



Test Report issued under the responsibility of:



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

Report Number: E331788-D1009-1/A0/C0-CB
Date of issue: 2021-11-16
Total number of pages.....: 201

Name of Testing Laboratory preparing the Report.....: UL VS Limited
 Unit 1-3 Horizon, Wade Road, Kingsland Business Park,
 Basingstoke RG24 8AH, United Kingdom

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

Test specification:

Standard: IEC 61010-1:2010, IEC 61010-1:2010/AMD1:2016
Test procedure: CB Scheme
Non-standard test method.....: N/A

TRF template used: IECEE OD-2020-F1:2020, Ed.1.3

Test Report Form No......: IEC61010_1P

Test Report Form Originator: VDE Prüf- und Zertifizierungsinstitut GmbH

Master TRF.....: 2021-04-12

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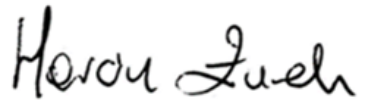
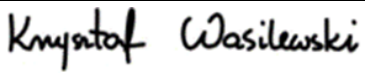
If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

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

General disclaimer:

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 NCB. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

Test item description:	Switch Mode Power Supply	
Trade Mark:	Trademark image(s): 	
Manufacturer	Same as Applicant	
Model/Type reference:	NV350 or NV3 or NV-350 (these models are identical). (May be prefixed by NS - # / or - where # may be any characters indicating non safety related model differences) Units may be additionally marked with a product code: K3x or Q3x where x may be any number of characters.	
Ratings:	100-240Vac nominal, (85-264Vac including tolerances). 47-440Hz, 5.5A rms Max.	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/> CB Testing Laboratory:		
Testing location/ address	UL VS Limited Unit 1-3 Horizon, Wade Road, Kingsland Business Park, Basingstoke RG24 8AH, United Kingdom	
Tested by (name, function, signature)	Marcin Zurek, Handler	
Approved by (name, function, signature)	Krzysztof Wasilewski, reviewer	
<input type="checkbox"/> Testing procedure: CTF Stage 1:		
Testing location/ address		
Tested by (name, function, signature)		
Approved by (name, function, signature)		
<input type="checkbox"/> Testing procedure: CTF Stage 2:		
Testing location/ address		
Tested by (name, function, signature)		
Witnessed by (name, function, signature)		
Approved by (name, function, signature)		
<input type="checkbox"/> Testing procedure: CTF Stage 3:		
<input type="checkbox"/> Testing procedure: CTF Stage 4:		
Testing location/ address	TDK-Lambda Ltd, Kingsley Avenue, Ilfracombe, Devon, EX34 8ES	

Tested by (name, function, signature)	N. S. Marsh, S. Hirstwood (Tester)	See Original Test report for signatures.
Witnessed by(name, function, signature):		
Approved by (name, function, signature):	K. P. Tizzard (Reviewer)	See Original Test report for signatures.
Supervised by (name, function, signature) ...:	Zmijewski Bartolomiej (Handler)	See Original Test report for signatures.

List of Attachments (including a total number of pages in each attachment)		
Document No.	Documents included / attached to this report (description)	Page No.
Refer to Appendix A of this report. All attachments are included within this report.		

Documents referenced by this report (available on request):		
Document Name or No.	Documents description	Page No.
Refer to Appendix A of this report. All attachments are included within this report.		

Summary of testing:

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

Clause	Comment
<i>Refer to the Test List in Appendix B of this report if testing was performed as part of this evaluation.</i>	<i>Refer to the Test List in Appendix B of this report if testing was performed as part of this evaluation.</i>

Test Report History: This report may consist of more than one report and is only valid with additional or previous issued reports:	
Report Ref. No.	Item
<i>Refer to Report Modifications under General product information for any modifications made to this report.</i>	
Tests performed (name of test and test clause): <i>Refer to the Test List in Appendix B of this report if testing was performed as part of this evaluation.</i>	Testing location: <i>Refer to the Test List in Appendix B of this report if testing was performed as part of this evaluation.</i>
Summary of compliance with National Differences (List of countries addressed): USA, Canada, EU Group <input checked="" type="checkbox"/> The product fulfils the requirements of <u>IEC 61010-1:2010, IEC 61010-1:2010/AMD1:2016.</u>	

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

(may be required by the product standard or client)

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

Procedure number, issue date and title:

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

Statement not required by the standard used for type testing

(Note: When IEC or ISO standard requires a statement concerning the uncertainty of the measurement systems used for tests, this should be reported above. The informative text in parenthesis should be delete in both cases after selecting the applicable option)

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 unless via the IEC60320 inlet.
Overvoltage category:	II
Pollution degree:	2
Means of protection:	Class I (PE connected)
Environmental conditions:	50°C ambient
For use in wet locations:	No
Equipment mobility:	Built-in
Operating conditions:	continuous
Overall size of equipment (W x D x H)	280 x 95 x 41mm Max.
Mass of equipment (kg):	2kg Max.
Marked degree of protection to IEC 60529:	N/A
Possible test case verdicts:	
- Test case does not apply to the test object	N/A (Not Applicable)
- Test object does meet the requirement	P (Pass)
- Test object does not meet the requirement	F (Fail)
Testing:	
Date of receipt of test item	2013-06-25, 2014-05-19 to 2014-10-07
Date(s) of performance of tests	2013-07-05 to 2013-07-08, 2014-05-20 to 2014-10-07
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 NCB. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.	
Throughout this report a point is used as the decimal separator.	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC60320-1:	
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 MICROTRONIC CO LTD SHIJI INDUSTRIAL ESTATE DONGYONG NANSHA GUANGZHOU GUANGDONG, 511453 CHINA

General product information and other remarks:**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

NV350 series. Switch mode power supplies for building into end equipment.

Additional Information

This report is a reissue of CBTR Ref. No. E331788-A17-CB-1, CB Test Certificate Ref. No. DK-33998-UL and E331788-A17-CB-1-Amendment-1, CB Test Certificate Ref. No. DK-33998-A1-UL. and CBTR Ref. No. E331788-A17-CB-1-Amendment-2, CB Test Certificate Ref. No. DK-33998-A2-UL. The original report was modified to include the following changes:

- The standard has been upgraded to the latest revision date.
- Standards were updated on critical component list
- Components licenses were attached to the report
- Capacitor Murata SA series and RA series with the same electrical ratings has been added as alternate to critical component list.

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.

Technical Considerations

- The product was investigated to the following standards:

Main Standard(s):

IEC 61010-1:2010/AMD1:2016/COR1:2019

From Country Differences:

- USA: UL 61010-1, 3rd Edition, May 11, 2012, Revised July 19, 2019
- Canada: CAN/CSA-C22.2 No. 61010-1(2012-05), 3rd Edition, with revisions through 2018-11
- EU Group: EN 61010-1:2010/A1:2019 (Edition 3.1)

Additional Standards:

-

- 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: -
- Equipment class: Class I

Equipment type: For building in

The product was submitted and tested for use at the maximum recommended ambient temperature (T_{mra}) of 50°C. From 50°C to 65°C the total output power and the module current ratings are both derated at 2.5% per °C.

Multilayer PWB's accepted under CBTR Ref. No.: E349607-A23 dated 2014-07-31 and letter report, Enclosure Multi-layer PWB Letter Reports of this report.

For any non-certification testing - Unless specified otherwise in this report, the compliance "Decision Rule" is based on Simple Acceptance (Measurement Uncertainty is not taken into account when making a statement of conformity)

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 Edition, May 11, 2012, Revised July 19, 2019, CAN/CSA-C22.2 No. 61010-1(2012-05), 3rd Edition, with revisions through 2018-11, IEC 61010-1:2010/AMD1:2016/COR1:2019, EN 61010-1:2010/A1:2019 (Edition 3.1) The end-product shall consider that: The enclosure does not serve as a fire/electrical/mechanical enclosure excluding the external face of the IEC60320 inlet.

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

The output connectors are Suitable for factory wiring only

Creepage and clearance distances were based on a maximum working voltage of Primary to earth dead metal: 622Vpeak, 343Vrms.

Primary to secondary: 650Vpeak, 363Vrms.

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 Double and Reinforced insulation

The following tests shall be performed in the end-product evaluation Temperature for customer air models Permissible Limits for Accessible Parts

Dielectric Strength

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. From 50°C to 65°C the total output power and the module current ratings are both derated at 2.5% per °C.

End-product temperature tests for power supplies shall consider that the following transformers employ the indicated insulation system Transformer TX1 Class F (155°C)

Transformer TX2 Class F (155°C)

Transformer T1 Class F (155°C)

Transformer T2 Class F (155°C)

End-product dielectric strength tests shall be based on the maximum working voltage of Primary to earth dead metal: 622Vpeak, 343Vrms.

Primary to secondary: 650Vpeak, 363Vrms.

The leakage current tests have been provided for information only. This test must be considered in the end product application and must be repeated for frequencies above 63Hz.

This product has been assessed for a maximum altitude of 3000m

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

Report Modifications

Date Modified (Year-Month-Day)	Modifications Made (include Report Reference Number)	Modified By
2021-11-16	This report is a reissue of CBTR Ref. No. E331788-A17-CB-1, CB Test Certificate Ref. No. DK-33998-UL and E331788-A17-CB-1-Amendment-1, CB Test Certificate Ref. No. DK-33998-A1-UL. and CBTR Ref. No. E331788-A17-CB-1-Amendment-2, CB Test Certificate Ref. No. DK-33998-A2-UL. The original report was modified to include the following changes: <ul style="list-style-type: none"> - The standard has been upgraded to the latest revision date. - Standards were updated on critical component list - Components licenses were attached to the report - Capacitor Murata SA series and RA series with the same 	Marcin Zurek

	<p>electrical ratings has been added as alternate to critical component list.</p> <p>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.</p>	

Description of model differences:

Unit Configuration Code:

a) Series NV350 or NV3 or NV-350 (these models are identical)
(May be prefixed by NS - # / where # may be any characters indicating non safety related model differences)

Products may additionally be marked with K3x or Q3x where x can be any characters indicating non-safety related model differences.

b) Followed by: S, R, Q, P, V, C, T, U or K. Where:

S = Forward airflow, standard fan
R = Reverse airflow, standard fan
Q = Forward airflow, quiet fan
P = Reverse airflow, quiet fan
V = Forward airflow, temperature controlled fan
C = Customer air, fan not fitted
T = Forward airflow, top fan
U = Customer air, fan not fitted, cover not fitted
L = Fixed speed fan (Non standards only)
K = Custom fan/chassis assembly (non -standard model X00004#
(IEC/EN/UL/cUL 60950-1 approval only)

c) Followed by: S, I or J. Where:

S = Screw input terminals
I = IEC input
J = IEC input. Dual fused

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

S = Standard Leakage (Class B Filter)
M = Medium Leakage
L = Low Leakage
R = Reduced Leakage
T = Tiny Leakage

Unit configuration may be given using the above code and/or by the option description. The input terminal type (screw or IEC) may alternatively be determined by examination of the unit.

e) Optionally followed by: EN#V, EN*V, IN#V, IN*V, ES#V, ES*V, IS#V, IS*V.

Where EN#V = AC good, global module good, PSU enable, 5-5.5V, 2A, standby output
EN*V = AC good, global module good, PSU enable, 12-13.5V, 1A, standby output
IN#V = AC good, global module good, PSU inhibit, 5-5.5V, 2A, standby output
IN*V = AC good, global module good, PSU inhibit, 12-13.5V, 1A, standby output

ES#V = AC good, PSU enable, 5-5.5V, 2A standby output
 ES*V = AC good, PSU enable, 12-13.5V, 1A standby output
 IS#V = AC good, PSU inhibit, 5-5.5V, 2A standby output
 IS*V = AC good, PSU inhibit, 12-13.5V, 1A standby output

Where # represents the standby output voltage and is in the range 5-5.5V
 Where * represents the standby output voltage and is in the range 12-13.5V

The Global Options Inhibit and Enable functions permit the customer to turn off or on the main psu outputs and the fan. The standby supply is for use by the customer and provides an SELV output that continues to operate when all the main psu outputs have been turned off using the Inhibit or Enable functions. All the functions of the Global Option pass through a single 8 way PWB socket and are all rated SELV.

NV350 Modules:

Up to 3 of the following modules types may be fitted:

@B
 or @BH
 or @C
 or @CM

Where @ is the output voltage of the module and is within the range given in the single output module table.

or @/#DB (/ maybe replaced with a _)

Where @ is the output voltage of channel 1 and # is the output voltage of channel 2 of the module. Voltages are within the range given in the DB module tables.

or @/#DA (/ maybe replaced with a _)

Where @ is the output voltage of channel 1 and # is the output voltage of channel 2 of the module. Voltages are within the range given in the DA module tables. Only 1 DA module may be fitted.

or B/S

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

The following nomenclature may optionally be used for outputs connected in series:
 (Note that outputs may be connected in series even when this nomenclature is not used)

@BB or @ BHB or @BBH or @BHBH or @CC or @CCM

Where @ is the total voltage of any two B, BH, C or CM modules connected in series.

or @/#BDB or @BHDB (/ maybe replaced with a _)

where @ is the total series voltage of any B or BH module and DB module channel 1. # is the output voltage of the DB module channel 2. Voltages for # are within the range given in the DB module tables.

or @HDB

where @ is the total series voltage of any DB module channel 1 and channel 2.

For all outputs connected in series:

Permissible min. value for @ is given by summing the min. voltage ratings of the outputs connected in series.

Permissible max. value for @ is given by summing the max. voltage ratings of the outputs connected in

series.

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Custom Models (as standard models unless specified otherwise):

Model: NV350 SJS 24B 24/24DB 12/12DB (K30012)

Maximum outputs: 24V, 8A; 24V, 7A; 24V, 2A; 12V, 13A; 12V, 5A (total power 350W max.)

Maximum ambient: 50°C

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

Comments: PSU is fitted with dual fused IEC inlet and double pole mains switch (option J).

Model: NV350 SJS 24B 24/24DB 24/12DB (K30036)

Maximum outputs: 24V, 8A; 24V, 7A; 24V, 2A; 24V, 7A; 12V, 5A (total power 350W max.)

Maximum ambient: 50°C

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

Comments: PSU is fitted with dual fused IEC inlet and double pole mains switch (option J).

Model: NV350 LSS 24/24DB 15.5/5.5DB (K30045A)

Maximum outputs: 24V, 1A; 24V, 0.7A; 15.5V, 6.4A; 5.5V, 6.4A. (total power 175W max.)

Maximum ambient: 50°C

Orientations: Horizontal with chassis lowest, on either side.

Comments: PSU has fan drive voltage fixed at 5.5V.

Model: NV350 LSS 24/24DB (K30045B)

Maximum outputs: 24V, 7A; 24V, 0.7A. (total power 184.8W max.)

Maximum ambient: 50°C

Orientations: Horizontal with chassis lowest, on either side.

Comments: PSU has fan drive voltage fixed at 5.5V.

Model: NV350 TSS 24/15DB 5/15DB (K30052x where x can be any number of characters indicating non safety related differences)

Maximum outputs: 350W max.

Comments: PSU has top fan fitted.

Compliant with EN/IEC/UL/cUL 60950-1 only.

Model: NV350 KISES5V 12/12DB 5B (X00004# where # can be any number of characters indicating non safety related differences)

Maximum outputs: 350W max.

Comments: PSU has top fan, at an angle fitted. Output cables of 12 to 24AWG, Max. 50cm long are supplied with this model.

Compliant with EN/IEC/UL/cUL 60950-1 only.

NV350FEP models as described below:

Unit Configuration Code:

a) NV350FEP or NF3 or NF3-350FEP (these models are identical)

followed by: S, R, C, T or U. Where:

S	=	Forward airflow, standard fan
R	=	Reverse airflow, standard fan
C	=	Customer air, fan not fitted
U	=	Customer air, fan not fitted, cover not fitted
T	=	Top fan, forward airflow

followed by: S, I or J. Where:

S	=	Screw input terminals
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I = IEC input
 J = IEC input. Dual fused

followed by: S. Where:

S = Standard Leakage (Class B Filter)

Unit configuration may be given using the above code and/or by the option description. The input terminal type (screw or IEC) may alternatively be determined by examination of the unit.

optionally followed by: ES#V or IS#V. Where:

ES5V = AC good, PSU enable, 5-5.5V, 2A standby output
 ES12V = AC good, PSU enable, 12-13.5V, 1A standby output
 IS5V = AC good, PSU inhibit, 5-5.5V, 2A standby output
 IS12V = AC good, PSU inhibit, 12-13.5V, 1A standby output

where # represents the standby output voltage.

The Global Options Inhibit and Enable functions permit the customer to turn off or on the main psu outputs and the fan. The standby supply is for use by the customer and provides an SELV output that continues to operate when all the main psu outputs have been turned off using the Inhibit or Enable functions. All the functions of the Global Option pass through a single 8 way PWB socket and are all rated SELV.

NV350 FEP Module:

One of the following modules is fitted:

@FE

where @ is the output voltage of the module and is within the range given in the FE module table on the following page

NF350 and NV350 Output Interface Assembly:

One of the following output interface assemblies may optionally be fitted:

Wxxx

where xxx is a number between 001 and 999. These assemblies attach to the module output(s) and contain circuitry providing one or more of the following: current sharing, reduced current limit, fusing, sequencing, diode or-ing, module good, filtering, connectors or terminal blocks for outputs or signalling purposes, indicator lamps or LEDs.

Input Parameters

All models:

Nominal input voltage (V)	100 - 240
Input voltage range (V)	85 - 264
Input frequency range (Hz)	47 - 440
Maximum input current (A)	5.5
Inrush Current (A)	<15

For input voltages between 85 and 89.9V the output power is derated to 94% of the values given for 90V input

NV350PFC model:

Main Output: Voltage 355-395
 Main Output: Power 350W
 Auxiliary Output: Voltage 12V nominal
 Auxiliary Output: Current 0.25A
 Maximum Ambient 65°C ‡
 Derating above 50°C 2.5% per °C †

† The main output power and the auxiliary output current are derated by the given value.

‡ Refer to Customer Air Cooling section for details.

NV350 & NF350 models:

Code	Cooling Option	Range (Vac)	Power (W)	Ambient (°C)	Derating
S,V,T	Forward airflow standard fan fixed speed & Temp. controlled	90 - 264	‡ 350W continuous (400W peak if 350W average #)	65	2.5% per °C above 50°C
S,V	Forward airflow standard fan fixed speed & Temp. controlled	115 - 264	450W continuous (510W peak if 450W average #)	65	2.5% per °C above 50°C
S,V,T	Forward airflow standard fan fixed speed & Temp. controlled	180 - 264	664W continuous (740W peak if 600W average #)	65	2.5% per °C above 50°C
R	Reverse airflow standard fan	90-264 ‡	250W continuous (no peak rating)	65	2.5% per °C above 50°C
Q	Forward airflow Quiet fan	90-264 ‡	350W continuous (no peak rating)	65	2.5% per °C above 50°C
P	Reverse airflow quiet fan	90-264 ‡	250W continuous (no peak rating)	60	3.8% per °C above 50°C
C, U	Customer air fan not fitted	Refer to Customer Air Cooling section for details			

† Both the total output power and the module output currents are derated by the given value.

‡ For input voltages between 85 and 89.9V the output power is derated to 94% of the values given for 90V input.

The PSU may output the given peak power for up to 10 seconds providing that the average power from the PSU does not exceed the stated value.

Continuous, peak and average power ratings may be linearly interpolated for input voltages between 90 and 180V.

Global Option standby outputs (12-13.5V at 1A or 5-5.5V at 2A) should not be included when calculating total PSU output power, but they are subject to the current deratings for operation above 50°C.

Global Options with output voltages between 5.01 and 5.5V have their max. output current linearly derated from 2A at 50°C ambient to 1.4A at 65°C ambient.

5V global options used in NV350FEP PSUs are derated to 1.8A max. when the PSUs is inhibited.

For reverse airflow cooling all B, BH and DB modules are limited to a maximum output power of 150W (total for both channels on dual output modules).

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

Output Parameters

Single Output Modules:

Module	Nom. Voltage (V)	Voltage Range (V)	#	Max. Current
B	3.3	3.135 - 3.6	40A	
	5	4.75 - 5.5	4.75-5.2V: 40A	
	8	7 - 9	5.2-5.5V: Linearly derate from 40 to 36A	
	12	12 - 15.5	7-8V: 22.5A	
	24	24 - 28	8-9V: Linearly derate from 22.5 to 20A	
			12-13.5V: 16A	
			13.5-15.5V: Linearly derate from 16 to 13A	
			24-26V: 8A	
			26-28V: Linearly derate from 8 to 7A	
BH	12	12 - 15.5	12-13.2V: 20A	
	24	24 - 28	13.2-15.5V: Linearly derate from 20 to 16.5A	
			24-25.7V: 10A	
			25.7-28V: Linearly derate from 10 to 8.5A	
C&CM †	12	12 - 13.2	12V:33.34A. Derated to 400W above 12V	
	16	15 - 17.6	15V:26.67A. Derated to 400W above 15V	
	24	24 - 26.4	24V:16.67A. Derated to 400W above 24V	
	30	27 - 32	27V:14.82A. Derated to 400W above 27V	

† C & CM modules may output up to 600W for up to 10 seconds providing that the converter ratings are not exceeded and the average power from the module does not exceed the following: 400W for 115 - 264Vac input or 350W for 90Vac input (average power may be linearly interpolated between 90 and 115Vac input).

Dual Output Modules:

Dual Output Modules, Output 1

Module	Nom. Voltage (V)	Voltage Range (V)	#	Max. Current
DA	12	12.25	3A (forward air), 2A (reverse air)	
DB	3.3	3.135 - 3.6	25A	
	5	4.75 - 5.5	25A	
	6 ‡	5.5 - 6.5	25A	
	12	12 - 15.5	12 - 12.5V:13A	
			12.5 - 15.5V: Linearly derate from 13 to 10A	
	24	24 - 28	24 - 25V: 7A	
			25 - 28V: Linearly derate from 7 to 6A	

‡ DB modules with 6V nominal, Output 1

Cooling options C, S & V	O/P 1 : 5.5 - 6V	O/P 1 + O/P 2 : 195W total.
	O/P 1 : 6 - 6.5V	O/P 1 + O/P 2 : Linearly derate from 195 to 170W total.
Cooling option Q	O/P 1 : 5.5 - 6V	O/P 1 + O/P 2 : 180W total.
	O/P 1 : 6 - 6.5V	O/P 1 + O/P 2 : Linearly derate from 180 to 140W total.
Cooling options P & R	O/P 1 : 5.5 - 6.5V	O/P 1 + O/P 2 : 120W total.

‡ DB modules with 6V nominal channel 1:

Voltage measured at the module power terminals. This voltage must not be exceeded when remote sense is used.

Dual Output Modules, Output 2

Module	Nom. Voltage (V)	Voltage Range (V)	Max. Current (A)	Max. Power (W)
DA	-12	(-)11.9- (-)12	1.0 (forward air) 0.6 (reverse air)	12 (forward air), 7.2 (reverse air)
DB	5	3.3 - 5.5#	10	55*
	12	7 - 15.5	5	60
	24	24 - 32	2	50

* DB module output 2: Voltage range may be extended up to 6.0V (60W max.) for some PSU configurations. Consult factory for details.

Voltage measured at the module power terminals. This voltage at the power terminals must not be exceeded when remote sense is used.

NV350FEP Module:

FE Module, Output 1

Nom. Voltage (V)	Voltage Range (V) #	Output Ratings
12	11.5 - 15.5	For 50°C max. ambient operation ‡: 11.5 - 12.5V: 350W total power † 12.5 - 13.7V: Linearly derate total power from 350 to 275W For 45°C max. ambient operation ¶: 13.71 - 15.5V: 210W total average power with 300W peak for up to 5% of time (1 sec max.) For 350W total output power (O/P 1 + O/P 2) †: 11.5 - 12.5V: 50°C max. ambient 12.5 - 13.7V: Linearly derate max. ambient from 50 to 42°C

FE Module, Output 2

Nom. Voltage (V)	Voltage Range (V)	Max. Current (A)	Max. Power (W)
-12	Fixed -12.1V	2	24.2

Voltage measured at the module power terminals. This voltage must not be exceeded when remote sense is used.

† Channel 1 current must not exceed 30A. Total power includes channel 2 and excludes global options.

‡ For ambient operation from 50 to 65°C apply an additional linear derating of 2.5% per °C.

¶ For ambient operation from 45 to 65°C apply an additional linear derating of 2.5% per °C.

SELV and Outputs Connected In Series:

All individual outputs are SELV. Outputs connected in series are non-SELV if the total output voltage + 1.3 times the highest of those outputs exceeds 60Vdc (the 30% addition allows for a single fault in any one individual channel).

If the total voltage of outputs connected in series exceed the 60Vdc SELV limit then all outputs must be considered non-SELV.

The total voltage of outputs connected in series must not exceed 160V.

Non-SELV outputs are hazardous and 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 spacings to earth, and due consideration must be given to this in the end product design.

Customer Air Cooling:

The following method must be used for determining the safe operation of PSUs when C or U option (Customer Air) is fitted, i.e. fan not fitted to PSU, and for the NV350PFC assembly. The minimum permitted airflow for customer air cooling is 0.5m/s.

For PSUs and assemblies cooled by customer supplied airflow the components listed in the following table must not exceed the temperatures given. Additionally ratings specified for units with an internal fan must still be complied with, e.g. mains input voltage range, maximum output power, 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 IEC60950-1:2005 Clause 4.5. Consideration should also be given to the requirements of other safety standards.

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

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 stabilized.

Circuit Ref.	Description	Max. Temperature (°C)
L2, L3, L4	Filter/PFC assy: Choke winding	155
C3, C4	Filter/PFC assy: X capacitors	100
L1	Filter/PFC assy: Boost choke winding	130
C1	Filter/PFC assy: Electrolytic capacitor	60 (105)
T1	Filter/PFC assy: Fly back transformer winding	130
RLY1	Filter/PFC assy: Relay	100
TX1, TX2	Modules: Power transformer windings	130
L1, XL1	B, BH & DB module chokes	130
L1	C & CM module chokes	140
Global option T2	Global Options: Transformer winding	90 (130)
Various	All other choke & transformer windings	110
Various	All <=10mm diameter electrolytic capacitors	80 (105)
Various	All 12.5mm diameter electrolytic capacitors	85 (105)
TX1	DA Module: Fly back transformer windings	100 (130)

Higher temperature limit (in brackets) may be used but product life may be reduced.

Description of special features:

(HV circuits, high pressure systems etc.)

See additional information above.