Test Report issued under the responsibility of:

TÜVRheinland®

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

Report Number.....:	32083425.303
Date of issue .....:	April 29, 2023
Total number of pages .....:	172 + Attachments
Name of Testing Laboratory preparing the Report .....:	TÜV Rheinland of North America, Inc.
Applicant's name.....:	TDK-Lambda Ltd.
Address .....:	56 Haharoshet St., P.O.B. 500 Karmiel Industrial Zone Karmiel 2161401, Israel
Test specification:	
Standard.....:	IEC 62368-1:2018
Test procedure.....:	CB Scheme
Non-standard test method .....:	N/A
TRF template used.....:	IECEE OD-2020-F1:2021, Ed.1.4
Test Report Form No. .....:	IEC62368_1E
Test Report Form(s) Originator ....:	UL(US)
Master TRF .....:	Dated 2022-04-14

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

General disclaimer:

The test results presented in this report relate only to the object tested.
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Test item description.....:	Switching power supplies and accessory racks
Trade Mark(s) .....:	TDK·Lambda
Manufacturer.....:	TDK Lambda Ltd. 56 Haharoshet St., P.O.B. 500 Karmiel Industrial Zone Karmiel 2161401, Israel
Model/Type reference.....:	**1)** Single Power Supply Modules: HFE1600-48xyzu/mmmmm or HFE1600-48xyzu-mmmmm, HFE1600-32xzu/mmmmm or HFE1600-32xzu-mmmmm, HFE1600-24xzu/mmmmm or HFE1600-24xzu-mmmmm, HFE1600-12xzu/mmmmm or HFE1600-12xzu-mmmmm (x=/S, blank; y=/POE, blank; z=-R, blank; u=/CO, blank; m=A-Z, 0-9, blank) **2)** Single Power Supply Modules: RFE1600-48xyu/mmmmm or RFE1600-48xyu-mmmmm, RFE1600-32xu/mmmmm or RFE1600-32xu-mmmmm, RFE1600-24xu/mmmmm or RFE1600-24xu-mmmmm, RFE1600-12xu/mmmmm or RFE1600-12xu-mmmmm (x=/S, blank; y=/POE, blank; u=/CO, blank; m=A-Z, 0-9, blank) **3)** HFE1600-48/INF **4)** HFE1600-48/SD **5)** HFE1600-12/S-R/001 **6)** Accessory rack: HFE1600-S1U-wu/mmmmm or HFE1600-S1U-wu-mmmmm HFE1600-D1U-wu/mmmmm or HFE1600-D1U-wu-mmmmm (w=TB or blank, u=/CO, blank, m=A-Z, 0-9, blank) **7)** Communication Module: HFE1600-LAN **8)** Single Power Supply Modules: HFE2500-48xyzu/mmmmm or HFE2500-48xyzu-mmmmm HFE2500-24xzu/mmmmm or HFE2500-24xzu-mmmmm HFE2500-12xzu/mmmmm or HFE2500-12xzu-mmmmm (x=/S, blank; y=/POE, blank; z=-R, blank; u=/CO, blank; m=A-Z, 0-9, blank) **9)** Single Power Supply Modules: RFE2500-48xyu/mmmmm or RFE2500-48xyu-mmmmm RFE2500-24xu/mmmmm or RFE2500-24xu-mmmmm RFE2500-12xu/mmmmm or RFE2500-12xu-mmmmm (x=/S, blank; y=/POE, blank; u=/CO, blank; m=A-Z, 0-9, blank) **10)** Single Power Supply Module: HFE2500-48/S-CQC **11)** Single Power Supply Module: HFE2500-12/S-R/RE **12)** Single Power Supply Module: HFE2500-24/S-Ky, HFE2500-12/S-Ky **13)** Accessory rack: HFE2500-S1Uwu/mmmmm or HFE2500-S1Uwu-mmmmm (w= TB, blank; u=/CO, blank; m=A-Z, 0-9, blank)

	14) Communication Module: HFE2500-LAN **15)** Single Power Supply Module: HFE2500-48/S-CQC2
Ratings ..... :	**1)** a) models without suffix -R (base models): Input: 100 - 240 VAC, 14.2 A max., 50/60 Hz; (*) Output: at ambient temperature up to 50°C, Vin=170-240 VAC,: 48VDC (38.4~58VDC), 33A max., 1584W max. 32VDC (25.6~38.4VDC), 47A max., 1504W max. 24VDC (19.2~29VDC), 67A max., 1608W max. 12VDC (9.6~13.2VDC), 133A max., 1596W max. b) models with suffix -R (reverse fan models): Input: 100-240 VAC, 13.5 A max., 50/60 Hz; (*) Output: at ambient temperature up to 50°C, Vin=170-240VAC,: 48VDC (38.4~58VDC), 27A max., 1296W max. 32VDC (25.6~38.4VDC), 38A max., 1216W max. 24VDC (19.2~29VDC), 54A max., 1296W max. 12VDC (9.6~13.2VDC), 107A max., 1284W max. **2)** Input: 100-240 VAC, 14.2 A max., 50/60 Hz; (*) Output: at ambient temperature up to 50°C, Vin=170-240VAC,: 48VDC (38.4~58VDC), 33A max., 1584W max. 32VDC (25.6~38.4VDC), 47A max., 1504W max. 24VDC (19.2~29VDC), 67A max., 1600W max. 12VDC (9.6~13.2VDC), 133A max., 1596W max. **3)** Input:100-240 VAC, 14.2 A max., 50/60 Hz; (*) Output: at ambient temperature up to 50°C, Vin=170-240VAC,: 48VDC (38.4~58VDC), 33A max., 1584W max. **4)** Input:100-240 VAC, 14.2 A max., 50/60 Hz; (*) Output: at ambient temperature up to 50°C Vin=170-240VAC,: 48VDC (38.4~58VDC), 27A max., 1296W max. **5)** Input:100-240 VAC, 11.7 A max., 50/60 Hz; (*) Output: at ambient temperature up to 35°C Vin=170-240VAC 12VDC (9.6~13.2VDC), 113A max., 1356W max. **6)** Input: (per each input): 100-240VAC, 14.2A max., 50/60 Hz. (*) Output: - output voltage: same with installed power supply modules - output current: HFE1600-S1U: according to number of installed modules but not more than 266A max. per each output, total 532A max. HFE1600-D1U: according to type and number of installed modules but not more than 266A max. per each output **7)** Input: 12 VDC, 0.5A max. **8)** a) models without suffix –R (base models): Input: 100 – 240 VAC, 15 A max., 50/60 Hz; Output: Main output at ambient temperature up to 50°C, Vin=170-240Vac:

	48VDC (38.4~58.0VDC), 52A max., 2496W max. 24VDC (19.2~29.0VDC), 104A max., 2496W max. 12VDC (9.6~13.2VDC), 200A max., 2400W max. b) models with suffix –R (reverse fan models): Input: 100 – 240 VAC, 13.5 A max., 50/60 Hz; Output: Main output at ambient temperature up to 50°C, Vin=170-240Vac: 24VDC (19.2~29.0VDC), 83.2A max., 1997W max. 12VDC (9.6~13.2VDC), 160A max., 1920W max. **9)** Input: 100 – 240 VAC, 15 A max., 50/60 Hz; Output: Main output at ambient temperature up to 50°C, Vin=170-240Vac 48VDC (38.4~58.0VDC), 52A max., 2496W max. 24VDC (19.2~29.0VDC), 96A max., 2304W max. 12VDC (9.6~13.2VDC), 200A max., 2400W max. **10)** Input: 100 – 240 VAC, 15 A max., 50/60 Hz; Output: Main output at ambient temperature up to 50°C, Vin=170-240Vac 48VDC (38.4~58.0VDC), 52A max., 2496W max. **11)** Input: 100 – 240 VAC, 15A max., 50/60 Hz; Output: Main output at ambient temperature up to 42°C, Vin=180-240Vac 12.6VDC (9.6~13.2VDC), 185 A max., 2331W max. **12)** Input: 100 – 240 VAC, 15A max., 50/60 Hz; Output: Main output at ambient temperature up to 50°C, Vin=180-240Vac 12VDC (9.6~13.2VDC), 167 max., 2000W max. 24VDC (19.2~29.0VDC), 83.5 max., 2000W max. **13)** Input: (per each input): 100-240Vac, 15A max., 50/60 Hz; Output: Main output: - output voltage: same with installed units - output current: according to number of installed modules but not more than 320A max. per each output, total 640A max. **14)** Input: 12 Vdc, 0.5A max. **15)** Input: 100 – 240 VAC, 15 A max., 50/60 Hz; Output: Main output at ambient temperature up to 50°C, Vin=170-240Vac: 48VDC (38.4~58.0VDC), 52A max., 2496W max. Auxiliary output (all, except 7, 14): 12VDC/0.5A (*) See “Condition of Use” for de-rating criteria vs. input voltage and vs. ambient temperature.

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☐	**CB Testing Laboratory:**	TÜV Rheinland of North America, Inc.	
Testing location/ address ..... :		1279 Quarry Lane, Ste. A, Pleasanton, CA 94566 **USA**	
Tested by (name, function, signature) ..... :			
Approved by (name, function, signature) .. :			
☐	**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, function, signature) ..... :			
Witnessed by (name, function, signature) . :			
Approved by (name, function, signature) .. :			
☒	**Testing procedure: CTF Stage 3:**		
☐	**Testing procedure: CTF Stage 4:**		
Testing location/ address ..... :		TDK-Lambda Ltd. 56 Haharoshet St., P.O.B. 500 Karmiel Industrial Zone Karmiel 2161401, Israel	
Tested by (name, function, signature) ..... :		Elias Jiries	
Witnessed by (name, function, signature) . :		N/A	
Approved by (name, function, signature) .. :		James Howell Test Engineer Principal	
Supervised by (name, function, signature) :		James Howell Test Engineer Principal	

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

Attachment 1.1: EU National Differences (21 pages)

Attachment 1.2: US & Canada National Differences (9 pages)

Attachment 2: Photographs **(16 pages)**

Attachment 3: Schematics (28 pages)

Attachment 4: PCB Layouts (77 pages)

Attachment 5: Magnetics (27 pages)

Attachment 6: Additional test data (2 pages)

Summary of testing:

32083425.300 - This report is a standard upgrade from IEC 62368-1:2014 (2nd Edition) to IEC 62368-1:2018 (3rd Edition). Testing not performed.

Test data from reports 31082331 and 31182226 are in this report for legacy purposes.

Tests performed (name of test and test clause):	**Testing location:**
32083425.303 – N/A	**N/A**
32083425.301 – N/A	N/A
32083425.300 – N/A	N/A
32083425.001	TDK-Lambda Ltd. 56 Haharoshet St., P.O.B. 500
5.4.8 Humidity conditioning (see Note 1)	Karmiel Industrial Zone Karmiel 2161401, Israel
5.4.9 Electric strength test (see Note 1)	
5.5.2.2 Capacitor discharge test (test performed on model RFE1600-32/S, see Note 1)	
5.7 Prospective touch voltage, touch current and protective conductor current (see Note 1)	
6.2.2.2 Power measurement for worst-case fault (see Note1)	
6.2.2.3 Power measurement for worst-case power source fault (see Note 1)	
9.2.5 Temperature test (see Note 2)	
V.1.2 Test method 1 - Surfaces and openings tested with jointed test probe (see Note 3)	
Note 1 - Due to the similar design, the output voltage and wattage does not affect the results of this test. RFE1600-32/S was evaluated because it was decided to be the worst case model for this test.	
Note 2 - The test performed on populated HFE2500-S1U-TB rack by four HFE2500-12/S single power supply modules, because it was decided to be the worst case for this test.	

Note 3 - Due to the similar design of enclosure, the test performed on HFE1600-12, HFE2500-12, RFE1600-12, RFE2500-12. **Following Testing Performed to IEC 60950-1 under CB Report No.** **31082331.023 (HFE1600-LAN)** (Clause 1.6.2) Input Test (B.2.5) (Clause 2.6.3.4) Earthing Test (5.6.6) (Clause 2.10.2) Working Voltage Measurement (5.4.1.8) (Clause 5.2) Dielectric Strength Test (5.4.9) **31082331.019 (HFE1600-12/S-R/001)** (Clause 1.6.2) Input Test (B.2.5) (Clause 4.5) Temperature test (5.4.1.4 / 9.2.5 / B.2.6) (Clause 5.2) Dielectric strength test (5.4.9) (Clause 5.3) Abnormal operating and fault conditions (B.3 / B.4) **31082331.017 (HFE1600-D1U)** (Clause 5.1) Touch current measurements (5.7) (Clause 5.2) Dielectric strength test (5.4.9) **31082331.001 (Models HFE1600-48/RFE1600-48 and HFE1600-12/RFE1600-12, HFE1600-S1U, HFE1600-D1U models)** (Clause 1.6.2) Input Test (B.2.5) (Clause 1.7.11) Durability of Marking Test (F.3.10) (Clause 2.1.1.1) Accessibility to Energized parts (V.1.2 / V.1.3) (Clause 2.1.1.5) Energy hazard measurements (5.2) (Clause 2.1.1.7) Capacitor discharge test (5.5.2.2) (Clause 2.2) SELV circuits – voltage measurements (normal and fault conditions) (5.2) (Clause 2.6.3.4) Protective earthing trace earth fault current; Earthing test (5.6.6) (Clause 2.9.1) Humidity test (5.4.8) (Clause 2.10.2) Determination of working voltage (5.4.1.8)	

(Clause 2.10.11) Semiconductor devices and cement joints (5.4.2 / 5.4.3) (Clause 4.2) Mechanical strength test (Clause 4.5) Temperature rise measurements (5.4.1.4 / 9.2.5 / B.2.6) (Clause 5.1) Touch current measurements (5.7) (Clause 5.2) Dielectric strength test (5.4.9) (Clause 5.3) Abnormal operating and fault conditions (B.3 / B.4) **31182226.016 (Model HFE2500-12/S-R-RE)** (Clause 1.6.2) Input Test (B.2.5) (Clause 4.5) Temperature measurements (5.4.1.4 / 9.2.5 / B.2.6) **31182226.014 (Model HFE2500-LAN)** (Clause 1.6.2) Input Test (B.2.5) (Clause 2.6.3.4) Earthing Test (5.6.6) (Clause 2.10.2) Working Voltage Measurement (5.4.1.8) (Clause 5.2) Dielectric strength test (5.4.9) **31182226.014 (Model HFE2500-12/S-R-RE)** (Clause 1.6.2) Input Test (B.2.5) (Clause 4.5) Temperature measurements (5.4.1.4 / 9.2.5 / B.2.6) (Clause 5.2) Dielectric strength test (5.4.9) (Clause 5.3) Abnormal operating and fault conditions (B.3 / B.4) **31182226.011 (Models RFE2500, HFE2500-48/S-CQC and HFE2500-12/S-R/RE)** (Clause 1.6.2) Input Test (B.2.5) (Clause 4.5) Temperature measurements (5.4.1.4 / 9.2.5 / B.2.6) (Clause 5.1) Touch current measurements (5.7) (Clause 5.2) Dielectric strength test (5.4.9) (Clause 5.3) Abnormal operating and fault conditions (B.3 / B.4)	

31182226.001 (Models HFE/RFE2500-12 and HFE/RFE2500-48 HFE2500-S1U) (Clause 1.6.2) Input Test (B.2.5) (Clause 1.7.11) Durability of Marking Test (F.3.10) (Clause 2.1.1.1) Accessibility to Energized parts (V.1.2 / V.1.3) (Clause 2.1.1.5) Energy hazard measurements (5.2) (Clause 2.1.1.7) Capacitor discharge test (5.5.2.2) (Clause 2.2) SELV circuits – voltage measurements (normal and fault conditions) (5.2) (Clause 2.6.3.4) Protective earthing trace earth fault current; Earthing test (5.6.6) (Clause 2.9.1) Humidity test (5.4.8) (Clause 2.10.2) Determination of working voltage (5.4.1.8) (Clause 2.10.11) Semiconductor devices and cement joints (5.4.2 / 5.4.3) (Clause 4.2) Mechanical strength test (Clause 4.5) Temperature rise measurements (5.4.1.4 / 9.2.5 / B.2.6) (Clause 5.1) Touch current measurements (5.7) (Clause 5.2) Dielectric strength test (5.4.9) (Clause 5.3) Abnormal operating and fault conditions (B.3 / B.4) (Annex C) Transformer Evaluation (G.5.3)	

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

Canada, Denmark*, Finland*, Ireland*, Germany*, Italy*, Norway*, Sweden*, United Kingdom*, USA, CENELEC common modifications as listed in online CB-Bulletin.

* European Group Differences and National Differences

☒ **The product fulfils the requirements of EN IEC 62368-1:2020 + A11:2020 and BS EN IEC 62368-1:2020 + A11:2020 and UL 62368-1:2019 R10.21 and CSA C22.2 No. 62368-1-19**

Use of uncertainty of measurement for decisions on conformity (decision rule) :

☒ No decision rule is specified by the IEC standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty ("simple acceptance" decision rule, previously known as "accuracy method").

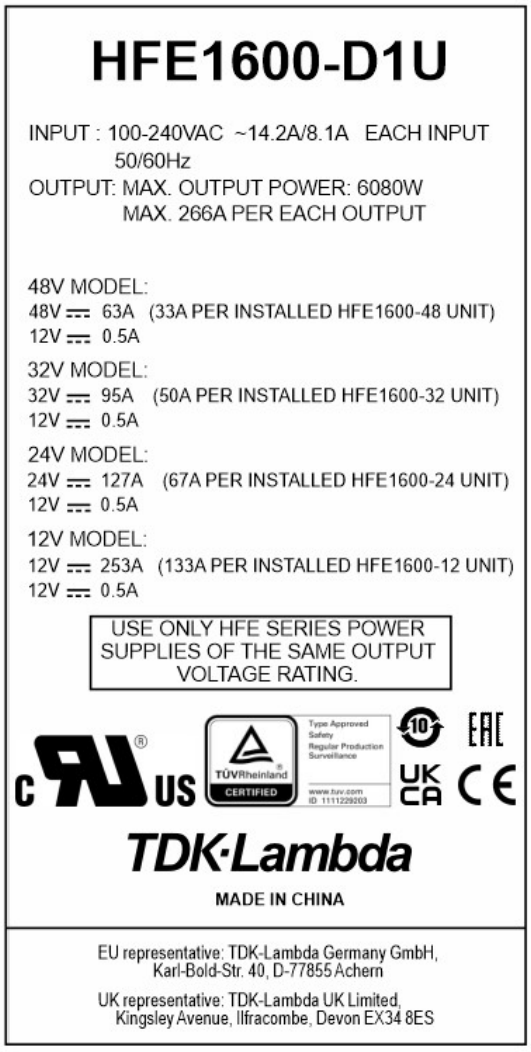
☐ Other:… (to be specified, for example when required by the standard or client, or if national accreditation requirements apply)

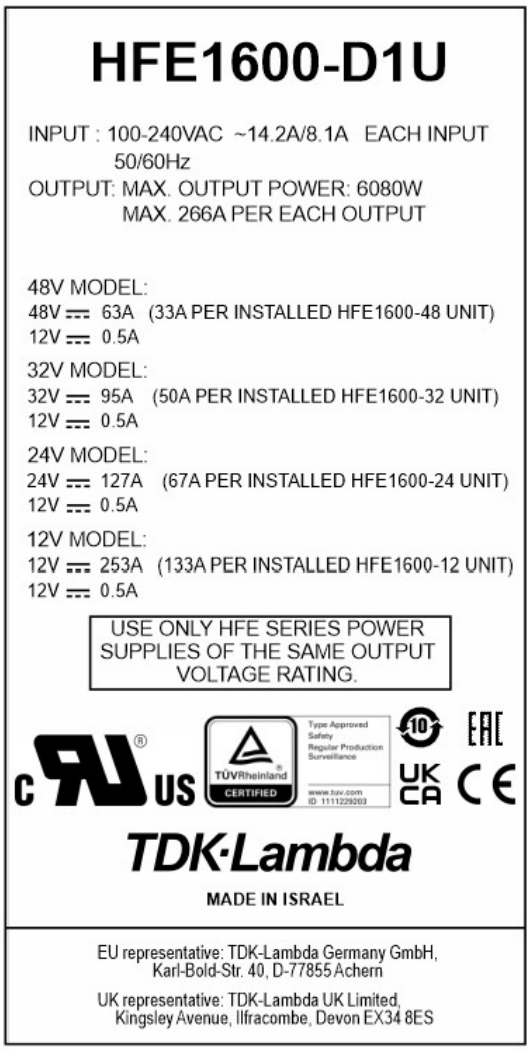
Information on uncertainty of measurement:
The uncertainties of measurement are calculated by the laboratory based on application of criteria given by OD-5014 for test equipment and application of test methods, decision sheets and operational procedures of IECEE.
IEC Guide 115 provides guidance on the application of measurement uncertainty principles and applying the decision rule when reporting test results within IECEE scheme, noting that the reporting of the measurement uncertainty for measurements is not necessary unless required by the test standard or customer.

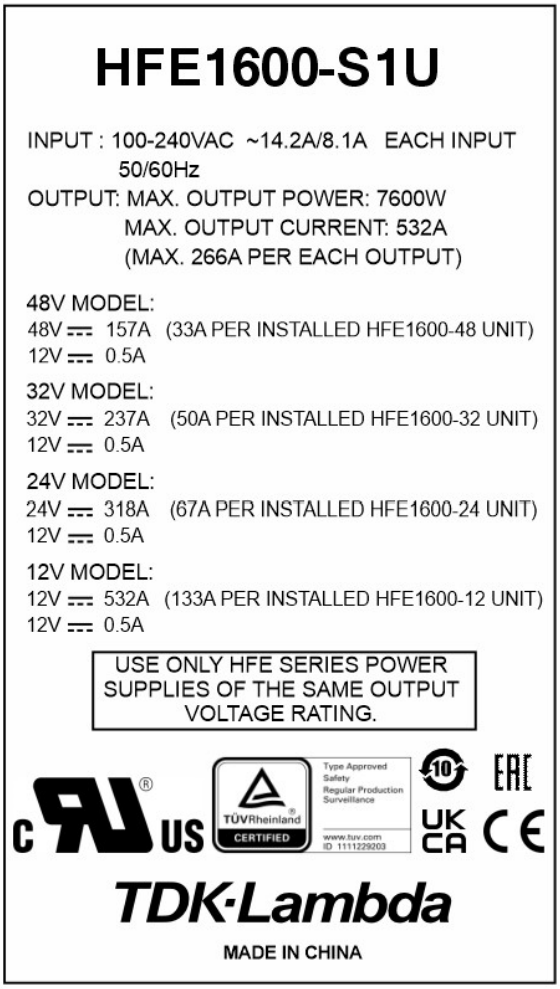
Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing.

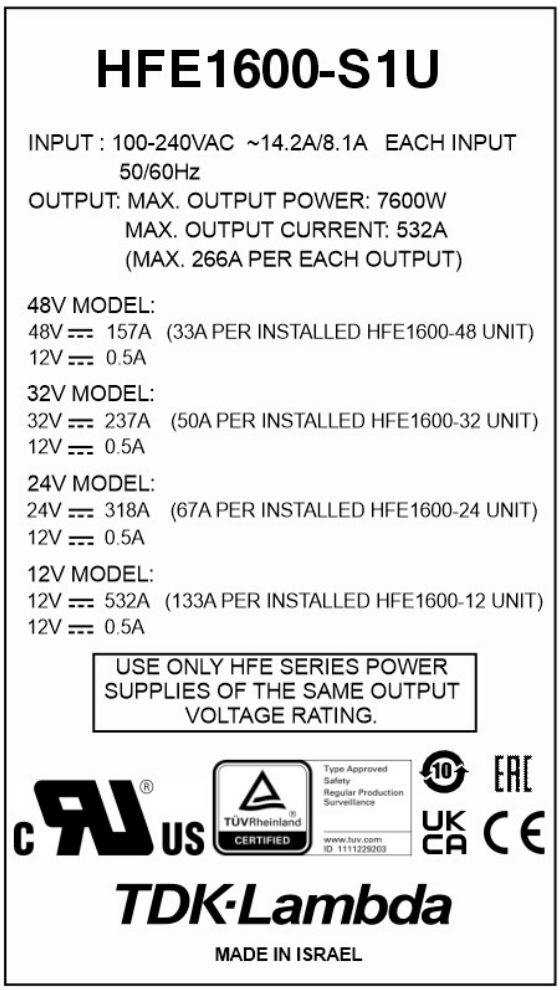
Copy of marking plate:

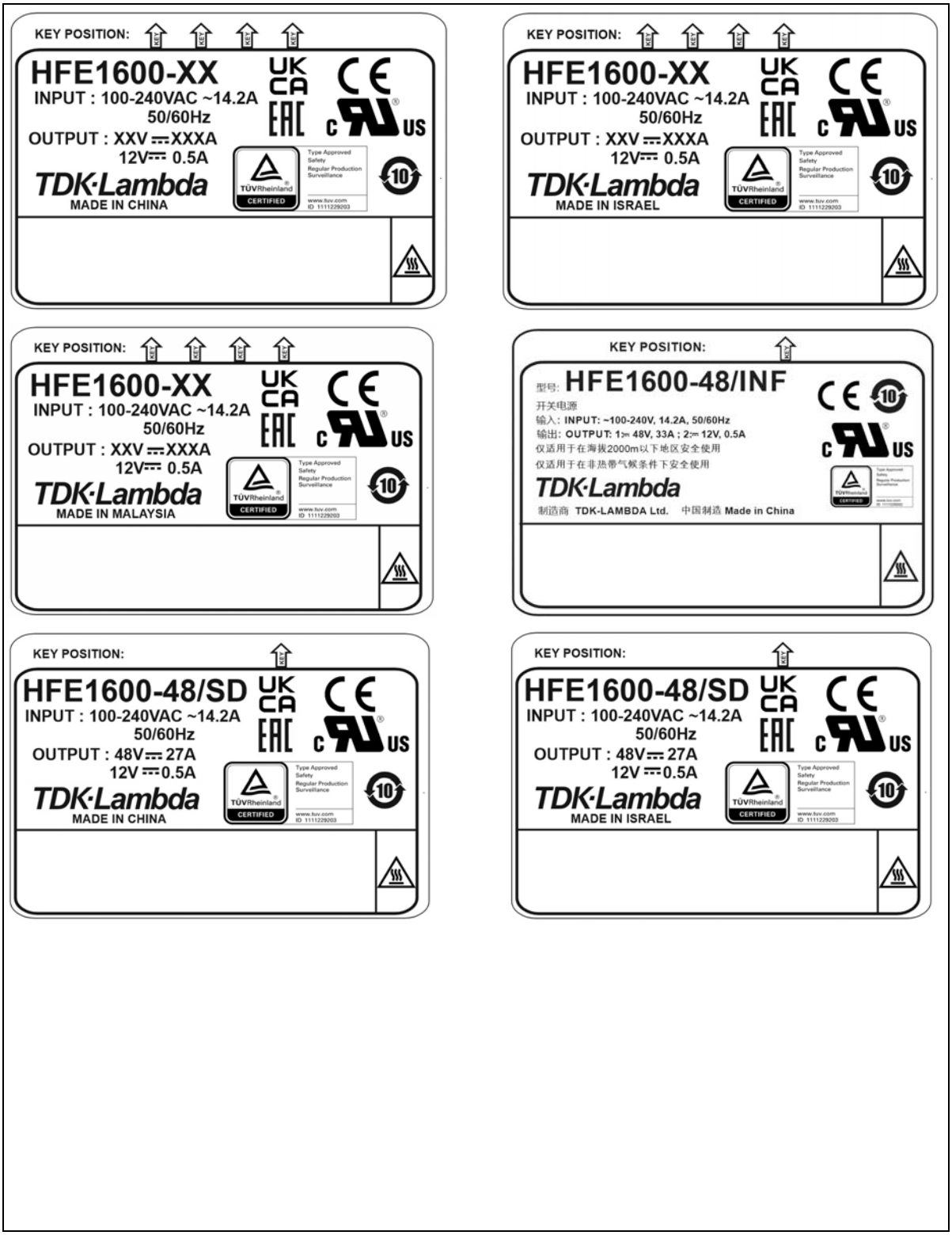
The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

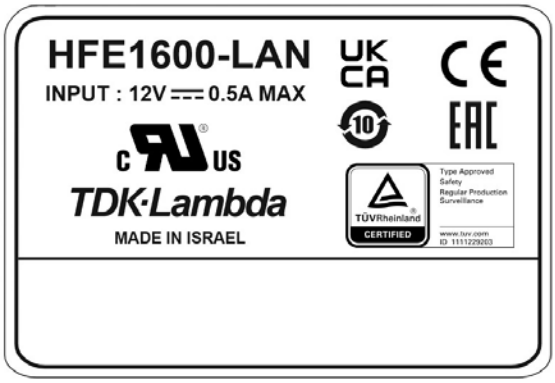


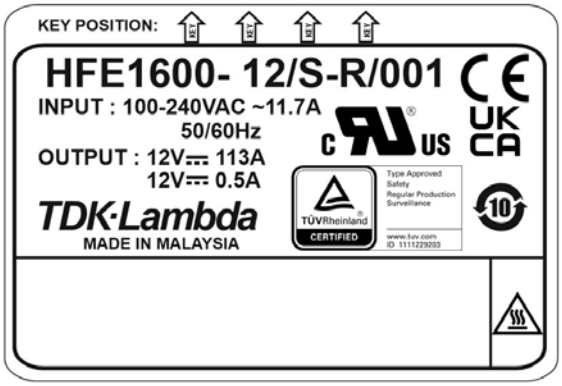



HFE1600-S1U
INPUT : 100-240VAC ~14.2A/8.1A EACH INPUT
50/60Hz
OUTPUT: MAX. OUTPUT POWER: 7600W
MAX. OUTPUT CURRENT: 532A
(MAX. 266A PER EACH OUTPUT)
48V MODEL:
48V ⎓ 157A (33A PER INSTALLED HFE1600-48 UNIT)
12V ⎓ 0.5A
32V MODEL:
32V ⎓ 237A (50A PER INSTALLED HFE1600-32 UNIT)
12V ⎓ 0.5A
24V MODEL:
24V ⎓ 318A (67A PER INSTALLED HFE1600-24 UNIT)
12V ⎓ 0.5A
12V MODEL:
12V ⎓ 532A (133A PER INSTALLED HFE1600-12 UNIT)
12V ⎓ 0.5A
USE ONLY HFE SERIES POWER SUPPLIES OF THE SAME OUTPUT VOLTAGE RATING.
TDK·Lambda
MADE IN CHINA

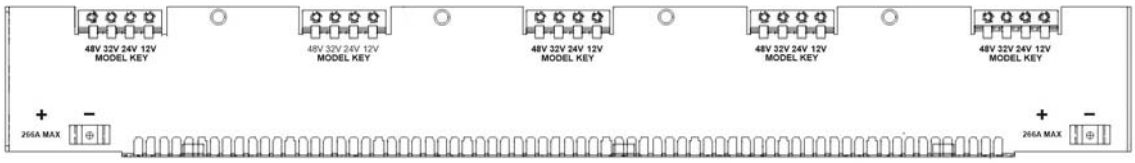

HFE1600-S1U
INPUT : 100-240VAC ~14.2A/8.1A EACH INPUT
50/60Hz
OUTPUT: MAX. OUTPUT POWER: 7600W
MAX. OUTPUT CURRENT: 532A
(MAX. 266A PER EACH OUTPUT)
48V MODEL:
48V ⎓ 157A (33A PER INSTALLED HFE1600-48 UNIT)
12V ⎓ 0.5A
32V MODEL:
32V ⎓ 237A (50A PER INSTALLED HFE1600-32 UNIT)
12V ⎓ 0.5A
24V MODEL:
24V ⎓ 318A (67A PER INSTALLED HFE1600-24 UNIT)
12V ⎓ 0.5A
12V MODEL:
12V ⎓ 532A (133A PER INSTALLED HFE1600-12 UNIT)
12V ⎓ 0.5A
USE ONLY HFE SERIES POWER SUPPLIES OF THE SAME OUTPUT VOLTAGE RATING.
TDK·Lambda
MADE IN ISRAEL


KEY POSITION:
HFE1600-XX
INPUT : 100-240VAC ~14.2A
50/60Hz
OUTPUT : XXV XXXA
12V 0.5A
TDK·Lambda
MADE IN CHINA
KEY POSITION:
HFE1600-XX
INPUT : 100-240VAC ~14.2A
50/60Hz
OUTPUT : XXV XXXA
12V 0.5A
TDK·Lambda
MADE IN ISRAEL
KEY POSITION:
HFE1600-XX
INPUT : 100-240VAC ~14.2A
50/60Hz
OUTPUT : XXV XXXA
12V 0.5A
TDK·Lambda
MADE IN MALAYSIA
KEY POSITION:
型号: HFE1600-48/INF
开关电源
输入: INPUT: ~100-240V, 14.2A, 50/60Hz
输出: OUTPUT: 1 48V, 33A ; 2 12V, 0.5A
仅适用于在海拔2000m以下地区安全使用
仅适用于在非热带气候条件下安全使用
TDK·Lambda
制造商 TDK-LAMBDA Ltd. 中国制造 Made in China
KEY POSITION:
HFE1600-48/SD
INPUT : 100-240VAC ~14.2A
50/60Hz
OUTPUT : 48V 27A
12V 0.5A
TDK·Lambda
MADE IN CHINA
KEY POSITION:
HFE1600-48/SD
INPUT : 100-240VAC ~14.2A
50/60Hz
OUTPUT : 48V 27A
12V 0.5A
TDK·Lambda
MADE IN ISRAEL

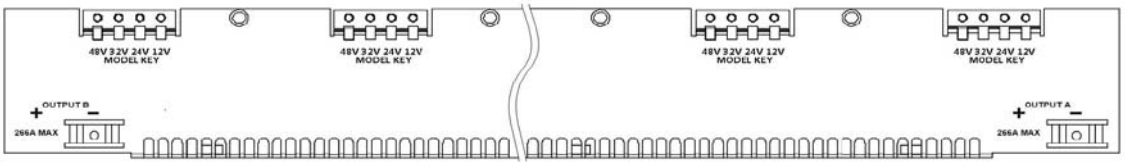


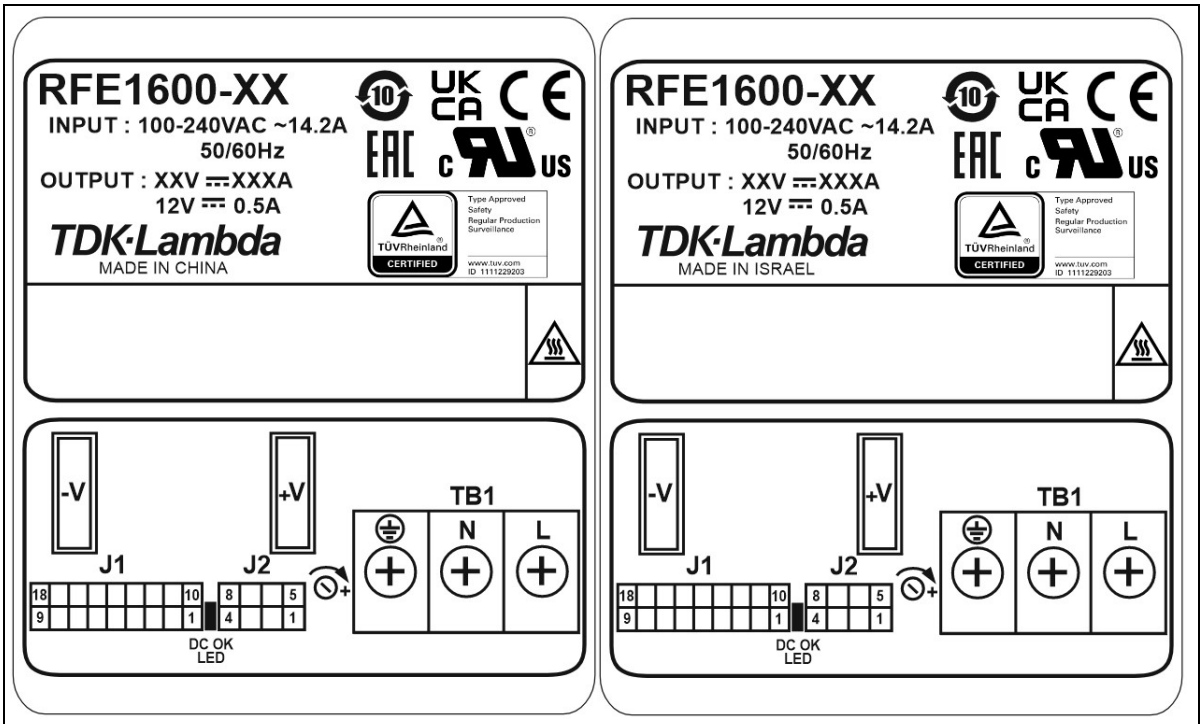


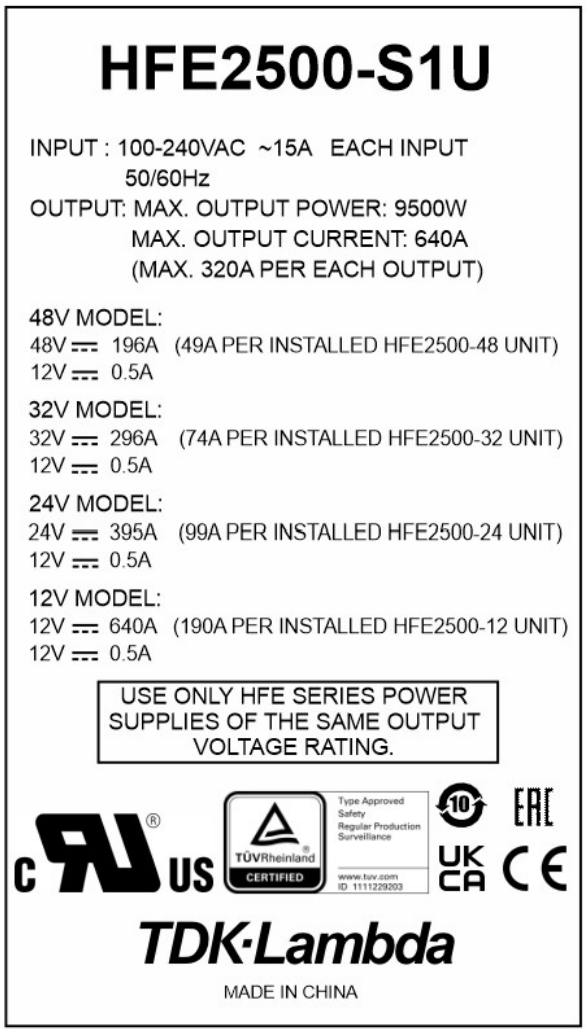
HFE1600 S1U

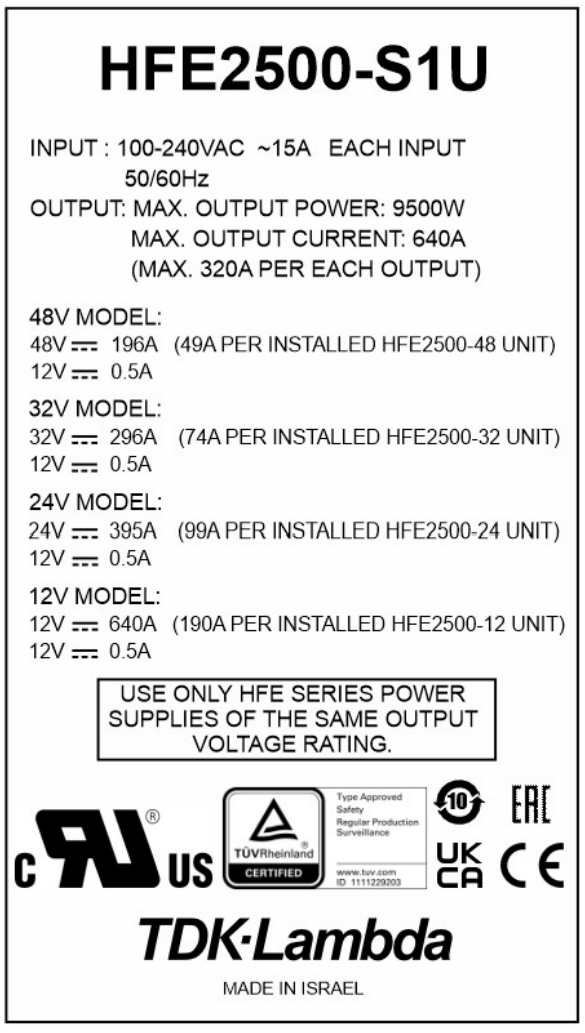


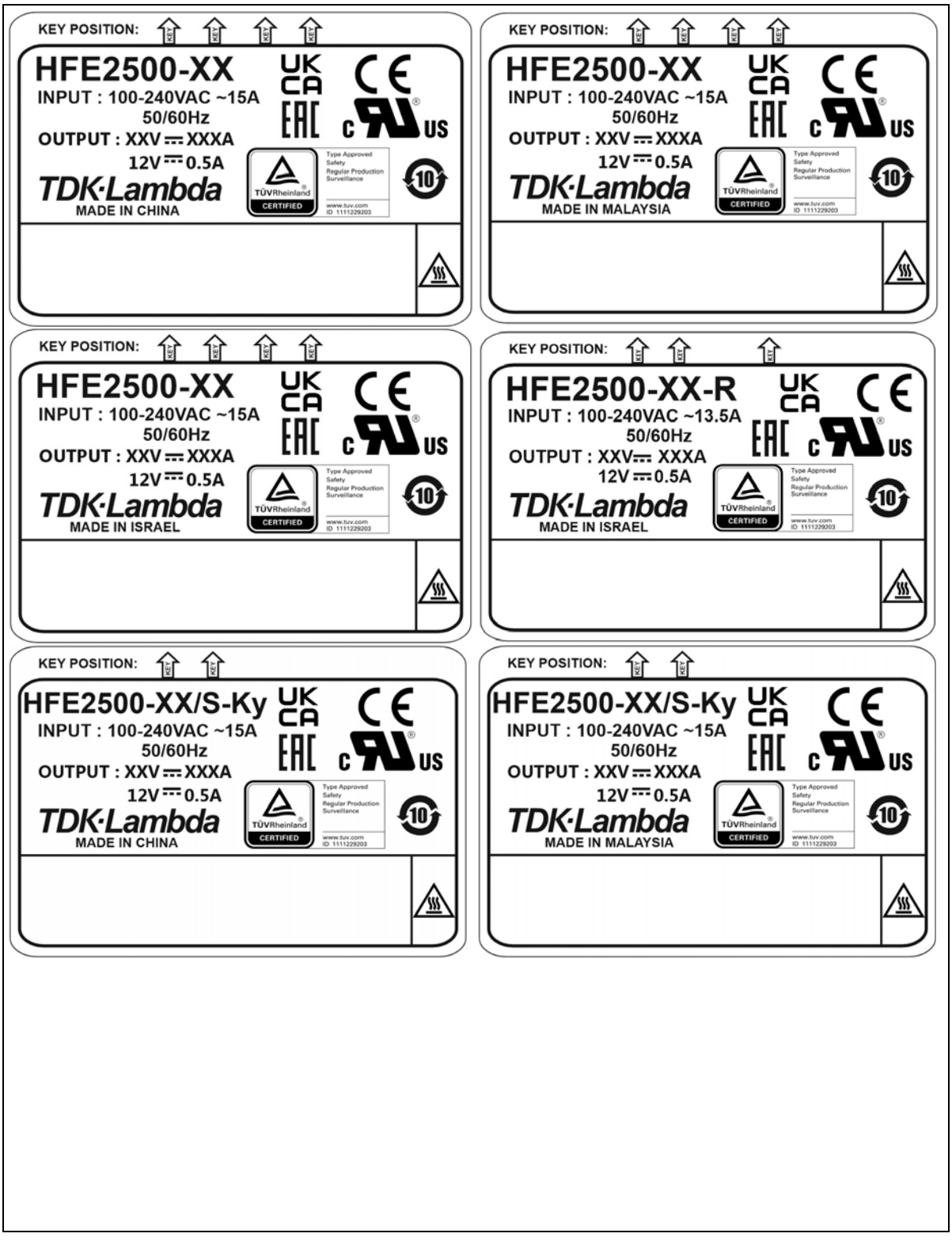
HFE1600 D1U

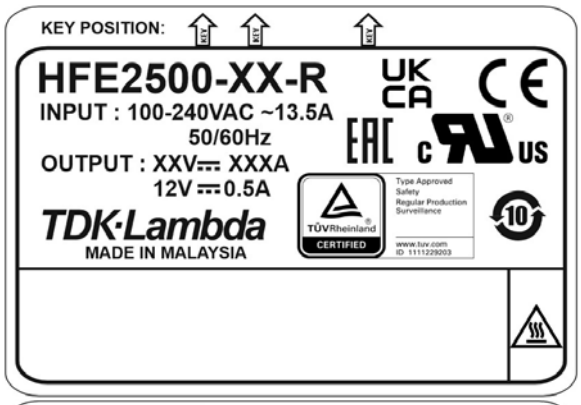


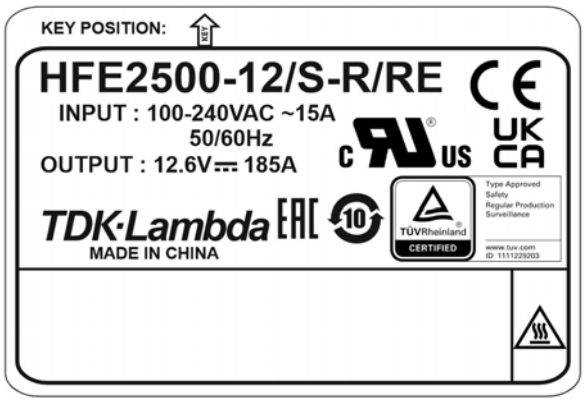

RFE1600-XX
INPUT : 100-240VAC ~14.2A
50/60Hz
OUTPUT : XXV ⎓XXXA
12V ⎓ 0.5A
TDK·Lambda
MADE IN CHINA
Type Approved
Safety
Regular Production
Surveillance
TÜVRheinland
CERTIFIED
www.tuv.com
ID 111229203
-V
+V
J1
J2
TB1
N
L
18
9
10
1
8
4
5
1
DC OK
LED
RFE1600-XX
INPUT : 100-240VAC ~14.2A
50/60Hz
OUTPUT : XXV ⎓XXXA
12V ⎓ 0.5A
TDK·Lambda
MADE IN ISRAEL
Type Approved
Safety
Regular Production
Surveillance
TÜVRheinland
CERTIFIED
www.tuv.com
ID 111229203
-V
+V
J1
J2
TB1
N
L
18
9
10
1
8
4
5
1
DC OK
LED

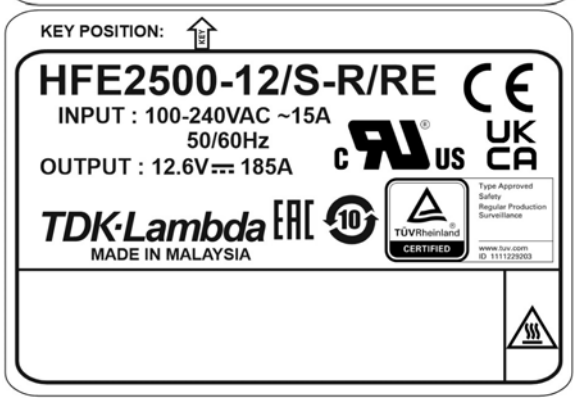

HFE2500-S1U
INPUT : 100-240VAC ~15A EACH INPUT
50/60Hz
OUTPUT: MAX. OUTPUT POWER: 9500W
MAX. OUTPUT CURRENT: 640A
(MAX. 320A PER EACH OUTPUT)
48V MODEL:
48V 196A (49A PER INSTALLED HFE2500-48 UNIT)
12V 0.5A
32V MODEL:
32V 296A (74A PER INSTALLED HFE2500-32 UNIT)
12V 0.5A
24V MODEL:
24V 395A (99A PER INSTALLED HFE2500-24 UNIT)
12V 0.5A
12V MODEL:
12V 640A (190A PER INSTALLED HFE2500-12 UNIT)
12V 0.5A
USE ONLY HFE SERIES POWER SUPPLIES OF THE SAME OUTPUT VOLTAGE RATING.
TDK·Lambda
MADE IN CHINA

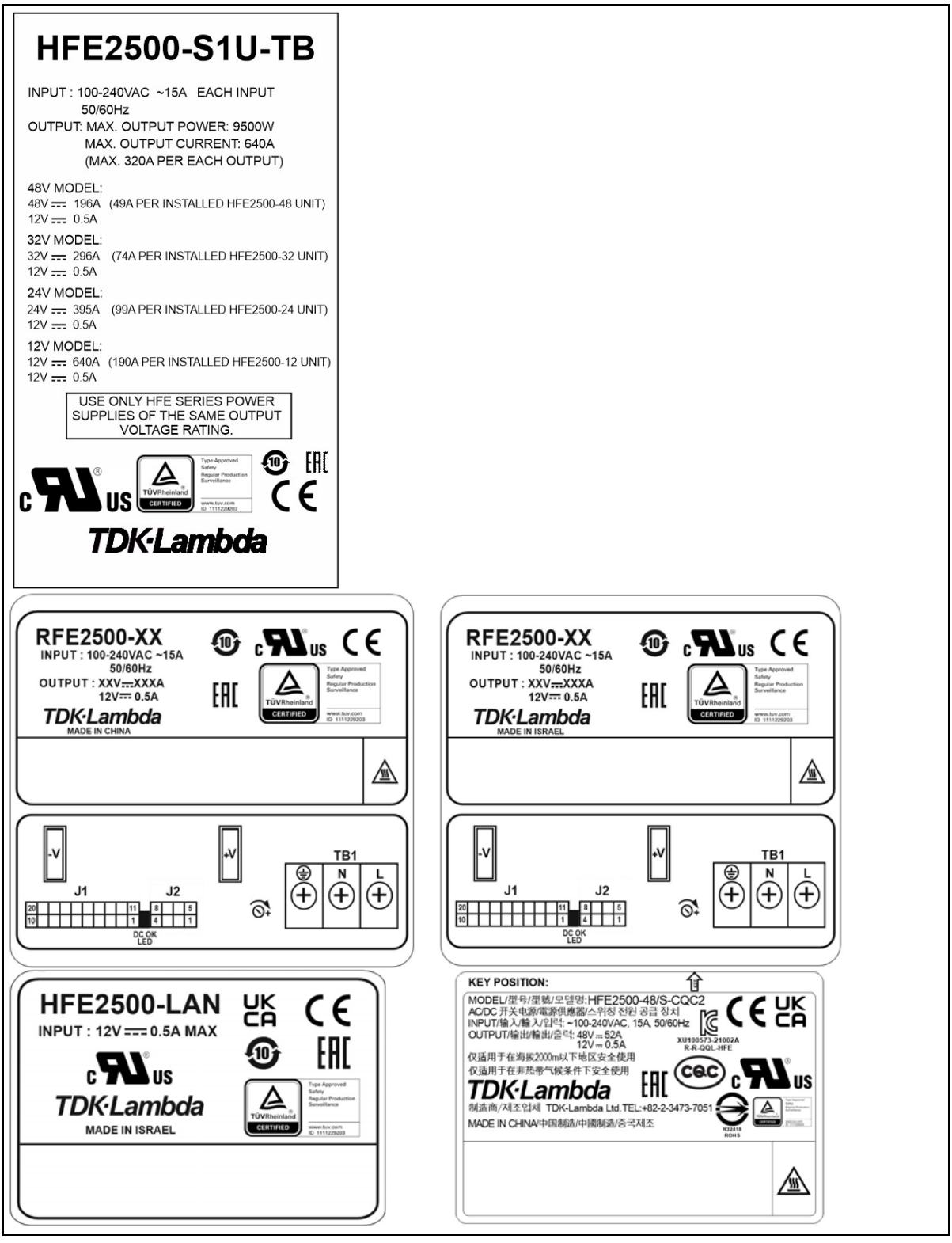

HFE2500-S1U
INPUT : 100-240VAC ~15A EACH INPUT
50/60Hz
OUTPUT: MAX. OUTPUT POWER: 9500W
MAX. OUTPUT CURRENT: 640A
(MAX. 320A PER EACH OUTPUT)
48V MODEL:
48V 196A (49A PER INSTALLED HFE2500-48 UNIT)
12V 0.5A
32V MODEL:
32V 296A (74A PER INSTALLED HFE2500-32 UNIT)
12V 0.5A
24V MODEL:
24V 395A (99A PER INSTALLED HFE2500-24 UNIT)
12V 0.5A
12V MODEL:
12V 640A (190A PER INSTALLED HFE2500-12 UNIT)
12V 0.5A
USE ONLY HFE SERIES POWER SUPPLIES OF THE SAME OUTPUT VOLTAGE RATING.
TDK·Lambda
MADE IN ISRAEL


KEY POSITION:
HFE2500-XX
INPUT : 100-240VAC ~15A
50/60Hz
OUTPUT : XXV XXXA
12V 0.5A
TDK·Lambda
MADE IN CHINA
KEY POSITION:
HFE2500-XX
INPUT : 100-240VAC ~15A
50/60Hz
OUTPUT : XXV XXXA
12V 0.5A
TDK·Lambda
MADE IN MALAYSIA
KEY POSITION:
HFE2500-XX
INPUT : 100-240VAC ~15A
50/60Hz
OUTPUT : XXV XXXA
12V 0.5A
TDK·Lambda
MADE IN ISRAEL
KEY POSITION:
HFE2500-XX-R
INPUT : 100-240VAC ~13.5A
50/60Hz
OUTPUT : XXV XXXA
12V 0.5A
TDK·Lambda
MADE IN ISRAEL
KEY POSITION:
HFE2500-XX/S-Ky
INPUT : 100-240VAC ~15A
50/60Hz
OUTPUT : XXV XXXA
12V 0.5A
TDK·Lambda
MADE IN CHINA
KEY POSITION:
HFE2500-XX/S-Ky
INPUT : 100-240VAC ~15A
50/60Hz
OUTPUT : XXV XXXA
12V 0.5A
TDK·Lambda
MADE IN MALAYSIA

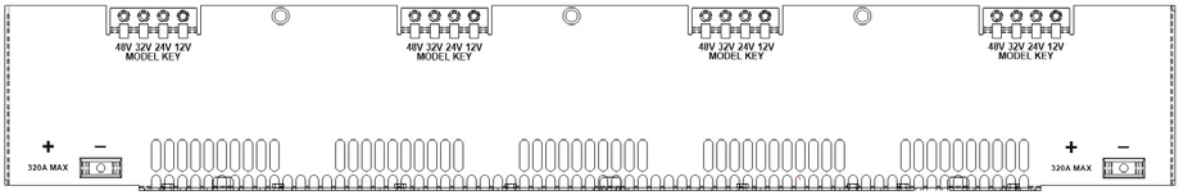

KEY POSITION:
HFE2500-XX-R
INPUT : 100-240VAC ~13.5A
50/60Hz
OUTPUT : XXV XXXA
12V 0.5A
TDK·Lambda
MADE IN MALAYSIA
CERTIFIED

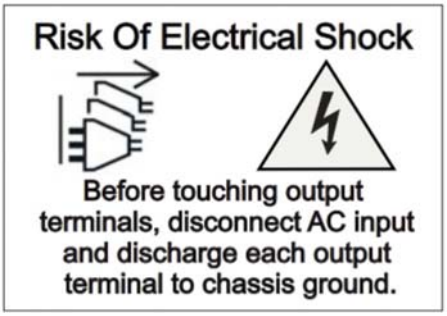

KEY POSITION:
HFE2500-12/S-R/RE
INPUT : 100-240VAC ~15A
50/60Hz
OUTPUT : 12.6V 185A
TDK·Lambda
MADE IN CHINA
CERTIFIED


KEY POSITION:
HFE2500-12/S-R/RE
INPUT : 100-240VAC ~15A
50/60Hz
OUTPUT : 12.6V 185A
TDK·Lambda
MADE IN MALAYSIA
CERTIFIED


HFE2500-S1U-TB
INPUT : 100-240VAC ~15A EACH INPUT
50/60Hz
OUTPUT: MAX. OUTPUT POWER: 9500W
MAX. OUTPUT CURRENT: 640A
(MAX. 320A PER EACH OUTPUT)
48V MODEL:
48V 196A (49A PER INSTALLED HFE2500-48 UNIT)
12V 0.5A
32V MODEL:
32V 296A (74A PER INSTALLED HFE2500-32 UNIT)
12V 0.5A
24V MODEL:
24V 395A (99A PER INSTALLED HFE2500-24 UNIT)
12V 0.5A
12V MODEL:
12V 640A (190A PER INSTALLED HFE2500-12 UNIT)
12V 0.5A
USE ONLY HFE SERIES POWER SUPPLIES OF THE SAME OUTPUT VOLTAGE RATING.
TDK·Lambda
RFE2500-XX
INPUT : 100-240VAC ~15A
50/60Hz
OUTPUT : XXV XXXA
12V 0.5A
TDK·Lambda
MADE IN CHINA
-V
+V
TB1
N
L
J1
J2
DC OK LED
RFE2500-XX
INPUT : 100-240VAC ~15A
50/60Hz
OUTPUT : XXV XXXA
12V 0.5A
TDK·Lambda
MADE IN ISRAEL
HFE2500-LAN
INPUT : 12V 0.5A MAX
TDK·Lambda
MADE IN ISRAEL
KEY POSITION:
MODEL/型号/型號/모델명:HFE2500-48/S-CQC2
AC/DC 开关电源/電源供應器/스위칭 전원 공급 장치
INPUT/输入/輸入/입력: ~100-240VAC, 15A, 50/60Hz
OUTPUT/输出/輸出/출력: 48V 52A
12V 0.5A
仅适用于在海拔2000m以下地区安全使用
仅适用于在非热带气候条件下安全使用
TDK·Lambda
制造商/제조업체 TDK-Lambda Ltd.TEL:+82-2-3473-7051
MADE IN CHINA/中国制造/中國制造/중국제조

320A max marking for HFE2500-S1U (screening on the top)





Test item particulars:	
Product group ..... :	☐ end product ☒ built-in component
Classification of use by ..... :	☒ Ordinary person ☐ Children likely present (See comments in General Product Information) ☒ Instructed person ☒ Skilled person
Supply connection ..... :	☒ AC mains (all models except HFE1600-LAN and HFE2500-LAN) ☐ DC mains ☒ not mains connected: ☒ ES1(for HFE1600-LAN and HFE2500-LAN only) ☐ ES2 ☒ ES3 (all models except HFE1600-LAN and HFE2500-LAN)
Supply tolerance ..... :	☒ +10%/-10% ☐ +20%/-15% ☐ + %/ - % ☐ None
Supply connection – type ..... :	☒ pluggable equipment type A - ☐ non-detachable supply cord ☒ appliance coupler (for HFE1600-S1U without suffix /TB, HFE1600-D1U without suffix /TB and HFE2500-S1U without suffix /TB racks only ☐ direct plug-in ☐ pluggable equipment type B - ☐ non-detachable supply cord ☐ appliance coupler ☒ permanent connection (for HFE1600-S1U-TB, HFE1600-D1U-TB, HFE2500-S1U-TB and RFE series) mating connector (for HFE single power supply modules, HFE1600-LAN and HFE2500-LAN) ☐ mating connector☐ other: *NOTE: Connection to the mains is various, depends on model: refer to General Product Information*
Considered current rating of protective device ..... :	☒ 30 A for all models except for HFE1600- LAN and HFE2500-LAN Location: ☐ building ☒ equipment ☒ N/A for models HFE1600- LAN and HFE2500-LAN

Equipment mobility ..... :	☐ movable ☐ hand-held ☐ transportable ☐ direct plug-in ☐ stationary ☒ for building-in (models HFE1600 single power supply modules series, HFE2500 single power supply modules series ,RFE1600 single power supply modules series , RFE2500 single power supply modules series , HFE1600-48/INF, HFE1600-48/SD, HFE1600-12/S-R/001,HFE1600-LAN and HFE2500- LAN , HFE2500-48/S-CQC , HFE2500-12/S-R/RE , HFE2500 single power supply modules KY series, HFE2500-48/S-CQC2, are intended to be built in to accessory racks HFE1600-S1U, HFE1600-D1U, or HFE2500-S1U) ☐ wall/ceiling-mounted ☒ ~~SRME/~~rack-mounted (RFE1600 single power supply modules series , RFE2500 single power supply modules series, HFE1600-S1U, HFE1600-D1U, HFE2500-S1U) ☐ other:
Overvoltage category (OVC) ..... :	☐ OVC I ☒ OVC II ☐ OVC III ☐ OVC IV ☐ other:
Class of equipment ..... :	☒ Class I (all models except HFE1600-LAN and HFE2500-LAN) ☐ Class II ☒ Class III (HFE1600-LAN and HFE2500-LAN only) ☐ Not classified ☐
Special installation location ..... :	☐ N/A ☒ restricted access area ☐ outdoor location ☐
Pollution degree (PD) ..... :	☐ PD 1 ☒ PD 2 ☐ PD 3
Manufacturer's specified T_{ma} ..... :	50°C full load, up to 70°C with de-ratings, refer to General Product Information below ☐ Outdoor: minimum °C
IP protection class ..... :	☒ IPX0 ☐ IP___
Power systems ..... :	☒ TN ☒ TT ☒ IT - 230 V $_{L-L}$ ☐ not AC mains
Altitude during operation (m) ..... :	☐ 2000 m or less ☒ 3000 m (all models except HFE2500-24/S-Ky and HFE2500-12/S-Ky) and 3048 m (models HFE2500-24/S-Ky and HFE2500-12/S-Ky) m
Altitude of test laboratory (m) ..... :	☒ 2000 m or less ☐ m
Mass of equipment (kg) ..... :	HFE1600 max 1.6 RFE1600 max 1.7 HFE1600-S1U (full populated rack) max 13.6 HFE1600-D1U (full populated rack) max 13.0 HFE2500 max 2.1 RFE2500 max 2.5 HFE2500-S1U (full populated rack) max 13.4 HFE1600-LAN and HFE2500-LAN max 0.8

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..... :	**32083425.303 (N/A)**
	32083425.301 (N/A)
	32083425.300 (N/A)
	32083425.001 (June 28, 2020)
	31082331.033 (N/A)
	31082331.031 (N/A)
	31082331.029 (N/A)
	31082331.027 (N/A)
	31082331.025 (N/A)
	31082331.023 (September 10, 2016)
	31082331.021 (N/A)
	31082331.019 (April 28, 2014)
	31082331.017 (July 8, 2013)
	31082331.015 (N/A)
	31082331.011 (N/A)
	31082331.009 (N/A)
	31082331.007 (N/A)
	31082331.005 (N/A)
	31082331.003 (N/A)
	31082331.001 (June 21, 2010)
	31182226.024 (N/A)
	31182226.022 (N/A)
	31182226.020 (N/A)
	31182226.018 (N/A)
	31182226.016 (May 10, 2017)
	31182226.014 (October 9, 2016; November 16, 2016)
	31182226.013 (N/A)
	31182226.011 (August 23, 2015)
	31182226.010 (N/A)
	31182226.008 (N/A)
	31182226.006 (N/A)
	31182226.005 (N/A)
	31182226.003 (N/A)
	31182226.001 (May 2, 2011)

Date (s) of performance of tests..... :	**32083425.303 (N/A)** 32083425.301 (N/A) 32083425.300 (N/A) 32083425.001 (July 16, 2020) **31082331.033 (N/A)** **31082331.031 (N/A)** **31082331.029 (N/A)** **31082331.027 (N/A)** **31082331.025 (N/A)** 31082331.023 (September 10 to October 10, 2016; November 16, 2016) **31082331.021 (N/A)** 31082331.019 (April 28 to May 27, 2014) 31082331.017 (July 8 to 9, 2013) **31082331.013 (N/A)** **31082331.011 (N/A)** **31082331.009 (N/A)** **31082331.007 (N/A)** **31082331.006 (N/A)** **31082331.005 (N/A)** **31082331.003 (N/A)** 31082331.001 (June 21 to August 5, 2010) **31182226.024 (N/A)** **31182226.022 (N/A)** **31182226.020 (N/A)** **31182226.018 (N/A)** 31182226.016 (May 10, 2017) 31182226.014 (October 9 to 10, 2016; November 16 to 20, 2016) **31182226.012 (N/A)** 31182226.011 (August 23 to September 24, 2015) **31182226.010 (N/A)** **31182226.008 (N/A)** **31182226.006 (N/A)** **31182226.005 (N/A)** **31182226.003 (N/A)** 31182226.001 (May 3 to 29, 2011)
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.

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)..... :

1) TDK-Lambda Ltd.
56 Haharoshet St., P.O.B. 500 Karmiel Industrial Zone Karmiel 2161401, Israel

2) TDK-Lambda (China) Electronics Co., Ltd.
No.95, Zhujiang Road, Xinwu District, Wuxi, Jiangsu 214028, P.R. China

3) TDK-LAMBDA (MALAYSIA) SDN BHD
Lot 2&3, Batu 9-3/4 Kawasan Perindustrian Bandar Baru Jaya Gading, Kuantan, Pahang Malaysia 26070

General product information and other remarks:

All products are Class I (excluding HFE1600-LAN and HFE2500-LAN models which are class III), designed for Overvoltage Category II and Pollution Degree 2.

The HFE single power supply modules series (HFE series) is a family of front-end (component) power supplies for built-in use with two series of 1600 W and 2500 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 HFE series intended for accessory racks. The HFE series modules may be used in the complete set of the accessory rack HFE1600-S1U, HFE1600-D1U for HFE1600 series and HFE2500-S1U for HFE2500 series or other models of accessory racks separately from TDK-Lambda designed accessory racks, in accordance with the "Additional application considerations".

The RFE single power supply modules series (RFE series) is a family of front-end (component) power supplies for built-in use with two series of 1600 W and 2500 W output power, which is the same as the HFE series and have minor differences due to using of separate input terminal block (TB), separate signals connectors and output bus-bars instead of common I/O connector which used in the HFE series modules. The RFE series is intended for use separately from TDK-Lambda designed accessory racks. The power supply cord not supplied with the unit and not evaluated in this report. Method of connection to the mains shall be evaluated in end use application.

For RFE series and HFE series modules which are used separately from TDK-Lambda designed accessory racks, the means of connection to the mains shall be specified in the end-installation.

The HFE1600-LAN and HFE2500-LAN models are optional communication ES1 module which may be used in the complete set of the accessory racks and powered by +12 V d.c. from auxiliary output of power supplies within the rack or separately by an external +12V ES1 output supply in accordance with the user manual.

Accessory racks:
HFE1600-S1U are intended for using with up to five HFE1600 power supply modules, HFE1600-D1U are intended for using with up to four HFE1600 power supply modules,
HFE2500-S1U accessory rack is intended using with up to four HFE2500 power supply modules.

DC main output for:
HFE1600-S1U all HFE1600 power supply modules connected by output in parallel, HFE1600-D1U two pair of HFE1600 power supply modules connected by output in parallel, HFE2500-S1U all HFE2500 power supply modules connected by output in parallel

Connection to the mains:
When built in to the accessory rack, the inputs of each power supply modules are separate from each other. One of the slots may be replaced by an optional HFE1600-LAN or HFE2500-LAN communication module. Instructions are provided to the skilled installation personnel that an AC mains connection is not required when the communication module is installed.

Accessory racks HFE1600-S1U, HFE1600-D1U and HFE2500-S1U are Pluggable Type A, intended for connection to mains via standard detachable power supply cord. An appliance coupler(s) is/are considered as the disconnect device(s). The power supply cord not supplied with the unit and not evaluated in this report.
Method of connection to the mains shall be evaluated in end use application.

For accessory racks HFE1600-S1U-TB, HFE1600-D1U-TB and HFE2500-S1U-TB and for RFE series modules, the power supply cord connection to the unit is non-detachable and the means of connection to the mains shall be specified in end-installation. Units are provided with terminal block for connection to AC mains, have no disconnect device provided with the unit. An appropriate disconnect device shall be provided by end- installation.

In all modules the outputs considered ES1 and separated by reinforced insulation from primary AC mains (ES3 primary).

For the HFE series and RFE series power supplies a suitable Electrical and Fire Enclosure is to be provided in the end product. All models have not been evaluated for these requirements.

For the accessory racks HFE1600-S1U, HFE1600-D1U and HFE2500-S1U a suitable Fire Enclosure is to be provided in the end product. All models have not been evaluated for these requirements.

The HFE series and RFE series power supplies and accessory racks designed by TDK-Lambda should only be installed in a Restricted Access Area. Access should be available to service personnel only.

All outputs are unearthed and may or may not be connected to earth in end-installation.

HFE2500-24/S-Ky and HFE2500-12/S-Ky are the same power supplies as HFE2500-12/S and HFE2500-24/S, but intended for altitudes up to 3048m or 10,000ft. instead.

HFE1600/R & HFE1600-12/S--R/001 & HFE1600-48/SD: Fan's air flow direction changed to Reverse direction
- exhaust. De-rating, change output power from 1600W to 1300W due to de-rating factors (according to thermal evaluation with reverse airflow). Operating temperature de-rated.

HFE1600-48/INF: This model is identical to model HFE1600-48xyzu/mmmmm and HFE1600-48xyzu-mmmmm except of an increased hold up time where the modification does not affect safety.

HFE2500/R: Fan's airflow direction changed to Reverse direction - exhaust. De-rating, change output power from 2500W to 2000W due to de-rating factors (according to thermal evaluation with reverse airflow).
Operating temperature de-rated.

HFE2500-12/S-R/RE: Fan's airflow direction changed to Reverse direction - exhaust. De-rating, change output power from 2500W to 2000W due to de-rating factors (according to thermal evaluation with reverse airflow).
Operating temperature de-rated. Remote enable by dry contact, on/off fans accordingly to DC output on/off.

HFE2500-48/S-CQC: Model name, Rating & Safety approval label will include CQC mark. Change PMBus software, refer to customer specification. RTV (glue) point addition in some component to meet Customer Shock & vibration test.(identification for specific customer, fully same with base model HFE2500- 48/S.)

HFE2500-48/S-CQC2: Model name, Rating & Safety approval label will include CQC mark. Change PMBus software, refer to customer specification. RTV (glue) point addition in some component to meet Customer Shock & vibration test. This model is identical to model to HFE2500-48/S-CQC except for non-safety related differences.
HFE2500-48/S-CQC has the same specifications as the standard HFE2500-48/S except for:

1. PMBus software was modified refer to Mellanox specification.
2. RTV points was added to some component in target to meet customer Shock & Vibration characteristics.
3. Safety Label will include CQC certification.

Model Differences –

Variable:	Range of variable:	Content:
x	/S – with communication option blank-without	(all models) external communication
y	/POE - with output circuit additionally meets of requirements of IEEE 802.3 Standard blank-base model	(For HFE1600-48 & HFE2500-48 only).
z	-R – with reverse air flow blank-standard air flow	FOR HFE only, standard airflow: front to rear
u	-CO – conformal coating used blank-without conformal coating	(all models) conformal coating used for environmental protection only
w	-TB- with input terminal blocks instead of IEC inlets blank-with IEC inlet	For HFE1600-S1U, HFE1600-D1U, HFE2500-S1U racks.
m	/any combination of A-Z and/or 0-9 blank-base model	Other options (not be safety relevant), may follow after "-".

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

The component was tested according to the standard IEC 62368-1:2018 (2nd Edition) and/or EN IEC 62368-1:2020+A11:2020.

Additionally the component was also evaluated according to the standards CSA/UL 62368-1:2019 and fulfils the requirements of this standard.

1. The products are intended for use with external 30 A (USA) and (IEC) branch circuit. External circuit breaker did not open during the testing. The unit is approved for TN mains star connections and IT mains with 230 V a.c. phase to phase voltage. Modules provide internally one fuse in live supply conductor. Main secondary output circuits are separated from mains by reinforced insulation and rated ES1 and PS3 level. Aux secondary output is rated ES1 and PS2.

2. The modules and racks with terminal block do not provide disconnect device. Therefore, disconnect

device must be provided as part of end product or as part of installation.

3. The power supply is rated class I. Power supply modules shall be properly bonded to the main protective bonding termination in the end product. The touch current to enclosure is below 7.07 mApk. An investigation of the protective bonding terminal has been conducted.

4. The equipment has been evaluated for use in a Pollution Degree 2 and overvoltage category II environment and a maximum altitude of 3048 m for models HFE2500-24/S-Ky and HFE2500-12/S-Ky and 3000 m for all other models.

5. All accessory rack model (models HFE1600-S1U-TB, HFE1600-D1U-TB and HFE2500-S1U-TB) are not supplied with slide rails and have not been evaluated for use with slide rails. Additional evaluation is required according to end use application.

6. The products were evaluated for a maximum ambient of 50°C. Following de-rating shall be considered for ambient temperature above 50°C:
All models (except listed separately below)
- +50°C to +60°C: the max. output power should be de-rated by 2%/°C;
- +60°C to +70°C: the max. output power should be de-rated by 2.5%/°C.

For HFE1600-xy-R:
- +50°C to +55°C: the max. output power should be de-rated by 2%/°C;

For HFE1600-48/SD:
- +50°C to +55°C: the max. output power should be de-rated by 2%/°C;

For HFE1600-12/S-R/001:
- +35°C to +45°C: the max. output power should be de-rated by 2%/°C;
- +45°C to +55°C: the max. output power should be de-rated by 2.5%/°C;

For HFE2500-12-R:
- +50°C to +55°C: the max. output power should be de-rated by 2%/°C;

For HFE2500-24-R:
- +45°C to +50°C: the max. output power should be de-rated by 1%/°C
- +50°C to +55°C: the max. output power should be de-rated by 2%/°C;

7. Following input voltage de-rating shall be considered
Depending on the input supply voltage the following de-rating criteria shall be applied:

HFE1600 models :
- 265VAC≥Vin≤170VAC - the max. output power equal 1608W;
- 170VAC>Vin≤100VAC - the max. output power equal 1200W;
- 85Vac ≤ Vin < 100Vac - 1%/V from the max. output power at 100VAC.

RFE1600 models :
- 265VAC≥Vin≤170VAC - the max. output power equal 1608W;
- 170VAC>Vin≤100VAC - the max. output power equal 1104W;
- 85Vac ≤ Vin < 100Vac – 0.6%/V from the max. output power at 100VAC.

All HFE/RFE2500 models :
- 180 ≤ Vin ≤ 265Vac -the max. output power equal 2496W
- 170 ≤ Vin ≤ 180Vac -the max. output power equal 2400W
- 100 ≤ Vin ≤ 132 Vac - max. output power equal 1500
- 85Vac ≤ Vin < 100Vac- 1.3%/V from the max. output power at 100VAC

HFE1600-48/SD and HFE1600-48-R:
- 265VAC≥Vin≤170VAC - the max. output power equal 1300W;

- 170VAC>Vin≤100VAC - the max. output power equal 1008W;
- Vin<100VAC - 1%/V from the max. output power at 100VAC.

HFE1600-32-R:
- 265VAC≥Vin≤170VAC - the max. output power equal 1216W;
- 170VAC>Vin≤100VAC - the max. output power equal 960W;
- Vin<100VAC - 1%/V from the max. output power at 100VAC.

HFE1600-24-R:
- 265VAC≥Vin≤170VAC - the max. output power equal 1296W;
- 170VAC>Vin≤100VAC - the max. output power equal 960W;
- Vin<100VAC - 1%/V from the max. output power at 100VAC.

HFE1600-12-R:
- 265VAC≥Vin≤170VAC - the max. output power equal 1284W;
- 170VAC>Vin≤100VAC - the max. output power equal 960W;
- Vin<100VAC - 1%/V from the max. output power at 100VAC.

HFE1600-12/S-R/001:
- 265VAC≥Vin≤170VAC - the max. output power equal 1356W;
- 170VAC>Vin≤100VAC - the max. output power equal 960W.

HFE2500-12-R:
- 265VAC≥Vin≤170VAC - the max. output power equal 1920W;
- 170VAC>Vin≤100VAC - the max. output power equal 1200W;
- Vin<100VAC – 1.3%/V from the max. output power at 100VAC.

HFE2500-24-R:
- 265VAC≥Vin≤170VAC - the max. output power equal 1997W;
- 170VAC>Vin≤100VAC - the max. output power equal 1200W;
- Vin<100VAC – 1.3%/V from the max. output power at 100VAC.

HFE2500-12/S-R/RE:
- 265VAC≥Vin≤180VAC - the max. output power equal 2331W;
- 180VAC≥Vin≤170VAC - the max. output power equal 2080W;
- 170VAC>Vin≤100VAC - the max. output power equal 1450W;
- Vin<100VAC – 1.5%/V from the max. output power at 100VAC.

Report history:

32083425.303	**This test report is a reissue of report 32083425.301 with the following administration changes:** - **Added 'USA' to the CBTL address** - **Added missing verdict Clause 5.6.4.1 in main report** - **Added missing verdict to Attachment 1.2: Annex DVH (DVH.3.4)** - **Adjusted Photo document to have maximum 2 photos per page so page number has changed from 15 to 16** - **Added the full history of 31082331 and 31182226 into the Date of receipt of test item, Date (s) of performance of tests, and Report History.**
32083425.301	This test report is a reissue of report 32083425.300 due to missing factories on the CB certificate. The report has not changed.
32083425.300	This test report is a standard upgrade to IEC 62368-1:2018 (3rd Edition).
32083425.001	Original IEC 62368-1:2014 (2nd Edition) report. This report is a conglomeration of CB reports 31082331 and 31182226.
	Report 31082331 is certified under TÜV Rheinland of North America, Inc., IEC 60950-1:2005+A1+A2, Cert. No. US-TUVR-12101.

31082331.001	**Original CB-report**
31082331.003	**Change of current rating from '14.2A' to '14.2 / 8.1A' for the accessory rack; correction of table 1.6.2 (some missing values for the 12V-modules re-entered)**
31082331.005	**New CB-report for an upgrade of standard to IEC 60950-1:2005+A1, listing of additional models HFE1600-48/IHF & -48/SD and RFE1600-48xy/ -32xy/ -24xy /-12xy; derating (model HFE1600-48/SD with derating)**
31082331.007	**New CB-report for a correction of model numbers: HFE1600-48/IHF to HFE1600-48/INF and HFE1600-S1U/TN to HFE1600-S1-TB**
31082331.009	**Amendment 1 - This is abbreviated report to delete factory TDK-LAMBDA ELECTRONICS CO LTD, LOT 107 WUXI, SINGAPORE INDUSTRIAL PARK XING CHUANG ERLU WUXI JIANGSU 214028 CHINA and add factory WUXI TDK-LAMBDA ELECTRONICS CO LTD, No.6,Xing Chuang Er Lu, Wuxi,Jiangsu Province 214028, CHINA. This report also provides for corrections to the description of optocoupler PC101-PC106 in the Critical Component List and related CDF. There is no impact to previous evaluation and testing, no additional testing was deemed necessary.**
31082331.011	**Amendment 2 - This is an abbreviated test report to correct the listing for the capacitances C101, C102 in the list of critical components**
31082331.015	**New CB-report. Correction of critical components list according to CQC requirements; adding new model (rack) HFE1600-D1U which is identical with previously certified rack model HFE1600-S1U but it is designed for a maximum of 4 power supplies instead of five. Also a separate output busbar for each two of the power modules instead of a common output used for the HFE1600-S1U rack; New CB-report also contains a minor modification of the HFE1600-S1U rack. All changes discussed above do not require any further testing.**
31082331.017	**Amendment 1 - This is an abbreviated test report covering the addition of capacitors C17–C24 to model HFE1600-D1U. This report is an abbreviated report and is to be used in conjunction with report 31082331.015**
31082331.019	**New CB test report for upgrade of standard to IEC 60950-1:2005 (Sec. Ed.) + Am 1:2009 + Am 2:2013 , listing of additional models with reverse air flow direction/marked with suffix -R, adding custom model HFE1600-12/S-R/001 with special max. ambient temperature at 100% load. Due to similarity with previously certified models only partial testing done for models HFE1600-12-R and custom model HFE1600-12/S-R/001 as described above in section "Summary of testing". This report also provides for corrections of Critical Component List and related CDF**
31082331.021	**Amendment 1 to CB report 31082331.019 covers the removal of factory: Panyu Trio Microtronics Co Ltd, Shiji Industrial Estate Dongyong, Nansha Guangzhou, Guangdong 511453 China. No testing is performed.**
31082331.023	**New CB report for listing of optional communication module HFE1600-LAN; re-arrange model/type listing and input/output rating listing; added suffix "u"and "z" for single power supply modules ; change HFE1600-S1U-z and HFE1600-D1U-z to HFE1600-S1U-wu and HFE1600-D1U-wu; correction of listing of L101, L102 in critical components list.**
31082331.025	**Amendment 1 to CB report 31082331.023. Adding suffix "/mmmmm", correction of critical component list, addition of manufacture for winding components, updating of magnet wire and tapes. Changing the recording format for components. Updating of attachment 3 (Schematics), attachment 4 (PCB), attachment 5 (Magnetics Construction). Testing during original evaluation according to report number 31082331.001/31082331.023 no further testing was deemed necessary for**

	this update.
31082331.027	**Addition of TIW (triple insulated wire) manufacturer in DC/DC transformers. Updating of attachment 3 (Schematics), attachment 4 (PCB), attachment 5 (Magnetics Construction), updating labels artwork, correction of typographical errors and addition of missing information in the critical component list, adding optional model names with "-mmmmm" to replace the model configuration "/mmmmm" and add m='blank', addition of PCB manufacturer for ICB263 and ICB314. Testing during original evaluation according to report number 31082331.001 /31082331.023 no further testing was deemed necessary for this update.**
31082331.029	**Addition of factory:** **TDK-LAMBDA (MALAYSIA) SDN BHD** **Lot 2&3, Batu 9-3/4 Kawasan Perindustrian Bandar Baru Jaya Gading, Kuantan, Pahang Malaysia 26070** **Updating of attachment 4 (PCB) with ICB263 and ICB314** **Updating labels artwork.** **Additions of an alternative type of Y-capacitor, with exactly the same or better properties. See Table 1.5.1 BOLD for details.** **No testing deemed necessary.**
31082331.031	**Remove factory WUXI TDK-LAMBDA ELECTRONICS CO LTD and add TDK-Lambda (China) Electronics Co., Ltd. located at:** **No.95, Zhujiang Road, Xinwu District, Wuxi, Jiangsu 214028 P.R. China** **No testing deemed necessary.**
31082331.033	**Addition of alternate option for internal DC fan (BL1, BL2) and marking label. No testing deemed necessary.**
	Report 31182226 is certified under TÜV Rheinland of North America, Inc., IEC 60950-1:2005+A1+A2, Cert. No. US-TUVR-11530
3118226.001	**original report**
3118226.003	**New test report for an upgrade of standard according to IEC60950-1:2005+A1**
3118226.005	**Amendment 1 to 31182226.008 for the listing of an alternate PCB-material in the list of Critical Components. The PCB is manufactured by an alternate manufacturer but according to the identical specification and drawings from the applicant which haven't changed.**
3118226.006	**New test report for an upgrade of standards according from (IEC 60950-1:2005+Am1:2009) to (IEC 60950-1;2005+Am 1:2009 + Am 2:2013) and (EN 60950-1:2006+A11:2009 +A1:2010+A12:2011) to (EN 60950-1:2006+A11:2009+A1:2010+A12:2011 +A2:2013)**
3118226.008	**Amendment 1 to report 31182226.006 for addition of suffix "z" to models HFE2500-48. Explanation below.** **CQC) (HFE2500-48/S only)-identification for specific customer, fully same with base model HFE2500- 48/S.**
3118226.010	**Amendment 2 to report 31182226.008 for correction of typing error: missed tables of clearance and creepage distance measurements (tables 2.10.3 & 2.10.4) for model HFE2500-XYZ.**

3118226.011	**New CB report. This report covers the following:** • **Additional models HFE2500 reverse fan** • **RFE2500, HFE2500-48/S-CQC and HFE2500-12/S-R/RE, correction of Critical Component List** • **Change of configuration code.**
3118226.013	**Amendment 1 to report 31182226.011 to adding the following:** • **Alternate Fan "Nidec model: W40S12BHA5-53".**
3118226.014	**Amendment 2 to report 31182226.011 covers listing of optional communication module HFE2500-LAN; adding of different marking for components used in HFE2500-12/RFE2500-12; correct listing of p/n of CN101/CN1101 in critical components list; correction of listing of L101, L102 in critical component list; changing of input/output rating for model HEF2500-12/S-R/RE from Iout=180A to Iout=190A, from Pout=2200W to Pout=2300W and from Iin=14A to Iin=15A; adding IEC60950-1: 2001 National Differences for Japan.**
3118226.016	**Amendment 3 to report 31182226.011 covers changing of output rating for model HEF2500-12/S-R/RE from Vout=12VDC to Vout=12.6VDC, from Iout=190A to Iout=185A, from Pout=2300W to Pout=2331W, changing of max. ambient temperature from Ta max.=40°C to Ta max.=42°C, changing fan's model for HFE2500-12/S-R/RE from W40S12BHA5-52 or W40S12BHA5- 53 or V40S12BHA5-53 to same as for standard models of HFE2500/RFE2500 modules.**
3118226.018	**Covers updating of labels artwork; adding optical model names with** **"-mmmmm" in addition to the model configuration "/mmmmm" and add m='blank'; addition of an alternate manufacturer of TIW (triple insulated wire) in DC/DC transformers; correction of typographical errors and addition of missing information to Critical Component List; updating of the National Differences, attachments 3 (Schematics), and attachment 4 (PCB); and clarifying models 3, 4, and 6 test item descriptions.**
3118226.020	**Covers:** **Addition of factory:** **TDK-LAMBDA (MALAYSIA) SDN BHD** **Lot 2&3, Batu 9-3/4 Kawasan Perindustrian** **Bandar Baru Jaya Gading, Kuantan, Pahang Malaysia 26070** **Updating of attachment 4 (PCB) with ICB264, ICB308, ICB334 and ICB333.** **Additions of an alternative type of Y-capacitor, with exactly the same or better properties.** **See Table 1.5.1 BOLD for details. No testing deemed necessary.**
3118226.022	**Covers:** **Remove factory WUXI TDK-LAMBDA ELECTRONICS CO LTD and add TDK-Lambda (China) Electronics Co., Ltd. located at:** **No.95, Zhujiang Road, Xinwu District, Wuxi, Jiangsu 214028** **P.R. China** **No testing deemed necessary.**
3118226.024	**Covers:** **Addition of alternate option for internal DC fan (BL1, BL2) and marking label.** **No testing deemed necessary.**

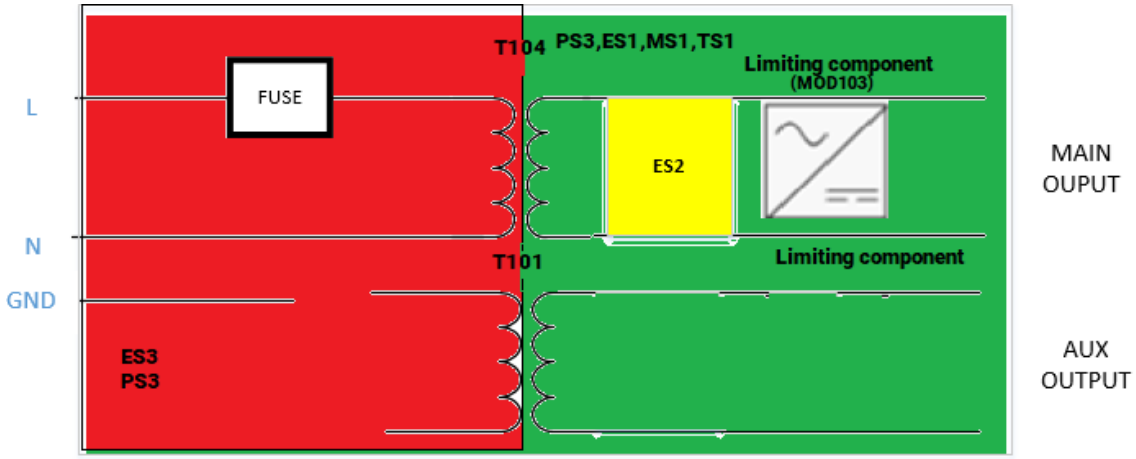
OVERVIEW OF ENERGY SOURCES AND SAFEGUARDS				
Clause	**Possible Hazard**			
5	Electrically-caused injury			
Class and Energy Source (e.g. ES3: Primary circuit)	Body Part (e.g. Ordinary)	Safeguards		
		B	S	R
ES3: Primary circuit	Ordinary	-	-	Equipment Enclosure
ES3: Pins of appliance inlet	Ordinary	-	-	Evaluated per Clause 5.5.2.2
ES3: Terminal block for AC mains	Skilled	-	-	N/A
ES2: Secondary circuit before rectifier of main transformer T104	Ordinary	-	-	Equipment Enclosure
ES2: Secondary circuit before rectifier of auxiliary transformer T101	Ordinary	-	-	Equipment Enclosure
ES1: Secondary main output connector	Ordinary	-	-	-
ES1: Secondary auxiliary output connector	Ordinary	-	-	-
ES1: Secondary communication connector	Ordinary	-	-	-
6	Electrically-caused fire			
Class and Energy Source (e.g. PS2: 100 Watt circuit)	Material part (e.g. Printed board)	Safeguards		
		B	1st S	2nd S
PS3: All primary and secondary circuits inside the equipment enclosure	All combustible materials within power supply modules	Equipment Safeguard (Limitation of the temperature under normal, abnormal and single fault conditions)	Selection of materials with suitable flam rating + A suitable Electrical and Fire enclosure shall be provided by end-product	-
PS3: All primary and secondary circuits inside the equipment enclosure (for HFE1600-S1U, HFE1600-D1U, HFE2500-S1U)	All combustible materials within racks	Equipment Safeguard (Limitation of the temperature under normal, abnormal and single fault conditions)	Selection of materials with suitable flam rating + fire enclosure	-

PS3 Main output connector	(except HFE1600-LAN and HFE2500-LAN)	Information for final product	Equipment meant for building-in – fire enclosure shall be provided by end-product.	-
PS2 Auxiliary output connector		-	-	-
PS1 Communication connector		-	-	-
7	Injury caused by hazardous substances			
Class and Energy Source (e.g. Ozone)	Body Part (e.g., Skilled)	Safeguards		
		B	S	R
N/A	N/A	-	-	-
8	Mechanically-caused injury			
Class and Energy Source (e.g. MS3: Plastic fan blades)	Body Part (e.g. Ordinary)	Safeguards		
		B	S	R
MS1: Sharp edges and corners	Ordinary	-	-	-
MS1: Equipment mass of module MS2: Equipment mass of rack	Ordinary	-	-	Installation by skilled / instructed person.
MS3: Fan blades	Skilled	-	-	Enclosure
9	Thermal burn			
Class and Energy Source (e.g. TS1: Keyboard caps)	Body Part (e.g., Ordinary)	Safeguards		
		B	S	R
TS1: Accessible surfaces-chassis	Ordinary	By test of Annex B.2.6.	-	-
10	Radiation			
Class and Energy Source (e.g. RS1: PMP sound output)	Body Part (e.g., Ordinary)	Safeguards		
		B	S	R
RS1:LED signal diode (indicator)	Ordinary	-	-	-
Supplementary Information: “B” – Basic Safeguard; “S” – Supplementary Safeguard; “R” – Reinforced Safeguard				

ENERGY SOURCE DIAGRAM
Optional. Manufacturers are to provide the energy sources diagram identify declared energy sources and identifying the demarcations are between power sources. Recommend diagram be provided included in power supply and multipart systems. Insert diagram below. Example diagram designs are; Block diagrams; image(s) with layered data; mechanical drawings

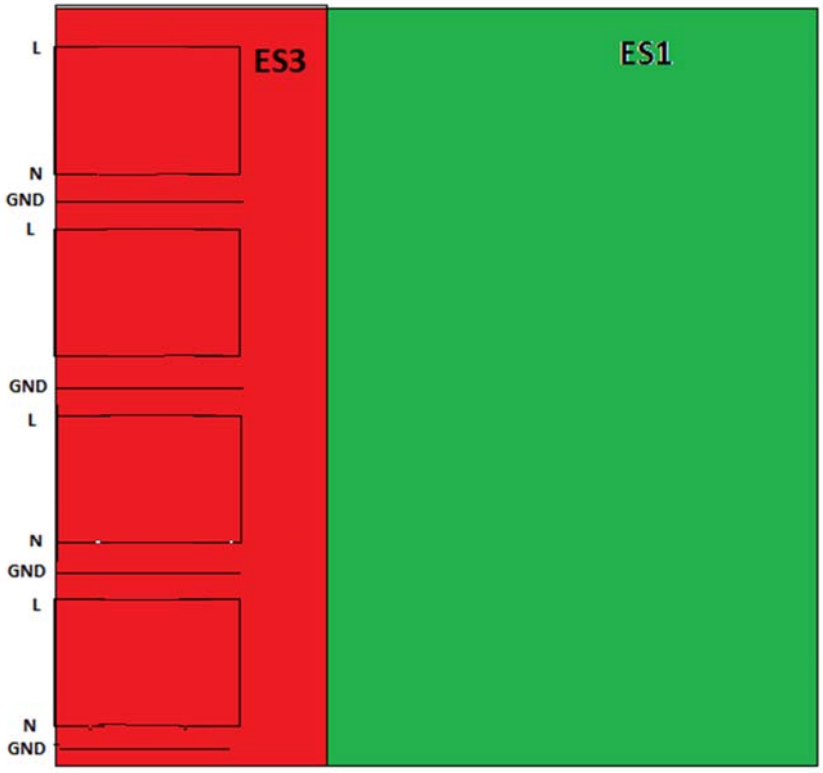
☒ ES ☒ PS ☒ MS ☒ TS ☐ RS

HFE/RFE 1600 & 2500 W, Models 12, 24 , 32, 48 Vdc



HFE1600/2500 LAN

Empty RACK all series



Description of the circuits:

AC input: ES3 (steady state and capacitance),

PS3 Primary circuit: ES3, PS3

Secondary circuit of T104 before rectification: ES2, PS3

Secondary circuit of T101 before rectification: ES2, PS3

Main output of the unit: ES1, PS3

Aux output of the unit: ES1, PS2

Communication/signal interface: ES1, PS1

Complete enclosure: TS1

LED: RS1

Mass: MS1 for modules, MS2 for racks

Edges/corners MS1

Fan: MS3 (Not accessible)