

Annexure-I (A)
Standard Procedure for Type Test, FAT and SAT

TYPE TEST PROCEDURE

SDH/PDH System

CONTENTS

1	GENERAL TEST SET-UP FOR BER TESTING, ETHERNET TESTING AND ALARM SIGNALING:	4
2	LIST OF TEST EQUIPMENT:	4
3	ACCEPTANCE CRITERIA:	4
4	TEMPERATURE AND HUMIDITY TESTS:	5
4.1:	Low Temperature test: Operation to Specification	5
4.2:	Low Temperature test: Operation Without Damage	5
4.3:	Dry Heat Test: Operation to Specification.....	6
4.4:	Dry Heat test: Operation Without Damage.....	6
4.5:	Damp Heat Test	7
4.6:	Temperature Variation Test	7
5	POWER SUPPLY & EMI/EMC TEST:	8
5.1	Immunity Test.....	8
5.1.1.	: Voltage fluctuations.....	8
5.1.2.	: Voltage dips	9
5.1.3.	: Voltage Interruption.....	10
5.1.4.	: 1.2/50 - 8/20 us Surge	11
5.1.5.	: Fast transient bursts.....	12
5.1.6.	: Damped Oscillatory Wave	13
5.1.7.	: Electrostatic Discharges	14
5.1.8.	: Radiated Electro Magnetic Field.....	15
5.2	Emission Tests:	16
5.2.1	: RF disturbance voltages	16
5.2.2	: RF disturbance currents.....	17
5.2.3	: RF Radiated Fields.....	18
5.3	Insulation Withstand Voltages:	19
5.3.1	: Insulation withstand voltage isolation test & 1.2/50 μ sec impulse voltage	19
6	MECHANICAL TEST:	20
6.1	: Mechanical Vibration Test	20
6.2	: Shock test.....	21
6.3	: Free Fall.....	21

1 GENERAL TEST SET-UP FOR BER TESTING, ETHERNET TESTING AND ALARM SIGNALING:

Test Set-up with detailed interconnection of cards and description for flow of signals to be provided.

2 LIST OF TEST EQUIPMENT:

Complete list of test equipment with serial number and validity of calibration to be provided.

3 ACCEPTANCE CRITERIA:

The functional acceptance criteria for EUT are defined below:

N= the performance of equipment (EUT) in non-degraded mode (N1, N2 & N3)

N1=BER test

Evaluation criteria N for BER test, the test duration / period, are 15 mins. The pass criteria for "Operation to specification tests is that the number of bit error at the end of specified measurement period shall not exceed the max number of errors generated by BER is equal 1×10^{-10} .

N2= Alarm status:

Evaluation criteria N for alarm status. No effect \geq No change of status in the LCT & alarm contacts.

N3= Ethernet ping test:

Evaluation criteria N for Ethernet ping test. Perform ping test and there shall be no missing of pings during normal operation of ping test.

D= The performance of equipment (EUT) In degraded mode (D1, D2):

D1= BER test:

Evaluation criterion D for minor failure: Temporary degradation (with the equipment or link still in operational status) or loss of functions or performance which is self-recoverable with respect to the loss signal recovery condition.

The allowed number of error \leq Error rate up to 10^{-6} error during the BER test.

D2= Alarm Status:

Evaluation criterion D for alarm status \Rightarrow change of alarm status allowed. Appearance of major and minor alarm on alarm contact. The alarms can be affected during the testing period but will be self-recoverable with respect to loss signal recovery condition.

D3= Ethernet ping test:

EUT performance check:

Equipment checks are made before, during and after the test as detailed in test procedures.

If functional degradation is allowed during the test then after the test, equipment under test should behave normally (i.e. without degradation with no manual intervention)

4 TEMPERATURE AND HUMIDITY TESTS:

Test Number/Name	4.1: Low Temperature test: Operation to Specification		
Standard reference	IEC 60068-2-1 (2007) Method Ad		
Test setup	As per figure shown in chapter General test setup		
Test Procedure	<p>The Climatic chamber shall be operated at Temperature = 0° C.</p> <p>The rate of change of temperature within the chamber shall be 0.5°C per minute. The test duration is 16 hours excluding thermal stabilization.</p> <p>The equipment shall be powered on after 1 hour of thermal stabilization.</p>		
Acceptance criteria	No degradation of performance is allowed during the test & after the test according to evaluation criteria N1, N2 & N3		
Observation	<p><u>During test & After test: Non degraded mode</u></p> <p><u>For Equipment Under Test (EUT)</u> N1= BER test N2= Alarm status. N3= Ethernet ping test</p>		
Result	Pass:	Fail:	Not Applicable:
Remark			

Test Number/Name	4.2: Low Temperature test: Operation Without Damage		
Standard reference	IEC 60068-2-1 (2007) Method Ad		
Test setup	As per figure shown in chapter General test setup		
Test Procedure	<p>The Climatic chamber shall be operated at Temperature = -10° C</p> <p>The rate of change of temperature within the chamber shall be 0.5°C per minute. The test duration is 72 hours excluding thermal stabilization.</p> <p>The equipment shall be powered on after 1 hour of thermal stabilization.</p>		
Acceptance criteria	<p>Degradation of performance is allowed during the test according to evaluation criteria D1, D2 & D3</p> <p>However, there shall be no degradation of performance in the post-test according evaluation criteria N1, N2 & N3.</p>		
Observation	<p>During test: Degraded mode</p> <p><u>For Equipment Under Test (EUT)</u> D1= BER test D2= Alarm Status D3= Ethernet ping test After the tests: Non-Degraded mode</p> <p><u>For Equipment Under Test (EUT)</u> N1= BER test N2= Alarm status N3= Ethernet ping test</p>		
Result	Pass:	Fail:	Not Applicable:
Remark			

Test Number/Name	4.3: Dry Heat Test: Operation to Specification		
Standard reference	IEC 60068-2-2 (2007) Method Bd		
Test setup	As per figure shown in chapter General test setup		
Test Procedure	<p>The Climatic chamber shall be operated at Temperature = 45° C.</p> <p>The rate of change of temperature within the chamber shall be 0.5°C per minute. The test duration is 96 hours excluding thermal stabilization.</p> <p>The equipment shall be powered on after 1 hour of thermal stabilization.</p>		
Acceptance criteria	No degradation of performance is allowed during the test & after the test according to evaluation criteria N1, N2 & N3.		
Observation	<p>During the tests & after the test: Non-Degraded mode</p> <p><u>For Equipment Under Test (EUT)</u> N1= BER test N2= Alarm status N3= Ethernet ping test</p>		
Result	Pass:	Fail:	Not Applicable:
Remark			

Test Number/Name	4.4: Dry Heat test: Operation Without Damage		
Standard reference	IEC 60068-2-2 (2007) Method Bd		
Test setup	As per figure shown in chapter General test setup		
Test Procedure	<p>The Climatic chamber shall be operated at Temperature = 55° C.</p> <p>The rate of change of temperature within the chamber shall be 0.5°C per minute. The test duration is 96 hours excluding thermal stabilization.</p> <p>The equipment shall be powered on after 1 hour of thermal stabilization.</p>		
Acceptance criteria	<p>Degradation of performance is allowed during the test according to evaluation criteria D1, D2 & D3</p> <p>However, there shall be no degradation of performance in the post-test according evaluation criteria N1, N2 & N3.</p>		
Observation	<p>During test: Degraded mode</p> <p><u>For Equipment Under Test (EUT)</u> D1= BER test D2= Alarm Status D3= Ethernet ping test</p> <p>After the tests: Non-Degraded mode</p> <p><u>For Equipment Under Test (EUT)</u> N1= BER test N2= Alarm status N3= Ethernet ping test</p>		
Result	Pass:	Fail:	Not Applicable:
Remark			

Test Number/Name	4.5: Damp Heat Test		
Standard reference	IEC 60068-2-3		
Test setup	As per figure shown in chapter General test setup		
Test Procedure	<p>The Climatic chamber shall be operated at Temperature = $(40 \pm 2) ^\circ\text{C}$ Humidity = $(93 \pm 3) \% \text{ RH}$ The rate of change of temperature within the chamber shall be 0.5°C per minute. The test duration is 240 hours excluding thermal stabilization. The equipment shall be powered on after 1 hour of thermal stabilization.</p>		
Acceptance criteria	No degradation of performance is allowed during the test & after the test according to evaluation criteria N1, N2 & N3.		
Observation	<p>During the tests & after the test: Non-Degraded mode</p> <p><u>For Equipment Under Test (EUT)</u></p> <p>N1= BER test N2= Alarm status N3= Ethernet ping test</p>		
Result	Pass:	Fail:	Not Applicable:
Remark			

Test Number/Name	4.6: Temperature Variation Test		
Standard reference	IEC 60068-2-14 (2009) Method Nb		
Test setup	As per figure shown in chapter General test setup		
Test Procedure	<p>The Climatic chamber shall be operated at Low temperature 0°C and at 45°C. The cycle test duration will be 3 hours for each temperature. The ramp is defined as $1^\circ\text{C}/\text{minute}$. The Number of cycle is 5. The equipment shall be powered on.</p>		
Acceptance criteria	No degradation of performance is allowed during the test & after the test according to evaluation criteria N1, N2 & N3.		
Observation	<p>During the tests & after the test: Non-Degraded mode</p> <p><u>For Equipment Under Test (EUT)</u></p> <p>N1= BER test N2= Alarm status N3= Ethernet ping test</p>		
Result	Pass:	Fail:	Not Applicable:
Remark			

Date:	For Laboratory representative/Manufacturer	For EMPLOYER
Name:		
Signature:		

5 POWER SUPPLY & EMI/EMC TEST:

5.1 Immunity Test

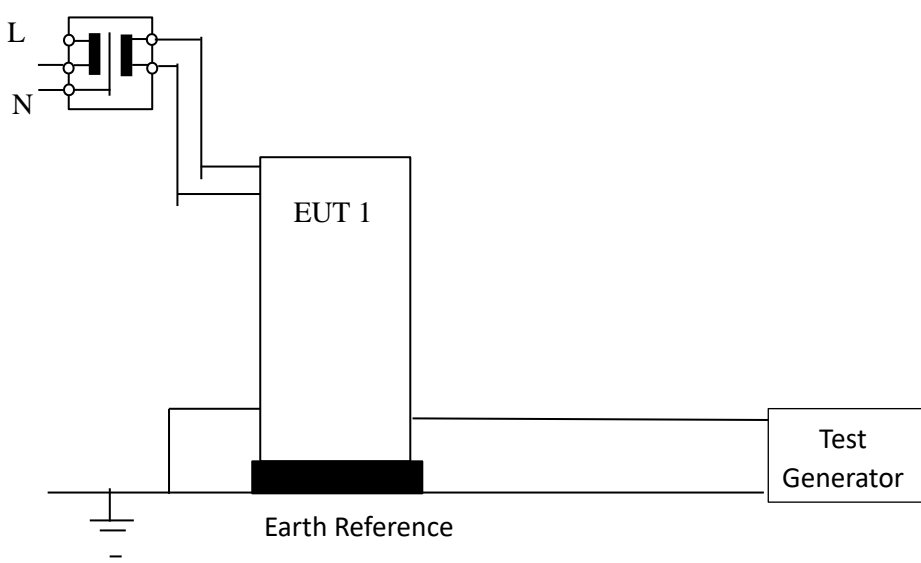
The list of Immunity tests are specified below:

Sr. No	Immunity test	AC Power Supply	DC Power Supply	Control & Signal	Telecom Lines	Parameters
1	Voltage Fluctuation	Yes	Yes	N/A	N/A	IEC 60870-2-1:1995, Table 11 Level:1
2	Voltage dips & Interruptions	Yes	Yes	N/A	N/A	
3	1.2/50-8/20µs surge	Yes	Yes	Yes	N/A	IEC 60870-2-1:1995, Table 12 Level 1
4	Fast transient Burst	Yes	Yes	Yes	Yes	IEC 60870-2-1:1995, Table 12 Level 4
5	Damped Oscillator waves	Yes	Yes	Yes	Yes	IEC 60870-2-1:1995, Table 12 Level 1
6	Electrostatic Discharge	N/A	Yes			IEC 60870-2-1:1995, Table 13 Level 4
7	Radiated Electromagnetic field	N/A	Yes			IEC 60870-2-1:1995, Table 15 Level 3

Test Number/Name	5.1.1. :Voltage fluctuations		
Standard reference	Table 11 of IEC 60870-2-1(1995) Level 1		
Test setup	As per figure shown in chapter General test setup		
Test Procedure	<p>This test is applicable on DC power supply port.</p> <p>The three conditions (Un, Un+10% and Un-10%) will be conducted. Un= (-48 VDC), U=±8% during 2.5±0.5 sec Global cycle: 10s for one cycle</p> <p>Test of sequence of three constructive cycles (Zero second delay between each cycle).</p>		
Acceptance criteria	No degradation of performance is allowed during and after the test. According to evaluation criteria N1, N2 & N3.		
Observation	<p>During test & after the test non degraded mode</p> <p><u>For Equipment Under Test (EUT)</u></p> <p>N1= BER test</p> <p>N2= Alarm status</p> <p>N3= Ethernet ping test</p>		
Result	Pass:	Fail:	Not Applicable:
Remark			

Test Number/Name	5.1.2. :Voltage dips		
Standard reference	Table 11 of IEC 60870-2-1(1995) Level 1		
Test setup	As per figure shown in chapter General test setup		
Test Procedure	<p>This test is applicable on DC power supply port.</p> <p>The three conditions (Un, Un+10% and Un-10%) will be conducted. Un= (-48 VDC)</p> <p>U=30% reduction:</p> <p>U= 14.4 for Un =-48V U=15.8 for Un =-48V+10% U=13.0Vfor Un=-48V-10%</p> <p>Duration of dips: ±0.5s</p> <p>One sequence of three dips with an interval of ten seconds.</p>		
Acceptance criteria	<p>Transient disturbance, Degradation of performance is allowed during the test according to the evaluation criteria D1, D2 & D3.</p> <p>However, there shall be no degradation of performance in the post test according to the evaluation criteria N1, N2 & N3.</p>		
Observation	<p><u>During the test: Degraded mode</u></p> <p><u>For Equipment Under Test (EUT)</u></p> <p>D1= BER test D2= Alarm Status</p> <p>D3= Ethernet ping test</p> <p>After the tests: Non-Degraded mode</p> <p><u>For Equipment Under Test (EUT)</u></p> <p>N1= BER test</p> <p>N2= Alarm status</p> <p>N3= Ethernet ping test</p>		
Result	Pass:	Fail:	Not Applicable:
Remark			

Test Number/Name	5.1.3. : Voltage Interruption		
Standard reference	Table 11 of IEC 60870-2-1(1995) Level 1 and IEC 61000-4-11		
Test setup	As per figure shown in chapter General test setup		
Test Procedure	<p>This test is applicable on DC power supply port.</p> <p>The three conditions (Un, Un+10% and Un-10%) will be conducted. Un= (-48 VDC)</p> <p>U=100% reduction:</p> <p>U= 45.6 for Un =-48V</p> <p>U=50.2 for Un =-48V+10%</p> <p>U=41.0V for Un=-48V-10%</p> <p>Duration of interruptions: 10ms</p> <p>One sequence of three interruptions with an interval of ten seconds.</p>		
Acceptance criteria	<p>Transient disturbance, Degradation of performance is allowed during the test according to the evaluation criteria D1, D2 & D3.</p> <p>However, there shall be no degradation of performance in the post test according to the evaluation criteria N1, N2 & N3.</p>		
Observation	<p><u>During the test: Degraded mode</u></p> <p><u>For Equipment Under Test (EUT)</u></p> <p>D1= BER test</p> <p>D2= Alarm Status</p> <p>D3= Ethernet ping test</p> <p>After the tests: Non-Degraded mode</p> <p><u>For Equipment Under Test (EUT)</u></p> <p>N1= BER test</p> <p>N2= Alarm status</p> <p>N3= Ethernet ping test</p>		
Result	Pass:	Fail:	Not Applicable:
Remark			

Test Number/Name	5.1.4. : 1.2/50 - 8/20 us Surge		
Standard reference	Table 12 of IEC 60870-2-1(1995) Level 1/IEC 61000-4-5		
Test setup	As per figure shown in chapter General test setup		
Test Procedure	<p>This test is applicable on</p> <ul style="list-style-type: none"> - DC power supply port. - control and signal lines -indoor telecommunication lines. <p>Wave: 1.2/50us – 8/20 us Level: 0.5KV common mode 0.25KV differential mode* (not applicable to balanced signal lines) 5 positive pulses and 5 negative pulses separated by 1 min are tested.</p> <p>Safety Insulation</p>  <p>Positive polarity and negative polarity are tested, 5 positive pulse and 5 negative pulse separated by 1 min.</p> <p>The differential mode will not be applied on shielded lines.</p>		
Acceptance criteria	<p>Transient disturbance, Degradation of performance is allowed during the test according to the evaluation criteria D1 & D2.</p> <p>However, there shall be no degradation of performance in the post test according to the evaluation criteria N1, N2 & N3.</p>		
Observation	<p>During the test: Degraded mode</p> <p><u>For Equipment Under Test (EUT)</u> D1= BER test D2= Alarm Status After the tests: Non-Degraded mode</p> <p><u>For Equipment Under Test (EUT)</u> N1= BER test N2= Alarm status N3= Ethernet ping test</p>		
Result	Pass:	Fail:	Not Applicable:
Remark			

Test Number/Name	5.1.5. : Fast transient bursts		
Standard reference	Table 12 of IEC 60870-2-1(1995) Level 4 / IEC 61000-4-4		
Test setup	As per figure shown in chapter General test setup		
Test Procedure	<p>This test is applicable on</p> <ul style="list-style-type: none"> - DC power supply port. - control and signal lines. -indoor telecommunication lines. <p>Level:</p> <ul style="list-style-type: none"> - DC Power Line: 4KV in common mode - Control & signal lines, telecom lines: 2KV in common mode. - Frequency repetition: 5KHz <p>Positive polarity & Negative polarity are tested.</p> <p>The test on the DC power line is realized with coupling/decoupling network.</p> <p>The test on the control & signal line, telecom lines is realized with a coupling clamp.</p>		
Acceptance criteria	<p>Transient disturbance, Degradation of performance is allowed during the test according to the evaluation criteria D1 & D2.</p> <p>However, there shall be no degradation of performance in the post test according to the evaluation criteria N1, N2 & N3.</p>		
Observation	<p>During the test: Degraded mode</p> <p><u>For Equipment Under Test (EUT)</u></p> <p>D1= BER test</p> <p>D2= Alarm Status</p> <p>After the tests: Non-Degraded mode</p> <p><u>For Equipment Under Test (EUT)</u></p> <p>N1= BER test</p> <p>N2= Alarm status</p> <p>N3= Ethernet ping test</p>		
Result	Pass:	Fail:	Not Applicable:
Remark			

Test Number/Name	5.1.6. : Damped Oscillatory Wave		
Standard reference	Table 12 of IEC 60870-2-1 (1995) Level: 1 / IEC 61000-4-18		
Test setup	As per figure shown in chapter General test setup		
Test Procedure	<p>This test is applicable on</p> <ul style="list-style-type: none"> - the DC power supply - control & signal lines - Telecommunication lines. <p>Test level:</p> <ul style="list-style-type: none"> - 0.5KV: common mode voltage - 0.25KV: differential mode voltage <p>Period injection: 1μs (damped oscillatory frequency is 1MHz) Duration of test is at least 2s on each line under test.</p> <p>The minimum time interval between two successive tests is 10sec. acc. IEC 61000-4-1 chapter 8.</p> <p>Injection with the generator connected to a coupling /decoupling network, for shielded lines coupling directly onto the screen.</p> <p>DC power supply: positive pole is earthed on sub rack, therefore only common test line to earth is applied.</p> <p>Control & Signal lines and telecommunication lines: All are balanced lines, therefore acc. IEC 60870-2-1 the differential mode test is not applicable.</p>		
Acceptance criteria	<p>Transient disturbance. Degradation of performance is allowed during the test according to the evaluation criteria D1 & D2.</p> <p>However, there shall be no degradation of performance in the post test according to the evaluation criteria N1, N2 & N3.</p>		
Observation	<p>During the test: Degraded mode</p> <p><u>For Equipment under Test (EUT)</u></p> <p>D1= BER test D2= Alarm Status After the tests: Non-Degraded mode</p> <p><u>For Equipment Under Test (EUT)</u></p> <p>N1= BER test N2= Alarm status N3= Ethernet ping test</p>		
Result	Pass:	Fail:	Not Applicable:
Remark			

Test Number/Name	5.1.7. : Electrostatic Discharges		
Standard reference	Table 13 of IEC 60870-2-1 (1995) Level: 4 /IEC61000-4-2		
Test setup	As per figure shown in chapter General test setup		
Test Procedure	<p>Contact discharge on vertical coupling plane and accessible metallic parts of the sub rack. Level: 8KV</p> <p>According to IEC 61000-4-2 all the intermediate levels (1 to 3) of 2KV, 4KV and 6KV are tested before the level 4 given by IEC 60870-2-1.</p> <p>Positive polarity and negative polarity are tested.</p> <p>Time between pulses is 1s.</p> <p>Ten discharges of each polarity are applied on each point tested.</p> <p>Note: The IEC 60870-2-1 does not specify tests for air discharge.</p>		
Acceptance criteria	<p>Transient disturbance. Degradation of performance is allowed during the test according to the evaluation criteria D1, D2 & D3.</p> <p>However, there shall be no degradation of performance in the post test according to the evaluation criteria N1, N2 & N3.</p>		
Observation	<p><u>During the test: Degraded mode</u></p> <p><u>For Equipment Under Test (EUT)</u></p> <p>D1= BER test D2= Alarm Status D3= Ethernet ping test After the tests: Non-Degraded mode</p> <p><u>For Equipment Under Test (EUT)</u></p> <p>N1= BER test N2= Alarm status N3= Ethernet ping test</p>		
Result	Pass:	Fail:	Not Applicable:
Remark			

Test Number/Name	5.1.8. : Radiated Electro Magnetic Field		
Standard reference	Table 15 of IEC 60870-2-1 (1995) Level: 3 /IEC61000-4-3		
Test setup	As per figure shown in chapter General test setup		
Test Procedure	Test field strength: 10 V/m (unmodulated signal) Modulation Frequency: 1KHz Modulation Depth: 80% Frequency Range: 80 MHz to 1000 MHz Step Size: 1% Both polarizations are tested. Distance between the equipment under test and the antenna: 1 meter. Four sided of the rack are tested.		
Acceptance criteria	No degradation of performance is allowed during the test & after the test. The performance is checked only during the test according to the evaluation criteria N1, N2 & N3.		
Observation	During test & after the test non degraded mode <u>For Equipment Under Test (EUT)</u> N1= BER test N2= Alarm status N3= Ethernet ping test		
Result	Pass:	Fail:	Not Applicable:
Remark			

	For Laboratory representative/Manufacturer	For EMPLOYER
Date:		
Name:		
Signature:		

5.2 Emission Tests:

The list of Emission tests are specified below:

Sr. No	Emission Test	AC Power Supply	DC Power Supply	Control & Signal	Telecom Line	Parameters
1	RF disturbance voltage CISPR 22	Yes	Yes	N/A	N/A	Table 17 of IEC 60870-2-1: 1995 - Class: B
2	RF disturbance currents CISPR 22	N/A	N/A	N/A	Yes	
3	RF radiated field CISPR 22	Yes				

Test Number/Name	5.2.1 : RF disturbance voltages										
Standard reference	CISPR 22 Table 17 of IEC 60870-2-1 (1995) Class: B										
Test setup	As per figure shown in chapter General test setup										
Test Procedure	<p>RF disturbance conducted voltages at the main ports.</p> <p>The voltage measurements are done with a receiver connected to a line impedance stabilization network [LISN]. The receiver has a peak average and quasi-peak detector. The test configuration for conducted measurements is floor standing equipment. Frequency range: 0.15 to 30 MHz</p> <p>Measurement unit: LISN</p> <p>Limits: Class B</p> <table><thead><tr><th>Frequency Range (MHz)</th><th>Quasi-peak Limits (dBμV) (Class B)</th></tr></thead><tbody><tr><td>0.15 to 0.5</td><td>66 to 56*</td></tr><tr><td>0.5 to 5</td><td>56</td></tr><tr><td>5 to 30</td><td>60</td></tr></tbody></table> <p>*The limit has a linear decrease with a logarithm frequency variation</p>			Frequency Range (MHz)	Quasi-peak Limits (dBμV) (Class B)	0.15 to 0.5	66 to 56*	0.5 to 5	56	5 to 30	60
Frequency Range (MHz)	Quasi-peak Limits (dBμV) (Class B)										
0.15 to 0.5	66 to 56*										
0.5 to 5	56										
5 to 30	60										
Acceptance criteria	The level must be lower or equal to the limits specified in the test procedure. It is an EMC measurement, so the performance is checked only after the test according to the evaluation criteria N1, N2 & N3.										
Observation	<p><u>During test non degraded mode</u></p> <p><u>For Equipment Under Test (EUT)</u></p> <p>N1= BER test</p> <p>N2= Alarm status</p> <p>N3= Ethernet ping test</p>										
Result	Pass:	Fail:	Not Applicable:								
Remark											

Test Number/Name	5.2.2 : RF disturbance currents								
Standard reference	CISPR 22 Table 17 of IEC 60870-2-1 (1995) Class: B								
Test setup	As per figure shown in chapter General test setup								
Test Procedure	<p>RF disturbance current at the telecommunication ports. The measurements are done a/c to CISPR 22 C.1.2 with a receiver connected to a current probe. The receiver has a peak average and quasi-peak detector. A decoupling network (Ferrite) is placed on the cable of the telecommunication line connected to the bench. The test configuration for conducted measurements is floor standing equipment. In semi- anechoic Faraday room or ambient ground floor. Frequency range: 0.15 to 30 MHz Measurement unit: LISN Limits: Class B</p> <table><tr><th>Frequency Range (MHz)</th><th>Quasi-peak Limits (dBμV) (Class B)</th></tr><tr><td>0.15 to 0.5</td><td>40 to 30*</td></tr><tr><td>5 to 30</td><td>30</td></tr></table> <p>*The limit has a linear decrease with a logarithm frequency variation The measurement shall be done with a peak detector. -if the disturbance levels are under the limits, the EUT (Equipment Under Test) is Declared in compliance with the specifications -if some disturbance levels are over the limits, detector QP (Quasi-Peak) is used to verify the compliance with the specification in the frequency range over the limit.</p>			Frequency Range (MHz)	Quasi-peak Limits (dBμV) (Class B)	0.15 to 0.5	40 to 30*	5 to 30	30
Frequency Range (MHz)	Quasi-peak Limits (dBμV) (Class B)								
0.15 to 0.5	40 to 30*								
5 to 30	30								
Acceptance criteria	The level must be lower or equal to the limits specified in the test procedure. It is an EMC measurement, so the performance is checked only after the test according to the evaluation criteria N1, N2 & N3.								
Observation	<u>During test non degraded mode</u> <u>For Equipment Under Test (EUT)</u> N1= BER test N2= Alarm status N3= Ethernet ping test								
Result	Pass:	Fail:	Not Applicable:						
Remark									

Test Number/Name	5.2.3 : RF Radiated Fields								
Standard reference	Table 17 of IEC 60870-2-1 (1995) Class B and CISPR 22 (2008)								
Test setup	As per figure shown in chapter General test setup								
Test Procedure	<div><p>The measurements are done with a receiver connected to an antenna. The receiver has peak and quasi peak detectors. Decoupling networks (DN: Ferrite) are placed on the cables connected to the bench.</p><div><div>Measurement Bench</div><div>DN</div><div>Equipment Under Test</div><div>A</div><div>Rec</div><div>D</div></div><p>The distance (D) between the EUT and the antenna is 3m. Only the EUT and the antenna are in the semi-anechoic chamber.</p><p>Frequency range: 30 to 1000MHz Measurements at 3 meters. Antenna: Broadband antenna (30 to 1000MHz) Polarization: Both polarizations are measured Turntable: 360⁰ Antenna mast: 1 to 4 meters above the ground plane Semi-anechoic Faraday room</p><table><tr><td>Frequency Range (MHz)</td><td>Quasi-peak Limits (dBuV/m) (Vertical & Horizontal polarization) (Class B)</td></tr><tr><td>30 to 230</td><td>40</td></tr><tr><td>230 to 1000</td><td>47</td></tr></table><p>Note: For reason of ambient noise at 10m in open area test site, the measurements will be done in a semi-anechoic Faraday room at 3m: according to chapter 10.2.1 of CISPR 22 IEC: 1997. According to CISPR 22, “An inversely proportionality factor of 20 dB/decade should be used to normalize the measured data to the specified distance for determining compliance.” So it’s necessary to add 10dB to the limits at 10meters indicted in the CISPR-22.</p></div>			Frequency Range (MHz)	Quasi-peak Limits (dBuV/m) (Vertical & Horizontal polarization) (Class B)	30 to 230	40	230 to 1000	47
Frequency Range (MHz)	Quasi-peak Limits (dBuV/m) (Vertical & Horizontal polarization) (Class B)								
30 to 230	40								
230 to 1000	47								
Acceptance criteria	The level must be lower or equal to the limits specified in the test procedure. It is an EMC measurement, so the performance is checked only after the test according to the evaluation criteria N1, N2 & N3.								
Observation	<u>During test non degraded mode</u> <u>For Equipment Under Test (EUT)</u> N1= BER test N2= Alarm status N3= Ethernet ping test								
Result	Pass:	Fail:	Not Applicable:						
Remark									

5.3 Insulation Withstand Voltages:

As per section 6 of IEC 60870-2-1. Recommended Class: VW1 of Table 18

Test Number/Name	5.3.1 : Insulation withstand voltage isolation test & 1.2/50 μsec impulse voltage		
Standard reference	IEC 60870-2-1 (1995) VWI of Table 18		
Test setup	As per figure shown in chapter General test setup		
Test Procedure	<p>This test is specified on DC power supply, control and signal ports and Telecommunication port as per table of 8 insulation with stand voltages class: VWI for DC power supply below 60V.</p> <p>The test to applied are:</p> <ul style="list-style-type: none"> a) Power supply with stand voltage: 0.5 KVRms b) Impulse: 1KV Peak for 1.2/50us impulse voltage; 5 pulse with negative polarity and 5 pulse with alternating polarity. 		
Acceptance criteria	<p>During the test, the equipment is powered off.</p> <p>After the test, the equipment is required to function correctly in non- degraded mode according to the evaluation criteria N1, N2 & N3.</p>		
Observation	<p>After the test: Non degraded mode:</p> <p><u>For Equipment Under Test (EUT)</u></p> <p>N1= BER test N2= Alarm status N3= Ethernet ping test</p>		
Result	Pass:	Fail:	Not Applicable:
Remark			

	For Laboratory representative/Manufacturer	For EMPLOYER
Date:		
Name:		
Signature:		

6 MECHANICAL TEST:

Test Number/Name	6.1 :Mechanical Vibration Test		
Standard reference	IEC Publication 60068-2-6		
Test setup	As per figure shown in General test setup		
Test Procedure	<p>6.1.1 5 to 9 Hz 0.3mm 9 to 200 Hz 1m/s² 1 sweep cycle per all the three axis</p> <p>6.1.2 5 to 9 Hz 3.5mm 9 to 200 Hz 10m/s² 200 to 500 Hz 15m/s² 5 sweep cycle per all the three axis</p> <p>6.1.3 5 to 9 Hz 0.3mm 9 to 200 Hz 1m/s² 1 sweep cycle per all the three axis</p> <p>Before commencing the vibration test, the EUT is switched on and functional test shall be done for 15 min period. During the test the equipment is powered off and packed. Vibration test will be conducted in the sequence 8.1, 8.2.1 and 8.1. After Completion of vibration test, EUT shall be unpacked, and functional test shall be done for 15 min period.</p>		
Acceptance criteria	After the test, the equipment is required to function correctly in non- degraded mode according to the evaluation criteria N1, N2 & N3.		
Observation	<p><u>After the test: Non degraded mode</u></p> <p><u>For Equipment Under Test (EUT)</u></p> <p>N1= BER test N2= Alarm status N3= Ethernet ping test</p>		
Result	Pass:	Fail:	Not Applicable:
Remark			

Test Number/Name	6.2 : Shock test		
Standard reference	IEC Publication 60068-2-27		
Test setup	As per figure shown in General test setup		
Test Procedure	Acceleration amplitude 294 m/s^2 . Duration: 18 ms Direction: Three Axis Number of shocks: 3 in each direction Direction of Shocks: 6 direction Total Number of shocks: 18		
Acceptance criteria	After the test, the equipment is required to function correctly in non- degraded mode according to the evaluation criteria N1, N2 & N3.		
Observation	<u>After the test: Non degraded mode</u> <u>For Equipment Under Test (EUT)</u> N1= BER test N2= Alarm status N3= Ethernet ping test		
Result	Pass:	Fail:	Not Applicable:
Remark			

Test Number/Name	6.3 : Free Fall		
Standard reference	IEC Publication 60068-2-31		
Test setup	As per figure shown in chapter General test setup		
Test Procedure	The free fall test is applicable to specimens which during transportation, handling or repair work are liable to be dropped from their means of transport or from a work surface. Height of Fall Specimen Mass (In integral transport cases) 250mm $\leq 75 \text{ Kg}$		
Acceptance criteria	After the test, the equipment is required to function correctly in non- degraded mode according to the evaluation criteria N1, N2 & N3.		
Observation	<u>After the test: Non degraded mode</u> <u>For Equipment Under Test (EUT)</u> N1= BER test N2= Alarm status N3= Ethernet ping test		
Result	Pass:	Fail:	Not Applicable:
Remark			

Date:	For Laboratory representative/Manufacturer	For EMPLOYER
Name:		
Signature:		