Test Report issued under the responsibility of:

TEST REPORT
IEC 61010-1
Safety requirements for electrical equipment for measurement, control, and laboratory use
Part 1: General requirements

Report Number. ..... :	T223-0768/25
Date of issue ..... :	2025-12-02
Total number of pages ..... :	361
Name of Testing Laboratory preparing the Report ..... :	**SIQ Ljubljana** SIQ Ljubljana is accredited by Slovenian Accreditation with accreditation number LP-009 in the field of testing (SIST EN ISO/IEC 17025)
Applicant's name ..... :	TDK-Lambda UK Ltd.
Address ..... :	Kingsley Ave, Ilfracombe, EX34 8ES, United Kingdom
Test specification:	
Standard ..... :	IEC 61010-1:2010, IEC 61010-1:2010/AMD1:2016
Test procedure ..... :	CB Scheme
Non-standard test method ..... :	N/A
TRF template used ..... :	IECEE OD-2020-F1:2020, Ed.1.3
Test Report Form No. ..... :	IEC61010_1P
Test Report Form(s) Originator .... :	VDE Prüf- und Zertifizierungsinstitut GmbH
Master TRF ..... :	2021-04-12

If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

This report is not valid as a CB Test Report unless signed by an approved IECEE Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

General disclaimer:

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Test item description..... :	Switching power supplies and accessory rack
Trade Mark..... :	TDK·Lambda
Manufacturer ..... :	TDK-Lambda UK Ltd. Kingsley Ave, Ilfracombe, EX34 8ES, United Kingdom
Model/Type reference..... :	1. Single power supply modules: HFE3500-24/FSD, HFE3500-24/TSD, HFE3500-24/FSE, HFE3500-24/TSE, HFE3500-48/FSD, HFE3500-48/TSD, HFE3500-48/FSE, HFE3500-48/TSE 2. Rack module: HFE3500-S1U/TB
Ratings..... :	1. Single Power Supply Modules ratings: Input: 100-240 V a.c.; 25 A max; 47 – 440 Hz; (for 2016 W output) 200-240 V a.c.; 22 A max; 47 – 440 Hz; (for 3504 W output) Output: 24 V d.c., 84 A (2016 W); 12 V d.c., 1 A (24 V version power supply module @ input 100-240 V a.c.); 24 V d.c., 146 A (3504 W); 5 V d.c., 2 A (24 V version power supply module @ input 200-240 V a.c.); 48 V d.c., 42 A (2016 W); 12 V d.c., 1 A (48 V version power supply module @ input 100-240 V a.c.); 48 V d.c., 73 A (3504 W); 5 V d.c., 2 A (48 V version power supply module @ input 200-240 V a.c.) 2. Rack module ratings: Input: refer to power supply modules (4 power supply modules included in the rack; each power supply module with individual connection to mains) Output: For output voltage refer to power supply modules (up to 4 power supply modules included in the rack), max output current of the rack: 584 A (max 320 A per metal busbar), max output power of the rack: 14016 W

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

☒	**CB Testing Laboratory:**	**SIQ Ljubljana**	
Testing location/ address ..... :		**Mašera-Spasićeva ulica 10, SI-1000 Ljubljana, Slovenia**	
Tested by (name, function, signature)..... :		Aleš Ivec (Authorization of test report) Service Provider	
Approved by (name, function, signature) .. :		Matej Šmidovnik Reviewer	
☐	**Testing procedure: CTF Stage 1:**		
Testing location/ address ..... :			
Tested by (name, function, signature)..... :			
Approved by (name, function, signature) .. :			

☐	**Testing procedure: CTF Stage 2:**		
Testing location/ address .....:			
Tested by (name + signature).....:			
Witnessed by (name, function, signature) . :			
Approved by (name, function, signature) .. :			
☐	**Testing procedure: CTF Stage 3:**		
☐	**Testing procedure: CTF Stage 4:**		
Testing location/ address .....:			
Tested by (name, function, signature)..... :			
Witnessed by (name, function, signature) . :			
Approved by (name, function, signature) .. :			
Supervised by (name, function, signature) :			

List of Attachments (including a total number of pages in each attachment)		
Document No.	Documents included / attached to this report (description)	Page No.
Enclosure No. 1	National Deviations for IEC 61010-1:2010 3rd Edition + A1	From 251 to 273
Enclosure No. 2	Pictures of the unit	From 274 to 291
Enclosure No. 3	Documentation	From 292 to 361

Documents referenced by this report (available on request):		
Document Name or No.	Documents description	Page No.

Summary of testing:

The products were tested according to the standard IEC 61010-1: 2010 (Third Edition) + Corrigendum 1:2011 + AMD1:2016 + Corrigendum 1:2019 and EN 61010-1:2010 + AMD1:2019 + Corrigendum 1:2019. Additionally, products were also evaluated according to the standards CAN/CSA C22.2 No. 61010-1-12 and UL 61010-1:2012 (Third Edition).

1. The products were tested to be suitable for connection to max. 32 A branch circuit (each internal Power Supply Module). The unit is approved for connection to the following connections to TN / TT power distribution systems.

2. All secondary output circuits are separated from mains by reinforced insulation and rated non-hazardous live (within 6.3.1 limits), hazardous energy levels.

3. The unit provides no disconnecting device. Disconnect device must be provided in the final installation (end-product consideration).

4. Safety Instructions: Built in product, safety instructions are end product considerations. In addition there are some safety instructions in the manual and/or Technical datasheet.

5. The input and output terminals on Rack module are suitable for factory and field wiring.

6. The power supplies and complete rack is rated class I. The power supply modules and rack module shall be properly bonded to the main protective bonding termination in the end product.

7. The transformers T301 (aux), TX1 and TX2 (inside of the power supply modules) provide reinforced insulation. These transformers are built up to fulfil the requirement of insulation class F and provide in addition an UR (OBJY2) insulation system).

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.

9. A suitable Electrical and Fire enclosure shall be provided in the end equipment. Front side of power supply modules (parts near fans when power supply modules inserted in the rack) are comply with the requirements of the fire and electrical enclosure.

10. Measured leakage/touch current exceeds the limits: “Caution” on the label → High touch current. Output of the unit (main output and aux. output) should be connected with PE in end application. Reliable earth provided/required.

11. The products were evaluated for a maximum ambient of 40°C for 48 V output power supply modules and 40°C or 50°C for 24 V output power supply modules. De-rating as specified below be considered for ambient above 40°C (for 24 V output power supply modules). De-rating as specified under Encl. No. 3.0 shall be considered for input voltage.

    <u>De-rating for 24 V output power supply modules for ambient above 40°C:</u>
    Input voltage: 180 Vac → output load 3300 W (@ambient 50°C)
    Input voltage: 264 Vac → output load 3300 W (@ambient 50°C)

(I)	Output Characteristics			HFE3500-24	HFE3500-48
1	Continuous output power	180 ≤ Vin ≤ 264Vac	W	3504	3504
		170 ≤ Vin < 180Vac	W	Linear derating 1% per V ac from 180V ac	
		90 ≤ Vin < 170Vac	W	2016	2016
		85V ≤Vin < 90Vac	W	Linear derating 1.3% per V ac from 90V ac	
2	Rated Output Current	180 < Vin ≤ 264Vac	A	146	73
		90 ≤ Vin ≤ 132Vac	A	84	42
		85V ≤Vin < 90Vac	A	Linear derating 1.3% per V ac from 90V ac	

Clause	Comment
—	—

Test Report History:
This report may consist of more than one report and is only valid with additional or previous issued reports:

Report Ref. No.	Item
T223-0768/25 (dated 2025-12-02)	Initial test report issued.

Tests performed (name of test and test clause):	**Testing location:**
4.4 Testing in SINGLE FAULT CONDITION: **4.4.2.7 Mains transformer short and overload** **4.4.2.8 Output abnormal testing** **4.4.2.10 Air holes closed, fans blocked** **4.4.2.12 Single faults on components** **5.1.3c) MAINS supply** **5.3 Durability of markings** **6.2 Determination of ACCESSIBLE parts** **6.3.1 Values in NORMAL CONDITION** **6.3.2 Values in SINGLE FAULT CONDITION** **6.5.2.4 / 6.5.2.5 Bonding impedance, earth trace test (CSA C22.2 No. 0.4)** **6.7 Insulation requirements- Clearances and Creepage distances** **6.8 Dielectric strength test** **6.8.2 Humidity Conditioning test** **10 Temperature Measurements** **10.5.3 Ball pressure test**	**SIQ Ljubljana** **Mašera-Spasićeva ulica 10, SI-1000 Ljubljana, Slovenia**

Summary of compliance with National Differences (List of countries addressed):

☒ **The product fulfils the requirements of National differences for Canada, USA, European group differences and national differences, Japan and Switzerland. For details refer to Enclosure No. 1.**

☒ **The product fulfils the requirements of EN 61010-1:2010 + AMD1:2019.**

☒ **The product fulfils the requirements of CAN/CSA C22.2 No. 61010-1-12; UPD1:2015; UPD2:2016; AMD1:2018; COR1:2019; UPD3:2023; UPD4:2024 and UL 61010-1:2012 (3rd Ed.) + A1.**

Statement concerning the uncertainty of the measurement systems used for the tests

☐ **Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:**

Procedure number, issue date and title:

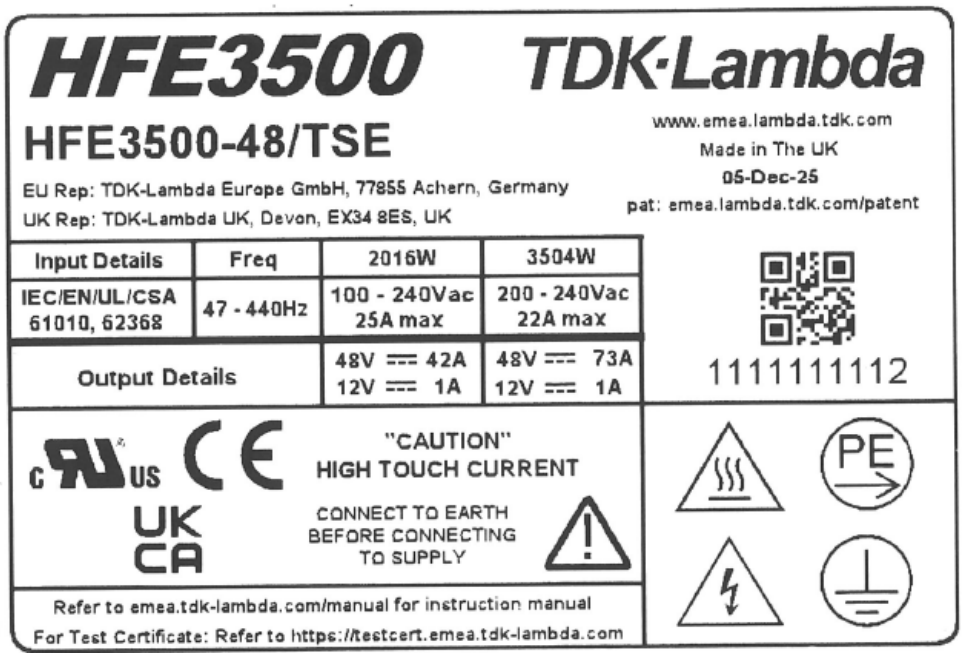
Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing.

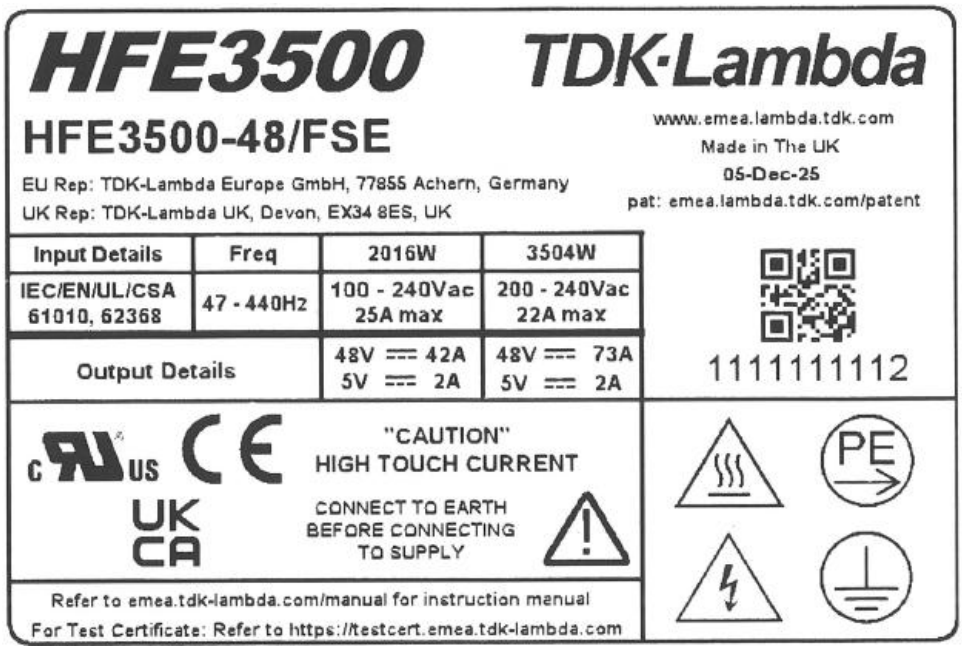
☒ **Statement not required by the standard used for type testing**

Copy of marking plate:

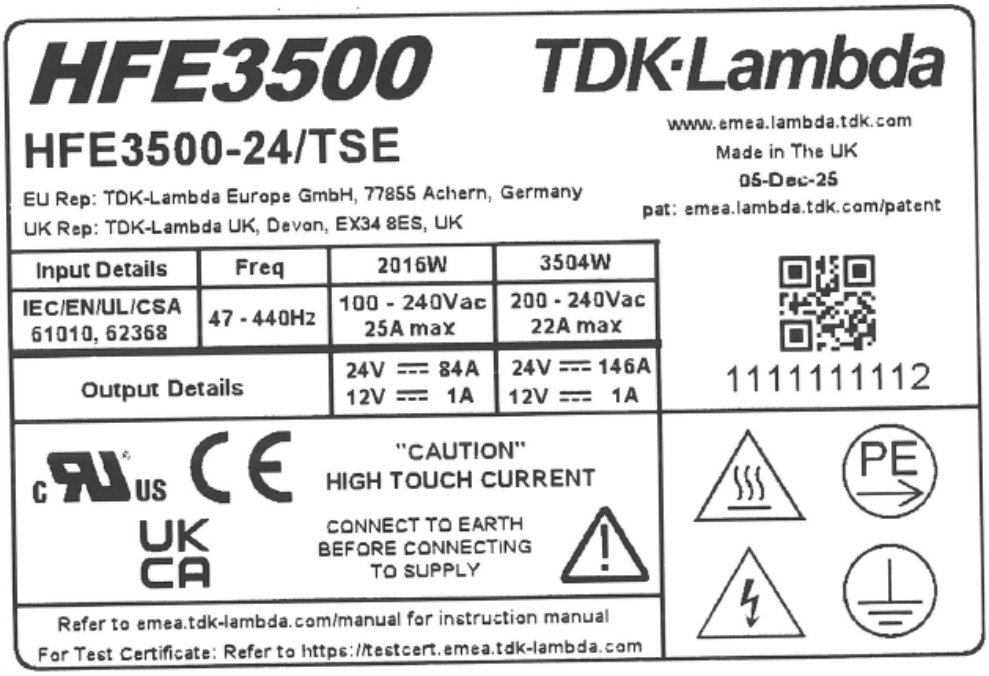
The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

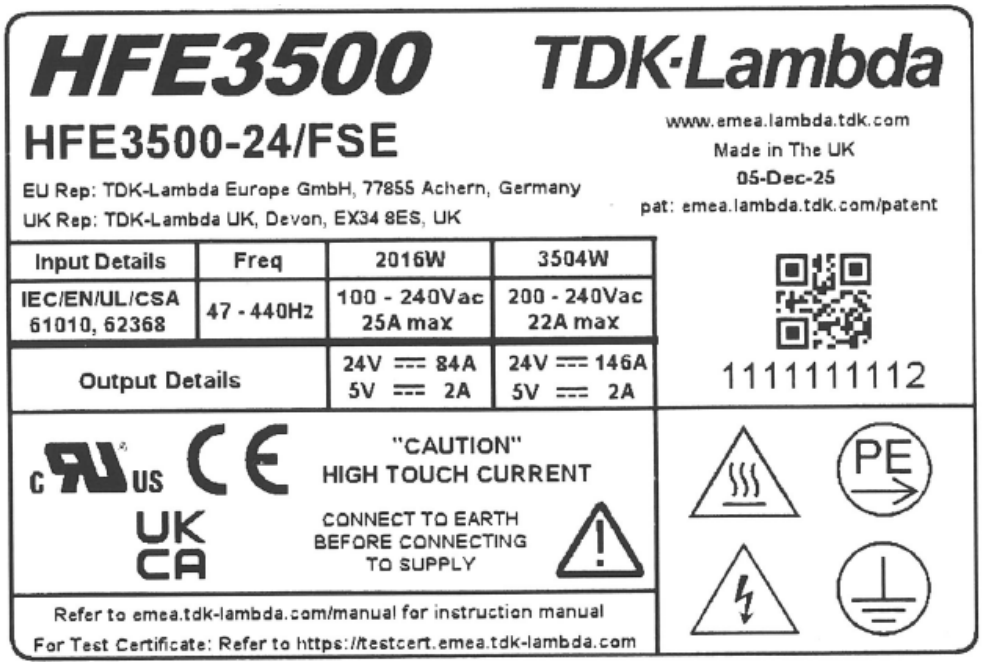
Power Supply modules





Corrected page on 2025-12-10 due to labels changed.
A.Ivec





Corrected page on 2025-12-10 due to labels changed.
A.Ivec

RACK label:

HFE3500-S1U/TB

24V MODELS: 584A (146A PER INSTALLED HFE3500-24/F or HFE3500-24/T UNIT)			
Input Details Per UNIT IEC/EN/UL/CSA 61010,62368	Freq 47 - 440Hz	2016W 100 - 240Vac 25A max	3504W 200 - 240Vac 22A max
Output Details		2016W	3504W
HFE3500-24/F		24V ⎓ 84A 5V ⎓ 2A	24V ⎓ 146A 5V ⎓ 2A
HFE3500-24/T		24V ⎓ 84A 12V ⎓ 1A	24V ⎓ 146A 12V ⎓ 1A

48V MODELS: 292A (73A PER INSTALLED HFE3500-48/F or HFE3500-48/T UNIT)			
Input Details Per UNIT IEC/EN/UL/CSA 61010,62368	Freq 47 - 440Hz	2016W 100 - 240Vac 25A max	3504W 200 - 240Vac 22A max
Output Details		2016W	3504W
HFE3500-48/F		48V ⎓ 42A 5V ⎓ 2A	48V ⎓ 73A 5V ⎓ 2A
HFE3500-48/T		48V ⎓ 42A 12V ⎓ 1A	48V ⎓ 73A 12V ⎓ 1A
MAX. OUTPUT POWER: 14,016W		MAX. OUTPUT CURRENT: 584A (MAX. 320A PER EACH OUTPUT)	

USE ONLY HFE3500 SERIES POWER SUPPLIES OF THE SAME OUTPUT VOLTAGE AND Standby VOLTAGE RATING.

"CAUTION" HIGH TOUCH CURRENT	CONNECT TO EARTH BEFORE CONNECTING TO SUPPLY

c UL us CE UKCA PE

TDK·Lambda

Serial No.

E252030000

www.emea.lambda.tdk.com

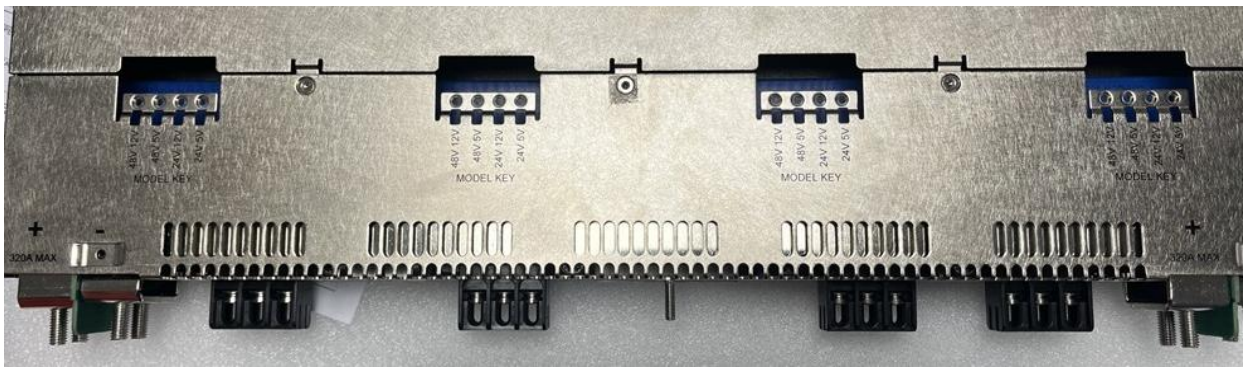
pat: emea.lambda.tdk.com/patent

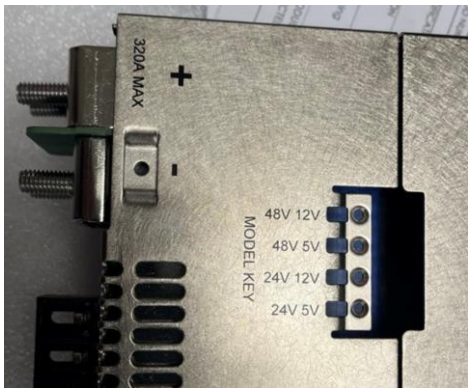
MADE IN THE UK

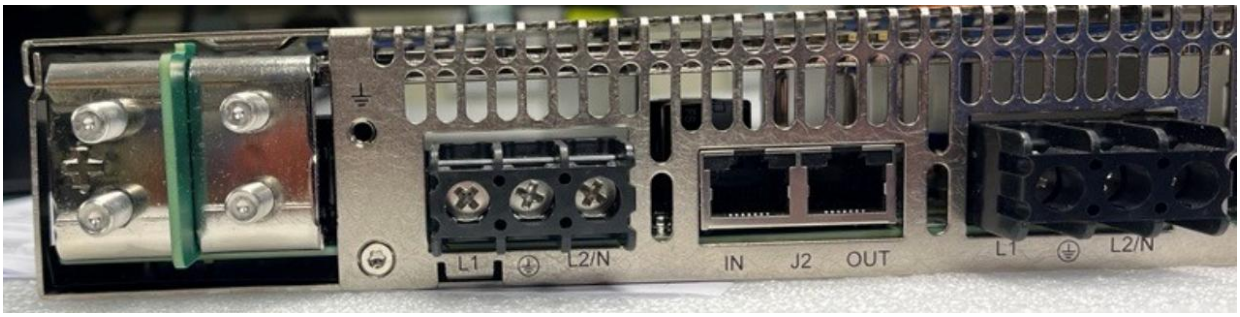
07-Nov-25

UK Rep: TDK-Lambda UK, Devon EX34 8ES, UK.

EU Rep: TDK-Lambda Europe GmbH, 77855 Achern, Germany.


MODEL KEY
320A MAX


320A MAX
+
-
MODEL KEY
48V 12V
48V 5V
24V 12V
24V 5V


L1
L2/N
IN
J2
OUT
L1
L2/N

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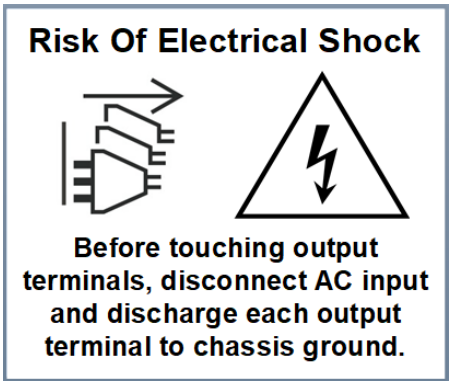
Risk Of Electrical Shock
Before touching output terminals, disconnect AC input and discharge each output terminal to chassis ground.

Test item particulars:	
Type of item ..... :	Measurement / Control / Laboratory
Description of equipment function..... :	Power supply
Connection to MAINS supply ..... :	The unit is for building-in and to be permanently connected to mains.
Overvoltage category ..... :	II
POLLUTION DEGREE..... :	2
Means of protection..... :	Class I (PE connected)
Environmental conditions ..... :	Extended (Specify): The product was evaluated for a maximum ambient of 40°C or 50 °C (see summary of testing for more information and deratings). Altitude ≤ 5000 m. Humidity ≤ 95 % (at 25°C, without condensation).
For use in wet locations..... :	No
Equipment mobility..... :	Built-in
Operating conditions..... :	Continuous
Overall size of equipment (W x D x H)..... :	Power supply: 108mm x 350mm x 40mm Rack: 483mm x 421mm x 45mm
Mass of equipment (kg)..... :	Approx. 1,950 kg (Power Supply Modules), approx. 12,750 kg (Rack equipped with all 4 Power Supply Modules)
Marked degree of protection to IEC 60529 ..... :	/
Possible test case verdicts:	
- Test case does not apply to the test object .....:	N/A (Not Applicable)
- Test object does meet the requirement.....:	P (Pass)
- Test object does not meet the requirement.....:	F (Fail)
Testing:	
Date of receipt of test item.....:	2025-04-25; 2025-05-20; 2025-07-08; 2025-09-18
Date (s) of performance of tests .....:	From 2025-06-02 to 2025-10-21

General remarks:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the issuing testing laboratory.
"(see ENCLOSURE #)" refers to additional information appended to the report.
"(see Form A.xx)" refers to a Table appended to the report.
Bottom lines for measurement Tables Forms A.xx are optional if used as record.

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

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:	
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..... :	☒ **Yes** ☐ **Not applicable**
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.p Shiji industrial estate, Dongyong, Nansha, Guangzhou, Guangdong 511453, China

General product information and other remarks:

The single power supply modules series HFE3500 is a family of front-end (component) power supplies for built-in use with 3504 W output power. All units provide a handle on front side for plugging/unplugging the unit to/from the rack. Rear side contains a connector with AC pins, output DC pins and signal pins. Only the front side is accessible to ordinary person once unit installed in the accessory racks.

The power supply modules are intended for accessory racks. The power supply modules may be used in the complete set of the accessory rack HFE3500-S1U/TB.

The complete EUT is rack module equipped with up to 4 power supply modules included for building-in intended for use within information technology or audio/video equipment.
There exist two different main output options (24 V d.c. or 48 V d.c.). Max. total power of each power supply module is 3504 W and max. power of rack module is 14016 W.

Power supply modules nomenclature
Unit Configuration Code:

HFEx-y/abcde

Where:

x - 3500

y - 24 or 48

Channel 1 output voltage

Input Voltage	Model	Output Voltage Channel 1	Voltage Range	Max Iout	Max Pout
100-240Vac	HFE3500	24	21.6-28.8	84	2016W
		48	43.2-57.6	42	
200-240Vac		24	21.6-28.8	146	3504W
		48	43.2-57.6	73	

a - Standby Output Voltage
F = 5V @ 2A
T = 12V @ 1A

b - Digital Interface
S = PMBus (fitted as standard)

c - Air flow
Blank = standard air flow

d - Fuse options
D = Dual AC Fuse
E = Single AC fuse in the live line

e - Coating options
blank = no coating options
CO = Coating
COx = Alternate Coating

Example: HFE3500-48/FSD
For a HFE3500, 48V with 5V standby, PMBus and dual fuse

Rack module nomenclature

Unit Configuration Code:

HFEx-y/abc

Where:

x - 3500

y - S1U

a – TB

b - LAN Digital Interface
Blank = Not fitted (note PMBus is provided as standard on rack)
LAN = LAN interface (integrated into rack backplane, connector on rack rear panel)

c - Coating options
Blank = No Coating
CO = Coating
COx = Alternate Coating

Description of model differences:

Minor changes between 48 V and 24 V version power supply modules such as transformer turns, output capacitors, synchronous rectifiers.

Description of special features:
(HV circuits, high pressure systems etc.)

None.