CT Control Technology (India) Pvt. Ltd.

Leaders in Low Level Measurements

Continuous Level System

Mutual Inductance Type Continuous Level Probe and Electronics.

Document No. : 0515001 Rev A 05-15

Data Sheet

Features

- Highly Reliable
- High Accuracy and Repeatability
- LAN Interface
- Two trip set Relay Contacts
- Levels up to 9999mm
- 0 to 10VDC Analog Output
- Spark Plug Leak Detector
- Biological Shielding

Market

- Nuclear Fast Breeder Reactor

Product Overview

The Continuous Level Measuring System consists of MI Type Continuous Level Probe (CLP) and its Electronics (CLPE).
The Continuous Level Measuring System is used to monitor the level of liquid Sodium in vessels and tanks of Fast Breeder Reactors, which uses liquid Sodium as coolant.
The Active Length of CLP can be up to 9000mm; as per the requirement. The CLP should be interfaced with CLPE to know the level of liquid Sodium in “mm”.

The CLPE is having graphical display to indicate the Level in mm and an Isolated Analog Output (0 – 10V) proportional to the level. Two trip set points are available to generate an alarm through relay contacts. Also CLPE is having a LAN interface, to transfer all data to main control room.

The CLP length could be customized, to suit the specific requirement.

Product Specifications

Probe Specifications

Parameters	Specifications
Fluid:	Liquid Sodium
Operating Temperature:	473 – 823K (200 - 550^{o}C)
Pocket Material:	SS316L
Sensing Element	MI (Mineral Insulated) Cable Cable Diameter : 1mm No. Of Core : 1 Core Material : Copper Core Diameter : 0.33mm
Pocket Dimensions:	ϕ 42.16mm
Active Sensor Length:	As per the requirement (200mm to 9999mm)
Non Active Sensor Length:	As per the requirement
Leak Tightness of Pocket:	More than 10^{-8} Pa m^3/Second of Helium
Insulation Resistance:	>100MΩ
Biological Shielding:	The Biological Shielding is in the form of Stainless Steel Balls. (Optional) Material : SS316L Density : 4.0 g/cc Diameter : 2.5 to 3.5mm
Interface:	6 Pin, 62 IN Series Circular Connector

Electronics Specifications

Parameters	Specifications
Power Supply:	240VAC ±10% @ 50Hz
Operating Temperature:	283 – 323K (10 - 50^{o}C)
Excitation to Probe:	Constant Current at Constant Frequency.
Frequency Range:	2KHz to 3KHz
Frequency Resolution:	1Hz
Frequency Stability:	Better than 25PPM/^{o}C
Constant Current Range:	80 to 100mA
Maximum Load Resistance:	150 Ohm
Line Regulation:	Better than 0.1%
Load Regulation:	Better than 0.1% (for Load Variation of 10 Ω to 150 Ω)
TC of Current:	Better than 100PPM/^{o}C
Input Signal from Probe:	AC Signal < 6kHz, 5mV to 250mV (rms)
Input Impedance:	>100 KΩ
Level Indication:	On LCD, LAN and 0 – 10V
Relay Contacts:	1 Set of C/O Relay Contact for each Set Point.
Response Time	<1 Sec for change in Level
Communication Interface:	Ethernet (Transmits Level and other information)
User Interface:	128x64 Graphical LCD and 8x2 Keypad
Enclosure:	EMI/EMC Compatible 3U Height, 19" Rack Mountable Instrument case

Certifications

EMI/EMC Certifications

- Conducted Emission Test as per CISPR 11, Class A,2004
- Radiated Emission Test as per CISPR 11, Class A, 2004
- Radiated Susceptibility Test as per IEC 61000-4-3, 2006
- Electrical Fast Transient Immunity Test as per IEC 61000-4-4, 2001
- High Energy Surge Immunity Test as per IEC 61000-4-5, 2005
- Conducted RF Immunity Test as per IEC 61000-4-9, 2001
- Power Frequency Magnetic Field Immunity Test as per IEC 61000-4-8, 2001
- Pulse Magnetic Field Test as per IEC 61000-4-9, 2001
- Damped Oscillatory Test as per IEC 61000-4-12, 2001
- Harmonics, Inter harmonics & Low Frequency Immunity Test as per IEC 61000-4-13, 2002
- Variation of Power Frequency Immunity Test as per IEC 61000-4-28, 2002

Environmental Certifications

- Dry Cold Test as per IS 9000 Part II, Section 4
- Dry Heat Test as per IS 9000 Part III, Section 5
- Temperature Cycling Test as per IS 9000 Part XIV, Section 2
- Damp Heat Test as per IS 9000 Part V, Section 1
- Drop Test as per IS 9000 Part VII, Section 3

Principle of Operation

Principle of Operation

The Continuous level probe is working on the principle of variation of mutual inductance between two windings, when they are immersed in an electrically conducting fluid such as liquid Sodium. The probe has two windings wound in bifilar fashion on a former. The probe is inserted in a stainless steel pocket. The primary winding of the probe is excited by an AC constant current at a constant frequency. This generates a magnetic field linking both windings. Hence an emf is induced in the secondary coil. Liquid Sodium being a good electrical conductor, an emf will also be induced in the liquid Sodium. The liquid Sodium surrounding the probe acts as a short circuited winding, inducing eddy currents to flow in it. The magnetic flux produced by the eddy current will oppose the main flux produced by the primary winding. Hence the net flux linking the secondary winding decreases thereby is reducing the secondary voltage; as the liquid Sodium level increases. Thus the secondary voltage is an inverse linear function of Sodium level.

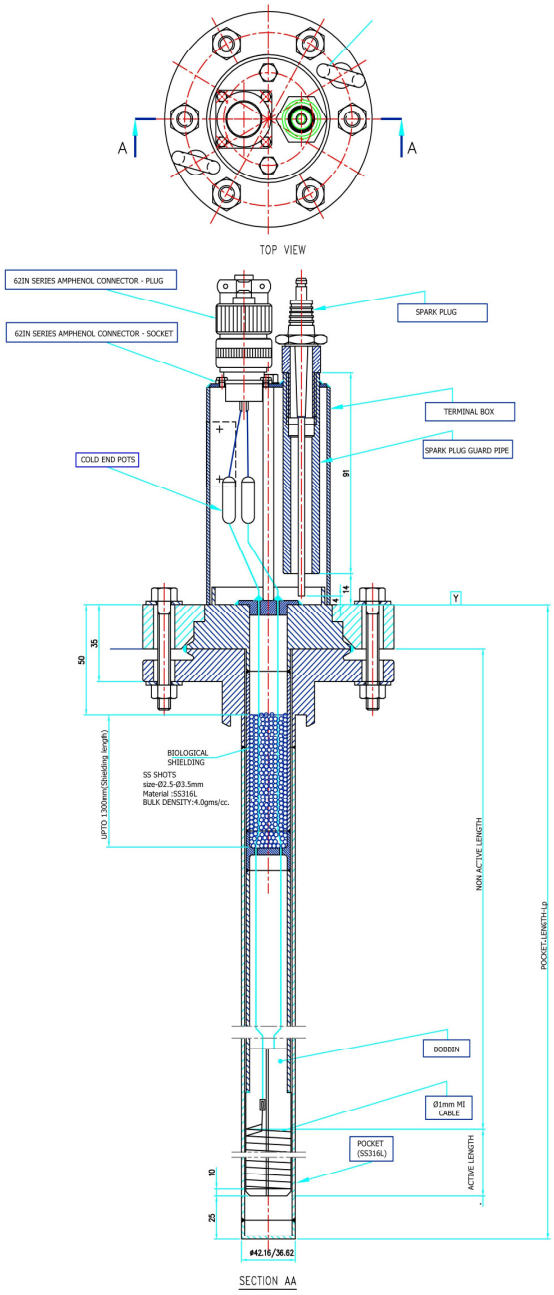
Sensing Element

The sensitive portion of the probe is made of two bobbin strips of SS316L. The two bobbin strips are welded to form a uniform (cross) shaped section. Primary and secondary windings are wound with 1mm dia, SS sheathed mineral insulated cable with copper conductor core.

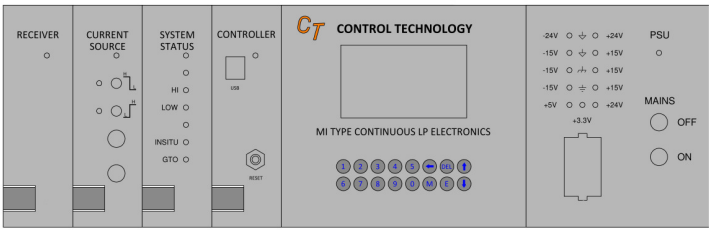
The insulation resistance between the windings and electrical ground is >100 MΩ at 20°C and the value of insulation resistance is >1MΩ at 600°C. The voltage for insulation resistance measurement is 100V DC. All the terminals of the windings are extended by cables with cold end pot and terminated in a terminal box at the upper part of the probe. Amphenol 62 IN Series circular connector (6 pin) is used as the interface connector

The nominal constant current input for primary is 100 mA ± 0.1 mA (typical) at the constant frequency of 2.50 kHz. Secondary output is around 28mV (rms) without Sodium and around 21mV (rms) when fully immersed in Sodium, for a 1000 mm active length probe.

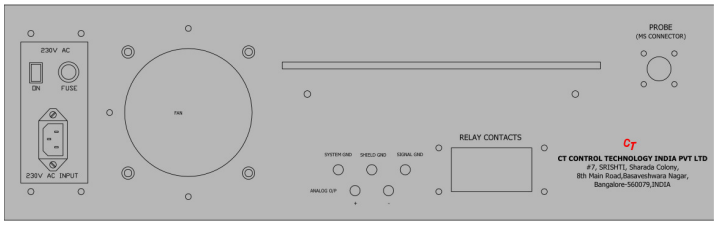
Product Drawing



Probe Drawing



Electronics Front View



Electronics Rear View

CT Control Technology (India) Pvt. Ltd.
Leaders in Low Level Measurements
#7, "SRISHTI", Sharada Colony, 8th Main Road,
Basaveshwara Nagar, Bangalore – 560079, INDIA
Tel : +91 80-22740336/41279403
e-mail: ctindia@controltechnology.co.in
http://www.controltechnology.co.in