# VOLTAGE TRANSFORMERS

## TYPE CPOEGLV

## 0. INTRODUCTION

TELK started manufacture of Current and Voltage Transformers in 1968 in collaboration with M/s. Hitachi Ltd., Japan. TELK now manufacture Current Transformers in the range 25 kV to 400 kV and Voltage Transformers in the range 25 kV to 220 kV. Over 20000 nos. current Transformers and 3000 nos. Voltage Transformers have so far been supplied to the various Electricity Boards, Private Electricity Supply undertakings and Industries in India.

## 1.0 VOLTAGE TRANSFORMERS

Voltage transformers are used to transform high tension line voltage to low voltage in order to supply appropriate voltage to measuring instruments, meters, relays and other similar apparatus. They can be used with voltmeters for voltage measurment or they can be used in combination with current transformers for wattmeter or watthour meter measurements. They are also used to operate protective relays and similar devices.

## 2.0 TELK ELECTROMAGNETIC VOLTAGE TRANSFORMER TYPE CPOEGLV

Type CPOEGLV Electromagnetic Voltage Transformer is the latest addition to TELK series of Voltage Transformers. These are compact, reliable, light weight, minimum oil, easy to maintain, easy to handle, Electromagnetic Voltage Transformers suitable for trouble - free continuous operation in netural solidly grounded Power systems. These Voltage Transformers are oil filled and hermetically sealed, single phase, grounding type suitable for effectively earthed systems. They are suitable for indoor or outdoor installations and are available for three standard primary voltages: 110 kV, 132 kV and 220 kV and with secondary windings for standard secondary voltages : 110V and / 0r $\frac{110\ V}{\sqrt{3}}$

## 2.1 DISTINCTIVE FEATURES

1. The incorporation of up-to-date principles of design and rationalised insulation construction ensures trouble - free service of the voltage transformer.

2. By the use of carefully selected materials for core, winding and insulation, the preservation of initial characteristics is guaranteed for years of service.

3. The hermetically sealed construction results in improved insulation reliability and simplifies handling and maintenance in the field.

4. More compact in size and light in weight.

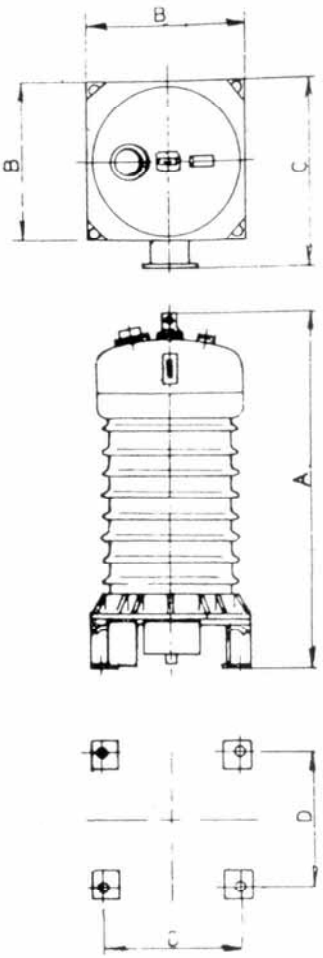


Fig. 1 DIMENSIONS OF TYPE CPOEGLV VOLTAGE TRANSFORMER

**Table 1. Standard Dimensions of Type CPOEGLV Voltage Transformer**

| Rated Voltage (kV) | Approx. Dimensions (mm) | | | | Approx. Oil quantity (l) | Approx. Wt. (kg) |
|---|---|---|---|---|---|---|
| | A | B | C | D | | |
| 110<br>132 | 1880 | 750 | 625 | 500 | 130 | 850 |
| 220 | 2650 | 750 | 625 | 545/500 | 250/200 | 1500 /1400 |

## 2.2 CONSTRUCTIONAL DETAILS

This type voltage Transformers essentially consists of one or more core and coil units assembled in stack one above the other, a lower base, a hollow porcelain and an expansion chamber. Core is made of high quality CRGO steel and has a rectangular construction. The secondary and primary windings are of high quality PVA enamelled copper wires wound concentrically around the core. The core of each unit is rigidly clamped and mounted on upright supports and secured to the lower base at the bottom. This assembly is housed in the hollow porcelain insulator. Porcelain insulator is clamped and sealed with the gaskets, by bolting metal clamps cemented at the bottom and top of the porcelain.

The line end of the primary is brought at the top and connected to the terminal cap provided on the expansion chamber. The other end of the primary winding which is to be earthed in service is brought out through a small bushing and is connected to the lower base. The secondary leads are brought out through an Epicast terminal board which is gasketted and bolted at the bottom of the lower base. From this board they are wired to terminate at the secondary terminal block where they are identified so that proper connection of secondary wiring can be made. These secondary terminal board and secondary terminal block are housed in a secondary terminal box gasketted and bolted at the bottem of the lower base. A 1"dia cable conduit entry is provided on the terminal box for taking out connections from terminal block.

These Voltage Transformers are suitable for mounting on concrete pedestals or steel structures using bolts and nuts. Bolt holes are provided at the corner of the base for this purpose.

## 3. DRYING

The drying, degassing and oil impregnation of the insulating paper is of great importance for the quality and reliability of instrument transformers in service. The internal body of the Voltage Transformer is subjected to heat and vacuum cycle in a drying chamber to extract the moisture accumulated in the paper during storage and handling. For this purpose, special drying ovens are available and the drying process is checked continuously by taking measurements. The drying period depends on the voltage class. At the end of the drying, the insulation is impregnated by oil under vacuum to avoid partial discharges by trapped gas bubbles. The elimination of water and oxygen during the drying process prevents ageing of oil-paper dielectric.

## 4. HERMETIC SEALING

Hermetic sealed construction is used in Voltage Transformers to ensure that the high quality of insulation achieved during manufacture is preserved during the service life of the transformer. A simple and safe method of hermetic sealing using dry nitrogen above oil is adopted. Nitrogen does not in any way affect the properties of oil and paper. When the oil expands or contracts due to temperature variations, the Nitrogen gas in the chamber undergoes changes in pressure. Also depending on the pressure and temperature, a part of the Nitrogen gas will be absorbed by oil. The volume of expansion chamber and the gas pressure at the time of initial filling are adjusted, so that gas pressure will not increase to a high value under normal working voltages and temperatures.

## 5. TANKS

Both expansion chamber and lower base are of high quality steel and can withstand full vacuum and pressures occuring in transit. The outer surface of ferrous parts are given light grey, 631 of IS : 5 enamel paint over a rust inhibitive coat of ready mixed zinc chrome primer. Steel surface coming in contact with transformer oil are given a coat of oil-resisting varnish. Galvanised bolts and nuts are used as fasteners. All welded and gasket joints are subjected to leak tests.

## 6. SPECIFICATIONS

1. The Voltage Transformers are generally manufactured to IS, BS or IEC specifications.

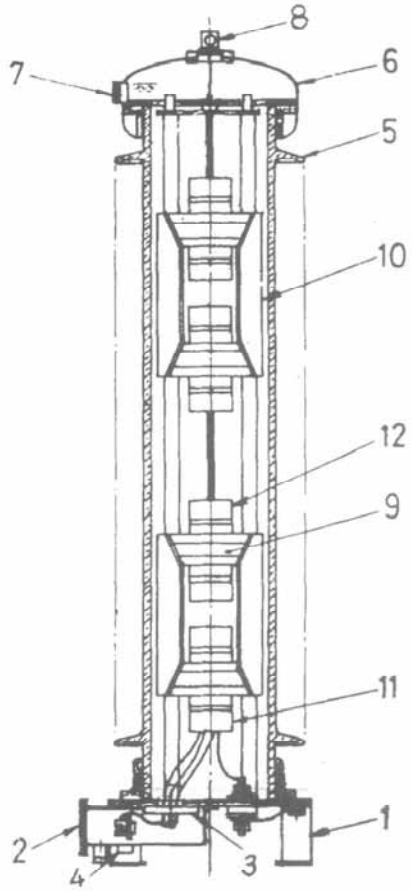


Fig. 2 **SECTIONAL DETAILS OF 220 kV VOLTAGE TRANSFORMER**

1. Base
2. Terminal Box
3. Terminal Board
4. Earth Terminal
5. Hollow Porcelain
6. Expansion Chamber
7. Oil Level Sight Window
8. Primary Terminal
9. Core
10. Core Clamp
11. Secondary Winding
12. Primary Winding

However, if desired, these can be manufactured to conform to any other specification.

2. The standard frequency is 50 Hz.

3. The voltage transformers have substractive polarity.

4. The porcelain insulators generally provided have creepage distance suitable for normally polluted atmospheres. However, where the chances of pollution are present, porcelain insulators with higher creepage distances suitable for heavily polluted atmospheres can also be provided on request.

5. The Voltage Transforemers are despatched filled with purified and filtered oil conforming to IS : 335.

6. The voltage transformers manufactured are suitable for connection between line and earth in effectively earthed systems.

7. i) The standard primary voltages are 110 kV, 132 kV and 220 kV.

ii) The standard secondary voltages are 110 V and $\frac{110\ V}{\sqrt{3}}$. Voltage Transformers with any other rated secondary voltage can be manufatured, if desired. A maximum of 3 secondary windings can be provided.

iii) The standard rated burden is 200 VA for each secondary winding. However, if required, equipment with higher values of secondary burden can be manufactured.

## 7.0 INSPECTION AND QUALITY CONTROL

### 7.1 Facilities

Measurements and tests are the means to ensure the quality of instrument transformers and to confirm that the guaranteed values are maintained. TELK have fully equipped testing department for testing raw materials, components and the equipment manufactured. TELK have facilities to carry out all routine and type tests prescribed in IS, BS and IEC specifications. Some of the important equipment / facilities installed are listed beleow :

* 3000 kV Impulse Generator
* 800 kV testing transformer
* ERA detector for partial discharge measurements.
* RNM for Radio interference voltage measurements
* RSO for measuring impulse distribution.
* Oil testing laboratory
* Materials testing laboratory

### 7.2 i) Routine Tests

Following routine tests are carried out on all type CPOEGLV Voltage Transformers at our works before despatch

1. Verification of terminal marking and polarity.
2. Power frequency dry withstand test on primary
3. Power frequency withstand test on secondary
4. Determination of errors according to the requirements of appropriate accuracy class.

### ii) Type tests

Reports of impulse voltage withstand test and temperature rise test carried out at our works on similar equipment are furnished. However on special request these tests will be carried out on individual units at extra cost.

## 8. FITTINGS AND ACCESSORIES

Voltages Transformers are normally provided with the following standard fittings and accessories.

1. 19 mm. dia single hole primary terminal pad (Bronze Casting)
2. Oil level sight window.

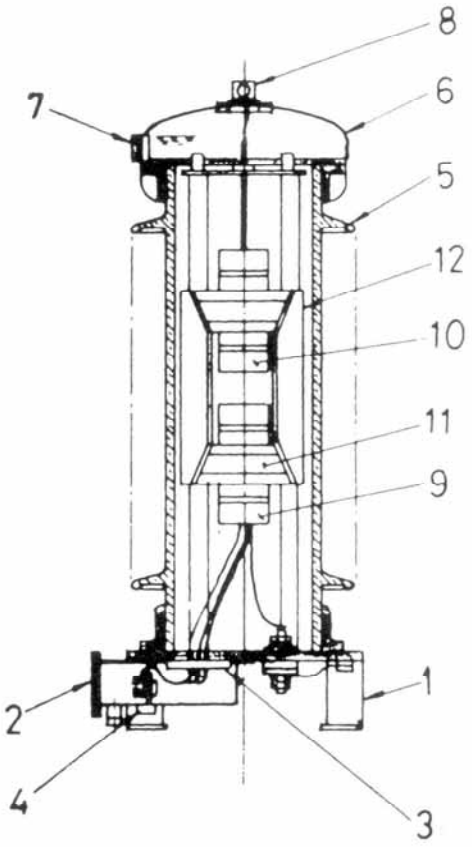


Fig.3 SECTIONAL DETAILS OF 110/132 kV. VOLTAGE TRANSFORMER

1. Base
2. Terminal Box
3. Terminal Board
4. Earth Terminal
5. Hollow Porcelain
6. Expansion Chamber
7. Oil Level Sight Window
8. Primary Terminal
9. Secondary Winding
10. Primary Winding
11. Core
12. Core Clamp

3. Oil filling and draining hole with cover.

4. Lifting lugs

5. Secondary terminal box with 1" dia cable conduit entry.

6. Clamp type earth terminals.

7. Rating plate.

8. Secondary terminal block.

The following items are available as special accessories. Please specify them if they are required.

9. 14 mm dia two-hole primary terminal pad (Bronze casting)

10. Primary terminal connector for connecting the Voltage Transformer to the line or bus connector. While requesting for this item please specify the conductor size.

11. Secondary terminal box with Siemens type chromium or Nickel plated brass cable gland / glands with brass washers and rubber ring. While specifying for this please furnish the max. outside dia of the cable and whether the cable is armoured or unarmoured.

12. Built in fuses in secondary circuit.

Spares are not necessary for 5 years of normal operation.

## 9. GUARANTEE

Generally our Voltage Transformers are guaranteed for trouble -free service for one year from the date of despatch from our works.

## 10. HANDLING AND MAINTENANCE

1. The Voltage Transformer for rated voltages upto and including 220 kV are despatched in wooden crates in the vertical position. Unpacking of the wooden crates should be done with particular care so as not to damage the porcelain and terminal bushing.

2. As the Voltage Transformer is despatched in a completely assembled state, there is no need for any assembly work at site. It can be installed readily. However, please ensure that before commissioning porcelain is clean and free from all dust, grease and particles of packing materials.

3. In order to keep the unit hermetically sealed, the flanged joints with gasket in between shall not be tampered with. The cover of the secondary terminal box alone need be opened for making connections.

4. In case of heavy pollution deposits due to the surrounding atmospheric conditions, periodic external cleaning of the porcelain insulators and all exposed surfaces is recommended.

5. Since the Voltage Transformers are hermetically sealed and use no material harmful to the oil there is no necessity for extraction of samples of oil for analysis or for re-conditioning. However, oil level has to be checked periodically. Any abnormal change in oil level indicate leak and should be investigated.

6. Before commissioning make sure that A2/V2 terminal to lower base connection is kept undisturbed.

7. Positive earthing shall be made at earth terminals before commissioning.

8. Cleaning of porcelain insulator and painting of outer parts are to be carried out at regular intervals which depend on atmospheric conditions.

## 11. INFORMATION TO BE GIVEN WITH ENQUIRY

1. Standard Specifications to be applied.

2. Rated voltage, type of supply earthing conditions.

3. Insulation Level.

4. Supply Frequency.

5. Transformation Ratio.

6. Rated Output.

7. Accuracy Class

8. Rated voltage factor and its duration.

9. Detailed service conditions

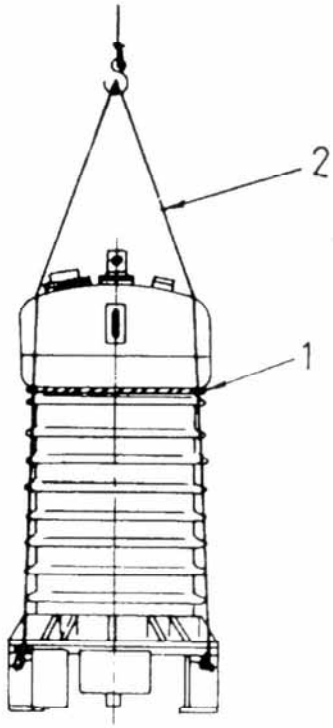


Fig. 4 LIFTING METHOD OF VOLTAGE TRANSFORMER

1. Nylon Rope

2. Sling

# TRANSFORMERS AND ELECTRICALS KERALA LTD.

( A Government of Kerala undertaking)
(In Collaboration with M/s. Hitachi Ltd., Tokyo, Japan)
Regd. Office : ANGAMALLY - 683 573

**Ernakulam Dist., Kerala State. India.**


Phone : (0484) - 452251, 452252, 452253, 452668
Fax : (91-0484) - 452873, 452363
E-mail : telk.chn@rmi.sprintrpg.ems.vsnl.net.in
Web Site : www.telk.com

Gram : 'TELK' ANGAMALLY
Telex : (0885) - 6278 TELK IN


## OUR PRODUCTS

- POWER TRANSFORMERS
- CURRENT TRANSFORMERS
- VOLTAGE TRANSFORMERS
- CONDENSER BUSHINGS
- ON - LOAD & OFF LOAD TAP CHANGERS
- SF6 GAS CIRCUIT BREAKERS
- ISOLATED PHASE BUS DUCTS
- SHUNT AND SERIES REACTORS
- SPECIAL TYPE TRANSFORMERS

CATALOGUE No : VT 701-A