



Technology Solutions

TEK-HYDRO 4500A-D

Differential Pressure Level Transmitter



LEVEL



Introduction

Tek-Hydro 4500A-D series Differential Pressure Level Transmitter is a commonly used instrument which measures the level of a liquid in a tank. It is a simple device used in a wide range of liquids, including corrosive, non-corrosive and abrasive liquids and slurries in tanks of any size. It can handle broad temperature and pressure ranges under different process conditions. It is a multivariable instrument which measures not only the liquid level, but also other parameters such as the flow rate and density.

Working Principle

The device does not measure the liquid level directly, but infers it based on the liquid's hydrostatic pressure which is the pressure exerted by the liquid in the tank.

It is calculated using the following formula:

$$P_g = h \times \rho g$$

Where,

P_g = Hydrostatic pressure of the liquid

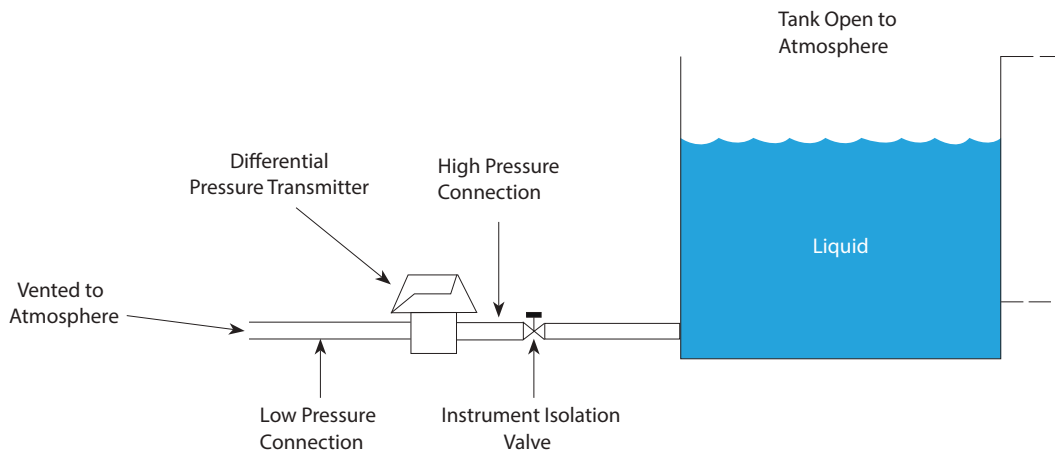
h = Liquid level

ρg = Specific gravity of the liquid

The liquid level is thus derived as follows:

$$h = P_g / \rho g$$

Each transmitter has two pressure ports, a high-pressure port which is connected at the base of the tank and a low-pressure port which is either connected at the top of the tank or opened to the atmosphere depending on the tank.



The above mentioned equation shows that the liquid level is directly proportional to the hydrostatic pressure. Therefore, as the liquid level increases, the hydrostatic pressure measured at the high-pressure port also increases.

A diaphragm which comes into direct contact with the liquid in the tank constitutes the sensing element of the transmitter. Some transmitters use remote seals in case of corrosive or abrasive liquids. A remote seal protects the sensor from the liquid and enables the pressure to be measured from a distance. It consists of a diaphragm that senses pressure and a capillary that connects to the transmitter. When the liquid in the tank exerts pressure against the remote seal diaphragm, it deflects and exerts a force on the liquid inside the capillary. This force is then transferred to the diaphragm in the transmitter, causing it to deflect. The liquid pressure is measured depending on this deflection.

Level measurement in open tanks

In open tanks, i.e. tanks in which the liquid is not pressurized or in vacuum, the high-pressure port is connected at the base of the tank and the low-pressure port is open to the atmosphere. The atmospheric pressure acting on the surface of the liquid is cancelled out by the low-pressure port. The pressure differential is therefore the hydrostatic pressure of the liquid.

Level measurement in closed tanks

In closed tanks, i.e. pressurized tanks or tanks that are closed to prevent vapor or gas from escaping, it is necessary to connect both pressure ports to the tank to measure the pressure acting on surface of the liquid. While the high-pressure port is connected to the base of the tank, the low-pressure port is connected to the top of the tank, and the vapor pressure is diverted to the low-pressure port by means of an impulse line. In this case, the high-pressure port measures the hydrostatic pressure plus the pressure exerted by the vapor or gas on the surface of the liquid, and the low-pressure port only measures the vapor or gas pressure. The level of the liquid is measured from the difference in the pressures measured at the two ports.

Benefits

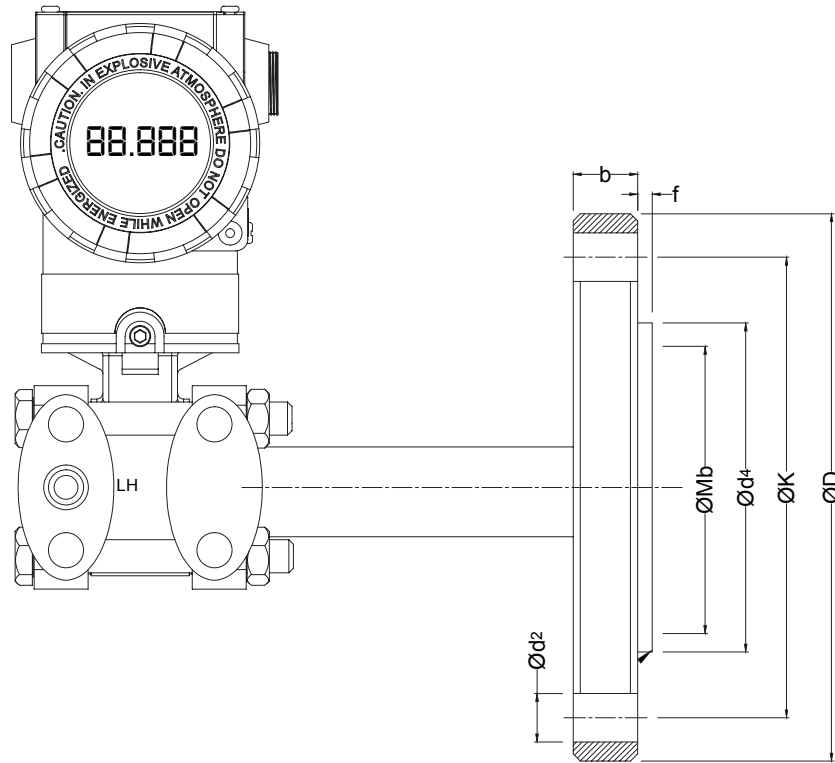
- Operator can calibrate device using zero/span button, no handheld calibrator required.
- Digital communication HART protocol.
- Fail-safe mode process function for detecting any abnormal condition occurred.
- High accuracy up to $\pm 0.075\%$
- Automatic ambient temperature compensation improves performance of device.
- Various Output: 4-20 mA, digital signals.
- The mounting bracket rotated up to 360° and LCD display up to 270° .
- EEPROM write protection.

Application

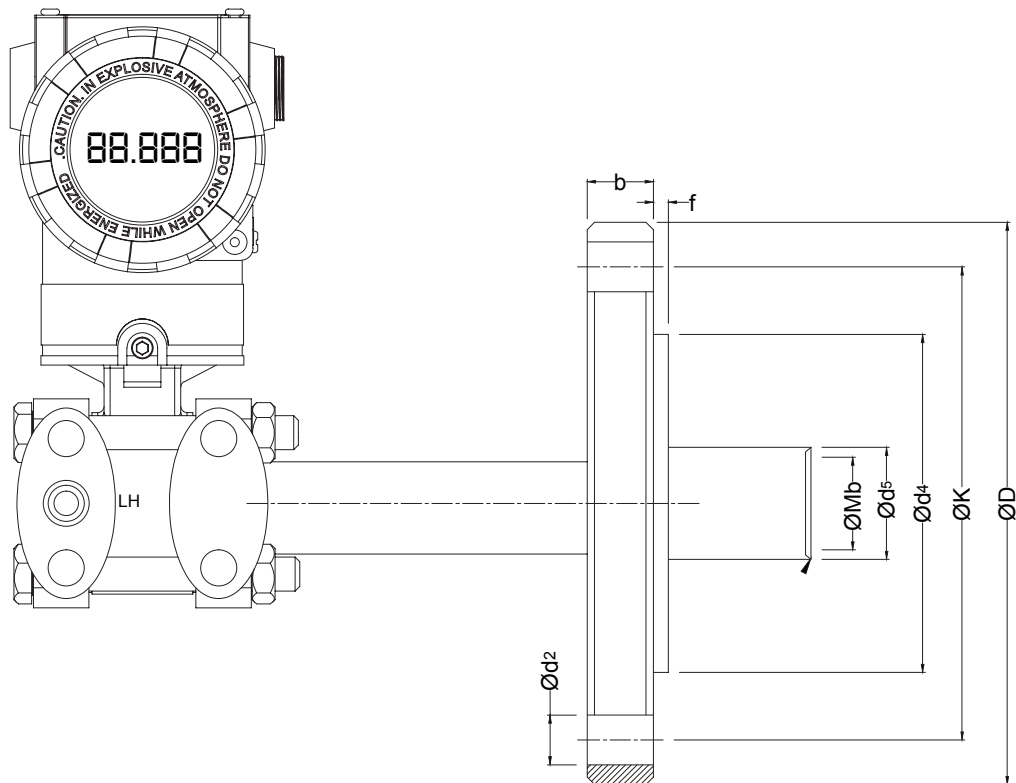
- It is used in level monitoring applications.

Dimensional Drawing

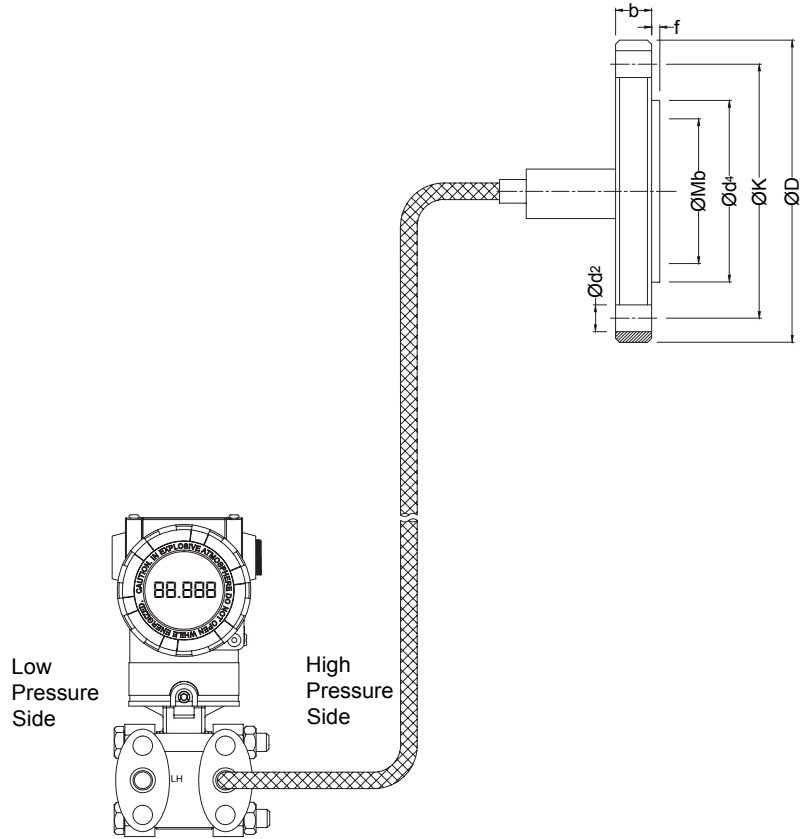
Tek-Hydro 4500A-D-LFD



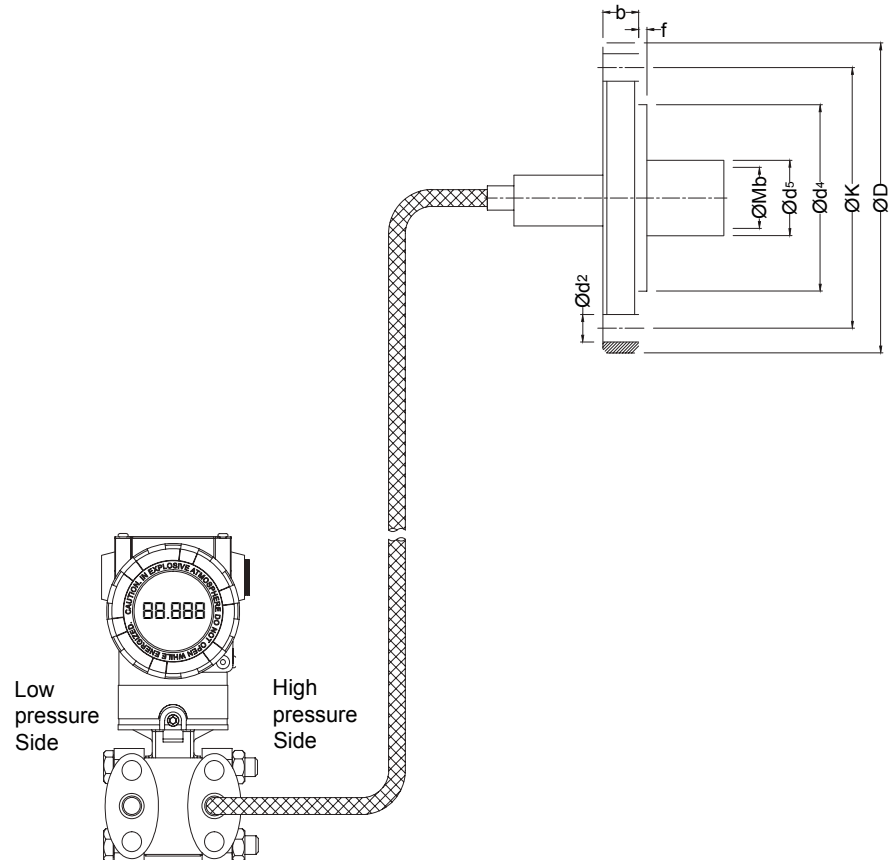
Tek-Hydro 4500A-D-LED



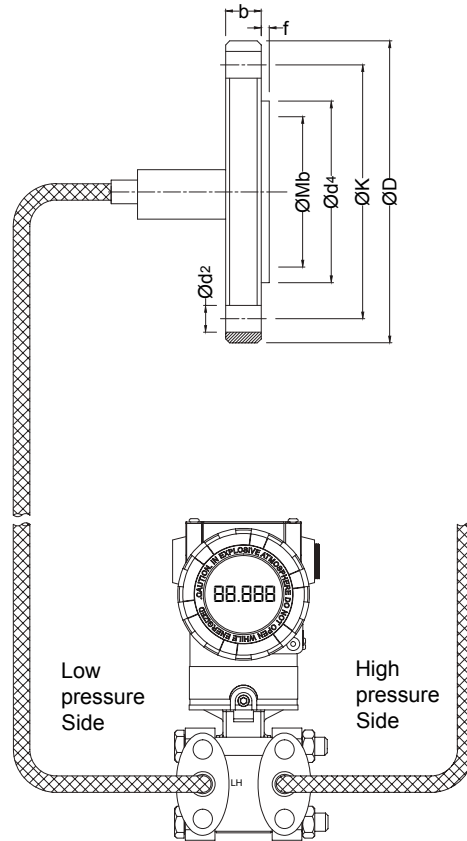
Tek-Hydro 4500A-D-LFS



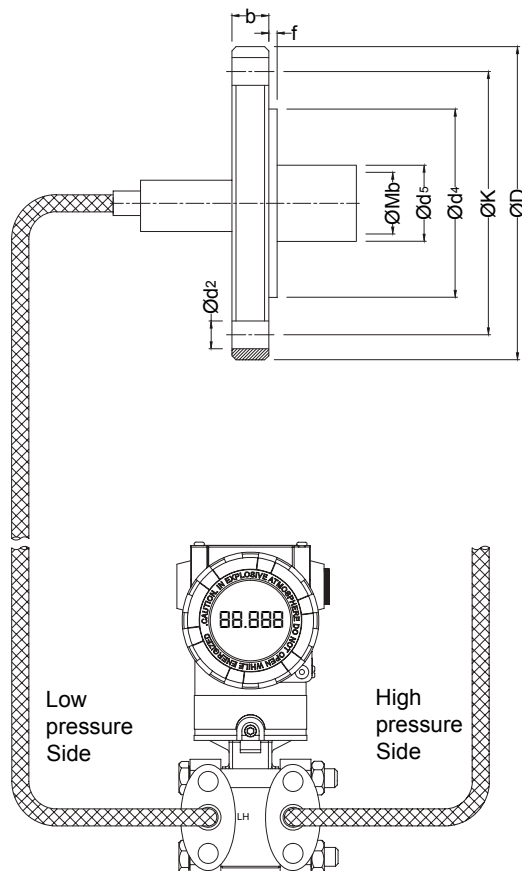
Tek-Hydro 4500A-D-LES



Tek-Hydro 4500A-D-LFC



Tek-Hydro 4500A-D-LEC



Dimensions

Dimension for Flush Diaphragm Seal

Size	Flange Rating	Mb	D	b	d ²	k	f	d ⁴	X
3" (80 mm)	ANSI Class 150	3.5" (89 mm)	7.48" (190 mm)	0.94" (24 mm)	0.74" (19 mm)	6" (152.5 mm)	0.05" (1.5 mm)	5" (127 mm)	0.15" (4 mm)
3" (80 mm)	ANSI Class 300		8.26" (210 mm)	1.14" (29 mm)	0.86" (22 mm)	6.63" (168.5 mm)			0.31" (8 mm)
2" (50 mm)	ANSI Class 150	2.4" (61mm)	5.98" (152 mm)	0.74" (19 mm)	0.74" (19 mm)	4.74" (120.5 mm)	0.05" (1.5 mm)	3.6" (92 mm)	0.15" (4 mm)
2" (50 mm)	ANSI Class 300		6.49" (165 mm)	0.86" (22 mm)		5" (127 mm)			0.31" (8 mm)

Dimension for Extended Diaphragm Seal

Size	Flange Rating	Mb	D	b	d ²	k	f	d ⁴	d ⁵	X
3" (80 mm)	ANSI Class 150	2.99" (76 mm)	7.48" (190)	0.94" (24)	0.74" (19)	6" (152.5)	0.05" (1.5)	5" (127)	2.99" (76)	0.15" (4)
3" (80 mm)	ANSI Class 300		8.26" (210)	1.14" (29)	0.86" (22)	6.63" (168.5)				0.31" (8)
2" (50mm)	ANSI Class 150	1.88" (48)	5.98" (152)	0.74" (19)	0.74" (19)	4.74" (120.5)	0.05" (1.5)	3.6" (92)	1.88" (48)	0.15" (4)
2" (50 mm)	ANSI Class 300		6.49" (165)	0.86" (22)		5" (127)				0.31" (8)

Specifications

Pressure Sensor Ranges

Code	Min/Max Span	LRV/URV
4	1.5 to 150 in H ₂ O	-150 to 150 in H ₂ O
5	7.5 to 750 in H ₂ O	-750 to 750 in H ₂ O
6	1 to 100 psi	-100 to 100 psi
7	3 to 300 psi	-300 to 300 psi
8	10 to 1000 psi	-1000 to 1000 psi

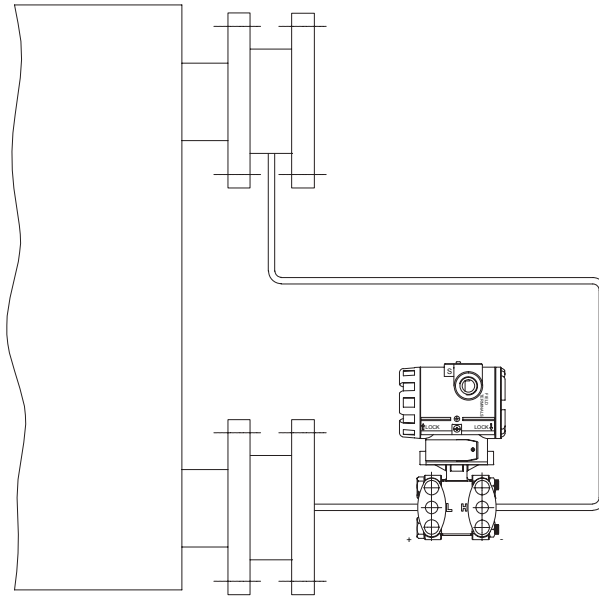
Electrical Specification	
Power Supply	12 to 45 VDC
HART loop resistance	250 to 550 ohm
Output Signal	4 to 20 mA DC / HART
Isolation	500 Vrms (707 VDC)
Update Time	0.25 sec.
Turn on time	5 sec.

Performance Specifications	
Reference Accuracy	± 0.075% of Span
Ambient Temp. Effect	±[0.025%URL+0.125% Span]/28 °C
Stability	±0.1% URL for 12 Months
Operating Temperature	-40 °F to 185 °F(-40 °C to 85 °C)
LCD Meter Operating Temperature	-22 °F to 176 °F (-30 °C to 80 °C)
Humidity Limits	5% to 98% RH
Process Temperature Limit	-40 °F to 248 °F(-40 °C to 120 °C)

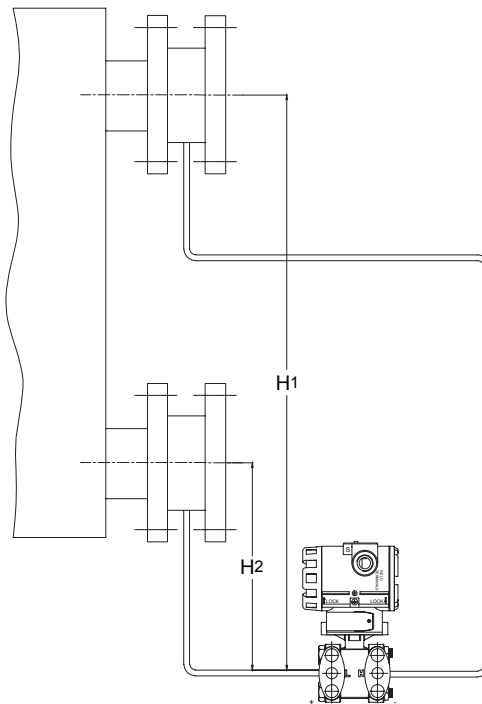
Physical Specifications	
Isolating Diaphragm	316L SST
Drain and Vent Valve	316 SST
Flange and Adapter	316 SST
O-ring	Viton, PTFE
Bolts and Bolting Flange	316 SST
Fill Fluid	Silicon 200
	Neobee
Process Connection Size	¼" – 18" NPTF
	½"-14" FNPT Connection Adapter (316 SST) for Tek-Hydro 4500A-D series w/ Single Diaphragm Seal
Electrical Connection Housing	½" - 14" NPTF Conduit/Epoxy Coated-Aluminum
	G1/2 Conduit/Epoxy Coated-Aluminum
Approvals	KOSHA Flameproof Approval: Ex d IIC T6
	KTL Intrinsic Safety Approval: Ex ia IIC
	ATEX (KEMA) Flameproof: Ex d IIC T6 or T5
	ATEX (DEKRA) Intrinsic Safety
	FM/FMC Explosion proof (for USA & Canada) Class I/II/III, Division ½, Group A-D/E-G

Installation

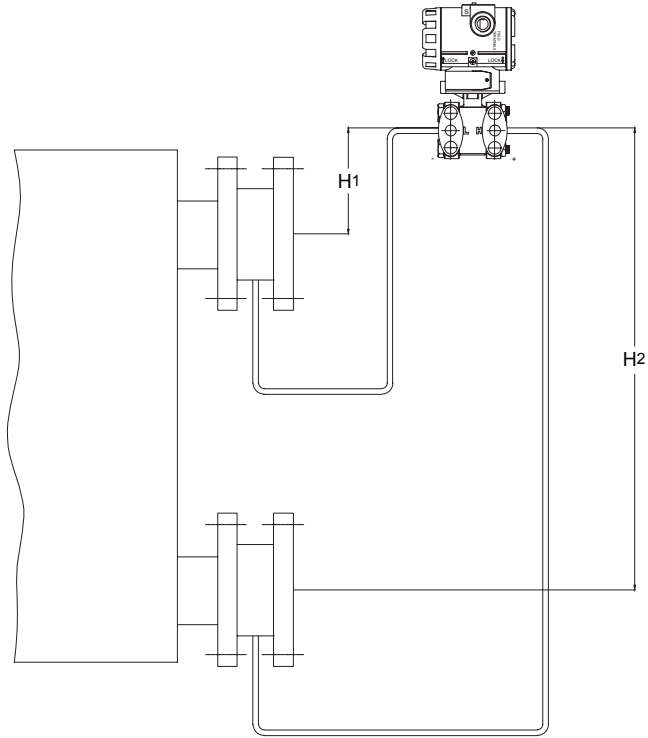
Standard Installation



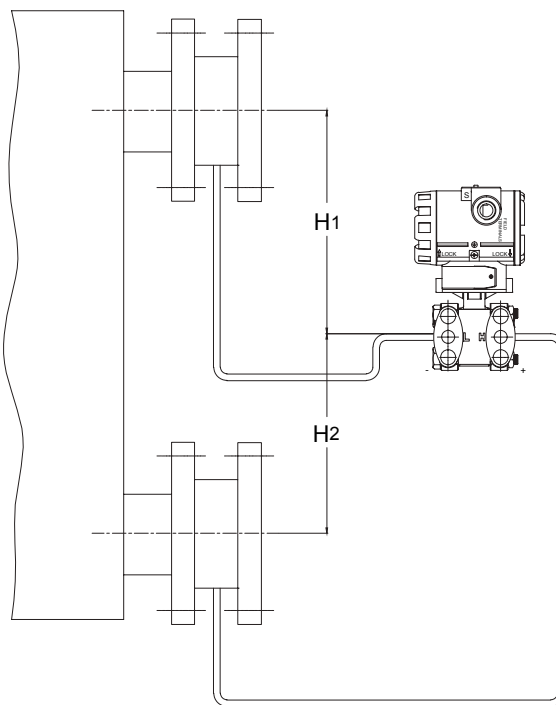
Installation for vacuum application



Installation of transmitter above the upper measuring point, no vacuum



Installation of transmitter between the measuring points, no vacuum



Model Chart

EXAMPLE	Tek-Hydro 4500A-D	1	FM	X	1	LFC	S2	A1	0	H	2	10	10	FC	4500A-D-1-FM-X-1-LFC-S2-A1-0-H-2-10-10-FC
Series	Tek-Hydro 4500A-D														Differential Pressure Level Transmitter
Range		1 2 3 4 5 6													0 - 24" w.c. (30:1 Turndown, Adj. Range: -24" to +24" w.c.) 0 - 160" w.c. (100:1 Turndown, Adj. Range: -160" to +160" w.c.) 0 - 1000" w.c. (100:1 Turndown, Adj. Range: -1000" to +1000" w.c.) 0 - 145 psid (100:1 Turndown, Adj. Range: -72 to +145 psid) 0 - 435 psid (100:1 Turndown, Adj. Range: -72 to +435 psid) 0 - 1450 psid (100:1 Turndown, Adj. Range: -72 to +1450 psid)
Approval Rating			FM ATEX WP												FM Approval ATEX Approved General Purpose NEMA 4X/IP66
Process Connection				X											Diaphragm Seal
Electrical Connection					1										½" Female NPT
Diaphragm Seal Type						LEC LED LEH LEL LFC LFD LFH LFL									2 Extended Diaphragm Seals Capillary Type 1 Extended Diaphragm Seals Direct Mount High Side 1 Extended Diaphragm Seals Capillary Type High Side 1 Extended Diaphragm Seals Capillary Type Low Side 2 Flush Diaphragm Seals Capillary Type 1 Flush Diaphragm Seals Direct Mount High Side 1 Flush Diaphragm Seals Capillary Type High Side 1 Flush Diaphragm Seals Capillary Type Low Side
Mounting Flange							S2 S3								2" (50 mm) 316L Stainless Steel 3" (80 mm) 316L Stainless Steel
Mounting Flange Rating								A1 A2 D1 D2 J1 J2							ANSI CLASS 150 ANSI CLASS 300 DIN PN 10/16 DIN PN 25/40 JIS 10K JIS 20K
Extension Length									0 5 10 15						No Extension Standard Option for Flush Mount 2" (50 mm) 4" (100 mm) 6" (150 mm)
Wetted Parts										H P S T					Hastelloy C-276 Diaphragm PTFE and 316L Stainless Steel Diaphragm 316L Stainless Steel Diaphragm Tantalum Diaphragm
Fill Fluid											2				D.C. Silicon 200 (-40 °F to 400 °F)
Capillary Length High Side												X			Capillary Length 0-30' (Whole numbers only)
Capillary Length Low Side													X		Capillary Length 0-30'
Options															CC Custom Calibration with 5 point Calibration Certificate FC Factory Configuration, No Certificate BA Stainless Steel Bracket (Angel Type) with SS Bolts BF Stainless Steel Bracket (Flat Type) with SS Bolts TAG Custom Laser Etched Name Plate

Customer Service and Support



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