

<b>Technical Requirements for Electrical Equipment</b>  Rubrik/Title <b>Dry-type Power Transformers</b>	Beteckning/Document <b>TBE 116</b>
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# 1 General

These Technical Requirements specify the requirements for dry-type power transformers, intended for use in nuclear power plants. The requirements concern design, performance and documentation. Some requirements are therefore applicable only for certain types of equipment. The Manufacturer/Supplier shall fulfil the requirements in order to meet the safety and reliability objectives of the Swedish Nuclear Power Plant (NPP) Owners.

The purpose of this document is to provide general requirements for dry-type power transformers having highest voltage for equipment up to and including 36 kV.

In addition to the requirements in this document, applicable parts of TBE 100:1 “General Technical Requirements and Explanations”, shall also apply.

Detailed Technical Data, and in some cases other technical requirements to be followed, for the equipment is given in the Technical Specification. If the requirements of various documents differ, the Technical Specification shall have precedence.

Section 6 is a checklist that should be used in connection with an inquiry or an order.

## 2 Definitions

For general definitions see TBE 100:1 and KBE 100-x.

## 3 General Product Requirements

### 3.1 Standardisation

Dry-type power transformers shall meet the requirements in Swedish regulations and the following standard:

IEC 60076-11      Power transformers Part 11

Specific requirements on standardization will be found in the Technical Specification.

The Manufacturer/Supplier shall in the quotation show degree of compliance with product standards.

### 3.2 Other Technical Requirements

Since the greatest degree of uniformity in the plant is desirable, the Manufacturer/Supplier shall choose manufacturer including type of equipment and components in consultation with the Purchaser.

#### 3.2.1 Short-circuit Conditions

The Manufacturer/Supplier has to show the transformer’s thermal and dynamic ability to resist external short circuits and earth faults.

### **3.2.2 Insulation Level**

Windings and connected parts shall be designed to meet the insulation level stated in the Technical Specification.

### **3.2.3 Off-Load Tap Changer**

The voltage ratio of the transformer should be changeable under non-energized conditions by means of a switch or by re-arrangement of links. The tap-changer and performance shall fulfil the requirements in the Technical Specification.

### **3.2.4 Electrical Terminals**

The terminals shall be suitable for connection to the Purchaser's equipment.

The terminals shall be suitable for connection with Cu-material if not otherwise stated in the Technical Specification.

The terminals performance with regard to location and dimensions shall be subject for approval by the Purchaser.

Insulators shall fulfil the requirement regarding insulation level stated in the Technical Specification.

### **3.2.5 Cooling Method**

The cooling medium shall be self-circulating air (cooling method AN) if not otherwise stated in the Technical Specification.

### **3.2.6 Installation**

Technical solutions to special requirements stated in the Technical Specification regarding wheels, locking of wheels, anti-vibration equipment etc. of importance for the installation of the transformer shall be approved by the Purchaser.

### **3.2.7 Noise Level**

If there is a special requirement on the noise level, this is stated in the in the Technical Specification.

### **3.2.8 Accessories**

Accessories such as temperature gauges shall fulfil the requirements in the Technical Specification.

## **4 Nuclear Specific Requirements**

### **4.1 Short Circuit Resistance**

The transformer shall be designed to withstand the thermal and dynamic effects of short-circuits in accordance with the requirements stated in the Technical Specification with regard to short-circuit and earth-fault currents.

## **4.2 Overloading**

The Manufacturer/Supplier shall specify acceptable overloading of the transformer with respect to time, temperature and reduced lifetime.

## **4.3 Windings**

The transformer windings shall be made of copper if not otherwise is stated in the Technical Specification.

## **5 Documentation**

In addition to documentation required in TBE 100:1 and KBE 100-x the following are required.

- The list of apparatus shall comprise all components used on the transformer.
- Dimension drawing shall indicate all dimensions (metric system shall be used) of importance for the installation and connection, and the location of components.
- Dimension drawing showing design and spacing of holes for eventual connection with bus bar. For connecting with cable the connecting point and eventual stress relieving point shall be documented.

The documentation shall comprise individual documents for each component. Each document shall be labelled with same designation as the equipment it belongs to.

## 6 Agreements between Manufacturer/Supplier and Purchaser

This list should be used as a base between Manufacturer/Supplier and Purchaser when discussing tenders or orders.

1	Examination and completion of Technical Specification	
2	Examination of Inspection Plan and Examination Procedures	
3	Verification of seismic requirements	
4	Type of windings	
5	Windings material and type of isolation material	
6	Number of phases and connection group	
7	Loading capacity at variations within stated voltage and frequency range	
8	Overloading, any consequences	
9	Erection, requirement upon ground	
10	Anti-corrosive treatment in moisture environment	
11	Transport protection, mode of transport	
12	Requirement upon storage before installation	
13	Connection for protective earth	
14	Off-load tap-changer, design, regulating range	
15	Design of connecting point on transformers high voltage side	
16	Design of connecting point on transformers low voltage side	
17	Temperature monitoring, type and design	
18	Enclosure, design, surface treatment	