



Test Report issued under  
the responsibility of:



**TEST REPORT**  
**IEC 60601-1**  
**Medical Electrical Equipment**  
**Part 1:General requirements for safety**

**Report Reference No** ..... : E349607-A43-CB-1  
**Date of issue** ..... : 2016-11-16  
**Total number of pages** ..... : 156

**CB Testing Laboratory** ..... : UL International (UK) Limited  
**Address** ..... : Wonersh House, The Guildway, Old Portsmouth Road, Guildford,  
Surrey, GU3 1LR, United Kingdom

**Applicant's name** ..... : TDK LAMBDA UK LTD  
KINGSLEY AVENUE  
**Address** ..... : ILFRACOMBE  
NORTH DEVON  
EX34 8ES  
UNITED KINGDOM

**Test specification:**

**Standard** ..... : IEC 60601-1:1988 + A1:1991 + A2:1995  
**Test procedure** ..... : CB Scheme  
**Non-standard test method** ..... : N/A

**Test Report Form No.** ..... : IEC60601\_1c/97-04  
**Test Report Form originator** ..... : UL LLC  
**Master TRF** ..... : dated 97-04

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Issue Date: 2016-11-16  
Amendment 2 2017-12-01

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Report Reference #

E349607-A43-CB-1

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

<b>Test item description</b> .....	Switch mode power supply
Trade Mark .....	TDK-Lambda 
Manufacturer .....	TDK LAMBDA UK LTD KINGSLEY AVENUE ILFRACOMBE NORTH DEVON EX34 8ES UNITED KINGDOM
Model/Type reference .....	QM5 and QS5, QM7 or QS7, QM8 switch mode power supplies (followed by alphanumeric characters - see model differences section in Test Report for details of models and nomenclature)
Ratings .....	QM5 & QS5 (700W): 100-240Vac nom, 47-63Hz, 11A rms max. QM5 & QS5 (1200W): 200-240Vac nom, 47-63Hz, 9A rms max.  QM7 & QS7 (1200W): 100-240Vac nom, 47-63Hz, 19A rms max. QM7 & QS7 (1500W): 166.7-240Vac nom, 47-63Hz, 14A rms max  QM8 (1200W): 100-240Vac nom, 47-63Hz, 19A rms max. QM8 (1500W): 166.7-240Vac nom, 47-63Hz, 14A rms max.

<b>Testing procedure and testing location:</b>	
<input type="checkbox"/> <b>CB Testing Laboratory</b>	
Testing location / address..... :	
<input type="checkbox"/> <b>Associated CB Test Laboratory</b>	
Testing location / address..... :	
Tested by (name + signature) .....	
Approved by (name + signature) ... :	
<input type="checkbox"/> <b>Testing Procedure: TMP/CTF Stage 1</b>	
Tested by (name + signature) .....	
Approved by (+ signature) .....	
Testing location / address..... :	
<input type="checkbox"/> <b>Testing Procedure: WMT/CTF Stage 2</b>	
Tested by (name + signature) .....	
Witnessed by (+ signature)..... :	
Approved by (+ signature) .....	
Testing location / address..... :	
<input checked="" type="checkbox"/> <b>Testing Procedure: SMT/CTF Stage 3 or 4</b>	
Tested by (name + signature) .....	N. Marsh, T. Burgess, S. Hirstwood
Approved by (+ signature) .....	Dennis Butcher, Reviewer
Supervised by (+ signature) .....	Hubert Koszewski, Project Handler
Testing location / address..... :	TDK-Lambda UK LTD, Kingsley Avenue, Ilfracombe, EX34 8ES, United Kingdom
<input type="checkbox"/> <b>Testing Procedure: RMT</b>	
Tested by (name + signature) .....	
Approved by (+ signature) .....	
Supervised by (+ signature) .....	
Testing location / address..... :	

<b>List of Attachments</b>
National Differences (0 pages)
Enclosures (216 pages)
<b>Summary Of Testing</b>
Unless otherwise indicated, all tests were conducted at TDK-Lambda UK LTD, Kingsley Avenue, Ilfracombe, EX34 8ES, United Kingdom.

Tests performed (name of test and test clause)	Testing location / Comments
Power Input (7.1) Voltage Limitation - Part 1 (15B) Earthing and Potential Equalization (18F) Leakage Current (19) Dielectric Voltage Withstand (20.4) Temperature (42) Humidity Preconditioning Treatment (44.5) Abnormal Operation and Fault Conditions (52) Transformer Overload and Short-Circuit (57.9.1) Low Voltage Reliability (16E) Working Voltage Measurement (20.3)	
<b>Summary of Compliance with National Differences:</b>	
Countries outside the CB Scheme membership may also accept this report.	
List of countries addressed: AT, AU, BE, BR, CA, CH, CZ, DE, DK, FI, FR, GB, GR, HU, IL, IN, IT, JP, KR, NL, NO, PL, RU, SE, SI, SK, UA, US	
The product fulfills the requirements of: EN60601-1:1990 + A1:1993 + A2:1995, UL60601-1, 1st Edition 2006-04-26 (includes National Differences for USA), CAN/CSA-C22.2 No. 601-1-M90 (R2005) (includes National Differences for Canada)	

**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.

www.tdk-lambda.com  
 Made in the UK  
 Test Results: testcert.tdk-lambda.com  
 Manual: tdk-lambda.com/manual  
 Patent: uk.tdk-lambda.com/patents  
 Des: QM7FSDLTSH

Product Code: QM7007R8  
 Serial Number: 1111111111

BS	BS	BS	YF	TS11
			48V25A + - +	Standby / Signals

www.tdk-lambda.com  
 Made in the UK  
 Test Results: testcert.tdk-lambda.com  
 Manual: tdk-lambda.com/manual  
 Patent: uk.tdk-lambda.com/patents  
 Des: QM5CSDLE12H

Product Code: QM500011  
 Serial Number: 1111111111

SB	DM	SB	SB	SB	T12H
5.2V69A + - +	5.2V69A + - +	5.2V69A + - +	5.2V69A + - +	5.2V69A + - +	Standby / Signals

<b>Test item particulars :</b>		
Classification of installation and use .....	Switch mode power supply for building into end medical equipment	
Supply connection .....	Connection to mains via host equipment or via appliance inlet for QM5 option I only	
Accessories and detachable parts included in the evaluation .....	None	
Options included .....	None	
<b>Possible test case verdicts:</b>		
- 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)	
Abbreviations used in the report:		
- normal condition .....	N.C. - single fault condition .....	S.F.C.
- operational insulation .....	OP - basic insulation .....	BI
- basic insulation between parts of opposite polarity:	BOP - supplementary insulation .....	SI
- double insulation .....	DI - reinforced insulation .....	RI
<b>Testing:</b>		
Date(s) of receipt of test item .....	2016-05-11 to 2017-10-11	
Date(s) of Performance of tests .....	2017-05-16 to 2017-10-11	
<b>General remarks:</b>		
List of test equipment must be kept on file and be available for review.		
"(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 point is used as the decimal separator.		
<b>Manufacturer's Declaration per Sub Clause 4.2.5 of IECEE 02:</b>		
	Yes	
The application for obtaining a CB Test Certificate includes more than one factory 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 .....		
When differences exist, they shall be identified in the General Product Information section.		
<b>Name and address of Factory(ies):</b>	TDK-LAMBDA UK LTD KINGSLEY AVE ILFRACOMBE EX34 8ES UNITED KINGDOM	
	PANYU TRIO MICROTRONICS CO LTD SHIJI INDUSTRIAL ESTATE DONGYONG NANSHA	

GUANGZHOU  
GUANGDONG CHINA

## GENERAL PRODUCT INFORMATION:

### Report Summary

The original report was modified on 2017-12-01 to include the following changes/additions: This report is the 2nd amendment to CB Test Report No: E349607-A43-CB-1 dated 2016-11-16 with CB Test Certificate No: DK-59516-UL, with Amendment 1 issued on 2017-05-26 with CB Test Certificate DK-59516-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.

1. Addition of QM8 model (8 slots)
2. Addition of the following models: 8.1, 18, 20 and 48V SB Modules, 30 and 48V SC Modules, 12/15, 15/15, 15/24 and 27/27V DH Modules, 17/8 DM Module.
3. Addition of the following Option: 12V HPGO
4. Added reverse air, customer ai for QM5 and QM8
5. Updates to CCL
6. Update of marking plate
7. Update of model differences
8. Ratings revised
9. Enclosures added and updated where necessary

### Product Description

The QM or QS series of switch mode power supplies consist 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 either 8 slot models (QM8), 7 slot models (QM7/QS7) or 5 slot models (QM5/QS5) with each slot capable of fitting single or dual modules (SC module requires two slots). The QM8, QM7 or QS7 are available as 1200W or 1500W depending on the input voltage. The QM5 or QS5 are available as 700W or 1200W depending on the input voltages. High power or Low power Standby Options may also 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

QMshabcdhefklm 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 model) 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
	d	=	Leakage Option: Blank or L for 300µA R for 150µA T for 60µA
	e	=	Primary option: Blank for none fitted (must also have no accessible standby) E for global enable T for global inhibit P for PMBus
	f	=	Standby supply: Blank for none fitted 5H for 5V/2A 5L for 5V/0.25A 12H for 12V/1A

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
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#### 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 Parallel modules

##### vHxcd

Where v = output voltage  
H = Series connected parallel SB, 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 - seriesed 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  
settings (Preceded by - ) which denotes various output voltage/current within the specified ranges of each output for a particular unit. (May define non-safety related parameters/features,

#### QSsh-vg-ef-abcd-klm for single output only

Where s = 5-xxxx (where 5 represents the number of available slots and xxxx can be any number or blank to represent the available output power)  
can 7-xxxx (Where 7 represents the number of available slots and xxxx be any number or left blank to represent the available output power).

		h	=	Hold Up Option: blank for none fitted H for Extended Hold Up
		a	=	Cooling: Blank or F for variable speed forward air fan R for variable speed, reverse air C for Customer air (not applicable to QM5 IEC model)
		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
		d	=	Leakage option: Blank or L for 300µA R for 150µA T for 60µA
		e	=	Primary option: blank for none fitted (must also have no accessible standby) E for global enable T for global inhibit P for PMBus
		f	=	Standby supply: Blank for none fitted 5H for 5V/2A 5L for 5V/0.25A 12H for 12V/1A
Output		v	=	Output voltage from within the allowable Vout range in the QS  Parameters Table
		g	=	Blank for Screw terminal F for Faston terminal
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)

May be followed by:

Blanking plates

B/S

Where B/S = Blanking plate

Parallel and Series combinations Tables

Series connection number of slots.

Qty of modules	SB Name	Slots	SC Name	Slots	DH 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	-	-	YR	4
5	YH	5	-	-	YS	5
6	YJ	6	-	-	YT	6
7	YK	7	-	-	YV	7
8	YL	8	-	-	YW	8

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

Parallel connection number of slots

slots	Number of modules in parallel		Name
	SB	SC	
2	2	0	ZC
3	1	1	ZD
4	0	2	ZF
5	1	2	ZG
6	0	3	ZH
7	1	3	ZJ
8	0	4	ZK
3	3	0	ZT
4	4	0	ZV
5	5	0	ZW
6	6	0	ZX
7	7	0	ZY
8	8	0	ZZ

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 - series Channel 1 only.

Number of modules	outputs	Nomenclature
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

Nominal input voltage 100 - 240 Vac (200-240 Vac)\*  
 Input voltage range 90 - 264 Vac (180 - 264 Vac)\*  
 Input frequency range 47 - 63 Hz  
 Maximum input current 11A rms (9A rms for 1200W models)

\* 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

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

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

QM5, QM7 and QM8 Output parameters

Module	Note	Number of slots	Output Channel	Vout nom	Adjustment range (V)	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 21.67.5	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	-	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 13.225	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	48	48 to 52.8	6.25	300	Yes	
SB	-	1	CH1	24	24 to 26.4	12.5	300	Yes	
SB	-	1	CH1	28	28 to 30.8	10.7	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	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	
HF	-	8	CH1	10	10 to 10.6	110	1100	Yes	
YB	-	1	CH1	24	20.4 to 27.6		9.8	200	Yes
YB	-	1	CH1	48	40.8 to 55.2		4.9	200	Yes
YC	-	2	CH1	10	10 to 11		30	300	Yes
YC	-	2	CH1	48	48 to 52.8	12.5	600	Yes	
YF	-	4	CH1	10	10 to 11		60	600	Yes
YF	-	4	CH1	24	24 to 26.4	50	1200	Yes	
YF	-	4	CH1	48	48 to 52.8	25	1200	Yes	
YM	6	6	CH1	15	15 to 15.9	60	1200	Yes	
YN	6	8	CH1	20	20 to 41.2	60	1200	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	
ZF	6	4	CH1	5	5 to 5.3		110	550	Yes
ZF	-	4	CH1	12	12 to 12.8	90	1080	Yes	

QS Output Parameters

Model	Note	Power (max)	Vout (range)	Current (max)	Hazardous Energy	Modules used
QM5	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
QM7	-	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

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 8. 12/12DM Module limited to 180W in slot 2 or 45°C ambient.

Further De-ratings Table

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

Cooling options QM5

Cooling option	Input voltage (Vnom)	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
* not applicable to IEC version	200-240	1200	50
R (Reverse air, variable speed fan)	100-240	700	35
	200-240	1200	30

Cooling options QM7

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

**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.

**Cooling for unit**

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:**

Circuit Ref.	Description	Max. Temperature (°C)
PFC	-	-
L2	Common Mode Choke	115 (140)
L3	Boost choke	(125)
C2, C10	Electrolytic Capacitors	66 (105)
C7 C	Electrolytic Capacitors	64 (105)
C11	Electrolytic Capacitors	73 (105)
C3, C14	X Capacitor	(100)
C12	Y Capacitors	(105)
TX1	Fly back Transformer	(120)
D1	Diode bridge	116 (130)
D3	PFC diode	(130)
U4	Opto-coupler	(100)
U3	Voltage regulator	93 (130)
Q2	Boost FETS	(130)
Options	-	-
Low Power	-	-
U6	Opto-couplers	(100)
High Power	-	-
C6	Electrolytic Capacitors	73 (105)
XU3	Opto-couplers	(100)
TX1	Transformer Class F(130)	
Modules	-	-
DM/DH	-	-

C206	Electrolytic Capacitor	83 (105)
C207	Electrolytic Capacitor	84 (105)
U8	Opto-couplers	(100)
Q1	Primary FET	120 (130)
D201	Output diode	124 (130)
TX1	Transformer Class B	(110)
SC module	-	-
C206	Electrolytic Capacitors	83 (105)
C209	Y Capacitors	(105)
U1	Opto-couplers	(100)
TX1 (5V, 24, 30 and 48V)	Transformer Class B	(110)
TX1 (12V)	Transformer Class F(130)	
Q1	Primary FET	127 (130)
Q203	Secondary FET	(130)
SB module	-	-
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.

#### Amendment 2

This CB Test Report No: E349607-A43-CB-1 dated 2016-11-16 with CB Test Certificate No: DK-59516-UL, with Amendment 1 issued on 2017-05-26 with CB Test Certificate DK-59516-A1-UL was modified to include the following changes/additions:

1. Addition of QM8 model (8 slots)
2. Addition of the following models: 8.1, 18, 20 and 48V SB Modules, 30 and 48V SC Modules, 12/15, 15/15, 15/24 and 27/27V DH Modules, 17/8 DM Module.
3. Addition of the following Option: 12V HPGO
4. Added reverse air, customer ai for QM5 and QM8
5. Updates to CCL
6. Update of marking plate
7. Update of model differences
8. Ratings revised
9. Enclosures added and updated where necessary

Test datasheets are according to IEC 60601-1: 2005 + CORR. 1:2006 + CORR. 2:2007 + AM1:2012 (or IEC 60601-1: 2012 reprint) / ANSI/AAMI ES60601-1:2005/(R)2012 and A1:2012,, C1:2009/(R)2012 and A2:2010/(R)2012 and found to be representative for this evaluation.

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.

#### Technical Considerations

- The product was investigated to the following additional standards: EN 60601-1: 1990 + A1:1993 + A2:1995, (except EMC limitations, EN 60601-1-2, Biocompatibility, EN 10993-1, Programmable Electronic Systems, IEC 60601-1-4), CAN/CSA-C22.2 No. 601.1-M90 (R2005) (includes National Differences for Canada)

- The product was not investigated to the following standards or clauses: Clause 52.1, Programmable Electronic Systems (IEC 601-1-4), Clause 48, Biocompatibility (ISO 10993-1), Clause 36, Electromagnetic Compatibility (IEC 601-1-2)
- The product is Classified only to the following hazards: Shock, Fire, Mechanical
- The degree of protection against harmful ingress of water is: Ordinary
- The following accessories were investigated for use with the product: No accessories
- The mode of operation is: Continuous
- Software is relied upon for meeting safety requirements related to mechanical, fire and shock: No
- The product is suitable for use in the presence of a flammable anesthetics mixture with air or oxygen or with nitrous oxide: No
- 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 following secondary output circuits are at hazardous energy levels: SC (All models), YB, YC and YF (All models), ZD and ZF (All models). SB (8.1, 12, 15, 18, 20, 24, 28 and 48V models, DH (All models) and DM (CH1 12, 17 and 24V modules) --
- The following secondary output circuits are non-hazardous energy levels: 5V, 12V Standby output, SB (3.3 and 5V models), DM (CH2: 3.3, 5, 8, 12 and 24V modules) --
- 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: II --
- Proper bonding to the end product main protective earthing termination is: required --
- The following magnetic devices (eg. transformers or inductor) are provided with an OBJY3 insulation system with the indicated rating greater than Class A (105°C): PFC: TX1 Class B or F, MODULES: TX1 Class B or F, GLOBAL OPTION: TX1 Class F. See table 1.5.1 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 (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 --