Ref. Certif. No

NO124880

IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST CERTIFICATES FOR ELECTRICAL EQUIPMENT (IECEE) CB SCHEME

CB TEST CERTIFICATE

Product	DC-DC Converter
Name and address of the applicant	Bel Fuse Inc. 206 Van Vorst St. Jersey City 07302 United States of America
Name and address of the manufacturer	Bel Fuse Inc. 206 Van Vorst St. Jersey City 07302 United States of America
Name and address of the factory	BPS Asia Pacific Electronics (Shenzhen) Co., Ltd. Building# 6, Nanming Road, Gongming Town Huahong Xintong Industrial Park Guangming District Shenzhen 518108 China
Note: *When more than one factory,please report on page 2*	☐ Additional Information on Page 2
Ratings and Principal characteristics	Input, DC Voltage: 36 - 75 V DC (48 V DC nominal) or 18 - 36 V DC (24 V DC nominal) Output, DC: 1.0 V to 12.0 V, 10 A to 50 A (model dependent)
Trademark /Brand (If any)	bel
Customer's Testing Facility (CTF) Stage used	CTF Stage 3
Model/Type Ref	SQE Series
Additional information(If necessary may also be reported on Page 2)	☑ Additional Information on Page 2
A sample of the product was tested and found to be in conformity with	IEC 62368-1:2018
As shown in the Test Report Ref. No. which forms part of this Certificate	REP003322

This CB Test Certificate is issued by the National Certification Body

Nemko

Philip Pedersen vei 11,
NO-1366 Lysaker, Norway
Date: 02-12-2022

Signature: Okhyun Jeon
Certification department

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Only the version on the IECEE Website is the current document version

Ref. Certif. No

NO124880

Additional Information (if necessary)

(followed by two digit numeric, one alpha character, five digit numeric and may or may not be followed by a dash and the letter ‘G’ or additional alpha/numeric characters denoting non-safety critical options)

Nemko

Philip Pedersen vei 11,
NO-1366 Lysaker, Norway
Date: 02-12-2022

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

Report Number..... :	REP003322
Date of issue ..... :	2022 December 1
Total number of pages ..... :	72
Name of Testing Laboratory preparing the Report ..... :	Nemko USA Inc.
Applicant's name..... :	Bel Fuse Inc.
Address ..... :	206 Van Vorst St., Jersey City, NJ 07302, USA
Test specification:	
Standard ..... :	IEC 62368-1: 2018
Test procedure..... :	CB Scheme
Non-standard test method..... :	N/A
TRF template used ..... :	IECEE OD-2020-F1:2021, Ed.1.4
Test Report Form No. ..... :	IEC62368_1E
Test Report Form(s) Originator.... :	UL(US)
Master TRF ..... :	Dated 2022-04-14

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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 CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

General disclaimer:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

This Test Report, when bearing the Nemko name and logo is only valid when issued by a Nemko laboratory, or by a laboratory having special agreement with Nemko.

Test item description .....:	DC-DC Converter
Trade Mark(s).....:	bel
Manufacturer.....:	Same as Applicant
Model/Type reference .....:	SQE Series (followed by two digit numeric, one alpha character, five digit numeric and may or may not be followed by a dash and the letter 'G' or additional alpha/numeric characters denoting non-safety critical options)
Ratings .....:	Input, DC Voltage: 36 - 75 V DC (48 V DC nominal) or 18 - 36 V DC (24 V DC nominal) Output, DC: 1.0 V to 12.0 V, 10 A to 50 A (model dependent)

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒	**CB Testing Laboratory:**	Nemko USA Inc.	
Testing location/ address ..... :		2210 Faraday Ave. Suite 150, Carlsbad, CA 92008, USA	
Tested by (name, function, signature) ..... :			
Approved by (name, function, signature) .. :			
☐	**Testing procedure: CTF Stage 1:**		
Testing location/ address ..... :			
Tested by (name, function, signature) ..... :			
Approved by (name, function, signature) .. :			
☐	**Testing procedure: CTF Stage 2:**		
Testing location/ address ..... :			
Tested by (name + signature) ..... :			
Client Representative (name, function, signature) ..... :			
Project Engineer (name, function, signature) ..... :			
Approved by (name, function, signature) .. :			
☒	**Testing procedure: CTF Stage 3:**	BPS Asia Pacific Electronics (Shenzhen) Co., Ltd.	
☐	**Testing procedure: CTF Stage 4:**		
Testing location/ address ..... :		Building#6, Nanming Road, Gongming Town Huahong Xintong Industrial Park Guangming District 518108 Shenzhen PEOPLE'S REPUBLIC OF CHINA	
Tested by (name + signature) ..... :			
Client Representative (name, function, signature) ..... :		Editha Vergara (Customer Representative)	
Project Engineer (name, function, signature) ..... :		Gladys Braunagel (Project Handler)	
Approved by (name, function, signature) .. :		George Daverin (Verificator)	

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

Attachment 1: Europe Group National Differences and National Differences according to EN 62368-1:2020+A11:2020 (21 pages)

Attachment 2: National Differences: USA and Canada (9 pages)

Attachment 3: National Differences: Singapore (3 pages)

Attachment 4: National Differences: Australia/New Zealand according to AS/NZS 62368.1:2022 and AS/NZS 3112:2017_A1:2021 (31 pages)

Attachment **5 :** Miscellaneous documentation, e.g. Photos, etc. (**14** pages)

Summary of testing:

The test data referenced in this report was originally generated and published as part of a previous evaluation to IEC 62368-1:2018. (CB Report Ref. No. 398930, CB Certificate Ref. No. NO112029).

This test report includes addition of alternate sources of components and removed coating of baseplate with minor change. Additional testing was conducted. For continuity, the entire report has been reissued, revised with highlighted in bold text.

One factory location was removed.

Updated the National Differences to use the latest versions.

The equipment is a component, switch mode power supply with universal DC input (ES2/PS3) and DC voltage outputs (ES1/PS3) for building-in. This report covers multiple models and all comments / tests apply to all models unless otherwise indicated. Testing was conducted on various models as indicated.

Intended location: The equipment is to be installed in the end product where the suitability of installation is to be evaluated in the end product.

Safety Instructions: Instructions shall be supplied in a language suitable for the country into which the product is to be sold.

Maximum operating temperatures: Equipment for building-in. Heating test was conducted monitoring the internal components temperature. Accessibility to high component temperature must be considered on end system equipment.

PCBs used for this equipment have been separately evaluated and determined to comply with requirements for Printed Boards per G.13.4.

Equipment markings: Identification marking (trade-mark and mode name) are marked on the equipment. However, the test was not considered because the equipment is a component level product for building-in. Therefore the marked surface is not to be located an external area where it is likely to be cleaned with cleaning solution, rubbed, etc.

Tests performed (name of test and test clause):	**Testing location:**
5.2 Classification of electrical energy sources 5.4.1.8 Determination of working Voltage measurement 5.4.2, 5.4.3 Minimum clearances/creepage distances 5.4.8 Humidity 5.4.9 Electric Strength tests 6.2.2 Power source circuit classifications **5.4.1.4, 9.3, B.1.5, B.2.6 – Temperature measurements** B.2.5 Input B.3, B.4 Abnormal operating and fault condition tests	BPS Asia Pacific Electronics (Shenzhen) Co., Ltd. Building#6, Nanming Road, Gongming Town Huahong Xintong Industrial Park Guangming District 518108 Shenzhen PEOPLE'S REPUBLIC OF CHINA

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

The list of countries recognizing the CB Scheme is actively updated on the iecee.org website.

All CENELEC members according to EN 62368-1:2020 +A11:2020.

All National Differences listed in the IECEE Online Bulletin are covered by the Common Modifications, Special National Conditions, National Differences, and the National Requirements noted above except for the following countries which are documented in National Differences Appendixes attached to this report.

Canada (CA); United States of America (US); Singapore (SG).

☒ **The product fulfils the requirements of EN/IEC 62368-1:2020+A11:2020.**

☒ **The product fulfils the requirements of CSA/UL 62368-1:2019.**

☒ **The product fulfils the requirements of additional national differences according to AS/NZS 62368.1:2022 and AS/NZS 3112:2017+A1:2021 Appendix J.**

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

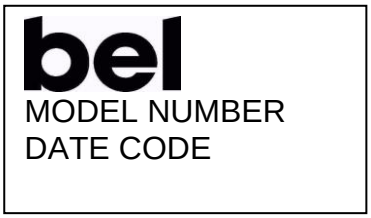
☒ No decision rule is specified by the IEC standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty ("simple acceptance" decision rule, previously known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

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

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

Copy of marking plate:

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



Test item particulars:	
Product group ..... :	☐ end product ☒ built-in component
Classification of use by ..... :	☐ Ordinary person ☐ Children likely present ☒ Instructed person ☒ Skilled person
Supply connection..... :	☐ AC mains ☐ DC mains (Secondary) (Regulated source) ☒ not mains connected: ☐ ES1 ☒ **ES2** ☐ ES3
Supply tolerance ..... :	☐ +10%/-10% ☐ +20%/-15% ☐ + %/ - % ☒ None
Supply connection – type ..... :	☐ pluggable equipment type A - ☐ non-detachable supply cord ☐ appliance coupler ☐ direct plug-in ☐ pluggable equipment type B - ☐ non-detachable supply cord ☐ appliance coupler ☐ permanent connection ☐ mating connector ☒ other: component for building-in
Considered current rating of protective device..... :	☒ Not applicable, component for building-in Location: ☐ building ☒ equipment ☐ N/A
Equipment mobility ..... :	☐ movable ☐ hand-held ☐ transportable ☐ direct plug-in ☐ stationary ☒ for building-in ☐ wall/ceiling-mounted ☐ SRME/rack-mounted ☐ other:
Overvoltage category (OVC) ..... :	☐ OVC I ☐ OVC II ☐ OVC III ☐ OVC IV ☒ other:
Class of equipment ..... :	☐ Class I ☐ Class II ☐ Class III ☐ Not classified ☒ open frame unit intended for building-in
Special installation location ..... :	☒ N/A ☐ restricted access area ☐ outdoor location ☐
Pollution degree (PD) ..... :	☐ PD 1 ☒ PD 2 ☐ PD 3
Manufacturer's specified T_{ma}..... :	Maximum Case temperature (Tc) of 120°C for all models expect for 12 V output models. Maximum 125°C Tc for 12V output models ☐ Outdoor: minimum °C
IP protection class ..... :	☒ IPX0 ☐ IP20
Power systems ..... :	☐ TN ☐ TT ☐ IT - V_{L-L} ☒ not AC mains
Altitude during operation (m) ..... :	☒ 2000 m or less ☐ _____ m
Altitude of test laboratory (m) ..... :	☐ 2000 m or less ☒ 94 m
Mass of equipment (kg) ..... :	33.5 g 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 .....:	April 2020, **2022-10-21**
Date (s) of performance of tests.....:	April – May 2020; **2022-10-21 to 2022-10-25**
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) ..... :	BPS Pacific Electronics (Shenzhen) Co.,Ltd. Building# 6, Nanming Road, Gongming Town Huahong Xintong Industrial Park Guangming District 518108 Shenzhen PEOPLE'S REPUBLIC OF CHINA

General product information and other remarks:

The subject equipment is intended for building-in type, series of ES2 DC/DC Converters intended to be connected to ES2 circuitry only, and intended for installation into end-use equipment that will be separately evaluated.

The DC/DC Converters are not intended for connection to external circuits.

The DC/DC Converters have no mains supply connections.

The devices are intended for factory installation by OEMs and systems integrators. Replacements are only supported by trained service personnel.

There are no inherent hazardous energy sources. All power is provided via standard PCIe bus

The devices are powered by an ES2 source and contain ES2 and ES1 circuits.

Maximum recommended Case Temperature (Tc): 120°C all models except 12V output models; 125°C for 12V output models

Connection to the supply: ES2, no mains supply connection.

'Gate Drive' Transformers referenced in table 5.4.1.4 (for Model 'SQE48T20120') are surface mount parts with Basic Insulation meeting Class 105 (A) limits. Therefore, 90˚C was used as a limit for Table 5.4.1.4.

'Planar' Transformers referenced in table 5.4.1.4 are planar type, with windings composed of traces on the PCB. The PCB material is rated at 130˚C. Therefore, 130˚C was used as a limit for Table 5.4.1.4.

Abnormal and Component Failure Tests were conducted with the power supply unprotected by an external fuse except for models with 10 A, 40 A and 50 A output current rating in which abnormal and component failure testing were conducted with 7 A, 125 Vdc external fuse

Model Differences –

All models are similar in construction to each other and differ only on transformer secondary windings, minor system configuration options, and/or minor ES2 circuit options, not affecting safety.

TYPICAL MODEL DESIGNATION:

SQE	48	T	15	033	-X
I	II	III	IV	V	VI

I - Product Series, Eighth Brick Format: SQE

II - Input Voltage:
- 48 = 36 - 75 V dc: 48 V dc nominal
- 485 = 36 - 75 V dc: 48 V dc nominal
- 24 = 18 - 36 V dc: 24 V dc nominal

III - Mounting Scheme:
- T = Through Hole
- S = Surface Mount

IV - Output Current Rating :
- 10 = 10 Amps
- 17 = 17 Amps
- 20 = 20 Amps
- 30 = 30 Amps
- 40 = 40 Amps
- 50 = 50 Amps

V - Output Voltage Rating:
- 010 = 1.0 Volts dc
- 012 = 1.2 Volts dc
- 015 = 1.5 Volts dc

018 = 1.8 Volts dc
020 = 2.0 Volts dc
025 = 2.5 Volts dc
033 = 3.3 Volts dc
050 = 5.0 Volts dc (20 A maximum for SQE)
060 = 6.0 Volts dc (17 A maximum)
092 = 9.2 Volts dc (20 A maximum)
120 = 12.0 Volts dc (20 A maximum)

VI - Optional Suffixes (denoting non-safety critical options)

Any combination of input voltage and output voltage within the nomenclature shown above creates a valid model number.

CONDITIONS OF ACCEPTABILITY (Considerations used to test a component or sub-assembly):

When installed in the end-use equipment, the following are among the considerations to be made:

1) All models are intended to be supplied from an isolated secondary circuit and have only been evaluated for basic insulation between the input and output circuits.
2) The power supplies have been evaluated for use in a Pollution Degree 2 environment.
3) Abnormal and Component Failure Tests were conducted with the power supply unprotected by an external fuse except for models with 10 A, 40 A and 50 A output current rating in which abnormal and component failure testing were conducted with 7 A, 125 Vdc external fuse.
4) All models submitted and tested for use at the maximum case temperature (Tc) permitted by the manufacturer's specification of: 130 °C measured on T401 coil PWB on all models except for 12V output models. The 12 V and 9.2 V, 10 A max. output models shall not exceed 125°C case temperature on L500, PWB at Q403 and T401 core. The 12V, 20 A model shall not exceed 125°C case temperature on T400 coil and Q506 case, not exceed 110°C on IC105 case , and not exceed 105° on baseplate.
5) If the input meets all of the requirements for ES1, the outputs may be considered ES1. Output voltages remain within ES1 limits, even with internally generated non-ES1 voltages, if any. Single Component Failure and Basic Insulation Bypass Tests were performed on the power supply.
6) The units were tested for zero tolerance input voltage.
7) Special spacing consideration should be given to the end-use product, as the spacings between the unit and mounting surface have not been evaluated.
8) Special enclosure consideration should be given to the end-use installation. ES2 voltage is available on the surface of the PWB. The end-use product should be reviewed to determine whether accessibility requirements are met for the end-use product.
9) The unit is tested with air-cooling applied from -Vin to +Vin pins.