	Guideline	**Technology**

Title:	**VOICE AND DATA SURGE PROTECTION, CABLES AND MATERIALS DESIGN GUIDE**	Unique Identifier:	**240-170000602**
		Alternative Reference Number:	**<n/a>**
		Area of Applicability:	**Engineering**
		Documentation Type:	**Guideline**
		Revision:	**1**
		Total Pages:	**17**
		Next Review Date:	**October 2026**
		Disclosure Classification:	**Controlled Disclosure**

Compiled by	**Approved by**	**Authorized by**
(signature)	*(signature)*	*(signature)*
Zwelandile Mbebe	**Cornelius Naidoo**	**Nelson Luthuli**
Chief Engineer	**PTM&C Telecoms Manager**	**PTM&C Senior Manager (Acting)**
Date: 11-10-2021	Date: 2021/10/13	Date: 14 October 2021

Supported by SCOT/SC

(signature)

Kgomotso Setlhapelo

SCOT/SC Chairperson

Date: 12 October 2021

Content

Document Classification: Controlled Disclosure

VOICE AND DATA SURGE PROTECTION, CABLES AND MATERIALS DESIGN GUIDE	Unique Identifier:	**240-170000602**
	Revision:	**1**
	Page:	**4 of 17**

Executive Summary

Eskom's telecommunications (ET) network fulfils a vital and strategic role in support of the power business. The ET network provides telecommunications services used for reliable operation and maintenance of the Eskom power network. Cables, connectors, convertors, surge protectors and various telecommunications materials are required to enable ET to continue providing reliable telecommunications services to Eskom. It is a normal practice that such materials used on the ET network are procured through enabling contracts to ensure standard implementation. This document is aimed to assist planners on selecting suitable materials with emphasis on cables, connectors, convertors, surge protectors and other major materials for compilation of Bill of Materials (BOMs) for ET projects. This document excludes minor materials which are found on the detailed catalogues provided through this link click here. For materials with wide-ranging lists, only samples are discussed to demonstrate variants/ categories of the provided materials, the comprehensive list is available on the above provided link.

Document Classification: Controlled Disclosure

VOICE AND DATA SURGE PROTECTION, CABLES AND MATERIALS DESIGN GUIDE	Unique Identifier:	**240-170000602**
	Revision:	**1**
	Page:	**5 of 17**

1. Introduction

Eskom Telecommunications (ET) OT voice and data network fulfils a vital role in support of the power business. The network provides voice and data network services used for operation and maintenance of the Eskom power grid. The network carries delay-sensitive, mission-critical applications such as Telecontrol and Teleprotection, which are critical for the reliable operation of the power network. Delay sensitive applications are carried over a deterministic Time Division Multiplexing (TDM) based access platforms with high levels of redundancy and predictable circuit delays. To enable migration of Intelligent Access Devices (IEDs) to IP, Eskom has embarked on an initiative to migrate some of the legacy devices to IP. This has resulted in changing of the interface types and, cabling and protocols used to access data from some of the devices. This document provides guidance on the choice of cables and major materials to be used for both TDM and IP connections.

2. Supporting clauses

2.1 Scope

The scope of this document covers the technical guidance for compilation of Bill of Material (BOM) required for cables and various materials for both TDM and IP networks. The scope of the document is generic to all OT voice and data designs or similar applications and excludes detailed site requirements. Covered technologies include Ethernet Cables, Ethernet Surge Protectors, Serial Cables, Serial Surge protectors, PoE injector's, converters and supporting materials.

2.1.1 Purpose

This document defines the design guide for the OT voice and data network cabling and materials.

2.1.2 Applicability

This document shall apply to Eskom Telecommunications.

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]   240-78817325 Voice and Data Networks Roadmap

[2]   240-46264031 Fibre-optic design & installations – substations

[3]   240-46263618 Labelling of fibre optic cables standard

[4]   240-132190480 Telecommunications equipment installation standard

[5]   240-132513474 Telecommunications Network Interface Converter Design guide

[6]   240-95399670 Telecommunications Network Interface Converters Standard

[7]   ESP 32-1203 Eskom Telecommunications User Requirements

[8]   240-131323522 X.21 surge protection installation and design guide

[9]   240-153473135 Standard for the installation of Telecommunications Equipment cabinet

[10]   240-70732272 MSAP design guide

2.2.2 Informative

[11]   ISO 9001, Quality Management Systems

[12]   ISO/IEC 11801 Generic cabling for customer premises

[13]   32-9 Definition of Eskom documents

[14]   32-644 Eskom documentation management Standard

[15]   474-65 Operating manual of the Steering Committee of Technologies (SCOT)

[16]   ESG 32-1200 Eskom Telecommunications Strategy Framework (ETSF)

2.3   Definitions

2.3.1   General

Definition	Description
Bandwidth Management Equipment (BME)	A device used to provision and groom analogue and digital circuits onto 64 kbit/s channels that can be collectively aggregated onto an E1 frame
CATx F/UTP	Ethernet cable with 4 unshielded twisted pairs and an outer foil shield
CATx S/FTP	Ethernet cable with 4 foil shielded twisted pairs and an outer screen braid
CATx U/FTP	Ethernet cable with 4 foil shielded twisted pairs and no outer shielding
CATx U/FTP	Ethernet cable with 4 foil shielded twisted pairs and no outer shielding
CATx U/UTP	Ethernet cable with 4 unshielded twisted pairs and no outer shielding
Multi-Service Access Platform	ABB FOX 615 Multiplexer

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
AL/MYL	Aluminium Mylar
ATP	Acceptance Test Procedure
BME	Bandwidth Management Equipment
BoM	Bill of Materials
CAB	Cable
CAS	Channel Associated Signalling
CAT Cable	Category "x" Cable
DC	Direct Current
DRT	Design Review Team
Dx	Distribution
EIA	Electronic Industry Association
EMI	Electromagnetic Interference
ET	Eskom Telecommunications

Abbreviation	Description
ETSI	European Telecommunications Standard Institute
GE	Gigabit Ethernet
GR	Grid
HDD	Heavy Duty Duct
Mbit/s	Megabit per second
MPLS	Multi-Protocol Label Switching
MSAP	Multiple-Service Access Platform
n/a	not applicable
OEM	Original Equipment Manufacturer
OT	Operational Technology
PoE	Power over Ethernet
PTM&C	Protection, Telecoms, Metering and Control
RGD	Ruggedized
RJ45	Registered Jack 45
S/FTP	Braided shielded cable/ Foil shielded twisted pairs
SAP	System Application Products
SCOT	Steering Committee of Technologies
SFP	Small form-factor Pluggable
SM	Single Mode
SWA	Steel wire armoured
TCP	Transmission Control Protocol
Tx	Transmission
U/FTP	Unshielded cable/ Foil shielded twisted pairs
U/UTP	Unshielded cable/ Unshielded twisted pairs
UTP	Unshielded Twisted Pair

2.5 Roles and responsibilities

SCOT- Responsible for the development of this standard

ET DRT – Shall review the designs against this standard

ET Quality Audit- Shall audit designs and installations against this standard and telecommunications equipment installation standard [4].

End users - Shall provide the user requirements and participate in the development of standards through SCOT

ET Planning – Shall do the plans for voice and data technologies

NMC – Shall monitor and provision OT voice and data services.

Standards implementation – Responsible for implementation of this standard

Document Classification: Controlled Disclosure

VOICE AND DATA SURGE PROTECTION, CABLES AND MATERIALS DESIGN GUIDE	Unique Identifier:	**240-170000602**
	Revision:	**1**
	Page:	**8 of 17**

2.6 Process for monitoring

The site-specific detailed designs shall go through the ET Design Review Team (ET DRT) to verify compliance of submitted designs with this guide. The Acceptance Test Procedure (ATP) will be used to verify if the installations are compliant with the Telecommunications equipment installation standard [4]. Eskom Telecommunication's (ET) quality auditing will ensure continuous compliance of the installed equipment with the installation standards.

2.7 Related/supporting documents

This document shall be used in conjunction with comprehensive buying catalogues for cables, connectors and various materials which should be retrieved by following this link: click here. In addition, the catalogues folder contains contracted items which will not be discussed in this document and the associated OEM data sheets. The following documents shall be adhered to for all installations [2],[3],[4],[8] and [9].

3. Document content

3.1 Copper Cables

3.1.1 Ethernet Cables

Ethernet Cables are used for interconnection of Eskom Telecommunications (ET) equipment and connection of IP end-user equipment to the ET network. Eskom will either use CAT5e or CAT6 depending on application and site requirements. CAT5e, CAT6, and CAT6A are all contracted options with unshielded, shielded and Steel Wire Armoured (SWA) options. Stranded cables are more expensive and recommended only on installations with tight turns e.g. very short copper Ethernet patch cables. SWA cables shall always be purchased as solid as the armouring takes away the flexibility of the cable.

Table 1 below shows a comparison between CAT5e, CAT6 and CAT6A. Based on this comparison, it makes sense to use CAT5e in the office environments, CAT6 in the substation environment and CAT 6A for high bandwidth applications. CAT 6 is recommended in substations due to the improved Electro Magnetic Interference (EMI) shielding and durability. To enhance physical strength of Ethernet cables, Eskom has made available SWA Ethernet cables. The armoured cables shall be used on cable trenches as they will not be destroyed by rodents and will not be damaged during the pulling of cables. For all cable types and applications discussed in this document, SWA cables shall not be used between the substation yard and the control room as the armouring may carry dangerous high electric currents. It is mandatory that for such applications, fibre must instead be used. Foil shielded and braided Ethernet cables must be grounded in order to drain the currents created by EMI. For high bandwidth applications, it is advisable to consider fibre before using CAT 6A however, it is understood that use of fibre can sometimes be limited by available hardware. The device where such a cable terminates must be properly earthed as per Eskom earthing standards and this is critical for all shielded cables discussed in this document. Shielding must be complete for an entire cable (end-to-end) with all components grounded.

Table 1: CAT5e vs CAT6/6A

Cable Type	Speed	Distance	Crosstalk and EMI
CAT5e	1Gbps	100m	Protected
CAT6	1Gbps	100m	Enhanced protection
	10Gbps	55m	Enhanced protection
CAT6A	10Gbps	100m	Enhanced protection
CAT5,7&8	Not in our contracts and not a requirement		

3.1.2 Contracted Ethernet Cable Options

Table 2 below shows Ethernet cable options contracted by Eskom. CAT5e, CAT6, and CAT6A are all contracted options with unshielded, shielded and SWA options. Stranded cables are more expensive and recommended only on installations with tight turns e.g. very short copper Ethernet patch cables. SWA cables shall always be purchased as solid as the armouring takes away the flexibility of the cable.

Table 2: Ethernet contracted cable options

Item number	Generic Description	SAP Short Description	UOM	SAP Item Codes
1)	CAT5E U/FTP, Stranded	CABLE COMM:CAT5E U/FTP;24 AWG;PVC	Per meter	678495
2)	CAT6 U/FTP, Stranded	CABLE COMM:CAT6 U/FTP;23 AWG;PVC	Per meter	678504
3)	CAT5E S/FTP, Solid	CABLE COMM:CAT5E S/FTP;24 AWG;PVC	Per meter	678496
4)	CAT5E S/FTP, Stranded	CABLE COMM:CAT5E S/FTP;24 AWG;PVC	Per meter	678497
5)	CAT6 S/FTP, Solid	CABLE COMM:CAT6 S/FTP;23 AWG;PVC	Per meter	678505
6)	CAT6 S/FTP, Stranded	CABLE COMM:CAT6 S/FTP;23 AWG;PVC	Per meter	678506
7)	CAT6A FTP, Solid	CABLE COMM:CAT6A FTP;(4) CU TWISTED PAIR	Per meter	678507
8)	CAT6A FTP, Stranded	CABLE COMM:CAT6A FTP;(4) CU TWISTED PAIR	Per meter	678508
9)	CAT5E U/FTP, Solid, SWA	CABLE COMM:CAT5E U/FTP;24 AWG;SWA	Per meter	678498
10)	CAT6 U/FTP, Solid, SWA	CABLE COMM:CAT6 U/FTP;23 AWG;SWA	Per meter	678509

3.1.3 Serial Cables and line drivers

Serial Cables are used for interconnection of ET equipment and connection of end-user legacy equipment to the ET network. Table 3 below shows typical serial distance limitations for X.21 and RS232 which depends on the baud rates. To interpret these limits in the context of Eskom requirements, Table 4 shows the baud rates for the current Eskom applications. In areas where a longer RS232 cable distance is required, RS232 to RS422/485/ Fibre distance extenders/ line drivers shall be used [5]. Supported synchronous and synchronous baud rates will depend on the used ET Data Communications Equipment (DCE). Line drivers available in this contract are as listed on Table 14.

Table 3: Typical serial cables distance limitations

Rate (bps)	Distance for EIA/TIA-232 (Metres)	Distance for X.21 and V.35 (Metres)
2400	60	1250
4800	30	625
9600	15	312
19200	7.6	156
38400	3.7	78
56000	2.6	31

Table 4: Baud rates for Eskom serial applications

Application	Rate (Kbps)	Used distance compensation measures
SCADA	9.6, 19.2 A few: 200, 1200	RS232 line drivers are used
Teleprotection	64	X.21 only, no line drivers
Disturbance Recorders	19.2	RS232 line drivers are used

3.1.4 Contracted Serial Cable Options

Table 5 below shows serial cable options contracted by Eskom. Both the armoured (SWA) and unarmoured cable options are shielded making them suitable for substation installations. During Bandwidth Management Equipment (BME) to Multiservice Access Platform (MSAP) X.21/RS232 services cutovers, where there is a need for longer MSAP cables, these cables shall be used for extension of the MSAP X.21/RS232 proprietary cables from the MSAP DB15 patch panel to the X.21 surge protector. Serial shielded cables must be grounded in order to drain the currents created by EMI and the serial surge protector/equipment where the cable terminates must be grounded. For additional durability, the SWA option shall be used on trenches installations and must not be used between the substation yard and the control room as the armouring can carry dangerous electric currents. For such applications, fibre cable shall be used.

Table 5: Contracted Serial Cables

Item number	Generic Description	SAP Short Description	UOM	SAP Item Codes
1)	Data cable X21 indoor 7 strand, 0.22mm diameter per strand, Aluminium Mylar shielded Individual and overall screen twisted 6 pair	CABLE COMM:X.21	Per meter	243297
2)	Data cable X21 SWA 7 strand, 0.22mm diameter per strand, Aluminium Mylar shielded Individual and overall screen twisted 6 pair	CABLE COMM:DATA X21;6 TWISTED PAIR;SWA	Per meter	253552

3.1.5 Other copper cable components

The following are the other copper cabling components included in the contract. Details for these items are as per the catalogue list. Eskom telecommunications equipment installation standard shall be adhered to when installing or using these items.

1) Ethernet connectors: Shielded and unshielded

2) Ethernet rubber connector boots

3) Serial connectors cover: Metallic and plastic

4) Junction boxes

5) 10 pair disconnect modules (Krone blocks)

6) Lugs: various types and sizes

7) Cable ties: various types and sizes

8) Cable glands, heat shrinks and sealers: various types and sizes

9) Back mount frames, data patch panels and cable trunking

10) Cable cutters, punch down tools and wire strippers

3.2 Fibre Cables

3.2.1 Contracted Fibre Cables

Table 6 below shows a sample of fibre cable options used in Eskom with the comprehensive list available in the buying catalogue. These cables come in two variants, Multimode (MM) and Single Mode (SM). On the description, the mode can be identified by core to cladding diameter ratio which is 9/125 for single mode and 50/125 for multimode. Ruggedised patch leads are indicated on the description. Lengths are specified in the description for fixed lengths and a Unit of Measure (UOM) is provided for customisable lengths. Eskom fibber installations standards [2]&[3] shall followed on all installation of fibber cables and a suitable cable for each application shall be selected using these standards. For Ethernet application where a multimode to single mode conversion is required, a small form-factor pluggable (SFP) based converter available in this contract shall be used to convert between the two modes. A detailed list of contracted fixed lengths patch leads and cuttable Heavy Duty Duct (HDD) fibre cables is available on the supplier catalogue. The contract HDD cables include 6,8,12, 24 and 48 cores.

Table 6: Contracted Fibre Cables (Sample only)

Item No	Generic Description	SAP Short Description	UOM	SAP Item Codes
1)	10M Duplex patch cord LC-LC 9/125 rugged	LEAD, PATCH:LG 10 M;9/125;(2) LC;SINGLE	Each	678049
2)	1M Duplex Patch cord FC-SC / APC 9/125	LEAD, PATCH:LG 1 M;9/125;ST-SC/APC;9 U	Each	678177
3)	10M Duplex patch cord ST-LC 50/125 rugged	LEAD, PATCH:LG 10 M;50/125;ST-LC;MULTI	Each	253771
4)	Fibre Pigtail 50/125 1M with ST connector	CORD COMM:PIGTAIL;LG 1 M;FO 50/125 U;ST	Each	253637
5)	CABLE; 8 FIBRE HDD 9/125, double sheath rodent resistant	CABLE FBR OPTC:HDD;8;9 U;DOUBLE;9/125 U	Per meter	678513
6)	CABLE; 24 FIBRE HDD 9/125, double sheath rodent resistant	ABLE FBR OPTC:HDD;24;9 U;DOUBLE;9/125 U	Per meter	678515

3.2.2   Other fibre materials

The following are other fibre materials included in the contract. Details for these items are as per the catalogue list. Eskom fibre installation standards [2]&[3] shall be adhered to when installing or using these items.

1)   19-inch Single mode Optical Distribution Frames / Patch Panels/Boxes: 12, 24 and 48 cores

2)   19-inch Multimode Optical Distribution Frames / Patch Panels/Boxes: 12,24 cores

3)   Wall mount/ din rail Optical Distribution Frames / Patch Panels/Boxes: 6, 12 cores

4)   Splice boxes: 12,24,48 Cores

5)   Mid couplers: Various connector types, Multimode and Single Mode

6)   Sprag Orange tubing: 20mm

7)   HDPE pipes: 16,20,25,32 mm

8)   Dome joints: 12 and 48 Cores

3.3   Telephone Cables

3.3.1   Contracted Telephone Cables

Table 7 below shows the contracted telephone cables. These are available as un-armoured and armoured cables.

Table 7: Contracted Telephone cables sample

Item number	Generic Description	SAP Short Description	UOM	SAP Item Codes
1)	Telephone cable, 0.5 mm x 10 pair indoor MOQ=100M	CABLE COMM:TEL INDR;(10) PAIR;0.5 MM	Per meter	253575
2)	MOQ 500m, Telephone cable 0.5 mm x 20 pair indoor	CABLE COMM:TEL INDR;(20) PAIR;0.5 MM;PE	Per meter	678471
3)	No MOQ, Telephone cable, 0.5 mm x 20 pair indoor MOQ=100M	CABLE COMM:TEL INDR;(20) PAIR;0.5 MM;PE	Per meter	253577
4)	Telephone cable, 0.5 mm x 10 pair outdoor, SWA MOQ=500M	CABLE COMM:TELEPHONE;0,5 MM	Per mete	704082

3.4   Surge Protectors

3.4.1   Ethernet Surge Protectors

Table 8 below shows the contracted Ethernet surge protectors. These surge protectors are required to protect the ET equipment from any electrical faults which may occur on the end user equipment. This will also protect the end user equipment should the fault be on the ET equipment. Surge protectors shall be installed as per the telecommunications equipment installation standard [4].

Table 8: Ethernet surge protectors

Item No	Generic Description	SAP Short Description	UOM	SAP Item Codes
1)	1 port 10/100/1000, CAT5E, RJ45, surge protector	ARRSTR ELECTRNC:(1) 10/100/1000 CAT5E	Each	697213

2)	2 port 10/100/1000, CAT5E, RJ45, surge protector	ARRSTR ELECTRNC:(2) 10/100/1000 CAT5E	Each	697215
3)	12 port 10/100/1000, CAT5E, RJ45, surge protector, 19 inch	ARRSTR ELECTRNC:(12) 10/100/1000 CAT5E	Each	697217
4)	24 port 10/100/1000, CAT5E, RJ45, surge protector, 19 inch	ARRSTR ELECTRNC:(24) 10/100/1000 CAT5E	Each	697221

3.4.2   Serial Surge Protectors

Table 9 below shows the contracted serial surge protectors. These surge protectors are required to protect the ET equipment from any electrical faults which may occur on the end user equipment. This will also protect the end user equipment should the fault be on the ET equipment. Both RS232 and X.21 serial surge protectors shall be installed as per the [8]240-131323522 X.21 surge protection installation and design guide.

Table 9: Serial surge protectors

Item No	Generic Description	SAP Short Description	UOM	SAP Item Codes
1)	16 port RS232 DB25, modular passive surge protector, 19 inch	ARRSTR ELECTRNC:15 VDC;RS232 DB25	Each	697233
2)	Single module for 19 inch 16 port RS232 DB25 surge protection	ARRSTR ELECTRNC:(16) PORT SINGLE MODULE	Each	697234
3)	Empty rack with copper earth bar for 19 inch 16 port RS232 DB25 surge protector	RACK EQP:SURGE ARRESTER;RS232 DATA	Each	678717
4)	One port RS232 DB25 surge protector, din rail mount	ARRSTR ELECTRNC:SINGLE PORT;15 VDC	Each	697235
5)	Single module for 16 port X.21 DB15 surge protector	ARRSTR ELECTRNC:(16) PORT SINGLE MODULE)	Each	697237
6)	Empty rack with copper earth bar for 19 inch 16 port X.21 DB15 surge protector	RACK;LIGHTNING ARRESTOR 19" 16 SLOTS	Each	229690
7)	One port X.21 DB15 surge protector, din rail mount	MODULE:PROTECTION;X.21 (STANDALONE)	Each	241949

3.4.3   Telephone Surge Protectors

Table 10 below shows the contracted telephony surge protectors. These are required to protect the ET voice equipment from any electrical faults which may occur on the telephone lines. Telephone surge protectors shall be installed as per the Telecommunications equipment installation standard [4].

Table 10: Telephone surge protectors

Item No	Generic Description	SAP Short Description	UOM	SAP Item Codes
1)	Subscriber line surge protector for 10 pair Krone block	ARRSTR ELECTRNC:(10) PAIR KRONE BLOCK	Each	697239
2)	RJ11 Telephone Line Protection	ARRSTR ELECTRNC:TELEPHONE LINE;RJ11	Each	697240

3.5   Industrial switches and converters

3.5.1   Industrial switches

Table 11 below shows Industrial switches for connecting IP industrial/substation devices. These switches include PoE for powering of PoE supporting devices. These switches provide a low-cost alternative for applications that do not require managed switches. These two SFP switches will provide a solution in areas where Multimode to Single Mode Ethernet conversion is required.

Table 11: PoE and Non-PoE Switches

Item No	Generic Description	SAP Short Description	UOM	SAP Item Codes
1)	4-Port 10/100/1000Base-T RJ45 PoE+ ports switch with two SFPs (100/1000Base-X)	SWITCH NETW:MC352-4P-2S – POE+	Each	699671
2)	8-Port 10/100/1000Base-T RJ45 ports switch (No PoE)	SWITCH NETW:NS3050-8T;INDUSTRIAL	Each	699672
3)	16-Port 10/100/1000Base-T RJ45 PoE ports switch with two SFPs (100/1000Base-X)	SWITCH NETW:NS3552-16P-2T-2S;INDUSTRIAL	Each	699668

3.5.2   SFPs

Eskom in is need of SFPs which can be used on both Ethernet and STMn applications. Table 12 shows the contracted SFPs which can be used on both applications. A caution must be taken to test the support of SFP in any device before using it. These SFPs will be usable on the switches listed on Table 11.

Table 12: SFP options

Item No	Generic Description	SAP Short Description	UOM	SAP Item Codes
1)	SFP-1 Fast Ethernet/STM-1, 1310 nm, multimode, LED, 2 km	TRNSCVR OPTCL:2 KM;1310 NM;155 MBIT/S	Each	678962
2)	SFP-2 Fast Ethernet/STM-1, 1310 nm, single mode, laser, 15 km	MODULE:SFP2;OPTICAL LINE TERM EQUIP	Each	569773
3)	SFP-3 Fast Ethernet/STM-1, 1310 nm, single mode, laser, 40 km	TRNSCVR OPTCL:40 KM;1310 NM;155 MBIT/S	Each	678965

3.5.3 PoE Injectors

PoE Injectors provide a low cost alternative to powering of Ethernet devices which are not connected on a PoE enabled switch. Table 13 provides a contracted PoE Injector. For the DC powered PoE requirements the PoE switches in Table 11 and Table 14 shall instead be considered.

Table 13: PoE Injector

Item No	Generic Description	SAP Short Description	UOM	SAP Item Codes
1)	AC PoE Injector	SWITCH NETW:A-POE-INJECTOR-0	Each	699674

3.5.4 Network interface Converters

Telecommunications network interface convertors are required to facilitate integration of legacy devices to the ET network. The modern WAN telecommunications equipment mostly comes with Ethernet interfaces with no legacy interfaces and in such cases, it is necessary to convert legacy interfaces to Ethernet. In addition, these converters play a role in extension of distance limited serial interfaces.[5] 240-132513474 Telecommunications Network Interface Converter Design guide provides further use cases of converters in Eskom. Table 14 provides a list of contracted converters.

Table 14: Network Interface Converters

Item No	Generic Description	SAP Short Description	UOM	SAP Item Codes
1)	USB to RS232 DB9 serial converter for local craft terminal	CONVERTER SGNL:FTDIFT232R;USB TO SERIAL	Each	699679
2)	4-Port 10/100/1000Base-T RJ45 PoE+ ports switch with one SFPs (100/1000Base-X)	CONVERTER SGNL:MC251-4P/1S	Each	700893

Item No	Generic Description	SAP Short Description	UOM	SAP Item Codes
3)	RS232 DB 9/ terminal block to RS422/RS485, port powered	CONVERTER SGNL:SERIAL;I/ P 0.2 VDC	Each	700889
4)	RS232/RS422/RS485 (terminal block) to fibre MM (ST/SC)	CONVERTER,SIGNAL:TCF-142-M-ST	Each	644466
5)	RS232/RS422/RS485 (terminal block) to fibre SM (ST/SC)	CONVERTER,SIGNAL:TCF-142-S-ST	Each	645744
6)	C37.94 to Ethernet converter, LC MM, DC power supplies if not port powered.	CONVERTER SGNL:VCL-2710;FIBRE	Each	700909

3.5.5 DC-DC Converter

Some of the network interface convertors used in Eskom (Including MOXAs) support 12- 48VDC. This resulted in instances where such converters blow when the DC changers boost to voltages above 48V. The DC-DC converter shown in Table 15 below is made available to connect such converters to ensure that they do not get damaged. These converters must strictly be powered using this DC-DC converter.

Table 15: DC-DC Converter

Item No	Generic Description	SAP Short Description	UOM	SAP Item Codes
1)	Control Voltage Isolated Dc-Dc Converter (36-72vdc Input, 48vdc Output)	Control Voltage Isolated DC-DC Converter (36-72VDC Input, 48VDC Output)	Each	0230761

3.5.6 Dial-up Modems

The 56K dial-up modem shown in Table 16 below is made available for users with their equipment connected on the ET network over the PAX lines. Currently it is only a few Travelling Wave System (TWS) connected over PAX with the majority in the process of being migrated to IP. This modem will provide an on option to connect to TWS units while these devices are being migrated to IP.

Table 16: Dial-up modems

Item No	Generic Description	SAP Short Description	UOM	SAP Item Codes
1)	USB 2.0 to RJ11 56K V.92 / V.90 External Data Modem	CONVERTER SGNL:USB56KEMH2;DIAL UP	Each	699712

3.5.7 Other miscellaneous materials

The two cables and various materials contracts make a provision for a wide range of miscellaneous materials used for installation of telecommunications equipment. The catalogues for these materials are available on this link click here and includes additional materials not listed in this document.

4. Authorization

This document has been seen and accepted by:

Name and surname	Designation
Aletta Mashao	Senior Manager – PTM&C DX
Alison Maseko	Senior Manager- Eskom Telecommunications
Barry Clayton	Chief Engineer- Tx Secondary Plant, Work Planning and Centralised Services
Cornelius Naidoo	Telecomms T&S Middle Manager – PTM&C
Lenah Mothata	Senior Manager- Grids
Maureen Mokone	Senior Manager – DX IM
Nhlanhla Tshabalala	Senior Manager - Security Business Intelligence
Prudence Madiba	Senior Manager – GX Engineering
Richard McCurrach	Acting Senior Manager – TX IM
Sikelela Mkhabela	Senior Manager – DX Network Operations

5. Revisions

Date	Rev	Compiler	Remarks
Oct 2021	1	Z. Mbebe	First issue

6. Development team

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

- Krupa Jose
- Zwelandile Mbebe

7. Acknowledgements

Not applicable.