

VRDLC3020 Series  
Smart Displacer Liquid Level (Interface) Transmitters  
Equipped with FISHER FIELDVUE DLC3020F  
AND FISHER 249 CONSTRUCTION

# Catalogue



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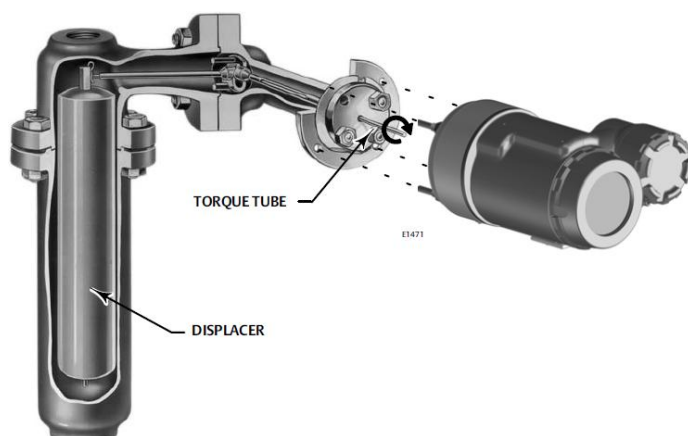
## 1. Introduction

VRDLC3020 series smart displacer level (interface) transmitters use the original Fisher FIELDVUE DLC3020F digital controller which is designed to directly replace pneumatic,



analogue, or HART transmitters. The other parts are made by V-river locally. The FIELDVUE DLC3020F digital level controller equipped with displacer sensors caged with FISHER 249 construction cage is a fieldbus communicating instrument used to measure liquid level, interface level. The buoyancy force from the liquid, which changes with the liquid level's change, is exerted on the displacer, which rotates the torque tube shaft. This rotary motion is transferred to the digital level controller, then the liquid level change finally is changed into digital signals, which is sent out from the digital level controller. (Please refer to

the picture lower left)



In addition to the normal function of reporting process level PV, the DLC3020F, using Foundation Fieldbus protocol, gives easy access to information critical to process operation and will readily integrate into a new or existing system. AMS Suite: Intelligent Device Manager or the 475 Field Communicator can be used to configure, calibrate, or test the digital level controller. It can be mounted on a

wide variety of cageless or caged displacer sensors with FISHER 249 construction as well as on other displacer type level sensors through the use of mounting adapters.

Fisher FIELDVUE DLC3020F digital level controller is a block-based device. Generally, there are two groups of blocks, instrument blocks and function blocks.

Instrument blocks:

Resource Blocks – The resource block contains the hardware specific characteristics associated with a device; it has no input or output parameters. The resource block monitors and controls the general operation of other blocks within the device. For example, when the mode of the



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resource block is out of service, it impacts all function blocks.

**Transducer Blocks** – The transducer block takes an analog signal and converts it to a level or interface reading. The DLC3020F has two transducer blocks, one for the device, and one for the display.

**Function Blocks:**

There are 6 function blocks. For the detail information, please kindly refer to “Instruction Manual of FISHER FIELDVUE DLC3020F Digital Level Controller”

## 2. Features

### ■Ease of use

The DLC3020F, a fieldbus level or interface transmitter, features the latest in user interface technology. In addition to reporting the PV, the DLC3020F can act as a PID controller or level switch.

### ■Guided Setup and Calibration

Leads you through instrument setup, process fluid selection, and calibration in an easy-to-use format.

### ■Dynamic Temperature Compensation.

Integration of process fluid temperature, when needed, enables density compensation to maintain PV accuracy.

### ■Simple Process Fluid Configuration

The capability to easily select/define process fluids allows for fluid changes without requiring recalibration.

### ■Calibration/Setup Logs Saved in Instrument

Logs, including calibration, instrument setup, and process fluid data, can be saved for future reference or re-use in batch or continuous applications. The instrument stores up to 30 logs

## 3. Technique parameters

**Function:** Transmitter, Controller, Switch

**Mounting types:** outer displacer type, top-bottom type, side-side type, top-side type, bottom-side type, internal displacer type, top-placed type, and side placed type

**Mounting positions:** right- or left-of-displacer, see figure 1.

**Operating pressure (MPa):** 4.0, 6.3, 16.0, 20.0, and 32.0. or higher on request.

**Operating temperature:** -190-29°C for Low-temp type; -29-150°C for normal type; 150-350°C for high-temp type, and 350-427°C for ultra-high temp type, see table 1 and

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figure 2.

**Flange connections:** JB/TB82.2-94, HGJ, GB, ANSI, JIS etc

**Materials:** Displacer: 1Cr18Ni9Ti, 316L

Measuring cage: carbon Steel, 1Cr18Ni9Ti, 316L

**Explosion proof:** Ex d IICT6 and Ex ia IICT6

**Differential density:** 0.4 - 1.5g/cm<sup>3</sup> (liquid level) and 0.05- 0.5g/cm<sup>3</sup> (liquid interface)

**Electrical connections:** G1/2" and M20\*1.5 adaptor available

**Power supply:** 9 to 32 volts DC, 17.7mA DC; instruments are not polarity sensitive

**Digital Communication Protocol:** Foundation fieldbus registered device (ITK5)

Physical Layer Type(s):

121 low-power signaling, bus-powered, Entity Model I.S.

123 low-power signaling, bus-powered, non I.S.

511 Low-power signaling, bus-powered, FISCO I.S.

### **Device Inputs:**

Level Sensor Input (Required)

Rotary motion of torque tube shaft is proportional to buoyant force of the displacer caused by changes in liquid level or interface level

Pressure Temperature Compensation Input (optional)

RTD interface for 2 or 3 wire 100 ohm platinum RTD

AO Block Foundation fieldbus temperature transmitter

Manual compensation values manually entered in device

### **LCD Meter Indication:**

Process variable in engineering units

Process variable in percent (%) only

Alternating process variable in engineering units and percent (%)

Optional: Alerts as configured

### **Function Blocks Suite:**

AI, PID, DI (two), AO(three), ISEL, and an ARTH function block

### **Block Execution Times:**

AI, PID, DI, AO, ISEL: 15ms

ARTH: 25ms

### **Fiedbus Device Capabilities:**

Backup Link Active Scheduler (BLAS)

### **Performance:**

Criteria	DLC3020F <sup>(1)</sup>
Independent Linearity	+/-0.1% of output span
Accuracy	+/-0.15%
Repeatability	<0.1% of full scale output
Hysteresis	<0.1% of full scale output
Deadband	<0.05% of input span
Humidity	+/-0.1% (RH9.2% to 90%)
Note: At full design span, reference conditions. 1. To lever assembly rotation inputs	

**Accuracy of Displacer Liquid Level Transmitters:**  $\pm 0.2\%$  for Level,  $\pm 0.5\%$  for interface

**Ambient Temperature Effect:** The combined temperature effect on zero and span is less than 0.01% of full scale per degree Celsius over the operating range  $-40$  to  $80\text{ }^{\circ}\text{C}$  ( $-40$  to  $176\text{ }^{\circ}\text{F}$ )

**Process Temperature Effect:** Temperature compensation can be implemented to correct for fluid density changes due to process temperature variations. Please refer to page 31 of "Instruction Manual of FISHER FIELDVUE DLC3020F Digital Level Controller" for information on how to correct with temperature compensation.

**Lightning and Surge Protection:** The degree of immunity to lightening is specified as surge immunity in table below. For additional surge protection commercial available transient protection can be used.

Port	Phenomenon	Basic Standard	Test Level	Performance Criteria <sup>(1)</sup>
Enclosure	Electrostatic discharge (ESD)	IEC61000-4-2	4 KV contact 8 KV air	A
	Radiated EM	IEC 61000-4-3	80 to 1000 MHz@10V/m with 1KHz @ 80%	A



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	field		1400 to 2000 MHz@3V/m with 1KHz @ 80% 200 to 2700 MHz@1V/m with 1KHz @ 80%	
	Rated power frequency magnetic field	IEC 61000-4-8	30 A/m at 50/60 Hz	A
I/O signal/ control	Burst	IEC 61000-4-4	1 KV	A
	Surge	IEC 61000-4-5	1KV (line to ground only, each)	A
	Conducted RF	IEC 61000-4-6	150 KHz to 80 MHz at 3 vrms	A
1. Performance criteria: +/- 1% effect. A=No degradation during testing, but is self-recovering.				

**Alerts and Diagnostics:** Electronic Alerts advise when there is an electronic error in memory  
**Operational Range Alerts:** notify when PV range and sensor range changes might affect calibration.

**Rate Limit Alerts:** indicate rapid rise or fall in displacer, which can signify abnormal operating conditions

**RTD Alerts:** show health and condition of connected RTD

**Sensor Board Alerts:** indicate if the device is operating above or below maximum recommended limits/ advises if the sensor electronics cannot communicate properly.

**Input Compensation Error Alerts:** advise of "Bad" or "Uncertain" status of AO connection or setup.

**Simulate Function:** Simulate Active, when enabled, simulates an active alert without making it visible.

### Operating Limits

Process Temperature: see table and figure below

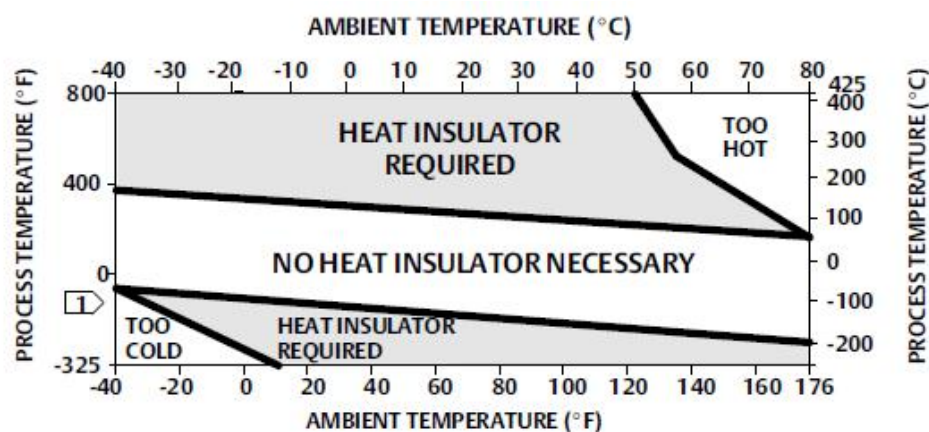
Allowable Process Temperatures for Common Fisher 249 Sensor Pressure Boundary Materials

Material	Process Temperature	
	Minimum	Maximum
Cast Iron	-29 °C (-20 °F)	232 °C (450°F)
Steel	-29 °C (-20 °F)	427 °C (800°F)
Stainless Steel	-198 °C (-325 °F)	427 °C (800°F)
N04400	-198 °C (-325 °F)	427 °C (800°F)
Graphite Laminate/SST	-198 °C (-325 °F)	427 °C (800°F)

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Gaskets		
N04400/PTFE Gaskets	-73 °C (-100 °F)	204 °C (400°F)

### Guidelines for Use of Optional Heat Insulator Assembly (for standard transmitters)



#### NOTES:

- FOR PROCESS TEMPERATURES BELOW -29°C (-20°F) AND ABOVE 204°C (400°F) SENSOR MATERIALS MUST BE APPROPRIATE FOR THE PROCESS. SEE THE TABLE ABOVE.
- IF AMBIENT DEW POINT IS ABOVE PROCESS TEMPERATURE, ICE FORMATION MIGHT CAUSE INSTRUMENT MALFUNCTION AND REDUCE INSULATOR EFFECTIVENESS.

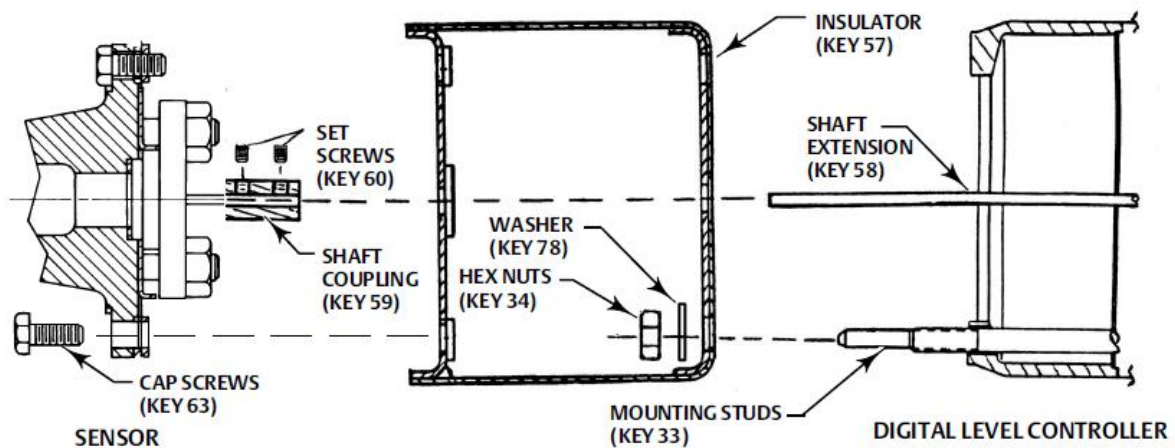
### Ambient Temperature and Humidity

Conditions	Normal Limits	Transport and Storage Limits	Nominal Reference
Ambient Temperature	-40 to 80 °C (-40 to 176°F)	-40 to 85 °C (-40 to 185°F)	25 °C (77°F)
Ambient Relative Humidity	0 to 95% (non-condensing)		40%



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### Digital Level Controller Mounting on Sensor in High Temperature Applications



The digital level controller requires an insulator assembly when temperatures exceed the limits shown in the figure on page 7 "Guidelines for Use of Optional Heat Insulator Assembly"

#### Input Signal:

**Liquid Level or Liquid to Liquid Interface Level:** from 0 to 100 percent of displacer length

**Liquid Density:** From 0 to 100 percent of displacement force change obtained with given displacer volume

**Mounting Positions:** Digital level controllers can be mounted right – or left-of-displacer, shown in figure 1.

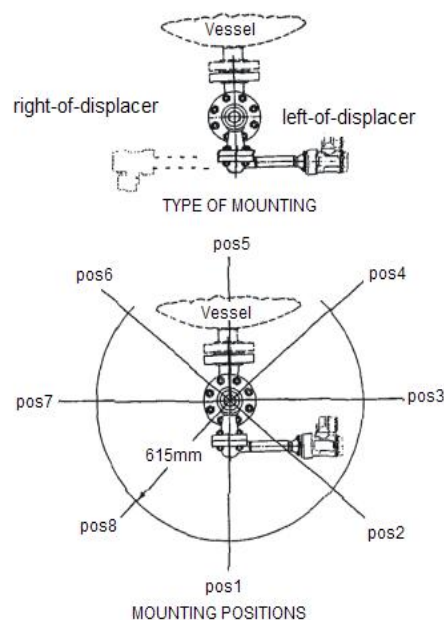


Figure 1: Typical Mounting Positions for VRDLC3020 Smart Level Transmitters

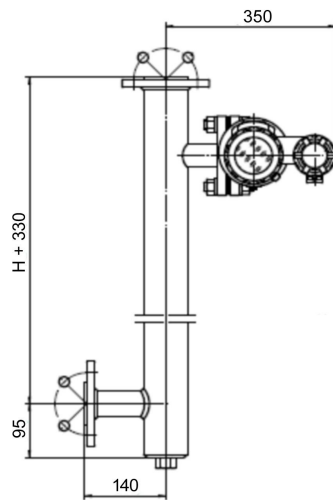
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**Electrical Connections:** Two 1/2 – 14 NPT internal conduit connections: one on bottom and one on back of terminal box. M20 adapters are available on request.

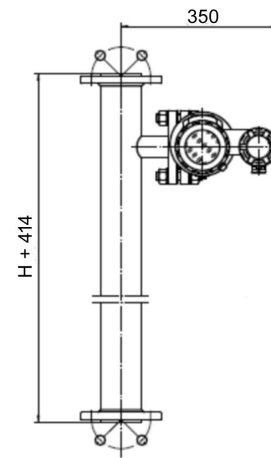
**Electronic Housing Material:** Case and Cover: Low-copper aluminum alloy  
Internal: Plated steel, aluminum, and stainless steel; encapsulated printed wiring boards; Neodymium iron.

### 4. Construction Schematics

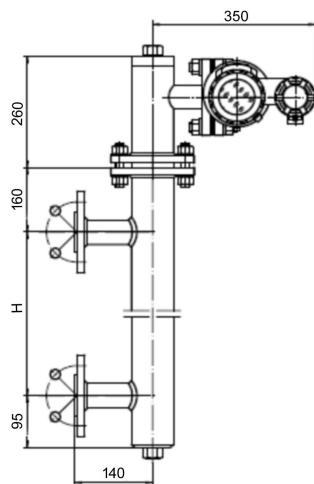
Different VRDLC3020 transmitter model and installation type have different shape size, please refer to figure 2 and table 1 below for details.



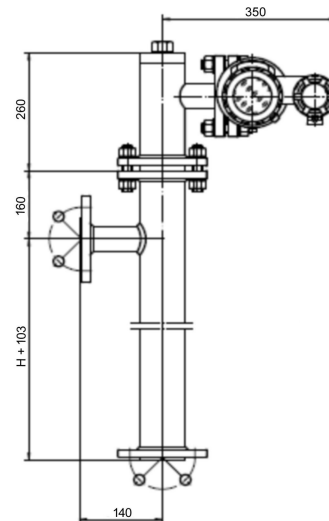
Top - Side Mounted



Top - bottom mounted



Side - side mounted



Bottom - side mounted

Figure 2

## VRDLC3020 Series Smart Displacer Level (Interface) Transmitters

Type	High Temp VRDLC3020 Transmitters Side - side mounted (Refer to figure 2)						Normal Temp VRDLC3020 Transmitters Side - side mounted (Refer to figure 2)					
Operating Pressure	6.3 MPa						16.0 MPa					
H	300	500	800	1200	1600	2000	300	500	800	1200	1600	2000
Total Height	815	1015	1315	1715	2115	2515	815	1015	1315	1715	2115	2515
Flange size and standard	JB/T82.2-94 DN40 PN6.3 RF Other standard is available on request						JB/T82.2-94 DN40 PN16 RF Other standard is available on request					

Note: The table above shows some examples for your reference. The dimensions, flanges rate and size may vary, depending on practical working conditions and constructions.

Type	VRDLC3020 Transmitters Top mounted (Refer to figure 3)					VRDLC3020 Transmitters Side mounted (Refer to figure 4)					
Operating Pressure	6.3/16 MPa					4.0 MPa					
H	500	800	1200	1600	2000	300	500	800	1200	1600	2000
Z	224										
G	860										
L	1000					1000					
Flange size and standard	JB/T82.2-94 DN40 PN6.3/PN16 RF Other standard is available on request					Different standard is available on request					

Table 1 DLC3020 Displacer Transmitter Outline Dimensions

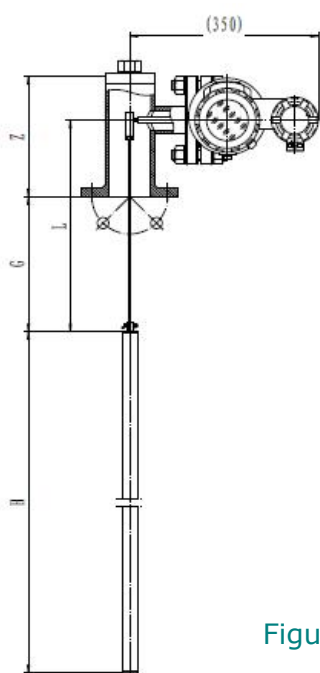


Figure 3

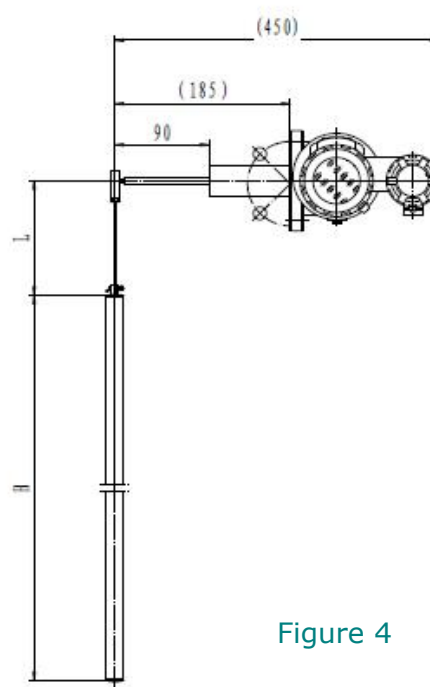


Figure 4

## 5. Model Selection Table

VRDLC3020-	Smart Displacer Liquid Level (Interface )Transmitter							Model Number								
	1	Level measurement							Measurement Type							
	2	Interface level measurement														
	3	Density measurement														
		A	Top - side mounted							Mounting Type						
		B	Top - bottom mounted													
		C	Side - side mounted													
		D	Bottom - side mounted													
		E	Top mounted													
		F	Side mounted													
			3	2.5 MPa							Pressure Grade					
			4	4.0 MPa												
			6	6.3 MPa												
			10	10.0 MPa												
			16	16.0 MPa												
				C	Carbon steel							Material of Measuring Cage				
				S	Stainless steel 304											
				U	Stainless steel 316											
				V	Stainless steel 316L											
				X	Other material											
					L	Normal temperature, lower than 100℃							Medium Temperature			
					H	High temperature, ≥ 100℃										
						N	No explosion-proof							Ex-proof Type		
						I	Intrinsically safe: Ex ia IIC T6									
	F					Flameproof: Ex d IIC T6										
							B	With heating jacket.							Accessories	
								-R	Measuring range							Measuring Range

Model selection sample:

Model: VRDLC3020-1C6SLI-800

Transmitting head: Fisher FIELDVUE DLC3020F digital level controller for Foundation fieldbus, output signals are digital, the communication is "Foundation fieldbus", measuring cage is side - side mounted type, working pressure: 6.3MPa, measuring cage material is stainless steel 304, working temperature is less than 100 degree Celsius, the explosion proof is intrinsically safe, Ex ia IIC T6, the measuring range is 800mm. The flanges sizes and grades will be on request. The material of torque tube will be on request.

## 6. Explosion Proof Wiring

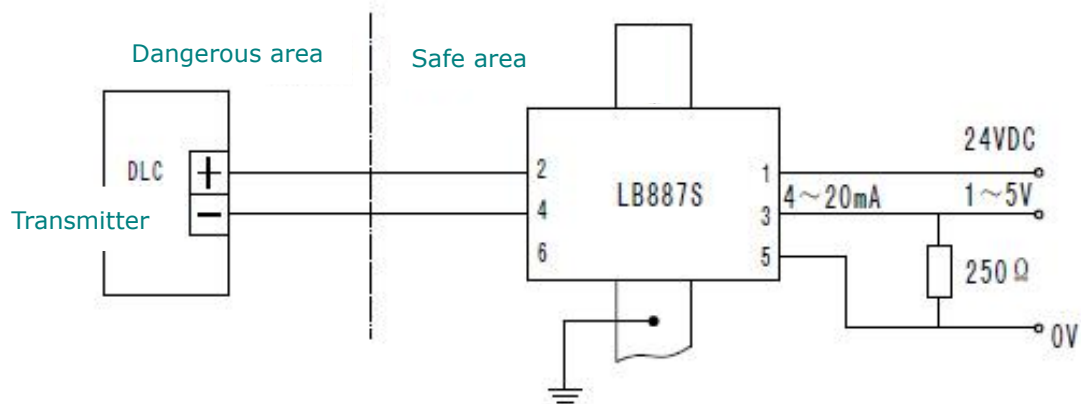


Figure 5

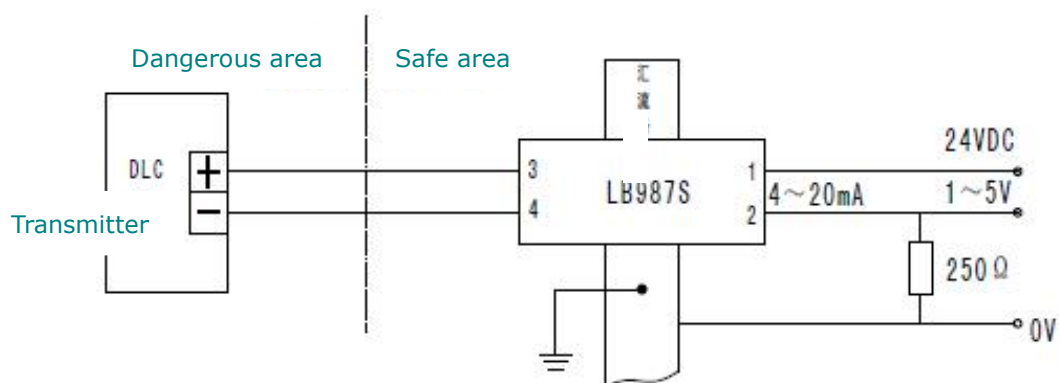


Figure 6



## 7. Installation Methods

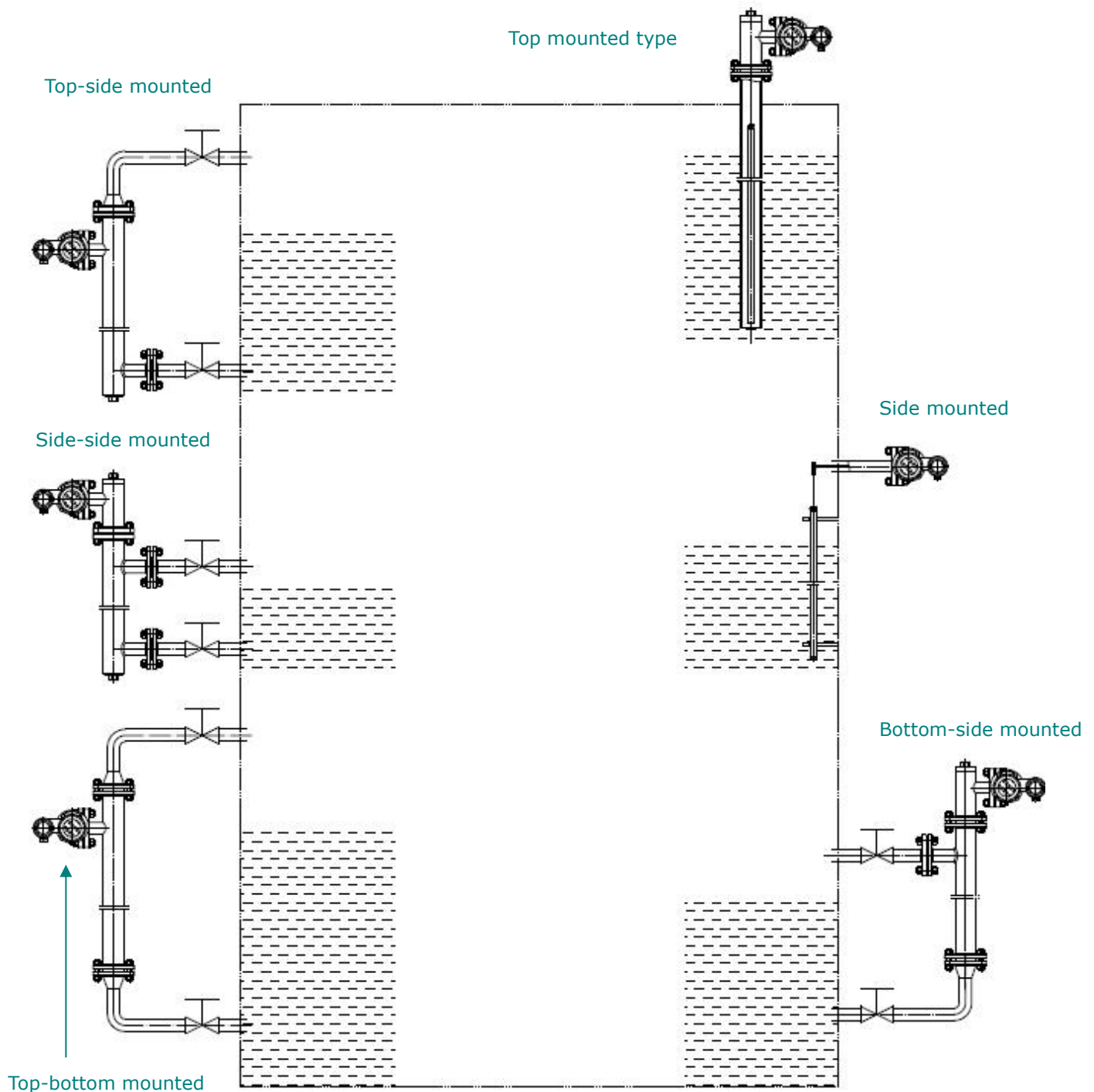


Figure 7 Installation Methods

## 8. Configuration, Calibration and other detail information:

For detail information on configuration, calibration, maintenance, troubleshooting and other, please refer to "Instruction Manual of Fisher FIELDVUE DLC3020F Digital Level Controller".





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