



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 Reference No.: E331788-D1000-1/A0/C0-CB
 Date of issue: 2018-07-27
 Total number of pages: 176

Applicant's name: TDK-LAMBDA UK LTD
 Address: KINGSLEY AVENUE
 ILFRACOMBE
 DEVON, EX34 8ES UNITED KINGDOM


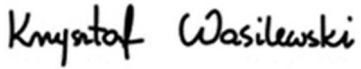
Test specification:
 Standard: IEC 61010-1:2010 (Third Edition)
 Test procedure: CB Scheme
 Non-standard test method: N/A

Test Report Form No.: IEC61010_1J
 Test Report Form Originator: VDE Testing and Certification Institute
 Master TRF: 2013-11

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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.

Test item description:	Switch mode power supply	
Trade Mark:	TDK-Lambda	
Manufacturer:	Same as Applicant	
Model/Type reference:	Vega 450, Vega 650, Vega 900, Vega Lite 550 and Vega Lite 750.	
Ratings:	<p>Vega 450 and Vega Lite 550. PSUs with cooling option F and without xFW and xEW options: Input voltage: 94.5-240 V ac nom., 47-63 Hz, 8.5 A rms max. All other PSUs: Input voltage: 100-240 V ac nom., 47-63 Hz, 8.5 A rms max.</p> <p>Vega 650, Vega Lite 750 and Vega 900. PSUs with cooling option F and without xFW and xEW options: Input voltage: 94.5-240 V ac nom., 47-63 Hz, 12 A rms max. All other PSUs: Input voltage: 100-240 V ac nom., 47-63 Hz, 11 A rms max.</p>	
Testing procedure and testing location:		
<input checked="" type="checkbox"/> CB Testing Laboratory:		
Testing location/ address:	UL International Polska Sp. z o.o. Aleja Krakowska 81 05-090 Sekocin Nowy Warszawy POLAND	
<input type="checkbox"/> Associated CB Testing Laboratory:		
Testing location/ address:		
Tested by (name + signature):	Marcin Zurek (Handler)	
Approved by (name + signature):	Krzysztof Wasilewski (Reviewer)	
<input type="checkbox"/> Testing procedure: TMP:		
Testing location/ address:		
Tested by (name + signature):		
Approved by (name + signature):		
<input type="checkbox"/> Testing procedure: WMT:		
Testing location/ address:		
Tested by (name + signature):		
Witnessed by (name + signature):		
Approved by (name + signature):		
<input checked="" type="checkbox"/> Testing procedure: SMT:		
Testing location/ address:	TDK-Lambda Ltd,	

	Kingsley Avenue, Ilfracombe, Devon EX34 8ES. United Kingdom	
Tested by (name + signature):	Mr K. P. Tizzard (Tester)	See the original CBTR for signatures
Approved by (name + signature):	Mr R. A. Taylor (Reviewer)	See the original CBTR for signatures
Supervised by (name + signature):	Manfred Mueller (Handler)	See the original CBTR for signatures
<input type="checkbox"/> Testing procedure: RMT		
Testing location/ address:		
Tested by (name + signature):		
Approved by (name + signature):		
Supervised by (name + signature):		

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

Refer to Appendix A of this report. All attachments are included within this report.

Summary of testing

Tests performed (name of test and test clause):

Testing location:

Refer to the Test List in Appendix B of this report if testing was performed as part of this evaluation.

Summary of compliance with National Differences

List of countries addressed: USA / Canada, Switzerland, Japan, Austria, Denmark, Korea, Republic Of, Slovenia, Sweden, United Kingdom

[X] The product fulfils the requirements of IEC 61010-1:2010 (Third Edition).

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.

Refer to the enclosure(s) titled Marking Label in the Enclosures section in Appendix A of this report for a copy.

Test item particulars:	
Type of item:	Laboratory
Description of equipment function:	Switch mode power supply for building in
Connection to mains supply:	None or IEC60320 inlet
Overvoltage category:	II
Pollution degree:	2
Means of protection:	Class I (PE connected)
Environmental conditions:	Normal
For use in wet locations:	No
Equipment mobility:	Built-in
Operating conditions:	continuous
Overall size of equipment (W x D x H)	272x127x63
Mass of equipment (kg):	2.5kg maximum
Marked degree of protection to IEC 60529:	None
Testing	
Date of receipt of test item(s)	2013-06-25
Dates tests performed	2013-07-05 to 2013-07-08
Possible test case verdicts:	
- test case does not apply to the test object	N/A
- test object does meet the requirement.....	Pass (P)
- test object was not evaluated for the requirement	N/E
- test object does not meet the requirement.....	Fail (F)
Abbreviations used in the report:	
- normal condition: N.C.	- single fault condition: S.F.C.
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 Form A.xx are optional if used as record.	
Throughout this report a point is used as the decimal separator.	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC60068-2-11:2012	
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
When differences exist; they shall be identified in the General product information section.	

Name and address of factory (ies): Same as Applicant

PANYU TRIO MICROTRONICS CO LTD
 SHIJI INDUSTRIAL ESTATE
 DONGYONG
 NANSHA
 GUANGZHOU

GUANGDONG, 511453 CHINA

GENERAL PRODUCT INFORMATION:

Report Summary

All applicable tests according to the referenced standard(s) have been carried out.
 Refer to the Report Modifications for any modifications made to this report.

Product Description

Vega 450, Vega 650, Vega 900, Vega Lite 550 and Vega Lite 750 are switch mode power supply units for building into host equipment. There are essentially 2 converters (450 and 650) and all units use the same modules. The Vega 450 and 550 use the 450 converter whilst the Vega 650, 750 and 900 use the 650 converter.

Model Differences

PRODUCTS COVERED

Vega models as described below:

Units may be marked with a Product Code: Ky*, KVy* or Vy* where y may be 4, 5, 6, 7 or 9 and * may be any series of numbers from 0 to 9 and/or any letters from A to Z.

a) V4, V5, V6, V7, V9, Vega 450, Vega 650, Vega 900, Vega Lite 550, Vega Lite 750, Vega Smart or Vega Smart Plus

Where V4 = Vega 450 range

V5 = Vega Lite 550 range

V6 = Vega 650 range

V7 = Vega Lite 750 range

V9 = Vega 900 range

Vega Smart = Vega 450 or 650 PSU with primary digital option fitted

Vega Smart Plus = Vega 450 or 650 PSU with primary and secondary digital options fitted

(may be prefixed by NS - # / or - where # may be

up to any four letters and may be followed by - \$ where \$ may be any number between 000 to 999, indicating non-safety related model differences.

b) Followed by: A, C, D, E, F, R, Q or P

Where F = Standard fan, forward airflow

R = Standard fan, reverse air

Q = Quiet fan, forward airflow

P = Quiet fan, reverse air

C = Customer air
 A = Custom models only
 D* = Ruggedised fan, forward airflow
 E* = Ruggedised fan, reverse air

* These fans must not be used for user accessible applications.

c) Optionally followed by: F, I or S

Where F = Fast-on or quick connect input terminals

S = Screw input terminals

I = IEC input

d) Followed by: S, M, G, L, R, or T

Where S = Standard Leakage (Class B Filter)

M = Medium Leakage

G = Moderate Leakage

L = Low Leakage

R = Reduced Leakage

T = Tiny Leakage

e) Optionally followed by: E, F, EV, FV, EY, FY, xEW, xFW or D

Where E = AC fail with PSU & fan enable and 5V aux supply

F = AC fail with PSU & fan inhibit and 5V aux supply

EV = AC fail with PSU & fan enable and 5V/300mA aux supply

FV = AC fail with PSU & fan inhibit and 5V/300mA aux supply

EY = AC fail with PSU & fan enable, 5V/300mA aux supply and fan fail signal

FY = AC fail with PSU & fan inhibit, 5V/300mA aux supply and fan fail signal

xEW = AC fail with PSU & fan enable and 5-15V/1A aux supply, where x = voltage setting

xFW = AC fail with PSU & fan inhibit and 5-15V/1A aux supply, where x = voltage setting

D = Primary digital option. Provides PSU inhibit and enable, fan monitor, standby supply, hours of operation, serial numbers, mains fail, over temperature warning. When secondary digital options fitted also provides status bytes, unit and module IDs, grouping, digital voltage and current limit programming, secondary inhibit and enable, secondary turn on delay, global and secondary module good, module monitoring.

Modules

B@, C@, C1Y, D@, E@, F1, F2, H@/@ or @_@, L@, W2, W5, W8 & W9.

where the letter represents a module and @ is a number between 1 and 5, which represents the number of turns on the transformer secondary. By reference to the following table, this in turn defines the permitted voltage range of the module.

@ may optionally be followed by the letter L or H, where L and H indicate the low or high output voltage variants of the module.

For W2, W5, W8 & W9 modules only: @ is followed by F, T, E or S

Where F = Fixed OVP

T = Tracking OVP

E = Fixed OVP, high current output

S = Tracking OVP, high current output

Followed by F or S, where F indicates fast-on output terminals and S indicates screw output terminals.

Or Z#

Where # is a number between 1 and 99. This code represents any two of the above modules that have had their outputs paralleled together. The number # is a module reference number and does not represent the number of turns. May optionally followed by F or S, where F indicates fast-on output terminals and S indicates screw output terminals.

Or BB@, CC@, DD@, EE@, HH@/@ or @_@, JJ@/@ or @_@, LL@, C5B4 or B5B4

Where @ is a number between 1 and 5, which represents the number of turns on the transformer secondary. For HH@/@ or @_@ the code represents one H module that has had its two outputs connected in series. For all other variants this code represents two modules, selected from those listed above, that have had their outputs connected in series. May optionally followed by F or S, where F indicates fast-on output terminals and S indicates screw output terminals.

Note: Seriated outputs may make all outputs hazardous, see Electrical & Thermal Ratings section for details. JJ@/@ or @_@ modules are HH@/@ or @_@ modules with reduced OVP and/or current ratings.

Or X1, X2, X4, X8, XR1, XR2, XR4 & XR8

Where the number relates to the maximum voltage capability of the X or XR module (voltage rating is 10 multiplied by the number). The X or XR modules are connected to the output terminals of B, D, E or W modules, which may be connected in series or parallel. The X and XR modules contains diodes in series with their output (for paralleling use). The X module also has additional circuitry for remote sense, paralleling with other X modules and module inhibit. A maximum of two X or XR modules may be fitted in a PSU.

Or B/S where B/S indicates that a blanking plate is fitted in place of a module.

Any of the above modules (except the X and XR modules) may have the module letter preceded with # or ## where # is represents the module output voltage.

Module Options:

N, E, P, R, T, L, K, D, V‡ or R‡

Where N = Inhibit, module good and remote sense.

E = Enable, module good and remote sense

P = Parallel with current share

R = Remote sense (twin output modules only)

T = Remote sense (one output of twin output modules only)

L = Module good using LED indication

K = Allows for Vega products to be paralleled with Omega products

D = Secondary digital option (may only be fitted to single output modules). Provides analogue voltage and resistive programming, current limit modes, inhibit output, enable output, turn on delay, module good, N+1 paralleling.

V‡ = Voltage programmable output voltage

R‡ = Resistance programmable output voltage

where ‡ represents a number between 1 and 99. Each number indicates an option variant which does not affect safety, of these the following are standard variants:

1 = Inhibit, fixed current limit

2 = Inhibit, programmable current limit

3 = Enable, fixed current limit

4 = Enable, programmable current limit

May additionally be marked with K4x, K5x, K6x or V4x, V5x, V6x, V7x, V9x where x can be up to five digits of any letter or number between 0 and 9 indicating non-safety related model differences.

ELECTRICAL & THERMAL RATINGS:

Output modules:

Module	O/P V	Rated I	P	Slots	Turns	A/T
B1L	1 - 3.8V	20A	76W	1	1	20
B1H	2 - 5.5V	20A	110W	1	1	20
B2	3 - 9V	25A	225W	1	2	50
B3	9.1 - 16.2V	12A	195W	1	3	36
B4	16.3 - 21.5V	10A	215W	1	4	40
B5	21.6 - 31V	6A	186W	1	5	30
C1	1 - 4.1V	35A	144W	1	1	35
C1Y	1 - 4.1V	40A	164W	1	1	40
C3	9.1 - 16.2V	18A	292W	1	3	54
C4	16.3 - 21.5V	14A	301W	1	4	56
C5	21.6 - 31V	10A	310W	1	5	50
D1L	1 - 3.8V	50A	190W	1.5	1	50
D1H	3.9 - 5.5V	50A	275W	1.5	1	50
D2	3.8 - 9V	45A	405W	1.5	2	90
D3	8 - 16.5V	24A	396W	1.5	3	72
D4	14 - 21.5V	18A	387W	1.5	4	72
D5	21 - 28V	15A	420W	1.5	5	75
E1	1 - 3.8V	60A	228W	2	1	60
E2	3.8 - 8V	60A	480W	2	2	120
E3L	8 - 13.9V	40A	556W	2	3	120
E3H	14 - 15V	36A	540W	2	3	108
E4	14 - 19.9V	30A	597W	2	4	120
E5L	20 - 24V	27A	648W	2	5	135
E5H	24 - 28V	25A	650W	2	5	125
F1	1 - 3.8V	80A	640W	2	1	80
F2	3.8 - 8V	80A	640W	2	2	160
H1L/1L	1-3.8/1-3.8V	12A/8A	46W/31W	1	1/1	12/8
H1L/1H	1-3.8/3.9-5.5V	12A/8A	46W/44W	1	1/1	12/8
H1H/1L	3.9-5.5 /1-3.8V	12A/8A	66W/31W	1	1/1	12/8
H1H/1H	3.9-5.5 /3.9-5.5V	12A/8A	66W/44W	1	1/1	12/8
H1L/2	1-3.8/5-9V	12A/6A	46W/54W	1	1/2	12/12
H1H/2	3.9-5.5/5-9V	12A/6A	66W/54W	1	1/2	12/12
H1L/3	1-3.8/9.1-16.2V	12A/6A	46W/98W	1	1/3	12/18
H1H/3	3.9-5.5/9.1-16.2V	12A/6A	66W/98W	1	1/3	12/18
H1L/4	1-3.8/16.3-25V	12A/4.5A	46W/113W	1	1/4	12/18
H1H/4	3.9-5.5/16.3-25V	12A/4.5A	66W/113W	1	1/4	12/18
H2/1L	5.6-9/1-3.8V	10A/8A	90W/31W	1	2/1	20/8
H2/1H	5.6-9/3.9-5.5V	10A/8A	90W/44W	1	2/1	20/8
H2/2	5.6-9/5.6-9V	10A/6A	90W/54W	1	2/2	20/12
H2/3	5.6-9/9.1-16.2V	10A/6A	90W/98W	1	2/3	20/18
H2/4	5.6-9/16.3-25V	10A/4.5A	90W/113W	1	2/4	20/18

H3/1L	9.1-16.2/1-3.8V	10A/8A	162W/31W	1	3/1	30/8
H3/1H	9.1-16.2/3.9-5.5V	10A/8A	162W/44W	1	3/1	30/8
H3/2	9.1-16.2/5.6-9V	10A/6A	162W/54W	1	3/2	30/12
H3/3	9.1-16.2/9.1-16.2V	10A/6A	162W/98W	1	3/3	30/18
H3/4	9.1-16.2/16.3-25V	10A/4.5A	162W/113W	1	3/4	30/18
H5/1L	16.2-31/1-3.8V	5A/8A	155W/31W	1	5/1	25/8
H5/1H	16.2-31/3.9-5.5V	5A/8A	155W/44W	1	5/1	25/8
H5/2	16.2-31/5.6-9V	5A/6A	155W/54W	1	5/2	25/12
H5/3	16.2-31/9.1-16.2V	5A/6A	155W/98W	1	5/3	25/18
H5/4	16.2-31/16.3-25V	5A/4.5A	155W/113W	1	5/4	25/18
L1	4.2 - 5.5V	35A	193W	1	1	35
W2	0.25 - 7.5V	30A	225W	1	2	60
W5 (Standard)	0.25 - 32V	8.5A	272W	1	5	50
W5 (High current o/p)	0.25 - 15V 15.01 - 32V	10A 8.5A	272W	1	5	50
W8	1 - 48V	5A	240W	1	8	-
W9	1-30V	2A	60W	1	5	-
X1	10V (See Note 1)	90A	See Note 2	1	-	-
X2	20V (See Note 1)	64.5A	See Note 2	1	-	-
X4	40V (See Note 1)	32.4A	See Note 2	1	-	-
X8	80V (See Note 1)	16.2A	See Note 2	1	-	-

Note 1: Actual voltage and current output of X and XR modules is dependent, and limited by, the ratings of the modules from which it is fed. The ratings given above are additional rating limitations imposed by the X module itself.

Note 2: The maximum power output of PSUs fitted with X or XR modules is reduced from its normal rated value by the following power: $0.55 \times (\text{total X1 \& XR1 current}) + 0.7 \times (\text{total X2, X4, XR2 \& XR4 current}) + 0.9 \times (\text{total X8 \& XR8 current})$

Additional module limitations:

E2 module fitted in slots 4/5 is limited to 55A.

C1Y module can only be fitted in slot 1.

F2 module may only be fitted in slots 1/2 and is limited to 75A for ambient temperatures of greater than 45°C.

F1 module may only be fitted in slots 1/2.

For PSUs with three D modules fitted:

D1L & D1H in slots 2/3 is limited to 42A and in slots 4/5 is limited to 47A

D2 in slots 2/3 is limited to 40A

For 900W PSUs:

W2 module not permitted.

F1 and F2 modules not permitted.

PSUs fitted with a W2 module are limited to a maximum ambient of 45°C.

All the above ratings and limitations apply to the individual modules from which a series or paralleled pair is

made.

SELV and Outputs Connected In Series:

Outputs are SELV except as described below:

Non-earthed outputs that have secondary's with 2 or more turns are non-SELV as a single fault in the secondary may make them exceed the SELV limit between output and earth.

Non-earthed outputs that are connected in series are non-SELV unless all the seriated outputs use 1 turn secondary's and there are no more than 3 outputs connected in series.

Outputs connected in series are non-SELV if the total output voltage + 20% of the max. rated output voltage of the output with the highest rated voltage exceeds 60Vdc (the 20% addition allows for a single fault in any one individual channel).

The total voltage of a seriated output must not exceed 160V.

If any output or seriated output is non-SELV then all the outputs in the PSU must be considered non-SELV.

Note:

Non-SELV outputs must be guarded or a deflector fitted during installation to avoid a service engineer making inadvertent contact with the output terminals, or dropping a tool onto them.

All outputs have operational spacing's to earth, and due consideration must be given to this in the end product design.

When the IEC inlet option is fitted (option I) together with a plastic fan grill then the end face of the PSU with the fan grill may be operator accessible.

Ratings Specific to Vega 450 and Vega Lite 550 Ranges:

PSUs with cooling option F and without xEW and xFW options:

Input voltage: 94.5-240 V ac nom., 85-264V ac max., 47-63 Hz, 8.5 A rms max.

All other PSUs:

Input voltage: 100-240 V ac nom., 90-264V ac max., 47-63 Hz, 8.5 A rms max.

Permitted orientations: Horizontal with chassis lowest, on either side or vertical with the airflow upwards.

Cooling Option	Max. Amb (°C)	Dual Width Modules Fitted	P (W)	Max. AT (Total)	Max. AT in adj	Max Modules I Rating Regions (Note 1)
F	See table below	No	See table below	180	N/A	100%
		Yes		180	180	100%
D	50	No	450	180	N/A	100%
		Yes	450	180	180	100%
R, E	50	No	450	180	N/A	100%
		Yes	450	180	162	90%
Q	50	No	450	180	N/A	100%
		Yes	450	180	180	100%
P	50	No	450	180	N/A	100%
		Yes	450	180	180	100%
C	50	See customer air cooling section for ratings				

Note 1: The PSU main transformer has three regions for module secondary's separated by two primary windings. Starting nearest slot 1, region A, primary winding, region B, primary winding, region C. The total ampere turns (AT) in any two adjacent regions is limited to that in the table above column, "Max AT in adjacent regions (note 1)". See Mains transformer regions table for modules allowed in each region. The table uses

module widths with a twin output module being single width. For PSUs fitted with F2 modules "Max AT in adjacent regions" does not apply.

n/a = not applicable

Ampere Turns (AT) is the sum of (output amps x secondary turns)

Power ratings for cooling option F:

I/P V (Vrms)	O/P P (W)	Max. Amb. 40°C xEW or xFW option fitted	Max. Amb. 50°C xEW or xFW option fitted
85	425	Not permitted	425
90	470	450	450
100	520	450	500
110-149.9	570	450	550
150-264	630	450	560

Linear interpolation may be used to determine the permitted output power for input voltages between 85 and 110V.

Ratings Specific to Vega 650 and Vega 750 Lite Ranges:

PSUs with cooling option F and without xEW and xFW options:

Input voltage: 94.5-240 V ac nom., 85-264V ac max., 47-63 Hz, 12 A rms max.

All other PSUs:

Input voltage: 100-240 V ac nom., 90-264V ac max., 47-63 Hz, 11 A rms max.

Permitted orientations: Horizontal with chassis lowest, on either side or vertical with the airflow upwards.

Cooling Option	Max. Amb (°C)	Dual Width Modules Fitted	P (W)	Max. AT (Total)	Max AT in Adj I	Max Module Rating Regions (Note 1)
F	See table below	No	See table below	220	N/A	100%
		Yes	See table below	220	180	100%
D	50	No	650	220	N/A	100%
		Yes	650	220	180	100%
R, E	40	No	530	212	N/A	100%
		Yes	550	212	158	90%
		Yes	500	212	158	90%
	50	No	575	180	N/A	100%
		Yes	600	210	162	90%
		No	500	200	N/A	100%
Q	50	Yes	550	180	140	100%
		No	650	220	N/A	100%
		Yes	610	220	180	95%
		Yes	650	145	115	95%
P	40	Yes	500	203	152	85%

	45	Yes	420	203	152	85%
	50	No	500	180	N/A	100%
C	50	See Customer Air Cooling section for ratings				

Note 1: The PSU main transformer has three regions for module secondary's separated by two primary windings. Starting nearest slot 1, region A, primary winding, region B, primary winding, region C. The total ampere turns (AT) in any two adjacent regions is limited to that in the table above column, "Max AT in adjacent regions (note 1)". See Mains transformer regions table on Page 16 for modules allowed in each region. The table uses module widths with a twin output module being single width. For PSUs fitted with F2 modules "Max AT in adjacent regions" does not apply.

n/a = not applicable

Ampere Turns (AT) is the sum of (output amps x secondary turns)

Power ratings for cooling option F:

I/P V (Vrms)	O/P Power (W)	Max. Amb. 40°C xEW or xFW option fitted	Max. Amb. 50°C xEW or xFW option fitted
85	650	Not permitted	615
90	720	650	650
100	830	650	720
110-149.9	900	650	770
150-264	900	900	900

Linear interpolation may be used to determine the permitted output power for input voltages between 85 and 110V.

Ratings Specific to Vega 900 Range:

PSUs with cooling option F and without xEW and xFW options:

Input voltage: 94.5-240 V ac nom., 85-264V ac max., 47-63 Hz, 12 A rms max.

All other PSUs:

Input voltage: 100-240 V ac nom., 90-264V ac max., 47-63 Hz, 11 A rms max.

Permitted orientations: Horizontal with chassis lowest, on either side or vertical with the airflow upwards.

For input voltages equal to or greater than 150V ac ratings are as follows:

Cooling Option	Max. Amb (°C)	Dual Width Modules	P (W)	Max AT (Total)	Max AT in Adj	Max Module I Rating
F, D	50	No	900	220	180	100%
		Yes	900	220	180	100%
		No	650	220	N/A	100%
Q	50	No	750	180	N/A	100%
		Yes	750	180	140	100%
C	50	See Customer Air Cooling section for ratings				

For input voltages less than 150V ac ratings are as follows:

Cooling Option	Max. Amb (°C)	Dual Width Modules	P (W)	Max AT (Total)	Max AT in Adj	Max Module I Rating
F	See table below	No	See table below	220	N/A	100%
		Yes	See table below	220	180	100%
D	50	No	650	220	N/A	100%
		Yes	650	220	180	100%
R, E	40	No	530	212	N/A	100%
		Yes	550	212	158	90%
	45	Yes	550	212	158	90%
		No	575	180	N/A	100%
	50	Yes	600	210	162	90%
		No	500	200	N/A	100%
Q	50	Yes	550	180	140	100%
		No	650	220	N/A	100%
		Yes	610	220	180	95%
		Yes	650	145	115	95%
P	40	Yes	500	203	152	85%
		Yes	420	203	152	85%
	50	No	500	180	N/A	100%
		Yes	450	190	162	85%
C	50	See Customer Air Cooling section for ratings				

Power ratings for cooling option F:

I/P V (Vrms)	O/P Power (W)	Max. Amb. 40°C xEW or xFW option fitted	Max. Amb. 50°C xEW or xFW option fitted
85	650	Not permitted	615
90	720	650	650
100	830	650	720
110-149.9	900	650	770

Linear interpolation may be used to determine the permitted output power for input voltages between 85 and 110V.

Note 1: The PSU main transformer has three regions for module secondary's separated by two primary windings. Starting nearest slot 1, region A, primary winding, region B, primary winding, region C. The total ampere turns (AT) in any two adjacent regions is limited to that in the table above column, "Max AT in adjacent regions (note 1)". See Mains transformer regions table on Page 16 for modules allowed in each region. The table uses module widths with a twin output module being single width. For PSUs fitted with F2 modules "Max AT in adjacent regions" does not apply.

n/a = not applicable

Ampere Turns (AT) is the sum of (output amps x secondary turns)

Main transformer regions table:

REAR VIEW OF TRANSFORMER

SLOT 5 PRIMARY			SLOT 1 PRIMARY		
REGION C		REGION B		REGION A	
Slot 1 Region A	Region B	Slot 5.5. Region C	Slot 1 Region A	Region B	Slot 5.5 Region C
S	D	D	1.5	1.5	-
Blank	D	D	S	S, S	D
S	D,S	S	1.5	1.5	D
S	D	S	-	F, M, S	S, S
S	D	-	-	F, M, S	S
-	D	-	-	F, M, S	-
S	S, S, S	S	-	F, M	-
S	S, S	S	-	F, M, S	D
S	S	-	-	F, M	D
-	S	-	-	F, M, S	1.5
1.5	D	1.5	-	F, M	1.5
S	D	1.5	-	F, M 1.5	1.5
-	D	1.5	-	F, M 1.5	S
S	1.5, S	S			
S	1.5	S	Combined Modules		
S	1.5	-	S	D	D
1.5	1.5	1.5	-	D	D
S	1.5, 1.5	S	1.5	D	1.5
S	1.5	1.5	S	D	1.5
-	1.5	1.5	-	D	1.5
-	1.5	-	S	1.5, 1.5	S
-	S, S	D	S	1.5, 1.5	-
-	1.5, S	S	-	1.5, 1.5	-
1.5	1.5, S	S	1.5	1.5, D	1.5
-	D, S	S	1.5	1.5	1.5
1.5	D	S	1.5	1.5, S	S

D = Dual. S = Single, M = Module

Custom Models:

All ratings as per standard models unless otherwise stated.

Model: V6 RSF 3/1HS C3S B/S E2S

Maximum outputs: 12V, 2A; 5V, 1.5A; 12V, 10A; 5V 52A

Maximum Power: 411.5W

Maximum ambient: 40°C

Orientation: Horizontal only

Cooling: Reverse air, Papst 612NM.

Model: V6 FISFV 5.1F2SP 12B3F 3.4E1SP

Maximum outputs: 5.1V, 80A; 12V, 3A; 3.4V, 60A

TRF No. IEC61010_1J

Maximum power: 648W
Maximum ambient: 50°C
Orientation: Horizontal only
Cooling: Forward air

Model: V6FSS 24C5S 24D5S
Maximum outputs: 24V, 10A; 24V, 15A
Maximum Power: 600W
Maximum ambient: 65°C
Orientation: All except upside down and vertical with the airflow downwards
Cooling: Forward air

Model: Vega 450 AFT B/S 24D5S 21D5S (K40054, NS-CLE-010)
Input: 85-264Vac, 47-63Hz
Maximum outputs: 24V, 12.5A; 21V, 7.143A
Orientation: All except upside down and vertical with the airflow downwards
Cooling: Papst 612NML or 612NGML or 612NMLE fan fitted with up to 66 ohms total resistance in series.
Comments: Forward air.

Model: Vega 650 BFTF B/S 24.5E5HFN
Input: 90-264Vac, 47-63Hz
Maximum output: 24.5V, 18.37A
Maximum output power: 450W
Orientation: All except upside down and vertical with the airflow downwards
Cooling: Papst 612NML or 612NGML fan fitted with up to 64 ohms total resistance in series.
Comments: Reverse air.

Model: Vega 450 AFT B/S 24E5HS (NS-CLE-011)
Input: 85-264Vac, 47-63Hz
Maximum outputs: 24V, 14.59A
Maximum output power: 350W
Orientation: All except upside down and vertical with the airflow downwards
Cooling: Papst 612NML or 612NGML fan fitted with up to 64 ohms total resistance in series.
Comments: Forward air.

Model: NS-WKR/V4AFS 5/5H1H/1HFN 12/12H3/3F 5/5H1H/1HFN 25/25H5/4F (K40072)
Input: 90-264Vac, 47-63Hz
Maximum outputs: 5.5V, 2.5A; 5.5V, 2.5A; 12.5V, 2.5A; 12.5V, 2.5A; 5.5V, 2.5A; 5.5V, 2.5A; 26V, 1.5A; 26V, 1.5A
Maximum output power: 195.5W
Orientation: All except upside down and vertical with the airflow downwards
Cooling: Papst 612NML or 612NMLE fan.
Comments: Forward air.

Model: NS-THE/V9FSSF B/S 28E5HS (K90036)
Input: 90-264Vac, 47-63Hz
Maximum outputs: 28V, 25A
Maximum output power: 700W
Orientation: All except upside down and vertical with the airflow downwards

Cooling: Standard fan, forward airflow

Model: Vega 450 ASS5FW 12.1C3S 3.33C1S 5.05B1HS 5.25/12.1H1H/3SR (K40089)

Input: 90-264Vac, 47-63Hz

Outputs: 12.1V, 9.5A; 3.3V, 9A; 5.05V, 20A; 12.1V, 2A; 5.25V, 4.7A (294.53W)

Orientation: All except upside down and vertical with the airflow downwards

Cooling: Papst 612NMLE fan, reverse air

Model: Vega 650 ASS5FW 3.35C1Y5S 12.6/5.1H3/1HSR 6.1/12.6H2/3SR 5.1/5.3H1H/1HSR (K60162)

Input: 90-264Vac, 47-63Hz

Maximum outputs: 3.35V, 22A; 5.1V, 3.5A; 12.6V, 7A; 12.6V, 1A; 6.1V, 3A; 5.3V, 3A; 5.1V, 6.5A (259.7W)

Orientation: All except upside down and vertical with the airflow downwards

Cooling: Papst 612NMLE fan, reverse air

Model: NS-MEL/V4FSS B/S 12/12H3/3S 6.7B2S 3.3C1SN (K40110)

Input: 90-264Vac, 47-63Hz

Maximum output: 12V, 10A; 12V, 6A; 6.7V, 25A; 3.3V, 35A

Maximum output power: 450W

Orientation: All except upside down and vertical with the airflow downwards

Cooling: Standard fan, forward airflow.

Comments: Fan grill not fitted.

Model: NS-WKR/V4AFS 5/5H1H/1HFN 12/12H3/3F 5/5H1H/1HFN 28/25H5/4F (K40107)

Input: 90-264Vac, 47-63Hz

Maximum outputs: 5.5V, 2.5A; 5.5V, 2.5A; 12.5V, 2.5A; 12.5V, 2.5A; 5.5V, 2.5A; 5.5V, 2.5A; 28V, 1.5A; 26V, 1.5A

Maximum output power: 198.5W

Orientation: All except upside down and vertical with the airflow downwards

Cooling: Papst 612NML or 612NMLE fan.

Comments: Forward air.

Additional Information

Customer Air Cooling (option C):

The following method must be used for determining the safe operation of PSUs when C option (Customer Air) is fitted, i.e. fan not fitted to PSU.

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

Test requirements include: PSU to be fitted in its end-use equipment and operated under the most adverse conditions permitted in the end-use equipment handbook/specification and which will result in the highest temperatures in the PSU. To determine the most adverse conditions consideration should be given to the end use equipment maximum operating ambient, the PSU loading and input voltage, ventilation, end use

equipment orientation, the position of doors & covers, etc. Temperatures should be monitored using type K fine wire thermocouples (secured with cyanoacrylate adhesive, or similar) placed on the hottest part of the component (out of any direct airflow) and the equipment should be run until all temperatures have stabilised.

Circuit Ref. ++	Description	Max. Temp (°C) +
-	Power transformer	130
T1, TX101, TX201	Module current transformer	127 (130)
XQ1, XT	D, E, EV, F & FV Primary Option transformers	90
XTR1	EY, FY, EV & FV Primary option transformers	90
TX1	xEW & xFW Primary option transformer	130
L1, L2, XT601	Choke winding	110 (130)
L4, T2	Choke winding	117 (130)
Various	All Choke & transformer windings	110
RLY1	Relay	100
Various	X capacitor	100
C2, C3, C14	Electrolytic Capacitors 67	105
Various	All other 10mm dia Electrolytic Capacitors	80 (105)
Various	All other 12.5mm dia Electrolytic Capacitors	85 (105)

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

++ When fitted

This report is an amendment to CBTR Ref. No. E331788-A14-CB-1 dated 2013-07-25, CB Test Certificate Ref. No. DK-33984-UL dated 2013-07-25.

Based on previously conducted testing and the review of product construction, no additional testing of the Vega AC was considered necessary for the following revisions:

1. Enclosures updated.
2. Adding/removing alternates, making corrections and updating component Certificates in the Critical Components list.
3. CBTL changed to UL Demko A/S.
4. Factory information updated.

Amendment 2

The Original Test Report E331788-A14 -CB-1 was modified to include the following changes/additions:

- added alternate fan YEN SUN TECHNOLOGY CORP type FD126025HB rated 12V, 24.5cfm.
- CBTL changed to UL International Polska

After review no test deemed necessary.

Technical Considerations

- The product was investigated to the following standards:

Main Standard(s):

IEC 61010-1:2010 (Third Edition)

From Country Differences:

- USA / Canada: UL 61010-1, 3rd Edition, 2012-05-11 / CAN/CSA-C22.2 No. 61010-1, 3rd

Edition, 2012-05

- Switzerland: SN EN 61010-1:2010
- Japan: -
- Austria: EN 61010-1:2010
- Denmark: DS/EN 61010-1:2010
- Korea, Republic Of: K 61010-1
- Slovenia: SIST EN 61010-1
- Sweden: SS-EN 61010-1:2010
- United Kingdom: BS EN61010-1:2010

Additional Standards:

CAN/CSA 22.2 No. 61010-1-12 3rd Ed, 2012

EN 61010-1:2010

- The following additional investigations were conducted:
- The product was not investigated to the following standards or clauses:
- The following accessories were investigated for use with the product:
- The product was submitted and tested for use at the maximum recommended ambient temperature (T_{mra}) of 50°C

Engineering Conditions of Acceptability

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

This component has been judged on the basis of the creepage and clearances required in the indicated Standards, which would cover the component itself if submitted for Listing: UL 61010-1 3rd Ed.

CAN/CSA 22.2 No. 61010-1-12 3rd Ed.

IEC 61010-1:2010 3rd Ed.

EN 61010-1:2010.

The end-product shall consider that: The complete enclosure does not serve as a fire/electrical/mechanical enclosure

Only the enclosure face of unit with IEC60320 inlets has been assessed as an enclosure.

The need for the following shall be considered in the end-product: Bonding to protective earthing terminal (Class I construction).

Creepage and clearance distances were based on a maximum working voltage of Primary to earthed dead metal: 298Vrms, 392V peak.

Primary to SELV: 328Vrms, 504V peak.

Insulation between primary circuits and accessible dead metal complies with the requirements for Basic insulation

Insulation between primary and secondary circuits complies with the requirements for Reinforced insulation

The following tests shall be performed in the end-product evaluation Temperature test for customer air models and

Dielectric Strength test in accordance with the handbook.

The unit is considered acceptable for use at on a max branch circuit of 20A

The unit is considered acceptable for use in a max ambient of 50°C with up to 65°C for certain custom models.

End-product temperature tests for power supplies shall consider that the following transformers employ the indicated insulation system Main barrier transformer Class F (155°C)

Primary 1A option transformer TX1 Class F (155°C)

Other primary option transformers XTR1, XT1, XQ1 Class A (105°C)

The risk associated with clause 5.4.5 shall be assessed in the end product.

The leakage current tests have been provided for information only. This test must be considered in the end product application.

Report Modifications

Date Modified (Year-Month-Day)	Modifications Made (include Report Reference Number)	Modified By
2018-07-27	<p>This report is a re-issue of Test Report Reference No. E331788-A14-CB-1 & Test Certificate Reference No. DK-33984-UL issued 2013-07-25, Test Report Reference No. E331788-A14-CB-1 Amd 1 & Test Certificate Reference No. DK-33984-A1-UL issued 2015-10-08, Test Report Reference No. E331788-A14-CB-1 & Test Certificate Reference No. DK-33984-A2-UL issued 2018-01-17. All test data previously captured has been re-produced in this report in its entirety. This update also includes the following changes to the report:</p> <ol style="list-style-type: none"> 1. Addition of alternate components having similar or better ratings to previous components detailed in the Critical Components Table 2. Deletion of the Avnet manufacturing location 3. Updated the text in the Model Differences section 4. Updated the text in the Additional Information section 	Marcin Zurek

	No testing was considered necessary to make these changes. Based on the previously conducted testing and the review of product technical documentation including photos, schematics, wiring diagrams and similar, has been determined that the product continues to comply with the standard.	