



Test Report issued under  
the responsibility of:



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

**Report Reference No** .....: E135494-A81-CB-3  
**Date of issue** .....: 2015-02-26  
**Total number of pages** .....: 13

**CB Testing Laboratory** .....: UL International Demko A/S  
**Address** .....: Borupvang 5A, 2750 Ballerup, Denmark

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

**Test specification:**

**Standard** .....: IEC 60950-1:2005 (Second Edition); Am1:2009 + Am2:2013  
**Test procedure** .....: CB Scheme  
**Non-standard test method** .....: N/A

**Test Report Form No.** .....: IEC60950\_1F  
**Test Report Form originator** .....: SGS Fimko Ltd  
**Master TRF** .....: Dated 2014-02

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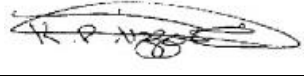

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**General disclaimer**

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<b>Test item description</b> .....	Switch Mode Power Supply
Trade Mark .....	TDK-Lambda
	
Manufacturer .....	TDK-LAMBDA UK LTD KINGSLEY AVE ILFRACOMBE DEVON EX34 8ES UNITED KINGDOM
Model/Type reference .....	CFE400M or CFE-400M series switch mode power supplies (See Model Differences for details of nomenclature)
Ratings .....	100 - 240Vac nom, 47 - 440Hz, 6.1A rms max. (see Model Differences for details)

<b>Testing procedure and testing location:</b>	
<input type="checkbox"/> <b>CB Testing Laboratory</b>	Testing location / address .....
<input type="checkbox"/> <b>Associated CB Test Laboratory</b>	Testing location / address .....
	Tested by (name + signature) .....
	Approved by (name + signature).....
<input type="checkbox"/> <b>Testing Procedure: TMP/CTF Stage 1</b>	Testing location / address .....
	Tested by (name + signature) .....
	Approved by (name + signature).....
<input type="checkbox"/> <b>Testing Procedure: WMT/CTF Stage 2</b>	Testing location / address .....
	Tested by (name + signature) .....
	Witnessed by (name + signature) ...
	Approved by (name + signature).....
<input checked="" type="checkbox"/> <b>Testing Procedure: SMT/CTF Stage 3 or 4</b>	Testing location / address .....: TDK-Lambda UK Limited, Kingsley Avenue, Ilfracombe, EX34 8ES. United Kingdom
	Tested by (name + signature) .....: T. Burgess, S. Hirstwood 
	Approved by (name + signature).....: K.P. Tizzard 
	Supervised by (name + signature) ..: Bartlomiej Zmijewski 
<input type="checkbox"/> <b>Testing Procedure: RMT</b>	Testing location / address .....
	Tested by (name + signature) .....
	Approved by (name + signature).....
	Supervised by (name + signature) ..

<b>List of Attachments</b>
National Differences (0 pages)
Enclosures (0 pages)
<b>Summary of Testing:</b>
No tests were conducted
<b>Summary of Compliance with National Differences:</b>

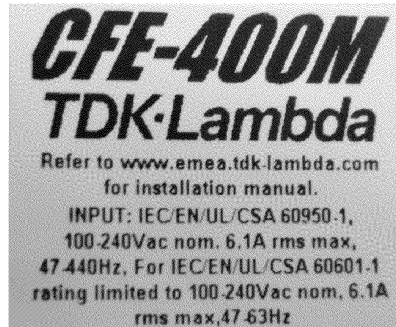
Countries outside the CB Scheme membership may also accept this report.

List of countries addressed: AR, AT, AU, BE, BG, BY, CA, CH, CN, CS, CZ, DE, DK, ES, EU, FI, FR, GB, GR, HU, IE, IL, IN, IT, JP, KR, MY, NL, NO, NZ, PL, PT, RO, SA, SE, SI, SK, UA, US, ZA

The product fulfills the requirements of: CSA C22.2 No. 60950-1-07 + A1:2011, EN 60950-1:2006 + A1:2010 + A11:2009 + A12:2011 + A2:2013, UL 60950-1 2nd Ed. Revised 2011-12-19

**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.



<b>Test item particulars :</b>	
Equipment mobility .....	for building-in
Connection to the mains .....	Connection to 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 .....	Yes (Norway only)
IT testing, phase-phase voltage (V) .....	230V
Class of equipment .....	Class I (earthed)
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) .....	1 kg 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>	
Date(s) of receipt of test item .....	N/A
Date(s) of Performance of tests .....	N/A
<b>General remarks:</b>	
<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 point is used as the decimal separator.</p>	
<b>Manufacturer's Declaration per Sub Clause 4.2.5 of IEC 60950-1:</b>	
<p>The application for obtaining a CB Test Certificate includes more than one factory 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 .....</p> <p>When differences exist, they shall be identified in the General Product Information section.</p>	
<b>Name and address of Factory(ies):</b>	TDK-LAMBDA UK LTD KINGSLEY AVE ILFRACOMBE DEVON EX34 8ES UNITED KINGDOM

PANYU TRIO MICROTRONIC CO., LTD,  
SHIJI INDUSTRIAL ESTATE,  
DONGYONG,  
NANSHA ,  
GUANGZHOU GUANGDONG CHINA

## GENERAL PRODUCT INFORMATION:

### Report Summary

The original report was modified on 2015-05-13 to include the following changes/additions:  
Correction 2 to report E135494-A81-CB-3 consist in republishing of the report due to administrative reasons.

### Product Description

CFE400M or CFE-400M series switch mode power supplies for building into host equipment. (see Model Differences for nomenclature and details)

### Model Differences

CFE400M or CFE-400M series as described below:

Units may be marked with a Product Code: U7x or Y7x where x may be any number of letters and/or numbers 0 to 9.

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

Unit Configuration Code:

CFE400Mx-a-bc-defg-hi-j-k-lmn-o

Where:

x = Blank for Y2 capacitors from output to earth  
P for Y1 capacitors from output to earth

a = Channel 1 output Voltage (see Ch1 in the table below, adjustment range column).

b = Standby voltage (see standby in the table below, adjustment range column).  
N for no supply

c = N no for supply.  
C for 0.1A.  
H for 2A.

d = NN for no fan, no fan supply  
N1 for 12V nom / 0.25A fan supply. (V varies with Ch1 output voltage)  
TF for chassis with fan fitted to cover.

e = U for chassis only.  
C for chassis with perforated or top fan cover.  
S for chassis with cover.

f = M for Molex KK type 41791 input connector or equivalent.  
S for screw terminal input connector.

g = S for standard Leakage,  
L for low Leakage,  
R for reduced Leakage  
T for tiny Leakage\*

h = Y for Oring FET included.  
N for no Oring FET.

i = N for no inhibit or enable.  
T for inhibit.  
E for enable.

j = Omit for standard channel 1 output voltage with no droop.  
Dx where D is for units with programmed negative load regulation,  
x is the voltage of the regulation in 100mVolts and is within the Output Adjustment range  
(example, D5 = 0.5V of negative load regulation).

k = Omit for no secondary comms.

lmn = Blank for standard output settings or three numbers from 0 to 9 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)

o = Blank for dual fuse input or -FL for single fuse input in the live line

\* S >300µA Leakage, L <300µA Leakage, R <150µA Leakage and T <75µA Leakage  
Input Parameters

Standard	60950-1
Nominal input voltage	100 - 240 Vac
Input voltage range	85 - 264 Vac
Input frequency range	47 - 440 Hz
Maximum input current	6.1A rms (6.4A rms 450W peak)

All ratings apply for ambient temperatures up to 50°C. (see variations and limitations below)

#### Output Parameters

There are three CFE400M standard models with various options and output parameters shown in the tables below.

Standard models:

Standard models at 50°C maximum ambient in forced air and top fan models:

Output Channel	Vout Nom.	Adjustment Range (V)	Maximum Output Current (A)	Maximum Power (W)
Channel 1	12	9 - 14.4	33.33 (35.7†)	400 (450†)
	15	14.4 - 15.5	24.67	370
	24	18 - 28.8	16.67 (18.75†)	400 (450†)



	48	36 - 54	8.34 (9.38†)	400 (450†)
Fan output (optional)	12	9 - 12	0.25	3
Standby output (optional)	5	5 - 5.5*	2	11
Standby output (optional)	5	5	0.1	0.5

Variations and limitations of use for Standard models at 50°C maximum ambient in forced air and fan models:

1. \* Can be adjusted at the factory only.
2. Maximum continuous power output 400W.
3. † Peak power of 450W for 10 seconds maximum, maximum rms power of 400W.
4. See Cooling for customer air below for forced air and convection cooled models.
5. Channel 1 output de-rated 10W/°C from 50°C - 70°C.

Standard model at 50°C maximum ambient convection cooled:

Output Channel	Vout Nom.	Adjustment Range (V)	Maximum Output Current (A)	Maximum Power (W)
Channel 1	12	9 - 14.4	20.83 (35.7†)	250 (450†)
	15	14.4 - 15.5	15.4	231
	24	18 - 28.8	10.41 (18.75†)	250 (450†)
	48	36 - 54	5.21 (9.38†)	250 (450†)
Fan output (optional)	12	9 - 12	0.25	3
Standby output (optional)	5	5 - 5.5*	2	11
Standby output (optional)	5	5	0.1	0.5

Variations and limitations of use for Standard models at 50°C maximum ambient convection cooled:

1. \* Can be adjusted at the factory only.
2. Maximum continuous power output 250W.
3. † Peak power of 450W for 10 seconds maximum, maximum rms power of 250W.
4. See Cooling for customer air below for convection cooled models.
5. Channel 1 output de-rated 10W/°C from 50°C - 60°C.

Standard model at 40°C maximum ambient convection cooled:

Output Channel	Vout Nom.	Adjustment Range (V)	Maximum Output Current (A)	Maximum Power (W)
Channel 1	12	9 - 14.4	25 (35.7†)	300 (450†)
	15	14.4 - 15.5	18.46	277
	24	18 - 28.8	12.5 (18.75†)	300 (450†)
	48	36 - 54	6.25 (9.38†)	300 (450†)
Fan output (optional)	12	9 - 12	0.25	3
Standby output (optional)	5	5 - 5.5*	2	11
Standby output (optional)	5	5	0.1	0.5

Variations and limitations of use for Standard models at 40°C maximum ambient convection cooled:

1. \* Can be adjusted at the factory only.
2. Maximum continuous power output 300W.
3. † Peak power of 450W for 10 seconds maximum, maximum rms power of 300W.
4. See Cooling for customer air below for convection cooled models.
5. Channel 1 output de-rated 5W/°C from 40°C - 50°C.

Standard model at 40°C maximum ambient convection cooled:

Output Channel	Vout Nom.	Adjustment Range (V)	Maximum Output Current (A)	Maximum Power (W)
Channel 1	48	38 - 42	6.25 (15†)	300 (630†)
Standby output (optional)	5	5	0.1	0.5

Variations and limitations of use for Standard models at 40°C maximum ambient convection cooled:

1. Maximum continuous power output 300W.
2. † Peak power of 630W with Ch1: 10ms sawtooth current waveform of 42V at 15A to 5A for 10s followed by 42V at 1A for 30s minimum. Standby at 5V, 0.1A continuous.
3. See Cooling for customer air below for convection cooled models.

#### Output Limitations

All outputs are SELV.

Seriesing of outputs is not allowed without further evaluation in end-use equipment.

All outputs have basic spacings to earth rated for mains - 250Vac, and due consideration must be given to this in the end product design.

#### Environmental parameters

Description	Operation	Storage
Use	Indoor	-
Temperature	0°C - +70°C *	-40°C - +70°C
Humidity	5 - 95% RH, non-condensing	5 - 95% RH, non-condensing
Altitude	-200m - 5000m	-200m - 5000m
Pressure	54kPa - 106kPa	54kPa - 106kPa
Orientation	Sides, vertical with input lowest, horizontal (customer air versions: all)	All
Material Group	IIIb	
Pollution Degree	2	
Overvoltage Category	II	
Class	I	

\* See variations and limitations of use for each model above.

#### Additional Information

Marking label is representative of entire series

#### Customer Air Cooling:

The following method must be used for determining the safe operation of PSUs when NN, U or S options (Customer Air) are fitted, i.e. fan not fitted to PSU. The minimum permitted airflow for customer air cooling is 0.5m/s.

For PSUs and assemblies cooled by customer supplied airflow the components listed in the following table must not exceed the temperatures given. Additionally ratings specified for units with an internal fan shall still be complied with, eg. mains input voltage range, maximum output power, module voltage / current ratings and maximum ambient temperature. To determine the component temperatures the heating tests shall be conducted in accordance with the requirements of IEC60950-1. Consideration should also be given to the requirements of other safety standards.

Test requirements include: PSU/assembly 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/assembly. To determine the most adverse conditions consideration shall be given to the end use equipment maximum operating ambient, the PSU/assembly loading and input voltage, ventilation, end use equipment orientation, the position of doors & covers, etc. Temperatures shall 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 shall be run until all temperatures have stabilised.

Circuit Ref.	Description	Max. Temperature (°C) †
J1	Input connector	105
C7, C8	X capacitor	100
L1, L2	Common mode choke winding	110
L9	Series mode choke winding	120 (130)
TX1††, TX3	Standby trx winding	110 (130)
U2, U7	Opto-coupler	100
ASY4-B	PFC FET	120
ASY4-C	Boost diode	120
L3, L5	Boost choke winding	110 (140)
C9	Boost capacitor	83 (105)
ASY5	Bridge	125 (130)
RLY1	Relay	100
L6 winding	Primary resonant choke winding	125 (145)
TX5-A	Primary winding	110 (130)
TX5-B	Channel 1 winding	110 (130)
TX5-C	Sec aux winding	110 (130)
XQ18	HS Ch1 synchronous rectifier	120 (130)
XL1	Channel 1 output choke	110 (130)
ASY7-C (††)	Standby switch	120
ASYF4-F (††)	Oring FET	120
C1, C3, C5, C16, C17, C21 (††)	Electrolytic capacitors	82.5 (105)
C6, C18 (††)	Electrolytic capacitors	91 (105)

† The higher temperatures limits in brackets may be used but product life may be reduced.

†† When fitted.

#### E135494-A81-CB-3:

This report is a reissue of CBTR Ref. No.: E135494-A81-CB-2, CB Test Certificate Ref. No. DK-27627-A2-UL, based on the previously conducted testing and the review of product technical documentation including photos, schematics, wiring diagrams and similar, it has been determined that the product continues to comply with the standard.

The original report was modified on 2014-10-31 to include the following changes/additions:-

1. Addition/deletion of multilayer PWBs to critical component list
2. Alternative transformer (TX1, TDK P/N 230071) and IC (Infineon ICE 3BR2565 L) added.
3. Alternative F2 Fuse to include 1A Hollyland 5EF-010H and 2A Daito DCP-20.
4. Enclosures updated to include revised handbook, drawings, photograph and licences.
5. Cemented joint test updated
6. New 15V range added
7. Updated critical component list
8. Added option to fit single fuse on the live line. No additional testing required as both fuses fail in abnormal conditions.
9. Alternative Y capacitors (4.7nF) added.

Correction 1 to E135494-A81-CB-3:

This is a correction of non-technical error consisting in improper setting a CBTL address.

Correction 2 to E135494-A81-CB-3:

This is a correction consisting in republishing of the report due to administrative reasons.

### 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: 70°C (see Product differences for limitations) --
- The product is intended for use on the following power systems: IT (Norway only) TN --
- 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 --
- The product was investigated to the following additional standards: EN 60950-1:2006 + A1:2010 + A11:2009 + A12:2011 + A2:2013 (which includes all European national differences, including those specified in this test report), UL 60950-1 2nd Ed. Revised 2011-12-19, CSA C22.2 No. 60950-1-07 + A1:2011 --
- Multilayer PWB's accepted under CBTR Ref. No. E349607-A23 dated 2014-07-31 and letter report in enclosure 8-08 of this report. --

### 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 --
- 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 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 --
- An investigation of the protective bonding terminals has: Been conducted, , --
- The following magnetic devices (e.g. transformers or inductor) are provided with an OBJY3 insulation system with the indicated rating greater than Class A (105°C): TX1, TX3 and TX5 (Class F) - see table 1.5.1 for details of insulation systems used --
- The following end-product enclosures are required: Mechanical, Fire, Electrical --
- The following components require special consideration during end-product Thermal (Heating) tests due to the indicated maximum temperature measurements during component-level testing: Models without a fan require component temperatures monitored as detailed in Additional Information --
- The end-product Electric Strength Test is to be based upon a maximum working voltage of: Primary-SELV: 384 Vrms, 614 Vpk Primary-Earthed Dead Metal: 340 Vrms, 614 Vpk --
- The following secondary output circuits are SELV: All --

- The clearances and creepage distances have additionally been assessed for suitability up to 5000 m elevation. --
- Fans: The fan provided in this sub-assembly is provided with a fan guard to reduce the risk of operator contact with the fan., The fan provided in this sub-assembly is not intended for operator access. --
- For frequencies above 63Hz, touch current should be assessed in the end application. --

Abbreviations used in the report:

- normal condition .....	N.C.	- single fault condition .....	S.F.C
- operational insulation .....	OP	- basic insulation .....	BI
- basic insulation between parts of opposite polarity:	BOP	- supplementary insulation .....	SI
- double insulation .....	DI	- reinforced insulation .....	RI

Indicate used abbreviations (if any)