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TEST REPORT
IEC 61800-5-1/EN 61800-5-1
Adjustable speed electrical power drive systems – Part 5-1:
Safety requirements – Electrical, thermal and energy

Report Number. ..... :	200600155SHA-001
Date of issue ..... :	2020-07-09
Total number of pages ..... :	39 pages
Name of Testing Laboratory preparing the Report ..... :	Intertek Testing Services Shanghai Limited
Applicant's name ..... :	EURA DRIVES Electric Co., Ltd.
Address ..... :	NO. 17 Fuzhou Rd, Economic & Technical Development Zone, Yantai, Shandong 264006, CHINA
Test specification:	
Standard ..... :	IEC 61800-5-1: 2007; AMD1:2016 EN 61800-5-1: 2007; AMD1:2017
Test procedure ..... :	CE-LVD
Non-standard test method ..... :	N/A
Test Report Form No. ..... :	IEC61800_5_1C
Test Report Form(s) Originator .... :	SGS Fimko Ltd.
Master TRF ..... :	Dated 2018-05-18

General disclaimer:

The test results presented in this report relate only to the object tested.
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Test item description ..... :	Inverter		
Trade Mark ..... :	EURA		
Manufacturer ..... :	Same as applicant		
Model/Type reference ..... :	E2X00 series (refer to page 5-7 for details)		
Ratings ..... :	Refer to page 5-7		
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒ **Testing Laboratory:**	Intertek Testing Services Shanghai Limited		
Testing location/ address..... :	Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China		
Tested by (name, function, signature)..... :	Martin Xu (Engineer)		
Approved by (name, function, signature)... :	Frank Song (Reviewer)		
☐ **Testing procedure: CTF Stage 1:**			
Testing location/ address..... :			
Tested by (name, function, signature)..... :			
Approved by (name, function, signature)... :			
☐ **Testing procedure: CTF Stage 2:**			
Testing location/ address..... :			
Tested by (name + signature) ..... :			
Witnessed by (name, function, signature) . :			
Approved by (name, function, signature)... :			

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

Attachment: 6 pages photo document.

Summary of testing:

The servo driver has been evaluated for following environmental condition:

- TN distribution system (not corner earthed)
- Supply OVC III
- Pollution Degree 2
- Operation altitude up to 1000 m
- Ambient temperature -10…+50 ºC

Intended for installed in closed electrical operating areas with metal enclosure or non-metal enclosure with 5VA flammability and in a pollution degree 2 environment.

Working voltage measurements have been carried out in non-corner earthed TN distribution system.

Optocouplers across reinforced insulation are evaluated as solid insulation.

Due to there is no obvious influence between 50Hz and 60Hz, all tests have been carried out at 50Hz.

E2X00-0022S2, E2X00-0022T2, E2X00-M0022T2, E2X00-0030T3, E2X00-M0030T3, E2X00-1100T3 and E2X00-2000T3 as representative models subjected to all the tests, other models subjected to partial tests and only unfavourable results recorded.

Tests performed (name of test and test clause):	**Testing location:**
Full applicable tests.	Intertek Shanghai, Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China.

Summary of compliance with National Differences (List of countries addressed):

None

☐ **The product fulfils the requirements of _____ (insert standard number and edition and delete the text in parenthesis, leave it blank or delete the whole sentence, if not applicable)**

Copy of marking plate (representative):

Inverter			
Model	E2000-0004T2	OPTION	XXXXXXXXXXXXXXX
Input	3PH, 200~240VAC, 50/60Hz,		
Output	3PH, 0-Input VAC,		
	0.5-650Hz, 2.5A, 0.4kW		
Serial No.	XXXXXXXXXXXXXXXXXXXXXXXXXXXXX		

EURA DRIVES Electric Co., Ltd.

BAR CODE

IP20

MADE IN CHINA

Warnings on the front cover

Caution:
1 Do not re-set while the motor is rotating
2 Perform the parts replacement after discharge is finished (*min)
3 Do not connect output terminals to the power supply

Remark:

* 5min for models rated output <= 22kW, 15min for models 22kW < rated <= 110kW, 30min for models 110kW < rated <= 315kW, 45min for models 355kW < rated <= 400kW.

Parameters

Type	Input	Output
E2X00-0002S2	1~, 200-240VAC, 50/60Hz	3~, 0-Input VAC, 0,5-650Hz, 1.5A, 0,2kW
E2X00-M0002S2		3~, 0-Input VAC, 0,5-3300Hz, 1.5A, 0,2kW
E2X00-0004S2		3~, 0-Input VAC, 0,5-650Hz, 2.5A, 0,4kW
E2X00-M0004S2		3~, 0-Input VAC, 0,5-3300Hz, 2.5A, 0,4kW
E2X00-0007S2		3~, 0-Input VAC, 0,5-650Hz, 4.5A, 0,75 kW
E2X00-M0007S2		3~, 0-Input VAC, 0,5-3300Hz, 4.5A, 0,75 kW
E2X00-0015S2		3~, 0-Input VAC, 0,5-650Hz, 7A, 1,5 kW
E2X00-M0015S2		3~, 0-Input VAC, 0,5-3300Hz, 7A, 1,5 kW
E2X00-0022S2		3~, 0-Input VAC, 0,5-650Hz, 10A, 2,2kW
E2X00-M0022S2		3~, 0-Input VAC, 0,5-3300Hz, 10A, 2,2kW
E2X00-0002T2	3~, 200-240VAC, 50/60Hz,	3~, 0-Input VAC, 0,5-650Hz, 1.5A, 0.2kW
E2X00-M0002T2		3~, 0-Input VAC, 0,5-3300Hz, 1.5A, 0.2kW
E2X00-0004T2		3~, 0-Input VAC, 0,5-650Hz, 2.5A, 0,4kW
E2X00-M0004T2		3~, 0-Input VAC, 0,5-3300Hz, 2.5A, 0,4kW
E2X00-0007T2		3~, 0-Input VAC, 0,5-650Hz, 4.5A, 0,75kW
E2X00-M0007T2		3~, 0-Input VAC, 0,5-3300Hz, 4.5A, 0,75kW
E2X00-0015T2		3~, 0-Input VAC, 0,5-650Hz, 7A, 1,5kW
E2X00-M0015T2		3~, 0-Input VAC, 0,5-3300Hz, 7A, 1,5kW
E2X00-0022T2		3~, 0-Input VAC, 0,5-650Hz, 10A, 2,2kW
E2X00-M0022T2		3~, 0-Input VAC, 0,5-3300Hz, 10A, 2,2kW
E2X00-0030T2		3~, 0-Input VAC, 0,5-650Hz, 12A, 3,0kW
E2X00-M0030T2		3~, 0-Input VAC, 0,5-3300Hz, 12A, 3,0kW
E2X00-0040T2		3~, 0-Input VAC, 0,5-650Hz, 17A, 4,0kW
E2X00-M0040T2		3~, 0-Input VAC, 0,5-3300Hz, 17A, 4,0kW
E2X00-0055T2		3~, 0-Input VAC, 0,5-650Hz, 21A, 5,5kW
E2X00-M0055T2		3~, 0-Input VAC, 0,5-3300Hz, 21A, 5,5kW
E2X00-0075T2		3~, 0-Input VAC, 0,5-650Hz, 30A, 7,5kW
E2X00-M0075T2		3~, 0-Input VAC, 0,5-3300Hz, 30A, 7,5kW
E2X00-0110T2		3~, 0-Input VAC, 0,5-650Hz, 40A, 11kW
E2X00-M0110T2		3~, 0-Input VAC, 0,5-3300Hz, 40A, 11kW
E2X00-0150T2		3~, 0-Input VAC, 0,5-650Hz, 55A, 15kW
E2X00-M0150T2		3~, 0-Input VAC, 0,5-3300Hz, 55A, 15kW
E2X00-0002T3	3~, 380-480VAC, 50/60Hz,	3~, 0-Input VAC, 0,5-650Hz, 0.6A, 0,2kW
E2X00-0004T3		3~, 0-Input VAC, 0,5-650Hz, 1.2A, 0,4kW
E2X00-0007T3		3~, 30-Input VAC, 0,5-650Hz, 2A, 0,75 kW
E2X00-M0007T3		3~, 0-Input VAC, 0,5-3300Hz, 2A, 0,75 kW
E2X00-P0007T3		3~, 0-Input VAC, 0,5-650Hz, 2A, 0,75 kW
E2X00-Q0007T3		3~, 0-Input VAC, 0,5-650Hz, 2A, 0,75 kW
E2X00-0015T3		3~, 0-Input VAC, 0,5-650Hz, 4A, 1,5 kW
E2X00-M0015T3		3~, 0-Input VAC, 0,5-3300Hz, 4A, 1,5 kW
E2X00-P0015T3		3~, 0-Input VAC, 0,5-650Hz, 4A, 1,5 kW
E2X00-Q0015T3		3~, 0-Input VAC, 0,5-650Hz, 4A, 1,5 kW
E2X00-0022T3		3~, 0-Input VAC, 0,5-650Hz, 6.5A, 2,2kW
E2X00-M0022T3		3~, 0-Input VAC, 0,5-3300Hz, 6.5A, 2,2kW
E2X00-P0022T3		3~, 0-Input VAC, 0,5-650Hz, 6.5A, 2,2kW
E2X00-Q0022T3		3~, 0-Input VAC, 0,5-650Hz, 6.5A, 2,2kW
E2X00-0030T3		3~, 0-Input VAC, 0,5-650Hz, 7.6A, 3,0 kW
E2X00-M0030T3		3~, 0-Input VAC, 0,5-3300Hz, 7.6A, 3,0 kW
E2X00-P0030T3		3~, 0-Input VAC, 0,5-650Hz, 7.6A, 3,0 kW
E2X00-Q0030T3		3~, 0-Input VAC, 0,5-650Hz, 7.6A, 3,0 kW
E2X00-0040T3		3~, 0-Input VAC, 0,5-650Hz, 9A, 4,0kW
E2X00-M0040T3		3~, 0-Input VAC, 0,5-3300Hz, 9A, 4,0kW
E2X00-P0040T3		3~, 0-Input VAC, 0,5-650Hz, 9A, 4,0kW
E2X00-Q0040T3		3~, 0-Input VAC, 0,5-650Hz, 9A, 4,0kW

X= 0-9, different figure stands for different country

Parameters

Type	Input	Output
E2X00-0055T3	3~, 380-480VAC, 50/60Hz	3~, 0-Input VAC, 0,5-650Hz, 12A, 5,5 kW
E2X00-M0055T3		3~, 0-Input VAC, 0,5-3300Hz, 12A, 5,5 kW
E2X00-P0055T3		3~, 0-Input VAC, 0,5-650Hz, 12A, 5,5 kW
E2X00-Q0055T3		3~, 0-Input VAC, 0,5-650Hz, 12A, 5,5 kW
E2X00-0075T3		3~, 0-Input VAC, 0,5-650Hz, 17A, 7,5 kW
E2X00-M0075T3		3~, 0-Input VAC, 0,5-3300Hz, 17A, 7,5 kW
E2X00-P0075T3		3~, 0-Input VAC, 0,5-650Hz, 17A, 5,5 kW
E2X00-Q0075T3		3~, 0-Input VAC, 0,5-650Hz, 17A, 7,5 kW
E2X00-0110T3		3~, 0-Input VAC, 0,5-650Hz, 23A, 11 kW
E2X00-M0110T3		3~, 0-Input VAC, 0,5-3300Hz, 23A, 11 kW
E2X00-P0110T3		3~, 0-Input VAC, 0,5-650Hz, 23A, 11 kW
E2X00-Q0110T3		3~, 0-Input VAC, 0,5-650Hz, 23A, 11 kW
E2X00-0150T3		3~, 0-Input VAC, 0,5-650Hz, 32A, 15 kW
E2X00-M0150T3		3~, 0-Input VAC, 0,5-3300Hz, 32A, 15 kW
E2X00-P0150T3		3~, 0-Input VAC, 0,5-650Hz, 32A, 15 kW
E2X00-Q0150T3		3~, 0-Input VAC, 0,5-650Hz, 32A, 15 kW
E2X00-0185T3		3~, 0-Input VAC, 0,5-650Hz, 38A, 18.5 kW
E2X00-M0185T3		3~, 0-Input VAC, 0,5-3300Hz, 38A, 18,5 kW
E2X00-P0185T3		3~, 0-Input VAC, 0,5-650Hz, 38A, 18.5 kW
E2X00-Q0185T3		3~, 0-Input VAC, 0,5-650Hz, 38A, 18.5 kW
E2X00-0220T3		3~, 0-Input VAC, 0,5-650Hz, 44A, 22 kW
E2X00-M0220T3		3~, 0-Input VAC, 0,5-3300Hz, 44A, 22 kW
E2X00-P0220T3		3~, 0-Input VAC, 0,5-650Hz, 44A, 22 kW
E2X00-Q0220T3		3~, 0-Input VAC, 0,5-650Hz, 44A, 22 kW
E2X00-0300T3		3~, 0-Input VAC, 0,5-650Hz, 60A, 30 kW
E2X00-M0300T3		3~, 0-Input VAC, 0,5-3300Hz, 60A, 30 kW
E2X00-P0300T3		3~, 0-Input VAC, 0,5-650Hz, 60A, 30 kW
E2X00-Q0300T3		3~, 0-Input VAC, 0,5-650Hz, 60A, 30 kW
E2X00-0370T3		3~, 0-Input VAC, 0,5-650Hz, 75A, 37kW
E2X00-M0370T3		3~, 0-Input VAC, 0,5-3300Hz, 75A, 37 kW
E2X00-P0370T3		3~, 0-Input VAC, 0,5-650Hz, 75A, 37 kW
E2X00-Q0370T3		3~, 0-Input VAC, 0,5-650Hz, 75A, 37 kW
E2X00-0450T3		3~, 0-Input VAC, 0,5-650Hz, 90A, 45 kW
E2X00-M0450T3		3~, 0-Input VAC, 0,5-3300Hz, 90A, 45 kW
E2X00-P0450T3		3~, 0-Input VAC, 0,5-650Hz, 90A, 45 kW
E2X00-Q0450T3		3~, 0-Input VAC, 0,5-650Hz, 90A, 45 kW
E2X00-0550T3		3~, 0-Input VAC, 0,5-650Hz, 110A, 55 kW
E2X00-P0550T3		3~, 0-Input VAC, 0,5-650Hz, 110A, 55 kW
E2X00-Q0550T3		3~, 0-Input VAC, 0,5-650Hz, 110A, 55 kW
E2X00-0750T3		3~, 0-Input VAC, 0,5-650Hz, 150A, 75 kW
E2X00-P0750T3		3~, 0-Input VAC, 0,5-650Hz, 150A, 75 kW
E2X00-Q0750T3		3~, 0-Input VAC, 0,5-650Hz, 150A, 75 kW
E2X00-0900T3		3~, 0-Input VAC, 0,5-650Hz, 180A, 90 kW
E2X00-P0900T3		3~, 0-Input VAC, 0,5-650Hz, 180A, 90 kW
E2X00-Q0900T3		3~, 0-Input VAC, 0,5-650Hz, 180A, 90 kW
E2X00-P1100T3		3~, 0-Input VAC, 0,5-650Hz, 220A, 110 kW
E2X00-1100T3		3~, 0-Input VAC, 0,5-650Hz, 220A, 110 kW
E2X00-Q1100T3		3~, 0-Input VAC, 0,5-650Hz, 220A, 110 kW
E2X00-1320T3		3~, 0-Input VAC, 0,5-650Hz, 265A, 132 kW
E2X00-P1320T3		3~, 0-Input VAC, 0,5-650Hz, 265A, 132 kW
E2X00-Q1320T3		3~, 0-Input VAC, 0,5-650Hz, 265A, 132 kW
E2X00-1600T3		3~, 0-Input VAC, 0,5-650Hz, 320A, 160 kW
E2X00-P1600T3		3~, 0-Input VAC, 0,5-650Hz, 320A, 160 kW
E2X00-Q1600T3		3~, 0-Input VAC, 0,5-650Hz, 320A, 160 kW

X= 0-9, different figure stands for different country

Parameters

Type	Input	Output
E2X00-1800T3	3~, 380-480VAC, 50/60Hz	3~, 0-Input VAC, 0,5-650Hz, 360A, 180 kW
E2X00-P1800T3		3~, 0-Input VAC, 0,5-650Hz, 360A, 180 kW
E2X00-Q1800T3		3~, 0-Input VAC, 0,5-650Hz, 360A, 180 kW
E2X00-2000T3		3~, 0-Input VAC, 0,5-650Hz, 400A, 200kW
E2X00-P2000T3		3~, 0-Input VAC, 0,5-650Hz, 400A, 200kW
E2X00-Q2000T3		3~, 0-Input VAC, 0,5-650Hz, 400A, 200kW
E2X00-2200T3		3~, 0-Input VAC, 0,5-650Hz, 440A, 220kW
E2X00-P2200T3		3~, 0-Input VAC, 0,5-650Hz, 440A, 220kW
E2X00-Q2200T3		3~, 0-Input VAC, 0,5-650Hz, 440A, 220kW
E2X00-2500T3		3~, 0-Input VAC, 0,5-650Hz, 480A, 250kW
E2X00-P2500T3		3~, 0-Input VAC, 0,5-650Hz, 480A, 250kW
E2X00-Q2500T3		3~, 0-Input VAC, 0,5-650Hz, 480A, 250kW
E2X00-2800T3		3~, 0-Input VAC, 0,5-650Hz, 530A, 280kW
E2X00-P2800T3		3~, 0-Input VAC, 0,5-650Hz, 530A, 280kW
E2X00-Q2800T3		3~, 0-Input VAC, 0,5-650Hz, 530A, 280kW
E2X00-3150T3		3~, 0-Input VAC, 0,5-650Hz, 580A, 315kW
E2X00-P3150T3		3~, 0-Input VAC, 0,5-650Hz, 580A, 315kW
E2X00-Q3150T3		3~, 0-Input VAC, 0,5-650Hz, 580A, 315kW
E2X00-3550T3		3~, 0-Input VAC, 0,5-650Hz, 640A, 355kW
E2X00-P3550T3		3~, 0-Input VAC, 0,5-650Hz, 640A, 355kW
E2X00-Q3550T3		3~, 0-Input VAC, 0,5-650Hz, 640A, 355kW
E2X00-4000T3		3~, 0-Input VAC, 0,5-650Hz, 690A, 400kW
E2X00-P4000T3		3~, 0-Input VAC, 0,5-650Hz, 690A, 400kW
E2X00-Q4000T3		3~, 0-Input VAC, 0,5-650Hz, 690A, 400kW

X= 0-9, different figure stands for different country

Test item particulars .....:	
Equipment under test .....:	☐ PDS ☒ CDM ☐ BDM ☐ Other:
Equipment location .....:	☐ stand alone ☒ for building-in (open type)
Mains supply overvoltage category (OVC) .....:	☐ OVC I ☐ OVC II ☒ OVC III ☐ OVC IV
Reduction of OVC for basic insulation used .....:	☒ No ☐ Yes, by:
Supply earthing systems and system voltage (V) :	Supply earthing system — System voltage ☒ TN-S, TN-C, TN-CS, TT (not corner earthed) — <=300V or <=150V ☐ TN-S, TT (corner earthed) ☐ TN-C (middle point earthed) ☐ IT (not corner referenced) ☐ IT (corner referenced) ☐ other:
DVC D circuits/terminals (other than mains) .....:	N/A
DVC C circuits/terminals (other than mains) .....:	Yes
DVC B circuits/terminals .....:	N/A
DVC A circuits/terminals .....:	Yes
Potential free circuits/terminals (voltage, OVC) ....:	N/A
Class of equipment .....:	☒ Class I ☐ Class II ☐ Class 0 ☐ Class III
Pollution degree .....:	☐ PD 1: ☒ PD 2: ☐ PD 3: ☐ PD 4:
IP protection classes .....:	IP20
Ambient temperature during operation (°C) with/without derating .....:	-10℃~+50℃
Liquid cooling temperature during operation (°C) with/without derating .....:	N/A
Maximum operation altitude (m) .....:	1000m
Altitude of test laboratory (m) .....:	<150m
Other particulars.....:	N/A

Motor overload and overtemperature protection ..:	☐ Thermal or electronic overload relay ☐ Electronic motor overload protection with thermal memory retention ☐ Electronic motor overload protection with speed sensitivity ☐ Monitoring and automatic reduction of motor current based on thermal sensor in or on motor ☐ Embedded motor thermal protection disconnecting the motor ☐ None ☒ Electronic motor overload protection without thermal memory retention
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 .....:	2020-06-02
Date (s) of performance of tests.....:	2020-06-02 to 2020-06-30

General remarks:

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

Throughout this report a ☒ comma / ☐ point is used as the decimal separator.

Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:

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** ☒ **Not applicable**

When differences exist; they shall be identified in the General product information section.

Name and address of factory (ies).....:	Same as applicant

Remark:

This report updates the standard to EN 61800-5-1:2007+A1:2017 base on the original test reports 150702703SHA-001, 150702703SHA-004, 150900609SHA-002, 150900609SHA-003, 160701200SHA-001 and 161200892SHA-001 for inverters of E2X00 series.

General product information and other remarks:

The products covered by this report is inverter intended to be installed in dry and closed electrical operating areas with metal enclosure or non-metal enclosure with 5VA flammability, permanently connected to power supply (described on page 5-7) with applicable over current protector and isolation switch.

E2X00-M series is same as E2X00 series except with different output frequency. E2X00-Q, E2X00-P and E2X00 are same except Q with heavy duty configuration, P with light duty and E2X00 with normal duty configuration.

IEC 61800-5-1			
Clause	Requirement + Test	Result - Remark	Verdict

4	**PROTECTION AGAINST ELECTRIC SHOCK, THERMAL, AND ENERGY HAZARDS**		
4.1	**General**		P
4.2	**Fault conditions**		P
4.3	**Protection against electric shock**		P
4.3.1	Decisive voltage classification		P
4.3.1.1	Use of decisive voltage class (DVC) .....:	Control: DVC A for circuit powered by isolating transformer. Power: DVC C	P
4.3.1.2	Limits of DVC		P
4.3.1.3	Requirements for protection		P
4.3.1.4	Circuit evaluation	DVC A circuit separated from DVC C circuit provided. DVC C circuit is protective separated from accessible surface.	P
4.3.1.4.1	General		P
4.3.1.4.2	A.C. working voltage		P
4.3.1.4.3	D.C. working voltage		P
4.3.1.4.4	Pulsating working voltage		N/A
4.3.2	Protective separation .....:	Double or reinforced insulation between voltage DVC A and DVC C circuit.	P
4.3.3	Protection against direct contact		P
4.3.3.1	General		P
4.3.3.2	Protection by means of insulation of live parts		P
4.3.3.3	Protection by means of enclosures and barriers		P
4.3.4	Protection in case of direct contact		P
4.3.4.1	General		P
4.3.4.2	Protection using DVC A .....:	Unearthed DVC A circuit	P
4.3.4.3	Protection by means of protective impedance		N/A
4.3.4.4	Protection by means of using limited voltages		N/A
4.3.5	Protection against indirect contact		P
4.3.5.1	General .....:	Class I	P

IEC 61800-5-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.3.5.2	Insulation between live parts and accessible conductive parts	Exposed conductive parts (metal enclosure) were earthed and basic insulated from DVC C circuit.	P
4.3.5.3	Protective bonding circuit	Accessible metal enclosures are adequately connected to the protective bonding circuit.	P
4.3.5.3.1	General	Direct metallic contact	P
4.3.5.3.2	Rating of protective bonding .....:	See 5.2.3.9	P
4.3.5.3.3	Protective bonding impedance		P
4.3.5.4	Protective earthing conductor .....:	Comply with table 5	P
4.3.5.5	Means of connection for the protective earthing conductor		P
4.3.5.5.1	General		P
4.3.5.5.2	Touch current in case of failure of protective earthing conductor .....:	Fixed connection + additional connection for second protective conductor. Warning.	P
4.3.5.6	Special features in equipment for protective class II		N/A
4.3.6	Insulation		P
4.3.6.1	General		P
4.3.6.1.1	Influencing factors		P
4.3.6.1.2	Pollution degree .....:	P2	P
4.3.6.1.3	Overvoltage category .....:	III	P
4.3.6.1.4	Supply earthing systems .....:	TN (not corner earthed)	P
4.3.6.1.5	Insulation voltages		P
4.3.6.2	Insulation to the surroundings		P
4.3.6.2.1	General		P
4.3.6.2.2	Circuits connected directly to the supply mains ...:	Applied to all circuits except SELV circuit.	P
4.3.6.2.3	Circuits not connected directly to the supply mains .....:	Applied to SELV circuit	P
4.3.6.2.4	Insulation between circuits .....:	Double or reinforced insulation between voltage Class A and Class C circuit Basic insulation control terminals and other circuits	P
4.3.6.3	Functional insulation		P
4.3.6.4	Clearance distances	See appended table 5.2.2.1.	P
4.3.6.4.1	Determination		P

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Clause	Requirement + Test	Result - Remark	Verdict
4.3.6.4.2	Electric field homogeneity		N/A
4.3.6.4.3	Clearance to conductive enclosures .....:		P
4.3.6.5	Creepage distances	See appended table 5.2.2.1.	P
4.3.6.5.1	General		P
4.3.6.5.2	Materials .....:	Usage of insulating materials Group IIIa is assumed for PWBs and Group IIIb for other materials.	P
4.3.6.6	Coating		N/A
4.3.6.7	PWB spacings for functional insulation .....:	PWBs min V-0 and CTI≥175. Comply with table 5.2.2.2	P
4.3.6.8	Solid insulation	See appended table 4.3.6.8.	P
4.3.6.8.1	General		P
4.3.6.8.2	Requirements for electrical withstand capability		P
4.3.6.8.2.1	Basic or supplementary insulation	Refer to table 4.3.6.8	P
4.3.6.8.2.2	Double and reinforced insulation	Refer to table 4.3.6.8	P
4.3.6.8.2.3	Functional insulation		P
4.3.6.8.3	Thin sheet or tape material		P
4.3.6.8.3.1	General		P
4.3.6.8.3.2	Material thickness not less than 0,2 mm		N/A
4.3.6.8.3.3	Material thickness less than 0,2 mm	Refer to table 4.3.6.8	P
4.3.6.8.3.4	Compliance		P
4.3.6.8.4	Printed wiring boards (PWBs)	Double-sided single layer PCB used as reinforced insulation between SELV circuit and live parts with thickness of 1,6mm.	P
4.3.6.8.4.1	General		P
4.3.6.8.4.2	Use of coating materials		N/A
4.3.6.8.5	Wound components		P
4.3.6.8.6	Potting materials		N/A
4.3.6.9	Insulation requirements above 30 kHz		N/A
4.3.7	Enclosures		P
4.3.7.1	General .....:	See cl. 5.2.2.5.2, 4.4.3, 5.2.2.5.3, 5.2.2.4.	P
4.3.7.2	Cast metal .....:		N/A
4.3.7.3	Sheet metal .....:	Refer to 5.2.2.5.2	P
4.3.8	Wiring and connections		P

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Clause	Requirement + Test	Result - Remark	Verdict
4.3.8.1	General		P
4.3.8.2	Routing	Smooth, rubber bushing is used for protection of power cable in the metal wall of the enclosure. All internal wires were well routed.	P
4.3.8.3	Colour coding	Green/yellow wires were only used for protective bonding.	P
4.3.8.4	Splices and connections	All electrical connections were securely connected by screws or screwless terminals.	P
4.3.8.5	Accessible connections	Plug in device net wire terminal	P
4.3.8.6	Interconnections between parts of the PDS	Not PDS	N/A
4.3.8.7	Supply connections	Screw terminal block used for supply connection.	P
4.3.8.8	Terminals		P
4.3.8.8.1	Construction requirements	Screw terminal used with spring washer. Conductors were reliable clamped and no damage to conductors.	P
4.3.8.8.2	Connecting capacity		P
4.3.8.8.3	Connection		P
4.3.8.8.4	Wire bending space for wires 10 mm² and greater ..... :	Not PDS	N/A
4.3.9	Output short circuit requirements .....:	Refer to 5.2.3.6.5	P
4.3.10	Residual current-operated protective (RCD) or monitoring (RCM) device compatibility		N/A
4.3.11	Capacitor discharge .....:	Refer to marking on page 4	P
4.3.12	Access conditions for high-voltage PDS		N/A
4.4	**Protection against thermal hazards**		P
4.4.1	Minimizing the risk of ignition		P
4.4.2	Insulating materials		P
4.4.2.1	General		P
4.4.2.2	Material requirements	PCB V-0 had been approved. Insulation material of terminal blocks, bridge rectifier and IGBT were verified by test of 5.2.5.2.	P
4.4.3	Flammability of enclosure materials	Component certified to UL	P
4.4.4	Temperature limits	See appended table 5.2.3.8.	P
4.4.4.1	Internal parts		P

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Clause	Requirement + Test	Result - Remark	Verdict
4.4.4.2	External parts of CDM	See appended table 5.2.3.8.	P
4.4.5	Specific requirements for liquid cooled PDS	Not such liquid cooled PDS	N/A
4.4.5.1	Coolant		N/A
4.4.5.2	Design requirements		N/A
4.4.5.2.1	Corrosion resistance		N/A
4.4.5.2.2	Tubing, joints and seals		N/A
4.4.5.2.3	Provision for condensation		N/A
4.4.5.2.4	Leakage of coolant		N/A
4.4.5.2.5	Loss of coolant		N/A
4.4.5.2.6	Conductivity of coolant		N/A
4.4.5.2.7	Insulation requirements for coolant hoses		N/A
4.4.6	Motor overload and overtemperature protection		P
4.4.6.1	Means of protection		P
4.4.6.2	CDM/BDM with electronic motor overload protection		P
4.4.6.3	CDM/BDM with electronic motor overload protection with thermal memory retention		N/A
4.4.6.4	CDM/BDM with electronic motor overload protection which is speed sensitive		N/A
4.4.6.5	CDM/BDM providing monitoring and automatic reduction of motor current by means of thermal sensors		N/A
4.5	**Protection against energy hazards**		P
4.5.1	Electrical energy hazards .....:	Noted	P
4.5.2	Mechanical energy hazards		N/A
4.5.2.1	General		N/A
4.5.2.2	Critical torsional speed		N/A
4.5.2.3	Transient torque analysis		N/A
4.5.3	Acoustic noise emission		N/A
4.6	**Protection against environmental stresses**		P
5	**TEST REQUIREMENTS**		
5.1	**General**		P
5.1.1	Test objectives and classification .....:	Type tests	P
5.1.2	Selection of test samples .....:		P
5.1.3	Sequence of tests		P
5.1.4	Earthing conditions .....:	Neutral to earth	P

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Clause	Requirement + Test	Result - Remark	Verdict
5.1.5	Compliance		P
5.1.6	Test Overview		—
5.2	**Test specifications**		P
5.2.1	Visual inspections (type test, sample test and routine test)		P
5.2.2	Mechanical tests		P
5.2.2.1	Clearance and creepage distances (type test)	See appended table 5.2.2.1.	P
5.2.2.2	PWB short-circuit test (type test)	See appended table 5.2.2.2.	P
5.2.2.3	Non-accessibility test (type test) .....:		P
5.2.2.4	Enclosure integrity test (type test) .....:		P
5.2.2.5	Deformation tests		P
5.2.2.5.1	General		P
5.2.2.5.2	Deflection test (type test) .....:	Deformation on the steel enclosure does not reduce cl.&cr. below their permitted value.	P
5.2.2.5.3	Impact test (type test), temperature (°C) .....:	Deformation of the plastic control panel (SELV circuit) do not cause hazard.	P
5.2.3	Electrical tests		P
5.2.3.1	Impulse voltage test (type test and sample test)	See appended table 5.2.3.1.	P
5.2.3.2	A.C. or d.c. voltage test (type and routine test)	See appended table 5.2.3.2.	P
5.2.3.2.1	Purpose of test		P
5.2.3.2.2	Value and type of test voltage		P
5.2.3.2.3	Performing the voltage test		P
5.2.3.2.4	Duration of the a.c. or d.c. voltage test		P
5.2.3.2.5	Verification of the a.c. or d.c. voltage test		P
5.2.3.3	Partial discharge test (type test, sample test)	See appended table 5.2.3.3.	N/A
5.2.3.4	Protective impedance (type test and routine test) :		N/A
5.2.3.5	Touch current measurement (type test)	See appended table 5.2.3.5.	P
5.2.3.6	Short-circuit test and Breakdown of components test (type tests)		P
5.2.3.6.1	General		P
5.2.3.6.2	Test configuration		P
5.2.3.6.2.1	Supply voltage and current		P
5.2.3.6.3	Short-circuit test	See appended table 5.2.3.6.3.	P
5.2.3.6.3.1	Load conditions		P

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Clause	Requirement + Test	Result - Remark	Verdict
5.2.3.6.3.2	Short-circuit between phase terminals of power outputs		P
5.2.3.6.3.3	Short-circuit between phase terminals of power output and protective earth		P
5.2.3.6.4	Breakdown of components test	See appended table 5.2.3.6.4.	P
5.2.3.6.4.1	Load conditions		P
5.2.3.6.4.2	Application of short-circuit or open-circuit		P
5.2.3.6.5	Test sequence		P
5.2.3.6.6	Pass criteria		P
5.2.3.7	Capacitor discharge (type test) .....:	See cl. 4.3.11.	P
5.2.3.8	Temperature rise test (type test)	See appended table 5.2.3.8.	P
5.2.3.9	Protective bonding (type test and routine test)	See appended table 5.2.3.9.	P
5.2.4	Abnormal operation tests	See appended table 5.2.4.	P
5.2.4.1	General		P
5.2.4.2	Test duration		P
5.2.4.3	Pass criteria		P
5.2.4.4	Loss of phase (type test)	See appended table 5.2.4.4.	P
5.2.4.5	Cooling failure tests (type tests)	See appended table 5.2.4.5.	P
5.2.4.5.1	General		P
5.2.4.5.2	Inoperative blower motor		P
5.2.4.5.3	Clogged filter		N/A
5.2.4.5.4	Loss of coolant		N/A
5.2.5	Material tests	See appended table 5.2.5. UL approved material	P
5.2.5.1	High current arcing ignition test (type test)		N/A
5.2.5.2	Glow-wire test (type test)		P
5.2.5.3	Hot wire ignition test (type test – alternative to Glow-wire test)		N/A
5.2.5.4	Flammability test (type test)		N/A
5.2.6	Environmental tests (type tests)		P
5.2.6.1	General		P
5.2.6.2	Acceptance criteria		P
5.2.6.3	Climatic tests		P
5.2.6.3.1	Dry heat test (steady state)	(50 ±2) °C, 16 h	P
5.2.6.3.2	Damp heat test (steady state)	(50 ±2) °C, 4 days	P

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Clause	Requirement + Test	Result - Remark	Verdict
5.2.6.4	Vibration test (type test)		P
5.2.7	Hydrostatic pressure test (type test and routine test) .....:		N/A
5.2.8	Electronic motor overload protection test (type test)	See appended Table 5.2.8.	P
5.2.8.1	General requirements		P
5.2.8.2	Test set-up		P
5.2.8.3	Pass criteria		P
5.2.8.4	CDM/BDM electronic motor overload protection test (type test)		P
5.2.8.5	CDM/BDM electronic motor thermal memory retention shutdown test (type test)		N/A
5.2.8.6	CDM/BDM electronic motor thermal memory retention loss of power test (type test)		N/A
5.2.8.7	CDM/BDM electronic motor thermal speed sensitivity test (type test)		N/A
5.2.9	Circuit functionality evaluation (routine and/or sample test)		P
6	**INFORMATION AND MARKING REQUIREMENTS**		
6.1	**General**		P
6.2	**Information for selection**	See appended table 6, part 6.2.	P
6.3	**Information for installing and commissioning**	See appended table 6, part 6.3.	P
6.3.1	General		P
6.3.2	Mechanical considerations		P
6.3.3	Environment		P
6.3.4	Handling and mounting		P
6.3.5	Motor and driven equipment		P
6.3.5.1	Motor selection		P
6.3.5.2	Motor integrated sensors		P
6.3.5.3	Critical torsional speeds		N/A
6.3.5.4	Transient torque analysis		N/A
6.3.6	Connections		P
6.3.6.1	General		P
6.3.6.2	Interconnection and wiring diagrams		P
6.3.6.3	Conductor (cable) selection		P
6.3.6.4	Terminal capacity and identification .....:	Refer to terminal connection diagram on page 4	P

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Clause	Requirement + Test	Result - Remark	Verdict
6.3.6.5	Protection requirements		P
6.3.6.6	Earthing		P
6.3.6.7	Protective earthing conductor current		P
6.3.6.8	Special requirements		P
6.3.7	Overcurrent and short-circuit protection		P
6.3.8	Motor overload protection and overtemperature protection		P
6.3.8.1	CDM/BDM not incorporating internal electronic motor overload and overtemperature protection		N/A
6.3.8.2	CDM/BDM incorporating internal electronic motor overload and overtemperature protection		P
6.3.9	Commissioning		N/A
6.4	**Information for use**	See appended table 6, part 6.4.	P
6.4.1	General		P
6.4.2	Adjustment		P
6.4.3	Labels, signs and signals		P
6.4.3.1	General		P
6.4.3.2	Isolators		N/A
6.4.3.3	Visual and audible signals		N/A
6.4.3.4	Hot surfaces		N/A
6.4.3.5	Equipment marking		P
6.5	**Information for maintenance**	See appended table 6, part 6.5.	P
6.5.1	General		P
6.5.2	Capacitor discharge	Warning to wait at least 15 minutes after disconnection.	P
6.5.3	Auto restart/bypass connection		N/A
6.5.4	PT/CT connection		P
6.5.5	Other hazards		N/A
Annex A	Examples of protection in case of direct contact	Considered	P
Annex B	Examples of overvoltage category reduction	Considered	P
Annex C	Measurement of clearance and creepage distances	Considered	P
Annex D	Altitude correction for clearances	Considered	N/A
Annex E	Clearance and creepage distance determination for frequencies greater than 30 kHz	Considered	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
Annex F	Cross-sections of round conductors	Considered	P
Annex G	Guidelines for RCD compatibility	Considered	N/A
Annex H	Symbols referred to in this part of IEC 61800	Considered	P

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Clause	Requirement + Test	Result - Remark	Verdict

5.2.2.1	TABLE: General selection and information of supply earthing systems for clearance distances									P
Network systems	**TN-S, TN-C, TN-CS, TT (not corner earthed)**		**TN-S, TT (corner earthed)**		**TN-C (middle point earthed)**		**IT (not corner referenced)**		**IT (corner referenced)**	
Rated voltage (V)	1~, 220-240V 3~, 380-480V or 3~, 220-240V		-		-		-		-	
Max. altitude (m)	1000		-		-		-		-	
System voltage for impulse / TOV (V)	≤300V or ≤150V		-		-		-		-	
	BI/SI	**RI**	**BI/SI**	**RI**	**BI/SI**	**RI**	**BI/SI**	**RI**	**BI/SI**	**RI**
For system voltage	≤300V									
Rated Impulse voltage (kV)	4,0	6,0	-	-	-	-	-	-	-	-
Temporary overvoltage (V rms / V peak)	1500/ 2120	2400/ 3392	-	-	-	-	-	-	-	-
Clearance (mm)	3,0	5,5	-	-	-	-	-	-	-	-
Test impulse voltage for clearance (kV)	4,0	6,0	-	-	-	-	-	-	-	-
For system voltage	≤150V									
Rated Impulse voltage (kV)	2,5	4,0	-	-	-	-	-	-	-	-
Temporary overvoltage (V rms / V peak)	1350/ 1910	2160/ 3056	-	-	-	-	-	-	-	-
Clearance (mm)	1,5	3,0	-	-	-	-	-	-	-	-
Test impulse voltage for clearance (kV)	2,5	4,0	-	-	-	-	-	-	-	-
Supplementary information:										

5.2.2.1	TABLE: Working voltage measurements for clearance and creepage distances						-
Conditi	**Between**	**TN-S, TN-C, TN-CS, TT (not corner earthed)**	**TN-S, TT (corner earthed)**	**TN-C (middle point earthed)**	**IT (not corner referenced)**	**IT (corner referenced)**	

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Clause	Requirement + Test	Result - Remark	Verdict

		peak	rms	peak	rms	peak	rms	peak	rms	peak	rms
IT network, simulated impedance (Ω).....:		1 kΩ according to IEC 60990.									
Supplementary information: Condition #:											

5.2.2.1	TABLE: Clearance and creepage distance measurements					P
Clearance (cl) and creepage distance (cr) at/of/between:	U_{peak} (V)	U_{rms} (V)	Req. cl. (mm)	Meas. cl. (mm)	Req. cr. (mm)	Meas. cr. (mm)
Control board[pri: OVC II, max. 250 V; SELV]						
Reinforced						
Pri – sec (PWB)	354	250	3,0	4,8	3,0	4,8
Pri – sec (Other electronic components)	354	250	3,0	⩾4,5	3,0	⩾4,5
240V Power board [OVC III/300 V; SELV]						
Functional						
L – N (PWB)	340	240	1,5	0,9*	1,5	0,9*
DC+ – U (PWB)	330	233	1,5	1,2*	1,5	1,2*
DC- – L (PWB)	330	233	1,5	1,3*	1,5	1,3*
DC+ – DC- (PWB)	330	330	1,5	3,8	1,7	3,8
DC+ – N (PWB)	330	233	1,5	2,4	1,5	2,4
Basic						
L/N – PE (PWB)	340	240	3,0	>5,5	3,0	>5,5
Reinforced						
Pri – sec (PWB at output U)	340	240	5,5	6,2	5,5	6,2
Pri – sec (PWB at gap)	340	240	5,5	5,7	-	-
Pri – sec (PWB at input N)	340	240	5,5	6,5	5,5	6,5
Pri (N connector) – sec (other electronic components)	340	240	5,5	>7,0	5,5	>7,0
480V Power board [OVC III/300 V; SELV]						
Functional:						
L1 – L2 – L3 (PWB)	570	480	1,5	3,0	2,4	3,0
L2 – L3 (PWB)	570	480	1,5	1,6	2,4	1,6
L1 – L2 (PWB)	570	480	1,5	2,5	2,4	2,5
L1 – DC+ (PWB)	570	429	1,5	1,5	2,2	1,5*
V – W (PWB)	570	480	1,5	1,5	2,4	1,5*

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Clause	Requirement + Test	Result - Remark	Verdict

DC+ – DC- (PWB)	570	480	1,5	2,5	3,4	2,5*
Basic/supplementary:						
L1/L2/L3 – PE (PWB)	679	480	3,0	>5,5	3,0	>5,5
Reinforced:						
Pri – sec (Transformer)	1100	561	5,5	12,0	5,5	12,0
Pri – sec (PWB at gap)	<1100	<561	5,5	8.0	-	-
Supplementary information: Working voltages measured in corner earthed TN-network. See “summary of testing”. *) Functional insulation, handled by PWB abnormal operation test. See Table 5.2.3.6 and 5.2.4. **) Clearance requirement calculated from 4.0 kV between phases and PE, which results to 1.5 kV between phase and star point.						

4.3.6.8 **5.2.3.1** **5.2.3.2** **5.2.3.3**	**TABLE: Solid insulation** **Impulse voltage test** **A.C. or d.c. voltage test** **Partial discharge test**	**P**

Test voltage applied between:	**DTI (mm)**	**Impulse test (kV, circuit)**	**Electric strength test (VAC, VDC, s)**	**Partial discharge test (V)**	**Result**
For models with system voltage <=300V					
Basic / supplementary insulation					
L1/L2/L3 – PE (solid insulation)	3	4	2120Vdc, 5s	-	P
SELV – control panel	1,5	4	2120Vdc, 5s	-	P
Reinforced insulation					
L1/L2/L3 – SELV (through optocoupler)	-	6	4240Vdc, 5s	-	P
L1/L2/L3 – SELV (through transformer)	>0,2	6	4240Vdc, 5s	-	P
After deflection and impact test:					
L1/L2/L3 – PE	-	4	2120Vdc, 5s	-	P
After dry heat test:					
L1/L2/L3 – PE	-	-	2120Vdc, 1s	-	P
L1/L2/L3 – SELV circuits	-	-	4240Vdc, 1s	-	P
After damp heat test:					

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Clause	Requirement + Test	Result - Remark	Verdict

4.3.6.8 **5.2.3.1** **5.2.3.2** **5.2.3.3**	**TABLE: Solid insulation** **Impulse voltage test** **A.C. or d.c. voltage test** **Partial discharge test**	**P**

Test voltage applied between:	**DTI (mm)**	**Impulse test (kV, circuit)**	**Electric strength test (VAC, VDC, s)**	**Partial discharge test (V)**	**Result**
L1/L2/L3 – PE	-	-	2120Vdc, 1s	-	P
L1/L2/L3 – SELV circuits	-	-	4240Vdc, 1s	-	P
After vibration test:					
L1/L2/L3 – PE	-	-	2120Vdc, 1s	-	P
L1/L2/L3 – SELV circuits	-	-	4240Vdc, 1s	-	P
After hydrostatic pressure test:					
					N/A
For models with system voltage <=150V					
Basic / supplementary insulation					
L1/L2/L3 – PE (solid insulation)	3	2,5	1910Vdc, 5s	-	P
SELV – control panel	1,5	2,5	1910Vdc, 5s	-	P
Reinforced insulation					
L1/L2/L3 – SELV (through optocoupler)	-	4	3820Vdc, 5s	-	P
L1/L2/L3 – SELV (through transformer)	>0,2	4	3820Vdc, 5s	-	P
After deflection and impact test:					
L1/L2/L3 – PE	-	2,5	1910Vdc, 5s	-	P
After dry heat test:					
L1/L2/L3 – PE	-	-	1910Vdc, 1s	-	P
L1/L2/L3 – SELV circuits	-	-	3820Vdc, 1s	-	P
After damp heat test:					

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Clause	Requirement + Test	Result - Remark	Verdict

4.3.6.8 **5.2.3.1** **5.2.3.2** **5.2.3.3**	**TABLE: Solid insulation** **Impulse voltage test** **A.C. or d.c. voltage test** **Partial discharge test**	**P**

Test voltage applied between:	**DTI (mm)**	**Impulse test (kV, circuit)**	**Electric strength test (VAC, VDC, s)**	**Partial discharge test (V)**	**Result**
L1/L2/L3 – PE	-	-	1910Vdc, 1s	-	P
L1/L2/L3 – SELV circuits	-	-	3820Vdc, 1s	-	P
After vibration test:					
L1/L2/L3 – PE	-	-	1910Vdc, 1s	-	P
L1/L2/L3 – SELV circuits	-	-	3820Vdc, 1s	-	P
After hydrostatic pressure test:					
					N/A
Supplementary information:					

5.2.3.5	**TABLE: Touch current measurement**							P
Single phase equipment								
L – N TN-S, TN-C, TN-CS, TT (not corner earthed) Figure 6	**L – L TN-C, TT (middle point earthed) Figure 7**	**L – L TN, TT (not corner earthed) Figure 8**	**L – N IT (not corner refe-renced) Figure 9**	**L – N IT (corner refe-renced) Figure 9**	**L – L IT (not corner refe-renced) Figure 10**	**L – L IT (corner refe-renced) Figure 10**	**Limit for 50 Hz (mA)**	**Limit for 60 Hz (mA)**
<3,5	-	-	-	-	-	-	3,5	3,5

Three-phase equipment							
TN-S, TN-C, TN-CS, TT (not corner earthed) Figure 11	**IT (star point referenced) Figure 12**	**IT (corner referenced) Figure 12**	**TN, TT (corner earthed) Figure 13**	**TN, TT (middle point earthed) Figure 14**	**Limit for 50 Hz (mA)**	**Limit for 60 Hz (mA)**
>3,5*	-	-	-	-	3,5	3,5

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Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information:

Measurements have been carried out according to figures of IEC 60990.

*for models with touch current exceed 3,5mA ac there are one of the following methods on the machine:

1, A fixed connection and a cross-section of the protective earthing conductor of at least 10 mm^2 Cu; or

2, A fixed connection and provision of an additional terminal for a second protective earthing conductor of the same cross-sectional area as the original protective earthing conductor.

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Clause	Requirement + Test	Result - Remark	Verdict

5.2.2.2 **5.2.3.6.3** **5.2.3.6.4** **5.2.4.4** **5.2.4.5** **5.2.8**	**TABLE: PWB short-circuit test** **Short-circuit test** **Breakdown of components test** **Loss of phase test** **Cooling failure tests** **Electronic motor overload protection test**	P

Tested item	Fault (SC, OC, OL)	Supply voltage (V)	PSCC (kA)	Test time	Test environment (ambient, fuse etc.) and observation	Result
5.2.2.2	SC Transformer inputs	480	-	1min	Recommend external circuit breaker operated at once, no hazards	P
5.2.3.6.3	SC outputs	480	-	At once	The test was carried out several times and Any two outputs were short circuit in turn. After power on, the driver is stopped right now.	P
5.2.3.6.3	SC output to PE	480	-	At once	The test was carried out several times and Any output to PE were short circuit in turn. After power on, the driver is stopped right now. The voltage with respect to earth at the output phase under test is reduced to 50 V a.c. within 7,5ms <40ms	P
5.2.3.6.4	SC VN1-VEN	480	-	At once	Short-circuit secondary of transformer during normal use, the driver shut down within 2s. The driver functioned as normal, after removed the shorted part	P
5.2.3.6.4	SC IGBT	480	-	At once	Recommend external circuit breaker operated at once, no hazards	P
5.2.3.6.4	OC DC link capacitor	480	-	1h	The driver opeated normally, no hazards	P
5.2.3.6.4	SC Bridge rectifier	480	-	At once	Recommend external circuit breaker operated at once, no hazards	P
5.2.3.6.4	SC DC link capacitor	480	-	1min	The driver worked as normal at first, within 1minute, the DC link capacitor broken, the driver stopped and the surgical cotton not ignition, no hazards.	P
5.2.3.6.4	SC Transformer pins	480	-	At once	The driver can't work, no hazards.	P

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Clause	Requirement + Test	Result - Remark	Verdict

5.2.2.2 **5.2.3.6.3** **5.2.3.6.4** **5.2.4.4** **5.2.4.5** **5.2.8**	**TABLE: PWB short-circuit test** **Short-circuit test** **Breakdown of components test** **Loss of phase test** **Cooling failure tests** **Electronic motor overload protection test**	P

Tested item	Fault (SC, OC, OL)	Supply voltage (V)	PSCC (kA)	Test time	Test environment (ambient, fuse etc.) and observation	Result
5.2.4.4	Loss phase	480	-	5s	The test was carried out several times and each phase is disconnected in turn. The driver is powered up with one phase disconnected and gets in ready state without tripping. After the drive is put into drive mode, the output power is gradually increased, and then the driver indicated error information and stop	P
5.2.4.5.2	Fan stop	480	-	1h	Driver was loaded to nominal current until temperatures are steady. After that one fan of two was shut down. The drive tripped in over temperature, when IGBT was 102°C under ambient of 20°C	P
5.2.8	OL	240	-	-	For E2000-0022S2: 7,2xcurrent setting, the driver stopped output right now <20s; 1,5xcurrent setting, the driver stopped output within 76s. < 8min.; 1,2xcurrent setting, the driver stopped output within 81min. < 2h; Current setting=10A	P
5.2.8	OL	240	-	-	For E2000-M0022T2: 7,2xcurrent setting, the driver stopped output right now <20s; 1,5xcurrent setting, the driver stopped output within 90s. < 8min.; 1,2xcurrent setting, the driver stopped output within 75min. < 2h; Current setting=10A	P
5.2.8	OL	240	-	-	For E2000-0022T2: 7,2xcurrent setting, the driver stopped output right now <20s; 1,5xcurrent setting, the driver stopped output within 120s. < 8min.; 1,2xcurrent setting, the driver stopped output within 78min. < 2h; Current setting=10A	P

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Clause	Requirement + Test	Result - Remark	Verdict

5.2.2.2 **5.2.3.6.3** **5.2.3.6.4** **5.2.4.4** **5.2.4.5** **5.2.8**	**TABLE: PWB short-circuit test** **Short-circuit test** **Breakdown of components test** **Loss of phase test** **Cooling failure tests** **Electronic motor overload protection test**	P

Tested item	Fault (SC, OC, OL)	Supply voltage (V)	PSCC (kA)	Test time	Test environment (ambient, fuse etc.) and observation	Result
5.2.8	OL	480	-	-	For E2000-0030T3: 7,2xcurrent setting, the driver stopped output right now <20s; 1,5xcurrent setting, the driver stopped output within 76s. < 8min.; 1,2xcurrent setting, the driver stopped output within 78min. < 2h; Current setting=7,6A	P
5.2.8	OL	480	-	-	For E2000-1100T3: 7,2xcurrent setting, the driver stopped output right now <20s; 1,5xcurrent setting, the driver stopped output within 58s. < 8min.; 1,2xcurrent setting, the driver stopped output within 61min. < 2h; Current setting=220A	P
5.2.8	OL	480	-	-	For E2000-2000T3: 7,2xcurrent setting, the driver stopped output right now <20s; 1,5xcurrent setting, the driver stopped output within 48s. < 8min.; 1,2xcurrent setting, the driver stopped output within 57min. < 2h; Current setting=400A	P
Supplementary information:						

5.2.3.8	**TABLE: Temperature rise test, thermocouple method** (E2X00-0022S2)							**P**
	Supply voltage (V) ..... :	240						—
	Supply frequency (Hz) ... :	50						—
	Load (V, A) ..... :	240V, 10A						—
	Ambient (°C) ..... :	29	50*					—
Thermocouple Location		**Temperature measured (°C)**						**Limit (°C)**
Materials, components and internal parts								

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Clause	Requirement + Test	Result - Remark	Verdict

IGBT module	59	80					150
Power transformer	62	83					105
DC link/Bus capacitor	49	70					105
X2 capacitor	55	76					105
Power board PCB	77	98					130
Bridge rectifier	61	82					150
Terminal block	40	61					90
Y2 capacitor	62	83					110
MOSFET	87	108					150
Relay	62	83					155
Charging resistor	63	84					-
Optical coupler	55	76					100
Absorb capacitor	61	82					105
EMC choke	69	90					105
Accessible parts							
Enclosure (metal)	32	53					70
Enclosure (plastic)	29	50					80
Supplementary information: *indicates that the temperature values in column are the temperatures corrected to ambient of 50°C.							

5.2.3.8	**TABLE: Temperature rise test, thermocouple method** (E2X00-0022T2)							**P**
	Supply voltage (V) ..... :	240						—
	Supply frequency (Hz) ... :	50						—
	Load (V, A) ..... :	240V, 10A						—
	Ambient (°C) ..... :	28	50*					—
Thermocouple Location		**Temperature measured (°C)**						**Limit (°C)**
Materials, components and internal parts								
IGBT module		59	81					150
Power transformer		62	84					105
DC link/Bus capacitor		35	57					105
X2 capacitor		50	72					105
Power board PCB		58	80					130

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Clause	Requirement + Test	Result - Remark	Verdict

Bridge rectifier	54	76					150
Terminal block	34	56					90
Y2 capacitor	40	62					110
MOSFET	57	79					150
Relay	65	87					155
Charging resistor	48	70					-
Optical coupler	52	74					100
Absorb capacitor	61	83					105
EMC choke	67	89					105
Accessible parts							
Enclosure (metal)	34	56					70
Enclosure (plastic)	29	51					80
Supplementary information: *indicates that the temperature values in column are the temperatures corrected to ambient of 50°C.							

5.2.3.8	**TABLE: Temperature rise test, thermocouple method** (E2X00-M0022T2)							**P**
	Supply voltage (V) ..... :	240						—
	Supply frequency (Hz) ... :	50						—
	Load (V, A) ..... :	240V, 10A						—
	Ambient (°C) ..... :	27	50*					—
Thermocouple Location		**Temperature measured (°C)**						**Limit (°C)**
Materials, components and internal parts								
IGBT module		57	80					150
Power transformer		54	77					105
DC link/Bus capacitor		33	56					105
X2 capacitor		47	70					105
Power board PCB		75	98					130
Bridge rectifier		48	71					150
Terminal block		33	56					90
Y2 capacitor		40	63					110
MOSFET		59	82					150
Relay		51	74					155

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Clause	Requirement + Test	Result - Remark	Verdict

Charging resistor	42	65					-
Optical coupler	42	65					100
Absorb capacitor	59	82					105
EMC choke	68	91					105
Accessible parts							
Enclosure (metal)	33	56					70
Enclosure (plastic)	29	52					80
Supplementary information: *indicates that the temperature values in column are the temperatures corrected to ambient of 50°C.							

5.2.3.8	**TABLE: Temperature rise test, thermocouple method** (E2X00-0030T3)							**P**
	Supply voltage (V) ..... :	480						—
	Supply frequency (Hz) ... :	50						—
	Load (V, A) ..... :	480V, 7,6A						—
	Ambient (°C) ..... :	25	50*					—
Thermocouple Location		**Temperature measured (°C)**						**Limit (°C)**
Materials, components and internal parts								
IGBT module		75	100					150
Power transformer		60	85					105
DC link/Bus capacitor		38	63					105
X2 capacitor		46	71					105
Power board PCB		67	92					130
Bridge rectifier		63	88					150
Terminal block		29	54					90
Y2 capacitor		35	60					110
MOSFET		64	89					150
Relay		64	89					155
Charging resistor		57	82					-
Optical coupler		64	89					100
Absorb capacitor		52	77					105
EMC choke		52	77					105
Accessible parts								

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Clause	Requirement + Test	Result - Remark	Verdict

Enclosure (metal)	36	61					70
Enclosure (plastic)	29	54					80
Supplementary information: *indicates that the temperature values in column are the temperatures corrected to ambient of 50°C.							

5.2.3.8	**TABLE: Temperature rise test, thermocouple method** (E2X00-M0030T3)						**P**
	Supply voltage (V) ..... :	480					**—**
	Supply frequency (Hz) ... :	50					**—**
	Load (V, A) ..... :	480V, 7,6A					**—**
	Ambient (°C) ..... :	25	50*				**—**
Thermocouple Location		**Temperature measured (°C)**					**Limit (°C)**
Materials, components and internal parts							
IGBT module	72	97					150
Power transformer	56	81					105
DC link/Bus capacitor	38	63					105
X2 capacitor	46	71					105
Power board PCB	66	91					130
Bridge rectifier	62	87					150
Terminal block	30	55					90
Y2 capacitor	35	60					110
MOSFET	63	88					150
Relay	63	88					155
Charging resistor	55	80					-
Optical coupler	63	88					100
Absorb capacitor	52	77					105
EMC choke	51	76					105
Accessible parts							
Enclosure (metal)	35	60					70
Enclosure (plastic)	28	53					80
Supplementary information: *indicates that the temperature values in column are the temperatures corrected to ambient of 50°C.							

5.2.3.8	**TABLE: Temperature rise test, thermocouple method** (E2X00-1100T3)	**P**

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Clause	Requirement + Test	Result - Remark	Verdict

	Supply voltage (V) ..... :	480						—
	Supply frequency (Hz) ... :	50						—
	Load (V, A) ..... :	480V, 220A						—
	Ambient (ºC) ..... :	25	50*					—
Thermocouple Location		**Temperature measured (°C)**						**Limit (°C)**
Materials, components and internal parts								
IGBT module		52	77					150
Power transformer		44	69					105
DC link/Bus capacitor		40	65					105
X2 capacitor		29	54					105
Power board PCB		57	82					130
Bridge rectifier		47	72					150
Terminal block		31	56					90
Y2 capacitor		29	54					110
MOSFET		48	73					150
Relay		38	63					155
Charging resistor		34	59					-
Optical coupler		34	59					100
Absorb capacitor		40	65					105
EMC choke		47	72					105
Accessible parts								
Enclosure (metal)		35	60					70
Enclosure (plastic)		28	53					80
Supplementary information: *indicates that the temperature values in column are the temperatures corrected to ambient of 50ºC.								

5.2.3.8	**TABLE: Temperature rise test, thermocouple method** (E2X00-2000T3)							**P**
	Supply voltage (V) ..... :	480						—
	Supply frequency (Hz) ... :	50						—
	Load (V, A) ..... :	480V, 400A						—
	Ambient (ºC) ..... :	26	50*					—

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Clause	Requirement + Test	Result - Remark	Verdict

Thermocouple Location	Temperature measured (°C)						Limit (°C)
Materials, components and internal parts							
IGBT module	57	81					150
Power transformer	52	76					105
DC link/Bus capacitor	45	69					105
X2 capacitor	37	61					105
Power board PCB	56	80					130
Bridge rectifier	46	70					150
Terminal block	40	64					90
Y2 capacitor	34	58					110
MOSFET	55	79					150
Relay	79	103					155
Charging resistor	42	66					-
Optical coupler	40	66					100
Absorb capacitor	48	72					105
EMC choke	49	73					105
Accessible parts							
Enclosure (metal)	41	65					70
Enclosure (plastic)	30	54					80
Supplementary information: *indicates that the temperature values in column are the temperatures corrected to ambient of 50°C.							

5.2.3.8	TABLE: Temperature rise test, resistance method		N/A
	Test voltage (V) ..... :		—
	Supply frequency (Hz) .... :		—
	Load (V, A) ..... :		—

Winding	t1 (°C)	r1 (Ω)	t2 (°C)	r2 (Ω)	T (°C)	Limit Tmax (°C)	Insu-lation class
Supplementary information:							

5.2.3.9	TABLE: Protective bonding	P

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Clause	Requirement + Test	Result - Remark	Verdict

Points of application	Current (A)	Voltage (V)	Resistance (mΩ)	Test time (min)	Result
PE terminal and assible metal enclosure	25	24	7,5	1	P
After dry heat test:					
PE terminal and assible metal enclosure	25	24	7,5	1	P
After damp heat test:					
PE terminal and assible metal enclosure	25	24	7,5	1	P
After vibration test:					
PE terminal and assible metal enclosure	25	24	7,5	1	P
Supplementary information:					

5.2.5	TABLE: Material test		P
Object / Part No. / Material	**Manufacturer / trademark / type designation**	**Test procedure**	**Result**
Terminal block	ANYTEK TECHNOLOGY CORP	850ºC glowing wire test	P
Bridge certifier	YANGZHOU SILING ELECTRONICS CO LTD	850ºC glowing wire test	P
IGBT	STARPOWER SEMICONDUCTOR LTD	850ºC glowing wire test	P
Supplementary information:			

6	TABLE: Information and marking requirements					P
		Product	Package	Installation	User	Maintenance
6.2	Information for selection					
- Name or trademark of the manufacturer, supplier or importer .....:		P	P	P	P	P
- Catalogue number or equivalent .....:		P	P	P	P	P
- Input voltage rating .....:		P	-	P	P	P
- Input current rating .....:		P	-	P	-	P
- Input power rating .....:		P	-	P	-	P
- Input frequency .....:		P	-	P	-	P
- Input number of phases .....:		P	-	P	-	P
- Output voltage rating .....:		P	-	P	P	P
- Output current rating .....:		P	-	P	-	P
- Output power rating .....:		P	-	P	-	P

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Clause	Requirement + Test	Result - Remark	Verdict

- Output frequency .....:	P	-	P	-	P
- Output number of phases .....:	P	-	P	-	P
- Protective class .....:	See 6.3.6.6.				
- Type of electrical supply system .....:	See 6.3.3.				
- Prospective short-circuit current and protective device characteristics .....:	See 6.3.7.				
- Field supply requirements (if any) .....:	See 6.3.3.				
- Coolant type and design pressure .....:	-	-	N/A	-	N/A
- IP rating .....:	P	-	P	-	P
- Operating and storage environment .....:	See 6.3.3.				
- Reference to relevant standards .....:	-	-	P	-	-
- Date code or serial number .....:	P	-	-	-	-
- Reference to instructions .....:	-	-	P	P	P
6.3	Information for installation and comissioning				
6.3.2: Mechanical considerations	-	P	P	-	P
- Dimensional drawing (SI units) .....:	-	-	P	-	P
- Mass (SI units) .....:	-	P	P	-	P
- Mounting drawing (SI units) .....:	-	-	P	-	P
6.3.3: Environment (operation, transport, storage) .....:	-	-	P	-	P
- Temperature .....:	-	-	P	-	P
- Humidity .....:	-	-	P	-	P
- Altitude .....:	-	-	P	-	P
- Pollution .....:	-	-	P	-	P
- Ultra violet light .....:	-	-	P	-	P
- Type of electrical supply system .....:	-	-	P	-	-
- Field supply requirements (if any) .....:	-	-	P	-	-
- Other .....:	-	-	P	-	-
6.3.4: Handling and mounting .....:	-	P	P	-	P
- Packing and unpacking .....:	-	P	P	-	P
- Moving .....:	-	P	P	-	P
- Lifting .....:	-	P	P	-	P
- Strength and rigidity of mounting surface .....:	-	P	P	-	P
- Fastening .....:	-	P	P	-	P
- Provision of adequate access for operation, adjustment and maintenance .....:	-	P	P	-	P
- Warning regarding combustibility if mounting surface ePceeds 90 °C .....:	-	-	N/A	-	-
6.3.5: Motor and driven equipment			P	P	P

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Clause	Requirement + Test	Result - Remark	Verdict

6.3.5.1: Motor selection .....:	-	-	P	P	P
6.3.5.2: Motor integrated sensors .....:	-	-	P	P	P
6.3.5.3: Critical torsional speeds .....:	-	-	N/A	N/A	N/A
6.3.5.4: Transient torque analysis .....:	-	-	N/A	N/A	N/A
6.3.6: Connections	P	-	P	P	P
6.3.6.1: General .....:	-	-	P	-	P
6.3.6.2: Interconnection and wiring diagrams .:	-	-	P	-	P
6.3.6.3: Conductor (cable) selection .....:	-	-	P	-	P
6.3.6.4: Terminal capacity and identification ..:	P	-	P	-	P
6.3.6.5: Protection requirements .....:	-	-	P	P	P
- Protective class 0 .....:	N/A	-	N/A	N/A	N/A
- Interface details .....:	-	-	P	-	P
- Terminals with protective separation .....:	-	-	N/A	N/A	N/A
6.3.6.6: Earthing .....:	-	-	P	-	P
- High-voltage PDS: Earthing switch .....:	-	-	N/A	-	N/A
- Symbol IEC 60417-5019, PE or green-yellow .....:	P	-	-	-	-
- Symbol IEC 6417-5172 for Class II .....:	N/A	-	-	-	-
6.3.6.7: Protective earthing conductor current .....:	P	-	P	P	P
- Symbol ISO 7000-0434 and instruction .....:	P	-	P	-	P
- RCD compability .....:	-	-	N/A	-	N/A
- RCD/RCM caution notice and marking ISO 7000-0434 .....:	N/A	-	-	N/A	-
6.3.6.8: Special requirements .....:	-	-	P	-	P
6.3.7: Overcurrent or short-circuit protection ..:	-	-	P	-	P
- Electronic power output short-circuit protection circuitry conditions .....:	-	-	P	-	-
6.3.8: Motor overload protection and overtemperature protection .....:	-	-	P	-	P
6.3.8.1: CDM/BDM not incorporating internal electronic motor overload and overtemperature protection .....:	-	-	N/A	-	-
6.3.8.2: CDM/BDM incorporating internal electronic motor overload and overtemperature protection .....:	-	-	P	-	P
6.3.9: Commissioning .....:	-	-	N/A	-	-
6.4 Information for use					
6.4.1: General .....:	-	-	P	P	P
6.4.2: Adjustment .....:	P	-	P	P	P

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Clause	Requirement + Test	Result - Remark	Verdict

6.4.3: Labels, signs, and signals .....:	P	-	P	P	P
6.4.3.1: General .....:	P	-	P	P	P
6.4.3.2: Isolators .....:	P	-	-	-	-
6.4.3.3: Visual and audible signals .....:	N/A	-	-	N/A	-
6.4.3.4: Hot surfaces, symbol IEC 60417-5041 .....:	N/A	-	-	N/A	-
6.4.3.5: Equipment marking .....:	P	-	P	P	P
- Control devices .....:	P	-	P	P	P
- Indicating devices .....:	P	-	P	P	P
- Replaceable fuses .....:	P	-	P	P	P
- Movable connectors .....:	P	-	P	P	P
- Test points .....:	P	-	P	P	P
- Polarized devices .....:	P	-	P	P	P
- Pre-set controls .....:	P	-	P	P	P
6.5 Information for maintenance					
6.5.1: General .....:	-	-	-	P	P
- Maintenance procedures .....:	-	-	-	-	P
- Maintenance schedules .....:	-	-	-	P	P
- Safety precautions .....:	-	-	-	-	P
- Location of live parts accessible during maintenance .....:	-	-	-	-	P
- Adjustment procedures .....:	-	-	P	P	P
- Repair and replacement procedures .....:	-	-	-	-	P
- Other relevant information (e.g. special tools list) .....:	-	-	-	P	P
6.5.2: Capacitor discharge .....:	P	-	P	-	P
6.5.3: Auto restart/bypass connection .....:	-	-	N/A	N/A	N/A
6.5.4: Potential Transformer (PT) / Current Transformer (CT) connection .....:	N/A	-	N/A	-	N/A
6.5.5: Other hazards .....:	P	-	-	-	P
Supplementary information:					