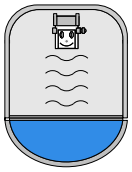
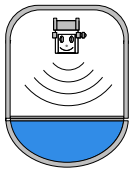
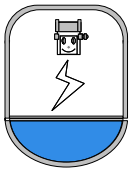
PRISMA Instruments
& Gauge Bourdon France

An Expertise in Industrial solution

TNUC Ultrasonic Level Transmitter







Prisma Instruments
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Table of Contents

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 me 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 TNUC.

Thanks to the advanced microprocessor and unique EchoDiscovery echo processing technology,thes 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

TNUC551

TNUC552

	TNUC551	TNUC552
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)

TNUC553

	TNUC553
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

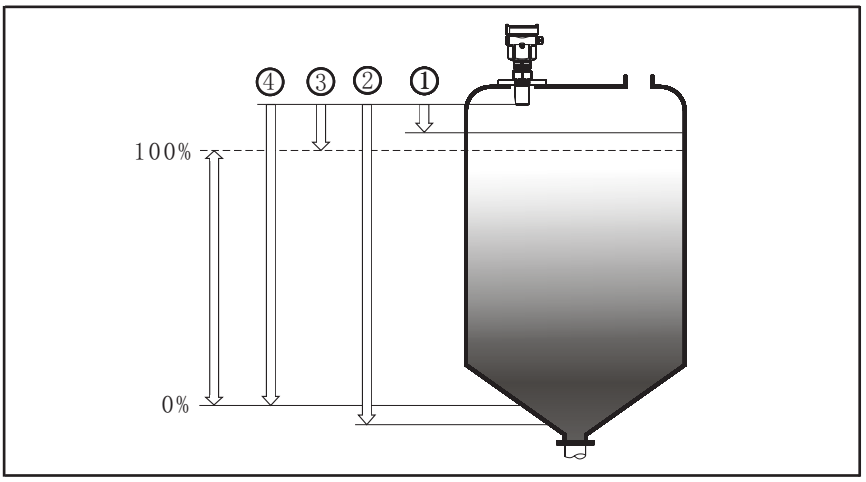
Basic Requirement

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

Illustration

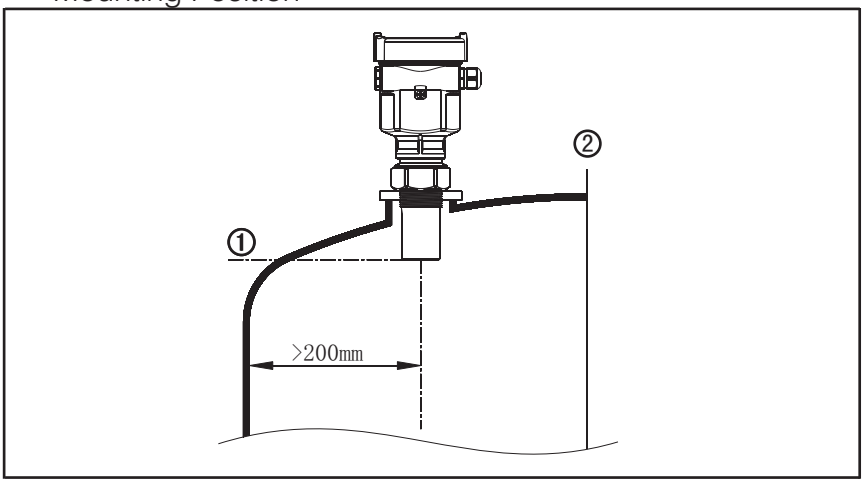


The lower edge of probe is the reference plane for measurement.

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

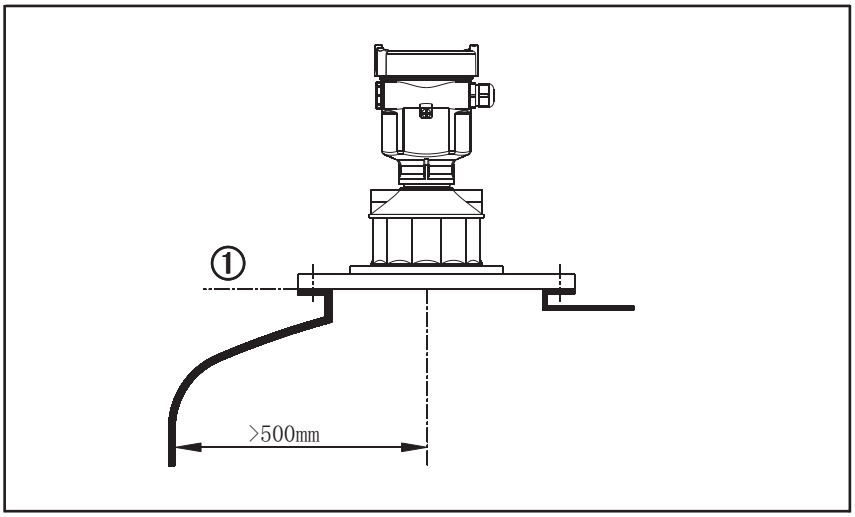
Note: The highest level of measured medium must not enter into blanking zone while
is in operation.

Mounting Position



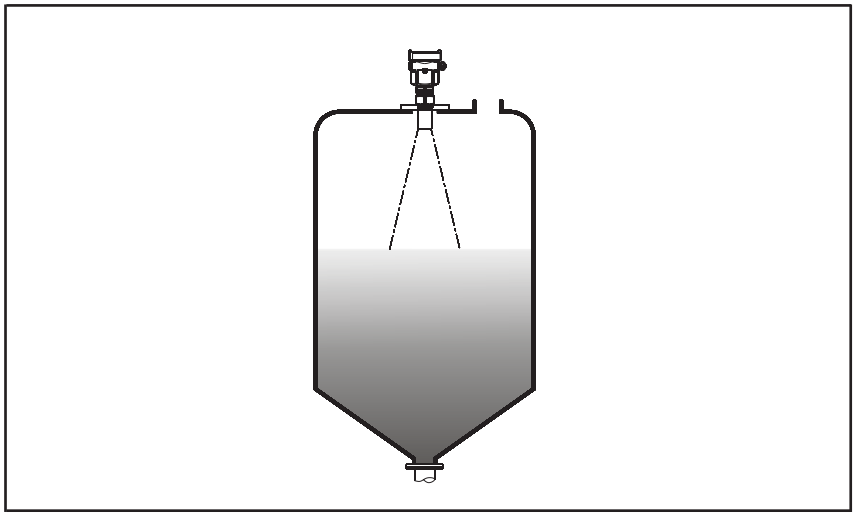
Minimum distance of 200mm between instrument and vessel wall must be assured while mounting TNUC551 or TNUC552

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



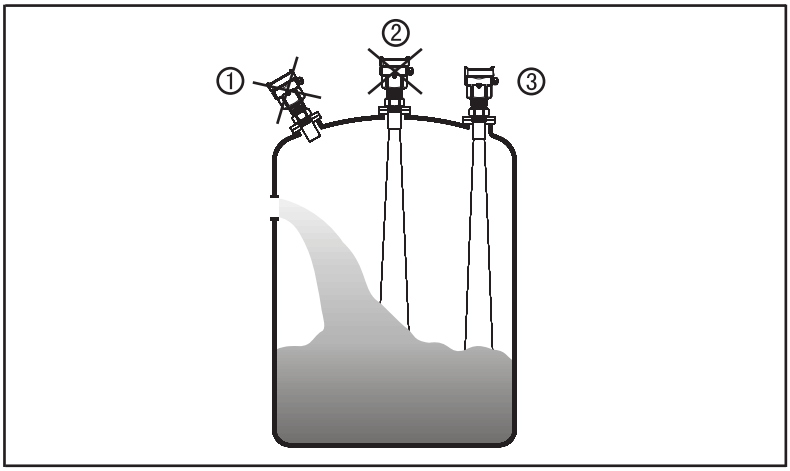
Minium distance of 500mm between instrument and vessel wall must be assured while mounting TNUC 553

1 Reference Plane

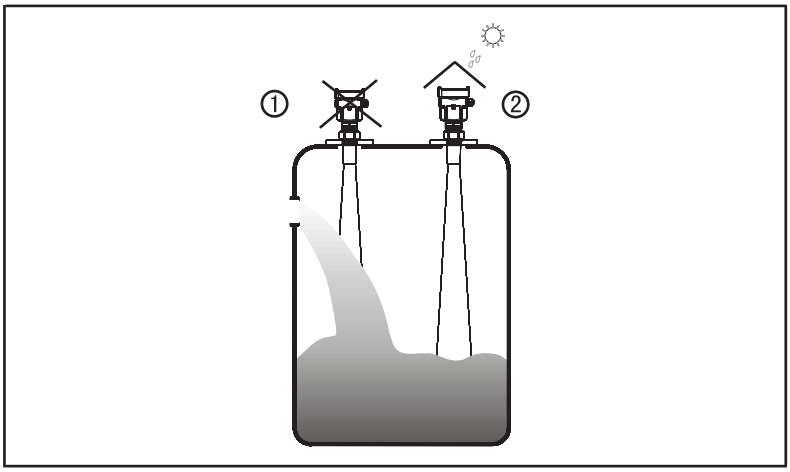


The best mounting position for a conical vessel with flat top is the center of its top, as the effective measurement can reach the bottom of vessel.

- Illustrative Diagram on Installation

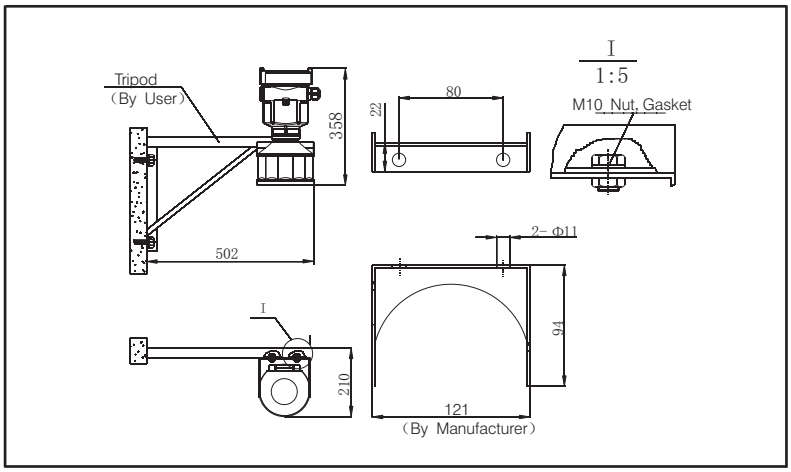


1 Wrong: Fail to turn the antenna perpendicular to the surface of target medium.
2 Wrong: Instruments are mounted in the center of concave or arched vessel tops, which results in multiple echoes.
3 Correct



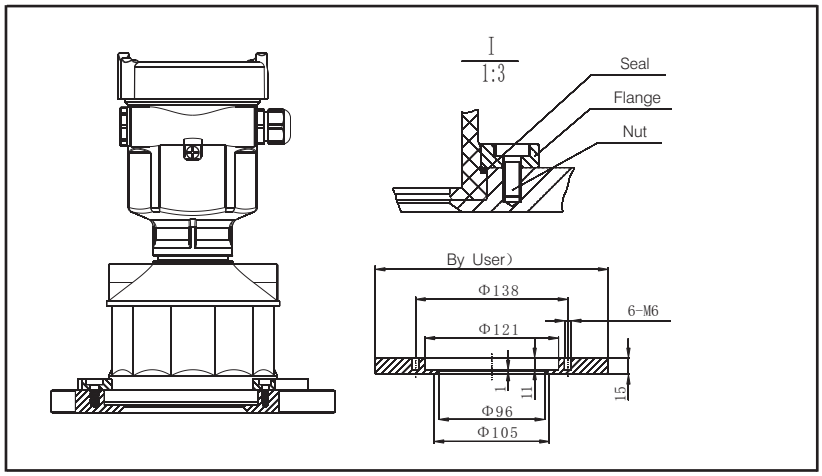
1 Wrong: Mount the instrument in/above filling stream, which results in the measurement of filling stream not the target medium
2 Correct
Note: Sun shield or rain-proof is required for outdoor mounting

- Installation Methods



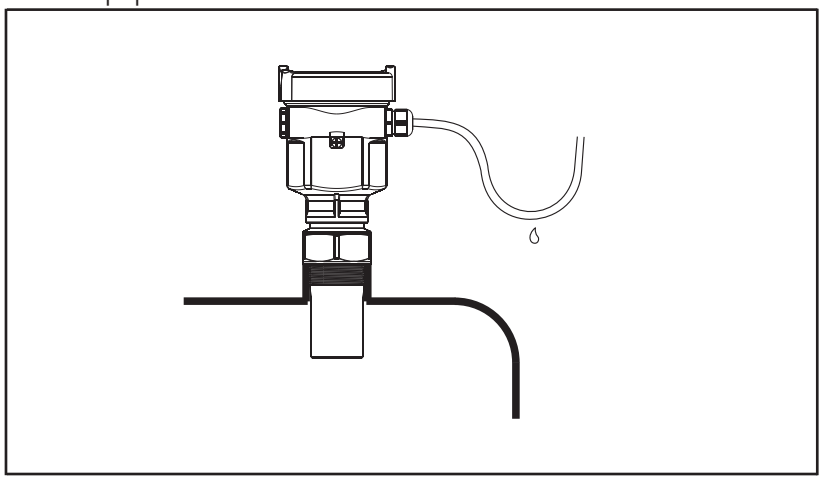
Installation with Swivelling Holder

Mount 553 with swivelling hold r



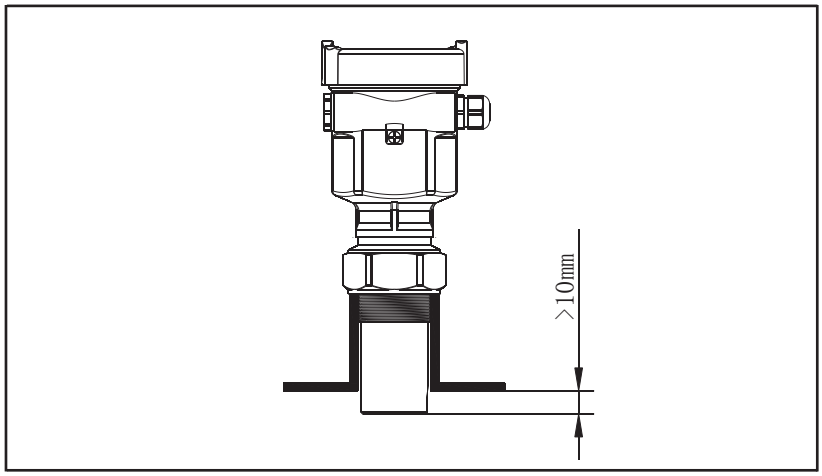
Use flange to mount TNUC553

- Damp-proof

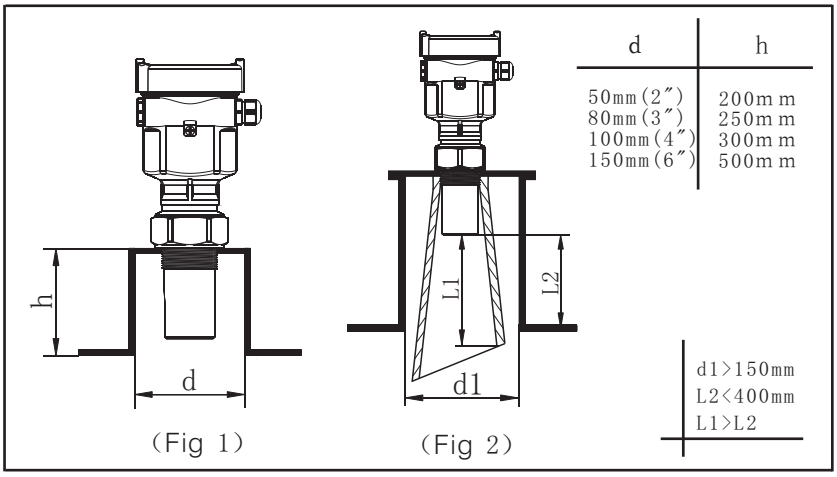


In order to avoid dampness under outdoor or humid indoor conditions or for those instruments mounted on cooling/heating vessels, seal rings used on cables should be screwed tight, plus the cable must be bended downward outside cable entry, indicated on the diagram below:

- Socket



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

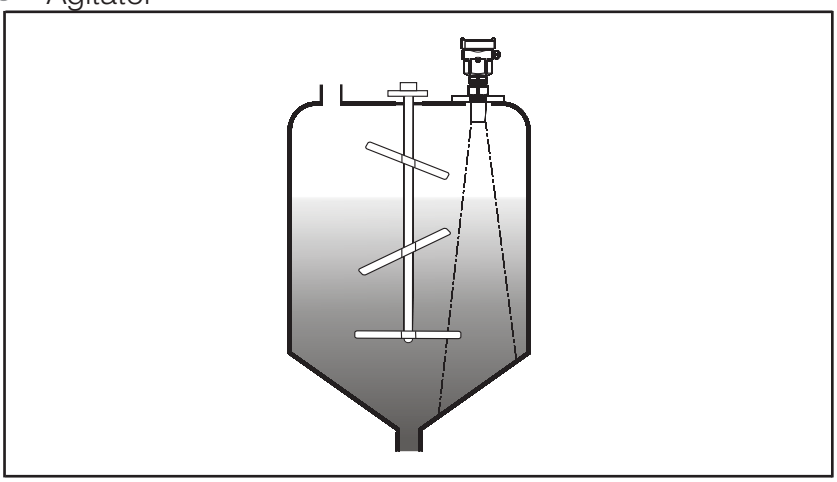


d	h
50mm(2″)	200mm
80mm(3″)	250mm
100mm(4″)	300mm
150mm(6″)	500mm

(Fig 1) (Fig 2)

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.

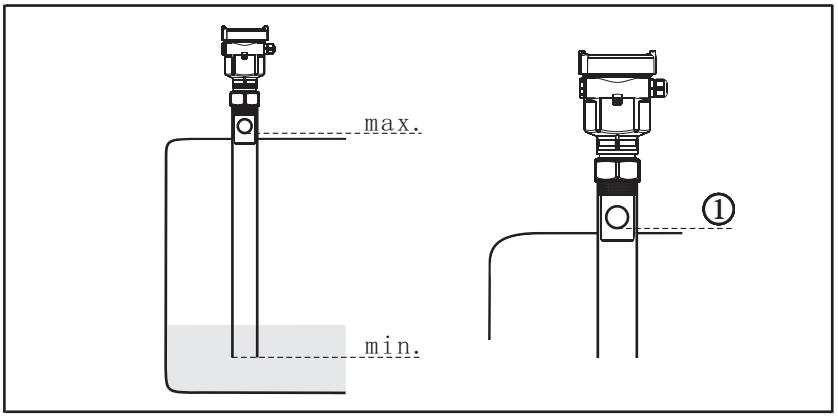
- Foam

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 TNUC55X 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.

20mA/HART(4-wire)

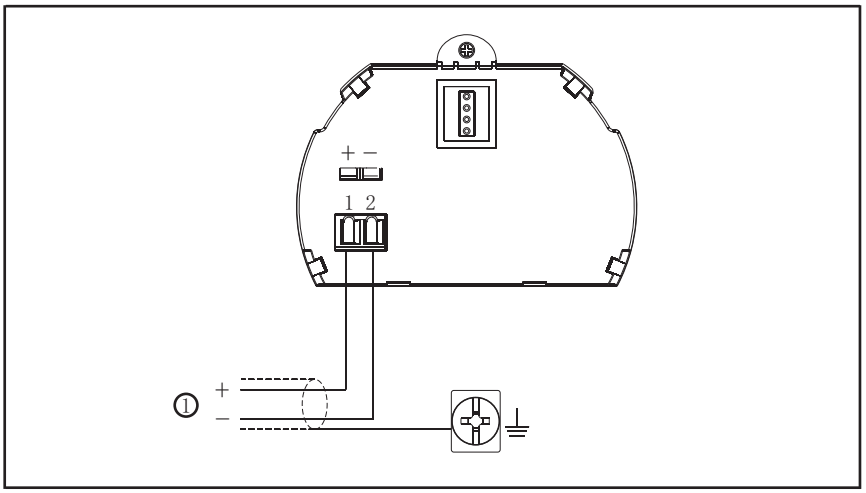
Connection cable with special earth wire can be used as feeder cable.

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 signals

● Wiring Diagram

2-wire

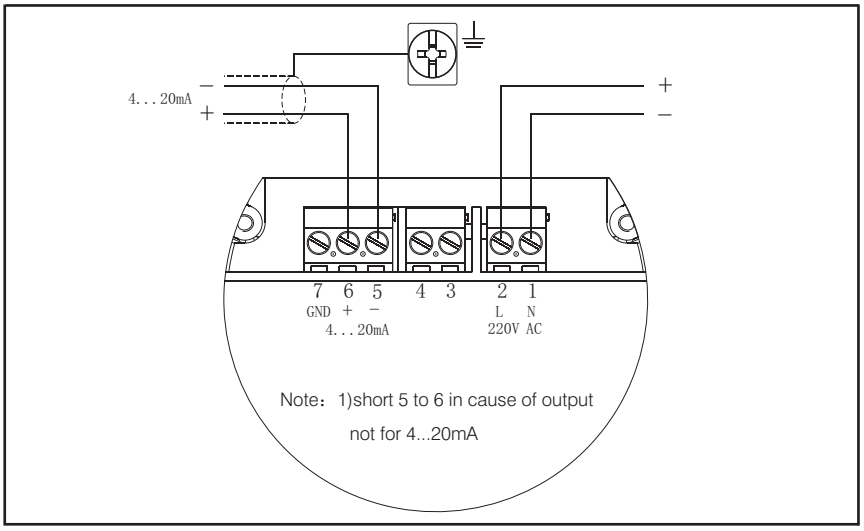


2-wire wiring used for HART

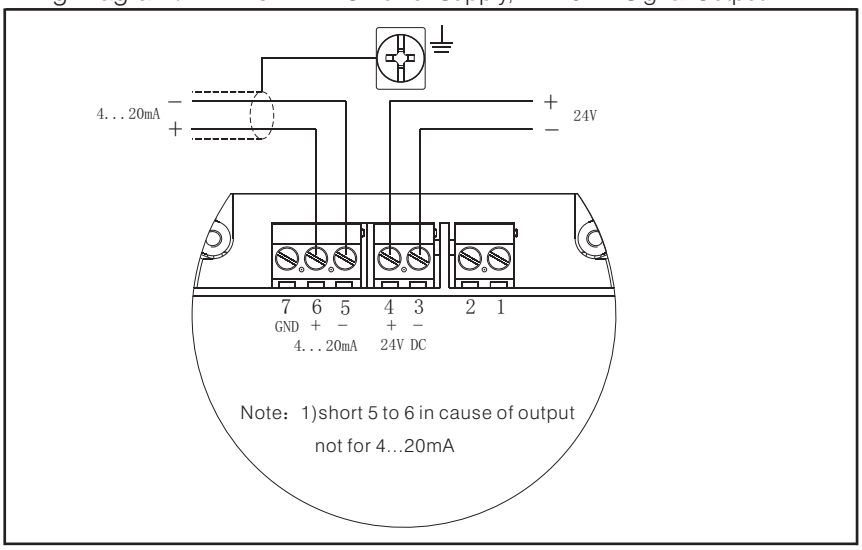
1）Power Supply and Signal Output

4-wire/2-chamber

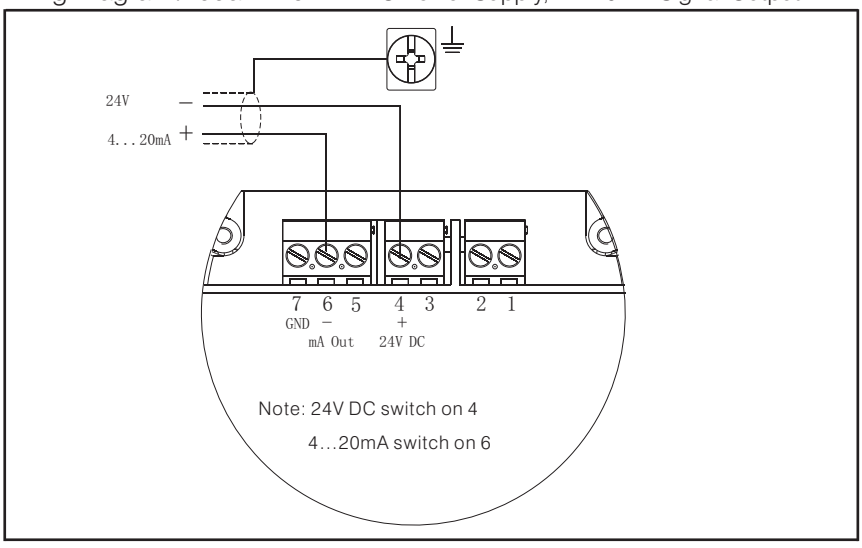
Wiring Diagram：200V AC Power Supply, 4…20mA Signal Output



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



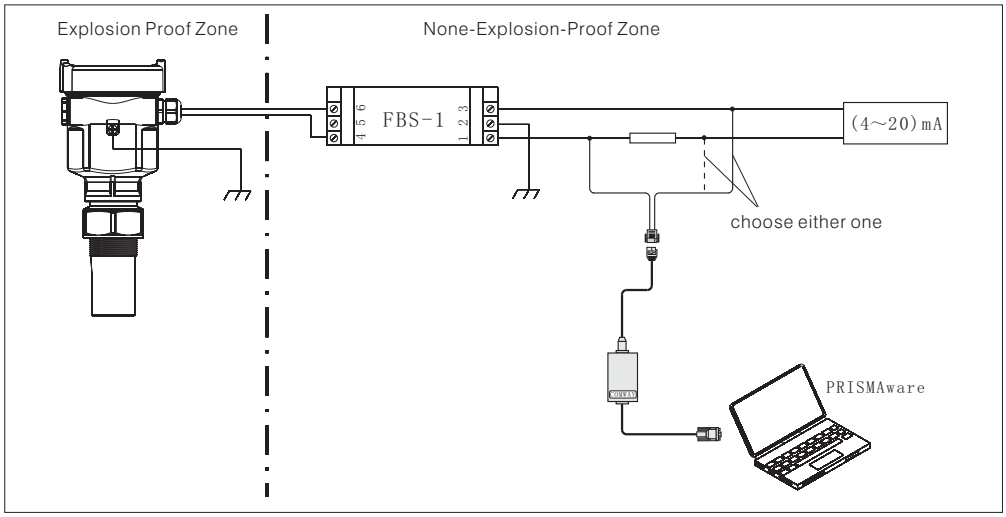
Wiring Diagram：dual-wire 24V DC Power Supply, 4…20mA Signal Output



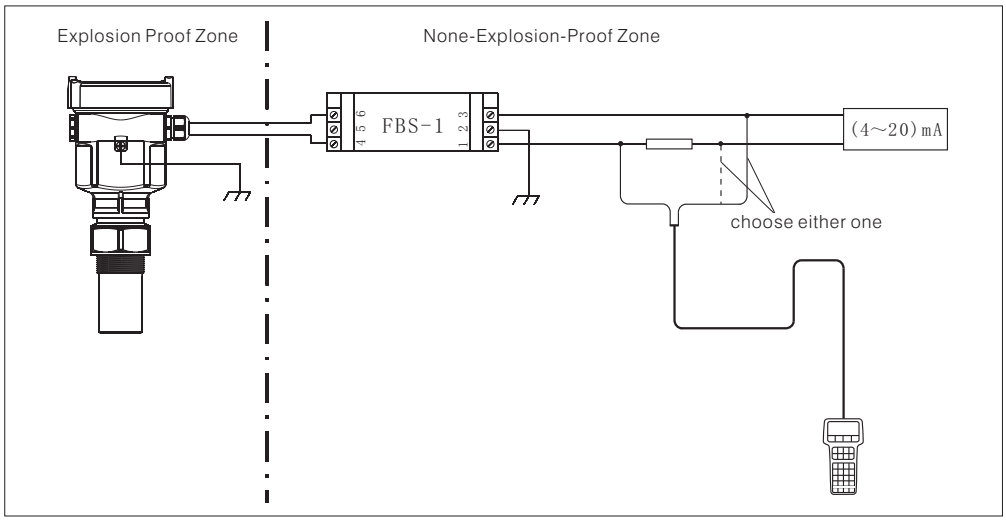
Explosion Proof Connection

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 **TNUC**55X 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 **PRISMA**ware



Adjust with HART handheld programmer

5 Adjustment Instructions

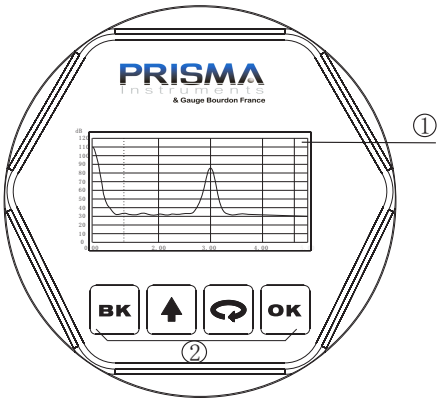
Adjustment Methods

Three adjustment methods available for TNUC55X:

1.Display/Adjustment Module
2.Adjustment software GODAware
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.

Display/Adjustment Module



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.

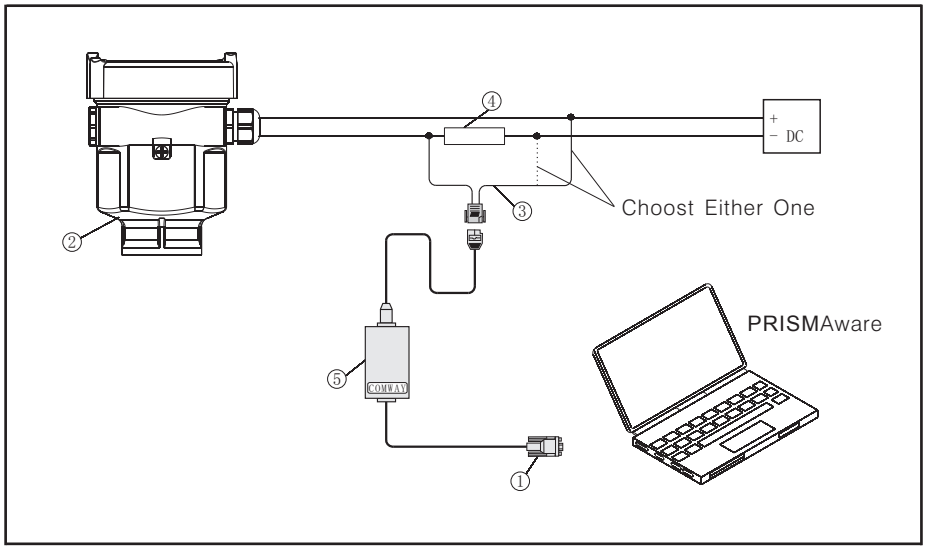
[ ]Keypad
-Modify parameter values.

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

Shortcut
[BK]Display Echo wave

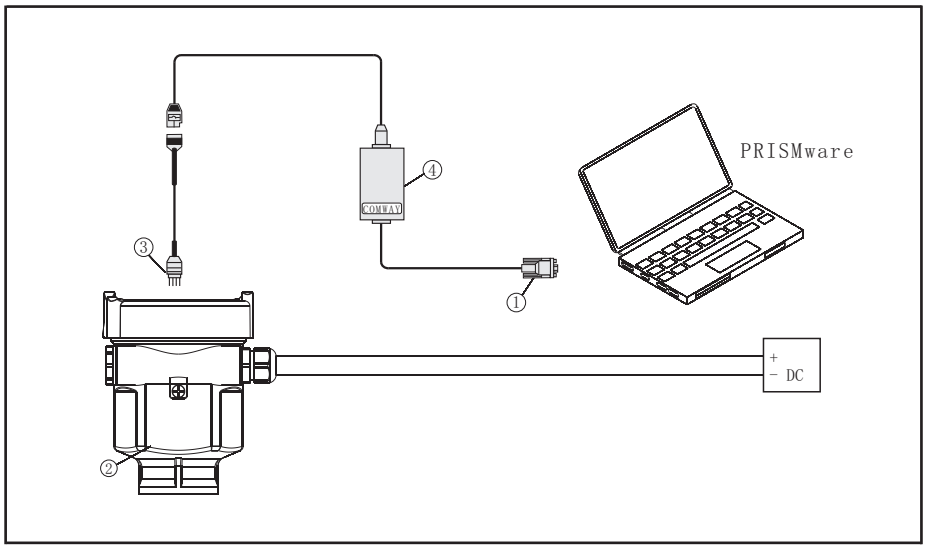
PRISMAware

Connect with another unit throuth HART.



1 RS232 Connect Cable/USB port
2 TNUC55X
3 HATR pont adapter used on COMWAY convertor
4 250 ohm Resistance
5 COMWAY Convertor

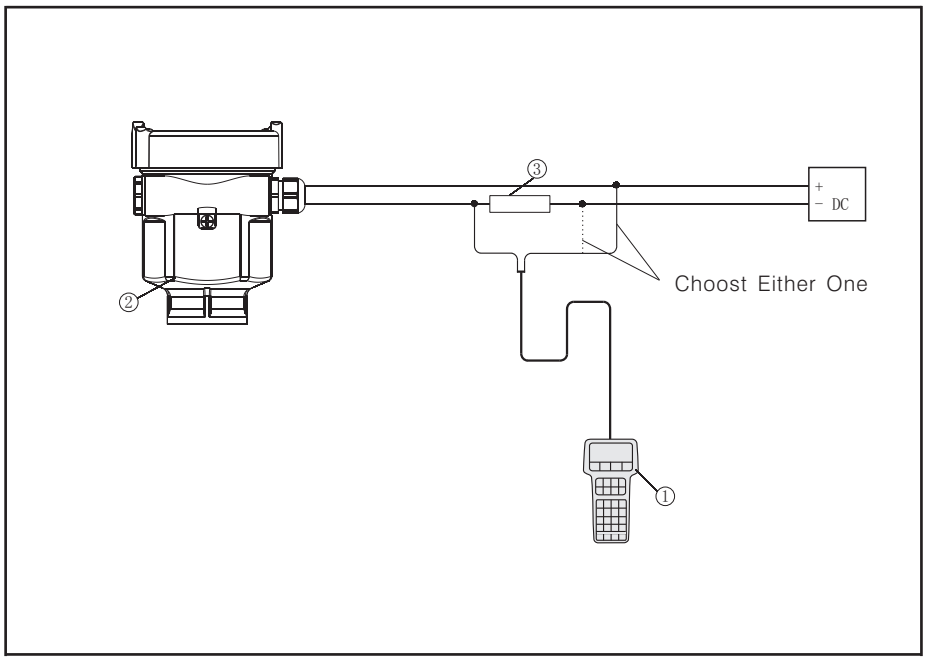
Connect with another unit throuth I²C.



1 RS232 Connect Cable/USB port
2 TNUC55X
3 I²C adapter pont used on MOMWAY convertor
4 COMWAY Convertor

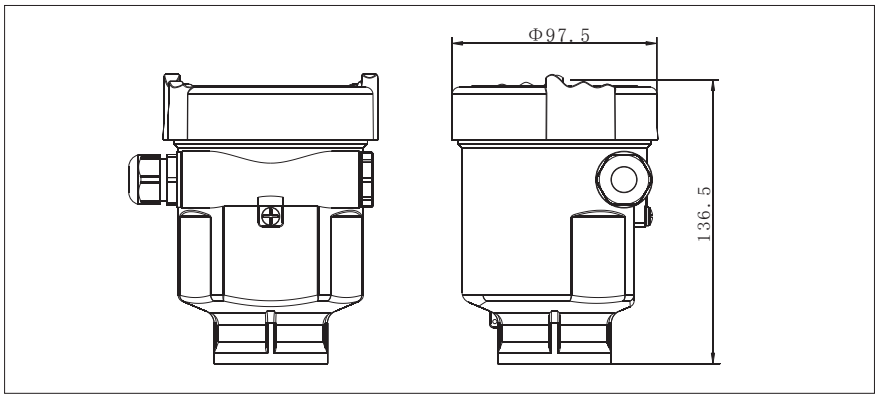
HART Handheld Programmer

Adjust TNRP5X with HART Handheld Programmer

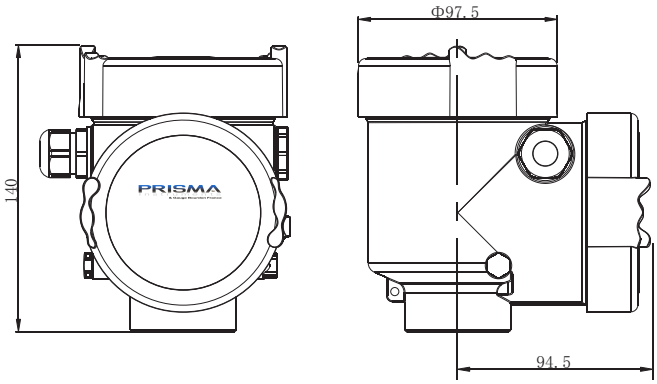


1 HART Handheld Programmer
2 TNRP5X
3 250 ohm Resistance

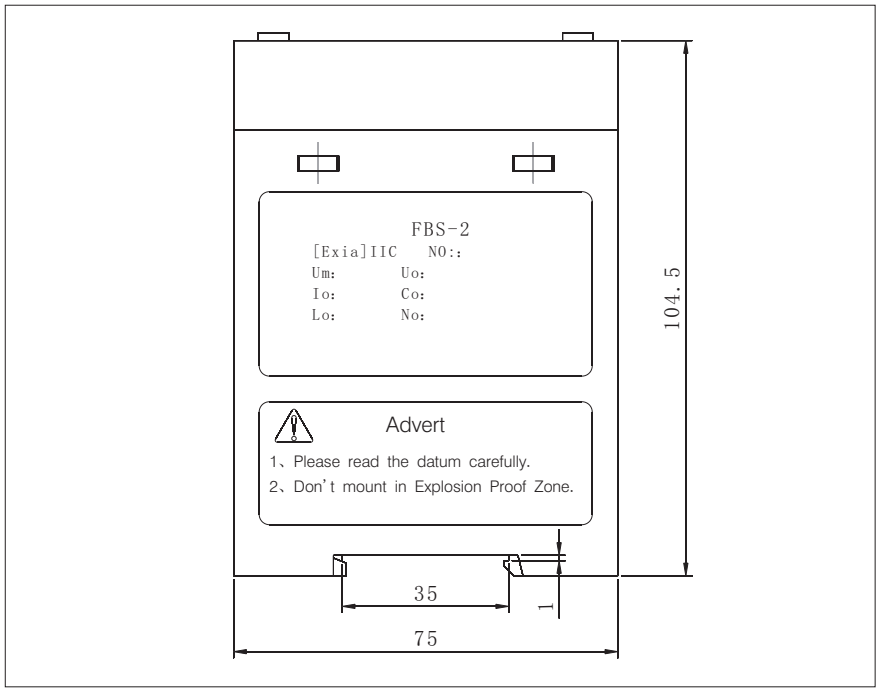
6 Dimension（Unit：mm）



Housing
Material: PBT/AL/316L

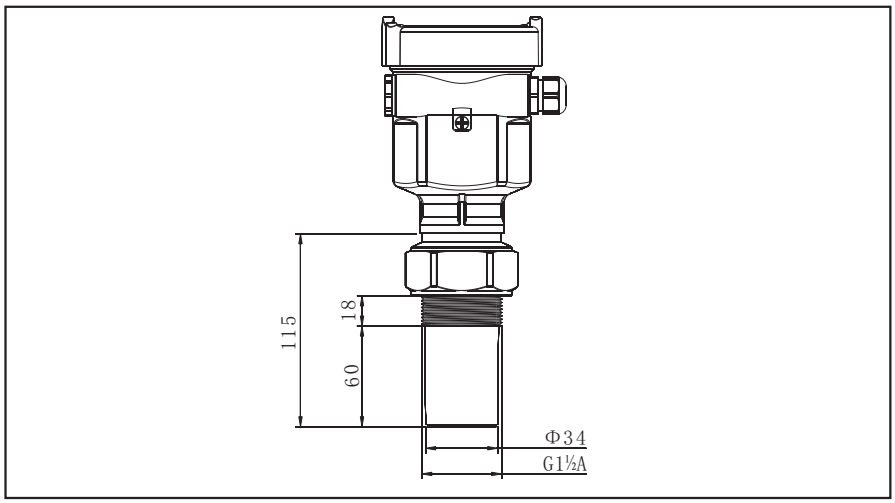


Material：two-chamber

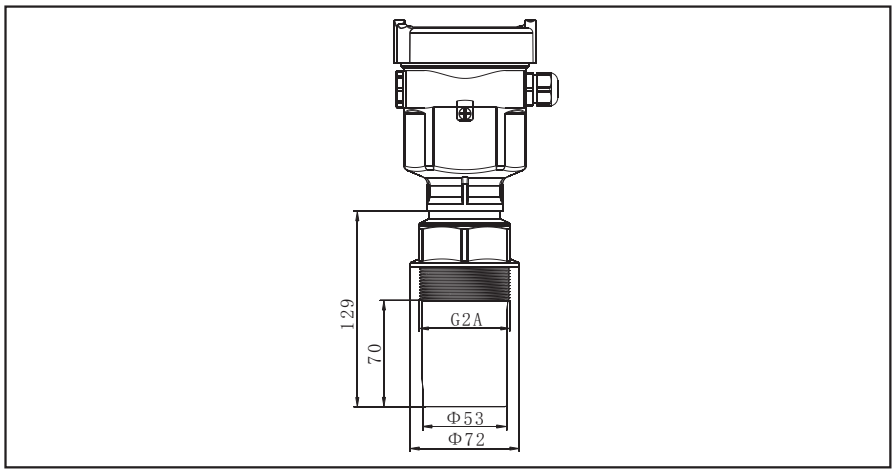


FBS Series

TNUC551



TNUC552



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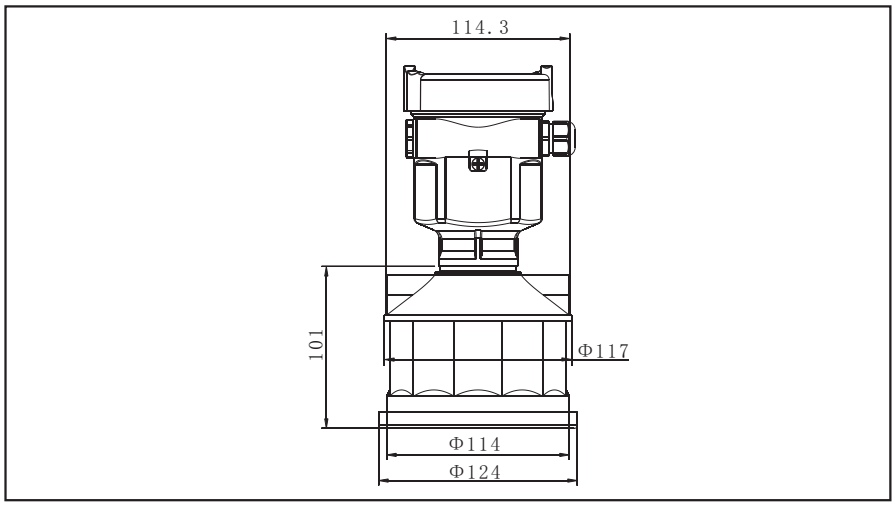


7 Technical Specifications

- General Parameters

Process Connection

—Process Connection	551	Silicone G1½A
—Process Connection	552	Silicone G2A
—Process Connection	553	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

— 551/552	3 kg（Depend on process connection and housing）
— 553	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

4-Wire

Ripple Allowance	
—<100Hz	Uss<1V
—(100～100K)Hz	Uss<10mV
Intrinsic Safe+Explosion-Proof	(22.8～26.4)V DC, (198～242)V AC
Power consumption	max.1VA，1W

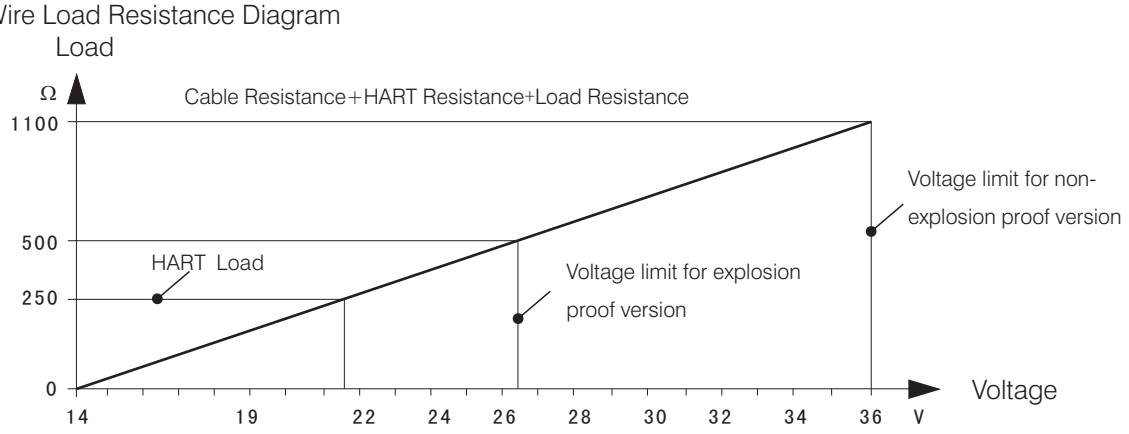
Parameters on Cable

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 2.5mm^2

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		
–	551	0. 25m
–	552	0. 4m
–	553	0. 5m
Max. Measurement Distance		Liquids
–	551	4m
–	552	8m
–	553	15m
Ultrasonic Frequency		
–	551	55kHz
–	552	55kHz
–	553	35kHz
Measurement Interval		>2s（Depend on parameter settings）
Adjustment Time 1)		>3s（Depend on parameter settings）
Beam Angle		
–	551/552	5. 5°
–	553	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/s^2 ，（10～150）Hz

1) Correct level measurement result needs longer time to be presented than usual in the event of drastic level changes.

8 Selection & Ordering Information

- **TNUC551**

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.

- TNUC552

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.

- TNUC553

Explosion Proof Approval
P Standard (Without Approval)
I Intrinsically Safe(Ex ia IIB T6)
Material/Process Temperature/Protection
A PU/PC/（-40～70）°C/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.

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

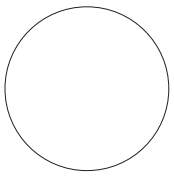
Shape of Top ☐ Flat ☐ Arch ☐ Conical ☐ Horizontal
Height _____ Diameter _____
Critical Information
Nozzle Length: _____ Nozzle Diameter: _____ Measurement Range: _____

Process Connection

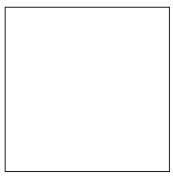
Thread（☐ G¾A ☐ ¾NPT ☐ G1A ☐ G1A、M105x2 ☐ G1½A ☐ 1½NPT ☐ G2A ）
☐ Flange（DN= ） ☐ Swivelling Holder

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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