



Test Report issued under the responsibility of:



IEC 60601-1
Medical electrical equipment
Part 1: General requirements for basic safety and essential performance

Report Reference No.: E349607-D1002-2/A0/C0-ULCB

Date of issue: 2018-06-01

Total number of pages: 809

CB Testing Laboratory: UL International Germany GmbH
 Address: Admiral-Rosendahl-Strasse 23, Zeppelinheim 63263 Neu-Isenburg ,
 Germany

Applicant's name: TDK-Lambda UK Ltd
 Address: Kingsley Avenue, Ilfracombe
 Devon, EX34 8ES UNITED KINGDOM

Test specification:

Standard: IEC 60601-1:2005 (Third Edition) + CORR. 1:2006 + CORR. 2:2007
 + A1:2012
 (or IEC 60601-1: 2012 reprint)

Test procedure: CB Scheme

Non-standard test method.....: N/A

Test Report Form No.....: IEC60601_1K

Test Report Form Originator: UL(US)

Master TRF: 2015-11

Copyright © 2015 Worldwide System for Conformity Testing and Certification of Electrotechnical Equipment and Components (IECEE), Geneva, Switzerland. All rights reserved.

This publication may be reproduced in whole or in part for non-commercial purposes as long as the IECEE is acknowledged as copyright owner and source of the material. IECEE takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

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.




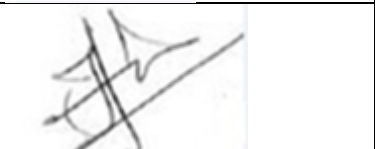
This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

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.

Test item description:	Switch mode power supplies	
Trade Mark:	Trademark image(s): See Enclosure	
	TDK-Lambda	
Manufacturer:	Same as Applicant	
Model/Type reference:	QM5 or QS5, QM7 or QS7, or QM8 (followed by alphanumeric characters - see model differences section in Test Report for details of models and nomenclature)	
Ratings:	<p>QM5 & QS5 (700W): 100-240Vac nom, 47-63Hz, 11A rms max or 144-318Vdc nom, 7A max.</p> <p>QM5 & QS5 (1200W): 200-240Vac nom, 47-63Hz, 9A rms max or 239-318Vdc nom, 7A max.</p> <p>QM7 & QS7 (1200W): 100-240Vac nom, 47-63Hz, 19A rms max.</p> <p>QM7 & QS7 (1500W): 166.7-240Vac nom, 47-63Hz, 14A rms max.</p> <p>QM8 (1200W): 100-240Vac nom, 47-63Hz, 19A rms max.</p> <p>QM8 (1500W): 166.7-240Vac nom, 47-63Hz, 14A rms max.</p>	
Testing procedure and testing location:		
<input type="checkbox"/> CB Testing Laboratory:		
Testing location/ address:	UL International Germany GmbH Admiral-Rosendahl-Strasse 23, Zeppelinheim 63263 Neu-Isenburg , Germany	
<input type="checkbox"/> Associated 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:		
<input checked="" type="checkbox"/> Testing procedure: CTF Stage 3:		
<input type="checkbox"/> Testing procedure: CTF Stage 4:		

Testing location/ address:	TDK-Lambda UK Ltd., Kingsley Avenue, Ilfracombe, Devon, EX34 8ES, United kingdom.	
Tested by (name, function, signature):	T. Burgess (Tester), M. Carter (Tester), S. Hirstwood (Tester)	
Witnessed by (name, function, signature):	Hima Chetty (Handler)	
Approved by (name, function, signature):	Hashan Dias (Reviewer)	
Supervised by (name, function, signature):	Hima Chetty (Handler)	

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 D of this report if testing was performed as part of this evaluation.

Summary of compliance with National Differences

List of countries addressed: Austria, Korea, Republic of, USA, Canada, United Kingdom, Sweden

[X] The product fulfils the requirements of IEC 60601-1:2005 (Third Edition) + CORR. 1:2006 + CORR. 2:2007 + A1:2012
(or IEC 60601-1: 2012 reprint).

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.

GENERAL INFORMATION	
Test item particulars(see also Clause 6):	
Classification of Installation and Use:	Component part of host equipment
Device type (component/sub-assembly/ equipment/ system):	Component Switch Mode Power Supply
Intended use (Including type of patient, application location):	To supply regulated power
Mode of Operation:	Continuous
Supply Connection:	Connection to mains via host equipment or via appliance inlet for QM5 option I only
Accessories and detachable parts included:	None
Other Options Include:	None
Testing	
Date of receipt of test item(s)	2017-05-09 to 2018-04-18
Dates tests performed	2018-03-16 to 2018-04-23
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.
- means of Operator protection: MOOP	- means of Patient protection: MOPP
General remarks:	
"(See Attachment #)" refers to additional information appended to the report.	
"(See appended table)" refers to a table appended to the report.	
The tests 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 testing laboratory.	
List of test equipment must be kept on file and available for review.	
Additional test data and/or information provided in the attachments to this report.	
Throughout this report a point is used as the decimal separator.	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC60601-1:2012	
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): TDK-Lambda UK Ltd
 Kingsley Avenue, Ilfracombe
 Devon, EX34 8ES UNITED KINGDOM

PANYU TRIO MICROTRONIC CO. LTD
 SHIJI INDUSTRIAL ESTATE
 DONGYONG, NANSHA, GUANGZHOU
 GUANGDONG 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

The QM or QS series of switch mode power supply consists of:

Main board

1. Input filter, consisting of the input fuse(s), X and Y capacitors, common mode chokes up to the bridge.
2. PFC (boost circuit), consisting of the boost choke and associated switching FETs/circuitry.
3. Low power Standby circuit and Fan outputs consisting of the fly-back transformer and switching IC/circuitry supplying the Low Power Standby option and Fan outputs.
4. Secondary circuits (SELV), consisting of supply to the Low Power Standby output and fan supply.

Modules

5. Forward converter situated on the module, consisting of the main transformer and switching FETs/circuitry.
6. Secondary circuits (SELV), consisting of Module output, CH1/2 good and inhibit/enable.

Standby options

7. High power Standby circuit, consisting of the standby transformer and switching IC/circuitry supplying the High Power standby output.
8. Low power Standby circuit, supplied from the Main board.
9. Secondary circuits (SELV), consisting of High Power Standby output, Low Power Standby output, fan supply, AC fail and inhibit/enable.

(See Model Differences for details of nomenclature)

Model Differences

This report covers the QM and QS series of switch mode power supplies. The QS is identical to the QM series but allows for only one output made up from modules either in series or in parallel. The QM and QS series consists of 5 slot models (QM5/QS5), 7 slot models (QM7/QS7) and 8 slot models (QM8) with each slot capable of fitting single or dual modules (SC module requires two slots) and "Non-standard models", see below for details. The QM5 or QS5 are available as 700W or 1200W and the QM7, QM8 or QS7 are available as 1200W or 1500W depending on the input voltage. High power/Low power and PMBus Standby Options may be fitted.

Units may be marked with a Product Code: KQMxy or KQSxy where x is the number of available slots and y may be any number of characters.

Unit configuration Code (Description): may be prefixed with NS # followed by / or - (where # may be any

number of characters indicating non-safety related model differences).

Nomenclature

QMshabcdefgklm for modular configurations

Where s = 5 for QM5 models
 7 for QM7 models
 8 for QM8 models

h = Hold Up Option
 Blank for none fitted
 H for extended hold up

a = Cooling:
 C for customer air (not applicable to QM5 IEC Models)
 F for variable speed forward air fan
 R for variable speed, reverse air

b = Input connector:
 Blank or S for screw
 F for faston
 I for IEC connector (QM5 only)

c = Input fuse:
 D for dual AC fuses
 E for single AC fuse in the Live line
 F for dual AC/DC fuses (QM5 only)
 G for single AC/DC fuse in the +ve input line (QM5 only)

d = Leakage option:
 L for 300 μ A
 R for 150 μ A
 T for 60 μ A

e = Primary option:
 blank for none fitted
 E for global enable
 T for global inhibit
 P for PMBus
 Q for PMBus with individual module enable (KQM700HJx model only, where x can be any letter for non-safety related differences)

f = Standby supply:
 Blank for none fitted
 5 for 5V/2A (Primary option Q or P only)
 5H for 5V/2A (Primary option E or T only)
 5L for 5V/0.25A (Primary option E or T only)

12 for 12V/1A (Primary option Q or P only)
 12H for 12V/1A (Primary option E or T only)

g = Blank if Primary option P or Q not fitted
 H for Input Power Present
 C for Control Pin Active High
 D for Control Pin Active Low
 F for PMBus™ and Control Pin Active High
 G for PMBus™ and Control Pin Active Low
 J for Individual output control, followed by two hexadecimal numbers specifying which modules are on/off (for 'Q' type PMBus option only)

May be followed by:

Single Output modules

vMcd

Where v = output voltage

M = module name (SB or SC)

c = S for screw terminal output 'F' for faston

d = 'N' for no signals, omit for standard signals

Optionally followed by '-Dxxx' where xxx is the number of mV of droop

Dual output modules

v1/v2DHcd

Where v1 = CH1 output voltage

v2 = CH2 output voltage

DH = module name (DH)

c = 'S' for screw terminal output, 'F' for faston

d = 'N' for no signals, omit for standard signals

v1/v2DMcd

Where v1 = CH1 output voltage

v2 = CH2 output voltage

DM = module name (DM)

c = 'S' for screw terminal output, 'F' for faston

d = 'N' for no signals, omit for standard signals

Blanking plates

B/S

Where B/S = Blanking plate

Parallel combinations

vZxcd

Where v = output voltage

Z = Paralleled output module comprising SB or SC modules

x = Number of slots. See table below.

c = 'S' for screw terminal output, 'F' for faston

d = 'N' for no signals, omit for standard signals

Optionally followed by '-Dxxx' where xxx is the number of mV of droop

Series connected modules

vYxcd

Where v = output voltage

Y = Series output module comprising SB, SC or DH modules

x = Number of slots. See tables below

c = 'S' for screw terminal output, 'F' for faston

d = 'N' for no signals, omit for standard signals

Optionally followed by '-Dxxx' where xxx is the number of mV of droop

Series connected Paralleled modules

vHxcd

Where v = output voltage

H = Series connected parallel SB and/or SC modules

x = Number of slots. See tables below

c = 'S' for screw terminal output, 'F' for faston

d = 'N' for no signals, omit for standard signals

Optionally followed by '-Dxxx' where xxx is the number of mV of droop

Combined DM modules - seriated Channel 1 only

vMxcd

Where v = output voltage

M = Series CH1 output comprising DM modules

x = Number of slots. See tables below

c = 'S' for screw terminal output, 'F' for faston

d = 'N' for no signals, omit for standard signals

Optionally followed by '-Dxxx' where xxx is the number of mV of droop

Unit options

klm

Where klm = Blank for standard output settings, may be three numbers from 0 to 9 (Preceded by -) which denotes various output voltage/current settings within the specified ranges of each output for a particular unit. (May define non-safety related parameters/features, e.g reduced primary current limit, reduced OVP)

QS[Number of available slots][Hold Up Option]-[Power]-[Voltage][Output Terminal][Standby/Signals][Unit Options]-[non safety related]

Number of available slots = 5 or 7

Hold Up Option = Blank for none fitted, H for Extended Hold Up

Power (max) = 550, 600, 1080 or 1200 from QS Output Parameters table below

Voltage = Output Voltage from the Vout range in the QS Output Parameters table below

Output Terminal = Blank for Screw terminal, F for Faston terminal

Standby/Signals = Blank or -E5H, -E5L, -T5H, -T5L, -E12H, -T12H, -P5H or -P12H

Where: E = Enable, T = Inhibit and P = PMBus

5H is 5V/2A, 5L is 5V/0.25A and 12H is 12V/1A

Followed by: (P option only)

H for Input Power Present

C for Control Pin Active High

D for Control Pin Active Low

F for PMBus™ and Control Pin Active High

G for PMBus™ and Control Pin Active Low

Unit Options = Blank for defaults or all of -[cooling][input connector][input fuse][leakage option]

Where [cooling] = F for Variable speed, forward air fan (default), R for Variable speed, reverse air fan, C for Customer air

[Input Connector] = S for screw (default), F for Faston, I for IEC

[Input Fuse] = D for dual AC fuses (default), E for single AC fuse in the live line

F for dual AC/DC fuses, G for single AC/DC fuse in the +ve line (QM5 only)

[Leakage Option] = L for 300 µA (default), R for 150 µA, T for 60 µA

[Non-safety related] = optional '-' followed by any number of characters indicating non-safety related model differences.

QS Output Parameters

Model	Note	Power (max)	Vout (Range)	Current (max)	Hazardous Energy	Modules Used
QS5	6	550	5-5.5V	110A	Yes	1 x ZF Module
QS5		600	12-13.2V	50A	Yes	1 x SC Module
QS5		600	24-26.4V	25A	Yes	1 x SC Module
QS5		600	30-33V	20A	Yes	1 x SC Module
QS5		600	48-52.8V	12.5A	Yes	1 x SC Module
QS5		600	56-61.6V	10.7A	Yes	1 x YC Module
QS5		600	95-105.6V	6.25A	Yes	1 x YC Module
QS5		1080	12-12.8V	90A	Yes	1 x ZF Module
QS5		1200	24-26.4V	50A	Yes	1 x YF Module
QS5		1200	48-52.8V	25A	Yes	1 x YF Module
QS7		1080	12-12.8V	90A	Yes	1 x ZF Module
QS7		1200	24-26.4V	50A	Yes	1 x YF Module
QS7		1200	48-52.8V	25A	Yes	1 x YF Module
QS7		1200	96-105.6V	12.5A	Yes	1 x YF Module

Parallel and Series combinations Table

Series connection number of slots.

Qty of Modules	SB		SC		DH	
	Name	Slots	Name	Slots	Name	Slots
1	SB	1	SC	2	YB	1
2	YC	2	YF	4	YP	2
3	YD	3	YM	6	YQ	3
4	YG	4	YN	8	YR	4
5	YH	5	-	-	YS	5
6	YJ	6	-	-	YT	6
7	YK	7	-	-	YV	7
8	YL	8	-	-	YW	8

Limitations of use:

1. Output voltage is the combined seriated modules voltage.
2. Module limitations apply to seriated modules.

Series connection of parallel connected modules

Module	Qty	Slots	Name
ZC	2	4	HC
ZD	2	6	HD
ZF	2	8	HF
ZT	2	6	HT
ZV	2	8	HV
ZC	3	6	HW
ZC	4	8	HX

Limitations of use:

1. Output voltage is the combined seriated modules voltage.
2. Module limitations apply to seriated/parallel modules.

Parallel connection number of slots

Number of modules in parallel

Slots	SB	SC	Name
2	2	0	ZC
3	1	1	ZD
4	0	2	ZF
6	0	3	ZH
3	3	0	ZT
4	4	0	ZV

See ratings in Module output ratings table below

DH outputs in series but split to create extra outputs.

Qty of modules	Split after output x (first output is 1)	Name
2	1	CB
2	3	CD
3	1	FB
3	3	FD
3	5	FG
4	1	GB
4	3	GD
4	5	GG
4	7	GJ
5	1	JB
5	3	JD
5	5	JG
5	7	JJ
5	9	JL
6	1	KB
6	3	KD
6	5	KG
6	7	KJ
6	9	KL
6	11	KN
7	1	LB
7	3	LD
7	5	LG
7	7	LJ
7	9	LL
7	11	LN
7	13	LQ
8	1	MB
8	3	MD
8	5	MG
8	7	MJ
8	9	ML
8	11	MN
8	13	MQ
8	15	MS

Combined DM modules - seriated Channel 1 only.

Number of		Nomenclature
Modules	Outputs	
2	3	v1/v2/v3MC
3	4	v1/v2/v3/v4MD
4	5	v1/v2/v3/v4/v5MF
5	6	v1/v2/v3/v4/v5/v6MG
6	7	v1/v2/v3/v4/v5/v6/v7MH
7	8	v1/v2/v3/v4/v5/v6/v7/v8MJ
8	9	v1/v2/v3/v4/v5/v6/v7/v8/v9MK

Input Parameters

QM5

input voltage nom. 100 - 240Vac, 144 – 318Vdc (200 - 240Vac, 239 – 318Vdc)*

Input voltage range 90 - 264Vac, 130 – 350Vdc (180 - 264Vac, 215 – 350Vdc)*

Input frequency range 47 - 63Hz

Maximum input current 11Arms or 7Adc (9Arms or 7Adc for 1200W model)

* Input for 1200W models.

Maximum ambient 70°C, (65°C for option I) total output power and module output power de-rated by 2.5% per °C above 50°C

QM7

input voltage nom. 100 - 240Vac (166.7 - 240Vac)*

Input voltage range 90 - 264Vac (150 - 264Vac)*

Input frequency range 47 - 63Hz

Maximum input current 19Arms (14Arms for 1500W model)

* Input for 1500W models.

Maximum ambient 70°C, total output power and module output power de-rated by 2.5% per °C above 50°C

QM8

input voltage nom. 100 - 240Vac (166.7 - 240Vac)*

Input voltage range 90 - 264Vac (150 - 264Vac)*

Input frequency range 47 - 63Hz

Maximum input current 19Arms (14Arms for 1500W model)

* Input for 1500W models.

Maximum ambient 70°C, total output power and module output power de-rated by 2.5% per °C above 50°C

QM5, QM7 and QM8 Output parameters

Module output ratings table.

Module	Note	No. of Slots	Output Channel	Vout nom (V)	Adjustment range	Output Current (A)	Output Power (W)	Hazardous Energy
DM	5, 8	1	CH1	12	11.9 to 16.1	10	120	Yes
DM	2	1	CH1	17	16 to 21.6	7.5	120	Yes
DM	4, 5	1	CH1	24	20.8 to 28.2	5	120	Yes
DM	-	1	CH2	3.3	2.8 to 3.8	10	33	No
DM	-	1	CH2	5	4.25 to 5.75	10	50	No
DM	-	1	CH2	8	7 to 9.5	10	95	No
DM	3, 8	1	CH2	14	11.9 to 16.1	8.3	100	No
DM	3	1	CH2	24	23.5 to 24.5	4.16	100	No
DH	1	1	CH1	12	10.2 to 13.8	10	120	Yes
DH	1	1	CH1	15	12.75 to 17.25	8	120	Yes
DH	1	1	CH1	24	20.4 to 27.6	5	120	Yes
DH	1	1	CH1	27	23 to 31	4.4	120	Yes
DH	2	1	CH2	12	10.2 to 13.8	10	120	Yes
DH	2	1	CH2	15	12.75 to 17.25	8	120	Yes
DH	2	1	CH2	24	20.4 to 27.6	5	120	Yes
DH	2	1	CH2	27	23 to 31	4.4	120	Yes
SB	-	1	CH1	3.3	3.3 to 3.63	37	122	No
SB	7	1	CH1	3.4	3.2 to 3.6	37	126	No

SB	-	1	CH1	5	5 to 5.5	30	150	No
SB	-	1	CH1	8.1	8 to 8.8	25	200	Yes
SB	-	1	CH1	12	12 to 13.2	25	300	Yes
SB	-	1	CH1	15	15 to 16.5	20	300	Yes
SB	-	1	CH1	18	18 to 19.8	16.7	300	Yes
SB	-	1	CH1	20	20 to 22	15	300	Yes
SB	-	1	CH1	28	28 to 30.8	10.7	300	Yes
SB	-	1	CH1	24	24 to 26.4	12.5	300	Yes
SB	-	1	CH1	48	48 to 52.8	6.25	300	Yes
SC	6	2	CH1	5	5 to 5.5	60	300	Yes
SC	-	2	CH1	12	12 to 13.2	50	600	Yes
SC	-	2	CH1	17	17 to 18.7	35.29	600	Yes
SC	-	2	CH1	24	24 to 26.4	25	600	Yes
SC	-	2	CH1	30	30 to 33	20	600	Yes
SC	-	2	CH1	36	36 to 39.6	16.7	600	Yes
SC	-	2	CH1	48	48 to 52.8	12.5	600	Yes
ZC	-	2	CH1	15	15 to 16	36	540	Yes
ZC	-	2	CH1	18	18 to 19.2	30	540	Yes
ZC	-	2	CH1	28	28 to 30	19.3	540	Yes
ZD	-	3	CH1	5	5 to 5.3	80	400	Yes
ZD	-	3	CH1	12	12 to 12.8	65	780	Yes
ZD	-	3	CH1	24	24 to 25.6	30	720	Yes
ZD	-	3	CH1	48	48 to 51.2	15	720	Yes
ZF	6	4	CH1	5	5 to 5.3	110	550	Yes
ZF	-	4	CH1	12	12 to 12.8	90	1080	Yes
ZF	9	4	CH1	17	17 to 18.19	63.5	1080	Yes
ZH	10	6	CH1	24	24 to 25.6	62.4	1200	Yes
ZT	-	3	CH1	15	15 to 16	50	750	Yes
ZV	-	4	CH1	15	15 to 16	66.4	996	Yes

Note 1: CH1 limited to 80W when CH2 at 120W. Maximum of 200W across module.

Note 2: CH2 Limited to 80W when CH1 at 120W. Maximum of 200W across module.

Note 3: CH2 has a maximum of 100W. Maximum of 200W across the module.

Note 4: CH1 (24V) has a reduced adjustment range when CH2 is 24V. Reduced adjustment range is 21.6V to 28.8V.

Note 5: CH1 limited to 100W when CH2 at 100W. Maximum of 200W across module. Achievable if the ambient temperature is reduced to 40°C.

Note 6: Please see Further De-ratings Table below

Note 7: Not used for 60601-1

Note 8: 12/12DM Module limited to 180W in slot 2 or 45°C ambient. (QM8 only)

Note 9: 67A for 10 seconds

Note 10: 1500W at high-line

Further De-ratings Table

Converter	Module	40°C Ambient	45°C Ambient	50°C Ambient	Global Option	Comments (applicable to 50°C ambient only)
QM5*	SC	60A	-	50A	N/A	-
-	YF	60A	-	50A	N/A	-
-	ZF	110A	-	90A	N/A	-
QM8	SC	-	60A	50A	Yes	Fitted in slots 1+2
-	SC	-	60A	60A	No	Fitted in slots 1+2
-	SC	-	60A	55A	No	Fitted in slots 3+4
-	SC	-	60A	55A	Yes	Fitted in slots 3+4
-	SC	-	60A	55A	N/A	Fitted in slots 7+8
-	YF, YM & YN	-	60A	55A	No	Limited by SC Module in slots 1+2
-	YF, YM & YN	-	60A	50A	Yes	Limited by SC Module in slots 1+2
-	HF	-	110A	90A	Yes	-
-	HF	-	110A	90A	No	-
-	ZF	-	110A	90A	Yes	Fitted in slots 1 to 4
-	ZF	-	110A	90A	No	Fitted in slots 1 to 4
-	ZF	-	110A	100A	Yes	Fitted in slots 3 to 8
-	ZF	-	110A	100A	No	Fitted in slots 3 to 8

QS5*

Cooling options QM5/QS5

Cooling option	Input voltage (Vac nom)	Output power (W)	Ambient (°C)
F (Forward air, variable speed)	100-240*	700	50
	200-240**	1200	50
C (Customer air***)	100-240*	700	50
	200-240**	1200	50
R (Reverse air, variable speed fan)	100-240*	700	35
	200-240**	1200	30

*144 - 272Vdc nom.

**239 - 272Vdc nom.

Cooling options QM7/QS7

Cooling option	Input voltage (Vnom)	Output power (W)	Ambient (°C)
F (Forward air, variable speed)	100-240	1200	50
	166.7-240	1500	50
C (Customer air)	100-240	1200	50
	166.7-240	1500	50
R (Reverse air, variable speed fan)	100-240	1200	40

Cooling options QM8

Cooling option	Input voltage (Vnom)	Output power (W)	Ambient (°C)
F (Forward air, variable speed)	100-240	1200	50
	166.7-240	1500	50
C (Customer air)	100-240	1200	50
	166.7-240	1500	50
R (Reverse air, variable speed fan)	100-240	1000	45

Non-standard models (as standard models except where stated below):

KQM700HJx (where x may be any letter for non-safety differences)

The KQM700HJx is 7 slot non-standard QM7 model:
NS-TLA/QM7FSDLQ5J3E B/S 24SBS 24SBS 24SBS 24SBS 12SBS B/S
This model has an option Q PMBus fitted in slot 1

KQM700HJx (where x may be any letter for non-safety differences)

The KQM700HJx is 7 slot non-standard QM7 model:
NS-TLA/QM7FSDLQ5J3E B/S 24SBS 24SBS 24SBS 24SBS 12SBS B/S
This model has an option Q PMBus fitted in slot

The KQM700NNx (where x may be any letter) is a non-standard QM7 model:
NS-TLA/QM7FSDR 48FYS B/S B/S B/S
With standard module output and the following peak output:

Max frequency (Hz)	750
Output voltage (Vnom)	48
Pulse duration (ms)	0.15 to 1
Max Duty cycle %	60
Peak current (A)	35

Additional Information

For best thermal performance and to ensure safety requirements are met at full load conditions, products are configured with modules starting from slot 1 in the following order:

1. Highest power SC modules
2. Lower power SC modules
3. Any other modules

Consult TDK-Lambda UK Ltd if a non-standard configuration is required.

Component temperatures, for customer air cooled models, must be monitored in the end use application as described in the "Cooling for Unit Temperature Table" below.

The following method must be used for determining the safe operation of PSUs.

The components listed in the following table must not exceed the temperatures given. To determine the component temperatures the heating tests must be conducted in accordance with the requirements of the standard in question. 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.

Cooling for unit temperature table (see layout drawings in handbook):

Cooling for unit temperature table:

Circuit Ref:	Description	Max. Temperature (°C)
PFC	-	-
QM7	-	-
L2	Common Mode Choke	115 (140)
L3	Boost choke	125
C2	Electrolytic Capacitors	71 (105)
C10	Electrolytic Capacitors	64 (105)
C7	Electrolytic Capacitors	64 (105)
C8	Electrolytic Capacitors	73 (105)
C11	Electrolytic Capacitors	77 (105)
C3, C14,	X Capacitor	100
C12	Y Capacitors	105
TX1	Fly back Transformer	120
D1	Diode bridge	114 (130)
D3	PFC diode	130
U4	Opto-coupler	100
U3	Voltage regulator	120 (130)
Q2	Boost FETS	130
QM5	-	-
L2	Common Mode Choke	115 (140)
L4	Boost choke	125
C2	Electrolytic Capacitors	71 (105)
C10	Electrolytic Capacitors	71 (105)
C7	Electrolytic Capacitors	64 (105)
C8	Electrolytic Capacitors	60 (105)
C11	Electrolytic Capacitors	77 (105)
C3, C14,	X Capacitor	100
C12	Y Capacitors	105
TX1	Fly back Transformer	120
D1	Diode bridge	118 (130)
D3	PFC diode	130
U4	Opto-coupler	100
U3	Voltage regulator	120 (130)
Q2	Boost FETS	130
QM8	-	-
L2	Common Mode Choke	115 (140)
L3	Boost choke	125
C2	Electrolytic Capacitors	71 (105)
C10	Electrolytic Capacitors	64 (105)
C7C	Electrolytic Capacitors	74 (105)
C8	Electrolytic Capacitors	73 (105)
C11	Electrolytic Capacitors	77 (105)
C3, C14,	X Capacitor	100
C12	Y Capacitors	105
TX1	Fly back Transformer	120
D1	Diode bridge	114 (130)
D3	PFC diode	130
U4	Opto-coupler	100
U3	Voltage regulator	120 (130)
Q2	Boost FETS	130
Low Power Options	-	-
U6	Opto-couplers	100
High Power Options	-	-
C6	Electrolytic Capacitors	73 (105)
XU3	Opto-couplers	100
TX1	Transformer Class F	130
Q PMbus-	-	-

XU3	Opto-couplers	100
DM/DH Modules	-	-
C206	Y Capacitors	105
C207	Electrolytic Capacitors	84 (105)
U8	Opto-couplers	100
Q1	Primary FET	120 (130)
D201	Output diode	124 (130)
TX1	Transformer Class B	110
SC module Modules	-	-
C206	Electrolytic Capacitors	83 (105)
C209	Y Capacitors	105
U1	Opto-couplers	100
TX1	Transformer Class B	110
TX1 (12V)	Transformer Class F	130
Q1	Primary FET	127 (130)
Q203	Secondary FET	130
SB module Modules	-	-
C206	Electrolytic Capacitors	83 (105)
C209	Y Capacitors	105
U1	Opto-couplers	100
TX1	Transformer Class B	110
Q1	Primary FET	127 (130)
Q203	Secondary FET	130

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

Technical Considerations

- The product was investigated to the following standards:

Main Standard(s):

ANSI/AAMI ES60601-1: A1:2012, C1:2009/(R)2012 and A2:2010/(R)2012, CSA CAN/CSA-C22.2 NO. 60601-1:14, IEC 60601-1 Edition 3.1 (2012)

From Country Differences:

- Austria: EN 60601-1:2006/A1:2013
- Korea, Republic of: KS C IEC 60601-1
- USA: ANSI/AAMI ES60601-1: A1:2012, C1:2009/(R)2012 and A2:2010/(R)2012
- Canada: CSA CAN/CSA-C22.2 NO. 60601-1:14
- United Kingdom: BS EN 60601:2006 A1
- Sweden: SS-EN 60601-1:2006+A11:2011+A1:2013+AC1:2014+A12:2014

Additional Standards:

EN 60601-1:2006/ A1:2013/ A12:2014

- The following additional investigations were conducted: N/A
 - The product was not investigated to the following standards or clauses: Biocompatibility, PESS, EMC, Annex Z of EN standards for compliance with the MDD
- Compliance with IEC 60601-1-6 was not evaluated for the models covered by this report.
- The risk management requirements of the standard were not addressed

- The following accessories were investigated for use with the product: N/A
- No Other Considerations

Engineering Conditions of Acceptability

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

The following production line tests are conducted for this product: Electric Strength, Earthing Continuity
The end-product Electric Strength Test is to be based upon a maximum working voltage of: Primary-SELV: 457Vrms, 635Vpk, Primary-Earthed Dead Metal: 373Vrms, 680Vpk, Secondary outputs-Earthed Dead Metal: 240Vrms, 340Vpk.

The following secondary output circuits are SELV: All

The following secondary output circuits are at hazardous energy levels: All modules except those listed as non-hazardous.

The following secondary output circuits are non-hazardous energy levels: 5V, 12V Standby output. SB (3.3, 5V models), DM (CH2: 3.3, 5, 8, 12 and 24V models).

The following output terminals were referenced to earth during performance testing. All outputs and their return lines individually referenced to earth to obtain maximum working voltage

The power supply terminals and/or connectors are: not investigated for field wiring

The maximum investigated branch circuit rating is: 20A

The investigated pollution degree is: 2

Proper bonding to the end product main protective earthing termination is: required

The following magnetic devices (eg. transformers or inductor) are provided with an OBJ2 insulation system with the indicated rating greater than Class A (105°C): TX1 Modules (Class B or F) TX1 PFC (Class F) TX1 Global option (Class F) see table 8.10 for details of insulation systems used.

The following end-product enclosures are required: Mechanical, Fire, Electrical (excluding QM5 option I, non-customer air version, front end).

All models require component temperatures to be monitored as detailed in the additional information

The product was tested for use at the maximum ambient temperature (TMA) 70° C (65° C for option I), output power and module output power de-rated 2.5% per °C above 50°C in normal conditions permitted by the manufacturer, see additional information for details

An investigation of the protective bonding terminals has been conducted

EMC compliance has not been verified nor has it been taken into consideration. An accredited EMC Test Report will be required in conjunction with the Certification of the end product.

The product was evaluated for use at the maximum altitude of operation: 5000 m

Report Modifications

Date Modified (Year-Month-Day)	Modifications Made (include Report Reference Number)	Modified By
2017-05-17	<p>This Report is the 1st Amendment to CB Test Report No. E349607-D1002-1 dated 2016-10-26 with CB Test Certificate No. DK-59517-UL. Based on conducted testing and the review of product technical documentation including photos, schematics, wiring diagrams and similar, it has been determined that the product continues to comply with the standard.</p> <ol style="list-style-type: none"> 1. Addition of QM5 and QS5 models (5 slots) 2. Added 3.3, 15 and 28V SB Modules 3. Added reverse air and customer air versions for QM7 4. Updates to CCL 5. Update of Marking Plates 6. Update of Model Differences nomenclature. 7. Ratings revised. <p>This Amendment 1 should be read in conjunction with Original CB Test Report.</p>	T. Burgess, N. Marsh, S. Hirstwood (Testers)

2017-11-23	<p>This Report is the 2nd Amendment to Original CB Test Report No. E349607-D1002-1 dated 2016-10-26 with CB Test Certificate No. DK-59517-UL, with Amendment 1 E349607-D1002-1/A1 issued on 2017-05-17 with CB Test Certificate No. DK-59517-A1-UL. Based on conducted testing and the review of product technical documentation including photos, schematics, wiring diagrams and similar, it has been determined that the product continues to comply with the standard.</p> <ol style="list-style-type: none"> 1. Addition of QM8 model (8 slots) 2. Addition of the following modules: 8.1, 18, 20 and 48V SB Modules. 30 and 48V SC modules.12/15, 15/15, 15/24, 27/27 DH modules. 17/8 DM module. 3. Addition of the following Option: 12V HPGO 4. Added reverse air, customer air for QM5 and QM8 5. Updates to CCL 6. Update of Marking Plates 7. Update of Model Differences nomenclature. 8. Ratings revised. 9. Enclosures added and updated where necessary. 	Hubert Koszewski
2018-04-16	<p>This report is a technical amendment to CBTR Ref. No. E349607-D1002-1/A0/C0-ULCB dated 2016-10-26 including amendment 1 dated 2017-05-17 and amendment 2 dated 2017-11-23 with CB Test Certificate DK-59517-A2-UL dated 2017-12-04.</p> <p>Based on previously conducted testing and the review of product technical documentation including photos, schematics, wiring diagrams and similar, it has been determined that the product continues to comply with the standard and only limited testing was required.</p> <p>The original report was modified to include the following changes/additions:</p> <ol style="list-style-type: none"> 1. Additions/alternates and corrections to CCL components 2. Changes to the Insulation diagram 3. Addition of Non-standard model KQM700HJx (PMBus with individual module enable) 4. Addition of DC input for QM5 models 5. Addition of 17SC module 6. Changes to nomenclature 7. Changes to enclosures 8. 48SC module current limit increase 9. Corrections to Additional Information 	Krzystof Wasilewski)
2018-05-31	<p>This report is a reissue of the original CB Test Report No. E349607-D1002-1 & CB Test Certificate No. DK-59517-UL dates 2016-10-26, the 1st Amendment CB Test Report No. E349607-D1002-1 & CB Test Certificate No. DK-59517-A1-UL dated 2017-05-17, the 2nd Amendment CB Test Report No. E349607-D1002-1 & CB Test Certificate No. DK-59517-A2-UL dated 2017-11-23 and the 3rd Amendment CB Test Report No. E349607-D1002-1 & CB Test Certificate No. DK-59517-A3-UL dated 2018-04-16. Based on conducted testing and the review of product technical documentation including photos, schematics, wiring diagrams and similar, it has been determined that the product continues to comply with the</p>	Hima Chetty

	<p>standard and only a limited test evaluation was required.</p> <p>The original report has been modified to include the following changes/additions:</p> <ol style="list-style-type: none">1. Addition of alternates components and corrections to the Critical Components Table2. Updated the model differences section of the report to include a new output module: 36SC3. Addition of a non-standard model KQM700NNx (where x may be any letter)4. Updated the enclosure drawings to include the 36SC module	
--	--	--

IEC 60601-1			
Clause	Requirement + Test	Result - Remark	Verdict

Insulation Diagram - (01) Insulation Diagram

