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DEKRA

Test report No:
6041647.50

TEST REPORT
Electromagnetic Compatibility (EMC)

Identification of item tested	Diamond Core Drill
Trademark	AGP
Model and /or type reference	DM6P; DBM200-3; EVO2 PWD; EVO2 DWD; EVO2 PW; EVO2 DW; MCM200; KDMM2000; MT-19A; MT-19P; MT-18P; MT-18A; CAR201; QDM-150D; QDM-150W; C-BMH-160; BB1004; HSD-6P; DM6D; DMC6P; DMC6D; DM62; DD62; DD160; EVO20-PDSI; MDB-180P
Ratings	DM6P; DBM200-3; EVO2 PWD; EVO2 DWD; EVO2 PW; EVO2 DW; MCM200; KDMM2000; MT-19A; MT-19P; MT-18P; MT-18A; CAR201; QDM-150D; QDM-150W; C-BMH-160; BB1004; HSD-6P; DM6D; DMC6P; DMC6D: 220-240 V; 50-60 Hz; 2000 W; n_0=930/1520/4270 min^{-1}; Class I 110-120 V; 50-60 Hz; 1700 W; n_0=930/1520/4270 min^{-1}; Class I DM62; DD62; DD160; EVO20-PDSI; MDB-180P: 220-240 V; 50-60 Hz; 2000 W; n_0=1250/1900 min^{-1}; Class I 110-120 V; 50-60 Hz; 1700 W; n_0=1250/1900 min^{-1}; Class I
Test Laboratory / address	DEKRA Testing and Certification (Shanghai) Ltd. No. 250 Jiangchangsan Road Shibei Hi-Tech Park, 200436 Zhabei District, Shanghai, China
Applicant´s name / address	LEE YEONG INDUSTRUAL CO., LTD. No.2, Kejia Rd., Douliu City, Yunlin County 64057, Taiwan
Test method requested, standard	EN 55014-1:2006+A1:2009+A2:2011; EN 55014-1:2017 EN 55014-2:2015 EN 61000-3-2:2014; EN 61000-3-3:2013
Verdict Summary	IN COMPLIANCE
Tested by	Kaiyuan Dai (Project Engineer) Kaiyuan. Dai
Approved by	Zuyao Fan (Project Manager) Zuyao. Fan

Date of issue	2018-11-29
Report template No	TRF-EMC-2018 V1.0

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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.

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.

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%. Refer to the Annex 1 for furter information.

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

☒ Indicates that the listed condition, standard or equipment is applicable for this report/test/EUT.				
☐ Indicates that the listed condition, standard or equipment is not applicable for this report/test/EUT.				
Decimal separator used in this report	☒	Comma (,)	☐	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

DOCUMENT HISTORY

Report nr.	Date	Description
6041647.50	2018-11-29	First release.

Modification -1 report:
The report is issued to base on original test report Ref. No. 6010548.50 dated on 2017-07-26 including the following modifications:

- Add new types. New types are same as previous types.
- Vibration retest according to instructions. (with 80 mm drill bit)

After review, no test is considered necessary.

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 RF function was not part of this EMC assessment.

According to the declaration from manufacturer, DM6P; DBM200-3; EVO2 PWD; EVO2 DWD; EVO2 PW; EVO2 DW; MCM200; KDMM2000; MT-19A; MT-19P; MT-18P; MT-18A; CAR201; QDM-150D; QDM-150W; C-BMH-160; BB1004; HSD-6P; DM6D; DMC6P; DMC6D; DM62; DD62 and DD160; EVO20-PDSI; MDB-180P are identical. The difference for DM6P; DBM200-3; EVO2 PWD; EVO2 DWD; EVO2 PW; EVO2 DW; MCM200; KDMM2000; MT-19A; MT-19P; MT-18P; MT-18A; CAR201; QDM-150D; QDM-150W; C-BMH-160; BB1004; HSD-6P; DM6D; DMC6P; DMC6D and DM62; DD62; DD160; EVO20-PDSI; MDB-180P is only the rated no-load speed due to the ratio of the gear box is different. The handles of these models can be D or P type

Therefore, model DM6D was selected for the full tests and the results are also representative for other models as well.

1 GENERAL INFORMATION

1.1 General Description of the Item(s)

Description of the item .....:	Diamond Core Drill
Model / Type number .....:	DM6D
Representative Type.....:	DM6P; DBM200-3; EVO2 PWD; EVO2 DWD; EVO2 PW; EVO2 DW; MCM200; KDMM2000; MT-19A; MT-19P; MT-18P; MT-18A; CAR201; QDM-150D; QDM-150W; C-BMH-160; BB1004; HSD-6P; DM6D; DMC6P; DMC6D; DM62; DD62; DD160; EVO20-PDSI; MDB-180P
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

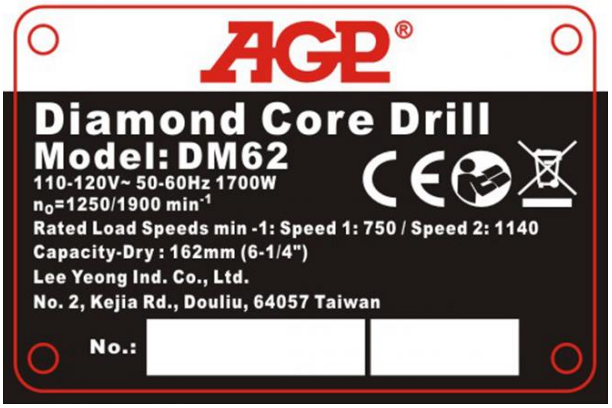
Rated power supply .....:	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☒	AC: 220-240 V, 50-60 Hz	☒	☐	☐	☒	☐
	☒	AC: 110-120 V, 50-60 Hz	☒	☐	☐	☒	☐
	☐	DC: 12 V, 24 V, 12 / 24 V					
	☐	Battery:					
Rated Power .....:	DM6P; DBM200-3; EVO2 PWD; EVO2 DWD; EVO2 PW; EVO2 DW; MCM200; KDMM2000; MT-19A; MT-19P; MT-18P; MT-18A; CAR201; QDM-150D; QDM-150W; C-BMH-160; BB1004; HSD-6P; DM6D; DMC6P; DMC6D: 220-240 V; 50-60 Hz; 2000 W; n_0=930/1520/4270 min^{-1}; Class I 110-120 V; 50-60 Hz; 1700 W; n_0=930/1520/4270 min^{-1}; Class I DM62; DD62; DD160; EVO20-PDSI; MDB-180P: 220-240 V; 50-60 Hz; 2000 W; n_0=1250/1900 min^{-1}; Class I 110-120 V; 50-60 Hz; 1700 W; n_0=1250/1900 min^{-1}; Class I						
Clock frequencies .....:	Not provided						
Other parameters.....:	N/A						
Mounting position.....:	☐	Table top equipment					
	☐	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					
	☒	Hand-held equipment					
	☐	Other:					

Intended use of the Equipment Under Test (EUT)
This machine is for the intended purpose of diamond core drilling of concrete, masonry, stone and similar materials.

No	Module/parts of test item	Type	Manufacturer

No	Documents as provided by the applicant - Description	File name	Issue date

Copy of marking plate:



Note: Marking labels of DM6P; DBM200-3; EVO2 PWD; EVO2 DWD;EVO2 PW;EVO2 DW; MCM200;KDMM2000;MT-19A;MT-19P;MT-18P;MT-18A; CAR201;QDM-150D;QDM-150W;C-BMH-160;BB1004;HSD-6P; DM6D; DMC6P; DMC6D; DM62; DD62; DD160; EVO20-PDSI; MDB-180P are same, only the rated no-load speed is different due to different ratio of gear box.

1.2 Environment

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

☒	Residential (domestic) environment.
☒	Commercial and light-industrial environment.
☐	Industrial environment.

1.3 Test Location

DEKRA Shanghai

Location	Global Certification Corp.
Address	No.146, Sec. 2, Xiangzhang Rd., Xizhi Dist., New Taipei City 221, Taiwan
Date	July 2017
Supervised by	Zuyao Fan

1.4 Classification according to EN 55014-2

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

☐	**Category I:** Apparatus containing no electronic control circuitry. Examples: Motor operated appliances, lighting toys, track sets without electronic control units, tools, heating appliances, UV and IR radiators and apparatus containing components such as electromechanical switches and thermostats. 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.
☒	**Category II:** Transformer toys, dual supply toys, mains powered motor operated appliances, tools, heating appliances and similar electric apparatus (for example – UV radiators, IR radiators and microwave ovens) containing electronic control circuitry with no internal clock frequency or oscillator frequency higher than 15 MHz.
☐	**Category III:** Battery powered apparatus (with built-in batteries or external batteries), which in normal use is not connected to the mains, containing an electronic control circuitry with no internal clock frequency or oscillator frequency higher than 15 MHz.
☐	**Category IV:** All other apparatus covered by the scope of the EN 55014-2 standard.
Clock frequency: Fundamental frequency of any signal used in the device, excluding those which are solely used inside integrated circuits (IC).	

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	Normal operation	☒	☒
2		☐	☐
3		☐	☐
4		☐	☐
5		☐	☐
6		☐	☐
Supplemental information:			

2.2 Port(s) of the EUT

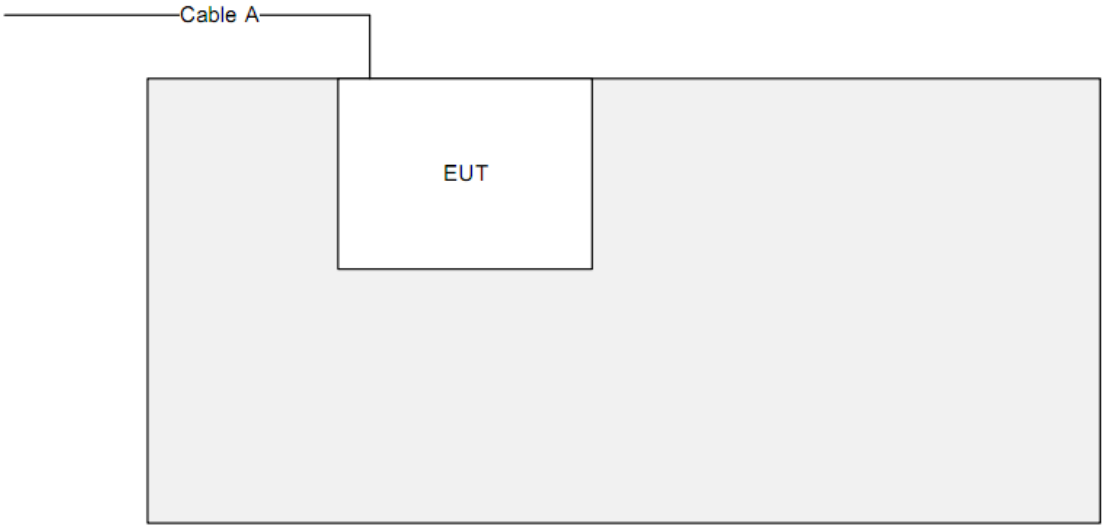
Port name and description	Connected to / Termination	Cable		
		Length used during test [m]	Attached during test	Shielded
AC mains input	AC mains	≥ 2 m	☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐
Supplemental information:				

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			
Supplemental information:			

2.4 Test Configuration / Block diagram used for tests

Test Configuration / Block diagram


Cable Type		Signal cable Description
A	Mains Cable	Non-Shielded, 1 m, 3pin

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 55014-1 +A1 +A2	2006 2009 2011	Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission.
EN 55014-1	2017 [1)]	
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 61000-3-2	2014	Limits for harmonic current emissions (equipment input current ≤ 16 A per phase).
EN 61000-3-3	2013	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection.
EN 55014-2	2015 [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 61000-4-4	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 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	---
Disturbance power (30 MHz to 300 MHz)	EN 55016-2-2	PASS	See 2)
Discontinuous disturbance (clicks) on AC power leads	EN 55014-1	N/A	See 1)
Supplementary information: 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.			

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

IMMUNITY TESTS – EN 55014-2			
Requirement – Test case	**Basic standard(s)**	**Verdict**	**Remark**
Electrostatic discharge	EN 61000-4-2	PASS	---
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	---
Supplementary information:			

4 EMISSION TEST RESULTS

4.1	**Conducted disturbance voltage - Mains**	**VERDICT: PASS**

Standard	EN 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.

☐	Rated power below 700 W	Limits as above
☐	Rated power between 700 and 1000 W	Limits +4 dB
☒	Rated power above 1000 W	Limits +10 dB

Performed measurements

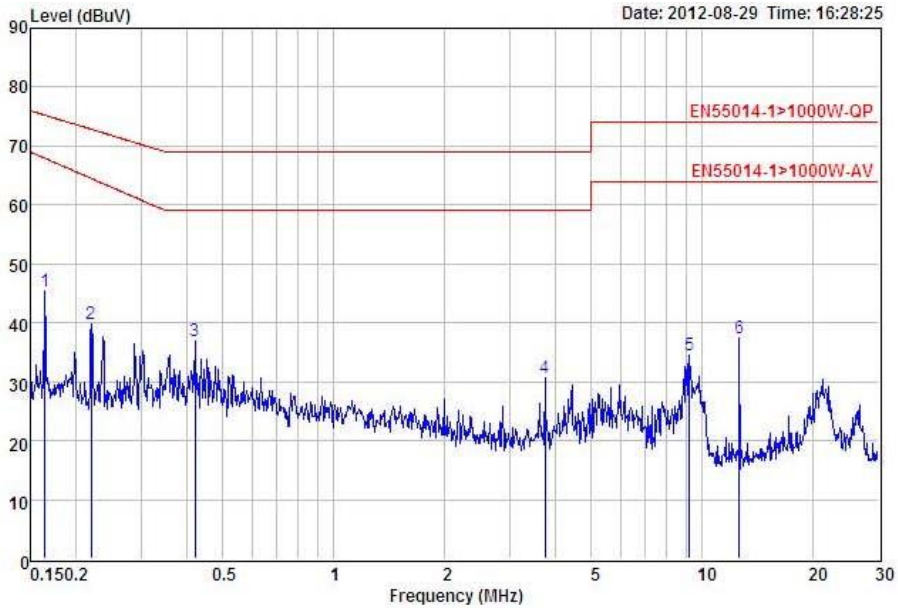
Scan range (0,9 - 1,1 U_N)	☒	198 – 264 V_{AC}	☐	207 – 253 V_{AC}		☐	230 V_{AC}			
Tested terminal(s) / port	☒	AC mains input power	☒	N	☒	L1	☐	L2	☐	L3
	☐	DC mains input power	☐	Positive (+)			☐	Negative (-)		

Voltage – Mains [V]	264 Vac			
Frequency – Mains [Hz]	50 Hz			
Test method applied	☒	Artificial mains network		
	☐	Voltage probe		
Test setup	☐	Table top	☒	Artificial hand applied
	☐	Floor standing	☐	Other:
	Refer to the Annex 3 for test setup photo(s).			
Operating mode(s) used	Mode 1			
Remark	---			

See next page.

Measurement data	Port under test	AC mains power input
Operating mode / voltage / frequency used during the test		Mode 1/ 264 Vac/ 50 Hz

Line

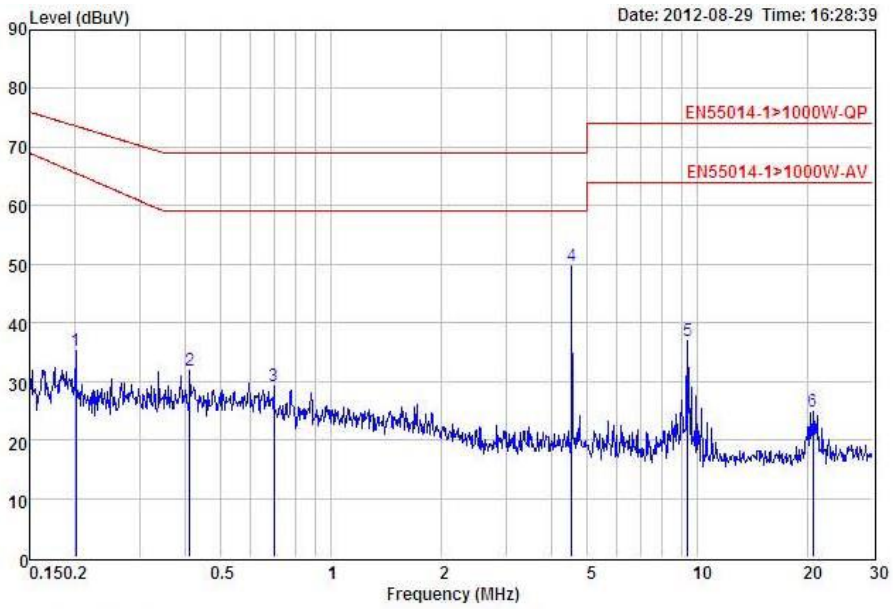


	Freq	Read Level	Level	Factor	Over Limit	Limit Line	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	
1	0.16	45.54	45.44	-0.10	-29.82	75.26	Peak
2	0.22	39.89	39.78	-0.11	-33.07	72.85	Peak
3	0.42	37.06	36.93	-0.13	-32.07	69.00	Peak
4	3.74	30.85	30.56	-0.29	-38.44	69.00	Peak
5	9.20	34.97	34.54	-0.43	-39.46	74.00	Peak
6	12.58	38.00	37.49	-0.51	-36.51	74.00	Peak

Remark	

Measurement data	Port under test	AC mains power input
Operating mode / voltage / frequency used during the test		Mode 1/ 264 Vac/ 50 Hz

Neutral



	Freq	Read Level	Level	Factor	Over Limit	Limit Line	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	
1	0.20	35.39	35.28	-0.11	-38.31	73.59	Peak
2	0.41	31.87	31.74	-0.13	-37.26	69.00	Peak
3	0.70	29.40	29.25	-0.15	-39.75	69.00	Peak
4	4.53	49.91	49.59	-0.32	-19.41	69.00	Peak
5	9.40	37.23	36.80	-0.43	-37.20	74.00	Peak
6	20.59	25.57	24.93	-0.64	-49.07	74.00	Peak

Remark	

4.2 **Disturbance power (30 MHz – 300 MHz)**	**VERDICT: PASS**

Standard	EN 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.				

☐	Rated power below 700 W	Limits as above
☐	Rated power between 700 and 1000 W	Limits +4 dB
☒	Rated power above 1000 W	Limits +10 dB

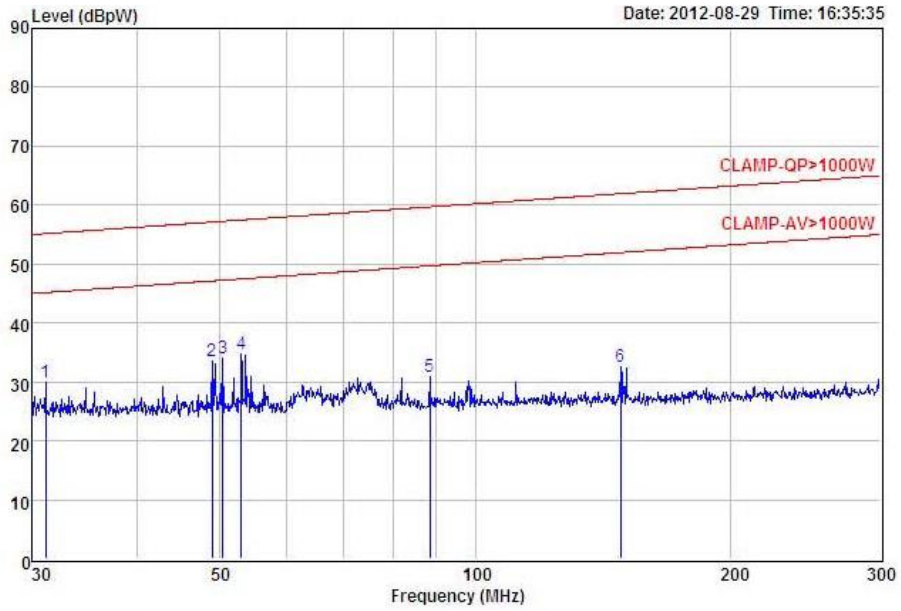
Performed measurements

Port(s) under test					
☒	AC mains input power	☐	Load	☐	Control
☐	Other:	☐	Other:	☐	Other:

Scan range (0,9 - 1,1 U_N)	☒	198 – 264 V_{AC}	☐	207 – 253 V_{AC}	☐	230 V_{AC}
Voltage – Mains [V]	264 Vac					
Frequency – Mains [Hz]	50 Hz					
Test setup	☒	Table top	☐	Floor standing		
	☐	Other:				
	Refer to the Annex 3 for test setup photo(s).					
Conditions for exemption from measurements above 300 MHz	☒	“Limits” reduced by “Margin” applied and passed				
	☐	Maximum clock frequency < 30 MHz				
Operating mode(s) used	Mode 1					
Remark	---					

See next page.

Measurement data	Port under test	AC mains power input
Operating mode / voltage / frequency used during the test		Mode1/ 264 Vac/ 50 Hz



	Freq	Read Level	Level	Factor	Over Limit	Limit Line	Remark
	MHz	dBpW	dBpW	dB	dB	dBpW	
1	31.13	11.66	29.89	18.23	-25.28	55.17	Peak
2	48.99	16.42	33.63	17.21	-23.51	57.14	Peak
3	50.36	16.82	33.95	17.13	-23.31	57.26	Peak
4	52.98	17.42	34.77	17.35	-22.71	57.48	Peak
5	88.33	15.12	30.81	15.69	-28.89	59.70	Peak
6	148.29	17.97	32.58	14.61	-29.37	61.95	Peak

Remark	

4.3 **Harmonic current emissions**	**VERDICT: PASS**

Standard	EN 61000-3-2	
Exlusions (For these categories of equipment, limits are not specified in the EN 61000-3-2 standard)	☐	Arc welding equipment intended for professional use.
	☐	System(s) with nominal voltage(s) less than 220 V_{AC} (line-to-neutral).
	☐	Equipment with rated power of ≤ 75 W (other than lighting equipment).
	☐	Professional equipment with total rated power > 1 kW.
	☐	Symmetrically controlled heating elements with a rated power ≥ 200 W.
	☐	Independent dimmers for incandescent lamps with rated power ≤ 1 kW.

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

Performed measurements

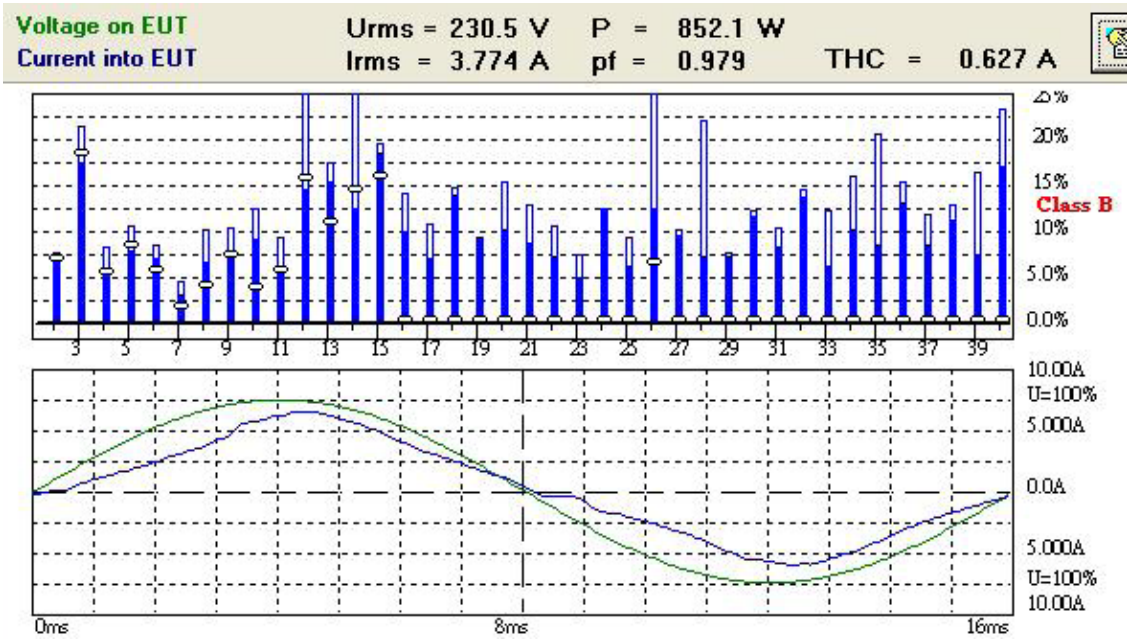
Port under test	AC mains power input					
Voltage – Mains [V]	230 Vac					
Frequency – Mains [Hz]	50 Hz					
Observation peroid	☐	6.5 min.	☒	2.5 min.	☐	Other:
Version of measurement instrument standard used EN / IEC61000-4-7 (Cl. 7)	☒	EN 61000-4-7:2002 + AM1:2009 (IEC 61000-4-7:2002+AM1:2008)				
	☐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

See next page.

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

Urms = 230.5V Freq = 60.056 Range: 10 A
Irms = 3.774A Ipk = 6.646A cf = 1.761
P = 852.1W S = 870.0VA pf = 0.979
THDi = 16.6 % THDu = 0.20 % Class B

Test completed, Result: PASSED



Remark	

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

Order	Freq. [Hz]	Iavg [A]	Irms [A]	Imax [A]	Limit [A]	Status
1	60	3.8212	3.7274	4.1522		
2	120	0.1067	0.1074	0.1184	1.6200	
3	180	0.6293	0.5884	0.7275	3.4500	
4	240	0.0341	0.0354	0.0513	0.6450	
5	300	0.1398	0.1294	0.1770	1.7100	
6	360	0.0246	0.0305	0.0366	0.4500	
7	420	0.0159	0.0311	0.0482	1.1550	
8	480	0.0130	0.0214	0.0336	0.3450	
9	540	0.0429	0.0439	0.0598	0.6000	
10	600	0.0100	0.0244	0.0336	0.2760	
11	660	0.0269	0.0269	0.0446	0.4950	
12	720	0.0355	0.0330	0.0592	0.2300	
13	780	0.0335	0.0476	0.0537	0.3150	
14	840	0.0281	0.0238	0.0507	0.1971	
15	900	0.0352	0.0409	0.0433	0.2250	
16	960	0.0000	0.0165	0.0238	0.1725	
17	1020	0.0000	0.0134	0.0208	0.1985	
18	1080	0.0000	0.0208	0.0220	0.1533	
19	1140	0.0000	0.0159	0.0159	0.1776	
20	1200	0.0000	0.0134	0.0208	0.1380	
21	1260	0.0000	0.0134	0.0201	0.1607	
22	1320	0.0000	0.0085	0.0128	0.1255	
23	1380	0.0000	0.0067	0.0104	0.1467	
24	1440	0.0000	0.0140	0.0140	0.1150	
25	1500	0.0000	0.0079	0.0122	0.1350	
26	1560	0.0065	0.0128	0.0275	0.1062	
27	1620	0.0000	0.0116	0.0122	0.1250	
28	1680	0.0000	0.0067	0.0214	0.0986	
29	1740	0.0000	0.0079	0.0085	0.1164	
30	1800	0.0000	0.0104	0.0110	0.0920	
31	1860	0.0000	0.0085	0.0110	0.1089	
32	1920	0.0000	0.0116	0.0122	0.0862	
33	1980	0.0000	0.0061	0.0122	0.1023	
34	2040	0.0000	0.0079	0.0128	0.0812	
35	2100	0.0000	0.0079	0.0195	0.0964	
36	2160	0.0000	0.0098	0.0116	0.0767	
37	2220	0.0000	0.0073	0.0104	0.0912	
38	2280	0.0000	0.0079	0.0092	0.0726	
39	2340	0.0000	0.0061	0.0140	0.0865	
40	2400	0.0000	0.0116	0.0159	0.0690	

Remark	

4.4 **Voltage changes, voltage fluctuations and flicker**	**VERDICT: PASS**

Standard	EN 61000-3-3

Limits

P_{ST} (Short term flicker)	☐	≤ 1	☒	Not Applicable
P_{LT} (Long term flicker)	☐	≤ 0,65	☒	Not Applicable
d_C (Relative Voltage change)	☒	≤ 3,3%	☐	Not Applicable
d_{MAX} (Max. voltage change)	☐	≤ 4%	☐	6%
	☒	7%	☐	Not Applicable
Supplemental information:				

Performed measurements

Reason for not performing the measurement(s)	☐	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	☒	Flickermeter according EN / IEC 61000-4-15:2011				
	☐	Simulation (Clause 4.2.3 of EN / IEC 61000-3-3)				
	☐	Analytical method (Clause 4.2.4 of EN / IEC 61000-3-3)				
	☐	Use of P_{st} = 1 curve (Clause 4.2.5 of EN / IEC 61000-3-3)				
Observation peroid	☐	10 min.	☐	120 min.	☐	Other:
	☒	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	

Tmax (dt > 3,3%)	0,0 ms
Maximum voltage change d_{MAX}	2,125%
Relative Voltage change d_C	0,873%
Short term flicker P_{ST}	Not applicable*
Long term flicker P_{LT}	Not applicable*

Remark	

5 IMMUNITY TEST RESULTS

5.1 Performance (Compliance) criteria

[According to EN 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
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.

☒	Motor speed	☐	Display data
☐	Switching	☐	Data storage
☐	Standby mode	☐	Sensor functions
☐	Temperature	☐	Audible signals
☐	Power consumption	☐	Others : LED's
☐	AC mains input current	☐	Others :
☐	Timing	☐	Others :
☐	Illumination	☐	Others :
Supplementary information :			

Immunity test	**Monitored - Checked function(s)/parameter(s) during / after the test**	**Method**
Electrostatic discharge	Pass	Visual
Fast transients	Pass	Visual
Surge transient	Pass	Visual
Injected currents (radio-frequency common mode)	Pass	Visual
Voltage dips and short interruptions	Pass	Visual
Supplementary information :		

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 55014-2							
Basic standard	EN 61000-4-2							
Port under test	Enclosure							
Air discharges [1)]	☒	±2 kV	☒	±4 kV	☒	±8 kV	☐	kV
Contact discharges [1)]	☐	±2 kV	☒	±4 kV	☐	±8 kV	☐	kV
Number of discharges	≥ 10 per polarity with ≥ 1 sec interval.							
[1)] Tests with lower voltages are not required.								

Performed tests

Set-up	☒	Table-top	☐	Floor standing	
Ambient temperature [°C]	23.7°C		Relative Humidity air [%]		49.1%
Voltage – Mains [V]	230 Vac				
Frequency – Mains [Hz]	50 Hz				
Operating mode(s) used	Mode 1				

Test Point (Location of discharge, see also photo)		Test Voltage [kV] & Polarity	Coupling type	# of applied discharges / polarity	Discharge interval [s]
☒	Points on conductive surface as indicated in the picture below.	±2/ ±4	Contact	10	1
☒	Points on non-conductive surface as indicated in the picture below.	±2/ ±4/ ±8	Air	10	1
☒	HCP top side.	±4	Contact	10	1
☒	HCP bottom side.	±4	Contact	10	1
☒	VCP right side.	±4	Contact	10	1
☒	VCP left side.	±4	Contact	10	1
☒	VCP front side.	±4	Contact	10	1
☒	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.				
Supplementary information:					

5.4 Electrical Fast Transients immunity — VERDICT: PASS

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 55014-2		
Basic standard		EN 61000-4-4		
Pulse characteristics		5/50 ns		
Port		Test level	Repetition frequency	Duration
☒	AC input-output power [1]	± 1000 V	5 KHz	2 min. / polarity
☐	DC input-output power [2]	± 500 V	5 KHz	2 min. / polarity
☐	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]	230 Vac			
Frequency – Mains [Hz]	50 Hz			
Operating mode(s) used	Mode 1			
Test Set-up (see annex 3 for photo)	☒	Equipment standing on floor at (0,1 ± 0,01) m above ground plane		
	☐	Equipment on the table (0,1 ± 0,01) m above ground plane		
	☐	Artificial hand applied. Location refer to annex 3.		
Coupling	☒	Common mode	☐	Other:

Port(s) under test	Test Voltage &Polarity	Repetition Frequency	Test duration / polarity	Injection method			
AC / DC mains power input	1 kV	5 KHz	2 min	☒	CDN	☐	Clamp
AC / DC power output		5 KHz		☐	CDN	☐	Clamp
Ethernet / LAN		5 KHz		☐	CDN	☐	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**

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 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]	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
☒	AC mains input power	Line to Neutral	+1 kV	90	
☒	AC mains input power	Line to Neutral	-1 kV	270	
☐	AC mains input power	Line to Earth	+2 kV	90	1
☐	AC mains input power	Line to Earth	-2 kV	270	1
☐	AC mains input power	Neutral to Earth	+2 kV	90	1
☐	AC mains input power	Neutral to Earth	-2 kV	270	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.			
Supplementary information: 1. The EUT does not include an earth port.					

5.6	**Injected currents (RF common mode) immunity**	**VERDICT: PASS**

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 55014-2		
Basic standard		EN 61000-4-6		
Frequency range		Modulation	Step size	Dwell time
☐	0,15 – 80 MHz	80% AM (1kHz)	≤ 1%	≥ 0,5 s
☒	0,15 – 230 MHz	80% AM (1kHz)	≤ 1%	≥ 0,5 s
Port			Test level, *Uo*	
☒	AC input-output power [1]		3 V	
☐	DC input-output power [2] [3]		1 V	
☐	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)
☐	0,15 – 80 MHz	☒	0,15 – 230 MHz	80% AM (1kHz)	1%
Voltage – Mains [V]		230 Vac		Frequency – Mains [Hz]	50 Hz
Operating mode(s) used		Mode 1			
Test set-up (see annex 3 for photo)		☐	Equipment standing on floor at (0,1 ± 0,01) m above ground plane.		
		☐	Equipment on the table (0,1 ± 0,01) m above ground plane.		
		☒	Artificial hand applied. Location refer to annex 3.		

Port(s) under test	Test Level (applied)	Injection method	Dwell time (applied)	Remark
AC mains power input	3 V	CDN-M2	3 s	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.			
Supplementary information:				

5.7	**Power supply interruptions and dips immunity**	**VERDICT: PASS**

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 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:
- 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]		Repetion 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

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.

Supplementary information:

6 IDENTIFICATION OF THE EQUIPMENT UNDER TEST

EUT PHOTOS

7 ANNEX 1 - MEASUREMENT UNCERTAINTIES

The table(s) below show(s) measurment 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%.

Emission tests		**Uncertainty**	**Ucispr**
RF Conducted disturbance (mains port) 9 kHz – 30MHz	AMN: R&S ESH2-Z5	3,38 dB	3,44 dB
Disturbance power, 30 MHz – 300 MHz		3,92 dB	4,50 dB
LF harmonic current emissions		0,2%	na
LF voltage fluctuations		2,5%	na

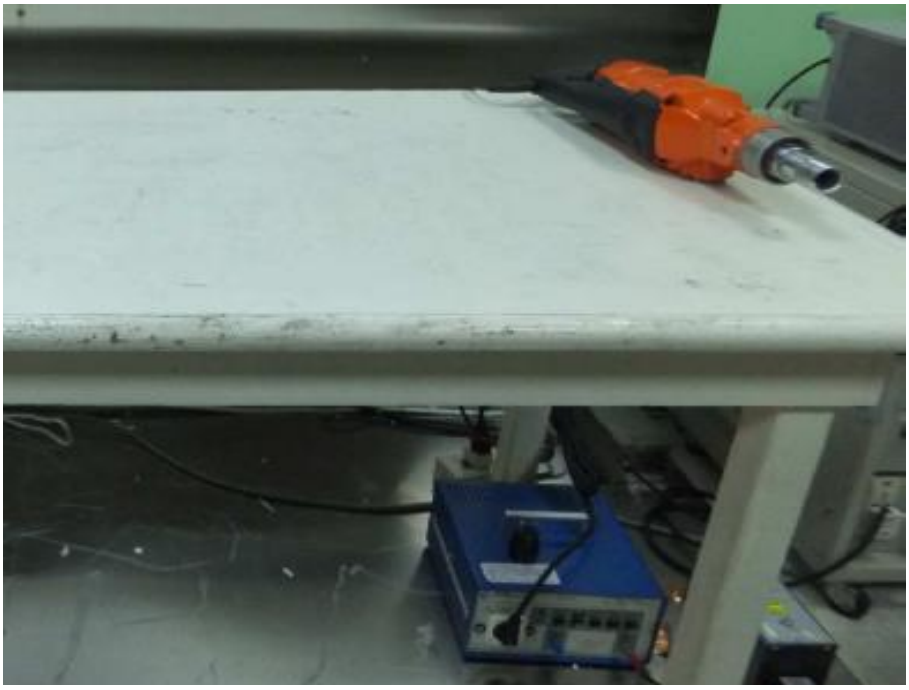
Immunity tests	**Uncertainty**
Electrostatic discharge	U_{peak}=6%, U_{30ns}=6%, U_{60ns}=6%, U_{rt}=8%
Fast transients	Utr=7%, Upw=5%, Ubp=2%, Ubd=2%
Surges	U_{peak}=5%, U_{ft}=5%, U_{dt}=4%
Injected currents (radio-frequency common mode)	1,71dB
Voltage dips and short interruptions	U_{out}=2%, U_{f}=4%, $U_{r\text{-}d}$=4%

8 ANNEX 2 - USED EQUIPMENT

Equipment	Manufacturer	Model No.	Serial No.	Cal. due date
EMI test receiver	R&S	ESCI	101351	2019/08/03
2-line V-network	R&S	ENV216	101620	2019/08/03
EMI absorbing clamp	SCHWARZBECK	MDS 21B	4183	2019/08/03
Harmonic currents and flick tester	California Instruments	CTS	1306A00135	2019/05/15
AC power source	California Instruments	5001iX-CTS-400	1306A00135	2019/05/15
ESD generator	TESEQ	NSG 435	6716	2019/08/23
EFT, Surge, DIPS all-in-one	TESEQ	NSG-3040-MF	2006/EFT:0535 /SURGE:1234 /DIPS:2062	2019/08/01
Compact immunity test system (RF)	TESEQ	NSG 4070-30	35895	2019/08/03
Coupling decoupling network (CDN)	TESEQ	CDN M016S	34640	2019/08/03
Attenuator	TESEQ	ANT 6050	34847	2019/08/03

9 ANNEX 3 - TEST PHOTOS

Conducted disturbance voltage at mains terminals



Disturbance power

Harmonic current emissions & Flicker

----------END----------