

UL TEST REPORT AND PROCEDURE

Standard: Certification Type: CCN: Complementary CCN:	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) Component Recognition QQJQ2, QQJQ8 (Power Supplies for Use in Audio/Video, Information and Communication Technology Equipment) N/A
Product:	AC-DC Switch mode power supply
Model:	CUS150M (may be prefixed and followed by alphanumeric characters - See model differences section for details of nomenclature) CUS150MD (may be prefixed and followed by alphanumeric characters - See model differences section for details of nomenclature) CUS100ME (may be prefixed and followed by alphanumeric characters - See model differences section for details of nomenclature)
Rating:	Input: CUS150M-xxVx/yyyy 100-240Vac; 47-63Hz or 47-440 Hz 2.2Arms Max. CUS150MD-xxVx/yyyy 133-318Vdc, 1.8A Max CUS100ME-xxVx/yyyy 100-240Vac; 47-63Hz; 1.4Arms Max. Output: CUS150M-12/yyyy output: 12-13.2Vdc 12.5A CUS150M-15/yyyy output: 15-16.5Vdc 10A CUS150M-18/yyyy output: 18-19.8Vdc 8.33A CUS150M-24/yyyy output: 24-26.4Vdc 6.25A CUS150M-28/yyyy output: 28-30.8Vdc 5.4A CUS150M-36/yyyy output: 36-39.6Vdc 4.2A CUS150M-48/yyyy output: 48-50Vdc 3.125A

CUS150MD-12/yyyy output: 12-13.2Vdc 12.5A
CUS150MD-15/yyyy output: 15-16.5Vdc 10A
CUS150MD-18/yyyy output: 18-19.8Vdc 8.33A
CUS150MD-24/yyyy output: 24-26.4Vdc 6.25A
CUS150MD-28/yyyy output: 28-30.8Vdc 5.4A
CUS150MD-36/yyyy output: 36-39.6Vdc 4.2A
CUS150MD-48/yyyy output: 48-50Vdc 3.125A

CUS100ME-12/yyyy output: 12-13.2Vdc 8.33A
CUS100ME-15/yyyy output: 15-16.5Vdc 6.66A
CUS100ME-18/yyyy output: 18-19.8Vdc 5.55A
CUS100ME-24/yyyy output: 24-26.4Vdc 4.16A
CUS100ME-28/yyyy output: 28-30.8Vdc 3.57A
CUS100ME-36/yyyy output: 36-39.6Vdc 2.77A
CUS100ME-48/yyyy output: 48-50Vdc 2.08A

Each output has a range shown in the table above which is factory configurable only.

For further details please see model differences section.

Applicant Name and Address:

TDK-LAMBDA UK LTD
KINGSLEY AVE
ILFRACOMBE
EX34 8ES UNITED KINGDOM
UNITED KINGDOM

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.

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

Prepared By: Casper Larsen / Project Handler Reviewed By: Jan J. Jensen / 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

The product is a power supply for building in to end equipment. It is available as open frame, U chassis, U chassis and lid, Base plate and with a top fan version (CUS150M model only).

The power supply can be used as either a Class I or a Class II construction.

- For Class I construction, the power supply will need to be reliably earthed, professionally installed and fixed with suitable, metal screws.

- For Class II construction no earthing connection is required. The power supply needs to be fixed so that it is insulated from any unearthed accessible conductive part by reinforced insulation.

The power supply provides two fuses for input protection. One in the Live line and one in the Neutral line. Option E uses one fuse only. This is fitted in the live line only.

The power supply can be forced air (top fan or customer air), convection or conduction cooled. Due to the fact that air flow for cooling depends on end product use, only convection cooling and top fan configurations were considered during temperature measurement.

The component temperatures listed in the additional information shall not be exceeded.

Model Differences

The CUS has two ranges of 100W and 150W each with seven nominal output voltages of 12, 15, 18, 24, 28, 36 and 48 Vdc. Each output has a range shown in the table below which is factory configurable only.

CUS models as described below:

Units may be marked with a Product Code: CUSZ-xxVx/yyyy where Z is 100ME or 150M and x may be any number of numbers or left blank to indicate the output voltage. V represents a decimal place when required or can be left blank. y can be any number of numbers or letters (excluding M, E, U, A, F, B, H) when indicating non-safety related model differences. y can be M, E, U, A, F, B, H when indicating the standard options as listed below.

Unit Product Code may be prefixed by K, SP # and/or NS # followed by / or - (where # may be any number of characters indicating non-safety related model differences).

Unit Product Code:

CUSZ-xxVx/yyyy

Where

Z = 150M for 150W model (May be followed by 'D' for DC input)
100ME for 100W model

xxVx = Channel 1 output voltage from within the output voltage adjustment range from the Output Parameters Table below.

yyyy = Unit options from list of standard unit options below, or non-safety related model differences

/M = Molex connectors

/E = Single fuse in the live line

/U = U chassis

/A = Cover and U chassis

/F = Top fan, cover and U chassis (CUS150M model only)

/B = Baseplate

/H = alternate link wire and discharge resistors (60335-1 compliant, and 62368-1 approved only)

Non standards

KCUSZ-xxVx-yyyy/H

Where:

Z = 150M for 150W model (May be followed by 'D' for DC input)
100ME for 100W model

xxVx = Channel 1 output voltage from within the output voltage adjustment range from the Output Parameters Table below.

yyyy = Unit options from list of standard unit options below, or non-safety related model differences

/M = Molex connectors

/E = Single fuse in the live line

Test Item Particulars	
Classification of use by	Skilled person
Supply Connection	AC Mains DC Mains ES3
Supply % Tolerance	+10%/-10%
Supply Connection – Type	pluggable equipment type A - mating connector permanent connection
Considered current rating of protective device as part of building or equipment installation	20 A; building;
Equipment mobility	for building-in
Over voltage category (OVC)	OVC II
Class of equipment	Class I Class II
Access location	N/A
Pollution degree (PD)	PD 2
Manufacturer's specified maximum operating ambient	50 °C
IP protection class	IPX0
Power Systems	TN TT IT - 230Vac(Norway) V L-L
Altitude during operation (m)	5000 m
Altitude of test laboratory (m)	2000 m or less
Mass of equipment (kg)	1kg max kg

Technical Considerations

- The product was submitted and evaluated for use at the maximum ambient temperature (T_{ma}) permitted by the manufacturer's specification of : 50°C
- The product is intended for use on the following power systems : TN, TT, IT(Norway), DC mains supply (CUS150M DC rated only) nominal voltage range 133-318 Vdc, restricted voltage 120-350Vdc.
- Considered current rating of protective device as part of the building installation (A) : 20
- Mains supply tolerance (%) or absolute mains supply values : AC Mains supply: +10%/-10%; DC mains supply: (CUS150M DC rated only) +10%/-10%
- The equipment disconnect device is considered to be : Provided in the end-product
- The following were investigated as part of the protective earthing/bonding : Printed wiring board trace (refer to Enclosure - Schematics + PWB for layouts)
- The following are available from the Applicant upon request : Installation (Safety) Instructions / Manual
- The means of connection to the mains supply is: to be determined in the end-product.
- Above 50°C the total output power and current ratings are both de-rated to ensure power curves are met. Refer to Handbook in Enclosures 6-01 and 6-02 for the power curves.
- For Class I construction, the power supply will need to be reliably earthed, professionally installed and fixed with suitable, metal screws. For Class II construction no earthing connection is required. The power supply needs to be fixed so that it is insulated from any unearthed accessible conductive part by reinforced insulation.
- The component temperatures listed in the Additional Information shall not be exceeded.
- The minimum CLEARANCE is multiplied by the factor 1.48 corresponding altitude of 5000m given in IEC 60664-1.

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, Earthing Continuity (except for XMSxD model)
- The end-product Electric Strength Test is to be based upon a maximum working voltage of : Primary-Secondary: 283 Vrms, 480 Vpk, Primary-Earthed Dead Metal: 404.7 Vrms, 421.7 Vpk
- The following output circuits are at ES1 energy levels : 12V, 15V,18V,24V and 36V models
- The following output circuits are at ES2 energy levels : 48V models
- The following output circuits are at PS3 energy levels : All circuits
- The maximum investigated branch circuit rating is : 20 A
- The investigated Pollution Degree is : 2
- The following end-product enclosures are required : Mechanical, Electrical, Fire
- The following magnetic devices (e.g. transformers or inductor) are provided with an OBJY2 insulation system with the indicated rating greater than Class A (105°C) : TX100 Class B
- The power supply was evaluated to be used at altitudes up to : "5,000 m"
- The power supply terminals and/or connectors are: Not investigated for field wiring.
- Fans: The fan provided in this sub-assembly is not intended for operator access.
- The power supply can be forced air (top fan or customer air) or convection cooled. Due to the fact that air flow for cooling depends on end product use, only convection cooling and top fan configurations were considered during temperature measurement.
- The following output terminals were referenced to earth during performance testing: Output negative.
- For option /E = Single fuse in the live line, end-product must be provided with a polarized plug.
- If this product is installed as Class I the protective bonding point J100 must be verified in the end-product.
- Prospective touch voltage, touch current and protective conductor current has not been evaluated for 440 Hz supply must be evaluated in the end-product.
- For Class II construction, if any unearthed conductive parts are provided in the end product besides the outputs these part or parts must be tested for Prospective touch voltage, and touch current as part of the end-product.

Additional Information

Cooling for units with forced air cooling.

The product can also operate at input voltage lowered to 85Vac with linear output de-rating to -10%.

The following method must be used for determining the safe operation of PSUs.

The components listed in the following table must not exceed the temperatures given. To determine the component temperatures the heating tests must be conducted in accordance with the requirements of the standard in question. Consideration should also be given to the requirements of other safety standards.

Test requirements include: PSU to be fitted in its end-use equipment and operated under the most adverse conditions permitted in the end-use equipment handbook/specification and which will result in the highest temperatures in the PSU. To determine the most adverse conditions consideration should be given to the end use equipment maximum operating ambient, the PSU loading and input voltage, ventilation, end use equipment orientation, the position of doors & covers, etc. Temperatures should be monitored using type K fine wire thermocouples (secured with cyanoacrylate adhesive or similar) placed on the hottest part of the component (out of any direct airflow) and the equipment should be run until all temperatures have stabilized.

Cooling for unit temperature table:

CUS150M Cooling for Unit Temperature Table:

Circuit Ref.	Description	Max. Temperature (°C)
L1	Common Mode Choke	110 (130)
L2	PFC choke	125 (130)
L3	Differential mode choke	125 (130)
C1	Film capacitor	105
C2, C110	Electrolytic Capacitors	86 (105)
C6, C102, C104, C105	Electrolytic Capacitors	92 (105)
C3	X Capacitor	100
C5, C100, C101, C103	Y Capacitors	105
TX100	Transformer Winding	110
XU101, XU102	Opto-Coupler	100 (110)
XD8	Diode	130
J1	Input Connector	105
J100	Output Connector	105

CUS100ME Cooling for Unit Temperature Table:

Circuit Ref.	Description	Max. Temperature (°C)
L1	Common Mode Choke	110 (130)
L2	PFC choke	125 (130)
L3	Differential mode choke	125 (130)
C1	Film capacitor	105
C2	Electrolytic Capacitors	90 (105)
C104, C105	Electrolytic Capacitors	92 (105)
C6, C102	Electrolytic Capacitors	93 (105)
C3	X Capacitor	100
C5, C100, C101, C103Y	Capacitors	105
TX100	Transformer Winding	110
XU101, XU102	Opto-Coupler	100 (110)
XD8	Diode	130
J1	Input Connector	105
J100	Output Connector	105

Higher temperature limits (in brackets) may be used but product life may be reduced.

Additional Standards

The product fulfills the requirements of: EN 62368-1:2014 + AC:2017+ A11:2017
 UL 62368-1 2ND Ed, Issued December 1, 2014
 CSA CAN/CSA-C22.2 NO. 62368-1 2nd Ed, Issued December 1, 2014
 AS/NZS 62368.1:2018

List of countries addressed:

Australia
 Austria (EN 62368-1:2014)
 CENELEC Group deviation (EN 62368-1:2014)
 Finland (EN 62368-1:2014)
 Italy(EN 62368-1:2014+A11)
 Norway (EN 62368-1:2014)
 Sweden (EN 62368-1:2014)
 UK (EN 62368-1:2014)
 US/CAN

Markings and Instructions

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
Equipment rating marking – ratings	"Input Ratings (voltage, frequency/dc, current/power)", "Output Ratings (voltage, frequency/dc, current/power)"

Special Instructions to UL Representative

N/A