| Eskom | Standard | Asset Management |
|---|---|---|

Title: **List of Approved Electronic Devices to be used on Eskom Power Stations Standard**

| | |
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# CONTENTS

## TABLES

# 1. INTRODUCTION

This document contains a list of products (e.g. protective IED's, relays, other electronic devices, etc.) for installation on Eskom Power Stations electrical plant.

# 2. SUPPORTING CLAUSES

## 2.1 SCOPE

### 2.1.1 Purpose

This document endorses Eskom Generation, Asset Management (i.e. Generation Engineering) and PTM field teams in their choice of products (protection, excitation and measurement related) when developing new schemes and/or when performing modifications to existing schemes.

Discrete relays for design and modifications (protection, excitation and measurement related) within the Eskom Generation environment are also listed.

### 2.1.2 Applicability

This document applies to all Eskom Generation sites.

## 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

These documents are indispensable for the application of this document and must be used in conjunction with this document.

[1] 32-9: Definition of Eskom documents.

[2] 32-644: Eskom documentation management standard.

[3] 240-64685228: Generic specification for protective intelligent electronic devices (IED's) standard

[4] 36-726: List of Approved Electronic Devices to be used on Eskom Power Stations

[5] 240-51999977: Specification for digital transducer-based measurement system for electrical quantities

[6] 32-310 (240-56032475): Specification for analogue transducer-based measurement system for electrical quantities

[7] 240-55410927: Cyber Security Standard for Operational Technology

[8] 240-55863502: Definition of Operational Technology (OT) and OT/IT Collaboration Accountabilities

[9] 32-373: Information Security – IT/OT Remote Access Standard

### 2.3 DEFINITIONS

| Definition | Description |
|---|---|
| N/A | N/A |

#### 2.3.1 Disclosure Classification

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

### 2.4 ABBREVIATIONS

| Abbreviation | Description |
|---|---|
| AC | Alternating Current |
| CoE | Centre of Excellence |
| DC | Direct Current |
| DPI | Dip Proofing Inverter |
| LV | Low Voltage |
| MV | Medium Voltage |
| N/A | Not Applicable |
| IED | Intelligent Electronic Devices |

## 3. REQUIREMENTS

### 3.1 INTRODUCTION

The IED's/relays/equipment will be divided into their functional type and application. Multi-function IED's/relays will be indicated as such.

Tests performed on IED's/relays/equipment are listed under test guidelines. Application testing or specific function testing will only be performed on request.

IED's/relays/equipment that has failed the tests will also be included for completeness. Certain IED's/relays/equipment that has failed the tests may be used **temporarily** with approved modifications to cure symptomatic problems. These will be indicated together with the modifications. These relays **should not** be utilised in the design of new schemes.

The following items, not being relays in the strict sense of the word, have been included in this document as they form an integral part of certain protection systems, or subsystems:

- Timers
- Paralleling devices
- Generator disturbance recorders
- Dip Proofing Inverters
- Transducers

### 3.2 IMPORTANT NOTES

- At the time of approval testing, the latest software tool version and current firmware version are used.

- The devices supplied might be of a higher version firmware. Attention is drawn to the relevant ESKOM standard. NOTE: The hardware shall be the same.
- Definitions of details in tables below:

➢ Approved devices.

➢ Devices not approved.

➢ Approved devices obsolete.

➢ Approved devices on hold.

### 3.3 ANSI DESCRIPTION OF FUNCTIONS

**Table 1: ANSI Description of Functions**

| ANSI No. | DESCRIPTION |
|---|---|
| 14 | Locked Rotor protection |
| 21 | Distance protection, phase |
| 24 | Overfluxing |
| 25 | Synchronising, Synchronism check |
| 26 | Resistive Temperature detection |
| 27 | Under Voltage |
| 27/51 | Voltage controlled overcurrent |
| 27TN | Third Harmonic under voltage |
| 27X | Auxiliary Under Voltage |
| 32 | Directional Power |
| 37 | Undercurrent or Under power |
| 38 | Bearing Over temperature |
| 39 | Bearing Vibration |
| 40 | Loss of Excitation (Impedance) |
| 40Q | Loss of Excitation ( Reactive Power) |
| 46 | Negative Sequence Current |
| 46R | Phase reversal |
| 47 | Phase Sequence voltage |
| 49M | Thermal Overload |
| 49R | Rotor Overload |
| 49S | Stator Overload |

| | |
|---|---|
| 50P | Instantaneous overcurrent (Phase) |
| 50/27 | Inadvertent Energising |
| 50BF | Breaker Failure (Instantaneous) |
| 50N/G | Instantaneous overcurrent (Neutral/Ground) |
| 51 | Time Overcurrent |
| 51BF | Breaker Failure (IDMT) |
| 51N | Neutral Time overcurrent |
| 51NBF | Breaker Failure (Neutral) |
| 51V | Voltage Restraint Phase Overcurrent |
| 53 | Out of Step |
| 56 | Field Application |
| 59 | Overvoltage |
| 59D | Third Harmonic Voltage Differential |
| 59N | Generator Ground Fault |
| 59X | Auxiliary Over Voltage |
| 60 | Voltage Balance |
| 60FL | Fuse Loss |
| 64G | Rotor Ground |
| 64R | Rotor Ground (Injection Principle) |
| 64S | Stator Ground (Injection Principle) |
| 66 | Cumulative Start-up |
| 67 | Ground Directional |
| 67N | Sensitive ground fault |
| 68 | Blocking |
| 74TC | Trip coil Supervision |
| 76 | Over excitation |
| 78 | Pole Slip |
| 79 | AC Reclosing |
| 81 | Frequency |
| 81A | Under Frequency Accumulation |
| 81R | R.O.C.O.F |
| 86 | Lockout (Master Trip) |

| | |
|---|---|
| 87G | Generator Differential |
| 87T | Transformer Differential |
| 87B | Bus Differential |
| 87S | Stator Differential |
| 87L | Line Current Differential |
| 87PC | Line Phase Comparison |
| 87Gnd | Ground Differential |
| AFD | Arc Flash Detection |

## 3.4 TYPE TESTING GUIDELINE

### 3.4.1 General

3.4.1.1 Type testing shall consist of performing testing on at least one sample of the IED/equipment family design.

3.4.1.2 The Tenderer is not required to repeat type tests already passed by its equipment, provided type test certificates are produced, including fully detailed, certified test reports from an independent laboratory and has been scrutinised by an Eskom employee with the related skill.

3.4.1.3 The submitted certification should clearly indicate conformance.

3.4.1.4 Where type test certificates and test reports are not available for the specific model of equipment being offered, evidence of equivalent tests performed on substantially similar equipment may be accepted subject to Eskom's approval.

3.4.1.5 Where required, type testing will be at the Tenderer's expense.

### 3.4.2 Protective Intelligent Electronic Devices and /or similar (i.e. bay controllers, etc.)

Selection and type testing of IED's for protective systems shall be performed in accordance to procedure 240-64685228: Generic specification for protective intelligent electronic devices (IED's) standard, point 4.2, "Type test requirements".

### 3.4.3 Other Electronic Devices and/or tripping or critical function equipment

Note: A suite of tests or all as listed below shall be performed dependant on the technology type and application of the device under test. The tests performed shall be selected and listed by the tester in the template (Appendix 26).

### 3.4.3.1 Electromagnetic Compatibility Tests

**Table 2: EMC Testing**

| **EMC immunity test level requirements** | |
|---|---|
| 1MHz burst disturbance test, class III<br>• Common mode<br>• Differential mode | According to IEC60255-22-1<br>2,5 kV<br>1,0 kV |
| Electrostatic discharge test, class 3<br>• For contact discharge<br>• For air discharge | According to IEC61000-4-2, IEC60255-22-2 and ANSI C37.90.3-2001<br>6 kV<br>8 kV |
| Radio frequency interference tests<br>• Conducted, common mode<br>• Radiated, amplitude-modulated<br>• Radiated, pulse-modulated | According to IEC61000-4-6 and IEC60255-22-6 (2000)<br>10V (rms), f=150 kHz…80 Mhz<br>According to IEC61000-4-3 and IEC60255-22-3 (2000)<br>10 V/m (rms), f=80…1000 MHz<br>According to the ENV 50204 and IEC60255-22-3 (2000)<br>10 V/m, f=900 Mhz |
| Fast transient disturbance tests<br>• Power outputs, energising inputs, power supply, I/O ports<br>• Communication ports | According to IEC60255-22-4 and IEC61000-4-4<br>2 kV<br>1 kV |
| Surge immunity test<br>• Power outputs, energising inputs, power supply, I/O ports<br>• Communication ports | According to IEC60255-22-5:<br>1.2/50 µs voltage and 8/20 µs current surges.<br>0.5, 1 and 2 kV line-to-earth and 0.5 and 1 kV line-to-line applied<br>0.5 and 1 kV line-to-earth applied |
| Power frequency (50 Hz) magnetic field IEC61000-4-8 | Class 5: 100 A/m continuous, 1000A/m for 1 to 3 s, 50Hz |
| Voltage dips and short interruptions | According to IEC60255-11:<br>• Voltage dip: a 20 ms interruption has no effect on operation<br>• Interruption: no mal operation for a 5 s interruption.<br>• Gradual start-up/shut-down: no mal operation for decaying DC to zero over 60 s, rising over 60 s.<br>• AC ripple: the device shall function correctly with 12 % 100Hz AC signal superimposed on the DC supply. |
| Electromagnetic emission tests<br>• Conducted, RF-emission (Power supply) | According to the IEC60255-25:<br>0.15 – 0.5 MHz 79 dB (µV) quasi peak, 66 dB (µV) average and 0.5 – 30 MHz 73 dB (µV) quasi peak, 60 dB (µV) average. |

| | |
|---|---|
| • Radiated RF-emission | 30 – 230 MHz 40 dB (μV) quasi peak at 10 m and 230 – 1000 MHz 47dB (μV) quasi peak at 10 m. |
| Capacitor discharge | 1.5 x Vn<br>Master trip circuits — 10 μF<br>Other protection & control circuits — 2 μF<br>Carrier/channel interface — 0,2 μF |

### 3.4.3.2 Insulation Resistance Tests

**Table 3: Insulation Resistance Test**

| **Insulation tests** | |
|---|---|
| Dielectric tests<br>• Test voltage | According to IEC60255-5<br>2 kV, 50 Hz, 1 min |
| Electrical impulse voltage test<br>• Test voltage | According to IEC60255-5<br>5 kV, unipolar impulses, waveform 1,2/50 μs, source energy 0,5 J |
| Insulation resistance measurements<br>• Isolation resistance | According to IEC60255-5<br>>20 MΩ, 500 V dc |

### 3.4.3.3 Environmental Tests

**Table 4: Environmental Tests**

| **Environmental test** | |
|---|---|
| Vibration tests (sinusoidal) | According to IEC60255-21-1, Class 1 |
| Shock and bump test | According to IEC60255-21-1, Class 1 |
| Seismic | According to IEC60255-21-3, Class 1 |
| Cold | According to IEC60068-2-1, Operate with tolerance at -10°C (LCD screen operative) |
| Dry heat | According to IEC60068-2-2, Operate with tolerance at +55°C |
| Cyclic temperature and humidity | According to IEC60068-2-30, 25°C and 95% relative humidity/ 55°C and 95% relative humidity, 12 + 12 hour cycle |

### 3.4.4 Measurement/Metering Equipment Testing

All tests done according to Eskom Specification documents, 32-310 (240-56032475), Specifications for analogue transducer based measurement systems for electrical quantities, 240-51999977, Specification for digital transducer-based measurement system for electrical quantities and IEC60688:Edition 2.2 2002-05 Electrical measuring transducers for converting a.c. electrical quantities to analogue or digital signals. The list of approved metering/measurement devices shall be available on the relevant SCOT SC website.

### 3.4.5 Criteria to change device status from “Approved” to “On Hold”

- A device upon activation of the “watch dog” function or generating of a fault code issued an incorrect trip signal.
- If two or more consecutive device failures/codes generated of the same type/function on different devices within a time frame of three months without causing incorrect trip signals.
- Protection function/application not in line with Eskom practices/philosophies.

- Any device that can/may cause a negative impact on quality of supply or safe and reliable operation of the Eskom Generation assets.
- When operation/information documentation with regard to a specific device/function are not clearly stated or described.

### 3.4.6 Criteria to change device status from "On Hold" to "Approved"

- Upon receiving a re-engineered or later version firmware device and tested by Eskom according to the testing guidelines of this document and found to be in order.
- When protection functions/application are re-engineered or revised to be in line with Eskom practice.
- Upon receiving and verifying that documentation/manuals regarding a device/function is clearly described and understood by Eskom staff.

### 3.5 LISTS OF EQUIPMENT

**Note:** Information can be found under "Contents".

## 4. AUTHORISATION

This document has been seen and accepted by:

| Name & Surname | Designation |
|---|---|
| Busi Green | Generation Electrical Protection and Control Care Group Chair |

## 5. REVISIONS

| Date | Rev. | Compiler | Remarks |
|---|---|---|---|
| November 2012 | 0 | PI Heera | Draft document for Review created from GST 36-726 |
| May 2013 | 1 | PI Heera | Final Document for Authorisation and Publication |
| May 2015 | 1.1 | J Strydom | Add 3.4.1 General<br>Revise 3.4.2<br>Revise 3.4.3<br>Revise 3.4.4<br>Include new tested devices.<br>Add "Bay controller" to annexure 16 description.<br>Add annexure 26 |
| June 2015 | 1.2 | J Strydom | Add OT and IT procedures under references. |
| July 2015 | 2 | J Strydom | Final Document for Authorisation and Publication |

| | | | |
|---|---|---|---|
| September 2016 | 2.1 | J Strydom | Add Comap GenSet Controllers to Appendix 19<br>Add Vecto II to Appendix 17<br>Add ION 8800 to Appendix 25<br>Add Iskra MT540 to Appendix 24<br>Add Measurelogic DTS 305 to Appendix 24<br>Add ABB RED67* to Appendix 8 |
| October 2016 | 3 | J Strydom | Final Document for Authorisation and Publication |
| June 2019 | 3.1 | J Strydom | Add ABB UMC100.3 LV motor controller to Appendix 3<br>Add Arcteq AQ 2** series IED's to Appendices 4,6 and 10<br>Add Arteche auxiliary devices to Appendix 13<br>Add Vecto III to Appendix 17<br>Add GE 350 IED to Appendix 6<br>Add ABB RE*-6** IED's to Appendix 4, 6 and 10<br>Add 2RMLG test block to Appendix 22<br>Add SEL 849 & 3421 to Appendix 3<br>Add SEL 710 to Appendix 4<br>Add SEL 2411 to Appendix 22<br>Add SEL 487E to Appendix 2<br>Add Siemens 7K*8* to Appendix 16<br>Add Siemens 7S*8** to Appendix 6<br>Add Siemens 7U*8** to Appendix 1, 2 and 4<br>Put DTS 305 in Appendix 24 "On Hold" |
| July 2019 | 3.2 | J Strydom | No comments from PTM Technical Committee, Generation Electrical Protection and Control Care Group and Protection and Automation Study Committee.<br>Final Draft for signature. |
| July 2019 | 4 | J Strydom | Final Rev 4 Document for Authorisation and Publication |
| October 2021 | 4.1 | J Strydom | Appendix 1: Update REG670 "functions" and "comments".<br>Appendix13: Add Schrack MT321***.<br>Appendix 14: Add Ashida ADE-TX and Schneider Preventa safety relay.<br>Appendix 22: Add Siemens/Reyrolle 7SR23, Weidmuller WAS1 and WDU 10.<br>Appendix 24: Add Schneider PM 8000, Camille Bauer I538, CEWE DPT100 and PCi MT025225 transducers.<br>Appendix 25: Move ION8800 from Appendix 24. |
| November 2021 | 4.2 | J Strydom | Final Draft after Comments Review Process |
| November 2021 | 5 | J Strydom | Final Rev 5 Document for Authorisation and Publication |

## 6. DEVELOPMENT TEAM

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

- Murray van Niekerk

## 7. ACKNOWLEDGEMENTS

The following members who provided valuable input when finalising the document:

- N/A

## APPENDIX 1: GENERATOR PROTECTION

| MANUFACTURER | TYPE | FUNCTIONS | PASS / FAIL | Y2K | Communication | COMMENTS |
|---|---|---|---|---|---|---|
| SEG Power | MRR1 | 64G | Pass | Y | | Rotor earth fault only |
| Siemens | 7UM61 | 14, 21, 24, 27, 27/34, 32F, 32R, 40, 46, 48, 49, 49S, 50, 50N, 50BF, 51, 51N, 51V, 59, 59N, 59GN, 64R, 67, 67N, 67G, 74TC, 81, 81R, 86, | Pass | Y | IEC60870-5-103, Profibus DP, Modbus RTU, DNP 3.0 | Generator and Motor |
| Siemens | 7UM62 | 14, 21, 24, 27, 27/34, 32, 32F, 32R, 37, 40, 46, 48, 47, 49, 49S, 50, 50N, 50BF, 51GN, 51, 51N, 51V, 59, 59N, 59GN, 64, 64R, 67, 67N, 67G, 68, 74TC, 78, 81, 81R, 86,87G,87T, 87M, 87N | Pass | Y | IEC60870-5-103, Profibus DP, Modbus RTU, DNP 3.0 | Generator and Motor |
| Siemens | 7SJ600 | 46, 48, 49, 49R, 49S, 50,50N, 51, 51N, 74TC, 79 | Pass | Y | IEC60870-5-103 | Motor and Generator |
| Siemens | 7SJ62 | 14, 21FL, 27, 37, 46, 47, 48, 49, 49R, 49S, 50, 50N, 50BF, 51, 51N, 59, 59N/ 64, 66, 67, 67N, 74TC, 79, 81, 86, 87N | Pass | Y | IEC60870-5-103/IEC61850, Profibus-FMS/-DP, DNP 3.0, Modbus RTU | Motor and Generator |
| Siemens | 7SJ642 | 14, 21FL, 25, 27/59, 32, 37, 38, 46,47, 48, 49, 49R, 49S, 50, 50N, 50BF, 51, 51N, 55, 59N/64, 67, 67N, 74TC, 79M, 81, 86, 87N | Pass | Y | IEC60870-5-103/IEC61850, Profibus-FMS/-DP, DNP 3.0, Modbus RTU | Motor and Generator |
| ABB | GPU2000 | 21, 24, 25, 27, 27G, 32ROU, 40, 46, 50P, 50G, 50IE, 51GPV, 59, 59G, 60, 64F, 67, 67N, 81OU, 87 | Pass | Y | INCOM, Modbus Plus, IRIG-B | Generator |
| ABB | REG316 | 21, 24, 27, 32, 40, 46, 49, 49S, 49R, 50, 51, 51/27, 59, 60, 64R, 64S, 67, 78, 81, 87G, 87T | Pass | Y | SPA or IEC 60870-5-103, LON or MVB (part of IEC 61375), MVB (part of IEC 61375) | Product |

| MANUFACTURER | TYPE | FUNCTIONS | PASS / FAIL | Y2K | Communication | COMMENTS |
|---|---|---|---|---|---|---|
| ABB | REG216 | 21, 24, 32, 40, 46, 49, 50, 51, 51/27, 59, 60, 64, 78, 81, 87T, 87G | Pass | Y | SPA or IEC 60870-5-103, LON or MVB (part of IEC 61375), MVB (part of IEC 61375) | System |
| SEL | 300G | 21P/C, 24, 25, 27, 32, 40, 46, 49, 50PGQ, 5ON, 51G, 51N, 51V/C, 52, 59PGQ, 60, 64G,81OU, 87, 87N | Pass | Y | SEL ASCII, SEL Distributed Port Switch Protocol (LMD), SEL Fast Meter, SEL Compressed ASCII, Modbus® RTU | Generator |
| Areva | Micom P34x | 87(Not P342), 50/51/67, 50N/51N, 67N/67W, 64, 51V, 21, 59V, 27/59, 81, 32, 40, 46T, 46OC, 47, 49, 24, 78, 27TN/59TN, 50/27,50BF, 64S(P345) | Pass | Y | K-Bus, IEC-60870-5-103, MODBUS or DNP3.0, IEC 874-10. | Generator |
| GE | G60 | 21P, 24, 25, 27P, 27TN, 27X, 32, 40, 46G, 50/27, 5ODD, 50P, 50G, 50N, 51P, 51G, 51N, 59N, 59P, 59X, 59_2, 64TN, 67P, 67N, 68, 78, 81U, 81O, 87S | Pass | Y | MMS/UCA2, DNP 3.0, Modbus RTU / TCP | Generator |
| GE | SR489 | 12, 21, 24, 27, 50/27, 32, 38, 39, 40, 40Q, 46, 47, 49, 50, 50BF, 50/51GN, 51V, 59, 59GN/27TN, 60FL, 67, 76, 81,86, 87G | Pass | Y | Modbus RTU, DNP 3.0 | Generator Management |
| Beckwith | M-3420 | 24, 27, 32, 40, 46, 50, 50/27, 50BF, 51N, 50N, 51V, 59, 59N, 60FL, 81, 87, 87GD | Pass | Y | Modbus, BECO 2200 | Generator |
| Areva | Micom P391 | 64R | Pass | N/A | | Injection unit to be used with Micom P345 Suffix K |

| MANUFACTURER | TYPE | FUNCTIONS | PASS / FAIL | Y2K | Communication | COMMENTS |
|---|---|---|---|---|---|---|
| ABB | REG216C | 21, 24, 32, 40, 46, 49, 50, 51, 51/27, 59, 60, 64, 78, 81, 87T, 87G | Pass | Y | SPA or IEC 60870-5-103, LON or MVB (part of IEC 61375), MVB (part of IEC 61375) | System (Compact) |
| Beckwith | M-3425 | 21, 24, 27, 27TN, 32, 40, 46, 49, 50, 50DT, 50/27, 50BF, 50N, 51N, 51V, 59, 59D, 59N, 59X, 60FL, 67N, 78, 81, 81A, 81R, 87, 87GD | Pass | Y | Modbus, BECO 2200 | Generator |
| VA-Tech | DRS Compact2 | 21, 24, 32, 40, 46, 49, 50/51, 50/51/37, 51/37, 59/27, 59/27DC, 64G, 64R, 78, 81, 87T, 87G | Pass | Y | IEC 60870-5-103 standard and IEC 60870-5-104 optional | Generator |
| ABB | REG670 | 21, 24, 25, 27, 32, 37, 40, 46, 49, 50, 50N, 50BF, 51/67, 51N/67N, 52PD, 59, 59N, 59THD, 60, 64S, 64 R, 67N, 78, 81, 87T, 87, 87G, 87N, 94 | Pass | Y | IEC 60870-5-103, TCP/IP or EIA-485 DNP 3.0, LON, SPA and IEC61850 | Generator and Transformer. Functions dependant on ordering code. 100% SEF injection unit up to 80 Hz. |
| SEG | XE2 | 76E | Pass | N/A | Via XRS1 interface | DC over and under current with settable time delay |
| SEL | 700G | Multi-function | Pass | Y | Modbus, DNP3.0, IEC61850 | Protection, Control and Synchroniser |
| Siemens | 7U*8** | Model dependant | Pass | Y | IEC61850 | Protection and Control |

## APPENDIX 2: TRANSFORMER PROTECTION

| MANUFACTURER | TYPE | FUNCTIONS | PASS/FAIL | Y2K | Communication | Comments |
|---|---|---|---|---|---|---|
| Siemens | 7UT612 | 46, 49, 50, 50N, 50BF, 51, 51N, 74TC, 86, 87G, 87T, 87M, 87L | Pass | Y | IEC60870-5-103, Profibus-FMS/-DP, DNP 3.0 or Modbus | Transformer |
| Siemens | 7UT613 | 24, 49, 50, 50N, 50BF, 51, 51N, 74TC, 86, 87G, 87T, 87BB, 87M, 87L | Pass | Y | IEC60870-5-103, Profibus-FMS/-DP, DNP 3.0 or Modbus | Transformer |
| Siemens | 7UT635 | 24, 46, 49, 50, 50BF, 50N, 51, 51N, 74TC, 86, 87G, 87T, 87BB, 87M, 87L, 87N | Pass | Y | IEC60870-5-103, Profibus-FMS/-DP, DNP 3.0 or Modbus | Transformer |
| Siemens | 7UT633 | 24, 46, 49, 50, 50BF, 50N, 51, 51N, 74TC, 86, 87G, 87T, 87BB, 87M, 87L, 87N | Pass | Y | IEC60870-5-103, Profibus-FMS/-DP, DNP 3.0 or Modbus | Transformer |
| Siemens | 7VH60 | 87T, 87N | Pass | Y | | Differential Transformer |
| ABB | SPAD346C | 50, 50BF, 50N, 51,51N,87G,87T | Pass | N/A | SPA-Bus | Transformer |
| ABB | RET54* | 21, 24, 27, 46, 47, 49, 50, 51, 59, 60FL, 67N, 81, 87G, 87T | Pass | Y | SPA, LON, IEC 60870-5-103, DNP 3.0,Modbus RTU/ASCII, Profibus DP or IEC 61850 | Transformer |
| SEL | 387 | 50PGQ, 51PGQ, 52, 67G, 87 | Pass | Y | Modbus , SEL Fast Messaging, or ASCII protocol | Diff and O/C |
| GE | T60 | 24, 27X, 50/87, 50P, 50G, 50N, 51P, 51G, 51N, 59N, 59P, 59X, 67P, 67N, 81U, 81O, 87T,87G | Pass | Y | MMS/UCA2, DNP 3.0, Modbus RTU / TCP | Transformer |
| BECKWITH | M-3310 | 24, 27, 46, 50, 50BF, 50G, 51, 51G, 51N, 59G, 81U, 87, 87GD | Pass | Y | Modbus, BECO 2200 | Transformer |

| MANUFACTURER | TYPE | FUNCTIONS | PASS/FAIL | Y2K | Communication | Comments |
|---|---|---|---|---|---|---|
| BECKWITH | M-3311 | 24, 27, 46, 49, 50, 50BF, 50G, 50N, 51, 51G, 51N, 59G, 81O/U, 87, 87GD | Pass | Y | Modbus, BECO 2200 | Transformer |
| ABB | RET67* | 21, 24, 25, 27, 46, 50, 50N, 50BF, 51/67, 51N/67N, 52PD, 59, 59N, 59THD, 67N, 81, 87T, 87, 87G, 87N, 94 | Pass | Y | IEC61850-8-1, IEC60870-5-103, DNP3.0, LON, SPA | Transformer |
| Areva | Micom P632 and P633 | 50/51PQN, 67, 50/27, 85, 79, 25, 67N, 37/48/49/49LR/50S/66, 49, 46, 27/59PQW, 81,32, 50BF/62, 30/70 | Pass | Y | IEC 60870-5-103, IEC 60870-5-101, DNP 3.0, Modbus | Transformer. Relays with processor boards P9651428 index G and P9651472 index B are approved. |
| ABB | RET63* | 27, 46, 49T, 50/51P&N, 51P&NBF, 59, 87N&T | Pass | Y | DNP3.0, IEC61850 | Transformer with differential |
| SEL | 487E | 16, 24, 25, 27, 32, 46, 49, 50/51P&N, 59, 67, 81, 85, 87 | Pass | Y | IEC61850 | Transformer with differential |
| Siemens | 7U*8** | Model dependant | Pass | Y | IEC61850 | Protection and Control |

## APPENDIX 3: LV MOTOR PROTECTION <1000V AC

| MANUFACTURER | TYPE | FUNCTIONS | PASS / FAIL | Y2K | Communication | COMMENTS |
|---|---|---|---|---|---|---|
| Newelec | 320M | | Pass | N/A | | AC Version only |
| Newelec | SDR1 | | Pass | N/A | | Stall unit only |
| Newelec | KD & KE | | Pass | N/A | | |
| Newelec | NH200 /1/F220 | | Fail | N/A | | |
| GECA | Motor Master | | Fail | N/A | | High failure rate |
| M.S.P. | MSP 3-2 | | Pass | N/A | | |
| GE-Multilyn | MMII | | Pass | N/A | | Protection&Control |
| Siemens | 3UN21 | | Pass | N/A | | Thermistor type |
| FANOX | F20 | | Pass | N/A | | |
| FANOX | G17 | | Pass | N/A | | |
| Siemens | Simocode DP | | Pass | N/A | | RS232 + Profibus |
| Powertronics | M400 | | Pass | N/A | | Version 5.5 only |
| Powertronics | M500 | | Pass | N/A | | |
| Ningi Services | M550 | | Pass | Y | | Use thermal protection functionality only |
| ABB | SPAM050 | | Pass | N/A | | |
| GECA | M202S | | Pass | N/A | | |
| GECA | M203 | | Pass | N/A | | |
| GECA | M204 | | Pass | N/A | | |
| ABB | UMC100.3 | | Pass | Y | | LV motor controller |
| SEL | 849 | | Pass | Y | Modbus | LV motor controller |
| SEL | 3421 | | Pass | Y | | HMI |

## APPENDIX 4: MV MOTOR PROTECTION

| MANUFACTURER | TYPE | FUNCTIONS | PASS / FAIL | Y2K | Communication | COMMENTS |
|---|---|---|---|---|---|---|
| GE-Multilin | M239 Plus | 37, 38, 46, 48, 49, 50, 50G, 51, 66, 74TC, 86 | Pass | O | | Modbus Protocol |
| VA-Tech Reyrolle ACP | RHO3 | 14, 37, 38, 46, 49, 50, 51, 50BF, 66, 74TC | Pass | Y | | Proper NPS |
| ABB | REM610 | 37, 38, 46, 46R, 48, 49M, 50, 51, 66, 86, 74TC | Pass | Y | | Proper NPS |
| ABB | REM54* | 21, 24, 25, 27, 32, 37, 40, 46, 49, 50, 51, 51V, 59, 60, 62BF, 66, 67, 68, 81O/81U, 87G/M/N | Pass | Y | | |
| Siemens | 7SJ6112 | 14, 37, 46, 48, 49, 49R, 49S, 50, 50N, 50BF, 51, 51N, 74TC, 79, 86, 87N | Pass | Y | | Incl Trip CCt Superv and CB Fail |
| VAMP | VAMP150 | 14, 37, 46, 49, 50, 50BF, 51, 66, 74TC | Pass | Y | | Arc Sensor input |
| Areva | Micom P241 | 14, 26, 37, 46, 48, 49, 27/49, 50, 51LR, 50N, 51N, 53, 59N, 61N, 32N/64N, 66, 81U | Pass | Y | | |
| Schweitzer Eng | SEL-701 | 27/59, 37, 46, 47, 49, 50, 55, 66, 81 | Pass | Y | | |
| Schweitzer Eng | SEL- 710 | 14, 27, 37, 38, 46, 47, 49, 50P/G/N, 55, 59, 66, 81O/U, 87 | Pass | Y | | Motor |
| Schweitzer Eng | SEL- 749M | 14, 27, 37, 38, 46, 47, 49, 50P/G/N, 55, 59, 66, 81O/U | Pass | Y | | Motor |
| ABB | MCX913 | | Pass | N/A | | |
| ABB | SPAM150 | 14, 37, 46, 46R, 49M, 50, 51, 66 | On Hold due to no NPS and power supply problems. | N/A | | Motor |
| Siemens | 7SJ551 | | Pass | N/A | | |
| Strike Technologies | FP2000 | | Pass | N/A | | |
| Cutler Hammer | MP3000 | | Pass | N/A | | |
| Microelletrica Scientifica | MM30 | | Pass | N/A | | |
| Siemens | 7UM61 | 14, 21, 24, 27, 27/34, 32F, 32R, 40, 46, 48, 49, 49S, 50, 50N, 50BF, 51, 51N, 51V, 59, 59N, 59GN, 64R, 67, 67N, 67G, 74TC, 81, 81R, 86, | Pass | Y | IEC60870-5-103, Profibus DP, Modbus RTU, DNP 3.0 | Generator and Motor |

| MANUFACTURER | TYPE | FUNCTIONS | PASS / FAIL | Y2K | Communication | COMMENTS |
|---|---|---|---|---|---|---|
| Siemens | 7UM62 | 14, 21, 24, 27, 27/34, 32, 32F, 32R, 37, 40, 46, 48, 47, 49, 49S, 50, 50N, 50BF, 51GN, 51, 51N, 51V, 59, 59N, 59GN, 64, 64R, 67, 67N, 67G, 68, 74TC, 78, 81, 81R, 86,87G,87T, 87M, 87N | Pass | Y | IEC60870-5-103, Profibus DP, Modbus RTU, DNP 3.0 | Generator and Motor |
| Siemens | 7SJ600 | 46, 48, 49, 49R, 49S, 50,50N, 51, 51N, 74TC, 79 | Pass | Y | IEC60870-5-103 | Motor and Generator |
| Siemens | 7SJ62 | 14, 21FL, 27, 37, 46, 47, 48, 49, 49R, 49S, 50, 50N, 50BF, 51, 51N, 59, 59N/ 64, 66, 67, 67N, 74TC, 79, 81, 86, 87N | Pass | Y | IEC60870-5-103/IEC61850, Profibus-FMS/-DP, DNP 3.0, Modbus RTU | Motor and Generator |
| Siemens | 7SJ642 | 14, 21FL, 25, 27/59, 32, 37, 38, 46,47, 48, 49, 49R, 49S, 50, 50N, 50BF, 51, 51N, 55, 59N/64, 67, 67N, 74TC, 79M, 81, 86, 87N | Pass | Y | IEC60870-5-103/IEC61850, Profibus-FMS/-DP, DNP 3.0, Modbus RTU | Motor and Generator |
| Areva | Micom P632 and P633 | 50/51PQN, 67, 50/27, 85, 79, 25, 67N, 37/48/49/49LR/50S/66, 49, 46, 27/59PQW, 81,32, 50BF/62, 30/70 | Pass | Y | IEC 60870-5-103, IEC 60870-5-101, DNP 3.0, Modbus | Generator and Motor |
| ABB | RE*6** | Model dependant | Pass | Y | DNP3.0, IEC61850, IEC60870-103 | Protection and Control |
| Arcteq | AQ M2** | Model dependant | Pass | Y | IEC61850, IEEE 1588, RSTP, PRP, PTP, Modbus TCP, DNP 3.0, FTP, Telnet | Protection and Control |
| Siemens | 7U*8** | Model dependant | Pass | Y | IEC61850 | Protection and Control |

## APPENDIX 5: OVER/UNDER FREQUENCY PROTECTION

| MANUFACTURER | TYPE | FUNCTIONS | PASS / FAIL | Y2K | Communication | COMMENTS |
|---|---|---|---|---|---|---|
| ABB | SPAF140 | 81 | Pass | Y | | |
| GECA | MFVU | 81 | Pass | N/A | | |
| Siemens | 7RW6000 | 24, 27, 59, 81 | Pass | Y | IEC60870-5-103 | |
| Areva | Micom P92* | 27, 47, 59, 81 | Pass | Y | IEC60870-5-103, Modbus (RTU), DNP3 | |

## APPENDIX 6: FEEDER PROTECTION

| MANUFACTURER | TYPE | FUNCTIONS | PASS / FAIL | Y2K | Communication | COMMENTS |
|---|---|---|---|---|---|---|
| General Electric Spa | MIC 1000 | | Pass | N/A | | |
| Strike Technologies RSA | Feederguard F150-1-0-0 | | Pass | N/A | | Three phase |
| Strike Technologies RSA | Feederguard FP2000 | | Pass | Y | | |
| Schneider | SEPAM 2000 | | Pass | Y | | With Thermal |
| GE | MIF | | Pass | Y | | With Thermal |
| ABB | REJ525 | 46, 50, 50N, 51, 51N, 62BF | Pass | Y | | |
| ABB | REF54* | 27, 27/47/59, 46, 50, 51, 50N, 51N, 59, 59N, 67, 79, 81U/81O | Pass | Y | | |
| ABB | RXIDK2H | 50, 51 | Pass | N/a | | 40 – 2000 Hz |
| Thytronics | SCC-P72 | | Pass | Y | | |
| Areva | Micom P12X | 37, 46, 49, 50, 50N, 50BF, 51, 51N, 79 | Pass | Y | | |
| ABB | SPAJ14* | 50, 50N, 51, 51N , 50BF | Pass | N/A | | IDMT blocks when I>> pick-up |
| GECA | KCGG | | Pass | N/A | | |
| Siemens | 7SJ511 | | Pass | N/A | | |
| Basler | BE1-50/51M | | Pass | N/A | | Single phase |
| Basler | BE1-50/51B | | Pass | N/A | | Three phase |
| CEE | ITG7366 | | Pass | N/A | | Three phase |
| ABB | SPAJ11* | 50N, 51N | Pass | N/A | | Earth fault |
| Siemens | 7SD61 | 49, 50, 50N, 50BF, 51, 51N, 74TC, 79, 85, 86, 87T, 87L | Pass | Y | IEC 60870-5-103, Profibus-DP, DNP-3.0 | Feeder |
| SEL | 351 | 25, 27, 32, 32 QVI, 50PGQ, 50N, 51PGQ, 51N, 52, 59, 67PGQ, 67N, 79 | Pass | Y | Modbus , SEL Fast Messaging, or ASCII protocol | Directional O/C and Reclosing |

| MANUFACTURER | TYPE | FUNCTIONS | PASS / FAIL | Y2K | Communication | COMMENTS |
|---|---|---|---|---|---|---|
| SEL | 501 | 49, 50PGQ, 51PGQ, 52, 62, 66 | Pass | Y | Modbus , SEL Fast Messaging, or ASCII protocol | Dual Universal O/C |
| SEL | 551 | 50PQG, 50N, 51PGQ, 51N, 52, 79 | Pass | Y | Modbus , SEL Fast Messaging, or ASCII protocol | O/C and Reclosing |
| SEL | 387 | 50PGQ, 51PGQ, 52, 67G, 87 | Pass | Y | Modbus , SEL Fast Messaging, or ASCII protocol | Diff and O/C |
| Areva | Micom P13* | 24, 27/59, 49, 50, 51, 87, 87G | Pass | Y | IEC 60870-5-103, IEC 60870-5-101, DNP 3.0, Modbus and Courier | Feeder |
| GE | L90 | 21G&P, 25, 27P, 27X, 32N, 50BF, 5ODD, 50P, 50G, 50N, 50P, 50_2, 51P, 51G, 51N, 51_2, 52, 59N, 59P, 59X, 67P, 67N, 67_2, 68, 78, 79, 87L | Pass | Y | DNP 3.0, IEC60870-5-104 | Line differential |
| GE | F35 | 27P, 27X, 50G, 50N, 50P, 51G, 51N, 51P, 52, 59N, 59X, 79, 81 | Pass | Y | DNP 3.0 or IEC60870-5-104 | Multiple Feeder in one |
| GE | MIF II | 49, 50P, 50G, 51G, 51P, 79 | Pass | Y | Modbus TCP/IP | Distribution Feeder |
| ABB | RE*6** | Model dependant | Pass | Y | DNP3.0, IEC61850-8-1 (GOOSE) | Protection and Control (Functions model dependant) |
| VAMP | VAMP25* | 27, 46, 49M, 50P/N, 50BF, 51P/N, 59, 79, 81, AFD | Pass | Y | DNP3.0, IEC61850. Modbus | Protection and Control |
| SEL | 451 | 27, 59, 50, 50BF, 51, 52, 59, 67, 79 | Pass | Y | IEC61850, DNP3.0, FTP, Telnet | Protection, automation, bay control |
| SEL | 751 | 25, 27, 32, 50, 51, 59, AFD, 79 | Pass | Y | IEC61850, Modbus, DNP3.0 | Feeder protection with ARC flash |
| Arcteq | AQ F2** | Model dependant | Pass | Y | IEC61850, IEEE 1588, RSTP, PRP, PTP, Modbus TCP, DNP 3.0, FTP, Telnet | Protection and Control |
| GE | 350 | 24, 25, 27, 27P, 27X, 32, 46, 49, 50/51P&N, 50BF, 59, 60, 67, 79 ,81, 86 | Pass | Y | IEC61850, DNP 3.0, Modbus RTU, | LV Incomers |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | Modbus TCP/IP, IEC60870-5-103&104, PRP & HSR, LLA, OPC-UA, IEEE1588 | |
| Siemens | 7S*8** | Model dependant | Pass | Y | IEC61850 | Protection and Control |

## APPENDIX 7: SYNCHRONISM CHECK

| TYPE | MANUFACTURER | PASS / FAIL | Y2K Compliant | COMMENTS |
|---|---|---|---|---|
| SPAU140 | ABB-Stromberg | Pass | N/A | |
| MIC 1000 | General Electric Spa. | Pass | N/A | Alt. To TC32 |
| BE3-25 | Basler | Pass | N/A | |
| BE1-25 | Basler | Pass | N/A | |
| MVAS | GECA | Pass | N/A | |
| 7VE512 | Siemens | Pass | N/A | |
| 7VM21/22 | Siemens | Pass | N/A | |
| 7VK51 | Siemens | Pass | N/A | |
| M-0359 | Beckwith Electric Inc | Pass | N/A | |

## APPENDIX 8: DIFFERENTIAL PROTECTION

| MANUFACTURER | TYPE | FUNCTIONS | PASS / FAIL | Y2K | Communication | COMMENTS |
|---|---|---|---|---|---|---|
| Microelletrica Scientifica | MD32-T | 87 | Pass | N/A | **1** | **2** Transformer |
| ABB | SPAD330 | 87 | Pass | N/A | **3** | **4** Transformer or Motor |
| ABB | RADSB | 87 | Pass | N/A | **5** | **6** Transformer or Motor |
| ABB | DT92 | 87 | Pass | N/A | **7** | **8** Transformer |
| Basler | BE1-87G | 87 | Pass | N/A | **9** | **10** Generator |
| Basler | BE1-87T | 87 | Pass | N/A | **11** | **12** Transformer |
| Siemens | 7VH83 | 87 | Pass | N/A | **13** | **14** Bus Zone |
| ABB-Stromberg | SPAE010 | 87 | Pass | N/A | | High Impedance |
| ABB-Stromberg | SPAJ115C | 87, 87Gnd | Pass | N/A | + Res. E/F | High impedance |
| ABB | RED615 | 46, 46PD, 49F, 50P/51P, 51BF, 51NBF, 51N, 67N, 68, 79, 86, 87L | Pass | N/A | Modbus, DNP3 & IEC 60870-103. IEC61850 via Ethernet LAN using GOOSE | Line differential and bay control |
| SEL | 787 | 24, 27, 32, 49, 50P&N, 50BF, 51P&N, 59, 67, 81, 87 | Pass | Y | Modbus, Telnet, FTP, IEC61850, DNP3.0 | Transformer Protection |
| Alstom/Schneider | Micom P746 | 50BF, 50P/N, 51P/N, 87CZ, 87BB | Pass | Y | Modbus, DNP3 & IEC61850 and IEC103 protocols | Bus bar protection |
| ABB | RED67* | 87L,21,50,51,59,27,24,81 | Pass | Y | IEC 60870-5-103, TCP/IP or EIA-485 DNP 3.0, LON, SPA and IEC61850 | Line differential and bay control |

## APPENDIX 9: SENSITIVE EARTH FAULT PROTECTION

| TYPE | MANUFACTURER | PASS / FAIL | Y2K Compliant | COMMENTS |
|---|---|---|---|---|
| SPAJ111C | ABB-Stromberg OY | Pass | N/A | |
| MCSU | GECA | Pass | N/A | |

## APPENDIX 10: OVER/UNDER VOLTAGE PROTECTION

| MANUFACTURER | TYPE | FUNCTIONS | PASS / FAIL | Y2K | Communication | COMMENTS |
|---|---|---|---|---|---|---|
| ABB-Stromberg | SPAU120 | 59 | Pass | N/A | | |
| Basler | BE1-59 | 59 | Pass | N/A | | |
| Siemens | 7RW6000 | 24, 27, 59, 81 | Pass | Y | IEC60870-5-103 | Voltage and Frequency |
| Areva | Micom P92* | 27, 47, 59, 81 | Pass | Y | IEC60870-5-103, Modbus (RTU), DNP3 | Voltage and Frequency |
| ABB | RE*6** | 27, 47, 59, 62, 86 | Pass | Y | IEC61850, IEC60870-103, Modbus, Profibus, DNP3.0, SPA, LON | Voltage and Control 9Functions model dependant |
| Arcteq | AQ V2** | 27, 59, 81 | Pass | Y | IEC61850, IEEE 1588, RSTP, PRP, PTP, Modbus TCP, DNP 3.0, FTP, Telnet | Protection and Control |

## APPENDIX 11: TIMERS

| TYPE | MANUFACTURER | PASS / FAIL | Y2K Compliant | COMMENTS |
|---|---|---|---|---|
| H3CA | OMRON | Pass | N/A | |
| H3BA | OMRON | Pass | N/A | |
| RXKL | ABB | Pass | N/A | |
| RXKM | ABB | Pass | N/A | |
| Timecount | Timecount | Fail | N/A | |
| T3D/S | Electro | Fail | N/A | |
| Klippon | Klippon | Pass | N/A | |
| RXKC | ABB | Fail | N/A | Reset Problems |
| RXKA | ABB | Fail | N/A | Spurious output |
| TRLM | Syrelec | Fail | N/A | |
| TDF 4 | Arteche | Pass | | Timer |

# APPENDIX 12: GENERATOR PARALLELING DEVICES

| TYPE | MANUFACTURER | PASS / FAIL | Y2K Compliant | COMMENTS |
|---|---|---|---|---|
| RES010 | ABB-Energi | Pass | N/A | |
| M-0193B | Beckwith Electric Inc | Pass | N/A | Dated Technology |
| M-0194 | Beckwith Electric Inc. | Pass | N/A | Dated Technology |
| Synchrotact V | ABB | Pass | Y | Recommended |
| 7VE63 | Siemens | Pass | Y | Recommended |
| 7VE61 | Siemens | Pass | Y | |
| Synchrotact 4 | ABB-Drives | Pass | N/A | Not recommended |
| 7VE512 | Siemens | Pass | N/A | |
| BE1-25A | Basler Electric | Pass | N/A | D/Gen only |
| BE3-25A | Basler Electric | Pass | N/A | D/Gen only |
| SYN3000 | VA-Tech | Pass | N/A | S/w Syn-Win version 2.2 |

## APPENDIX 13: AUXILIARY CONTROL RELAYS

| TYPE | MANUFACTURER | PASS / FAIL | VOLTAGE | COMMENTS |
|---|---|---|---|---|
| SH05.22 | AEG | Pass | 24 DC | Mini-contactor |
| RSA1022-4/ED | Siemens | Pass | 220 DC | Module type |
| Haller RE1.6505/10 | Haller | Pass | 220 DC | 11 pin plug-in |
| MR301221 | Schrack | Fail | 220 DC | 11 pin plug-in |
| RL300048 | Schrack | Pass | 48 DC | 11 pin plug-in |
| RL301220 | Schrack | Fail | 220 DC | 11 pin plug-in |
| MK2KP | Omron | Pass | 24 DC | 11 pin plug-in |
| 7TR2001 | Siemens | Fail | 220 DC | Coupling Module |
| MY2-US-SV(DC) | Omron | Pass | 24 DC | Plug-in/solder |
| MY2-US-SV(AC) | Omron | Fail | 220/240 AC | Plug-in/solder |
| MK2 P-I (AC) | Omron | Fail | 230 AC | 11 pin plug-in |
| MY214-N | Omron | Pass | 24 DC | Plug-in/solder |
| G6B-4BND | Omron | Fail | 24 DC | PCB mount |
| RXMC 1 | ABB | Pass | 24 DC | 1MRK000450-AD |
| MR900304 | Schrack | Fail | 250 DC | Used on AVR's |
| SH04.22 | AEG | Pass | 230 AC | Mini-contactor |
| SH04.22 | AEG | Pass | 24 DC | Mini-contactor |
| SKR115F AK 428391 P 124 | ELESTA | Pass | 24 DC | 11 pin plug-in |
| SKR115F AK 428391 P 127 | ELESTA | Fail | 110 DC | Can be used with PTC (C890) |
| RXMVB | ABB | Pass | 220 DC | Flip-flop |
| D-B | Smitt | Pass | 24 DC | Plug-in type relays |
| D | Smitt | Pass | 24 DC | Plug-in type relays |
| G08-D024 | Smitt | Pass | 24 DC | Plug-in type relays |
| G11-D220 | Smitt | Pass | 220 DC | Plug-in type relays |

| | | | | |
|---|---|---|---|---|
| G11-L D048 | Smitt | Pass | 48 DC | Plug-in type relays |
| KDN | Smitt | Pass | 24 DC | Plug-in type relays |
| KDN | Smitt | Pass | 220 DC | Plug-in type relays. Bi-stable |
| D-HL | Nieaf – Smit Products | Pass | 110V & 220V DC | Auxiliary relay with PTC |
| MT323024 | Schrack | Pass | 24V DC | Plug-in type relays |
| CR-PO24 DC2 | ABB | Pass | 24V DC | Plug-in type relays. A PTC needs to be fitted when used |
| B65-30-10-1.7 | ABB | Pass | | Mini-contactor |
| KC6-40E | ABB | Pass | | Mini-contactor |
| PSR-SCP | Phoenix | Pass | 24V DC | Plug-in type relays |
| WDDE-1 | Smitt | Pass | 24-220V AC/DC | Plug-in relay. Pulse relay |
| RF4XR | Arteche | Pass | 110&125V DC | |
| RF4SY | Arteche | Fail | 110V DC | Use with desensitizing |
| RUT4 | Arteche | Pass | 110&125V DC | Passed 4,7 and 10 µF test |
| CF4 | Arteche | Fail | 110&125V DC | Contactor, not auxiliary relay |
| RD2SY | Arteche | Fail | 110V DC | Use with desensitizing |
| BF3 | Arteche | Fail | 110V DC | Use with desensitizing |
| BF4RP | Arteche | Pass | 110&125V DC | Failed 10µF test at 187V |
| RJ8 | Arteche | Pass | 110V DC | VT selection |
| RF4XR4 | Arteche | Pass | 110&125V DC | |
| BJ8RP | Arteche | Pass | 110V DC | Only as auxiliary, not master |
| RD2A | Arteche | Pass | 1A DC | DC surge absorption |
| VDF10 | Arteche | Pass | 110&125V DC | Coil supervision |
| TDF 4 | Arteche | Pass | | Timer |
| RF4 | Arteche | Pass | 230V AC | Control circuit device |
| MT321*** | Schrack | Pass | 24V and 220V DC | Plug-in type relays |

As these relays are electro-mechanical, Y2K is irrelevant.

## APPENDIX 14: MASTER TRIPPING RELAYS

| TYPE | MANUFACTURER | PASS / FAIL | VOLTAGE | COMMENTS |
|---|---|---|---|---|
| 7PA1035-XXX | Siemens | Pass | 220 DC | |
| VAA21ZG | GECA | Fail | 220 DC | Needs Surge Unit |
| RSA1022-4/ED | Siemens | Pass | 220 DC | |
| RTR98 | Siemens | Pass | 220 DC | |
| RXME var'E' | ABB | Fail | 220 DC | Needs Surge Unit |
| RXMS1 | ABB | Fail | 220 DC | Needs Surge Unit |
| RXSF1 | ABB | Pass | 48 DC | PR5651 2019-AA |
| RXSF1 | ABB | Pass | 110 DC | PR5651 2019-AB |
| RXSF1 | ABB | Pass | 220 DC | PR5651 2019-AC |
| RXME18 | ABB | Fail | 220 DC | Needs Surge Unit |
| RXMH2 | ABB | Fail | 220 DC | Needs Surge Unit |
| RXMVB | ABB | Fail | 220 DC | Needs Surge Unit |
| RTR95 | Siemens | Pass | 220 DC | |
| RPA9900(110v) | Siemens | Pass | 110 DC | Bi-Stable type |
| RB4 | Microelletrica Scientifica | Pass | | |
| ADE-TX | Ashida | Pass | 220 DC | Needs sensitising unit for external input use |
| XPSAXE5120P | Schneider Preventa Safety relay | Pass | 24 DC | Boiler trip relay |

**NOTE :** All relays that are indicated in the shaded area above, i.e. RXSF1s, are to be used together with the specified surge units. Note : The PR numbers for relays having n/c contacts in the contact stack, will be announced shortly.

As these relays are electro-mechanical, Y2K is irrelevant.

## APPENDIX 15: VOLTAGE REGULATOR RELAYS (TAP CHANGER CONTROLLERS)

| TYPE | MANUFACTURER | PASS / FAIL | Y2K Compliant | COMMENTS |
|---|---|---|---|---|
| MK30 | MaschinenFabrik-Reinhausen | Pass | N/A | Susceptible to Harmonics |
| VC100 | MaschinenFabrik-Reinhausen | Pass | N/A | Replacement for MK30 |
| REG-DA | Eberle | Pass | Y | |

## APPENDIX 16: GENERATOR DISTURBANCE RECORDER / BAY CONTROLLER

| MANUFACTURER | TYPE | FUNCTIONS | PASS / FAIL | Y2K | Communication | COMMENTS |
|---|---|---|---|---|---|---|
| ABB | Indactic 650 | | Pass | Y | | |
| ABB | Indactic 425 | | Pass | Y | | S.E.R. only |
| Siemens | Siemeas R | | Pass | Y | | |
| ABB | RES505C1 | | Pass | Y | | No mA inputs |
| KocOS | Sherlog | | Pass | Y | | |
| ABB | REC670 | 87X, 50, 51, 51/67, 26, 49, 50BF, 50STB, 52PD, 27, 59, 59N, 81, 25, 79 | Pass | Y | IEC 60870-5-103, LON, SPA, IEC 61850-8-1, C37.94 & G.703 | Bay Controller |
| Areva | C264 | 25, 79 | Pass | Y | UCA2, IEC61850, IEC60870-5-104, DNP3.0 | Bay Controller including interlocks |
| CSD | CSD-IMS8 | | Fail | Not used | | |
| Areva | Bitronics M87* | | Pass | Y | ZM OD EM, DNP3.0, Modbus | Virtual recorder can also be set up. |
| SEL | SEL3530 | Real Time Automation Controller | Pass | Y | | |
| SEL | SEL2440 | Programmable Automation Controller | Pass | Y | | |
| HV Test | IDM | Disturbance recorder | Pass | Y | | |
| Siemens | 7K*8* | Disturbance recorder | Pass | Y | IEC 61850 | |

## APPENDIX 17: VOLTAGE MONITORING RELAYS FOR 380V AC

| TYPE | MANUFACTURER | PASS / FAIL | Y2K Compliant | COMMENTS |
|---|---|---|---|---|
| ESN | Entrelec | Pass | N/A | |
| SX125/380A | Rhomberg Electronic | Fail | N/A | 2kV Test failed |
| PFN | Entrelec | Pass | N/A | Fixed Settings |
| PVN | Entrelec | Pass | N/A | |
| PW380V-04X | Tele | Pass | N/A | Re-tested 20/2/97 |
| CM-PVS | ABB | Pass | N/A | Over/Under Voltage |
| RXEDA 1 | ABB | Pass | N/A | Time-over voltage only. AC or DC. No auxiliary supply. |
| 3UG4615-1 CR20 | Siemens | Pass | N/A | Up to 690V. Protection: phase sequence, phase loss, O/V, U/V, digital display, fault indications. |
| VME420 | Bender | Pass | N/A | AC/DC over voltage, under voltage, over frequency and under frequency. |
| Vecto II | CT Lab | Pass | N/A | Power Quality Recorder with Osprey Light s/w 2.6.0 Build 46 |
| Vecto III | CT Lab | Pass | N/A | Power Quality Recorder with Osprey Light s/w 2.6.0 Build 46 |

## APPENDIX 18: MOTOR BUS TRANSFER SCHEMES

| TYPE | MANUFACTURER | PASS / FAIL | Y2K Compliant | COMMENTS |
|---|---|---|---|---|
| SYNCROTRAN | Beckwith Electric | | N/A | *M-5821 Scheme* |
| Transfer Logic Controller | Beckwith Electric | Pass | N/A | M-0272 Mod346 |
| Power Transfer Relay | Beckwith Electric | Pass | N/A | M-0236B |
| Auto Transfer Switch and mains Control Module | Deep Sea Electronics | Pass | N/A | DSE8660 |

## APPENDIX 19: DIESEL GENERATOR CONTROLLER MODULE

| TYPE | MANUFACTURER | PASS / FAIL | Y2K Compliant | COMMENTS |
|---|---|---|---|---|
| GenCon II | Wexler CSD , Israel | Pass | N/A | Sync, Metering, Control unit |
| DSE5510 | Deep Sea Electronics | Pass | N/A | PLC Control Unit |
| DSE8610 | Deep Sea Electronics | Pass | N/A | Auto Start Multi-Set Controller |
| MainsPro; IntelliMains BaseBox; IntelliVision8; IntelliSys BaseBox; IntelliPro | Comap | Pass | N/A | Interface software: WinXP and Win 7 (64bit). Operating software: IntelliPro Install Suite V1.6.0-2, LiteEdit V5.1.0.3 |

# APPENDIX 20: INTERNAL ARC PROTECTION

| TYPE | MANUFACTURER | PASS / FAIL | Y2K Compliant | COMMENTS |
|---|---|---|---|---|
| REA101 | ABB Stromberg OY | Pass | N/A | |
| VAMP | Vaasa Electronics | Pass | N/A | |
| REA103/105/ 107 | ABB Stromberg OY | Pass | N/A | Extension Unit |
| VPJ140 | Vaasa Electronics | Pass | Y | With Arc Option |
| VAMP 221 | Vaasa Electronics | Pass | Y | O/C, E/F and CBFP |
| D1000 | Selco | Fail | N/A | |
| AQ100 | Arcteq | Pass | Y | O/C, E/F and light |

# APPENDIX 21: DC EARTH FAULT PROTECTION

| TYPE | MANUFACTURER | PASS / FAIL | Y2K Compliant | COMMENTS |
|---|---|---|---|---|
| Eldec | EPC | Pass | N/A | Dual Transcore version |
| Eldec-A-1 and CTE DC Differential relay | Strike Technologies | Pass | N/A | |

## APPENDIX 22: MISCELLANEOUS

| TYPE | MANUFACTURER | PASS / FAIL | Y2K Compliant | COMMENTS |
|---|---|---|---|---|
| Ferruling System | Murrplastik | Pass | N/A | Much cheaper than Grafoplast |
| MCR1022ATD | GE Mini contactor – 24 VDC | Pass | N/A | |
| MCRC031ATN | GE Mini contactor – 220 VDC | Pass | N/A | |
| MCRC022AT | GE Mini contactor – 220 VDC | Pass | N/A | |
| MCRC040ATN | GE Mini contactor – 220 VDC | Pass | N/A | |
| UPCV3K 4-G-7, 62 | Phoenix | Pass | N/A | Universal terminal Blocks |
| VBST 4-FS(6-2, 8-0.8) | Phoenix | Pass | N/A | ST4 Terminal Blocks |
| N/A | ELMEX | Pass | N/A | Products listed on the following product lists: 0902171, 0902172 & 0902168 |
| N/A | Supplied by Alstom | Pass | N/A | Universal terminal blocks: KUT2.5, KUT4, KULT4, KUT6, KULT6, KUT10, KULT1, KUT16, KUT25, KUT35, KUT50, KUT95, MBT4, KATM5, KBTM5, DPCC70, DPBB70, DPBC70, DPCC70BS, DPBB70BS, DPBC70BS, KST4UWS, KST4U, KST6WS, KULTD6, KUDD4, KU2D4, KU2D4S, DU3D4, DUSD4, KUDT4, KUTSD6, KSTD6WS, KUTD10, KUDF4, KUDDF4, KUFH4, KATM4, KBTM4 |
| P991 | Areva | Pass | N/A | Test blocks |
| P992 | Areva | Pass | N/A | Test plugs |
| PMBT 14 | GE | Pass | N/A | Test block and plug |
| 6MD6* | Siemens | Pass | Y | I/O enhancing box. IEC61850 – GOOSE |
| IRDH275 | Bender | Pass | N/A | Insulation monitoring for IT systems |
| 2RMLG | Siemens | Pass | N/A | Select correct compliance criteria |

| | | | | |
|---|---|---|---|---|
| 2411 | SEL | Pass | Y | Automation controller |
| 7SR23 | Siemens / Reyrolle | Pass | Y | High impedance differential |
| WAS1 | Weidmuller | Pass | N/A | Terminal |
| WDU10 | Weidmuller | Pass | N/A | Terminal replace RSF1 |

- Surge Suppression Circuit
  Peak Pulse Voltage : 2000 V
  Rated Voltage : 300V DC
  Rated Current : 3 A
  Supplier : Ningi Services

## APPENDIX 23: DIP PROOF INVERTERS (DPI'S)

| TYPE | MANUFACTURER | PASS / FAIL | Y2K Compliant | COMMENTS |
|---|---|---|---|---|
| 4000ST | Switching Systems | Pass | N/A | |
| 52L | Switching Systems | Pass | N/A | Slow synchronising time when dip is close to setting |
| 53L | Switching Systems | Pass | N/A | Processor base |
| 54L version 2 | Switching Systems | Pass | N/A | Processor base. Vulnerable to harmonics. |

## APPENDIX 24: MEASUREMENT (TRANSDUCERS)

| TYPE | MANUFACTURER | SERIES | PASS / FAIL | Y2K Compliant | COMMENTS |
|---|---|---|---|---|---|
| Din Rail | ISKRA | MI413 Watt (200W or 1000W) | Pass | N/A | Single measured output quantity |
| Din Rail | ISKRA | MI414 Var (200Var or 1000Var) | Pass | N/A | Single measured output quantity |
| Din Rail | ISKRA | MI416 Volts (0-132V) | Pass | N/A | Single measured output quantity |
| Din Rail | ISKRA | MI418 Amp (0 – 1,2A) | Pass | N/A | Single measured output quantity |
| Din Rail | ISKRA | MI420 Hz (45 – 55 Hz) | Pass | N/A | Single measured output quantity |
| Din Rail | ISKRA | MI421 pf (0 1 0) | Pass | N/A | Single measured output quantity |
| Din Rail | ISKRA | MI400 Programmable Universal transducer with energy. | Pass | N/A | 4 Programmable analogue outputs. RS232/RS485 (Modbus) |
| Din Rail | ABB | E-SU Programmable Universal transducer | Pass | N/A | 4 Programmable analogue outputs. RS232/RS485. 1xBinary. |
| Din Rail | DPM | Model 9000 Option 3002 | Pass | N/A | Programmable (analogue in, analogue out). RS232 and/or RS485. |
| Din Rail | ISKRA | MT540 Multifunction Programmable | Pass | N/A | Cls 0,2. Four programmable outputs. Watt, Var, I, V and pf |
| Din Rail | Measurelogic | DTS 305 | On hold. High rate of power supply failures. Caused unit trips. | N/A | Cls 0,5. Programmable outputs. Watt, Var, I, V, Hz and pf |
| Surface mounted | Schneider | PM 8000 | Pass | N/A | Not suitable for turbine load control transducer application when on slow response. Select fast response for turbine load control transducer application. |
| Din rail | Camille Bauer | I538 | Pass | N/A | 1A or 5A input |

| | | | | | |
|---|---|---|---|---|---|
| Din rail | CEWE | DPT100 | Pass | N/A | Single phase multi function |
| Din rail | PCi | MT025225 | Pass | N/A | 1A input (Cl 0.5) |

## APPENDIX 25: METERING

| TYPE | MANUFACTURER | SERIES | PASS / FAIL | Y2K Compliant | COMMENTS |
|---|---|---|---|---|---|
| 19” | Landis & Gyr | ZMQ202C.6r4af9.E22 | Pass | N/A | Cls 0,2S (3phase 4 wire) |
| 19” | Landis & Gyr | f9 | Pass | N/A | 19’’ chassis, option plugs for two meters |
| Surface mounted | Landis & Gyr | ZMQ202C.8r4af6.E22 | Pass | N/A | Cls 0,2S (3phase 4 wire) |
| | Landis & Gyr | MAP110 | Pass | N/A | Software (Data reading) |
| | Landis & Gyr | MAP120 | Pass | N/A | Software (Meter configuration) |
| Surface mounted | Landis & Gyr | ZMD402CT44.457 | Pass | N/A | Cls 0,2 (3phase 4 wire) with additional power supply board (RS232 + RS485) |
| Surface mounted | Landis & Gyr | ZMD405CT44.457 | Pass | N/A | Cls 0,5 (3phase 4 wire) with additional power supply board (RS232 + RS485) |
| Surface mounted | Landis & Gyr | ZMD402CT44.657 | Pass | N/A | Cls 0,2 (3phase 4 wire) with additional power supply board |
| Surface mounted | Landis & Gyr | ZMD405CT44.657 | Pass | N/A | Cls 0,5 (3phase 4 wire) with additional power supply board |
| Surface mounted | Elster Kent | A1700 Vision meter | Pass | N/A | Cls 0,2 (3phase 4 wire) with additional power supply board (RS232 + RS485) |
| Surface mounted | Elster Kent | A1700 Vision meter | Pass | N/A | Cls 0,5 (3phase 4 wire) with additional power supply board (RS232 + RS485) |
| | Elster Kent | A1700 | Pass | N/A | Software (Data reading) |
| | Elster Kent | A1700 | Pass | N/A | Software (Meter configuration) |
| 19” | Landis & Gyr | FBC datgyr Encoder | Pass | N/A | 16 channel pulse encoder |
| Surface mounted | Landis & Gyr | FBC datgyr Encoder | Pass | N/A | 16 channel pulse encoder |
| Surface mounted | Landis & Gyr | FBC datgyr Encoder | Pass | N/A | 8 channel pulse encoder with STOM interface |
| Surface mounted | Schneider | ION 8800 | Pass | N/A | Cls 0,2 4Q (3PH). SAP number 0242589. Buyers guide D-DT 9420. |

## APPENDIX 26: TYPE TEST CHECK SHEET

| | |
|---|---|
| **Description of device (i.e. IED, tripping, etc.)** | |
| **Model number** | |
| **Part number** | |
| **Firmware version** | |
| **Interface software & version** | |
| **Operating Software & version/service pack** | |
| **List tests performed and/or type test certificates available (attach certificates)** | **Device type testing adhere to compliance criteria (yes or no)** |
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Compliance testing and/or verification done by:

Signature:

Date: