



Underwriters Laboratories (UL LLC) Safety Certification Report

Model: PT2043, PT2070, PT2080, PT2100,
PK2043, PK2070, PK2080, PK2100,
xPT2043, xPT2070, xPT2080, xPT2100,
KT2043, KT2070, KT2080, KT2100,
FT2043, FT2070, FT2080, FT2100,
OP2043, OP2070, OP2080, OP2100,
MT2043, MT2070, MT2080, MT2100,
NT2043, NT2070, NT2080, NT2100,
XT2043, XT2070, XT2080, XT2100,
TP2043, TP2070, TP2080, TP2100,
LT2043, LT2070, LT2080, LT2100,
VT2043, VT2070, VT2080, VT2100,
IW405H, IW407H, IW408H, IW410H,
may be followed 11 alphanumeric characters.

Device Description: Human Machine Interface (HMI)

Applicant: CERMATE TECHNOLOGIES INC
7F-1 No 168 Liancheng Rd Zhonghe Dist
New Taipei City, 23553 Taiwan

Manufacturer: Same as Applicant

Manufacturing Facility(ies): CERMATE TECHNOLOGIES INC
7F-1 No 168 Liancheng Rd Zhonghe Dist
New Taipei City, 23553 Taiwan

Advantech Technology (China) Co; Ltd
600 Han-Pu Rd Yushan Town,
Kunshan Jiangsu 215316, CHINA

Report No.: E465558-D1000-1/A2/C2-UL

Report (Re)Issue Date: 2018-05-25; 2018-08-24(A1); 2018-09-20(C1); 2018-11-19(A2); 2020-09-16(C2)

Base Standard(s): UL 61010-1, 3rd Edition, April 29, 2016
CAN/CSA-C22.2 No. 61010-1, 3rd Edition, April 2016

Additional Standards: UL 61010-2-201, First Edition, February 20, 2017
CSA C22.2 NO. 61010-2-201, First Edition, February, 2014

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
2018-08-24	(A1) Add Type 4X enclosure rating according to UL 50E 2nd Edition, October 16, 2015	Hans Hsieh
2018-09-20	SR5047972.1167131: Correction- Update applicant's address to "7F-1 No 168 Liancheng Rd Zhonghe Dist New Taipei City 23553 Taiwan" (E465558-D1000-1/A1/C1)	Melissa Lai
2018-11-19	(A2) See below modification items: 1. to alternate front panel material (metallic) 2. to evaluate the alternate material compliance with Type 4x according to UL50E 3. to add the following new models with identical design for marketing purpose only - xPT2043/xPT2070/xPT2080/xPT2100 - KT2043/KT2070/KT2080/KT2100 - FT2043/FT2070/FT2080/FT2100 - OP2043/OP2070/OP2080/OP2100 - MT2043/MT2070/MT2080/MT2100 - NT2043/NT2070/NT2080/NT2100 - XT2043/XT2070/XT2080/XT2100 - TP2043/TP2070/TP2080/TP2100 - LT2043/LT2070/LT2080/LT2100 - VT2043/VT2070/VT2080/VT2100 - IW405H/IW407H/IW408H/IW410H	Hans Hsieh
2020-09-16	SR5367708.1324026: Correction- Updates Factory ID for CERMATE TECHNOLOGIES INC. (Factory ID: CT1); Advantech Technology (China) Co; Ltd (Factory ID: AC2)(E465558-D1000-1/A2/C2)	Funny Kwok

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.	E465558-D1000-1/A2/C2-UL
Date of issue	2018-05-25; 2018-08-24(A1); 2018-09-20(C1); 2018-11-19(A2); 2020-09-16(C2)
Total number of pages	67
Testing Laboratory	SUPERIOR PRODUCT CONSULTING INC
Address	3RD FL, 10 ALLEY 6, LANE 235 PAO CHIAO RD, HSIN-TIEN, TAIPEI, 23145 TAIWAN
Applicant's name	CERMATE TECHNOLOGIES INC
Address	7F-1 No 168 Liancheng Rd Zhonghe Dist New Taipei City, 23553 Taiwan
Test specification:	
Standard	IEC 61010-1:2010 (Third Edition)
Test procedure	UL Certification
Non-standard test method.....	N/A
Test Report Form No.....	IEC61010_1J
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:	Human Machine Interface (HMI)	
Trade Mark:	Trademark image(s): 	
Manufacturer:	Same as Applicant	
Model/Type reference:	PT2043, PT2070, PT2080, PT2100, PK2043, PK2070, PK2080, PK2100, xPT2043, xPT2070, xPT2080, xPT2100, KT2043, KT2070, KT2080, KT2100, FT2043, FT2070, FT2080, FT2100, OP2043, OP2070, OP2080, OP2100, MT2043, MT2070, MT2080, MT2100, NT2043, NT2070, NT2080, NT2100, XT2043, XT2070, XT2080, XT2100, TP2043, TP2070, TP2080, TP2100, LT2043, LT2070, LT2080, LT2100, VT2043, VT2070, VT2080, VT2100, IW405H, IW407H, IW408H, IW410H, may be followed 11 alphanumeric characters.	
Ratings:	Power input: 24Vdc, 0.4A for Serie 2043 with prefix PT, PK, xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT, and IW405H Power input: 24Vdc, 0.8A for Serie 2070, 2080, 2100 with prefix PT, PK, xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT, IW and IW407H, IW408H, IW410H	
Testing procedure and testing location:		
<input checked="" type="checkbox"/> UL/DAP Testing Laboratory:		
Testing location/ address:	SUPERIOR PRODUCT CONSULTING INC 3RD FL, 10 ALLEY 6, LANE 235 PAO CHIAO RD, HSIN-TIEN, TAIPEI, 23145 TAIWAN	
Tested by (name + signature):	Hans Hsieh(Project Handler)	
Approved by (name + signature):	Cloud Chen(Project Reviewer)	
[] Testing procedure: WMT:		
Testing location/ address:		
Tested by (name + signature):		
Approved by (name + 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:	These devices are HMI and intended for use in the industrial application. All series are equipped with different combination of communication ports including USB, RJ45 type ethernet, RS232, RS485, RS422.
Connection to mains supply:	Not connect to MAINS directly
Overvoltage category:	Not connect to MAINS directly
Pollution degree:	2
Means of protection:	Class III
Environmental conditions:	Extended operating temperature -10 to 60 °C
For use in wet locations:	No
Equipment mobility:	Permanently mounted
Operating conditions:	Continuous
Overall size of equipment (W x D x H)	Series 2043 with prefix PT, PK, xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT, and IW405H: 129mm by 103mm by 33mm Series 2070 with prefix PT, PK, xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT, and IW407H: 203.5mm by 148.5mm by 37mm Series 2080 with prefix PT, PK, xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT, and IW408H: 233mm by 176mm by 42.2mm Series 2100 with prefix PT, PK, xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT, and IW410H: 270.8mm by 212.8mm by 42.5mm
Mass of equipment (kg):	Series 2043 with prefix PT, PK, xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT and IW405H: 0.23kg max. Series 2070 and 2080, with prefix PT, PK, xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT and IW407H and IW408H: 0.55kg max. Series 2100 with prefix PT, PK, xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT and IW410H: 1.1kg max.
Marked degree of protection to IEC 60529:	N/A
Testing	
Date of receipt of test item(s)	2017-12-13 ;2018-01-15 ; 2018-05-10(A1); 2018-09-26(A2)
Dates tests performed	2018-03-16 to 2018-03-29; 2018-05-10(A1); 2018-11-07(A2)
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 testing laboratory.

"(see ENCLOSURE #)" refers to additional information appended to the report.

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

Bottom lines for measurement tables Form A.xx are optional if used as record.

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 HMI and intended for use in the industrial application. All series are equipped with different combination of communication ports including USB, RJ45 type ethernet, RS232, RS485, RS422.

Model Differences

See Nomenclature of Models PT and PK series in Enclosure Miscellaneous.

Models PT2070, PT2080, PT2100 series have identical circuit design except for Enclosure size, Panel size, model designation.

Model PT2043 is similar to Models PT2070, PT2080, PT2100 except for input current rating, Enclosure size, Panel size, main board, model designation.

Models PK series are similar to Models PT series except for model designation or signal port combinations.

(A2) Models xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT, IW series have identical circuit design to PT and PK series except for model designation for marketing purpose.

Additional Information

All of models are SELV circuit and supplied by UL Listed 61010-2-201 SELV power..

Technical Considerations

- The product was investigated to the following standards:

Main Standard(s):

UL 61010-1, 3rd Edition, April 29, 2016

CAN/CSA-C22.2 No. 61010-1, 3rd Edition, April 2016

From Country Differences:

- USA / Canada: UL 61010-1, 3rd Edition, 2012-05-11 / CAN/CSA-C22.2 No. 61010-1, 3rd Edition, 2012-05

Additional Standards:

UL 61010-2-201, First Edition, February 20, 2017

CSA C22.2 NO. 61010-2-201, First Edition, February, 2014

- The following additional investigations were conducted: Type 4X rating according to UL50E, 2nd Edition, October 16, 2015
- The product was not investigated to the following standards or clauses: N/A
- The following accessories were investigated for use with the product: N/A
- N/A

Engineering Conditions of Acceptability

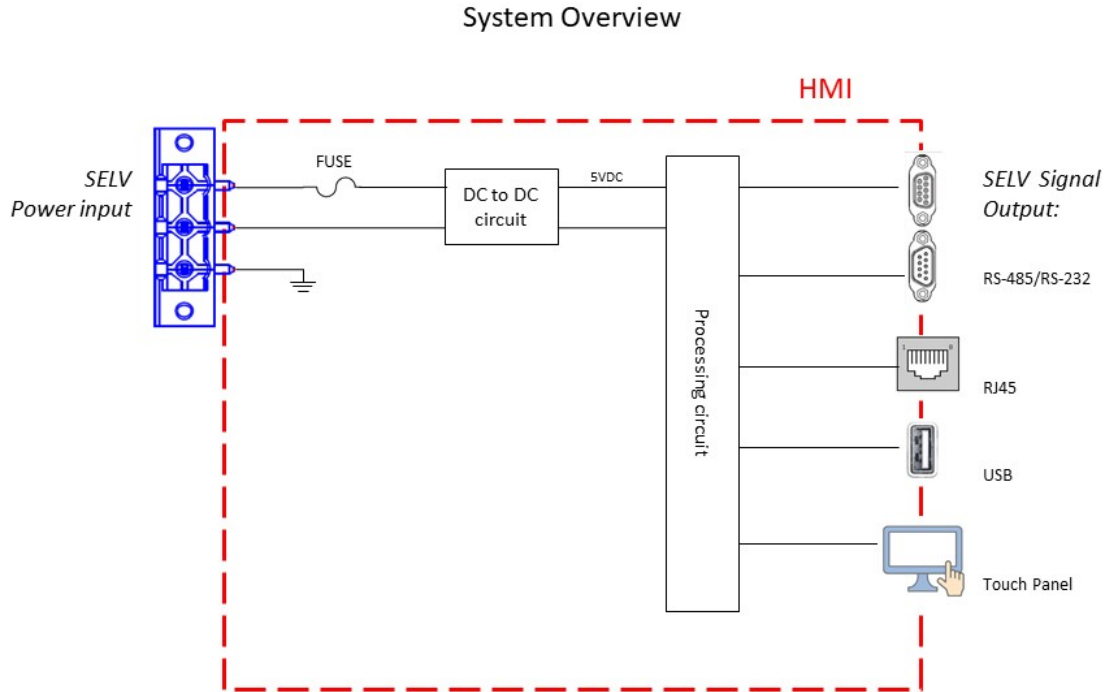
When installed in an end-product, consideration must be given to the following:

None

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

Insulation Diagram - (01) 01. System overview

Insulation Diagram - (01) 01. System overview



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		-
4.4.2.2	PROTECTIVE IMPEDANCE		N/A
4.4.2.3	PROTECTIVE CONDUCTOR	No protective earth (class III equipment).	N/A
4.4.2.4	Equipment or parts for short-term or intermittent operation		N/A
4.4.2.5	Motors	No motor.	-
	- stopped while fully energized		N/A
	- prevented from starting		N/A
	- one phase interrupted (multi-phase)		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.4.2.6	Capacitors		N/A
4.4.2.7	MAINS transformers	No MAINS transformer.	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		N/A
	- 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
5.1.1	Required equipment markings		-
	- visible from the exterior; or	Marking is provided on chassis.	Pass
	- visible after removing cover or opening door		N/A
	- visible after removal from a rack or panel		N/A
	Not put on parts which can be removed by an operator		N/A
	Letter symbols (IEC 60027) used		Pass
	Graphic symbols (IEC 61010-1: Table 1) used	Symbol 5 for functional ground. Symbol 14 for warning mark.	Pass
5.1.2	Identification	The following information is provided on the label.	Pass
	Equipment is identified by:		-
	a) Manufacturer's or supplier's name or trademark	CERMATE TECHNOLOGIES INC	Pass
	b) Model number, name or other means	Models PT and PK series	Pass
	Manufacturing location identified	See factory ID.	Pass

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.1.3	MAINS supply	Device is not connected to MAINS directly.	N/A
	Equipment is marked as follows:	Power input: 24Vdc, 0.4A for models PT2043, PK2043 Power input: 24Vdc, 0.8A for models PT2070, PT2080, PT2100, PK2070, PK2080, PK2100	-
	a) Nature of supply:		-
	1) a.c. RATED MAINS frequency or range of frequencies:		-
	2) d.c. with symbol :		-
	b) RATED supply voltage(s) or range:	See above.	-
	c) Max. RATED power (W or VA) or input current:	See above.	-
	The marked value not less than 90 % of the maximum value	See Mains Supply test in datasheet.	N/A
	If more than one voltage range:		-
	Separate values marked; or		N/A
	Values differ by less than 20 %		N/A
	d) OPERATOR-set for different RATED supply voltages:		-
	Indicates the equipment set voltage		N/A
	Portable equipment indication is visible from the exterior		N/A
	Changing the setting changes the indication		N/A
	e) Accessory MAINS socket-outlets accepting standard MAINS plugs are marked:		-
	With the voltage if it is different from the MAINS supply voltage:		-
	For use only with specific equipment		N/A
	If not marked for specific equipment it is marked with:		-
	The maximum rated current or power; or		N/A
	Symbol 14 with full details in the documentation		N/A
5.1.4	Fuses		N/A
	Operator replaceable fuse marking (see also 5.4.5):	No replaceable fuse.	-
5.1.5	TERMINALS, connections and operating devices	These devices have the following external terminals: (1) Power input (SLEV) (2) Functional terminal (3) USB, COM, Ethernet ports	N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.1.5.1	General		-
	Where necessary for safety, indication of purpose of TERMINALS, connectors, controls and indicators marked	All markings is provided on metal chassis near each connector.	Pass
	If insufficient space, symbol 14 used		N/A
	Push-buttons and actuators of emergency stop devices and indicators:		-
	- used only to indicate a warning of danger; or		N/A
	- the need for urgent action		N/A
	- coloured red		N/A
	- coded as specified in IEC 60073		N/A
	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	Device is not connected to MAINS directly.	N/A
	Other TERMINAL marking:		-
	a) FUNCTIONAL EARTH TERMINALS (symbol 5 used)	Frame screw serves as functional ground terminal, and is marked symbol 5.	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 control circuits (symbol 7 used)		N/A
	d) HAZARDOUS LIVE TERMINALS supplied from the interior		N/A
	Standard MAINS socket outlet; or		N/A
	RATINGS marked; or		N/A
	Symbol 14 used		N/A
5.1.6	Switches and circuit breakers		N/A
	If disconnecting device, off position clearly marked		N/A
	If push-button used as power supply switch:		-
	- symbol 9 and 15 used for on-position		N/A
	- symbol 10 and 16 used for off-position		N/A
	- pair of symbols 9, 15 and 10, 16 close together		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
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	Terminal block (CN1) for power input and relay output.	Pass
	If TERMINAL or ENCLOSURE exceeds 60 °C:	See temperature test in datasheet.	-
	Cable temperature RATING marked:	Symbol 14, warning mark, is marked.	-
	Marking visible before and during connection or beside TERMINAL		Pass
5.2	Warning markings	See clause 5.1.8 for detail.	Pass
	Visible when ready for NORMAL USE	On the label.	Pass
	Are near or on applicable parts	On the label.	Pass
	Symbols and text correct dimensions and colour:		-
	a) symbols min 2,75 mm and text 1,5 mm high and contrasting in colour with background	Symbols measured over 5 mm high.	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		N/A
	Statement to isolate or disconnect if access by using a tool to HAZARDOUS LIVE parts is permitted		N/A
5.3	Durability of markings		Pass
	The required markings remain clear and legible in NORMAL USE	See durability of marking test in datasheet.	Pass
5.4	Documentation		Pass
5.4.1	General		Pass
	Equipment is accompanied by documentation for safety purposes for OPERATOR or RESPONSIBLE BODY	User manual is shipped with purchase.	Pass
	Safety documentation for service personnel authorized by the manufacturer		N/A
	Documentation necessary for safe operation is provided in printed media or	Printed user manual is shipped with purchase.	Pass
	in electronic media if available at any time		N/A
	Documentation includes:		-
	a) intended use	Industrial HMI	Pass

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	b) technical specification	Power input: 24Vdc, 0.4A for models PT2043, PK2043 Power input: 24Vdc, 0.8A for models PT2070, PT2080, PT2100, PK2070, PK2080, PK2100	Pass
	c) name and address of manufacturer or supplier		Pass
	d) information specified in 5.4.2 to 5.4.6	See individual clauses.	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	Symbol 14 is marked on the chassis, and is explained in user manual.	Pass
	- information is marked on the equipment		N/A
5.4.2	Equipment ratings	Power input: 24Vdc, 0.4A for models PT2043, PK2043 Power input: 24Vdc, 0.8A for models PT2070, PT2080, PT2100, PK2070, PK2080, PK2100	Pass
	Documentation includes:		-
	a) Supply voltage or voltage range:	24 V	-
	Frequency or frequency range:	dc	-
	Power or current rating:	See above.	-
	b) Description of all input and output connections in accordance to 6.6.1 a)	Power input connecting by terminal block. Signal communication connecting by terminal block.	Pass
	c) RATING of insulation of external circuits in accordance to 6.6.1 b)	All circuit is connected to SELV circuit.	Pass
	d) Statement of the range of environmental conditions (see 1.4)	Operating altitude 2000 m. Indoor use. PD 2.	Pass
	e) Degree of protection (IEC 60529)		N/A
	f) If impact rating less than 5 J:		-
	IK code in accordance to IEC 62262 marked; or		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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	See user manual.	Pass
	b) protective earthing		N/A
	c) connections to supply	See user manual.	Pass
	d) PERMANENTLY CONNECTED EQUIPMENT:		-
	1) Supply wiring requirements	Replaced by part 2-201.	N/A
	2) If external switch or circuit-breaker, requirements and location recommendation		N/A
	e) ventilation requirements	Not to block air ventilation holes.	Pass
	f) special services (e. g. 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	Operation instruction is provided on website.	Pass
	b) positioning for disconnection		N/A
	c) instructions for interconnection		N/A
	d) specification of intermittent operation limits		N/A
	e) explanation of symbols used	Symbol 14 is marked on the chassis, and is explained in user manual. See 5.1.8.	Pass
	f) replacement of consumable materials		N/A
	g) cleaning and decontamination	Use dry cloth for cleaning.	Pass
	h) listing of any poisonous or injurious gases and quantities		N/A
	i) RISK reduction procedures relating to flammable liquids (see 9.5)		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:		-

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Clause	Requirement + Test	Result - Remark	Verdict
	Instructions sufficient in detail permitting safe maintenance and inspection and continued safety:		-
	Instruction against the use of detachable MAINS supply cord with inadequate rating	No MAINS supply cord is used.	N/A
	Specific battery type of user replaceable batteries	No replaceable battery.	N/A
	Any manufacturer specified parts		N/A
	Rating and characteristics of fuses	No external or replaceable fuse.	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	Repair is not carried out in the field.	N/A
5.4.6	Integration into systems or effects resulting from special conditions		Pass
	Aspects described in documentation	operating temperature -10 to 60 °C	Pass
6	PROTECTION AGAINST ELECTRIC SHOCK		Pass
6.1	General	See Insulation Diagram for details. (1) All circuits are SELV and intended for using in the dry location only. (2) All accessible parts are SELV and limited energy circuit and do not require additional evaluation for risk against electrical shock.	Pass
6.1.1	Requirements		Pass
	Protection against electric shock maintained in NORMAL CONDITION and SINGLE FAULT CONDITION		Pass
	ACCESSIBLE parts not HAZARDOUS LIVE		Pass
	Voltage, current, charge or energy below the limits in NORMAL CONDITION and in SINGLE FAULT CONDITION between:		-
	ACCESSIBLE parts and earth		Pass
	two ACCESSIBLE parts on same piece of the equipment within a distance of 1,8 m		N/A
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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	All circuit is SELV for use in dry location.	Pass
6.2.1	General		Pass
	Unless obviously determination of ACCESSIBLE parts as specified in 6.2.2 to 6.2.4	The following port is the accessible part checked by method of visual. (1) Ethernet RJ45 port: SELV, signal level. (2) COM port: SELV, signal level. (3) USB port: SELV, signal level.	Pass
6.2.2	Examination		N/A
	- with jointed test finger (as specified B.2)		N/A
	- with rigid test finger (as specified B.1) and a force of 10 N		N/A
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 diameter applied		N/A
6.3	Limit values for ACCESSIBLE parts		N/A
6.3.1	Levels in NORMAL CONDITION		-
	a) Voltage limits less than 33 V r.m.s. and 46,7V peak or 70 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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	or		-
	c) Levels of capacitive charge or energy less:		-
	1) 45 μ C for voltages up to 15 kV peak or d.c. or line A of Figure 3		N/A
	2) 350 mJ stored energy for voltages above 15 kV peak r d.c.		N/A
6.3.2	Levels in SINGLE FAULT CONDITION		-
	a) Voltage limits less than 55 V r.m.s. and 78 V peak or 140 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
	or		-
	c) Levels of capacitive charge or energy less line B of Figure 3		N/A
6.4	Primary means of protection	All circuit is SELV for use in dry location.	N/A
6.4.1	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		-
	- meet rigidity requirements of 8.1		N/A
	- meet requirements for BASIC INSULATION, if protection is provided by insulation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- 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		-
	- meet CLEARANCE, CREEPAGE DISTANCE and solid - insulation requirements of 6.7		N/A
6.4.4	Impedance		-
	Impedance used as primary means of protection meets all of following requirements:		-
	a) limits current or voltage to level of 6.3.2		N/A
	b) RATED for maximum WORKING VOLTAGE and the amount of power it will dissipate		N/A
	c) CLEARANCE, CREEPAGE DISTANCE between terminations of the impedance meet requirements of BASIC INSULATION of 6.7		N/A
6.5	Additional means of protection in case of SINGLE FAULT CONDITION		N/A
6.5.1	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	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		-

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	exempted as removable part carries MAINS SUPPLY input connection		N/A
	e) Any movable PROTECTIVE BONDING connection specifically designed, and meets 6.5.2.4		N/A
	f) No external metal braid of cables used (not regarded as PROTECTIVE BONDING)		N/A
	g) IF MAINS SUPPLY passes through:		-
	Means provided for passing protective conductor;		N/A
	Impedance meets 6.5.2.4		N/A
	h) Protective conductors bare or insulated, if insulated, green/yellow		N/A
	Exceptions:		-
	1) earthing braids;		N/A
	2) internal protective conductors etc.;		N/A
	Green/yellow not used for other purposes		N/A
	TERMINAL suitable for connection of a PROTECTIVE CONDUCTOR, and meets 6.5.2.3		N/A
6.5.2.3	PROTECTIVE CONDUCTOR TERMINAL		-
	a) Contact surfaces are metal		N/A
	b) Appliance inlet used		N/A
	c) For rewirable cords and PERMANENTLY CONNECTED EQUIPMENT, PROTECTIVE CONDUCTOR TERMINAL is close to MAINS supply TERMINALS		N/A
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	f) If plug-in, makes first and breaks last		N/A
	g) If also used for other bonding purposes, PROTECTIVE CONDUCTOR:		-
	Applied first;		N/A
	Secured independently;		N/A
	Unlikely to be removed by servicing		N/A
	h) PROTECTIVE CONDUCTOR of measuring circuit:		-
	1) Current RATING equivalent to measuring circuit TERMINAL;		N/A
	2) PROTECTIVE BONDING: not interrupted by any switch or interrupting device		N/A
	i) FUNCTIONAL EARTH TERMINALS allow independent connection		N/A
	j) If a binding screw used for PROTECTIVE CONDUCTOR TERMINAL:		-
	Suitable size for bond wire		N/A
	Not smaller than M 4		N/A
	At least 3 turns of screw engaged		N/A
	Passes tightening torque test		N/A
	k) Contact pressure not capable being reduced by deformation of materials		N/A
6.5.2.4	Impedance of PROTECTIVE BONDING of plug-connected equipment		-
	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	Bonding impedance of PERMANENTLY CONNECTED EQUIPMENT		-
6.5.2.6	Transformer PROTECTIVE BONDING screen		-
	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:		N/A
	- Independently secured against loosening		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- 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:		-
	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

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Clause	Requirement + Test	Result - Remark	Verdict
6.6.1	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
	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	ACCESSIBLE 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
	ACCESSIBLE TERMINALS will not work loose		N/A
6.7	Insulation requirements		N/A
6.7.1	The nature of insulation		-
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
6.7.1.2	CLEARANCES		-
	Required CLEARANCES reflecting factors of 6.7.1.1		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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		-
	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		-
	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		-
	a) 6.7.2 MAINS circuits of OVERVOLTAGE CATEGORY II up to nominal supply voltage of 300 V		N/A
	b) 6.7.3 secondary circuits separated from circuits defined in a) by transformer		N/A
	c) K.1 MAINS circuits of OVERVOLTAGE CATEGORY III and IV or OVERVOLTAGE CATEGORY II over 300 V		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

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

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Clause	Requirement + Test	Result - Remark	Verdict
	c) insulation is assembled of min three separate layers, where the combination of two layers passed voltage tests of 6.8.3 with values of Table 5 for REINFORCED INSULATION		N/A
6.7.3	Insulation for secondary circuits derived from MAINS CIRCUITS of OVERVOLTAGE CATEGORY II up to 300 V		N/A
6.7.3.1	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		-
	a) meet the values of Table 6 for BASIC INSULATION and SUPPLEMENTARY INSULATION; or		N/A
	twice the values of Table 6 for REINFORCED INSULATION		N/A
	or		-
	b) pass the voltage tests of 6.8 with values of Table 6;		-
	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		-
	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		-
6.7.3.4.1	Withstands electrical and mechanical stresses in normal use and all RATED environmental conditions of 1.4		-

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Clause	Requirement + Test	Result - Remark	Verdict
	a) Equipment passed voltage test of 6.8.3.1 for 5 s with VALUES of Table 6 for BASIC and SUPPLEMENTARY INSULATION		N/A
	values for REINFORCED INSULATION are 1,6 times the values of BASIC INSULATION		N/A
	b) if WORKING VOLTAGE exceeds 300 V, equipment passed voltage test of 6.8.3.1 for 1 min with a test voltage of 1,5 times working voltage for BASIC or SUPPLEMENTARY INSULATION		N/A
	value for REINFORCED INSULATION are twice the WORKING VOLTAGE		N/A
	Complies as applicable:		-
	1) ENCLOSURE or PROTECTIVE BARRIER of Clause 8		N/A
	2) moulded and potted parts requirements of 6.7.3.4.2		N/A
	3) inner layers of printed wiring boards requirements of 6.7.3.4.3		N/A
	4) thin-film insulation requirements of 6.7.3.4.4		N/A
6.7.3.4.2	Moulded and potted parts		-
	Conductors between same two layers are separated by applicable distances of Table 8		N/A
6.7.3.4.3	Inner insulation layers of printed wiring boards		-
	Separated by at least by applicable distances of Table 8 between same two layers		N/A
	REINFORCED INSULATION have adequate electric strength; one of following methods used:		-
	a) thickness at least applicable distance of Table 8		N/A
	b) insulation is assembled of minimum two separate layers, each RATED for test voltage of Table 6 for BASIC INSULATION		N/A
	c) insulation is assembled of min two separate layers, where the combination is RATED for 1,6 times the test voltage of Table 6		N/A
6.7.3.4.4	Thin-film insulation		-
	Conductors between same two layers are separated by applicable CLEARANCES and CREEPAGE DISTANCE of 6.7.3.2 and 6.7.3.3		N/A
	REINFORCED INSULATION have adequate electric strength; one of following methods used:		-
	a) thickness at least applicable distance of Table 8		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	b) insulation is assembled of min. two separate layers, each RATED for test voltage of Table 6 for BASIC INSULATION		N/A
	c) insulation is assembled of min. three separate layers, where the combination of two layers passed voltage tests with 1,6 time values of Table 6:		-
	a.c. test of 6.8.3.1; or		N/A
	d.c. test of 6.8.3.2 for circuits stressed only by d.c. voltages		N/A
6.8	Procedure for dielectric strength tests		N/A
6.9	Constructional requirements for protection against electric shock		N/A
6.9.1	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
	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		-
	Green-and-yellow insulation shall not be used except:		N/A
	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		-
	RATED for maximum equipment current (see 5.1.3 c)		N/A
	Cable complies with IEC 60227 or IEC 60245		N/A
	Heat-resistant if likely to contact hot parts		N/A

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

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Clause	Requirement + Test	Result - Remark	Verdict
	b) input has a protective earth conductor if outlet has EARTH TERMINAL CONTACT		N/A
6.11	Disconnection from supply source		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		-
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:		-
	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	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:		-
	Meets IEC 60947-1 and IEC 60947-3		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):		-

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Clause	Requirement + Test	Result - Remark	Verdict
	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		Pass
7.1	Equipment does not cause a mechanical HAZARD in NORMAL nor in SINGLE FAULT CONDITION		Pass
	Conformity is checked by 7.2 to 7.7		Pass
7.2	Sharp edges		Pass
	Easily touched parts are smooth and rounded		Pass
	Do not cause injury during NORMAL USE and		Pass
	Do not cause injury during SINGLE FAULT CONDITION		Pass
7.3	Moving parts		N/A
7.3.1	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:		-

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Clause	Requirement + Test	Result - Remark	Verdict
	A. Low level measures		N/A
	B. Moderate measures		N/A
	C. Stringent measures		N/A
7.3.4	Limitation of force and pressure		N/A
	Following levels are met in NORMAL and SINGLE FAULT CONDITION:		-
	Continuous contact pressure below 50 N / cm ² with force below 150 N		N/A
	Temporary force below 250 N for an area at least of 3 cm ² for a maximum duration of 0,75 s		N/A
7.3.5	Gap limitations between moving parts		N/A
7.3.5.1	Access normally allowed		-
	If levels of 7.3.4 exceeded and 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 that supports greatest load		N/A
	e) castor or support that supports greatest load removed from equipment		N/A
7.5	Provisions for lifting and carrying		N/A
7.5.1	Equipment more than 18 kg :		-
	Has means for lifting or carrying; or		N/A
	Directions in documentation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
7.5.2	Handles and grips		-
	Handles or grips withstand four times weight		N/A
7.5.3	Lifting devices and supporting parts		-
	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
7.7	Expelled parts		N/A
	Equipment contains or limits the energy		N/A
	Protection not removable without the aid of a tool		N/A
8	RESISTANCE TO MECHANICAL STRESSES		Pass
8.1	Equipment does not cause a HAZARD when subjected to mechanical stresses in NORMAL USE		Pass
	Normal protection level is 5 J		Pass
	Levels below 5 J but not less than 1 J are acceptable if all of 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		Pass
	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		Pass
	2) impact test of 8.2.2 with 5 J except for HAND-HELD EQUIPMENT		Pass
	if impact energy not selected to 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

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Clause	Requirement + Test	Result - Remark	Verdict
	Equipment RATED with an impact rating of IK 08 that obviously meets the criteria		N/A
	After the tests inspection with following results:		-
	- HAZARDOUS LIVE parts above the limits of 6.3.2 not ACCESSIBLE		N/A
	- insulation pass the voltage tests of 6.8		N/A
	i) no leaks of corrosive and harmful substances		N/A
	ii) ENCLOSURE shows no cracks resulting in a HAZARD		N/A
	iii) CLEARANCES not less than their permitted values		N/A
	iv) insulation of internal wiring remains undamaged		N/A
	v) PROTECTIVE BARRIERS not damaged or loosened		N/A
	vi) No moving parts exposed, except permitted by 7.3		N/A
	vii) no damage which could cause spread of fire		N/A
8.2	ENCLOSURE rigidity test		Pass
8.2.1	Static test	See datasheet for Rigidity Test.	Pass
	- 30 N with 12 mm rod to each part of ENCLOSURE		Pass
	- in case of doubt test conducted at maximum RATED ambient temperature		N/A
8.2.2	Impact test	See datasheet for Impact Test.	Pass
	Impact applied to any part of ENCLOSURE causing a HAZARD if damaged		Pass
	Impact energy level and corresponding IK code:		-
	Non-metallic ENCLOSURES cooled to minimum RATED ambient temperature if below 2 °C		Pass
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		-
	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

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Clause	Requirement + Test	Result - Remark	Verdict
9.1	No spread of fire in NORMAL and SINGLE FAULT CONDITION		Pass
	MAINS supplied equipment meets requirements of 9.6 additionally		N/A
	Conformity is checked by minimum one or a combination of the following (see Figure 11):	The method of protection against spread of fire is to adopted the method 9.1 (c).	-
	a) SINGLE FAULT test of 4.4; or		N/A
	b) Application of 9.2 (eliminating or reducing the sources of ignition); or		N/A
	c) Application of 9.3 (containment of fire within the equipment)	See critical component list.	Pass
9.2	Eliminating or reducing the sources of ignition within the equipment		N/A
	a) 1) Limited-energy circuit (see 9.4); or		N/A
	b) 2) BASIC INSULATION provided for parts of different potential; or		N/A
	Bridging the insulation does not cause ignition		N/A
	c) Surface temperature of liquids and parts (see 9.5)		N/A
	d) 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	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		Pass
	Requirements of 9.5 are met		N/A
9.3.2	Constructional requirements	Device is open type equipment conform with a) and b).	-
	a) Connectors and insulating material have flammability classification V-2 or better	See critical component list.	Pass
	b) Insulated wires and cables are flame retardant (VW-1 or equivalent)	No wiring applied.	N/A
	c) ENCLOSURE meets following requirements:	Open type device with partial enclosure	-
	1) Bottom and sides in arc of 5 ° (see Figure 13) to non-limited circuits (9.4) meets:		-
	i) no openings; or		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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	See datasheet for flammability classification V-1 test.	Pass
	3) ENCLOSURE and any baffle or flame barrier have adequate rigidity		N/A
9.4	Limited-energy circuit		N/A
	a) Potential not more than 30 r.m.s. and 42,4 V peak, or 60 V dc		N/A
	b) Current limited by one of following means:		-
	1) Inherently or by impedance (see table 17); or		N/A
	2) Overcurrent protective device (see table 18); or		N/A
	3) A regulating network limits also in SINGLE FAULT CONDITION (see table 17)		N/A
	c) Is separated by at least BASIC INSULATION		N/A
	Fuse or a nonadjustable electromechanical device is used		N/A
9.5	Requirements for equipment containing or using flammable liquids		N/A
	Flammable liquids contained in or specified for use with equipment do not cause spread of fire		N/A
	RISK is reduced to a tolerable level:		-
	a) The temperature of surface or parts in contact with flammable liquids is 25 °C below fire point		N/A
	b) The quantity of liquid is limited		N/A
	c) Flames are contained within the equipment		N/A
	Detailed instructions for RISK-reduction provided		N/A
9.6	Overcurrent protection		N/A
9.6.1	MAINS supplied equipment protected		N/A
	BASIC INSULATION between MAINS parts of opposite polarity provided		N/A
	Devices not in the protective conductor		N/A
	Fuses or single-pole circuit-breakers not fitted in neutral (multi-phase)		N/A
9.6.2	PERMANENTLY CONNECTED EQUIPMENT		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Overcurrent protection device:		-
	Fitted within the equipment; or		N/A
	Specified in manufacturer's instructions		N/A
9.6.3	Other equipment		-
	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:	See temperature test in datasheet.	-
	- at an specified ambient temperature of 40 °C		N/A
	- for equipment rated above 40 °C ambient temperature limits not exceeded raised by the difference to 40 °C	maximum operating temperature 60 °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	No insulation winding is used.	N/A
	Limits not exceeded in:		-
	NORMAL CONDITION		N/A
	SINGLE FAULT CONDITION		N/A
10.3	Other temperature measurements	See temperature test in datasheet.	Pass
	Following measurements conducted if applicable:		-
	a) Value of 60 °C of field-wiring terminal box not exceeded	Power input terminal block is to use R/C (XCFR2/8) terminal block and suitable for field wiring and rated 90 degree C. See Clause 5.1.8 for details.	Pass
	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	To measure relay output terminal in temperature test.	Pass
10.4	Conduct of temperature tests		Pass

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Clause	Requirement + Test	Result - Remark	Verdict
10.4.1	Tests conducted under reference test conditions and manufacturer's instructions		Pass
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	Replaced by part 2-201.	Pass
	Equipment built in as specified in installation instructions		Pass
10.5	Resistance to heat		Pass
10.5.1	Integrity of CLEARANCE and CREEPAGE DISTANCES		N/A
10.5.2	Non-metallic ENCLOSURES	See datasheet for Non-metallic ENCLOSURES Heat Resistance Test.	Pass
	Within 10 min after treatment:		-
	Equipment subjected to suitable stresses of 8.2 and 8.3 complying with criteria of 8.1		Pass
10.5.3	Insulating material	Not connected to MAINS circuit	N/A
	a) Parts supporting parts connected to MAINS supply		N/A
	b) TERMINALS carrying a current more than 0,5 A	Power input terminal block (CN1).	N/A
	Examination of material data; or	Power input terminal block is to use R/C (XCFR2/8) terminal block and suitable for field wiring and rated 90 degree C.	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		N/A
11.1	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	See 13.2.2 Batteries and battery charging for details.	Pass
	Battery electrolyte leakage presents no HAZARD		Pass

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Clause	Requirement + Test	Result - Remark	Verdict
11.6	Specially protected 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		-
	Fluid-containing parts subjected to hydraulic test if:		-
	a) product of pressure and volume > 200 kPa; and		N/A
	b) pressure > 50 kPa		N/A
	Parts of refrigerating systems meets pressure-related requirements of IEC 60335-24 or IEC 60335-2-89		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		Pass
12.1	Equipment provides protection		N/A
12.2	Equipment producing ionizing radiation		N/A
12.2.1	Ionizing radiation		N/A
12.2.1.1	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 60405		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		-

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Clause	Requirement + Test	Result - Remark	Verdict
	Effective dose rate of radiation measured:		-
	If dose rate exceeds 5 µSv/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 µSv/h and 5 µSv/h in m:		-
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 :		-
12.2.2	Accelerated electrons		-
	Compartments opened only by the use of a TOOL		N/A
12.3	Ultraviolet (UV) radiation		N/A
	No unintentional HAZARDOUS escape of UV radiation:		-
	- checked by inspection; and		N/A
	- evaluation of RISK assessment documentation		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		-
	No HAZARDOUS sound emission		N/A
	Maximum sound pressure level measured and calculated for maximum sound power level as specified in ISO 3746 or ISO 9614-1		N/A
	Instruction describes measures for protection		N/A
12.5.2	Ultrasonic pressure		N/A
	Equipment not intended to emit ultrasound does not exceed limit of 110 dB between 20 kHz and 100 kHz		N/A
	Equipment intended to emit ultrasound:		N/A
	Outside useful beam does not exceed limit of 110 dB between 20 kHz and 100 kHz		N/A
	If inside useful beam above values exceeded:		-
	Marked with Symbol 14 of table 1		N/A
	and following information in the documentation:		-
	a) dimensions of useful beam		N/A
	b) area where ultrasonic pressure exceed 110 dB		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
13.1	Poisonous and injurious gases and substances		N/A
	No poisonous or injurious gases or substances liberated in NORMAL CONDITION		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		-
	If explosion or fire HAZARD could occur:		-
	Protection incorporated in the equipment; or	Provided protective reversing charging circuit	Pass
	Instructions specify batteries with built-in protection		N/A
	In case of wrong type of battery used:		-
	No HAZARD; or		N/A
	Warning by marking and within instructions	Add Warning mark in user manual.	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		Pass

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Clause	Requirement + Test	Result - Remark	Verdict
	Single component failure	The RTC Lithium Battery is protected reversing fail by a resistor and a diode. The maximum reversing charging current does not exceed the minimum value of the RTC battery source.	Pass
	Polarity reversal test		Pass
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	Where safety is involved, components and subassemblies meet relevant requirements	See critical component list.	Pass
14.2	Motors		N/A
14.2.1	Motor temperatures		N/A
	Does not present a HAZARD when stopped or prevented from starting; or		N/A
	Protected by over-temperature or thermal protection device conform with 14.3		N/A
14.2.2	Series excitation motors		N/A
	Connected direct to device, if overspeeding causes a HAZARD		N/A
14.3	Overtemperature protection devices		N/A
	Devices operating in a SINGLE FAULT CONDITION		N/A
	a) Reliable function is ensured		N/A
	b) RATED to interrupt maximum current and voltage		N/A
	c) Does not operate in NORMAL USE		N/A
	If self-resetting device used to prevent a HAZARD, protected part requires intervention before restarting		N/A
14.4	Fuse holders		N/A
	No access to HAZARDOUS LIVE parts		N/A
14.5	MAINS voltage selecting devices		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Accidental change not possible		N/A
14.6	MAINS transformers tested outside equipment		N/A
14.7	Printed circuit 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 or components used as TRANSIENT OVERVOLTAGE limiting devices		N/A
	Test conducted between each pair of MAINS SUPPLY TERMINALS		N/A
	No HAZARD resulting from rupture or overheating of the component:		-
	- no bridging of safety relevant insulation		N/A
	- no heat to other parts above the self-ignition points		N/A
15	PROTECTION BY INTERLOCKS		N/A
15.1	Interlocks are designed to remove a HAZARD before OPERATOR exposed		N/A
15.2	Prevention of reactivation		N/A
15.3	Reliability		N/A
	Single fault unlikely to occur; or		N/A
	Cannot cause a HAZARD		N/A
16	HAZARDS RESULTING FROM APPLICATION		N/A
16.1	REASONABLY FORESEEABLE MISUSE		N/A
	No HAZARDS arising from settings not intended and not described in the instructions		N/A
	Other cases of REASONABLY FORESEEABLE MISUSE addressed by RISK assessment		N/A
16.2	Ergonomic aspects		N/A
	Factors giving rise to a HAZARD the RISK assessment is reflecting those aspects:		-
	a) limitation of body dimensions		N/A
	b) displays and indicators		N/A
	c) accessibility and conventions of controls		N/A
	d) arrangement of TERMINALS		N/A
17	RISK ASSESSMENT		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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
H.2	Technical properties		N/A
	Technical properties of conformal coatings are suitable for the intended application. In particular:		-

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Clause	Requirement + Test	Result - Remark	Verdict
	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
Front Bezel, Enclosure	Formosa Idemitsu Petrochemical Corp	IV2200R(f1)	Rated V-2, 125 degree C, minimum 1.5 mm thick, see Diagram (01) in Enclosure for dimension details.	UL94, UL746B, additional test in end product by 20 mm (3/4 inch) flame test for flammability class v-1	UL R/C (QMFZ2/8) (E238753)
Alternate	Interchangeable	Interchangeable	Aluminum alloy, Code 6061-T6, minimum 1.5 mm thick, see Diagram (01) in Enclosure for dimension details	-	-
Corrosion Resistance Coating for Aluminum alloy front bezel	JING HONG DA HARDWARE PRODUCTS CO.,LTD.	P3M-JHD-088 and P3M- JHD-088	Surface Finishes on Aluminum alloy by Black Anodize, 3 to 5 um. See Diagram (02) in Enclosure for dimension details.	Additional test in end product by Additional Corrosion Test for Type 4X rating according to UL50E	-
Rear Housing	Same as above	Same as above	Same as above	Same as above	Same as above
Gasket	Jiangsu Tianchen New Materials PLC	HT851B	Minimum 1 mm thick, see Diagram (03) in Enclosure for dimension details.	Additional test in end product by Gasket Aging Test and Hosedown Test for Type 4X rating according to UL50E	-
Label System	CAR TONG CO	CT-M007C	Adhered on the Rear Housing and used by suitable ink type, rated 70 degree C	UL 969 / CSA-C22.2 No. 0.15	UL R/C (PGJI2/8) (MH19370)
(alternate)	Interchangeable	Interchangeable	Same as above	UL 969 / CSA-C22.2 No. 0.15	Any UL R/C (PGJI2/8) or (PGDG2/8)
Overlay	MacDermid Autotype Ltd	Autoflex EB	PET, min. 0.19 mm thick, rated HB and 105 degree C, adhered on the front bezel. See Diagram – (01) for dimension details.	UL94, UL746B, additional test in end product by Hosedown Test for Type 4X rating according to UL50E	UL R/C (QMFZ2/8) (E165805)
Adhesive	FLEXCON CO INC	212R	Rated -35 to 75 degree C and adhered between overlay (PET) and front bezel (PC).	UL 969 / CSA-C22.2 No. 0.15, additional test in end product by Hosedown Test for Type 4X rating according to UL50E	Any UL R/C (QOQW2) MH18496
LCD Panel module for Models PT2043 and PK2043 series only	YU DU AMSON ELECTRONICS CO.,LTD. / Amson	AM-480272-043RT-B220	4.3" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-
(alternate)	CHIMEI	AT043TN24 V.7	4.3" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-
(alternate)	PINGCHUANG DISPLAY	PC043TN42-B10	4.3" TFT-LCD, rated	-	-

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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	
	CORPORATION		3.6Vdc maximum and 25 mA maximum.		-	
(alternate)	Ti Hao Corporation	TH043480272RYR25S1	4.3" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-	
(alternate)	Shenzhen fortada electric Co.,LTD	FTD-430LQE22-V05T	4.3" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-	
LCD Panel module for Models PT2070 and PK2070 series only	INNOLUX DISPLAY CORPORATION	AT070TN92	7.0" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-	
(alternate)	SHENZHEN COWIN OPTOELECTRONICS TECHNOLOGY CO.,LTD	COWIN070ID27570255B	7.0" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-	
(alternate)	MIND Electronics Co Limited	MD070NL27-50ND-27C	7.0" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-	
(alternate)	All win photoelectric Co., Ltd	TS070BH06-08E	7.0" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-	
(alternate)	PINGCHUANG DISPLAY CORPORATION	PC070TN92-400C	7.0" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-	
LCD Panel module for Models PT2080 and PK2080 series only	CHIMEI	EJ080NA-05B	8.0" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-	
(alternate)	SHANGHAI AVIC OPTOELECTRONICS	TM080SDH01-00	8.0" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-	
LCD Panel module for Models PT2100 and PK2100 series only	SHENZHEN COWIN OPTOELECTRONICS TECHNOLOGY CO.,LTD	COWIN101HD425050267 B	10.1" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-	
(alternate)	InfoVision Optoelectronics (Kunshan) Co.,LTD.	M101AWN9 R2	10.1" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-	
(alternate)	PINGCHUANG DISPLAY CORPORATION	PC101TN52-C38	10.1" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-	
(alternate)	All win photoelectric Co., Ltd	TC101BM05-08E	10.1" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-	
Printed Wiring Board	Interchangeable	Interchangeable	Rated min. V-1, min. 105 °C.	UL 796 / CSA-C22.2 No. 0.17	Any UL R/C (ZPMV2/8)	-
The following component were provided for models PT2043 and PK2043 series	-	-	-	-	-	

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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
only					
Fuse (F1)	LITTELFUSE INC	SMD150F/33-2920	Rated 1.5A, 33Vdc.	UL 1434	UL R/C (XGPU2/8) (E74889)
Terminal Block (TB1)	DINKLE ENTERPRISE CO LTD	Socket Cat. No. 2EHDRC series, mate with plug Cat. No. 2ESDV series	Socket rated 300 V, 15 A, UG: B, 105°C. (insulation material rated minimum V-2) Plug rated 300 V, 15 A, 105°C, Fw=2, UG:D, suitable for 12-28 AWG wire size, torque value 4.5 lb-in.	UL 1059 / C22.2 No. 158	UL R/C (XCFR2/8) (E102914)
Capacitor (C37)	Interchangeable	Interchangeable	Rated min. 35 V, max. 470 uF, min. 105°C.	-	-
LAN port (CON6)	Interchangeable	Interchangeable	Plastic Material rated minimum V-2, 105°C.	UL 94 / CSA-C22.2 No. 0.17 / UL 746B	Any UL R/C (QMFZ2/8) -
USB Type A port (CON4)	Interchangeable	Interchangeable	Plastic Material rated minimum V-2, 105°C.	UL 94 / CSA-C22.2 No. 0.17 / UL 746B	Any UL R/C (QMFZ2/8) -
USB Type B port (CON5)	Interchangeable	Interchangeable	Plastic Material rated minimum V-2, 105°C.	UL 94 / CSA-C22.2 No. 0.17 / UL 746B	Any UL R/C (QMFZ2/8) -
COM 1/2 ports (CON2, CON3)	Interchangeable	Interchangeable	Plastic Material rated minimum V-2, 105°C.	UL 94 / CSA-C22.2 No. 0.17 / UL 746B	R/C QMFZ2/8 -
Reversing Protection Resistor (R24)	Interchangeable	Interchangeable	Rated 1K.	-	-
Reversing Protection Diode (D1)	Interchangeable	Interchangeable	Rated min. 30 V, min. 200mA.	-	-
RTC Lithium Battery (BT1)	PANASONIC CORPORATION, PANASONIC CORPORATION OF NORTH AMERICA	VL2330	Rated maximum abnormal charging current 300 mA, protected by diode and resistor.	UL 1642	UL R/C BBCV2 (MH12210)
(alternate)	PANASONIC CORPORATION, PANASONIC CORPORATION OF NORTH AMERICA	CR2450	Rated maximum abnormal charging current 30 mA, protected by diode and resistor.	UL 1642	UL R/C BBCV2 (MH12210)
Poly-switch for USB port (F2)	Interchangeable	Interchangeable	PTC type. Rated 6 V dc, I _h 1.1 A. CA3. T _{moa} = 85 degree C	UL 1434	Any UL R/C (XGPU2/8)
The following component were provided for models PT2070, PT2080, PT2100, PK2070, PK2080, PK2100 series only	-	-	-	-	-
Terminal Block (TB1)	DINKLE ENTERPRISE CO LTD	Socket Cat. No. 2EHDVC series, mate with plug Cat. No. 2ESDV series	Socket rated 300 V, 15 A, UG: B, 105°C. (insulation material	UL 1059 / C22.2 No. 158	UL R/C (XCFR2/8) (E102914)

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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
			rated minimum V-2) Plug rated 300 V, 10 A, 105°C, Fw=2, UG:D, suitable for 12-28 AWG wire size, torque value 4.5 lb-in.		
Fuse (F1)	LITTELFUSE INC	SMD150F/33-2920	Rated 1.5A, 33V.	UL 1434	UL R/C (XGPU2/8) (E74889)
Capacitor (C114)	Interchangeable	Interchangeable	Rated min. 35 V, max. 470 uF, min. 105°C.	-	- -
COM 1/2 ports (CON2, CON3)	Interchangeable	Interchangeable	Plastic Material rated minimum V-2, 105°C.	UL 94 / CSA-C22.2 No. 0.17 / UL 746B	Any UL R/C (QMFZ2/8) -
LAN port (CON13)	Interchangeable	Interchangeable	Plastic Material rated minimum V-2, 105°C.	UL 94 / CSA-C22.2 No. 0.17 / UL 746B	Any UL R/C (QMFZ2/8) -
COM 1/2/3 port (COM1)	Interchangeable	Interchangeable	Plastic Material rated minimum V-2, 105°C.	UL 94 / CSA-C22.2 No. 0.17 / UL 746B	Any UL R/C (QMFZ2/8) -
USB Type B port (CON10)	Interchangeable	Interchangeable	Plastic Material rated minimum V-2, 105°C.	UL 94 / CSA-C22.2 No. 0.17 / UL 746B	Any UL R/C (QMFZ2/8) -
USB Type A port (CON7)	Interchangeable	Interchangeable	Plastic Material rated minimum V-2, 105°C.	UL 94 / CSA-C22.2 No. 0.17 / UL 746B	Any UL R/C (QMFZ2/8) -
COM 4/5 port (COM10)	Interchangeable	Interchangeable	Plastic Material rated minimum V-2, 105°C.	UL 94 / CSA-C22.2 No. 0.17 / UL 746B	Any UL R/C (QMFZ2/8) -
Reversing Protection Resistor (R91)	Interchangeable	Interchangeable	Rated 1K.	-	- -
Reversing Protection Diode (D25)	Interchangeable	Interchangeable	Rated min. 30 V, min. 200mA.	-	- -
RTC Lithium Battery (BT1)	PANASONIC CORPORATION, PANASONIC CORPORATION OF NORTH AMERICA	VL2330	Rated maximum abnormal charging current 300 mA, protected by diode and resistor.	UL 1642	UL R/C BBCV2 (MH12210)
(alternate)	PANASONIC CORPORATION, PANASONIC CORPORATION OF NORTH AMERICA	CR2450	Rated maximum abnormal charging current 30 mA, protected by diode and resistor.	UL 1642	UL R/C BBCV2 (MH12210)
Poly-switch for USB port (F1)	Interchangeable	Interchangeable	PTC type. Rated 6 V dc, 1h 1.1 A. CA3. Tmoa = 85 degree C	UL 1434	Any UL R/C (XGPU2/8)

Supplementary information:

The Test Laboratory has verified the component information.

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

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Clause	Requirement + Test	Result - Remark	Verdict

National Differences

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

Selected? (y/n)	Country	Standard	Abbreviation
Yes	USA / Canada	UL 61010-1, 3rd Edition, 2012-05-11 / CAN/CSA-C22.2 No. 61010-1, 3rd Edition, 2012-05	USC
No	Switzerland	SN EN 61010-1:2010	SW
No	Japan	-	JP
No	Austria	EN 61010-1:2010	-
No	Denmark	DS/EN 61010-1:2010	-
No	Republic of Korea	K 61010-1	-
No	Slovenia	SIST EN 61010-1	-
No	Sweden	SS-EN 61010-1:2010	-
No	United Kingdom	BS EN61010-1:2010	-

USA / Canada(UL 61010-1, 3rd Edition, 2012-05-11 / CAN/CSA-C22.2 No. 61010-1, 3rd Edition, 2012-05)			
1.1.4 DV[DR]	This standard applies to equipment to be employed in accordance with ANSI/NFPA 70, National Electrical Code® (NEC); designed to be installed in accordance with the Canadian Electrical Code (CEC), Part I, CSA C22.1, and CSA C22.2 No. 0; or designed to comply with both the NEC and CEC	Open type ethernet switch intend to install in the industrial control panel by DIN rail or wall mounting kit.	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.	Pass

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Clause	Requirement + Test	Result - Remark	Verdict				
		If the product standard does NOT provide the exact translation, the evidence must simply include French text (no translation required).					
	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.		N/A				
6.3.1	Replace (a) with: The a.c. voltage levels are 30 V r.m.s., 42.4 V peak and the d.c. voltage level is 60 V. For equipment intended to be used in WET LOCATIONS, the voltage levels are 16 V r.m.s., 22.6 V peak and the d.c. voltage level is 35 V d.c.		N/A				
6.3.2	Replace (a) with: The a.c. voltage levels are 50 V r.m.s., 70 V peak and the d.c. voltage level is 120 V. For equipment intended to be used in WET LOCATIONS, the a.c. voltage levels are 33 V r.m.s., 46.7 V peak and the d.c. voltage level is 70 V. For voltages of short duration, the duration versus voltage levels are those of figure 2.DV, measured across a 50 kohm resistor.		N/A				
6.5.2.4	<p>Replace with the following: The impedance between the PROTECTIVE CONDUCTOR TERMINAL and each ACCESSIBLE part for which PROTECTIVE BONDING is specified shall not cause a potential drop of more than 4 V.</p> <p>Metal that is part of the protective bond shall not melt, and heating and burning shall not occur to the extent that could cause a fire HAZARD.</p> <p>Conformity is checked by inspection and by applying an a.c. test current for the duration specified in Table 6.5.2.4DV and then measuring the voltage drop. See 4.4.4.3 for test conditions regarding the spread of fire.</p> <p>The test current is twice the rating of the attachment plug cap, but not less than 40 A. If the equipment contains overcurrent protection devices for all poles of the MAINS supply, and if the wiring on the supply side of the overcurrent protection devices cannot become connected to ACCESSIBLE conductive parts in the case of a single fault, the test current need not be more than twice the RATED current of the internal overcurrent protection devices. If the test current exceeds 500A, see CSA 0.4.</p>		N/A				
6.5.2.4 D.1[D2]	<p>Duration of protective bonding test</p> <p>Value of building MAINS supply overcurrent protection means (A) Time (Min)</p> <table><tr><td>0 - 30</td><td>2</td></tr><tr><td>31 - 60</td><td>4</td></tr></table>	0 - 30	2	31 - 60	4		N/A
0 - 30	2						
31 - 60	4						

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Clause	Requirement + Test	Result - Remark	Verdict
	61 - 100 6 101 - 200 8 201 and over 10		
6.5.2.5	In the last sentence of the conformity statement, replace "1 min" with "the duration specified in Table 6.5.2.4DV". In the second sentence of the conformity statement, replace "10 V" with "4 V".		N/A
6.10.1	Delete: reference to requirements of IEC 60227 or IEC 60245 for MAINS supply cords in the second paragraph.		N/A
	Replace the fifth paragraph with: Green covered conductors (with or without yellow stripes) shall be used only for connection to PROTECTIVE CONDUCTOR TERMINALS.		N/A
	Delete: reference to requirements of IEC 60799 for detachable MAINS supply cords in the sixth paragraph.		N/A
	Add after the sixth paragraph: Requirements for MAINS cords or cord sets are contained in ANSI/UL 817 and CSA C22.2 No. 21.		N/A
	Add after the sixth paragraph: Requirements for general use receptacles, attachment plugs, and similar wiring devices are contained in 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
	Add after the sixth paragraph: Note: Clause 6.10.1 only applies to cords connected to the external fixed MAINS socket-outlet and to external interconnecting MAINS cords. Clause 6.10.1 does not apply to cords fully contained within the equipment enclosure.		N/A
6.10.3	Add: Requirements for plugs of MAINS cords are contained in 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 the mains shall have provision for connection of Annex DVD.		N/A
	Conformity is checked as specified in Annex DVD.		N/A
6.11	Add: "and maintaining polarity" to the end of the subclause title		N/A
6.11.5	Polarity of connections to the MAINS circuit		N/A
	Add: Any line-connected single-pole switch, any center contact of a lampholder, and any automatic control with a marked off position shall be connected to a TERMINAL or lead intended for connection to the ungrounded conductor of the supply circuit.		N/A
	Note: An "ungrounded" supply conductor is one that is not connected to protective earth at any point in the		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	building installation.		
9.3.2	Add the following to the end of item a): Flammability RATINGS of ANSI/UL 94 V-0, V-1, and V-2 are equivalent to the same classifications of IEC 60695-11-10.		Pass
	Add the following to the end of Note 2: Flammability RATINGS FT-1 of CSA C22.2 No. 0.3 and VW-1 ANSI/UL 1581 are considered acceptable for insulated wire and cable.		N/A
9.6.1 A	Add: A single-pole circuit breaker used as an overcurrent protective device shall be connected in the ungrounded supply conductor.		N/A
	Note: An "ungrounded" supply conductor is one that is not connected to the protective earth at any point in the building installation. A "grounded" supply conductor is one that is connected to protective earth at some point in the building installation. It is sometimes called the "neutral conductor".		N/A
	Add: A multiple-pole circuit breaker used as an overcurrent protective device or devices shall be so constructed as to interrupt all of the neutral (grounded) and ungrounded conductors of the MAINS supply simultaneously.		N/A
	Add: A single fuse used as an overcurrent protective device shall be connected in the ungrounded supply conductor.		N/A
	Add: Where fuses are used as overcurrent protective devices in both the neutral (grounded) and ungrounded supply conductors, the fuseholders should be mounted adjacent to each other and the fuses shall be of the same RATING and characteristics.		N/A
	Add: The screw shell of a plug fuseholder and the ACCESSIBLE contact of an extractor fuseholder connected to the ungrounded supply conductor shall be connected towards the load. The ACCESSIBLE contact or screw shell of fuseholders connected in the neutral (grounded) conductor shall be located towards the grounded supply line.		N/A
11.7.1	Add: Annex G is the normative for certain types of products.		N/A
	Add: Laboratory equipment and testing and measurement equipment having both of the following characteristics shall meet the requirements of 11.7.2 of G.5: a) a product of pressure and volume greater than 200kPa-l. b) a pressure greater than 50 kPa.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Add: Laboratory equipment and testing and measurement equipment that do not have those characteristics shall meet the requirements of 11.7.3 and 11.7.4 as applicable.		N/A
	Add: Other types of equipment shall meet the requirements of Annex G, as applicable.		N/A
	Add: Conformity is checked as specified in 11.7.2 to 11.7.4 and Annex G.		N/A
11.7.2	Replace the note with the following note: Note: National authorities may allow safety to be established by calculation, for example according to the ASME Boiler and Pressure Vessel Code.		N/A
12.1	Add: Note: In the USA, x-ray equipment is within the scope of 21 CFR 1020 and laser equipment is within the scope of 21 CFR 1040. In Canada, both are within the scope of the Canadian Radiation Emitting Devices Act.		N/A
12.3	Add: Note 3: The ACIGH UV Guidelines, UL 746C, and CSA C22.2 No. 0.17 may provide useful guidance to the RISK assessment.		N/A
14.1.1	Add: In item a), replace "IEC" with "ANSI", CAN, CSA, IEC, SO, or UL".	Components which are certified to UL/CUL and/or US and CN national standards are used properly within their ratings.	Pass
14.1.2	Add: In item b), replace "IEC" with "ANSI", CAN, CSA, IEC, SO, or UL".		Pass
14.1.3	Add: In item c), replace "IEC" with "ANSI", CAN, CSA, IEC, SO, or UL".		Pass
14.1.4	Add: In item d), replace "IEC" with "ANSI", CAN, CSA, IEC, SO, or UL", in three instances.		Pass
	Add: Note 3: Annex DVA provides applicable safety requirements.		Pass
14.7	Add the following to the end of the first paragraph: A flammability RATING of ANSI/UL94 V-1 or and CAN/CSA C22.2 No. 0.17 is considered equivalent to the same classifications of IEC 60695-11-10.		Pass
14.9	Enclosures intended for outdoor use		N/A
	Nonmetallic enclosures intended for outdoor use shall meet the UV resistance requirements of ANSI/UL 746C or CSA C22.2 No. 0.17, or both as appropriate.		N/A
	Note: ANSI/UL 746C, clause 25 requires a 1 000 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 1 000 hour UV/water exposure preconditioning.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
14.10	Conductive coatings, shields, and tape		N/A
14.10.1	Conductive coatings The bond of a conductive (metallic) coating applied to a polymeric part shall be evaluated.		N/A
	Add: Conformity is checked by: a) Evaluating the bond in accordance with the requirements for "Adhesives" in ANSI/UL 746C and/or CSA C22.2 No. 0.17, or b) Evaluating the product to determine that peeling or flaking of the coating would not reduce spacings or bridge live parts so as to introduce a risk of fire or electric shock.		N/A
14.10.2	Conductive shield or tape		N/A
	If peeling of the conductive shield or tape may introduce a RISK of fire or electric shock, the bond between a conductive shield or tape and any other surface shall be investigated.		N/A
	Conformity is checked by inspection.		N/A
14.11	Direct plug-in transformer units Direct plug-in transformer units are subject to additional requirements found in ANSI/UL 1310, CAN/CSA C22.2 No. 223, ANSI/UL 60950-1, or CSA C22.2 No. 60950-1 as applicable.		N/A
Annex DVC	UV radiation limits: Guidelines from the American Conference of Governmental Industrial Hygienists (ACGIH)		N/A
Annex DVC.1	General These threshold limit values (TLV) refer to ultraviolet (UV) radiation in the spectral region between 180 nm and 400 nm, and represent levels to which nearly all workers may be repeatedly exposed without adverse health effects. These values for exposure of the eye or the skin apply to UV radiation from arc, gas, and vapor discharges, fluorescent and incandescent sources, and solar radiation, but they do not apply to UV lasers (see the TLV for lasers). These values do not apply to UV radiation exposure of photosensitive individuals or of individuals concomitantly exposed to photosensitizing agents. These exposures to the eye do not apply to aphakics. (See light and near-infrared radiation TLV). These values should be used as guides in the control of exposure to continuous sources where the duration of exposure is not less than 0,1 s. Likewise, these values should not be regarded as a fine line between safe and dangerous levels.		N/A
Annex DVC.2	Recommended values: The TLV for occupational exposure to UV radiation incident upon skin or eye		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	<p>where irradiance values are known and exposure time is controlled are as follows:</p> <p>a) UV-A (315 to 400 nm) radiation to the unprotected eye:</p> <p>1) For exposure times less than 1 000 seconds, the total energy should not exceed 1 J/cm² (1 000 mJ/cm²).</p> <p>2) For exposure times greater than 1 000 seconds, the average power level should not exceed 1 mW/cm²; and no 1 000 second time period should present a total energy that exceeds 1 J/cm² (1 000 mJ/cm²).</p> <p>b) For monochromatic sources, the TLV for exposure to the unprotected skin or eye is shown in Table DVC.4.1 (also represented in figure DVC.4.1) and should not be exceeded within an 8-hour period.</p> <p>c) For broad-spectrum or multi-peak sources, the TLV for exposure of the unprotected skin or eye should be calculated based on an effective weighting formula:</p> $E_{eff} = \sum (E_{\lambda} \cdot S_{\lambda} \cdot \Delta\lambda)$ <p>Where: E_{eff} is the effective irradiance relative to a monochromatic source at 270 nm in mW/cm² [mJ/(s•cm²)];</p> <p>E_{λ} is the spectral irradiance in W/(cm²•nm);</p> <p>S_{λ} is the relative spectral effectiveness (unitless);</p> <p>$\Delta\lambda$ is the bandwidth in nm.</p> <p>The result of the calculation, E_{eff}, should then be either applied to table DVC.4.2 or should be used in the following calculation:</p> $\text{Exposure time TLV} = 3 \text{ (mJ/cm}^2\text{)} / E_{eff}$ <p>(where E_{eff} is in mW/cm²)</p> <p>d) For most white-light sources and all open arcs, the weighting of spectral irradiance between 200 and 315 nm should suffice to determine the effective irradiance. Only specialized UV sources designed to emit UV-A radiation would normally require spectral weighting from 315 to 400 nm.</p> <p>All of the preceding TLVs for UV energy apply to sources which subtend an angle less than 80°. Sources which subtend a greater angle need to be measured only over an angle of 80°.</p> <p>NOTE 1 Conditioned (tanned) individuals can tolerate skin exposure in excess of the TLV without erythral effects. However, such conditioning may not protect persons against skin cancer.</p> <p>NOTE 2 Ozone (O₃) is produced in air by sources emitting UV radiation at wavelengths below 250 nm. Refer to chemical substances TLV for ozone.</p>		
Annex DVD	Permanent connection to MAINS		N/A
Annex DVD.1	General Equipment intended for permanent connection to the MAINS shall have provision for connection of a wiring system in accordance with ANSI/NFPA 70, NEC, with CSA		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	C22.1, CEC, Part 1 or with both as appropriate, and shall meet the requirements of DVD.2 to DVD.3, as applicable. Conformity is checked by inspection, and as specified in DVD.2 to DVD.3.		
Annex DVD.2	<p>Wiring TERMINALS and leads</p> <p>PERMANENTLY CONNECTED EQUIPMENT shall be provided with TERMINALS or leads for the connection of conductors having an ampacity that, in accordance with the National Electrical Code and/or the Canadian Electrical Code, Part 1, is acceptable for the equipment.</p> <p>A TERMINAL or splice compartment shall be complete. The top, all sides, and a complete bottom shall be provided when the equipment is shipped from the factory and shall enclose all FIELD WIRING TERMINALS and splices intended to be made in the field. Equipment with an ENCLOSURE that is complete need not be provided with a separate compartment.</p> <p>The TERMINAL or splice compartment in which MAINS connections to PERMANENTLY CONNECTED EQUIPMENT are made shall be located so that:</p> <ul style="list-style-type: none"> a) Internal wiring and electrical components are not exposed to mechanical damage or strain while connections are being made, and b) These connections may be readily inspected after the equipment is installed as intended. <p>Conformity is checked by inspection.</p>		N/A
Annex DVD.2.1	<p>Wiring Terminals</p> <p>Wiring TERMINALS shall provide effective connections, by use of screws, nuts or equally effective devices.</p> <p>Wire binding screws are permitted as follows:</p> <ul style="list-style-type: none"> a) A No. 6 or M4 screw may be used to connect a 14 AWG (2.1 mm²) or smaller wire. b) A No. 8 or M4.5 screw may be used to connect a 12 AWG (3.3 mm²) or smaller wire. c) A No. 10 or M5 screw may be used to connect a 10 AWG (5.3 mm²) or smaller wire. <p>Conformity is checked by inspection.</p>		N/A
Annex DVD.2.2	<p>Leads</p> <p>The free length of a lead inside a wiring compartment shall be at least 6 inches (150 mm).</p> <p>Conformity is checked by inspection.</p>		N/A
	<p>TERMINAL and lead identification</p> <p>TERMINALS and leads shall be identified in a manner that will permit the equipment to be connected as intended by the manufacturer.</p>		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	<p>Equipment containing either a MAINS-connected polarized convenience receptacle or a MAINS-connected polarized lamp socket shall have an identified neutral (grounded) conductor.</p> <p>NOTE A “grounded” supply conductor is one that is connected to protective earth at some point in the building installation. It is sometimes called the “neutral conductor”.</p> <p>A wiring TERMINAL that is intended solely for connection of the neutral (grounded) MAINS conductor shall be readily distinguishable from all other TERMINALS. It shall be constructed of, or plated with, metal that is substantially white in color or shall be clearly identified in some other manner, such as on a wiring diagram permanently attached to the equipment.</p> <p>A lead intended solely for field wiring connection to the neutral (grounded) MAINS conductor shall be readily distinguishable from all other leads by means of it being finished to show a white or natural gray color.</p> <p>The protective grounding (earthing) TERMINAL shall be marked in accordance with 5.1.6 (b) or marked “G”, “GR”, “GND”, “GRD”, “GROUND”, or “GROUNDING” or provided with a green colored screwhead that is hexagonal, slotted, or both.</p> <p>A lead intended for field connection to the protective grounding conductor shall be readily distinguishable from all other leads by being finished to show a green color with or without yellow stripes.</p> <p>Conformity is checked by inspection.</p>		
Annex DVD.3	<p>ENCLOSURE requirements for conduit entry</p> <p>An ENCLOSURE shall not pull apart or sustain damage such as cracking and breaking, and knockouts shall remain in place when subjected to the pulling, torque, and bending that is likely to occur.</p> <p>ENCLOSURES having sheet metal members with a thickness no less than 0.81 mm if of uncoated sheet steel, no less than 0.86 mm if of galvanized sheet steel, no less than 1.11 mm if of sheet aluminum, and no less than 1,09 mm if of sheet copper or sheet brass are not required to be tested.</p> <p>NOTE ENCLOSURES complying with ANSI/UL 50 are deemed to comply with DVD.4.1 and DVD.4.2.</p>		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	<p>An ENCLOSURE made either wholly or in part of insulating material shall have an acceptable bonding means to provide continuity of bonding between all metallic conduits entering the ENCLOSURE.</p> <p>Conformity is checked by inspection and by performing the applicable tests of DVD.4.</p>		
Annex DVD.4	Conduit ENCLOSURE entry tests		N/A
Annex DVD.4.1	<p>Conduit pull-out test</p> <p>The ENCLOSURE is suspended by a length of rigid conduit installed in one wall of the ENCLOSURE or mounted as intended in service, and a pulling force of 200 lb (890 N) is applied for 5 min to a length of conduit installed in the opposite wall (or wall with conduit entry if ENCLOSURE is mounted rather than suspended).</p>		N/A
Annex DVD.4.2	<p>Conduit torque test</p> <p>The ENCLOSURE is securely mounted as intended in service. A torque in accordance with table DVD.1 is applied to a length of installed conduit in a direction tending to tighten the connection. The lever arm is measured from the center of the conduit.</p>		N/A
Annex DVD.4.3	<p>Bending</p> <p>A length of conduit at least 1 ft (300 mm) long of the intended size is installed:</p> <ul style="list-style-type: none"> -a) In the center of the largest unreinforced surface, or -b) In a hub or an opening if provided as part of the ENCLOSURE. <p>The ENCLOSURE is securely mounted as intended in service, but positioned so that the installed conduit extends in a horizontal plane. A weight is suspended from the end of the conduit to produce the bending moment specified in Table DVD.2. The magnitude of the weight is determined from the equation: $W = (M - 0.5 \cdot C \cdot L) / L$, in which: W is the weight, in lb, to be hung at the end of the conduit; L is the length of the conduit, in inches, from the wall of the ENCLOSURE to the point at which the weight is suspended; C is the weight of the conduit, in lb; and M is the bending moment required in lb-in.</p> <p>For the SI system of units, the equation is: $W = (0.1 \cdot M - 0.5 \cdot C \cdot L) / L$, in which: W and C are measured in kg; M is measured in N•m; and L is measured in m.</p> <p>If the ENCLOSURE surface can be installed in either a</p>		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	<p>horizontal or a vertical plane, the vertical bending moment value is used.</p> <p>The test procedure may be terminated prior to attaining the values specified if the deflection of the conduit exceeds 10 in (250 mm) for a 10 ft (3.05 m) length of conduit.</p> <p>For an end-of-line ENCLOSURE as defined in Table DVD.1, the bending moment is 150 lb in (17.0 N•m).</p>		
Annex DVD.4.4	Knockouts A knockout is subjected to a force of 20 lb (89 N) applied at right angles by means of a mandrel with a 1/4-in (6.4-mm) diameter flat end. The mandrel is applied at the point most likely to cause movement of the knockout.		N/A
Annex DVE	Permanently installed equipment		Pass
Annex DVE.1	<p>General</p> <p>These requirements cover permanently installed, open-type or enclosed-type, equipment rated 1000 volts or less and intended for installation in accordance with the National Electrical Code, ANSI/NFPA 70 and the Canadian Electrical Code, C22.1.</p> <p>NOTE This equipment may also be intended for use in metering, monitoring, and measuring electrical power. Its primary function is to monitor, measure, or record power consumption. These devices could communicate with other devices by means of power line carrier, satellite/radio frequency, or wired/wireless signaling communications.</p> <p>With the exception of open-type energy-monitoring current transformers evaluated as part of an equipment, these devices and their associated communication modules evaluated to these requirements are not intended for retrofit installation within the enclosure of switchgears/panel boards. Equipment intended for installation within a switchgear/panel board shall meet these requirements and be additionally evaluated as accessories for use with specific switchgear/panel boards, in accordance with the appropriate standards for safety of that equipment.</p> <p>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.¹</p> <p>NOTE 1 The safety requirements for utility equipment can be found in the Standard for Safety of Electric Utility Meters, UL 2735 or alternating-current electricity</p>		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	<p>metering, CSA CAN3-C17.</p> <p>NOTE 2 These safety requirements do not apply to equipment intended for use in utility substations or equivalent areas that have over voltages greater than Cat. IV.</p> <p>The requirements in this Annex are to be used as supplements to the general requirements in this standard.</p>		
Annex DVE.3	Marking and documentation		Pass
Annex DVE.3.1	Marking		Pass
Annex DVE.3.1.1	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.	No switching device	N/A
Annex DVE.3.1.2	<p>An equipment provided with or intended for use with an external power-line current-sensing transformer shall be marked with the following the word "Warning" and the following or the equivalent: "To reduce risk of electric shock, always open or disconnect circuit from power-distribution system (or service) of building before installing or servicing current-sensing transformers."</p> <p>Additionally, such equipment shall be marked with a correlation marking to identify the specific manufacturers name and model designations of the current transformers that have been tested for use with the equipment. Alternatively, the equipment may be marked with the following, or equivalent: "For use with Listed Energy-Monitoring Current Transformers".</p>		N/A
Annex DVE.3.1.3	Field-wiring terminal markings		Pass
Annex DVE.3.1.3.1	<p>Equipment having field-wiring terminals shall be marked:</p> <p>a) "Use Copper Conductors Only" if the terminal is only for connection to copper wire;</p> <p>b) "Use Copper or Copper-Clad Aluminum Conductors Only" if the terminal is only for connection to copper and copper-clad aluminum wire;</p> <p>c) "Use Aluminum Conductors Only" or "Use Aluminum or Copper-Clad Aluminum Conductors Only" if the terminal is only for connection to aluminum wire; and</p> <p>d) "Use Copper or Aluminum Conductors" or "Use Copper, Copper-Clad Aluminum, or Aluminum Conductors" if the terminals is for connection to either</p>	"Use Copper Conductors Only"	Pass

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Clause	Requirement + Test	Result - Remark	Verdict
	copper or aluminum wire.		
Annex DVE.3.1.3.2	<p>Alternatively, the markings in DVE.3.1.3.1 may be abbreviated as follows:</p> <p>a) Equipment having a connector intended only for use with aluminum wire shall be plainly marked with the letters "AL".</p> <p>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".</p> <p>c) Equipment having a connector intended for use with copper-clad aluminum and copper wire shall be plainly marked "CC-CU" or "CU-CC".</p>		N/A
Annex DVE.3.1.3.3	<p>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.</p> <p>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.</p>		N/A
Annex DVE.3.2	Documentation: equipment installation		N/A
Annex DVE.3.2.1	<p>Equipment intended for use with field installed current transformers that could be installed in panel boards or switchgears shall include the following statements:</p> <p>a) "Always open or disconnect circuit from power-distribution system (or service) of building before installing or servicing current transformers".</p> <p>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".</p> <p>c) "Restrict installation of current transformer in an area where it would block ventilation openings".</p> <p>d) "Restrict installation of current transformer in an area of breaker arc venting".</p> <p>e) "Not suitable for Class 2 wiring methods" and "Not intended for connection to Class 2 equipment".</p> <p>f) "Secure current transformer and route conductors so that they do not directly contact live terminals or bus".</p> <p>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".</p>		N/A
Annex DVE.3.2.2	Unless intended for use with listed energy-monitoring current transformers, the following information and		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	<p>instructions shall be included for open-type equipment with field installed accessory current transformers that could be installed within the same overall enclosure:</p> <p>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".</p> <p>b) "Associated leads of the current transformers shall be maintained within the same overall enclosure" or similar.</p> <p>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.</p> <p>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.</p>		
Annex DVE.4	Protection against electric shock		N/A
Annex DVE.4.1	Primary means of protection		N/A
Annex DVE.4.1.1	Due to the potential co-mingling of 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
Annex DVE.4.1.2	There shall be reliable segregation or separation by barriers between the following different circuits: 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 b) Class 2 and Class 3 field installed and factory wiring, terminals, and uninsulated live parts.		N/A
Annex DVE.4.1.3	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 4-010) between parts of different circuits.		N/A
Annex DVE.4.1.4	Conductors provided with insulation rated for the highest voltage involved need not be separated or segregated.		N/A
Annex DVE.4.1.5	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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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."		
Annex DVE.4.2	Connections to external circuits		N/A
Annex 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 and supplied by the manufacturer shall comply with the requirements for the intended application.		N/A
Annex DVE.4.3	Insulation requirements		N/A
Annex DVE.4.3.1	Neutral conductors and parts, if any, shall be considered hazardous live as if they were a line circuit.		N/A
Annex DVE.4.4	Permanent connection to MAINS		N/A
Annex 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
Annex 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
Annex 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: 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. b) The factory-provided leads are bunched or otherwise arranged so that stress does not result on an individual lead. c) The equipment is marked to specify that the wire connector for field-installed wiring is to be used in making the field connection.		N/A
Annex DVE.4.4.4	A pigtail lead intended for field-wiring connection shall be subjected to the test specified in DVE.4.4.5.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
Annex DVE.4.4.5	A pigtail lead intended for field-wiring connection shall withstand without damage or displacement a direct pull of: a) 89 N (20 lb) for 1 minute applied to a lead extending from the enclosure such as through a hub or nipple and; b) 44.5 N (10 lb) for 1 minute applied to a lead within a wiring compartment.		N/A
Annex DVE.4.4.6	In addition to the protective grounding terminals marking as noted in DVD.2.4.5, a marking on a wiring diagram provided on the product may also be marked.		N/A
Annex DVE.5	Resistance to mechanical stresses		N/A
Annex DVE.5.1	Impact test		N/A
Annex DVE.5.1.1	For the Impact test, 8.2.2, replace the X test distance to 1.3 meters.		N/A
Annex DVE.6	Protection against the spread of fire		N/A
Annex DVE.6.1	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
Annex DVE.7	Equipment temperature limits and resistance to heat		Pass
Annex DVE.7.1	Conduct of temperature tests		Pass
Annex DVE.7.1.1	OPEN EQUIPMENT shall be mounted in an enclosure considered representative of the least favorable intended use. The maximum enclosure dimensions shall be determined by one of the following methods: a) 150 % of the dimensions of the device, length, width, and height; 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; c) The minimum enclosure size if marked on the device or defined by the manufacturer in the installation sheet; or d) The intended enclosure, such as a standard outlet box if marked on the device or defined by the manufacturer in the installation sheet.	The client declares to use surrounding air temperature.	Pass

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Clause	Requirement + Test	Result - Remark	Verdict
Annex DVE.7.1.2	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.		Pass
Annex DVE.7.2	Equipment intended for permanent installation		Pass
Annex DVE.7.2.1	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
Annex DVE.7.2.2	Permanently installed equipment shall be installed so that it is located as close to the wall or corner as the construction will permit.		N/A
Annex DVE.8	Components and subassemblies		N/A
Annex DVE.8.1	Current transformers		N/A
Annex DVE.8.1.1	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

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

APPENDIX A: Enclosures

Collateral/Particular Standard Enclosures

Enclosures

<u>Supplement ID</u>	<u>Description</u>
Particular Standard - (01)	IEC61010_2_201B(W)



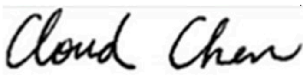
Particular Standard - (01) IEC61010_2_201B(W)Particular Standard - (01) IEC61010_2_201B(W)

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.	E465558 -D1000-1/A2/C1-UL
Date of issue	2018-05-25; 2018-08-24(A1); 2018-09-20(C1); 2018-11-19(A2)
Total number of pages	23
Name of Testing Laboratory preparing the Report	
Applicant's name	CERMATE TECHNOLOGIES INC
Address	7F-1 168 LIEN CHENG RD CHUNG HO DIST NEW TAIPEI, 235 TW
Test specification:	
Standard	IEC 61010-2-201: 2013 (First Edition)
Test procedure	CB Scheme
Non-standard test method	N/A
Test Report Form No.	IEC61010_2_201B
Test Report Form(s) Originator	UL(US)
Master TRF	2014-10
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General disclaimer:	
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Particular Standard - (01) IEC61010_2_201B(W)

Test item description	Human Machine Interface (HMI)	
Trade Mark	Trademark image(s): 	
Manufacturer	Same as Applicant	
Model/Type reference	PT2043, PT2070, PT2080, PT2100, PK2043, PK2070, PK2080, PK2100, xPT2043, xPT2070, xPT2080, xPT2100, KT2043, KT2070, KT2080, KT2100, FT2043, FT2070, FT2080, FT2100, OP2043, OP2070, OP2080, OP2100, MT2043, MT2070, MT2080, MT2100, NT2043, NT2070, NT2080, NT2100, XT2043, XT2070, XT2080, XT2100, TP2043, TP2070, TP2080, TP2100, LT2043, LT2070, LT2080, LT2100, VT2043, VT2070, VT2080, VT2100, IW405H, IW407H, IW408H, IW410H, may be followed 11 alphanumeric characters.	
Ratings	Power input: 24Vdc, 0.4A for Series 2043 with prefix PT, PK, xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT, and IW405H Power input: 24Vdc, 0.8A for Series 2070, 2080, 2100 with prefix PT, PK, xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT, IW and IW407H, IW408H, IW410H	
Testing procedure and testing location:		
<input checked="" type="checkbox"/> CB Testing Laboratory:		
Testing location/ address:	SUPERIOR PRODUCT CONSULTING INC 3RD FL, 10 ALLEY 6, LANE 235 PAO CHIAO RD, HSIN-TIEN, TAIPEI, 23145 TAIWAN	
<input type="checkbox"/> Associated CB Testing Laboratory:		
Testing location/ address:		
Tested by (name + signature):	Hans Hsieh(Project Handler)	
Approved by (name + signature):	Cloud Chen(Project Reviewer)	
[] Testing procedure: TMP/CTF Stage 1:		
Testing location/ address:		
Tested by (name + signature):		

Particular Standard - (01) IEC61010 2 201B(W)

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Report No. E465558 -D1000-1/A2/C1-UL

Approved by (name + signature):		
<input type="checkbox"/> Testing procedure: WMT/CTF Stage 2:		
Testing location/ address:		
Tested by (name + signature):		
Witnessed by (name + signature):		
Approved by (name + signature):		
<input type="checkbox"/> Testing procedure: SMT/CTF Stage 3 or 4:		
Testing location/ address:		
Tested by (name + signature):		
Witnessed by (name + signature):		
Approved by (name + signature):		
Supervised by (name + signature):		

Particular Standard - (01) IEC61010_2_201B(W)**List of Attachments (including a total number of pages in each attachment):**

See Part 1 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 for List of Country Differences applied.

☒ The product fulfils the requirements of UL61010-2-201:2013

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.

Particular Standard - (01) IEC61010_2_201B(W)**Test item particulars:**

Type of item	Control
Modular equipment.....	No
Description of equipment function (intended use)	These devices are HMI and intended for use in the industrial application. All series are equipped with different combination of communication ports including USB, RJ45 type ethernet, RS232, RS485, RS422.
Switching device, intended use	N/A
Enclosure type.....	Open equipment with partial enclosure
Connection to MAINS supply.....	Not connect to MAINS directly
Overvoltage category	Not connect to MAINS directly
POLLUTION DEGREE	2
Means of protection	Class III
Environmental conditions	Extended operating temperature -10 to 60 °C
For use in wet locations	No
Equipment mobility	Permanently mounted
Operating conditions.....	Continuous
Overall size of equipment (W x D x H)	Series 2043 with prefix PT, PK, xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT, and IW405H: 129mm by 103mm by 33mm Series 2070 with prefix PT, PK, xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT, and IW407H: 203.5mm by 148.5mm by 37mm Series 2080 with prefix PT, PK, xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT, and IW408H: 233mm by 176mm by 42.2mm Series 2100 with prefix PT, PK, xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT, and IW410H: 270.8mm by 212.8mm by 42.5mm
Mass of equipment (kg)	Series 2043 with prefix PT, PK, xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT and IW405H: 0.23kg max. Series 2070 and 2080, with prefix PT, PK, xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT and IW407H and IW408H: 0.55kg max. Series 2100 with prefix PT, PK, xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT and IW410H: 1.1kg max.
Marked degree of protection to IEC 60529.....	N/A

Possible test case verdicts:

- Test case does not apply to the test object : N/A
- Test object does meet the requirement..... : P (Pass)
- Test object does not meet the requirement..... : F (Fail)

Particular Standard - (01) IEC61010_2_201B(W)

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Report No. E465558 -D1000-1/A2/C1-UL

Testing:	
Date of receipt of test item.....	: 2017-12-13 ;2018-01-15 ; 2018-05-10(A1); 2018-09-26(A2)
Date (s) of performance of tests.....	: 2018-03-16 to 2018-03-29; 2018-05-10(A1); 2018-11-07(A2)
General remarks:	
<p>"(see Attachment #)" refers to additional information appended to the report.</p> <p>"(see appended Table)" refers to a table appended to the report.</p> <p>The tests results presented in this report relate only to the object tested.</p> <p>This report shall not be reproduced except in full without the written approval of the testing laboratory.</p> <p>List of test equipment must be kept on file and available for review.</p> <p>This Test Report Form is intended for the investigation of control equipment in accordance with IEC 61010-2-201. It cannot be used alone but only together with IEC 61010-1:2010 (Third Edition) Test Report.</p> <p>Additional test data and/or information are provided in the attachments to this report.</p> <p>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</p>	

Manufacturer's Declaration per sub-clause 4.2.5 of IEC61010-2:	
<p>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: N/A</p> <p>When differences exist; they shall be identified in the General product information section.</p>	
General product information:	
See part 1 report.	
Test configuration (cl. 4.1):	
See part 1 report.	

Particular Standard - (01) IEC61010_2_201B(W)

IEC 61010-2-201			
Clause	Requirement + Test	Result - Remark	Verdict

Particular Standard - (01) IEC61010 2 201B(W)

IEC 61010-2-201		
Clause	Requirement – Test	Verdict

4.4.1.101.1	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:			

4.4.1.101.2	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:			

Particular Standard - (01) IEC61010_2_201B(W)

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Report No. E465558 -D1000-1/A2/C1-UL

IEC 61010-2-201			
Clause	Requirement — Test		Verdict
6.5.2.5	TABLE: Bonding impedance of permanently connected equipment		
ACCESSIBLE part under test	Test current (A)	Voltage attained after 1 min (maximum 10 V) (V)	Verdict
Supplementary information: See Part 1 for Testing Conducted.			

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: See Part 1 for Testing Conducted.				

Particular Standard - (01) IEC61010 2 201B(W)

IEC 61010-2-201							
Clause	Requirement — Test					Verdict	
6.7	TABLE: Insulation requirements- Block diagram of system						
See Part 1 for Block Diagram							
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							
<div style="display: flex; justify-content: space-between;"> <div> <p>NOTE 1 – Type of insulation:</p> <p>BI = BASIC INSULATION</p> <p>DI = DOUBLE INSULATION</p> <p>PI = PROTECTIVE IMPEDANCE</p> <p>RI = Reinforced INSULATION</p> <p>SI = Supplementary INSULATION</p> <p>see also Table 6.7B for further details</p> </div> <div> <p>NOTE 2 - Types of voltage</p> <p>Peak impulse test voltage (pulse)</p> <p>r.m.s.</p> <p>d.c.</p> <p>peak</p> </div> <div> <p>NOTE 3 - OVERVOLTAGE CATEGORIES</p> <p>or POLLUTION DEGREES which differ</p> <p>should be shown under "Comments"</p> </div> </div>							
Supplementary Information: See Part 1 for Block Diagram and Details.							

Particular Standard - (01) IEC61010_2_201B(W)

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			
Supplementary information: See Part 1 for Testing Conducted.			

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	
Location		mm	30 °
1)			
2)			
Dropping onto an edge or corner		Raised up to	
Location		mm	30 °
1)			
2)			
Supplementary information: See Part 1 for Testing Conducted.			

Particular Standard - (01) IEC61010 2 201B(W)

IEC 61010-2-201			
Clause	Requirement — Test		Verdict
9	TABLE: Protection against the spread of fire		
Item	Source of HAZARD or area of the equipment considered (circuit, component, liquid etc.)	Protection Method (9a, 9b or 9c)	Protection details
Supplementary information: See Part 1 for Details.			

Particular Standard - (01) IEC61010_2_201B(W)

IEC 61010-2-201				
Clause	Requirement — Test			Verdict
11	TABLE : Protection against HAZARDS from fluids			
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)	
NOTE 1 - 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 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: See Part 1 for Testing Conducted.				

Particular Standard - (01) IEC61010_2_201B(W)**List of test equipment used:**

A completed list of used test equipment shall be provided in the Test Reports when a Manufacturer Testing Laboratory according to TMP/CTF stage 1 or WMT/CTF stage 2 procedure has been used.

Note: This page may be removed when TMP/CTF stage 1 or WMT/CTF stage 2 are not used. See also clause 4.8 in OD 2020 for more details.

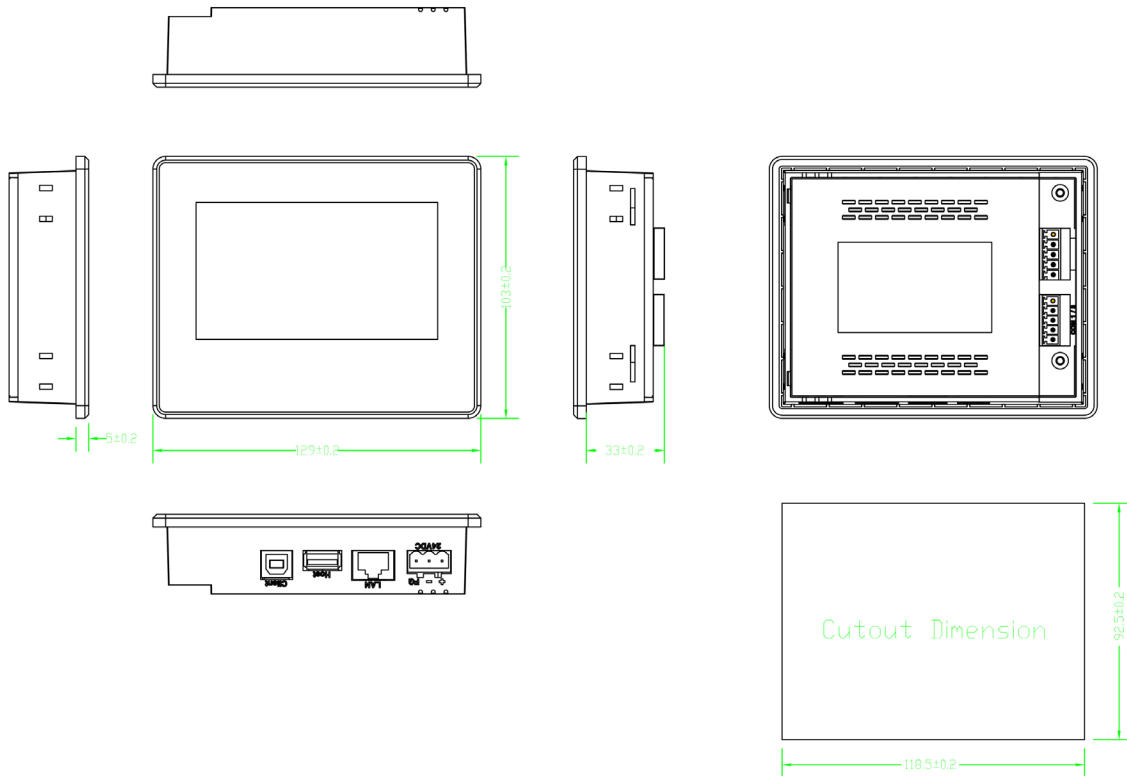
Clause	Measurement / testing	Testing / measuring equipment / material used, (Equipment ID)	Range used	Last Calibration date	Calibration due date

Other Enclosures

All Enclosures associated with this report are shown below.

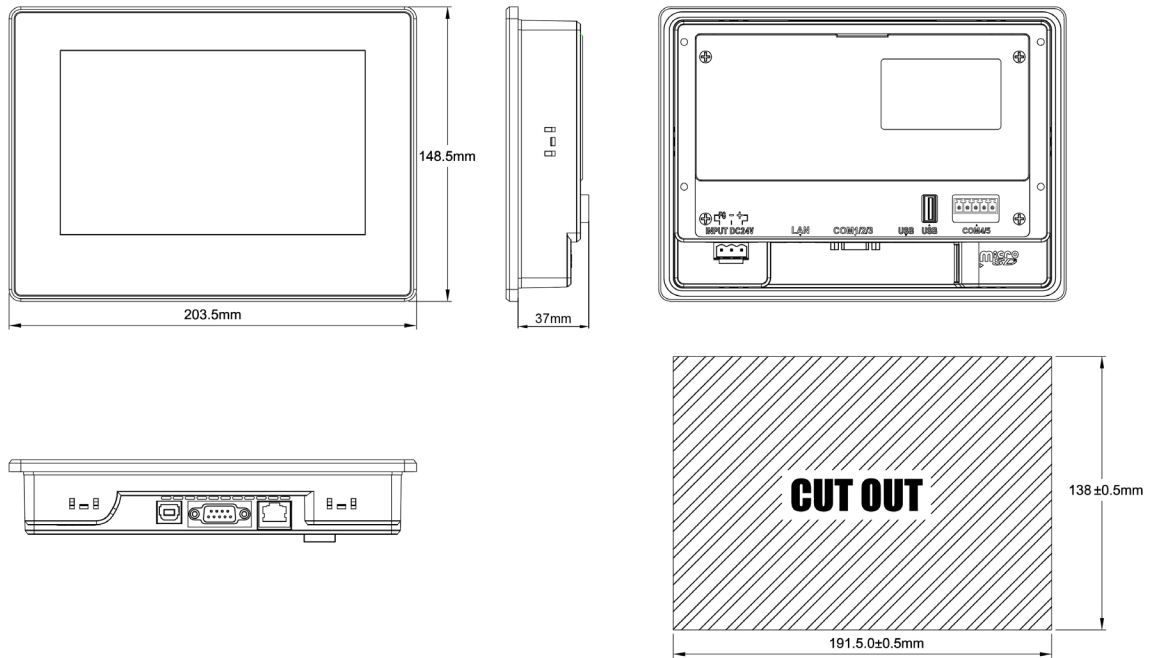
Enclosures

<u>Supplement - (ID)</u>	<u>Description</u>
Diagrams - (01)	01-a. dimension size of plastic PT2043 series
Diagrams - (02)	01-b. dimension size of plastic PT2070 series
Diagrams - (03)	01-c. dimension size of plastic PT2080 series
Diagrams - (04)	01-d. dimension size of plastic PT2100 series
Diagrams - (05)	01-e. dimension size of metallic PT2070 series
Diagrams - (06)	01-f. dimension size of metallic PT2080 series
Diagrams - (07)	01-g. dimension size of metallic PT2100 series
Diagrams - (34)	02-a. Corrosion resistance coating
Diagrams - (35)	02-b. Corrosion resistance coating
Marking Label - (01)	PT2_UL LABEL SAMPLE_v2-01, 0420
Miscellaneous - (01)	01. Nomenclature
Photographs - (01)	01-a. 4.3 inch overview
Photographs - (02)	01-b. 4.3 inch overview
Photographs - (03)	01-c. 4.3 inch overview
Photographs - (04)	01-d. 4.3 inch overview
Photographs - (05)	01-e. 4.3 inch rear side
Photographs - (06)	01-f. 4.3 inch Bottom PWB
Photographs - (07)	01-g. 4.3 inch Top PWB
Photographs - (08)	02-a. 7 inch overview
Photographs - (09)	02-b. 7 inch overview
Photographs - (10)	02-c. 7 inch overview
Photographs - (11)	02-d. 7 inch overview
Photographs - (12)	03-a. 10 inch overview
Photographs - (13)	03-b. 10 inch overview
Photographs - (14)	03-c. 10 inch overview
Photographs - (15)	03-d. 10 inch overview
Photographs - (16)	03-e. 10 inch rear side
Photographs - (17)	03-f. 10 inch Top PWB
Photographs - (18)	03-g. 10 inch Bottom PWB



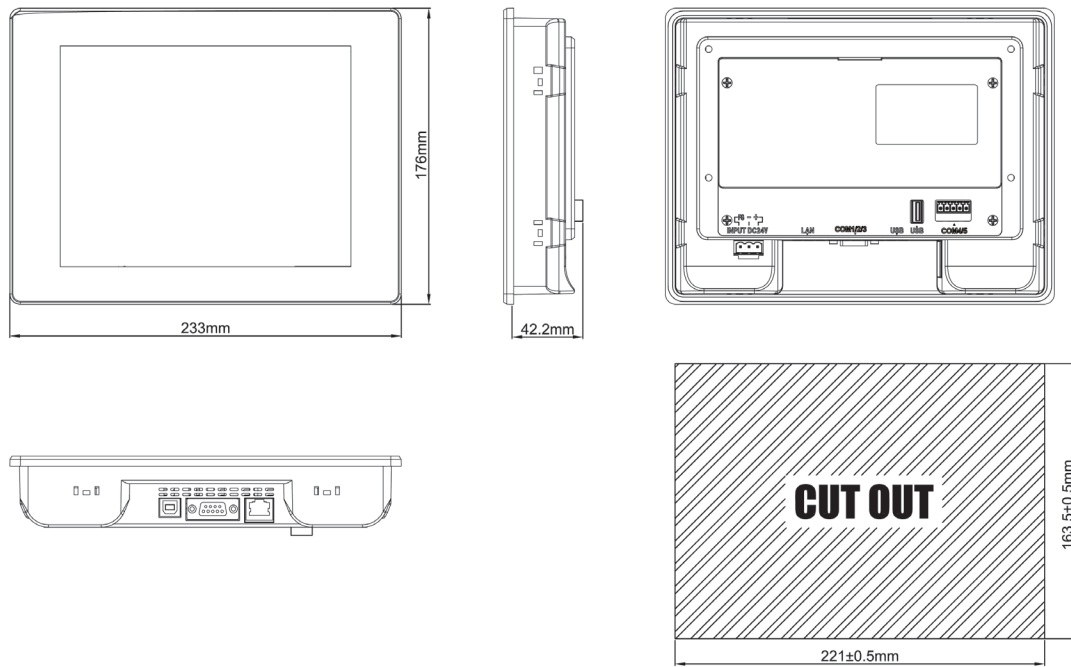
Diagrams - (02) 01-b. dimension size of plastic PT2070 series

Diagrams - (02) 01-b. dimension size of plastic PT2070 series



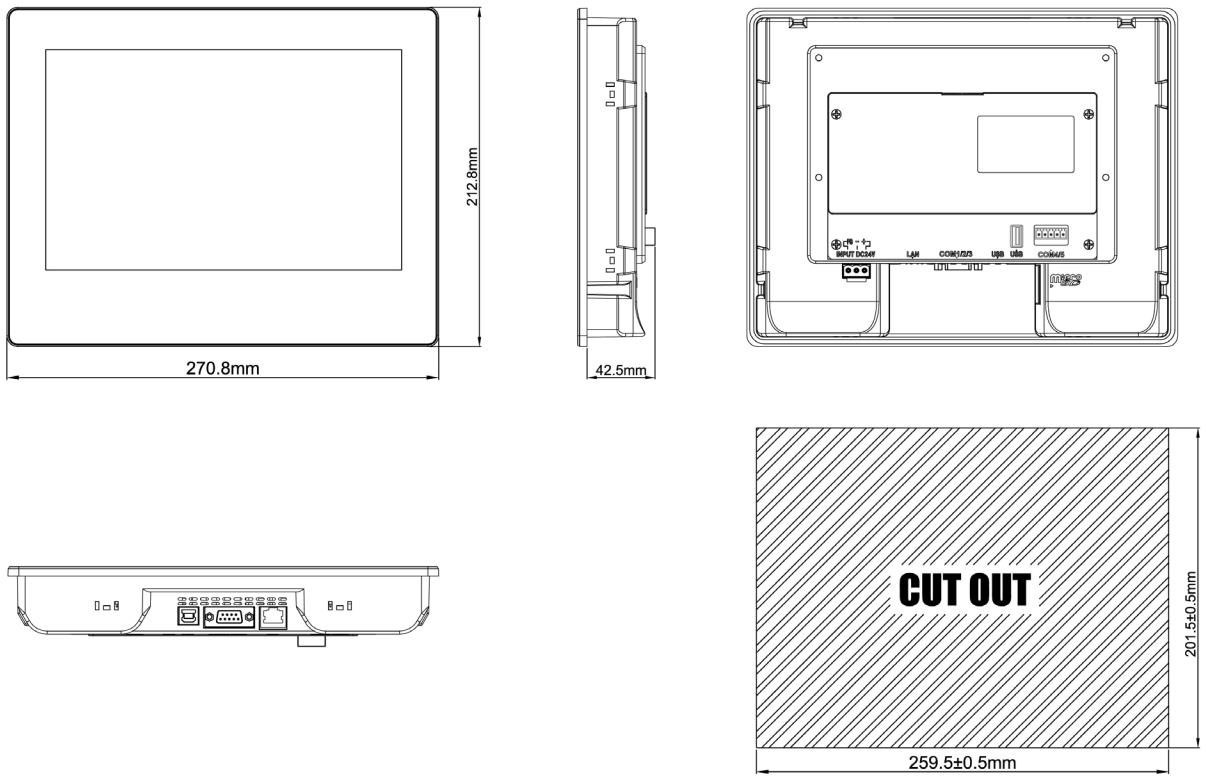
Diagrams - (03) 01-c. dimension size of plastic PT2080 series

Diagrams - (03) 01-c. dimension size of plastic PT2080 series



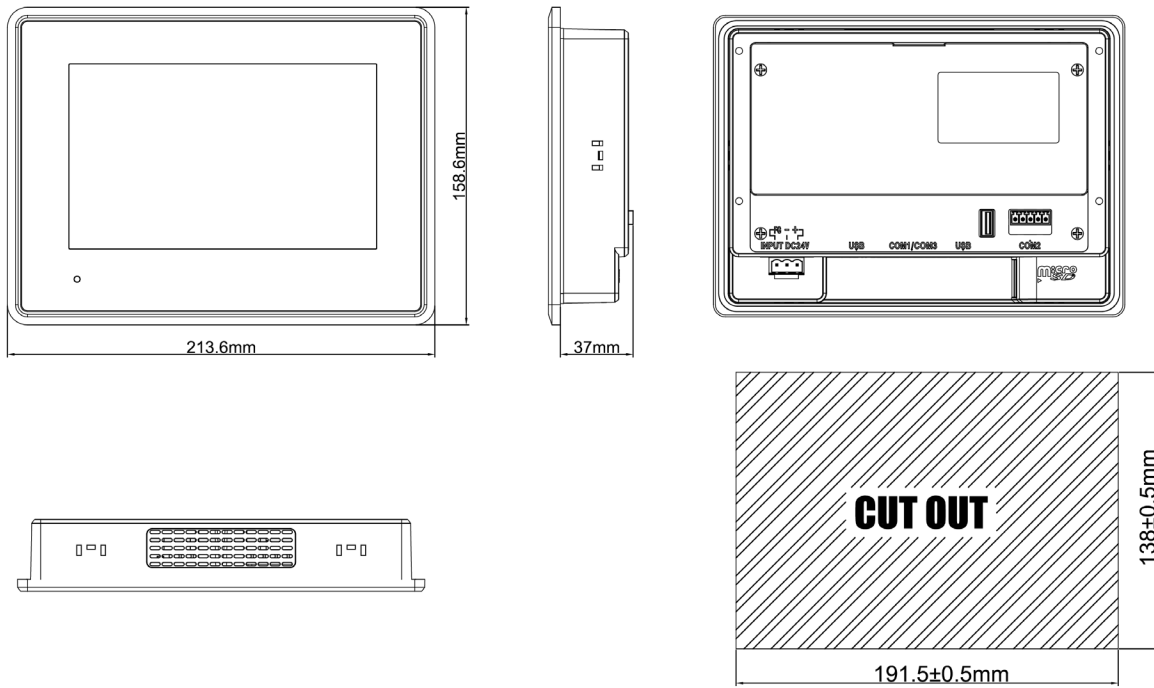
Diagrams - (04) 01-d. dimension size of plastic PT2100 series

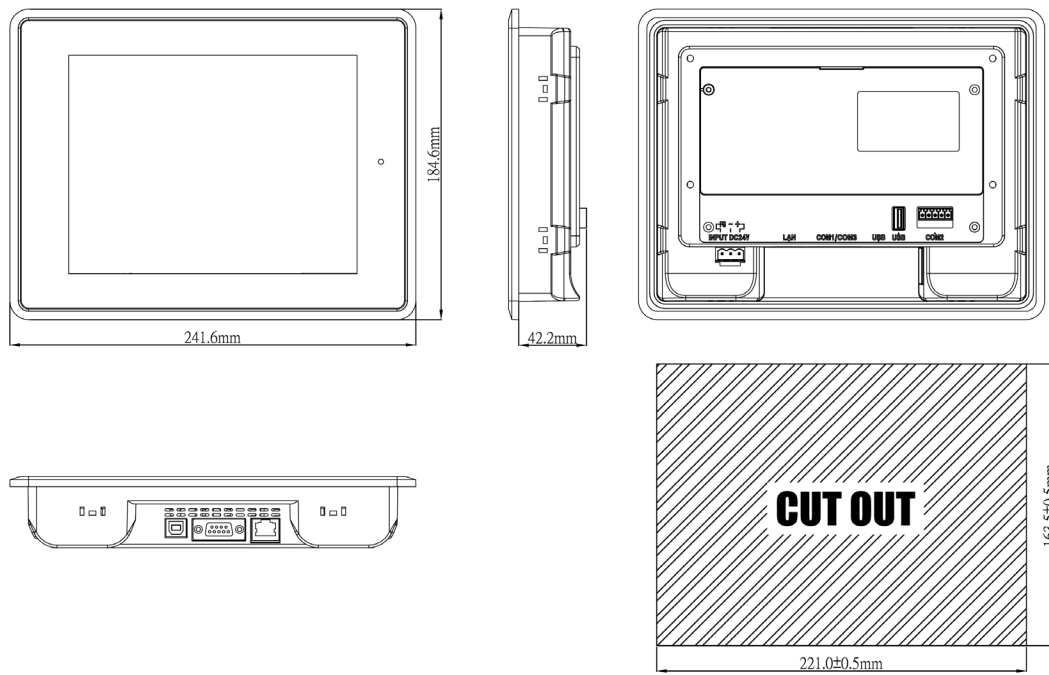
Diagrams - (04) 01-d. dimension size of plastic PT2100 series



Diagrams - (05) 01-e. dimension size of metallic PT2070 series

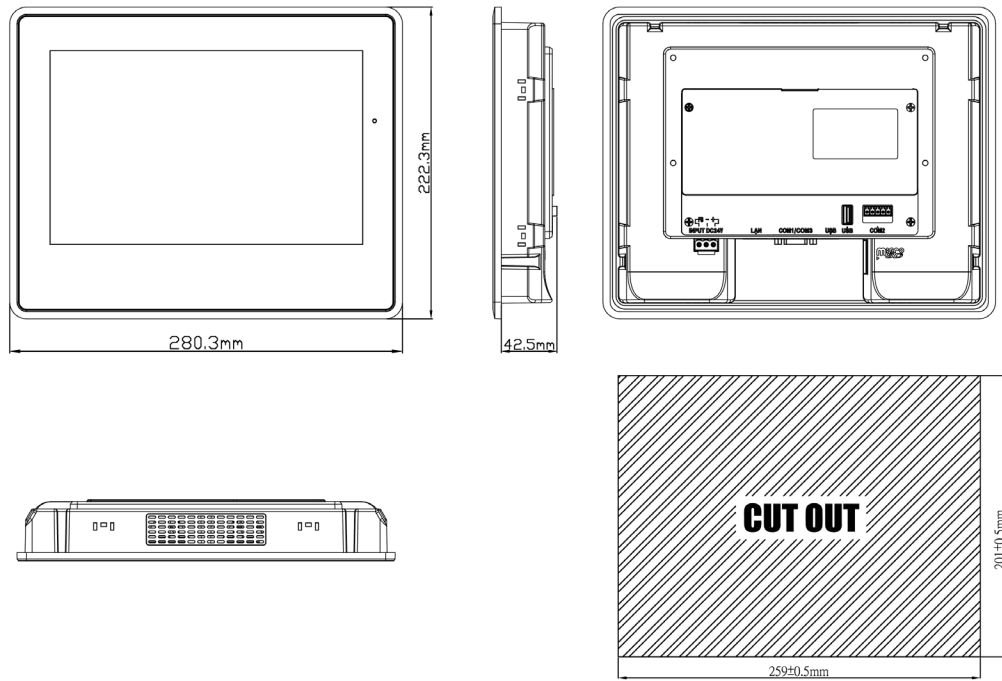
Diagrams - (05) 01-e. dimension size of metallic PT2070 series





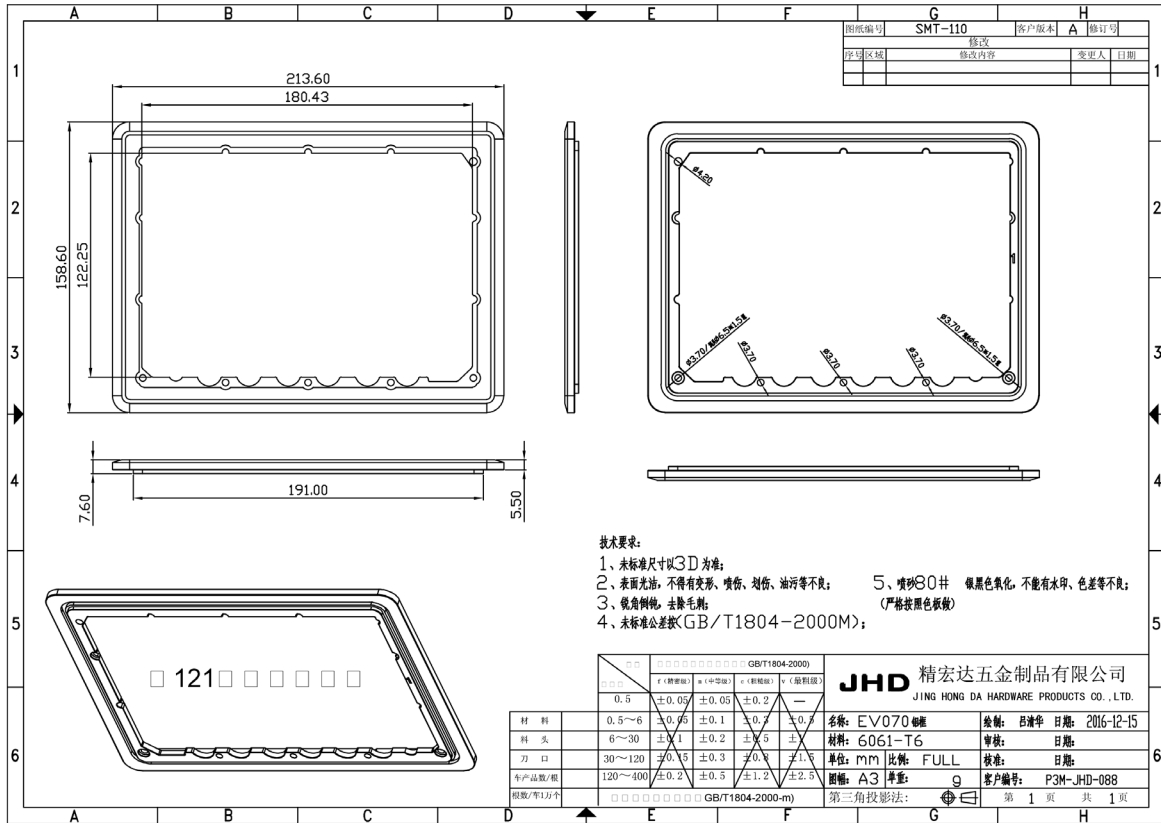
Diagrams - (07) 01-g. dimension size of metallic PT2100 series

Diagrams - (07) 01-g. dimension size of metallic PT2100 series








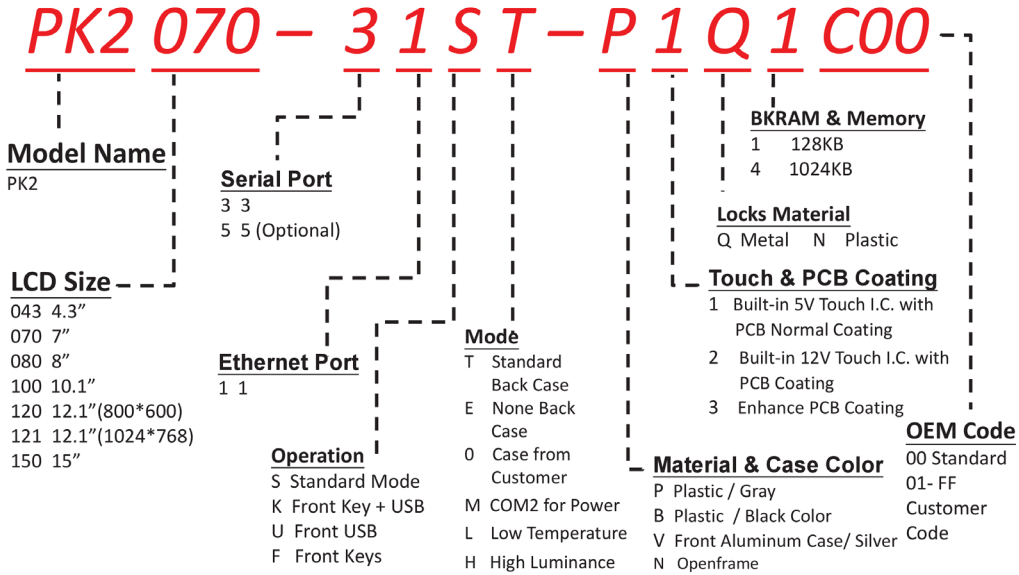
Diagrams - (35) 02-b. Corrosion resistance coating

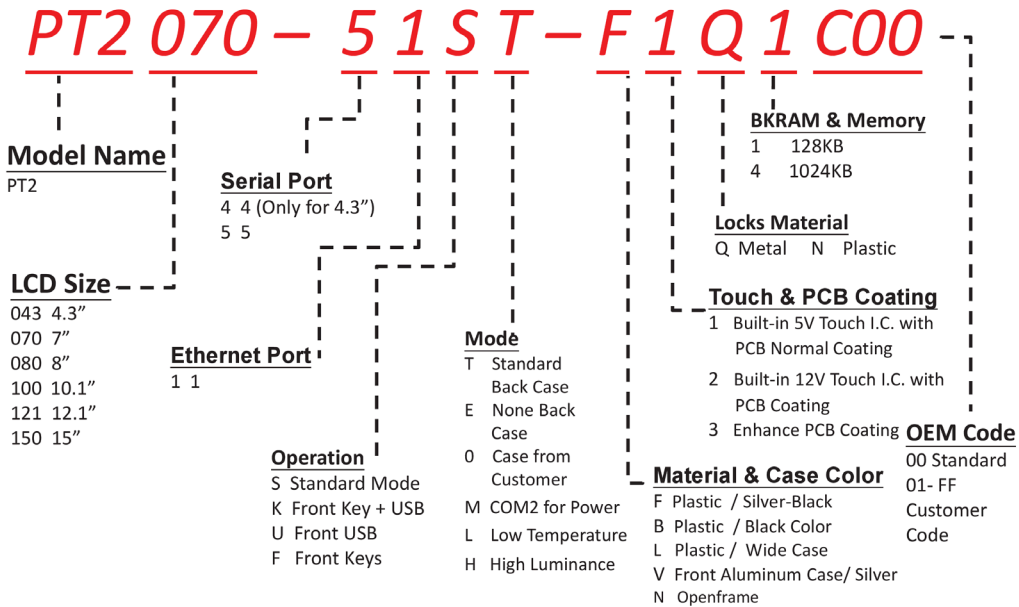
Diagrams - (35) 02-b. Corrosion resistance coating



Marking Label - (01) PT2_UL LABEL SAMPLE_v2-01, 0420Marking Label - (01) PT2_UL LABEL SAMPLE_v2-01, 0420

Cermate Cermate Technologies Inc. 屏通科技股份有限公司		www.cermate.com Made in Taiwan (台灣製造)	
LCD Touch Control Panel / 人機介面 / 触控屏			
Model No: ■PT2043 ■PT2070 ■PT2080 ■PT2100			
Input: ■24Vdc 0.4A ■24Vdc 0.8A Class 2			
Serial Port: ■1 ■2 ■3 ■4 ■5			
Ethernet Port: ■0 ■1 ■2			
Operation: ■S ■K ■U ■F			
Mode: ■T ■E ■L			
Case: ■F ■B ■L ■V			
SRAM: ■128KB ■1MB			
		 	
			This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
<div>  <div> <p>注意!!</p> <p>產品避免碰撞。</p> <p>請勿自行拆卸機殼。</p> <p>機台內部無客戶可自行處理部份，</p> <p>若有問題請洽詢專業人員。</p> </div> </div>			
<div> <div> <p>LISTED</p> <p>PROG. CNTLR.</p> <p>E465558</p> </div> <div> <p>注意!!</p> <p>產品避免碰撞。</p> <p>請勿自行拆卸機殼。</p> <p>機台內部無客戶可自行處理部份，</p> <p>若有問題請洽詢專業人員。</p> </div> </div>			
<div> <div> <p>Caution!</p> <p>To prevent shock. Do not remove cover.</p> <p>No user serviceable parts inside.</p> <p>Refer servicing to qualified personnel.</p> <p>Maximum Surrounding Air Temperature 60 Degrees Celsius.</p> <p>For use in Pollution Degree 2 Environment.</p> </div> <div> <p>Attention!</p> <p>Afin d'éviter les chocs électriques, ne pas retirer le capot arrière.</p> <p>Aucune pièce réparable par l'utilisateur.</p> <p>Confiez la réparation au personnel qualifié.</p> <p>Température maximale de l'air ambiant 60 degrés Celsius.</p> <p>Pour une utilisation dans l'environnement de pollution degré 2.</p> </div> </div>			

Miscellaneous - (01) 01. NomenclatureMiscellaneous - (01) 01. Nomenclature**PK2 Ethernet Series Product Naming Rule****A Professional HMI Solution Provider****Cermate**

Miscellaneous - (01) 01. Nomenclature**PT2 Series Product Naming Rule****A Professional HMI Solution Provider****Cermate**

Photographs - (01) 01-a. 4.3 inch overview

Photographs - (01) 01-a. 4.3 inch overview



Photographs - (02) 01-b. 4.3 inch overview

Photographs - (02) 01-b. 4.3 inch overview



Photographs - (03) 01-c. 4.3 inch overview

Photographs - (03) 01-c. 4.3 inch overview



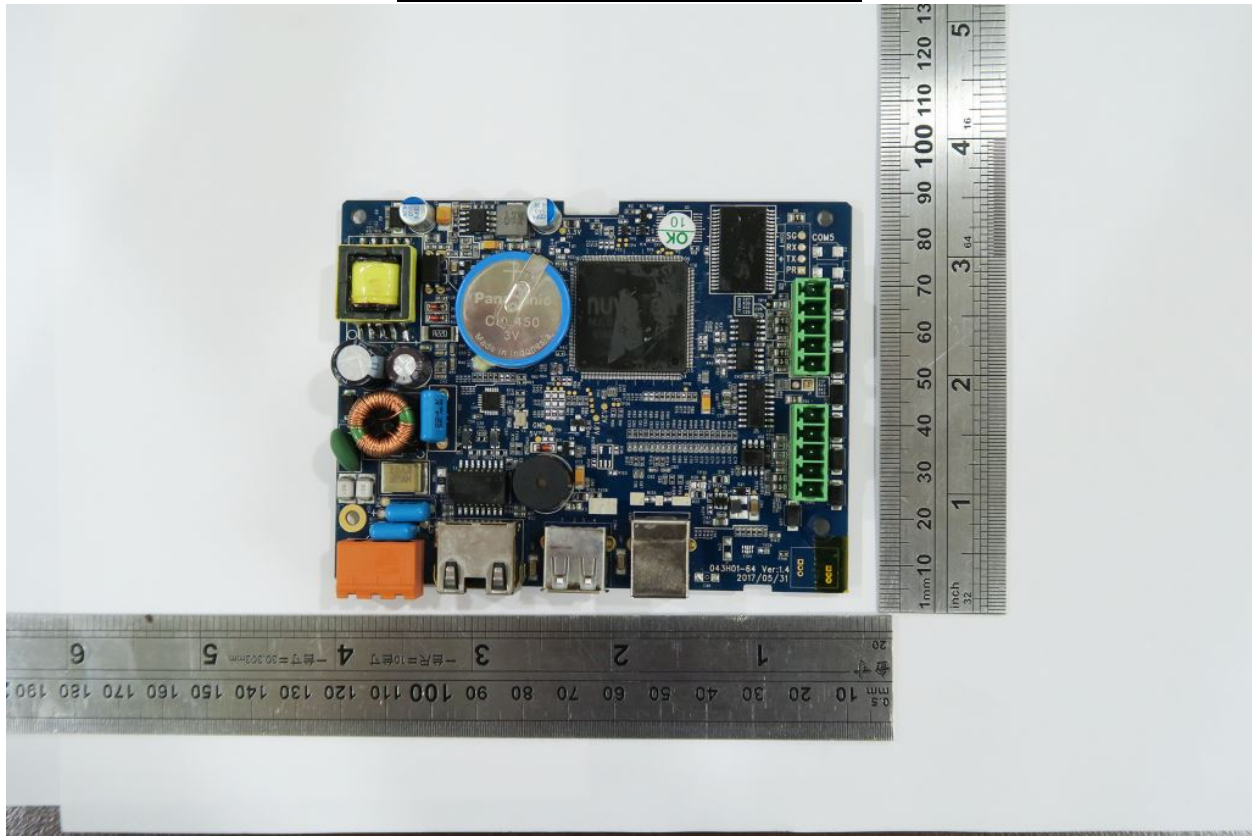
Photographs - (04) 01-d. 4.3 inch overviewPhotographs - (04) 01-d. 4.3 inch overview

Photographs - (05) 01-e. 4.3 inch rear sidePhotographs - (05) 01-e. 4.3 inch rear side

Photographs - (06) 01-f. 4.3 inch Bottom PWBPhotographs - (06) 01-f. 4.3 inch Bottom PWB

Photographs - (07) 01-g. 4.3 inch Top PWB

Photographs - (07) 01-g. 4.3 inch Top PWB



Photographs - (08) 02-a. 7 inch overview

Photographs - (08) 02-a. 7 inch overview



Photographs - (09) 02-b. 7 inch overviewPhotographs - (09) 02-b. 7 inch overview

Photographs - (10) 02-c. 7 inch overview

Photographs - (10) 02-c. 7 inch overview



Photographs - (11) 02-d. 7 inch overview

Photographs - (11) 02-d. 7 inch overview



Photographs - (12) 03-a. 10 inch overview

Photographs - (12) 03-a. 10 inch overview



Photographs - (13) 03-b. 10 inch overview

Photographs - (13) 03-b. 10 inch overview



Photographs - (14) 03-c. 10 inch overviewPhotographs - (14) 03-c. 10 inch overview

Photographs - (15) 03-d. 10 inch overview

Photographs - (15) 03-d. 10 inch overview



Photographs - (16) 03-e. 10 inch rear side

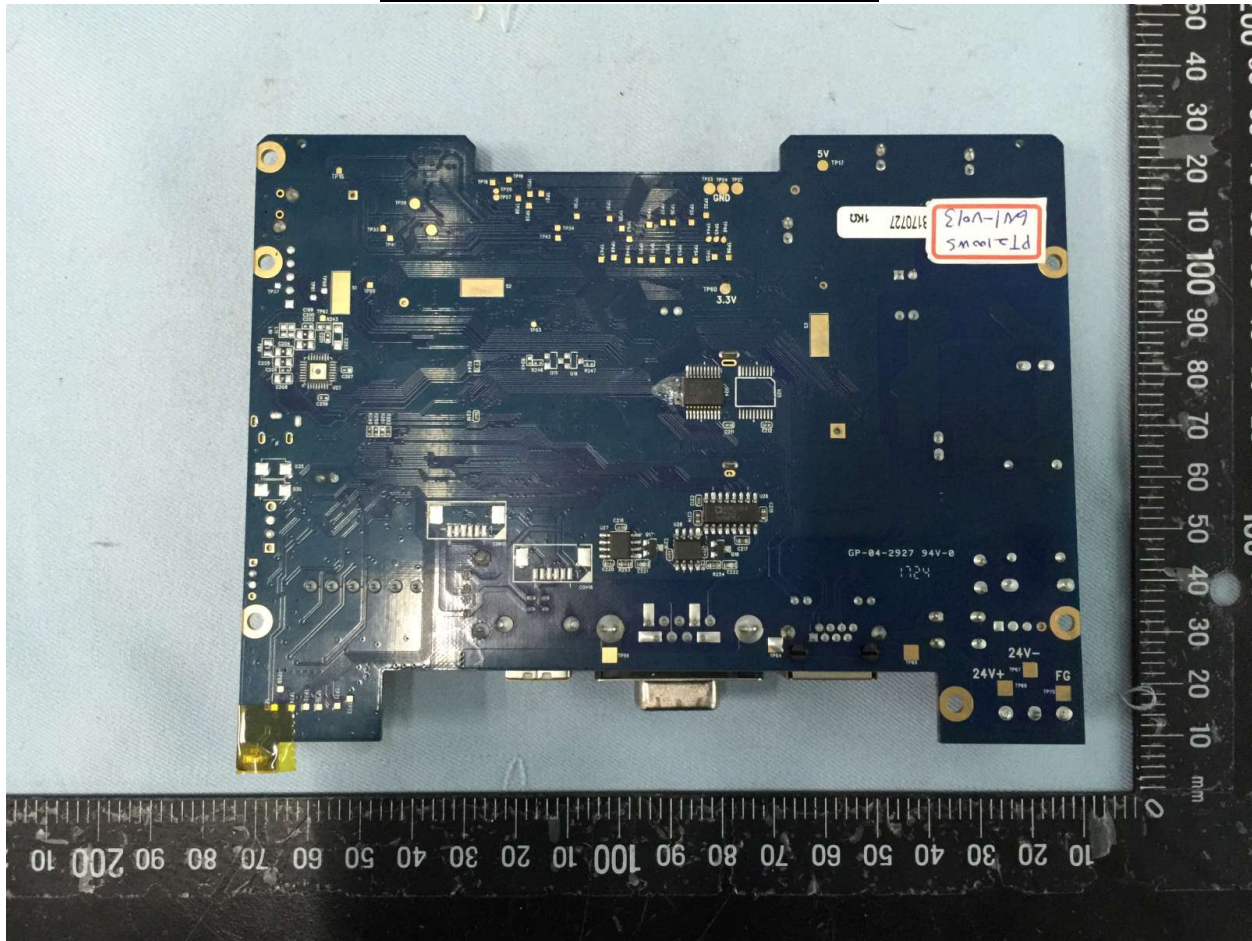
Photographs - (16) 03-e. 10 inch rear side



Photographs - (17) 03-f. 10 inch Top PWBPhotographs - (17) 03-f. 10 inch Top PWB

Photographs - (18) 03-g. 10 inch Bottom PWB

Photographs - (18) 03-g. 10 inch Bottom PWB



--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 samples of Model PT2043, PT2070, PT2080, PT2100.

Tests performed on model PT2043, PT2070, PT2080, PT2100 are considered representative of all models due to identical construction.

(A1) The manufacturer submitted representative production samples of Model PT2043, PT2080, PT2100.

Tests performed on model PT2043, PT2080, PT2100 are considered representative of all models due to identical construction.

(A2) The manufacturer submitted representative production samples of Model PT2080, PT2100.

Tests performed on model PT2080, PT2100 are considered representative of all models due to identical construction.

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.

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

UL File Number: E465558 Volume: D1 Issue Date: 2018-05-25;
2018-08-24(A1); 2018-09-20(C1); 2018-11-19(A2); 2020-09-16(C2)

FOLLOW-UP SERVICE PROCEDURE

(TYPE R)

**PRODUCT CATEGORY NAME
(NRAQ / NRAQ7)**

Manufacturer: SEE ADDENDUM FOR MANUFACTURING LOCATIONS

Applicant: 752439 (Party Site)
100609690 CERMATE TECHNOLOGIES INC
7F-1 No 168 Liancheng Rd Zhonghe Dist
New Taipei City, 23553 Taiwan

Listee/Classified/ Recognized Co.: Same as Applicant (unless specified differently below)
Same as Applicant

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 on addendum to this Follow-Up Service Procedure ("UL Contracting Party"). UL Contracting Party and UL LLC are referred to jointly herein as "UL."

UL further defines responsibilities, duties and requirements for both Manufacturers and UL representatives in the document titled, "UL Mark Surveillance Requirements" that can be located at the following web-site: <http://www.ul.com/fus>. Manufacturers without Internet access may obtain the current version of this document from their local UL customer service representative or UL field representative. For assistance, or to obtain a paper copy of this document or the Follow-Up Service Terms referenced below, please contact UL's Customer Service at <http://ul.com/aboutul/locations/>, select a location and enter your request, or call the number listed for that location.

The Applicant, the specified Manufacturer(s) and any Listee/Classified/Recognized 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/Recognized Company will be bound to a Service Agreement for Follow-Up Services upon the earliest by any Subscriber of use of the prescribed UL Mark, acceptance of the factory inspection, or payment of the Follow-Up Service fees which will incorporate such GSA, this Follow-Up Service Procedure and the Follow-Up Service Terms which can be accessed by clicking here: <http://services.ul.com/fus-service-termshttp://www.ul.com/contracts/Terms-After-12-31-2011>. 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.

It is the responsibility of the Listee/Classified/Recognized 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.

This Follow-Up Service Procedure contains information for the use of the above Manufacturer(s) and representatives of UL and is not to be used for any other purpose. It is provided to the Manufacturer with the understanding that it will be returned upon request and is not to be copied in whole or in part.

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 above named 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.

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.

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).

UL LLC has signed below solely in its capacity as the accredited entity to indicate that this Follow-Up Service Procedure is in compliance with the accreditation requirements.

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

Addendum to Authorization Page

LOCATION

Manufacturing Factory(ies)
Information:

CERMATE TECHNOLOGIES INC
7F-1 No 168 Liancheng Rd Zhonghe Dist
New Taipei City, 23553 Taiwan
Party Site: 752439
Subscriber No: 100609690
Factory ID: CT1
UL Contracting Party: UL GmbH

Advantech Technology (China) Co; Ltd
600 Han-Pu Rd Yushan Town,
Kunshan Jiangsu 215316, CHINA
Party Site: 356011
Subscriber No: 117252001
Factory ID: AC2
UL Contracting Party: UL GmbH

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

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

	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	<p>The UL Representative shall determine that the printed wiring board is as specified in the Procedure. The UL Representative then shall make a visual inspection of the printed wiring board assemblies for any mechanical damage or evidence of exposure to excessive temperatures that may have occurred during the soldering operation. The base material and the conductors shall be examined for nonconforming features as indicated below:</p> <p>A. Conductors, Terminal Pads, and Tabs</p> <ol style="list-style-type: none"> 1. Reduction in cross-section, such as scratches, nicks, pin holes, tearing. 2. Loosening or lifting of printed wiring conductor, pad, or tab from the base material. 3. Sections missing or damaged. 4. Blistering 5. Breaks <p>B. Base Material</p> <ol style="list-style-type: none"> 1. Warping 2. Cracking 3. Charring, blistering, or other heat damage due to solder process 4. Delamination

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

TABLE AA1
PRINTED WIRING BOARD SAMPLE SELECTION

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

Notes:

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

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

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

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

TABLE AA2
FOLLOW-UP TESTING FOR PLASTIC ENCLOSURES AND PARTS

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

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

	responsibility to order and purchase the probe through UL's Corporate Standards Department, at the Northbrook Office.
AA4.1.5.5	To determine compliance with AA4.1.5.3 (B), the UL Representative shall give consideration to the functioning of safety devices and constructional features (such as thermostats, overload protective devices and strain relief). Cracking or denting of the enclosure shall not result in the exposure of moving parts that could cause a risk of injury to persons.
AA4.1.5.6	To determine compliance with AA4.1.5.3 (C), the product shall be subjected to a Dielectric Voltage-Withstand Test as described in AC2.3 without dielectric breakdown.
AA4.1.5.7	If the Impact Test sample produces any one of the conditions specified in AA4.1.5.3, the test is to be repeated on three previously untested samples from the same lot. The results are considered acceptable if all three samples comply with the requirements. If a nonconformance occurs on any one of the additional samples, then the lot shall be considered rejected.
AA4.1.6	ID and Flammability Tests
AA4.1.6.1	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: <ul style="list-style-type: none">A. MaterialB. ManufacturerC. Model numberD. Follow-Up Test(s) requiredE. 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	<p><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.</p> <p><u>Exception</u> - Records of test results need not be maintained for 100% Production-Line Tests.</p>
AC1.5	<u>Test Equipment and Personnel</u> - Provide, at a convenient location, all required test equipment and facilities and any required personnel for conducting all tests that are to be performed at the factory. These shall be available when needed so that the inspection work can proceed without undue delay.
AC1.6	<u>Test Equipment Calibration</u> - Determine that the test equipment is functioning properly daily, and have it calibrated at least annually, or whenever it has been subject to abuse (such as being dropped or struck with an object) or its accuracy is questionable. The test equipment and instruments shall be calibrated either by the manufacturer or by an outside laboratory. In either case, it shall be calibrated by comparison with a standard that is traceable to the applicable U.S. or foreign National Standard. A letter from the outside laboratory or from an off-site manufacturer's calibration lab stating that their lab standards are directly traceable to their country's National Standard and outlining their traceability pathway is considered adequate proof of traceability. For in-house calibrations, the Standard (weight and gauge blocks, etc.) used shall be calibrated every three years, or whenever the Standard has been subject to some form of abuse that may affect the Standard's fitness for use. The Standard shall be stored to protect it from damage or deterioration per the Standard manufacturer's recommendations. Records of the calibration of the test equipment and Standard(s) shall be maintained until the next required calibration is completed and recorded, and shall be readily available for review by the UL Representative.

AC2.0	REQUIREMENTS FOR PRODUCTION-LINE TESTS
AC2.1	The following Production-Line Tests shall be conducted on the products covered by this Procedure. During production, the test equipment shall be checked for proper operation at least once during each shift. When the tests are not performed concurrently, it is preferred that the Grounding Continuity Test be performed before either Dielectric Voltage-Withstand Test.
AC2.2	Production-Line Grounding Continuity Test
AC2.2.1	<p><u>General</u> - Except as may be noted under "Exceptions" in each Test Report, the manufacturer shall subject 100 percent of production of all of the following products to a routine Production-Line Grounding Continuity Test as described in section AC2.2.3:</p> <ul style="list-style-type: none"> A. Products that are provided with a grounding type power supply cord, or B. Fixed products that are for permanent connection to the branch circuit. <p>Exception: This test is not required for permanent connection to the branch circuit by fixed wiring if the design does not employ bonding jumpers or grounding wiring to remote units.</p>
AC2.2.2	<u>Test Equipment</u> - Any suitable continuity-indicating device (such as an ohmmeter, a battery and buzzer combination, or the like) may be used to determine compliance with the Grounding Continuity Test requirements.
AC2.2.3	<u>Method</u> - Continuity shall be determined between the grounding conductor of the attachment plug cap, and/or the designated main grounding point, and accessible dead-metal parts of the product, using the test equipment indicated above.
AC2.2.4	<u>Basis for Acceptability</u> - There shall be grounding continuity between the parts specified.
AC2.3	Production-Line Dielectric Voltage-Withstand Test
AC2.3.1	<u>General</u> - Except as may be noted under "Exceptions" in each Test Report, the manufacturer shall subject 100 percent of production of all products to a routine Production-Line Dielectric Voltage-Withstand Test as described in section AC2.3.3.
AC2.3.2	<p><u>Test Equipment</u> - The test equipment shall include a means of indicating the test potential, an audible or visual indicator of electrical breakdown, and either a manually operated reset device to restore the equipment after electrical breakdown or an automatic feature that rejects any unacceptable unit. If an ac test potential is applied, the test equipment shall also include a transformer having an essentially sinusoidal output.</p> <p>If the output of the test-equipment transformer is less than 500 volt-amperes, the equipment shall include a voltmeter in the output circuit to indicate the test potential directly.</p> <p>If the output of the test-equipment transformer is 500 volt-amperes or more, the test potential may be indicated (1) by a voltmeter in the primary circuit or in a tertiary-winding circuit, (2) by a selector switch marked to indicate the test potential, or (3), in the case of equipment having a single test-potential output, by a marking in a readily visible location to indicate the test potential. When marking is used without an indicating voltmeter, the equipment shall include a positive means, such as an indicator lamp, to indicate that the manually operated reset switch has been reset following a dielectric breakdown.</p> <p>Test equipment other than that described above may be used when it can be shown that UL has previously confirmed in writing that the equipment complies with the above requirements and is deemed suitable for use for this test.</p>
AC2.3.3	<p><u>Method</u> - Each product shall withstand without electrical breakdown, as a routine production-line test, the application of an ac potential at a frequency within the range of 40-70 Hz or DC potential between the primary wiring, including connected components, and accessible dead metal parts that are likely to become energized.</p> <p>The test potential shall be in accordance with Table AC1. The manufacturer's test conditions may be higher than those shown in Table AC1 when necessary to comply with other international</p>

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

TABLE AC1
DIELECTRIC VOLTAGE-WITHSTAND TEST CONDITIONS

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

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

PART AD**GENERAL TERMINOLOGY**

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

Table 17 – Limits of maximum available current

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

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

PART AE**GENERAL PRODUCT CONSTRUCTION REQUIREMENTS**

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

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

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

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

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

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

TABLE AE1
DETACHABLE POWER SUPPLY CORD REQUIREMENTS

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

TABLE AE2
EQUIVALENT CORDS

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

TABLE AE3
CERTIFICATION MARKINGS



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




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

Approval Organization	Printed or Embossed Harmonization Marking (May be Located On Jacket or Insulation of Internal Wiring)		Alternative Marking Utilizing Black-Red Yellow Thread (Length of color Section, mm)		
Comite Electrotechnique Belge (CEBEC)	CEBEC	<HAR>	10	30	10
Verband Deutscher Elektrotechniker (VDE) e.V. 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>	"PROGRAMMABLE CONTROLLER" (or "PROG. CNTLR.")

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, April 29, 2016 CAN/CSA-C22.2 No. 61010-1, 3rd Edition, April 2016
Certification Type:	Listing
CCN:	NRAQ / NRAQ7
Complementary CCNs:	
Product:	Human Machine Interface (HMI)
Model:	PT2043, PT2070, PT2080, PT2100, PK2043, PK2070, PK2080, PK2100, xPT2043, xPT2070, xPT2080, xPT2100, KT2043, KT2070, KT2080, KT2100, FT2043, FT2070, FT2080, FT2100, OP2043, OP2070, OP2080, OP2100, MT2043, MT2070, MT2080, MT2100, NT2043, NT2070, NT2080, NT2100, XT2043, XT2070, XT2080, XT2100, TP2043, TP2070, TP2080, TP2100, LT2043, LT2070, LT2080, LT2100, VT2043, VT2070, VT2080, VT2100, IW405H, IW407H, IW408H, IW410H, may be followed 11 alphanumeric characters.
Rating:	Power input: 24Vdc, 0.4A for Serie 2043 with prefix PT, PK, xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT, and IW405H Power input: 24Vdc, 0.8A for Serie 2070, 2080, 2100 with prefix PT, PK, xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT, IW and IW407H, IW408H, IW410H
Applicant Name and Address:	CERMATE TECHNOLOGIES INC 7F-1 No 168 Liancheng Rd Zhonghe Dist New Taipei City, 23553, Taiwan

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: Hans Hsieh(Project Handler)

Reviewed by: Cloud Chen(Project 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 HMI and intended for use in the industrial application. All series are equipped with different combination of communication ports including USB, RJ45 type ethernet, RS232, RS485, RS422. Refer to the Report Modifications page for any modifications made to this report.

Model Differences

See Nomenclature of Models PT and PK series in Enclosure Miscellaneous.

Models PT2070, PT2080, PT2100 series have identical circuit design except for Enclosure size, Panel size, model designation.

Model PT2043 is similar to Models PT2070, PT2080, PT2100 except for input current rating, Enclosure size, Panel size, main board, model designation.

Models PK series are similar to Models PT series except for model designation or signal port combinations. (A2) Models xPT, KT, FT, OP, MT, NT, XT, TP, LT, VT, IW series have identical circuit design to PT and PK series except for model designation for marketing purpose.

Additional Information

All of models are SELV circuit and supplied by UL Listed 61010-2-201 SELV power..

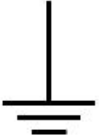

Technical Considerations

- The product was investigated to the following additional standards: UL 61010-2-201, First Edition, February 20, 2017
CSA C22.2 NO. 61010-2-201, First Edition, February, 2014
- The following additional investigations were conducted: Type 4X rating according to UL50E, 2nd Edition, October 16, 2015
- The product was not investigated to the following standards or clauses: N/A
- The following accessories were investigated for use with the product: N/A
- N/A

Engineering Conditions of Acceptability

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

- None

Markings and instructions	
Clause Title	Marking or Instruction Details
Company	Listee's or Recognized company's name, Trade name, Trademark or File
Manufacturers identification	Factory identification
Model identification	Model number
Functional earth terminal	
Field wiring box cable temperature	
Reference to the Manual, Caution Symbol 14	

Special Instructions to UL Representative

None

Production-Line Testing Requirements**Test Exemptions** - The following models are exempt from the indicated test

Test	Exemption Specifics	Details
Grounding Continuity	This test is not required for the following models: all models	N/A
Dielectric Strength	This test is not required for the following models: all models	N/A
Dielectric Strength Test Component	The following solid-state components may be disconnected from the remainder of the circuitry during the performance of this test: None	N/A

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
F.2 protective earth	-	-	-

[illegible]

TABLE: List of Critical Components

TABLE: List of critical components					
Component/ Part No.	Manufacturer/ Trademark	Type No./model No./	Technical data	Standard No. ¹	Required Mark(s) & Certificates of Conformity
Front Bezel, Enclosure	Formosa Idemitsu Petrochemical Corp	IV2200R(f1)	Rated V-2, 125 degree C, minimum 1.5 mm thick, see Diagram (01) in Enclosure for dimension details.	UL94, UL746B, additional test in end product by 20 mm (3/4 inch) flame test for flammability class v-1	UL R/C (QMF22/8) (E238753)
Alternate	Interchangeable	Interchangeable	Aluminum alloy, Code 6061-T6, minimum 1.5 mm thick, see Diagram (01) in Enclosure for dimension details	-	-
Corrosion Resistance Coating for Aluminum alloy front bezel	JING HONG DA HARDWARE PRODUCTS CO.,LTD.	P3M-JHD-088 and P3M- JHD-088	Surface Finishes on Aluminum alloy by Black Anodize, 3 to 5 um. See Diagram (02) in Enclosure for dimension details.	Additional test in end product by Additional Corrosion Test for Type 4X rating according to UL50E	-
Rear Housing	Same as above	Same as above	Same as above	Same as above	Same as above
Gasket	Jiangsu Tianchen New Materials PLC	HT851B	Minimum 1 mm thick, see Diagram (03) in Enclosure for dimension details.	Additional test in end product by Gasket Aging Test and Hosedown Test for Type 4X rating according to UL50E	-
Label System	CAR TONG CO	CT-M007C	Adhered on the Rear Housing and used by suitable ink type, rated 70 degree C	UL 969 / CSA-C22.2 No. 0.15	UL R/C (PGJ12/8) (MH19370)
(alternate)	Interchangeable	Interchangeable	Same as above	UL 969 / CSA-C22.2 No. 0.15	Any UL R/C (PGJ12/8) or (PGDG2/8)
Overlay	MacDermid Autotype Ltd	Autoflex EB	PET, min. 0.19 mm thick, rated HB and 105 degree C, adhered on the front bezel. See Diagram – (01) for dimension details.	UL94, UL746B, additional test in end product by Hosedown Test for Type 4X rating according to UL50E	UL R/C (QMF22/8) (E165805)
Adhesive	FLEXCON CO INC	212R	Rated -35 to 75 degree C and adhered between overlay (PET) and front bezel (PC).	UL 969 / CSA-C22.2 No. 0.15, additional test in end product by Hosedown Test for Type 4X rating according to UL50E	Any UL R/C (QOQW2) MH18496
LCD Panel module for Models PT2043 and PK2043 series only	YU DU AMSON ELECTRONICS CO.,LTD. / Amson	AM-480272-043RT-B220	4.3" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-
(alternate)	CHIMEI	AT043TN24 V.7	4.3" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-
(alternate)	PINGCHUANG DISPLAY CORPORATION	PC043TN42-B10	4.3" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-

(alternate)	Ti Hao Corporation	TH043480272RYR25S1	4.3" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-
(alternate)	Shenzhen fortida electric Co.,LTD	FTD-430LQE22-V05T	4.3" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-
LCD Panel module for Models PT2070 and PK2070 series only	INNOLUX DISPLAY CORPORATION	AT070TN92	7.0" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-
(alternate)	SHENZHEN COWIN OPTOELECTRONICS TECHNOLOGY CO.,LTD	COWIN070ID275750255B	7.0" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-
(alternate)	MIND Electronics Co Limited	MD070NL27-50ND-27C	7.0" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-
(alternate)	All win photoelectric Co., Ltd	TS070BH06-08E	7.0" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-
(alternate)	PINGCHUANG DISPLAY CORPORATION	PC070TN92-400C	7.0" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-
LCD Panel module for Models PT2080 and PK2080 series only	CHIMEI	EJ080NA-05B	8.0" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-
(alternate)	SHANGHAI AVIC OPTOELECTRONICS	TM080SDH01-00	8.0" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-
LCD Panel module for Models PT2100 and PK2100 series only	SHENZHEN COWIN OPTOELECTRONICS TECHNOLOGY CO.,LTD	COWIN101HD425050267 B	10.1" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-
(alternate)	InfoVision Optoelectronics (Kunshan) Co.,LTD.	M101AWN9 R2	10.1" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-
(alternate)	PINGCHUANG DISPLAY CORPORATION	PC101TN52-C38	10.1" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-
(alternate)	All win photoelectric Co., Ltd	TC101BM05-08E	10.1" TFT-LCD, rated 3.6Vdc maximum and 25 mA maximum.	-	-
Printed Wiring Board	Interchangeable	Interchangeable	Rated min. V-1, min. 105 °C.	UL 796 / CSA-C22.2 No. 0.17	Any UL R/C (ZPMV2/8)
The following component were provided for models PT2043 and PK2043 series only	-	-	-	-	-
Fuse (F1)	LITTELFUSE INC	SMD150F/33-2920	Rated 1.5A, 33Vdc.	UL 1434	UL R/C (XGPU2/8) (E74889)

Terminal Block (TB1)	DINKLE ENTERPRISE CO LTD	Socket Cat. No. 2EHDRC series, mate with plug Cat. No. 2ESDV series	Socket rated 300 V, 15 A, UG: B, 105°C. (insulation material rated minimum V-2) Plug rated 300 V, 15 A, 105°C, Fw=2, UG:D, suitable for 12-28 AWG wire size, torque value 4.5 lb-in.	UL 1059 / C22.2 No. 158	UL R/C (XCFR2/8) (E102914)
Capacitor (C37)	Interchangeable	Interchangeable	Rated min. 35 V, max. 470 uF, min. 105°C.	-	-
LAN port (CON6)	Interchangeable	Interchangeable	Plastic Material rated minimum V-2, 105°C.	UL 94 / CSA-C22.2 No. 0.17 / UL 746B	Any UL R/C (QMFZ2/8)
USB Type A port (CON4)	Interchangeable	Interchangeable	Plastic Material rated minimum V-2, 105°C.	UL 94 / CSA-C22.2 No. 0.17 / UL 746B	Any UL R/C (QMFZ2/8)
USB Type B port (CON5)	Interchangeable	Interchangeable	Plastic Material rated minimum V-2, 105°C.	UL 94 / CSA-C22.2 No. 0.17 / UL 746B	Any UL R/C (QMFZ2/8)
COM 1/2 ports (CON2, CON3)	Interchangeable	Interchangeable	Plastic Material rated minimum V-2, 105°C.	UL 94 / CSA-C22.2 No. 0.17 / UL 746B	R/C QMFZ2/8
Reversing Protection Resistor (R24)	Interchangeable	Interchangeable	Rated 1K.	-	-
Reversing Protection Diode (D1)	Interchangeable	Interchangeable	Rated min. 30 V, min. 200mA.	-	-
RTC Lithium Battery (BT1)	PANASONIC CORPORATION, PANASONIC CORPORATION OF NORTH AMERICA	VL2330	Rated maximum abnormal charging current 300 mA, protected by diode and resistor.	UL 1642	UL R/C BBCV2 (MH12210)
(alternate)	PANASONIC CORPORATION, PANASONIC CORPORATION OF NORTH AMERICA	CR2450	Rated maximum abnormal charging current 30 mA, protected by diode and resistor.	UL 1642	UL R/C BBCV2 (MH12210)
Poly-switch for USB port (F2)	Interchangeable	Interchangeable	PTC type. Rated 6 V dc, Ih 1.1 A. CA3. Tmoa = 85 degree C	UL 1434	Any UL R/C (XGPU2/8)
The following component were provided for models PT2070, PT2080, PT2100, PK2070, PK2080, PK2100 series only	-	-	-	-	-
Terminal Block (TB1)	DINKLE ENTERPRISE CO LTD	Socket Cat. No. 2EHDVC series, mate with plug Cat. No. 2ESDV series	Socket rated 300 V, 15 A, UG: B, 105°C. (insulation material rated minimum V-2) Plug rated 300 V, 10 A, 105°C, Fw=2, UG:D, suitable for 12-28 AWG wire size, torque value 4.5 lb-in.	UL 1059 / C22.2 No. 158	UL R/C (XCFR2/8) (E102914)
Fuse (F1)	LITTELFUSE INC	SMD150F/33-2920	Rated 1.5A, 33V.	UL 1434	UL R/C (XGPU2/8) (E74889)
Capacitor (C114)	Interchangeable	Interchangeable	Rated min. 35 V, max. 470 uF, min. 105°C.	-	-

COM 1/2 ports (CON2, CON3)	Interchangeable	Interchangeable	Plastic Material rated minimum V-2, 105°C.	UL 94 / CSA-C22.2 No. 0.17 / UL 746B	Any UL R/C (QMFZ2/8)
LAN port (CON13)	Interchangeable	Interchangeable	Plastic Material rated minimum V-2, 105°C.	UL 94 / CSA-C22.2 No. 0.17 / UL 746B	Any UL R/C (QMFZ2/8)
COM 1/2/3 port (COM1)	Interchangeable	Interchangeable	Plastic Material rated minimum V-2, 105°C.	UL 94 / CSA-C22.2 No. 0.17 / UL 746B	Any UL R/C (QMFZ2/8)
USB Type B port (CON10)	Interchangeable	Interchangeable	Plastic Material rated minimum V-2, 105°C.	UL 94 / CSA-C22.2 No. 0.17 / UL 746B	Any UL R/C (QMFZ2/8)
USB Type A port (CON7)	Interchangeable	Interchangeable	Plastic Material rated minimum V-2, 105°C.	UL 94 / CSA-C22.2 No. 0.17 / UL 746B	Any UL R/C (QMFZ2/8)
COM 4/5 port (COM10)	Interchangeable	Interchangeable	Plastic Material rated minimum V-2, 105°C.	UL 94 / CSA-C22.2 No. 0.17 / UL 746B	Any UL R/C (QMFZ2/8)
Reversing Protection Resistor (R91)	Interchangeable	Interchangeable	Rated 1K.	-	-
Reversing Protection Diode (D25)	Interchangeable	Interchangeable	Rated min. 30 V, min. 200mA.	-	-
RTC Lithium Battery (BT1)	PANASONIC CORPORATION, PANASONIC CORPORATION OF NORTH AMERICA	VL2330	Rated maximum abnormal charging current 300 mA, protected by diode and resistor.	UL 1642	UL R/C BBCV2 (MH12210)
(alternate)	PANASONIC CORPORATION, PANASONIC CORPORATION OF NORTH AMERICA	CR2450	Rated maximum abnormal charging current 30 mA, protected by diode and resistor.	UL 1642	UL R/C BBCV2 (MH12210)
Poly-switch for USB port (F1)	Interchangeable	Interchangeable	PTC type. Rated 6 V dc, 1h 1.1 A. CA3. Tmoa = 85 degree C	UL 1434	Any UL R/C (XGPU2/8)

Supplementary information:

The Test Laboratory has verified the component information.

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

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

TEST RESULTS:

APPENDIX D: Test Datasheets Enclosures

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

Standard	Clause No.	Test Name	Testing Location / Comments
IEC 61010-1:2010 (Third Edition)	5.1.3	Mains Supply	SPC
IEC 61010-1:2010 (Third Edition)	5.3	Durability Of Markings Test	SPC
IEC 61010-1:2010 (Third Edition)	8.2.1	Rigidity Test	SPC
IEC 61010-1:2010 (Third Edition)	8.2.2	Impact Test	SPC
IEC 61010-1:2010 (Third Edition)	10.1-10.4	Temperature Test	SPC
IEC 61010-1:2010 (Third Edition)	10.5.2	Resistance To Heat Of Nonmetallic Enclosure Test	SPC
UL 746C 6th Edition, 2017-05-19	16	20 mm or 3/4 Inch Flame Test (V-1)	UL Taiwan
UL 50E 2nd Edition, October 16, 2015	8.6	Hosedown Test	UL Taiwan
UL 50E 2nd Edition, October 16, 2015	8.13	Gasket Aging Test	UL Taiwan
UL 50E 2nd Edition, October 16, 2015	8.9	Additional Corrosion Protection	UL Taiwan

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

Supplement ID	Description
-	No separate datasheet enclosures attached.

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

CERTIFICATE OF COMPLIANCE

Certificate Number 2018-05-25; 2018-08-24(A1); 2018-09-20(C1); 2018-11-19(A2);
2020-09-16(C2)-E465558
Report Reference E465558-D1000-1/A2/C2-UL
Issue Date 2018-05-25; 2018-08-24(A1); 2018-09-20(C1); 2018-11-19(A2);
2020-09-16(C2)
Issued to: CERMATE TECHNOLOGIES INC
Applicant Company: 7F-1 No 168 Liancheng Rd Zhonghe Dist
New Taipei City, 23553 Taiwan
Listed Company: Same as Applicant

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

Human Machine Interface (HMI)
PT2043, PT2070, PT2080, PT2100,
PK2043, PK2070, PK2080, PK2100,
xPT2043, xPT2070, xPT2080, xPT2100,
KT2043, KT2070, KT2080, KT2100,
FT2043, FT2070, FT2080, FT2100,
OP2043, OP2070, OP2080, OP2100,
MT2043, MT2070, MT2080, MT2100,
NT2043, NT2070, NT2080, NT2100,
XT2043, XT2070, XT2080, XT2100,
TP2043, TP2070, TP2080, TP2100,
LT2043, LT2070, LT2080, LT2100,
VT2043, VT2070, VT2080, VT2100,
IW405H, IW407H, IW408H, IW410H,
may be followed 11 alphanumeric characters.

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

Standard(s) for Safety: UL 61010-1, 3rd Edition, April 29, 2016
CAN/CSA-C22.2 No. 61010-1, 3rd Edition, April 2016
Additional Standards: UL 61010-2-201, First Edition, February 20, 2017
CSA C22.2 NO. 61010-2-201, First Edition, February, 2014
Additional Information: See the UL Online Certifications Directory at
www.ul.com/database for additional information.

B. Mahrenholz

Bruce Mahrenholz, Assistant Chief Engineer, Global Inspection and Field Services, UL LLC
Joseph Hosey, General Manager, Director of Sales – Canada, UNDERWRITERS LABORATORIES OF CANADA INC.

Helena Y. Wolf

Helena Y. Wolf, Director, Global Market Access Operations, UL LLC

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Only those products bearing the UL Certification Mark should be considered as being covered by UL's Certification and Follow-Up Service.

Recognized components are incomplete in certain constructional features or restricted in performance capabilities and are intended for use as components of complete equipment submitted for investigation rather than for direct separate installation in the field. The final acceptance of the component is dependent upon its installation and use in complete equipment submitted to UL LLC.

Look for the UL Certification Mark on the product.

This is to certify that representative samples of the product as specified on this certificate were tested according to the current UL requirements.



Bruce Mahrenholz, Assistant Chief Engineer, Global Inspection and Field Services, UL LLC
Joseph Hosey, General Manager, Director of Sales – Canada, UNDERWRITERS LABORATORIES OF CANADA INC.



Helena Y. Wolf, Director, Global Market Access Operations, UL LLC

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