ULS6300	5 kg（Depend on process connection and housing）	

Power		
2-Wire	Standard Version	(16～36)V DC
	Intrinsic Safe Version	(21.6～26.4)V DC
	Power consumption	max.22.5mA
	Ripple Allowance	
	—<100Hz	Uss<1V
	—(100～100K)Hz	Uss<10mV
4-Wire	Intrinsic Safe+Explosion-Proof	(22.8～26.4)V DC,(198～242)V AC
	Power consumption	max.1VA，1W

Parameters on Cable	Cable Entry/Plug	One cable entry of M20x1.5（cable diameter of 5～9m）, one binding of M20x1.5
	Spring Connection Terminal	Applicable for cables with cross section of 2.5mm²
Output	Output Signal	4～20mA/HART
	Resolution	1.6uA
	Fault Signal	Constant current output: 20.5mA; 22mA；3.9mA
	-2-wire load resistance	See diagram below
	-4-wire load resistance	Max. 500ohm
	Integration Time	0～40sec, adjustable

2-Wire Load Resistance Diagram



Characteristic Parameters	Blanking Distance	
	-ULS6100	0.25m
	-ULS6200	0.4m
	-ULS6300	0.5m
	Max. Measurement Distance	Liquids
	-ULS6100	4m
	-ULS6200	8m
	-ULS6300	15m
	Ultrasonic Frequency	
	-ULS6100	55kHz
	-ULS6200	55kHz
	-ULS6300	35kHz
	Measurement Interval	>2s（Depend on parameter settings）
	Adjustment Time [1)]	>3s（Depend on parameter settings）
	Beam Angle	
	-ULS6100/6200	5.5°
	-ULS6300	3°
	Resolution of Display	1mm
	Accuracy	±0.5%(Full measurement range)
	Temperature for Storage/Transport	（-40～70）℃
	Process Temperature （Probe）	（-40～70）℃
	-Relative Humidity	<95%
	-Pressure	Max.0.1MPa
	Vibration Proof	Mechanical vibration 10m/s², (10～150)Hz

8 Selection & Ordering Information

- ULS6100

Explosion Proof Approval
P Standard (Without Approval)
I Intrinsically Safe(Ex ia IIB T6)
Material/Process Temperature/Protection
A PU/PC/ (-40～70) ℃/IP66
B PTFE/ (-40～70) ℃/IP67
Electronic
B (4～20) mA/HART 2-Wire
C (4～20) mA/(22.8～26.4) V DC/HART 2-Wire/4-Wire
D (198～242) V AC/HART 4-Wire
Housing / Protection
A Aluminium/IP67
B Plastic/IP66
D Aluminium (2-chamber)/IP67
G Stainless Steel316L/IP67
Cable Entry
M M20x1.5
N ½NPT
Display/Programming
A Yes
X No

Note: Version I product must be matched with housing A and electronic components A & C.

- ULS6200

Explosion Proof Approval
P Standard (Without Approval)
I Intrinsically Safe(Ex ia IIB T6)
Material/Process Temperature/Protection
A PU/PC/ (-40～70)℃/IP66
B PTFE/ (-40～70) ℃/IP67
Electronic
B (4～20) mA/HART 2-Wire
C (4～20) mA/(22.8～26.4) V DC/HART 2-Wire/4-Wire
D (198～242) V AC/HART 4-Wire
Housing / Protection
A Aluminium/IP67
B Plastic/IP66
D Aluminium (2-chamber)/IP67
G Stainless Steel316L/IP67
Cable Entry
M M20x1.5
N ½NPT
Display/Programming
A Yes
X No

Note: Version I product must be matched with housing A and electronic components A & C.

- ULS6300

Explosion Proof Approval
P Standard (Without Approval)
I Intrinsically Safe(Ex ia IIB T6)
Material/Process Temperature/Protection
A PU/PC/ (-40～70) ℃/IP66
Process Connection
FL Flange
DJ Swivelling Holder
Electronic
B (4～20) mA/HART 2-Wire
C (4～20) mA/(22.8～26.4) V DC/HART 2-Wire/4-Wire
D (198～242) V AC/HART 4-Wire
Housing / Protection
A Aluminium/IP67
B Plastic/IP66
D Aluminium (2-chamber)/IP67
G Stainless Steel316L/IP67
Cable Entry
M M20x1.5
N ½NPT
Display/Programming
A Yes
X No

Note: Version I product must be matched with housing A and electronic components A & C.

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9 Application Questionnaire

Approvals

☐ Standard Version ☐ Intrinsically Safe Version（Exia IIC T6） ☐ Intrinsically Safe Version（Exia IIC T6）
☐ Intrinsically Safe Version+Ship Approval（Exia IIC T6） ☐ Intrinsically Safe Version+Explosion Proof（Exd [ia] IIC T6）

Measured Medium

Name _____
Condition ☐ Liquid (☐Solid（Form ☐ Mass ☐ Particle ☐ Dust)
Temperature: Min._____℃ Norm._____℃ Max._____℃
Surface ☐ Flat ☐Turbulent ☐Agitated Vorte
Dielectric Constant ☐εr<3 ☐εr>3

Atmosphere

Atmosphere ☐Form ☐Foam ☐ Dust ☐Deposit ☐Vapour
Atmosphere Pressure Min. _____ Norm. _____ Max. _____

Vessel

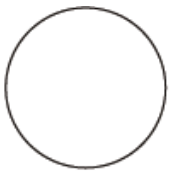
Shape of Top ☐ Flat ☐ Arch ☐ Conical ☐ Horizontal
Height _____ Diameter _____
Critical Information
Nozzle Length: _____ Nozzle Diameter: _____ Measurement Range: _____

Process Connection

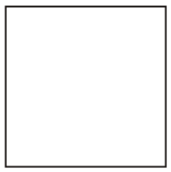
Thread（☐G¾A ☐¾NPT ☐ G1A ☐ G1A、M105x2 ☐ G1½A ☐ 1½NPT ☐ G2A ）
☐ Flange（DN= ） ☐ Swivelling Holder

Installation

Mode: ☐ Top ☐ Side
Filling Stream inlet position and installation position （Please specify in the diagram below）



Circular Vessel



Square Vessel

Power Supply

☐220V AC ☐2-wire 24V DC ☐ 3-wire 24V DC ☐ 4-wire 24V DC

Communication

☐(4~20) mA/ HART

Display

☐ Yes ☐ No

Customer Information

Contact: _____

Company: _____

Address: _____

P. C.: _____ Tel: _____

Email: _____ Fax: _____

Please give brief explanation on the application of instrument:

Date:

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