Eskom	Standard	Technology

Title: **STANDARD FOR ENERGY METER KIOSKS: LOW-VOLTAGE FOR SMALL POWER USERS (SPU) & 100KVA LARGE POWER USERS (LPU)**

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Compiled by	Approved by	Authorized by
Henri Groenewald	**Deon van Rooi**	**Aletta Mashao**
Chief Engineer - Standards Working Group	**Middle Manager Dx PTM&C**	**Senior Manager: PTM&C**
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Supported by SCOT/SC

Edison Makwarela

Metering and Measurements Study Committee Chairperson

Date: 2023-07-28

PCM Reference: **PTM&C**

SCOT Study Committee Number/Name: **Metering and Measurements**

Content

Tables

1. Introduction

This design of the small power user low voltage metering kiosks is similar for the various applications and this document combines the individual standards of all the options into one document.

- The options include:
- Single phase kiosk
- Three phase kiosk – 25 & 50kVA
- Three phase kiosk – 100kVA
- Three phase kiosk - prepayment.

2. Supporting clauses

2.1 Scope

2.1.1 Purpose

This standard sets out the Distribution Division's requirements for the manufacturing of single- and three phase pole-, ground- or wall mounted low-voltage meter kiosks for small electrical power users (SPU) and 100kVA large electrical power users (LPU).

2.1.2 Applicability

The document is applicable to Eskom Distribution Division

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] ISO 9001, Quality Management Systems.

[2] SANS 60947-2, Low-voltage switchgear and control gear Part 2: Circuit-breakers

[3] SANS 1091, National colour standards for paint

[4] SANS 1507, Electric cables with extruded solid dielectric insulation for fixed installations (300/500V to 1900/3000V).

[5] SANS 1574-3, Electric flexible cables with solid extruded dielectric insulation Part 3: PVC-insulated cables for industrial use

[6] SANS 1186-1, Symbolic safety signs Part 1: Standard signs and general requirements

[7] SANS 60529, Degrees of protection for enclosures (IP code)

[8] SANS 60947-7-1, Low-voltage switchgear and control gear Part 7: Ancillary equipment Section 1: Terminal blocks for copper conductors

[9] SANS 61643-1: Surge protective devices connected to low-voltage power distribution systems Part 1: Performance requirements and testing methods

[10] SANS 556: 2004, Low-voltage switchgear and control gear Part 1: Circuit-breakers

[11] 240-76628631 (old DSP 34-749), Standard for sealing metering equipment.

[12] 240-76628289 (old DSP 34-1068 & 34-866), Specification for single and three phase whole current meters.

[13] 240-52840736 (old DSP_34-869 & TSP 41-395), Specification for three-phase programmable energy meters

[14] Eskom's Technical bulletin 08 TI – 010: Meter kiosk numbering

[15] Eskom's Technical bulletin 240-98195962 - chemical treatment of 3CR12 kiosks.

[16] Eskom drawing D-DT-1004, Eskom manufacturing drawings: SPU single-phase meter kiosk manufacturing details.

[17] Eskom drawing D-DT-1002, Eskom manufacturing drawings: SPU 3 phase 25 & 50kVA manufacturing details.

[18] Eskom drawing D-DT-1003, Eskom manufacturing drawings: 3 phase 100kVA SPU & LPU manufacturing details.

[19] Eskom drawing D-DT-1015, Eskom manufacturing drawings: Inner plate for 3 phase prepayment meter kiosk

2.2.2 Informative

[20] DIN 17441, Stainless steel: technical delivery conditions for cold rolled strip and slit strip and for plate and sheet cut there from

[21] SANS 474 Electricity metering – standard requirements

2.3 Definitions

2.3.1 General

Definition	Description
Metering Equipment	A collection of components in the metering installation, namely the instrument transformers, cables, meters, and any housing and ancillary equipment such as test blocks.
Metering Installation	All meters, fittings, equipment, wiring and installations used for measuring the flow of electrical power.

2.3.2 Disclosure classification

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

2.4 Abbreviations

Abbreviation	Description
3CR12	Low grade ferritic stainless steel
IP	Ingress Protection
MCB	Miniature Circuit-breaker
MCCB	Moulded Case Circuit-breaker
n/a	not applicable
PTM&C	Protection, Telecoms, Metering and Control
UV	Ultra Violet

2.5 Roles and responsibilities

The relevant metering design sections within Eskom Distribution are responsible to implement the new designs according to the requirements as listed in this document.

2.6 Process for monitoring

Adherence to this document shall be monitored through routine inspections.

2.7 Related/supporting documents

Not applicable.

3. Requirements

3.1 Meter kiosk construction

The entire kiosk shall be manufactured from 1,5mm 3CR12 steel. The complete kiosk shall have an IP rating of 3 for protection against touching live parts and it shall have an IP rating of 3 for protection against ingress of liquids. (IP33)

The kiosks shall be suitable for single pole- and wall mounting. An optional kiosk base will be specified when ground mounting is required for the three phase kiosks.

3.1.1 Box

The kiosk shall be fitted with brackets welded onto the back of the kiosk as shown in the reference drawings by which the kiosk can be fixed to a pole using stainless steel strapping.

Knock-out holes are provided on the back of the kiosks whereby they can be fitted to a wall by using raw-bolts.

The sides shall have vermin proof louvres with an effective width of 150mm and an effective height of 100mm at the top and bottom as shown in D-DT-1002 & D-DT-1003. The width of the opening in the louvres shall be between 2mm and 5mm. A UV stabilised plastic mesh with openings of not more than 2mm shall be fastened onto the back of the louvre.

3.1.1.1 Door surround

The door surround for the single phase meter kiosk shall incorporate a splash proof channel at the top of the kiosk.

The door surround for the three phase meter kiosk shall incorporate a splash proof sill around the inner border of the door opening of the kiosk.

3.1.1.2 Bottom of enclosure (Gland plate)

The gland plate shall form part of the box and shall not be a separate item. All the holes in the bottom of the enclosure for cable entries shall be fitted with square knockouts which cover the hole. The knockouts shall be spot welded onto the gland plate on one corner of the square.

An area surrounding the holes shall not be powder coated as indicated in the drawings to allow for proper earthing of the cables through the glands.

The bottom shall have four holes as indicated in D-DT-1002 & D-DT-1003 for the fitment of a kiosk base if needed. These holes shall also be covered by knockouts spot-welded onto the bottom.

3.1.1.3 Earthing details

An earth stud shall be provided as indicated in the drawings. The earth stud shall be an M10 35mm stainless steel set screw (welded onto the bottom plate) and bolt and nut.

All metal components of the panel, doors and devices shall be effectively connected to this earth stud by green 2.5mm^2 PVC insulated earthing conductors. All earth connections shall be as short as possible and shall not be coiled.

3.1.2 Inner plate

3.1.2.1 Single phase kiosk

The back of the kiosk shall be utilised for the fitment of the equipment. A DIN-rail shall be fitted using stainless steel bolts, nuts and spring washers or screws and spring washers or rivets. The DIN-rail may also be spot welded onto the back of the kiosk.

Holes for the mounting of the meters shall be provided by the manufacturer as indicated in the drawings. These holes shall be fitted with stainless steel or brass self-clinching nuts or rivet nuts with a M4 or M5 thread size.

3.1.2.2 Three phase kiosks

An inner plate shall be used to fit the electrical equipment of the kiosk. The inner plate shall be manufactured from 1,5mm 3CR12 steel and shall be powder coated in a white colour. All the holes shall be drilled by the manufacturer as shown in the reference drawings.

The plate shall have a 10mm lip bent at 90° to the plate, on all the sides.

Holes for the mounting of the meters shall be provided by the manufacturer as indicated in the drawings. These holes shall be fitted with stainless steel or brass self-clinching nuts or rivet nuts with a M4 or M5 thread size.

The DIN-rails shall be fitted onto the inner plate using stainless steel bolts, nuts and spring washers or screws and spring washers or rivets as shown in the drawing. The DIN-rail may also be spot welded onto the back of the kiosk.

The inner plate shall be fitted onto the box by means of four stainless steel bolts.

3.1.3 Door

The door shall have an UV resistant, impact resistant window as shown in the reference drawings.

The window shall be fastened onto the door by means of stainless steel rivets.

A sturdy door stay shall be provided on the doors to ensure that the door can be kept in a 90º open position. The door stays shall be manufactured from a non-ferrous metal.

3.1.3.1 Single phase kiosk

The door shall be fitted with two hinges at the top of the door that will allow for at least a 90º angle of opening. The hinges shall be of stainless steel.

The kiosk shall be lockable by means of an 8mm diameter shackle padlock.

3.1.3.2 Three phase kiosk

The door shall be fitted with stainless steel hinges at the top and bottom of the left side of the door.

A stainless steel three way lever lock suitable for a padlock with an 8mm diameter shackle shall be fitted horizontally on the right. The holes in the lever lock shall have a minimum diameter of 12mm. A protective box which is open on the bottom shall be fitted over the lever lock.

3.1.4 Base

3.1.4.1 Single phase kiosk

No base is provided for this kiosk.

3.1.4.2 Three phase kiosk

A separate kiosk base shall be supplied only when ordered and the base shall be delivered as a separate item. The base shall be manufactured from 2mm 3CR12 steel.

Four M10 30mm stainless steel set screws, nuts and spring washers shall be provided to secure the kiosk onto the base as indicated on D-DT-1002 & D-DT-1003. 13mm diameter holes shall be drilled or punched in the base and the nuts shall then be welded inside the base centred over the holes to allow the bolts to be screwed from the outside into the nuts.

Two inspection covers shall be fitted onto the front and back of the base and each shall be secured onto the base by six stainless steel set screws and nuts. The nuts shall be welded onto the inside of the base.

Six M8 20mm stainless steel set screws, nuts and spring washers for each of the cover plates shall be provided to secure the plates onto the base. 12mm diameter holes shall be drilled or punched in the base and the nuts shall then be welded inside the base centred over the holes to allow the bolts to be screwed from the outside into the nuts.

3.1.5 Set screws, nuts and spring washers

All set screws, nuts and spring washers used for the fitment of different parts or equipment in the kiosk shall be of stainless steel. All set screws and nuts shall be fitted with spring washers.

3.2 Fabrication of 3CR12 steel kiosks

All cutting, forming, forging, machining, welding, fastening, annealing, stress relieving, post weld cleaning and coating shall comply with the internal standards of the manufacturer of 3CR12 steel.

3.2.1 Cutting

In all cutting operations, whether thermal or mechanical, carried out on 3CR12 steel, no contamination by ferrous (iron or steel) material or particles shall take place. Sharp or rough edges shall be removed by manual grinding or filing.

3.2.2 Bending

It is important to ensure that there is no contamination of the 3CR12 steel from mild steel particles adhering to the tooling. It is recommended that the tooling be thoroughly cleaned before running 3CR12 steel.

3.2.3 Welding

For Manual Metal Arc (MMA) welding type 309L electrodes are recommended for welding 3CR12 steel, although E308L and E316L may also be used.

For Tungsten Inert Gas (TIG), Metal Inert Gas (MIG) and Plasma arc welding (PAW) the recommended welding consumables are AWS A5.9 ER309L, ER308L or ER316L.

When welding stainless steel studs, bolts or nuts onto 3CR12 steel it is recommended that the weld consumable shall be the AWS class 309L to avoid excessive weld metal dilution.

Where the manufacturer is using stud welding onto 3CR12 steel then 304L stainless steel studs shall be used.

Spot welding (resistance welding) shall only be used on parts of the kiosk that are not directly in contact with the outside atmosphere.

3.2.4 Post weld cleaning (pickling and passivation)

Post weld cleaning, pickling and passivation shall be done according to Technical bulletin 240-98195962 - chemical treatment of 3CR12 kiosks.

3.2.5 Powder coating

Before powder coating can take place it is very important to ensure that there is no oil present on the kiosk. The kiosk shall be degreased before powder coating.

The inner plate shall be powder coated with white epoxy-polyester powder (SANS colour code 69-0135) to ensure a coating thickness of between 60µm and 80µm.

The kiosk (box, roof and/or base) shall be powder coated with light navy grey polyester powder (SABS colour code G35) and the thickness shall be between 60µm and 80µm.

3.3 Meter kiosk electrical equipment

All equipment used within the kiosk (meters, circuit breakers and terminals) shall be touch safe i.e. have enclosed terminals, recessed screws etc. They shall comply with clause 8.2 of IEC 60898, which states all the requirements for equipment to be touch safe.

Where equipment is used that does not allow for the touch safe requirement, then they shall be protected by means of suitable covers.

Any live part of the equipment shall have at least 20mm of clearance from metal parts that is connected to earth.

3.3.1 Wiring

The kiosk shall be wired in accordance with the reference drawings. All wiring shall be done in stranded copper PVC insulated conductor which shall comply with SANS 1507, SANS 1411 or SANS 1574 (where relevant).

There shall be no joints or splices in the wiring.

The wiring shall be colour coded to represent the different phases. The neutral shall be black and the earth wire shall be green and yellow.

No bare wiring shall be exposed at termination points on the meter, the circuit-breaker and the terminals.

Wiring into the meter terminals shall be long enough to be fastened by both terminal screws.

No individual wire numbering is required.

3.3.1.1 Single phase kiosk

The Eskom incoming cable shall be connected onto the supply side of the circuit-breaker and the neutral directly onto the meter.

The wiring between the MCB to the meter and the meter to the phase terminals for the kiosk shall be colour coded 25mm^2 cables, which shall comply with SANS 1507.

The customer's cable shall be connected onto the Din-rail mounted terminals. The neutral from Eskom's side will be hard-wired, by way of the bridge bar on the neutral- and earth terminal, onto the earth stud inside the kiosk.

3.3.1.2 Three phase kiosk

The Eskom incoming cable shall be connected onto the supply side of the circuit-breaker and the neutral directly onto the neutral/earth terminal.

The wiring between the MCCB to the meter and the meter to the phase terminals for the 25 & 50kVA kiosks shall be colour coded 25mm^2 cables, which shall comply with SANS 1507.

The wiring between the MCCB to the meter and the meter to the phase terminals for the 100kVA kiosk shall be colour coded 50mm^2 flexible cables, which shall comply with SANS 1574. The cable ends at the meter terminal side shall be ferruled by sleeved ferrules. The neutral wire from the neutral terminal to the meter can be a 25mm^2 black wire.

The customer's cable shall be connected onto the Din-rail mounted terminals. The neutral from Eskom's side will be hard-wired, by way of the bridge bar onto the neutral and earth terminals. The earth wire from the earth terminal to the earth stud shall be a 16mm^2 (7 strands) green and yellow wire.

3.3.2 Circuit breakers

Miniature circuit-breakers (MCB) shall comply with SANS 556 and IEC 60898. Their operating mechanism shall be hydraulic-magnetic.

The circuit-breakers for the 16kVA single phase and 25 & 50kVA three phase kiosks shall have a curve 1 tripping curve and the rupturing capacity of the circuit-breaker shall not be less than 5kA. These miniature circuit- breakers shall be DIN-rail mounted.

Moulded case circuit-breakers (MCCB) shall comply with SANS 556 and SANS IEC60947-2. Their operating mechanism shall be hydraulic-magnetic or electronic-magnetic. The rupturing capacity of the MCCB shall not be less than 20kA.

Where MCBs or MCCBs are used that are not touch safe, then their terminals shall be protected by suitable terminal covers.

Only Eskom accepted MCBs and MCCBs circuit-breakers shall be used as specified in the Eskom List of Accepted products.

3.3.3 Surge arresters

Surge arrestors shall be installed onto all the phase conductors as indicated in the drawings. The surge arrester shall be the metal oxide, DIN rail mount type with indication suitable for Zone 1 protection. The arrester shall comply with SANS 61643- 1 and bear the SANS mark.

The technical specification for the surge arresters shall be:

Imax (8/20□s)	40kA or 65kA (4/20µs)
Response time	<25ns
Max. operating voltage	275V AC (phase-to-neutral)
	360V DC
Frequency	50Hz
Internal fuse	Yes
Open-circuit	Open-circuit on expiry of the device
Indication	Clear change-of-state (functional or non-functional) indication

3.3.4 Meter

3.3.4.1 Single and three phase kiosk

The kWh (active energy) meter shall be an accepted Eskom meter as specified in the Eskom List of Accepted products.

The meter shall be a calibrated unit (at a SANAS approved calibration facility) and sealed on the front cover and terminal cover in accordance with 240-76628631, Standard for sealing metering equipment.

3.3.4.2 Prepayment three phase kiosk

The kiosk is designed for use with an 80A three-phase prepayment meter in accordance with D-DT-3145.

The kiosk shall be supplied without the meter fitted.

The mounting holes in the inner plate have been placed to cater for the fitment of an approved three-phase prepayment meter as listed on the official Eskom list of accepted products.

3.3.5 Terminals

The terminals shall be approved units as listed on the drawings. The terminals shall be arranged according to the respective drawings.

3.4 Notices, labeling and packaging

3.4.1 Notices

Notices shall be provided as required by the Occupational Health and Safety Act. All notices shall be fastened to the kiosks by self-tapping stainless steel screws or by rivets.

A standard “Danger” notice in accordance with SANS 1186 shall be provided and placed on the front and back of the kiosk.

3.4.2 Labels

A label showing the name of the manufacturer, the date of manufacture and the various quality checks shall be placed on the inside of the kiosk door. The label shall be durable preferably of metal.

3.4.3 Packaging

Each kiosk shall be wrapped in bubble wrapping or cardboard before shipping to Eskom stores. This covering shall protect the kiosk and its components from reasonable transport related wear and tear from the supplier’s works to the end customer. The cabinet shall be clearly labelled as follows:

- Full delivery address
- Detailed content description as stated on the order
- Dispatch date
- Eskom and supplier order number

Note: (Label shall also be placed inside the cabinet. This helps when the packaging is damaged.)

3.4.3.1 Kiosk identification

The kiosks shall be marked according to the size of the kiosk with a permanent black marker (pen) on the outside, top, left side of the door (front door). A stencil that represents an Arial font size 72 (± 18-25mm high) shall be used. A 50kVA kiosk shall thus have the mark “50kVA” on the door.

A barcode label indicating the size of the kiosk and the Eskom SAP number shall be placed on the inside of the kiosk door and on the outside of the packaging material of the kiosk.

The kiosk shall also have a unique number as specified in Eskom’s Technical instruction: 08 TI – 010: Meter kiosk numbering.

3.5 Quality inspections

To ensure that the requirements are met as specified in this document, quality inspections and tests shall be done before shipment of the kiosk to Eskom stores.

Details of the manufacturer inspection label are shown in table B1 in annex B.

4. Authorization

This document has been seen and accepted by:

Name and surname	Designation
S Mkhabela	Senior Manager: Distribution
A Mashao	Senior Manager: Dx PTM&C Engineering
D Van Rooi	Middle Manager: Dx Metering, Security and DC Technologies Manager

5. Revisions

Date	Rev.	Compiled by	Clause	Remarks
Feb 2022	3	HPD Groenewald	3.1.1	Changed the louvre mesh material to plastic
			3.3.4.1	Meter will not be supplied with the box as standard
Feb 2017	2	HPD Groenewald		Added the 100kVA LPU option for this type of design
			3.2.4	Post manufacturing chemical treatment shall be done according to Technical bulletin 240-98195962
			3.3.3	Added requirements for surge arrestors
Nov 2014	1	HPD Groenewald		New document number for document 240-76628293
				Split the old 25, 50 & 100kVA kiosk into two separate kiosk designs
			3.1.1	Kiosks to be wall-mounted through knock-out holes on the back of the kiosk.
			3.1.1.3	Earthing stud changed to a M10 35mm set screw. Earthing required between door and panel.
			3.1.3.2	Protective box added over lever lock.
Dec 2009	1	HPD Groenewald	3.1.1	Din-rail added to side of kiosk
			3.1.1.1	Door splash proof surround wording changed
			3.1.3.1 & 2	Removed barrel bolt as standard with kiosks
			3.1.3.2	Revised description for new door design
			3.3.1	Wiring into meter terminals to be long enough for fastening by both terminal screws
			3.3.3.1	Meters calibrated at a SANAS approved facility
			-	Changes to impact assessment
Oct 2007	0		-	Keywords added
			-	Normative references changed to reflect new document numbering.
			-	All references to individual options have been removed and replaced by general references to SPU kiosks.
			3.1.4	Added requirement for rivet nuts to be fitted to meter holes on inner plate

Date	Rev.	Compiled by	Clause	Remarks
			3.1.5.2	Kiosk base thickness reduced from 3mm to 2mm.
			3.3.1	Wiring shall be colour coded to represent the different phases, neutral and earth.
			3.3.1.2	Neutral wire for 100kVA kiosk from terminal to meter may be a 25mm square cable.

6. Development team

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

- Henri Groenewald PTM&C Dx
- Mohamed Omar PTM&C Tx
- Braam Wahl Transmission North East Grid
- Christian Nel Central East Cluster
- Gerhard Sommer Transmission Northern Grid
- André le Roux Cape Coastal Cluster
- Hylton Hiralal Gauteng Cluster
- Reginald Brooks Cape Coastal Cluster
- Allen Naidoo Central East Cluster
- Johan le Roux PTM Generation
- Una van Zyl Central East Cluster
- Sello Lekalakala Limlanga Cluster

7. Acknowledgements

Not applicable.

Annex A – List of drawings

The following drawing forms part of this annex:

Number	Title
D-DT-1002	Eskom manufacturing drawings: 25 & 50kVA three phase SPU kiosk
D-DT-1003	Eskom manufacturing drawings: 100kVA three phase SPU & LPU kiosk
D-DT-1004	Eskom manufacturing drawings: 16kVA single phase SPU kiosk
D-DT-1015	Eskom manufacturing drawings: Inner plate for 3 phase prepayment meter kiosk

Annex B – - Manufacturer inspection label

Table B.1

Name of manufacturer:	
Date of manufacture:	
Order number:	
Name of manufacturer's quality inspector:	
Correct meters installed?	
Correct MCB / MCCB installed?	
Correct conductors installed?	
Correct terminals installed?	
Wiring checked?	
Tightness checks done on wiring?	
Powder coating checked?	