وزارة الكهرباء والماء والطاقة المتجددة
Ministry of Electricity & Water & Renewable Energy
State of Kuwait | دولـــة الكويـت

قطاع شبكات التوزيع الكهربائية

كراسة الأسس والمعايير لتأهيل مصانع محولات توزيع كهربائية جافة جهد 0.433/11 ك.ف.

PRE-QUALIFICATION OF MANUFACTURERS FOR THE MANUFACTURE OF DRY TYPE (CAST RESIN) DISTRIBUTION TRANSFORMERS

تمهيد

ترغب وزارة الكهرباء والماء والطاقة المتجددة في تأهيل المصـــانع لتصـــميم وتصـــنيع محولات التوزيع الكهربـائيـة الجـافـة 11/0.433 ك.ف وذلـك عبر اعتمـاد الوزارة للتصـاميم الهندسية التصـنيعية للمنتج وفق المواصـفات الفنية المذكورة في الكراسـة وتقديم المصـنع للمخططات الهندسـية وكافة المتطلبات المذكورة في المسـتندات الواجب تقديمها والمذكورة في اشـتراطات الكراسـة ، على ان يقدم المصـنع ما يثبت قدرته التصـنيعية لاعتماده كمصـــنع وذلك من خلال تقديم شـــهادات الفحص النوعي والتقارير الفنية لتلك الاختبارات كما هو مذكور في كراسة التأهيل.

1. أسس ومعايير المتطلبات المالية :

1) أن تكون الميزانية العمومية لآخر ثلاث سنوات مالية منفصلة مدعمة بتقرير مدقق الحسابات للشركة / للمصنع عن كل سنة مالية متضمنة بيان المركز المالي وقائمة الدخل على أن يكون مكتب التدقيق معتمد من قبل وزارة التجارة والصناعة وذلك للشركات / المصانع (المحلية).
2) على الشركات الأجنبية/ المصانع الأجنبية تقديم المستندات المالية على أن تكون معتمدة من مكتب تدقيق في بلد الشركة / المصنع وموثقة من السفارة الكويتية في بلد المنشأ والخارجية الكويتية بدولة الكويت.
3) أن تكون الشركة المحلية /الاجنبية و المصنع المحلي / الأجنبي قد حققت أرباحاً في كل سنة عن آخر ثلاث سنوات مالية.
4) إذا لم يتحقق شرط الربح في السنة من الثلاث سنوات المذكورة في البند ثالثا أعلاه، فإن على الشركة المحلية والمصانع المحلية تقديم كتاب البنك يبدي استعداده لمنحها تسهيلات بنكية.

2. أسس ومعايير المتطلبات القانونية :

– كتاب من الشركة / المصنع يطلب من خلاله التأهيل مع كافة المرفقات والمستندات (المالية والقانونية والفنية) والتعهد بأن كافة المستندات والمرفقات صحيحة وخالية من التدليس.

2.1. المستندات القانونية المطلوبة للشركات / المصانع المحلية:

- صورة من عقد تأسيس الشركة / المصنع.
- صورة شهادة غرفة التجارة والصناعة بالكويت لهذه السنة.
- صورة السجل التجاري للشركة / المصنع
- صورة شهادة تسجيل لدى الجهاز المركزي للمناقصات العامة وتكون سارية.
- صورة شهادة نسبة العمالة الوطنية وتكون سارية.
- صورة رخصة الشركة / المصنع لدى وزارة التجارة والصناعة وتكون سارية .
- مستخرج وزارة التجارة والصناعة لمن له حق الادراة بالشركة / المصنع.
- براءة ذمة من قطاع خدمات العملاء من الوزارة.

2.2. المستندات القانونية المطلوبة للشركات والمصانع الأجنبية (مع الوكيل المحلي / مستقل بذاته:

2.2.1. في حال مستقل بذاته يتم تقديم:

- الكيان القانوني للشركة الأجنبية / للمصنع الأجنبي معتمد من الجهات الرسمية في بلد المنشأ، ومن ثم إعتمادها من السفارة الكويتية أيضاً في بلد المنشأ والخارجية الكويتية بدولة الكويت وترجمتها إلى اللغة العربية من مكتب ترجمة معتمد داخل دولة الكويت.

2.2.2. في حال وجود وكيل محلي يتم التقديم:

- إتفاقية الوكالة بين الشركة الأجنبية / المصنع الأجنبي والوكيل المحلي معتمد من الجهات الرسمية في بلد المنشأ (الدولة الأجنبية) ومن ثم اعتمادها من السفارة الكويتية في بلد المنشأ واعتماد الاتفاقية من الجهات الرسمية في دولة الكويت (وزارة العدل / وزارة الخارجية) وترجمتها إلى اللغة العربية من مكتب ترجمة معتمد داخل دول الكويت.
- شهادة قيد الوكالة صادرة من وزارة التجارة والصناعة بين الشركة الأجنبية / المصنع الأجنبي والوكيل المحلي تكون سارية المفعول.
- كافة المستندات القانونية المطلوبة للشركات المحلية في حال تأهيل شركة أجنبية / مصنع أجنبي مع وكيل محلي لها داخل دولة الكويت.

3 .المستندات الفنية الواجب تقديمها:

1)تقديم شهادات الفحص النوعي type test والتقارير الخاصة بها (مشابهة أو مماثلة لأي جهد من الجهود بين جهد 11 ك.ف. إلى جهد 33 ك.ف. بغض النظر عن أية اشتراطات فنية مذكورة في المواصفات الفنية للكراسة) على جميع أجزاء المحول بالكامل تبين قيام المصنع بعمل الاختبارات النوعية بنجاح لمحولات التوزيع الكهربائية الجافة في مختبرات عالمية محايدة التالية:

(ANY MEMBER OF STL LIAISON - ASTA, CESI, CPRI, ESEF, JSTC, KEMA, KERI, PEHLA, SATS, STLNA, VEIKI OR, ZKU) OR (ANY INTERNATIONAL REPUTED ELECTRICAL TESTING ACCREDITATION THE LABORATORY AUTHORITY HAS CERTIFICATE ISO/IEC 17025- SHALL BE ACCREDITED WITH THE INTERNATIONAL STANDARD SELF ISO/IEC 17025 BY AN ACCREDITATION BODY THAT IS IT ACCREDITED IN ACCORDANCE WITH ISO/IEC 17011, EITHER THROUGH THE GCC ACCREDITATION CENTER OR THROUGH THE INTERNATIONAL LABORATORY ACCREDITATION COOPERATION (ILAC).) (TYPE TEST IN FACTORY IS NOT ACCEPTED).

2) تقديم المخططات القياسية (Fully dimensional drawings) للمعدة مع ذكر تفاصيل تبين جميع أجزاءها.
3) يجب على المصنّع الإلتزام بمواصفات و شروط وزارة الكهرباء و الماء المذكورة في كراسة التأهيل.
4) يجب على المصنع استيفاء و استكمال جميع الجداول الفنية و البيانات المطلوبة والمستندات الفنية في كراسة التأهيل بالكامل دون نقصان مع توفير جميع المستندات الفنية المطلوبة و يحق للوزارة طلب أي نسخة أصلية للتأكد من مطابقتها لنسخ المستندات المرفقة.

4. المستندات الفنية للاسترشاد في الدراسة الفنية (في حالة توفرها):

1) تقديم كتالوجات تبين مراحل تصنيع المعدة المراد تأهيلها و نبذة من تاريخ المصنع و مكانه وتفاصيل المواد الأولية المكونة للمادة.
2) تقديم معلومات عن الخبرة السابقة للمصنّع في مجال التأهيل مع ذكر عدد و قيمة الأعمال المنفذة و الجاري تنفيذها وتقديم شهادات موثقة من العملاء تثبت كفاءة المصنع في تصنيع المواد و أن يكون مدون بها رقم العقد و إسم المشروع و قيمتها المالية و مدة التوريد و بداية التعاقد وانتهاء التنفيذ.

5. تعليمات عامة:

1) جميع الوثائق و المستندات المقدمة من المصانع (خارج دولة الكويت) يجب أن تكون مصدقة و موثقة من جهات الإختصاص و من سفارة دولة الكويت في بلد المنشأ لإثبات صحتها و سريان مفعولها.
2) يجب أن تكون جميع المستندات و البيانات المقدمة من قبل المصانع واضحة ومتسلسلة.

ملاحظة: يتم تقديم شهادات اختبار النوع (type test certificate) لمحولات التوزيع الكهربائية الجافة 11/0.433 ك.ف في مناقصات قطاع شبكات التوزيع الكهربائية وذلك عند تقديم العطاء في المناقصة على ان تكون هذه الشهادات صادرة من المختبرات التالية:

[ANY MEMBER OF STL LIAISON - ASTA, CESI, CPRI, ESEF, JSTC, KEMA, KERI, PEHLA, SATS, STLNA, VEIKI OR, ZKU] OR [ANY INTERNATIONAL REPUTED ELECTRICAL TESTING ACCREDITATION THE LABORATORY AUTHORITY HAS CERTIFICATE ISO/IEC 17025- SHALL BE ACCREDITED WITH THE INTERNATIONAL STANDARD ISO/IEC 17025 BY AN ACCREDITATION BODY THAT IS IT SELF ACCREDITED IN ACCORDANCE WITH ISO/IEC 17011, EITHER THROUGH THE GCC ACCREDITATION CENTER OR THROUGH THE INTERNATIONAL LABORATORY ACCREDITATION COOPERATION (ILAC)].

والتي تبين اجتيازه لكافة الاختبارات المنصوص عليها في معايير اللجنة الكهروتقنية الدولية (IEC) حسب مواصفات الوزارة المستخدمة في الشبكة الكهربائية في دولة الكويت مع تقديم الكتالوجات الفنية الخاصة بمحولات التوزيع الكهربائية الجافة 11/0.433 ك.ف

TECHNICAL SPECIFICATIONS OF EQUIPMENT

DRY TYPE (CAST RESIN) DISTRIBUTION TRANSFORMERS

1. GENERAL:

1.1 MINISTRY SYSTEM:

The equipment covered by this specification is for extending the ministry existing distribution system and shall be suitable in all respects for connection to the existing system, characteristics of which are:-

System voltage	: 11 KV	415 volts
System Highest Voltage	: 12KV	457 volts.
Frequency	: 50 Hz	50 Hz.
Neutral Point	: Solidly earthed or through Low Resistance	Solidly earthed.
Maximum fault level	: 31.5KA	50 KA
Maximum fault duration	: 1.25 sec.	0.5 seconds.

1.1 CLIMATIC CONDITIONS:

THE EQUIPMENT IS FOR CONTINUOUS SERVICES IN KUWAIT AND THE CLIMATIC CONDITIONS UNDER WHICH IT WILL OPERATE ARE TO BE CONSIDERED THROUGHOUT THE DESIGN.

Climatic conditions in Kuwait are rigorous and the Summer season during which the equipment will function under continuous maximum load condition is long and shall be considered to fall during the period starting from 15th of April till 15th of November. The remainder of the year shall be considered as winter season since Autumn and Spring seasons are very short in Kuwait.

THE FOLLOWING ARE PREVAILING ATMOSPHERIC CONDITIONS BASED ON THE LATEST RECORDS:

Ambient temperature in shade	:	Maximum 55 Degrees C (summer day)
Ambient temperature in shade	:	Minimum – 6 Degree C
(winter night) Maximum sun radiation temperature as measured with a black bulb thermometer	:	85 Degrees C.
Average maximum ambient temp.	:	45 Degrees C.

Periods of high humidity are common and a humidity of 100% has been recorded at 30 degrees centigrade. However, high temperature is normally accompanied with low humidity. Violent sand and dust storms occur with wind speeds up to 120 km/hour (Gust 160 km/hour), and even on comparatively still days, fine dust is carried in suspension in atmosphere. The average rainfall is of the order of 15 cms., but this may be concentrated in 2 or 3 severe downpours.

The equipment required under these specifications shall give continuous and trouble-free service under the arduous conditions mentioned above.

1.2 STANDARD SPECIFICATIONS:

A) All materials and equipment shall comply as a minimum with:

i) The latest relevant recommendations of the International Electro-Technical Commission (I.E.C) if available.

ii) If (i) above is not available, with the latest relevant British Standard Specifications (B.S.S).

This applies to quality of material and testing … etc... If standard as mentioned above contradict with this specification then the requirements of this specification shall apply.

A) Manufacturers who manufactures equipment based on standards other than those mentioned under item "A" above must confirm that such standards meet the requirements under "A" as a minimum and must also prove this by type test certificate.

B) What is mentioned under item, "A" and "B" above applies to wherever B.S.S. is mentioned in the different clauses of this specification.

2. TECHNICAL SPECIFICATIONS:

2.1 TYPE:

Three phase, Cast-Resin, naturally cooled, core type power distribution transformer.

The transformer shall be in accordance with the IEC No. 60076-11 or equivalent except where stated otherwise.

2.2 INSTALLATION:

Generally, the Transformers will be installed indoor but stored outdoor (thus it will be exposed to direct sun rays) and they shall be capable of carrying their full rated current under Kuwait's worst temperature conditions as specified.

NOTE:

THE CAST RESIN TRANSFORMERS ARE TO BE DESIGNED FOR INSTALLATION OVER CONCRETE FOUNDATIONS OF (1.6 X 0.7 M) and (1.6 X 1.1 M).

2.3 NORMAL RATING:

The normal rating shall be the maximum continuous rating under the worst temperature conditions encountered in Kuwait (see climatic conditions).

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Manufacturers shall state in the schedule the equivalent British Standard specification or the International Electro Technical Commission rating for the transformer.

The Kuwait continuous rating should not be more than 80% of the IEC Recommendations / British Standard specifications continuous rating.

2.4 VOLTAGE RATIO:

The normal voltage ratio of the transformers at normal tapping and no load shall be 11/0.433 KV.

2.5 DUTY UNDER FAULT CONDITIONS:

The transformers shall be capable of sustaining a three phase symmetrical short circuit current on the L.V. side with a fault power being maintained on the H.V. side and without damage to the transformer for a period of **three seconds** (at tap position 3).

2.6 IMPEDANCE VOLTAGE:

The impedance voltage at normal rating and voltage, and at 115 degree C shall be 6 % and stated in the schedules.

2.7 TEMPERATURE RISE:

The transformers shall be capable of carrying its full normal rated current continuously under the worst temperature conditions encountered in Kuwait, and at any tapping, without the temperature rise of winding (both H.V & L.V) exceeding 75 degree centigrade measured by resistance.

Any transformer exceeding the above temperature rise limits will be rejected.

2.8 CONNECTION & RATIO:

The transformers are to be wound to International Electro-Technical commission No. 60076, Vector symbol Dyn11 with normal voltage ratio on normal tapping at no load and neutral point brought out on
L.V. side .

2.9 COOLING:

The transformers shall be cooled by natural circulations of air, and due note should be taken of the site conditions.

2.10 CORE:

The core shall be constructed of the best quality low loss, high permeability cold rolled, grain oriented electrical steel laminations. **The flux density in any part of the core shall not exceed 1.6 TESLA at normal voltage and frequency.**

2.11 WINDING AND INSULATION LEVEL:

All windings shall be made of high conductivity conductors of best quality and shall be fully insulated to IEC 60076-11, Insulation Level List 2, Table V, and for a system highest voltage of 12.0 KV. The insulation shall be Class "F" to British Standard Specification No. 2757.

The HV-LV winding shall be (CU.– CU.) or (Al.– Al.) or (CU.– Al.), and can be (wire/foil/ sheet).

Both H.V. and L.V. windings shall be cast under vacuum into moulds with reinforced epoxy resin. The windings shall be non-flammable to a reasonable and practical degree, and shall be self-extinguishing.

The transformers shall be protected against thermal overload by the use of two sensors embedded in L.T. windings; one for alarm and the other for tripping. The connections for these sensors must be brought out to a terminal block. The relay is to be fixed in a separate box fixed on the housing with suitable connection from the L.V. cable end box with related terminal block.

2.12 OFF CIRCUIT TAPPING:

Off circuit tapping shall be provided on the center (both electrical and mechanical) of the H.V. windings. These shall be arranged as follows:

Normal Voltage, + 2.5%, - 2.5%, + 5%, – 5%

The transformer shall be capable of operation at its rated KVA without injury on any tapping and at any applied voltage which does not vary from the voltage for which the tapping is rated by more than +5%.

The tap changer is to be protected by a transparent dust proof box. A stainless steel engraved caution plate of adequate thickness and dimensions stating that the tap changer is to be changed only after disconnecting the transformer from both HV and LV sides is to be fixed on the transformer housing on the access cover to the tap changer (Stickers are not accepted).

2.13 HOUSING:

The housing shall be constructed of hot-dip galvanized steel 3 mm. thick with the necessary reinforcing sections.

Suitable lifting lugs must be provided to enable the transformer to be lifted by means of an overhead crane and slings. Suitable lugs shall be provided on the housing to facilitate its removal.

The housing shall be provided with two suitably located earthing studs connected in a ring through 5x30 mm. Tinned Copper strip. All transformers shall be fitted with jacking lugs located at a suitable height from ground level.

The housing shall provide protection against contact with any live part, and also to protect the equipment against mechanical damage. Appropriate class or degree of protection shall be clearly stated (not less than IP-23). The housing shall be finished both internally and externally with powder coating paint.

The housing shall be well ventilated by having suitable perforations in the bottom plate and on the upper parts of the sides. The perforations must be an integral part of the housing (not removable).

The construction of the housing shall be such that the accumulation of fine sand and dust is avoided to a practical degree.

The housing shall have an easy access to the tap changer by means of a removable cover specially when high voltage and low voltage cables are connected.

2.14 RATING AND TERMINAL MARKING PLATES:

Substantial brass or stainless steel diagram and rating plates in accordance with International Electro- Technical Commission No. 60076 and British Standard Specification No. 171 shall be fixed to each transformer giving full detailed information.

All of the plates shall be made of Substantial Brass or stainless steel 2 mm. thick and the marking and writing shall be laser printed therein to a depth of not less than 0.5 mm. The background shall be filled in black for the rating plate and in red / yellow for the other terminal, caution and danger plates.

The transformer is to be provided with (2) two 200 mm. x 300 mm., 2mm. thick blank white traffolite plate for the Transformer Circuit No.

2.15 NUTS AND BOLTS:

All nuts and pins shall be high tensile zinc coated steel alloy and locked in position in an approved manner with the exception of those external to the transformer where locking may be omitted.

2.16 CABLE TERMINATIONS:

The transformer shall be provided with suitable cable termination boxes on both H.V. and L.V. sides. The cable terminals shall be of ample dimensions to render easy connection of cables. H.V. & L.V. cable terminals shall be arranged on the opposite sides of the transformer and shall be suitable for bottom entry vertically arranged cables. The gland plates at the bottom of the H.V and L.V cable termination boxes shall be completely removable from the outside, and shall be with condensation socket. Suitable steel brackets complete with cleats and clamps of non-magnetic metal (wooden clamps of any kind will not be acceptable) to support both high and low voltage cables, shall be provided. The bottom of the cable glands of cable end boxes shall not be less than 600 mm. above the base of the transformer. The sheet thickness for HV/LV cable box to be 3mm thick.

A) H.V. SIDE:

The H.V. cable end box shall be provided with H.V. bushing suitable for heat shrinkable cable terminations. The cable terminals shall be suitable for 11 KV 3-Core 300 sq. mm. stranded AL. or Copper conductor XLPE insulated, steel wire armoured and PVC served cable. The cable end box shall facilitate easy access, jointing and allowing crossing of cores without damage to insulation but the vertical distance from the cable crutch to the center line of the bushing terminals shall not be less than 570 mm.

11 KV cable end box shall be designed to fit with compression type cable gland to BS6121 pt.1, type C 90 made of brass and copper bonding strip of 5 x 30 mm. for earth connection to the main earth of the transformer.

The HV terminals of the transformers are to be marked clearly outside and inside cable end box. Identification of the phases using stickers is not acceptable. The phasing order shall be ("R-Y-B" / "A- B-C").

B) L.V. SIDE:

The L.V. cable end box shall be provided with a 10 mm. thick insulation barrier and phase support insulators. The distance between bushing terminals and the compression gland shall not be less than 350 mm. The bottom plate of the (0.433 KV) cable termination box must be of non-magnetic material.

The LV terminals of the transformers are to be marked clearly outside and inside cable end box Identification of the phases using stickers is not acceptable. The phasing order shall be ("b-y-r-n" / "c-b- a-n")

The cable termination box shall be suitable to receive seven (2 per phase & 1 for neutral) single cores 630 sq.mm., seven (2 per phase & 1 for neutral) single cores 800 sq.mm. and eleven (3 per phase & 2 for neutral) single cores 800 sq.mm. stranded CU/XLPE/PVC cables, respectively for 1000, 1250 and 1600 KVA transformers.

3. TYPE TESTS ON EQUIPMENT:

The Dry Type (Cast Resin) distribution transformers [match or similar for any voltage between (11 KV to 33 KV) irrespective to any technical parameters stipulated in PQ document] shall undergo type tests as stipulated in the relevant IEC/BS, which shall be carried out in full compliance with the standard [as clause 1. general (MINISTRY SYSTEM, CLIMATIC CONDITIONS, STANDARD SPECIFICATION] from an independent acknowledged international testing laboratory (Type test certificates issued from independent acknowledged international testing laboratory (ANY MEMBER OF STL LIAISON - ASTA, CESI, CPRI, ESEF, JSTC, KEMA, KERI, PEHLA, SATS, STLNA, VEIKI or, ZKU)) or (any international reputed electrical testing accreditation authority has certificate ISO/IEC 17025-The laboratory shall be accredited with the international standard ISO/IEC 17025 by an Accreditation Body that is itself accredited in accordance with ISO/IEC 17011, either through the GCC Accreditation Center or through the International Laboratory Accreditation Cooperation (ILAC)). (type test in factory is not accepted).

The following type tests shall be carried out on transformer:-

1-(a) Ability to withstand short circuit test on one transformer of each size.

(b) The transformer shall be capable of sustaining a three phase symmetrical short circuit current on the LV side with a fault power being maintained on the HV side and without damage to the transformer for a period of three seconds. This is to be verified by testing, not by calculations. So, in addition to the above mentioned test No. "1-(a)" above, the transformer is to be tested three shots short circuit test for a current duration of (3) three seconds on tap position No. 3.

The percentage change in the transformer reactance before and after the short circuit withstand test is to be mentioned in the Test Certificate, and should be in accordance with the IEC No. 60076

2- Temperature rise tests on one transformer of each size in accordance with IEC 60076-11 for:
a- Continuous maximum rating under Kuwait conditions.
b- Equivalent to B.S. continuous maximum rating.

3- Impulse voltage withstand test on one transformer of each size. The test shall be applied on each H.V. winding and shall be in accordance with IEC 60076-11.

The following additional tests shall also be carried out on the transformer.

1- Partial discharge test.

2- Noise level test.

3- Fire behaviour test.

4- Condensation and humidity test.

4. DATA TO BE SUBMITTED:

The manufacturer of the transformer shall submit the following technical data for the pre-qualification study.

1. All the technical schedules filled correctly and fully.
2. General layout drawing to Scale and in A-1 sized sheets showing front elevation, side elevation and plan elevation with all the fittings and major dimensions for each size of transformers.
3. General layout drawing to Scale and in A-1 sized sheets showing construction details as required in clause (2.16: "Construction Details") of the specification, for each size of transformers.
4. General layout of tap-changer showing constructional details for each size of transformers.
5. General layout of H.V. & L.V. cable end boxes with all fittings and major dimensions for each size of transformers.
6. General layout drawing showing the earthing inside the transformers.
7. General layout of relay box with MCB's and terminal blocks.
8. General layout of the transformer base showing the skids details.
9. Assembly of clamps, bushing and glands.
10. Type test certificate along with complete type test reports for the transformers as clause (3) (TYPE TESTS ON EQUIPMENT).
11. Other documents as specified in different clauses of the specification

دولـة الـكويـت

STATE OF KUWAIT

Ministry of Electricity, Water, and Renewable Energy

وزارة الـكـهـرباء والـمـاء والطاقة المتجددة

SCHEDULE "A"

TECHNICAL SCHEDULE & GUARANTEED PARTICULARS FOR

DRY TYPE (CAST RESIN) DISTRIBUTION TRANSFORMERS

S.No.	Description	1000 KVA TR.	1250 KVA TR.	1600 KVA TR.
1.	Continuous rating under Kuwait conditions (KVA)			
2.	Equivalent IEC/BSS continuous rating (KVA)			
3.	Normal voltage ratio at normal tapping (KV)			
4.	Maximum temperature rise at normal rating			
	Of winding			
5.	Iron loss (normal volt) on normal tapping (KW)			
6.	Winding loss at normal full load and 115 degree			
	Centigrade (KW)			
7.	Magnetizing current (Normal Volts) appr. % F.L.C.			
8.	Impedance voltage at normal tapping and			
	Frequency and at 115 degree Centigrade and			
	Normal rating %			
9.	Regulation at 1.0 P.F. %			
10.	Regulation at 0.8 P.F. lagging %			
11.	Partial discharge at 2 times the normal rated			
	Voltage			
12.	Partial discharge at 1.6 times the normal rated			
	Voltage.			
13.	Efficiency at: - 125% load at 0.8 P.F. % - 100% load at 0.8 P.F. % - 75 % load at 0.8 P.F. % - 50 % load at 0.8 P.F. %			
14.	Watts loss per kg. of iron at 1.6 Tesla (Watts)			
15.	Watts loss per Kg. winding at rated load (Watts)			

SIGNED : .....
(MANUFACTURER)

NAME : .....

ADDRESS : .....

DATE : / /**20**

SIGNED : .....
(LOCAL AGENT)
(if applicable)

NAME : .....

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DATE : / /**20**

SCHEDULE "A" (CONT'D…)
TECHNICAL SCHEDULE & GUARANTEED PARTICULARS
FOR DRY TYPE (CAST RESIN) DISTRIBUTION
TRANSFORMERS

S.No.	Description	1000 KVA TR.	1250 KVA TR.	1600 KVA TR.
16.	Maximum flux density in core (Tesla)			
17.	Maximum flux density in yoke (Tesla)			
18.	Primary Winding : a) Shape of AL/Copper conductor b) Cross-sectional area of AL/Copper conductor Sq.mm c) Maximum current density Amps/sq mm d) Type of winding AL/CU(wire/foil/sheet)			
19.	Secondary winding : a) Shape of AL / Copper conductor b) Cross-sectional area of AL / Copper conductor Sq.mm.. c) Maximum current density. Amps/sq mm d) Type of winding AL/CU (wire/foil/sheet)			
20.	Thickness of Transformer Housing:			
	a) Sides (mms)			
	b) Bottom (mms)			
	c) Top (mms)			
21.	Insulation resistance of windings (after vacuum			
	Drying process) (M. Ohm)			
22.	Weights:			
	a) Core & Winding (M. Ton)			
	b) Transformer as shipped (M. Ton)			
23.	Overall Dimensions of Housing			
	a) Height (Max. 2.650 Metres)			
	b) Length (Max. 2.500 Metres)			
24.	c) Width (Max. 2.000 Metres) Protection degree			

SIGNED : ..... **(MANUFACTURER)**

NAME : .....

ADDRESS : .....

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DATE : / /**20**