



Test report No:
6108443.50

TEST REPORT

Electromagnetic Compatibility (EMC)

Identification of item tested	Concrete Saw (Cut-off Machine)
Trademark	AGP
Model and /or type reference	C14; C355; CS355; CS14; SCS14; SCS355; SC14; SC355; CS350; DS-3500; QHS-350; TRE355; EPC-350; ECS500; HBE350; ROBUST 19 MSNT 350; fb 3500 WET-E14
Ratings	220 Vac; 50-60 Hz; 2800 W; n=4 500 min ⁻¹ ; ø355 mm 230-240 Vac; 50-60 Hz; 3000W; n=4 500 min ⁻¹ ; ø355 mm 110-120 Vac; 50-60 Hz; 2300 W; n=4 500 min ⁻¹ ; ø355 mm Class I
Test Laboratory / address	DEKRA Testing and Certification (Shanghai) Ltd. No.250, Jiangchangsan Road, Jing'an District, Shanghai, China
Applicant / address	LEE YEONG INDUSTRIAL CO., LTD. No.2, Kejia Rd., Douliu City, Yunlin County 64057, Taiwan
Test method requested, standard	EN IEC 55014-1:2021 EN IEC 55014-2:2021 EN IEC 61000-3-2:2019+A1:2021 EN 61000-3-3:2013+A1:2019
Verdict Summary	IN COMPLIANCE
Tested by	Henry Cheng Project Engineer 
Approved by	Wency Yang Technical Manager 
Date of issue	2022-01-04
Report template No	TRF_EN55014-1_EN55014-2_EMC02 V1.0

INDEX

	page
Competences and Guarantees.....	4
General conditions.....	4
Uncertainty.....	5
Environmental conditions.....	5
Possible test case verdicts	6
Definition of symbols used in this test report.....	6
Abbreviations	6
Document History	7
Remarks and Comments	7
1 General Information.....	8
1.1 General Description of the Item(s).....	8
1.2 Environment	9
1.3 Test Location.....	9
1.4 Classification according to EN IEC 55014-2.....	10
2 Description of Test Setup	11
2.1 Operating mode(s) used for tests.....	11
2.2 Port(s) of the EUT	11
2.3 Support / Auxiliary equipment / unit / software for the EUT	11
2.4 Test Configuration / Block diagram used for tests	12
3 Verdict summary section	13
3.1 Standards	13
3.2 Deviation(s) from the Standard(s) / Test Specification(s)	13
3.3 Overview of results.....	14
4 Emission Test Results	15
4.1 Conducted disturbance voltage – Mains	15
4.2 Disturbance power (30 MHz – 300 MHz).....	23
4.3 Harmonic current emissions.....	28
4.4 Voltage changes, voltage fluctuations and flicker	32
5 Immunity Test Results	34
5.1 Performance (Compliance) criteria	34
5.1.1 Performance criteria related to immunity tests	34
5.1.2 Manufacturer defined performance criteria.....	34
5.2 Monitored – Checked Functions / Parameters.....	35
5.3 Electrostatic discharge immunity.....	36

5.4	Electrical Fast Transients immunity	37
5.5	Surge transient immunity	38
5.6	Injected currents (RF common mode) immunity	39
5.7	Power supply interruptions and dips immunity.....	40
6	Identification of the Equipment Under Test	41
7	Measurement Uncertainties	42
8	Used Equipment	44
9	Test Photos	46

COMPETENCES AND GUARANTEES

DEKRA is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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GENERAL CONDITIONS

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA.
5. The information provided by the customer in this report may affect the validity of the results, the test lab is not responsible for it.
6. The test results presented in this report relate only to the object tested.

UNCERTAINTY

For all measurements where guidance for the calculation of the instrumentation uncertainty of a measurement is specified in EN 55016-4-2 (CISPR 16-4-2), EN/IEC 61000-4 series or a product standard, the measurement instrumentation uncertainty has been calculated and applied in accordance with these standards.

Uncertainties have been calculated according to the DEKRA internal document. The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

ENVIRONMENTAL CONDITIONS

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:

Ambient temperature	15 °C – 35 °C
Relative Humidity air	30% - 60%
Atmospheric pressure	86 kPa – 106 kPa

If explicitly required in the basic standard or applied product / product family standard the climatic values are recorded and documented separately in this test report.

POSSIBLE TEST CASE VERDICTS

Test case does not apply to test object	N/A
Test object does meet requirement	P (Pass) / PASS
Test object does not meet requirement	F (Fail) / FAIL
Not measured	N/M

DEFINITION OF SYMBOLS USED IN THIS TEST REPORT

<input checked="" type="checkbox"/> Indicates that the listed condition, standard or equipment is applicable for this report/test/EUT.			
<input type="checkbox"/> Indicates that the listed condition, standard or equipment is not applicable for this report/test/EUT.			
Decimal separator used in this report	<input checked="" type="checkbox"/>	Comma (,)	<input type="checkbox"/> Point (.)

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

EUT	:	Equipment Under Test
QP	:	Quasi-Peak
CAV	:	CISPR Average
AV	:	Average
CDN	:	Coupling Decoupling Network
SAC	:	Semi-Anechoic Chamber
OATS	:	Open Area Test Site
BW	:	Bandwidth
AM	:	Amplitude Modulation
PM	:	Pulse Modulation
HCP	:	Horizontal Coupling Plane
VCP	:	Vertical Coupling Plane
U_N	:	Nominal voltage
N/A	:	Not Applicable
N/M	:	Not Measured

DOCUMENT HISTORY

Report nr.	Date	Description
6108443.50	2022-01-04	First release

REMARKS AND COMMENTS

The equipment under test (EUT) does meet the requirements of the stated standard(s)/test(s).

The test results relate only to the samples tested.

The all models have the same material and structure except for the different models' names.

After review, all test were carried out on the following models C14. The test results stated in this report are also representative for all models

1 GENERAL INFORMATION

1.1 General Description of the Item(s)

Description of the item	Concrete Saw (Cut-off Machine)
Model / Type number	C14
Trademark.....	AGP
Manufacturer.....	LEE YEONG INDUSTRIAL CO., LTD. No.2, Kejia Rd., Douliu City, Yunlin County 64057, Taiwan
Factory	LEE YEONG INDUSTRIAL CO., LTD. No.2, Kejia Rd., Douliu City, Yunlin County 64057, Taiwan

Rated Power	3000 W / 2800 W / 1700 W
Clock frequencies	< 15 MHz
Other parameters.....	N/A
Mounting position.....	<input type="checkbox"/> Table top equipment
	<input type="checkbox"/> Wall/Ceiling mounted equipment
	<input type="checkbox"/> Floor standing equipment
	<input checked="" type="checkbox"/> Hand-held equipment
	<input type="checkbox"/> Other:

Intended use of the Equipment Under Test (EUT)
The apparatus as supplied for the test is a concrete saw intended for residential use. These products have electronic control unit and with earth connection.

No	Module/parts of test item	Type	Manufacturer
	N/A		

No	Documents as provided by the applicant – Description	File name	Issue date
	N/A		

Copy of marking plate:
N/A

1.2 Environment

The requirements and standards apply to equipment intended for use in:

<input checked="" type="checkbox"/>	Residential (domestic) environment.
<input checked="" type="checkbox"/>	Commercial and light-industrial environment.
<input type="checkbox"/>	Industrial environment.

1.3 Test Location

Test Location	DEKRA Testing and Certification Co.,Ltd. No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 31061, Taiwan, R.O.C
Date(receive sample)	2021-09-13
Date (start test)	2021-09-13
Date (finish test)	2022-01-04

1.4 Classification according to EN IEC 55014-2

The standard EN IEC 55014-2 is subdivided in four categories. For each category, specific immunity requirements are formulated.

<input type="checkbox"/>	<p>Category I: equipment containing no electronic control circuitry.</p> <p><u>Examples:</u> Appliances, tools and toys that contain no electronic control circuits and only electromechanical components such as switches, thermostats, brush motors, induction motors, heating elements, lighting toys containing only batteries and LED.</p> <p>Electric circuits consisting of passive components (such as radio interference suppression capacitors or inductors, mains transformers and mains frequency rectifiers) are not considered to be electronic control circuitry.</p>
<input checked="" type="checkbox"/>	<p>Category II: mains operated equipment containing electronic control circuitry with no clock frequency higher than 15 MHz.</p>
<input type="checkbox"/>	<p>Category III: battery operated equipment not included in Category I.</p> <p><u>Examples:</u> Appliances, tools and toys powered by batteries and that include a microprocessor to provide a selection of functions.</p> <p>NOTE The assignment to Category III is independent of the clock frequency.</p> <p>This category also includes equipment provided with rechargeable batteries, which can be charged, directly or indirectly, from the mains. Accordingly, this equipment shall also be subjected to the test requirements for mains operated equipment but only when testing the charging function.</p> <p>If the equipment can operate its intended functions when connected, directly or indirectly to the mains, then it is not battery operated. Accordingly, it shall be classified as Category II, Category IV or Category V, as applicable, and subjected to the corresponding test requirements when in mains operation.</p>
<input type="checkbox"/>	<p>Category IV: mains operated equipment containing electronic control circuitry with a highest clock frequency greater than 15 MHz but lower than or equal to 200 MHz.</p>
<input type="checkbox"/>	<p>Category V: mains operated equipment containing electronic control circuitry with a highest clock frequency greater than 200 MHz.</p>
<p>Clock frequency: Fundamental frequency of any signal used in the device, excluding those which are solely used inside integrated circuits (IC).</p>	

2 DESCRIPTION OF TEST SETUP

2.1 Operating mode(s) used for tests

During the tests the following operating mode(s) has(have) been used.

Operating mode	Operating mode description	Used for testing	
		Emission	Immunity
1	The EUT is operating continuously without load at its maximum speed.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2		<input type="checkbox"/>	<input type="checkbox"/>
3		<input type="checkbox"/>	<input type="checkbox"/>
4		<input type="checkbox"/>	<input type="checkbox"/>
5		<input type="checkbox"/>	<input type="checkbox"/>
6		<input type="checkbox"/>	<input type="checkbox"/>
<u>Supplemental information:</u>			

2.2 Port(s) of the EUT

Port name and description	Connected to / Termination	Cable		
		Length used during test [m]	Attached during test	Shielded
N/A			<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>
<u>Supplemental information:</u>				

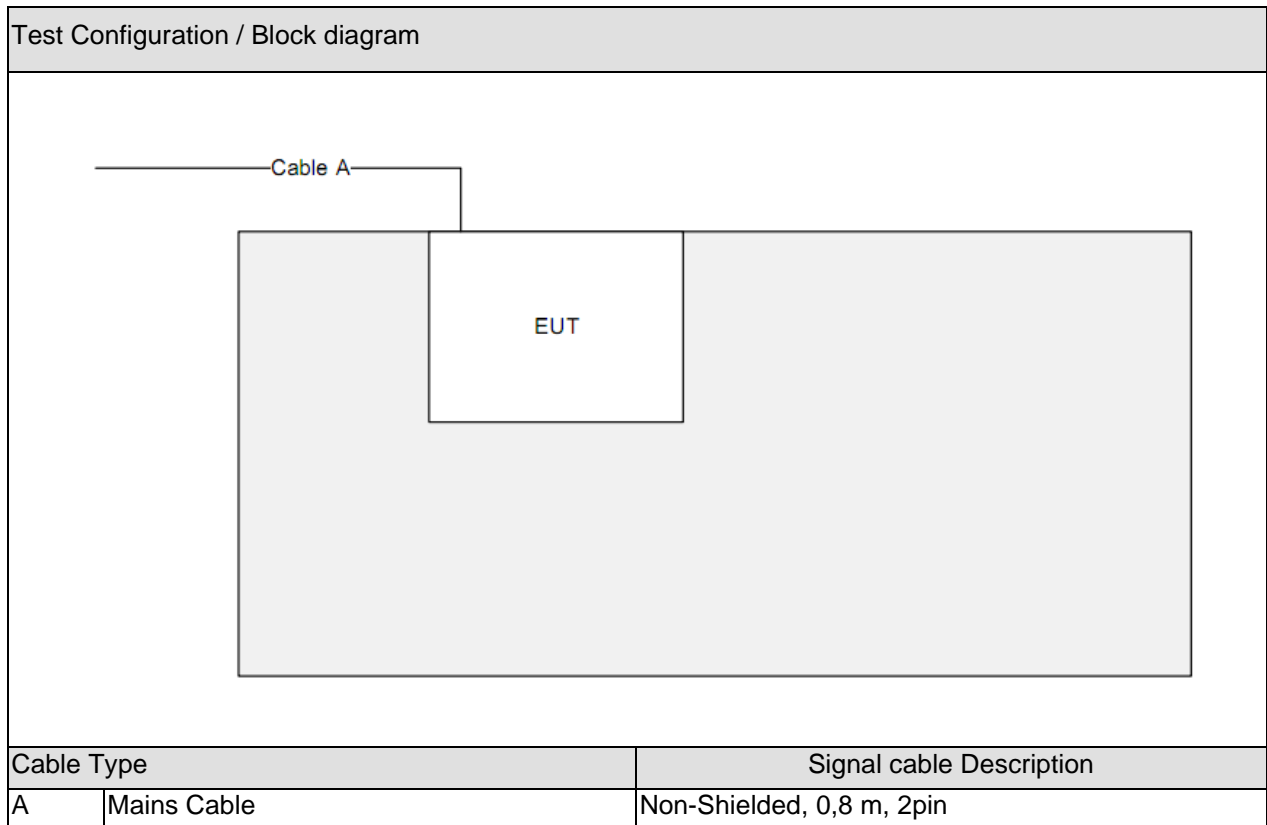
2.3 Support / Auxiliary equipment / unit / software for the EUT

The EUT has been tested with the following auxiliary equipment / unit / software:

Auxiliary equipment / unit / software	Type / Version	Manufacturer	Supplied by
N/A			
<u>Supplemental information:</u>			

2.4 Test Configuration / Block diagram used for tests

The following test setup / configuration / block diagram has been used during the tests:
 Refer to chapter 9 for details.



3 VERDICT SUMMARY SECTION

This chapter presents an overview of standards and results. Refer to the next chapters for details of measured test results and applied test levels.

3.1 Standards

Standard	Year	Description
EN IEC 55014-1	2021 ¹⁾	Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission.
EN 55016-2-1	2014	Methods of measurement of disturbances and immunity – Conducted disturbance measurements.
EN 55016-2-2	2010	Methods of measurement of disturbances and immunity – Measurement of disturbance power.
EN 55016-2-3 +A1 +A2	2010 2010 2014	Methods of measurement of disturbances and immunity – Radiated disturbance measurements.
EN IEC 61000-3-2 A1	2019 ¹⁾ 2021 ¹⁾	Limits for harmonic current emissions (equipment input current ≤ 16 A per phase).
EN 61000-3-3 A11	2013 2019 ¹⁾	Limitation of voltage fluctuations and flicker
EN IEC 55014-2	2021 ¹⁾	Requirements for household appliances, electric tools and similar apparatus – Part 2: Immunity – Product family standard.
EN 61000-4-2	2009	Electrostatic discharge immunity test.
EN 61000-4-3 +A1 +A2	2006 2008 2010	Radiated, radio-frequency, electromagnetic field immunity test.
EN 61000-4-4	2012	Electrical fast transient/burst immunity test.
EN 61000-4-5	2014	Surge immunity test.
EN 61000-4-6	2014	Immunity to conducted disturbances, induced by radio-frequency fields.
EN 61000-4-11	2004	Voltage dips, short interruptions and voltage variations immunity tests.

¹⁾ Not harmonized yet.

3.2 Deviation(s) from the Standard(s) / Test Specification(s)

No deviation.

3.3 Overview of results

EMISSION TESTS – EN IEC 55014-1			
Requirement – Test case	Basic standard(s)	Verdict	Remark
Conducted disturbance voltage at mains terminals (150 KHz – 30 MHz)	EN 55016-2-1	PASS	---
Conducted disturbance voltage at load terminals (150 KHz – 30 MHz)	EN 55016-2-1	N/A	See 3)
Conducted disturbance voltage at additional terminals (150 KHz – 30 MHz)	EN 55016-2-1	N/A	See 3)
Disturbance power (30 MHz to 300 MHz)	EN 55016-2-2	PASS	See 2)
Radiated electromagnetic disturbances (30 – 1000 MHz)	EN 55016-2-3	N/A	---
Discontinuous disturbance (clicks) on AC power leads	EN IEC 55014-1	N/A	See 1)
<u>Supplementary information:</u> 1) Exemptions from click measurements applicable (clause 4.2.3). 2) According to clause 4.1.2.3.2 procedure (a) of the EN 55014-1 standard the EUT is deemed to comply in the frequency range from 300 MHz to 1000 MHz without further measurements. 3) The test is not applicable as the EUT does not have wired network ports.			

EMISSION TESTS – EN IEC 61000-3-2, EN 61000-3-3			
Requirement – Test case	Basic standard(s)	Verdict	Remark
Harmonic current emissions	EN IEC 61000-3-2	PASS	---
Voltage changes, voltage fluctuations and flicker	EN 61000-3-3	PASS	---
<u>Supplementary information:</u>			

IMMUNITY TESTS – EN IEC 55014-2			
Requirement – Test case	Basic standard(s)	Verdict	Remark
Electrostatic discharge	EN 61000-4-2	PASS	---
Radio-frequency electromagnetic fields	EN 61000-4-3	N/A	See 1)
Fast transients	EN 61000-4-4	PASS	---
Surge transient	EN 61000-4-5	PASS	---
Injected currents (radio-frequency common mode)	EN 61000-4-6	PASS	---
Voltage dips and short interruptions	EN 61000-4-11	PASS	---
<u>Supplementary information:</u> 1) The equipment is classified as category II equipment according to EN 55014-2, no radio-frequency electromagnetic fields immunity test is applicable.			

4 EMISSION TEST RESULTS

4.1	Conducted disturbance voltage – Mains	VERDICT: PASS
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Standard	EN IEC 55014-1
Basic standard	EN 55016-2-1

Limits – Tools

Frequency range [MHz]	Limit: QP [dB(μV) ^{1]}	Limit: AV [dB(μV) ^{1]}	IF BW	Detector(s)
0,15 - 0,35	66 – 56 ²⁾	59 - 46 ²⁾	9 KHz	QP, CAV
0,35 - 5,0	56	46	9 KHz	QP, CAV
5,0 - 30	60	50	9 KHz	QP, CAV

¹⁾ At the transition frequency, the lower limit applies.
²⁾ The limit decreases linearly with the logarithm of the frequency.

<input type="checkbox"/>	Rated power below 700 W	Limits as above
<input type="checkbox"/>	Rated power between 700 and 1000 W	Limits +4 dB
<input checked="" type="checkbox"/>	Rated power above 1000 W	Limits +10 dB

Performed measurements

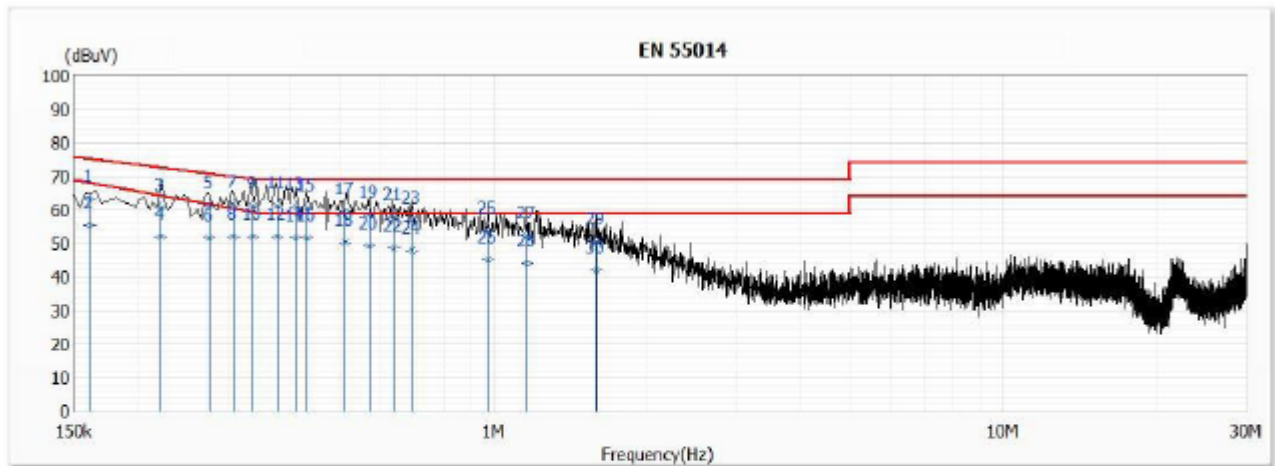
Scan range (0,9 – 1,1 U _N)	<input type="checkbox"/>	198 – 264 V _{AC}	<input type="checkbox"/>	207 – 253 V _{AC}	<input checked="" type="checkbox"/>	120/230 V _{AC}
Tested terminal(s) / port	<input checked="" type="checkbox"/>	AC mains input power	<input checked="" type="checkbox"/>	N	<input checked="" type="checkbox"/>	L1
	<input type="checkbox"/>	DC mains input power	<input type="checkbox"/>	Positive (+)	<input type="checkbox"/>	Negative (-)
Voltage – Mains [V]	120 Vac / 230 Vac					
Frequency – Mains [Hz]	50 Hz					
Test method applied	<input checked="" type="checkbox"/>	Artificial mains network				
	<input type="checkbox"/>	Voltage probe				
Test setup	<input checked="" type="checkbox"/>	Table top	<input checked="" type="checkbox"/>	Artificial hand applied		
	<input type="checkbox"/>	Floor standing	<input type="checkbox"/>	Other:		
Refer to the Annex 3 for test setup photo(s).						
Operating mode(s) used	Mode 1					
Remark	For the level of continuous disturbance is not steady, the reading on the measuring receiver is observed for at least 15 s for each measurement.					

Measurement data		Port under test	AC mains power input				
Operating mode / voltage / frequency used during the test			Mode 1/ 120 Vac/ 50 Hz				
Line							
<p>The figure is a line graph titled 'EN 55014' showing the emission spectrum. The vertical axis is labeled '(dBuV)' and ranges from 0 to 100 in increments of 10. The horizontal axis is labeled 'Frequency(Hz)' and is on a logarithmic scale with major ticks at 150k, 1M, 10M, and 30M. A black line represents the measured emission, which starts around 70 dBuV at 150k Hz and generally decreases as frequency increases, with some noise and specific peaks. A red line represents the limit, which is piecewise constant: it starts at approximately 75 dBuV, drops to about 68 dBuV at 0.311 MHz, then to about 60 dBuV at 0.517 MHz, and finally to about 50 dBuV at 1 MHz. Blue vertical lines with arrows point to specific peaks in the emission spectrum, numbered 1 through 18. The data for these peaks is provided in the table below.</p>							
No	Frequency (MHz)	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	0.156	65.55	75.67	-10.12	55.92	9.63	QP
2	0.156	58.15	68.53	-10.38	48.52	9.63	AV
3	0.175	63.07	74.72	-11.65	53.44	9.63	QP
4	0.175	55.32	67.17	-11.85	45.69	9.63	AV
5	0.227	61.22	72.58	-11.36	51.58	9.64	QP
6	0.227	52.74	64.11	-11.37	43.10	9.64	AV
7	0.259	61.28	71.48	-10.20	51.64	9.64	QP
8	0.259	51.97	62.55	-10.58	42.33	9.64	AV
9	0.311	61.80	69.98	-8.18	52.15	9.65	QP
10	0.311	52.13	60.39	-8.26	42.48	9.65	AV
11	0.366	61.48	69.00	-7.52	51.83	9.65	QP
*12	0.366	52.01	59.00	-6.99	42.36	9.65	AV
13	0.432	60.86	69.00	-8.14	51.20	9.66	QP
14	0.432	51.35	59.00	-7.65	41.69	9.66	AV
15	0.517	59.02	69.00	-9.98	49.35	9.67	QP
16	0.517	49.89	59.00	-9.11	40.22	9.67	AV
17	0.738	55.65	69.00	-13.35	45.95	9.70	QP
18	0.738	47.08	59.00	-11.92	37.38	9.70	AV

Measurement data			Port under test		AC mains power input		
19	0.850	54.50	69.00	-14.50	44.79	9.71	QP
20	0.850	46.21	59.00	-12.79	36.50	9.71	AV
21	1.228	51.86	69.00	-17.14	42.13	9.73	QP
22	1.228	43.68	59.00	-15.32	33.95	9.73	AV
23	1.662	49.56	69.00	-19.44	39.80	9.76	QP
24	1.662	41.33	59.00	-17.67	31.57	9.76	AV
Remark							

Measurement data	Port under test	AC mains power input
Operating mode / voltage / frequency used during the test		Mode 1/ 120 Vac/ 50 Hz

Neutral



No	Frequency (MHz)	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	0.161	63.31	75.43	-12.12	53.67	9.64	QP
2	0.161	55.62	68.19	-12.57	45.98	9.64	AV
3	0.222	60.75	72.77	-12.02	51.11	9.64	QP
4	0.222	52.02	64.39	-12.37	42.38	9.64	AV
5	0.276	61.48	70.95	-9.47	51.84	9.64	QP
6	0.276	51.87	61.79	-9.92	42.23	9.64	AV
7	0.307	61.75	70.08	-8.33	52.09	9.66	QP
8	0.307	52.10	60.54	-8.44	42.44	9.66	AV
9	0.336	61.52	69.34	-7.82	51.86	9.66	QP
10	0.336	52.04	59.48	-7.44	42.38	9.66	AV
11	0.376	61.41	69.00	-7.59	51.74	9.67	QP
*12	0.376	52.01	59.00	-6.99	42.34	9.67	AV
13	0.408	61.01	69.00	-7.99	51.34	9.67	QP
14	0.408	51.74	59.00	-7.26	42.07	9.67	AV
15	0.430	60.77	69.00	-8.23	51.10	9.67	QP
16	0.430	51.64	59.00	-7.36	41.97	9.67	AV
17	0.512	59.55	69.00	-9.45	49.87	9.68	QP
18	0.512	50.23	59.00	-8.77	40.55	9.68	AV

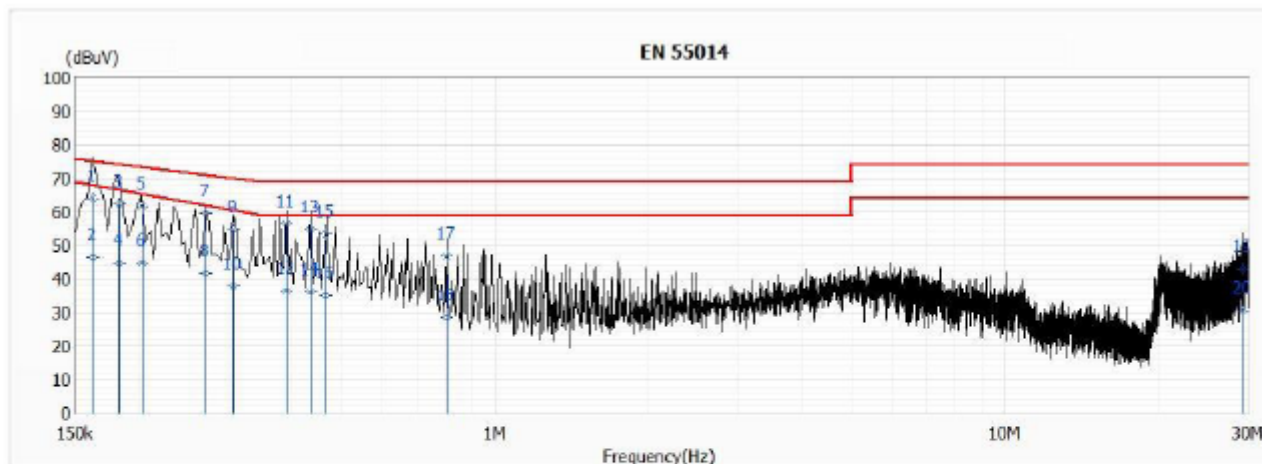
Measurement data			Port under test		AC mains power input		
19	0.569	58.58	69.00	-10.42	48.89	9.69	QP
20	0.569	49.48	59.00	-9.52	39.79	9.69	AV
21	0.634	57.98	69.00	-11.02	48.29	9.69	QP
22	0.634	48.71	59.00	-10.29	39.02	9.69	AV
23	0.692	56.83	69.00	-12.17	47.13	9.70	QP
24	0.692	47.83	59.00	-11.17	38.13	9.70	AV
25	0.975	53.68	69.00	-15.32	43.95	9.73	QP
26	0.975	45.34	59.00	-13.66	35.61	9.73	AV
27	1.165	52.53	69.00	-16.47	42.79	9.74	QP
28	1.165	44.08	59.00	-14.92	34.34	9.74	AV
29	1.586	50.58	69.00	-18.42	40.81	9.77	QP
30	1.586	42.06	59.00	-16.94	32.29	9.77	AV
Remark							

Measurement data		Port under test	AC mains power input				
Operating mode / voltage / frequency used during the test			Mode 1/ 230 Vac/ 50 Hz				
Line							
No	Frequency (MHz)	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
*1	0.176	60.13	74.68	-14.55	50.50	9.63	QP
2	0.176	44.33	67.11	-22.78	34.70	9.63	AV
3	0.211	58.56	73.17	-14.61	48.92	9.64	QP
4	0.211	41.78	64.96	-23.18	32.14	9.64	AV
5	0.255	51.88	71.60	-19.72	42.24	9.64	QP
6	0.255	37.48	62.72	-25.24	27.84	9.64	AV
7	0.282	53.19	70.79	-17.60	43.54	9.65	QP
8	0.282	37.17	61.56	-24.39	27.52	9.65	AV
9	0.330	48.28	69.49	-21.21	38.63	9.65	QP
10	0.330	32.58	59.70	-27.12	22.93	9.65	AV
11	0.368	52.87	69.00	-16.13	43.22	9.65	QP
12	0.368	34.45	59.00	-24.55	24.80	9.65	AV
13	0.403	53.85	69.00	-15.15	44.19	9.66	QP
14	0.403	37.67	59.00	-21.33	28.01	9.66	AV
15	0.468	43.43	69.00	-25.57	33.76	9.67	QP
16	0.468	26.71	59.00	-32.29	17.04	9.67	AV
17	0.515	41.21	69.00	-27.79	31.54	9.67	QP
18	0.515	25.80	59.00	-33.20	16.13	9.67	AV

Measurement data			Port under test		AC mains power input		
19	0.562	40.03	69.00	-28.97	30.36	9.67	QP
20	0.562	26.96	59.00	-32.04	17.29	9.67	AV
21	0.634	41.34	69.00	-27.66	31.66	9.68	QP
22	0.634	26.61	59.00	-32.39	16.93	9.68	AV
23	0.746	51.38	69.00	-17.62	41.68	9.70	QP
24	0.746	33.55	59.00	-25.45	23.85	9.70	AV
25	0.930	48.49	69.00	-20.51	38.78	9.71	QP
26	0.930	30.62	59.00	-28.38	20.91	9.71	AV
Remark							

Measurement data	Port under test	AC mains power input
Operating mode / voltage / frequency used during the test		Mode 1/ 230 Vac/ 50 Hz

Neutral



No	Frequency (MHz)	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
*1	0.162	64.11	75.37	-11.26	54.47	9.64	QP
2	0.162	46.63	68.10	-21.47	36.99	9.64	AV
3	0.183	62.31	74.35	-12.04	52.68	9.63	QP
4	0.183	44.86	66.64	-21.78	35.23	9.63	AV
5	0.203	61.58	73.48	-11.90	51.94	9.64	QP
6	0.203	44.89	65.41	-20.52	35.25	9.64	AV
7	0.271	59.71	71.12	-11.41	50.07	9.64	QP
8	0.271	41.60	62.03	-20.43	31.96	9.64	AV
9	0.306	54.93	70.12	-15.19	45.27	9.66	QP
10	0.306	37.87	60.60	-22.73	28.21	9.66	AV
11	0.389	56.59	69.00	-12.41	46.92	9.67	QP
12	0.389	36.60	59.00	-22.40	26.93	9.67	AV
13	0.434	54.76	69.00	-14.24	45.09	9.67	QP
14	0.434	36.16	59.00	-22.84	26.49	9.67	AV
15	0.465	53.37	69.00	-15.63	43.69	9.68	QP
16	0.465	35.24	59.00	-23.76	25.56	9.68	AV
17	0.802	46.75	69.00	-22.25	37.04	9.71	QP
18	0.802	28.71	59.00	-30.29	19.00	9.71	AV
19	29.316	43.06	74.00	-30.94	32.26	10.80	QP
20	29.316	30.67	64.00	-33.33	19.87	10.80	AV

Remark

4.2 Disturbance power (30 MHz – 300 MHz)	VERDICT: PASS
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Standard	EN IEC 55014-1
Basic standard	EN 55016-2-2

Limits – Tools

Frequency range [MHz]	Limit: QP [dB(pW)]	Limit: AV [dB(pW)]	IF BW	Detector(s)
30 - 300	45 – 55 ¹⁾	35 – 45 ¹⁾	120 KHz	QP, CAV
Margin				
200 - 300	0 – 10 ¹⁾	---	120 KHz	QP, CAV
¹⁾ The limit increases linearly with the frequency.				
<input type="checkbox"/>	Rated power below 700 W		Limits as above	
<input type="checkbox"/>	Rated power between 700 and 1000 W		Limits +4 dB	
<input checked="" type="checkbox"/>	Rated power above 1000 W		Limits +10 dB	

Performed measurements

Port(s) under test						
<input checked="" type="checkbox"/>	AC mains input power	<input type="checkbox"/>	Load	<input type="checkbox"/>	Control	
<input type="checkbox"/>	Other:	<input type="checkbox"/>	Other:	<input type="checkbox"/>	Other:	
Scan range (0,9 – 1,1 U _N)	<input type="checkbox"/>	198 – 264 V _{AC}	<input type="checkbox"/>	207 – 253 V _{AC}	<input checked="" type="checkbox"/>	120/230 V _{AC}
Voltage – Mains [V]	120 Vac / 230 Vac					
Frequency – Mains [Hz]	50 Hz					
Test setup	<input checked="" type="checkbox"/>	Table top	<input type="checkbox"/>	Floor standing		
	<input type="checkbox"/>	Other:				
Refer to the Annex 3 for test setup photo(s).						
Conditions for exemption from measurements above 300 MHz	<input checked="" type="checkbox"/>	"Limits" reduced by "Margin" applied and passed				
	<input type="checkbox"/>	Maximum clock frequency < 30 MHz				
Operating mode(s) used	Mode 1					
Remark	For the level of continuous disturbance is not steady, the reading on the measuring receiver is observed for at least 15 s for each measurement.					

Measurement data		Port under test	AC mains power input				
Operating mode / voltage / frequency used during the test			Mode 1/ 120 Vac/ 50 Hz				
No	Frequency (MHz)	Emission Level (dBpW)	Limit (dBpW)	Margin (dB)	Reading Level (dBpW)	Correct Factor (dB)	Detector Type
1	31.885	35.81	55.26	-19.45	10.71	25.10	QP
2	31.885	18.78	45.26	-26.48	-6.32	25.10	AV
3	33.395	38.88	55.47	-16.59	13.91	24.97	QP
4	33.395	20.28	45.47	-25.19	-4.69	24.97	AV
5	36.636	43.11	55.87	-12.76	18.42	24.69	QP
6	36.636	20.73	45.87	-25.14	-3.96	24.69	AV
7	38.000	44.32	56.03	-11.71	19.74	24.58	QP
8	38.000	21.24	46.03	-24.79	-3.34	24.58	AV
9	39.856	44.08	56.23	-12.15	19.65	24.43	QP
10	39.856	21.11	46.23	-25.12	-3.32	24.43	AV
11	41.502	44.49	56.41	-11.92	20.24	24.25	QP
12	41.502	22.21	46.41	-24.20	-2.04	24.25	AV
*13	43.518	46.36	56.62	-10.26	22.33	24.03	QP
14	43.518	23.31	46.62	-23.31	-0.72	24.03	AV
15	46.224	41.63	56.88	-15.25	17.90	23.73	QP
16	46.224	19.81	46.88	-27.07	-3.92	23.73	AV
17	50.033	43.75	57.22	-13.47	20.42	23.33	QP

Measurement data			Port under test		AC mains power input		
19	52.935	46.03	57.47	-11.44	22.54	23.49	QP
20	52.935	24.79	47.47	-22.68	1.30	23.49	AV
21	55.711	43.11	57.69	-14.58	19.46	23.65	QP
22	55.711	21.96	47.69	-25.73	-1.69	23.65	AV
23	59.752	41.71	57.99	-16.28	17.84	23.87	QP
24	59.752	21.66	47.99	-26.33	-2.21	23.87	AV
25	69.290	38.44	58.64	-20.20	16.77	21.67	QP
26	69.290	18.94	48.64	-29.70	-2.73	21.67	AV
27	76.361	36.42	59.06	-22.64	14.58	21.84	QP
28	76.361	17.71	49.06	-31.35	-4.13	21.84	AV
29	81.217	35.04	59.33	-24.29	12.99	22.05	QP
30	81.217	17.14	49.33	-32.19	-4.91	22.05	AV
31	90.413	37.44	59.79	-22.35	15.24	22.20	QP
32	90.413	18.27	49.79	-31.52	-3.93	22.20	AV
33	97.719	34.19	60.13	-25.94	11.83	22.36	QP
34	97.719	16.25	50.13	-33.88	-6.11	22.36	AV
35	193.117	30.04	63.09	-33.05	9.87	20.17	QP
36	193.117	13.77	53.09	-39.32	-6.40	20.17	AV
Remark							

Measurement data		Port under test	AC mains power input				
Operating mode / voltage / frequency used during the test			Mode 1/ 230 Vac/ 50 Hz				
No	Frequency (MHz)	Emission Level (dBpW)	Limit (dBpW)	Margin (dB)	Reading Level (dBpW)	Correct Factor (dB)	Detector Type
1	30.234	44.52	55.03	-10.51	19.27	25.25	QP
2	30.234	23.52	45.03	-21.51	-1.73	25.25	AV
3	32.372	40.73	55.33	-14.60	15.67	25.06	QP
4	32.372	21.10	45.33	-24.23	-3.96	25.06	AV
5	34.324	49.69	55.58	-5.89	24.80	24.89	QP
6	34.324	25.29	45.58	-20.29	0.40	24.89	AV
7	35.512	51.57	55.73	-4.16	26.79	24.78	QP
8	35.512	27.27	45.73	-18.46	2.49	24.78	AV
9	36.362	51.39	55.84	-4.45	26.67	24.72	QP
10	36.362	29.31	45.84	-16.53	4.59	24.72	AV
11	37.471	50.70	55.97	-5.27	26.07	24.63	QP
12	37.471	31.34	45.97	-14.63	6.71	24.63	AV
13	38.172	51.11	56.05	-4.94	26.54	24.57	QP
14	38.172	31.57	46.05	-14.48	7.00	24.57	AV
15	39.772	52.29	56.22	-3.93	27.85	24.44	QP
16	39.772	31.49	46.22	-14.73	7.05	24.44	AV
*17	42.929	53.44	56.56	-3.12	29.35	24.09	QP
18	42.929	32.00	46.56	-14.56	7.91	24.09	AV

Measurement data			Port under test		AC mains power input		
19	44.787	53.22	56.74	-3.52	29.33	23.89	QP
20	44.787	31.85	46.74	-14.89	7.96	23.89	AV
21	46.993	45.00	56.95	-11.95	21.35	23.65	QP
22	46.993	24.41	46.95	-22.54	0.76	23.65	AV
23	50.869	46.54	57.29	-10.75	23.17	23.37	QP
24	50.869	26.24	47.29	-21.05	2.87	23.37	AV
25	53.828	42.93	57.54	-14.61	19.39	23.54	QP
26	53.828	21.81	47.54	-25.73	-1.73	23.54	AV
27	58.580	47.56	57.91	-10.35	23.76	23.80	QP
28	58.580	25.22	47.91	-22.69	1.42	23.80	AV
29	80.335	38.05	59.28	-21.23	16.02	22.03	QP
30	80.335	16.80	49.28	-32.48	-5.23	22.03	AV
31	99.095	41.04	60.19	-19.15	18.65	22.39	QP
32	99.095	19.76	50.19	-30.43	-2.63	22.39	AV
33	102.969	40.17	60.36	-20.19	17.81	22.36	QP
34	102.969	19.28	50.36	-31.08	-3.08	22.36	AV
35	214.031	36.97	63.53	-26.56	16.75	20.22	QP
36	214.031	15.99	53.53	-37.54	-4.23	20.22	AV
Remark							

4.3 Harmonic current emissions	VERDICT: PASS
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Standard	EN IEC 61000-3-2	
Exclusions (For these categories of equipment, limits are not specified in the EN 61000-3-2 standard)	<input type="checkbox"/>	Arc welding equipment intended for professional use.
	<input type="checkbox"/>	System(s) with nominal voltage(s) less than 220 V _{AC} (line-to-neutral).
	<input type="checkbox"/>	Equipment with rated power of ≤ 75 W (other than lighting equipment).
	<input type="checkbox"/>	Professional equipment with total rated power > 1 kW.
	<input type="checkbox"/>	Symmetrically controlled heating elements with a rated power ≥ 200 W.
	<input type="checkbox"/>	Independent dimmers for incandescent lamps with rated power ≤ 1 kW.

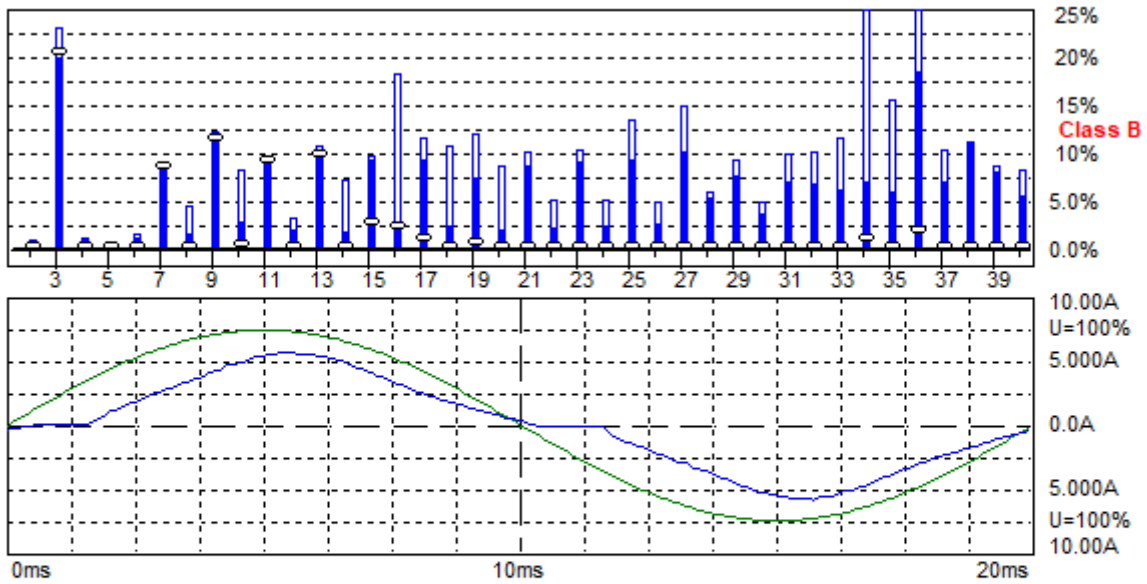
Classification		
<input type="checkbox"/>	Class A	All apparatus not classified as Class B, C or D
<input checked="" type="checkbox"/>	Class B	Portable tools
<input type="checkbox"/>	Class C	<input type="checkbox"/> Lighting equipment with active input power > 25 W
		<input type="checkbox"/> Lighting equipment with active input power ≤ 25 W (First requirement, Table 3 column 2)
		<input type="checkbox"/> Lighting equipment with active input power ≤ 25 W (Second requirement)
<input type="checkbox"/>	Class D	Personal computers, television receivers

Performed measurements

Port under test	AC mains power input					
Voltage – Mains [V]	230 Vac					
Frequency – Mains [Hz]	50 Hz					
Observation period	<input type="checkbox"/>	6.5 min.	<input checked="" type="checkbox"/>	2.5 min.	<input type="checkbox"/>	Other:
Version of measurement instrument standard used EN / IEC61000-4-7 (Cl. 7)	<input checked="" type="checkbox"/>	EN 61000-4-7:2002 + AM1:2009 (IEC 61000-4-7:2002+AM1:2008)				
	<input type="checkbox"/>	EN 61000-4-7:1991				
Control principle used in the EUT	<input checked="" type="checkbox"/>	Comply with the requirements of the Clause 6.1 (EN / IEC 61000-3-2).				
	<input type="checkbox"/>	Not comply with the requirements of the Clause 6.1 (EN / IEC 61000-3-2).				
Operating mode(s) used	Mode 1					
Remark						

Measurement data	Port under test	AC mains power input
Operating mode / voltage / frequency used during the test		Mode 1/ 230 Vac/ 50 Hz

Temperature (°C) :24 ; Relative Humidity (%RH) :65



Harmonic Emission - IEC 61000-3-2 , EN 61000-3-2 , (EN60555-2)

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Urms = 229.9 V P = 745.6 W THC = 0.694 A
 Irms = 3.369 A pf = 0.963

Range: 10 A
 V-nom: 230 V
 TestTime: 5 min (100%)

Test completed, Result: PASSED

Temperature (°C) :24 ; Relative Humidity (%RH) :65

HAR-1000 EMC-Partner

Measurement data				Port under test		AC mains power input				
Urms =	229.9V	Freq =	49.987	Range:	10 A					
Irms =	3.369A	Ipk =	5.825A	cf =	1.729					
P =	745.6W	S =	774.6VA	pf =	0.963					
THDi =	21.1 %	THDu =	0.10 %	Class B						
Test - Time :		5min		(100 %)						
Test completed, Result: PASSED										
Order	Freq. [Hz]	Iavg [A]	Irms [A]	Irms% [%]	Irms%L [%]	I _{max} [A]	I _{max} % [%]	I _{max} %L [%]	Limit [A]	Status
1	50	3.3512	3.2977	97.880		3.6426	108.12			0.00
2	100	0.0000	0.0055	0.1630	0.3391	0.0085	0.2536	0.5275	1.6200	0.00
3	150	0.7008	0.6805	20.199	19.726	0.7874	23.370	22.822	3.4500	0.00
4	200	0.0000	0.0043	0.1268	0.6624	0.0055	0.1630	0.8517	0.6450	0.00
5	250	0.0000	0.0085	0.2536	0.4997	0.0085	0.2536	0.4997	1.7100	0.00
6	300	0.0000	0.0037	0.1087	0.8138	0.0061	0.1812	1.3563	0.4500	0.00
7	350	0.0965	0.0958	2.8442	8.2966	0.0989	2.9348	8.5608	1.1550	0.00
8	400	0.0000	0.0043	0.1268	1.2384	0.0146	0.4348	4.2459	0.3450	0.00
9	450	0.0682	0.0671	1.9928	11.190	0.0720	2.1377	12.004	0.6000	0.00
10	500	0.0009	0.0067	0.1993	2.4326	0.0220	0.6522	7.9611	0.2760	0.00
11	550	0.0447	0.0439	1.3043	8.8778	0.0470	1.3949	9.4944	0.4950	0.00
12	600	0.0000	0.0037	0.1087	1.5922	0.0067	0.1993	2.9191	0.2300	0.00
13	650	0.0304	0.0299	0.8877	9.4944	0.0330	0.9783	10.463	0.3150	0.00
14	700	0.0000	0.0031	0.0906	1.5480	0.0134	0.3986	6.8112	0.1971	0.00
15	750	0.0055	0.0201	0.5978	8.9518	0.0214	0.6341	9.4944	0.2250	0.00
16	800	0.0035	0.0037	0.1087	2.1230	0.0311	0.9239	18.045	0.1725	0.00
17	850	0.0016	0.0177	0.5254	8.9157	0.0226	0.6703	11.375	0.1985	0.00
18	900	0.0000	0.0031	0.0906	1.9903	0.0159	0.4710	10.349	0.1533	0.00
19	950	0.0006	0.0128	0.3804	7.2157	0.0208	0.6159	11.683	0.1776	0.00
20	1000	0.0000	0.0024	0.0725	1.7691	0.0116	0.3442	8.4034	0.1380	0.00
21	1050	0.0000	0.0134	0.3986	8.3550	0.0159	0.4710	9.8741	0.1607	0.00
22	1100	0.0000	0.0024	0.0725	1.9460	0.0061	0.1812	4.8651	0.1255	0.00
23	1150	0.0000	0.0128	0.3804	8.7348	0.0146	0.4348	9.9826	0.1467	0.00
24	1200	0.0000	0.0024	0.0725	2.1230	0.0055	0.1630	4.7767	0.1150	0.00
25	1250	0.0000	0.0122	0.3623	9.0422	0.0177	0.5254	13.111	0.1350	0.00
26	1300	0.0000	0.0024	0.0725	2.2999	0.0049	0.1449	4.5998	0.1062	0.00
27	1350	0.0000	0.0122	0.3623	9.7656	0.0183	0.5435	14.648	0.1250	0.00
28	1400	0.0000	0.0049	0.1449	4.9536	0.0055	0.1630	5.5728	0.0986	0.00
29	1450	0.0000	0.0085	0.2536	7.3423	0.0104	0.3080	8.9157	0.1164	0.00
30	1500	0.0000	0.0031	0.0906	3.3171	0.0043	0.1268	4.6440	0.0920	0.00
31	1550	0.0000	0.0073	0.2174	6.7274	0.0104	0.3080	9.5305	0.1089	0.00
32	1600	0.0000	0.0055	0.1630	6.3689	0.0085	0.2536	9.9072	0.0862	0.00
33	1650	0.0000	0.0061	0.1812	5.9679	0.0116	0.3442	11.339	0.1023	0.00
34	1700	0.0007	0.0055	0.1630	6.7669	0.0220	0.6522	27.068	0.0812	0.00
35	1750	0.0000	0.0055	0.1630	5.6966	0.0146	0.4348	15.191	0.0964	0.00
36	1800	0.0014	0.0140	0.4167	18.311	0.0226	0.6703	29.456	0.0767	0.00
37	1850	0.0000	0.0061	0.1812	6.6913	0.0092	0.2717	10.037	0.0912	0.00
38	1900	0.0000	0.0079	0.2355	10.924	0.0079	0.2355	10.924	0.0726	0.00
39	1950	0.0000	0.0067	0.1993	7.7582	0.0073	0.2174	8.4635	0.0865	0.00
40	2000	0.0000	0.0037	0.1087	5.3074	0.0055	0.1630	7.9611	0.0690	0.00

Measurement data		Port under test	AC mains power input
Fixed Limits for Class B : (1.5 times Limits of Class A)			
Order	Limits in Ampere		
	100%	150%	
2	1.6199	2.4298	
3	3.4497	5.1746	
4	0.6451	0.9677	
5	1.7102	2.5653	
6	0.4498	0.6747	
7	1.1548	1.7322	
8	0.3448	0.5173	
9	0.6000	0.9000	
10	0.2759	0.4138	
11	0.4950	0.7425	
12	0.2301	0.3452	
13	0.3149	0.4724	
14	0.1971	0.2957	
15	0.2252	0.3378	
16	0.1727	0.2591	
17	0.1984	0.2975	
18	0.1532	0.2298	
19	0.1776	0.2664	
20	0.1379	0.2069	
21 *	0.1605	0.2408	
22	0.1257	0.1886	
23 *	0.1465	0.2197	
24	0.1147	0.1721	
25 *	0.1349	0.2023	
26	0.1062	0.1593	
27 *	0.1251	0.1877	
28	0.0983	0.1474	
29 *	0.1166	0.1749	
30	0.0922	0.1382	
31 *	0.1086	0.1630	
32	0.0861	0.1291	
33 *	0.1025	0.1538	
34	0.0812	0.1218	
35 *	0.0964	0.1447	
36	0.0769	0.1154	
37 *	0.0909	0.1364	
38	0.0726	0.1089	
39 *	0.0867	0.1300	
40	0.0690	0.1035	
EUT is PASSED.			
Remark			

4.4 Voltage changes, voltage fluctuations and flicker	VERDICT: PASS
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Standard	EN 61000-3-3
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Limits

P _{ST} (Short term flicker)	<input type="checkbox"/>	≤ 1	<input checked="" type="checkbox"/>	Not Applicable
P _{LT} (Long term flicker)	<input type="checkbox"/>	≤ 0,65	<input checked="" type="checkbox"/>	Not Applicable
d _c (Relative Voltage change)	<input checked="" type="checkbox"/>	≤ 3,3%	<input type="checkbox"/>	Not Applicable
d _{MAX} (Max. voltage change)	<input type="checkbox"/>	≤ 4%	<input type="checkbox"/>	6%
	<input checked="" type="checkbox"/>	7%	<input type="checkbox"/>	Not Applicable
<u>Supplemental information:</u>				

Performed measurements

Reason for not performing the measurement(s)	<input type="checkbox"/>	Tests are not necessary because the EUT is unlikely to produce significant voltage fluctuations or flicker (clause 6.1).				
Port under test	AC Mains power input					
Voltage – Mains [V]	230 Vac					
Frequency – Mains [Hz]	50 Hz					
Test method	<input checked="" type="checkbox"/>	Flickermeter according EN / IEC 61000-4-15:2011				
	<input type="checkbox"/>	Simulation (Clause 4.2.3 of EN / IEC 61000-3-3)				
	<input type="checkbox"/>	Analytical method (Clause 4.2.4 of EN / IEC 61000-3-3)				
	<input type="checkbox"/>	Use of P _{st} = 1 curve (Clause 4.2.5 of EN / IEC 61000-3-3)				
Observation period	<input type="checkbox"/>	10 min.	<input type="checkbox"/>	120 min.	<input type="checkbox"/>	Other:
	<input checked="" type="checkbox"/>	24 times switching according to Annex B				
Operating mode(s) used	Mode 1					
Remark	---					

See next page.

Measurement data	Port under test	AC mains power input										
Operating mode used during the test	Mode1/ 230 Vac/ 50 Hz											
<table border="1"> <tbody> <tr> <td data-bbox="258 461 1066 501">Relative voltage change characteristic dt</td> <td data-bbox="1066 461 1406 501">0,0</td> </tr> <tr> <td data-bbox="258 501 1066 542">Maximum voltage change d_{MAX}</td> <td data-bbox="1066 501 1406 542">1,23%</td> </tr> <tr> <td data-bbox="258 542 1066 582">Relative Voltage change dc</td> <td data-bbox="1066 542 1406 582">0,21%</td> </tr> <tr> <td data-bbox="258 582 1066 622">Short term flicker P_{ST}</td> <td data-bbox="1066 582 1406 622">N/A</td> </tr> <tr> <td data-bbox="258 622 1066 663">Long term flicker P_{LT}</td> <td data-bbox="1066 622 1406 663">N/A</td> </tr> </tbody> </table>			Relative voltage change characteristic dt	0,0	Maximum voltage change d _{MAX}	1,23%	Relative Voltage change dc	0,21%	Short term flicker P _{ST}	N/A	Long term flicker P _{LT}	N/A
Relative voltage change characteristic dt	0,0											
Maximum voltage change d _{MAX}	1,23%											
Relative Voltage change dc	0,21%											
Short term flicker P _{ST}	N/A											
Long term flicker P _{LT}	N/A											
Remark												

5 IMMUNITY TEST RESULTS

5.1 Performance (Compliance) criteria

[According to EN IEC 55014-2 (CISPR 14-2)]

Performance criteria A : The apparatus shall continue to operate as intended during the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer when the apparatus is used as intended. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and from what the user may reasonably expect from the apparatus if used as intended.

Performance criteria B : The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer when the apparatus is used as intended. During the test, degradation of performance is allowed however no change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and from what the user may reasonable expect from the apparatus if used as intended.

Performance criteria C : Temporary loss of function is allowed provided the function is self- recoverable or can be restored by the operation of the controls or by any operation specified in the instruction for use.

5.1.1 Performance criteria related to immunity tests

Immunity test	Performance criteria
Electrostatic discharge	B
Radio-frequency electromagnetic fields	A
Fast transients	B
Surge transient	B
Injected currents (radio-frequency common mode)	A
Voltage dips and short interruptions	C

5.1.2 Manufacturer defined performance criteria

Not provided.

5.2 Monitored – Checked Functions / Parameters

During the immunity tests the following functions of the EUT has/have been monitored/checked.

<input checked="" type="checkbox"/>	Motor speed	<input type="checkbox"/>	Display data
<input type="checkbox"/>	Switching	<input type="checkbox"/>	Data storage
<input type="checkbox"/>	Standby mode	<input type="checkbox"/>	Sensor functions
<input type="checkbox"/>	Temperature	<input type="checkbox"/>	Audible signals
<input type="checkbox"/>	Power consumption	<input type="checkbox"/>	Others : LED's
<input type="checkbox"/>	AC mains input current	<input type="checkbox"/>	Others :
<input type="checkbox"/>	Timing	<input type="checkbox"/>	Others :
<input type="checkbox"/>	Illumination	<input type="checkbox"/>	Others :
<u>Supplementary information :</u>			

Immunity test	Monitored - Checked function(s)/parameter(s) during / after the test	Method
Electrostatic discharge	Tool speed	Visual
Radio-frequency electromagnetic fields	Tool speed	Visual / Camera/ tachometer
Fast transients	Tool speed	Visual
Surge transient	Tool speed	Visual
Injected currents (radio-frequency common mode)	Tool speed	Visual
Voltage dips and short interruptions	Tool speed	Visual
<u>Supplementary information :</u>		

5.3 Electrostatic discharge immunity	VERDICT: PASS
---	----------------------

Electrostatic discharges (ESD) are the result of persons or objects that accumulate static electricity due to for instance walking on synthetic carpets. The ESD can influence the operation of equipment or damage its electronics, either by a direct discharge or indirectly by coupling or radiation. Both effects are simulated during the tests.

Requirements

Standard	EN IEC 55014-2							
Basic standard	EN 61000-4-2							
Port under test	Enclosure							
Air discharges ¹⁾	<input type="checkbox"/>	±2 kV	<input type="checkbox"/>	±4 kV	<input checked="" type="checkbox"/>	±8 kV	<input type="checkbox"/>	kV
Contact discharges ¹⁾	<input type="checkbox"/>	±2 kV	<input checked="" type="checkbox"/>	±4 kV	<input type="checkbox"/>	±8 kV	<input type="checkbox"/>	kV
Number of discharges	≥ 10 per polarity with ≥ 1 sec interval.							
¹⁾ Tests with lower voltages are not required.								

Performed tests

Set-up	<input checked="" type="checkbox"/>	Table-top	<input type="checkbox"/>	Floor standing
Ambient temperature [°C]	23 °C		Relative Humidity air [%]	46.1%
Voltage – Mains [V]	120 Vac / 230 Vac			
Frequency – Mains [Hz]	50 Hz			
Operating mode(s) used	Mode 1			

Test Point	Test Voltage [kV] & Polarity	Coupling type	# of applied discharges / polarity	Discharge interval [s]
<input checked="" type="checkbox"/> Points on conductive surface.	±4	Contact	10	1
<input checked="" type="checkbox"/> Points on non-conductive surface.	±8	Air	10	1
<input checked="" type="checkbox"/> HCP top side.	±4	Contact	10	1
<input checked="" type="checkbox"/> HCP bottom side.	±4	Contact	10	1
<input checked="" type="checkbox"/> VCP right side.	±4	Contact	10	1
<input checked="" type="checkbox"/> VCP left side.	±4	Contact	10	1
<input checked="" type="checkbox"/> VCP front side.	±4	Contact	10	1
<input checked="" type="checkbox"/> VCP rear side.	±4	Contact	10	1

Observation(s)	During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance or data was observed.
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Supplementary information:

5.4	Electrical Fast Transients immunity	VERDICT: PASS
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The EFT immunity test simulates disturbances by bursts of very short transients caused for example by switching off loads such as an AC motor or bouncing relay contacts. The transients are likely to disturb electronics but less likely to cause damage.

Requirements

Standard	EN IEC 55014-2			
Basic standard	EN 61000-4-4			
Pulse characteristics	5/50 ns			
Port	Test level	Repetition frequency	Duration	
<input checked="" type="checkbox"/> AC input-output power ¹⁾	± 1000 V	5 KHz	2 min. / polarity	
<input type="checkbox"/> DC input-output power ²⁾	± 500 V	5 KHz	2 min. / polarity	
<input type="checkbox"/> Signal and Control lines ³⁾	± 500 V	5 KHz	2 min. / polarity	
¹⁾ For extra low voltage a.c ports, this testing is only applicable to ports interfacing with cables whose total length may exceed 3 m according to the manufacturer's functional specification. ²⁾ Not applicable to battery operated appliances that cannot be connected to the mains while in use. ³⁾ Applicable only to ports interfacing with cables whose total length may exceed 3 m according to the manufacturer's functional specification.				

Performed tests

Voltage – Mains [V]	120 Vac / 230 Vac		
Frequency – Mains [Hz]	50 Hz		
Operating mode(s) used	Mode 1		
Test Set-up	<input checked="" type="checkbox"/>	Equipment standing on floor at (0,1 ± 0,01) m above ground plane	
	<input type="checkbox"/>	Equipment on the table (0,1 ± 0,01) m above ground plane	
	<input type="checkbox"/>	Artificial hand applied.	
Coupling	<input checked="" type="checkbox"/>	Common mode	<input type="checkbox"/> Other:

Port(s) under test	Test Voltage & Polarity	Repetition Frequency	Test duration / polarity	Injection method		
				<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AC / DC mains power input	1 kV	5 KHz	2 min	<input checked="" type="checkbox"/>	CDN	<input type="checkbox"/> Clamp
AC / DC power output		5 KHz		<input type="checkbox"/>	CDN	<input type="checkbox"/> Clamp
Ethernet / LAN		5 KHz		<input type="checkbox"/>	CDN	<input type="checkbox"/> Clamp
Observation(s)	During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.					

5.5	Surge transient immunity	VERDICT: PASS
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The surge transient immunity test simulates the surges that are caused by over-voltages due to indirect (induced) lightning transients. The pulse is a slow transient with high-energy contents and due to its long duration may cause damage to an unprotected EUT.

Requirements

Standard	EN IEC 55014-2		
Basic standard	EN 61000-4-5		
Pulse characteristics	1,2/50µs Voltage; 8/20µs Current		
Repetition rate	≥ 60 secs. (for each test level and phase angle)		
Number of pulses	5 pulses (at each polarity and phase angle)		
Port	Test level & Polarity & Coupling		Phase angle [°]
	Line to Line	Line to Earth	
AC input power ¹⁾	+ 1 kV	N/A	90
AC input power ¹⁾	- 1 kV	N/A	270
¹⁾ Tests with lower voltages are not required.			

Performed tests

Voltage – Mains [V]	120 Vac / 230 Vac
Frequency – Mains [Hz]	50 Hz
Operating mode(s) used	Mode 1
Repetition rate	60 secs. (for each test level and phase angle)
Number of pulses	5 pulses (at each polarity and phase angle)

Port(s) under test	Coupling	Test level & Polarity	Phase angle [°]	Remark
<input checked="" type="checkbox"/> AC mains input power	Line to Neutral	+1 kV	90	
<input checked="" type="checkbox"/> AC mains input power	Line to Neutral	-1 kV	270	
<input type="checkbox"/> AC mains input power	Line to Earth	+2 kV	90	
<input type="checkbox"/> AC mains input power	Line to Earth	-2 kV	270	
<input type="checkbox"/> AC mains input power	Neutral to Earth	+2 kV	90	
<input type="checkbox"/> AC mains input power	Neutral to Earth	-2 kV	270	

Observation(s)	During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance or data was observed.
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Supplementary information:
1. The EUT not include an earth port.

5.6	Injected currents (RF common mode) immunity	VERDICT: PASS
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During this test the immunity of the equipment for induced or conducted electromagnetic fields is checked. Fields generated by radio and other transmitters cause RF voltages in long cables like the mains network. This test reproduces these induced disturbing voltages by injecting them to the EUT via the cabling.

Requirements

Standard		EN IEC 55014-2		
Basic standard		EN 61000-4-6		
Frequency range		Modulation	Step size	Dwell time
<input type="checkbox"/>	0,15 – 80 MHz	80% AM (1kHz)	≤ 1%	≥ 0,5 s
<input checked="" type="checkbox"/>	0,15 – 230 MHz	80% AM (1kHz)	≤ 1%	≥ 0,5 s
Port			Test level, U _o	
<input checked="" type="checkbox"/>	AC input-output power ¹⁾		3 V	
<input type="checkbox"/>	DC input-output power ^{2) 3)}		1 V	
<input type="checkbox"/>	Signal and Control lines ⁴⁾		1 V	
¹⁾ For extra low voltage a.c ports, this testing is only applicable to ports interfacing with cables whose total length may exceed 3 m according to the manufacturer's functional specification. ²⁾ Not applicable to battery operated appliances that cannot be connected to the mains while in use. ³⁾ Applicable to battery operated appliances that can be connected to the mains while in use, or to appliances for which the length of d.c. cables may exceed 3 m according to the manufacturer's functional specification. ⁴⁾ Applicable only to ports interfacing with cables whose total length may exceed 3 m according to the manufacturer's functional specification.				

Performed tests

Frequency range (applied)		Modulation (applied)		Step size (applied)
<input type="checkbox"/>	0,15 – 80 MHz	<input checked="" type="checkbox"/>	0,15 – 230 MHz	80% AM (1kHz)
Voltage – Mains [V]		120 Vac / 230 Vac		Frequency – Mains [Hz]
				50 Hz
Operating mode(s) used		Mode 1		
Test set-up		<input type="checkbox"/>	Equipment standing on floor at (0,1 ± 0,01) m above ground plane.	
		<input type="checkbox"/>	Equipment on the table (0,1 ± 0,01) m above ground plane.	
		<input checked="" type="checkbox"/>	Artificial hand applied.	

Port(s) under test	Test Level (applied)	Injection method	Dwell time (applied)	Remark
AC mains power input	3 V	CDN-M2	3 s	
Observation(s)	During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance or data was observed.			
Supplementary information:				

5.7	Power supply interruptions and dips immunity	VERDICT: PASS
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The purpose of the test is to verify the immunity of the equipment against voltage dips and voltage interruptions. It helps to ensure that the equipment functions properly (as expected and safely) with power supply fluctuations. Voltage dips and interruptions are caused by faults in the LV, MV, HV networks (short-circuit or ground faults).

Requirements

Standard	EN IEC 55014-2			
Basic standard	EN 61000-4-11			
# of dips & interruptions	3 dips / interruptions for each test level and phase angle			
Interval between events	≥ 10 seconds			
Port	Test level ¹⁾	Period (Cycles)		Performance Criteria
		50 Hz	60 Hz	
AC input power port	$U_{NOM} - 100\%$	0,5	0,5	C; Refer to the chapter 5.1 for details.
AC input power port	$U_{NOM} - 60\%$	10	12	C; Refer to the chapter 5.1 for details.
AC input power port	$U_{NOM} - 30\%$	25	30	C; Refer to the chapter 5.1 for details.
¹⁾ Changes to the voltage level shall occur at a zero crossing point in the a.c. voltage waveform. NOTE: Where the equipment has a rated voltage range the following shall apply: <ul style="list-style-type: none"> - If the voltage range does not exceed 20% of the lower voltage specified for the rated voltage range. A single voltage within that range may be selected for testing. - In all other cases, the test procedure shall be applied for both the lowest and highest voltages declared in the voltage range. 				

Performed tests

U_{NOM} [V _{AC}]	Terminal	Voltage dip [% U_{NOM}]	Duration [cycles]		Repetition rate [s]	Number of dips per test	Phase angle [°]
			50 Hz	60 Hz			
230	L-N	0	0,5	/	10	3	0, 180
230	L-N	40	10	/	10	3	0, 180
230	L-N	70	25	/	10	3	0, 180
120	L-N	0	0,5	/	10	3	0, 180
120	L-N	40	10	/	10	3	0, 180
120	L-N	70	25	/	10	3	0, 180
Operating mode(s) used		Mode 1					
Observation(s)		During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.					
<u>Supplementary information:</u>							

6 IDENTIFICATION OF THE EQUIPMENT UNDER TEST

EUT PHOTOS



7 MEASUREMENT UNCERTAINTIES

The table(s) below show(s) measurement uncertainties of the EMC test set-ups. The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

Conducted Emissions

The measurement uncertainty is evaluated as ± 2.26 dB.

Disturbance Power Emission

The measurement uncertainty is evaluated as ± 3.34 dB.

Harmonic Current Emission

The measurement uncertainty is evaluated as 0.1%.

Voltage Fluctuation and Flicker

The measurement uncertainty is evaluated as $\pm 4\%$.

Electrostatic Discharge

As what is concluded in the document from Note2 of clause 5.4.6.2 of ISO/IEC 17025: 1999[2], the requirements for measurement uncertainty in ESD testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant ESD standards. The immunity test signal from the ESD system meet the required specifications in

IEC 61000-4-2 through the calibration report with the calibrated uncertainty for the waveform of voltage and timing as being $1.63 \% \cdot 10^{-10}$ and 2.76%.

Radiated susceptibility

As what is concluded in the document from Note2 of clause 5.4.6.2 of ISO/IEC 17025: 1999[2], the requirements for measurement uncertainty in RS testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant RS standards. The immunity test signal from the RS system meet the required specifications in

IEC 61000-4-3 through the calibration for the uniform field strength and monitoring for the test level with the uncertainty evaluation report for the electrical field strength as being 2.72 dB.

Electrical fast transient/burst

As what is concluded in the document from Note2 of clause 5.4.6.2 of ISO/IEC 17025: 1999[2], the requirements for measurement uncertainty in EFT/Burst testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant EFT/Burst standards. The immunity test signal from the EFT/Burst system meet the required specifications in IEC 61000-4-4 through the calibration report with the calibrated uncertainty for the waveform of voltage, frequency and timing as being

1.63 %, 2.8×10^{-10} and 2.76%.

Surge

As what is concluded in the document from Note2 of clause 5.4.6.2 of ISO/IEC 17025: 1999[2], the requirements for measurement uncertainty in Surge testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant Surge standards. The immunity test signal from the Surge system meet the required specifications in IEC 61000-4-5 through the calibration report with the calibrated uncertainty for the waveform of voltage and timing as being 1.63 % and 2.76%.

Conducted susceptibility

As what is concluded in the document from Note2 of clause 5.4.6.2 of ISO/IEC 17025: 1999[2], the requirements for measurement uncertainty in CS testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant CS standards. The immunity test signal from the CS system meet the required specifications in IEC 61000-4-6 through the calibration for unmodulated signal and monitoring for the test level with the uncertainty evaluation report for the injected modulated signal level through CDN and EM Clamp/Direct Injection as being 3.72 dB and 2.78 dB.

Voltage dips and interruptions

As what is concluded in the document from Note2 of clause 5.4.6.2 of ISO/IEC 17025: 1999[2], the requirements for measurement uncertainty in DIP testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant DIP standards. The immunity test signal from the DIP system meet the required specifications in IEC 61000-4-11 through the calibration report with the calibrated uncertainty for the waveform of voltage and timing as being 1.63 % and 2.76%.

8 USED EQUIPMENT

Conducted Emission / SR2-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Test Receiver	R&S	ESR3	102608	2020/06/16	2022/06/15
Artificial Mains Network	R&S	ENV4200	848411/010	2020/01/08	2022/01/07
LISN	R&S	ENV216	100092	2020/06/22	2022/06/21
Coaxial Cable(9m)	Belden	8129	SR2-H	2020/08/15	2022/08/14
DEKRA-EMI system	DEKRA	Version 1.0	SR2-H	N/A	N/A

Disturbance Power Emission / SR2-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Test Receiver	R&S	ESC17	100879	2020/06/16	2022/06/15
Absorbing Clamp	Luthi	MDS 21B	P1602169770	2020/01/16	2022/01/15
Coaxial Cable(5m)	Schwarzbeck	RG-223U	SR2-H-PT	2020/08/15	2022/08/14
DEKRA-EMI system	DEKRA	Version 1.0	SR2-H	N/A	N/A

Power Harmonics / SR3-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
EMC Emission Tester	EMC-Partner	HAR-1000-1P	109	2019/12/17	2022/12/16

Voltage Fluctuation and Flicker / SR3-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
EMC Emission Tester	EMC-Partner	HAR-1000-1P	109	2019/12/17	2022/12/16

Electrostatic Discharge / SR8-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Electrostatic Simulator Discharge	NoiseKen	ESS-2002	ESS04Z3759	2020/05/26	2022/05/25
Horizontal Coupling Plane (HCP)	QuieTek	HCP AL50	N/A	N/A	N/A
Vertical Coupling Plane (VCP)	QuieTek	HCP AL50	N/A	N/A	N/A

Electrical fast transient/ Brust / SR3-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
EMC Immunity Tester	Teseq	NSG 3060	1424	2020/07/09	2022/07/08
CDN	Teseq	CDN 3083-B100	3022	2019/12/16	2022/12/15
Clamper	Haefely	093 506.1	083 593-23	2019/12/16	2022/12/15

Surge / SR3-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
EMC Immunity Tester	Teseq	NSG 3060	1424	2020/06/12	2022/06/11
CDN	Teseq	CDN 3083-S100	5017	2019/12/16	2022/12/15

Conducted susceptibility / SR7-H

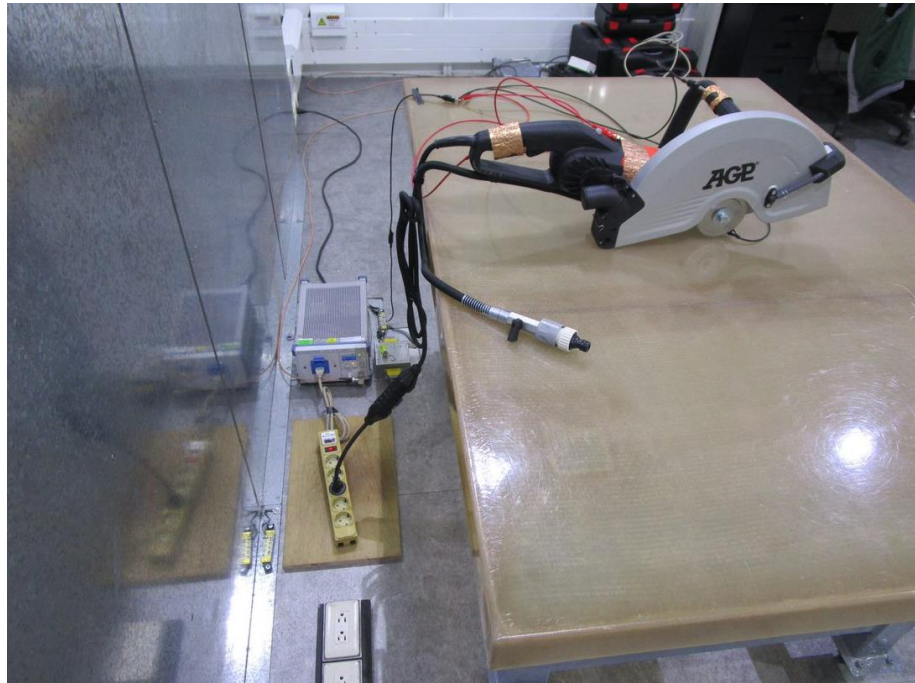
Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Compact Immunity Test System	Teseq	NSG 4070b-80	41145	2019/20/05	2022/10/04
CDN	Teseq	CDN M016	50519	2020/02/27	2022/02/26
CDN	Teseq	CDN M5-100-750V	55497	2019/12/18	2022/12/17
Immunity Injection Clamp	Schafner	KENZ801	15928	2019/10/14	2022/10/13
6Db PAD	JFW	50FHAO-06-100	N/A	N/A	N/A

Voltage dips and interruptions / SR7-H

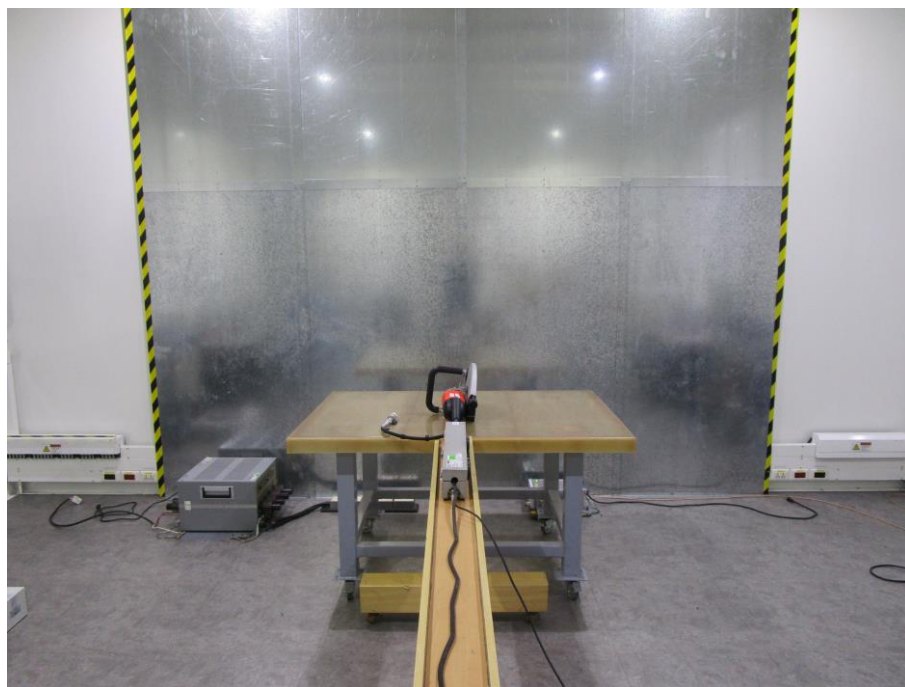
Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
EMC Immunity Tester	Teseq	NSG 3060	1424	2020/06/12	2022/06/11

9 TEST PHOTOS

Conducted disturbance at mains terminals



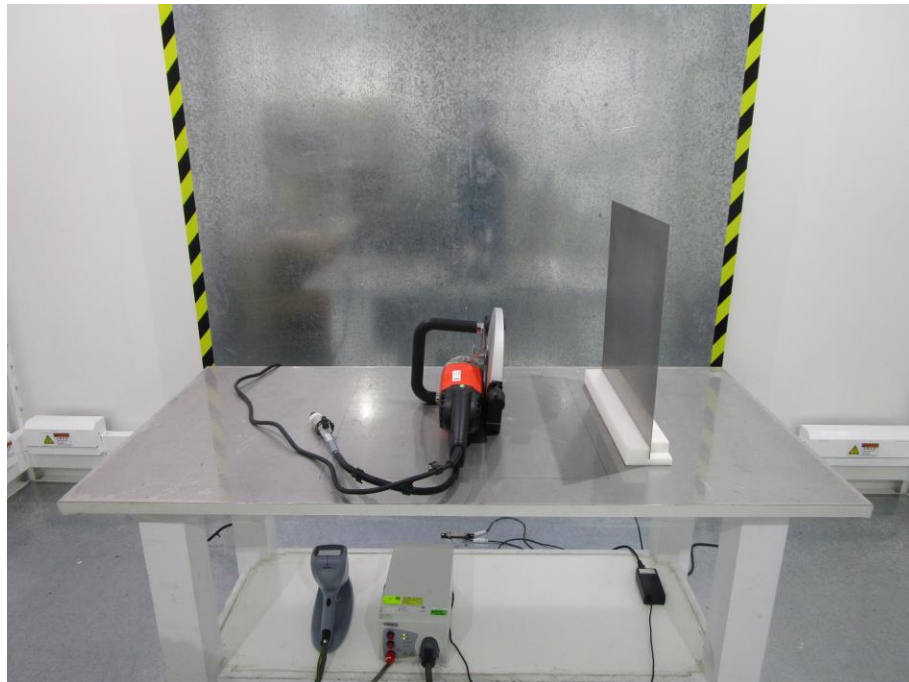
Disturbance power



Harmonic current emissions & Voltage changes, voltage fluctuations and flicker



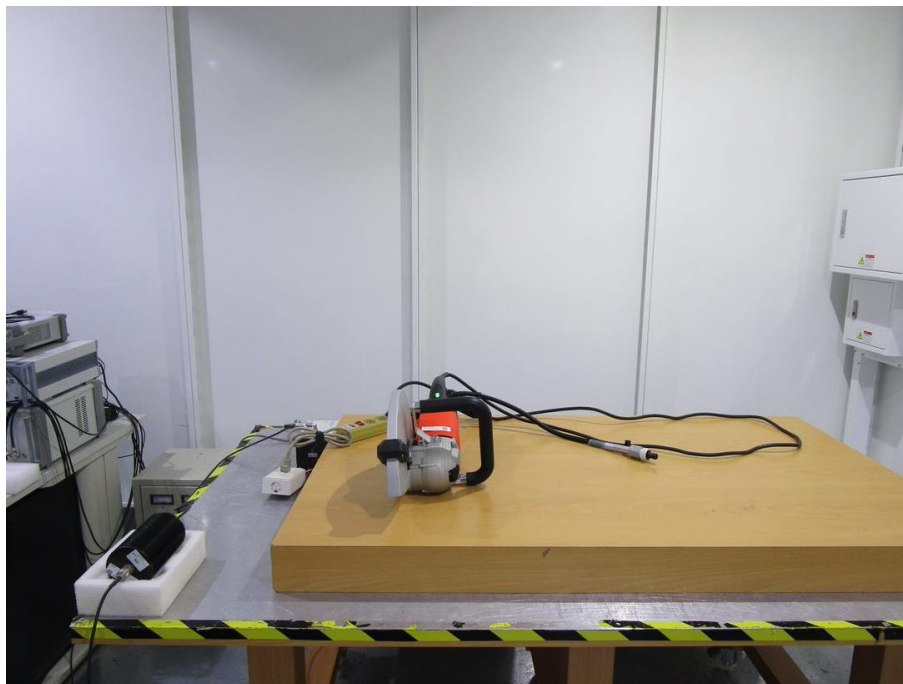
Electrostatic discharge immunity



Fast transients, Surges & Voltage dips and short interruptions immunity



Injected currents (radio-frequency common mode) immunity



End of the report