Test Report issued under the responsibility of:

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

Report Number .....:	E135494-A6017-CB-1
Date of issue.....:	2020-01-31 ; Amendment 3 : 2024-07-30
Total number of pages .....:	118
Name of Testing Laboratory preparing the Report .....:	UL VS Limited
Applicant's name.....:	**TDK-LAMBDA UK LTD**
Address .....:	**KINGSLEY AVE** **ILFRACOMBE** **EX34 8ES UNITED KINGDOM**
Test specification:	
Standard .....:	IEC 62368-1:2014
Test procedure .....:	CB Scheme
Non-standard test method.....:	N/A
TRF template used .....:	IECEE OD-2020-F1:2021, Ed.1.4
Test Report Form No.....:	IEC62368_1D
Test Report Form(s) Originator .....:	UL(US)
Master TRF.....:	Dated 2022-04-14

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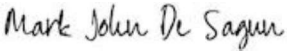
Test Item description .....:	Power Supply
Trade Mark(s) .....:	TDK-Lambda
Manufacturer .....:	TDK-LAMBDA UK LTD KINGSLEY AVE ILFRACOMBE EX34 8ES UNITED KINGDOM
Model/Type reference .....:	(Standard model) NV350 or NV3 or NV-350 series (May be prefixed by NS - # / or - where # may be any characters indicating non safety related model differences) followed by abcde. See report Model Differences for details). (Non-Standard model) K300yy#, X00004# (where yy can be 45A, 45B, 52X, 68X. Where # can be any letter denoting non-safety related changes, e.g. extra labels on the unit. See report Model Differences for details).
Ratings .....:	100-240 Vac nominal, 47-440 Hz, 5.5 A rms max.

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
☐ CB Testing Laboratory:		
Testing location/ address .....:		
Tested by (name, function, signature) .....:		
Approved by (name, function, signature).....:		
☐ Testing procedure: CTF Stage 1:		
Testing location/ address.....:		
Tested by (name, function, signature) .....:		
Approved by (name, function, signature).....:		
☐ Testing procedure: CTF Stage 2:		
Testing location/ address..... :		
Tested by (name, function, signature) .....:		
Witnessed by (name, function, signature) ...:		

Approved by (name, function, signature).....:		
☒ Testing procedure: CTF Stage 3:		
☐ Testing procedure: CTF Stage 4:		
Testing location/ address.....:	TDK-LAMBDA UK LTD KINGSLEY AVE ILFRACOMBE EX34 8ES UNITED KINGDOM	
Tested by (name, function, signature).....:	Mark Gisbey / Tester	
Witnessed by (name, function, signature) ...:	Mark John De Sagun / Witness Engineer	See GPI for details
Approved by (name, function, signature).....:	Mark John De Sagun / Reviewer	
Supervised by (name, function, signature)..:	Daniel Wong / Handler	

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

National Differences (0 pages)
Enclosures (3 pages)

Summary of testing:

Tests performed (name of test and test clause):	**Testing Location:**
	Unless otherwise noted, test are all conducted in CTF Stage 3: TDK-LAMBDA UK LTD KINGSLEY AVE ILFRACOMBE EX34 8ES UNITED KINGDOM
5.4.9.1 – ELECTRIC STRENGTH TEST – TYPE TESTING OF SOLID INSULATION	
5.7.4 – TOUCH CURRENT MEASUREMENT – EARTHED ACCESSIBLE CONDUCTIVE PARTS – SINGLE-PHASE EQUIPMENT ON TN OR TT SYSTEM	
B.2.6, 5.4.1.4, 6.3, 9.2, B.1.6 – NORMAL OPERATING CONDITIONS TEMPERATURE MEASUREMENT	
B.4 – SIMULATED SINGLE FAULT CONDITIONS	
G.5.4.6.3 – ALTERNATIVE LOCKED-ROTOR OVERLOAD TEST FOR D.C. MOTOR	

Summary of compliance with National Differences:

List of countries addressed: Australia - AU, New Zealand - NZ, EU Group Differences, Japan - JP, United States of America - US, Canada - CA

UK added per customer request

☒ **The product fulfils the requirements of:** EN 62368-1:2014 + A11:2017, BS EN 62368-1:2014 + A11:2017, CSA/UL 62368-1:2014, J62368-1 (2020), AS/NZS 62368.1:2018

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

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

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

Information on uncertainty of measurement:

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

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

Copy of Marking Plate - Refer to Enclosure titled Marking Plate for copy.

TEST ITEM PARTICULARS:	
Classification of use by	Skilled person
Supply Connection	AC Mains
Supply % Tolerance	+10%, -10%
Supply Connection – Type	pluggable equipment type A - appliance coupler mating connector
Considered current rating of protective device as part of building or equipment installation	20 A; building;
Equipment mobility	for building-in
Over voltage category (OVC)	OVC II
Class of equipment	Class I
Access location	N/A
Pollution degree (PD)	PD 2
Manufacturer's specified maximum operating ambient (°C)	50°C (Full Load); 65°C (Output power decreased linearly by 2.5%/°C above 50°C)
IP protection class	IPX0
Power Systems	TN
Altitude during operation (m)	5000 m
Altitude of test laboratory (m)	64 m
Mass of equipment (kg)	1 kg max
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..... :	2019-09-04 TO 2024-05-23
Date (s) of performance of tests..... :	2024-04-08 TO 2024-07-10
GENERAL REMARKS:	
"(See Enclosure #)" refers to additional information appended to the report. **"(See appended table)" refers to a table appended to the report.** **Throughout this report a ☐ comma / ☒ point is used as the decimal separator.**	
Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:	

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided ..... :	☒ **Yes** ☐ **Not applicable**
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies) ..... :	TDK-LAMBDA UK LTD KINGSLEY AVE ILFRACOMBE EX34 8ES UNITED KINGDOM Panyu Trio Microtronics Co Ltd SHIJI INDUSTRIAL ESTATE DONGYONG NANSHA GUANGZHOU GUANGDONG 511453 CHINA TDK-Lambda (China) Electronics Co. Ltd, No.95, Zhujiang Road, Xinwu District, Wuxi, Jiangsu Province, 214028, P.R. CHINA

GENERAL PRODUCT INFORMATION:

Report Summary

The original report was modified on 2024-07-30 to include the following changes/additions:
Technical Amendment (UL project 4791352650)

This report should be read in conjunction with CBTR E135494-A6017-CB-1 and CBTC DK-92750-UL, dated 2020-01-31 and CBTR E135494-A6017-CB-1, Amd1 and CBTC DK-92750-M1-UL, dated 2021-04-19 and CBTR E135494-A6017-CB-1, Amd2 and CBTC DK-92750-M2-UL, dated 2022-12-02.

Additional test was deemed necessary.

This report includes the changes/ additions as below:
1. Updated the Model name and nomenclature.
2. Updated the Model Differences section.
3. Added a new factory of TDK-Lambda (China) Electronics Co. Ltd.
4. Updated the CCL table to include the alternate fan YS Tech FD124020UB-H-NCB, fusible resistor in place of F2 fuse and other critical components.
5. Updated test tables B.4, 5.4.1.4, 5.7.4 for additional tests.
6. Updated Draft CB Test Certificate in enclosure section.

Product Description

NV350 is a range of switching power supplies intended for building-in as component which employ isolating transformers. Reinforced insulation is provided between primary and secondary circuits. Basic insulation is provided between primary circuit and PE (Protective Earth).

Model Differences

Unit Configuration Code:

NV350abcde or NV3abcde or NV-350abcde

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.

Where

a) S, R, Q, P, V, C, T, U, L 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)

b) S, I or J.

Where:

S = Screw input terminals

I = IEC input

c) 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.

d) 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
S#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.

e) NV350 or NV3 or NV-350 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.
.

Custom/ Non-Standard Models (as standard models unless specified otherwise):

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/CSA 60950-1 and 62368-1 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/CSA 60950-1 and 62368-1 only

Model: NV350 NV3LISIS5V 3.3B 12BH (K30068X, where X can be any character)
Maximum outputs: 201.4W max.
Comments: PSU has fixed, reduced speed fan set to 5.5V.
Compliant with EN/IEC/UL/CSA 60950-1 and 62368-1 only

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 (400W peak if fixed speed & Temp. controlled)	90 - 264 ‡	350W continuous 350W average #	65 above 50°C	2.5% per °C
S,V	Forward airflow	standard fan (510W peak if fixed speed & Temp. controlled)	115 - 264	450W continuous 450W average #	65 above 50°C	2.5% per °C
S,V,T	Forward airflow	standard fan (740W peak if fixed speed & Temp. controlled)	180 - 264	664W continuous 600W average #	65 above 50°C	2.5% per °C
R	Reverse airflow	standard fan (no peak rating)	90-264 ‡	250W continuous	65 above 50°C	2.5% per °C
Q	Forward airflow	Quiet fan (no peak rating)	90-264 ‡	350W continuous	65 above 50°C	2.5% per °C
P	Reverse airflow	quiet fan (no peak rating)	90-264 ‡	250W continuous	60 above 50°C	3.8% per °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	
		5.2-5.5V: Linearly derate	from 40 to 36A
8	7 - 9	7-8V: 22.5A	
		8-9V: Linearly derate from	22.5 to 20A
12	12 - 15.5	12-13.5V: 16A	
		13.5-15.5V: Linearly derate	from 16 to 13A
24	24 - 28	24-26V: 8A	
		26-28V: Linearly derate from	8 to 7A
BH	12	12 - 15.5	12-13.2V: 20A
		13.2-15.5V: Linearly derate	from 20 to 16.5A
24	24 - 28	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)	12 (forward air), 0.6 (reverse 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.

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

The following tests were selected as representative of the test program applicable to model covered by this CBTR: ELECTRIC STRENGTH TEST – TYPE TESTING OF SOLID INSULATION (Cl. 5.4.9.1), CAPACITOR DISCHARGE AFTER DISCONNECTION OF A CONNECTOR (Cl. 5.5.2.2), TOUCH CURRENT MEASUREMENT – EARTHED ACCESSIBLE CONDUCTIVE PARTS – SINGLE-PHASE EQUIPMENT ON TN OR TT SYSTEM (Cl. 5.7.5), NORMAL OPERATING CONDITIONS TEMPERATURE MEASUREMENT (B.2.6, 5.4.1.4, 6.3, 9.3, B.1), INPUT TEST: SINGLE PHASE (Cl. B.2.5), SIMULATED SINGLE FAULT CONDITIONS (Cl. B.4) and STEADY FORCE TEST, 250 N (Cl. 4.4.3.2, T.5) These tests have been witnessed for models selected as representative of the standard covered by this report and the applicable test program. (Ref: 4791153162, DA file 331).

The marking label provided is representative of all models.

Customer Air Cooling (options C or U):

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. The minimum permitted airflow for customer air cooling is 0.5m/s.

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, 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 appropriate 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/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: Flyback 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: Flyback transformer windings	100 (130)
XTH101	Primary IMS measured adjacent to XTH101	100 (105)

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

The manufacturer submitted representative production sample(s) of NV350. The following sample ID 2764822 was used for construction review.

NV3SSS24/24DB24BH28BH, NV350-SSS12BH13.2B12.5/6DB and etc, were used for test purposes and are considered representative of the entire series.

Report based on testing conducted in E135494-A57 for details see list of tests.

Technical Considerations

- The product was submitted and evaluated for use at the maximum ambient temperature (Tma) permitted by the manufacturer's specification of : 50°C (full load) to 65°C maximum (see cooling options for models and conditions to which the extended ambient applies) with de-ratings.
- The product is intended for use on the following power systems : TN
- Mains supply tolerance (%) or absolute mains supply values : +10%/-10%
- The equipment disconnect device is considered to be : appliance coupler (if fitted), or provided by the end equipment.
- The following were investigated as part of the protective earthing/bonding : Printed wiring board trace (refer to Enclosure - Schematics + PWB for layouts)
- The following are available from the Applicant upon request : Installation (Safety) Instructions / Manual
- The product was investigated to the following additional standard : EN 62368-1:2014 + A11:2017 (which includes all European national differences, including those specified in this test report). , CSA CAN/CSA-C22.2 NO. 62368-1 2nd Ed, Issued December 1, 2014
- Capacitors are rated for 230V due to the IT power system used in Norway. Further evaluation may be required in the end use product.
- The NV350 range is suitable for use at an altitude of 5000 metres.

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

- The following product-line tests are conducted for this product : Earthing Continuity, Electric Strength
- The end-product Electric Strength Test is to be based upon a maximum working voltage of : Primary-Secondary: 363 Vrms, 650 Vpk;, Primary – Earthed Dead Metal: 343 Vrms, 622 Vpk
- The following output circuits are at ES1 energy levels : All except for 24VDB CH2 which is ES2
- The following output circuits are at PS3 energy levels : All circuits
- The maximum investigated branch circuit rating is : 20 A
- The investigated Pollution Degree is : 2
- Proper bonding to the end-product main protective earthing termination is : Required
- An investigation of the protective bonding terminals has : been conducted
- The following input terminals/connectors must be connected to the end-product supply neutral : N
- The following end-product enclosures are required : Mechanical, Fire, Electrical with the exception of the IEC inlet face of units fitted with an IEC60320 inlet.
- The following magnetic devices (e.g. transformers or inductor) are provided with an OBJY2 insulation system with the indicated rating greater than Class A (105°C) : T1, T2, TX1 & TX2 (all Class F). See table 1.5.1 for details of insulation systems used.
- The following components require special consideration during end-product Thermal (Heating) tests due to the indicated maximum temperature measurements during component-level testing : Refer to additional application considerations.
- The equipment is suitable for direct connection to : AC mains supply
- The power supply terminals and/or connectors are: Screw terminals (where used) are suitable for factory wiring only.
- The following output terminals were referenced to earth during performance testing: All outputs and their return lines individually referenced to obtain maximum working voltage.
- Fans: The end fan provided in this sub-assembly is provided with a fan guard to reduce the risk of accidental contact with the stator. The top fan provided in this sub-assembly is not intended for access by ordinary person.
- When operated at a frequency greater than 60Hz, evaluation of the end equipment against the requirements of clause 5.7 must be considered.