

## CONTINUOUS LEVEL EQUIPMENT SERIES CPS.2

The Series CPS.2 equipment is designed to provide continuous indication of the level of liquids or free flowing solids stored in hoppers, silos or other containers. The equipment operates on the principle of measuring the capacitance change as the material covers or uncovers a probe mounted vertically in the storage container.

The equipment comprises a probe assembly, an associated plug-in control module, and an indicating meter. Switched outputs for control or alarm purposes also may be incorporated. The module and the associated indicating meters can be mounted any distance from the probe in any convenient panel space. Alternatively the module and meter can be supplied housed in a compact wall mounting enclosure as a packaged control unit.

### PROBE ASSEMBLIES

Various mechanical configurations are available to suit the application and material being monitored. The probe may comprise a solid rod or a weighted steel cable either of which may be insulated with p.v.c. or p.t.f.e. as necessary.

In all cases the probe will incorporate an ICT transducer insert in the probe head. This insert, which contains all the electronic circuitry, is encapsulated in epoxy resin to ensure environmental immunity.

### CONTROL MODULE TYPE CLM.1

The CLM.1 module is of plug-in construction and fitted with an international 11 pin base. The module operates direct from 115/240 volts 50/60 Hz mains supplies and provides a linear 0 – 1 milliamp out put for the indicating meter and a 0 to – 10 volts DC interface signal for operating any additional Trip modules included in the installation.

### TRIP MODULE TYPE CLM.1/T

This module is generally as the Type CLM.1 above but also incorporates a single switched output for control/alarm purposes which can be set to operate at any required level.

### TRIP MODULE TYPE TLM.3

The TLM.3 module is designed to operate in conjunction with either the CLM.1 or CLM.1/T control modules and provides two independent adjustable switched outputs which can be set to operate at any required levels. The TLM.3 is designed for operation from 115/240 volts 50/60 Hz mains supplies, and up to 20 TLM.3 modules can be operated from one CLM.1 or CLM.1/T module.

### PACKAGED EQUIPMENTS

The modules and any associated indicating meters can be supplied loose for panel mounting in any convenient location. Alternatively, they can be supplied housed in a single wall mounting packaged control unit. The standard packaged controllers available are:-

- Type CPS.2/1 – Indication only.
- Type CPS.2/1T1 – Indication plus one trip.
- Type CPS.2/1T2 – Indication plus two trips.

### INSTALLATION

1. Mount the probe assembly vertically in the container as centrally as possible. If the container is filled from the top it is advisable to mount the probe away from the material fall line.
2. Mount the control modules or packaged controller in the desired location. This can be virtually any distance from the probe assembly.
3. Connect the equipment as detailed later in these instructions. Screened cable is not necessary and all interconnections can be made in ordinary cable (1.0 mm cable or similar is ideal).
4. It is advisable to protect the incoming mains-supply to the equipment with a 2 amp (max.) fuse.

### COMMISSIONING

1. Check all the connections are correct, the container is empty and then switch on the supply.
2. Turn the Span control on the CLM.1 (CLM1/T) module fully clockwise.
3. Adjust the Zero control on the module until the indicating meter reads zero (empty). If a zero reading cannot be obtained see under 'Probe Head Adjustment' below.
4. Fill the container to the required high level and adjust the Span control until the meter reads full scale. If a full scale reading cannot be obtained see under 'Probe Head Adjustment'.
5. If a CLM.1/T module or additional TLM.3 modules are being used, the switched output operating points can now be set. This can be done by filling the container to the required trip point level and adjusting the trip control until the relay operates. If this is not practical the trip control scales are linear and will provide fairly accurate settings, i.e. with a trip control set at 50% of the scale span the output relay will operate when the container is approximately half full.

## OPERATING RANGE SELECTION

The probe head insert is fitted with three terminals marked A, B and C. These provide the means by which three separate sensitivity ranges can be selected as follows:-

- High Sensitivity (20 microamps/pf) - No Link.
- Medium Sensitivity (7 microamps/pf) - Link A and B.
- Low Sensitivity (2.5 microamps/pf) - Link A and C.

For the majority of continuous level measuring applications the low sensitivity range (A and C linked) is usually satisfactory, and probes are despatched set in this mode. In certain circumstances (see 8 above) it may be necessary to select the medium sensitivity range (A and B linked). The only occasion the high sensitivity range will be required is if the material has an extraordinary low di-electric constant (low capacitance change) i.e. materials such as polystyrene, dry wood, waste etc.

## CONNECTION NOTES

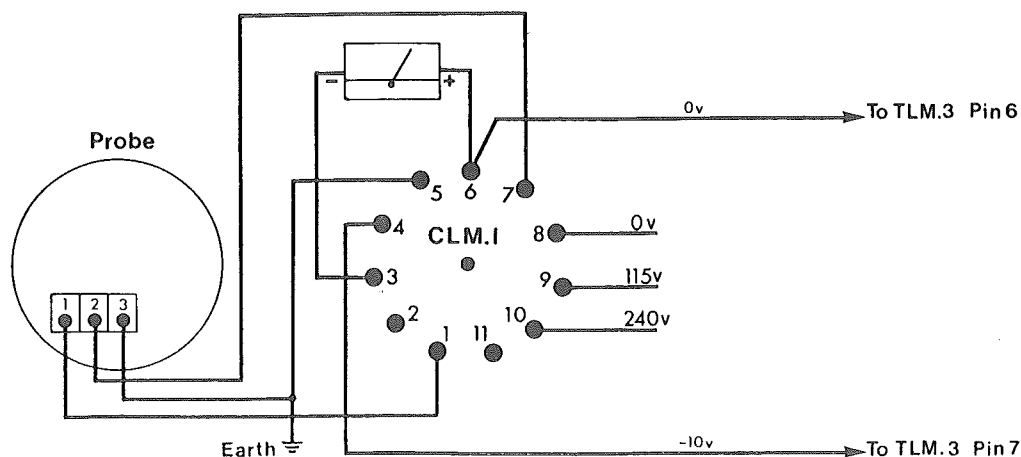
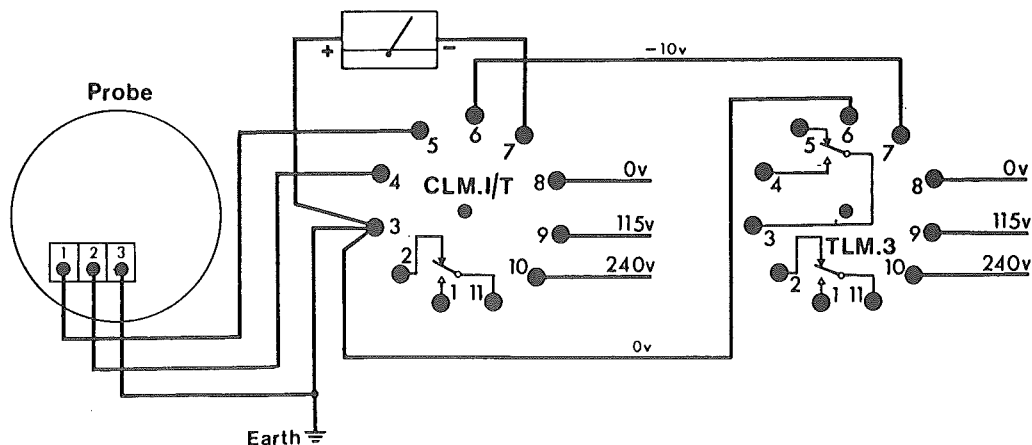
- (1) Always ensure that the mains supply to the modules is connected correctly i.e. Pins 8 and 9 for 110 volts or Pins 8 and 10 for 240 volts.
- (2) To obtain satisfactory operation it is essential that the probe head housing makes a good contact with earth (the container) either via the 1" BSP fixing nipple or via metal conduit carrying the wires to the probe head.
- (3) Note that the output contacts from the CLM.1/T and TLM.3 modules are voltage free.
- (4) For applications where the probe is in contact with a 'hot' material which would result in the temperature of the ICT insert rising above its maximum rating, the insert can be removed from the probe head and mounted remote. If this is done the insert should be mounted not more than 1 metre from the probe head and the connections between the insert and the probe MUST be made in low loss screened (co-axial) cable. Terminals 4 and 5 on the insert are specially provided for this purpose and these should be connected as follows:-

Terminal 4 - Via coax braid to probe head case (Earth)

Terminal 5 - Via coax inner core to probe rod.

All other connections and setting-up details remain the same.

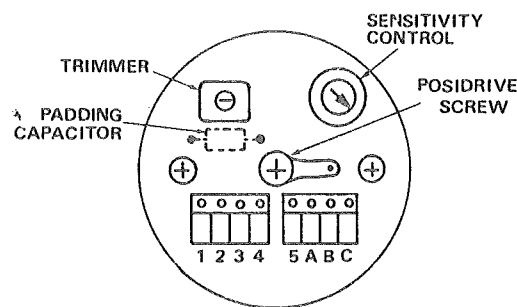
- (5) Where packaged controllers are supplied, the meter connections and CLM.1/CLM.1/T connections to the TLM.3 are completed before despatch.



- On the TLM.3 module the upper control relates to the relay contacts wired to Pins 3, 4 and 5 and the lower control to the contacts wired to Pins 11, 1 and 2. The upper control relay is normally de-energised and energises at trip point or above, the lower control relay is normally energised and de-energises at trip point or above. The associated LED indicators are illuminated when the relays are energised.

#### PROBE HEAD ADJUSTMENT

The probe head is fitted with an encapsulated capacitance - to - current insert unit. Basically this unit detects the change in capacitance as material covers or uncovers the probe and converts this into a current output. As will be seen from the diagram below this insert is fitted with an adjustable trimmer capacitor and in some cases also a fixed padding capacitor wired across two tags just below the trimmer. In addition there is also an adjustable sensitivity control fitted. When the probe is fitted into the container the normal standing capacitance of the container will cause the output from the insert to rise i.e. in effect the probe 'sees' the standing capacitance of the container as 'material' and starts to give an output. The trimmer capacitor enables this standing capacitance to be offset and the output brought down to zero. On all probes this trimmer is present before despatch so that the normal standing capacitance when the probe is fitted is automatically offset. If, however, the probe is modified in any way, the probe is mounted close to the side of the container or there is build-up on the probes it may be found necessary to re-adjust the trimmer to offset a larger (or smaller) standing capacitance. This should only be done if the normal setting-up sequence fails to obtain satisfactory operation or if build-up on the probe starts to give a false (high) level measurement at a later date.



The procedure for checking and re-adjusting the probe insert is as follows:-

- Ensure the level of material is well clear of the probe. If build-up has occurred do not remove this from the probe.
- Disconnect the wire from Terminal 2 on the insert.
- Using a test meter with at least a 0 - 250 microamp range (1000 microamps = 1 milliamp) connect it across terminals 2 and 3 on the insert with the POSITIVE lead on Terminal 2.
- A reading of between 10 - 15 microamps should be observed. If the reading is above or below these figures, adjust the trimmer to correct.
- The trimmer capacitor has a range of adjustment (100 pf) sufficient to cover most applications. If, however, the trimmer has insufficient adjustment to correct an abnormally high or low current reading it will be necessary to add extra or remove existing padding capacitors. If the reading is too high add extra or fit a higher value padding capacitor. If the reading is too low remove or lower the value of the existing padding capacitor. As a guide to calculating the increase or decrease in value of the padding capacitor required divide the microamp reading being obtained by 2.5 and the answer is the capacitor value in picofarads.
- Replace the connection on Terminal 2 of the insert and adjust the zero control on the module as detailed in the Commissioning instructions.
- Fill the container to the required high level (full), disconnect the wire from Terminal 2 on the insert and reconnect the test meter as in (3) above.
- Using the sensitivity adjuster obtain an output from the insert as close to 1 milliamp (1000 microamps) as possible. If the maximum reading obtainable is below 0.3 milliamp (300 microamps) select the next highest sensitivity range as detailed under 'Operating Range Selection' below and repeat the adjustment.
- Having obtained a satisfactory output reading replace the connection on Terminal 2 of the insert and adjust the Span control on the module as detailed in the Commissioning instructions.