52-SDMS-01

REV. 0

SPECIFICATION

FOR

ENCLOSED DRY-TYPE DISTRIBUTION TRANSFORMERS

Revision History

#	Date	Revision No.	Major Revision Description
1	27-12-2022	0	

Table of Contents

1 SCOPE

This specification defines the minimum technical requirements for design, engineering, manufacturing, testing, inspection and performance of an enclosed dry-type medium-voltage distribution transformers with cast-resin encapsulated windings rated up to 36kV for indoor installation intended to be used in the distribution system of Saudi Electricity Company (SEC) in Saudi Arabia.

2 CROSS REFERENCES

This specification shall always be read in conjunction with the latest revisions of SEC specifications 01-SDMS-01, 12-SDMS-01, and 12-SDMS-02 titled "General Requirements for all Equipment/Materials," "Specification for Cable Joint, Terminations, and Accessories up to 36kV", and "Specification for Lugs and Connectors for Low-Voltage and Medium-Voltage Distribution System", respectively, which shall be considered as an integral part of this specification. It shall also be read in conjunction with SEC purchase order and/or contract schedules, and scope of work/technical specifications for projects, as applicable.

3 APPLICABLE CODES AND STANDARDS

The latest revision of the following codes and standards shall be applicable for the equipment/materials covered in this specification. In case of any deviation, the vendor/manufacturer may propose equipment/materials conforming to alternate codes or standards. However, the provisions of SEC standards shall supersede the provisions of these alternate standards in case of any difference.

IEC #	International Electro-technical Commission
IEC 60076-11	Power transformers – Part. 11: Dry – type
IEC 60076-12	Power transformers – Part. 12: Loading guide for dry-type power Transformers
IEC 60076-1	Power transformers – Part. 1: General
IEC 60076-2	Power transformers – Part. 2: Temperature rise
IEC 60076-3	Power transformers – Part. 3: Insulation levels, dielectric test and External clearances in air
IEC 60076-5	Power transformers – Part. 5: Ability to withstand short circuit
IEC 60076-10	Power transformers – Part. 10: Determination of sound levels

IEC #	International Electro-technical Commission
IEC 60085	Thermal evaluations and designation
IEC 60270	High-voltage techniques – Partial discharge measurement
IEC 60529	Degree of protection provided by enclosures (IP code)

Table 1: Applicable Codes and standard (IEC).

SASO	Saudi Arabian Standards Organization
SASO-GSO-IEC-60076-11	Power transformers - Part 11: Dry-type transformers

Table 2: Applicable Codes and standard (SASO).

4 SERVICE CONDITIONS

The enclosed dry-type medium-voltage distribution transformer with cast-resin encapsulated windings shall be suitable for indoor operation under the service conditions specified in the latest revision of SEC specification 01-SDMS-01. All fittings and attachments shall be capable of withstanding the effects at their installed locations such as temperature, humidity, etc.

5 DESIGN AND CONSTRUCTION REQUIREMENTS

5.1 General

The mechanical and electrical design of an enclosed dry-type medium-voltage distribution transformers shall be based on the following conditions and requirements:

5.1.1 It shall meet or exceed the requirements of this specification in all respects and shall be manufactured and tested in conformance with relevant international standards.

5.1.2 It shall be capable of operating continuously at full load at any tap position within their temperature rise limit.

5.2 Design Criteria

5.2.1 The transformer shall be three-phase, class F (not exceeding 155° C) with natural air ventilation (AN) for indoor installation, destined for use in three-phase MV/LV distribution systems.

5.2.2 Indicated transformer rating is for natural air ventilation at an ambient temperature from -5°C to 50°C.

5.2.3 The transformer shall be designed to allow for forced cooling (AF). Forced cooling shall increase the transformer capacity rating by 25%.

5.2.4 The transformer shall be interfaced with Building Management System (BMS) for monitoring and control.

5.2.5 The transformer shall be of climatic class C2 and of environmental class E3 as defined in IEC 60076-11. C2 and E3 classes shall be indicated on the rating plate.

5.2.6 The transformer shall be of fire behavior class F1 as defined in IEC 60076-11. F1 class shall be indicated on the rating plate.

5.2.7 Protection against voltage transients:

a. The transformer shall be designed and equipped to withstand voltage transients generated from fast-switching devices such as vacuum or SF6 insulated circuit breakers to ensure high-degree of system reliability.
b. The protection must be guaranteed by the transformer manufacturer to work in any system configuration without the need to consider cable capacitances, proximity of switching devices, or other system characteristics.
c. The protection method shall be guaranteed to be operational throughout the expected life of the transformer.
d. The protection shall also not increase the size of the transformer's outer dimensions.

5.3 Magnetic Core

5.3.1 Magnetic core shall be made from laminations of cold-rolled grain-oriented silicon steel, insulated with mineral oxide, and shall be protected against corrosion with a coat of varnish.

5.3.2 The laminations shall be stacked step–lap type to minimize stray-flux losses and to prevent joint vibration.

5.3.3 The assembled core shall be braced in suitable steel frames that make up the base-frame and the lifting facilities for complete transformer. The core assembly shall enable the removal of the coils in the field, if this should become necessary.

5.3.4 The entire core assembly shall be covered with a resin based lacquer as protection for corrosion before the coils are mounted. Every part of the

core shall be of robust design capable of withstanding any shocks or vibration to which they may be subjected during hauling, lifting, transportation, etc.

5.4 Medium-Voltage Windings

5.4.1 MV windings shall be encapsulated in glass fiber reinforced epoxy resin or quartz filler epoxy resin. Encapsulation of the winding shall be achieved by vacuum impregnation at elevated temperature and shall be free of bubbles and voids.

5.4.2 MV winding shall be independent of the LV windings and shall be made of multi-layer aluminium foil with class F insulation.

5.4.3 MV windings shall be vacuum cast in a class F fireproof epoxy resin casting system composed of:

a. An epoxy resin
b. An anhydride hardener (glass fiber filler must have flexibilizing additive, for quartz filler flexibilizing additive is not required)
c. A flame-retardant filler

5.4.4 The casting system shall be of class F.

5.4.5 The interior and exterior of the windings shall be reinforced with a combination of fillers, either glass-fiber or quartz to provide thermal shock withstand.

5.5 Low-Voltage Windings

5.5.1 LV winding shall be liberally designed and adequately insulated and supported to withstand the short circuit forces.

5.5.2 LV winding shall be made of multi-layer aluminium foil in order to cancel out axial stress during short circuit; this foil shall be insulated between each layer using class F resin films of either heat-reactivated pre-impregnated epoxy resin film or by vacuum pressure impregnated polyester resin film.

5.5.3 Foil must be protected everywhere with a class F insulation material even in the air ducts.

5.5.4 Cooling ducts shall be incorporated in the LV windings minimizing the temperature gradient in the coils.

5.6 Medium-Voltage Winding Support Spacers

5.6.1 Support spacers shall provide sufficient support in transport, operation and during bolted short circuit conditions as well as in the case of an earthquake.

5.6.2 These spacers will be in rectangular in shape for better mechanical strength. They shall give an extended tracking line to give better dielectric withstand under humid or high dust conditions.

5.6.3 These spacers shall include an elastomer cushion that will allow it to absorb expansion according to load conditions. This elastomer cushion shall be incorporated in the spacer to prevent it being deteriorated by air or UV.

5.7 Enclosure

5.7.1 The transformer shall be housed in a protective steel housing with sufficient ventilation offering a minimum degree of protection Class IP31.

5.7.2 Enclosure shall be made of galvanized steel sheet at least 3mm thickness or Aluzinc at least 2 mm thickness.

5.7.3 The unit shall be fitted with plain bi-directional rollers. The unit shall form one movable and liftable unit (with transformer). Adequate ventilation shall be provided by vermin proof louvers.

5.7.4 The perforated bottom plate shall have sufficient clearance from the floor level to guarantee sufficient flow of natural air ventilation.

5.7.5 Hand-hole shall be provided with transparent cover to operate the tap changer. The hand-hole cover shall be provided with transparent cover to reach the tap changers. The hand-hole cover shall be openable with special Key/Tool only. It shall be located as shown in Drawing 13.1 Front View (M.V. Side).

5.7.6 The unit shall be fitted with lifting lugs on both side at the top, and located such that the unit is balanced when lifted.

5.8 Medium-Voltage Cable Termination Box

5.8.1 A medium-voltage air-insulated cable termination box shall be provided to form as an integral part of the transformer enclosure, and shall be located as shown in Figure-1.

5.8.2 Medium-voltage cable termination shall be done through Type-C bushing interface per EN 50181.

5.8.3 The MV terminations shall be labeled U, V, W, using an indelible black color paint. Phase identification using adhesive stickers is not acceptable.

5.8.4 Cable termination box shall be adequate for terminating 3 x single-core or 1 x three-core medium-voltage power cables per SEC specification 11-SDMS-03, sizes are: 50mm² copper, or 70mm² aluminum, or 95mm² copper, with the use of T-Type separable elbow connector per latest revision of 12-SDMS-01. The cable box shall have a single gasket, removable, bolted-type cover. Its bottom plate shall be in two halves with cable entry steel knockouts suitable for the aforementioned cables. Loose rubber bushings shall be provided inside the cable box for the knockouts.

5.9 Low-Voltage Cable Termination Box

5.9.1 A low-voltage air-insulated cable termination box shall be provided to form as an integral part of the transformer enclosure, and shall be located on the opposite side of the medium-voltage cable termination box as shown in Figure-1.

5.9.2 Connection of the LV neutral shall be directly made to the LV terminals between the LV phase bars.

5.9.3 The LV terminal bars shall be made of electrical grade aluminum, tin-plated with minimum thickness of 20µm, and shall be suitable to accept SEC standard cables per Table 3 below equipped with 4-holes terminal lugs as per Figures 8 and 9 of SEC specification 12-SDMS-02 Rev.06, respectively.

5.9.4 The LV cable box shall have removable, single-gasket, bolted front cover. Its bottom plate shall be in two-halves with cable entry steel knockouts suitable for passing SEC cables. Loose rubber bushings shall be provided inside of the box for the easily detachable knockouts.

5.9.5 The LV terminals shall be provided with complete fittings (suitable bolts, nuts, and washers) for SEC cable connections, and labeled n, u, v, w from right to left by using indelible black color paint. Phase identification using adhesive stickers are not acceptable.

5.9.6 The LV terminals shall be suitable for connecting copper or aluminum cables as specified in Table 3.

Transformer Rating, kVA	Cable Conductor Material	Number of Cables that can be Connected per Phase	Number of Cables that can be Connected on the Neutral
500	Copper	1 - (1C x 630mm²)	1 - (1C x 630mm²)
	Aluminum	1 - (1C x 800mm²)	1 - (1C x 800mm²)
1000	Copper	2 - (1C x 630mm²)	1 - (1C x 630mm²)
	Aluminum	2 - (1C x 800mm²)	1 - (1C x 800mm²)
1500	Copper	3 - (1C x 630mm²)	2 - (1C x 630mm²)
	Aluminum	3 - (1C x 800mm²)	2 - (1C x 800mm²)
Note: Cable lugs shall comply with the latest revision of SEC specification 12-SDMS-02 and 11-SDMS-01 for the low-voltage cables.			

Table 3: Allowable copper/aluminum LV cables to be connected to transformer.

5.10 Medium-Voltage Tapping Links

5.10.1 The tapping, which act on the highest voltage adapting the transformer to the real supply voltage value, shall be off-circuit bolted links.

5.10.2 Tapping shall be provided on MV side by means of re-connectable links (off-circuit), giving +/-2.5% and +/-5% tapping on transformers for each primary voltage rating.

5.10.3 Tapping with connection cables is not allowed.

5.10.4 These bolted links shall be attached to the MV coils.

5.11 Emergency Loading

5.11.1 Transformer manufacturer calculations/literature to demonstrate the transformer's ability to operate under the specified emergency loading conditions in accordance with IEC 60076-12 must be provided.

5.11.2 The transformer shall also be able to calculate/estimate the loss of life during its operational life and provide consumed life estimate based on IEC 60076-12.

5.12 Earthing

5.12.1 Internal Earthing

a- All non-current carrying metal parts of the transformer with the exception of the core laminations, core bolts and associated clamping plates shall be maintained at ground potential.

b- The top main core clamping structure shall be connected to the enclosure by a copper strap. The bottom core clamping structure shall be earthed by suitable method.

5.12.2 Earthing of Magnetic Circuit

The transformer core shall be insulated from the structure so as to withstand core insulation tests and subsequently be earthed through a detachable flexible copper link.

5.12.3 External Earthing

Provision shall be made to connect external earthing at positions close to each bottom four corners of the enclosure. Earthing terminals shall be adequately dimensioned to receive the external earthing conductor.

5.13 Ratings, Losses, impedances, and Noise Levels

The acceptable maximum losses of the transformers shall be as shown in Table 4. Any transformer unit exceeding the allowable maximum losses will be rejected.

Transformer Rating	No-Load Losses, Watts	Load Losses, Watts @ 120° C	Impedance,%	Noise level, dB(A)
500kVA, 13.8kV/400V	1400	5750	5	69
1000kVA, 13.8kV/400V	2300	9000	6	73
1500kVA, 13.8kV/400V	3050	12200	6	76
500kVA, 33kV/400V	2000	6500	5	70
1000kVA, 33kV/400V	3100	10000	6	73
1500kVA, 33kV/400V	4200	13500	6	76
Note: No-load and load losses (referred at 400V) submitted in the tender shall be treated as guaranteed values, any increase in these values at the time of testing shall not be accepted.				

Table 4: Cast resin dry type transformers allowable maximum losses.

5.14 Dimensions

The maximum allowable dimensions of a completely assembled transformer with enclosure shall be as per Table 5.

Transformer Rating kVA / KV	**Length, A1** (mm)	**Width, B1** (mm)	**Height$_{max}$, C1** (mm)	**Roller Diameter** (mm)	**Roller Spacing, E1** (mm)
500 / 13.8	2150	2200	2200	125	820 x 820
1000 / 13.8	2400	2300	2400	160	820 x 820
1500 / 13.8	2550	2400	2600	200	1070 x 1070
500 / 33	2750	2600	2400	160	820 x 820
1000 / 33	2950	2700	2600	200	820 x 820
1500 / 33	3150	2800	2700	200	1070 x 1070

- All dimensions in (mm).
- ±10% dimensional tolerance on length and width.
- Upper and lower M.V & L.V cable entry Plates are undrilled.

Table 5: Allowable dimensions of transformer.

5.15 Finishing Color

The enclosure shall be adequately protected against corrosion and shall be painted with color RAL 7035 or as per latest revision of SEC specification No. 01-SDMS-01.

5.16 Accessories and Standard Equipment

5.16.1 The transformers shall be equipped with:

a. (4) Flat bi-directional rollers
b. (2) Lifting lugs
c. (2) Earthing terminals (M12 brass studs).
d. Hauling holes under the skid base.

5.16.2 Thermal protection and winding temperature monitoring system.

a. As a minimum requirement, the transformer shall be able to monitor the following parameters which includes but not limited to ambient temperature, winding average temperature, hot-spot temperature, voltages, currents, forced air circuit currents, etc.

b. The transformer shall be provided with three temperature sensors PT100 installed in the low voltage winding (one per phase) and connected to a terminal board with plug-in connector and a digital thermometer with two contacts, i.e. alarm at 130° and trip at 140°.

c. The temperature monitoring system provided shall have two numbers of potential free contacts for alarm / trip. The digital indicator shall continuously display the actual temperature and indicate the highest temperature reached.

d. Temperature sensors PT100 sensors shall be placed in a tube to enable them to be replaced if ever necessary.

e. Additional thermal monitoring/control is to be provided for cooling fan operation. Temperature monitoring system is to be microprocessor/Microcontroller based digital type and equipped with temperature indicator to display winding temperature values in degrees Celsius.

f. Modbus RTU RS485 output /isolated 4-20mA output shall be provided for BMS connection.

g. Temperature controller to be fixed on side cover of the enclosure.

6 MARKING

For each requested transformer, the supplier shall give the following data:

- Manufacturer Name
- Manufacturer Serial Number
- SEC Serial Number (Information shall be filled by SEC)
- Year/Month of Manufacture
- SEC Issued PO Number
- Reference SEC Specification
- SEC Item Code
- SEC Monogram
- Type of Cooling
- Connection Diagram
- Rated power (KVA)
- Rated frequency (HZ)
- Primary voltage (KV)
- Secondary voltage (V)
- Ambient Temperature, (°C)

- Protection degree (IP)
- Length (mm)
- Width (mm)
- Height (mm)
- Total weight (kg)

Nameplate information/entries that are not fixed shall either be engraved or stamped legibly on the blank entries on the nameplate. Blank fillable entries on the nameplates shall have a black background.

7 MONOGRAM & DANGER PLATES

Danger plate and SEC monogram as per SEC drawing Nos. SEC-01-01 and fig. 49A of SEC specification No. 20-SDMS-02 respectively shall be provided and installed at the front (on SEC approved location) of the unit using M5 stainless steel (oval head rounded neck bolts with nuts and external tooth lock washers) not removable/accessible from the front. SEC shall approve location and samples of danger and monogram plates prior the installation.

8 TESTING AND INSPECTION

Cast resin dry type distribution transformer shall be tested in conformance with the applicable requirements of IEC 60076-11.

8.1 Routine Tests

The following tests shall be carried out on all the transformers after the manufacturing, enabling an official test certificate to be produced for each one:

a. Insulation Test
b. Impedance Voltage Test
c. No-load Loss
d. Polarity and Phase-Rotation.
e. Separate-Source AC Withstand Test
f. Induced AC Withstand Voltage Test
g. Partial Discharge Measurement

8.2 Type Tests

Type test shall be performed in complete conformance with the applicable requirements of IEC 60076-1, 2, 3 and 11.

a. Lightning Impulse Test

b. Temperature-Rise Test
c. Short-Circuit Test

Type test shall be performed at SEC approved laboratories. SEC reserves the right to attend and witness the tests. SEC reserves the right to request the supplier/manufacturer to repeat the type test every five (5) years, or as needed should the supplied dry-type transformers have frequent faults and failures.

8.3 Special Tests

a. Measurement of sound level according to IEC 60076-11, and IEC 60076-10
b. Environmental Test according to IEC 60076-11, for E2, and IEC 60076-16
c. Climatic Test according to IEC 60076-11
d. Fire Behavior Test according to IEC 60076-11
e. Measurement of Zero-Sequence Impedance according to IEC 60076-1

8.4 Sample Inspection and Acceptance Testing

8.4.1 Samples together with actual CAD drawings, user manuals and routine test reports shall be subject for inspection/evaluation prior to issuance of approval for mass production.

8.4.2 Sample inspection/evaluation shall be conducted at the manufacturer facilities. The following attributes shall be checked:

a. Dimensional Verification
b. Routine Tests
c. Markings
d. Accessories

8.4.3 Acceptance testing shall be performed to samples selected by SEC authorized personnel prior to issuance of release of the requested batch.

9 PACKING AND SHIPPING

Packing and shipping requirement shall generally be as per latest revision of SEC General Requirements for Equipment/Materials, 01-SDMS-01 or as per purchase order requirements. Each distribution transformers shall be packed as a complete unit and shall be delivered ready for use. Packing shall protect the distribution transformers against damage during shipment and site handling. Suppliers/manufacturers should coordinate with SEC Warehousing Department for additional packing, handling, and or shipping instructions, as applicable.

Packing crates shall be marked with the following information:

a. Manufacturer's Name and Model/Type
b. Country of Origin
c. SEC Purchase Order Number / Tender Number
d. SEC Item Code
e. Gross Weight, (kg)
f. Handling Instructions
g. Final Destination (SEC Warehouse)

10 GUARANTEE

The supplier/manufacturer shall guarantee the products against all defects arising out of faulty design or manufacturing defects or defective materials for a period of five (5) years from the date of delivery.

The supplier/manufacturer shall guarantee the uniformity of the products delivered with the approved samples and drawings.

The supplier/manufacturer shall guarantee that the transformers manufactured under this specification are designed to operate normally indoor at an ambient temperature of 50°C in Saudi Arabia environmental conditions.

11 SUBMITTALS

11.1 Submittals required with tender/inquiry

11.1.1 Summary in table form with the following information: list of items offered, B.O.Q. for each unit offered, manufacturer, origin, catalogue number, and quantity.

11.1.2 Clause-by-clause compliance with the latest revision of this specification.

11.1.3 General arrangement of transformer showing all important dimensions, together with mountings/ accessories.

11.1.4 General arrangement showing masses, main dimensions, arrangement of auxiliary components and the minimum clearances required for ventilation and safety during operation and maintenance.

11.1.5 Foundation plan, including foundation loading

11.1.6 Schematic and connection diagrams covering all equipment pertaining to the transformer

11.1.7 Instrument Schedule

11.1.8 Details of HV Cable Terminations

11.1.9 Details of LV Cable Terminations

11.1.10 Temperature Monitoring System

11.1.11 Details of Housing

11.1.12 Technical Manual giving installation, operation and maintenance instructions

11.1.13 Detailed Summary of Deviations from the Specification

11.1.14 Certificate stating that the raw material has been sampled, tested and inspected in accordance with relevant standard specifications

11.1.15 Product type test and special test reports and certificates carried out from SEC approved laboratories

11.1.16 Filled-up technical data schedule on each of the items offered, e-copy in Excel (*.xlsx) format

11.1.17 Manufacturer CAD drawings like: transformer outlines showing the position of the fittings and attachments, details of the primary and secondary terminals, mounting arrangements, lifting arrangements, cable clamps, etc. E-copies of 3D Step Files with portable viewers, and AutoCAD 2013 (*.dwg) format, for each of the items offered

11.1.18 USB Flash Drive containing e-copy of all the documents mentioned above

11.2 Submittals required following award of contract

11.2.1 Fabrication CAD drawings.
11.2.2 Quality assurance tests.
11.2.3 Manufacturing and routine test schedules.
11.2.4 Special tests, if applicable.
11.2.5 USB Flash Drive containing e-copy of all the documents mentioned above.

12 TECHNICAL DATA SCHEDULE:

12.1 The vendor shall complete and return one copy of the attached data Schedule with quotation. In addition to data Schedule, clause-by-clause compliance to this specification shall be confirmed/ submitted.

12.2 Detail dimensional drawing of each item shall be submitted.

12.3 Type test certificates.

TECHNICAL DATA SCHEDULE

ENCLOSED DRY-TYPE DISTRIBUTION TRANSFORMERS

SEC Inquiry No. _____ *Item No.* _____

No	Description	SEC Specified Values (*)	Vendor Proposed Values (**)
1	**General**		
1.1	Reference Manufacturing Standard	IEC 60076-11	
2	**Design Requirements**		
2.1	Type	Dry-Type (Cast-Resin)	
2.2	Number of Phase	3	
2.3	Number of Windings	2	
2.4	Material of Windings	Aluminium	
2.5	Rated Frequency, Hz	60	
2.6	Rated Primary Voltage, kV	13.8 / 33	
2.7	Rated Secondary Voltage, V	400/230	
2.8	Cooling	AN / AF	
2.9	Vector Group	Dyn11	
2.10	Rated impedance % voltage at 120° C	5 / 6	
2.11	Noise Level, dB	As per table 4	
2.12	Short-Circuit Withstand for 2 Seconds, kA	*	
2.13	Degree of Protection (IP Code), Enclosure	IP 31	
3	**Insulation Level**		
3.1	Impulse Withstand Voltages (BIL): - Primary Winding, kV_{peak} - Secondary Winding, kV_{peak}	200 / 170/ 110 / 95	
3.2	Separate-source Power Frequency Test Voltage: - Primary Winding, kV_{rms} - Secondary Winding, kV_{rms}	70 / 38 10 / 3	
3.3	Induced Overvoltage withstand Test: - Primary Winding, kV_{rms} - Secondary Winding, kV_{rms} - Test Frequency, Hz		

TECHNICAL DATA SCHEDULE

ENCLOSED DRY-TYPE DISTRIBUTION TRANSFORMERS

SEC Inquiry No. _____ *Item No.* _____

No	Description	SEC Specified Values (*)	Vendor Proposed Values (**)
4	**Constructional Features**		
4.1	Flux Density at Rated Voltage and Frequency, T		
4.2	Specific Loss in Core Laminations, Watt/kg		
4.3	Insulation Core Laminations		
4.4	Winding Conductor Material: - Primary Winding - Secondary Winding	 Aluminium Aluminium	
4.5	Winding Conductor Shape: - Primary Winding - Secondary Winding		
4.6	Winding Resistance at 20°C per Phase at Principal Tap: - Primary Winding, Ohm - Secondary Winding, Ohm		
4.7	Maximum Current Densities in Windings at Normal Rating and Principal Tap: - Primary Winding, A/mm² - Secondary Winding, A/mm²		
4.8	Material of Winding Insulation		
4.9	Grade and Type of Core		
5	**Ratings**		
5.1	Nominal Transformer Rating at Principal Tapping		
5.2	Normal Rated Current: - Primary, A - Secondary, A		
5.3	Design Continuous Ambient Temperature, °C		
6	**Losses**		
6.1	Core Loss (No-Load Loss), $kW_{(max)}$		
6.2	Winding Loss (Load Loss) at 120°C: - Principal Tap, $kW_{(max)}$ - Tapping with Highest Losses, $kW_{(max)}$		
6.3	Magnetizing Current, A		

TECHNICAL DATA SCHEDULE

ENCLOSED DRY-TYPE DISTRIBUTION TRANSFORMERS

SEC Inquiry No. _____ *Item No.* _____

No	Description	SEC Specified Values (*)	Vendor Proposed Values (**)
7	**Emergency Loading**		
7.1	Maximum Duration of Overload at 30°C: - 133%, minutes - 150%, minutes		
8	**Tap Changer**		
8.1	Type	**	
8.2	Make	**	
8.3	Rated Current, A	**	
8.4	Rated Step Voltage, V	**	
8.5	Voltage Class, kV	**	
8.6	Taps (Off-load) on Primary: - Tapping Range, ±% - Number of Taps - Plus Steps, % - Minus Steps, %	 5 5 +2.5, +5 -2.5, -5	
9	**Temperature-Rise**		
9.1	Maximum Average Winding Temperature-Rise, °C	as per IEC 60076-11	
9.2	Maximum Hot Spot Temperature, °C	as per IEC 60076-12	
9.3	Temperature-Rise Due to Short-Circuit Current Above hottest Spot After Full-Load, °C	200	
10	**Dimensions and Mass**		
10.1	Overall Dimension of Completely Assembled Transformer with Enclosure: - Width, mm - Depth, mm - Height, mm		
10.2	Mass: - Mass of Core of Winding, kg - Total Mass of Completely Assembled Transformer, kg - Shipping Mass, kg		

TECHNICAL DATA SCHEDULE

ENCLOSED DRY-TYPE DISTRIBUTION TRANSFORMERS

SEC Inquiry No. _____ *Item No.* _____

No	Description	SEC Specified Values (*)	Vendor Proposed Values (**)
11	**Primary (HV TERMINALS)**		
11.1	Manufacturer		
11.2	Origin		
11.3	Material / Color		
11.4	Rated Current, A		
11.5	Rated Thermal Current: - 1 Second, kA - 3 Seconds, kA		
11.6	Impulse Withstand Voltage, kV_{peak}		
11.7	Impulse Flashover Voltage, kV_{peak}		
11.8	Power Frequency Withstand Voltage: - Dry, kV_{rms} - Wet, kV_{rms}		
11.9	Power Frequency Flashover Voltage: - Dry, kV_{rms} - Wet, kV_{rms}		
11.10	Puncture Voltage, kV		
11.11	Maximum Withstand Salinity, kg/m^3		
11.12	Maximum Withstand Voltage at $224kg/m^3$ salinity at 20°C, kV		
11.13	Total Creepage Distance, mm		
12	**Secondary (LV TERMINALS)**		
12.1	Manufacturer		
12.2	Origin		
12.3	Material / Color		
12.4	Rated Current, A		
12.5	Rated Thermal Current: - 1 Second, kA - 3 Seconds, kA		

TECHNICAL DATA SCHEDULE

ENCLOSED DRY-TYPE DISTRIBUTION TRANSFORMERS

SEC Inquiry No. _____ *Item No.* _____

No	Description	SEC Specified Values (*)	Vendor Proposed Values (**)
12.6	Impulse Withstand Voltage, kV_{peak}		
12.7	Power Frequency Withstand Voltage: - Dry, kV_{rms} - Wet, kV_{rms}		
12.8	Total Creepage Distance, mm		
13	**Supplementary Fittings**		
13.1	Is the transformer fitted with all the accessories mentioned in this specification?	Yes	
14	**Testing**		
14.1	Product is Type Tested	Yes	
14.2	SEC Approved Laboratory	**	
14.3	Date Tested	**	
14.4	Manufacturer	**	
14.5	Model/Type	**	
14.6	Country of Origin	**	
14.7	Submittals Required with Tender/Inquiry Included or Not?	**	

TECHNICAL DATA SCHEDULE

ENCLOSED DRY-TYPE DISTRIBUTION TRANSFORMERS

SEC Inquiry No. _____ *Item No.* _____

Additional Technical Information or Features Specified by SEC

Additional Supplementary Data or Features Proposed by Bidder/Vendor/Supplier.

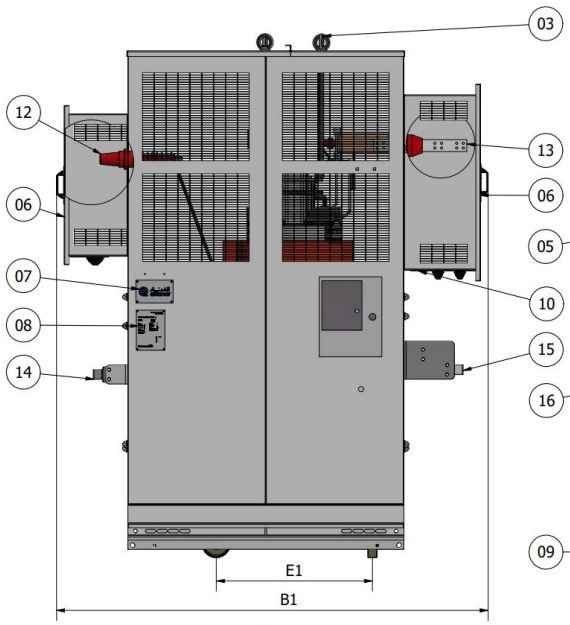
Other Particulars to be filled-up by the Bidder/Vendor/Supplier.

List of Deviations and Clauses to which exception is taken by the Bidder/Vendor/Supplier. (Use separate sheet, if necessary).

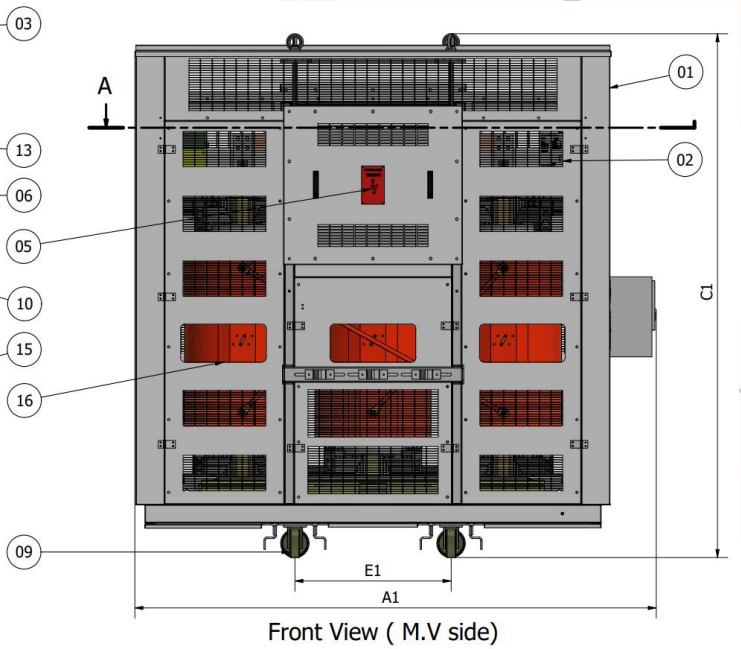
Description	Manufacturer of Material/Equipment	Vendor/Supplier
Name of Company		
Location and Office Address		
Name and Signature of Authorized Representative with Date		
Official Seal / Stamp		

13 DRAWINGS:

13.1 Transformer with Enclosure IP31.

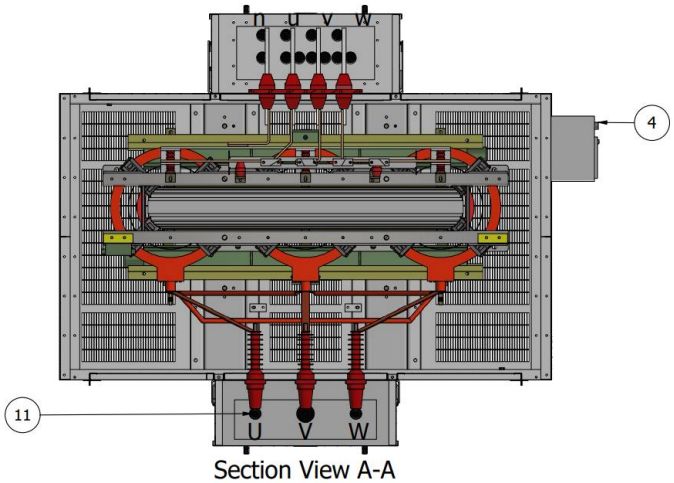


Side View



Front View (M.V side)

Items Table	
No.	Description
01	Metal Enclosure
02	Ventilation Slots
03	Lifting eye
04	Control and Termination Box
05	Danger Plate
06	Removable Cover
07	Logo Plate
08	Name Plate
09	Bi-directional roller wheels
10	L.V Lower cable entrance
11	M.V lower cable entrance
12	M.V Bushing
13	L.V Bushing
14	M.V Clamp
15	L.V Clamp
16	HAND HOLE WITH TRANSPARENT COVER



Section View A-A

13.2 Transformer without the enclosure: