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KLM Technology Group #03-12 Block Aronia, Jalan Sri Perkasa 2 Taman Tampoi Utama 81200 Johor Bahru Malaysia	<b>SPECIFICATION FOR POWER TRANSFORMER</b>  <b>(PROJECT STANDARDS AND SPECIFICATIONS)</b>	

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## SCOPE

This Project Standard and Specification covers the technical requirements for the design, construction, inspection and testing of power transformers.

## REFERENCES

Power transformers shall be designed, constructed and tested in accordance with the requirements of the following Codes:

ANSI/IEEE C57.12.00	General Requirements for Distribution Power and Regulating Transformers
ANSI C57.12.10	Requirements for Transformers, 230,000 Volts and below, 833/958 through 8333/10,417kVA, Single-phase; and 758/862 through 60,000/80,000/100,000kVA, Three-Phase
ANSI/IEEE C57.12.90	Liquid-immersed Distribution, Power and Regulating Transformers and Guide for Short-circuit Testing of Distribution and Power Transformers
ANSI C57.92	Guide for Loading Oil-immersed Distribution Power and Power Transformers
ANSI C57.96	Guide for Dry-type Distribution Power and Power Transformers
ANSI/NFPA 70	National Electric Code
IEC	International Electrotechnical Commission

## Rating

Power transformers shall be rated for continuous duty as follows:

Rated no-load Voltage Ratio	:	13.8kV/6.9kV and 6.6kV/480V
Rated Frequency	:	60Hz
Vector Group	:	Dyn11
% Impedance	:	as per required

Note: The no load voltages and impedance of transformers shall be selected based on system design/studies.

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## **CONSTRUCTION**

### **General**

Power transformers shall be outdoor type, oil-immersed natural cooled (type ONAN). Transformers fitted with conservator or sealed tank types are acceptable.

Transformers shall be of the two-winding type, connected delta-star, unless otherwise specified or required by system design.

Transformers secondary star point shall be brought out and terminated at an insulated bushing, enclosed in a separate cable box, and solidly or resistor earthed. All transformers having a 460V secondary shall have provision for distributing the neutral to provide a four-wire system.

Transformers of similar rating shall be suitable for operating in parallel. They shall be electrically and mechanically identical with particular reference to impedance voltage, vector reference, etc.

The power transformers shall have provision for 'FUTURE' conversion to ONAF. The necessary provision for adding fans, control panel and controls shall be made in the transformer and vendor drawings should clearly indicate the ONAF arrangement in (dotted lines) which needs to be added in future.

### **Tanks and Cooling Tubes**

Transformer tanks shall be constructed of mild steel plates of adequate thickness with suitable continuously welded stiffeners to prevent excessive deformation.

Tanks and enclosures shall be of sufficient strength to prevent distortion occurring when the transformer is lifted, jacked or transported. The joints, seams and fittings shall be sufficiently strong and well protected to prevent leakage of coolant under these conditions.

All tanks and covers shall be so designed as to prevent the collection of water on the outside surfaces and also to prevent the trappings of air within the tanks when being filled with oil. Any horizontal access covers shall be provided with handles and gaskets and shall be raised above the tank surface.

Lifting lugs shall be fitted to the transformer tank or enclosure both for lifting the complete assembly and for core and coils.

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For cooling purposes, tanks shall be fitted with cooling tubes which may be directly welded onto the tank sides or welded onto separate headers. When cooling tubes are fitted, they shall be so arranged as to facilitate cleaning and repainting. Bends in cooling tubes shall be smooth and any clearance gaps where they join the tank shall be effectively filled in.

### **Tappings**

Of-circuit tapping switches shall be provided with freely accessible and lockable operating handle and suitable for continuous full load rating at all taps of the transformer. The switches shall have position indicators. It shall not be possible for the switches to be padlocked in a position between tappings.

A suitable padlock, complete with two (2) keys, manufactured of a non-corrodible material shall be supplied with each transformer, Voltage tappings shall be provided on the primary winding for a variation of no-load voltage of  $\pm 2.5\%$  and  $\pm 5\%$ (5taps).

### **Skid Base**

The base of the transformers shall be formed of structural steel members and shall be sufficiently rigid to permit skidding.

## **ACCESSORIES**

### **Conservator**

Conservator shall be provided with cleaning doors, oil level gauge and valves. The outlet pipe shall protrude at least 25mm into the conservator so as to trap any sediment or moisture within the conservator and not allow these to enter the main tank, Conservators shall be mounted at the end of the transformers in such a way as not to obstruct external connections or reduce the safety clearances to live external connections.

### **Pressure-Relief Vent**

Transformers above 500kVA shall be provided with pressure-relief vents with alarm/relay contact.