



Test Report issued under the responsibility of:



TEST REPORT IEC 60950-1 Information technology equipment – Safety – Part 1: General requirements	
Report Number :	31082331.023
Date of issue :	13 th December, 2016
Total number of pages	161
Applicant's name	TDK-Lambda Ltd.
Address	56 Haharoshet St., P.O.B. 500 Karmiel Industrial Zone Karmiel 2161401, Israel
Test specification:	
Standard :	IEC 60950-1:2005 (Second Edition) + Am 1:2009 + Am 2:2013
Test procedure	CB Scheme
Non-standard test method	N/A
Test Report Form No.	IEC60950_1F
Test Report Form(s) Originator :	SGS Fimko Ltd
Master TRF	Dated 2014-02
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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.	
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Test item description	Switching power supplies and accessory rack
Trade Mark	TDK-Lambda, <i>TDK-Lambda</i>
Manufacturer	TDK-Lambda Ltd.
Model/Type reference	<p>Single Power Supply Modules:</p> <p>1) HFE1600-48xyz, HFE1600-32xz, HFE1600-24xz, HFE1600-12xz (x = /S, blank; y = /POE, blank; z= -R, blank; u = /CO, blank)</p> <p>2) RFE1600-48xy, RFE1600-32xu, RFE1600-24xu, RFE1600-12xu (x = /S, blank; y = /POE, blank; u = /CO, blank)</p> <p>3) HFE1600-48/INF</p> <p>4) HFE1600-48/SD</p> <p>5) HFE1600-12/S-R/001</p> <p>Accessory rack:</p> <p>6) HFE1600-S1Uwu, HFE1600-D1Uwu (w = -TB or blank, u = /CO, blank)</p> <p>7) HFE1600-LAN</p>
Ratings	<p>1)</p> <p>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., 1600W max. 32VDC (25.6~38.4VDC), 50A max., 1600W max. 24VDC (19.2~29VDC), 67A max., 1600W max. 12VDC (9.6~13.2VDC), 133A max., 1600W max.</p> <p>b) models with suffix -R (reverse fan models) Input: 100-240 VAC, 11.7 A max., 50/60 Hz; (*Output: at ambient temperature up to 50°C, Vin=170-240VAC, : 48VDC (38.4~58VDC), 27A max., 1300W max. 32VDC (25.6~38.4VDC), 38A max., 1200W max. 24VDC (19.2~29VDC), 54A max., 1300W max. 12VDC (9.6~13.2VDC), 107A max., 1300W max.</p> <p>2)</p> <p>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., 1600W max. 32VDC (25.6~38.4VDC), 50A max., 1600W max. 24VDC (19.2~29VDC), 67A max., 1600W max. 12VDC (9.6~13.2VDC), 133A max., 1600W max.</p> <p>3)</p> <p>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., 1600W max.</p> <p>4)</p> <p>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., 1600W max.</p> <p>5)</p> <p>Input:100-240 VAC, 11.7 A max., 50/60 Hz; (*Output: at ambient temperature up to 35°C Vin=170-240VAC, : 12V DC (9.6~13.2VDC), 113A max., 1356W max. Auxiliary output (all single power supply modules): 12V/0.5A</p> <p>6) Input: (per each input): 100-240VAC, 14.2A/8.1A max., 50/60 Hz. (*Output: -output voltage: same with installed power supply modules -output current:</p>

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

Auxiliary output (all): 12VDC/0.5A

(*) See "Condition of Use" for de-rating criteria vs. input voltage and vs. ambient temperature.

7) Input: 12 VDC, 0.5A max.

Testing procedure and testing location:		
<input checked="" type="checkbox"/>	CB Testing Laboratory:	TÜV Rheinland of North America, Inc.
Testing location/ address		1279 Quarry Lane, Ste. A, Pleasanton, CA 94566
<input type="checkbox"/>	Associated CB Testing Laboratory:	
Testing location/ address		
Tested by (name + signature)		
Approved by (name + signature)		
<input type="checkbox"/>	Testing procedure: TMP/CTF Stage 1:	
Testing location/ address		
Tested by (name + signature)		
Approved by (name + signature)		
<input type="checkbox"/>	Testing procedure: WMT/CTF Stage 2:	
Testing location/ address		
Tested by (name + signature)		
Witnessed by (name + signature)		
Approved by (name + signature)		
<input checked="" type="checkbox"/>	Testing procedure: SMT/CTF Stage 3 or 4:	TDK-Lambda Ltd. 56 Haharoshet St., P.O.B. 500 Karmiel Industrial Zone Karmiel 2161401, Israel
Testing location/ address		
Tested by (name + signature)		Gorinshtein Boris
Witnessed by (name + signature)		Valery Rodionov
Approved by (name + signature)		Duy Nguyen
Supervised by (name + signature).....		Norman Chadwick

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

- Attachment 1: National Differences (28 pages)
- Attachment 2: Photo Documentation (6 pages)
- Attachment 3: Schematics (13 pages)
- Attachment 4: PCB Artwork (27 pages)
- Attachment 5: Magnetics Construction (7 pages)

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

[testing performed during original evaluation, report number 31082331.001]

Clause 1.2.1 Maximum output voltage, current and measurements
 Clause 1.6.2 Power Input Measurements
 Clause 1.7.11 Durability of Marking Test
 Clause 2.1.1.1 Accessibility to Energized parts
 Clause 2.1.1.5 Energy hazard measurements
 Clause 2.1.1.7 Capacitor discharge test
 Clause 2.2 SELV circuits – voltage measurements (normal and fault conditions)
 Clause 2.6.3.4 Protective earthing trace earth fault current; Earthing test
 Clause 2.9.1 Humidity test
 Clause 2.10.2 Determination of working voltage
 Clause 2.10.11 Semiconductor devices and cement joints
 Clause 4.2 Mechanical strength test
 Clause 4.5 Temperature rise measurements
 Clause 5.1 Touch current measurements
 Clause 5.2 Dielectric strength test
 Clause 5.3 Abnormal operating and fault conditions

[testing performed for report 31082331.017]

Clause 5.1 Touch current measurements
 Clause 5.2 Dielectric strength test

[testing performed for report 31082331.019]

The partial tests as listed below were done for HFE1600-12-R and HFE1600-12/S-R/001 to evaluate differences between previously evaluated models and added models with reverse air flow direction/marked with suffix –R, custom model HFE1600-12/S-R/001. Testing for HFE1600-48-R was waived due to similarity with previously evaluated model HFE1600-48/SD.

The decision about partial testing based on similarity of electrical schematic, mechanical construction, used components and environmental conditions for added models.

Testing location:

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

[according to original test reports, report numbers 31082331.001, 31082331.017, 31082331.019]

<p>Clause 1.6.2 Power input measurements Clause 4.5 Temperature rise measurements Clause 5.2 Dielectric strength test Clause 5.3 Abnormal operating and fault conditions</p> <p><u>31082331.021</u> No testing</p> <p><i>[testing performed for report 31082331.023] The partial tests as listed below were done for HFE1600-LAN. Clause 1.6.2 Input Current Clause 2.6.3.4 Earthing Test Clause 2.10.2 Working Voltage Measurement. Clause 5.2 Dielectric Strength Test.</i></p>																	
<p>Summary of compliance with National Differences</p> <p>List of countries addressed:</p> <p>EU Group Differences, EU Special National Conditions, CA, US.</p> <p>Explanation of used codes: CA = Canada, US = United States of America.</p> <p><input checked="" type="checkbox"/> The product fulfils the requirements of EN 60950-1:2006/A2:2013</p>																	
<p>CB-Report History:</p> <table border="0"> <tr> <td data-bbox="220 1048 395 1077">31082331.001</td> <td data-bbox="496 1048 703 1077">original CB-report</td> </tr> <tr> <td data-bbox="220 1095 395 1124">31082331.003</td> <td data-bbox="496 1095 1430 1155">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)</td> </tr> <tr> <td data-bbox="220 1155 395 1184">31082331.005</td> <td data-bbox="496 1155 1437 1245">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)</td> </tr> <tr> <td data-bbox="220 1245 395 1274">31082331.007</td> <td data-bbox="496 1245 1326 1305">New CB-report for a correction of model numbers: HFE1600-48/IHF to HFE1600-48/INF and HFE1600-S1U/TN to HFE1600-S1-TB</td> </tr> <tr> <td data-bbox="220 1305 395 1335">31082331.009</td> <td data-bbox="496 1305 1481 1547">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.</td> </tr> <tr> <td data-bbox="220 1547 395 1576">31082331.011</td> <td data-bbox="496 1547 1374 1608">Amendment 2 - This is an abbreviated test report to correct the listing for the capacitances C101, C102 in the list of critical components</td> </tr> <tr> <td data-bbox="220 1608 395 1637">31082331.015</td> <td data-bbox="496 1608 1433 1850">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.</td> </tr> <tr> <td data-bbox="220 1883 395 1912">31082331.017</td> <td data-bbox="496 1883 1477 1998">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</td> </tr> </table>		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
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31082331.019	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	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	<i>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.</i>

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 the se marks.

HFE1600-D1U

INPUT : 100-240VAC ~14.2A/8.1A EACH INPUT
50/60Hz
OUTPUT: MAX. OUTPUT POWER: 6080W
MAX. 266A PER EACH OUTPUT




48V MODEL:
48V \equiv 63A (33A PER INSTALLED HFE1600-48 UNIT)
12V \equiv 0.5A

32V MODEL:
32V \equiv 95A (50A PER INSTALLED HFE1600-32 UNIT)
12V \equiv 0.5A

24V MODEL:
24V \equiv 127A (67A PER INSTALLED HFE1600-24 UNIT)
12V \equiv 0.5A

12V MODEL:
12V \equiv 253A (133A PER INSTALLED HFE1600-12 UNIT)
12V \equiv 0.5A

USE ONLY HFE SERIES POWER SUPPLIES OF THE SAME OUTPUT VOLTAGE RATING.

TDK-Lambda

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 \equiv 157A (33A PER INSTALLED HFE1600-48 UNIT)
12V \equiv 0.5A

32V MODEL:
32V \equiv 237A (50A PER INSTALLED HFE1600-32 UNIT)
12V \equiv 0.5A

24V MODEL:
24V \equiv 318A (67A PER INSTALLED HFE1600-24 UNIT)
12V \equiv 0.5A

12V MODEL:
12V \equiv 400A (133A PER INSTALLED HFE1600-12UNIT)
12V \equiv 0.5A

USE ONLY HFE SERIES POWER SUPPLIES OF THE SAME OUTPUT VOLTAGE RATING.

TDK-Lambda

KEY POSITION:

HFE1600-

INPUT : 100-240VAC ~14.2A
50/60Hz

OUTPUT : XXV \rightleftharpoons XXA
12V \rightleftharpoons 0.5A

TDK-Lambda
MADE IN ISRAEL

KEY POSITION:

HFE1600- /S-R

INPUT : 100-240VAC ~11.7A
50/60Hz

OUTPUT : XXV \rightleftharpoons XXA
12V \rightleftharpoons 0.5A

TDK-Lambda
MADE IN CHINA

RFE1600-

INPUT : 100-240VAC ~14.2A
50/60Hz

OUTPUT : XXV \rightleftharpoons XXA
12V \rightleftharpoons 0.5A

TDK-Lambda
MADE IN ISRAEL

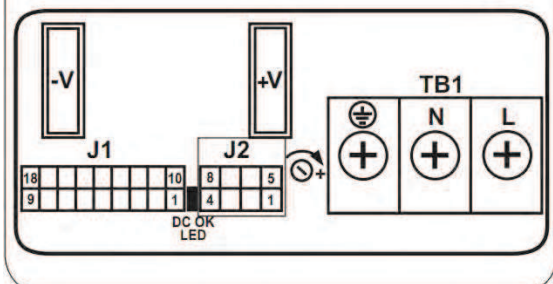
KEY POSITION:

HFE1600-12/S-R/001

INPUT : 100-240VAC ~11.7A
50/60Hz

OUTPUT : 12V \rightleftharpoons 113A
12V \rightleftharpoons 0.5A

TDK-Lambda
MADE IN CHINA



KEY POSITION:

HFE1600-48/SD

INPUT : 100-240VAC ~14.2A
50/60Hz

OUTPUT : 48V \rightleftharpoons 27A
12V \rightleftharpoons 0.5A

TDK-Lambda
MADE IN ISRAEL

HFE1600-LAN

INPUT : 12V \rightleftharpoons 0.5A MAX

TDK-Lambda
MADE IN ISRAEL

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

Test item particulars:	
Equipment mobility:	<input type="checkbox"/> movable <input type="checkbox"/> hand-held <input type="checkbox"/> transportable <input type="checkbox"/> stationary <input checked="" type="checkbox"/> for building-in <input type="checkbox"/> direct plug-in
Connection to the mains:	<input checked="" type="checkbox"/> pluggable equipment (*) <input checked="" type="checkbox"/> type A (*) <input type="checkbox"/> type B <input type="checkbox"/> permanent connection <input checked="" type="checkbox"/> detachable power supply cord (*) <input type="checkbox"/> non-detachable power supply cord <input type="checkbox"/> not directly connected to the mains NOTE: Connection to the mains depends to model: refer to General Product Information below. (*)-for HFE1600-S1U and HFE1600-D1U racks only (also see Note above)
Operating condition:	<input checked="" type="checkbox"/> continuous <input type="checkbox"/> rated operating / resting time:
Access location	<input checked="" type="checkbox"/> operator accessible (see NOTE below) <input type="checkbox"/> restricted access location <i>NOTE: Only front side of HFE1600 modules and RFE1600 units, HFE1600-D1U and HFE1600-S1U racks may be accessible for user. Component for build-in.</i>
Over voltage category (OVC)	<input type="checkbox"/> OVC I <input checked="" type="checkbox"/> OVC II <input type="checkbox"/> OVC III <input type="checkbox"/> OVC IV <input type="checkbox"/> other:
Mains supply tolerance (%) or absolute mains supply values	±10%
Tested for IT power systems	<input checked="" type="checkbox"/> Yes (Norway only) <input type="checkbox"/> No
IT testing, phase-phase voltage (V)	230
Class of equipment	<input checked="" type="checkbox"/> Class I <input type="checkbox"/> Class II <input checked="" type="checkbox"/> Class III (HFE1600-LAN) <input type="checkbox"/> Not classified
Considered current rating of protective device as part of the building installation (A)	
Pollution degree (PD)	<input type="checkbox"/> PD 1 <input checked="" type="checkbox"/> PD 2 <input type="checkbox"/> PD 3
IP protection class	IPX0
Altitude during operation (m)	max. 3000m
Altitude of test laboratory (m)	50m
Mass of equipment (kg)	1) max. 2.1kg 2) max. 10.5kg
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.....	: [according to original test report with number 31082331.001]: 06/21/2010 31082331.017 – 07/08/2013 31082331.019 – 04/28/2014 31082331.023 – 09/10/2016
Date(s) of performance of tests	: [according to original test report with number 31082331.001]: 06/21/2010 – 08/05/2010 31082331.017 – 07/08/2013 to 07/09/2013 31082331.019 – 04/28/2014 to 05/27/2014 31082331.023 – 09/10/2016 to 10/10/2016,16/11/2016
General remarks:	
<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 <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</p>	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC60950-1:	
<p>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.....</p>	<p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> Not applicable</p> <p>The units manufactured in each factory are fully identical. All tested samples are representing products from each factory.</p>
Name and address of factory (ies)	<p>1) TDK-Lambda Ltd. 56 Haharoshet St., P.O.B. 500 Karmiel Industrial Zone Karmiel 2161401, Israel</p> <p>2) WUXI TDK-LAMBDA ELECTRONICS CO LTD NO 6 XING CHUANG ER LU WUXI JIANGSU 214028 CHINA</p>

General product information:

All products are Class I, designed for Overvoltage Category II and Pollution Degree 2.

HFE1600 **modules** may be used in the complete set of the accessory rack HFE1600-S1U /HFE1600-D1U or separately from the accessory rack HFE1600-S1U /HFE1600-D1U in accordance with the “Conditions of Use”.

For HFE1600 **modules** and for RFE1600 units using separately the means of connection to the mains shall be specified in end-installation.

RFE1600 units are same with the HFE1600 **modules** and have minor differences due to using of separate input TB, separate signals connectors and output bus-bars instead of common I/O connector which used in HFE1600 **modules**.

Accessory racks HFE1600-S1U/HFE1600-D1U intended for use only with HFE1600 **modules**.

Accessory rack HFE1600-S1U intended for using with up to five power supply modules all connected by output in parallel.

Accessory rack HFE1600-D1U intended for using with up to four power supply modules with separate output for each couple of power supply modules.

Accessory racks HFE1600-S1U/HFE1600-D1U are Pluggable Type A, intended for connection to mains via standard detachable power supply cord.

For accessory racks HFE1600-S1U/HFE1600-D1U an appliance coupler(s) considered as disconnect device(s).

For accessory racks HFE1600-S1U-TB/HFE1600-D1U-TB, for HFE1600 **modules** and for RFE1600 units the means of connection to the mains shall be specified in end-installation.

HFE1600-xy-z, RFE1600 units and accessory racks HFE1600-S1U-TB/HFE1600-D1U-TB have no a disconnect device provided with unit. An appropriate disconnect device shall be provided by end- installation.

In all units the outputs considered SELV and separated by reinforced insulation from primary mains.

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

HFE1600-LAN is optional communication SELV module which may be used in the complete set of the accessory rack HFE1600-S1U-w/HFE1600-D1U-w and powered by +12 VDC from auxiliary output of power supplies within the rack or separately by an external +12V SELV output supply in accordance with the user manual.

Definition of variable(s):

Model configuration code: HFE1600-xyzu, RFE1600-xyu, HFE1600-S1Uwu, HFE1600-D1U-wu

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-standard model	For HFE1600-48 only
z	-R – with reverse air flow blank-standard air flow	(HFE1600 only) standard air flow: 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 racks

Abbreviations used in the report:

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

Indicate used abbreviations (if any)

- primary	PRI
- ground (protective earth)	GND
- safety extra low voltage	SELV
- terminal block	TB
- Triple Insulated Wire	TIW

CONDITIONS OF USE:

- All units shall be installed in compliance with the enclosure, mounting, spacing, casualty, segregation and other safety related requirements of the final application.
- The main outputs (48VDC, 32VDC, 24VDC or 12VDC) have been investigated for SELV with energy hazardous level.
- Auxiliary output (12VDC) has been investigated for SELV with non-energy hazardous level.
- All outputs are separated by reinforced insulation from supply mains and primary circuit. Outputs are unearthed and may or may not be earthed during product installation.
- For **HFE1600 modules** used separately and for **RFE1600** units the voltage value for Dielectric Strength Test should be based on the maximum supply voltage for end-product.
- A suitable Electrical and Fire enclosure shall be provided by end-product.
- The products shall be properly bonded to the protective earth in end-product.
- For accessory racks HFE1600-S1U and HFE1600-D1U an appliance coupler(s) considered as Disconnect device(s).
HFE1600 modules, RFE1600units and accessory racks HFE1600-S1U-TB, HFE1600-D1U-TB have no disconnect device provided with unit. An appropriate disconnect device shall be provided in end-installation.
- All units were tested on a 30A branch circuit for each AC input. If used on a branch circuit greater than listed above, an additional testing may be necessary.
- All units (except HFE1600-48/SD, HFE1600-xy-R and HFE1600-12/S-R/001) are suitable for the maximum ambient operating temperature of 50°C at max. output power equal or less of 1600W. HFE1600-48/SD and HFE1600-xy-R are suitable for the maximum ambient operating temperature 35°C at max. output power equal or less of 1300W max. HFE1600-12/S-R/001 is suitable for the maximum ambient operating temperature 35° at max. output power equal or less of 1356W.
- The following de-rating criteria shall be applied when the ambient temperatures will exceed allowed max. ambient temperature at max. output power:
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;
- $V_{in} < 100VAC$ - 1%/V from the max. output power at 100VAC.
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;
- Depending on the input supply voltage the following de-rating criteria shall be applied:
All models (except listed separately below)
- $265VAC \geq V_{in} \leq 170VAC$ - the max. output power equal 1600W;
- $170VAC > V_{in} \leq 100VAC$ - the max. output power equal 1200W;
- $V_{in} < 100VAC$ - 1%/V from the max. output power at 100VAC.
HFE1600-48/SD and HFE1600-48-R:
- $265VAC \geq V_{in} \leq 170VAC$ - the max. output power equal 1300W;

- $170\text{VAC} > V_{in} \leq 100\text{VAC}$ - the max. output power equal 1008W;
 - $V_{in} < 100\text{VAC}$ - 1%/V from the max. output power at 100VAC.
- HFE1600-32-R:
- $265\text{VAC} \geq V_{in} \leq 170\text{VAC}$ - the max. output power equal 1216W;
 - $170\text{VAC} > V_{in} \leq 100\text{VAC}$ - the max. output power equal 960W;
 - $V_{in} < 100\text{VAC}$ - 1%/V from the max. output power at 100VAC.
- HFE1600-24-R:
- $265\text{VAC} \geq V_{in} \leq 170\text{VAC}$ - the max. output power equal 1296W;
 - $170\text{VAC} > V_{in} \leq 100\text{VAC}$ - the max. output power equal 960W;
 - $V_{in} < 100\text{VAC}$ - 1%/V from the max. output power at 100VAC.
- HFE1600-12-R:
- $265\text{VAC} \geq V_{in} \leq 170\text{VAC}$ - the max. output power equal 1284W;
 - $170\text{VAC} > V_{in} \leq 100\text{VAC}$ - the max. output power equal 960W;
 - $V_{in} < 100\text{VAC}$ - 1%/V from the max. output power at 100VAC.
- HFE1600-12/S-R/001:
- $265\text{VAC} \geq V_{in} \leq 170\text{VAC}$ - the max. output power equal 1356W;
 - $170\text{VAC} > V_{in} \leq 100\text{VAC}$ - the max. output power equal 960W.