



Test Report issued under the responsibility of:



TEST REPORT

IEC 62368-1

Audio/video, information and communication technology equipment

Part 1: Safety requirements

Report Number: E135494-A6011-CB-1

Date of issue.....: 2019-06-28 ; Amendment 3 : 2020-12-11

Total number of pages: 54

Applicant's name.....: TDK-LAMBDA UK LTD

Address: KINGSLEY AVE
ILFRACOMBE
EX34 8ES UNITED KINGDOM

Name of Test Laboratory: UL VS Limited

preparing the Report: Unit 1-3 Horizon, Wade Road, Kingsland Business Park, Basingstoke
RG24 8AH, United Kingdom

Test specification:

Standard: IEC 62368-1:2014 (Second Edition)

Test procedure: CB Scheme

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

Test Report Form No.....: IEC62368_1B

Test Report Form(s) Originator: UL(US)

Master TRF.....: 2014-03

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Test Item description :	Switch-mode Power Supply
Trade Mark	TDK-Lambda 
Manufacturer	TDK-LAMBDA UK LTD KINGSLEY AVE ILFRACOMBE EX34 8ES UNITED KINGDOM
Model/Type reference	QM4, QI4 or QS4, QM5, QI5 or QS5, QM7, QI7 or QS7, QM8, QI8, QM8B, QI8B and KQM5001V-x switch mode power supplies (followed by alphanumeric characters - see Model Differences section in Test Report for details of models and nomenclature)
Ratings	<p>QM4, QI4 or QS4 (550W): 100-240Vac nom, 47-440Hz, 9A rms max</p> <p>QM4, QI4 or QS4 (600W): 115-240Vac nom, 47-440Hz, 9A rms max</p> <p>QM4, QI4 or QS4 (650W): 200-240Vac nom, 47-440Hz, 6A rms max</p> <p>QM4, QI4 or QS4 (550W): 144-318Vdc nom, 6Adc max</p> <p>QM4, QI4 or QS4 (650W): 239-318Vdc nom, 5Adc max</p> <p>QM5, QI5 or QS5 (700W): 100-240Vac nom, 47-440Hz, 11A rms max</p> <p>QM5, QI5 or QS5 (750W): 115-240Vac nom, 47-440Hz, 11A rms max</p> <p>QM5, QI5 or QS5 (800W): 200-240Vac nom, 47-440Hz, 9A rms max</p> <p>QM5H, QI5H or QS5H (700W): 100-240Vac nom, 47-440Hz, 11A rms max</p> <p>QM5H, QI5H or QS5H (750W): 115-240Vac nom, 47-440Hz, 11A rms max</p> <p>QM5H, QI5H or QS5H (800W): 200-240Vac nom, 47-440Hz, 9A rms max</p> <p>QM5H, QI5H or QS5H (1200W): 200-240Vac nom, 47-440Hz, 9A rms max</p> <p>QM5, QI5 or QS5 (700W): 144-318Vdc nom, 7Adc max</p> <p>QM5, QI5 or QS5 (800W): 239-318Vdc nom, 7Adc max</p> <p>QM5H, QI5H or QS5H (700W): 144-318Vdc nom, 7Adc max</p> <p>QM5H, QI5H or QS5H (800W): 239-318Vdc nom, 7Adc max</p> <p>QM5H, QI5H or QS5H (1200W): 239-318Vdc nom, 7Adc max</p> <p>QM7, QI7 or QS7 (1200W): 100-240Vac nom, 47-440Hz, 19A rms max</p> <p>QM7, QI7 or QS7 (1300W): 115-240Vac nom, 47-440Hz, 19A rms max</p> <p>QM7, QI7 or QS7 (1500W): 166.7-240Vac nom, 47-440Hz, 14A rms max</p>

		QM7, QI7 or QS7 (1200W): 144-318Vdc nom, 13Adc max QM7, QI7 or QS7 (1500W): 239-318Vdc, 9Adc max QM8, QI8 (1200W): 100-240Vac nom, 47-440Hz, 19A rms max QM8, QI8 (1500W): 166.7-240Vac nom, 47-440Hz, 14A rms max QM8, QI8 (1200W): 144-318Vdc nom, 13Adc max QM8, QI8 (1500W): 239-318Vdc, 10Adc max QM8B, QI8B (1200W): 100-240Vac nom, 47-440Hz, 19A rms max QM8B, QI8B (1500W): 166.7-240Vac nom, 47-440Hz, 14A rms max QM8B, QI8B (2000W): 200-240Vac nom, 47-440Hz, 15A rms max QM8B, QI8B (1200W): 144-318Vdc nom, 13Adc max QM8B, QI8B (1500W): 239-318Vdc, 10Adc max QM8B, QI8B (2000W): 239-318Vdc, 12Adc max	
Testing procedure and testing location:			
<input type="checkbox"/>	CB Testing Laboratory:		
Testing location/ address			
Tested by (name + signature).....:			
Approved by (name + signature)			
<input type="checkbox"/>	Testing procedure: CTF Stage 1		
Testing location/ address..... :			
Tested by (name + signature).....:			
Approved by (name + signature)			
<input type="checkbox"/>	Testing procedure: CTF Stage 2		
Testing location/ address..... :			
Tested by (name + signature).....:			
Witnessed by (name + signature).....:			
Approved by (name + signature)			
<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 AVE	

	ILFRACOMBE EX34 8ES UNITED KINGDOM	
Tested by (name + signature).....:	N.Marsh, M. Carter / Safety Engineer	See the original/ amendment CBTR for signatures
Witnessed by (name + signature).....:	Mark John De Sagun / Project Handler	See the original/ amendment CBTR for signatures
Approved by (name + signature)	Dennis Butcher / Reviewer	See the original/ amendment CBTR for signatures
Supervised by (name + signature)	Dennis Butcher / Reviewer	See the original/ amendment CBTR for signatures

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

National Differences (0 pages)

Enclosures (4 pages)

Summary of testing:**Tests performed (name of test and test clause):**
None**Testing Location: None****Summary of compliance with National Differences:****List of countries addressed:** Australia / New Zealand, EU Group and National Differences, Japan, USA / Canada

EU Group and National Differences applies to CENELEC member countries: Austria , Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom

☒ **The product fulfils the requirements of:** EN 62368-1:2014 + A11:2017, , CSA CAN/CSA-C22.2 No. 62368-1 2nd Edition, Issued December 1, 2014

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

TEST ITEM PARTICULARS:	
Classification of use by	Skilled person
Supply Connection	AC Mains DC Mains
Supply % Tolerance	+10%/-10%
Supply Connection – Type	mating connector
Considered current rating of protective device as part of building or equipment installation	20 A; building;
Equipment mobility	for building-in
Over voltage category (OVC)	OVC II
Class of equipment	Class I
Access location	N/A
Pollution degree (PD)	PD 2
Manufacturer's specified maximum operating ambient (°C)	70°C (de-rated output power by 2.5% per °C above 50°C)
IP protection class	IPX0
Power Systems	TN
Altitude during operation (m)	5000 m
Altitude of test laboratory (m)	2000 m or less
Mass of equipment (kg)	3.6kg QM8, 3.2kg for QM7, 2.3kg for QM5 and 1.9/kg for the QM4
POSSIBLE TEST CASE VERDICTS:	
- test case does not apply to the test object..... :	N/A
- test object does meet the requirement :	P (Pass)
- test object does not meet the requirement :	F (Fail)
TESTING:	
Date of receipt of test item..... :	2018-11-20 TO 2020-08-21
Date (s) of performance of tests..... :	N/A
GENERAL REMARKS:	
<p>"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report.</p> <p>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</p>	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60335-1:	

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 :	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Not applicable
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies) :	TDK-LAMBDA UK LTD KINGSLEY AVE ILFRACOMBE EX34 8ES UNITED KINGDOM PANYU TRIO MICROTRONICS CO LTD SHIJI INDUSTRIAL ESTATE DONGYONG NANSHA GUANGZHOU GUANGDONG 511453 CHINA TRIO-TRONICS (THAILAND) LTD 7/295 MU. 6 MAP YANG PHON SUB-DISTRICT PLUAK DAENG DISTRICT RAYONG PROVINCE THAILAND
GENERAL PRODUCT INFORMATION:	
Report Summary The original report was modified on 2020-12-11 to include the following changes/additions: Technical Amendment: This report has been revised for adding an alternate magnetic supplier "Axis Corporation" in the LoCC table. Based on the previously conducted testing and the review of product technical documentation, it has been determined that the product continues to comply with the standard and all required tests were carried out under the original investigation. This report should be read in conjunction with CBTR Ref. No: E135494-A6011-CB-1-Original - Amendment-1, and -Amendment-2; CBTC Ref. no: DK-85162-M2-UL issued on 2020-09-23.	
Product Description The QM, QI 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, 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, 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, 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

See Enclosure 7-01.

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

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 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
QM4	-	-
L2	Common Mode Choke	115 (140)
L3	Boost choke	125

C8	Electrolytic Capacitors	57 (105)
C10	Electrolytic Capacitors	71 (105)
C11	Electrolytic Capacitors	77 (105)
C5	X Capacitor	100
C12, C15	Y Capacitors	105
TX1	Fly back Transformer	120
D1	Diode bridge	118 (130)
D3	PFC diode	130
U3	Voltage regulator	120 (130)
Q1	Boost FET	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
SA module Modules	-	-
C202	Electrolytic Capacitors	76 (105)
C209	Y Capacitors	105
XU206	Opto-couplers	100
TX2	Transformer Class B	110
XQ1	Primary FET	130
XU202	Secondary FET	130

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

The marking label provided is representative of all models.

The test item receipt dates shown are those of the amendment testing.

Technical Considerations

- The product was submitted and evaluated for use at the maximum ambient temperature (Tma) permitted by the manufacturer's specification of : 70°C, (65°C for QM5 option I), total output power and module output power de-rated 2.5% per °C above 50°C
- The product is intended for use on the following power systems : TN, TT
- The equipment disconnect device is considered to be : provided in the end product
- The following were investigated as part of the protective earthing/bonding : Printed wiring board trace (refer to Enclosure - Schematics + PWB for layouts)
- The following are available from the Applicant upon request : Installation (Safety) Instructions / Manual
- The product was investigated to the following additional standard : EN 62368-1:2014 + A11:2017
- Capacitors are rated for 230V due to the IT power system used in Norway. Further evaluation may be required in the end use product.

Engineering Conditions of Acceptability

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

- The following product-line tests are conducted for this product : Earthing Continuity
- The end-product Electric Strength Test is to be based upon a maximum working voltage of : Primary-Secondary: 457Vrms, 665Vpk, Primary-Earthed Dead Metal: 373Vrms, 680Vpk
- The following output circuits are at ES1 energy levels : see Model differences in Enclosure 7-01
- The following output circuits are at ES2 energy levels : see Model differences in Enclosure 7-01
- The following output circuits are at ES3 energy levels : see Model differences in Enclosure 7-01
- The following output circuits are at PS3 energy levels : all circuits
- The maximum investigated branch circuit rating is : 20 A
- The investigated Pollution Degree is : 2
- Proper bonding to the end-product main protective earthing termination is : Required
- An investigation of the protective bonding terminals has : been conducted
- The following end-product enclosures are required : Mechanical, Fire, Electrical (excluding QM5 option I, non-customer air version, front end)
- The following magnetic devices (e.g. transformers or inductor) are provided with an OBJY2 insulation system with the indicated rating greater than Class A (105°C) : examples: T2 (Class B) or L1 (155°C), examples: T2 (Class B) or L1 (155°C), examples: T2 (Class B) or L1 (155°C), PFC : TX1 Class F, MODULES: TX1 (TX2 for SA modules) Class B except 12V SC Module TX1 Class F. GLOBAL OPTIONS/PMBUS: TX1 Class F. See Critical Components Table for details of insulation systems used.
- Fans: The fan provided in this sub-assembly is not intended for operator access.
- All models require component temperatures to be monitored as detailed in the additional information.
- Model KQM5001V-x is a customer air model and due consideration to the cooling in end equipment as described in the Additional Information section must be applied.
- TS3 metal chassis/enclosure accessible to skilled person, skilled safeguard to be considered in the end-product.
- For frequencies above 63Hz, the requirements of clause 5.7 must be considered in the end application.

Miscellaneous ID 07-01

Model Differences –

This report covers the QM, QI and QS series of switch mode power supplies. The QS is identical to the QM and QI series but allows for only one output made up from modules either in series or in parallel. The QM, QI and QS series consists of 4 slot models (QM4/QS4/QI4), 5 slot models (QM5/QS5/QI5), 7 slot models (QM7/QS7/QI7) and 8 slot models (QM8/QI8) with each slot capable of fitting single or dual modules (SC module requires two slots) and Non- standard models, see below for details. The QM4, QI4 or QS4 are available as 550W or 650W. The QM5, QI5 or QS5 are available as 700W, 800W or 1200W and the QM7, QI7, QM8, QI8 or QS7 are available as 1200W or 1500W depending on the input voltage. There is a QM8B and QI8B version which are available as 1200W, 1500W and 2000W. 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 (applicable to QM and QI models)

QMshabcdefghklm or QIshabcdefghklm for modular configurations

Where	s	=	4 for QM4 or QI4 models 5 for QM5 or QI5 models 7 for QM7 or QI7 models 8 for QM8 or QI8 models
	h	=	Hold Up Option Blank for none fitted H for extended hold up B for 2000W converter (QM8 only)
	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 G for single AC/DC fuse in the +ve input line
	d	=	Leakage option: S for 3.5mA L for 300µA R for 150µA T for 60µA
	e	=	Primary option: blank for none fitted E for global enable

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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) 13.5H for 13.5V/0.6A (KQM5001V-x model 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)
h	=	Blank for non-industrial leakage C for Industrial leakage, output Y capacitors up to 100nF (Leakage option S only)

May be followed by:

Single Output modules

vMcode

Where	v	=	output voltage
	M	=	module name (SA, SB or SC)
	c	=	S for screw terminal output 'F' for faston
	d	=	See letter from Module Signal Option Table
	e	=	C for Industrial Leakage, omit for standard leakage

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

Dual output modules

v1/v2DHcde

Where	v1	=	CH1 output voltage
	v2	=	CH2 output voltage
	DH	=	module name (DH)
	c	=	'S' for screw terminal output, 'F' for faston
	d	=	See letter from Module Signal Option Table
	e	=	C for Industrial Leakage, omit for standard leakage

v1/v2DMcde

Miscellaneous ID 07-01

Where	v1	=	CH1 output voltage
	v2	=	CH2 output voltage
	DM	=	module name (DM)
	c	=	'S' for screw terminal output, 'F' for faston
	d	=	See letter from Module Signal Option Table
	e	=	C for Industrial Leakage, omit for standard leakage

Blanking plates

B/S

Where	B/S	=	Blanking plate
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Parallel combinations

vZxcde

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	=	See letter from Module Signal Option Table
	e	=	C for Industrial Leakage, omit for standard leakage

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

Series connected modules

vYxcde

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	=	See letter from Module Signal Option Table
	e	=	C for Industrial Leakage, omit for standard leakage

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

Series connected Paralleled modules

vHxcde

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	=	See letter from Module Signal Option Table
	e	=	C for Industrial Leakage, omit for standard leakage

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

Combined DM modules - serialied Channel 1 only

Miscellaneous ID 07-01

vMxcde

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	=	See letter from Module Signal Option Table
e	=	C for Industrial Leakage, omit for standard leakage

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)
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Module Signal Option Table

Letter	Voltage adjustment pot	Module/ output inhibit	Module/ output good	Remote sense
Blank	Yes	Yes	Yes	Yes
N	Yes	No	No	No
L	No	No	No	No
R	No	No	No	Yes
B	No	No	Yes	No
D	No	No	Yes	Yes
F	No	Yes	No	No
G	No	Yes	No	Yes
H	No	Yes	Yes	No
J	No	Yes	Yes	Yes
K	Yes	No	No	Yes
M	Yes	No	Yes	No
P	Yes	No	Yes	Yes
Q	Yes	Yes	No	No
S	Yes	Yes	No	Yes
T	Yes	Yes	Yes	No

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

Number of available slots	=	4, 5 or 7
Hold Up Option	=	Blank for none fitted, H for Extended Hold Up
Power (max)	=	550, 600, 1044, 1080 or 1200 from QS Output Parameters table below
Voltage	=	Output Voltage from the Vout range in the QS Output Parameters

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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 fuse][leakage option]	=	Blank for defaults or all of -[cooling][input connector][input
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
[Leakage Option]	=	S for 3.5mA, L for 300 µA (default), R for 150µA, 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)	Modules used
QS4	6	550	5-5.3V	110A	1 x ZF Module
-	-	600	12-13.2V	50A	1 x SC Module
-	-	600	24-26.4V	25A	1 x SC Module
-	-	600	30-33V	20A	1 x YC Module
-	-	600	36-39.6V	16.67A	1 x SC Module
-	-	600	48-52.8V	12.5A	1 x SC Module
-	-	600	56-61.6V	10.7A	1 x YC Module
-	-	600	96-105.6V	6.25A	1 x YC Module
QS5	6	550	5-5.3V	110A	1 x ZF Module
-	-	600	12-13.2V	50A	1 x SC Module
-	-	600	24-26.4V	25A	1 x SC Module
-	-	600	30-33V	20A	1 x YC Module
-	-	600	36-39.6V	16.67	1 x SC Module
-	-	600	48-52.8V	12.5A	1 x SC Module
-	-	600	56-61.6V	10.7A	1 x YC Module
-	-	600	96-105.6V	6.25A	1 x YC Module
-	-	1080	12-12.8V	90A	1 x ZF Module
-	-	1200	24-26.4V	50A	1 x YF Module
-	-	1200	48-52.8V	25A	1 x YF Module
QS7	-	1080	12-12.8V	90A	1 x ZF Module

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-	-	1200	24-26.4V	50A	1 x YF Module
-	-	1044	36-38.4V	29A	1 x ZF Module
-	-	1200	48-52.8V	25A	1 x YF Module
-	-	1200	72-79.2V	16.6A	1 x YF Module
-	-	1200	96-105.6V	12.5A	1 x YF Module

Parallel and Series combinations Tables

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.

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Qty of modules	Split after output (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

Limitations of use:

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

Combined DM modules - seriated 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

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8 9 v1/v2/v3/v4/v5/v6/v7/v8/v9MK

Limitations of use:

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

Series modules:

For series modules, where the Energy Source Classification may change, refer to Energy Source Classification Table and/or the Handbook.

Input Parameters

QM4/QI4/QS4

Input voltage nom. 100 - 240Vac, 144 - 318Vdc¹ (200 - 240Vac, 239 - 318Vdc)* (115 - 240Vac)³
 Input voltage range **85 - 264Vac, 130 - 350Vdc (180 - 264Vac, 215 - 350Vdc)* (103.5 - 264Vac)³
 Input frequency range 47 - 440Hz or dc
 Maximum input current 9Arms or 6Adc¹ (6Arms or 5Adc for 650W model) (9A rms)³

¹Input for 550W models

* Input for 650W models.

**Output power is derated to 500W between 85-89.9Vac.

³Input for 600W models

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

QM5/QI5/QS5

Input voltage nom. 100 - 240Vac, 144 - 318Vdc¹ (200 - 240Vac, 239 - 318Vdc)* (115 - 240Vac)³
 Input voltage range **85-264Vac, 130-350Vdc (180-264Vac, 215-350Vdc)* (103.5 - 264Vac)³
 Input frequency range 47 - 440Hz or dc
 Maximum input current 11Arms or 7Adc¹ (9Arms or 7Adc for 800 or 1200W model) (11A rms)³

¹Input for 700W models

* Input for 1200W models.

**Output power is derated to 650W between 85-89.9Vac.

³Input for 750W 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/QI7/QS7

Input voltage nom. 100 - 240Vac, 144 - 318Vdc¹ (166.7 - 240Vac, 239 - 318Vdc)* (115 - 240Vac)³
 Input voltage range **85 - 264Vac, 130 - 350Vdc (150 - 264Vac, 215 - 350Vdc)* (103.5 - 264Vac)³
 Input frequency range 47 - 440Hz or dc
 Maximum input current 19Arms or 13Adc¹ (14Arms or 9Adc for 1500W model) (19A rms)³

¹Input for 1200W models

* Input for 1500W models.

**Output power is derated to 1100W between 85-89.9Vac.

³Input for 1300W models

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

QM8/QI8

Input voltage nom. 100 - 240Vac, 144 - 318Vdc¹ (166.7 - 240Vac, 239 - 318Vdc)*
 Input voltage range **85 - 264Vac, 130 - 350Vdc (150 - 264Vac, 215 - 350Vdc)*
 Input frequency range 47 - 440Hz or dc
 Maximum input current 19Arms or 13Adc¹ (14Arms or 10Adc for 1500W model)

¹Input for 1200W models

* Input for 1500W models.

**Output power is derated to 1100W between 85-89.9Vac.

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

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QM8B/QI8B

Input voltage nom. 100 - 240Vac, 144 - 318Vdc¹ (166.7 - 240Vac, 239 - 318Vdc)* (200 - 240Vac, 239 - 318Vdc)**

Input voltage range ***85 - 264Vac, 130 - 350Vdc (150 - 264Vac, 215 - 350Vdc)* (180 - 264Vac, 215 - 350Vdc)**

Input frequency range 47 - 440Hz or dc

Maximum input current 19Arms or 13Adc¹ (14Arms or 10Adc for 1500W model), (15Arms or 12Adc for 2000W model)

¹Input for 1200W models

* Input for 1500W models.

**Input for 2000W models.

***Output power is derated to 1100W between 85-89.9Vac

Maximum ambient 70°C, total output power and module output power de-rated by 2.5% per 2°C above 50°C

QM4, QI4, QM5, QI5, QM7, QI7, QM8, QI8, QM8B, QI8B Output Parameters

Module output ratings table.

Module	Note	Number of slots	Output Channel	Vout nom	Adjustment range	Output Current	Output Power
DM	5,8,11	1	CH1	12	11.9 to 16.1	10	120
DM	2	1	CH1	17	16 to 21.6	7.5	120
DM	4,5	1	CH1	24	20.8 to 28.2	5	120
DM	-	1	CH2	0	0	0	0
DM	-	1	CH2	3.3	2.8 to 3.8	10	33
DM	-	1	CH2	5	4.25 to 5.75	10	50
DM	-	1	CH2	8	7 to 9.5	10	95
DM	3,8,11	1	CH2	14	11.9 to 16.1	8.3	100
DM	3	1	CH2	24	23.5 to 24.5	4.16	100
DH	1	1	CH1	12	10.2 to 13.8	10	120
DH	1	1	CH1	15	12.75 to 17.25	8	120
DH	1	1	CH1	24	20.4 to 27.6	5	120
DH	1	1	CH1	27	23 to 31	4.4	120
DH	-	1	CH2	0	0	0	0
DH	2	1	CH2	12	10.2 to 13.8	10	120
DH	2	1	CH2	15	12.75 to 17.25	8	120
DH	2	1	CH2	24	20.4 to 27.6	5	120
DH	2	1	CH2	27	23 to 31	4.4	120
SA	-	1	CH1	5	5 to 5.5	15	75
SA	-	1	CH1	12	12 to 13.2	12.5	150
SA	-	1	CH1	15	15 to 16.5	10	150
SA	-	1	CH1	24	24 to 26.4	6.25	150
SB	-	1	CH1	3.3	3.3 to 3.63	37	122
SB	7	1	CH1	3.4	3.2 to 3.6	37	126
SB	-	1	CH1	5	5 to 5.5	30	150
SB	-	1	CH1	8.1	8 to 8.8	25	200
SB	-	1	CH1	12	12 to 13.2	25	300
SB	-	1	CH1	15	15 to 16.5	20	300

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SB	-	1	CH1	18	18 to 19.8	16.7	300
SB	-	1	CH1	20	20 to 22	15	300
SB	-	1	CH1	24	24 to 26.4	12.5	300
SB	-	1	CH1	28	28 to 30.8	10.7	300
SB	-	1	CH1	48	48 to 52.8	6.25	300
SC	6	2	CH1	5	5 to 5.5	60	300
SC	-	2	CH1	12	12 to 13.2	50	600
SC	-	2	CH1	17	17 to 18.7	35.29	600
SC	-	2	CH1	24	24 to 26.4	25	600
SC	-	2	CH1	30	30 to 33	20	600
SC	-	2	CH1	36	36 to 39.6	16.7	600
SC	-	2	CH1	48	48 to 52.8	12.5	600
ZC	-	2	CH1	15	15 to 16	36	540
ZC	-	2	CH1	18	18 to 19.2	30	540
ZC	-	2	CH1	20	20 to 22	27	540
ZC	-	2	CH1	28	28 to 30	19.3	540
ZD	-	3	CH1	5	5 to 5.3	80	400
ZD	-	3	CH1	12	12 to 12.8	65	780
ZD	-	3	CH1	24	24 to 25.6	30	720
ZD	-	3	CH1	48	48 to 51.2	15	720
ZF	6	4	CH1	5	5 to 5.3	110	550
ZF	-	4	CH1	12	12 to 12.8	90	1080
ZF	9	4	CH1	17	17 to 18.19	63.5	1080
ZF	-	4	CH1	36	36 to 38.4	29	1044
ZH	10	6	CH1	24	24 to 25.6	62.4	1200
ZT	-	3	CH1	15	15 to 16	50	750
ZV	-	4	CH1	15	15 to 16	66.4	996

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.

Note 6: Please see Further De-ratings Table below

Note 7: KQM5001V-x model only

Note 8: 12/12DM Module limited to 180W in slot 2 or 45°C ambient. (QM8 only) or 190W in slot 2 or 45°C ambient at low line (QM4 only)

Note 9: 67A for 10 seconds

Note 10: 1500W at high-line

Note 11: 12/24DM Module limited to 180W at low line in slot 2 or 45°C ambient (QM4 only).

Further De-ratings Table

Converter Module		40°C Ambient	45°C Ambient	50°C Ambient	Global Option Fitted	Comments (applicable to 50C ambient only)
QM4*	5SC	60A	-	55A	N/A	Fitted in slots 1+2
	5SC	60A	-	54A	N/A	Fitted in slots 3+4

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-	10YF	60A	-	54A	N/A	-
-	5ZF	110A	-	109A	N/A	-
QM5**	5SC	60A	-	50A	N/A	-
-	10YF	60A	-	50A	N/A	-
-	5ZF	110A	-	90A	N/A	-
QM8***	5SC	-	60A	50A	Yes	Fitted in slots 1+2
-	5SC	-	60A	60A	No	Fitted in slots 1+2
-	5SC	-	60A	55A	No	Fitted in slots 3+4
-	5SC	-	60A	55A	Yes	Fitted in slots 3+4
-	5SC	-	60A	55A	N/A	Fitted in slots 7+8
-	10YF, 15YM & 20YN	-	60A	55A	No	Limited by SC Module in slots 1+2
-	10YF, 15YM & 20YN	-	60A	50A	Yes	Limited by SC Module in slots 1+2
-	10HF	-	110A	90A	Yes	-
-	10HF	-	110A	90A	No	-
-	5ZF	-	110A	90A	Yes	Fitted in slots 1 to 4
-	5ZF	-	110A	90A	No	Fitted in slots 1 to 4
-	5ZF	-	110A	100A	Yes	Fitted in slots 3 to 8
-	5ZF	-	110A	100A	No	Fitted in slots 3 to 8
QS4/Q14*						
QS5/Q15**						
Q18***						

Cooling options	Input voltage	Output power	Ambient
QM4/QS4/Q14	(Vac nom)	(W)	°C
F (Forward air, variable speed)	100-240*	550	50
	115-240	600	50
	200-240**	650	50
C (Customer air)	100-240*	550	50
	115-240	600	50
	200-240**	650	50
R (Reverse air, variable speed fan)	100-240*	550	40
	200-240**	650	40
	100-240*	300	50
	200-240**	300	50
*144 - 318Vdc nom.			
**239 - 318Vdc nom.			

Cooling options	Input voltage	Output power	Ambient
QM5/QS5/Q15	(Vac nom)	(W)	°C
F (Forward air, variable speed)	100-240*	700	50
	115-240	750	50
	200-240**	800	50
	200-240**	1200	50
C (Customer air***)	100-240*	700	50
	115-240	750	50
	200-240**	800	50
***not applicable to IEC version	200-240**	1200	50
R (Reverse air, variable speed fan)	100-240*	700	35
	200-240**	800	30
	200-240**	1200	30
*144 - 318Vdc nom.			
**239 - 318Vdc nom.			

Cooling options	Input voltage	Output power (W)	Ambient (°C)
QM7/QS7/Q17	(Vnom)		
F (Forward air, variable speed)	100-240*	1200	50
	115-240	1300	50

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	166.7-240**	1500	50
C (Customer air)	100-240*	1200	50
	115-240	1300	50
	166.7-240**	1500	50
R (Reverse air, variable speed fan)	100-240*	1200	40
*144 - 318Vdc nom.			
**239 - 318Vdc nom.			
Cooling options			
QM8/QI8	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
*144 - 318Vdc nom.			
**239 - 318Vdc nom.			
Cooling options			
QM8B/QI8B	Input voltage (Vnom)	Output power (W)	Ambient (°C)
F (Forward air, variable speed)	100-240*	1200	50
	166.7-240**	1500	50
	200-240**	2000	50
C (Customer air)	100-240*	1200	50
	166.7-240**	1500	50
	200-240**	2000	50
R (Reverse air, variable speed fan)	100-240*	1000	45

*144 - 318Vdc nom.

**239 - 318Vdc nom.

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

KQM5001V-x (where x may be any letter for non-safety differences)

The KQM5001V-x is a non-standard QM5 model:
 QM5CSDLE13.5H 3.4SBS 12.2SBS 5.2SBS-D100 5.2SCS-D100
 Input rating: 47 - 63Hz, 12Arms max
 Max output power: 815W
 Max ambient 50°C
 Customer air

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

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KQM7016Mx (where x may be any letter for non-safety differences)

The KQM7016Mx is a 7 slot standard QM7 model using a non-standard module:

NS-TLI/QM7FSDL 165YD 48SBS 48SBS 48SBS B/S

This model uses 3 non-standard 48VSB modules, adjusted to 55Vdc, to give a module with a maximum output of 165Vdc.

KQM70143x (where x may be any letter for non-safety differences)

The KQM70143x is a 7 slot non-standard QM7 model:

NS-TLA/QM7FSDLT5H 48YFS 24SBS B/S B/S

The total output power for this configuration is 1500W, at an input of 120Vac nom.

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

The KQM700HJx is 7 slot non-standard QM7 model:

NS-TLA/QM7FSDSQ5J3EC B/S 24SBSC 24SBSC 24SBSC 24SBSC 12SBSC B/S

This model has an option Q PMBus fitted in slot 1

KQM501DWx (where x may be any letter for non- safety differences).

The KQM501DWx is a non-standard QM5 model.

NS-TLI/QM5RSDL 12/5.2DMS 12/5.2DMS 12/3.5DMS 24SBS B/S

This reverse air configuration is limited to a maximum of 350 Watts in a 50°C ambient.

KQM701HTx (where x may be any letter for no- safety differences).

The KQM701HTx is a non-standard QM7 model.

NS-TLA/QM7CSDSP5HC 18ZHSC B/S

This non-standard has additional signal components added to both the PFC and PMbus PCBs.