



Underwriters Laboratories (UL LLC)

Safety Certification Report

Model: 6-slot backboard module, Model LK132C
Static trusted controller, Model LK226CT1
24V power switching module, Model LK921C

Device Description: Programmable controller

Applicant: BEIJING HOLLYSYS INTELLIGENT TECHNOLOGIES CO LTD
No 2 Disheng Middle Rd
Beijing Technological Development Area
Beijing 100176 CHINA

Manufacturer: Same as Applicant

Manufacturing Facility(ies): Same as Applicant

Report No.: E311062-D1000-1/A0/C0-UL

Report (Re)Issue Date: 2022-07-13

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

Additional Standards: UL 61010-2-201, 2nd Edition, Issue date 2018/05/14.
CAN/CSA-C22.2 No. 61010-2-201:18, 2nd Edition, Issue date 2018/02

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.: E311062-D1000-1/A0/C0-UL

Date of issue: 2022-07-13

Total number of pages: 70

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

Applicant's name: BEIJING HOLLYSYS INTELLIGENT TECHNOLOGIES CO LTD
 Address: No 2 Disheng Middle Rd
 Beijing Technological Development Area
 Beijing 100176 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_10

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:	Programmable controller	
Trade Mark:		
Manufacturer:	Same as Applicant	
Model/Type reference:	6-slot backboard module, Model LK132C Static trusted controller, Model LK226CT1 24V power switching module, Model LK921C	
Ratings:	LK921C: Input : 24Vdc (19.2 to 28.8Vdc), max. 2A LK226CT1: Input : 24Vdc (19.2 to 28.8Vdc), 500mA LK132C: Not provided	
Testing procedure and testing location:		
☒ 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, handler	<i>Sandy Fu</i>
Approved by (name, function, signature):	Pauline Wu, reviewer	<i>Pauline Wu</i>
☐ 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:	Control
Description of equipment function:	Open type Programmable controller
Connection to mains supply:	None
Overvoltage category:	N/A
Pollution degree:	3
Means of protection:	Class III
Environmental conditions:	Ambient temperature: -20 to 70°C Humidity: 10%-95%, no condensation
For use in wet locations:	No
Equipment mobility:	Built-in
Operating conditions:	Continuous
Overall size of equipment (W x D x H)	LK132C: 325 mm*44.3 mm* 166mm ±0.5 mm LK226CT1: 44.7 mm*152 mm*166 mm ±0.5 mm LK921C: 62.7 mm *152 mm *166 mm ±0.5 mm
Mass of equipment (kg):	LK132C: 1332g LK226CT1:382g LK921C: 371g
Marked degree of protection to IEC 60529:	IP20 apply for the model LK226CT1 and LK921C
Supply Connection	Not connection to mains
Testing	
Date of receipt of test item(s)	2022-03-01
Dates tests performed	2022-03-17 to 2022-06-20
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 NCB. 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

These devices are open type programmable logic controllers intended for use in industrial control applications. The above three modules are connected to form a system. LKA102 battery power box can optionally be inserted into a backup battery slot of LK226CT1.

Model Differences

N/A

Additional Information

N/A

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(2012-05), 3rd Edition, with revisions through 2018-11

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 61010-2-201, 2nd Edition, Issue date 2018/05/14.

CAN/CSA-C22.2 No. 61010-2-201:18, 2nd Edition, Issue date 2018/02

- The following additional investigations were conducted: The following additional investigations were conducted: IP20 according to IEC 60529:Edition 2.2, Issued 2013-08 + Corr. 1:2013-10 + Corr. 2:2015-01.
- 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
- No Other Considerations

Engineering Conditions of Acceptability

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

None

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
4	TESTS		N/A
4.4	Testing in single fault conditions		N/A
4.4.1	Fault tests		N/A
4.4.2	Application of single fault conditions		N/A
4.4.2.1	single fault conditions not covered by 4.4.2.2 to 4.4.2.14		N/A
4.4.2.2	Protective impedance		N/A
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		N/A
4.4.2.7.2	Short circuit		N/A
4.4.2.7.3	Overload		N/A
4.4.2.8	Outputs		N/A
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		N/A
5	MARKING AND DOCUMENTATION		Pass
5.1	Marking		Pass

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.1.1	General		Pass
	Required equipment markings		-
	– Visible from the exterior; or		N/A
	– Visible after removing cover or opening door		N/A
	– Visible after removal from a rack or panel		Pass
	Not put on parts which can be removed by an operator		Pass
	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		N/A
	Equipment is marked as follows	Not intended to be connected to mains directly	-
	a) Nature of supply	24VDC,(19.2 to 28.8V)	-
	1) a.c. rated mains frequency or range of frequencies		-
	2) d.c. with symbol 1		-
	b) rated supply voltage(s) or range		-
	c) Max. rated power (W or VA) or input current	LK921C: max. 2A LK226CT1: 500mA	-
	The marked value not less than 90 % of the maximum value		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		-

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
	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
	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	Not connected to mains	N/A
	Other terminal marking		-
	a) functional earth terminals marked with symbol 5	Functional earth symbol refer to UL61010-2-201 is used.	Pass
	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

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
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		N/A
	Protected throughout (symbol 11 used)		N/A
	Only partially protected (symbol 11 not used)		N/A
5.1.8	Field-wiring terminal boxes		N/A
	If terminal or enclosure exceeds 60 (C		-
	Cable temperature rating marked		-
	Marking visible before and during connection or beside terminal		N/A
5.2	Warning markings		Pass
	Visible when ready for normal use		Pass
	Are near or on applicable parts		N/A
	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		Pass
	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	Open type equipment not need to subject to the marking durability test	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

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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		Pass
	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
	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	24VDC,(19.2 to 28.8V)	-
	Frequency or frequency range		-
	Power or current rating	LK921C: max. 2A LK226CT1: 500mA	-
	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)		Pass
	d) Statement of the range of environmental conditions (refer to 1.4)	Ambient temperature: -20 to 70°C Humidity: 10%-95%, no condensation	-
	1) indoor or outdoor use,		Pass
	2) altitude,		Pass
	3) temperature,		Pass

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	4) relative humidity,		Pass
	5) mains supply voltage fluctuations,		N/A
	6) overvoltage category,		N/A
	7) wet location, if applicable,		N/A
	8) pollution degree of the intended environment		Pass
	e) Degree of ingress protection (IEC 60529)	IP20	Pass
	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
	2) If external switch or circuit-breaker, requirements and location recommendation		N/A
	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		Pass
	g) Cleaning and decontamination		N/A
	h) Listing of any poisonous or injurious gases and quantities		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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	LKA102 battery power box	Pass
	Any manufacturer specified parts		Pass
	rating and characteristics of fuses		N/A
	Instructions include following subjects permitting safe servicing and continued safety		-
	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		N/A
	Aspects described in documentation		N/A
6	PROTECTION AGAINST ELECTRIC SHOCK		N/A
6.1	General	powered by a power supply which provides double/reinforce insulation	N/A
6.1.1	Requirements		N/A
	Protection against electric shock maintained in normal condition and single fault condition		N/A
	accessible parts not hazardous live		N/A
	Voltage, current, charge or energy below the limits in normal condition and in single fault condition between		-
	accessible parts and earth		N/A
	two accessible parts on same piece of the equipment within a distance of 1,8 m		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Conformity is checked by the determination of 6.2 and 6.3 followed by the tests of 6.4 to 6.11		N/A
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		N/A
6.2.1	General		N/A
	Unless obviously determination of accessible parts as specified in 6.2.2 to 6.2.4		N/A
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
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		N/A
6.3.1	Levels in normal condition		N/A
	a) Voltage limits less than 30 V r.m.s. and 42,4 V peak or 60 V d.c.		N/A
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	c) Levels of capacitive charge or energy less		-
	1) 45 μC 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		N/A
	a) Voltage limits less than 50 V r.m.s. and 70 V peak or 120 V d.c.		N/A
	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		N/A
6.4.1	General		N/A
	Accessible parts prevented from being hazardous live by one or more of following means		-
	a) enclosures or protective barriers (see 6.4.2)		N/A
	b) basic insulation (see 6.4.3)		N/A
	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		N/A
	– meet clearance, creepage distance and solid insulation requirements of 6.7		N/A
6.4.4	Impedance		N/A
	Impedance used as primary means of protection meets all the following requirements		-

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
6.5.1	General		N/A
	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)		N/A
	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)		N/A
	f) protective impedance (see 6.5.4)		N/A
6.5.2	Protective bonding		N/A
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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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		-
	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		N/A
	Meet clearance, creepage distance and solid insulation requirements of 6.7		N/A
6.5.4	Protective impedance		N/A
	Limits current or voltage to level of 6.3.1 in normal and to level of 6.3.2 in single fault condition		N/A
	clearance, creepage distance between terminations of the impedance meet requirements of double or reinforced insulation of 6.7		N/A
	The protective impedance consists of one or more of the following		-

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Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
	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
6.6	Connections to external circuits		N/A
6.6.1	General		N/A
	Connections do not cause accessible parts of the following to become hazardous live in normal condition or single fault condition		-
	– the external circuits		N/A
	– the equipment		N/A
	Protection achieved by separation of circuits; or		N/A
	short circuit of separation does not cause a hazard		N/A
	Instructions or markings for each terminal include		-
	a) rated conditions for terminal		N/A
	b) Required rating of external circuit insulation		N/A
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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	These circuits are		-
	Not connected to accessible conductive parts; or		N/A
	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		N/A
6.6.4	Terminals for stranded conductors		N/A
	No risk of accidental contact because		-
	– Located or shielded		N/A
	– Self-evident or marked whether or not connected to accessible conductive parts		N/A
	Complies as applicable		-
	a) Manufacturer's specified maximum length of removed insulation, or		N/A
	b) 8 mm length of insulation removed		N/A
6.7	Insulation requirements		N/A
6.7.1	The nature of insulation		N/A
6.7.1.1	General		N/A
	Insulation between accessible parts or between separate circuits consist of clearances, creepage distances and solid insulation if provided as protection against a hazard		N/A
6.7.1.2	Clearances		N/A
	Required clearances reflecting factors of 6.7.1.1		N/A
	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		N/A
	Required creepage distances reflecting factors of 6.7.1.1 a) to d)		N/A
	CTI material group reflected by requirements		N/A
	CTI test performed		N/A
6.7.1.4	Solid insulation		N/A
	Required solid insulation reflecting factors of 6.7.1.1 a) to d)		N/A
6.7.1.5	Requirements for insulation according to type of circuit		N/A
	a) 6.7.2 mains circuits of overvoltage category II up to nominal supply voltage of 300 V		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
	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		N/A
	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
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		-

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Clause	Requirement + Test	Result - Remark	Verdict
	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 has 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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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		-
	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		-

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	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		N/A
6.9	Constructional requirements for protection against electric shock		N/A
6.9.1	General		N/A
	If a failure could cause a hazard		-
	a) security of wiring connections		N/A
	b) screws securing removable covers		N/A
	c) accidental loosening		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	d) clearances and creepage distances not reduced below the values of basic insulation by loosening of parts or wires		N/A
6.9.2	Insulating materials		N/A
	Material not to be used for safety relevant insulation		-
	a) easily damaged materials not used		N/A
	b) non-impregnated hygroscopic materials not used		N/A
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		N/A
6.10.1	Mains supply cords	Not mains connected	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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	b) input has a protective earth conductor if outlet has earth terminal contact		N/A
6.11	Disconnection from supply source		N/A
6.11.1	Disconnects all current-carrying conductors		N/A
6.11.2	Exceptions		N/A
6.11.3	Requirements according to type of equipment		N/A
6.11.3.1	Permanently connected equipment and multi-phase equipment		N/A
	Employs switch or circuit-breaker		N/A
	If switch or circuit-breaker is not part of the equipment, documentation requires		-
	a) switch or circuit-breaker to be included in building installation		N/A
	b) suitable location easily reached		N/A
	c) marking as disconnecting for the equipment		N/A
6.11.3.2	Single-phase cord-connected equipment		N/A
	Equipment is provided with one of the following		-

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
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		-

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Clause	Requirement + Test	Result - Remark	Verdict
	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
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

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Clause	Requirement + Test	Result - Remark	Verdict
	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		-
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	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	Not mains connected	N/A
	Conformity is checked by minimum one or a combination of the following (see Figure 11)		-
	a) Single Fault test of 4.4; or		N/A
	b) Application of 9.2 (eliminating or reducing the sources of ignition); or		Pass
	c) Application of 9.3 (containment of fire within the equipment)		Pass
9.2	Eliminating or reducing the sources of ignition within the equipment		Pass
	a) 1) Limited-energy circuit (see 9.4); or	test the model LK226CT1	Pass

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Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
	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		-
	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		Pass
	a) Potential not more than 30 r.m.s. and 42,4 V peak, or 60 V d.c.		Pass
	b) Current limited by one of following means		-
	1) Inherently or by impedance (see Table 17); or		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	2) Overcurrent protective device (see Table 18); or		N/A
	3) A regulating network limits also in single fault condition (see Table 17)		Pass
	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		N/A
9.6.1	General		N/A
	Mains supplied equipment protected		N/A
	Basic insulation between mains parts of opposite polarity provided		N/A
	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		N/A
	Overcurrent protection device		-
	Fitted within the equipment; or		N/A
	Specified in manufacturer's instructions		N/A
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

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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		N/A
10.3	Other temperature measurements		N/A
	Following measurements conducted if applicable		-
	a) Value of 60 °C of field-wiring terminal box not exceeded	Replaced this clause of Part 1 by Part 2-201	N/A
	b) Surface of flammable liquids and parts in contact with this liquids		N/A
	c) Surface of non-metallic enclosures		N/A
	d) Parts made of insulating material supporting parts connected to mains supply		N/A
	e) Terminals carrying a current more than 0,5 A		N/A
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		Pass
	Equipment built in as specified in installation instructions		Pass
10.5	Resistance to heat		N/A
10.5.1	Integrity of clearance and creepage distances		N/A
10.5.2	Non-metallic enclosures		N/A
	Within 10 min after treatment		-

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Clause	Requirement + Test	Result - Remark	Verdict
	Equipment subjected to suitable stresses of 8.2 and 8.3 complying with criteria of 8.1		N/A
10.5.3	Insulating material		N/A
	a) Parts supporting parts connected to mains supply		N/A
	b) Terminals carrying a current more than 0,5 A		N/A
	Examination of material data; or		N/A
	in case of doubt		N/A
	1) Ball pressure test; or		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		N/A
	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		N/A
	Battery electrolyte leakage presents no hazard		N/A
11.6	Equipment rated with a degree of ingress protection (IP code)	IP20 apply for the model LK226CT1 and LK921C	Pass
11.6.1	General		Pass
	Equipment marked with IP code		-
	Conditions specified in the documentation		Pass
11.6.2	Conditions for testing		Pass
	Equipment in clean and new condition, all parts in place and mounted as specified by manufacturer		Pass
	Complete equipment tested, or		Pass
	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		-

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Clause	Requirement + Test	Result - Remark	Verdict
	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		Pass
	b) No created accumulations that have the potential to cause spread of fire		Pass
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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
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 μ 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 μ Sv/h and 5 μ Sv/h in m		-

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Clause	Requirement + Test	Result - Remark	Verdict
12.2.1.3	Equipment not intended to emit radiation		-
	Limit for unintended stray radiation of 1 µSv/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
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		-

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Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
	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		N/A
13.2.1	Components		N/A
	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		Pass
	If explosion or fire hazard could occur		-
	Protection incorporated in the equipment; or	Diode D3 and Resistor R2 provided reverse current protection	Pass
	Instructions specify batteries with built-in protection		N/A
	In case of wrong type of battery used	Provided the battery type in manual, cannot use the wrong type battery BAT indicator lamp will Off when need battery replacement	-
	No hazard; or		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
	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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
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		-
	– 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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	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		N/A
	Manufacturer's declaration		N/A
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

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Clause	Requirement + Test	Result - Remark	Verdict
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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

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Clause	Requirement + Test	Result - Remark	Verdict

SP	TABLE: Additional or special tests conducted		N/A
Clause and Name of Test	Test type and condition	Observed results	
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
LK132C					
Label marking	interchangeable	interchangeable	Suitable for the surface applied, Min. 85°C	UL 969	UL/ any/ (PGJ12 or PGDQ2)
Top cover	SABIC INNOVATIVE PLASTICS US L L C	CX7240 U(GG)	Min. 2 mm thick. V-0, RTI: 90°C	U746C	UL / E121562 (QMFZ2)
Bottom Cover	Interchangeable	Interchangeable	Stainless Steel. Min.44.3 mm thick. Dimension: 325mm by 166 mm by 44.3 mm	-	-
PWB	Interchangeable	Interchangeable	Minimum V-1, 105°C	UL 796	UL /any/ (ZPMV2)
Connector (J1-J6)	WUHAN CLIP ELECTRONICS CO LTD	HMMA11001112J	Max. operating temperature: 125°C	UL1977	UL/E320764(ECBT2)
Internal connector	Interchangeable	Interchangeable	Minimum V-2, 105°C	UL 94, UL 746B	UL/ any/ (QMFZ2)
LK921C					
Cover	SABIC INNOVATIVE PLASTICS US L L C	CX7240 U(GG)	Min. 2 mm thick. V-0, RTI: 90°C	UL746C	UL / E121562 (QMFZ2)
PWB	Interchangeable	Interchangeable	Minimum V-1, 105°C	UL 796	UL /any/ (ZPMV2)
Terminal Blocks Header (J1, J2)	SHENZHEN SUCCEED ELECTRONICS TECHNOLOGY CO LTD	TP508H-00V-3P-GY	Rated 300 V, 18 A, CU, FW=1 (mated with FW2 plug), UG=D, 115°C	UL1059	UL, CUL/ E332956 (XCFR2/8)
Terminal Blocks Plug	SHENZHEN SUCCEED ELECTRONICS TECHNOLOGY CO LTD	TP508P-00-3P-GY	Rated 300 V, 18 A, CU, FW=2, 30-12 AWG (Sol, Str), UG=D, 5 Lb- in, 115°C	UL1059	UL, CUL / E332956 (XCFR2/8)
Connector J3	WUHAN CLIP ELECTRONICS CO LTD	HMFA110002412B	Max. operating temperature: 125°C	UL1977	UL/E320764 (ECBT2)
Internal connector	Interchangeable	Interchangeable	Minimum V-2, 105°C	UL 94, UL 746B	UL/ any/ (QMFZ2)
L1	HOLLYLAND(CHINA) ELECTRONICS TECHNOLOGY CORPORATION LTD.	25F-030H/L1	Rated Current 3A. Rated Voltage 125V Min 125°C	-	-
Core	Interchangeable	Interchangeable	Ferrite, 105°C	-	-
Bobbin	CHANG CHUN PLASTICS CO LTD	T200NA	Phenolic, BK or BN, minimum 0.38 mm thick, V-0, RTI: 150°C	UL746C	UL/E59481 (QMFZ2)
wire	Interchangeable	Interchangeable	105°C	UL1446	UL/any/

IEC 61010-1			
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
					(OBMW2)
Fuses (F2, F3)	HOLLYLAND CO LTD	51MS	Rated 125 V ac, 3.15 A	UL248-1, UL248-14	UL, CSA / E156471 (JDYX2)
Fuse (F4)	HOLLYLAND CO LTD	50T	Rated 250 V ac, 3A	UL248-1, UL248-14	UL, CSA / E156471 (JDYX2)
LK226CT1					
Cover	SABIC INNOVATIVE PLASTICS US L L C	CX7240 U(GG)	Min. 2 mm thick. V-0, RTI: 90°C	U746C	UL / E121562 (QMFZ2)
PWB	Interchangeable	Interchangeable	Minimum V-1, 105°C	UL 796	UL /any/ (ZPMV2)
Connector (J3)	WUHAN CLIP ELECTRONICS CO LTD	HMFA110002412B	Max. Operating current Min 125°C	UL1977	UL/E320764(ECBT2)
Internal connector	Interchangeable	Interchangeable	Minimum V-2, 105°C	UL 94, UL 746B	UL/ any/ (QMFZ2)
Battery Power Box (Optional)	Beijing HollySys Intelligent Technologies Co Ltd	LKA102	-	-	-
Cover	SABIC INNOVATIVE PLASTICS B V	CX7240	Min. 2 mm thick. V-0, RTI: 90°C	U746C	UL / E45329(QMFZ2)
PWB	Interchangeable	Interchangeable	Minimum V-1, 105°C	UL796	UL / (ZPMV2)
Wire Leads	Interchangeable	Interchangeable	Minimum 300 V, 80°C, VW-1	UL758	UL, cUL / (AVLV2/8)
Battery	EEMB CO LTD	CR2477 EEMB	Diode D3 and Resistor R2 are provided in series to prevent abnormal charging current	UL1642	UL / MH20555 (BBCV2)
Heatsink	-	-	Aluminum, refer to enclosure for detail dimension.	-	-

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		N/A
	Equipment intended for permanent connection to mains complies with Annex DVD		N/A
	Open-type equipment intended for permanent connection to mains complies with Annex DVE		N/A
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.		Pass
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		N/A
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		N/A
DVD.2.1.1	Equipment provided with TERMINALS or leads for connection and sized per the NEC or CEC		N/A
DVD.2.1.2	Equipment provided with a TERMINAL or splice compartment is complete		N/A
DVD.2.1.3	TERMINAL or splice compartment not exposed to damage or strain and able to be inspected after installation		N/A
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		N/A
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		N/A
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 than 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		N/A
DVE.3.1.2.1	Warning marking to disconnect power when installing or servicing current transformer provided		N/A
DVE.3.1.2.2	Marking for use with listed Energy-Monitoring Current Transformers provided		N/A
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		N/A
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 its 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		N/A
DVE.3.2.1	Current transformers intended for field installation inside a panel board or switchgear have the following		-

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Clause	Requirement + Test	Result - Remark	Verdict
	markings		
	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		N/A
	b) Statement that the leads are maintained within the same end-product enclosure		N/A
	c) Statement to segregate of or insulate the leads from different circuits		N/A
	d) Statement that the current transformers are for installation within the same enclosure as the equipment but not switchgears and panel boards		N/A
DVE.4.1.1	Current transformer leads considered NFPA 70 C22.1 Class 1 wiring		N/A
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		N/A
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 MAINS circuit		N/A
DVE.4.4	Permanent connection to MAINS		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
DVE.4.4.1	Field-wiring leads not smaller than two wire sizes and not smaller than 18 AWG		N/A
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 small 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		N/A
DVE.8.1.1	Current transformers for field installation are Listed energy monitoring current transformer or comply with DVE.8.1.2		N/A
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 intended conductor insulation (60°C, 75°C or 90°C)		N/A
	d) Current transformer leads and electrical sleeving		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	voltage rating complies		
	e) Current transformer leads rated minimum 90°C		N/A
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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		N/A
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 6.8.3.2 with a test voltage of:		-
	- 1,5 times the WORKING VOLTAGE for BASIC		-

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Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
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]		N/A
	Requirements for mains connections comply with Annex DVD		N/A
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.		N/A
6.11DV	Disconnection from Supply Source and maintaining polarity [D2]		N/A
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
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

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Clause	Requirement + Test	Result - Remark	Verdict
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.		Pass
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
11.7.1DV.2	Equipment with other characteristics meet the requirements of 11.7.3 and 11.7.4		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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 UV/water exposure preconditioning.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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
DVC.1	General		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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]		N/A
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		N/A
	Equipment meet the requirements of DVD.2 to DVD.3		N/A
DVD.1.2	Compliance is checked by inspection and comply with DVD.2 to DVD.3		N/A
DVD.2	Wiring TERMINALS and leads		N/A
DVD.2.1	General		N/A
DVD.2.1.1	PERMANENTLY CONNECTED EQUIPMENT provided with TERMINALS or leads comply with ampacity according		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	to NEC and/or Canadian Electrical Code, Part I		
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:		N/A
	a) Internal wiring and electrical components not damaged while connections are being made		N/A
	b) Connection may be readily inspected after installation		N/A
DVD.2.1.4	Compliance is checked by inspection.		N/A
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		N/A
DVD.2.4.1	TERMINALS and leads are suitably identified		N/A
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
DVD.2.4.4	Neutral (grounded) MAINS conductor is readily distinguishable from other leads (white or natural grey		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	colour)		
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		N/A
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
DVD.4.3.1	A length of conduit at least 300 mm (1 ft) long of the intended size shall be installed:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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.		N/A
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.		N/A
DVE.1.4 Amd 1	The requirements in this Annex are to be used as supplements to the general requirements in this standard.		N/A
DVE.1.5 Amd 1	These safety requirements do not apply to equipment intended for use in utility substations or equivalent areas that have impulse voltages greater than Overvoltage		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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.		N/A
DVE.3.1.2 Amd 1	Current transformer warning and correlation marking		N/A
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		N/A
	a) ?For use with Listed Energy-Monitoring Current Transformers?; or		N/A
	b) symbol 14, Table 1, accompanied by statement a) in the installation instructions.		N/A
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
	c) Use Aluminum Conductors Only or "Use Aluminum or Copper-Clad Aluminum Conductors Only" if the terminal		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	is only for connection to aluminium wire; and		
	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
	e) "Not suitable for Class 2 wiring methods" and "Not intended for connection to Class 2 equipment".		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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:		N/A
	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".		N/A
	b) "Leads of the current transformers shall be maintained within the same end-product enclosure" or similar.		N/A
	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.		N/A
	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		N/A
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 6.0 mm (per NFPA 70, Article 725.136, and C22.1 Rule 4-10) between parts of different circuits.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
DVE.4.1.4 U2	Conductors provided with insulation rated for the highest voltage involved need not be separated or segregated.		N/A
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		N/A
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		N/A
DVE.4.3.1	Neutral conductors as part of the mains circuit, shall be considered hazardous live.		N/A
DVE.4.4	Permanent connection to MAINS		N/A
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).		N/A
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 lead.		N/A
	c) The equipment is marked to specify that the wire		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	connector for field-installed wiring is to be used in making the field connection.		
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:		Pass
	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; or		N/A
	d) The intended enclosure, such as a standard outlet box if marked on the device or defined by the manufacturer		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	in the installation sheet.		
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		N/A
DVE.8.1 U2	Current transformers		N/A
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.		N/A
	Accessory current transformers for OPEN EQUIPMENT intended only for field installation within the same enclosure as the OPEN EQUIPMENT shall be:		N/A
	a) evaluated to the requirements as outlined in DVE.8.1.2; or		N/A
	b) listed as energy monitoring current transformers.		N/A
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 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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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_201d_2019-04-11

Particular Standard - (001) iec61010_2_201d_2019-04-11Particular Standard - (001) iec61010 2 201d 2019-04-11

Test Report issued under the responsibility of:



TEST REPORT IEC 61010-2-201 Safety requirements for electrical equipment for measurement, control, and laboratory use Part 2-201: Particular requirements for control equipment	
Report Number.....	E311062-D1000-1/A0/C0
Date of issue	2022-07-13
Total number of pages	32
Name of Testing Laboratory preparing the Report	UL-CCIC Company Limited
Applicant's name	BEIJING HOLLYSYS INTELLIGENT TECHNOLOGIES CO LTD
Address.....	No 2 Disheng Middle Rd Beijing Technological Development Area Beijing 100176 CHINA
Test specification:	
Standard	IEC 61010-2-201:2017 for use with IEC61010-1:2010, AMD1:2016
Test procedure.....	CB Scheme
Non-standard test method	N/A
Test Report Form No.	IEC61010_2_201D
Test Report Form(s) Originator....	UL(US)
Master TRF	2019-04-11
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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.	

Particular Standard - (001) iec61010 2 201d 2019-04-11

Test item description..... :	Programmable Controllers	
Trade Mark..... :		
Manufacturer..... :	Same as Applicant	
Model/Type reference..... :	6-slot backboard module, Model LK132C Static trusted controller, Model LK226CT1 24V power switching module, Model LK921C	
Ratings..... :	LK921C: Input : 24Vdc (19.2 to 28.8Vdc), max. 2A LK226CT1: Input : 24Vdc (19.2 to 28.8Vdc), 500mA LK132C: Not provided	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
☒ CB 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, handler	<i>Sandy Fu</i>
Approved by (name, function, signature) .. :	Pauline Wu, reviewer	<i>Pauline Wu</i>
Testing procedure: CTF Stage 1:		
Testing location/ address..... :		
Tested by (name, function, signature)..... :		
Approved by (name, function, signature) .. :		
Testing procedure: CTF Stage 2:		
Testing location/ address..... :		
Tested by (name + signature)..... :		
Witnessed by (name, function, signature) .. :		
Approved by (name, function, signature) .. :		
Testing procedure: CTF Stage 3:		
Testing procedure: CTF Stage 4:		
Testing location/ address..... :		
Tested by (name, function, signature)..... :		

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

Particular Standard - (001) iec61010 2 201d 2019-04-11

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): See part 1 report	Testing location: See part 1 report
Summary of compliance with National Differences (List of countries addressed): See part 1 report ☐ The product fulfils the requirements of _ (insert standard number and edition and delete the text in parenthesis, leave it blank or delete the whole sentence, if not applicable)	

Particular Standard - (001) iec61010 2 201d 2019-04-11

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 part 1 report

Particular Standard - (001) iec61010_2_201d_2019-04-11

Test item particulars:	
Type of item	Control
Modular equipment	No
Description of equipment function (intended use)	The device is an open type programmable controller.
Switching device, intended use	N/A
Enclosure type	open equipment
Connection to MAINS supply	N/A
Overvoltage category	N/A
POLLUTION DEGREE	2
Means of protection	Class III
Environmental conditions	Ambient temperature: -20 to 70° C Humidity: 10%-95%, no condensation
For use in wet locations	No
Equipment mobility	Built in
Operating conditions	Continuous
Overall size of equipment (W x D x H)	LK132C: 325 mm*44.3 mm* 166mm ±0.5 mm LK226CT1: 44.7 mm*152 mm*166 mm ±0.5 mm LK921C: 62.7 mm *152 mm *166 mm ±0.5 mm
Mass of equipment (kg)	LK132C: 1332g LK226CT1: 382g LK921C: 371g
Marked degree of protection to IEC 60529	IP20 apply for the model LK226CT1 and LK921C
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	2022-03-01
Date (s) of performance of tests	2022-03-17 to 2022-06-20
General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. Throughout this report a ☐ comma / ☒ point is used as the decimal separator.	

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Manufacturer's Declaration per sub-clause 4.2.5 of IEC60080-1:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided	☐ Yes ☒ Not applicable
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies) : Same as Applicant	
General product information and other remarks: See part 1 TRF	

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IEC 61010-2-201			
Clause	Requirement + Test	Result - Remark	Verdict
4.4	Testing in SINGLE FAULT CONDITIONS		N/A
4.4.2	Application of fault conditions	Powered by a power supply which provides double/reinforce insulation	N/A
4.4.2.101	Switching devices test		N/A
4.4.2.101.1	Overload test		N/A
4.4.2.101.2	Endurance test (when required by cl. 14.102)		N/A
	Exemption for solid state devices for general or resistive use		N/A
5	MARKING AND DOCUMENTATION		P
5.1.5.2	TERMINALS		N/A
	a) FUNCTIONAL EARTH TERMINALS	Function earth symbol refer to UL61010-2-201	P
5.1.8	FIELD WIRING TERMINAL boxes		N/A
5.4.1	Documentation in electronic media provided with symbol 14		N/A
5.4.3	Equipment installation		P
	h) OPEN EQUIPMENT		P
	d) 1) Supply and FIELD WIRING requirements		P
5.4.4	Equipment operation		P
	j) methods of reducing risk of burns from surfaces		N/A
6	PROTECTION AGAINST ELECTRIC SHOCK		P
6.1.2	Exceptions: Parts for operating reasons HAZARDOUS LIVE and ACCESSIBLE to SERVICE PERSONNEL during NORMAL USE:	Powered by a power supply which provides double/reinforce insulation	N/A
	a) parts of lamps and lamp sockets after lamp removal		N/A
	b) parts intended to be replaced by SERVICE PERSONNEL or other action if accessible only by a tool and having a warning marking		N/A
	Parts not HAZARDOUS LIVE 10 s after interruption of supply		N/A
	Charge received from an internal capacitor tested to clause 6.3, below levels of 6.3.1 c)		N/A
6.2	Determination of ACCESSIBLE PARTS		P
6.2.1	General (enclosed equipment)		N/A
6.2.2	Examination (enclosed equipment)		N/A
6.2.3	Openings above parts that are HAZARDOUS LIVE (enclosed equipment)		N/A

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IEC 61010-2-201			
Clause	Requirement + Test	Result - Remark	Verdict
6.2.4	Openings for pre-set controls		N/A
	EUT is enclosed equipment		N/A
	- test pin with length of 100 mm and 3 mm in diameter applied		N/A
6.2.101	Accessibility of TERMINALS and ports		P
	Operator accessible interfaces, ports, terminals not hazardous live under normal and single-fault conditions		P
6.2.102	Control equipment		P
6.2.102.1	Accessible parts		P
	No hazardous live parts accessible at enclosed equipment or at open equipment installed to manufacturer's instructions (See 6.2.2)		P
	Protection from hazards for service personnel making adjustments at open equipment (See 6.2.2)		N/A
6.2.102.2	SELV/PELV circuits		N/A
	Intended use at dry locations		N/A
6.5.2.6	Transformer PROTECTIVE BONDING screen :		N/A
	No overcurrent protection means for the winding		N/A
	Test current twice the rating of equipment overcurrent protection means		N/A
	Overcurrent protection means		N/A
	- integrated into equipment		N/A
	- specified in manual		N/A
6.5.2.101	Classes of equipment or equipment classes		P
6.5.2.101.2	Class I equipment		N/A
	Flexible cord includes protective earth (PE)		N/A
	Accessible conductive parts connected to PE		N/A
	PE circuit not interrupted by removing parts of enclosure for normal maintenance		N/A
6.5.2.101.3	Class II equipment		N/A
	Double or reinforced insulation used or		N/A
	Protective impedance used		N/A
	Means for maintaining continuity of double insulated for protection		N/A
	Connection to earth terminals for functional purposes doesn't break continuity of double insulation		N/A
	Is one of the following types:		N/A
	a) Insulation encased		N/A
	- by durable and continuous enclosure of insulating material		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- envelops all conductive parts with exception of small parts		N/A
	- small parts insulated by reinforced insulation or equivalent		N/A
	b) Metal-encased		N/A
	- by continuous metal enclosure		N/A
	- double insulation used throughout, except:		N/A
	- parts have reinforced insulation		N/A
	c) combination of a) and b)		N/A
6.5.2.101.4	Class III equipment		P
	All circuits SELV/PELV		N/A
	Voltages do not exceed SELV/PELV limits		N/A
	Earth terminals for functional purposes		P
	Wiring for SELV/PELV circuits and other circuits:		N/A
	- segregated, or		N/A
	- insulation rated for the rated voltage, or		N/A
	- earthed screen, or		N/A
	- additional insulation based on 60364-4-41		N/A
6.5.2.102	Protective earth requirement for enclosed equipment		N/A
	Accessible parts of Class I equipment electrically interconnected and connected to the protective earth terminal		N/A
	Structural parts providing electrical continuity independent of usage on its own or incorporated in an assembly		N/A
	Cord or cable that supplies Class I portable equipment has a PE conductor		N/A
	Accessible isolated conductive parts are so located that exclude contact with live parts and dielectric voltage test passed for reinforced insulation :		N/A
	Class II equipment with internal functional earth connection, without PE terminal or PE conductor in input cord		N/A
	Class I equipment with PE terminal		N/A
	PE terminal readily accessible, and		N/A
	Connection maintained when cover or any removable part removed		N/A
	Mains cord connected equipment with PE terminal integral to plug cap or socket		N/A
	PE terminal is screw, stud or pressure type and made of corrosion resistant material		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Clamping means PE terminals adequately locked against accidental loosening and		N/A
	- only to be loosed by aid of a tool		N/A
	PE terminals and earth contacts not connected direct to neutral terminal within equipment		N/A
	Devices (as capacitors or surge suppression devices) appropriately rated, when used to connect PE terminal and neutral		N/A
	PE terminal and subsequent protective internal equipment complies with requirements in 6.5.2.5		N/A
	PE terminal has no other function		N/A
6.5.2.103	Protective earth requirements for open equipment		N/A
	Open equipment complies with the requirements of clause 6.5.2.4 or 6.5.2.5. Except that the provision for connection to an external protective conductor is replaced by a means for bonding to the enclosure accessible to the operator.		N/A
6.6.2	TERMINALS for external circuits		N/A
	All parts of terminals that maintain contact and carry current are of metal, and have adequate mechanical strength in		N/A
	Bending of each conductor not possible to radius curvature less than six times of its diameter after removal of covering elements		N/A
	Clearances between terminals and between terminals and earthed parts in conformity to 6.7.101		N/A
6.6.3	Circuits with terminals which are HAZARDOUS LIVE		N/A
	No accessible conductive parts of terminals and ports of enclosed equipment are hazardous life		N/A
	Ports of open equipment protected as defined in table 103		N/A
6.7	Insulation requirements :		N/A
6.7.1	The nature of insulation		N/A
6.7.1.1	Insulation between ACCESSIBLE parts or between separate circuits consist of CLEARANCES, CREEPAGE DISTANCES and solid insulation if provided as protection against a HAZARD		N/A
	Insulation specified in Figure 102 :		N/A
	Between ACCESSIBLE SELV circuits, ACCESSIBLE PELV circuits, or ungrounded conductive ACCESSIBLE parts and HAZARDOUS LIVE parts, two levels of protection		N/A
6.7.1.2	CLEARANCES		N/A
	Linear interpolation used between nearest two points in Table 3.		N/A

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IEC 61010-2-201			
Clause	Requirement + Test	Result - Remark	Verdict
6.7.1.5	Requirements for insulation according to type of circuit..... :		N/A
	a) requirements as specified in Figure 102, or		N/A
	b) requirements as specified in Part 1 Annex K.3 for circuits that have one or more of the following characteristics..... :		N/A
	1) maximum TRANSIENT OVERVOLTAGE is limited to known level below the level of MAINS CIRCUIT		N/A
	2) maximum TRANSIENT OVERVOLTAGE is 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		N/A
	5) WORKING VOLTAGE with a frequency above 30kHz		N/A
	c) requirements as specified in Annex K.1 for Mains circuits of Overvoltage Category III or IV or II over 300 V.		N/A
	d) requirements as specified in Annex K.2 for secondary circuits separated from the circuits in c) only by means of a transformer		N/A
6.7.1.101	Non-metallic material supporting hazardous live parts		N/A
	CTI ≥ 175 for non-metallic material supporting hazardous live parts		N/A
6.7.2	Insulation for MAINS CIRCUITS of OVERVOLTAGE CATEGORY II with a nominal supply voltage up to 300V		N/A
	For mains circuits above 300 V Annex K applies. For Tables K.2, K.3, and K.4, linear interpolation of creepage used		N/A
6.7.2.1	CLEARANCES and CREEPAGE DISTANCES..... :		N/A
	Values for MAINS CIRCUITS of replacement Table 4 are met		N/A
6.7.2.2	Solid insulation		N/A
6.7.2.2.1	For mains > 300V values of Annex K applied		N/A
	Withstands electrical and mechanical stresses in normal use and all RATED environmental conditions of clause 1.4		N/A
	Voltage tests of 6.8.3 with values of Table 5..... :		N/A
	A.C. circuits with the A.C. test of 6.8.3.1		N/A
	D.C. circuits with the D.C. test of 6.8.3.2		N/A
	The 1 min & the 5 s test or a single test representing the worst case combination of both tests :		N/A
6.7.3.1	For MAINS CIRCUITS above 300 V, Annex K used		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
6.7.3.2	CLEARANCES		N/A
	a) meet the values of replacement Table 6 for BASIC INSULATION and SUPPLEMENTARY INSULATION; or		N/A
	twice the values of replacement Table 6 for REINFORCED INSULATION, or		N/A
	b) pass the voltage tests of 6.8 with values of replacement Table 6 ; with following adjustments :		N/A
	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
6.7.3.3	CREEPAGE DISTANCES		N/A
	Based on WORKING VOLTAGE meets the values of Table 7 WITH THE REPLACEMENT OF THE FIRST COLUMN HEADING 'SECONDARY WORKING VOLTAGE A.C.R.M.S V ^c		N/A
6.7.101	Insulation for field wiring terminals of overvoltage category II with a nominal voltage up to 1000 V		N/A
	Minimum clearances at field wiring terminals comply with Table 104		N/A
	Minimum creepage distances at field wiring terminals comply with Table 104		N/A
7	PROTECTION AGAINST MECHANICAL HAZARDS		P
7.1.101	Open and panel mounted equipment	Open type	N/A
	Open equipment installed within an enclosure		N/A
	For panel mounted equipment, the portion that form as part of the ENCLOSURE complies with clause 7		N/A
7.3	Moving parts		N/A
7.3.3	RISK assessment for mechanical HAZARDS to body parts		N/A
	For control equipment having only cooling fans as moving parts only accessibility checked		N/A
8	RESISTANCE TO MECHANICAL STRESSES		P
8.1	Normal Energy protection level is 6.8 ±5 % J	Open Type	N/A
8.1.101	Open equipment		N/A
	Additional enclosure providing safety required by the manual		N/A
8.1.102	Panel mounted equipment		N/A
	When portion inside the required additional enclosure is an open equipment, the portion outside the additional enclosure is in conformity with cl. 8		N/A

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IEC 61010-2-201			
Clause	Requirement + Test	Result - Remark	Verdict
8.2	ENCLOSURE rigidity test		N/A
8.2.2	Impact test		N/A
	Impact applied to any part of ENCLOSURE causing a HAZARD if damaged, dimension X and mass are determined by equation $J = X \times m \times g$		N/A
9	PROTECTION AGAINST THE SPREAD OF FIRE		P
9.3.2	Constructional requirements	Powered by a power supply which provides double/reinforce insulation	P
	Open equipment conforms with a) and b)		P
	Non-metallic enclosure of open equipment and portion of PANEL MOUNTED EQUIPMENT, forming part of enclosed equipment		N/A
	- has flammability rating of V-1 or better, or		N/A
	- the glow-wire test is passed		N/A
	Magnesium alloy used for the enclosure verified as specified in Annex DD		N/A
10	EQUIPMENT TEMPERATURE LIMITS AND RESISTANCE TO HEAT		P
10.1	Surface temperature limits for protection against burns		P
	Easily touched surfaces within the limits in NORMAL and in SINGLE FAULT CONDITION (Table 19, Part 201) . :		P
	- at an specified ambient temperature of 40 °C		N/A
	- for equipment exceeding the limits in Table 19, see 5.4.4 item j.		N/A
10.3	Other temperature measurements		P
	Following measurements conducted if applicable ... :		P
	a) Does not apply to control equipment FIELD WIRING which do not contain power consumable parts		N/A
	f) Temperature of field wiring terminals measured, and - temperature requirements checked		P
10.4	Conduct of temperature tests		P
10.4.1.100	General method		P
	Tests conducted under reference test conditions .. :	Ambient temperature: -20 to 70° C Humidity: 10%-95%, no condensation	P
10.4.1.101	Special method, PANEL MOUNTED EQUIPMENT		N/A
	Test ambient temperatures of the outer portion of the equipment and inner portion of the equipment		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	General method from 10.4.1.100 followed with regard to test conditions and least favourable EUT configuration		N/A
	Three special methods for testing PANEL MOUNTED EQUIPMENT a), b), or c)		N/A
10.4.1.102	Special method, large or heavy equipment		N/A
	Tested at room AMBIENT TEMPERATURE, with the recorded temperature corrected by the difference between the EUT's max. RATED AMBIENT TEMPERATURE and actual room AMBIENT TEMPERATURE		N/A
10.4.1.103	Other considerations, applying to all cases		N/A
	a) temperature of windings measured by resistance method or use of temperature sensors		N/A
	b) Fault tests done at room AMBIENT TEMPERATURE and corrected to RATED AMBIENT TEMPERATURE		N/A
10.5	Resistance to heat		N/A
10.5.2	Non-metallic enclosures		N/A
	This sub clause is applicable for enclosed equipment		N/A
11	PROTECTION AGAINST HAZARDS FROM FLUIDS		P
11.6	Specially protected equipment	IP20 apply for the model LK226CT1 and LK921C	N/A
	Inspection of the equipment		N/A
	Equipment testing to IEC 60529 or other method..... :		N/A
	Voltage test to 6.8 without humidity preconditioning . :		N/A
14	COMPONENTS AND SUBASSEMBLIES		N/A
14.101	Components bridging insulation		N/A
14.101.1	Capacitors		N/A
	Capacitor(s) connected between 2 line conductors in mains circuit or between line conductor and neutral complies with subclass X1 or X2 of IEC 60384-14,		N/A
	- used in accordance with its rating		N/A
	Capacitor(s) bridging any double or reinforced insulation comply with Y1 or Y2 of IEC 60384-14 in accordance with its ratings (requires 2 x Y2 in series)		N/A
	Capacitor(s) between the MAINS CIRCUIT and protective earth complies with subclass Y1, Y2, or Y4 of IEC 60384-14		N/A
14.101.2	Surge suppressors		N/A
	Surge suppressor in mains circuit is a VDR, and		N/A
	- complies with IEC 61051-2		N/A

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IEC 61010-2-201			
Clause	Requirement + Test	Result - Remark	Verdict
14.102	Switching devices		N/A
	Switching devices controlling outputs operate within their ratings or		N/A
	- according to IEC 60947-5-1, or		N/A
	- overload and endurance tests to 4.4.2.15 passed		N/A

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IEC 61010-2-201		
Clause	Requirement – Test	Verdict

4.4.2.101.1	TABLE: Switching devices tests - Overload test		
Parameter	Test value	Note	—
Intended use			—
Current			—
Voltage			—
Power factor			—
Number of cycles	50	each cycle: 1 sec on / 9 sec off	—
Endurance test follows	YES / NO		—
Electrical function	--	--	
Mechanical function	--	--	
No dielectric breakdown	--	--	
Supplementary information:			

4.4.2.101.2	Endurance test		
Parameter	Test value	Note	—
Intended use			—
Current			—
Voltage			—
Power factor			—
Number of cycles	6000	each cycle: 1 sec on / 9 sec off	—
		except first 1000 cycles of pilot duty test: 1 cycle per second, except first 10 to 12 cycles as fast as possible	
Electrical function	--	--	
Mechanical function	--	--	
No dielectric breakdown	--	--	
Supplementary information:			

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IEC 61010-2-201		
Clause	Requirement — Test	Verdict

6.5.2.6	TABLE: Transformer PROTECTIVE BONDING screen				
ACCESSIBLE part under test	Test current (see NOTE) (A)	Voltage attained after 1 min (max. 10 V), (V)	Calculated resistance (maximum 0,1 Ω) (Ω)	Verdict	
NOTE – Test current must be twice the value of the over current protection means of the winding. Test is specified in 6.5.2.6 a) or b).					
Supplementary information:					

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IEC 61010-2-201							
Clause	Requirement — Test					Verdict	
6.7	TABLE: Insulation requirements- Block diagram of system						
Pollution degree				Overvoltage category			
Area	Location	Insulation type	WORKING VOLTAGE			Test voltage	Comments (NOTE 3)
		(NOTE 1)	RMS (V)	Peak (V)	Frequency (kHz)	(NOTE 2) (V)	
A							
B							
C							
D							
E							
F							
NOTE 1 – Type of insulation: BI = BASIC INSULATION DI = DOUBLE INSULATION PI = PROTECTIVE IMPEDANCE RI = Reinforced INSULATION SI = Supplementary INSULATION see also Table 6.7B for further details		NOTE 2 - Types of voltage Peak impulse test voltage (pulse) r.m.s. d.c. peak			NOTE 3 - OVERVOLTAGE CATEGORIES or POLLUTION DEGREES which differ should be shown under "Comments"		
Supplementary Information:							

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IEC 61010-2-201			
Clause	Requirement — Test		Verdict
8.2.2	Table: Impact test		
	Material of enclosure	Metal / non-metallic	—
	Corresponding IK-code		—
	Preparation for the test		—
	Cooled to (temperature)	° C	—
	Location	Comments	
	1) Top		
	2) Side left / right		
	3) Bottom		
8.3	Drop test		
	Material of enclosure	Metal / non-metallic	—
	Preparation for the test		—
	Cooled to (temperature)	° C	—
	Mass of equipment	kg	—
Free Fall	Lands in position	Comments	
1 st trial			
2 nd trial			
Dropping onto a face	Raised up to		Comments
Location	mm	30 °	
1)			
2)			
Dropping onto an edge or corner	Raised up to		Comments
Location	mm	30 °	
1)			
2)			
Supplementary information:			

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IEC 61010-2-201			
Clause	Requirement — Test		Verdict
9	TABLE: Protection against the spread of fire		P
Item	Source of HAZARD or area of the equipment considered (circuit, component, liquid etc.)	Protection Method (9a, 9b or 9c)	Protection details
1	Power circuit Processing circuit Other circuit	9.1 a), b), c)	Connector and internal wire were complied with clause 9.3.2 constructional requirements
Supplementary information:			

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IEC 61010-2-201				
Clause	Requirement — Test			Verdict
11	TABLE : Protection against HAZARDS from fluids			P
8	Mechanical resistance to shock and impact			
Voltage tests can be carried out once after performing the tests of clause 8 and clause 11. However, if voltage tests are carried out separately after each set of tests, two forms can be used.				
Location (see Table 6.7.A)	Clause 11 tests			Comments
	IEC 60529 (11.6)	Working voltage, (V)	Test voltage (V)	
	IP20			
NOTE 1 - t_m = measured temperature $t_c = t_m$ corrected ($t_m - t_a + 40\text{ °C}$ or max. RATED ambient) t_{max} = maximum permitted temperature NOTE 2 - see also 14.1 with reference to component operating conditions NOTE 3 - Record values for NORMAL CONDITION and / or SINGLE FAULT CONDITION in this Table NOTE 4 - see Table 10.2 for details of winding temperature measurements				
Supplementary information:				

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[illegible]

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IEC 61010-2-201			
Clause	Requirement – Test	Result — Remark	Verdict
TABLE: Additional or special tests conducted			
Clause and name of test	Test type and condition	Observed results	—
Supplementary information:			

Particular Standard - (001) iec61010 2 201d 2019-04-11**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

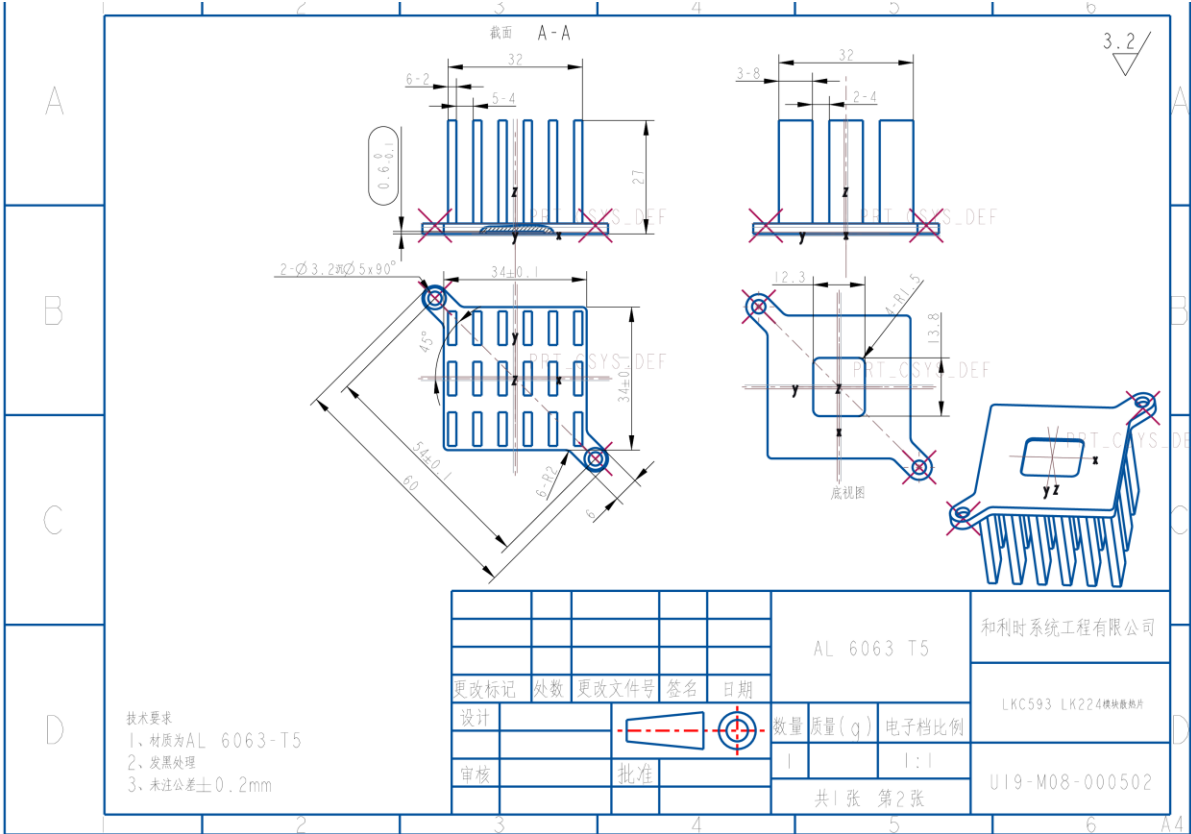
Other Enclosures

All Enclosures associated with this report are shown below.

Enclosures

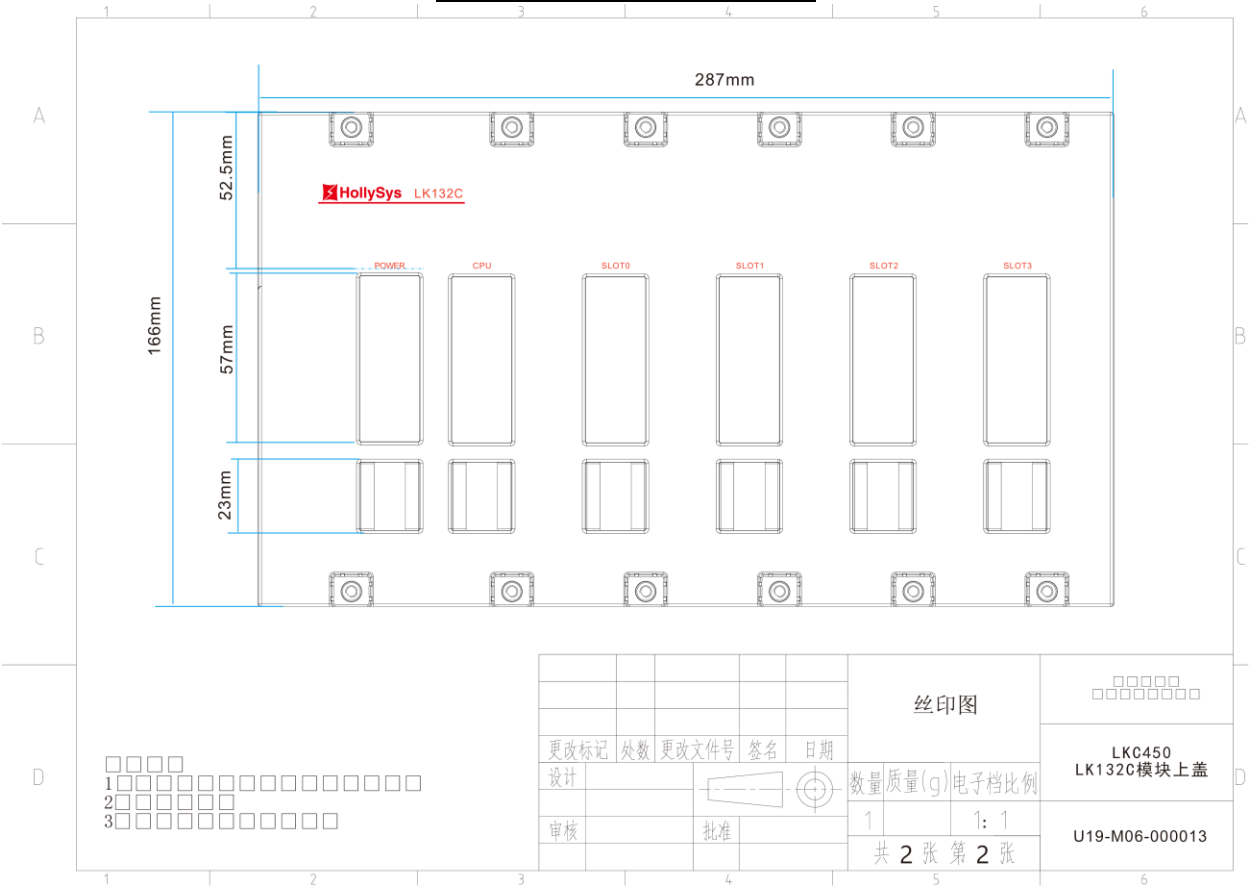
<u>Supplement - (ID)</u>	<u>Description</u>
Diagrams - (001)	heatsink
Diagrams - (002)	LK132C top cover
Diagrams - (003)	LK226CT1 bottom cover
Diagrams - (004)	LK226CT1 top cover
Diagrams - (005)	LK921C bottom cover
Diagrams - (006)	LK921C top cover
Marking Label - (003)	label
Photographs - (001)	LK132C view
Photographs - (002)	LK226CT1 external view1
Photographs - (003)	LK226CT1 external view2
Photographs - (004)	LK226CT1 PWB-1
Photographs - (005)	LK226CT1 PWB-2
Photographs - (006)	LK921C external view1
Photographs - (007)	LK921C internal view
Photographs - (008)	LK921C wiring view
Schematics + PWB - (001)	LK132C Layout
Schematics + PWB - (002)	LK226CT1 Layout
Schematics + PWB - (003)	LK921C Layout

Diagrams - (001) heatsink



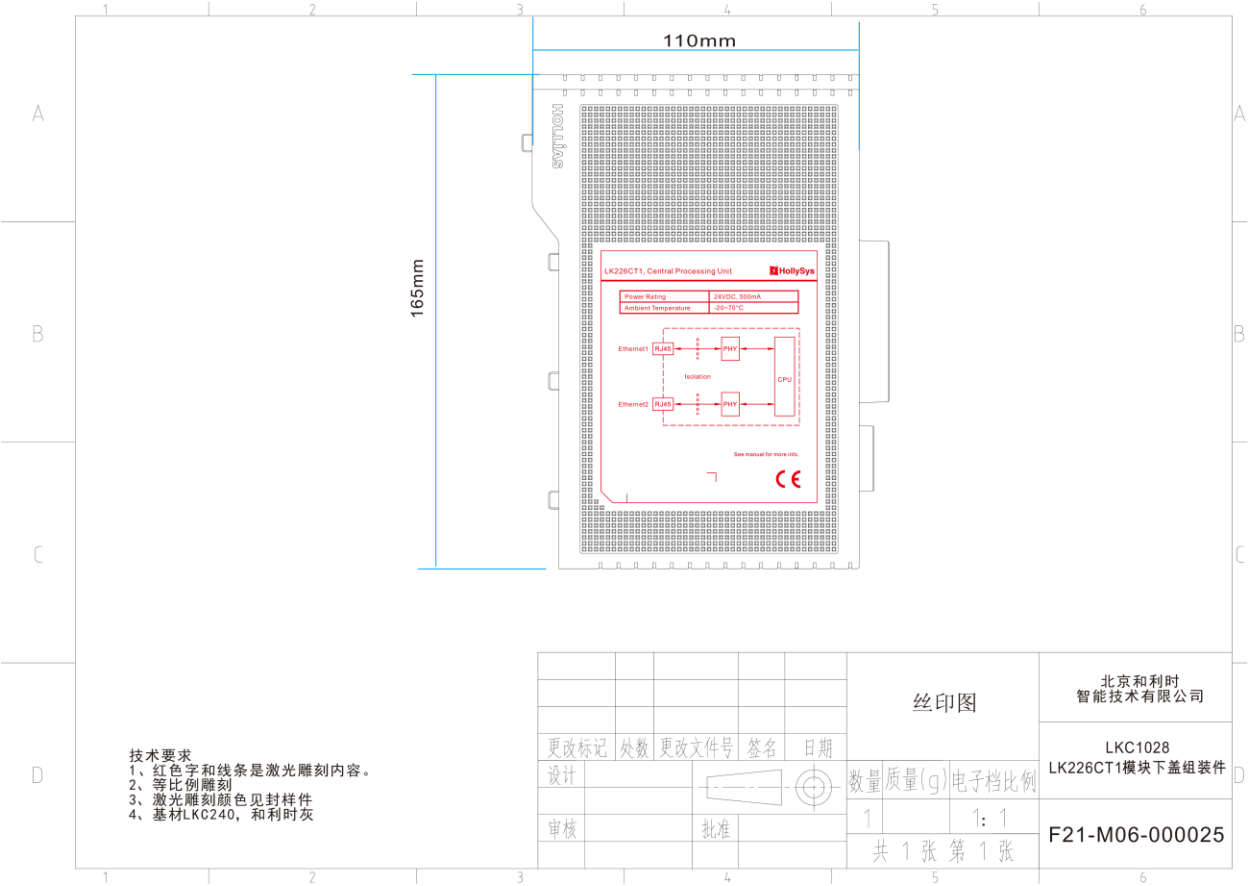
Diagrams - (002) LK132C top cover

Diagrams - (002) LK132C top cover



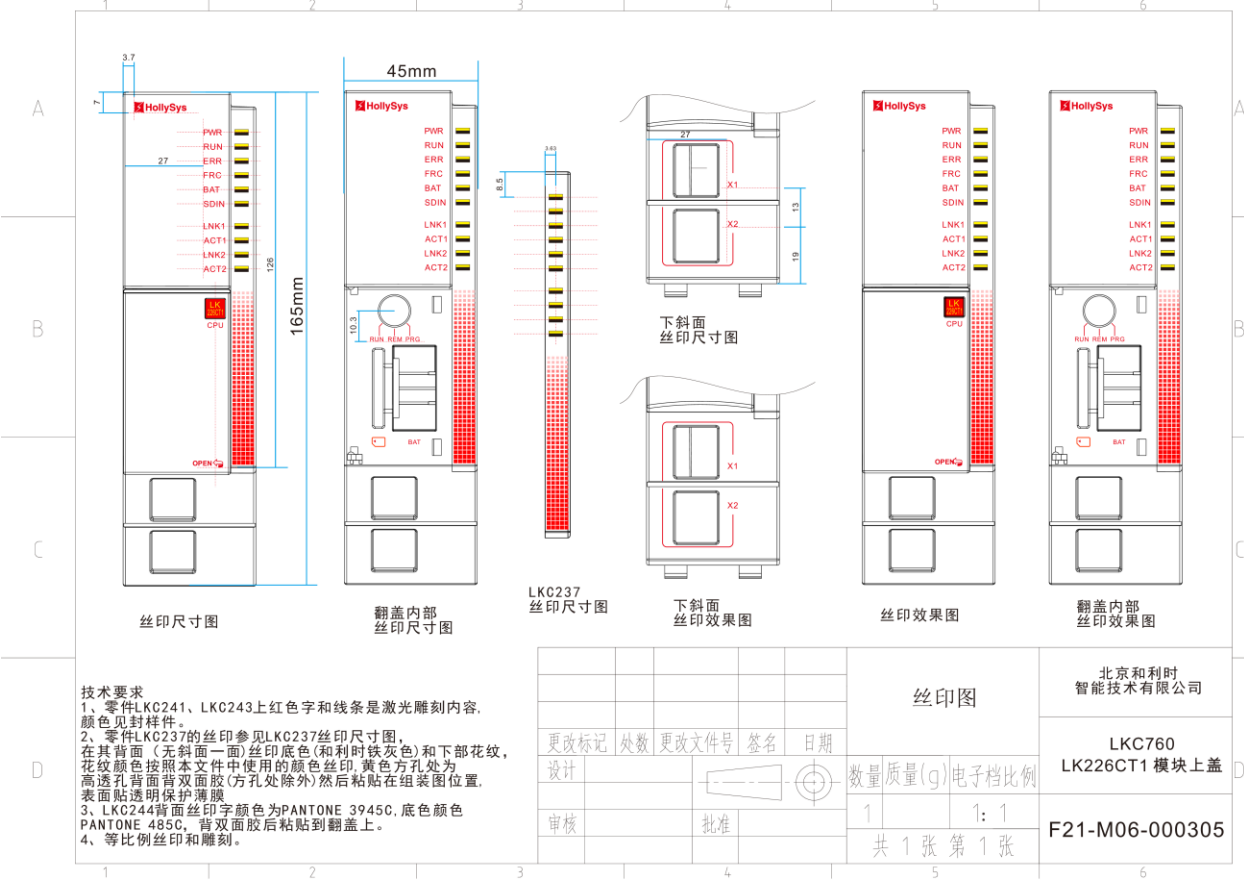
Diagrams - (003) LK226CT1 bottom cover

Diagrams - (003) LK226CT1 bottom cover



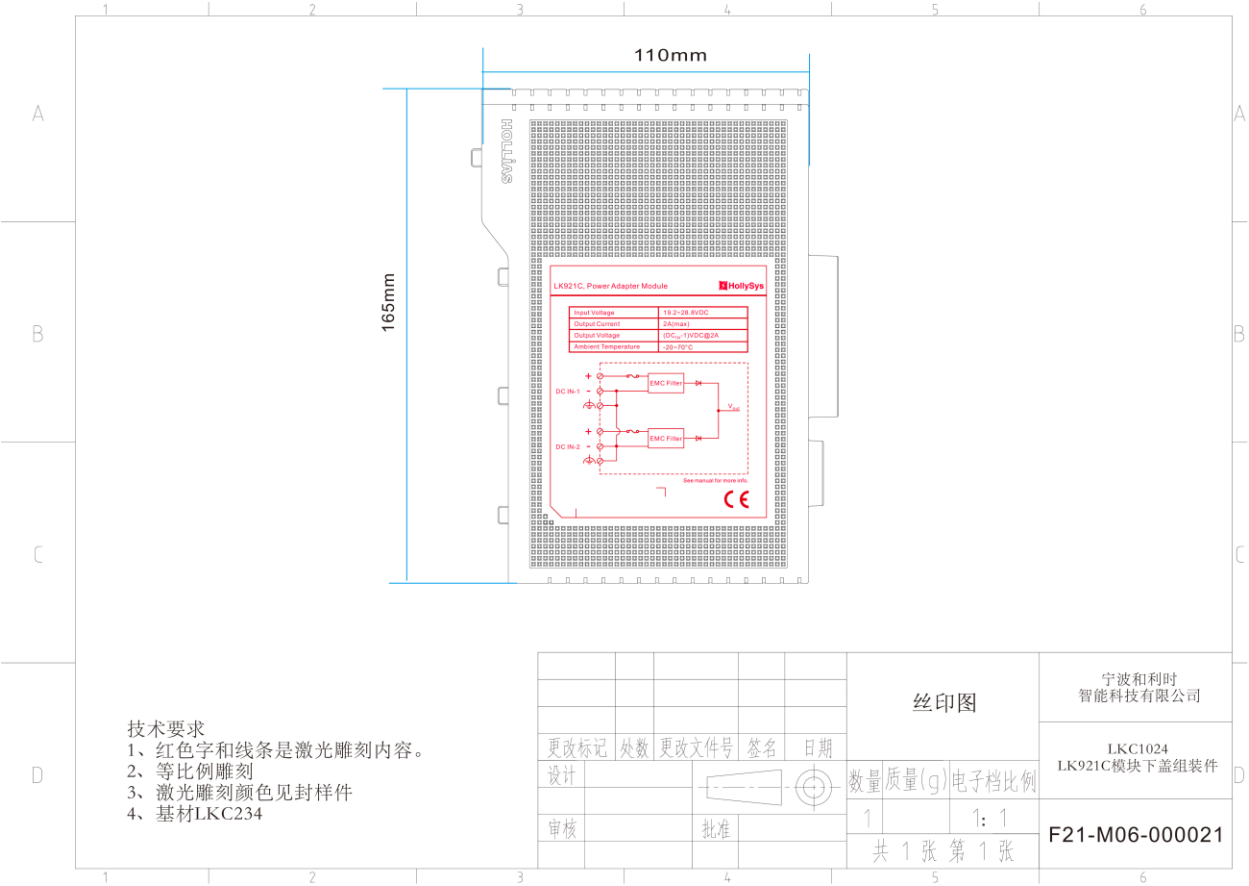
Diagrams - (004) LK226CT1 top cover

Diagrams - (004) LK226CT1 top cover



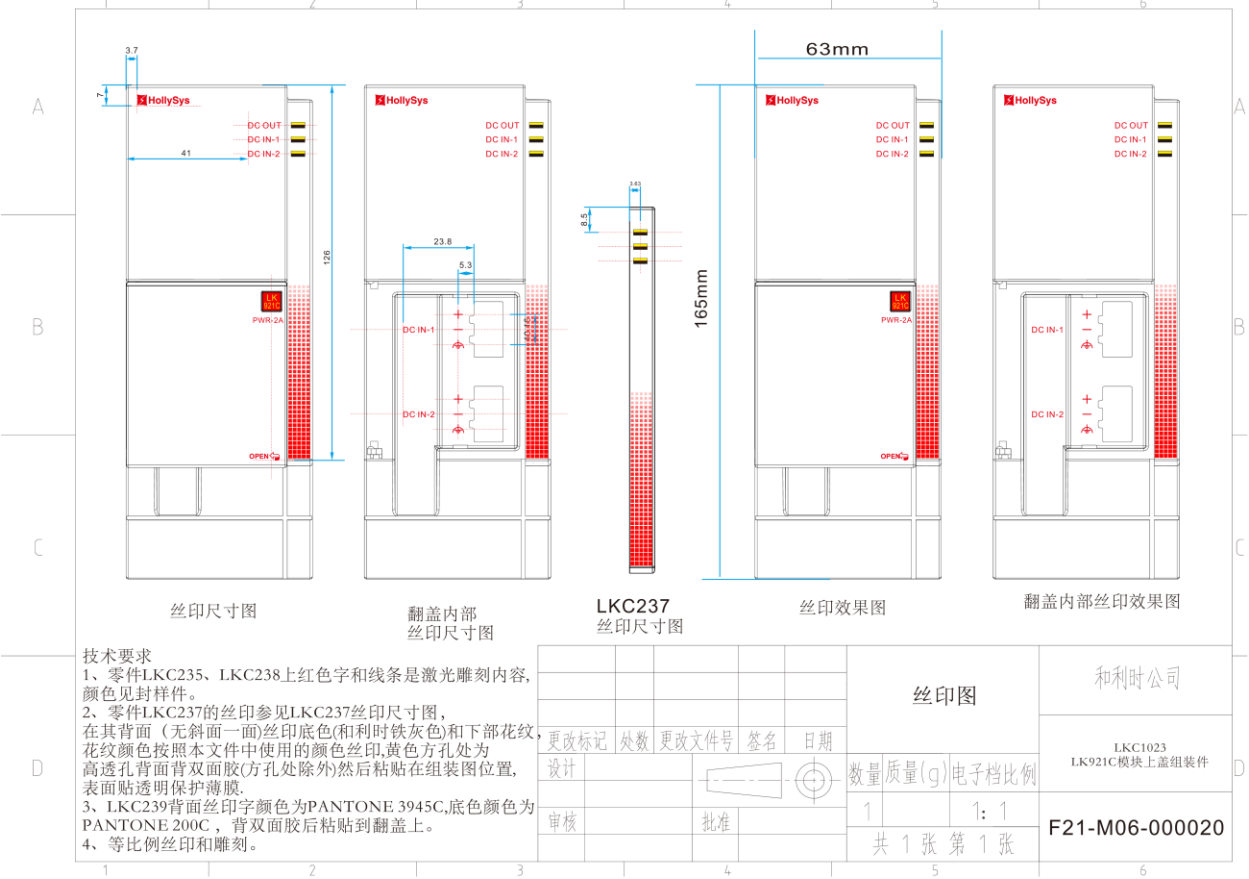
Diagrams - (005) LK921C bottom cover

Diagrams - (005) LK921C bottom cover



Diagrams - (006) LK921C top cover

Diagrams - (006) LK921C top cover



Marking Label - (003) label

Marking Label - (003) label

ProductName: Six-slot local backplane module

Model:

Feature:

MAC:

Input Voltage:



Caution/Attention

see the manual

Voir le cahier des charges



012345645678910123456789

Manufacturer:

Hollysys

origin :Beijing China

Photographs - (001) LK132C view

Photographs - (001) LK132C view



Photographs - (002) LK226CT1 external view1

Photographs - (002) LK226CT1 external view1

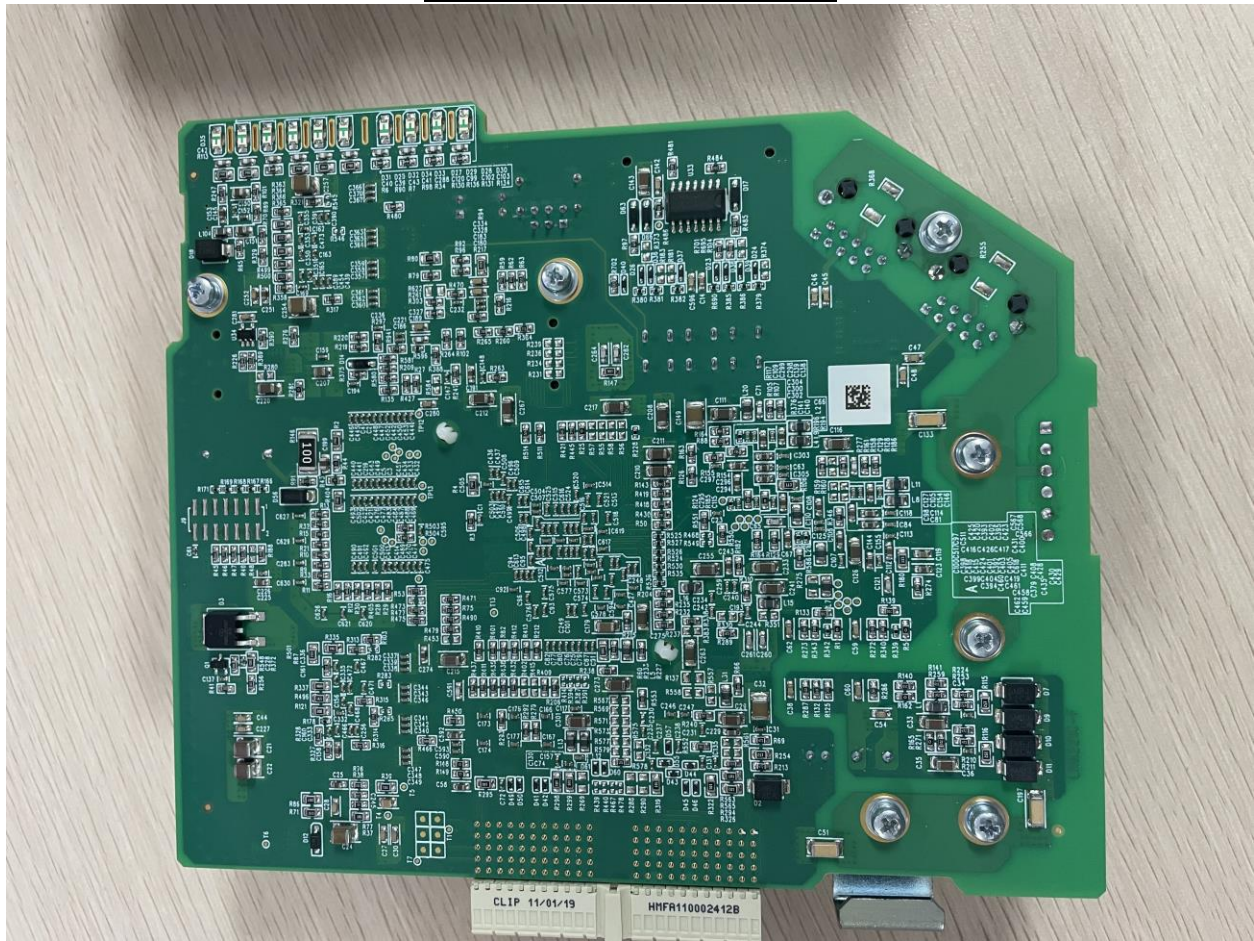


Photographs - (003) LK226CT1 external view2

Photographs - (003) LK226CT1 external view2



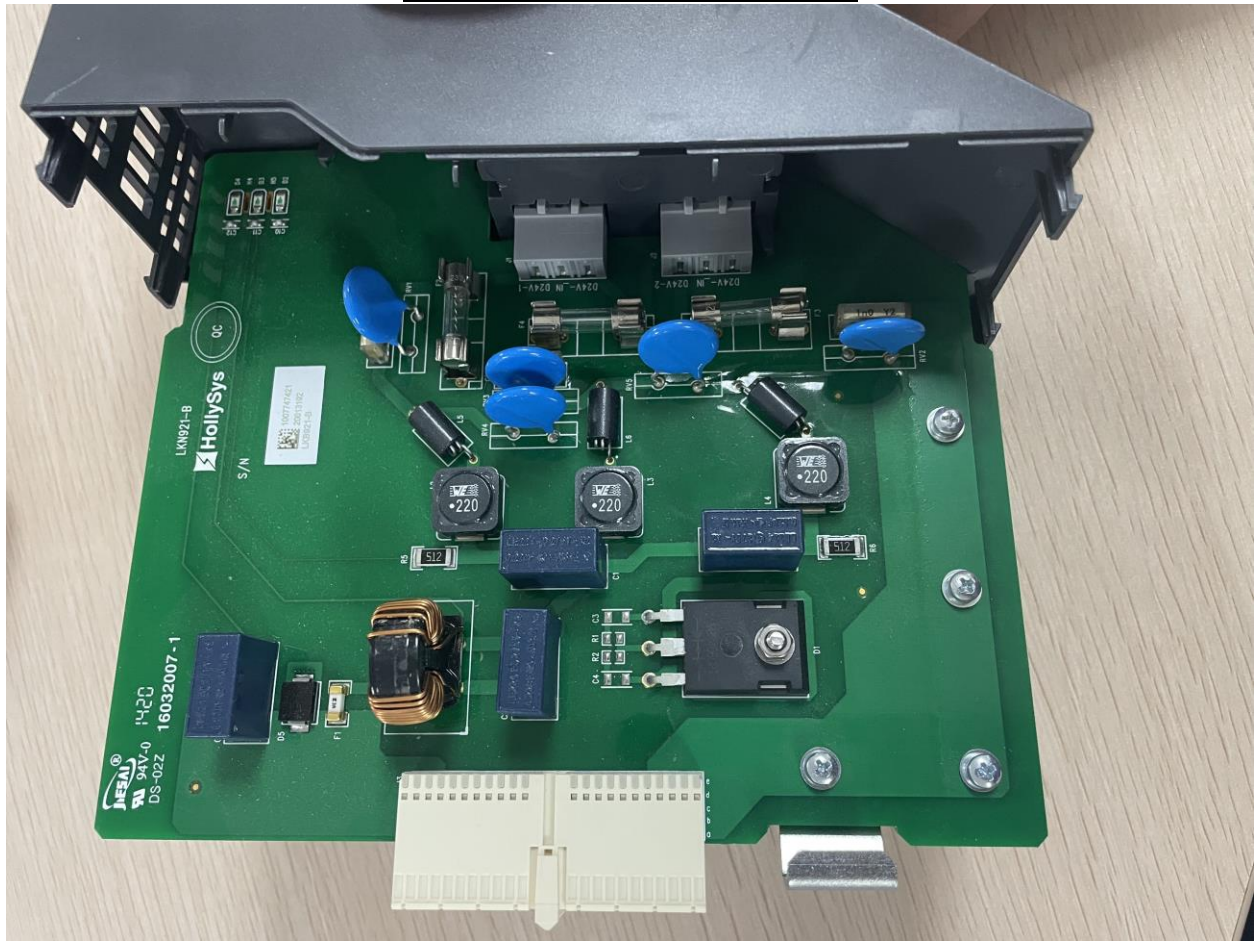
Photographs - (004) LK226CT1 PWB-1Photographs - (004) LK226CT1 PWB-1

Photographs - (005) LK226CT1 PWB-2Photographs - (005) LK226CT1 PWB-2

Photographs - (006) LK921C external view1

Photographs - (006) LK921C external view1



Photographs - (007) LK921C internal viewPhotographs - (007) LK921C internal view

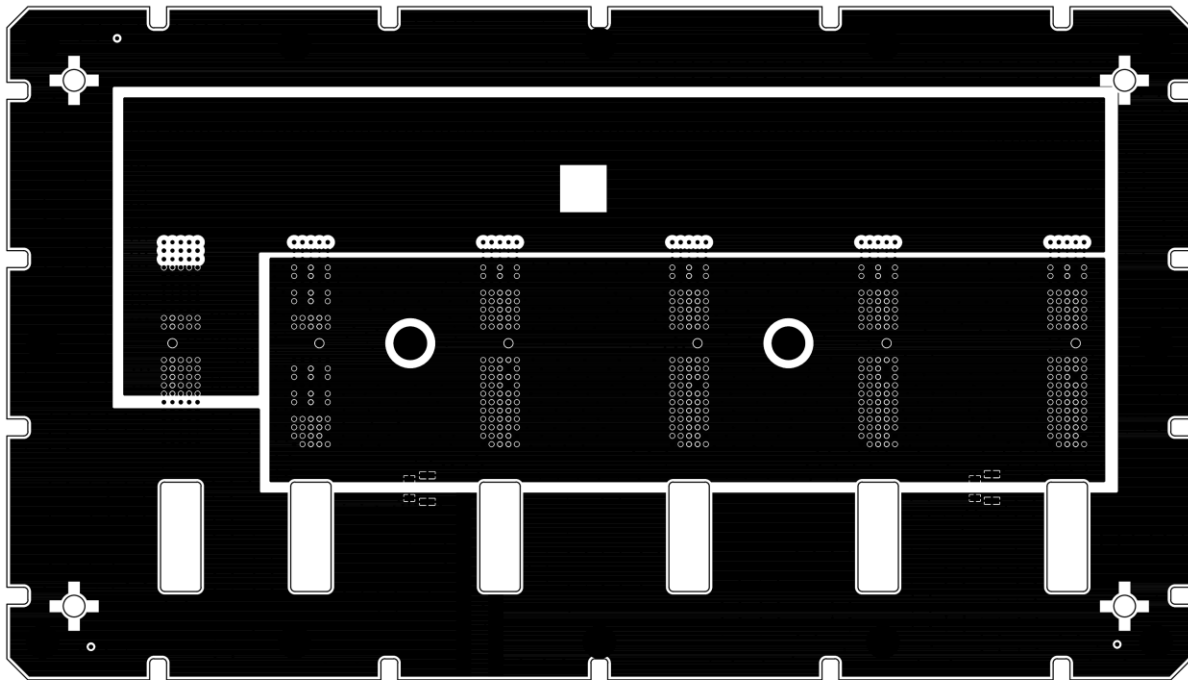
Photographs - (008) LK921C wiring view

Photographs - (008) LK921C wiring view



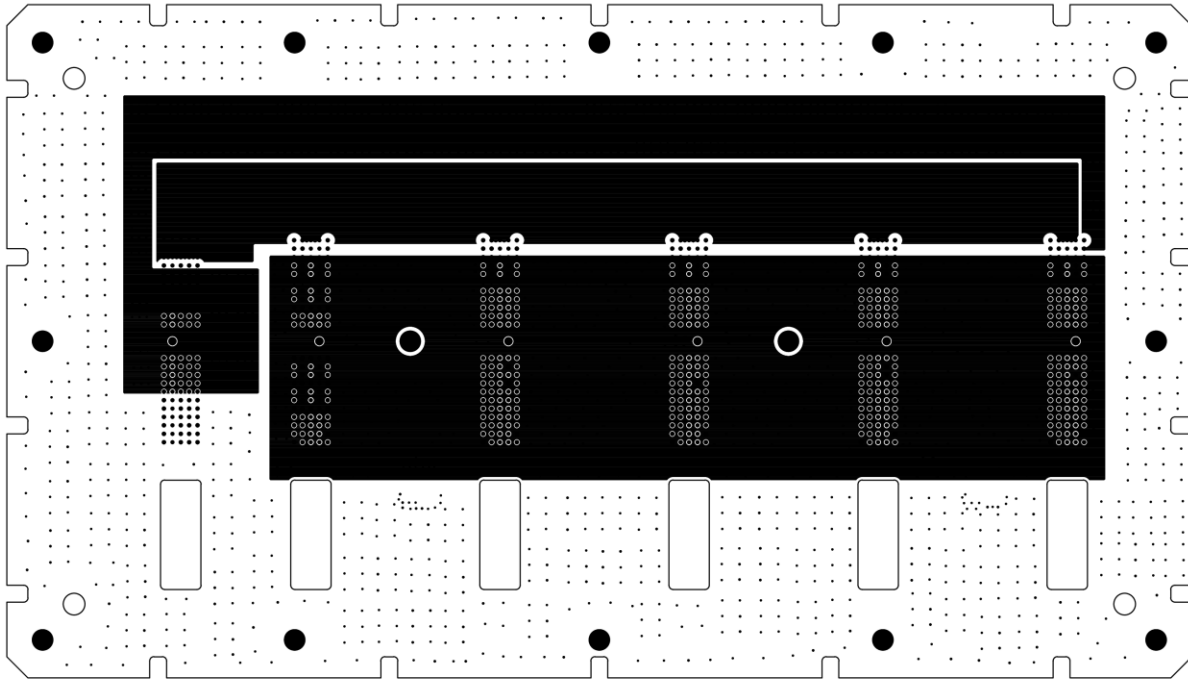
Schematics + PWB - (001) LK132C LayoutSchematics + PWB - (001) LK132C Layout

CAM350 V 9.5 : Fri Sep 27 10:26:30 2019 - LKN132-A.cam : art001.pho



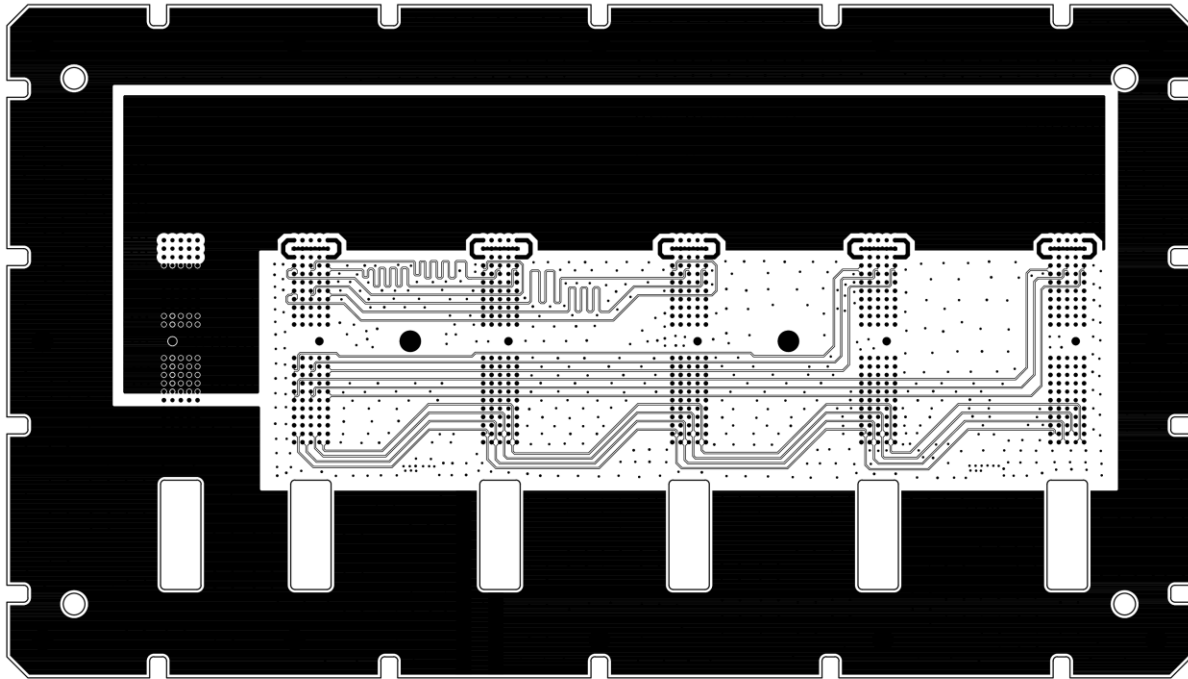
Schematics + PWB - (001) LK132C Layout

CAM350 V 9.5 : Fri Sep 27 10:26:30 2019 - LKN132-A.cam : art002.pho



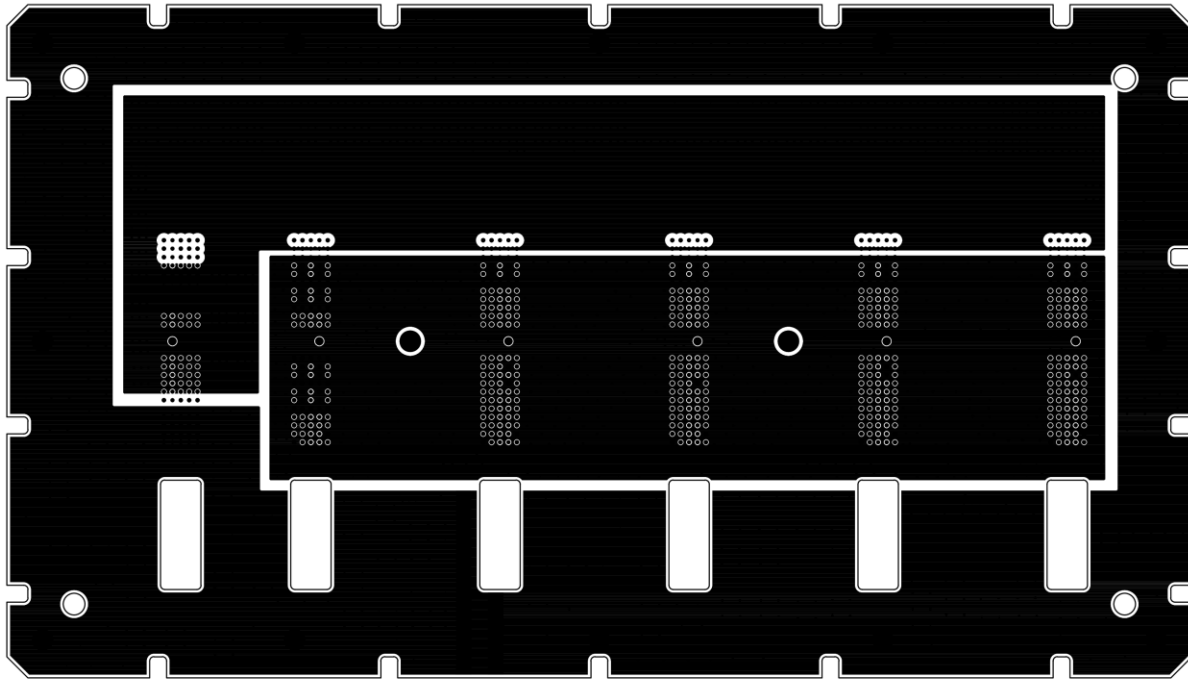
Schematics + PWB - (001) LK132C Layout

CAM350 V 9.5 : Fri Sep 27 10:26:30 2019 - LKN132-A.cam : art003.pho



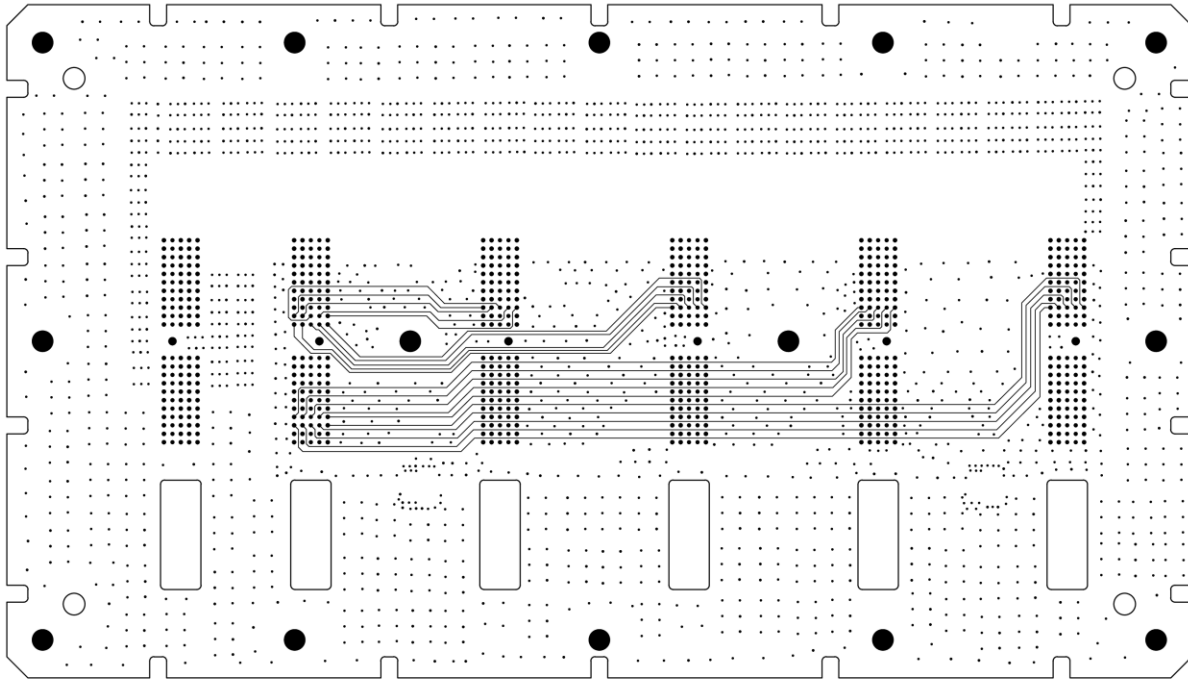
Schematics + PWB - (001) LK132C Layout

CAM350 V 9.5 : Fri Sep 27 10:26:30 2019 - LKN132-A.cam : art004.pho



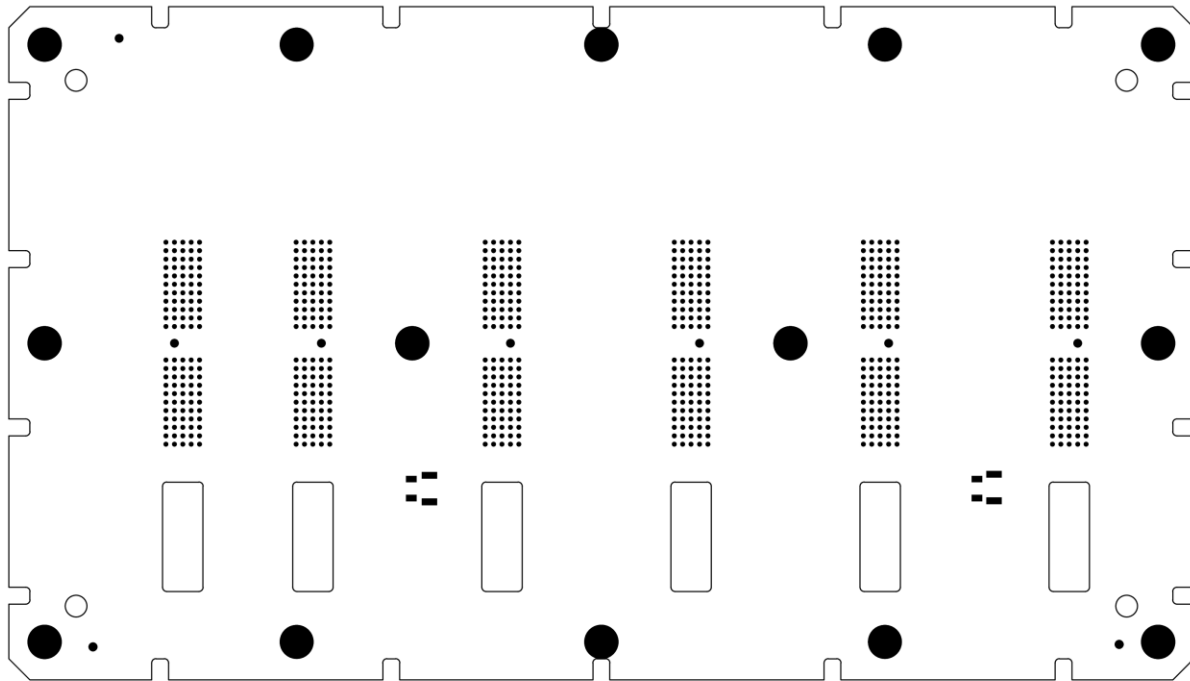
Schematics + PWB - (001) LK132C Layout

CAM350 V 9.5 : Fri Sep 27 10:26:30 2019 - LKN132-A.cam : art005.pho



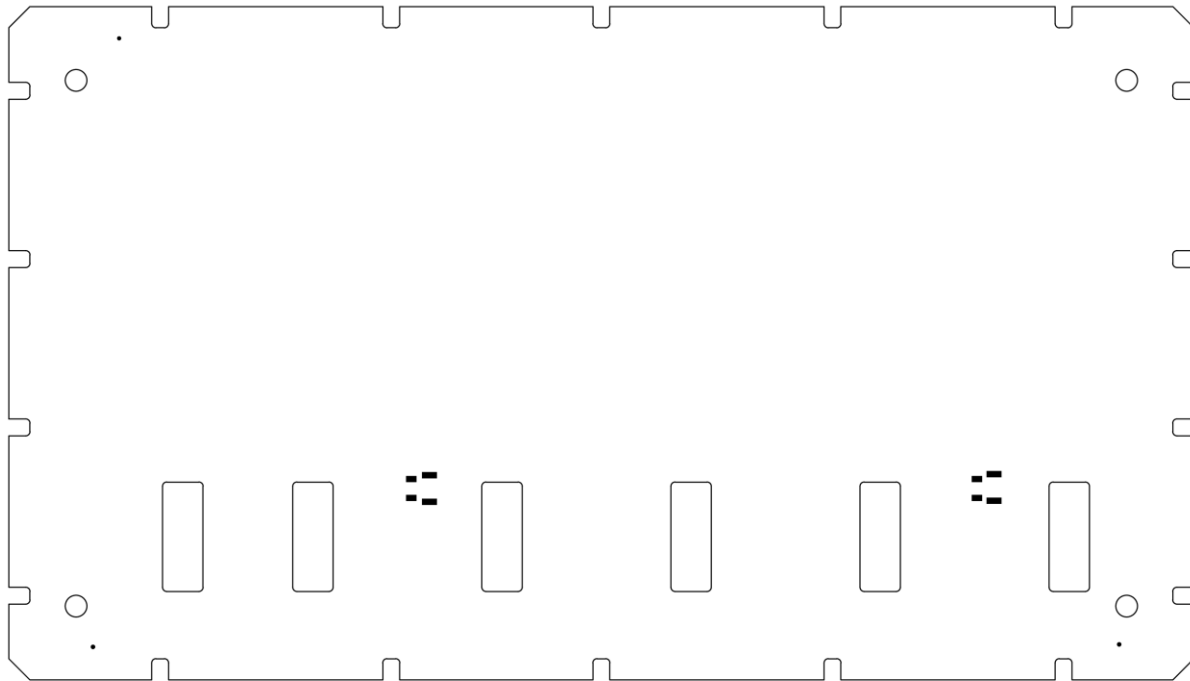
Schematics + PWB - (001) LK132C Layout

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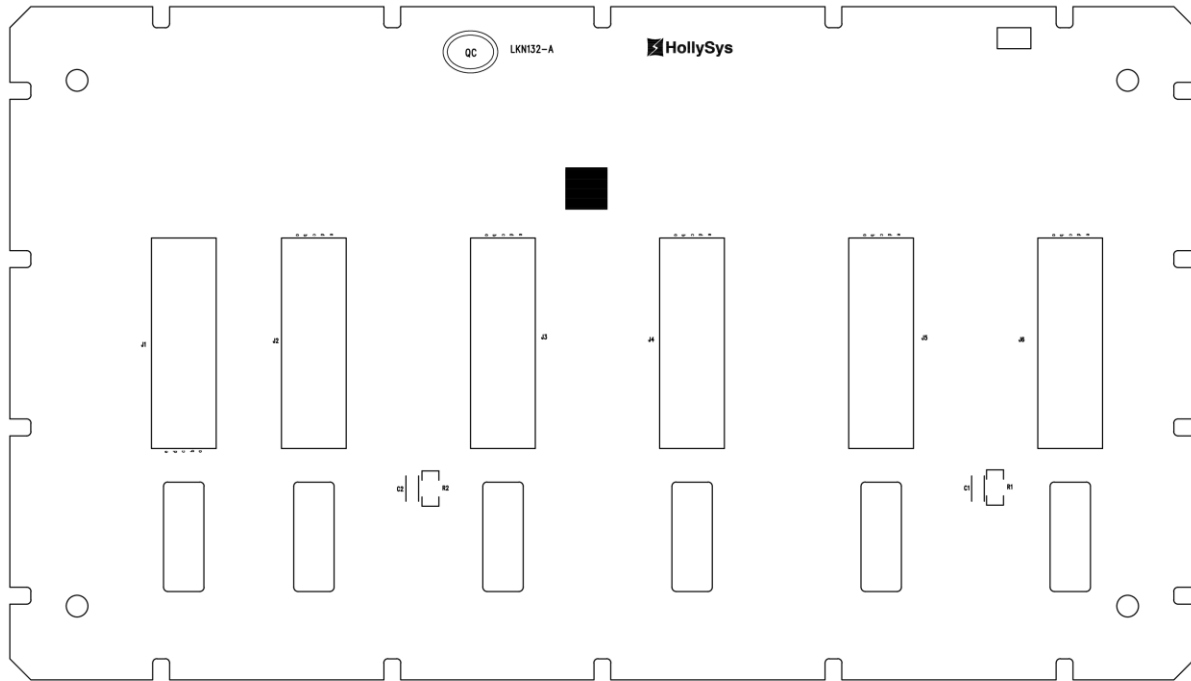
Schematics + PWB - (001) LK132C Layout

CAM350 V 9.5 : Fri Sep 27 10:26:30 2019 - LKN132-A.cam : smd001023.pho



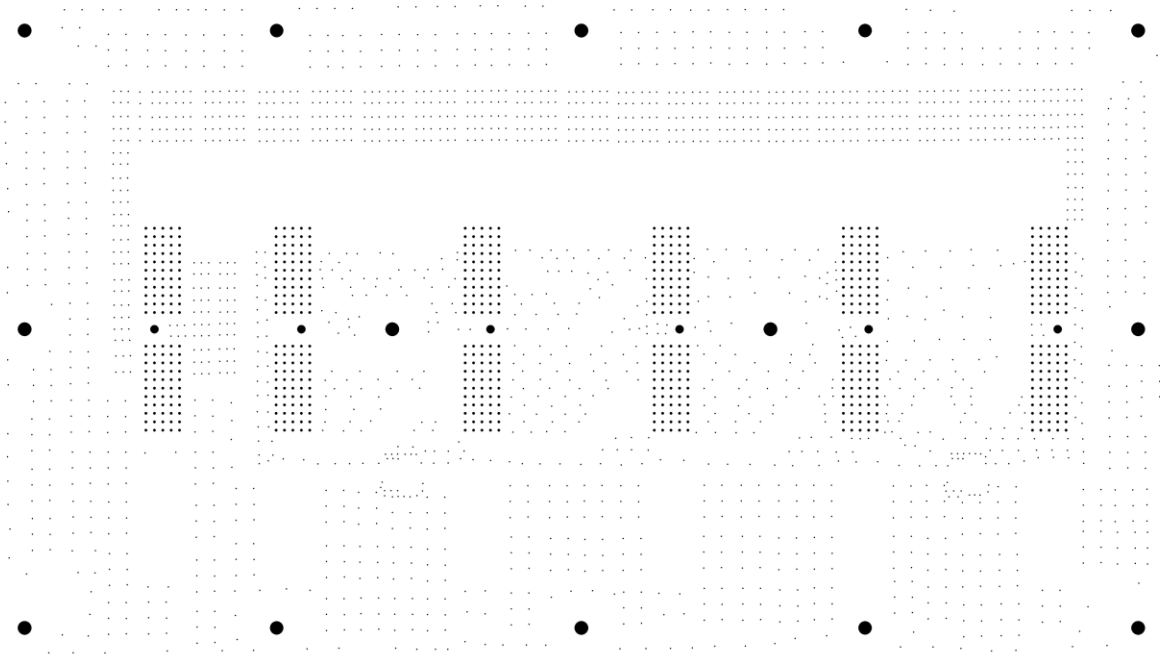
Schematics + PWB - (001) LK132C Layout

CAM350 V 9.5 : Fri Sep 27 10:26:30 2019 - LKN132-A.cam : sst001026.pho



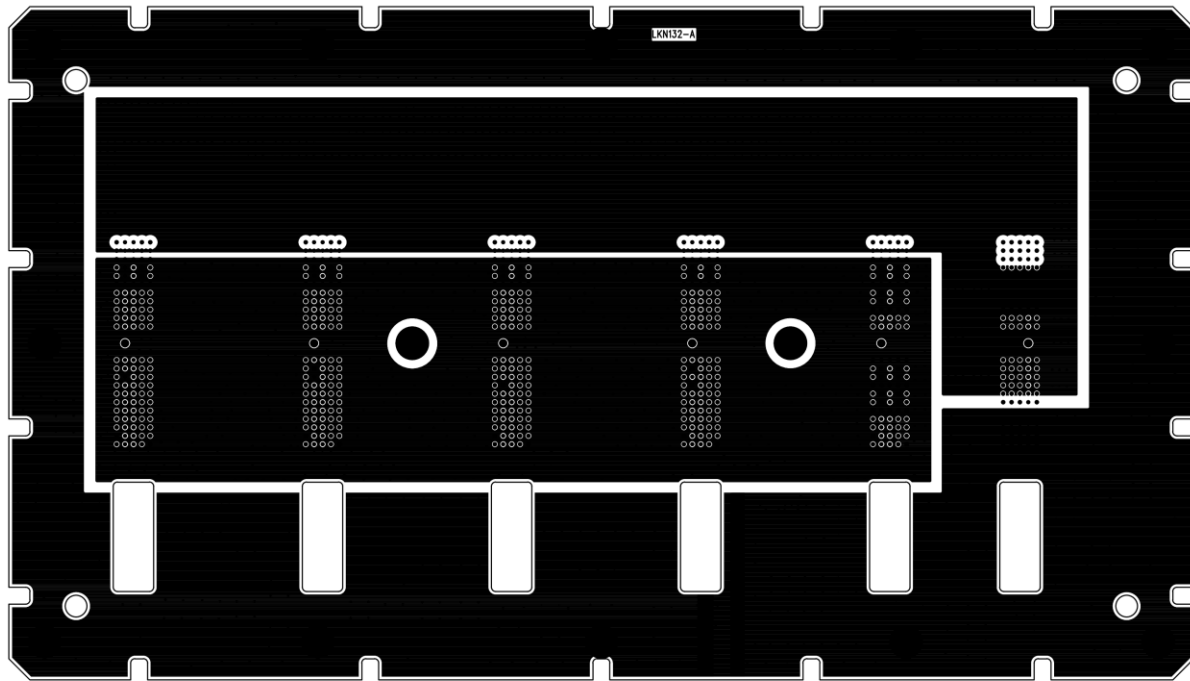
Schematics + PWB - (001) LK132C Layout

CAM350 V 9.5 : Fri Sep 27 10:26:30 2019 - LKN132-A.cam : dr1001.dr1



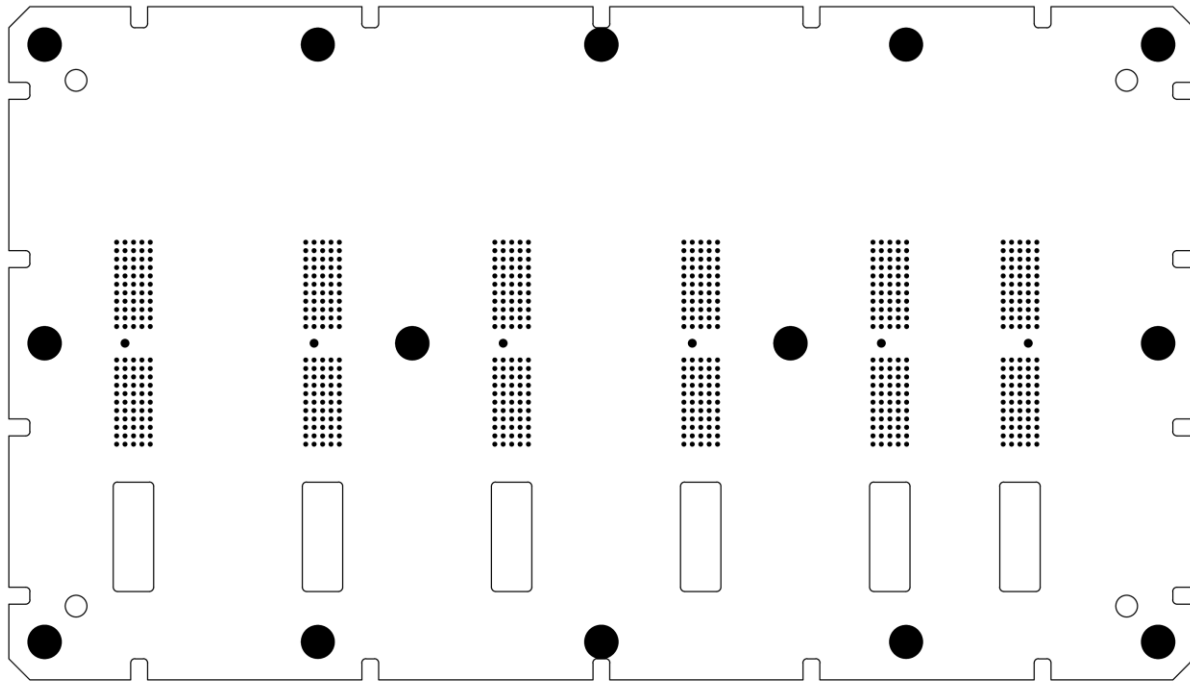
Schematics + PWB - (001) LK132C Layout

CAM350 V 9.5 : Fri Sep 27 10:27:34 2019 - LKN132-A.cam : art006.pho



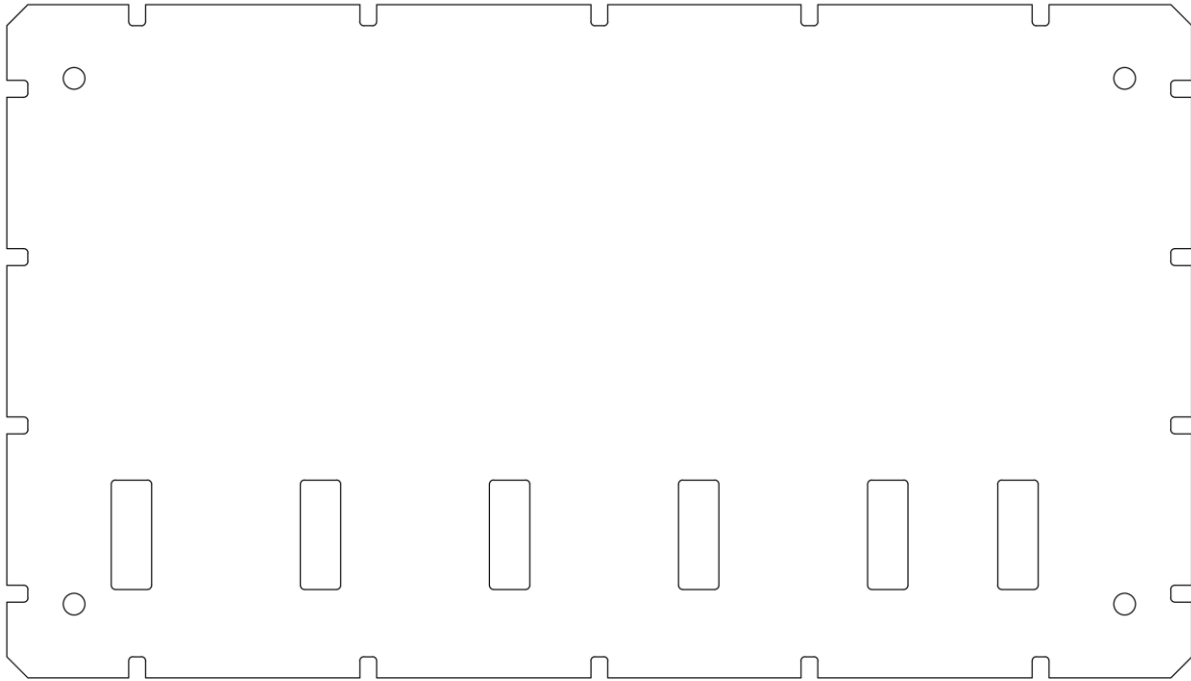
Schematics + PWB - (001) LK132C Layout

CAM350 V 9.5 : Fri Sep 27 10:27:34 2019 - LKN132-A.cam : sm006028.pho



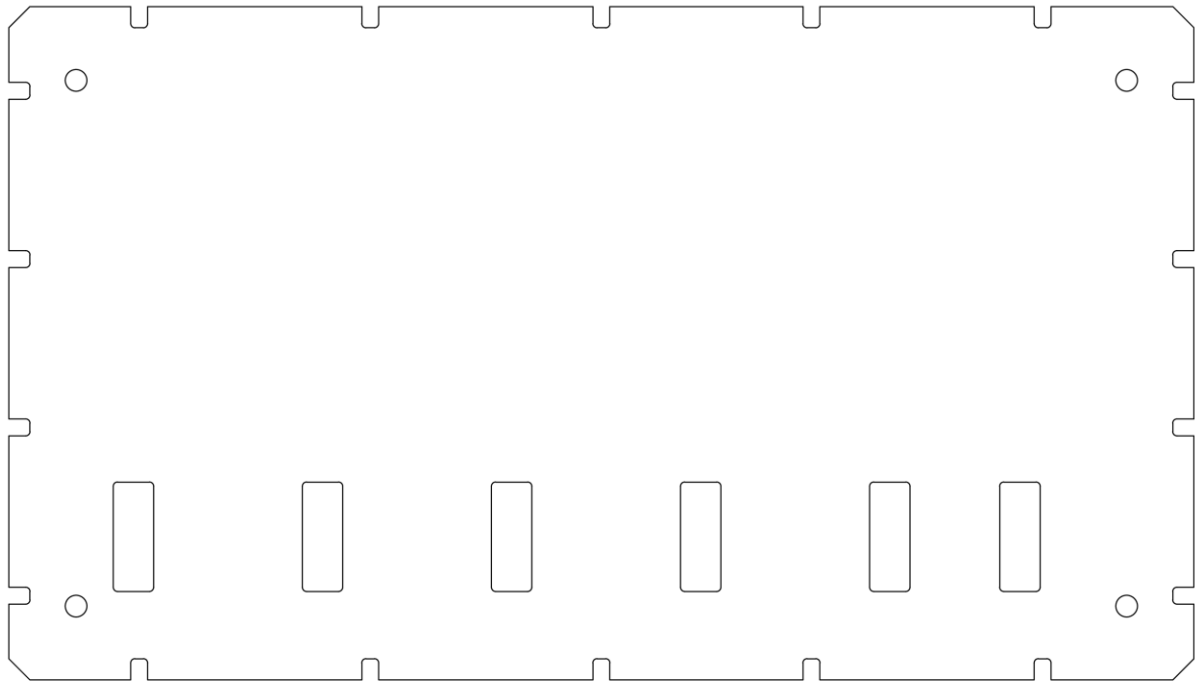
Schematics + PWB - (001) LK132C Layout

CAM350 V 9.5 : Fri Sep 27 10:27:34 2019 - LKN132-A.cam : smd006022.pho



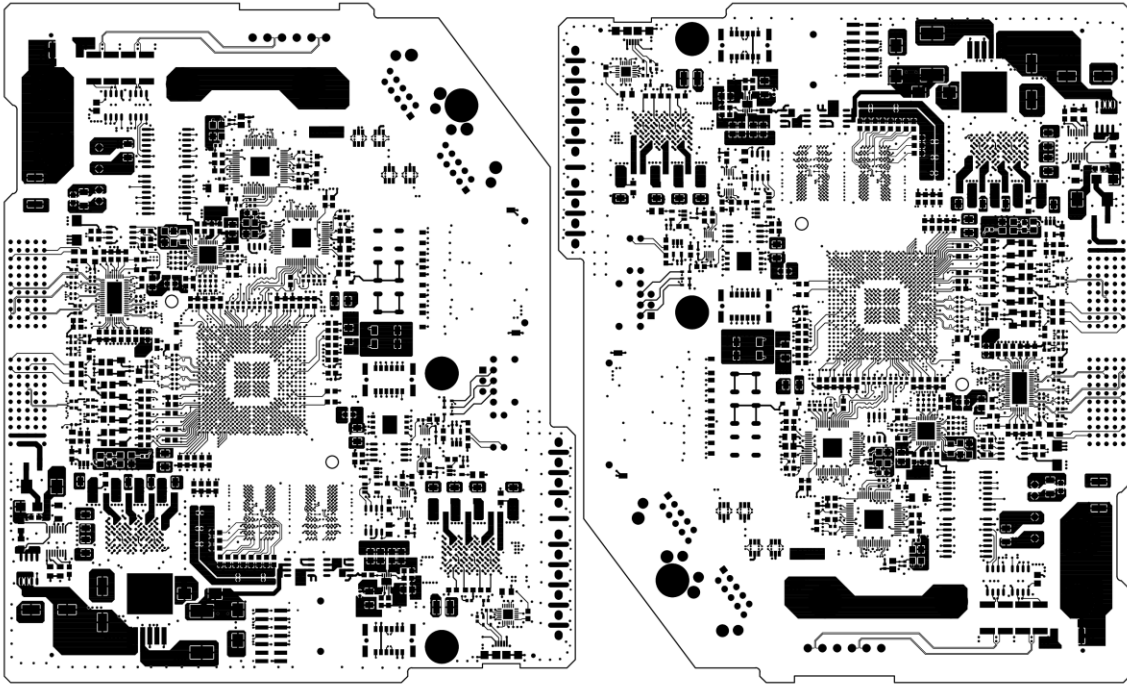
Schematics + PWB - (001) LK132C Layout

CAM350 V 9.5 : Fri Sep 27 10:27:34 2019 - LKN132-A.cam : ssb006029.pho



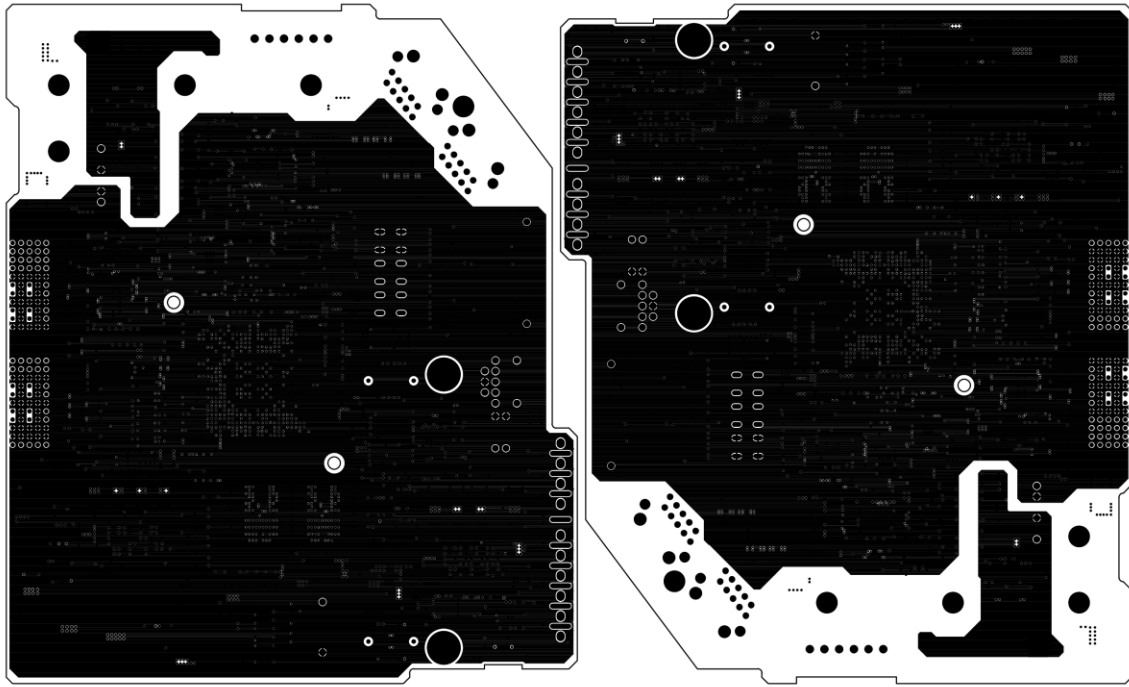
Schematics + PWB - (002) LK226CT1 LayoutSchematics + PWB - (002) LK226CT1 Layout

CAM350 V 9.5 : Mon May 18 09:26:28 2020 - lkn221c-f-2pa.cam : art001.pho



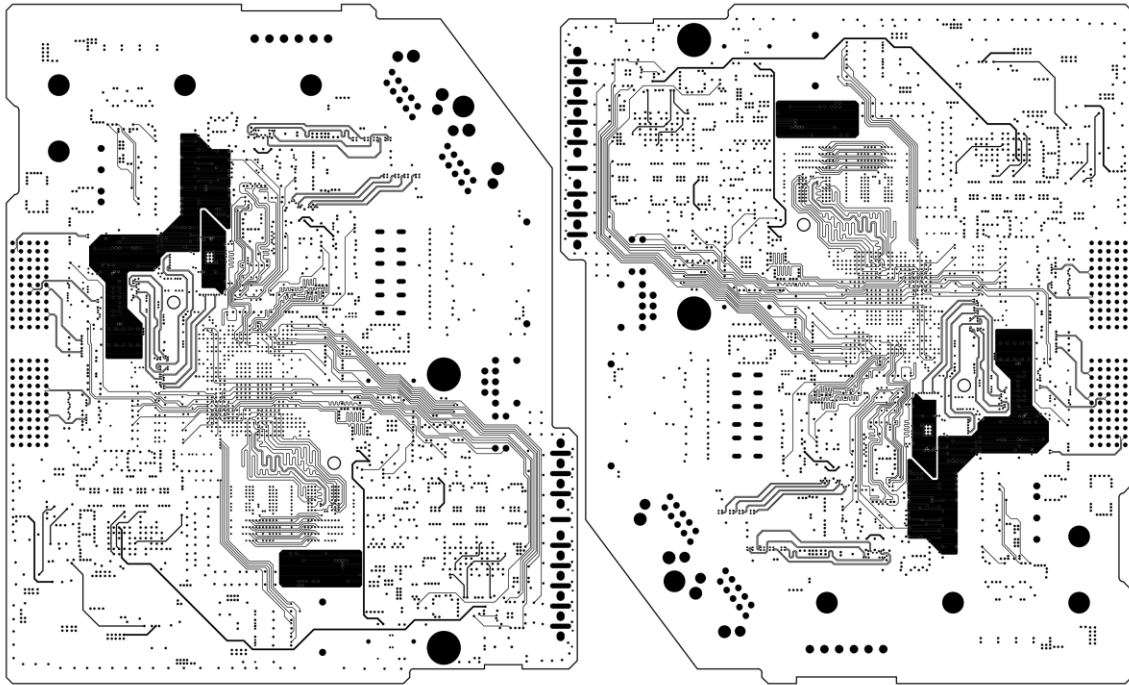
Schematics + PWB - (002) LK226CT1 Layout

CAM350 V 9.5 : Mon May 18 09:26:28 2020 - 1kn221c-f-2pa.cam : art002.pho



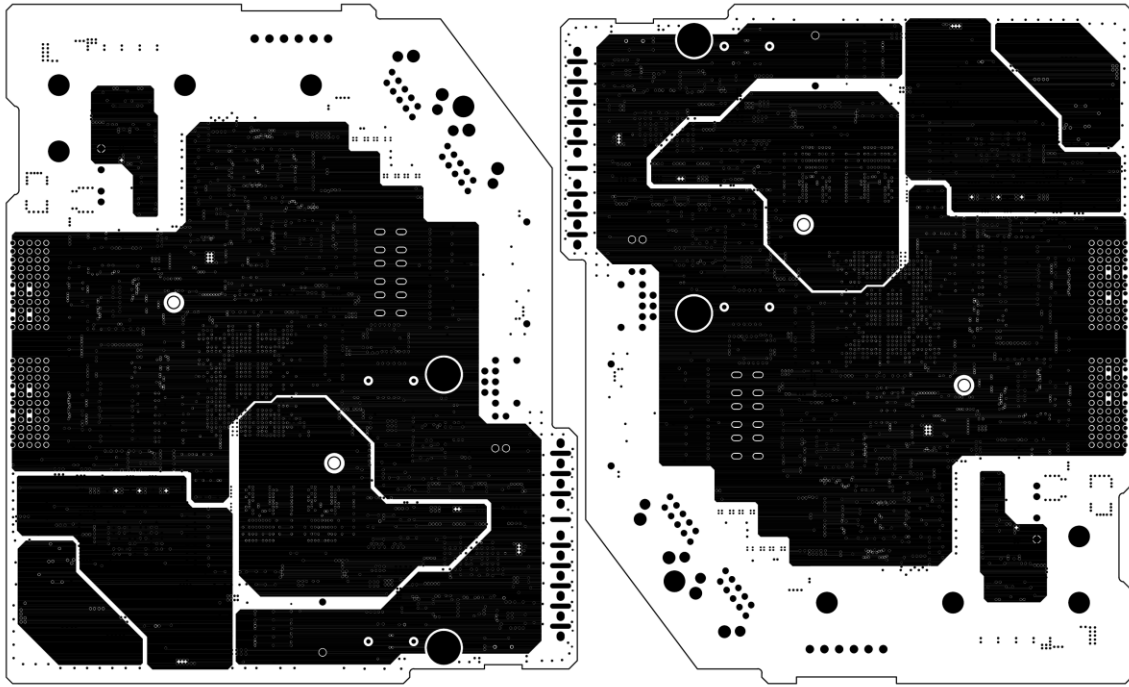
Schematics + PWB - (002) LK226CT1 Layout

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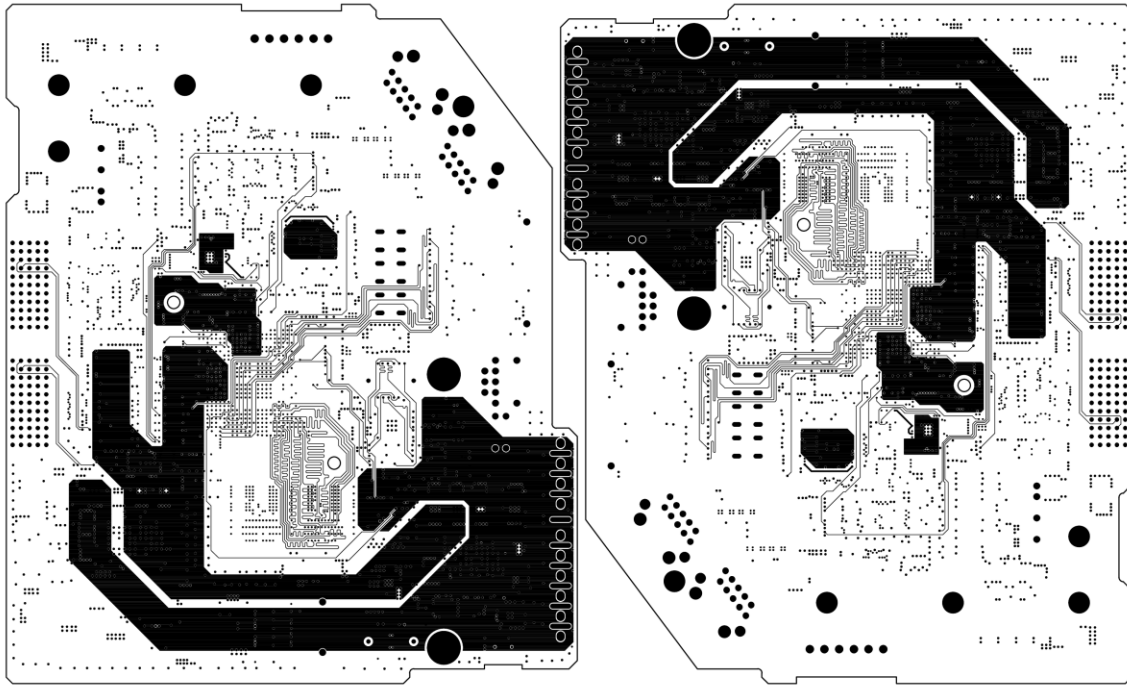
Schematics + PWB - (002) LK226CT1 Layout

CAM350 V 9.5 : Mon May 18 09:26:29 2020 - 1kn221c-f-2pa.cam : art004.pho



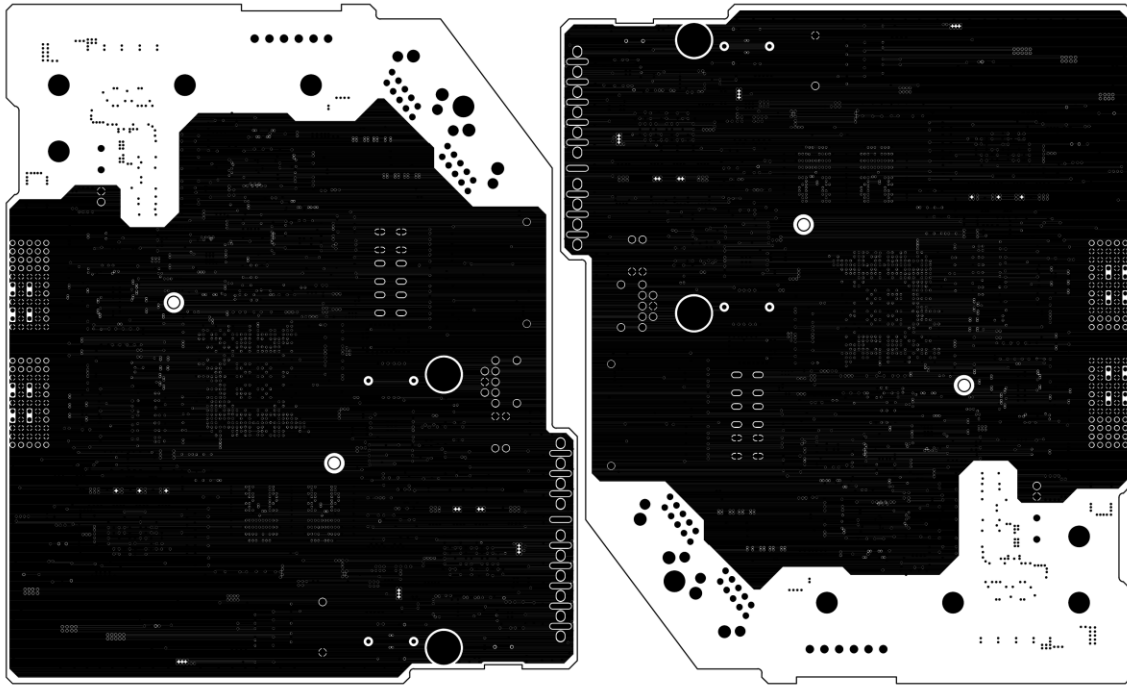
Schematics + PWB - (002) LK226CT1 Layout

CAM350 V 9.5 : Mon May 18 09:26:29 2020 - 1kn221c-f-2pa.cam : art005.pho



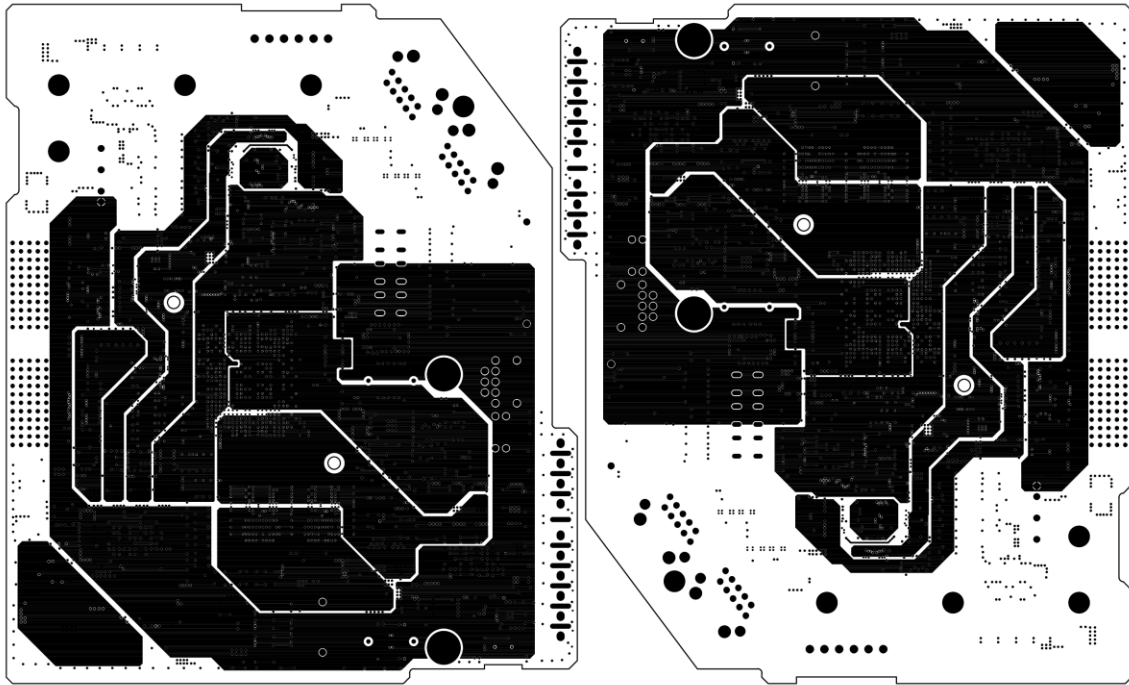
Schematics + PWB - (002) LK226CT1 Layout

CAM350 V 9.5 : Mon May 18 09:26:29 2020 - 1kn221c-f-2pa.cam : art006.pho



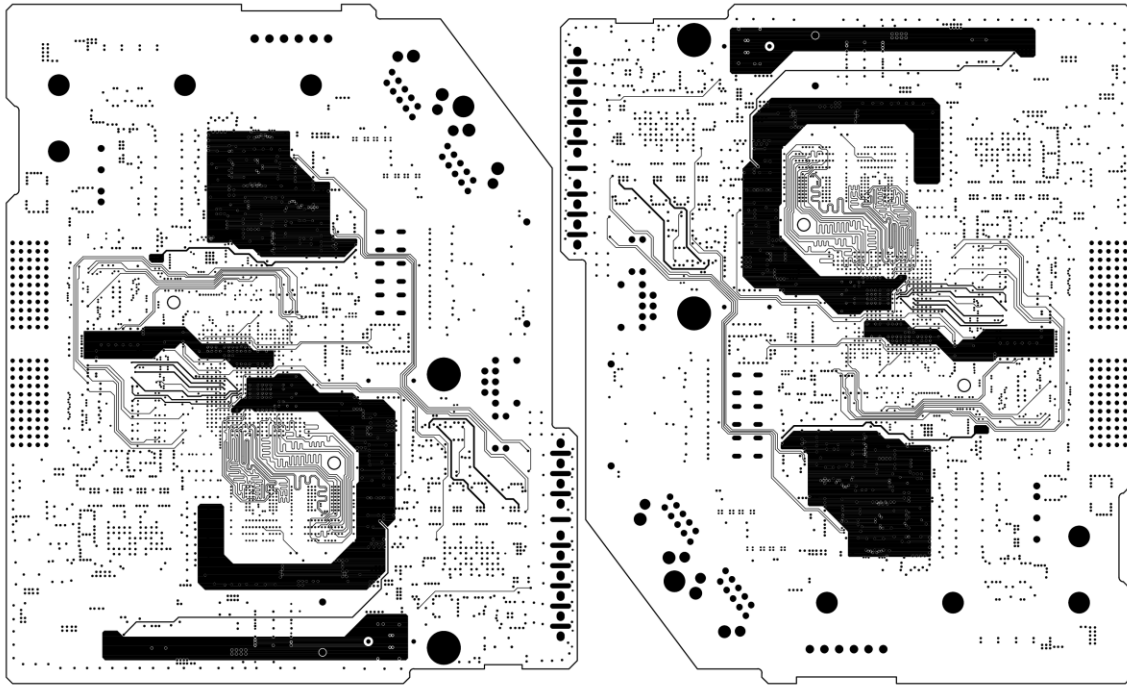
Schematics + PWB - (002) LK226CT1 Layout

CAM350 V 9.5 : Mon May 18 09:26:29 2020 - 1kn221c-f-2pa.cam : art007.pho



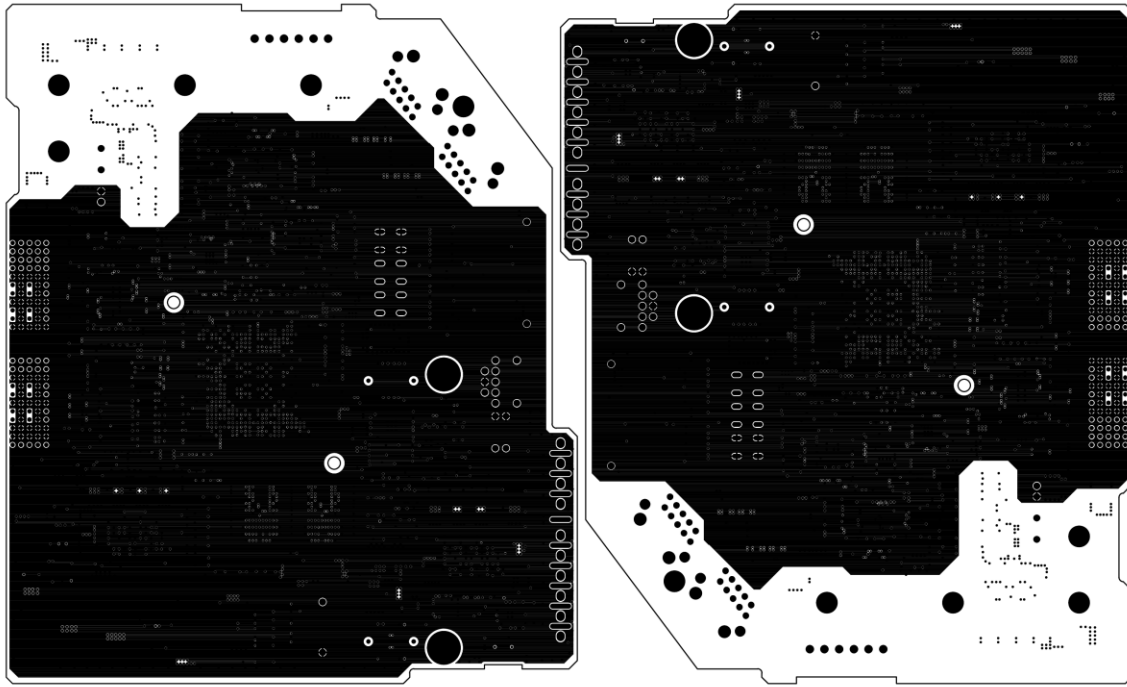
Schematics + PWB - (002) LK226CT1 Layout

CAM350 V 9.5 : Mon May 18 09:26:30 2020 - 1kn221c-f-2pa.cam : art008.pho



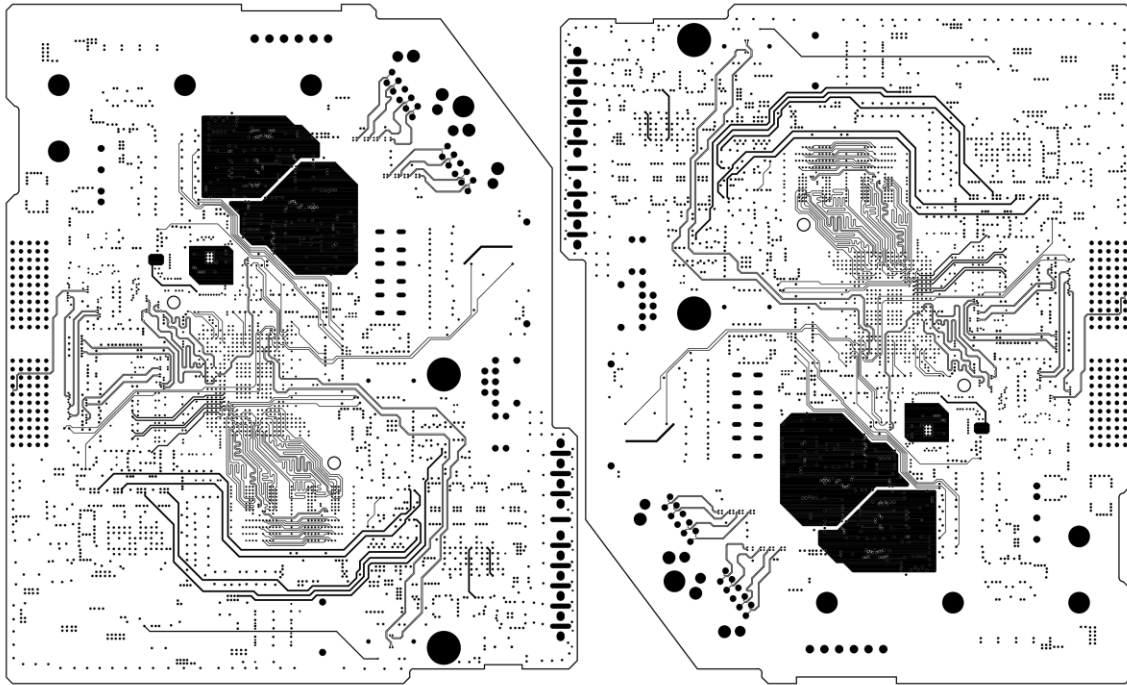
Schematics + PWB - (002) LK226CT1 Layout

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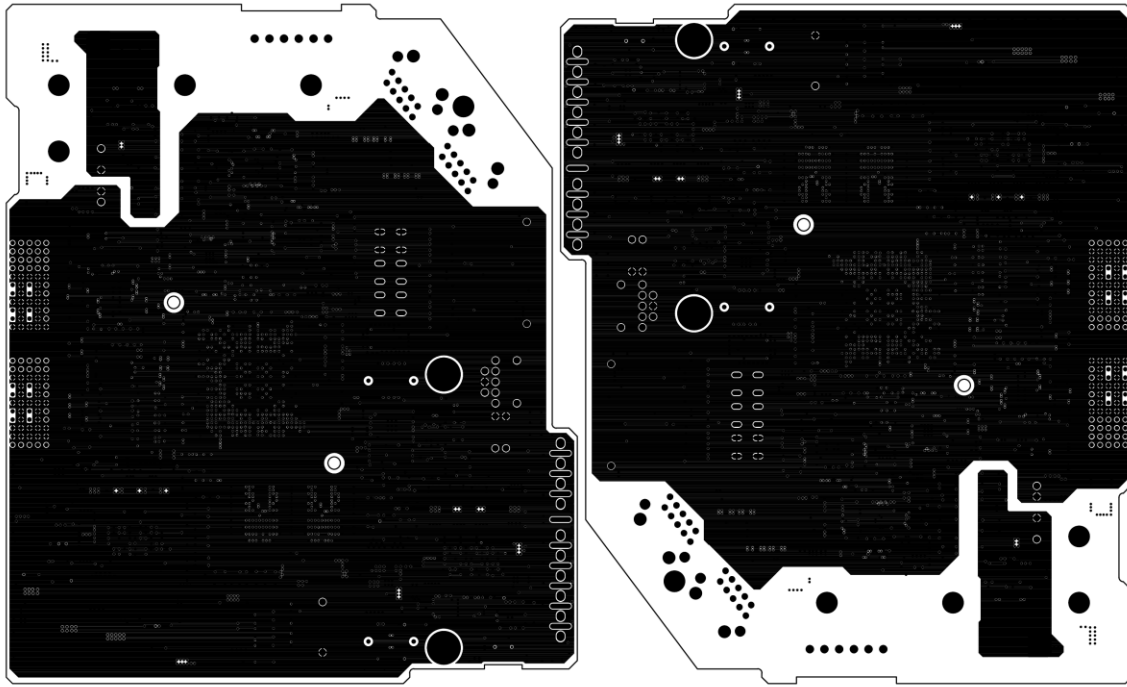
Schematics + PWB - (002) LK226CT1 Layout

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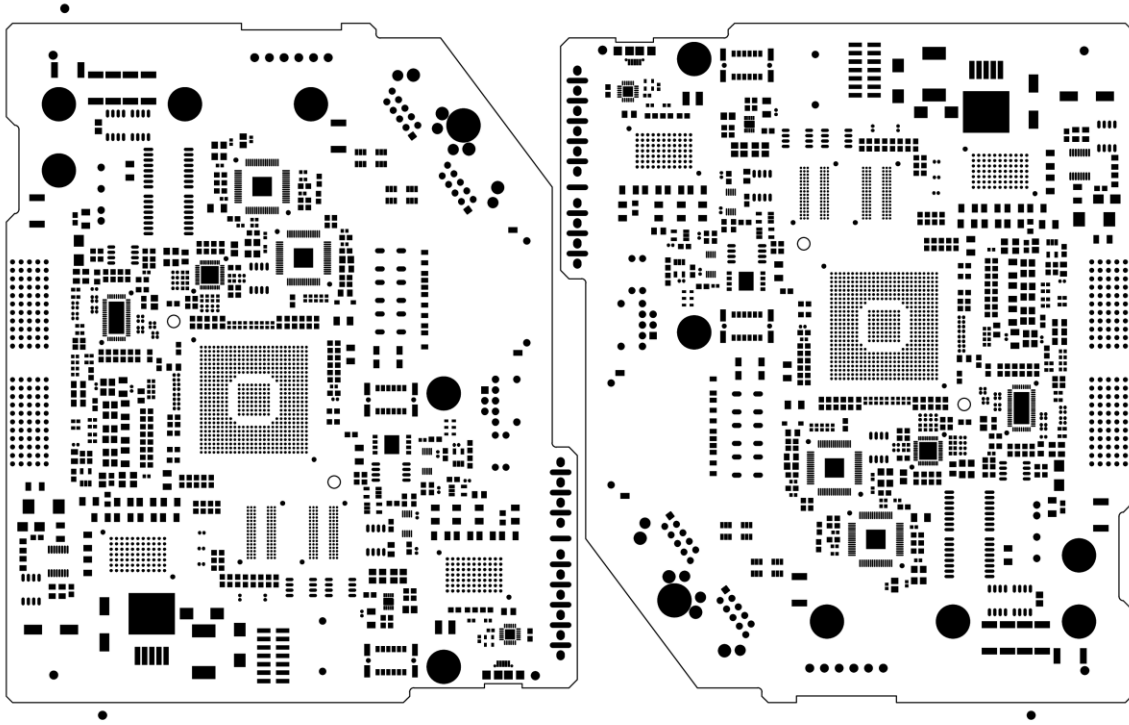
Schematics + PWB - (002) LK226CT1 Layout

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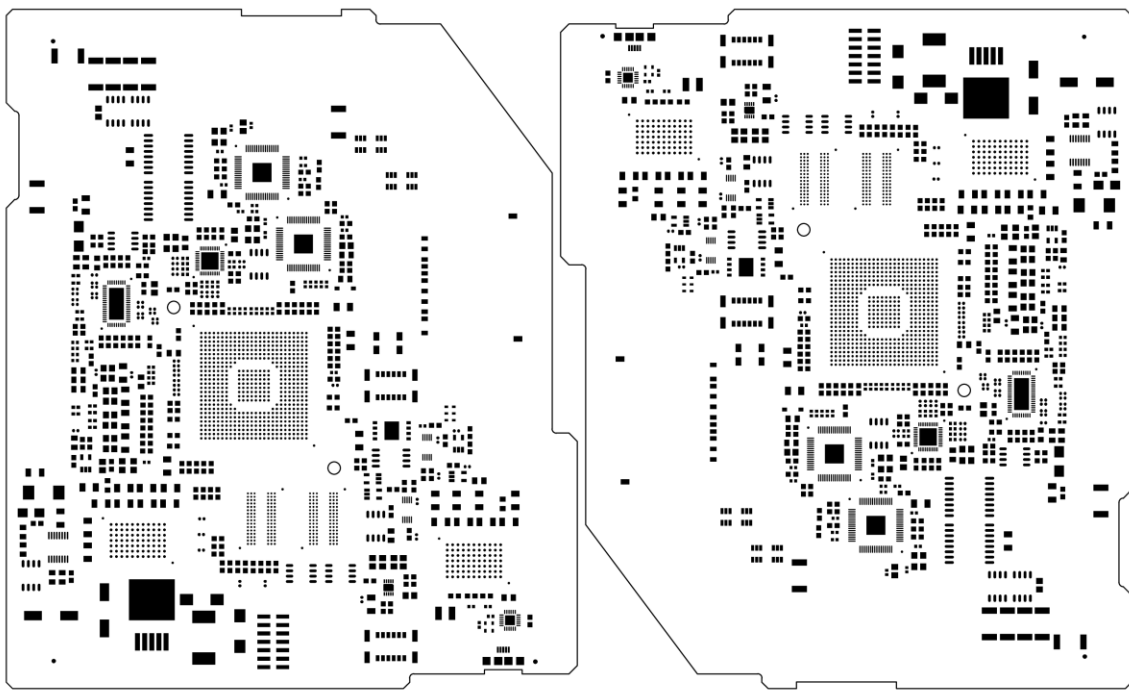
Schematics + PWB - (002) LK226CT1 Layout

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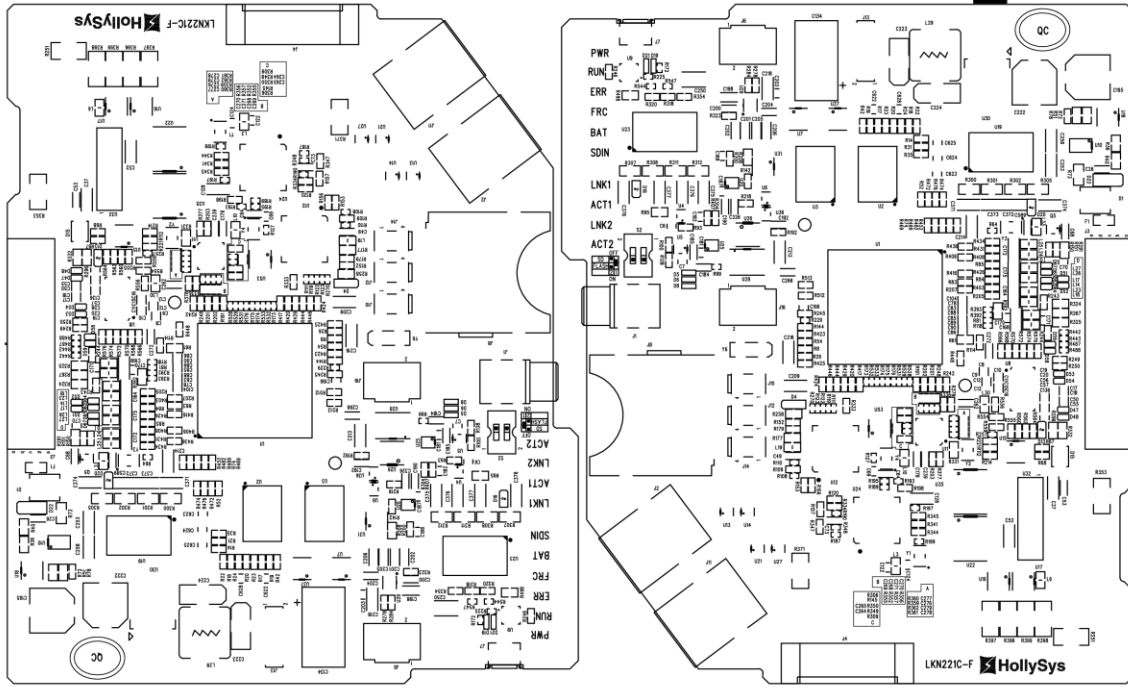
Schematics + PWB - (002) LK226CT1 Layout

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Schematics + PWB - (002) LK226CT1 Layout

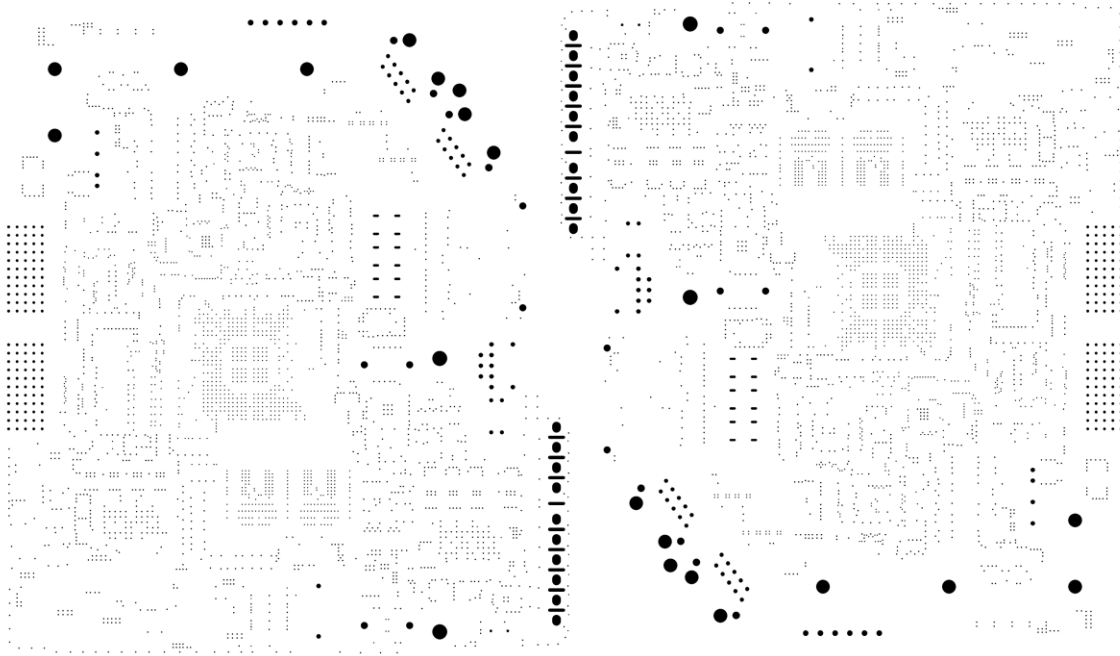
CAM350 V 9.5 : Mon May 18 09:26:31 2020 - lkn221c-f-2pa.cam : sst001026.pho



LK221C-F-2PA

Schematics + PWB - (002) LK226CT1 Layout

CAM350 V 9.5 : Mon May 18 09:26:31 2020 - 1kn221c-f-2pa.cam : dr1001.dr1



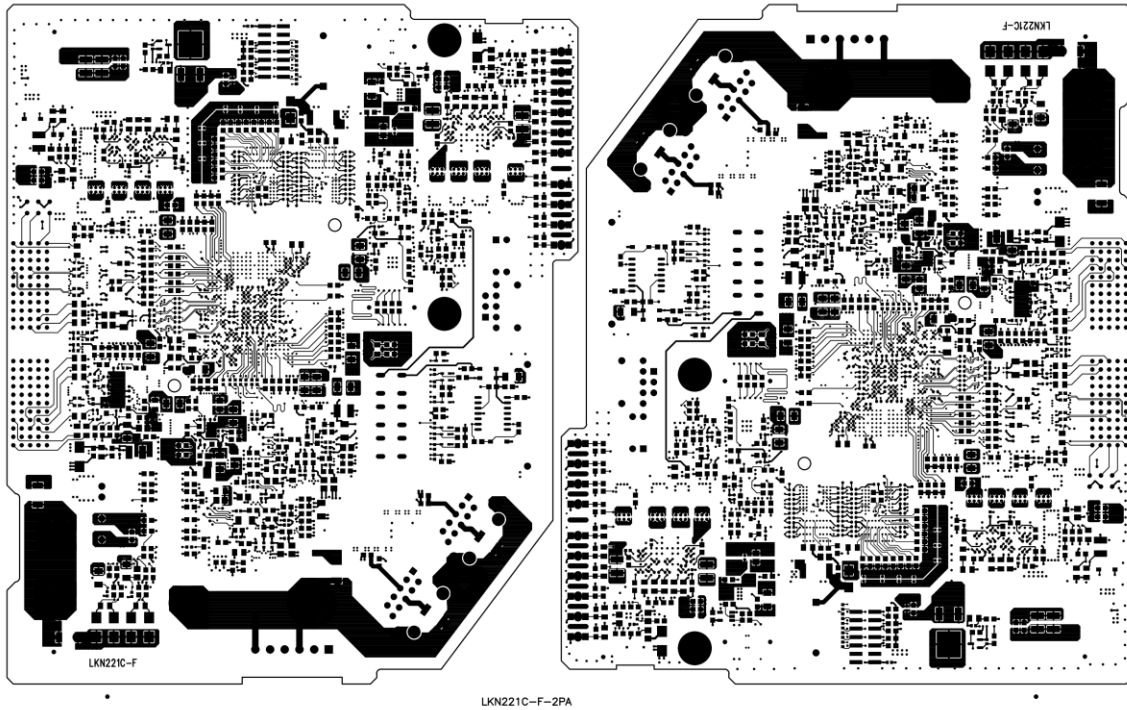
Schematics + PWB - (002) LK226CT1 Layout

CAM350 V 9.5 : Mon May 18 09:26:31 2020 - 1kn221c-f-2pa.cam : boarder.gbr



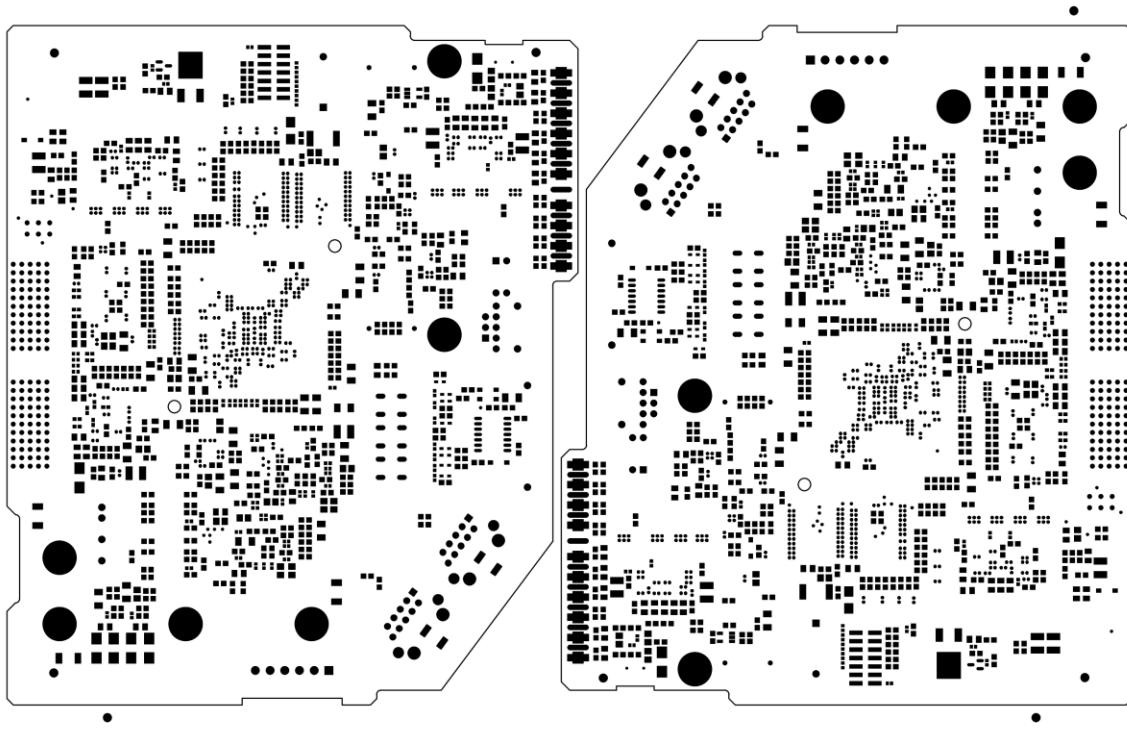
Schematics + PWB - (002) LK226CT1 Layout

CAM350 V 9.5 : Mon May 18 09:32:21 2020 - lkn221c-f-2pa.cam : art012.pho



Schematics + PWB - (002) LK226CT1 Layout

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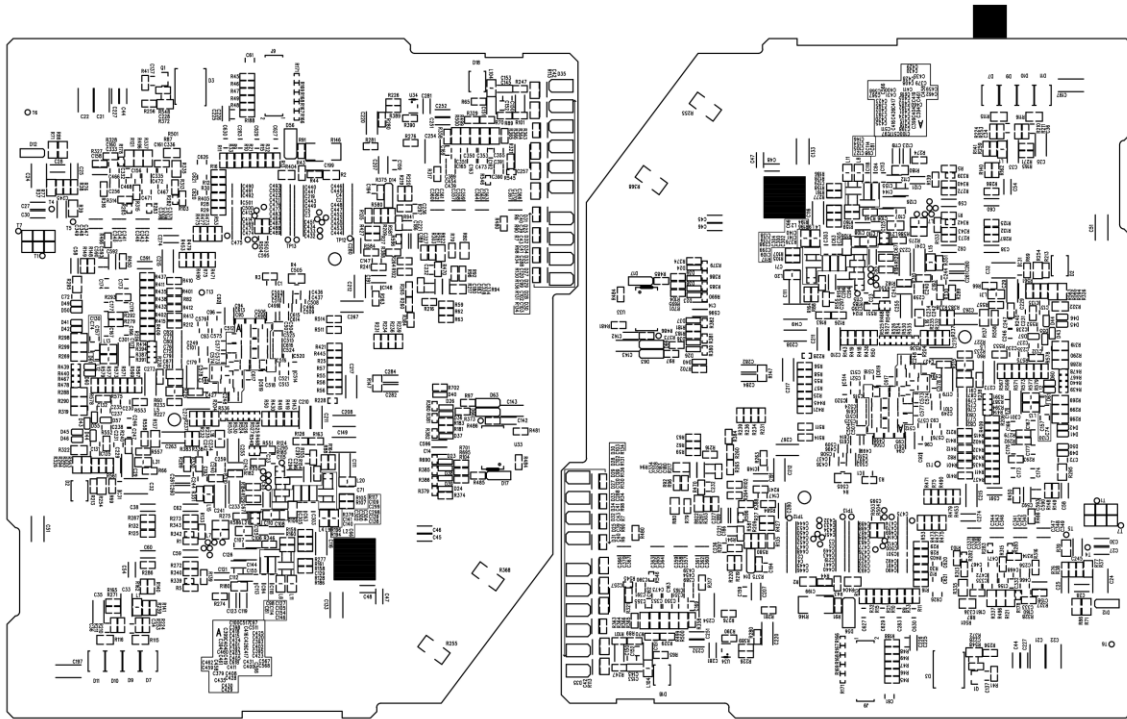
Schematics + PWB - (002) LK226CT1 Layout

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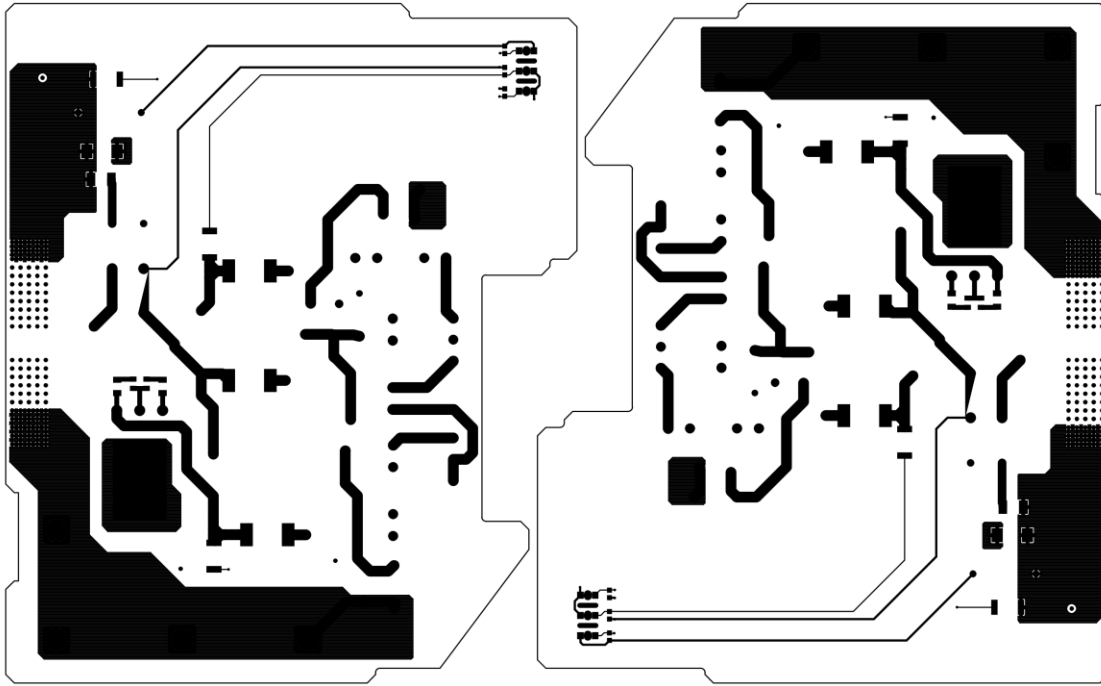
Schematics + PWB - (002) LK226CT1 Layout

CAM350 V 9.5 : Mon May 18 09:32:21 2020 - 1kn221c-f-2pa.cam : ssb012029.pho



Schematics + PWB - (003) LK921C LayoutSchematics + PWB - (003) LK921C Layout

CAM350 V 9.5 : Mon Jan 14 13:47:39 2019 - LKN921-B-2PB.cam : LKN921-B-2PB-ar



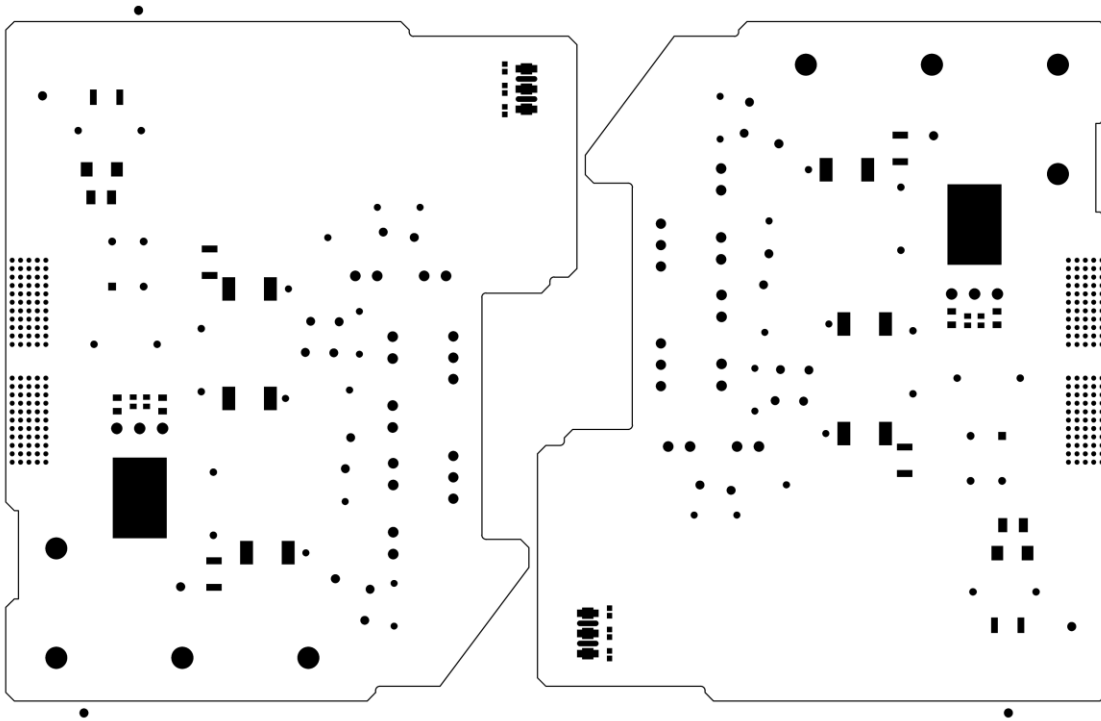
Schematics + PWB - (003) LK921C Layout

CAM350 V 9.5 : Mon Jan 14 13:47:39 2019 - LKN921-B-2PB.cam : LKN921-B-2PB-bo



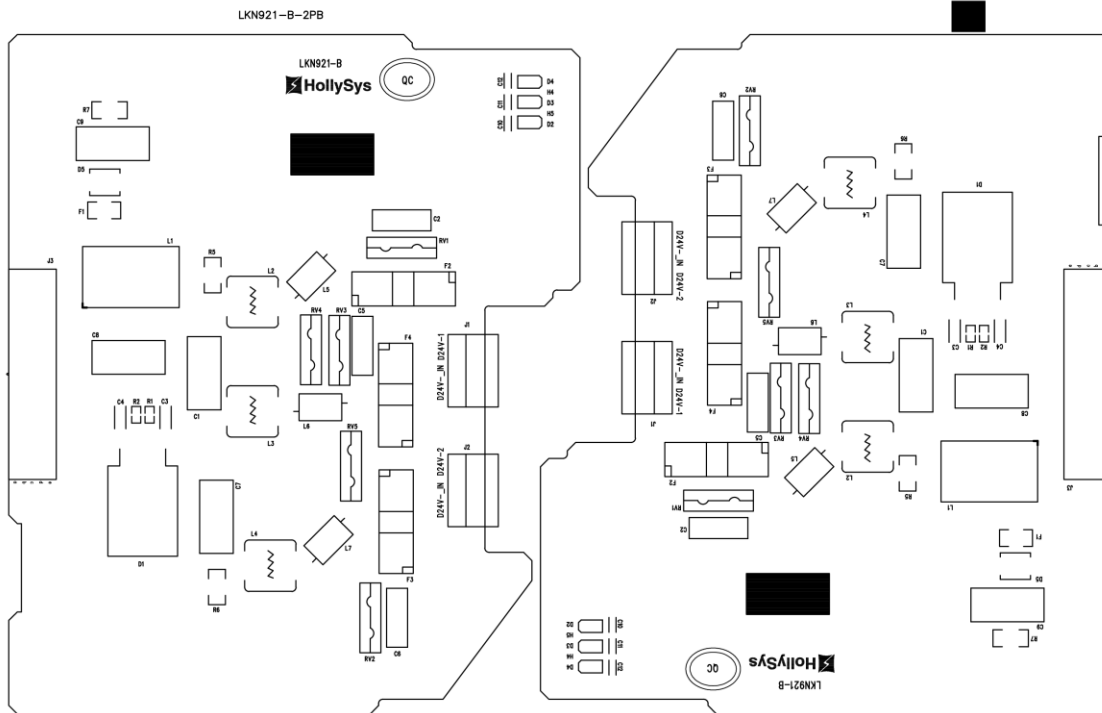
Schematics + PWB - (003) LK921C Layout

CAM350 V 9.5 : Mon Jan 14 13:47:39 2019 - LKN921-B-2PB.cam : LKN921-B-2PB-sm



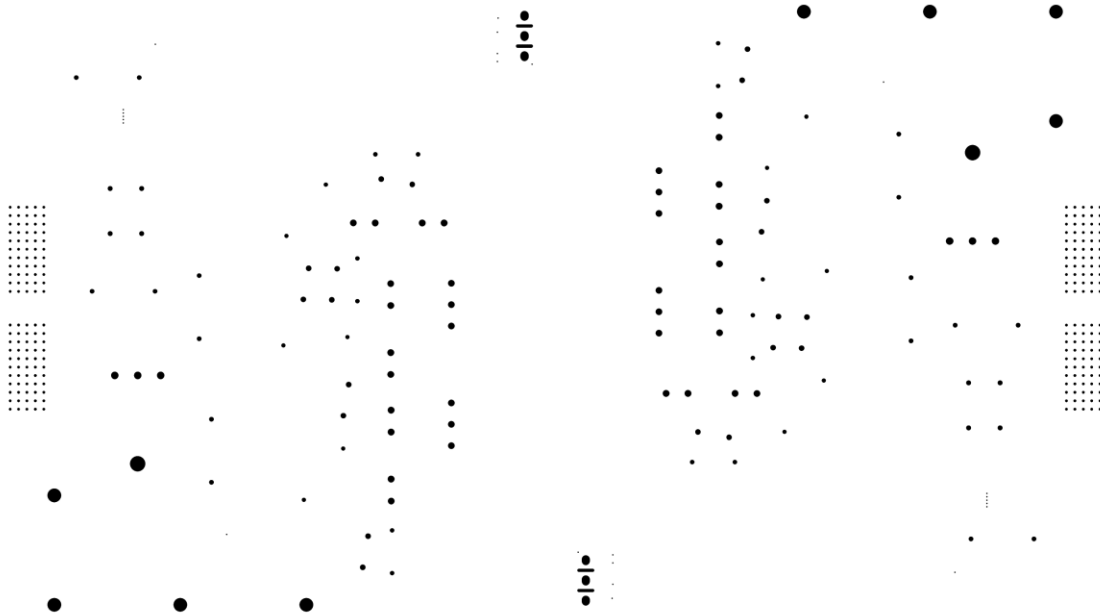
Schematics + PWB - (003) LK921C Layout

CAM350 V 9.5 : Mon Jan 14 13:47:39 2019 - LKN921-B-2PB.cam : LKN921-B-2PB-ss



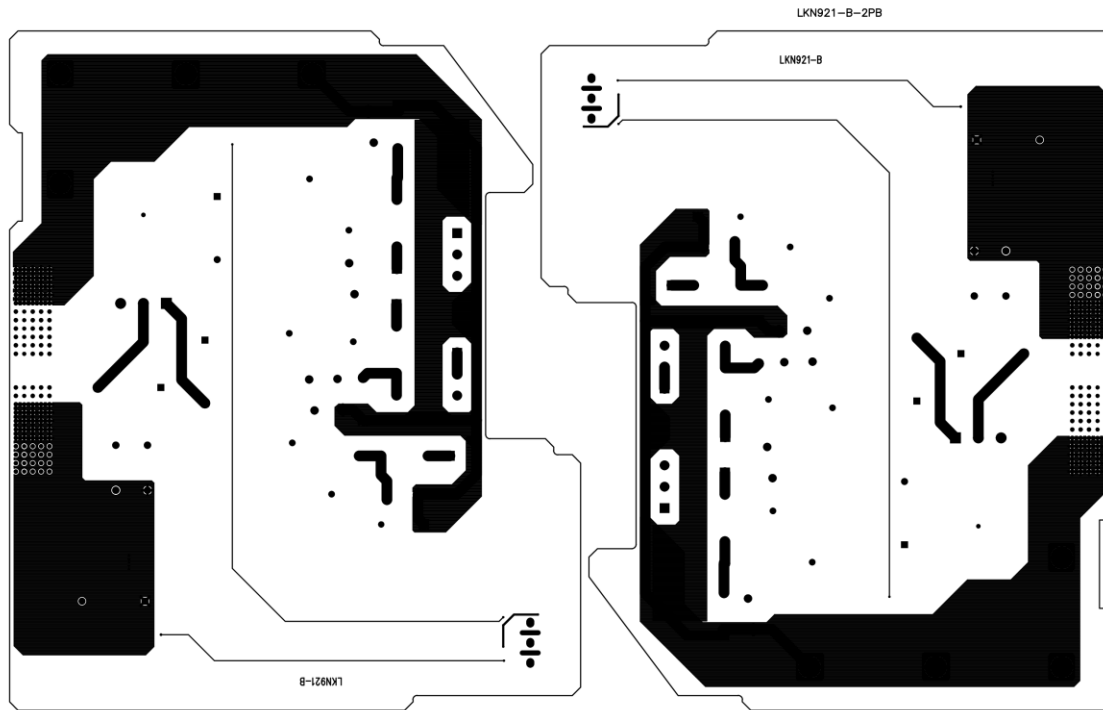
Schematics + PWB - (003) LK921C Layout

CAM350 V 9.5 : Mon Jan 14 13:47:39 2019 - LKN921-B-2PB.cam : LKN921-B-2PB-dr



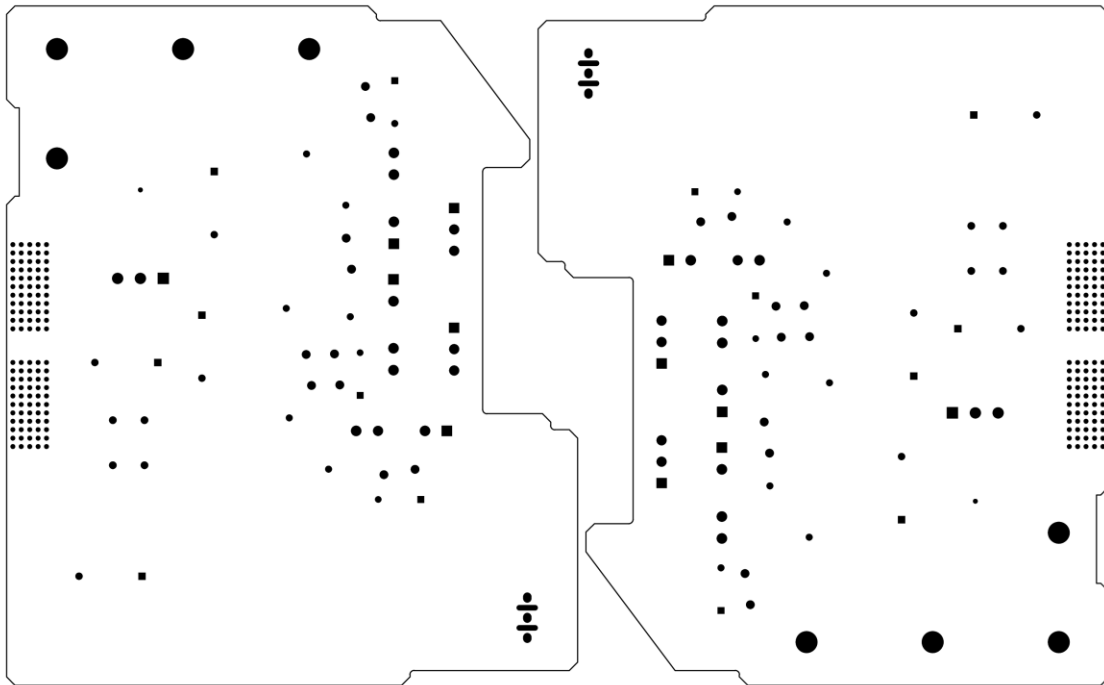
Schematics + PWB - (003) LK921C Layout

CAM350 V 9.5 : Mon Jan 14 13:51:09 2019 - LKN921-B-2PB.cam : LKN921-B-2PB-ar



Schematics + PWB - (003) LK921C Layout

CAM350 V 9.5 : Mon Jan 14 13:51:09 2019 - LKN921-B-2PB.cam : LKN921-B-2PB-sm



-----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 LK921C, LK226CT1, LK132C.

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(2012-05), 3rd Edition, with revisions through 2018-11

Additional Standards: UL 61010-2-201, 2nd Edition, Issue date 2018/05/14.
CAN/CSA-C22.2 No. 61010-2-201:18, 2nd Edition, Issue date 2018/02

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 E311062

Vol D1

Issued: 2022-07-13

**FOLLOW-UP SERVICE PROCEDURE
(TYPE R)****Programmable Controllers
(NRAQ / NRAQ7)****Manufacturer:** SEE ADDENDUM FOR MANUFACTURER LOCATIONS

Applicant: 645424 (Party Site)
BEIJING HOLLYSYS INTELLIGENT TECHNOLOGIES CO LTD
() No 2 Disheng Middle Rd
Beijing Technological Development Area
Beijing 100176 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 web-site: <http://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 <http://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: <http://services.ul.com/fus-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.

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
Programmable Controllers	NRAQ

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	The UL Representative's duties include, but are not limited to: 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: 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	Report to the manufacturer and UL LLC by means of a Variation Notice (VN) if: 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	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.
AA2.3	When a product does not conform with the Procedure, require that the manufacturer: 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. 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.

	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.
AA2.4	It is the manufacturer's responsibility to forward a copy of the Variation Notice to the Applicant.
AA2.5	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.

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	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: A. Conductors, Terminal Pads, and Tabs 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 B. Base Material 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
^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. ^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. ^c The manufacturer may elect either an Impact Test or ID Tests. The UL Representative shall act accordingly. ^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. ^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.			

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	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: 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	<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: 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. 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.
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	<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. 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. 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. 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.
AC2.3.3	<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. 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

	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. The product may be in a heated or unheated condition for the test. 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: 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. 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. Electromagnetic interference filter capacitors connected to the primary circuit shall not be disconnected during the test.
AC2.3.4	<u>Basis for Acceptability</u> - All products shall withstand the applied potential without an indication of electrical breakdown.

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 μs Impulse	a.c.	d.c.	1,2/50 μs Impulse	a.c.	d.c.	1,2/50 μs Impulse
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 ≤ 300	1 400	2 000	2 000	2 200	3 100	3 100	3 300	4 700	4 700
>300 ≤ 600	2 200	3 100	3 100	3 300	4 700	4 700	4 300	6 000	6 000
>600 ≤ 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	<u>Grounding</u> - The following guidelines shall be observed: A. <u>Non-Detachable Cord Connected Appliance</u> - The equipment-grounding conductor of the flexible cord: 1. Shall be connected to the grounding member of the attachment-plug cap. Note: The grounding member of the attachment-plug shall be fixed in position with respect to the cap. 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. 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.

	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. 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): 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. 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: 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. 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. 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 "⊕". 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. 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.
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	<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: A. Tinning

	B. Inserting properly into suitable wire connectors. C. Crimped connectors and/or eyelets with the crimp containing all strands D. Solder lugs.
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	<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: 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. 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.
AE1.1.16	<u>Power Supply Cords</u> 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> 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.
AE1.1.17	<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. 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. 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. The base material and the conductors shall be examined for nonconforming features as indicated below. A. Conductors, Terminal Pads, and Tabs 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 B. Base Material 1. Warping 2. Cracking 3. Charring, blistering, or other heat damage due to solder process 4. Delamination
AE1.1.18	Protection of Wiring - 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. 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. Conductors shall be examined for evidence of damage. Faulty practices which can cause damage to conductors and/or insulation include: 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. Constructions which may cause damage to conductors and/or insulation include: 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	<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. 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. 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. Some means commonly used to prevent rotation are: 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	<u>Solder Connections</u> - All solder connections shall be made mechanically secure before soldering. Some typical examples of mechanical securement are: 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	<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.
AE1.1.22	<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.
AE1.1.23	<u>Documentation</u> - Handling of hazardous substances and correct disposal procedure, field-installed devices, explanation of warning symbols.
	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.
	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: 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: 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. Prüfstelle	<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 Materiellkontroll (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>	Programmable Controllers
<i>Product Category CCN:</i>	NRAQ / NRAQ7
<i>Product Identity:</i>	One of the following product identities appears on the product: Ind. Cont. Eq., Industrial Control Equipment, Prog. Cntrl., or Programmable Controller

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.

Description

UL TEST REPORT AND PROCEDURE

Standard:	UL 61010-1, 3rd Edition, May 11, 2012, Revised July 19, 2019, CAN/CSA-C22.2 No. 61010-1(2012-05), 3rd Edition, with revisions through 2018-11
Certification Type:	Listing
CCN:	NRAQ / NRAQ7
Complementary CCNs:	
Product:	Programmable controller
Model:	6-slot backboard module, Model LK132C Static trusted controller, Model LK226CT1 24V power switching module, Model LK921C
Rating:	LK921C: Input : 24Vdc (19.2 to 28.8Vdc), max. 2A LK226CT1: Input : 24Vdc (19.2 to 28.8Vdc), 500mA LK132C: Not provided
Applicant Name and Address:	BEIJING HOLLYSYS INTELLIGENT TECHNOLOGIES CO LTD No 2 Disheng Middle Rd Beijing Technological Development Area Beijing 100176 CHINA

This is to certify that representative samples of the products covered by this Test Report have been investigated in accordance with the above referenced Standards. The products have been found to comply with the requirements covering the category and the products are judged to be eligible for Follow-Up Service under the indicated Test Procedure. The manufacturer is authorized to use the UL Mark on such products which comply with this Test Report and any other applicable requirements of UL LLC ('UL') in accordance with the Follow-Up Service Agreement. Only those products which properly bear the UL Mark are considered as being covered by UL's Follow-Up Service under the indicated Test Procedure.

The applicant is authorized to reproduce the referenced Test Report provided it is reproduced in its entirety.

UL authorizes the applicant to reproduce the latest pages of the referenced Test Report consisting of the first page of the Specific Technical Criteria through to the end of the Conditions of Acceptability as applicable.

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL.

Prepared by: Sandy Fu, handler

Reviewed by: Pauline Wu, reviewer

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

These devices are open type programmable logic controllers intended for use in industrial control applications. The above three modules are connected to form a system. LKA102 battery power box can optionally be inserted into a backup battery slot of LK226CT1.

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

Model Differences

N/A

Additional Information

N/A

Technical Considerations

- The product was investigated to the following additional standards: UL 61010-2-201, 2nd Edition, Issue date 2018/05/14.
CAN/CSA-C22.2 No. 61010-2-201:18, 2nd Edition, Issue date 2018/02
- The following additional investigations were conducted: The following additional investigations were conducted: IP20 according to IEC 60529:Edition 2.2, Issued 2013-08 + Corr. 1:2013-10 + Corr. 2:2015-01.
- 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
- No Other Considerations

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:

- None

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
Functional earth terminal	
Reference to the Manual, Caution Symbol 14	

Special Instructions to UL Representative

Production-Line Testing Requirements			
Required	Test	Model/Part Exempt from Test	Additional Details
No	Grounding Continuity	This test is not required for the following models:	All models
No	Dielectric Strength	This test is not required for the following models:	All models
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
LK132C					
Label marking	interchangeable	interchangeable	Suitable for the surface applied, Min. 85°C	UL 969	UL/ any/ (PGI2 or PGDQ2)
Top cover	SABIC INNOVATIVE PLASTICS US L L C	CX7240 U(GG)	Min. 2 mm thick. V-0, RTI: 90°C	U746C	UL / E121562 (QMFZ2)
Bottom Cover	Interchangeable	Interchangeable	Stainless Steel. Min.44.3 mm thick. Dimension: 325mm by 166 mm by 44.3 mm	-	-
PWB	Interchangeable	Interchangeable	Minimum V-1, 105°C	UL 796	UL /any/ (ZPMV2)
Connector (J1-J6)	WUHAN CLIP ELECTRONICS CO LTD	HMMA11001112J	Max. operating temperature: 125°C	UL1977	UL/E320764(ECBT2)
Internal connector	Interchangeable	Interchangeable	Minimum V-2, 105°C	UL 94, UL 746B	UL/ any/ (QMFZ2)
LK921C					
Cover	SABIC INNOVATIVE PLASTICS US L L C	CX7240 U(GG)	Min. 2 mm thick. V-0, RTI: 90°C	UL746C	UL / E121562 (QMFZ2)
PWB	Interchangeable	Interchangeable	Minimum V-1, 105°C	UL 796	UL /any/ (ZPMV2)
Terminal Blocks Header (J1, J2)	SHENZHEN SUCCEED ELECTRONICS TECHNOLOGY CO LTD	TP508H-00V-3P-GY	Rated 300 V, 18 A, CU, FW=1 (mated with FW2 plug), UG=D, 115°C	UL1059	UL, CUL/ E332956 (XCFR2/8)
Terminal Blocks Plug	SHENZHEN SUCCEED ELECTRONICS TECHNOLOGY CO LTD	TP508P-00-3P-GY	Rated 300 V, 18 A, CU, FW=2, 30-12 AWG (Sol, Str), UG=D, 5 Lb-in, 115°C	UL1059	UL, CUL / E332956 (XCFR2/8)
Connector J3	WUHAN CLIP ELECTRONICS CO LTD	HMFA110002412B	Max. operating temperature: 125°C	UL1977	UL/E320764 (ECBT2)
Internal connector	Interchangeable	Interchangeable	Minimum V-2, 105°C	UL 94, UL 746B	UL/ any/ (QMFZ2)
L1	HOLLYLAND(CHINA) ELECTRONICS TECHNOLOGY CORPORATION LTD.	25F-030H/L1	Rated Current 3A. Rated Voltage 125V Min 125°C	-	-
Core	Interchangeable	Interchangeable	Ferrite, 105°C	-	-
Bobbin	CHANG CHUN PLASTICS CO LTD	T200NA	Phenolic, BK or BN, minimum 0.38 mm thick, V-0, RTI: 150°C	UL746C	UL/E59481 (QMFZ2)
wire	Interchangeable	Interchangeable	105°C	UL1446	UL/any/ (OBMW2)
Fuses (F2, F3)	HOLLYLAND CO LTD	51MS	Rated 125 V ac, 3.15 A	UL248-1, UL248-14	UL, CSA / E156471 (JDYX2)
Fuse (F4)	HOLLYLAND CO LTD	50T	Rated 250 V ac, 3A	UL248-1, UL248-14	UL, CSA / E156471 (JDYX2)
LK226CT1					

Cover	SABIC INNOVATIVE PLASTICS US L L C	CX7240 U(GG)	Min. 2 mm thick. V-0, RTI: 90°C	U746C	UL / E121562 (QMFZ2)
PWB	Interchangeable	Interchangeable	Minimum V-1, 105°C	UL 796	UL /any/ (ZPMV2)
Connector (J3)	WUHAN CLIP ELECTRONICS CO LTD	HMFA110002412B	Max. Operating current Min 125°C	UL1977	UL/E320764(ECBT2)
Internal connector	Interchangeable	Interchangeable	Minimum V-2, 105°C	UL 94, UL 746B	UL/ any/ (QMFZ2)
Battery Power Box (Optional)	Beijing HollySys Intelligent Technologies Co Ltd	LKA102	-	-	-
Cover	SABIC INNOVATIVE PLASTICS B V	CX7240	Min. 2 mm thick. V-0, RTI: 90°C	U746C	UL / E45329(QMFZ2)
PWB	Interchangeable	Interchangeable	Minimum V-1, 105°C	UL796	UL / (ZPMV2)
Wire Leads	Interchangeable	Interchangeable	Minimum 300 V, 80°C, VW-1	UL758	UL, cUL / (AVLV2/8)
Battery	EEMB CO LTD	CR2477 EEMB	Diode D3 and Resistor R2 are provided in series to prevent abnormal charging current	UL1642	UL / MH20555 (BBCV2)
Heatsink	-	-	Aluminum, refer to enclosure for detail dimension.	-	-

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	5.1.3	Mains Supply	ZENITH INTERNATIONAL COMPLIANCES SERVICES CO LTD
IEC 61010-1:2010, AMD1:2016	9.4	Limited Energy Circuit Determination Test	ZENITH INTERNATIONAL COMPLIANCES SERVICES CO LTD
IEC 61010-1:2010, AMD1:2016	10.1-10.4	Temperature Test	ZENITH INTERNATIONAL COMPLIANCES SERVICES CO LTD
IEC 61010-1:2010, AMD1:2016	11.6	Specially protected Equipment (IEC60529, IP Test)	ZENITH INTERNATIONAL COMPLIANCES SERVICES CO LTD

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>
Datasheets - (002)	E311062-D1000-TesRec1-DS1

Datasheets - (002) E311062-D1000-TesRec1-DS1Datasheets - (002) E311062-D1000-TesRec1-DS1

Project No. 4790194591
LABORATORY DATA PACKAGE

File E311062

Page 1

Number of pages in this package 38 ~~{ including additional pages _____ }~~
(Fill in when using printed copy as record)

CLIENT INFORMATION			
Company Name	Beijing HollySys Intelligent Technologies Co Ltd		
Address	No 2 Disheng Middle Rd Beijing Technological Development Area Beijing 100176 CHINA		

AUDIT INFORMATION:			
Description of Tests	Per Standard No.	Edition	Revision Date
	UL 61010-1	3rd Edition	2019-07-19
	CSA C22.2 NO. 61010-1-12	3rd Edition	2018-11
	UL 61010-2-201	2nd edition	2018-05-14
	CSA C22.2 NO. 61010-2-201:18	2nd edition	2018-02

[X] Tests Conducted by	Wei Jiang	Wei Jiang
[X] UL Staff conducting or witnessing testing (WTDP, CTF2 (TMP), CTF1 (WMT) only) [] UL Staff supervising UL Staff in training	My printed name is my declaration that all results recorded in this datasheet package are factual and accurate, and that I was present during the testing and data acquisition, where such presence is required by UL CB Scheme and/or WTDP rules. [X] Where Live Stream Video (LSV) is used for remote witness testing of CTF Stage 2, 3 or 4 , it is clearly declared in this datasheet package.	
	Sandy Fu	Sandy Fu
	Printed Name	Signature
[] Authorized Signatory [CTDP, TPTDP, TCP, PPP, CTF1 (WMT), CTF2 (TMP), CTF3 (SMT)]		
	Printed Name	Signature. Include date for CTDP, TPTDP, TCP, PPP, CTF1 (WMT), CTF2 (TMP), CTF3 (SMT)

Datasheets - (002) E311062-D1000-TesRec1-DS1

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LABORATORY DATA PACKAGE

File E311062

Page 2

TESTS TO BE CONDUCTED:			
Test No.	Done ³	Test Name	☒ Comments/Parameters ☐ Tests Conducted by ² ☐ Link to separate data files ⁴
1	X	MAINS SUPPLY (5.1.3):	Compliance
2	X	LIMITED ENERGY CIRCUIT DETERMINATION TEST (9.4)	Compliance
3	X	TEMPERATURE TEST (10.1-10.4) (61010-2-201, 2ND ED. 10.4.1.100-10.4.1.103)	Compliance
4	X	INGRESS PROTECTION - IP CODE 1X-2X - PROTECTED AGAINST [SOLID FOREIGN OBJECTS] [ACCESS TO HAZARDOUS PARTS]	Compliance

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Project No. 4790194591
LABORATORY DATA PACKAGE

File E311062

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Instructions -

1 - When all tests are conducted by one person, name can be inserted here instead of including name on each page containing data.
2 - When test conducted by more than one person, name of person conducting the test can be inserted next to the test name instead of including name on each page containing data. Test dates may be recorded here instead of entering test dates on the individual datasheet pages.
3 - Use of this field is optional and may be employed differently. If used to include a date instead of entering the testing date on the individual datasheet pages, the date shall be the date the test was conducted.
4 - Link to separate data files for a test can be inserted here. The link must be to a server that is accessible to UL staff, that provides for backup, required retention periods and a path, including file name, that does not change and result in a broken link. Not applicable to DAP.

Special Instructions -

[X] Unless specified otherwise in the individual Methods, the tests shall be conducted under the following ambient conditions. Confirmation of these conditions shall be recorded at the time the test is conducted.

<u>Standard</u>	<u>Ambient Temperature,</u> <u>°C</u>		<u>Relative Humidity, %</u>	<u>Barometric Pressure,</u> <u>mBar</u>
	<u>±</u>	<u>±</u>	<u>±</u>	<u>±</u>
60065	25	± 10	Max 75	Not specified
60601-1	+10 to +40		30 to 75	700 to 1060 hPa
60950	Not specified		Not specified	Not specified
60950-1	Not specified		Not specified	Not specified
61010-1	+15 to +35		Max 75	75 to 106 kPa
61215	Not specified		Not specified	Not specified
61646	Not specified		Not specified	Not specified
61730	Not specified		Not specified	Not specified

[] No general environmental conditions are specified in the Standard(s) or have been identified that could affect the test results or measurements.

RISK ANALYSIS RELATED TO TESTING PERFORMANCE:

The following types of risks have been identified. Take necessary precautions. This list is not all inclusive.

[] Electric shock	[] Radiation
[X] Energy related hazards	[] Chemical hazards
[X] Fire	[] Noise
[X] Heat related hazards	[] Vibration
[] Mechanical	[] Other (Specify)___

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 Tested by: _____ Date See individual datasheet

WITNESS TEST DATA PROGRAM (WTDP) INFORMATION:

Environment:	
Accommodations and Environmental conditions, including proper power source meet the requirements of the test standard or UL default criteria (ISO/IEC 17025:2005 Clauses 5.3.1, 5.3.2, 5.3.3, 5.3.4)	☒ Yes ☐ No ☐ N/A
Personnel:	
Lab Management shall authorize personnel to operate particular types of equipment used in testing. (ISO/IEC 17025:2005 Clause 5.5.3)	☒ Yes ☐ No
Equipment:	
Testing is being conducted within the test equipment calibration dates. (See Test Instrument Information Page and ISO/IEC 17025:2005 Clauses 5.5.1, 5.5.2, 5.5.4, 5.5.5, 5.5.8)	☒ Yes ☐ No
Calibrations for testing equipment is traceable to SI Units. Refer to 00-OP-C0032 (Calibration Certificate Analysis). (ISO/IEC 17025:2005 Clause 5.6.2.2)	☒ Yes ☐ No
Critical Consumables:	
Critical consumables are compliant with test standard requirements. (ISO/IEC 17025:2005 Clause 4.6)	☐ Yes ☐ No ☒ N/A
Sample Identification:	
Identification of items to be tested has been made (e.g. model no., Serial No., etc.) (See Test Sample Identification page and ISO/IEC 17025:2005 Clause 5.8.2)	☒ Yes ☐ No
Additional Requirements:	
Testing at a third party laboratory selected by UL and not part of the Third Party Test Data Program requires a Mutual Nondisclosure (NDA) and Confidentiality Agreement, 00-LE-F0025, or alternate agreement form approved by UL's Legal Department to be stored and included with the Test Package.	☐ Yes ☐ No ☒ N/A
Summary:	
The test facility was was not deemed to have the environment and capabilities necessary to perform the tests included in this data package.	

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~~{ } The CAS Staff as indicated below, (a competent L1, L2 or L3 in a similar GCN/Standard for a similar test method) was utilized to conduct the witnessing of tests on behalf of the project handler. (Please complete the table below to document the rationale and approval.)~~

Name of UL Staff conducting WTDP	GCN/Standard to be witnessed	Test(s) to be witnessed	L1, L2 or L3 Competency	Similar GCN/Standard Competency

~~{ } The Field Services Staff Member, as indicated below, (with a competent program competency as authorized by the FOM) was informed and utilized to conduct the witnessing of tests on behalf of the project handler. (Please complete the table below to document the information and approval.)~~

Name of UL Staff conducting WTDP	GCN/Standard to be witnessed	Test(s) to be witnessed	FOM Approver (name)

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datasheet

TEST LOCATION: (To be completed by Staff Conducting the Testing)					
☐ UL or Affiliate	☒ WTDP	☐ CTDP	☐ TPTDP	☐ TCP	☐ PPP
	☐ CTF	☐ CTF	☐ CTF	☐ CTF	
Company Name: ZENITH INTERNATIONAL COMPLIANCES SERVICES CO LTD					
Address: BLDG 14. 25 XIANXING RD, XIANLIN INDUSTRY ZONE, XIANLIN TOWN. YUHANG DISTRICT, HANGZHOU, ZHEJIANG 311122 CHINA					

TEST EQUIPMENT INFORMATION

☐ UL test equipment information is recorded on Meter Use.

☐ UL test equipment information is recorded on <<insert location and local laboratory equipment system identification.>>

Inst.ID No.	Instrument Type	Test Number+ ,Test Title or Conditioning	Function/ Range	Last Cal. Date	Next Cal. Date
D18034	hygrothermograph	1,2,3,4	10°C~40°C; 30%~90%RH	2021-11-15	2022-11-14
D7005	aneroid barometer	1,2,3,4	870~1050hPa	2021-06-14	2022-06-13
D10058	Test sphere without handle (Φ12.5mm) for IP code	4	Φ12.5mm	2021-07-24	2022-07-23
D6109	Force Gauge	4	0~300N	2021-09-27	2022-09-26
D16011	Stop Watch	2	1s~60min	2021-09-27	2022-09-26
D10065	Oscilloscope	2	1mV/div~10V/div;2nS~10S;1kHz 5vpp	2021-05-06	2022-05-05
D10065A	Passive Voltage Probe	2	10MΩ DC:10.0:1 1kHz 10.1:1	2021-05-06	2022-05-05
D13028	Digital Power Meter	1,2,3	ACV: 1~600V ACC: 1mA~20A ACP: 120V/220V 1~20A,1w~12kw Calibration frequency: 50~60HZ DCV: 1~600V DCC: 1mA~20A DCP: 1w~12kw Number of oblique	2021-05-28	2022-05-27
				2022-05-31	2022-05-30

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			waves: 2- 50times 2-10times		
D4018	Digital Power Meter	1,2,3	ACV: 1-600V ACC: 1mA-20A ACP: 120V/220 V 1-20A, 1w- 12kw Calibration frequency: 50 -60HZ DCV: 1-600V DCC: 1mA-20A DCP: 1w-12kw Number of oblique waves: 2- 50times 2-10times	2022-01-24	2023-01-23
D21067	Hybrid Recorder	3	-50°C~400°C	2021-10-15	2022-10-14
D21065	Hybrid Recorder	3	-50°C~400°C	2021-10-15	2022-10-14
D5064	Clock	3	1min-24h	2021-09-27	2022-09-26
D8019	Low Temperature/ Humidity Chamber/Oven	3	-60°C~150°C; 30%~98%RH	2021-07-24	2022-07-23
D16002	Measuring Tape Rule	3	0~2000mm	2021-07-09	2022-07-08
D5039	Torque Driver	3	60~260cN.m	2021-09-27	2022-09-26
D19011	Digital Caliper	3	0-200mm	2021-07-24	2022-07-23
D11014	Thermocouple Wire	3	0°C~200°C	2022-03-11	2023-03-10
D21067	Hybrid Recorder	3	-50°C~400°C	2021-10-15	2022-10-14
D21068	Hybrid Recorder	3	-50°C~400°C	2021-10-15	2022-10-14
D21032	aneroid barometer	3	870~1050hPa	2022-05-23	2023-05-22
D14044	Air Circulation	3	40°C~300°C	2022-03-04	2023-03-03

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	Oven				
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+ - If Test Number is used, the Test Number must be identified on the data sheet pages or on the Data Sheet Package cover page.

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The following additional information is required when using client's or rented equipment, or when a UL ID Number for an instrument number is not used. The Inst. ID No. below corresponds to the Inst. ID No. above.

Inst. ID No.	Make/Model/Serial Number/Asset No.
D18034	Shenzhen jintuojia electronic technology co. LTD / HTC-1 / N/A / N/A
D7005	Shanghai Mengte Instruments & Meters Co., Ltd. / YM3 / 07087 / N/A
D10058	Wuhan Research Institute of Electronic Computer Peripheral Equipment / TZ-2(Test Probe 2) / N/A / N/A
D6109	taiwan ALGOL / NK-300 / 55287 / N/A
D16011	Huibo Industrial & Trading Co., Ltd. / TF807 / N/A / N/A
D10065	Tektronix, Inc. / TDS3034C / C013560 / N/A
D10065A	Tektronix, Inc. / P6139A / N/A / N/A
D13028	Yokogawa Electric Corporation / WT210 / 91N609933 / N/A
D4018	Yokogawa Electric Corporation / WT210 / 270B43735L / N/A
D21067	Zhejiang SUPCON Automation Instrumentation Co., Ltd / R5032 / 310301005260921010003 / N/A
D21065	Zhejiang SUPCON Automation Instrumentation Co., Ltd / R5032 / 310301005260921010001 / N/A
D5064	Guangzhou TIANWANGXING technology Co., Ltd / 8951A / N/A / N/A
D8019	Shanghai Linpin Testing Equipment Co., LTD. / GDJS-100 / LP08-168 / N/A
D16002	Ningbo Great Wall Precision Industrial Co., Ltd. / HY-253W / N/A / N/A
D5039	TOHNICHI MFG. CO., LTD / RTD260CN / 446054U / N/A
D19011	Shanghai meinite industrial co., LTD / 0-200mm / 19030400 / N/A
D11014	OMEGA ENGINEERING INC. / TT-J-30-SLE / 092517B / N/A
D21067	Zhejiang SUPCON Automation Instrumentation Co., Ltd / R5032 / 310301005260921010003 / N/A
D21068	Zhejiang SUPCON Automation Instrumentation Co., Ltd / R5032 / 310301005260921010004 / N/A
D21032	/ DYM3 / 028P5 / N/A
D14044	Guangzhou Wusuo Environmental Equipment Co.,Ltd / PHH-101 / 15102424 / N/A

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TEST SAMPLE IDENTIFICATION:

The table below is provided to establish correlation of sample numbers to specific product related information. Refer to this table when a test identifies a test sample by "Sample No." only.

Sample Card No.	Date Received	[X] Test No.+	Sample No.	Manufacturer, Product Identification and Ratings
2195461	2021-11-10	1,2,3,4	01-A001	Beijing HollySys Intelligent Technologies Co Ltd Model : LK921C Input : 24Vdc (19.2 to 28.8Vdc), max. 2A Ambient temperature: -20 to 70°C
			02-A001	Beijing HollySys Intelligent Technologies Co Ltd Model : LK226CT1 Input : 24Vdc (19.2 to 28.8Vdc), 500mA Ambient temperature: -20 to 70°C
			03-A001	Beijing HollySys Intelligent Technologies Co Ltd Model : LK132C Ambient temperature: -20 to 70°C

+ - If Test Number is used, the Test Number or Numbers the sample was used in must be identified on the data sheet pages or on the Data Sheet Package cover page.

[] Sampling Procedure -

[X] This document contains data or information using color and if printed, should be printed in color to retain legibility and the information represented by the color.

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Date 2022-03-17

MAINS SUPPLY (5.1.3):

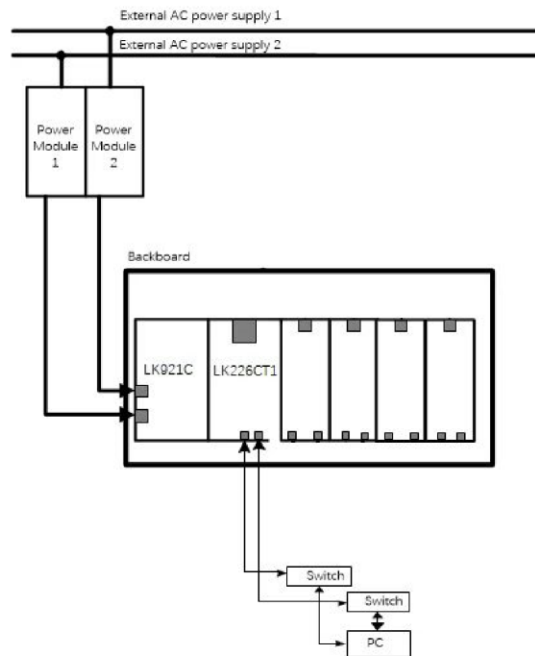
Ambient Temperature, °C 23.9 Ambient Humidity, % 46 Ambient Pressure, Hpa 1030

METHOD

A sample of the unit was connected to a variable voltage and a variable frequency source of supply as noted below and operated until well heated under the conditions of operation noted below. The Input Current (and Power) were measured and recorded below.

Conditions of Operation Normal operation at maximum load continuously, setup as below

EUT Setup:



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MAINS SUPPLY (5.1.3) (CONT'D):

Ambient Temperature, °C 23.9 Ambient Humidity, % 46 Ambient Pressure, HPa 1030

RESULTS

DC-IN1 input

5.1.3c)	TABLE: Mains supply					P
-	Marked rating (V)	24 (19.2 to 28.8)				-
-	Phase	DC				-
-	Frequency (Hz)	N/A				-
-	Current (A)	See below				-
-	Power (W)	N/A				-
-	Power (VA)	N/A				-
Test No.	Voltage (V)	Frequency (Hz)	Current (A)	Power in (W)	Power in (VA)	Comments
DC 19.2 V input						
Model: LK921C						
1	19.2	DC	0.3971	7.625	7.625	-
Model: LK226CT1						
2	18.62	DC	0.3915	7.289	7.289	-
Model: LK132C						
3	-	DC	-	-	-	-
DC 24 V input						
Model: LK921C						
1	24	DC	0.3192	7.661	7.661	Rated 2A
Model: LK226CT1						
2	23.49	DC	0.3114	7.315	7.315	Rated 0.5A
Model: LK132C						
3	-	DC	-	-	-	-
DC 28.8 V input						
Model: LK921C						
1	28.8	DC	0.2699	7.779	7.779	-
Model: LK226CT1						
2	28.32	DC	0.2608	7.386	7.386	-
Model: LK132C						
3	-	DC	-	-	-	-
Note: Measurements are only required for marked ratings.						
Supplementary information: N/A						
Sample No.: 01-A001, 02-A001, 03-A001						

The marked input current or power ~~was~~ [was not] less than 90 % of the maximum measured value

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MAINS SUPPLY (5.1.3) (CONT'D):

Ambient Temperature, °C 23.9 Ambient Humidity, % 46 Ambient Pressure, HPa 1030

RESULTS

DC-IN2 input

5.1.3c)	TABLE: Mains supply					P
-	Marked rating (V)	24 (19.2 to 28.8)				-
-	Phase	DC				-
-	Frequency (Hz)	N/A				-
-	Current (A)	See below				-
-	Power (W)	N/A				-
-	Power (VA)	N/A				-
Test No.	Voltage (V)	Frequency (Hz)	Current (A)	Power in (W)	Power in (VA)	Comments
DC 19.2 V input						
Model: LK921C						
1	19.2	DC	0.3995	7.672	7.672	-
Model: LK226CT1						
2	18.62	DC	0.3945	7.344	7.344	-
Model: LK132C						
3	-	DC	-	-	-	-
DC 24 V input						
Model: LK921C						
1	24	DC	0.3225	7.739	7.739	Rated 2A
Model: LK226CT1						
2	23.47	DC	0.3152	7.397	7.397	Rated 0.5A
Model: LK132C						
3	-	DC	-	-	-	-
DC 28.8 V input						
Model: LK921C						
1	28.8	DC	0.2741	7.896	7.896	-
Model: LK226CT1						
2	28.30	DC	0.2656	7.516	7.516	-
Model: LK132C						
3	-	DC	-	-	-	-
Note: Measurements are only required for marked ratings.						
Supplementary information: N/A						
Sample No.: 01-A001, 02-A001, 03-A001						
The marked input current or power was was not less than 90 % of the maximum measured value						

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MAINS SUPPLY (5.1.3) (CONT'D):

Ambient Temperature, °C 23.9 Ambient Humidity, % 46 Ambient Pressure, HPa 1030

RESULTS

DC-IN1&DC-IN2 input

5.1.3c)	TABLE: Mains supply					P
-	Marked rating (V)	24(19.2 to 28.8)				-
-	Phase	DC				-
-	Frequency (Hz)	N/A				-
-	Current (A)	See below				-
-	Power (W)	N/A				-
-	Power (VA)	N/A				-
Test No.	Voltage (V)	Frequency (Hz)	Current (A)	Power in (W)	Power in (VA)	Comments
DC 19.2 V input						
Model: LK921C						
1	19.2	DC	0.4021	7.724	7.724	-
Model: LK226CT1						
2	18.66	DC	0.3944	7.362	7.362	-
Model: LK132C						
3	-	DC	-	-	-	-
DC 24 V input						
Model: LK921C						
1	24	DC	0.3259	7.828	7.828	2A
Model: LK226CT1						
2	23.52	DC	0.3144	7.397	7.397	0.5A
Model: LK132C						
3	-	DC	-	-	-	-
DC 28.8 V input						
Model: LK921C						
1	28.8	DC	0.2786	8.027	8.027	-
Model: LK226CT1						
2	28.34	DC	0.2643	7.491	7.491	-
Model: LK132C						
3	-	DC	-	-	-	-
Note: Measurements are only required for marked ratings.						
Supplementary information: N/A						
Sample No.: 01-A001, 02-A001, 03-A001						
The marked input current or power was was not less than 90 % of the maximum measured value						

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LIMITED ENERGY CIRCUIT DETERMINATION TEST (9.4):

Ambient Temperature, °C 23.6 Ambient Humidity, % 48 Ambient Pressure, HPa 1030

METHOD

The sample was connected to a 28.8 V dc, _____ Hz, source of supply. The load was then disconnected from each circuit listed below.

The maximum voltage of each circuit was then measured in an open circuit condition (linear) or minimum load condition (switch mode).

Each circuit under test was then resistively loaded, including short circuit (linear), to result in the maximum secondary current after 1 minute of operation.

RESULTS

9.4	TABLE: Limited-energy circuit			P
Item	9.4 a)	9.4 b) Current limitation		Comments
Location	Maximum potential in circuit voltage r.m.s./d.c.; (V)	Maximum available current; (A)	Overload protection after 120 s; (A)	
Model LK226CT1, between D+5V and DGND	5.08	2.80	-	-
Model LK226CT1, between D+5V and DGND (U30 pin 1 to 2, VIN and Output shorted)	0	0	-	Control shut down immediately, there was no output.
Model LK226CT1, between D+5V and DGND (R256 short)	5.27	0	-	Control shut down immediately, there was no output.
Supplementary information: N/A				
Sample No.: 02-A001				

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Tested by: _____ Date 2022-03-17

TEMPERATURE TEST (10.1-10.4)
(61010-2-201, 2ND ED. 10.4.1.100-10.4.1.103)

Ambient Temperature, °C 23.9 Ambient Humidity, % 46 Ambient Pressure, HPa 1030

METHOD

The device was tested under the maximum condition of normal load outlined below until steady state temperatures were obtained. Temperatures were measured by thermocouples and/or change of resistance as indicated.

☐ The equipment was tested on a test corner consisting of two walls at right angles, a floor and if necessary a ceiling, all of plywood approximately 20 mm thick and painted mat black. The linear dimensions of the test corner were at least 15 percent greater than those of the device under test.

☒ The equipment was positioned from the walls, floor, or ceiling as specified by the manufacturer:

Screw mounting as manual.

☐ The equipment was placed as near to the walls as possible.

☐ The equipment was mounted on one wall and as near to the other wall and to the floor or ceiling as was likely to occur in normal use.

☐ The equipment was mounted to the ceiling and as near to the walls as was likely to occur in normal use.

☒ The equipment was built into an installation as noted in the installation instructions. Plywood painted mat black and approximately 10 mm thick when representing the walls of a cabinet, and 20 mm thick when representing the walls of a building, was employed.

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TEMPERATURE TEST (10.1-10.4)

(61010-2-201, 2ND ED. 10.4.1.100-10.4.1.103) (CONT'D):

Ambient Temperature, °C 23.9 Ambient Humidity, % 46 Ambient Pressure, hPa 1030

[X] 61010-2-201 Ambient Testing:

[] Vented equipment, cooled by natural air convection - the AMBIENT TEMPERATURE is the incoming air temperature at a point not more than 50 mm and not less than 25 mm away from the plane of the equipment's air flow entry point. See 61010-2-201, Figure 106. The point with the lowest temperature was used for the ambient temperature.

[X] Non-vented equipment, cooled by natural air convection - the AMBIENT TEMPERATURE is the air temperature at a point not more than 50 mm and not less than 25 mm away from the equipment, on a horizontal plane located at the vertical mid-point of the equipment. See 61010-2-201, see Figure 107. The point with the lowest temperature was used for the ambient temperature.

[] a) Panel Mounted Equipment - Shall be mounted that the 2 Portions of the EUT (EUTa and EUTb) are subjected to their specific environments.

[] b) Panel Mounted Equipment - The total EUT (EUTa + EUTb) shall be mounted in a single environment, which shall be the higher rated temperature of the two, and the recorded temperatures of the lower rated temperature EUT portion are corrected by the difference between the EUT's maximum rated ambient temperature and the actual test ambient temperature.

EXAMPLE: If internal maximum rated ambient temperature = 60 °C and external maximum rated ambient temperature = 50 °C, the test shall be run with a test ambient temperature = 60 °C. Temperatures taken for external ambient would be corrected by -10 °C (50 °C - 60 °C).

[] c) Panel Mounted Equipment - The total EUT (EUTa + EUTb) shall be mounted in a single environment, which shall be the lower rated temperature of the two, and the recorded temperatures of the higher rated temperature EUT portion are corrected by the difference between the EUT's maximum rated ambient temperature and the actual test ambient temperature.

EXAMPLE: If internal maximum rated ambient temperature = 60 °C and external maximum rated ambient temperature = 50 °C, the test shall be run with a test ambient temperature = 50 °C. Temperatures taken for internal ambient would be corrected by +10 °C (60 °C - 50 °C).

[X] for -2-201 2nd Edition only: Temp test shall be conducted at the highest rated ambient specified by the customer but at least 40°C. Specified ambient: 70 °C.

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TEMPERATURE TEST (10.1-10.4)

(61010-2-201, 2ND ED. 10.4.1.100-10.4.1.103) (CONT'D):

Ambient Temperature, °C 23.9 Ambient Humidity, % 46 Ambient Pressure, HPa 1030

Condition of maximum normal load:

Normal operation at maximum load. All load connected and run testing software
EUT setup as page 11. The power supply connector cables with wire
30AWG, 0.56Nm. The equipment shall be tested with minimum
1.22m(4ft) of wire attached to each field-wiring terminal.

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TEMPERATURE TEST (10.1-10.4)

(61010-2-201, 2ND ED. 10.4.1.100-10.4.1.103) (CONT'D):

Ambient Temperature, °C 23.9 Ambient Humidity, % 46 Ambient Pressure, HPa 1030

RESULTS A

DC-IN1&DC-IN2 input

10	TABLE: Temperature Measurements (Thermocouple method)			Pass	
-	Frequency (Hz)	:	N/A	-	
-	Voltage (V)	:	19.2	-	
-	Test room ambient temperature (t _a) (°C) :	:	70	-	
-	Test duration (h min)	:	3h25min	-	
Part / Location		t _m °C	t _c °C	t _{max} °C	Comments
LK132C		-			-
A1.Top cover		76.2	76.3	90	-
A2.Top cover near CPU		72.3	72.4	90	-
A3.Connector SLOT0		74.7	74.8	125	-
A4.Connector SLOT power		77.5	77.6	125	-
A5.PWB near C2		71.1	71.2	105	-
A6.PWB near C1		73.8	73.9	105	-
A7.Mounting bracket(metal)		72.0	72.1	115	-
LK921C		-			-
A8.Top cover		71.2	71.3	90	-
A9.Right side of cover		80.6	80.7	90	-
A10.Terminal block near V+(DC IN-1)		73.0	73.1	115	-
A11.Terminal block near V+(DC IN-2)		72.3	72.4	115	-
A12.left side Cover		72.1	72.2	115	-
A13.Connector J3		75.5	75.6	125	-
A14.L1 winding		74.6	74.7	105	-
A15.PWB between C1 and C8		75.7	75.8	105	-
A16.PWB near L3 and C1		75.5	75.6	105	-
A17.PWB between D1		77.1	77.2	105	-
A18.PWB between L4 and L7		74.1	74.2	105	-
A19.PWB near C6		72.6	72.7	105	-
A20.PWB near C5		74.5	74.6	105	-
A21.Connector J2		73.3	73.4	105	-
LK226CT1		-			-
A22.Top Cover		75.6	75.7	115	-
A23.left side Cover		85.9	86.0	115	-
A24.Connector X1		76.7	76.8	105	-

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10	TABLE: Temperature Measurements (Thermocouple method)				Pass
A25.right side Cover	77.2	77.3	115	-	
A26.Connector J3	92.5	92.6	125	-	
A27.PWB between C222 and U30	94.6	94.7	105	-	
A28.PWB near L29	96.3	96.4	105	-	
A29.PWB between C52 and U22	83.1	83.2	105	-	
A30.PWB near Middle Heatsink	95.1	95.2	105	-	
A31.PWB near U23	93.6	93.7	105	-	
A32.PWB near J6	92.8	92.9	105	-	
B1.Connecto J16	89.7	89.8	105	-	
B2.PWB near BAT	77.1	77.2	105	-	
B3.Ambient 1(Front) 25mm	70.1	70	70	-	
B4.Ambient 2(bottom) 25mm	69.9		70	-	
B5.Ambient 3(left) 25mm	70.8		70	-	
B6.Ambient 4(right) 25mm	70.5		70	-	
Supplementary information:					
Sample No.: 01-A001, 02-A001, 03-A001					
Where: t_m = measured temperature					
$t_c = t_m$ corrected ($t_m - t_a + 40^{\circ}\text{C}$ or max. rated ambient)					
t_{max} = maximum permitted temperature					
[X] 61010-2-201, 2 nd ed Ambient Temperature measurement:					
Location front Ambient 70.1 Distance from enclosure 25 mm					
Location bottom Ambient 69.9 Distance from enclosure 25 mm					
Location left Ambient 70.8 Distance from enclosure 25 mm					
Location right Ambient 70.5 Distance from enclosure 25 mm					

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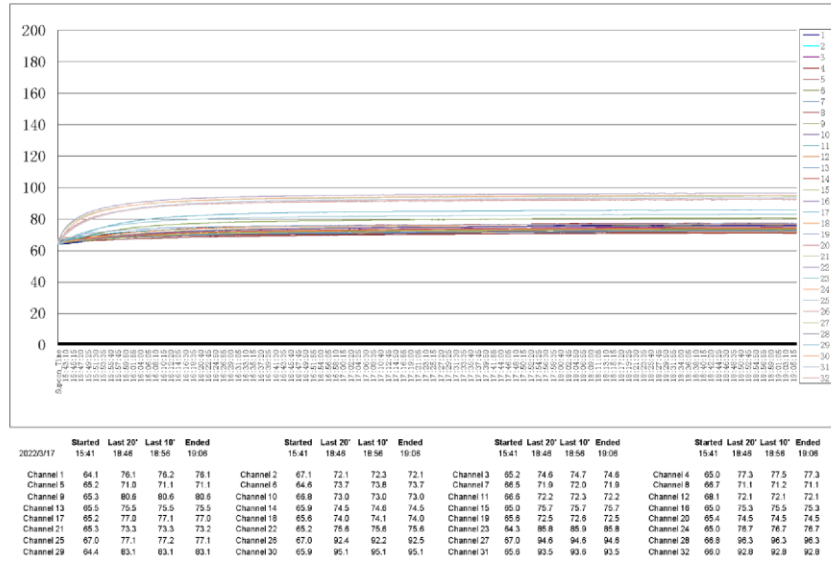
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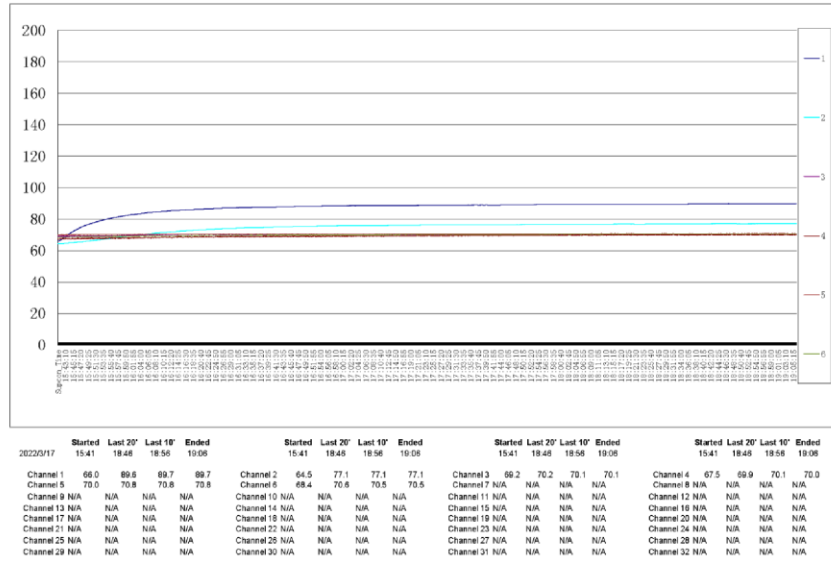
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TEMPERATURE TEST (10.1-10.4)

(61010-2-201, 2ND ED. 10.4.1.100-10.4.1.103) (CONT'D):

Ambient Temperature, °C 23.9 Ambient Humidity, % 46 Ambient Pressure, HPa 1030

RESULTS B

DC-IN1&DC-IN2 input

10	TABLE: Temperature Measurements (Thermocouple method)			Pass	
-	Frequency (Hz)	:	N/A	-	
-	Voltage (V)	:	28.8	-	
-	Test room ambient temperature (t _a) (°C) :	:	70	-	
-	Test duration (h min)	:	3h22min	-	
Part / Location		t _m °C	t _c °C	t _{max} °C	Comments
LK132C		-			-
C1.Top case		76.5	76.5	90	-
C2.Housing near CPU		72.2	72.2	90	-
C3.Connector SLOT0		75.0	75.0	125	-
C4.Connector SLOT power		77.6	77.6	125	-
C5.PWB near C2		71.4	71.4	105	-
C6.PWB near C1		74.1	74.1	105	-
C7.Mounting bracket(metal)		72.1	72.1	115	-
LK921C		-			-
C8.Top case		70.7	70.7	105	-
C9.Right side housing		81.0	81.0	105	-
C10.Terminal block near V+(DC IN-1)		72.5	72.5	115	-
C11.Terminal block near V+(DC IN-2)		72.0	72.0	115	-
C12.left side Cover		72.0	72.0	115	-
C13.Connector J3		76.0	76.0	125	-
C14.L1 winding		74.8	74.8	105	-
C15.PWB between C1 and C8		75.0	75.0	105	-
C16.PWB near L3 and C1		75.7	75.7	105	-
C17.PWB between D1		76.5	76.5	105	-
C18.PWB between L4 and L7		75.1	75.1	105	-
C19.PWB near C6		72.7	72.7	105	-
C20.PWB near C5		74.6	74.6	105	-
C21.Connector J2		73.2	73.2	105	-
LK226CT1		-			-
C22.Top Cover		75.5	75.5	115	-
C23.left side Cover		86.3	86.3	115	-
C24.Connector X1		76.8	76.8	105	-

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10	TABLE: Temperature Measurements (Thermocouple method)				Pass
C25.right side Cover	76.7	76.7	115	-	
C26.Connector J3	93.2	93.2	125	-	
C27.PWB between C222 and U30	95.6	95.6	105	-	
C28.PWB near L29	97.7	97.7	105	-	
C29.PWB between C52 and U22	83.0	83.0	105	-	
C30.PWB near Middle Heatsink	95.5	95.5	105	-	
C31.PWB near U23	93.8	93.8	105	-	
C32.PWB near J6	93.4	93.4	105	-	
D1.Connecto J16	90.1	90.1	105	-	
D2.PWB near BAT	77.2	77.2	105	-	
D3.Ambient 1(Front) 25mm	70.2	70	70	-	
D4.Ambient 2(bottom) 25mm	70.0		70	-	
D5.Ambient 3(left) 25mm	70.4		70	-	
D6.Ambient 4(right) 25mm	70.3		70	-	
7.Ambient 5(back) 25mm	-	-	-	-	
Supplementary information: Sample No.: 01-A001, 02-A001, 03-A001 Where: t_m = measured temperature $t_c = t_m$ corrected ($t_m - t_a + 40$ °C or max. rated ambient) t_{max} = maximum permitted temperature [X] 61010-2-201, 2 nd ed Ambient Temperature measurement: Location <u>front</u> Ambient <u>70.2</u> Distance from enclosure <u>25</u> mm Location <u>bottom</u> Ambient <u>70.0</u> Distance from enclosure <u>25</u> mm Location <u>left</u> Ambient <u>70.4</u> Distance from enclosure <u>25</u> mm Location <u>right</u> Ambient <u>70.3</u> Distance from enclosure <u>25</u> mm					

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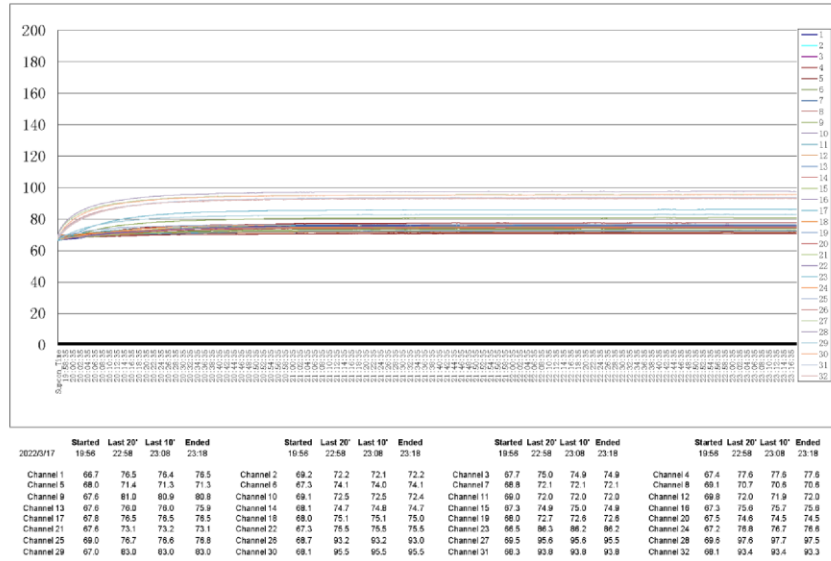
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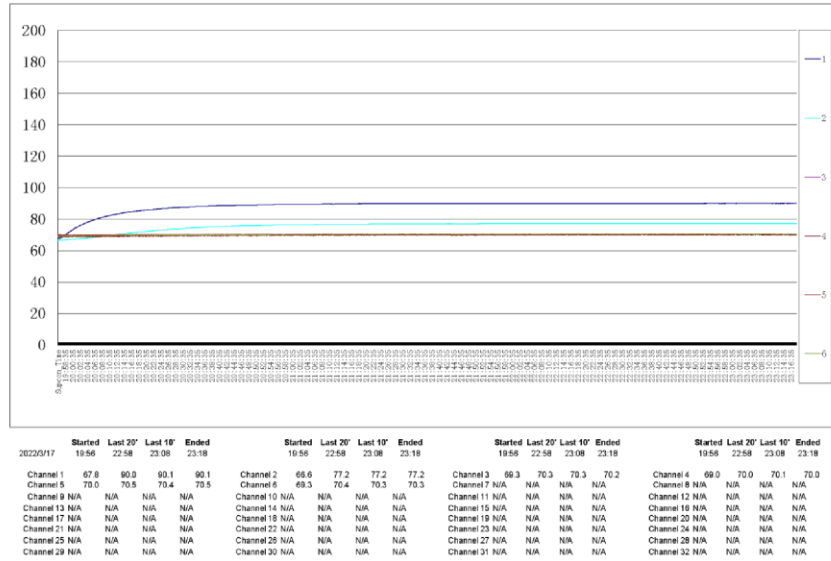
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TEMPERATURE TEST (10.1-10.4)

(61010-2-201, 2ND ED. 10.4.1.100-10.4.1.103) (CONT'D):

Ambient Temperature, °C 24.1 Ambient Humidity, % 48 Ambient Pressure, HPa 1030

RESULTS B

DC-IN2 input

10	TABLE: Temperature Measurements (Thermocouple method)			Pass
-	Frequency (Hz)	:	N/A	-
-	Voltage (V)	:	19.2	-
-	Test room ambient temperature (t _a) (°C) :		70	-
-	Test duration (h min)	:	3h21min	-
Part / Location	t _m °C	t _c °C	t _{max} °C	Comments
LK132C	-			-
E1.Top case	77.0	77.0	90	-
E2.Housing near CPU	72.4	72.4	90	-
E3.Connector SLOT0	75.2	75.2	125	-
E4.Connector SLOT power	78.1	78.1	125	-
E5.PWB near C2	71.4	71.4	105	-
E6.PWB near C1	74.5	74.5	105	-
E7.Mounting bracket (metal)	72.4	72.4	115	-
LK921C	-			-
E8.Top case	73.1	73.1	105	-
E9.Right side housing	81.2	81.2	105	-
E10.Terminal block near V+(DC IN-1)	75.0	75.0	115	-
E11.Terminal block near V+(DC IN-2)	70.4	70.4	115	-
E12.left side Cover	72.2	72.2	115	-
E13.Connector J3	76.5	76.5	125	-
E14.L1 winding	75.1	75.1	105	-
E15.PWB between C1 and C8	75.4	75.4	105	-
E16.PWB near L3 and C1	76.2	76.2	105	-
E17.PWB between D1	77.0	77.0	105	-
E18.PWB between L4 and L7	75.4	75.4	105	-
E19.PWB near C6	73.6	73.6	105	-
F01.PWB near C5	75.1	75.1	105	-
F02.Connector J2	73.6	73.6	105	-
LK226CT1	-			-
F03.Top Cover	75.8	75.8	115	-

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10	TABLE: Temperature Measurements (Thermocouple method)				Pass
F04.left side Cover	87.0	87.0	115	-	
F05.Connector X1	77.0	77.0	105	-	
F06.right side Cover	77.0	77.0	115	-	
F07.Connector J3	93.9	93.9	125	-	
F08.PWB between C222 and U30	95.8	95.8	105	-	
F09.PWB near L29	98.0	98.0	105	-	
F10.PWB between C52 and U22	83.3	83.3	105	-	
F11.PWB near Middle Heatsink	95.8	95.8	105	-	
F12.PWB near U23	94.1	94.1	105	-	
F13.PWB near J6	93.9	93.9	105	-	
F14.Connecto J16	90.3	90.3	105	-	
F15.PWB near BAT	77.6	77.6	105	-	
F16.Ambient 1(Front) 25mm	70.1	70	70	-	
F17.Ambient 2(bottom) 25mm	70.1		70	-	
F18.Ambient 3(left) 25mm	70.9		70	-	
F19.Ambient 4(right) 25mm	70.6		70	-	
Supplementary information:					
Sample No.: 01-A001, 02-A001, 03-A001					
Where: t_m = measured temperature					
$t_c = t_m$ corrected ($t_m - t_a + 40\text{ }^{\circ}\text{C}$ or max. RATED ambient)					
t_{max} = maximum permitted temperature					
[X] 61010-2-201, 2 nd ed Ambient Temperature measurement:					
Location <u>front</u> Ambient <u>70.1</u> Distance from enclosure <u>25</u> mm					
Location <u>bottom</u> Ambient <u>70.1</u> Distance from enclosure <u>25</u> mm					
Location <u>left</u> Ambient <u>70.9</u> Distance from enclosure <u>25</u> mm					
Location <u>right</u> Ambient <u>70.6</u> Distance from enclosure <u>25</u> mm					

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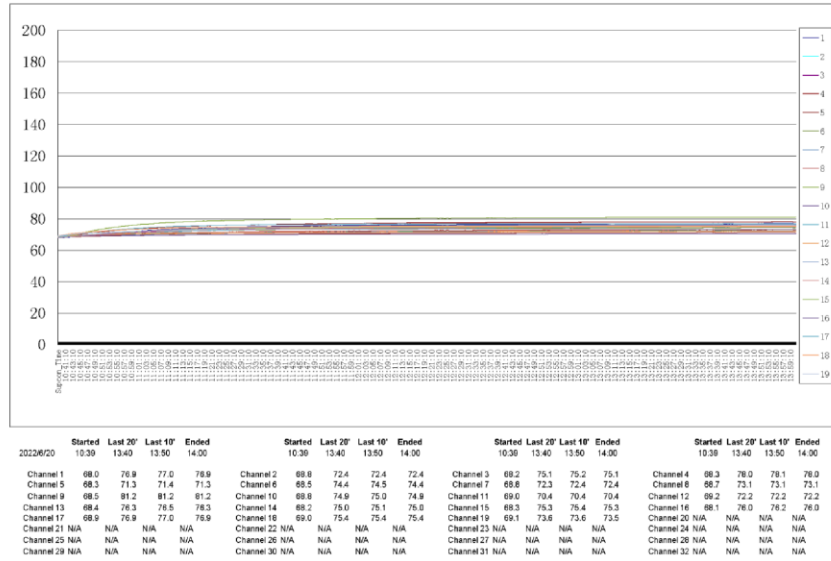
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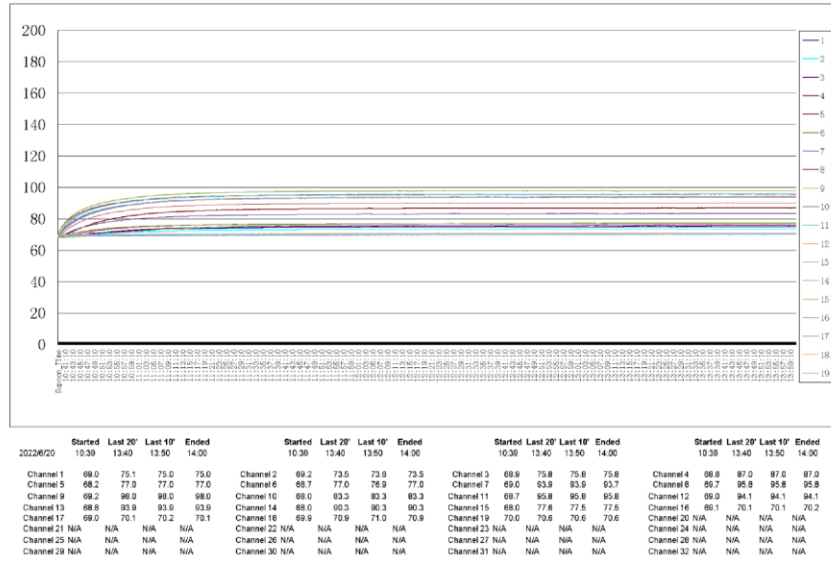
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TEMPERATURE TEST (10.1-10.4)

(61010-2-201, 2ND ED. 10.4.1.100-10.4.1.103) (CONT'D):

Ambient Temperature, °C 23.9 Ambient Humidity, % 46 Ambient Pressure, HPa 1030

The temperatures measured ~~did not~~ ~~did~~ exceed the limits in Table 19 and Table 20 at an ambient of 70° C

[X] Indicate reason for test termination:

[X] Temperature stabilization determined by no change in temperature for 2°C readings 60 minutes apart. Test duration was 3h25min/3h22min/3h21min hours.

[] Test terminated because _____.

Example: Temperature Stabilization e.g. Temperature raise less than 2 degree C within 1 hour, (from 60601-1 and 60950, CTL DSH 335 (61010-1))

Note: If equipment is rated higher than 40° C the temperature may have to be repeated at this elevated temperature.

Note: 61010-2-201, 2nd ed - All testing to be conduct at rated ambient except for large equipment.

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TEMPERATURE TEST (10.1-10.4)

(61010-2-201, 1ST ED. 10.4.1.100-10.4.1.103) (CONT'D):**Table 19 – Surface temperature limits in NORMAL CONDITION**

Part	Limit °C
1 Outer surface of ENCLOSURE (unintentional contact)	
a) metal, uncoated or anodized	65
b) metal, coated (paint, non metallic)	80
c) plastics	85
d) glass and ceramics	80
e) small areas (<2 cm ²) that are not likely to be touched in NORMAL USE	100
2 Knobs and handles (NORMAL USE contact)	
a) metal	55
b) plastics	70
c) glass and ceramics	65
d) non-metallic parts that in NORMAL USE are held only for short periods (1 s – 4 s)	70
NOTE EN 563 gives information about the effect of the duration of contact.	

Table 20 – Maximum temperatures for insulation material of windings

Class of insulation (see IEC 60085)	NORMAL CONDITION °C	SINGLE FAULT CONDITION °C
Class A	105	150
Class B	130	175
Class E	120	165
Class F	155	190
Class H	180	210

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TEMPERATURE TEST (10.1-10.4)

(61010-2-201, 2nd ed. 10.4.1.100-10.4.1.103) (CONT'D):**TABLE 19 - 61010-2-201**

Part	ENCLOSED EQUIPMENT °C	OPEN EQUIPMENT °C
1 Outer surface of ENCLOSURE or barrier (unintentional contact)	65	70
a) metal uncoated or anodized	80	85
b) metal coated (paint, non-metallic)	85	85
c) plastics	80	85
d) glass and ceramics	100	100
e) small areas ($\sim 2 \text{ cm}^2$) that are not likely to be touched in NORMAL USE		
2 Knobs and handles (NORMAL USE contact)		
a) metal	55	55
b) plastics	70	70
c) glass and ceramics	65	70
d) non-metallic parts that in NORMAL USE are held only for short periods (1 s-4 s)	70	85
NOTE 1 NORMAL USE contact could be surfaces touched by an OPERATOR in NORMAL USE or by SERVICE PERSONNEL.		
NOTE 2 This table is based on IEC Guide 117:2010.		

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~~TEMPERATURE TEST (10.1-10.4)~~~~(61010-2-201, 2nd ED. 10.4.1.100-10.4.1.103) (CONT'D):~~~~Ambient Temperature, °C _____ Ambient Humidity, % _____ Ambient Pressure, mBar _____~~~~CHANGE-OF-RESISTANCE CALCULATIONS~~~~FORMULA: $\Delta T = \frac{(R_{warm} - R_{cold})}{(K + t_1) - (t_2 - t_1)} R_{cold}$~~ ~~Where: ΔT is the temperature rise of the coil.~~ ~~R_{warm} is the hot resistance of the coil.~~ ~~R_{cold} is the cold resistance of the coil.~~~~K is 234.5 for copper and 225.0 for aluminum.~~~~T1 is the room ambient when the cold measurements were made.~~~~T2 is the room ambient when the hot measurements were made.~~

10.2 TABLE: Temperature of windings (Resistance method)							
Frequency (Hz)							-
Voltage (V)							-
Test room ambient temperature (t_{a1}/t_{a2}) (°C)							-
Test duration (h min)							-
Part / Designation	R_{cold} (Ω)	R_{warm} (Ω)	Current (A)	t_e (K)	t_e^* (°C)	t_{max} (°C)	Comments
Supplementary information:							
$t_e^* = t_e \text{ corrected } (t_e^* = t_e - (t_{a2} - t_{a1}) + [40^\circ\text{C or max RATED ambient}])$							

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INGRESS PROTECTION - IP CODE 1X-2X - PROTECTED AGAINST [SOLID
FOREIGN OBJECTS][ACCESS TO HAZARDOUS PARTS]:Clause [12][13] of IEC 60529, Edition 2.2, Issued 2013-08 + Corr. 1:2013-
10 + Corr. 2:2015-01

Ambient Temperature, °C 23.6 Ambient Humidity, % 48 Ambient Pressure, hPa 1030

METHOD

A sample of ~~{ Cat. No(s). }~~ [Model No(s).] LK921C/ LK226CT1 device [was] ~~{ were each }~~ ~~{ supported }~~ ~~{ positioned }~~ [in the intended mounting position] ~~{ per the client's stated instructions }~~.

For first characteristic numeral 1 (IP10): A 50 mm +0.05/-0 mm diameter rigid sphere without a handle or guard was pushed against any openings on the air outlet side with the force of 50 N ± 5 N.

[x] For first characteristic numeral 2 (IP20) - a) Standard Test Finger: A steel test finger as depicted in the standard was used. Both joints of this finger may have been bent through an angle of 90° with respect to the axis of the finger, but in one and the same direction only. The finger was pushed with a force not to exceed 10 N against any openings on the air inlet side. If it entered any opening, it was placed in every possible position. Moving parts of the machine were rotated slowly, where this was possible.

[x] For first characteristic numeral 2 (IP20) - b) Sphere test: A 12.5 mm +0.05/-0 mm diameter rigid sphere without a handle or a guard was pushed against any openings on the air inlet side with a force of 30 N ± 3 N. Moving parts of the machine were rotated slowly, where this was possible.

RESULTS

Test	Applied Force, N
IP10 - Air Outlet	--
IP20 - Air Inlet	30N

~~For IP10 on the air outlet side:~~

~~{ } The sphere did not pass through any opening and adequate clearance was maintained to moving parts of the apparatus.~~

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~~[] The sphere passed through the _____
opening located _____ or the sphere
contacted moving parts of the machine.~~

For IP20 on the air inlet side using the Standard Test Finger:

[x] Adequate clearance was maintained between the test finger and any moving parts of the apparatus. Note that it was permissible to contact smooth rotating shafts and similar non-dangerous parts of the apparatus.

[] The test finger contacted the following moving parts of the apparatus, other than those permitted: _____ .

For IP20 on the air inlet side using the 12.5 mm sphere:

[x] The sphere did not pass through any opening and adequate clearance was maintained to moving parts of the apparatus.

[] The sphere passed through the _____
opening located _____ or
the sphere contacted moving parts of the machine.

Datasheets - (002) E311062-D1000-TesRec1-DS1

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Tested by: _____ Date 2022-03-18

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Form Issued: 2017-04-18
Form Revised: 2020-09-18

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Only those products bearing the UL Mark should be considered as being covered by UL.

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

CERTIFICATE OF COMPLIANCE

Certificate Number 2022-07-13-E311062
Report Reference E311062-D1000-1/A0/C0-UL
Date 2022-07-13

Issued to: BEIJING HOLLYSYS INTELLIGENT TECHNOLOGIES CO LTD
Applicant Company: No 2 Disheng Middle Rd
Beijing Technological Development Area
Beijing 100176 CHINA

Listed Company: Same as Applicant

**This is to certify that
representative samples of**

Programmable controller
6-slot backboard module, Model LK132C
Static trusted controller, Model LK226CT1
24V power switching module, Model LK921C

Have been investigated by UL in accordance with the
Standard(s) indicated on this Certificate.

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

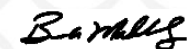
Additional Standards: UL 61010-2-201, 2nd Edition, Issue date 2018/05/14.
CAN/CSA-C22.2 No. 61010-2-201:18, 2nd Edition, Issue date
2018/02

Additional Information: See the UL Online Certifications Directory at
www.ul.com/database for additional information.

This Certificate of Compliance does not provide authorization to apply the UL Mark. Only the UL Follow-Up Services Procedure provides authorization to apply the UL Mark.

Only those products bearing the UL Mark should be considered as being UL Certified and covered under UL's Follow-Up Services.

Look for the UL Certification Mark on the product.



Bruce Mahrenholz, Director North American Certification Program
UL LLC

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