



Test Report issued under the responsibility of:



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

Report Number.....: T223-0302/20
Date of issue.....: 2020-06-19
Total number of pages.....: 390 pages

Applicant's name: TDK-Lambda UK Limited
Address.....: Kingsley Avenue, Ilfracombe, Devon EX34 8ES, United Kingdom

Test specification:
Standard: IEC 62368-1:2014 (Second Edition)
Test procedure.....: CB Scheme
Non-standard test method: N/A

Test Report Form No...... : IEC62368_1B
Test Report Form(s) Originator: UL(US)
Master TRF.....: 2014-03

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Test Item description	: Switch mode power supply for building-in
Trade Mark	: TDK-Lambda
Manufacturer	: ARCH Electronics Corp. 7TH FL-1, No. 79, Sec. 1, Hsin Tai Wu Rd., Hsin Chin, New Taipei TW-221, Taiwan
Model/Type reference	: KMS15A-xx/yy-zzz, where: "xx" can be 3,75 ~ 5,25; 6,75 ~ 9,45; 9 ~ 12,6; 11,25 ~ 15,75 or 18 ~ 25,2 "yy" can be /blank or SC = Screw terminal chassis mount or SD = Screw terminal DIN rail mount "zzz" can be alphanumeric and does not have affect on safety KMS30A-xx/yy-zzz, where: "xx" can be 3,75 ~ 5,25; 9,0 ~ 12,6; 11,25 ~ 15,75 or 18,0 ~ 25,2 "yy" can be /blank or SC = Screw terminal chassis mount or SD = Screw terminal DIN rail mount "zzz" can be alphanumeric and does not have affect on safety KMS60A-xx/yy-zzz, where: "xx" can be 3,75 ~ 5,25; 6,75 ~ 9,45; 9 ~ 12,6; 11,25 ~ 15,75 or 18 ~ 25,2 "yy" can be /blank or SC = Screw terminal chassis mount or SD = Screw terminal DIN rail mount "zzz" can be alphanumeric and does not have affect on safety

Ratings	<p>: <u>Input:</u> KMS15A-xx/yy-zzz; 100-240 Vac; 47-63 Hz; 0,385 Amax KMS30A-xx/yy-zzz; 100-240 Vac; 47-63 Hz; 0,65 Amax KMS60A-xx/yy-zzz; 100-240 Vac; 47-63 Hz; 1,5 Amax</p> <p><u>Output:</u> KMS15A-xx/yy-zzz Where "xx" can be 3,75 ~ 5,25: 3,75 ~ 5,25 Vdc; 3 Amax.; Max. 15 W Where "xx" can be 6,75 ~ 9,45: 6,75 ~ 9,45 Vdc; 1,666 Amax.; Max. 15 W Where "xx" can be 9,0 ~ 12,6: 9,0 ~ 12,6 Vdc; 1,25 Amax.; Max. 15 W Where "xx" can be 11,25 ~ 15,75: 11,25 ~ 15,75 Vdc; 1Amax.; Max. 15 W Where "xx" can be 18,0 ~ 25,2: 18,0 ~ 25,2 Vdc; 0,625 Amax.; Max. 15 W</p> <p>KMS30A-xx/yy-zzz Where "xx" can be 3,75 ~ 5,25: 3,75 ~ 5,25 Vdc; 5 Amax.; Max. 25 W Where "xx" can be 9,0 ~ 12,6: 9 ~ 12,6 Vdc; 2,5 Amax.; Max. 30 W Where "xx" can be 11,25 ~ 15,75: 11,25 ~ 15,75 Vdc; 2Amax.; Max. 30 W Where "xx" can be 18,0 ~ 25,2: 18,0 ~ 25,2 Vdc; 1,25 Amax.; Max. 30 W</p> <p>KMS60A-xx/yy-zzz Where "xx" can be 3,75 ~ 5,25: 3,75 ~ 5,25 Vdc; 10 Amax.; Max. 51 W Where "xx" can be 6,75 ~ 9,45: 6,75 ~ 9,45 Vdc; 6,666 Amax.; Max. 60 W Where "xx" can be 9,0 ~ 12,6: 9,0 ~ 12,6 Vdc; 5 Amax.; Max. 60 W Where "x" can be 11,25 ~ 15,75: 11,25 ~ 15,75 Vdc; 4 Amax.; Max. 60 W Where "x" can be 18,0 ~ 25,2: 18,0 ~ 25,2 Vdc; 2,5 Amax.; Max. 60 W</p>
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Testing procedure and testing location:		
<input checked="" type="checkbox"/>	CB Testing Laboratory:	SIQ Ljubljana SIQ Ljubljana is accredited by Slovenian Accreditation with accreditation number LP-009 in the field of testing
Testing location/ address		Mašera-Spasičeva ulica 10, SI-1000 Ljubljana, Slovenia
<input type="checkbox"/>	Associated CB Testing Laboratory:	
Testing location/ address		
Tested by (name + signature)		Luka Košir
Approved by (name + signature).....		Boštjan Glavič
<input type="checkbox"/>	Testing procedure: TMP/CTF Stage 1	
Testing location/ address		
Tested by (name + signature)		
Approved by (name + signature).....		
<input type="checkbox"/>	Testing procedure: WMT/CTF Stage 2	
Testing location/ address		
Tested by (name + signature)		
Witnessed by (name + signature)		
Approved by (name + signature).....		
<input type="checkbox"/>	Testing procedure: SMT/CTF Stage 3 or 4	
Testing location/ address		
Tested by (name + signature)		
Approved by (name + signature).....		
Supervised by (name + signature)		

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

1. National differences according to IEC 62368-1:2014 (Second Edition) – Enclosure No. 1 (43 pages)
2. Pictures of the unit – Enclosure No. 2 (9 pages)
3. Technical documentation – schematics, layouts, transformer data – Enclosure No. 3 (22 pages)
4. Additional test data – Enclosure No. 4 (50 pages)

Summary of testing:

Tests performed (name of test and test clause):

- 5.2 Electrical energy source measurement*
- 5.4.1.4 Measurement of maximum operating temperatures for materials, components and systems
- 5.4.1.8 Determination of working voltage
- 5.4.2 / 5.4.3 Clearance and creepage distances*
- 5.4.4.2 Minimum distance through insulation
- 5.4.4.6.2 Separable thin sheet material
- 5.4.8 Humidity conditioning
- 5.4.9 Electric strength test*
- 5.4.10 Safeguards against transient voltages from external circuits
- 5.4.11 Separation between external circuits and earth
- 5.5.2.2 Capacitor discharge test
- 5.7 Prospective touch voltage, touch current and protective conductor current*
- 6.2.2.2 Power measurement for worst-case fault*
- 6.2.2.3 Power measurement for worst-case power source fault*
- 9.2.5 Temperature test
- B.2.5 Input test
- B.4.1 – B.4.9 Simulated single fault conditions:
 - Short circuit of clearances for functional insulation
 - Short circuit of creepage distances for functional insulation
 - Short circuit semiconductors
 - Short circuit or disconnection of passive devices
 - Continuous operation of components
- F.3.10 Permanence of markings
- G.5.3.3 Transformer overload test
- T.2 Steady force test, 10 N

Only limited tests were conducted under this investigation based on testing previously conducted under CBTR T223-0127/16 to IEC 60950-1:2005 (Second Edition), Am1:2009 +

Testing location:

SIQ Ljubljana,
Mašera-Spasičeva ulica 10, SI-1000 Ljubljana, Slovenia.

See also history sheet.

<p>Am2:2013. All additional tests performed under this investigation marked with *. For all other tests results from T223-0127/16 report were considered acceptable based on comparison between methods and based on review of test data.</p>	
<p>Summary of compliance with National Differences:</p> <p>List of countries addressed</p> <p>Australia, Austria, Canada, China, Denmark*, Finland*, Ireland, Germany*, Israel, Italy*, Japan, Korea, Norway*, Slovenia, Spain, Sweden*, Switzerland, Turkey, United Kingdom*, USA as listed in online CB-Bulletin.</p> <p>* European Group Differences and National Differences</p> <p>See enclosure No. 1 for details.</p> <p><input checked="" type="checkbox"/> The product fulfils the requirements of EN 62368-1:2014 + A11:2017</p>	

Copy of marking plate:

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

1) KMS15A-xx/yy-zzz



2) KMS30A-xx/yy-zzz





3) KMS60A-xx/yy-zzz



TEST ITEM PARTICULARS:	
Classification of use by	<input type="checkbox"/> Ordinary person <input type="checkbox"/> Instructed person <input checked="" type="checkbox"/> Skilled person <input type="checkbox"/> Children likely to be present
Supply Connection	<input checked="" type="checkbox"/> AC Mains <input type="checkbox"/> DC Mains <input type="checkbox"/> External Circuit - not Mains connected - <input type="checkbox"/> ES1 <input type="checkbox"/> ES2 <input type="checkbox"/> ES3
Supply % Tolerance	<input checked="" type="checkbox"/> +10%/-10% <input type="checkbox"/> +20%/-15% <input type="checkbox"/> +15%/-10% <input type="checkbox"/> None
Supply Connection – Type	<input type="checkbox"/> pluggable equipment type A - <input type="checkbox"/> non-detachable supply cord <input type="checkbox"/> appliance coupler <input type="checkbox"/> direct plug-in <input type="checkbox"/> mating connector <input type="checkbox"/> pluggable equipment type B - <input type="checkbox"/> non-detachable supply cord <input type="checkbox"/> appliance coupler <input type="checkbox"/> permanent connection <input type="checkbox"/> mating connector <input checked="" type="checkbox"/> other: Not directly connected to mains
Considered current rating of protective device as part of building or equipment installation.....	Max. 2A Installation location: <input checked="" type="checkbox"/> building; <input type="checkbox"/> equipment
Equipment mobility	<input type="checkbox"/> movable <input type="checkbox"/> hand-held <input type="checkbox"/> transportable <input type="checkbox"/> stationary <input checked="" type="checkbox"/> for building-in <input type="checkbox"/> direct plug-in <input type="checkbox"/> rack-mounting <input type="checkbox"/> wall-mounted
Over voltage category (OVC)	<input type="checkbox"/> OVC I <input checked="" type="checkbox"/> OVC II <input type="checkbox"/> OVC III <input type="checkbox"/> OVC IV <input type="checkbox"/> other: _____
Class of equipment	<input type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> Class III <input checked="" type="checkbox"/> Not classified
Access location	<input type="checkbox"/> restricted access location <input checked="" type="checkbox"/> N/A
Pollution degree (PD)	<input type="checkbox"/> PD 1 <input checked="" type="checkbox"/> PD 2 <input type="checkbox"/> PD 3
Manufacturer’s specified maximum operating ambient:	50°C (without derating) and with derating above up to 80°C (see general product information)
IP protection class	<input checked="" type="checkbox"/> IPX0 <input type="checkbox"/> IP____
Power Systems	<input checked="" type="checkbox"/> TN <input checked="" type="checkbox"/> TT <input type="checkbox"/> IT - ____ V _{L-L}
Altitude during operation (m)	<input type="checkbox"/> 2000 m or less <input checked="" type="checkbox"/> 5000 m
Altitude of test laboratory (m)	<input type="checkbox"/> 2000 m or less <input checked="" type="checkbox"/> 300 m
Mass of equipment (kg)	KMS15A-xx/yy-zzz: 0,059 KMS30A-xx/yy-zzz: 0,130 KMS60A-xx/yy-zzz: 0,280

POSSIBLE TEST CASE VERDICTS:	
- test case does not apply to the test object	: N/A
- test object does meet the requirement	: P (Pass)
- test object does not meet the requirement	: F (Fail)
TESTING:	
Date of receipt of test item.....	: 2020-05-11
Date (s) of performance of tests.....	: From 2020-05-12 to 2020-06-02
GENERAL REMARKS:	
<p>"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report.</p> <p>Throughout this report a <input checked="" type="checkbox"/> comma / <input type="checkbox"/> point is used as the decimal separator.</p>	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC60068-2-1:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Not applicable
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies)	ARCH Electronics Corp. 7TH FL-1, No. 79, Sec. 1, Hsin Tai Wu Rd., Hsin Chin, New Taipei TW-221, Taiwan
GENERAL PRODUCT INFORMATION:	
Product Description	
<p>EUT is power supply unit intended for building-in provided with a single power output and with universal input range 100-240 Vac.</p> <p>Power supply unit is provided with plastic enclosure and additionally filled with non-conductive insulation compound to increase rigidity of the power supply unit. Clearance and creepage distances not rely on insulation compounds; therefore thermal cycling not performed.</p> <p>Power supply unit is provided with input and output pins intended for soldering to the PCB within end product (KMS15A-xx, KMS30A-xx, KMS60A-xx) or with screw terminals for input/output wires connection (KMS15A-xx/SC, KMS15A-xx/SD, KMS30A-xx/SC, KMS30A-xx/SD, KMS60A-xx/SC, KMS60A-xx/SD).</p> <p>In model designation KMS15A-xx/yy-zzz:</p> <p>"xx" can be 3,75 ~ 5,25; 6,75~9,45; 9 ~ 12,6; 11,25~15,75 or 18~25,2 and denotes DC output voltage "yy" can be /blank or SC = Screw terminal chassis mount or SD = Screw terminal DIN rail mount "zzz" can be alphanumeric and does not have affect on safety</p> <p>In model designation KMS30A-xx/yy-zzz:</p> <p>"xx" can be 3,75 ~ 5,25; 9,0 ~ 12,6; 11,25 ~ 15,75 or 18,0 ~ 25,2 and denotes DC output voltage "yy" can be /blank or SC = Screw terminal chassis mount or SD = Screw terminal DIN rail mount "zzz" can be alphanumeric and does not have affect on safety</p> <p>In model designation KMS60A-xx/yy-zzz:</p>	

"xx" can be 3,75 ~ 5,25; 6,75~9,45; 9~12,6; 11,25 ~ 15,75 or 18~25,2 and denotes DC output voltage
 "yy" can be /blank or SC = Screw terminal chassis mount or SD = Screw terminal DIN rail mount
 "zzz" can be alphanumeric and does not have affect on safety

For output rating of each model, see table on page 3 for details.

KMS15A-xx/yy-zzz: PCB with dimension 50,1 mm by 25,0 mm is used.

Additional PCB for KMS15A-xx/yy-zzz (yy can be SC or SD): 92,5 mm by 50,5 mm is used.

KMS30A-xx/yy-zzz: PCB with dimension 60 mm by 41,5 mm is used.

Additional PCB for KMS30A-xx/yy-zzz (yy can be SC or SD): 92,5 mm by 50,5 mm is used.

KMS60A-xx/yy-zzz: PCB with dimension 85 mm by 60 mm is used.

All the transformers have similar construction, transformer construction details of model KMS15A-xx/yy-zzz, KMS30A-xx/yy-zzz and KMS60A-xx/yy-zzz are specified in Enclosure No. 3

Model Differences:

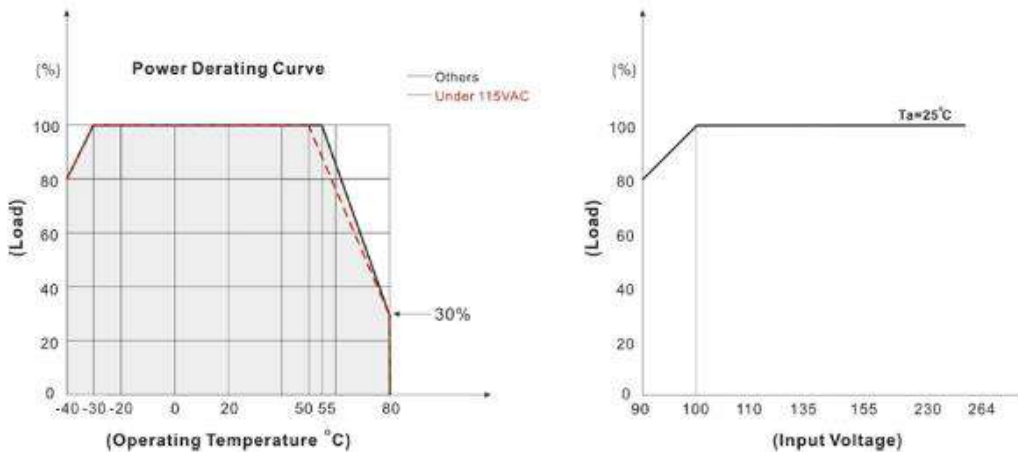
See above description.

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

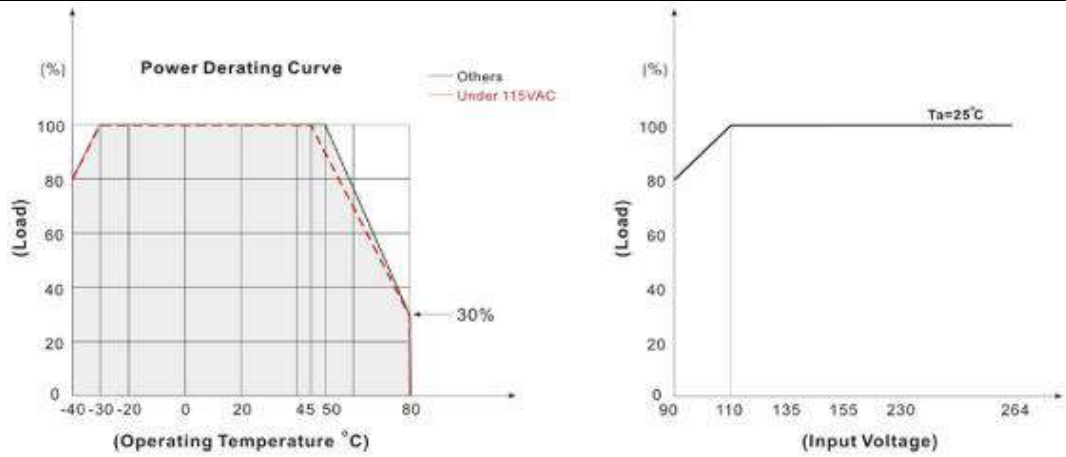
Limited tests were conducted under this investigation based on testing previously conducted under CBTR Ref. No. T223-0127/16. IEC 60950-1:2005 (Second Edition), Am1:2009 + Am2:2013. All required tests were carried out under the previous investigation except where specifically noted.

- 1.) The power supply tested in this test report is only component level power supply. Power supply unit is intended for building-in. Disconnect device is end product consideration. Essential performance shall be determined within the end equipment.
- 2.) The power supply unit is intended for building-in and provided with plastic enclosure (filled with insulation compound to improve rigidity of the enclosure). Enclosure is considered as part that cannot be touched by the operator when installed within the end product.
- 3.) The unit provides internally one primary fuse. Primary fuse not accessible due the power supply unit is additionally filed with insulation compound. Additionally for models KMS15A-xx/SC-zzz, KMS15A-xx/SD-zzz, KMS30A-xx/SC-zzz, KMS30A-xx/SD-zzz, KMS60A-xx/SC-zzz, KMS60A-xx/SD-zzz external fuse is provided.
- 4.) Secondary output circuit is separated from mains by reinforced insulation and rated ES1. The output does not provide hazard energy level.
- 5.) Power supply is provided with electrical specifications. Built in product, safety instructions are end product considerations
- 6.) The power supply is rated as class II construction (provided in fully plastic enclosure).
- 7.) The transformers T1 provide reinforced insulation. These transformers are built up to fulfil the requirement of insulation class B.
- 8.) The equipment has been evaluated for use in a Pollution Degree 2 and overvoltage category II environment and a maximum altitude of 5000 m. Multiplication factor 1,48 used for required clearance distance between primary and secondary.
- 9.) Power supply unit is provided with plastic enclosure made by non-flammable material V-0.
- 10.) The power supply is maintenance free.

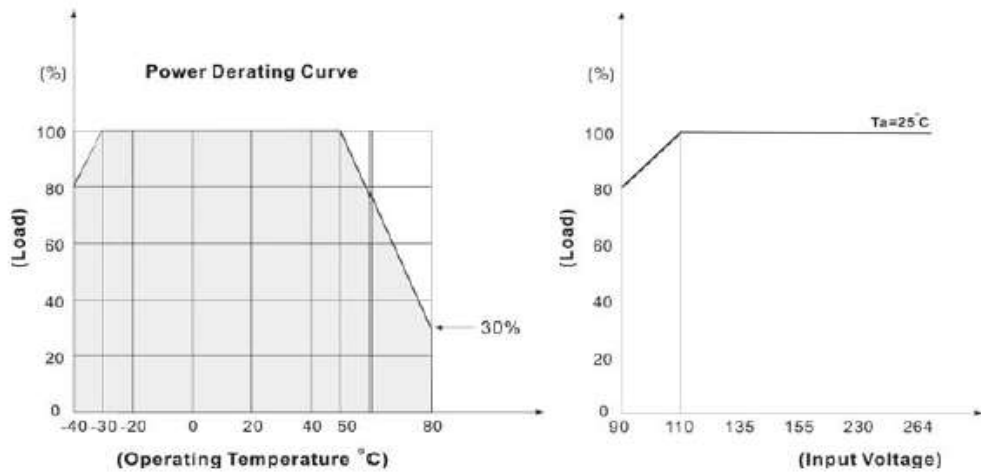
The power supplies KMS15A –xx/yy-zzz are intended for operating at ambient temperature up to 50°C (without derating) or up to 80°C (with derating). Additional derating at input voltage below 115Vac. See charts below.



The power supplies KMS30A-xx/yy-zzz are intended for operating at ambient temperature up to 50°C (without derating) or up to 80°C (with derating). Additional derating at input voltage below 115Vac. See chart below.



The power supplies KMS60A-xx/yy-zzz are intended for operating at ambient temperature up to 50°C (without derating) or up to 80°C (with derating):



The unit shall not be used for use in an oxygen rich environment.

The unit is not intended to be used with flammable anesthetics and not intended for use in conjunction with flammable agents.

History Sheet:

Date	Report No.	Change/Modification	Rev. No.
2020-06-12	T223-0302/20	This test report is based on CB Test Report T223-0127/16 acc. to IEC 60950-1:2005 (Second Edition) + Am 1:2009 + Am 2:2013. Additional tests were performed to comply also according to IEC 62368-1:2014 (Second Edition) & EN 62368-1:2014 + A11:2017: 5.2 Electrical energy source measurement 5.4.9 Electric strength test 5.6.6 Resistance of the protective bonding system 5.7 Prospective touch voltage, touch current and protective conductor current 6.2.2.2, 6.2.2.3 Power Measurements	-

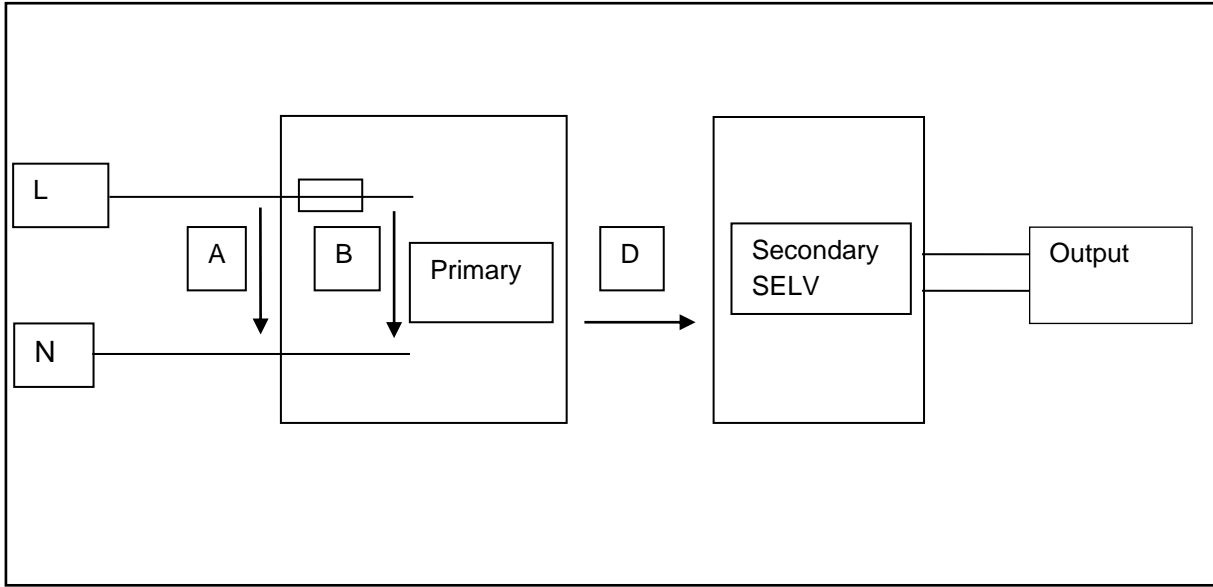
ENERGY SOURCE IDENTIFICATION AND CLASSIFICATION TABLE:	
(Note 1: Identify the following six (6) energy source forms based on the origin of the energy.) (Note 2: The identified classification e.g., ES2, TS1, should be with respect to its ability to cause pain or injury on the body or its ability to ignite a combustible material. Any energy source can be declared Class 3 as a worse case classification e.g. PS3, ES3.)	
Electrically-caused injury (Clause 5): (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)
Primary circuits supplied by a.c. mains	ES3 (steady-state voltage and current)
Supply terminals	ES3 (stored capacitance)
Secondary circuit before rectifier of T1	ES3
Secondary output connector	ES1
Electrically-caused fire (Clause 6): (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)
All primary circuits (all models)	PS3
KMS15A-xx/yy-zzz & KMS30A-xx/yy-zzz output	PS2
KMS60A-xx/yy-zzz output	PS3
Injury caused by hazardous substances (Clause 7) (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	N/A
Mechanically-caused injury (Clause 8) (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)
Sharp edges and corners	N/A (no external enclosure)
Equipment mass	MS1
Thermal burn injury (Clause 9) (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)
Accessible surfaces	N/A (no external enclosure)

ENERGY SOURCE IDENTIFICATION AND CLASSIFICATION TABLE:	
Radiation (Clause 10)	
(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	N/A

ENERGY SOURCE DIAGRAM

Indicate which energy sources are included in the energy source diagram. Insert diagram below

ES PS MS TS RS



AC input: ES3 (steady state and capacitance), PS3

Primary circuit: ES3, PS3

Secondary circuit of T1: ES3, PS3

Output of the unit: ES1, PS2 (KMS15A-xx/yy-zzz) and PS3 (KMS60A-xx/yy-zzz)

Unit all parts: TS3 (Unit for building-in. Enclosure is end product consideration)

Mass, edges/corners: MS1

OVERVIEW OF EMPLOYED SAFEGUARDS				
Clause	Possible Hazard			
5.1	Electrically-caused injury			
Body Part (e.g. Ordinary)	Energy Source (ES3: Primary Filter circuit)	Safeguards		
		Basic	Supplementary	Reinforced (Enclosure)
Skilled	ES3: Primary circuit	N/A	N/A	Equipment Enclosure
Skilled	ES3: supply terminal (Stored Energy)	Skill safeguard	N/A	N/A
Skilled	ES3: Secondary circuit of T1 before rectification	N/A	N/A	Equipment Enclosure
Ordinary	ES1: output of the unit	N/A	N/A	N/A
6.1	Electrically-caused fire			
Material part (e.g. mouse enclosure)	Energy Source (PS2: 100 Watt circuit)	Safeguards		
		Basic	Supplementary	Reinforced
All combustible materials	PS3 Less than 4000W	No ignition and no excessive temperature under normal and abnormal operation.	No fire after single fault condition. Unit for building-in. Fire enclosure is end product consideration.	N/A
Output of the unit (KMS15A-xx/yy-zzz & KMS30A-xx/yy-zzz)	PS2	No ignition and no excessive temperature under normal and abnormal operation.	No fire after single fault condition. Unit for building-in. Fire enclosure is end product consideration.	N/A
Output of the unit (KMS60A-xx/yy-zzz)	PS3			
7.1	Injury caused by hazardous substances			
Body Part (e.g., skilled)	Energy Source (hazardous material)	Safeguards		
		Basic	Supplementary	Reinforced
N/A	N/A	N/A	N/A	N/A
8.1	Mechanically-caused injury			
Body Part (e.g. Ordinary)	Energy Source (MS3:High Pressure Lamp)	Safeguards		
		Basic	Supplementary	Reinforced (Enclosure)
Skilled	MS1: sharp edges and corners	N/A	N/A	N/A

Skilled	MS1: equipment mass	N/A	N/A	N/A
9.1	Thermal Burn			
Body Part (e.g., Ordinary)	Energy Source (TS2)	Safeguards		
		Basic	Supplementary	Reinforced
Skilled	TS3	N/A	N/A	N/A
10.1	Radiation			
Body Part (e.g., Ordinary)	Energy Source (Output from audio port)	Safeguards		
		Basic	Supplementary	Reinforced
N/A	N/A	N/A	N/A	N/A
Supplementary Information:				
(1) See attached energy source diagram for additional details.				
(2) "N" – Normal Condition; "A" – Abnormal Condition; "S" Single Fault				