TEST REPORT

Applicant:	WUHAN HUAZHONG NUMERICAL CONTROL CO., LTD
Address of Applicant:	H.U.S.T PARK, Miaoshan Region, East-lake Development Zone, Wuhan, Hubei, P.R.China

Equipment Under Test (EUT)

Product Name:	AC SERVO DRIVE
Brand Name:	
Model No.:	Please refer to page 4
Applicable standards:	EN 61800-5-1:2007+A1:2017
Date of sample receipt:	December 16, 2020
Date of Test:	December 16, 2020 To December 22, 2020
Date of report issued:	December 22, 2020
Test Result :	PASS*

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EU Declaration of Conformity and compliance with all relevant EU Directives.

Authorized Signature

Kevin Wang
Laboratory Manager

EBO assures objectivity and justness of the test, and fulfill the duty of confidentiality for applicant's information. Applicant should undertake responsibility for the authenticity of submitted sample and information. The result(s) shown in this report refer only to the sample(s) tested. The test results only reflect the evaluation of the sample under test and are not authorized for other purposes. EBO do not accept any liability to you for any loss arising out of or in connection with this report, in contract, tort, by statute or otherwise. This report is invalid without signatures of approver and special seal for inspection of EBO, or it has been reproduced in full or part. This report shall not be published as advertisement without the approval of EBO. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. This document is issued by the company under its General Conditions of Service accessible at http://www.ebotest.com/zjyb/318.html.

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

Administrative Data

Report Reference No. .....:	EBO2012093-E180
Testing laboratory.....:	Shenzhen EBO Testing Center
Address.....:	Building A, Qinye Business Center, Xin'an Sixth Road, 82th District, Bao'an, Shenzhen, China
Tested by (name and signature) .....:	Bernie Xia
Approved by (name and signature)..:	Kevin Wang
Date of issue .....:	December 22, 2020
Contents.....:	28 Pages.

Test specification:

Standard(s) .....:	EN 61800-5-1:2007+A1:2017
Test procedure ..... :	CE-LVD
Non-standard test method.....:	N/A

Applicant's name .....:	WUHAN HUAZHONG NUMERICAL CONTROL CO., LTD
Address .....:	H.U.S.T PARK, Miaoshan Region, East-lake Development Zone, Wuhan, Hubei, P.R.China
Manufacturer……..:	WUHAN HUAZHONG NUMERICAL CONTROL CO., LTD
Address……..:	H.U.S.T PARK, Miaoshan Region, East-lake Development Zone, Wuhan, Hubei, P.R.China

Test item description.....:	AC SERVO DRIVE
Brand Name .....:	
Model/Type reference .....:	Please refer to page 4
Model tested……..:	HSV-180AS-050
Rating(s).....:	AC 380V, 50/60Hz, 21.9A

Test item particulars:	
Type of item tested……..:	Safety Evaluation
Description of equipment function……..:	AC SERVO DRIVE
Overall size of the equipment (L x W x H)…..:	See instruction
Mass of the equipment (kg)……..:	/
Accessories and detachable parts included in the evaluation……..:	—
Option…… …:	—
Test case verdicts:	
Test case does not apply to the test object…..:	N(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……..:	December 16, 2020
Date (s) of performance of tests……:	December 16, 2020 To December 22, 2020

General Remarks:
This 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(s) tested.
”(see remark #)" refers to a remark appended to the report.
"(see Annex #)" refers to an annex appended to the report.
Throughout this report a comma is used as the decimal separator.

Copy of Marking Plate:

Product Name: AC SERVO DRIVE
Model no.: HSV-180AS-050
AC 380V, 50/60Hz, 21.9A
WUHAN HUAZHONG NUMERICAL CONTROL CO., LTD
H.U.S.T PARK, Miaoshan Region, East-lake Development Zone,
Wuhan, Hubei, P.R.China



S/N:XXXXXX Importer:XXXXXX Address:XXXXXX
Made In China

Summary of Testing:
The product has been tested and found in compliance with the standard requirements.
All models are identical in the same PCB layout, interior structure and electrical circuits. The only differences are the model name and appearance color for commercial purpose.
We select the models of maximum power model HSV-180AS-050 for all testings.

Model No.:

HSV-180AD-050	HSV-180AD-035	HSV-180AD-075
HSV-180AD-100	HSV-180AD-150	HSV-180AD-200
HSV-180AD-300	HSV-180AD-400	HSV-180AD-450
HSV-180AD-100	HSV-180AD-150	HSV-180AD-200
HSV-180AD-300	HSV-180AS-035	HSV-180AS-050
HSV-180AS-075	HSV-180AS-100	HSV-180AS-150
HSV-180AS-200	HSV-180AS-300	HSV-180AS-400
HSV-180AS-450	HSV-180A1S-100	HSV-180A1S-150
HSV-180A1S-200	HSV-180A1S-300	HSV-180UD-035
HSV-180UD-050	HSV-180UD-075	HSV-180UD-100
HSV-180UD-150	HSV-180UD-200	HSV-180UD-300
HSV-180UD-400	HSV-180UD-450	HSV-180UD-035C
HSV-180UD-050C	HSV-180UD-075C	HSV-180UD-100C
HSV-180UD-150C	HSV-180UD-200C	HSV-180UD-300C
HSV-180UD-400C	HSV-180UD-450C	HSV-180U1D-100
HSV-180U1D-150	HSV-180U1D-200	HSV-180U1D-300
HSV-180US-035	HSV-180US-050	HSV-180US-075
HSV-180US-100	HSV-180US-150	HSV-180US-200
HSV-180US-300	HSV-180US-400	HSV-180US-450
HSV-180US-035C	HSV-180US-050C	HSV-180US-075C
HSV-180US-100C	HSV-180US-150C	HSV-180US-200C
HSV-180US-300C	HSV-180US-400C	HSV-180US-450C
HSV-180US-035R	HSV-180US-050R	HSV-180US-075R
HSV-180US-100R	HSV-180US-150R	HSV-180U1S-100
HSV-180U1S-150	HSV-180U1S-200	HSV-180U1S-300
HSV-160U-005	HSV-160U-007	HSV-160U-009
HSV-160U-010	HSV-160U-020	HSV-160U-030
HSV-160U-050	HSV-160U-075	HSV-160U-100
HSV-160UP-005	HSV-160UP-007	HSV-160UP-009
HSV-160UP-010	HSV-160UP-020	HSV-160UP-030
HSV-160UP-050	HSV-160UP-075	HSV-160UP-100
HSV-160B+-020	HSV-160B+-030	HSV-160B+-050
HSV-160B+-075	HSV-160C-010	HSV-160C-020
HSV-160C-030	HSV-160C-050	HSV-160C-075
HSV-162C-030M	HSV-162C-030S	/
Remark: All models are identical in the same PCB layout, interior structure and electrical circuits. The only differences are the model name and appearance color for commercial purpose.		

EN 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) .....:	DVC C for all circuits	P
4.3.1.2	Limits of DVC	< 1000 V r.m.s	P
4.3.1.3	Requirements for protection	Basic insulation on opposite input live part. Basic insulation on live part and protective bonding or earth.	P
4.3.1.4	Circuit evaluation		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		N
4.3.1.4.4	Pulsating working voltage		N
4.3.2	Protective separation .....:	Basic insulation on opposite input live part. Basic insulation on live part and protective bonding or earth.	P
4.3.3	Protection against direct contact	Built-in product, overall should considered in end use system	P
4.3.3.1	General		P
4.3.3.2	Protection by means of insulation of live parts	Plastic cover is separated form live parts	P
4.3.3.3	Protection by means of enclosures and barriers	Build-in component consider in end system, according installation instruction will install closed electrical operation areas.	N
4.3.4	Protection in case of direct contact	Build-in component consider in end system	N
4.3.4.1	General		N
4.3.4.2	Protection using DVC A .....:		N
4.3.4.3	Protection by means of protective impedance		N
4.3.4.4	Protection by means of using limited voltages		N

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Clause	Requirement + Test	Result - Remark	Verdict
4.3.5	Protection against indirect contact	Build-in component consider in end system again.	P
4.3.5.1	General .....:	Product cover by plastic cover, internal output circuit with protect earth terminal.	P
4.3.5.2	Insulation between live parts and accessible conductive parts	See appended table 5.2.2.1	P
4.3.5.3	Protective bonding circuit		P
4.3.5.3.1	General	Except protective chassis, other Part circuits see subclause 4.3.4.3 to 4.3.4.4	P
4.3.5.3.2	Rating of protective bonding .....:	See appended table 5.2.3.9 and sub-clause 4.3.5.4	P
4.3.5.3.3	Protective bonding impedance		N
4.3.5.4	Protective earthing conductor .....:	See components list table 1 and clause 5.2.3.9.	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 .....:	See appended table 5.2.3.5 and components list table.	P
4.3.5.6	Special features in equipment for protective class II		N
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 .....:	2	P
4.3.6.1.3	Overvoltage category .....:	III for input terminal, II after earthed SPD circuits.	P
4.3.6.1.4	Supply earthing systems .....:	TN (TN-C, TN-S, TN-C-S) TT	P
4.3.6.1.5	Insulation voltages	2120 V crest value for temporary overvoltage. 4000 V for impluse voltage for OVC III and 2500 V for impluse voltage for OVC II	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 ...:	OVC III consider.	P

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Clause	Requirement + Test	Result - Remark	Verdict
4.3.6.2.3	Circuits not connected directly to the supply mains .....:		N
4.3.6.2.4	Insulation between circuits .....:	Considered, basic between protective earth and live part.	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	3000 m Max.	P
4.3.6.4.2	Electric field homogeneity		N
4.3.6.4.3	Clearance to conductive enclosures .....:	Considered, see sub-clause 5.2.2.5.	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 .....:	IIIa	P
4.3.6.6	Coating		N
4.3.6.7	PWB spacings for functional insulation .....:	See appended components list table 1	P
4.3.6.8	Solid insulation		N
4.3.6.8.1	General		N
4.3.6.8.2	Requirements for electrical withstand capability		N
4.3.6.8.2.1	Basic or supplementary insulation		N
4.3.6.8.2.2	Double and reinforced insulation		N
4.3.6.8.2.3	Functional insulation		N
4.3.6.8.3	Thin sheet or tape material		N
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		N
4.3.6.8.4	Printed wiring boards (PWBs)		N
4.3.6.8.4.1	General		N
4.3.6.8.4.2	Use of coating materials		N
4.3.6.8.5	Wound components		N
4.3.6.8.6	Potting materials		N
4.3.6.9	Insulation requirements above 30 kHz		N
4.3.7	Enclosures		N
4.3.7.1	General .....:		N

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Clause	Requirement + Test	Result - Remark	Verdict
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		P
4.3.8.2	Routing		N
4.3.8.3	Colour coding		P
4.3.8.4	Splices and connections		P
4.3.8.5	Accessible connections	Built-in component consider in end system	N
4.3.8.6	Interconnections between parts of the PDS		N
4.3.8.7	Supply connections		N
4.3.8.8	Terminals	See appended component list table 1	P
4.3.8.8.1	Construction requirements		P
4.3.8.8.2	Connecting capacity		P
4.3.8.8.3	Connection		N
4.3.8.8.4	Wire bending space for wires 10 mm² and greater ..... :		N
4.3.9	Output short circuit requirements .....:	See appended table 5.2.3.6	P
4.3.10	Residual current-operated protective (RCD) or monitoring (RCM) device compatibility	Built-in component consider in end system.	P
4.3.11	Capacitor discharge .....:	Built-in component consider in end system.	N
4.3.12	Access conditions for high-voltage PDS		N
4.4	**Protection against thermal hazards**		P
4.4.1	Minimizing the risk of ignition	See appended table 1.	P
4.4.2	Insulating materials		P
4.4.2.1	General	See appended table 5.2.3.8.	P
4.4.2.2	Material requirements	See cl. 5.2.5.1, 5.2.5.2 and appended table 1.	P
4.4.3	Flammability of enclosure materials	Built-in component consider in end system	N
4.4.4	Temperature limits	Built-in component consider in end system again.	P
4.4.4.1	Internal parts		P
4.4.4.2	External parts of CDM	Used within BDM.	N

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Clause	Requirement + Test	Result - Remark	Verdict
4.4.5	Specific requirements for liquid cooled PDS		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		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		P
4.4.6.4	CDM/BDM with electronic motor overload protection which is speed sensitive		P
4.4.6.5	CDM/BDM providing monitoring and automatic reduction of motor current by means of thermal sensors		P
4.5	**Protection against energy hazards**		P
4.5.1	Electrical energy hazards .....:		P
4.5.2	Mechanical energy hazards		N
4.5.2.1	General		N
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 .....:	Sample tests.	P
5.1.2	Selection of test samples .....:	See product general information.	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	Verified by suitable examination, visual inspection, and/or measurement.	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		N
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) .....:		N
5.2.2.4	Enclosure integrity test (type test) .....:		N
5.2.2.5	Deformation tests		N
5.2.2.5.1	General		N
5.2.2.5.2	Deflection test (type test) .....:		N
5.2.2.5.3	Impact test (type test), temperature (°C) .....:		N
5.2.3	Electrical tests		P
5.2.3.1	Impulse voltage test (type test and sample test)	Clearances and solid insulation have adequate dielectric strength	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)		N
5.2.3.4	Protective impedance (type test and routine test) :		N
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

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Clause	Requirement + Test	Result - Remark	Verdict
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
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) .....:	Built-in component consider in end system	N
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)		P
5.2.4.5	Cooling failure tests (type tests)		N
5.2.4.5.1	General		P
5.2.4.5.2	Inoperative blower motor		P
5.2.4.5.3	Clogged filter		N
5.2.4.5.4	Loss of coolant		N
5.2.5	Material tests		N
5.2.5.1	High current arcing ignition test (type test)		N
5.2.5.2	Glow-wire test (type test)		N
5.2.5.3	Hot wire ignition test (type test – alternative to Glow-wire test)		N
5.2.5.4	Flammability test (type test)		N
5.2.6	Environmental tests (type tests)		N
5.2.6.1	General		N
5.2.6.2	Acceptance criteria		N

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Clause	Requirement + Test	Result - Remark	Verdict
5.2.6.3	Climatic tests		N
5.2.6.3.1	Dry heat test (steady state)	Test conditions: 40°C of ambient air, BDM operates during 16 hours.	P
5.2.6.3.2	Damp heat test (steady state)	Test conditions: power supply disconnected, ambient air is 40°C, humidity is 95%, and test duration is 96 hours.	P
5.2.6.4	Vibration test (type test)	Test conditions: power supply disconnected. Motion is sinusoidal. Vibration amplitude/acceleration is 0.075mm/1g	P
5.2.7	Hydrostatic pressure test (type test and routine test) .....:		N
5.2.8	Electronic motor overload protection test (type test)	See appended Table 5.2.8.	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)		P
6	**INFORMATION AND MARKING REQUIREMENTS**		P
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		N
6.3.3	Environment		P
6.3.4	Handling and mounting		P

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Clause	Requirement + Test	Result - Remark	Verdict
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
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
6.3.6.4	Terminal capacity and identification .....:		P
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		N
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		P
6.3.8.2	CDM/BDM incorporating internal electronic motor overload and overtemperature protection		P
6.3.9	Commissioning		P
6.4	**Information for use**	See appended table 6, part 6.4.	P
6.4.1	General		N
6.4.2	Adjustment		N
6.4.3	Labels, signs and signals		N
6.4.3.1	General		N
6.4.3.2	Isolators		N
6.4.3.3	Visual and audible signals		N
6.4.3.4	Hot surfaces		N
6.4.3.5	Equipment marking		N
6.5	**Information for maintenance**	See appended table 6, part 6.5.	N
6.5.1	General		N

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Clause	Requirement + Test	Result - Remark	Verdict
6.5.2	Capacitor discharge		N
6.5.3	Auto restart/bypass connection		N
6.5.4	PT/CT connection		N
6.5.5	Other hazards		N
Annex A	Examples of protection in case of direct contact	Considered	—
Annex B	Examples of overvoltage category reduction	Considered	—
Annex C	Measurement of clearance and creepage distances	Considered	P
Annex D	Altitude correction for clearances	Considered	—
Annex E	Clearance and creepage distance determination for frequencies greater than 30 kHz	Considered	—
Annex F	Cross-sections of round conductors	Considered	—
Annex G	Guidelines for RCD compatibility	Considered	—
Annex H	Symbols referred to in this part of IEC 61800	Considered	—

1	TABLE: List of materials and components separately evaluated				P
Object/part No.	**Manufacturer/ trademark**	**Type/model**	**Technical data**	**Standard (Edition / year)**	**Mark(s) of conformity**
PCB	Interchangeable	Interchangeable	V-0,130℃	UL 796	UL
IGBT module	Interchangeable	Interchangeable	150℃	EN 61800-5-1	Test with appliance
Terminal	Interchangeable	Interchangeable	105℃	UL1977	UL

5.2.2.1	TABLE: General selection and information of supply earthing systems for clearance distances									-
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)	380		N/A		N/A		N/A		N/A	
Max. altitude (m)	3000		N/A		N/A		N/A		N/A	
System voltage for impulse / TOV (V)	466 V r.m.s.		N/A		N/A		N/A		N/A	
	BI/SI	**RI**	**BI/SI**	**RI**	**BI/SI**	**RI**	**BI/SI**	**RI**	**BI/SI**	**RI**
Rated Impulse voltage (kV)	Case A Case B	N/A	--	--	--	--	--	--	--	--
Temporary overvoltage (V rms / V peak)	2120	N/A	--	--	--	--	--	--	--	--
Clearance (mm)	3.5 for OVC III 2.6 for OVC II	N/A	--	--	--	--	--	--	--	--
Test impulse voltage for clearance (kV)	Case A Case B	N/A	--	--	--	--	--	--	--	--
Supplementary information: Case A: 4kV for input terminal, Case B: 2.5kV for after MOV.										

5.2.2.1	TABLE: Working voltage measurements for clearance and creepage distances										-
Condition #	**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)**	
		peak	**rms**	**peak**	**rms**	**peak**	**rms**	**peak**	**rms**	**peak**	**rms**

--	Basic for Between Live parts and protective earth	400	292	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	Functional for different polarity	644	466	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
IT network, simulated impedance (Ω) .....:					1 kΩ according to IEC 60990.						
Supplementary information: -- Condition #:--											

5.2.2.1	**TABLE: Clearances and creepage distances**					
clearance cl and creepage distance cr at/between:	**U peak (V)**	**U rms (V)**	**Req. cl (mm)**	**Meas. cl (mm)**	**Req. cr (mm)**	**Meas. cr (mm)**
Minimum distance of Among L1, L2, L3	--	300	3.5	12.2	3.5	12.2
RV2 to earth on PCB	--	300	2.6	3.5	2.8	3.5
L1 to earth on PCB	--	300	2.6	3.5	2.8	3.5
L1 on PCB to cover external	--	300	5.5	15.4	5.6	> 15.4
JP screw to cover external	--	300	5.5	11.1	5.6	> 11.1
Supplementary information: U r.m.s. is phase to earth. Altitude: 3000m						

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**
Between Live parts and protective earth	N/A	N/A	1500	N/A	P
Between Live parts and Plastic enclosure	N/A	N/A	3000*	N/A	P
Supplementary information: *: ref. data only.					

5.2.3.5	**TABLE:**	**Touch current measurement**	
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)
protective earth	N/A	N/A	N/A	N/A	N/A	N/A	3,5	N/A
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)**
protective earth / chassis	N/A	N/A	N/A	N/A			3,5	N/A
Supplementary information: Measurements have been carried out according to figures of IEC 60990.								

5.2.3.6.3 **5.2.3.6.4** **5.2.4.4** **5.2.4.5** **5.2.8**	**TABLE:**	**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)**	**Test time**	**Test environment (ambient, fuse etc.) and observation**	**Result**
Output U-V-W	SC	380	15mins	Unit shutdown immediately, no damage, no hazard.	P
Input	Loss a phase	380	15mins	Unit shutdown immediately, no damage, no hazard.	P
(T1 primary side)	S-C	380	15 mins	Unit shutdown immediately, recoverable no damage, no hazard.	P
(T1 secondary side)	S-C	380	15 mins	Unit shutdown immediately, recoverable no damage, no hazard.	P
Brake IGBT	S-C	380	15min	Unit shutdown immediately, no damage, no hazard	P
Inverter IGBT	S-C	380	15min	Unit shutdown immediately, no damage, no hazard	P
U3 pin 1-2	S-C	380	10min	Unit shut down ,no hazards	P
U3 pin 6-8	S-C	380	10min	Unit shut down ,no hazards	P
Q1 pin G-S	S-C	380	10min	Unit shut down ,no hazards	P
R69	S-C	380	10min	Unit shut down ,no hazards	P

R17	S-C	380	10min	Unit shut down ,no hazards	P
U22 pin 3-4	S-C	380	10min	Unit shut down ,no hazards	P
U22 pin 1-2	S-C	380	10min	Unit shut down ,no hazards	P
C45	S-C	380	10min	Unit shut down ,no hazards	P
C47	S-C	380	10min	Unit shut down ,no hazards	P
C76	S-C	380	10min	Unit shut down ,no hazards	P
Supplementary information:					

5.2.3.8	**TABLE: Temperature rise test, thermocouple method**						**P**
	Supply voltage (V) .....:	380	--	--	--	--	—
	Supply frequency (Hz) ....:	50Hz	--	--	--	--	—
	Load (V, A) .....:	--	--	--	--	--	—
	Ambient (°C) .....:	40	--	--	--	--	—
Thermocouple Location		**Temperature measured (°C)**					**Limit (°C)**
C6		81.4	--	--	--	--	105
Rectifier body of input		74.2	--	--	--	--	100
Connector JP1		65.1	--	--	--	--	--
Y-cap		81.7	--	--	--	--	125
PCB near U1		80.4	--	--	--	--	130
PCB under T1		63.1	--	--	--	--	130
T1 coil		61.2	--	--	--	--	90
T1 core		59.2	--	--	--	--	90
Optocoupler IC		72.4	--	--	--	--	100
Internal wire		51.3					105
Inverter IGBT1		88.4					100
Varistor		52.7					85
Enclosure		44.3	--	--	--	--	Ref.
Supplementary information: test temperature data reference only, built-in product should consider in end system with an enclosure again.							

5.2.3.9	**TABLE: Protective bonding**				P
Points of application		**Voltage (V)**	**Resistance (mΩ)**	**Test time (min)**	**Result**
Output terminal block protective earth / driver board		24V	1.5	60	P
Supplementary information:					

5.2.5	TABLE: Material test		
Object / Part No. / Material	**Manufacturer / trademark / type designation**	**Test procedure**	**Result**
--	--	--	--
Supplementary information: --			

6	TABLE: Information and marking requirements					
		Product	Package	Installation	User	Maintenance
6.2	Information for selection					
- Name or trademark of the manufacturer, supplier or importer ..... :		OK	OK	OK	OK	OK
- Catalogue number or equivalent ..... :		OK	OK	OK	OK	OK
- Input voltage rating ..... :		OK	-	OK	-	OK
- Input current rating ..... :		OK	-	OK	-	OK
- Input power rating ..... :		OK	-	OK	-	OK
- Input frequency ..... :		OK	-	OK	-	OK
- Input number of phases ..... :		OK	-	OK	-	OK
- Reference to standards .....:		-	-	OK	-	-
- Date code or serial number .....:		OK	-	-	-	-
- Reference to instructions .....:		-	-	OK	OK	OK
- 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 ..... :		-	-		-	
- IP rating ..... :			-		-	
- Operating and storage environment ..... :		See 6.3.3.				
- Reference to relevant standards ..... :		-	-		-	-
- Date code or serial number ..... :			-	-	-	-
- Reference to instructions ..... :		-	-			
6.3	Information for installation and comissioning					
6.3.2: Mechanical considerations		-	OK	OK	-	OK
- Dimensional drawing (SI units) ..... :		-	-	OK	-	OK
- Mass (SI units) ..... :		-	OK	OK	-	OK
- Mounting drawing (SI units) ..... :		-	-	OK	-	OK

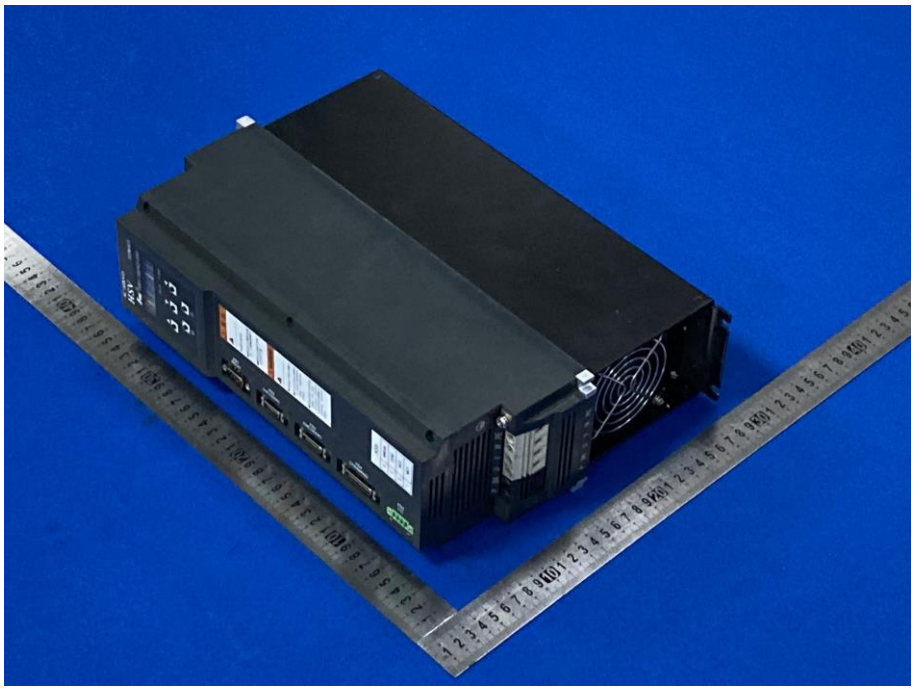
6.3.3: Environment (operation, transport, storage) ..... :	-	-	OK	-	OK
- Temperature ..... :	-	-	OK	-	OK
- Humidity ..... :	-	-	OK	-	OK
- Altitude ..... :	-	-	OK	-	OK
- Pollution ..... :	-	-	OK	-	OK
- Ultra violet light ..... :	-	-	N/A	-	N/A
- Type of electrical supply system ..... :	-	-	OK	-	-
- Field supply requirements (if any) ..... :	-	-	N/A	-	-
- Other ..... :	N/A	-	N/A	-	N/A
6.3.4: Handling and mounting ..... :	-	OK	OK	-	OK
- Packing and unpacking ..... :	-	OK	OK	-	OK
- Moving ..... :	-	OK	OK	-	OK
- Lifting ..... :	-	OK	OK	-	OK
- Strength and rigidity of mounting surface .... :	-	OK	OK	-	OK
- Fastening ..... :	-	OK	OK	-	OK
- Coolant type and design pressure for liquid cooled product ..... :	-	N/A	N/A		N/A
- Provision of adequate access for operation, adjustment and maintenance ..... :	-	-	OK	-	OK
- Warning regarding combustibility if mounting surface exceeds 90 °C ..... :	-	N/A	N/A	-	N/A
6.3.5: Motor and driven equipment					
6.3.5.1: Motor selection ..... :	-	-	OK	OK	OK
6.3.5.2: Motor integrated sensors ..... :	-	-	N/A	N/A	N/A
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		-			
6.3.6.1: General ..... :	-	-		-	
6.3.6.2: Interconnection and wiring diagrams :	-	-	OK	-	OK
6.3.6.3: Conductor (cable) selection ..... :	-	-	OK	-	OK
6.3.6.4: Terminal capacity and identification .. :	OK	-	OK	-	OK
6.3.6.5: Protection requirements ..... :	-	-	OK	OK	OK
- Protective class 0 ..... :	OK	-	OK	OK	OK
- Interface details ..... :	-	-	OK	-	OK
- Terminals with protective separation ..... :	-	-	OK		OK
6.3.6.6: Earthing ..... :	-	-	OK	-	OK

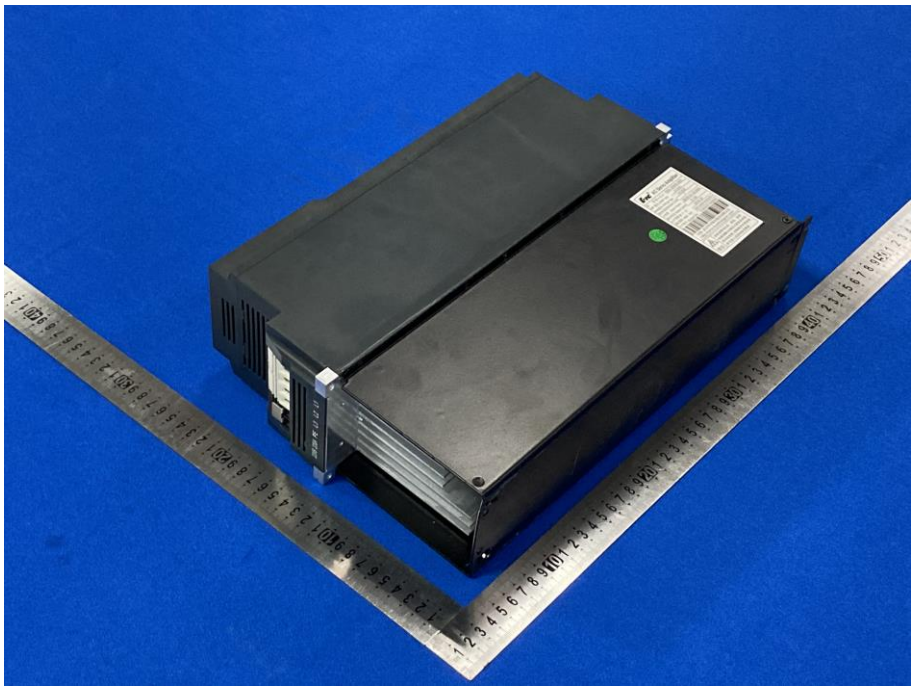
- High-voltage PDS: Earthing switch ..... :	-	-		-	
- Symbol IEC 60417-5019, PE or green-yellow ..... :	OK	-	-	-	-
- Symbol IEC 6417-5172 for Class II ..... :	N/A	-	-	-	-
6.3.6.7: Protective earthing conductor current ..... :	-	-	N/A		N/A
- Symbol ISO 7000-0434 and instruction..... :	N/A	-	N/A	-	N/A
- RCD compability ..... :	-	-	OK	-	OK
- RCD/RCM caution notice and marking ISO 7000-0434 ..... :	N/A	-	-		-
6.3.6.8: Special requirements ..... :	-	-	N/A	-	N/A
6.3.7: Overcurrent or short-circuit protection . :	-	-	N/A	-	N/A
- Electronic power output short-circuit protection circuitry conditions ..... :	-	-		-	
6.3.8: Motor overload protection and overtemperature protection ..... :	-	-	N/A	-	N/A
6.3.8.1: CDM/BDM not incorporating internal electronic motor overload and overtemperature protection ..... :	-	-		-	-
6.3.8.2: CDM/BDM incorporating internal electronic motor overload and overtemperature protection ..... :	-	-		-	
6.3.9: Commissioning ..... :	-	-	OK	-	-
6.4 Information for use					
6.4.1: General ..... :	-	-	OK	OK	OK
6.4.2: Adjustment ..... :	OK	-	OK	OK	OK
6.4.3: Labels, signs, and signals ..... :	OK	-	OK	OK	OK
6.4.3.1: General ..... :	OK	-	OK	OK	OK
6.4.3.2: Isolators ..... :	OK	-	-	-	-
6.4.3.3: Visual and audible signals ..... :	OK	-	-	OK	-
6.4.3.4: Hot surfaces, symbol IEC 60417-5041 ..... :	N/A	-	-	N/A	-
6.4.3.5: Equipment marking ..... :	OK	-	OK	OK	OK
- Control devices ..... :	-	-	-	-	-
- Indicating devices ..... :	-	-	-	-	-
- Replaceable fuses ..... :	-	-	-	-	-
- Movable connectors ..... :	-	-	-	-	-
- Test points ..... :	-	-	-	-	-
- Polarized devices ..... :	-	-	-	-	-

- Pre-set controls ..... :					
6.5	Information for maintenance				
6.5.1: General ..... :	-	-	-	OK	OK
- Maintenance procedures ..... :	-	-	-	-	OK
- Maintenance schedules ..... :	-	-	-	OK	OK
- Safety precautions ..... :	-	-	-	-	OK
- Location of live parts accessible during maintenance ..... :	-	-	-	-	OK
- Adjustment procedures ..... :	-	-	OK	OK	OK
- Repair and replacement procedures ..... :	-	-	-	-	OK
- Other relevant information (e.g. special tools list) ..... :	-	-	-	N/A	N/A
6.5.2: Capacitor discharge ..... :	N/A	-	N/A	-	N/A
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 ..... :	N/A	-	-	-	N/A
Supplementary information:					

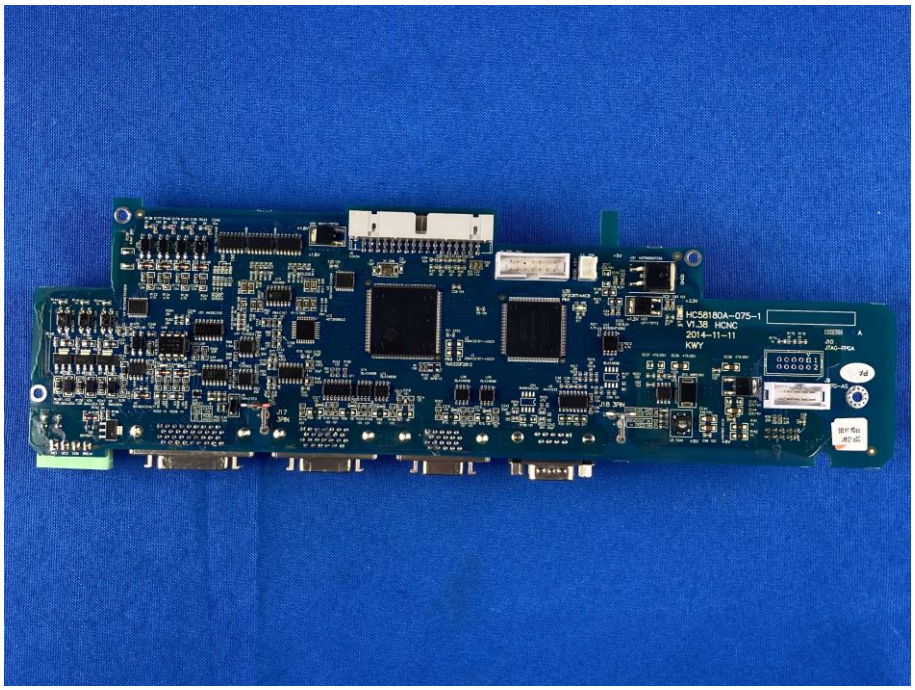
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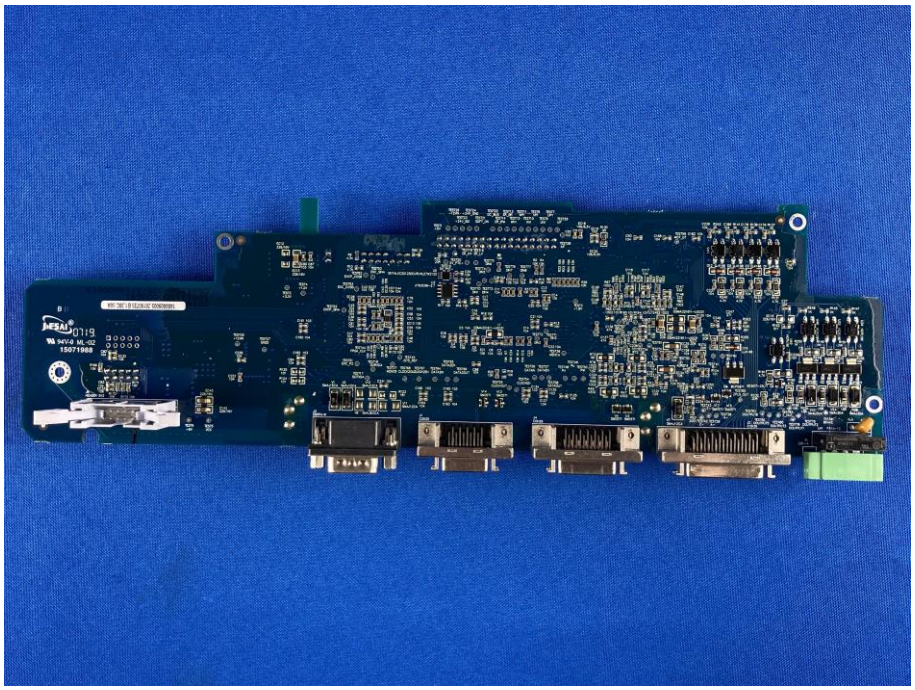


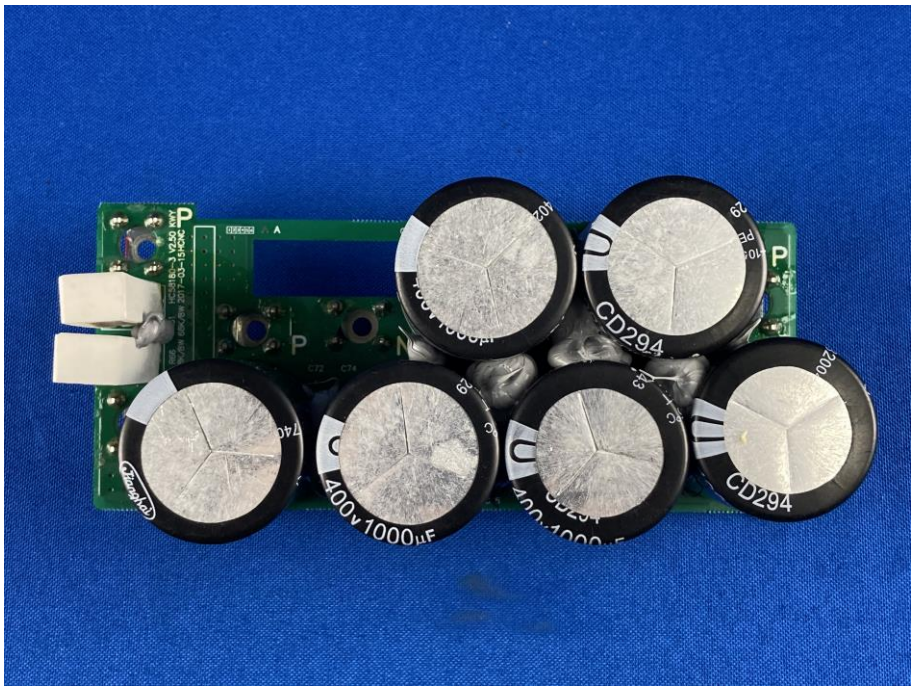


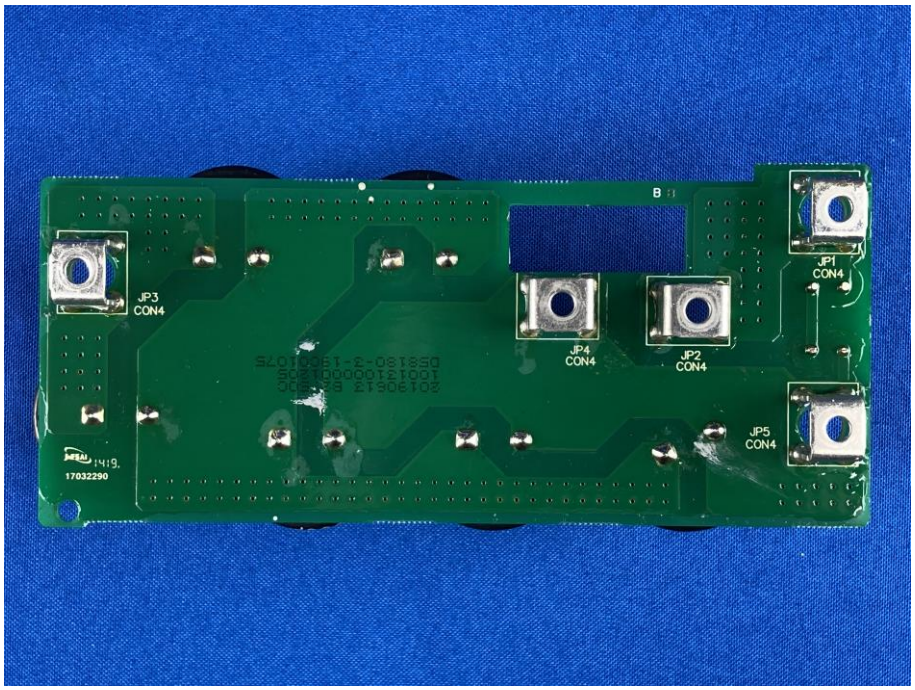


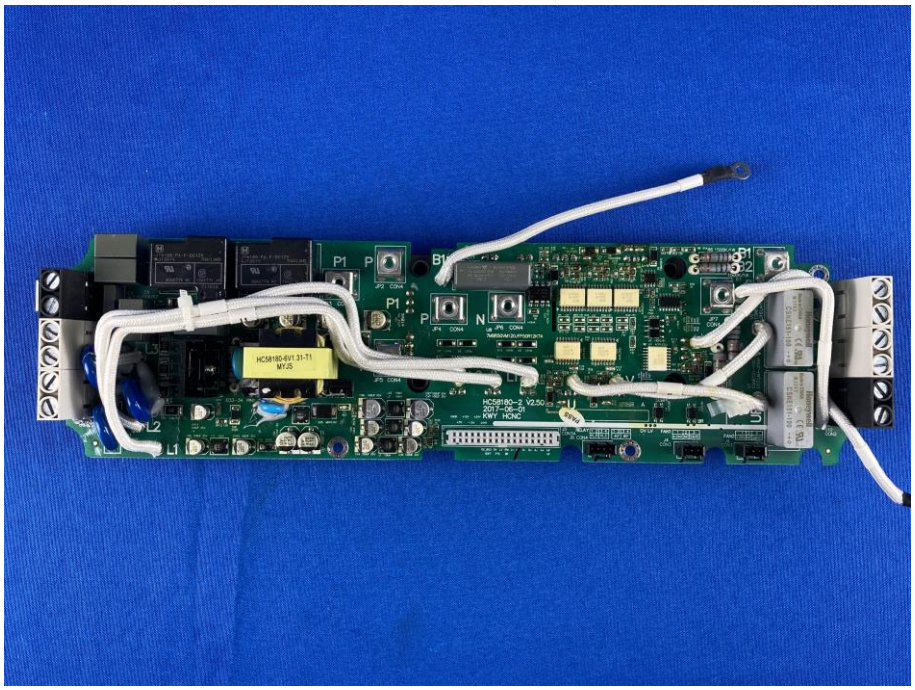

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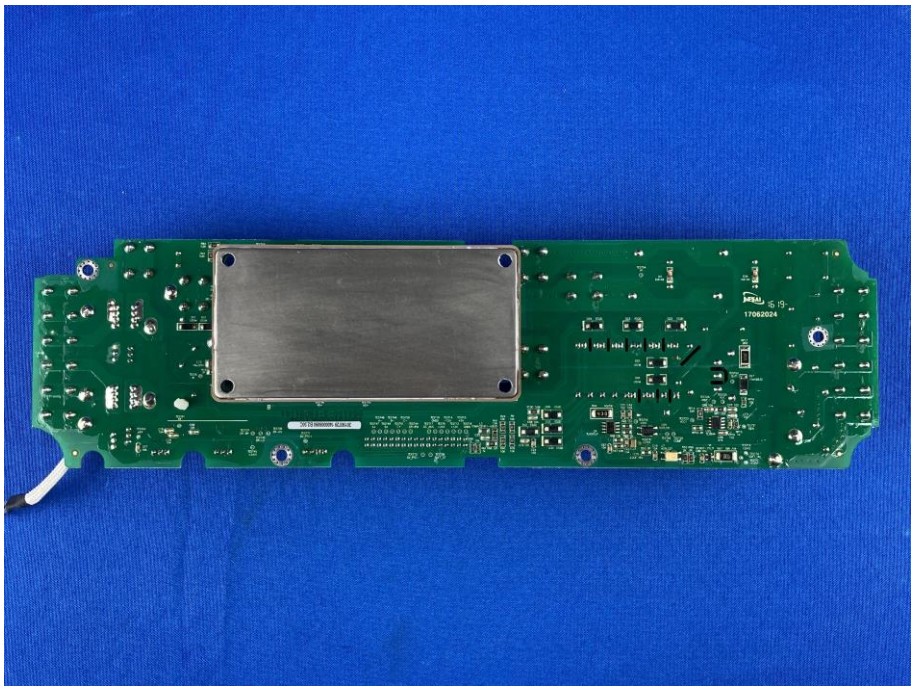

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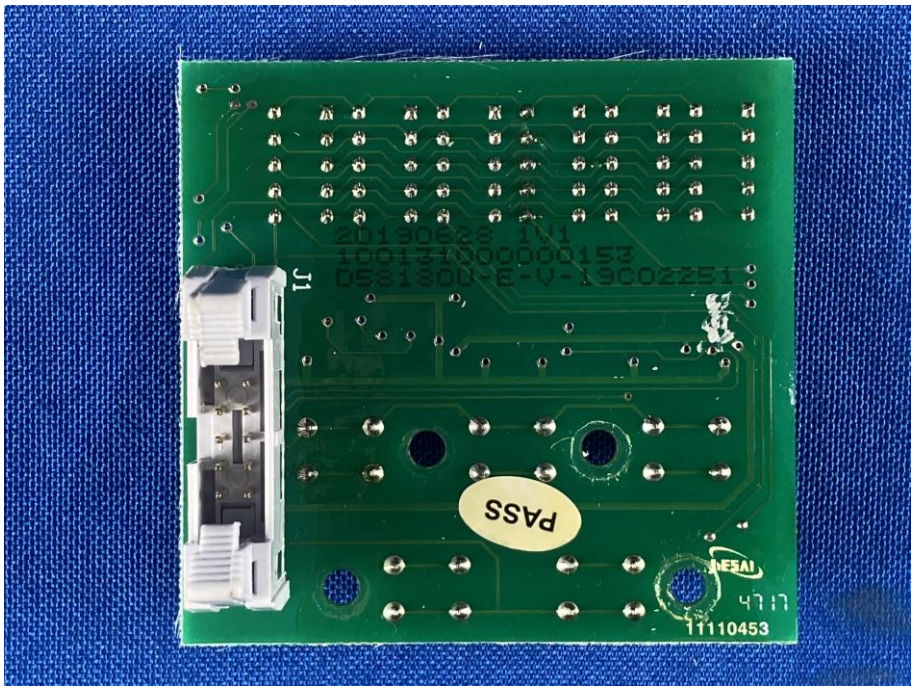


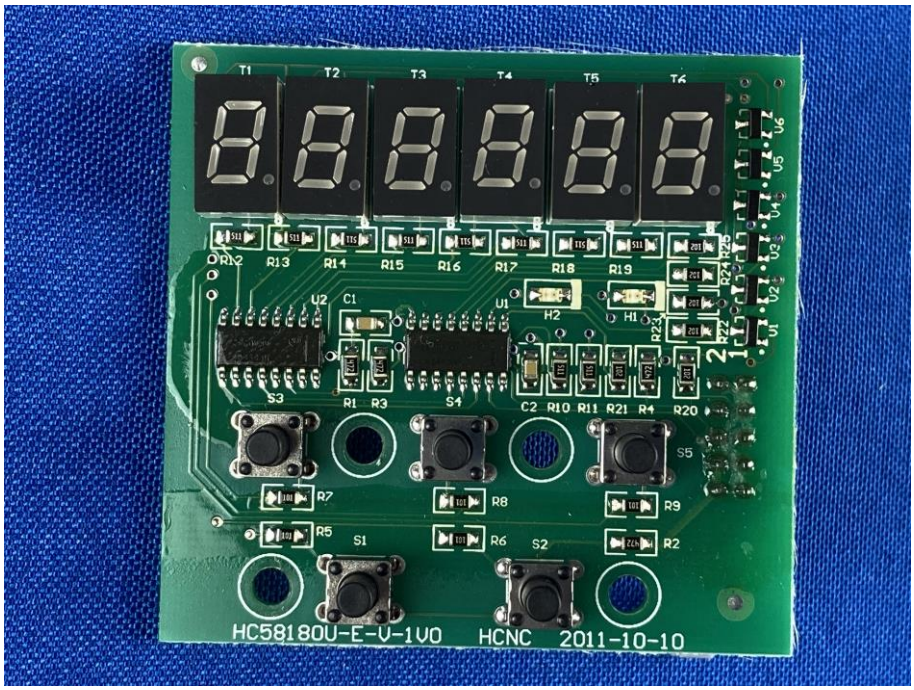

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