TEST REPORT

Applicant	:	Shenzhen Cumark Sci. & Tech. Co., Ltd.
Address	:	3F, Cumark Building, Dongzhou Community, Guangming Street, Guangming District, Shenzhen
Manufacturer	:	Shenzhen Cumark Sci. & Tech. Co., Ltd.
Address	:	3F, Cumark Building, Dongzhou Community, Guangming Street, Guangming District, Shenzhen
Product Name	:	3~380V Low Voltage AC Single Drive
Trade Mark	:	cumark
Model No.	:	ES350-F0-4K0G-3B (See attachment for additional models)
Ratings	:	380VAC 4kW
Standard	:	EN 61800-5-1:2007+A1:2017 Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy
Date of Receiver	:	December 16, 2021
Date of Test	:	December 17, 2021 to January 04, 2022
Date of Issue	:	January 05, 2022
Test Report Form No	:	NTCS-EN61800-5-1-A2-E
Test Result	:	Pass *

This Test Report is Issued Under the Authority of :

Compiled by

Erik Cheng/ Engineer

Approved by

Vic Wang / Manager

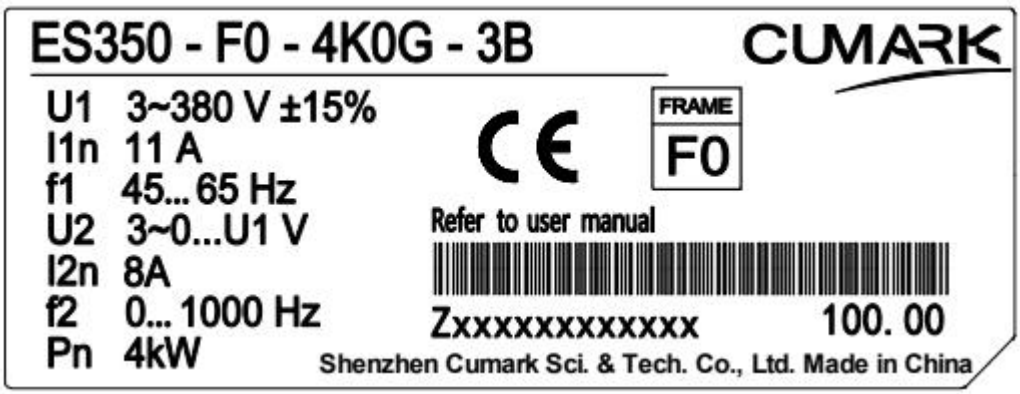
*Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot bereproduced, except in full, without prior written permission of Shenzhen Nore Testing Center Co., Ltd. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Revision History of This Test Report

Report Number	Description	Issued Date
SZNTC21121031SV00	Initial Issue	2022-01-05

Copy of marking plate:



Note:

- The above markings are the minimum requirements required by the safety standard. For the final production samples, the additional markings which do not give rise to misunderstanding may be added.
- The CE marking and WEEE symbol should be at least 5.0mm and 7.0mm respectively in height.
-The information above is stated in the user's manual.
- The manufacturer and importer information should be marked in manual or attachments when this product import to European Marketing.

Summary of testing:

The submitted samples were found to comply with the above standard.

• The test is carried out on the wall hanging test platform

• Maximum ambient temperature: +40°C

• Tested for moderate conditions

Test item particulars:	
Environmental conditions.....…….:	-10℃~+40℃, 95.%RH, no condensation
Operating conditions.....……...:	Continuous operation
Connection to supply mains..... ……...:	Permanent connection
Degree of mobility..... ……:	Fixed equipment
Mass of the equipment.....……..:	See user manual
Special protection to IEC 60529.....…….....:	IP20
Cooling…….:	Fan forced cooling
Accessories and detachable parts included in the evaluation……...:	N/A
Possible test case verdicts:	
- test case does not apply to the test object……..:	N(Not Applicable)
- test object does meet the requirement..... ……...:	P(ass)
- test object does not meet the requirement.……....:	F(ail)

General remarks

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

The test results presented in this report relate only to the item tested.

"(see remark #)" refers to a remark appended to the report.

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

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

Comments:

Factory: Shenzhen Cumark Sci. & Tech. Co., Ltd.

Address: 3F, Cumark Building, Dongzhou Community, Guangming Street, Guangming District, Shenzhen

General Descriptions of Product:

All tests are carried out on ES350-F0-4K0G-3B and the whole series has the same circuit principle Indoor use; Fixed installation

Altitude <1000m,

Free from dust, corrosive gas, and direct sunlight.

Attachment

Series models are shown in the following table

No.	Model	Input voltage	Output current	Output power
1	ES350-F0-0K7G/1K5P-3B	AC 380-500V 45-65Hz，3Φ	2.5A	0.75kW
	ES350L-F0-0K7G/1K5P-3B			
	ES350T-F0-0K7G/1K5P-3B			
	ES350T-F0-0K7-3B			
	ES310-F0-0K7G/1K5P-3B			
2	ES350-F0-1K5G/2K2P-3B		4.0A	1.5kW
	ES350L-F0-1K5G/2K2P-3B			
	ES350T-F0-1K5G/2K2P-3B			
	ES350T-F0-1K5-3B			
	ES310-F0-1K5G/2K2P-3B			
3	ES350-F0-2K2G/4K0P-3B		5.0A	2.2kW
	ES350L-F0-2K2G/4K0P-3B			
	ES350T-F0-2K2G/4K0P-3B			
	ES350T-F0-2K2-3B			
	ES310-F0-2K2G/4K0P-3B			
4	ES350-F0-4K0G-3B		8.0A	4.0kW
	ES350L-F0-4K0G-3B			
	ES350T-F0-4K0G-3B			
	ES350T-F0-4K0-3B			
	ES310-F0-4K0G-3B			

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Clause	Requirement + Test	Result - Remark	Verdict

4	**PROTECTION AGAINST ELECTRIC SHOCK, THERMAL, AND ENERGY HAZARDS**		**P**
4.1	General	Considered	P
4.2	Fault conditions	Considered	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)	According to Table 3 correlates the limits of the working voltage within the circuit.	P
4.3.1.2	Limits of DVC		P
	DVC A		P
	DVC B		N
	DVC C	≥200V peak and 200Vr.m.s considered.	P
	DVC D		N
4.3.1.3	Requirements for protection		P
	DVC of considered circuit	There is protective isolation between DVC C circuit and DVC A circuit	P
	Protection required against direct contact	Yes	P
	Insulation to earthed parts	Basic insulation	P
	Insulation to accessible conductive parts that are not earthed	Protective separation	P
	Insulation to adjacent circuit of DVC:		P
4.3.1.4	Circuit evaluation	AC and DC circuits	P
4.3.1.4.1	General		P
4.3.1.4.2	AC working voltage		P
4.3.1.4.3	DC working voltage		P
4.3.1.4.4	Pulsating working voltage		N
4.3.2	Protective separation	Be fully and effectively maintained under all conditions of intended use.	P
4.3.3	Protection against direct contact		P
4.3.3.1	General	See 4.3.3.2 and 4.3.3.3	P

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Clause	Requirement + Test	Result - Remark	Verdict
4.3.3.2	Protection by means of insulation of live parts	Impulse voltage, temporary overvoltage or working voltage was considered.	P
	Case a): Accessible parts are conductive and are connected to earth by protective bonding.		P
	Cases b): Accessible parts are non-conductive		P
	Cases c): Accessible parts are conductive but not connected to earth by protective bonding		P
4.3.3.3	Protection by means of enclosures and barriers	Metal enclosure and plastic enclosure provided. IP20.	P
	Live parts of DVC B, C or D		P
	Open type sub-assemblies		P
	Products containing circuits of DVC A, B or C, intended for installation in closed electrical operating areas		P
	Products containing circuits of DVC D, intended for installation within a closed electrical operating area		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		P
4.3.4.3	Protection by means of protective impedance		P
	Stored charge < 50μC		N
	Current <3,5 mA a.c. or 10 mA d.c.		P
4.3.4.4	Protection by means of limited voltage		N
4.3.5	Protection against indirect contact		P
4.3.5.1	General	Protective class I	P
	Class 0		N
	Class I		P
	Class II		N
	Class III		N
4.3.5.2	Insulation between live parts and accessible conductive parts		P
4.3.5.3	Protective bonding circuit		P
4.3.5.3.1	General		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Except a): when accessible conductive parts are protected by one of the measures in 4.3.4.2 to 4.3.4.4;		N
	Except b): when accessible conductive parts are separated from live parts using double or reinforced insulation.		N
	Incorporated switch device in protective bonding circuit.		N
4.3.5.3.2	Rating of protective bonding		N
	Cross-section (mm^2)		N
4.3.5.3.3	Protective bonding impedance		N
	During normal operation, no voltage exceeding continuously 5 V a.c. or 12 V d.c.		N
	Under fault conditions, no voltage exceeding AC-2 or DC-2 in Figure 7		N
4.3.5.4	Protective earthing conductor	Be connected at all times when power is supplied.	P
	Cross-section (mm^2)	Not less than the line conductor.	P
4.3.5.5	Means of connection for the protective earthing conductor		P
4.3.5.5.1	General		P
	Separate means of connection shall be provided for each protective earthing conductor.		P
	Protective shields of high voltage cables		N
4.3.5.5.2	Touch current in case of failure of protective earthing conductor		P
	a) A fixed connection		N
	b) connection with an industrial connector according to IEC 60309		P
4.3.5.6	Special features in equipment for protection class II	Class I equipment	N
4.3.6	Insulation		P
4.3.6.1	General		P
4.3.6.1.1	Influencing factors		P
	Pollution degree	Pollution degree II	P
	Overvoltage category;	Overvoltage category III	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Supply earthing system		P
	Insulation voltage	2500V	P
	Location of insulation		P
	Type of insulation		P
4.3.6.1.2	Pollution degree		P
	Pollution degree 1		N
	Pollution degree 2		P
	Pollution degree 3		N
	Pollution degree 4		N
4.3.6.1.3	Overvoltage category		P
	Category IV		N
	Category III		P
	Category II		N
	Category I		N
4.3.6.1.4	Supply earthing systems		P
	TN system		P
	TT system		P
	IT system		N
4.3.6.1.5	Insulation voltages		P
	Impulse voltage (V)	4000V	P
	Temporary overvoltage (crest value/r.m.s.) (V)		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		N
	Insulation between the surroundings and circuits which are connected directly to the supply mains		N
4.3.6.2.3	Circuits not connected directly to the supply mains	Evaluated to withstand impulses of overvoltage category III	P
	Insulation between the surroundings and circuits supplied by a transformer providing galvanic isolation from the supply mains		P
4.3.6.2.4	Insulation between circuits		P
4.3.6.3	Functional insulation		P

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Clause	Requirement + Test	Result - Remark	Verdict
4.3.6.4	Clearance distances		P
4.3.6.4.1	Determination		P
	Low-voltage PDS		P
	High-voltage PDS		N
4.3.6.4.2	Electric field homogeneity		N
4.3.6.4.3	Clearance to conductive enclosures		N
4.3.6.5	Creepage distance		P
4.3.6.5.1	General		P
4.3.6.5.2	Materials		P
	Insulating material group I CTI ≥ 600		N
	Insulating material group II 600 > CTI ≥ 400		N
	Insulating material group IIIa 400 > CTI ≥ 175		N
	Insulating material group IIIb 175 > CTI ≥ 100	Considered	P
4.3.6.6	Coating		N
4.3.6.7	PWB spacings for functional insulation	Rating of V-0, CTI >100.	P
4.3.6.8	Solid insulation		P
4.3.6.8.1	General	Withstand mechanical, electrical, thermal and climatic stresses expected in normal use	P
4.3.6.8.2	Requirements for electrical withstand capability		P
4.3.6.8.2.1	Basic or supplementary Insulation		P
4.3.6.8.2.2	Double and reinforced Insulation		N
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		N
4.3.6.8.3.2	Material thickness not less than 0,2 mm		N
4.3.6.8.3.3	Material thickness less than 0,2 mm		N
4.3.6.8.3.4	Compliance is checked by the tests described in 5.2.3.1 to 5.2.3.3.		P
4.3.6.8.4	Printed wiring boards (PWBs)		P
4.3.6.8.4.1	General		P
	Conductor layers in double-sided single-layer PWBs, multi-layer PWBs and metal core PWBs		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Adjacent tracks on the same layer for the inner layers of multi-layer PWBs		P
4.3.6.8.4.2	Use of coating materials		N
	Type 1 protection		N
	Type 2 protection		N
4.3.6.8.5	Wound components	Meet the requirements of 4.3.6.8.1 and 4.3.6.8.2	P
4.3.6.8.6	Potting materials		N
4.3.6.9	Insulation requirements above 30 kHz		P
4.3.7	Enclosure		P
4.3.7.1	General		P
4.3.7.2	Cast metal		N
4.3.7.3	Sheet metal		N
4.3.8	Wiring and connections		P
4.3.8.1	General	The insulation, conductors and routing of all wires of the equipment were suitable for the electrical, mechanical, thermal and environmental conditions of use	P
4.3.8.2	Routing		P
	Hole through which insulated wires pass in a sheet metal wall within the enclosure of the equipment.		N
	Routing for internal wiring	Routed away from sharp edges and similar parts, which abrade the wire insulation	P
	Clamps and guides, either metallic or non-metallic, used for routing stationary internal wiring		N
4.3.8.3	Color coding		P
4.3.8.4	Splices and connections		P
4.3.8.5	Accessible connections		P
4.3.8.6	Interconnections between parts of the PDS		N
	Cable assemblies and flexible cords		N
	Misalignment of male and female connectors		N
	External interconnecting cables terminate in a plug		N

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Clause	Requirement + Test	Result - Remark	Verdict
4.3.8.7	Supply connections		P
4.3.8.8	Terminals		P
4.3.8.8.1	Construction requirements		P
4.3.8.8.2	Connecting capacity	Accommodate the conductors specified in the installation and maintenance manuals.	P
4.3.8.8.3	Connection	Readily accessible during installation.	P
4.3.8.8.4	Wire bending space for wires 10 mm² and greater		N
	low-voltage PDS		N
	high-voltage PDS		N
4.3.9	Output short-circuit requirements		P
	Performed according to 5.2.3.6 on all power outputs		P
4.3.10	Residual current-operated protective (RCD) or monitoring (RCM) device compatibility		N
	a) A plug-connected single-phase PDS with rated input current less than or equal to 16 A		N
	b) For plug-connected PDS other than a) with an industrial connector according to IEC 60309, and PDS having a fixed connection		N
4.3.11	Capacitor discharge		P
4.3.12	Access conditions for high-voltage PDS		N
	a) Operating conditions		N
	b) Access for maintenance – earthing instructions		N
4.4	Protection against thermal hazards		P
4.4.1	Minimizing the risk of ignition	No maximum working temperature under normal load conditions was less than that necessary to cause ignition of the surrounding materials with which they are likely to come into contact.	P
4.4.2	Insulating materials		P

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Clause	Requirement + Test	Result - Remark	Verdict
4.4.2.1	General	Suitable for the maximum temperature and mechanical strength	P
4.4.2.2	Material requirements		P
	CTI of 100 or greater		P
	Glow-wire test described in 5.2.5.2 at a test temperature of 850 °C		P
	Incorporates switching contacts		N
4.4.3	Flammability of enclosure materials	See 5.2.5.4	P
	Metals, ceramic materials, and glass		P
	Flammability class 5VA		N
4.4.4	Temperature limits		P
4.4.4.1	Internal parts	No excessive temperature measured. (see appended table)	P
4.4.4.2	External parts of CDM	No excessive temperature measured. (see appended table)	P
4.4.5	Specific requirements for liquid cooled PDS	Not for liquid cooling.	N
4.4.5.1	Coolant		N
4.4.5.2	Design requirements		N
4.4.5.2.1	Corrosion resistance		N
4.4.5.2.2	Tubing, joints and seals		N
4.4.5.2.3	Provision for condensation		N
4.4.5.2.4	Leakage of coolant		N
4.4.5.2.5	Loss of coolant		N
4.4.5.2.6	Conductivity of coolant		N
4.4.5.2.7	Insulation requirements for coolant hoses		N
4.4.6	Motor overload and overtemperature protection		N
4.4.6.1	Means of protection		N
4.4.6.2	CDM/BDM with electronic motor overload protection		N
4.4.6.3	CDM/BDM with electronic motor overload protection with thermal memory retention		N

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Clause	Requirement + Test	Result - Remark	Verdict
4.4.6.4	CDM/BDM with electronic motor overload protection which is speed sensitive		N
4.4.6.5	CDM/BDM providing monitoring and automatic reduction of motor current by means of thermal sensors		N
4.5	Protection against energy hazards		P
4.5.1	Electrical energy hazards		P
4.5.2	Mechanical energy hazards		P
4.5.2.1	General		P
4.5.2.2	Critical torsional speed		N
4.5.2.3	Transient torque analysis		N
4.5.3	Acoustic noise emission		N
4.6	Protection against environmental stresses		N
5	**TEST REQUIREMENTS**		**P**
5.1	General		P
5.1.1	Test objectives and classification		P
	Type tests;		P
	Routine tests;	Be carried out by the manufacturer.	N
	Sample tests;		N
5.1.2	Selection of test samples	Considered	P
5.1.3	Sequence of tests	Considered	P
5.1.4	Earthing conditions	TN power system considered	P
	Neutral to earth;		N
	Line to earth;		P
	Neutral to earth through high impedance;		N
	Isolated (not earthed)		N
5.1.5	Compliance	See below. Verified by suitable examination, visual inspection, and/or measurement	P
5.1.6	Test overview	Type tests followed the specification of table 17.	P
5.2	Test specifications		P

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Clause	Requirement + Test	Result - Remark	Verdict
5.2.1	Visual inspections (type test, sample test and routine test)	Inspect the labeling, warnings of the PDS delivered.	P
5.2.2	Mechanical tests		P
5.2.2.1	Clearance and creepage distance (type test)	Comply with table 9 and table 10 by measurement. (see appended table)	P
5.2.2.2	PWB short-circuit test (type test)	Short-circuited one at a time and be maintained until no further damage occurs. No emission of flame, no deformation of enclosure, no hazard.	P
5.2.2.3	Non-accessibility test (type test)	No accessible to live parts protected by means of enclosure and barriers.	P
5.2.2.4	Enclosure integrity test (type test)	IP20	P
5.2.2.5	Deformation tests		P
5.2.2.5.1	General	No crack of enclosure, no live parts become accessible.	P
5.2.2.5.2	Deflection test (type test)	Steel rod (12.7mmx12.7mm), steady force of 250N, applied for 5s.	P
5.2.2.5.3	Impact test (type test)	Steel sphere (weight: 500g) fall (height: 1300mm) test on surface of enclosure. No cracks, no accessible live parts.	P
5.2.3	Electrical tests		P
5.2.3.1	Impulse voltage test (type test and sample test)		P
	For low-voltage PDS		P
	For high-voltage PDS		N
5.2.3.2	A.C. or d.c. voltage test (type test and routine test)		P
5.2.3.2.1	Purpose of test		P
5.2.3.2.2	Value and type of test voltage		P
	A.C. or d.c. test voltage for circuits connected directly to low voltage mains		N
	A.C. or d.c. test voltage for circuits connected directly to high voltage mains		N

EN 61800-5-1			
Clause	Requirement + Test	Result - Remark	Verdict
	A.C. or d.c. test voltage for circuits not connected directly to the mains		P
5.2.3.2.3	Performing the voltage test	(see appended table)	P
a)	Test (1) between accessible conductive part connected to earth) and each circuit sequentially except DVC A circuits).		P
	Test (2) between accessible surface (non conductive or conductive but not connected to earth) and each circuit sequentially (except DVC A circuits).		P
b)	Test between each considered circuit sequentially and the other adjacent circuits connected together.		P
c)	Test between DVC A circuit and each adjacent circuit sequentially.		P
5.2.3.2.4	Duration of the a.c. or d.c. voltage test	5s for type test.	P
5.2.3.2.5	Verification of the a.c. or d.c. voltage test	No electrical breakdown	P
5.2.3.3	Partial discharge Test (type test and sample test)	Test according to IEC 60664-1.	N
5.2.3.4	Protective impedance (type test and routine test)	(see appended table)	N
5.2.3.5	Touch current measurement (type test)	(see appended table)	P
	For a PDS to be connected to an earthed neutral system		P
	For a PDS to be connected to an isolated system or impedance system		P
	For a PDS to be connected to a corner earthed system		N
	For a PDS with a particular earthing system		N
	If a PDS is intended to be connected to more than one system network		N
5.2.3.6	Short-circuit test and Breakdown of components test (type tests)		P
5.2.3.6.1	General		P
	a) tests defined in 5.2.3.6.3 and 5.2.3.6.4	(see appended table)	P
	b) calculation or simulation based on tests as defined in 5.2.3.6.3 and 5.2.3.6.4		P
	c) for high-voltage PDS		N
	d) for custom PDS		P
5.2.3.6.2	Test configuration		P

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Clause	Requirement + Test	Result - Remark	Verdict
5.2.3.6.2.1	Supply voltage and current	100%-105% of the rated input voltage and or rated input frequency.	P
5.2.3.6.3	Short-circuit test		P
5.2.3.6.3.1	Load conditions	Creates the more severe condition.	P
5.2.3.6.3.2	Location of short-circuit		P
5.2.3.6.4	Breakdown of components test		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	No emission of flame, no deformation of enclosure, no hazard.	P
5.2.3.7	Capacitor discharge (type test)		P
5.2.3.8	Temperature rise test (type test)	(see appended table)	P
5.2.3.9	Protective bonding (type test and routine test)		P
	Test current of 10A, impedance (Ω).	<0.02Ω	P
5.2.4	Abnormal operation tests	(see appended table)	P
5.2.4.1	General		P
5.2.4.2	Test duration	Performed until terminated by a protective devices or mechanism, a component failure occurs, or the temperature stabilizes.	P
5.2.4.3	Pass criteria	No emission of flame, no deformation of enclosure, no hazard.	P
5.2.4.4	Loss of phase (type test)		P
5.2.4.5	Cooling failure tests (type tests)		P
5.2.4.5.1	General		P
5.2.4.5.2	Inoperative blower motor		P
5.2.4.5.3	Clogged filter		P
5.2.4.5.4	Loss of coolant		N
5.2.5	Material tests		P
5.2.5.1	High current arcing ignition test (type test)		N

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Clause	Requirement + Test	Result - Remark	Verdict
5.2.5.2	Glow-wire test (type test)	Test according to IEC 60695-2-10 and IEC 60695-2-13. (see appended table)	P
5.2.5.3	Hot wire ignition test (type test - alternative to Glow-wire test)		N
5.2.5.4	Flammability test (type test)	Not burn.	N
5.2.6	Environmental tests (type tests)		P
5.2.6.1	General	Tested on the complete equipment	P
5.2.6.2	Acceptance criteria		P
	- no degradation of any safety-relevant component of the PDSICDMIBDM		_
	- no potentially hazardous behaviour of the PDSICDMIBDM during the test		_
	- no sign of component overheating		_
	- no live part shall become accessible		_
	- no cracks in the enclosure and no damaged or loose insulators		_
	- pass routine a.c. or d.c. voltage test 5.2.3.2		_
	- pass Protective bonding test 5.2.3.9		_
	- no potentially hazardous behaviour when the PDSICDMIBDM is operated following the test		_
5.2.6.3	Climatic tests		P
5.2.6.3.1	Dry heat test (steady state)	Test according to IEC 60068-2-2. Operating at rated conditions. 40°C, 16 hours.	P
5.2.6.3.2	Damp heat test (steady state)	Test according to IEC60068-2-78. Power supply unconnected. 40°C, 93%RH, 96 hours.	P
5.2.6.4	Vibration test (type test)	Test according to IEC60068-2-6. Power supply unconnected. Sinusoidal motion, Vibration amplitude/acceleration:10 Hz ≤ f ≤ 57 Hz (0,075 mm amplitude); 57 Hz < f ≤ 150 Hz(1g). Vibration duration: 10 sweep cycles per axis on each of three mutually perpendicular axes.	P

EN 61800-5-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.2.7	Hydrostatic pressure (type test and routine test)		N
5.2.8	Electronic motor overload protection test (type test)		N
5.2.8.1	General requirements		N
5.2.8.2	Test set-up		N
5.2.8.3	Pass criteria		N
5.2.8.4	CDM/BDM electronic motor overload protection test (type test)		N
5.2.8.5	CDM/BDM electronic motor thermal memory retention shutdown test (type test)		N
5.2.8.6	CDM/BDM electronic motor thermal memory retention loss of power test (type test)		N
5.2.8.7	CDM/BDM electronic motor thermal speed sensitivity test (type test)		N
5.2.9	Circuit functionality evaluation (routine and/or sample test)		N
6	**Information and marking requirements**		**P**
6.1	General		P
6.2	Information for selection	See the copy of marking plate or instruction manual for detail	P
	The name or trademark of the manufacturer, supplier or importer		P
	Catalogue number or equivalent		P
	Input and output voltage range, current, and power rating information, including		P
	– number of phases		P
	– frequency range		P
	Protective class	Class I	P
	The type of electrical supply system (e.g. TN, IT, etc.) to which the PDS/CDM/BDM may be connected;		P
	Prospective short-circuit current rating(s) and protective device characteristics		P
	Field supply requirements (if any)		P
	Coolant type and design pressure for liquid cooled product		P
	IP rating		P
	Operating and storage environment		P

EN 61800-5-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Reference(s) to relevant international standard(s) for manufacture, test, or use		P
	Date code, or serial number from which the date of manufacture can be determined		P
	Reference to instructions for installation, use and maintenance		P
6.3	Information for installing and commissioning	See instruction manual for detail.	P
6.3.1	General	Unambiguous information.	P
6.3.2	Mechanical considerations	In diagrammatic form.	P
	Dimensional drawing, including mass information;		P
	Mounting drawing.		P
6.3.3	Environment		P
	Climatic (temperature, humidity, altitude, pollution);		P
	Mechanical;		P
	Electrical.		P
6.3.4	Handling and mounting		P
	Packing and unpacking;		P
	Moving;		P
	Lifting;		P
	Strength and rigidity of mounting surface;		P
	Fastening;		P
	Provision of adequate access for operation, adjustment and maintenance.		P
	Warning for mounting surface with temperature exceed 90℃		N
6.3.5	Motor and driven equipment		N
6.3.5.1	Motor selection		N
6.3.5.2	Motor integrated sensors		N
6.3.5.3	Critical torsional speeds		N
6.3.5.4	Transient torque analysis		N
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

EN 61800-5-1			
Clause	Requirement + Test	Result - Remark	Verdict
6.3.6.4	Terminal capacity and identification	Indicated the range of acceptable conductor sizes and types (solid or stranded) for all terminals, and also the maximum number of conductors which can simultaneously be connected.	P
6.3.6.5	Protection requirements		P
6.3.6.6	Earthing		P
6.3.6.7	Protective earthing conductor current	Considered.	P
6.3.6.8	Special requirements		P
6.3.7	Overcurrent or short-circuit protection		P
6.3.8	Motor overload protection		N
6.3.9	Commissioning		P
6.4	Information for use		P
6.4.1	General		P
6.4.2	Adjustment		P
6.4.3	Labels, signs and signals		P
6.4.3.1	General	Visible and was located beside the mentioned parts.	P
6.4.3.2	Isolators	 “DO NOT OPEN UNDER LOAD”	P
6.4.3.3	Visual and audible signals	Be clearly perceived and recognized.	P
6.4.3.4	Hot surface		N
6.4.3.5	Equipment marking		P
6.5	Information for maintenance	See instruction manual for detail.	P
6.5.1	General		P
6.5.2	Capacitor discharge		P
6.5.3	Auto restart/bypass connection		N
6.5.4	PT/CT connections		N
6.5.5	Other hazards		P
ANNEX A	**EXAMPLES OF PROTECTION IN CASE OF DIRECT CONTACT**		**P**

EN 61800-5-1			
Clause	Requirement + Test	Result - Remark	Verdict
A.1	General		P
A.2	Protection by means of DVC A		N
A.3	Protection by means of protective impedance		N
A.4	Protection by using limited voltages		N
ANNEX B	**EXAMPLES OF OVERVOLTAGE CATEGORY REDUCTION**		**P**
B.1	General		N
B.2	Insulation to the surroundings (see 4.3.6.2)		N
B.2.1	Circuits connected directly to the supply mains (see 4.3.6.2.2)		N
B.2.2	Circuits not connected directly to the supply mains (see 4.3.6.2.3)		P
B.2.3	Insulation between circuits (see 4.3.6.2.4)		P
B.3	Functional insulation (see 4.3.6.3)		N
B.4	Further examples		N
ANNEX C	**MEASUREMENT OF CLEARANCE AND CREEPAGE DISTANCES**		**P**
C.1	Measurement		P
C.2	Relationship of measurement to pollution degree		P
C.3	Examples		P
ANNEX D	**ALTITUDE CORRECTION FOR CLEARANCES**		**N**
	Table D.1– Correction factor for clearances at altitudes between 2 000 m and 20 000 m		N
	Table D.2 – Test voltages for verifying clearances at different altitudes		N
ANNEX E	**CLEARANCE AND CREEPAGE DISTANCE DETERMINATION FOR FREQUENCIES GREATER THAN 30 KHZ**		**N**
E.1	Clearance		N
E.2	Creepage distance		N
ANNEX F	**CROSS-SECTIONS OF ROUND CONDUCTORS**		**N**
	Table F.1 – Standard cross-sections of round conductors		N
ANNEX G	**GUIDELINES FOR RCD COMPATIBILITY**		**N**
G.1	Selection of RCD type		N
G.2	Fault current waveforms		N

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

ANNEX H	**SYMBOLS REFERRED TO IN THIS PART OF IEC 61800**		**P**
	Table H.1 – Symbols used		P

ANNEX ZA	**NORMATIVE REFERENCES TO INTERNATIONAL PUBLICATIONS WITH THEIR CORRESPONDING EUROPEAN PUBLICATIONS**		**---**
	The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.		---
	IEC 60034 Series	EN 60034 Series	N
	IEC 60050-111	---	N
	IEC 60050-151	---	N
	IEC 60050-161	---	N
	IEC 60050-191	---	N
	IEC 60050-441	---	N
	IEC 60050-442	---	N
	IEC 60050-551	---	N
	IEC 60050-601	---	N
	IEC 60060-1:1989 + corr. March: 1990	HD 588.1 S1: 1991	N
	IEC 60068-2-2:1974	EN 60068-2-2: 1993	N
	IEC 60068-2-6	EN 60068-2-6: 1995	N
	IEC 60068-2-78	EN 60068-2-78: 2001	N
	IEC 60112: 2003	EN 60112: 2003	N
	IEC 60204-11: 2000	EN 60204-11: 2000	N
	IEC 60309 (mod) Series	EN 60309 Series	N
	IEC 60364-1: 2001	---	N
	IEC 60364-5-54(mod): 2002	HD 60364-5-54: 2007	N
	IEC 60417 Series		N
	IEC 60529: 1989	EN 60529:1991 + corr. May: 1993	N
	IEC 60617 Series		N
	IEC 60664-1: 1992+A1:2000+A2:2002	EN 60664-1: 2003	N
	IEC 60664-3: 2003	EN 60664-3: 2003	N
	IEC 60664-4: 2005	EN 60664-4:2006+ corr. October: 2006	N
	IEC 60695-2-10: 2000	EN 60695-2-10: 2001	N
	IEC 60695-2-13: 2000	EN 60695-2-13: 2001	N

EN 61800-5-1			
Clause	Requirement + Test	Result - Remark	Verdict
	IEC 60695-11-10: 1999	EN 60695-11-10: 1999	N
	IEC 60695-11-20: 1999	EN 60695-11-20: 1999	N
	IEC/TR 60755: 1983	---	N
	IEC 60947-7-1: 2002	EN 60947-7-1: 2002	N
	IEC 60947-7-2: 2002	EN 60947-7-2: 2002	N
	IEC 60990: 1999	EN 60990 1999	N
	IEC 61230 (mod)	EN 61230:1995+A11:1999	N
	IEC 61800-1	EN 61800-1: 1998	N
	IEC 61800-2	EN 61800-2: 1998	N
	IEC 61800-4	EN 61800-4: 2003	N
	IEC 62020	EN 62271-102: 2002+ corr. March:2005	N
	IEC 62271-102		N
	ISO 3864 Series		N
	ISO 7000 2004		N

Annex 1	**TABLE: List of critical components**				**P**
Object/part No.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity[1]
PCB	Interchangeable	Interchangeable	V-0 or better, minimum 130°C	UL 94	UL
Power terminal(J1 for ES350-4K0-POW PCB)	ShenZhen Connection Electronic Co., Ltd	ERTB5-03 series	300V, 20A	UL 94	UL E304128
Capacitor(CX1, CX2,CX3for ES350-4K0-POW PCB）	TDK Electronics Co., Ltd	CS11ZU2GA472MYNKA	100nF 1000Vdc	UL 30684-14	US-24251-UL
Capacitor(CY2 for ES350-4K0-POW PCB)	TDK Electronics Co., Ltd	CD12ZU2GA472MYNKA	400VAC 4700 pF	UL 30684-14	US-24251-UL
Varistor(VR1、VR2、VR3for ES350-4K0-POW PCB)	Ceramate Technical Co., LTD	CNR-10D471K	275VAC 5.1mm 775V 5%	UL 1449	UL E316325
R25, R26(for ES350-4K0-POW PCB)	Shimeng Electronics (Huizhou) Co Ltd	Interchangeable	200R 5WS 5% -55~+175°C	UL 1412	UL E339430
Relay(RE1 for ES350-4K0-POW PCB)	ShangHai Churod Electronic Co., Ltd	CHI03-S-124DA2	24VDC 17A	UL 60947-1	UL E341422
IGBT(Q8, Q9, Q10, Q11,Q12, Q13, Q14 for ES350-4K0-POW PCB)	Jiaxing star semiconductor co., LTD	GD300HFY120C2S	300A/1200V	EN 61800-5-1:2007+A1:2017	Tested in appliance
Electrolytic capacitor(E1、E2 for ES350-4K0-POW PCB)	NANTONG JIANGHAI CAPACITOR FACTORY	Interchangeable	400V/820uF ±20% 85℃ 2000H 30*55mm	EN 61800-5-1:2007+A1:2017	Tested in appliance
Transformer(T1 for ES350-4K0-POW PCB)	Shenzhen comsun Electronics Co. , Ltd.	ES350-0R4-POW-T1	130°C	EN 61800-5-1:2007+A1:2017	Tested in appliance
Optical coupler(U1, U9 for ES350-4K0-POW PCB)	CT Microelectronics Far East Ltd	CT817 @	series35V 200%~400% 60mA 5000Vrms -55℃~+110℃	UL 1577	UL E364000

Optical coupler(U4, U5, U6, U7, U8, U10 for ES350-4K0-POW PCB)	CT Microelectronics Far East Ltd	Interchangeable	14V~32V 5A 5700VRMS -40°C ~125°C	UL 1577	UL E364000
Fan	Ningbo ShengJiu Technology Co Ltd	SA240515BUCNR004	12VDC, 0.55A	UL 507	UL E471112
Terminal(J2, J4 for ES350-4R0-CON PCB)	MITSUI CHEMICALS INC	Interchangeable	500V	UL 94	UL E52579
Terminal(J3 for ES350-4R0-CON PCB)	MITSUI CHEMICALS INC	Interchangeable	500V	UL 94	UL E52579
Terminal(J1 for ES350-4R0-CON PCB)	MITSUI CHEMICALS INC	Interchangeable	500V	UL 94	UL E52579
Terminal (J4 for ES350-4R0-CON PCB)	DONGGUAN TERMINAL ELECTRONIC TECHNOLOGY CO LTD	Interchangeable	500V	UL 94	UL E346560
Terminal (J5 for ES350-4R0-CON PCB)	DONGGUAN TERMINAL ELECTRONIC TECHNOLOGY CO LTD	Interchangeable	500V	UL 94	UL
Supplementary information:					

5.2.2.1	TABLE: Clearance and creepage distance measurements					P
clearance cl and creepage distance dcr at/of:	Up (V)	U r.m.s. (V)	Required cl (mm)	Cl (mm)	Required Cr (mm)	Cr (mm)
Live parts to PE circuits	<420	<250	1.5	2.8	2.5	2.8
Live parts to shortest distance to a surface that can be touched	<420	<250	3.0	5.2	5.0	5.2
Live parts to shortest distance from which a terminal component can be touched	<420	<250	3.0	5.2	5.0	5.2
Under photocoupler (U1, U9)	<420	<250	3.0	6.3	5.0	6.3
Under photocoupler (U4, U5, U6, U7, U8, U10)	<420	<250	3.0	6.7	5.0	6.7
Pri. Winding to Sec. Winding of T1	<420	<250	3.0	7.6	5.0	7.6
Circuits of live parts and SELV circuits	<420	<250	3.0	5.5	5.0	5.5
Supplementary information: Evaluated for inhomogeneous field.						

5.2.2.4	TABLE: Enclosure integrity test	P
Location	Size (mm)	Comments
Top	--	No openings except the fan hole which covered with mesh
Front	--	No openings.
Rear	--	No openings.
Side	--	Dangerous parts are out of reach.
Bottom	--	Dangerous parts are out of reach.
Supplementary information: For protection of electric shock, had to be evaluated in the final system.		

5.2.3.1	TABLE: Impulse voltage tests	P
Test voltage applied between:	Test voltage (V)	Breakdown (Yes /No)
Input terminal to plastic enclosure	6000	No
Output terminal to plastic enclosure	6000	No
Input terminal to SELV terminal	6000	No

Input terminal to GND-COM	6000	No
Supplementary information: Three pulses 1,2/50 μs of each polarity in ≥ 1 s interval, peak voltage (± 5 %)		

5.2.3.2	**TABLE: A.C. or d.c. voltage tests**	**P**
Test voltage applied between:	Test voltage (V)	Breakdown (Yes /No)
Input terminal to plastic enclosure	3000	No
Output terminal to plastic enclosure	3000	No
Input terminal to SELV terminal	3000	No
Input terminal to GND-COM	3000	No
Supplementary information: The test voltage was applied with increasing voltage but the full voltage was maintained for 5 s.		

5.2.3.4	**TABLE: Protective impedance test**		**N**
Measured between:	Measured (mA)	Limit (mA)	Comments
--	--	--	--
Supplementary information:			

5.2.3.5	**TABLE : Touch current measurement**		**P**
Measured between:	Measured (mA)	Limit (mA)	Comments/conditions
Display panel to PE	0.01	3.5/10	--
SELV terminal to PE	0.01	3.5/10	--
GND-COM to PE	0.03	3.5/10	--
Plastic enclosure to PE	0.01	3.5/10	--
Earthed metal enclosure to PE	0.08	3.5/10	--
Supplementary information:			

5.2.3.6	**TABLE: Short-circuit and breakdown of components tests**		**P**
	Ambient temperature (°C) .....:	See below	---
	Manufacturer/model/type/rating.....:	--	---

No.	Component No.	Fault	Test voltage (V)	Test time	Fuse No.	Fuse current (A)	Observation
1	R	Lack of phase	380Vac	10mins	--	--	Unit can not operation normal, no damage, no hazards.
2	S	Lack of phase	380Vac	10mins	--	--	Unit can not operation normal, no damage, no hazards.
3	T	Lack of phase	380Vac	10mins	--	--	Unit can not operation normal, no damage, no hazards.

4	Output terminal	S-C	380Vac	10mins	--	--	Unit output shut down immediately. No damage, no hazards.
5	Output terminal	O-L	380Vac	30mins	--	--	Unit shutdown when increased the output current to110%, no damaged, no hazards.
6	Ventilation opening	Blocked	380Vac	70mins	--	--	Unit output shutdown after 1hr, No damaged no hazards. T1 coil: 101.6°C T1 core: 99.0°C Ambient: 40.0°C
7	DC Fan	Locked	380Vac	50mins	--	--	Unit shutdown after 20mins, No damaged no hazards. T1 coil: 73.6°C T1 core: 72.7°C Ambient: 40.0°C
8	U1 Pin1-2	S-C	380Vac	10mins	--	--	Unit normal operation, no damaged no hazards
9	U1 Pin3-4	S-C	380Vac	10mins	--	--	Unit normal operation, no damaged no hazards
10	U1 Pin1	O-C	380Vac	10mins	--	--	Unit normal operation, no damaged no hazards
11	Pri. Winding of T1	S-C	380Vac	10mins	--	--	Unit output shut down immediately. No damage, no hazards.
12	Sec. Winding of T1	S-C	380Vac	10mins	--	--	Unit output shut down immediately. No damage, no hazards.
13	Q9	S-C	380Vac	10mins	--	--	Unit output shut down immediately. Q9 damage, no hazards.
Supplementary information: S-C=Short Circuit, O-C=Open Circuit, O-L=Overload.							

5.2.3.7	**TABLE: Discharge of capacitor test**			**P**
Location	T calculated (s)	T measured (s)	Tu→0v (s)	Comments
E1+ to E2-	--	--	Time required to drain to DVC A voltage 1S	Vpeak=402V
L1 to L2	--	--	1.23	Vpeak=549V

L1 to L3	--	--	1.25	Vpeak=549V
L2 to L3	--	--	1.34	Vpeak=549V
Supplementary information:				

5.2.3.8	**TABLE: Temperature rise measurements**			**P**
	Test voltage (V).....	323V	437V	---
	T_{amb1}(°C).....	--	--	---
	T_{amb2} (°C)	--	--	---
Maximum temperature T of part/at:		T(℃)	T(℃)	Allowed T_{max}(℃)
Whole unit				
Plastic enclosure(Front)		44.9	43.6	85
Plastic enclosure(Side near Heat sink)		46.9	47.2	85
Plastic enclosure(Mounting surface)		45.4	43.9	90
AC input terminal		52.0	46.9	85
AC output terminal		40.8	41.4	85
Knob body		47.0	48.1	85
LCD panel		46.2	47.8	85
On main board				
Y-Cap(CY3)		64.2	55.5	130
PCB near M1		67.1	57.1	130
T1 coil		74.9	68.0	110
T1 core		62.8	57.9	Ref.
PCB near D19		64.7	61.3	130
E-Cap(E2)		58.8	57.5	105
Heat sink body		64.7	67.0	Ref.
U17 body		64.6	66.3	100
U1 body		60.2	56.8	100
On CNTL board				
PCN near U5		66.6	66.5	130
RE1 body		60.6	61.0	85
Ambient		40.0	40.0	--
Supplementary information: EE was operated under its rated conditions until thermal equilibrium is reached.				

5.2.3.9	TABLE: Protective bonding impedance test	P

Location	Resistance measured (mΩ)	Comments
PE terminal block to the farthest end protects PE	15.63	Not exceed 0.2Ω
Supplementary information:		

5.2.5.2	TABLE: Glow-wire test				P
part under test	material designation	test temperature (°C)	visible flame and sustained glowing (Y/N)	flame and glowing extinction time	ignition of the tissue paper (Y/N)
Plastic enclosure	See annex 1	850	N	N	N
supplementary information:					

Photo documentation

Photo 1

Photo 2

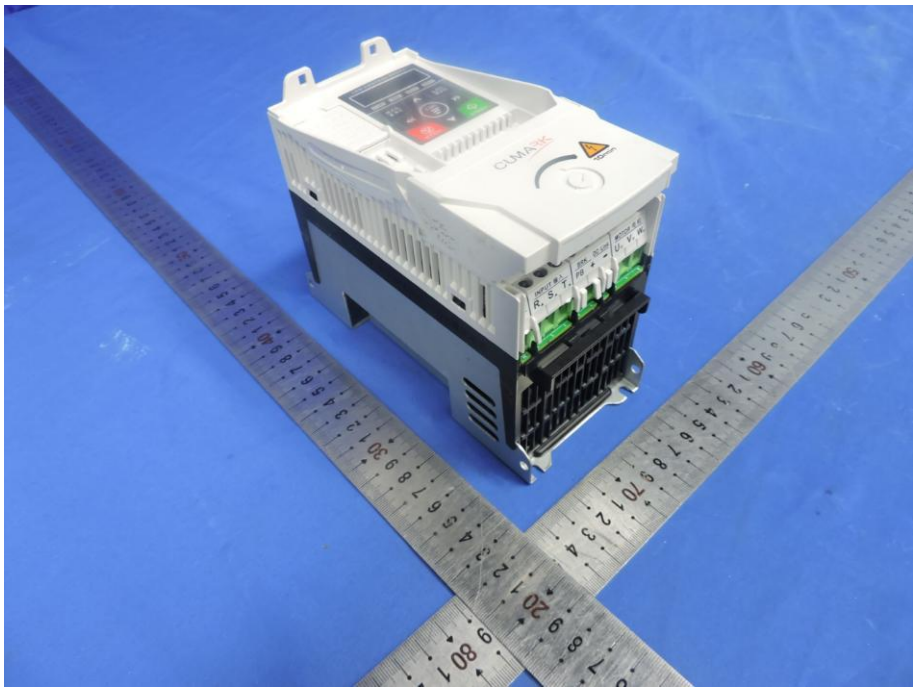
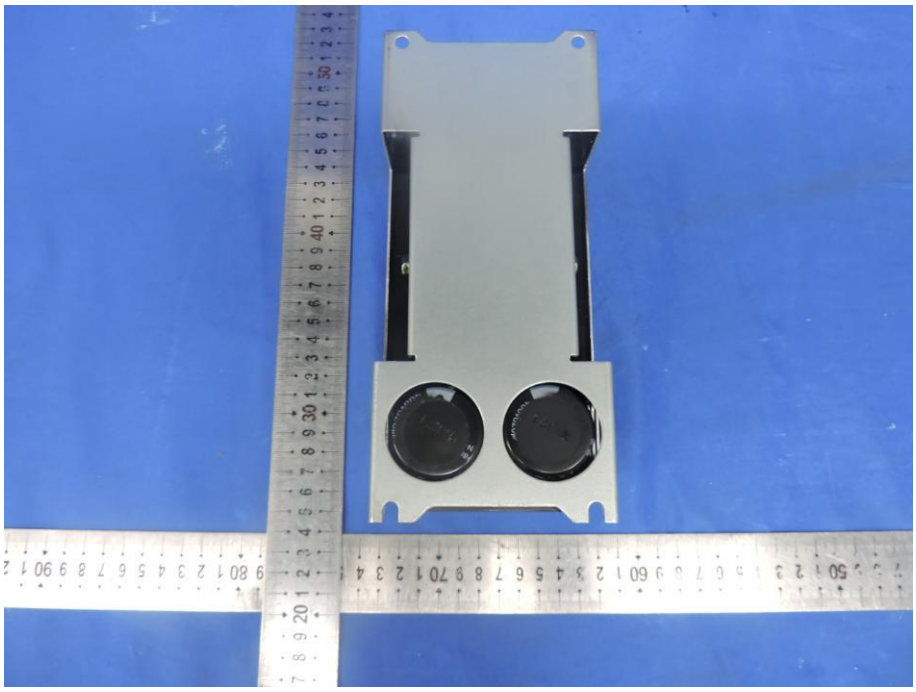


Photo 3



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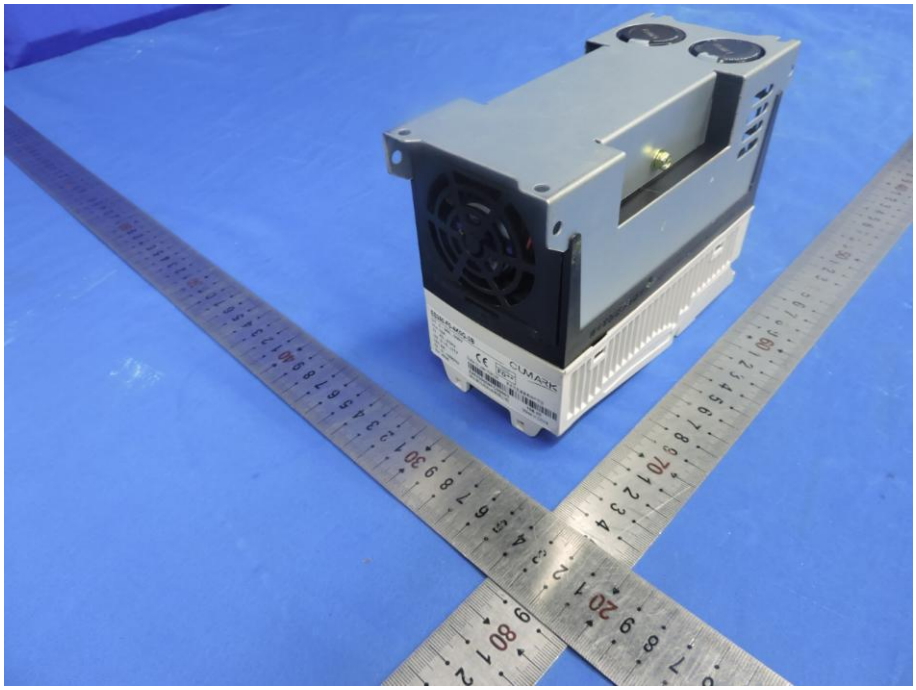

Photo 5

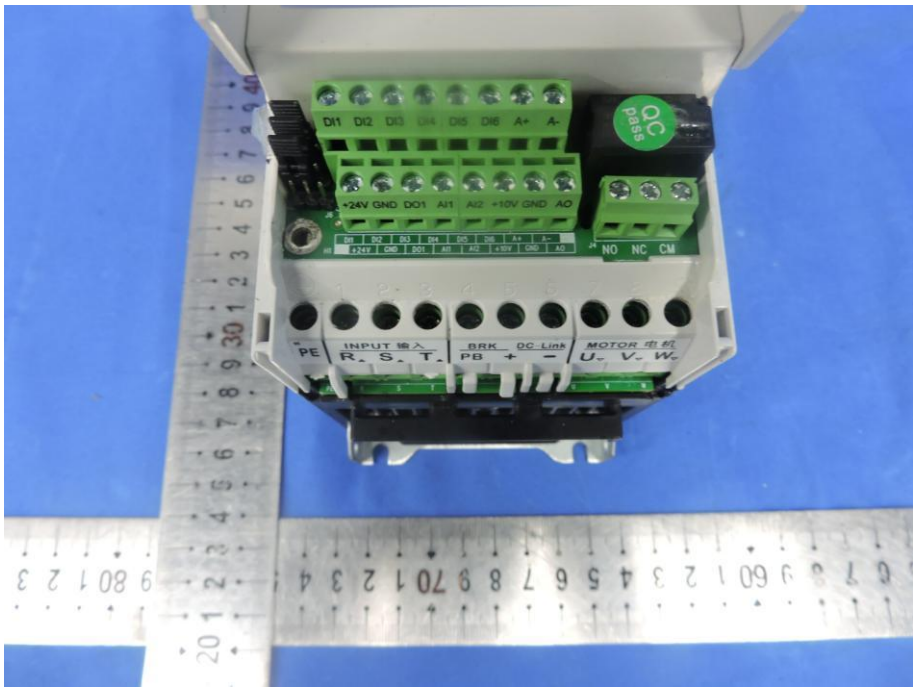

Photo 6

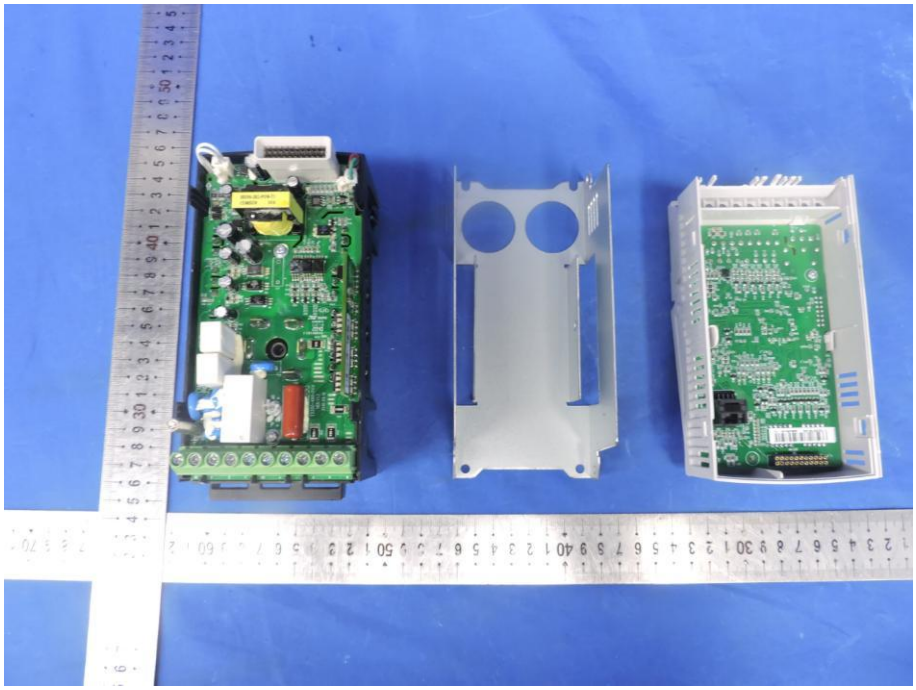

Photo 7

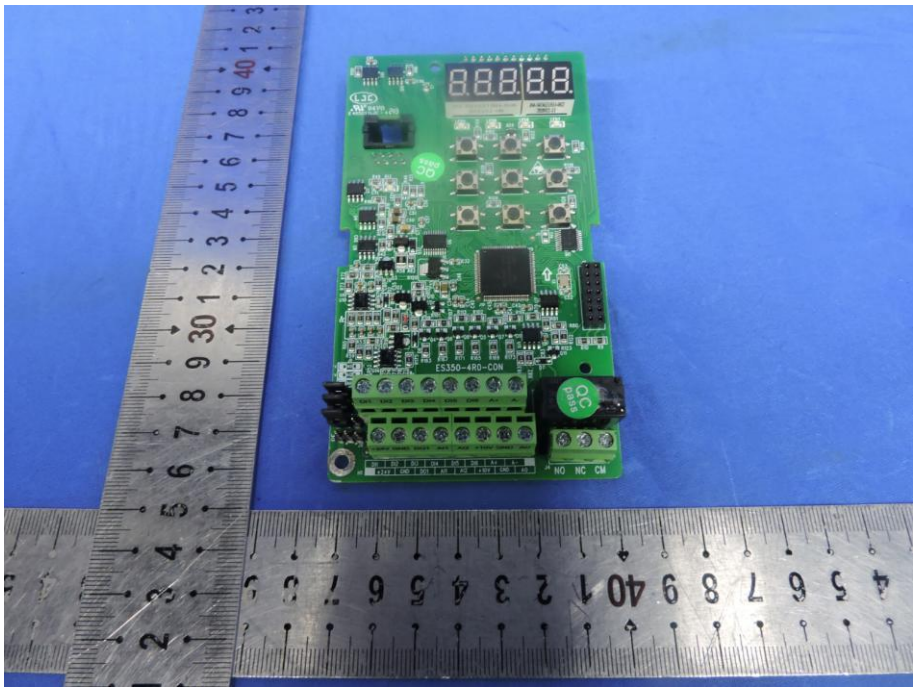

Photo 8

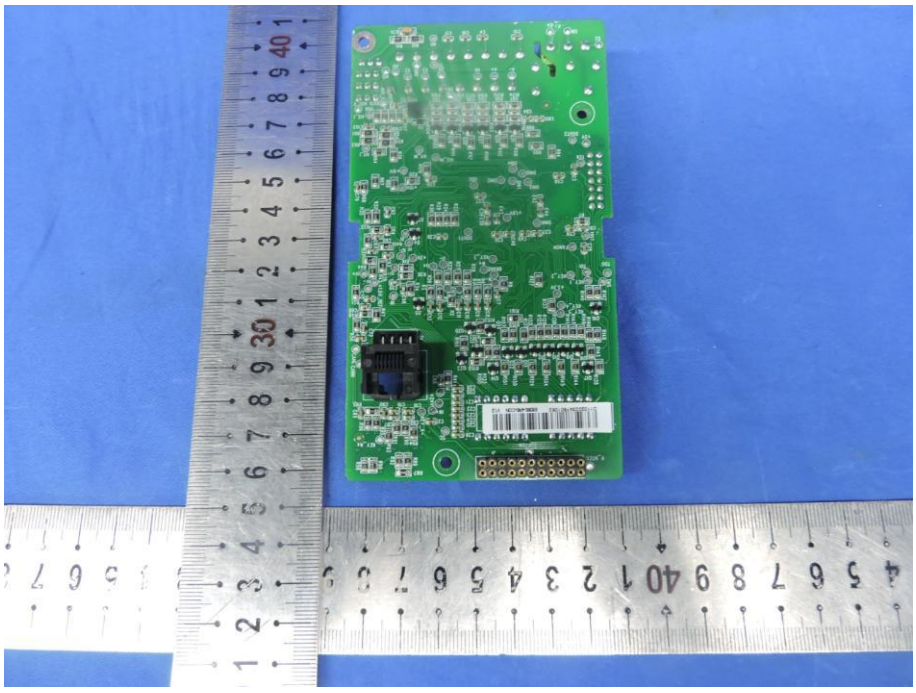

Photo 9

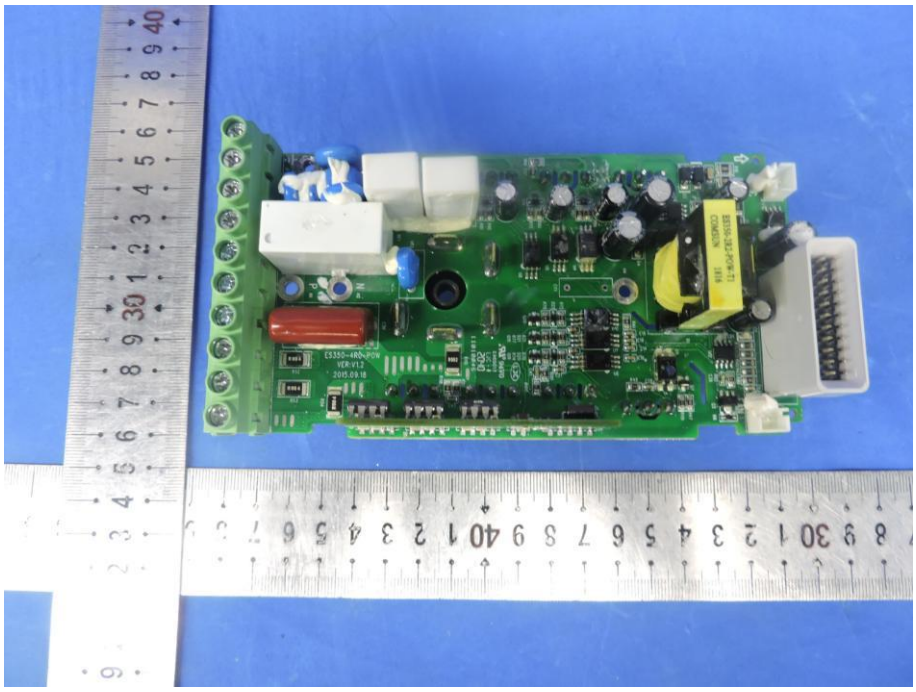

Photo 10

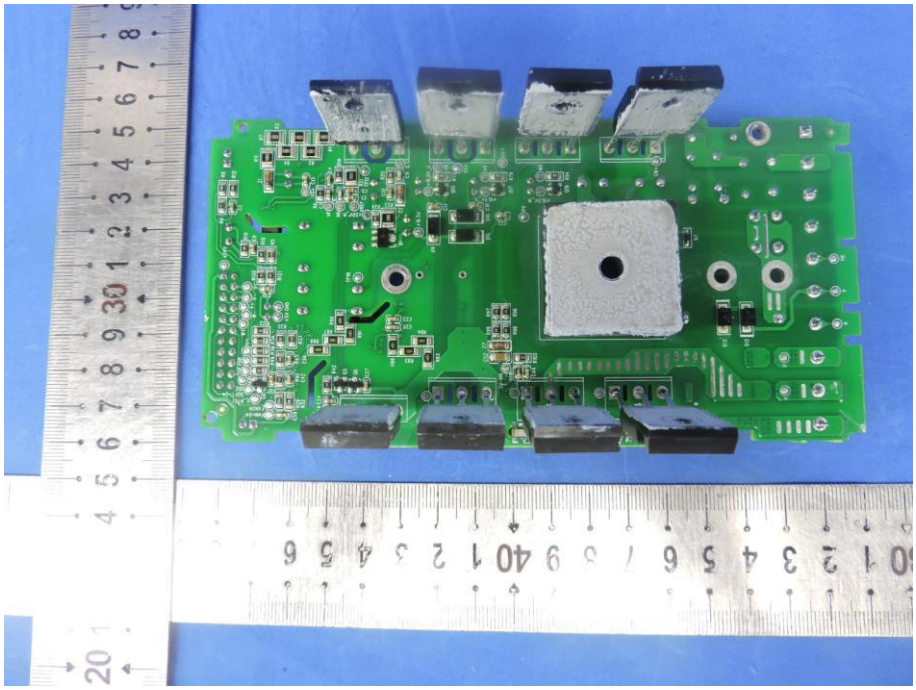

Photo 11

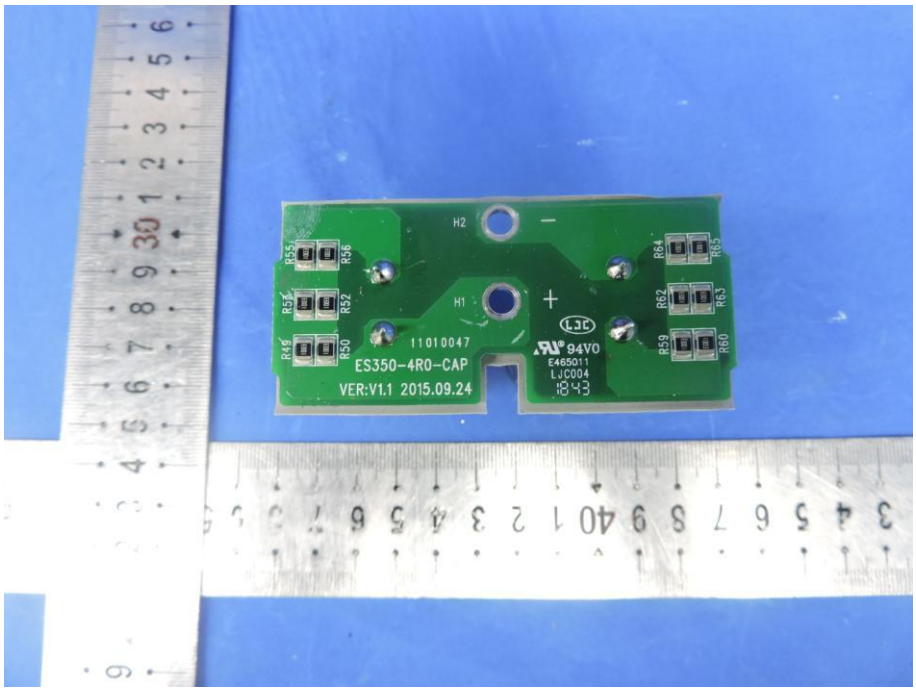

Photo 12

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