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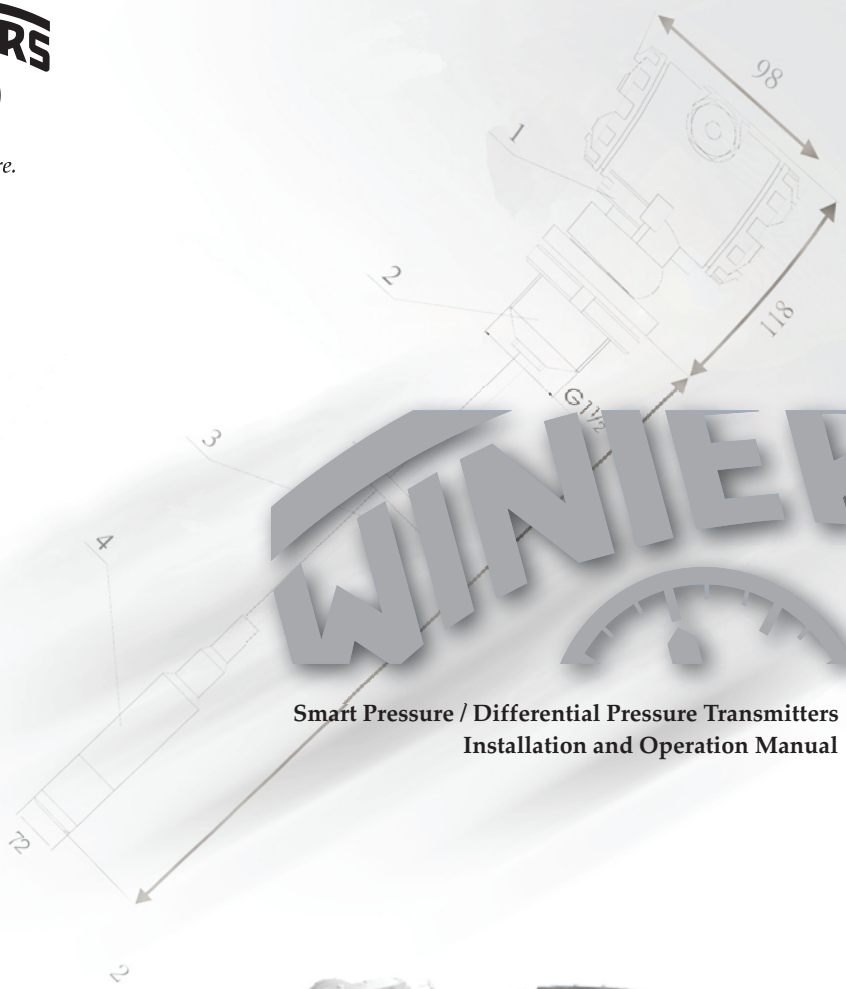


# Smart Pressure / Differential Pressure Transmitters
## Installation and Operation Manual

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## CONTENT

# SECTION 1 Working principle

## 1. Working principle

The section describes a basic working principle for LY smart capacitive pressure/differential pressure transmitter, as shown in fig.1-1:

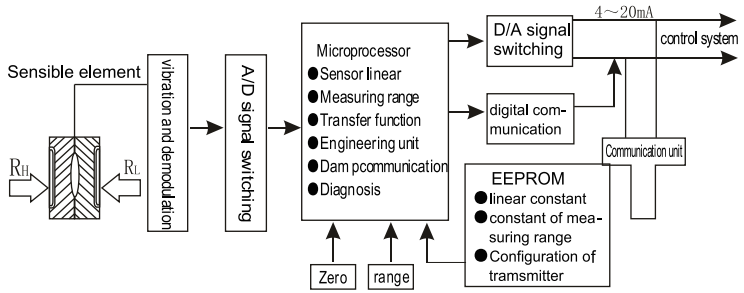



Figure 1-1 square diagram of working principle

### 1.1 " δ " room sensor (sensible organ)

The center of smart transmitter is a capacitive pressure transmitter,and called" δ " room (see fig.1-2). Sensor transfers flow pressure to sensing diaphragm through isolated diaphragm and filled fluid so as to causing drift that is a fully sealedomponent. Differential capacitance between sensing diaphragm and bipolar capacitance changes electronic part to two -wire system 4～20 mA DC signal.

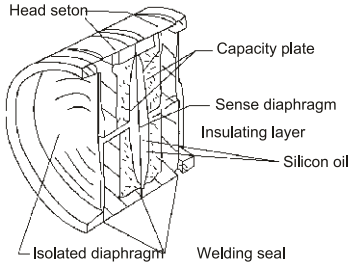



Figure 1-2 "δ" room

This change is based on the under-mentioned formula:

① $P=K1\frac{C_1-C_2}{C_1+C_2}$

Where: P is measured pressure

$K_1$is constant

$C_1$is a capacitance between high-pressure side polar plates and sensing diaphragm

$C_2$is a capacitance between low-pressure side polar plates and sensing diaphragm

② $fV_{p\text{-}p}=\frac{I_{ref}}{C_1+C_2}$

Where: Iref is constant current value

Vp-p is peak with vibration voltage ----- peak value

f is vibration frequency

③ Idiff = fV ρ -p (C1C2)

Where: Idiff is pass over current difference of the C1C2

④ Isig = K2× Idiff

Where: Isig is output signal current

K2 is constant

Therefore: $Isig = K2Iref\frac{C_1-C_2}{C_1+C_2}$ =constant×P

Flow pressure is transferred to sensing diaphragm with the center of δ room through isolation diaphragm and filled fluid, standard pressure will also be transferred to another side of sensing diaphragm by the same way, and then displacement of sensing diaphragm is direct proportion to differential pressure. Location of sensing diaphragm is determined from its bilateral capacitive polar plates. A capacity between sensing diaphragm and bipolar plates are about 150 PF. A sensor drives by the vibrator (its frequency is about 32 KHz, amplitude is approximately Vp-p≈30 V) and is rectified through a demodulator.

**1.2 Demodulator and vibrator**

A demodulator is made up of diode bridge with $V_1 \sim V_6$, which action is rectifying to alternating-current signal with the vibration. Put diode's bridge and measure temperature compensation thermistor in sensor's component, which compensation function on thermistor is controlled from resistance in electric box. A vibrator consists of electronic element and vibrating transformer. Its vibrating frequency depends on capacitance of a sensor and winding inductance of vibrating transformer. Capacitance of a sensor changes according to pressure; therefore, its vibrating frequency also changes with it. (Approximately 32 KHz or so)

**1.3 A/D switching**

A/D switching circuit introduces 16-digit low consumption integrated circuit of which will change analog signal on the demodulator into digital signal and give to microprocessor as input signal.

**1.4 Microprocessor**

A microprocessor on the transmitter can completely self-diagnose and to realize digital communication as well as switch to A/D and D/A. Wile working, a digital pressure value is handled by processor and serves as digital memory to make sure that correction is precise and switch to engineer's unit. In addition, microprocessor can also finish sensor's setup

such as linear, range ratio, damping time and other functions.

**1.5 EEPROM memory**

EEPROM on which stores all configurations, characterization and digital trimming parameter, and the memory is non-volatile. So, even if the electricity went off, data-saved can still remain perfectly so that realize smart communication at all times.

**1.6 D/A switching**

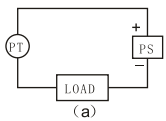
D/A switching changes digital signal calibrated through microprocessor sent into analog signal of 4～20 mA and output to loop..

**1.7 Digital communication**

LY series smart capacitive pressure/differential pressure transmitter, through a communication unit, is testing and configuring. Or communication is completed through any supported upper mainframe with HART communication protocol. HART protocol employs the industrial standard BELL202 frequency shift keying (FSK) technology that can superimpose digital of the 1200 Hz or 2200 Hz on the signal of 4～20 mA to realize communication. Frequency signal has no any interference to the process of 4～20 mA while communicating.

**2. Rapid sampling calculative filter method**

A capacitance sensor requests that a capacitance signal isto stimulated by alternating current. Alternating current produces from a vibrator of the 32 KHz frequencies. This AC signal of the 32 KHz is grounded via capacitance coupling in the sensor. Because the method of this couple will make the load appear an additional voltage on which size depends on grounding selected. (See fig.1-3)



(a)

Fig. 1-3a
non-grounding system
Additional voltage: 12～22 mVp-p 32 KHz
Influence: the maximum is 0.01% of range

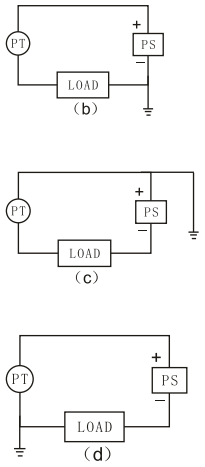



Fig. 1-3b
grounding between power negative terminal and load
Additional voltage: 35～60 mVp-p
Influence: the maximum is 0.03% of range
Fig.1-3c
grounding between positive terminal of a transmitter and power source
Additional voltage: 35～60 mVp-p
Influence: the maximum is 0.03% of range
Fig.1-3d
grounding between negative terminal of a transmitter and load
Additional voltage: 500～600 mVp-p
Influence: the maximum is 0.27%

Fig.1-3 Accuracy on rapid sampling computer affects while grounding

Additional voltage affects for the computer sampling time on this computer is 100 ms, its signal voltage is 2～10 V.
This additional voltage appears on load is a high-frequent noise signal. For many instruments is without affect. But when sampling period of the computer is shorter, the computer can be detected a bigger noise signal according to circuit connection of fig.1-3d. In order to filter out this noise signal that has to bridge a 1μF big capacitance or a LC filter of 32 Khz frequency on two ends of load. As shown in fig.1-3a～1-3c for connection of computer and grounding method, the influence of noise voltage doesn't obvious, so need not to add filter.

# SECTION 2 Technical specifications

## 1. Functional parameter

Operating medium: liquids, gases and steams

Measuring range: see table 2-1

Output signal: HART digital signal is superimposed on two-wire system
4～20 mA DC signal to choose linear output or square output by users, see fig.2-1

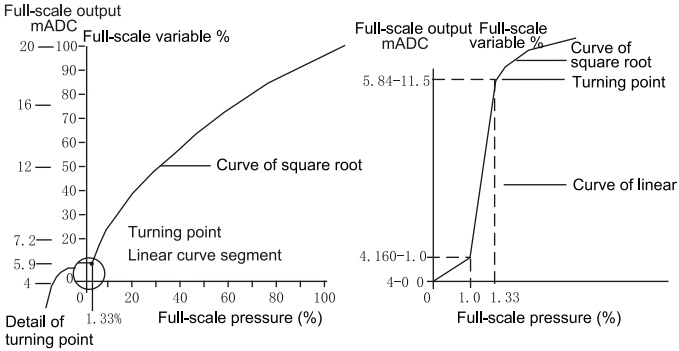



Fig.2-1 curve of square root output

Supply power: supply power is 12～45 VDC, general working power is 24 VDC

Load: maximum load resistance RL on circuit board is: RL = Vs－12 V/0.023 A

Where RL is max. load resistance Ω, Vs is supply power, voltage Vo

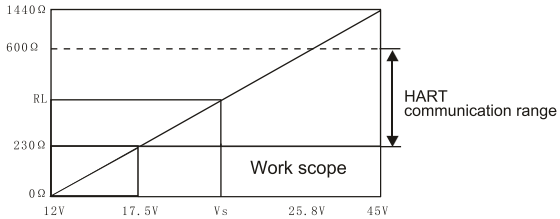



Fig.2-2 Load characteristics chart

**Indicator:**

Field output indication including current meter, linear indication 0～100%.

**LED display:**

3 1/2 bits, word high 13 mm, output displays according to percentage or range

**Range and zero:**

Through in-situ button or adopt HART communication unit distance to adjust.

**Positive and negative offset:**

**Differential pressure transmitter:**

maximum positive offset is a difference between upper limit value and measuring range (below URL is the same); maximum negative offset is URL.

**Pressure transmitter:**

maximum positive offset is a difference between URL and measuring range, maximum negative offset is not greater than atmosphere

**Absolute pressure transmitter:**

maximum positive offset is a difference between URL AND measuring range, without negative offset.

**Failure warning:**

self-diagnosis program has been detected a trouble; analog output alarms that is higher than 22 mA or under 3.8mA alarm, high/low sign may be selected through switch on electronic components.

**Insulated resistance:**

insulated resistance between grounding terminal and others terminal on circuit board is not less than 20 MΩ.

**Writing protection in the case of a transmitter:**

To dial the switch on electronic part may prevent change of transmitter configuration.

**The scope of temperature:**

**Electronic line:** -40～+85℃ sensible element (filled silicon oil): -40～+104℃(filled inert oil) 0～+71℃
**Storage temperature:** -40～55℃
**Startup time:** maximum damping time＜2 s
**Volume absorption:**＜ 0.16cm$^2$
**Damping:**electric damping is 0～16s, which may be adjusted according to the interval of 0.1 s, natural time of sensible element (filled silicon oil) is 0.2 s, code of range is 0.4 s.

## 2. Technical parameters

**Accuracy:** pressure/differential pressure transmitter changes with different range, which is from±0.2% to±0.5% separately
**Stability:** doesn't beyond the accuracy of a transmitter within 6 months.
**Temperatue effect:** (for DCP, GP transmitter, code of range is 4～9)
Total error:＜±0.3% maximum range value, change 10℃ at a time
Others transmitter and its range will increase double above error value.
**Static pressure effect:**
DP type: zero error: for 14 Mpa, under the pipeline pressure,±0.25% maximum limited value or±0.5% (code of range is 3) is calibrated through **zero adjustment.**
Range error: the same as above
Hp type: zero error: For 32 Mpa,±0.2%maximum limited value of range is calibrated through zero adjustment under the line pressure.
Range error: Change 7 Mpa at a time,±0.25% input reading is calibrated through zero adjustment under the line pressure
**Vibration effect:** 0.1% maximum limited value of range, 10～55 Hz, S= 0.15 mm is upward on any direction
**Power supply effect:** less than 0.005%/V of output range
**Installation position effect:**when a sensing diaphragm isn't perpendicular

that might be resulted zero system error, which isn't greater than 0.24 Kpa, But this error is eliminated through zero-adjusted and no influence to range.

**Structure materials:** see option manual for WIDE PLUS smart capacitive pressure / differential pressure transmitter with regard to vessels, adaptors, drain/vent valve, isolated diaphragm and part materials with medium contact. Electric housing is low copper aluminum alloy

The surface of electric housing is an oxaminic acid vinyl resin baking varnish.

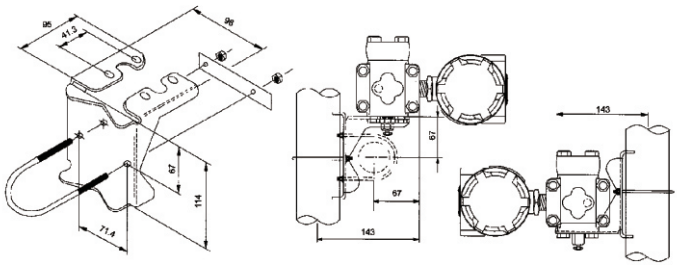
**Process connections:** A connection hole on vessel is 1/4 18NPT, on lead-pressure adaptor is 1/2 14NPT, its center may be changed through changing of connector.

**Electrical connections:** there are two M20×1.5 screws on the housing of a transmitter that use to connect conduit and metering screw of terminal is in the housing to use testing, if connect with communication unit, then it must be fixed to terminal block.

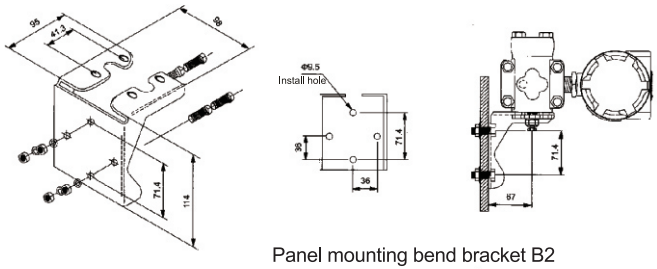
**Weight:** approximately 4.9 kg (doesn't include accessories)

## 3. Installation form of a transmitter

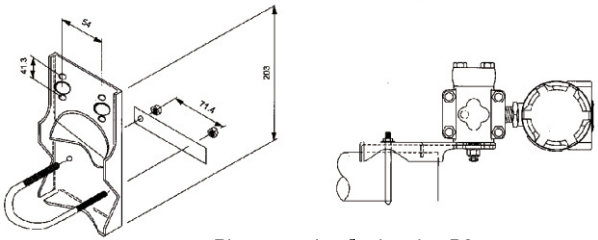
Installation drawing as below.




Pipe mounting bend bracket B1

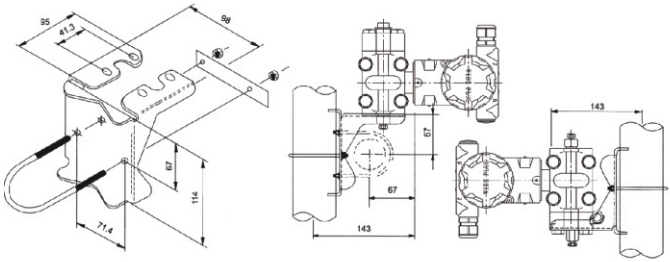



Panel mounting bend bracket B2

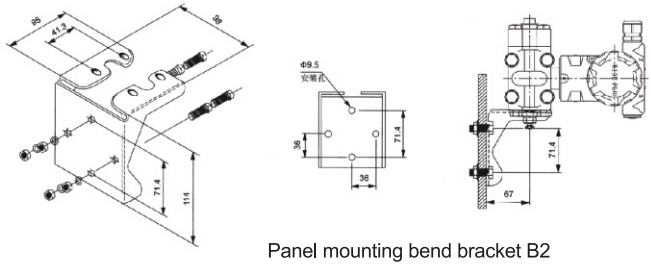



Pipe mounting flat bracket B3

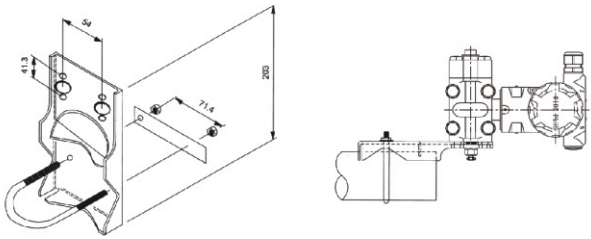
LY series outline mounting bracket dimension and schematic drawing of installation form




Pipe mounting bend bracket B1



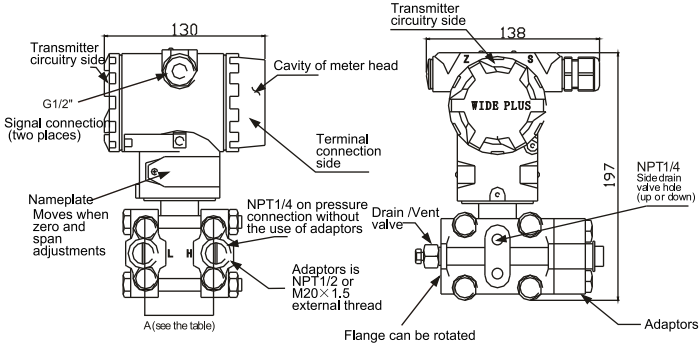

Panel mounting bend bracket B2



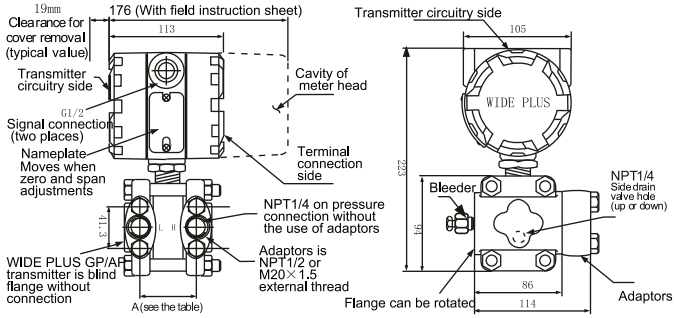

Pipe mounting flat bracket B3

LY36 outline mounting bracket dimension and schematic drawing of installation form

## 4. Outline dimension for a transmitter



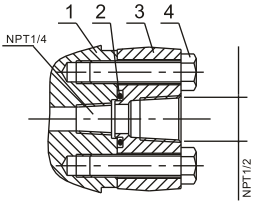

LY36 series shape dimensional drawing




LY series shape dimensional drawing

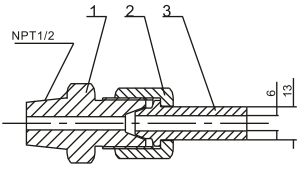
| Range code (Mpa) | 3<br>4<br>5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|
| A(mm) | 54 | 55.2 | 55.6 | 57.2 | 57.6 |

Note: Lead-pressure connection as follows:



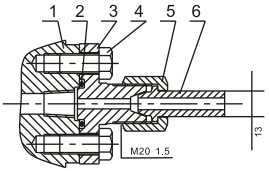

(A1)

A1. Cone pipe internal thread connect
(option code" N " )
1.Pressure cavity flange for a transmitter
2. " O " ring
3.Cone pipe internal thread connect to adaptors
4.Bolts




(A2)

A2. NPT1/2 lead-pressure transient adaptors and background wedding lead-pressure pipe (code "C12" )
1.NPT1/2 connects transient adaptors with sphere-cone
2.Nut M20×1.5
3.Sphere-adaptors (Φ13 places can be wedded with lead-pressure pipe)




(A3)

A3. " J " type connection links
(option code " J " )
1.Pressure cavity flange for a transmitter
2. " O " ring
3.Sphere connection M20×1.5 external thread
4.Bolts
5.Nuts
6.Sphere adaptors ( Φ13 places can be wedded with lead-pressure pipe)

Fig.9

# SECTION 3 Configuration

LY series of smart pressure transmitter has already been characterized before leaving the factory and its configuration information has also saved in electronic parts. If users need to change it, they can refer to relative specification. In this section there only introduces several features such as reset range of output unit, output type, damp, calibrating zero position of sensor and (4~20) mA output. If there is not a handhold communicator, then we are able to adjust to zero and span.

**1. Zero and span adjustment**

1) Explanation of key-pressing
Zero key (Z), Span key (S), Function key (M)

2) Zero and span adjustment of key-pressing

(1) key-pressing unlock: Simultaneously click (Z) and (S) key for 5 seconds or so, and then unlock (LCD indicates: OPEN)

(2) Zero adjustment by key-pressing: it will exert zero pressure on the transmitter, click (Z) key for 2 seconds. The transmitter outputs 4.000 mA current and to be completed (LCD indicates: LSET).

(3) Span adjustment by key-pressing: it will exert span pressure on the transmitter, click (S) key for 2 seconds. The transmitter outputs 20.000 mA current and to be completed (LCD indicates: HSET).

(4) PV value reset: Put the transmitter onto atmosphere. After unlock the key-pressure, and click (Z) and (S) key for 2 seconds or so simultaneously so as to set current PV value is 0 (LCD indicates: PV=0).

Attention: If error of current PV and 0 value exceeds 50%FS or so, then the PV value reset is ineffective. (LCD indicates: PVER)

(5) If do not click any of key-pressing within 2 minutes, then the key-pressing on the transmitter will be locked automatically. So if you want to operate, you have to unlock it afresh.

3) Data recovery
At first, click Z key, switch on power source of the transmitter again and

Continue to click Z key for 5 seconds above. When LCD indicates OK, the data of the transmitter has been recover to primary situation, and then release the key-pressing is over. When LCD indicates FAIL, the data of the transmitter is not to being stand, so this data does not recover to primary situation.

4) Flow table of parameter setup on the transmitter:

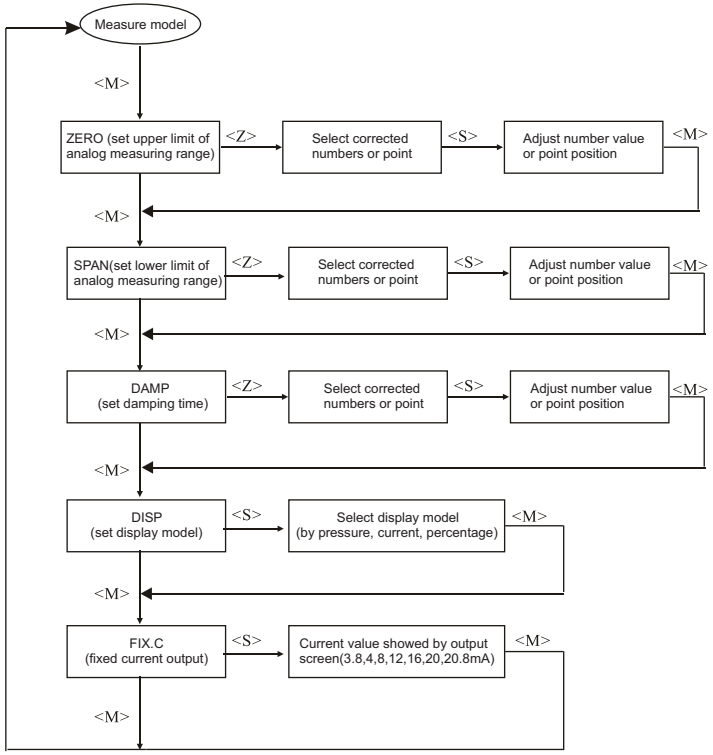



Fig.3-1

Description: when setting the parameters, if do not click any of key-pressing within 2 minutes, then it will directly return to measure mode (do not save setting data).

## 2. Explanation of instrument and communicator connection

**We first will simply describe external hardware how to connect to loop before introduce this procedure:**

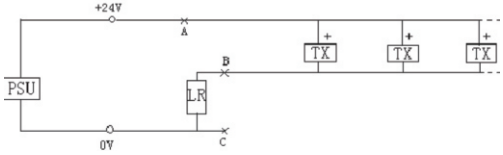



Fig.3-2

Communication circuit on the mainframe is not able to bridge two ends of power source that is bridged both two ends in the field (A, B) and two ends of load resistance(B, C) (under two circumstances, the circuits are all supplied by power source), HART specification allows load resistance is 250~650Ω.

In figure 3-2, PSU is power source, LR is load resistance, TX is intelligent transmitter. As shown is multi-level online methods of HART specification, and HART regulates to join 15 sets of intelligent apparatus at most every time.

# SECTION 4 Installation

## 1.Description

Pressure/differential pressure transmitter may be used to meter fluid, liquid level and apply to meter accurately the differential pressure and pressure with other's requirement.

Installation between the transmitter and connecting pipe is correct or not, which will directly effect accuracy class to pressure measurement. So it is very important that master the installation between the transmitter and connecting pipe.

Due to requirement for technological fluid as well as in order to save the material of connecting pipe sometimes, the transmitter is usual mounted on the worse field under working condition. In order to do their best to reduce heavy level for working condition of the transmitter, which should be try to mount on temperature graded and temperature becomes small, no rush and vibrating field.

**Notice!**

Medium measured don't permit frozen, otherwise isolated diaphragm of sensing element will be damaged and causing trouble on the transmitter.

## 2. Connecting pipe

Here's material is very importance to LY smart capa - citive pressure / differential pressure transmit is corrected or not.All requirement for installation position, steam measure and decrease error as follow:

### 2.1 Installation position

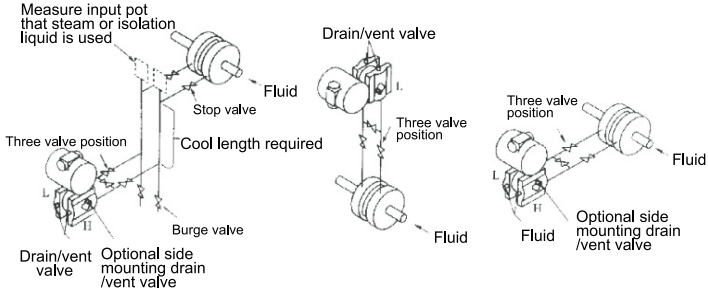
The transmitter is in the technological line that is associated with medium measured according the correct installation position. In order to get optimal installation, this product should be paid attention to consider the following condition:

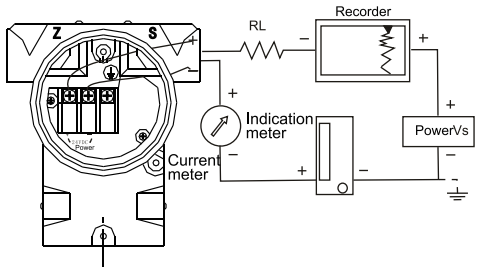
1) To prevent the transmitter contacts with corrosive or superheated medium measured.
2) To prevent the sediments deposit in connecting pipe.
3) Connecting pipe must be as short as possible
4) Liquid column pressure head in both sides of connecting pipe should be keep balance.
5) Connecting pipe should be mounted on the place between temperature graded and temperature wave is smaller.

When metering liquid pressure, fetch pressure nozzle should be open in the inside of flow pipeline, in case there are sediments. Simultaneously, the transmitter must be mounted on the side or below the fetch pressure nozzle so that bubble discharges into flow pipeline.

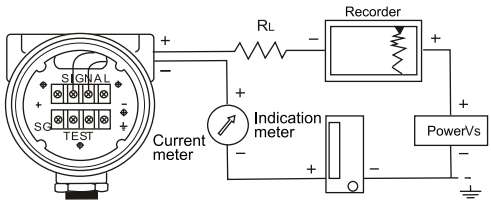
When metering gas pressure, fetch pressure nozzle should be open on the top or inside of flow pipeline. Therefore, the transmitter must be mounted in the side or above of flow pipeline so that accumulation fluid is easy to influx into flow pipeline.

Using pressure vessel install the transmitter with drain / vent valve, fetch pressure nozzle must be opened in the side of flow pipeline. When medium measured is fluid, drain/vent valve on the transmitter should be mounted on the top so as to discharge gas seep in the medium measured. When medium measured is gas, drain/vent valve on the transmitter should be installed below so as to dischar ge accumulation liquid (see fig.4-1). Pressure vessel rotates 180° that can make drain/vent value position change from above to below.




LY36 series sharp wiring diagram for the transmitter with external circuit




LY series sharp wiring diagram for the transmitter with external circuit

Fig.4-1 Installment

**2.2 Measurement on steam**

When metering steam pressure, fetch pressure nozzle should be opened in the side of flow pipeline, therefore, the transmitter must be mounted below fetch pressure nozzle so as to condensate liquid can be filled in the connecting pipe.

Be careful, metering steam or other high-temperature medium, its temperature shouldn't be beyond operation-limited temperature of transmitter.

When medium measured is steam, water in connecting pipe must be filled fully, in case steam contacts directly with the transmitter. Because the transmitter works, which volume change is not worth mention, so it doesn't need to mount condensate pot.

**2.3 Decrease error**

Connecting pipe makes the transmitter connect to flow technological pipeline, and transfer the pressure of fetch pressure nozzle on the technological pipeline to transmitter. In the pressure transmission process where might be caused the reason of error as follows:

1) Leakage
2) Abrasion lose (particularly use cleanliness agent)
3) There is gas in liquid pipeline (causing pressure head error)
4) Accumulation fluid in the gas pipeline (causing pressure head error)
5) The different density results from temperature both sides of connection pipe (causing pressure head error)

The methods of decrease error as follows:

1) Connecting pipe should be as shorter as possible.
2) When metering fluids or vapor, connecting pipe should be linked to flow arts and crafts line, which inclination should be not less than 1/12
3) When metering the gas, connecting pipe should be linked to flow arts and crafts line, which inclination should be not less than 1/12

4) Design of connecting pipe with fluid has to avoid appearing high point from middle, connecting pipe with gas has to avoid appearing low-point from middle.
5) Both connecting pipes should be remain same temperature
6) To avoid friction effect, caliber on connecting pipe should be big enough
7) No gases exist in the connecting pipe with filling fluid
8) When using isolated liquid, both sides of connecting pipe with fluid must be same
9) When adopting clean agent, which connection position should be close to fetch pressure nozzle on arts and crafts line, the pipeline where length and caliber should be same, also should be avoided clean agent went through the transmitter.

## 3. Installation

The transmitter may directly be mounted on measure point and also mounted on the wall, or choose to use clamping installation panel (transmitter accessories) to 2″(about 60 mm) pipeline

Connection hole on the pressure vessel of a transmitter is 1/4 - 18 NPT threaded hole, connection hole on adaptor is 1/2-14 NPT cone pipe thread, the transmitter may be easiest to remove from process pipeline, its method is screw off two bolts from fastening adaptor.

In order to ensure that adaptor seals, when installing, operation should be according to the following steps: two fastening bolts should be alternative screw on by spanner, it finally screws moment is about 40 N • m (29 ft 1bs), not to screw some bolt. Sometimes in order to easy to install, the transmitter may be rotated on the pressure vessel. As long as pressure vessel is in vertical panel, rotation of the transmitter cannot change of zero position. If pressure vessel is mounted horizontally (such as metering flow on vertical pipeline), it must be disassembled the influence of pressure head with liquid column results from the different height of connecting pipe.

## 4. Connection

LY series shape: signal terminal is designed in a separate cabin of electric box. When connecting, it may screw off meter housing with connection side. Terminal-above is signal terminal, terminal-under is testing terminal (see fig.4-1). Current on testing terminal is the same with current on signal terminal, are both 4～20 mA DC. Therefore, testing terminal may be used to connect indication meter head. But it can't link pointer digital multi-meter which inner resistance greater than 10Ω.

LY36 series shape: signal terminal is designed in a separate cabin of electric box. When connecting, it may screw off meter housing with connection side and can immediately be connected, power source is linked to transmitter through signal line, and needn't to another connection. Signal line doesn't need to shield, but using wire that results is optimal.

Threading hole on electrical housing of a transmitter of which should be sealed or plugging ( using sealant ) , avoiding humidity accumulation in the electric housing. If threading hole doesn't seal, then threading hole should be downward so that the liquid is easy to remove before the transmitter is mounted.

Signal line may be floated or grounded in any point of signal loop; the housing of transmitter may be grounded or no grounded. Power source mustn't stable, even if the voltage of power source waves 1V (peak value), the influence of output signal may almost be omitted.

Because a transmitter is grounded through capacitance coupling, so high pressure megohmmeter can't be used and application for megohmmeter isn't greater than 100 V /100 mΩ when checking absolute resistance.

Maximum output current on the transmitter doesn't beyond 30 mA DC.

Notice: don't connect power-signal line with testing terminal; otherwise power source can be burned out bridge on a diode of testing terminal. If diode is burned out, the two testing terminals may be shorted, but the

transmitter may still normal work.

**5. Measurement on level**

Differential pressure transmitter is used to meter level is actually metering static pressure head with liquid column. This pressure is determined by high/low of level and proportion of liquid, which size is a multiple of level height on fetch pressure nozzle and the proportion of liquid, and is independent of volume or form of the vessel.

**5.1 Measurement on level of opened vessel**

When metering the level of opened vessel, the transmitter is mounted on the close to the bottom of vessel so as to meter its corresponding pressure on the top of level height, as shown in fig.4-2.

Level pressure on the vessel is connected to high-pressure side of transmitter, and atmosphere by low-pressure side.

If minimum level of level measured is on the top of transmitter, then the transmitter must be carried out positive offset.

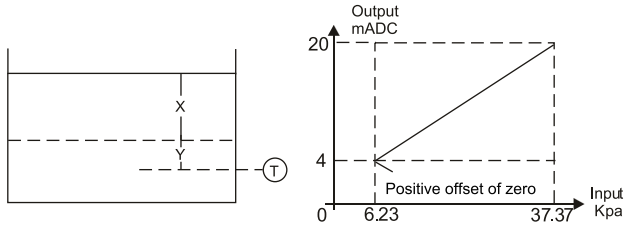



Fig.4-2 Example for opened vessel liquid measure

For example:

Set X is vertical distance between level measured with minimum and maximum, X=3175 mm.

Y is vertical distance from fetch pressure nozzle to minimum level,

y=635 mm.

ɣ is proportion of fluid, ɣ = 1.

h is maximum pressure head produced by liquid column X, unit: Kpa

e is pressure head produced by liquid column, unit: Kpa.

1 mH20=9.80665 Pa (here's the same)

Measuring range is from e to e+h

So: h = X• ɣ

= 3175×1

= 3175 mm H20

= 31.14 Kpa

e = y • ɣ

=635×1

=535 mm H20

= 6.23 Kpa

that is measuring range on the transmitter is 6.23 Kpa～37.37 Kpa

**5.2 Level measure of closed vessel**

In the closed vessel where pressure of vessel on the top of liquid affects pressure measured at the bottom of vessel. Therefore, pressure at the bottom of vessel is a multiple of level height and the proportion of liquid and plus pressure of closed vessel.

In order to meter real level that should be decrease pressure of vessel from pressure measured at the bottom of vessel. So a fetch pressure nozzle is opened on the top of vessel and links it to low-pressure side of transmitter. This pressure in the vessel is acted on the high-pressure side of transmitter simultaneously. Differential pressure is direct proportion to multiple of level height and the proportion of liquid.

1) Dry process connection

If gases on the top of liquid level don't condensate, connector tube of low-pressure side of transmitter must be kept dry, this case is called dry

process connection. It is decides that the method of measuring range of transmitter is the same as opened vessel level. (See fig.4-2)

2) Wetted process connection

If gases on the top of liquid appear condensation, connecting pipe of low-pressure side of transmitter can gradually be accumulated liquid and to cause measuring error. In order to eliminate this error, at first choose to use some liquid filled in connecting pipe of low-pressure side of transmitter, this case is called wetted process connection.

Above-mentioned case makes low-pressure side of transmitter exist a pressure head, negative offset must be made. (See fig.4-3)

Wetted process connection as example:

Set X is vertical distance between level measured with minimum and maximum, X=2450 mm.

Y is vertical distance from fetch pressure vessel to minimum level, Y=635 mm

Z is distance from filled connecting pipe top to datum line of transmitter, Z=3800 mm.

$\gamma 1$ is the proportion of liquid, $\gamma 1=1$

$\gamma 2$ is the proportion of low-pressure side filling liquid, $\gamma 1=1$

H is maximum pressure head produced by liquid column X, unit: Kpa.

E is maximum pressure head produced by liquid column Y, unit: Kpa

S is pressure head produced by filling liquid column Z, unit: Kpa

Measuring range is from (e—s) to (h+e—), then

$h=X \cdot \gamma 1$

$=2540 \times 1$

=2540 mm H20

$e=Y \cdot \gamma 1$

$=635 \times 1$

=635 mm H20

$s=Z \cdot \gamma 2$

$=3800 \times 1$

=3800 mm H20

=37.27 Kpa

So: e－s=6.23－37.27=－31.04 Kpa

h＋e－s=24.91＋6.23－37.27=－6.13 Kpa

therefore measuring range on the transmitter is: －31.04 Kpa～－6.13 Kpa

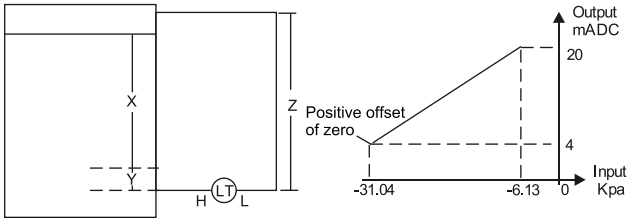



Fig.4-3 Example for process connection with closed vessel measure

5.3 Measure level by blow method

Level on opened vessel is not only used to meter, but also " blow method". Here the transmitter is mounted on the top of opened vessel (see fig.4-4). The whole device consists of air supply, voltage-regulator valve, constant flowmeter, transmitter and plug-in pipe below the vessel. Because flow velocity of gas via the pipe is constant, gas pressure with constant flow is remained (that is send into the pressure of transmitter) is a multiple of vertical distance on the level and proportion of liquid.

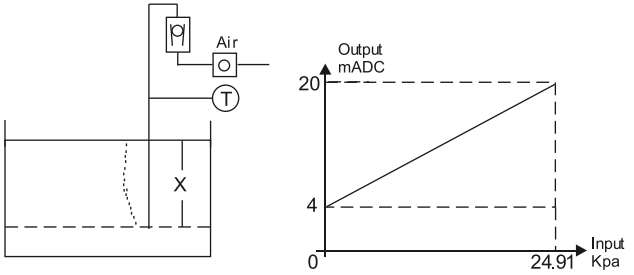



Fig.4-4 the scavenge method survey liquid level as example

For example:

If X is distance between minimum level of liquid measured (blow position) and maximum level,

X=2540 mm

Y is proportion of fluid 1

h is X produced maximum pressure head unit: Kpa

Measuring range is from 0 to h

That is: $h=X \cdot \gamma$

$=2540 \times 1$

=2540 mm H20

= 24.91 Kpa

So measuring range is 0～24.91 Kpa, that is the span of transmitter is 24.91 Kpa.

# SECTION 5 Maintenance

## 1. Description

LY series smart capacitive pressure/differential pressure transmitter has no movable mechanism part and seldom periodic maintenance, the steps with adjustment or change measuring rang had been described above section..

This section introduces disassembly steps and failure removal for the whole mechanism.

### Notice

**In the process of the transmitter has been characterized, the transmitter needs to newly characterize after electronic part or sensor's component is newly changed.**

## 2. Disassembly steps

### 2.1 Disassembly of sensor body

1) Before the sensor's body is disassembled, at first, the transmitter is disassembled from arts and crafts line.
2) Toscrew off four bolts so as to take positive/negative pressure vessel. Be careful don't scoring or damage isolation diaphragm.
3) When cleaning isolation diaphragm, the mull must be dipped in neutral clean agent, then cleaning by water. Be careful don't use any chloride or acidiferous solution clean.
4) In order to easy to installation, adaptor and positive/negative pressure vessel may be rotated or back-mounted.
5) After reequipped, temperature cycle need to be made to guarantee its performance.

### 2.2 Electrical box

1) To screw off meter cover on connection terminal side and can touch

signal terminal (power terminal) and field indicator terminal. They are fastened firmly irthe electrical box, don't disassemble, or sealing between cavities are damaged.

2) At first, power source is gone off, then take meter cover of circuit side and can touch smart electronic parts.

2.3 separate between sensor's component and electric box

1) To remove smart electronic parts (pay attention to static electric protection), pull pin on the smart board out
2) Aluminum housing is screwed off from the sensor
3) Take out black plastic part from the sensor (built-in demodulation panel)
4) Pull pin on the demodulation panel out
5) Relax locking nut and take out sensor. Pay attention to don't damage isolation diaphragm of component.
6) Sensor is the whole wedding parts, and it can't be disassembled again.

## 3. Failure overhaul

If the transmitter occurs trouble, the following steps might be help you find out problems. Simultaneously it might be you decision whether it needs to disassemble down and repair, these materials will help you understand how to diagnose and repair for three basic failure symptoms. For various symptom,at first, the place where is the easiest found the problem must be checked, if no maintenance, please contact service center.

### 3.1 Output too large

Possible reason and resolve method:

1) Primary element (like orifice) checks the span of primary element
2) Connecting pipe

a.Check connecting pipe whether to leakage or jam

b.Check stop valve whether to fully open

c.Check gas connection pipe whether to exist fluids, and fluids connecting

pipe whether to exist gases.

d.Check pressure vessel on the transmitter whether to have sediment

e.Check proportion of fluids on the connecting pipe whether to change

3) Electric connection on the transmitter

a.Be sure to connectorcontact cleaning position and checksensor connection condition

b.Check power voltage whether to exist in 12～45 VDC

4) Circuit failure on the transmitter

a.Using HART communication unit enters "Self Test" to determine the ineffective of electronic parts

b.Change of electronic part including troubles

5) Sensor's components

a.Refer to sensor's components of this section inspect

6) Power source

Check output of power source whether to suitable for voltage value required.

**3.2 Output too small or without output**

Possible reason and resolve method

1) Primary element

a.Check installation of element and working condition

b.Check characteristic of medium measured whether to change, it was possible to effect output.

2) Connection loop

a.Check voltage on transmitter whether to normal

b.Check loop whether to short or multi-point grounding

c.Check positive/negative polarity of loop connection

d.Using HART communication unit enter " loop test" to check loop impedance whether to suitable for requirement.

**Notice**

**Don't check loop under the voltage exceed 45V**

3) Connecting pipe

a.Check the connection of pipeline pressure whether to correct

b.Check connecting pipe whether to leakage or jam

c.Check the gas whether to exist in the filled connecting pipe

d.Check pressure vessel on the transmitter whether to have sediments

e.Check stop valve whether to fully open, balance value whether to had closed

f.Check the proportion of fluid on the connecting pipe whether to change

4) Electric connection on the transmitter

a.Check lead-out line on the sensor components whether to short connecting

b.Be sure to connector contacts cleaning position and check the connection condition of sensor component

c.Check each regulating bolt whether to in control scope

5) Sensor's component

In this section, refer to sensor's components check their contents.

**3.3 Output unstable**

Possible reason and resolve method

1) Connection loop

a.Check the transmitter whether to intermittence short, open and multi-point grounding

b.Check the voltage of transmitter whether to suitable

**Notice**

**Don’t check loop under the voltage exceed 45V**

2) Fluid measured wave

Adjusting damping function of circuit

3) Connecting pipe

Check filled connecting pipe whether to have gases and gas connecting pipe whether to have fluid

4) Electric connection of transmitter

a.Check the loop of transmitter whether to intermittence short or open

b.Be sure to connector contacts cleaning position and check connection condition of sensor's components
5) Circuit failure of transmitter
a.Using HART communication unit enter Self Test to determine ineffective of electronic parts
b.Change of electronic parts including trouble
6) Sensor's components
In this section, refer to inspection contents on sensor's components
3.4 Transmitter cannot communicate
Possible reason and resolve method
1) Power source is out of the way
Check the voltage of power source whether to suitable for requirement
2) Load resistance
Check load resistance whether to suitable for requirement (see fig.2-1 load characteristic drawing), minimum is 250
3) Circuit failure of transmitter
Change electronic part failure

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Winters Instruments
121 Railside Road
Toronto,Ontario
M3A1B2
Tel: 416-444-2345
Fax: 416-444-8979
1-800-WINTERS
sales@winters.com

**BUFFALO U.S.A. DIVISION**
Winters Instruments
600 Ensminger Road
Buffalo, New York
14150
Tel: 716-874-8700
Fax: 716-874-8800
1-800-WINTERS
usasales@winters.com

**Canada - Calgary**
Winters Instruments
8 - 2807 107th Ave. SE
Calgary, Alberta
T2Z 4M2
Tel: 403-723-6645
Fax: 403-723-6647
1-800-WINTERS
calgary@winters.com

**USA - Houston**
Winters Instruments
10757 Cutten Road
Building 7
Houston, Texas
U.S.A. 77066
Tel: 713-983-8607
Fax: 713-983-8608
usasales@winters.com

**Asia**
Winters Instruments
Shanghai WitHub Hi-Tech
Business Center
Suite 311 No. 333
Hongqiao Road
Shanghai 200030 China
Tel: 86-21-6104-2610
Fax: 86-21-6104-2615
asiasales@winters.com

**Latin America**
Winters Instruments
Albarellos 1916 1° Piso
E3, E4, E5
B1640BIN, Martinez
Buenos Aires, Argentina
Tel: 54-11-4733-3003
Fax: 54-11-4733-0572
latinsales@winters.com
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