

Underwriters Laboratories (UL LLC) Safety Certification Report



Model: DJSF1352-RN/D
Device Description: Power meter
Applicant: Jiangsu Acrel Electrical Manufacturing. Co., Ltd.
No.31, Hongtu Road, Nanzha Street, Jiangyin City, Jiangsu Province, China
China
Manufacturer: Same as Applicant

Manufacturing Facility(ies): Same as Applicant

Report No.: E527278-D1001-1/A0/C0-UL

Report (Re)Issue Date: 2023-04-28

Base Standard(s): UL 61010-1, 3rd Edition, May 11, 2012, Revised July 19 2019, CAN/CSA-C22.2 No. 61010-1-12, 3rd Edition, Amendment 1:2018, Revision dated November 21 2018

Additional Standards: UL 61010-2-030, Second Edition, CSA C22.2 NO. 61010-2-030:18, Second Edition.

Report Types: This report consists of the following report types:
[Yes] US Certification (UL Listing)
[Yes] CAN Certification (cUL Listing)

This report covers the Safety evaluation of the referenced model(s) according to the standard(s) specified above.

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Report Modifications Summary

The following changes were made to this report. If none listed in the below table, this report is the originally issued report.

The following scheme is used throughout this report to reflect the **Report No.:**

(File No.) – (Report Ref. No.) – (x) / A(y) / C(z) – YYY, where:

(x) = Report (Re)Issue No.

(y) = Amendment No.

(z) = Correction No.

YYY = Report Type (UL/CB/IEC)

Date Modified (Year-Month-Day)	Modifications Made (include Report Reference Number)	Modified By

Test Report issued under the responsibility of:



TEST REPORT
IEC 61010-1
Safety requirements for electrical equipment for measurement, control, and
laboratory use
Part 1: General requirements

Report Reference No.: E527278-D1001-1/A0/C0-UL

Date of issue: 2023-04-28

Total number of pages: 75

Testing Laboratory: UL-CCIC Company Limited
 Address: No. 2, Chengwan Road, Suzhou Industrial Park, 215122, Suzhou
 China

Applicant's name: Jiangsu Acrel Electrical Manufacturing. Co., Ltd.
 Address: No.31, Hongtu Road, Nanzha Street, Jiangyin City, Jiangsu
 Province, China
 China

Test specification:

Standard: IEC 61010-1:2010, AMD1:2016

Test procedure: UL Certification

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

Test Report Form No.....: IEC61010_1L

General disclaimer:

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

This report shall not be reproduced, except in full, without the written approval of the Issuing UL testing laboratory. The authenticity of this Test Report and its contents can be verified by contacting UL.

Test item description:	Power meter	
Trade Mark:		
Manufacturer:	Same as Applicant	
Model/Type reference:	DJSF1352-RN/D	
Ratings:	Model: DJSF1352-RN/D Power input: 230Vac (-10% to 10%), 45-65Hz, Power consumption ≤ 3W, OVCIII. Voltage measurement: CAT III,10-1000Vdc Measurement Current: 75mV Voltage output: ±12Vdc, 50mA Switch output: 24V, max.5mA, resistive	
Testing procedure and testing location:		
<input checked="" type="checkbox"/> UL/DAP Testing Laboratory:		
Testing location/ address:	UL-CCIC Company Limited No. 2, Chengwan Road, Suzhou Industrial Park, 215122, Suzhou China	
Tested by (name, function, signature):	Sandy Fu/Pauline wu, handler	<i>Sandy Fu</i> <i>Pauline wu</i>
Approved by (name, function, signature):	Rudy Manzano , reviewer	
<input type="checkbox"/> Testing procedure: WMT:		
Testing location/ address:		
Tested by (name, function, signature):		
Approved by (name, function, signature):		

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

Refer to Appendix A of this report. All attachments are included within this report.

Summary of testing

Tests performed (name of test and test clause):

Testing location:

Refer to the Test List in Appendix D of this report if testing was performed as part of this evaluation.

Copy of marking plate

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective owners of these marks.

Refer to the enclosure(s) titled Marking Label in the Enclosures section in Appendix A of this report for a copy.

Test item particulars :	
Type of item:	Measurement
Description of equipment function:	Power Meter
Connection to mains supply:	Permanent
Overvoltage category:	III
Pollution degree:	2
Means of protection:	Class II (isolated)
Environmental conditions:	Extended: -25~55°C/ humidity <95% non-condensing/max. 2000 m altitude
For use in wet locations:	No
Equipment mobility:	Built-in
Operating conditions:	Continuous
Overall size of equipment (W x D x H)	72*71*87.8 mm
Mass of equipment (kg):	0.206
Marked degree of protection to IEC 60529:	N/A
Testing	
Date of receipt of test item(s)	2023-02-14
Dates tests performed	2023-02-20 to 2023-04-03
Possible test case verdicts:	
- test case does not apply to the test object	N/A
- test object does meet the requirement.....	Pass (P)
- test object was not evaluated for the requirement	N/E
- test object does not meet the requirement.....	Fail (F)
Abbreviations used in the report:	
- normal condition: N.C.	- single fault condition: S.F.C.
General remarks:	
The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.	
Throughout this report a point is used as the decimal separator.	
GENERAL PRODUCT INFORMATION:	
Report Summary	
All applicable tests according to the referenced standard(s) have been carried out. Refer to the Report Modifications for any modifications made to this report.	
Product Description	
The equipment is open type multifunction meter, which used as a built-in equipment to measure voltage, current and power measurements.	
Model Differences	
N/A	
Additional Information	

UL 61010-2-201, Second Edition, CSA C22.2 No. 61010-2-201, Second Edition, only sub-clauses 4.4.2.101 are used for evaluating pulse output resistive load overload test
The trf for UL/CSA 61010-2-201 is not provided since only sub-clauses 4.4.2.101 are used for evaluating pulse output resistive load overload test.

Technical Considerations

- The product was investigated to the following standards:

Main Standard(s):

UL 61010-1, 3rd Edition, May 11, 2012, Revised July 19 2019, CAN/CSA-C22.2 No. 61010-1-12, 3rd Edition, Amendment 1:2018, Revision dated November 21 2018

From Country Differences:

- USA: UL 61010-1, 3rd Edition, May 11, 2012, Revised July 19, 2019
- Canada: CAN/CSA-C22.2 No. 61010-1(2012-05), 3rd Edition, with revisions through 2018-11

Additional Standards:

UL 61010-2-030, Second Edition, CSA C22.2 NO. 61010-2-030:18, Second Edition.

- The following additional investigations were conducted: N/A
- The product was not investigated to the following standards or clauses: N/A
- The following accessories were investigated for use with the product: N/A
- N/A

Engineering Conditions of Acceptability

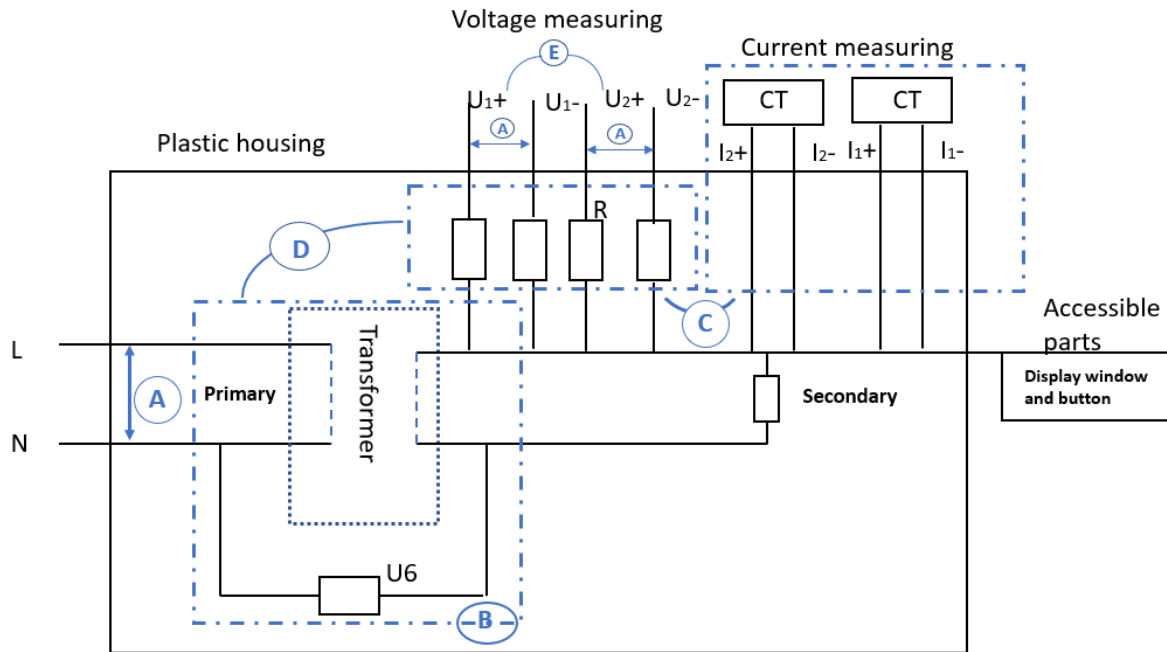
When installed in an end-product, consideration must be given to the following:

N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict

Insulation Diagram - (001) insulation diagram

Insulation Diagram - (001) insulation diagram



Location	A	B,C	D	E (U1 to U2)
Insulation	FI	DI	BI	DI

4	TESTS		Pass
4.4	Testing in single fault conditions		Pass
4.4.1	Fault tests		Pass
4.4.2	Application of single fault conditions		Pass
4.4.2.1	single fault conditions not covered by 4.4.2.2 to 4.4.2.14		Pass
4.4.2.2	Protective impedance		Pass
4.4.2.3	Protective conductor		N/A
4.4.2.4	Equipment or parts for short-term or intermittent operation		N/A
4.4.2.5	Motors		-
	– stopped while fully energized		N/A
	– prevented from starting		N/A
	– one phase interrupted (multi-phase)		N/A
4.4.2.6	Capacitors		N/A
4.4.2.7	Mains transformers		Pass
4.4.2.7.2	Short circuit	see test datasheet	Pass
4.4.2.7.3	Overload	see test datasheet	Pass

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.4.2.8	Outputs	Voltage output +/- 12Vdc, 50mA. Connected to external sensor	Pass
4.4.2.9	Equipment for more than one supply		N/A
4.4.2.10	Cooling		-
	– air holes closed		N/A
	– fans stopped		N/A
	– coolant stopped		N/A
	– loss of cooling liquid		N/A
4.4.2.11	Heating devices		-
	– timer overridden		N/A
	– temperature controller overridden		N/A
4.4.2.12	Insulation between circuits and parts		N/A
4.4.2.13	Interlocks		N/A
4.4.2.14	Voltage selectors		N/A
4.4.3	Duration of tests		-
4.4.4	Conformity after application of fault conditions		Pass
5	MARKING AND DOCUMENTATION		Pass
5.1	Marking		Pass
5.1.1	General		Pass
	Required equipment markings		-
	– Visible from the exterior; or		Pass
	– Visible after removing cover or opening door		N/A
	– Visible after removal from a rack or panel		N/A
	Not put on parts which can be removed by an operator		N/A
	Letter symbols (IEC 60027) used		Pass
	Graphic symbols of Table 1 used		Pass
5.1.2	Identification		Pass
	Equipment is identified by		-
	a) Manufacturer's or supplier's name or trademark		Pass
	b) Model number, name or other means		Pass
	Manufacturing location identified		N/A
5.1.3	mains supply		Pass
	Equipment is marked as follows		-
	a) Nature of supply		-

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	1) a.c. rated mains frequency or range of frequencies	45-65 Hz	-
	2) d.c. with symbol 1		-
	b) rated supply voltage(s) or range	230Vac	-
	c) Max. rated power (W or VA) or input current		-
	The marked value not less than 90 % of the maximum value	see test datasheet	Pass
	If more than one voltage range		-
	Separate values marked; or		N/A
	Values differ by less than 20 %		N/A
	d) operator-set for different rated supply voltages		-
	Indicates the equipment set voltage		N/A
	portable equipment indication is visible from the exterior		N/A
	Changing the setting changes the indication		N/A
	e) Accessory mains socket-outlets accepting standard mains plugs are marked		-
	With the voltage if it is different from the mains supply voltage		-
	For use only with specific equipment		N/A
	If not marked for specific equipment it is marked with		-
	The maximum rated current or power; or		N/A
	Symbol 14 with full details in the documentation		N/A
5.1.4	Fuses		N/A
	operator replaceable fuse marking (see also 5.4.5)		-
5.1.5	Terminals, connections and operating devices		Pass
5.1.5.1	General		Pass
	Where necessary for safety, indication of purpose of terminals, connectors, controls and indicators marked		Pass
	If insufficient space, symbol 14 used		N/A
	Push-buttons and actuators of emergency stop devices and indicators		-
	– used only to indicate a warning of danger; or		N/A
	– the need for urgent action		N/A
	– coloured red		N/A
	– coded as specified in IEC 60073		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Supplementary means of coding provided, if meaning of colour relates (see IEC 60073)		-
	– to safety of persons; or		N/A
	– safety of the environment		N/A
5.1.5.2	terminals		-
	mains supply terminal identified		Pass
	Other terminal marking		-
	a) functional earth terminals marked with symbol 5		N/A
	b) protective conductor terminals		-
	Symbol 6 is placed close to or on the terminal; or		N/A
	Part of appliance inlet		N/A
	c) terminals of circuits (symbol 7 used)		N/A
	d) Hazardous live terminals supplied from the interior		N/A
	Standard mains socket outlet used; or		N/A
	ratings marked; or		N/A
	Symbol 14 used		N/A
5.1.6	Switches and circuit-breakers		N/A
	If disconnecting device, off position clearly marked		N/A
	If push-button used as power supply switch		-
	– Symbol 9 and 15 used for on-position		N/A
	– Symbol 10 and 16 used for off-position		N/A
	– Pair of symbols 9, 15 and 10, 16 close together		N/A
5.1.7	Equipment protected by double insulation or reinforced insulation		Pass
	Protected throughout (symbol 11 used)		N/A
	Only partially protected (symbol 11 not used)		Pass
5.1.8	Field-wiring terminal boxes		Pass
	If terminal or enclosure exceeds 60 °C		-
	Cable temperature rating marked	Symbol 14 is affixed on the product. The manufacturer's instructions include the information of minimum temperature rating of wire.	-
	Marking visible before and during connection or beside terminal		Pass
5.2	Warning markings		Pass
	Visible when ready for normal use		Pass

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Are near or on applicable parts		Pass
	Symbols and text correct dimensions and colour		-
	a) Symbols min 2,75 mm and text 1,5 mm high and contrasting in colour with background		Pass
	b) Symbols and text moulded, stamped or engraved in material min. 2,0 mm high and		N/A
	0,5 mm depth or raised if not contrasting in colour		N/A
	If necessary marked with symbol 14, or		N/A
	Additional symbols such as symbol 12, 13 or 17 used to indicate the nature of hazard		N/A
	Statement to place equipment in a safe state before access by using a tool to hazardous parts is permitted		N/A
5.3	Durability of markings	the product is open type. The test is waived since the customer declare the product only could be cleaned by dry cloth in manual.	N/A
	The required markings remain clear and legible in normal use		N/A
5.4	Documentation		Pass
5.4.1	General		Pass
	Equipment is accompanied by documentation for safety purposes for operator or responsible body		Pass
	Safety documentation for service personnel authorized by the manufacturer		Pass
	Documentation necessary for safe operation is provided in printed media or		Pass
	in electronic media if available at any time		N/A
	Documentation includes		-
	a) Intended use		Pass
	b) Technical specification		Pass
	c) Name and address of manufacturer or supplier		Pass
	d) Information specified in 5.4.2 to 5.4.6		Pass
	e) Information to mitigate residual risk (see also subclause 17)		N/A
	f) Accessories for safe operation of the equipment specified		N/A
	g) Guidance provided to check correct function of the equipment, if incorrect reading may cause a hazard from harmful or corrosive substances of hazardous live parts		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	h) Instructions for lifting and carrying		N/A
	Warning statements and a clear explanation of warning symbols		-
	– provided in the documentation; or		Pass
	– information is marked on the equipment		N/A
5.4.2	Equipment ratings		Pass
	Documentation includes		-
	a) Supply voltage or voltage range		-
	Frequency or frequency range		-
	Power or current rating		-
	b) Description of all input and output connections in accordance to 6.6.1 a)		Pass
	c) rating of insulation of external circuits in accordance to 6.6.1 b)		N/A
	d) Statement of the range of environmental conditions (refer to 1.4)		-
	1) indoor or outdoor use,	indoor	Pass
	2) altitude,	2000 m	Pass
	3) temperature,	(-25 to 55 degree C)	Pass
	4) relative humidity,	5% to 95%	Pass
	5) mains supply voltage fluctuations,	±10%	Pass
	6) overvoltage category,	III	Pass
	7) wet location, if applicable,		N/A
	8) pollution degree of the intended environment	2	Pass
	e) Degree of ingress protection (IEC 60529)		N/A
	f) If impact rating less than 5 J		-
	IK code in accordance to IEC 62262 marked; or		N/A
	symbol 14 of Table 1 marked, with		N/A
	rated energy level and test method stated		N/A
5.4.3	Equipment installation		Pass
	Documentation includes instructions for		-
	a) Assembly, location and mounting requirements		Pass
	b) Instructions for protective earthing		N/A
	c) Connections to supply		Pass
	d) permanently connected equipment		-
	1) Supply wiring requirements		Pass

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	2) If external switch or circuit-breaker, requirements and location recommendation	A external circuit-breaker must be included in the installation.	Pass
	e) Ventilation requirements		N/A
	f) Safety characteristics for special external services (e. g. maximum and minimum temperature, pressure, flow of air, cooling liquid)		N/A
	g) Instructions relating to sound level		N/A
5.4.4	Equipment operation		Pass
	Instructions for use include		-
	a) Identification and description of operating controls		Pass
	b) Positioning for disconnection		N/A
	c) Instructions for interconnection to accessories or other equipment		Pass
	d) Specification of intermittent operation limits		N/A
	e) Explanation of symbols used		Pass
	f) Replacement of consumable materials		N/A
	g) Cleaning and decontamination		N/A
	h) Listing of any poisonous or injurious gases and quantities		N/A
	i) risk reduction procedures relating to flammable liquids (see 9.5 c)		N/A
	j) risk reduction procedures relating burn from surfaces permitted to exceed limits of 10.1		N/A
	Additional precautions for IEC 60950 conforming equipment in regard to moistures and liquids		N/A
	A statement about protection impairment if used in a manner not specified by the manufacturer		Pass
5.4.5	Equipment maintenance and service		Pass
	Instructions for responsible body include		-
	Instructions sufficient in detail permitting safe maintenance and inspection and continued safety		-
	Instruction against the use of detachable mains supply cord with inadequate rating		N/A
	Specific battery type of user replaceable batteries		Pass
	Any manufacturer specified parts		N/A
	rating and characteristics of fuses		N/A
	Instructions include following subjects permitting safe servicing and continued safety		-

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	a) Product specific risks may affect service personnel		N/A
	b) Protective measures for these risks		N/A
	c) Verification of the safe state after repair		N/A
5.4.6	Integration into systems or effects resulting from special conditions		Pass
	Aspects described in documentation		Pass
6	PROTECTION AGAINST ELECTRIC SHOCK		Pass
6.1	General		Pass
6.1.1	Requirements		Pass
	Protection against electric shock maintained in normal condition and single fault condition		Pass
	accessible parts not hazardous live		Pass
	Voltage, current, charge or energy below the limits in normal condition and in single fault condition between		-
	accessible parts and earth		Pass
	two accessible parts on same piece of the equipment within a distance of 1,8 m		Pass
	Conformity is checked by the determination of 6.2 and 6.3 followed by the tests of 6.4 to 6.11		Pass
6.1.2	Exceptions		N/A
	Following hazardous live parts may be accessible to an operator		-
	a) parts of lamps and lamp sockets after lamp removal		N/A
	b) parts to be replaced by operator only by the use of tool and warning marking		N/A
	Those parts not hazardous live 10 s after interruption of supply		N/A
	Capacitance test if charge is received from internal capacitor		N/A
6.2	Determination of accessible parts		Pass
6.2.1	General		Pass
	Unless obviously determination of accessible parts as specified in 6.2.2 to 6.2.4		Pass
6.2.2	Examination		N/A
	– with jointed test finger (as specified B.2)		N/A
	– with rigid test finger (as specified B.1) and a force of 10 N		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
6.2.3	Openings above parts that are hazardous live		N/A
	– test pin with length of 100 mm and 4 mm in diameter applied		N/A
6.2.4	Openings for pre-set controls		N/A
	– test pin with length of 100 mm and 3 mm in diameter applied		N/A
6.3	Limit values for accessible parts		Pass
6.3.1	Levels in normal condition		Pass
	a) Voltage limits less than 30 V r.m.s. and 42,4 V peak or 60 V d.c.	see test datasheet	Pass
	for wet locations voltage limits less than 16 V r.m.s. and 22,6 V peak or 35 V d.c.		N/A
	Voltages are not hazardous live the levels of		-
	b) Current less than 0,5 mA r.m.s. for sinusoidal, 0,7 mA peak non-sinusoidal or mixed frequencies or 2 mA d.c. when measured with measuring circuit A.1 or A.2 if less than 100 Hz		N/A
	for wet locations measuring circuit A.4 used		N/A
	70 mA r.m.s. when measured with circuit A.3 for higher frequencies		N/A
	c) Levels of capacitive charge or energy less		-
	1) 45 μ C for voltages up to 15 kV peak or d.c. or line A of Figure 3		N/A
	2) 350 mJ stored energy for voltages above 15 kV peak or d.c.		N/A
6.3.2	Levels in single fault condition		Pass
	a) Voltage limits less than 50 V r.m.s. and 70 V peak or 120 V d.c.	see test datasheet	Pass
	for wet locations voltage limits less than 33 V r.m.s. and 46,7 V peak or 70 V d.c.		N/A
	Voltages are not hazardous live the levels of		-
	b) Current less than 3,5 mA r.m.s. for sinusoidal, 5 mA peak non-sinusoidal or mixed frequencies or 15 mA d.c. when measured with measuring circuit A.1 or A.2 if less than 100 Hz		N/A
	for wet locations measuring circuit A.4 used		N/A
	500 mA r.m.s. when measured with circuit A.3 for higher frequencies		N/A
	c) Levels of capacitive charge or energy less line B of Figure 3		N/A
6.4	Primary means of protection		Pass
6.4.1	General		Pass

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Accessible parts prevented from being hazardous live by one or more of following means		-
	a) enclosures or protective barriers (see 6.4.2)		Pass
	b) basic insulation (see 6.4.3)		Pass
	c) Impedance (see 6.4.4)		N/A
6.4.2	Enclosures or protective barriers		N/A
	– meet rigidity requirements of 8.1		N/A
	– meet requirements for basic insulation, if protection is provided by insulation		N/A
	– meet requirements of 6.7 for creepage and clearances between accessible parts and hazardous live parts, if protection is provided by limited access		N/A
6.4.3	Basic insulation		Pass
	– meet clearance, creepage distance and solid insulation requirements of 6.7		Pass
6.4.4	Impedance		N/A
	Impedance used as primary means of protection meets all the following requirements		-
	a) limits current or voltage to level of 6.3.2		N/A
	b) rated for maximum working voltage and the amount of power it will dissipate		N/A
	c) clearance, creepage distance between terminations of the impedance meet requirements of basic insulation of 6.7		N/A
6.5	Additional means of protection in case of single fault condition		Pass
6.5.1	General		Pass
	Accessible parts are prevented from becoming hazardous live by the primary means of protection and supplemented by one of		-
	a) protective bonding (see 6.5.2)		N/A
	b) supplementary insulation (see 6.5.3)		Pass
	c) automatic disconnection of the supply (see 6.5.5)		N/A
	d) current- or voltage-limiting device (see 6.5.6)		N/A
	Alternatively one of the single means of protection is used		-
	e) reinforced insulation (see 6.5.3)		Pass
	f) protective impedance (see 6.5.4)		Pass
6.5.2	Protective bonding		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
6.5.2.1	General		N/A
	Accessible conductive parts, may become hazardous live in single fault condition		-
	Bonded to the protective conductor terminal; or		N/A
	Separated by conductive screen or barrier bonded to protective conductor terminal		N/A
6.5.2.2	Integrity of protective bonding		-
	a) protective bonding consists of directly connected structural parts or discrete conductors or both; and withstands thermal and dynamic stresses		N/A
	b) Soldered connections		-
	Independently secured against loosening		N/A
	Not used for other purposes		N/A
	c) Screw connections are secured		N/A
	d) protective bonding not interrupted; or		N/A
	except as removable part that carries mains supply input connection to the whole equipment		N/A
	e) Any movable protective bonding connection specifically designed, and meets 6.5.2.4		N/A
	f) No external metal braid of cables used (not regarded as protective bonding)		N/A
	g) If mains supply passes through		-
	Means provided for passing protective conductor;		N/A
	Impedance meets 6.5.2.4		N/A
	h) Protective conductors bare or insulated, if insulated, green/yellow		N/A
	Exceptions		-
	1) earthing braids;		N/A
	2) internal protective conductors etc.;		N/A
	Green/yellow not used for other purposes		N/A
	terminal suitable for connection of a protective conductor, and meets 6.5.2.3		N/A
6.5.2.3	Protective conductor terminal		-
	a) Contact surfaces are metal		N/A
	b) Appliance inlet used		N/A
	c) For rewirable cords and permanently connected equipment, protective conductor terminal is close to mains supply terminals		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	d) If no mains supply is required, any protective conductor terminal		-
	Is near terminals of circuit for which protective earthing is necessary		N/A
	External if other terminals external		N/A
	e) Equivalent current-carrying capacity to mains supply terminals		N/A
	f) If plug-in, makes first and breaks last		N/A
	g) If also used for other bonding purposes, protective conductor		-
	Applied first;		N/A
	Secured independently;		N/A
	Unlikely to be removed by servicing		N/A
	h) Protective conductor of measuring circuit		-
	1) Current rating equivalent to measuring circuit terminal;		N/A
	2) protective bonding: not interrupted by any switch or interrupting device		N/A
	i) functional earth terminals allow independent connection		N/A
	j) If a binding screw used for Protective conductor terminal		-
	Suitable size for bond wire		N/A
	Not smaller than M 4		N/A
	At least 3 turns of screw engaged		N/A
	Passes tightening torque test		N/A
	k) Contact pressure not capable being reduced by deformation of materials		N/A
6.5.2.4	Impedance of protective bonding of plug-connected equipment		N/A
	Impedance between protective conductor terminal and each accessible part where protective bonding is specified, is		-
	– less than 0,1 Ohm; or		N/A
	– less than 0,2 Ohm if equipment is provided with non-detachable cord		N/A
6.5.2.5	Impedance of protective bonding of permanently connected equipment		N/A
6.5.2.6	Transformer protective bonding screen		N/A
	Transformer provided with screen for protective bonding		-

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Clause	Requirement + Test	Result - Remark	Verdict
	screen bonding consists of directly connected structural parts or discrete conductors or both; and withstands thermal and dynamic stresses (see 6.5.2.2 a)		N/A
	screen bonding with soldered connection (see 6.5.2.2 b) is		-
	– Independently secured against loosening		N/A
	– Not used for other purposes		N/A
6.5.3	Supplementary and reinforced insulation		Pass
	Meet clearance, creepage distance and solid insulation requirements of 6.7		Pass
6.5.4	Protective impedance	(see Form A.12)	Pass
	Limits current or voltage to level of 6.3.1 in normal and to level of 6.3.2 in single fault condition		Pass
	clearance, creepage distance between terminations of the impedance meet requirements of double or reinforced insulation of 6.7	(see Form A.15)	Pass
	The protective impedance consists of one or more of the following		-
	a) appropriate single component suitable for safety and reliability for protection, it is		-
	1) rated twice the maximum working voltage		N/A
	2) resistor rated for twice the power dissipation for maximum working voltage		N/A
	b) combination of components		Pass
	Single electronic device not used as protective impedance		N/A
6.5.5	Automatic disconnection of the supply		N/A
	a) rated to disconnect the load within time specified in Figure 2		N/A
	b) rated for the maximum load conditions of the equipment		N/A
6.5.6	Current- or voltage-limiting devices		N/A
	Device complies with all of		-
	a) rated to limit the current or voltage to the level of 6.3.2		N/A
	b) rated for the maximum working voltage; and		N/A
	rated for the maximum operational current if applicable		N/A
	c) clearance, creepage distance between terminations of the impedance meet requirements of supplementary insulation of 6.7		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
6.6	Connections to external circuits		Pass
6.6.1	General		Pass
	Connections do not cause accessible parts of the following to become hazardous live in normal condition or single fault condition		-
	– the external circuits		Pass
	– the equipment		Pass
	Protection achieved by separation of circuits; or		Pass
	short circuit of separation does not cause a hazard		N/A
	Instructions or markings for each terminal include		-
	a) rated conditions for terminal		Pass
	b) Required rating of external circuit insulation		Pass
6.6.2	Terminals for external circuits		N/A
	Terminals which receive a charge from an internal capacitor are not hazardous live after 10 s of interrupting supply connection		N/A
6.6.3	Circuits with terminals which are hazardous live		Pass
	These circuits are		-
	Not connected to accessible conductive parts; or		Pass
	Connected to accessible conductive parts, but are not mains circuits and have one terminal contact at earth potential		N/A
	No accessible conductive parts are hazardous live		Pass
6.6.4	Terminals for stranded conductors		Pass
	No risk of accidental contact because		-
	– Located or shielded		Pass
	– Self-evident or marked whether or not connected to accessible conductive parts		Pass
	Complies as applicable		-
	a) Manufacturer's specified maximum length of removed insulation, or		N/A
	b) 8 mm length of insulation removed		Pass
6.7	Insulation requirements		Pass
6.7.1	The nature of insulation		Pass
6.7.1.1	General		Pass
	Insulation between accessible parts or between separate circuits consist of clearances, creepage distances and solid insulation if provided as protection against a hazard		Pass

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Clause	Requirement + Test	Result - Remark	Verdict
6.7.1.2	Clearances		Pass
	Required clearances reflecting factors of 6.7.1.1		Pass
	Equipment rated for operating altitude greater than 2000 m correction factor of Table 3 of 61010-1 applied		N/A
6.7.1.3	Creepage distances		Pass
	Required creepage distances reflecting factors of 6.7.1.1 a) to d)		Pass
	CTI material group reflected by requirements		Pass
	CTI test performed		N/A
6.7.1.4	Solid insulation		Pass
	Required solid insulation reflecting factors of 6.7.1.1 a) to d)		Pass
6.7.1.5	Requirements for insulation according to type of circuit		Pass
	a) 6.7.2 mains circuits of overvoltage category II up to nominal supply voltage of 300 V		N/A
	b) 6.7.3 secondary circuits separated from circuits defined in a) by transformer		N/A
	c) K.1 mains circuits of overvoltage category III and IV or overvoltage category II over 300 V		Pass
	d) K.2 secondary circuits separated from circuits defined in c) by transformer		N/A
	e) K.3 circuits having one or more of		-
	1) maximum transient overvoltage is limited to known level below the level of mains circuit		N/A
	2) maximum transient overvoltage above the level of mains circuit		N/A
	3) Working voltage is the sum of more than one circuit or a mixed voltage		N/A
	4) Working voltage includes recurring peak voltage, may include non-sinusoidal or non-periodic waveform		Pass
	5) Working voltage with a frequency above 30 kHz		N/A
6.7.2	Insulation for mains circuits of overvoltage category II with a nominal supply voltage up to 300 V		N/A
6.7.2.1	Clearances and creepage distances		-
	Values for mains circuits of Table 4 are met		N/A
	Coatings to achieve reduction to pollution degree 1 comply with requirements of Annex H		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
6.7.2.2	Solid insulation		N/A
6.7.2.2.1	General		N/A
	Withstands electrical and mechanical stresses in normal use and all rated environmental conditions of 1.4		N/A
	Equipment passed voltage tests of 6.8.3 with values of Table 5		N/A
	Complies as applicable		-
	a) enclosure or protective barrier of Clause 8		N/A
	b) moulded and potted parts requirements of 6.7.2.2.2		N/A
	c) inner layers of printed wiring boards requirements of 6.7.2.2.3		N/A
	d) thin-film insulation requirements of 6.7.2.2.4		N/A
6.7.2.2.2	Moulded and potted parts		-
	Conductors between same two layers are separated by at least 0,4 mm after moulding is completed		N/A
6.7.2.2.3	Inner insulating layers of printed wiring boards		-
	Separated by at least 0,4 mm between same two layers		N/A
	Reinforced insulation have adequate electric strength; one of following methods used		-
	a) thickness of insulation is at least 0,4 mm		N/A
	b) insulation is assembled of minimum two separate layers, each rated for test voltage of Table 5 for basic insulation		N/A
	c) insulation is assembled of minimum two separate layers, where the combination is rated for test voltage of Table 5 for reinforced insulation		N/A
6.7.2.2.4	Thin-film insulation		-
	Conductors between same two layers are separated by applicable clearances and creepage distance of 6.7.2.1		N/A
	Reinforced insulation have adequate electric strength; one of the following methods used		-
	a) thickness through the insulation at least 0,4 mm		N/A
	b) insulation is assembled of min. two separate layers, each rated for test voltage of Table 5 for basic insulation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	c) insulation is assembled of min. three separate layers, where the combination of two layers passed voltage tests of 6.8.3 with values of Table 5 for reinforced insulation		N/A
6.7.3	Insulation for secondary circuits derived from mains circuits of overvoltage category II up to 300 V		N/A
6.7.3.1	General		N/A
	Secondary circuits where separation from mains circuits is achieved by a transformer providing		-
	– reinforced insulation		N/A
	– double insulation		N/A
	– screen connected to the protective conductor terminal		N/A
6.7.3.2	Clearances		N/A
	a) meet the values of Table 6 for basic insulation and supplementary insulation; or		N/A
	twice the values of Table 6 for reinforced insulation; or		N/A
	b) pass the voltage tests of 6.8 with values of Table 6;		N/A
	with following adjustments		-
	1) values for reinforced insulation are 1,6 times the values for basic insulation		N/A
	2) if operating altitude is greater than 2000 m values of clearances multiplied with factor of Table 3		N/A
	3) minimum clearance is 0,2 mm for pollution degree 2 and 0,8 mm for pollution degree 3		N/A
6.7.3.3	Creepage distances		N/A
	Based on working voltage meets the values of Table 7 for basic and supplementary insulation		N/A
	Values for reinforced insulation are twice the values of basic insulation		N/A
	Coatings to achieve reduction to pollution degree 1 comply with requirements of Annex H		N/A
6.7.3.4	Solid insulation		N/A
6.7.3.4.1	General		N/A
	Withstands electrical and mechanical stresses in normal use and all rated environmental conditions of 1.4		-

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Clause	Requirement + Test	Result - Remark	Verdict
	a) Equipment passed voltage test of 6.8.3.1 for 5 s with values of Table 6 for basic and supplementary insulation		N/A
	values for reinforced insulation are 1,6 times the values of basic insulation		N/A
	b) if working voltage exceeds 300 V, equipment passed voltage test of 6.8.3.1 for 1 min with a test voltage of 1,5 times working voltage for basic or supplementary insulation		N/A
	value for reinforced insulation are twice the working voltage		N/A
	Complies as applicable		-
	1) enclosure or protective barrier of Clause 8		N/A
	2) moulded and potted parts requirements of 6.7.3.4.2		N/A
	3) inner layers of printed wiring boards requirements of 6.7.3.4.3		N/A
	4) thin-film insulation requirements of 6.7.3.4.4		N/A
6.7.3.4.2	Moulded and potted parts		-
	Conductors between same two layers are separated by applicable distances of Table 8		N/A
6.7.3.4.3	Inner insulation layers of printed wiring boards		-
	Separated by at least the applicable distances of Table 8 between same two layers		N/A
	Reinforced insulation have adequate electric strength; one of following methods used		-
	a) thickness at least applicable distance of Table 8		N/A
	b) insulation is assembled of minimum two separate layers, each rated for test voltage of Table 6 for basic insulation		N/A
	c) insulation is assembled of min. two separate layers, where the combination is rated for 1,6 times the test voltage of Table 6		N/A
6.7.3.4.4	Thin-film insulation		-
	Conductors between same two layers are separated by applicable clearances and creepage distance of 6.7.3.2 and 6.7.3.3		N/A
	Reinforced insulation have adequate electric strength; one of following methods used		-
	a) thickness at least applicable distance of Table 8		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	b) insulation is assembled of min. two separate layers, each rated for test voltage of Table 6 for basic insulation		N/A
	c) insulation is assembled of min. three separate layers, where the combination of two layers passed voltage tests with 1,6 time values of Table 6		-
	a.c. test of 6.8.3.1; or		N/A
	d.c. test of 6.8.3.2 for circuits stressed only by d.c. voltages		N/A
6.8	Procedure for voltage tests		Pass
6.9	Constructional requirements for protection against electric shock		Pass
6.9.1	General		Pass
	If a failure could cause a hazard		-
	a) security of wiring connections		Pass
	b) screws securing removable covers		Pass
	c) accidental loosening		Pass
	d) clearances and creepage distances not reduced below the values of basic insulation by loosening of parts or wires		Pass
6.9.2	Insulating materials		Pass
	Material not to be used for safety relevant insulation		-
	a) easily damaged materials not used		Pass
	b) non-impregnated hygroscopic materials not used		Pass
6.9.3	Colour coding		N/A
	Green-and-yellow insulation shall not be used except		-
	a) protective earth conductors;		N/A
	b) protective bonding conductors;		N/A
	c) potential equalization conductors;		N/A
	d) functional earth conductors		N/A
6.10	Connection to mains supply source and connections between parts of equipment		Pass
6.10.1	Mains supply cords		N/A
	rated for maximum equipment current (see 5.1.3 c)		N/A
	Cable complies with IEC 60227 or IEC 60245		N/A
	Heat-resistant if likely to contact hot parts		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Temperature rating (cord and inlet)		-
	Green/yellow used only for connection to protective conductor terminals		N/A
	Detachable cords with IEC 60320 mains connectors		-
	Conform to IEC 60799; or		N/A
	Have the current rating of the mains connector		N/A
6.10.2	Fitting of non-detachable mains supply cords		N/A
6.10.2.1	Cord entry		-
	a) inlet or bushing with a smoothly rounded opening; or		N/A
	b) insulated cord guard protruding >5 D (diameter)		N/A
6.10.2.2	Cord anchorage		-
	Protective earth conductor is the last to take the strain		N/A
	a) cord is not clamped by direct pressure from a screw		N/A
	b) knots are not used		N/A
	c) cannot push the cord into the equipment to cause a hazard		N/A
	d) no failure of cord insulation in anchorage with metal parts		N/A
	e) not to be loosened without a tool		N/A
	f) cord replacement does not cause a hazard and method of strain relief is clear		N/A
	Push-pull and or torque test		N/A
6.10.3	Plugs and connectors		N/A
	Mains supply plugs, connectors etc., conform with relevant specifications		N/A
	If equipment supplied at voltages below 6.3.2.a) or from a sole source		-
	Plugs of supply cords do not fit mains sockets above rated supply voltage		N/A
	Mains type plugs used only for connection to mains supply		N/A
	Plug pins which receive a charge from an internal capacitor		N/A
	Accessory mains socket outlets		-
	a) marking if accepts a standard mains supply plug (see 5.1.3e)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	b) input has a protective earth conductor if outlet has earth terminal contact		N/A
6.11	Disconnection from supply source		Pass
6.11.1	Disconnects all current-carrying conductors		Pass
6.11.2	Exceptions		N/A
6.11.3	Requirements according to type of equipment		Pass
6.11.3.1	Permanently connected equipment and multi-phase equipment		Pass
	Employs switch or circuit-breaker		Pass
	If switch or circuit-breaker is not part of the equipment, documentation requires	A external circuit-breaker must be included in the installation.	-
	a) switch or circuit-breaker to be included in building installation		Pass
	b) suitable location easily reached		Pass
	c) marking as disconnecting for the equipment		Pass
6.11.3.2	Single-phase cord-connected equipment		N/A
	Equipment is provided with one of the following		-
	a) switch or circuit-breaker		N/A
	b) appliance coupler (disconnectable without tool)		N/A
	c) separable plug (without locking device)		N/A
6.11.4	Disconnecting devices		N/A
6.11.4.1	General		N/A
	Disconnecting device part of equipment		N/A
	Electrically close to the supply		N/A
	Power-consuming components not electrically located between the supply source and the disconnecting device		N/A
	Except electromagnetic interference suppression circuits permitted to be located on the supply side of the disconnecting device		N/A
6.11.4.2	Switches and circuit-breakers		N/A
	When used as disconnection device		-
	Circuit breaker meets the relevant requirements IEC 60947-2 and is suitable for the application		N/A
	Switch meets the relevant requirements IEC 60947-3 and is suitable for the application		N/A
	Marked to indicate function		-
	Not incorporated in mains cord		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Does not interrupt protective earth conductor		N/A
6.11.4.3	Appliance couplers and plugs		N/A
	Where an appliance coupler or separable plug is used as the disconnecting device (see 6.11.3.2)		-
	Readily identifiable and easily reached by the operator		N/A
	Single-phase portable equipment cord length not more than 3 m		N/A
	Protective earth conductor connected first and disconnected last		N/A
7	PROTECTION AGAINST MECHANICAL HAZARDS		N/A
7.1	General	open type	N/A
	Equipment does not cause a mechanical hazard in normal nor in single fault condition		N/A
	Conformity is checked by 7.2 to 7.7		N/A
7.2	Sharp edges		N/A
	Easily-touched parts are smooth and rounded		N/A
	Do not cause injury during normal use and		N/A
	Do not cause injury during single fault condition		N/A
7.3	Moving parts		N/A
7.3.1	General		N/A
	Hazards from moving parts limited to a tolerable level with the conditions specified in 7.3.2 and 7.3.5		N/A
	Risk assessment in accordance with 7.3.3 carried out		N/A
7.3.2	Exceptions		N/A
	Access to hazardous moving parts permitted under following circumstances		-
	a) obviously intended to operate on parts or materials external of the equipment		N/A
	inadvertent touching of moving parts minimized by equipment design (e .g. guards or handles)		N/A
	b) If operator access is unavoidable outside normal use following precautions have been taken		-
	1) access requires tool		N/A
	2) statement about training in the instructions		N/A
	3) warning markings on covers prohibiting access by untrained operators		N/A
	or symbol 14 with full details in documentation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
7.3.3	Risk assessment for mechanical hazards to body parts		N/A
	Risk is reduced to a tolerable level by protective measures as specified in Table 12		N/A
	Minimum protective measures		-
	A. Low level measures		N/A
	B. Moderate measures		N/A
	C. Stringent measures		N/A
7.3.4	Limitation of force and pressure		N/A
	Following levels are met in normal and single fault condition		-
	Continuous contact pressure below 50 N / cm ² with force below 150 N		N/A
	Temporary force below 250 N for an area at least of 3 cm ² for a maximum duration of 0,75 s		N/A
7.3.5	Gap limitations between moving parts		N/A
7.3.5.1	Access normally allowed		-
	If levels of 7.3.4 exceeded and a body part may be inserted minimum gap as specified in Table 13 assured in normal and in single fault condition		N/A
7.3.5.2	Access normally prevented		-
	Maximum gap as specified in Table 14 assured in normal and in single fault condition		N/A
7.4	Stability		N/A
	Equipment not secured to building structure is physical stable		N/A
	Stability maintained after opening of drawers etc. by automatic means, or		N/A
	warning marking requires the application of means		N/A
	Compliance checked by following tests as applicable		-
	a) 10° tilt test for other than handheld equipment		N/A
	b) multi-directional force test for equipment exceeds height of 1 m and mass of 25 kg		N/A
	c) downward force test for floor-standing equipment		N/A
	d) overload test with 4 times maximum load for castor or support foot that supports greatest load, or		N/A
	e) castor or support foot that supports greatest load removed from equipment		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
7.5	Provisions for lifting and carrying		N/A
7.5.1	General		N/A
	Equipment more than 18 kg		N/A
	Has means for lifting or carrying; or		N/A
	Directions are given in documentation		N/A
7.5.2	Handles and grips		N/A
	Handles or grips withstand four times weight		N/A
7.5.3	Lifting devices and supporting parts		N/A
	rated for maximum load; or		N/A
	Tested with four times maximum static load		N/A
7.6	Wall mounting		N/A
	Mounting brackets withstand four times weight		N/A
	One fastener removed and test repeated with two times weight		N/A
7.7	Expelled parts		N/A
	Equipment contains or limits the energy		N/A
	Protection not removable without the aid of a tool		N/A
8	RESISTANCE TO MECHANICAL STRESSES		N/A
8.1	General	open type	N/A
	Equipment does not cause a hazard when subjected to mechanical stresses in normal use		N/A
	Normal protection level is 5 J		N/A
	Levels below 5 J but not less than 1 J are acceptable if all of the following criteria are met		-
	a) Lower level justified by risk assessment of manufacturer		N/A
	b) Equipment installed in its intended application is not easily touched		N/A
	c) Only occasional access during normal use		N/A
	d) IK code in accordance to IEC 62262 marked or symbol 14 used with full information in the documentation		N/A
	for non-metallic enclosures rated below 2 °C ambient temperature value chosen for minimum rated temperature		N/A
	impact energies between IK values, the IK code marked for nearest lower value		N/A
	Conformity is checked by performing following tests		-

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Clause	Requirement + Test	Result - Remark	Verdict
	1) Static test of 8.2.1		N/A
	2) Impact test of 8.2.2 with 5 J except for hand-held equipment		N/A
	if specified impact energy is not 5 J alternate method of IEC 62262 used		N/A
	3) Drop test of 8.3.1 or 8.3.2 except for fixed equipment and equipment with mass over 100 kg		N/A
	Equipment rated with an impact rating of IK 08 that obviously meets the criteria		N/A
	After the tests inspection with following results		-
	– hazardous live parts above the limits of 6.3.2 not accessible		N/A
	– insulation pass the voltage tests of 6.8		N/A
	i) No leaks of corrosive and harmful substances		N/A
	ii) enclosure shows no cracks resulting in a hazard		N/A
	iii) clearances not less than their permitted values		N/A
	iv) Insulation of internal wiring remains undamaged		N/A
	v) protective barriers not damaged or loosened		N/A
	vi) No moving parts exposed, except permitted by 7.3		N/A
	vii) No damage which could cause spread of fire		N/A
8.2	Enclosure rigidity test		N/A
8.2.1	Static test		N/A
	– 30 N with 12 mm rod applied to each part of enclosure		N/A
	– in case of doubt test conducted at maximum rated ambient temperature		N/A
8.2.2	Impact test		N/A
	Impact applied to any part of enclosure causing a hazard if damaged		N/A
	Impact energy level and corresponding IK code		-
	Non-metallic enclosures cooled to minimum rated ambient temperature if below 2 °C		N/A
8.3	Drop test		N/A
8.3.1	Other than hand-held and direct-plug-in equipment		N/A
	Tests conducted with a drop height or angle of		-
8.3.2	hand-held and direct-plug-in equipment		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Non-metallic enclosures cooled to minimum rated ambient temperature if below 2 °C		N/A
	Drop test conducted with an height of 1 m		N/A
9	PROTECTION AGAINST THE SPREAD OF FIRE		Pass
9.1	General		Pass
	No spread of fire in normal and single fault condition		Pass
	Mains supplied equipment meets requirements of 9.6 additionally		Pass
	Conformity is checked by minimum one or a combination of the following (see Figure 11)		-
	a) Single Fault test of 4.4; or		Pass
	b) Application of 9.2 (eliminating or reducing the sources of ignition); or		N/A
	c) Application of 9.3 (containment of fire within the equipment)		Pass
9.2	Eliminating or reducing the sources of ignition within the equipment		N/A
	a) 1) Limited-energy circuit (see 9.4); or		N/A
	2) basic insulation provided for parts of different potential; or		N/A
	Bridging the insulation does not cause ignition		N/A
	b) Surface temperature of liquids and parts (see 9.5)		N/A
	c) No ignition in circuits designed to produce heat		N/A
9.3	Containment of the fire within the equipment, should it occur		Pass
9.3.1	General		Pass
	Spread of fire outside equipment reduced to a tolerable level if		-
	a) Energizing of the equipment is controlled by an operator held switch		N/A
	b) Enclosure is conform with constructional requirements of 9.3.2; and		N/A
	Requirements of 9.5 are met		N/A
9.3.2	Constructional requirements		Pass
	a) Connectors and insulating material have flammability classification V-2 or better		Pass
	b) Insulated wires and cables are flame retardant (VW-1 or equivalent)		Pass
	c) Enclosure meets following requirements		-

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Clause	Requirement + Test	Result - Remark	Verdict
	1) Bottom and sides in arc of 5 ° (see Figure 13) to non-limited circuits (9.4) meets		-
	i) no openings; or		N/A
	ii) perforated as specified in Table 16; or		N/A
	iii) metal screen with a mesh; or		N/A
	iv) baffles as specified in Figure 12		N/A
	2) Material of enclosure and any baffle or flame barrier is made of		-
	Metal (except magnesium); or		N/A
	Non-metallic materials have flammability classification V-1 or better		N/A
	3) Enclosure and any baffle or flame barrier have adequate rigidity		N/A
9.4	Limited-energy circuit		N/A
	a) Potential not more than 30 r.m.s. and 42,4 V peak, or 60 V d.c.		N/A
	b) Current limited by one of following means		-
	1) Inherently or by impedance (see Table 17); or		N/A
	2) Overcurrent protective device (see Table 18); or		N/A
	3) A regulating network limits also in single fault condition (see Table 17)		N/A
	c) Is separated by at least basic insulation		N/A
	Fuse or a nonadjustable electromechanical device is used		N/A
9.5	Requirements for equipment containing or using flammable liquids		N/A
	Flammable liquids contained in or specified for use with equipment do not cause spread of fire		N/A
	Risk is reduced to a tolerable level		-
	a) The temperature of surface or parts in contact with flammable liquids is 25 °C below fire point		N/A
	b) The quantity of liquid is limited		N/A
	c) Flames are contained within the equipment		N/A
	Detailed instructions for risk-reduction provided		N/A
9.6	Overcurrent protection		Pass
9.6.1	General		Pass
	Mains supplied equipment protected		Pass
	Basic insulation between mains parts of opposite polarity provided		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Overcurrent protection devices not fitted in the protective conductor		N/A
	Fuses or single-pole circuit-breakers not fitted in neutral (multi-phase equipment)		N/A
9.6.2	Permanently connected equipment		Pass
	Overcurrent protection device		-
	Fitted within the equipment; or		N/A
	Specified in manufacturer's instructions		Pass
9.6.3	Other equipment		N/A
	Protection within the equipment		N/A
10	EQUIPMENT TEMPERATURE LIMITS AND RESISTANCE TO HEAT		Pass
10.1	Surface temperature limits for protection against burns		Pass
	Easily touched surfaces within the limits in normal and in single fault condition		-
	– at an specified ambient temperature of 40 °C		N/A
	– for equipment rated above 40 °C ambient temperature limits not exceeded raised by the difference to 40 °C		Pass
	Heated surfaces necessary for functional reasons exceeding specified values		-
	– Are recognizable as such by appearance or function; or		N/A
	– Are marked with symbol 13		N/A
	– Guards are not removable without tool		N/A
10.2	Temperatures of windings		Pass
	Limits not exceeded in		-
	normal condition		Pass
	single fault condition		Pass
10.3	Other temperature measurements		Pass
	Following measurements conducted if applicable		-
	a) Value of 60 °C of field-wiring terminal box not exceeded		Pass
	b) Surface of flammable liquids and parts in contact with this liquids		N/A
	c) Surface of non-metallic enclosures	open type	N/A
	d) Parts made of insulating material supporting parts connected to mains supply		Pass
	e) Terminals carrying a current more than 0,5 A		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
10.4	Conduct of temperature tests		Pass
10.4.1	General		Pass
	Tests conducted under reference test conditions and manufacturer's instructions		Pass
	Tests alternatively conducted at the least favourable ambient temperature within the rated ambient temperature		-
10.4.2	Temperature measurement of heating equipment		N/A
	Tests conducted in test corner		N/A
10.4.3	Equipment intended for installation in a cabinet or wall		N/A
	Equipment built in as specified in installation instructions		Pass
10.5	Resistance to heat		Pass
10.5.1	Integrity of clearance and creepage distances		Pass
10.5.2	Non-metallic enclosures		N/A
	Within 10 min after treatment		-
	Equipment subjected to suitable stresses of 8.2 and 8.3 complying with criteria of 8.1		N/A
10.5.3	Insulating material		Pass
	a) Parts supporting parts connected to mains supply		Pass
	b) Terminals carrying a current more than 0,5 A		Pass
	Examination of material data; or		Pass
	in case of doubt		N/A
	1) Ball pressure test; or	phenolic bobbin used	N/A
	2) Vicat softening test of ISO 306		N/A
11	PROTECTION AGAINST HAZARDS FROM FLUIDS AND SOLID FOREIGN OBJECTS		Pass
11.1	General		Pass
	Protection to operators and surrounding area provided by equipment		N/A
	All fluids specified by manufacturer considered		N/A
11.2	Cleaning		N/A
11.3	Spillage		N/A
11.4	Overflow		N/A
11.5	Battery electrolyte	Replacing the Battery can only be operated by the manufacturer's personnel.	Pass

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Clause	Requirement + Test	Result - Remark	Verdict
	Battery electrolyte leakage presents no hazard		N/A
11.6	Equipment rated with a degree of ingress protection (IP code)		N/A
11.6.1	General		N/A
	Equipment marked with IP code		-
	Conditions specified in the documentation		N/A
11.6.2	Conditions for testing		N/A
	Equipment in clean and new condition, all parts in place and mounted as specified by manufacturer		N/A
	Complete equipment tested, or		N/A
	representative parts tested		N/A
	hand-held equipment and portable equipment placed in least favourable position of normal use		N/A
	Other equipment positioned or installed as specified		N/A
	terminals provided with protective cap or cover, are installed as specified by manufacturer		N/A
	The equipment is operating (energized) during the treatment except		-
	a) If manufacturer specifies degrees of protection for non-operating (de-energized) equipment, or		N/A
	b) Equipment is operating or non-operating during the treatment with does not affect the test results		N/A
11.6.3	Protection against solid foreign objects (including dust)		N/A
	Applicable test of IEC 60529 for protection against solid foreign objects conducted		N/A
	Additionally inspection of equipment resulted		-
	a) No deposit on insulation parts that could lead to a hazard		N/A
	b) No created accumulations that have the potential to cause spread of fire		N/A
11.6.4	Protection against water		N/A
	Applicable test of IEC 60529 for protection against water conducted		N/A
	If any water has entered, safety is not impaired, inspection of equipment resulted		-
	a) No deposit on insulation parts that could lead to a hazard		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	b) Water has not reached hazardous live parts or windings which are not designed to operate when wet		N/A
	c) No accumulations near the end of cable nor enter the cable where it could cause a hazard		N/A
	d) No accumulations where it could lead to a hazard taking in consideration movement of the equipment		N/A
11.7	Fluid pressure and leakage		N/A
11.7.1	Maximum pressure		-
	Maximum pressure of any part does not exceed Prated		N/A
11.7.2	Leakage and rupture at high pressure		N/A
	Fluid-containing parts checked by inspection or if a hazard could arise subjected to hydraulic test, if		-
	a) product of pressure and volume > 200 kPa·l; and		N/A
	b) pressure > 50 kPa		N/A
	Safety evidence established by calculation in acc. to national authorities (e.g. Pressure Equipment Directive 2014/68/EU)		N/A
	Parts of refrigerating systems meets pressure-related requirements of EN 378-2 or IEC 60335-2-89 as applicable		N/A
11.7.3	Leakage from low-pressure parts		N/A
11.7.4	Overpressure safety device		N/A
	Does not operate in normal use		N/A
	a) Connected as close as possible to parts intended to be protected		N/A
	b) Easy access for inspection, maintenance and repair		N/A
	c) Adjustment only with tool		N/A
	d) No discharge towards person		N/A
	e) No hazard from deposit of discharged material		N/A
	f) Adequate discharge capacity		N/A
	No shut-off valve between overpressure safety device and protected parts		N/A
12	PROTECTION AGAINST RADIATION, INCLUDING LASER SOURCES, AND AGAINST SONIC AND ULTRASONIC PRESSURE		N/A
12.1	General		N/A
	Equipment provides protection		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
12.2	Equipment producing ionizing radiation		N/A
12.2.1	Ionizing radiation		N/A
12.2.1.1	General		N/A
	Equipment meets the following requirements		-
	a) if intended to emit radiation meets requirements of 12.2.1.2; or		N/A
	tested, classified and marked in accordance to IEC 62598		N/A
	b) if only emits stray radiation meets requirements of 12.2.1.3		N/A
12.2.1.2	Equipment intended to emit radiation		-
	Effective dose rate of radiation measured		-
	If dose rate exceeds 5 $\mu\text{Sv/h}$ marked with the following		-
	a) symbol 17 (ISO 361)		N/A
	b) abbreviations of the radionuclides		-
	c) with maximum dose at 1 m; or		-
	with dose rate value between 1 $\mu\text{Sv/h}$ and 5 $\mu\text{Sv/h}$ in m		-
12.2.1.3	Equipment not intended to emit radiation		-
	Limit for unintended stray radiation of 1 $\mu\text{Sv/h}$ at any easily reached point kept		N/A
12.2.2	Accelerated electrons		N/A
	Compartments opened only by the use of a tool		N/A
12.3	Optical radiation		N/A
	No unintentional hazardous escape of optical radiation as ultraviolet, visible or infrared radiation, including light emitting diodes		-
	– Checked by inspection; and		N/A
	– Radiation sources assessed in acc. to the requirements of IEC 62471, except for sources considered to be safe (Table 22) or conditionally safe (Table 23).		N/A
	– Lamp and lamp systems assessed to Risk Groups 1, 2, or 3 of IEC 62471 are labelled in acc. to IEC 62471-2		N/A
	– If labelling impractical, lamp or lamp systems marked with symbol 14		N/A
	– Protective measures, restrictions on use, and operating instructions that may be necessary are provided, including the applicable conditions of use of Table 23.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
12.4	Microwave radiation		N/A
	Power density does not exceed 10 W/m ²		N/A
12.5	Sonic and ultrasonic pressure		N/A
12.5.1	Sound level		N/A
	No hazardous sound emission		N/A
	Maximum sound pressure level measured and calculated for maximum sound power level as specified in ISO 3746 or ISO 9614-1		N/A
	Instruction describes measures for protection		N/A
12.5.2	Ultrasonic pressure		N/A
	Equipment not intended to emit ultrasound does not exceed limit of 110 dB between 20 kHz and 100 kHz		N/A
	Equipment intended to emit ultrasound		N/A
	Outside useful beam does not exceed limit of 110 dB between 20 kHz and 100 kHz		N/A
	If inside useful beam above values exceeded		-
	Marked with Symbol 14 of Table 1		N/A
	and following information in the documentation		-
	a) dimensions of useful beam		N/A
	b) area where ultrasonic pressure exceed 110 dB		N/A
	c) maximum sound pressure inside beam area		N/A
12.6	Laser sources		N/A
	Equipment meets requirements of IEC 60825-1		N/A
13	PROTECTION AGAINST LIBERATED GASES AND SUBSTANCES, EXPLOSION AND IMPLOSION		Pass
13.1	Poisonous and injurious gases and substances		Pass
	No hazardous substances liberated in normal condition and in single fault condition		N/A
	If potentially-hazardous substances are liberated		-
	Operator is not directly exposed to a quantity of the substance that could cause harm		N/A
	Requirements to discharge of hazardous substances during normal operation in accordance to manufacturer's instructions not considered as liberation		N/A
	Attached data/test reports demonstrate conformity		N/A
13.2	Explosion and implosion		Pass
13.2.1	Components		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Components liable to explode		-
	Pressure release device provided; or		N/A
	Apparatus incorporates operator protection (see also 7.7)		N/A
	Pressure release device		-
	Discharge without danger		N/A
	Cannot be obstructed		N/A
13.2.2	Batteries and battery charging	Primary type, Lithium/manganese dioxide (Coin), Max Abnormal Charging Current 310mA, Max Abnormal Charging Voltage, 12V dc. Use the single-phase conduction characteristic of D9 (40V, 200mA) diode and Resistor R26(10Ohm, 0.125W) provide to prevent the battery reverse charging and current.	Pass
	If explosion or fire hazard could occur		-
	Protection incorporated in the equipment; or		Pass
	Instructions specify batteries with built-in protection		N/A
	In case of wrong type of battery used		-
	No hazard; or		N/A
	Warning by marking and within instructions		Pass
	Equipment with means to charge rechargeable batteries		-
	Warning against the charging of non-rechargeable batteries; and		N/A
	Type of rechargeable battery indicated; or		N/A
	Symbol 14 used		N/A
	Battery compartment design		N/A
	Single component failure		Pass
	Polarity reversal test		N/A
13.2.3	Implosion of cathode ray tubes		N/A
	If maximum face dimensions > 160 mm		-
	Intrinsically protected and correctly mounted; or		N/A
	enclosure provides protection		N/A
	If non-intrinsically protected		-
	Screen not removable without tool		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	If glass screen, not in contact with surface of tube		N/A
14	COMPONENTS AND SUBASSEMBLIES		Pass
14.1	General		Pass
	Where safety is involved, components and subassemblies meet relevant requirements		Pass
14.2	Motors		N/A
14.2.1	Motor temperatures		N/A
	Does not present a hazard when stopped or prevented from starting; or		N/A
	Protected by over-temperature or thermal protection device conform with 14.3		N/A
14.2.2	Series excitation motors		N/A
	Connected direct to device, if overspeeding causes a hazard		N/A
14.3	Overtemperature protection devices		N/A
	Devices operating in a single fault condition		N/A
	a) Reliable function is ensured		N/A
	b) Rated to interrupt maximum current and voltage		N/A
	c) Does not operate in normal use		N/A
	If self-resetting device used to prevent a hazard, protected part requires intervention before restarting		N/A
14.4	Fuse holders		N/A
	No access to hazardous live parts		N/A
14.5	Mains voltage selecting devices		N/A
	Accidental change not possible		N/A
14.6	Mains transformers tested outside equipment		N/A
14.7	Printed wiring boards		Pass
	Data shows conformity with V-1 of IEC 60695-11-10 or better; or		Pass
	Test shows conformity with V-1 of IEC 60695-11-10 or better		N/A
	Not applicable for printed wiring boards with limited-energy circuits (9.4)		N/A
14.8	Circuits used to limit transient overvoltages		N/A
	Test conducted between each pair of mains supply terminals		N/A
	No ignition or overheating of other materials		-

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Clause	Requirement + Test	Result - Remark	Verdict
	– no ignition		N/A
	– no heat to other parts above the self-ignition points		N/A
	Safely suppressing and properly functional after applied tests		N/A
15	PROTECTION BY INTERLOCKS		N/A
15.1	General		N/A
	Interlocks are designed to remove a hazard before operator exposed		N/A
15.2	Prevention of reactivation		N/A
15.3	Reliability		N/A
	Single fault unlikely to occur; or		N/A
	Cannot cause a hazard		N/A
16	HAZARDS RESULTING FROM APPLICATION		N/A
16.1	Reasonably foreseeable misuse		N/A
	No hazards arising from settings not intended and not described in the instructions		N/A
	Other cases of reasonably foreseeable misuse addressed by risk assessment		N/A
16.2	Ergonomic aspects		N/A
	Factors giving rise to a hazard the risk assessment is reflecting those aspects		-
	a) limitation of body dimensions		N/A
	b) displays and indicators		N/A
	c) accessibility and conventions of controls		N/A
	d) arrangement of terminals		N/A
17	RISK ASSESSMENT		N/A
	Risk assessment conducted, if hazard might arise and not covered by Clauses 6 to 16		N/A
	Tolerable risk achieved by iterative documented process covering the following		-
	a) Risk analysis		N/A
	Identifies hazards and estimates risk		N/A
	b) Risk evaluation		N/A
	Plan to judge acceptability of resulting risk level based on the estimated severity and likelihood of a risk		N/A
	c) Risk reduction		N/A
	Initial risk reduced by counter measures;		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Repeated risk evaluation without new risks introduced		N/A
	Risks remaining after risk assessment addressed in instructions to responsible body		-
	Information contained how to mitigate these risks		N/A
	Following principles in methods of risk reduction applied by manufacturer in given order		-
	1) Risks eliminated or reduced as far as possible		N/A
	2) Protective measures taken for risks that cannot be eliminated		N/A
	3) User information about residual risk due to any defect of the protective measures		N/A
	Indication of particular training is required		N/A
	Specification of the need for personal protective equipment		N/A
	Conformity checked by evaluation of the risk assessment documentation		N/A
ANNEX F	ROUTINE TESTS		Pass
	Manufacturer 's declaration		Pass
ANNEX H	QUALIFICATION OF CONFORMAL COATINGS FOR PROTECTION AGAINST POLLUTION		N/A
H.1	General		N/A
	Conformal coatings meet the requirements of Clause H.2 and H.3.		N/A
H.2	Technical properties		N/A
	Technical properties of conformal coatings are suitable for the intended application. In particular		-
	a) Manufacturer indicate that it is a coating for PWBs;		N/A
	b) rated operating temperature include the temperature range of the indicated application;		N/A
	c) CTI, insulation resistance and dielectric strength are suitable for the intended application;		N/A
	d) Coating have adequate UV resistance, if it is exposed to sunlight;		N/A
	e) Flammability rating of the coating is at least the required flammability rating of the applied PWB.		N/A
H.3	Qualification of coatings		N/A
	Coating complies with the conformity requirements.		N/A
ANNEX K	INSULATION REQUIREMENTS NOT COVERED BY CLAUSE 6.7		Pass

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Clause	Requirement + Test	Result - Remark	Verdict

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Clause	Requirement + Test	Result - Remark	Verdict

Area	Location	Insulation type (NOTE 1)	WORKING VOLTAGE (NOTE 2)			Clearance		Creepage		CTI	Verdict	Comments
			RMS [V]	Peak [V]	Frequency [kHz]	Required [mm]	Measured [mm]	Required [mm]	Measured [mm]			
B	Transformer primary/secondary pin to core	BI	182.6	327.2	-	3.3	3.8	3.3	3.8	CTI>=175	P	Table K.15, Table K.13 Impulse voltage is 4kV
B	Transformer primary pin 4 to secondary pin 6	RI/DI	182.6	327.2	-	6.6	6.95	6.6	6.95	CTI>=175	P	Table K.15, Table K.13 Impulse voltage is 4kV
B	Transformer primary pin 4 to secondary pin 6 on PWB	RI/DI	182.6	327.2	-	6.6	6.11	3.27	6.11	CTI>=175		<i>Verified by DIELECTRIC VOLTAGE WITHSTAND TEST as datasheet</i> Table K.15, Table K.13 Impulse voltage is 4kV
B	Primary winding to secondary winding	RI/DI	182.6	327.2	-	6.6	9.6	6.6	9.6	CTI>=175	P	Table K.15, Table K.13 Impulse voltage is 4kV
B	Primary winding to secondary pin	RI/DI	182.6	327.2	-	6.6	6.85	6.6	6.85	CTI>=175	P	Table K.15, Table K.13 Impulse voltage is 4kV
B	Secondary winding to Primary pin	RI/DI	182.6	327.2	-	6.6	6.8	6.6	6.8	CTI>=175	P	Table K.15, Table K.13 Impulse voltage is 4kV
B	Primary/Secondary winding to core	BI	182.6	327.2	-	3.3	4.8	3.3	4.8	CTI>=175	P	Table K.15, Table K.13 Impulse voltage is 4kV

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Clause	Requirement + Test	Result - Remark	Verdict

Area	Location	Insulation type (NOTE 1)	WORKING VOLTAGE (NOTE 2)			Clearance		Creepage		CTI	Verdict	Comments
			RMS [V]	Peak [V]	Frequency [kHz]	Required [mm]	Measured [mm]	Required [mm]	Measured [mm]			
B	Primary C15 to Transformer secondary pin 2 on PWB	RI/DI	182.6	327.2	-	6.6	6	3.27	6	CTI>=175	Verified by DIELECTRIC VOLTAGE WITHSTAND TEST as datasheet	Table K.15, Table K.13 Impulse voltage is 4kV
B	Primary circuit to secondary circuit (Optical isolator U6 body primary to secondary)	RI/DI	230	-	-	6	7	6	7	CTI>=175	P	Table K.3
C	Voltage measure input HV+ to current measure input I- on power board	RI/DI	1000	-	-	14.3	14.4	14.3	14.4	CTI>=175	P	Table K.101, Table K.13
C	Voltage measure input HV+ to current measure input I- on bottom SIG power board	RI/DI	1000	-	-	14.3	20.2	14.3	20.2	CTI>=175	P	Table K.101, Table K.13
C	current measure input I- to voltage measure circuit R18 on power PWB	RI/DI	1000	-	-	14.3	16.2	14.3	16.2	CTI>=175	P	Table K.101, Table K.13
C	Voltage measure input HV+ to current measure circuit R11 on PWB	RI/DI	1000	-	-	14.3	13.5	10	13.5	CTI>=175	Verified by DIELECTRIC VOLTAGE WITHSTAND TEST as datasheet	Table K.101, Table K.13

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Clause	Requirement + Test	Result - Remark	Verdict

Area	Location	Insulation type (NOTE 1)	WORKING VOLTAGE (NOTE 2)			Clearance		Creepage		CTI	Verdict	Comments
			RMS [V]	Peak [V]	Frequency [kHz]	Required [mm]	Measured [mm]	Required [mm]	Measured [mm]			
C	Voltage measure circuit U1 to SELV across impedance (R12~R20, R22, R31~R38, R40, R41)	RI/DI	1000	-	-	14.3	18.5	20	21.1	CTI>=175	P	Table K.101, Table K.13
C	Voltage measure circuit U1 to SELV across impedance (R1~R6, R13~R16, R31~R38, R40, R41)	RI/DI	1000	-	-	14.3	16.62	20	21.1	CTI>=175	P	Table K.101, Table K.13
D	Voltage measure HV- to Power input on PWB	BI	1000	-	-	8	12.7	5	12.7	CTI>=175	P	Table K.101, Table K.13 Note: BI when U1 connect to 1000Vdc, DI when U1 connector to 10Vdc, 8mm is favorless value
D	Voltage measure HV- to Power input on terminal	BI	1000	-	-	8	11.6	10	20.94	CTI>=175	P	Table K.101, Table K.13 Note: BI when U1 connect to 1000Vdc, DI when U1 connector to 10Vdc, 8mm is favorless value

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Clause	Requirement + Test	Result - Remark	Verdict

Area	Location	Insulation type (NOTE 1)	WORKING VOLTAGE (NOTE 2)			Clearance		Creepage		CTI	Verdict	Comments
			RMS [V]	Peak [V]	Frequency [kHz]	Required [mm]	Measured [mm]	Required [mm]	Measured [mm]			
D	Voltage measure U1 to U2 circuit (U1 circuit on POW board, U2 circuit on SIG board)	RI/DI	1000	-	-	14.3	17.75	14.3	17.75	CTI>=175	P	Table K.101, Table K.13
E	Voltage measure circuit U1 on POW board to Voltage measure circuit U2 on SIG board	RI/DI	1000	-	-	14.3	19.57	-	-	-	P	Table K.101
-	Voltage measure U1+ to U1- on terminal J1	-	1000	-	-	2.6	15.16	2.6	15.16	CTI>=175	P	Table 101 Terminal spacing
-	Voltage measure U2+ to U2- on terminal J2	-	1000	-	-	2.6	14.34	2.6	14.34	CTI>=175	P	Table 101 Terminal spacing
NOTE 1 – refer to Form A.14 for type of insulation shown in the insulation diagram			NOTE 2 - to be used for definition of required insulation (see Form A.14)									
Input supply voltage.....:		230	V	65	Hz							
Supplementary information: N/A												

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Clause	Requirement + Test	Result - Remark	Verdict

SP	TABLE: Additional or special tests conducted		Pass
Clause and Name of Test	Test type and condition	Observed results	
UL/CSA 61010-2-201, 4.4.1.101.1	Overload And Endurance Test - General Use And Resistive Loads	Pass	
UL/CSA 61010-2-030 101.4	PROTECTION AGAINST MAINS OVERVOLTAGES	Pass	
Supplementary information:			
This table is used to identify test results for tests other than referenced in the above test tables. Refer to Appendix D for all tests performed within this report.			

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE: List of critical components					Pass
Component/ Part No.	Manufacturer/ Trademark	Type No./model No./	Technical data	Standard No. / Edition ²	Mark(s) & Certificates of conformity ¹
Front panel (transparent screen plastic and flip on terminal)	ZHEN JIANG CHI MEI CHEMICAL CO LTD	PC-6610	V-2, Minimum 1.5mm, 80 °C	UL94, UL746B	UL, CUL / E194560 (QMFZ2/8) ---
Housing	ZHEN JIANG CHI MEI CHEMICAL CO LTD	PC-6610	V-2, Minimum 1.5mm, 80 °C	UL94, UL746B	UL, CUL / E194560 (QMFZ2/8) ---
Capacity C1	JYH HSU (JEC) ELECTRONICS LTD	JD Series	2.2nF, Rtd Voltage: 400VAC, Operating Temperature: -40°C to +85°C, Y1 type.	UL 60384-14	E356696(FOWX2/8)
Terminal block socket (J2 for U2, I 2)	ANYTEK TECHNOLOGY CORP	OQ (@@60)	300V, 20A, FW=1, 115 degree C.	UL 1059	UL, CUL /E202113 (XCFR2/8)
Terminal block plug (J2 for U2, I2)	ANYTEK TECHNOLOGY CORP	TJ (@@11)	12-24 Sol/Str, CU, FW=2, 5 Lb.In., 300 V, 10 A, Use Group D, 115 degree C	UL 1059	UL, CUL /E202113 (XCFR2/8)
Terminal block socket (J11)	ANYTEK TECHNOLOGY CORP	OQ (@@62)	300V, 20A, FW=1, 115 degree C.	UL 1059	UL, CUL /E202113 (XCFR2 8
Terminal block plug (J11) Blank terminal with no connection	ANYTEK TECHNOLOGY CORP	TJ (@@396)	30-12AWG, Sol/Str, CU, FW=2, 4.4 Lb.In., 300 V, 10 A, Use Group D, 115 degree C	UL 1059	UL, CUL /E202113 (XCFR2/8)
Terminal block (J1, J3) J1 for U1,I1 J3 for output of RS485, voltage output and switch output	ANYTEK TECHNOLOGY CORP	J1:VI122155007AG J3:VI0921550000G	12-28AWG, Str/Sol, CU, FW=2, 3.5Lb.in., rated 300V, 16A, Use Group D, 115 degree C.	UL 1059	UL, CUL /E202113(XCFR2/8)
Label	Suzhou Jinhe New Material Co Ltd	JHRH-PC-LABEL	Min. 80 degree C, suitable for Polycarbonate housing.	UL 969	UL / MH60757 (PGDQ2) ---
Battery on LCD board BT1	FDK CORPORATION	CR1220s(I)	Primary type, Lithium/manganese dioxide (Coin), Max Abnormal Charging Current 3mA, Max Abnormal Charging Voltage, 12V dc. Use the single-phase conduction characteristic of D9 (40V、200mA) diode and Resistor R26 (10Ohm, 0.125W) provide to prevent	UL 1642	UL/ MH13421(BBCV2)

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE: List of critical components					Pass
Component/ Part No.	Manufacturer/ Trademark	Type No./model No./	Technical data	Standard No. / Edition ²	Mark(s) & Certificates of conformity ¹
			the battery reverse charging and current.		
PWB	interchangeable	interchangeable	Minimum V-0, 130°C, CTI>=175	UL796	UL / (ZPMV2) ---
Electrolytic Capacitors (C15)	interchangeable	interchangeable	Electrolytic type, min.400V, Min.10uf, Min. 105°C	-	---
Transformer (T1)	WUXI WATTECH ELECTRONIC TECHNOLOGY CO LTD	T--EPC19-220V-5V- 8V±15v-1	-	-	- ---
-Insulation system	WUXI WATTECH ELECTRONIC TECHNOLOGY CO LTD	WTW 130-B	Class B, table IX	UL 1446	UL / E335368 (OBJY2)
-Core	interchangeable	interchangeable	DMR44 or TP4A material, sinlge air gap, 19.3*9.85*7.3 mm	-	- ---
-Bobbin	SUMITOMO BAKELITE CO LTD	PM-9820	Phenolic, black, rated V-0,150 °C, minimum 0.16 mm thick, CTI=3	UL94, UL746B	UL, CUL /E41429(QMFZ2/8) ---
-Triple insulated wire (winding between pin 1-2, 10-11)	GREAT LEOFロン INDUSTRIAL CO LTD	TRW(B)*	Rated 130 °C	UL2353	UL / E211989 (OBJT2) ---
CU wire(winding between pin 4-5, pin6 to 7 and 7 to 8)	interchangeable	interchangeable	Min. 155 °C, ANSI Type MW79C	UL 1446	UL (OBMW2) ---
Barrier tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	WF* (c)(h)	Rated 130 °C, white, 3 mm wide on PIN side of bobbin.	UL510A	UL / E165111 (OANZ2) ---
Polyester tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	CT* (b)(g)	Rated 130 °C, CTI=2	UL510A	UL / E165111 (OANZ2)
-Tube	GREAT HOLDING INDUSTRIAL CO LTD	TFL	150V 200°C	UL224	UL / E156256 (YDPU2) ---
-Varnish	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260(a)	Min. 130°C	UL1446	UL / E228349(OBOR2)
Optical Isolator U6 、 U7、 U8、 U10 、 U12、 U13(POW), U3、 U8(SIG)	LITE-ON TECHNOLOGY CORP	LTV-816	Isolation voltage 5300 V, max. operating temperature 115 °C	UL1577	UL, CUL / E113898 (FPQU2/8) ---
resettable fuse PT1	BESTBRIGHT ELECTRONICS CO LTD	BK250-180-SZ	Class C3, 250V, I max 10A, Tmoa 85°C.	UL1343	UL, CUL / E482628 (XGPU2/8) ---

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE: List of critical components					Pass
Component/ Part No.	Manufacturer/ Trademark	Type No./model No./	Technical data	Standard No. / Edition ²	Mark(s) & Certificates of conformity ¹
Piezo resistor RV1	ACPA TECHNOLOGY CO LTD	10&471%X	Rated 300VAC, 85°C SPD type 5, In 2KA.	UL1449	UL / E315423 (VZCA2), CSA certified
Common mode choke L1	JIANGYIN LIYI ELECTRONICS TECHNOLOGY CO,LTD	L-T6-10-4.5-20mH-50mA-±30%(embedment)	Inductance: 20mH	-	-
Bridge Diode(DB1)	CHANGZHOU STARSEA ELECTRONICS CO,LTD	ABS10	Voltage Range: 1000 V Current- 0.8/1.0 A	-	-
PWM U4	Power Integrations, Inc.	TNY286DG-TL	725V Rated MOSFET, 470uA -40~150 °C	-	-
Panel Button plastic	JIANGSU PEARL SILICONE RUBBER MATERIAL CO LTD	HD-87XX	Gray, 0.8mm, V-0, 150°C	UL94, UL746B	UL, CUL /E231325(QMFZ2/8)
LCD	JIANGSU JINHUA ELECTRONICS TECHNOLOGY CO.,LTD	3.3V-WB-38.8*26.8-EN-A-JH26625A	Rated 3.3V, -20°C~+70°C	--	-- ---
Internal connector	interchangeable	interchangeable	V-0, Minimum 0.4mm, 85 °C	UL94, UL746B	UL, CUL / (QMFZ2)
Protective impedances (R12~R20,R22,R31~R38,R40,R41(POW) ;R1~R6,R13~R16,R31~R38,R40,R41(SIG))	Viking Tech Corporation Kaoshiung Branch	HVR06FTEV1004	1M ohms, 0.25W	UL60950	UL, CUL / E490339(NWGO2/8)

Supplementary information:

The Test Laboratory has verified the component information.

- 1) An asterisk indicates a mark which assures the agreed level of surveillance. See Licenses and Certificates of Conformity for verification.
- 2) Anything specified within brackets “()” is for reference purposes only and can be used to specify the UL Product Category CCN(s)/File Number if the component includes an UL Certification. This can be useful for the UL Follow-Up Service Inspection associated with the UL Mark; however if in brackets, should not be a required element of the UL Inspection.

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Clause	Requirement + Test	Result - Remark	Verdict

National Differences

The following National Differences are included in this Report. If not 'Selected', the device was not evaluated to these Differences.

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

Selected? (y/n)	Group / Country	Standard	Abbreviation
Yes	USA	UL 61010-1, 3rd Edition, May 11, 2012, Revised July 19, 2019	US
Yes	Canada	CAN/CSA-C22.2 No. 61010-1(2012-05), 3rd Edition, with revisions through 2018-11	CAN
No	EU Group	EN 61010-1:2010/A1:2019 (Edition 3.1)	EN

USA(UL 61010-1, 3rd Edition, May 11, 2012, Revised July 19, 2019)			
1.1.4	Equipment installation complies with the National Electrical Code (NEC), ANSI/NFPA 70 and the Canadian Electrical Code (CEC) CAN/CSA C22.2 No. 0 and Part 1, CSA C22.1		Pass
9.2.3 [SCC]	CBs shall include dual language safety labeling within their product certification requirements, if so required by the standard or by the authority having jurisdiction.		Pass
	The manufacturer has confirmed they have the ability to include English and French safety labeling (markings associated with the signal words DANGER, WARNING, and CAUTION) when required.	The ability of the manufacturer to include these markings was verified by either (1) visual inspection of the markings on the actual product or (2) draft of labels that will be applied to the product or (3) written confirmation from the customer of the markings that will appear on the product. If the product standard provides the exact translation, the evidence must match the exact translation. If the product standard does NOT provide the exact translation, the evidence must simply include French text (no translation required).	Pass

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Clause	Requirement + Test	Result - Remark	Verdict
	Manufacturer has a method to manage distribution of products, IF all products with the Canadian certification mark are NOT going to include the dual language.	Evaluation staff are to only verify that the manufacturer has a method to control distribution. Evaluation staff do not have to record the method of control nor are the evaluation staff expected to verify the effectiveness of the method of control. This requirement to verify that a method exist will be noted in the FUS Procedure. The UL Field Engineer will verify the method during surveillance. If the manufacturer is going to include the dual language on all products with the Canadian certification mark, then this item is N/A; no further action required.	Pass
5.1.3	Measurement of maximum input power or current with all accessories and plug-in modules connected during a 10 second period complies with the marked mains supply rating requirements.		N/A
6.5.2.4	Impedance of protective bonding of plug-connected equipment		N/A
	The impedance does not cause a potential drop of more than 4V.		N/A
	Test current is twice the rating of the plug, not less than 40A, twice the rating of the internal overcurrent protection or complies with CAN/CSA-C22.2 No 0.4. with the duration specified in Table 6.5.2.4 DV.1		N/A
6.5.2.5	Impedance of protective bonding of permanently connected equipment		N/A
	Test duration specified in Table 6.5.3.4DV.1		N/A
	Voltage drop did not exceed 4V		N/A
6.7.3.4.1	For solid insulation the equivalent d.c. voltage test values for an a.c. circuit was used		N/A
6.7.3.4.4	For thin film insulation the equivalent d.c. voltage test values for an a.c. circuit was used		N/A
6.10.1	Mains supply cords		N/A
	Mains supply cords or cord sets comply with ANSI/UL 817 and CSA C22.2. No.1		N/A
	General use receptacles, attachment plugs and similar wiring devices comply with ANSI/UL 498 and CSA C22.2 No. 42, CSA C22.2 No. 182.1, CSA C22.2 No. 182.2 and CSA C22.2 No. 182.3		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Green covered conductors (with or without yellow stripes) used only for Protective conductors terminals		N/A
6.10.3	Plugs of mains cords comply with ANSI/UL 498 and CSA C22.2 No. 42, CSA C22.2 No. 182.1, CSA C22.2 No. 182.2 and CSA C22.2 No. 182.3		N/A
6.10.4	Permanently connected equipment		Pass
	Equipment intended for permanent connection to mains complies with Annex DVD		Pass
	Open-type equipment intended for permanent connection to mains complies with Annex DVE		Pass
6.11.5	Polarity of MAINS circuits for line-connected single-pole switch, center contact of a lampholder and any automatic control with a marked off position connected to ungrounded conductor		N/A
9.3.2	Flammability RATINGS of ANSI/UL94, V-0, V-1, V-2 and VW-1 of ANSI/UL 1581 are considered equivalent to IEC classifications. Flammability rating FT-1 and CSA C22.2. No. 0.3 and VW-1 or ANSI/UL 1581 are considered acceptable for wire and cable.		N/A
9.6.1	Overcurrent protection		N/A
	Single-pole circuit breaker connected in the ungrounded supply conductor.		N/A
	Multiple-pole circuit breaker interrupt all neutral (grounded) and ungrounded conductors simultaneously.		N/A
	A single fuse used connected in the ungrounded supply conductor.		N/A
	Fuses connected in both the neutral (grounded) and ungrounded supply conductors are mounted adjacent to each other and have the same RATING.		N/A
	The screw shell of a plug fuseholder and the accessible contact of an extractor fuseholder connected to the ungrounded supply is connected towards the load. The accessible contact or screw shell of fuseholder connected in the neutral (grounded) conductor is connected towards the grounded supply line.		N/A
11.6	Replace IP code with Type rating specified in UL 50E and CSA C22.2 No. 94.2.		N/A
11.6.1	IEC 60529 rating, and marking replaced by UL 50E and CSA C22.2 No. 94.2		N/A
11.6.3	Protection against solid foreign objects, IEC 60529 replaced by UL 50E and CSA C22.2 No. 94.2.		N/A
11.6.4	Protection against water, IEC 60529 replaced by UL 50E and CSA C22.2 No. 94.2		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
11.7.1	Leakage and rupture at high pressure comply with 11.7.2 and Annex G		N/A
12.1	X-ray equipment complies with 21 CFR 1020 and laser equipment complies with 21 CFR 1040		N/A
14.1	Components meet applicable ANSI/UL, CAN, CSA requirements		Pass
14.9	Nonmetallic enclosure for outdoor use comply with UV requirements in ANSI/UL746C or CSA C22.2 No.0.17 as applicable		N/A
14.10	Conductive coatings if peeling or flaking would reduce spacings or bridge live part comply with ANSI/UL 746C or CSA C22.2 No.0.17 as applicable		N/A
14.11	Direct plug-in transformer units comply with ANSI/UL1310, CAN/CSA C22.2 No.223, ANSI/UL 60950-1, or CSA C22.2 No.60950-1		N/A
ANNEX DVC	Addition: UV radiation limits comply with the ACGIH requirements		N/A
ANNEX DVD	Addition: Permanent connection to MAINS		Pass
DVD.1.1	Equipment has provision for connection of a wiring system according to ANSI/NFPA 70, NEC or CSA C22.2, CEC, Part I as applicable		Pass
DVD.2.1.1	Equipment provided with TERMINALS or leads for connection and sized per the NEC or CEC		Pass
DVD.2.1.2	Equipment provided with a TERMINAL or splice compartment is complete		Pass
DVD.2.1.3	TERMINAL or splice compartment not exposed to damage or strain and able to be inspected after installation		Pass
DVD.2.2	Wiring TERMINALS provide effective connection device or sufficient wire binding screw		N/A
DVD.2.3	Leads used for field wiring minimum 6 inches long		N/A
DVD.2.4.1	TERMINALS and lead identified for their intend use		Pass
DVD.2.4.2	Polarized convenience receptacle or polarized lamp socket identifies the neutral (grounded) conductor		N/A
DVD.2.4.3	TERMINAL intended for neutral (grounded) conductor identified		N/A
DVD.2.4.4	Neutral (grounded) field wiring lead white or gray color		N/A
DVD.2.4.5	Protective earth TERMINAL marked per 5.1.5.2 or "G", "GR", "GND", "GROUND", or "GROUNDING" or green colored screwhead		N/A
DVD.2.4.6	Protective grounding conductor green color with or without yellow stripes		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
DVD.3.1	ENCLOSURE complies with the pulling, torque and bending test		N/A
DVD.3.2	Metallic ENCLOSURE meet minimum thickness		N/A
DVD.3.3	Bonding between all metallic conduits entering the ENCLOSURE provided		N/A
DVD.4.1	ENCLOSURE complies with the Conduit pull-out test		N/A
DVD.4.2	ENCLOSURE complies with the Conduit torque test		N/A
DVD.4.3	ENCLOSURE complies with the Conduit bending test		N/A
DVD.4.4	ENCLOSURE complies with the Knockout test		N/A
DVE	Addition: Permanently installed equipment		Pass
DVE.1.2	Energy-monitoring equipment is not intended for retrofit field installation within the enclosure of switchgears/panel boards unless it has been specifically covered as and accessory by the switchgear/panel board listing		Pass
DVE.1.3	Meter is not an electric utility meters Type S and Type A evaluated to UL2735 or CSA CAN3-C-17		N/A
DVE.1.5	Meter is not intended for use in utility substations or equivalent areas greater that CAT IV		N/A
DVE.3.1.1.1	Contact device (switch, relay) rated for intended load		N/A
DVE.3.1.2	Current Transformer warning and correlation marking		Pass
DVE.3.1.2.1	Warning marking to disconnect power when installing or servicing current transformer provided		Pass
DVE.3.1.2.2	Marking for use with listed Energy-Monitoring Current Transformers provided		Pass
DVE.3.1.2.3	Marking for use with specific energy monitoring current transformer provided		N/A
DVE.3.1.3	Field-wiring terminal markings		Pass
DVE.3.1.3.1	Field-wiring terminal marking specifying the use of copper or aluminum or both provided		Pass
DVE.3.1.3.2	Field-wiring terminal marking in DVE.3.1.3.1 abbreviated.		N/A
DVE.3.1.3.3	Wire connectors for field installation comply with DVE.4.4.3 and if necessary marked to restrict it use to the smaller size conductor		N/A
DVE.3.1.3.4	Markings required in DVE.3.1.3.1 to DVE.3.1.3.3 use a coded correlation marking or Table 1, symbol 14		Pass
DVE.3.2	Documentation: equipment installation		Pass
DVE.3.2.1	Current transformers intended for field installation inside a panel board or switchgear have the following	The current transformers are intended for installation within the same enclosure as the	-

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Clause	Requirement + Test	Result - Remark	Verdict
	markings	equipment. These may not be installed within switchgears and panel boards or similar equipment.	
	a) Disconnect power to equipment before installing or servicing		N/A
	b) Minimum 75 percent wiring space required		N/A
	c) Do not restrict ventilation openings		N/A
	d) Do not install near breaker arc vent		N/A
	e) Not suitable for Class 2 applications		N/A
	f) Secure current transformer and route conductors away from live terminals or bus structure		N/A
	g) Warning to disconnect power before installing or servicing		N/A
DVE.3.2.2	Instructions for OPEN EQUIPMENT installed within the same end-product enclosure have the following information		-
	a) Correlation statement identifying the current transformer being used		Pass
	b) Statement that the leads are maintained within the same end-product enclosure		Pass
	c) Statement to segregate of or insulate the leads from different circuits		Pass
	d) Statement that the current transformers are for installation within the same enclosure as the equipment but not switchgears and panel boards		Pass
DVE.4.1.1	Current transformer leads considered NFPA 70 C22.1 Class 1 wiring	For use with listed Energy-Monitoring Current Transformers.	Pass
DVE.4.1.2	Segregation between the following circuits is provided		-
	a) Class 1, factory wiring, terminal and uninsulated live parts		N/A
	b) Class 2 and Class 3 wiring and uninsulated live parts		N/A
DVE.4.1.3	Segregation by clamping, routing or equivalent min. 6.0 mm distance		N/A
DVE.4.1.4	Insulation rated for highest voltage		Pass
DVE.4.1.5	Kit provided with the equipment and statement in the installation manual explaining how to maintain segregation between circuits		N/A
DVE.4.2.1	Class 2 Circuit and connections comply with NFPA 70 ARTICLE 725, and C22.1, Section 16		N/A
DVE.4.3.1	Neutral conductors are evaluated as hazardous live		Pass

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Clause	Requirement + Test	Result - Remark	Verdict
	MAINS circuit		
DVE.4.4	Permanent connection to MAINS		Pass
DVE.4.4.1	Field-wiring leads not smaller than two wire sizes and not smaller than 18 AWG		Pass
DVE.4.4.2	18 AWG field-wiring lead connection to No. 12 AWG applied		N/A
DVE.4.4.3	Field-wiring lead more than two wire sizes but not smaller than 18 AWG if more than one wire connected to the same field-provided lead and complies with a) to c) below		N/A
	a) Wire connector provided and suitable for combination of wires		N/A
	b) Field-wiring leads are arranged to reduce stress on individual leads		N/A
	c) Equipment marked to specify the wire connector to be used		N/A
DVE.4.4.4	Pigtail leads comply with testing in DVE.4.4.5		N/A
	a) Pigtail lead extending from enclosure complies with direct pull test of 89 N (20 lb)		N/A
	b) Pigtail lead within a wiring compartment complies with direct pull test of 44.5 N (10 lb)		N/A
DVE.4.4.6	Protective grounding terminals noted in DVD.2.4.5 marked on wiring diagram		N/A
DVE.5.1.1	Enclosure withstands an impact test of 6.8 joules		N/A
DVE.6.1	Enclosure comply with UL50 and/or UL50E or as appropriate CSA C22.2 Nos. 94.1 and 94.2		N/A
DVE.7.1	OPEN EQUIPMENT tested per installation instructions or referenced test ambient condition		Pass
DVE.7.2.1	Wiring for connection to the field-wiring terminal min. 1.22 m (4 ft) long and sized per Table 310-15(B), column 60°C or 75°C for greater than 100 A.		Pass
DVE.8.1	Current transformers		Pass
DVE.8.1.1	Current transformers for field installation are Listed energy monitoring current transformer or comply with DVE.8.1.2		Pass
DVE.8.1.2	Accessory current transformers for field installation with OPEN EQUIPMENT comply with a) to e) below		N/A
	a) Case and potting material minimum basic insulation between internal circuits and external surfaces		N/A
	b) Minimum 105°C case and potting material used		N/A
	c) Minimum case and potting material used is based on		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	intended conductor insulation (60°C, 75°C or 90°C)		
	d) Current transformer leads and electrical sleeving voltage rating complies		N/A
	e) Current transformer leads rated minimum 90°C		N/A
Canada(CAN/CSA-C22.2 No. 61010-1(2012-05), 3rd Edition, with revisions through 2018-11)			
5	MARKING AND DOCUMENTATION		-
5.1.3	The measurement is made at each RATED voltage range with the equipment consuming, where the measured power or current is the steady-state current is taken as the mean indication of the highest measured r.m.s. value during any 10 second period of the normal operation cycle.		N/A
6	PROTECTION AGAINST ELEKTRIC SHOCK		-
6.5	Protection in SINGLE FAULT CONDITION		Pass
6.5.2.4DV D2	Bonding impedance for plug connected equipment		-
	Voltage drop between the PROTECTIVE CONDUCTOR TERMINAL and each ACCESSIBLE parts for PROTECTIVE BONDING less than 4 V		N/A
	Metal parts of the protective bond shall not melt; and		N/A
	Heating and burning shall not causing a fire HAZARD.		N/A
6.5.2.4DV1	Duration of protecting bonding test		-
	Duration of test in accordance to Table 6.5.2.4DV.1		N/A
6.5.2.5DV	Bonding impedance of PERMANENTLY CONNECTED EQUIPMENT [D2]		-
	Voltage drop between the PROTECTIVE CONDUCTOR TERMINAL and each ACCESSIBLE parts for PROTECTIVE BONDING less than 4 V		N/A
	Test duration in accordance to table 6.5.2.4.DV.1		N/A
6.7.2.2.1DV D2 U1	a.c. test of 6.8.3.1 with a duration of at least 1 min, or the 1 min d.c. test of 6.8.3.2, using the applicable voltage from Table 5 conducted:		-
6.7.2.2.4DV D2 U1	a.c. test of 6.8.3.1 with a duration of at least 1 min, or the 1 min d.c. test of 6.8.3.2 applied to two of the three layers using the applicable voltage for REINFORCED INSULATION of Table 5 conducted:		-
6.7.3.4.1DV D2 U1	a) by the voltage test of 6.8.3.1 for 5 s or the voltage test of 6.8.3.2 using the applicable test voltage of table 6 for BASIC INSULATION or SUPPLEMENTARY INSULATION conducted; and		-
	b) if the WORKING VOLTAGE exceeds 300 V, by the voltage test of 6.8.3.1 for 1 min or the voltage test of		-

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Clause	Requirement + Test	Result - Remark	Verdict
	6.8.3.2 with a test voltage of:		
	- 1,5 times the WORKING VOLTAGE for BASIC INSULATION or SUPPLEMENTARY INSULATION		-
	- 2 times the WORKING VOLTAGE for REINFORCED INSULATION:		-
6.7.3.4.4DV D2 U1	c) a.c. test of 6.8.3.1 with a duration of at least 1 min, or the 1 min d.c. test of 6.8.3.2, using the applicable test voltage from Table 6 multiplied by 1,6 for a.c. tests or by 1,6 $\sqrt{2}$ for d.c. tests, applied to two of the three layers.		-
6.10	Connection to MAINS supply source and connections between parts of equipment		Pass
6.10.1DV	MAINS supply cords [D2]		N/A
DV.1	Compliance with IEC 60227 or IEC 60245 not required		N/A
DV.2	Green covered conductors (with or without yellow stripes) used only for connection to PROTECTIVE CONDUCTOR TERMINALS		N/A
DV.3	Compliance with IEC 60799 not required		N/A
DV.4	The cord or cord set complies with ANSI/UL 817 and CSA C22.2 No. 21		N/A
	Receptacles, plugs, wiring devices comply with ANSI/UL 498 and CSA C22.2 No. 42, No. 182.1, No.182.2, and No. 182.3		N/A
6.10.3DV	Plugs and Connectors [D2]		N/A
	Plugs comply with ANSI/UL 498 and CSA C22.2 No. 42, No. 182.1, No.182.2, and No. 182.3		N/A
6.10.4DV	PERMANENTLY CONNECTED EQUIPMENT [D2]		Pass
	Requirements for mains connections comply with Annex DVD		Pass
6.10.4DV.2 U2	Equipment intended for permanent connection to the MAINS shall meet the requirements of Annex DVD. Open-type or enclosed-type equipment for permanently installation of the MAINS shall meet the requirements of Annex DVE. Conformity is checked as specified in Annex DVE.		Pass
6.11DV	Disconnection from Supply Source and maintaining polarity [D2]		Pass
6.11.5DV	Polarity of Connections to the MAINS Circuit [D2]		N/A
6.11.5DV.1	Single-pole devices connected to ungrounded conductor of supply circuit		N/A
9	PROTECTION AGAINST THE SPREAD OF FIRE		-
9.3.2DV	Constructional requirements [D2]		Pass

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Clause	Requirement + Test	Result - Remark	Verdict
9.3.2DV.1	Flame RATINGS of ANSI/UL 94 V-0, V-1, and V-2 are equivalent to the flammability classifications of IEC 60695-11-10.		Pass
9.3.2DV.2	Flame ratings FT-1 of CSA C22.2 No. 0.3 and VW-1 ANSI/UL 1581 are considered acceptable for insulated wire and cable.		N/A
9.6DV	Overcurrent Protection [D2]		N/A
9.6.1ADV.1	A single-pole circuit breaker connected in ungrounded conductor		N/A
9.6.1ADV.2	A multiple-pole circuit breaker interrupts both neutral and ungrounded conductors simultaneously		N/A
9.6.1ADV.3	Single fuse connected in the ungrounded supply conductor		N/A
9.6.1ADV.4	Where fuses used in both conductors :		N/A
	- fuseholders mounted adjacent to each other		N/A
	- fuses are of the same RATING and characteristics		N/A
9.6.1ADV.5	Screw shell of fuseholder and ACCESSIBLE contact (ungrounded supply conductor) of extractor fuseholder connected towards the load		N/A
	Screw shell of fuseholder or ACCESSIBLE contact (neutral / grounded supply conductor) of extractor fuseholder connected towards the grounded supply line		N/A
11	PROTECTION AGAINST HAZARDS FROM FLUIDS		-
11.6DV.1 U2	Specially protected equipment If the equipment is RATED and marked by the manufacturer as conforming to one of the stated degrees of protection of UL 50E and CSA C22.2 No. 94.2, it shall resist the entry of water to the extent specified.		N/A
11.6.3	Protection against solid foreign objects (including dust)		N/A
	Applicable test of UL 50E and CSA C22.2 No. 94.2 for protection against solid foreign objects conducted		N/A
11.6.4	Protection against water		N/A
	Applicable test of UL 50E and CSA C22.2 No. 94.2 for protection against water conducted		N/A
11.7	Fluid pressure and leakage		N/A
11.7.1DV	Annex G for certain types of products [D2]		N/A
11.7.1DV.1	Equipment having both of the following characteristics meet the requirements of 11.7.2 and G.5:		N/A
	a) A product of pressure and volume greater than 200 kPa* ^l ,		N/A
	b) A pressure greater than 50 kPa.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
11.7.1DV.2	Equipment with other characteristics meet the requirements of 11.7.3 and 11.7.4		N/A
11.7.1DV.3	Other equipment than laboratory, testing and measurement equipment meet the requirements of Annex G		N/A
11.7.1DV.4	Requirements of 11.7.2 to 11.7.4 and / or Annex G fulfilled		N/A
11.7.2	Leakage and rupture at high pressure		N/A
11.7.2DV	NOTE: National authorities may allow safety to be established by calculation, for example according to the ASME Boiler and Pressure Vessel Code [D2]		N/A
12	PROTECTION AGAINST RADIATION, INCLUDING LASER SOURCES, AND AGAINST SONIC AND ULTRASONIC PRESSURE		N/A
12.1DV	General [D2]		N/A
	NOTE 1A: For USA x-ray equipment within the scope of 21 CFR 1020 and		N/A
	laser equipment within the scope 21 CFR 1040		N/A
	For Canada both with the scope Radiation Emitting Device Act		N/A
12.3DV	Ultraviolet (UV) radiation [D2]		N/A
	NOTE: 2A: ACIGH UV Guidelines, UL 746C and CSA C.22.2 No. 0.17 guidance applied		N/A
14	COMPONENTS AND SUBASSEMBLIES		Pass
14.1DV	General [D2]		Pass
	Components comply with applicable safety requirements of relevant ANSI, CAN, CSA, IEC, ISO or UL standards		Pass
14.1DV.4	Safety requirements of Annex DVA used for applicable safety requirements		Pass
14.7DV	Printed circuit boards [D2]		Pass
	Flame RATINGS of ANSI/UL 94 and CAN/CSA C22.2 No. 0.17, V-0, V-1, and V-2, are equivalent to the flammability classifications of IEC 60695-11-10.		Pass
14.9DV	Outdoor-use enclosure resistance to UV [D2]		N/A
14.9DV.1	Nonmetallic enclosures meet the UV resistance requirements of ANSI/UL 746C or of CSA C22.2 No. 0.17, or both as appropriate		N/A
	NOTE: ANSI/UL 746C, clause 25, requires a 1000 hour UV/water exposure preconditioning using a xenon-arc or alternatively a 720 hour UV/water exposure preconditioning using twin carbon arcs. CSA C22.2 No. 0.17, subclause 5.9, permits only the 1000 hour		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	UV/water exposure preconditioning.		
14.10DV	EMC coatings, shield, and tape [D2]		N/A
14.10DV.1	Conductive coatings:		N/A
14.10 DV.1.1	The bond of a conductive coating applied to a polymeric part was evaluated:		N/A
14.10 DV.1.2	Conformity is checked by:		N/A
	a) Bond of conductive (metallic) applied to polymeric part complies with the requirements for adhesives in ANSI/UL 746C and / or CSA C22.2 No. 0.17 or		N/A
	b) Flaking or peeling of the coating does not introduce risk of fire or electric shock		N/A
14.10DV.2	Conductive shield or tape:		N/A
14.10 DV.2.1	Peeling of the conductive shield or tape does not introduce risk of fire or electric shock		N/A
	Bond between a conductive shield or tape and any other surface was evaluated		N/A
14.10 DV.2.2	Compliance with the requirements is checked by inspection.		N/A
14.11DV	Direct plug-in transformers [D2]		N/A
14.11DV.1	Units met the additional requirements according to ANSI/UL 1310, CAN/CSA C22.2 No. 223, ANSI/UL 60950-1, or CSA C22.2 No. 60950-1.		N/A
ANNEX G	Leakage and rupture from fluids under pressure		-
G DV D2	Refer to 11.7.1DV for cases in which Annex G apply.		-
ANNEX K	Insulation requirements not covered by 6.7		-
K.1.3.1 DV D2 U1	A DC voltage of ± 2 times the a.c. r.m.s. test voltage is acceptable.		-
K.1.3.4DV D2 U1	A DC voltage of ± 2 times the a.c. r.m.s. test voltage is acceptable.		-
K.2.4.1DV D2 U1	A DC voltage of ± 2 times the a.c. r.m.s. test voltage is acceptable.		-
K.2.4.4DV D2 U1	A DC voltage of ± 2 times the a.c. r.m.s. test voltage is acceptable.		-
K.3.2DV D2 U1	A DC voltage of ± 2 times the a.c. r.m.s. test voltage is acceptable.		-
Annex DVA	CSA, UL and IEC component standards		Pass
	Components comply with the applicable standard (IEC; UL; CSA) acceptable in the country where the product is used.		Pass

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Clause	Requirement + Test	Result - Remark	Verdict
DVC.1	General		N/A
DVC.1.1	The threshold limit values (TLVs) comply with the spectral region between 180 and 400 nm.		N/A
DVC.1.2	The values apply to UV radiation, but not to UV lasers (see TLV for laser).		N/A
	The duration of exposure is not less than 0.1 sec.		N/A
DVC.2	Recommended values		N/A
DVC.2.1	The TLVs for occupational exposure to UV radiation incident upon skin or eye where irradiance values are known and exposure time is controlled are as follows:		N/A
	a) UV-A (315 to 400 nm) radiation to unprotected eye:		N/A
	1) Total energy not exceed 1 J/cm ² (1000 mJ/cm ²) for less than 1000s.		N/A
	2) Power not exceed 1 mW/cm ² for greater than 1000s, and		N/A
	No 1000s time period should present a total energy that exceeds 1 J/cm ² (1000 mJ/cm ²).		N/A
	b) For monochromatic sources, the TVL for exposure to the unprotected skin or eye not exceeded within an 8-hour period, acc. to Table DVC.2.1.1.		N/A
	c) For broad-spectrum or multi-peak sources, the TVL for exposure of the unprotected skin or eye was calculated.		N/A
	d) For white-light sources and all open arcs, the spectral irradiance between 200 and 315 nm determine the effective irradiance.		N/A
	UV sources which emit UV-A radiation require spectral weighting from 315 to 400 nm.		N/A
	TLVs for UV energy apply to sources which subtend an angle less than 80°.		N/A
	Sources which subtend a greater angle need to be measured only over an angle of 80°.		N/A
Annex DVD	Permanent connection to MAINS [D2]		Pass
DVD.1.1	Equipment has provision for connection of wiring system in accordance with ANSI/NFPA 70, NEC and/or with CSA C22.1, CEC Part 1		Pass
	Equipment meet the requirements of DVD.2 to DVD.3		Pass
DVD.1.2	Compliance is checked by inspection and comply with DVD.2 to DVD.3		Pass
DVD.2	Wiring TERMINALS and leads		Pass
DVD.2.1	General		Pass

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Clause	Requirement + Test	Result - Remark	Verdict
DVD.2.1.1	PERMANENTLY CONNECTED EQUIPMENT provided with TERMINALS or leads comply with am ampacity according to NEC and/or Canadian Electrical Code, Part I		Pass
DVD.2.1.2	TERMINAL or splice compartment encloses all FIELD WIRING TERMINALS		N/A
	Equipment has an complete ENCLOSURE		N/A
DVD.2.1.3	TERMINAL or splice compartment in MAINS connections to PERMANENTLY CONNECTED EQUIPMENT are located so that:		Pass
	a) Internal wiring and electrical components not damaged while connections are being made		Pass
	b) Connection may be readily inspected after installation		Pass
DVD.2.1.4	Compliance is checked by inspection.		Pass
DVD.2.2	Wiring TERMINALS		N/A
DVD.2.2:1	Wiring TERMINALS provided with effective connections		N/A
DVD.2.2:2	Wire binding screws for mains connection:		N/A
	a) M4 (No 6) for 2.1mm ² (14 AWG) or smaller wire		N/A
	b) M4.5 (No 8) for 3.3mm ² (12 AWG) or smaller wire		N/A
	c) M5 (No 10) for 5.3mm ² (10 AWG) or smaller wire		N/A
DVD.2.2.3	Compliance with the requirements in this Clause is checked by inspection		N/A
DVD.2.3	Leads		N/A
DVD.2.3.1	Free length of lead inside compartment at least 6 inches (150mm)		N/A
DVD.2.3.2	Compliance is checked by inspection		N/A
DVD.2.4	TERMINAL and lead identification		Pass
DVD.2.4.1	TERMINALS and leads are suitably identified		Pass
DVD.2.4.2	Neutral (ground) conductor identified		N/A
	NOTE: A "grounded" supply conductor is connected to protective earth at some point in the building installation. It is sometimes called the "neutral conductor".		N/A
DVD.2.4.3	A wiring TERMINAL solely for neutral (grounded) MAINS conductor :		N/A
	- TERMINAL is readily distinguishable from other TERMINALS		N/A
	- TERMINAL constructed of or plated with metal substantially white in color or		N/A
	- TERMINAL clearly identified by other manner		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
DVD.2.4.4	Neutral (grounded) MAINS conductor is readily distinguishable from other leads (white or natural grey colour)		N/A
DVD.2.4.5	Protective Grounding (earthing) TERMINAL marked according to Cl. 5.1.5.2(b) or		N/A
	Protective Grounding (earthing) TERMINAL marked with "G," "GR," "GND," "GRD," "GROUND," or "GROUNDING" or		N/A
	Protective Grounding (earthing) TERMINAL provided with green colored screwhead that is hexagonal, slotted, or both		N/A
DVD.2.4.6	Protective Grounding (earthing) lead is readily distinguishable from other leads is green color with or without yellow stripes		N/A
DVD.2.4.7	Compliance with the requirements in this Clause is checked by inspection		Pass
DVD.3	ENCLOSURE requirements for conduit entry		N/A
DVD.3.1	Tests performed without pulling apart, cracking or breaking and knockouts remaining in place		N/A
DVD.3.2	ENCLOSURES with sheet metal members with a thickness not less than:		N/A
	- 0.81 mm (uncoated sheet steel)		N/A
	- 0.86 mm (galvanized sheet steel)		N/A
	- 1.11 mm (sheet aluminum)		N/A
	- 1.09 mm (sheet copper or brass)		N/A
	NOTE: ENCLOSURES comply with ANSI/UL 50 and comply with DVD.4.1 and DVD.4.2.		N/A
DVD.3.3	ENCLOSURE made wholly or in part of insulating material provides continuity of bonding between all metallic conduits entering the ENCLOSURE.		N/A
DVD.3.4	Compliance with the requirements in this Clause is checked by performing the tests of DVD.4.		N/A
DVD.4	Conduit ENCLOSURE entry tests		N/A
DVD.4.1	Conduit pull-out test		N/A
DVD.4.1.1	Direct pulling force of 890 N (200 lb) on conduit for 5 min.		N/A
DVD.4.2	Conduit torque test		N/A
DVD.4.2.1	Tightening torque per Table DVD.4.2.1.1 apply		N/A
	22.6 Nm for an end-of-line ENCLOSURE		N/A
DVD.4.3	Bending		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
DVD.4.3.1	A length of conduit at least 300 mm (1 ft) long of the intended size shall be installed:		N/A
	a) In the center of the largest unreinforced surface, or		N/A
	b) In a hub or an opening if provided as part of the ENCLOSURE		N/A
DVD.4.3.2	Bending moment for conduit openings per Table DVD.4.3.2.1 used		N/A
	The magnitude of the weight shall be determined from the equation: $W = (M-0.5 * C * L) / L$		N/A
DVD.4.3.3	Vertical bending moment value used		N/A
DVD.4.3.4	Deflection of conduit exceeds 250 mm (10 in) for a 3.05 m (10 ft) length of conduit		N/A
DVD.4.3.5	17 Nm (150 lb-in) for bending moment of end-of-line ENCLOSURE defined per Table DVD.4.2.1.1 used		N/A
DVD.4.4	Knockouts		N/A
DVD.4.4.1	Knockouts withstand force of 89 N (20 lb); applied at right angles by means of a mandrel with a 6.4 mm (1/4-in) diameter flat end.		N/A
Annex DVE	Permanently Installed Equipment [D2]		Pass
DVE 1	General		Pass
DVE.1.1 Amd 1	DVE.1.1 These requirements cover permanently installed, OPEN EQUIPMENT or enclosed-type intended for installation in accordance with the National Electrical Code, ANSI/NFPA 70 and the Canadian Electrical Code, C22.1.		Pass
DVE.1.2 Amd 1	With the exception of OPEN EQUIPMENT energy-monitoring current transformers, metering equipment, and their associated communication modules evaluated to these requirements are not intended for retrofit field installation within the enclosure of switchgears/panel boards.		Pass
DVE.1.3 Amd 1	These requirements do not apply to detachable (Type S) meters and non-detachable bottom-connected (Type A) electric utility meters that measure, monitor, record, transmit, or receive electrical energy generation or consumption information, including plug-in-type meters intended for installation in meter sockets, meter-socket bases, metering transformer cabinets, or other equipment (such as panel boards) incorporating provisions for plug-in-type meters.		Pass
DVE.1.4 Amd 1	The requirements in this Annex are to be used as supplements to the general requirements in this standard.		Pass
DVE.1.5	These safety requirements do not apply to equipment		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
Amd 1	intended for use in utility substations or equivalent areas that have impulse voltages greater than Overvoltage Category IV.		
DVE.3.1.1 Amd 1	A contact device intended for control of different types of load (e.g. pilot duty, horsepower, general purpose, resistive, etc.) shall be rated accordingly in volt, current, power, and/or horse power rating. Contacts marked "Pilot Duty" may be additionally marked with a pilot duty rating code.		Pass
DVE.3.1.2 Amd 1	Current transformer warning and correlation marking		Pass
DVE.3.1.2.1 Amd 1	Energy-monitoring equipment provided with, or intended for use with, an external power line current transformers shall be marked with:		N/A
	a) the following, or equivalent, statement: "Warning: To reduce risk of electric shock, always open or disconnect circuit from power-distribution system (or service) of building before installing or servicing current transformers"; or		N/A
	b) symbol 14, Table 1, accompanied by statement a) in the installation instructions.		N/A
DVE.3.1.2.2 Amd 1	Energy-monitoring equipment evaluated for use with listed energy monitoring current transformers shall be marked with		Pass
	a) ?For use with Listed Energy-Monitoring Current Transformers?; or		Pass
	b) symbol 14, Table 1, accompanied by statement a) in the installation instructions.		Pass
DVE.3.1.2.3 Amd 1	Energy-monitoring equipment evaluated for use with specific (not listed) energy monitoring current transformers shall be marked with		N/A
	a) the specific manufacturers name and model designations of the current transformers that have been tested for use with the equipment; or		N/A
	b) symbol 14, Table 1, accompanied by statement e) in the installation instructions.		N/A
DVE.3.1.3	Field-wiring terminal markings		Pass
DVE.3.1.3.1 U2	Equipment having field-wiring terminals shall be marked:		Pass
	a) Use Copper Conductors Only if the terminal is only for connection to copper wire;		Pass
	b) Use Copper or Copper-Clad Aluminum Conductors Only if the terminal is only for connection to copper and copper-clad aluminum wire;		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	c) Use Aluminum Conductors Only or "Use Aluminum or Copper-Clad Aluminum Conductors Only" if the terminal is only for connection to aluminium wire; and		N/A
	d) Use Copper or Aluminum Conductors or "Use Copper, Copper-Clad Aluminum, or Aluminum Conductors" if the terminals is for connection to either copper or aluminum wire		N/A
DVE.3.1.3.2 U2	Alternatively, the markings in DVE.3.1.3.1 may be abbreviated as follows:		N/A
	a) Equipment having a connector intended only for use with aluminum wire shall be plainly marked with the letters "AL".		N/A
	b) Equipment having a connector intended for use with aluminum or copper-clad aluminum and copper wire shall be plainly marked "AL-CU" or "CU-AL".		N/A
	c) Equipment having a connector intended for use with copper-clad aluminium and copper wire shall be plainly marked "CC-CU" or "CU-CC".		N/A
DVE.3.1.3.3 U2	Equipment provided with a wire connector for field-installed wiring as covered in DVE.4.4.3 shall be marked to specify that the connector provided is to be used in making the field connection. A wiring terminal that is not intended to receive a conductor one size larger than that specified in DVE.4.4 shall be marked to restrict its use to the smaller size conductor.		N/A
DVE.3.1.3.4 Amd 1	The markings required by DVE.3.1.3.1 to DVE.3.1.3.3 may be in the installation instructions, provided the equipment is marked with a coded correlation marking referencing the installation instruction, or with the marking of Table 1, symbol 14.		Pass
DVE.3.2.1 U2	Equipment intended for use with field installed current transformers, where the transformer is intended to be installed in panel boards or switchgears, shall include the following statements:		N/A
	a) "Always open or disconnect circuit from power-distribution system (or service) of building before installing or servicing current transformers".		N/A
	b) "The current transformers may not be installed in equipment where they exceed 75 percent of the wiring space of any cross-sectional area within the equipment".		N/A
	c) "Restrict installation of current transformer in an area where it would block ventilation openings".		N/A
	d) "Restrict installation of current transformer in an area of breaker arc venting".		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	e) "Not suitable for Class 2 wiring methods" and "Not intended for connection to Class 2 equipment".		N/A
	f) "Secure current transformer and route conductors so that the conductors do not directly contact live terminals or bus".		N/A
	g) The word "WARNING" and the following or equivalent statement: "To reduce the risk of electric shock, always open or disconnect circuit from power distribution system (or service) or building before installing or servicing current transformers".		N/A
DVE.3.2.2 U2	Unless intended for use with listed energy-monitoring current transformers, the following information and instructions shall be included for OPEN EQUIPMENT with field installed accessory current transformers that could be installed within the same end-product enclosure:		Pass
	a) A correlation statement to identify the specific manufacturer's name and model designation of the current transformers that have been determined suitable for use with the equipment. Alternatively, the manual may include the following statement: "For use with listed Energy-Monitoring Current Transformers".		Pass
	b) "Leads of the current transformers shall be maintained within the same end-product enclosure" or similar.		Pass
	c) Unless the current transformers and its leads have been evaluated for REINFORCED INSULATION, a statement to segregate or insulate the leads from different circuits shall be provided.		Pass
	d) "The current transformers are intended for installation within the same enclosure as the equipment. These may not be installed within switchgears and panel boards" or similar		Pass
DVE.4.1.1 U2	Due to the potential contact between hazardous live conductors with the output conductors of field-installed energy-monitoring current transformers, these incoming field-installed leads from switchgears/panel boards shall be reclassified as NFPA 70 and C22.1 Class 1 wiring.		N/A
DVE.4.1.2 U2	There shall be reliable segregation or separation by barriers between the following different circuits:		N/A
	a) Class 1 field and factory installed wiring (such as CT output leads, voltage measurement leads, mains input power), terminals, and uninsulated live parts; and		N/A
	b) Class 2 and Class 3 field installed and factory wiring, terminals, and uninsulated live parts.		N/A
DVE.4.1.3 U2	Segregation is accomplished by clamping, routing, or equivalent means that provides a minimum permanent		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	6.0 mm (per NFPA 70, Article 725.136, and C22.1 Rule 4-10) between parts of different circuits.		
DVE.4.1.4 U2	Conductors provided with insulation rated for the highest voltage involved need not be separated or segregated.		Pass
DVE.4.1.5 U2	Routing and separation between conductors and parts of different circuits can be achieved by provision of flexible tubing as part of an installation kit with the equipment. The tubing shall be rated not less than the highest working voltage involved between the two circuits. The installation manual shall include the following statement: "All Class 2 wiring is to be installed within the provided flexible tubing to maintain segregation between circuits."		N/A
DVE.4.2	Connections to external circuits		Pass
DVE.4.2.1	Circuits and connections intended for Class 2 wiring method shall comply with Class 2 limits as specified in Article 725 of NFPA 70 and Section 16 of C22.1. The cable external to the equipment that is either provided or specified by the manufacturer shall comply with the requirements for the intended application.		N/A
DVE.4.3	Insulation requirements		Pass
DVE.4.3.1	Neutral conductors as part of the mains circuit, shall be considered hazardous live.		Pass
DVE.4.4	Permanent connection to MAINS		Pass
DVE.4.4.1	A field-wiring lead shall not be more than two standard wire sizes smaller than the copper conductor to which it will be connected, and shall not be smaller than 18 AWG (0.82 mm ²).		Pass
DVE.4.4.2	As an option to the requirement in DVE.4.4.1, an 18 AWG size field-wiring lead may be provided for connection to a No. 12 (3.3 mm ²) size branch circuit conductor.		N/A
DVE.4.4.3	As an option to the requirements in DVE.4.4.1, a lead may be more than two wire sizes smaller than the field-provided copper conductor to which it will be connected, but not smaller than 18 AWG, if more than one factory-provided copper lead is intended for connection to the same field-provided lead, and the construction complies with the conditions a) to c) below:		N/A
	a) A wire connector for connection of the field-provided wire is provided as part of the unit, and the wire connector can be used with the combination of wires that will be spliced.		N/A
	b) The factory-provided leads are bunched or otherwise arranged so that stress does not result on an individual		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	lead.		
	c) The equipment is marked to specify that the wire connector for field-installed wiring is to be used in making the field connection.		N/A
DVE.4.4.4 U2	A pigtail lead intended for field-wiring connection shall be subjected to the test specified in DVE.4.4.5.		N/A
	DVE.4.4.5 A pigtail lead intended for field-wiring connection shall withstand without damage or displacement a direct pull of:		N/A
	a) 89 N (20 lbs) for 1 minute applied to a lead extending from the enclosure such as through a hub or nipple and;		N/A
	b) 44.5 N (10 lbs) for 1 minute applied to a lead within a wiring compartment.		N/A
DVE.4.4.6 U2	The protective grounding terminals marking as noted in DVD.2.4.5 may be marked on the equipment or on a wiring diagram provided on the product.		N/A
DVE.5 U2	Resistance to mechanical stresses		N/A
DVE.5.1 U2	Impact test		N/A
DVE.5.1.1 U2	For the Impact test, 8.2.2, replace the X test distance using the formula below such that the impact force equals 6.8 joules \pm 5%.		N/A
DVE.6 U2	Protection against the spread of fire		N/A
DVE.6.1 U2	Enclosures complying with UL 50 and/or UL 50E and CSA C22.2 Nos. 94.1 or 94.2 for the intended application need not be subjected to the applicable requirements in this standard. Non-metallic materials of enclosures complying with the above standards relied upon for containment of fire within the equipment shall have a minimum flammability rating of V-1.		N/A
DVE.7 U2	Equipment temperature limits and resistance to heat		Pass
DVE.7.1 U2	Conduct of temperature tests		Pass
DVE.7.1.1 U2	OPEN EQUIPMENT shall be tested within an enclosure with dimensions as specified in the OPEN EQUIPMENT S installation instructions or tested under the referenced test ambient condition:		N/A
	a) 150% of the dimensions of the device, length, width, and height;		N/A
	b) The dimensions of the device, length, width, and height, plus any keep out zone around the device if marked on the device or defined by the manufacturer in the installation sheet;		N/A
	c) The minimum enclosure size if marked on the device or defined by the manufacturer in the installation sheet;		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	or		
	d) The intended enclosure, such as a standard outlet box if marked on the device or defined by the manufacturer in the installation sheet.		N/A
DVE.7.1.2 U2	When utilizing a) or b), for any device face which has wire(s) exiting it, 20 times the largest accommodated wire diameter may be added, as bend radius, to the appropriate dimension(s), length, width, and/or height. This is to allow proper wire bending space.		N/A
DVE.7.2 U2	Equipment intended for permanent installation		Pass
DVE.7.2.1 U2	Permanently installed equipment shall be tested with a minimum 1.22 m (4 ft) of wire attached to each field-wiring terminal. Wire size shall be determined in accordance with Table 310-15(B) of NFPA 70, and Tables 1 to 5 of C22.1. The size shall be based upon wire that is rated for a temperature of 60°C (140°F) for connection to a branch circuit with a rating of 100 amperes or less, and upon wire that is rated per the 75°C (167°F) column for a rating greater than 100 amperes.		Pass
DVE.8 U2	Components and subassemblies		Pass
DVE.8.1 U2	Current transformers		Pass
DVE.8.1.1 md 1	Listed energy monitoring current transformers intended for field installation shall be used when installed within distribution and control equipment such as panel boards, switchgears, industrial control equipment, and energy-monitoring/management equipment.		Pass
	Accessory current transformers for OPEN EQUIPMENT intended only for field installation within the same enclosure as the OPEN EQUIPMENT shall be:		Pass
	a) evaluated to the requirements as outlined in DVE.8.1.2; or		N/A
	b) listed as energy monitoring current transformers.		Pass
DVE.8.1.2 Amd 1	Accessory current transformers for field installation with OPEN EQUIPMENT, when evaluated to the requirements of this standard, shall comply with the following additional provisions:		N/A
	a) The case or potting material shall provide minimum basic insulation between the external surface of the current transformer and the internal coil or sensing circuit.		N/A
	b) If the current transformer is intended for installation on bare (uninsulated) conductor, its case or potting material shall be rated for minimum 105°C, Electrical Relative Thermal Index (RTI).		N/A
	c) If the current transformer is intended for installation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	on insulated conductor, its case or potting material shall be rated for at least the same temperature as the maximum temperature rating of the conductor insulation (60°C, 75°C, or 90°C).		
	d) Current transformer field wiring leads and electrical sleeving shall be rated minimum the primary voltage rating of the current transformer.		N/A
	e) The temperature rating of the current transformer field wiring leads and electrical sleeving shall not be lower than 90°C.		N/A

-----END OF MAIN REPORT-----

APPENDIX A: Enclosures

Collateral/Particular Standard Enclosures

Enclosures

<u>Supplement ID</u>	<u>Description</u>
Particular Standard - (001)	iec61010_2_030b

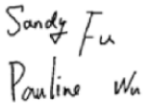
Particular Standard - (001) iec61010_2_030bParticular Standard - (001) iec61010_2_030b

Test Report issued under the responsibility of:



TEST REPORT IEC 61010-2-030 Safety requirements for electrical equipment for measurement, control, and laboratory use Part 2-030: Particular requirements for equipment having testing or measurement circuits	
Report Number.....	E527278-D1001-1/A0/C0
Date of issue.....	Refer to part 1
Total number of pages	30
Name of Testing Laboratory preparing the Report	UL-CCIC Company Limited
Applicant's name	Jiangsu Acrel Electrical
Address	No.31, Hongtu Road, Nanzha Street, Jiangyin City, Jiangsu Province, China
Test specification:	
Standard	IEC 61010-2-030:2017 used in conjunction with IEC 61010-1:2010
Test procedure	UL Certification
Non-standard test method	N/A
Test Report Form No.	IEC61010_2_030B
Test Report Form(s) Originator	TÜV SÜD Product Service GmbH
Master TRF	Dated 2019-06-07
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General disclaimer:	
The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.	

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Test item description :	Power Meter	
Trade Mark :	N/A	
Manufacturer :	Jiangsu Acrel Electrical Manufacturing. Co., Ltd.	
Model/Type reference :	DJSF1352-RN/D	
Ratings :	Model: DJSF1352-RN/D Power input: 230Vac (-10% to 10%), 45-65Hz, Power consumption ≤ 3W, OVCIII. Voltage measurement: CAT III,10-1000Vdc Measurement Current: 75mV Voltage output: ±12Vdc, 50mA Switch output: 24V, max.5mA, resistive	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/>	CB Testing Laboratory:	
Testing location/ address	UL-CCIC Company Limited No.2,Chengwan Road, Suzhou Industrial Park Suzhou 215122 ,China	
Tested by (name, function, signature)	Sandy Fu/Pauline Wu	
Approved by (name, function, signature) ..	Rudy Manzano, reviewer	
<input type="checkbox"/>	Testing procedure: CTF Stage 1:	
Testing location/ address		
Tested by (name, function, signature)		
Approved by (name, function, signature) ..		
<input type="checkbox"/>	Testing procedure: CTF Stage 2:	
Testing location/ address		
Tested by (name + signature)		
Witnessed by (name, function, signature)		
Approved by (name, function, signature) ..		
<input type="checkbox"/>	Testing procedure: CTF Stage 3:	
<input type="checkbox"/>	Testing procedure: CTF Stage 4:	
Testing location/ address		

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Tested by (name, function, signature)		
Witnessed by (name, function, signature)		
Approved by (name, function, signature)...		
Supervised by (name, function, signature)		

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List of Attachments (including a total number of pages in each attachment):	
Summary of testing:	
Tests performed (name of test and test clause): Protection Against Mains Overvoltage Test (101.4)	Testing location: UL-CCIC Company Limited No.2,Chengwan Road, Suzhou Industrial Park Suzhou 215122 ,China
Summary of compliance with National Differences (List of countries addressed):	
<input checked="" type="checkbox"/> The product fulfils the requirements of _UL61010-2-030, second edition, CSA 22.2 No 61010-2-030:18, second edition__ (insert standard number and edition and delete the text in parenthesis, leave it blank or delete the whole sentence, if not applicable)	

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Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBS that own these marks.

See description

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Test item particulars.....:	
Type of item tested.....:	Measurement
Description of equipment function	Power Meter
Installation/overvoltage category	OVCIII
Measurement category	III
Protection class	Class II (isolated)
Pollution degree.....:	2
Environmental rating.....:	Extended: -25~55°C/ humidity <95% non-condensing/max. 2000 m altitude
Equipment mobility	Built in
Connection to mains supply	Permanent, build in
Operating conditions	Continuous
Overall size of the equipment (W x D x H).....:	72*71*87.8 mm
Mass of the equipment (kg).....:	0.206
Marked degree of protection to IEC 60529.....:	N/A
Accessories and detachable parts included in the evaluation	N/A
Options.....:	N/A
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	Refer to datasheet
Date (s) of performance of tests	Refer to datasheet
General remarks:	
<p>The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the issuing Testing Laboratory. "(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report.</p> <p>Throughout this report a <input checked="" type="checkbox"/> comma / <input type="checkbox"/> point is used as the decimal separator.</p> <p>This Test Report Form is intended for the investigation of testing and measurement circuits in accordance with IEC 61010-1:2010. It can only be used together with the Part 1 TRF for the appropriate edition of IEC 61010-1.</p>	

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Manufacturer's Declaration per sub-clause 4.2.5 of IEC60080-02:	
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	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies) : Same as application	
General product information and other remarks:	
See description	

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IEC 61010-2-030			
Clause	Requirement + Test	Result - Remark	Verdict
5.	MARKING AND DOCUMENTATION		P
5.1.5	TERMINALS, connections and operating devices		P
5.1.5.101	Measuring circuit TERMINALS		P
5.1.5.101.1	General		P
	a) The value of the RATED voltage to earth of measuring circuit TERMINALS is marked		P
	b) the value of the RATED voltage or the RATED current, as applicable, for each pair or set of measuring circuit TERMINALS that are intended to be used together are marked		N/A
	c) the pertinent MEASUREMENT CATEGORY for each individual pair or set of measuring circuit TERMINALS or symbol 14 of Table 1 of Part 1 are marked		P
	Measuring circuit TERMINALS are usually supplied in pairs or sets. Each pair or set of TERMINALS may have a RATED voltage or a RATED current, or both, within that set, and each individual TERMINAL may have a RATED voltage to earth.		N/A
	For some equipment, the RATED voltage between TERMINALS may be different from the RATED voltage to earth. Markings shall be clear to avoid misunderstanding		N/A
	Symbol 14 of Table 1 is marked if current measuring TERMINALS are not intended for connection to current transformers without internal protection (see 101.2).		N/A
	Markings are placed adjacent to the TERMINALS, however, if there is insufficient space, the marking may be on the RATING plate or scale plate, or the TERMINAL may be marked with symbol 14 of Table 1.		P
	For any set of measuring circuit TERMINALS, symbol 14 of Table 1 does not need to be marked more than once, if it is close to the TERMINALS.		N/A
5.1.5.101.2	The relevant MEASUREMENT CATEGORY is marked for measuring circuit TERMINALS. The CATEGORY markings are "CAT II", "CAT III" or "CAT IV" as applicable.		P
	Marking more than one type of MEASUREMENT CATEGORY and its RATED voltage to earth is permissible		N/A
5.1.5.101.3	Measuring circuit TERMINALS RATED for connection to voltages above the level of 6.3.1 are marked with Symbol 14 of Table 1, if not RATED for measurements within MEASUREMENT CATEGORIES II, III or IV		N/A
5.1.5.101.4	Low voltage, permanently connected, or dedicated measuring circuit TERMINALS do not need to be marked if a), b), c) below apply		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	a) they are intended to be permanently connected and not ACCESSIBLE (see 5.4.3 aa) and bb), or		N/A
	b) they are dedicated only for connection to specific TERMINALS of other equipment, or		N/A
	c) It is obvious from other indications that the RATED voltage is below the levels of 6.3.1.		N/A
5.4.1	General		P
	aa) information about each relevant MEASUREMENT CATEGORY if the measuring circuit has a RATING for MEASUREMENT CATEGORY II, III or IV (see 5.1.5.101.2).		P
	bb) for measuring circuits that do not have a RATING for MEASUREMENT CATEGORY II, III or IV, but could be misused by connection to such circuits, a warning not to use the equipment for measurements on MAINS, and a detailed RATING including TRANSIENT OVERVOLTAGES (see AA.2.4)		N/A
5.4.3	Equipment installation		P
	aa) for measuring circuit TERMINALS intended for permanent connection and that are RATED for MEASUREMENT CATEGORIES II, III or IV, information regarding the MEASUREMENT CATEGORY, RATED VOLTAGE, and RATED current, as applicable (see 5.1.5.101.2);		P
	bb) for measuring circuit TERMINALS intended for permanent connection and that are not RATED for MEASUREMENT CATEGORIES II, III or IV, information regarding the RATED VOLTAGE, RATED current, and RATED TRANSIENT OVERVOLTAGES as applicable (see 5.1.5.101.4).		N/A
6	Protection against electric shock		P
6.1.2	Exceptions: aa) locking or screw-held type measuring TERMINALS, including TERMINALS which do not require the use of a TOOL.		P
6.5.2.3	Protective conductor terminal		N/A
	h) 2) the PROTECTIVE BONDING is not be interrupted by any switching or interrupting device. Devices used for indirect bonding in test and measurement circuits (see 6.5.2.101) are permitted to be part of the PROTECTIVE BONDING.		N/A
6.5.2.101	Indirect bonding for testing and measuring circuits		N/A
	Indirect bonding establishes a connection between the PROTECTIVE CONDUCTOR TERMINAL and ACCESSIBLE conductive parts if these become HAZARDUS LIVE as a result of fault. Devices to establish indirect bonding are:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	a) voltage limiting devices which become conductive when the voltage across them exceeds the relevant levels of 6.3.2 a), with overcurrent protection to prevent breakdown of the device		N/A
	The duration versus the current shall not exceed the levels of Figure 101.		N/A
	The current between the ACCESSIBLE conductive parts and the PROTECTIVE CONDUCTOR TERMINAL is measured with the circuit of Figure A.1	(See appended Table 6.5.2.101)	N/A
	b) voltage-sensitive tripping devices which interrupt all poles of the MAINS supply or the hazardous LIVE voltage source, and connect the ACCESSIBLE conductive parts to the PROTECTIVE CONDUCTOR TERMINAL whenever the voltage across them reaches the relevant levels of 6.3.2 a).		N/A
	The tripping duration versus the current shall not exceed the levels of Figure 101		N/A
	The current between the ACCESSIBLE conductive parts and the PROTECTIVE CONDUCTOR TERMINAL is measured with the circuit of Figure A.1.	(See appended Table 6.5.2.101)	N/A
	Voltage limiting devices or voltage-sensitive tripping devices as defined in a) and b), shall have at least the voltage and current RATINGS of the measuring TERMINALS.		N/A
6.6	Connections to external circuits		N/A
6.6.101	Conductive parts of each unmated measuring circuit TERMINAL which could become HAZARDOUS LIVE when the highest RATED voltage is applied to other measuring circuit TERMINALS on the equipment shall be separated by at least:	See appended Table 6.6.101	N/A
	a) for TERMINALS with voltage RATING up to 1 000 V a.c. or 1 500 V d.c., the applicable CLEARANCE and CREEPAGE DISTANCE of Table 101 from the closest approach of the test finger touching the external parts of the TERMINAL in the least favourable position		N/A
	b) for TERMINALS with voltage RATING exceeding 1 000 V a.c. or 1 500 V d.c., 2,8 mm for the CLEARANCE and CREEPAGE DISTANCE from the closest approach of the test finger touching the external parts of the TERMINAL in the least favourable position.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Additionally, TERMINALS with voltage RATING exceeding 1 000 V a.c. or 1 500 V d.c. shall withstand the voltage test of 6.8 with a test voltage equal to the RATED voltage of the TERMINAL multiplied by 1,25 applied between the closest approach of the test finger touching the external parts of the TERMINAL in the least favourable position and the other measuring circuit TERMINALS.		N/A
	For WET LOCATIONS, there are no CLEARANCE and CREEPAGE DISTANCE requirements for voltages between 16 V a.c. r.m.s. and 30 V a.c. r.m.s., or between 35 V d.c. and 60 V d.c., but conductive parts of unmated measuring circuit TERMINAL shall not be ACCESSIBLE.		N/A
6.6.102	Components, sensors, and devices intended to be connected to specialized measuring circuit TERMINALS are not both ACCESSIBLE and HAZARDOUS LIVE, in either NORMAL CONDITION or SINGLE-FAULT CONDITION, even when the highest RATED voltage is applied to any other measuring circuit TERMINAL	(See appended Table 6.6.102)	N/A
	a) highest RATED a.c. voltage at any RATED MAINS frequency;		N/A
	b) highest RATED d.c. voltage;		N/A
	c) highest RATED a.c. voltage at the related maximum RATED measurement frequency.		N/A
6.7.1.3	CREEPAGE DISTANCES		N/A
	For HAND-HELD EQUIPMENT not powered from the MAINS or the measuring circuit, CREEPAGE DISTANCES are allowed to be according to material group I for all insulating materials.		N/A
6.7.1.5	Requirements for insulation according to type of circuit		P
	a) 6.7.2 mains circuits of overvoltage category II up to nominal supply voltage of 300 V		N/A
	b) 6.7.3 secondary circuits separated from circuits defined in a) only by means of a transformer		N/A
	c) K.1 mains circuits of overvoltage category III and IV or overvoltage category II over 300 V		P
	d) K.2 secondary circuits separated from circuits defined in c) only by means of a transformer		N/A
	e) K.3 circuits having one or more of:		P
	1) maximum TRANSIENT OVERVOLTAGE is limited to known level below the level of MAINS CIRCUIT		N/A
	2) maximum TRANSIENT OVERVOLTAGE above the level of MAINS CIRCUIT		N/A
	3) WORKING VOLTAGE is the sum of more than one circuit or a mixed voltage		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	4) WORKING VOLTAGE includes recurring peak voltage, may include non-sinusoidal or non-periodic waveform		P
	5) Working voltage with a frequency above 30 kHz		N/A
	6) circuit is a measuring circuit where MEASUREMENT CATEGORIES do not apply;		N/A
	f) in Clause K.101 for measuring circuits of MEASUREMENT CATEGORIES II, III and IV.		P
14	Components and subassemblies		N/A
14.101	Circuits used to limit TRANSIENT OVERVOLTAGE in measuring circuits are used to measure MAINS		N/A
	If control of TRANSIENT OVERVOLTAGE is employed in a measuring circuit used to measure MAINS, the overvoltage limiting component or circuit has adequate strength to limit TRANSIENT OVERVOLTAGES	(See appended Table 14.101)	N/A
14.102	Probe assemblies and accessories		N/A
	Probe assemblies and accessories within the scope of IEC 61010-031, and current sensors within the scope of IEC 61010-2-032 shall meet the requirements thereof.		N/A
101	Measuring circuits		P
101.1	The equipment provides protection of HAZARD resulting from NORMAL USE and REASONABLY FORSEEABLE MISUSE of measuring circuits as specified below:		P
	a) If a HAZARD could result, a current measuring circuit does not interrupt the circuit being measured during range changing, or during the use of current transformers without internal protection (see 101.2)		P
	b) An electrical quantity that is within specification for any TERMINAL does not cause a HAZARD when it is applied to that TERMINAL or any other compatible TERMINAL, with the range and function settings set in any possible manner (see 101.3)		N/A
	c) Any interconnection between the equipment and other devices or accessories intended to be used with the equipment shall not cause a HAZARD even if the documentation or markings prohibit the interconnection while the equipment is used for measurement purposes (see 6.6).		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	d) For measuring circuits that include one or more FUNCTIONAL EARTH TERMINALS, a RISK assessment (see Clauses 16 and 17) addresses the HAZARDS that may result if the equipment is operated with a disconnected PROTECTIVE CONDUCTOR TERMINAL and if the operator unintentionally connects a FUNCTIONAL EARTH TERMINAL to any RATED voltage for any other TERMINAL.		N/A
	e) A TEMPORARY OVERVOLTAGE or a TRANSIENT OVERVOLTAGE applied on the measuring circuits TERMINALS in voltage measurement function shall not cause a HAZARD		N/A
	f) Other HAZARDS that could result from REASONABLY FORESEEABLE MISUSE is addressed by RISK assessment (see Clauses 16 and 17).		N/A
101.2	Current measuring circuits		N/A
	Current measuring circuits are so designed that, when range changing takes place, there is no interruption which could cause a HAZARD.	(See appended Table 101.2)	N/A
	Current measuring circuits intended for connection to current transformers without internal protection are adequately protected to prevent a HAZARD arising from interruption of these circuits during operation.	current input is directly the voltage value.	N/A
101.3	Protection against mismatches of inputs and ranges	Permanently connected by qualified technicians	N/A
101.3.1	In NORMAL CONDITION and in cases of REASONABLY FORESEEABLE MISUSE, no HAZARD arises when the highest RATED voltage or current of a measuring circuit TERMINAL is applied to that TERMINAL or any other compatible TERMINAL, with any combination of function and range settings		N/A
	The equipment provides protection against these HAZARDS; one of the following techniques is used.		N/A
	TERMINALS that are clearly not of similar types and that will not retain the connectors of the probe or accessory do not need to be tested. TERMINALS that can only be accessed by use of a TOOL do not need to be tested		N/A
	a) Use of a certified overcurrent protection device to interrupt short-circuit currents before a HAZARD arises; requirements of Clause 101.3.2 apply, or		N/A
	b) Use an uncertified current limitation device, an impedance, or a combination of both to prevent the HAZARD from arising; requirements of 101.3.3 apply		N/A
101.3.2	Protection by a certified overcurrent protection device	(See appended Table 101.3.2)	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Overcurrent protection device certified by an independent laboratory meet all of the specified requirements		N/A
	a) The a.c. and d.c. RATED voltages of the overcurrent protection device is at least as high as, respectively, the highest a.c. and d.c. RATED voltages of any measuring circuit TERMINAL on the equipment.		N/A
	b) The RATED time-current characteristic (speed) of the overcurrent protection device is such that no HAZARD will result from any possible combination of RATED input voltages, TERMINALS, and range selection		N/A
	c) The a.c. and d.c. RATED breaking capacities of the overcurrent protection device exceeds the possible a.c. and d.c. short-circuit currents.		N/A
	The possible a.c. and d.c. short-circuit currents shall be calculated as the highest RATED voltages for any TERMINAL divided by the impedance of the overcurrent-protected measuring circuit, taking the impedance of the test leads specified in 101.3.4 into account.		N/A
	For MEASUREMENT CATEGORIES II and III, the possible a.c. short-circuit current does not need to exceed the applicable value of Table AA.1.		N/A
	Additionally, spacings surrounding the overcurrent protection device in the equipment and following the protection device in the measuring circuit is sufficiently large to prevent arcing after the protection device opens.		N/A
101.3.3	Protection by uncertified current limitation devices or by impedances	(See appended Table 101.3.3)	N/A
	Devices used for current limitation are capable of safely withstanding, dissipating, or interrupting the energy that will result from the application of the maximum RATED voltage of any compatible TERMINAL in NORMAL CONDITION and in the case of REASONABLY FORESEEABLE MISUSE.		N/A
	An impedance used for limitation of current is one or more of the following:		N/A
	a) An appropriate single component which is constructed, selected, and tested so that safety and reliability for protection against relevant HAZARDS is assured.		N/A
	1) the component RATED for the max voltage that may be present in NORMAL CONDITION or during the REASONABLY FORESEEABLE MISUSE event;		N/A
	2) if a resistor, be RATED for twice the power or energy dissipation that may result in NORMAL CONDITION or from the REASONABLY FORESEEABLE MISUSE event;		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	3) meets the applicable CLEARANCE and CREEPAGE distance requirements of Annex K for BASIC INSULATION between its terminations of the combination of components.		N/A
	b) A combination of components		N/A
	1) which can withstand the maximum voltage that may be present in NORMAL CONDITION or during the REASONABLY FORESEEABLE MISUSE event,		N/A
	2) be able to dissipate the power or energy that may result in NORMAL CONDITION or from the REASONABLY FORESEEABLE MISUSE event,		N/A
	3) meet the applicable CLEARANCE and CREEPAGE distance requirements of Annex K for BASIC INSULATION between the terminations of each component.		N/A
101.3.4	Test leads for the tests of 101.3.2 and 101.3.3 shall		N/A
	be performed with all test leads that are included with or supplied by the manufacturer for use with the equipment,		N/A
	and if the manufacturer hasn't specified the test leads, the tests shall be performed with test leads that meet the following specifications:		N/A
	a) length = 1 m;		N/A
	b) cross section of the conductor = 1,5 mm ² , stranded copper wire;		N/A
	c) equipment connector compatible with the measuring circuit TERMINALS;		N/A
	d) connection to the test voltage source into suitable screw TERMINALS or thimble connectors (twist-on wire connectors) or equivalent means of providing a low impedance connection;		N/A
	e) arranged as straight as possible.		N/A
	If the manufacturer-supplied test leads are permanently connected to the equipment, then the attached test leads supplied by the manufacturer were used without modification		N/A
101.4	Protection against MAINS overvoltages		P
	To ensure protection against arc flash or fire, measuring circuits RATED for measuring MAINS voltages shall have minimum CLEARANCE and CREEPAGE DISTANCE equivalent to BASIC INSULATION between MAINS-connected conductive parts of opposite polarity.		P

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IEC 61010-2-030			
Clause	Requirement + Test	Result - Remark	Verdict
	The measuring circuit TERMINALS of a voltage measuring circuit that is RATED for MEASUREMENT CATEGORIES III or IV shall withstand the applicable TRANSIENT OVERVOLTAGE of Table K.106 with the voltage measurement function selectors set for the proper function and range, without damage which could cause a HAZARD.		P
101.5	Over-range indication		N/A
	If a HAZARD could arise from an OPERATOR'S reliance on the value (for example, voltage) displayed by the equipment, the display shall give an unambiguous indication whenever the value is above the maximum positive value or below the minimum negative value of the range to which the equipment is set.		N/A

Annex K.3	Insulation in circuits not addressed in 6.7, K.1 or K.2, and in measuring circuits where MEASUREMENTS CATEGORIES do not apply		N/A
K.3.1	General		N/A
	These circuits have one or more of the following characteristics:		N/A
	a) the maximum possible TRANSIENT OVERVOLTAGE is limited by the supply source or within the equipment (see Clause K.4.) to a known level below the level assumed for the MAINS CIRCUIT;		N/A
	b) the maximum possible TRANSIENT OVERVOLTAGE is above the level assumed for the MAINS CIRCUIT;		N/A
	c) the WORKING VOLTAGE is the sum of voltages from more than one circuit, or is a mixed voltage;		N/A
	d) the WORKING VOLTAGE includes a recurring peak voltage that may include a periodic non-sinusoidal waveform or a non-periodic waveform that occurs with some regularity;		N/A
	e) the WORKING VOLTAGE has a frequency above 30 kHz;		N/A
	f) the circuit is a measuring circuit where MEASUREMENT CATEGORIES do not apply.		N/A
	In cases a) to c) and f), CLEARANCES for BASIC INSULATION and SUPPLEMENTARY INSULATION are determined according to K.3.2.		N/A
	In cases d) and e) CLEARANCES are determined according to K.3.3.		N/A
	In all cases K.3.4 addresses CREEPAGE DISTANCE and K.3.5 solid insulation.		N/A
K.101	Insulation requirements for measuring circuits of MEASUREMENT CATEGORIES II, III, IV		P

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IEC 61010-2-030			
Clause	Requirement + Test	Result - Remark	Verdict
K.101.1	General		P
K.101.2	CLEARANCES		P
	For equipment intended to be powered from the circuit being measured, CLEARANCES of the MAINS CIRCUIT are designed according to the requirements of the RATED MEASUREMENT CATEGORIES		N/A
	Overvoltage limiting devices may be used to reduce the transient Overvoltages to a level consistent with a lower MEASUREMENT CATEGORIES (see K.102)		N/A
	Additional marking requirements in 5.1.5.2 and 5.1.5.101		N/A
	CLEARANCES for measuring circuits of MEASUREMENT CATEGORIES II, III, IV meet Table K.101		P
	Equipment rated to operate at an altitude greater than 2000 m, correction factor of Table K.1 of 61010-1 applied		N/A
	Voltage tests of 6.8.3.1 or 6.8.3.3 of 61010-1		P
K.101.3	CREEPAGE DISTANCES		P
	The requirements of K.2.3 of 61010-1 applied		P
K.101.4	Solid insulation		P
K.101.4.1	General		P
	Solid insulation withstands the electrical and mechanical stresses that may occur in NORMAL USE in all RATED environmental conditions (see 1.4) during the intended life of the equipment		P
	The manufacturer should take the expected life of the equipment into account when selecting insulating materials.		P
	Solid insulation also meets the following requirements as applicable		N/A
	a) solid insulation used as an ENCLOSURE or PROTECTIVE BARRIER, the requirements of Clause 8		N/A
	b) moulded and potted parts, the requirements of K.101.4.2		N/A
	c) insulating layers of printed wiring boards, the requirements of K.101.4.3		N/A
	d) thin-film insulations, the requirements of K.101.4.4		N/A
K.101.4.2	Moulded and potted parts		N/A
	Conductors located between same two layers moulded together are separated by at least the applicable minimum distance of Table K.9 of 61010-1		N/A

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IEC 61010-2-030			
Clause	Requirement + Test	Result - Remark	Verdict
K.101.4.3	Insulating layers of printed wiring boards		N/A
	For BASIC INSULATION, SUPPLEMENTARY INSULATION and REINFORCED INSULATION, conductors located between the same two layers shall be separated by at least the applicable minimum distance of Table K.9.		N/A
	REINFORCED INSULATION have adequate electric strength; one of the following methods are used:		N/A
	a) thickness at least the applicable value of Table K.9 of 61010-1		N/A
	b) insulation is assembled from at least two separate layers, each RATED for test voltage of Table K.102 to K.104 for BASIC INSULATION		N/A
	c) insulation is assembled from at least two separate layers, where the combination is RATED for test voltage of Table K.102 to K.104 for REINFORCED INSULATION		N/A
K.101.4.4	Thin-film insulation		N/A
	Conductors between same layers are separated by at least the applicable CLEARANCES and CREEPAGE DISTANCE of K.101.2 and K.101.3		N/A
	REINFORCED INSULATION have adequate electric strength; one of the following methods are used:		N/A
	a) thickness at least the applicable value of Table K.9 of 61010-1		N/A
	b) insulation consists of at least two separate layers, each RATED for test voltage of Table K.102 to Table K.104 for BASIC INSULATION		N/A
	c) insulation consists of at least three separate layers, where the combination of two layers passed voltage tests of Table K.102 to K.104 for REINFORCED INSULATION		N/A
	a.c. Voltage tests of 6.8.3.1 of 61010-1		N/A
K.102	Reduction of TRANSIENT OVERVOLTAGES by the use of overvoltage limiting devices		N/A
	If the overvoltage limiting device or circuit is intended to reduce TRANSIENT OVERVOLTAGES, a RISK ASSESSMENT (see Clause 17) is performed taking into account both of the followings		N/A
	a) Even under SINGLE FAULT CONDITIONS, the circuit shall reduce TRANSIENT OVERVOLTAGES to a lower voltage value which depends on the design		N/A
	SINGLE FAULT CONDITION includes a short and open circuit of MOV (metal oxide varistor)		N/A

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IEC 61010-2-030			
Clause	Requirement + Test	Result - Remark	Verdict
	a) the circuit operates as intended even after withstanding repeated TRANSIENT OVERVOLTAGES		N/A

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IEC 61010-2-030			
Clause	Requirement + Test	Result - Remark	Verdict
6.5.2.101	TABLE: Indirect bonding for test and measuring circuits		N/A
a) Voltage limiting device			
ACCESSIBLE part under test	Voltage attained (V)	Time for voltage to drop to allowable levels (s)	ACCESSIBLE part under test
b) Voltage-sensitive tripping device			
ACCESSIBLE part under test	Voltage applied (V)	Time for device to trip (s)	ACCESSIBLE part under test
Supplementary Information:			

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IEC 61010-2-030			
Clause	Requirement + Test	Result - Remark	Verdict

6.6.101	TABLE: CLEARANCES and CREEPAGE distances for measuring circuit terminals with HAZADUS LIVE conductive parts				N/A
Location/ Terminal/Rate d Voltage (ac or dc)	Required		Measured		Location/ Terminal CLEARANCE mm
	CREEPAGE DISTANCE	CLEARANCE	CREEPAGE DISTANCE	CREEPAGE DISTANCE	
	mm	mm	mm	mm	
Supplementary information:					

Particular Standard - (001) iec61010 2 030b

IEC 61010-2-030			
Clause	Requirement + Test	Result - Remark	Verdict

6.6.101	TABLE: CLEARANCES and CREEPAGE distances for measuring circuit terminals with HAZADUS LIVE conductive parts	N/A		
Accessible parts	Voltage r.m.s./peak/d.c. (V)	Current (mA)	Capacitance	Comments
Supplementary information:				

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IEC 61010-2-030			
Clause	Requirement + Test	Result - Remark	Verdict

6.6.102 (6.3.2)		TABLE: Values in SINGLE FAULT CONDITION					N/A	
Accessible parts	Subclause/ Fault No.	Voltage r.m.s./ peak/d.c (V).	Transient		Current; (mA)		Capacitance (μF)	Comments
			(V)	(s)	Test circuit A1/A2/A3	r.m.s. or peak or d.c.		

NOTE - Required values are determined by calculation for Reinforce Insulation. Transients are not taken into account.

Supplementary information:

Transient voltages must be below the limits given from Figure 2 and the capacitance below the limits from figure 3 of IEC 61010-1.

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IEC 61010-2-030			
Clause	Requirement + Test	Result - Remark	Verdict

6.9.101		TABLE: Over range indication test			N/A
Measuring Terminal	Applied Voltage (V)	Contents of Display	Verdict	Comments	
Supplementary information: See test datasheet					

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Clause	Requirement + Test	Result - Remark	Verdict
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14.101 TABLE: Transient overvoltage limiting devices										N/A
Component / Designation	Overtoltage Category	MAINS voltage V rms	Test voltage V	t_m °C	t_c °C	t_{max} °C	Rupture Yes / No	Circuit breaker tripped	Comments	
Test room ambient temperature: °C										
NOTE - t_m = measured temperature t_c = t_m corrected ($t_m - t_a + 40$ °C or max. RATED ambient) t_{max} = maximum permitted temperature Conformity is checked by applying 5 positive and 5 negative impulses with the applicable impulse withstand voltage, spaced up to 1 min apart, from a hybrid impulse generator (see IEC 61180-1).										
Supplementary information:										

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IEC 61010-2-030			
Clause	Requirement + Test	Result - Remark	Verdict

101.2	TABLE: Current measuring circuits - Current transformers			N/A
Type/Model	RATED current (A)	Test current (A)	Interrupt Yes / No	Result / Comments
NOTE - These tests are performed with all types and models of current transformers without internal protection, and which are specified by the manufacturer for use with the equipment				
Supplementary information:				

Particular Standard - (001) iec61010 2_030b

IEC 61010-2-030			
Clause	Requirement + Test	Result - Remark	Verdict

101.2	TABLE: Current measuring circuits - Range changing switches			N/A
Type / Model	Switch maximum rated current (A)	Cycling test Result	Comments	
Supplementary Information:				

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IEC 61010-2-030			
Clause	Requirement + Test	Result - Remark	Verdict

101.3.2	TABLE: Certified overcurrent protection device test					N/A
Type / Model / Terminal	Max. rated Voltage (V)	Test Voltage (V)	Test leads		Verdict	Comments
			Mfr.	Std.		
NOTE 1: Test voltage = 2 times max. rated Voltage for 1 min.						
NOTE 2: Mfr – Manufacturer supplied leads Std. – Leads as described in 101.3.4						
Supplementary Information:						

Particular Standard - (001) iec61010 2 030b

IEC 61010-2-030			
Clause	Requirement + Test	Result - Remark	Verdict

101.3.3	TABLE: Uncertified overcurrent protection device test					N/A
Type / Model / Terminal	Max. rated Voltage (V)	Test Voltage (V)	Test leads		Verdict	Comments
			Mfr.	Std.		
NOTE 1 - Test was conducted 3 times. NOTE 2 - Any damage to a device used for current limitation was ignored when other parts of the equipment were not affected during the test. NOTE 3 - Mfr – Manufacturer supplied leads Std. – Leads as described in 101.3.4 NOTE 4 - Note current limit devices manufacture, type and ratings.						
Supplementary Information:						

Particular Standard - (001) iec61010 2_030b

List of test equipment used:

A completed list of used test equipment shall be provided in the Test Reports when a Customer's Testing Facility according to CTF stage 1 or CTF stage 2 procedure has been used.
Note: This page may be removed when CTF stage 1 or CTF stage 2 are not used. See also clause 4.8 in OD 2020 for more details.

Clause	Measurement / testing	Testing / measuring equipment / material used, (Equipment ID)	Range used	Last Calibration date	Calibration due date

Note: all the test and equipment see datasheet detail. -Sandy Fu 2023-03-16

Other Enclosures

All Enclosures associated with this report are shown below.

Enclosures

<u>Supplement - (ID)</u>	<u>Description</u>
Diagrams - (001)	Transformer specification
Marking Label - (001)	label marking
Marking Label - (002)	Label
Miscellaneous - (001)	Installation instruction
Photographs - (001)	Assembly view
Photographs - (002)	External side view 1
Photographs - (003)	External side view 2
Photographs - (004)	External Top view
Photographs - (005)	LCD Board top and bottom view
Photographs - (006)	Power board top and bottom view
Photographs - (007)	SIG Board top and bottom view
Schematics + PWB - (001)	LCD Board Layout
Schematics + PWB - (002)	POW Board layout
Schematics + PWB - (003)	SIG Board layout

Diagrams - (001) Transformer specification

Diagrams - (001) Transformer specification

请 确 认 书

SPECIFICATION FOR APPROVAL

客户名称 CUSTOMER	安科瑞微电网研究院
产品描述 DESCRIPTION	DJSF1352-RN导轨直流电能表开关变压器
客户型号 PART NUMBER	T-EPC19-220V-5V-8V±15V-1 / Y0100199
华德型号 PRODUCT CODE	WTW 13506-9
送样日期 SAMPLE DATE	Oct.23 th .2022

我们已经测试了无锡华德电子科技有限公司的样品，测试结果如下：

We have tested the samples from WTW, and result as following:

释放 Fully Approved

条件释放 Conditionally Approved

见备注 See Remark

拒绝释放 Refused

见备注 See Remark

备注 Remark:

! 样品确认后请签字回传。接到产品定单，即为样品已经完全释放。

! Please sign and return it after your approval. If getting production order, it will be looked as full approval.



无锡华德电子科技有限公司

WUXI WATTECH ELECTRONIC TECHNOLOGY CO.,LTD

ISO9001:2015 ISO14001:2015 IATF16949:2016 ISO45001:2018 UL-E335368(B/F/H)

地址: 214072 中国江苏省无锡市滨湖区滴翠路82号C2楼三层

ADD: Floor 3, Building C2, No.82 Dicui Road, Binhu District, 214072 Wuxi, China.

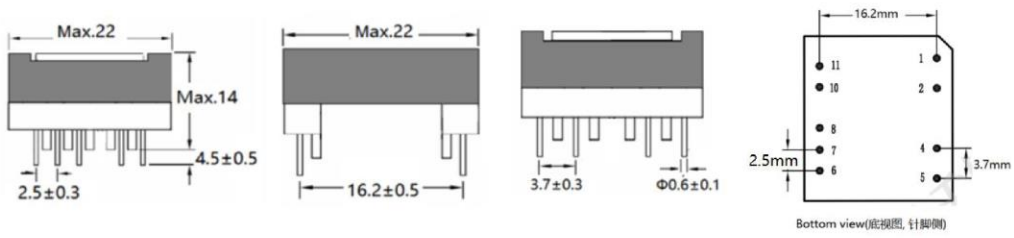
电话TEL: +86 510 6610 1171, +86 510 6610 1178, +86 15895350298 传真FAX: +86 510 6610 1170

网址WEBSITE: WWW.WTW-ELECTRONICS.COM

NOTE: NO PROVIDING TO ANY THIRD PART WITHOUT AGREEMENT FROM WATTECH IN WRITTEN ! OTHERWISE USD\$100K WILL BE PAID BY PROVIDER !

Diagrams - (001) Transformer specification

1. DIMENSION(UNIT:mm)

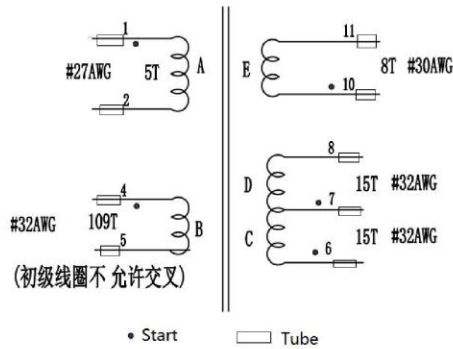


Note:

- 1) Before core assembly, Install a piece of insulating film between the core and the bobbin, then use 3 turns of insulation tape to fixed the cores.
- 2) Pin3 and 9 removed.
- 3) Wound one turn of copper foil around the core and bobbin, and solder to Pin5
- 4) Varnished.
- 5) Marking on the side of core:
Y0100199
 WTW 13506-9 ww/yy ww:week yy:year
- 6) This transformer is meet our B class insulation system, UL-E335368



2a. SCHEMATIC:



2b. WINDING INSTRUCTION:

Pin10-11 AWG30 TIW wire, 8turns	
Pin6-7&Pin7-8 并绕, 15turns	AWG32 wire
Pin1-2 AWG27 TIW wire, 5turns	
Pin4-5 AWG32 wire,109Turns	

Bobbin

Note:

- 1) All the windings with the same direction.
- 2) Wound 1.5mm wide margin tape on both sides of pin 4-5 winding
- 3) Wound 3.0mm wide margin tape on both sides of pin 6-7&pin7-8 winding

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			WTW 13506-9	PAGE	3/6

Diagrams - (001) Transformer specification**3. ELECTRICAL CHARACTERISTICS**

No.	ITEM	TERMINAL	SPECIFICATION	REMARKS
1	INDUCTANCE	Pin 4 - 5	1645uH±10%	100KHZ/1V
2	LEAKAGE INDUCTANCE	Pin 4 - 5	Max.86uH	100KHZ/1V, shorted all other pins
3	TURNS AND PHASE	Pin4-5:1-2:6-7:7-8:10-11	109:5:15:15:8(+)	100KHZ/1V
4	HIGH VOLTAGE	Pin1 to Pin 4/7/11	4000V	AC, 0.5mA,1min
5	HIGH VOLTAGE	Pin4 to Pin11	4000V	AC, 0.5mA,1min
6	HIGH VOLTAGE	Pin7 to Pin4/11	3000V	AC, 0.5mA,1min

4. MAIN MATERIAL LIST

No.	NAME	DESCRIPTION	NOTE
1	CORE	EPC19, DMR44 or TP4A material, single air gap	DMEGC/TDG
2	BOBBIN	EPC19, Phenolic PM9820 material, UL94V-0, UL-QMFZ2	E41429
3	CU WIRE	Enamelled cu wire, xUEW/xJEW/155, QA-x/155, MW79C/MW80C, UL-OBMW2	E237377/ E227047
4	TIW WIRE	Triple insulated wire, TRW(B) , Class-B/130C, UL-OBJT2, GREAT LEOFLON	E211989
5	CU FOIL	Adhesive cu foil 0.1x6mm	YAHUA
6	MARGIN TAPE	Non-woven tape, WF*(c)(h) type, 3.0mm width, Class-B/130°C, UL-OANZ2	E165111
7	TAPE	Polyester tape, CT*(b)(g) type, 0.055mm thickness, Class-B/130°C, yellow color, UL-OANZ2	E165111
8	TUBE	Teflon tube, TFL type , transparant color, UL-YDPU2	E156256
9	VARNISH	TAIHU T4260a, UL-OBOR2	E228349

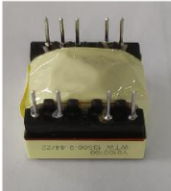
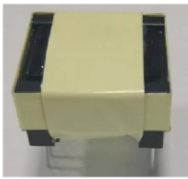
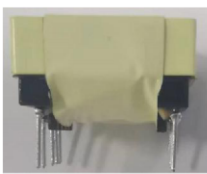
* All materials according to RoHS Directive. 2002/95/EC and 2015/863.

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Diagrams - (001) Transformer specification

5. TEST RESULT(Test condition: 100KHZ/1V, 24.5°C/48%)						
No./Test item	L Pin4 - 5 1480.5~1809.5uH	LK Pin4 - 5 Max.86uH	Turns and phase	High voltage Pin1 to Pin 4/7/11 4000V, AC, 0.5mA, 1min	High voltage Pin4 to Pin11 4000V, AC, 0.5mA, 1min	High voltage Pin7 to Pin4/11 3000V, AC, 0.5mA, 1min
1	1591.50	50.486	OK	PASS	PASS	PASS
2	1528.30	50.758	OK	PASS	PASS	PASS
3	1572.30	50.124	OK	PASS	PASS	PASS
4	1619.20	50.166	OK	PASS	PASS	PASS
5	1618.70	51.423	OK	PASS	PASS	PASS
6	1634.60	51.180	OK	PASS	PASS	PASS
7	1623.90	51.107	OK	PASS	PASS	PASS
8	1571.20	49.959	OK	PASS	PASS	PASS
9	1617.30	50.163	OK	PASS	PASS	PASS
10	1608.00	50.589	OK	PASS	PASS	PASS
11	1582.00	50.396	OK	PASS	PASS	PASS
12	1622.20	50.479	OK	PASS	PASS	PASS
13	1578.40	50.071	OK	PASS	PASS	PASS
14	1623.10	51.829	OK	PASS	PASS	PASS
15	1610.80	50.996	OK	PASS	PASS	PASS
16	1627.70	49.642	OK	PASS	PASS	PASS
17	1584.00	49.866	OK	PASS	PASS	PASS
18	1569.50	50.217	OK	PASS	PASS	PASS
19	1547.90	50.397	OK	PASS	PASS	PASS
20	1593.20	49.563	OK	PASS	PASS	PASS
21	1549.80	49.714	OK	PASS	PASS	PASS
22	1578.50	51.477	OK	PASS	PASS	PASS
23	1586.50	49.831	OK	PASS	PASS	PASS
24	1645.40	49.444	OK	PASS	PASS	PASS
25	1538.20	51.484	OK	PASS	PASS	PASS
MIN	1528.30	49.444				
MAX	1645.40	51.829				
$u=\sum/n$	1592.89	50.454				
Result	OK	OK	OK	OK	OK	OK

Note: all the 50pcs samples pass the above test.

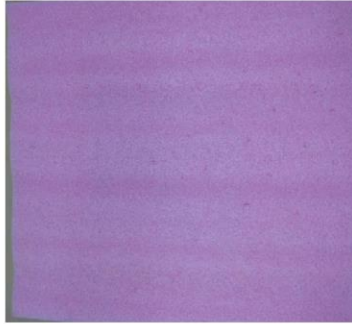




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Diagrams - (001) Transformer specification

6. PACKAGING REQUIREMENT:

1) antistatic foam EPE



2) carton boxes with RoHS



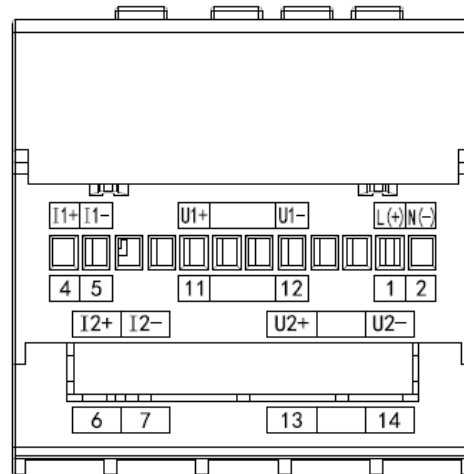
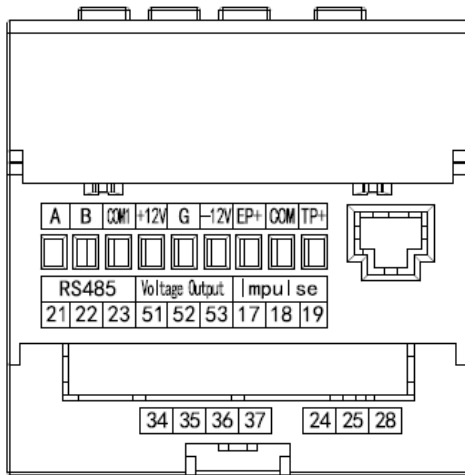
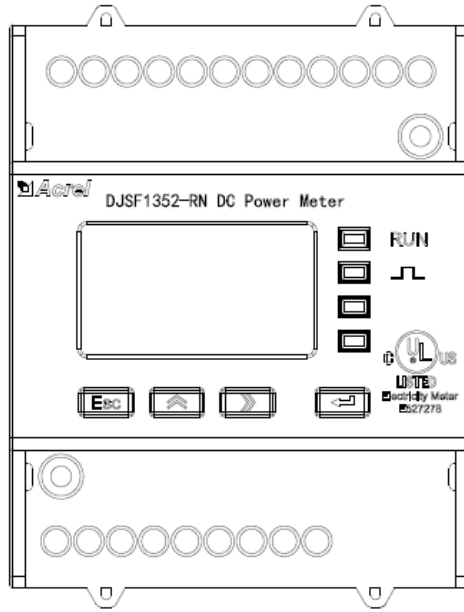
3) carton boxes with UL-E335368



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Marking Label - (001) label marking

Marking Label - (001) label marking



Marking Label - (002) Label

Marking Label - (002) Label

单位: mm

44

1.13

条形码

二维码

35

2.40

Type: DJSF1352-RN/D
 Auxiliary voltage: AC 230V 45~65Hz
 Input power: ≤3W
 Measure voltage: DC 10-1000V \equiv
 CAT III
 Current signal input: 75mV
 Communication protocol: Modbus-RTU
 DATE: XX/XX/XX

active

For use with listed Energy-Monitoring
 Current Transformers

Acrel ACREL Co., LTD.
 www.acrel-electric.com

媒体编号									
旧底图总号									
	标记	数量	更改单号	签名	日期				
底图总号	设计		SJ	SJRQ		阶段	标记	质量	比例
	审核		SH	SHRQ		A	0		
	工艺		GY	GYRQ					
日期	签名					第 1 张	共 1 张		
	标准化		BZH	BZHRQ		安科瑞电气			
	批准		PZ	PZRQ					
格式 (1)	制图:					消银龙	幅面: A4		

Miscellaneous - (001) Installation instruction

Miscellaneous - (001) Installation instruction

TDE12.714.091

单位: mm

序号	编号	名称	数量	备注
10	TJ-5.08-10P		1	附件
9	TJ-3.62-7P(2P, 4, 6p1c)		1	附件
8	YL-LB-92.80044	平嵌十字槽嵌头自攻螺钉M3*2-镀锌	2	
7	HTBC1.204.0162.0001	绝缘衬 111P132-530	1	
6	2102260-10528-610-614.216		1	
5	2102260-48528-018-618.514		1	
4	TDE12.714.1036.2	塑料壳(带) 311P132-8131-182(不带0)	1	
3	TDE12.714.1036	塑料壳(不带) 311P132-8131-182(不带0)	1	
2	TDE12.420.1216	塑料底座CT 311P132-8131-182(不带0)	1	
1	TDE12.414.1036	塑料底座DT 311P132-8131-182(不带0)	2	

设计	数量	更改单号	签名	日期
设计	SJ		SJHQ	
审核	SH		SHHQ	
工艺	GY		GYHQ	
标准化	BZ		BZHQ	
标准	PZ		PZHQ	

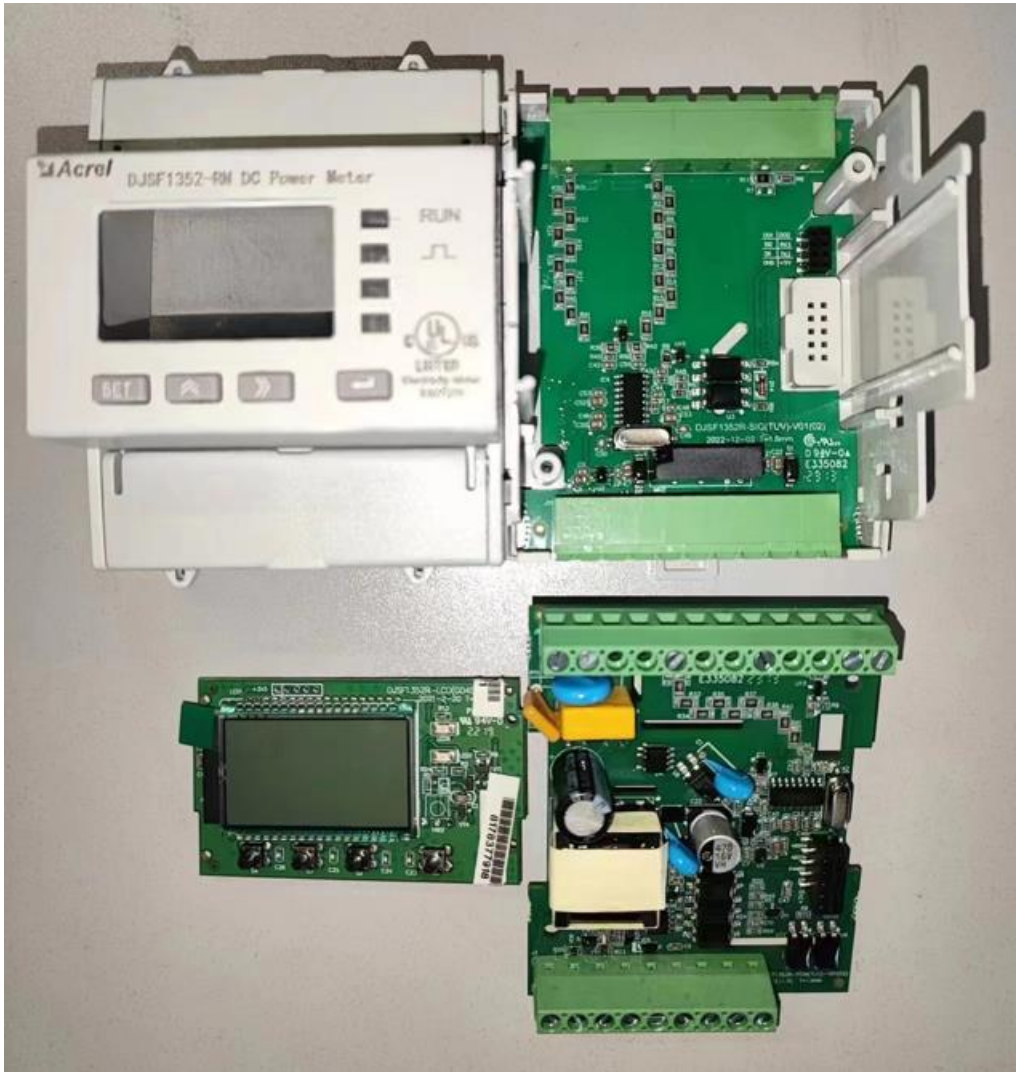
**导轨式直流电能表
DJSF1352-R(UL)
装配图**

阶段	标记	数量	比例
A	0		
第 1 张		共 1 张	

安科瑞电气

Photographs - (001) Assembly view

Photographs - (001) Assembly view



Photographs - (002) External side view 1

Photographs - (002) External side view 1



Photographs - (003) External side view 2

Photographs - (003) External side view 2



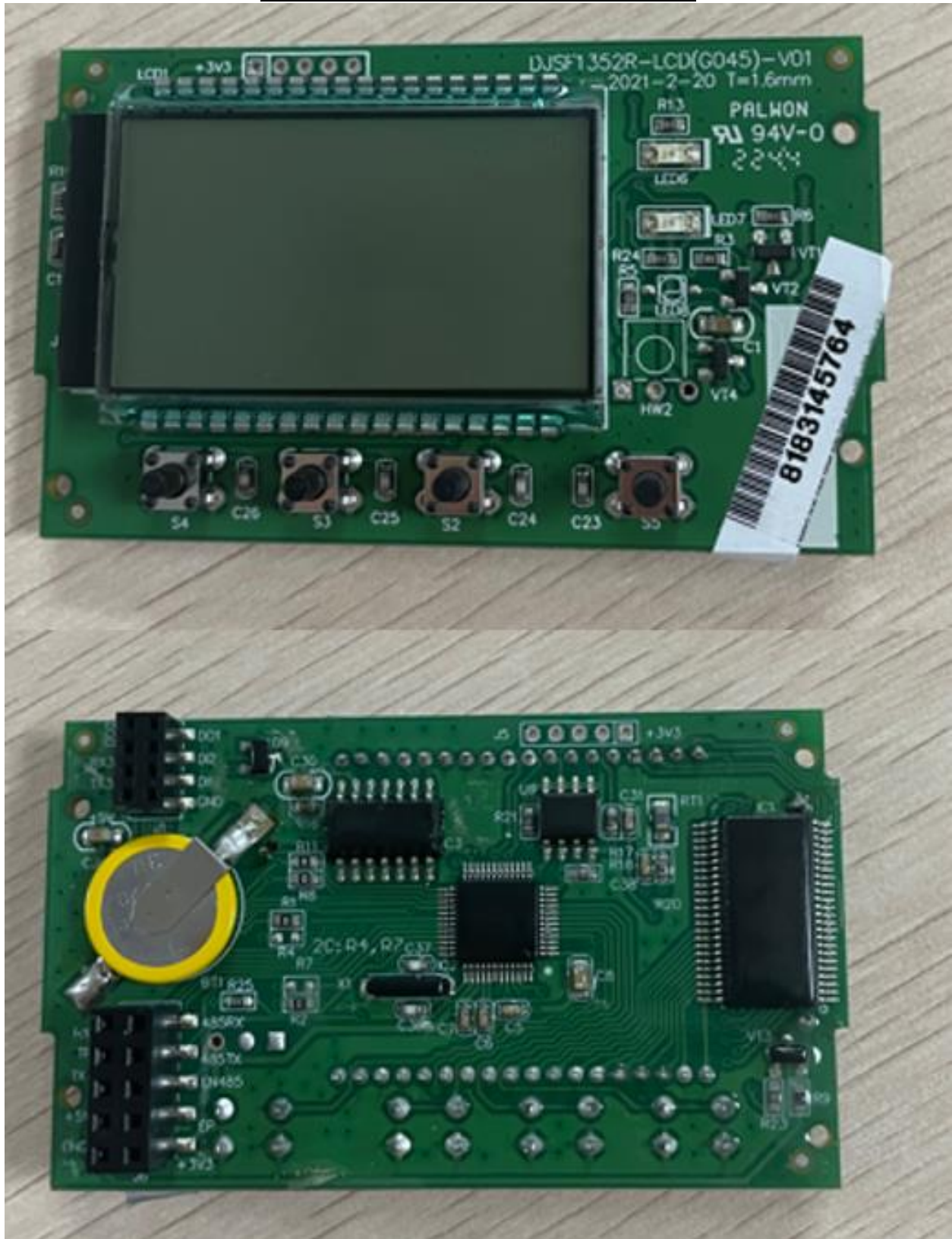
Photographs - (004) External Top view

Photographs - (004) External Top view



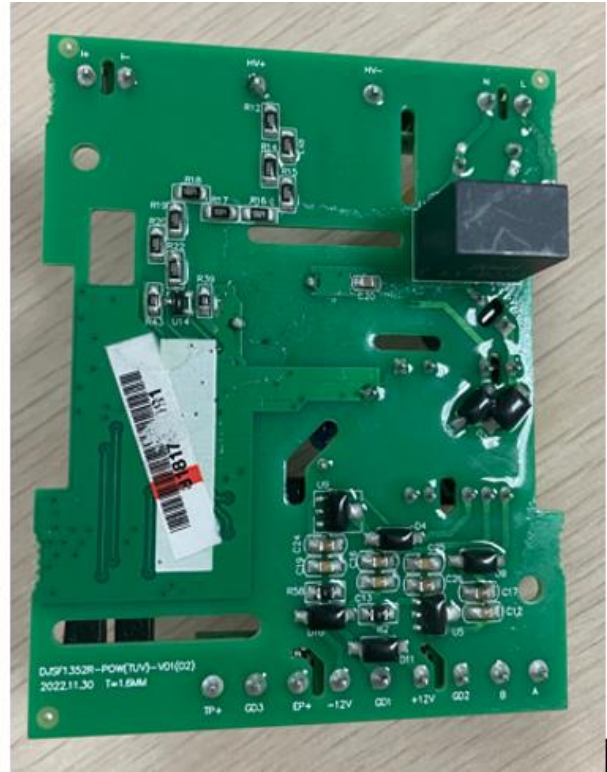
Photographs - (005) LCD Board top and bottom view

Photographs - (005) LCD Board top and bottom view



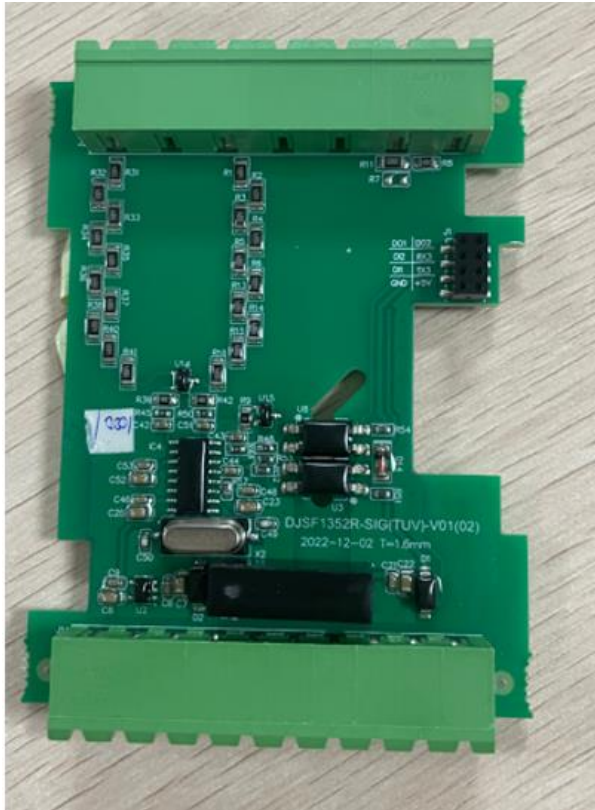
Photographs - (006) Power board top and bottom view

Photographs - (006) Power board top and bottom view



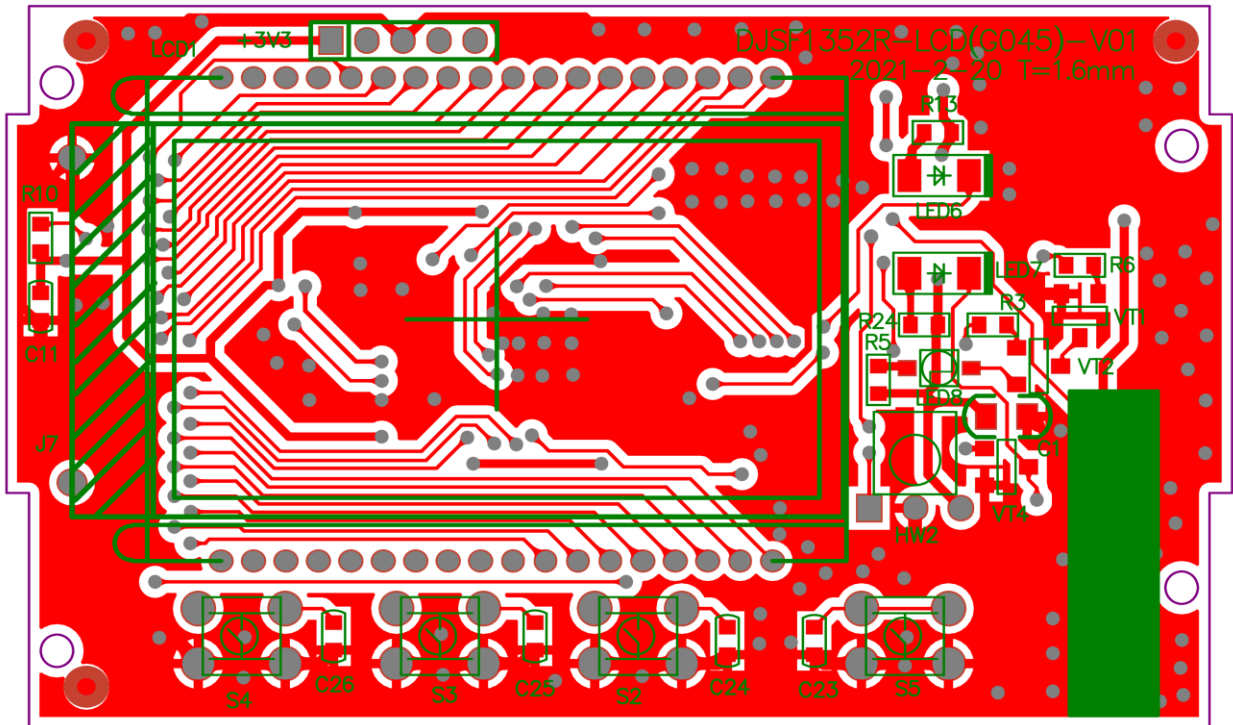
Photographs - (007) SIG Board top and bottom view

Photographs - (007) SIG Board top and bottom view

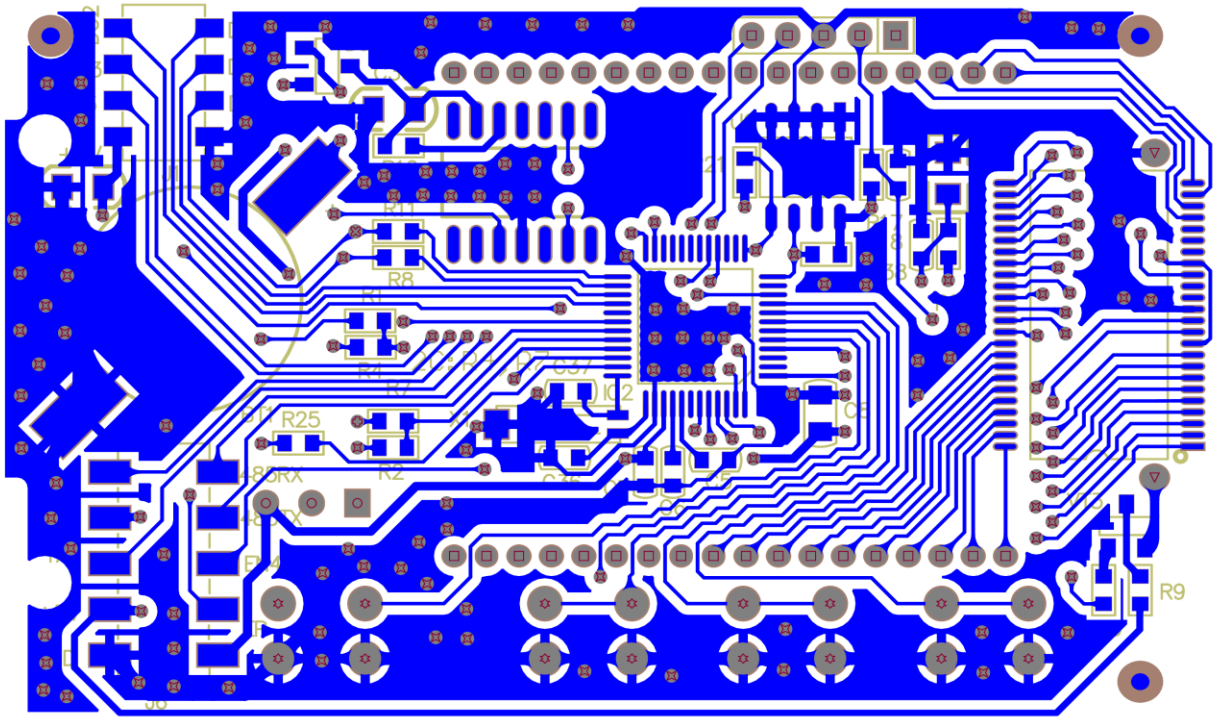


Schematics + PWB - (001) LCD Board Layout

Schematics + PWB - (001) LCD Board Layout

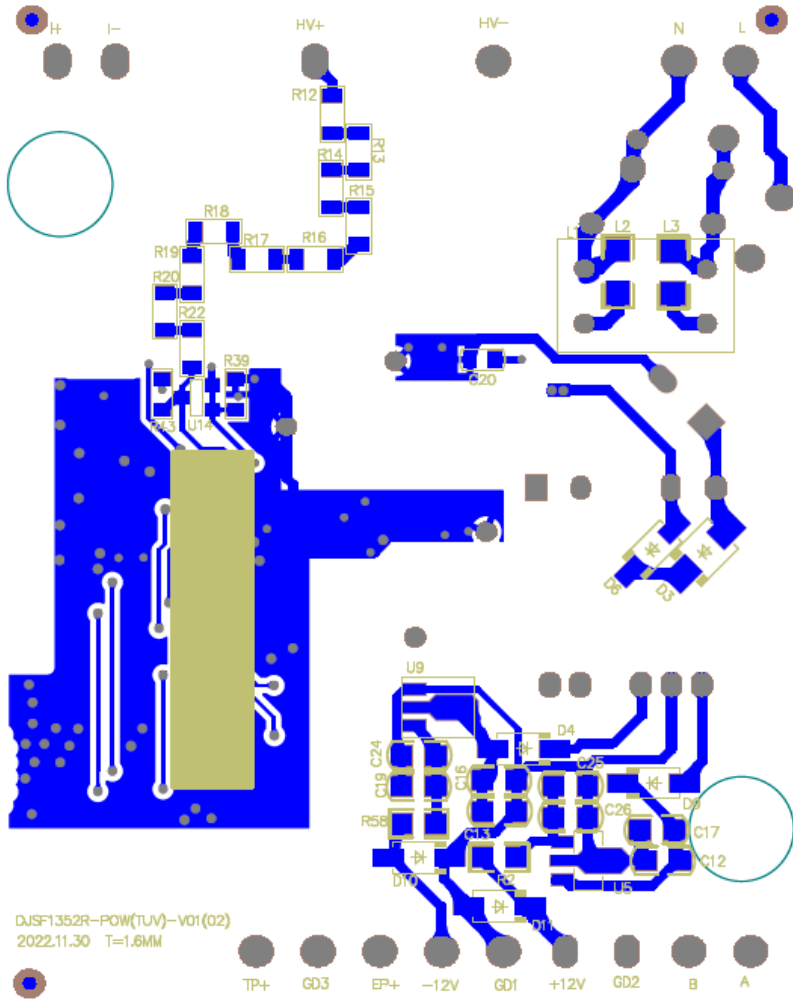


Schematics + PWB - (001) LCD Board Layout

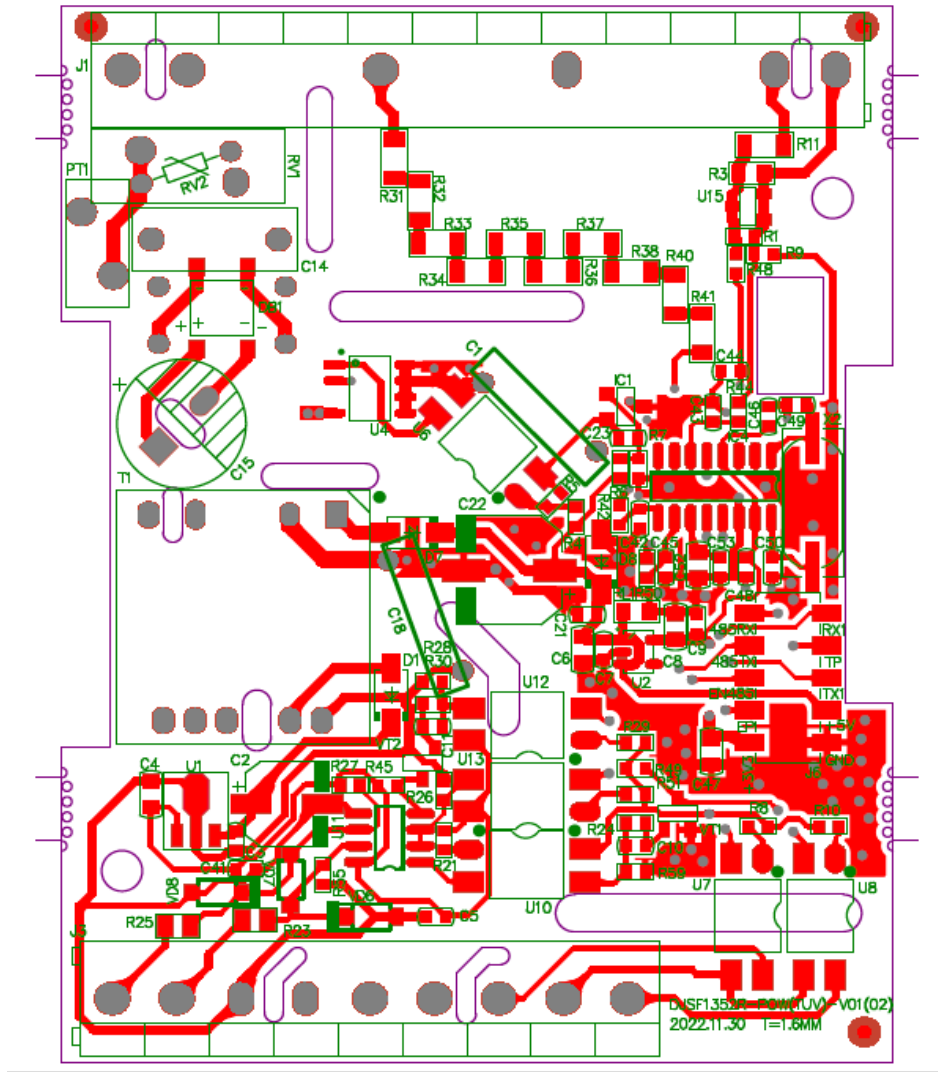


Schematics + PWB - (002) POW Board layout

Schematics + PWB - (002) POW Board layout

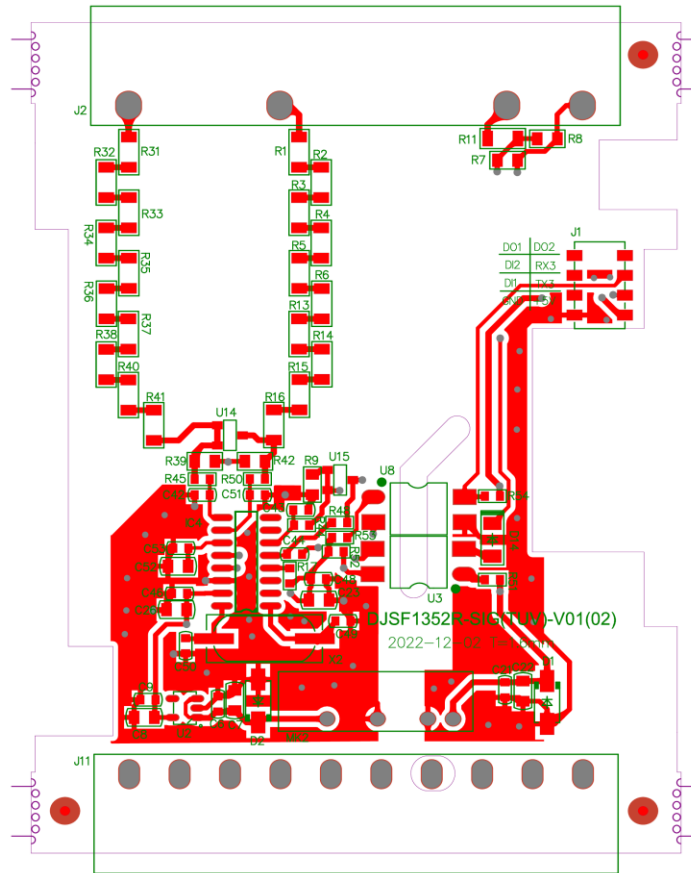


Schematics + PWB - (002) POW Board layout

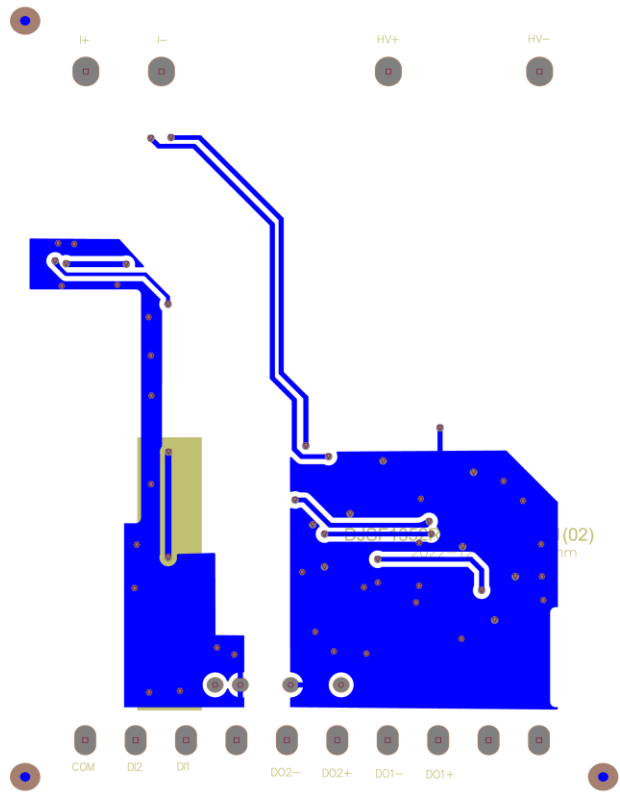


Schematics + PWB - (003) SIG Board layout

Schematics + PWB - (003) SIG Board layout



Schematics + PWB - (003) SIG Board layout



-----END OF APPENDIX A-----

UL CERTIFICATION DOCUMENTATION:

APPENDIX B: UL Certification Documentation

This Appendix includes additional documentation for the UL Certification.

Test Record

The manufacturer submitted representative production sample(s) of DJSF1352-RN/D.

All applicable tests according to the referenced standard(s) have been carried out.

The following tests were conducted:

Refer to the Test List in Appendix D of this report if testing was performed as part of this evaluation.

Test results are valid only for the tested equipment. These tests are considered representative of the products covered by this Test Report. The test methods and results of the above tests have been reviewed and found to be in accordance with the requirements in the Standard(s) referenced at the beginning of this Test Report.

Compliance of the tested equipment was determined based on the requirements of the below listed standards.

Base Standard(s): UL 61010-1, 3rd Edition, May 11, 2012, Revised July 19 2019, CAN/CSA-C22.2 No. 61010-1-12, 3rd Edition, Amendment 1:2018, Revision dated November 21 2018

Additional Standards: UL 61010-2-030, Second Edition, CSA C22.2 NO. 61010-2-030:18, Second Edition.

Any supplements provided as a part of this Test Record are located in Appendix A of this report.

NOTE: If there is a Multiple Listee associated with this report, the ML Correlation Sheet is not included in this report and is located as a separate file in UL's CDA system.

-----END OF APPENDIX B-----

APPENDIX C: Follow-Up Service Documentation

Follow-Up Service Procedure

It is important to keep UL Procedures and Test Reports up-to-date as new or revised pages are received. Correct maintenance will decrease the amount of time the UL Representative spends when visiting your facility.

UL LLC offers MyHome @UL, a dedicated website providing secure access to online tools and databases that can help simplify your compliance activities. You can customize your personal MyHome @UL page to include the content needed most, including timely information about certification updates and links to other Web sites you visit regularly. Visit <http://my.home.ul.com/> to sign up today!

PAGES (in content order)	FUNCTION	HOW TO UPDATE
Authorization Page	Displays the Product Category, the type of Follow-Up Service (Type R=Reexamination / Type L=Label), the File Number and the Volume Number associated with each Applicant's, Manufacturer's and Listee's company name and address.	Replace existing page by matching the UL File Number and Volume Number. Discard the older page (refer to "Issued" or "Revised" date).
Addendum to Authorization Page*	Lists the additional names and addresses of manufacturing locations, when multiple locations exist	Replace existing page by matching the UL File Number and Volume Number. Discard the older page (refer to "Issued" or "Revised" date).
Listing Mark Data (LMD), Classification Mark Data (CMD) or Recognized Component Mark Data (RCMD) Pages* #	Used only for products covered under Type R Service. Displays the correct LMD, CMD, or RCMD Mark, the Control Number for Listed and Classified categories and additional information regarding minimum size, application, procurement, and any other optional markings, in addition to the UL Mark.	Replace existing page by matching the UL File Number and Volume Number. Discard the older page (refer to "Issued" or "Revised" date).
Multiple Listing (ML) Correlation Sheet*	Correlates product model numbers between those products made by a Manufacturer for the Basic Applicant and those supplied to another company, the Multiple Listee.	Replace, add or delete page(s) with most current "Issued" or "Revised" date.
Index*	Catalogs the contents of the Procedure by some logical means, i.e. Section Number, Report Reference Number, or Issue Date.	Replace present page by matching the UL File Number, Volume Number, Page Number and most current "Revised" date.
Appendices* # (App.)	Contains instructions for the Manufacturer and UL Representative concerning specific responsibilities and required periodic tests. May also outline tests to be conducted on samples to be forwarded to UL's facilities.	Replace present page by matching the UL File Number, Volume Number, Appendix letter (eg. App. A), Page Number and most current "Revised" date.
	Standardized Appendix Pages are the same for all manufacturers within a particular product category.	Replace present page by matching the Appendix letter (eg. App. A), Page Number and most current "Revised" date.
Follow-Up Inspection Instructions (FUII) Pages*	Contains information similar to that in the Appendices. FUII Pages are issued as part of the Procedure when a UL Standard is used in conjunction with the Procedure, and are the same for all manufacturers within a particular category.	Replace present pages by matching the Page Number and most current "Issued" or "Revised" date.
Section General* # (Sec. Gen.)	Contains description, requirements, identifications and/or specifications that are common to all products covered by the entire volume and supplements the information provided in the Description Section.	Replace present page by matching the UL File Number, Volume Number, Page Number and most current "Revised" date.
Description, or Section (Sec.)*	Contains the specific description of one or more products or systems. This includes written text supplemented by photographs, drawings, etc., as necessary, to define features that affect compliance with the applicable requirements.	Replace present page by matching the UL File Number, Volume Number, Section Number, Page Number and most current "Issued" date.

* The above page(s) may not appear in all UL Follow-Up Service Procedures; UL's Conformity Assessment Services staff determines their inclusion.

These pages are combined in the **Generic Inspection Instructions** for International Style Reports, identified, as example by Vol. X1, X2, etc.

PLEASE NOTIFY YOUR LOCAL UL OFFICE OF ANY CHANGES IN CONTACT NAME, COMPANY NAME OR ADDRESS, SO THIS MATERIAL AND IMPORTANT INFORMATION CONTINUES TO BE DELIVERED TO YOUR FACILITY WITHOUT INTERRUPTION.

UL Authorization Page

File E527278

Vol D1

Issued: 2023-04-28

FOLLOW-UP SERVICE PROCEDURE
(TYPE R)

Energy Usage Monitoring Systems
(FTRZ / FTRZ7)

Manufacturer: SEE ADDENDUM FOR MANUFACTURER LOCATIONS

(Party Site)
Applicant: Jiangsu Acrel Electrical Manufacturing. Co., Ltd.
() No.31, Hongtu Road, Nanzha Street, Jiangyin City,
Jiangsu Province, China
China

Recognized Company: SAME AS APPLICANT (unless specified differently below)

Same as Applicant

Use of the Mark

This Follow-Up Service Procedure authorizes the above Manufacturer(s) to use the marking specified by UL LLC, or any authorized licensee of UL LLC, including the UL Contracting Party, only on products when constructed, tested and found to be in compliance with the requirements of this Follow-Up Service Procedure and in accordance with the terms of the applicable service agreement with UL Contracting Party. The UL Contracting Party for Follow-Up Services is listed in the addendum to this Follow-Up Service Procedure ("UL Contracting Party"). UL Contracting Party and UL LLC are referred to jointly herein as "UL."

It is the responsibility of the Applicant, Manufacturer(s), and Listee/Classified Company. to make sure that only the products meeting the aforementioned requirements bear the authorized Marks of UL LLC, or any authorized licensee of UL LLC.

Additional Responsibilities

Additional responsibilities, duties and requirements for the Applicant and Manufacturers are defined under Additional Resources at the following website: <https://www.ul.com/fus>. Manufacturers without Internet access may obtain the current version of these documents from their local UL customer service representative or UL field representative. For assistance, or to obtain a paper copy of these documents or the Follow-Up Service Terms referenced below, please contact UL's Customer Service at <https://www.ul.com/aboutul/locations/>, select a location and enter your request, or call the number listed for that location.

Acceptance of Follow-Up Services

The Applicant and the specified Manufacturer(s) and any Listee/Classified Company in this Follow-Up Service Procedure must agree to receive Follow-Up Services from UL Contracting Party. If your applicable service agreement is a Global Services Agreement ("GSA"), the Applicant, the specified Manufacturer(s) and any Listee/Classified Company will be bound to a Service Agreement for Follow-Up Services upon the earliest by any

Subscriber of a) use of the prescribed UL Mark, b) acceptance of the factory inspection, or c) payment of the Follow-Up Service fees. The Service Agreement incorporates such GSA, this Follow-Up Service Procedure and the Follow-Up Service Terms which can be accessed by clicking the following link: <https://www.ul.com/resources/contracts/follow-up-service-terms>. In all other events, Follow-Up Services will be governed by and incorporate the terms of your applicable service agreement and this Follow-Up Service Procedure.

Use and Ownership of the Follow-Up Service Procedure

This Follow-Up Service Procedure, and any subsequent revisions, is the property of UL and is not transferable. This Follow-Up Service Procedure contains confidential information for use only by the Applicant, the specified Manufacturer(s), and representatives of UL and is not to be used for any other purpose. It is provided to the Subscribers with the understanding that it is not to be copied, either wholly or in part unless specifically allowed, and that it will be returned to UL, upon request.

Definition of Terms

Capitalized terms used but not defined herein have the meanings set forth in the GSA and the applicable Service Terms or any other applicable UL service agreement.

No Third Party Liability

UL shall not incur any obligation or liability for any loss, expense or damages, including incidental, consequential or punitive damages arising out of or in connection with the use or reliance upon this Follow-Up Service Procedure to anyone other than the above Manufacturer(s) as provided in the agreement between UL LLC or an authorized licensee of UL LLC, including UL Contracting Party, and the Manufacturer(s).

Certification Body

UL LLC has signed below solely in its capacity as the certification body to indicate that this Follow-Up Service Procedure fulfills the requirements for certification documentation issued by the certification body. The certification body's accreditation status for the applicable certification scheme and identification of the accreditation body can be found at <https://www.ul.com/resources/accreditation>.

Bruce A. Mahrenholz
Director
Conformity Assessment Programs (CPO)
UL LLC

Addendum to Authorization Page

LOCATION

Manufacturing Factory(ies)
Information: Same as Applicant

Party Site:
Subscriber No:
Factory ID:
UL Contracting Party:

UL Appendix:**GENERIC INSPECTION INSTRUCTIONS**

Product Category	Product Category CCN
Energy Usage Monitoring Systems	FTRZ

These instructions consist of the following Parts:

Part	Description
AA	Instructions and Responsibilities for UL Representative
AB	Instructions for Follow-Up Tests at UL
AC	Responsibilities and Requirements for Manufacturer
AD	General Terminology
AE	General Product Construction Requirements
AF	UL Certification Marks

PART AA**INSTRUCTIONS AND DUTIES FOR UL REPRESENTATIVE**

AA1.0	UL REPRESENTATIVE'S DUTIES
AA1.1	<p>The UL Representative's duties include, but are not limited to:</p> <ul style="list-style-type: none"> A. Examining the construction of production intended to bear the UL Mark or Marking to determine compliance with the description of the product and any other requirements expressed in this Procedure. B. Where so specified in each Test Report, forwarding samples to UL for Follow-Up tests. C. Where so specified by Part AC, inspecting the test records and facilities of the manufacturer to ensure that: <ul style="list-style-type: none"> 1. The proper number of samples are undergoing the required tests, and 2. The required tests are being performed correctly, and 3. The proper information is being recorded and is up-to-date, and 4. The instruments being used for the tests have been calibrated at the prescribed interval and are in good working order.

AA2.0	PROCEDURE IN CASE OF NONCONFORMANCE
AA2.1	<p>Report to the manufacturer and UL LLC by means of a Variation Notice (VN) if:</p> <ul style="list-style-type: none"> A. Variations in construction are found, or B. The manufacturer's method and/or frequency of testing is not as described, or C. The test records maintained by the manufacturer are not as described, or D. The manufacturer's inspection program is not being performed as described, or E. Nonconforming test results are witnessed during tests conducted specifically for the UL Representative.
AA2.2	<p>Explain to the manufacturer that a VN is a means of communication with the manufacturer and applicant and forms a record of those items where nonconformance to the Procedure has been found.</p>
AA2.3	<p>When a product does not conform with the Procedure, require that the manufacturer:</p> <ul style="list-style-type: none"> A. Remove any markings referencing UL from the product, or obliterate these markings where the marking is imprinted, die-stamped, molded, etc., or B. Suitably modify all products that do not comply with the Procedure, or C. Hold shipment pending further instructions from UL LLC D. Demonstrate that one of the conditions shown below exist and be able to provide any of the referenced information or documentation. Under the following conditions, variations from Procedure described constructions shall be noted on a Variation Notice, however, the manufacturer is not required to remove UL markings, rework the product or hold shipment. <ul style="list-style-type: none"> 1. A part is called out as Listed and the manufacturer or part number is not as described and the alternate part being used is Listed and all other attributes for the part are met. 2. A part is called out as a Recognized Component (R/C) and the manufacturer or part number is not as described and the alternate part being used is Recognized under the described category and all other attributes for the part are met.

	<p>3. Internal wiring is identified by UL Style Number and the manufacturer is using (R/C) Appliance Wiring Material (AWM) with Style Numbers not referenced in the Procedure description. The manufacturer must be able to provide documentation that the voltage and temperature ratings of the alternate Style Number are equal to or greater than the ratings of the Style Numbers specified in the Procedure. AWM with Style Numbers not specified in the Procedure must be rated VW-1.</p>
AA2.4	It is the manufacturer's responsibility to forward a copy of the Variation Notice to the Applicant.
AA2.5	<p>If the manufacturer or Applicant question the rejection of the product, the material may be held at the point of inspection, typically at the factory, pending an appeal. The manufacturer has the right to appeal a decision with which they disagree. Provide the name of the UL engineer to whom the appeal is to be made. To resolve issues involving variations in construction, the manufacturer and Applicant may also be offered the option of contacting their New Work assignment engineer. Held shipment appeals involving Follow-Up Services issues (e.g. -improper labeling, etc.) should be directed to an appropriate staff member designated by the Reviewing Office for the product category. Should UL grant temporary authorization for the continued use of the UL Mark, such temporary authorization shall only be for the time needed to review and/or process the Procedure revisions, or as otherwise specified to cover a particular lot or production run. The manufacturer shall satisfy the UL Representative that all marks referencing UL are removed from the rejected material. Those marks referencing UL not destroyed during their removal from the product shall be turned over to the UL Representative for destruction.</p>

AA3.0	EXAMINATIONS TO BE WITNESSED BY UL REPRESENTATIVE
AA3.1	Inspection of Printed Wiring Boards and Printed Wiring Board Assemblies
AA3.1.1	The UL Representative shall determine that the printed wiring board is as specified in the Procedure.
AA3.1.2	If the soldering operation is performed at the Original Equipment Manufacturer's factory (OEM) and the soldering temperature and dwell time are given in the Procedure, the temperature and dwell time shall also be checked to determine that they do not exceed the limits specified.
AA3.1.3	<p>The UL Representative shall determine that the printed wiring board is as specified in the Procedure. The UL Representative then shall make a visual inspection of the printed wiring board assemblies for any mechanical damage or evidence of exposure to excessive temperatures that may have occurred during the soldering operation. The base material and the conductors shall be examined for nonconforming features as indicated below:</p> <p>A. Conductors, Terminal Pads, and Tabs</p> <ol style="list-style-type: none"> 1. Reduction in cross-section, such as scratches, nicks, pin holes, tearing. 2. Loosening or lifting of printed wiring conductor, pad, or tab from the base material. 3. Sections missing or damaged. 4. Blistering 5. Breaks <p>B. Base Material</p> <ol style="list-style-type: none"> 1. Warping 2. Cracking 3. Charring, blistering, or other heat damage due to solder process 4. Delamination

AA3.1.4	Samples shall be selected at random as shown in Table AA1 in accordance with the size of the incoming lot. The lot is to be rejected in accordance with the fifth column of the table.
AA3.1.5	With respect to printed wiring boards using Surface Mounted Technology (SMT), if the SMT assembly process is done at temperatures and times below the soldering limits, the UL Representative will accept the boards. If the assembly process is conducted on-site with temperatures/times in excess of soldering limits or if the process is conducted off-site and the temperatures/times cannot be verified, a visual inspection will be conducted by the UL Representative in accordance with the guidelines shown above. If any instructions for SMT components are specified in the Procedure, then these SMT instructions are superseded.

TABLE AA1
PRINTED WIRING BOARD SAMPLE SELECTION

Size of incoming lot# for each type##	Initial number of samples taken	Number of nonconforming samples requiring additional samples	Additional number of samples to retest lot	Cumulative number of nonconforming samples to reject lot
1 - 500	8	1	13	2
501 - 3200	13	1	20	2
3201 - 35000	20	1	32	2
Above 35000	32	1	50	2

Notes:

A lot is considered to comprise all printed wiring board assemblies of the same type at the manufacturer's factory at the time of the UL Representative's visit, which have not been previously checked by the UL Representative.

A type is considered a printed wiring board assembly meeting all the following:

1. Same vendor who mounts and solders the components.
2. Same board manufacturer and type or catalog number.
3. Same size
4. Same pattern
5. Same components

AA4.0	SAMPLE SELECTION FOR TESTS CONDUCTED AT MANUFACTURER AND UL
AA4.1	Standard Follow-Up Tests for Plastic Enclosures and Parts
AA4.1.1	Each Test Report indicates the plastics enclosures or parts that may require Follow-Up Service testing. The UL Representative shall consult Table AA2 to determine which tests are required.
AA4.1.2	With respect to Table AA2, Access to Molding Operation shall be determined in accordance with the following:
	A. UL is considered to have access to the plastic molding operation if the molding takes place in the end-product assembly location and the operation complies with the requirements below.
	B. The UL Representative shall have free, unannounced, and immediate access to the factory and the storage facility during all business hours of the factory or storage facility. The UL Representative shall also have access to the records required below.
	C. The manufacturer shall mark each enclosure, cartons containing enclosures, or a tag accompanying the enclosure in a manner such that the UL Representative can trace the origin of each enclosure to a specific batch.
	D. The manufacturer shall keep records for each batch of plastic enclosures molded, in accordance with the below requirements.
	E. The records shall be thorough, so that the UL Representative may determine the composition of the enclosure. The records shall be maintained for at least six months from the date of production, and shall be accurate. All of the following items are to be covered:
	1. The records shall indicate the base material. The manufacturer may not blend resins. <i>Exception: The manufacturer may blend resins provided it is specifically stated in the Procedure.</i>
	2. The records shall include the amount of regrind used. Thermoplastic regrind shall not exceed 25 percent by weight. UL does not authorize the use of thermoset regrind. <i>Exception: Thermoplastic regrind may exceed 25 percent provided it is specifically stated in the Procedure and does not exceed the percent stated in the Procedure.</i>
	3. The composition of the enclosures shall not include recycled plastics, color concentrates, flame retardants, or mold release lubricants. <i>Exception: One or more of the elements indicated in 3) may be included, provided the Procedure specifically acknowledges its use.</i>
AA4.1.3	Where testing is required, samples are to be selected no less than once per year in accordance with each Test Report. All samples are to be handled in accordance with the requirements of this section.
AA4.1.4	Enclosure samples shall be chosen in a manner such that each enclosure material in use by the manufacturer is represented by tests no less than once over a two-year period. Enclosure materials that are used infrequently (i.e. less than once in a two year period) shall be selected whenever they are used.

TABLE AA2
FOLLOW-UP TESTING FOR PLASTIC ENCLOSURES AND PARTS

Enclosure plastic	Molding location		
	Recognized Component molder or evaluated component molder other than Recognized ^a	Not evaluated molding	
		UL has access to molding operation ^b	UL does not have access to molding operation ^b
Recognized Component	No tests required	Annual Impact Test at Mfg. OR Annual ID Tests at UL ^{c, d}	Annual Impact and ID Tests at UL
Unlisted Component ^e	Annual Impact Test at Mfg. ^d AND Annual ID and Flame Tests at UL	Annual Impact Test at Mfg. ^d AND Annual ID and Flame Tests at UL	Bi-annual Impact and ID Tests at UL
<p>^a The reference to evaluated component molder other than Recognized is in regard to a molder of plastic fabricated parts which has been authorized by UL to mold plastic for the end-use product, but for which no Recognition has been established.</p> <p>^b Access to molding operation means the molding takes place in the end-product assembly location and the manufacturer follows the requirements in AA4.1.2.</p> <p>^c The manufacturer may elect either an Impact Test or ID Tests. The UL Representative shall act accordingly.</p> <p>^d If the manufacturer does not have the ability to perform the Impact Test in accordance with AA4.1.5, the required test samples are to be forwarded to UL for testing.</p> <p>^e The reference to Unlisted component plastic is in regard to a component plastic used in a Listed or Recognized product which is separately investigated in accordance with applicable requirements for the end-use product, and for which no coverage has been requested or established.</p>			

AA4.1.5	Impact Test at Manufacturer
AA4.1.5.1	Where indicated in Table AA2, the UL Representative shall conduct the Impact Test as part of the product inspection at the manufacturer's facility and shall determine if the manufacturer records the test data in compliance with the requirements of this document <i>Exception: As noted in Table AA2 footnote (d), the Impact Test shall be conducted at UL if the manufacturer does not have the ability to conduct the test.</i>
AA4.1.5.2	Each enclosure sample fabricated with the material specified in the Test Report shall be subjected to a single impact. The impact shall be directed onto the surface most likely to demonstrate a nonconformance when the Basis of Acceptability of AA4.1.5.3 is applied. The impact is to be produced by dropping a steel sphere 2 inches (50.8 mm) in diameter and weighing 1.18 pounds (0.536 kg mass) a height of 50.85 in. (129.2 cm). For surfaces other than the top of an enclosure the steel sphere is to be suspended by a cord and swung as a pendulum, dropping through the 50.85 in. (129.2 cm) vertical distance before striking the surface
AA4.1.5.3	Each sample shall withstand the impact of AA4.1.5.2 without being affected to the extent that: A. Uninsulated, live parts are accessible to contact, or B. The mechanical performance of the product is adversely affected so as to create a risk of injury to persons, or C. A condition is produced that can cause a risk of electric shock.
AA4.1.5.4	To determine compliance with AA4.1.5.3 (A), the UL Representative shall apply the articulate probe to verify that the probe cannot contact an uninsulated, live part. It is the manufacturer's

	responsibility to order and purchase the probe through UL's Corporate Standards Department, at the Northbrook Office.
AA4.1.5.5	To determine compliance with AA4.1.5.3 (B), the UL Representative shall give consideration to the functioning of safety devices and constructional features (such as thermostats, overload protective devices and strain relief). Cracking or denting of the enclosure shall not result in the exposure of moving parts that could cause a risk of injury to persons.
AA4.1.5.6	To determine compliance with AA4.1.5.3 (C), the product shall be subjected to a Dielectric Voltage-Withstand Test as described in AC2.3 without dielectric breakdown.
AA4.1.5.7	If the Impact Test sample produces any one of the conditions specified in AA4.1.5.3, the test is to be repeated on three previously untested samples from the same lot. The results are considered acceptable if all three samples comply with the requirements. If a nonconformance occurs on any one of the additional samples, then the lot shall be considered rejected.
AA4.1.6	ID and Flammability Tests
AA4.1.6.1	<p>Samples selected in accordance with Table AA2 shall be tagged with all the following information, and the manufacturer shall forward them to the Reviewing Office:</p> <ul style="list-style-type: none"> A. Material B. Manufacturer C. Model number D. Follow-Up Test(s) required E. Test parameters (if any)

PART AB**INSTRUCTIONS FOR FOLLOW-UP TESTS AT UL**

AB1.0	GENERAL
AB1.1	The samples forwarded by the UL Representative shall be subjected to the tests indicated on the sample tags in accordance with any indicated test specifics (e.g. oven temperature).
AB1.2	Unless otherwise notes, all references are to the Generic Inspection Instructions.

**TABLE AB1
TEST PARAMETERS**

Test	Method	Basis for Acceptability
Impact	AA4.1.5.2	AA4.1.5.3 – AA4.1.5.7
Identification		
Qualitative Infrared Analysis (IR)	UL 746A	Compare to original spectrum in Test Report
Differential Scanning Calorimetry (DSC)	UL 746A	Compare to original thermogram in Test Report
Thermogravimetry (TGA)	UL 746A	Compare to original thermogram in Test Report
Flammability		
3/4 Inch Flame	UL 746C	UL 746C
5 Inch Flame	UL 746C	UL 746C

PART AC**RESPONSIBILITIES AND REQUIREMENTS FOR MANUFACTURER**

AC1.0	MANUFACTURER'S RESPONSIBILITIES (INCLUDING BUT NOT LIMITED TO)
AC1.1	<u>Control of UL Mark</u> - Restrict the use of markings that reference UL (either directly or by use of the name, an abbreviation of it, or the UL symbol or Classification Mark, or indirectly by means of agreed-upon markings that are understood to indicate acceptance by UL) to those products that are found by the manufacturer's own inspection to comply with the Procedure description. Such restrictions apply to packaging, brochures or other means of advertising that reference UL. Use of such markings is further limited by the agreements that have been executed by the subscriber and UL. Markings shall be confined to the locations authorized in these Generic Inspection Instructions or in individual Test Reports.
AC1.2	<u>Access to Factory</u> - During hours in which the factory is in operation, provide the UL Representative with free access to any portion of the premises where the product or components thereof are being fabricated, processed, finished or stored, and to the test area assigned for the UL Representative's use. The UL Representative shall be permitted to inspect and subject to prescribed tests, prior to shipment, any product bearing or intended to bear markings referencing UL.
AC1.3	<u>Production-Line Tests</u> - Conduct the tests detailed in Part AC2.0.
AC1.4	<u>Required Records</u> - Maintain records of test performance. The records shall include the model or catalog designation of the product, the date of production, the tests performed, number of units tested, test results and action taken on rejections. Records for test performance shall be retained for six (6) months and shall be readily available for review by the UL Representative. <u>Exception</u> - Records of test results need not be maintained for 100% Production-Line Tests.
AC1.5	<u>Test Equipment and Personnel</u> - Provide, at a convenient location, all required test equipment and facilities and any required personnel for conducting all tests that are to be performed at the factory. These shall be available when needed so that the inspection work can proceed without undue delay.
AC1.6	<u>Test Equipment Calibration</u> - Determine that the test equipment is functioning properly daily, and have it calibrated at least annually, or whenever it has been subject to abuse (such as being dropped or struck with an object) or its accuracy is questionable. The test equipment and instruments shall be calibrated either by the manufacturer or by an outside laboratory. In either case, it shall be calibrated by comparison with a standard that is traceable to the applicable U.S. or foreign National Standard. A letter from the outside laboratory or from an off-site manufacturer's calibration lab stating that their lab standards are directly traceable to their country's National Standard and outlining their traceability pathway is considered adequate proof of traceability. For in-house calibrations, the Standard (weight and gauge blocks, etc.) used shall be calibrated every three years, or whenever the Standard has been subject to some form of abuse that may affect the Standard's fitness for use. The Standard shall be stored to protect it from damage or deterioration per the Standard manufacturer's recommendations. Records of the calibration of the test equipment and Standard(s) shall be maintained until the next required calibration is completed and recorded, and shall be readily available for review by the UL Representative.

AC2.0	REQUIREMENTS FOR PRODUCTION-LINE TESTS
AC2.1	The following Production-Line Tests shall be conducted on the products covered by this Procedure. During production, the test equipment shall be checked for proper operation at least once during each shift. When the tests are not performed concurrently, it is preferred that the Grounding Continuity Test be performed before either Dielectric Voltage-Withstand Test.
AC2.2	Production-Line Grounding Continuity Test
AC2.2.1	<p><u>General</u> - Except as may be noted under "Exceptions" in each Test Report, the manufacturer shall subject 100 percent of production of all of the following products to a routine Production-Line Grounding Continuity Test as described in section AC2.2.3:</p> <p>A. Products that are provided with a grounding type power supply cord, or B. Fixed products that are for permanent connection to the branch circuit.</p> <p>Exception: This test is not required for permanent connection to the branch circuit by fixed wiring if the design does not employ bonding jumpers or grounding wiring to remote units.</p>
AC2.2.2	<u>Test Equipment</u> - Any suitable continuity-indicating device (such as an ohmmeter, a battery and buzzer combination, or the like) may be used to determine compliance with the Grounding Continuity Test requirements.
AC2.2.3	<u>Method</u> - Continuity shall be determined between the grounding conductor of the attachment plug cap, and/or the designated main grounding point, and accessible dead-metal parts of the product, using the test equipment indicated above.
AC2.2.4	<u>Basis for Acceptability</u> - There shall be grounding continuity between the parts specified.
AC2.3	Production-Line Dielectric Voltage-Withstand Test
AC2.3.1	<u>General</u> - Except as may be noted under "Exceptions" in each Test Report, the manufacturer shall subject 100 percent of production of all products to a routine Production-Line Dielectric Voltage-Withstand Test as described in section AC2.3.3.
AC2.3.2	<p><u>Test Equipment</u> - The test equipment shall include a means of indicating the test potential, an audible or visual indicator of electrical breakdown, and either a manually operated reset device to restore the equipment after electrical breakdown or an automatic feature that rejects any unacceptable unit. If an ac test potential is applied, the test equipment shall also include a transformer having an essentially sinusoidal output.</p> <p>If the output of the test-equipment transformer is less than 500 volt-amperes, the equipment shall include a voltmeter in the output circuit to indicate the test potential directly.</p> <p>If the output of the test-equipment transformer is 500 volt-amperes or more, the test potential may be indicated (1) by a voltmeter in the primary circuit or in a tertiary-winding circuit, (2) by a selector switch marked to indicate the test potential, or (3), in the case of equipment having a single test-potential output, by a marking in a readily visible location to indicate the test potential. When marking is used without an indicating voltmeter, the equipment shall include a positive means, such as an indicator lamp, to indicate that the manually operated reset switch has been reset following a dielectric breakdown.</p> <p>Test equipment other than that described above may be used when it can be shown that UL has previously confirmed in writing that the equipment complies with the above requirements and is deemed suitable for use for this test.</p>
AC2.3.3	<p><u>Method</u> - Each product shall withstand without electrical breakdown, as a routine production-line test, the application of an ac potential at a frequency within the range of 40-70 Hz or DC potential between the primary wiring, including connected components, and accessible dead metal parts that are likely to become energized.</p> <p>The test potential shall be in accordance with Table AC1. The manufacturer's test conditions may be higher than those shown in Table AC1 when necessary to comply with other international</p>

	<p>product safety certifications. The test duration for the a.c. and d.c. tests shall be raised to its specified value within 5s and maintained for at least 2s. The test duration for impulse tests are a minimum of three pulses of each polarity at 1s minimum intervals.</p> <p>The product may be in a heated or unheated condition for the test.</p> <p>The test shall be conducted when the product is complete (fully assembled), and it is not intended that the product be unwired, modified, or disassembled for the test, unless otherwise permitted below:</p> <ul style="list-style-type: none">A. A part, such as a snap cover or a friction-fit knob, that would interfere with conducting the test need not be in place.B. The test may be conducted before final assembly if the test parameters represent that for the completed product. <p>During the test, the primary switch is to be in the on position, both sides of the primary circuit of the product are to be connected together and to one terminal of the test equipment, and the second test-equipment terminal is to be connected to accessible dead metal.</p> <p>Electromagnetic interference filter capacitors connected to the primary circuit shall not be disconnected during the test.</p>
AC2.3.4	<p><u>Basis for Acceptability</u> - All products shall withstand the applied potential without an indication of electrical breakdown.</p>

TABLE AC1
DIELECTRIC VOLTAGE-WITHSTAND TEST CONDITIONS

Table F.1 – Test voltages for ROUTINE TESTS of MAINS CIRCUITS

Nominal line- toneutral voltage of MAINS supply	OVERVOLTAGE CATEGORY II			OVERVOLTAGE CATEGORY III			OVERVOLTAGE CATEGORY IV		
	a.c. r.m.s. or d.c.	a.c.	d.c.	1,2/50 μ s Impulse	a.c.	d.c.	1,2/50 μ s Impulse	a.c.	d.c.
V	V r.m.s.	V	V peak	V r.m.s.	V	V peak	V r.m.s.	V	V peak
≤ 150	840	1 200	1 200	1 400	2 000	2 000	2 200	3 100	3 100
$>150 \leq 300$	1 400	2 000	2 000	2 200	3 100	3 100	3 300	4 700	4 700
$>300 \leq 600$	2 200	3 100	3 100	3 300	4 700	4 700	4 300	6 000	6 000
$>600 \leq 1\ 000$	3 300	4 700	4 700	4 300	6 000	6 000	5 300	7 500	7 500

PART AD**GENERAL TERMINOLOGY**

AD1.0	ABBREVIATIONS / DEFINITIONS	
AD1.1	IEC	Component provided with a testing agency's mark as indicated in Table II
AD1.2	PRI	Primary circuit (mains)
AD1.3	PWB	Printed wiring board
AD1.4	SEC	Secondary circuit
AD1.5	CN	Component provided with CSA or CUL Marking
AD1.6	LC	Supplied by source limited to the values specified Table 17 (see below)

Table 17 – Limits of maximum available current

Open-circuit output voltage (U or \hat{U})			Maximum available current
V			A
a.c. r.m.s.	d.c.	Peak ^a	a.c. r.m.s. or d.c.
$U \leq 2$	$U \leq 2$	$\hat{U} \leq 2,8$	50
$2 < U \leq 12,5$	$2 < U \leq 12,5$	$2,8 < \hat{U} \leq 17,6$	$100 / U$
$12,5 < U \leq 18,7$	$12,5 < U \leq 18,7$	$17,6 < \hat{U} \leq 26,4$	8
$18,7 < U \leq 30$	$18,7 < U \leq 60$	$26,4 < \hat{U} \leq 42,4$	$150 / U$

^a The peak value (\hat{U}) applies to non-sinusoidal a.c. and to d.c. with ripple exceeding 10 %, and is provided for convenience. The r.m.s. value of the maximum available current shall be determined as that value is related to heating.

PART AE**GENERAL PRODUCT CONSTRUCTION REQUIREMENTS**

AE1.0	CONSTRUCTION DETAILS
AE1.1	Unless otherwise described or supplemented in individual Test Reports, the following requirements apply to all equipment included in this Procedure. It is the manufacturer's responsibility to assure the compliance of production with these requirements.
AE1.1.1	<u>Accessories Parts and Accessories</u> - Such items packaged with the product shall be specifically described in a Test Report.
AE1.1.2	<u>Adapters</u> – Three or two wire grounding type adapters shall not be furnished with the product unless specifically authorized by a Test Report.
AE1.1.3	Not Applicable
AE1.1.4	<u>Bonding</u> - Except where specifically noted in a Test Report, bonding of internal dead-metal parts to the enclosure for grounding purposes shall be accomplished by a positive means such as clamping, riveting, bolting or screwed connection. The bonding connection shall reliably penetrate any nonconductive coatings such as paint or vitreous enamel.
AE1.1.5	<u>Casualty Considerations</u> - Except as described, or as necessary for normal operation of the equipment, there shall be no sharp edges, burrs, points, or spikes inside or outside the device that may cause injury during use or during cleaning operations.
AE1.1.6	<u>Connectors</u> - Connectors shall be applied so as to ensure that all bare strands are contained and insulated.
AE1.1.7	<p><u>Grounding</u> - The following guidelines shall be observed:</p> <p>A. <u>Non-Detachable Cord Connected Appliance</u> - The equipment-grounding conductor of the flexible cord:</p> <ol style="list-style-type: none"> 1. Shall be connected to the grounding member of the attachment-plug cap. <p>Note: The grounding member of the attachment-plug shall be fixed in position with respect to the cap.</p> <ol style="list-style-type: none"> 2. Shall be conductively connected to all dead-metal parts of the product that are specified in the description as being connected to the grounding conductor. The grounding-conductor shall be connected by either (1) a screw or other reliable means which serves no other purpose and which is not liable to be removed during any servicing operation, or (2) a threaded grounding stud on which a closed ring connector secured to the ground conductor is the first conductor mounted and secured by a nut and split ring lockwasher. Solder alone shall not be used for securing this conductor. <p>Note: The screw or stud and nut shall: (1) be provided with a means to penetrate nonconductive coatings, such as paint or enamel; (2) be of a corrosion-resistant metal or shall be protected against corrosion; and (3) be marked on or adjacent with a grounding symbol or the IEC417 Grounding Symbol 5019 “⊕”. The installation instructions shall identify the meaning of the symbol.</p>

	<p>B. <u>Detachable Cord Connected Appliance</u> - Polarization shall be maintained through the load fitting of the cord (appliance coupler) and the mating connector (appliance inlet) on the product. The load fitting shall be a three wire ANSI configuration.</p> <p>Exception: The load fitting need not be an ANSI configuration provided it is wired as follows (the description applies when viewing the face of the connector on the product, with the center contact down):</p> <ol style="list-style-type: none"> 1. The right contact shall be connected to the grounded conductor (neutral) of the cord. 2. The center contact shall be connected to the grounding conductor of the cord. <p>C. <u>Permanently-Connected Products</u> - In a permanently connected product (1) all exposed metal parts, and (2) all dead-metal parts within the enclosure, which are specified in the description as being connected (see "Bonding") to the grounding conductor, shall be conductively connected to:</p> <ol style="list-style-type: none"> 1. The point of the enclosure at which the metal raceway of the power supply circuit will be connected, and 2. The equipment-grounding field-wiring terminal or lead. <p>The equipment-grounding terminal or grounding lead shall be connected to the frame or enclosure by a positive means, such as by a bolted or screwed connection. The grounding connection shall reliably penetrate nonconductive coatings, such as paint or vitreous enamel. The grounding point shall be so located that it is unlikely that the grounding means will be removed during normal servicing.</p> <p>A wire-binding screw intended for the connection of an equipment-grounding conductor shall be identified by the protective earth symbol. The head shall be either hexagonal shaped or slotted, or both. A pressure wire connector intended for connection of an equipment grounding conductor shall be identified by the protective earth symbol "⊕".</p> <p>The wire-binding screw or pressure wire connector shall be so located that it is unlikely to be removed during normal servicing of the unit.</p> <p>D. <u>Grounding Terminal</u>:- The grounding conductor shall be the first conductor terminated on a grounding terminal and secured by a separate nut. Other grounding conductors may be secured to this terminal if they are secured on top of the first nut by a second nut.</p>
AE1.1.8	<u>Indicators</u> - Indicator lights shall be clearly visible to the equipment operator.
AE1.1.9	<u>Internal Plastic Parts</u> - For each type of plastic material the manufacturer shall review the Recognized Component Directory and Supplement or UL Online Certification Directory (http://www.ul.com/database) in order to insure that the plastic material in question meets all the material characteristics specified (i.e. flammability rating, Relative Thermal Index (RTI), and color) at the thickness specified. Alternatively, a copy of the Plastic Manufacturer's Component Recognition Report or Recognition Card may be used as a traceability pathway only if these materials were issued after the latest publication of the Recognized Component Directory.
AE1.1.10	<u>Internal Wiring</u> - Conductors shall be routed away or protected from sharp edges and moving parts. Exception: LC that are reliably separated from PRI and SEC circuits need not be Recognized AWM.
AE1.1.11	<u>Lampholder Connections</u> - All screw shells of lampholders shall be connected to the same conductor of the supply circuit.
AE1.1.12	<p><u>Loose Strands</u> - Ends of stranded conductors shall have all strands contained to prevent contacting of, or reduction of spacing to, other live parts and dead metal. This can be accomplished by:</p> <ol style="list-style-type: none"> A. Tinning

	<p>B. Inserting properly into suitable wire connectors.</p> <p>C. Crimped connectors and/or eyelets with the crimp containing all strands</p> <p>D. Solder lugs.</p>
AE1.1.13	<u>Markings</u> - Required information shall be legibly marked on the product, in the manner and minimum height specified.
AE1.1.14	<u>Multiple Voltage</u> - Cord-connected multiple voltage products shall be provided with an attachment plug that is suitable for the voltage for which the product is set.
AE1.1.15	<p><u>Polarity</u> - An appliance intended for permanent connection to the source of supply and having an identified terminal or lead; and an appliance employing a power supply cord with a polarized attachment plug cap (excluding 250 volt, 2-pole and 250 volt, 3-pole, 3-phase), utilizing the components indicated, shall have the components wired as follows:</p> <p>A. <u>Lampholders and Receptacles</u> - The screw shell or identified terminal or lead of a lampholder and the identified terminal or lead of a receptacle, shall be connected to the identified grounded conductor or terminal within the product.</p> <p>B. <u>Switches (Single Pole)</u> - Unless otherwise specified in the Procedure, a manual single pole switch, and an automatic control with a marked "off" position, shall not be connected to the identified grounded conductor.</p>
AE1.1.16	<p><u>Power Supply Cords</u></p> <p>A. <u>Non-Detachable Power Supply Cord</u> – A non-detachable power supply cord as described in each Test Report <u>must</u> be provided and shipped with the unit in <u>all</u> cases. The power supply cord and any alternatives must be described in each Test Report. <u>Each conductor of a non-detachable power supply cord shall have only one color, except the conductor identified by a combination of green and yellow.</u></p> <p>B. <u>Detachable Power Supply Cord</u> – The detachable power supply cord as described in each Test Report may or may not be shipped with the unit. Follow the guidelines in Table AE1 to apply the alternatives under each of the situations described in the notes to Table AE1. Table AE1 also includes alternative detachable power supply cords that may be shipped with units intended for use outside the USA.</p>
AE1.1.17	<p><u>Printed Wiring Boards (PWBs)</u> - PWBs shall show no burning, bubbling or other visible evidence of damage to their conductors or substrate material as a result of the fabrication process.</p> <p>With respect to PWBs using Surface Mounted Technology (SMT), it is acceptable if the SMT assembly process is done at temperatures and times below the soldering limits. If the SMT assembly process is conducted on-site with temperatures/times in excess of soldering limits or if the process is conducted off-site and the temperatures/times cannot be verified, a visual inspection shall be conducted by the UL Representative.</p> <p>The PWBs shall be inspected by the manufacturer for mechanical damage or evidence of exposure to excessive temperatures that may have occurred during the soldering operation. If any nonconforming features (defined below) are found after visual inspection, the manufacturer shall reject the lot (as defined in Table AA1). Otherwise, the use of PWBs may continue without any interruption.</p> <p>The base material and the conductors shall be examined for nonconforming features as indicated below.</p> <p>A. Conductors, Terminal Pads, and Tabs</p> <ol style="list-style-type: none"> 1. Reduction in cross-section, such as scratches, nicks, pin holes, tearing. 2. Loosening or lifting of printed wiring conductor, pad, or tab from the base material.

	<ol style="list-style-type: none"> 3. Sections missing or damaged. 4. Blistering 5. Breaks <p>B. Base Material</p> <ol style="list-style-type: none"> 1. Warping 2. Cracking 3. Charring, blistering, or other heat damage due to solder process 4. Delamination
AE1.1.18	<p><u>Protection of Wiring</u> - All wire and wire insulation in the product shall be protected from damage. This is commonly achieved by securement, segregation, and routing to keep the wire away from parts or assemblies which can damage the wire or insulation. Internal wiring that might make contact with metal parts shall be protected from sharp metal edges. This can be accomplished by rounding or deburring the metal, using a Recognized Component bushing, or through other construction features described in the Test Report.</p> <p>If the wiring is located where it may be in proximity to combustible material, it shall be protected by the method(s) described in the individual Test Report.</p> <p>Conductors shall be examined for evidence of damage. Faulty practices which can cause damage to conductors and/or insulation include:</p> <ol style="list-style-type: none"> A. Improper application of crimped connectors, including but not limited to, use of crimping tool and dies not recommended by the manufacturer of the connector. B. Improper insulation removal. C. Overheating of conductor insulation because of routing or contact with hot surfaces during or after installation. D. Use of wire in which the insulation has been cut, cracked, crushed, abraded, etc. <p>Constructions which may cause damage to conductors and/or insulation include:</p> <ol style="list-style-type: none"> A. Moving parts such as rotating or reciprocating cams, shafts, and the like, as well as removable or sliding covers, hinged doors. B. Sharp edges and corners (including screw threads, burrs, points, stamped metal edges). C. Heat sources (including lamps, heating elements, etc.). D. Assemblies that clamp or squeeze wire insulation, unless described in the Test Report.

AE1.1.19	<p><u>Securement of Parts</u> - Screws or other fastenings used to mount or support small, fragile, insulating parts shall not be tight enough to cause cracking or breaking of these parts. Uninsulated live parts, components which support live parts, and dead metal parts, that are normally intended to remain stationary, shall be prevented from rotating or shifting if movement will result in twisting or stress of internal wiring or connections, or spacings being reduced below that specified in the Test Report. Similar parts that are normally intended to move or rotate shall be prevented from excessive movement if such movement will result in twisting or stress of internal wiring or connections, or spacings being reduced below that specified in the Test Report.</p> <p>A switch, lampholder, attachment plug receptacle, motor attachment plug cap, or other components subject to handling by the user shall be mounted securely and prevented from rotating.</p> <p>Exception: Based on engineering considerations certain constructions of securely mounted push button or plunger type switches, and lampholders of the type in which the lamp cannot be replaced (such as a neon pilot or indicator light in which the lamp is sealed in a non-removable jewel) may be excluded from the above. These constructions are described in the Procedure. However, in no case will nonconforming spacings be allowed.</p> <p>Some means commonly used to prevent rotation are:</p> <ul style="list-style-type: none"> A. Lock washer. B. Matched keying of the component and its mounting. C. Two or more fasteners (screws, rivets, pins, etc.). D. Strap, clip, or pin fitted into an adjacent part. E. Physical barrier (molded boss, side of enclosure, adjacent component, etc.) that bears against the component.
AE1.1.20	<p><u>Solder Connections</u> - All solder connections shall be made mechanically secure before soldering. Some typical examples of mechanical securement are:</p> <ul style="list-style-type: none"> A. Twisting wire around a solder post that has a change in dimension or restriction so unsoldered wire will not slip off post. B. Inserting wire through an opening, and bending over the free end.
AE1.1.21	<p><u>Strain Relief</u> - Strain Relief methods such as tying the supply cord into a knot or tying the ends of the cord with string shall not be used.</p>
AE1.1.22	<p><u>Usage Markings</u> - There shall be no marking in the instruction manual, or on the carton or package that is, or could be construed to be, in conflict with or an extension of the use covered in the Test Report.</p>
AE1.1.23	<p><u>Documentation</u> - Handling of hazardous substances and correct disposal procedure, field-installed devices, explanation of warning symbols.</p>
	<ul style="list-style-type: none"> A. Documentation such as an instruction manual shall be provided with these products. No attachments or accessories are mentioned in the instruction manual unless specifically mentioned in a particular section.
	<ul style="list-style-type: none"> B. For products where attachments are specifically mentioned in a particular section, which are packaged and sold separately, the instruction manual packaged with the basic appliance identifies each separately available attachment by attachment name and model number. In addition, the manual packaged with the attachment indicates by name and model number the basic appliance with which it is to be used.

	C. Documentation shall also include the complete electrical rating of the device as described in the electrical rating section of the Procedure; a description of all input/output connections; assembly, location and mounting requirements; supply connection and earthing requirements, ventilation requirements; identification of operating controls, instructions for cleaning, replacement of consumable materials, interconnecting accessories, indication of suitable accessories, instructions for use, technical specifications, name and address of manufacturer or supplier and as statement of range of environmental conditions as noted below.
	- Indoor use or outdoor use;
	- Altitude up to 2000 m or above 2000 m if specified by the manufacturer
	- Temperature 0 to 40°C, or outside this range if specified by the manufacturer.
	- Maximum relative humidity 80 percent for temperatures up to 31°C decreasing linearly to 50 percent relative humidity at 40°C;
	- Mains supply voltage fluctuations not to exceed ± 10 percent of the nominal voltage;
	- Temporary Overvoltages as stated by the manufacturer;
	- Transient overvoltages according to INSTALLATION CATEGORIES (OVERVOLTAGE CATEGORIES) I, II, III and IV. For mains supply the minimum and normal category is II;
	- POLLUTION DEGREE 1 2, 3 or 4.

TABLE AE1
DETACHABLE POWER SUPPLY CORD REQUIREMENTS

Detachable Power Supply Cord	
Provided	Not Provided
A or B	(C and D) or (C and E)
A. The power supply cord should be as described in the Test Report.	
B. The detachable power supply cord is either: <ol style="list-style-type: none"> 1. Certified by one of the agencies listed in Table AE3; or 2. Comprised of cordage marked with an agency marking per Table AE3 or marked per Table AE4. The fittings are to be marked with at least one of the agencies listed in Table AE3. Units provided with detachable power supply cords, which are certified by one of the agencies listed in Table AE3 or AE4, shall be considered to be intended for use outside of the USA.	
C. A marking must be provided adjacent to the appliance coupler or at an equivalent location either to inform the user on proper selection of the power supply cord or to see the instruction manual for this information. This marking may be in the form of a tag, nonpermanent label, or product insert that is provided on or packaged with the product so that the marking is visible at the time of installation.	
D. The marking (tag, label, or product insert) or instruction manual must contain complete instructions concerning selection of the power supply cord. It shall include either Option 1, 2, or 3 as follows: <ol style="list-style-type: none"> 1. Reference to a power supply cord must be as a UL Listed detachable power supply cord consisting of the specific configuration of appliance coupler, the cord type, and the electrical rating of the power supply cord as described in each Test Report. Refer to Table AE2 for equivalent cord types. 2. Reference to a power supply cord may be made to a Listed field installed accessory kit containing a suitable Listed power supply cord. Authorization for use of a Listed field installed accessory kit must be included in the individual Test Reports. 3. Reference to a power supply cord may be made to a cord that is not Listed and not intended for use in the United States or Canada. In this case, the manufacturer is to supply the UL Representative with information to verify that the referenced cord is certified or similarly appropriate for use in the destination country. 	
E. The reference to the power supply cord (see Note C) shall include instruction for selection of the proper power supply cord as described in Note B above.	

TABLE AE2
EQUIVALENT CORDS

Basis Cord Type	Equivalent Types
SP-2	SPE-2, SPT-2
SP-3	SPE-3, SPT-3
SV	SVE, SVO, SVOO, SVT, SVTO, SVTOO
SJ	SJE, SJO, SJOO, SJT, SJTO, SJTOO
S	SE, SO, SOO, ST, STO, STOO

TABLE AE3
CERTIFICATION MARKINGS





















Country	Cert. Agency	Mark	Country	Cert. Agency	Mark
Argentina	IRAM		Ireland	NSAI	
Australia	SAA		Italy	IMQ	
Austria	OVE		Japan	JET, JQA	
Belgium	CEBEC		Netherlands	KEMA	
Canada	CSA		Norway	NEMKO	
China	CCC		Spain	AEE	
Denmark	DEMKO		Sweden	SEMKO	
Finland	FEI		Switzerland	SEV	
France	UTE		United Kingdom	ASTA	
Germany	VDE			BSI	




TABLE AE4
HAR FLEXIBLE CORDS
APPROVAL ORGANIZATIONS AND CORDAGE HARMONIZATION MARKING METHODS

Approval Organization	Printed or Embossed Harmonization Marking (May be Located On Jacket or Insulation of Internal Wiring)		Alternative Marking Utilizing Black-Red Yellow Thread (Length of color Section, mm)		
Comite Electrotechnique Belge (CEBEC)	CEBEC	<HAR>	10	30	10
Verband Deutscher Elektrotechniker (VDE) e.V. Prufstelle	<VDE>	<HAR>	30	10	10
Union technique de l'Electricite (UTE)	UTE	<HAR>	30	10	30
Instituto Italiano del Marchio di Qualita (IMQ)	IEMMEQU	<HAR>	10	30	50
British Approvals Service for Electric Cables (BASEC)	BASEC	<HAR>	10	10	30
N.V. KEMA	KEMA-KEUR	<HAR>	10	30	30
SEMKO AB Svenska Elektriska materielkontrollanstalter	SEMKO	<HAR>	10	10	50
Österreichischer Verband für Elektrotechnik (ÖVE)	<ÖVE>	<HAR>	30	10	50
Danmarks Elektriske Materialkontroll (DEMKO)	<DEMKO>	<HAR>	30	10	30
National Standards Authority of Ireland (NSAI)	<NSAI>	<HAR>	30	30	50
Norges Elektriske Materielkontroll (NEMKO)	NEMKO	<HAR>	10	10	70
Asociacion Electrotecnica Y Electronica Espanola (AEE)	<UNED>	<HAR>	30	10	70
Hellenic Organization for Standardization (ELOT)	ELOT	<HAR>	30	30	70
Instituto Portages da Qualidade (IPQ)	np	<HAR>	10	10	90
Schweizerischer Elektro Technischer Verein (SEV)	SEV	<HAR>	10	30	90
Elektriska Inspektoratet	SETI	<HAR>	10	30	90

PART AF
UL CERTIFICATION MARK

<i>Product Category:</i>	Energy Usage Monitoring Systems
<i>Product Category CCN:</i>	FTRZ / FTRZ7
<i>Product Identity:</i>	"WATT-HOUR METER," "ENERGY USAGE MONITOR" or "SUB-METERING EQUIPMENT," or other appropriate product name as shown in the individual Listing.

UL Listing Mark

AF1.1	The Test Report covering each product must be consulted to determine which Listing Marks are authorized for use in conjunction with that product.
AF1.1.1	The following Listing Mark is authorized for use on products that are Listed only to the requirements for Canada: 
AF1.1.1	The following Listing Mark is authorized for use on products which are Listed only to the requirements for the United States: 
AF1.1.2	Either of the following Listing Marks is authorized for use on products that are Listed to the requirements of both the United States and Canada: 
AF1.2	The Listing Mark consists of several elements that are placed in close proximity to each other and shall appear on Listed products only.
AF1.2.1	Element 1 - UL Symbol. There is no required minimum height for the UL Symbol, as long as it is legible. The minimum height of the registered trademark symbol ® shall be 3/64 of an inch. When the overall diameter of the UL Symbol is less than 3/8 of an inch, the trademark symbol may be omitted if it is not legible to the naked eye. Information on downloading electronic versions or receiving camera-ready artwork of the UL Symbols may be obtained at www.ul.com .
AF1.2.2	Element 2 - The word "LISTED"
AF1.2.3	Element 3 - A product identity
AF1.2.3.1	<product identity details are provided above this table>
AF1.2.3.2	The product identity may be omitted if the Listing Mark is directly and permanently applied to the product by stamping, molding, ink-stamping, silk screening or similar process. The product identity may appear elsewhere on the product if the other three elements are part of the nameplate that includes the rating or the catalog or model designation.
AF1.2.4	Element 4 - A number represented above by XXXX is to be replaced with the Applicant's or Listee's file number or a control number.
AF1.3	A separable Listing Mark (not part of a nameplate and in the form of decals, stickers or labels) must include all elements.
AF1.4	The manufacturer may reproduce the Listing Mark or obtain it from a UL authorized supplier.

Supporting Documentation

The following documents located at the beginning of this Procedure supplement the requirements of this Test Report:

A. Authorization - The Authorization page may include additional Factory Identification Code markings.

B. Generic Inspection Instructions -

- i. **Part AC** details important information which may be applicable to products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of this Test Report.
- ii. **Part AE** details any requirements which may be applicable to all products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of each Test Report.
- iii. **Part AF** details the requirements for the UL Certification Mark which is not controlled by the technical standard used to investigate these products. Products are permitted to bear only the Certification Mark(s) corresponding to the countries for which it is certified, as indicated in each Test Report.

Product Description

The equipment is open type multifunction meter, which used as a built-in equipment to measure voltage, current and power measurements.

Refer to the Report Modifications page for any modifications made to this report.

Model Differences

N/A

Additional Information

UL 61010-2-201, Second Edition, CSA C22.2 No. 61010-2-201, Second Edition, only sub-clauses 4.4.2.101 are used for evaluating pulse output resistive load overload test

The trf for UL/CSA 61010-2-201 is not provided since only sub-clauses 4.4.2.101 are used for evaluating pulse output resistive load overload test.



Technical Considerations

- The product was investigated to the following additional standards: UL 61010-2-030, Second Edition, CSA C22.2 NO. 61010-2-030:18, Second Edition.
- The following additional investigations were conducted: N/A
- The product was not investigated to the following standards or clauses: N/A
- The following accessories were investigated for use with the product: N/A
- N/A

Engineering Conditions of Acceptability

For use only in or with complete equipment where the acceptability of the combination is determined by UL LLC. When installed in an end-product, consideration must be given to the following:

- N/A

Markings and instructions	
Clause Title	Marking or Instruction Details
Company	Listee's or Recognized company's name, Trade name, Trademark or File
Model identification	Model number
Nature and ratings of mains supply (ac)	 ac
Nature and ratings of mains supply	Frequency or frequency range, power in watts or VA or input current in amperes
Field wiring box cable temperature	Minimum temperature rating of the cable to be connected to the field wiring terminals, <80> °C
Measurement CAT Rating (61010-2-030/032/033)	<III>
Reference to the Manual, Caution Symbol 14	

Special Instructions to UL Representative
None

Production-Line Testing Requirements			
Required	Test	Model/Part Exempt from Test	Additional Details
No	Grounding Continuity	All models	NA
Yes	Dielectric Strength	All models required: OVCIII	NA
Solid-State Components			
The following solid-state components that can be disconnect from the remainder of the circuitry during either Dielectric Voltage Withstand Test:		Parts to be disconnected for test:	Specific Test:

Sample and Test Specifics for Follow-Up Tests at UL			
The following tests shall be conducted in accordance with the Generic Inspection Instructions			
Plastic Enclosure or Part	Test	Sample(s)	Test Specifics
None	NA	NA	NA

TABLE: List of Critical Components

TABLE: List of critical components					
Component/ Part No.	Manufacturer/ Trademark	Type No./model No./	Technical data	Standard No. ¹	Required Mark(s) & Certificates of Conformity
Front panel (transparent screen plastic and flip on terminal)	ZHEN JIANG CHI MEI CHEMICAL CO LTD	PC-6610	V-2, Minimum 1.5mm, 80 °C	UL94, UL746B	UL, CUL / E194560 (QMFZ2/8)
Housing	ZHEN JIANG CHI MEI CHEMICAL CO LTD	PC-6610	V-2, Minimum 1.5mm, 80 °C	UL94, UL746B	UL, CUL / E194560 (QMFZ2/8)
Capacity C1	JYH HSU (JEC) ELECTRONICS LTD	JD Series	2.2nF, Rted Voltage: 400VAC, Operating Temperature: —40°C to +85°C, Y1 type.	UL 60384-14	E356696(FOWX2/8)
Terminal block socket (J2 for U2, I 2)	ANYTEK TECHNOLOGY CORP	OQ (@@60)	300V, 20A, FW=1, 115 degree C.	UL 1059	UL, CUL /E202113 (XCFR2/8)
Terminal block plug (J2 for U2, I2)	ANYTEK TECHNOLOGY CORP	TJ (@@11)	12-24 Sol/Str, CU, FW=2, 5 Lb.In., 300 V, 10 A, Use Group D, 115 degree C	UL 1059	UL, CUL /E202113 (XCFR2/8)
Terminal block socket (J11)	ANYTEK TECHNOLOGY CORP	OQ (@@62)	300V, 20A, FW=1, 115 degree C.	UL 1059	UL, CUL /E202113 (XCFR2 8
Terminal block plug (J11) Blank terminal with no connection	ANYTEK TECHNOLOGY CORP	TJ (@@396)	30-12AWG, Sol/Str, CU, FW=2, 4.4 Lb.In., 300 V, 10 A, Use Group D, 115 degree C	UL 1059	UL, CUL /E202113 (XCFR2/8)
Terminal block (J1, J3) J1 for U1,J1 J3 for output of RS485, voltage output and switch output	ANYTEK TECHNOLOGY CORP	J1:VI122155007AG J3:VI0921550000G	12-28AWG, Str/Sol, CU, FW=2, 3.5Lb.in., rated 300V, 16A, Use Group D, 115 degree C.	UL 1059	UL, CUL /E202113(XCFR2/8)
Label	Suzhou Jinhe New Material Co Ltd	JHRH-PC-LABEL	Min. 80 degree C, suitable for Polycarbonate housing.	UL 969	UL / MH60757 (PGDQ2)

Battery on LCD board BT1	FDK CORPORATION	CR1220s(I)	Primary type, Lithium/manganese dioxide (Coin), Max Abnormal Charging Current 3mA, Max Abnormal Charging Voltage, 12V dc. Use the single-phase conduction characteristic of D9 (40V、200mA) diode and Resistor R26 (100Ohm, 0.125W) provide to prevent the battery reverse charging and current.	UL 1642	UL/ MH13421(BBCV2)
PWB	interchangeable	interchangeable	Minimum V-0, 130°C, CTI>=175	UL796	UL / (ZPMV2)
Electrolytic Capacitors (C15)	interchangeable	interchangeable	Electrolytic type, min.400V, Min.10uf, Min. 105°C	-	
Transformer (T1)	WUXI WATTECH ELECTRONIC TECHNOLOGY CO LTD	T--EPC19-220V-5V-8V±15v-1	-	-	-
-Insulation system	WUXI WATTECH ELECTRONIC TECHNOLOGY CO LTD	WTW 130-B	Class B, table IX	UL 1446	UL / E335368 (OBJY2)
-Core	interchangeable	interchangeable	DMR44 or TP4A material, single air gap, 19.3*9.85*7.3 mm	-	-
-Bobbin	SUMITOMO BAKELITE CO LTD	PM-9820	Phenolic, black, rated V-0,150 °C, minimum 0.16 mm thick, CTI=3	UL94, UL746B	UL, CUL /E41429(QMFZ2/8)
-Triple insulated wire (winding between pin 1-2, 10-11)	GREAT LEOFロン INDUSTRIAL CO LTD	TRW(B)*	Rated 130 °C	UL2353	UL / E211989 (OBJT2)
CU wire(winding between pin 4-5, pin6 to 7 and 7 to 8)	interchangeable	interchangeable	Min. 155 °C, ANSI Type MW79C	UL 1446	UL (OBMW2)
Barrier tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	WF* (c)(h)	Rated 130 °C, white, 3 mm wide on PIN side of bobbin.	UL510A	UL / E165111 (OANZ2)
Polyester tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	CT* (b)(g)	Rated 130 °C, CTI=2	UL510A	UL / E165111 (OANZ2)
-Tube	GREAT HOLDING INDUSTRIAL CO LTD	TFL	150V 200°C	UL224	UL / E156256 (YDPU2)
-Varnish	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260(a)	Min. 130°C	UL1446	UL / E228349(OBOR2)

Optical Isolator U6、U7、U8、U10、U12、U13(POW), U3、U8(SIG)	LITE-ON TECHNOLOGY CORP	LTV-816	Isolation voltage 5300 V, max. operating temperature 115 °C	UL1577	UL, CUL / E113898 (FPQU2/8)
resettable fuse PT1	BESTBRIGHT ELECTRONICS CO LTD	BK250-180-SZ	Class C3, 250V, I max 10A, Tmoa 85°C.	UL1343	UL, CUL / E482628 (XGPU2/8)
Piezo resistor RV1	ACPA TECHNOLOGY CO LTD	10&471%X	Rated 300VAC, 85°C SPD type 5, In 2KA.	UL1449	UL / E315423 (VZCA2), CSA certified
Common mode choke L1	JIANGYIN LIYI ELECTRONICS TECHNOLOGY CO,LTD	L-T6-10-4.5-20mH-50mA-±30%(embedment)	Inductance: 20mH	-	-
Bridge Diode(DB1)	CHANGZHOU STARSEA ELECTRONICS CO,LTD	ABS10	Voltage Range: 1000 V Current- 0.8/1.0 A	-	-
PWM U4	Power Integrations, Inc.	TNY286DG-TL	725V Rated MOSFET, 470uA -40~150 °C	-	-
Panel Button plastic	JIANGSU PEARL SILICONE RUBBER MATERIAL CO LTD	HD-87XX	Gray, 0.8mm, V-0, 150°C	UL94, UL746B	UL, CUL /E231325(QMFZ2/8)
LCD	JIANGSU JINHUA ELECTRONICS TECHNOLOGY CO.,LTD	3.3V-WB-38.8*26.8-EN-A-JH26625A	Rated 3.3V, -20°C~+70°C	--	--
Internal connector	interchangeable	interchangeable	V-0, Minimum 0.4mm, 85 °C	UL94, UL746B	UL, CUL / (QMFZ2)
Protective impedances (R12~R20,R22,R31~R38,R40,R41(POW) ;R1~R6,R13~R16,R31~R38,R40,R41(SIG))	Viking Tech Corporation Kaoshiung Branch	HVR06FTEV1004	1M ohms, 0.25W	UL60950	UL, CUL / E490339(NWQG2/8)

Supplementary information:

The Test Laboratory has verified the component information.

- 1) Anything specified within brackets "()" is for reference purposes only and can be used to specify the UL Product Category CCN(s)/File Number if the component includes an UL Certification. This can be useful for the UL Follow-Up Service Inspection associated with the UL Mark; however if in brackets, should not be a required element of the UL Inspection.

----- END OF APPENDIX C -----

TEST RESULTS:

APPENDIX D: Test Datasheets Enclosures

The following tests have been performed as part of this report:

Standard	Clause No.	Test Name	Testing Location / Comments
IEC 61010-1:2010, AMD1:2016	4.4	Single Fault Condition Tests	UL-CCIC COMPANY LIMITED
IEC 61010-1:2010, AMD1:2016	4.4.1	Component Abnormal	UL-CCIC COMPANY LIMITED
IEC 61010-1:2010, AMD1:2016	4.4.2.2	Protective Impedance Abnormal Test	UL-CCIC COMPANY LIMITED
IEC 61010-1:2010, AMD1:2016	4.4.2.7.2	Mains Transformer Short Circuit Test	UL-CCIC COMPANY LIMITED
IEC 61010-1:2010, AMD1:2016	4.4.2.7.3	Mains Transformer Overload Test	UL-CCIC COMPANY LIMITED
IEC 61010-1:2010, AMD1:2016	5.1.3	Mains Supply	UL-CCIC COMPANY LIMITED
IEC 61010-1:2010, AMD1:2016	6.2	Determination Of Accessible Parts	UL-CCIC COMPANY LIMITED
IEC 61010-1:2010, AMD1:2016	6.3	Limit Values For Accessible Parts	UL-CCIC COMPANY LIMITED
IEC 61010-1:2010, AMD1:2016	6.7, ANNEX K	Insulation Requirements	UL-CCIC COMPANY LIMITED
IEC 61010-1:2010, AMD1:2016	6.8	Dielectric Voltage Withstand Test	UL-CCIC COMPANY LIMITED
IEC 61010-1:2010, AMD1:2016	6.8.2	Humidity Conditioning Test	UL-CCIC COMPANY LIMITED
IEC 61010-1:2010, AMD1:2016	10.1-10.4	Temperature Test	UL-CCIC COMPANY LIMITED
IEC 61010-1:2010, AMD1:2016	IEC 61010-2-030, 1st, 14.101 IEC61010-2-030, 2nd, 101.4	Transient Overvoltage Protection against mains overvoltages	UL-CCIC COMPANY LIMITED
IEC 61010-1:2010, AMD1:2016	IEC 61010-2-201, 4.4.1.101.1, 4.4.1.101.2	Overload And Endurance Test - General Use And Resistive Loads	UL-CCIC COMPANY LIMITED

NOTE: If testing location is blank then the test was performed at the Testing Laboratory as specified at the beginning of this report.

The following datasheet enclosures are provided in this section of the report. If blank, no separate enclosures are attached.

Enclosures

<u>Supplement ID</u>	<u>Description</u>
-	No separate datasheet enclosures attached.

----- END OF APPENDIX D -----