
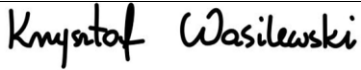





Test Report issued under the responsibility of:



IEC 60601-1 Medical electrical equipment Part 1: General requirements for basic safety and essential performance	
Report Reference No.	E349607-D1002-1/A3/C0-ULCB
Date of issue	2017-11-23; 2018-04-16 (A3)
Total number of pages	471
CB Testing Laboratory	UL International Polska Sp. z o.o. Aleja Krakowska 81 05-090 Sekocin Nowy Warszawy POLAND
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
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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): 	
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 checked="" type="checkbox"/> CB Testing Laboratory:		
Testing location/ address:	UL International Polska Sp. z o.o. Aleja Krakowska 81 05-090 Sekocin Nowy Warszawy POLAND	
<input type="checkbox"/> Associated CB Testing Laboratory:		
Testing location/ address:		
Tested by (name, function, signature):	Krzysztof Wasilewski (Project Handler)	
Approved by (name, function, signature):	Bruno F. Motta (Reviewer)	
Testing procedure: CTF Stage 1:		
<input type="checkbox"/> Testing procedure: CTF Stage 1:		
Testing location/ address:		
Tested by (name, function, signature):		
Approved by (name, function, signature):		
Testing procedure: CTF Stage 2		
<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):		
[] Testing procedure: CTF Stage 3:		
[X] 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, N. Marsh, S. Hirstwood (Testers)	<i>T. Burgess N. Marsh S. Hirstwood</i>
Witnessed by (name, function, signature):		
Approved by (name, function, signature):	Bruno F. Motta (Reviewer)	<i>Bruno F. Motta</i>
Supervised by (name, function, signature):	Krzysztof Wasilewski (Project Handler)	<i>Krzysztof Wasilewski</i>

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)	2016-12-07 to 2018-01-26
Dates tests performed	2017-07-24 to 2018-02-21
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:	
<p>Before starting to use the TRF please read carefully the 4 instructions pages at the end of the report on how to complete the new version "J" of TRF for IEC for 60601-1 3rd edition with Amendment 1.</p> <p>"(See Attachment #)" refers to additional information appended to the report.</p> <p>"(See appended table)" refers to a table appended to the report.</p> <p>The tests results presented in this report relate only to the object tested.</p> <p>This report shall not be reproduced except in full without the written approval of the testing laboratory.</p> <p>List of test equipment must be kept on file and available for review.</p> <p>Additional test data and/or information provided in the attachments to this report.</p>	
Throughout this report a point is used as the decimal separator.	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60601-1:2012	
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

TRF No. IEC60601_1K

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 μ A (default), R for 150 μ A, T for 60 μ A

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

QS Output Parameters

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

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	Number of slots	Output Channel	Vout nom range	Adjustment	Output Current	Output Power	Output Energy	Hazardous
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DM	5,8	1	CH1	12	11.9 to 16.1	10	120	Yes
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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
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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
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SB	-	1	CH1	8.1	8 to 8.8	25	200	Yes
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SB	-	1	CH1	12	12 to 13.2	25	300	Yes
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SB	-	1	CH1	15	15 to 16.5	20	300	Yes
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SB	-	1	CH1	18	18 to 19.8	16.7	300	Yes
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SB	-	1	CH1	20	20 to 22	15	300	Yes
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SB	-	1	CH1	28	28 to 30.8	10.7	300	Yes
----	---	---	-----	----	------------	------	-----	-----

SB	-	1	CH1	24	24 to 26.4	12.5	300	Yes
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SB	-	1	CH1	48	48 to 52.8	6.25	300	Yes
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SC	6	2	CH1	5	5 to 5.5	60	300	Yes
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SC	-	2	CH1	12	12 to 13.2	50	600	Yes
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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 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 45°C 50°C Global Comments (applicable to 50°C
 Ambient Ambient Ambient Option ambient only)
 fitted

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 60A 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 -

- ZF - 110A 90A Yes Fitted in slots 1 to 4

- ZF - 110A 100A Yes Fitted in slots 3 to 8

† QS5

Cooling options QM5/QS5

TRF No. IEC60601_1K

Cooling option Input voltage Output power Ambient
(Vac nom) (W) °C

F (Forward air, variable speed) 100-240† 700 50
200-240†† 1200 50

C (Customer air*) 100-240† 700 50

* not applicable to IEC version 200-240†† 1200 50

R (Reverse air, variable speed fan) 100-240† 700 35
200-240†† 1200 30

† 144 – 318Vdc nom.
†† 239 – 318Vdc nom.

Cooling options QM7/QS7

Cooling option Input voltage Output Ambient
(Vnom) power (W) (°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 Output Ambient
(Vnom) power (W) (°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.

Input frequency range 47 – 63 Hz

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

* 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

Nominal input voltage 100 – 240 Vac (166.7-240 Vac)*

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

Input frequency range 47 – 63 Hz

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

* 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

See Enclosures for the Parallel and Series combinations Tables.

See Enclosures for QM5 QM7 and QM8 Output parameters

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.

See Enclosures for Temperature Table.

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
- Multilayer PWB's accepted under CBTR Ref No. E349607-A23 dated 2014-07-31 and letter report in enclosure 8-06 of this report.

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	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	T. Burgess, N. Marsh, S. Hirstwood (Testers)

	<p>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>	
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 2016-11-16 including amendment 1 dated 2017-05-26 and amendment 2 dated 2017-12-04 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 	Krzysztof Wasilewski)

	6. Changes to nomenclature 7. Changes to enclosures 8. 48SC module current limit increase 9. Corrections to Additional Information	