



APPLICATION FOR LOW VOLTAGE DIRECTIVE

On Behalf of

Suzhou Gongyuan Automation Technology Co., Ltd.

Dc insulation monitor

**GYDCG-UBCS1, GYDCG-UBCS1 (250;ST;),
GYDCG-UB1K(AR;ARH;ARB;ARBH),
GYDCG-UB100(AR;ARH;ARB;ARBH),
GYDCG-UBC1(X;MV;MVX;LZ;HRLZ) V5.0,
GYDCG-UBC2, GYDCG-UBCF1-ZC,
GYDCG-UBCH1(MV;MC;MVC;LZ;MV-LZ;DC10) V5.0,
GYDCG-UBCH2(MV;LZ)V5.0, GYDCG-UBCH2-LZ V2206,
GYDCG-UBCW2K(A;RS;RSA), GYDCG-UBCFH2-XP**

Prepared for : **Suzhou Gongyuan Automation Technology Co., Ltd.**
118 Fuchunjiang Dong Lu, Changshu City,
Jiangsu Province, China

Prepared By : **Shenzhen HTT Technology Co., Ltd.**
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Date of Test: **Feb.15,2023~Feb.21,2023**
Date of Report: **Feb.21,2023**
Report Number: **HTT202302222LR**

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**TEST REPORT****EN 61557-8: 2015****EN 61557-1: 2007****Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. - Equipment for testing, measuring or monitoring of protective measures****Part 8: Insulation monitoring devices for IT systems**

Report reference No: HTT202302222LR

Tested by (+ signature)..... Darek Wang

Darek Wang

Approved by (+ signature)..... Kevin Yang

Kevin Yang

Date of issue : Feb.21,2023

Testing Laboratory Name: Shenzhen HTT Technology Co., Ltd.

Address: 1F, B Building, Huaifeng International Robotics Industrial Park,
Gushu, Xixiang Street, Bao'an District, ShenzhenTesting location: CBTL ☐ CCATL ☐ SMT ☐ TMP ☐

Address.....: Same as above.

:

Applicant's Name: Suzhou Gongyuan Automation Technology Co., Ltd.

Address: 118 Fuchunjiang Dong Lu, Changshu City, Jiangsu Province, China

Standard.....: EN 61557-8: 2015

EN 61557-1: 2007

Test procedure: LVD Approval

Procedure deviation: N/A

Non-standard test method: N/A

Product.....: Dc insulation monitor

Manufacturer.....: Suzhou Gongyuan Automation Technology Co., Ltd.

address.....: 118 Fuchunjiang Dong Lu, Changshu City, Jiangsu Province, China

Trademark.....: N/A

Model and/or type reference.....: GYDCG-UBCS1

Rating(s): 10-30Vdc 0.25A 3W



Test item particulars :	
Equipment mobility	Building-in equipment
Test case verdicts:	
Test case does not apply to the test object.....	N(/A.)
Test item does meet the requirement.....	P(ass)
Test item does not meet the requirement.....	F(ail)
Testing:	
Date of receipt of test item	Feb.15,2023
Date(s) of performance of test	Feb.15,2023~Feb.21,2023

Label

Dc insulation monitor Model: GYDCG-UBCS1 Input:10-30Vdc 0.25A 3W  Suzhou Gongyuan Automation Technology Co., Ltd.
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Note:

1. The height of graphical symbols shall not be less than 5 mm;
2. The height of letters and numerals shall not be less than 2 mm;
3. The main rating label was attached in enclosure.



General remarks: Clause number between brackets refer to clauses in EN 61557-8 "(see remark #)" refers to a remark appended to the report. "(see appended table)" refers to a table appended to the report. Throughout this report a comma is used as the decimal separator. 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 testing laboratory. When determining the test conclusion, the Measurement Uncertainty of test has been considered. . Unless otherwise specified, test are made under normal conditions at an ambient temperature within the range of 15°C to 35°C, RH45% to 75% and an air pressure of 860mbar of 1060mbar	Attachment with: 1) Photo documentation
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IEC 61557-8			
Clause	Requirement - Test	Result - Remark	Verdict

4	REQUIREMENTS		P
4.1	General		P
	requirements of Clause 4 apply additional to IEC 61557-1, clause 4		P
	IMD's capable of monitoring of insulation resistance between:		—
	system and earth or		N/A
	system and PE connection or		N/A
	system and another reference point for equipotential bonding and		N/A
	give an optical insulation warning		N/A
4.2	Types of IMDs		P
4.2.1	type AC IMD or		P
	type AC / DC IMD or		N/A
	type DC IMD		P
4.2.2	Mandatory functions provided by IMDs		P
4.2.2.1	comprise a visual warning device with:		—
	local insulation warning (LIW) and/or		N/A
	remote insulation warning (RIW).		P
	no switch off device used at IMD		P
	fault indication not resettable		P
	audible signalling device provide resetting facility		N/A
	warning signal issued if $R_a < R_F$		N/A
	insulation resistance indication not regarded for visual signalling		N/A
4.2.2.2	Local insulation warning (LIW)		N/A
	IMD provide:		—
	a function for measurement of the insulation resistance R_F		N/A
	an assessment of this resistance and		N/A
	a local warning		N/A
	the local insulation warning (LIW) should be made:		—
	by visual indicators and/or		N/A
	audible signals		N/A
4.2.2.3	Remote insulation warning (RIW)		N/A



IEC 61557-8			
Clause	Requirement - Test	Result - Remark	Verdict
	IMD provide:		—
	a function for measurement of the insulation resistance R_F		N/A
	an assessment of this resistance and		N/A
	a warning output		P
	the warning output reported remotely with an output signal, generated by:		—
	relay contact, or		P
	electronic switching output, or		N/A
	data communication		P
	warning output used for other functions..... :		P
4.2.3	Mandatory service function provided by the IMD – Test function		P
	connection to a test device provided		P
	no negative influence to IMD and the IT system		P
	indication provided to show capability to issue an insulation warning		P
	reaction shown by:		—
	an indication on a display, or		P
	on another visual indication, or		P
	via a remote output signal.		P
	During the test the response time t_{an} extended		P
4.3	Optional functions provided by IMD		P
4.3.1	optional functions are not mandatory according to the annexes of this standard		—
4.3.2	Local transformer monitoring warning (LTMW)		P
	local warning signal is issued when the isolating transformer for IT systems is working in abnormal conditions of:		—
	current at the secondary side of the transformer or		P
	the temperature of the transformer		P
	Function includes:		—
	monitoring of the rated output current, or		P
	monitoring of the temperature of the transformer, and		P
	an assessment of these measurements and		P
	a local warning		P



IEC 61557-8			
Clause	Requirement - Test	Result - Remark	Verdict
	The local warning should made by:		—
	visual indicators and/or		P
	audible signals		P
4.3.3	Remote transformer monitoring warning (RTMW)		
	Remote warning signal is issued when the isolating transformer for IT systems is working in abnormal conditions of:		—
	current at the secondary side of the transformer or		P
	the temperature of the transformer		P
	Function includes:		—
	monitoring of the rated output current, or		P
	monitoring of the temperature of the transformer, and		P
	an assessment of these measurements and		P
	a remotely warning		P
	The warning output reported remotely with an output signal, generated by:		—
	relay contact, or		P
	electronic switching output, or		P
	data communication		P
	warning output used for other functions..... :		P
4.3.4	Remote enabling and disabling command (REDC)		N/A
	insulation resistance measurement enabled or disabled by:		—
	input contact, or		N/A
	electronic input signal or		N/A
	data communication.		N/A
4.4	Performance requirements		P
4.4.1	Specified response value R_{an}		P
	the response value of an IMD shall be:		—
	permanently set as a fixed value or		P
	adjustable within a response range.		P
	if adjustable, modification of the settings, possible only by the use of a key, a tool or a password.....:		P
	response value of R_{an} :		—
	continuously, or..... :		P



IEC 61557-8			
Clause	Requirement - Test	Result - Remark	Verdict
	stepwise..... :		P
4.4.2	System leakage capacitance C_e		P
	capable of monitoring the insulation resistance R_F as specified:		P
	at the standard, or		P
	by manufacturer..... :		P
4.4.3	Relative percentage uncertainty A of the specified response value R_{an}		P
	The max. operating uncertainty shall apply under the following standard operating conditions:		P
	-temperature range from -5 °C to 45 °C;		—
	-at nominal voltage U_n between 0 % to 115 %,		—
	-at supply voltage U_s between 85 % and 110 %,		—
	-at nominal frequency f_n of the nominal voltage,		—
	-at system leakage capacitance C_e of 1 μ F.		—
	or at different specification of the manufacturer:		
	-at a frequency $f = < f_n >$:		—
	-at system leakage capacitance $C_e > 1 \mu$ F..... :		—
	Different operating conditions included in documentation		P
4.4.4	Response time t_{an}		P
	the response time t_{an} shall be:		—
	≤ 10 s for type AC IMD, or		P
	≤ 100 s for type AC/DC IMD and for type DC IMD.		P
	reference conditions considered:		P
	-temperature range from -5 °C to 45 °C;		—
	-at nominal voltage U_n between 0 % to 115 %,		—
	-at supply voltage U_s between 85 % and 110 %,		—
	-at nominal frequency f_n of the nominal voltage,		—
	-at system leakage capacitance C_e of 1 μ F.		—
	Information about the response time t_{an} over the range of system leakage capacitances C_e and over the specified range of frequencies f_n included in the documentation.		P
	system leakage capacitance C_e of 1 μ F considered as reference, and (if applicable)		P



IEC 61557-8			
Clause	Requirement - Test	Result - Remark	Verdict
	max. system leakage capacitance C_e selected, as stated by manufacturer.....:		—
	If max. system leakage capacitance selected, the max. value response time t_{an} shall be:		—
	≤ 30 min for all types of IMDs		P
	reference conditions considered:		P
	-same as for 1 μ F and		P
	-system leakage capacitance as stated by manufacturer.....:		P
4.4.5	Measuring voltage U_m and measuring current I_m		P
	For all waveforms and for positive and negative values, the peak value of the measuring voltage U_m and the peak value of the measuring current I_m shall:		—
	$-U_m \leq 120$ V.....:		P
	$-I_m \leq 10$ mA (at $R_F = 0 \Omega$)		P
4.4.6	Internal d.c. resistance R_i and internal impedance Z_i		P
	the internal d.c. resistance R_i of the IMD shall be:		—
	$\geq 30 \Omega/V$ (of nominal system voltage) and.....:		P
	≥ 15 k Ω:		P
	the internal d.c. resistance Z_i of the IMD shall be:		—
	$\geq 30 \Omega/V$ (of nominal system voltage) and.....:		P
	$\geq 1,8$ k Ω (for type AC, AC / DC IMD).....:		P
4.4.7	Indication of the value of the insulation 4.4.7 resistance R_F		P
	IMD include indication of the value of the insulation resistance:		—
	-percentage uncertainty stated in accompanying documents.....:		P
4.4.8	Permanently admissible nominal voltage U_n		P
	$U_n \geq 110$ % applied or		P
	$U_n \geq 105$ % (specific system)		P
	U_n applied between:		—
	- system connections of the IMD and		P
	- the system connections and earth		P
	Type AC / DC IMDs tested with:		—



IEC 61557-8			
Clause	Requirement - Test	Result - Remark	Verdict
	- a.c. voltages with superimposed d.c. components		P
	- d.c. voltage with superimposed a.c. components		P
	Type AC IMDs and type AC / DC IMDs working with frequencies different from main nominal frequency:		—
	- manufacturer provide information.....:		P
	- stated in operating instruction..... :		P
4.4.9	Permanently admissible extraneous d.c. voltage U_{fg}		P
	Type AC / DC IMDs tested with:		—
	115 % of the highest nominal a.c. voltage U_n or		P
	not used in pure d.c. IT systems		P
	Operating instructions indicate:		—
	- U_{fg} for type AC IMDs, and		P
	- influence of U_{fg} on the measurement.		P
4.4.10	Supply voltage U_s		P
	If U_s is taken out of the system voltage U_n :		—
	- the working range of U_s is equal to U_n		P
	If U_s is connected separately		—
	- manufacturer provide information.....:		P
4.5	Electromagnetic compatibility (EMC)		P
	EMC requirements of IEC 61326-2-4 apply..... :		P
4.6	Safety requirements		
4.6.1	Safety requirements of		—
	IEC 61010-1, and.....:		P
	IEC 61010-2-030, and.....:		P
	of clause 4.6 to 4.8 apply		P
4.6.2	Clearances and creepage distances		P
	comply with:		—
	IEC 61010-1 and IEC 61010-2-030, or		P
	IEC 60664 series : (for fixed equipment, acc. table 3)		P
	are selected for:		—
	- overvoltage / measurement category III, or		N/A
	- overvoltage / measurement category II, and		P
	- pollution degree 2, or		P



IEC 61557-8			
Clause	Requirement - Test	Result - Remark	Verdict
	- pollution degree 3 (for accessible parts on outside of the housing)		N/A
	A division into circuits with different nominal insulation voltages is permissible, if:		—
	- the electrical connection is made via resistive, capacitive or inductive voltage dividers, and		P
	- inadmissibly high touch voltage or high currents to earth prevented by circuit design features		P
	Circuit design features (see IEC 61140) can be:	(see corresponding IEC61010-1 Test Report, also)	—
	- reliable voltage dividers, or		P
	- protective impedance, or		P
	- other reliable feature.....:		P
4.6.3	Protection class and earth connection of an IMD		N/A
	protection class I, or		N/A
	protection class II,		N/A
	earth connection of IMDs with protection class II treated as a functional earth connection (FE)		N/A
	protective impedances used in functional earth connection		N/A
	if protection class I, protective conductor connection treated as protective earth connection		N/A
4.7	Climatic environmental conditions		P
	IMD operate under climatic conditions according to		—
	- IEC 60721-3-3, class 3K5 (operation: 5 °C to +45 °C)		P
	- IEC 60721-3-2, class 2K3 (transport: -25 °C to +70 °C)		N/A
	- IEC 60721-3-1, class 1K4 (storage: -25 °C to +55 °C)		N/A
4.8	Mechanical requirements		
4.8.1	instead of the requirements of IEC 61557-1, clause 4.10 the requirements of clause 4.8.2 and 4.8.3 apply		—
4.8.2	Product mechanical robustness		P
	requirement of table 2 tested.....:	(see Attachment)	P
4.8.3	IP protection class requirements		P
	protection class, according IEC 60529.....:		N/A



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Clause	Requirement - Test	Result - Remark	Verdict

	described in operating instructions, and..... :		N/A
	minimum requirements of Table 3 applied.....		N/A

5	Marking and operating instructions		P
5.1	Marking	See page 3	P
	Different to the marking in Clause 5 of IEC 61557-1:2007, the following information shall be provided on the IMD:		—
	- type of IT system to be monitored (if designed for a specific type of IT system), or... :		P
	- type of the IMD..... :		P
	- nominal system voltage or voltage range (U_n) ... :		P
	- nominal supply voltage or voltage range (U_s) :		P
	- nominal frequency f_n (of supply voltage(U_s)) :		P
	- serial number:		—
	outside, or..... :		P
	inside..... :		P
	- specified response value R_{an} , or..... :		P
	minimum and maximum specified response value:		P
5.2	Operating instructions		P
	additional to IEC 61557-1:2007, clause 5.2, the following instructions shall be included:		—
	- internal impedance Z_i (as a function of f_n) :		P
	- peak value of the measuring voltage U_m :		P
	- internal d.c. resistance R_i :		P
	- maximum value of the measuring current I_m :		P
	For IMDs with remote insulation warning (RIW):		—
	- technical data of the interface..... :		P
	- rated voltage, :		P
	- rated current, :		P
	- rated insulation voltage, :		P
	- explanation of the interface function		P
	if contact circuit used, data reference to:		—
	- IEC 61810-2, or		P
	- IEC 60947-5-1, and		P



IEC 61557-8			
Clause	Requirement - Test	Result - Remark	Verdict
	- IEC 60947-5-4.		P
	Information that:		—
	- IMDs not connected in parallel, or		P
	- information on the interaction between IMDs		P
	Wiring diagram:		—
	- marked on the equipment, or		P
	- kept in operating instructions		P
	Effects of the system leakage capacitances C_e		—
	- response value (Ω), and		P
	- response time (s), and		P
	- permissible maximum value of the system leakage capacitance (μF)		P
	Extraneous d.c. voltage (U_{fg}) of any polarity..... :		P
	Test voltage (see 6.2.13)		P
	Conformity to relevant EMC-standards..... :		P
	Range of specified response values		P
	IP protection class..... :		P
	Percentage uncertainty of the insulation resistance R_f (if applicable)		P

6.	Tests		P
6.1	General		P
	tests according to Clause 6 of IEC 61557-1:2007 and the tests detailed in 6.2 and 6.3 performed		P
6.2	Type tests		P
6.2.1	General		P
	Equipment operated under climatic environmental conditions according to Table 5, and		P
	Equipment storage under climatic environmental conditions according to Table 6		P
6.2.2	Test of response values		P
	Response values shall be tested at:		—
	- lowest and highest value of U_N , and..... :		P
	- lowest and highest value of supply voltage U_s		P
	For IMDs with continuously variable specified response value, or digital setting:		—



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Clause	Requirement - Test	Result - Remark	Verdict
	- compliance with the requirements of clause 4.4.2, 4.4.3 and 4.4.4 checked..... :		P
	For IMDs with response value adjusted by means of a mechanical switch:		—
	- each step tested..... :		P
	If the measuring method is affected by the magnitude of the system leakage capacitance C_e :		—
	- tested by insertion of capacitors,		P
	- limits of 4.4.3 met		P
	- relative percentage uncertainty determined.		P
	Insulation warning function tested according 4.2.2		P
6.2.3	Test of response time t_{an}		P
	Test performed with:		—
	- symmetrical system leakage capacitance C_e of 1 μF		P
	- nominal system voltage U_N :		P
	Compliance with clause 4.4.4. :		P
6.2.4	Test of peak value of the measuring voltage U_m		P
	requirements given in 4.4.5 are met		P
	internal resistance $\geq 20 \times R_i$:	(see appended Form C)	P
	measuring uncertainty $\leq 5 \%$:	(see appended Form C)	P
6.2.5	Test of the peak value of the measuring current I_m		P
	requirements given in 4.4.5 are met		P
	internal resistance $\leq 5 \%$ of R_i :	(see appended Form C)	P
	measuring uncertainty $\leq 5 \%$:	(see appended Form C)	P
6.2.6	Test of internal d.c. resistance R_i and internal impedance Z_i		P
6.2.6.1	requirements given in 4.4.6 are met		P
	tests performed with or without rated supply voltage U_s :	(see appended Form C)	P
	measuring voltage applied..... :	(see appended Form C)	P
	measuring uncertainty $\leq 5 \%$:	(see appended Form C)	P
6.2.6.2	Test of internal impedance Z_i		P
	requirements given in 4.4.6 are met		P
	impedance measuring voltage source U_n :		P



IEC 61557-8			
Clause	Requirement - Test	Result - Remark	Verdict
	frequency of the measuring is identical to the nominal system frequency f_n		P
	distortion factor $\leq 5\%$:	(see appended Form C)	P
	internal resistance $\leq 10\ \Omega$:	(see appended Form C)	P
	For IMDs with frequency range, the internal impedance Z_i measured at:		—
	- lowest nominal frequency f_n		P
	- highest nominal frequency f_n		P
	Z_i calculated $Z_i = \frac{2\sqrt{2} U_n}{I_{PP}}$:		P
6.2.6.3	Test of internal d.c. resistance R_i		P
	requirements given in 4.4.6 are met		P
	d.c. voltage have a magnitude of U_n :		P
	limited to maximum extraneous d.c. voltage U_{fg} :		P
	internal resistance $\leq 10\ \Omega$:		P
	R_i calculated $R_i = \frac{U_n}{I} (U_n \leq U_{fg})$:		P
6.2.7	Test of facilities for indicating the insulation resistance RF		P
	percentage uncertainty limit [%]..... :		P
6.2.8.	Test of effectiveness of the test device		P
	The internal test function, and		—
	the external test function are		—
	compliant with the requirements given in 4.2.3..... :		P
6.2.9	Test of permanently admissible nominal voltage U_n		P
	requirements of 4.4.8 tested..... :	(see appended Form D)	P
6.2.10	Test of permanently admissible extraneous d.c. voltage U_{fg}		P
	type AC IMDs tested according 4.4.9..... :	(see appended Form D)	P
6.2.11	Test of supply voltage U_s		P
	requirements of 4.4.10 tested..... :		P
6.2.12	Test of optional functions		P
6.2.12.1	Test of the performance of the remote enabling/disabling command (REDC)		P
	requirements of 4.3.4 validated by tests..... :		P
	One or all of the IMDs shall respond		P



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Clause	Requirement - Test	Result - Remark	Verdict
	None of the IMDs shall erroneously respond		P
6.2.12.2	Test of the local transformer monitoring warning (LTMW)		P
	requirements of 4.3.2 validated by tests.....:		P
	local transformer warning function respond		P
6.2.12.3	Test of the remote transformer monitoring warning (RTMW)		P
	requirements of 4.3.3 validated by tests.....:		P
	local transformer warning function respond		P
6.2.13	Voltage tests		P
	requirements of 4.6 considered		P
	voltage tests according Annex F of IEC 61010-1:2010 performed		P
6.2.14	Test of electromagnetic compatibility (EMC)		P
	requirements of 4.5 considered		P
6.2.15	Inspection of the marking and operating instructions		P
	requirements of clause 5 checked		P
6.2.16	Mechanical tests		P
6.2.16.1	Shock and vibration test according 4.8.2. performed		P
6.2.16.2	IP requirements checked by visual inspection		P
6.3	Routine tests		P
6.3.1	each IMD subjected to routine test, except		P
	technical failure analysis and/or.....:		—
	statistical analysis, show that.....:		—
	routine tests can be limited to.....:		P
	Routine tests carried out:		—
	during the manufacturing process, or		P
	at the end of the manufacturing process		P
6.3.2	Test of response values		—
	Routine tests of the relative percentage uncertainty of the response values shall be performed:		P
	- room temperature (23 ± 3) °C		P
	- at 1,0 times U_n and 1,0 times U_s , or		P
	the lowest and highest rated value of U_n and U_s , or		P
	with a range of rated voltages		P



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Clause	Requirement - Test	Result - Remark	Verdict

	- at a minimum of three settings, including minimum, maximum and centre, or		P
	- at each step (for devices with stepwise adjustments, only)		P
	During this test, the limits reduced a degree that the requirements are met.		P
	Insulation warning function according to 4.2.2.2 and 4.2.2.3 tested		P
6.3.3	Test of effectiveness of the test function		P
	correct operation tested for:		—
	- the internal test device		P
	- the external test device (of provided),		P
6.3.4	Test of facility for indicating the insulation resistance R_F		P
	IMD with facilities for indicating the insulation resistance R_F :		—
	- the relative percentage uncertainty limits are determined		P
6.3.5	Voltage tests		P
	- tested according IEC61010-1:2010, Annex F	(see appended Form E)	P
6.3.6	Compliance with tests of 6.3		P
	- tests of 6.3 should be recorded		P

Annex A	Medical insulation monitoring devices (MED-IMD)		N.A
A.1	Scope and object		N.A
	applicable for		—
	- devices permanently monitor medical a.c. IT systems, and		N.A
	- used in group 2 medical locations according to 710.413.1.5 of IEC 60364-7-710:2002.		N.A

A.2	Requirements		N.A
	Additional to Clause 4, the requirements or modifications detailed in A.2.2 to A.2.5 apply.		N.A
A.2.1	Types of MED-IMDs		N/A
	type AC MED- IMD, or		N/A
	type AC / DC MED-IMD.		N/A



IEC 61557-8			
Clause	Requirement - Test	Result - Remark	Verdict
A.2.3	Mandatory functions provided by MED-IMD		N.A
A.2.3.1	The following functions shall be provided:		—
	- warning indication if R_F has decreased to 50 k Ω ,		N.A
	- test device according to 4.2.3 provided,		N.A
	- lowest setting shall be ≥ 50 k Ω .		N.A
A.2.3.2	Local insulation warning (LIW)		N.A
	This function include:		—
	- the measurement of the insulation resistance R_F ,		N.A
	- an assessment of this resistance R_F , and		N.A
	- a local warning.		N.A
	Acoustic and visual alarm system provided, which:		—
	- can placed that it can be permanently monitored,		N.A
	- provide green signal lamp (normal operation);		N.A
	- provide yellow signal lamp (warning indication)		N.A
	- signal lamp not to be cancelled or disconnected;		N.A
	- an audible alarm		N.A
	- audible alarm may to be silenced (alarm);		N.A
	- yellow signal and the audible alarm shall be cancelled only after removal of the fault		N.A
A.2.3.3	Remote insulation warning (RIW)		N.A
	This function include:		—
	- the measurement of the insulation resistance R_F ,		N.A
	- an assessment of this resistance R_F , and		N.A
	- a warning output.		N.A
	Warning output reported remotely with an output signal:		—
	- by relay contact output, or		N.A
	- an electronic switching output, or		N.A
	- a communication protocol		N.A
	External of the MED-IMD, for each medical IT system following components are incorporated:		—
	Acoustic and visual alarm system provided, which:		N.A
	- can placed that it can be permanently monitored,		N.A
	- provide green signal lamp (normal operation);		N.A
	- provide yellow signal lamp (warning indication);		N.A



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Clause	Requirement - Test	Result - Remark	Verdict
	- signal lamp not to be cancelled or disconnected;		N.A
	- an audible alarm		N.A
	- audible alarm may to be silenced (alarm);		N.A
	- yellow signal and the audible alarm shall be cancelled only after removal of the fault		N.A
A.2.3.4	Indication for the interruption to the system to be monitored		N.A
	Indication provided of the loss of:		—
	- the connection to the system,		N.A
	- the connection between the IMD and earth		N.A
A.2.3.5	Information about the value of the insulation resistance		N.A
	value of the insulation resistance indicated by:		—
	- a meter, or		N.A
	- a display, or		N.A
	- data communication.		N.A
A.2.4	Performance requirements		N.A
A.2.4.1	Specified response value R_{an}		N.A
	specified response value of a MED-IMD shall be:	(see appended Form A)	—
	- permanently set as a fixed value of 50 k Ω , or;		N.A
	- adjustable within a response range with a lowest value of 50 k Ω .		N.A
	If adjustable, modification of the settings, possible only by the use of a key, a tool or a password.....:		N.A
	response value of R_{an} :		—
	continuously, or.....:		N.A
	stepwise.....:		N.A
A.2.4.2	Response time t_{an}		N.A
	at system leakage capacitance of 0,5 μ F the response time t_{an} and alarm-off time shall be:	(see appended Form B)	—
	≤ 5 s for an insulation resistance $R_F \leq 25$ k Ω .		N.A
	alarm off-time clearing the fault:		—
	≤ 5 s for an insulation resistance 25 k $\Omega \leq R_F \leq 10$ M Ω		N.A
	For MED-IMD with automatic , periodic self-test:		—
	- response time t_{an} can be extended		N.A



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Clause	Requirement - Test	Result - Remark	Verdict

	Indication provided of the loss of:		—
	- the connection to the system,		N.A
	- the connection between the IMD and earth.		N.A
	Response time for the indication of loss of the connection shall be indicated in the operating instructions.:		N.A
A.2.4.3	Measuring voltage U_m and measuring current I_m		N.A
	- $U_m \leq 25$ V peak, and.....:	(see appended Form C)	N.A
	- $I_m \leq 1$ mA.....:	(see appended Form C)	N.A
A.2.4.4	Internal impedance (Z_i)		N.A
	- $Z_i \geq 100$ k Ω:	(see appended Form C)	N.A
A.2.5	Electromagnetic compatibility (EMC)		N.A
	IEC 61326-2-4 applies		N.A
A.3	Marking and operating instructions		N.A
	additional information provided by MED-IMD:		—
	- marked with the pictogram Figure A.1, and		N.A
	- pictogram for the type of IMD (5.1, Table 4).		N.A
	- operating instructions according to Clause B.3		N.A

A.4	Tests		N.A
A.4.1	Additional to Clause 6, the tests detailed in Clause A.4 and A.5 shall be performed.		N.A
A.4.2	Type tests		N.A
A.4.2.1	Test of the maximum value of the measuring voltage U_m and of the measuring current I_m		N.A
	tests of 6.2.4 and 6.2.5 shall be performed with the requirements of A.2.4	(see appended Form C)	N.A
A.4.2.2	Test of the function of the indication of the interruption to the system to be monitored		N.A
	connection to the system and to the earth tested		N.A
	alarm take place if connection to the system and to the earth is lost		N.A

Annex C	Insulation monitoring devices for photovoltaic systems (PV-IMD)		N.A
C.2	Requirements for PV-IMDs for PV installations		N.A



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Clause	Requirement - Test	Result - Remark	Verdict
C.2.1	PV-IMDs capable of monitoring the insulation resistance R_F		N.A
	Insulation fault location (IFLS) equipment integrated		N.A
	Warning given if R_F falls below a predetermined level		N.A
C.2.2	Types of PV-IMDs		N.A
	type AC / DC PV-IMD or		N.A
	type DC PV-IMD		N.A
	Shall be capable of monitoring the insulation resistance R_F ,		N.A
	- including symmetric and asymmetric allocation, and		N.A
	- give a warning		N.A
C.2.3	Mandatory functions provided by IMDs		N.A
C.2.3.1	Local insulation monitoring warning (LIW) and remote insulation monitoring warning (RIW)		N.A
	comprise a visual warning device with:		—
	local insulation warning (LIW) or		N.A
	remote insulation warning (RIW) or		N.A
	remote output is used (RIW)		N.A
C.2.3.2	Test function		N.A
	The requirements of 4.2.3 apply, and additional:		—
	an automatic self-test function is provided, with		N.A
	warning indication on the device, and / or		N.A
	as an electronic signal for remote indication.		N.A
C.2.4	Performance requirements		N.A
C.2.4.1	Specified response values R_{an}		N.A
	response values of PV-IMDs adjustable..... :		N.A
	adjustment possible only by a tool, a key or a password. :		N.A
C.2.4.2	System leakage capacitance C_e		N.A
	Range of system leakage capacitance C_e :		N.A
	No alarm due to fluctuations of the system leakage capacitance C_e		N.A
C.2.4.3	Permanently admissible nominal voltage U_n and characteristics of the d.c. PV system voltage		N.A



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Clause	Requirement - Test	Result - Remark	Verdict

	addition to 4.4.8:		—
	PV-IMD operates under dynamic reference characteristics of the d.c. voltage of the PV system.		N.A
	no alarm stated due to voltage changes, shown in figure C.1		N.A
	PV-IMD operate normally under reference characteristics of Figure C.1:		—
	- not switch to alarm state under no fault conditions.		N.A
	- not switch to no-alarm state under fault conditions		N.A
	- detect an insulation fault within the specified response time, and		N.A
	switch to alarm state		N.A
	- switch to no-alarm state when the alarm disappears		N.A

C.3	Marking and operating instructions		N.A
C.3.1	Marking		N.A
	additional to requirements of clause 5.1:		—
	PV-IMD shall be marked with the pictogram according to Figure C.2.		N.A
C.3.2	Operating instructions		N.A
	additional to requirements of clause 5.2, the following advises shall be included:		—
	- explanation of the function of the automatic self-test included..... :		N.A
	- the time intervals in which the automatic self-test..... :		N.A
	- the warnings which are generated..... :		N.A
	- explanation of the remote warning function..... :		N.A

C.4	Tests		N.A
C.4.1	additional to the requirements of clause 6, the following apply:		—
C.4.2	Additional type tests		N.A
C.4.2.1	The tests of 6.2 of this standard apply and additionally or alternatively the following type tests apply.		—
C.4.2.2	Test of the warning function		N.A
	the test of clause 6.2.2 applies, and		—



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Clause	Requirement - Test	Result - Remark	Verdict

	the remote warning function is verified.		N.A
C.4.2.3	Test of the test function		N.A
	the test of clause 6.2.8 applies, and		—
	the function of the automatic self-test according to C.2.3.2 shall be verified		N.A
C.4.2.4	Test of the permanently admissible nominal voltage U_n and of the characteristics of the d.c. PV system voltage		N.A
	additional to the tests of clause 6.2.9 and 6.2.10:	(see appended Form D)	—
	PV-IMD not switch to the alarm state during the voltage changes, acc. to figure C.1, and		N.A
	system leakage capacitance $C_e = C_{e-max}$, and.....:		N.A
	insulation resistance $R_F = 2 \times R_{an}$.		N.A
C.4.2.5	Inspection of marking and operating instructions		N.A
	requirements of Clauses 5 and C.3 shall be verified		N.A
C.4.3	Additional routine tests		N.A
C.4.3.1	Test of the warning function		N.A
	tests of 6.3.3 apply, and		N.A
	the requirements of C.2.3.1 are tested		N.A
C.4.3.2	Test of the test function		N.A
	tests of 6.3.3 apply, and		N.A
	the requirements of C.2.3.2 are tested		N.A

Annex D	Insulation monitoring function of a photovoltaic inverter (PV-IMF) or in a charge controller		N/A
D.1	Scope and object		N.A
	This annex applies for the insulation monitoring function that is integrated in a PV inverter (PV-IMF) according to IEC 62109-2.		N.A
	PV-IMF monitors the insulation resistance to earth of unearthed d.c. PV arrays.		N.A
D.2	Requirements for PV-IMFs		N.A
	the requirements of Clause 4, Clause 5 and Clause 6 apply, and additional:		—
	PV-IMFs capable of monitoring the insulation resistance R_F		N.A
	The PV-IMF provide output signals:		—



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Clause	Requirement - Test	Result - Remark	Verdict
	- about the measured insulation resistance R_F , and / or		N.A
	- the response of the insulation monitoring function		N.A
D2.2	Types of PV-IMFs		N.A
	type AC / DC PV-IMF or		N.A
	type DC PV-IMF		N.A
	Shall be capable of monitoring the insulation resistance R_F ,		N.A
	- including symmetric and asymmetric allocation, and		N.A
	- give a signal to the PV-inverter		N.A
	The relevant output information is:		—
	- analogue or digital signal (for R_F), and / or		N.A
	- digital signal (for response)		N.A
D2.3	Mandatory functions provided by PV-IMFs		N.A
D.2.3.1	Remote insulation warning (RIW)		N.A
	insulation faults to be signalled :		—
	- digital warning signal (if $R_F < \text{response value}$) (relay contact or electronic output); and/or		N.A
	- analogue signal (for the value of R_F),		N.A
	- signalling of warning via bus interface (for the value of R_F),		N.A
	The warning function according to 4.2.2.2 and 4.2.2.3 is performed by the inverter.		N.A
	PV-IMF provide the following warning function:		—
	- a visible or audible indication, and		N.A
	- an electrical or electronic indication.		N.A
D.2.3.2	Self-test function		N.A
	- initiated by an electronic signal from the inverter; and/or		N.A
	- automatic execution, by the PV-IMF		N.A
	Warning indicated by the inverter, if failure during the self-test is detected.		N.A
D.2.4	Performance requirements for PV-IMFs		N.A
D.2.4.1	Specified response values R_{an}		N.A
	- fixed value set inside PV-IMF, and / or..... :		N.A
	- variable value set by an interface signal, and / or.:		N.A



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Clause	Requirement - Test	Result - Remark	Verdict
	- analogue or digital signal		N.A
	Adjustment at inverter possible only by a tool, a key or a password. :		N.A
D.2.4.2	System leakage capacitance C_e		N.A
	requirements of C.2.4.2 apply		N.A
D.2.4.3	Indication of the value of the insulation resistance R_F		N.A
	The performance requirements of 4.4.7 apply, but		N.A
	indication provided at inverter		N.A
D.2.4.4	Permanently admissible nominal voltage U_n and characteristics of the d.c. PV system voltage		N.A
	requirements of C.2.4.3 apply, except:		—
	U_n corresponds to the permanently admissible nominal voltage U_n of the inverter		N.A
D.2.4.5	Supply voltage U_s		N.A
	sub clause 4.4.10 applies, except:		—
	supply voltage is provided internally from the inverter, and		N.A
	the working range of the supply voltage is equal to the internal voltage range..... :		N.A
D.2.5	Electromagnetic compatibility (EMC)		N.A
	sub clause 4.5 applies, except:		—
	- requirements compatible for the inverter, and		N.A
	- performance criteria of IEC 61324-2-4 applies..... :		N.A
D.2.6	Safety requirements		N.A
D.2.6.1	Clearances and creepage distances		N.A
	requirements of 4.6.2 of this standard apply with the following differences:		—
	- inverter includes overvoltage limitation device..... :		N.A
	- the pollution degree corresponds to the degree inside the inverter. :		N.A
D.2.7	Climatic environmental conditions		N.A
	sub clause 4.7 applies, except:		—
	climatic classes inside of the inverter adapted		N.A
D.2.8	Mechanical requirements		N.A
	sub clause 4.8 applies, except:		—
	- product mechanical robustness adapted to the protection class required inside the inverter..... :		N.A



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Clause	Requirement - Test	Result - Remark	Verdict

	- IP protection class shall be adapted to the protection class required inside of the inverter.:		N.A
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D.3	Marking and operating instructions		N.A
D.3.1	Marking		N.A
	additional to requirements of clause 5.1:		—
	PV-IMF shall be marked with:		—
	- type designation, and.....:		N.A
	- manufacturer identification code, or.....:		N.A
	- no marking, (if integrated into inverter)		N.A
D.3.2	Operating instructions		N.A
	sub clause 5.1 applies, except:		N.A
	- part of the operating instructions of the inverter.....:		N.A

D.4	Tests		N.A
D.4.1	Type tests of clause 6, performed with following changes:		—
	- the PV-IMF is integrated in the inverter, or alternatively		N.A
	- without the inverter (if simulated)		N.A
D.4.2	Type tests		N.A
D.4.2.1	Test of the response values R_{an}		N.A
	performed according clause 6.2.2:	(see appended Form A)	N.A
	- for fixed response values, or.....:		N.A
	- variable response values.....:		N.A
D.4.2.2	Test of the warning function		N.A
	requirements of D.2.3.1 verified.....:		N.A
D.4.2.3	Test of the test function		N.A
	requirements of D.2.3.2 verified.....:		N.A
D.4.2.4	Test of the permanently admissible nominal voltage U_n and characteristics of the PV system voltage		N.A
	tests of C.4.2.4 performed under consideration of D.2.4.4.:		N.A
D.4.2.5	Test of the supply voltage U_s		N.A
	test of 6.2.11 performed under consideration of the requirements of D.2.4.5.:		N.A



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Clause	Requirement - Test	Result - Remark	Verdict
D.4.2.6	Voltage test		N.A
	tests of 6.2.13 performed under consideration of D.2.6.1. :	(see appended Form E)	N.A
D.4.2.7	Test of the electromagnetic compatibility (EMC)		N.A
	test of 6.2.14 performed under consideration of D.2.5. :		N.A
D.4.2.8	Test under the specified environmental climatic conditions		N.A
	test under specific environmental climatic conditions performed under consideration of the requirements of D.2.7. :		N.A
D.4.2.9	Inspection of marking and operating instructions		N.A
	test of 6.2.15 performed under consideration of the requirements of Clause D.3. :		N.A
D.4.2.10	Mechanical test		N.A
	performed with the PV-IMF integrated in the inverter		—
	requirements of D.2.8 verified..... :		N.A
D.4.3	Routine tests		N.A
D.4.3.1	Test of the response values		N.A
	tested according 6.2.2 under consideration of the requirements of D.4.2.1.		N.A
D.4.3.2	Test of the warning function		N.A
	tested according D.4.2.2		N.A
D.4.3.3	Test of the test function		N.A
	tested according D.4.2.3		N.A
D.4.3.4	Voltage test		N.A
	tested according D.4.2.6		N.A



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Clause	Requirement + Test	Result - Remark	Verdict

6.2.4 / 6.2.5	TABLE: Measuring voltage, measuring current		Form C (Part 8)	P
Measuring voltage U_m [V, $R_F \infty \Omega$]		Measuring current $I_m @ R_F = 0 \Omega$ [mA]	Remark	Verdict
30Vdc		250mA	Normal operation	Pass
Supplementary information: Measuring uncertainty of the test equipment for voltage measurement [$\leq 5 \%$]: Measuring uncertainty of the test equipment for current measurement [$\leq 5 \%$]:				
6.2.6	TABLE: Internal d.c. resistance R_i and internal impedance Z_i			P
Internal d.c. resistance R_i [k Ω]		internal impedance Z_i [k Ω]	Remark	Verdict
Internal d.c. resistance		<1k Ω	No damage	Pass
Supplementary information:				

6.2.9	TABLE: Permanently admissible nominal voltage U_n				Form D (Part 8)	P
6.2.10	TABLE: Permanently admissible extraneous d.c. voltage U_{fg}					
Location or Condition	Sub-clause (NOTE 1)	Value test voltage (NOTE 2)	Protective means operating Y/N	Remark	Verdict	
Normal	--	30Vdc	Y	No damage	Pass	
NOTE 1 – Indicate subclause of part 8 requirements NOTE 2 – Value of test voltage is based on subclause 4.4.8 and 4.4.9						
Supplementary information:						

6.3.5	TABLE: Dielectric strength tests					Form E (part 8)	P
4.6.2	Voltage test according Annex F of IEC 61010-1:2010						
¹ Record the fault, test or treatment applied before the dielectric strength test							
Location or references	Clause or sub-clause	Humidity Yes/No	Working voltage V	Test voltage r.m.s/peak/d.c V	Comments	Verdict	
Input to enclosure	--	No	30Vdc	500Vrms	Unbroken	Pass	
This table may be included in separate issued IEC 61010-1:2010 Test Report							
Input to enclosure	--	No	30Vdc	500Vrms	Unbroken	Pass	
Supplementary information:							

Appendix 1

Photo documentation

Photo 1

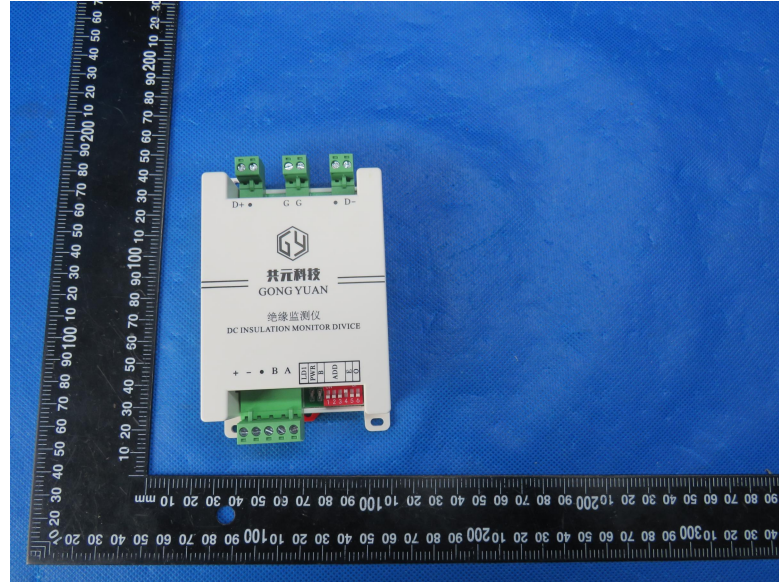


Photo 2

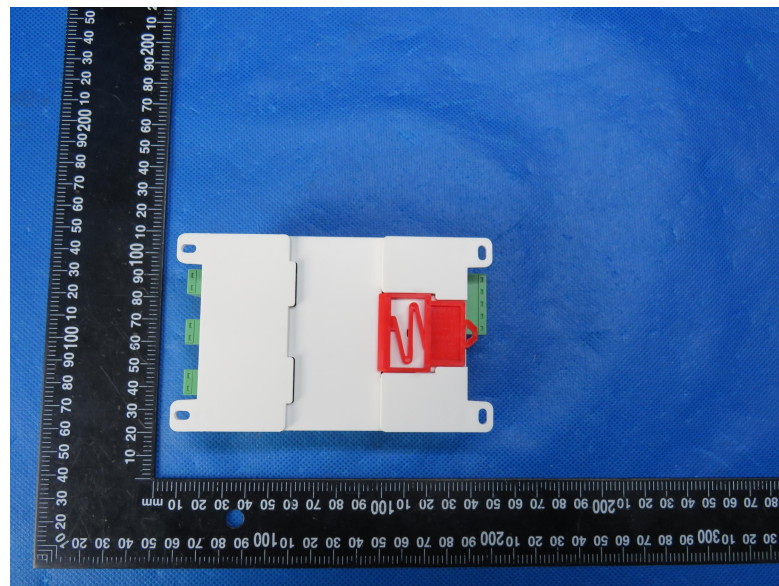


Photo 3

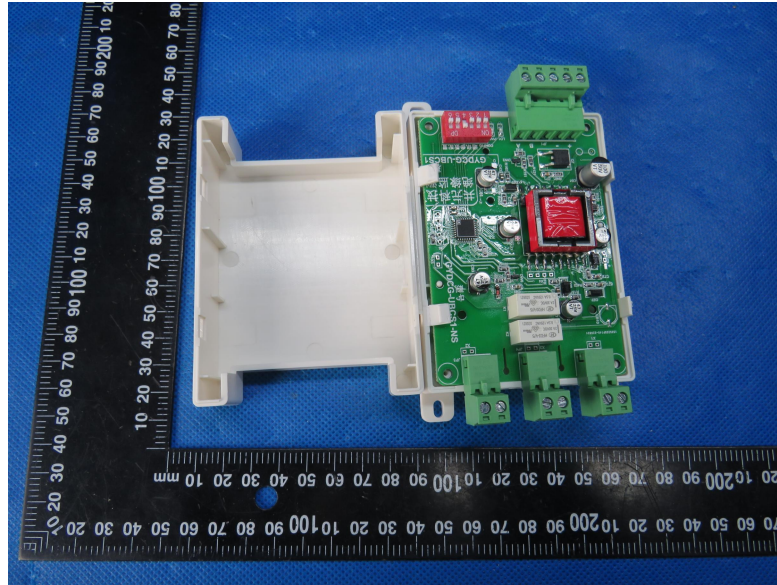
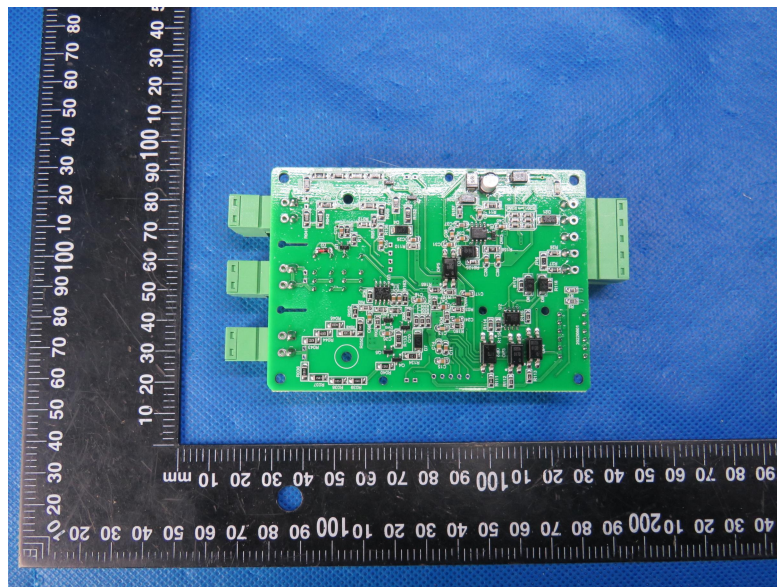


Photo 4



*****End of Test Report*****