

Title: **MEDIUM VOLTAGE CT-VT
METERING UNITS WITH
NOMINAL VOLTAGES FROM
6.6KV TO 33KV STANDARD**

Unique Identifier: **240-56065032**

Alternative Reference Number: **34-870**

Area of Applicability: **Engineering**

Documentation Type: **Standard**


Revision: **2**

Total Pages: **70**

Next Review Date: **August 2025**

Disclosure Classification: **Controlled
Disclosure**

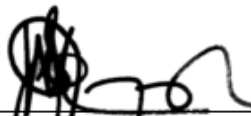
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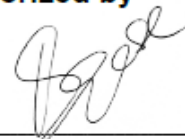
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1. Introduction

This requirement is for the combined current and voltage transformer metering units, and this standard is based upon the following specifications: IEC 61869 – 1, Instrument transformers – Part 1: General requirements and IEC 61869 – 4, Instrument transformers – Part 4: Additional requirements for combined transformers.

This standard was prepared on behalf of the Steering Committee for Technology (SCOT). It has been approved by the committee for use by Distribution Group as a requirement standard when purchasing CT-VT metering units for medium – voltage systems with nominal voltages from 6.6kV up to and including 33kV.

2. Supporting clauses

2.1 Scope

This standard contains Distribution Group's minimum requirements for the selection, manufacture, testing and supply of outdoor type CT-VT (combination current and voltage transformer) metering units. It is applicable to medium-voltage units for three-phase systems with AC nominal voltages from 6.6kV to 33kV and for 19kV (33 kV/ $\sqrt{3}$) SWER (single wire earth return) systems. The standard covers units intended for both overhead line and underground cable systems and distinguish between units for inland and coastal applications.

The tests prescribed in this standard will evaluate the performance capabilities of medium – voltage CT-VT metering units. The test methods are based on the IEC 61869-4 specification.

2.1.1 Purpose

This document standardises Distribution Group's requirements for CT-VT metering units to ensure that CT-VT metering units used across Distribution operating units are standard.

2.1.2 Applicability

This document shall apply throughout Eskom Holdings Limited, its Divisions, subsidiaries and entities wherein Eskom has a controlling interest.

2.2 Normative/informative references

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

- [1] IEC 61869 – 1: Instrument Transformers – General Requirements
- [2] IEC 61869 – 2 : Instrument Transformers – Additional Requirements for Current Transformers
- [3] IEC 61869 – 3: Instrument Transformers – Additional Requirements for Inductive Voltage Transformers
- [4] IEC 61869 – 4: Instrument Transformers – Additional Requirements for Combined Transformers

2.2.2 Informative

- [5] 240 – 56063742: Insulation Requirements for Medium Voltage Cable Connected Equipment With Air-Filled Enclosures
- [6] 240 – 75881784: KIPTS Natural Ageing and Pollution Performance Test Procedure for Outdoor Insulator Products Section 2: Particular Requirements for Through Wall Bushings
- [7] 240 – 75655504: Corrosion Protection Standard for New Indoor and Outdoor Eskom Equipment, Components, Materials and Structures Manufactured from Steel Standard

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- [8] 240 -76628631: Standard for sealing of metering equipment
- [9] 240 – 75883906: Medium Voltage Reticulation Section 0: General Information and Requirements for Overhead Lines up to 33kV Standard
- [10] 240 – 75884040: Medium Voltage Reticulation Section 1: Light Conductors Particular Requirements for Overhead Lines up to 33kV Standard
- [11] 240 – 98195962 – Chemical Treatment and Powder Coating of 3CR12 Metering Kiosk During Manufacturing
- [12] D-DT-0270: MV Reticulation equipment mounting assembly single wood pole – transformer
- [13] D-DT-0271: MV Reticulation equipment mounting assembly single platform
- [14] D-DT-0861: 11kV and 22kV CT-VT Plinth Details
- [15] D-DT-1840: MV Reticulation CT-VT metering bulk tariff (General arrangement)
- [16] D-DT-1841: MV Reticulation CT-VT metering statistical (General arrangement)
- [17] D-DT-3118: CT-VT Metering Units (Standard items – overhead, pole mounted)
- [18] D-DT-3118: CT-VT Metering Unit (SWER – overhead, pole mounted)
- [19] D-DT-3118: CT-VT Metering Units (Standard items – ground mounted, cable connected)
- [20] D-DT-3202: Danger Signs
- [21] D-DT-8019: Clamp, cable polypropylene black
- [22] D-DT-8025: Plinths, Pre-cast Concrete
- [23] D-DT-8027: Rubber grommet

2.3 Definitions

2.3.1 General

Definition	Description
Air-filled enclosure	A metallic enclosure designed to protect the ends of the cables and bushings, providing a weatherproof enclosure with a minimum rating of IP54.
Bushing	A structure carrying one or more conductors through a partition (such as a wall or tank) and insulating it there from, including the means of attachment (flange or other fixing device) to the partition.
CT/VT metering unit	A primary plant device that comprises a combination of current and voltage transformers for metering purposes. It is a stand – alone device that can be constructed for pole-mounting (overhead line systems) or ground-mounting (underground cable systems). For the purposes of this specification, the metering units will be for 6.6kV, 11kV, 22kV, 33kV and 19kV (SWER) system voltage use.
Impulse	An aperiodic transient voltage or current that usually rises rapidly to a peak and then falls more slowly to zero. Such an impulse is, in general, well represented by the sum of two exponentials.
Insulation level	A combination of the relevant of the following the rated short duration power-frequency withstand voltage; and the rated lightning impulse withstand voltage (BIL).
Insulation level	A combination of the relevant of the following the rated short duration power-frequency withstand voltage; and the rated lightning impulse withstand voltage (BIL).

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Definition	Description
Lightning impulse	An impulse that has a front duration of less than a few tenths of microseconds to less than one microsecond.
Nominal voltage	The stated r.m.s. phase-to-phase voltage (U_n) of the supply to which the equipment is connected.
Rated voltage	The highest r.m.s. phase-to-phase voltage (U_m) of the supply for which the equipment is designed to operate continuously.
Screened separable connector termination	An air-filled enclosure within which the cable cores are terminated with screened separable connectors.
Termination	A device fitted to the end of a cable to ensure electrical connection with other parts of the system and to maintain the insulation up to the point of connection. [IEV 461-10-01]
Termination tail	The part of a cable termination from the lead-cut to the end of the core insulation of an impregnated-paper-insulated cable or measured from the PVC bedding cut to the end of the core insulation of an extruded insulation cable.
Unscreened separable connector termination	An air insulated termination that is fitted with unscreened separable connectors.

2.3.2 Disclosure classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 Abbreviations

Abbreviation	Description
AC	Alternating Current
BIL	Basic Insulation Level
CT	Current Transformer
Eskom	Eskom Holdings SOC (Ltd)
SWER	Single wire earth return
VT	Inductive Voltage Transformer

2.5 Roles and responsibilities

The Instrument Transformer Care Group leader must ensure that this document is updated and is current at all times.

2.6 Process for monitoring

Not applicable

2.7 Related/supporting documents

Not applicable

3. CT-VT Metering Units Requirements

3.1 General Requirements

Nothing in this specification shall lessen the obligations of the supplier. The supplier shall be fully responsible for the design of CT-VT units and their satisfactory performance in service. Acceptance by Eskom shall not relieve the supplier of the responsibility for the adequacy of the design.

This specification distinguishes between CT-VT metering units for inland application and coastal application. The technical schedules of a pre-qualification document will be arranged to cater for both inland and coastal applications. It is assumed that except for the housing, corrosion protection and creepage distance, units will be exactly the same for the two different applications. If there are differences they shall be indicated in the deviation schedules.

In addition, this specification covers the requirements for pole-mounted and ground-mounted units intended for overhead-line and underground-cable systems respectively. The particular requirements for SWER applications are also specified.

3.1.1 Standard operating conditions

The units shall be suitable for outdoor operation under the following conditions:

- a) Altitude: not exceeding 1800 m;
- b) Ambient air temperature: -5°C to 40°C ;
- c) Lightning ground flash density: severe (14 flashes/ km^2/year);
- d) Maximum solar radiation: 2500 W/m^2 ;
- e) Ultraviolet radiation: high;
- f) Relative humidity: 10% to 95%;
- g) Pollution conditions: non-corrosive/corrosive (depending on application i.e. inland/coastal respectively); and
- h) Wind pressures not exceeding 700Pa (equivalent to 34 m/s) shall be allowed for.

3.1.2 Insulation Medium

The primary insulation medium for the current and voltage transformers shall be oil. Mineral insulating oil in accordance with 240-75661431 shall be used. Eskom is willing to accept metering units with Ester oils and/or Cast Resin should such units pass there required tests (type, special and routine).

3.1.3 Configuration detail

3.1.3.1 Three phase configuration

Three-phase CT-VT metering units shall be configured as three-phase, four-wire units, i.e. comprising three VTs and three CTs.

The primary star point of the VTs shall be brought out of the tank to an accessible terminal in the terminal box through a bushing capable of withstanding 5kV d.c. and shall be earthed to the tank by a removable link. The core structure shall be a five-limb type. Alternatively, three single-phase VTs may be used.

Note: the primary star point of the VTs shall be brought out of the tank in order to facilitate primary insulation tests using a 5kV d.c. insulation tester.

3.1.3.2 Dual phase configuration

Dual-phase CT-VT metering units shall be configured as for the three-phase units. Two of the external terminals shall not be utilized.

3.1.3.3 SWER configuration

SWER CT-VT metering units shall be configured as single-phase, one-wire units, i.e. comprising one VT between live and earth and one CT. The unit shall have two external terminals (outdoor bushings). SWER units shall be for overhead line applications only.

3.1.4 Current transformers (CTs)

Type A, B and Type C CT-VT metering units shall be determined by their respective primary current ranges (see table 1). For SWER applications, the unit shall be Type B.

The current transformers shall be housed in an oil-filled tank/enclosure.

3.1.4.1 Accuracy and burden

The accuracy and burden shall be as specified in table 1.

Table 1: CT Nominal Ratings

Type A			Type B			Type C		
Primary current and ratio	Accuracy	Burden (VA)	Primary current and ratio	Accuracy	Burden (VA)	Primary current and ratio	Accuracy	Burden (VA)
100 / 1A	Class 0.2	5	200 / 1A	Class 0.2S	5	400	Class 0.2S	5

Note: The terminal markings (tapping polarities) shall be indicated on the rating and diagram plate. Limits of ratio error and phase displacement are defined in IEC 61869-2.

3.1.4.2 Tapping Points

Secondary tapping points are given in table 2.

Table 2: Nominal Current Ratios and Tap Points

Type A		Type B		Type C	
Nominal ratio	Tap points	Nominal ratio	Tap points	Nominal ratio	Tap points
100	50/25/1	200	100/50/1	400	200/100/1

3.1.4.3 Secondary current

The secondary current rating of all CTs shall be 1A.

3.1.4.4 Short time current (STC) withstand level

The short-time current withstand level shall be 12kA for 1 second for type A units and 20kA for 1 second for type B and C units

3.1.5 Voltage transformers (VTs)

The voltage transformers shall be housed in an oil-filled tank/enclosure.

3.1.5.1 Accuracy and burden

The accuracy shall be class 0.2.

The burden shall be 25VA per phase.

3.1.5.2 Primary nominal voltage

The standard primary nominal voltages, U_n , for the three-phase and dual-phase metering units shall be 6.6kV, 11kV, 22kV and 33 kV (phase-to-phase).

For SWER applications, the standard nominal primary voltage shall be 19 kV ($33\text{kV}/\sqrt{3}$) (phase-to-earth).

3.1.5.3 Secondary nominal voltage

The secondary nominal voltage for three-phase/dual-phase units shall be 110V (phase-to-phase).

The secondary nominal voltage for SWER units shall be 63.5V ($110\text{V}/\sqrt{3}$) (phase-to-earth).

Table 3: VT Nominal Ratings

Primary voltage, U_n (kV)	Secondary voltage (V)	Accuracy	Burden (VA)
6.6	110	Class 0.2	25
11	110	Class 0.2	25
22	110	Class 0.2	25
33	110	Class 0.2	25
19 (SWER)	63,5	Class 0.2	25

3.1.5.4 Insulation levels

The metering units shall have minimum insulation levels as specified in table 5.

Table 4: Insulation levels – voltage withstand capabilities

Primary voltage, U_n (kV)	Lightning impulse peak withstand voltage (kV)	Rated short duration (60s) power- frequency r.m.s. withstand voltage (kV)
6.6	75	22
11	95	28
22	150	50
33, SWER	200	70
Note: For ground-mounted units, the cable connection onto the unit under test may be shrouded during the test.		

3.1.5.5 Rated voltage factor

The rated voltage factor for all VTs shall be $1.2 \times U_n$, for continuous operation, and $1.9 \times U_n$, for 30 s.

Note: The above voltage factor is based on IEC 61869-3 for VTs that are connected between phase and earth in a non-effectively earthed system with automatic earth-fault tripping.

3.1.6 Earthing terminal

An external earthing terminal shall be provided on the CT-VT metering unit. The earth terminal shall be a 30mm long boss, with an M12 thread throughout, welded to the enclosure. The boss shall be fitted with a M12 x 25mm setscrew, washer and spring washer. The boss and the setscrew shall be stainless steel of grades 304 and 316 respectively.

3.1.7 Terminal box

The terminal box shall have 32A (slow blow fuse of class AM) fuses in the voltage transformer secondary circuit.

An M6 earth stud shall be fitted in the terminal box.

All terminals shall be M6 and shall be fitted with a nut, spring washer and washer.

A conductive removable gland plate shall be provided with an M32 pre-punched, spot welded knock-out (suitable for a size #3 mechanical gland) for the remote metering multi-core cable entry.

The removable gland plate shall be inherently non-corrosive and shall not be coated, so that it will remain conductive.

3.1.8 Oil level indicator and dip stick

No oil level indicators shall be fitted to the units.

An oil level dip stick shall be fitted to the filler cap/plug.

3.1.9 Housing and corrosion protection

The CT-VT metering unit shall be suitable for corrosive (coastal) or non-corrosive (inland) environments as specified in schedule A of the pre-qualification document.

For corrosive environments, the unit shall be 3CR12 or zinc metal sprayed mild steel.

For non-corrosive environments, the unit shall be mild steel.

Corrosion protection shall be in accordance with 240 – 75655504.

The colour of the final coat shall be in accordance with SANS 780, i.e. Avocado green (C12 of SANS 1091) for inland units and Navy light grey (G35 of SANS 1091) for coastal units.

The entire unit shall have an IP rating, in accordance with IEC 60529, of at least IP44.

3.2 Specific requirements for ground-mounted units

3.2.1 Cable termination enclosure requirements

The cable termination enclosures shall be air-filled and shall be positioned on the side of the CT/VT unit with the following specific requirements.

3.2.1.1 Clearances

- a) For 11 kV units, the enclosure shall be designed for the termination of three-core XLPE or impregnated paper insulated cable (up to 185 mm²) by means of unscreened separable connectors.

Note: This arrangement allows for the use of either unscreened or screened separable connectors.

- b) For 22 kV units, the enclosure shall be designed for the termination of three-core XLPE cable (up to 95 mm²) by means of screened separable connectors.
- c) The cable termination enclosure shall provide a minimum clearance of 50 mm from the back of the separable connector to the cable enclosure cover (see figure 7 of annex D).
- d) The dimensions of the separable connector shall be assumed to be as indicated in figure 1.

Note: This clearance requirement is applicable to 11 kV where it is intended that unscreened separable connectors will be used. At 22 kV where screened separable connectors are to be used the clearance will ensure that the cable box cover does not interfere with the connectors.

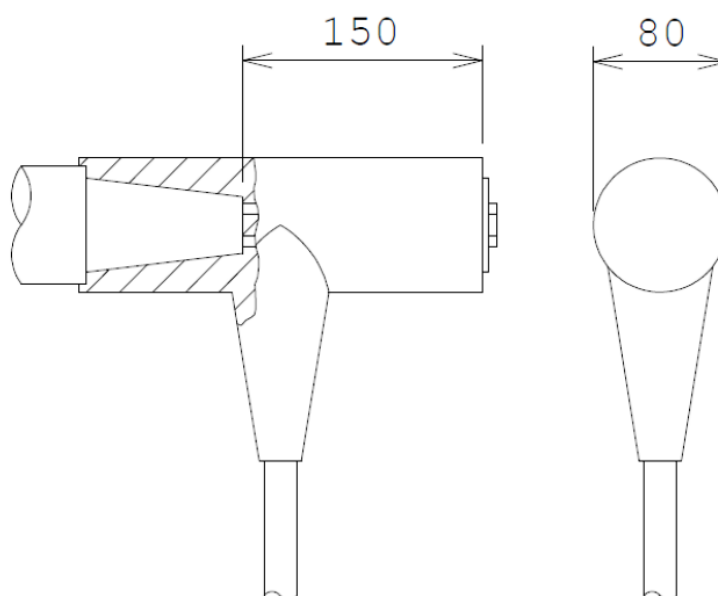


Figure 1: Unscreened separable connector dimensions

3.2.1.2 Height of enclosure

The minimum distance between the centre line of the bushings and the gland plate of an enclosure shall be as specified in table 5 (dimension 'a' of figure 8 shown in annex D). The distance specified is adequate to allow for core crossings, if necessary, to achieve correct phasing.

Table 5: Distance from bushing centre line to gland plate

Cable size	Clearance (mm)		
	Voltage rating of enclosure (kV)		
	12	24	36
up to 185 mm ²	800	800	950

3.2.1.3 Bushings

The bushings shall comply with EN 50180 Type C (630A – tapered) bolted-type bushings with an M16x2 thread. These bushings have an internal screen that shall be earthed.

The bushings shall be horizontally positioned. The phase sequence of all bushings shall be marked.

The bushing-centre spacing shall be ≥ 135 mm and the distance between the outer bushing-centres and the metal enclosure shall be ≥ 90 mm – as indicated in figure 8 of Annexure D. The actual distances provided shall be indicated in technical schedule B.

3.2.1.4 Gland plates and cable glands

- a) A removable gland plate shall be provided for each cable termination enclosure. The gland plate shall be designed in such a way that, once removed, the entire bottom of the cable box is open (i.e. the bottom of the cable box shall form the gland plate). The gland plate shall have a pre-drilled/punched cable entry hole of 110 mm diameter that is positioned below the attachment point of the centre phase bushing. The hole shall be fitted with a rubber grommet in accordance with D-DT-8027.

Note: The primary function of the rubber grommet is to seal the cable entry into the MV cable box.

- b) A cable support clamp in accordance with Eskom drawing D-DT-8019 shall be provided below the cable termination enclosure for supporting the MV cable. The clamp shall be suitable for a cable with outer diameter in the range of 50 - 75 mm. The centre of the clamp (i.e. when a cable of diameter 75 mm is installed) shall be positioned to correspond with the centre of the cable entry hole in the gland plate.

3.2.1.5 Earthing for cable termination enclosures

- a) An earth terminal shall be provided for earthing the MV cable within the enclosure.
- b) The earth terminal shall be a 30 mm long boss, with an M12 thread throughout, welded to the enclosure at a height of 100 mm from the gland plate. The boss shall be fitted with a M12 x 25 mm setscrew, washer and spring washer. The boss and the setscrew shall be stainless steel of grades 304 and 316.

3.2.1.6 Fasteners

Fasteners used to secure the cable termination enclosure gland plate and front cover shall be stainless steel.

3.2.2 Terminal box

The terminal box cover shall have the facility to be sealed in accordance with Eskom sealing standard 240-76628631.

A vertical support bracket shall be provided and positioned below the gland plate of the terminal box for strapping the multi-core metering cable. The bracket shall be attached to the CT-VT unit tank/frame and be vertically aligned with the knock-out provided in the gland plate of the terminal box.

3.2.3 Plinth requirements

A standard plinth footprint in accordance with figure 2 shall be used for all ground-mounted (free standing) CT-VT metering units. The unit pedestal shall be designed to suit the standard plinth footprint. The pedestal base shall have 4 x 18 mm slotted mounting holes provided to clear the M16 bolts according to the spacing shown in figure 2.

Note: The slotted mounting holes are required in order to allow for tolerances in the manufacture of the plinth.

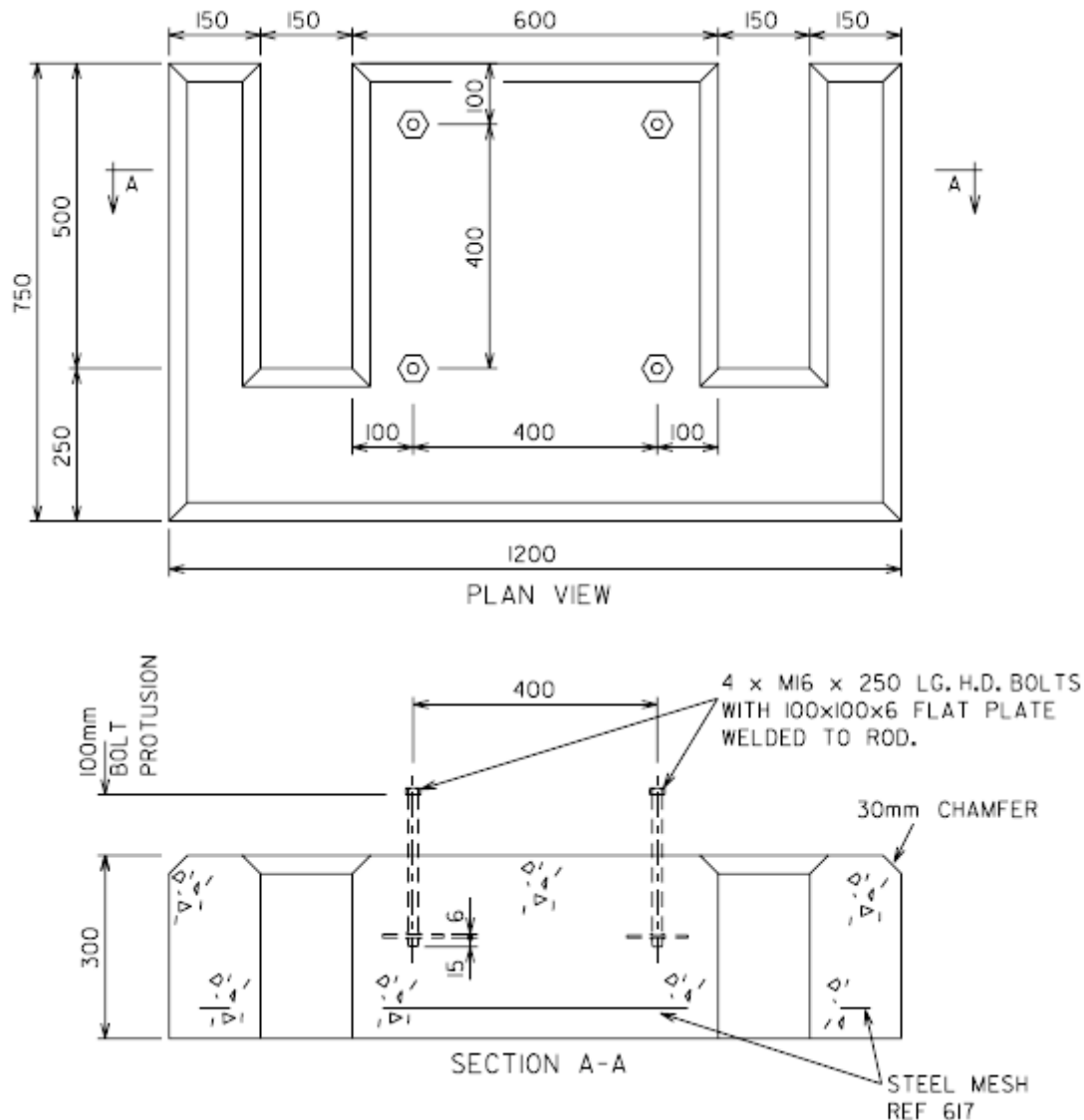


Figure 2: Standard plinth footprint dimensions

3.2.4 Marking and labelling

The source and load cable termination enclosures and covers shall be externally labelled 'P1' and 'P2' respectively. The labels shall be white and in characters larger than 50 mm high.

An MV warning sign in accordance with D-DT-3202 shall be fitted to the cover/lid of the cable termination enclosure. If pop-rivets are used to attach the sign to the cover, only aircraft pop-rivets will be acceptable. Normal pop-rivets are not acceptable.

All bushings and secondary terminals shall be labelled in accordance with the rating and diagram plate (see 3.7. below) and figure 3.

3.3 Specific requirements for pole-mounted units

3.3.1 Bushings

Bushings shall be of the outdoor type and comply with the requirements of SANS 1037, SANS 60137 and SANS 60815.

Bushings shall be clamped at the base of the bushing.

The minimum creepage distance of the bushings shall be as specified in table 6.

Note: For SWER applications, the rated voltage for the calculation of creepage is 36kV

The bushing profile characteristics shall comply with Annex D of SANS 60815.

The minimum creepage distance of the bushings shall be as specified in table 6.

Note: For SWER applications, the rated voltage used for the calculation of creepage distance is 36kV.

The bushing stem shall be copper with an M12 diameter and threaded. Bushing stems larger than M12 shall be supplied with a flag. The flag shall have two holes. Each hole shall be fitted with stainless steel M12 x 40 mm set screw, 2 x flat washers and 2 x nuts.

The phase sequence of all bushings shall be marked.

All bushings shall be side wall mounted. Lid mounted bushings are not acceptable. All bushings 11kV and up must be clamped at the base of the bushing. The bushing design drawings must include the wall thickness the bushing is suitable for and tested on.

Table 6: Creepage distance

	Coastal and inland applications
SANS 60815 pollution level	Very heavy (VH)
Specific creepage distance	31 mm/kV

3.3.2 Pole-mounting requirements

3.3.2.1 Three-phase/dual-phase metering units

The three-phase/dual-phase CT-VT metering unit shall be mounted on an H-pole single platform. Refer to drawings D-DT-1840 and D-DT-1841 for the general arrangement of the H-pole structure (240 - 75884040).

The mounting holes arrangement details shall be as shown in figure 4 (see Annexure B). Refer to drawing D-DT-0271 for the equipment mounting single platform assembly arrangement (DST 34-240 - 758839061).

The overall dimensions of the three-phase/dual-phase metering unit are shown in figure 5 (see Annexure C).

3.3.2.2 SWER metering units

The SWER CT-VT metering unit shall be mounted on a single pole. The mounting bracket details shall be as shown in figure 7 (see Annexure C). Refer to drawing D-DT-0270 for the single-pole equipment mounting assembly arrangement (240 - 758839061).

The overall dimensions of the SWER metering unit are shown in figure 6 (see Annexure C).

3.3.3 Surge arrester mounting brackets

Surge protection mounting brackets shall be fitted on the unit. The clearances, distances and interfacing dimensions required for the mounting of surge arresters shall be as shown in figure 4 (see Annexure A). Brackets shall be fitted on both the load and source sides of the metering unit.

Note: Surge arresters are only required on the line (source) side (P1) of the metering unit.

3.4 Installation

The manufacturer of the unit shall submit an installation instruction document to Eskom as part of tender returnable documentation.

3.4.1 Pole-mounted unit specific installation requirements

The three-phase/dual-phase CT-VT metering unit shall be mounted on an H-pole single platform. Refer to drawings D-DT-1840 and D-DT-1841 for the general arrangement of the H-pole structure (240 - 75884040).

The SWER CT-VT metering unit shall be mounted on a single pole. The mounting bracket details shall be as shown in figure 6 (see Annex C). Refer to drawing D-DT-0270 for the single-pole equipment mounting assembly arrangement (240 - 758839061).

The earthing arrangement details shall be as shown in D-DT-1840 (240 - 75884040). Note that there shall be one common earth point (earthing terminal) for all earths.

3.4.2 Free-standing (ground-mounted) unit specific installation requirements

The standard plinth footprint in accordance with figure 2 shall be used for the CT-VT metering unit.

3.5 Documentation

3.5.1 Technical schedules

The full Technical Schedule B and the Deviation Schedule shall be completed by the manufacturer and, together with Technical Schedule A, shall be submitted to Eskom for acceptance at the time of tender submission.

3.5.2 Drawings

The following drawings shall be submitted to Eskom as part of the tender returnable documents:

- 1) The final outline drawings reflecting the major dimensions and layout of the unit and these drawings shall clearly indicate the following:
 - a) General assembly indicating the source and load sides of the unit and all bushing labels;
 - b) Position of all earthing bosses;
 - c) Position of the rating and diagram plate;
 - d) Position of the terminal box;
 - e) Terminal box internal arrangement details – including the following:
 - M32 gland plate knock-out;
 - M6 terminals and earthing stud;
 - VT primary star point bushing and removable earth link;
 - f) For pole-mounted units, the following additional detail shall clearly be shown:
 - The outdoor bushing profile, showing compliance with SANS 60815;
 - Surge arrester mounting bracket details indicating dimensions D, E & F as shown in figure 3 of Annexure A;
 - Maximum and minimum surge arrester dimensions;
 - g) For ground-mounted units, the following additional detail shall clearly be shown:
 - MV cable termination enclosure dimensions (width, height and depth);
 - MV warning signs and a reference to D-DT-3202;
 - the labels “P1” and “P2” stencilled on the MV cable termination enclosures;
 - the MV cable support clamp position (below grommet) and a reference to D-DT-8019;

-
- the gland plate cable entry hole rubber grommet and a reference to D-DT-8027;
 - MV bushing and a reference to “Type C M16x2”;
 - MV bushing spacing (centre to centre as well as centre to cable termination enclosure side wall);
 - cable termination enclosure earthing bosses;
 - distance from the bushing centre line to the cable termination enclosure gland plate;
 - vertical support bracket positioned below the gland plate of the terminal box for strapping the multi-core metering cable;
- 2) The wiring circuit diagrams;
- 3) The rating and diagram plate layout and information – see 3.7.
- 4) Any revision to drawings of units being manufactured for and supplied to Eskom shall clearly indicate the revision number and date, and shall be submitted to Eskom for acceptance before manufacturing.

3.5.3 Test certificates

All required type test certificates (see 3.9.1) shall be submitted to Eskom by the manufacturer during tender submission. Single copies of all type-test reports and certificates, in English, for the metering units offered shall be supplied to Eskom and certificates supplied for previous tender(s) shall be re-submitted.

Full routine test certificates (see 3.9.2) shall be provided with the metering units supplied. Original manufacturer's test certificates/reports for bought-out (out-sourced) equipment shall be provided with the equipment supplied.

Test certificates for each unit shall be traceable by reference to the manufacturer's serial reference number marked on the unit.

Any additional test certificates shall be marked “Additional tests” and kept separate from the required test certificates.

3.6 Quality Assurance

A quality management system shall be set up in order to assure the quality of the CT-VT metering units during design, development, production, installation and servicing. Guidance on the requirements for a quality management system can be found in the following standards: SANS 9000, SANS 9001 and SANS 9004. The details shall be subject to agreement between the purchaser and supplier.

3.7 Rating and diagram plate information

The following information shall be clearly shown on the rating and diagram plate:

- a) Manufacturer's name;
- b) Year and month of manufacture
- c) Serial number;
- d) Primary and secondary voltages;
- e) CT type;
- f) Current ratios available;
- g) Ratio connection table;
- h) Accuracy class (VTs and each of the CT ratios);
- i) Burden (VTs and CTs);
- j) Wiring circuit diagram (for 3-phase units) indicating the terminal labelling as shown in figure 3;

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- k) Source and load sides shall be shown on the diagram plate;
- l) Short-time current withstand levels;
- m) Insulation test levels (BIL and short-time power frequency r.m.s. withstand voltage);
- n) Rated voltage factor of the VTs;
- o) Bushing creepage distance;
- p) Total mass of the unit;
- q) The intended application: Coastal / Inland;
- r) The statement "Manufactured in accordance with Eskom standard 240-56065032 Rev. 3";
- s) The statement "Oil contains to trace of PCBs";
- t) Eskom order number; and
- u) Eskom SAP material number.

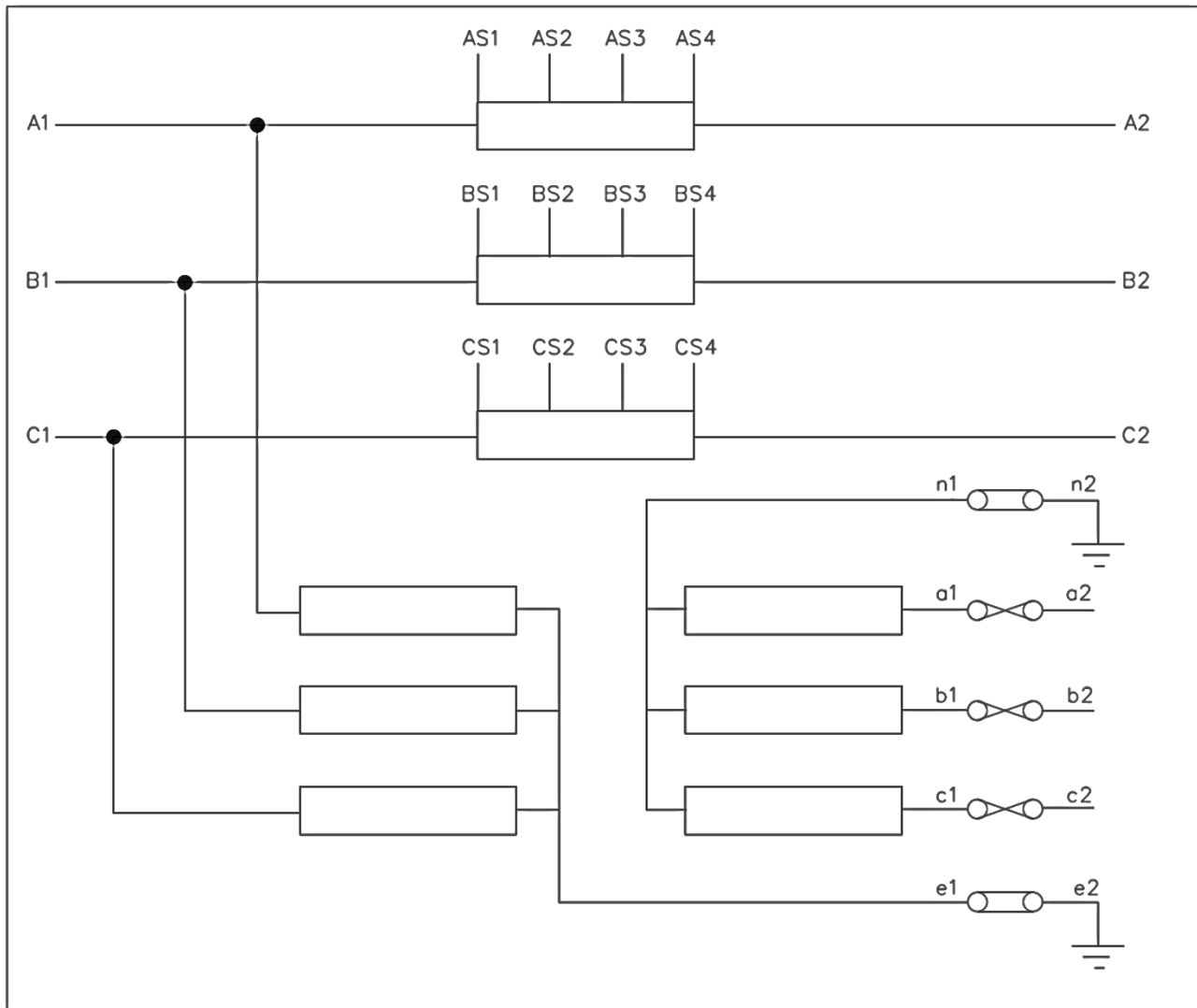


Figure 3: Wiring circuit diagram

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4. Additional Requirements

Not applicable.

5. Tests

5.1 General

The tests shall be performed to establish the design characteristics of the CT-VT metering units and assure compliance with the requirements specified. The tests shall be conducted on new units in the same state as they are normally supplied.

Eskom reserves the right to witness any or all of these tests. The supplier or manufacturer shall demonstrate an ability to provide means to enable Eskom to witness such tests.

Suppliers are requested to indicate their compliance with the relevant standard during tender stage and shall submit all the required type test reports and design drawings. If the units offered have been tested for compliance with an internationally accepted standard, Eskom may accept those test reports in place of the tests covered by this specification. The type test reports and alternative test standards shall be submitted with the tender returnable documents, for Eskom's consideration.

The qualifying type tests need not be performed if they were successfully completed for a previous Eskom tender, provided that the design and material have not been changed or modified in any way. The type test certificates of completed successful type tests previously submitted shall be submitted with the current tender returnable documents for review. Unless otherwise accepted by Eskom, type test reports shall not be older than ten years. Any change in the components shall be indicated at the time of tender.

The transfer of test certificates between manufacturers will not be allowed.

The supplier shall ensure that type tests are valid.

If there is reasonable doubt as to the validity of test certificates submitted, for example, by virtue of modifications made to the CT-VT metering unit, Eskom may direct that further tests are carried out at an accredited test facility in the presence of a representative of the purchaser on a sample CT-VT metering unit. These tests shall be at the expense of the supplier.

5.1.1 Manufacturer's testing capabilities

The manufacturer shall be fully responsible for performing or having performed all the required tests as specified. Any limitations shall be clearly stated. The manufacturer/supplier shall be responsible for all costs related to testing.

5.1.2 Witnessing of tests

Eskom reserves the right to be present at any of the tests specified. Eskom shall be notified as soon as possible of all test failures and corrective measures. This shall take the form of abbreviated reports that shall, upon request, be supported by more detailed reports. It is desirable that Eskom is notified of test failures to allow in situ inspection if desired.

5.1.3 Test certificates and reports

Type test certificates together with each complete test report (in English) shall be supplied with the tender returnable documents in electronic format (pdf).

Generic routine test certificates/reports shall be supplied with tender returnable documents in electronic format (pdf). The test certificates shall indicate (make provision for) the tests performed, results, identification of the equipment tested, etc. The format of the test certificate/report shall make provision for approval by an authorised Eskom representative.

One hardcopy of the routine test certificates/reports shall be supplied with each CT-VT metering unit supplied to Eskom. The routine test certificates / report must be inserted in the terminal box.

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5.2 Qualifying tests

5.2.1 Type tests

Type tests are intended to establish design characteristics. They are normally only made once and repeated only when the design, components or the material of the unit are changed. The results of the type tests are recorded as evidence of compliance with design requirements.

The following type tests are required. The supplier shall pay for the cost of type testing and shall provide Eskom with the details of when and where these tests will be conducted.

5.2.1.1 Insulation tests

- a) A lightning impulse test on the primary windings, as specified in clause 7.2.3 of IEC 61869-4 for combined transformers and also 7.2.3 of IEC 61869-2 for current transformers and 7.2.3 of IEC 61869-3 for voltage transformers, shall be carried out.
- b) A power-frequency wet withstand test (pole-mounted units only), as specified in clause 7.2.4 of IEC 61869-2 for current transformers, and clause 7.2.4 of IEC 61869-3 for voltage transformers, shall be carried out.

5.2.1.2 Short-time current/short-circuit withstand capability tests

- a) A short-time current test, as specified in clause 7.2.201 of IEC 61869-4, shall be carried out for current transformers.
- b) A short-circuit withstand capability test, as specified in clause 7.2.301 of IEC 61869-4, shall be carried out for voltage transformers.

5.2.1.3 Temperature rise test

A temperature-rise test, as specified in clause 7.2.2 of IEC 61869-4 for combined transformers, shall be carried out.

5.2.1.4 Determination of errors (Tests for accuracy) tests

Determination of errors, as specified in clause 7.2.6 of IEC 61869-4 for combined transformers, shall be carried out.

5.2.2 Routine tests

Routine tests are intended to prove conformance of units to specific requirements and are made on every unit. These tests shall be non-destructive. The following routine tests shall be carried out.

- a) Power frequency withstand tests on primary windings (see table 2, column 2) and partial discharge measurement [7.3.1 and 7.3.2 of IEC 61869-4].
- b) Note: The induced voltage test for the VTs is also the power-frequency test for the primary winding of the CTs.
- c) Power-frequency withstands tests between sections and on secondary windings [7.3.3 and 7.3.4 of IEC 61869-4]
- d) Inter-turn overvoltage test on current transformers [7.3.204 of IEC 61869-2]
- e) Verification of terminal markings/labelling [7.3.6 of IEC 61869-2 and IEC 61869-3]
- f) Test for accuracy [7.3.5 of IEC 61869-4]
- g) Partial discharge measurement [7.3.2 of IEC 61869-4]
- h) All transformer bushings shall be subjected to a partial discharge test in accordance with IEC 60137.

Note: The order of the tests is not standardized but the determination of errors shall be performed after each test.

5.2.3 Special tests

The following special tests shall be carried out.

- a) Chopped impulse test on the primary windings [7.4.1 of IEC 61869-4]

Note: The chopped impulse test on the primary windings is considered to be a type test.

5.2.4 Sample tests

Sample tests are intended to verify the quality of materials and workmanship. For each sample test, the type of inspection (by attributes or by variables and detailed procedures inspection level, acceptable quality level, single, double or multiple sampling, etc.) shall be agreed between the purchaser and the supplier.

Unless otherwise agreed between the purchaser and the supplier, the sampling plan procedures according to SANS 2859-1 (inspection by attributes) and to SANS 3951 (inspection by variables) shall be applied.

5.2.5 Bushing tests

- a) All bushings shall be tested in accordance with their relevant standards.
- b) All bushings shall be subjected to a routine partial discharge test in accordance with IEC 60137.
- c) Outdoor bushings shall be tested in accordance with 240 – 75881784 (KIPTS natural ageing and pollution performance test).

6. Marking and Labelling

Specific requirements are included under section 3.

7. Inspection and testing plan

7.1 Quality control plan

The supplier shall submit the quality control plans to Eskom with the tender documents, indicating all inspection hold points. Eskom may add the necessary inspection hold and/or witness points for Eskom or its appointed representative. The supplier shall make due allowance for these activities in the manufacturing program and, to avoid delays, shall give sufficient, agreed upon, advanced notice of the date of inspection. Eskom will not accept late delivery on the basis of inspection delays.

7.2 Inspection of manufacturing facilities and CT-VT metering units

- a) Eskom reserves the right to inspect and evaluate all manufacturing and testing facilities relating to the CT-VT metering units offered – both before and at any time during manufacturing.
- b) Eskom reserves the right to inspect any ordered CT-VT unit before delivery, or at any stage of manufacture. This inspection will entail a thorough check to ensure complete compliance with this specification, schedules and the approved manufacturer's drawings.
- c) Any deviations in the CT-VT unit design shall be pointed out in accordance with the tendered deviation schedule and the type test certificates provided for the specific unit design. No clearance will be given where there is no satisfactory evidence of the relevant type test certificates, where such tests are required.
- d) Clearance shall be obtained before dispatching the equipment. This clearance shall be confirmed on the routine test certificates. No clearance shall be given where there are any outstanding defects resulting from Factory Acceptance Testing (FAT) or from this inspection.

7.3 Spares

None

8. Authorization

This document has been seen and accepted by:

Name and surname	Designation
Bheki Ntshangase	SCOT/SC Chairperson
Sibongile Maphosa	Engineer Instrument Transformers

9. Revisions

Date	Rev	Compiler	Remarks
Aug 2020	2	S Maphosa	Finalised the rating requirements for new type A units and also allocated Eskom SAP numbers. Document revised to include requirements for type A CT-VT units.
Feb 2014	1	H. Boshoff	Final Rev 2 document for Authorisation and Publication
June 2013	1	B. Mwarehwa	Final Document for Publication
Feb 2009	0	B. Mwarehwa	Document revised according to revision cycle and latest TESCOOD document template. The requirements of revision no. 5 of specification no DSP0028 have been incorporated into this specification.

10. Development team

The following people were involved in the development of this document:

- Sibongile Maphosa
- Keneilwe Seleme
- Japhta Makgotlho

11. Acknowledgements

The author acknowledges the input from the members of the Instrument Transformer Care Group and all subject matter experts who contributed in this edition.

Annex A – Surge arrester mounting details (pole-mounted units)

- NOTE :
- * D - SHORTEST DISTANCE BETWEEN SA LINE TERMINAL AND TRANSFORMER BUSHING.
 - * E - SHORTEST DISTANCE BETWEEN SA LINE TERMINAL AND ANY EARTHED METAL.
 - * F - RADIUS SHALL BE CLEAR OF ANY OBJECTS.
 - * PARAMETERS A, B AND C ARE GIVEN VALUES SPECIFIED BY THE SA MANUFACTURES.
 - * TRANSFORMERS SHALL BE DESIGNED TO COMPLY WITH PARAMETERS D, E AND F.

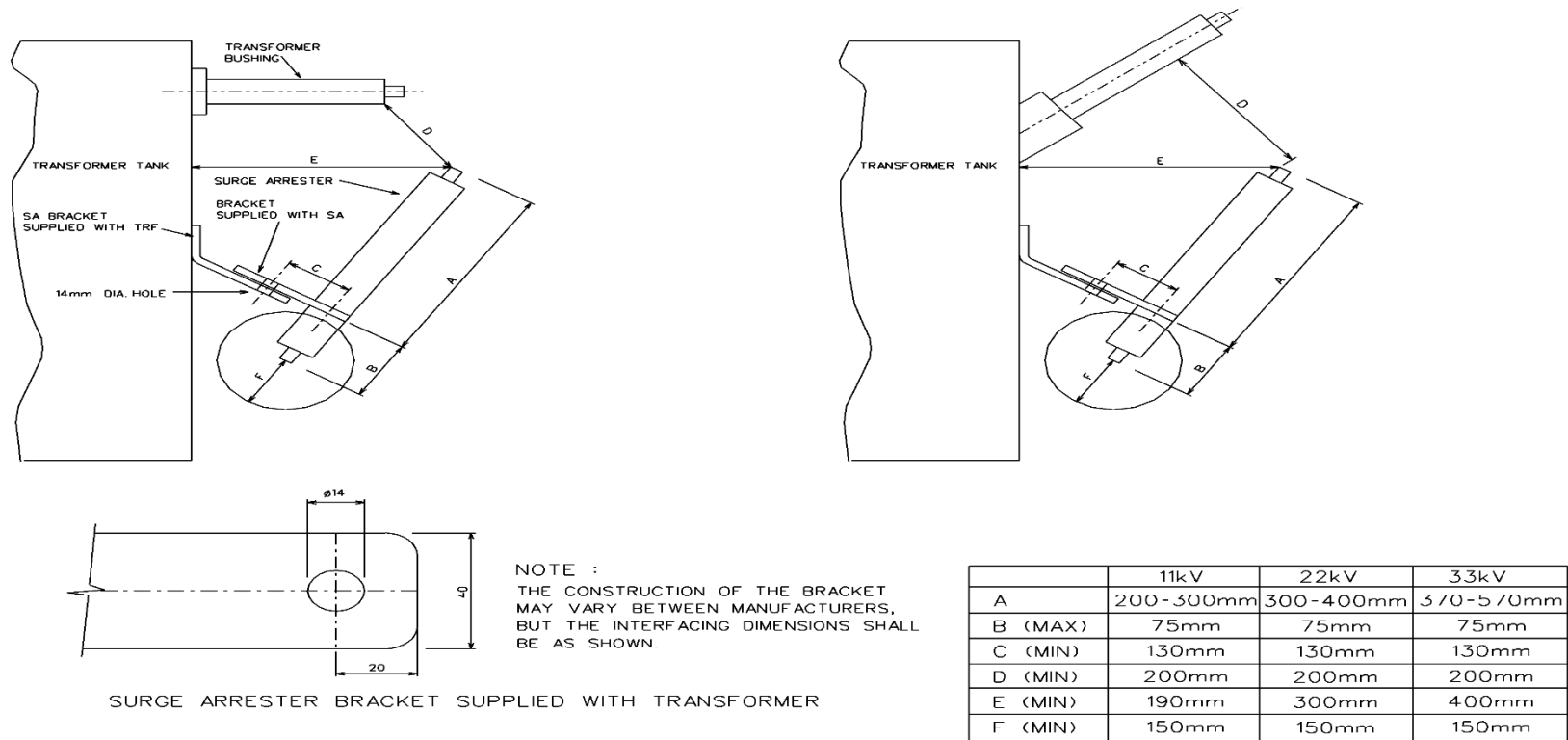
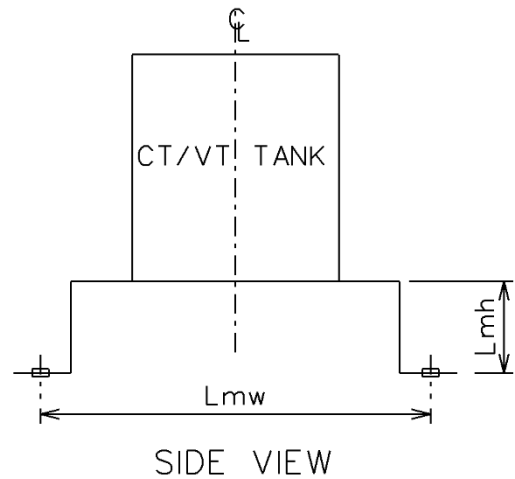
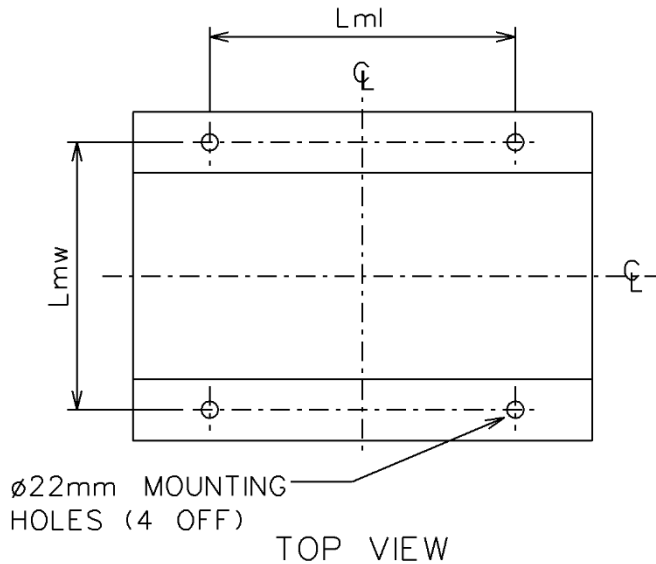


Figure A.1: Surge arrester mounting details

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Annex B – Three-phase/dual-phase CT-VT unit mounting hole arrangement

$L_{ml} = 400\text{mm}$
 $L_{mw} = 350, 400 \text{ or } 450\text{mm}$
 $L_s > 320\text{mm}$
 $L_{mh} < 120\text{mm}$



OR

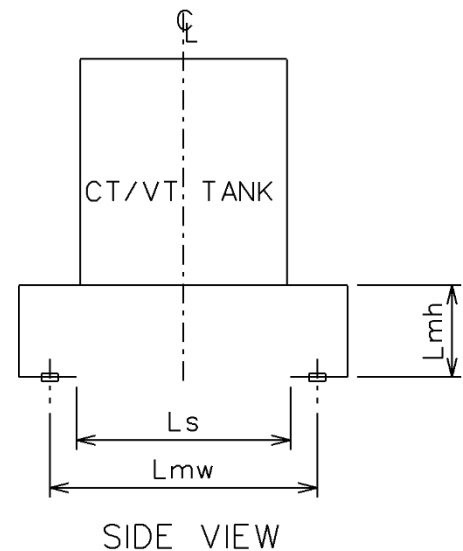
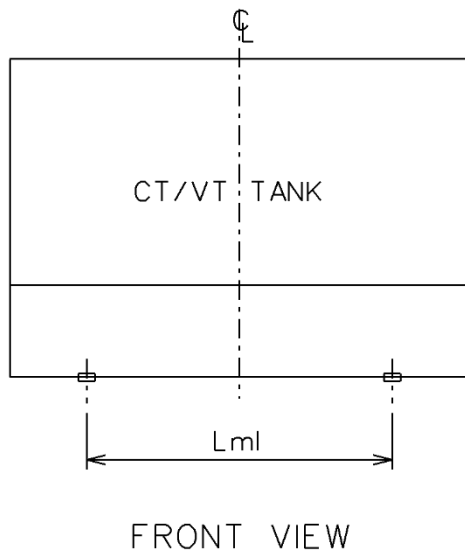
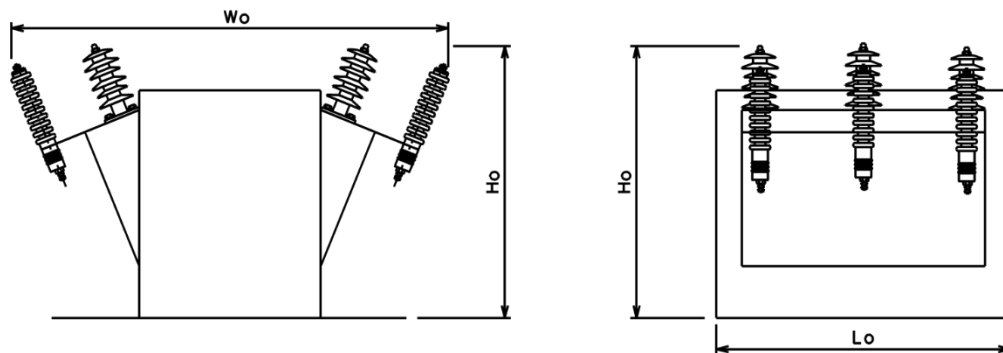


Figure B.1: CT-VT Unit mounting hole arrangement

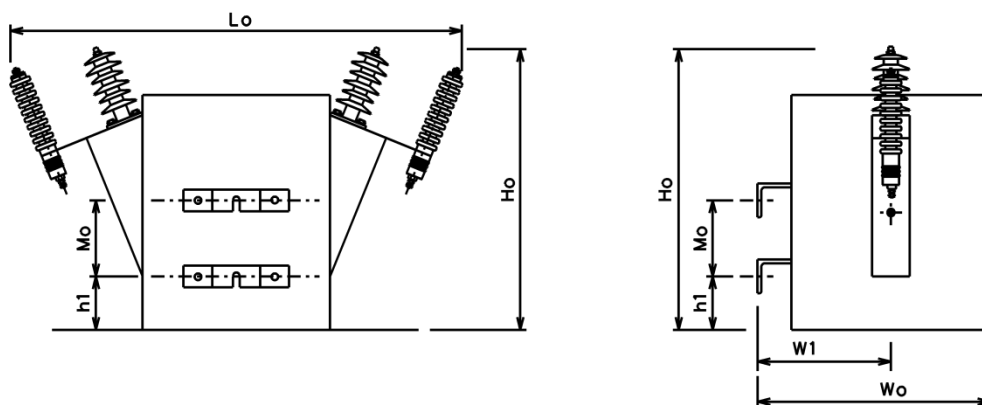
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Annex C – CT-VT unit dimensions (pole-mounted units)



MAX. OVERALL HEIGHT	Ho	1100
MAX. OVERALL WIDTH (INCLUDING SURGE ARRESTER)	Wo	1080
MAX. OVERALL LENGTH	Lo	1500
MAX. MASS		1700kg

Figure C.1: Three-/dual-phase CT-VT unit dimensions



MAX. OVERALL HEIGHT	Ho	1100
VERTICAL POLE HOOKING DISTANCE	Mo	400
MAX. VERTICAL BASE-LOWER POLE HOOKING POINT	h1	400
MAX. OVERALL WIDTH	Wo	1080
MAX. HORIZONTAL DISTANCE POLE-HOOKING TO CENTRE OF GRAVITY	W1	450
MAX. OVERALL LENGTH (INCLUDING SURGE ARRESTER)	Lo	1500
MAX. MASS		900kg

Figure C.2: SWER CT-VT unit dimensions

Annex D – CT-VT unit MV bushing spacing (ground mounted units)

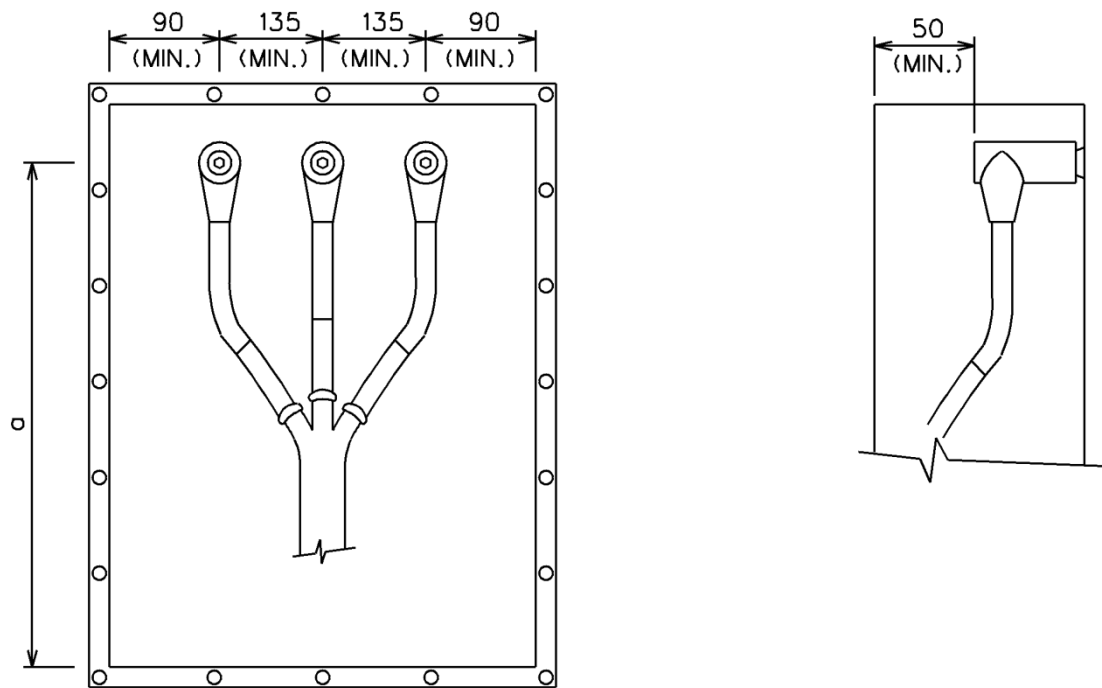


Figure D.1: MV cable box dimensions

Annex E – List of CT-VT Units

Item	SAP No:	Short Description
1	676218	CT+VT 6.6kV-110V A 3VT+3CT I/LD D2118
2	402243	CT+VT 6.6kV-110V B 3VT+3CT I/LD D2118
3	597272	CT+VT 6.6kV-110V C 3VT+3CT I/LD D2118
4	676223	CT+VT 11kV-110V A 3VT+3CT CBL I/LD D3118
5	676229	CT+VT 11kV-110V A 3VT+3CT CBL CSTL D3118
6	175942	CT+VT 11kV-110V B 3VT+3CT CBL I/LD D3118
7	175943	CT+VT 11kV-110V B 3VT+3CT CBL CSTL D3118
8	216388	CT+VT 11kV-110V C 3VT+3CT CBL I/LD D3118
9	216389	CT+VT 11kV-110V C 3VT+3CT CBL CSTL D3118
10	676232	CT+VT 11kV-110V A 3VT+3CT I/LD D3118
11	676227	CT+VT 11kV-110V A 3VT+3CT CSTL D3118
12	402167	CT+VT 11kV-110V B 3VT+3CT I/LD D3118
13	175934	CT+VT 11kV-110V B 3VT+3CT CSTL D3118
14	216390	CT+VT 11kV-110V C 3VT+3CT I/LD D3118
15	216391	CT+VT 11kV-110V C 3VT+3CT CSTL D3118
16	676224	CT+VT 22kV-110V A 3VT+3CT CBL I/LD D3118
17	676235	CT+VT 22kV-110V A 3VT+3CT CBL CSTL D3118
18	175967	CT+VT 22kV-110V B 3VT+3CT CBL I/LD D3118
19	175968	CT+VT 22kV-110V B 3VT+3CT CBL CSTL D3118
20	216392	CT+VT 22kV-110V C 3VT+3CT CBL I/LD D3118
21	216393	CT+VT 22kV-110V C 3VT+3CT CBL CSTL D3118
22	676234	CT+VT 22kV-110V A 3VT+3CT I/LD D3118
23	676228	CT+VT 22kV-110V A 3VT+3CT CSTL D3118
24	402169	CT+VT 22kV-110V B 3VT+3CT I/LD D3118
25	175935	CT+VT 22kV-110V B 3VT+3CT CSTL D3118
26	216394	CT+VT 22kV-110V C 3VT+3CT I/LD D3118
27	216395	CT+VT 22kV-110V C 3VT+3CT CSTL D3118
28	676226	CT+VT 33kV-110V A 3VT+3CT I/LD D3118
29	676236	CT+VT 33kV-110V A 3VT+3CT CSTL D3118
30	180234	CT+VT 33kV-110V B 3VT+3CT I/LD D3118
31	180235	CT+VT 33kV-110V B 3VT+3CT CSTL D3118
32	175936	CT+VT 19.5kV-63.5V B 1VT+1CT I/LD D3118
33	175937	CT+VT 19.5kV-63.5V B 1VT+1CT CSTL D3118

Annex F – Technical Schedules**Technical schedules A and B****6.6 kV Type A CT-VT Metering Unit (Pole Mounted)**

Schedule A: Purchaser's specific requirements

Schedule B: Particulars of equipment to be supplied

1	2	3	4	5
Item	Sub-clause	Description	Schedule A	Schedule B
1	3.1.1	Standard operating conditions		
1.1		a) Altitude m	1800	xxxxxxx
1.2		b) Ambient air temperature °C	–5 to +40	xxxxxxx
1.3		c) Lightning ground flash density Flashes/ km ² /year	High	xxxxxxx
1.4		d) Maximum solar radiation W/m ²	2500	xxxxxxx
1.5		e) Ultraviolet radiation	High	xxxxxxx
1.6		f) Relative humidity %	10-95	xxxxxxx
1.7		g) Application: coastal/inland	_____	xxxxxxx
1.8		h) wind pressure Pa	700	xxxxxxx
2	3.1.2	Insulation Medium		
2.1		Primary insulation medium for CTs & VTs	Oil - EST 32-321	xxxxxxx
3	3.1.3	Configuration Detail		
3.1		Configuration	3Φ / 4 wire	xxxxxxx
3.2		Primary star point earthing (required)	External	xxxxxxx
3.3		Secondary star point earthing (required)	External	xxxxxxx
3.4	3.1.3.1	Core structure (5 limb / 3 x 1Ø VTs)	xxxxxxx	_____
4	3.1.4	Current Transformers		
4.1		Type (A or B or C)	A (100A)	xxxxxxx
	3.1.4.1	Accuracy class (see Table 1)	0.2	xxxxxxx
4.2		25/1 A Class	0.2	_____
4.3	3.1.4.1	Burden VA	5	_____
4.5	3.1.4.3	Secondary current A	1	_____
4.6	3.1.4.4	Short time current withstand level – 1 s kA	12	_____
5	3.1.5	Voltage Transformers		
5.1	3.1.5.1	Accuracy class Class	0.2	_____

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**MEDIUM VOLTAGE CT-VT METERING UNITS WITH
NOMINAL VOLTAGES FROM 6.6KV TO 33KV
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5.2	3.1.5.1	Burden	VA	25	_____
5.3	3.1.5.2	Primary nominal voltage	kV	6.6	_____
5.4	3.1.5.3	Secondary nominal voltage	V	110	_____
	3.1.5.4	Insulation levels:			
5.5		Lightning impulse peak withstand voltage	kV	75	_____
5.6		Rated short-duration power-frequency r.m.s. withstand voltage – 60 seconds	kV	22	_____
5.7	3.1.5.5	Rated voltage factor: Continuous	kV	1.2 x U _n	_____
		30 seconds	kV	1.9 x U _n	_____
6	3.1.9	Housing and corrosion protection			
6.1		Inland - mild steel		xxxxxxx	_____
		Coastal - 3CR12 or zinc sprayed mild steel		xxxxxxx	_____
6.2		Corrosion protection		As per 240 – 75655504	_____
6.3	3.1.9	Colour		As per SANS 780	_____
7	3.3.1	Bushings			
7.1		Profile		As per IEC 60815	_____
7.2		Bushing Material		xxxxxxx	_____
7.3		Creepage (See Table 6)	mm/kV	31	_____
7.4		Stem diameter		M12	_____
7.5		Stem type		Threaded	_____
7.6		Stem material		Copper	_____
7.7		Manufacturer		xxxxxxx	_____
8	3.3.2	Pole mounting requirements			
8.1		Mass of unit	kg	xxxxxxx	_____
8.2		H ₀ (max) including surge arrester	mm	1100	_____
8.3		W ₀ (max) including surge arrester	mm	1080	_____
8.4		L ₀ (max)	mm	1500	_____
9	3.5	Documentation			
9.1	3.5.2	Number of copies of all drawings and wiring diagrams to be submitted with tender		1	_____
9.2	3.5.3	Number of copies of all type test certificates to be submitted with tender		1	_____
10		Tests			
	3.9.1	Type Tests:			Rep No.
10.1	3.9.1.1	Lightning impulse test		xxxxxxx	_____
10.2	3.9.1.1	Power frequency wet withstand test		xxxxxxx	_____
10.3	3.9.1.2	Short-circuit withstand capability test for VTs		xxxxxxx	_____
10.4	3.9.1.2	Short time current test for current transformers		xxxxxxx	_____
10.5	3.9.1.3	Temperature rise tests		xxxxxxx	_____

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10.6	3.9.1.4	Accuracy tests	xxxxxxx	_____
10.7	3.9.3.1	Chopped Impulse	xxxxxxx	_____

Technical schedules A and B

6.6 kV Type B CT-VT Metering Unit (Pole Mounted)

Schedule A: Purchaser's specific requirements

Schedule B: Particulars of equipment to be supplied

1	2	3	4	5
Item	Sub-clause	Description	Schedule A	Schedule B
1	3.1.1	Standard operating conditions		
1.1		a) Altitude m	1800	xxxxxxxx
1.2		b) Ambient air temperature °C	–5 to +40	xxxxxxxx
1.3		c) Lightning ground flash density Flashes/ km ² /year	High	xxxxxxxx
1.4		d) Maximum solar radiation W/m ²	2500	xxxxxxxx
1.5		e) Ultraviolet radiation	High	xxxxxxxx
1.6		f) Relative humidity %	10-95	xxxxxxxx
1.7		g) Application: coastal/inland	_____	xxxxxxxx
1.8		h) wind pressure Pa	700	xxxxxxxx
2	3.1.2	Insulation Medium		
2.1		Primary insulation medium for CTs & VTs	Oil - EST 32-321	xxxxxxxx
3	3.1.3	Configuration Detail		
3.1		Configuration	3Φ - 4 wire	xxxxxxxx
3.2		Primary star point earthing (required)	External	xxxxxxxx
3.3		Secondary star point earthing (required)	External	xxxxxxxx
3.4	3.1.3.1	Core structure (5 limb / 3 x 1 Ø VTs)	xxxxxxxx	_____
4	3.1.4	Current Transformers		
4.1		Type (A or B or C)	B (200A)	xxxxxxxx
	3.1.4.1	Accuracy class (see Table 1)	0.2 S	xxxxxxxx
4.2		40/1 A Class	0.2	_____
4.3	3.1.4.1	Burden VA	5	_____
4.5	3.1.4.2	Secondary current A	1	_____
4.6	3.1.4.3	Short time current withstand level – 1 s kA	20	_____
5	3.1.5	Voltage Transformers		
5.1	3.1.5.1	Accuracy class Class	0.2	_____
5.2	3.1.5.1	Burden VA	25	_____
5.3	3.1.5.2	Primary nominal voltage kV	6.6	_____

**MEDIUM VOLTAGE CT-VT METERING UNITS WITH
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5.4	3.1.5.3	Secondary nominal voltage	V	110	_____
	3.1.5.4	Insulation levels:			
5.5		Lightning impulse peak withstand voltage	kV	75	_____
5.6		Rated short-duration power-frequency r.m.s. withstand voltage – 60 seconds	kV	22	_____
5.7	3.1.5.5	Rated voltage factor: Continuous	kV	1.2 x U _n	_____
		30 seconds	kV	1.9 x U _n	_____
6	3.1.9	Housing and corrosion protection			
6.1		Inland - mild steel		xxxxxxxxxx	_____
		Coastal - 3CR12 or zinc sprayed mild steel			_____
6.2		Corrosion protection		As per 240 – 75655504	_____
6.3		Colour		As per SANS 780	_____
7	3.3.1	Bushings			
7.1		Profile		As per IEC 60815	_____
7.2		Bushing Material		xxxxxxxxxx	_____
7.3		Creepage (See Table 5)	mm/kV	xxxxxxxxxx	_____
7.4		Stem diameter		M12	_____
7.5		Stem type		Threaded	_____
7.6		Stem material		Copper	_____
7.7		Manufacturer		xxxxxxxxxx	_____
8	3.3.2	Pole mounting requirements			
8.1		Mass of unit	kg	xxxxxxxxxx	_____
8.2		H ₀ (max) including surge arrester	mm	1100	_____
8.3		W ₀ (max) including surge arrester	mm	1080	_____
8.4		L ₀ (max)	mm	1500	_____
9	3.5	Documentation			
9.1	3.5.2	Number of copies of all drawings and wiring diagrams to be submitted with tender		1	_____
9.2	3.5.3	Number of copies of all type test certificates to be submitted with tender		1	_____
10		Tests			
	3.9.1	Type Tests:			Rep No.
10.1	3.9.1.1	Lightning impulse test		xxxxxxxxxx	_____
10.2	3.9.1.1	Power frequency wet withstand test		xxxxxxxxxx	_____
10.3	3.9.1.2	Short-circuit withstand capability test VTs		xxxxxxxxxx	_____
10.4	3.9.1.2	Short time current test for CTs		xxxxxxxxxx	_____
10.5	3.9.1.3	Temperature rise tests		xxxxxxxxxx	_____
10.6	3.9.1.4	Accuracy tests		xxxxxxxxxx	_____
10.7	3.9.3.1	Chopped Impulse		xxxxxxxxxx	_____

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Technical schedules A and B

6.6 kV Type C CT-VT Metering Unit (Pole Mounted)

Schedule A: Purchaser's specific requirements

Schedule B: Particulars of equipment to be supplied

1	2	3	4	5
Item	Sub-clause	Description	Schedule A	Schedule B
1	3.1.1	Standard operating conditions		
1.1		a) Altitude m	1800	xxxxxxxx
1.2		b) Ambient air temperature °C	-5 to +40	xxxxxxxx
1.3		c) Lightning ground flash density Flashes/ km ² /year	High	xxxxxxxx
1.4		d) Maximum solar radiation W/m ²	2500	xxxxxxxx
1.5		e) Ultraviolet radiation	High	xxxxxxxx
1.6		f) Relative humidity %	10-95	xxxxxxxx
1.7		g) Application: coastal/inland	_____	xxxxxxxx
1.8		h) wind pressure Pa	700	xxxxxxxx
2	3.1.2	Insulation Medium		
2.1		Primary insulation medium for CTs & VTs	Oil - EST 32-321	xxxxxxxx
3	3.1.3	Configuration Detail		
3.1		Configuration	3Φ - 4 wire	xxxxxxxx
3.2		Primary star point earthing (required)	External	xxxxxxxx
3.3		Secondary star point earthing (required)	Eternal	xxxxxxxx
3.4	3.1.3.1	Core structure (5 limb / 3 x 1Ø VTs)	xxxxxxxx	_____
4	3.1.4	Current Transformers		
4.1		Type (A or B or C)	C (400A)	xxxxxxxx
	3.1.4.1	Accuracy class (see Table 1)	0.2 S	xxxxxxxx
4.2		80/1 A Class	0.2	_____
4.3	3.1.4.1	Burden VA	5	_____
4.5	3.1.4.2	Secondary current A	1	_____
4.6	3.1.4.3	Short time current withstand level – 1 s kA	20	_____

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5	3.1.5	Voltage Transformers			
5.1	3.1.5.1	Accuracy class	Class	0.2	_____
5.2	3.1.5.1	Burden	VA	25	_____
5.3	3.1.5.2	Primary nominal voltage	kV	6.6	_____
5.4	3.1.5.3	Secondary nominal voltage	V	110	_____
	3.1.5.4	Insulation levels:			
5.5		Lightning impulse peak withstand voltage	kV	75	_____
5.6		Rated short-duration power-frequency r.m.s. withstand voltage – 60 seconds	kV	22	_____
5.7	3.1.5.5	Rated voltage factor: Continuous	kV	1.2 x U _n	_____
		30 seconds	kV	1.9 x U _n	_____
6	3.1.9	Housing and corrosion protection			
6.1		Inland - mild steel		xxxxxxx	_____
		Coastal - 3CR12 or zinc sprayed mild steel		xxxxxxx	_____
6.2		Corrosion protection		As per 240 – 7565504	_____
6.3		Colour		As per SANS 780	_____
7	3.3.1	Bushings			
7.1		Profile		As per IEC 60815	_____
7.2		Bushing Material		xxxxxxx	_____
7.3		Creepage (See Table 5)	mm/kV	xxxxxxx	_____
7.4		Stem diameter		M12	_____
7.5		Stem type		Threaded	_____
7.6		Stem material		Copper	_____
7.7		Manufacturer		xxxxxxx	_____
8	3.3.2	Pole mounting requirements			
8.1		Mass of unit	kg	xxxxxxx	_____
8.2		H ₀ (max) including surge arrester	mm	1100	_____
8.3		W ₀ (max) including surge arrester	mm	1080	_____
8.4		L ₀ (max)	mm	1500	_____
9	3.5	Documentation			
9.1	3.5.2	Number of copies of all drawings and wiring diagrams to be submitted with tender		1	_____
9.2	3.5.3	Number of copies of all type test certificates to be submitted with tender		1	_____
10		Tests			
	3.9.1	Type Tests:			Rep No.

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10.1	3.9.1. 1	Lightning impulse test	xxxxxxx	_____
10.2	3.9.1. 1	Power frequency wet withstand test	xxxxxxx	_____
10.3	3.9.1. 2	Short-circuit withstand capability test for VTs	xxxxxxx	_____
10.4	3.9.1. 2	Short time current test for CTs	xxxxxxx	_____
10.5	3.9.1. 3	Temperature rise tests	xxxxxxx	_____
10.6	3.9.1. 4	Accuracy tests	xxxxxxx	_____
10.7	3.9.3. 1	Chopped Impulse	xxxxxxx	_____

Technical schedules A and B

11 kV Type A CT-VT Metering Unit (Ground Mounted)

Schedule A: Purchaser's specific requirements

Schedule B: Particulars of equipment to be supplied

1	2	3	4	5
Item	Sub-clause	Description	Schedule A	Schedule B
1	3.1.1	Standard operating conditions		
1.1		a) Altitude m	1800	xxxxxxx
1.2		b) Ambient air temperature °C	-5 to +40	xxxxxxx
1.3		c) Lightning ground flash density Flashes/km ² /year	High	xxxxxxx
1.4		d) Maximum solar radiation W/m ²	2500	xxxxxxx
1.5		e) Ultraviolet radiation	High	xxxxxxx
1.6		f) Relative humidity %	10-95	xxxxxxx
1.7		g) Application: coastal/inland	_____	xxxxxxx
1.8		h) wind pressure Pa	700	xxxxxxx
2	3.1.2	Insulation Medium		
2.1		Primary insulation medium for CTs & VTs	Oil - EST 32-321	xxxxxxx
3	3.1.3	Configuration Detail		
3.1		Configuration	3Φ / 4 wire	xxxxxxx
3.2		Primary star point earthing (required)	External	xxxxxxx
3.3		Secondary star point earthing (required)	External	xxxxxxx

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3.4	3.1.3. 1	Core structure (5 limb / 3 x 1Ø VTs)		xxxxxxx	_____
4	3.1.4	Current Transformers			
4.1		Type (A or B or C)		A (100A)	xxxxxxx
	3.1.4. 1	Accuracy class (see Table 1)		0.2	xxxxxxx
4.2		25/1 A	Class	0.2	_____
4.3	3.1.4. 1	Burden	VA	5	_____
4.4	3.1.4. 3	Secondary current	A	1	_____
4.5	3.1.4. 4	Short time current withstand level – 1s	kA	12	_____
5	3.1.5	Voltage Transformers			
5.1	3.1.5. 1	Accuracy class	Class	0.2	_____
5.2	3.1.5. 1	Burden	VA	25	_____
5.3	3.1.5. 2	Primary nominal voltage	kV	11	_____
5.4	3.1.5. 3	Secondary nominal voltage	V	110	_____
	3.1.5. 4	Insulation levels:			
5.5		Lightning impulse peak withstand voltage	kV	95	_____
5.6		Rated short-duration power-frequency r.m.s. withstand voltage – 60 seconds	kV	28	_____
5.7	3.1.5. 5	Rated voltage factor: Continuous	kV	1.2 x U _n	_____
		30 seconds	kV	1.9 x U _n	_____
6	3.1.9	Housing and corrosion protection			
6.1		Inland - mild steel		xxxxxxx	_____
		Coastal - 3CR12 or zinc sprayed mild steel		xxxxxxx	_____
6.2		Corrosion protection		As per 240 – 7565504	_____
6.3		Colour		As per SANS 780	_____
7	3.2.1	Cable termination enclosure			
7.1	3.2.1. 1	Bushing-centre spacing (minimum)	mm	135	_____
7.2	3.2.1. 1	Distance between outer bushing-centres and metal enclosure (minimum)	mm	90	_____
7.3	3.2.1. 3	Bushing specification		EN 50180	_____
7.4	3.2.1. 3	Bushing type		Type C 630A with M16x2 thread size	_____

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7.5	3.2.1. 3	Bushing creepage	mm/kV	As per EN 50180	_____
7.6	3.2.1. 4	Removable gland plate		YES	_____
7.7	3.2.1. 5	Boss to be provided for cable earthing		YES	_____
7.8		Incoming MV cable requirements			
		a) 3 × single core / 1 × three core		1 × 3 core	_____
		b) Cable material		Copper	_____
		c) Size of core cross-section	mm ²	≤ 95	_____
		d) Type of cable (PILC/XLPE)		_____	_____
		e) Rubber grommet and cable support clamp required		YES	_____
		f) Minimum distance from gland plate to centre-line of bushings	mm	800	_____
		g) Type of connection (240 -76628631)		Type 3	_____
8		Ground mounting requirements			
8.1		Mass of unit	kg	xxxxxxx	_____
8.2	3.2.3	Plinth requirements		As per Figure 2	_____
9	3.5	Documentation			
9.1	3.5.2	Number of copies of all drawings and wiring diagrams to be submitted with tender		1	_____
9.2	3.5.3	Number of copies of all type test certificates to be submitted with tender		1	_____
10		Tests			
	3.9.1	Type Tests:			Rep No.
10.1	3.9.1. 1	Lightning impulse test		xxxxxxx	_____
10.2	3.9.1. 1	Power frequency wet withstand test		xxxxxxx	_____
10.3	3.9.1. 2	Short-circuit withstand capability test for VTs		xxxxxxx	_____
10.4	3.9.1. 2	Short time current test for CTs		xxxxxxx	_____
10.5	3.9.1. 3	Temperature rise tests		xxxxxxx	_____
10.6	3.9.1. 4	Accuracy tests		xxxxxxx	_____
10.7	3.9.3. 1	Chopped Impulse		xxxxxxx	_____

Technical Schedules A & B

11kV Type B CT-VT metering Unit (Ground Mounted)

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Schedule A: Purchaser's specific requirements

Schedule B: Particulars of equipment to be supplied

1	2	3	4	5
Item	Sub-clause	Description	Schedule A	Schedule B
1	3.1.1	Standard operating conditions		
1.1		a) Altitude m	1800	xxxxxxxx
1.2		b) Ambient air temperature °C	-5 to +40	xxxxxxxx
1.3		c) Lightning ground flash density Flashes/ km ² /year	High	xxxxxxxx
1.4		d) Maximum solar radiation W/m ²	2500	xxxxxxxx
1.5		e) Ultraviolet radiation	High	xxxxxxxx
1.6		f) Relative humidity %	10-95	xxxxxxxx
1.7		g) Application: coastal/inland	_____	xxxxxxxx
1.8		h) wind pressure Pa	700	xxxxxxxx
2	3.1.2	Insulation Medium		
2.1		Primary insulation medium for CTs & VTs	Oil - EST 32-321	xxxxxxxx
3	3.1.3	Configuration Detail		
3.1		Configuration	3Φ / 4 wire	xxxxxxxx
3.2		Primary star point earthing (required)	External	xxxxxxxx
3.3		Secondary star point earthing (required)	External	xxxxxxxx
3.4	3.1.3.1	Core structure (5 limb / 3 x 1Ø VTs)	xxxxxxxx	_____
4	3.1.4	Current Transformers		
4.1		Type (A or B or C)	B (200A)	xxxxxxxx
	3.1.4.1	Accuracy class (see Table 1)	0.2 S	xxxxxxxx
4.2		40/1 A Class	0.2	_____
4.3	3.1.4.1	Burden VA	5	_____
4.4	3.1.4.2	Secondary current A	1	_____
4.5	3.1.4.3	Short time current withstand level – 1s kA	20	_____
5	3.1.5	Voltage Transformers		
5.1	3.1.5.1	Accuracy class Class	0.2	_____
5.2	3.1.5.1	Burden VA	25	_____
5.3	3.1.5.2	Primary nominal voltage kV	11	_____
5.4	3.1.5.3	Secondary nominal voltage V	110	_____
	3.1.5.4	Insulation levels:		
5.5		Lightning impulse peak withstand voltage kV	95	_____
5.6		Rated short-duration power-frequency r.m.s. withstand voltage – 60 seconds kV	28	_____

5.7	3.1.5.5	Rated voltage factor: Continuous 30 seconds	kV kV	1.2 x U _n 1.9 x U _n	_____
6	3.1.9	Housing and corrosion protection			
6.1		Inland - mild steel		xxxxxxx xxxxxxx	_____
		Coastal - 3CR12 or zinc sprayed mild steel			_____
6.2		Corrosion protection		As per 240 – 75655504	_____
6.3		Colour		As per SANS 780	_____
7	3.2.1	Cable termination enclosure			
7.1	3.2.1.1	Bushing-centre spacing (minimum)	mm	135	_____
7.2	3.2.1.1	Distance between outer bushing-centres and metal enclosure (minimum)	mm	90	_____
7.3	3.2.1.3	Bushing specification		EN 50180	_____
7.4	3.2.1.3	Bushing type		Type C 630A with M16x2 thread size	_____
7.5	3.2.1.3	Bushing creepage	mm/kV	As per EN 50180	_____
7.6	3.2.1.4	Removable gland plate		YES	_____
7.7	3.2.1.5	Boss to be provided for cable earthing		YES	_____
7.8		Incoming MV cable requirements			
		a) 3 × single core / 1 × three core		1 × 3 core	_____
		b) Cable material		Copper	_____
		c) Size of core cross-section	mm ²	≤ 95	_____
		d) Type of cable (PILC/XLPE)		_____	_____
		e) Rubber grommet and cable support clamp required		YES	_____
		f) Minimum distance from gland plate to centre-line of bushings	mm	800	_____
		g) Type of connection (240 -76628631)		Type 3	_____
8		Ground mounting requirements			
8.1		Mass of unit	kg	xxxxxxx	_____
8.2	3.2.3	Plinth requirements		As per Figure 2	_____
9	3.5	Documentation			
9.1	3.5.2	Number of copies of all drawings and wiring diagrams to be submitted with tender		1	_____
9.2	3.5.3	Number of copies of all type test certificates to be submitted with tender		1	_____
10		Tests			

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	3.9.1	Type Tests:		Rep No.
10.1	3.9.1.1	Lightning impulse test	xxxxxxx	_____
10.2	3.9.1.1	Power frequency wet withstand test	xxxxxxx	_____
10.3	3.9.1.2	Short-circuit withstand capability test for VTs	xxxxxxx	_____
10.4	3.9.1.2	Short time current test for CTs	xxxxxxx	_____
10.5	3.9.1.3	Temperature rise tests	xxxxxxx	_____
10.6	3.9.1.4	Accuracy tests	xxxxxxx	_____
10.7	3.9.3.1	Chopped Impulse	xxxxxxx	_____

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Technical schedules A and B

11 kV Type C CT-VT Metering Unit (Ground Mounted)

Schedule A: Purchaser's specific requirements

Schedule B: Particulars of equipment to be supplied

1	2	3	4	5
Item	Sub-clause	Description	Schedule A	Schedule B
1	3.1.1	Standard operating conditions		
1.1		a) Altitude m	1800	xxxxxxxx
1.2		b) Ambient air temperature °C	-5 to +40	xxxxxxxx
1.3		c) Lightning ground flash density Flashes/ km ² /year	High	xxxxxxxx
1.4		d) Maximum solar radiation W/m ²	2500	xxxxxxxx
1.5		e) Ultraviolet radiation	High	xxxxxxxx
1.6		f) Relative humidity %	10-95	xxxxxxxx
1.7		g) Application: coastal/inland	_____	xxxxxxxx
1.8		h) wind pressure Pa	700	xxxxxxxx
2	3.1.2	Insulation Medium		
2.1		Primary insulation medium for CTs & VTs	Oil - EST 32-321	xxxxxxxx
3	3.1.3	Configuration Detail		
3.1		Configuration	3Φ / 4 wire	xxxxxxxx
3.2		Primary star point earthing (required)	External	xxxxxxxx
3.3		Secondary star point earthing (required)	External	xxxxxxxx
3.4	3.1.3.1	Core structure (5 limb / 3 x 1Ø VTs)	xxxxxxxx	_____
4	3.1.4	Current Transformers		
4.1		Type (A or B or C)	C (400A)	xxxxxxxx
	3.1.4.1	Accuracy class (see Table 1)	0.2 S	xxxxxxxx
4.2		80/1 A Class	0.2	_____
4.3	3.1.4.1	Burden VA	5	_____
4.4	3.1.4.2	Secondary current A	1	_____
4.5	3.1.4.3	Short time current withstand level – 1 s kA	20	_____
5	3.1.5	Voltage Transformers		
5.1	3.1.5.1	Accuracy class Class	0.2	_____
5.2	3.1.5.1	Burden VA	25	_____
5.3	3.1.5.2	Primary nominal voltage kV	11	_____

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5.4	3.1.5.3	Secondary nominal voltage	V	110	_____
	3.1.5.4	Insulation levels:			
5.5		Lightning impulse peak withstand voltage	kV	95	_____
5.6		Rated short-duration power-frequency r.m.s. withstand voltage – 60 seconds	kV	28	_____
5.7	3.1.5.5	Rated voltage factor: Continuous	kV	1.2 x U _n	_____
		30 seconds	kV	1.9 x U _n	_____
6	3.1.9	Housing and corrosion protection			
6.1		Inland - mild steel		xxxxxxx	_____
		Coastal - 3CR12 or zinc sprayed mild steel		xxxxxxx	_____
6.2		Corrosion protection		As per 240 – 7565504	_____
6.3		Colour		As per SANS 780	_____
7	3.2.1	Cable termination enclosure			
7.1	3.2.1.1	Bushing-centre spacing (minimum)	mm	135	_____
7.2	3.2.1.1	Distance between outer bushing-centres and metal enclosure (minimum)	mm	90	_____
7.3	3.2.1.3	Bushing specification		EN 50180	_____
7.4	3.2.1.3	Bushing type		Type C 630A with M16x2 thread size	_____
7.5	3.2.1.3	Bushing creepage	mm/kV	As per EN 50180	_____
7.6	3.2.1.4	Removable gland plate		YES	_____
7.7	3.2.1.5	Boss to be provided for cable earthing		YES	_____
7.8		Incoming MV cable requirements			
		a) 3 × single core / 1 × three core		1 × 3 core	_____
		b) Cable material		Copper	_____
		c) Size of core cross-section	mm ²	≤ 185	_____
		d) Type of cable (PILC/XLPE)		_____	_____
		e) Rubber grommet and cable support clamp required		YES	_____
		f) Minimum distance from gland plate to centre-line of bushings	mm	800	_____
		g) Type of connection (240 -76628631)		Type 3	_____
8		Ground mounting requirements			
8.1		Mass of unit	kg	xxxxxxx	_____
8.2	3.2.3	Plinth requirements		As per Figure 2	_____
9	3.5	Documentation			
9.1	3.5.2	Number of copies of all drawings and wiring diagrams to be submitted with tender		1	_____

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9.2	3.5.3	Number of copies of all type test certificates to be submitted with tender	1	_____
10		Tests		
	3.9.1	Type Tests:		Rep No.
10.1	3.9.1.1	Lightning impulse test	xxxxxxx	_____
10.2	3.9.1.1	Power frequency wet withstand test	xxxxxxx	_____
10.3	3.9.1.2	Short-circuit withstand capability test for VTs	xxxxxxx	_____
10.4	3.9.1.2	Short time current test for CTs	xxxxxxx	_____
10.5	3.9.1.3	Temperature rise tests	xxxxxxx	_____
10.6	3.9.1.4	Accuracy tests	xxxxxxx	_____
10.7	3.9.3.1	Chopped Impulse	xxxxxxx	_____

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Technical schedules A and B**11 kV Type A CT-VT Metering Unit (Pole Mounted)**

Schedule A: Purchaser's specific requirements

Schedule B: Particulars of equipment to be supplied

1	2	3	4	5
Item	Sub-clause	Description	Schedule A	Schedule B
1	3.1.1	Standard operating conditions		
1.1		a) Altitude m	1800	xxxxxxxx
1.2		b) Ambient air temperature °C	-5 to +40	xxxxxxxx
1.3		c) Lightning ground flash density Flashes/ km ² /year	High	xxxxxxxx
1.4		d) Maximum solar radiation W/m ²	2500	xxxxxxxx
1.5		e) Ultraviolet radiation	High	xxxxxxxx
1.6		f) Relative humidity %	10-95	xxxxxxxx
1.7		g) Application: coastal/inland	_____	xxxxxxxx
1.8		h) wind pressure Pa	700	xxxxxxxx
2	3.1.2	Insulation Medium		
2.1		Primary insulation medium for CTs & VTs	Oil - EST 32-321	xxxxxxxx
3	3.1.3	Configuration Detail		
3.1		Configuration	3Φ / 4 wire	xxxxxxxx
3.2		Primary star point earthing (required)	External	xxxxxxxx
3.3		Secondary star point earthing (required)	External	xxxxxxxx
3.4	3.1.3.1	Core structure (5 limb / 3 x 1Ø VTs)	xxxxxxxx	_____
4	3.1.4	Current Transformers		
4.1		Type (A or B or C)	A (100A)	xxxxxxxx
	3.1.4.1	Accuracy class (see Table 1)	0.2	xxxxxxxx
4.2		25/1 A Class	0.2	_____
4.3	3.1.4.1	Burden VA	5	_____
4.4	3.1.4.2	Secondary current A	1	_____
4.5	3.1.4.4	Short time current withstand level – 1 s kA	12	_____
5	3.1.5	Voltage Transformers		
5.1	3.1.5.1	Accuracy class Class	0.2	_____
5.2	3.1.5.1	Burden VA	25	_____
5.3	3.1.5.2	Primary nominal voltage kV	11	_____

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5.4	3.1.5.3	Secondary nominal voltage	V	110	_____
	3.1.5.4	Insulation levels:			_____
5.5		Lightning impulse peak withstand voltage	kV	95	_____
5.6		Rated short-duration power-frequency r.m.s. withstand voltage – 60 seconds	kV	28	_____
5.7	3.1.5.5	Rated voltage factor: Continuous	kV	1.2 x U _n	_____
		30 seconds	kV	1.9 x U _n	_____
6	3.1.9	Housing and corrosion protection			
6.1		Inland - mild steel		xxxxxxx	_____
		Coastal - 3CR12 or zinc sprayed mild steel		xxxxxxx	_____
6.2		Corrosion protection		As per 240 – 7565504	_____
6.3		Colour		As per SANS 780	_____
7	3.3.1	Bushings			
7.1		Profile		As per IEC 60815	_____
7.2		Bushing Material		xxxxxxx	_____
7.3		Creepage (See Table 6)	mm/kV	xxxxxxx	_____
7.4		Stem diameter		M12	_____
7.5		Stem type		Threaded	_____
7.6		Stem material		Copper	_____
7.7		Manufacturer		xxxxxxx	_____
8	3.3.2	Pole mounting requirements			
8.1		Mass of unit	kg	xxxxxxx	_____
8.2		H ₀ (max) including surge arrester	mm	1100	_____
8.3		W ₀ (max) including surge arrester	mm	1080	_____
8.4		L ₀ (max)	mm	1500	_____
9	3.5	Documentation			
9.1	3.5.2	Number of copies of all drawings and wiring diagrams to be submitted with tender		2	_____
9.2	3.5.3	Number of copies of all type test certificates to be submitted with tender		1	_____
10		Tests			
	3.9.1	Type Tests:			Rep No.
10.1	3.9.1.1	Lightning impulse test		xxxxxxx	_____
10.2	3.9.1.1	Power frequency wet withstand test		xxxxxxx	_____
10.3	3.9.1.2	Short-circuit withstand capability test for VTs		xxxxxxx	_____
10.4	3.9.1.2	Short time current test for CTs		xxxxxxx	_____
10.5	3.9.1.3	Temperature rise tests (Provide report ref. no.)		xxxxxxx	_____
10.6	3.9.1.4	Accuracy tests (Provide report ref. no.)		xxxxxxx	_____
10.7	3.9.3.1	Chopped Impulse (Provide report ref. no.)		xxxxxxx	_____

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Technical schedules A and B

11kV Type B CT-VT Metering Unit (Pole Mounted)

Schedule A: Purchaser's specific requirements

Schedule B: Particulars of equipment to be supplied

1	2	3	4	5
Item	Sub-clause	Description	Schedule A	Schedule B
1	3.1.1	Standard operating conditions		
1.1		a) Altitude m	1800	xxxxxxxx
1.2		b) Ambient air temperature °C	-5 to +40	xxxxxxxx
1.3		c) Lightning ground flash density Flashes/ km ² /year	High	xxxxxxxx
1.4		d) Maximum solar radiation W/m ²	2500	xxxxxxxx
1.5		e) Ultraviolet radiation	High	xxxxxxxx
1.6		f) Relative humidity %	10-95	xxxxxxxx
1.7		g) Application: coastal/inland	_____	xxxxxxxx
1.8		h) wind pressure Pa	700	xxxxxxxx
2	3.1.2	Insulation Medium		
2.1		Primary insulation medium for CTs & VTs	Oil - EST 32-321	xxxxxxxx
3	3.1.3	Configuration Detail		
3.1		Configuration	3Φ / 4 wire	xxxxxxxx
3.2		Primary star point earthing (required)	External	xxxxxxxx
3.3		Secondary star point earthing (required)	External	xxxxxxxx
3.4	3.1.3.1	Core structure (5 limb / 3 x 1Ø VTs)	xxxxxxxx	_____
4	3.1.4	Current Transformers		
4.1		Type (A or B or C)	B (200A)	xxxxxxxx
	3.1.4.1	Accuracy class (see Table 1)	0.2 S	xxxxxxxx
4.2		40/1 A Class	0.2	_____
4.3	3.1.4.1	Burden VA	5	_____
4.4	3.1.4.2	Secondary current A	1	_____
4.5	3.1.4.4	Short time current withstand level – 1 s kA	20	_____
5	3.1.5	Voltage Transformers		
5.1	3.1.5.1	Accuracy class Class	0.2	_____
5.2	3.1.5.1	Burden VA	25	_____
5.3	3.1.5.2	Primary nominal voltage kV	11	_____
5.4	3.1.5.3	Secondary nominal voltage V	110	_____
	3.1.5.4	Insulation levels:		

5.5		Lightning impulse peak withstand voltage	kV	95	_____
5.6		Rated short-duration power-frequency r.m.s. withstand voltage – 60 seconds	kV	28	_____
5.7	3.1.5.5	Rated voltage factor: Continuous	kV	1.2 x U _n	_____
		30 seconds	kV	1.9 x U _n	_____
6	3.1.9	Housing and corrosion protection			
6.1		Inland - mild steel		xxxxxxx	_____
		Coastal - 3CR12 or zinc sprayed mild steel		xxxxxxx	_____
6.2		Corrosion protection		As per 240 – 7565504	_____
6.3		Colour		As per SANS 780	_____
7	3.3.1	Bushings			
7.1		Profile		As per IEC 60815	_____
7.2		Bushing Material		xxxxxxx	_____
7.3		Creepage (See Table 6)	mm/kV	xxxxxxx	_____
7.4		Stem diameter		M12	_____
7.5		Stem type		Threaded	_____
7.6		Stem material		Copper	_____
7.7		Manufacturer		xxxxxxx	_____
8	3.3.2	Pole mounting requirements			
8.1		Mass of unit	kg	xxxxxxx	_____
8.2		H ₀ (max) including surge arrester	mm	1100	_____
8.3		W ₀ (max) including surge arrester	mm	1080	_____
8.4		L ₀ (max)	mm	1500	_____
9	3.5	Documentation			
9.1	3.5.2	Number of copies of all drawings and wiring diagrams to be submitted with tender		2	_____
9.2	3.5.3	Number of copies of all type test certificates to be submitted with tender		1	_____
10		Tests			
	3.9.1	Type Tests:			Rep No.
10.1	3.9.1.1	Lightning impulse test		xxxxxxx	_____
10.2	3.9.1.1	Power frequency wet withstand test		xxxxxxx	_____
10.3	3.9.1.2	Short-circuit withstand capability test for voltage transformers		xxxxxxx	_____
10.4	3.9.1.2	Short time current test for current transformers		xxxxxxx	_____
10.5	3.9.1.3	Temperature rise tests (Provide report ref. no.)		xxxxxxx	_____
10.6	3.9.1.4	Accuracy tests (Provide report ref. no.)		xxxxxxx	_____
10.7	3.9.3.1	Chopped Impulse (Provide report ref. no.)		xxxxxxx	_____

Technical Schedules A & B

11kV Type C CT-VT Metering Unit (Pole Mounted)

Schedule A: Purchaser's specific requirements

Schedule B: Particulars of equipment to be supplied

1	2	3	4	5
Item	Sub-clause	Description	Schedule A	Schedule B
1	3.1.1	Standard operating conditions		
1.1		a) Altitude m	1800	xxxxxxxx
1.2		b) Ambient air temperature °C	-5 to +40	xxxxxxxx
1.3		c) Lightning ground flash density Flashes/ km ² /year	High	xxxxxxxx
1.4		d) Maximum solar radiation W/m ²	2500	xxxxxxxx
1.5		e) Ultraviolet radiation	High	xxxxxxxx
1.6		f) Relative humidity %	10-95	xxxxxxxx
1.7		g) Application: coastal/inland	_____	xxxxxxxx
1.8		h) wind pressure Pa	700	xxxxxxxx
2	3.1.2	Insulation Medium		
2.1		Primary insulation medium for CTs & VTs	Oil - EST 32- 321	xxxxxxxx
3	3.1.3	Configuration Detail		
3.1		Configuration	3Φ / 4 wire	xxxxxxxx
3.2		Primary star point earthing (required)	External	xxxxxxxx
3.3		Secondary star point earthing (required)	External	xxxxxxxx
3.4	3.1.3.1	Core structure (5 limb / 3 x 1Φ VTs)	xxxxxxxx	_____
4	3.1.4	Current Transformers		
4.1		Type (A or B or C)	C (400A)	xxxxxxxx
	3.1.4.1	Accuracy class (see Table 1)	0.2 S	xxxxxxxx
4.2		80/1 A Class	0.2	_____
4.3	3.1.4.1	Burden VA	5	_____
4.4	3.1.4.2	Secondary current A	1	_____
4.5	3.1.4.4	Short time current withstand level – 1 s kA	20	_____
5	3.1.5	Voltage Transformers		
5.1	3.1.5.1	Accuracy class Class	0.2	_____
5.2	3.1.5.1	Burden VA	25	_____
5.3	3.1.5.2	Primary nominal voltage kV	11	_____

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5.4	3.1.5.3	Secondary nominal voltage	V	110	_____
	3.1.5.4	Insulation levels:			_____
5.5		Lightning impulse peak withstand voltage	kV	95	_____
5.6		Rated short-duration power-frequency r.m.s. withstand voltage – 60 seconds	kV	28	_____
5.7	3.1.5.5	Rated voltage factor: Continuous	kV	1.2 x U _n	_____
		30 seconds	kV	1.9 x U _n	_____
6	3.1.9	Housing and corrosion protection			
6.1		Inland - mild steel		xxxxxxx	_____
		Coastal - 3CR12 or zinc sprayed mild steel		xxxxxxx	_____
6.2		Corrosion protection		As per 240 – 7565504	_____
6.3		Colour		As per SANS 780	_____
7	3.3.1	Bushings			
7.1		Profile		As per IEC 60815	_____
7.2		Bushing Material		xxxxxxx	_____
7.3		Creepage (See Table 6)	mm/kV	xxxxxxx	_____
7.4		Stem diameter		M12	_____
7.5		Stem type		Threaded	_____
7.6		Stem material		Copper	_____
7.7		Manufacturer		xxxxxxx	_____
8	3.3.2	Pole mounting requirements			
8.1		Mass of unit	kg	xxxxxxx	_____
8.2		H ₀ (max) including surge arrester	mm	1100	_____
8.3		W ₀ (max) including surge arrester	mm	1080	_____
8.4		L ₀ (max)	mm	1500	_____
9	3.5	Documentation			
9.1	3.5.2	Number of copies of all drawings and wiring diagrams to be submitted with tender		2	_____
9.2	3.5.3	Number of copies of all type test certificates to be submitted with tender		1	_____
10		Tests			
	3.9.1	Type Tests:			Rep No.
10.1	3.9.1.1	Lightning impulse test		xxxxxxx	_____
10.2	3.9.1.1	Power frequency wet withstand test		xxxxxxx	_____
10.3	3.9.1.2	Short-circuit withstand capability test for VTs		xxxxxxx	_____
10.4	3.9.1.2	Short time current test for CTs		xxxxxxx	_____
10.5	3.9.1.3	Temperature rise tests (Provide report ref. no.)		xxxxxxx	_____
10.6	3.9.1.4	Accuracy tests (Provide report ref. no.)		xxxxxxx	_____
10.7	3.9.3.1	Chopped Impulse (Provide report ref. no.)		xxxxxxx	_____

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Technical schedules A and B

22 kV Type A CT-VT Metering Unit (Ground Mounted)

Schedule A: Purchaser's specific requirements

Schedule B: Particulars of equipment to be supplied

1	2	3	4	5
Item	Sub-clause	Description	Schedule A	Schedule B
1	3.1.1	Standard operating conditions		
1.1		a) Altitude m	1800	xxxxxxxx
1.2		b) Ambient air temperature °C	-5 to +40	xxxxxxxx
1.3		c) Lightning ground flash density Flashes/ km ² /year	High	xxxxxxxx
1.4		d) Maximum solar radiation W/m ²	2500	xxxxxxxx
1.5		e) Ultraviolet radiation	High	xxxxxxxx
1.6		f) Relative humidity %	10-95	xxxxxxxx
1.7		g) Application: coastal/inland	_____	xxxxxxxx
1.8		h) wind pressure Pa	700	xxxxxxxx
2	3.1.2	Insulation Medium		
2.1		Primary insulation medium for CTs & VTs	Oil - EST 32-321	xxxxxxxx
3	3.1.3	Configuration Detail		
3.1		Configuration	3Φ / 4 wire	xxxxxxxx
3.2		Primary star point earthing (required)	External	xxxxxxxx
3.3		Secondary star point earthing (required)	External	xxxxxxxx
3.4	3.1.3.1	Core structure (5 limb / 3 x 1Φ VTs)	xxxxxxxx	_____
4	3.1.4	Current Transformers		
4.1		Type (A or B or C)	A (100A)	xxxxxxxx
	3.1.4.1	Accuracy class (see Table 1)	0.2	xxxxxxxx
4.2		25/1 A Class	0.2	_____
4.3	3.1.4.1	Burden VA	5	_____
4.4	3.1.4.2	Secondary current A	1	_____
4.5	3.1.4.4	Short time current withstand level – 1 s kA	12	_____
5	3.1.5	Voltage Transformers		
5.1	3.1.5.1	Accuracy class Class	0.2	_____
5.2	3.1.5.1	Burden VA	25	_____
5.3	3.1.5.2	Primary nominal voltage kV	22	_____
5.4	3.1.5.3	Secondary nominal voltage V	110	_____

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	3.1.5.4	Insulation levels:			
5.5		Lightning impulse peak withstand voltage	kV	150	_____
5.6		Rated short-duration power-frequency r.m.s. withstand voltage – 60 seconds	kV	50	_____
5.7	3.1.5.5	Rated voltage factor: Continuous	kV	1.2 x U _n	_____
		30 seconds	kV	1.9 x U _n	_____
6	3.1.9	a. Housing and corrosion protection			
6.1		Inland - mild steel		xxxxxxx	_____
		Coastal - 3CR12 or zinc sprayed mild steel		xxxxxxx	_____
6.2		Corrosion protection		As per 240 – 75655504	_____
6.3		Colour		As per SANS 780	_____
7	3.2.1	Cable termination enclosure			
7.1	3.2.1.1	Bushing-centre spacing (minimum)	mm	135	_____
7.2	3.2.1.1	Distance between outer bushing-centres and metal enclosure (minimum)	mm	90	_____
7.3	3.2.1.3	Bushing specification		EN 50180	_____
7.4	3.2.1.3	Bushing type		Type C 630A with M16x2 thread size	_____
7.5	3.2.1.3	Bushing creepage	mm/kV	As per EN 50180	_____
7.6	3.2.1.4	Removable gland plate		YES	_____
7.7	3.2.1.5	Boss to be provided for cable earthing		YES	_____
7.8		Incoming MV cable requirements			
		a) 3 × single core / 1 × three core		1 × 3 core	_____
		b) Cable material		Copper	_____
		c) Size of core cross-section	mm ²	≤ 95	_____
		d) Type of cable (PILC/XLPE)		_____	_____
		e) Rubber grommet and cable support clamp required		YES	_____
		f) Minimum distance from gland plate to centre-line of bushings	mm	800	_____
		g) Type of connection (240 -76628631)		Type 4	_____
8		Ground mounting requirements			
8.1		Mass of unit	kg	xxxxxxx	_____
8.2	3.2.3	Plinth requirements		As per Figure 2	_____
9	3.5	Documentation			
9.1	3.5.2	Number of copies of all drawings and wiring diagrams to be submitted with tender		2	_____
9.2	3.5.3	Number of copies of all type test certificates to be submitted with tender		1	_____

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10		Tests		Rep No.
	3.9.1	Type Tests:		
10.1	3.9.1.1	Lightning impulse test	xxxxxxx	_____
10.2	3.9.1.1	Power frequency wet withstand test	xxxxxxx	_____
10.3	3.9.1.2	Short-circuit withstand capability test for VTs	xxxxxxx	_____
10.4	3.9.1.2	Short time current test for CTs	xxxxxxx	_____
10.5	3.9.1.3	Temperature rise tests	xxxxxxx	_____
10.6	3.9.1.4	Accuracy tests	xxxxxxx	_____
10.7	3.9.3.1	Chopped Impulse	xxxxxxx	_____

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Technical schedules A and B

22kV Type B CT-VT Metering Unit (Ground Mounted)

Schedule A: Purchaser's specific requirements

Schedule B: Particulars of equipment to be supplied

1	2	3	4	5
Item	Sub-clause	Description	Schedule A	Schedule B
1	3.1.1	Standard operating conditions		
1.1		a) Altitude m	1800	xxxxxxxx
1.2		b) Ambient air temperature °C	-5 to +40	xxxxxxxx
1.3		c) Lightning ground flash density Flashes/ km ² /year	High	xxxxxxxx
1.4		d) Maximum solar radiation W/m ²	2500	xxxxxxxx
1.5		e) Ultraviolet radiation	High	xxxxxxxx
1.6		f) Relative humidity %	10-95	xxxxxxxx
1.7		g) Application: coastal/inland	_____	xxxxxxxx
1.8		h) wind pressure Pa	700	xxxxxxxx
2	3.1.2	Insulation Medium		
2.1		Primary insulation medium for CTs & VTs	Oil - EST 32-321	xxxxxxxx
3	3.1.3	Configuration Detail		
3.1		Configuration	3Φ / 4 wire	xxxxxxxx
3.2		Primary star point earthing (required)	External	xxxxxxxx
3.3		Secondary star point earthing (required)	External	xxxxxxxx
3.4	3.1.3.1	Core structure (5 limb / 3 x 1Φ VTs)	xxxxxxxx	_____
4	3.1.4	Current Transformers		
4.1		Type (A or B or C)	B (200A)	xxxxxxxx
	3.1.4.1	Accuracy class (see Table 1)	0.2 S	xxxxxxxx
4.2		40/1 A Class	0.2	_____
4.3	3.1.4.1	Burden VA	5	_____
4.4	3.1.4.2	Secondary current A	1	_____
4.5	3.1.4.4	Short time current withstand level – 1 s kA	20	_____
5	3.1.5	Voltage Transformers		
5.1	3.1.5.1	Accuracy class Class	0.2	_____
5.2	3.1.5.1	Burden VA	25	_____
5.3	3.1.5.2	Primary nominal voltage kV	22	_____
5.4	3.1.5.3	Secondary nominal voltage V	110	_____

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	3.1.5.4	Insulation levels:			
5.5		Lightning impulse peak withstand voltage	kV	150	_____
5.6		Rated short-duration power-frequency r.m.s. withstand voltage – 60 seconds	kV	50	_____
5.7	3.1.5.5	Rated voltage factor: Continuous	kV	1.2 x U _n	_____
		30 seconds	kV	1.9 x U _n	_____
6	3.1.9	a. Housing and corrosion protection			
6.1		Inland - mild steel		xxxxxxx	_____
		Coastal - 3CR12 or zinc sprayed mild steel		xxxxxxx	_____
6.2		Corrosion protection		As per 240 – 75655504	_____
6.3		Colour		As per SANS 780	_____
7	3.2.1	Cable termination enclosure			
7.1	3.2.1.1	Bushing-centre spacing (minimum)	mm	135	_____
7.2	3.2.1.1	Distance between outer bushing-centres and metal enclosure (minimum)	mm	90	_____
7.3	3.2.1.3	Bushing specification		EN 50180	_____
7.4	3.2.1.3	Bushing type		Type C 630A with M16x2 thread size	_____
7.5	3.2.1.3	Bushing creepage	mm/kV	As per EN 50180	_____
7.6	3.2.1.4	Removable gland plate		YES	_____
7.7	3.2.1.5	Boss to be provided for cable earthing		YES	_____
7.8		Incoming MV cable requirements			
		a) 3 × single core / 1 × three core		1 × 3 core	_____
		b) Cable material		Copper	_____
		c) Size of core cross-section	mm ²	≤ 95	_____
		d) Type of cable (PILC/XLPE)		_____	_____
		e) Rubber grommet and cable support clamp required		YES	_____
		f) Minimum distance from gland plate to centre-line of bushings	mm	800	_____
		g) Type of connection (240 -76628631)		Type 4	_____
8		Ground mounting requirements			
8.1		Mass of unit	kg	xxxxxxx	_____
8.2	3.2.3	Plinth requirements		As per Figure 2	_____
9	3.5	Documentation			
9.1	3.5.2	Number of copies of all drawings and wiring diagrams to be submitted with tender		2	_____
9.2	3.5.3	Number of copies of all type test certificates to be submitted with tender		1	_____

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10		Tests		Report Number
	3.9.1	Type Tests:		
10.1	3.9.1.1	Lightning impulse test	xxxxxxx	_____
10.2	3.9.1.1	Power frequency wet withstand test	xxxxxxx	_____
10.3	3.9.1.2	Short-circuit withstand capability test for VTs	xxxxxxx	_____
10.4	3.9.1.2	Short time current test for CTs	xxxxxxx	_____
10.5	3.9.1.3	Temperature rise tests	xxxxxxx	_____
10.6	3.9.1.4	Accuracy tests	xxxxxxx	_____
10.7	3.9.3.1	Chopped Impulse	xxxxxxx	_____

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Technical schedules A and B

22kV Type C CT-VT Metering Unit (Grounded Mounted)

Schedule A: Purchaser's specific requirements

Schedule B: Particulars of equipment to be supplied

1	2	3	4	5
Item	Sub-clause	Description	Schedule A	Schedule B
1	3.1.1	Standard operating conditions		
1.1		a) Altitude m	1800	xxxxxxxx
1.2		b) Ambient air temperature °C	–5 to +40	xxxxxxxx
1.3		c) Lightning ground flash density Flashes/ km ² /year	High	xxxxxxxx
1.4		d) Maximum solar radiation W/m ²	2500	xxxxxxxx
1.5		e) Ultraviolet radiation	High	xxxxxxxx
1.6		f) Relative humidity %	10-95	xxxxxxxx
1.7		g) Application: coastal/inland	_____	xxxxxxxx
1.8		h) wind pressure Pa	700	xxxxxxxx
2	3.1.2	Insulation Medium		
2.1		Primary insulation medium for CTs & VTs	Oil - EST 32-321	xxxxxxxx
3	3.1.3	Configuration Detail		
3.1		Configuration	3Φ / 4 wire	xxxxxxxx
3.2		Primary star point earthing (required)	External	xxxxxxxx
3.3		Secondary star point earthing (required)	External	xxxxxxxx
3.4	3.1.3.1	Core structure (5 limb / 3 x 1Φ VTs)	xxxxxxxx	_____
4	3.1.4	Current Transformers		
4.1		Type (A or B or C)	C (400A)	xxxxxxxx
	3.1.4.1	Accuracy class (see Table 1)	0.2 S	xxxxxxxx
4.2		80/1 A Class	0.2	_____
4.3	3.1.4.1	Burden VA	5	_____
4.4	3.1.4.2	Secondary current A	1	_____
4.5	3.1.4.3	Short time current withstand level – 1 s kA	20	_____
5	3.1.5	Voltage Transformers		
5.1	3.1.5.1	Accuracy class Class	0.2	_____
5.2	3.1.5.1	Burden VA	25	_____
5.3	3.1.5.2	Primary nominal voltage kV	22	_____
5.4	3.1.5.3	Secondary nominal voltage V	110	_____

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	3.1.5.4	Insulation levels:			
5.5		Lightning impulse peak withstand voltage	kV	150	_____
5.6		Rated short-duration power-frequency r.m.s. withstand voltage – 60 seconds	kV	50	_____
5.7	3.1.5.5	Rated voltage factor: Continuous	kV	1.2 x U _n	_____
		30 seconds	kV	1.9 x U _n	_____
6	3.1.9	a. Housing and corrosion protection			
6.1		Inland - mild steel		xxxxxxx	_____
		Coastal - 3CR12 or zinc sprayed mild steel		xxxxxxx	_____
6.2		Corrosion protection		As per 240 – 75655504	_____
6.3		Colour		As per SANS 780	_____
7	3.2.1	Cable termination enclosure			
7.1	3.2.1.1	Bushing-centre spacing (minimum)	mm	135	_____
7.2	3.2.1.1	Distance between outer bushing-centres and metal enclosure (minimum)	mm	90	_____
7.3	3.2.1.3	Bushing specification		EN 50180	_____
7.4	3.2.1.3	Bushing type		Type C 630A with M16x2 thread size	_____
7.5	3.2.1.3	Bushing creepage	mm/kV	As per EN 50180	_____
7.6	3.2.1.4	Removable gland plate		YES	_____
7.7	3.2.1.5	Boss to be provided for cable earthing		YES	_____
7.8		Incoming MV cable requirements			
		a) 3 × single core / 1 × three core		1 × 3 core	_____
		b) Cable material		Copper	_____
		c) Size of core cross-section	mm ²	≤ 185	_____
		d) Type of cable (PILC/XLPE)		_____	_____
		e) Rubber grommet and cable support clamp required		YES	_____
		f) Minimum distance from gland plate to centre-line of bushings	mm	800	_____
		g) Type of connection (240 -76628631)		Type 4	_____
8		Ground mounting requirements			
8.1		Mass of unit	kg	xxxxxxx	_____
8.2	3.2.3	Plinth requirements		As per Figure 2	_____
9	3.5	Documentation			
9.1	3.5.2	Number of copies of all drawings and wiring diagrams to be submitted with tender		1	_____
9.2	3.5.3	Number of copies of all type test certificates to be submitted with tender		1	_____

10		Tests		Rep No.
	3.9.1	Type Tests:		
10.1	3.9.1.1	Lightning impulse test	xxxxxxx	_____
10.2	3.9.1.1	Power frequency wet withstand test	xxxxxxx	_____
10.3	3.9.1.2	Short-circuit withstand capability test for VTs	xxxxxxx	_____
10.4	3.9.1.2	Short time current test for CTs	xxxxxxx	_____
10.5	3.9.1.3	Temperature rise tests	xxxxxxx	_____
10.6	3.9.1.4	Accuracy tests	xxxxxxx	_____
10.7	3.9.3.1	Chopped Impulse	xxxxxxx	_____

Technical schedules A and B

22 kV Type A CT-VT Metering Unit (Pole Mounted)

Schedule A: Purchaser's specific requirements

Schedule B: Particulars of equipment to be supplied

1	2	3	4	5
Item	Sub-clause	Description	Schedule A	Schedule B
1	3.1.1	Standard operating conditions		
1.1		a) Altitude m	1800	xxxxxxxx
1.2		b) Ambient air temperature °C	-5 to +40	xxxxxxxx
1.3		c) Lightning ground flash density Flashes/ km ² /year	High	xxxxxxxx
1.4		d) Maximum solar radiation W/m ²	2500	xxxxxxxx
1.5		e) Ultraviolet radiation	High	xxxxxxxx
1.6		f) Relative humidity %	10-95	xxxxxxxx
1.7		g) Application: coastal/inland	_____	xxxxxxxx
1.8		h) wind pressure Pa	700	xxxxxxxx
2	3.1.2	Insulation Medium		
2.1		Primary insulation medium for CTs & VTs	Oil - EST 32-321	xxxxxxxx
3	3.1.3	Configuration Detail		
3.1		Configuration	3Φ / 4 wire	xxxxxxxx
3.2		Primary star point earthing (required)	External	xxxxxxxx
3.3		Secondary star point earthing (required)	External	xxxxxxxx
3.4	3.1.3.1	Core structure (5 limb / 3 x 1Φ VTs)	xxxxxxxx	_____
4	3.1.4	Current Transformers		
4.1		Type (A or B or C)	A (100A)	xxxxxxxx
	3.1.4.1	Accuracy class (see Table 1) Class	0.2	xxxxxxxx
4.2		25/1 A Class	0.2	_____
4.3	3.1.4.1	Burden VA	5	_____
4.4	3.1.4.2	Secondary current A	1	_____
4.5	3.1.4.4	Short time current withstand level – 1 s kA	12	_____
5	3.1.5	Voltage Transformers		
5.1	3.1.5.1	Accuracy class Class	0.2	_____
5.2	3.1.5.1	Burden VA	25	_____
5.3	3.1.5.2	Primary nominal voltage kV	22	_____
5.4	3.1.5.3	Secondary nominal voltage V	110	_____

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	3.1.5.4	Insulation levels:			
5.5		Lightning impulse peak withstand voltage	kV	150	_____
5.6		Rated short-duration power-frequency r.m.s. withstand voltage – 60 seconds	kV	50	_____
5.7	3.1.5.5	Rated voltage factor: Continuous	kV	1.2 x U _n	_____
		30 seconds	kV	1.9 x U _n	_____
6	3.1.9	Housing and corrosion protection			
6.1		Inland - mild steel		xxxxxxx	_____
		Coastal - 3CR12 or zinc sprayed mild steel		xxxxxxx	_____
6.2		Corrosion protection		As per 240 – 75655504	_____
6.3		Colour		As per SANS 780	_____
7	3.3.1	Bushings			
7.1		Profile		As per IEC 60815	_____
7.2		Bushing Material		xxxxxxx	_____
7.3		Creepage (See Table 6)	mm/kV	xxxxxxx	_____
7.4		Stem diameter		M12	_____
7.5		Stem type		Threaded	_____
7.6		Stem material		Copper	_____
7.7		Manufacturer		xxxxxxx	_____
8	3.3.2	Pole mounting requirements			
8.1		Mass of unit	kg	xxxxxxx	_____
8.2		H ₀ (max) including surge arrester	mm	1100	_____
8.3		W ₀ (max) including surge arrester	mm	1080	_____
8.4		L ₀ (max)	mm	1500	_____
9	3.5	Documentation			
9.1	3.5.2	Number of copies of all drawings and wiring diagrams to be submitted with tender		2	_____
9.2	3.5.3	Number of copies of all type test certificates to be submitted with tender		1	_____
10		Tests			
	3.9.1	Type Tests:			Rep No.
10.1	3.9.1.1	Lightning impulse test		xxxxxxx	_____
10.2	3.9.1.1	Power frequency wet withstand test		xxxxxxx	_____
10.3	3.9.1.2	Short-circuit withstand capability test for VTs		xxxxxxx	_____
10.4	3.9.1.2	Short time current test for CTs		xxxxxxx	_____
10.5	3.9.1.3	Temperature rise tests (Provide report ref. no.)		xxxxxxx	_____
10.6	3.9.1.4	Accuracy tests (Provide report ref. no.)		xxxxxxx	_____
10.7	3.9.3.1	Chopped Impulse (Provide report ref. no.)		xxxxxxx	_____

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Technical schedules A and B

22 kV Type B CT-VT Metering Unit (Pole Mounted)

Schedule A: Purchaser's specific requirements

Schedule B: Particulars of equipment to be supplied

1	2	3	4	5
Item	Sub-clause	Description	Schedule A	Schedule B
1	3.1.1	Standard operating conditions		
1.1		a) Altitude m	1800	xxxxxxxx
1.2		b) Ambient air temperature °C	-5 to +40	xxxxxxxx
1.3		c) Lightning ground flash density Flashes/ km ² /year	High	xxxxxxxx
1.4		d) Maximum solar radiation W/m ²	2500	xxxxxxxx
1.5		e) Ultraviolet radiation	High	xxxxxxxx
1.6		f) Relative humidity %	10-95	xxxxxxxx
1.7		g) Application: coastal/inland	_____	xxxxxxxx
1.8		h) wind pressure Pa	700	xxxxxxxx
2	3.1.2	Insulation Medium		
2.1		Primary insulation medium for CTs & VTs	Oil - EST 32-321	xxxxxxxx
3	3.1.3	Configuration Detail		
3.1		Configuration	3Φ / 4 wire	xxxxxxxx
3.2		Primary star point earthing (required)	External	xxxxxxxx
3.3		Secondary star point earthing (required)	External	xxxxxxxx
3.4	3.1.3.1	Core structure (5 limb / 3 x 1Φ VTs)	xxxxxxxx	_____
4	3.1.4	Current Transformers		
4.1		Type (A or B or C)	B (200A)	xxxxxxxx
	3.1.4.1	Accuracy class (see Table 1)	Class 0.2 S	xxxxxxxx
4.2		40/1 A	Class 0.2	_____
4.3	3.1.4.1	Burden VA	5	_____
4.4	3.1.4.2	Secondary current A	1	_____
4.5	3.1.4.4	Short time current withstand level – 1 s kA	20	_____
5	3.1.5	Voltage Transformers		
5.1	3.1.5.1	Accuracy class	Class 0.2	_____
5.2	3.1.5.1	Burden VA	25	_____
5.3	3.1.5.2	Primary nominal voltage kV	22	_____
5.4	3.1.5.3	Secondary nominal voltage V	110	_____

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	3.1.5.4	Insulation levels:			
5.5		Lightning impulse peak withstand voltage	kV	150	_____
5.6		Rated short-duration power-frequency r.m.s. withstand voltage – 60 seconds	kV	50	_____
5.7	3.1.5.5	Rated voltage factor: Continuous	kV	1.2 x U _n	_____
		30 seconds	kV	1.9 x U _n	_____
6	3.1.9	Housing and corrosion protection			
6.1		Inland - mild steel		xxxxxxx	_____
		Coastal - 3CR12 or zinc sprayed mild steel		xxxxxxx	_____
6.2		Corrosion protection		As per 240 – 75655504	_____
6.3		Colour		As per SANS 780	_____
7	3.3.1	Bushings			
7.1		Profile		As per IEC 60815	_____
7.2		Bushing Material		xxxxxxx	_____
7.3		Creepage (See Table 6)	mm/kV	xxxxxxx	_____
7.4		Stem diameter		M12	_____
7.5		Stem type		Threaded	_____
7.6		Stem material		Copper	_____
7.7		Manufacturer		xxxxxxx	_____
8	3.3.2	Pole mounting requirements			
8.1		Mass of unit	kg	xxxxxxx	_____
8.2		H ₀ (max) including surge arrester	mm	1100	_____
8.3		W ₀ (max) including surge arrester	mm	1080	_____
8.4		L ₀ (max)	mm	1500	_____
9	3.5	Documentation			
9.1	3.5.2	Number of copies of all drawings and wiring diagrams to be submitted with tender		2	_____
9.2	3.5.3	Number of copies of all type test certificates to be submitted with tender		1	_____
10		Tests			
	3.9.1	Type Tests:			Rep No.
10.1	3.9.1.1	Lightning impulse test		xxxxxxx	_____
10.2	3.9.1.1	Power frequency wet withstand test		xxxxxxx	_____
10.3	3.9.1.2	Short-circuit withstand capability test for VTs		xxxxxxx	_____
10.4	3.9.1.2	Short time current test for CTs		xxxxxxx	_____
10.5	3.9.1.3	Temperature rise tests (Provide report ref. no.)		xxxxxxx	_____
10.6	3.9.1.4	Accuracy tests (Provide report ref. no.)		xxxxxxx	_____
10.7	3.9.3.1	Chopped Impulse (Provide report ref. no.)		xxxxxxx	_____

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Technical schedules A and B

22 kV Type C CT-VT Metering Unit (Pole Mounted)

Schedule A: Purchaser's specific requirements

Schedule B: Particulars of equipment to be supplied

1	2	3	4	5
Item	Sub-clause	Description	Schedule A	Schedule B
1	3.1.1	Standard operating conditions		
1.1		a) Altitude m	1800	xxxxxxxx
1.2		b) Ambient air temperature °C	–5 to +40	xxxxxxxx
1.3		c) Lightning ground flash density Flashes/ km ² /year	High	xxxxxxxx
1.4		d) Maximum solar radiation W/m ²	2500	xxxxxxxx
1.5		e) Ultraviolet radiation	High	xxxxxxxx
1.6		f) Relative humidity %	10-95	xxxxxxxx
1.7		g) Application: coastal/inland	_____	xxxxxxxx
1.8		h) wind pressure Pa	700	xxxxxxxx
2	3.1.2	Insulation Medium		
2.1		Primary insulation medium for CTs & VTs	Oil - EST 32-321	xxxxxxxx
3	3.1.3	Configuration Detail		
3.1		Configuration	3Φ / 4 wire	xxxxxxxx
3.2		Primary star point earthing (required)	External	xxxxxxxx
3.3		Secondary star point earthing (required)	External	xxxxxxxx
3.4	3.1.3.1	Core structure (5 limb / 3 x 1Φ VTs)	xxxxxxxx	_____
4	3.1.4	Current Transformers		
4.1		Type (A or B or C)	C (400A)	xxxxxxxx
	3.1.4.1	Accuracy class (see Table 1) Class	0.2 S	xxxxxxxx
4.2		80/1 A Class	0.2	_____
4.3	3.1.4.1	Burden VA	5	_____
4.4	3.1.4.2	Secondary current A	1	_____
4.5	3.1.4.4	Short time current withstand level – 1s kA	20	_____
5	3.1.5	Voltage Transformers		
5.1	3.1.5.1	Accuracy class Class	0.2	_____
5.2	3.1.5.1	Burden VA	25	_____
5.3	3.1.5.2	Primary nominal voltage kV	22	_____
5.4	3.1.5.3	Secondary nominal voltage V	110	_____
	3.1.5.4	Insulation levels:		
5.5		Lightning impulse peak withstand voltage kV	150	_____

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5.6		Rated short-duration power-frequency r.m.s. withstand voltage – 60 seconds	kV	50	_____
5.7	3.1.5.5	Rated voltage factor: Continuous	kV	1.2 x U _n	_____
		30 seconds	kV	1.9 x U _n	_____
6	3.1.9	Housing and corrosion protection			
6.1		Inland - mild steel		xxxxxxx	_____
		Coastal - 3CR12 or zinc sprayed mild steel		xxxxxxx	_____
6.2		Corrosion protection		As per 240 – 7565504	_____
6.3		Colour		As per SANS 780	_____
7	3.3.1	Bushings			
7.1		Profile		As per IEC 60815	_____
7.2		Bushing Material		xxxxxxx	_____
7.3		Creepage (See Table 6)	mm/kV	xxxxxxx	_____
7.4		Stem diameter		M12	_____
7.5		Stem type		Threaded	_____
7.6		Stem material		Copper	_____
7.7		Manufacturer		xxxxxxx	_____
8	3.3.2	Pole mounting requirements			
8.1		Mass of unit	kg	xxxxxxx	_____
8.2		H ₀ (max) including surge arrester	mm	1100	_____
8.3		W ₀ (max) including surge arrester	mm	1080	_____
8.4		L ₀ (max)	mm	1500	_____
9	3.5	Documentation			
9.1	3.5.2	Number of copies of all drawings and wiring diagrams to be submitted with tender		1	_____
9.2	3.5.3	Number of copies of all type test certificates to be submitted with tender		1	_____
10		Tests			
	3.9.1	Type Tests:			Rep No.
10.1	3.9.1.1	Lightning impulse test		xxxxxxx	_____
10.2	3.9.1.1	Power frequency wet withstand test		xxxxxxx	_____
10.3	3.9.1.2	Short-circuit withstand capability test for VTs		xxxxxxx	_____
10.4	3.9.1.2	Short time current test for CTs		xxxxxxx	_____
10.5	3.9.1.3	Temperature rise tests (Provide report ref. no.)		xxxxxxx	_____
10.6	3.9.1.4	Accuracy tests (Provide report ref. no.)		xxxxxxx	_____
10.7	3.9.3.1	Chopped Impulse (Provide report ref. no.)		xxxxxxx	_____

Technical schedules A and B

33 kV Type A CT-VT Metering Unit (Pole Mounted)

Schedule A: Purchaser's specific requirements

Schedule B: Particulars of equipment to be supplied

1	2	3	4	5
Item	Sub-clause	Description	Schedule A	Schedule B
1	3.1.1	Standard operating conditions		
1.1		a) Altitude m	1800	xxxxxxxx
1.2		b) Ambient air temperature °C	–5 to +40	xxxxxxxx
1.3		c) Lightning ground flash density Flashes/ km ² /year	High	xxxxxxxx
1.4		d) Maximum solar radiation W/m ²	2500	xxxxxxxx
1.5		e) Ultraviolet radiation	High	xxxxxxxx
1.6		f) Relative humidity %	10-95	xxxxxxxx
1.7		g) Application: coastal/inland	_____	xxxxxxxx
1.8		h) wind pressure Pa	700	xxxxxxxx
2	3.1.2	Insulation Medium		
2.1		Primary insulation medium for CTs & VTs	Oil - EST 32-321	xxxxxxxx
3	3.1.3	Configuration Detail		
3.1		Configuration	3Φ / 4 wire	xxxxxxxx
3.2		Primary star point earthing (required)	External	xxxxxxxx
3.3		Secondary star point earthing (required)	External	xxxxxxxx
3.4	3.1.3.1	Core structure (5 limb / 3 x 1Φ VTs)	xxxxxxxx	_____
4	3.1.4	Current Transformers		
4.1		Type (A or B or C)	A (100A)	xxxxxxxx
	3.1.4.1	Accuracy class (see Table 1) Class	0.2	xxxxxxxx
4.2		25/1 A Class	0.2	_____
4.3	3.1.4.1	Burden VA	5	_____
4.4	3.1.4.2	Secondary current A	1	_____
4.5	3.1.4.3	Short time current withstand level – 1 s kA	12	_____
5	3.1.5	Voltage Transformers		
5.1	3.1.5.1	Accuracy class Class	0.2	_____
5.2	3.1.5.1	Burden VA	25	_____
5.3	3.1.5.2	Primary nominal voltage kV	33	_____
5.4	3.1.5.3	Secondary nominal voltage V	110	_____

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	3.1.5.4	Insulation levels:			
5.5		Lightning impulse peak withstand voltage	kV	200	_____
5.6		Rated short-duration power-frequency r.m.s. withstand voltage – 60 seconds	kV	70	_____
5.7	3.1.5.5	Rated voltage factor: Continuous	kV	1.2 x U _n	_____
		30 seconds	kV	1.9 x U _n	_____
6	3.1.9	Housing and corrosion protection			
6.1		Inland - mild steel		xxxxxxx	_____
		Coastal - 3CR12 or zinc sprayed mild steel		xxxxxxx	_____
6.2		Corrosion protection		As per 240 – 7565504	_____
6.3		Colour		As per SANS 780	_____
7	3.3.1	Bushings			
7.1		Profile		As per IEC 60815	_____
7.2		Bushing Material		xxxxxxx	_____
7.3		Creepage (See Table 6)	mm/kV	xxxxxxx	_____
7.4		Stem diameter		M12	_____
7.5		Stem type		Threaded	_____
7.6		Stem material		Copper	_____
7.7		Manufacturer		xxxxxxx	_____
8	3.3.2	Pole mounting requirements			
8.1		Mass of unit	kg	xxxxxxx	_____
8.2		H ₀ (max) including surge arrester	mm	1100	_____
8.3		W ₀ (max) including surge arrester	mm	1080	_____
8.4		L ₀ (max)	mm	1500	_____
9	3.5	Documentation			
9.1	3.5.2	Number of copies of all drawings and wiring diagrams to be submitted with tender		1	_____
9.2	3.5.3	Number of copies of all type test certificates to be submitted with tender		1	_____
10		Tests			
	3.9.1	Type Tests:			Rep No.
10.1	3.9.1.1	Lightning impulse test		xxxxxxx	_____
10.2	3.9.1.1	Power frequency wet withstand test		xxxxxxx	_____
10.3	3.9.1.2	Short-circuit withstand capability test for VTs		xxxxxxx	_____
10.4	3.9.1.2	Short time current test for CTs		xxxxxxx	_____
10.5	3.9.1.3	Temperature rise tests (Provide report ref. no.)		xxxxxxx	_____
10.6	3.9.1.4	Accuracy tests (Provide report ref. no.)		xxxxxxx	_____
10.7	3.9.3.1	Chopped Impulse (Provide report ref. no.)		xxxxxxx	_____

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Technical schedules A and B

33 kV Type B CT-VT Metering Unit (Pole Mounted)

Schedule A: Purchaser's specific requirements

Schedule B: Particulars of equipment to be supplied

1	2	3	4	5
Item	Sub-clause	Description	Schedule A	Schedule B
1	3.1.1	Standard operating conditions		
1.1		a) Altitude m	1800	xxxxxxxx
1.2		b) Ambient air temperature °C	–5 to +40	xxxxxxxx
1.3		c) Lightning ground flash density Flashes/ km ² /year	High	xxxxxxxx
1.4		d) Maximum solar radiation W/m ²	2500	xxxxxxxx
1.5		e) Ultraviolet radiation	High	xxxxxxxx
1.6		f) Relative humidity %	10-95	xxxxxxxx
1.7		g) Application: coastal/inland	_____	xxxxxxxx
1.8		h) wind pressure Pa	700	xxxxxxxx
2	3.1.2	Insulation Medium		
2.1		Primary insulation medium for CTs & VTs	Oil - EST 32-321	xxxxxxxx
3	3.1.3	Configuration Detail		
3.1		Configuration	3Φ / 4 wire	xxxxxxxx
3.2		Primary star point earthing (required)	External	xxxxxxxx
3.3		Secondary star point earthing (required)	External	xxxxxxxx
3.4	3.1.3.1	Core structure (5 limb / 3 x 1Φ VTs)	xxxxxxxx	_____
4	3.1.4	Current Transformers		
4.1		Type (B or C)	B (200A)	xxxxxxxx
	3.1.4.1	Accuracy class (see Table 1) Class	0.2 S	xxxxxxxx
4.2		40/1 A Class	0.2	_____
4.3	3.1.4.1	Burden VA	5	_____
4.4	3.1.4.2	Secondary current A	1	_____
4.5	3.1.4.3	Short time current withstand level – 1 s kA	20	_____
5	3.1.5	Voltage Transformers		
5.1	3.1.5.1	Accuracy class Class	0.2	_____
5.2	3.1.5.1	Burden VA	25	_____
5.3	3.1.5.2	Primary nominal voltage kV	33	_____
5.4	3.1.5.3	Secondary nominal voltage V	110	_____

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	3.1.5.4	Insulation levels:			
5.5		Lightning impulse peak withstand voltage	kV	200	_____
5.6		Rated short-duration power-frequency r.m.s. withstand voltage – 60 seconds	kV	70	_____
5.7	3.1.5.5	Rated voltage factor: Continuous	kV	1.2 x U _n	_____
		30 seconds	kV	1.9 x U _n	_____
6	3.1.9	Housing and corrosion protection			
6.1		Inland - mild steel		xxxxxxx	_____
		Coastal - 3CR12 or zinc sprayed mild steel		xxxxxxx	_____
6.2		Corrosion protection		As per 240 – 7565504	_____
6.3		Colour		As per SANS 780	_____
7	3.3.1	Bushings			
7.1		Profile		As per IEC 60815	_____
7.2		Bushing Material		xxxxxxx	_____
7.3		Creepage (See Table 6)	mm/kV	xxxxxxx	_____
7.4		Stem diameter		M12	_____
7.5		Stem type		Threaded	_____
7.6		Stem material		Copper	_____
7.7		Manufacturer		xxxxxxx	_____
8	3.3.2	Pole mounting requirements			
8.1		Mass of unit	kg	xxxxxxx	_____
8.2		H ₀ (max) including surge arrester	mm	1100	_____
8.3		W ₀ (max) including surge arrester	mm	1080	_____
8.4		L ₀ (max)	mm	1500	_____
9	3.5	Documentation			
9.1	3.5.2	Number of copies of all drawings and wiring diagrams to be submitted with tender		2	_____
9.2	3.5.3	Number of copies of all type test certificates to be submitted with tender		1	_____
10		Tests			
	3.9.1	Type Tests:			Rep No.
10.1	3.9.1.1	Lightning impulse test		xxxxxxx	_____
10.2	3.9.1.1	Power frequency wet withstand test		xxxxxxx	_____
10.3	3.9.1.2	Short-circuit withstand capability test for VTs		xxxxxxx	_____
10.4	3.9.1.2	Short time current test for CTs		xxxxxxx	_____
10.5	3.9.1.3	Temperature rise tests		xxxxxxx	_____
10.6	3.9.1.4	Accuracy tests		xxxxxxx	_____
10.7	3.9.3.1	Chopped Impulse		xxxxxxx	_____

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Technical schedules A and B

19 kV Type B CT-VT Metering Unit (SWER - Pole Mounted)

Schedule A: Purchaser's specific requirements

Schedule B: Particulars of equipment to be supplied

1	2	3	4	5
Item	Sub-clause	Description	Schedule A	Schedule B
1	3.1.1	Standard operating conditions		
1.1		a) Altitude m	1800	xxxxxxxx
1.2		b) Ambient air temperature °C	-5 to +40	xxxxxxxx
1.3		c) Lightning ground flash density Flashes/ km ² /year	High	xxxxxxxx
1.4		d) Maximum solar radiation W/m ²	2500	xxxxxxxx
1.5		e) Ultraviolet radiation	High	xxxxxxxx
1.6		f) Relative humidity %	10-95	xxxxxxxx
1.7		g) Application: coastal/inland	_____	xxxxxxxx
1.8		h) wind pressure Pa	700	xxxxxxxx
2	3.1.2	Insulation Medium		
2.1		Primary insulation medium for CTs & VTs	Oil - EST 32-321	xxxxxxxx
3	3.1.3	Configuration Detail		
3.1		Configuration	1Φ	xxxxxxxx
3.2		VT primary earthing (required)	External	xxxxxxxx
3.3		VT secondary earthing (required)	External	xxxxxxxx
4	3.1.4	Current Transformers		
4.1		Type (A or B or C)	B (200A)	xxxxxxxx
	3.1.4.1	Accuracy class (see Table 1) Class	0.2 S	xxxxxxxx
4.2		40/1 A Class	0.2	_____
4.3	3.1.4.1	Burden VA	5	_____
4.4	3.1.4.2	Secondary current A	1	_____
4.5	3.1.4.3	Short time current withstand level – 1 s kA	20	_____
5	3.1.5	Voltage Transformers		
5.1	3.1.5.1	Accuracy class Class	0.2	_____
5.2	3.1.5.1	Burden VA	25	_____
5.3	3.1.5.2	Primary nominal voltage kV	19	_____
5.4	3.1.5.3	Secondary nominal voltage V	63.5	_____
	3.1.5.4	Insulation levels:		

**MEDIUM VOLTAGE CT-VT METERING UNITS WITH
NOMINAL VOLTAGES FROM 6.6KV TO 33KV
STANDARD**
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5.5		Lightning impulse peak withstand voltage	kV	200	_____
5.6		Rated short-duration power-frequency r.m.s. withstand voltage – 60 seconds	kV	70	_____
5.7	3.1.5.5	Rated voltage factor: Continuous	kV	1.2 x U _n	_____
		30 seconds	kV	1.9 x U _n	_____
6	3.1.9	Housing and corrosion protection			
6.1		Inland - mild steel		xxxxxxx	_____
		Coastal - 3CR12 or zinc sprayed mild steel		xxxxxxx	_____
6.2		Corrosion protection		As per 240 – 75655504	_____
6.3		Colour		As per SANS 780	_____
7	3.3.1	Bushings			
7.1		Profile		As per IEC 60815	_____
7.2		Bushing Material		xxxxxxx	_____
7.3		Creepage (See Table 6)		xxxxxxx	_____
7.4		Stem diameter		M12	_____
7.5		Stem type		Threaded	_____
7.6		Stem material		Copper	_____
7.7		Manufacturer		xxxxxxx	_____
8	3.3.2	Pole mounting requirements			
8.1		Mass of unit max)	kg	900	_____
8.2		H ₀ (max) including surge arrester	mm	1100	_____
8.3		W ₀ (max) including surge arrester	mm	1080	_____
8.4		L ₀ (max)	mm	1500	_____
9	3.5	Documentation			
9.1	3.5.2	Number of copies of all drawings and wiring diagrams to be submitted with tender		1	_____
9.2	3.5.3	Number of copies of all type test certificates to be submitted with tender		1	_____
10		Tests			
	3.9.1	Type Tests:			Rep No.
10.1	3.9.1.1	Lightning impulse test		xxxxxxx	_____
10.2	3.9.1.1	Power frequency wet withstand test		xxxxxxx	_____
10.3	3.9.1.2	Short-circuit withstand capability test for VTs		xxxxxxx	_____
10.4	3.9.1.2	Short time current test for CTs		xxxxxxx	_____
10.5	3.9.1.3	Temperature rise tests (Provide report ref. no.)		xxxxxxx	_____
10.6	3.9.1.4	Accuracy tests (Provide report ref. no.)		xxxxxxx	_____
10.7	3.9.3.1	Chopped Impulse (Provide report ref. no.)		xxxxxxx	_____