

**DISTURBANCE RECORDER\_110V DC\_DSP\_INPUT A(32)/B(132)\_OUTPUT  
E(2)/M(8)****1. Introduction**

This document has been developed to set the technical evaluation criteria to be used in the Eastern Cape Operating Unit when evaluating the tender submissions. This covers the technical evaluation on the disturbance recorder used with power system protection and control circuits.

The entire evaluation covers the documentation evaluation and the sample evaluation.

**2. Scope**

This document covers the criteria for the evaluation of the disturbance recorder used with power system protection and control circuits.

**3. Applicability**

The document is applicable to the Eastern Cape Operating Unit in the Distribution Division.

**4. Process for monitoring**

The disturbance recorder acceptance shall be based on fully compliant submission of documents and sample evaluation.

**5. Requirements**

The successful tenderer should be compliant, both, during documentation evaluation and during sample evaluation.

All submissions, correspondence and communication must be in the English language.

**5.1 Documentation evaluation**

Documentation evaluation consists of two levels. Level 1 consists of mandatory gatekeepers, constituting 80% of the total documentation evaluation. Level 2 consists of objective criteria, constituting 20% of the total documentation evaluation.

Level 1 submission is gatekeepers. Any non-compliance at this level would result in an overall mark of 0% for this level attained by the tenderer, followed by an immediate disqualification.

Level 2 submission is objective criteria. In order to facilitate evaluation at this level, the tenderer is required to submit the disturbance recorder user manual in electronic PDF format and / or in hardcopy. The manual should include the summary of the recorder specification or a separate leaflet, in addition to the manual, need to be submitted.

The minimum pass mark for documentation evaluation is 95%. If no tenderer achieves 95%, then the minimum pass mark would be lowered to 85%, and with no further adjustments.

The tenderer that does not qualify at this stage would not have the sample evaluated, and would automatically be disqualified.

## **5.2 Sample evaluation**

The sample evaluations are only performed on submissions that have achieved the minimum pass mark during documentation evaluation.

The sample evaluation will be the evaluation of the exact replica product that is offered to Eskom during tender.

It is required that the tenderer ensures that the required exact replica sample, in accordance with the specifications accompanying these criteria, is acquired, tested and ready for evaluation within 45 days after Eskom notifies the tenderer that Eskom will proceed with sample evaluation. Eskom notification will include the sample evaluation stages and procedure. The tenderer must bring along or preferably send in advance the type test results and routine test results of the sample to be evaluated.

The minimum pass mark for sample evaluations is 80%. If no tenderer achieves 80%, then the minimum pass mark for sample evaluations would be lowered to 70%, and with no further adjustments.

Eskom may require the tenderer to perform few demonstrations on the functioning of the sample. Following that, the tenderer would leave the sample with Eskom to perform further evaluation. The tenderer should expect Eskom to keep the sample for a period of 90 days, after which it would be returned to the tenderer.

The sample evaluations would be conducted at Eskom offices that would be communicated to the tenderer on the notification.

Eskom Commercial shall make the necessary arrangements for the exact replica factory sample evaluations by ensuring that the tenderers are notified and the technical representatives are invited on time.

## 6. Mandatory Technical Criteria (Gatekeepers) for the Disturbance Recorder (Weight = 80%)

Level 1 - Gatekeepers	
Criteria	Acceptance [Yes/No]
6.1 Are all submissions in the English language?	
6.2 Has the <u>exact</u> product <b>manual</b> , including the summary of the recorder specifications in the manual or a separate leaflet with the recorder specifications, in addition to the manual, been submitted?	
6.3 Has the A and B schedule below been fully completed and submitted?	
6.4 Has the deviation schedule been submitted?	
<ul style="list-style-type: none"> <li>• If all the criteria above have a response of “Yes”, the score is 80%.</li> <li>• Any “No” response above would result in a score of 0%, and immediate disqualification of the tenderer.</li> </ul>	

## 7. Objective Technical Criteria for the Disturbance Recorder (Weight = 20%)

The Objective Technical Criteria has two components. The first deals with the disturbance recorder functionality. 15% of the score is allocated to this component. The second deals with the submitted type test results (not older than 10 years). 5% of the score is allocated to this component.

### 7.1 Disturbance recorder functionality (Weight = 15%)

The tenderer is required to complete the A and B schedule (included at the end) based on the technical specification below. By completing this schedule, the tenderer would illustrate the extent of capability to meet the required specifications. There are 33 items of the schedule that require an input (under B) by the tenderer. Each item constitutes 1 mark. 33 marks obtained by the tenderer equate to 15% obtained for the total documentation evaluation.

#### 7.1.1 General description

- The recorder must be of a 19” rack mounted modular format, multi-functional measurement and analysis system for comprehensively monitoring and assessing equipment in electricity supply systems. It must combine the monitoring functions of high-resolution digital fault recorders, power quality analysers, phasor measurement units, continuous data recorders and event recorders in one device.
- Individual devices can be networked via an Interlink interface to monitor extensive installations.

#### **7.1.1.1 Multi-Processor System**

- It should have a multi-processor system. A digital signal processor (DSP) for processing signals and processes in real time and a communication processor for mass data storage, simultaneous data communication using different interfaces and protocols, web server functionality and stand-alone operation.

#### **7.1.1.2 User controls and displays**

- Status LEDs for alarm, trigger and status display
- At least a 3.5" colour graphical display with touch screen and function keys

#### **7.1.1.3 Number of measurement inputs**

- 32 Analog inputs and 128 binary inputs

#### **7.1.1.4 Data memory**

- At least 32 GB flash RAM for reliable data storage

#### **7.1.1.5 Quality system**

- Developed and manufactured to DIN ISO 9001:2015

#### **7.1.1.6 Calibration**

- Software-controlled calibration
- Calibration data is saved on the individual measurement modules
- No calibration required after module replacement or upgrade (plug & play) with a recommended calibration cycle check every 3 years

#### **7.1.1.7 Operating software**

- Operating software for Windows 7, Windows 8.1 (32 and 64 bit),
- Windows 10 (32 and 64 bit), Windows Server 2012 R2

### **7.1.2. Function overview**

#### **7.1.2.1 Recording functions**

- Digital fault recorder with 2 sampling rates from 500 Hz...30 kHz for RMS fault recorder and sampling rate from 1 Hz...120 Hz for Continuous data recording
- Event data recording
- Power quality analyser, class A (optional) Phasor measurement unit/PMU (optional)

#### **7.1.2.2 Standards for measurement and analysis**

- IEC 61000-4-30 class A
- IEC 61000-4-7 harmonics and inter-harmonics IEC 61000-4-15 flicker
- EN 50160, IEEE 519, IEEE 1159
- IEEE C37.118

### **7.1.3. Analog inputs**

### 7.1.3.1 General information

- Resolution : 16 Bit, S/R:92 dB typical
- Sampling frequency : 200 kHz per channel
- Accuracy : 0.05% of range
- Protection : Galvanic isolation Channel to channel = 2.5 kV, and  
channel to device = 2.5 kV

### 7.1.3.2 Input module

#### 7.1.3.2.1 Number of measurement inputs

- 8 inputs with selectable measuring ranges for:
  - Voltage measurement
  - Current measurement with external sensors (e.g. shunts)
  - Measurement of low-level signals

#### 7.1.3.2.2 Measuring ranges

- Each measurement input should have multiple selectable measuring ranges:
  - Measuring range 1: 300 V AC /  $\pm 424$  V DC (impedance 6.6 M $\Omega$ )
  - Measuring range 2: 700 mV AC /  $\pm 1000$  mV DC (impedance 14.7 k $\Omega$ )
  - Measuring range 3: 200 mV AC /  $\pm 282$  mV DC (impedance 14.7 k $\Omega$ )
  - Measuring range 4:  $\pm 20$  mA / 4...20 mA (impedance 10  $\Omega$ )

#### 7.1.3.2.3 Overload

- 1000 V AC sustained in the 300 V measuring range

#### 7.1.3.2.4 Frequency range

- DC...10 kHz

### 7.1.3.3 Input module

#### 7.1.3.3.1 Number of measurement inputs

- At least 3 separate high-current inputs for connection to protection or instrument transformers

#### 7.1.3.3.2 Measuring ranges

- Each measurement input should have at least 3 selectable measuring ranges:
  - Measuring range 1: 10 A AC (impedance 0.002  $\Omega$ )
  - Measuring range 2: 40 A AC (impedance 0.002  $\Omega$ )
  - Measuring range 3: 200 A AC (impedance 0.002  $\Omega$ )

#### 7.1.3.3.3 Overload

- 40 A AC sustained (minimum)
- 200 A AC for 5 seconds (minimum)
- 500 A AC for 1 second (minimum)

#### **7.1.3.3.4 Frequency range**

- 10 Hz...10 kHz

#### **7.1.4. Binary inputs**

##### **7.1.4.1 Input module**

- Max. 8 input modules (128 inputs)
- Number of measurement inputs per module should at least be 16 inputs
- Galvanic isolated in 4 groups of 4 inputs (per module)
- Activation range : 24...300 V DC (wide-range inputs)
- Resolution : 0.1 ms

##### **7.1.4.1.1 Protection**

- Transient protection
- Polarity protection
- Galvanic isolation up to 2.5 kV

#### **7.1.5. Binary outputs**

##### **7.1.5.1 Electronic relays**

- At least 2 freely configurable relays for status and alarm signals
- Switching capacity : Max. 60 V AC/DC, 200 mA

##### **7.1.5.2 Mechanical relays**

- At least 8 freely configurable relays for status and alarm signals
- Contact type : Potential-free relay contact, configurable as NC or NO contact
  - Switching capacity Max. 220 V AC, 8 A AC
  - Max. 60 W
  - Max. 500 ms
  - Max. continuous current 2 A AC

#### **7.1.6. Time synchronisation**

##### **7.1.6.1 Standard equipment**

- Internal real-time clock : Accuracy 2.5 ppm without external time synchronisation
- NTP/SNTP : Synchronisation over Ethernet network
- Interlink interface : Master-slave time synchronisation between several devices

#### **7.1.7. Interfaces**

##### **7.1.7.1 Standard equipment**

- The device shall have the following standard interfaces as a minimum:
  - Data communication : 2 x RS232, 1 x RS485  
: 2 x USB-A, 1 x USB-B  
: 1 x 10/100 Mbit Ethernet (RJ 45)
  - Interlink interface : Electric 2-wire interface for networking a number of devices
  - Enables cross-triggering and master-slave time synchronisation over distances of up to 500 m

#### **7.1.7.2 Interface module**

- Data communication : 1 x 10/100 Mbit optical Ethernet (ST II) 1 x 10/100 Mbit Ethernet (RJ 45)
- Interlink interface : Optical Interlink interface for networking a number of devices
- Enables cross-triggering and master-slave time synchronisation by means of a fibre optic loop
- Maximum distance between 2 devices is 2 km

#### **7.1.7.3 Protocols**

Standard : TCP/IP, Modbus TCP, IEC 60870-5-103, GSM, GPRS  
 Standard : IEC 61850, IEEE C37.118 (PMU)

#### **7.1.8. Power supply**

- The device power supply shall comply with the following specifications:
  - Operating voltage : 110 V DC
  - Working range : +6% / -10% of the nominal range
  - Power consumption : Max. 30 VA with maximum configuration (32 analog and 128 binary inputs)
  - Redundancy : Power supply unit and power supply redundancy provided by accommodation of up to two independent power supply modules of the same type or of different types

#### **7.1.9. Complete system**

##### **7.1.9.1 Mechanical**

- The device shall comply with the following mechanical specifications:
  - Weight : <3 kg
  - Housing : 19" housing for rack mounting, 84 HP/3 U
  - Protection class : IP 52 (front panel)
  - Dimensions : 483 mm x 132.5 mm x 263 mm

##### **7.1.9.2 Environment**

- The device shall comply to the following environmental conditions:
  - Storage temperature : -20...+70 °C
  - Relative humidity : 5...95%, non-condensing

##### **7.1.10. EMC standards**

- The device shall comply with the following EMC standards:
  - IEC 60255-1                    Measuring relays and protection equipment - Part 1
  - IEC 60255-5  
IEEE C37.90                    Dielectric test, 2.5 kV, 50 Hz  
Insulation test, 500 V, 50 Hz  
Impulse voltage test, 5 kV, 0.5 Joule
  - IEC 61000-4-2  
IEC 60255-22-2                Electro-static discharge test, class 4 8 kV  
contact, 15 kV air
  - IEC 61000-4-3  
IEC 60255-22-3                Radiated susceptibility  
10 V/m, 80...3000 MHz, AM  
10 V/m, 900 MHz, PM
  - IEC 61000-4-4  
IEC 60255-22-4  
IEEE C37.90.1                Electrical fast transient burst  
4 kV, 2.5 kHz, 5 kHz, 100 kHz
  - IEC 61000-4-5  
IEC 60255-22-5                Surge test, class 4 e  
4 kV common mode  
2 kV differential mode
  - IEC 61000-4-6  
IEC 60255-22-6                Conducted susceptibility  
10 V, 150 kHz...80 MHz
  - IEC 61000-4-8  
IEC 60255-6                    Power frequency magnetic field  
30 A/m, 50 Hz, x, y, z axis
  - IEC 61000-4-11  
IEC 60255-11                 Supply voltage dips and interruptions, class 3
  - IEC 61000-4-18  
IEC 60255-22-1                Damped oscillatory waves  
2.5 kV, 1 MHz common mode  
1.0 kV, 1 MHz differential mode

#### 7.1.11. Vibration Standards

- The device shall comply to the following Vibration Standards:
  - IEC 60068-2-6  
IEC 60255-21-1                Vibration test  
5.2 g, 5...55 Hz, x, y, z axis
  - IEC 60068-2-27  
IEC 60255-21-2                Vibration test  
5 g / 11 ms, x, y, z axis

#### 7.1.12. Climatic standards



- The device shall comply to the following Climatic Standards:
  - IEC 60068-2-2      Cyclic temperature test, dry heat  
                                 16 hours, 55 °C, operating condition  
                                 96 hours, 70 °C, power off condition

## **7.2 Test Results (Weight = 5%)**

The tenderer should submit the following test results that are not older than 10 years. Each valid test results item submitted constitutes 1 mark of the total 13 marks for this section. 13 marks obtained by the tenderer equate to 5% obtained for the total documentation evaluation.

1. Dielectric test results, according to IEEE C37.90
2. Insulation test results, according to IEEE C37.90
3. Impulse voltage test results, according to C37.90
4. Electrostatic discharge test results, according to IEC 60255-22-2
5. Radiated susceptibility test results, according to IEC 60255-22-3
6. Electrical fast transient burst test results, according to IEC 60255-22-4
7. Surge test results, according to IEC 60255-22-5
8. Conducted susceptibility test results, according to IEC 60255-22-6
9. Power frequency magnetic field test results, according to IEC 60255-6
10. Supply voltage dips and interruptions test results, according to IEC 60255-11
11. Damped oscillatory waves test results, according to IEC 60255-22-1
12. Vibration test results, according to IEC 60255-21-1/2
13. Cyclic temperature test results, according to IEC 60068-2-2

## A and B Schedule for the Disturbance Recorder

**Note:**

Section A of the Schedule to be completed by ESKOM

Section B of the Schedule to be completed by THE TENDERER

**A.**

**1. General description**

The recorder must be of a 19" rack mounted modular format, multi-functional measurement and analysis system for comprehensively monitoring and assessing equipment in electricity supply systems. It must combine the monitoring functions of high-resolution digital fault recorders, power quality analysers, phasor measurement units, continuous data recorders and event recorders in one device.

Individual devices can be networked via an Interlink interface to monitor extensive installations.

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**B.**

**1. General description**

**A.**

**1.1 Multi-Processor System**

It should have a multi-processor system. A digital signal processor (DSP) for processing signals and processes in real time and a communication processor for mass data storage, simultaneous data communication using different interfaces and protocols, web server functionality and stand-alone operation.

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**B.**

**1.1 Multi-Processor System**

**A.**

**1.2 User controls and displays**

1.2.1 Status LEDs for alarm, trigger and status display

1.2.2 At least a 3.5" colour graphical display with touch screen and function keys

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**B.**

**1.2 User controls and displays**

1.2.1

1.2.2

**A.**

**1.3 Number of measurement inputs**

1.3.1 32 Analog inputs and 128 binary inputs

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**B.**

**1.3 Number of measurement inputs**

1.3.1

**A.**

**1.4 Data memory**

1.4.1 At least 32 GB flash RAM for reliable data storage

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**B.**

**1.4 Data memory**

1.4.1

**A.**

**1.5 Quality system**

1.5.1 Developed and manufactured to DIN ISO 9001:2015

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**B.**

**1.5 Quality system**

1.5.1

**A.**

**1.6 Calibration**

1.6.1 Software-controlled calibration

1.6.2 Calibration data is saved on the individual measurement modules

1.6.3 No calibration required after module replacement or upgrade (plug & play) with a recommended calibration cycle check every 3 years

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**B.**

**1.6 Calibration**

1.6.1

1.6.2

1.6.3

**A.**

**1.7 Operating software**

1.7.1 Operating software for Windows 7, Windows 8.1 (32 and 64 bit),

1.7.2 Windows 10 (32 and 64 bit), Windows Server 2012 R2

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**B.**

**1.7 Operating software**

1.7.1

1.7.2

**2. Function overview**

**A.**

**2.1 Recording functions**

2.1.1 Digital fault recorder with 2 sampling rates from 500 Hz...30 kHz for RMS fault recorder and sampling rate from 1 Hz...120 Hz for Continuous data recording

2.1.2 Event data recording

2.1.3 Power quality analyser, class A (optional) Phasor measurement unit/PMU (optional)

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**B.**

**2.1 Recording functions**

2.1.1

2.1.2

2.1.3

**A.**

**2.2 Standards for measurement and analysis complied with**

2.2.1 IEC 61000-4-30 class A  
IEC 61000-4-7 harmonics and inter-harmonics IEC 61000-4-15 flicker  
IEEE 519, IEEE 1159  
IEEE C37.118

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**B.**

**2.2 Standards for measurement and analysis complied with**

2.2.1

**3. Analog inputs**

**A.**

**3.1 General information**

3.1.1 Resolution	: 16 Bit, S/R: 92 dB typical
3.1.2 Sampling frequency	: 200 kHz per channel
3.1.3 Accuracy	: 0.05% of range
3.1.4 Protection	: Galvanic isolation Channel to channel = 2.5 kV, and channel to device = 2.5 kV

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**B.**

**3.1 General information**

3.1.1

3.1.2

3.1.3

3.1.4

## 3.2 Input module

A.

### 3.2.1 Number of measurement inputs

3.2.1.1 8 inputs with selectable measuring ranges for:

Voltage measurement

Current measurement with external sensors (e.g. shunts)

Measurement of low-level signals

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B.

### 3.2.1 Number of measurement inputs

3.2.1.1

A.

### 3.2.2 Measuring ranges

3.2.2.1 Each measurement input should have multiple selectable measuring ranges:

Measuring range 1: 300 V AC /  $\pm 424$  V DC (impedance 6.6 M $\Omega$ )

Measuring range 2: 700 mV AC /  $\pm 1000$  mV DC (impedance 14.7 k $\Omega$ )

Measuring range 3: 200 mV AC /  $\pm 282$  mV DC (impedance 14.7 k $\Omega$ )

Measuring range 4:  $\pm 20$  mA / 4...20 mA (impedance 10  $\Omega$ )

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B.

### 3.2.2 Measuring ranges

3.2.2.1

A.

### 3.2.3 Overload

3.2.3.1 1000 V AC sustained in the 300 V measuring range

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**B.**

**3.2.3 Overload**

3.2.3.1

**A.**

**3.2.4 Frequency range**

3.2.4.1 DC...10 kHz

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**B.**

**3.2.4 Frequency range**

3.2.4.1

**3.3 Input module**

**A.**

**3.3.1 Number of measurement inputs**

3.3.1.1 At least 3 separate high-current inputs for connection to protection or instrument transformers

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**B.**

**3.3.1 Number of measurement inputs**

3.3.1.1

**A.**

**3.3.2 Measuring ranges**

3.3.2.1 Each measurement input should have at least 3 selectable measuring ranges:

Measuring range 1: 10 A AC (impedance 0.002  $\Omega$ )

Measuring range 2: 40 A AC (impedance 0.002  $\Omega$ )

Measuring range 3: 200 A AC (impedance 0.002  $\Omega$ )

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**B.**

**3.3.2 Measuring ranges**

3.3.2.1

**A.**

**3.3.3 Overload**

3.3.3.1 40 A AC sustained (minimum)  
3.3.3.2 200 A AC for 5 seconds (minimum)  
3.3.3.3 500 A AC for 1 second (minimum)

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**B.**

**3.3.3 Overload**

3.3.3.1  
3.3.3.2  
3.3.3.3

**A.**

**3.3.4 Frequency range**

3.3.4.1 10 Hz...10 kHz

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**B.**

**3.3.4 Frequency range**

3.3.4.1

**4. Binary inputs**

**A.**

**4.1 Input module**

4.1.1 Max. 8 input modules (128 inputs)  
4.1.2 Number of measurement inputs per module should at least be 16 inputs  
4.1.3 Galvanic isolated in 4 groups of 4 inputs (per module)  
4.1.4 Activation range : 24...300 V DC (wide-range inputs)  
4.1.5 Resolution : 0.1 ms

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**B.**

**4.1 Input module**



- 4.1.1
- 4.1.2
- 4.1.3
- 4.1.4
- 4.1.5

**A.**

**4.1.1 Protection**

- 4.1.1.1 Transient protection
  - 4.1.1.2 Polarity protection
  - 4.1.1.3 Galvanic isolation up to 2.5 kV
- 

**B.**

**4.1.1 Protection**

- 4.1.1.1
- 4.1.1.2
- 4.1.1.3

**5. Binary outputs**

**A.**

**5.1 Electronic relays**

- 5.1.1 At least 2 freely configurable relays for status and alarm signals
  - 5.1.2 Switching capacity : Max. 60 V AC/DC, 200 mA
- 

**B.**

**5.1 Electronic relays**

- 5.1.1
- 5.1.2

**A.**

**5.2 Mechanical relays**

- 5.2.1 At least 8 freely configurable relays for status and alarm signals
  - 5.2.2 Contact type : Potential-free relay contact, configurable as NC or NO contact
  - : Switching capacity Max. 220 V AC, 8 A AC
  - : Max. 60 W
  - : Max. 500 ms
  - : Max. continuous current 2 A AC
-

**B.**

## **5.2 Mechanical relays**

5.2.1

5.2.2

## **6. Time synchronisation**

**A.**

### **6.1 Standard equipment**

- 6.1.1 Internal real-time clock : Accuracy 2.5 ppm without external time synchronisation
- 6.1.2 NTP/SNTP : Synchronisation over Ethernet network
- 6.1.3 Interlink interface : Master-slave time synchronisation between several devices
- 

**B.**

### **6.1 Standard equipment**

6.1.1

6.1.2

6.1.3

## **7. Interfaces**

**A.**

### **7.1 Standard equipment**

- 7.1.1 The device shall have the following standard interfaces as a minimum:
- Data communication : 2 x RS232, 1 x RS485  
: 2 x USB-A, 1 x USB-B  
: 1 x 10/100 Mbit Ethernet (RJ 45)
  - Interlink interface : Electric 2-wire interface for networking a number of devices
- Enables cross-triggering and master-slave time synchronisation over distances of up to 500 m
-

**B.**

**7.1 Standard equipment**

7.1.1

**A.**

**7.2 Interface module**

7.2.1 Data communication : 1 x 10/100 Mbit optical Ethernet (ST II) 1 x 10/100 Mbit Ethernet (RJ 45)

7.2.2 Interlink interface : Optical Interlink interface for networking a number of devices

7.2.3 Enables cross-triggering and master-slave time synchronisation by means of a fibre optic loop

7.2.4 Maximum distance between 2 devices is 2 km

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**B.**

**7.2 Interface module**

7.2.1

7.2.2

7.2.3

7.2.4

**A.**

**7.3 Protocols**

7.3.1 Standard : TCP/IP, Modbus TCP, IEC 60870-5-103, GSM, GPRS

7.3.2 Standard : IEC 61850, IEEE C37.118 (PMU)

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**B.**

**7.3 Protocols**

7.3.1

7.3.2

**A.**

## **8. Power supply**

8.1 The device power supply shall comply with the following specifications:

8.2 Operating voltages : 90...365 V DC and 85...265 V AC; 47...63 Hz; 9...18 V DC; 18...36 V DC; 36...72 V DC

8.3 Working range : +6% / -10% of the nominal range

8.4 Power consumption : Max. 30 VA with maximum configuration (32 analog and 128 binary inputs)

8.5 Redundancy : Power supply unit and power supply redundancy provided by accommodation of up to two independent power supply modules of the same type or of different types

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**B.**

## **8. Power supply**

8.1

8.2

8.3

8.4

8.5

## **9. Complete system**

**A.**

### **9.1 Mechanical**

9.1.1 The device shall comply with the following mechanical specifications:

Weight : <5 kg

Housing : 19" housing for rack mounting, 84 HP/3 U

Protection class : IP 52 (front panel)

Dimensions : 483 mm x 132.5 mm x 263 mm

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**B.**

### **9.1 Mechanical**

9.1.1

**A.**

## **9.2 Environment**

9.2.1 The device shall comply with the following environmental conditions:

Storage temperature : -20...+70 °C

Relative humidity : 5...95%, non-condensing

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**B.**

## **9.2 Environment**

9.2.1

**A.**

## **10. EMC standards**

10.1 The device shall comply with the following EMC standards:

IEC 60255-1 Measuring relays and protection equipment - Part 1

IEC 60255-5

IEEE C37.90

Dielectric test, 2.5 kV, 50 Hz

Insulation test, 500 V, 50 Hz

Impulse voltage test, 5 kV, 0.5 Joule

IEC 61000-4-2

IEC 60255-22-2

Electro-static discharge test, class 4 8 kV contact, 15 kV air

IEC 61000-4-3

IEC 60255-22-3

Radiated susceptibility

10 V/m, 80...3000 MHz, AM

10 V/m, 900 MHz, PM

IEC 61000-4-4

IEC 60255-22-4

IEEE C37.90.1

Electrical fast transient burst

4 kV, 2.5 kHz, 5 kHz, 100 kHz

IEC 61000-4-5

IEC 60255-22-5

Surge test, class 4 e

4 kV common mod

2 kV differential mode

IEC 61000-4-6

IEC 60255-22-6

Conducted susceptibility

10 V, 150 kHz...80 MHz

IEC 61000-4-8

IEC 60255-6

Power frequency magnetic field

30 A/m, 50 Hz, x, y, z axis

IEC 61000-4-11

IEC 60255-11

Supply voltage dips and interruptions, class 3

IEC 61000-4-18  
IEC 60255-22-1

Damped oscillatory waves  
2.5 kV, 1 MHz common mode  
1.0 kV, 1 MHz differential mode

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**B.**

**10. EMC standards**

10.1

**A.**

**11 Vibration Standards**

11.1 The device shall comply with the following Vibration Standards:

IEC 60068-2-6

IEC 60255-21-1      Vibration test

5.2 g, 5...55 Hz, x, y, z a

IEC 60068-2-27

IEC 60255-21-2

Vibration test

5 g / 11 ms, x, y, z axis

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**B.**

## **11 Vibration Standards**

11.1

**A.**

## **12 Climatic standards**

12.1 The device shall comply with the following Climatic Standards:

IEC 60068-2-2

Cyclic temperature test, dry heat

16 hours, 55 °C, operating condition

96 hours, 70 °C , power off condition

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**B.**

## **12 Climatic standards**

12.1