| SHEET NUMBER | TITLE | DESIGN REV NO. | DESIGN REV DATE | PROJECT REV NO. | PROJECT REV DATE |
|---|---|---|---|---|---|
| 0 | COVER SHEET | 0 | | | |
| 1 | GENERAL POWER LINE CARRIER PANEL LAYOUT AND WIRING DIAGRAM | 0 | | | |
| 2 | SINGLE LINE DIAGRAM | 0 | | | |
| 3 | TELEPROTECTION ARRANGEMENT | 0 | | | |
| 4 | LINE TRAP MOUNTING | 0 | | | |
| 5 | CABLE BLOCK DIAGRAM | 0 | | | |
| | | | | | |

| LEVEL | DESCRIPTION | LEVEL | DESCRIPTION |
|---|---|---|---|
| 1 | DRAWING SHEET BORDER & TITLE BLOCK | 18 | |
| 2 | REVISION TO MASTER | 19 | |
| 3 | | 20 | EHV - SEPARATELY MOUNTED LINE TRAP |
| 4 | | 21 | |
| 5 | | 22 | |
| 6 | | 23 | |
| 7 | | 24 | |
| 8 | | 25 | |
| 9 | | 26 | |
| 10 | STANDARD DESIGN DRAWING & TITLE BLOCK TEXT | 27 | |
| 11 | | 28 | |
| 12 | | 29 | |
| 13 | | 30 | |
| 14 | | 31 | WITH APPLICATION |
| 15 | | 32 | |
| 16 | | 33 | |
| 17 | CURRENT DIFFERENTIAL AND IMPEDANCE | 34 | |

NOTES:

REFERENCE DOCUMENTS

| DOC NUMBER | DESCRIPTION |
|---|---|
| 240-53458797 | STANDARD FOR INSTALLATION OF TELECOMMUNICATION EQUIPMENT CABINET |
| 240-90353855 | DESIGN FOR TELEPROTECTION SYSTEMS |

| REV | REVISION TO MASTER | BY | CHKD | APP | DATE |
|---|---|---|---|---|---|

| REV | REVISION DESCRIPTION | BY | CHKD | AUTH | DATE |
|---|---|---|---|---|---|

| | |
|---|---|
| PROJECT APPROVED | DESIGN APPROVED T.GOSAI |
| DATE | DATE 11/09/2017 |
| PROJECT CHECKED | DESIGN CHECKED M.TSHIKOSI |
| DATE | DATE 11/09/2017 |
| PROJECT DRAWN BY | DESIGN DRAWN BY R.VILJOEN |
| DATE | DATE 18/07/2017 |
| SCALE | |

Eskom

Eskom Holdings SOC Ltd
Reg No 2002/015527/30

© COVER SHEET

| SHEET NUMBER | REVISION |
|---|---|
| 0 | 0 |

LEVELS 1 2 10 17 20 31

SIZE GROOTTE A1L

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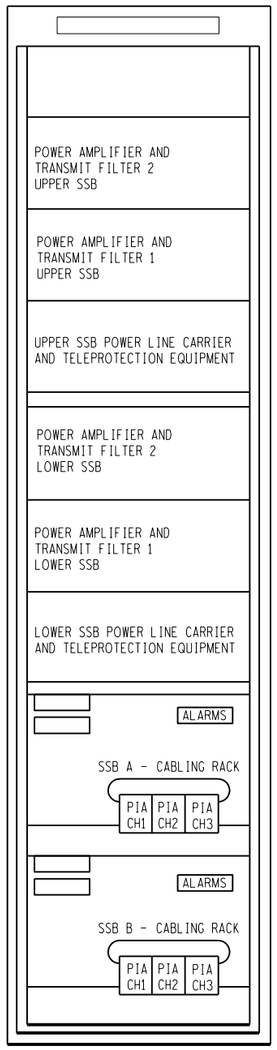
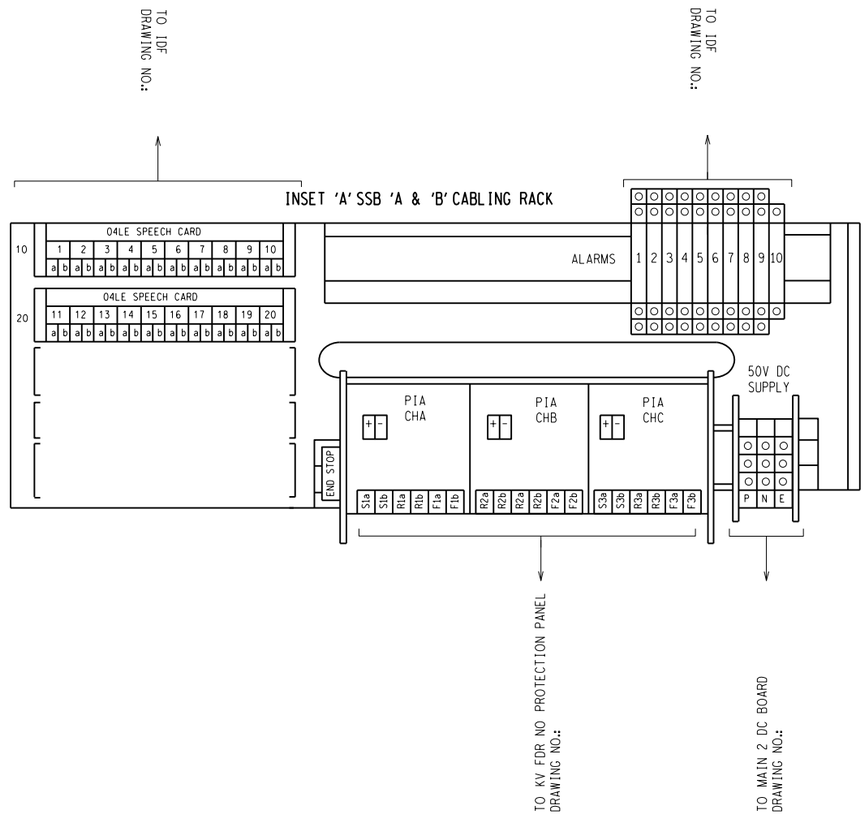
## TYPICAL CARRIER PANEL LAYOUT




## INSET 'A' SSB 'A & 'B' CABLING RACK




NOTE:

1. PLC CABINET MUST BE INSTALLED AS PER STANDARD FOR INSTALLATION OF A TELECOMMUNICATION EQUIPMENT CABINET

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|---|---|---|---|---|---|
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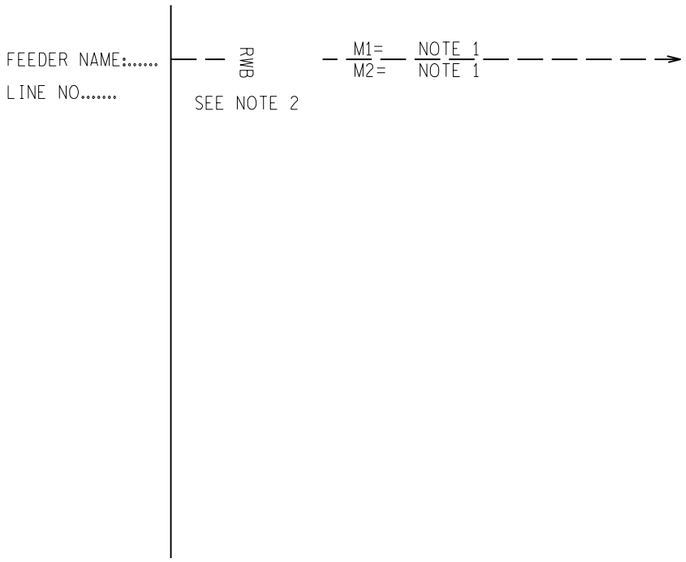
| DATE | DATE 11/09/2017 | |
| PROJECT CHECKED | DESIGN CHECKED: M.TSHIKOSI | GENERAL POWER LINE CARRIER PANEL LAYOUT AND WIRING DIAGRAM © |
| DATE | DATE 11/09/2017 | |
| PROJECT DRAWN BY | DESIGN DRAWN BY: R.VILJOEN | SHEET NUMBER: 1 / REVISION: 0 |
| DATE | DATE 18/07/2017 | |
| SCALE | | |

LEVELS 1 2 10 17 20

GROOTTE A1L

MASTER FILED UNDER 0.52/30110 SHEET 1 OF 5 REVISION 0




NOTE:

1. PLC/CUR DIFF/NSD570
2. LINE TRAP POSITION TO BE COMPILED BASED ON THE SUBSTATION & LINE PHASING DIAGRAM

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| PROJECT CHECKED | DESIGN CHECKED M. TSHIKOSI | | |
| DATE | DATE 11/09/2017 | | |
| PROJECT DRAWN BY | DESIGN DRAWN BY R. VILJOEN | © | SINGLE LINE DIAGRAM |
| DATE | DATE 18/07/2017 | | SHEET NUMBER 2 / REVISION 0 |
| SCALE | | | |

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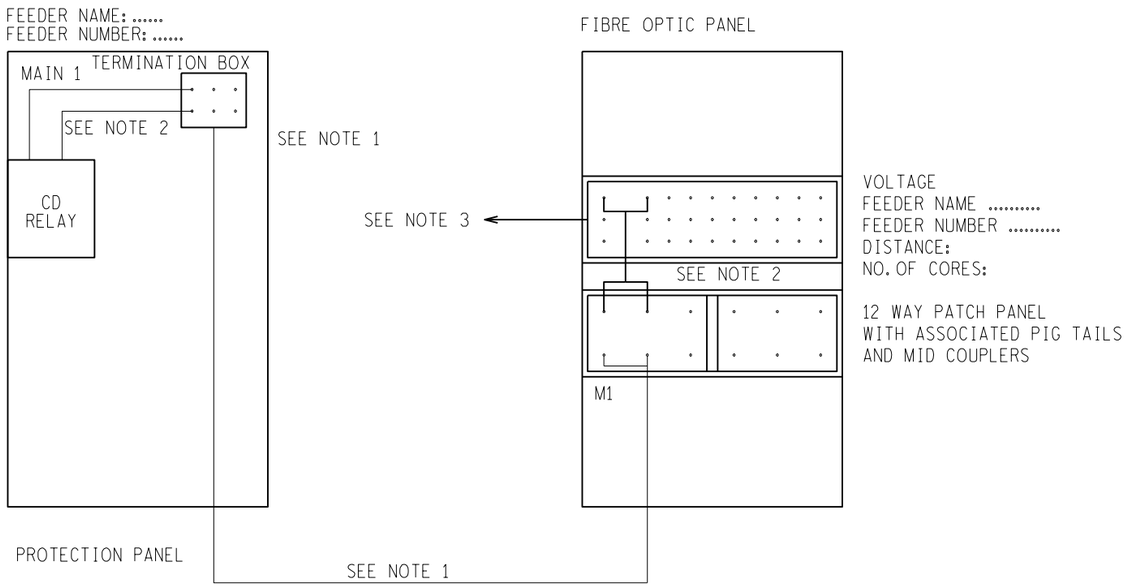
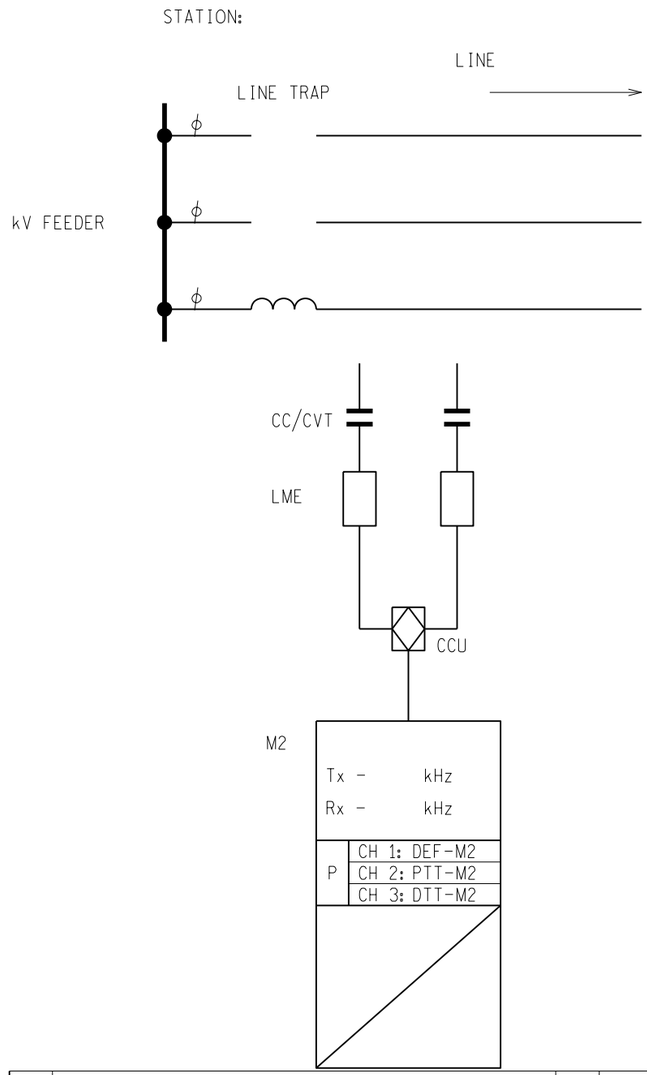
LEVELS 1 2 10 17 20 31

SIZE GROOTTE A2L

# IMPEDANCE & CURRENT DIFFERENTIAL ARRANGEMENT




| LINE TRAP DETAILS | MAKE: | INDUCTANCE (mH) | CURRENT (A) |
|---|---|---|---|
| | FAULT CURRENT (kA): | BLOCKING BAND (kHz): | CREEPAGE (mm/kV): |
| | S/N: | | |
| | | | |
| LME DETAILS | MAKE: | TYPE: | BLOCKING RANGE (kHz): |
| | S/N: | | |
| | | | |
| CARRIER DETAILS | MAKE: | SIGNALING VOLTAGE: | OUTPUT POWER (W): |
| | DATA (YES/NO): | VOICE (YES/NO): | S/N: |
| | | | |

* NOTE TO BE COMPLETED ON SITE WHEN COMMISSIONING

NOTES:

1. RUNS IN THE CABLE TRENCH
   THE BEND RADIUS MUST BE NO LESS THAN 30mm
   - PIN HDPE OPTEX OR CLASS TUBING MUST BE USED
   - 8/12 CORE DUCT CABLE MUST BE USED
   ONLY 6 CORES ARE TERMINATED
2. THE PATCH LEADS ARE USED BETWEEN THE RELAY AND THE TERMINATION BOX, AND BETWEEN PATCH PANELS
3. FIBRE TO THE DISTANT END

LEGEND:

ϕ - PHASE
⌒ - LINE TRAP

LME - LINE MATCHING EQUIPMENT
CC - COUPLING CAPACITOR
CCU - CARRIER COMBINING UNIT
CVT - CURRENT VOLTAGE TRANSFORMER

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| DATE | DATE 11/09/2017 | | |
| PROJECT DRAWN BY | DESIGN DRAWN BY R. VILJOEN | © | TELEPROTECTION ARRANGEMENT |
| DATE | DATE 18/07/2017 | | SHEET NUMBER 3 / REVISION 0 |
| SCALE | | | |

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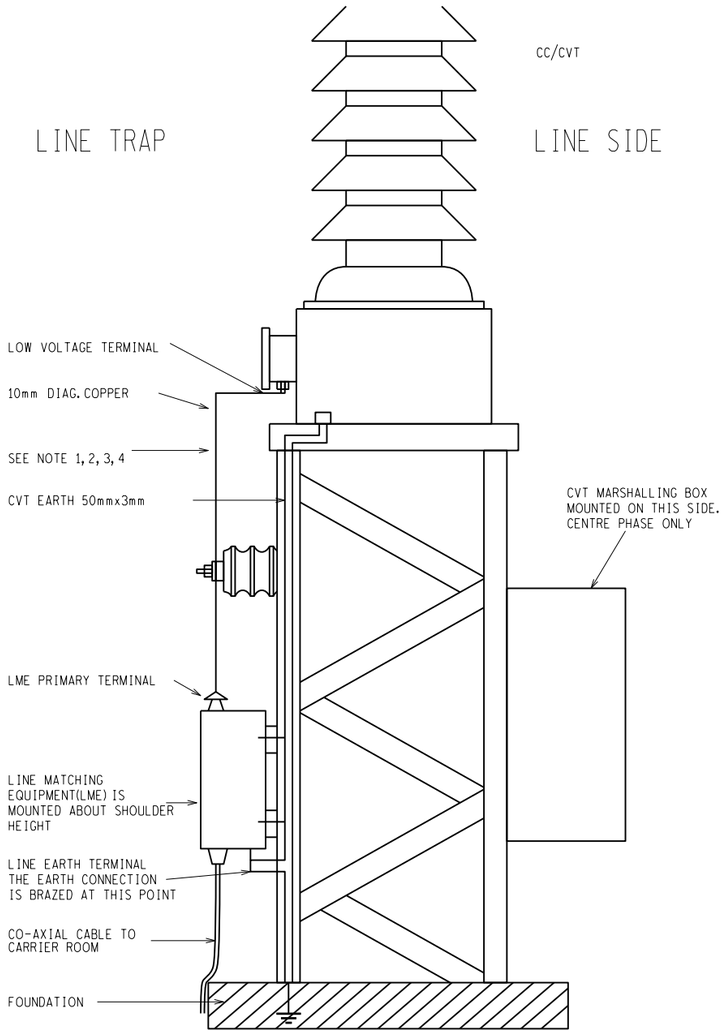
LEVELS 1 2 10 17 20 31

SIZE GROOTTE A2L

# SEPARATELY MOUNTED LINE TRAP WITH CVT/CC




FEEDER NAME:
PHASE:
LME TYUPE:

NOTE:

1. A 10mm COPPER ROD BETWEEN THE HF TERMINAL OF THE CC/VT AND THE LME PRIMARY TERMINAL MUST BE INSTALLED
2. BREATHER HOLES OF THE LME MUST NOT BE USED FOR THE COAXIAL CABLE GLANDS
3. THE 10mm COPPER ROD MUST BE BRAZED NOT CRIMPED
4. IF THE DISTANCE BETWEEN THE LOW VOLTAGE TERMINAL OF THE CC/CVT IS GREATER THAN 1500mm A PIN INSULATOR IS REQUIRED
5. THE PERSON PERFORMING THIS WORK MUST ENSURE THAT THEY COMPLETED THE ORHVS (OPERATING REGULATION FOR HIGH VOLTAGE SYSTEMS) COURSE

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| PROJECT CHECKED | DESIGN CHECKED M.TSHIKOSI | | |
| DATE | DATE 11/09/2017 | | |
| PROJECT DRAWN BY | DESIGN DRAWN BY R.VILJOEN | © | LINE TRAP MOUNTING |
| DATE | DATE 18/07/2017 | | SHEET NUMBER 4 / REVISION 0 |
| SCALE | | | |

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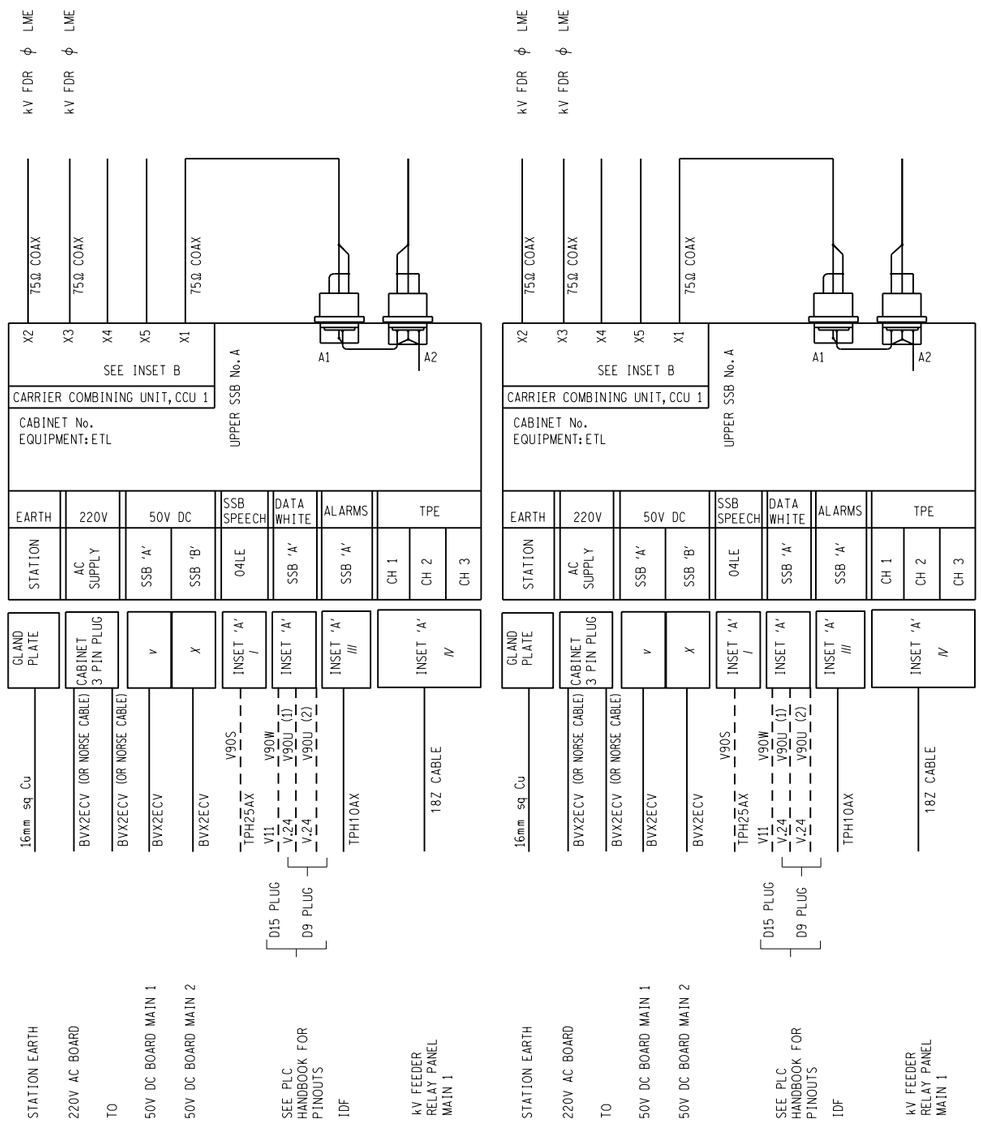
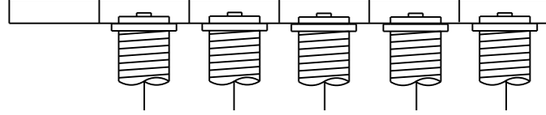
LEVELS 1 2 10 17 20 31

SIZE GROOTTE A1L




## INSET 'B' - CARRIER COMBINING UNIT

| CCU TYPE | TO SSB X1 | TO LME X5 | TO LME X4 | TO LME X3 | TO LME X2 | COUPLING ARRANGEMENT |
|---|---|---|---|---|---|---|
| CCU-1 PHASING | ↑ | | | OUTER PHASE LME ↓ | CENTRE PHASE LME ↑ | SINGLE LINE PHASE TO PHASE |
| CCU-1 PHASING | ↑ | | | LINE 2 CENTRE PHASE LME ↓ | LINE 1 CENTRE PHASE LME ↑ | PARALLEL LINES CENTRE PHASE TO CENTRE PHASE |
| CCU-2 PHASING | ↑ | LINE 2 OUTER PHASE LME ↑ | LINE 2 CENTRE PHASE LME ↓ | LINE 1 CENTRE PHASE LME ↑ | LINE 1 OUTER PHASE LME ↓ | PARALLEL LINES PHASE TO PHASE INTERCIRCUIT |
| CCU-3 PHASING | ↑ | | OUTER PHASE LME ↑ | CENTRE PHASE LME ↑ | OUTER PHASE LME ↓ | SINGLE LINE 3 PHASE, OUTER PHASE LME (X4) TO BE REVERSED BY 180° |



| TELEPROTECTION EQUIPMENT | | PROTECTION SIGNAL | POLARITY | TDE TERMINAL | Z CABLE COLOURS |
|---|---|---|---|---|---|
| | CHANNEL A DIRECTIONAL EARTH FAULT | SEND (TX) | + | S1a | RED (R) |
| | | | - | S1b | BLUE(Be) |
| | | REVEIVE (RX) | + | R1a | BROWN (Bn) |
| | | | - | R1b | LIGHT GREEN (LGn) |
| | | ALARM (AL) | + | F1a | YELLOW/RED (Y/R) |
| | | | - | F1b | WHITE/RED (W/R) |
| TELEPROTECTION EQUIPMENT | | PROTECTION SIGNAL | POLARITY | TPE TERMINAL | Z CABLE COLOURS |
| | CHANNEL B PERMISSIVE | SEND (TX) | + | S2a | GREY (GY) |
| | | | - | S2b | VIOLET (V) |
| | | REVEIVE (RX) | + | R2a | ORANGE (O) |
| | | | - | R2b | PINK (PK) |
| | | ALARM (AL) | + | F2a | RED/BLUE (R/Be) |
| | | | - | F2b | GREEN/RED (Gn/R) |
| TELEPROTECTION EQUIPMENT | | PROTECTION SIGNAL | POLARITY | TPE TERMINAL | Z CABLE COLOURS |
| | CHANNEL C DIRECT TRANSFER TRIP | SEND (TX) | + | S3a | GREEN (Gn) |
| | | | - | S3b | BLACK (Bk) |
| | | REVEIVE (RX) | + | R3a | WHITE (W) |
| | | | - | R3b | YELLOW (Y) |
| | | ALARM (AL) | + | F3a | RED/BLACK (R/Bk) |
| | | | - | F3b | RED/BROWN (R/Bn) |

NOTE:

1. THE PLC CABINET MUST BE INSTALLED AS PER STANDARD FOR INSTALLATION OF A TELECOMMUNICATION EQUIPMENT CABINET
2. THE CABINET MUST BE INSTALLED IN THE POSITION AS SHOWN ON THE CONTROL/CARRIER ROOM LAYOUT
3. ALL NEW 2/18Z TELEPROTECTION CABLES MUST BE GLANDED AND LUGGED WITH SUFFICIENT SLACK
4. ARMOUR GLANDS MUST BE USED FOR ALL ARMOURED CABLES AND COMPRESSION GLANDS FOR ALL UNARMOUIRED CABLES
5. ALL CABLES (NEW AND EXISTING) MUST BE NUMBERED ON BOTH ENDS
6. ALL CONDUCTORS TO BE TERMINATED, MUST BE FITTED WITH THE APPROPRIATED 'SPADE LUGS'
7. ALL UNTERMINATED CABLES MUST BE SEALED TO PREVENT THE INGRESS OF MOISTURE AND WATER

### INSET 'C'

COLOUR CODING OF THE TVH 25 AX CABLE SHOWING THE FUNTIONS ON THE CABLE PAIRS

| PAIR No | | SUB UNIT BLUE | FUNCTION |
|---|---|---|---|
| 1 | a | BLUE | AF1-IN |
| | b | WHITE | |
| 2 | a | ORANGE | AF1-OUT |
| | b | WHITE | |
| 3 | a | GREEN | E-WIRE |
| | b | WHITE | |
| 4 | a | BROWN | M-WIRE |
| | b | WHITE | LOCAL TRANSIT |
| 5 | a | GREY | |
| | b | WHITE | SPARE |
| 6 | a | BLUE | PAX BLOCKING |
| | b | RED | |
| 7 | a | ORANGE | |
| | b | RED | SPARE |
| 8 | a | GREEN | PAX 2 WIRE |
| | b | RED | |
| 9 | a | BROWN | SPARE |
| | b | RED | |
| 10 | a | GREY | SUBSCRIBER |
| | b | RED | |

| PAIR No | | SUB UNIT ORANGE | FUNCTION |
|---|---|---|---|
| 11 | a | BLUE | SPARE |
| | b | WHITE | |
| 12 | a | ORANGE | SPARE |
| | b | WHITE | |
| 13 | a | GREEN | AF2-IN |
| | b | WHITE | |
| 14 | a | BROWN | AF2-OUT |
| | b | WHITE | |
| 15 | a | GREY | AF3-IN |
| | b | WHITE | |
| 16 | a | BLUE | AF3-OUT |
| | b | RED | |
| 17 | a | ORANGE | AF4-IN |
| | b | RED | |
| 18 | a | GREEN | AF4-OUT |
| | b | RED | |
| 19 | a | BROWN | EXT-BOOST |
| | b | RED | |
| 20 | a | GREY | RTC-SYNC |
| | b | RED | |

### INSET 'D'

COLOUR CODING OF THE TVH 10 AX CABLE SHOWING THE FUNTIONS ON THE CABLE PAIRS

| PAIR No | | SUB UNIT BLUE | ALARM |
|---|---|---|---|
| 1 | a | BLUE NC | HARDWARE ALARM |
| | b | WHITE C | |
| 2 | a | ORANGE NO | LINK ALARM |
| | b | WHITE NC | |
| 3 | a | GREEN C | |
| | b | WHITE NO | |
| 4 | a | BROWN NC | CABINET ALARM |
| | b | WHITE C | |
| 5 | a | GREY NO | |
| | b | WHITE | EARTH SPARE |
| 6 | a | BLUE | |
| | b | RED | |
| 7 | a | ORANGE | SPARE |
| | b | RED | |
| 8 | a | GREEN | SPARE |
| | b | RED | |
| 9 | a | BROWN | SPARE |
| | b | RED | |
| 10 | a | GREY | SPARE |
| | b | RED | |

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|---|---|---|---|
| DATE | T. GOSAI DATE 11/09/2017 | | |
| PROJECT CHECKED | DESIGN CHECKED M. TSHIKOSI | | |
| DATE | DATE 11/09/2017 | | |
| PROJECT DRAWN BY | DESIGN DRAWN BY R. VILJOEN | © | ETL 6 CABLE BLOCK DIAGRAM |
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| SCALE | | | |

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LEVELS 1 2 10 17 20 31

SIZE GROOTTE A1L