

## UL TEST REPORT AND PROCEDURE

<b>Standard:</b>	UL 62368-1, 2nd Ed, 2014-12-01 (Audio/video, information and communication technology equipment Part 1: Safety requirements) CAN/CSA C22.2 No. 62368-1-14, 2nd Ed (Audio/video, information and communication technology equipment Part 1: Safety requirements)
<b>Certification Type:</b>	Component Recognition
<b>CCN:</b>	QQJQ2, QQJQ8 (Power Supplies for Use in Audio/Video, Information and Communication Technology Equipment)
<b>Complementary CCN:</b>	N/A
<b>Product:</b>	Component DC-DC Power Supply
<b>Model:</b>	IQG Series  See Model Matrix under Enclosure.  May include optional "-R" appended to product model name to indicate ROHS compliance.
<b>Rating:</b>	Optional 36 - 75 VDC (Max) 15 A  8 - 12.4 VDC max; Max 50 A Max output Power 540 W
<b>Applicant Name and Address:</b>	TDK-LAMBDA AMERICAS INC SUITE 100 3320 MATRIX DR RICHARDSON TX 75082 UNITED STATES

This is to certify that representative samples of the products covered by this Test Report have been investigated in accordance with the above referenced Standards. The products have been found to comply with the requirements covering the category and the products are judged to be eligible for Follow-Up Service under the indicated Test Procedure. The manufacturer is authorized to use the UL Mark on such products which comply with this Test Report and any other applicable requirements of UL LLC ('UL') in accordance with the Follow-Up Service Agreement. Only those products which properly bear the UL Mark are considered as being covered by UL's Follow-Up Service under the indicated Test Procedure.

The applicant is authorized to reproduce the referenced Test Report provided it is reproduced in its entirety.

UL authorizes the applicant to reproduce the latest pages of the referenced Test Report consisting of the first page of the Specific Technical Criteria through to the end of the Conditions of Acceptability.

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL.

Prepared By: Mengis Tesfay - Handler /  
Project Handler

Reviewed By: Scott Shepler / Reviewer

### Supporting Documentation

The following documents located at the beginning of this Procedure supplement the requirements of this Test Report:

- A. Authorization - The Authorization page may include additional Factory Identification Code markings.
- B. Generic Inspection Instructions -
  - i. Part AC details important information which may be applicable to products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of this Test Report.
  - ii. Part AE details any requirements which may be applicable to all products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of each Test Report.
  - iii. Part AF details the requirements for the UL Certification Mark which is not controlled by the technical standard used to investigate these products. Products are permitted to bear only the Certification Mark(s) corresponding to the countries for which it is certified, as indicated in each Test Report.

### Product Description

EUT is a DC-DC Converter which is considered to be a secondary, building-in component intended for use in Information Technology Equipment consisting of electronic components mounted on min. V-1 PWB. The modules will be offered in multiple input voltage and output voltage ranges. The input ranges from 36 - 75 Vdc input at 15 A max. The output voltage will be adjustable between 8V to 12.4 Vdc, max 50A.

### Model Differences

All models within the series are similar except for input rating, output rating, and non-safety features variations.

### Test Item Particulars

Classification of use by	Instructed person
Supply Connection	External Circuit - not Mains connected ES2
Supply % Tolerance	None. Declared range.
Supply Connection – Type	Not directly connected to Mains
Considered current rating of protective device as part of building or equipment installation	40 A. External fuse to be provided in the end product. A; equipment
Equipment mobility	for building-in
Over voltage category (OVC)	OVC II
Class of equipment	Not classified
Access location	N/A
Pollution degree (PD)	PD 2
Manufacturer's specified maximum operating ambient (°C)	85°C, per client's provided de-rating curve
IP protection class	IPX0
Power Systems	N/A
Altitude during operation (m)	2000 m or less
Altitude of test laboratory (m)	2000 m or less
Mass of equipment (kg)	0.10

### Technical Considerations

- The product was submitted and evaluated for use at the maximum ambient temperature (T<sub>ma</sub>) permitted by the manufacturer's specification of : See de-rating curve for more details
- The product is intended for use on the following power systems : No direct connection
- Considered current rating of protective device as part of the building installation (A) : External fast blow 40 A fuse to be provided in the end product.
- Mains supply tolerance (%) or absolute mains supply values : No direct connection
- The equipment disconnect device is considered to be : For building in
- The following are available from the Applicant upon request : Installation (Safety) Instructions / Manual
- The product was investigated to the following additional standards : EN 62368-1:2014 + A11:2017

### Engineering Conditions of Acceptability

For use only in or with complete equipment where the acceptability of the combination is determined by UL LLC. When installed in an end-product, consideration must be given to the following:

- The following product-line tests are conducted for this product : Electric Strength
- The following output circuits are at ES1 energy levels : All
- The following output circuits are at PS3 energy levels : All
- The investigated Pollution Degree is : 2
- An investigation of the protective bonding terminals has : Not been conducted
- The following end-product enclosures are required : Electrical, Fire
- The maximum continuous power supply output (Watts) relied on forced air cooling from : Ranging from 5.2 to 70 CFM depending on ambient, and load. See Derating Curve
- The power supply was evaluated to be used at altitudes up to : "2,000 m"
- Test was conducted using fast blow external fuse rated 40 A. External fuse employed shall comply with IEC 60127.
- Heating Test need to re-conducted as part of an end product evaluation to ensure the max temperature of 125 C at PWB near T1 is not exceeded.

### Additional Information

This report is based on CB report reference numbers 2520400-3336-0023, 2520400-3336-0023 (124227), 2520400-3336-0023/151890, 2520400-3336-0023/160105, 2520400-3336-0023/168899, 2520400-3336-0023/172854, 2520400-3336-0023/182394, 2520400-3336-0023/193814, 207809-CI3-1, 258199-TL1-1 and CB certificates DE1-40099, CB/DE1- 40099/M1, CB/DE1- 40099/A1, CB DE1-49345, CB DE1-49345 /A1, CB DE1-49345 /A2, CB DE1-49345/A3, CB DE1-49345/A3/M1, CB DE1-49345/A4/M1, CB DE1-49345/A5/M1 respectively which was previously evaluated to UL/CSA/IEC 60950-1, 2nd edition, + Amendment 1 + Amendment 2; and UL report E220248-A20.

Testing conducted in accordance with IEC 60950-1:2005 (Second Edition), Am1:2009 + Am2:2013; UL 60950-1, 2nd Edition, 2014-10-14; and CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, 2014-10, and was deemed equivalent to the test required by IEC62368-1, 2nd Edition, CAN/CSA-C22.2 NO. 62368-1 2nd Ed, Issued December 1, 2014, and UL 62368-1 2nd Ed, Issued December 1, 2014. Testing correlation explanation provided in Enclosure. All original sample and test dates are noted in the testing portion of this report. Only Electric Strength test (5.4.9) was conducted at UL RTP, 12 Laboratory Dr. RTP NC 27709.

Marking label provided represents all models in series. The label also may include an optional "-R" as a suffix to denote ROHS compliance. The list of test equipment is absent from the VDE CB reports and TDK is a UL current CTF Stage 2 Laboratory customer.

### Additional Standards

The product fulfills the requirements of: EN 62368-1:2014 + A11:2017	
<b>Markings and Instructions</b>	
Clause Title	Marking or Instruction Details
Equipment identification marking – Manufacturer identification	Listees or Recognized companys name, Trade Name, Trademark or File Number
Equipment identification marking – model identification	Model Number
<b>Special Instructions to UL Representative</b>	

<b>BD1.0</b>						
<b>TABLE: Production-Line Testing Requirements</b>						
<b>BD1.1</b>						
<b>Electric Strength Test Special Constructions – Refer to Generic Inspection Instructions, Part AC for further information.</b>						
Model	Component	Removable parts	Test probe location	Test V rms	Test V dc	Test Time, s
--	--	--	--	--	--	--
<b>BD1.2</b>						
<b>Earthing Continuity Test Exemptions – This test is not required for the following models:</b>						
All Models						
<b>BD1.3</b>						
<b>Electric Strength Test Exemptions – This test is not required for the following models:</b>						
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<b>BD1.4</b>						
<b>Electric Strength Test Component Exemptions – The following solid-state components may be disconnected from the remainder of the circuitry during the performance of this test.</b>						
N/A						

<b>BE1.0</b>					
<b>Sample and Test Specifics for Follow-Up Tests at UL</b>					
Model	Component	Material	Test	Sample (s)	Test Specifics

4.1.2	TABLE: List of critical components					Pass
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Product Category CCN(s)	Mark(s) of conformity	Supplement ID
Main isolation(T1) Planar transformer/PWB Printed Wiring Board (PWB):Top and Bottom wiring board	Interchangeable	Interchangeable	Min. V-1, 130°C, multiple layers, with epoxy type film (FR-4) or Prepreg) used to separate each layer. Refer to "PWB traces"and "PWB Fabrication" files in the supplements to this report.	ZPMV2	UL	
PWB	Interchangeable	Interchangeable	Min. V-1, 130°C	ZPMV2	UL	
Transformer(T151) Gate Transformer	Bourns Bourns(Dong guan) Electronics Co.Ltd	P/n AT00143 or AT00164	See Enclosure 4-01 and 4-02. Employs Class F insulation system	OBJY2	UL	
Transformer(T300) Bias transformer	Bourns Bourns(Dong guan) Electronics Co.Ltd	P/n AT00131	See Enclosure 4-03 Employs Class F insulation system	OBJY2	UL	
Transformer(TS1) current sense	Bourns Bourns(Dong guan) Electronics Co.Ltd	P/n AT00160	See Enclosure 4-04 Employs Class F insulation system	OBJY2	UL	
Inductor (L2)/PWB	Interchangeable	Interchangeable	Min. V-1, 130°C. multiple layers PWB, with epoxy type film (FR-4)or (Prepreg) used to separate each layer	ZPMV2	UL	
Marking Label (optional)	Identco International Corp	TTL139-401-10	Max temperature 175°C, Indoor use only	PGJ12	UL	

**Enclosures**

<b>Type</b>	<b>Supplement Id</b>	<b>Description</b>
Photographs	03-01	Fig 1
Photographs	03-02	Fig 2
Photographs	03-03	Fig 3
Photographs	03-04	Fig 4
Diagrams	04-01	Gate transformer, T151
Diagrams	04-02	Gate transformer, T151
Diagrams	04-03	Transformer Bias (T300)
Diagrams	04-04	Current Sense transformer, TS1
Miscellaneous	07-01	Model Matrix
Miscellaneous	07-03	Letter of Assurance

**Test Record No. 1**

This report is based on CB report reference numbers 2520400-3336-0023, 2520400-3336-0023 (124227), 2520400-3336-0023/151890, 2520400-3336-0023/160105, 2520400-3336-0023/168899, 2520400-3336-0023/172854, 2520400-3336-0023/182394, 2520400-3336-0023/193814, 207809-CI3-1, 258199-TL1-1 and CB certificates DE1-40099, CB/DE1- 40099/M1, CB/DE1- 40099/A1, CB DE1-49345, CB DE1-49345 /A1, CB DE1-49345 /A2, CB DE1-49345/A3, CB DE1-49345/A3/M1, CB DE1-49345/A4/M1, CB DE1-49345/A5/M1 respectively which was previously evaluated to UL/CSA/IEC 60950-1, 2nd edition, + Amendment 1 + Amendment 2; and UL report E220248-A20. Only electric test per 62368-1, second edition was considered necessary.

The following tests were conducted:

<b>Tests performed (name of test and test clause):</b>	<b>Testing location:</b> UL RTP, 12 Laboratory Drive, Research Triangle Park , NC, 27709, USA
ELECTRIC STRENGTH TEST (5.4.9)	Additional test was conducted at UL, RTP 12 Laboratory Drive, Research Triangle Park , NC, 27709, USA under this CBTR.
<b>The following tests were waived:</b>	<b>Rationale for Waiving</b>
<b>Tests performed (name of test and test clause):</b>	<b>Testing location:</b> TDK-LAMBDA AMERICAS INC SUITE 100 3320 MATRIX DR RICHARDSON TX 75082 UNITED STATES
ELECTRIC STRENGTH TEST (5.4.9)	Testing conducted under IEC 60950-1:2005 (Second Edition); Am1:2009 + Am2:2013 evaluation was considered equivalent. Test was covered under 2520400-3336-0028/142949, 2520400-3336-0028/158198, 2520400-3336-0028/168900, 207809-CI3-3, 250567-TL4-1, and CB Test Certificate Ref. DE1-47514, DE1-49640, DE1-49640/A1, DE1-49640/A2, DE1-49640/A3 respectively which were previously evaluated to UL/CSA/IEC 60950-1, 2nd edition, + Amendment 1 & 2 by VDE Testing and Certification Institute.
INPUT TEST: SINGLE PHASE (B.2.5)	Tests conducted under 60950-1, Second edition, Amendment 2 was considered representative.
NORMAL OPERATING CONDITIONS TEMPERATURE MEASUREMENT (B.2.6)	Tests conducted under 60950-1, Second edition, Amendment 2 was considered representative.
SIMULATED ABNORMAL OPERATING CONDITIONS (B.3)	Tests conducted under 60950-1, Second edition, Amendment 2 was considered representative.

SIMULATED SINGLE FAULT CONDITIONS (B.4)	Tests conducted under 60950-1, Second edition, Amendment 2 was considered representative.
<b>The following tests were waived:</b>	<b>Rationale for Waiving</b>

Test results are valid only for the tested equipment. These tests are considered representative of the products covered by this Test Report. The test methods and results of the above tests have been reviewed and found to be in accordance with the requirements in the Standard(s) referenced at the beginning of this Test Report.

The following supplements are provided as part of this Test Record. NOTE: These supplements are only available to the Applicant via the myUL™ Client Portal.

Type	Supplement Id	Description
Datasheet	02-01	Datasheet
Attachment	02-02	French CRD

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

4.8.4, 4.8.5	<b>TABLE: Lithium coin/button cell batteries mechanical tests</b>		N/A
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**(The following mechanical tests are conducted in the sequence noted.)**

4.8.4.2	<b>TABLE: Stress Relief test</b>		—
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Part	Material	Oven Temperature (°C)	Comments
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4.8.4.3	<b>TABLE: Battery replacement test</b>		—
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Battery part no. .... :

Battery Installation/withdrawal	Battery Installation/Removal Cycle	Comments
---------------------------------	------------------------------------	----------

	1	
	2	
	3	
	4	
	5	
	6	
	8	
	9	
	10	

4.8.4.4	<b>TABLE: Drop test</b>		—
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Impact Area	Drop Distance	Drop No.	Observations
		1	
		2	
		3	

4.8.4.5	<b>TABLE: Impact</b>		—
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Impacts per surface	Surface tested	Impact energy (Nm)	Comments

4.8.4.6	<b>TABLE: Crush test</b>		—
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Test position	Surface tested	Crushing Force (N)	Duration force applied (s)

Supplementary information:

4.8.5	<b>TABLE: Lithium coin/button cell batteries mechanical test result</b>		N/A
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Test position	Surface tested	Force (N)	Duration force applied (s)

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
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Supplementary information:			

<b>5.2</b>	<b>Table: Classification of electrical energy sources</b>	Pass
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5.2.2.2 – Steady State Voltage and Current conditions

No.	Supply Voltage	Location (e.g. circuit designation)	Test conditions	Parameters			ES Class
				U (Vrms or Vpk)	I (Apk or Arms)	Hz	
1	All models	Input	Normal	75 VDC			ES2
			Abnormal	--	--	--	
			Single fault – SC/OC	--	--	--	
3	All Models	Output	Normal	12.4 VDC	--	--	ES1
			Abnormal	--	--	--	
			Single fault – SC/OC	--	--	--	

5.2.2.3 - Capacitance Limits

No.	Supply Voltage	Location (e.g. circuit designation)	Test conditions	Parameters		ES Class
				Capacitance, nF	Upk (V)	
--	--	--	Normal	--	--	--
			Abnormal	--	--	
			Single fault – SC/OC	--	--	

5.2.2.4 - Single Pulses

No.	Supply Voltage	Location (e.g. circuit designation)	Test conditions	Parameters			ES Class
				Duration (ms)	Upk (V)	lpk (mA)	
---	--	--	Normal	--	---	--	--
			Abnormal	--	--	--	
			Single fault – SC/OC	--	--	--	

5.2.2.5 - Repetitive Pulses

No.	Supply Voltage	Location (e.g. circuit designation)	Test conditions	Parameters			ES Class
				Off time (ms)	Upk (V)	lpk (mA)	
--	--	--	Normal	--	--	--	--
			Abnormal	--	--	--	

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

<b>5.2</b>	<b>Table: Classification of electrical energy sources</b>						Pass
			Single fault – SC/OC	--	--	--	
Test Conditions: Normal – Abnormal - Supplementary information: SC=Short Circuit, OC=Short Circuit							

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

<b>5.4.1.4, 6.3.2, 9.0, B.2.6</b>	<b>TABLE: Temperature measurements</b>				Pass	
	Supply voltage (V) .....	36Vdc (normal)	48Vdc (normal)	75Vdc (normal)	---	---
	Ambient T <sub>min</sub> (°C) .....	22.3	22.3	21.3	--	---
	Ambient T <sub>max</sub> (°C) .....	--	--	--	--	---
	T <sub>ma</sub> (°C) .....	22.3	22.3	21.3	--	---
Maximum measured temperature T of part/at:		T (°C)				Allowed T <sub>max</sub> (°C)
	Input inductor L100 lead	50	51.1	63.1	--	130
	Current sense TS1 winding	51.2	51.6	62.6	--	130
	Output L2 winding	57.5	60.5	77.9	--	130
	Output L2 core	62.7	68.4	90.4	--	130
	Main xform T1 winding	73.8	75.9	99.2	--	130
	Main xform T1 core	64.4	66.6	86.2	--	130
	IMS board	61.2	63.1	80.9	--	130
	Gate xform T151 winding	60.1	59.5	71.7	--	130
	Opto U102 lead	61	62.6	79.8	--	130
	Bais xfom T300 winding	66.1	66.6	82.4	--	130
	Pri FET Q113 tab	74.8	77.7	103.2	--	130
	--	48Vdc Abnormal no air	75Vdc Overload power supply output	T (°C) #6: 75Vdc short circuit / power supply output	--	--
	Input inductor L100 lead	90	64.7	22.5	--	--
	Current sense TS1 winding	101	64.6	22.7	--	--
	Output L2 winding	105	80	23.1	--	--
	Output L2 core	115	92.4	23.3	--	--
	Main xform T1 winding	127.1	101.7	23.5	--	--
	Main xform T1 core	118.8	88.4	23.5	--	--
	IMS board	115.1	82.6	22.9	--	--
	Gate xform T151 winding	95.6	73.7	23.3	--	--
	Opto U102 lead	100.5	81.8	24.1	--	--
	Bais xfom T300 winding	113.2	84.1	25.3	--	--
	Pri FET Q113 tab	127.6	105.6	23.4	--	--

IEC 62368-1					
Clause	Requirement + Test	Result - Remark			Verdict
E220248-A20-UL-1 Amendment #2	T (°C) 36 Vdc test time: 27 min , 26sec	48 Vdc test time: 17 min , 47sec	75 Vdc test time: 37 min , 3sec	--	Tmax
iQG48033A120V - The Heating test was conducted with the power supply mounted in a vertical position on its side, in a wind tunnel with forced air cooling of 400LFM. Recorded test data was Normalized.					
Normalized Ambient	25	25	25	--	--
Main Transformer T1 Core	96.8	97.5	109.1	--	130
Main Transformer Winding (PWB)	105	105.2	117.4	--	130
Output Inductor L2 Core	89.7	91.5	107.4	--	130
Output Inductor L2 Winding (PWB)	83.3	84	95.5	--	130
Current Sense Transformer TS1 Winding	72	72	77.9	--	90
Gate Transformer T151 Winding	76.1	74.9	80.7	--	90
U102 Pin	82.9	83.2	92.3	--	130
Secondary FET Q413 Tab	111.3	110.2	120.4	--	130
Bias Transformer T300 Winding	73.4	73.6	80.6	--	90
--	Abnormal 48 Vin test time 8min 46 sec	Overload *1	--	--	--
Normalized Ambient	25	25	--	--	--
Main Transformer T1 Core	131.8	113.4	--	--	--
Main Transformer Winding (PWB)	138.5	122.5	--	--	--
Output Inductor L2 Core	123	111.2	--	--	--
Output Inductor L2 Winding (PWB)	114.2	99	--	--	--
Current Sense Transformer TS1 Winding	111.7	79.2	--	--	--
Gate Transformer T151 Winding	95.5	82.7	--	--	--
U102 Pin	104.5	95.1	--	--	--
Secondary FET Q413 Tab	145.8	126.7	--	--	--
Bias Transformer T300 Winding	103.4	82.1	--	--	--
E220248-A20-UL-1 (11NK15102)	41 Vdc @ ambient 22.1	48 Vdc @ ambient 21.3	75 Vdc @ ambient 21.9	--	
iQG48047A096V-xxx- The Heating test was conducted with the power supply mounted in a vertical position on its side, in a wind tunnel with forced air cooling of 250LFM. Recorded test data was Normalized.					
U 102 Pin	82.0	81.8	94.3	--	100
Bias Transformer T300 Winding	79.1	78.7	88.8	--	130
Mains Transformer T 1 (PWB)	101.2	101.2	117.3	--	130

IEC 62368-1					
Clause	Requirement + Test		Result - Remark		Verdict
Main Transformer T1 Core	97.4	98.0	115.5	--	130
I sense Transformer TS1 Winding	73.1	71.7	79.1	--	90
Secondary FET Q412 (PWB)	104.6	104.0	118.5	--	130
Output Inductor L2 COre	91.8	92.7	112.7	--	130
Output Inductor L2 Winding (PWB)	87.0	87.0	101.1	--	130
Gate Transorment T151 Winding	72.5	71.5	79.3	--	90
E220248-A20-UL-1 (11NK15102) iQG48047A096V-xxx-	Overload	Short Circuit	Abnormal (no air flow)	--	--
U 102 Pin	103.7	26.1	105.9	--	--
Bias Transformer T300 Winding	97.0	27.1	107.0	--	--
Mains Transformer T 1 (PWB)	130.1	25.8	126.0	--	--
Main Transformer T1 Core	129.2	25.6	129.4	--	--
I sense Transformer Ts1 Winding	88.0	24.9	102.5	--	--
Secondary FET Q412 (PWB)	131.4	25.9	123.5	--	--
Output Inductor L2 COre	124.5	25.5	123.4	--	--
Output Inductor L2 Winding (PWB)	111.4	25.4	110.5	--	--
Gate Transorment T151 Winding	88.0	25.3	94.4	--	--
E220248-A20-UL-1 (11NK15102) iQG4N050A108V-xxx	51 Vdc @ ambient 22.0	54 Vdc @ ambient 21.8	55.5 Vdc @ ambient 21.6	--	--
U102 Pin	61.1	61.3	62.0	---	100
Bias Transformer T300 Winding	82.5	82.6	82.6	---	90
I Sense Transformer TS1 Winding (PWB)	119.8	120.8	121.4	---	130
Main Transformer T1 Winding (PWB)	105.4	106.5	107.1	---	130
Main Transformer T1 Core	100.9	102.3	103.1	---	130
Secondary FET Q412 (PWB)	111.2	112.1	112.5	---	130
Output Inductor L2 Winding (PWB)	91.8	92.6	93.0	---	130
Output Inductor L2 Core	96.9	98.3	99.0	---	130
Gate Transformer T151 Winding	49.9	50.0	49.8	---	90
E220248-A20-UL-1 (11NK15102) iQG4N050A108V-xxx	Overload	Short Circuit	Abnormal (no air flow)	--	--
U102 Pin	71.4	23.2	96.9	--	--
Bias Transformer T300 Winding	93.1	25.3	117.2	--	--
I Sense Transformer TS1 Winding	148.5	23.9	136.5	--	--
Main Transformer T1 Winding (PWB)	126.6	23.9	128.9	--	--
Main Transformer T1 Core	120.8	23.8	130	--	--

IEC 62368-1					
Clause	Requirement + Test		Result - Remark		Verdict
Secondary FET Q412 (PWB)	133.7	23.9	127.3	--	--
Output Inductor L2 Winding (PWB)	110.5	23.5	113.3	--	--
Output Inductor L2 Core	116.7	23.4	124.2	--	--
Gate Transformer T151 Winding	56.5	22.6	91.2	--	--
Model iQG48042A120V-xxx; Input: 39-75Vdc, 15Adc max. , Output: 12Vdc, 42Adc. Tests conducted in wind tunnel with 450 LFM. All tests done with base plate attached to unit.	Input 39Vdc @ ambient 23.6C	Input 48Vdc @ ambient 23.7C	Input 75Vdc @ ambient 24C	--	--
Isolator U102 Body	76.5	74.9	84.2	--	90
Gate Drive Transformer T151 Winding	85.5	83.2	92.3	--	130
Bias Transformer T300 Winding	81.4	79.2	88.7	--	130
Snubber Resistor R430 Terminal	107.9	105.3	120.4	--	130
I Sense Transformer TS1 Winding	81.2	78.2	86.1	--	130
Main Transformer T1 Winding (PWB)	101.8	98.7	112.1	--	130
Main Transformer T1 Core	93.2	91.1	104.2	--	130
---	Overload Input: 75Vdc @ ambient 24.6C	Short Circuit Input: 75Vdc @ ambient 24.5C	Abnormal (no air flow) Input: 48Vdc @ ambient 28.7C	--	--
Isolator U102 Body	98.7	23.9	102.2	---	--
Gate Drive Transformer T151 Winding	109.1	23.8	115.2	---	--
Bias Transformer T300 Winding	103.6	26.2	122.2	---	--
Snubber Resistor R430 Terminal	142.3	24.2	146.0	---	--
I Sense Transformer TS1 Winding	100.8	23.6	126.9	---	--
Main Transformer T1 Winding (PWB)	133.1	24.0	138.6	---	--
Main Transformer T1 Core	123.6	23.6	130.8	---	--
Supplementary information:					

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

\* Indicates component is integrated into the PWB  
 - models were operated at maximum normal load (MNL) as indicated in Table 1.6.2.  
 - The Heating test was conducted with the power supply mounted in a vertical position on its side, in a wind tunnel with forced air cooling of 200LFM.

\*1 - Short Circuit test was conducted at 75 Vin and output shorted. Short circuit protection instantly operates and shuts down unit. Once the short is removed EUT recovers.

Temperatures were measured according to sub-clause 1.4.5 in continuous normal operation at the same time voltages for power input measurements table 1.6 which resulted in the highest temperature values & steady conditions were established. Temperature limits are calculated according to sub-clause 1.4.12 with regard to the maximum ambient operation temperature, as specified by the manufacture. Temperatures of windings are reduced by 10 K due to the use of thermocouples. If there is no required dT, the temperatures were measured for reference only.

Temperature T of winding:	t <sub>1</sub> (°C)	R <sub>1</sub> (Ω)	t <sub>2</sub> (°C)	R <sub>2</sub> (Ω)	T (°C)	Allowed T <sub>max</sub> (°C)	Insulation class
Supplementary information:							

5.4.1.10.2	TABLE: Vicat softening temperature of thermoplastics			N/A
Penetration (mm) .....				—
Object/ Part No./Material	Manufacturer/t rademark	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	Test temperature (°C)	Impression diameter (mm)	
Supplementary information:				

5.4.2.2, 5.4.2.4 and 5.4.3	TABLE: Minimum Clearances/Creepage distance						Pass
Clearance (cl) and creepage distance (cr) at/of/between:	Up (V)	U r.m.s. (V)	Frequency (kHz) <sup>1</sup>	Required cl (mm)	cl (mm) <sup>2</sup>	Required <sup>3</sup> cr (mm)	cr (mm)
iQG48025A120V-xxx -	--	--	--	--	--	--	--

IEC 62368-1							
Clause	Requirement + Test			Result - Remark			Verdict
WORKING VOLTAGE TEST							
Input to output isolation on PWB top/bottom layers	75V dc (assumed TNV-2)	(Assumed TNV-2)	<30KHz	0.2	1.52	1.4	1.52
E220248-A20-UL-1 Amendment #2 - iQG48033A120V-xxx - WORKING VOLTAGE TEST	--	--	--	--	--	--	--
Main Transformer TP101 to T1 pins 8 to 10	135.9	45.80	<30KHz	0.2	14.09	1.40	14.09
Main Transformer TP101 to T1 Secondary Center tap	82.8	29.93	<30KHz	0.2	14.00	1.40	14.00
Main Transformer TP101 to T1 pins 4 to 6	81.3	17.28	<30KHz	0.2	17.52	1.40	17.52
Main Transformer TP102 to T1 pins 8 to 10	82.8	16.75	<30KHz	0.2	14.39	1.40	14.39
Main Transformer TP102 to T1 Secondary center tap	67.2	29.8	<30KHz	0.2	13.44	1.40	13.44
Main Transformer TP102 to T1 pins 4 to 6	107.8	45.51	<30KHz	0.2	13.79	1.40	13.79
Current Sense Transformer TS1 pins 4 to pin 1	59.4	26.83	<30KHz	0.2	1.77	1.40	1.77
Current Sense Transformer TS1 pins 3 to pin 1	51.6	27.01	<30KHz	0.2	1.52	1.40	1.52
Current Sense Transformer TS1 pins 4 to pin 2	57.8	24.84	<30KHz	0.2	2.29	1.40	2.29
Current Sense Transformer TS1 pins 3 to pin 2	51.6	24.93	<30KHz	0.2	2.04	1.40	2.04
Bias Transformer T300 pin 3 to Pin 6	90.9	11.67	<30KHz	0.2	3.25	1.40	3.25
Bias Transformer T300 pin 3 to Pin 5	23.7	3.81	<30KHz	0.2	2.43	1.40	2.43
Bias Transformer T300 pin 4 to Pin 6	81.6	13.74	<30KHz	0.2	4.54	1.40	4.54
Bias Transformer T300 pin 4 to Pin 5	108.1	23.62	<30KHz	0.2	3.49	1.40	3.49
Bias Transformer T300 pin 2 to Pin 6	48.9	5.64	<30KHz	0.2	2.42	1.40	2.42
Bias Transformer T300 pin 2 to Pin 5	66.4	11.10	<30KHz	0.2	2.03	1.40	2.03
Bias Transformer T300 pin 1 to Pin 6	64.9	11.43	<30KHz	0.2	2.03	1.40	2.03
Bias Transformer T300 pin 1 to Pin 5	16.0	3.32	<30KHz	0.2	2.04	1.40	2.04

IEC 62368-1							
Clause	Requirement + Test			Result - Remark			Verdict
E220248-A20-UL-1 (11NK15102) iQG48047A096V- xDx DETER WORKING VOLTAGE MEASUREMENT TEST	--	--	--	--	--	--	--
Main Transformer TP101 to T1 pins 8 - 10	68.8	36.06	<30KHz	0.2	20.91	1.40	9.22
Main Transformer TP101 to T1 Secondary Center Tap	51.6	24.32	<30KHz	0.2	34.79	1.40	21.05
Main Transformer TP101 to T1 pins 4 - 6	32.8	13.3	<30KHz	0.2	20.90	1.40	9.22
Current Sense Transformer TS1 pin 4 to pin 1	56.3	26.90	<30KHz	0.2	5.31	1.40	1.78
Current Sense Transformer TS1 pin 3 to pin 1	48.8	26.95	<30KHz	0.2	5.69	1.40	1.51
Current Sense Transformer TS1 pin 4 to pin 2	53.1	24.83	<30KHz	0.2	5.69	1.40	2.29
Bias Transformer T300 pin 4 to pin 5	81.3	25.68	<30KHz	0.2	7.47	1.40	3.48
Model iQG48042A120V-xxx; Input: 39-75Vdc, 15Adc max. , Output: 12Vdc, 42Adc. Tests conducted in wind tunnel with 450 LFM. All tests done with base plate attached to unit.	--	--	--	--	--	--	--
Main Transformer, T1.1 to T1.8	42.43	104.7	<30KHz	0.2	19.871	1.40	2.920
Main Transformer, T1.1 to T1.CT	26.44	66.3	<30KHz	0.2	32.699	1.40	4.634
Main Transformer, T1.1 to T1.4	11.26	46.9	<30KHz	0.2	23.321	1.40	2.793
Main Transformer, T1.3 to T1.8	11.28	48.4	<30KHz	0.2	14.305	1.40	2.412
Main Transformer, T1.3 to T1.CT	26.50	61.3	<30KHz	0.2	27.214	1.40	4.126
Main Transformer, T1.3 to T1.4	42.23	101.6	<30KHz	0.2	17.918	1.40	2.285
Bias Transformer, T300.2 to T300.6	2.04	10.0	<30KHz	0.2	5.156	1.40	5.156
Bias Transformer, T300.2 to T300.5	9.68	39.4	<30KHz	0.2	5.524	1.40	5.524
Bias Transformer, T300.1 to T300.6	10.54	40.0	<30KHz	0.2	6.299	1.40	5.714
Bias Transformer, T300.1 to T300.5	1.79	9.4	<30KHz	0.2	7.104	1.40	6.082
Bias Transformer, T300.3 to T300.6	11.12	48.1	<30KHz	0.2	6.581	1.40	6.581
Bias Transformer, T300.3 to T300.5	3.72	15.0	<30KHz	0.2	6.553	1.40	6.553
Bias Transformer, T300.4 to T300.6	11.14	41.3	<30KHz	0.2	6.957	1.40	6.957

IEC 62368-1								
Clause	Requirement + Test				Result - Remark			Verdict
Bias Transformer, T300.4 to T300.5	20.87	77.5	<30KHz	0.2	6.553	1.40	6.553	
Current Transformer, TS1.3 to TS1.2	27.84	63.1	<30KHz	0.2	2.54	1.40	2.54	
Current Transformer, TS1.3 to TS1.1	25.99	61.3	<30KHz	0.2	3.088	1.40	3.088	
Current Transformer, TS1.4 to TS1.2	28.23	56.3	<30KHz	0.2	2.901	1.40	2.901	
Current Transformer, TS1.4 to TS1.1	26.22	54.4	<30KHz	0.2	3.149	1.40	3.149	
OPTO Isolator, U102.1 to U102.4	3.86	7.8	<30KHz	0.2	4.521	1.40	4.521	
OPTO Isolator, U102.1 to U102.3	0.66	4.1	<30KHz	0.2	3.522	1.40	3.522	
OPTO Isolator, U102.2 to U102.4	2.89	6.9	<30KHz	0.2	4.555	1.40	4.555	
OPTO Isolator, U102.2 to U102.3	1.40	5.0	<30KHz	0.2	1.626	1.40	1.626	
Gate Drive Transformer, T151.1 to T151.6	2.34	8.8	<30KHz	0.2	1.538	1.40	1.538	
Gate Drive Transformer, T151.1 to T151.4	8.21	19.7	<30KHz	0.2	1.816	1.40	1.816	
Gate Drive Transformer, T151.3 to T151.6	8.20	17.2	<30KHz	0.2	4.953	1.40	1.919	
Gate Drive Transformer, T151.3 to T151.4	1.81	7.2	<30KHz	0.2	5.588	1.40	2.197	
--	--	--	--	--	--	--	--	
Input to Output Per 62368	75 VDC		<30KHz	0.2	1.52	1.4	1.52	
Supplementary information:								
Note 1: Only for frequency above 30 kHz								
Note 2: See table 5.4.2.4 if this is based on electric strength test								
Note 3: Provide Material Group								

<b>5.4.2.3</b>	<b>TABLE: Minimum Clearances distances using required withstand voltage</b>						N/A
	<b>Overvoltage Category (OV):</b>						--
	<b>Pollution Degree:</b>						--
Clearance distanced between:		Required withstand voltage	Required cl (mm)	Measured cl (mm)			
--		--	--	--			
Supplementary information:							

<b>5.4.2.4</b>	<b>TABLE: Clearances based on electric strength test</b>					N/A
Test voltage applied between:		Required cl (mm)	Test voltage (kV) peak/ r.m.s. / d.c.	Breakdown Yes / No		

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
Supplementary information:			

5.4.4.2, 5.4.4.5 c) 5.4.4.9	TABLE: Distance through insulation measurements					Pass
Distance through insulation di at/of:	Peak voltage (V)	Frequency (kHz)	Material	Required DTI (mm)	DTI (mm)	
Supplementary information:						
Based on our review with client, inner surface of a multi-layer printed board are either all primary or all secondary. Furthermore whenever inner layer have both primary and secondary traces on the same inner layer spacings are no less than 0.75 mm, which satisfies the Functional and/or Basic Insulation requirements of current edition.						

5.4.9	TABLE: Electric strength tests			Pass
Test voltage applied between:	Voltage shape (AC, DC)	Test voltage (V)	Breakdown Yes / No	
Functional:				
--	--	--	--	
Basic/supplementary:				
Input and Output: BI, (Per 60950-1)	DC	1414 V dc	No	
Input and Output: BI (Per 60950-1)	DC	1500V dc	No	
Input and Output: BI (Model iQG48047A096V-xxx) (Per 60950-1)	DC	1500Vdc	No	
Input and Output: BI (Model iQG4N050A096V-xxx) (Per 60950-1)	DC	1500Vdc	NO	
Input pins 1-3 / Output pins 4-8 (iQG48042A120V-xxx) (Per 60950-1)	DC	2250Vdc	NO	
Input pins 1-3 / Baseplate (iQG48042A120V-xxx) (Per 60950-1)	DC	1500Vdc	No	
Input to Output (Per 62368-1)*	DC	1500	No	
Input to Output (Reversed polarity) (Per 62368-1)*	DC	1500	No	
Reinforced:				
--	--	--	--	
Routine Tests:				
--	--	--	--	
Supplementary information:				

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

<b>5.4.9</b>	<b>TABLE: Electric strength tests</b>			Pass
Test voltage applied between:		Voltage shape (AC, DC)	Test voltage (V)	Breakdown Yes / No
*1500 potential per 60950-1 was considered more stringent than what is required per 62368-1, therefore used 1500 DC Voltage.				

<b>5.5.2.2</b>	<b>TABLE: Stored discharge on capacitors</b>					N/A
Supply Voltage (V), Hz	Test Location	Operating Condition (N, S)	Switch position On or off	Measured Voltage (after 2 seconds)	ES Classification	
--						
Supplementary information:						
<p>X-capacitors installed for testing are:</p> <p><input type="checkbox"/> bleeding resistor rating:</p> <p><input type="checkbox"/> ICX:</p> <p>Notes:</p> <p>A. Test Location: Phase to Neutral; Phase to Phase; Phase to Earth; and/or Neutral to Earth</p> <p>B. Operating condition abbreviations: N – Normal operating condition (e.g., normal operation, or open fuse); S –Single fault condition</p>						

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

<b>5.6.6.2</b>	<b>TABLE: Resistance of protective conductors and terminations</b>				N/A
Accessible part	Test current (A)	Duration (min)	Voltage drop (V)	Resistance (Ω)	
Supplementary information:					

<b>5.7.2.2, 5.7.4</b>	<b>TABLE: Earthed accessible conductive part</b>			N/A
Supply voltage .....				—
Location	Test conditions specified in 6.1 of IEC 60990 or Fault Condition No in IEC 60990 clause 6.2.2.1 through 6.2.2.8, except for 6.2.2.7			Touch current (mA)
		1		
		2*		
		3		
		4		
		5		
		6		
		8		
Supplementary Information:				
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.				

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

6.2.2	Table: Electrical power sources (PS) measurements for classification					Pass
Source	Description	Measurement	Max Power after 3 s	Max Power after 5 s <sup>*</sup>	PS Classification	
All circuits	--	Power (W) :	--	--	PS3 (To be employed in an end product)	
		V <sub>A</sub> (V) :	--	--		
		I <sub>A</sub> (A) :	--	--		
Supplementary Information:						
(*) Measurement taken only when limits at 3 seconds exceed PS1 limits						

6.2.3.1	Table: Determination of Potential Ignition Sources (Arcing PIS)				Pass
Location	Open circuit voltage After 3 s (V <sub>p</sub> )	Measured r.m.s current (I <sub>rms</sub> )	Calculated value (V <sub>p</sub> x I <sub>rms</sub> )	Arcing PIS? Yes / No	
All circuits	--	--	--	Yes. To be addressed in the end product	
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 <sub>p</sub> ) and normal operating condition rms current (I <sub>rms</sub> ) is greater than 15.					

6.2.3.2	Table: Determination of Potential Ignition Sources (Resistive PIS)				Pass
Circuit Location (x-y)	Operating Condition (Normal / Describe Single Fault)	Measured wattage or VA During first 30 s (W / VA)	Measured wattage or VA After 30 s (W / VA)	Protective Circuit, Regulator, or PTC Operated? Yes / No (Comment)	Resistive PIS? Yes/No
All Circuits	--	--	--	--	Yes. To be addressed in the end product.
Supplementary Information:					
<p>A combination of voltmeter, VA and ammeter IA may be used instead of a wattmeter.</p> <p>If a separate voltmeter and ammeter are used, the product of (VA x IA) is used to determine Resistive PIS classification.</p> <p>A Resistive PIS: (a) dissipates more than 15 W, measured after 30 s of normal operation, or (b) under single fault conditions has either a power exceeding 100 W measured immediately after the introduction of the fault if electronic circuits, regulators or PTC devices are used, or has an available power exceeding 15 W measured 30 s after introduction of the fault.</p>					

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

8.5.5	TABLE: High Pressure Lamp		N/A
Description	Values	Energy Source Classification	
Lamp type .....		—	
Manufacturer .....		—	
Cat no.....		—	
Pressure (cold) (MPa) .....		MS_	
Pressure (operating) (MPa).....		MS_	
Operating time (minutes).....		—	
Explosion method .....		—	
Max particle length escaping enclosure (mm) .:		MS_	
Max particle length beyond 1 m (mm).....		MS_	
Overall result .....			
Supplementary information:			

B.2.5 TABLE: Input test								Pass
U (V)	Hz	I (A)	I rated (A)	P (W)	P rated (W)	Fuse No	I fuse (A)	Condition/status
36Vdc	dc	10A	8.915A	368.915	--	--	--	MNL
48Vdc	dc	10A	6.713A	322.224	--	--	--	MNL
75Vdc	dc	10A	4.423A	331.725	--	--	--	MNL
--	--	--	--	--	--	--	--	--
36Vdc	dc	11.5A	10.395A	374.22	--	--	--	Test was conducted in a wind tunnel with forced air cooling of 400 LFM. Unit was loaded with a resistive load of 12VDC, 33 A for a max Normal Load.
48Vdc	dc	11.5A	8.544A	410.11	--	--	--	See Above
75Vdc	dc	11.5A	5.538A	415.35	--	--	--	See Above
--	--	--	--	--	--	--	--	--
41Vdc	dc	12A	10.91A	447.07	--	--	--	Model iQG48047A096V-xxx: Output 9.6 V, 47 A, MNL**

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

B.2.5	TABLE: Input test							Pass
U (V)	Hz	I (A)	I rated (A)	P (W)	P rated (W)	Fuse No	I fuse (A)	Condition/status
48Vdc	dc	12A	9.35A	448.48	--	--	--	Model iQG48047A096V-xxx: Output 9.6 V, 47 A, MNL **
75Vdc	dc	12A	6.05A	453.93	--	--	--	Model iQG48047A096V-xxx: Output 9.6 V, 47 A, MNL**
51Vdc	dc	12.5A	10.62A	541.54	--	--	--	Model iQG4N050A108V-xxx: Output 10.8 V, 50 A, MNL***
54Vdc	dc	12.5A	10.05A	542.42	--	--	--	Model iQG4N050A108V-xxx: Output 10.8 V, 50 A, MNL***
55.5Vdc	dc	12.5A	9.78A	542.72	--	--	--	Model iQG4N050A108V-xxx: Output 10.8 V, 50 A, MNL***
--	--	--	--	--	--	--	--	Model iQG48042A120V-xxx; Input: 39-75Vdc, 15Adc max. , Output: 12Vdc, 42Adc. Tests conducted in wind tunnel with 450 LFM. All tests done with base plate attached to unit.
39Vdc	dc	15A	13.01A	507.520	--	--	--	Output:12.0Vdc,42 Adc, MNL
48Vdc	dc	15A	10.57A	507.377	--	--	--	Output:12.0Vdc,42 Adc, MNL
75Vdc	dc	15A	6.84A	512.918	--	--	--	Output:12.0Vdc,42 Adc, MNL
Supplementary information:								
MNL- unit was loaded with a Resistive load of 25A @ 12V for Maximum Normal load (MNL). Test performed on Model iQG48025A120V-xxx in wind tunnel force air of 200LFM was considered to be representative of the entire series. ** - Test was conducted in wind tunnel with 250 LFM *** - Test was conducted in wind tunnel with 350 LFM. Equipment may be have rated current or rated power or both. Both should be measured								

B.3	TABLE: Abnormal operating condition tests	Pass
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IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict

Ambient temperature (°C) .....		See Below		—				
Power source for EUT: Manufacturer, model/type, output rating ...:		See Below		—				
Component No.	Abnormal Condition	Supply voltage, (V)	Test time (ms)	Fuse no.	Fuse current, (A)	T-couple	Temp. (°C)	Observation
Power supply output	Overload output	75Vdc	42 min.	@BC	15	--	--	See temp table for details, CT, NB, NC
Power supply output	Short circuit	75Vdc	Instantaneous, however continued for 50min	@BC	15	--	--	See temp table for details, CT, NB, NC
--	--	--	--	--	--	--	--	--
Model iQG48033A120 V-xxx, 400 Watts See below	Fault	Test Voltage	Test time	--	--	--	--	--
EUT	No Forced Air	48VDC	8 Minutes 46 Sec	--	--	--	--	NB, NC, Thermal Shutdown activated. See table 4.5 for temperature data
Output	Overload	75VDC	18 minutes 40 Sec	--	--	--	--	CT, NC, NB, EUT was Overloaded to 34.2 A
Output	Short Circuit	75VDC	27 minutes 11 Sec	--	--	--	--	CT, NC, NB, test was conducted at 75 Vin and output shorted. Short circuit protection triggered instantly. recovered to normal when short was removed
--	--	--	--	--	--	--	--	--

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

B.3		TABLE: Abnormal operating condition tests						Pass
Ambient temperature (°C) .....		See Below						—
Power source for EUT: Manufacturer, model/type, output rating ...:		See Below						—
Component No.	Abnormal Condition	Supply voltage, (V)	Test time (ms)	Fuse no.	Fuse current, (A)	T-couple	Temp. (°C)	Observation
iQG48047A096 V-xDx, (Power supply output, Pin 4 to pin 8)	Overload output	75Vdc	49m43s	N/A	N/A	--	--	See heating test for component temperatures, CT, NC, NB
iQG48047A096 V-xDx, (Power supply output, Pin 4 to pin 8)	Short circuit	75Vdc	42m55s	N/A	N/A	--	--	See heating test for component temperatures, CT, NC, NB
iQG4N050A108 V-xDx, (Power supply output, Pin 4 to pin 8)	Overload output	55.5Vdc	41m19s	N/A	N/A	--	--	See heating test for component temperatures, CT, NC, NB
iQG4N050A108 V-xDx, (Power supply output, Pin 4 to pin 8)	Short circuit	55.5Vdc	41m45s	N/A	N/A	--	--	See heating test for component temperatures, CT, NC, NB

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

B.3		TABLE: Abnormal operating condition tests						Pass
Ambient temperature (°C) .....		See Below						—
Power source for EUT: Manufacturer, model/type, output rating ...:		See Below						—
Component No.	Abnormal Condition	Supply voltage, (V)	Test time (ms)	Fuse no.	Fuse current, (A)	T-couple	Temp. (°C)	Observation
Model iQG48042A120 V-xxx; Input: 39-75Vdc, 15Adc max. , Output: 12Vdc, 42Adc. Tested with MNL, See Power Supply Reference Page for details, No Fan used, F1, F2 is external fuse on test fixture specified in manufacturer specification for end use application. Note: *Module initially shutdown then restarted until thermal shutdown became active and cycled thermal shutdown On then Off.	--	--	--	--	--	--	--	--
Output pin 4 to pin 8	Overload	75Vdc	51m31s	N/A	N/A	--	--	NC,NB, See table 4.5 for component temperatures. Test conducted in Wind Tunnel with no air flow to the point of thermal protection.

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

B.3		TABLE: Abnormal operating condition tests						Pass
Ambient temperature (°C) .....		See Below						—
Power source for EUT: Manufacturer, model/type, output rating ...:		See Below						—
Component No.	Abnormal Condition	Supply voltage, (V)	Test time (ms)	Fuse no.	Fuse current, (A)	T-couple	Temp. (°C)	Observation
Output pin 4 to pin 8	Short Circuit	75Vdc	44m58s	N/A	N/A	--	--	See Table 4.5 for component temperatures, CT, NC, NB. Test was conducted in a wind tunnel with forced air cooling of 450 LFM. Unit was operated with baseplate.
Output pin 4 to pin 8	Overload	75Vdc	51m31s	N/A	N/A	--	--	See Table 4.5 for component temperatures, CT, NC, NB. Test was conducted in a wind tunnel with forced air cooling of 450 LFM. Unit was operated with baseplate.
Supplementary information:								
<p>Comments key used in result are defined as below: IP - Internal Protection operated (list component). CT - Constant temperatures were obtained. CD - Components damaged (list damaged components). NCD - No component damaged. SD - Unit shutdown immediately and input current became zero ampere. NC - Cheesecloth remained intact. NT - Tissue paper remained intact. NB - No indication of dielectric breakdown. DM = Dead metal; B = circuit measures less than 12.5 mA; C = circuit measures 0 volts. At the end of the test, an Electric Strength potential was applied as indicated below for one minute.: A: Between input and output/ conductive parts (FG) = 1500 V dc. - The BC fuse is an external (not part of product) which the mfr. specs. require since there is no internal fuse in the product. OVP is internal protection that shuts off unit - requiring Vin cycling / on/ off toggling to restart unit. OTP is Over Temperature Protection. F1 is external fuse on test fixture specified in mfr's specification for end use application.</p>								

B.4		TABLE: Fault condition tests						Pass
-----	--	------------------------------	--	--	--	--	--	------

IEC 62368-1								
Clause	Requirement + Test				Result - Remark			Verdict
Ambient temperature (°C) .....					25			—
Power source for EUT: Manufacturer, model/type, output rating ...:					See Below			—
Component No.	Fault Condition	Supply voltage, (V)	Test time (ms)	Fuse no.	Fuse current, (A)	T-couple	Temp. (°C)	Observation
Q303 pin 1-4	Short	75Vdc	Instantaneous, however continued for 5 min	F1	15	--	--	Output went to 0V, CD: R308, R311, R312 open Q303 shorted, YC-charred, NB
Q303 pin 1-4	Short	75Vdc	Instantaneous, however continued for 5 min	F1	15	--	--	Output went to 0V, CD: R308, R311, R312 open Q303 shorted, YC-charred, NB
Q303 pin 1-4	Short	75Vdc	Instantaneous, however continued for 5 min	F1	15	--	--	Output went to 0V, CD: R308, R311, R312 open Q303 shorted, YC-charred, NB
R533 pin 1-2	Short	75Vdc	Instantaneous, however continued for 5 min	F1	15	--	--	Output went to 0V, F1 open, CD: shorted Q111- Q114 NC, NB
Q114 pin 1-4	Short	75Vdc	Instantaneous, however continued for 5 min	F1	15	--	--	Output went to 0V, F1 open, CD: shorted Q111- Q114 NC, NB
T300 pin 5-6	Short	75Vdc	Instantaneous, however continued for 5 min	F1	15	--	--	Output went to 0V, IP (IC300, R310, R311, R312, C307) NB, NC
C102 pin 1-2	Short	75Vdc	Instantaneous, however continued for 5 min	F1	15	--	--	Output went to 0V, F1 open, NC, NB

IEC 62368-1								
Clause	Requirement + Test				Result - Remark			Verdict
Q403 pin 1-5	Short	75Vdc	Instantaneous, however continued for 5 min	F1	15	--	--	Output went to 0V, IP (CR531, CR532, IC400, R533, R534, R526, R527) NB, NC
--	--	--	--	--	--	--	--	--
iQG48047A096 V-XXX (Q303 pins1-4 )	Short	75Vdc	15 min.	N/A	20	--	--	Output to 0Vdc, CD: (R308, R311, R312 opened and Q303 shorted), YC Charred, NB (test repeated 3 times)
iQG48047A096 V-XXX ( TS1 pins 1-2)	Short	75Vdc	15 min.	N/A	20	--	--	Output to 0 Vdc, Hiccup Mode, IP: (RT500, C513, R517, R509, R520, and IC400), NC, NB
iQG48047A096 V-XXX (Q112 pins 1-5)	Short	75Vdc	15 min.	N/A	20	--	--	Output to 0Vdc, Open F2, CD: (Shorted Q111, Q112, Q113, Q114), NC, NB
iQG48047A096 V-XXX (T300 pins 5-6)	Short	75Vdc	15 min.	N/A	20	--	--	Output to 0Vdc, IP: (IC300, R310, R311, R312, C307), NC, NB
iQG48047A096 V-XXX (C102 pins 1-2)	Short	75Vdc	15 min.	N/A	20	--	--	Output to 0Vdc, Open F1, NC, NB
iQG48047A096 V-XXX (Q411 pins 1-5)	Short	75Vdc	15 min.	N/A	20	--	--	Output to 0Vdc, IP: (TS1, CR531, CR532, C531, R533, R534, R526, R527, and IC400), NC, NB

IEC 62368-1								
Clause	Requirement + Test					Result - Remark		Verdict
iQG48047A096 V-XXX (Abnormal)	No Airflow	48 VDC	17 min 19 Sec	N/A	N/A	--	--	NC,NB, See table 4.5 for component temperatures
iQG4N050A108 V-xxx (Abnormal)	No Airflow	54Vdc	8m16s	N/A	N/A	--	--	NC,NB, See table 4.5 for component temperatures
Q303 pins1-4	Short	75Vdc	15 min.	N/A	20Adc	--	--	Output to 0Vdc, CD: (R311, R312, T300 opened, and Q303 shorted), YC Charred, NB, (P0014)
Q303 pins1-4	Short	75Vdc	15 min.	N/A	20Adc	--	--	Output to 0Vdc, CD: (R308, R311, R312 opened, and Q303 shorted), YC Charred, NB, (P0014)
Q303 pins1-4	Short	75Vdc	15 min.	N/A	20Adc	--	--	Output to 0Vdc, CD: (R308, R311, R312 opened, and Q303 shorted), YC Charred, NB, (P0014)
*TS1 pins 1-2	Short	75Vdc	30 min.	N/A	20Adc	--	--	Output to 0 Vdc, Hiccup Mode, IP: (RT500, C513, R517, R509, R520, and IC400), NC, NB, (P0008)
Q112 pins 1-5	Short	75Vdc	15 min.	F2	20Adc	--	--	Output to 0Vdc, Open F2, CD: (Shorted Q111, Q112, Q113, Q114, Q411, Q412, Q413), NC, NB, (P0008)

IEC 62368-1								
Clause	Requirement + Test				Result - Remark			Verdict
T300 pins 5-6	Short	75Vdc	15 min.	N/A	20Adc	--	--	Output to 0Vdc, IP: (IC300, R310, R311, R312, C307), NC, NB, (P0008)
C102 pins 1-2	Short	75Vdc	15 min.	F1	20Adc	--	--	Output to 0Vdc, Open F1, NC, NB, (P0008)
Q411 pins 1-5	Short	75Vdc	30 min.	N/A	20Adc	--	--	Output to 0Vdc, IP: (TS1, CR531, CR532, C531, R533, R534, R526, R527, and IC400), NC, NB, (P0008)
iQG48042A120 V-xxx	No airflow	48Vdc	9m59s	N/A	N/A	--	--	NC,NB, See table 4.5 for component temperatures. Test conducted in Wind Tunnel with no air flow to the point of thermal protection.
Supplementary information:								

Annex M	TABLE: Batteries								N/A
The tests of Annex M are applicable only when appropriate battery data is not available									
Is it possible to install the battery in a reverse polarity position? .....									
	Non-rechargeable batteries			Rechargeable batteries					
	Discharging		Un-intentional charging	Charging		Discharging		Reversed charging	
	Meas. current	Manuf. Specs.		Meas. current	Manuf. Specs.	Meas. current	Manuf. Specs.	Meas. current	Manuf. Specs.
Max. current during normal condition									
Max. current during fault condition									

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
Test results:			Verdict
- Chemical leaks			
- Explosion of the battery			
- Emission of flame or expulsion of molten metal			
- Electric strength tests of equipment after completion of tests			
Supplementary information:			

Annex M.4 Table: Additional safeguards for equipment containing secondary lithium batteries			N/A		
Battery/Cell No.	Test conditions	Measurements			Observation
		U	I (A)	Temp (°C)	
	Normal				
	Abnormal				
	Single fault –SC/OC				
Supplementary Information:					
Battery identification	Charging at T <sub>lowest</sub> (°C)	Observation	Charging at T <sub>highest</sub> (°C)	Observation	
Supplementary Information:					

Annex Q.1		TABLE: Circuits intended for interconnection with building wiring (LPS)				N/A	
Note: Measured UOC (V) with all load circuits disconnected:							
Output Circuit	Components	U <sub>oc</sub> (V)	I <sub>sc</sub> (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)	Force (N)	Test Duration (sec)	Observation		

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

Supplementary information:

T.6, T.9	TABLE: Impact tests				N/A
Part/Location	Material	Thickness (mm)	Vertical distance (mm)	Observation	
Supplementary information:					

T.7	TABLE: Drop tests				N/A
Part/Location	Material	Thickness (mm)	Drop Height (mm)	Observation	
Supplementary information:					

T.8	TABLE: Stress relief test					N/A
Part/Location	Material	Thickness (mm)	Oven Temperature (°C)	Duration (h)	Observation	
Supplementary information:						

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
<b>4</b>	<b>GENERAL REQUIREMENTS</b>		Pass
4.1.1	Acceptance of materials, components and subassemblies		Pass
4.1.2	Use of components		Pass
4.1.3	Equipment design and construction		Pass
4.1.15	Markings and instructions .....	(See Annex F)	Pass
4.4.4	Safeguard robustness	Unit intended for building-in. Additional Safeguards to be determined in the end product.	Pass
4.4.4.2	Steady force tests .....		N/A
4.4.4.3	Drop tests .....		N/A
4.4.4.4	Impact tests .....		N/A
4.4.4.5	Internal accessible safeguard enclosure and barrier tests .....		N/A
4.4.4.6	Glass Impact tests.....		N/A
4.4.4.7	Thermoplastic material tests .....		N/A
4.4.4.8	Air comprising a safeguard .....		N/A
4.4.4.9	Accessibility and safeguard effectiveness		N/A
4.5	Explosion		N/A
4.6	Fixing of conductors		N/A
4.6.1	Fix conductors not to defeat a safeguard		N/A
4.6.2	10 N force test applied to .....		N/A
4.7	Equipment for direct insertion into mains socket - outlets		N/A
4.7.2	Mains plug part complies with the relevant standard .....		N/A
4.7.3	Torque (Nm) .....		N/A
4.8	Products containing coin/button cell batteries		N/A
4.8.2	Instructional safeguard		N/A
4.8.3	Battery Compartment Construction		N/A
	Means to reduce the possibility of children removing the battery .....		—
4.8.4	Battery Compartment Mechanical Tests.....		N/A
4.8.5	Battery Accessibility		N/A
4.9	Likelihood of fire or shock due to entry of conductive object .....	This component is DC to DC converter intended for building in. To be determined in the end product.	N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
<b>5</b>	<b>ELECTRICALLY-CAUSED INJURY</b>		Pass
5.2.1	Electrical energy source classifications .....	(See appended table 5.2)	Pass
5.2.2	ES1, ES2 and ES3 limits		Pass
5.2.2.2	Steady-state voltage and current .....	(See appended table 5.2)	Pass
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 .....		N/A
5.2.2.7	Audio signals .....		N/A
5.3	Protection against electrical energy sources	Unit is for building-in	Pass
5.3.1	General Requirements for accessible parts to ordinary, instructed and skilled persons	Energy source is ES2. Unit is for building-in	Pass
5.3.2.1	Accessibility to electrical energy sources and safeguards	Energy source is ES2. Unit is for building-in. Accessible to Instructed or Skilled person.	Pass
5.3.2.2	Contact requirements	To be considered in the endproduct	N/A
	a) Test with test probe from Annex V.....		N/A
	b) Electric strength test potential (V) .....		N/A
	c) Air gap (mm) .....		N/A
5.3.2.4	Terminals for connecting stripped wire		N/A
5.4	Insulation materials and requirements		Pass
5.4.1.2	Properties of insulating material		Pass
5.4.1.3	Humidity conditioning .....	(See sub-clause 5.4.8)	Pass
5.4.1.4	Maximum operating temperature for insulating materials .....	(See appended table 5.4.1.4)	Pass
5.4.1.5	Pollution degree .....	PD2	—
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		N/A
5.4.1.6	Insulation in transformers with varying dimensions		N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.4.1.7	Insulation in circuits generating starting pulses		N/A
5.4.1.8	Determination of working voltage		Pass
5.4.1.9	Insulating surfaces	EUT is for building in	N/A
5.4.1.10	Thermoplastic parts on which conductive metallic parts are directly mounted		N/A
5.4.1.10.2	Vicat softening temperature .....		N/A
5.4.1.10.3	Ball pressure .....		N/A
5.4.2	Clearances		Pass
5.4.2.2	Determining clearance using peak working voltage	(See appended table 5.4.2.2)	Pass
5.4.2.3	Determining clearance using required withstand voltage .....	Not connected to Mains.	N/A
	a) a.c. mains transient voltage.....		—
	b) d.c. mains transient voltage .....		—
	c) external circuit transient voltage.....		—
	d) transient voltage determined by measurement... :		—
5.4.2.4	Determining the adequacy of a clearance using an electric strength test	Not connected to Mains.	N/A
5.4.2.5	Multiplication factors for clearances and test voltages.....		N/A
5.4.3	Creepage distances.....	(See appended table 5.4.3)	Pass
5.4.3.1	General		Pass
5.4.3.3	Material Group .....	Material Group IIIb $100 \leq CTI < 175$	—
5.4.4	Solid insulation		Pass
5.4.4.2	Minimum distance through insulation .....		N/A
5.4.4.3	Insulation compound forming solid insulation		N/A
5.4.4.4	Solid insulation in semiconductor devices		N/A
5.4.4.5	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
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

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.4.4.9	Solid insulation at frequencies >30 kHz .....		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
	Insulation resistance (MΩ) .....		—
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		Pass
	Relative humidity (%) .....	95 %	—
	Temperature (°C) .....	25 °C	—
	Duration (h) .....	48 hours	—
5.4.9	Electric strength test.....	(See appended table 5.4.9)	Pass
5.4.9.1	Test procedure for a solid insulation type test		N/A
5.4.9.2	Test procedure for routine tests		N/A
5.4.10	Protection against transient voltages between external circuit	Equipment is for building in. To be considered in the end product.	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
5.4.11	Insulation between external circuits and earthed circuitry .....		N/A
5.4.11.1	Exceptions to separation between external circuits and earth		N/A
5.4.11.2	Requirements		N/A
	Rated operating voltage $U_{op}$ (V) .....		—
	Nominal voltage $U_{peak}$ (V) .....		—
	Max increase due to variation $U_{sp}$ .....		—
	Max increase due to ageing $\Delta U_{sa}$ .....		—
	$U_{op} = U_{peak} + \Delta U_{sp} + \Delta U_{sa}$ .....		—
5.5	Components as safeguards		Pass
5.5.1	General		Pass
5.5.2	Capacitors and RC units		N/A
5.5.2.1	General requirement		N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.5.2.2	Safeguards against capacitor discharge after disconnection of a connector .....		N/A
5.5.3	Transformers	See Annex G.5.3)	Pass
5.5.4	Optocouplers		N/A
5.5.5	Relays		N/A
5.5.6	Resistors		N/A
5.5.7	SPD's		N/A
5.5.7.1	Use of an SPD connected to reliable earthing		N/A
5.5.7.2	Use of an SPD between mains and protective earth		N/A
5.5.8	Insulation between the mains and external circuit consisting of a coaxial cable.....		N/A
5.6	Protective conductor		N/A
5.6.2	Requirement for protective conductors		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 <sup>2</sup> ) .....		—
5.6.4	Requirement for protective bonding conductors		N/A
5.6.4.1	Protective bonding conductors		N/A
	Protective bonding conductor size (mm <sup>2</sup> ).....		—
	Protective current rating (A) .....		—
5.6.4.3	Current limiting and overcurrent protective devices		N/A
5.6.5	Terminals for protective conductors		N/A
5.6.5.1	Requirement		N/A
	Conductor size (mm <sup>2</sup> ), nominal thread diameter (mm) .....		N/A
5.6.5.2	Corrosion		N/A
5.6.6	Resistance of the protective system		N/A
5.6.6.1	Requirements		N/A
5.6.6.2	Test Method Resistance ( $\Omega$ ) .....		N/A
5.6.7	Reliable earthing		N/A
5.7	Prospective touch voltage, touch current and protective conductor current		Pass
5.7.2	Measuring devices and networks		Pass
5.7.2.1	Measurement of touch current .....		N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.7.2.2	Measurement of prospective touch voltage	Outputs meet ES1 based on Voltages	Pass
5.7.3	Equipment set-up, supply connections and earth connections		N/A
	System of interconnected equipment (separate connections/single connection) .....		—
	Multiple connections to mains (one connection at a time/simultaneous connections) .....		—
5.7.4	Earthed conductive accessible parts.....		N/A
5.7.5	Protective conductor current		N/A
	Supply Voltage (V) .....		—
	Measured current (mA) .....		—
	Instructional Safeguard .....		N/A
5.7.6	Prospective touch voltage and touch current due to external circuits		N/A
5.7.6.1	Touch current from coaxial cables		N/A
5.7.6.2	Prospective touch voltage and touch current from external circuits		N/A
5.7.7	Summation of touch currents from external circuits		N/A
	a) Equipment with earthed external circuits Measured current (mA) .....		N/A
	b) Equipment whose external circuits are not referenced to earth. Measured current (mA).....		N/A

<b>6</b>	<b>ELECTRICALLY- CAUSED FIRE</b>		Pass
6.2	Classification of power sources (PS) and potential ignition sources (PIS)		Pass
6.2.2	Power source circuit classifications		Pass
6.2.2.1	General	(See appended table 6.2.2)	Pass
6.2.2.2	Power measurement for worst-case load fault ... :	(See appended table 6.2.2)	Pass
6.2.2.3	Power measurement for worst-case power source fault .....	(See appended table 6.2.2)	Pass
6.2.2.4	PS1 .....		N/A
6.2.2.5	PS2 .....		N/A
6.2.2.6	PS3 .....	Input and outputs are PS3 classified	Pass
6.2.3	Classification of potential ignition sources	Considered to exist in PS3 circuits	Pass
6.2.3.1	Arcing PIS .....	(See appended table 6.2.3.1)	Pass
6.2.3.2	Resistive PIS .....	(See appended table 6.2.3.2)	Pass
6.3	Safeguards against fire under normal operating and abnormal operating conditions		Pass

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
6.3.1 (a)	No ignition and attainable temperature value less than 90 % defined by ISO 871 or less than 300 °C for unknown materials .....	(See appended table 5.4.1.5, 6.3.2, 9.0, B.2.6)	Pass
6.3.1 (b)	Combustible materials outside fire enclosure		N/A
6.4	Safeguards against fire under single fault conditions		Pass
6.4.1	Safeguard Method	Control of Fire Spread Method used. The suitability of a fire enclosure should be considered in the end-product.	Pass
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	Test was conducted with a 40 A external fuse during single fault test. Additional testing may be considered in an end product.	N/A
6.4.3.1	General		N/A
6.4.3.2	Supplementary Safeguards	Fire enclosure to be provided in the end product.	N/A
	Special conditions if conductors on printed boards are opened or peeled		N/A
6.4.3.3	Single Fault Conditions..... :	See B.2	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		N/A
6.4.5.2	Supplementary safeguards .....	(See appended tables 4.1.2 and Annex G)	N/A
6.4.6	Control of fire spread in PS3 circuit	All parts are mounted on a min. V-1 PWB.	Pass
6.4.7	Separation of combustible materials from a PIS	should be considered in the end-application	Pass
6.4.7.1	General..... :	Supplementary Safeguard provided such as PWB min. V-1. Fire enclosure should be considered in the end-product.	Pass
6.4.7.2	Separation by distance	should be considered in the end-application	N/A
6.4.7.3	Separation by a fire barrier	should be considered in the end-application	N/A
6.4.8	Fire enclosures and fire barriers	To be considered in the end-application. EUT is for building in	N/A
6.4.8.1	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

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
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 in Fire Enclosure: dimensions (mm) .....		N/A
	Needle Flame test		N/A
6.4.8.3.4	Bottom Openings in Fire Enclosure, condition met a), b) and/or c) dimensions (mm) .....		N/A
	Flammability tests for the bottom of a fire enclosure .....		N/A
6.4.8.3.5	Integrity of the fire enclosure, condition met: a), b) or c) .....		N/A
6.4.8.4	Separation of PIS from fire enclosure and fire barrier distance (mm) or flammability rating.....		N/A
6.5	Internal and external wiring		N/A
6.5.1	Requirements		N/A
6.5.2	Cross-sectional area (mm <sup>2</sup> ) .....		—
6.5.3	Requirements for interconnection to building wiring .....		N/A
6.6	Safeguards against fire due to connection to additional equipment		N/A
	External port limited to PS2 or complies with Clause Q.1		N/A

<b>7</b>	<b>INJURY CAUSED BY HAZARDOUS SUBSTANCES</b>		N/A
7.2	Reduction of exposure to hazardous substances		N/A
7.3	Ozone exposure		N/A
7.4	Use of personal safeguards (PPE)		N/A
	Personal safeguards and instructions.....		—
7.5	Use of instructional safeguards and instructions		N/A
	Instructional safeguard (ISO 7010) .....		—
7.6	Batteries .....		N/A

<b>8</b>	<b>MECHANICALLY-CAUSED INJURY</b>		N/A
8.1	General		N/A
8.2	Mechanical energy source classifications		N/A
8.3	Safeguards against mechanical energy sources		N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
8.4	Safeguards against parts with sharp edges and corners		N/A
8.4.1	Safeguards		N/A
8.5	Safeguards against moving parts		N/A
8.5.1	MS2 or MS3 part required to be accessible for the function of the equipment		N/A
8.5.2	Instructional Safeguard..... :		—
8.5.4	Special categories of equipment comprising moving parts		N/A
8.5.4.1	Large data storage equipment		N/A
8.5.4.2	Equipment having electromechanical device for destruction of media		N/A
8.5.4.2.1	Safeguards and Safety Interlocks .....		N/A
8.5.4.2.2	Instructional safeguards against moving parts		N/A
	Instructional Safeguard..... :		—
8.5.4.2.3	Disconnection from the supply		N/A
8.5.4.2.4	Probe type and force (N) .....		N/A
8.5.5	High Pressure Lamps		N/A
8.5.5.1	Energy Source Classification		N/A
8.5.5.2	High Pressure Lamp Explosion Test..... :		N/A
8.6	Stability		N/A
8.6.1	Product classification		N/A
	Instructional Safeguard..... :		—
8.6.2	Static stability		N/A
8.6.2.2	Static stability test		N/A
	Applied Force .....		—
8.6.2.3	Downward Force Test		N/A
8.6.3	Relocation stability test		N/A
	Unit configuration during 10° tilt .....		—
8.6.4	Glass slide test		N/A
8.6.5	Horizontal force test (Applied Force)..... :		N/A
	Position of feet or movable parts..... :		—
8.7	Equipment mounted to wall or ceiling		N/A
8.7.1	Mounting Means (Length of screws (mm) and mounting surface) .....		N/A
8.7.2	Direction and applied force..... :		N/A
8.8	Handles strength		N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
8.8.1	Classification		N/A
8.8.2	Applied Force .....		N/A
8.9	Wheels or casters attachment requirements		N/A
8.9.1	Classification		N/A
8.9.2	Applied force .....		—
8.10	Carts, stands and similar carriers		N/A
8.10.1	General		N/A
8.10.2	Marking and instructions		N/A
	Instructional Safeguard.....		—
8.10.3	Cart, stand or carrier loading test and compliance		N/A
	Applied force .....		—
8.10.4	Cart, stand or carrier impact test		N/A
8.10.5	Mechanical stability		N/A
	Applied horizontal force (N) .....		—
8.10.6	Thermoplastic temperature stability (°C).....		N/A
8.11	Mounting means for rack mounted equipment		N/A
8.11.1	General		N/A
8.11.2	Product Classification		N/A
8.11.3	Mechanical strength test, variable <i>N</i> .....		N/A
8.11.4	Mechanical strength test 250N, including end stops		N/A
8.12	Telescoping or rod antennas.....		N/A
	Button/Ball diameter (mm).....		—
<b>9</b>	<b>THERMAL BURN INJURY</b>		Pass
9.2	Thermal energy source classifications	TS3	Pass
9.3	Safeguard against thermal energy sources	Unit is for building-in - shall be considered in the final end-use	N/A
9.4	Requirements for safeguards		N/A
9.4.1	Equipment safeguard		N/A
9.4.2	Instructional safeguard .....		N/A
<b>10</b>	<b>RADIATION</b>		N/A
10.2	Radiation energy source classification		N/A
10.2.1	General classification		N/A
10.3	Protection against laser radiation		N/A
	Laser radiation that exists in the equipment:		—

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Normal, abnormal, single-fault .....		N/A
	Instructional safeguard.....		—
	Tool .....		—
10.4	Protection against visible, infrared, and UV radiation		N/A
10.4.1	General		N/A
10.4.1.a)	RS3 for Ordinary and instructed persons ..... :		N/A
10.4.1.b)	RS3 accessible to a skilled person ..... :		N/A
	Personal safeguard (PPE) instructional safeguard .....		—
10.4.1.c)	Equipment visible, IR, UV does not exceed RS1...:		N/A
10.4.1.d)	Normal, abnormal, single-fault conditions .....		N/A
10.4.1.e)	Enclosure material employed as safeguard is opaque ..... :		N/A
10.4.1.f)	UV attenuation ..... :		N/A
10.4.1.g)	Materials resistant to degradation UV.....:		N/A
10.4.1.h)	Enclosure containment of optical radiation ..... :		N/A
10.4.1.i)	Exempt Group under normal operating conditions ..... :		N/A
10.4.2	Instructional safeguard ..... :		N/A
10.5	Protection against x-radiation		N/A
10.5.1	X- radiation energy source that exists equipment:		N/A
	Normal, abnormal, single fault conditions		N/A
	Equipment safeguards .....		N/A
	Instructional safeguard for skilled person .....		N/A
10.5.3	Most unfavourable supply voltage to give maximum radiation .....		—
	Abnormal and single-fault condition .....		N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Maximum radiation (pA/kg) .....		N/A
10.6	Protection against acoustic energy sources		N/A
10.6.1	General		N/A
10.6.2	Classification		N/A
	Acoustic output, dB(A) .....		N/A
	Output voltage, unweighted r.m.s. ....		N/A
10.6.4	Protection of persons		N/A
	Instructional safeguards .....		N/A
	Equipment safeguard prevent ordinary person to RS2 .....		—
	Means to actively inform user of increase sound pressure .....		—
	Equipment safeguard prevent ordinary person to RS2 .....		—
10.6.5	Requirements for listening devices (headphones, earphones, etc.)		N/A
10.6.5.1	Corded passive listening devices with analog input		N/A
	Input voltage with 94 dB(A) $L_{Aeq}$ acoustic pressure output .....		—
10.6.5.2	Corded listening devices with digital input		N/A
	Maximum dB(A).....		—
10.6.5.3	Cordless listening device		N/A
	Maximum dB(A).....		—

<b>B</b>	<b>NORMAL OPERATING CONDITION TESTS, ABNORMAL OPERATING CONDITION TESTS AND SINGLE FAULT CONDITION TESTS</b>		Pass
B.2	Normal Operating Conditions		Pass
B.2.1	General requirements .....	(See Test Item Particulars and appended test tables)	Pass
	Audio Amplifiers and equipment with audio amplifiers .....		N/A
B.2.3	Supply voltage and tolerances		Pass
B.2.5	Input test.....	(See appended table B.2.5)	Pass
B.3	Simulated abnormal operating conditions		Pass
B.3.1	General requirements .....	(See appended table B.3)	Pass
B.3.2	Covering of ventilation openings		N/A
B.3.3	D.C. mains polarity test		N/A
B.3.4	Setting of voltage selector .....		N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
B.3.5	Maximum load at output terminals .....	See Table	Pass
B.3.6	Reverse battery polarity		N/A
B.3.7	Abnormal operating conditions as specified in Clause E.2.		N/A
B.3.8	Safeguards functional during and after abnormal operating conditions		Pass
B.4	Simulated single fault conditions		Pass
B.4.2	Temperature controlling device open or short-circuited .....		N/A
B.4.3	Motor tests		N/A
B.4.3.1	Motor blocked or rotor locked increasing the internal ambient temperature .....		N/A
B.4.4	Short circuit of 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
B.4.5	Short circuit and interruption of electrodes in tubes and semiconductors		N/A
B.4.6	Short circuit or disconnect of passive components		N/A
B.4.7	Continuous operation of components		Pass
B.4.8	Class 1 and Class 2 energy sources within limits during and after single fault conditions		N/A
B.4.9	Battery charging under single fault conditions ... :		N/A
<b>C</b>	<b>UV RADIATION</b>		N/A
C.1	Protection of materials in equipment from UV radiation		N/A
C.1.2	Requirements		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 apparatus		N/A
C.2.4	Xenon-arc light exposure apparatus		N/A
<b>D</b>	<b>TEST GENERATORS</b>		N/A
D.1	Impulse test generators		N/A
D.2	Antenna interface test generator		N/A
D.3	Electronic pulse generator		N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
<b>E</b>	<b>TEST CONDITIONS FOR EQUIPMENT CONTAINING AUDIO AMPLIFIERS</b>		N/A
E.1	Audio amplifier normal operating conditions		N/A
	Audio signal voltage (V) .....		—
	Rated load impedance ( $\Omega$ ) .....		—
E.2	Audio amplifier abnormal operating conditions		N/A
<b>F</b>	<b>EQUIPMENT MARKINGS, INSTRUCTIONS, AND INSTRUCTIONAL SAFEGUARDS</b>		Pass
F.1	General requirements		Pass
	Instructions – Language .....	Only English reviewed	—
F.2	Letter symbols and graphical symbols		N/A
F.2.1	Letter symbols according to IEC60027-1		N/A
F.2.2	Graphic symbols IEC, ISO or manufacturer specific		N/A
F.3	Equipment markings		Pass
F.3.1	Equipment marking locations		Pass
F.3.2	Equipment identification markings		Pass
F.3.2.1	Manufacturer identification .....	see attached label	—
F.3.2.2	Model identification .....	see attached label	—
F.3.3	Equipment rating markings	Optional	N/A
F.3.3.1	Equipment with direct connection to mains		N/A
F.3.3.2	Equipment without direct connection to mains		N/A
F.3.3.3	Nature of supply voltage .....	Not required.	—
F.3.3.4	Rated voltage .....	Not required.	—
F.3.3.5	Rated frequency .....	DC	—
F.3.3.6	Rated current or rated power .....		—
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
F.3.5.1	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
F.3.5.4	Replacement battery identification marking .....		N/A
F.3.5.5	Terminal marking location		N/A
F.3.6	Equipment markings related to equipment classification		N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
F.3.6.1	Class I Equipment		N/A
F.3.6.1.1	Protective earthing conductor terminal		N/A
F.3.6.1.2	Neutral conductor terminal		N/A
F.3.6.1.3	Protective bonding conductor terminals		N/A
F.3.6.2	Class II equipment (IEC60417-5172)		N/A
F.3.6.2.1	Class II equipment with or without functional earth		N/A
F.3.6.2.2	Class II equipment with functional earth terminal marking		N/A
F.3.7	Equipment IP rating marking .....		—
F.3.8	External power supply output marking		N/A
F.3.9	Durability, legibility and permanence of marking	Unit is for building-in	N/A
F.3.10	Test for permanence of markings		N/A
F.4	Instructions		N/A
	a) Equipment for use in locations where children not likely to be present - marking		N/A
	b) Instructions given for installation or initial use		N/A
	c) Equipment intended to be fastened in place		N/A
	d) Equipment intended for use only in restricted access area		N/A
	e) Audio equipment terminals classified as ES3 and other equipment with terminals marked in accordance F.3.6.1		N/A
	f) Protective earthing employed as safeguard		N/A
	g) Protective earthing conductor current exceeding ES 2 limits		N/A
	h) Symbols used on equipment		N/A
	i) Permanently connected equipment not provided with all-pole mains switch		N/A
	j) Replaceable components or modules providing safeguard function		N/A
F.5	Instructional safeguards		N/A
	Where “instructional safeguard” is referenced in the test report it specifies the required elements, location of marking and/or instruction		N/A
<b>G</b>	<b>COMPONENTS</b>		Pass
<b>G.1</b>	<b>Switches</b>		N/A
G.1.1	General requirements		N/A
G.1.2	Ratings, endurance, spacing, maximum load		N/A
<b>G.2</b>	<b>Relays</b>		N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
G.2.1	General requirements		N/A
G.2.2	Overload test		N/A
G.2.3	Relay controlling connectors supply power		N/A
G.2.4	Mains relay, modified as stated in G.2		N/A
<b>G.3</b>	<b>Protection Devices</b>		N/A
G.3.1	Thermal cut-offs		N/A
G.3.1.1a) &b)	Thermal cut-outs separately approved according to IEC 60730 with conditions indicated in a) & b)		N/A
G.3.1.1c)	Thermal cut-outs tested as part of the equipment as indicated in c)		N/A
G.3.1.2	Thermal cut-off connections maintained and secure		N/A
G.3.2	Thermal links		N/A
G.3.2.1a)	Thermal links separately tested with IEC 60691		N/A
G.3.2.1b)	Thermal links tested as part of the equipment		N/A
	Aging hours (H) .....		—
	Single Fault Condition .....		—
	Test Voltage (V) and Insulation Resistance ( $\Omega$ ). :		—
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.3.5		N/A
G.3.5.1	Non-resettable devices suitably rated and marking provided		N/A
G.3.5.2	Single faults conditions .....	(See appended Table B.4)	N/A
<b>G.4</b>	<b>Connectors</b>		N/A
G.4.1	Spacings		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
<b>G.5</b>	<b>Wound Components</b>		Pass
G.5.1	Wire insulation in wound components.....		N/A
G.5.1.2 a)	Two wires in contact inside wound component, angle between 45° and 90°		N/A
G.5.1.2 b)	Construction subject to routine testing		N/A
G.5.2	Endurance test on wound components		N/A
G.5.2.1	General test requirements		N/A
G.5.2.2	Heat run test		N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Time (s) .....		—
	Temperature (°C) .....		—
G.5.2.3	Wound Components supplied by mains		N/A
<b>G.5.3</b>	<b>Transformers</b>		Pass
G.5.3.1	Requirements applied (IEC61204-7, IEC61558-1/-2, and/or IEC62368-1) .....		N/A
	Position.....		—
	Method of protection .....		—
G.5.3.2	Insulation		Pass
	Protection from displacement of windings .....	Planar construction	—
G.5.3.3	Overload test.....	(See appended table B.3)	Pass
G.5.3.3.1	Test conditions		Pass
G.5.3.3.2	Winding Temperatures testing in the unit		Pass
G.5.3.3.3	Winding Temperatures - Alternative test method		N/A
<b>G.5.4</b>	<b>Motors</b>		N/A
G.5.4.1	General requirements		N/A
	Position .....		—
G.5.4.2	Test conditions		N/A
G.5.4.3	Running overload test		N/A
G.5.4.4	Locked-rotor overload test		N/A
	Test duration (days) .....		—
G.5.4.5	Running overload test for d.c. motors in secondary circuits		N/A
G.5.4.5.2	Tested in the unit		N/A
	Electric strength test (V) .....		—
G.5.4.5.3	Tested on the Bench - Alternative test method; test time (h) .....		N/A
	Electric strength test (V) .....		—
G.5.4.6	Locked-rotor overload test for d.c. motors in secondary circuits		N/A
G.5.4.6.2	Tested in the unit		N/A
	Maximum Temperature .....		N/A
	Electric strength test (V) .....		N/A
G.5.4.6.3	Tested on the bench - Alternative test method; test time (h) .....		N/A
	Electric strength test (V) .....		N/A
G.5.4.7	Motors with capacitors		N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
G.5.4.8	Three-phase motors		N/A
G.5.4.9	Series motors		N/A
	Operating voltage .....		—
<b>G.6</b>	<b>Wire Insulation</b>		N/A
G.6.1	General		N/A
G.6.2	Solvent-based enamel wiring insulation		N/A
<b>G.7</b>	<b>Mains supply cords</b>		N/A
G.7.1	General requirements		N/A
	Type .....		—
	Rated current (A).....		—
	Cross-sectional area (mm <sup>2</sup> ), (AWG) .....		—
G.7.2	Compliance and test method		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) .....		—
G.7.3.2.2	Strain relief mechanism failure		N/A
G.7.3.2.3	Cord sheath or jacket position, distance (mm)....		—
G.7.3.2.4	Strain relief comprised of polymeric 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	Mass (g) .....		—
	Diameter (m) .....		—
	Temperature (°C) .....		—
G.7.6	Supply wiring space		N/A
G.7.6.2	Stranded wire		N/A
G.7.6.2.1	Test with 8 mm strand		N/A
<b>G.8</b>	<b>Varistors</b>		N/A
G.8.1	General requirements		N/A
G.8.2	Safeguard against shock		N/A
G.8.3	Safeguard against fire		N/A
G.8.3.2	Varistor overload test .....		N/A
G.8.3.3	Temporary overvoltage .....		N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
<b>G.9</b>	<b>Integrated Circuit (IC) Current Limiters</b>		N/A
G.9.1 a)	Manufacturer defines limit at max. 5A.		N/A
G.9.1 b)	Limiters do not have manual operator or reset		N/A
G.9.1 c)	Supply source does not exceed 250 VA .....		—
G.9.1 d)	IC limiter output current (max. 5A) .....		—
G.9.1 e)	Manufacturers' defined drift .....		—
G.9.2	Test Program 1		N/A
G.9.3	Test Program 2		N/A
G.9.4	Test Program 3		N/A
<b>G.10</b>	<b>Resistors</b>		N/A
G.10.1	General requirements		N/A
G.10.2	Resistor test		N/A
G.10.3	Test for resistors serving as safeguards between the mains and an external circuit consisting of a coaxial cable		N/A
G.10.3.1	General requirements		N/A
G.10.3.2	Voltage surge test		N/A
G.10.3.3	Impulse test		N/A
<b>G.11</b>	<b>Capacitor and RC units</b>		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
<b>G.12</b>	<b>Optocouplers</b>		N/A
	Optocouplers comply with IEC 60747-5-5:2007 Spacing or Electric Strength Test (specify option and test results).....		N/A
	Type test voltage Vini .....		—
	Routine test voltage, Vini,b .....		—
<b>G.13</b>	<b>Printed boards</b>		Pass
G.13.1	General requirements		Pass
G.13.2	Uncoated printed boards		Pass
G.13.3	Coated printed boards	No-Coated types used	N/A
G.13.4	Insulation between conductors on the same inner surface		N/A
	Compliance with cemented joint requirements (Specify construction).....		—
G.13.5	Insulation between conductors on different surfaces		N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Distance through insulation.....:	(See appended table 5.4.4.5)	N/A
	Number of insulation layers (pcs) .....	Basic	—
G.13.6	Tests on coated printed boards		N/A
G.13.6.1	Sample preparation and preliminary inspection		N/A
G.13.6.2a)	Thermal conditioning		N/A
G.13.6.2b)	Electric strength test		N/A
G.13.6.2c)	Abrasion resistance test		N/A
<b>G.14</b>	<b>Coating on components terminals</b>		N/A
G.14.1	Requirements .....		N/A
<b>G.15</b>	<b>Liquid filled components</b>		N/A
G.15.1	General requirements		N/A
G.15.2	Requirements		N/A
G.15.3	Compliance and test methods		N/A
G.15.3.1	Hydrostatic pressure test		N/A
G.15.3.2	Creep resistance test		N/A
G.15.3.3	Tubing and fittings compatibility test		N/A
G.15.3.4	Vibration test		N/A
G.15.3.5	Thermal cycling test		N/A
G.15.3.6	Force test		N/A
G.15.4	Compliance		N/A
<b>G.16</b>	<b>IC including capacitor discharge function (ICX)</b>		N/A
G.16 a)	Humidity treatment in accordance with sc 5.4.8 – 120 hours		N/A
G.16 b)	Impulse test using circuit 2 with $U_c =$ to transient voltage .....		N/A
G.16 C1)	Application of ac voltage at 110% of rated voltage for 2.5 minutes		N/A
G.16 C2)	Test voltage .....		—
G.16 D1)	10,000 cycles on and off using capacitor with smallest capacitance resistor with largest resistance specified by manufacturer		N/A
G.16 D2)	Capacitance .....		—
G.16 D3)	Resistance .....		—
<b>H</b>	<b>CRITERIA FOR TELEPHONE RINGING SIGNALS</b>		N/A
H.1	General		N/A
H.2	Method A		N/A
H.3	Method B		N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
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) .....		—
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 complied with		N/A
H.3.2.2	Tripping device		N/A
H.3.2.3	Monitoring voltage (V) .....		—
<b>J</b>	<b>INSULATED WINDING WIRES FOR USE WITHOUT INTERLEAVED INSULATION</b>		N/A
	General requirements		N/A
<b>K</b>	<b>SAFETY INTERLOCKS</b>		N/A
K.1	General requirements		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
	Compliance .....		N/A
K.6	Mechanically operated safety interlocks		N/A
K.6.1	Endurance requirement		N/A
K.6.2	Compliance and Test method .....		N/A
K.7	Interlock circuit isolation		N/A
K.7.1	Separation distance for contact gaps & interlock circuit elements (type and circuit location) .....		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
<b>L</b>	<b>DISCONNECT DEVICES</b>		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

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
L.7	Plugs as disconnect devices		N/A
L.8	Multiple power sources		N/A
<b>M</b>	<b>EQUIPMENT CONTAINING BATTERIES AND THEIR PROTECTION CIRCUITS</b>		N/A
M.1	General requirements		N/A
M.2	Safety of batteries and their cells		N/A
M.2.1	Requirements		N/A
M.2.2	Compliance and test method (identify method) .. :		N/A
M.3	Protection circuits		N/A
M.3.1	Requirements		N/A
M.3.2	Tests		N/A
	- Overcharging of a rechargeable battery		N/A
	- Unintentional charging of a non-rechargeable battery		N/A
	- Reverse charging of a rechargeable battery		N/A
	- Excessive discharging rate for any battery		N/A
M.3.3	Compliance .....		N/A
M.4	Additional safeguards for equipment containing secondary lithium battery		N/A
M.4.1	General		N/A
M.4.2	Charging safeguards		N/A
M.4.2.1	Charging operating limits		N/A
M.4.2.2a)	Charging voltage, current and temperature .....		—
M.4.2.2 b)	Single faults in charging circuitry .....		—
M.4.3	Fire Enclosure		N/A
M.4.4	Endurance of equipment containing a secondary lithium battery		N/A
M.4.4.2	Preparation		N/A
M.4.4.3	Drop and charge/discharge function tests		N/A
	Drop		N/A
	Charge		N/A
	Discharge		N/A
M.4.4.4	Charge-discharge cycle test		N/A
M.4.4.5	Result of charge-discharge cycle test		N/A
M.5	Risk of burn due to short circuit during carrying		N/A
M.5.1	Requirement		N/A
M.5.2	Compliance and Test Method (Test of P.2.3)		N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
M.6	Prevention of short circuits and protection from other effects of electric current		N/A
M.6.1	Short circuits		N/A
M.6.1.1	General requirements		N/A
M.6.1.2	Test method to simulate an internal fault		N/A
M.6.1.3	Compliance (Specify M.6.1.2 or alternative method) .....		N/A
M.6.2	Leakage current (mA) .....		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
M.7.2	Compliance and test method		N/A
M.8	Protection against internal ignition from external spark sources of lead acid batteries		N/A
M.8.1	General requirements		N/A
M.8.2	Test method		N/A
M.8.2.1	General requirements		N/A
M.8.2.2	Estimation of hypothetical volume Vz (m <sup>3</sup> /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
M.9.2	Tray for preventing electrolyte spillage		N/A
M.10	Instructions to prevent reasonably foreseeable misuse (Determination of compliance: inspection, data review; or abnormal testing) .....		N/A
<b>N</b>	<b>ELECTROCHEMICAL POTENTIALS</b>		N/A
	Metal(s) used .....	Must be determined in the end-application	—
<b>O</b>	<b>MEASUREMENT OF CREEPAGE DISTANCES AND CLEARANCES</b>		Pass
	Figures O.1 to O.20 of this Annex applied.....	considered	—
<b>P</b>	<b>SAFEGUARDS AGAINST ENTRY OF FOREIGN OBJECTS AND SPILLAGE OF INTERNAL LIQUIDS</b>		N/A
P.1	General requirements	Component is for building in	N/A
P.2.2	Safeguards against entry of foreign object		N/A
	Location and Dimensions (mm) .....		—
P.2.3	Safeguard against the consequences of entry of foreign object		N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
P.2.3.1	Safeguards against the entry of a foreign object		N/A
	Openings in transportable equipment		N/A
	Transportable equipment with metalized plastic parts .....		N/A
P.2.3.2	Openings in transportable equipment in relation to metallized parts of a barrier or enclosure (identification of supplementary safeguard) .....		N/A
P.3	Safeguards against spillage of internal liquids		N/A
P.3.1	General requirements		N/A
P.3.2	Determination of spillage consequences		N/A
P.3.3	Spillage safeguards		N/A
P.3.4	Safeguards effectiveness		N/A
P.4	Metallized coatings and adhesive securing parts		N/A
P.4.2 a)	Conditioning testing		N/A
	Tc (°C) .....		—
	Tr (°C) .....		—
	Ta (°C) .....		—
P.4.2 b)	Abrasion testing .....		N/A
P.4.2 c)	Mechanical strength testing .....		N/A
<b>Q</b>	<b>CIRCUITS INTENDED FOR INTERCONNECTION WITH BUILDING WIRING</b>		N/A
Q.1	Limited power sources		N/A
Q.1.1 a)	Inherently limited output		N/A
Q.1.1 b)	Impedance limited output		N/A
	- Regulating network limited output under normal operating and simulated single fault condition		N/A
Q.1.1 c)	Overcurrent protective device limited output		N/A
Q.1.1 d)	IC current limiter complying with G.9		N/A
Q.1.2	Compliance and test method		N/A
Q.2	Test for external circuits – paired conductor cable		N/A
	Maximum output current (A) .....		—
	Current limiting method .....		—
<b>R</b>	<b>LIMITED SHORT CIRCUIT TEST</b>		N/A
R.1	General requirements		N/A
R.2	Determination of the overcurrent protective device and circuit		N/A
R.3	Test method Supply voltage (V) and short-circuit current (A). .....		N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
<b>S</b>	<b>TESTS FOR RESISTANCE TO HEAT AND FIRE</b>		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 .....		—
	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).....		—
	Conditioning (°C).....		—
	Test flame according to IEC 60695-11-5 with conditions as set out		N/A
	Test specimen does not show any additional hole		N/A
S.3	Flammability test for the bottom of a fire enclosure		N/A
	Samples, material .....		—
	Wall thickness (mm).....		—
	Cheesecloth did not ignite		N/A
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 does not exceed 4 000 W		N/A
	Samples, material .....		—
	Wall thickness (mm).....		—
	Conditioning (test condition), (°C).....		—
	Test flame according to IEC 60695-11-20 with conditions as set out		N/A
	After every test specimen was not consumed completely		N/A
	After fifth flame application, flame extinguished within 1 min		N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
<b>T</b>	<b>MECHANICAL STRENGTH TESTS</b>		Pass
T.1	General requirements	EUT is a component for building in	Pass
T.2	Steady force test, 10 N .....		N/A
T.3	Steady force test, 30 N .....		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 .....		N/A
T.8	Stress relief test .....		N/A
T.9	Impact Test (glass)		N/A
T.9.1	General requirements		N/A
T.9.2	Impact test and compliance		N/A
	Impact energy (J).....		—
	Height (m) .....		—
T.10	Glass fragmentation test .....		N/A
T.11	Test for telescoping or rod antennas		N/A
	Torque value (Nm) .....		—
<b>U</b>	<b>MECHANICAL STRENGTH OF CATHODE RAY TUBES (CRT) AND PROTECTION AGAINST THE EFFECTS OF IMPLOSION</b>		N/A
U.1	General requirements		N/A
U.2	Compliance and test method for non-intrinsically protected CRTs		N/A
U.3	Protective Screen .....		N/A
<b>V</b>	<b>DETERMINATION OF ACCESSIBLE PARTS (FINGERS, PROBES AND WEDGES)</b>		N/A
V.1	Accessible parts of equipment		N/A
V.2	Accessible part criterion		N/A

**Enclosure**  
**National Differences**  
USA / Canada

IEC62368_1B - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

ATTACHMENT TO TEST REPORT IEC 62368-1 2th Ed. U.S.A. NATIONAL DIFFERENCES	
Audio/video, information and communication technology equipment – Part 1: Safety requirements	
Differences according to	CSA/UL 62368-1:2014
Attachment Form No.	US&CA_ND_IEC623681B
Attachment Originator	UL(US)
Master Attachment	Date 2015-06
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IEC 62368-1 - US and Canadian National Differences Special National Conditions based on Regulations and Other National Differences			
1.1	All equipment is to be designed to allow installation according to the National Electrical Code (NEC), ANSI/NFPA 70, the Canadian Electrical Code (CEC), Part I, 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.	Noted	Pass
1.4	Additional requirements apply to some forms of power distribution equipment, including sub-assemblies.		N/A
4.1.17	For lengths exceeding 3.05 m, external interconnecting flexible cord and 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 flexible cord and cable assemblies that are not types specified in the NEC generally are required to have special construction features and identification markings.		N/A
4.8	Lithium coin / button cell batteries have modified special construction and performance requirements.		N/A
5.6.3	Protective earthing conductors comply with the minimum conductor sizes in Table G.5, except as required by Table G.7ADV.1 for cord connected equipment, or Annex DVH for permanently connected equipment		N/A
5.7.7	Equipment intended to receive telecommunication ringing signals complies with a special touch current measurement tests.		N/A
6.5.1	PS3 wiring outside a fire enclosure complies with single fault testing in B.4, or be current limited per one of the permitted methods.		N/A

IEC62368_1B - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
Annex F (F.3.3.8)	Output terminals provided for supply of other equipment, except mains, supply are marked with a maximum rating or references to which equipment it is permitted to be connected.		N/A
Annex G (G.7.1)	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
Annex G (G.7.3)	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
Annex G (G.7.5)	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
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 V <sub>peak</sub> or 60 V d.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 M	Battery packs for stationary applications comply with special component requirements.		N/A
Annex DVA (1)	Equipment intended for use in spaces used for environmental air 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 m <sup>3</sup> (27 cu ft) 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. & Canadian Regulations.		N/A
	Baby monitors additionally comply with ASTM F2951, Consumer Safety Specification for Baby Monitors.		N/A

IEC62368_1B - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
Annex DVA (5.6.3)	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 complies with NFPA 30.	No flammable liquid	N/A
Annex DVA (6.4.8)	For ITE room applications, enclosures with combustible material measuring greater than 0.9 m <sup>2</sup> (10 sq ft) or a single dimension greater than 1.8 m (6 ft) 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 min. flammability classification of V-1.		N/A
Annex DVA (10.3.1)	Equipment with lasers meets the U.S. Code of Federal Regulations 21 CFR 1040 (and the Canadian Radiation Emitting Devices Act, REDR C1370).		N/A
Annex DVA (10.5.1)	Equipment that produces ionizing radiation complies 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.3.3.3)	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 are lower than the "Normal Operating Condition" in Table 2 of CAN/CSA C22.2 No. 235."		N/A
Annex DVA (F.3.3.5)	Equipment identified for ITE (computer) room installation is marked with the rated current		N/A
Annex DVA (G.1)	Vertically-mounted disconnect switches and circuit breakers have the "on" position indicated by the handle in the up 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
Annex DVA (G.4.2)	Equipment with isolated ground (earthing) receptacles complies with NEC 250.146(D) and CEC 10-112 and 10-906(8).		N/A
Annex DVA (G.4.3)	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.5.3)	Power distribution transformers distributing power at 100 volts or more, and rated 10 kVA or more, require special transformer overcurrent protection.	Tested in application	N/A

IEC62368_1B - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
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 (Annex M)	For ITE room applications, equipment with battery systems capable of supplying 750 VA for five minutes have a battery disconnect means that may be connected to the ITE room remote power-off circuit.		N/A
Annex DVA (Q)	Wiring terminals intended to supply Class 2 outputs according to the NEC or CEC Part 1 are marked with the voltage rating and "Class 2" or equivalent; marking is located adjacent to the terminals and visible during wiring.		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
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 have component or material ratings in accordance with the applicable national (U.S. and Canadian) component or material requirements. Components required to comply include: appliance couplers, attachment plugs, battery back-up systems, battery packs, circuit breakers, communication circuit accessories, connectors (used for current interruption of non-LPS circuits), power supply cords, direct plug-in equipment, electrochemical capacitor modules (energy storage modules with ultra-capacitors), enclosures (outdoor), flexible cords and cables, fuses (branch circuit), ground-fault current interrupters, interconnecting cables, data storage equipment, printed wiring, protectors for communications circuits, receptacles, surge protective devices, vehicle battery adapters, wire connectors, and wire and cables.		Pass
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 in accordance with the NEC/CEC.		N/A

<b>IEC62368_1B - ATTACHMENT</b>			
<b>Clause</b>	<b>Requirement + Test</b>	<b>Result - Remark</b>	<b>Verdict</b>
Annex DVH (DVH.3.2)	Terminals for permanent wiring, including protective earthing terminals, are suitable for U.S./Canadian wire gauge sizes, rated 125 percent of the equipment rating, and are specially marked when specified.		N/A
Annex DVH (DVH.3.2)	Wire binding screws are not permitted to attach conductors larger than 10 AWG (5.3 mm <sup>2</sup> ).		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 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, complies 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
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

<b>ENERGY SOURCE IDENTIFICATION AND CLASSIFICATION TABLE:</b>	
(Note 1: Identify the following six (6) energy source forms based on the origin of the energy.) (Note 2: The identified classification e.g., ES2, TS1, should be with respect to its ability to cause pain or injury on the body or its ability to ignite a combustible material. Any energy source can be declared Class 3 as a worse case classification e.g. PS3, ES3.)	
<b>Electrically-caused injury (Clause 5):</b> (Note: Identify type of source, list sub-assembly or circuit designation and corresponding energy source classification) Example: +5 V dc input ES1	
Source of electrical energy	Corresponding classification (ES)
Input (All Models)	ES2
Output (All Models)	ES1
<b>Electrically-caused fire (Clause 6):</b> (Note: List sub-assembly or circuit designation and corresponding energy source classification) Example: Battery pack (maximum 85 watts): PS2	
Source of power or PIS	Corresponding classification (PS)
Input (All Models)	PS3
Output (All Models)	PS3
<b>Injury caused by hazardous substances (Clause 7)</b> (Note: Specify hazardous chemicals, whether produces ozone or other chemical construction not addressed as part of the component evaluation.) Example: Liquid in filled component Glycol	
Source of hazardous substances	Corresponding chemical
N/A	--
<b>Mechanically-caused injury (Clause 8)</b> (Note: List moving part(s), fan, special installations, etc. & corresponding MS classification based on Table 35.) Example: Wall mount unit MS2	
Source of kinetic/mechanical energy	Corresponding classification (MS)
N/A	--
<b>Thermal burn injury (Clause 9)</b> (Note: Identify the surface or support, and corresponding energy source classification based on type of part, location, operating temperature and contact time in Table 38.) Example: Hand-held scanner – thermoplastic enclosure TS1	
Source of thermal energy	Corresponding classification (TS)
PWB and Components	TS3 (for building in, to be addressed in the end product)
<b>Radiation (Clause 10)</b> (Note: List the types of radiation present in the product and the corresponding energy source classification.) Example: DVD – Class 1 Laser Product RS1	
Type of radiation	Corresponding classification (RS)
N/A	--