

TELCONTROL TEST REPORT

SCOPE OF WORK

EMC TESTING – HEAT RADIATOR – AERO D2

REPORT NUMBER

200026212UDI-EMC

ISSUE DATE

March 31, 2020

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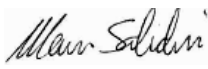
48

DOCUMENT CONTROL NUMBER

RT-EMEA-IT-EMC-003-IAS (29 July 2019)

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TEST REPORT CISPR 14-1; CISPR 14-2; IEC 61000-3-2; IEC 61000-3-3; EN 55014-1; EN 55014-2; EN 61000-3-2; EN 61000-3-3 Electromagnetic compatibility (EMC) Requirements for household appliances, electric tools and similar apparatus	
Report Reference No.	200026212UDI-EMC
Compiled by (+ signature)	Marco Tell 
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Date of issue	March 31, 2020
Total number of pages	48
Testing Laboratory	Intertek Italia S.p.A.
Address	Via Principe di Udine, 114 I - 33030 Campoformido (UD)
Applicant's name	Telcontrol S.r.l.
Address	Via Olivi, 38 31100 - Treviso Italy
Test specification:	
Standards	CISPR 14-1:2016; CISPR 14-2:2015; IEC 61000-3-2:2018, IEC 61000-3-3:2013 + AMD1 EN 55014-1:2017; EN 55014-2:2015; EN 61000-3-2:2019, EN 61000-3-3:2013 + AMD1
Test procedure	
Non-standard test method	N/A
Test Report Form No.	RT-EMEA-IT-EMC-003-IAS
TRF date	05 Jun 2017
Test item description	Heat radiator
Trade Mark	
Manufacturer	CINI INVEST
Model/Type reference	AERO D20
Ratings	220 - 240 V, 50-60 Hz, 2000 W
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REPORT INDEX

Item	Description	Page
1.0	Program details	4
1.1	Equipment Description	6
1.2	Equipment Marking Plate	6
1.3	Equipment Used During Test	7
1.4	Input / Output Ports	8
1.5	EUT Internal Operating Frequencies	8
1.6	Power Interface	8
1.7	EUT Operation Modes	8
1.8	EUT Configuration Modes	8
1.9	Technical documentation	9
1.10	Performance Criteria	9
1.11	Result Summary	10
1.12	Test Conditions and Results – Emission – Radiated disturbance	12
1.13	Test Conditions and Results – Emission – Disturbance power	16
1.14	Test Conditions and Results - Emission – Terminal voltages (continuous interference)	17
1.15	Test Conditions and Results - Emission - Mains terminals (discontinuous interference)	22
1.16	Test Conditions and Results - Emission - AC mains terminals of induction cooking appliances	25
1.17	Test Conditions and Results - Emission – Magnetic field strength of induction cooking appliances	25
1.18	Test Conditions and Results – Radio-frequency electromagnetic fields	25
1.19	Test Conditions and Results – Electrostatic discharges (ESD)	26
1.20	Test Conditions and Results – Injected currents – 0,15 to 230 MHz	30
1.21	Test Conditions and Results – Injected currents – 0,15 to 80 MHz	32
1.22	Test Conditions and Results – Fast transients	33
1.23	Test Conditions and Results – Surges	36
1.24	Test Conditions and Results – Voltage dips	39
1.25	Test Conditions and Results – Limits of harmonics of current	42
1.26	Test Conditions and Results – Limits of voltage changes, voltage fluctuations and flicker	46

1.0 Program Details

TESTING LOCATION:	
Testing Laboratory:	Intertek Italia SpA
Testing location/ address:	EMC Lab Via Principe di Udine, 114 I - 33030 Campoformido (UD)

Test item description..... :	Heat radiator
Trade Mark	
Manufacturer..... :	CINI INVEST
Model/Type reference..... :	AERO D20
Ratings..... :	220 - 240 V, 50-60 Hz, 2000 W
Test item identification	UDI2003101434-001
Protection class..... :	Class I
Classification of equipment	Category II (CISPR 14-2 / EN 55014-2) Class A (IEC / EN 61000-3-2)
Firmware version	1.5
Possible test case verdicts:	
- test case does not apply to the test object.:	N/A
- test object does meet the requirement	P (Pass)
- test object doesn't meet the requirement.:	F (Fail)
Statement of the measurement uncertainty:	
The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.	
Testing	
Date of receipt of test item.....:	March 10, April 20, 2020
Date (s) of performance of tests.....:	March 17 – 27, April 29, 2020

General remarks:

The test results presented in this report relate only to the object tested.

The results contained in this report reflect the results for this particular model and item identifier. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

The latest edition of standard series IEC / EN 61000-4-XX, IEC / EN 61000-3-2, IEC / EN 61000-3-3, IEC / EN 61000-3-11 and IEC / EN 61000-3-12 have been applied, where applicable.

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

Throughout this report a comma is used as the decimal separator.

General product information:

A capacitor with the following specifics has been added between supply lines of AC input.



Conformance of tested model can be extended to models AERO D15 and AERO D10, having lower and same other components.

Also models FINESA D-2 120, FINESA D-2 100 and FINESA D-2 80 are included, differing only for lower power and a different external case.

In addition to the rated voltage of 220-240 V, the models can be rated 115V. The only difference are the values of two resistors in the AC mains input.

Conducted emission test has been performed on sample UDI2004201157-001.

Summary of compliance with National Differences (List of countries addressed):

Revision summary:

List of Attachments (including a total number of pages in each attachment):

1.1 Equipment Description

EUT is a heat radiator, provided with a main switch, and a button display for temperature setting up to 30 °C.

Its dimensions are 90 cm (l) x 45 cm (h) x 10 cm (w), and it's provided with a mains cable 120 cm long.

1.2 Equipment Marking Plate

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective certification bodies that own these marks.



Above is shown the label of tested models, as representative for the extended models.

1.3 Equipment Used During Test:

USE*	PRODUCT TYPE	MANUFACTURER	MODEL	COMMENTS
EUT	Heat radiator	CINI INVEST	AERO D20	Intertek id: UDI2003101434-001
EUT	Heat radiator	CINI INVEST	AERO D20	Intertek id: UDI2004201157-001
Note: * Use = EUT – Equipment Under Test, AE – Auxiliary/Associated Equipment, or SIM – Simulator (Not Subjected to Test)				

1.4 Input/Output Ports:

PORT #	NAME	TYPE*	CABLE MAX. >3M	CABLE SHIELDED	COMMENTS
0	Enclosure	N/E	—	—	None
1	Mains	AC	No	No	-
*Note: AC = AC Power port DC = DC Power port N/E = Non-Electrical I/O = Signal Input or Output Port (Not Involved in Process Control) TP = Telecommunication Ports					

1.5 EUT Internal Operating Frequencies:

FREQUENCY	DESCRIPTION
128 kHz	Clock frequency

1.6 Power Interface:

MODE #	VOLTAGE (V)	CURRENT (A)	POWER (W)	FREQUENCY (DC/AC-Hz)	PHASES (#)	COMMENTS
Rated	230	-	2500	AC-50/60	1	-
1	230	-	-	AC-50	1	-
2	230	-	-	AC-60	1	-
3	115	-	-	AC-50	1	-

1.7 EUT Operation Modes:

MODE #	DESCRIPTION
1	Heating
2	Not heating (setpoint lower than temperature)
3	Temperature maintenance (25°C)

1.8 EUT Configuration Modes:

MODE #	DESCRIPTION
1	Standalone appliance

1.9 EUT Technical documentation

DOCUMENT	REFERENCE
-	-

1.10 Performance Criteria

General

Performance criterion A

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

Performance criterion 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 specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. 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, either of these may be derived from the product description and documentation, and what the user may reasonably expect from the apparatus if used as intended.

Performance criterion C

Temporary loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls.

1.10.1 Product Specific Performance Criteria

1.11 Result Summary

CISPR 14-1 / EN 55014-1			
CLAUSE 4	REQUIREMENT – TEST	RESULT	VERDICT
Table 9	Emission - radiated disturbance (frequency range: 30 - 1000 MHz)		P
Tables 7 and 8	Emission - disturbance power (frequency range: 30 - 300 MHz)		N/A
Table 5 – Columns 2 and 3	Emission - mains terminals (frequency range: 0,15 - 30 MHz) continuous interference		P
Table 5 – Columns 4 and 5	Emission associated ports – disturbance voltages (frequency range: 0,15 - 30 MHz) continuous interference		N/A
Table 5 – Columns 6 and 7	Emission – associated ports – disturbance current (frequency range: 0,15 - 30 MHz) continuous interference		N/A
Table 6	Emission - mains terminals of tools (frequency range: 0,15 - 30 MHz) continuous interference		N/A
Table 2	Emission - AC mains terminals of induction cooking appliances (frequency range: 0,009 - 30 MHz) continuous interference		N/A
Table 3	Emission – magnetic field strength of induction cooking appliances (frequency range: 0,009 - 30 MHz)		N/A
Table 4	Alternate method for appliance having diagonal dimension up to 1,6 m: Emission – magnetic field strength of induction cooking appliances (frequency range: 0,009 - 30 MHz)		N/A
4.4	Emission discontinuous interference		P
CISPR 14-2 / EN 55014-2			
CLAUSE 5	REQUIREMENT – TEST	RESULT	VERDICT
Table 1	Electrostatic Discharges		P
Table 2	Fast Transients (signal / control lines)		N/A
Table 3	Fast Transients (Input/output DC power		N/A

	ports)		
Table 4	Fast Transients (Input/output AC power ports)		P
Table 5	Injected currents (signal / control lines) (0,15 – 230 MHz)		N/A
Table 6	Injected currents (Input/output DC power ports) (0,15 – 230 MHz)		N/A
Table 7	Injected currents (Input/output AC power ports) (0,15 – 230 MHz)		P
Table 8	Injected currents (signal / control lines) (0,15 – 80 MHz)		N/A
Table 9	Injected currents (Input/output DC power ports) (0,15 – 80 MHz)		N/A
Table 10	Injected currents (Input/output AC power ports) (0,15 – 80 MHz)		N/A
Table 11	Radio-frequency electromagnetic fields (80 - 1000 MHz)		N/A
Table 12	Surges (Input AC power ports)		P
Table 13	Voltage Dips (Input AC power ports)		P
IEC / EN 61000-3-2			
CLAUSE	REQUIREMENT - TEST	RESULT	VERDICT
7.1	Limits for Class A equipment		P
7.2	Limits for Class B equipment		N/A
7.4	Limits for Class D equipment		N/A
IEC / EN 61000-3-3			
CLAUSE	REQUIREMENT - TEST	RESULT	VERDICT
4	Limits of voltage changes, voltage fluctuations and flicker		P

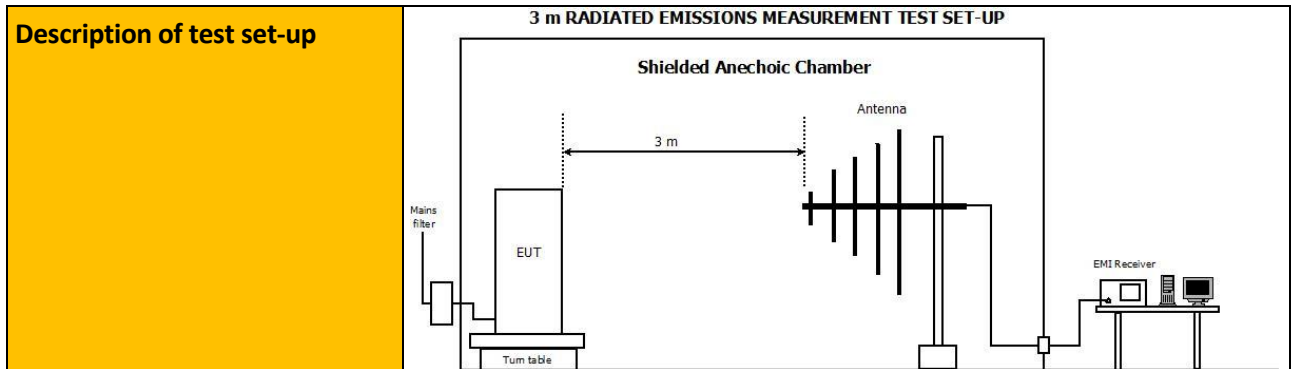
1.12 Test Conditions and Results – Emission - RADIATED DISTURBANCE

1.12	TEST: EMISSION - RADIATION DISTURBANCE		VERDICT
<u>Method:</u> Measurements were made in a 3-meter semi-anechoic chamber or Open Area Test Site that complies to CISPR 16. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3 meters. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in horizontal and vertical polarities. Final measurements (quasi-peak) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4 m. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.			N/A
Laboratory parameters:	Required prior to the test	During the test	
Ambient temperature	15 to 35 °C	25 °C	
Relative humidity	10 to 90 %	45 %	
Fully configured sample scanned over the following frequency range	Frequency range on each side of line	Measurement Point	
	30 MHz – 1 GHz	Enclosure	
Equipment mode	Power interface mode	1	
	EUT configurations mode	1	
	Operation mode	1, 2	
Limits			
Frequency (MHz)	Limit dB (µV/m)		
	QP	Results	
30 - 230 ¹	40,5	P	
230 - 1000 ¹	47,5	P	
Supplementary information:			
¹ At transitional frequencies the lower limit applies.			

1.12.1 Test Equipment Used

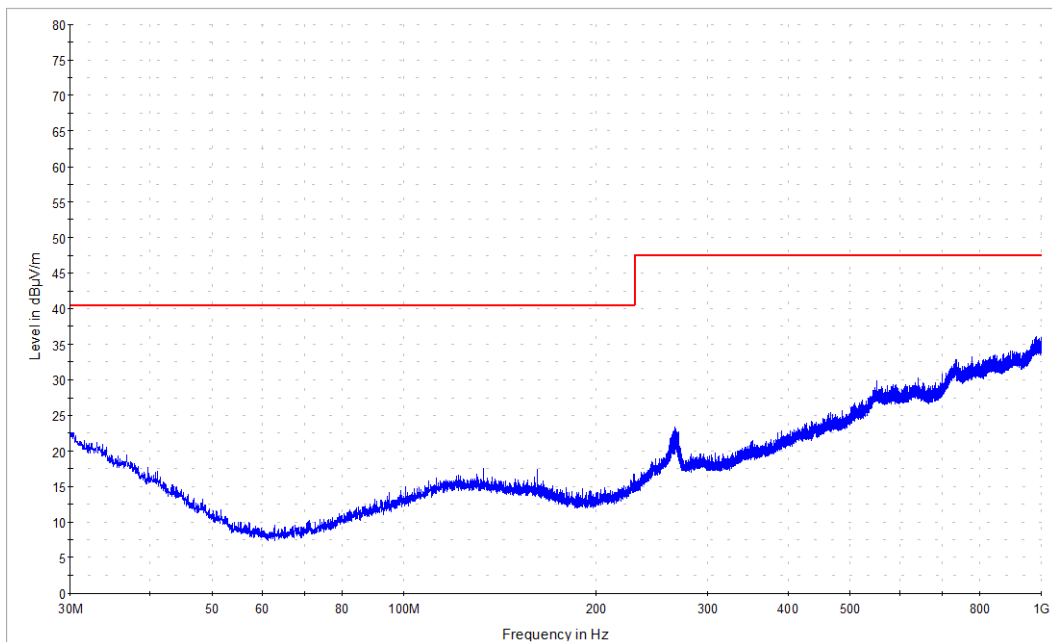
DESCRIPTION	MANUFACTURER	MODEL	IDENTIFIER	CALIBRATION DATE	CALIBRATION DUE
EMI Receiver	Rohde & Schwarz	ESR26	2203	Nov 08, 2019	Nov 08, 2020
Bilog antenna	Chase	CBL6111B	2027	Aug 30, 2019	Aug 30, 2020
Thermo-hygrograph	PCE Group	PCE-HT110	1579	Jan 27, 2020	Jan 27, 2021
Digital Multimeter	Fluke	189	1187	Nov 13, 2019	Nov 13, 2020
Thermo-hygrograph	Delta Ohm	HD35EDL14bNTV.E	1600-10	Mar 01, 2019	Mar 01, 2020

1.12.2 Photo of the test setup

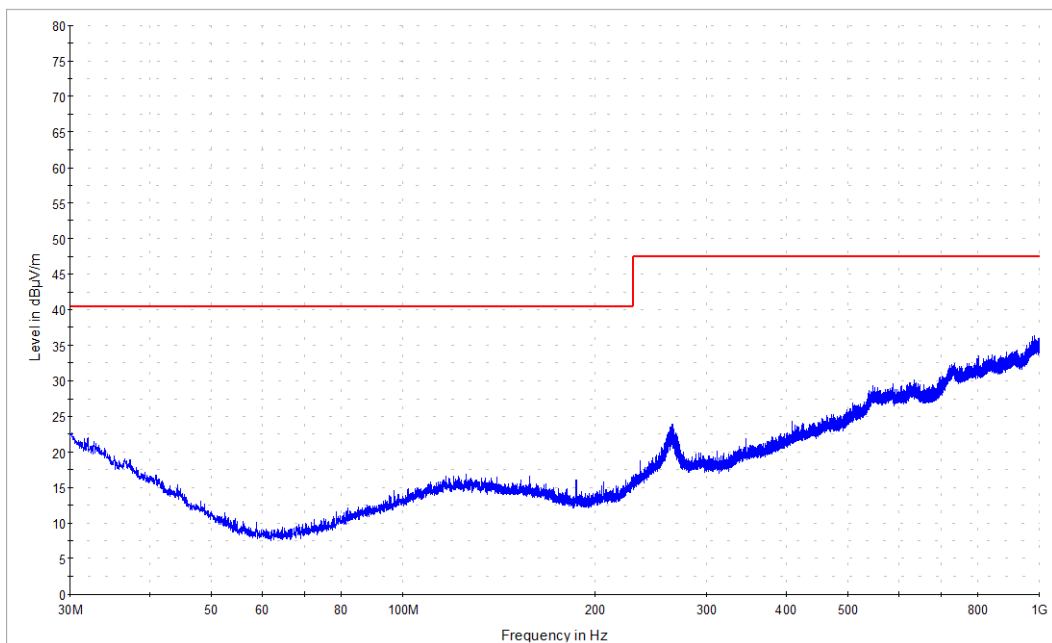


1.12.3 Measurement tables / Graphical representation for Emission - Radiation disturbance

TABULATED RESULTS FOR RADIATED DISTURBANCE								
Test Frequency (MHz)	Detector (Pk/QP)	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Correction Factor (dB)	Level dB(μV/m)	Limit dB(μV/m)	Margin ¹ (dB)
30,150	Pk	V	0	340	19,4	22,78	40,50	17,72 ²
265,320	Pk	V	0	112	15,9	23,93	47,50	23,57 ²
Note: ¹ Margin = Limit – Level ² Margin refers to QP limit.								



Client: Telcontrol– Heat radiator – Model: AERO
Project: 26212
Date: March 27, 2020
Power interface mode: 1; Operation mode: 1, 2
Red trace=Quasi Peak, Blue trace=Peak
H - Pol



Client: Telcontrol– Heat radiator – Model: AERO
Project: 26212
Date: March 27, 2020
Power interface mode: 1; Operation mode: 1, 2
Red trace=Quasi Peak, Blue trace=Peak
V - Pol

1.13 Test Conditions and Results – Disturbance power

1.13	TEST: disturbance power	VERDICT
	<u>Method:</u> Measurements were made on a ground plane that extends 1-meter minimum beyond all sides of the system under test. All power was connected to the system through Line Impedance Stabilization Networks (LISN). The lead to be measured on is stretched in a straight line for a distance sufficient to accommodate the absorbing clamp, and to permit the necessary measuring adjustment of position for tuning. The clamp is placed around the lead so as to measure a quantity proportional to the disturbance on the lead.	N/A

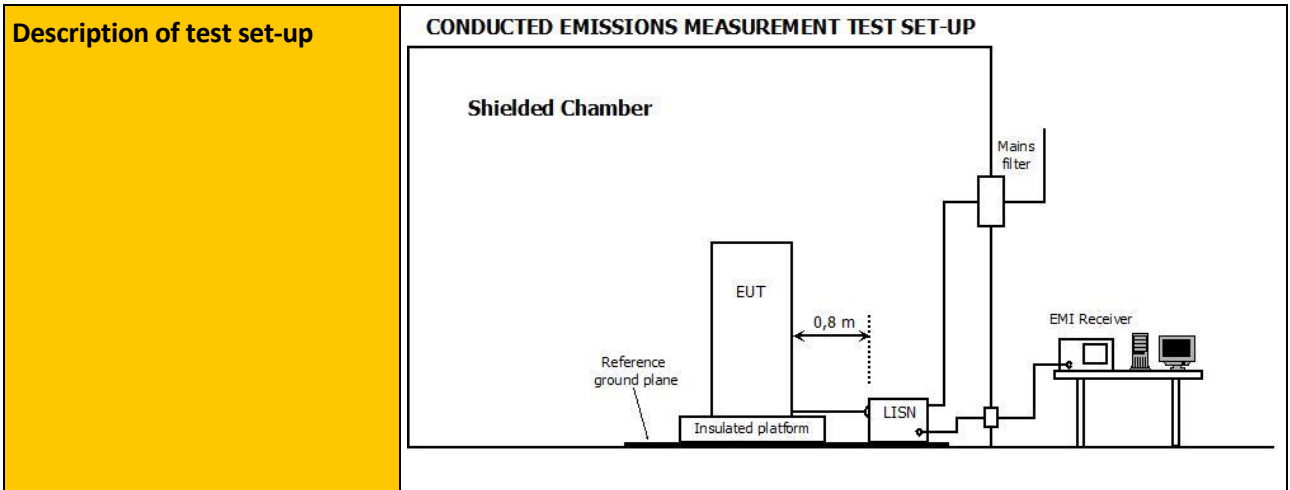
1.14 Test Conditions and Results - EMISSION – TERMINAL VOLTAGES (continuous interference)

1.14	TEST: EMISSION – TERMINAL VOLTAGES (CONTINUOUS INTERFERENCE)			VERDICT	
<u>Method:</u> Measurements were made on a ground plane. All power was connected to the system through Line Impedance Stabilization Networks (LISN). Conducted voltage measurements on mains lines were made at the output of the LISN. Conducted voltage on load terminals and additional terminals were made by using a 1500 Ω probe.				P	
Laboratory parameters:		Required prior to the test	During the test		
Ambient temperature		15 to 35°C	22 °C		
Relative humidity		10 to 90 %	31 %		
Fully configured sample scanned over the following frequency range		Frequency range on each side of line	Measurement Point		
		150 kHz - 30 MHz	Mains terminals		
Equipment mode		Power interface mode	1		
		EUT configurations mode	1		
		Operation mode	1, 2		
Limits					
Mains terminals					
Frequency (MHz)		Limit dB (µV)			
		QP	Results	Av	Results
0,15 - 0,50		66 to 56 ¹	P	59 to 46 ¹	P
0,50 – 5 ²		56	P	46	P
5 – 30 ²		60	P	50	P
Supplementary information:					
¹ Decreasing linearly with the logarithm of frequency					
² At transitional frequencies the lower limit applies.					

1.14.1 Test Equipment Used

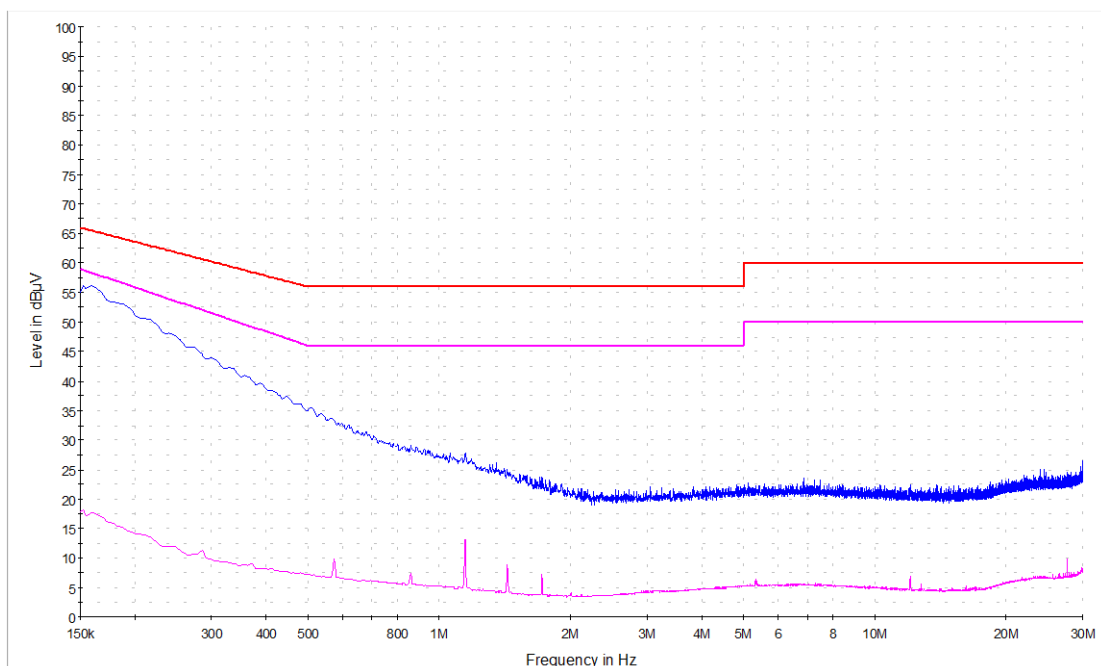
DESCRIPTION	MANUFACTURER	MODEL	IDENTIFIER	CALIBRATION DATE	CALIBRATION DUE
EMI Receiver	Rohde & Schwarz	ESR26	2203	Nov 08, 2019	Nov 08, 2020
Pulse limiter	Rohde & Schwarz	ESH3Z2	2086-2	Aug 20, 2019	Aug 20, 2020
LISN	Rohde & Schwarz	ESH2-Z5	0504	Apr 23, 2019	Apr 23, 2020
LISN	Rohde & Schwarz	ESH2-Z5	2113	Nov 13, 2019	Nov 13, 2020
3 Phase Voltage Variator	Zucchiatti	---	2119	V.B.U.	V.B.U.
Digital Multimeter	Fluke	189	1187	Nov 13, 2019	Nov 13, 2020
Thermo-hygrograph	Delta Ohm	HD35EDL14bNTV.E	1600-10	Mar 01, 2019	Mar 01, 2020
Thermo-hygrograph	Delta Ohm	HD35EDL14bNTV.E	1600-10	Mar 09, 2020	Mar 09, 2021

1.14.2 Photo of the test setup



1.14.3 Measurement tables / Graphical representation for Emission – mains terminals (continuous interference)

TABULATED RESULTS FOR MAINS TERMINALS DISTURBANCE VOLTAGE						
Terminal	Test Frequency (MHz)	Detector (Pk/QP/Av)	Correction Factor (dB)	Level dB (μV)	Limit dB (μV)	Margin (dB) ¹
N	0,150	Pk	10,2	57,00	66,00	9,00 ²
L	0,150	Av	10,2	18,00	59,00	41,00
Note: ¹ Margin = Limit – Level ² Margin refers to QP limit.						



Client: Telcontrol Srl – Heat radiator – Model: AERO D20

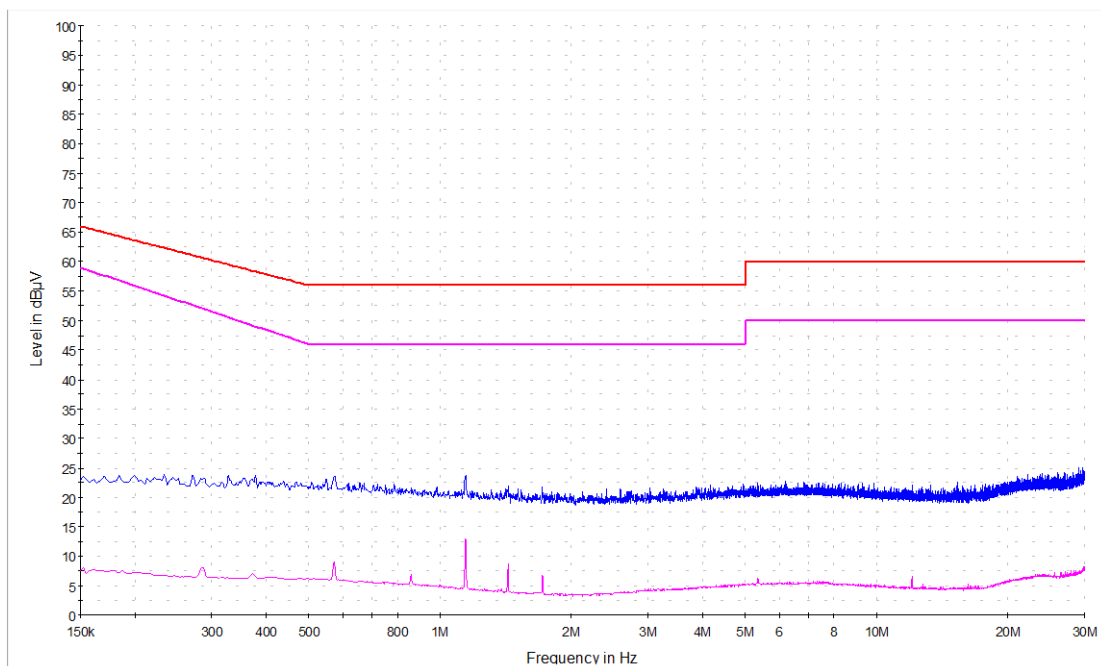
Project: 26212

Date: March 27, 2020

Power interface mode: 1; Operation mode: 1

Red trace=Quasi Peak, Blue trace=Peak; Violet trace=Average

Both lines



Client: Telcontrol Srl – Heat radiator – Model: AERO D20

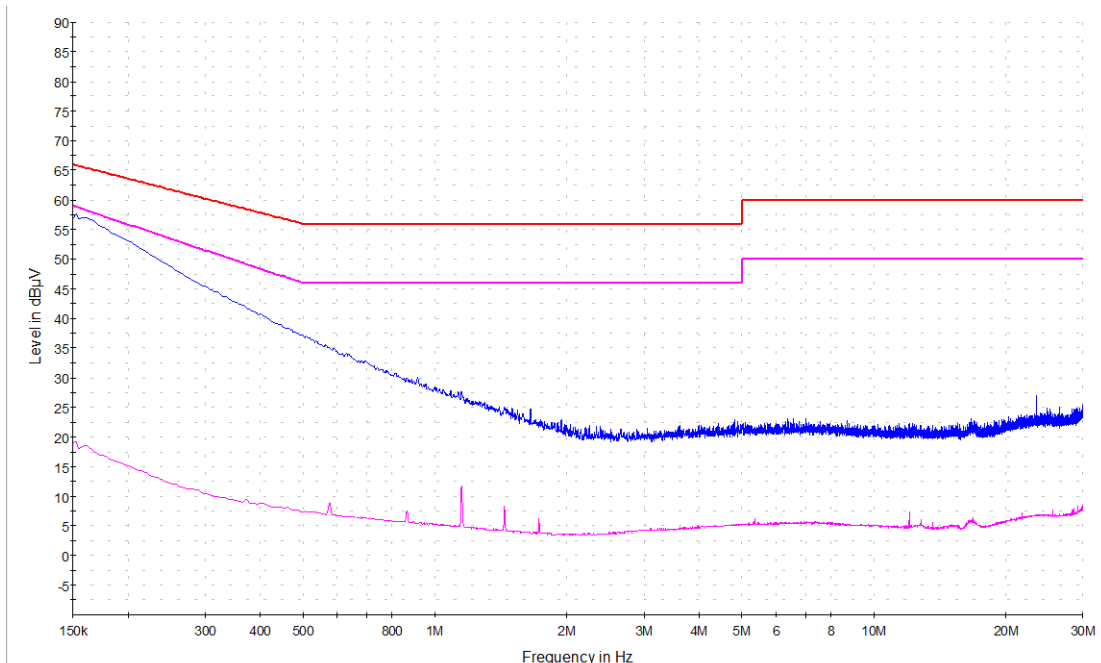
Project: 26212

Date: March 27, 2020

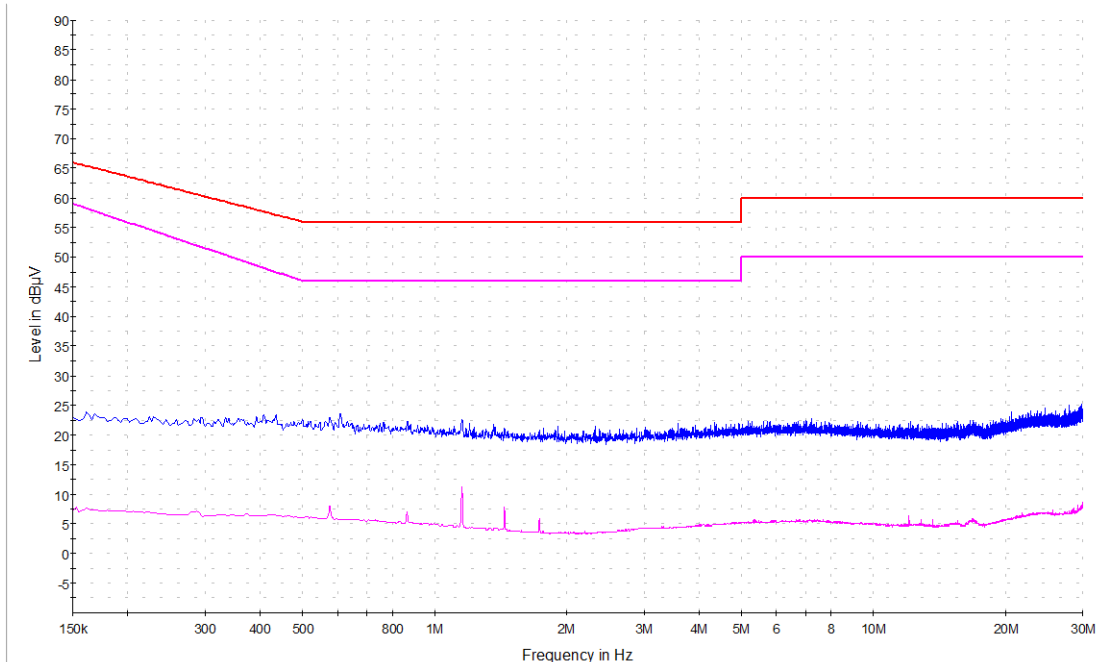
Power interface mode: 1; Operation mode: 2

Red trace=Quasi Peak, Blue trace=Peak; Violet trace=Average

Both lines



Client: Telcontrol Srl – Heat radiator – Model: AERO D20
 Project: 26212
 Date: April 29, 2020
 Power interface mode: 3; Operation mode: 1
 Red trace=Quasi Peak, Blue trace=Peak; Violet trace=Average
 Both lines



Client: Telcontrol Srl – Heat radiator – Model: AERO D20
 Project: 26212
 Date: April 29, 2020
 Power interface mode: 3; Operation mode: 1
 Red trace=Quasi Peak, Blue trace=Peak; Violet trace=Average
 Both lines

1.15 Test Conditions and Results - EMISSION – MAINS TERMINALS (discontinuous interference)

1.15	TEST: EMISSION – MAINS TERMINALS (DISCONTINUOUS INTERFERENCE)		VERDICT
<u>Method:</u> Measurements were made on a ground plane. All power was connected to the system through Line Impedance Stabilization Networks (LISN). Discontinuous conducted voltage measurements on mains lines were made at the output of the LISN, using a disturbance analyzer.			P
Laboratory parameters:	Required prior to the test	During the test	
Ambient temperature	15 to 35 °C	20 °C	
Relative humidity	10 to 90 %	19 %	
Fully configured sample scanned over the following frequency range	Frequency range on each side of line	Measurement Point	
	150 kHz - 30 MHz	Mains terminals	
Equipment mode	Power interface mode	1	
	EUT configurations mode	1	
	Operation mode	3	
Limits			
Frequency (MHz)	QP (dB (µV))	Results	
0,15	66	P	
0,50	56	P	
1,4	56	P	
30	60	P	
Supplementary information:			
1. Limits refer to CISPR 14-1 clause 4.2 and table 1 (limits for household appliances and equipment causing similar disturbances at mains terminals)			
2. For discontinuous disturbance, the click limit Lq is attained by increasing the relevant limit L (L=Low voltage AC mains port -continuous interference limit) with:			
44 dB for N < 0,2 or			
20 lg (30/N) dB for 0,2 ≤ N < 30			
Exemptions see CISPR 14-1 clause 4.2.3			

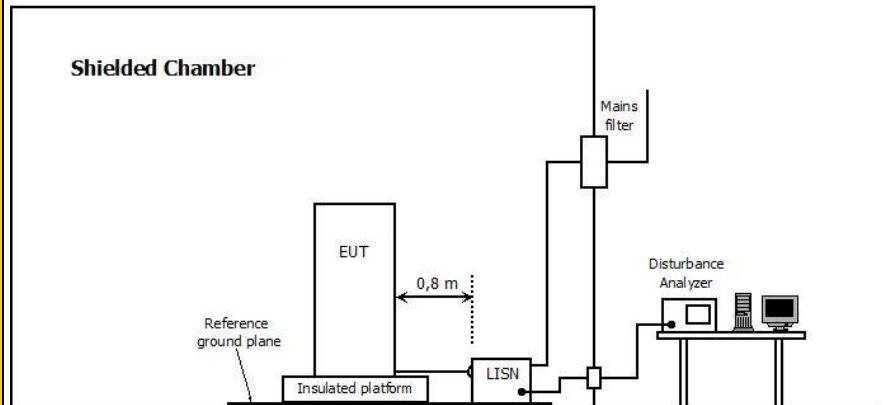
1.15.1 Test Equipment Used

DESCRIPTION	MANUFACTURER	MODEL	IDENTIFIER	CALIBRATION DATE	CALIBRATION DUE
Click analyser	Schaffner	DIA1521D	2091	Jul 15, 2019	Jul 15 2020
LISN	Rohde & Schwarz	ESH2-Z5	0504	Apr 23, 2019	Apr 23, 2020
3 Phase Voltage Variator	Zucchiatti	---	2119	V.B.U.	V.B.U.
Digital Multimeter	Fluke	189	1187	Nov 13, 2019	Nov 13, 2020
Thermo-hygrograph	Delta Ohm	HD35EDL14bNTV.E	1600-10	Mar 01, 2019	Mar 01, 2020

1.15.2 Photo of the test setup

Description of test set-up

DISCONTINUOUS CONDUCTED EMISSIONS MEASUREMENT TEST SET-UP



1.15.3 Measurement tables for Emission - Mains terminals (discontinuous interference)

Neutral										
Freq (MHz)	L (dBμV)	T(1) (min)	n _A (2)	n _B (3)	n _C (4)	N (5)	d (6)	Lq(7) (dBμV)	n ₂ (8)	n ₃ (9)
0,15	66	65,00	0	0	0	0	-	-	-	-
0,5	56	65,00	37	3	0	0,62	-	-	-	-
1,4	56	65,00	36	3	0	0,62	-	-	-	-
30	60	65,00	0	0	0	0,62	-	-	-	-
Line 1										
Freq (MHz)	L (dBμV)	T(1) (min)	n _A (2)	n _B (3)	n _C (4)	N (5)	d (6)	Lq(7) (dBμV)	n ₂ (8)	n ₃ (9)
0,15	66	42,68	21	0	0	0,49	-	-	-	-
0,5	56	42,68	39	1	0	0,94	-	-	-	-
1,4	56	42,68	35	2	0	0,94	-	-	-	-
30	60	42,68	0	0	0	0,94	-	-	-	-

- 1) Minimum between time to reach 40 clicks and 120 minutes
- 2) n_A = number of short clicks (< 10 ms)
- 3) n_B = number of medium clicks (> 10 ms and < 20 ms); if all clicks <20 ms and at least 90% clicks <10 ms and click rate N ≤ 5 the EUT complies.
- 4) n_C = number of long clicks (>20 ms and <200 ms)
- 5) N = click rate (number of counted clicks/ minute); computed as $N = (n_A + n_B + n_C) / T$. The click rate at the 1,4 and 30 MHz are the same of the value at 0,5 MHz.
- 6) d = duration of continuous disturbances during the observation time T (max acceptable limit of 0,6 s)
- 7) Lq = L + Increment according to table:

Click rate	$N \leq 0,2$	$0,2 < N < 30$	$N \geq 30$
Increment (dB)	44	$20 \lg (30/N)$	0

- 8) n₂ Number of clicks > Lq for compliance $n_2 \leq n_3$
- 9) n₃ Number of authorized clicks $n_3 = \text{Int} [(n_A + n_B + n_C) / 4]$

1.16 Test Conditions and Results – EMISSION – AC MAINS TERMINALS OF INDUCTION COOKING APPLIANCES

1.16	TEST: EMISSION - AC MAINS TERMINALS OF INDUCTION COOKING APPLIANCES	VERDICT
<u>Method:</u> Measurements were made on a ground plane. All power was connected to the system through Line Impedance Stabilization Networks (LISN). Conducted voltage measurements on mains lines were made at the output of the LISN.		N/A

1.17 Test Conditions and Results – EMISSION – MAGNETIC FIELD STRENGTH OF INDUCTION COOKING APPLIANCES

1.17	TEST: EMISSION - MAGNETIC FIELD STRENGTH OF INDUCTION COOKING APPLIANCES	VERDICT
<u>Method:</u> Measurements were made in a 3-meter anechoic chamber that complies to CISPR 16. In the measurement with the 0,6 m loop antenna, measurements were performed at an antenna to EUT separation distance of 3 meter. The antenna was vertically installed, with the lower edge of the loop at a height of 1 m above the floor, in accordance to CISPR 16-1-4. The test with the large loop antenna was performed using a loop antenna system in accordance to CISPR 16-2-3.		N/A

1.18 Test Conditions and Results – RADIO-FREQUENCY ELECTROMAGNETIC FIELDS

1.18	TEST: RADIO-FREQUENCY ELECTROMAGNETIC FIELD S	VERDICT
<u>Method:</u> The test allows estimating of the radiated immunity of electrical and electronic equipment to electromagnetic disturbances coming from intended radio-frequency (RF) transmitters in the frequency range 80 MHz to 1000 MHz. The interference is applied on the enclosure of the equipment by using transmitting antennas.		N/A

1.19 Test Conditions and Results – ELECTROSTATIC DISCHARGES (ESD)

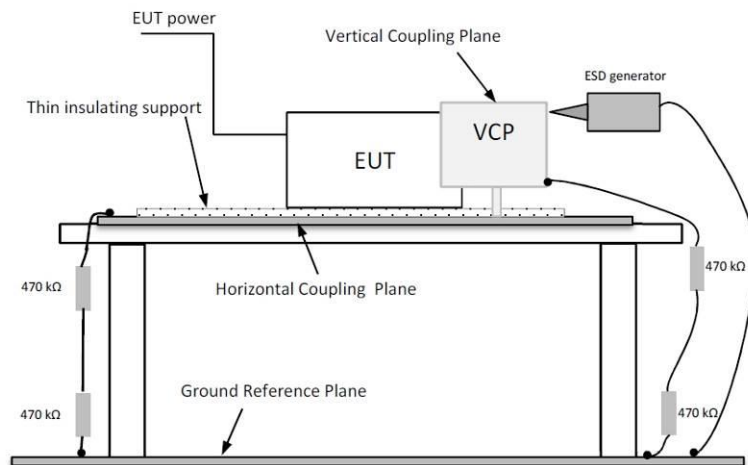
1.19	TEST: ELECTROSTATIC DISCHARGE				VERDICT
<u>Method:</u> The test is intended to demonstrate the immunity of equipment subjected to static electricity discharges from operators directly and to adjacent objects. The table-top equipment under test is placed on a wooden table, 0.8 m high, standing on the ground reference plane. A horizontal coupling plane (HCP), 1.6 x 0.8 m, is placed on the table. The EUT and the cables are isolated from the coupling plane by an insulating support 0.5 mm thick. The floor standing equipment is isolated from the ground reference plane by an insulating support about 0.1 m thick. The vertical coupling plane (VCP) of dimensions 0.5 m x 0.5 m is placed parallel to, and positioned at a distance of 0.1 m from, the EUT.					P
Laboratory parameters:		Required prior to the test		During the test	
Ambient temperature		15 to 35°C		22 °C	
Relative humidity		30 to 60 %		31 %	
Air pressure		860 – 1060 mBar		1007 mBar	
Basic standard		IEC 61000-4-2: 2008 / EN 61000-4-2: 2009			
Equipment mode		Power interface mode		1	
		EUT configurations mode		1	
		Operation mode		3	
—		Measurement point			
Fully configured sample subjected to the levels shown below.		Product enclosure			
Test levels				Performance Criteria	
Discharge type	Discharge level (kV)		Number of discharges per location (each polarity)		
	Positive	Negative			
Air – Direct	8	8	10	B	
Contact – Direct	4	4	10	B	
Contact – Indirect	4	4	10	B	
Supplementary information:					

1.19.1 Test Equipment Used

DESCRIPTION	MANUFACTURER	MODEL	IDENTIFIER	CALIBRATION DATE	CALIBRATION DUE
ESD Generator	EM Test	Dito	2120	May 31, 2019	May 31, 2020
Digital Multimeter	Fluke	189	1187	Nov 13, 2019	Nov 13, 2020
Thermo-hygrograph	Delta Ohm	HD35EDL14bNTV.E	1600-10	Mar 01, 2019	Mar 01, 2020

1.19.2 Test setup

Description of test set-up



1.19.3 Results for Electrostatic Discharges – Contact Discharges

TEST POINT	POSITIVE POLARITY	NEGATIVE POLARITY
	4 kV	4 kV
All over metal case, especially near display/panel	1	1
HCP	1	1
VCP	1	1

1.19.3.1 Results description

1	Compliant – Discharge observed, no observed response from EUT. Criterion A
Note:	

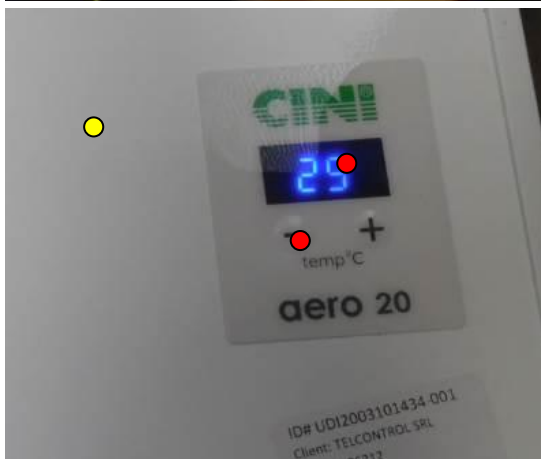
1.19.4 Results for Electrostatic Discharges – Air Discharges

TEST POINT	POSITIVE POLARITY	NEGATIVE POLARITY
	8 kV	8 kV
Button panel/display	1	1

1.19.4.1 Results description

1	Compliant – No perceived discharge, no observed response from EUT. Criterion A
Note:	

1.19.5 Photos of test point locations



Red Spots – Air electrostatic discharges
 Yellow Spots – Contact electrostatic discharges
 * This picture is just indicative

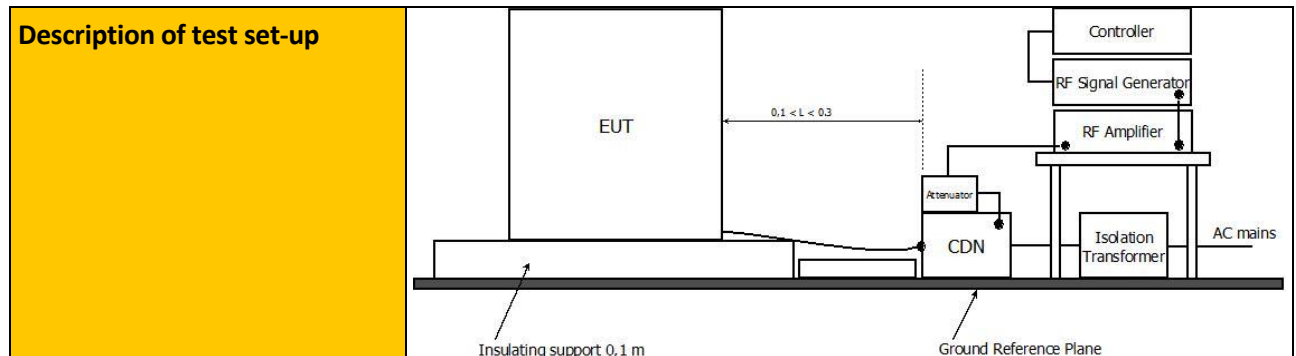
1.20 Test Conditions and Results – INJECTED CURRENTS – 0,15 TO 230 MHz

1.20	TEST: INJECTED CURRENTS – 0,15 TO 230 MHz				VERDICT
<u>Method</u> : The test allows estimating of the conducted immunity of electrical and electronic equipment to electromagnetic disturbances coming from intended radio-frequency (RF) transmitters in the frequency range 150 kHz to 230 MHz. The interference is applied on mains supply, signal line and earth connection ports by using coupling decoupling networks or a clamp.					P
Laboratory parameters:		Required prior to the test		During the test	
Ambient temperature		15 to 35°C		22 °C	
Relative humidity		10 to 90 %		33 %	
Basic standard		IEC 61000-4-6: 2013/ EN 61000-4-6: 2014			
Equipment mode		Power interface mode		1	
		EUT configurations mode		1	
		Operation mode		3	
—		Frequency range		Measurement points	
Fully configured sample scanned over the following frequency range		150 kHz to 230 MHz		Input AC power port	
Applied level				Performance Criterion	
Port	Frequency (MHz)	(Vrms)	Modulation		
AC power ports	0,15 – 230	3	80% AM (1 kHz)		
DC power ports	0,15 – 230	1	80% AM (1 kHz)		
Signal /control lines	0,15 – 230	1	80% AM (1 kHz)		
Supplementary information:					

1.20.1 Test Equipment Used

DESCRIPTION	MANUFACTURER	MODEL	IDENTIFIER	CALIBRATION DATE	CALIBRATION DUE
Signal Generator 9kHz - 3 GHz, AC power	PMM	PMM 3030-01	2205	Jun 21, 2019	Jun 21, 2020
RF Power Amplifier 10KHz-230MHz	Kalmus	210LCR	2074	Apr 04, 2019	Apr 04, 2020
Attenuator	Pasternak	PE7021-6	2079	Apr 09, 2019	Apr 09, 2020
Coupler 10KHz-230MHz	Amplifier Research	DC2000	2004	Apr 12, 2019	Apr 12, 2020
Coupling Decoupling Network	Luthi	CDN801-M2/M3	2112	Apr 05, 2019	Apr 05, 2020
Digital Multimeter	Fluke	189	1187	Nov 13, 2019	Nov 13, 2020
Thermo-hygrograph	Delta Ohm	HD35EDL14bNTV.E	1600-10	Mar 01, 2019	Mar 01, 2020

1.20.2 Test setup



1.20.3 Results for injected currents 0,15 to 230 MHz

POINT OF APPLICATION	RESULTS
Mains	1

1.20.3.1 Results Description

1	Compliant – No observed response from EUT. Criterion A
Note:	

1.21 Test Conditions and Results – INJECTED CURRENTS – 0,15 TO 80 MHz

1.21	TEST: INJECTED CURRENTS – 0,15 TO 80 MHz	VERDICT
	<u>Method:</u> The test allows estimating of the conducted immunity of electrical and electronic equipment to electromagnetic disturbances coming from intended radio-frequency (RF) transmitters in the frequency range 150 kHz to 80 MHz. The interference is applied on mains supply, signal line and earth connection ports by using coupling decoupling networks or a clamp.	N/A

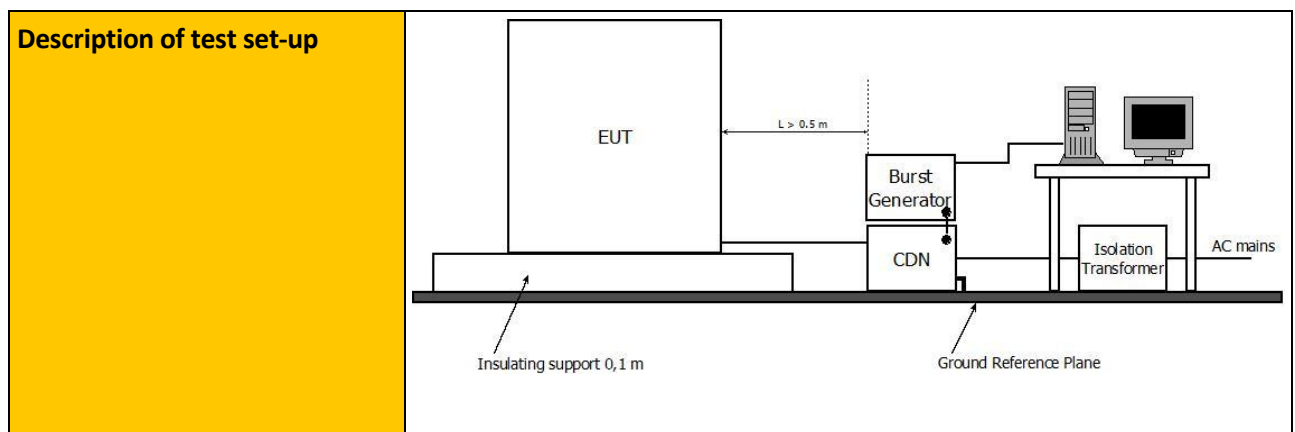
1.22 Test Conditions and Results – FAST TRANSIENTS

1.22	TEST: FAST TRANSIENTS			VERDICT
<u>Method:</u> The test is intended to demonstrate the immunity of equipment subjected to types of transient disturbances such as those originating from switching transients (interruption of inductive loads, relay contact bounce.....). The bursts are applied on the mains supply port by using a coupling decoupling network and on signal and control lines ports by using a capacitive clamp.				P
Laboratory parameters:		Required prior to the test	During the test	
Ambient temperature		15 to 35°C	22 °C	
Relative humidity		10 to 90 %	25 %	
Basic standard		IEC 61000-4-4:2012 / EN 61000-4-4:2012		
Equipment mode		Power interface mode	1	
		EUT configurations mode	1	
		Operation mode	3	
—		Measurement points		
Fully configured sample subject to the levels shown below.		Input AC power ports		
Applied level			Performance Criteria	
Application point	(kV)	Repetition Frequency (kHz)		
Input and output AC power ports	1	5		
Input and output DC power ports ¹	0,5	5		
Signal ports ²	0,5	5		
Supplementary information:				
¹ Not applicable to input ports intended for connection to a battery or a rechargeable battery which must be removed or disconnected from the apparatus for recharging. Apparatus with a DC power input intended for use with an AC-DC power adaptor shall be tested on the AC power input of the AC-DC power adaptor specified by the manufacturer or, where none is so specified, using a typical AC-DC power adaptor. The test is applicable to DC power input ports intended to be connected permanently to cables longer than 3 m.				
² Applicable only to ports interfacing with signal cables whose total length according to the manufacturer's functional specification may exceed 3 m.				

1.22.1 Test Equipment Used

DESCRIPTION	MANUFACTURER	MODEL	IDENTIFIER	CALIBRATION DATE	CALIBRATION DUE
EFT / Burst / Surge module	Teseq	NSG 3040	2121A	Mar 25, 2019	Mar 25, 2020
Coupling-decoupling network	Teseq	CDN 3043 - C32, three phase 32 A/phase	2121B	Mar 25, 2019	Mar 25, 2020
Digital Multimeter	Fluke	189	1187	Nov 13, 2019	Nov 13, 2020
Thermo-hygrograph	Delta Ohm	HD35EDL14bNTV.E	1600-10	Mar 01, 2019	Mar 01, 2020

1.22.2 Test setup



1.22.3 Results of Fast transients

POINT OF APPLICATION	RESULT
AC Mains	1

1.22.3.1 Results Descriptions

1	Compliant – No observed response from EUT. Criterion A.
Note:	

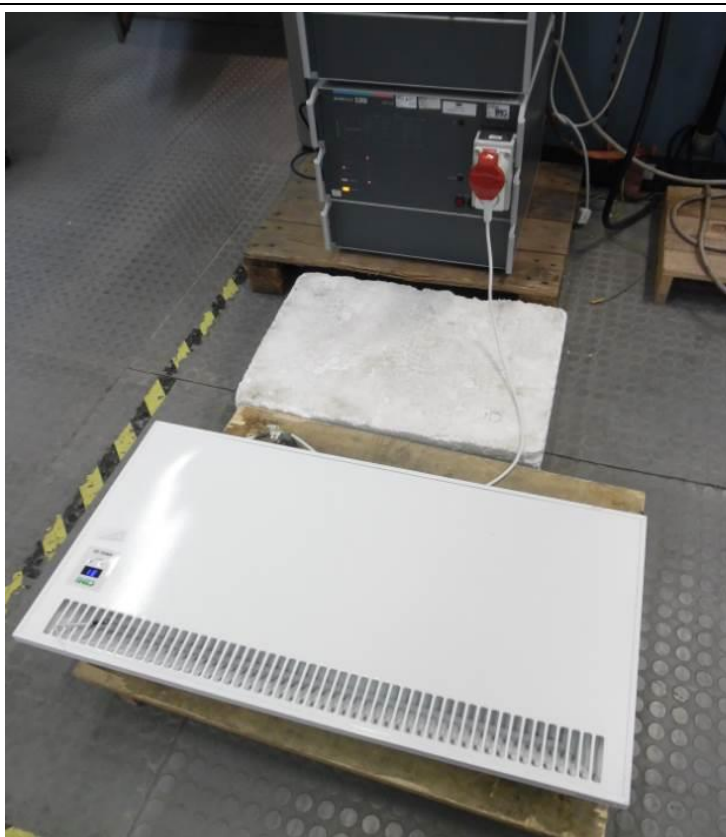
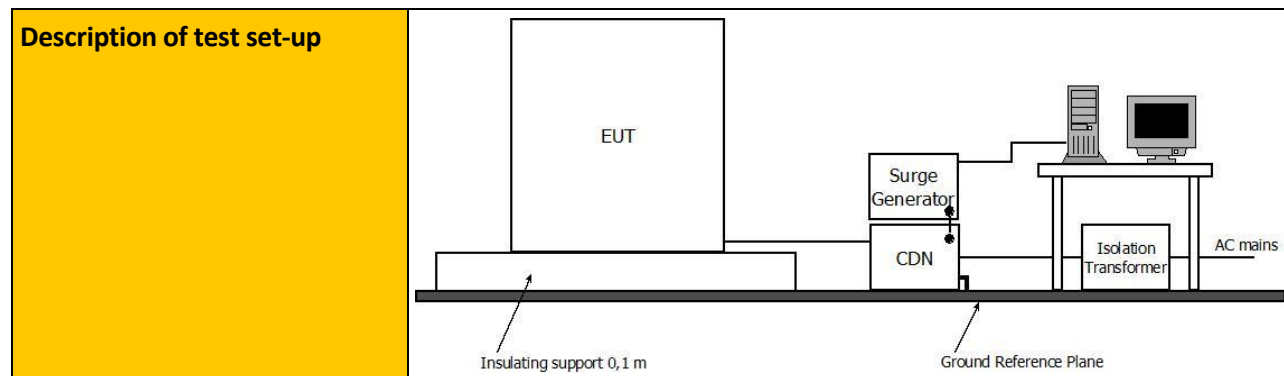
1.23 Test Conditions and Results – SURGES

1.23	TEST: SURGES		VERDICT
<u>Method:</u> The test allows estimating of the conducted immunity of electrical and electronic equipment to unidirectional surges caused by overvoltages from switching and lighting transients. The interference is applied on symmetrical and unsymmetrical modes on mains supply port by using coupling decoupling network. The positive pulses are applied 90° relative to the phase angle of the a.c. line voltage to the equipment under test, and the negative pulses are applied 270° relative to the phase angle of the a.c. line voltage to the equipment under test. Lines to earth and neutral to earth surges are not applicable to products which do not have provision for connection to earth.			P
Laboratory parameters:	Required prior to the test	During the test	
Ambient temperature	15 to 35°C	22 °C	
Relative humidity	10 to 90 %	21 %	
Basic standard	IEC 61000-4-5:2014 / EN 61000-4-5:2014		
Equipment mode	Power interface mode	1	
	EUT configurations mode	1	
	Operation mode	3	
—	Measurement points		
Fully configured sample subject to the levels shown below.	Input AC power ports		
Applied level		Performance Criteria	
Application point	(kV)		
Input AC power ports	1 (Line to Line)	Combination Wave (1,2/50µs Voltage, 8/20µs Current)	
	2 (Line to Earth)	Combination Wave (1,2/50µs Voltage, 8/20µs Current)	
Supplementary information:			

1.23.1 Test Equipment Used

DESCRIPTION	MANUFACTURER	MODEL	IDENTIFIER	CALIBRATION DATE	CALIBRATION DUE
EFT / Burst / Surge module	Teseq	NSG 3040	2121A	Mar 25, 2019	Mar 25, 2020
Coupling-decoupling network	Teseq	CDN 3043 - C32, three phase 32 A/phase	2121B	Mar 25, 2019	Mar 25, 2020
Digital Multimeter	Fluke	189	1187	Nov 13, 2019	Nov 13, 2020
Thermo-hygrograph	Delta Ohm	HD35EDL14bNTV.E	1600-10	Mar 01, 2019	Mar 01, 2020

1.23.2 Test setup



1.23.3 Results for Surges on AC mains

MODE OF APPLICATION	LEVEL	POLARITY	RESULTS
Neutral to Line	1,0 kV	Positive	1
		Negative	1
Neutral to Earth	2,0 kV	Positive	1
		Negative	1
Line to Earth	2,0 kV	Positive	1
		Negative	1

1.23.4 Results Descriptions

1	Compliant – No observed response from EUT. Criterion A.
Note:	

1.24 Test Conditions and Results – VOLTAGE DIPS

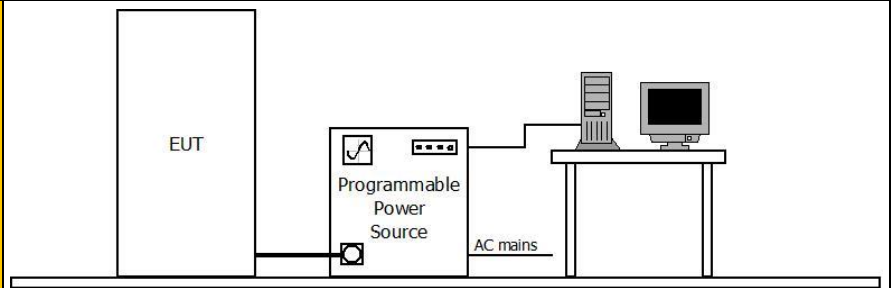
1.24	TEST: VOLTAGE DIPS			VERDICT
<u>Method:</u> The test allows estimating of the conducted immunity of electrical and electronic equipment connected to low-voltage power supply networks for voltage dips and short interruptions. The interference is applied on mains supply port by using a testing generator.				P
Laboratory parameters:		Required prior to the test	During the test	
Ambient temperature		15 to 35 °C	23 °C	
Relative humidity		10 to 90 %	20 %	
Basic standard		IEC 61000-4-11:2004 / EN 61000-4-11:2004		
Equipment mode		Power interface mode	1	
		EUT configurations mode	1	
		Operation mode	1	
—		Measurement point		
Fully configured subjected to the levels indicated below.		Input AC power ports		
Applied levels			Performance Criteria	
Voltage reduction (%)	Period (Cycles)	Sync angle (degrees)		
100	0,5	0	C	
60	10/12 at 50/60Hz	0	C	
30	25/30 at 50/60Hz	0	C	
Supplementary information: 0 degrees is the crossover point of the voltage waveform.				

1.24.1 Test equipment used

DESCRIPTION	MANUFACTURER	MODEL	IDENTIFIER	CALIBRATION DATE	CALIBRATION DUE
Programmable AC and DC Power source / analyzer 5kVA	California Instr.	5001ix	2022	Apr 03, 2019	Apr 03, 2020
Thermo-hygrograph	Delta Ohm	HD35EDL14bNTV.E	1600-10	Mar 01, 2019	Mar 01, 2020

1.24.2 Test setup

Description of test set-up



1.24.3 Results for Voltage Dips

POINT OF APPLICATION	VOLTAGE REDUCTION	RESULTS
AC mains	100%, 0,5 cycles	1
AC mains	60%, 10 cycles	1
AC mains	60%, 12 cycles	1
AC mains	30%, 25 cycles	1
AC mains	30%, 30 cycles	1
Supplementary information:		

1.24.3.1 Results description

1	Compliant – No observed response from EUT. Criterion A.
Note:	

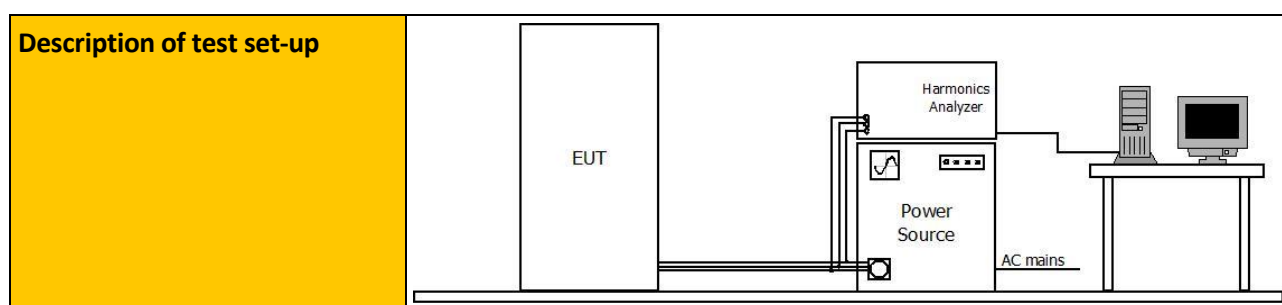
1.25 TEST: Conditions and Results – Limits of harmonics of current

1.25	TEST: LIMITS OF HARMONICS OF CURRENT				VERDICT
Method: This test consists on the measurement of harmonics components of the input current which may be produced by equipment intended to be connected to public low-voltage distribution systems. The equipment is tested under specified conditions of operation.					P
Laboratory parameters:		Required prior to the test		During the test	
Ambient temperature		15 to 35 °C		22 °C	
Relative humidity		10 to 90 %		18 %	
Basic standard		IEC / EN 61000-3-2			
Equipment mode		Power interface mode		1	
		EUT configurations mode		1	
		Operation mode		1	
—		Measurement Point			
Fully configured subjected to the levels indicated below.		Input AC power ports			
Classification of equipment IEC / EN 61000-3-2					
☒ Class A	☐	Balanced three-phase equipment	☐ Class B	☐	Portable tools
	☒	Household appliance, excluding equipment identified as class D		☐	Arc welding equipment which is not professional equipment
	☐	Tools, excluding portable tools			
	☐	Dimmers for incandescent lamps	☐ Class D	☐	Personal computers and personal computer monitors
	☐	Audio equipment		☐	Television receivers
	☐	All equipment not specified in the other classes		☐	refrigerators / freezers having variable-speed drives
Limits IEC / EN 61000-3-2					
Class A equipment			See § 7.1 of standard		
Class B equipment			See § 7.2 of standard		
Class D equipment			See § 7.4 of standard		
Supplementary information:					

1.25.1 Test equipment used

DESCRIPTION	MANUFACTURER	MODEL	IDENTIFIER	CALIBRATION DATE	CALIBRATION DUE
Programmable AC and DC Power Source/Analyzer 5kVA	California Instrum.	5001IX	2022	Apr 03, 2019	Apr 03, 2020
Harmonic Flicker Analyzer	California Instrum.	PACS-3	2023	Apr 03, 2019	Apr 03, 2020
Thermo-hygrograph	Delta Ohm	HD35EDL14bNTV.E	1600-10	Mar 01, 2019	Mar 01, 2020

1.25.2 Photo of the test setup





1.25.3 Measurement tables / Graphical representation

Power interface mode: 1 Operation mode: 1

LIMITS - CLASS A EQUIPMENT			
Odd harmonics			
Harmonic order (n)	Maximum permissible harmonic current (A)	Result (A)	Margin (A)
3	2,30	0,014	2,286
5	1,14	0,005	1,135
7	0,77	--*	0,77
9	0,40	--*	0,40
11	0,33	--*	0,33
13	0,21	--*	0,21
$15 \leq n \leq 40$	$0,15 \times 15/n$	--*	0,058
Even harmonics			
2	1,08	0,006	1,074
4	0,43	--*	0,43
6	0,30	--*	0,300
$8 \leq n \leq 40$	$0,23 \times 8/n$	--*	0,046

*Harmonics value less than 5 mA were disregarded

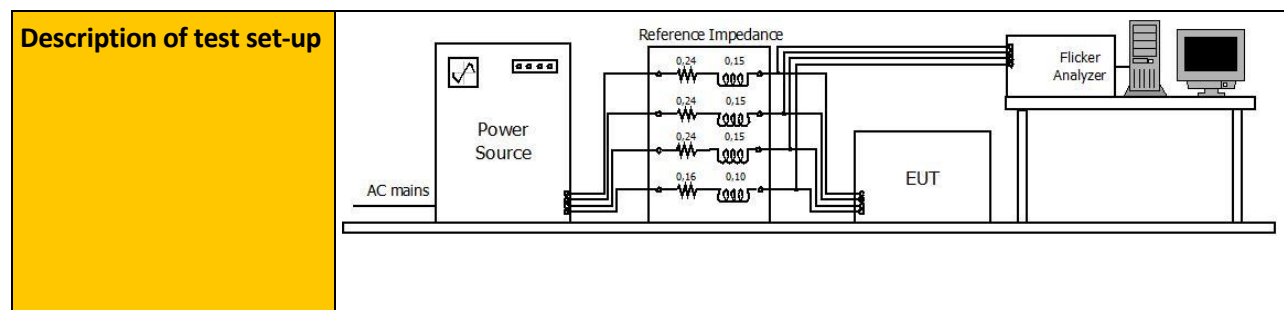
1.26 TEST: Conditions and results - Voltage changes, voltage fluctuations and flicker

1.26	TEST: VOLTAGE CHANGES, VOLTAGE FLUCTUATIONS AND FLICKER					VERDICT
<u>Method:</u> This test consists on the measurement of voltage changes, voltage fluctuations and flicker which may be produced by equipment intended to be connected to public low-voltage distribution systems. The equipment is tested under specified conditions of operation.						P
Laboratory Parameters		Required prior to the test		During the test		
Ambient Temperature		15 to 35 °C		23 °C		
Relative Humidity		10 to 90 %		43 %		
Basic Standard		IEC / EN 61000-3-3				
Equipment mode		Power interface mode		1		
		EUT configurations mode		1		
		Operation mode		3		
—		Measurement Point				
Fully configured subjected to the levels indicated below.		Input AC power ports				
Control Method of Equipment						
☒ without additional conditions						
☐ switched manually, or switched automatically more frequently than twice per day, and also has either a delayed restart (the delay not less than a few tens of seconds), or manual restart, after a power supply interruption						
☐ attended whilst in use (for example: hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as lawn mowers, portable tools such as electric drills), or switched on automatically, or is intended to be switched on manually, no more than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds) or manual restart, after a power supply interruption.						
Limits						
Items:	d_{max}	d_c	P_{st}	P_{lt}	T_{max}	
Limit:	☒ 4% ☐ 6% ☐ 7%	3,3 %	1,0	0,65	500 ms	
Supplementary information:						

1.26.1 Test equipment used

DESCRIPTION	MANUFACTURER	MODEL	IDENTIFIER	CALIBRATION DATE	CALIBRATION DUE
Programmable AC and DC Power Source/Analyzer 5kVA	California Instrum.	5001IX	2022	Apr 03, 2019	Apr 03, 2020
Harmonic Flicker Analyzer	California Instrum.	PACS-3	2023	Apr 03, 2019	Apr 03, 2020
Flicker Impedance 3ph	California Instrum.	OMNI-3-16	2024	Apr 03, 2019	Apr 03, 2020
Thermo-hygraph	Delta Ohm	HD35EDL14bNTV.E	1600-10	Mar 01, 2019	Mar 01, 2020

1.26.2 Photo documentation of the test set-up



1.26.3 Test results

Operation Mode		1	Configuration Mode		1
Items	d _{max}	d _c	P _{st}	P _{lt}	T _{max}
Limit	☒ 4% ☐ 6% ☐ 7%	3,3 %	1,0	0,65	500 ms
Reading	2,13	2,00	0,445	0,377	0