



Test Report issued under the responsibility of:



TEST REPORT
IEC 60950-1
Information technology equipment – Safety –
Part 1: General requirements

Report Number.....: E135494-A103-CB-3
Date of issue.....: 2020-12-11
Total number of pages..... 154

Name of Testing Laboratory UL VS Limited
preparing the Report .....: Unit 1-3 Horizon, Wade Road, Kingsland Business Park, Basingstoke
RG24 8AH, United Kingdom

Applicant's name .....: TDK-LAMBDA UK LTD
Address .....: KINGSLEY AVE
ILFRACOMBE
EX34 8ES UNITED KINGDOM

Test specification:
Standard.....: IEC 60950-1:2005, AMD1:2009, AMD2:2013
Test procedure .....: CB Scheme
Non-standard test method .....: N/A

Test Report Form No. ....: IEC60950\_1G
Test Report Form(s) Originator ....: SGS Fimko Ltd
Master TRF.....: Dated 2019-07-02

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<b>Test item description</b> .....	Switch mode power supply
<b>Trade Mark</b> .....	TDK-Lambda 
<b>Manufacturer</b> .....	TDK-LAMBDA UK LTD KINGSLEY AVE ILFRACOMBE EX34 8ES UNITED KINGDOM
<b>Model/Type reference</b> .....	XMS350 or XMS-350, XMS500 or XMS-500, XMS500P or XMS-500P, XMS500A or XMS-500A, XMS500AP or XMS-500AP series switch
<b>Ratings</b> .....	XMS350, XMS-350: 100-240Vac nom, 47-63Hz, 5.3A rms max. XMS500, XMS-500, XMS500P, XMS-500P, XMS500A, XMS-500A, XMS500AP, XMS-500AP: 100-240Vac nom, 47-63Hz, 7A rms max. (see report Model Differences for details and variations)

**Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):**

<input type="checkbox"/>	<b>CB Testing Laboratory:</b>	
	<b>Testing location/ address</b> .....	
	<b>Tested by (name, function, signature)</b> .....	
	<b>Approved by (name, function, signature)</b> .....	
<input type="checkbox"/>	<b>Testing procedure: CTF Stage 1:</b>	
	<b>Testing location/ address</b> .....	
	<b>Tested by (name, function, signature)</b> .....	
	<b>Approved by (name, function, signature)</b> .....	
<input type="checkbox"/>	<b>Testing procedure: CTF Stage 2:</b>	
	<b>Testing location/ address</b> .....	
	<b>Tested by (name + signature)</b> .....	
	<b>Witnessed by (name, function, signature)</b> ..	
	<b>Approved by (name, function, signature)</b> .....	
<input checked="" type="checkbox"/>	<b>Testing procedure: CTF Stage 3:</b>	
<input type="checkbox"/>	<b>Testing procedure: CTF Stage 4:</b>	
	<b>Testing location/ address</b> .....	TDK-LAMBDA UK LTD KINGSLEY AVE ILFRACOMBE EX34 8ES UNITED KINGDOM

<b>Tested by (name, function, signature).....:</b>	Matt Carter / Tester	See the original/ reissue/ amendment CBTR for signatures
<b>Witnessed by (name, function, signature) .:</b>	Huber Koszewski / Witness	See the original/ reissue/ amendment CBTR for signatures
<b>Approved by (name, function, signature)...</b>	Tracy Burgess / Approver	See the original/ reissue/ amendment CBTR for signatures
<b>Supervised by (name, function, signature) :</b>	Dennis Butcher / Reviewer	See the original/ reissue/ amendment CBTR for signatures

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

National Differences (54 pages)  
 Enclosures (154 pages)

**Summary of testing:**

**Tests performed (name of test and test clause):**

Input: Single-Phase (1.6.2)  
 Durability of Marking (1.7.11)  
 Energy Hazard Measurements (2.1.1.5, 2.1.2, 1.2.8.10)  
 Capacitance Discharge (2.1.1.7)  
 SELV Reliability Test Including Hazardous Voltage Measurements (2.2.2, 2.2.3, 2.2.4, Part 22 6.1)  
 Limited Current Circuit Measurement (2.4.1, 2.4.2)  
 Limited Short-Circuit (2.6.3.4)  
 Protective Bonding II (2.6.3.4, 2.6.1)  
 Humidity (2.9.1, 2.9.2, 5.2.2)  
 Determination of Working Voltage; Working Voltage Measurement (2.10.2)  
 Thin Sheet Material (2.10.5.9, 2.10.5.10, 2.10.5.6)  
 Steady Force (4.2.1 - 4.2.4)  
 Hazardous Moving Parts (4.4.2, 4.4.4)  
 Heating (4.5.1, 1.4.12, 1.4.13)  
 Touch Current (Single-Phase; TN/TT System) (5.1, Annex D)  
 IT Touch Current (Single-Phase) (5.1, Annex D)  
 Electric Strength (5.2.2)  
 Component Failure (5.3.1, 5.3.4, 5.3.7)  
 Abnormal Operation (5.3.1 - 5.3.9)  
 Transformer Abnormal Operation (5.3.3, 5.3.7b, Annex C.1)  
 Power Supply Output Short-Circuit/Overload (5.3.7)  
 Locked-Rotor Overload for DC Motors in Secondary Circuits (Annex B.7)

**Testing Location:**

**CBTL: UL VS Limited, Unit 1-3 Horizon, Wade Road, Kingsland Business Park, Basingstoke RG24 8AH, United Kingdom**

**Summary of compliance with National Differences:**

**List of countries addressed:** Argentina, Australia / New Zealand, EU Group and National Differences, Israel, Japan, Korea, USA, Canada

EU Group and National Differences applies to CENELEC member countries: Austria , Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom

**The product fulfils the requirements of:** UL60950-1, 2nd Edition, 2014-10-14, CSA C22.2 No. 60950-1-07+A1 +A2:2014, 2nd Edition, 2014-10, EN 60950-1:2006 + A1:2010 + A11:2009 + A12:2011 +A2:2013

**Copy of Marking Plate** - Refer to Enclosure titled Marking Plate for copy.

<b>Test item particulars</b> .....	
Equipment mobility	for building-in
Connection to the mains	Connection to the mains via host equipment
Operating condition	continuous
Access location	For building in
Over voltage category (OVC)	OVC II
Mains supply tolerance (%) or absolute mains supply values	+10%, -10%
Tested for IT power systems	No
IT testing, phase-phase voltage (V)	N/A
Class of equipment	Class I (earthed) and Class II models (double insulated)
Considered current rating of protective device as part of the building installation (A)	20A
Pollution degree (PD)	PD 2
IP protection class	IP X0
Altitude of operation (m)	5000m
Altitude of test laboratory (m)	64m
Mass of equipment (kg)	1kg max

<b>Possible test case verdicts:</b>	
- 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)
<b>Testing</b> .....	
<b>Date of receipt of test item</b> .....	2015-06-24 to 2015-08-27, 2015-07-17 to 2015-12-17, 2017-04-04, 2017-10-18, 2018-05-25 to 2020-06-17
<b>Date (s) of performance of tests</b> .....	2015-06-30 to 2015-09-21, 2015-11-10 to 2015-12-17, 2017-10-19 to 2017-11-03, 2018-04-25, 2020-05-05 to 2020-07-07

**General remarks:**

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

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

<b>Manufacturer's Declaration per sub-clause 4.2.5 of IEC60950:</b>	
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"/> <b>Yes</b> <input type="checkbox"/> <b>Not applicable</b>

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

**Name and address of factory (ies) .....** : TDK-LAMBDA UK LTD  
KINGSLEY AVE  
ILFRACOMBE  
EX34 8ES UNITED KINGDOM

PANYU TRIO MICROTRONICS CO LTD  
SHIJI INDUSTRIAL ESTATE  
DONGYONG  
NANSHA  
GUANGZHOU  
GUANGDONG 511453 CHINA

TRIO-TRONICS (THAILAND) LTD  
7/295 MU. 6  
MAP YANG PHON SUB-DISTRICT  
PLUAK DAENG DISTRICT RAYONG PROVINCE  
THAILAND

**General product information:****Product Description**

XMS350 or XMS500 series switch mode power supplies  
(See Model Differences for details and variations)

The series consists of two power outputs, a 350W and 500W, these use the same topology with some component variations.

The XMS series switch mode power supply consists of:

1. Input filter, consisting of the input fuse(s), X and Y capacitors, common mode chokes up to the bridge and series choke after the bridge.
2. PFC (boost circuit), consisting of the boost choke and associated switching FETs/circuitry.
3. Forward converter, consisting of the main transformer and switching FETs/circuitry supplying channel 1 and fan supply outputs.
4. Standby circuit, consisting of the standby transformer and switching IC/circuitry supplying the standby output.
5. Secondary circuits (SELV), consisting of channel 1 output, standby output, fan supply, power OK and inhibit/enable.



**Model Differences**

XMS350 or XMS500 series (may also be marked as XMS-350 or XMS-500) as described below:

Units may be marked with a Product Code: Xy where y may be any number of characters.

Unit Configuration Code (Description): may be prefixed with NS # or K # followed by / or - (where # may be any number of characters indicating non-safety related model differences).

Unit Configuration Code (Description): may be prefixed by SP followed by / or - (where SP represents a sales code)

Unit Configuration (Description)

XMSxy-a-bc-defghijklm

where:

- x = 350 for 350W model  
500 for 500W model  
500A for enhanced 500W model (less than 1W inhibited)  
500P for 576W peak power models (36V, 40V and 48V output models only)  
500AP for enhanced 500W model with 576W peak power (36V, 40V and 48V output models only)
- y = Blank for Class I  
D for Class II
- a = Channel 1 Output Voltage (see Ch1 in the table below, adjustment range column).
- b = Standby Output Voltage: see standby voltage in table below  
N for no supply  
5 for 5 volt  
12 for 12 volt
- c = Standby Output Current†:  
C for 0.5A  
M for 1.0A  
H for 2.0A  
N for no supply or 0 amps output
- d = Fan Supply†:  
N for no fan supply (customer cooling)  
N1 for 24V fan supply (customer cooling)  
N2 for 12V variable supply  
N3 for 12V fixed supply  
KF for non-standard top fan  
TF for top-fan
- e = U for non-standard U chassis  
P for perforated frame  
N for Open Frame  
C for custom chassis/covers for non-standard models  
S for standard U chassis  
B for standard U chassis with perforated cover
- f = Touch (Enclosure) current:  
B for <100uA  
T for <75uA

- g = Earth leakage current:  
 D for Class II (no Earth)  
 L for <300uA  
 R for <150uA  
 T for <100uA
- h = E or In for inhibit  
 T or En for enable
- i = A for AC OK option  
 N for no AC OK option  
 P for Power Good Option (500A or 500PA models only)
- j = Blank for dual fuses fitted  
 FL for single fuse fitted in the Live line

klm = Blank for standard output settings  
 May be three numbers from 0 to 9 (preceded by -) which denotes various output voltage/current settings within the specified ranges of each output for a particular unit. (may define non-safety related parameters/feature, e.g. reduced primary current limit, reduced OVP)

Input Parameters

Nominal input voltage 100 - 240 Vac  
 Input voltage range 85 - 264 Vac  
 Input frequency range 47 - 63 Hz  
 Maximum input current 7A (5.3A\*) rms

\* Input for 350W models.  
 All ratings apply for ambient temperatures up to 50°C.

At 85Vac the following deratings apply to all XMS500 TF models: 500W output power at 40°C ambient or 400W output power at 50°C ambient.

Output Parameters

†Output ratings are in accordance with the following table:

Standard models:

Output Channel	Voltage Designation	Vout nom.(V)	Adjustment Range (V)	Output Current (A)	Output Power (W)
CH1 (500W)	12	12	11.6 - 13.2	41.6	500
	24	24	23.8 - 25.2	20.8	500
	36	36	35.4 - 37.8	13.8(16*)	500(576*)
	40	40	38 - 42	12.5(15.16*)	500(576*)
	48	48	47-50	10.4(12*)	500(576*)
CH1 (350W)	24	24	23.8 - 25.2	14.6	350
Standby Option	5	5	5 - 5.5	0.5	2.75
	5	5	5 - 5.5	2.0	11.0
	12	12	12-13.2	1	13.2
	N	10	5 – 15	0	0
Fan Supply	N	-	-	-	-
	N1	24	Fixed	0.2	4.8
	N2	12	6-12	-	3.0
	N3	12	Fixed	0.25	3.0

\*576W peak power up to 2 minutes with 500Wrms power using the following formula:

$$500Wrms = ((\text{peakpower}^2 \times T1 + \text{reducedpower}^2 \times T2) / (T1 + T2))^{1/2}$$

Where T1 = peak power time on in seconds

T2 = reduced power time on in seconds

Non-Standard Models:

X00011#	XMS350-24-NN-N1CBLEN	Customer specific chassis
X00023#	XMS500D-24.5-5C-KFCBDEN	Customer specific top fan/chassis model
X00073#	XMS500-24-NN-NCBRInA	Customer specific chassis/cover

Where # can be any letter denoting non-safety related changes.

Output Limitations:

All outputs are SELV

Channel 1 is hazardous energy

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

This report is a reissue of CBTR Ref. No. E135494-A103-CB-2-Reissue, -Amendment-1, -Amendment-2, & -Amendment-3; CB Test Certificate Ref. No. DK-64643-A3-UL, DK-64587-A3-UL dated 2020-07-30.

The reissue is due to 3 previous Amendment reports being issued. During this revision additional magnetic supplier "Axis Corporation" was added in the LoCC table.

Based on the previously conducted testing and the review of product technical documentation, it has been determined that the product continues to comply with the standard and all required tests were carried out under the original investigation.

The test dates shown are those of the original and previous amendment testing.

Cooling for units with customer supplied air (all models except KF and TF fan supplies)

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:

Circuit Ref:	Description	Max. Temperature (°C)
J1	Input Connector	105
C7, C8	X Capacitor	100
L2, L4	Common Mode Choke Winding	130 (145)
L6	Series Mode Choke Winding	130
ASY5 D7	Bridge Diode	125 (130)
C14, C11, C21, C22, C10, C23, C24, C6, C18 (++)	Y Capacitors	100
C26	Capacitor	85 (105)
RLY1	Relay	100
U1, U2, U5, U6, U7 (++)	Opto-Coupler	100
TX1 (Standby)	Windings and core	120 (130)
TX3 500W	Windings and core	120 (130)
TX3 350W	Windings and core	100 (110)
ASY6 Q3	Boost FET	127 (130)
ASY4 Q1	Forward FET	127 (130)
ASY3 Q4	Output FET	127 (130)
C13	Boost Capacitor	80 (105)
C9	Boost Capacitor	70 (105)

L3, L5	Boost Choke Winding	130 (140)
L7	Channel 1 Output Choke	130 (140)
C4, C5, C15, C16, C17		
C19, C20 (++)	Electrolytic Capacitors	80 (105)

+ The higher temperature limits in brackets may be used but product life may be reduced.

++ When fitted

### 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 : 50°C
- The product is intended for use on the following power systems : TN, TT
- The equipment disconnect device is considered to be : provided by the end equipment
- 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
- Multi-layer PWBs accepted under CBTR Ref. No. E349607-A23 dated 2014-07-31 and letter report in Enclosure 8-07

### Engineering Conditions of Acceptability

When installed in an end-product, consideration must be given to the following:

- The following Production-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-SELV: 405Vrms, 655Vpk, Primary-Earthed Dead Metal: 365Vrms, 632Vpk
- The following secondary output circuits are SELV : All
- The following secondary output circuits are at hazardous energy levels : Channel 1
- The following secondary output circuits are at non-hazardous energy levels : Standby output, fan output
- The following output terminals were referenced to earth during performance testing : All outputs and their return lines individually referenced to earth to obtain maximum working voltage.
- The power supply terminals and/or connectors are : Not investigated for field wiring
- The maximum investigated branch circuit rating is : 20 A
- The investigated Pollution Degree is : 2
- Proper bonding to the end-product main protective earthing termination is : Required (except for the XMSxD model)
- An investigation of the protective bonding terminals has : Been conducted
- 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) : TX1 Class F. TX3 (Class B or F) see table 1.5.1 for details of insulation systems used.
- The following end-product enclosures are required : Mechanical, Fire, Electrical
- All models require component temperatures monitored as detailed in the additional information (except - KF and -TF fan models)
- The product was tested for use at the maximum ambient temperature (TMA) 50°C in normal conditions permitted by the manufacturer, see additional information for details.
- The Customer fixings screw penetration require special attention: see handbook in enclosures for details.

**Abbreviations used in the report:**

- normal conditions	<b>N.C.</b>	- single fault conditions	<b>S.F.C</b>
- functional insulation	<b>OP</b>	- basic insulation	<b>BI</b>
- double insulation	<b>DI</b>	- supplementary insulation	<b>SI</b>
- between parts of opposite polarity	<b>BOP</b>	- reinforced insulation	<b>RI</b>

**Indicate used abbreviations (if any)**