



## Operating & Maintenance Manual

2021

**General note to our customers and contractors**

This documentation is a general guide, which should cover most of the instructions and commissioning information, relative to the various transformers we provide.

This document covers various specifications of transformers and only certain sections will apply to each transformer in question.

Installation should only be carried out by qualified personnel. This document will provide information to be of assistance, in case of query please contact us via the details below.

Bowers Group of Companies are proud to be members of:



# Hermetically Sealed Transformers

## Installation, Operation & Maintenance Manual

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## 1. PREFACE

### 1.1 General

- 1.1.1 The product to which this manual refers should be installed, commissioned, operated and maintained under the supervision of a competent Electrical Engineer, in accordance with relevant statutory requirements and good engineering practice, including Codes of Practice where applicable, and properly used within the terms of the specification.
- 1.1.2 The contents of this manual include advice and instructions to secure safe and satisfactory service. In the event of any doubt, query or the need for further information, please contact us.
- 1.1.3 In any communication please quote the following information: (see rating plate) serial number, kVA rating, Bowers Job No. and year of manufacture.

### 1.2 Specification

- 1.2.1 This is a Fluid filled hermetically sealed type transformer.
- 1.2.2 The product has been designed and tested in accordance with the specification and standards quoted in our acknowledgement of the order and any subsequent modifications.
- 1.2.3 Some of the components referred to in this manual are supplied only when specified and will not be incorporated into all products.
- 1.2.4 For the relevant UK and International Standards and Codes of Practice, reference should be made to the current edition of the following publications: B.S.I. Standards Catalogue; I.E.C. Catalogue of Publications; I.S.O. Catalogue.

### 1.3 Health & Safety

- 1.3.1 The Electricity at Work Regulations apply to UK electrical installations.
- 1.3.2 The IEE "Regulations for the Electrical Equipment of Buildings" apply to installations up to 650v.
- 1.3.3 IEC 364 "Electrical Installations in Buildings" also covers safety aspects.
- 1.3.4 We would in particular stress the importance of care in:
  - Site selection and design, embodying features which provide adequate ventilation, protection and security and which have taken account of appropriate fire, moisture and explosion hazards.
  - Selection and setting of electrical protection in primary and secondary, against overload, over-voltage and short-circuit.
  - Avoiding excess operating temperatures.
  - Carrying out regular inspection and electrical / mechanical maintenance.
- 1.3.5 Materials or components liable to be exposed or handled in normal operation and maintenance and which present any hazard to health are covered in the text.

## 2. CONSTRUCTION AND FITTINGS

### 2.1 Tank Construction

Tanks are designed so as to allow the core and coils in the tank complete with fluid to be removed by crane, winch or jacks, without over-straining any joints, and without causing subsequent leakage of fluid. All ground mounted transformer tanks are fitted with skid under bases suitable for handling with roller bars. The skids are drilled to accommodate axles and rollers when required. Radiators, when fitted, are attached to the main tank on naturally cooled units. A detachable or welded cover is fitted, the gasket material, if fitted being synthetic resin bonded cork.

### 2.2 Standards Fittings

The "Standard Fittings" listed below are those which are considered to be the minimum for the correct and safe operation of a Bowers Electricals Hermetically Sealed Transformer.

- Diagram and Rating Plate
- Hermetically Sealed Warning Plate
- Fluid Warning Plate (Other than Oil)
- Off-Circuit Tapping Switch
- Lifting Lugs
- Earthing Terminal
- Oil Level Indicator
- Pressure/Vacuum Relief Valve
- Drain/Sampling Valve
- Thermometer Pocket
- Jacking facilities

### 2.2 Optional Fittings

Fitted only at Customer's request:

Customers Tag No. Plate  
Radiator Isolating Valves  
Radiator Air release Plug  
Radiator Lifters  
Winding Temperature Indicator  
Fluid Temperature Indicator  
Rapid Rise Relay  
Disconnecting Chambers

Marshalling Box  
Magnetic Oil Gaug

#### 2.4 Terminations

Weatherproof bushings and/or cable boxes.

## 3.0 - INSTALLATION

### 3.1 Despatch

**The transformer is despatched sealed and filled with fluid to the correct level.**

On arrival units should be examined and any transit damage reported to BOWERS ELECTRICALS LTD.

### 3.2 Gaskets

Ensure that the gaskets fitted on all Fluid and airtight joints are secure and uniformly tightened.

### 3.3 Temperature Indicators

Fluid and Winding Temperature Indicators are of the rigid stem or capillary type. Care must be taken to ensure that the capillary type instrument is mounted in a vertical position. Care is needed when running the capillary and sharp bends should be avoided, particularly where it joins the instrument and bulb. The capillary should be supported by suitable clips at intervals of 300 to 450mm and a suitable length left so that the bulb may be freely installed or removed.

### 3.4 Terminations

All porcelain insulators should be examined for minute cracks or damage that may have occurred during transit.

### 3.5 Earthing

The tank should be effectively earthed before making the equipment live. Earthing terminals are provided for this purpose and their position is shown on the outline drawing.

### 3.6 Fluid Level Gauges

Check fluid level gauges for damage and security.

### 3.7 Cable and Wiring

All auxiliary wiring is routed from the respective fittings to the Marshalling box/Terminal Instrument box, and is securely fastened to the tank side by Studs

## 4. COMMISSIONING

### 4.1 Temperature Indicators

#### 4.1.1 Instrument Calibration

The indicating accuracy of the instrument should be checked. Remove the temperature sensitive bulb from its pocket on the tank and immerse it in an oil bath, together with a thermometer and controlled heating element. The oil should now be warmed through definite intervals to a maximum temperature of 120oC, and instrument readings checked against the thermometer. The instrument should be allowed to steady off at each interval to allow for its inherent indicating time lag, and readings should be accurate to within +/-1oC.

#### 4.1.2 Switch Adjustment

The switches should be adjusted to operate at the required values. Recommended maximum settings are:

	Liquid Temperature	Winding Temperature
Alarm Contact	85C	105C
Trip Contact	95C	115C

To adjust switches, remove the instrument bezel and slacken the switch clamp screw located on the extremity of the switch arm. Adjust the switch to the desired operating temperature on the setting scale and re-tighten the clamp screw. When carrying out this adjustment, the mercury switch table should be supported so that excessive pressure is not applied to the movement.

### 4.2 Recommended Commissioning Tests

The following Commissioning Tests are recommended:

#### 4.2.1 Insulation Tests

The following insulation Tests should be made using a megger and the readings noted.  
HV winding to earth

LV winding to earth

HV winding to LV winding

Readings below 75 Meg. Ohms should be reported to the manufacturer.

#### 4.3 **Safety**

Attention is drawn to "Safety in Electrical Testing" (HSW Series No: 31) from HMSO.

## 5.0 - OPERATION

### 5.1 **Fluid Level Gauge**

The gauge enables the level of the fluid to be clearly observed and the gauge is calibrated to show 15oC (cold fluid level).

### 5.2 **Tap Changing**

This is carried out by means of an off-circuit tapping switch. The moving contacts are spring loaded, self-aligning roller type and operation is by means of a handle suitably positioned on the tank. The switch has a positive locating action and provision is made for padlocking if required. A position indicator mounted on the operating mechanism shows the tapping position in use at any time. It is important to ensure that before carrying out a change of tap the transformer is isolated on both HV and LV side.

### 5.3 **Fluid Temperature Indicator**

A Mercury-in-Steel, Bi-metallic or Vapour Pressure Expansion Thermometer can be used to indicate the transformer top oil temperature. An indicating pointer provides indication over the range of 10oC to 120oC. A maximum resettable indicating pointer can be provided to most instruments. Switching for alarm and/or trip is achieved by one or two switches.

### 5.4 **Winding Temperature Indicator**

A temperature sensitive bulb situated in the top oil, operates in conjunction with a heater coil energised by a current transformer, mounted in one of the transformer power lines. Operating on the thermal image principle the instrument will indicate the winding hot spot temperature.

### 5.5 **Loading**

Attention is drawn to BS7735 or IEC 354:1972.

#### 5.6 **Rapid Pressure Rise Relay**

The rapid pressure rise relay protects the transformer from excessive gas pressure in the tank by detecting 'rate of pressure increase' in excess of safe limits. When such conditions are experienced it will initiate an electrical signal. The design of the relay is such that it will not be actuated by normal pressure variations caused by temperature change, variation, or mechanical shock.

## 6. PRESERVATION

Transformers should be thoroughly inspected every 12 months and attention given to all items where necessary.

#### 6.1 **Paintwork**

The transformer tank and fitting should be carefully examined to see if rust is forming, especially at the welded seams. If so, it should be completely removed with a wire brush or other means and the metal given a coat of red oxide paint followed by an appropriate undercoat and finally the finishing coat.

#### 6.2 **Temperature Indicators**

Check contacts. [Refer to clause 4...1.2]

#### 6.3 **Fluid Level**

Check Fluid level, preferably when cold.

The transformer is of the hermetically sealed type and should not normally be opened to atmosphere when in service.

#### 6.4 **Fluid Tight Joints**

After the equipment has been in service for some time it may be found that the compression gaskets have shrunk a little and that small fluid leaks have developed at some of the joints. It is advisable therefore, to carry out a general tightening of the joints after a period of not more than 12 months after commissioning. The correct method is to tighten each bolt slightly, moving around the flange until the whole joint is perfectly tight. Joints should never be tightened at one point alone, even if the Fluid leaks appear to have developed at this point. Failure to adopt this method of tightening may result in a serious fluid leak which will be found difficult to check. If, after carrying out the tightening described above, the fluid leak still persists, the fluid should be lowered below the gasket level and an inspection of the gasket carried out. If damage or deterioration is evident, a replacement gasket should be fitted.

## 7. MAINTENANCE

### 7.1 Maintenance

A sealed transformer, correctly operated according to the rating plate requires no maintenance.

## 8. CONTACT DETAILS

Contact Transformer Sales and Service Department at:

Bowers Electricals Ltd.  
Heanor Gate Road  
Heanor Derbyshire  
DE75 7GX

E- Mail: [enquiries@bowerselec.co.uk](mailto:enquiries@bowerselec.co.uk)

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