Levelstate Systems Ltd.

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INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR ELECTRONIC LEVEL SWITCH TYPE – ELS 300

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Solution at all levels

C O N T E N T S

1. OPERATING PRINCIPLE

The Levelstate Electronic Level Switch – ELS 300 is an alternative to the Float Level Switch for steam / water applications, providing a significant improvement in reliability and safety, reduced installation and maintenance costs.

Applications include the detection of water in turbine steam extraction lines, level alarms and tripping circuits for feed water heater and high security low-water cut-off for boilers.

The discrimination between water and steam is based on the significant difference in resistivity between the two states over the saturation range. The sensing element is a probe with an insulated tip, inserted in housing assembly (Fig. 1.1) or standpipe, which protrudes into the required sensing location. If a voltage is applied to the tip and it senses water, conduction occurs between probe tip and inside wall of the insert assembly. The level of conduction is electronically detected to initiate relay action.

The ELS 300 system is designed for any of the following system requirements of plant:

- 4 Probe system
- 3 probe system
- 2 probe system

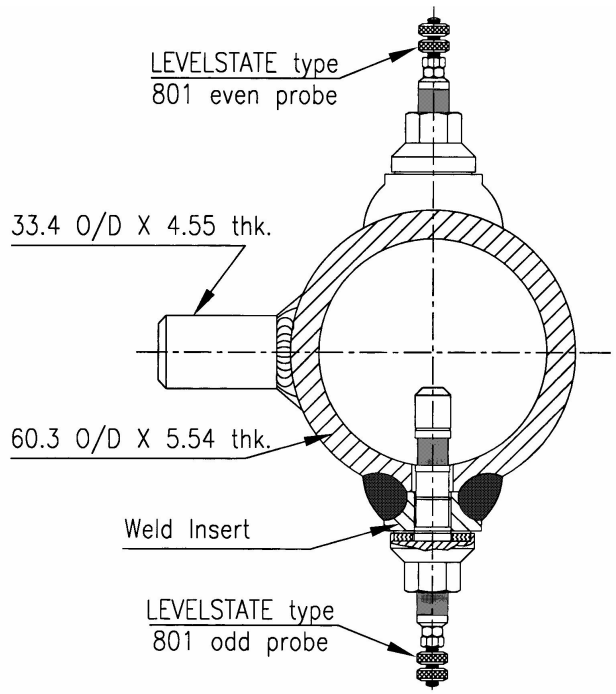


Fig. 1.1

Typical water conductivity's are shown in Fig 1.2. The definition of the various categories is indicated at the top.

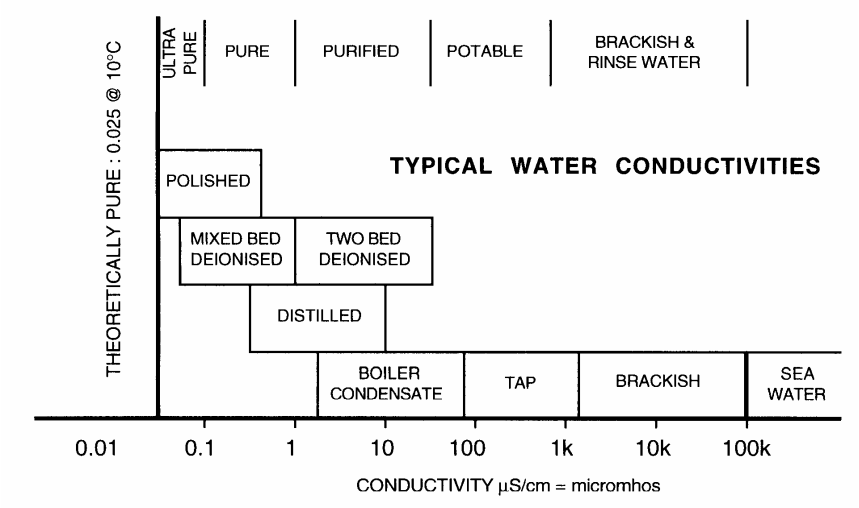


Fig 1.2

Fig 1.3 below shows the relationship between boiler water resistivity (the inverse of conductivity) and boiler drum pressure. The side-arm column purposely stimulates condensate flow and this flushing effect results in the column water being purer than the water in the drum. As the pressure increases the water resistivity increases and it is essential that the water/steam switching threshold lies above the side-arm water resistivity for the maximum boiler pressure encountered. On the other hand it is advisable to use as low a resistivity switching threshold as possible to render the system less susceptible to switching over due to moisture and water droplets.

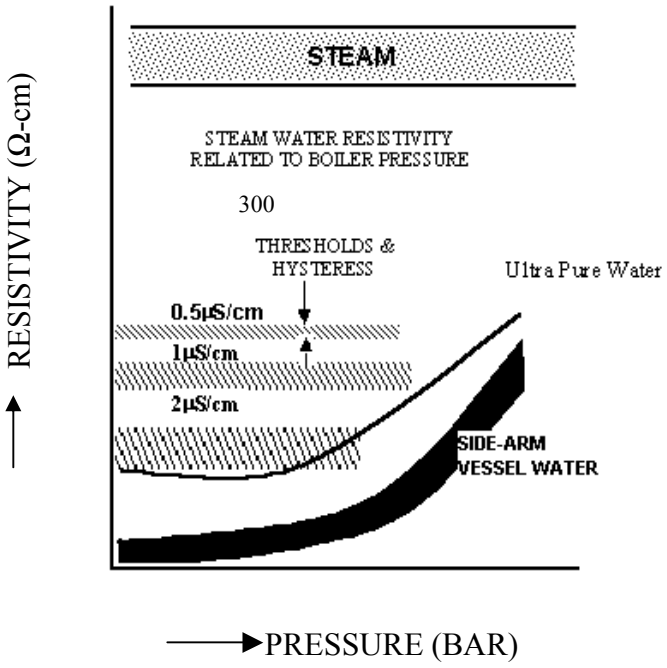


Fig. 1.3

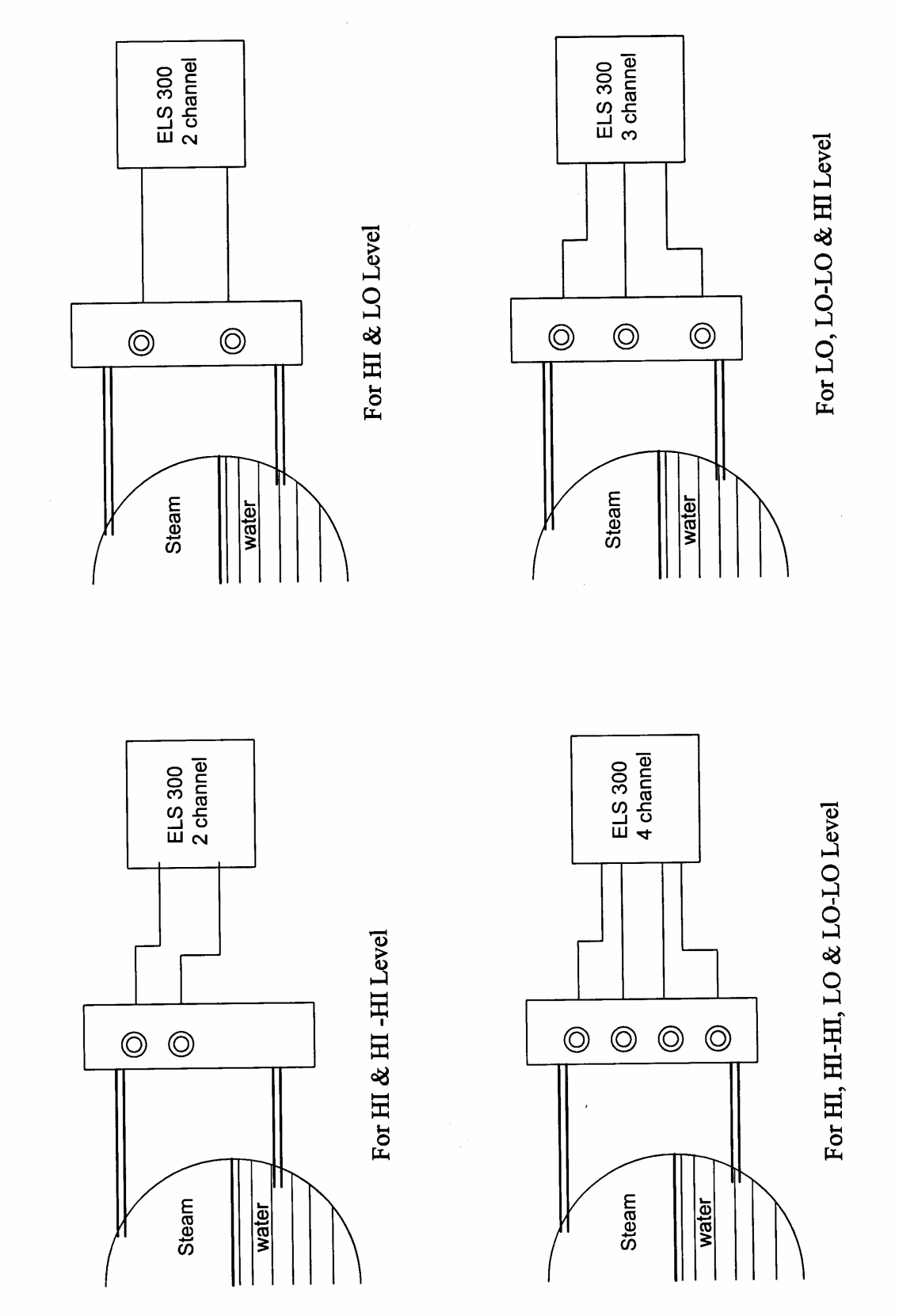


Fig. 1.4 Typical application of ELS 300

2. EQUIPMENT DESCRIPTION

2.1 ELS 300 Electronic Unit

If two probes are mounted so that they are aligned horizontally and the outputs compared (coincident validation Fig. 2.1a) then any difference in their output condition is signaled as a fault. Spurious actions due to a single probe channel fault are avoided by interconnecting the outputs and both the channels should agree that a trip i.e. either Lo Lo or Hi Hi condition exists. The possibility of both channels failing simultaneously is extremely remote.

Two probes may be aligned vertically and the outputs compared (vertical validation Fig. 2.1b) here the fault condition is initiated if the upper probe channel indicates water and the lower probe channel indicates steam, which is not physically acceptable. Here both channels output are verified so that action is initiated only when both channels agree that a trip condition exists. For alarm action, no verification is involved & thus straight forward.

The ELS 300 provides four probe channels with two separate supply inputs. Normally Supply 1 gives power to channels 1 and 3 and supply 2 gives power to channels 2 and 4. On failure of any one of the Mains, the other Mains will take up the total load and thus the system is fully operational with one mains supply.

Each channel may be used for alarm levels but for trip levels the validated pair configuration consisting of 1 and 2, 3 and 4 provides the ultimate security and reliability. The relays can be configured either energized or de-energizing in the ‘normal’ state for the alarm / trip action.

The Mains Supplies should be provided from secure sources appropriate to the reliability and integrity of the protective system to be installed.

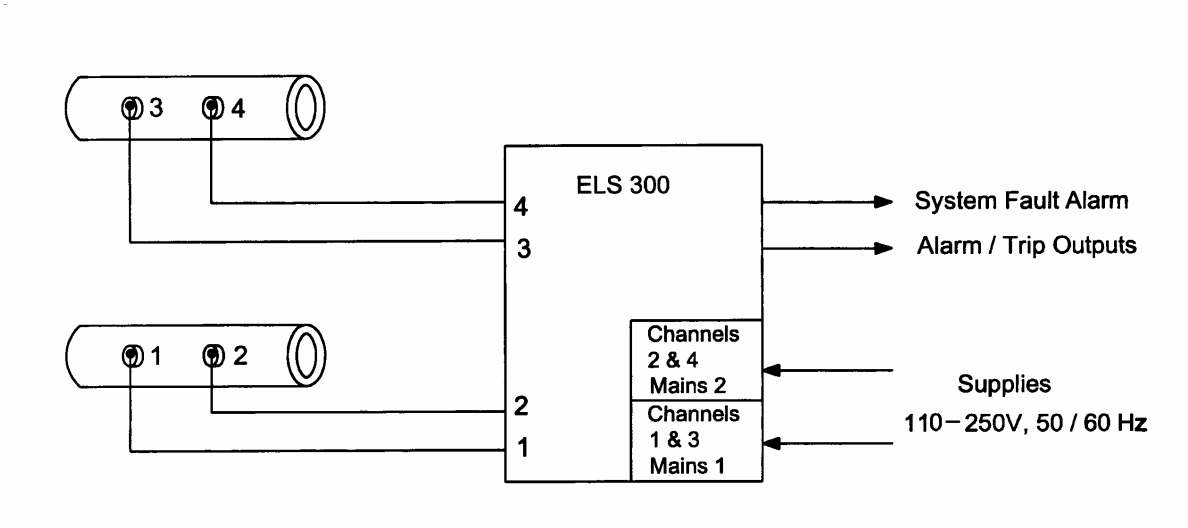


Fig. 2.1a Coincident Probe Configuration

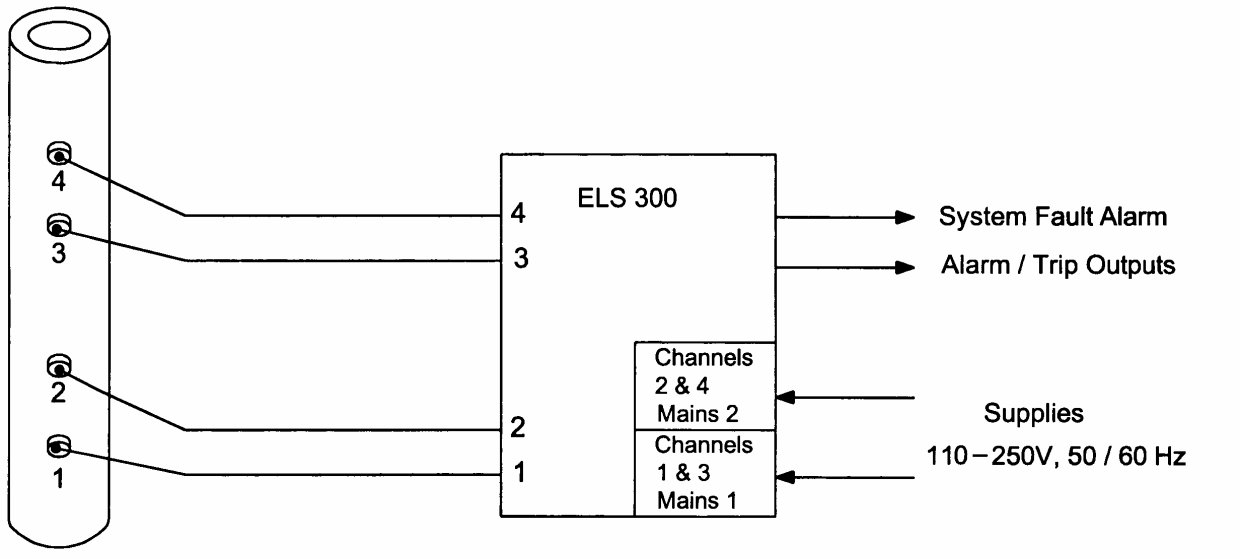


Fig. 2.1b Vertical Probe Configuration

2.2 Electronic unit enclosure

The polyester / glass-fibre (FRP) reinforced enclosure with overall dimensions of 320H x 200W x 120D mm (Refer Fig. 2.2) is intended for wall mounting using four M6 or 0.25" fixing screws through the corner apertures of the base external to the cover sealing gasket. The cover has quick release hinge pins at the bottom and two polyester / glass-fibre screws at the top. Seven cable glands are provided on the bottom face of the base unit. Protection rating for this enclosure is IP65 / NEMA 4X for locations in harsh environments.

The discriminator / display PCB is secured in the enclosure cover and a thin glass fibre board provides protection for PCB1 components. Channel alarm and equipment fault LED's are visible through clear areas in the front label.

A metal chassis plate is secured to the base unit by four M6 screws. The supply and relay PCBs are mounted on the chassis plate and retained by screws. Terminals are provided for two separate 110-250 V mains supply inputs on the SMPS .

A 20 core flat ribbon cable which plugs into PCB1 Interconnects with the Relay PCB. The PCBs have been designed for long term reliability using the minimum number of components and inter connections.

Replacement of PCB components is a delicate operation requiring special equipment to avoid damage to other components or the copper track. To maintain operational reliability and security it is recommended that spare boards are available and the faulty board returned to the manufacturer for repair and test.

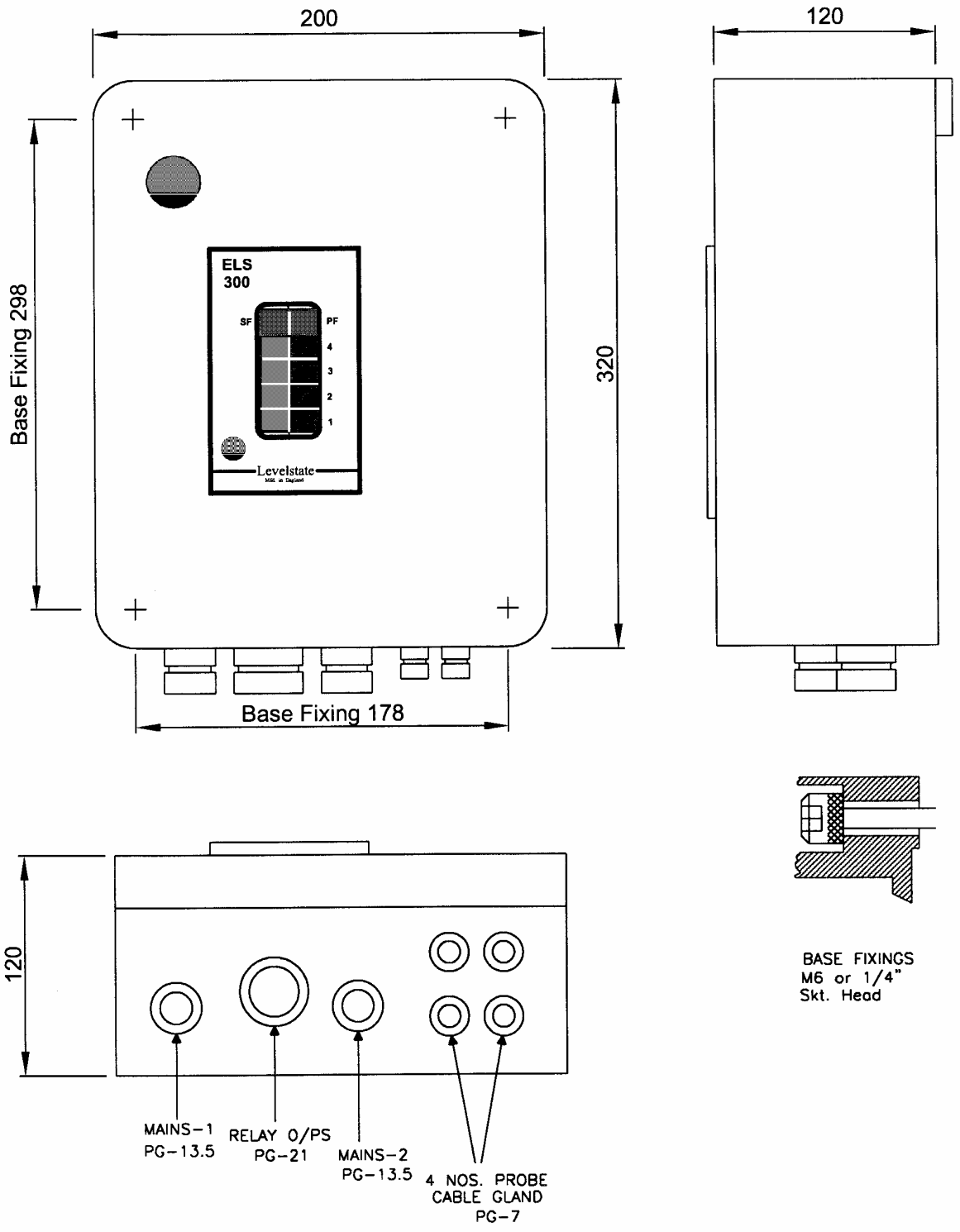


Fig. 2.2 Electronic Unit Dimensions And Cable Gland Location

2.3 Discriminator & Display Circuit : PCB1 (P/N 3002501)

The ELS 300 has 4 probe channels and the system works on solid state hardware based digital CMOS electronics. PCB1 board contains 1-multiplexed sensing circuit to sense all 4 channels and steam/water LED display (Refer Fig. 2.3). through display driver. In addition to these, circuits are included for system fault detection, process fault delay circuit and on-line test facilitation.

The channel display block comprises of 10 mm sq. Red and Green LEDs. Red LED represent steam state and Green LED represents water state. Two Yellow LEDs (10x10 mm) fitted one above the another, situated above the channel display block are dedicated for System Fault and Process Fault display. All the above LED displays are available in enclosure front.

The channel displays, alarms/trips and system fault detection circuit works on the digital electronic and channel output is derived from the detector Circuit output. Independent Probe and Cable fault sensing through enhanced discrimination logic for short circuit, open circuit and contamination. When contamination is optional and can be set from the programmer. An unique indication for each fault along with power supply failure and channel ground failure has been introduced to give clear indication about the nature of fault during operation. Voting logic is provided for Steam to Water and Water to Steam at all channels for trip and alarm indication.

A delay circuit is included to all channel prevent initiation of the process fault output from transient conditions. A delay of 1-20 Sec can be set through program.

Upon occurrence of the Process Fault (Lo Lo, Lo, Hi, Hi Hi), the process fault Yellow LED and the corresponding channel LED starts flushing at 2 Hz and in PCB 2 the respective output Relay will be activated. The System Fault signal is initiated on either any of the supply failure or any channel failure due to probe / probe cable fault. Supply failure is detected by opto-electronics. The opto-electronics output is low (0) if any of the supply main fails which initiates System Fault output signal. Upon occurrence of System Fault, respective Yellow LED will flushes at 1 Hz. Details of indication in different condition as stated below.

For probe channel failure detection, facilities are provided for vertical and horizontal validation. Vertical validation is applied while probes are mounted one above the other and coincidence validation applied to two electrodes mounted horizontally.

Failure of any probe channel initiates System Fault output signal. To prevent from initiation of fault alarm due to transient condition, a delay circuit (3 Secs.) is included. While any of the above faults occurs System Fault Yellow LED will be illuminated and the System Fault output relay in PCB2 would be activated.

Two test button switch, one for Steam Test (S1) and another for Water Test (S2) for all channels have been provided.

Any of the channels can be configured either Steam or Water normal condition through Handheld programmer. Thus the configuration facilitates to select any of the combinations such as: -

- 4 Channels (Lo Lo, Lo, Hi, Hi Hi)
- 3 Channels (Lo Lo, Lo, Hi or Lo, Hi, Hi Hi)
- 2 Channels (Hi, Lo, or Lo Lo, Lo or Hi , Hi Hi)

Input Probe Cable for each Channel from Water Column is terminated in CN1.

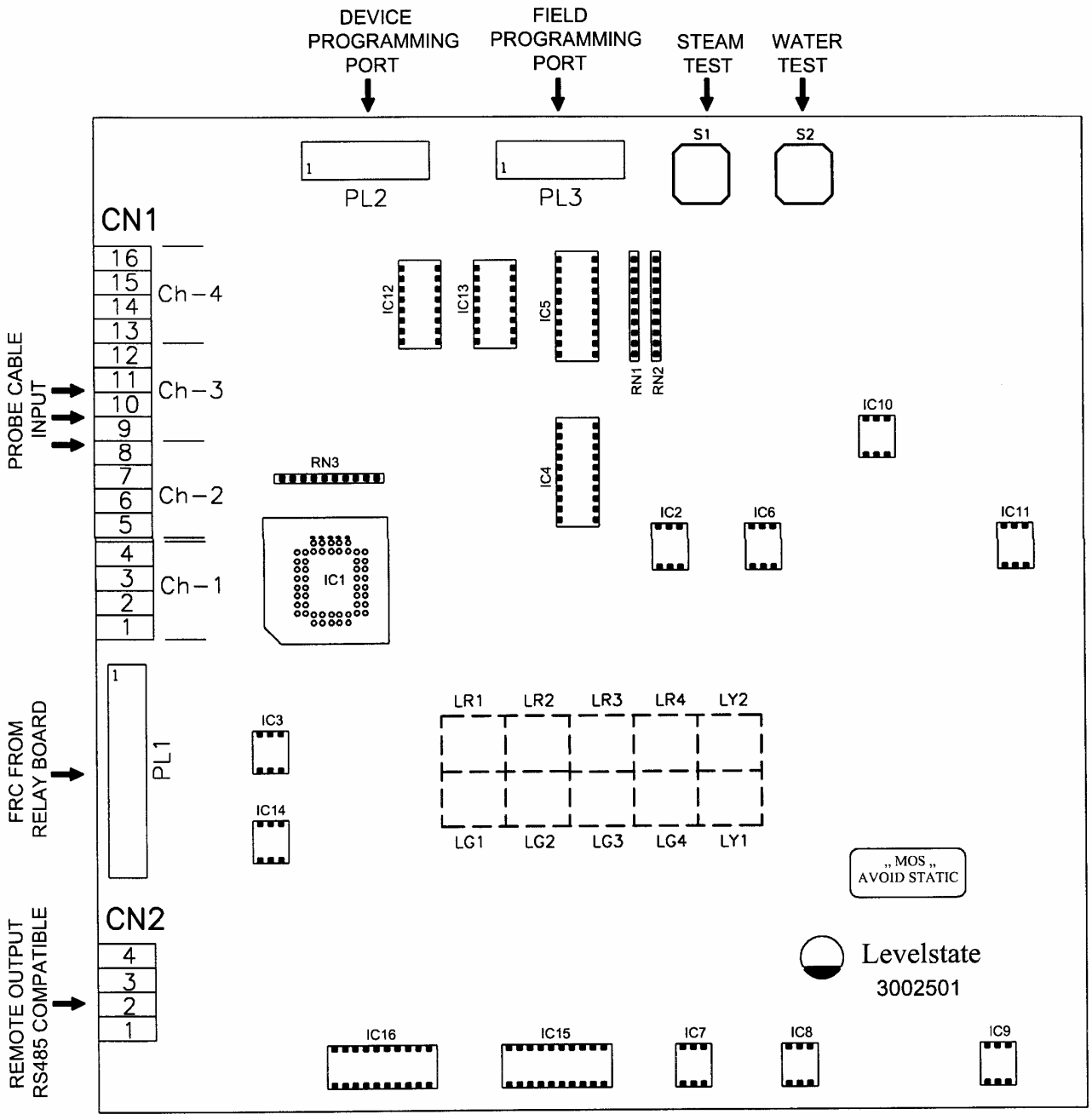


Fig. 2.3 ELS 300 PCB1

2.4 Supply and Relay PCB2 (P/N 3002502)

Mains supply 1 is connected to SMPS with input facility of 110V to 250V AC or 120-370V DC. Mains supply 2 is similarly connected to 2nd SMPS (Refer Fig. 2.4).

Normally Power Supply System receives power from two Mains AC inputs. Upon failure of any of the Mains Supply, the System shall remain fully functional with one Mains Supply input. While Mains Supply 1 is ON, Green LED on SMPS will be illuminated and while Mains Supply 2 is ON, Green LED on 2nd. SMPS will be illuminated. For each SMPS there are three output +12V, -12V & +5V for supply the Discriminator & Relay PCB.

Inter connection between PCB1 & PCB2 are done by 20 core ribbon cable PL1 for supplying power to PCB1 and PCB1 signal output to PCB2 to operate relays. Four output relays RL1, RL2, RL3 & RL4 are operated by channel –1, 2, 3 & 4 respectively. The output relays can be either normally energized or de-energized state through handheld programmer. Each output relay has two sets of dry SPDT contacts. The relay contacts are terminated in terms of CN3 to CN6 for alarm and trip outputs.

The system fault relay RL5 is normally in energized state. RL5 de-energizes on any of the system fault signals. Normally close contact (NC) of RL5 is terminated in term CN7 for system fault alarm output.

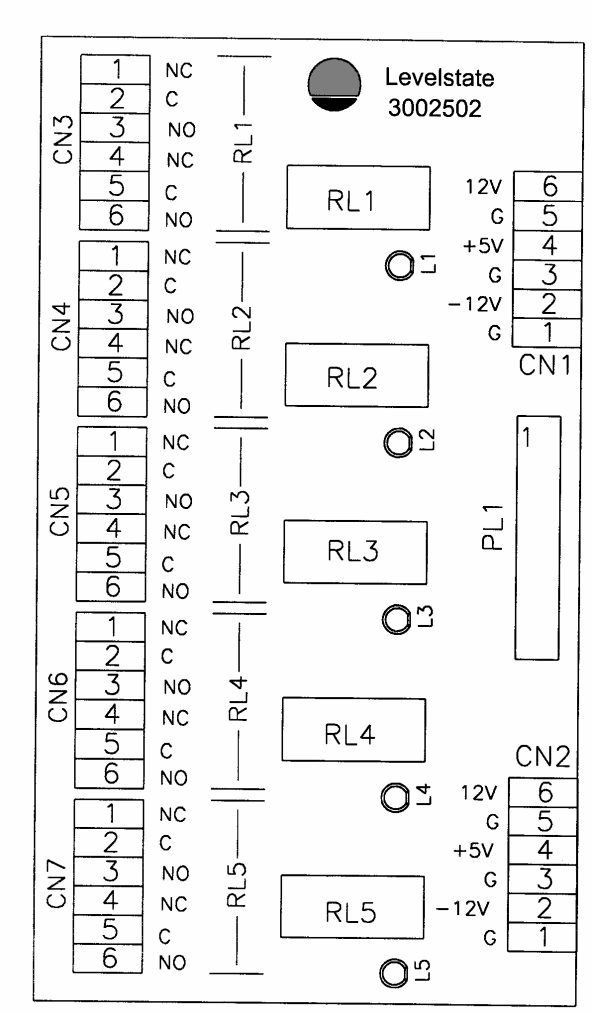


Fig. 2.4 ELS 300 Relay PCB

3.0 PROBES

The robust design probes are made of stainless steel with high resistivity insulators exhibiting a high degree of chemical inertness at elevated temperatures. Pressure sealing is achieved through ceramic to metal vacuum brazing. The standard probes (Refer Fig. 3.0) for ELS 300 are as follows:

a) Type 801 – rated at 150 bar and screwed type design,

b) Type 802 – rated at 207 bar and Swagelok type design &

c) Type 803 – rated at 207 bar and clamp plate design.

Hydrostatic test at twice the rated pressure is performed on the probes. Probes 801 & 803 are provided with a Metaflex gasket seal. Probe 802 is of Swagelok fitting with metal to metal contact.

Where moisture on the standard ceramic insulator could cause problems, Type 811 probes are supplied. These probes are rated at 23 bar @ 220 °C and are fitted with a non-wetting PTFE insulator.

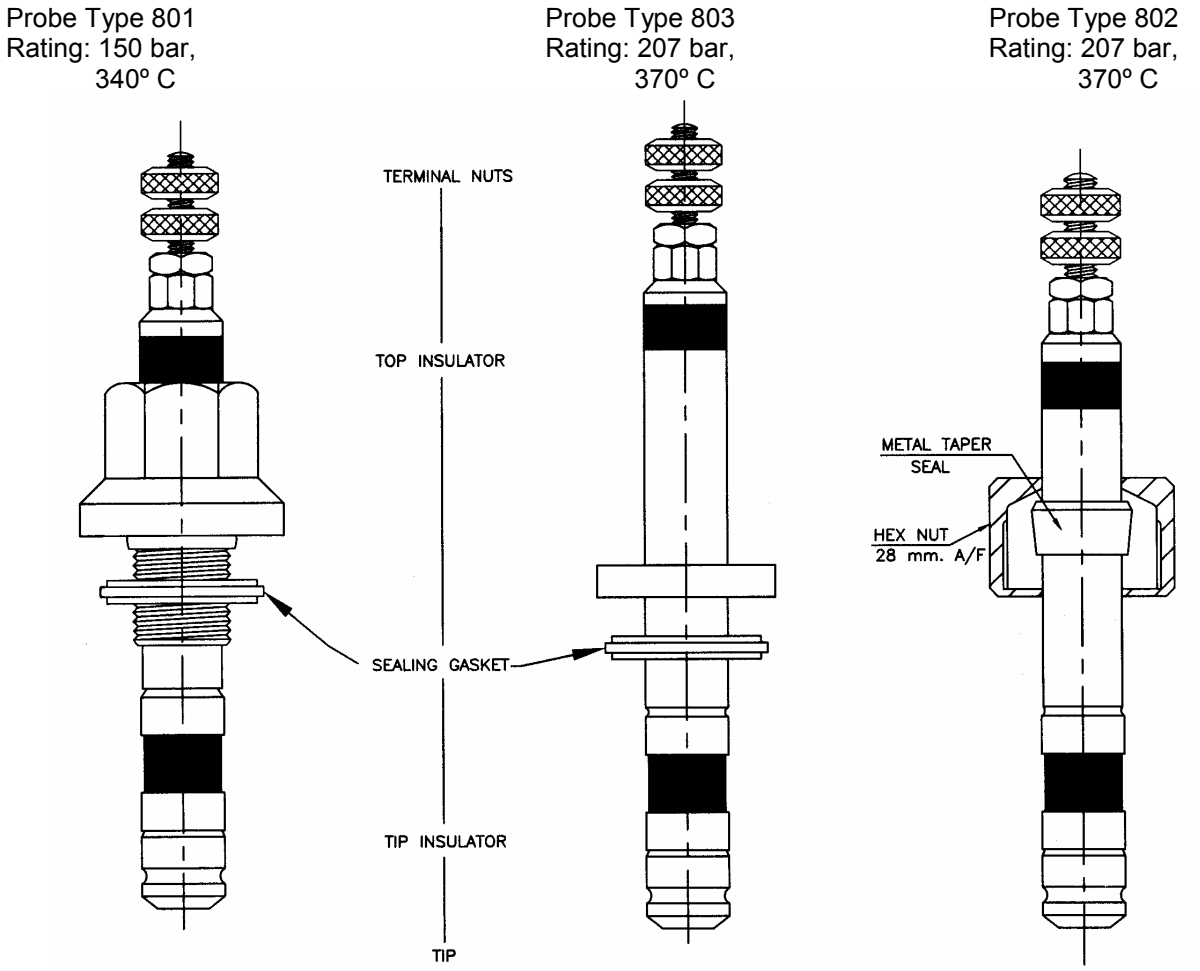


Fig. 3.0 Standard Probes For ELS 300

3.1 MOUNTING ASSEMBLIES

Probe Insert Assembly

Probe Type 801 & 802 may be mounted in Type 701 & 702 Probe Insert Assembly depending on the pressure rating. This Insert Assembly shrouds the probe to define a particular water resistance switching threshold for specified water conductivity. This assembly has an integral cover and removable end cap. The insert is welded into the required location observing recognizing standards.

Stand Pipe Assembly

As stated below 2" nominal bore pipe work is supplied with unshrouded insert, fitted at defined position and an overall probe guard assembly applied (Refer Fig 3.1).

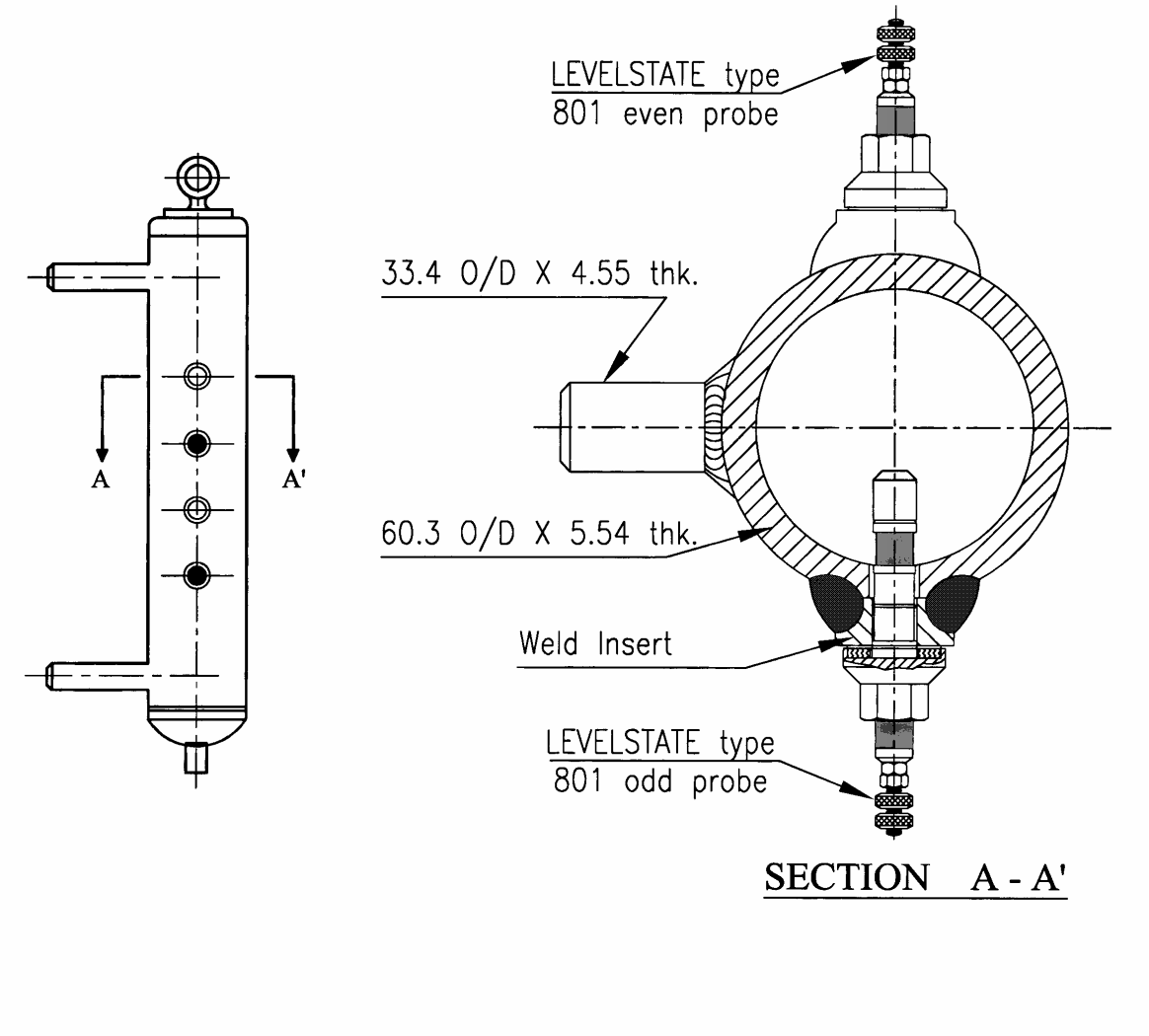


Fig. 3.1 Stand Pipe Assembly

4.0 GENERAL CONFIGURATION

4.1 Sensing Circuit Functions

To avoid galvanic action at the Probe and variations in sensing voltage due to electrolytic potentials, an alternating source voltage is applied to the probe and the sensing circuit responds only to an alternating waveform. The peak voltage applied to the probe is less than 6V; current limited to 50 microamps and presents no risk to personnel.

As the steam (or water absent) condition presents a high resistance to the sensing circuit which is indistinguishable from an open circuit connection, channels normally sensing steam (water = alarm state) require a 4 wire connection to the probe source, sense, 0 V and 0 V return (Refer Fig. 4.1a and 4.1b). If any wire is disconnected the sensing circuit indicates the water state thus declaring the fault.

For channels normally sensing water a low resistance is presented to the sensing circuit, hence with a 2 wire connection an open circuit connection obviously represents the steam state at the output thus declaring fault.

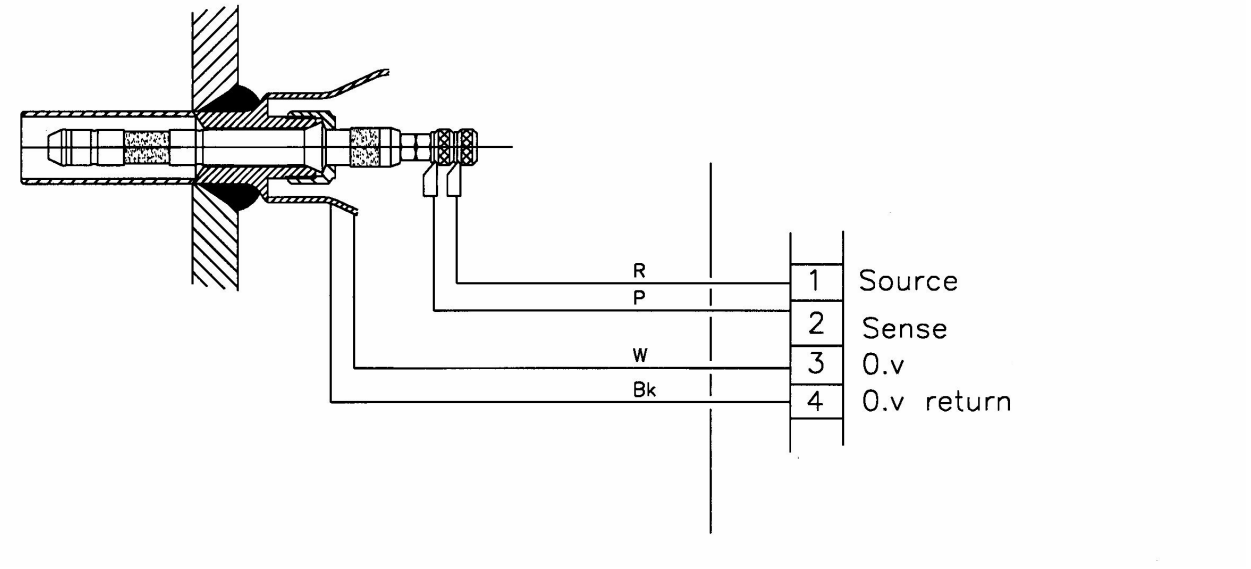


Fig. 4.1a Probe Normally in Steam.
Water = Alarm condition

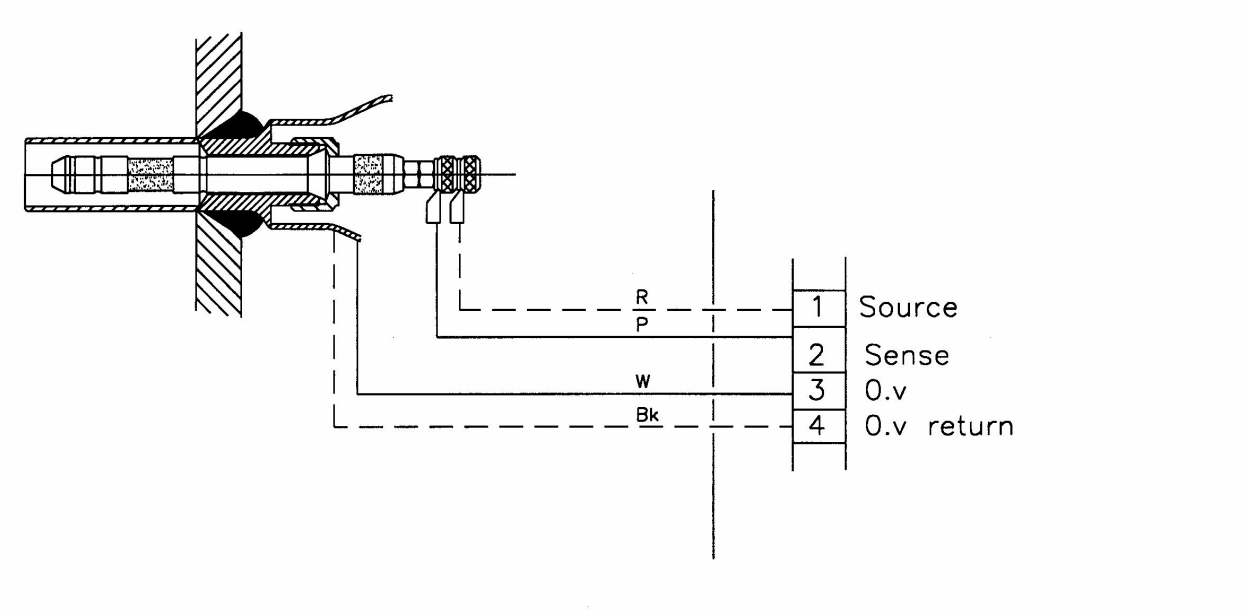


Fig. 4.1b Probe Normally in Water.
Steam = Alarm condition

4.2 Channel Output Relays

RL1, RL2, RL3 and RL4 are channel output relays. Each relay has 2 sets of potential free SPDT contacts (DPCO). The digital contact outputs are used in the protective circuits as per plant requirement.

The channel relays can be configured either normally energised or de-energised. For normally de-energised system, protection system works while Relay is energised. On the other hand, for normally energised system, protection works when the Relay is de-energised. Although later is fail safe, this will cause spurious trips resulting loss of production. Therefore both systems has advantages and disadvantages.

4.3 Channel Validation

For 4-probe channel configuration, normally Ch 1 is envisaged for very low level, Ch 2 for low level, Ch 3 for high level and Ch 4 for very high level. For protection / interlock circuit, Ch 2 and Ch 3 are assigned alarm and Ch 1 and Ch 4 are assigned for trip / interlock.

To avoid spurious action by Ch 1 and Ch 4 due to probe / probe cable failure, validated output signals are considered for trip / interlock action. By the use of validation logic, very low level signal to RL1 will be active only while both Ch 1 and Ch 2 agree ‘steam state’. On the other hand very high level signal to RL4 will be active only while both Ch 3 and Ch 4 agree ‘Water State’.

In the event of probe / probe cable fault, System Fault (SF) LED will glow and SF alarm will be initiated (Ref fig. 4.3 Sequence of Indication).

LED					
Channel Status	**GREEN**	**RED**	**YELLOW (SF)**	**YELLOW (PF)**	
WATER	ON	OFF	OFF	OFF	
STEAM	OFF	ON	OFF	OFF	
OPEN CIRCUIT	OFF	FLASH	FLASH	OFF	2Hz.
SHORT CIRCUIT	FLASH	OFF	FLASH	OFF	2Hz.
CONTAMINATION	FLASH	FLASH	FLASH	OFF	2Hz.
GROUND FAULT	OFF	OFF	FLASH	OFF	2Hz.
PROCESS FAULT (NS)	FLASH	OFF	OFF	FLASH	1Hz.
PROCESS FAULT (NW)	OFF	FLASH	OFF	FLASH	1Hz.

Fig. 4.3 Sequence of Indication

Note: NS- channel is in normally steam, NW- Channel is in normally water.

Two 10 x 10 Sq. mm. Yellow LED at top.

Left Yellow LED for System fault indication always in 2 Hz flashing during any system fault in any channel.

Right Yellow LED for Process fault indication always at 1 Hz flashing during any process fault in any channel.

The above validation logic is applicable for vertical as well as coincidence validation described later.

4.4 Equipment Fault Alarm

Any of the mains supply failure or an inadmissible discrepancy between selected probe channels due to probe cable/probe open circuit or short circuit fault i.e. front panel yellow LED display and signalled by de-energisation of RL5 changeover contacts available on CN7 in Relay PCB for System Fault alarm.

Coincident validation is applied while probes are aligned horizontally and for vertical validation probes are mounted one above the other. Vertical or Coincident Validation can be selected for the channel 3 & 4, 2 & 3 and 1 & 2.

4.5 Channel Output Time Delay

To take care of the effect of transient conditions, each channel is provided with time delay facility. Time delay settings are available through handheld programmer from 1-20 Sec for all channels.

5.0 ELS 300 Electronic Unit - Installation

Before installation remove the front cover assembly (Refer Fig. 5.0) and PCB 2 with chassis plate from the enclosure and store in a safe place.

1. Open front cover by loosening the two top FRP screws.

2. Disconnect ribbon cable from PCB 1 by pressing the two ejection levers on PL1 in an outward direction and ease out the plug/cable assembly. Press the two bottom cover hinge pins inwards and remove the complete cover assembly. Please Refer to the figure below.
3. Unscrew the four M6 cap head (5mm Allen Key) screws at the corners of the base unit and remove SMPS & PCB 2 and chassis assembly. Refit M6 chassis plate screws into corner inserts to avoid loss.

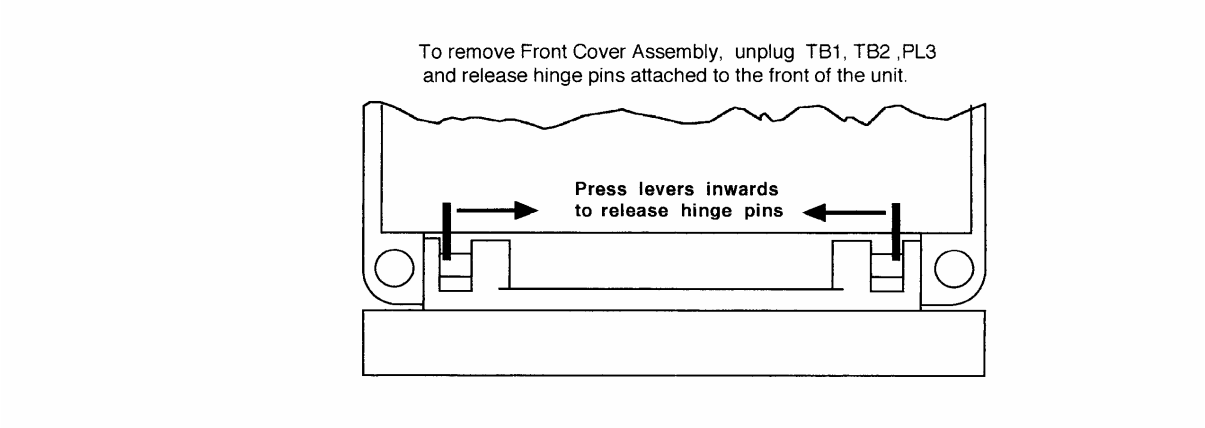


Fig. 5.0 Spring hinge cover removal

4. Mount the base of the enclosure with cable glands downward at the site chosen using 4 corner fixing screws, M6 or 0.25 inch.
5. Strip cable sheaths so that they do not project beyond the inside of cable gland; PTFE probe cable is pre-formed for correct length. Insert cable through glands, trim ends to template and fit crimped ferrules where required.
6. Test cable continuity.

5.1 System Cabling

Fig. 5.1 shows the probe cable fitting in the probe and ELS 300 Electronic Unit. A 10 mtr. length of special 4 core high temperature PTFE cable is provided for each probe to ELS 300 connection. Crimped nickel ring terminations and cable bush are pre-formed for probe assembly fitting.

Two 3 core Power supply cables are required. PVC insulated armored copper conductor cable shall be used and conduit size either 0.5 mm² or 1 mm² is recommended.

For alarm & trip cable, 4 channel system normally requires 18 core copper conductor cable (0.5 or 1 mm²). It is pReferred that no. of cores for alarm & trip cable should be decided after finalization of the plant requirement for alarm & trip/interlock protection logic.

For Remote Display (Optional) wherever used, 5 pair STP copper conductor cable (0.5 mm²) for each is required.

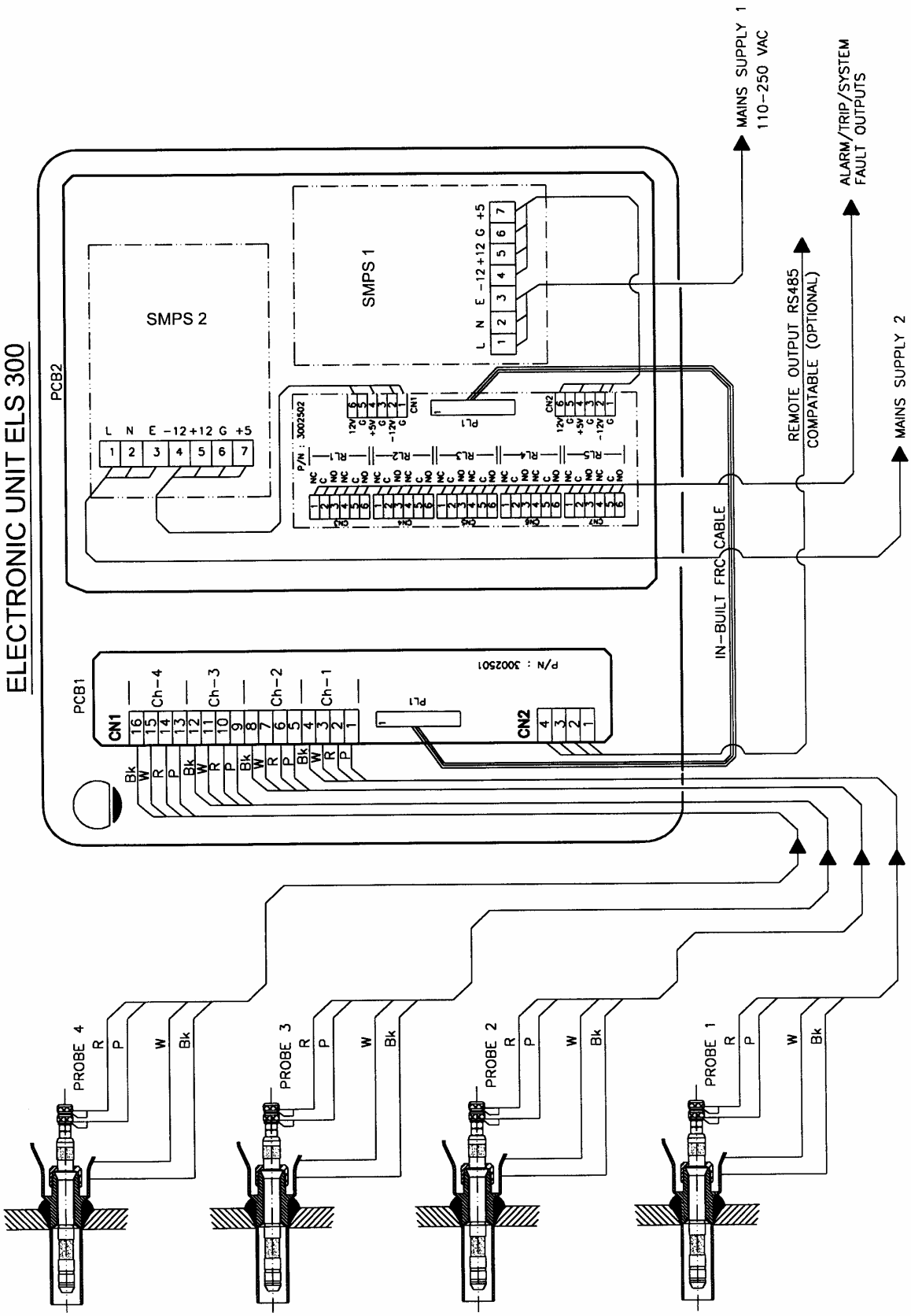


Fig. 5.1 System Cabling

6.0 Commissioning procedure

It is essential the probes are not installed until acid cleaning or steam purging of the plant has been completed. The location may be valved off during this procedure or special probe position blanking plugs can be inserted.

6.1 Probe Installation

Handle probes with care. Do not remove from packing until required for insertion. The probe insulators are high quality ceramic material and are liable to crack if subjected to crack – do not use if dropped.

Type 801 and 802:

(i) Inspect vessel seating recess ensuring it is clean dry and free of radial score marks.

(ii) Use molybdenum based anti-seize compound on threads avoiding contact with seating face and probe insulators.

(iii) Screw in each probe with gasket and tighten. **DO NOT EXCEED 70 Nm (52lb.ft).**

(iv) Connect wires to probe terminals (Refer System Cabling Fig. 5.1 as required), tighten knurled nuts using finger pressure only. Refit guards for probe protection.

Type 803:

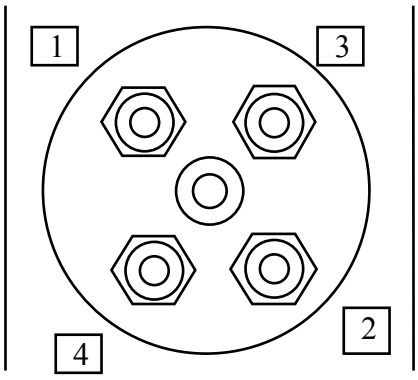
(i) Inspect vessel seating recess ensuring it is clean dry and free of radial score marks. Clean mating faces of clamp plate and vessel.

(ii) Insert probe with gasket to vessel and carefully fit clamp plate over probe and studs.

(iii) Apply a thin film of molybdenum based anti-seize compound to exposed ends of studs.

(iv) Fit nuts finger tight; adjust nuts to obtain clamp plate parallel to vessel face.

(v) Set torque wrench fitted with 17mm A/F socket to 20Nm. Initially tighten each nut equally through 45º or subsequently where wrench ‘clicks' at torque setting in the sequence 1, 2, 3, 4 until clamp plate is flush with vessel face. If the torque wrench ‘clicks' without nut rotation this indicates that the clamp plate is not parallel to vessel face; before proceeding adjust nuts for parallel faces.



Set torque wrench to 25Nm and tweak each nut until the wrench clicks at the torque limit.

DO NOT ROTATE WRENCH BEYOND THE POINT WHERE IT BREAKS (CLICKS)

DO NOT EXCEED 25Nm TORQUE SETTING.

Connect wires to probe terminals (Refer System Cabling Fig. 5.1 as required), tighten knurled nuts using finger pressure only.

6.2 Electronic Unit

(i) Fit chassis plate + PCB2 and SMPS to base of enclosure.

(ii) Fit cover + PCB1 to enclosure by springing hinges inwards before locating on base hinge holes.

(iii) Connect ribbon cable to PCB1 via PL1 ensuring hinged retainers on PCB1/PL1 are first hinged outwards.

(iv) Ensure mains cables are not live and connect to SMPS Line(L), Neutral(N) and Earth(E).

(v) Connect probe wires to PCB1 by inserting CN1.

(vi) Switch supplies.

(vii) Insert PCB2/CN1 to CN7 and check the various operation states of external alarm circuits etc., by open circuiting or shorting the relevant probe wires. Applying a shorting link between the probe top terminal and the body represents water; disconnecting the top terminal wires and holding them together but isolated from the pipework represents steam.

(viii) If any problems arise during the above procedures check the connections and Refer to Maintenance and Fault Identification section.

(ix) It is advisable to keep the ELS 300 enclosure cover closed at all times except for test and maintenance. Generally plant locations have corrosive atmospheres which in the presence of moisture can cause serious problems with electronic equipment particularly terminals and contact connections.

6.3 Probe Pipework – Bringing on line

(i) Notify personnel of the intention to commission the ELS 300 Level Switch.

(ii) When operational, check probes for steam leaks. If steam issues from the probe top insulator replace probe using Maintenance and Fault Identification section.

7.0 Maintenance and Fault Identifications

The following sections outline fault identification and rectification procedures. No routine maintenance is required apart from periodic dusting of probe external insulators using a small paintbrush to remove the possible accumulation of fly ash.

It is recommended in the interests of preventative maintenance that all probes are replaced every 4 years. Or, at least replace the lower probes, which are continuously immersed in water within 4 years as some dissolution of the ceramic insulator does occur, particularly at high temperatures and pressures.

A check on the condition of the lower probes, normally immersed in water is recommended every six months to ensure they correctly switch to the steam condition when the pipework is drained. With the system at operational temperature isolate and drain the pipework. When fully drained check that all probe channels indicate the steam condition (Red). If any channel indicates water (Green) check the probe connections at the electronic unit and probe ends. If it is connected properly, remove the probe connection and verify that the indication changes from Green to Red, in which case the probe is faulty and must be replaced. If a fault has occurred on the electronic unit rectify this first then replace the probe connection before determining whether probe is faulty.

7.1 Pressure Parts

If a serious probe leak occurs the standpipe should be isolated immediately otherwise gasket seat erosion may entail re-machining of the insert seating faces.

For damaged seating faces on Type 702 inserts, re-cut taper seat at 40° included angle ensuring a surface finish which must be better that N5C, ensuring it is concentric with bore. For the Type 701 insert re-cut seating face to an N8C, finish which must be accurately machined at 90° to the centre line of the thread opening.

7.1.1 Probe leaks

It is difficult to distinguish between probe internal seal failure or seating face failure unless the leak is small. Steam emanating from the probe top ceramic insulator indicates internal seal failure and requires probe replacement. Steam emanating from the insert / probe seating area may be rectified by further tightening of the probe. **DO NOT EXCEED 25 Nm** probe tightening torque - otherwise replace probe or gasket using the following procedures.

7.1.2 Pipework Isolation Procedure

(i) If shutdown or trip circuits are connected to the system ensure they are disarmed.
(ii) Close the steam and water isolation valves.
(iii) Slowly open the drain valve(s) and leave open.
(iv) Check at drain outlet turn dish that the isolation valves are sealing properly.
(v) Isolate and drain pipework.

7.1.3 Probe Replacement Procedure

(i) Isolate water column as per 7.1.2 above, ensuring drain valve is open, with steam and water isolation valves closed and sealing properly.

(ii) Remove probe guard and disconnect probe wire(s).
(iii) Replace probe as per procedure Clause 6.1 for Type 801 or Type 803.

7.1.4 Column Re-commissioning Procedure

(i) Close drain valve(s).
(ii) Crack open the steam isolation valve(s) and check with the display that the water column fills slowly due to condensate (15 minutes plus).

(iii) Crack open the water isolation valve(s) and check that the water level falls to the expected NWL.

(iv) Check probes for steam leaks using Clause 7.1.1.

(v) After approximately 10 minutes fully open first water and then the steam isolation valves.

(vi) Ensure all valves are correctly set (and locked).

(vii) Inform operators that the indication system is now in service.

(viii) Check that approximately normal water level is displayed before ordering any shutdown or trip circuits are connected to the System.

The above procedure allows the water column and probes to be heated at a controlled rate to prevent the probes being subjected to excessive thermal shock which could damage the ceramic insulators.

7.1.5 Column or Pipework Blockage

If the water column and pipework installation complies with recommendations of Chapter 2 and with the stimulation of condensate flow through the water column, pipework blockage should not occur. However, the boiler water treatment should conform to recommended practices such as ASME "Consensus on Operating Practices for the Control of Feedwater and Boiler Water Quality in Modern Industrial Boilers" or BS 2486 "Recommendations for treatment of water for land boilers".

If a partial blockage is suspected by the slow response time of the level, indicator isolate the water column as per procedure 7.1.2. With the drain valve open, slowly open the steam isolating valve until there is free flow of steam at the drain outlet. Then close the steam valve. Slowly open the water isolating valve until there is free flow at the drain outlet. Then close the water valve. Close the drain valve(s) and open steam and water valves. Ensure all valves are correctly set (and locked) and re-arm trip circuits if fitted. If the response time is still sluggish suspect problems with Isolation valves not opening fully.

7.2 Electronic Unit Faults

Check probes connections – Check black & white connections to housing assembly. Check probes top connections, Red and Pink.

Channels indicating Steam – Apply a short circuit between the probe top terminal and insert cover assembly – probe channel should change to short circuit & indication will be as per (Fig. 4.3 Sequence of Indication).

Channels indicating Water – Disconnect red and pink wires from probe and short them together but isolated from metalwork – probe channel should change to steam. If this check is all right but when wire reconnected to the probe the channel indicates water when it is judged to be in steam, suspect a faulty probe. Fit new probe.

If the operation does not comply with the above procedure an electronic fault is to be suspected.

Checking the Electronic Unit – Open the enclosure by releasing the two cap screws. Check probes connections to PCB1, CN1. If LED's PF and SF are illuminated, supplies and fuses are all right, check connections to PCB2, CN1 to CN7.

If a circuit board is found to be defective it is pReferable to replace it with a spare.

For local board repairs ensure precautions are taken to avoid STATIC, as some components are MOS devices.

8.0 Technical Specification of ELS 300

GENERAL

1.	Make	Levelstate Systems Ltd., U.K
2.	Principle of Measurement	Conductivity based

PLANT OPERATING / MAXIMUM CONDITIONS

1.	Maximum Pressure	200 Kg/cm^2
2.	Maximum Temperature	350 °C
3.	Operating Pressure	10 to 50 Kg/cm^2
4.	Operating Process Temp.	150 °C to 330 °C

STAND PIPE

1.	Type	501, with 25 mm NB side arm Steam & Water nozzles and 15 mm NB Drain nozzles
2.	No. of probe connections	Four
3.	Stand Pipe Length / Probe pitch	As required.
4.	Material	Carbon Steel seamless pipe to ASTM A 106
5.	Design code	ANSI B 31.1 Power Piping code
6.	Design Pressure / Temp	150 bar g @ 370 °C
7.	Steam / Water connection	25 NB – SW Sch. 160
8.	Drain Connection	15 NB – SW Sch. 80
9.	Testing & Certification	IBR form III C

PROBES (ELECTRODES)

1.	Type	801
2.	No. of probes	4 per Stand Pipe
3.	Probe connection	Threaded, M16 x 1.5
4.	Material of construction	Stainless Steel with high purity ceramic insulator.
5.	Max. working Press./Temp.	150 bar g @ 370 °C

PROBE (ELECTRODE) CABLE

1.	Quantity per probe	01
2.	Length	10 meters
3.	Insulation	PTFE
4.	No. of cores	04

(F) ELECTRONIC UNIT

1.	Type	ELS 300
2.	No. of Channels	04
3.	Enclosure Rating	IP 65 / NEMA 4X protection
4.	Enclosure Dimensions	320H x 200W x 120D mm
5.	Display	4 Channel Red and Green LED display. Red for steam and Green for water
6.	Fault diagnosis	Yellow LED for any Power Supply failure,

		probe cable fault.
7.	Test Facility	Online test facility with bypass during test to ensure no effect on plant.
8.	Supply Requirements	Two independent Power Supply 110 V-250 V A.C (±10%) @ 48-63 Hz, 15 VA
9.	Alarm / Trip Relays	Two output relays for alarm and trip (one relay per channel). Relays can be selected either energized state for normal condition. Validated trip signal ensures / avoids spurious trips.
10.	Relay Contact Ratings	Two pole change-over (DPCO) contact per channel. Rating: 8A @ 250V AC, 0.5A @ 220V DC Response time: 0.5 m Sec (approx)
11.	System Fault Relay	This relay is in energized state in normal conditions. NC contact for fault alarm, Rating 8A, 250V AC / 0.5 A, 220V DC

(G) ISOLATION VALVES AND DRAIN VALVES

1.	Type	Globe with socket weld ends
2.	Material	Carbon Steel ASTM A 105 with SS trim
3.	Size	Isolation valves: 25 mm NB Drain valves: 15 mm NB
4.	Pressure class	ANSI Class 800
5.	Operation	Manual
6.	Certification	IBR form IIIC