**ZTD-G Displacer Liquid (Interface) Level Transmitter (High Pressure and Explosion Isolation)**

## Summary

ZTD-G Displacer Liquid (Interface) Level Transmitter is one of the knew type of level measuring instruments that have been developed cooperatively by Dandong Top Electronics Instrument Co., Ltd and Magnettop Company in USA. The transmitters can be divided into ZTD-GZ intelligent type and ZTD-GM non-intelligent type according to their different types of signal transmitting parts. Not only can the transmitter indicate the liquid level in a vessel locally on field, but also it can output 4-20mA analogue signals on which the digital signals being conformity with HART PROTOCAL are superimposed. For ZTD-GZ type transmitter, it can be used to form production process measurement and monitoring management systems to realize remote configuration, monitoring, maintenance and calibration, etc functions since it adopts HART bus technique. The transmitters characterize themselves with high precision, low drift, and strong anti-interference ability, etc. So, they can be used extensively for measuring dirty, inflammable, explosive and corrosive, etc fluids levels and transferring the levels signals into analogue signals and transmit them out. They are ideal level measurement instrument for production process control in petroleum, chemical, metallurgy, electrical power and light industrial products industries, etc. The transmitters figure themselves with their fashionable shell structures, elegant appearances and high safety reliability because of separated chambers.

## Main Performances and Qualifications

| Main Performances and Qualifications | ZTD-GM Non-intelligent | ZTD-GZ Intelligent |
|---|---|---|
| Supply Voltage | 24VDC | 24VDC |
| Output Signal | 4-20mA | 4-20mA + HART Protocol |
| Precision | 0.5%FS, 1%FS | 0.5%FS, 1%FS |
| Field Indication | Ammeter | LCD |
| Debugging Method | Adjusting Screw | Field Magnet Switch;<br>Debugging Software + PC;<br>Communicator (Remote) |
| Damping Time | 0.2-1.67 Seconds | 0-199 Seconds |
| Field and Remote Configuration | Non | Yes |
| Exceeding Measuring Range Alarm;<br>Fault Diagnosis | Non | Yes |
| Ambient Temperature | -40-70℃ | -40-70℃<br>(-30-70℃ for field indication) |
| Operation Temperature | See Ambient Temperature and Process Temperature Comparing Chart for Transmitter | |
| Load Resistance | Load Performance Chart | |

Dandong Top Electronics Instrument Co., Ltd Add: No..10 Huanghai Street, Zhenxing District, Dandong City, Liaoning Province, P.R. China P.C.: 118000 Tel:+86-415-6227343 Fax: +86-415-6270003
Web site: http://www.ddtop.com E-mail: top@ddtop.com davidsong@ddtop.com

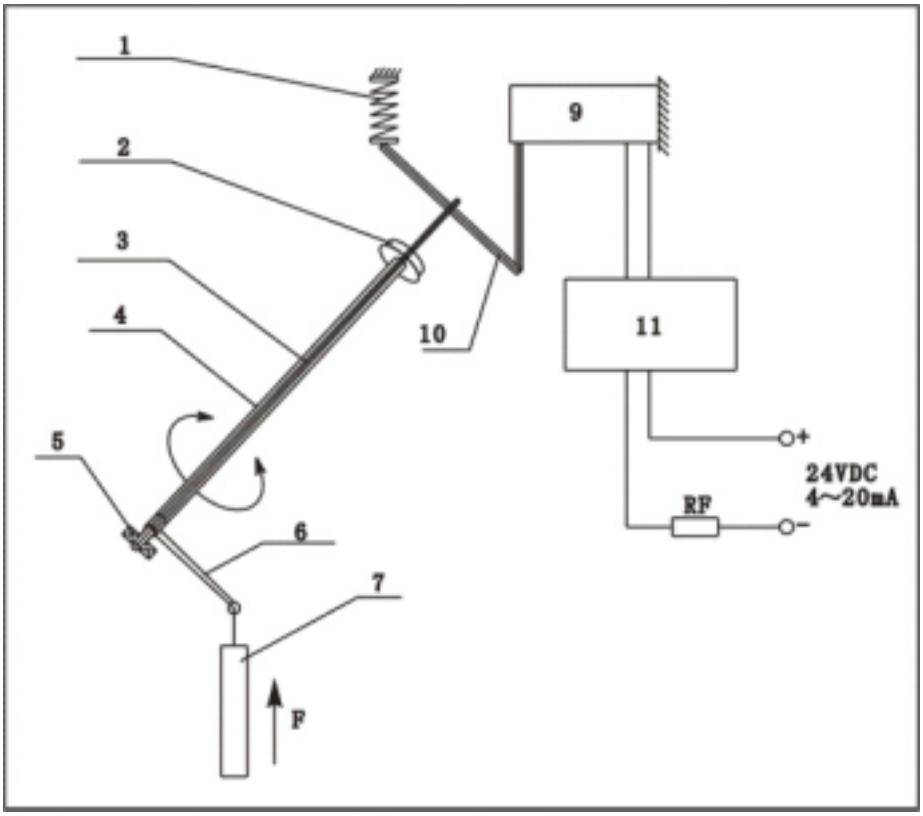
| | |
|---|---|
| Displacer Weight | See Rating Plate |
| Cable Entry | M20×1.5 (female thread) |
| Protection Grade | IP65 |
| Explosion-proof | See the Appendix |
| Safety Barrier Model | See the Appendix |

## Measurement Range and Fluid Density Range

| Measurement Type | Measuring Range (mm) | Fluid Density Range |
|---|---|---|
| Liquid Level | 300, 500, 600, 800, 1000, 1500, 2000, 2500 | 0.3 – 1.6g/cm$^3$ |
| Interface Level | 500, 600, 800, 1000, 1500, 2000, 2500 | ≧0.1g/cm$^3$ |
| Density | 500, 600, 800, 1000, 1500, 2000, 2500 | ≧0.1g/cm$^3$ |

## Operating Principle

A displacer (cylinder float) is hung at an end of the arm lever (see schematic diagram). The displacer rises and goes down with the changes of the buoyancy F that is produced by the fluid level changes. The buoyancy is transmitted to the arm lever through the displacer. With the action of the buoyancy F and through the driving mandrel that is connected with the level, the arm lever drives the lever rotating, then an end of the level presses the weighing sensor and makes it produce a deformation. The sensor converts the deformation into electric signal. Through the microprocessor's treatment, the signal is converted into 4-20mA standard signal which will be transmitted. This is the whole process of the transition. See figure 1 and figure 2.




1. adjusting spring; 2. mechanical seal;3. driving mandrel;4. torque tube;5 pivot point;6.steeve7. displacer; F. buoyancy; 9. sensor;10. Arm lever;11 signal process and conversion circuit.

Figure 1

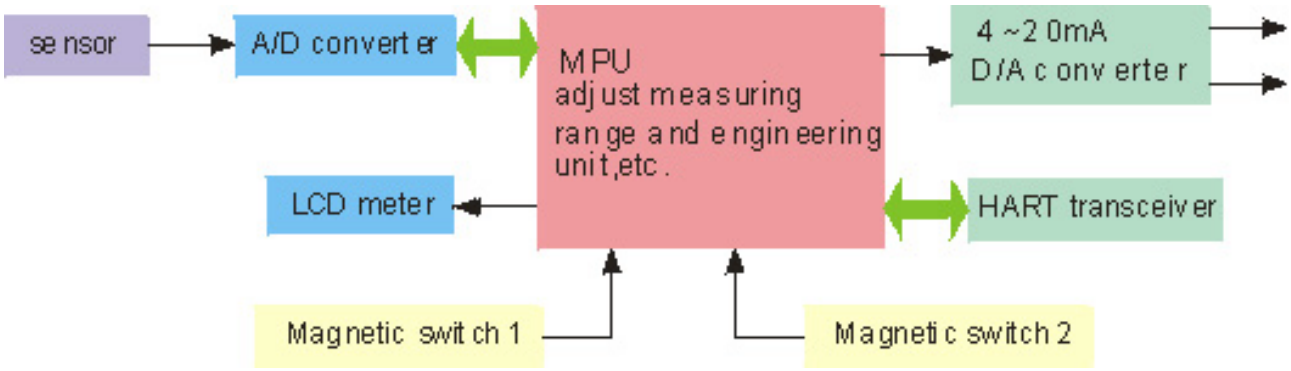



Figure 2

## Model Selection Table

| Model | Specification Code | | | Code Meaning |
|---|---|---|---|---|
| ZTD-GM | | | | Non-intelligent Displacer Liquid (Interface) Level Transmitter |
| ZTD-GZ | | | | Intelligent Displacer Liquid (Interface) Level Transmitter |
| | 1 | | | Liquid Level Measurement |
| | 2 | | | Interface Level Measurement |
| | 3 | | | Density Measurement |
| | | A | | Top-side Mounted Type |
| | | B | | Top-bottom Mounted Type |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | C | | | | Side-side Mounted Type |
| | | | | | D | | | | Bottom-side Mounted Type |
| | | | | | E | | | | Top mounted Type |
| | | | | | F | | | | Side mounted Type |
| | | | | | S | | | | Top-mounted Type |
| | | | | 1 | | | | | Nominal Pressure : PN 2.5 MPa |
| | | | | 2 | | | | | Nominal Pressure : PN 4.0 MPa |
| | | | | 3 | | | | | Nominal Pressure : PN 6.3 MPa |
| | | | | 4 | | | | | Nominal Pressure : PN 10 MPa |
| | | | | 5 | | | | | Nominal Pressure : PN 16 MPa |
| | | | | 6 | | | | | Nominal Pressure : PN 20 MPa |
| | | | | 7 | | | | | Nominal Pressure : PN 25 MPa |
| | | | | 8 | | | | | Nominal Pressure : PN 32 MPa |
| | | | | | / | | | | |
| | | | | | | I | | | Explosion-proof Type: Intrinsical Safety Type |
| | | | | | | d | | | Explosion-proof Type: Explosion Isolation Type |
| | | | | | | | T | | Liquid Contacting Material: Carbon Steel |
| | | | | | | | H | | Liquid Contacting Material: 1Cr18Ni9Ti |
| | | | | | | | | D | Without radiating fin. See figure 5 |
| | | | | | | | | G | With radiating fins. See figure 5 |
| | | | | | | | | X | Field auxiliary ( please note if radiating fins or insulations are needed.) |
| | | | | | | | | | □ Fluid density |

| Measuring Range | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| | 300 | 500 | 600 | 800 | 1000 | 1500 | 2000 | 2500 |

| | | |
|---|---|---|
| Additional code | F | With flanges connection, steam tracing DN15, PN2.5 |
| | Z | With thread connection, steam tracing ZG1/2” |

**Model selection example**

ZTD-GZ-2C2/iHG0.8-1.0/4F

It is intelligent displacer transmitter, for interface level measurement, side-side mounted type, nominal pressure 4.0Mpa, intrinsically safe type, measuring chamber material is 1Cr18Ni9Ti, with radiating fins, fluid densities are 0.8g/cm$^3$ and 1.0g/com$^3$, measuring range is 800mm, with flange connection and steam tracing.

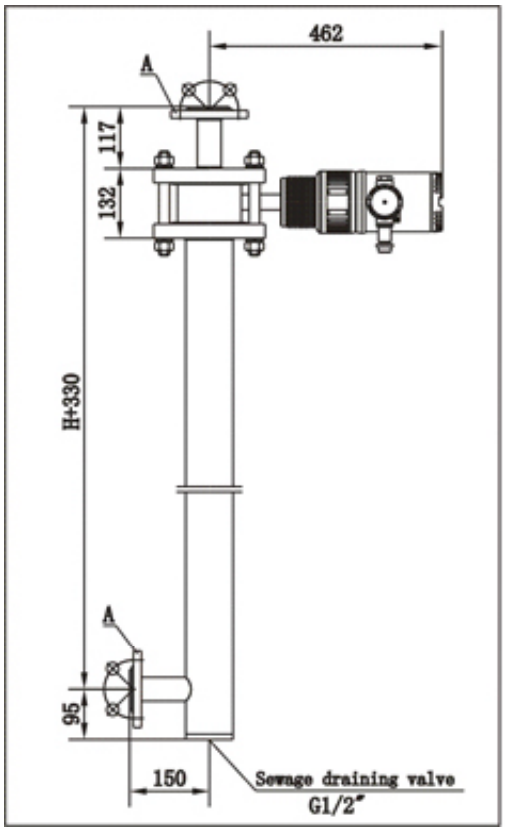
## Outside drawing and installation dimensions

Flanges marking meaning in the following outside drawings

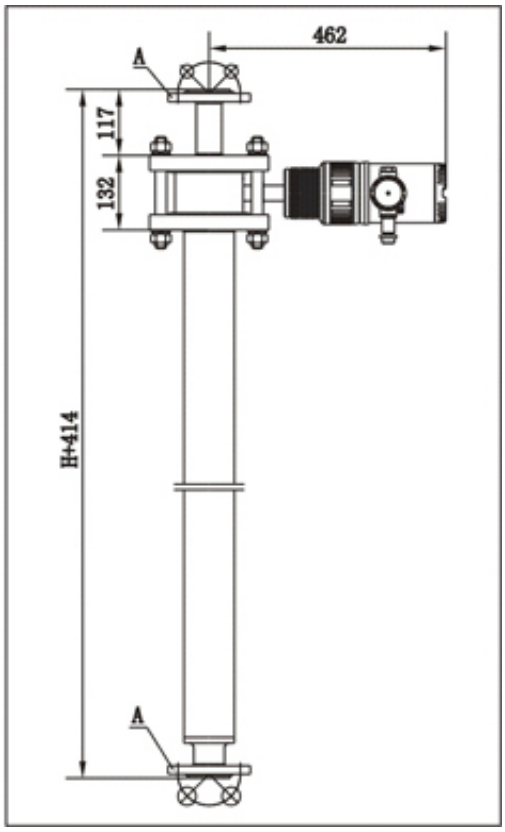
| Flange mark | Nominal diameter DN (mm) | Nominal pressure PN (MPa) | Flange type | Standard |
|---|---|---|---|---|
| A | 40 | 2.5 | Plain flange | JB/T82.1-94 |
| | | 4.0, 6.3, 10, 16, 20 | Raised face flange | JB/T82.2-94 |
| B | 40 | 6.3 | Female flange | |
| C | 15 | 2.5 | Plain flange | JB/T82.1-94 |

Note: H is measuring range, all dimensions marked in the outside drawings are on the basis of the nominal pressure being no more than 6.3 MPa. If the nominal pressure is large than 6.3 MPa, special designs for them are

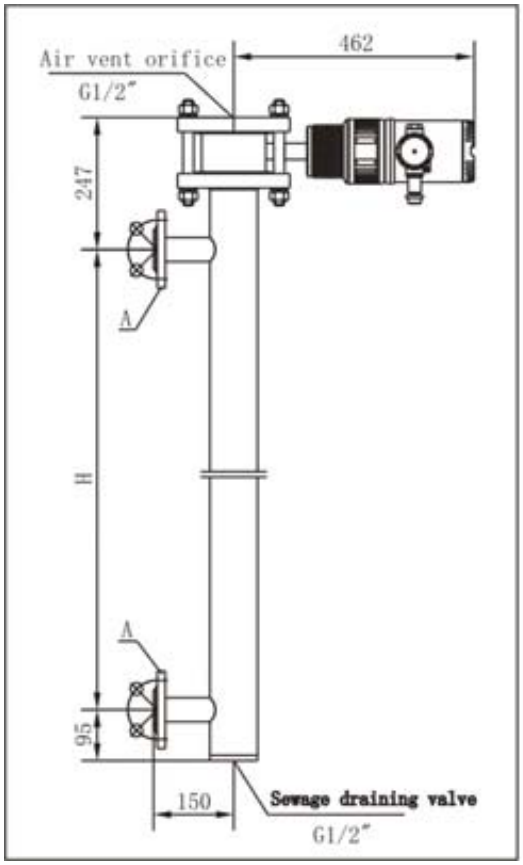
needed.



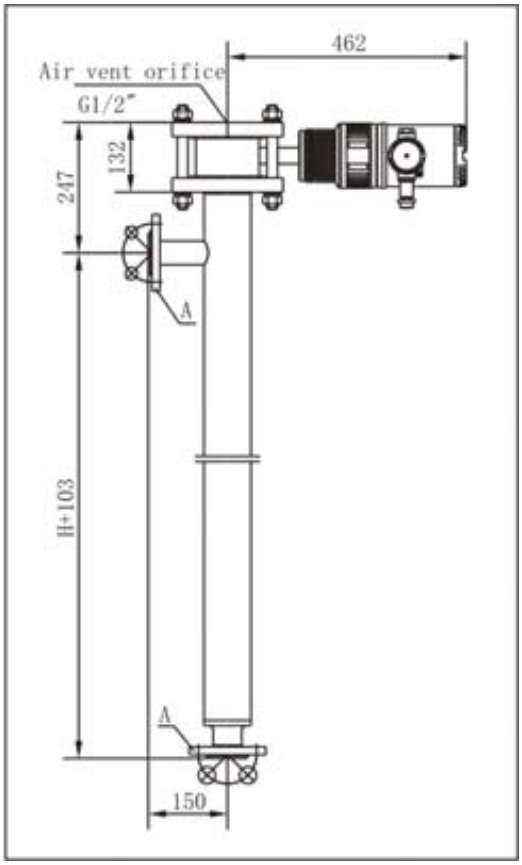

A Top-side mounted type;




B Top-bottom mounted type;




C side-side mounted type;




D bottom-side mounted type;

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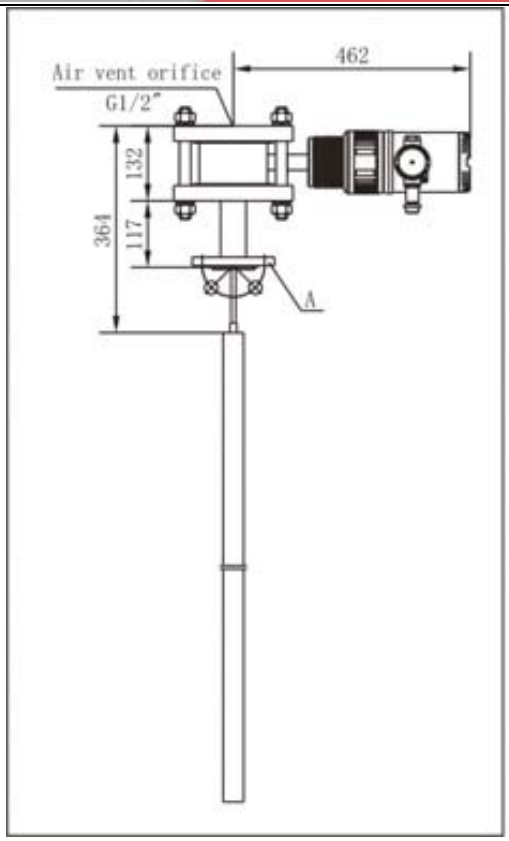
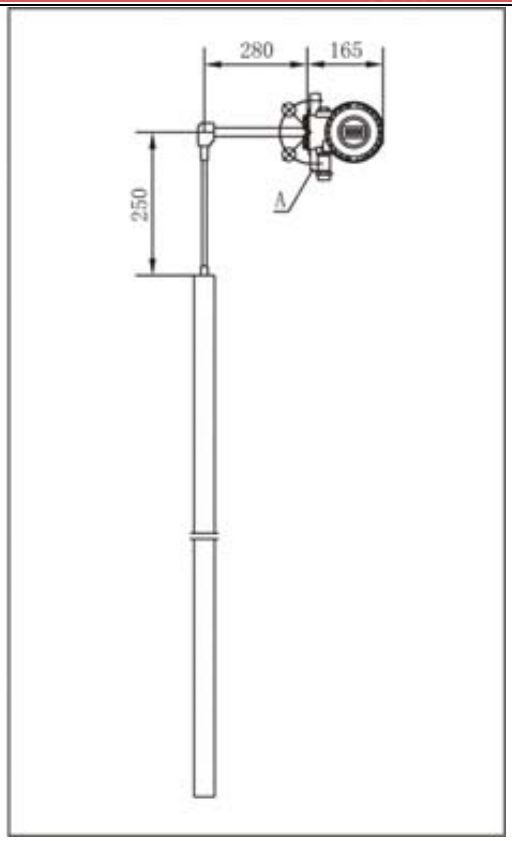
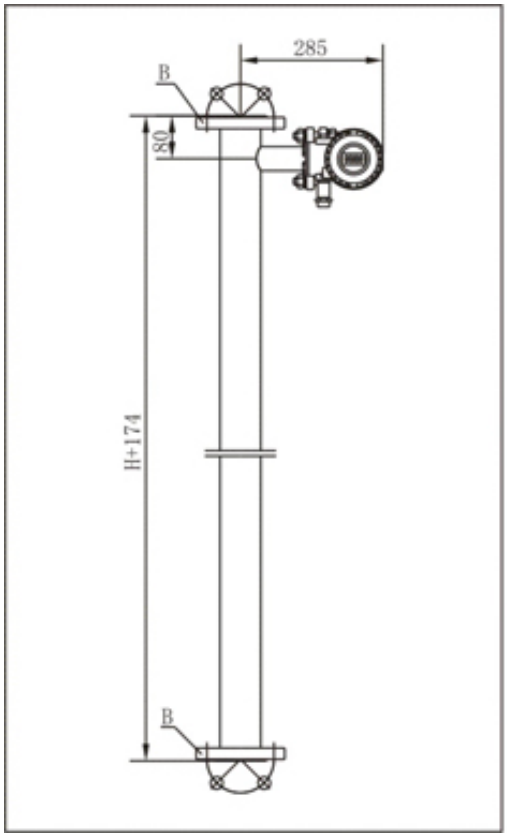


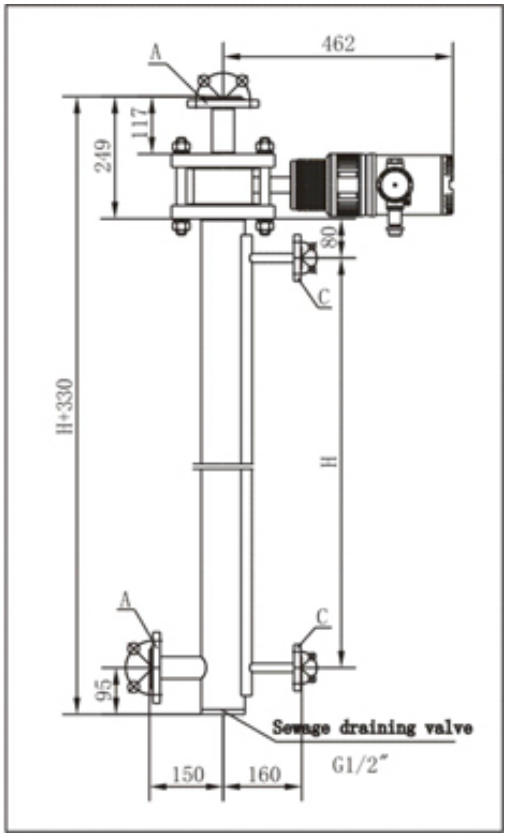

E Top mounted type;




F Side mounted type;




S Top-bottom mounted type;




A Top-side mounted with steam tracing type;

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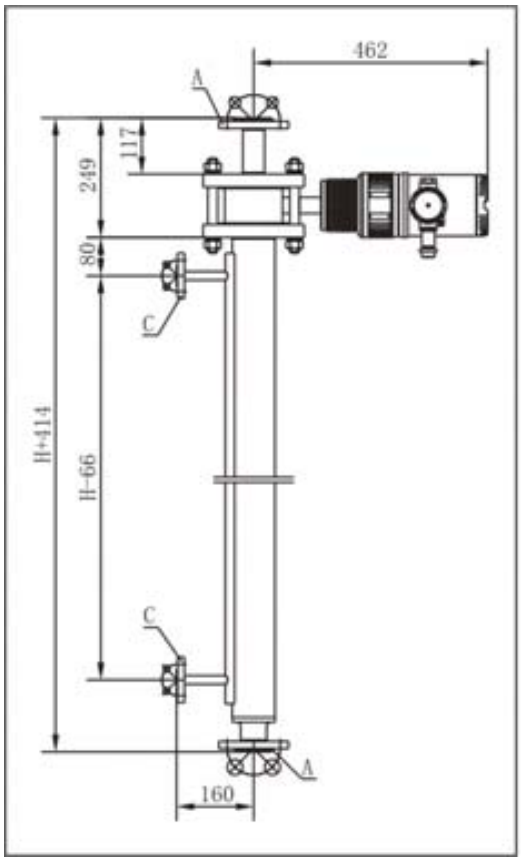
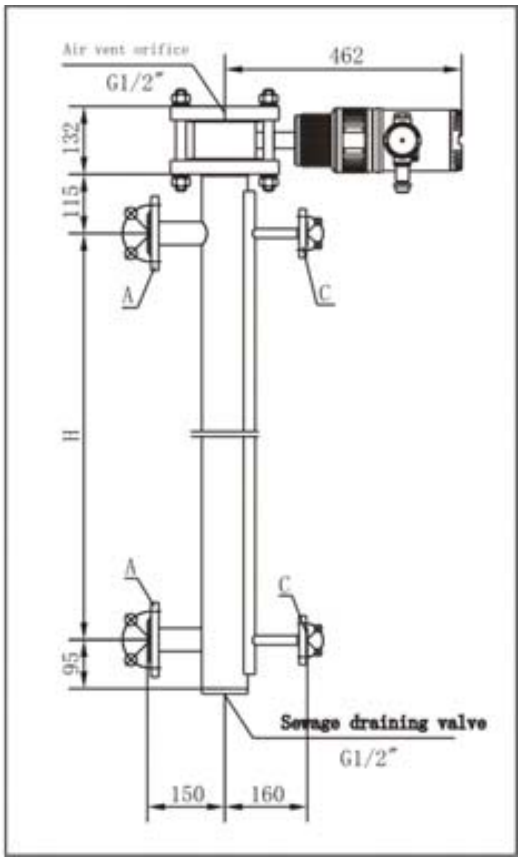
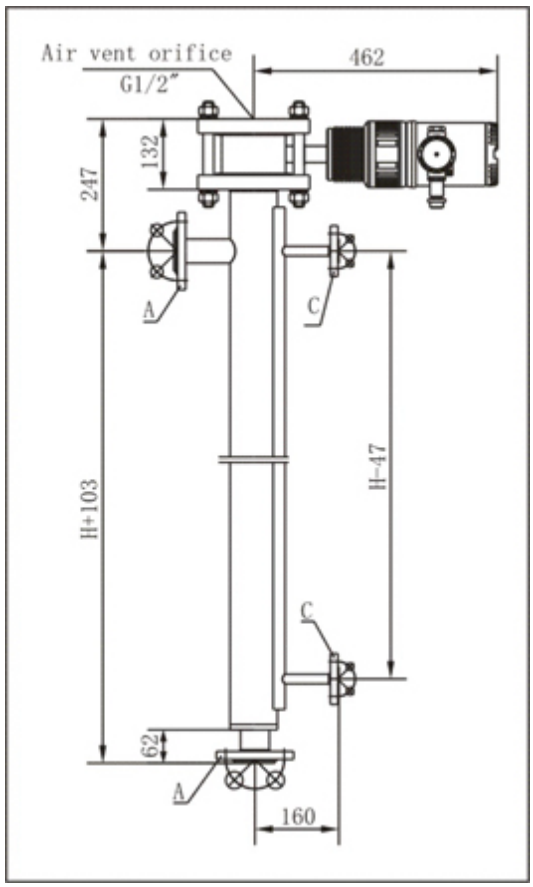



B Top-bottom mounted with steam tracing type;




C Side-side mounted with steam tracing;

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D bottom-side mounted with steam tracing type;

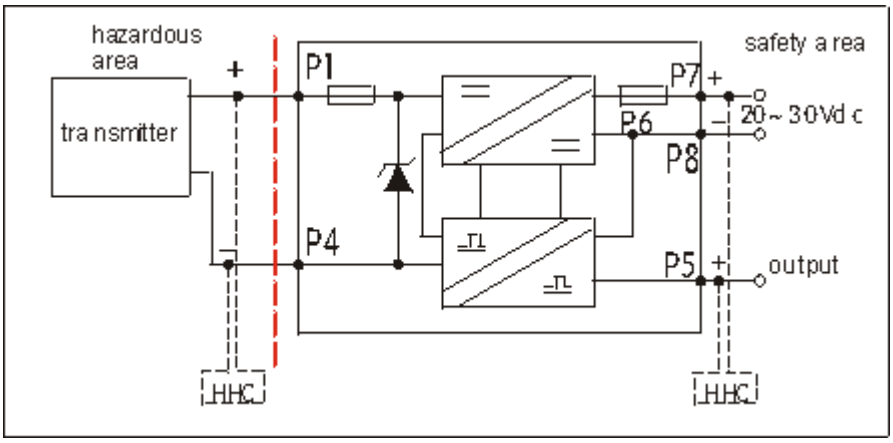



Figure 3 Electricity schematic diagram.

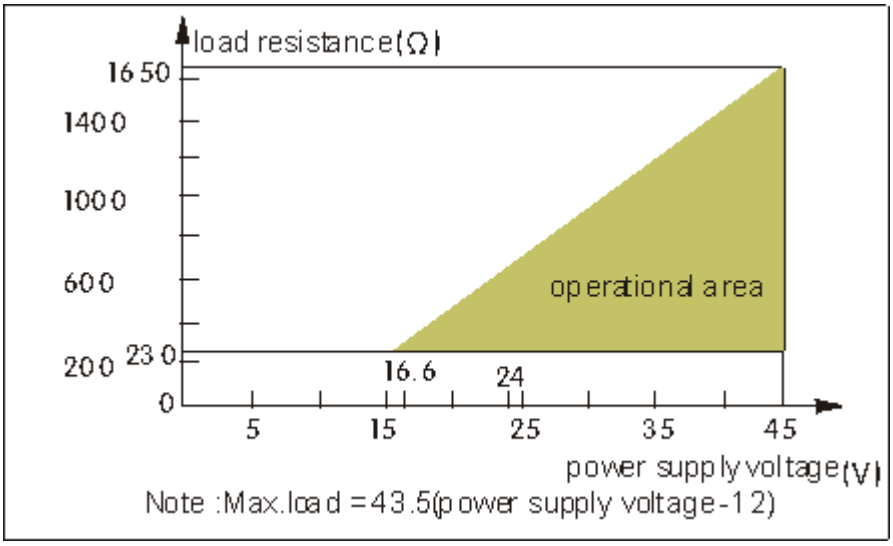
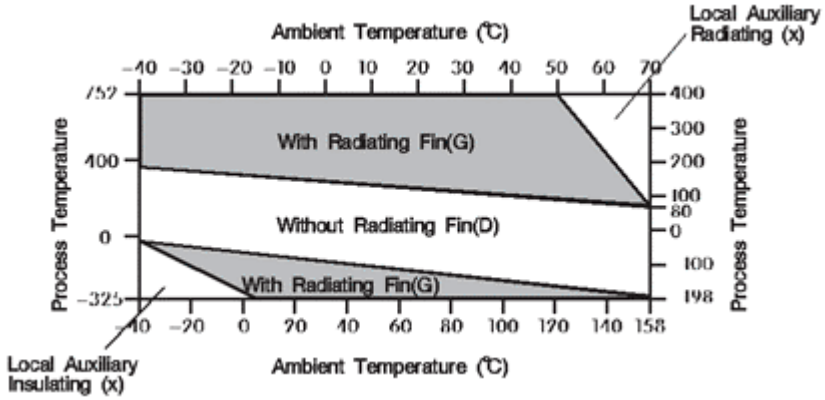



Figure 4 Load performance chart.

## The matters needed attentions when purchasing the transmitter

1. **Being sure that the model is selected correctly according to the model selection table.**
2. **Please note your special requirements that are not included in the model selection table.**
   - Operating Pressure;
   - Fluid Name;
   - Special Liquid Contacting Materials' grade and type;
   - The Transmitter's work station number;
   - Standards for special required flanges;
   - Precision (transmitter with precision 1.0% FS will be supplied without special note);




Note: If ambient dew-point temperature is higher than the process temperature Ice formation will cause instrument failure and decrease of effectivity of the insulator.

Figure 5. Ambient Temperature and Process Temperature Comparing Chart for Transmitter

Process temperature (℉); Ambient temperature (℃);

Note: If the ambient dew-point is higher than the process temperature, ice forming will arouse default and will decrease the reliability of the insulator.

## Calculation formula and calculation method

For filling water calibration, filling water height should be calculated with the following formula.

| Formula for liquid level measurement | Meanings and units of signs in the formula | Formula for interface level measurement |
|---|---|---|
| $L_0 = 0$ | $L_0$- water level (mm) of zero point | $L_0=H*\rho_2$ |
| | Lm- water level (mm) of full scale | |
| | H – measuring range mm | |
| Lm = H* ρ | ρ - fluid density g/m$^3$ | Lm = H* ρ 1 |
| | ρ 1 – heavy fluid density g/m$^3$ | |
| | ρ 2 – light fluid density g/m$^3$ | |

For weighing calibration, the weight of weights should be calculated with the following formula.

| Formula for liquid level measurement | Meanings and units of signs in the formula | Formula for interface level measurement |
|---|---|---|
| $G_0 = P$ | $G_0$ - weight of the weights (g) for zero point | $G_0 = P-F_2$ |
| | Gm–weight of the weights (g) for full scale | |
| | P- weight (g) of inner displacer | |
| Gm=P-F | F- buoyancy value (g) | Gm=P-F1 |
| | F1- buoyancy (g) value from heavy fluid | |
| | F2- buoyancy (g) value from heavy fluid | |

Note: The diameter and the weight are marked on the rating plate of the transmitter

## Calculating method of buoyancy value F

$F=\pi/4D^2H\rho$ $F_1=\pi/4D^2H\rho_1$ $F_2=\pi/4D^2H\rho_2$

F- Buoyancy ; $F_1$= Buoyancy from heavy fluid; $F_2$= Buoyancy from light fluid; ρ - Fluid density; ρ 1– Heavy fluid density; ρ 2= Light fluid density; H-Measuring range; D- Inner displacer diameter.

## Explosion-proof information

| Model | ZTD-GZ Intelligent Type | ZTD-GM Intelligent Type |
|---|---|---|

| | | | | |
|---|---|---|---|---|
| Explosion-proof type | Intrinsically safe | Explosion isolation | Intrinsically safe | Explosion isolation |
| Explosion-proof mark | Exia Ⅱ CT1- 6 | Exia Ⅱ CT1- 6 | Exia Ⅱ CT1- 6 | Exia Ⅱ CT1- 6 |
| Explosion-proof certificate | GYB03278 | GYB03276 | GYB03279 | GYB03277 |

## Guard grating (Safety fence ) recommendation table

| Guard Grating Recommendation Table for ZTD-GZ Intelligent Transmitter | |
|---|---|
| Dandong Top Electronics Instrument Co., Ltd | TP5041-Ex; TP5047-Ex |
| Shanghai Automation Instrument Institute | GS8036-Ex; GS8047-Ex |
| British MTL Company | MTL5043; MTL5041 |
| Germany P+F Company | KFD2-CR-Ex1.30300 |
| TURCK Company | MK33-Li-Ex0/24VDC |

| Guard Grating Recommendation Table for ZTD-GM Intelligent Transmitter | |
|---|---|
| Dandong Top Electronics Instrument Co., Ltd | TP5035-Ex; TP5047-Ex |
| Shanghai Automation Instrument Institute | GS8036-Ex; GS8047-Ex |
| British MTL Company | MTL5043; MTL5041 |
| Germany P+F Company | KFD2-CR-Ex1.30300 |
| TURCK Company | MK33-Li-Ex0/24VDC |

Note:

1. If you have special technical and design requirements that are not mentioned in this guide book, please contact us.
2. In case there are modifications, upgrading and remodeling for the products, the information published in our website is preferential.