

PROJECT:RUBEK BALLOONS	Specification:
	TRANSFORMER

POWER TRANSFORMER (ANAN)

1.0 SCOPE

- 1.1 This Specification covers the design, manufacture, inspection and testing at the works, packing, transportation, delivery, testing and commissioning of the following:

1 No 11 KV / 433V, 3 PHASE, 2 winding, 630kVA, Dyn11 with Z=5% Air cooled (ANAN) Resin cast type indoor transformer with tap + or – 10% in steps of 2.5% in IP 33 enclosure

2.0 SYSTEM DESCRIPTION

- | | | |
|-----|----------------------------------|--------------------------------|
| 2.1 | Primary system voltage | |
| | Nominal voltage | : 11000 V |
| | Maximum | : 12000 V |
| 2.2 | Secondary system Voltage | : 433 V |
| 2.3 | Input voltage variation limits | : -10% to +10% |
| 2.4 | No. Of phases | : 3 |
| 2.5 | Frequency | : 50 Hz |
| 2.6 | Frequency variation limits | : +/-3% |
| 2.7 | Fault level | : Not exceeding 500MVA at 11KV |
| 2.8 | Neutral earthing on HV & LV side | : Solidly earthed |

3.0 REFERENCE STANDARDS

- | | | |
|-----|---|--------------------|
| 3.1 | Power transformer | IS 2026 / IS 11171 |
| 3.2 | Fittings & accessories | IS 3639 |
| 3.3 | Degree of protection | IS 2147 |
| 3.4 | Tests | IS 2026 |
| 3.5 | Tolerance on guaranteed particulars | IS 2026 |
| 3.6 | Electrical insulation classified by Thermal stability | IS 1271 |
| 3.7 | Installation and maintenance | IS 10028 |

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4.0 DESIGN AND PERFORMANCE REQUIREMENTS

- 4.1 The distribution transformers shall be cast resin Dry type ANAN. The transformer shall be in compliance with specification given
- 4.2 Transformers shall operate without injurious heating at the rated capacity within ± 10 percent of the rated voltage of that particular tap.
- 4.3 Transformers shall be capable of delivering the rated current at a voltage equal to 105 percent of the rated voltage without exceeding the limiting temperature rise.
- 4.4 Overloads shall be allowed within the conditions defined in the loading guide of the applicable standard. Under these conditions, no limitations by terminal bushings, or other auxiliary equipment shall apply.
- 4.5 Transformers, complete with bushings / cable boxes, shall be designed and constructed to withstand without damage, the effects of external short circuits as per the specified standards.
- 4.6 Enclosure shall be fabricated out of sheet steel of minimum 2.5 mm thick and painted with epoxy paint after thorough cleaning. The enclosure shall be provided with louvers at bottom and top for ventilation.
- 4.7 A suitable channel frame shall be provided at the bottom to lift the entire Transformer.

5.0 CORE

- 5.1 The magnetic circuit shall be constructed from high-grade cold rolled non-aging grain oriented silicon steel laminations.
- 5.2 The insulation structure for the core to bolts and core to lamination plates shall be such as to withstand a voltage of 2000 V for one minute.

6.0 INTERNAL EARTHING

The framework and clamping arrangement of core and coil shall be securely earthed inside the tank by copper strap connection to the tank.

7.0 WINDINGS

- 7.1 Windings shall be of electrical grade copper
- 7.2 Winding shall be subjected to a shrinking and seasoning process, so that no further shrinkage occurs during service.
- 7.3 The insulation of the winding shall be uniformly insulated and shall be of class-B or H.
- 7.4 The winding shall withstand peak impulse voltage of 75KV and power frequency voltage withstand of 28KV/ 3KV for HV/ LV respectively.

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7.5 The completed core and coil assembly shall be dried in Vacuum to ensure elimination of air and moisture within the insulation.

8.0 BUSHINGS

- 8.1 Bushings shall be designed and tested to comply with IS 2026 (Part III) and to suit the current class.
- 8.2 Bushings shall be so located on the transformers that full flashover strength will be utilised and minimum clearance as required for the BIL shall be realised between live parts and live parts to earthed structures.
- 8.3 The bushing terminal shall be rated to carry the bushing rated current without exceeding a temperature rise of 45 deg. C in an ambient of 40 deg. C. The connector/clamp shall be designed to be corona free at the maximum rated line to ground voltage.
- 8.4 For HV minimum clearance of 280 mm between phase to phase and 140 mm between phases to earth should be maintained.

9.0 CABLE BOXES AND DISCONNECTING CHAMBERS

- 9.1 Disconnecting chambers suitable for Primary and secondary shall be provided
- 9.2 Cable boxes shall be suitable for terminating the cables

10.0 FITTINGS AND ACCESSORIES

Following fittings shall be provided:

- 10.1 Bushing Terminals complete with connectors for the cables
- 10.2 Neutral bushing terminal complete with connector for earth conductor.
- 10.3 Inspection cover
- 10.4 Rating and terminal marking plates.
- 10.5 Two earthing terminals for enclosure, HV and LV cable boxes

11.0 WTI with alarm & trip contacts

To be provided

12.0 TESTS

Transformers shall be completely assembled at Works to ascertain that all parts fit correctly.

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12.1 Routine Tests

- (i) Routine tests as per specified standards shall be performed on all transformers. The following additional points may be noted:
- (ii) 2kV withstand test for all wiring.
- (iii) Voltage ratio at all taps
- (iv) Resistance of each winding of each phase shall be measured at principal and at all the taps and corrected to 75 deg. C.
- (v) No load loss and exciting current shall be measured at rated frequency at 90%, 100% and 110% rated voltage. These tests shall be done after impulse tests if the latter is conducted. Exciting current shall be measured on each phase and recorded. Form factor shall be noted during the test and included in the test report.
- (vi) Magnetic balance test.
- (vii) Calibration of temperature indicators and relays.
- (viii) Double voltage double frequency test

12.2 Type Tests

CONTRACTOR shall furnish type test certificates along with the Tender. In the absence of the same, CONTRACTOR shall carry out the type tests without any cost implication to the RUBEK BALLOONS. Test certificates for short circuit test and Impulse test conducted for similar transformer shall be furnished.

12.3 Test Reports

Test results shall be corrected to a reference temperature of 75 deg.C.

Two copies of preliminary test results shall be submitted for the RUBEK BALLOONS approval before despatch of transformer.

Additional bound copies of complete test results including all tests on transformers, auxiliaries, and current transformer characteristics shall be furnished with the transformer.

13.0 **LOSSES**

13.1 Tenders will be evaluated based as mentioned below:

As per ECBC 2017

Losses: on 50% load - 2000W
Losses: on 100% load - 5855W

14.0 **REJECTION**

Rubek may reject any transformer if during tests any of the following conditions arise:

14.1 Load loss exceeds the guaranteed value.

14.2 Impedance value differs the guaranteed value by $\pm 10\%$ or more.

14.3 Winding temperature rise exceeds the specified value by 5°C.

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14.4 Transformer fails on power frequency voltage withstand test.

14.5 Transformer is proved to have been manufactured not in accordance with the agreed specification.

15.0 GUARANTEES

15.1 The items of performance on transformers shall be guaranteed either under penalty or under correction. The temperature rise guarantee shall have zero tolerance on the positive side

16.0 DATA TO BE FURNISHED BY THE VENDOR AFTER AWARDING THE CONTRACT

- 16.1 Positive Sequence impedance at normal tap.
- 16.2 losses
 - At 50% load
 - At 100% load.
- 16.3 Maximum efficiency and load at which it occurs
- 16.4 Regulation at full load at 75°C winding temperature at
- 16.5 Unity power factor
- 16.6 0.85 power factor lag.
- 16.7 Resistance per phase at
 - HV winding: ohms
 - LV winding: ohms
- 16.8 Conductor area (sq. mm) and current density (amp / cm²)
 - HV winding
 - LV winding
- 16.9 Type of winding
 - HV
 - LV
- 16.1 Insulating materials for inter turn insulation
 - HV winding
 - LV winding
- 16.11 Insulating materials for inter winding insulation
 - Insulating materials between
 - Winding and core

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Laminations of core

Make, type, number of contacts and contact ratings current and voltage rating for following items

Winding temperature indicator

16.12 DRAWINGS

The following drawings shall be submitted for the RUBEK'S approval in the stipulated time

16.13 General outline drawings as submitted with the bid

16.14 General outline drawings showing plan, front elevation, and side elevation, with all fittings and accessories, locating dimensions of cable entries, earthing terminals, foundation/floor fixing details, jacking pads and weights of the following

16.15 Cable end boxes

16.16 Bushings

16.17 Plan, elevation, terminal details, mounting details, make and type number, current and voltage rating, creepage distances and principal characteristics.

Rating and diagram plates

17.0 TEST REPORTS

Test results shall be corrected to a reference temperature of 75°C.

17.1 Two copies of test results shall be submitted for RUBEK approval before dispatch of transformer.

17.2 Additional bound copies, as required by the RUBEK of complete test results including all tests on transformer, bushing, shall be furnished.

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