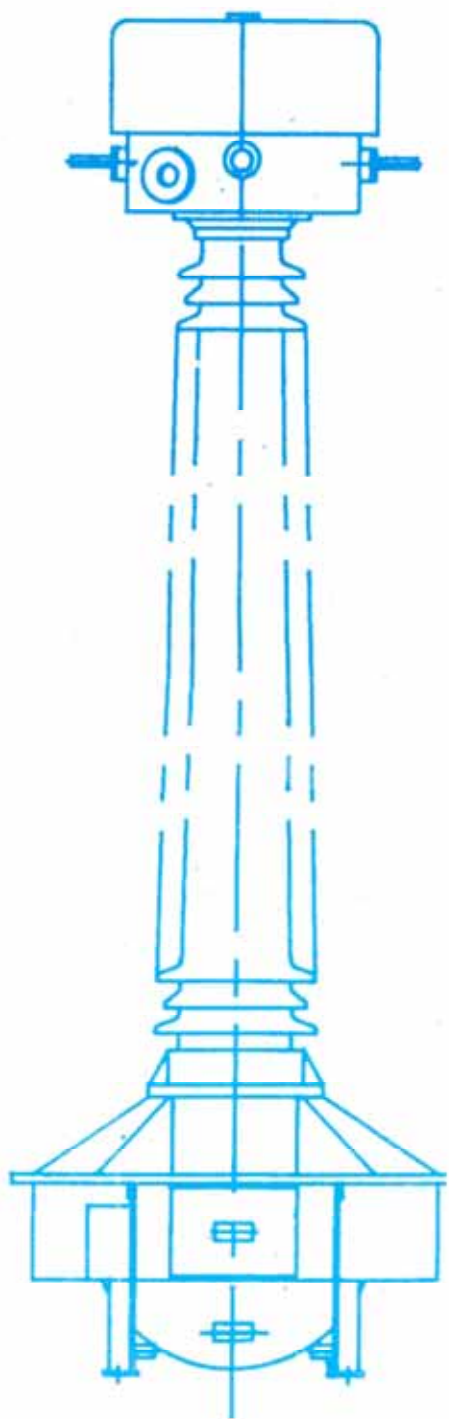


INSTRUCTION MANUAL OF CURRENT TRANSFORMER (400 kV CLASS)



TRANSFORMERS AND ELECTRICALS KERALA LIMITED
ANGAMALLY KERALA

MADE IN INDIA

400 kV CURRENT TRANSFORMER

INSTRUCTION MANUAL

1. CONSTRUCTION

Current Transformer essentially consists of primary and secondary coils and core. The core is constructed in the form of rings. The secondary terminals are brought out through a terminal board into the terminal box. From terminal board the connections are given to the terminal blocks as shown in drawing terminal blocks.

The primary winding consists of copper strips (with single turn) over which high quality insulation paper is wound. Aluminium foil is wrapped at suitable intervals over the insulation paper to get a constant voltage gradient along the arcing distance of the porcelain insulator. The insulated primary conductors pass through the porcelain insulator. The insulated primary conductors pass through the porcelain insulator and are taken out through 4 Nos. terminal bushings (each rated for 1200 A) fixed on the wall of the top expansion chamber. Appropriate terminal bushings are shorted internally. For general arrangement refer drawing No. TK 323148.

Primary conductors have sufficient cross sectional area to meet the continuous and short-time current ratings specified. Expansion chamber and tanks are of high quality steel and can withstand full vacuum and operating pressures during in transit and in service. The outer surface of ferrous parts is given light grey enamel paint to shade 631 of IS 5 over rust inhibitive primer coat of ready mixed zinc chrome. Steel surface coming in contact with transformer oil is given a coat of oil resisting varnish. Galvanized bolts and nuts are used as fasteners. All welded and gasket joints are subjected to leak tests. The expansion chamber is kept at the potential of P1 terminal by means of suitable connections. A spark gap is provided across the expansion chamber and P2 terminal for protection of primary winding against surges due to reflection of incident waves.

2. HERMETIC SEALING

The internal body of the current transformer is subjected to heat and vacuum cycles in a drying chamber to extract the moisture accumulated in the insulation paper. After drying and oil impregnation under vacuum the current transformer is hermetically sealed with dry Nitrogen gas above oil. When the oil expands or contracts due to temperature variations, the Nitrogen gas pressure at the time of initial filling are adjusted such that the gas pressure will be less than + 0.5 kg/cm² at 75° C and above - 0° C.

A drain hole with cover is provided at the bottom of lower tank.

3. TRANSPORTATION

Current Transformer is despatched in horizontal position, (with P2 Terminal At the top) fixed to a transportation frame and in wooden crates. Special oil sealing arrangement is provided in the

| | | | |
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| CHD | AP | INSTRUCTION | |
| APPD | EJT | MANUAL 400 KV CT | |

expansion chamber to prevent entry of Nitrogen gas into paper insulation during horizontal transportation of the Current Transformer.

While unpacking the CT from wooden crates, special care shall be taken so as not to damage the porcelain insulator and terminal bushings.

400 kV CT is to be made vertical immediately on receipt at site and kept in vertical position only. Ref. drawing TK 332894.

4. SLINGING AND LIFTING IN VERTICAL POSITION

Position.4 of TK 332894 shall be referred for slinging and lifting the CT in vertical position. Use 4 Nos. D shackles for slinging the CT.

After installation, remove the sling guides on expansion chamber.

5. HANDLING AND MAINTANANCE

1. As the Current Transformer is despatched in completely assembled condition, it can be installed readily after making it upright. Please ensure that before commissioning, the porcelain insulator is clean and free from all dust, grease and particles of packing material.
2. In order to keep the unit hermetically sealed, the flanged joints with gaskets in between shall not be tampered with. The cover of the secondary terminal box alone need be opened for giving connections to terminals.
3. Since the Current Transformer is hermetically sealed and since no material harmful to oil is used, there is no necessity for taking out oil samples for analysis or for reconditioning of oil. Nitrogen gas pressure monitoring is also not required. If oil level is below the red mark it indicates leak and should be investigated
4. In case of heavy pollution where deposits from surrounding atmosphere may occur, periodic external cleaning of porcelain insulator and cleaning/painting of other exposed surfaces are recommended.
5. Precaution shall be taken not to keep the secondary circuit open when current is flowing in the primary as this may cause overheating of core and breakdown of the insulation due to high voltage developed across the secondary terminals.
6. the lower tank shall be earthed in a positive and permanent manner before commissioning.

6. ACCESSORIES

1. Auxiliary Reactor as shown in drawing TK 428220 is supplied with 400 kV CT. This is required to limit ISF value to 5 for all ratio of core No.3. The auxiliary reactor may be mounted near the measuring equipments in the control cubicles.
2. When specified terminal connectors for primary are also supplied along with the Current Transformer.

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| CHD | AP | INSTRUCTION | |
| APPD | EJT | MANUAL 400 KV CT | |

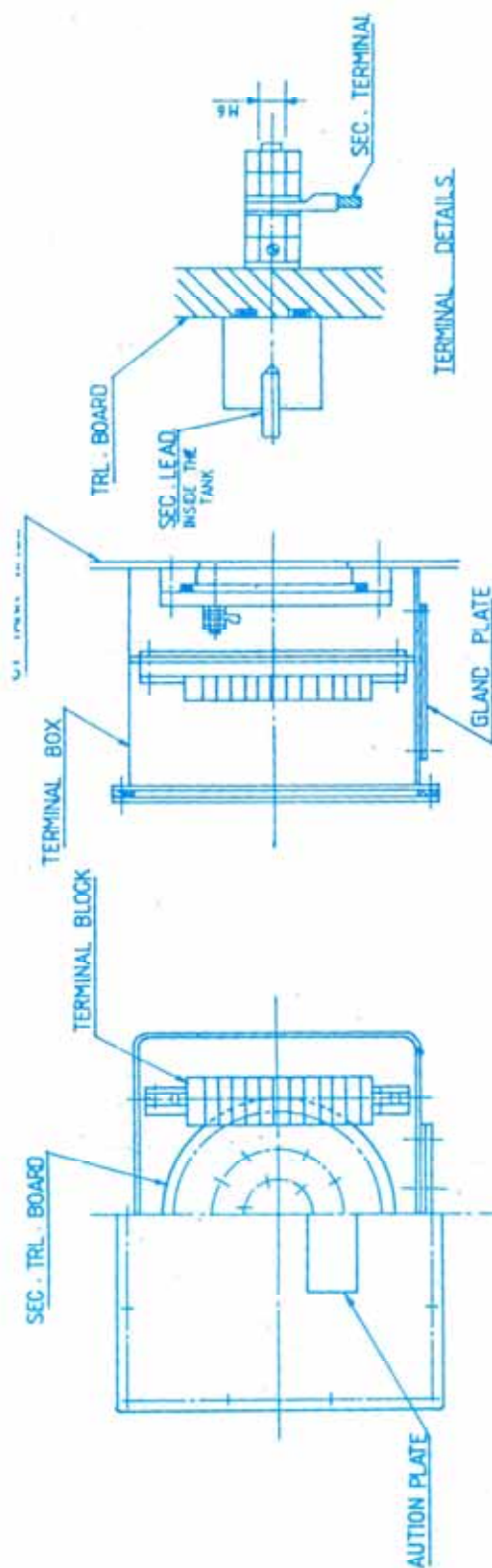
| | | | | |
|------|-----|--|---|--|
| DRN | CAM | TITLE INSTRUCTION MANUAL 400 KV CT | 7. <u>FIELD CHECKS</u> | |
| CHD | AP | | 1. <u>Inspection After Receipt At Site</u> | |
| APPD | EJT | | No. Item Description Remarks | |
| | | | a. Tightness Ensure tightness of all gasket joints If a joint is not tight fasteners should be tightened eventually | |
| | | | b. Oil level Oil level should be above red mark If oil level is below red mark oil leak should be suspected. Temperarily prevent the leak and report to the manufacturer | |
| | | | c. Threaded fastners Fasteners shall be clean and tight Replace missing or broken fasteners. | |
| | | | d. Cleaning of insulator Insulator should not be covered with snow, dust or grease. Clean the insulator with cloth. If necessary clean with water and detergent. | |
| | | | 2. <u>Commissioning Checks</u> | |
| | | | a. Alignment Check alignment of equipment with support structure | |
| | | | b. Shorting of idle secondary Unconnected secondary terminals should be shorted with shorting links | |
| | | | c. Spark gap check Spark gap should be set at 1.0 -1.5 mm | |

| 7. <u>FIELD CHECKS</u> | | TITLE INSTRUCTION MANUAL 400 KV CT | <div>TELK</div> <div>ANGAMALY KERALA</div> |
|---|--|--|--|
| DRN CHD APPD | CAM AP EJT | | |
| 3. <u>Post Commissioning Test/Check</u> | | | |
| No. | Item | Description | Remarks |
| a. | Tightness | Ensure tightness of all gasket joints | If a joint is not tight fasteners shall be tightened eventually. |
| b. | Oil level | Oil level should be above red mark | If oil level is below red mark oil leak is to be suspected. Temporarily prevent the leak and report to the manufacturer. |
| c. | Discolouration of Primary connection due to over heating | There should not be discolouration of conducting part due to over heating. | The discoloured part should be cleaned removing the oxide film and keep fast ners tight. |
| d. | Ground connection | Ground connection should be perfect | |
| e. | Corrosion | There should not be rust or peeling of paint on outer parts | Rub off the rust with sand paper and repaint. |
| f. | Thread inspection | Threads should not be loose | |
| g. | Insulator cleaning | Insulator should not be covered with snow, dust or grease. | Clean the insulator with a cloth, If necessary clean with water and detergent, Periodic cleaning depending upon pollution condition necessary. |

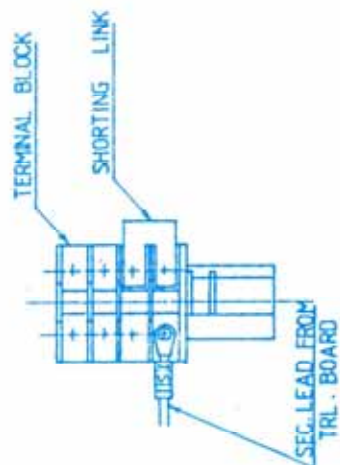
| SL | ITEM |
|----|---------------------------------|
| 1 | COVER TANK |
| 2 | SEC. TERMINAL BOX |
| 3 | GLAND PLATE |
| 4 | GALVAN PLATE |
| 5 | INSUL PLATE |
| 6 | UPPER TANK |
| 7 | GRAB HOLE WITH COVER |
| 8 | EARTH TERMINAL |
| 9 | LONGER HORN FITTING |
| 10 | HOLLOW PORCELAIN |
| 11 | UPPER METAL FITTING |
| 12 | PRIMARY TERMINAL |
| 13 | OIL INDICATOR WITH COVER |
| 14 | PRE-INSULATED VENT |
| 15 | SLIP GUDGE |
| 16 | SPARK GAP ARRANGEMENT |
| 17 | EXP. WOOD CHAMBER |
| 18 | OIL TELLER & G. HOLE WITH COVER |
| 19 | TEST TAP |
| 20 | TERMINAL BOX WITH COVER |
| 21 | TELE FLEWM |

| | | |
|----|-------------------------------|----------|
| 1. | ALL DIMENSIONS ARE IN mm | |
| 2. | TOTAL MASS (APPROX.) WITH OIL | 2500 Kg |
| 3. | TOTAL MASS WITHOUT OIL | 2050 KG |
| 4. | OIL QUANTITY | 450 lit |
| 5. | TOTAL CREEPAGE DISTANCE (MIN) | 10500 mm |

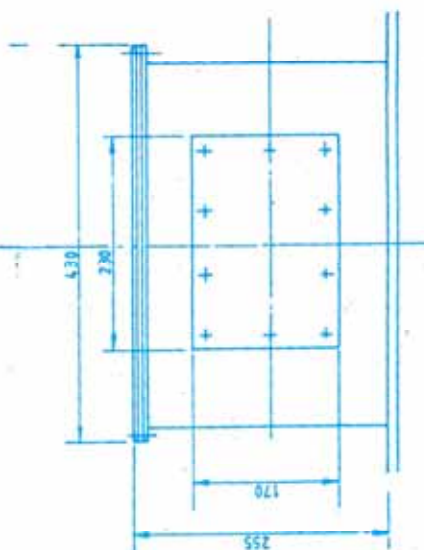
| | | | |
|---|------------------|---|-------------------------------------|
| ALL DIMENSIONS ARE IN FEET UNITS | STATUS OF DRG | CUSTOMER'S REFERENCE | PROVIDE |
| DRN CAM  | 10.3.95 | PROJECTION SCALE | TITLE |
| TOD CAD | |  NTS | GENERAL ARRANGEMENT OF 420 KW CT |
| RGD CAM  | 10.3.95 | | |
| AMP  | | | TELE DRG NO 12 |
| CHD | | | |
| APPD EJT | | TELK | TK323148 |
| | |  | ARACAMALLY KERALA INDIA |




TERMINAL DETAILS



TERMINAL BLOCK DETAILS



| ALL DIMENSIONS ARE IN mm UNITS | STATUS OF DRG. | PROJECTION | SCALE | TITLE | PROJGE. |
|--|----------------|------------|-------|--------------------------|---------|
| DRN. MOHAN | 17-03-95 | — | — | TERMINAL BOX ARRANGEMENT | |
| TCO. RAJANI | 24-03-95 | — | — | | |
| DCO. MOHAN | — | — | — | | |
| CHD. — | — | — | — | | |
| APPRO. C J T | — | — | — | | |
|  TELK ANOMALLY KERALA INDIA | | | | | |
| TELR DRG. NO. TK 323171 | | | | | |

- NOTE :-
1. WEIGHT OF CT : 2500 KG
 2. WEIGHT OF CT WITH TRANSPORTATION FRAME : 3300 KG.
 3. THE CT SHALL BE MADE HORIZONTAL WITH THE OIL SIGHT WINDOW SIDE AT THE TOP AS SHOWN IN FIG - 1

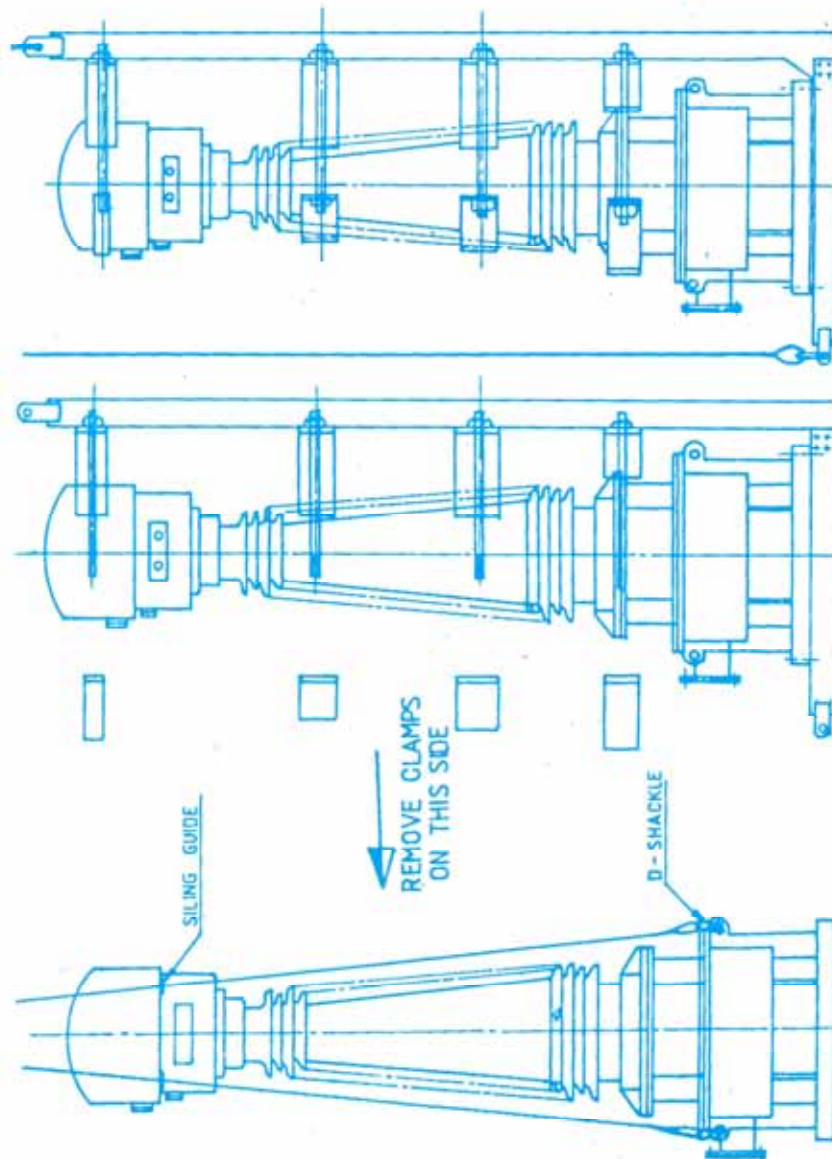


FIG-4

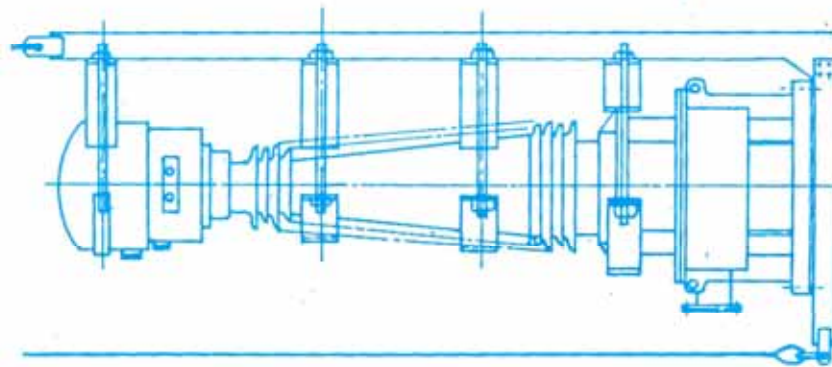


FIG-3

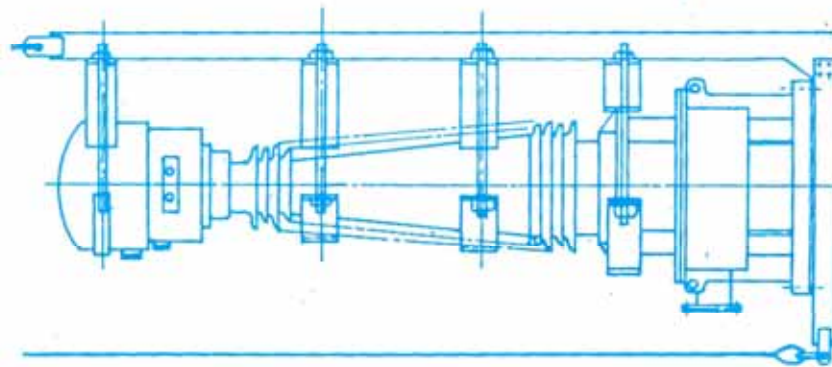


FIG-2

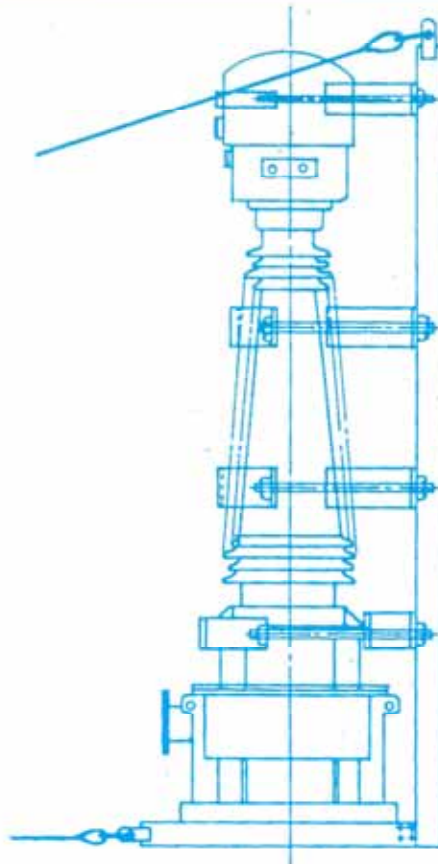
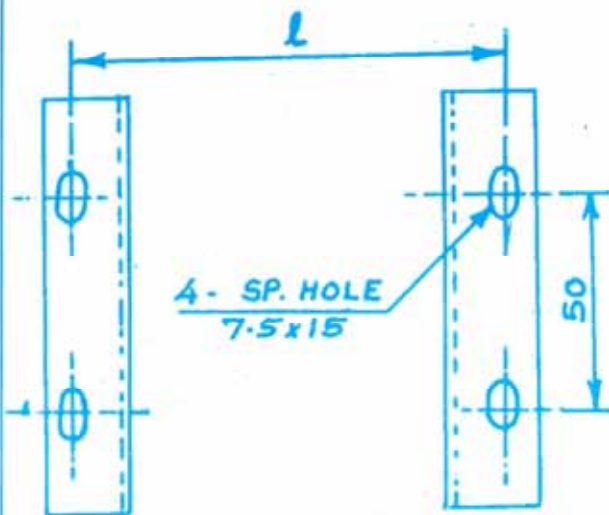
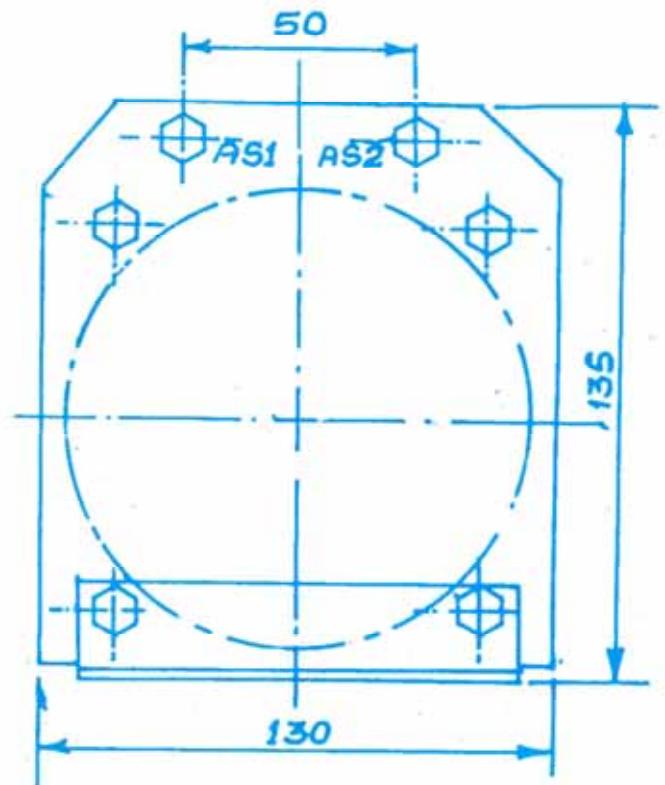
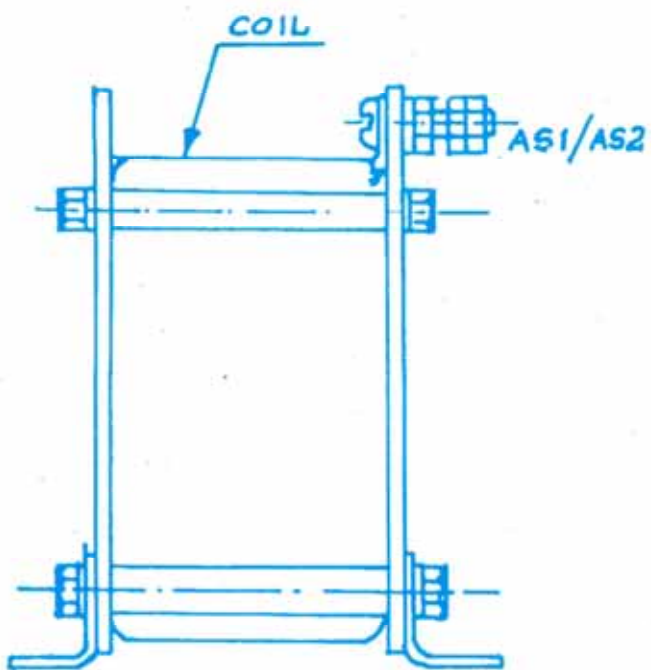


FIG-1

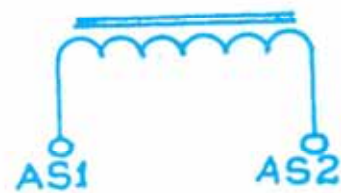
FACILITIES REQUIRED FOR MAKING THE CT UPRIGHT

1. CRANE HAVING 4 \$ (MINIMUM) CAPACITY WITH A LIFT 8 METERS.
2. HAND OPERATED CHAIN PULLEY BLOCK OF 3 \$ (MINIMUM) CAPACITY AND LIFT OF 8 METERS. (CHAIN PULLEY BLOCK WILL NOT BE REQUIRED, IF THE CRANE AVAILABLE HAS AN AUXILIARY HOOK OF 3 \$ CAPACITY.)
3. D-SHACKLE - 25 mm / 28mm SIZE, 4 Nos.
4. STEEL WIRE ROPE SLINGS 16 mm DIA.
5. REF. FIG - 4 FOR SLINGING & LIFTING THE CT IN VERTICAL POSITION.

| ALL DIMENSIONS ARE IN MM/UNITS | | STATUS OF DRG. | PROVIDE. | SCALE | | TITLE |
|--------------------------------|----------|----------------|----------|------------------------|---|---|
| DRN. | REVISION | 20-3-95 | | PROJECTION | — | METHOD OF LIFTING CT FROM TRANSPORTATION FRAME. |
| TCD. | RAJANI | 23-03-'95 | | | | |
| RGD. | REVISION | 21-3-95 | | | | |
| CHD. | — | | | | | |
| APPD. | K.J.T | | | | | |
| | | | | TELK | | TK 332894 |
| | | | | ANGAMALLY KERALA INDIA | | |



BASE DETAILS.



TERMINAL MARKING