

ZTD DISPLACER LEVEL TRANSMITTER

Overview

DDTOP has been developing and producing displacer liquid (interface) displacer level transmitters since 1992. After years of technical research and experience accumulation, the product performance has reached the international leading level. ZTD type displacer liquid level (interface) transmitter can be used to measure liquid level, interface or density, output 4 ~ 20mA current signal with HART communication protocol. Through a compatible HART communicator, the level controller can be queried, configured, calibrated or tested, and the information of a single measurement loop can also be accepted, and the information on site can be transmitted to the control system.



Working Principle

ZTD series intelligent displacer liquid (interface) level transmitter is composed of controller, chamber, displacer, torque tube and other components. The change of the liquid level causes the buoyancy of the displacer to change, and the change is transmitted to the torque tube assembly, so that the torque tube and the mandrel rotate an angle synchronously. A sensing system coupled to the torque tube mandrel generates a voltage signal. The electronic component of the liquid level controller measures the liquid (interface) level signal and provides a 4-20mA current output. The microcontroller measures the ambient temperature to compensate for changes in liquid density due to process temperature changes. LCD can display information such as analog output, process variable, process temperature (RTD needs to be installed), torque tube rotation angle and percentage range of liquid (interface) level.

ZTD Displacer Level Transmitter with DLT9010 Level Controller

The DLT9010 is the transmitter that independently developed by DDTOP. After years of development and improvement, it has reached the international leading level. Exquisite craftsmanship and mature technology make the product performance more stable and reliable. A number of authoritative certifications ensure clients to use the product with confidence and safety.

Certification, Patent, Software Copyright, Achievements

Certifications

Functional safety SIL 2 certificate is issued by the third party French BV company
CE ATEX explosion-proof certificate is issued by the third party Germany TUV Rheinland
CE PED directive certificate is issued by the third party Germany TUV SÜD

Patent

Displacer level transmitter zero point device - utility model patent (patent number: ZL 2014 2 0097716.3).
Displacer level transmitter with overload protection mechanism - utility model patent (patent number: ZL 2014 2 0801088.2).
Displacer level transmitter on-line calibration and self-inspection mechanism- utility model patent (patent number: ZL 2009 2 0203039.8).
Displacer level transmitter--appearance design patent (patent number: ZL 2010 3 0660336.3).

Software Copyright

"DDTOP Displacer Level Transmitter Embedded Software V1.0 Compliant with Functional Safety" (Registration No.0694038).
"DDTOP Intelligent Digital Liquid Level Transmitter Embedded Intelligent Software V1.0" (Registration No.0225313).

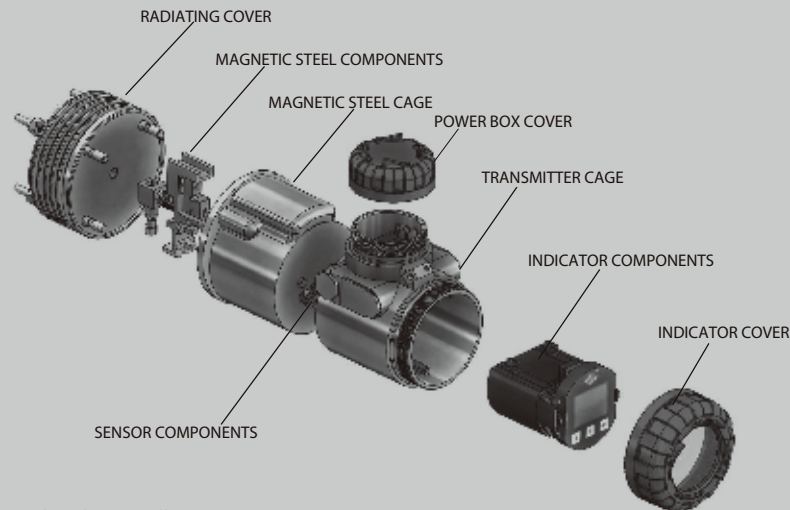
Achievement

"Provincial Science and Technology Research Achievement" certificate issued by Liaoning Provincial Department of Science and Technology (2012.3)
"Specialized Specialty New Product" certificate issued by Liaoning Provincial Department of Small and Medium Enterprises (2012.6)

The second prize certificate of "Liaoning Province Excellent New Product Award" issued by the People's Government of Liaoning Province (Certificate No.: 09XCP-2-060) (2012.7)

The third prize certificate of "Liaoning Province Excellent New Product Award" issued by Liaoning Provincial People's Government (Certificate No.: 10XCP-3-158) (2014.8)

Certificate of "2012 Excellent Product Award" issued by China Instrument Society (2012.8)

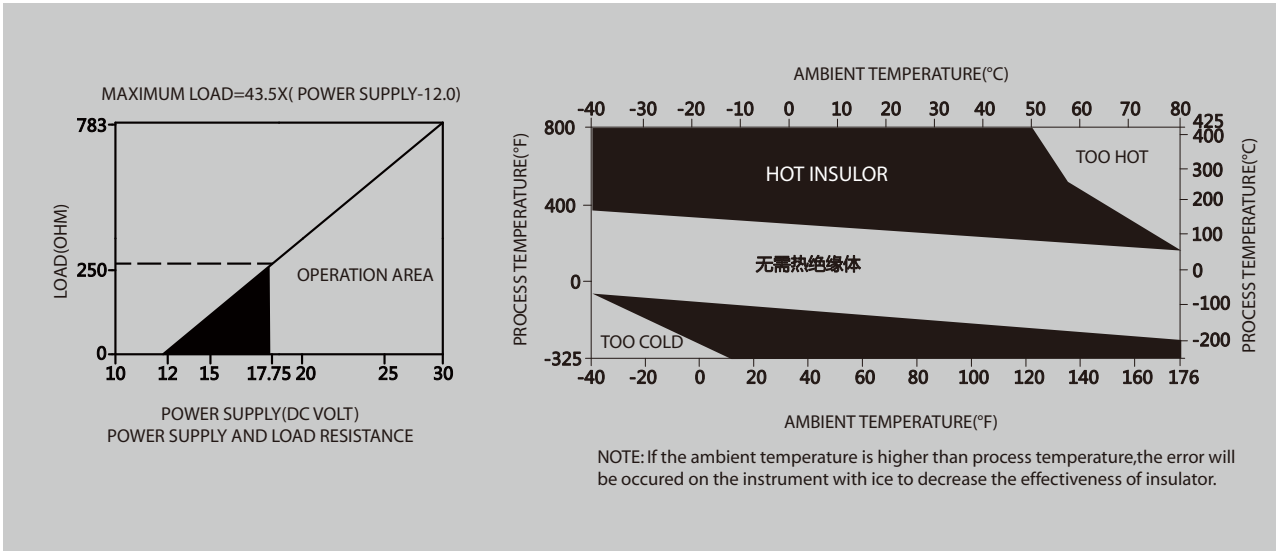


Exploded diagram of DLT9010 level controller

Main Technical Data

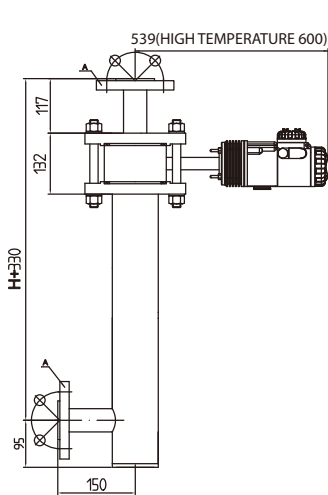
- **Power supply:** 12~30V DC; Reverse polarity protection inside the controller (Controller voltage ≥ 17.75 V DC during HART protocol communication)
- **Output:** 4~20mA DC+HART (Positive action—increasing liquid level, interface, or density increases output; or reverse—increasing liquid level, interface, or density decreases output)
- **Measuring range:** 300mm~2500mm (Can be customized out of range)
- **Pressure rating:** ≤ 42.0 MPa(Class2500)
- **Nominal diameter:** DN40 or customized
- **Ambient temperature:** $-40^{\circ}\text{C} \sim +80^{\circ}\text{C}$ (When $\leq -20^{\circ}\text{C}$, there is no display on the LCD, and the remote transmission can be used normally)
- **Medium temperature:** $-196^{\circ}\text{C} \leq T \leq +450^{\circ}\text{C}$
- **Accuracy:** $\pm 0.5\%$ or $\pm 0.2\%$
- **Power supply impact:** When the power supply changes between the minimum and maximum values of the specified voltage, the output changes $< \pm 0.2\%$ of full scale
- **LCD indicator:** Output current signal, process variable, process temperature, percentage range, torque tube rotation angle
- **Liquid density:** $0.2 \leq \rho \leq 1.9\text{g/cm}^3$
- **Density difference:** $\geq 0.04\text{g/cm}^3$
- **Torque tube material:** Standard Inconel 600, Optional Monel, Hastelloy C-276
- **Chamber material:** Carbon steel, SS304, SS316L or as customer requirements
- **Displacer material:** SS304, SS316L or as customer requirements
- **Flange standard:** HG/T20592-2009, HG/T20615-2009 or as customer requirement
- **Power inlet:** 2 pcs M20 \times 1.5 (internal thread) or as customer requirement
- **Explosion-proof type:**
IECEX Ex ia II C T5 Ga, Ex d II C T5/T6 Gb
TUV Ex ia II C T5 Ga, Ex d II C T5/T6 Gb

- **Functional Safety Level:** SIL2
- **Ingress protection:** IP66
- **Alarm selection:** Self-diagnosis of faults with inaccurate measurements of process variables, such as faults in electronic modules. Configurable high and low alarms for process variables

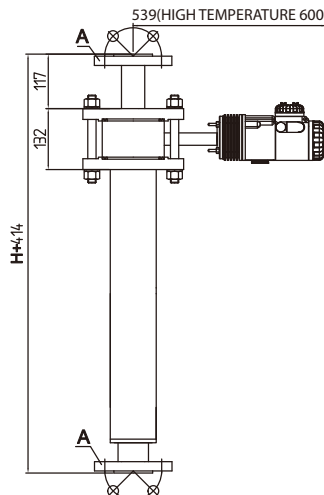


Outline Drawing

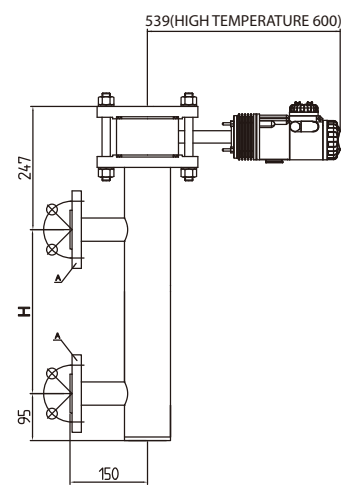
H in the figure below is the measuring range, the nominal pressure is \leq PN63, and the dimensions in the brackets in the figure are products with heat-insulating sleeves.



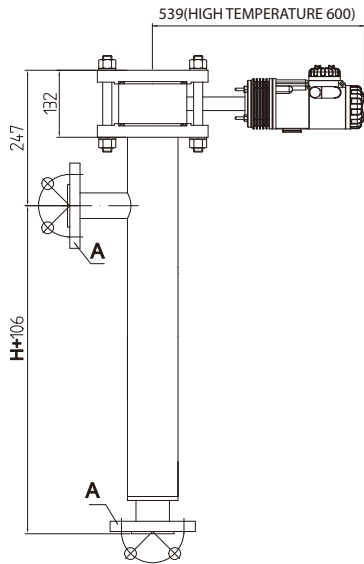
A. TOP-SIDE MOUNTED



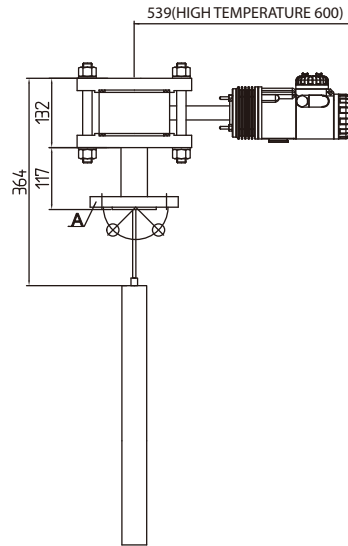
B. TOP-BOTTOMED MOUNTED



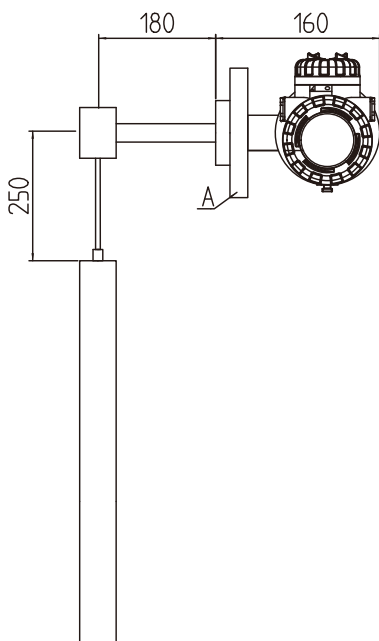
C. SIDE-SIDE MOUNTED



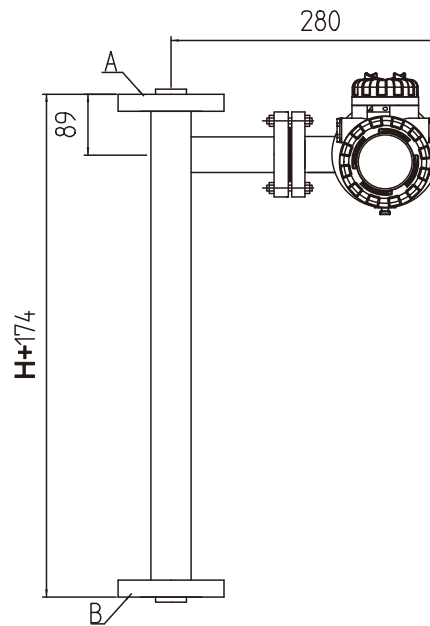
D. SIDE-BOTTOM MOUNTED



E. TOP MOUNTED



F. SIDE MOUNTED



S. TOP-BOTTOM MOUNTED

ZTD Displacer Level Transmitter with DLC3000 Level Controller

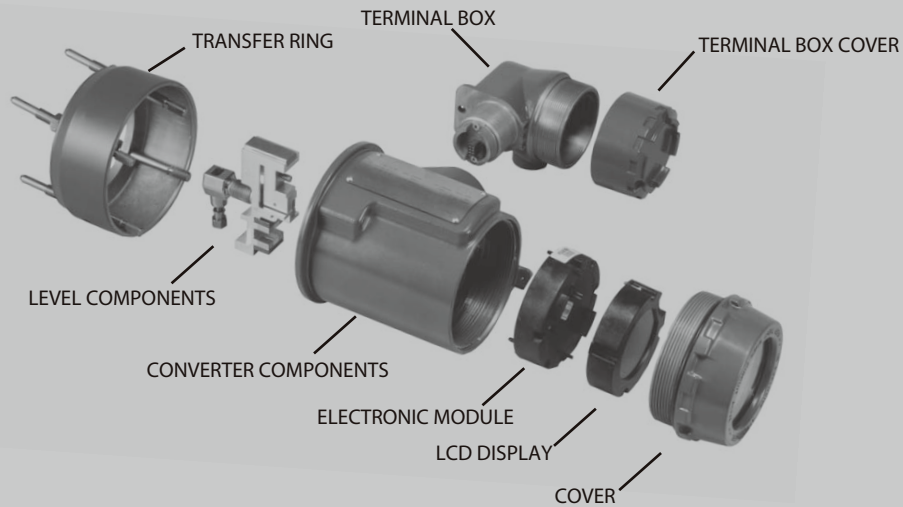
DDTOP is the largest OEM of Fisher DLC3000 series displacer level controller in the world. We have accumulated rich experience in the process of supporting manufacturing and maintenance for many years to ensure the safe use of products.



DISPLACER LEVEL TRANSMITTER WITH DLC3020F



DISPLACER LEVEL TRANSMITTER WITH DLC3100

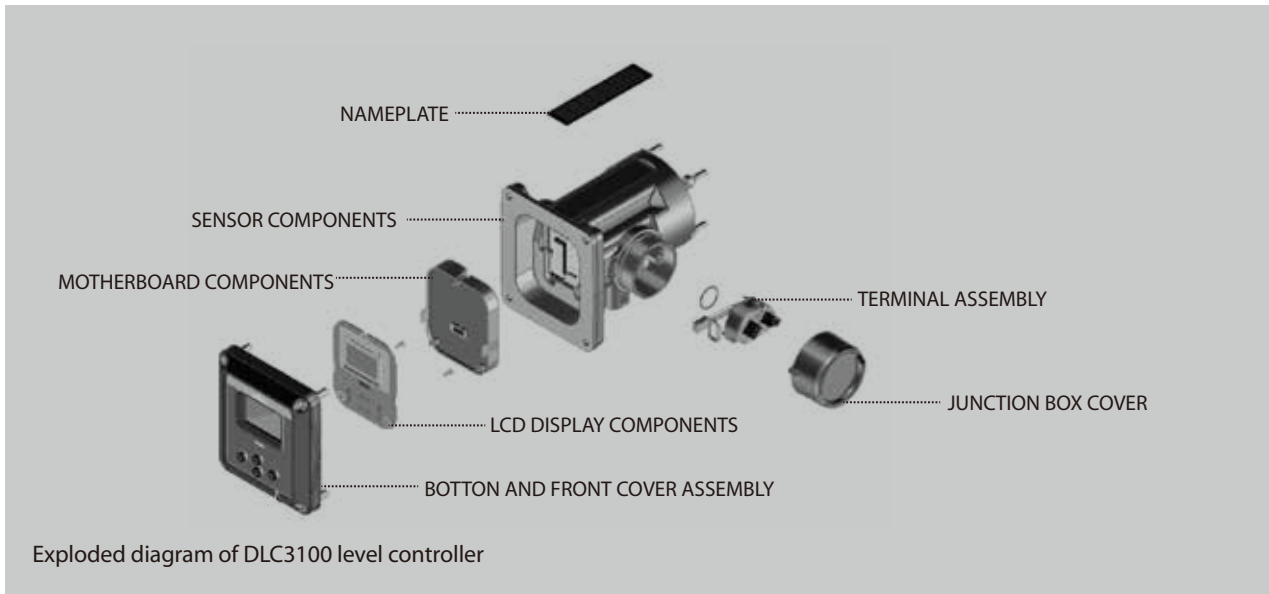


Exploded diagram of the transmitter with DLC3020f level controller

The second prize certificate of "Liaoning Province Excellent New Product Award" issued by the People's Government of Liaoning Province (Certificate No.: 09XCP-2-060) (2012.7)

The third prize certificate of "Liaoning Province Excellent New Product Award" issued by Liaoning Provincial People's Government (Certificate No.: 10XCP-3-158) (2014.8)

Certificate of "2012 Excellent Product Award" issued by China Instrument Society (2012.8)



Main Technical Data

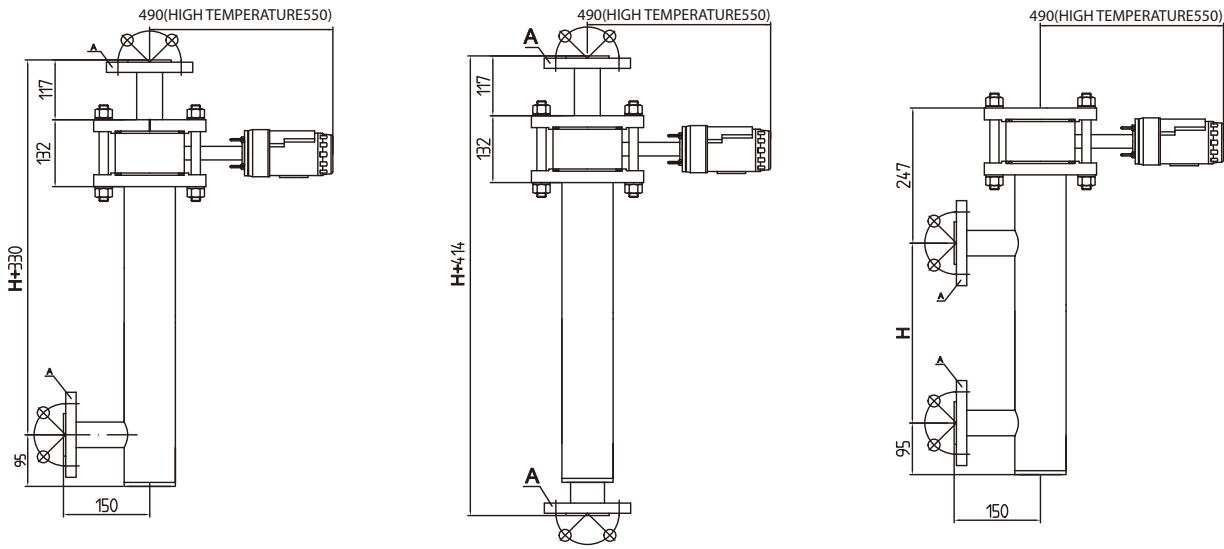
- **Power supply:** 12~30V DC, Reverse polarity protection inside the controller (Controller voltage ≥ 17.75 V DC during HART protocol communication)
- **Output:** 4~20mA DC+HART (Positive action—increasing level, interface, or density increases output; or reverse—increasing level, interface, or density decreases output)
- **Measuring range:** 300mm~2500mm (Can be customized out of range)
- **Pressure rating:** ≤ 42.0 MPa(Class2500)
- **Nominal diameter:** DN40 or customized
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- **Power supply impact:** When the power supply changes between the minimum and maximum values of the specified voltage, the output changes $< \pm 0.2\%$ of full scale
- **LCD indicator:** Output current signal, process variable, process temperature, percentage range, torque tube rotation angle
- **Liquid density:** $0.2 \leq \rho \leq 1.9$ g/cm³
- **Density difference:** ≥ 0.04 g/cm³
- **Torque tube material:** Standard Inconel 600, Optional Monel, Hastelloy C-276
- **Chamber material:** Carbon steel, SS304, SS316L or as customer requirements
- **Displacer material:** SS304, SS316L or as customer requirements
- **Flange standard:** HG/T20592-2009, HG/T20615-2009 or as customer requirement
- **Power inlet:** 2 pcs M20×1.5 (internal thread) or as customer requirement
- **DLC3020f explosion-proof type:** IEx ia II C T5/T6 Ga, Ex d II C T5/T6 Gb
- **DLC3100 explosion-proof type:** Ex ia II C T5/T6 Ga, Ex d II C T5/T6 Gb
- **DLC3020f functional safety level:** SIL 1
- **DLC3100 functional safety level:** No SIL /SIL 2 (Optional)

- **Ingress protection:** IP66
- **Alarm selection:** Self-diagnosis of faults with inaccurate measurements of process variables, such as faults in electronic modules. Configurable high and low alarms for process variables

Outline Drawing

H in the figure below is the measuring range, the nominal pressure is \leq PN63, and the dimensions in the brackets in the figure are products with heat-insulating sleeves.

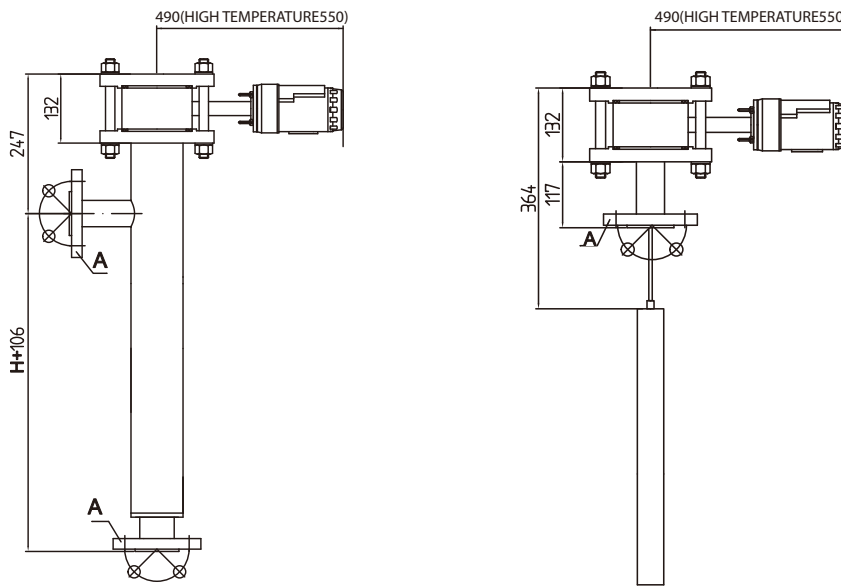
Outline Drawing with DLC3010/3020f Transmitter



A. TOP-SIDE MOUNTED

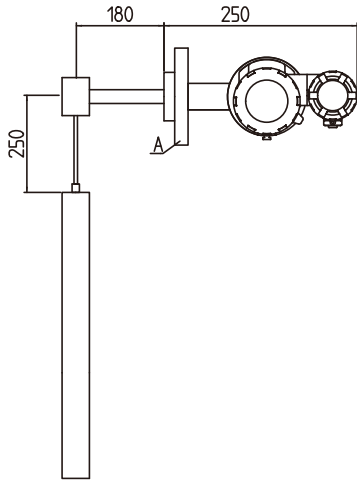
B. TOP-BOTTOMED MOUNTED

C. SIDE-SIDE MOUNTED

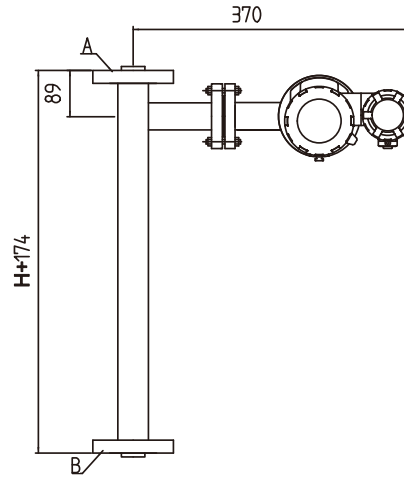


D. SIDE-BOTTOM MOUNTED

E. TOP MOUNTED

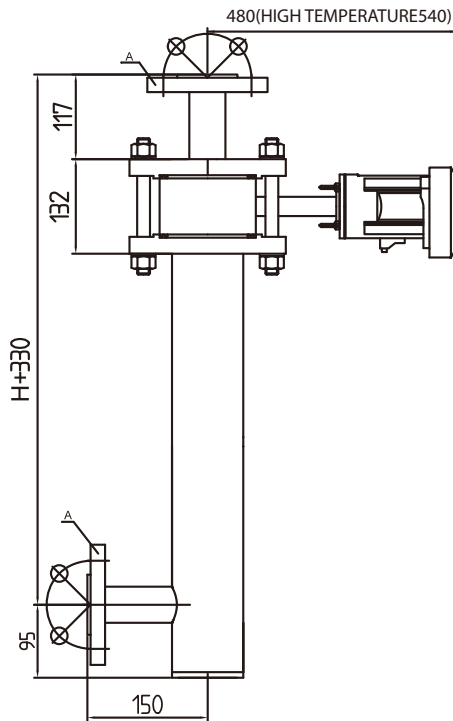


F. SIDE MOUNTED

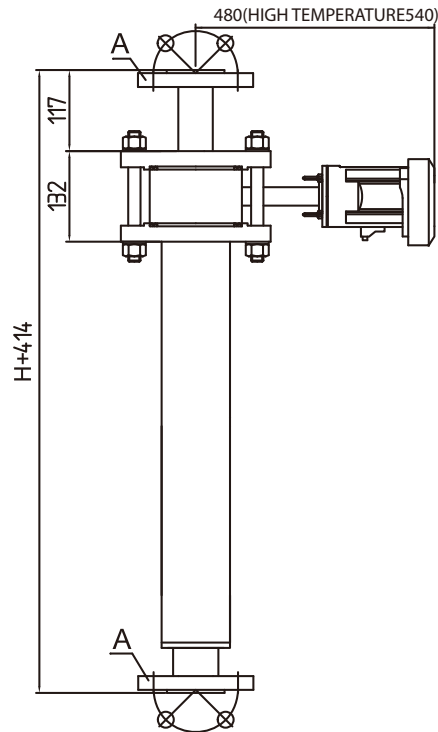


S. TOP-BOTTOM MOUNTED

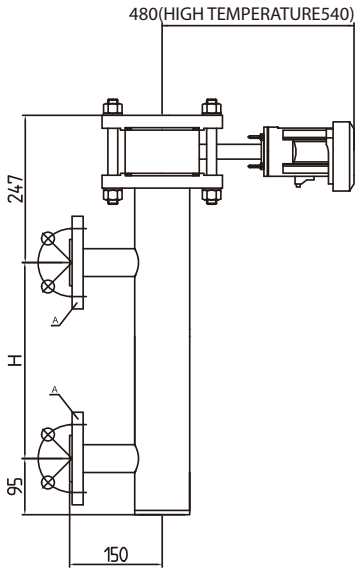
Outline Drawing with DLC3100



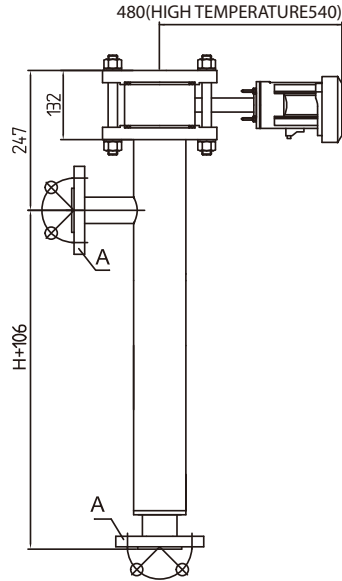
A. TOP-SIDE MOUNTED



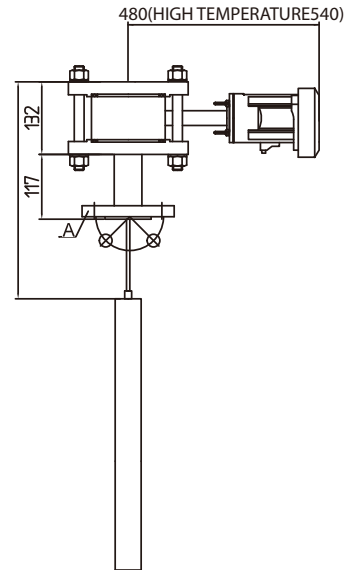
B. TOP-BOTTOM MOUNTED



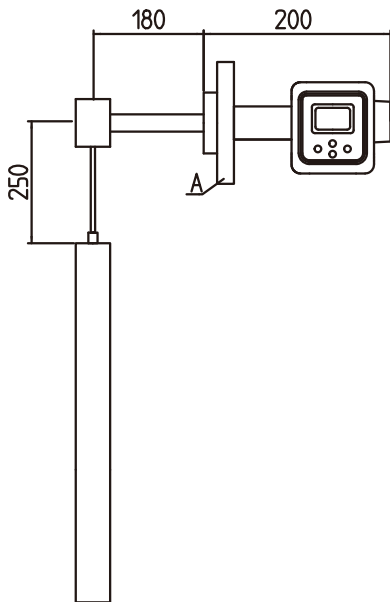
C. SIDE-SIDE MOUNTED



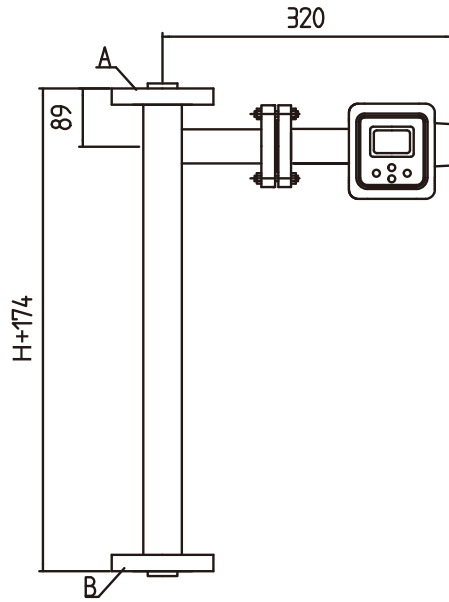
D. SIDE-BOTTOM MOUNTED



E. TOP MOUNTED



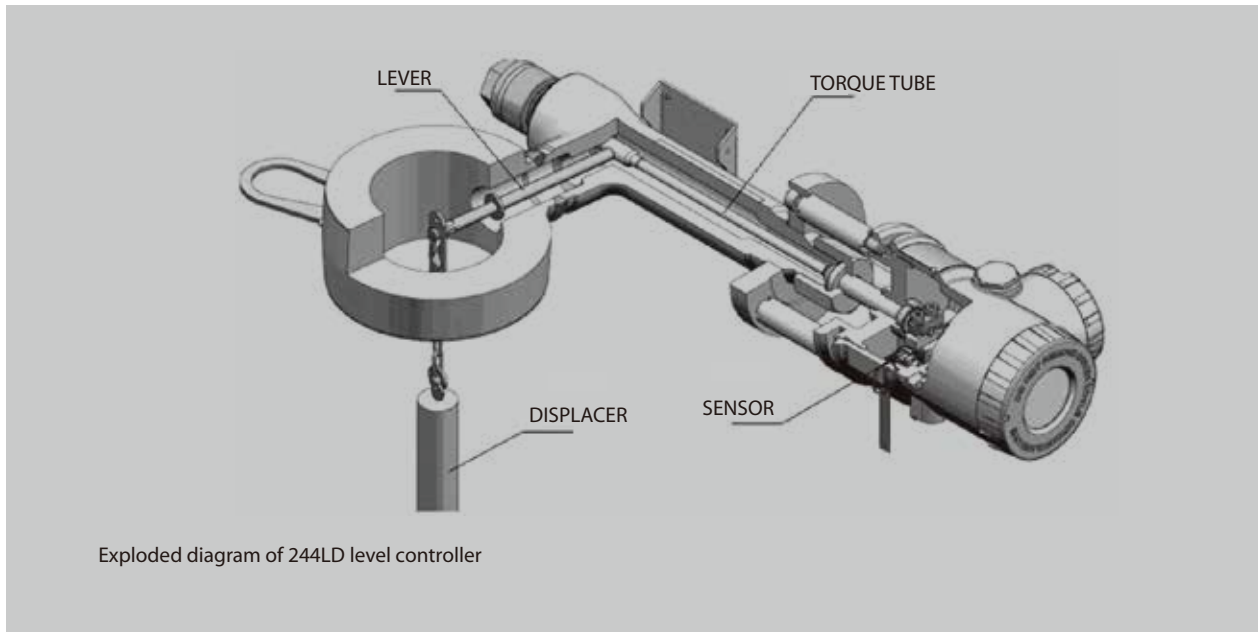
F. SIDE MOUNTED



S. TOP-BOTTOM MOUNTED

ZTD Displacer Level Transmitter with 244LD Level Controller

DDTOP is the world's largest OEM of FOXBORO's 244LD level controller. The level controller is imported from FOXBORO. After many years of OEM manufacturing and maintenance of 144LD, 244LD, and 244LD Level Star controllers, we have accumulated rich experience of this series technical characteristics to ensure clients long-term and safe use of this series products.



Working Principle

The buoyancy force experienced by the displacer 4 is transmitted to the sensor 3 through the lever 1 and the torque tube 2. Within the measurement range, the voltage is proportional to the buoyancy and is sent as an input signal to the electronic amplifier. Through the electronic amplifier, the voltage is converted into a 4-20mA two-wire output signal. In two-wire mode, the amplifier is powered by the signal current circuit.

Any part of the displacer immersed in the liquid obeys the principle of Archimedes buoyancy. By measuring the change in the buoyancy of the cylindrical displacer suspended in the liquid, the liquid level, interface or density can be measured.

When measuring density and interface, the inner displacer should be completely immersed in the liquid. The change of liquid level must be within the measuring range.

Calculation of buoyancy: $F_A = V_x \cdot \rho_1 \cdot G + (V - V_x) \cdot \rho_2 \cdot G$

In the formula

FA-Buoyancy

V_x -The volume of the displacer

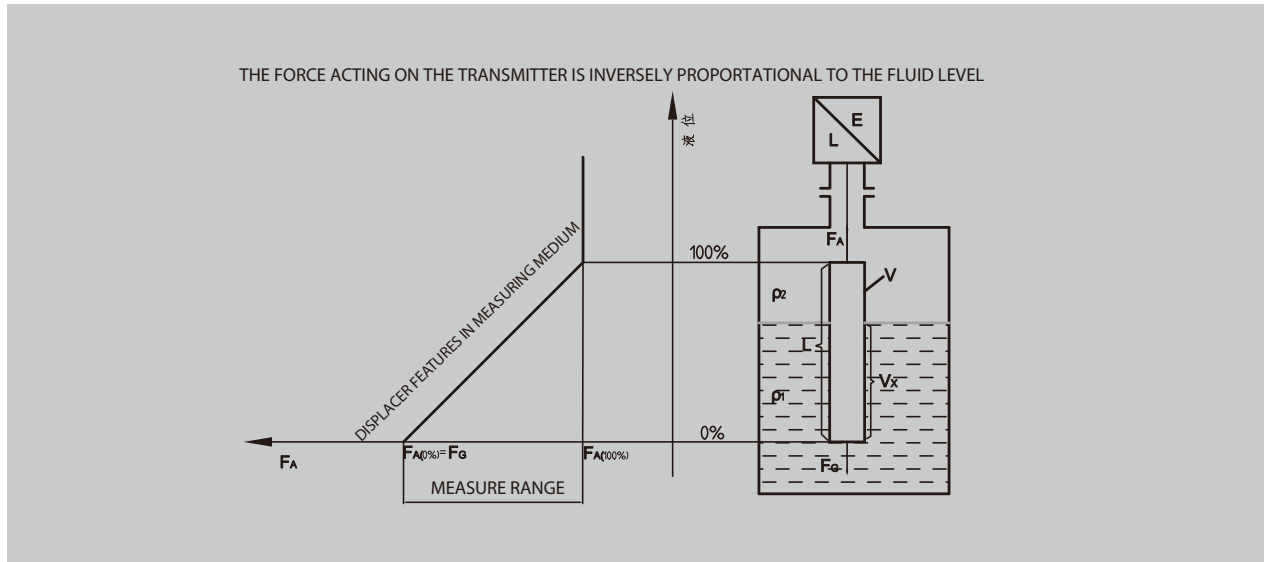
-In a liquid with a density of ρ_1 , the volume of the medium displaced by the displacer

ρ_1 -Average density of heavier medium

ρ_2 -Average density of lighter medium

G-Local acceleration of gravity

F_G -The gravity of the displacer itself

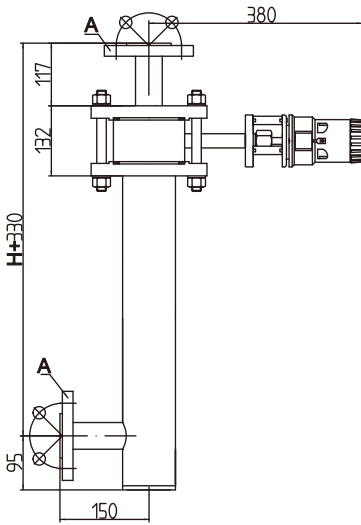


Main Technical Data

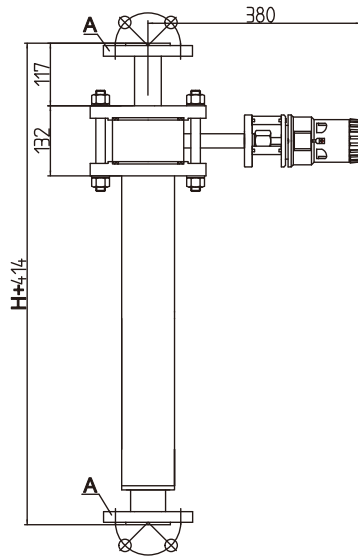
- **Power supply:** 12~42V DC
- **Output:** 4~20mA/20~4mA+HART
- **Measuring range:** 300~3000mm (Can be customized out of range)
- **Pressure rating:** ≤ 42.0 MPa
- **Nominal diameter:** DN40 or customized
- **Ambient temperature:** $-40^{\circ}\text{C} \sim +80^{\circ}\text{C}$ (When $\leq -20^{\circ}\text{C}$ there is no display on the LCD, and the remote transmission can be used normally)
- **Medium temperature:** $-196^{\circ}\text{C} \leq T \leq +450^{\circ}\text{C}$
- **Accuracy:** $\pm 0.5\%$
- **Load resistance:** (power supply voltage-12V)/0.02A
- **LCD display:** five digits can be configured as %, mA or other physical units
- **Liquid density:** $0.2 \leq \rho \leq 1.9\text{g/cm}^3$
- **Density difference:** $\geq 0.04\text{g/cm}^3$
- **Torque tube material:** Standard Inconel 600, Optional Monel, Hastelloy C-276
- **Chamber material:** Carbon steel, SS304, SS316L or as customer requirements
- **Displacer material:** SS304, SS316L or as customer requirements
- **Flange standard:** HG/T20592-2009, HG/T20615-2009 or as customer requirement
- **Power inlet:** 2 NPT1/2 (internal thread) or according to user requirements
- **Explosion-proof type:** IExia II CT4/6, Ex d II CT4/6
- **Functional safety level:** SIL 2
- **Ingress protection:** IP66

Outline Drawing

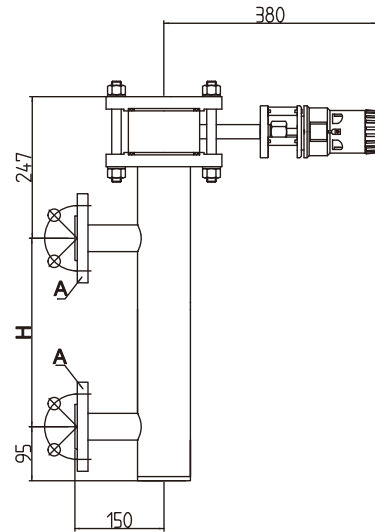
Structural form and size, H in the figure below is the range, nominal pressure \leq PN63.



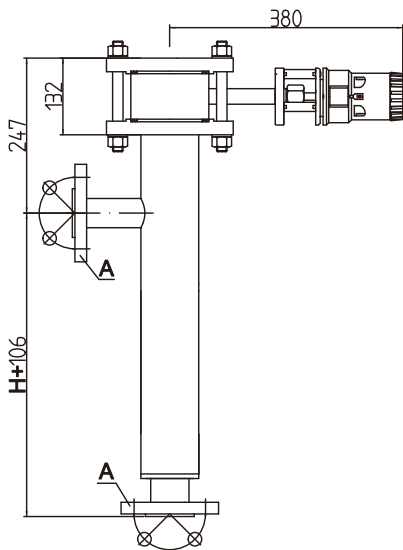
A. TOP-SIDE MOUNTED



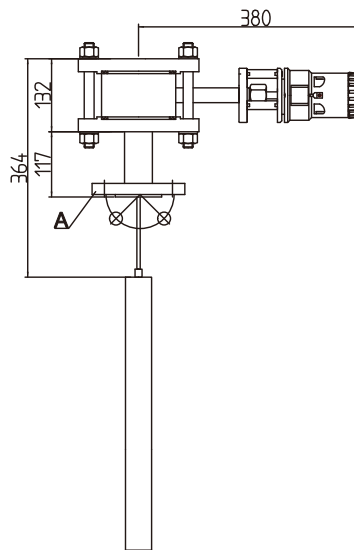
B. TOP-BOTTOMED MOUNTED



C. SIDE-SIDE MOUNTED



D. SIDE-BOTTOM MOUNTED



E. TOP MOUNTED

Model Selection Table

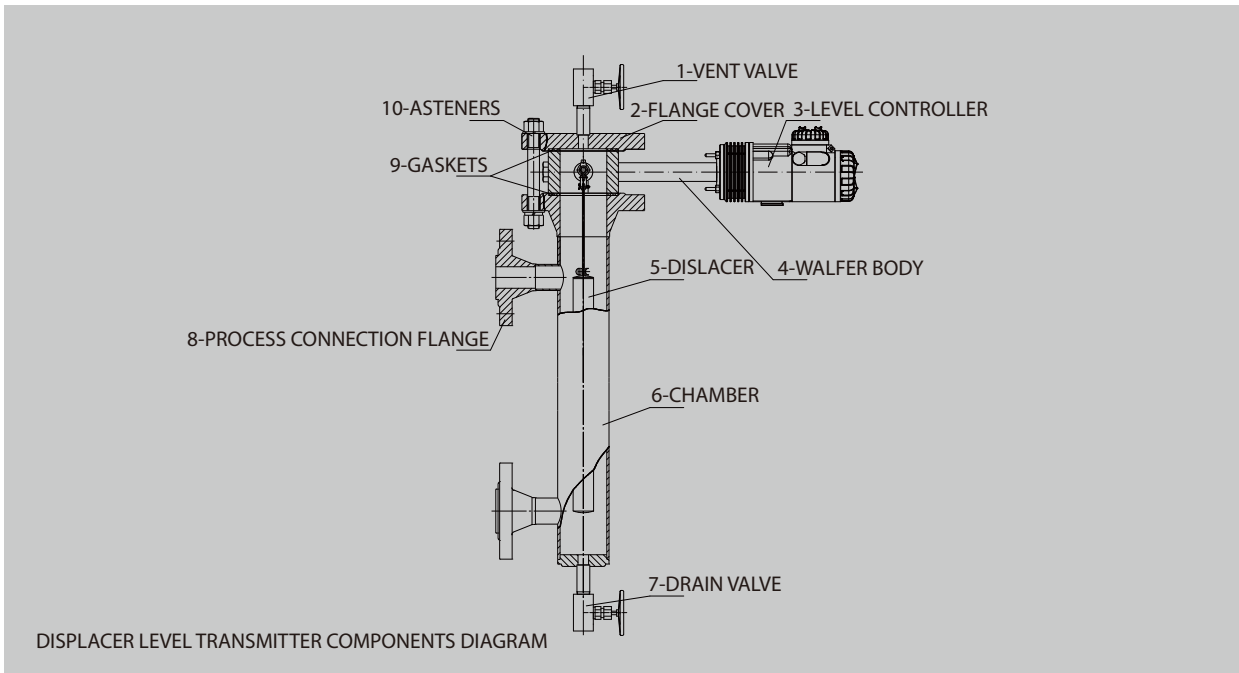
MODEL	CODE		CONTENT
ZTD-			Smart Type Displacer Level (Interface) Transmitter
MEASUREMENT	1		Level
	2		Interface
	3		Density
MOUNTING TYPE	A		Top-Side
	B		Top-Bottom
	C		Side-Side
	D		Side-Bottom
	E		Top Mounting
PRESSURE RATING	2		PN10(1.0MPa)
	3		PN16(1.6MPa)
	4		PN20(CLASS150)
	5		PN25(2.5MPa)
	6		PN40(4.0MPa)
	7		PN50(CLASS300)
	8		PN63(6.3MPa)
	9		PN100(10.0MPa)
	10		PN110(CLASS600)
	11		PN150(CLASS900)
	12		PN160(16.0MPa)
	13		PN250(25.0MPa)
	14		PN260(CL1500)
	15		PN420(42.0MPa)
16		PN420(CL2500)	
EXPLOSION-PROOF TYPE	d		Explosion-proof
	i		Intrinsic safe
CHAMBER MATERIAL	1		20
	2		304
	3		316
	4		316L
	X		As customer requirement
TEMPERATURE RANGE	D		-30°C ≤ T < +100°C
	G		-196°C ≤ T ≤ +450°C
		/	
		Measure Range	Range: Actual measuring range, unit is mm
		-	
HEAT TRACING INTERFACE TYPE	F		Chamber with heat tracing, flange interface
	Z		Chamber with heat tracing, thread interface
TRANSMITTER MOUNTING ORIENTATION	Y		Right hand (default)
	W		Left hand
	-		
TRANSMITTER MODEL	1		DLT9010(Hart)
	2		DLC3100(Hart)
	3		DLC3020f(FF)
	4		244LD(Hart)
	5		DLT9010(Hart SIL2)
	6		DLC3100(Hart SIL2)
ZTD-		/ / - -	

Sample of Model Selection

ZTD-2C7/i1D/800FY-1: Interface measurement, side-side mounting, pressure rating 5.0MPa, intrinsically safe, output is HART, chamber material is carbon steel, medium temperature range $-30\text{ }^{\circ}\text{C} \leq T < +100\text{ }^{\circ}\text{C}$, measuring range 800mm, chamber with heat tracing, heat tracing interface is flanged type, right hand mounting, level controller model is DLT9010.

Mounting Orientation of Level Controller

Assemble the transmitter on the walfer body. When Facing the LCD screen of the level controller, the liquid level controller is located on the right side of the displacer measuring chamber, which is the right type installation, and the torque tube rotates clockwise when the liquid level rises; the liquid level controller is located on the left side of the displacer measuring chamber, which is the left type installed, the torque tube rotates counterclockwise as the fluid level rises.



Mounting Orientation of Level Controller

Material	Process Temperature	
	Min	Mix
Cast Iron	-29°C	232°C
Steel	-29°C	427°C
Stainless Steel	-196°C	427°C
Monel	-196°C	371°C
Inconel	-196°C	600°C
Hastelloy	-196°C	400°C
Graphite gasket/Stainless steel gasket	-196°C	427°C
Monel/PTFE	-73°C	204°C

Safety Barrier Recommended Use Table

Shanghai I.S.Instruments & System Co.,Ltd	LS4041-Ex
Germany P+F Company	KFD2-STC3- Ex1
Shanghai Automation Instrument Institute	GS8041- Ex GS8045- Ex
Dandong Top Electronics Instrument (Group) Co.,Ltd	TP5041- Ex TP5045- Ex
Longfei Group Corporation in China	LF1045
England	MTL3046B MTL5042 MTL706 ⁺

Order Information

- | | | |
|--|--|--|
| <ul style="list-style-type: none"> ▶ Model | <ul style="list-style-type: none"> Operating pressure & temperature | <ul style="list-style-type: none"> Special wetted material name |
| <ul style="list-style-type: none"> ▶ Tag No. | <ul style="list-style-type: none"> Medium name & density | <ul style="list-style-type: none"> Flange standard |
| <ul style="list-style-type: none"> ▶ Accuracy | | |