

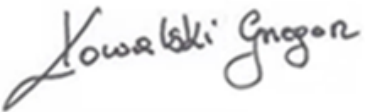



Test Report issued under the responsibility of:



| <b>IEC 60601-1</b><br><b>Medical electrical equipment</b><br><b>Part 1: General requirements for basic safety and essential performance</b>  |  |
|--|--|
| <b>Report Reference No.....</b>  | E349607-D1002-2/A3/C0-ULCB   |
| <b>Date of issue .....</b>   | 2018-06-01, 2019-06-04 (A1) ,<br>2020-10-07 (A2), 2020-11-27<br>(A3)               |
| <b>Total number of pages.....</b>  | 545  |
| <b>CB Testing Laboratory.....</b>  | UL International Germany GmbH  |
| <b>Address .....</b>   | Admiral-Rosendahl-Strasse 23, Zeppelinheim 63263 Neu-Isenburg ,<br>Germany         |
| <b>Applicant's name.....</b>   | TDK-Lambda UK Ltd  |
| <b>Address .....</b>   | Kingsley Avenue, Ilfracombe<br>Devon, EX34 8ES UNITED KINGDOM                      |
| <b>Test specification:</b>   |  |
| <b>Standard .....</b>  | IEC 60601-1:2005, COR1:2006, COR2:2007, AMD1:2012<br>(or IEC 60601-1:2012 reprint) |
| <b>Test procedure .....</b>  | CB Scheme  |
| <b>Non-standard test method.....</b>   | N/A  |
| <b>Test Report Form No.....</b>  | IEC60601_1P  |
| <b>Test Report Form Originator .....</b>   | UL(US)   |
| <b>Master TRF .....</b>  | 2019-10-11   |
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| If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.   |  |
| <b>This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.</b>   |  |
| <b>General disclaimer:</b>   |  |
| The test results presented in this report relate only to the object tested.<br>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.                      |  |

|  |  |
|--|--|
| <b>Test item description</b> .....:                  | Switch mode power supplies   |
| <b>Trade Mark</b> .....:                             | Trademark image(s): See Enclosure  |
| <b>Original Product/Equipment Manufacturer</b> ..... | Same as Applicant  |
| <b>Branding Manufacturer(s)</b> .....:               |  |
| <b>Model/Type reference</b> .....:                   | QM4 or QS4, 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)   |
| <b>Ratings</b> .....:                                | <p>QM4 or QS4 (550W): 100-240Vac nom, 47-63Hz, 9A rms max<br/> QM4 or QS4 (600W): 115-240Vac nom, 47-63Hz, 9A rms max<br/> QM4 or QS4 (650W): 200-240Vac nom, 47-63Hz, 6A rms max<br/> QM4 or QS4 (550W): 144-318Vdc nom, 6Adc max<br/> QM4 or QS4 (650W): 239-318Vdc nom, 5Adc max</p> <p>QM5 or QS5 (700W): 100-240Vac nom, 47-63Hz, 11A rms max<br/> QM5 or QS5 (750W): 115-240Vac nom, 47-63Hz, 11A rms max<br/> QM5 or QS5 (800W): 200-240Vac nom, 47-63Hz, 9A rms max<br/> QM5H or QS5H (700W): 100-240Vac nom, 47-63Hz, 11A rms max<br/> QM5H or QS5H (750W): 115-240Vac nom, 47-63Hz, 11A rms max<br/> QM5H or QS5H (800W): 200-240Vac nom, 47-63Hz, 9A rms max<br/> QM5H or QS5H (1200W): 200-240Vac nom, 47-63Hz, 9A rms max</p> <p>QM5 or QS5 (700W): 144-318Vdc nom, 7Adc max<br/> QM5 or QS5 (800W): 239-318Vdc nom, 7Adc max<br/> QM5H or QS5H (700W): 144-318Vdc nom, 7Adc max<br/> QM5H or QS5H (800W): 239-318Vdc nom, 7Adc max<br/> QM5H or QS5H (1200W): 239-318Vdc nom, 7Adc max</p> <p>QM7 or QS7 (1200W): 100-240Vac nom, 47-63Hz, 19A rms max<br/> QM7 or QS7 (1300W): 115-240Vac nom, 47-63Hz, 19A rms max<br/> QM7 or QS7 (1500W): 166.7-240Vac nom, 47-63Hz, 14A rms max<br/> QM7 or QS7 (1200W): 144-318Vdc nom, 13Adc max<br/> QM7 or QS7 (1500W): 239-318Vdc, 9Adc max</p> <p>QM8 (1200W): 100-240Vac nom, 47-63Hz, 19A rms max<br/> QM8 (1500W): 166.7-240Vac nom, 47-63Hz, 14A rms max<br/> QM8 (1200W): 144-318Vdc nom, 13Adc max<br/> QM8 (1500W): 239-318Vdc, 10Adc max</p> <p>QM8B (1200W): 100-240Vac nom, 47-63Hz, 19A rms max<br/> QM8B (1500W): 166.7-240Vac nom, 47-63Hz, 14A rms max<br/> QM8B (2000W): 200-240Vac nom, 47-63Hz, 15A rms max<br/> QM8B (1200W): 144-318Vdc nom, 13Adc max<br/> QM8B (1500W): 239-318Vdc, 10Adc max<br/> QM8B (2000W): 239-318Vdc, 12Adc max</p> |
| <b>Testing procedure and testing location:</b>       |  |

|  |  |   |
|--|--|---|
| <input checked="" type="checkbox"/>                | <b>CB Testing Laboratory:</b>          |   |
| <b>Testing location/ address .....</b>             |  | UL International Germany GmbH<br>Admiral-Rosendahl-Strasse 23, Zeppelinheim 63263 Neu-<br>Isenburg , Germany  |
| <b>Tested by (name, function, signature) .....</b> |  | Grzegorz Kowalski<br>      |
| <b>Approved by (name, function, signature) ..</b>  |  | Mona Nielsen, Reviewer<br> |
| <input type="checkbox"/>                           | <b>Testing procedure: CTF Stage 1:</b> |   |
| <b>Testing location/ address .....</b>             |  |   |
| <b>Tested by (name, function, signature) .....</b> |  |   |
| <b>Approved by (name, function, signature) ..</b>  |  |   |
| <input type="checkbox"/>                           | <b>Testing procedure: CTF Stage 2:</b> |   |
| <b>Testing location/ address .....</b>             |  |   |
| <b>Tested by (name, function, signature) .....</b> |  |   |
| <b>Witnessed by (name, function, signature) ..</b> |  |   |
| <b>Approved by (name, function, signature) ..</b>  |  |   |
| <input checked="" type="checkbox"/>                | <b>Testing procedure: CTF Stage 3:</b> |   |
| <input type="checkbox"/>                           | <b>Testing procedure: CTF Stage 4:</b> |   |
| <b>Testing location/ address .....</b>             |  | TDK-Lambda UK Ltd., Kingsley Avenue, Ilfracombe,<br>Devon, EX34 8ES, United kingdom.                          |
| <b>Tested by (name, function, signature) .....</b> |  | Tested by N. Marsh, M.<br>Carter and Approved by T.<br>Burgess<br>See the original CBTR for signature         |
| <b>Witnessed by (name, function, signature) ..</b> |  | Witnessed by Dennis<br>Butcher<br>See the original CBTR for signature   |
| <b>Approved by (name, function, signature) ..</b>  |  | Sven Friis, Reviewer<br>See the original CBTR for signature   |
| <b>Supervised by (name, function, signature) :</b> |  | Gustav Hoppe, Handler<br>See the original CBTR for signature  |

**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, Republic of Korea, USA, Canada, United Kingdom, Sweden, Israel

[X] The product fulfils the requirements of IEC 60601-1:2005, COR1:2006, COR2:2007, AMD1:2012  
(or IEC 60601-1:2012 reprint).

**Statement concerning the uncertainty of the measurement systems used for the tests**

(may be required by the product standard or client)

**Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:**

**Procedure number, issue date and title:**

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

**Statement not required by the standard used for type testing**

(Note: When IEC or ISO standard requires a statement concerning the uncertainty of the measurement systems used for tests, this should be reported above. The informative text in parenthesis should be delete in both cases after selecting the applicable option)

**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.*

| <b>GENERAL INFORMATION</b>                                      |   |
|---|---|
| <b>Test item particulars(see also Clause 6):</b>                |   |
| 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  |
| <b>Testing</b>  |   |
| Date of receipt of test item(s) .....                           | 2018-11-20 to 2020-08-21  |
| Dates tests performed .....                                     | 2019-03-06 to 2020-08-24  |
| <b>Possible test case verdicts:</b>                             |   |
| - 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 (collateral standards only)   |
| - test object does not meet the requirement.....                | Fail (F)  |
| <b>Abbreviations used in the report:</b>                        |   |
| - normal condition .....  | N.C.  |
| - means of Operator protection .....                            | MOOP  |
| - single fault condition.....                                   | S.F.C.  |
| - means of Patient protection .....                             | MOPP  |

**General remarks:**

"(See Attachment #)" refers to additional information appended to the report.

"(See appended table)" refers to a table appended to the report.

The tests results presented in this report relate only to the object tested.

This report shall not be reproduced except in full without the written approval of the testing laboratory.

List of test equipment must be kept on file and available for review.

Additional test data and/or information provided in the attachments to this report.

Throughout this report a point is used as the decimal separator.

**Manufacturer's Declaration per sub-clause 4.2.5 of IEC60060-1:2012**

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

Trio-Tronics (Thailand) Ltd  
7/295 Mu. 6  
Map Yang Phon Sub-District, PLUAK DAENG  
DISTRICT RAYONG PROVINCE THAILAND

**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 1(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 1(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 1(SELV), consisting of High Power Standby output, Low Power Standby output, fan supply, AC fail and inhibit/enable.

1Non SELV if certain modules are in series. See Engineering Conditions of acceptability. (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 4 slot models (QM4/QS4), 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 QM4 or QS4 is available as 550W or 650W, the QM5 or QS5 are available as 700W, 800W or 1200W and the QM7, QM8 or QS7 are available as 1200W or 1500W depending on the input voltage. There is a QM8B version which is available as 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

QMshabcdefgklm for modular configurations

Where s = 4 for QM4 models  
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  
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:



L for 300 $\mu$ A  
 R for 150 $\mu$ A  
 T for 60 $\mu$ 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 (SA, SB or SC)

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

d = See letter from Module Signal Option Table

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 = See letter from Module Signal Option Table

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 = See letter from Module Signal Option Table

#### 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 = See letter from Module Signal Option Table

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 = See letter from Module Signal Option Table

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 = See letter from Module Signal Option Table

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 = See letter from Module Signal Option Table

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)

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 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

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

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

#### QS Output Parameters

| Model | Note | Power (Max) | Vout (Range) | Current (Max) | Hazardous Energy Modules used |
|-------|------|-------------|--------------|---------------|-------------------------------|
| QS4   | 6    | 550         | 5-5.3V       | 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         | 36-39.6V     | 16.67A        | Yes 1 x SC Module             |

|     |   |      |           |        |     |               |
|-----|---|------|-----------|--------|-----|---------------|
| -   | - | 600  | 48-52.8V  | 12.5A  | Yes | 1 x SC Module |
| -   | - | 600  | 56-61.6V  | 10.7A  | Yes | 1 x YC Module |
| -   | - | 600  | 96-105.6V | 6.25A  | Yes | 1 x YC Module |
| QS5 | 6 | 550  | 5-5.3V    | 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  | 36-39.6V  | 16.67A | Yes | 1 x SC Module |
| -   | - | 600  | 48-52.8V  | 12.5A  | Yes | 1 x SC Module |
| -   | - | 600  | 56-61.6V  | 10.7A  | Yes | 1 x YC Module |
| -   | - | 600  | 96-105.6V | 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 |
| -   | - | 1044 | 36-38.4V  | 29A    | Yes | 1 x ZF Module |
| -   | - | 1200 | 48-52.8V  | 25A    | Yes | 1 x YF Module |
| -   | - | 1200 | 72-79.2V  | 16.6A  | Yes | 1 x YF Module |
| -   | - | 1200 | 96-105.6V | 12.5A  | Yes | 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 | Name Slots |
| 1              | SB 1       | SC 2       | YB 1       |
| 2              | YC 2       | YF 4       | YP 2       |
| 3              | YD 3       | YM 6       | YQ 3       |
| 4              | YG 4       | YN 8       | YR 4       |
| 5              | YH 5       | -          | YS 5       |
| 6              | YJ 6       | -          | YT 6       |
| 7              | YK 7       | -          | YV 7       |
| 8              | YL 8       | -          | YW 8       |

Limitations of use:

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

Series connection of parallel connected modules

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

Limitations of use:

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

Parallel connection number of slots

Number of modules in parallel

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

See ratings in Module output ratings table below

DH outputs in series but split to create extra outputs.

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

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 | Nomenclature 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 |

Limitations of use:

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

Series modules:

For SB, SC and DM modules, all outputs are SELV except under the following circumstance: Outputs connected in series are non-SELV if, using the formula below, VTotal is found to be >60Vdc

$$V_{Total} = (n-1) \times V_{outmax} + X$$

Where n is the number of seriesed outputs

Where X is taken from the table below

Where Voutmax is taken from the table below

| SC modules | Voutmax | OVP (% Voutnom) | X    |
|------------|---------|-----------------|------|
| 5          | 5.5     | 140             | 7    |
| 12         | 13.2    | 140             | 16.8 |
| 24         | 26.4    | 130             | 31.2 |
| 36         | 39.6    | 140             | 50.4 |
| 48         | 52.8    | 125             | 60   |

| SB modules | Voutmax | OVP | (% Voutnom) | X |
|------------|---------|-----|-------------|---|
| 3.3        | 3.63    | 140 | 4.62        |   |
| 5          | 5.5     | 140 | 7           |   |
| 12         | 13.2    | 140 | 16.8        |   |
| 15         | 16.5    | 140 | 21          |   |
| 18         | 19.8    | 140 | 25.2        |   |
| 24         | 26.4    | 130 | 31.2        |   |
| 28         | 30.8    | 140 | 39.2        |   |
| 48         | 52.8    | 125 | 60          |   |

| DM modules | Voutmax | OVP | (% Voutmax) | X |
|------------|---------|-----|-------------|---|
| 12         | 16.1    | 135 | 21.7        |   |
| 24         | 28.8    | 135 | 38.8        |   |

For DH modules, all outputs are SELV except under the following circumstance: Outputs connected in series are non-SELV if, using the formula below, VTotal is found to be >60Vdc

$$V_{Total} = (2 \times V_{outmax} \times 1.3) + (n-2) \times V_{outmax}$$

Where n is the number of outputs connected in series

| DH modules | Voutmax | OVP (% Voutmax) |
|------------|---------|-----------------|
| 12         | 13.8    | 130             |
| 15         | 17.25   | 130             |
| 24         | 27.6    | 130             |
| 27         | 31      | 130             |

If the total voltage of outputs connected in series exceeds the 60Vdc SELV limit then all outputs must be considered non-SELV.

## Input Parameters

## QM4/QS4

Input voltage nom. 100 - 240Vac, 144 - 318Vdc\*\*\*\* (200 - 240Vac, 239 - 318Vdc)\* (115 - 240Vac)\*\*\*  
 Input voltage range \*\*85 - 264Vac, 130 - 350Vdc (180 - 264Vac, 215 - 350Vdc)\* (103.5 - 264Vac)\*\*\*  
 Input frequency range 47 - 440Hz or dc  
 Maximum input current 9Arms or 6Adc (6Arms or 5Adc for 650W model) (9A rms for 550W model)  
 \* Input for 650W models.  
 \*\*Output power is derated to 500W 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  
 \*\*\* Input for 600W models  
 \*\*\*\* Input for 550W models

## QM5/QS5

Input voltage nom. 100 - 240Vac, 144 - 318Vdc\*\*\*\* (200 - 240Vac, 239 - 318Vdc)\* (115 - 240Vac)\*\*\*  
 Input voltage range \*\*85- 264Vac, 130 - 350Vdc (180 - 264Vac, 215 - 350Vdc)\* (103.5 - 264Vac)\*\*\*  
 Input frequency range 47 - 440Hz or dc  
 Maximum input current 11Arms or 7Adc\*\*\*\* (9Arms or 7Adc for 800 or 1200W model) (11A rms for 750W model)  
 \* Input for 800 or 1200W models.  
 \*\*Output power is derated to 650W between 85-89.9Vac.  
 \*\*\* Input for 750W models  
 \*\*\*\*Input for 700W 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/QS7

Input voltage nom. 100 - 240Vac, 144 - 318Vdc\*\*\*\* (166.7 - 240Vac, 239 - 318Vdc)\* (115 - 240Vac)\*\*\*  
 Input voltage range \*\*85 - 264Vac, 130 - 350Vdc (150 - 264Vac, 215 - 350Vdc)\* (103.5 - 264Vac)\*\*\*  
 Input frequency range 47 - 440Hz or dc  
 Maximum input current 19Arms or 13Adc\*\*\*\* (14Arms or 9Adc for 1500W model) (19A rms for 1300W model)  
 \* Input for 1500W models.  
 \*\*Output power is derated to 1100W between 85-89.9Vac.  
 \*\*\* Input for 1300W models  
 \*\*\*\*Input for 1200W 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, 144 - 318Vdc\*\*\* (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 13Adc\*\*\* (14Arms or 10Adc for 1500W model),  
 \* Input for 1500W models.  
 \*\*Output power is derated to 1100W between 85-89.9Vac.  
 \*\*\*Input for 1200W models  
 Maximum ambient 70°C, total output power and module output power de-rated by 2.5% per 2°C above 50°C

## QM8B

Input voltage nom. 100 - 240Vac, 144 - 318Vdc\*\*\*\* (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 13Adc\*\*\*\* (14Arms or 10Adc for 1500W model), (15Arms or 12Adc for 2000W model)  
 \* Input for 1500W models.  
 \*\*Input for 2000W models

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

\*\*\*\*Input for 1200W

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

QM4, QM5, QM7 and QM8 Output parameters

Module output ratings table.

| Module | Output current | Note | Number of slots | Output power | Hazardous energy | Output Channel | Vout nom | Adjustment range |
|--------|----------------|------|-----------------|--------------|------------------|----------------|----------|------------------|
| DM     | 5,8,111        | CH1  | 12              | 11.9 to 16.1 | 10               | 120            | Yes      |                  |
| DM     | 2              | 1    | CH1             | 17           | 16 to 21.6       | 7.5            | 120      | Yes              |
| DM     | 4,5            | 1    | CH1             | 24           | 20.8 to 28.2     | 5              | 120      | Yes              |
| DM     | -              | -    | 1               | CH2          | 0                | 0              | 0        | No               |
| 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     | 3,8,111        | 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     | -              | 1    | CH2             | 0            | 0                | 0              |          | No               |
| 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              |
| SA     | -              | 1    | CH1             | 5            | 5 to 5.5         | 15             | 75       | No               |
| SA     | -              | 1    | CH1             | 12           | 12 to 13.2       | 12.5           | 150      | No               |
| SA     | -              | 1    | CH1             | 15           | 15 to 16.5       | 10             | 150      | No               |
| SA     | -              | 1    | CH1             | 24           | 24 to 26.4       | 6.25           | 150      | No               |
| SB     | -              | 1    | CH1             | 3.3          | 3.3 to 3.63      | 37             | 122      | No               |
| SB     | 7              | 1    | CH1             | 3.4          | 3.2 to 3.6       | 37             | 126      | No               |
| SB     | -              | 1    | CH1             | 5            | 5 to 5.5         | 30             | 150      | No               |
| SB     | -              | 1    | CH1             | 8.1          | 8 to 8.8         | 25             | 200      | Yes              |
| SB     | -              | 1    | CH1             | 12           | 12 to 13.2       | 25             | 300      | Yes              |
| SB     | -              | 1    | CH1             | 15           | 15 to 16.5       | 20             | 300      | Yes              |
| SB     | -              | 1    | CH1             | 18           | 18 to 19.8       | 16.7           | 300      | Yes              |
| SB     | -              | 1    | CH1             | 20           | 20 to 22         | 15             | 300      | Yes              |
| SB     | -              | 1    | CH1             | 24           | 24 to 26.4       | 12.5           | 300      | Yes              |
| SB     | -              | 1    | CH1             | 28           | 28 to 30.8       | 10.7           | 300      | Yes              |
| SB     | -              | 1    | CH1             | 48           | 48 to 52.8       | 6.25           | 300      | Yes              |
| SC     | 6              | 2    | CH1             | 5            | 5 to 5.5         | 60             | 300      | Yes              |
| SC     | -              | 2    | CH1             | 12           | 12 to 13.2       | 50             | 600      | Yes              |
| SC     | -              | 2    | CH1             | 17           | 17 to 18.7       | 35.29          | 600      | Yes              |
| SC     | -              | 2    | CH1             | 24           | 24 to 26.4       | 25             | 600      | Yes              |
| SC     | -              | 2    | CH1             | 30           | 30 to 33         | 20             | 600      | Yes              |
| SC     | -              | 2    | CH1             | 36           | 36 to 39.6       | 16.7           | 600      | Yes              |
| SC     | -              | 2    | CH1             | 48           | 48 to 52.8       | 12.5           | 600      | Yes              |
| ZC     | -              | 2    | CH1             | 15           | 15 to 16         | 36             | 540      | Yes              |
| ZC     | -              | 2    | CH1             | 20           | 20 to 22         | 27             | 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 |
| ZF | -  | 4 | CH1 | 36 | 36 to 38.4  | 29   | 1044 |      | 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.

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) 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          | Comments (applicable to 50°C ambient only) |
|-----------|-------------|--------------|--------------|--------------|------------------------|--|
|           |             |              |              | fitted       |                        |  |
| QM4*      | 5SC         | 60A          | 55A          | N/A          | Fitted in slots 1+2    |  |
|           | 5SC         | 60A          | 54A          | N/A          | Fitted in slots 3+4    |  |
| -         | 10YF        | 60A          | 54A          | N/A          | -                      |  |
| -         | 5ZF         | 110A         | 100A         | N/A          | -                      |  |
| QM5*      | SC          | 60A          | 50A          | N/A          | -                      |  |
| -         | YF          | 60A          | 50A          | N/A          | -                      |  |
| -         | ZF          | 110A         | 90A          | N/A          | -                      |  |
| QM8       | SC          | 60A          | 50A          | Yes          | Fitted in slots 1+2    |  |
| -         | SC          | 60A          | 60A          | No           | Fitted in slots 1+2    |  |
| -         | SC          | 60A          | 55A          | No           | Fitted in slots 3+4    |  |
| -         | SC          | 60A          | 55A          | Yes          | Fitted in slots 3+4    |  |
| -         | SC          | 60A          | 55A          | N/A          | Fitted in slots 7+8    |  |
| -         | YF, YM & YN | -            | 60A          | 55A          | No                     | Limited by SC Module in slots 1+2          |
| -         | YF, YM & YN | -            | 60A          | 50A          | Yes                    | Limited by SC Module in slots 1+2          |
| -         | HF          | 110A         | 90A          | Yes          | -                      |  |
| -         | HF          | 110A         | 90A          | No           | -                      |  |
| -         | ZF          | 110A         | 90A          | Yes          | Fitted in slots 1 to 4 |  |
| -         | ZF          | 110A         | 90A          | No           | Fitted in slots 1 to 4 |  |
| -         | ZF          | 110A         | 100A         | Yes          | Fitted in slots 3 to 8 |  |
| -         | ZF          | 110A         | 100A         | No           | Fitted in slots 3 to 8 |  |

QS4\*

QS5\*

#### Cooling options QM4/QS4

| Cooling option                  | Input voltage (Vac nom) | Output power (W) | Ambient (°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 QM5/QS5             |                            |                     |                      |         |
| Cooling option                      | Input voltage<br>(Vac nom) | Output power<br>(W) | Output power<br>(°C) | Ambient |
| 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    |                            |                     |                      |         |
| R (Reverse air, variable speed fan) | 200 - 240**                | 1200                | 50                   |         |
|                                     | 100 - 240*                 | 700                 | 35                   |         |
|                                     | 200 - 240**                | 800                 | 30                   |         |
|                                     | 200 - 240**                | 1200                | 30                   |         |
| *144 - 318Vdc nom.                  |                            |                     |                      |         |
| **239 - 318Vdc nom.                 |                            |                     |                      |         |
| Cooling options QM7/QS7             |                            |                     |                      |         |
| Cooling option                      | Input voltage<br>(Vnom)    | Output power<br>(W) | Output power<br>(°C) | Ambient |
| F (Forward air, variable speed)     | 100 - 240*                 | 1200                | 50                   |         |
|                                     | 115-240                    | 1300                | 50                   |         |
|                                     | 166.7 - 240**              | 1500                | 50                   |         |
| C (Customer air)                    | 100 - 240*                 | 1200                | 50                   |         |
|                                     | 115-240                    | 1300                | 50                   | 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                 |                            |                     |                      |         |
| Cooling option                      | Input voltage<br>(Vnom)    | Output power<br>(W) | Output power<br>(°C) | Ambient |
| 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                |                            |                     |                      |         |
| Cooling option                      | Input voltage<br>(Vnom)    | Output power<br>(W) | Output power<br>(°C) | Ambient |
| 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):

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

The KQM700HJx is 7 slot non-standard QM7 model:

NS-TLA/QM7FSDLQ5J3E B/S 24SBS 24SBS 24SBS 24SBS 12SBS B/S

This model has an option Q PMBus fitted in slot 1

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

The KQM700HJx is 7 slot non-standard QM7 model:

NS-TLA/QM7FSDLQ5J3E B/S 24SBS 24SBS 24SBS 24SBS 12SBS B/S

This model has an option Q PMBus fitted in slot

The KQM700NNx (where x may be any letter) is a non-standard QM7 model:

NS-TLA/QM7FSDR 48YFS 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        |

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.

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

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

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

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

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.

**Additional Information**

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

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

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

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

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

The components listed in the following table must not exceed the temperatures given. To determine the component temperatures the heating tests must be conducted in accordance with the requirements of the standard in question. Consideration should also be given to the requirements of other safety standards.

Test requirements include: PSU to be fitted in its end-use equipment and operated under the most adverse conditions permitted in the end-use equipment handbook/specification and which will result in the highest temperatures in the PSU. To determine the most adverse conditions consideration should be given to the end use equipment maximum operating ambient, the PSU loading and input voltage, ventilation, end use equipment orientation, the position of doors & covers, etc. Temperatures should be monitored using type K fine wire thermocouples (secured with cyanoacrylate adhesive or similar) placed on the hottest part of the component (out of any direct airflow) and the equipment should be run until all temperatures have stabilised.

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

Cooling for unit temperature table:

| Circuit Ref: | Description             | Max. Temperature (C) |
|--------------|-------------------------|----------------------|
| PFC          | -                       | -                    |
| QM7          | -                       | -                    |
| L2           | Common Mode Choke       | 115 (140)            |
| L3           | Boost choke             | 125                  |
| C2           | Electrolytic Capacitors | 71 (105)             |
| C10          | Electrolytic Capacitors | 64 (105)             |
| C7           | Electrolytic Capacitors | 64 (105)             |
| C8           | Electrolytic Capacitors | 73 (105)             |
| C11          | Electrolytic Capacitors | 77 (105)             |
| C3, C14,     | X Capacitor             | 100                  |
| C12          | Y Capacitors            | 105                  |
| TX1          | Fly back Transformer    | 120                  |
| D1           | Diode bridge            | 114 (130)            |
| D3           | PFC diode               | 130                  |
| U4           | Opto-coupler            | 100                  |
| U3           | Voltage regulator       | 120 (130)            |
| Q2           | Boost FETS              | 130                  |
| QM5          | -                       | -                    |
| L2           | Common Mode Choke       | 115 (140)            |
| L4           | Boost choke             | 125                  |
| C2           | Electrolytic Capacitors | 71 (105)             |
| C10          | Electrolytic Capacitors | 71 (105)             |
| C7           | Electrolytic Capacitors | 64 (105)             |
| C8           | Electrolytic Capacitors | 60 (105)             |
| C11          | Electrolytic Capacitors | 77 (105)             |
| C3, C14,     | X Capacitor             | 100                  |
| C12          | Y Capacitors            | 105                  |
| TX1          | Fly back Transformer    | 120                  |

|                    |                         |           |           |
|--------------------|-------------------------|-----------|-----------|
| D1                 | Diode bridge            |           | 118 (130) |
| D3                 | PFC diode               | 130       |           |
| U4                 | Opto-coupler            |           | 100       |
| U3                 | Voltage regulator       |           | 120 (130) |
| Q2                 | Boost FETS              | 130       |           |
| QM8                | -                       | -         |           |
| L2                 | Common Mode Choke       |           | 115 (140) |
| L3                 | Boost choke             | 125       |           |
| C2                 | Electrolytic Capacitors |           | 71 (105)  |
| C10                | Electrolytic Capacitors |           | 64 (105)  |
| C7C                | Electrolytic Capacitors |           | 74 (105)  |
| C8                 | Electrolytic Capacitors |           | 73 (105)  |
| C11                | Electrolytic Capacitors |           | 77 (105)  |
| C3, C14,           | X Capacitor             |           | 100       |
| C12                | Y Capacitors            |           | 105       |
| TX1                | Fly back Transformer    |           | 120       |
| D1                 | Diode bridge            |           | 114 (130) |
| D3                 | PFC diode               | 130       |           |
| U4                 | Opto-coupler            |           | 100       |
| U3                 | Voltage regulator       |           | 120 (130) |
| Q2                 | Boost FETS              | 130       |           |
| 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 FETS              | 130       |           |
| Low Power Options  | -                       | -         |           |
| U6                 | Opto-couplers           |           | 100       |
| High Power Options | -                       | -         |           |
| C6                 | Electrolytic Capacitors |           | 73 (105)  |
| XU3                | Opto-couplers           |           | 100       |
| TX1                | Transformer Class F     |           | 130       |
| Q PMbus            | -                       | -         |           |
| XU3                | Opto-couplers           |           | 100       |
| DM/DH Modules      | -                       | -         |           |
| C206               | Y Capacitors            |           | 105       |
| C207               | Electrolytic Capacitors |           | 84 (105)  |
| U8                 | Opto-couplers           |           | 100       |
| Q1                 | Primary FET             | 120 (130) |           |
| D201               | Output diode            |           | 124 (130) |
| TX1                | Transformer Class B     |           | 110       |
| SC module Modules  | -                       | -         |           |
| C206               | Electrolytic Capacitors |           | 83 (105)  |
| C209               | Y Capacitors            |           | 105       |
| U1                 | Opto-couplers           |           | 100       |
| TX1                | Transformer Class B     |           | 110       |
| TX1 (12V)          | Transformer Class F     |           | 130       |
| Q1                 | Primary FET             | 127 (130) |           |
| Q203               | Secondary FET           |           | 130       |
| SB module Modules  | -                       | -         |           |
| C206               | Electrolytic Capacitors |           | 83 (105)  |

|           |                         |           |  |
|-----------|-------------------------|-----------|--|
| C209      | Y Capacitors            | 105       |  |
| U1        | Opto-couplers           | 100       |  |
| TX1       | Transformer Class B     | 110       |  |
| Q1        | Primary FET             | 127 (130) |  |
| Q203      | Secondary FET           | 130       |  |
| 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.

#### Technical Considerations

- The product was investigated to the following standards:

##### Main Standard(s):

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

##### From Country Differences:

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

##### Additional Standards:

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

- The following additional investigations were conducted: N/A
- The product was not investigated to the following standards or clauses: Biocompatibility, PESS, EMC, Annex Z of EN standards for compliance with the MDD
- Compliance with IEC 60601-1-6 was not evaluated for the models covered by this report.
- The risk management requirements of the standard were not addressed
- The following accessories were investigated for use with the product: N/A
- No Other Considerations.

#### Technical Considerations

- The product was investigated to the following standards:

##### Main Standard(s):

IEC 60601-1 Edition 3.1 (2012)

##### From Country Differences:

- Austria: EN 60601-1:2006/A1:2013
- Republic of Korea: KS C IEC 60601-1
- USA: ANSI/AAMI ES60601-1:2005/(R)2012 and 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
- Israel: SI 60601 Part 1 (2018-06)

**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
- N/A

**Engineering Conditions of Acceptability**

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

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, 665Vpk, Primary-Earthed Dead Metal: 373Vrms, 680Vpk, Secondary outputs-Earthed Dead Metal: 240Vrms, 340Vpk.

The following secondary output circuits are SELV: All except specific series modules. Refer to Model Differences for series modules which may not be SELV.

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), SA (5, 12, 15 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 OBJY2 insulation system with the indicated rating greater than Class A (105°C): TX1 Modules (Class B or F), TX2 SA modules (Class B), 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

1 x MoPP isolation is possible between modules separated by a blanking slot. Non-standard models only.

**Report Modifications**

| Date Modified<br>(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, | T. Burgess, N. Marsh, S. Hirstwood (Testers) |

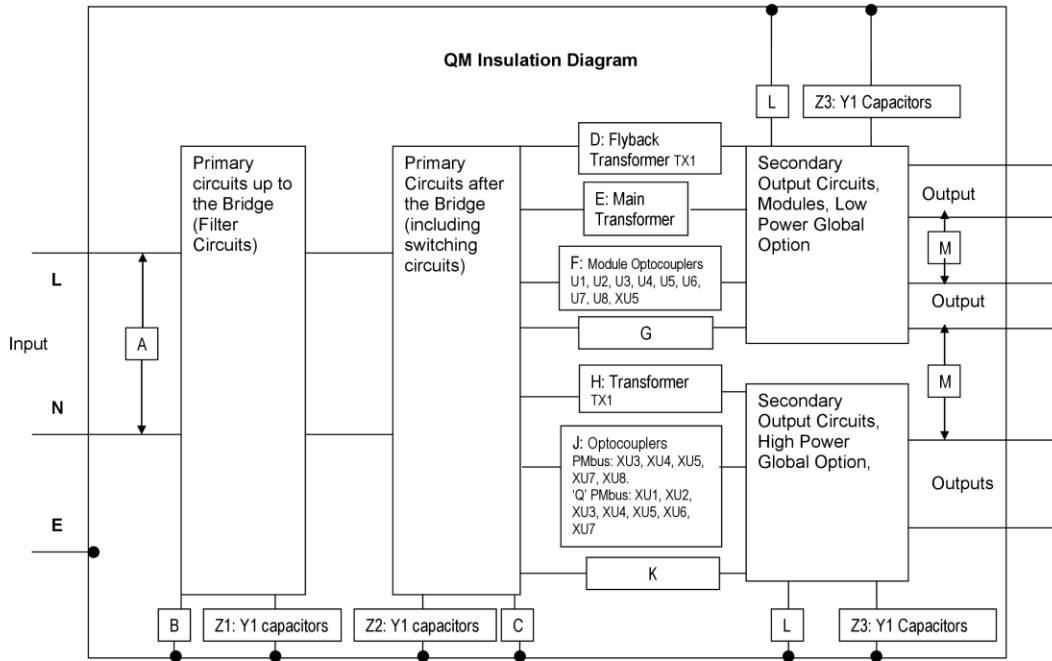
|            |   |                       |
|------------|---|-----------------------|
|            | <p>schematics, wiring diagrams and similar, it has been determined that the product continues to comply with the standard.</p> <ol style="list-style-type: none"> <li>1. Addition of QM5 and QS5 models (5 slots)</li> <li>2. Added 3.3, 15 and 28V SB Modules</li> <li>3. Added reverse air and customer air versions for QM7</li> <li>4. Updates to CCL</li> <li>5. Update of Marking Plates</li> <li>6. Update of Model Differences nomenclature.</li> <li>7. Ratings revised.</li> </ol> <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"> <li>1. Addition of QM8 model (8 slots)</li> <li>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.</li> <li>3. Addition of the following Option: 12V HPGO</li> <li>4. Added reverse air, customer air for QM5 and QM8</li> <li>5. Updates to CCL</li> <li>6. Update of Marking Plates</li> <li>7. Update of Model Differences nomenclature.</li> <li>8. Ratings revised.</li> <li>9. Enclosures added and updated where necessary.</li> </ol>  | Hubert Koszewski      |
| 2018-04-16 | <p>This report is a technical amendment to CBTR Ref. No. E349607-D1002-1/A0/C0-ULCB dated 2016-10-26 including amendment 1 dated 2017-05-17 and amendment 2 dated 2017-11-23 with CB Test Certificate DK-59517-A2-UL dated 2017-11-23.</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"> <li>1. Additions/alternates and corrections to CCL components</li> <li>2. Changes to the Insulation diagram</li> <li>3. Addition of Non-standard model KQM700HJx (PMBus with individual module enable)</li> <li>4. Addition of DC input for QM5 models</li> <li>5. Addition of 17SC module</li> <li>6. Changes to nomenclature</li> <li>7. Changes to enclosures</li> <li>8. 48SC module current limit increase</li> <li>9. Corrections to Additional Information</li> </ol> | Krzysztof Wasilewski) |



|            |  |               |
|------------|--|---------------|
| 2018-06-01 | <p>This report is a reissue of the original CB Test Report No. E349607-D1002-1 &amp; CB Test Certificate No. DK-59517-UL dated 2016-10-26, the 1st Amendment CB Test Report No. E349607-D1002-1 &amp; CB Test Certificate No. DK-59517-A1-UL dated 2017-05-17, the 2nd Amendment CB Test Report No. E349607-D1002-1 &amp; CB Test Certificate No. DK-59517-A2-UL dated 2017-11-23 and the 3rd Amendment CB Test Report No. E349607-D1002-1 &amp; CB Test Certificate No. DK-59517-A3-UL dated 2018-04-16. Based on conducted testing and the review of product technical documentation including photos, schematics, wiring diagrams and similar, it has been determined that the product continues to comply with the standard and only a limited test evaluation was required.</p> <p>The original report has been modified to include the following changes/additions:</p> <ol style="list-style-type: none"> <li>1. Addition of alternates components and corrections to the Critical Components Table</li> <li>2. Updated the model differences section of the report to include a new output module: 36SC</li> <li>3. Addition of a non-standard model KQM700NNx (where x may be any letter)</li> <li>4. Updated the enclosure drawings to include the 36SC module</li> </ol>  | Hima Chetty   |
| 2019-06-04 | <p>This report is a technical amendment to CBTR Ref. E349607-D1002-2/A0/C0-ULCB dated 2018-06-01 with CB Test Certificate DK-74224-UL dated 2018-06-27. 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. The original report was modified to include the following changes/additions:</p> <ol style="list-style-type: none"> <li>1. QM8B version added. B version is the standard QM8 with bigger value capacitors to allow for 2KW output.</li> <li>2. QM4 converter added to the QM range.</li> <li>3. QM4, 7 and 8 evaluated for dc input.</li> <li>4. QM range evaluated for 85Vac input (with de-rating).</li> <li>5. Single channel output DH/DM modules added.</li> <li>6. SA modules added</li> <li>7. Nonstandard KQM70143x added</li> <li>8. Model Differences section updated</li> <li>9. Enclosures updated</li> <li>10. Addition of alternates components and corrections to the Critical Components Table</li> </ol> <p>The following testing was required due to the above changes/additions:</p> <p>4.11 Power Input, 5.7 Humidity Conditioning, 8.4.2 Limitation of Voltage, Current or Power, 8.4.3 Voltage or Charge Limitation, 8.5.4 Working Voltage Measurements, 8.6.4a Impedance and Current Carrying Capability, 8.7 Leakage Current Tests, 8.7.4.5 Earth Leakage Current, 8.7.4.6 Touch Leakage Current, 8.7.4.8 Patient Auxiliary Current, 8.7.3 e) Non-Frequency-Weighted Leakage Current, 8.8.3 Dielectric Voltage Withstand, 11 Temperature, 13 Abnormal Operation Testing, 13.2 Impairment of Cooling, 15.5.1.2 Transformer Short Circuit, 15.5.1.3 Transformer Overload</p> | Hedieh Naderi |

|            |  |                   |
|------------|--|-------------------|
| 2020-10-07 | <p>This report is the 2nd technical amendment to CB Test Report No. E349607-D1002-2/A0/CO-ULCB, dated 2018-06-01 &amp; CB Test Certificate No. DK-74224-UL dated 2018-06-27, including the 1st Amendment dated 2019-06-04 and CB Test Certificate No. DK-74224-M1-UL dated 2019-07-03.</p> <p>The original report has been modified to include the following changes:</p> <ol style="list-style-type: none"> <li>1. Ratings: Additional power ratings (no constructional change)</li> <li>2. Model options: Added High hold up option for the QM4 and addition of Non-standards KQM7016Mx and KQM501DWx</li> <li>3. LOCC – Update of Certificate references and C8 Capacitor increased value to 680uF.</li> <li>4. New Factory location added for Trio-Tronics (Thailand ) Ltd</li> </ol>  | Gustav Hoppe      |
| 2020-11-27 | <p>This report is the 3rd technical amendment to CB Test Report No. E349607-D1002-2/A0/CO-ULCB, dated 2018-06-01 &amp; CB Test Certificate No. DK-74224-UL dated 2018-06-27.</p> <p>The report has been modified to include the following changes:</p> <ol style="list-style-type: none"> <li>1. New supplier Axis Corporation was added to the following components: <ul style="list-style-type: none"> <li>- QM7 TX1 Flyback Transformer</li> <li>- QM8 TX1 Flyback Transformer</li> <li>- TX1 Flyback Transformer</li> <li>- L3 PFC Choke Bobbin</li> <li>- L4 PFC Choke Bobbin</li> <li>- TX1 Flyback Transformer</li> <li>- TX1 Transformer</li> <li>- DM Module TX1 Transformers</li> <li>- DH Module TX1 Transformers</li> <li>- TX1 Transformer - 5V, 17V, 24V, 30V, 36V and 48V</li> <li>- TX1 Transformer - 12V</li> <li>- TX1 Transformer</li> <li>- TX2 Transformer - 12V, 15V, 24V</li> <li>- TX2 Transformer - 5V</li> <li>- TX1 Flyback Transformer</li> <li>- TX1 Flyback Transformer (alternative)</li> </ul> </li> </ol> <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 no additional testing was required.</p> | Grzegorz Kowalski |

Insulation Diagram - (001) QM Insulation Diagram 60601-1Rev 4



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

| TABLE: INSULATION DIAGRAM                                |  |      |   |                          |                        |                         |                        |                         | Pass   |
|--|--|------|---|--------------------------|------------------------|-------------------------|------------------------|-------------------------|--|
| Pollution Degree:  |  |      | 2   |                          |                        |                         |                        |                         | -  |
| Overvoltage category:                                    |  |      | II  |                          |                        |                         |                        |                         | -  |
| Altitude:  |  |      | 5000 (m)  |                          |                        |                         |                        |                         | -  |
| Additional details on parts considered as applied parts: |  |      | [X] None [ ] Areas:<br>(See Clause 4.6 for details) |                          |                        |                         |                        |                         | -  |
| Area   | Number and type of Means of Protection: MOOP, MOPP | CTI  | Working Voltage $V_{rms}$                           | Working Voltage $V_{pk}$ | Required creepage (mm) | Required clearance (mm) | Measured creepage (mm) | Measured clearance (mm) | Remarks  |
| A  | 1 MOOP   | IIIb | 240   | 340                      | 3                      | 3                       | 3.4                    | 3.4                     | (QM7) J1 Live to Neutral PFC                   |
| A  | 1 MOOP   | IIIb | 240   | 340                      | 3                      | 3                       | 3.4                    | 3.4                     | (QM5) J1 Live to Neutral PFC                   |
| A  | 1 MOOP   | IIIb | 240   | 340                      | 3                      | 3                       | 3.4                    | 3.4                     | (QM7) L1 to Earth PFC                          |
| B  | 1 MOPP   | IIIb | 240   | 340                      | 4                      | 3.3                     | 4.2                    | 4.2                     | (QM5) L1 pin 2 (Neutral) to L3 Earth PFC       |
| C  | 1 MOPP   | IIIb | 373   | 680                      | 5.7                    | 4.6                     | 29                     | 29                      | (QM7) TX1-A pin 2 to Earth (Global Option)     |
| C  | 1 MOPP   | IIIb | 343   | 420                      | 5.3                    | 4.6                     | 6.7                    | 5.5                     | (QM5) J12 pin 1 pad (boost) to C15 pin 2 Earth |
| C  | 1 MOPP   | IIIb | 343   | 420                      | 5.3                    | 4.6                     | 6.7                    | 5.5                     | (QM5) J8 pin 1 pad (boost) to H2 Earth pad     |
| C  | 2 MOPP   | IIIb | 350   | 440                      | 5.4                    | 4.6                     | 7                      | 7                       | Earth to V boost + (SC module)                 |
| D  | 2 MOPP   | IIIb | 363   | 598                      | 11.1                   | 9.1                     | 21.9                   | 14.4                    | (QM7) TX1A pin 8 to TX1- flying lead J11 pin 1 |
| D  | 2 MOPP   | IIIb | 355   | 603                      | 10.8                   | 9.1                     | 17.5                   | 17.5                    | (QM5) TX1A pin 8 to U4 pin 4                   |
| E  | 2 MOPP   | IIIb | 262   | 450                      | 9.1                    | 9.1                     | 13.6                   | 10.1                    | TX1 pin 2 to TX1 pin 15 (SC/SB module)         |
| E  | 2 MOPP   | IIIb | 240   | 490                      | 7.9                    | 6.5                     | 15.6                   | 15.6                    | TX1 pin 20 to TX1 pin 18 (DH module)           |
| F  | 2 MOPP   | IIIb | 240   | 444                      | 7.9                    | 6.5                     | 8.7                    | 8.7                     | U6 opto pin 1 to pin 4 DH module               |
| F  | 2 MOPP   | IIIb | 240   | 438                      | 7.9                    | 6.5                     | 8.6                    | 8.6                     | U1 opto, pins 1 to 4 (SB/SC module)            |
| F  | 2 MOPP   | IIIb | 240   | 340                      | 7.9                    | 6.5                     | 8.6                    | 8.6                     | (QM5) U4 pin 2 pad to U4 pin 3 pad             |
| G  | 2 MOPP   | IIIb | 369   | 635                      | 11.2                   | 9.1                     | 18.9                   | 18.9                    | (QM7) TX1A pin 8 to U4 pin 4                   |
| G  | 2 MOPP   | IIIb | 240   | 431                      | 7.9                    | 6.5                     | 14.2                   | 14.2                    | (QM5) L4 pin 7 track to J9 pin 1 pad           |
| G  | 2 MOPP   | IIIb | 240   | 418                      | 7.9                    | 6.5                     | 8.2                    | 8.2                     | OV primary via                                 |

| IEC 60601-1 |                    |      |     |     |      |                 |       |       |   |
|-------------|--------------------|------|-----|-----|------|-----------------|-------|-------|---|
| Clause      | Requirement + Test |      |     |     |      | Result - Remark |       |       | Verdict   |
|             |                    |      |     |     |      |                 |       |       | to Sec Aux -VE (DH module)                                  |
| G           | 2 MOPP             | IIIb | 240 | 544 | 7.9  | 6.5             | 8.7   | 8.7   | U8 via to XD275-A (DM module)                               |
| G           | 2 MOPP             | IIIb | 403 | 494 | 12.2 | 11.7            | 19.2  | 19.2  | Ch1 -ve to V-Boost (SC module)                              |
| H           | 2 MOPP             | IIIb | 378 | 635 | 11.5 | 9.1             | 20.5  | 20.5  | TX1-A pin 2 to TX1-S pin 3 (Global option)                  |
| H           | 2 MOPP             | IIIb | 240 | 406 | 7.9  | 6.5             | 17.01 | 17.01 | TX1-A pin 7 to TX1-S pin 1 (Global option)                  |
| J           | 2 MOPP             | IIIb | 240 | 388 | 7.9  | 6.5             | 8.6   | 8.6   | U4 Opto, pins 1 to 4 (PFC)                                  |
| J           | 2 MOPP             | IIIb | 240 | 406 | 7.9  | 6.5             | 8.2   | 8.2   | U4 Opto, pins 1 to 4 (PFC)                                  |
| K           | 2 MOPP             | IIIb | 439 | 635 | 13.6 | 11.7            | 18.8  | 18.8  | J2 pin 2 to XU3 Pin 2 (Global Option)                       |
| K           | 2 MOPP             | IIIb | 352 | 508 | 10.8 | 9.1             | 37    | 9.2   | F2 to J16 track (PFC)                                       |
| K           | 2 MOPP             | IIIb | 240 | 398 | 7.9  | 6.5             | 11.1  | 11.1  | D2 to TX1-S pin 1 (Global option)                           |
| K           | 2 MOPP             | IIIb | 475 | 534 | 14.3 | 11.7            | 18.9  | 18.9  | J2 Pin 1 to XU201 pin 2 (12V Global Option)                 |
| L           | 1 MOPP             | IIIb | 240 | 340 | 4    | 3.3             | 4.2   | 4.2   | XR355 to Chassis (DH module)                                |
| Z1          | 1 MOPP             | IIIb | 240 | 340 | 4    | 3.2             | 6.3   | 6.3   | C6 pin 1 to pin 2 (Earth) PFC ; minimum 240Vac used         |
| Z2          | 1 MOPP             | IIIb | 240 | 382 | 4    | 3.2             | 6.3   | 6.3   | C12 pin 1 to pin 2 (Earth) PFC; minimum 240Vac used.        |
| Z3          | 1 MOPP             | IIIb | 240 | 340 | 4    | 3.2             | 4.2   | 4.2   | C205 Pin 1 to pin 2 (Earth) DM module; minimum 240Vac used. |
| A           | 1 MOOP             | IIIb | 318 | 318 | 3    | 3               | 3.9   | 3.9   | J1 Live to Neutral PFC                                      |
| B           | 1 MOPP             | IIIb | 318 | 318 | 3.8  | 3.3             | 4.2   | 4.2   | L1 pin 2 to L3 earth track                                  |
| C           | 1 MOPP             | IIIb | 398 | 398 | 4.6  | 4.6             | 6.2   | 6.2   | J8 pin 1 pad (boost) to H2 earth pad                        |
| C           | 1 MOPP             | IIIb | 398 | 398 | 4.6  | 4.6             | 7.8   | 5.5   | J12 pin 1 pad (boost) to C15 pin 2 Earth                    |
| Z1          | 1 MOPP             | IIIb | 318 | 318 | 3.8  | 3.3             | 6.2   | 6.2   | C6 pin 1 to pin 2 (Earth)                                   |
| Z2          | 1 MOPP             | IIIb | 318 | 318 | 3.8  | 3.3             | 7.6   | 7.6   | C12 pin 1 to pin 2 (Earth)                                  |
| D           | 2 MOPP             | IIIb | 404 | 582 | 12.2 | 11.7            | 17.5  | 17.5  | TX1a pin 8 to U4 pin 4                                      |
| F           | 2 MOPP             | IIIb | 318 | 318 | 7.6  | 6.5             | 8.6   | 8.6   | U4 pin 2 pad to U4 pin 3 pad                                |
| G           | 2 MOPP             | IIIb | 371 | 443 | 11.3 | 9.1             | 13.2  | 13.2  | L4 pin 7 track to J9 pin 1 pad                              |
| L           | 1 MOPP             | IIIb | 318 | 318 | 3.8  | 3.3             | 4.2   | 4.2   | J202 to FX201   |
| L           | 1 MOPP             | IIIb | 318 | 318 | 3.8  | 3.3             | 4.9   | 4.9   | XR355 to Chassis  |

| IEC 60601-1 |        |                    |     |     |     |     |                 |     |            |
|-------------|--------|--------------------|-----|-----|-----|-----|-----------------|-----|------------|
| Clause      |        | Requirement + Test |     |     |     |     | Result - Remark |     | Verdict    |
| Z3          | 1 MOPP | IIIb               | 318 | 318 | 3.8 | 3.3 | 4.2             | 4.2 | C208 to PE |
|             |        |                    |     |     |     |     |                 |     |            |