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SIST EN ISO/IEC 17025
LP-009

Test Report issued under the responsibility of:

TEST REPORT
IEC 62368-1
Audio/video, information and communication technology equipment
Part 1: Safety requirements

Report Number..... :	T223-0418/24
Date of issue ..... :	2024-06-28
Total number of pages ..... :	155 pages
Name of Testing Laboratory preparing the Report ..... :	SIQ Ljubljana SIQ Ljubljana is accredited by Slovenian Accreditation with accreditation number LP-009 in the field of testing (SIST EN ISO/IEC 17025).
Applicant's name..... :	Blues Inc.
Address ..... :	50 Harbor Street, Manchester, MA 01944, USA
Test specification:	
Standard ..... :	IEC 62368-1:2018
Test procedure..... :	Type test
Non-standard test method..... :	N/A
TRF template used ..... :	IECEE OD-2020-F1:2021, Ed.1.4
Test Report Form No. ..... :	IEC62368_1E
Test Report Form(s) Originator.... :	UL(US)
Master TRF ..... :	Dated 2022-04-14

General disclaimer:

The test results presented in this report relate only to the object tested.
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Test item description .....:	Notecard v2 M.2 card (embeddable module for low-power cellular connectivity)
Trade Mark(s).....:	Blues
Manufacturer.....:	Blues Inc.
	50 Harbor Street, Manchester, MA 01944, USA
Model/Type reference .....:	NOTE-NBGLN, NOTE-NBNAN, NOTE-WBNAN,
	NOTE-WBEXN
Ratings .....:	NOTE-NBGLN, NOTE-NBNAN, NOTE-WBNAN,
	NOTE-WBEXN: 2,5 – 5,5 V d.c.; 0,25 A; Class III

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☐	**CB Testing Laboratory:**	SIQ Ljubljana	
Testing location/ address ..... :		Mašera-Spasićeva ulica 10, SI-1000 Ljubljana Slovenia	
Tested by (name, function, signature) ..... :		Branko Lamovšek (Service Provider)	
Approved by (name, function, signature) .. :		Matej Šmidovnik (Approved Signatory)	
☐	**Testing procedure: CTF Stage 1:**		
Testing location/ address ..... :			
Tested by (name, function, signature) ..... :			
Approved by (name, function, signature) .. :			
☐	**Testing procedure: CTF Stage 2:**		
Testing location/ address ..... :			
Tested by (name, function, signature) ..... :			
Witnessed by (name, function, signature). :			
Approved by (name, function, signature) .. :			
☐	**Testing procedure: CTF Stage 3:**		
☐	**Testing procedure: CTF Stage 4:**		
Testing location/ address ..... :			
Tested by (name, function, signature) ..... :			
Witnessed by (name, function, signature). :			
Approved by (name, function, signature) .. :			
Supervised by (name, function, signature) :			

List of Attachments (including a total number of pages in each attachment):

1. National differences according to IEC 62368-1:2018 (Third Edition) – Enclosure No. 1 (44 pages)
2. Pictures of the unit – Enclosure No. 2 (5 pages)
3. Technical documentation – Enclosure No. 3 (48 pages)

Summary of testing:

Tests performed (name of test and test clause):	**Testing location:**
5.4.1.4 Measurement of maximum operating temperatures for materials, components and systems 9.3 Temperature test B.2.5 Input test	**SIQ Ljubljana** **Mašera-Spasićeva ulica 10, SI-1000 Ljubljana, Slovenia**

Summary of compliance with National Differences (List of countries addressed):

EUROPEAN GROUP AND NATIONAL DIFFERENCES (CENELEC), USA, Canada, Saudi Arabia, Australia, New Zealand, Singapore, China

☒ **The product fulfils the requirements of EN IEC 62368-1:2020 + A11:2020, BS EN IEC 62368-1:2020 + A11:2020.**

Use of uncertainty of measurement for decisions on conformity (decision rule) :

☒ No decision rule is specified by the IEC standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty ("simple acceptance" decision rule, previously known as "accuracy method").

☐ Other:… (to be specified, for example when required by the standard or client, or if national accreditation requirements apply)

Information on uncertainty of measurement:
The uncertainties of measurement are calculated by the laboratory based on application of criteria given by OD-5014 for test equipment and application of test methods, decision sheets and operational procedures of IECEE.
IEC Guide 115 provides guidance on the application of measurement uncertainty principles and applying the decision rule when reporting test results within IECEE scheme, noting that the reporting of the measurement uncertainty for measurements is not necessary unless required by the test standard or customer.
Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing.

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

NOTE-NBGLN

NOTE-NBNAN

NOTE-WBNAN

NOTE-WBEXN

Test item particulars:	
Product group .....:	☐ end product ☒ built-in component
Classification of use by .....:	☒ Ordinary person ☐ Children likely present ☐ Instructed person ☐ Skilled person
Supply connection.....:	☐ AC mains ☐ DC mains ☒ not mains connected: ☒ ES1 ☐ ES2 ☐ ES3
Supply tolerance .....:	☐ +10%/-10% ☐ +20%/-15% ☐ + %/ - % ☒ None (d.c. range specified)
Supply connection – type .....:	☐ pluggable equipment type A - ☐ non-detachable supply cord ☐ appliance coupler ☐ direct plug-in ☐ pluggable equipment type B - ☐ non-detachable supply cord ☐ appliance coupler ☐ permanent connection ☒ mating connector ☐ other:
Considered current rating of protective device.....:	☐ A; Location: ☐ building ☐ equipment ☒ N/A (Unit supplied from ES1 Limited Power Source)
Equipment mobility .....:	☐ movable ☐ hand-held ☐ transportable ☐ direct plug-in ☐ stationary ☒ for building-in ☐ wall/ceiling-mounted ☐ SRME/rack-mounted ☐ other:
Overvoltage category (OVC) .....:	☐ OVC I ☐ OVC II ☐ OVC III ☐ OVC IV ☒ other: DC unit
Class of equipment .....:	☐ Class I ☐ Class II ☒ Class III ☐ Not classified ☐
Special installation location .....:	☒ N/A ☐ restricted access area ☐ outdoor location ☐
Pollution degree (PD) .....:	☐ PD 1 ☒ PD 2 ☐ PD 3
Manufacturer's specified T_{ma}.....:	☒ 75°C for all models
IP protection class .....:	☒ IPX0
Power systems .....:	☐ TN ☐ TT ☐ IT - V_{L-L} ☒ not AC mains
Altitude during operation (m) .....:	☒ 2000 m or less ☐ m
Altitude of test laboratory (m) .....:	☒ 2000 m or less ☐ m
Mass of equipment (kg) .....:	App. 0,008 kg for each Notecard

Possible test case verdicts:	
- test case does not apply to the test object....:	N/A
- test object does meet the requirement.....:	P (Pass)
- test object does not meet the requirement....:	F (Fail)
Testing:	
Date of receipt of test item .....:	2024-03-27
Date (s) of performance of tests.....:	From 2024-05-16 to 2024-06-18

General remarks:

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

Throughout this report a ☒ comma / ☐ point is used as the decimal separator.

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided .....:	☐ **Yes** ☒ **Not applicable**

When differences exist; they shall be identified in the General product information section.

Name and address of factory (ies) ..... :	Blues Inc. 50 Harbor Street, Manchester, MA 01944, USA

General product information and other remarks:

Units are a drop-in embeddable data storage and transport module for cellular IoT products. Modules are provided without power source nor enclosure and can be oriented in any direction.
Modules are supplied from ES1 Limited Power source in the end-product.

Model Differences –

Notecard NOTE-NBGLN uses Quectel BG95-M3 modem for LTE-M / NB-IoT / GPRS networks.

NOTE-NBNAN uses Quectel BG95-M1 modem for LTE-M network.

NOTE-WBEXN uses Quectel EG91-EX modem for LTE Cat-1 / WCDMA / GPRS network.

NOTE-WBNAN uses Quectel EG91-NAXD modem for LTE Cat-1 / WCDMA network.

There are other non-safety relevant differences in the schematics, PCB layout and number of antenna connections.

Additional application considerations – (Considerations used to test a component or sub-assembly) –

The component was tested according to the standard IEC 62368-1:2018 (3rd Edition) and/or EN IEC 62368-1:2020 + A11:2020 and/or BS EN IEC 62368-1:2020 + A11:2020.

Additionally, the component was also evaluated according to the standards CSA C22.2 No. 62368-1:2019 and UL 62368-1:2019 (3rd Edition) and fulfils the requirements of these standards.

1. Units can be supplied via external power source with d.c. voltage range 2,5 – 5,5 V d.c. or external battery. Power supply source considered ES1, Limited Power Source.
2. Units for building-in. No enclosure provided.
3. Units provide no disconnect device.
4. Units are rated Class III.
5. The equipment has been evaluated for use in a Pollution Degree 2 environment and a maximum altitude of 2000 m.
6. The product was evaluated for a maximum ambient of 75 °C.

History Sheet:

Date	Report No.	Change/Modification	Rev. No.
2024-06-28	T223-0418/24	Initial report issued.	-

OVERVIEW OF ENERGY SOURCES AND SAFEGUARDS				
Clause	**Possible Hazard**			
5	Electrically-caused injury			
Class and Energy Source (e.g. ES3: Primary circuit)	Body Part (e.g. Ordinary)	Safeguards		
		B	S	R
ES1: Complete unit	Ordinary	N/A	N/A	N/A
6	Electrically-caused fire			
Class and Energy Source (e.g. PS2: 100 Watt circuit)	Material part (e.g. Printed board)	Safeguards		
		B	1st S	2nd S
PS2 (LPS)	Complete unit	N/A	Equipment safeguard (e.g., control of fire spread)	N/A
7	Injury caused by hazardous substances			
Class and Energy Source (e.g. Ozone)	Body Part (e.g., Skilled)	Safeguards		
		B	S	R
N/A	N/A	N/A	N/A	N/A
8	Mechanically-caused injury			
Class and Energy Source (e.g. MS3: Plastic fan blades)	Body Part (e.g. Ordinary)	Safeguards		
		B	S	R
MS1: sharp edges and corners	Ordinary	N/A	N/A	N/A
MS1: equipment mass	Ordinary	N/A	N/A	N/A
9	Thermal burn			
Class and Energy Source (e.g. TS1: Keyboard caps)	Body Part (e.g., Ordinary)	Safeguards		
		B	S	R
TS1: accessible parts	Ordinary	N/A	N/A	N/A
10	Radiation			
Class and Energy Source (e.g. RS1: PMP sound output)	Body Part (e.g., Ordinary)	Safeguards		
		B	S	R
RS1: LED	Ordinary	N/A	N/A	N/A
Supplementary Information: “B” – Basic Safeguard; “S” – Supplementary Safeguard; “R” – Reinforced Safeguard				

ENERGY SOURCE DIAGRAM
Optional. Manufacturers are to provide the energy sources diagram identify declared energy sources and identifying the demarcations are between power sources. Recommend diagram be provided included in power supply and multipart systems. Insert diagram below. Example diagram designs are; Block diagrams; image(s) with layered data; mechanical drawings
☐ **ES** ☐ **PS** ☐ **MS** ☐ **TS** ☐ **RS** **Refer to table OVERVIEW OF ENERGY SOURCES AND SAFEGUARDS.**

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
4	**GENERAL REQUIREMENTS**		P
4.1.1	Acceptance of materials, components and subassemblies		P
4.1.2	Use of components	Certified components are used in accordance with their ratings, certifications and they comply with applicable parts of this standard. Components not certified are used in accordance with their ratings and they comply with applicable parts of IEC 62368-1 and the relevant component standard. Components, for which no relevant IEC-standard exists, or used in circuits not in accordance with their specified ratings, have been tested under the conditions occurring in the equipment, using applicable parts of IEC 62368-1. (See appended table 4.1.2)	P
4.1.3	Equipment design and construction	Equipment is designed in such a manner that under normal operating condition, abnormal operating condition and single fault condition does not cause any injury or in case of fire, property damage.	P
4.1.4	Specified ambient temperature for outdoor use (°C)		N/A
4.1.5	Constructions and components not specifically covered	No such part.	N/A
4.1.8	Liquids and liquid filled components (LFC)		N/A
4.1.15	Markings and instructions	(See Annex F)	P
4.4.3	Safeguard robustness	Class III unit for building in. No test performed.	N/A
4.4.3.1	General		N/A
4.4.3.2	Steady force tests	(See Clause T.3)	N/A
4.4.3.3	Drop tests		N/A
4.4.3.4	Impact tests	No enclosure provided. Impact test not applicable.	N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.4.3.5	Internal accessible safeguard tests		N/A
4.4.3.6	Glass impact tests	No safeguard made of glass.	N/A
4.4.3.7	Glass fixation tests	No such part.	N/A
	Glass impact test (1J)		N/A
	Push/pull test (10 N)		N/A
4.4.3.8	Thermoplastic material tests	(See Annex T.8) No such safeguard.	N/A
4.4.3.9	Air comprising a safeguard	Class III unit, no hazardous voltages.	N/A
4.4.3.10	Accessibility, glass, safeguard effectiveness		N/A
4.4.4	Displacement of a safeguard by an insulating liquid	No insulating liquid.	N/A
4.4.5	Safety interlocks		N/A
4.5	**Explosion**		N/A
4.5.1	General	No such hazard.	N/A
4.5.2	No explosion during normal/abnormal operating condition	(See Clause B.2, B.3)	N/A
	No harm by explosion during single fault conditions	(See Clause B.4)	N/A
4.6	**Fixing of conductors**		N/A
	Fix conductors not to defeat a safeguard	No such conductors.	N/A
	Compliance is checked by test ..... :		N/A
4.7	**Equipment for direct insertion into mains socket–outlets**		N/A
4.7.2	Mains plug part complies with relevant standard .. :		N/A
4.7.3	Torque (Nm) ..... :		N/A
4.8	**Equipment containing coin/button cell batteries**		N/A
4.8.1	General	No batteries.	N/A
4.8.2	Instructional safeguard ..... :		N/A
4.8.3	Battery compartment door/cover construction		N/A
	Open torque test		N/A
4.8.4.2	Stress relief test		N/A
4.8.4.3	Battery replacement test		N/A
4.8.4.4	Drop test		N/A
4.8.4.5	Impact test		N/A
4.8.4.6	Crush test		N/A
4.8.5	Compliance		N/A
	30N force test with test probe		N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
	20N force test with test hook		N/A
4.9	**Likelihood of fire or shock due to entry of conductive object**		N/A
		(See Annex P)	N/A
4.10	**Component requirements**		N/A
4.10.1	Disconnect Device		N/A
4.10.2	Switches and relays		N/A

5	**ELECTRICALLY-CAUSED INJURY**		P
5.2	**Classification and limits of electrical energy sources**		P
5.2.2	ES1, ES2 and ES3 limits		P
5.2.2.2	Steady-state voltage and current limits .....:	ES1 – supplied by 5 V d.c. USB interface.	P
5.2.2.3	Capacitance limits .....:		N/A
5.2.2.4	Single pulse limits.....:		N/A
5.2.2.5	Limits for repetitive pulses .....:		N/A
5.2.2.6	Ringing signals	No ringing signals	N/A
5.2.2.7	Audio signals	No audio signals	N/A
5.3	**Protection against electrical energy sources**		P
5.3.1	General Requirements for accessible parts to ordinary, instructed and skilled persons	Only ES1.	P
5.3.1 a)	Accessible ES1/ES2 derived from ES2/ES3 circuits	Only ES1.	N/A
5.3.1 b)	Skilled persons not unintentional contact ES3 bare conductors		N/A
5.3.2.1	Accessibility to electrical energy sources and safeguards		N/A
	Accessibility to outdoor equipment bare parts	ES1	N/A
5.3.2.2	Contact requirements		N/A
	Test with test probe from Annex V		—
5.3.2.2 a)	Air gap – electric strength test potential (V) .....:		N/A
5.3.2.2 b)	Air gap – distance (mm) .....:		N/A
5.3.2.3	Compliance		N/A
5.3.2.4	Terminals for connecting stripped wire	No ES2 or ES3 circuits in the unit.	N/A
5.4	**Insulation materials and requirements**		P
5.4.1.2	Properties of insulating material	No hygroscopic insulation materials used. See list of critical components.	P

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.4.1.3	Material is non-hygroscopic		N/A
5.4.1.4	Maximum operating temperature for insulating materials .....:	(See appended table 5.4.1.4)	P
5.4.1.5	Pollution degrees.....:	PD2	P
5.4.1.5.2	Test for pollution degree 1 environment and for an insulating compound		N/A
5.4.1.5.3	Thermal cycling test		N/A
5.4.1.6	Insulation in transformers with varying dimensions	No such transformer used.	N/A
5.4.1.7	Insulation in circuits generating starting pulses	No such circuits.	N/A
5.4.1.8	Determination of working voltage .....:		N/A
5.4.1.9	Insulating surfaces	No accessible surface made of insulating material.	N/A
5.4.1.10	Thermoplastic parts on which conductive metallic parts are directly mounted		N/A
5.4.1.10.2	Vicat test.....:		N/A
5.4.1.10.3	Ball pressure test.....:		N/A
5.4.2	Clearances	Class III unit, only functional insulation not safety relevant.	N/A
5.4.2.1	General requirements		N/A
	Clearances in circuits connected to AC Mains, Alternative method		N/A
5.4.2.2	Procedure 1 for determining clearance		N/A
	Temporary overvoltage .....:		—
5.4.2.3	Procedure 2 for determining clearance		N/A
5.4.2.3.2.2	a.c. mains transient voltage .....:		—
5.4.2.3.2.3	d.c. mains transient voltage .....:		—
5.4.2.3.2.4	External circuit transient voltage.....:		—
5.4.2.3.2.5	Transient voltage determined by measurement .....:		—
5.4.2.4	Determining the adequacy of a clearance using an electric strength test .....:		N/A
5.4.2.5	Multiplication factors for clearances and test voltages:		N/A
5.4.2.6	Clearance measurement.....:		N/A
5.4.3	Creepage distances	Class III unit, only functional insulation not safety relevant.	N/A
5.4.3.1	General		N/A
5.4.3.3	Material group.....:	Material group IIIb considered.	—

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Clause	Requirement + Test	Result - Remark	Verdict
5.4.3.4	Creepage distances measurement .....:		N/A
5.4.4	Solid insulation		N/A
5.4.4.1	General requirements		N/A
5.4.4.2	Minimum distance through insulation .....:		N/A
5.4.4.3	Insulating compound forming solid insulation		N/A
5.4.4.4	Solid insulation in semiconductor devices		N/A
5.4.4.5	Insulating compound forming cemented joints		N/A
5.4.4.6	Thin sheet material		N/A
5.4.4.6.1	General requirements		N/A
5.4.4.6.2	Separable thin sheet material		N/A
	Number of layers (pcs) .....:		N/A
5.4.4.6.3	Non-separable thin sheet material		N/A
	Number of layers (pcs) .....:		N/A
5.4.4.6.4	Standard test procedure for non-separable thin sheet material .....:		N/A
5.4.4.6.5	Mandrel test		N/A
5.4.4.7	Solid insulation in wound components		N/A
5.4.4.9	Solid insulation at frequencies >30 kHz, E_P, K_R, d, V_{PW} (V) .....:		N/A
	Alternative by electric strength test, tested voltage (V), K_R .....:		N/A
5.4.5	Antenna terminal insulation		N/A
5.4.5.1	General		N/A
5.4.5.2	Voltage surge test		N/A
5.4.5.3	Insulation resistance (MΩ).....:		N/A
	Electric strength test.....:		N/A
5.4.6	Insulation of internal wire as part of supplementary safeguard		N/A
5.4.7	Tests for semiconductor components and for cemented joints		N/A
5.4.8	Humidity conditioning		N/A
	Relative humidity (%), temperature (°C), duration (h).....:		—
5.4.9	Electric strength test		N/A
5.4.9.1	Test procedure for type test of solid insulation.....:		N/A
5.4.9.2	Test procedure for routine test		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
5.4.10	Safeguards against transient voltages from external circuits		N/A
5.4.10.1	Parts and circuits separated from external circuits		N/A
5.4.10.2	Test methods		N/A
5.4.10.2.1	General		N/A
5.4.10.2.2	Impulse test ..... :		N/A
5.4.10.2.3	Steady-state test ..... :		N/A
5.4.10.3	Verification for insulation breakdown for impulse test ..... :		N/A
5.4.11	Separation between external circuits and earth		N/A
5.4.11.1	Exceptions to separation between external circuits and earth		N/A
5.4.11.2	Requirements		N/A
	SPDs bridge separation between external circuit and earth		N/A
	Rated operating voltage U_{op} (V) ..... :		—
	Nominal voltage U_{peak} (V) ..... :		—
	Max increase due to variation ΔU_{sp} ..... :		—
	Max increase due to ageing ΔU_{sa} ..... :		—
5.4.11.3	Test method and compliance ..... :		N/A
5.4.12	Insulating liquid		N/A
5.4.12.1	General requirements		N/A
5.4.12.2	Electric strength of an insulating liquid ..... :		N/A
5.4.12.3	Compatibility of an insulating liquid ..... :		N/A
5.4.12.4	Container for insulating liquid ..... :		N/A
5.5	**Components as safeguards**		N/A
5.5.1	General		N/A
5.5.2	Capacitors and RC units		N/A
5.5.2.1	General requirement		N/A
5.5.2.2	Safeguards against capacitor discharge after disconnection of a connector ..... :		N/A
5.5.3	Transformers		N/A
5.5.4	Optocouplers		N/A
5.5.5	Relays		N/A
5.5.6	Resistors		N/A
5.5.7	SPDs		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
5.5.8	Insulation between the mains and an external circuit consisting of a coaxial cable..... :		N/A
5.5.9	Safeguards for socket-outlets in outdoor equipment		N/A
	RCD rated residual operating current (mA) ..... :		—
5.6	**Protective conductor**		N/A
5.6.2	Requirement for protective conductors	Class III product. This clause is N/A.	N/A
5.6.2.1	General requirements		N/A
5.6.2.2	Colour of insulation		N/A
5.6.3	Requirement for protective earthing conductors		N/A
	Protective earthing conductor size (mm^2) ..... :		—
	Protective earthing conductor serving as a reinforced safeguard		N/A
	Protective earthing conductor serving as a double safeguard		N/A
5.6.4	Requirements for protective bonding conductors		N/A
5.6.4.1	Protective bonding conductors		N/A
	Protective bonding conductor size (mm^2). ..... :		—
5.6.4.2	Protective current rating (A)..... :		N/A
5.6.5	Terminals for protective conductors		N/A
5.6.5.1	Terminal size for connecting protective earthing conductors (mm) ..... :		N/A
	Terminal size for connecting protective bonding conductors (mm) .....:		N/A
5.6.5.2	Corrosion		N/A
5.6.6	Resistance of the protective bonding system		N/A
5.6.6.1	Requirements		N/A
5.6.6.2	Test Method..... :		N/A
5.6.6.3	Resistance (Ω) or voltage drop..... :		N/A
5.6.7	Reliable connection of a protective earthing conductor		N/A
5.6.8	Functional earthing		N/A
	Conductor size (mm^2)..... :		N/A
	Class II with functional earthing marking ..... :		N/A
	Appliance inlet cl & cr (mm) ..... :		N/A
5.7	**Prospective touch voltage, touch current and protective conductor current**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
5.7.2	Measuring devices and networks		N/A
5.7.2.1	Measurement of touch current		N/A
5.7.2.2	Measurement of voltage		N/A
5.7.3	Equipment set-up, supply connections and earth connections		N/A
5.7.4	Unearthed accessible parts ..... :		N/A
5.7.5	Earthed accessible conductive parts ..... :		N/A
5.7.6	Requirements when touch current exceeds ES2 limits		N/A
	Protective conductor current (mA) ..... :		N/A
	Instructional Safeguard ..... :		N/A
5.7.7	Prospective touch voltage and touch current associated with external circuits		N/A
5.7.7.1	Touch current from coaxial cables		N/A
5.7.7.2	Prospective touch voltage and touch current associated with paired conductor cables		N/A
5.7.8	Summation of touch currents from external circuits		N/A
	a) Equipment connected to earthed external circuits, current (mA) ..... :		N/A
	b) Equipment connected to unearthed external circuits, current (mA) ..... :		N/A
5.8	**Backfeed safeguard in battery backed up supplies**		N/A
	Mains terminal ES ..... :		N/A
	Air gap (mm) ..... :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
6	**ELECTRICALLY- CAUSED FIRE**		P
6.2	**Classification of PS and PIS**		P
6.2.2	Power source circuit classifications.....:	(See appended table 6.2.2) Units for building-in. and can be supplied via external power source with d.c. voltage range 2,5 – 5,5 V d.c. or external battery. Power supply source considered ES1, Limited Power Source.	N/A
6.2.3	Classification of potential ignition sources		P
6.2.3.1	Arcing PIS .....:		N/A
6.2.3.2	Resistive PIS .....:	All internal circuits considered resistive PIS.	P
6.3	**Safeguards against fire under normal operating and abnormal operating conditions**		P
6.3.1	No ignition and attainable temperature value less than 90 % defined by ISO 871 or less than 300 °C for unknown materials ..... :	(See appended table B.1.5 and B.3)	P
	Combustible materials outside fire enclosure .....:		N/A
6.4	**Safeguards against fire under single fault conditions**		P
6.4.1	Safeguard method	Control fire spread. Selection and application of supplementary safeguards for components, wiring, materials and constructional measures that reduce the spread of fire. Fire enclosure is not required.	P
6.4.2	Reduction of the likelihood of ignition under single fault conditions in PS1 circuits		N/A
6.4.3	Reduction of the likelihood of ignition under single fault conditions in PS2 and PS3 circuits		N/A
6.4.3.1	Supplementary safeguards		N/A
6.4.3.2	Single Fault Conditions ..... :		N/A
	Special conditions for temperature limited by fuse		N/A
6.4.4	Control of fire spread in PS1 circuits		N/A
6.4.5	Control of fire spread in PS2 circuits		P

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Clause	Requirement + Test	Result - Remark	Verdict
6.4.5.2	Supplementary safeguards	Components other than PCB and wires are: - mounted on PCB rated V-1 or better, or -mass of components made of combustible materials less than 4g	P
6.4.6	Control of fire spread in PS3 circuits		N/A
6.4.7	Separation of combustible materials from a PIS		P
6.4.7.2	Separation by distance	All components and combustible materials other than small parts are either rated at least V-1 or mounted on material with rating minimum V-0.	N/A
6.4.7.3	Separation by a fire barrier		N/A
6.4.8	Fire enclosures and fire barriers	Unit supplied from LPS. Fire enclosure not required.	N/A
6.4.8.2	Fire enclosure and fire barrier material properties		N/A
6.4.8.2.1	Requirements for a fire barrier		N/A
6.4.8.2.2	Requirements for a fire enclosure		N/A
6.4.8.3	Constructional requirements for a fire enclosure and a fire barrier		N/A
6.4.8.3.1	Fire enclosure and fire barrier openings		N/A
6.4.8.3.2	Fire barrier dimensions		N/A
6.4.8.3.3	Top openings and properties		N/A
	Openings dimensions (mm)..... :		N/A
6.4.8.3.4	Bottom openings and properties		N/A
	Openings dimensions (mm)..... :		N/A
	Flammability tests for the bottom of a fire enclosure		N/A
	Instructional Safeguard.....:		N/A
6.4.8.3.5	Side openings and properties		N/A
	Openings dimensions (mm)..... :		N/A
6.4.8.3.6	Integrity of a fire enclosure, condition met: a), b) or c)..... :		N/A
6.4.8.4	Separation of a PIS from a fire enclosure and a fire barrier distance (mm) or flammability rating ..... :		N/A
6.4.9	Flammability of insulating liquid.....:		N/A
6.5	**Internal and external wiring**		N/A
6.5.1	General requirements	No internal wiring.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
6.5.2	Requirements for interconnection to building wiring ..... :		N/A
6.5.3	Internal wiring size (mm^2) for socket-outlets..... :		N/A
6.6	**Safeguards against fire due to the connection to additional equipment**		N/A
		No such outputs for supplying additional equipment.	N/A
7	**INJURY CAUSED BY HAZARDOUS SUBSTANCES**		N/A
7.2	**Reduction of exposure to hazardous substances**		N/A
		No hazardous substances.	N/A
7.3	**Ozone exposure**		N/A
		Unit does not produce ozone.	N/A
7.4	**Use of personal safeguards or personal protective equipment (PPE)**		N/A
	Personal safeguards and instructions ..... :		—
7.5	**Use of instructional safeguards and instructions**		N/A
	Instructional safeguard (ISO 7010)..... :		—
7.6	**Batteries and their protection circuits**		N/A
	(See Annex M)	No batteries.	N/A
8	**MECHANICALLY-CAUSED INJURY**		P
8.2	**Mechanical energy source classifications**		P
		Sharp edges and corners, and equipment mass are both classified as MS1. There are no moving parts inside the unit neither equipment is intended for wall/ceiling mounting.	P
8.3	**Safeguards against mechanical energy sources**		N/A
		No safeguard is required to be interposed between MS1 and an ordinary person.	N/A
8.4	**Safeguards against parts with sharp edges and corners**		N/A
		No parts with sharp edges or corners.	N/A
8.4.1	Safeguards		N/A
	Instructional Safeguard.....:		N/A
8.4.2	Sharp edges or corners		N/A
8.5	**Safeguards against moving parts**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
		No moving parts.	N/A
8.5.1	Fingers, jewellery, clothing, hair, etc., contact with MS2 or MS3 parts		N/A
	MS2 or MS3 part required to be accessible for the function of the equipment	No such part.	N/A
	Moving MS3 parts only accessible to skilled person		N/A
8.5.2	Instructional safeguard.....:		N/A
8.5.4	Special categories of equipment containing moving parts		N/A
8.5.4.1	General		N/A
8.5.4.2	Equipment containing work cells with MS3 parts		N/A
8.5.4.2.1	Protection of persons in the work cell		N/A
8.5.4.2.2	Access protection override		N/A
8.5.4.2.2.1	Override system		N/A
8.5.4.2.2.2	Visual indicator		N/A
8.5.4.2.3	Emergency stop system		N/A
	Maximum stopping distance from the point of activation (m).....:		N/A
	Space between end point and nearest fixed mechanical part (mm) .....:		N/A
8.5.4.2.4	Endurance requirements		N/A
	Mechanical system subjected to 100 000 cycles of operation		N/A
	- Mechanical function check and visual inspection		N/A
	- Cable assembly .....:		N/A
8.5.4.3	Equipment having electromechanical device for destruction of media		N/A
8.5.4.3.1	Equipment safeguards		N/A
8.5.4.3.2	Instructional safeguards against moving parts .....:		N/A
8.5.4.3.3	Disconnection from the supply		N/A
8.5.4.3.4	Cut type and test force (N).....:		N/A
8.5.4.3.5	Compliance		N/A
8.5.5	High pressure lamps		N/A
	Explosion test.....:		N/A
8.5.5.3	Glass particles dimensions (mm) .....:		N/A
8.6	**Stability of equipment**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
8.6.1	General	Equipment mass is <7kg and classified MS1. No stability requirements are applicable.	N/A
	Instructional safeguard.....:	The EUT is not a TV set.	N/A
8.6.2	Static stability		N/A
8.6.2.2	Static stability test .....:		N/A
8.6.2.3	Downward force test		N/A
8.6.3	Relocation stability		N/A
	Wheels diameter (mm) .....:		—
	Tilt test		N/A
8.6.4	Glass slide test		N/A
8.6.5	Horizontal force test.....:		N/A
8.7	**Equipment mounted to wall, ceiling or other structure**		N/A
		The EUT is not intended for wall or ceiling mounting.	N/A
8.7.1	Mount means type .....:		N/A
8.7.2	Test methods		N/A
	Test 1, additional downwards force (N).....:		N/A
	Test 2, number of attachment points and test force (N).....:		N/A
	Test 3 Nominal diameter (mm) and applied torque (Nm).....:		N/A
8.8	**Handles strength**		N/A
8.8.1	General	No handles.	N/A
8.8.2	Handle strength test		N/A
	Number of handles.....:		—
	Force applied (N) .....:		—
8.9	**Wheels or casters attachment requirements**		N/A
		No wheels or casters.	N/A
8.9.2	Pull test		N/A
8.10	**Carts, stands and similar carriers**		N/A
		No cart, stand or similar carriers.	N/A
8.10.1	General		N/A
8.10.2	Marking and instructions.....:		N/A
8.10.3	Cart, stand or carrier loading test		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Loading force applied (N) .....:		N/A
8.10.4	Cart, stand or carrier impact test		N/A
8.10.5	Mechanical stability		N/A
	Force applied (N) .....:		—
8.10.6	Thermoplastic temperature stability		N/A
8.11	**Mounting means for slide-rail mounted equipment (SRME)**		N/A
		The EUT is not intended for rack mounting. No slide-rails provided.	N/A
8.11.1	General		N/A
8.11.2	Requirements for slide rails		N/A
	Instructional Safeguard.....:		N/A
8.11.3	Mechanical strength test		N/A
8.11.3.1	Downward force test, force (N) applied.....:		N/A
8.11.3.2	Lateral push force test		N/A
8.11.3.3	Integrity of slide rail end stops		N/A
8.11.4	Compliance		N/A
8.12	**Telescoping or rod antennas**		N/A
		No telescoping or rod antennas.	N/A
	Button/ball diameter (mm) .....:		—

9	**THERMAL BURN INJURY**		P
9.2	**Thermal energy source classifications**		P
		All accessible surfaces are classified as TS1.	P
9.3	**Touch temperature limits**		P
9.3.1	Touch temperatures of accessible parts .....:	(See appended table)	P
9.3.2	Test method and compliance		P
9.4	**Safeguards against thermal energy sources**		P
		No safeguard needs to be interposed between TS1 and any person.	N/A
9.5	**Requirements for safeguards**		N/A
9.5.1	Equipment safeguard	All temperatures are limited to TS1. See enclosed table.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
9.5.2	Instructional safeguard.....:	No part at TS2 or TS3.	N/A
9.6	**Requirements for wireless power transmitters**		N/A
9.6.1	General		N/A
9.6.2	Specification of the foreign objects		N/A
9.6.3	Test method and compliance .....:		N/A
10	**RADIATION**		P
10.2	**Radiation energy source classification**		P
		No hazardous radiation energy sources as specified in this standard are present. Control LED is considered low power application LED and specified as RS1.	P
10.2.1	General classification	RS1 low power LED	P
	Lasers ..... :	/	—
	Lamps and lamp systems ..... :	/	—
	Image projectors ..... :	/	—
	X-Ray ..... :	/	—
	Personal music player ..... :	/	—
10.3	**Safeguards against laser radiation**		N/A
		No laser source inside the unit.	N/A
	The standard(s) equipment containing laser(s) comply .....:		N/A
10.4	**Safeguards against optical radiation from lamps and lamp systems (including LED types)**		N/A
10.4.1	General requirements	RS1 low power LED	N/A
	Instructional safeguard provided for accessible radiation level needs to exceed		N/A
	Risk group marking and location .....:		N/A
	Information for safe operation and installation		N/A
10.4.2	Requirements for enclosures		N/A
	UV radiation exposure .....:		N/A
10.4.3	Instructional safeguard ..... :		N/A
10.5	**Safeguards against X-radiation**		N/A
		No X-Radiation.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
10.5.1	Requirements		N/A
	Instructional safeguard for skilled persons ..... :		—
10.5.3	Maximum radiation (pA/kg)..... :		—
10.6	**Safeguards against acoustic energy sources**		N/A
		The EUT is not a personal music player.	N/A
10.6.1	General		N/A
10.6.2	Classification		N/A
	Acoustic output $L_{Aeq,T}$, dB(A).....:		N/A
	Unweighted RMS output voltage (mV).....:		N/A
	Digital output signal (dBFS).....:		N/A
10.6.3	Requirements for dose-based systems		N/A
10.6.3.1	General requirements		N/A
10.6.3.2	Dose-based warning and automatic decrease		N/A
10.6.3.3	Exposure-based warning and requirements		N/A
	30 s integrated exposure level (MEL30) .....:		N/A
	Warning for MEL ≥ 100 dB(A) .....:		N/A
10.6.4	Measurement methods		N/A
10.6.5	Protection of persons		N/A
	Instructional safeguards ..... :		N/A
10.6.6	Requirements for listening devices (headphones, earphones, etc.)		N/A
10.6.6.1	Corded listening devices with analogue input		N/A
	Listening device input voltage (mV)..... :		N/A
10.6.6.2	Corded listening devices with digital input		N/A
	Max. acoustic output $L_{Aeq,T}$, dB(A) .....:		N/A
10.6.6.3	Cordless listening devices		N/A
	Max. acoustic output $L_{Aeq,T}$, dB(A) .....:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

B	**NORMAL OPERATING CONDITION TESTS, ABNORMAL OPERATING CONDITION TESTS AND SINGLE FAULT CONDITION TESTS**		P
B.1	**General**		P
B.1.5	Temperature measurement conditions	(See appended table B.1.5)	P
B.2	**Normal operating conditions**		P
B.2.1	General requirements ..... :	(See Test Item Particulars and appended test tables)	P
	Audio Amplifiers and equipment with audio amplifiers ..... :		N/A
B.2.3	Supply voltage and tolerances		P
B.2.5	Input test ..... :	(See appended table B.2.5)	P
B.3	**Simulated abnormal operating conditions**		N/A
B.3.1	General		N/A
B.3.2	Covering of ventilation openings	No ventilation openings.	N/A
	Instructional safeguard ..... :		N/A
B.3.3	DC mains polarity test	Special connector used.	N/A
B.3.4	Setting of voltage selector	No voltage selector.	N/A
B.3.5	Maximum load at output terminals	No output terminal for supplying power to other equipment.	N/A
B.3.6	Reverse battery polarity		N/A
B.3.7	Audio amplifier abnormal operating conditions		N/A
B.3.8	Safeguards functional during and after abnormal operating conditions ..... :		N/A
B.4	**Simulated single fault conditions**		N/A
B.4.1	General	Control of fire spread method used. No tests performed.	N/A
B.4.2	Temperature controlling device	No temperature controlling device.	N/A
B.4.3	Blocked motor test	No motor.	N/A
B.4.4	Functional insulation		N/A
B.4.4.1	Short circuit of clearances for functional insulation		N/A
B.4.4.2	Short circuit of creepage distances for functional insulation		N/A
B.4.4.3	Short circuit of functional insulation on coated printed boards		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
B.4.5	Short-circuit and interruption of electrodes in tubes and semiconductors		N/A
B.4.6	Short circuit or disconnection of passive components	See appended table B.4.	N/A
B.4.7	Continuous operation of components		N/A
B.4.8	Compliance during and after single fault conditions ..... :	(See appended table B.4)	N/A
B.4.9	Battery charging and discharging under single fault conditions	(See Annex M) No batteries.	N/A
C	**UV RADIATION**		N/A
C.1	**Protection of materials in equipment from UV radiation**		N/A
C.1.2	Requirements	Units for building-in.	N/A
C.1.3	Test method		N/A
C.2	**UV light conditioning test**		N/A
C.2.1	Test apparatus..... :		N/A
C.2.2	Mounting of test samples		N/A
C.2.3	Carbon-arc light-exposure test		N/A
C.2.4	Xenon-arc light-exposure test		N/A
D	**TEST GENERATORS**		N/A
D.1	**Impulse test generators**		N/A
D.2	**Antenna interface test generator**		N/A
D.3	**Electronic pulse generator**		N/A
E	**TEST CONDITIONS FOR EQUIPMENT CONTAINING AUDIO AMPLIFIERS**		N/A
E.1	**Electrical energy source classification for audio signals**		N/A
	Maximum non-clipped output power (W)..... :		—
	Rated load impedance (Ω) ..... :		—
	Open-circuit output voltage (V)..... :		—
	Instructional safeguard ..... :		—
E.2	**Audio amplifier normal operating conditions**		N/A
	Audio signal source type ..... :		—
	Audio output power (W)..... :		—
	Audio output voltage (V) ..... :		—
	Rated load impedance (Ω) ..... :		—
	Requirements for temperature measurement		N/A
E.3	Audio amplifier abnormal operating conditions		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
F	**EQUIPMENT MARKINGS, INSTRUCTIONS, AND INSTRUCTIONAL SAFEGUARDS**		P
F.1	**General**		P
	Language ..... :	English	—
F.2	**Letter symbols and graphical symbols**		P
F.2.1	Letter symbols according to IEC60027-1		P
F.2.2	Graphic symbols according to IEC, ISO or manufacturer specific		P
F.3	**Equipment markings**		P
F.3.1	Equipment marking locations		P
F.3.2	Equipment identification markings	Units for building-in.	P
F.3.2.1	Manufacturer identification ..... :	In specifications	P
F.3.2.2	Model identification ..... :	In specifications	P
F.3.3	Equipment rating markings	In specifications	P
F.3.3.1	Equipment with direct connection to mains		N/A
F.3.3.2	Equipment without direct connection to mains	No electrical markings on the unit.	P
F.3.3.3	Nature of the supply voltage..... :	In specifications	P
F.3.3.4	Rated voltage..... :	In specifications	P
F.3.3.5	Rated frequency ..... :		N/A
F.3.3.6	Rated current or rated power..... :	In specifications	P
F.3.3.7	Equipment with multiple supply connections		N/A
F.3.4	Voltage setting device		N/A
F.3.5	Terminals and operating devices		N/A
.1	Mains appliance outlet and socket-outlet markings ..... :		N/A
F.3.5.2	Switch position identification marking..... :		N/A
F.3.5.3	Replacement fuse identification and rating markings ..... :		N/A
	Instructional safeguards for neutral fuse ..... :		N/A
F.3.5.4	Replacement battery identification marking ..... :		N/A
F.3.5.5	Neutral conductor terminal		N/A
F.3.5.6	Terminal marking location		N/A
F.3.6	Equipment markings related to equipment classification		N/A
F.3.6.1	Class I equipment	Class III	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
F.3.6.1.1	Protective earthing conductor terminal ..... :		N/A
F.3.6.1.2	Protective bonding conductor terminals ..... :		N/A
F.3.6.2	Equipment class marking ..... :		N/A
F.3.6.3	Functional earthing terminal marking ..... :		N/A
F.3.7	Equipment IP rating marking ..... :		N/A
F.3.8	External power supply output marking ..... :		N/A
F.3.9	Durability, legibility and permanence of marking		N/A
F.3.10	Test for permanence of markings	Unit for building-in.	N/A
F.4	**Instructions**		N/A
	a) Information prior to installation and initial use	Unit for building-in. Instructions are end-product consideration.	N/A
	b) Equipment for use in locations where children not likely to be present		N/A
	c) Instructions for installation and interconnection		N/A
	d) Equipment intended for use only in restricted access area		N/A
	e) Equipment intended to be fastened in place		N/A
	f) Instructions for audio equipment terminals		N/A
	g) Protective earthing used as a safeguard		N/A
	h) Protective conductor current exceeding ES2 limits		N/A
	i) Graphic symbols used on equipment		N/A
	j) Permanently connected equipment not provided with all-pole mains switch		N/A
	k) Replaceable components or modules providing safeguard function		N/A
	l) Equipment containing insulating liquid		N/A
	m) Installation instructions for outdoor equipment		N/A
F.5	Instructional safeguards		N/A
G	**COMPONENTS**		P
G.1	**Switches**		N/A
G.1.1	General		N/A
G.1.2	Ratings, endurance, spacing, maximum load		N/A
G.1.3	Test method and compliance		N/A
G.2	**Relays**		N/A
G.2.1	Requirements		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
G.2.2	Overload test		N/A
G.2.3	Relay controlling connectors supplying power to other equipment		N/A
G.2.4	Test method and compliance		N/A
G.3	**Protective devices**		N/A
G.3.1	Thermal cut-offs		N/A
	Thermal cut-outs separately approved according to IEC 60730 with conditions indicated in a) & b)		N/A
	Thermal cut-outs tested as part of the equipment as indicated in c)		N/A
G.3.1.2	Test method and compliance		N/A
G.3.2	Thermal links		N/A
G.3.2.1	a) Thermal links tested separately according to IEC 60691 with specifics		N/A
	b) Thermal links tested as part of the equipment		N/A
G.3.2.2	Test method and compliance		N/A
G.3.3	PTC thermistors		N/A
G.3.4	Overcurrent protection devices		N/A
G.3.5	Safeguards components not mentioned in G.3.1 to G.3.4		N/A
G.3.5.1	Non-resettable devices suitably rated and marking provided		N/A
G.3.5.2	Single faults conditions ..... :		N/A
G.4	**Connectors**		N/A
G.4.1	Spacings	Only ES1	N/A
G.4.2	Mains connector configuration..... :		N/A
G.4.3	Plug is shaped that insertion into mains socket-outlets or appliance coupler is unlikely		N/A
G.5	**Wound components**		N/A
G.5.1	Wire insulation in wound components		N/A
G.5.1.2	Protection against mechanical stress		N/A
G.5.2	Endurance test		N/A
G.5.2.1	General test requirements		N/A
G.5.2.2	Heat run test		N/A
	Test time (days per cycle) ..... :		—
	Test temperature (°C)..... :		—
G.5.2.3	Wound components supplied from the mains		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
G.5.2.4	No insulation breakdown		N/A
G.5.3	Transformers		N/A
G.5.3.1	Compliance method..... :		N/A
	Position ..... :		N/A
	Method of protection..... :		N/A
G.5.3.2	Insulation		N/A
	Protection from displacement of windings..... :		—
G.5.3.3	Transformer overload tests		N/A
G.5.3.3.1	Test conditions		N/A
G.5.3.3.2	Winding temperatures		N/A
G.5.3.3.3	Winding temperatures - alternative test method		N/A
G.5.3.4	Transformers using FIW		N/A
G.5.3.4.1	General		N/A
	FIW wire nominal diameter..... :		—
G.5.3.4.2	Transformers with basic insulation only		N/A
G.5.3.4.3	Transformers with double insulation or reinforced insulation..... :		N/A
G.5.3.4.4	Transformers with FIW wound on metal or ferrite core		N/A
G.5.3.4.5	Thermal cycling test and compliance		N/A
G.5.3.4.6	Partial discharge test		N/A
G.5.3.4.7	Routine test		N/A
G.5.4	Motors		N/A
G.5.4.1	General requirements		N/A
G.5.4.2	Motor overload test conditions		N/A
G.5.4.3	Running overload test		N/A
G.5.4.4.2	Locked-rotor overload test		N/A
	Test duration (days) ..... :		—
G.5.4.5	Running overload test for DC motors		N/A
G.5.4.5.2	Tested in the unit		N/A
G.5.4.5.3	Alternative method		N/A
G.5.4.6	Locked-rotor overload test for DC motors		N/A
G.5.4.6.2	Tested in the unit		N/A
	Maximum Temperature ..... :		N/A
G.5.4.6.3	Alternative method		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
G.5.4.7	Motors with capacitors		N/A
G.5.4.8	Three-phase motors		N/A
G.5.4.9	Series motors		N/A
	Operating voltage ..... :		—
G.6	**Wire Insulation**		N/A
G.6.1	General		N/A
G.6.2	Enamelled winding wire insulation		N/A
G.7	**Mains supply cords**		N/A
G.7.1	General requirements	Not connected to the mains.	N/A
	Type ..... :		—
G.7.2	Cross sectional area (mm^2 or AWG) ..... :		N/A
G.7.3	Cord anchorages and strain relief for non-detachable power supply cords		N/A
G.7.3.2	Cord strain relief		N/A
G.7.3.2.1	Requirements		N/A
	Strain relief test force (N) ..... :		N/A
G.7.3.2.2	Strain relief mechanism failure		N/A
G.7.3.2.3	Cord sheath or jacket position, distance (mm) ..... :		N/A
G.7.3.2.4	Strain relief and cord anchorage material		N/A
G.7.4	Cord Entry		N/A
G.7.5	Non-detachable cord bend protection		N/A
G.7.5.1	Requirements		N/A
G.7.5.2	Test method and compliance		N/A
	Overall diameter or minor overall dimension, *D* (mm) ..... :		—
	Radius of curvature after test (mm) ..... :		—
G.7.6	Supply wiring space		N/A
G.7.6.1	General requirements		N/A
G.7.6.2	Stranded wire		N/A
G.7.6.2.1	Requirements		N/A
G.7.6.2.2	Test with 8 mm strand		N/A
G.8	**Varistors**		N/A
G.8.1	General requirements		N/A
G.8.2	Safeguards against fire		N/A
G.8.2.1	General		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
G.8.2.2	Varistor overload test		N/A
G.8.2.3	Temporary overvoltage test		N/A
G.9	**Integrated circuit (IC) current limiters**		N/A
G.9.1	Requirements		N/A
	IC limiter output current (max. 5A)..... :		—
	Manufacturers' defined drift ..... :		—
G.9.2	Test Program		N/A
G.9.3	Compliance		N/A
G.10	**Resistors**		N/A
G.10.1	General		N/A
G.10.2	Conditioning		N/A
G.10.3	Resistor test		N/A
G.10.4	Voltage surge test		N/A
G.10.5	Impulse test		N/A
G.10.6	Overload test		N/A
G.11	**Capacitors and RC units**		N/A
G.11.1	General requirements		N/A
G.11.2	Conditioning of capacitors and RC units		N/A
G.11.3	Rules for selecting capacitors		N/A
G.12	**Optocouplers**		N/A
	Optocouplers comply with IEC 60747-5-5 with specifics		N/A
	Type test voltage $V_{ini,a}$..... :		—
	Routine test voltage, $V_{ini,b}$ ..... :		—
G.13	**Printed boards**		P
G.13.1	General requirements	Only ES1 within the unit.	P
G.13.2	Uncoated printed boards	Only functional insulation.	N/A
G.13.3	Coated printed boards	No special coating used on PCB.	N/A
G.13.4	Insulation between conductors on the same inner surface		N/A
G.13.5	Insulation between conductors on different surfaces		N/A
	Distance through insulation ..... :		N/A
	Number of insulation layers (pcs) ..... :		—
G.13.6	Tests on coated printed boards		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
G.13.6.1	Sample preparation and preliminary inspection		N/A
G.13.6.2	Test method and compliance		N/A
G.14	**Coating on components terminals**		N/A
G.14.1	Requirements ..... :		N/A
G.15	**Pressurized liquid filled components**		N/A
G.15.1	Requirements		N/A
G.15.2	Test methods and compliance		N/A
G.15.2.1	Hydrostatic pressure test		N/A
G.15.2.2	Creep resistance test		N/A
G.15.2.3	Tubing and fittings compatibility test		N/A
G.15.2.4	Vibration test		N/A
G.15.2.5	Thermal cycling test		N/A
G.15.2.6	Force test		N/A
G.15.3	Compliance		N/A
G.16	**IC including capacitor discharge function (ICX)**		N/A
G.16.1	Condition for fault tested is not required		N/A
	ICX with associated circuitry tested in equipment		N/A
	ICX tested separately		N/A
G.16.2	Tests		N/A
	Smallest capacitance and smallest resistance specified by ICX manufacturer for impulse test..... :		—
	Mains voltage that impulses to be superimposed on ..... :		—
	Largest capacitance and smallest resistance for ICX tested by itself for 10000 cycles test ..... :		—
G.16.3	Capacitor discharge test..... :		N/A
H	**CRITERIA FOR TELEPHONE RINGING SIGNALS**		N/A
H.1	**General**		N/A
		No ringing generator.	N/A
H.2	**Method A**		N/A
H.3	**Method B**		N/A
H.3.1	Ringing signal		N/A
H.3.1.1	Frequency (Hz) ..... :		—
H.3.1.2	Voltage (V) ..... :		—
H.3.1.3	Cadence; time (s) and voltage (V) ..... :		—

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Clause	Requirement + Test	Result - Remark	Verdict
H.3.1.4	Single fault current (mA): ..... :		—
H.3.2	Tripping device and monitoring voltage		N/A
H.3.2.1	Conditions for use of a tripping device or a monitoring voltage		N/A
H.3.2.2	Tripping device		N/A
H.3.2.3	Monitoring voltage (V) ..... :		N/A
J	**INSULATED WINDING WIRES FOR USE WITHOUT INTERLEAVED INSULATION**		N/A
J.1	**General**		N/A
	Winding wire insulation ..... :		—
	Solid round winding wire, diameter (mm) ..... :		N/A
	Solid square and rectangular (flatwise bending) winding wire, cross-sectional area (mm^2) ..... :		N/A
J.2/J.3	Tests and Manufacturing		—
K	**SAFETY INTERLOCKS**		N/A
K.1	**General requirements**		N/A
	Instructional safeguard ..... :		N/A
K.2	**Components of safety interlock safeguard mechanism**		N/A
K.3	**Inadvertent change of operating mode**		N/A
K.4	**Interlock safeguard override**		N/A
K.5	**Fail-safe**		N/A
K.5.1	Under single fault condition		N/A
K.6	**Mechanically operated safety interlocks**		N/A
K.6.1	Endurance requirement		N/A
K.6.2	Test method and compliance ..... :		N/A
K.7	**Interlock circuit isolation**		N/A
K.7.1	Separation distance for contact gaps & interlock circuit elements		N/A
	In circuit connected to mains, separation distance for contact gaps (mm) ..... :		N/A
	In circuit isolated from mains, separation distance for contact gaps (mm) ..... :		N/A
	Electric strength test before and after the test of K.7.2 ..... :		N/A
K.7.2	Overload test, Current (A) ..... :		N/A
K.7.3	Endurance test		N/A
K.7.4	Electric strength test		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
L	**DISCONNECT DEVICES**		N/A
L.1	**General requirements**		N/A
L.2	**Permanently connected equipment**		N/A
L.3	**Parts that remain energized**		N/A
L.4	**Single-phase equipment**		N/A
L.5	**Three-phase equipment**		N/A
L.6	**Switches as disconnect devices**		N/A
L.7	**Plugs as disconnect devices**		N/A
L.8	**Multiple power sources**		N/A
	Instructional safeguard ..... :		N/A
M	**EQUIPMENT CONTAINING BATTERIES AND THEIR PROTECTION CIRCUITS**		N/A
M.1	**General requirements**		N/A
		No batteries.	N/A
M.2	**Safety of batteries and their cells**		N/A
M.2.1	Batteries and their cells comply with relevant IEC standards ..... :		N/A
M.3	**Protection circuits for batteries provided within the equipment**		N/A
M.3.1	Requirements		N/A
M.3.2	Test method		N/A
	Overcharging of a rechargeable battery		N/A
	Excessive discharging		N/A
	Unintentional charging of a non-rechargeable battery		N/A
	Reverse charging of a rechargeable battery		N/A
M.3.3	Compliance	(See appended table M.3)	N/A
M.4	**Additional safeguards for equipment containing a portable secondary lithium battery**		N/A
M.4.1	General		N/A
M.4.2	Charging safeguards		N/A
M.4.2.1	Requirements		N/A
M.4.2.2	Compliance ..... :	(See appended table M.4.2)	N/A
M.4.3	Fire enclosure ..... :		N/A
M.4.4	Drop test of equipment containing a secondary lithium battery		N/A
M.4.4.2	Preparation and procedure for the drop test		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
M.4.4.3	Drop, Voltage on reference and dropped batteries (V); voltage difference during 24 h period (%): ..... :		N/A
M.4.4.4	Check of the charge/discharge function		N/A
M.4.4.5	Charge / discharge cycle test		N/A
M.4.4.6	Compliance		N/A
M.5	**Risk of burn due to short-circuit during carrying**		N/A
M.5.1	Requirement		N/A
M.5.2	Test method and compliance		N/A
M.6	**Safeguards against short-circuits**		N/A
M.6.1	External and internal faults		N/A
M.6.2	Compliance		N/A
M.7	**Risk of explosion from lead acid and NiCd batteries**		N/A
M.7.1	Ventilation preventing explosive gas concentration		N/A
	Calculated hydrogen generation rate ..... :		N/A
M.7.2	Test method and compliance		N/A
	Minimum air flow rate, Q (m^3/h) ..... :		N/A
M.7.3	Ventilation tests		N/A
M.7.3.1	General		N/A
M.7.3.2	Ventilation test – alternative 1		N/A
	Hydrogen gas concentration (%) ..... :		N/A
M.7.3.3	Ventilation test – alternative 2		N/A
	Obtained hydrogen generation rate..... :		N/A
M.7.3.4	Ventilation test – alternative 3		N/A
	Hydrogen gas concentration (%) ..... :		N/A
M.7.4	Marking ..... :		N/A
M.8	**Protection against internal ignition from external spark sources of batteries with aqueous electrolyte**		N/A
M.8.1	General		N/A
M.8.2	Test method		N/A
M.8.2.1	General		N/A
M.8.2.2	Estimation of hypothetical volume V_Z (m^3/s)..... :		—
M.8.2.3	Correction factors ..... :		—
M.8.2.4	Calculation of distance d (mm) ..... :		—
M.9	**Preventing electrolyte spillage**		N/A
M.9.1	Protection from electrolyte spillage		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
M.9.2	Tray for preventing electrolyte spillage		N/A
M.10	Instructions to prevent reasonably foreseeable misuse		N/A
	Instructional safeguard ..... :		N/A
N	**ELECTROCHEMICAL POTENTIALS**		N/A
	Material(s) used ..... :		—
O	**MEASUREMENT OF CREEPAGE DISTANCES AND CLEARANCES**		N/A
	Value of *X* (mm) ..... :		—
P	**SAFEGUARDS AGAINST CONDUCTIVE OBJECTS**		N/A
P.1	**General**		N/A
P.2	**Safeguards against entry or consequences of entry of a foreign object**		N/A
P.2.1	General		N/A
P.2.2	Safeguards against entry of a foreign object		N/A
	Location and Dimensions (mm) ..... :		—
P.2.3	Safeguards against the consequences of entry of a foreign object		N/A
P.2.3.1	Safeguard requirements		N/A
	The ES3 and PS3 keep-out volume in Figure P.3 not applicable to transportable equipment		N/A
	Transportable equipment with metalized plastic parts ..... :		N/A
P.2.3.2	Consequence of entry test ..... :		N/A
P.3	**Safeguards against spillage of internal liquids**		N/A
P.3.1	General		N/A
P.3.2	Determination of spillage consequences		N/A
P.3.3	Spillage safeguards		N/A
P.3.4	Compliance		N/A
P.4	**Metallized coatings and adhesives securing parts**		N/A
P.4.1	General		N/A
P.4.2	Tests		N/A
	Conditioning, T_C (°C) ..... :		—
	Duration (weeks) ..... :		—
Q	**CIRCUITS INTENDED FOR INTERCONNECTION WITH BUILDING WIRING**		N/A
Q.1	**Limited power sources**	Unit supplied from LPS.	N/A
Q.1.1	Requirements		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	a) Inherently limited output		N/A
	b) Impedance limited output		N/A
	c) Regulating network limited output		N/A
	d) Overcurrent protective device limited output		N/A
	e) IC current limiter complying with G.9		N/A
Q.1.2	Test method and compliance ..... :		N/A
	Current rating of overcurrent protective device (A) ..... :		N/A
Q.2	**Test for external circuits – paired conductor cable**		N/A
	Maximum output current (A) ..... :		N/A
	Current limiting method ..... :		—
R	**LIMITED SHORT CIRCUIT TEST**		N/A
R.1	**General**	Class III unit.	N/A
R.2	**Test setup**		N/A
	Overcurrent protective device for test..... :		—
R.3	**Test method**		N/A
	Cord/cable used for test ..... :		—
R.4	**Compliance**		N/A
S	**TESTS FOR RESISTANCE TO HEAT AND FIRE**		N/A
S.1	**Flammability test for fire enclosures and fire barrier materials of equipment where the steady state power does not exceed 4 000 W**		N/A
	Samples, material ..... :	Certified materials used. No additional testing considered required. See list of critical components.	—
	Wall thickness (mm) ..... :		—
	Conditioning (°C) ..... :		—
	Test flame according to IEC 60695-11-5 with conditions as set out		N/A
	- Material not consumed completely		N/A
	- Material extinguishes within 30s		N/A
	- No burning of layer or wrapping tissue		N/A
S.2	**Flammability test for fire enclosure and fire barrier integrity**		N/A
	Samples, material ..... :		—
	Wall thickness (mm) ..... :		—

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Clause	Requirement + Test	Result - Remark	Verdict
	Conditioning (°C) ..... :		—
S.3	**Flammability test for the bottom of a fire enclosure**		N/A
S.3.1	Mounting of samples		N/A
S.3.2	Test method and compliance		N/A
	Mounting of samples ..... :		—
	Wall thickness (mm) ..... :		—
S.4	**Flammability classification of materials**		N/A
S.5	**Flammability test for fire enclosures and fire barrier materials of equipment where the steady state power exceeding 4 000 W**		N/A
	Samples, material ..... :		—
	Wall thickness (mm) ..... :		—
	Conditioning (°C) ..... :		—
T	**MECHANICAL STRENGTH TESTS**		N/A
T.1	**General**		N/A
T.2	**Steady force test, 10 N ..... :**	(See appended table T.2)	N/A
T.3	**Steady force test, 30 N ..... :**	(See appended table T.3)	N/A
T.4	**Steady force test, 100 N ..... :**		N/A
T.5	**Steady force test, 250 N ..... :**		N/A
T.6	**Enclosure impact test**		N/A
	Fall test		N/A
	Swing test		N/A
T.7	**Drop test ..... :**	(See appended table T.7)	N/A
T.8	**Stress relief test..... :**	(See appended table T.8)	N/A
T.9	**Glass Impact Test .....:**		N/A
T.10	**Glass fragmentation test**		N/A
	Number of particles counted.....:		N/A
T.11	**Test for telescoping or rod antennas**		N/A
	Torque value (Nm) ..... :		N/A
U	**MECHANICAL STRENGTH OF CATHODE RAY TUBES (CRT) AND PROTECTION AGAINST THE EFFECTS OF IMPLOSION**		N/A
U.1	**General**		N/A
	Instructional safeguard **:**		N/A
U.2	**Test method and compliance for non-intrinsically protected CRTs**		N/A
U.3	**Protective screen**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
V	**DETERMINATION OF ACCESSIBLE PARTS**		N/A
V.1	**Accessible parts of equipment**		N/A
V.1.1	General		N/A
V.1.2	Surfaces and openings tested with jointed test probes		N/A
V.1.3	Openings tested with straight unjointed test probes		N/A
V.1.4	Plugs, jacks, connectors tested with blunt probe		N/A
V.1.5	Slot openings tested with wedge probe		N/A
V.1.6	Terminals tested with rigid test wire		N/A
V.2	**Accessible part criterion**		N/A
X	**ALTERNATIVE METHOD FOR DETERMINING CLEARANCES FOR INSULATION IN CIRCUITS CONNECTED TO AN AC MAINS NOT EXCEEDING 420 V PEAK (300 V RMS)**		N/A
	Clearance .....:		N/A
Y	**CONSTRUCTION REQUIREMENTS FOR OUTDOOR ENCLOSURES**		N/A
Y.1	**General**	Units for building-in.	N/A
Y.2	**Resistance to UV radiation**		N/A
Y.3	**Resistance to corrosion**		N/A
Y.3	**Resistance to corrosion**		N/A
Y.3.1	Metallic parts of outdoor enclosures are resistant to effects of water-borne contaminants by ..... :		N/A
Y.3.2	Test apparatus		N/A
Y.3.3	Water – saturated sulphur dioxide atmosphere		N/A
Y.3.4	Test procedure ..... :		N/A
Y.3.5	Compliance		N/A
Y.4	**Gaskets**		N/A
Y.4.1	General		N/A
Y.4.2	Gasket tests		N/A
Y.4.3	Tensile strength and elongation tests		N/A
	Alternative test methods ..... :		N/A
Y.4.4	Compression test		N/A
Y.4.5	Oil resistance		N/A
Y.4.6	Securing means		N/A
Y.5	**Protection of equipment within an outdoor enclosure**		N/A
Y.5.1	General		N/A
Y.5.2	Protection from moisture		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Relevant tests of IEC 60529 or Y.5.3 ..... :		N/A
Y.5.3	Water spray test		N/A
Y.5.4	Protection from plants and vermin		N/A
Y.5.5	Protection from excessive dust		N/A
Y.5.5.1	General		N/A
Y.5.5.2	IP5X equipment		N/A
Y.5.5.3	IP6X equipment		N/A
Y.6	**Mechanical strength of enclosures**		N/A
Y.6.1	General		N/A
Y.6.2	Impact test ..... :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

5.2	TABLE: Classification of electrical energy sources						N/A
Supply Voltage	Location (e.g. circuit designation)	Test conditions	Parameters				ES Class
			U (V)	I (mA)	Type[1)]	Additional Info [2)]	
Supplementary information:							
1) Type: Steady state (SS), Capacitance (CP), Single pulse (SP), Repetitive pulses (RP), etc.							
2) Additional Info: Frequency, Pulse duration, Pulse off time, Capacitance value, etc.							

5.4.1.8	TABLE: Working voltage measurement			N/A
Location	RMS voltage (V)	Peak voltage (V)	Frequency (Hz)	Comments
Supplementary information:				

5.4.1.10.2	TABLE: Vicat softening temperature of thermoplastics			N/A
Method.....:		ISO 306 / B50		—
Object/ Part No./Material	Manufacturer/trademark	Thickness (mm)	T softening (°C)	
Supplementary information:				

5.4.1.10.3	TABLE: Ball pressure test of thermoplastics				N/A
Allowed impression diameter (mm).....:		≤ 2 mm			—
Object/Part No./Material	Manufacturer/trademark	Thickness (mm)	Test temperature (°C)	Impression diameter (mm)	
Supplementary information:					
The impression diameter caused by the ball did not exceed 2,0mm.					

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Clause	Requirement + Test	Result - Remark	Verdict

5.4.2, 5.4.3	TABLE: Minimum Clearances/Creepage distance							N/A
Clearance (cl) and creepage distance (cr) at/of/between:	U_p (V)	U_{rms} (V)	Freq [1] (Hz)	Required cl (mm)	cl (mm)	E.S. [2] (V)	Required cr (mm)	cr (mm)
Supplementary information:								
1) Only for frequency above 30 kHz 2) Complete Electric Strength voltage (E.S. (V) when 5.4.2.4 applied)								

5.4.4.2	TABLE: Minimum distance through insulation			
Distance through insulation (DTI) at/of	Peak voltage (V)	Insulation	Required DTI (mm)	Measured DTI (mm)
Supplementary information:				

5.4.4.9	TABLE: Solid insulation at frequencies >30 kHz					N/A
Insulation material	E_P	Frequency (kHz)	K_R	Thickness d (mm)	Insulation	V_{PW} (Vpk)
Supplementary information:						

5.4.9	TABLE: Electric strength tests			N/A
Test voltage applied between:	Voltage shape (Surge, Impulse, AC, DC, etc.)	Test voltage (V)	Breakdown Yes / No	
Supplementary information:				

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Clause	Requirement + Test	Result - Remark	Verdict

5.5.2.2	TABLE: Stored discharge on capacitors				N/A
Location	Supply voltage (V)	Operating and fault condition [1)]	Switch position	Measured voltage (Vpk)	ES Class

Supplementary information:

X-capacitors installed for testing:

☐ bleeding resistor rating:

☐ ICX:

1) Normal operating condition (e.g., normal operation, or open fuse), SC= short circuit, OC= open circuit

5.6.6	TABLE: Resistance of protective conductors and terminations				N/A
Location	Test current (A)	Duration (min)	Voltage drop (V)	Resistance (Ω)	

Supplementary information:

The resistance of protective bonding path did not exceed 0,1ohm.

5.7.4	TABLE: Unearthed accessible parts					N/A
Location	Operating and fault conditions	Supply Voltage (V)	Parameters			ES class
			Voltage (V_{rms} or V_{pk})	Current (A_{rms} or A_{pk})	Freq. (Hz)	

Supplementary information:

Abbreviation: SC= short circuit; OC= open circuit

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Clause	Requirement + Test	Result - Remark	Verdict

5.7.5	TABLE: Earthed accessible conductive part			N/A
Supply voltage (V) ..... :				—
Phase(s) ..... :	[ ] Single Phase; [ ] Three Phase: [ ] Delta [ ] Wye			
Power Distribution System ..... :	[ ] TN [ ]TT [ ] IT			
Location	Fault Condition No in IEC 60990 clause 6.2.2	Touch current (mA)	Comment	

Supplementary information:

Faults:

No. 1: PE of not reliable earthed equipment disconnected. Normal and reverse polarity.

No. 2: Neutral of single phase equipment open. Normal and reverse polarity.

No. 3: EUT use on IT systems shall be tested with each phase conductor faulted to earth (switch g)

No. 4: Three phase equipment should be tested with each phase conductor open, one at the time.

No. 5: Single phase equipment use on IT system or on 3P delta-system shall be tested with a 3P power system, with each phase faulted to PE, one at the time in combination with normal and reverse polarity and separately with each phase conductor open one at the time and in combination with normal and reverse polarity.

No. 6: Three phase equipment for use on centre-earthed delta supply systems shall be tested on a delta supply system with each delta-leg centre-earthed, one at the time.

No. 8: Accessible conductive parts which are only incidentally electrically connected to other parts shall be tested for both when connected electrically to other parts and when not. Examples of such parts: doors and assemblies attached by metal hinges, adhesively-bonded labels which have an accessible conductive part etc.

Notes:
[1] Supply voltage is the anticipated maximum Touch Voltage

[2] Earthed neutral conductor [Voltage differences less than 1% or more]

[3] Specify method used for measurement as described in IEC 60990 sub-clause 4.3

[4] IEC60990, sub-clause 6.2.2.7, Fault 7 not applicable.

[5] (*) IEC60990, sub-clause 6.2.2.2 is not applicable if switch or disconnect device (e.g., appliance coupler) provided.

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Clause	Requirement + Test	Result - Remark	Verdict

5.8	TABLE: Backfeed safeguard in battery backed up supplies					N/A
Location	Supply voltage (V)	Operating and fault condition	Time (s)	Open-circuit voltage (V)	Touch current (A)	ES Class
Supplementary information:						
Abbreviation: SC= short circuit, OC= open circuit						

6.2.2	TABLE: Power source circuit classifications					N/A
Location	Operating and fault condition	Voltage (V)	Current (A)	Max. Power[1)] (W)	Time (S)	PS class
Supplementary information:						
Abbreviation: SC= short circuit; OC= open circuit 1) Measured after 3 s for PS1 and measured after 5 s for PS2 and PS3. Units for building-in and can be supplied via external power source with d.c. voltage range 2,5 – 5,5 V d.c. or external battery. Power supply source considered ES1, Limited Power Source.						

6.2.3.1	TABLE: Determination of Arcing PIS			N/A
Location	Open circuit voltage after 3 s (Vpk)	Measured r.m.s current (A)	Calculated value (V_p x I_{rms})	Arcing PIS? Yes / No
Supplementary information:				
An Arcing PIS requires a minimum of 50 V (peak) a.c. or d.c. An Arcing PIS is established when the product of the open circuit voltage (V_p) and normal operating condition rms current (I_{rms}) is greater than 15.				

6.2.3.2	TABLE: Determination of resistive PIS		N/A
Location	Operating and fault condition	Dissipate power (W)	Arcing PIS? Yes / No
Supplementary information:			
Abbreviation: SC= short circuit; OC= open circuit			

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Clause	Requirement + Test	Result - Remark	Verdict

All internal circuits considered resistive PIS.

8.5.5	TABLE: High pressure lamp			N/A
Lamp manufacturer	Lamp type	Explosion method	Longest axis of glass particle (mm)	Particle found beyond 1 m Yes / No
Supplementary information:				

9.6	TABLE: Temperature measurements for wireless power transmitters								N/A
Supply voltage (V)..... :									—
Max. transmit power of transmitter (W)..... :									—
	w/o receiver and direct contact		with receiver and direct contact		with receiver and at distance of 2 mm		with receiver and at distance of 5 mm		
Foreign objects	Object (°C)	Ambient (°C)	Object (°C)	Ambient (°C)	Object (°C)	Ambient (°C)	Object (°C)	Ambient (°C)	
Supplementary information:									

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Clause	Requirement + Test	Result - Remark	Verdict

5.4.1.4, 9.3, B.1.5, B.2.6	**TABLE: Temperature measurements** **NOTE-NGBLN**	P

Supply voltage (V)..... :	5,5	2,5			—
Ambient temperature during test T_{amb} (°C) .... :	74,3	74,3			—
Ambient temperature specified by manufacturer T_{ma} (°C) ..... :	75	75			
Maximum measured temperature *T* of part/at:	*T* (°C)				Allowed T_{max} (°C)
Printed circuit board near BG95-M3 modem	89,2	89,8			130
BG95-M3 modem	90,2	90,5			130
Supplementary information:					
Temperatures were measured at Tamb and were calculated to Tma.					
Modem in active mode.					

5.4.1.4, 9.3, B.1.5, B.2.6	**TABLE: Temperature measurements** **NOTE-NBNAN**	P

Supply voltage (V)..... :	5,5	2,5			—
Ambient temperature during test T_{amb} (°C) .... :	74,3	74,3			—
Ambient temperature specified by manufacturer T_{ma} (°C) ..... :	75	75			
Maximum measured temperature *T* of part/at:	*T* (°C)				Allowed T_{max} (°C)
Printed circuit board near BG95-M1 modem	88,9	89,3			130
BG95-M1 modem	89,8	89,5			130
Supplementary information:					
Temperatures were measured at Tamb and were calculated to Tma.					
Modem in active mode.					

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Clause	Requirement + Test	Result - Remark	Verdict

5.4.1.4, 9.3, B.1.5, B.2.6	**TABLE: Temperature measurements** **NOTE-WBNAN**					P
Supply voltage (V)..... :		5,5	2,5			—
Ambient temperature during test T_{amb} (°C) .... :		74,3	74,4			—
Ambient temperature specified by manufacturer T_{ma} (°C) ..... :		75	75			
Maximum measured temperature *T* of part/at:		*T* (°C)				Allowed T_{max} (°C)
Printed circuit board near EG91-NAXD modem		89,2	89,3			130
EG91-NAXD modem		89,9	89,5			130
Supplementary information:						
Temperatures were measured at Tamb and were calculated to Tma. Modem in active mode.						

5.4.1.4, 9.3, B.1.5, B.2.6	**TABLE: Temperature measurements** **NOTE-WBEXN**					P
Supply voltage (V)..... :		5,5	2,5			—
Ambient temperature during test T_{amb} (°C) .... :		74,4	74,4			—
Ambient temperature specified by manufacturer T_{ma} (°C) ..... :		75	75			
Maximum measured temperature *T* of part/at:		*T* (°C)				Allowed T_{max} (°C)
Printed circuit board near EG91-EX modem		89,4	89,6			130
EG91-EX modem		89,3	89,5			130
Supplementary information:						
Temperatures were measured at Tamb and were calculated to Tma. Modem in active mode.						

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict

B.2.5	TABLE: Input test							P
U (V)	Hz	I (A)	I rated (A)	P (W)	P rated (W)	Fuse No	I fuse (A)	Condition/status
Note-NBNAN								
2,5	0	0,26	0,25	0,65	-	-	-	*
5	0	0,11	0,25	0,55	-	-	-	*
5,5	0	0,12	0,25	0,66	-	-	-	*
Note-NBGLN								
2,5	0	0,26	0,25	0,65	-	-	-	*
5	0	0,11	0,25	0,55	-	-	-	*
5,5	0	0,12	0,25	0,66	-	-	-	*
NOTE-WBEXN								
2,5	0	0,26	0,25	0,65	-	-	-	*
5	0	0,11	0,25	0,55	-	-	-	*
5,5	0	0,12	0,25	0,66	-	-	-	*
NOTE-WBNAN								
2,5	0	0,16	0,25	0,40	-	-	-	*
5	0	0,07	0,25	0,35	-	-	-	*
5,5	0	0,07	0,25	0,39	-	-	-	*
Supplementary information:								
Equipment may be have rated current or rated power or both. Both should be measured. Measured together with the NOTECARRIER-D V1.6 board. Modems in active mode. Average r.m.s. value of the current measured.								

B.3, B.4	TABLE: Abnormal operating and fault condition tests					N/A
Ambient temperature T_{amb} (°C)..... :						—
Power source for EUT: Manufacturer, model/type, output rating . :						—
Component No.	Condition	Supply voltage (V)	Test time	Fuse no.	Fuse current (A)	Observation
Supplementary information:						

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict

M.3	**TABLE: Protection circuits for batteries provided within the equipment**							N/A
Is it possible to install the battery in a reverse polarity position? .....:					N/A			—
Equipment Specification	Charging							
	Voltage (V)				Current (A)			
Manufacturer/type	Battery specification							
	Non-rechargeable batteries		Rechargeable batteries					
	Discharging current (A)	Unintentional charging current (A)	Charging			Discharging current (A)		Reverse charging current (A)
			Voltage (V)		Current (A)			
Note: The tests of M.3.2 are applicable only when above appropriate data is not available.								
Specified battery temperature (°C) .....:								—
Component No.	Fault condition	Charge/ discharge mode	Test time	Temp. (°C)	Current (A)	Voltage (V)	Observation	
Supplementary information:								
Abbreviation: SC= short circuit; OC= open circuit NL= no chemical leakage; NS= no spillage of liquid; NE= no explosion; NF= no emission of flame or expulsion of molten metal. No battery provided.								

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict

M.4.2	**TABLE: Charging safeguards for equipment containing a secondary lithium battery**					N/A
Maximum specified charging voltage (V) ..... :						—
Maximum specified charging current (A) ..... :						—
Highest specified charging temperature (°C) ..... :						
Lowest specified charging temperature (°C) ..... :						
Battery manufacturer/type	Operating and fault condition	Measurement			Observation	
		Charging voltage (V)	Charging current (A)	Temp. (°C)		
Supplementary information:						
Abbreviation: SC= short circuit; OC= open circuit; MSCV= maximum specified charging voltage; MSCC= maximum specified charging current; HSCT= highest specified charging temperature; LSCT= lowest specified charging temperature No battery provided.						

Q.1	**TABLE: Circuits intended for interconnection with building wiring (LPS)**							N/A
Output Circuit	Condition	U_{oc} (V)	Time (s)	I_{sc} (A)		S (VA)		
				Meas.	Limit	Meas.	Limit	
Supplementary Information:								
SC=Short circuit, OC=Open circuit								

T.2, T.3, T.4, T.5	**TABLE: Steady force test**					N/A
Part/Location	Material	Thickness (mm)	Probe	Force (N)	Test Duration (s)	Observation
Supplementary information:						
No enclosure or barrier used as a safeguard.						

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Clause	Requirement + Test	Result - Remark	Verdict

T.6, T.9	TABLE: Impact test				N/A
Location/part	Material	Thickness (mm)	Height (mm)	Observation	
Supplementary information:					
No enclosure provided. Class III units for building-in.					

T.7	TABLE: Drop test				N/A
Location/part	Material	Thickness (mm)	Height (mm)	Observation	
Supplementary information:					
No enclosure, safeguards or batteries provided.					

T.8	TABLE: Stress relief test					N/A
Location/Part	Material	Thickness (mm)	Oven Temperature (°C)	Duration (h)	Observation	
Supplementary information:						
No enclosure or safeguard depended on the thermoplastic materials.						

X	TABLE: Alternative method for determining minimum clearances distances			N/A
Clearance distanced between:	Peak of working voltage (V)	Required cl (mm)	Measured cl (mm)	
Supplementary information:				

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict

4.1.2	TABLE: Critical components information				P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity[1)]
NOTE-NBGLN					
Radio modem	Quectel	BG95-M3	23,6×19,9 ×2,2mm 75°C Supply voltage 3,3V to 4,3V	IEC 62368-1:2018	Accepted
Printed wiring board	Panasonic Industry Co., Ltd.	Laminat: R-1755M Prepreg: R-1650M	30 x 35 mm Min. thickness 0,8 mm Laminat R-1755M: V-0 130° RTI	IEC 60695-11-10 ANSI/UL 746E	UR QMTS2.E81336 Accepted
Printed wiring board (Alternative)	Interchangeable	Interchangeable	30 x 35 mm Min. V-1, 130°	IEC 60695-11-10 ANSI/UL 746E UL796	-
NOTE-NBNAN					
Radio modem	Quectel	BG95-M1	23,6×19,9 ×2,2mm 75°C Supply voltage 2,4V to 4,8V	IEC 62368-1:2018	Accepted
Printed wiring board	Panasonic Industry Co., Ltd.	Laminat: R-1755M Prepreg: R-1650M	30 x 35 mm Min. thickness 0,8 mm Laminat R-1755M: V-0 130° RTI Prepreg: R-1650M	IEC 60695-11-10 ANSI/UL 746E	UR QMTS2.E81336 Accepted
Printed wiring board (Alternative)	Interchangeable	Interchangeable	30 x 35 mm Min. V-1, 130°	IEC 60695-11-10 ANSI/UL 746E UL796	-

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict

NOTE-WBNAN					
Radio modem	Quectel	EG91-NAXD	29,0 × 25,0 × 2,3mm 75°C Supply voltage 3,3V to 4,3V	IEC 62368-1:2018	Accepted
Printed wiring board	Panasonic Industry Co., Ltd.	Laminat: R-1755M Prepreg: R-1650M	30 x 35 mm Min. thickness 0,8 mm Laminat R-1755M: V-0 130° RTI Prepreg: R-1650M	IEC 60695-11-10 ANSI/UL 746E	UR QMTS2.E81336 Accepted
Printed wiring board (Alternative)	Interchangeable	Interchangeable	30 x 35 mm Min. V-1, 130°	IEC 60695-11-10 ANSI/UL 746E UL796	-
NOTE-WBEXN					
Radio modem	Quectel	EG91-EX	29,0 × 25,0 × 2,3mm 75°C Supply voltage 3,3V to 4,3V	IEC 62368-1:2018	Accepted
Printed wiring board	Panasonic Industry Co., Ltd.	Laminat: R-1755M Prepreg: R-1650M	30 x 35 mm Min. thickness 0,8 mm Laminat R-1755M: V-0 130° RTI Prepreg: R-1650M	IEC 60695-11-10 ANSI/UL 746E	UR QMTS2.E81336 Accepted
Printed wiring board (Alternative)	Interchangeable	Interchangeable	30 x 35 mm Min. V-1, 130°	IEC 60695-11-10 ANSI/UL 746E UL796	-
Supplementary information:					
[1)] Provided evidence ensures the agreed level of compliance. See OD-2039.					

Enclosure No. 1

National differences according to IEC 62368-1:2018 (Third Edition)

(44 pages including this cover page)

IEC62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
ATTACHMENT TO TEST REPORT **IEC 62368-1** **U.S.A. AND CANADA NATIONAL DIFFERENCES** (AUDIO/VIDEO, INFORMATION AND COMMUNICATION TECHNOLOGY EQUIPMENT – PART 1: SAFETY REQUIREMENTS)			
Differences according to.....:	CSA/UL 62368-1:2019		
TRF template used: .....:	IECEE OD-2020-F3, Ed. 1.1		
Attachment Form No.....:	US_CA_ND_IEC62368_1E		
Attachment Originator .....:	UL(US)		
Master Attachment.....:	Dated 2022-03-04		
IEC 62368-1 - US and Canadian National Differences **Special National Conditions based on Regulations and Other National Differences**			
1 (1DV.1) (1.3)	All equipment is to be designed to allow installation in accordance with the National Electrical Code (NEC), ANSI/NFPA 70, the Canadian Electrical Code (CEC), Part 1, CAN/CSA C22.1, and when applicable, the National Electrical Safety Code, IEEE C2. Also, for such equipment marked or otherwise identified, installation is allowed per the Standard for the Protection of Information Technology Equipment, ANSI/NFPA 75.		N/A
1 (1DV.2.1)	This standard includes additional requirements for equipment used for entertainment purposes intended for installation in general patient care areas of health care facilities. See Annex DVB.		N/A
1 (1DV.2.2)	This standard includes additional requirements for equipment intended for mounting under cabinets. See Annex DVC.		N/A
1 (1DV.2.3)	IEC 62368-3 clause 5 for DC power transfer at ES1 or ES2 voltage levels is considered informative. IEC 62368-3 clause 6 for remote power feeding telecommunication (RFT) circuits is considered normative (see ITU K.50). Alternatively, equipment with RFT circuits are given in either UL 2391 or CSA/UL 60950-21. RFT-C circuits are not permitted unless the RFT-C circuit complies with RFT-V limits (≤ 200V per conductor to earth).		N/A

IEC62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
1 (1DV.3)	For protection against direct lightning strikes, reference is made to NFPA 780 and CAN/CSA-B72 for additional requirements.		N/A
1 (DV.5)	Additional requirements apply to some forms of power distribution equipment, including sub-assemblies.		N/A
4.1 (4.1.17)	*For lengths exceeding 3,05 m, external interconnecting cable assemblies are required to be a suitable cable type (e.g., DP, CL2) specified in the NEC.*		N/A
	For lengths 3,05 m or less, external interconnecting cable assemblies that are not types specified in the NEC generally are required to have special construction features and identification markings.		N/A
4.6 (4.6.2)	Wire-wrap terminals have special construction and performance requirements.		N/A
4.8 (4.8.3, 4.8.4.5, 4.8.5)	Coin / button cell batteries have modified special construction and performance requirements.		N/A
5.4.2.3.2 (5.4.2.3.2.1)	*Surge Arrestors and Transient Voltage Surge Suppressors installed external to the equipment are required to comply with the appropriate NEC and CEC requirements.*		N/A
5.5.9	Receptacles, rated 125-V, single phase, 15- or 20-A accessible to either ordinary, instructed, or skilled persons are required to be provided with GFCI Protection for Personnel if the equipment containing the receptacles is installed outdoors. The protection devices are required to comply with UL 943, and CAN/CSA C22.2 No.144.		N/A
5.6.3	Protective earthing conductors comply with the minimum conductor sizes in Table G.7, except as required by Table G.7ADV.1 for cord connected equipment, or Annex DVH for permanently connected equipment.		N/A
5.7.8 (5.7.8.1)	Equipment intended to receive telecommunication ringing signals is required to comply with a special touch current measurement tests.		N/A
6.5.1	PS3 wiring outside a fire enclosure is required to comply with single fault testing in B.4, or be current limited per one of the permitted methods.		N/A

IEC62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
Annex F (F.3.3.9)	Output terminals provided for supply of other equipment, except mains supply, are required to be marked with a maximum rating or reference to equipment permitted to be connected.		N/A
Annex F (F.3.7)	Outdoor Enclosures are required to be classified and marked in accordance with UL 50 or 50E, or CAN/CSA C22.2 No. 94.1 or 94.2.		N/A
Annex G (G.7)	Permanent connection of equipment to the mains supply by a power supply cord is not permitted, except for certain equipment, such as ATMs.		N/A
	Power supply cords are required to have attachment plugs rated not less than 125 percent of the rated current of the equipment.		N/A
	Flexible power supply cords are required to be compatible with Article 400 of the NEC, and Tables 11 and 12 of the CEC.		N/A
	Minimum cord length is required to be 1.5 m, with certain constructions such as external power supplies allowed to consider both input and output cord lengths into the requirement. Power supply cords are required to be no longer than 4.5 m in length if used in ITE Rooms.		N/A
	Power supply cords for outdoor equipment are required to be suitable outdoor use type as required by Section 400.4 of the NEC and Rule 4-012 of the CEC, i.e., marked “W.”		N/A
Annex H.2	Continuous ringing signals under normal operating conditions up to 16 mA only are permitted if the equipment is subjected to special installation and performance restrictions.		N/A
Annex H.4	For circuits with other than ringing signals and with voltages exceeding 42.4 Vpeak or 60 Vd.c., the maximum acceptable current through a 2000 ohm resistor (or greater) connected across the voltage source with other loads disconnected is 7.1 mA peak or 30 mA d.c. under normal operating conditions.		N/A
Annex Q (Q.3)	Equipment with paired conductor and/or coax communications cables/wiring connected to building wiring are required to have special voltage, current, power and marking requirements.		N/A

IEC62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
Annex DVA (1)	Equipment that is designed such that it may be powered from a separate electrical service, is required to meet applicable requirements for service equipment for control and protection of services and their installation and complies with Article 230 of the National Electrical Code (NEC), NFPA 70 and Section 6 of the Canadian Electrical Code, Part I, CSA C22.1.		N/A
	Equipment intended for use in spaces used for environmental air (plenums) are subjected to special flammability requirements for heat and visible smoke release.		N/A
	For ITE room applications, automated information storage systems with combustible media greater than 0.76 m3 (27 cu ft) are required to have a provision for connection of either automatic sprinklers or a gaseous agent extinguishing system with an extended discharge.		N/A
	Consumer products designed or intended primarily for children 12 years of age or younger are subject to additional requirements in accordance with U.S. and Canadian Regulations.		N/A
	Baby monitors are required to additionally comply with ASTM F2951, Consumer Safety Specification for Baby Monitors.		N/A
	Storage batteries and battery management equipment, other than associated with lead-acid batteries, and including battery backup systems that are not an integral part of stationary AV and ICT equipment, such as provided in separate cabinets, are required to be certified (listed) to the appropriate standard(s) for such storage batteries and equipment.		N/A
Annex DVA (5.6)	For Pluggable Equipment Type A, the protection in the installation is assumed to be 20A.		N/A
Annex DVA (6.3)	The maximum quantity of flammable liquid stored in equipment is required to comply with NFPA 30.		N/A
Annex DVA (6.4.8)	For ITE room applications, enclosures with combustible material measuring greater than 0.9 m^2 (10 sq ft) or a single dimension greater than 1.8 m (6 ft) are required to have a flame spread rating of 50 or less. For equipment with the same dimensions for other applications, an external surface that is not a fire enclosure requires a minimum flammability classification of V-1.		N/A

IEC62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
Annex DVA (10.3)	Equipment with lasers is required to meet the U.S. Code of Federal Regulations 21 CFR 1040 (and the Canadian Radiation Emitting Devices Act, REDR C1370).		N/A
Annex DVA (10.5)	Equipment that produces ionizing radiation is required to comply with the U.S. Code of Federal Regulations, 21 CFR 1020 (and the Canadian Radiation Emitting Devices Act, REDR C1370).		N/A
Annex DVA (F.3.3.4)	Equipment for use on a.c. mains supply systems with a neutral and more than one phase conductor (e.g. 120/240 V, 3-wire) require a special marking format for electrical ratings. Additional considerations apply for voltage ratings that exceed the attachment cap rating or that are lower than the “Normal Operating Condition” in Table 2 of CAN/CSA C22.2 No. 235.”		N/A
Annex DVA (F.3.3.6)	Equipment identified for ITE (computer) room installation is required to be marked with the rated current.		N/A
Annex DVA (G.1)	Vertically-mounted disconnect switches and circuit breakers are required to have the "on" position indicated by the handle in the up position, where mounted in an enclosure, vertically mounted **disconnect switches** and **circuit breakers** with vertical operating means extending outside the enclosure are required to indicate in a location visible when accessing the external operating means whether the switch or circuit breaker is in the open (off) or closed (on) position.		N/A
Annex DVA (G.3.4)	Suitable NEC/CEC branch circuit protection rated at the maximum circuit rating is required for all standard supply outlets and receptacles (such as supplied in power distribution units) if the supply branch circuit protection is not suitable.		N/A
	Where a fuse is used to provide Class 2 or Class 3 current limiting, it is not operator-accessible unless it is non- interchangeable.		N/A
Annex DVA (G.4.2)	Equipment with isolated ground (earthing) receptacles is required to comply with NEC 250.146(D) and CEC 10-400 and 10-612.		N/A

IEC62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
Annex DVA (G.4.3)	Interconnection of units by conductors supplied by a limited power source, or a Class 2 circuit defined in the NEC/CEC may have field wiring connections other than specified in DVH.3, such as wire-wrap and crimp-on types, if the limited power source and Class 2 circuits are separated from all other circuits by barriers, routing or fixing.		N/A
Annex DVA (G.5.3)	Power distribution transformers distributing power at 100 volts or more, and rated 10 kVA or more, require special transformer overcurrent protection.		N/A
Annex DVA (G.5.4)	Motor control devices are required for cord-connected equipment with a mains-connected motor if the equipment is rated more than 12 A, or if the equipment has a nominal voltage rating greater than 120 V, or if the motor is rated more than 1/3 hp (locked rotor current over 43 A).		N/A
Annex DVA (G.7)	Flexible cords used outdoors are required to have the suffix “W” marked on the flexible cord.		N/A
Annex DVA (M)	For ITE room applications, equipment with battery systems capable of supplying 750 VA for five minutes are required to have a battery disconnect means that may be connected to the ITE room remote power-off circuit.		N/A
Annex DVA (Q)	If applicable per NEC 725.121(C), some limited power sources supplied from AV/ICT equipment are required to have a label indicating the maximum voltage and rated current output for per conductor for each connection point. Where multiple connection points have the same rating, a single label is permitted to be used.		N/A
	Wiring terminals intended to supply Class 2 outputs in accordance with the NEC or CEC Part 1are required to be marked with the voltage rating and “Class 2” or equivalent. The marking is located adjacent to the terminals and visible during wiring.		N/A
	Applicable parts of Chapter 8 of the NEC, and Rules 54 and 60 of the CEC, may be applicable to ITE installed outdoors with connections to communication systems.		N/A
Annex DVB (1)	Additional requirements apply for equipment used for entertainment purposes intended for installation in general patient care areas of health care facilities.		N/A

IEC62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
Annex DVC (1)	Additional requirements apply for equipment intended for mounting under kitchen cabinets.		N/A
Annex DVE (4.1.1)	Some equipment, components, sub-assemblies and materials associated with the risk of fire, electric shock, or personal injury are required to have component or material ratings in accordance with the applicable national (U.S. and Canadian) component or material requirements. These equipment and components include: appliance couplers, attachment plugs, battery backup systems, circuit breakers, communication circuit accessories, connectors (used for current interruption of non-LPS circuits), direct plug-in equipment, electrochemical capacitor modules (energy storage modules with ultracapacitors), enclosures (outdoor), flexible cords and cables, fuses (branch circuit), ground-fault current interrupters, interconnecting cables, modular data centres, power supply cords, some power distribution equipment, printed wiring, protectors for communications circuits, receptacles, surge protective devices, vehicle battery adapters, wire connectors, and wire and cables.		N/A
Annex DVH	Equipment for permanent connection to the mains supply is subjected to additional requirements.		N/A
Annex DVH (DVH.1)	Wiring methods (terminals, leads, etc.) used for the connection of the equipment to the mains are required to be in accordance with the NEC/CEC.		N/A
Annex DVH (DVH.2.1)	For safe and reliable connection to a mains, permanently connected equipment is to be provided.		N/A
Annex DVH (DVH.2.2)	Additional considerations for D.C. mains.		N/A
Annex DVH (DVH.3.2.1)	Terminals for permanent wiring, including protective earthing terminals, are required to be suitable for U.S./Canadian wire gauge sizes, rated 125 percent of the equipment rating, and be specially marked when specified.		N/A
Annex DVH (DVH.3.2.3)	Wire binding screws are not permitted to attach conductors larger than 10 AWG (5.3 mm2).		N/A
Annex DVH (DVH.3.2.4)	All associated mains supply terminals are located in proximity to each other and to the main protective earthing terminal, if any.		N/A

IEC62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
Annex DVH (DVH.3.2.5)	Terminals are located, guarded or insulated so that, should a strand of a conductor escape when the conductor is fitted, there is no likelihood of accidental contact between such a strand and accessible conductive parts or unearthed conductive parts separated from accessible conductive parts by supplementary insulation only.		N/A
Annex DVH (DVH.3.3)	When field connection to an external circuit is via wires (example, free conductors), the wires are not smaller than 18 AWG (0,82 mm^2) and the free length of the wire inside an outlet box or wiring compartment is 150 mm or more.		N/A
Annex DVH (DVH.3.4)	Size of protective earthing conductors and terminals		N/A
Annex DVH (DVH.4)	Permanently connected equipment is required to have a suitable wiring compartment and wire bending space.		N/A
Annex DVH (DVH.4.1)	Wire bending space		N/A
Annex DVH (DVH.4.2)	Volume of wiring compartment		N/A
Annex DVH (DVH.4.3)	Separation of circuits		N/A
Annex DVH (DVH.5)	Equipment markings and instructional safeguards		N/A
Annex DVH (DVH.5.1)	Identification of protective earthing terminal		N/A
Annex DVH (DVH.5.2)	Identification of terminal for earthed conductor (neutral)		N/A
Annex DVH (DVH.5.3)	Identification of terminals for aluminium conductors		N/A
Annex DVH (DVH.5.4)	Wire temperature ratings		N/A
Annex DVH (DVH 5.5)	Equipment connected to a centralized d.c. power system, and having one pole of the DC mains input terminal connected to the main protective earthing terminal in the equipment, is required to comply with special earthing, wiring, marking and installation instruction requirements.		N/A
Annex DVI (6.7)	Equipment intended for connection to telecommunication network outside plant cable is required to be protected against overvoltage from power line crosses.		N/A

IEC62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
Annex DVJ (10.6.1)	Equipment connected to a telecommunication and cable distribution networks and supplied with an earphone intended to be held against, or in the ear is required to comply with special acoustic pressure requirements.		N/A

IEC62368_1C- ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
ATTACHMENT TO TEST REPORT **IEC 62368-1** **EUROPEAN GROUP DIFFERENCES AND NATIONAL DIFFERENCES** (AUDIO/VIDEO, INFORMATION AND COMMUNICATION TECHNOLOGY EQUIPMENT - PART 1: SAFETY REQUIREMENTS)			
Differences according to ..... : EN IEC 62368-1:2020+A11:2020			
Attachment Form No. ..... : EU_GD_IEC62368_1E **Attachment Originator .....** : UL(Demko) **Master Attachment**..... : 2021-02-04			
Copyright © 2021 IEC System for Conformity Testing and Certification of Electrical Equipment (IECEE), Geneva, Switzerland. All rights reserved.			
	CENELEC COMMON MODIFICATIONS (EN)		—
	Clause numbers in the cells that are shaded light grey are clause references in EN IEC 62368-1:2020+A11:2020. All other clause numbers in that column, except for those in the paragraph below, refers to IEC 62368-1:2018. Clauses, subclauses, notes, tables, figures and annexes which are additional to those in IEC 62368-1:2018 are prefixed “Z”.		—
	Add the following annexes: Annex ZA (normative) Normative references to international publications with their corresponding European publications Annex ZB (normative) Special national conditions Annex ZC (informative) A-deviations Annex ZD (informative) IEC and CENELEC code designations for flexible cords		—
	Modification to Clause 3 .		—
3.3.19	**Sound exposure** *Replace 3.3.19 of IEC 62368-1 with the following definitions:*		N/A

IEC62368_1C- ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
3.3.19.1	**momentary exposure level, MEL** metric for estimating 1 s sound exposure level from the HD 483-1 S2 test signal applied to both channels, based on EN 50332-1:2013, 4.2. Note 1 to entry: MEL is measured as A-weighted levels in dB. Note 2 to entry: See B.3 of EN 50332-3:2017 for additional information.		N/A
3.3.19.3	**sound exposure, *E*** A-weighted sound pressure (p) squared and integrated over a stated period of time, T Note 1 to entry: The SI unit is Pa^2 s. $E = \int_0^T p(t)^2 \, dt$		N/A
3.3.19.4	**sound exposure level, *SEL*** logarithmic measure of sound exposure relative to a reference value, E_0, typically the 1 kHz threshold of hearing in humans. Note 1 to entry: *SEL* is measured as A-weighted levels in dB. $SEL = 10 \lg\left(\frac{E}{E_0}\right)$ dB Note 2 to entry: See B.4 of EN 50332-3:2017 for additional information.		N/A
3.3.19.5	**digital signal level relative to full scale, dBFS** levels reported in dBFS are always r.m.s. Full scale level, 0 dBFS, is the level of a dc-free 997-Hz sine wave whose undithered positive peak value is positive digital full scale, leaving the code corresponding to negative digital full scale unused Note 1 to entry: It is invalid to use dBFS for non-r.m.s. levels. Because the definition of full scale is based on a sine wave, the level of signals with a crest factor lower than that of a sine wave may exceed 0 dBFS. In particular, square wave signals may reach +3,01 dBFS.		N/A
2	**Modification to Clause 10**		—
10.6	**Safeguards against acoustic energy sources** Replace 10.6 of IEC 62368-1 with the following:		N/A
10.6.1.1	**Introduction** **Safeguard** requirements for protection against long-term exposure to excessive sound pressure levels from personal music players closely coupled to the ear are specified below. Requirements for earphones and headphones intended for use with personal music players are also covered.		N/A

IEC62368_1C- ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	A personal music player is a portable equipment intended for use by an **ordinary person**, that: – is designed to allow the user to listen to audio or audiovisual content / material; and – uses a listening device, such as headphones or earphones that can be worn in or on or around the ears; and – has a player that can be body worn (of a size suitable to be carried in a clothing pocket) and is intended for the user to walk around with while in continuous use (for example, on a street, in a subway, at an airport, etc.). EXAMPLES Portable CD players, MP3 audio players, mobile phones with MP3 type features, PDAs or similar equipment. Personal music players shall comply with the requirements of either 10.6.2 or 10.6.3. NOTE 1 Protection against acoustic energy sources from telecom applications is referenced to ITU-T P.360. NOTE 2 It is the intention of the Committee to allow the alternative methods for now, but to only use the dose measurement method as given in 10.6.5 in future. Therefore, manufacturers are encouraged to implement 10.6.5 as soon as possible. Listening devices sold separately shall comply with the requirements of 10.6.6. These requirements are valid for music or video mode only. The requirements do not apply to: – professional equipment; NOTE 3 Professional equipment is equipment sold through special sales channels. All products sold through normal electronics stores are considered not to be professional equipment. – hearing aid equipment and other devices for assistive listening; – the following type of analogue personal music players: • long distance radio receiver (for example, a multiband radio receiver or world band radio receiver, an AM radio receiver), and • cassette player/recorder; NOTE 4 This exemption has been allowed because this technology is falling out of use and it is expected that within a few years it will no longer exist. This exemption will not be extended to other technologies. – a player while connected to an external amplifier that does not allow the user to walk around while in use.		

IEC62368_1C- ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	For equipment that is clearly designed or intended primarily for use by children, the limits of the relevant toy standards may apply. The relevant requirements are given in EN 71-1:2011, 4.20 and the related tests methods and measurement distances apply.		
10.6.1.2	**Non-ionizing radiation from radio frequencies in the range 0 to 300 GHz** The amount of non-ionizing radiation is regulated by European Council Recommendation 1999/519/EC of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz). For intentional radiators, ICNIRP guidelines should be taken into account for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz). For hand-held and body mounted devices, attention is drawn to EN 50360 and EN 50566.		N/A
10.6.2	**Classification of devices without the capacity to estimate sound dose**		N/A
10.6.2.1	**General** This standard is transitioning from short-term based (30 s) requirements to long-term based (40 hour) requirements. These clauses remain in effect only for devices that do not comply with sound dose estimation as stipulated in EN 50332-3. For classifying the acoustic output $L_{Aeq,T}$, measurements are based on the A-weighted equivalent sound pressure level over a 30 s period. For music where the average sound pressure (long term $L_{Aeq,T}$) measured over the duration of the song is lower than the average produced by the programme simulation noise, measurements may be done over the duration of the complete song. In this case, T becomes the duration of the song. NOTE Classical music, acoustic music and broadcast typically has an average sound pressure (long term $L_{Aeq,T}$) which is much lower than the average programme simulation noise. Therefore, if the player is capable to analyse the content and compare it with the programme simulation noise, the warning does not need to be given as long as the average sound pressure of the song does not exceed the required limit. For example, if the player is set with the programme simulation noise to 85 dB, but the average music level of the song is only 65 dB, there is no need to give a warning or ask an acknowledgement as long as the average sound level of the song is not above the basic limit of 85 dB.		N/A
10.6.2.2	**RS1 limits (to be superseded, see 10.6.3.2)** RS1 is a class 1 acoustic energy source that does		N/A

IEC62368_1C- ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	not exceed the following: – for equipment provided as a package (player with its listening device), and with a proprietary connector between the player and its listening device, or where the combination of player and listening device is known by other means such as setting or automatic detection, the $L_{Aeq,T}$ acoustic output shall be ≤ 85 dB when playing the fixed "programme simulation noise" described in EN 50332-1. – for equipment provided with a standardized connector (for example, a 3,5 phone jack) that allows connection to a listening device for general use, the unweighted r.m.s. output voltage shall be ≤ 27 mV (analogue interface) or -25 dBFS (digital interface) when playing the fixed "programme simulation noise" described in EN 50332-1. – The RS1 limits will be updated for all devices as per 10.6.3.2.		
10.6.2.3	**RS2 limits (to be superseded, see 10.6.3.3)** RS2 is a class 2 acoustic energy source that does not exceed the following: – for equipment provided as a package (player with its listening device), and with a proprietary connector between the player and its listening device, or when the combination of player and listening device is known by other means such as setting or automatic 130 detection, the $L_{Aeq,T}$ acoustic output shall be ≤ 100 dB(A) when playing the fixed "programme simulation noise" as described in EN 50332-1. – for equipment provided with a standardized connector (for example, a 3,5 phone jack) that allows connection to a listening device for general use, the unweighted r.m.s. output voltage shall be ≤ 150 mV (analogue interface) or -10 dBFS (digital interface) when playing the fixed "programme simulation noise" as described in EN 50332-1.		N/A
10.6.2.4	**RS3 limits** RS3 is a class 3 acoustic energy source that exceeds RS2 limits.		N/A
10.6.3	**Classification of devices (new)**		N/A
10.6.3.1	**General** Previous limits (10.6.2) created abundant false negative and false positive PMP sound level warnings. New limits, compliant with The Commission Decision of 23 June 2009, are given below.		N/A
10.6.3.2	**RS1 limits (new)**		N/A

IEC62368_1C- ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	RS1 is a class 1 acoustic energy source that does not exceed the following: – for equipment provided as a package (player with its listening device), and with a proprietary connector between the player and its listening device, or where the combination of player and listening device is known by other means such as setting or automatic detection, the $L_{Aeq,T}$ acoustic output shall be ≤ 80 dB when playing the fixed “programme simulation noise” described in EN 50332-1. – for equipment provided with a standardized connector (for example, a 3,5 phone jack) that allows connection to a listening device for general use, the unweighted r.m.s. output voltage shall be ≤ 15 mV (analogue interface) or -30 dBFS (digital interface) when playing the fixed “programme simulation noise” described in EN 50332-1.		
10.6.3.3	**RS2 limits (new)** RS2 is a class 2 acoustic energy source that does not exceed the following: – for equipment provided as a package (player with its listening device), and with a proprietary connector between the player and its listening device, or where the combination of player and listening device is known by other means such as setting or automatic detection, the weekly sound exposure level, as described in EN 50332-3, shall be ≤ 80 dB when playing the fixed "programme simulation noise" described in EN 50332-1. – for equipment provided with a standardized connector (for example, a 3,5 phone jack) that allows connection to a listening device for general use, the unweighted r.m.s. output level, integrated over one week, as described in EN50332-3, shall be ≤ 15 mV (analogue interface) or -30 dBFS (digital interface) when playing the fixed “programme simulation noise” described in EN 50332-1.		N/A
10.6.4	**Requirements for maximum sound exposure**		N/A
10.6.4.1	**Measurement methods** All volume controls shall be turned to maximum during tests. Measurements shall be made in accordance with EN 50332-1 or EN 50332-2 as applicable.		N/A
10.6.4.2	**Protection of persons** Except as given below, protection requirements for parts **accessible** to **ordinary persons**, **instructed persons** and **skilled persons** are given in 4.3. NOTE 1 Volume control is not considered a **safeguard.**		N/A

IEC62368_1C- ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	Between RS2 and an **ordinary person**, the **basic safeguard** may be replaced by an **instructional safeguard** in accordance with Clause F.5, except that the **instructional safeguard** shall be placed on the equipment, or on the packaging, or in the instruction manual. Alternatively, the **instructional safeguard** may be given through the equipment display during use. The elements of the **instructional safeguard** shall be as follows: – element 1a: the symbol  , IEC 60417-6044 (2011-01) – element 2: “High sound pressure” or equivalent wording – element 3: “Hearing damage risk” or equivalent wording – element 4: “Do not listen at high volume levels for long periods.” or equivalent wording An **equipment safeguard** shall prevent exposure of an **ordinary person** to an RS2 source without intentional physical action from the **ordinary person** and shall automatically return to an output level not exceeding what is specified for an RS1 source when the power is switched off. The equipment shall provide a means to actively inform the user of the increased sound level when the equipment is operated with an output exceeding RS1. Any means used shall be acknowledged by the user before activating a mode of operation which allows for an output exceeding RS1. The acknowledgement does not need to be repeated more than once every 20 h of cumulative listening time. NOTE 2 Examples of means include visual or audible signals. Action from the user is always needed. NOTE 3 The 20 h listening time is the accumulative listening time, independent of how often and how long the personal music player has been switched off. A **skilled person** shall not be unintentionally exposed to RS3.		
10.6.5	**Requirements for dose-based systems**		N/A
10.6.5.1	**General requirements** Personal music players shall give the warnings as provided below when tested according to EN 50332-3, using the limits from this clause.		N/A

IEC62368_1C- ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	The manufacturer may offer optional settings to allow the users to modify when and how they wish to receive the notifications and warnings to promote a better user experience without defeating the safeguards. This allows the users to be informed in a method that best meets their physical capabilities and device usage needs. If such optional settings are offered, an administrator (for example, parental restrictions, business/educational administrators, etc.) shall be able to lock any optional settings into a specific configuration. The personal music player shall be supplied with easy to understand explanation to the user of the dose management system, the risks involved, and how to use the system safely. The user shall be made aware that other sources may significantly contribute to their sound exposure, for example work, transportation, concerts, clubs, cinema, car races, etc.		
10.6.5.2	**Dose-based warning and requirements** When a dose of 100 % *CSD* is reached, and at least at every 100 % further increase of *CSD*, the device shall warn the user and require an acknowledgement. In case the user does not acknowledge, the output level shall automatically decrease to compliance with class RS1. The warning shall at least clearly indicate that listening above 100 % *CSD* leads to the risk of hearing damage or loss.		N/A
10.6.5.3	**Exposure-based requirements** With only dose-based requirements, cause and effect could be far separated in time, defying the purpose of educating users about safe listening practice. In addition to dose-based requirements, a PMP shall therefore also put a limit to the short-term sound level a user can listen at. The exposure-based limiter (EL) shall automatically reduce the sound level not to exceed 100 dB(A) or 150 mV integrated over the past 180 s, based on methodology defined in EN 50332-3. The EL settling time (time from starting level reduction to reaching target output) shall be 10 s or faster. Test of EL functionality is conducted according to EN 50332-3, using the limits from this clause. For equipment provided as a package (player with its listening device), the level integrated over 180 s shall be 100 dB or lower. For equipment provided		N/A

IEC62368_1C- ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	with a standardized connector, the unweighted level integrated over 180 s shall be no more than 150 mV for an analogue interface and no more than -10 dBFS for a digital interface. NOTE In case the source is known not to be music (or test signal), the EL may be disabled.		
10.6.6	**Requirements for listening devices (headphones, earphones, etc.)**		N/A
10.6.6.1	**Corded listening devices with analogue input** With 94 dB L_{Aeq} acoustic pressure output of the listening device, and with the volume and sound settings in the listening device (for example, built-in volume level control, additional sound features like equalization, etc.) set to the combination of positions that maximize the measured acoustic output, the input voltage of the listening device when playing the fixed “programme simulation noise” as described in EN 50332-1 shall be ≥ 75 mV. NOTE The values of 94 dB and 75 mV correspond with 85 dB and 27 mV or 100 dB and 150 mV.		N/A
10.6.6.2	**Corded listening devices with digital input** With any playing device playing the fixed “programme simulation noise” described in EN 50332-1, and with the volume and sound settings in the listening device (for example, built-in volume level control, additional sound features like equalization, etc.) set to the combination of positions that maximize the measured acoustic output, the $L_{Aeq,T}$ acoustic output of the listening device shall be ≤ 100 dB with an input signal of -10 dBFS.		N/A
10.6.6.3	**Cordless listening devices** In cordless mode, – with any playing and transmitting device playing the fixed programme simulation noise described in EN 50332-1; and – respecting the cordless transmission standards, where an air interface standard exists that specifies the equivalent acoustic level; and – with volume and sound settings in the receiving device (for example, built-in volume level control, additional sound features like equalization, etc.) set to the combination of positions that maximize the measured acoustic output for the above mentioned programme simulation noise, the $L_{Aeq,T}$ acoustic output of the listening device shall be ≤ 100 dB with an input signal of -10 dBFS.		N/A
10.6.6.4	**Measurement method** *Measurements shall be made in accordance with EN 50332-2 as applicable.*		N/A

<table>
<tr><td colspan="4">IEC62368_1C- ATTACHMENT</td></tr>
<tr><td>Clause</td><td>Requirement + Test</td><td>Result - Remark</td><td>Verdict</td></tr>
<tr><td>3</td><td colspan="2">Modification to the whole document</td><td>—</td></tr>
<tr><td></td><td colspan="2">Delete all the “country” notes in the reference document according to the following list:
<table>
<tr><td>0.2.1</td><td>Note 1 and 2</td><td>1</td><td>Note 4 and 5</td><td>3.3.8.1</td><td>Note 2</td></tr>
<tr><td>3.3.8.3</td><td>Note 1</td><td>4.1.15</td><td>Note</td><td>4.7.3</td><td>Note 1 and 2</td></tr>
<tr><td>5.2.2.2</td><td>Note</td><td>5.4.2.3.2.2 Table 12</td><td>Note c</td><td>5.4.2.3.2.4</td><td>Note 1 and 3</td></tr>
<tr><td>5.4.2.3.2.4 Table 13</td><td>Note 2</td><td>5.4.2.5</td><td>Note 2</td><td>5.4.5.1</td><td>Note</td></tr>
<tr><td>5.4.10.2.1</td><td>Note</td><td>5.4.10.2.2</td><td>Note</td><td>5.4.10.2.3</td><td>Note</td></tr>
<tr><td>5.5.2.1</td><td>Note</td><td>5.5.6</td><td>Note</td><td>5.6.4.2.1</td><td>Note 2 and 3 and 4</td></tr>
<tr><td>5.6.8</td><td>Note 2</td><td>5.7.6</td><td>Note</td><td>5.7.7.1</td><td>Note 1 and Note 2</td></tr>
<tr><td>8.5.4.2.3</td><td>Note</td><td>10.2.1 Table 39</td><td>Note 3 and 4 and 5</td><td>10.5.3</td><td>Note 2</td></tr>
<tr><td><s>10.6.1</s></td><td>Note 3</td><td>F.3.3.6</td><td>Note 3</td><td>Y.4.1</td><td>Note</td></tr>
<tr><td>Y.4.5</td><td>Note</td><td></td><td></td><td></td><td></td></tr>
</table></td><td>N/A</td></tr>
<tr><td>4</td><td colspan="2">Modification to Clause 1</td><td>—</td></tr>
<tr><td>1</td><td>Add the following note:
NOTE Z1 The use of certain substances in electrical and electronic equipment is restricted within the EU: see Directive 2011/65/EU.</td><td></td><td>N/A</td></tr>
<tr><td>5</td><td colspan="2">Modification to 4.Z1</td><td>—</td></tr>
</table>

IEC62368_1C- ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
4.Z1	***Add*** *the following new subclause after 4.9:* To protect against excessive current, short-circuits and earth faults in circuits connected to an a.c. **mains**, protective devices shall be included either as integral parts of the equipment or as parts of the building installation, subject to the following, a), b) and c): a) except as detailed in b) and c), protective devices necessary to comply with the requirements of B.3.1 and B.4 shall be included as parts of the equipment; b) for components in series with the mains input to the equipment such as the supply cord, appliance coupler, r.f.i. filter and switch, short-circuit and earth fault protection may be provided by protective devices in the building installation; c) it is permitted for **pluggable equipment type B** or **permanently connected equipment**, to rely on dedicated overcurrent and short-circuit protection in the building installation, provided that the means of protection, e.g. fuses or circuit breakers, is fully specified in the installation instructions. If reliance is placed on protection in the building installation, the installation instructions shall so state, except that for **pluggable equipment type A** the building installation shall be regarded as providing protection in accordance with the rating of the wall socket outlet.		N/A
6	**Modification to 5.4.2.3.2.4**		—
5.4.2.3.2.4	***Add*** *the following to the end of this subclause:* The requirement for interconnection with **external circuit** is in addition given in EN 50491-3:2009.		N/A
7	**Modification to 10.2.1**		—
10.2.1	Add the following to [c)] and [d)] in table 39: For additional requirements, see 10.5.1.		N/A
8	**Modification to 10.5.1**		—

IEC62368_1C- ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
10.5.1	***Add*** *the following after the first paragraph:* For RS 1 compliance is checked by measurement under the following conditions: In addition to the normal operating conditions, all controls adjustable from the outside by hand, by any object such as a tool or a coin, and those internal adjustments or pre-sets which are not locked in a reliable manner, are adjusted so as to give maximum radiation whilst maintaining an intelligible picture for 1 h, at the end of which the measurement is made. NOTE Z1 Soldered joints and paint lockings are examples of adequate locking. The dose-rate is determined by means of a radiation monitor with an effective area of 10 cm², at any point 10 cm from the outer surface of the apparatus. Moreover, the measurement shall be made under fault conditions causing an increase of the high voltage, provided an intelligible picture is maintained for 1 h, at the end of which the measurement is made. For RS1, the dose-rate shall not exceed 1 µSv/h taking account of the background level. NOTE Z2 These values appear in Directive 96/29/Euratom of 13 May 1996.		N/A
9	**Modification to G.7.1**		—
G.7.1	***Add*** *the following note:* NOTE Z1 The harmonized code designations corresponding to the IEC cord types are given in Annex ZD.		N/A
10	**Modification to Bibliography**		—

IEC62368_1C- ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	Add the following notes for the standards indicated: IEC 60130-9 NOTE Harmonized as EN 60130-9. IEC 60269-2 NOTE Harmonized as HD 60269-2. IEC 60309-1 NOTE Harmonized as EN 60309-1. IEC 60364 NOTE some parts harmonized in HD 384/HD 60364 series. IEC 60601-2-4 NOTE Harmonized as EN 60601-2-4. IEC 60664-5 NOTE Harmonized as EN 60664-5. IEC 61032:1997 NOTE Harmonized as EN 61032:1998 (not modified). IEC 61508-1 NOTE Harmonized as EN 61508-1. IEC 61558-2-1 NOTE Harmonized as EN 61558-2-1. IEC 61558-2-4 NOTE Harmonized as EN 61558-2-4. IEC 61558-2-6 NOTE Harmonized as EN 61558-2-6. IEC 61643-1 NOTE Harmonized as EN 61643-1. IEC 61643-21 NOTE Harmonized as EN 61643-21. IEC 61643-311 NOTE Harmonized as EN 61643-311. IEC 61643-321 NOTE Harmonized as EN 61643-321. IEC 61643-331 NOTE Harmonized as EN 61643-331.		N/A
11	**ADDITION OF ANNEXES**		—
ZB	**ANNEX ZB, SPECIAL NATIONAL CONDITIONS (EN)**		N/A
4.1.15	**Denmark, Finland, Norway** and **Sweden** To the end of the subclause the following is added: **Class I pluggable equipment type A** intended for connection to other equipment or a network shall, if safety relies on connection to reliable earthing or if surge suppressors are connected between the network terminals and **accessible** parts, have a marking stating that the equipment shall be connected to an earthed **mains** socket-outlet. The marking text in the applicable countries shall be as follows: In **Denmark**: “Apparatets stikprop skal tilsluttes en stikkontakt med jord som giver forbindelse til stikproppens jord.” In **Finland**: "Laite on liitettävä suojakoskettimilla varustettuun pistorasiaan" In **Norway**: “Apparatet må tilkoples jordet stikkontakt” In **Sweden**: “Apparaten skall anslutas till jordat uttag”		N/A
4.7.3	**United Kingdom** To the end of the subclause the following is added: The torque test is performed using a socket-outlet complying with BS 1363, and the plug part shall be assessed to the relevant clauses of BS 1363. Also see Annex G.4.2 of this annex		N/A

IEC62368_1C- ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
5.2.2.2	**Denmark** After the 2nd paragraph add the following: A warning (marking safeguard) for high touch current is required if the touch current exceeds the limits of 3,5 mA a.c. or 10 mA d.c.		N/A
5.4.11.1 **and** **Annex G**	**Finland and Sweden** To the end of the subclause the following is added: For separation of the telecommunication network from earth the following is applicable: If this insulation is solid, including insulation forming part of a component, it shall at least consist of either • two layers of thin sheet material, each of which shall pass the electric strength test below, or • one layer having a distance through insulation of at least 0,4 mm, which shall pass the electric strength test below. If this insulation forms part of a semiconductor component (e.g. an optocoupler), there is no distance through insulation requirement for the insulation consisting of an insulating compound completely filling the casing, so that clearances and creepage distances do not exist, if the component passes the electric strength test in accordance with the compliance clause below and in addition • passes the tests and inspection criteria of 5.4.8 with an electric strength test of 1,5 kV multiplied by 1,6 (the electric strength test of 5.4.9 shall be performed using 1,5 kV), and • is subject to routine testing for electric strength during manufacturing, using a test voltage of 1,5 kV. It is permitted to bridge this insulation with a capacitor complying with EN 60384-14:2005, subclass Y2. A capacitor classified Y3 according to EN 60384-14:2005, may bridge this insulation under the following conditions: • the insulation requirements are satisfied by having a capacitor classified Y3 as defined by EN 60384-14, which in addition to the Y3		N/A

IEC62368_1C- ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	testing, is tested with an impulse test of 2,5 kV defined in 5.4.11; • the additional testing shall be performed on all the test specimens as described in EN 60384-14; the impulse test of 2,5 kV is to be performed before the endurance test in EN 60384-14, in the sequence of tests as described in EN 60384-14.		
5.5.2.1	**Norway** After the 3rd paragraph the following is added: Due to the IT power system used, capacitors are required to be rated for the applicable line-to-line voltage (230 V).		N/A
5.5.6	**Finland, Norway** and **Sweden** To the end of the subclause the following is added: Resistors used as **basic safeguard** or bridging **basic insulation** in **class I pluggable equipment type A** shall comply with G.10.1 and the test of G.10.2.		N/A
5.6.1	**Denmark** **Add** to the end of the subclause Due to many existing installations where the socket-outlets can be protected with fuses with higher rating than the rating of the socket-outlets the protection for pluggable equipment type A shall be an integral part of the equipment. *Justification:* In Denmark an existing 13 A socket outlet can be protected by a 20 A fuse.		N/A
5.6.4.2.1	**Ireland and United Kingdom** After the indent for **pluggable equipment type A**, the following is added: – the **protective current rating** is taken to be 13 A, this being the largest rating of fuse used in the **mains** plug.		N/A
5.6.4.2.1	**France** After the indent for **pluggable equipment type A**, the following is added: – in certain cases, the **protective current rating** of the circuit supplied from the mains is taken as 20 A instead of 16 A.		N/A

IEC62368_1C- ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
5.6.5.1	To the second paragraph the following is added: The range of conductor sizes of flexible cords to be accepted by terminals for equipment with a rated current over 10 A and up to and including 13 A is: 1,25 mm^2 to 1,5 mm^2 in cross-sectional area.		N/A
5.6.8	**Norway** To the end of the subclause the following is added: Equipment connected with an earthed mains plug is classified as **class I equipment**. See the Norway marking requirement in 4.1.15. The symbol IEC 60417-6092, as specified in F.3.6.2, is accepted.		N/A
5.7.6	**Denmark** To the end of the subclause the following is added: The installation instruction shall be affixed to the equipment if the **protective conductor current** exceeds the limits of 3,5 mA a.c. or 10 mA d.c.		N/A
5.7.6.2	**Denmark** To the end of the subclause the following is added: The warning (marking safeguard) for high touch current is required if the touch current or the protective current exceed the limits of 3,5 mA .		N/A
5.7.7.1	**Norway and Sweden** To the end of the subclause the following is added: The screen of the television distribution system is normally not earthed at the entrance of the building and there is normally no equipotential bonding system within the building. Therefore the protective earthing of the building installation needs to be isolated from the screen of a cable distribution system. It is however accepted to provide the insulation external to the equipment by an adapter or an interconnection cable with galvanic isolator, which may be provided by a retailer, for example. The user manual shall then have the following or similar information in Norwegian and Swedish language respectively, depending on in what country the equipment is intended to be used in: “Apparatus connected to the protective earthing of the building installation through the mains connection or through other apparatus with a connection to protective earthing – and to a television distribution system using coaxial cable, may in some circumstances create a fire hazard. Connection to a television distribution		N/A

IEC62368_1C- ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	system therefore has to be provided through a device providing electrical isolation below a certain frequency range (galvanic isolator, see EN 60728-11)" NOTE In Norway, due to regulation for CATV-installations, and in Sweden, a galvanic isolator shall provide electrical insulation below 5 MHz. The insulation shall withstand a dielectric strength of 1,5 kV r.m.s., 50 Hz or 60 Hz, for 1 min. Translation to Norwegian (the Swedish text will also be accepted in Norway): "Apparater som er koplet til beskyttelsesjord via nettplugg og/eller via annet jordtilkoplet utstyr – og er tilkoplet et koaksialbasert kabel-TV nett, kan forårsake brannfare. For å unngå dette skal det ved tilkopling av apparater til kabel-TV nett installeres en galvanisk isolator mellom apparatet og kabel-TV nettet." Translation to Swedish: "Apparater som är kopplad till skyddsjord via jordat vägguttag och/eller via annan utrustning och samtidigt är kopplad till kabel-TV nät kan i vissa fall medföra risk för brand. För att undvika detta skall vid anslutning av apparaten till kabel-TV nät galvanisk isolator finnas mellan apparaten och kabel-TV nätet.".		
8.5.4.2.3	**United Kingdom** Add the following after the 2nd dash bullet in 3rd paragraph: An emergency stop system complying with the requirements of IEC 60204-1 and ISO 13850 is required where there is a risk of personal injury.		N/A
B.3.1 and B.4	**Ireland and United Kingdom** The following is applicable: To protect against excessive currents and short-circuits in the primary circuit of **direct plug-in equipment**, tests according to Annexes B.3.1 and B.4 shall be conducted using an external miniature circuit breaker complying with EN 60898-1, Type B, rated 32A. If the equipment does not pass these tests, suitable protective devices shall be included as an integral part of the **direct plug-in equipment**, until the requirements of Annexes B.3.1 and B.4 are met		N/A
G.4.2	**Denmark** To the end of the subclause the following is added:		N/A

IEC62368_1C- ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	Supply cords of single phase appliances having a rated current not exceeding 13 A shall be provided with a plug according to DS 60884-2-D1:2011. CLASS I EQUIPMENT provided with socket-outlets with earth contacts or which are intended to be used in locations where protection against indirect contact is required according to the wiring rules shall be provided with a plug in accordance with standard sheet DK 2-1a or DK 2-5a. If a single-phase equipment having a RATED CURRENT exceeding 13 A or if a polyphase equipment is provided with a supply cord with a plug, this plug shall be in accordance with the standard sheets DK 6-1a in DS 60884-2-D1 or EN 60309-2. Mains socket outlets intended for providing power to Class II apparatus with a rated current of 2,5 A shall be in accordance DS 60884-2-D1:2011 standard sheet DKA 1-4a. Other current rating socket outlets shall be in compliance with Standard Sheet DKA 1-3a or DKA 1-1c. Mains socket-outlets with earth shall be in compliance with DS 60884-2-D1:2011 Standard Sheet DK 1-3a, DK 1-1c, DK1-1d, DK 1-5a or DK 1-7a *Justification:* Heavy Current Regulations, Section 6c		
G.4.2	**United Kingdom** To the end of the subclause the following is added: The plug part of direct plug-in equipment shall be assessed to BS 1363: Part 1, 12.1, 12.2, 12.3, 12.9, 12.11, 12.12, 12.13, 12.16, and 12.17, except that the test of 12.17 is performed at not less than 125 °C. Where the metal earth pin is replaced by an Insulated Shutter Opening Device (ISOD), the requirements of clauses 22.2 and 23 also apply.		N/A

IEC62368_1C- ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
G.7.1	**United Kingdom** To the first paragraph the following is added: Equipment which is fitted with a flexible cable or cord and is designed to be connected to a mains socket conforming to BS 1363 by means of that flexible cable or cord shall be fitted with a 'standard plug' in accordance with the Plugs and Sockets etc. (Safety) Regulations 1994, Statutory Instrument 1994 No. 1768, unless exempted by those regulations. NOTE "Standard plug" is defined in SI 1768:1994 and essentially means an approved plug conforming to BS 1363 or an approved conversion plug.		N/A
G.7.1	**Ireland** To the first paragraph the following is added: Apparatus which is fitted with a flexible cable or cord shall be provided with a plug in accordance with Statutory Instrument 525: 1997, "13 A Plugs and Conversion Adapters for Domestic Use Regulations: 1997. S.I. 525 provides for the recognition of a standard of another Member State which is equivalent to the relevant Irish Standard		N/A
G.7.2	**Ireland and United Kingdom** To the first paragraph the following is added: A power supply cord with a conductor of 1,25 mm^2 is allowed for equipment which is rated over 10 A and up to and including 13 A.		N/A
ZC	**ANNEX ZC, NATIONAL DEVIATIONS (EN)**		N/A
10.5.2	**Germany** The following requirement applies: For the operation of any cathode ray tube intended for the display of visual images operating at an acceleration voltage exceeding 40 kV, authorization is required, or application of type approval (Bauartzulassung) and marking. *Justification*: German ministerial decree against ionizing radiation (Röntgenverordnung), in force since 2002-07-01, implementing the European Directive 96/29/EURATOM. **NOTE** Contact address: Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig, Tel.: Int+49-531-592-6320, Internet: http://www.ptb.de		N/A

ZD	IEC and CENELEC CODE DESIGNATIONS FOR FLEXIBLE CORDS (EN)	N/A

N/A

Type of flexible cord	Code designations	
	IEC	CENELEC
PVC insulated cords		
Flat twin tinsel cord	60227 IEC 41	H03VH-Y
Light polyvinyl chloride sheathed flexible cord	60227 IEC 52	H03VV-F H03VVH2-F
Ordinary polyvinyl chloride sheathed flexible cord	60227 IEC 53	H05VV-F H05VVH2-F
Rubber insulated cords		
Braided cord	60245 IEC 51	H03RT-F
Ordinary tough rubber sheathed flexible cord	60245 IEC 53	H05RR-F
Ordinary polychloroprene sheathed flexible cord	60245 IEC 57	H05RN-F
Heavy polychloroprene sheathed flexible cord	60245 IEC 66	H07RN-F
Cords having high flexibility		
Rubber insulated and sheathed cord	60245 IEC 86	H03RR-H
Rubber insulated, crosslinked PVC sheathed cord	60245 IEC 87	H03RV4-H
Crosslinked PVC insulated and sheathed cord	60245 IEC 88	H03V4V4-H
Cords insulated and sheathed with halogen-free thermoplastic compounds		
Light halogen-free thermoplastic insulated and sheathed flexible cords		H03Z1Z1-F H03Z1Z1H2-F
Ordinary halogen-free thermoplastic insulated and sheathed flexible cords		H05Z1Z1-F H05Z1Z1H2-F

IEC 62368-1 ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
ATTACHMENT TO TEST REPORT **IEC 62368-1:2018** **SAUDI ARABIA NATIONAL DIFFERENCES** **(Audio/video, information and communication technology equipment Part 1: Safety requirements)**			
Differences according to ..... :	National standard SASO-IEC 62368-1:2020		
TRF template used: ..... :	IECEE OD-2020-F3, Ed. 1.1		
Attachment Form No. ..... : **Attachment Originator .....** : **Master Attachment**..... :	SA_ND_IEC62368_1E SASO 2022-12-22		
Copyright © 2022 IEC System for Conformity Testing and Certification of Electrical Equipment (IECEE), Geneva, Switzerland. All rights reserved.			
	National Differences		N/A
			N/A
	Plugs used for pluggable equipment comply with standard SASO-2203.		N/A
--	**Frequency (Hz)**		N/A
	60 Hz		N/A
--	**Rated voltage (V)**		N/A
	Single phase 230 V Three phase 400 V		N/A

IEC 62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
ATTACHMENT TO TEST REPORT IEC 62368-1 (AUSTRALIA / NEW ZEALAND) NATIONAL DIFFERENCES (**Audio/video, information and communication technology equipment**)			
Differences according to ..... : AS/NZS 62368.1:2022			
TRF template used: .....: IECEE OD-2020-F3, Ed. 1.1			
Attachment Form No. ..... : AU_NZ_ND_IEC62368_1E **Attachment Originator .....** : JAS-ANZ **Master Attachment**..... : 2022-07-01			
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	National Differences		N/A
Appendix ZZ	Variations to IEC 62368-1:2018 (ED. 3.0) for Australia and New Zealand		N/A
ZZ1 Scope	This Appendix lists the normative variations to IEC 62368-1:2018 (ED. 3.0)		N/A
ZZ2 Variations	The following modifications are required for Australian/New Zealand conditions:		N/A
2	After the first paragraph, *add* the following: The Australian or Australian/New Zealand Standards listed below are modified adoptions of, or not equivalent to, the IEC normative references and are required for the application of this Standard. All references in the source text to those IEC normative references shall be replaced by references to the corresponding Australian or Australian/New Zealand Standards. Australian or Australian/New Zealand Standards that are identical adoptions of international normative references may be used interchangeably -AS/NZS 3112, *Approval and test specification—Plugs and socket-outlets* -AS/NZS 3123, *Approval and test specification—Plugs, socket-outlets and couplers for general industrial application* -AS/NZS 3191, *Electric flexible cords* *-AS/NZS 60884.1.Plugs and socket-outlets for household and similar purposes, Part 1: General requirements* *-IEC 60086-2 Primary batteries — Part 2: Physical and electrical specifications* -AS/NZS 60065, *Audio, video and similar electronic apparatus—Safety requirements (IEC 60065:2015 (ED.8.0) MOD)* -AS/NZS 60320.1, *Appliance couplers for*		N/A

IEC 62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	household and similar general purposes, Part 1: General requirements (IEC 60320-1, Ed.2.1 (2007) MOD) -AS/NZS 60320.2.2, *Appliance couplers for household and similar general purposes Part 2.2: Interconnection couplers for household and similar equipment (IEC 60320-2-2, Ed.2.0 (1998) MOD)* -AS/NZS 60695.2.11*, Fire hazard testing, Part 2.11: Glowing/hot wire based test methods—Glow-wire flammability test method for end-products* -AS/NZS 60695.11.5, *Fire hazard testing, Part 11.5: Test flames—Needle-flame test method—Apparatus, confirmatory test arrangement and guidance* -AS/NZS 60695.11.10, *Fire hazard testing, Part 11.10: Test flames—50 W horizontal and vertical flame test methods* -AS/NZS 60884.1, *Plugs and socket-outlets for household and similar purposes, Part 1: General requirements* -AS/NZS 60950.1, *Information technology equipment—Safety*, Part 1: *General requirements (IEC 60950-1, Ed.2.2 (2013), MOD)* IEC 61032:1997, *Protection of persons and equipment by enclosures—Probes for verification* -AS/NZS 61558.1, *Safety of Power Transformers, Power Supplies, Reactors and Similar Products, Part 1: General requirements and tests (IEC 61558-1 Ed 3, MOD)* -AS/NZS 61558.2.16, *Safety of transformers, reactors, power supply units and similar products for voltages up to 1 100 V, Part 2.16: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units.*		
4.7.2	**Requirements** *Delete* the text of the second paragraph and *replace* with the following: Equipment with a plug portion, suitable for insertion into a 10 A 3-pin flat-pin socket-outlet conforming to AS/NZS 3112, shall conform to the requirements in AS/NZS 3112 for equipment with integral pins for insertion into socket-outlets. Conformity is checked by inspection and, if necessary, by the tests in AS/NZS 3112. NOTE: Equipment with plug portions for use in countries other than Australia and New Zealand will need to conform to other countries' requirements Note Additional AS/NZS 3112 Appendix J, TRF is appended to end of this TRF.		N/A

<table>
<tr><td colspan="4">IEC 62368_1E ATTACHMENT</td></tr>
<tr><td>Clause</td><td>Requirement + Test</td><td>Result - Remark</td><td>Verdict</td></tr>
<tr><td>4.7.3</td><td>Compliance Criteria
Delete this clause</td><td></td><td>N/A</td></tr>
<tr><td>4.8.1</td><td>General
After second list, add the following:
NOTE: Refer to the Consumer Goods (Products Containing Button/Coin Batteries) Safety Standard 2020 and Consumer Goods (Products Containing Button/Coin Batteries) Information Standard 2020 for more information on button cell batteries in Australia.</td><td></td><td>N/A</td></tr>
<tr><td>5.4.10.2.1</td><td>General
Delete the first paragraph and replace with the following:
In Australia, the separation is checked by the test given in both Clause 5.4.10.2.2 and Clause 5.4.10.2.3.
In New Zealand, the separation is checked by the test given in either 5.4.10.2.2 or 5.4.10.2.3.</td><td></td><td>N/A</td></tr>
<tr><td>Table 28</td><td colspan="2">Delete Table 28 and replace with the following:</td><td>N/A</td></tr>
<tr><td colspan="4">
<table>
<tr><td rowspan="2">Parts</td><td colspan="2">Impulse test</td><td colspan="2">Steady state test</td></tr>
<tr><td>New Zealand</td><td>Australia</td><td>New Zealand</td><td>Australia</td></tr>
<tr><td>Parts indicated in Clause 5.4.10.1 a) [a]</td><td>2.5 kV</td><td>7.0 kV for hand-held telephones and headsets, 2.5 kV for other equipment.</td><td>1.5 kV</td><td>3 kV</td></tr>
<tr><td>Parts indicated in Clause 5.4.10.1 b) and c) [b]</td><td colspan="2">1.5 kV [c]</td><td>1.0 kV</td><td>1.5 kV</td></tr>
<tr><td colspan="5">[a] Surge suppressors shall not be removed.
[b] Surge suppressors may be removed, provided that such devices pass the impulse test of Clause 5.4.10.2.2 when tested as components outside the equipment.
[c] During this test, it is allowed for a surge suppressor to operate and for a sparkover to occur in a GDT.</td></tr>
</table>
</td></tr>
<tr><td>5.4.10.2.2</td><td>Delete “NOTE” and replace with “NOTE 1”.
After NOTE 1, add the following:
NOTE 2: For Australia, the 7 kV impulse simulates lightning surges on typical rural and semi-rural network lines.
NOTE 3: For Australia, the value of 2.5 kV for Clause 5.4.10.1 a) was chosen to ensure the adequacy of the insulation concerned and does not necessarily simulate likely overvoltages.</td><td></td><td>N/A</td></tr>
</table>

IEC 62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
5.4.10.2.3	*Delete* "NOTE" and *replace* with "NOTE 1". After NOTE 1, *add* the following: NOTE 2: For Australia, where there are capacitors across the insulation under test, it is recommended that d.c. test voltages are used. NOTE 3: The 3 kV and 1.5 kV values for Australia have been determined considering the low frequency induced voltages from the power supply distribution system.		N/A
6	**Electrically-caused fire**		N/A
6.6	After Clause 6.6, *add* the new Clauses 6.201 as follows: **6.201 External power supplies, docking stations and other similar devices** (see special national conditions)		N/A
8.6	**Stability of equipment**		N/A
Table 36	Footnote [a], after first sentence, *add* the following: Equipment having displays with moving images shall include "television sets and display devices".		N/A
8.6.1	After Clause 8.6.1 *add* the following new clauses: **8.6.201 Restraining Device fixing point** (see special national conditions) **8.6.202 Restraining device** (see special national conditions)		N/A
Annex F **Paragraph F.3.3.4**	**Rated Voltage** *Delete* "NOTE" and *replace* with NOTE1" After NOTE 1, *add* the following Equipment that is intended for connection to the supply mains in Australia and New Zealand shall be marked with: (a) A rated voltage of: • 230 V for single phase equipment • 400 V for poly phase equipment Or (b) A rated voltage range that includes: • 230 V for single phase equipment • 400 V for poly phase equipment NOTE 2: equipment that is not rated as above is not suitable for direct connection to the supply mains in Australia or new Zealand.		N/A
Annex F.3.3.5	After the list, *add* the following Equipment that is intended for connection to supply mains in Australia or New Zealand shall be marked with a rated frequency of 50 Hz or a rated frequency range or nominal value which includes 50Hz		N/A
Annex F.3.8	After "The DC output of an external power supply", insert "or docking stations and other similar external devices"		N/A

IEC 62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
Annex G **Paragraph G.4.2**	**Mains connectors** 1 After “IEC 60320”, insert “or AS/NZS 60320 series”. 2 After “IEC 60906-1”, insert”or AS/NZS 3123” 3 *After* first paragraph *add* the following: 10 A or 15 A 250 V flat pin plugs for the connection of equipment to mains-powered socket-outlets for household or similar general use shall comply with AS/NZS 3112 or AS/NZS 60884.1.		N/A
Paragraph G.5.3.1	**Transformers, General** 1 Third dashed point *replace* ‘IEC 61558-1 and the relevant parts of IEC 61558-2’ with ‘AS/NZS 61558-1 and the relevant parts of AS/NZS 61558.2’ 2 Fourth dashed point *replace* ‘IEC 61558-2-16’ with ‘AS/NZS 61558.2.16’.		N/A
Annex G.7.1	**Mains supply cords, General** Fourth dashed paragraph, *replace* ‘IEC 60320-1’ with ‘AS/NZS 60320.1’		N/A
Table G.7	**Sizes of conductors** 1 First column, second row, *delete* “6” and *replace* with “7.5” 2 Second column, second row, *delete* ‘0,75’ and *replace* with ‘0.75[b] 3 *Delete* NOTE 1. 4 *Replace* ‘NOTE 2’ with ‘NOTE:’. 5 *Delete* ‘Footnote b’ and *replace* with the following: [b] This nominal cross-sectional area is only allowed for Class II appliances if the length of the power supply cord, measured between the point where the cord, or cord guard, enters the appliance, and the entry to the plug does not exceed 2 m (0.5 mm^2 three-core supply flexible cords are not permitted; see AS/NZS 3191). 6 Footnote c *replace* ‘IEC 60320-1’ with ‘AS/NZS 60320.1’ 7 Footnote d *replace* ‘IEC 60320-1’ with ‘AS/NZS 60320.1’		N/A
Annex M **M 2.1**	*Add* “IEC 60086-2” to the list		N/A

IEC 62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
Annex M **Paragraph M.3.2**	**Test method** Delete"NOTE" and replace with "NOTE 1" After NOTE 1 *add* the following: NOTE 2: In cases where the voltage source is provided by power from an unassociated power source, consideration should be given to the effects of possible single fault conditions in the unassociated equipment. If the power source is unknown then it should be assumed that the maximum limit of ES1 may be applied to the source input under assumed single fault conditions in the source when assessing the charging circuit in the equipment under test.		N/A
	Special national conditions (if any)		N/A
6.201	**External power supplies, docking stations and other similar devices** For external power supplies, docking stations and other similar devices, during and after abnormal operating conditions and during single fault conditions the output voltage— (a) at all ES1 outlets or connectors shall not increase by more than 10 % of the output rated voltage under normal operating conditions, measured after 3 s of introducing a singlefault condition and after 3 s of introducing abnormal operating conditions; and (b) of a USB outlet or connector shall not increase by more than 3 V or 10 % of the output rated voltage under normal operating conditions, whichever is higher, measured after3 seconds of introducing a single fault condition and after 3 s of introducing abnormal operating conditions For equipment with multiple rated voltages at the output, the requirements apply with the equipment configured for each output rated voltage in turn NOTE: This is intended to reduce the possibility of battery fire or explosion in attached equipment or accessories when charging secondary lithium batteries. The 3 s measurement delay is based on IEC document 108/742/INF, *TC 108, Standards Interpretation Panel Question 15 — Output voltage*, in relation to similar requirements in IEC 62368-3:2017. Conformity shall be checked by measurement, taking into account the abnormal operating conditions of Annex B.3 and the simulated single fault conditions of Annex B.4.		N/A

IEC 62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
8.6.201	**Restraining device fixing point** Freestanding-capable MS2 and MS3 television sets and display devices shall be provided with a fixing point to facilitate the anchoring of the equipment from toppling. The fixing point shall conform to Clause 8.7 where the fixing point uses a wall, ceiling or other structure mount. Alternatively, the fixing point shall be capable of withstanding a pull equal to the mass of the equipment in all directions without damage. Instructions for installation or instructions for use shall be provided to specify correct use of the fixing point.		N/A
8.6.202	**Restraining device** MS2 and MS3 television sets and display devices shall be provided with a restraining device and associated hardware to attach to the television set or display device. The restraining device shall be capable of withstanding a pull equal to the mass of the equipment in all directions. Instructions for installation or instructions for use shall be provided to specify correct use of the fixing point.		N/A

IEC62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
ATTACHMENT TO TEST REPORT **IEC 62368-1** **SINGAPORE NATIONAL DIFFERENCES** Audio/video, information and communication technology equipment - Part 1: Safety requirements			
Differences according to ..... :	Special National Conditions		
TRF template used: ..... :	IECEE OD-2020-F3, Ed. 1.1		
Attachment Form No. ..... :	SG_ND_IEC62368_1E		
Attachment Originator ..... :	Intertek Testing Services (Singapore) Pte Ltd		
Master Attachment..... :	2022-07-08		
	National Differences		—
	Not Applicable		—
Chapter 4.2	**Special national conditions (if any)** Controlled goods under the Consumer Protection (Safety Requirements) Registration Scheme (CPS) are required to be tested to additional requirements stipulated by the Consumer Product Safety Office (CPSO) of Enterprise Singapore in Chapter 7 of the CPS information booklet. The CPS information booklet is updated on an ongoing basis. At the point of testing, refer to the latest copy of the CPS information booklet for the minimum edition of standard to apply for testing of products under the CPS scheme and any new requirements. Link to CPS information booklet: https://www.consumerproductsafety.gov.sg/files/cps-info-booklet.pdf		N/A
Clause 1	All appliances must be tested to 230 VAC, 50 Hz.		N/A
4	Appliance fitted with voltage selector shall be tested as follows: Connect appliance to 230 VAC mains with voltage selector switch to settings not suitable for operation at 230 VAC.		N/A
5	All appliances (with tropical test requirements in applicable Standards) shall comply with the tropical condition test as stated in the relevant IEC Standards.		N/A

IEC62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
7	All Class I appliances must be fitted with 3-pin mains plugs that are registered with the CPSO.		N/A
8	a) All Class II appliances must be fitted with 2-pin mains plug complying with EN 50075. b) Class II appliances that are fitted with 3-pin mains plugs must use plugs that are registered with the CPSO.		N/A
9	Detachable power cord set must be listed in the test report critical component list.		N/A
14	AC Adaptor incorporated with 13A socket-outlet to be tested to additional tests clauses 13, 17 and 18 of SS 145 Part 3: 2020.		N/A
15	Supplier who is supplying AC adaptors with detachable interchangeable plug pins must include with its products, written instructions to inform customer on the type of detachable interchangeable plug pins that are approved and suitable to use in Singapore. These instructions are to be submitted to the Conformity Assessment Body for verification when applying for Certificate of Conformity.		N/A
16	For AC Adaptors supplied together with Personal Mobility Devices: 1. Registered Supplier to declare the model of the AC adaptor that is to be used with/ bundled together with the PMDs; 2. Registered Supplier to provide valid IEC 60950-1 or IEC 62368-1 test reports for certification and registration of the declared AC adaptor under the CPS scheme; and 3. Registered Supplier to provide the UL 2272 test report as supporting document, showing that the listed AC adaptor in the UL 2272 test report is the model declared to be used with/ bundled together with the PMDs.		N/A
18	CD/ DVD ROMs (used in personal computers) to have test certificate showing that CD/DVD ROM drive has complied with IEC 60825- 1.		N/A
19	Modem card incorporated in the personal computer must be tested at set level (sub-clauses 5.1 & 6 of IEC 60950) or at component level.		N/A
20	Powerline Ethernet Adaptor incorporated with 13A socket-outlet, to be tested to additional test clauses 13, 17 & 18 of SS 145 Part 3: 2020.		N/A
	Other additional requirements which may be included in Chapter 7 of the information booklet in ongoing basis at the time of testing.		N/A

IEC 62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
ATTACHMENT TO TEST REPORT **IEC 62368-1** **CHINA NATIONAL DIFFERENCES** (**Audio/video, information and communication technology equipment -Part 1: Safety requirements**)			
Differences according to ..... : GB 4943.1-2022			
TRF template used: ..... : IECEE OD-2020-F3, Ed. 1.1			
Attachment Form No. ..... : CN_ND_IEC62368_1E **Attachment Originator .....** : CQC **Master Attachment**..... : Dated 2022-12-01			
	National Differences		N/A
4.1.2	**Use of components** Add a paragraph: A component used shall comply with related requirements corresponding altitude of the equipment.		N/A
4.11	Add clause 4.11,as follows: Protection in PRIMARY CIRCUITS against overcurrent short-circuits and earth faults shall be provided as an integral part of the equipment except the device shall meet the all requirement of Fault conditions. If pluggable equipment type B or permanently connected equipment depends on protective devices outside the equipment for protection, this shall be stated in the installation instructions of the equipment, with requirements for short-circuit protection, over-current protection ,or both if necessary.		N/A
5.3.2.2	**Contact requirements** Amend the 2nd paragraph of table 8 to be: For equipment intended to be used at altitude of 2000m to 5000m, the values in this table are multiplied by the multiplication factor corresponding altitude of 5000m.		N/A

IEC 62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
5.4.2.5	**Multiplication factors for altitudes higher than 2 000 m above sea level** Amend the 1st paragraph to be: For equipment to be operated at more than 2000 m above sea level and up to 5000m above sea level, the minimum CLEARANCE in tables 10,11 and 14,and resistance test voltages required in table 15, shall meet the requirements of 5000 m above sea level, This is multiplied by the multiplication factor corresponding altitude of 5000m in table 16. For equipment to be used at equal or less than 2000 m above sea level, the minimum CLEARANCE in tables 10, 11 and 14, and resistance test voltages required in table 15, shall meet the requirements of 2000 m above sea level. This is multiplied by the multiplication factor corresponding altitude of 2000m in table 16. Delete note 2 of Clause 5.4.2.5.		N/A
5.4.5.1	**General** Delete the 2nd paragraph of Clause 5.4.5.1: This test does not apply to equipment where one antenna terminal on the equipment is connected to earth in accordance with 5.6.7. Add the following: The Insulation resistance between CATV antenna coaxial sockets and protective earth of apparatus shall comply with BASIC INSULATION. If it's possible that CLASS II apparatus with CATV antenna coaxial sockets connect with protective earth of another CLASS I apparatus by other terminals, the insulation resistance between them shall comply with BASIC INSULATION as well. If antenna cable separated from the protective earth before connection to the apparatus, there is no requirements of Insulation resistance between them but F.4 requirements shall be meet. *Del*ete "NOTE" of Clause 5.4.5.1		N/A

IEC 62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
5.4.8	**Humidity conditioning** Amend clause 5.4.8 as follows : The humidity conditioning is conducted for 120 h in a cabinet or room containing air with ambient temperature (40±2) °C and a relative humidity of (93±3)%. During this conditioning, the component or subassembly is not energized. For equipment not to be operated at tropical climatic conditions, humidity conditioning is conducted for 48 h in a cabinet or room containing air with a relative humidity of (93±3) %. The temperature of the air, at all places where samples can be located, is maintained within 2 °C of any convenient value between 20 °C and 30 °C such that condensation does not occur. Add note: For equipment to be operated at 2000 m - 5000m above sea level, assessment and requirement of humidity conditioning for Insulation material properties are considered. Pre-processing conditions and requirements below 2000m can be used until additional data is available.		N/A
6.4.9 Y.4.3	Delete references to ASTM and NEMA.		N/A
6.5.1	**General requirements** Delete the text of the Note “Wire complying with UL 2556 VW-1 is considered to comply with these requirements”.		N/A
F.1	Amend the second paragraph of annex F.1 to be: Unless symbols are used or otherwise specified, safety related equipment markings, instructions, and instructional safeguards shall be in normative Chinese.		N/A

IEC 62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
F.2.2	After the first paragraph of annex F.2.2 ,add the following: For apparatus intended to be used at altitude not exceeding 2000m, a warning label containing the following or a similar appropriate wording or a symbol shown below shall fixed to the equipment at readily visible place. "Only used at altitude not exceeding 2000m."  For apparatus intended to be used in not-tropical climate regions, a warning label containing the following or a similar appropriate wording or a symbol shown below shall fixed to the equipment at readily visible place. "Only used in not-tropical climate regions."  If only symbol used, the explanation of the symbol shall be contained in the instruction manual. The statements above shall be given in a language acceptable to the regions where the apparatus is intended to be used.		N/A
F.3.3.4	After the last paragraph, Added: …for single rated voltage, “220 V” or three-phase “380V” shall be marked only. For a rating voltage range, 220 V or three-phase 380V shall be covered. For multiple rated voltages, one of them shall be 220 V or three-phase 380V and which default setting from manufacture shall be 220 V or three-phase 380V as well.		N/A
F.3.3.5	After the last paragraph, Added: Rated frequency shall be 50Hz or frequency range shall cover 50Hz.		N/A
F.4	**Instructions** Added: – For apparatus incorporating antenna coaxial sockets which is non-separated with CATV network, a warning wording or a similar shall be given in the instruction manual: “A CATV cable intended to be connected to apparatus shall be separated with the protective earth of the apparatus, otherwise fire hazard might be caused.”		N/A
F.5	**Instructional safeguards** In table F.2 ， change 230V to 220V， change 400Y/230V 3Ø to 380 Y/220 V 3Ø		N/A

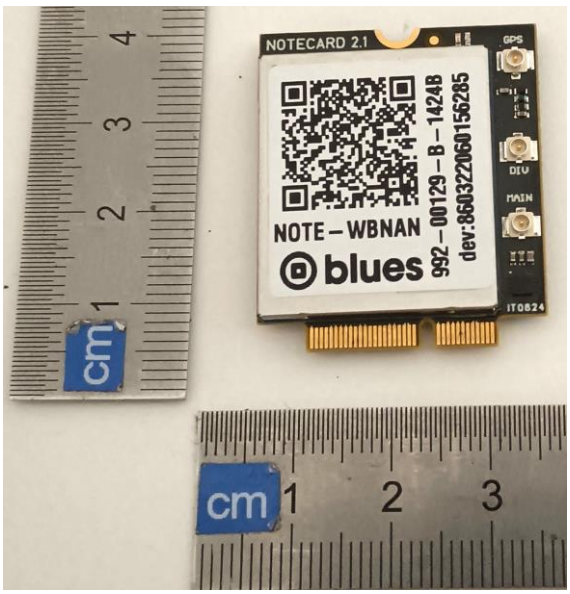
IEC 62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
G.4.2	Amend clause G.4.2 as follows : Plugs connected to the MAINS in apparatus shall comply with GB/T 1002,GB/T 1003,GB/T 2099.1 or GB/T11918（All parts） series. Appliance coupler shall comply with GB/T 17465（All parts） series or GB/T 11918（All parts） series.		N/A
	Special national conditions (if any)		N/A
0.12	Add clause 0.12 Description of relevant information.		N/A
1	GB 4943.1-2022 applies to equipment used at altitudes not exceeding 5000m above sea level, For apparatus intended to be used at altitude not exceeding 2000m, The requirements can be appropriately reduced, but warning instructions shall be provided.. Revise the sixth paragraph of 1 as: In addition to specified by the manufacturer, this document assumes a maximum altitude of 5000m		N/A
B.2.6.1	Amend T_{ma} as follows: T_{ma} is the maximum ambient temperature permitted by the manufacturer's specification, or 35 °C, whichever is greater. Add note 1: For equipment not to be operated at tropical climatic conditions, T_{ma} is the maximum ambient temperature permitted by the manufacturer's specification, or 25 °C, whichever is greater. Add note 2: For equipment to be operated at 2000m-5000m above sea leave, its temperature test conditions and temperature limits are under consideration. temperature test conditions and temperature limits below 2000m can be used until additional data is available.		N/A
Annex Z **(normative)**	Added annex Z: Instructions of the new safety warning labels.		N/A
Annex AA (informative)	Added annex AA: Illustration relative to safety explanation in normative Chinese, Tibetan, Mongolian, Zhuang Language and Uighur.		N/A

Enclosure No. 2

of the unit

(5 pages including this cover page)

NOTE-WBNAN:


NOTECARD 2.1
GPS
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MAIN
NOTE – WBNAN
blues
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IT0624
cm
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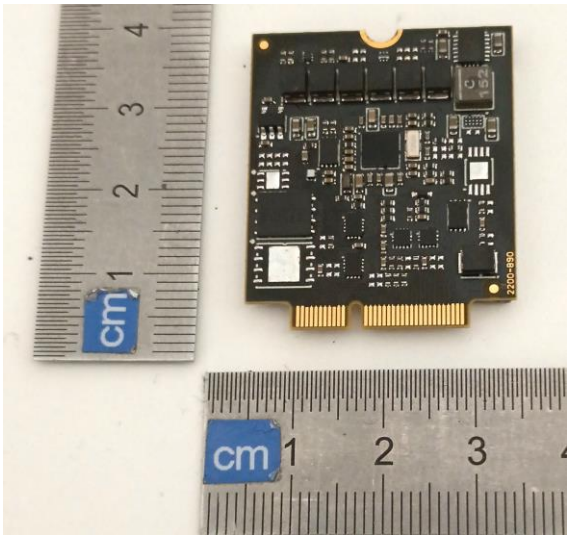
2
3
4


cm
1
2
3
4

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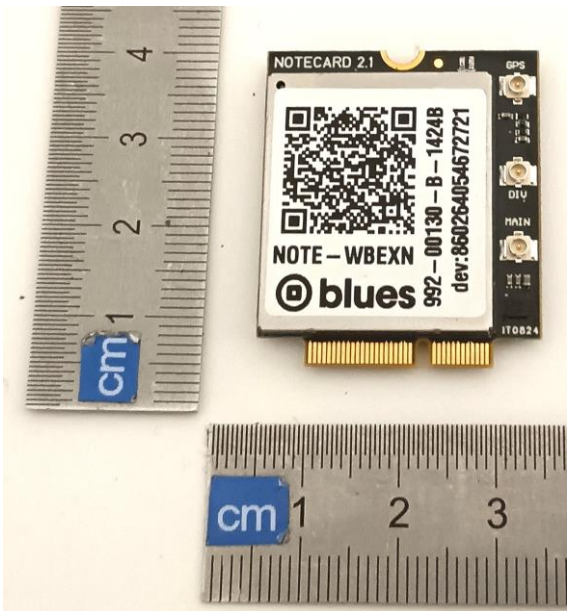
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GPS
DIV
MAIN
NOTE – WBEXN
blues
992 – 00130 – B – 14248
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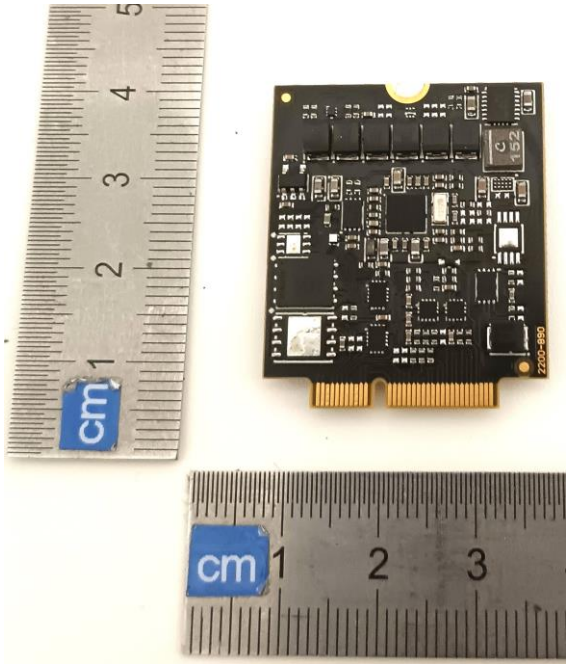
cm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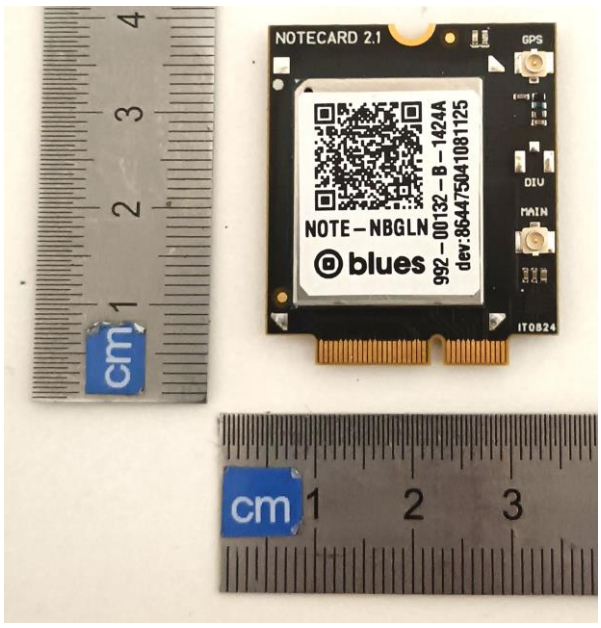
NOTE-NBGLN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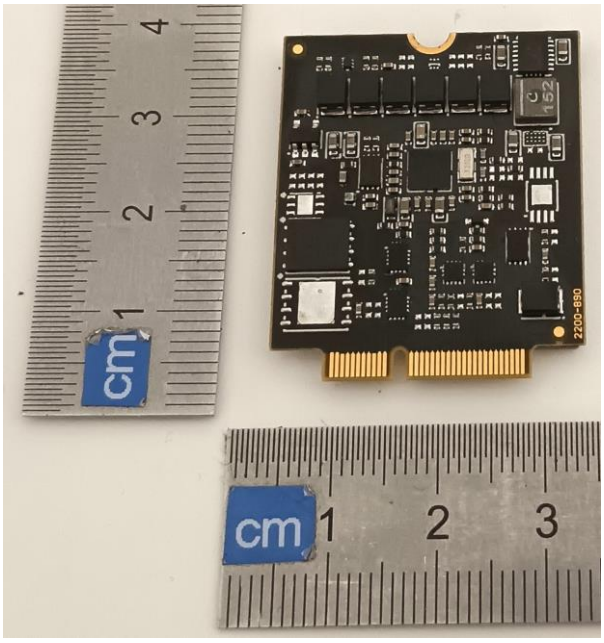
GPS
DIV
MAIN
NOTE – NBGLN
blues
992 – 00132 – B – 1424A
dev:864475041081125
IT0824
cm
1
2
3
4


cm
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4

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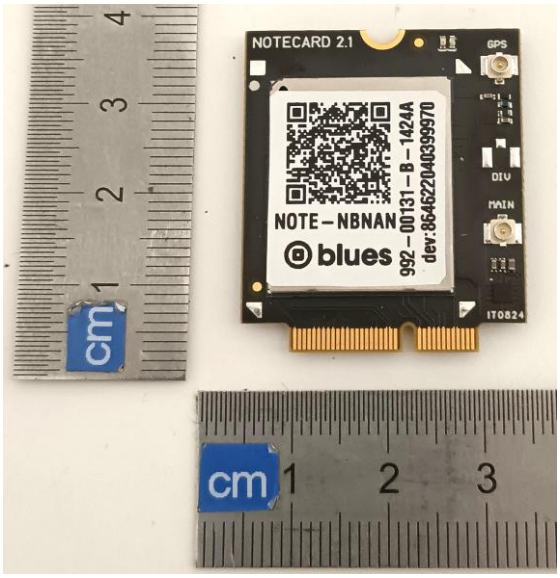
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GPS
DIV
MAIN
NOTE – NBNAN
blues
992 – 00131 – B – 1424A
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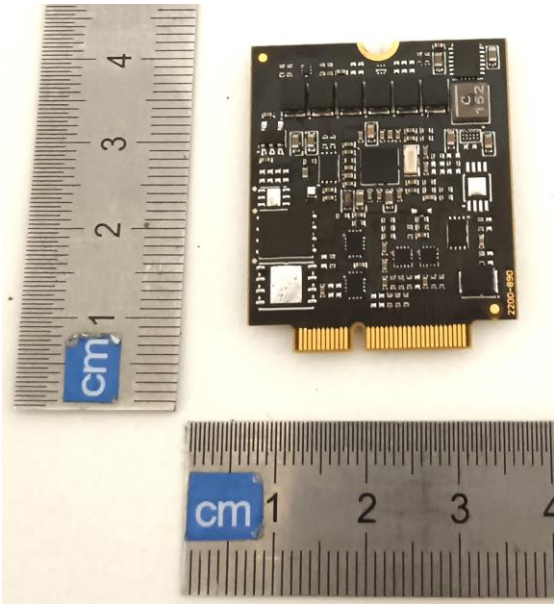
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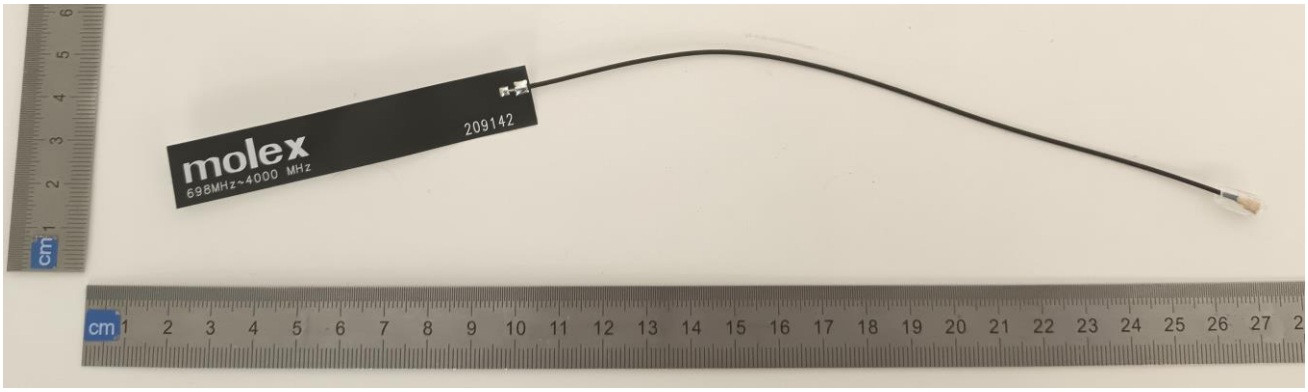

molex
698MHz~4000 MHz
209142
cm

Enclosure No. 3

Technical documentation
(48 pages including this cover page)

NOTE-NBGLN, NOTE-NBNAN, NOTE-WBNAN, NOTE-WBEXN specifications

Specifications

General Characteristics

Description	Value
Weight	6 grams

Electrical Characteristics

Absolute Maximum Ratings

Description	Minimum	Maximum	Unit
Storage temperature	-40	80	°C
Ambient operating temperature	-35	75	°C

DC Characteristics

Description	Minimum	Typical	Maximum	Unit
VIO Supply Voltage	1.8		3.3	V
VMODEM Supply Voltage	2.5		5.5	V
VIO Operating Current			150	mA

Description	Minimum	Typical	Maximum	Unit
VMODEM Operating Current		250	2000	mA

Full specifications for NOTE-NBGLN
(Other available on request)

Docs > Datasheets > Notecard Datasheet - NOTE-NBGLN

Blues Notecard® Datasheet: NOTE-NBGLN

Select Hardware: NOTE-NBGLN

Cellular Device-to-Cloud Data Pump

Affordable, embeddable module for low-power cellular connectivity.

Modern industrial and commercial systems increasingly need to securely send data to the cloud, and often enable remote control, as well. These requirements require greenfield or retrofit designs to adapt existing systems to this new operating reality.

The growing danger of connecting devices to the internet using Wi-Fi, combined with the increasing need to track assets while in-motion, has generated tremendous interest in cellular as an alternative for safe and reliable transport of data between devices and the cloud.

To date, however, cellular communications have been equated with high cost, power-hungry devices, and high implementation complexity for hardware and software developers alike.

Functional Description

As an embeddable device-to-cloud data pump, the Notecard eliminates all complexity and friction that exists with existing IoT solutions. It enables development and rapid iteration of production-quality secure cellular, Wi-Fi, or LoRa IoT solutions at an extremely low, fixed cost. With as little as two lines of code on the controlling MCU, and with no external libraries or dependencies, data can be sent from device to cloud.

Notecard is:

- A drop-in embeddable data storage and transport module for cellular IoT products, pumping JSON-formatted or binary data ("Notes") bi-directionally between device and cloud:
  - JSON from/to MCU application using I2C, Serial, or USB.
  - JSON to/from your cloud app using HTTPS or MQTT.
  - JSON is auto-tagged with date/time, tower, and GPS locations.

- A removable and field-upgradable 30mm x 35-42mm system-on-a-module (SOM).
- A cellular device without the monthly fees.
- Ability to add a second MFF2 SIM to provide extended cellular coverage.

> **Note**
>
> Notecard XP is a low-cost variant of NOTE-NBGLN for customers looking to scale with Blues beyond their first few thousand units. The Notecard XP is a field-upgradable, network sunset-resilient alternative to chip down cellular design that allows product builders to incorporate aspects of the Notecard hardware into their own PCB to optimize BOM costs for a volume order.
>
> The Notecard XP requires the companion Notecarrier XP in order to function while prototyping, since this version of the Notecard **does not include a cellular radio power supply, embedded SIM, SIM-switching circuitry, or conformal coating**. Therefore, information specific in this datasheet to those components do not apply to the Notecard XP variant.

Features

- **Low-power.** Designed to operate on battery power, be "always-on", maintain time & location, while typically drawing less than ~8µA@5V when idle.
- **MCU-agnostic.** Will support any MCU or single-board computer as your app processor - even low-memory, 8-bit microcontrollers.
- **Global.** With both narrowband and wideband modems tailored for use in North America or globally, a Notecard can connect in almost any location. See Cellular Service for details.

Decoding Notecard SKUs

Each cellular-based Notecard is supplied a SKU in the format of "NOTE-XXXXX". The following table shows how to decode the differences in Notecard SKUs.

Example:	NOTE-	WB	GL	W	T
Bands **WB** = Wideband (Cat-1) **MB** = Midband (Cat-1 bis) **NB** = Narrowband (LTE-M/NB-IoT)		⬅			

Example:	NOTE-	WB	GL	W	T
Region **GL** = Global **NA** = North America **EX** = EMEA			⬅		
Wi-Fi **W** = Includes Wi-Fi **N or blank** = Cellular only				⬅	
Modem **T** = Has a Telit modem **Blank** = See tables below for modem					⬅

Note

Legacy Notecard Cellular SKUs have additional characters to denote the 500MB of data included, e.g. `-500`.

Wideband (LTE Cat-1 Notecards)

SKU	General Region	Bands	Data Networks	Modem	Wi-Fi
NOTE-**WBEX**-500	**EX** - EMEA (Europe, Middle East, Africa)	**WB** - Wideband	LTE Cat-1 / WCDMA / GPRS	Quectel EG91-EX	No
NOTE-**WBEXN**	**EX** - EMEA (Europe, Middle East, Africa)	**WB** - Wideband	LTE Cat-1 / WCDMA / GPRS	Quectel EG91-EX	No
NOTE-**WBEXW**	**EX** - EMEA (Europe, Middle East, Africa)	**WB** - Wideband	LTE Cat-1 / WCDMA / GPRS	Quectel EG91-EX	Yes

SKU	General Region	Bands	Data Networks	Modem	Wi-Fi
NOTE-**WBGLW**	**GL** - Global	**WB** - Wideband	LTE Cat-1 / WCDMA / GPRS	Telit LE910C1-WWXD	Yes
NOTE-**WBNA**-500	**NA** - North America	**WB** - Wideband	LTE Cat-1 / WCDMA	Quectel EG91-NAX	No
NOTE-**WBNAN**	**NA** - North America	**WB** - Wideband	LTE Cat-1 / WCDMA	Quectel EG91-NAX	No
NOTE-**WBNAW**	**NA** - North America	**WB** - Wideband	LTE Cat-1 / WCDMA	Quectel EG91-NAXD	Yes

See Cellular Band Support for Wideband Notecards

Midband (LTE Cat-1 bis Notecards)

SKU	General Region	Bands	Data Networks	Modem	Wi-Fi
NOTE-**MBGLN**	**GL** - Global	**MB** - Midband	LTE Cat-1 bis	Quectel EG916Q-GL	No
NOTE-**MBGLW**	**GL** - Global	**MB** - Midband	LTE Cat-1 bis	Quectel EG916Q-GL	Yes
NOTE-**MBNAN**	**NA** - North America	**MB** - Midband	LTE Cat-1 bis	Quectel EG915Q-NA	No
NOTE-**MBNAW**	**NA** - North America	**MB** - Midband	LTE Cat-1 bis	Quectel EG915Q-NA	Yes

See Cellular Band Support for Midband Notecards

Narrowband (LTE-M/NB-IoT Notecards)

SKU	General Region	Bands	Data Networks	Modem	Wi-Fi
NOTE-**NBGL**-500	**GL** - Global	**NB** - Narrowband	LTE-M / NB-IoT / GPRS	Quectel BG95-M3	No
NOTE-**NBGLN**	**GL** - Global	**NB** - Narrowband	LTE-M / NB-IoT / GPRS	Quectel BG95-M3	No
NOTE-**NBGLW**	**GL** - Global	**NB** - Narrowband	LTE-M / NB-IoT / GPRS	Quectel BG95-M3	Yes
NOTE-**NBNA**-500	**NA** - North America	**NB** - Narrowband	LTE-M	Quectel BG95-M1	No
NOTE-**NBNAN**	**NA** - North America	**NB** - Narrowband	LTE-M	Quectel BG95-M1	No
NOTE-**NBNAW**	**NA** - North America	**NB** - Narrowband	LTE-M	Quectel BG95-M1	Yes

See Cellular Band Support for Narrowband Notecards

- **Hassle-free.** The integrated, embedded MFF2 SIM features both North American and Global coverage options. No SIM or carrier subscription is required. Includes 10-years of global cellular service with 500MB of data (more data options available upon request).
- **Connected.** Provides connectivity without the hassle of dealing with SSIDs, passwords, access points, gateways, carriers, or SIMs.
- **Secure.** Integrated STSAFE Secure Element with hardware crypto, true hardware random number generator, and a factory-installed ECC P-384 certificate provisioned at chip manufacture.
- **Simple.** Uses a JSON command interface over I2C, UART, or USB. Allows you to connect your 3.3V or 1.8V MCU, while eliminating complex AT commands and state to manage.
- **Power-conscious.** Integrated GPS with LIS2DTW accelerometer, for power-optimized location/motion awareness. Not to mention a mostly-offline data sync mode for low power, and

always-online mode for low latency.

- **Encrypted.** Secures transactions without any provisioning challenges, using encrypted "off the internet" communication.
- **Efficient.** Battery-powered cellular without the complexity of managing modems, connections, queues, or storage.
- **Integrated.** Utilizes an extremely thin cloud infrastructure that directly routes your data to where it belongs: AWS, Azure, GCP, or your own cloud.
- **Built for data.** Data routing and simple "no code/low code" visual data stream analysis through Notehub.io (SaaS), or host and integrate Notehub functionality into your own app (OSS).

Package Configuration

NOTE-NBGLN - Notecard, Narrowband, Global, 500MB

- Product Name: Notecard Cellular (NB)
- Modem: Quectel BG95-M3
- Data Networks: LTE-M / NB-IoT / GPRS
- General Region: Global (see Cellular Service below)
- Data included: 500MB

View in Store

Modem Datasheet

To best determine the supported bands and radio access technologies, RATs, refer to the modem datasheet.

- Quectel BG95

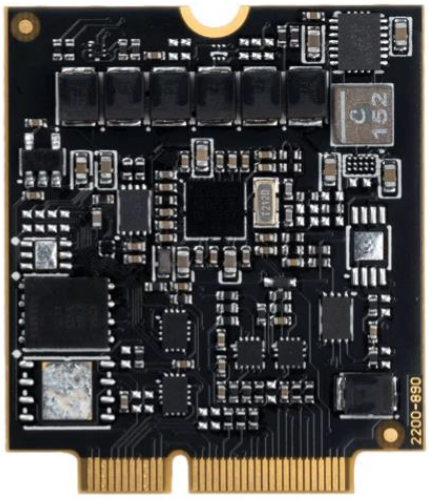
Block Diagram

The Cellular Notecard is packaged using a compact removable form factor, 30mm x 35mm.

Open hardware schematics for both the Notecard and Notecarrier boards are available on GitHub, making it a straightforward task to embed the Notecard into a broad variety of host device designs.

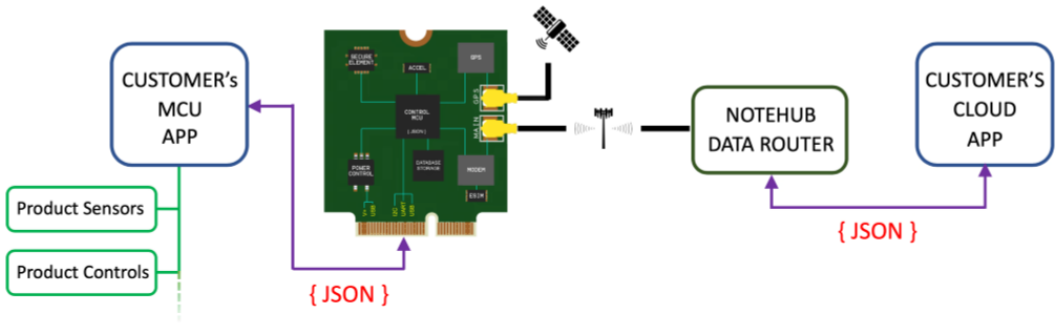
The Notecard has an embedded MFF2 SIM that enables its included cellular service coverage, with an integrated external SIM switch for applications that require such a capability.

The Notecard can interface with the host MCU at either 1.8v or 3.3v levels.

Front	Back
	

Typical Application

As shown below, Notecard is not an application processor and hosts no customer application code. It can be used as a data pump peripheral that is focused on bidirectional, asynchronous, secure data staging and transfer of JSON Notes. The Notecard can also be configured as a low powered, autonomous, asset tracking device, in which case it does not require a host processor.



Key Features

- **Tracking**

  Notes transferred by the Notecard can be tagged with time and location. Location is obtained using a GPS receiver, and time is available from both the cellular network and GPS. To optimize energy use in devices when not in motion, the Notecard has a MEMS-based, LIS2DTW accelerometer that determines when use of the GPS is not required.

- **Security**

  Modern services require that the cloud and the device perform bidirectional authentication so that neither can be spoofed. For many applications it's important that over-the-air and over-the-wire data is encrypted. For this reason, the Notecard integrates an STSAFE Secure Element which contains symmetric keys manufactured into the chip. Neither the manufacturer of the Notecard nor the manufacturer of the customer's product has any need to handle or manage secure key material. The keys generated by STMicroelectronics for the Notecard use ECC with the NIST P-384 curve, and the signature algorithm is ECDSA-with-SHA384.

- **Low Power Consumption**

  The Notecard has sophisticated power control and makes heavy use of variable clock speeds. This enables the Notecard to have a typical idle current consumption of ~8µA@5V, while still supporting active UART and I2C communication.

Power Information

The Notecard's main supply voltage (`VMODEM_P`) is used for the cellular modem and associated circuitry. The Notecard has on-board regulators designed for direct connection to a battery, so any voltage in the range of 2.5V to 5.5V may be provided.

The Notecard typically sits in an ~8µA@5V idle mode waiting for a request from the host MCU, however the Notecard current draw increases to the ~250mA range when the modem is active. Furthermore, when in a region requiring the use of GSM, it can spike to up to nearly 2A for a few milliseconds. The modem also draws 10's of mA when the GPS is receiving or the CPU is performing session encryption. As such, it's recommended that `VMODEM_P` be directly connected to a battery or other supply that is capable of such brief spikes. It is also recommended that PCB traces for `VMODEM_P` and `GND` be designed to handle such current.

The Notecard's logic voltage (`VIO_P`) is provided by the Notecarrier or host system for digital communication; it will be either 1.8V or 3.3V. Although the Notecard typically draws very little current, this supply should be designed with a 150mA budget allocated to the Notecard.

Pin Name	Direction	Pin Numbers	Usage
GND	--	3,5,6,11,18,33,39,45,51,57,71,73	Ground
VIO_P	IN	2,4	1.8V or 3.3V @ 150mA
VUSB	IN	13	USB Serial proxy for "line power", with respect to dynamic line voltage detection
VMODEM_P	IN	70,72,74	2.5V to 5.5V, capable of sustained 750mA draw

Note

In order to take advantage of various Notecard features pertaining to "dynamic line voltage detection" (both now and in the future), or establish a USB Serial connection to the Notecard, you must connect the `VUSB` power pin and support the USB power design aspects of the Notecard.

Features include:

- Continuous mode behavior with the `usb` flag.
- Triangulate mode behavior with the `usb` flag.
- Monitor mode behavior.

Antenna Requirements

The Notecard requires a cellular antenna. The antenna should support the entire range of LTE bands in use in the region of deployment.

Note

Actual RF performance of the Notecard depends on a variety of physical factors, including:

- The choice of antenna(s).
- The physical environment.
- The trace layout, dimensions, and/or PCB tolerance of the carrier board (e.g. Notecarrier) used.

If an application utilizes GPS location, a GPS antenna is also required. The Notecard design allows the option of a passive or active GPS antenna, and can supply a 3.3V - 4.0V bias voltage to power an active antenna's LNA. If an active antenna requires a different voltage, the board designer can inject whatever voltage they require into the antenna's coax by feeding it to the `VACT_GPS_IN` pin.

Active GPS

If you choose to connect an Active GPS antenna to the Notecard GPS u.fl connector, you are required to provide your antenna's DC bias voltage to the center conductor of the coax antenna via `VACT_GPS_IN`. For your convenience and the Notecard supplies a 3.3V - 4.0V power supply at `VACT_GPS_OUT` whenever it activates its GPS, so `VACT_GPS_OUT` can be connected directly to `VACT_GPS_IN`. `VACT_GPS_OUT` must not be used for any other purpose than powering an active antenna Low-Noise Amplifier.

Pin Name	Direction	Pin Number	Usage
VACT_GPS_IN	IN	22	Active GPS antenna DC bias voltage

Pin Name	Direction	Pin Number	Usage
VACT_GPS_OUT	OUT	20	+3.3V - 4.0V from Notecard when GPS is operating

Cellular Service

A 10-year data plan with 500MB of cellular data is embedded in the Notecard, with more available for applications requiring it. No other actions related to cellular activation or deactivation are required. There are no "know your customer" restrictions, so the Notecard can be embedded in a product without knowing the ultimate end-customer. Placement of a product can be permanent. Although the coverage area may change from time to time because of local technical and regulatory restrictions.

Covered Countries

To approximately forecast the Notecard's compatibility with a country, you can research the networks available (for example on Wikipedia) and cross-reference with the modem datasheet.

Warning

This list of covered countries does not imply any widespread deployment or national coverage. Carrier agreements change over time. This list is for planning purposes only - we have not independently verified coverage.

If your experience differs please let us know so we can keep this list updated.

Covered Countries			
Afghanistan	Aland Islands	Albania	Anguilla
Antigua and Barbuda	Argentina	Armenia	Aruba
Australia	Austria	Azerbaijan	Bahamas
Bangladesh	Barbados	Belarus	Belgium

Covered Countries			
Belize	Bermuda	Bolivia	Bosnia and Herzegovina
Bulgaria	Burkina Faso	Cambodia	Cameroon
Canada	Cayman Islands	Chad	Chile
Colombia	Costa Rica	Croatia	Cyprus
Czech Republic	Denmark	Dominica	Dominican Republic
Dutch Antilles	Ecuador	El Salvador	Estonia
Ethiopia	Faroe Islands	Fiji	Finland
France	Gabon	Georgia	Germany
Ghana	Gibraltar	Greece	Greenland
Grenada	Guam	Guatemala	Guernsey
Haiti	Honduras	Hong Kong	Hungary
Iceland	Indonesia	Ireland	Isle Of Man
Israel	Italy	Jamaica	Japan
Jersey	Jordan	Kazakhstan	Kenya
Kyrgyzstan	Lao	Latvia	Lesotho
Liechtenstein	Lithuania	Luxembourg	Macao
Macedonia	Malawi	Malaysia	Mali
Malta	Martinique	Mayotte	Mexico

Covered Countries			
Moldova	Mongolia	Montenegro	Montserrat
Morocco	Mozambique	Nepal	Netherlands
New Zealand	Nicaragua	Niger	Norway
Panama	Paraguay	Peru	Poland
Portugal	Puerto Rico	Romania	Rwanda
Saint Barthelemy	Saint Kitts and Nevis	Saint Lucia	Saint Martin
Seychelles	Sierra Leone	Singapore	Slovakia
Slovenia	South Africa	Spain	Sri Lanka
Suriname	Sweden	Switzerland	Taiwan
Tajikistan	Tanzania	Thailand	Trinidad and Tobago
Turks and Caicos Islands	Uganda	Ukraine	United Kingdom
United States	Uruguay	Virgin Islands (British)	Zambia
Zimbabwe			

Countries Not Included*			
Bahrain	Brazil	China	Curacao
Democratic Republic of the Congo	Egypt	Equatorial Guinea	French Guiana

Countries Not Included*			
French Southern Territories	Guadeloupe	Guinea	Guyana
India	Ivory Coast	Iraq	Kuwait
Nigeria	Northern Mariana Islands	Oman	Pakistan
Philippines	Qatar	Reunion	Russia
Saudi Arabia	Serbia	South Korea	Togo
Turkey	United Arab Emirates	Venezuela	Vietnam
Yemen			

**These countries are not covered by the embedded MFF2 SIM, and require use of a user-supplied, external SIM*

Cellular Band Support by SKU

Wideband Bands (LTE Cat-1 Notecards)

SKU	Modem	LTE Cat-1	WCDMA (3G)	GSM/EDGE (2G)
NOTE-**WBEX**-500	Quectel EG91-EX	B1, B3, B7, B8, B20, B28	B1, B8	900, 1800 MHz
NOTE-**WBEXN**	Quectel EG91-EX	B1, B3, B7, B8, B20, B28	B1, B8	900, 1800 MHz
NOTE-**WBEXW**	Quectel EG91-EX	B1, B3, B7, B8, B20, B28	B1, B8	900, 1800 MHz

SKU	Modem	LTE Cat-1	WCDMA (3G)	GSM/EDGE (2G)
NOTE-**WBGLW**	Telit LE910C1-WWXD	B1, B2, B3, B4, B5, B7, B8, B8_US, B9, B12, B13, B14, B18, B19, B20, B25, B26, B28	B1, B2, B4, B5, B6, B8, B19	B2, B3, B5, B8
NOTE-**WBNA**-500	Quectel EG91-NAX	B2, B4, B5, B12, B13, B25, B26	B2, B4, B5	
NOTE-**WBNAN**	Quectel EG91-NAX	B2, B4, B5, B12, B13, B25, B26	B2, B4, B5	
NOTE-**WBNAW**	Quectel EG91-NAXD	B2, B4, B5, B12, B13, B25, B26	B2, B4, B5	

Midband Bands (LTE Cat-1 bis Notecards)

SKU	Modem	LTE Cat-1 bis
NOTE-**MBGLN**	Quectel EG916Q-GL	B1, B2, B3, B4, B5, B7, B8, B12, B13, B18, B19, B20, B25, B26, B28, B34, B38, B39, B40, B41, B66
NOTE-**MBGLW**	Quectel EG916Q-GL	B1, B2, B3, B4, B5, B7, B8, B12, B13, B18, B19, B20, B25, B26, B28, B34, B38, B39, B40, B41, B66
NOTE-**MBNAN**	Quectel EG915Q-NA	B2, B4, B5, B12, B13, B66
NOTE-**MBNAW**	Quectel EG915Q-NA	B2, B4, B5, B12, B13, B66

Narrowband Bands (LTE-M/NB-IoT Notecards)

SKU	Modem	LTE-M	NB-IoT	GSM/EDGE (2G)
NOTE-**NBGL**-500	Quectel BG95-M3	B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B26, B27, B28, B66, B85	B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B28, B66, B71, B85	850, 900, 1800, 1900 MHz
NOTE-**NBGLN**	Quectel BG95-M3	B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B26, B27, B28, B66, B85	B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B28, B66, B71, B85	850, 900, 1800, 1900 MHz
NOTE-**NBGLW**	Quectel BG95-M3	B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B26, B27, B28, B66, B85	B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B28, B66, B71, B85	850, 900, 1800, 1900 MHz
NOTE-**NBNA**-500	Quectel BG95-M1	B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B26, B27, B28, B66, B85		
NOTE-**NBNAN**	Quectel BG95-M1	B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B26, B27, B28, B66, B85		
NOTE-**NBNAW**	Quectel BG95-M1	B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B26, B27, B28, B66, B85		

Pin Information

Pin Definitions

Pin Name	Pin Description
ALT_DFU_BOOT	Used by Notecard to control the BOOT pin of the host MCU during Outboard DFU. Tri-state when Outboard DFU is not in progress.
ALT_DFU_RESET	Used by Notecard to control the RESET pin of the host MCU during Outboard DFU. Tri-state when Outboard DFU is not in progress.
ALT_DFU_ACTIVE	Driven low by Notecard to indicate to the host that an Outboard DFU is in progress.
ALT_DFU_RX	Input on which Notecard receives data from the host during Outboard DFU. Tri-stated when Outboard DFU is not in progress.
ALT_DFU_TX	Output on which Notecard sends data to the host during Outboard DFU. Tri-stated when Outboard DFU is not in progress.
ATTN_P	Attention pin (requires protection)
AUX_EN_P	Auxiliary serial port enable (requires protection)
AUX_RX_P	Auxiliary UART receive (requires protection)
AUX_TX_P	Auxiliary UART transmit (requires protection)
AUX1	Auxiliary GPIO pin 1
AUX2	Auxiliary GPIO pin 2

Pin Name	Pin Description
AUX3	Auxiliary GPIO pin 3
AUX4	Auxiliary GPIO pin 4
AUX5	Alt. attention pin or charge detection
GND	Ground
NC	No connection (reserved and must be left open)
NRST	Active-low (not) reset
RX_P	UART receive (requires protection)
SCL_P	I2C clock (requires protection)
SDA_P	I2C data (requires protection)
SIM_CLK	External SIM clock
SIM_IO	External SIM input/output
SIM_NPRESENT	External SIM active-low (not) present
SIM_RST	External SIM reset
SIM_VCC	External SIM positive (common collector) voltage
TX_P	UART transmit (requires protection)
USB_DN	USB data negative
USB_DP	USB data positive
VACT_GPS_IN	Active antenna GPS bias voltage
VACT_GPS_OUT	Active antenna GPS 3.8V from Notecard

Pin Name	Pin Description
VIO_P	I/O Voltage (requires protection)
VMODEM_P	Voltage modem (requires protection)
VUSB	5V USB voltage

Pin Description

Notecard M.2 Key E, Edge Connector Pinout

Pin #	Pin Name	Func. Interface	Func. Interface	Pin Name	Pin #
1	NC		Power	VIO_P	2
3	GND	Power	Power	VIO_P	4
5	GND	Power	Power	GND	6
7	USB_DP	USB Serial	External SIM	SIM_VCC	8
9	USB_DN	USB Serial	External SIM	SIM_RST	10
11	GND	Power	External SIM	SIM_IO	12
13	VUSB	USB Serial	External SIM	SIM_CLK	14
15	NC	Power	External SIM	SIM_PRESENT	16
17	NC		Power	GND	18
19	NC			VACT_GPS_OUT	20
21	NC		Active GPS	VACT_GPS_IN	22

Pin #	Pin Name	Func. Interface	Func. Interface	Pin Name	Pin #
23	NC		MODULE KEY	--	24
25	--	MODULE KEY	MODULE KEY	--	26
27	--	MODULE KEY	MODULE KEY	--	28
29	--	MODULE KEY	MODULE KEY	--	30
31	--	MODULE KEY	Outboard DFU	ALT_DFU_BOOT	32
33	GND	Power	Outboard DFU	ALT_DFU_RESET	34
35	NC		Outboard DFU	ALT_DFU_ACTIVE	36
37	NC		Auxiliary Ports	AUX_CHARGING	38
39	GND	Power	I2C Serial	SCL_P	40
41	ALT_DFU_RX	Outboard DFU	I2C Serial	SDA_P	42
43	ALT_DFU_TX	Outboard DFU		MODEM_UPDATE_FLAG	44
45	GND	Power	Auxiliary Ports	AUX1	46
47	RTX		Auxiliary Ports	AUX2	48
49	CTX		Auxiliary Ports	AUX3	50
51	GND	Power	Auxiliary Ports	AUX4	52
53	NC		Attention	ATTN_P	54
55	NC		Auxiliary Ports	AUX_EN_P	56
57	GND	Power	Auxiliary Ports	AUX_RX_P	58
59	NC		Auxiliary Ports	AUX_TX_P	60

Pin #	Pin Name	Func. Interface	Func. Interface	Pin Name	Pin #
61	NC		UART Serial	RX_P	62
63	JT_RST		UART Serial	TX_P	64
65	BOOT			NC	66
67	RST	Reset		NC	68
69	NC		Power	VMODEM_P	70
71	GND	Power	Power	VMODEM_P	72
73	GND	Power	Power	VMODEM_P	74
75	NC				

> *Link: Digi-Key part number of the connector - Both Digi-Key and Mouser have pictures for this part number that show a component with a different key, but both have links to datasheet/drawing/CAD models.*

Note

All pins whose **Functional Interface** is marked "Power" must be connected.

All pins named `NC` MUST have no connection and be left open because they are reserved for future use. Furthermore, any pin not used in a design MUST also be left open.

Those pins ending with `_P` may be optionally protected from anomalous external conditions on some Notecarrier designs, depending upon use-case specific requirements.

Technical Details

Host Microcontroller API

Notecard supports a rich, simple API whose syntax is standard JSON. The developer can communicate requests to Notecard, generally by using little more than `printf` functions available in most programming languages.

Serial Communication

JSON requests and responses (the Notecard's Application Programming Interface "API") may be sent over any of the following interfaces:

- USB Serial Interface
- UART Serial Interface
- I2C Interface

> **Note**
>
> If NOT using a Notecard firmware library, you may unintentionally send requests to the Notecard so fast that you overflow the 1500 byte buffer used to receive data (whether it be I2C, Serial, or UART). The solution is to pause 250 ms after every 250 bytes sent and ensure the total size of each NDJSON object sent is no more than 8KB.

API Reference

For API usage, names, and parameters, please refer to the Notecard API Reference.

USB Serial Interface

The USB Serial Interface appears to the host as a USB 2.0 Full Speed CDC device. You can access it from Linux, Windows, or macOS without a device driver using terminal emulation software. Newline-

delimited JSON requests may be sent directly as UTF-8 text over this port, or you may use the open-source Blues libraries for C, Python, Go, and Arduino.

Pin Name	Direction	Pin Number	Usage
USB_DM	I/O	9	USB D- data signal
USB_DP	I/O	7	USB D+ data signal
VUSB	IN	13	+5V from USB
GND	I/O	11	Ground from USB

UART Serial Interface

The UART Serial Interface operates at `VIO_P` at a fixed baud rate of 9600 using eight data bits, no parity bit, and one stop bit. Newline-delimited JSON requests may be sent directly as UTF-8 text over this port, or you may use the open-source Blues libraries for C, Python, Go, and Arduino.

Pin Name	Direction	Pin Number	Usage
RX_P	IN	62	Receive data signal
TX_P	OUT	64	Transmit data signal

I2C Interface

The Notecard acts as an I2C secondary device operating at `VIO_P`, and it implements a simple Serial-over-I2C protocol. You can access it from an embedded host using open-source Blues libraries for C, Python, Go, and Arduino.

Pin Name	Direction	Pin Number	Usage
SCL_P	IN	40	I2C clock

Pin Name	Direction	Pin Number	Usage
SDA_P	I/O	42	I2C data

Host Microcontroller Hardware Interface

Attention Interrupt

Using software, you can optionally configure Notecard to use the `ATTN` output pin to:

- Inform the host MCU of certain asynchronous events (such as incoming data availability, or Notecard motion) in an interrupt-driven manner rather than just polling.
- Place the host MCU into a power-off sleep state and wake it back up again.

Pin Name	Direction	Pin Number	Usage
ATTN_P	OUT	54	Attention pin

Note

This pin operates at `VIO_P`. If it is unused it can be left disconnected.

Auxiliary Ports

An optional Auxiliary UART Serial Interface is available on the `AUX_RX_P` and `AUX_TX_P` pins. This interface is inactive unless enabled by raising the `AUX_EN_P` pin since this UART consumes extra power when in use. It operates at `VIO_P` at a fixed baud rate of 115200 using eight data bits, no parity bit, and one stop bit. If this interface is unused, the three pins can be left disconnected.

The AUX1-4 pins operate at `VIO_P` and can be configured in software to operate in several optional modes such as GPS Tracking Mode, GPIO Mode, and Internet Button Mode. If these pins are unused, they can be left disconnected.

Pin Name	Direction	Pin Number	Usage
AUX_EN_P	IN	56	Enables serial port on `AUX_RX_P` and `AUX_TX_P`
AUX_RX_P	IN	58	RX data for serial port enabled by `AUX_EN_P`
AUX_TX_P	OUT	60	TX data for serial port enabled by `AUX_EN_P`
AUX1	I/O	46	General Purpose IO
AUX2	I/O	48	General Purpose IO
AUX3	I/O	50	General Purpose IO
AUX4	I/O	52	General Purpose IO
AUX5	I/O	38	Alt. attention pin or charge detection

Note

The auxiliary serial port is normally disabled because it consumes up to 100µA of power when enabled.

Outboard DFU Interface

As an alternative to using the Auxiliary Ports for Outboard DFU, there are also dedicated pins on certain Notecards. For more information on using this interface, check the detailed documentation

Pin Name	Direction	Pin Number	Usage
ALT_DFU_BOOT	OUT	32	Used by Notecard to control the BOOT pin of the host MCU during Outboard DFU. Tri-state when Outboard DFU is not in progress.

Pin Name	Direction	Pin Number	Usage
ALT_DFU_RESET	OUT	34	Used by Notecard to control the RESET pin of the host MCU during Outboard DFU. Tri-state when Outboard DFU is not in progress.
ALT_DFU_ACTIVE	OUT	36	Driven low by Notecard to indicate to the host that an Outboard DFU is in progress.
ALT_DFU_RX	IN	41	Input on which Notecard receives data from the host during Outboard DFU. Tri-stated when Outboard DFU is not in progress.
ALT_DFU_TX	OUT	43	Output on which Notecard sends data to the host during Outboard DFU. Tri-stated when Outboard DFU is not in progress.

External SIM

Notecard contains an integrated, embedded MFF2 SIM but may also be configured to use an external 1.8V Micro-SIM via this interface. This interface is powered by the Notecard. Note that use of an external SIM card also requires that the Notecard be re-configured in software with the APN, access technology, and bands appropriate for the SIM's carrier.

Pin Name	Direction	Pin Number	Usage
SIM_CLK	OUT	14	Clock
SIM_IO	I/O	12	Data
SIM_NPRESENT	IN	16	Active-low input indicating presence of SIM card, else must be `NC`. Required if an external SIM is used, and is supported by the mechanical switch in SIM card slot hardware.

Pin Name	Direction	Pin Number	Usage
SIM_RST	OUT	10	Reset
SIM_VCC	OUT	8	+1.8V supply for external Micro-SIM

Reset

Use of this pin is optional. If the host system has a global reset line, caution should be used when connecting this pin to the host system's reset because the Notecard may independently pull the line low in software. Restrictions on this pin are:

- If this pin is not used, it must remain not connected (`NC`).
- The pin is active-low. It must be held low for at least 350nS for a clean reset.
- This pin must never be pulled-up. A pull-up would interfere with the Notecard's own internal watchdog timer and thus will prevent reliable operations.
- Some Notecarriers may invert this signal to be active-high.

Pin Name	Direction	Pin Number	Usage
NRST	I/O	67	Active-low reset

Network Communication Behavior

The Notecard includes a built-in connection to Notehub.io (specifically `a.notefile.net:8086`) and communicates over SSL. Outbound connections speak directly with the Notehub session load balancer (or "Discovery Service") for provisioning and device authentication. By default, the TLS connection is unidirectional, but can operate bi-directionally, if needed. The keys and certificates for each device are provisioned by STMicrosystems inside the STSAFE secure element present on every Notecard. Once the Discovery Service has provisioned or authenticated a device, it issues a "ticket" and a Handler IP address that the Notecard can use to make subsequent requests.

The Notecard can also connect to the Handler to do a constrained set of remote procedure calls related to synchronization. If the Notecard determines that the data queued for transmission to or from the Handler should be encrypted, it opens a session to the Handler on port `8086` . Otherwise, an unencrypted socket is opened on port `8081` .

The over-the-wire data transmitted on both sockets is highly byte-optimized, which is why raw SSL and TCP sockets are used, and not unoptimized HTTP/HTTPS transactions.

Specifications

General Characteristics

Description	Value
Weight	6 grams

Electrical Characteristics

Absolute Maximum Ratings

Description	Minimum	Maximum	Unit
Storage temperature	-40	80	°C
Ambient operating temperature	-35	75	°C

DC Characteristics

Description	Minimum	Typical	Maximum	Unit
VIO Supply Voltage	1.8		3.3	V
VMODEM Supply Voltage	2.5		5.5	V
VIO Operating Current			150	mA

Description	Minimum	Typical	Maximum	Unit
VMODEM Operating Current		250	2000	mA

Ordering Information

Blues Shop

Certifications

- PTCRB
- CE
- FCC
- UK

PTCRB

Pending

CE

Pending

FCC

Pending

UK

Pending

Terms and Conditions

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Security and Vulnerability Scanning

As a part of our regular audit and scanning process, Blues Inc. performs full vulnerability scanning every six months. Any identified vulnerabilities will be analyzed, reported, and patched in a timely fashion, where appropriate.

Revision History

Author	Date	Summary
Ray Ozzie	2019-2020	Document drafted
John Wiedey	2020	Various improvements
Sean Taylor	2020	Various improvements
Zachary J. Fields	11 SEP 2020	Updated information and translated to markdown
Brandon Satrom	13 APR 2021	Updated Country list based on carrier audit
Carlton Henderson	12 JUL 2021	Update coverage information
Carlton Henderson	12 JUL 2021	Fix block diagram photo
Brandon Satrom	11 NOV 2021	Added Certification Dates
Brandon Satrom	07 JAN 2022	Added RoHS Certification Dates
Brandon Satrom	15 FEB 2022	Add Wi-Fi Notecard Datasheet
Rob Lauer	25 AUG 2022	Added updated certification data

Author	Date	Summary
Rob Lauer	27 OCT 2022	Update country coverage information
Rob Lauer	13 JAN 2023	Added RF performance information
Rob Lauer	2 FEB 2023	Warning re: STM32 light sensitivity
Kimball Johnson	21 SEP 2023	Updated for new Cellular + Wi-Fi, LoRa, and Wi-Fi Notecards
Rob Lauer	23 OCT 2023	Update and clarify power consumption values
Rob Lauer	31 JAN 2023	Update Notecard LoRa datasheet details
Rob Lauer	16 APR 2024	Updated for new Cellular (black PCB) Notecards, MB Cellular Notecards, and Notecard XP
Rob Lauer	6 JUN 2024	Added cell band support for Cellular Notecards

Contact Information

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Can we improve this page? Send us feedback

Schematics for NOTE-NBGLN, NOTE-NBNAN, NOTE-WBNAN, NOTE-WBEXN

Module name

Notecard V2 Quectel

Index	Description
01	Cover
02	Variants
03	Block diagram
04	MCU
05	Peripherals
06	Modem
07	SIM Cards
08	Modem Power
09	MCU Power
10	M.2 connector

REVISION BLOCK

Rev. Proto.	Rev. Prod.	Date	Description	# VAR	# BOM	# ECO
10	-	2024-02-16	Initial prototype release	1	3000-735-001	
				2	3000-747-001	
				3	3000-748-001	
				4	3000-749-001	
				5	3000-754-001	
				6	3000-755-001	
11	-	2024-03-11	Documentation cleanup, variant tweaks	1	3000-735-003	
				2	3000-747-003	
				3	3000-748-003	
				4	3000-749-003	
				5	3000-754-003	
				6	3000-755-003	
12	-	2024-05-02	EG915/6 flashing support, minor PCB tweaks	1	3000-779-001	
				2	3000-780-001	
				3	3000-781-001	
				4	3000-782-001	
				5	3000-783-001	

LIST OF AVAILABLE VARIANTS

# VAR	Variant name	Description
		Variants are listed on a seperate sheet

REVISION FORMAT EXPLANATION

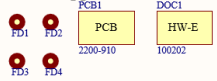
-	-	202y-mm-dd	Development phase, date only		-
10	-	202y-mm-dd	Prototyping phase, revision numeric		3000-xxx-xxx
-	A	202y-mm-dd	Production phase, revision alphanumeric		3000-xxx-xxx

Design considerations

SOFTWARE CONFIG NOTE:
- Contains important notes for software development.
- Things like: pin configuration, timing requirements, IC configuration etc.

DESIGN NOTE:
- Hardware notes

Board support



Title:	**01_COVER.SchDoc**
Project:	100202_hw_notecard-v2-cellular.PrjPCB
Company:	Byte Lab Grupa d.o.o.
Company:	Medarska 69/1, 10000 Zagreb, Croatia
Company:	www.byte-lab.com
Author: M. Marsic	Acceptor: J. Wiedey
Sheet 1 of 10	Rev: 12 Format: A4

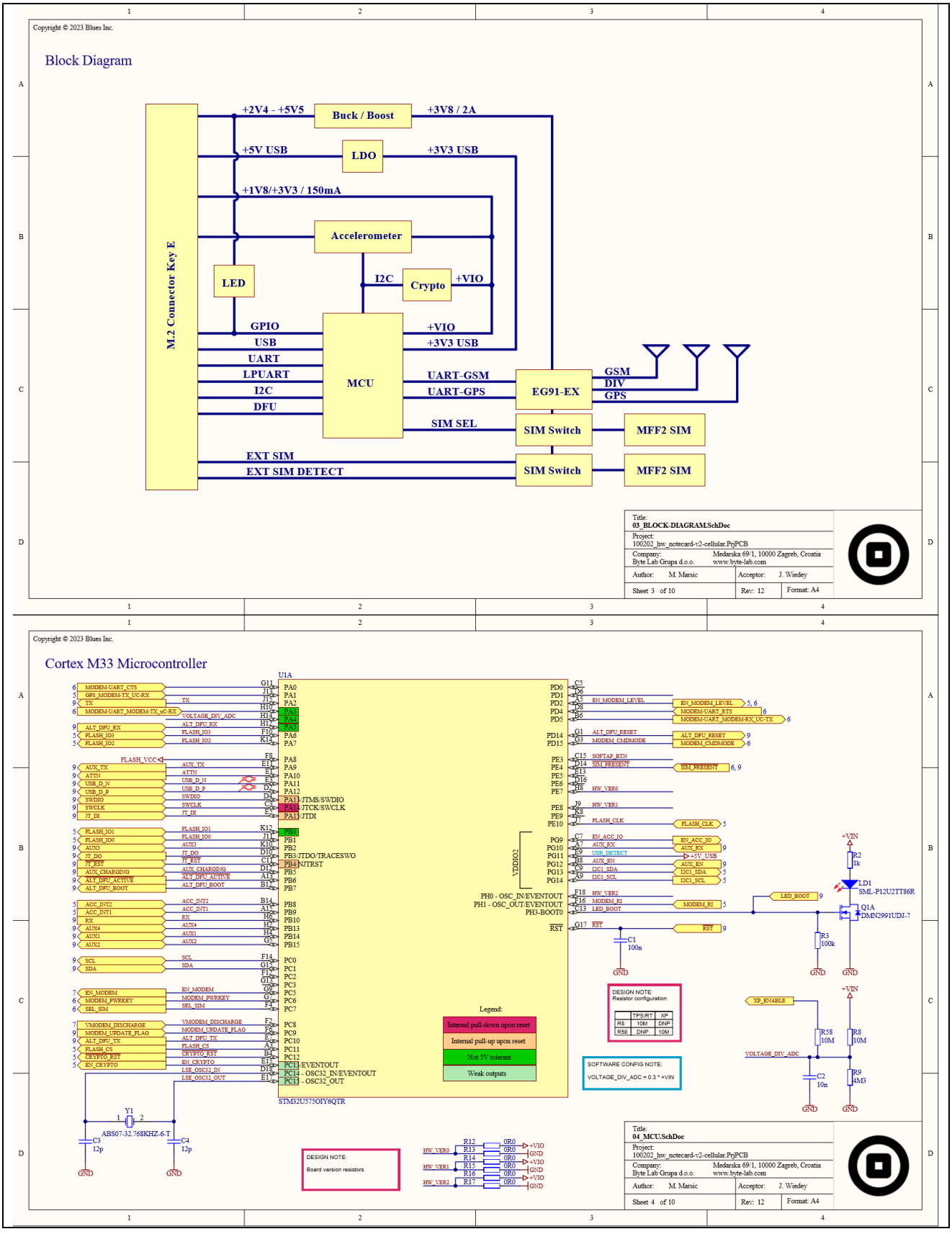
REVISION BLOCK

Rev. Proto.	Rev. Prod.	Date	Description	# VAR	# BOM	# ECO
11	-	2024-03-11	EG915/6 flashing support, minor PCB tweaks	6	3000-755-003	

LIST OF AVAILABLE VARIANTS

#VAR	Variant name	Description
1	WBEXN-S1A1F2P1	EG91-EX modem, TPS regulator, primary MFF2 SIM, 16Mb Flash, calibrated accelerometer
2	WBNAN-S1A1F2P1	EG91-NAXD modem, TPS regulator, primary MFF2 SIM, 16Mb Flash, calibrated accelerometer
3	NBNAN-S1A1F2P1	BG95-M1 modem, TPS regulator, primary MFF2 SIM, 16Mb Flash, calibrated accelerometer
4	NBGLN-S1A1F2P1	BG95-M3 modem, TPS regulator, primary MFF2 SIM, 16Mb Flash, calibrated accelerometer
5	MBNAN-S1A1F2P1	EG915Q-NA modem, TPS regulator, primary MFF2 SIM, 16Mb Flash, calibrated accelerometer
6	MBGLN-S1A1F2P1	EG916Q-NA modem, TPS regulator, primary MFF2 SIM, 16Mb Flash, calibrated accelerometer

Title:	**02_VARIANTS.SchDoc**
Project:	100202_hw_notecard-v2-cellular.PrjPCB
Company:	Byte Lab Grupa d.o.o.
Company:	Medarska 69/1, 10000 Zagreb, Croatia
Company:	www.byte-lab.com
Author: M. Marsic	Acceptor: J. Wiedey
Sheet 2 of 10	Rev: 12 Format: A4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Block Diagram
M.2 Connector Key E
+2V4 - +5V5
Buck / Boost
+3V8 / 2A
+5V USB
LDO
+3V3 USB
+1V8/+3V3 / 150mA
Accelerometer
LED
I2C
Crypto
+VIO
GPIO
USB
UART
LPUART
I2C
DFU
MCU
+VIO
+3V3 USB
UART-GSM
UART-GPS
EG91-EX
GSM
DIV
GPS
SIM SEL
SIM Switch
MFF2 SIM
EXT SIM
EXT SIM DETECT
SIM Switch
MFF2 SIM
Title: 03_BLOCK-DIAGRAM.SchDoc
Project: 100202_hw_notecard-v2-cellular.PrjPCB
Company: Byte Lab Grupa d.o.o.
Medarska 69/1, 10000 Zagreb, Croatia
www.byte-lab.com
Author: M. Marsic
Acceptor: J. Wiedey
Sheet 3 of 10
Rev: 12
Format: A4
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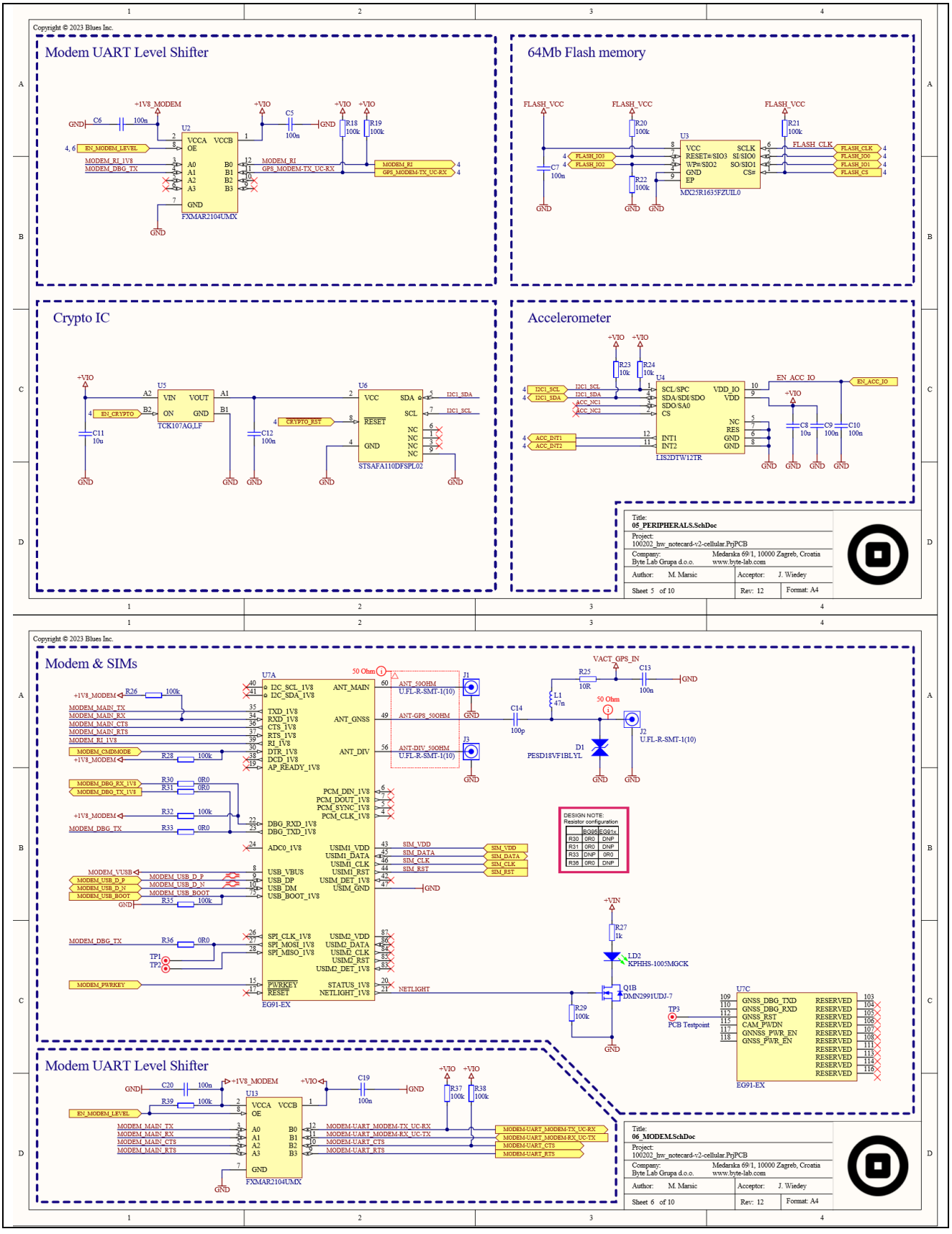
Cortex M33 Microcontroller
U1A
STM32U575OIY6QTR
Legend:
Internal pull-down upon reset
Internal pull-up upon reset
Not 5V tolerant
Weak outputs
DESIGN NOTE:
Resistor configuration
DESIGN NOTE:
Board version resistors
SOFTWARE CONFIG NOTE:
VOLTAGE_DIV_ADC = 0.3 * +VIN
Y1
ABS07-32.768KHZ-6-T
Title: 04_MCU.SchDoc
Project: 100202_hw_notecard-v2-cellular.PrjPCB
Company: Byte Lab Grupa d.o.o.
Medarska 69/1, 10000 Zagreb, Croatia
www.byte-lab.com
Author: M. Marsic
Acceptor: J. Wiedey
Sheet 4 of 10
Rev: 12
Format: A4


Copyright © 2023 Blues Inc.
Modem UART Level Shifter
64Mb Flash memory
Crypto IC
Accelerometer
Title: 05_PERIPHERALS.SchDoc
Project: 100202_hw_notecard-v2-cellular.PrjPCB
Company: Byte Lab Grupa d.o.o.
Medarska 69/1, 10000 Zagreb, Croatia
www.byte-lab.com
Author: M. Marsic
Acceptor: J. Wiedey
Sheet 5 of 10
Rev: 12
Format: A4
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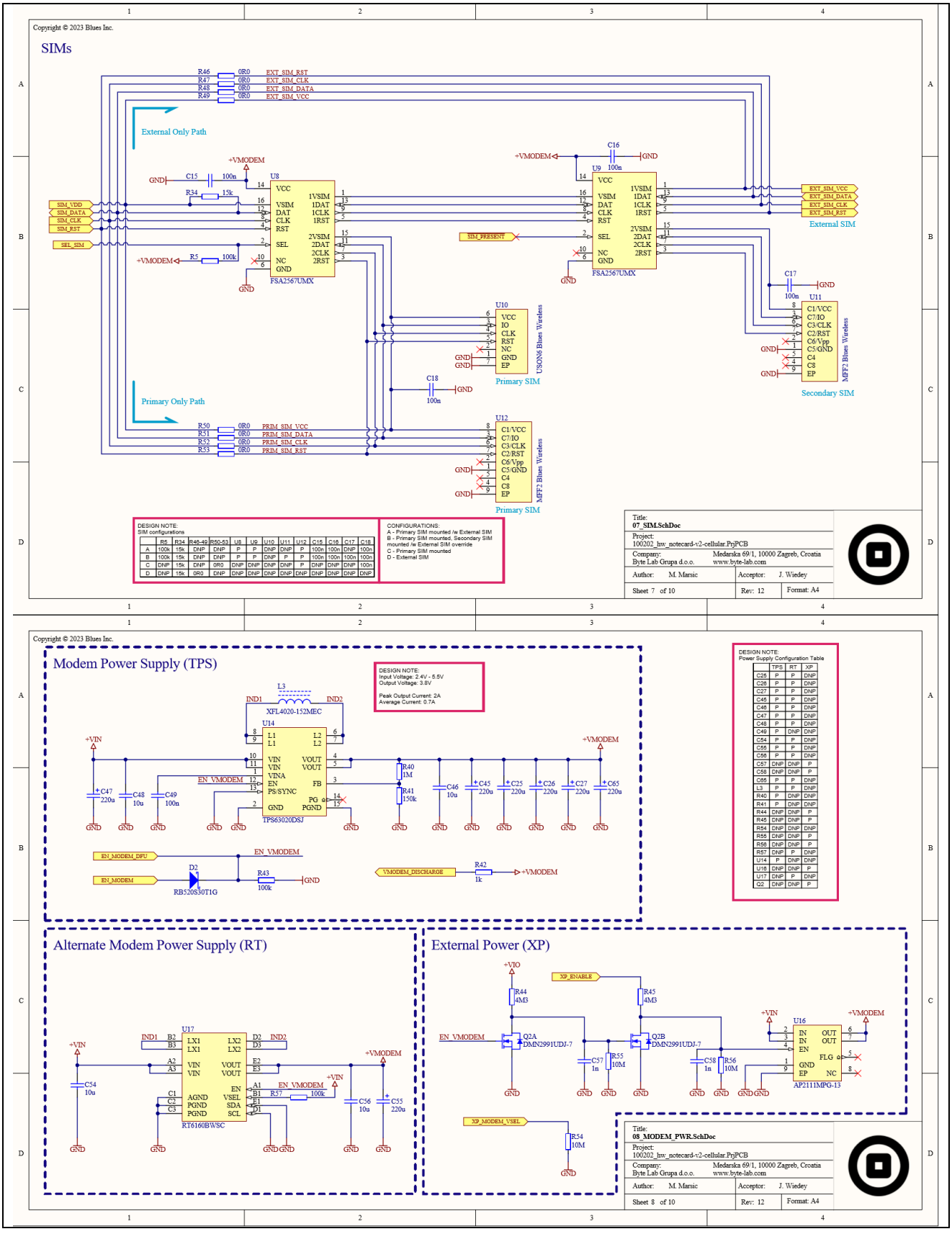
Modem & SIMs
Modem UART Level Shifter
Title: 06_MODEM.SchDoc
Project: 100202_hw_notecard-v2-cellular.PrjPCB
Company: Byte Lab Grupa d.o.o.
Medarska 69/1, 10000 Zagreb, Croatia
www.byte-lab.com
Author: M. Marsic
Acceptor: J. Wiedey
Sheet 6 of 10
Rev: 12
Format: A4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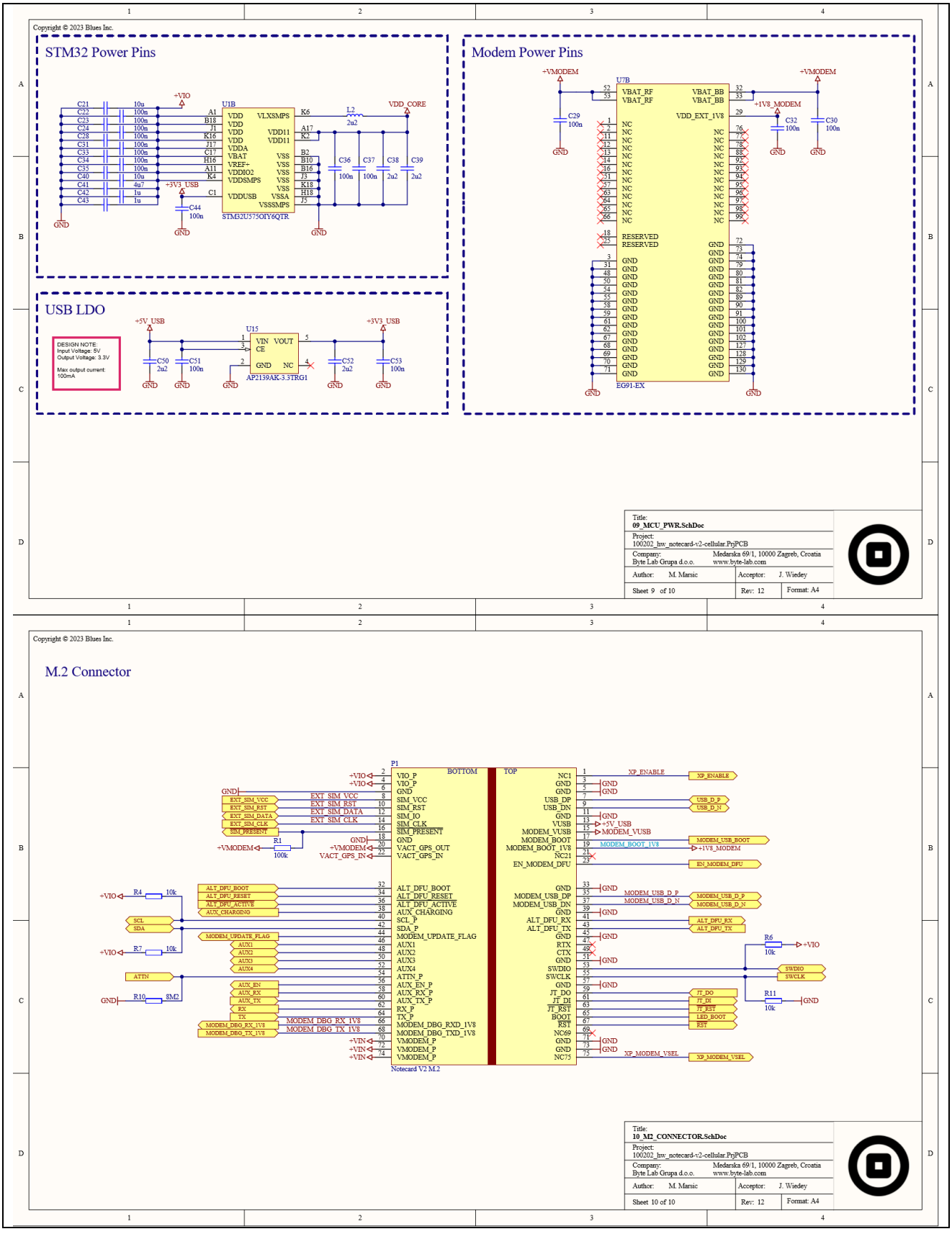
SIMs
External Only Path
Primary Only Path
External SIM
Primary SIM
Secondary SIM
FSA2567UMX
USON6 Blues Wireless
MFF2 Blues Wireless
Title: 07_SIM.SchDoc
Project: 100202_hw_notecard-v2-cellular.PrjPCB
Company: Byte Lab Grupa d.o.o.
Medarska 69/1, 10000 Zagreb, Croatia
www.byte-lab.com
Author: M. Marsic
Acceptor: J. Wiedey
Sheet 7 of 10
Rev: 12
Format: A4
Modem Power Supply (TPS)
TPS63020DSJ
XFL4020-152MEC
Alternate Modem Power Supply (RT)
RT6160BWSC
External Power (XP)
AP2111MPG-13
Title: 08_MODEM_PWR.SchDoc
Project: 100202_hw_notecard-v2-cellular.PrjPCB
Company: Byte Lab Grupa d.o.o.
Author: M. Marsic
Acceptor: J. Wiedey
Sheet 8 of 10
Rev: 12
Format: A4


Copyright © 2023 Blues Inc.
STM32 Power Pins
Modem Power Pins
USB LDO
M.2 Connector
Title: 09_MCU_PWR.SchDoc
Project: 100202_hw_notecard-v2-cellular.PrjPCB
Company: Byte Lab Grupa d.o.o.
Medarska 69/1, 10000 Zagreb, Croatia
www.byte-lab.com
Author: M. Marsic
Acceptor: J. Wiedey
Sheet 9 of 10
Rev: 12
Format: A4
Title: 10_M2_CONNECTOR.SchDoc
Project: 100202_hw_notecard-v2-cellular.PrjPCB
Company: Byte Lab Grupa d.o.o.
Medarska 69/1, 10000 Zagreb, Croatia
www.byte-lab.com
Author: M. Marsic
Acceptor: J. Wiedey
Sheet 10 of 10
Rev: 12
Format: A4