

Installation and Operating Instructions

ZAXRF S26 SERIES RF Admittance LEVEL SWITCH



General Safety Notes

- 1. For safety, please take good care of both personnel and instrument during lifting and installation. Total weight about 4 kg or higher with certain longer cable probes and over 15 kg with flanges.**
- 2. Be aware of the power and relay wiring when doing calibration or maintenance as high voltage can exist on these connections.**
- 3. Strict follow “STOP OEPN THE LID WHILE POWER ON” during field operation or maintain, recommended operate 10 minutes after power off.**
- 4. To avoid danger, please first read this manual carefully and pay attention to unsafe conditions when installing the instrument in the field.**
- 5. Before installation, make sure that the field and power are both meet safety installation requirements, and the instrument could meet the field process applications.**
- 6. No spare is needed as the instrument is a solid-state device with no wearing parts. It will work properly after correct installation and calibration.**
- 7. The instrument is designed to give years of unattended service. Neither the probes nor the electronics require routine maintenance or periodic adjustments except necessary calibration. If occur instrument failure, please contact our service engineer for troubleshooting as a reference in section 7.9.**

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SECTION 1 INTRODUCTION

1.1 System Description

This instruction manual is for the ZAXRF S26 Series general purpose RF admittance level switch, which is used for most level measurements and control and is suitable for almost all industrial or civil applications where measuring level of liquids, powders, slurries and interface. The equipment can be either installed indoor or outdoor, no special mounting requirements needed. See figure 1.1 as ZAXRF S26 series integral system scheme.

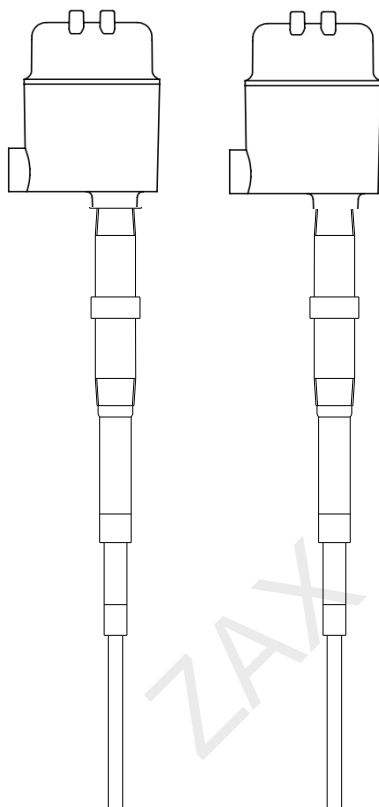


Figure 1.1 Z A X R F S 2 6 series General RF Level Switch

ZAXRF S26 serial is general purpose level control equipment, which comprised of one electronic unit, one housing and one rigid or cable sensing element (and also it could be called probe). These components can be connected in an integral configuration (electronic unit and sensing element are both connected in one explosion-proof housing) or a remote configuration which all electrical components are mounted away from the measuring point and the sensing element, electronic unit and sensing element are in two independent explosion-proof housings. The sensing element can be manufactured of many different metals and insulators depending on the specific application.

The design of ZAXRF S26 series RF level switch is strictly followed the International/Chinese standards which list below.

The equipment safety requirements meet IEC61010-1:2001 standard.

The equipment electromagnetism compatibility meets IEC 61326:1998+Al standard.

Explosion-proof design meets the following standards:

GB3836.1-2010 Electrical apparatus for explosive gas atmospheres Part I: General requirements;

GB3836.2-2010 Electrical apparatus for explosive gas atmospheres-part II :Explosion-proof “d”;

GB3836.4-2010 Electrical apparatus for explosive gas atmospheres-part IV : Intrinsic safety “i”.

GB12476.1-2000 Electrical apparatus for use in the presence for combustible dust—Part I : Electrical apparatus protected by enclosures — Construction and testing section 1: Technical requirements for electrical apparatus

Conformity with GB4208-2008 Degrees of Protection Provided by Enclosure (IP).

1.2 Operation Principle

As stems from capacitance level control technology, the Radio frequency admittance technology is a more advanced level control technology with a better coating rejection ability (material adhere on the sensing element is called as coating)、more reliable operation、higher accuracy、wider application. “Admittance” in “Radio frequency admittance” means the reciprocal value of the impedance in electricity, it includes resistance、capacitance and inductance. While “Radio frequency” means high frequency, so the radio frequency admittance could be understand as a method to measure admittance through high frequency current.

The main difference between capacitance technology and Point Driven Shield Radio Frequency level technology is due to the Point Driven Shield RF technology adopts a three terminal driven shield circuit and adds other measuring variables as “impedance”, this not only resolve the temperature drift in the connecting cable but also resolve the sensing element coating problem. Radio Frequency admittance technology employs a capacitance bridge and differs from capacitance technology in the electronics; cable and sensing element uses a driven shield circuit to stabilize the coaxial cable. The electronic unit’s measuring (probe) signal is also passed through a parallel in-phase amplifier internally. This additional signal is connected to the shield of the coaxial cable and then is passed to the sensing element’s shield connection. This driven shield amplifier is an in-phase amplifier with a gain of 1. The signal on the shield has the same potential, phase, and frequency as the measuring signal but is electrically isolated from the measuring signal and measuring circuit. Since the center wire & shield wire of the coaxial cable have the above relationship, there is no potential difference between them. No potential difference means that no current flows between the conductors, and no current flow (leakage) from the center wire to the shield means there is no capacitance between them (capacitance equal zero.) As a result, build-up on the sensor, cable length and cable temperature have no affect on the measurement. A separate ground wire connects the probe ground to the electronic amplifier ground.

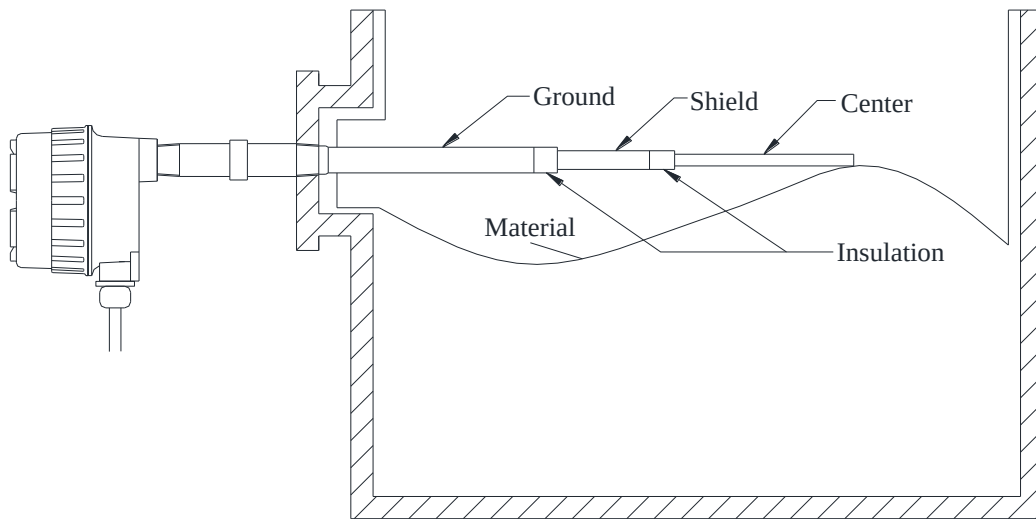


Figure 1.2 Sensing element in vessel

The RF admittance technology eliminates the effect of build-up on the sensing element (usually called coating), using a five layer coaxial configuration sensing element (See figure 1.2 sensing element in vessel). The measuring element is the center rod, Driven Shield is the middle element, and the inactive (ground) is the outside element. Each element is isolated from each other with an appropriate insulation material. As explained in the coaxial cable description, the same signals are connected to the sensing element; center wire to measuring element, shield to the driven shield element, and ground to ground. We put a special circuit to keep no potential difference between the measuring element & shield element. When there is some coating on the probe, the impedance of the build-up is low and measurable current will not pass from the measuring element to the shield or ground, i.e. $U_A = U_B$, $I_{AB} = (U_A - U_B) \cdot Y_L = 0$. The electronic unit so only measures the current between the sensing element & probe ground (vessel wall). See figure 1.3 equivalent sketch. The shield to ground (vessel wall) potential is difference but this current is not part of the measurement circuit so it does not affect the measurement. A proprietary amplifier circuit keeps the potential on the driven shield element intrinsically safe and in balance with the measuring circuit. With this technique the measurement circuit is not affected by build-up on the sensing element. Only when material in the vessel raises up to touch the center rod (measuring sensing element) could make the current flow through the material from the center rod to ground to change the state of the alarm loop output current.

Since Radio Frequency admittance technology adds some other measuring variables except capacitance especially for impedance which increases the signal/noise ratio. Those tremendously improve the instrument resolution、accuracy and stability and also give a concrete/widely application condition for the instrument.

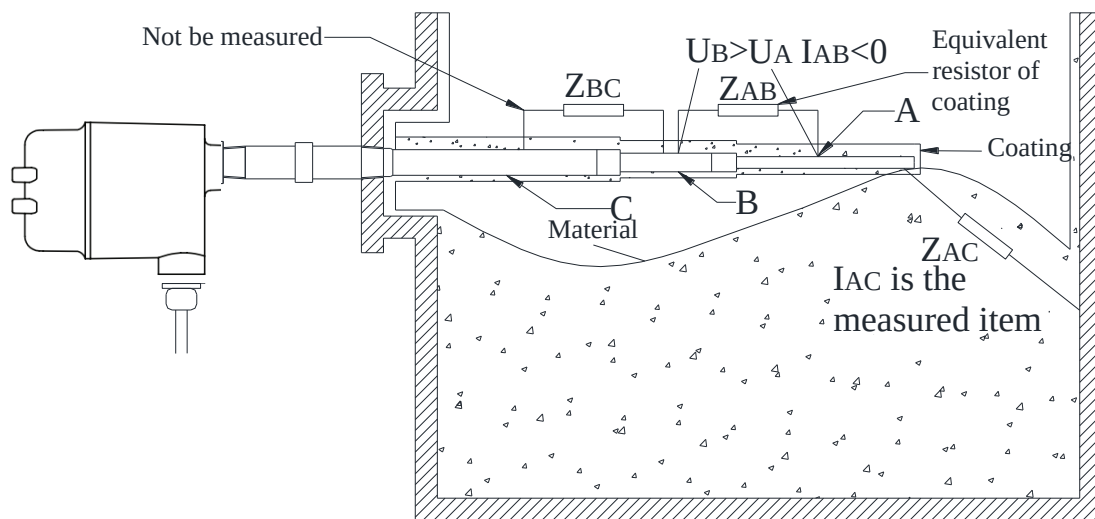


Figure 1.3 Equivalent sketch

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SECTION 2 SPECIFICATIONS

2.1 System specification

Output: DPDT (double pole double throw)

Contact Rating: 250VAC: 1A inductive, 3A non-inductive

Power requirement: Universal Power supply 30~265VAC, 50/60Hz & 18~30VDC automatic adoption

Dissipation power : 2W

Resolution: 0.2 pF or lower

Set-point accuracy : <1mm (0.04") or 0.5pF (conductive) ; <20mm (0.79") or 0.5pF (insulator)

Load resistance: Center wire to shield 150Ω,

Fail safe: High (HLFS) or low (LLFS) field adjustable

Indicators: On- level alarm ; Off-system normal

Ambient Operating Temp.: T5: -40~+80°C

(Effect of the process temperature on the environment temperature should not exceed the environment temperature requirements of the instrument.)

Storage Temp.: -40~+80°C

Response time: <0.5second

Time delay: 1 ~55seconds (adjustable)

Spark protection (for sensing element): anti-surge strike 1KV

Radio frequency protection (with built-in filter) provides protection against radio frequency interference from other exposed sensing elements, cables or output lines that are 1.5 meters (59 inches) away and have a power of 5W. The transmitter circuit of this device has this protective function.

Sensing element IL: 0.457m (118") (standard), 0.1m (3.9") ~20m (787.4") (optional)

Cable length: 5m (197") (standard), 0.1 (3.9") ~50m (1968.5") (optional),

>50m (1968.5") ~ 100m (3937") (consult factory)

Electrical connection: M20×1.5

Process connection: Thread /Flange

Housing Material: Die casting aluminum epoxy coating

Ingress protection: IP67

Explosion-proof rating: EX D [ia] ia IIC T4

2.2 Probe(sensing element) specifications

Probe No.	Probe Insertion Length(IL)	DSH	Wetted Material	Insulation	S.E. Mounting	S.E. Type	Weight/ anchor	Temperature/Pressure	Applications
J11	S.t.500mm(19.7")/250mm(9.8") Max. 2m(78.7")	250mm(9.8")/80mm(3.1") 450mm(18")/650mm(26")	304SS(s.t.) Other optional	PPS	3/4"BSPT 3/4"NPT	O.D. 9mm(0.35") Three terminal rod	NO	230°C/1.0MPa (446°F/145psi) 120°C/1.6MPa (248°F/232psi)	Mid-Temperature Low pressure
J12	S.t.500mm(19.7")/250mm(9.8") Max. 2m(78.7")	250mm(9.8")/80mm(3.1") 450mm(18")/650mm(26")	316SS(s.t.) Other optional	PEEK	3/4"BSPT 3/4"NPT	O.D. 9mm(0.35") Three terminal rod	NO	230°C/1.0MPa (446°F/145psi) 120°C/1.6MPa (248°F/232psi)	Mid-Temperature Mid-pressure
J13	S.t.500mm(19.7") Max.2m(78.7")	250mm(9.8") Other optional	304SS(s.t.) Other optional	PTFE	1 1/2"BSPT 1 1/2"NPT	O.D.22mm(0.87") Three terminal rod	NO	230°C/Ambient (446°F/0 psi) 100°C/1.6MPa (212°F/232psi)	Heavy duty Anti-agitation
J14	Flat 205mm(8")×205mm(8")		304SS(s.t.) Other optional	UR	170mm(6.7") ×170mm(6.7")	Three terminal flush mounting	NO	80°C/0.01MPa (176°F/1.5psi)	Heavy duty Anti-mechanical shock
J15	S.t.500mm(19.7") Max.5m(197") Rod	250mm(9.8") Other optional	304SS(s.t.) Other optional	Ceramic	1 1/4"BSPT 1 1/4"NPT	O.D. 9mm(0.35") Three terminal	NO	815°C/0.1MPa (1500°F/15psi) 300°C/2.5MPa (572°F/363psi)	High temperature
J16	S.t.500mm(19.7") Max. 25m(984") Cable	250mm(9.8") Other optional	304SS(s.t.) Other optional	Ceramic	1 1/4"BSPT 1 1/4"NPT	O.D. 4mm(0.16") Three terminal	NO	815°C/0.1MPa (1500°F/15psi) 300°C/2.5MPa (572°F/363psi)	High temperature Long range
J17	S.t.500mm(19.7") Max. 5m(197") Rod	250mm(9.8") Other optional	304SS(s.t.) Other optional	Ceramic	1 1/4"BSPT 1 1/4"NPT	O.D. 9mm(0.35") Three terminal	NO	815°C/0.1MPa (1500°F/15psi) 300°C/1.6MPa (572°F/2320psi)	High-temperature High-pressure
J18	S.t.500mm(19.7") Max.5m(197") Rod	250mm(9.8") Other optional	316L (s.t.) Monel optional	Ceramic	1 1/4"BSPT 1 1/4"NPT	O.D. 9mm(0.35") Three terminal	NO	815°C/0.1MPa (1500°F/15psi) 300°C/1.0MPa (572°F/1450psi)	High-temperature Corrosion
J19	S.t.500mm(19.7") Max. 8m(315")	250mm(9.8") Other optional	304SS(s.t.) Other optional	PPS	3/4"BSPT 3/4"NPT	O.D. 9mm(0.35") Three terminal cable	YES	230°C/1.0MPa (446°F/145psi) 120°C/1.6MPa (248°F/232psi)	Mid-Temperature Low pressure
J20	S.t. 500mm(19.7") Max. 2m(78.7")	250mm(9.8") Other optional	304SS(s.t.) Monel optional	PTFE	3/4"BSPT 3/4"NPT	O.D. 9mm(0.35") Three terminal rod	NO	230°C/4.0MPa (446°F/580 psi) 40°C/6.3MPa (104°F/913psi)	Mid-Temperature Mid-pressure
J21	Max. 3m(118")		304SS(s.t.) Other optional	PTFE	1 1/2"Tri-clamp Other optional	O.D. 12mm(0.47") Two terminal rod	NO	230°C/2.5MPa (446°F/363psi) 40°C/6.3MPa(104°F/913psi)	Sanitary 3A probe
J22	Max. 3m(118")	250mm(9.8")/80mm(3.1") Other optional	304SS(s.t.) Other optional	PTFE	3/4"BSPT 3/4"NPT	O.D. 18mm(0.71") Three terminal rod	NO	230°C/4.0MPa (446°F/580psi) 40°C/6.3MPa(104°F/913psi)	Corrosive liquid

NOTE: 1. DSH(shield length)must go into the vessel wall over 50mm.

SECTION 4 INSTALLATION

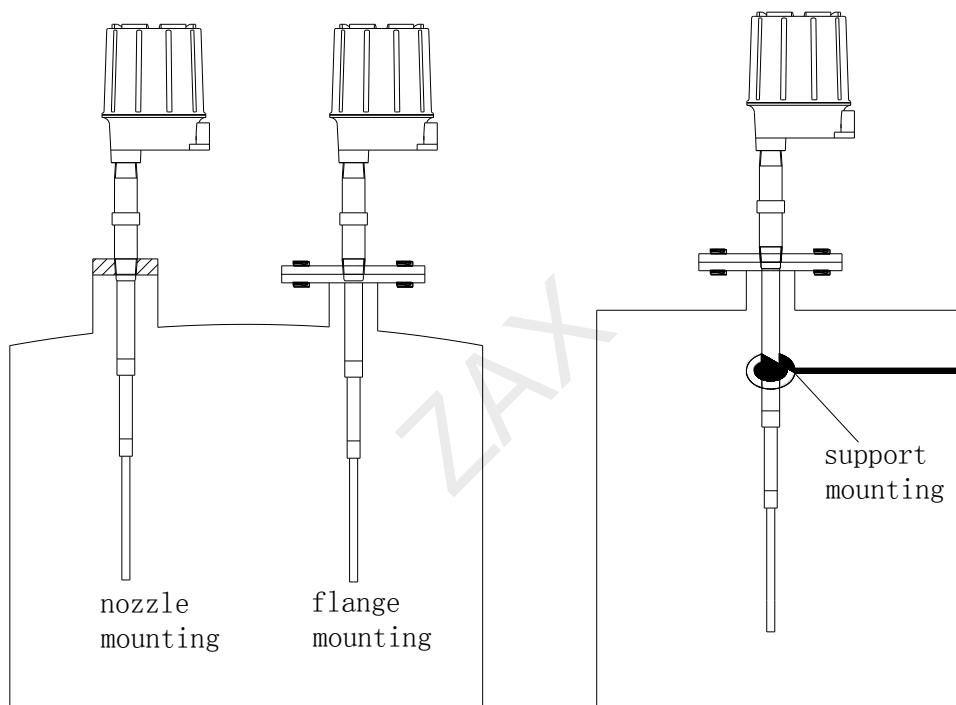
4.1 Unpacking

Carefully remove the contents of the shipping carton and check each item such as model number, serial number of electronic unit & sensing element、 accessory、 instruction manual etc. against the packing list before destroying any packing materials. If there is any shortage or damage, report it to the factory or local representative.

4.2 General Requirements

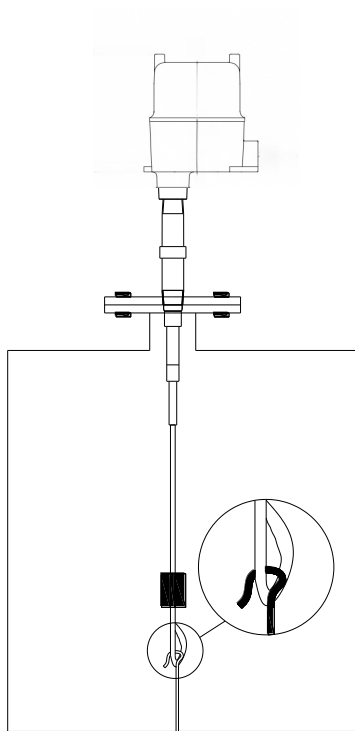
- Installation、 Utility & Maintenance of the instrument should comply with the instruction manual and GB50257 《Construction & Verification Standard of Electrical apparatus mounting in explosion or flaming dangerous area》、 GB3836.15 & GB3836.13 requirements.
- The mounting location of the instrument should be free of vibration, high temperature, corrosive atmospheres, or any possibility of mechanical damage for maximum service life. If this is not possible, consider a remote system installation. Ambient temperature should be between -40 ~70°C (-40 ~158°F).
- Instruments installed outdoors in areas of lightning strikes should be installed with lightning protection.
- DO NOT ADOPT MONO-COMPOSITION ENCAPSULATION SEALING inside of instrument housing since most of that kind of encapsulation will contain acetic acid. (Acetic acid could decay the electrical component.) Please consider to use SPECIAL DOUBLE-COMPOSITION ENCAPSULATION (non-erosive).
- The instrument has ground terminal on its housing. Please connect the terminals to the field ground properly during installation. For non-metallic vessel/tank installation, the field should provide a standard ground. CONNECT TO DYNAMIC GROUND IS FORBIDDEN!
- Cable inlet should meet GB4208 standard requirements reach IP65 code to ensure reliable electrical connections. It will avoid water or other corrosive gas destroys the electronic unit.
- Do not open sensing element or loosen sealed gland. That may cause system leakage.
- Do not install the sensing element directly under a flow stream or feed line. If this is the only position available, use a baffle or shield above the probe to keep it out of the flow stream.
- Only the mounting screw or flange part of the sensing element need be well connected to the vessel, reliable sealed and electrical connected properly. Any other parts of the sensing element should not touch the vessel for good insulation.
- For horizontal mounting, sensing element should be pointed downward to the vessel, angle around 10~20°.
- Review the installation distance when mounting rigid probe. Keep the rigid probe at least 100mm away from the vessel wall. For cable probe, keep it as straight as possible and at least 300mm away from the vessel wall to avoid hitting the vessel wall (shorted to earth.).
- For agitation、 gas/material flow fluctuation vessel, except avoid directly mechanical damage on sensing element, middle support (for rigid probe)/bottom anchor (for cable probe) of sensing element need be considered to avoid indirect mechanical broken under long-term utility. Please note: the support/anchor must be insulated with the sensing element. The insulating material should be high insulation, low hardness, lubricant and anti-abrasion material such as PTFE etc. Otherwise, periodical maintenance need be considered to avoid linkage loss.
- Probe is not allowed to go into cone part of the vessel under long range granular/powder application, since the pulling force of the material will increase tremendously at cone part. If necessary, the maximum length to go into cone should not be bigger than 20% of the vessel O.D.
- The inactive part of the sensing element should go into vessel at least 50mm. For cable probe, the rigid part should not be less than 200mm under horizontal mounting, 100mm for vertical mounting.
- For explosion-proof instrument installation, cable inlet should come with approved cable accessory such as XP fittings or XP steel conduit sealing according to GB3836.1 & GB3836.2 explosion-proof standard requirements.
- 24VDC Instrument power noise should be lower than 100mV.
- Power wire should meet IEC60245/60227 standard requirements Recommended as 3 terminal armature cable, cable O.D. should be less than 12mm, conductor material of the cable is copper, section area should be between 0.13 ~2.1 mm²(AWG14-26), insulating capability 1500V. And associated switch should meet IEC60947 requirements. Do not make the unshielded cable parallel with power supply cable for long distance..
- Strict follow “STOP OPEN THE LID WHILE POWER ON” during field operation or maintain, recommended operate 10 minutes after power off.

4.4 Typical Mounting

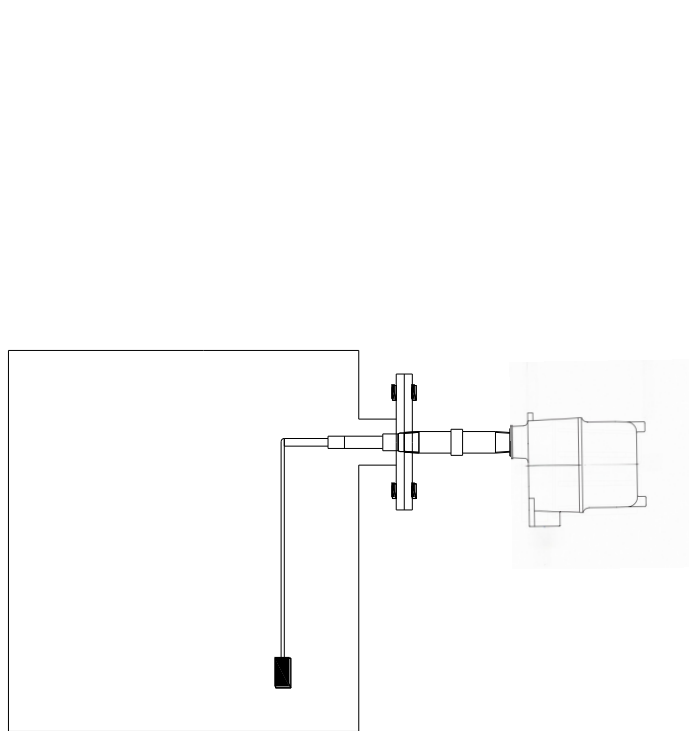


Nozzle/Flange mounting

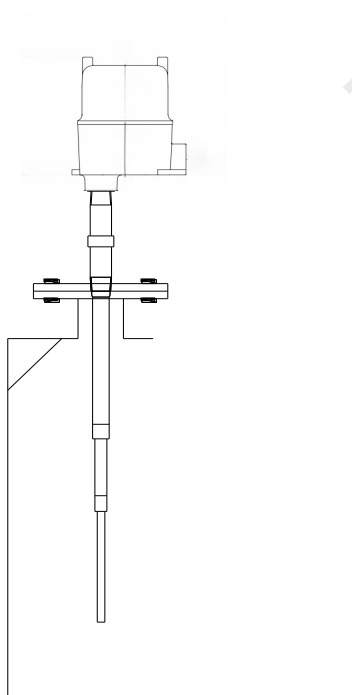
Insulation Support mounting



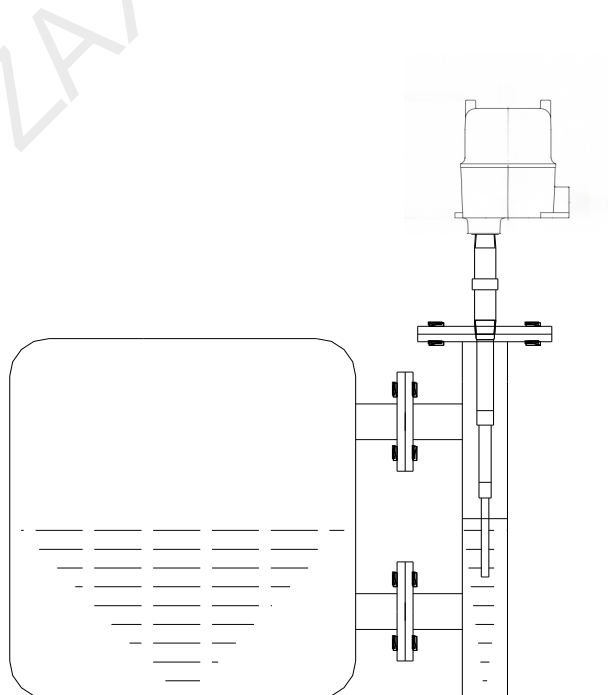
Anchor mounting



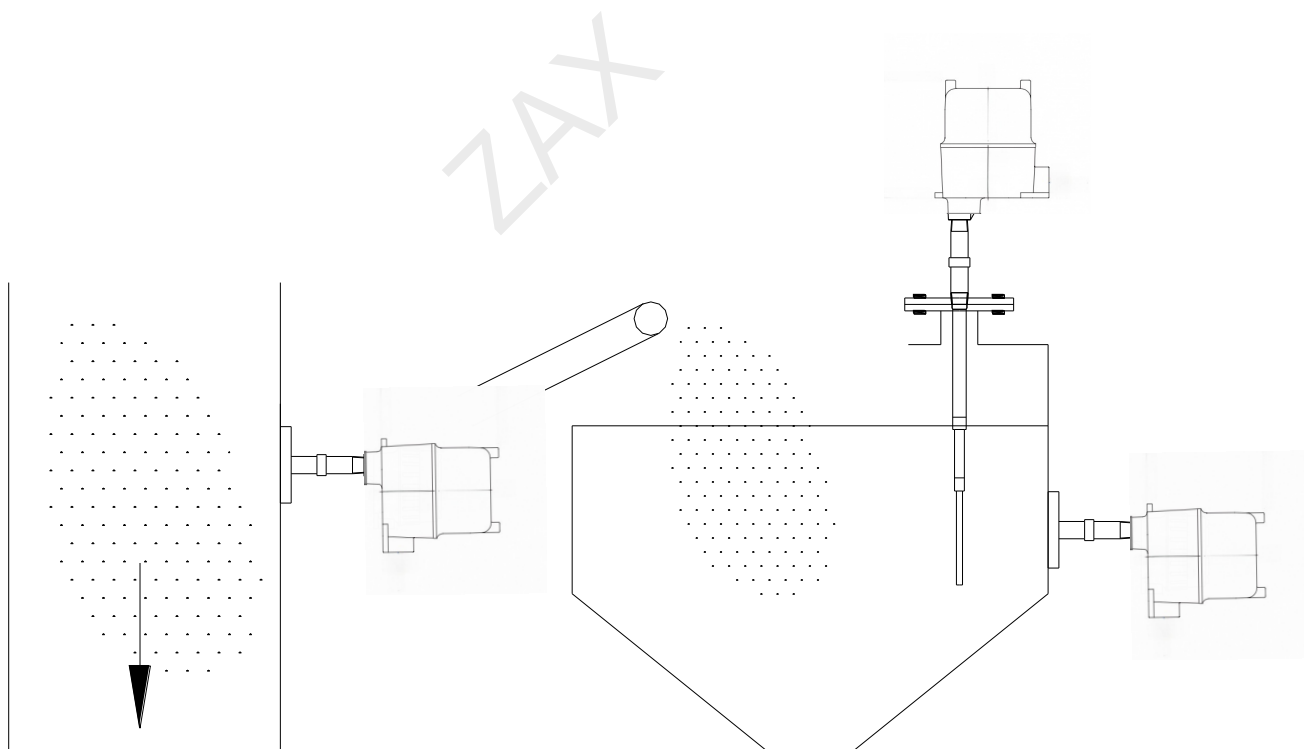
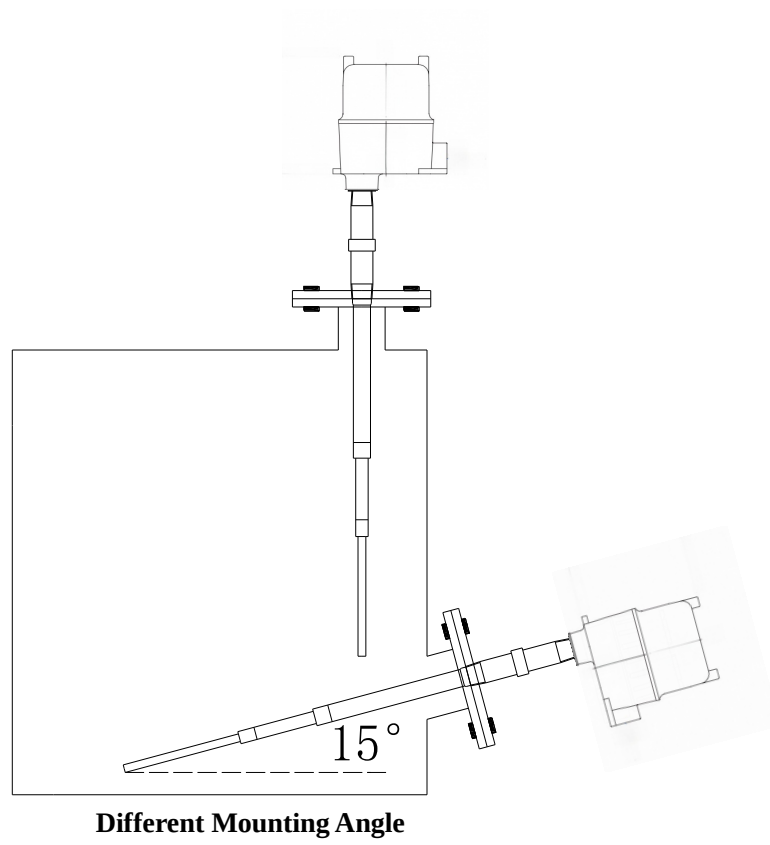
Bent mounting



Bracket mounting in open vessel



External side arm mounting



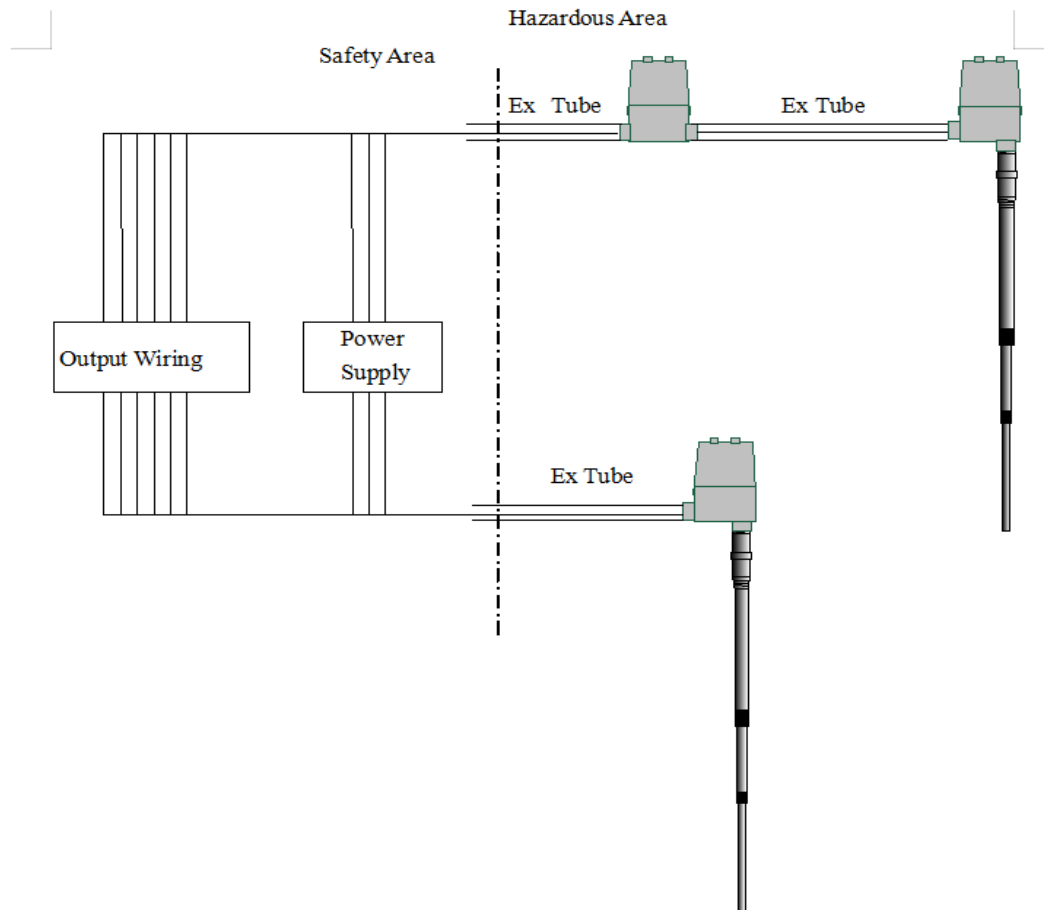


Figure 4.4 System wiring

4.6 Sensing Element wiring



Assure power to the equipment has been turned off before opening the explosion-proof housing. Also make sure relay power has been turned off more than ten minutes !!

For integral mounting, the sensing element is usually pre-wired at the factory. If the system were shipped unassembled or you want to replace the cable see figure 4.5 below. All of the sensing element connections are made to the terminals on the opposite side of the power and relay connections. The shield wire (red) and the center wire (blue) are twisted, be sure the shield wire connects to the electronic unit shield terminal (DSH), the center wire connects to the center terminal (CW) . Since a metal housing is used the electronic unit ground does not have to be connected. At the probe end, connect the Center wire (blue) to the center rod of probe and the shield wire (red) to the shield of probe.

See figure 4.6 for remote wiring. Remote wiring connections are the same as integral except the ground wire is connected at both the probe and electronic units.

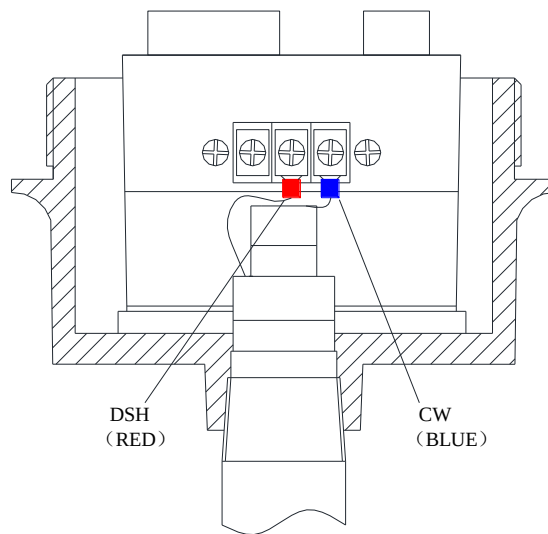


Figure 4.5 Integral System wiring

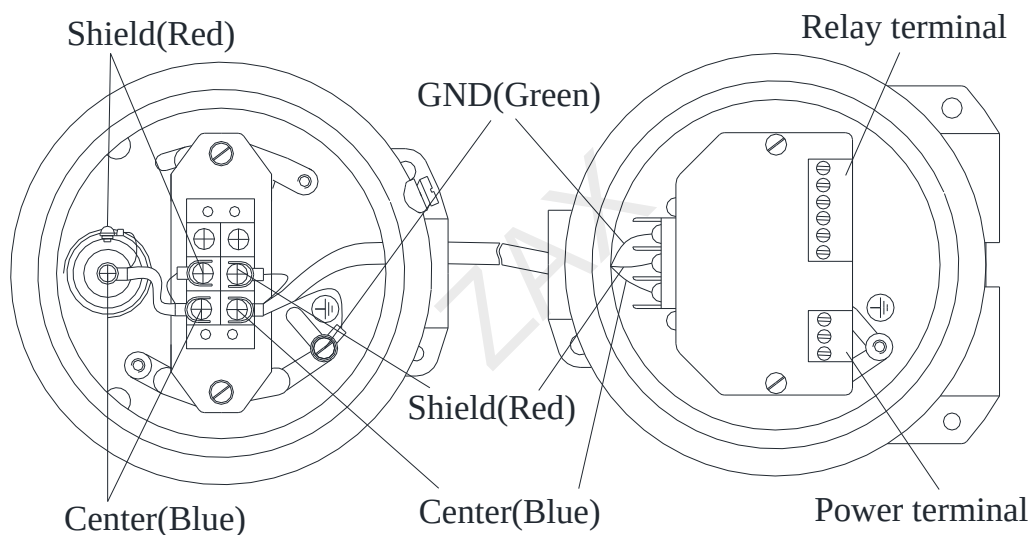


Figure 4.6 Remote System wiring

4.7 Relay wiring



Assure power to the equipment has been turned off before open the explosion-proof housing. Also make sure relay power has been turned off over ten minutes!! Before connect replays, check the power supply and relay wires do NOT have power!!

Use approved sealed fitting in the conduit entrances of the explosion-proof housing in hazardous areas.

The relay is a double-pole, double-throw (DPDT) dry contact relay. The relay serves as a switch and does not provide the power to operate an enunciator or other equipment. All relay connections are made to the right hand terminal strips on the power side of electronic unit. See figure 4.7 as relay contacts.

Relay Terminal Connection Procedure:

- 1、 Open upper lid of the housing, put the relay contact wires through conduit
- 2、 Take off the protecting line box from the electronic unit(keep the two nuts carefully).
- 3、 Connect the wires to the proper terminals and verify it is correct.
- 4、 Put the protecting line box back to the unit.

- 5、 Adjust the cable for suitable length, tighten the conduit.
- 6、 Tighten the upper lid again.

Instrument uses normal relay logic; the relay fails safe and contacts are de-energized in alarm. This is also the no power state.

A red LED indicates that the relay is de-energized (reset), normally this is the alarm condition. (When the power is cut off, the relay is also in a de-energized state, and at this time the red light does not light up.)

High level Fail Safe (alarm) means that the relay will de-energize when level is high. These contacts also de-energize indicating high level upon loss of power.

Low-level Alarm Fail Safe (alarm) means that the relay will de-energize when level is low. These contacts also de-energize indicating low level upon loss of power.

Remark: There is no absolute fail-safe device made. Critical applications should have redundant or back-up devices.

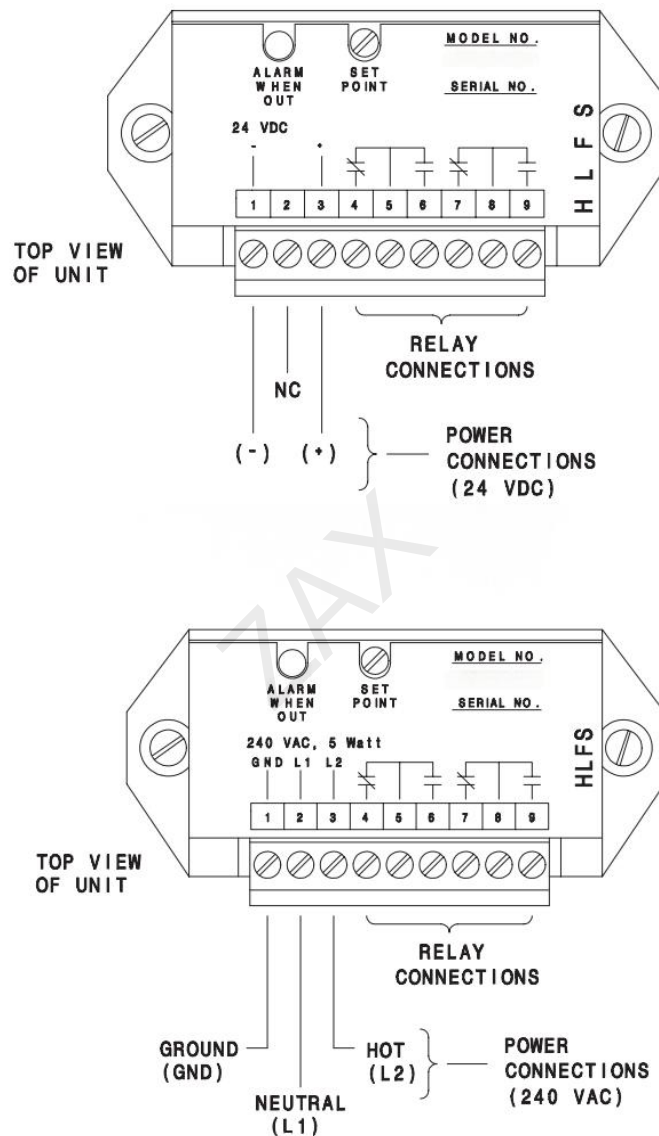


Figure 4.7 Power wiring & Relay contacts

4.8 Power Wiring



Assure power to the equipment has been turned off before open the explosion-proof housing. Also make sure relay power has been turned off over ten minutes!! Before connect power, check the power supply and relay wires do NOT have power!!

Use approved sealed fitting in the conduit entrances of the explosion-proof housing in hazardous areas. All power connections are made to the terminal strip on the left side of electronic unit. See figure 4.7 as power wiring & relay contacts.

Power Supply Terminal Connection Procedure:

- 1、 Open upper lid of the housing, put the power wires through conduit then feed it at the left hand entrance fitting into housing.
- 2、 Take off the protecting line box from the electronic unit (keep the two nuts carefully).3
- 、 Connect the wires to the proper terminals and verify it is correct.
- 4、 Put the protecting line box back to the unit.
- 5、 Adjust the cable for suitable length, tighten the conduit.
- 6、 Tighten the upper lid again.

SECTION 5 FUNCTION SETTING

5.1 Process material setting

See figure 4.7 power wiring & relay contacts, the “SETPOINT” is the operating control used to control the switch point at which the relay changes state. Turning the switch point adjustment clockwise increases the amount of sensed capacitance required (less sensitive) to change the relay state. Counter clockwise reduces the amount of sensed capacitance required (more sensitive) to change the relay state. A Green LED indicates that the electronic unit is in the normal state and the relay is energized. A Red LED indicates that the electronic unit is in alarm and the relay is de-energized.

5.2 HLFS/LLFS setting

The High Level Fail Safe (HLFS) / Low Level Fail Safe (LLFS) jumper determines whether the relay will de-energize when material is higher or lower than the set point. HLFS means the relay will de-energize (alarm) when sensed capacitance (level) is higher than the set point. LLFS means relay will de-energize (alarm) when sensed capacitance (level) lower than the set point. The instrument is supplied in the failsafe mode requested when the order is placed (HLFS, if not specified.) The HLFS/LLFS jumper is located on the side of the unit. See figure 5.1 Electronic Unit Sketch.

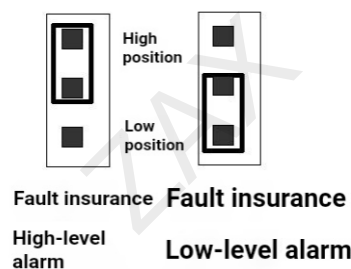


Figure 5.1 HLFS/LLFS

5.3 Time delay setting

The time delay adjustment is a potentiometer located at the right side of the unit “TIME DELAY”. It could adjust the reset time of the relay when an alarm condition ceases to exist. Clockwise the adjustment could increase the time delay. The time delay function only works during the alarm change to normal status period of the unit i.e. the electronic unit will always output alarm signal regardless time delay setting.

If the unit without “TIMA DELAY” adjustment, then no time delay option available.

SECTION 6 CALIBRATION



Assure power to the equipment has been turned off before opening the explosion-proof housing. Also make sure relay power has been turned off over ten minutes and control elements are in manual!!

6.1 Start-up



Before turn on the power, please carefully check the power wiring according to Section 4.8.

The area should be evaluated, and if found safe, the housing cover should be removed for start-up. It is advisable at this time to disable control elements until proper operation is verified !!

After start-up, please install the housing properly. Each wiring which connected to the explosion-proof housing in hazardous area should be along with an approved sealed fitting.

6.2 Factory Calibration

All CLLL-AT101 series products are factory configured to switch on water based conducting materials (set point adjustment is set to full clockwise position) and sealed with a paper seal.

6.3 Calibration for Insulating Materials (HLFS)

- A. Be sure the material level is well below the sensing element.
 - B. Turn the set point adjustment to the full counterclockwise (CCW) position.
 - C. Turn set point adjustment slowly clockwise (CW) until the relay just changes state. (LED light in GREEN color). Make a pencil mark on the label at one of the screw driver slot ends.
 - D. Increase the material level until it is well above the sensing element. (GREEN LED is off).
 - E. Pay attention to the position of the calibration tool.
 - F. Turn the set point adjustment slowly clockwise (CW) until relay once again just operates (LED change to GREEN) counting the number of revolutions required to change states, or you come to the end of the adjustment travel.
 - G. Turn the adjustment back counterclockwise (CCW) half of the number of turns that was counted.
 - H. Calibration now is complete. For re-calibration, the recorded 1/2 number of turns is "pre-load".
- CAUTION: If the set point status change less than one turn or the relay does not change state, consult factory.**

6.4 Calibration for Conducting Materials (HLFS)

- A. Be sure the material level is well below the sensing element.
- B. Turn the set point adjustment to the full counterclockwise (CCW) position.

- C. Turn set point adjustment slowly clockwise (CW) until the relay just changes state. (LED changes color to GREEN).
- D. Continue turn the set point adjustment slowly clockwise (CW) for 2 to 5 turns, if the process material conductivity is good, then make more turns. For conductive material like water, the set point could be set as full clockwise position.

6.5 Pre-calibration or empty calibration for START-UP (HLFS)

- A . Ensure vessel is empty or material is well below probe.
- B. Turn the set point adjustment to the full counterclockwise (CCW) to position .
- C. Turn the set point adjustment slowly clockwise (CW) until the relay just changes state (LED changes color to GREEN).
- D. Turn the set point adjustment slowly clockwise (CW) 3/4 turn, this is called as pre-load, if the material is high insulating one, then make it as 1/2 turn as a good initial set up. Normally 3/4 turn is for general insulating/conductive material, for high conductive one, than make more turns.

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SECTION 7 TROUBLE SHOOTING

7.1 Introduction

AT101 series is a solid-state device with no moving parts except the alarm relay. Neither the probe nor the electronics require routine maintenance or periodic adjustments. All components are tested and inspected during manufacture and then as a complete system. The systems are designed to give years of unattended service.

A spare electronic chassis is recommended for every 25 units so that, in case of a failed unit, a critical application will not be delayed while the unit is returned to the rep or factory for repair or replacement. A complete system is recommended for critical applications or for project start-up where additional applications may be required.

No SPECIAL tools are required for servicing the CLLL-AT101 product line except a digital or analog multi-meter for measuring the resistance of the probe and cable and checking the relay contacts.



Assure power to the equipment has been turned before opening the explosion-proof housing. Also make sure power to the relay contacts have been turned off over ten minutes and control devices are in manual!!

7.2 Testing the electronic unit



During electronic unit testing , personal care should be taken as line power will be on the power terminals. Also assure relay power is off!

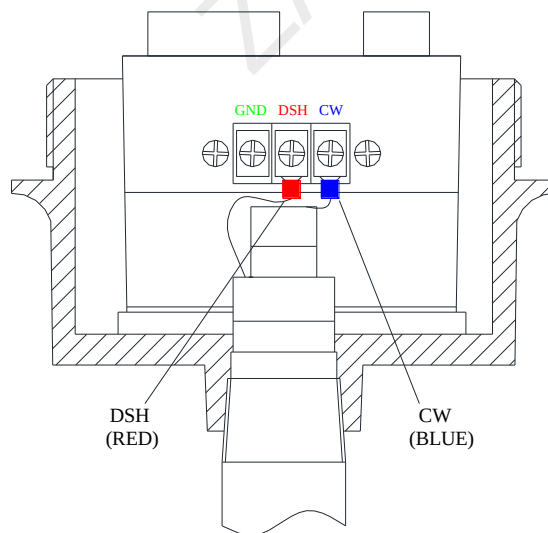


Figure 7.1 Testing electronic unit

- Disconnect the sensing element wires from the instrument by removing the blue wire from the center terminal and the red wire from shield terminal. Leave the power connected. See figure 7.1.
- Connect a 1 to 10pF capacitor between center wire and ground.
- Starting with the set point adjustment in the extreme counterclockwise (CCW) position, turn the screwdriver clockwise (CW) until the relay just operates.
- Rotate the set point adjustment back and forth about this point, observing the travel of the

screwdriver between the relay pull-in and relay drop-out. If the instrument is working properly, the screwdriver should travel less than 1/4 turn to operate the relay.

If instrument doesn't work properly, consult service department.

7.3 Testing the sensing element

A. See figure 7.1. Disconnect the sensing element wires from the instrument by removing the blue wire from the center terminal and the red wire from shield terminal.

B. If there is some build-up on sensing element, see figure 7.2. using an analog ohmmeter, measuring the following values

- Center wire to shield _____ohms
- Shield to ground _____ohms

Using the same analog ohmmeter on the DC voltage scale, measure following values:

- Center wire to shield _____mV
- Shield to ground _____mV

C. Resistance result in item B should over following values:

- Center wire to shield 500ohms
- Shield to ground 150ohms

Voltage result in item B should less than following value:

- Center Wire to shield 100mV
- Shield to ground 200mV

D. If voltage results are over above values or resistance results are lower than above values, please clean the sensing element and do procedure B again.

E. A new or clean Sensing element without build-up, using an analog ohmmeter, measuring the following values

- Center wire to shield _____ohms
- Shield to ground _____ohms

Using the same analog ohmmeter on the DC voltage scale, measure following values:

- Center wire to shield _____mV
- Shield to ground _____mV

F. If the above two resistance values both below 1M Ω or voltage values both above 200mV, please consult factory.

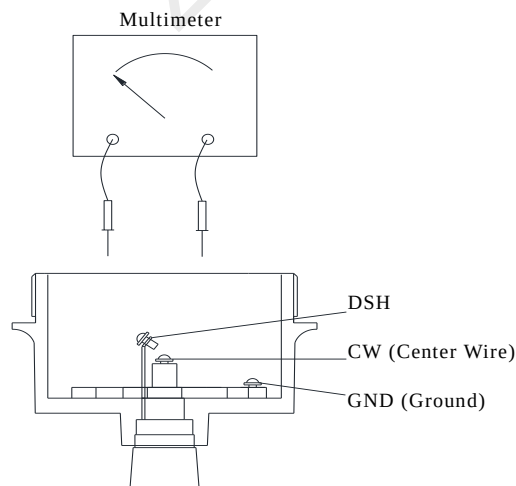


Figure7.2 Testing sensing element

7.4 Testing the relay circuits



Be careful during relay check since line power is present on power terminals!!

- A. The relay circuits consist of double-pole double-throw relay contact brought out to terminal strips.
- B. Adjust equipment per section 5.1.
- C. Relay operation may generally be heard as a audible click when the background noise is not too high. To be sure that the contacts actually change state, disconnect the wires to the relay contacts, use an ohmmeter to check if relay contacts work properly. In many cases, contacts can oxidize and not carry current.
- D. The difficulty of calibration mostly comes from the wrong wiring between the relays and the alert or other equipment of the cabinet. Please check the wiring according to Section 4.7 Relay wiring, make sure that the instrument is in the proper HLFS/LLFS position as figure 5.1.

7.5 Testing the coaxial cable

Disconnect all three spade lugs of the coaxial cable at the electronic unit and sensing element. Use an ohmmeter measure following value, check if the result meets the value in brackets.

See figure 7.3 integral cable, figure 7.4 remote cable.

Integral cable:

- Resistance between the two blue spade lugs(< 2Ω)
- Resistance between the two red spade lugs(< 2Ω)
- Resistance between the red & blue spade lug(>100MΩ)



Figure 7.3 Integral Cable

Remote Cable

- Resistance between the two blue spade lugs(< 10Ω)
- Resistance between the two red spade lugs(< 10Ω)
- Resistance between the two green spade lugs(< 10Ω)
- Resistance between the three different color lugs(>100MΩ)

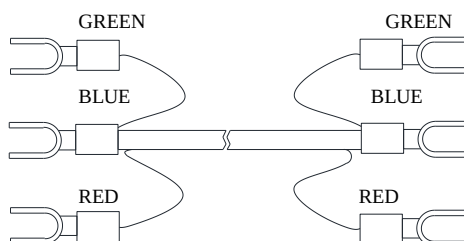


Figure 7.4 Remote Cable

7.6 Possible Problem and Cause

<u>Problem</u>	<u>Possible Cause</u>	<u>Solution</u>
1. Instrument indicates alarm at all time (HLFS)	a. Severe coating build-up	a. Need longer shield, please consult factory*
	b. Sensing Element always touch material	b. Need shorter insertion length, please consult factory*
	c. Defect in sensing element.	c. See section 7.3
	d. Improper wiring	d. See section 4.7,4.8
	e. Improper calibration.	e. See section 6.3, 6.4
	f. Electronic unit malfunction (Yellow LED)	f. Replace unit*
	g. LED failed	g. Replace fuse of unit or turn power on again
2. Instrument never indicates alarm (HLFS)	a. Sensing element not “seeing” material (HLFS)	a. Need longer insertion length, please consult factory*
	b. Broken wiring	b. Replace signal cable*
	c. Improper calibration	c. See section 6.3,6.4
3. Instrument can’t be calibrated	a. Improper wiring	a. See section 4.7,4.8
	b. Sensing Element not “seeing” material (HLFS)	b. Need longer insertion length, please consult factory *
	c. High insulating material	c. Need high resolution unit. Consult factory.
4. Instrument gives a false alarm	a. Improper Calibration.	a. See section 6.3,6.4.
	b. Loose wiring	b. See section 4.7,4.8.
	c. Electronic unit malfunction.	c. See section 7.2.
5. Instrument operates intermittently.	a. Improper calibration.	a. See section 6.3,6.4
	b. Loose wiring.	b. See section 4.7,4.8.
	c. High insulating material.	c. Need high resolution unit. Consult factory.

NOTE: For solution with mark “” could only be resolved by factory or local representative.

7.8 Equipment Return

In order to provide the best service, any equipment being returned for repair or credit must be pre-approved by the factory.

In many applications, sensing elements are exposed to hazardous materials.

OSHA mandates that our employees be informed and protected from hazardous chemicals.

Material Safety Data Sheets (MSDS) listing the hazardous materials that the sensing element has been exposed to must accompany any repair.

It is your responsibility to fully disclose all chemicals and decontaminate the sensing element.

To obtain a return authorization (RA#), contact the factory. Please provide the following information:

Return Authorization Number _____

Reason for equipment return _____

Contact Person _____

Shipping Address _____

Please include a purchase order copy even if the repair is under warranty. If repair is covered under warranty, you will not be charged.

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