INSTRUCTION MANUAL

ADMITTANCE LEVEL LIMIT SWITCH
LEVTESTER - SLA SERIES
Models SLA-122/222/322/622/522/722

INTRODUCTION :

`SAPCON' Admittance Level Limit Switch utilizing specially designed immuno coat probe offers a reliable solution to level detection problems so far difficult to solve with capacitance type system utilizing conventional 2 element probes.

Referring to figure 01, it may be observed that the Immuno Coat Probe comprises of two concentrically constructed electrodes that are insulated from each other and ground. The innermost electrode is the measuring electrode, the next is the shield and the outermost is ground. The measuring electrode and shield are connected to a radio frequency source. Due to the geometry of construction and Immuno Coat circuitry, RF current does not flow between the measuring electrode and shield. Current can, however, flow between the shield and mounting (ground) which being out of the measuring circuit does not effect indication. The only path left for the current to flow through is the Admittance path via the material to the vessel wall (ground). This being the only path of interest, the system gives a reliable indication of level.

Admittance measurement using Immuno Coat Probe give satisfactory solutions in tough environments such as where;

i) Conductive or non-conductive material coats the probe.

ii) There is bridging of material between Probe and sidewall.

iii) Material particles with electrostatic charge and varying temperature float in the vicinity of the Probe.

TECHNICAL SPECIFICATIONS :

A. EVALUATION UNIT : (STANDARD)

Housing	: Cast aluminium Weather proof suitable for mounting in safe area
Mounting	: Separate - Back panel/wall
Cable Entry	: 3 X / 1/2"/3/4"/NG 20 - BSP/NPT Brass / S S / Plastic
Cable Gland Type	: Single / Double Compression Gland
Mains Voltage	: 220/230/110 V AC (+10%, -15%), 50 Hz, 24 V DC
Max. Ambient Temp.	: - 20° C. to + 60° C.
Power Consumption	: 5 VA (approx.)

Contd...2..

Fail Safe Mode	:	Max. or Min. (field selectable)
Output	:	One set/Two sets of potential free c/o contacts rated at 6 amps, 230 V AC for non-inductive loads
Indication of operation	:	Red LED indicates Alarm Condition Green LED indicates Normal Condition Yellow LED indicates system fault
Measuring Frequency	:	500 KHz (approx.)
Response Time	:	0.1 to 0.3 sec's.
Switching Delay (for model SLA-322 and/or SLA-622)	:	0.5 to 10/20 sec's. (adjustable) for Probe covered or uncovered condition (selectable by toggle switch)
Calibration	:	By means of single continuously adjustable set point control
Weight	:	3.00 Kg. (Approx)
Overall Dimensions	:	L- 180 X B- 180 X H- 85 (mm) - (approx) (Refer enclosed drawing)

B. ELECTRONIC INSERT - ICA 3000A :

Housing	:	Plastic, electronics potted with epoxy resin
Working Frequency	:	500 KHz (approx)
Tolerable Ambient Temp.	:	- 20° C to + 80° C
Supply Voltage	:	15 V DC from Evaluation Unit
Output Signal	:	3-12 V DC
Weight	:	125 Gms. (approx.)

C. PROBE : (Refer enclosed Probe drawing)

IMMUNO COAT PROBE with built-in high voltage Discharge Device (optional)

Housing	:	Cast aluminium Weather proof suitable for mounting in safe area
Cable Entry	:	1 X 1/2" / 3/4" BSP/NPT, Brass / S S
Cable Gland Type	:	Single / Double Compression Gland

Contd...3..

Mounting	: Screwed - 1" / 1-1/2" BSP / NPT Flanged - As per your requirement Material - M S (Plated) / S S
Insulation	: PART / FULL - PVC /NYLON/ PTFE/ CERAMIC
Working Temp. (Maximum):	80° C / 120° C / 250° C / 300° C/ °C
Extension	: Rod - M S (Plated) / S S ; Rope - G I / S S
Sensing	: Rod / Plate / Weight , M S (Plated) / S S
Shield	: Pipe - M S (Plated) / S S
Grounding	: Pipe, G I / M S (Plated) / S S

PRINCIPLE OF OPERATION :

The Sensitive portion of the probe and the container wall (or ground electrode) from a means to measure the Admittance of the system with and without the intervening material. When all the parameters that affect the Admittance value are kept constant then its value changes only due to the difference in material level. This change after amplification is used to operate a relay, the output contacts of which are used for signaling or control.

MEASURING SYSTEM :

The complete Admittance system comprises of the following:

A. Probe of special construction Immuno Coat system.

B. Electronic Insert ICA-3000A in plastic housing, fully potted with epoxy resin.

C. Evaluation Unit type LEVTESTER - SLA...Series.

SYSTEM DESCRIPTION :

The Probe is of a special construction with two concentrically positioned electrodes, that are isolated from each other and ground. The innermost electrode serves as the sense electrode whereas the one next to it is the shield and the outermost is ground. Due to the typical geometric configuration of the electrodes and the maintenance of equi-potential and equi-phase relation between the sense & shield waveforms a high degree of immunity to probe coating and buildup achieved.

Contd...4...

The probe head is of cast aluminium construction and is fitted on the probe extension, away from heat. It is provided with a suitable mounting arrangement of the Screwed or Flanged type(as per order).The Electronic Insert can either be directly mounted in Probe housing or remotely installed in a separate housing. The Electronic Insert comprises of an RF Oscillator, Detector and Coat Immunising circuitry all encased in a plastic housing and potted with epoxy resin. Built in terminals on Electronic Insert facilitate interconnections. The Insert is further housed in a cast aluminium housing provided with a suitable entry and houses a high voltage Discharge Device (Optional).

The Evaluation Unit consists of a step down transformer, rectifier, voltage regulator, oscillator and probe immunizing circuitry, set point adjusting capacitor, relay driving circuitry, fail safe selection LED Indicator and Relay. In case of Time Delay model, a separate timing mode selection switch and pot is provided for delay setting. The electronics alongwith interconnecting terminals is assembled on a glass epoxy PCB heavily lacquered for rendering it immune to moisture, dust and fungus. The card in turn is mounted in a cast aluminium weather proof housing, staved enamel painted & provided with 3 Nos. of cable entries.

INSTALLATION :

A. PROBE - The mechanical construction of the probe differs from application to application. Standard methods of mounting are screwed or flanged. A 1-«" BSP Mounting Bush (standard) is provided for screwing on to the container having a threaded flange fitted with the probe has to be bolted on to matching flanged welded to a pipe which in turn is fixed to the container. The construction and size of the mounting bush/flange as well as material of mounting bush/flange depends on the application. Depending on the application Rod Probes can be either mounted from the top of the container or from the side of the container. Rope probes have to be mounted from the top only. For installing Rod Probes from the top of the containers, sufficient clearance between the roof and tank top is necessary as the Probe has to be hoisted-up over the tank top during installation. Accurate length adjustments can be made at site for Part Insulated Rod or Rope Probes by sawing off additional length from the bottom of the Probe. In the case of Fully Insulated Probes, this is not possible. If the container material is turbulent, Rope Probe may sway excessively. They can be anchored to the container, and a special weight with the provision for anchoring is provided. The cable entry gland in the case of side mounted Rod Probe should always face downwards.

B. ELECTRONIC INSERT - The Electronic Insert ICA-3000A is fitted in the probe head by means of single screw. It can operate satisfactorily up to a ambient temp. of 80° C. If the ambient temp. exceeds this the Insert has to be mounted away from the container in a special cast aluminium weather proof housing and interconnected by screened cable. Thereby the initial admittance is increased by the amount of the admittance of the screened cable.

Contd...5...

C. EVALUATION UNIT - The Evaluation Unit is suitable for back panel mounting. Refer mounting details diagram for hole locations in the back panel and drill holes accordingly. Remove instrument cover by unscrewing the four screws provided on front cover. Box fixing holes will be clearly visible on the box bottom, above and below card. Mounting hardware consisting of 4 nos. of M4 Cheese Head Screws have Rubber `O' Rings to render the box dust tight after fitting. After installation the cover should be refitted to avoid dust ingression. The housing is suitable for outdoor installation. However, in no case should the instrument be subjected to temperature exceeding 60° C. Through the instrument can be installed outdoors, it should never be subjected to direct sun rays. Preferably a sun shade should be provided.

CONNECTION :

A. ELECTRONIC INSERT - ICA 3000A :

Ordinary three core cable of core cross-section 1.5 mm² & resistance per core less than 25 ohms can be used to connect the Electronic Insert to the Evaluation Unit since only DC proportional to admittance change is transmitted over the line.

In the case of direct mounting of Electronic Insert in the Probe,

connection to the measuring electrode is made by the single mounting screw. The ground wire is connected to terminal 6 of the Insert. Wire from the shield electrode is connected to terminals 5 of the Insert. Additional ground terminals is provided on the outside of the housing for connecting to external earth.

In case the Insert is remotely mounted in a separate housing the connection to the Evaluation Unit can be made by ordinary three core cable as above but the connection to the measuring & shield electrode should be made with two core shield cable with teflon insulation. The length of the cable should be restricted to a maximum of 3 mtrs. as the admittance of the cable adds upto the probe admittance.

B. EVALUATION UNIT :

Refer enclosed drawing for connecting ICA-3000A to SLA-122/222/322/522/ 622/722 connect appropriate mains supply to terminals 1, 2 & 3 in the sequence Line (L), Neutral (N) and Ground (G) respectively. In case of 110 V AC operation, 110 V AC sticker is pasted on the card.

CAUTION : Connecting 230 V AC mains to instruments meant for 110 V

AC operation can cause permanent damage.

Contd...6...

Terminals 4, 5 & 6 are Relay output contacts of standard version. Terminals 7, 8 & 9 are optional Relay output contacts available in special models. Contact position shown in the enclosed diagram is in normal condition when green LED glows. Terminals 12, 13 & 14 are for connecting to Electronic Insert - ICA 3000A. Terminals 12 & 14 supply 15V DC for the operation of the electronic circuitry in the Insert. Terminal 12 being the DC ground (zero V) and terminal 14 (+15 V DC). Terminal 13 receives the signal in the form of DC Voltage variation proportional to the change in admittance as a result of level change. Terminals 12, 13 & 14 of the Evaluation Unit should be connected to terminals 2, 1 & 3 of the Electronic Insert respectively. Connections can be made by means of ordinary 3 core cable of core cross-section not exceeding 2.5 mm².

Maximum allowable cable length is that length wherein the resistance per core does not exceed 25 ohms.

C. CONNECTION OF ALARM UNIT :

Audio/Visual alarm annunciators can be connected to the Evaluation Unit. A set of single change-over potential free relay contacts rated at 6 amps, 230 V AC for non-inductive loads are provided for the purpose. Required contacts should be selected after referring enclosed diagram that show the dependence of relay operation/ indication on fail safe mode and level.

D. FAIL SAFE OPERATION :

Instrument operation is supposed to be fail safe if alarm condition is signaled by the relay in the de-energized condition. This necessitates a change in the state of the relay when the instrument is used for high or low alarm as the conditions are opposite. Fail safe select switch is provided just for this purpose. When the instrument is used for high level alarm the switch should be in fail safe high position whereas for low level alarm it should be in fail safe low position. It should be noted that the output contacts will change positions as per fail safe selection. Connections to external alarms should made accordingly. Red and Green LED's indicate Alarm & Normal operation. Red LED glows when the relay in de-energized position.

CALIBRATION :

Calibration controls are accessible after opening the Evaluation Unit cover.

A. SLA 122 / 222 : Calibration is done with the probe uncovered.
Clearance between the probe and material should be at least 100 mm.

1) Make all connections as per connection diagram after reading the instructions under connection caption, and switch on the mains.
2) Throw the fail safe selection switch to fail safe ‘HI’ position

Contd...7...

3) Throw the range selection switch to range `I' position.

4) Calibration procedure for Fail Safe High mode : -

a) Turn `sensitivity adj.' pot anti-clockwise to the extreme left position. Red LED goes ON.

b) Turn pot clockwise until Green LED goes ON.

c) If the Green LED does not glow even though the pot is turned fully clockwise, select next higher range i.e. range II . If green LED goes ON go thru to next step. If green LED does no go ON select next higher range i.e. range III. LED would definitely go ON.

d) Turn sensitivity pot anticlockwise until red LED goes ON . again turn sensitivity pot slowly clockwise until green LED just goes ON.

e) From this accurate switch point position, turn the pot a few degrees clockwise (Green LED remains ON), thereby setting the sensitivity to a stable switching position.

f) The instrument is now calibrated. If it be possible to vary the material level in the vicinity of the switch point, the correctness of calibration can be confirmed.

5. Calibration procedure for Fail Safe Low mode : -

a) After following similar instructions 4(a) to (e) throw the fail safe switch to fail safe LO position.

f) The instrument is now calibrated. If it be possible to vary the material level in the vicinity of the switch point, the correctness of calibration can be confirmed.

B. SLA 322 / 622 :- Rotate time delay pot fully anti-clockwise (minimum delay position), then proceed as per calibration instructions for SLA 122 /222 (Sr. No. 1 to 5).

Switching delay adjustment :

a) Select delay mode by throwing the mode select switch to appropriate position-

Position `S' gives delay for probe uncovered condition.

Position `T' gives delay for probe covered condition.

b) Set time delay approx. between 0.5 to 10/20 sec's. by turning the time delay pot clockwise

Contd...8...

C. SLA 522 / 722 : These models have built in pump control logic. The switching hysterisis is continuously adjustable over the full range (wide differential)

Calibration procedure starts after filling the tank up to upper level point.

1. Throw the fail safe select switch to fail safe 'HI'
2. Throw the calibration switch 'CAL' to position CA position.
3. Throw the range selection switch to position I
4. **CALIBRATION PROCEDURE FOR FAIL SAFE HI**
   a) Rotate pot 'ΔS' anti clock wise to its extreme position.
   b) Rotate pot for 'CA' clock wise to its extreme position . Green LED goes ON. Go to step d.
   c) If green LED does not go ON, select next higher range i.e. range II. If green LED does not go ON select next higher range i.e. range III. Now green LED will definitely glow. If it does not, contact us.
   d) After green LED glows, turn CA pot slowly anticlockwise until red LED just goes ON.
   e) Empty the tank upto lower level point.
   f) Throw the calibration switch CAL to 'ΔS' position. Red LED glows.
   g) Turn 'ΔS' pot slowly clockwise until green LED just goes ON
   h) Throw calibration switch 'CAL' to 'S' position.

CAUTION : Do not move 'CA' or 'ΔS' pot hereafter.

5. **CALIBRATION PROCEDURE FOR FAIL SAFE LOW**
   a) After following similar instructions 4a to g throw the fail safe select switch 'FSS' to fail safe 'LO' position.

The instrument is now calibrated . Ensure the calibration is correct by observing the filling and emptying cycles.

SAPCON INSTRUMENTS PRIVATE LIMITED

131, Palshikar Colony, INDORE - 452 004
Tel: 4085751, 2475751, 2475752, 2475753
Fax: 0731 – 2475475
E-mail: sales@sapconinstruments.com ; sales@sapcon.in
www.sapconinstruments.com