

Afore New Energy Technology (Shanghai) Co., Ltd.

TEST REPORT

SCOPE OF WORK:

EMC directive (2014/30/EU) – EMC report

Model:

AF*-TH (*=3K, 4K, 5K, 6K, 8K, 10K, 12K, 15K, 17K, 20K, 25K,30K)

AF*-THP (*=3K, 4K, 5K, 6K, 8K, 10K, 12K)

AF*-THA (*=3K, 4K, 5K, 6K, 8K, 10K, 12K, 15K, 17K)

AF*-THC (*=3K, 4K, 5K, 6K)

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TEST REPORT

Report no. 2404B0472SHA-001

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201112

Manufacturer : Afore New Energy Technology (Shanghai) Co., Ltd.

Manufacturing site : Building 7, No.333 Wanfang Rd, Minhang District, Shanghai. China.
201112

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Summary

The equipment complies with the requirements according to the following standard(s) or Specification:

EN IEC 61000-6-1: 2019: Electromagnetic compatibility (EMC) - General standards – Immunity for residential, commercial and light-industrial environment

EN IEC 61000-6-3: 2021: General standards – Emission standard for residential, commercial and light-industrial environment

EN IEC 61000-6-2: 2019: Electromagnetic compatibility (EMC) - General standards – Immunity for residential, commercial and light-industrial environment

EN IEC 61000-6-4: 2019: General standards – Emission standard for residential, commercial and light-industrial environment

EN IEC 61000-3-2:2019+A1:2021: Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)

EN 61000-3-3:2013+A1:2019+A2:2021: Electromagnetic compatibility (EMC) - Part 3-3: Limits - 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 61000-3-12:2011: Electromagnetic compatibility (EMC) - Part 3-12: Limits - Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16 A and ≤ 75 A per phase

EN IEC 61000-3-11:2019: Electromagnetic compatibility (EMC) - Part 3-11: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems - Equipment with rated current ≤ 75 A and subject to conditional connection

EN 62920:2017+A1:2021: Photovoltaic power generating systems – EMC requirements and test methods for power conversion equipment

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Revision History

Report No.	Version	Description	Issued Date
2404B0472SHA-001	Rev. 01	Initial issue of report	2024-05-14

Measurement result summary

TEST ITEM	TEST RESULT	NOTE
Conducted disturbance voltage at mains terminals	Pass	
Electromagnetic radiation disturbance	Pass	
Harmonic current	Pass	
Voltage fluctuations and flicker	Pass	
Electrostatic discharge	Pass	
Radio frequency electromagnetic field	Pass	
Fast transients	Pass	
Surges	Pass	
Radio frequency, common mode	Pass	
Voltage dips	Pass	
Power frequency magnetic field	Pass	

Notes: 1: NA =Not Applicable

2: Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

3: Additions, Deviations and Exclusions from Standards: None.

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name : Hybrid inverter

Type/Model : AF*-TH (*=3K, 4K, 5K, 6K, 8K, 10K, 12K, 15K, 17K, 20K, 25K,30K)
AF*-THP (*=3K, 4K, 5K, 6K, 8K, 10K, 12K)
AF*-THA (*=3K, 4K, 5K, 6K, 8K, 10K, 12K, 15K, 17K)
AF*-THC (*=3K, 4K, 5K, 6K)

Description : The testing item is a Hybrid inverter for indoor or outdoor installation. The Inverter is three-phase type and non-isolated between PV, BATT and AC output. The internal control is redundantly built. It contains a main DSP and a slave DSP
PE terminal on external and internal enclosure.
The final used earth system shall comply the local code requirement.
The inverter has adjustable power factor function. But the function is not available for this test report.
And The testing performed on typical model: Max power model.
AF3K-THA, AF4K-THA, AF5K-THA, AF6K-THA, AF8K-THA, AF10K-THA, AF12K-THA, AF15K-THA, AF17K-THA.
AF3K-THC, AF4K-THC, AF5K-THC, AF6K-THC.
Model AF*K-THA (*=3,4,5,6) are identical with Model AF*K-TH (*=6,8,10,12), except power of PV input, max. battery voltage, AC output ratings as well as AC voltage is 3P+PE/3P 133/230V instead of 3P+N+PE/3P+PE 230/400V.
Model AF*K-THC (*=3,4,5,6) are identical with Model AF*K-THP (*=6,8,10,12), except power of PV input, voltage range and max. charge/discharge current of battery, AC output ratings as well as AC voltage is 3P+PE/3P 133/230V instead of 3P+N+PE/3P+PE 230/400V.
Model AF*K-THA (*=8,10,12,15,17) are identical with Model AF*K-TH (*=15,17,20,25,30), except power of PV input, max. voltage and max. charge/discharge current of battery, AC output ratings as well as AC voltage is 3P+PE/3P 133/230V instead of 3P+N+PE/3P+PE 230/400V.
For IT system, the grid side is not grounded and the client side is protectively grounded, the wiring method is shown in the manual.

This report is based on 230601230SHA-001. The modification is add new test datas on harmonics, flicker, and immunity items for meet EN62920 and EN61000-6-2 standard requirements.

Rating : See Appendix I specifications table

Trade Mark : Afore

EUT type : ☒ Table-top
☐ Floor standing

Sample received date : 2022-08-03

Sample identification : NA
number

Date of test : 2023-06-30 to 2023-07-01, 2024-03-14 to 2024-03-16

1.2 Description of Test Facility

Name : Intertek Testing Services Shanghai

Address : Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R.
China

Telephone : 86 21 61278200

Telefax : 86 21 54262353

The test facility is : CNAS Accreditation Lab
recognized, certified, Registration No. CNAS L0139
or accredited by these FCC Accredited Lab
organizations Designation Number: CN0175
IC Registration Lab
CAB identifier.: CN0051
VCCI Registration Lab
Registration No.: R-14243, G-10845, C-14723, T-12252
A2LA Accreditation Lab
Certificate Number: 3309.02

2 TEST SPECIFICATIONS

2.1 Normative references

EN IEC 61000-6-1: 2019: Electromagnetic compatibility (EMC) – General standards- Immunity for residential, commercial and light-industrial environment.

EN IEC 61000-6-3: 2021: General standards – Emission standard for residential, commercial and light-industrial environment

EN IEC 61000-3-2:2019+A1:2021: Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)

EN 61000-3-12:2011: Electromagnetic compatibility (EMC) - Part 3-12: Limits - Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16 A and ≤ 75 A per phase

EN 61000-3-3:2013+A1:2019+A2:2021: Electromagnetic compatibility (EMC) - Part 3-3: Limits - 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 IEC 61000-3-11:2019: Electromagnetic compatibility (EMC) - Part 3-11: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems - Equipment with rated current ≤ 75 A and subject to conditional connection

EN 62920:2017+A1:2021: Photovoltaic power generating systems – EMC requirements and test methods for power conversion equipment

2.2 Mode of operation during the test

Within this test report, EUT was tested under all available operation modes and tested under its rating voltage and frequency. Other voltage and frequency is specified if used.

2.3 Test peripherals used

Item No	Description	Brand and Model	S/No
-	-	-	-

2.4 Record of climatic conditions

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (Kpa)
Mains terminal disturbance voltage	24	37	NA
Electromagnetic radiation disturbance	24	37	NA
Harmonic current	26	38	NA
Voltage fluctuations and flicker	27	39	NA
Electrostatic discharge	24	37	101
Radio frequency electromagnetic field	28	36	NA
Fast transients	27	39	NA
Surges	29	36	NA
Radio frequency, common mode	24	37	NA
Voltage dips	24	37	NA
Power frequency magnetic field	28	36	NA

Notes: NA =Not Applicable

2.5 Instrument list

Conducted Emission/Disturbance Power/Tri-loop Test/CDN method					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESCS 30	EC 2107	2022-07-14
☒	A.M.N.	R&S	ESH2-Z5	EC 3119	2022-11-29
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB 26	EC 3045	2022-09-11
☒	Bilog Antenna	TESEQ	CBL 6112D	EC 4206	2022-06-09
ESD					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	ESD generator	TESEQ	NSG 437	EC 4792-4	2022-03-21
EFT/Surge Voltage Dips					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Conduct immunity system	EM TEST	UCS 500M6B	EC 2958	2022-04-06
☒	Automatic transformer	EM TEST	MV2616	EC 2957	2022-04-06
Conducted Immunity					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Signal generator	R&S	SML 01	EC 2338	2022-09-09
☒	Power amplifier	AR	75A250	EC 3043-1	2022-07-14
☒	Attenuator	EM TEST	ATT6/75	EC 3043-3	2022-02-04
☒	CDN	Frankonia	CDN M2M316	EC 5969	2022-03-14
Radiated Immunity					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Signal generator	R&S	SMR 20	EC 3044-1	2022-01-29
☒	Power amplifier	AR	250W1000B	EC 5818-2	2022-04-18

☒	Power amplifier	BONN	BLMA1060-100	EC 5818-4	2022-04-18
☒	Log-period antenna	AR	AT 1080	EC 3044-7	2022-01-03
☒	Horn antenna	Schwarzbeck	STLP 9149	EC5881	2022-06-18
☒	Field meter	AR	FL17000	EC 5818-1	2022-05-20
☒	Power sensor	Keysight	N1914A	EC 5818-3	2022-04-18
Test Site					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Shielded room	Zhongyu	-	EC 2838	2022-01-14
☒	Shielded room	Zhongyu	-	EC 2839	2022-01-14
☒	Semi-anechoic chamber	Albatross project	-	EC 3048	2022-07-30
☒	Fully-anechoic chamber	Albatross project	-	EC 3047	2022-07-30
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Spectrum analyzer	Agilent	E7402A	EC 2254	2022-07-14
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2022-02-27
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 2122	2022-03-10
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5198	2022-01-18
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3326	2022-03-27
☒	Pressure meter	YM3	Shanghai Mengde	EC 3320	2022-06-30

2.6 Measurement Uncertainty

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted emission at mains ports	9kHz ~ 150kHz	3.71 dB
	150kHz ~ 30MHz	3.31 dB
Continuous disturbance measurements using a VP	0.09MHz ~ 30MHz	2.75dB
Continuous disturbance voltage at telecom ports with AAN	150kHz ~ 30MHz	4.10 dB
Continuous disturbance current at telecom ports	150kHz ~ 30MHz	2.73 dB
Continuous disturbance power	30MHz ~ 300MHz	4.42 dB
Discontinuous disturbance voltage/click	150kHz ~ 30MHz	3.87dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.04 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	4.97 dB
	6GHz ~ 18GHz	5.29 dB
Harmonic current emission	-	3.90%
Voltage fluctuations and flicker	-	10.34%
ESD	-	6.65%
Radiated susceptibility	80MHz ~ 1000MHz	2.38%
EFT test at main terminal	-	11.57%
EFT test at signal/telecom terminal	-	11.62%
Surge test at main terminal	-	11.57%
Surge test at signal/telecom line	-	11.89%
Injected current test at main terminal	-	1.88 dB
Injected current test at unshielded signal terminal	-	3.41 dB
Injected current test at shielded signal terminal	-	3.30dB
Voltage dips and interruption	-	6.05%

3 Mains terminal disturbance voltage

Test result: **PASS**

3.1 Limits

3.1.1 Limits at the AC mains ports

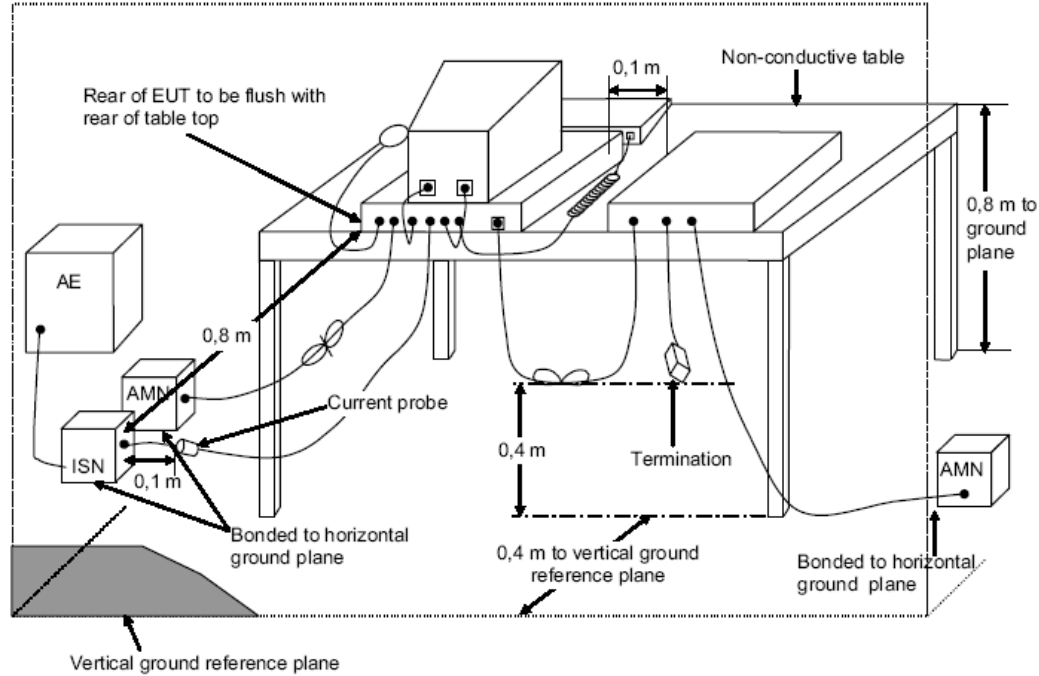
Frequency range (MHz)	Limits (dBuV)	
	Quasi-peak	Average
0.15 ~ 0.5	66-56*	56-46*
0.5 ~ 5	56	46
5 ~ 30	60	50
Note: 1. * means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz 2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.		

3.1.2 Limits at the DC mains ports

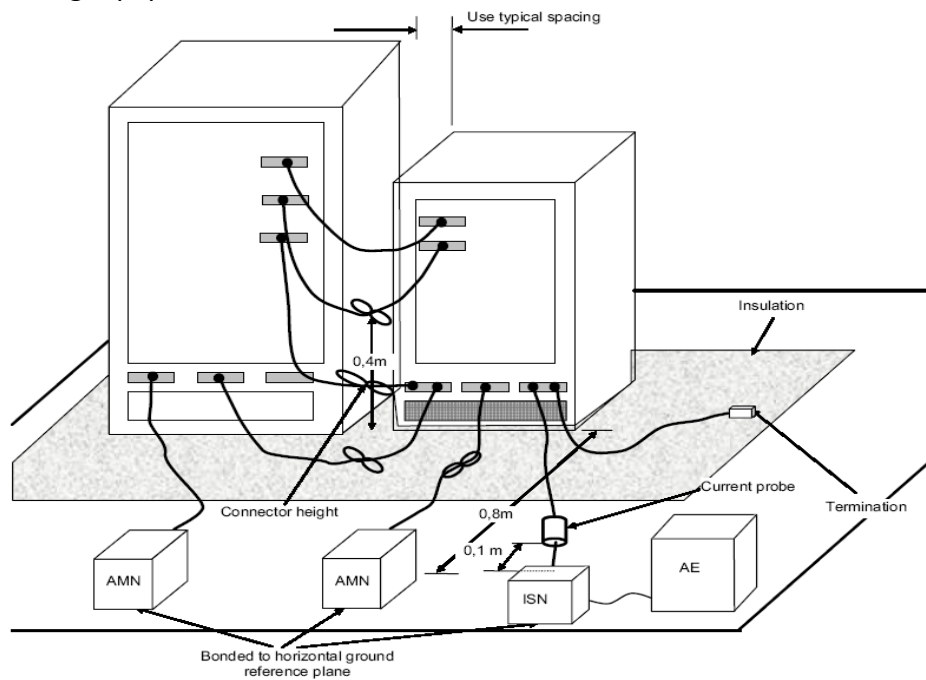
Frequency range (MHz)	Limits (dBuV)	
	Quasi-peak	Average
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60
Note: 1. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.		

3.2 Test setup

For table top equipment



For floor standing equipment



3.3 Test Procedure

Measurement was performed in shielded room, and instruments used were following CISPR 16-1-2 clause 4.3.

Detailed test procedure was following CISPR 16-2-1 clause 7.4

EUT arrangement and operation conditions were according to CISPR 16-2-1 clause 7.4.

Frequency range 150kHz – 30MHz was checked and EMI receiver measurement bandwidth was set to 9 kHz.

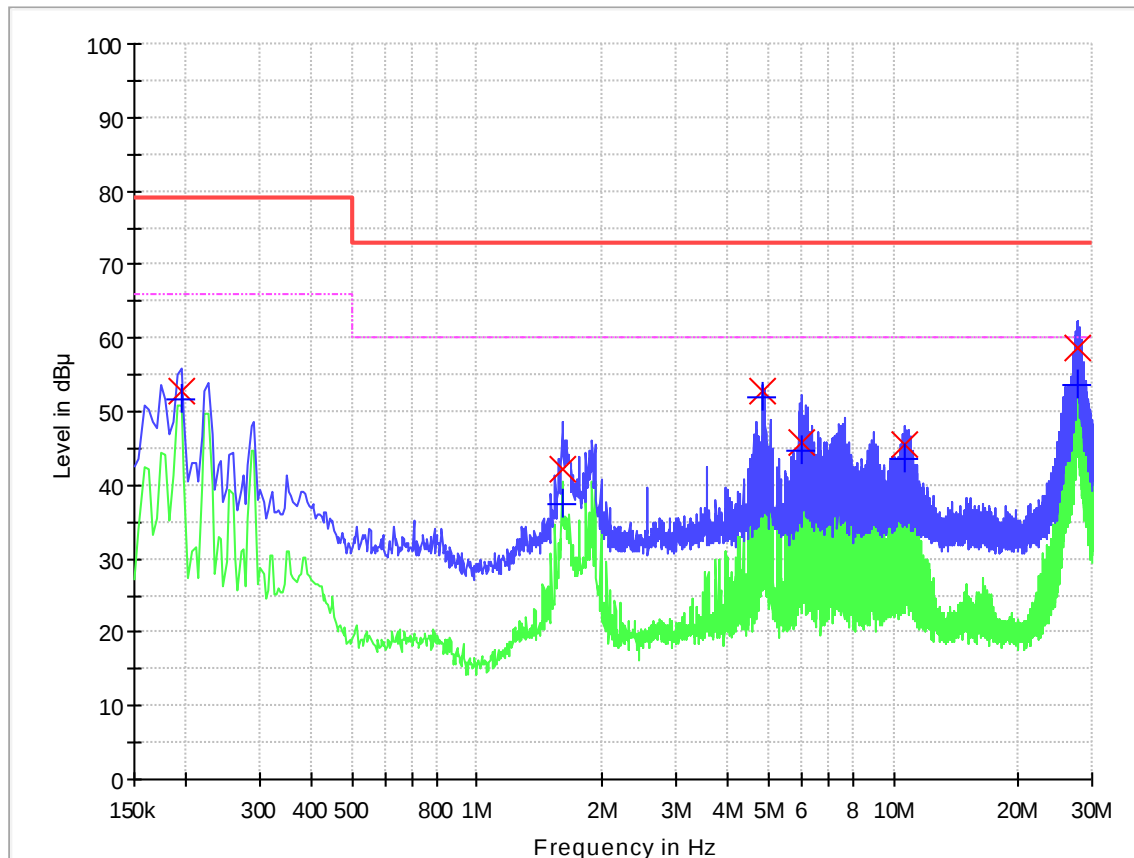
3.4 Test Result

TEST RESULT: PASS

Charging mode

Positive:

Test Curve:



Test Data:

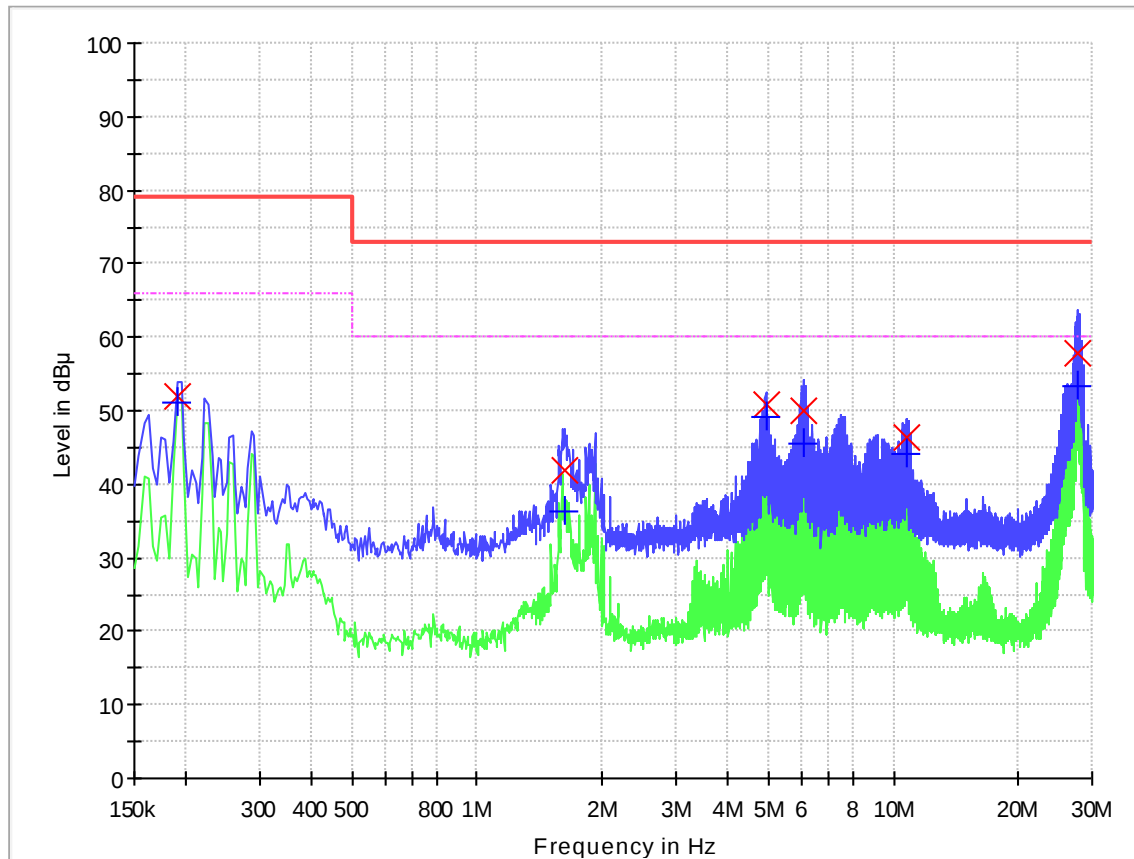
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.194000	52.8	51.6	9.000	P	30.3	26.2	79.0	14.4	66.0
1.602000	42.2	37.5	9.000	P	28.3	30.8	73.0	22.5	60.0
4.866000	52.7	52.0	9.000	P	29.7	20.3	73.0	8.0	60.0
6.018000	45.9	44.8	9.000	P	29.7	27.1	73.0	15.2	60.0
10.658000	45.4	43.4	9.000	P	29.8	27.6	73.0	16.6	60.0
27.746000	58.7	53.8	9.000	P	30.0	14.3	73.0	6.2	60.0

TEST REPORT

Charging mode

Negative:

Test Curve:



Test Data:

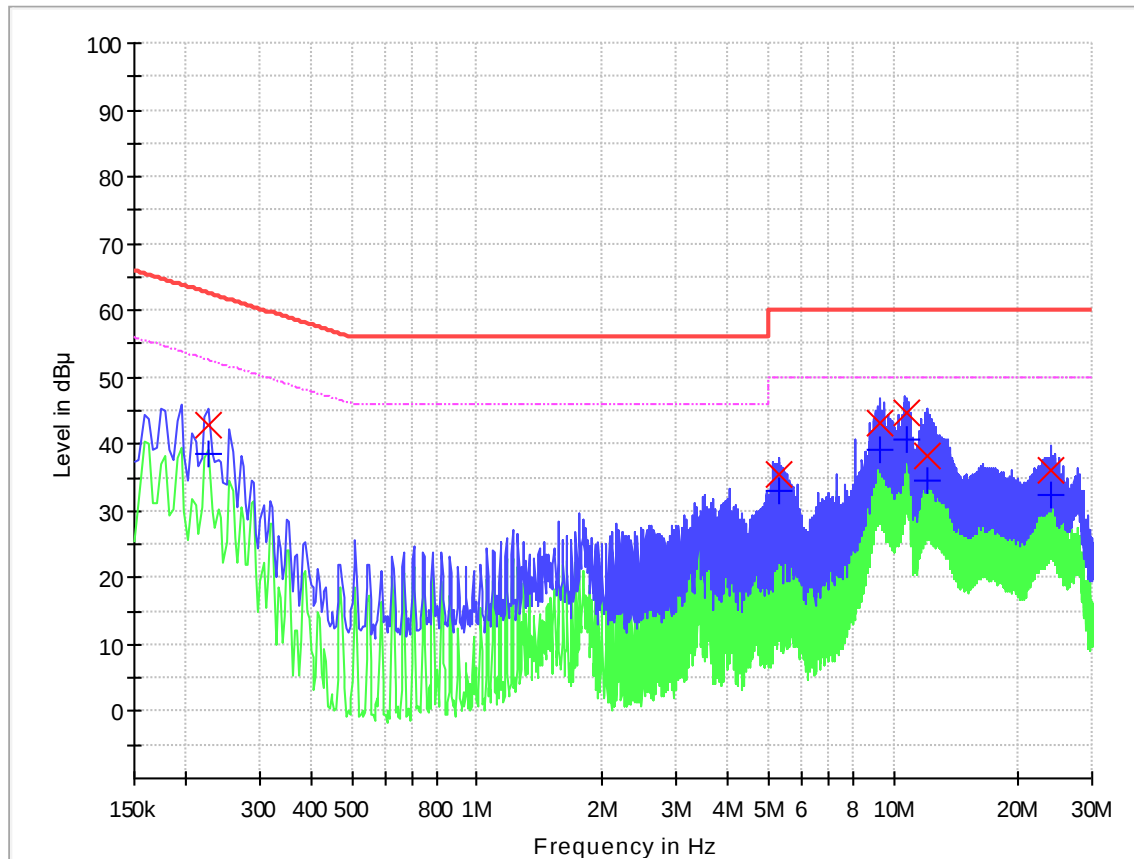
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.190000	51.9	51.0	9.000	N	30.3	27.1	79.0	15.0	66.0
1.622000	41.9	36.4	9.000	N	29.5	31.1	73.0	23.6	60.0
4.930000	50.9	49.0	9.000	N	29.7	22.1	73.0	11.0	60.0
6.110000	50.1	45.7	9.000	N	29.7	22.9	73.0	14.3	60.0
10.782000	46.3	44.1	9.000	N	29.8	26.7	73.0	15.9	60.0
27.682000	57.9	53.3	9.000	N	29.9	15.1	73.0	6.7	60.0

TEST REPORT

Charging mode

L1 line:

Test Curve:



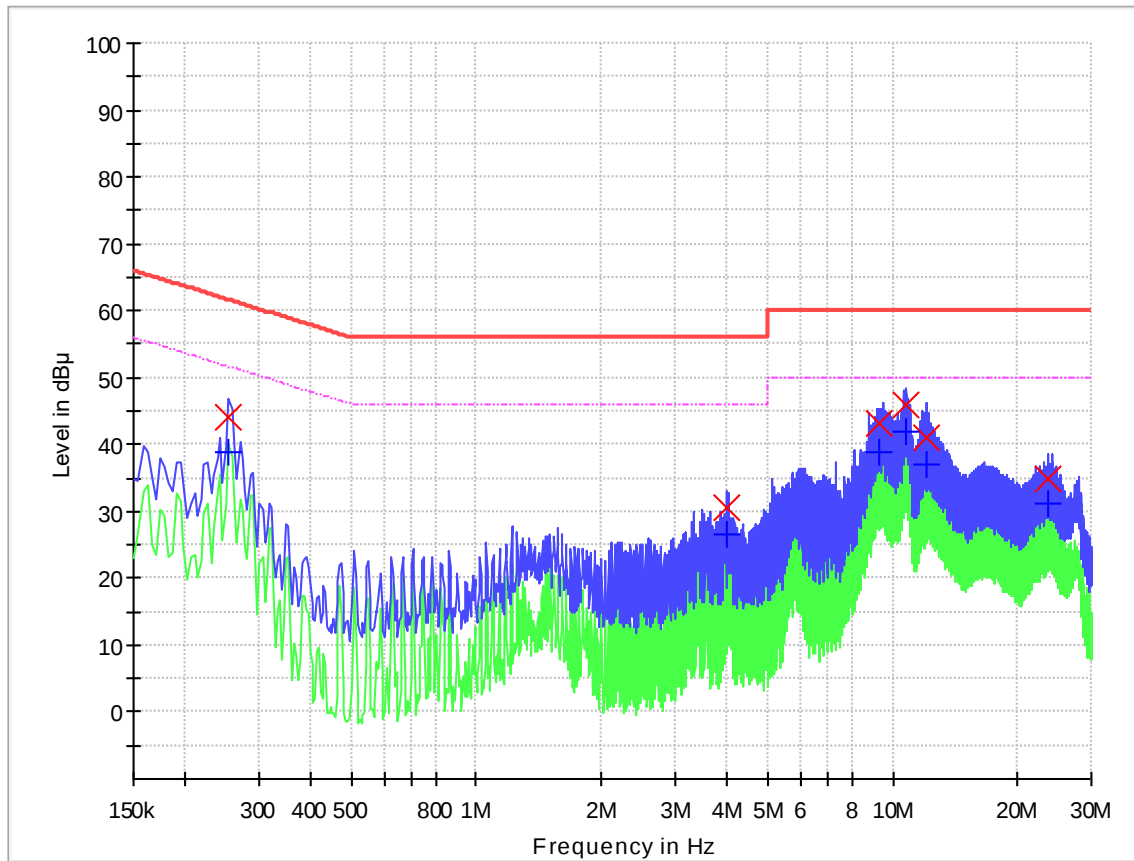
Test Data:

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.226000	43.0	38.7	9.000	L1	9.9	19.6	62.6	13.9	52.6
5.286000	35.5	32.9	9.000	L1	10.1	24.5	60.0	17.1	50.0
9.246000	43.2	39.1	9.000	L1	10.2	16.8	60.0	10.9	50.0
10.786000	44.7	40.7	9.000	L1	10.2	15.3	60.0	9.3	50.0
12.038000	38.3	34.4	9.000	L1	10.3	21.7	60.0	15.6	50.0
23.966000	36.1	32.3	9.000	L1	10.6	23.9	60.0	17.7	50.0

Charging mode

L2 line:

Test Curve:



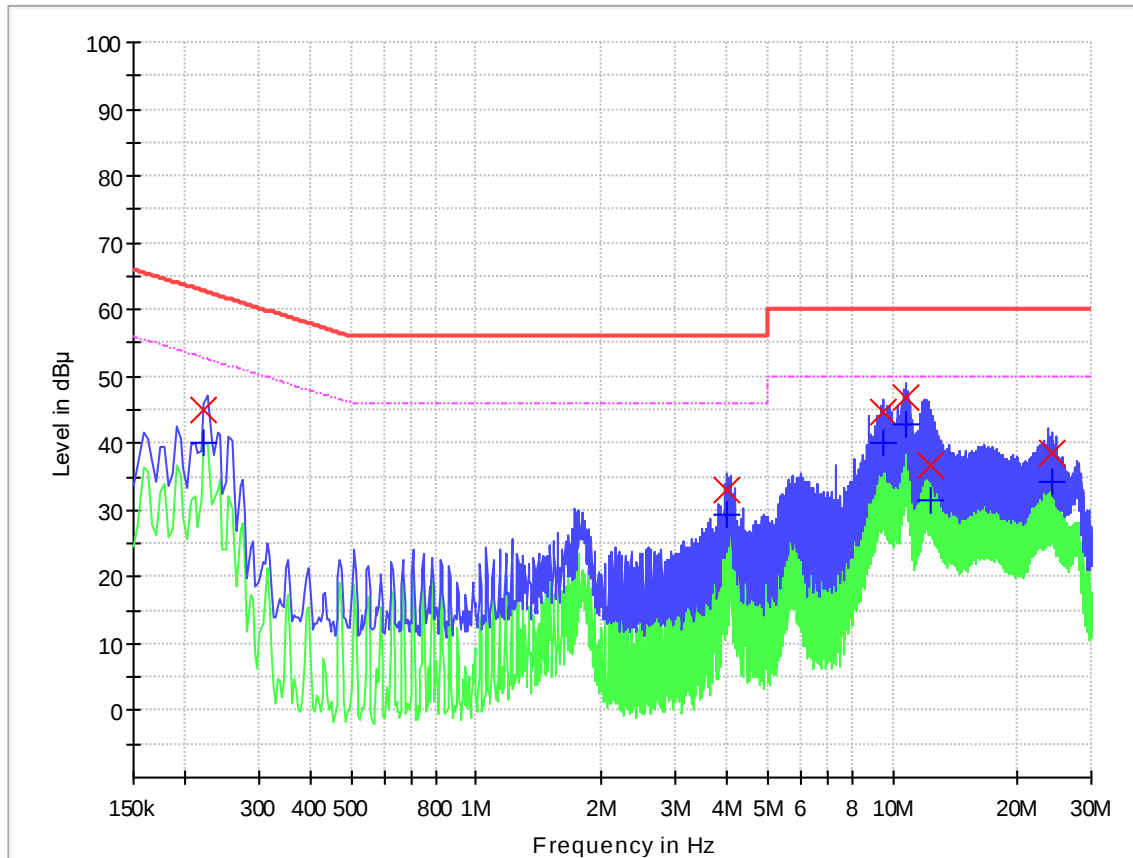
Test Data:

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.254000	44.2	38.8	9.000	L2	9.9	17.4	61.6	12.8	51.6
3.998000	30.6	26.6	9.000	L2	10.0	25.4	56.0	19.4	46.0
9.282000	43.1	39.0	9.000	L2	10.2	16.9	60.0	11.0	50.0
10.782000	45.9	42.0	9.000	L2	10.2	14.1	60.0	8.0	50.0
12.034000	41.0	37.0	9.000	L2	10.3	19.0	60.0	13.0	50.0
23.710000	34.7	31.1	9.000	L2	10.6	25.3	60.0	18.9	50.0

Charging mode

L3 line:

Test Curve:



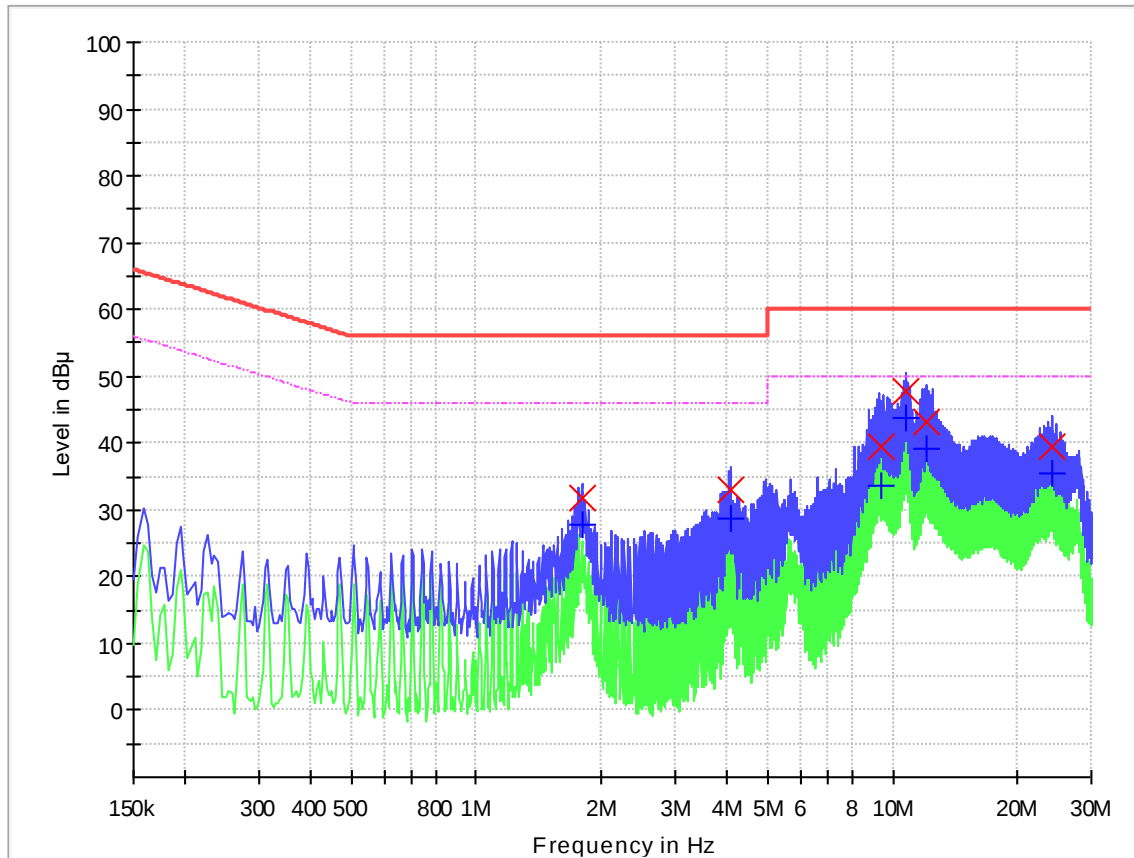
Test Data:

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.222000	44.9	40.2	9.000	L3	10.0	17.9	62.7	12.6	52.7
3.998000	32.9	29.3	9.000	L3	10.0	23.1	56.0	16.7	46.0
9.534000	44.7	40.1	9.000	L3	10.2	15.3	60.0	9.9	50.0
10.754000	46.8	42.7	9.000	L3	10.3	13.2	60.0	7.3	50.0
12.266000	36.7	31.6	9.000	L3	10.3	23.3	60.0	18.4	50.0
24.286000	38.5	34.2	9.000	L3	10.6	21.5	60.0	15.8	50.0

Charging mode

N line:

Test Curve:



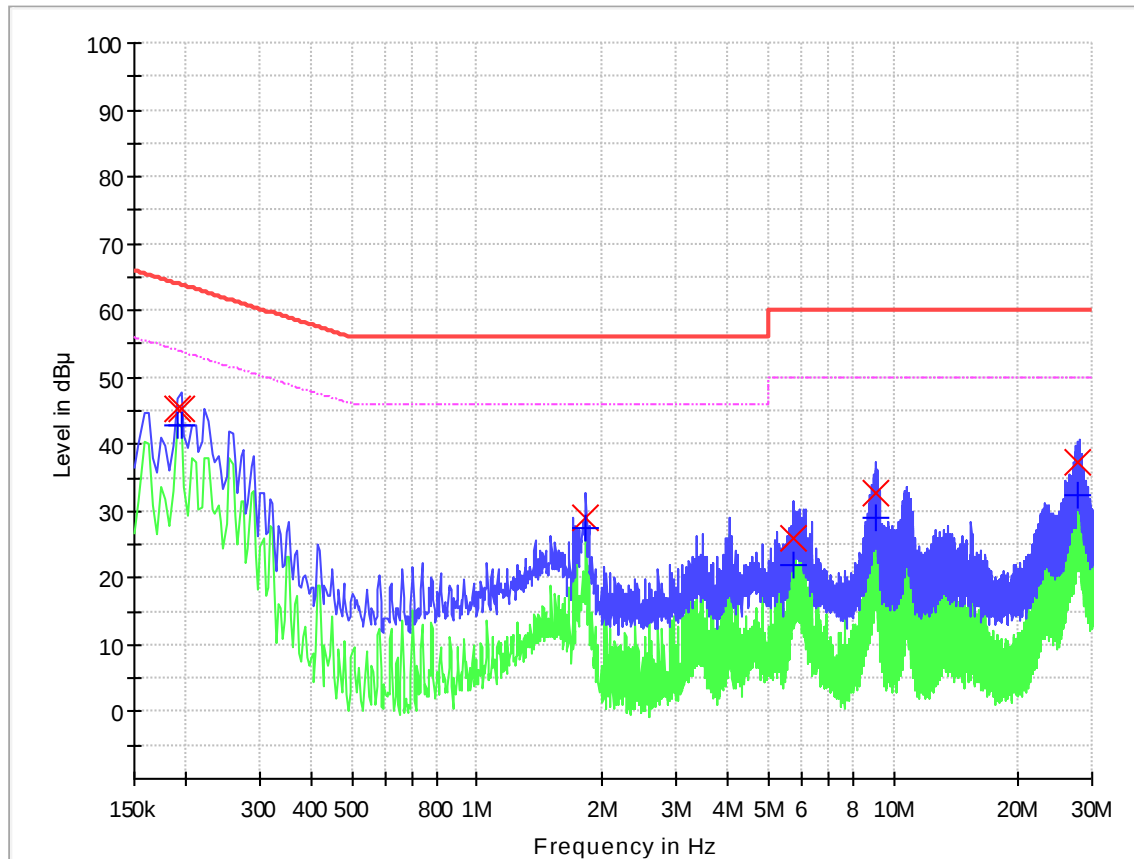
Test Data:

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
1.790000	31.9	27.6	9.000	N	10.0	24.1	56.0	18.4	46.0
4.066000	32.9	28.6	9.000	N	10.0	23.1	56.0	17.4	46.0
9.418000	39.5	33.5	9.000	N	10.2	20.5	60.0	16.5	50.0
10.754000	47.8	43.9	9.000	N	10.3	12.2	60.0	6.1	50.0
12.002000	43.2	39.3	9.000	N	10.3	16.8	60.0	10.7	50.0
24.194000	39.4	35.5	9.000	N	10.7	20.6	60.0	14.5	50.0

Discharging mode

L1 line:

Test Curve:



Test Data:

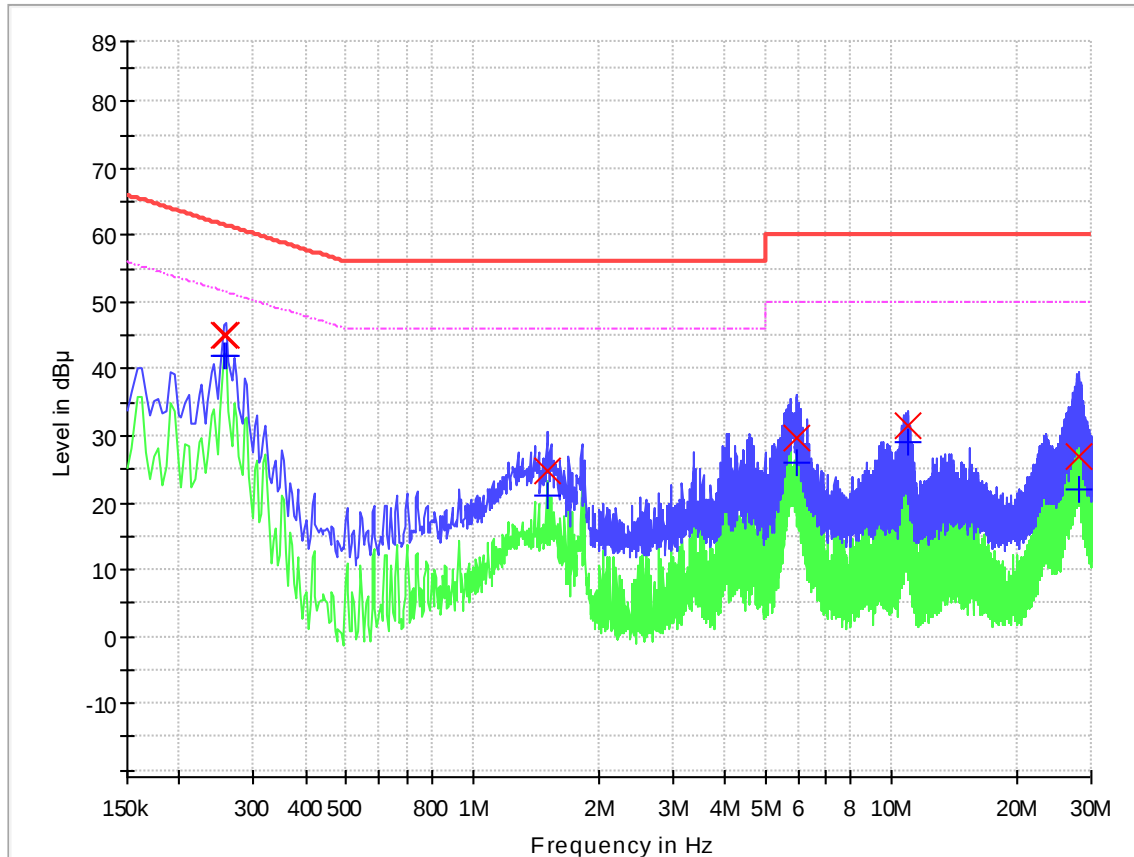
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.190000	45.2	42.8	9.000	L1	9.9	18.9	64.0	11.3	54.0
0.194000	45.4	42.8	9.000	L1	9.9	18.5	63.9	11.1	53.9
1.826000	29.1	27.4	9.000	L1	10.0	26.9	56.0	18.6	46.0
5.758000	25.8	21.8	9.000	L1	10.1	34.2	60.0	28.2	50.0
9.086000	32.6	28.9	9.000	L1	10.2	27.4	60.0	21.1	50.0
27.838000	37.2	32.5	9.000	L1	10.7	22.8	60.0	17.5	50.0

TEST REPORT

Discharging mode

L2 line:

Test Curve:



Test Data:

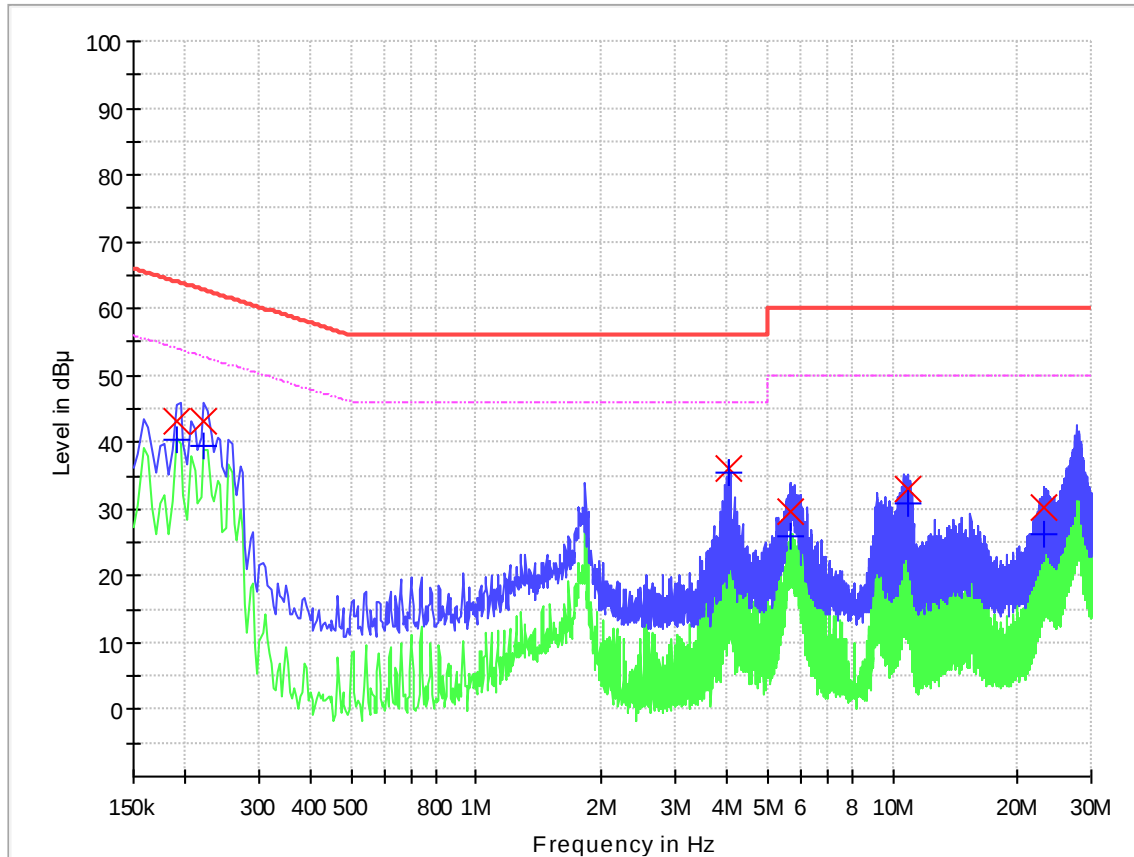
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.254000	44.9	42.1	9.000	L2	9.9	16.7	61.6	9.5	51.6
0.258000	45.1	42.1	9.000	L2	9.9	16.4	61.5	9.4	51.5
1.506000	24.8	21.0	9.000	L2	10.0	31.2	56.0	25.0	46.0
5.954000	29.8	26.0	9.000	L2	10.1	30.2	60.0	24.0	50.0
10.914000	31.5	29.1	9.000	L2	10.2	28.5	60.0	20.9	50.0
28.014000	26.8	22.1	9.000	L2	10.7	33.2	60.0	27.9	50.0

TEST REPORT

Discharging mode

L3 line:

Test Curve:



Test Data:

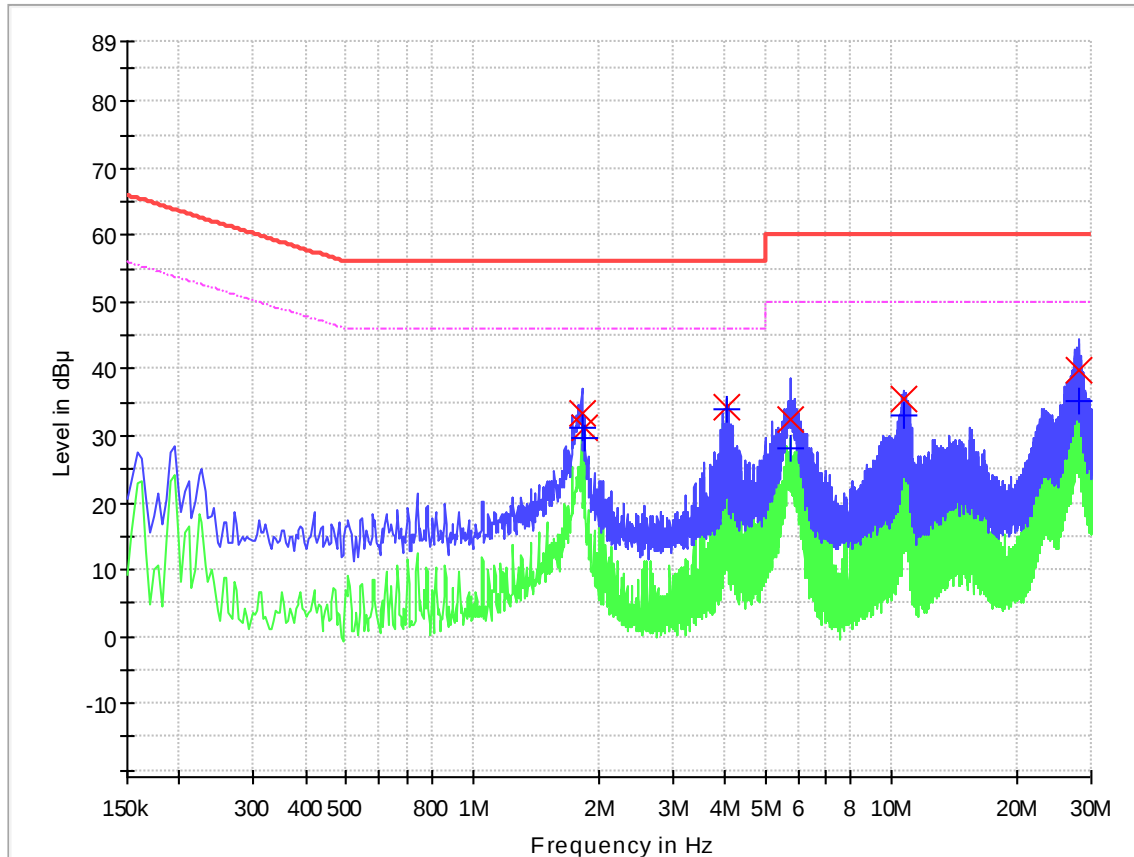
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.190000	43.2	40.3	9.000	L3	9.9	20.8	64.0	13.7	54.0
0.222000	43.2	39.6	9.000	L3	10.0	19.5	62.7	13.2	52.7
4.030000	36.0	35.4	9.000	L3	10.0	20.0	56.0	10.6	46.0
5.698000	29.6	25.9	9.000	L3	10.1	30.4	60.0	24.1	50.0
10.914000	33.0	30.8	9.000	L3	10.3	27.0	60.0	19.2	50.0
23.170000	30.2	26.3	9.000	L3	10.6	29.8	60.0	23.7	50.0

TEST REPORT

Discharging mode

N line:

Test Curve:



Test Data:

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
1.822000	33.5	31.2	9.000	N	10.0	22.5	56.0	14.8	46.0
1.858000	31.3	29.8	9.000	N	10.0	24.7	56.0	16.2	46.0
4.030000	34.2	33.8	9.000	N	10.0	21.8	56.0	12.2	46.0
5.730000	32.6	28.3	9.000	N	10.1	27.4	60.0	21.7	50.0
10.722000	35.7	33.0	9.000	N	10.3	24.3	60.0	17.0	50.0
27.938000	39.8	35.2	9.000	N	10.7	20.2	60.0	14.8	50.0

4 Radiated emission

Test result: **PASS**

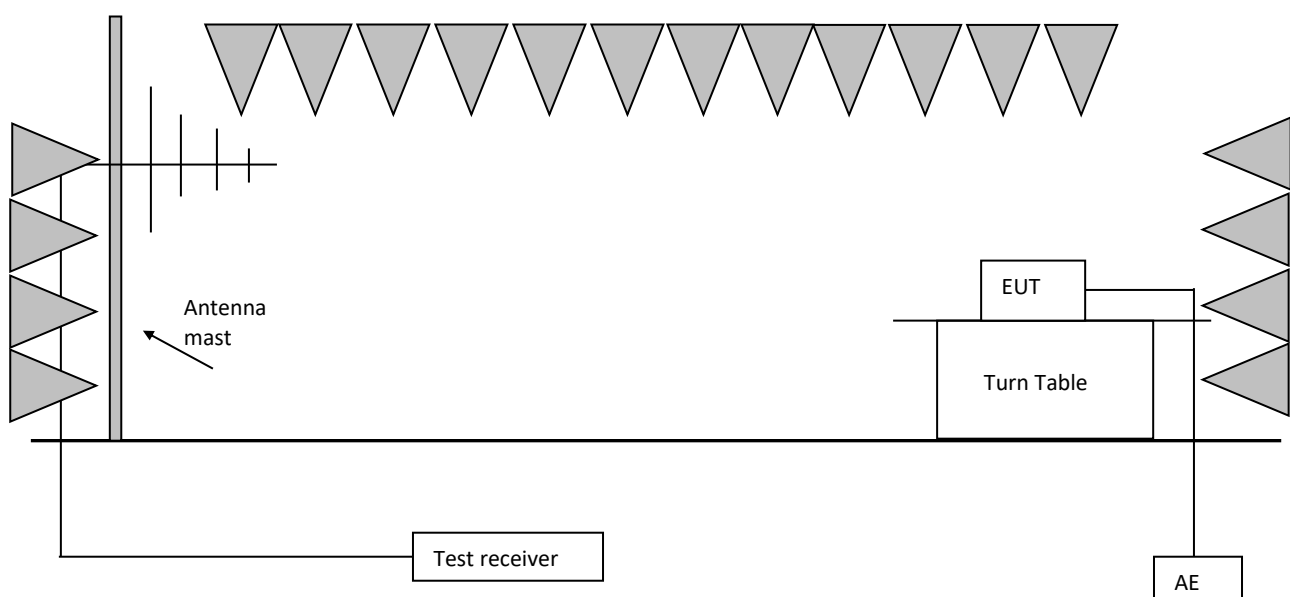
4.1 Limits

Frequency range (MHz)	Limit in dBuV/m (Quasi-peak) Of measurement distance 3m	Limit in dBuV/m (Quasi-peak) Of measurement distance 10m
30-230	40	30
230-1000	47	37
Note: 1. for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades. 2. The gray rows are selected items. 3. If the internal emission source is operating at a frequency below 9kHz then measurements need only to be performed up to 230MHz.		

1-6GHz:

Frequency range (GHz)	Average limit in dBuV/m Of measurement distance 3m	Peak limit in dBuV/m Of measurement distance 3m
1-3	50	70
3-6	54	74
Note: 1. for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.		

4.2 Block diagram of test set up



4.3 Test Procedure

The measurement was applied in a semi-anechoic chamber.

Measurement was performed according to CISPR 16-2-3.

Setting of EUT is according to CISPR 16-2-3.

The bandwidth setting on R&S Test Receiver ESI26 was 120 kHz.

The frequency range from 30MHz to 1000MHz was checked.

The bandwidth setting on R&S Test Receiver ESI26 was 1MHz.

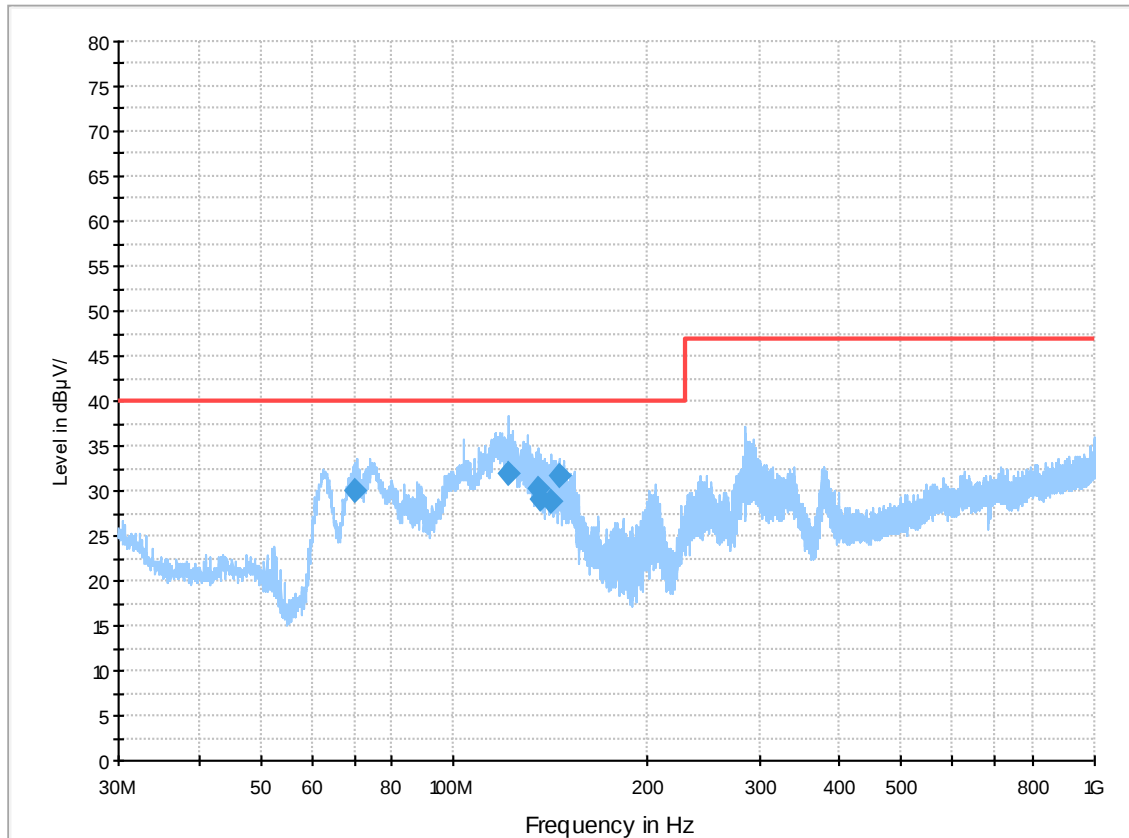
The frequency range from 1000MHz to 6000MHz was checked.

4.4 Test Result

Charging mode

Test Curve:

Horizontal polarization



Test Data:

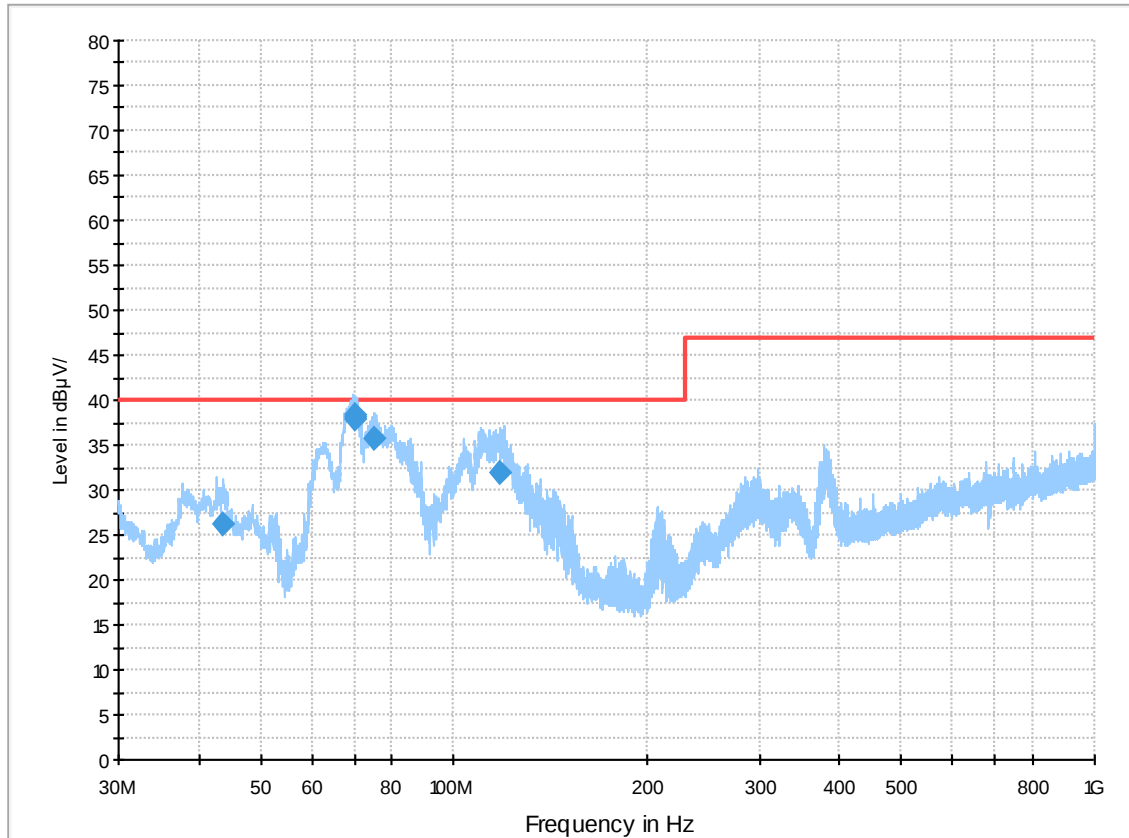
Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
70.360000	29.9	120.000	400.0	H	261.0	6.0	10.1	40.0
122.240000	31.8	120.000	261.0	H	72.0	12.5	8.2	40.0
136.000000	30.3	120.000	297.0	H	70.0	11.9	9.7	40.0
136.600000	29.0	120.000	207.0	H	84.0	11.9	11.0	40.0
142.480000	28.7	120.000	207.0	H	72.0	11.4	11.3	40.0
145.840000	31.6	120.000	183.0	H	73.0	11.3	8.4	40.0

TEST REPORT

Charging mode

Test Curve:

Vertical polarization



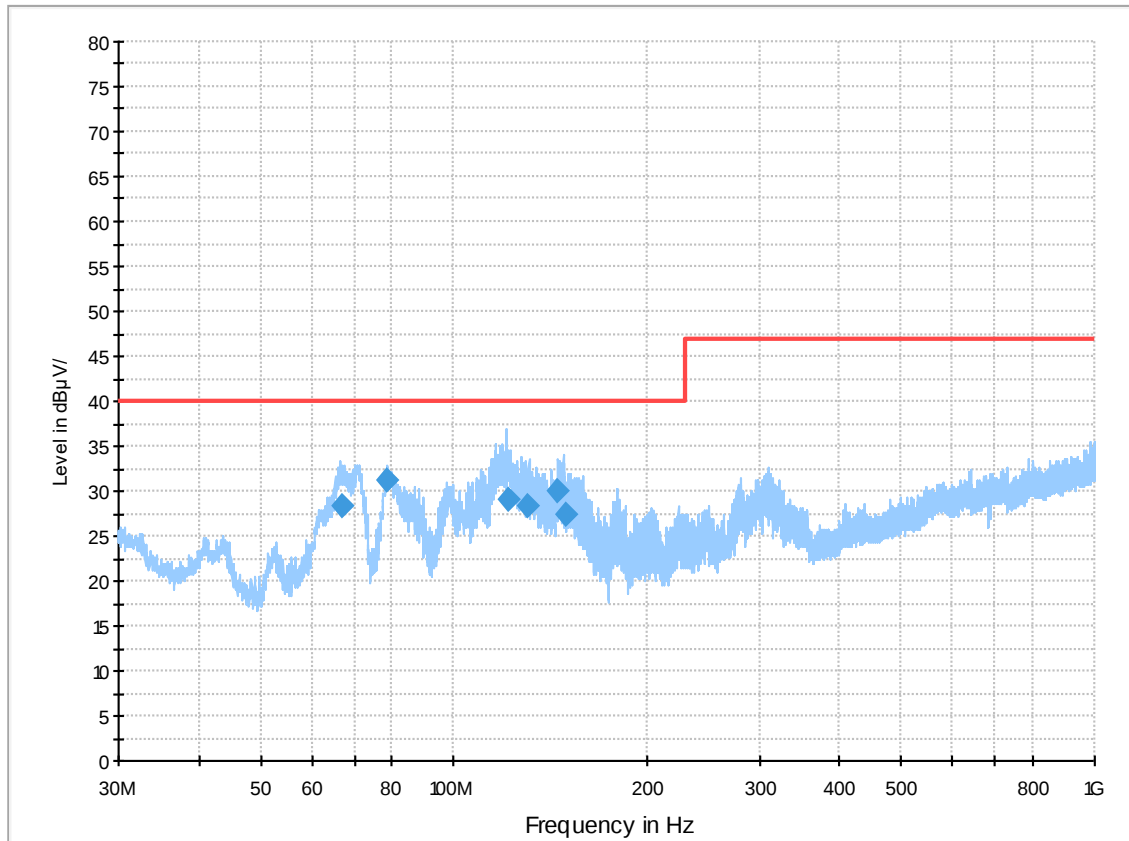
Test Data:

Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
43.720000	26.2	120.000	100.1	V	116.0	10.5	13.8	40.0
70.240000	38.0	120.000	144.1	V	225.0	6.0	2.0	40.0
70.280000	38.2	120.000	161.1	V	226.0	6.0	1.8	40.0
70.360000	38.3	120.000	160.1	V	226.0	6.0	1.7	40.0
75.160000	35.7	120.000	149.9	V	200.0	6.4	4.3	40.0
117.760000	31.9	120.000	100.1	V	142.0	12.5	8.1	40.0

Discharging mode

Test Curve:

Horizontal polarization



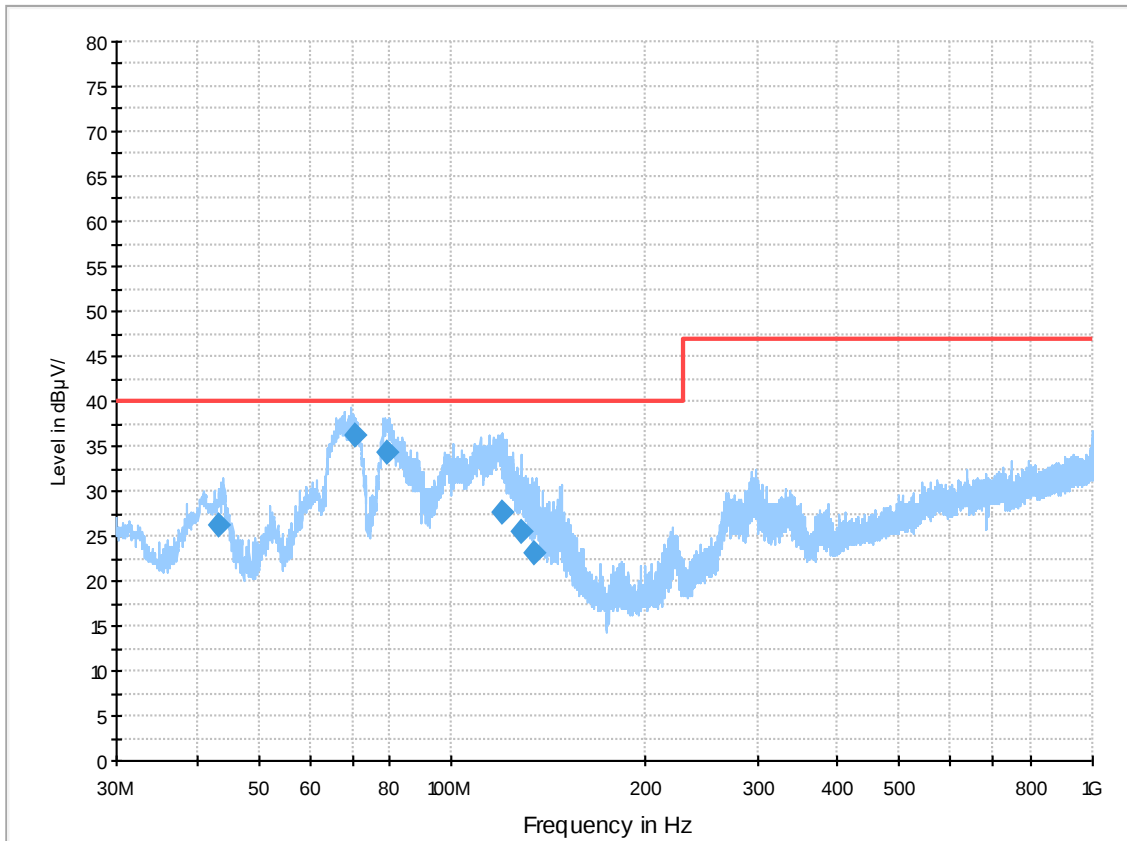
Test Data:

Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
66.800000	28.4	120.000	384.0	H	279.0	5.9	11.6	40.0
79.000000	31.3	120.000	236.0	H	56.0	6.9	8.7	40.0
121.800000	29.0	120.000	295.0	H	232.0	12.5	11.0	40.0
130.040000	28.4	120.000	250.0	H	73.0	12.2	11.6	40.0
145.760000	29.9	120.000	250.0	H	82.0	11.3	10.1	40.0
149.200000	27.3	120.000	249.9	H	82.0	11.1	12.7	40.0

Discharging mode

Test Curve:

Vertical polarization



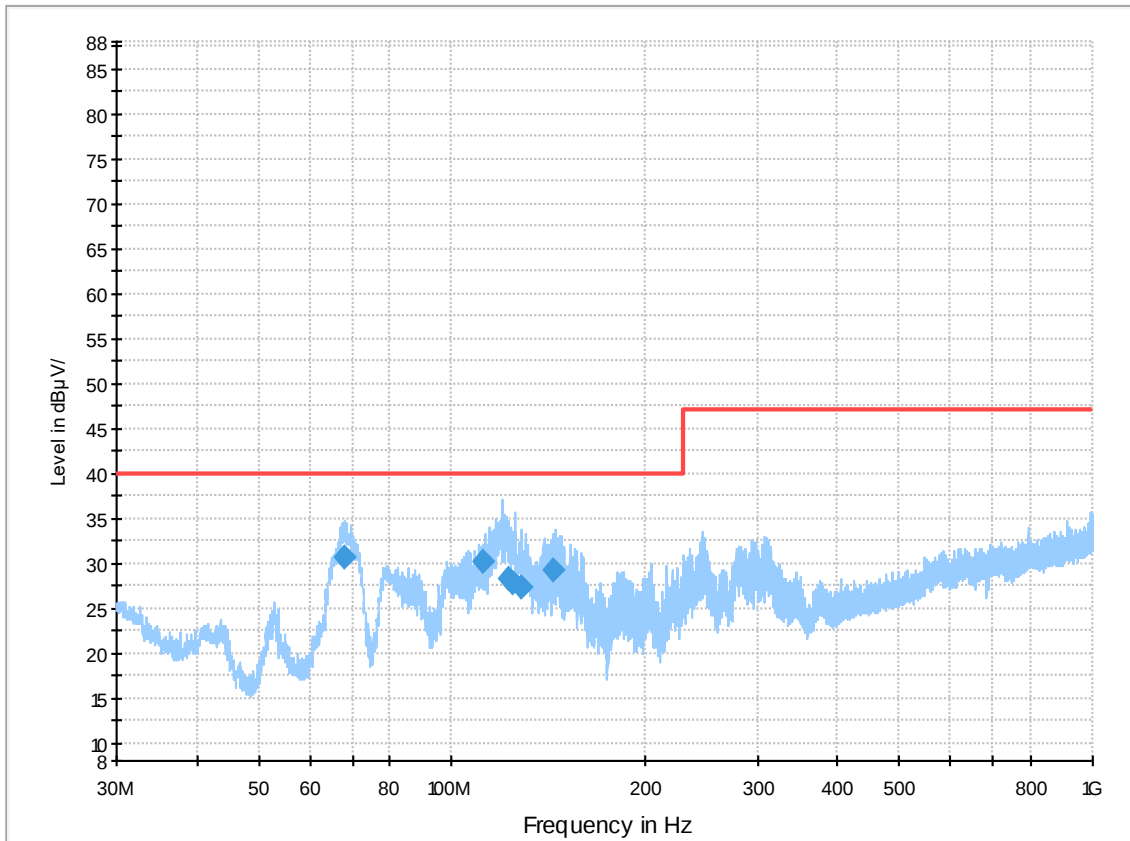
Test Data:

Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
43.480000	26.1	120.000	100.0	V	109.0	10.7	13.9	40.0
70.920000	36.1	120.000	160.0	V	225.0	6.0	3.9	40.0
79.040000	34.3	120.000	150.0	V	181.0	6.9	5.7	40.0
119.560000	27.7	120.000	150.0	V	143.0	12.6	12.3	40.0
128.840000	25.6	120.000	100.0	V	225.0	12.3	14.4	40.0
134.160000	23.1	120.000	100.0	V	171.0	12.0	16.9	40.0

Off grid mode

Test Curve:

Horizontal polarization



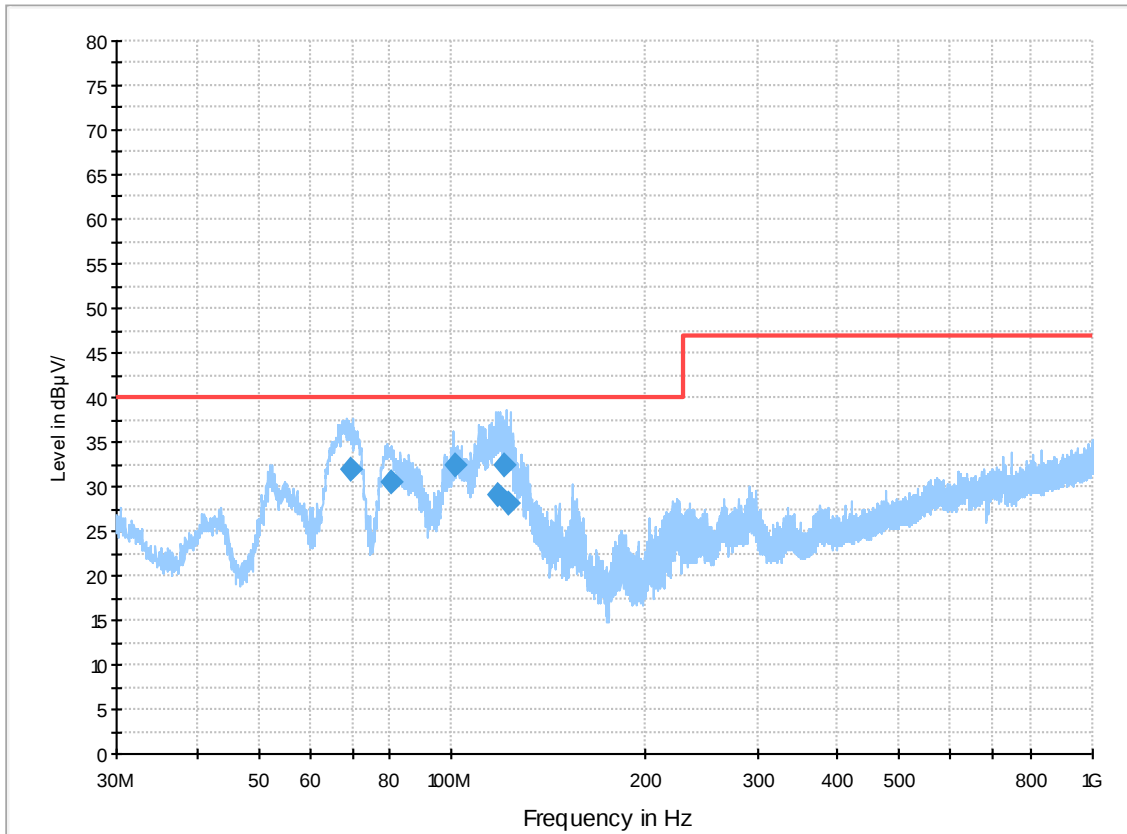
Test Data:

Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
67.840000	30.5	120.000	399.9	H	241.0	5.9	9.5	40.0
112.240000	30.1	120.000	318.1	H	63.0	12.2	9.9	40.0
122.280000	28.1	120.000	296.1	H	232.0	12.5	11.9	40.0
124.360000	27.9	120.000	150.1	H	252.0	12.5	12.1	40.0
128.760000	27.3	120.000	172.0	H	64.0	12.3	12.7	40.0
144.600000	29.3	120.000	250.0	H	74.0	11.3	10.7	40.0

Off grid mode

Test Curve:

Vertical polarization



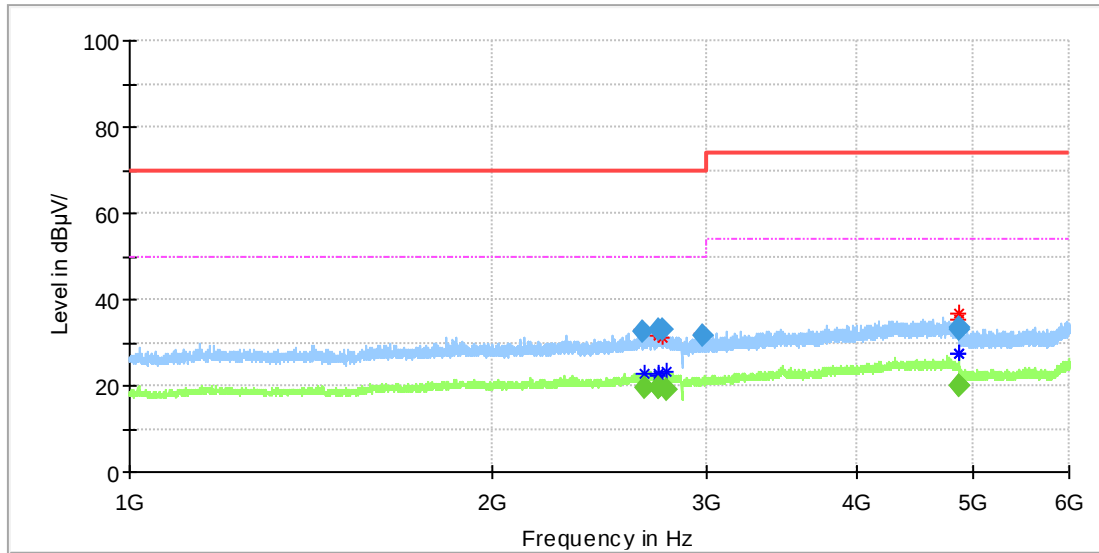
Test Data:

Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
69.560000	32.0	120.000	150.0	V	315.0	5.9	8.0	40.0
80.400000	30.4	120.000	100.0	V	225.0	7.1	9.6	40.0
101.480000	32.3	120.000	149.9	V	100.0	11.0	7.7	40.0
117.680000	29.0	120.000	112.1	V	91.0	12.5	11.0	40.0
121.280000	32.4	120.000	100.0	V	135.0	12.5	7.6	40.0
123.120000	28.0	120.000	100.0	V	135.0	12.5	12.0	40.0

1-6GHz

Test Curve:

Horizontal polarization



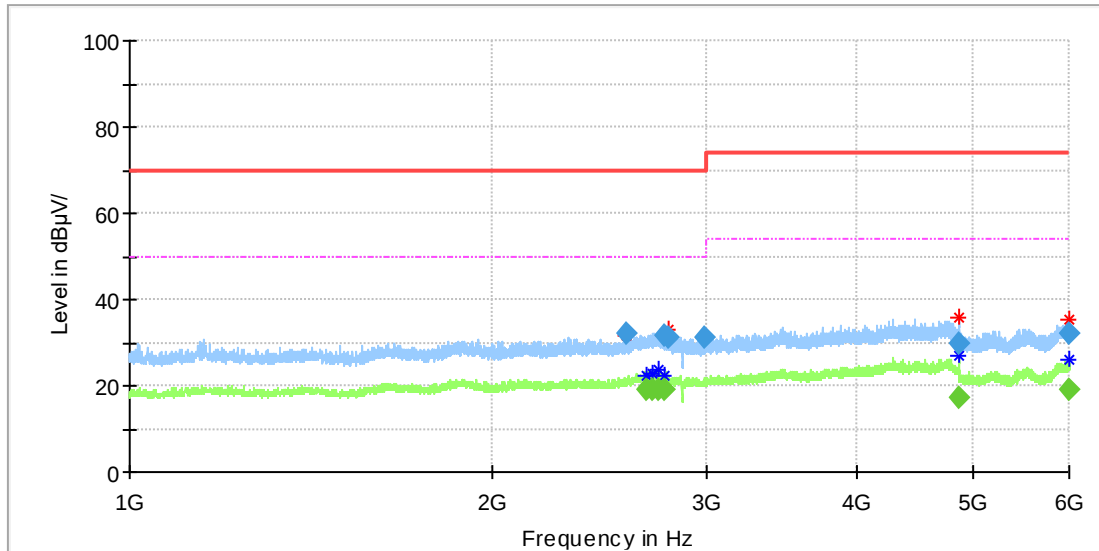
Final Result

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2654.500000	32.59	---	70.00	37.41	1000.0	1000.000	100.0	H	-99.0
2670.500000	---	19.44	50.00	30.56	1000.0	1000.000	200.0	H	180.0
2737.833333	---	19.36	50.00	30.64	1000.0	1000.000	200.0	H	-44.0
2738.166667	32.86	---	70.00	37.14	1000.0	1000.000	200.0	H	180.0
2738.333333	---	19.41	50.00	30.59	1000.0	1000.000	200.0	H	180.0
2760.166667	32.96	---	70.00	37.04	1000.0	1000.000	100.0	H	-180.0
2787.666667	---	19.05	50.00	30.95	1000.0	1000.000	200.0	H	15.0
2979.833333	31.63	---	70.00	38.37	1000.0	1000.000	200.0	H	180.0
4861.166667	32.87	---	74.00	41.13	1000.0	1000.000	100.0	H	-175.0
4863.166667	33.54	---	74.00	40.46	1000.0	1000.000	100.0	H	-41.0
4863.166667	---	20.02	54.00	33.98	1000.0	1000.000	100.0	H	-41.0
4864.666667	---	20.03	54.00	33.97	1000.0	1000.000	200.0	H	-129.0

1-6GHz

Test Curve:

Vertical polarization



Final Result

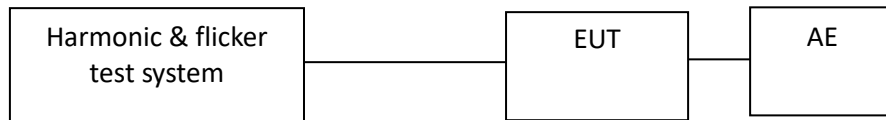
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2583.833333	32.07	---	70.00	37.93	1000.0	1000.000	200.0	V	180.0
2681.333333	---	18.94	50.00	31.06	1000.0	1000.000	100.0	V	-180.0
2714.833333	---	19.19	50.00	30.81	1000.0	1000.000	100.0	V	-180.0
2737.833333	---	19.29	50.00	30.71	1000.0	1000.000	100.0	V	-53.0
2771.000000	---	19.08	50.00	30.92	1000.0	1000.000	200.0	V	180.0
2771.333333	31.80	---	70.00	38.20	1000.0	1000.000	200.0	V	178.0
2791.666667	31.21	---	70.00	38.79	1000.0	1000.000	200.0	V	112.0
2994.500000	31.19	---	70.00	38.81	1000.0	1000.000	200.0	V	51.0
4863.000000	29.94	---	74.00	44.06	1000.0	1000.000	200.0	V	158.0
4864.666667	---	17.30	54.00	36.70	1000.0	1000.000	200.0	V	112.0
6000.000000	31.96	---	74.00	42.04	1000.0	1000.000	100.0	V	-145.0
6000.000000	---	19.07	54.00	34.93	1000.0	1000.000	200.0	V	-31.0

Note: The worst test mode was evaluated by 1-6G above the emission test.

5 Harmonic current emission

Test result: **PASS**

5.1 Test Setup



5.2 Test Procedure

Harmonics of the fundamental current were measured up to 40 order harmonics using a digital power meter with an analogue output and frequency analyzer which was integrated in the harmonic & flicker test system. The measurements were carried out under steady conditions.

☐ Measuring instrumentation according to IEC 61000-4-7:2002+A1:2008

☐ This product is not defined as lighting equipment, and has rated power less than 75W, therefore, no limit applies according to EN 61000-3-2

☐ The EUT is kitchen machines as listed in the scope of IEC 60335-2-14, therefore, is deemed to conform to the harmonic current limits of this standard without further testing.

5.3 Test limit

TEST REPORT

5.3.1 Limits for equipment with input current $\leq 16A$ per phase

Harmonic order n	Maximum permissible harmonic current A
Odd harmonics	
3	2,30
5	1,14
7	0,77
9	0,40
11	0,33
13	0,21
$15 \leq n \leq 39$	$0,15 \frac{15}{n}$
Even harmonics	
2	1,08
4	0,43
6	0,30
$8 \leq n \leq 40$	$0,23 \frac{8}{n}$

5.3.2 Limits for equipment with input current $> 16A$ and $\leq 75A$ per phase

☐ Current emission limits for professional equipment with $I_{1max} \leq 75 A$ other than balanced three-phase equipment

Minimal R_{sce}	Admissible individual harmonic current I_n/I_1^a %						Admissible harmonic current distortion factors %	
	I_3	I_5	I_7	I_9	I_{11}	I_{13}	THD	$PWHD$
33	21,6	10,7	7,2	3,8	3,1	2	23	23
66	24	13	8	5	4	3	26	26
120	27	15	10	6	5	4	30	30
250	35	20	13	9	8	6	40	40
≥ 350	41	24	15	12	10	8	47	47
NOTE 1 The relative values of even harmonics up to order 12 must not exceed $16/n$ %. Even harmonics above order 12 are taken into account in THD and $PWHD$ in the same way as odd order harmonics.								
NOTE 2 Linear interpolation between successive R_{sce} values are permitted.								
^a I_1 = reference fundamental current; I_n = harmonic current component.								

☐ Current emission limits for professional balanced three-phase equipment
with $I_{1\max} \leq 75 \text{ A}$

Minimal R_{scs}	Admissible individual harmonic current I_n/I_1^a				Admissible harmonic current distortion factors	
	%				%	
	I_5	I_7	I_{11}	I_{13}	THD	$PWHD$
33	10,7	7,2	3,1	2	13	22
66	14	9	5	3	16	25
120	19	12	7	4	22	28
250	31	20	12	7	37	38
≥ 350	40	25	15	10	48	46
NOTE 1 The relative values of even harmonics up to order 12 must not exceed $16/n$ %. Even harmonics above order 12 are taken into account in THD and $PWHD$ in the same way as odd order harmonics.						
NOTE 2 Linear interpolation between successive R_{scs} values are permitted.						
^a I_1 = reference fundamental current; I_n = harmonic current component.						

☐ Current emission limits for professional balanced three-phase equipment
with $I_{1\max} \leq 75 \text{ A}$ under specified conditions

Minimal R_{scs}	Admissible individual harmonic current I_n/I_1^a				Admissible harmonic current distortion factors	
	%				%	
	I_5	I_7	I_{11}	I_{13}	THD	$PWHD$
33	10,7	7,2	3,1	2	13	22
≥ 120	40	25	15	10	48	46
NOTE 1 The relative values of even harmonics up to order 12 must not exceed $16/n$ %. Even harmonics above order 12 are taken into account in THD and $PWHD$ in the same way as odd order harmonics.						
NOTE 2 Linear interpolation between successive R_{scs} values are permitted.						
^a I_1 = reference fundamental current; I_n = harmonic current component.						

5.4 Test Result

100 % of nominal power

Charging mode

L1:

Normal Mode

Uover:■■■■

PLL Source: U2

YOKOGAWA

Iover:■■■■

Integ:Reset

change items

PLL	U2	Or.	I1 [A]	hdf[%]	Or.	I1 [A]	hdf[%]
Freq	49.995 Hz		42.796		dc	-0.086	-0.202
		1	42.780	99.991	2	0.210	0.491
Urms1	234.147 V	3	0.305	0.712	4	0.077	0.180
Irms1	42.796 A	5	0.316	0.739	6	0.037	0.086
P1	-10.014kW	7	0.179	0.418	8	0.018	0.042
S1	10.020kVA	9	0.039	0.091	10	0.013	0.031
Q1	-0.346kvar	11	0.088	0.206	12	0.030	0.070
λ1	-0.99940	13	0.048	0.113	14	0.024	0.057
φ1	181.979 °	15	0.037	0.085	16	0.016	0.037
Uthd1	0.362 %	17	0.034	0.080	18	0.018	0.043
Ithd1	1.336 %	19	0.055	0.128	20	0.012	0.028
Pthd1	0.000 %	21	0.010	0.023	22	0.003	0.006
Uthf1	0.404 %	23	0.068	0.159	24	0.014	0.032
Ithf1	0.713 %	25	0.083	0.193	26	0.009	0.021
Utif1	17.832	27	0.004	0.010	28	0.006	0.013
Itif1	28.809	29	0.070	0.164	30	0.012	0.029
		31	0.071	0.167	32	0.008	0.019
		33	0.016	0.037	34	0.008	0.019
		35	0.058	0.135	36	0.012	0.027
		37	0.063	0.147	38	0.009	0.022
		39	0.025	0.057	40	0.012	0.027

Σ A(3P4W)

U1 300Vrms

I1 10Arms

U2 300Vrms

I2 10Arms

U3 300Vrms

I3 10Arms

Element4

U4 300Vrms

I4 1Arms

Integ:Reset

Time

-----:--:--

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Update 3334

L2:

Normal Mode		Uover: ■ ■ ■ ■		PLL Source: U2		YOKOGAWA ◆	
		Iover: ■ ■ ■ ■		Integ:Reset			
change items							
PLL	U2	Or.	I2 [A]	hdf[%]	Or.	I2 [A]	hdf[%]
Freq	49.997 Hz		42.816		dc	0.105	0.246
Urms2	234.806 V	1	42.808	99.993	2	0.205	0.480
Irms2	42.816 A	3	0.184	0.430	4	0.023	0.054
P2	-10.048kW	5	0.214	0.500	6	0.004	0.009
S2	10.053kVA	7	0.276	0.644	8	0.014	0.034
Q2	-0.332kvar	9	0.062	0.145	10	0.008	0.018
λ2	-0.99945	11	0.122	0.286	12	0.009	0.022
φ2	181.895 °	13	0.109	0.255	14	0.014	0.034
Uthd2	0.388 %	15	0.015	0.034	16	0.003	0.008
Ithd2	1.177 %	17	0.070	0.163	18	0.014	0.034
Pthd2	0.000 %	19	0.052	0.122	20	0.014	0.033
Uthf2	0.455 %	21	0.017	0.039	22	0.010	0.023
Ithf2	0.594 %	23	0.044	0.103	24	0.015	0.035
Utif2	19.940	25	0.060	0.140	26	0.016	0.038
Itif2	22.867	27	0.025	0.059	28	0.005	0.011
		29	0.044	0.102	30	0.010	0.022
		31	0.043	0.101	32	0.019	0.045
		33	0.028	0.065	34	0.013	0.029
		35	0.029	0.067	36	0.017	0.040
		37	0.036	0.083	38	0.017	0.039
		39	0.027	0.062	40	0.017	0.040
Σ A(3P4W) U1 300Vrms I1 10Arms U2 300Vrms I2 10Arms U3 300Vrms I3 10Arms Element4 U4 300Vrms I4 1Arms Integ:Reset Time -----:--:--							
△PAGE ▾ 2/7				▲PAGE ▾ 1/3			
Update 3422							

L3:

Normal Mode		Uover: ■ ■ ■ ■		PLL Source: U2		YOKOGAWA ◆	
		Iover: ■ ■ ■ ■		Integ:Reset			
change items							
PLL	U2	Or.	I3 [A]	hdf[%]	Or.	I3 [A]	hdf[%]
Freq	49.997 Hz		42.084		dc	-0.048	-0.114
Urms3	234.493 V	1	42.105	99.993	2	0.108	0.256
Irms3	42.084 A	3	0.205	0.487	4	0.051	0.120
P3	-9.862kW	5	0.295	0.702	6	0.014	0.033
S3	9.868kVA	7	0.190	0.451	8	0.019	0.044
Q3	-0.364kvar	9	0.030	0.072	10	0.018	0.042
λ3	-0.99932	11	0.073	0.174	12	0.006	0.014
φ3	182.112 °	13	0.058	0.138	14	0.014	0.034
Uthd3	0.335 %	15	0.031	0.074	16	0.017	0.041
Ithd3	1.149 %	17	0.053	0.126	18	0.013	0.030
Pthd3	0.000 %	19	0.059	0.139	20	0.007	0.017
Uthf3	0.404 %	21	0.021	0.051	22	0.003	0.008
Ithf3	0.782 %	23	0.069	0.163	24	0.009	0.021
Utif3	17.838	25	0.084	0.199	26	0.015	0.037
Itif3	31.752	27	0.021	0.050	28	0.005	0.012
		29	0.079	0.187	30	0.004	0.010
		31	0.081	0.192	32	0.009	0.021
		33	0.025	0.060	34	0.004	0.008
		35	0.060	0.143	36	0.004	0.010
		37	0.070	0.166	38	0.011	0.027
		39	0.028	0.067	40	0.008	0.019
Σ A(3P4W) U1 300Vrms I1 10Arms U2 300Vrms I2 10Arms U3 300Vrms I3 10Arms Element4 U4 300Vrms I4 1Arms Integ:Reset Time -----:--:--							
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Update 3463							

TEST REPORT

50 % of nominal power

Charging mode

L1:

Wide-Band Harmonics

Uover: ■ ■ ■ ■

PLL Source: U1

YOKOGAWA ◆

Iover: ■ ■ ■ ■

change items

PLL	U1	Or.	I1 [A]	hdf[%]	Or.	I1 [A]	hdf[%]	Σ A(3P4W)
Freq	50.000 Hz	Tot.	21.916		dc			U1 300V
		1	21.903	99.943	2	0.384	1.754	I1 100mV
U1	230.751 V	3	0.360	1.642	4	0.085	0.388	U2 300V
I1	21.916 A	5	0.387	1.766	6	0.091	0.418	I2 100mV
P1	-5.0537kW	7	0.237	1.079	8	0.057	0.262	U3 300V
S1	5.0542kVA	9	0.078	0.356	10	0.015	0.066	I3 100mV
Q1	0.0760kvar	11	0.080	0.363	12	0.016	0.075	
λ1	-0.99989	13	0.079	0.358	14	0.017	0.079	
φ1	G 179.138 °	15	0.032	0.145	16	0.007	0.031	Element4
Uthd1	0.186 %	17	0.045	0.204	18	0.010	0.047	U4 300V
Ithd1	3.383 %	19	0.024	0.108	20	0.007	0.031	I4 100mV
Pthd1	0.001 %	21	0.020	0.092	22	0.009	0.039	
Uthf1	0.138 %	23	0.020	0.093	24	0.002	0.009	
Ithf1	1.151 %	25	0.006	0.028	26	0.007	0.031	
Utif1	6.509	27	0.013	0.061	28	0.007	0.033	
Itif1	51.796	29	0.024	0.110	30	0.014	0.064	
		31	0.010	0.044	32	0.005	0.023	
		33	0.020	0.091	34	0.008	0.038	
		35	0.022	0.102	36	0.020	0.092	
		37	0.012	0.054	38	0.001	0.005	
		39	0.021	0.094	40	0.007	0.031	

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Update 543

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Update 543

TEST REPORT

L2:

Wide-Band Harmonics

Uover: ■ ■ ■ ■

PLL Source: U1

YOKOGAWA ◆

Iover: ■ ■ ■ ■

change items

PLL	U1	Or.	I2 [A]	hdf[%]	Or.	I2 [A]	hdf[%]	Σ A(3P4W)
Freq	50.000 Hz	Tot.	21.984		dc			U1 300V
		1	21.971	99.940	2	0.419	1.904	I1 100mV
U2	230.712 V	3	0.301	1.370	4	0.117	0.532	
I2	21.984 A	5	0.402	1.828	6	0.144	0.655	U2 300V
P2	-5.0637kW	7	0.251	1.142	8	0.071	0.322	I2 100mV
S2	5.0684kVA	9	0.055	0.251	10	0.039	0.176	
Q2	0.2202kvar	11	0.091	0.412	12	0.043	0.195	U3 300V
λ2	-0.99906	13	0.071	0.323	14	0.029	0.130	I3 100mV
φ2	G 177.510 °	15	0.023	0.103	16	0.027	0.124	
Uthd2	0.637 %	17	0.047	0.216	18	0.022	0.102	Element4
Ithd2	3.470 %	19	0.035	0.160	20	0.014	0.065	U4 300V
Pthd2	0.008 %	21	0.044	0.202	22	0.015	0.069	I4 100mV
Uthf2	0.146 %	23	0.026	0.117	24	0.009	0.041	
Ithf2	1.237 %	25	0.029	0.133	26	0.005	0.024	
Utif2	6.489	27	0.030	0.136	28	0.018	0.082	
Itif2	53.807	29	0.013	0.060	30	0.003	0.012	
		31	0.018	0.081	32	0.005	0.024	
		33	0.023	0.106	34	0.003	0.014	
		35	0.013	0.059	36	0.033	0.151	
		37	0.009	0.043	38	0.019	0.088	
		39	0.005	0.024	40	0.003	0.014	

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Update 553

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Update 553

L3:

Wide-Band Harmonics

Uover:■■■■

PLL Source: U1

YOKOGAWA ◆

Iover:■■■■

change items

PLL	U1	Or.	I3 [A]	hdf[%]	Or.	I3 [A]	hdf[%]	Σ A(3P4W)
Freq	50.000 Hz	Tot.	21.964		dc			U1 300V
		1	21.953	99.951	2	0.357	1.625	I1 100mV
U3	230.738 V	3	0.299	1.361	4	0.026	0.116	
I3	21.964 A	5	0.364	1.657	6	0.039	0.176	U2 300V
P3	-5.0648kW	7	0.251	1.142	8	0.037	0.166	I2 100mV
S3	5.0654kVA	9	0.077	0.351	10	0.010	0.047	
Q3	0.0767kvar	11	0.092	0.418	12	0.019	0.087	U3 300V
λ3	-0.99989	13	0.081	0.368	14	0.005	0.022	I3 100mV
φ3	G 179.133 °	15	0.020	0.090	16	0.015	0.067	
Uthd3	0.160 %	17	0.037	0.169	18	0.010	0.047	Element4
Ithd3	3.134 %	19	0.038	0.175	20	0.014	0.064	U4 300V
Pthd3	0.000 %	21	0.029	0.132	22	0.013	0.057	I4 100mV
Uthf3	0.170 %	23	0.022	0.098	24	0.014	0.062	
Ithf3	1.415 %	25	0.007	0.033	26	0.014	0.062	
Utif3	8.300	27	0.028	0.125	28	0.012	0.055	
Itif3	66.164	29	0.009	0.043	30	0.017	0.077	
		31	0.013	0.060	32	0.009	0.039	
		33	0.013	0.058	34	0.004	0.018	
		35	0.030	0.137	36	0.034	0.154	
		37	0.031	0.142	38	0.012	0.056	
		39	0.007	0.031	40	0.006	0.026	

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Update 567

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Update 567

TEST REPORT

25 % of nominal power

Charging mode

L1:

Wide-Band Harmonics

Uover:■■■■

PLL Source: U1

YOKOGAWA

Iover:■■■■

change items

PLL	U1	Or.	I1 [A]	hdf[%]	Or.	I1 [A]	hdf[%]
Freq	50.000 Hz	Tot.	10.891		dc		
		1	10.878	99.882	2	0.298	2.737
U1	230.977 V	3	0.104	0.958	4	0.040	0.367
I1	10.891 A	5	0.328	3.010	6	0.063	0.577
P1	-2.5116kW	7	0.150	1.378	8	0.025	0.233
S1	2.5125kVA	9	0.017	0.156	10	0.015	0.137
Q1	0.0687kvar	11	0.046	0.426	12	0.012	0.113
λ1	-0.99963	13	0.048	0.439	14	0.005	0.050
φ1	G 178.434 °	15	0.028	0.256	16	0.013	0.115
Uthd1	0.127 %	17	0.049	0.452	18	0.009	0.087
Ithd1	4.866 %	19	0.042	0.389	20	0.009	0.086
Pthd1	0.000 %	21	0.019	0.170	22	0.003	0.025
Uthf1	0.173 %	23	0.033	0.299	24	0.003	0.028
Ithf1	2.682 %	25	0.033	0.306	26	0.014	0.127
Utif1	7.844	27	0.009	0.086	28	0.005	0.044
Itif1	122.408	29	0.015	0.136	30	0.017	0.155
		31	0.020	0.188	32	0.013	0.115
		33	0.010	0.094	34	0.006	0.055
		35	0.007	0.063	36	0.081	0.746
		37	0.007	0.066	38	0.009	0.084
		39	0.023	0.207	40	0.010	0.096

Σ A(3P4W)

U1 300V

I1 100mV

U2 300V

I2 100mV

U3 300V

I3 100mV

Element4

U4 300V

I4 100mV

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Update 122

TEST REPORT

L2:

Wide-Band Harmonics

Uover:■■■■

PLL Source: U1

YOKOGAWA ◆

Iover:■■■■

change items

PLL	U1	Or.	I2 [A]	hdf[%]	Or.	I2 [A]	hdf[%]	Σ A(3P4W)
Freq	50.000 Hz	Tot.	10.921		dc			U1 300v
		1	10.910	99.895	2	0.199	1.819	I1 100mV
U2	230.876 V	3	0.262	2.402	4	0.099	0.911	
I2	10.921 A	5	0.244	2.237	6	0.096	0.883	U2 300v
P2	-2.5123kW	7	0.151	1.381	8	0.038	0.350	I2 100mV
S2	2.5187kVA	9	0.016	0.147	10	0.021	0.194	
Q2	0.1797kvar	11	0.046	0.421	12	0.010	0.091	U3 300v
λ2	-0.99745	13	0.037	0.341	14	0.010	0.088	I3 100mV
φ2	G 175.909 °	15	0.029	0.267	16	0.004	0.034	
Uthd2	0.600 %	17	0.036	0.326	18	0.028	0.257	Element4
Ithd2	4.585 %	19	0.038	0.348	20	0.009	0.081	U4 300v
Pthd2	0.004 %	21	0.016	0.144	22	0.011	0.098	I4 100mV
Uthf2	0.147 %	23	0.013	0.117	24	0.019	0.172	
Ithf2	2.476 %	25	0.014	0.131	26	0.006	0.054	
Utif2	6.572	27	0.013	0.116	28	0.013	0.121	
Itif2	114.250	29	0.032	0.291	30	0.016	0.149	
		31	0.009	0.086	32	0.009	0.080	
		33	0.020	0.181	34	0.028	0.253	
		35	0.007	0.060	36	0.038	0.345	
		37	0.026	0.238	38	0.009	0.087	
		39	0.016	0.143	40	0.006	0.055	

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Update 168

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Update 168

L3:

Wide-Band Harmonics

Uover:■■■■

PLL Source: U1

YOKOGAWA

Iover:■■■■

change items

PLL	U1	Or.	I3 [A]	hdf[%]	Or.	I3 [A]	hdf[%]	Σ A(3P4W)
Freq	49.999 Hz	Tot.	10.779		dc			U1 300v
		1	10.767	99.890	2	0.265	2.461	I1 100mV
U3	230.934 V	3	0.201	1.863	4	0.056	0.521	
I3	10.779 A	5	0.270	2.501	6	0.074	0.691	U2 300v
P3	-2.4845kW	7	0.147	1.360	8	0.015	0.142	I2 100mV
S3	2.4865kVA	9	0.012	0.115	10	0.015	0.138	
Q3	0.0999kvar	11	0.051	0.469	12	0.008	0.078	U3 300v
λ3	-0.99919	13	0.039	0.362	14	0.030	0.282	I3 100mV
φ3	G 177.698 °	15	0.030	0.278	16	0.011	0.098	
Uthd3	0.199 %	17	0.044	0.410	18	0.019	0.178	Element4
Ithd3	4.683 %	19	0.035	0.327	20	0.020	0.188	U4 300v
Pthd3	0.002 %	21	0.016	0.150	22	0.016	0.151	I4 100mV
Uthf3	0.160 %	23	0.025	0.229	24	0.008	0.071	
Ithf3	2.774 %	25	0.023	0.216	26	0.009	0.085	
Utif3	7.718	27	0.013	0.116	28	0.006	0.059	
Itif3	132.958	29	0.036	0.334	30	0.006	0.059	
		31	0.033	0.305	32	0.014	0.133	
		33	0.005	0.046	34	0.007	0.062	
		35	0.021	0.195	36	0.042	0.393	
		37	0.018	0.165	38	0.002	0.019	
		39	0.004	0.034	40	0.015	0.136	

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Update 196

TEST REPORT

100 % of nominal power

Discharging mode

L1:

Normal Mode		Uover: ■ ■ ■		PLL Source: U2		YOKOGAWA ◆	
		Iover: ■ ■ ■		Integ:Reset			
change items							
PLL	U2	Or.	I1 [A]	hdf[%]	Or.	I1 [A]	hdf[%]
Freq	49.994 Hz		43.597		dc	-0.085	-0.196
Urms1	234.286 V	1	43.583	99.992	2	0.228	0.524
Irms1	43.597 A	3	0.304	0.697	4	0.086	0.198
P1	10.207kW	5	0.327	0.750	6	0.037	0.086
S1	10.213kVA	7	0.169	0.388	8	0.023	0.053
Q1	-0.357kvar	9	0.042	0.097	10	0.013	0.030
λ1	0.99939	11	0.086	0.198	12	0.033	0.076
φ1	182.000 °	13	0.045	0.103	14	-----	-----
Uthd1	0.270 %	15	-----	-----	16	-----	-----
Ithd1	1.260 %	17	-----	-----	18	-----	-----
Pthd1	0.001 %	19	-----	-----	20	-----	-----
Uthf1	0.013 %	21	-----	-----	22	-----	-----
Ithf1	0.156 %	23	-----	-----	24	-----	-----
Utif1	0.454	25	-----	-----	26	-----	-----
Itif1	4.252	27	-----	-----	28	-----	-----
		29	-----	-----	30	-----	-----
		31	-----	-----	32	-----	-----
		33	-----	-----	34	-----	-----
		35	-----	-----	36	-----	-----
		37	-----	-----	38	-----	-----
		39	-----	-----	40	-----	-----

Σ A(3P4W)
U1 300Vrms
I1 10Arms
U2 300Vrms
I2 10Arms
U3 300Vrms
I3 10Arms
Element4
U4 300Vrms
I4 1Arms
Integ:Reset
Time
-----:--:--

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Update 47

L2:

Normal Mode		Uover: ■ ■ ■		PLL Source: U2		YOKOGAWA ◆	
		Iover: ■ ■ ■		Integ:Reset			
change items							
PLL	U2	Or.	I2 [A]	hdf[%]	Or.	I2 [A]	hdf[%]
Freq	50.000 Hz		43.624		dc	0.093	0.212
Urms2	234.921 V	1	43.615	99.992	2	0.238	0.545
Irms2	43.624 A	3	0.316	0.725	4	0.061	0.140
P2	10.242kW	5	0.296	0.678	6	0.009	0.021
S2	10.248kVA	7	0.165	0.378	8	0.009	0.022
Q2	-0.345kvar	9	0.021	0.048	10	0.011	0.026
λ2	0.99943	11	0.072	0.165	12	0.018	0.041
φ2	181.930 °	13	0.038	0.087	14	-----	-----
Uthd2	0.260 %	15	-----	-----	16	-----	-----
Ithd2	1.219 %	17	-----	-----	18	-----	-----
Pthd2	0.000 %	19	-----	-----	20	-----	-----
Uthf2	0.019 %	21	-----	-----	22	-----	-----
Ithf2	0.130 %	23	-----	-----	24	-----	-----
Utif2	0.611	25	-----	-----	26	-----	-----
Itif2	3.504	27	-----	-----	28	-----	-----
		29	-----	-----	30	-----	-----
		31	-----	-----	32	-----	-----
		33	-----	-----	34	-----	-----
		35	-----	-----	36	-----	-----
		37	-----	-----	38	-----	-----
		39	-----	-----	40	-----	-----

Σ A(3P4W)
U1 300Vrms
I1 10Arms
U2 300Vrms
I2 10Arms
U3 300Vrms
I3 10Arms
Element4
U4 300Vrms
I4 1Arms
Integ:Reset
Time
-----:--:--

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PAGE▼ 1/3

Update 72

TEST REPORT

L3:

Normal Mode

change items

Uover: ■ ■ ■ ■

Iover: ■ ■ ■ ■

PLL Source: U2

Integ:Reset

YOKOGAWA ◆

PLL U2

Freq 50.001 Hz

Urms3 234.640 V

Irms3 42.908 A

P3 10.061kW

S3 10.068kVA

Q3 -0.377kvar

λ3 0.99930

φ3 182.147 °

Uthd3 0.226 %

Ithd3 1.041 %

Pthd3 0.000 %

Uthf3 0.011 %

Ithf3 0.160 %

Utif3 0.375

Itif3 4.338

Or.	I3 [A]	hdf[%]	Or.	I3 [A]	hdf[%]
	42.908		dc	-0.060	-0.141
1	42.853	99.994	2	0.115	0.269
3	0.195	0.455	4	0.055	0.128
5	0.310	0.723	6	0.016	0.037
7	0.190	0.443	8	0.015	0.036
9	0.050	0.117	10	0.018	0.042
11	0.083	0.193	12	0.007	0.015
13	0.052	0.121	14	---	---
15	---	---	16	---	---
17	---	---	18	---	---
19	---	---	20	---	---
21	---	---	22	---	---
23	---	---	24	---	---
25	---	---	26	---	---
27	---	---	28	---	---
29	---	---	30	---	---
31	---	---	32	---	---
33	---	---	34	---	---
35	---	---	36	---	---
37	---	---	38	---	---
39	---	---	40	---	---

Σ A(3P4W)

U1 300Vrms

I1 10Arms

U2 300Vrms

I2 10Arms

U3 300Vrms

I3 10Arms

Element4

U4 300Vrms

I4 1Arms

Integ:Reset

Time

-----:--:--

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△PAGE▽ 1/3

Update 92

TEST REPORT

50 % of nominal power

Discharging mode

L1:

Wide-Band Harmonics

Uover: ■ ■ ■ ■

Iover: ■ ■ ■ ■

YOKOGAWA

change items

PLL

U1

Freq

49.999 Hz

U1

230.028 V

I1

21.749 A

P1

4.9998kW

S1

5.0006kVA

Q1

0.0856kvar

λ 1

0.99985

ϕ 1

G 0.981 °

Uthd1

0.302 %

Ithd1

3.183 %

Pthd1

0.003 %

Uthf1

0.214 %

Ithf1

1.591 %

Utif1

9.024

Itif1

71.043

Or.	I1 [A]	hdf[%]	Or.	I1 [A]	hdf[%]
Tot.	21.749		dc		
1	21.738	99.949	2	0.458	2.107
3	0.359	1.652	4	0.082	0.376
5	0.199	0.917	6	0.040	0.186
7	0.117	0.536	8	0.053	0.246
9	0.060	0.277	10	0.038	0.176
11	0.120	0.553	12	0.033	0.150
13	0.052	0.240	14	0.043	0.199
15	0.022	0.102	16	0.026	0.120
17	0.053	0.246	18	0.009	0.042
19	0.048	0.221	20	0.023	0.104
21	0.013	0.061	22	0.007	0.033
23	0.052	0.238	24	0.016	0.073
25	0.038	0.173	26	0.013	0.058
27	0.019	0.089	28	0.008	0.035
29	0.032	0.148	30	0.007	0.032
31	0.051	0.236	32	0.018	0.083
33	0.025	0.115	34	0.007	0.033
35	0.055	0.251	36	0.001	0.004
37	0.033	0.150	38	0.017	0.080
39	0.022	0.101	40	0.011	0.053

Σ A(3P4W)

U1 300V

I1 100mV

U2 300V

I2 100mV

U3 300V

I3 100mV

Element4

U4 1000V

I4 30A

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▲PAGE▼ 1/3

Update 1925

L2:

Wide-Band Harmonics

Uover: ■ ■ ■ ■

Iover: ■ ■ ■ ■

YOKOGAWA ◆

change items

PLL	U1	Or.	I2 [A]	hdf[%]	Or.	I2 [A]	hdf[%]	Σ A(3P4W)
Freq	49.999 Hz	Tot.	21.725		dc			U1 300V
		1	21.717	99.966	2	0.313	1.439	I1 100mV
U2	230.297 V	3	0.227	1.046	4	0.063	0.291	
I2	21.725 A	5	0.230	1.060	6	0.155	0.711	U2 300V
P2	5.0006kW	7	0.183	0.843	8	0.034	0.158	I2 100mV
S2	5.0013kVA	9	0.025	0.116	10	0.046	0.214	
Q2	-0.0793kvar	11	0.099	0.454	12	0.057	0.262	U3 300V
λ2	0.99987	13	0.055	0.255	14	0.028	0.130	I3 100mV
φ2	D 0.909 °	15	0.023	0.107	16	0.025	0.113	
Uthd2	0.384 %	17	0.032	0.149	18	0.045	0.205	Element4
Ithd2	2.593 %	19	0.025	0.115	20	0.016	0.072	U4 1000V
Pthd2	0.002 %	21	0.019	0.087	22	0.014	0.064	I4 30A
Uthf2	0.161 %	23	0.018	0.084	24	0.010	0.047	
Ithf2	1.227 %	25	0.029	0.132	26	0.005	0.025	
Utif2	6.502	27	0.011	0.051	28	0.012	0.056	
Itif2	53.630	29	0.013	0.061	30	0.014	0.063	
		31	0.030	0.139	32	0.019	0.087	
		33	0.028	0.127	34	0.004	0.020	
		35	0.025	0.114	36	0.008	0.035	
		37	0.021	0.095	38	0.003	0.015	
		39	0.018	0.084	40	0.009	0.040	

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Update 1947

△PAGE ▾ 2/7

PAGE ▾ 1/3

Update 1947

L3:

Wide-Band Harmonics

Uover: ■ ■ ■ ■

Iover: ■ ■ ■ ■

YOKOGAWA ◆

change items

PLL	U1	Or.	I3 [A]	hdf[%]	Or.	I3 [A]	hdf[%]	Σ A(3P4W)
Freq	50.000 Hz	Tot.	21.772		dc			U1 300V
		1	21.763	99.960	2	0.314	1.442	I1 100mV
U3	230.339 V	3	0.387	1.779	4	0.111	0.510	
I3	21.772 A	5	0.155	0.712	6	0.049	0.224	U2 300V
P3	5.0131kW	7	0.128	0.589	8	0.030	0.138	I2 100mV
S3	5.0131kVA	9	0.017	0.076	10	0.034	0.154	
Q3	0.0039kvar	11	0.088	0.406	12	0.029	0.131	U3 300V
λ3	1.00000	13	0.083	0.381	14	0.038	0.175	I3 100mV
φ3	G 0.045 °	15	0.023	0.104	16	0.020	0.090	
Uthd3	0.228 %	17	0.039	0.178	18	0.014	0.062	Element4
Ithd3	2.816 %	19	0.054	0.247	20	0.016	0.073	U4 1000V
Pthd3	0.004 %	21	0.012	0.057	22	0.023	0.107	I4 30A
Uthf3	0.164 %	23	0.041	0.187	24	0.018	0.081	
Ithf3	1.667 %	25	0.024	0.111	26	0.014	0.064	
Utif3	6.825	27	0.007	0.031	28	0.011	0.052	
Itif3	74.047	29	0.018	0.081	30	0.014	0.066	
		31	0.039	0.180	32	0.006	0.028	
		33	0.010	0.046	34	0.011	0.050	
		35	0.049	0.227	36	0.062	0.284	
		37	0.109	0.502	38	0.010	0.046	
		39	0.018	0.085	40	0.013	0.061	

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Update 1967

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PAGE ▾ 1/3

Update 1967

TEST REPORT

25 % of nominal power

Discharging mode

L1:

Wide-Band Harmonics

Uover:■■■■

PLL Source: U1

YOKOGAWA ◆

Iover:■■■■

change items

PLL	U1	Or.	I1 [A]	hdf[%]	Or.	I1 [A]	hdf[%]	Σ A(3P4W)
Freq	49.999 Hz	Tot.	10.891		dc			U1 300V
		1	10.884	99.934	2	0.183	1.681	I1 100mV
U1	231.441 V	3	0.227	2.085	4	0.061	0.560	
I1	10.891 A	5	0.179	1.645	6	0.043	0.399	U2 300V
P1	2.5185kW	7	0.057	0.526	8	0.023	0.207	I2 100mV
S1	2.5191kVA	9	0.057	0.527	10	0.016	0.145	
Q1	0.0571kvar	11	0.057	0.521	12	0.008	0.075	U3 300V
λ1	0.99974	13	0.019	0.174	14	0.012	0.109	I3 100mV
φ1	G 1.299 °	15	0.010	0.090	16	0.022	0.199	
Uthd1	0.177 %	17	0.045	0.413	18	0.008	0.072	Element4
Ithd1	3.619 %	19	0.012	0.108	20	0.019	0.172	U4 300V
Pthd1	0.002 %	21	0.012	0.113	22	0.008	0.069	I4 100mV
Uthf1	0.123 %	23	0.023	0.209	24	0.015	0.137	
Ithf1	2.085 %	25	0.015	0.140	26	0.005	0.049	
Utif1	5.936	27	0.029	0.266	28	0.008	0.075	
Itif1	96.233	29	0.011	0.104	30	0.013	0.117	
		31	0.017	0.155	32	0.012	0.115	
		33	0.025	0.229	34	0.011	0.105	
		35	0.012	0.106	36	0.032	0.290	
		37	0.021	0.197	38	0.009	0.082	
		39	0.003	0.027	40	0.010	0.089	

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Update 73

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Update 73

L2:

Wide-Band Harmonics

Uover:■■■■

PLL Source: U1

YOKOGAWA ◆

Iover:■■■■

change items

PLL	U1	Or.	I2 [A]	hdf[%]	Or.	I2 [A]	hdf[%]	Σ A(3P4W)
Freq	50.000 Hz	Tot.	10.924		dc			U1 300V
		1	10.916	99.925	2	0.242	2.213	I1 100mV
U2	231.202 V	3	0.253	2.317	4	0.060	0.546	
I2	10.924 A	5	0.143	1.308	6	0.053	0.484	U2 300V
P2	2.5235kW	7	0.030	0.278	8	0.048	0.440	I2 100mV
S2	2.5237kVA	9	0.061	0.559	10	0.019	0.177	
Q2	0.0299kvar	11	0.053	0.485	12	0.004	0.040	U3 300V
λ2	0.99993	13	0.026	0.239	14	0.004	0.034	I3 100mV
φ2	G 0.680 °	15	0.016	0.150	16	0.001	0.008	
Uthd2	0.578 %	17	0.038	0.352	18	0.026	0.241	Element4
Ithd2	3.876 %	19	0.030	0.270	20	0.009	0.085	U4 300V
Pthd2	0.003 %	21	0.005	0.047	22	0.017	0.152	I4 100mV
Uthf2	0.128 %	23	0.005	0.042	24	0.017	0.158	
Ithf2	1.757 %	25	0.015	0.135	26	0.012	0.110	
Utif2	5.690	27	0.001	0.007	28	0.006	0.051	
Itif2	80.852	29	0.007	0.066	30	0.015	0.137	
		31	0.015	0.140	32	0.019	0.170	
		33	0.013	0.115	34	0.002	0.014	
		35	0.011	0.100	36	0.006	0.057	
		37	0.005	0.050	38	0.005	0.045	
		39	0.005	0.041	40	0.004	0.040	

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Update 95

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Update 95

L3:

Wide-Band Harmonics

Uover:■■■■

PLL Source: U1

YOKOGAWA

Iover:■■■■

change items

PLL	U1	Or.	I3 [A]	hdf[%]	Or.	I3 [A]	hdf[%]	Σ A(3P4W)
Freq	50.000 Hz	Tot.	10.880		dc			U1 300V
		1	10.873	99.933	2	0.148	1.359	I1 100mV
U3	231.389 V	3	0.240	2.204	4	0.089	0.816	U2 300V
I3	10.880 A	5	0.179	1.649	6	0.028	0.257	I2 100mV
P3	2.5154kW	7	0.084	0.768	8	0.015	0.141	U3 300V
S3	2.5158kVA	9	0.054	0.501	10	0.012	0.113	I3 100mV
Q3	0.0474kvar	11	0.050	0.457	12	0.009	0.080	
λ3	0.99982	13	0.046	0.418	14	0.010	0.088	
φ3	G 1.080 °	15	0.031	0.289	16	0.014	0.133	
Uthd3	0.254 %	17	0.031	0.281	18	0.009	0.087	Element4
Ithd3	3.665 %	19	0.035	0.325	20	0.015	0.137	U4 300V
Pthd3	0.001 %	21	0.013	0.121	22	0.013	0.115	I4 100mV
Uthf3	0.141 %	23	0.014	0.129	24	0.011	0.104	
Ithf3	2.172 %	25	0.014	0.126	26	0.004	0.038	
Utif3	6.817	27	0.013	0.118	28	0.009	0.079	
Itif3	101.059	29	0.016	0.143	30	0.006	0.051	
		31	0.028	0.261	32	0.008	0.071	
		33	0.016	0.149	34	0.031	0.285	
		35	0.026	0.238	36	0.013	0.123	
		37	0.012	0.108	38	0.007	0.063	
		39	0.016	0.151	40	0.006	0.052	

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Update 106

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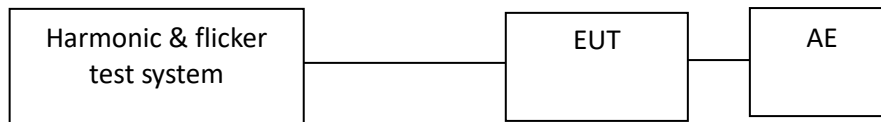
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Update 106

6 Voltage fluctuations and flicker

Test result: PASS

6.1 Test Setup



6.2 Test Procedure

6.2.1 Definition

- Flicker: impression of unsteadiness of visual sensation induced by a lighting stimulus whose luminance or spectral distribution fluctuates with time.
- Pst: Short-term flicker indicator the flicker severity evaluated over a short period (in minutes); Pst=1 is the conventional threshold of irritability
- Plt: long-term flicker indicator; the flicker severity evaluated over a long period (a few hours) using successive Pst values.
- dc: the relative steady-state voltage change
- dmax: the maximum relative voltage change
- d(t): the value during a voltage change

6.2.2 Test condition

The EUT was set to produce the most unfavorable sequence of voltage changes according to Clause A.15 of IEC61000-3-3: 2013.

6.2.3 Test protocol

The tested object operated under the operating condition specified in IEC 61000-3-3: 1994+A1:2001

The following limits apply

- "Plt" shall not exceed 0.65.
- "Pst" shall not exceed 1.0.
- "dc" shall not exceed 3.3%.
- "dmax" shall not exceed 4/6/7%*
- "d(t)" shall not exceed 3.3% for more than 500ms.

Notes:

- * means for 4% limit, without additional conditions
 - 6% limit, switched manually or automatically more than twice per day
 - 7% limit, switched automatically for no more than twice per day or attended while in use.

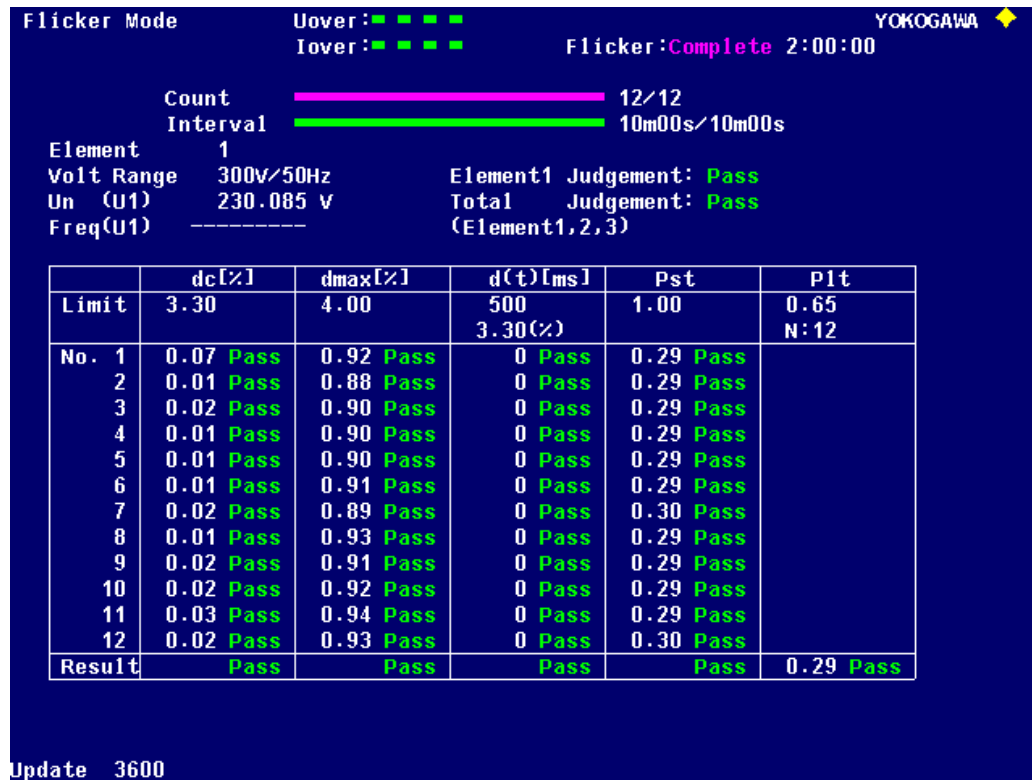
TEST REPORT

6.3 Test Result

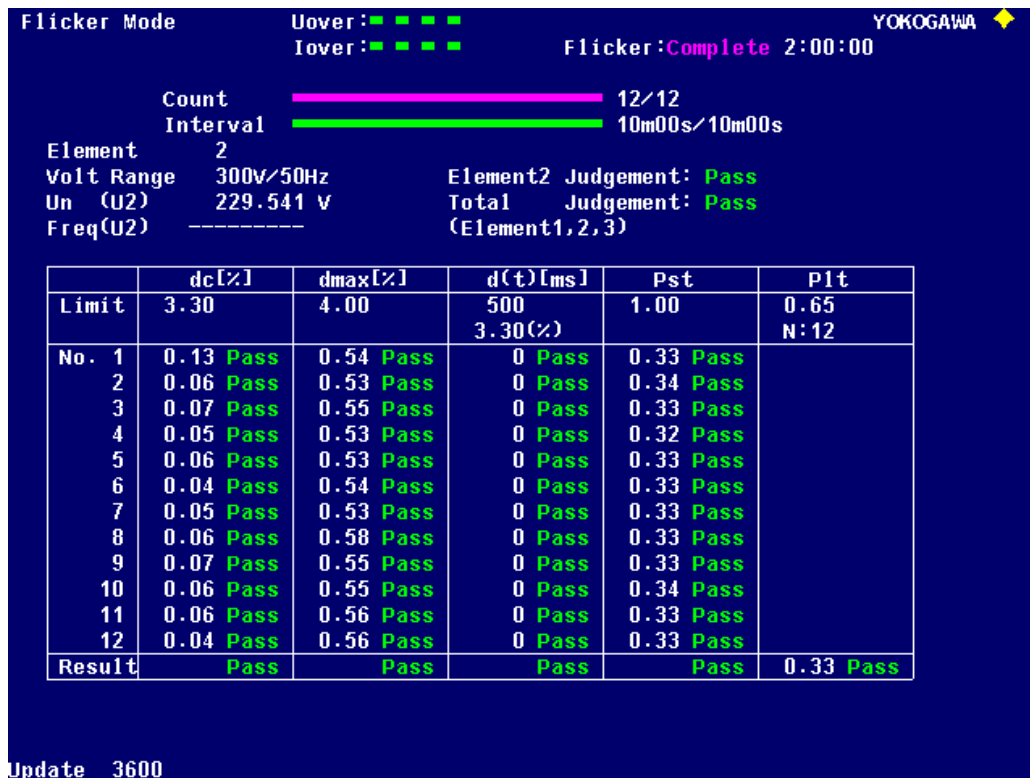
100 % of nominal power

Charging mode

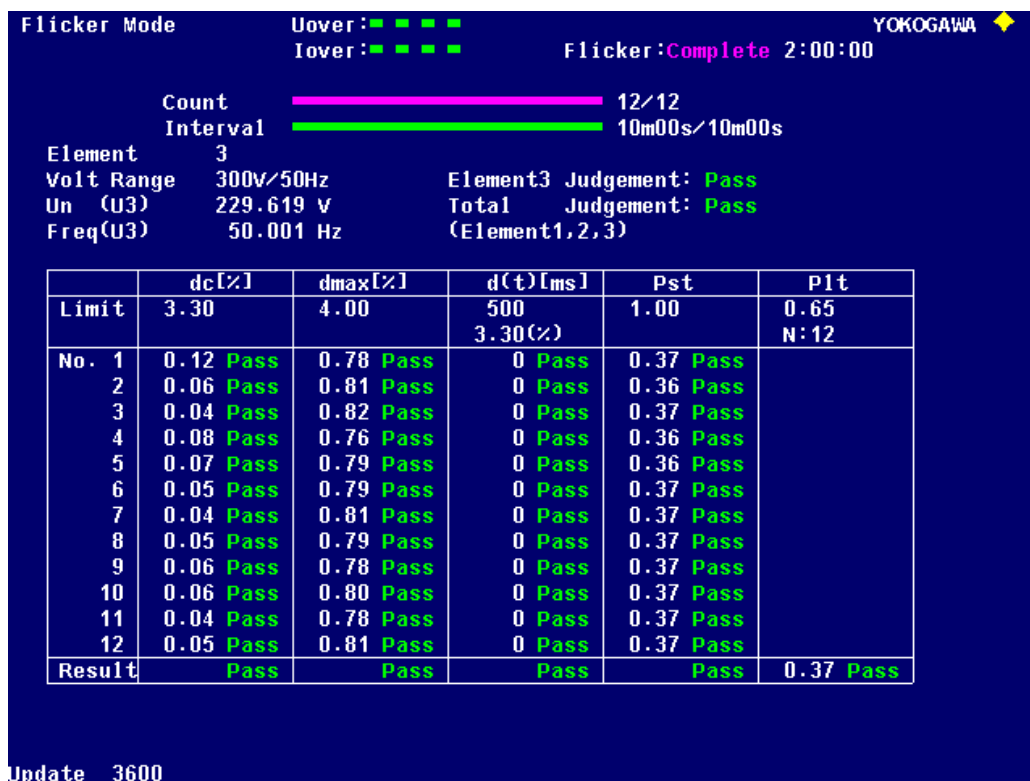
L1:



L2:



L3

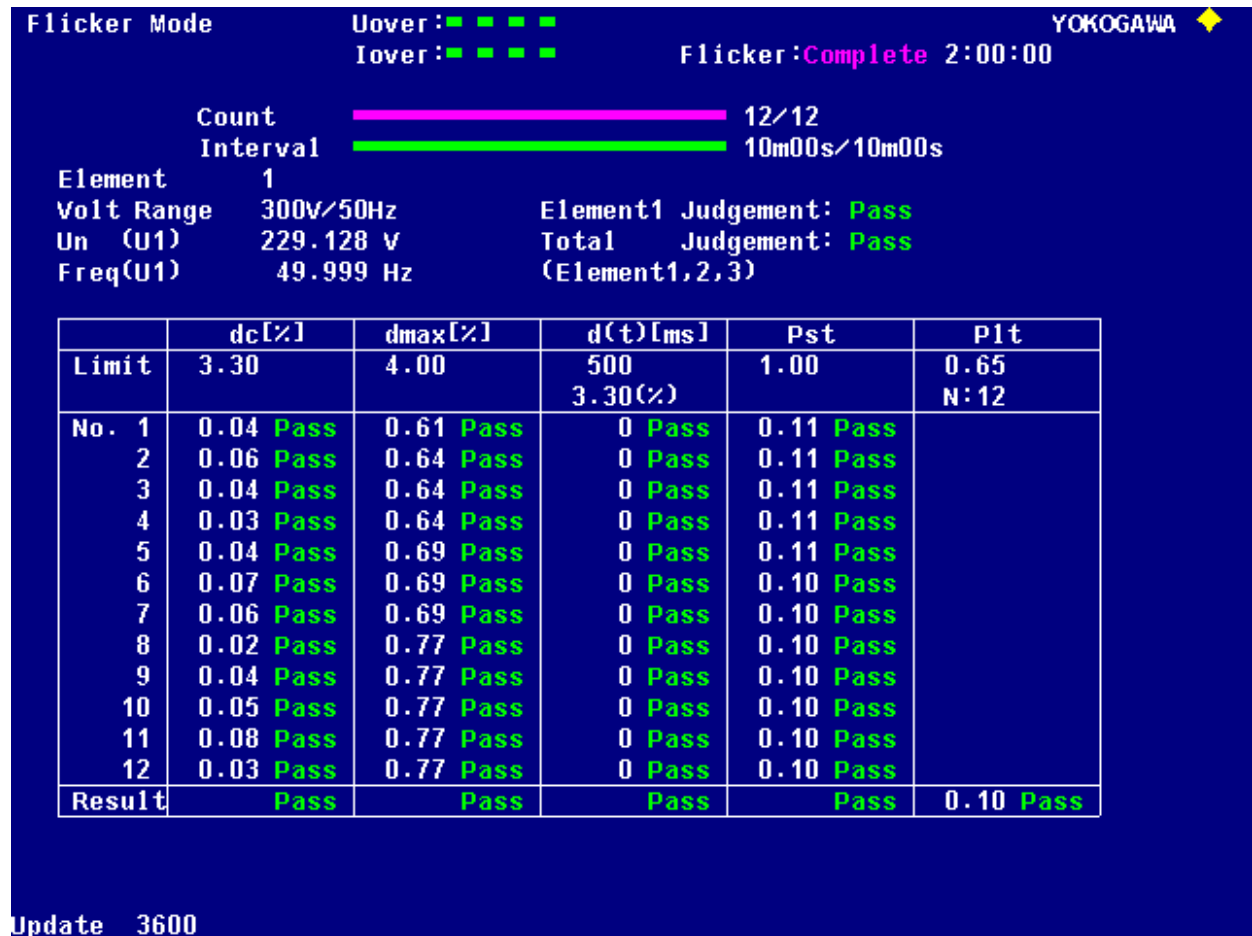


TEST REPORT

50 % of nominal power

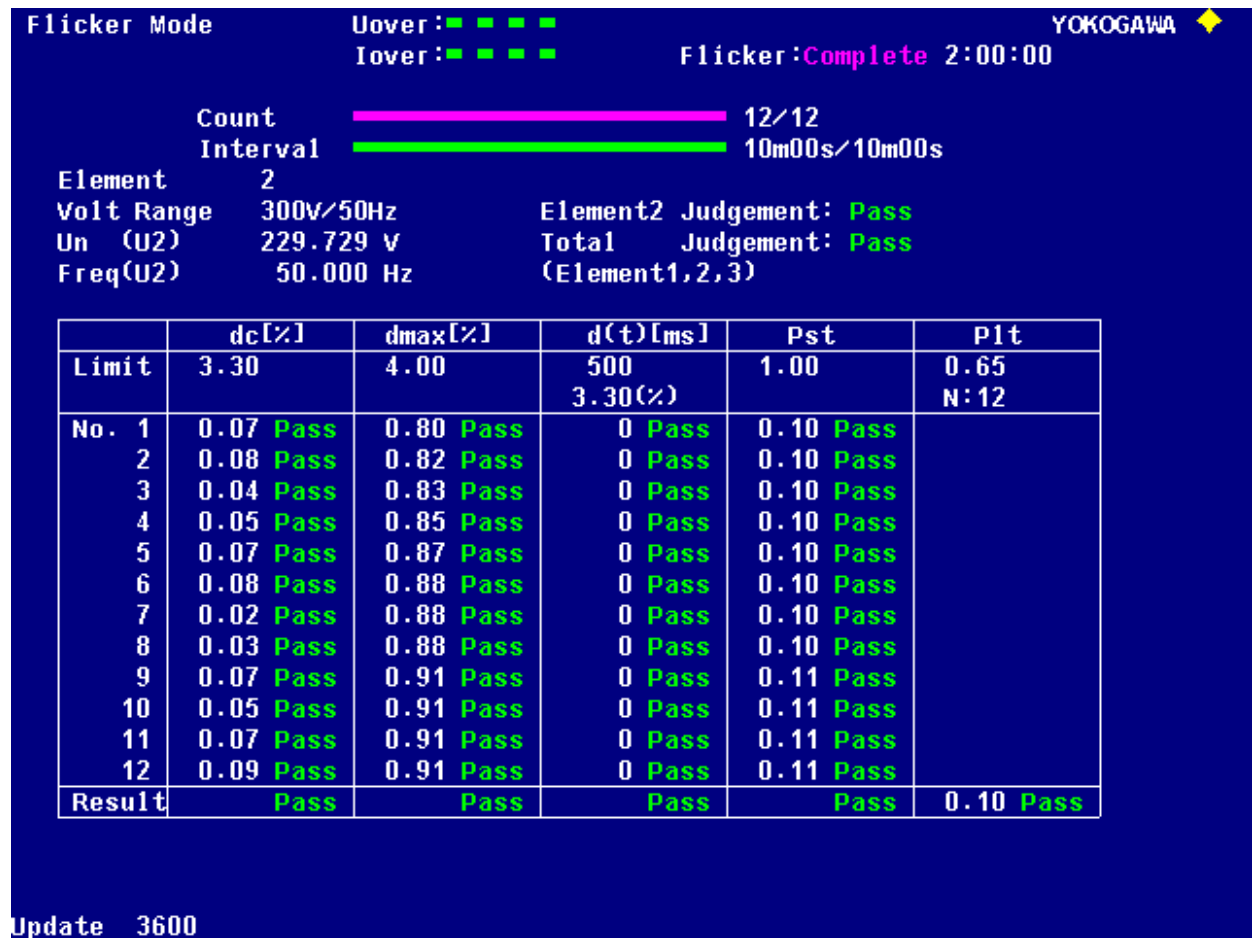
Charging mode

L1:

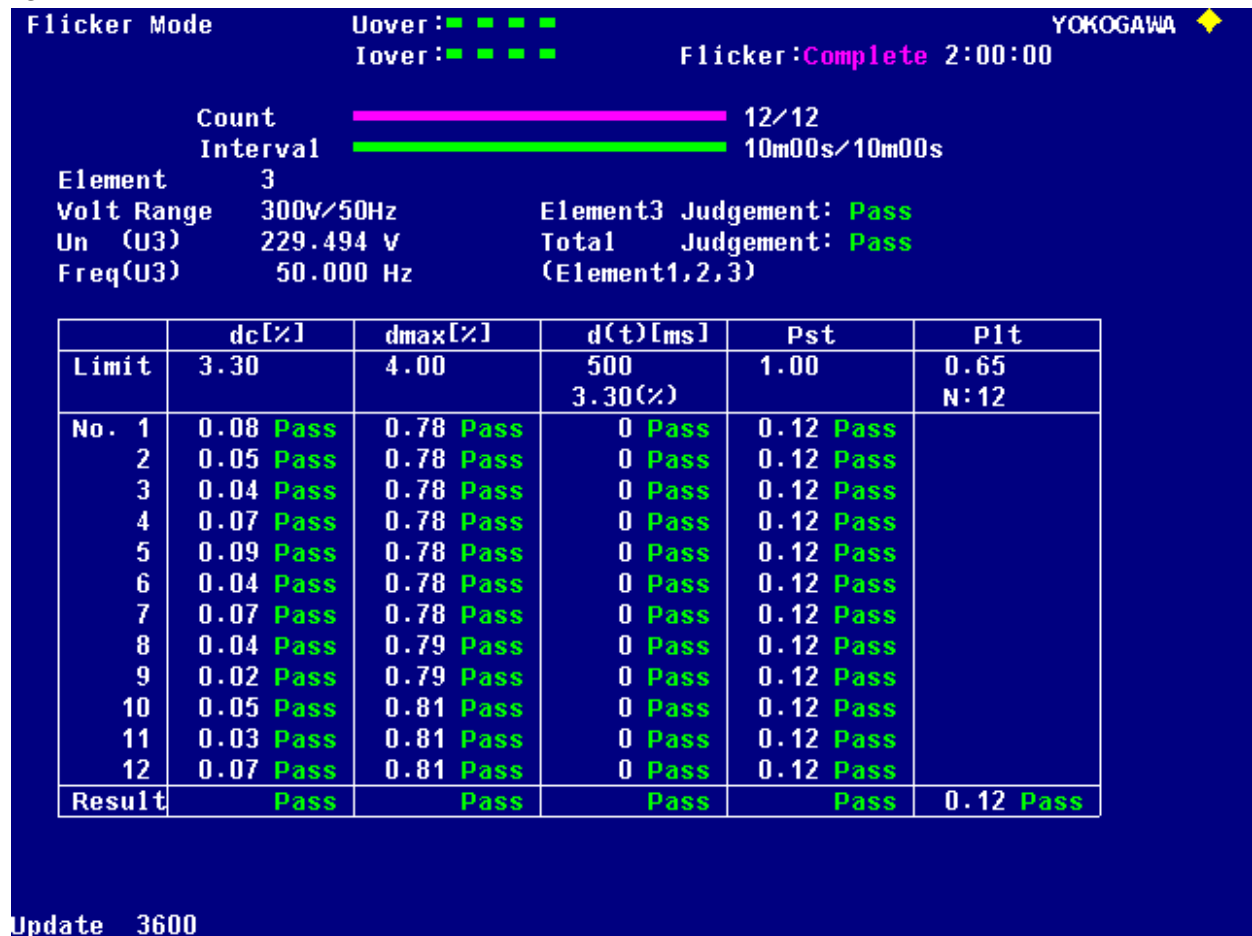


TEST REPORT

L2:



L3:

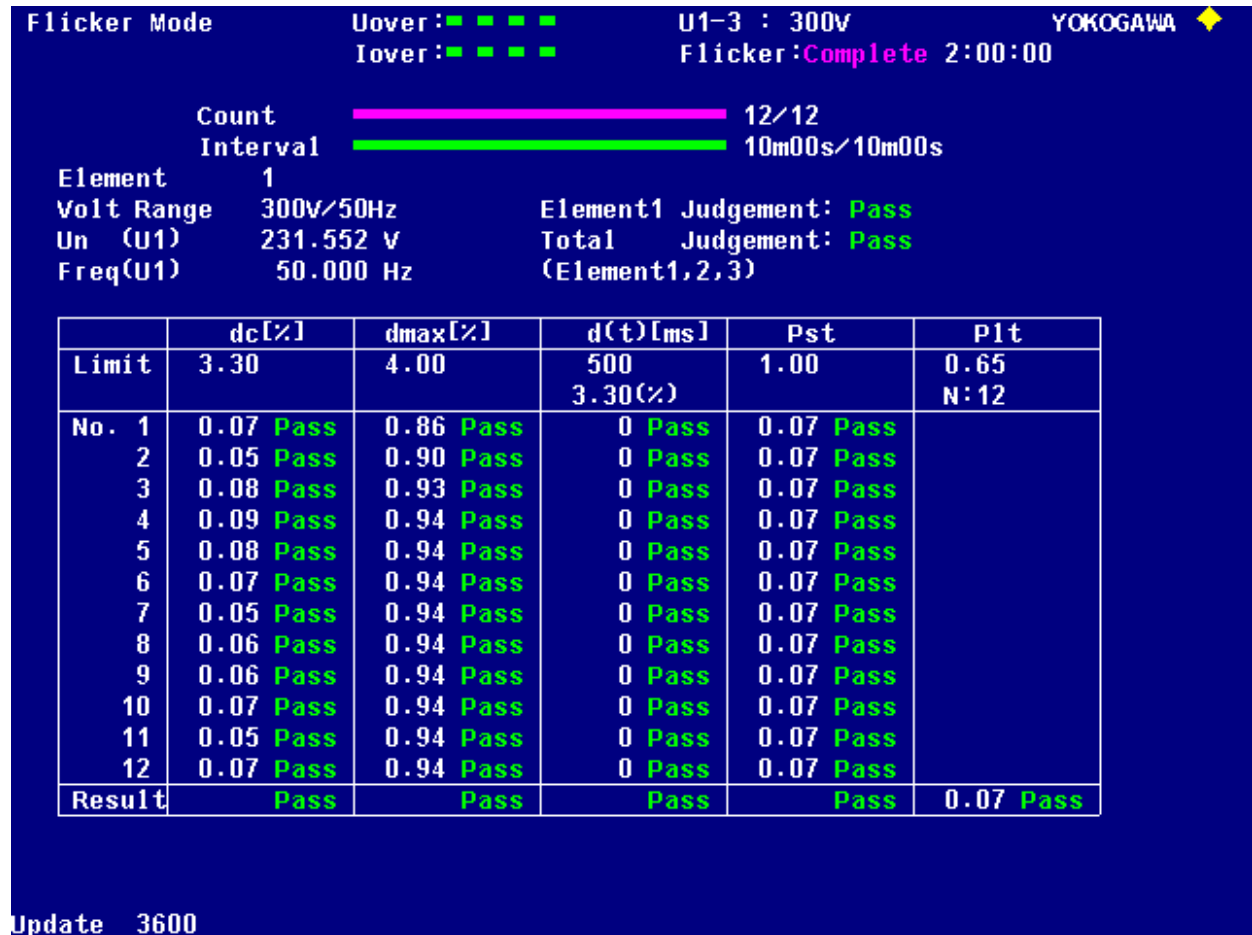


TEST REPORT

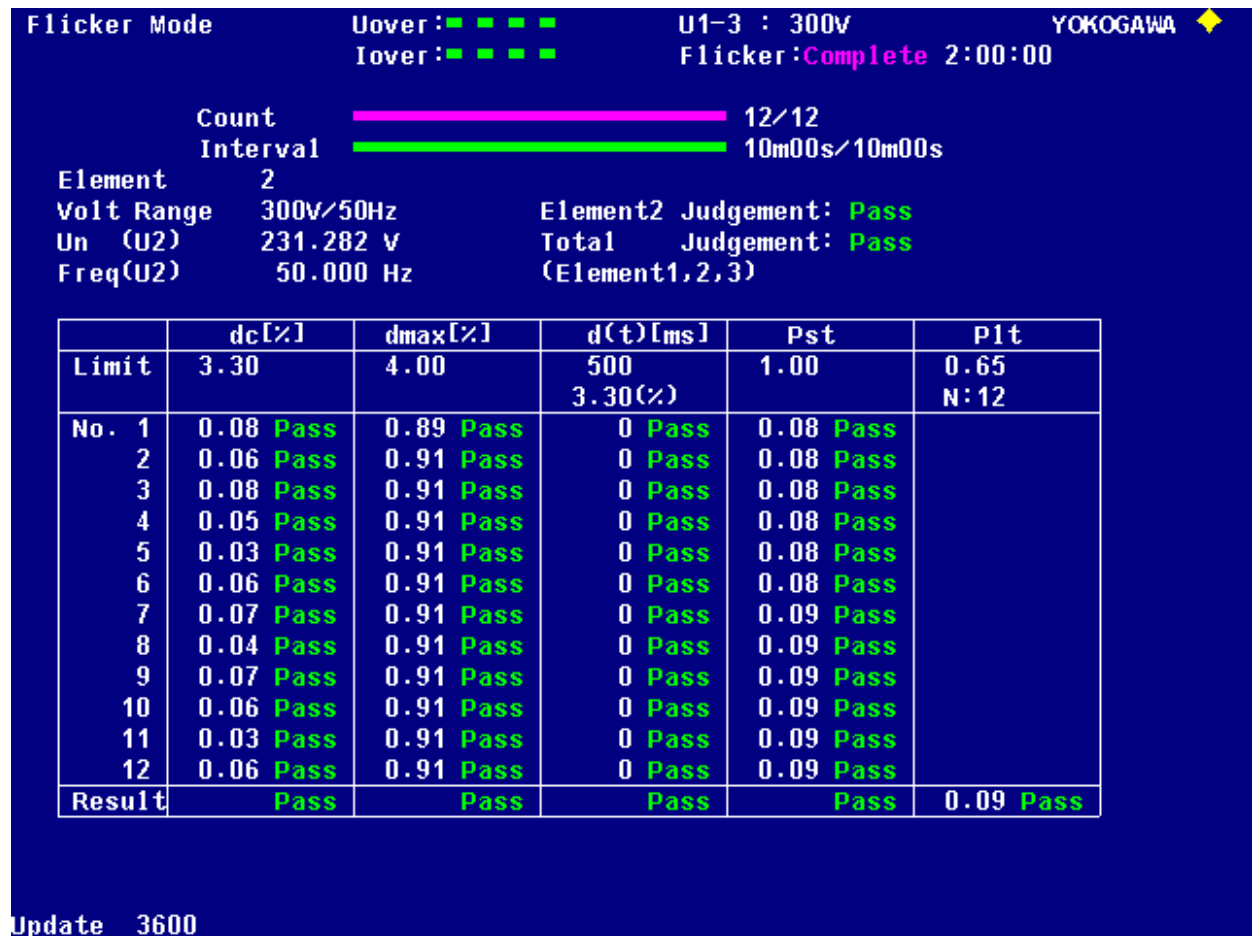
25 % of nominal power

Charging mode

L1:



L2:



TEST REPORT

L3:

Flicker Mode

Uover: ■ ■ ■ ■

U1-3 : 300V

YOKOGAWA

◆

Iover: ■ ■ ■ ■

Flicker:Complete 2:00:00

Count

Interval

12/12

10m00s/10m00s

Element

3

Volt Range

300V/50Hz

Element3 Judgement:

Pass

Un (U3)

231.545 V

Total Judgement:

Pass

Freq(U3)

50.000 Hz

(Element1,2,3)

	dc[%]	dmax[%]	d(t)[ms]	Pst	P1t
Limit	3.30	4.00	500 3.30(%)	1.00	0.65 N:12
No. 1	0.09 Pass	0.92 Pass	0 Pass	0.08 Pass	
2	0.03 Pass	0.92 Pass	0 Pass	0.08 Pass	
3	0.08 Pass	0.92 Pass	0 Pass	0.07 Pass	
4	0.09 Pass	0.92 Pass	0 Pass	0.07 Pass	
5	0.08 Pass	0.92 Pass	0 Pass	0.07 Pass	
6	0.07 Pass	0.92 Pass	0 Pass	0.07 Pass	
7	0.09 Pass	0.92 Pass	0 Pass	0.07 Pass	
8	0.03 Pass	0.92 Pass	0 Pass	0.07 Pass	
9	0.06 Pass	0.92 Pass	0 Pass	0.07 Pass	
10	0.02 Pass	0.92 Pass	0 Pass	0.07 Pass	
11	0.09 Pass	0.92 Pass	0 Pass	0.07 Pass	
12	0.06 Pass	0.92 Pass	0 Pass	0.07 Pass	
Result	Pass	Pass	Pass	Pass	0.07 Pass

Update

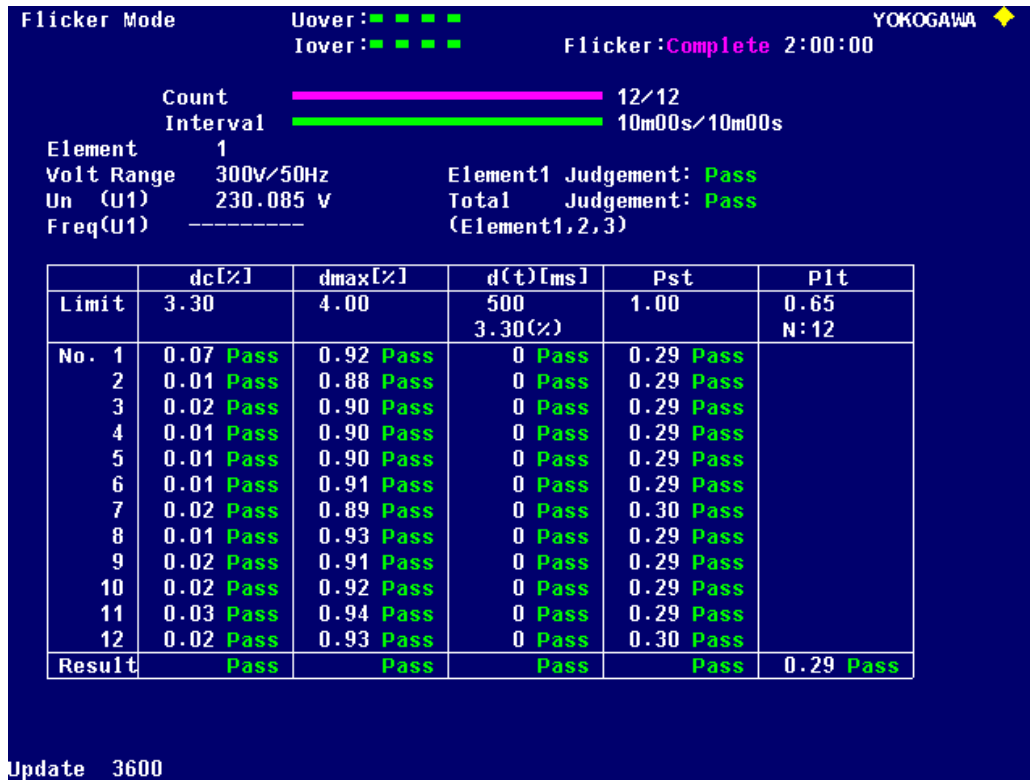
3600

TEST REPORT

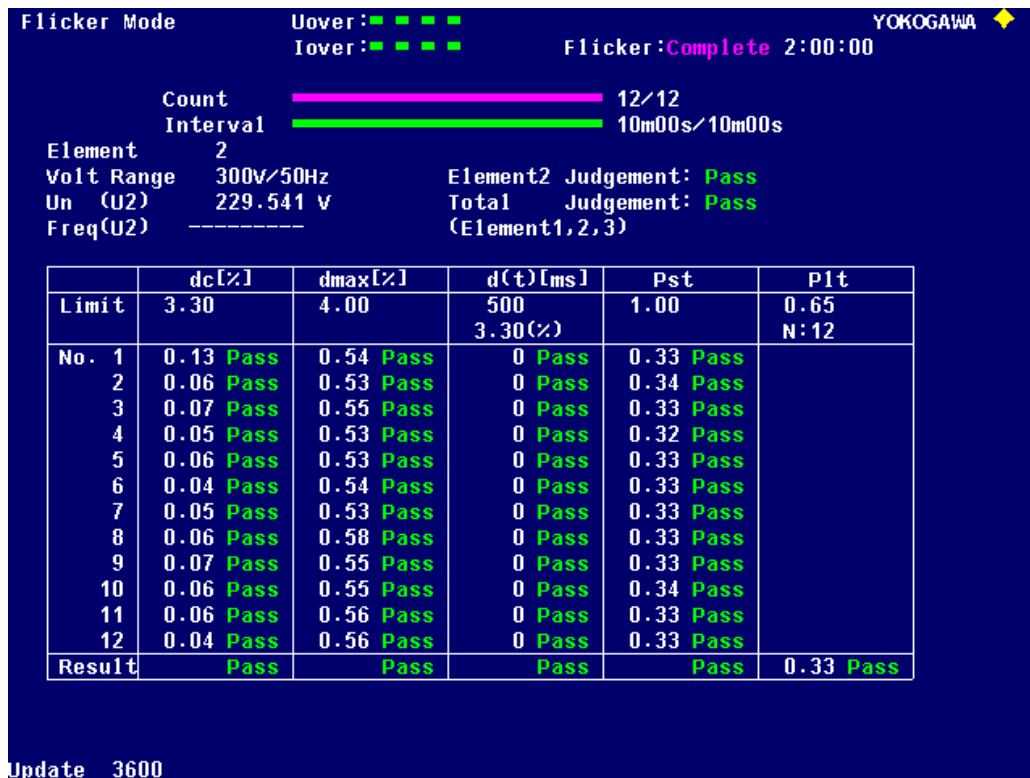
100 % of nominal power

Discharging mode

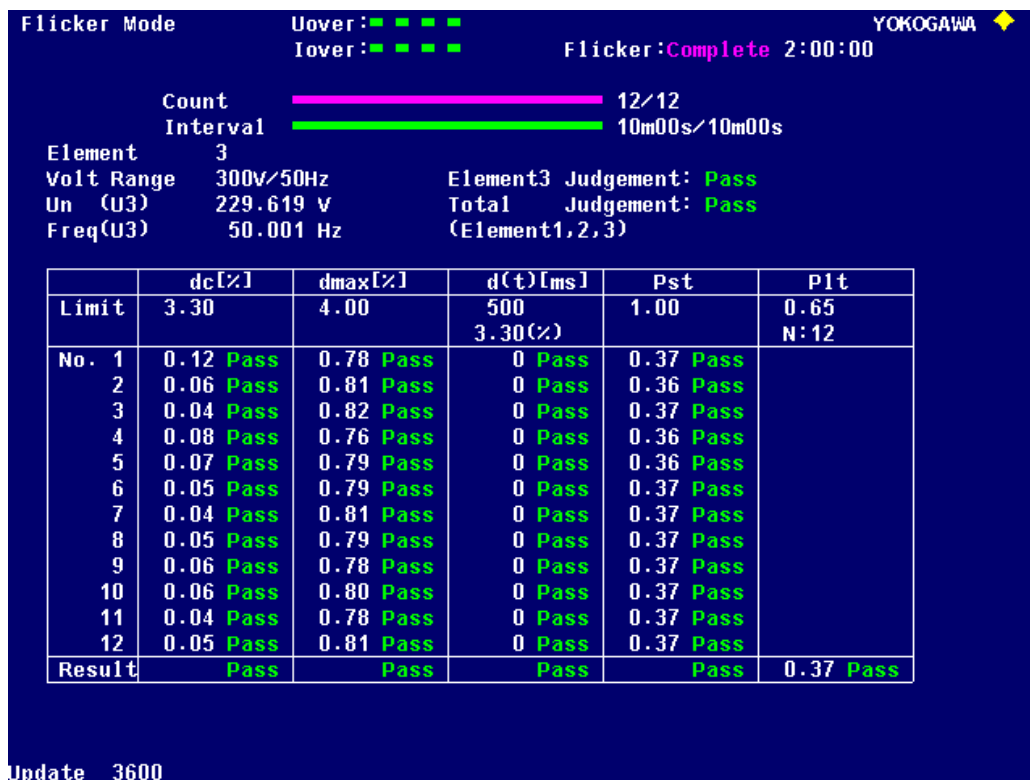
L1:



L2:



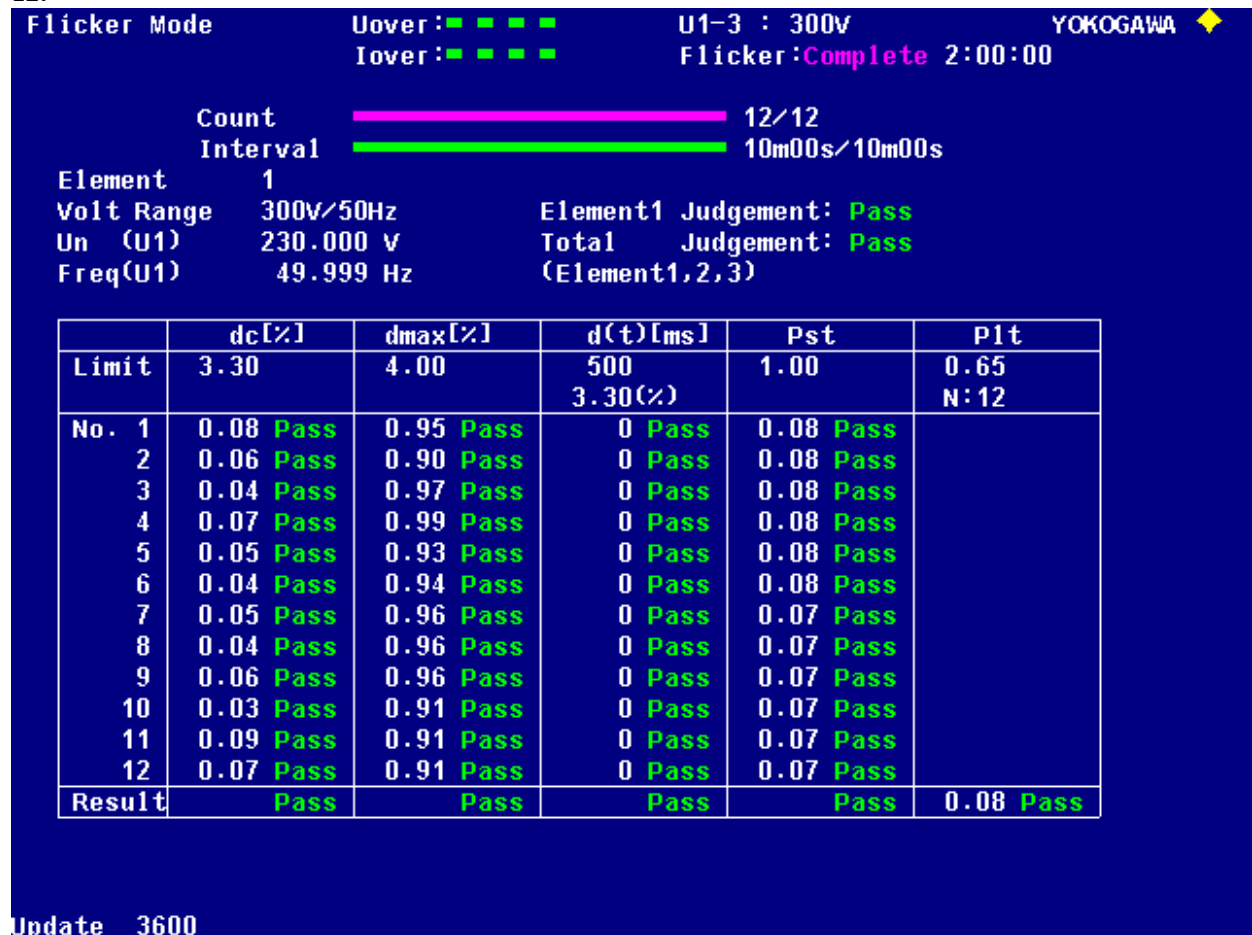
L3:



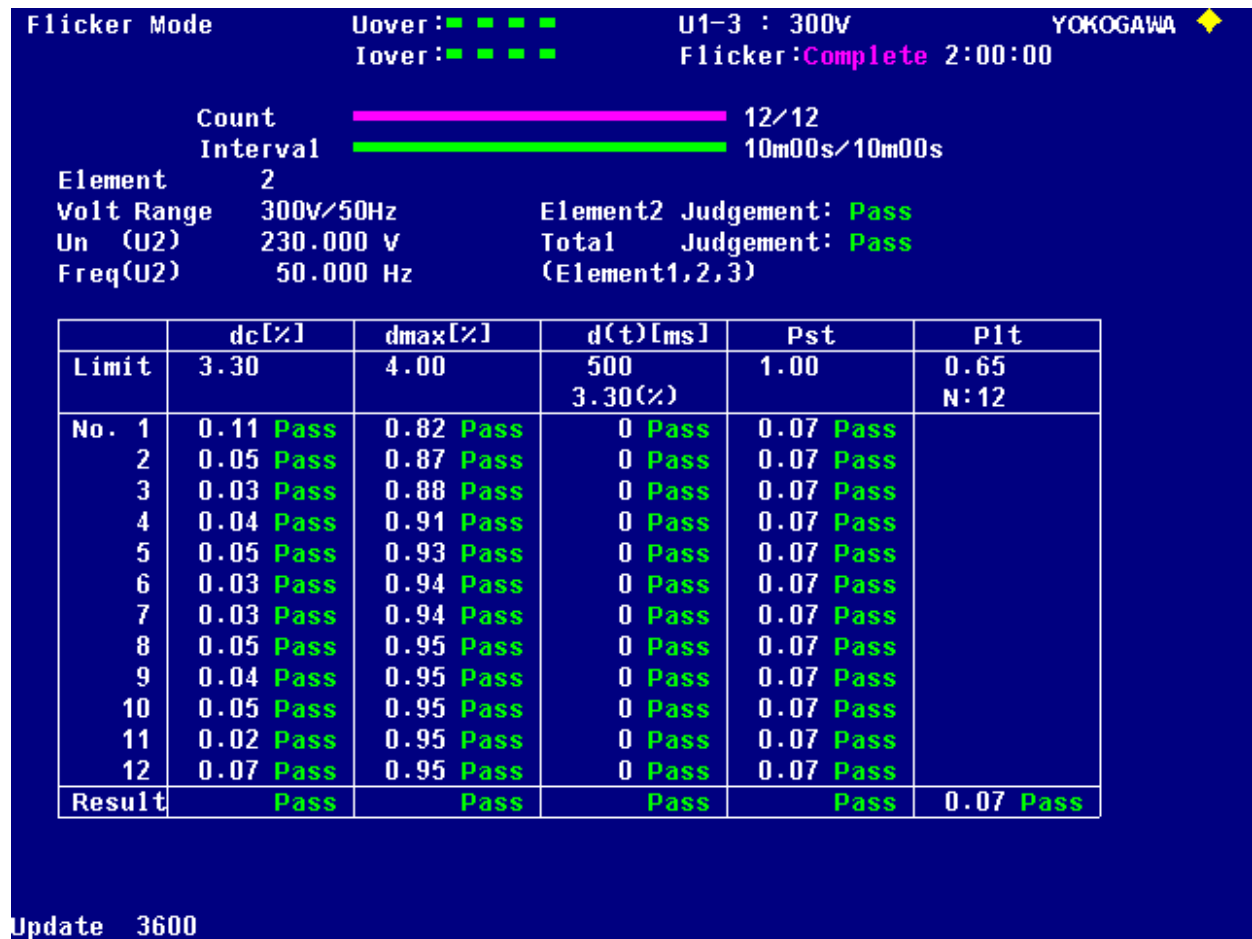
50 % of nominal power

Discharging mode

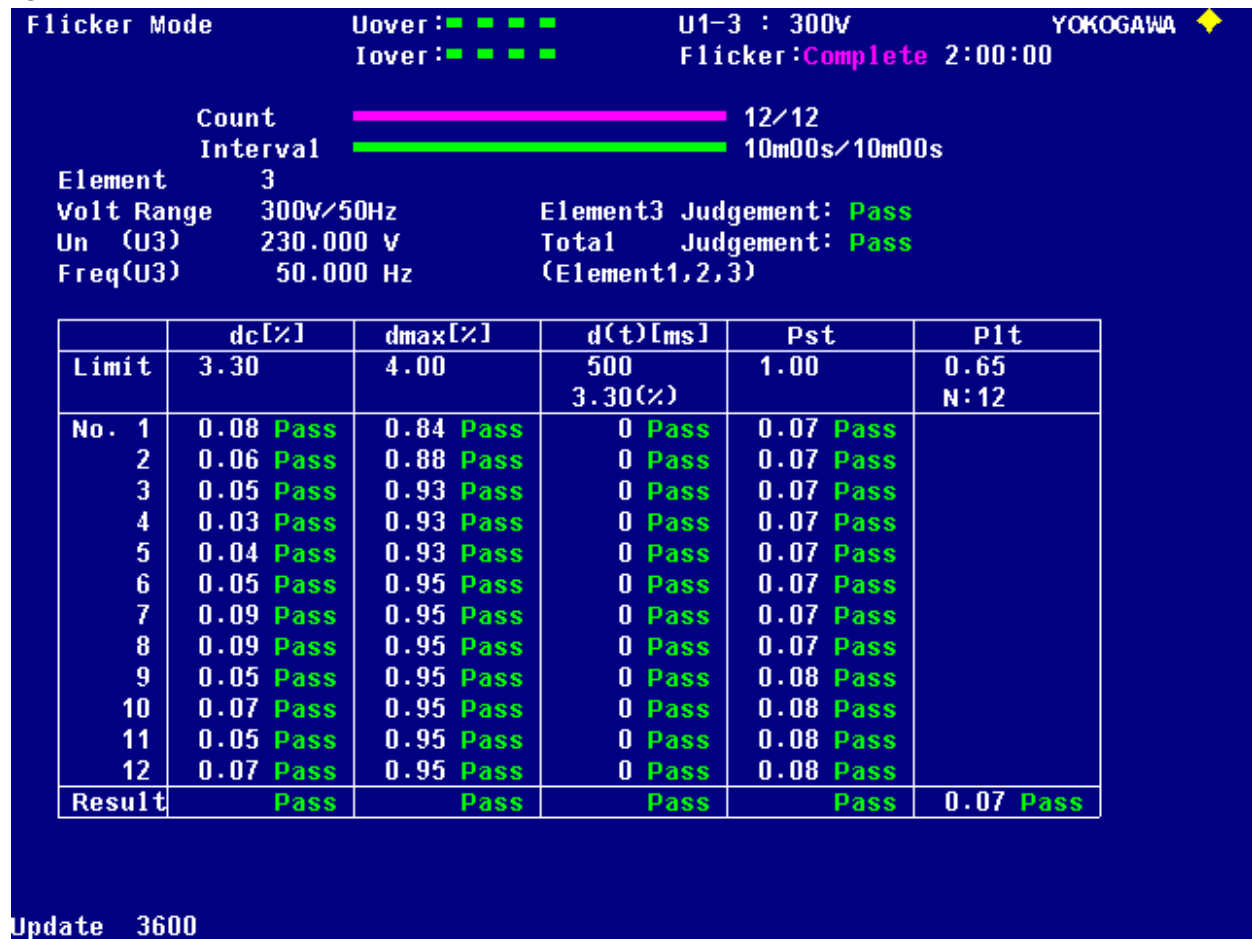
L1:



L2:



L3:

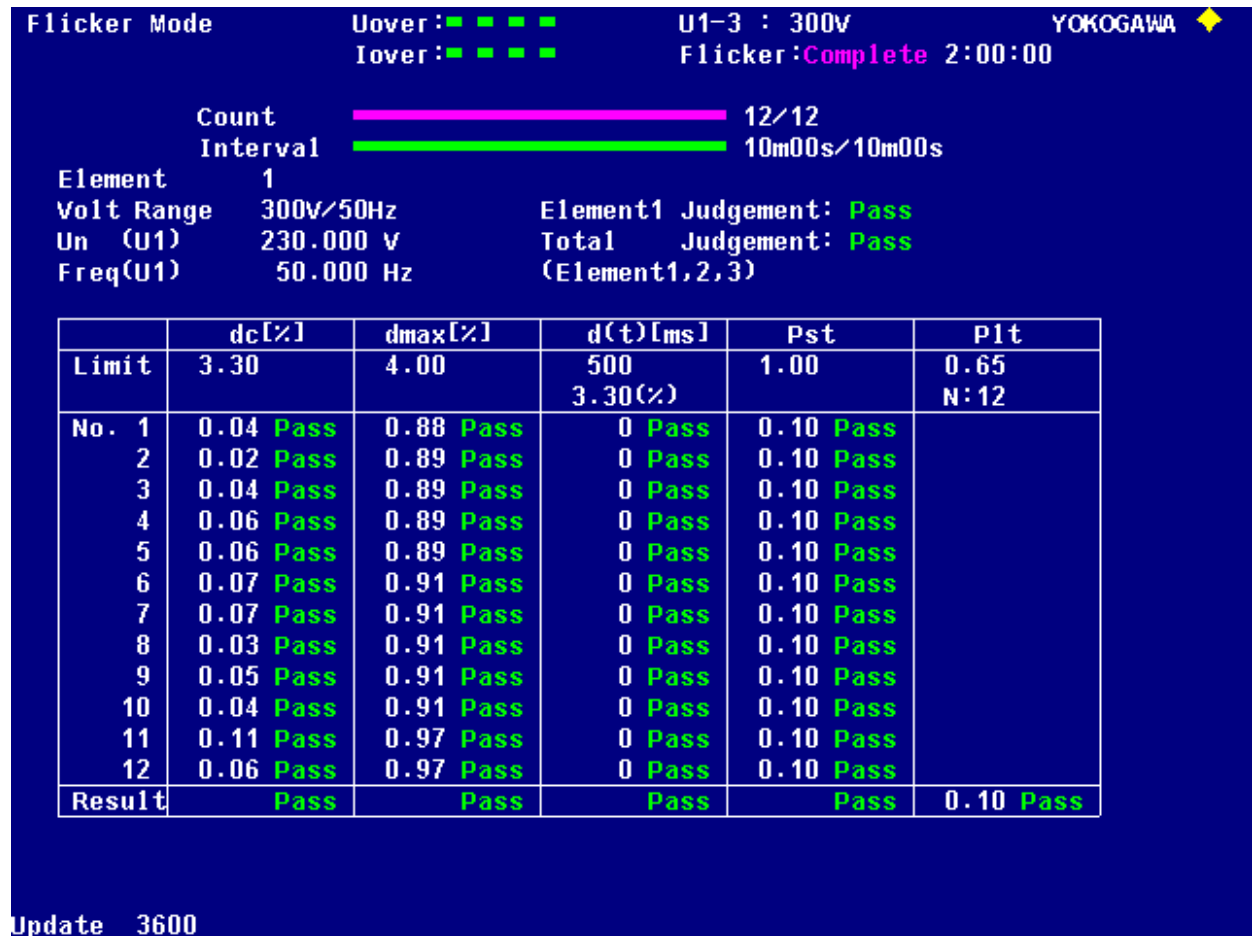


TEST REPORT

25 % of nominal power

Discharging mode

L1:



L2:

Flicker Mode

Uover: ■ ■ ■ ■

Iover: ■ ■ ■ ■

U1-3 : 300V

Flicker: Complete 2:00:00

YOKOGAWA ◆

Count ████████████████████ 12/12

Interval ████████████████████ 10m00s/10m00s

Element 2

Volt Range 300V/50Hz

Un (U2) 230.000 V

Freq(U2) 50.000 Hz

Element2 Judgement: Pass

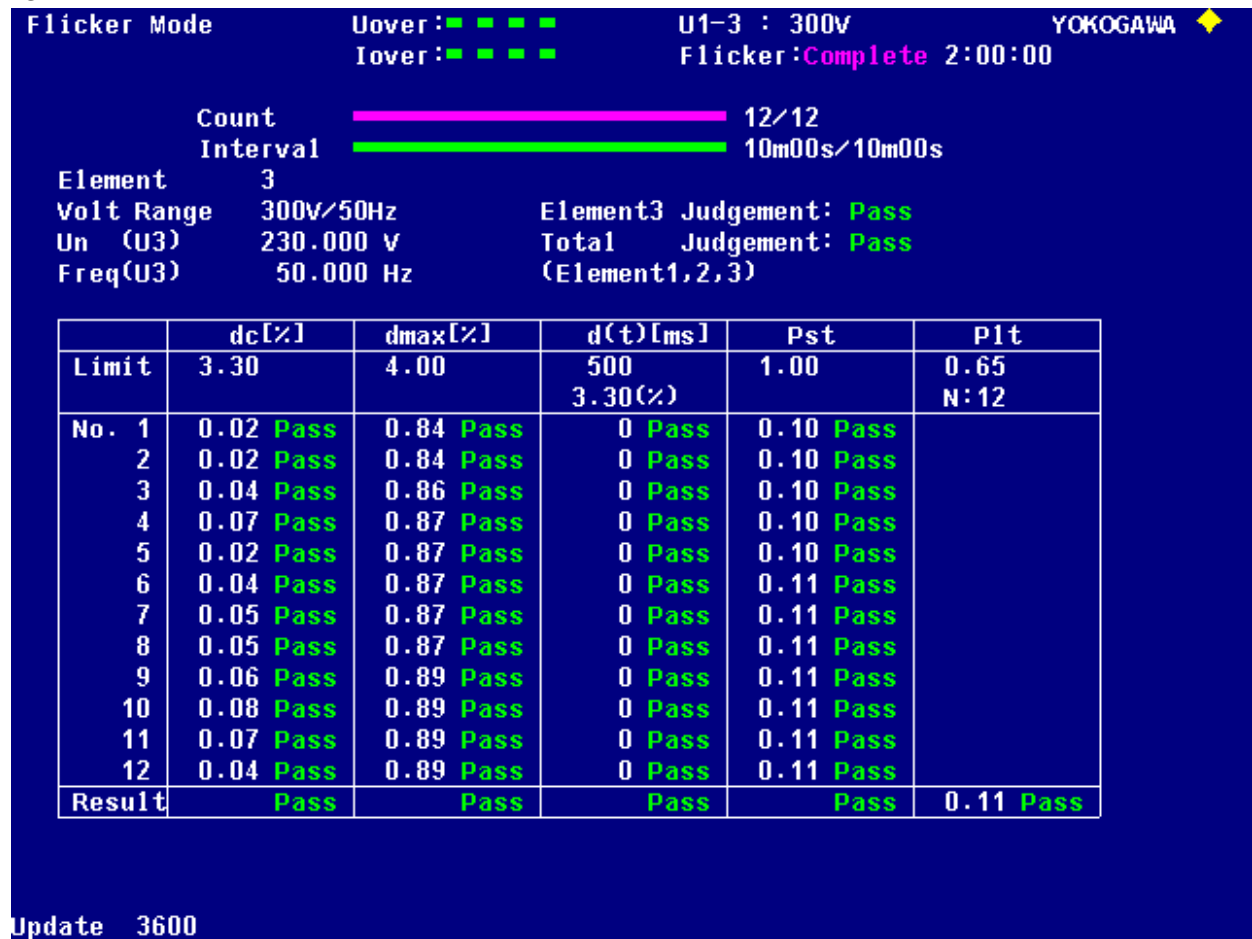
Total Judgement: Pass

(Element1,2,3)

	dc[%]	dmax[%]	d(t)[ms]	Pst	P1t
Limit	3.30	4.00	500	1.00	0.65
			3.30(%)		N:12
No. 1	0.08 Pass	0.87 Pass	0 Pass	0.10 Pass	
2	0.03 Pass	0.87 Pass	0 Pass	0.10 Pass	
3	0.04 Pass	0.87 Pass	0 Pass	0.10 Pass	
4	0.03 Pass	0.87 Pass	0 Pass	0.10 Pass	
5	0.05 Pass	0.88 Pass	0 Pass	0.10 Pass	
6	0.08 Pass	0.90 Pass	0 Pass	0.10 Pass	
7	0.02 Pass	0.90 Pass	0 Pass	0.10 Pass	
8	0.05 Pass	0.90 Pass	0 Pass	0.10 Pass	
9	0.07 Pass	0.90 Pass	0 Pass	0.10 Pass	
10	0.07 Pass	0.90 Pass	0 Pass	0.10 Pass	
11	0.06 Pass	0.90 Pass	0 Pass	0.10 Pass	
12	0.09 Pass	0.91 Pass	0 Pass	0.10 Pass	
Result	Pass	Pass	Pass	Pass	0.10 Pass

Update 3600

L3:



Immunity Test

Performance criteria

Criterion A: The EUT 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 EUT is used as intended. If the performance level is not specified by the manufacturer, this may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

Criterion B: The EUT 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 EUT is used as intended. The performance level may be replaced by a permissible loss of performance. However, during the test degradation of performance is allowed but 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 equipment if used as intended.

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

7 Electrostatic Discharge (ESD)

Test result **PASS**

7.1 Severity Level and Performance Criterion

7.1.1 Test level

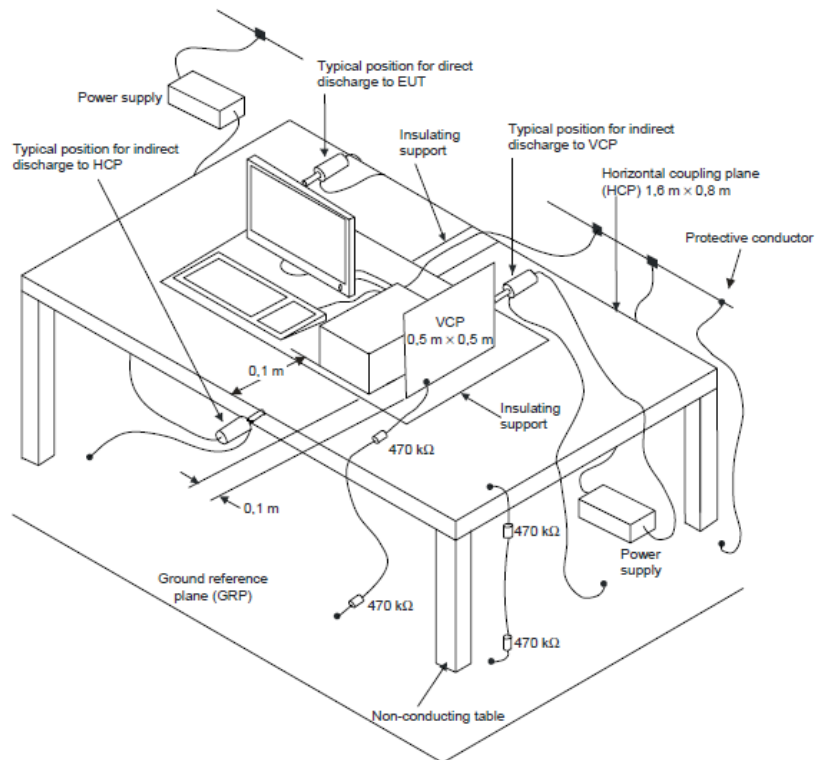
Contact discharge		Air discharge	
Level	Test voltage (kV)	Level	Test voltage (Kv)
1	2	1	2
2	4	2	4
3	6	3	8
4	8	4	15
X	Special	X	Special
Notes: 1. "X" is an open level. The level has to be specified in the dedicated equipment specification. If higher voltages than those shown are specified, special test equipment may be needed. 2. The gray rows were the selected test level.			

7.1.2 Performance Criterion

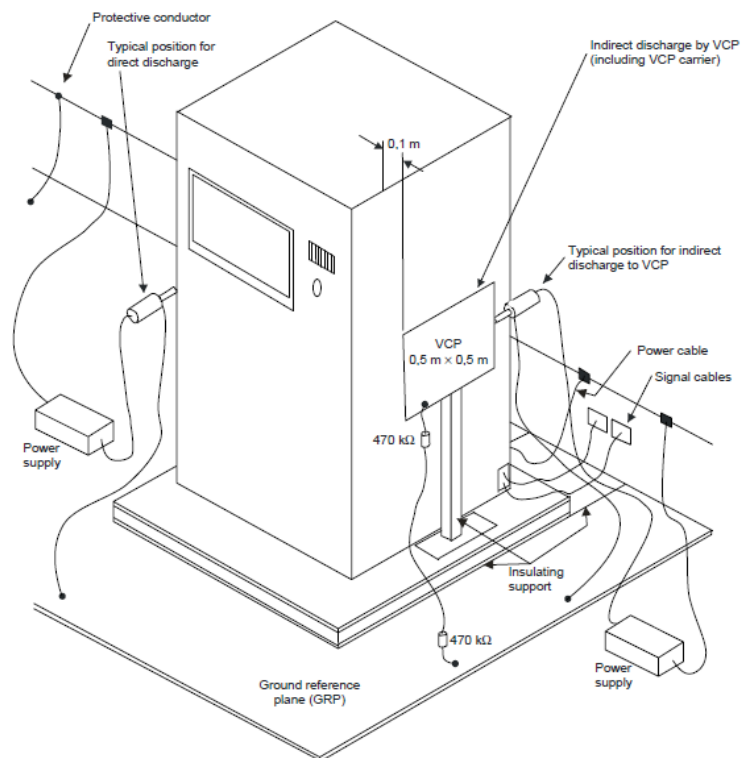
Criterion B

7.2 Test Setup

For table-top equipment



For floor standing equipment



7.3 Test Procedure

Measurement was performed in shielded room.

Measurement procedure was applied according to EN 61000-4-2 clause 8.

The test method and equipment was specified by EN 61000-4-2.

7.4 Test Result

Direct discharges were applied at the following selected points:

Test level [kV]	Air/Contact	Polarity (+/-)	Pass/Fail/NA	Comment
2/4	Contact	+/-	Pass	Accessible metal parts of the EUT
2/4	Contact	+/-	Pass	All touchable screws of enclosure
2/4/8	Air	+/-	Pass	Air gaps of the switch, button, connectors, fans
2/4/8	Air	+/-	Pass	Slots around the EUT, LED panel,

Indirect contact discharges were applied to the VCP and the HCP at the following selected points:

For table-top equipment

Position	Description	Point	Pass/Fail/NA
HCP front	0,1m from the front of the EUT	Edge of centre on HCP	Pass
HCP back	0,1m from the back of the EUT	Edge of centre on HCP	Pass
HCP right	0,1m from the right side of the EUT	Edge of centre on HCP	Pass
HCP left	0,1m from the left side of the EUT	Edge of centre on HCP	Pass
VCP front	0,1m from the front of the EUT	Edge of centre on VCP	Pass
VCP back	0,1m from the back of the EUT	Edge of centre on VCP	Pass
VCP right	0,1m from the right of the EUT	Edge of centre on VCP	Pass
VCP left	0,1m from the left of the EUT	Edge of centre on VCP	Pass

For floor standing equipment

Position	Description	Point	Pass/Fail/NA
CP front	0,1m from the front of the EUT	Edge of centre on VCP	NA
CP back	0,1m from the back of the EUT	Edge of centre on VCP	NA
CP right	0,1m from the right of the EUT	Edge of centre on VCP	NA
CP left	0,1m from the left of the EUT	Edge of centre on VCP	NA

Observation: All the functions were operated as normal after the test.

Conclusion: The EUT can meet the requirement of Performance Criterion B.

8 Radio frequency electromagnetic field

Test result **PASS**

8.1 Severity Level and Performance Criterion

8.1.1 Test level

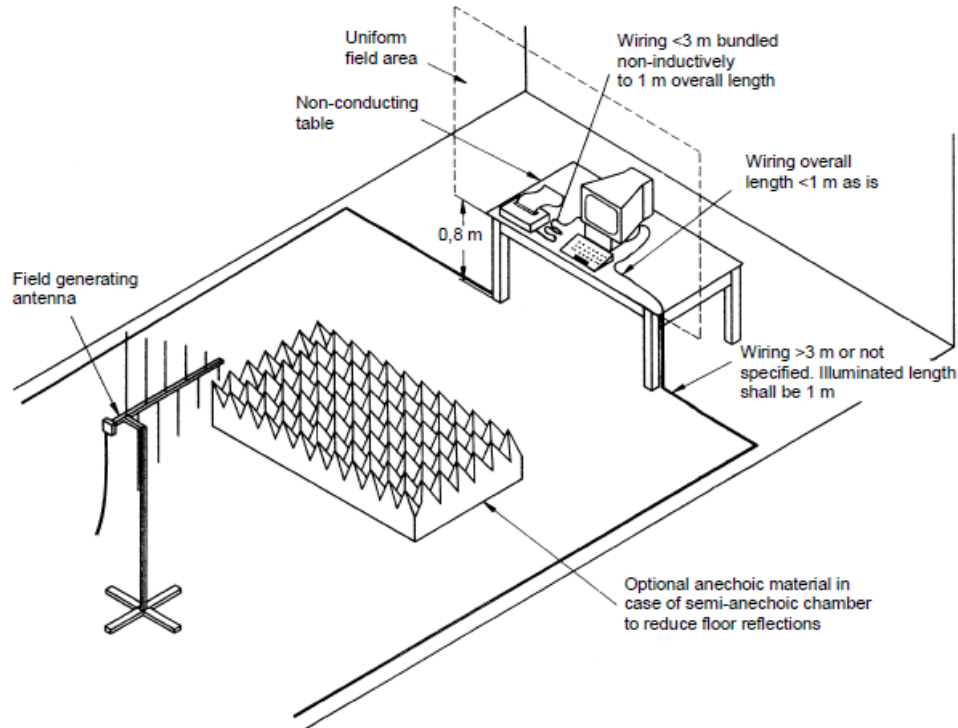
Level	Test field strength V/m
1	1
2	3
3	10
X	Special
Note: 1. X is an open test level. This level may be given in the product specification. 2. The gray row is the selected test level.	

8.1.2 Performance Criterion

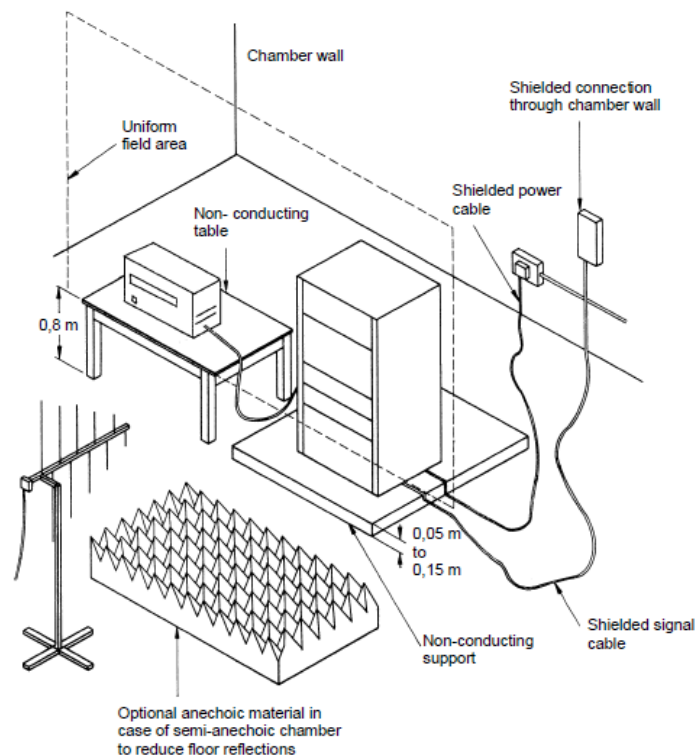
Criterion A

8.2 Test Setup

For table-top equipment



For floor standing equipment



8.3 Test Procedure

Measurement was performed in full-anechoic chamber.

Measurement procedure was applied according to EN 61000-4-3 clause 8.

The test method and equipment was specified by EN 61000-4-3.

8.4 Test Result

Test no.	Frequency (MHz)	Polarization	Test level (V/m)	Modulation	Exposed location	Pass/Fail/NA
1	80-1000	H & V	10	1 kHz, 80% AM 1 % increment	All sides	Pass
2	1400-6000	H & V	3	1 kHz, 80% AM 1 % increment	All sides	Pass

Observation: All the functions were operated as normal during and after test.

Conclusion: The EUT can meet the requirement of Performance Criterion A

9 Fast transients, common mode

Test result **PASS**

9.1 Severity Level and Performance Criterion

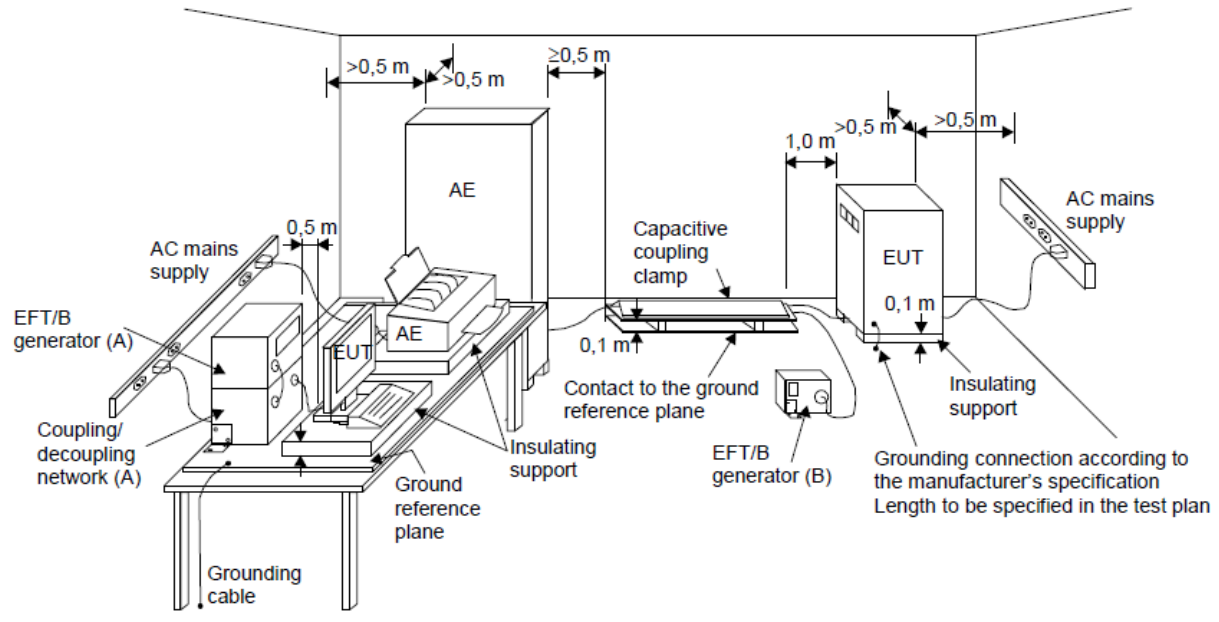
9.1.1 Test level

Open circuit output test voltage and repetition rate of the impulses				
Level	AC mains power input ports		Signal ports, DC power ports	
	Voltage peak (kV)	Repetition rate (kHz)	Voltage peak (kV)	Repetition rate (kHz)
1	0.5	5 or 100	0.25	5 or 100
2	1	5 or 100	0.5	5 or 100
3	2	5 or 100	1	5 or 100
4	4	5 or 100	2	5 or 100
X	Special	Special	Special	Special
Notes: 1. "X" is an open level. The level has to be specified in the dedicated equipment specification. 2. The gray rows were the selected test level.				

9.1.2 Performance Criterion

Criterion B

9.2 Test Setup



(A) location for supply line coupling

(B) location for signal lines coupling

9.3 Test Procedure

Measurement was performed in shielded room.

Measurement procedure was applied according to EN 61000-4-4 clause 8.

The test method and equipment was specified by EN 61000-4-4.

9.4 Test Result

Test No.	Level (kV)	Polarity (+/-)	Line for test	Pass/Fail/NA
1	2	+/-	AC power ports	Pass
2	1	+/-	Signal ports	NA
3	1	+/-	DC power ports	Pass

Observation: All the functions were operated as normal during and after test.

Conclusion: The EUT can meet the requirement of Performance Criterion B

10 Surges

Test result **PASS**

10.1 Severity Level and Performance Criterion

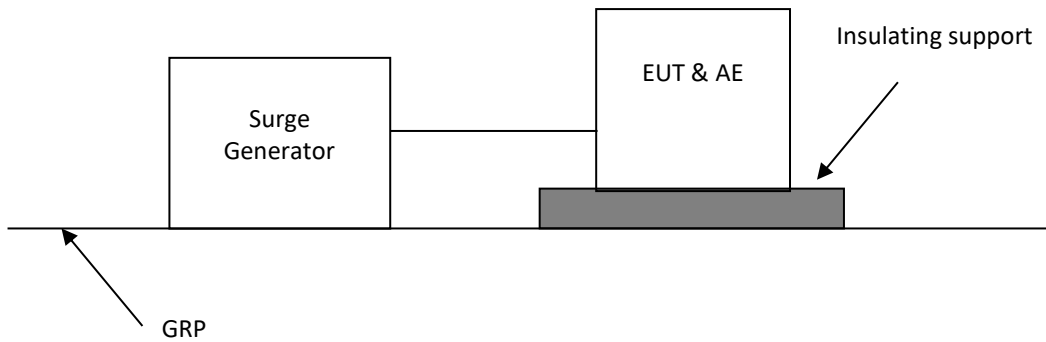
10.1.1 Test level

Level	Open-circuit test voltage (kV)
1	0.5
2	1.0
3	2.0
4	4.0
X*	Special
Notes: 1. "X" is an open class. This level can be specified in the product specification 2. The gray rows are the selected level.	

10.1.2 Performance Criterion

Criterion B

10.2 Test Setup



10.3 Test Procedure

Measurement was performed in shielded room.
Measurement procedure was applied according to EN 61000-4-5 clause 8.
The test method and equipment was specified by EN 61000-4-5.

10.4 Test Result

Test No.	Level [kV]	Polarity +/-	Line for test	Pass/Fail/NA
1	0.5/1	+/-	AC mains power input port (line to line)	Pass
2	0.5/1/2	+/-	AC mains power input port (line to earth)	Pass
3	0.5/1	+/-	DC power ports	Pass

Observation: All the functions were operated as normal during and after test.

Conclusion: The EUT can meet the requirement of Performance Criterion B

11 Radio frequency, common mode

Test result **PASS**

11.1 Severity Level and Performance Criterion

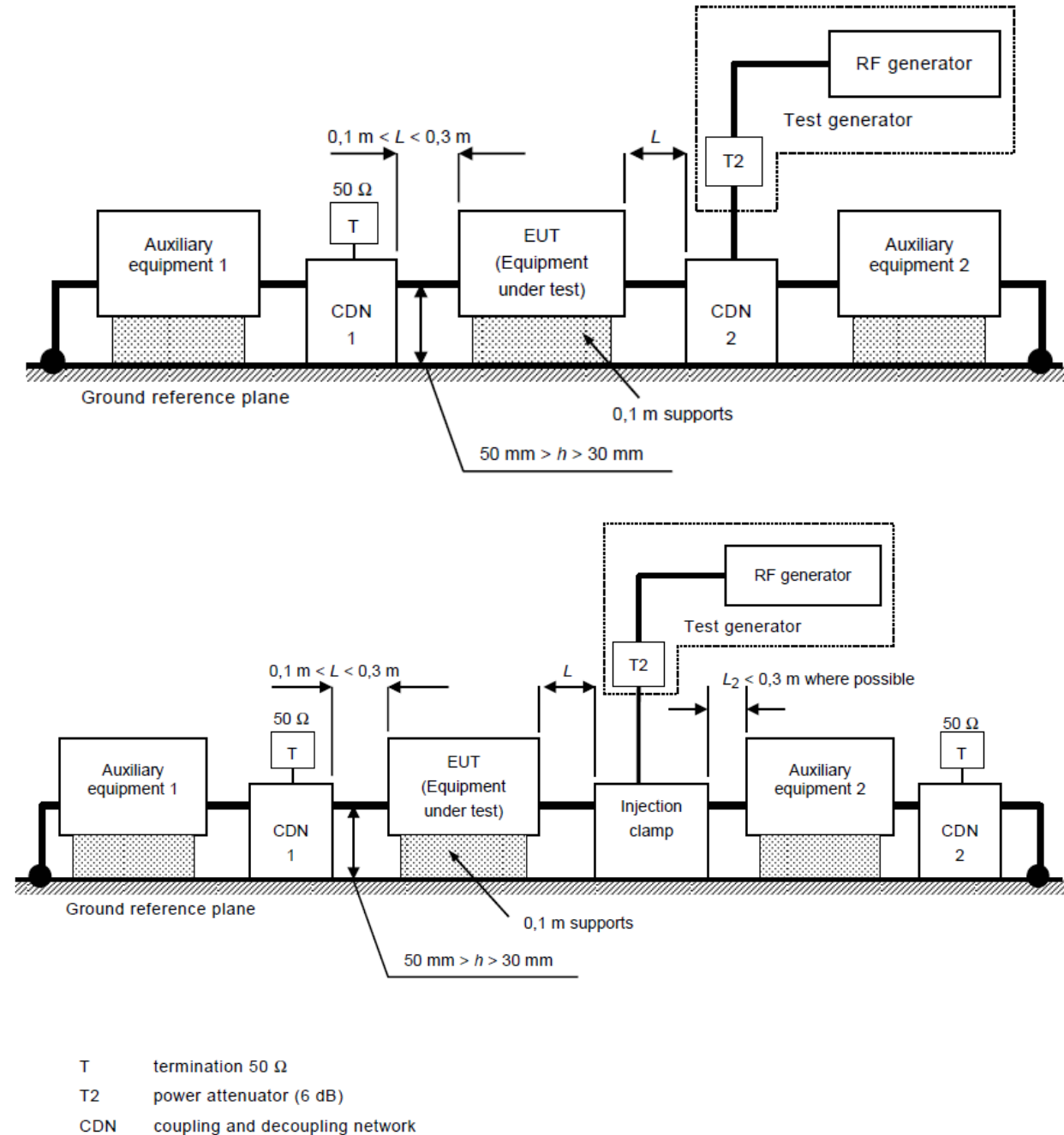
11.1.1 Test level

Frequency range 150kHz – 80MHz		
Level	Voltage level	
	U ₀ (dBuV)	U ₀ (V)
1	120	1
2	130	3
3	140	10
X	Special	Special
Notes: 1. "X" is an open level 2. The gray row is the selected test level.		

11.1.2 Performance Criterion

Criterion A

11.2 Block Diagram of Test Setup



11.3 Test Procedure

Measurement procedure was applied according to EN 61000-4-6 clause 8.
The test method and equipment was specified by EN 61000-4-6.

11.4 Test Result

Test No.	Frequency (MHz)	Level (V)	Modulation	Injected point	Pass/Fail/NA
1	0.15~80	10	80%, 1 kHz, AM	AC power port	Pass
2	0.15~80	10	80%, 1 kHz, AM	signal ports	NA
3	0.15~80	10	80%, 1 kHz, AM	DC power ports	Pass

Observation: All the functions were operated as normal during and after test.

Conclusion: The EUT can meet the requirement of Performance Criterion A

12 Voltage dips

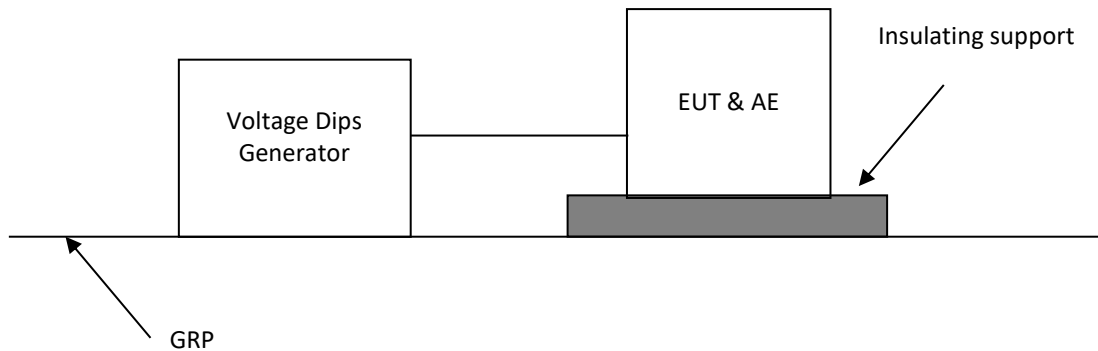
Test result **PASS**

12.1 Severity Level and Performance Criterion

12.1.1 Test level

Test level Reduction (%)	Voltage level in % of rated Ut	Duration (cycles)	Performance criterion
100	0	0.5	B
		1	B
		250 (at 50Hz) 300 (at 60Hz)	C
30	70	25 (at 50Hz) 30 (at 60Hz)	C
Notes: The gray rows are selected test level.			

12.2 Test Setup



12.3 Test Procedure

Measurement was performed in shielded room.

Measurement procedure was applied according to EN 61000-4-11 clause 8.

The test method and equipment was specified by EN 61000-4-11.

12.4 Test Result

Test no.	Test level % U _T	Voltage dip and short interruptions % U _T	Duration (in periods)	Pass/ Fail
1	70	30%	25 cycles at 50Hz	Pass
			30 cycles at 60Hz	Pass
2	0	100%	0.5 cycle	Pass
3	0	100%	1 cycle	Pass
4	0	100%	250 cycles at 50Hz	Pass
			300 cycles at 60Hz	Pass

Observation: At test level of 0%, the EUT worked interrupted during a short time. Once the interference is removed, it recovered its normal mode at once

Conclusion: The EUT met the requirements of Performance Criterion B and C.

13 Power Frequency Magnetic field

Test result: **PASS**

13.1 Severity Level and Performance Criterion

13.1.1 Test level

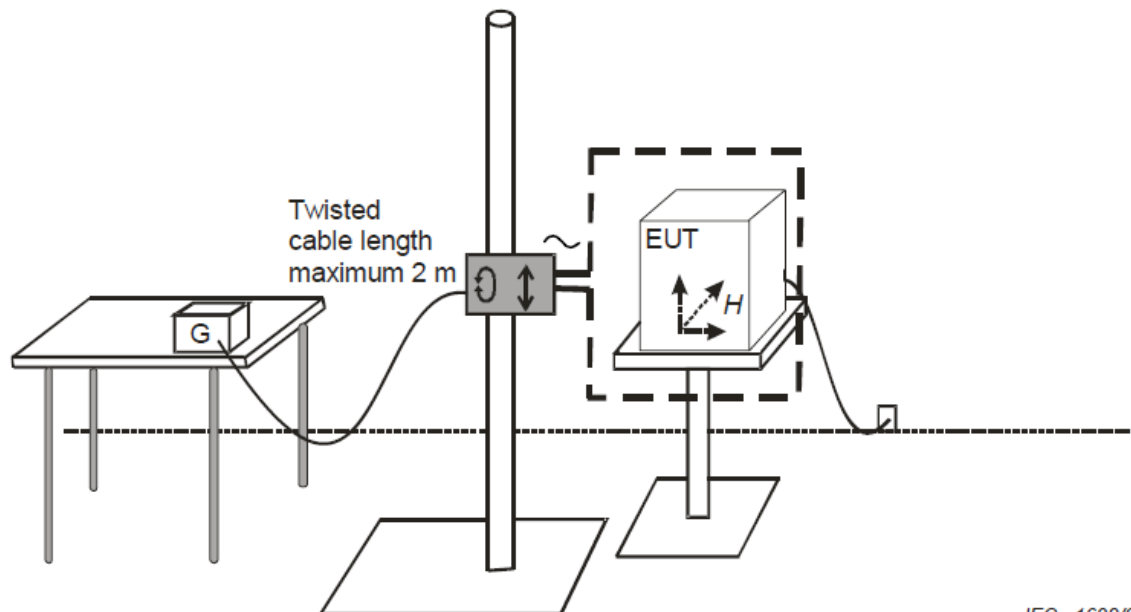
Level	Magnetic field strength A/m
1	1
2	3
3	10
4	30
5	100
X	Special
Note: 1. X is an open test level; this level may be given in the product specification. 2. The gray row is the selected test level.	

13.1.2 Performance Criterion

Performance criterion A

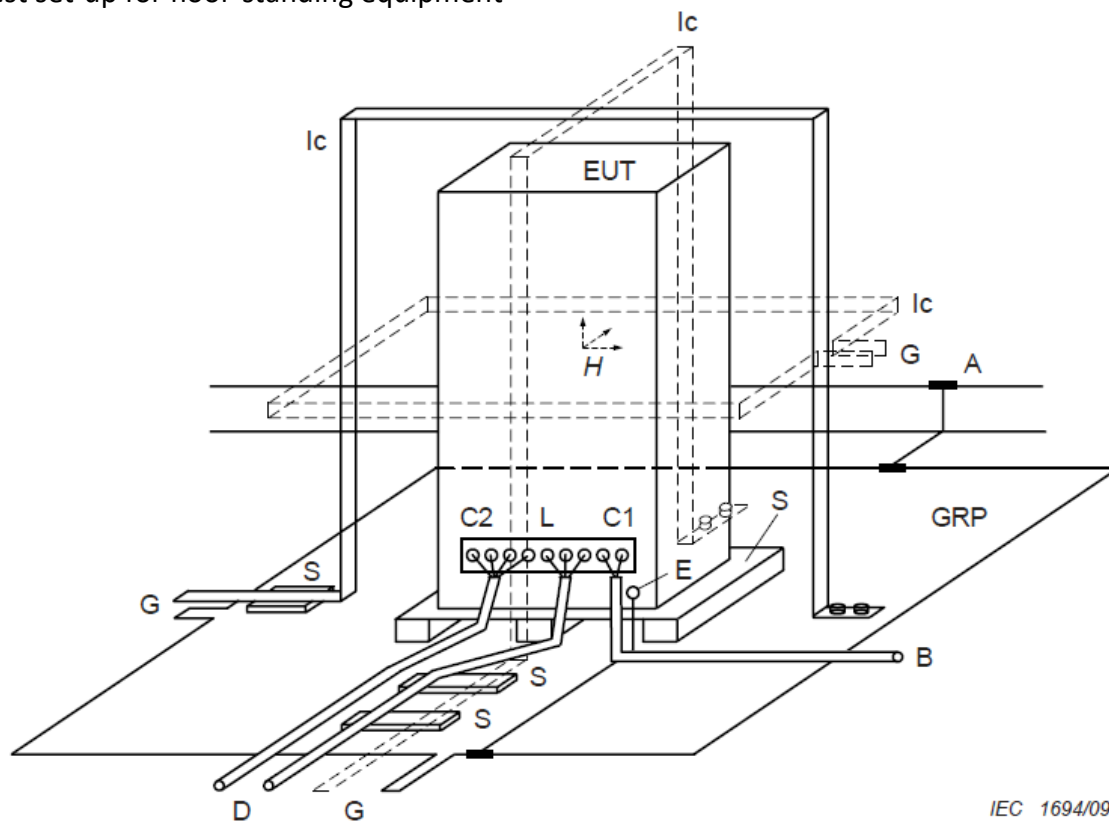
13.2 Diagram of Test Setup

Test set-up for table-top equipment



IEC 1692/09

Test set-up for floor-standing equipment



IEC 1694/09

13.3 Test Setup and Test Procedure

Measurement was performed in shielded room.

Measurement and setting of EUT was applied according to clause 7 of IEC 61000-4-8.

The test method and equipment was specified by IEC 61000-4-8 with the modifications by clause 8 of EN 61000-6-1.

13.4 Test Protocol

Test No.	Level A/m	Axis	Result
1	30	X	PASS
2	30	Y	PASS
3	30	Z	PASS

Observation: All the functions were operated as normal during and after test.

Conclusion: The EUT can meet the requirement of Performance Criterion A

Appendix I: Specifications table

Model	AF3K-TH	AF4K-TH	AF5K-TH	AF6K-TH
PV input				
P pv Max(kW)	5	6	7.5	9
Vmax PV (Vdc) (absolute Max.)	1000	1000	1000	1000
Isc PV (absolute Max.) (A)	30*2	30*2	30*2	30*2
Number MPP trackers	2	2	2	2
Number input strings	1/1	1/1	1/1	1/1
Max. PV input current (A)	20*2	20*2	20*2	20*2
MPPT voltage range (Vdc)	150-850	150-850	150-850	150-850
Vdc range @ full power (Vdc)	200-850	200-850	200-850	250-850
Battery (charge/discharge)				
Battery type	Li-ion/Lead-acid			
Battery Normal Voltage (Range) (Vdc)	150-800(Field adapt battery voltage range)			
Max charge/discharge Current(A)	30	30	30	30
Max charge/discharge Power(kW)	3	4	5	6
AC Grid (input and output)				
Normal AC Voltage (VAC)	3P+N+PE/3P+PE 230/400			
Frequency (Hz)	50			
Normal AC Current (A)	4.4	5.8	7.3	8.7
Max. cont. input/output current (A)	8 / 5.3	10.5 / 7	13 / 8.5	16 / 10.5
Rated Power (kW)	3	4	5	6
Rated Apparent Power (kVA)	3	4	5	6
Max. cont. input/output Power (kW)	4.5 / 3.3	6 / 4.4	7.5 / 5.5	9 / 6.6
Max. cont. Apparent input/output Power (KVA)	4.5 / 3.3	6 / 4.4	7.5 / 5.5	9 / 6.6
Power factor(adjustable)	1.0(-0.8~ +0.8)			
AC Load output (stand alone)				
Normal Voltage (VAC)	3P+N+PE/3P+PE 230/400			
Frequency (Hz)	50			
Nominal Current (A)	4.4	5.8	7.3	8.7
Max. cont. current (A)	5.3	7	8.5	10.5
Max. cont. Power (kW)	3	4	5	6
Rated Apparent Power (kVA)	3	4	5	6
Max. cont. Apparent Power (kVA)	3	4	5	6
Power factor	1.0			
Others				
Ingress protection (IP)	IP65			
Protective class	Class I			
Temperature (°C)	-25°C to +60°C (Derating 45°C)			
Inverter Isolation	Non-isolated (PV-AC-BAT)			
Overvoltage category	OVC III (AC Main), OVC II (PV)			
Firmware Version	1.01			
Software Version	V01			

TEST REPORT

Model	AF8K-TH	AF10K-TH	AF12K-TH	AF15K-TH
PV input				
P _{pv} Max(kW)	12	15	18	22.5
V _{max} PV (Vdc) (absolute Max.)	1000	1000	1000	1000
I _{sc} PV (absolute Max.) (A)	30*2	30*2	30*2	30+48
Number MPP trackers	2	2	2	2
Number input strings	1/1	1/1	1/1	1/2
Max. PV input current (A)	20*2	20*2	20*2	20+32
MPPT voltage range (Vdc)	150-850	150-850	150-850	150-850
Vdc range @ full power (Vdc)	300-850	500-850	500-850	500-850
Battery (charge/discharge)				
Battery type	Li-ion/Lead-acid			
Battery Normal Voltage (Range) (Vdc)	150-800(Field adapt battery voltage range)			
Max charge/discharge Current(A)	30	30	30	50
Max charge/discharge Power(kW)	8	10	12	15
AC Grid (input and output)				
Normal AC Voltage (VAC)	3P+N+PE/3P+PE 230/400			
Frequency (Hz)	50			
Normal AC Current (A)	11.6	14.5	17.4	21.8
Max. cont. input/output current (A)	20 / 13.5	26 / 17	32 / 21.5	40.5 / 27
Rated Power (kW)	8	10	12	15
Rated Apparent Power (kVA)	8	10	12	15
Max. cont. input/output Power (kW)	12 / 8.8	15 / 11	18 / 13.2	22.5 / 16.5
Max. cont. Apparent input/output Power (kVA)	12 / 8.8	15 / 11	18 / 13.2	22.5 / 16.5
Power factor(adjustable)	1.0(-0.8~ +0.8)			
AC Load output (stand alone)				
Normal Voltage (VAC)	3P+N+PE/3P+PE 230/400			
Frequency (Hz)	50			
Nominal Current (A)	11.6	14.5	17.4	21.8
Max. cont. current (A)	13.5	17	21.5	27
Max. cont. Power (kW)	8	10	12	15
Rated Apparent Power (kVA)	8	10	12	15
Max. cont. Apparent Power (kVA)	8	10	12	15
Power factor	1.0			
Others				
Ingress protection (IP)	IP65			
Protective class	Class I			
Temperature (°C)	-25°C to +60°C (Derating 45°C)			
Inverter Isolation	Non-isolated (PV-AC-BAT)			
Overvoltage category	OVC III (AC Main), OVC II (PV)			
Firmware Version	1.01			
Software Version	V01			

TEST REPORT

Model	AF3K-THP	AF4K-THP	AF5K-THP	AF6K-THP
PV input				
P _{pv} Max(kW)	5	6	7.5	9
V _{max} PV (Vdc) (absolute Max.)	1000	1000	1000	1000
I _{sc} PV (absolute Max.) (A)	30*2	30*2	30*2	30*2
Number MPP trackers	2	2	2	2
Number input strings	1/1	1/1	1/1	1/1
Max. PV input current (A)	20*2	20*2	20*2	20*2
MPPT voltage range (Vdc)	150-850	150-850	150-850	150-850
Vdc range @ full power (Vdc)	200-850	200-850	200-850	250-850
Battery (charge/discharge)				
Battery type	Li-ion/Lead-acid			
Battery Normal Voltage (Range) (Vdc)	80-600(Field adapt battery voltage range)			
Max charge/discharge Current(A)	50	50	50	50
Max charge/discharge Power(kW)	3	4	5	6
AC Grid (input and output)				
Normal AC Voltage (VAC)	3P+N+PE/3P+PE 230/400			
Frequency (Hz)	50			
Normal AC Current (A)	4.4	5.8	7.3	8.7
Max. cont. input/output current (A)	8 / 5.3	10.5 / 7	13 / 8.5	16 / 10.5
Rated Power (kW)	3	4	5	6
Rated Apparent Power (kVA)	3	4	5	6
Max. cont. input/output Power (kW)	4.5 / 3.3	6 / 4.4	7.5 / 5.5	9 / 6.6
Max. cont. Apparent input/output Power (KVA)	4.5 / 3.3	6 / 4.4	7.5 / 5.5	9 / 6.6
Power factor(adjustable)	1.0(-0.8~ +0.8)			
AC Load output (stand alone)				
Normal Voltage (VAC)	3P+N+PE/3P+PE 230/400			
Frequency (Hz)	50			
Nominal Current (A)	4.4	5.8	7.3	8.7
Max. cont. current (A)	5.3	7	8.5	10.5
Max. cont. Power (kW)	3	4	5	6
Rated Apparent Power (kVA)	3	4	5	6
Max. cont. Apparent Power (kVA)	3	4	5	6
Power factor	1.0			
Others				
Ingress protection (IP)	IP65			
Protective class	Class I			
Temperature (°C)	-25°C to +60°C (Derating 45°C)			
Inverter Isolation	Non-isolated (PV-AC-BAT)			
Overvoltage category	OVC III (AC Main), OVC II (PV)			
Firmware Version	1.01			
Software Version	V01			

TEST REPORT

Model	AF8K-THP	AF10K-THP	AF12K-THP
PV input			
P pv Max(kW)	12	15	18
Vmax PV (Vdc) (absolute Max.)	1000	1000	1000
Isc PV (absolute Max.) (A)	30*2	30*2	30*2
Number MPP trackers	2	2	2
Number input strings	1/1	1/1	1/1
Max. PV input current (A)	20*2	20*2	20*2
MPPT voltage range (Vdc)	150-850	150-850	150-850
Vdc range @ full power (Vdc)	300-850	500-850	500-850
Battery (charge/discharge)			
Battery type	Li-ion/Lead-acid		
Battery Normal Voltage (Range) (Vdc)	80-600(Field adapt battery voltage range)	120-650(Field adapt battery voltage range)	
Max charge/discharge Current(A)	50	50	50
Max charge/discharge Power(kW)	8	10	12
AC Grid (input and output)			
Normal AC Voltage (VAC)	3P+N+PE/3P+PE 230/400		
Frequency (Hz)	50		
Normal AC Current (A)	11.6	14.5	17.4
Max. cont. input/output current (A)	20 / 13.5	26 / 17	32 / 21.5
Rated Power (kW)	8	10	12
Rated Apparent Power (kVA)	8	10	12
Max. cont. input/output Power (kW)	12 / 8.8	15 / 11	18 / 13.2
Max. cont. Apparent input/output Power (kVA)	12 / 8.8	15 / 11	18 / 13.2
Power factor(adjustable)	1.0(-0.8~ +0.8)		
AC Load output (stand alone)			
Normal Voltage (VAC)	3P+N+PE/3P+PE 230/400		
Frequency (Hz)	50		
Nominal Current (A)	11.6	14.5	17.4
Max. cont. current (A)	13.5	17	21.5
Max. cont. Power (kW)	8	10	12
Rated Apparent Power (kVA)	8	10	12
Max. cont. Apparent Power (kVA)	8	10	12
Power factor	1.0		
Others			
Ingress protection (IP)	IP65		
Protective class	Class I		
Temperature (°C)	-25°C to +60°C (Derating 45°C)		
Inverter Isolation	Non-isolated (PV-AC-BAT)		
Overvoltage category	OVC III (AC Main), OVC II (PV)		
Firmware Version	1.01		
Software Version	V01		

Specifications table				
Model	AF17K-TH	AF20K-TH	AF25K-TH	AF30K-TH
PV input				
P pv Max(kW)	25.5	30	37.5	45
Vmax PV (Vdc) (absolute Max.)	1000	1000	1000	1000
Isc PV (absolute Max.) (A)	48*2	48*2	60*2	60*2
Number MPP trackers	2	2	2	2
Number input strings	2/2	2/2	2/2	2/2
Max. PV input current (A)	32*2	32*2	40*2	40*2
MPPT voltage range (Vdc)	150-850	150-850	150-850	150-850
Vdc range @ full power (Vdc)	500-850	500-850	500-850	500-850
Battery (charge/discharge)				
Battery type	Li-ion/Lead-acid			
Battery Normal Voltage (Range) (Vdc)	150-800(Field adapt battery voltage range)			
Max charge/discharge Current(A)	50	50	60	60
Max charge/discharge Power(kW)	17	20	25	30
AC Grid (input and output)				
Normal AC Voltage (VAC)	3P+N+PE/3P+PE 230/400			
Frequency (Hz)	50			
Normal AC Current (A)	24.7	29	36.3	43.5
Max. cont. input/output current (A)	45 / 30	48 / 32	60 / 40	72 / 48
Rated Power (kW)	17	20	25	30
Rated Apparent Power (kVA)	17	20	25	30
Max. cont. input/output Power (kW)	25.5 / 18.7	30 / 22	37.5 / 27.5	45 / 33
Max. cont. Apparent input/output Power (kVA)	25.5 / 18.7	30 / 22	37.5 / 27.5	45 / 33
Power factor(adjustable)	1.0(-0.8~ +0.8)			
AC Load output (stand alone)				
Normal Voltage (VAC)	3P+N+PE/3P+PE 230/400			
Frequency (Hz)	50			
Nominal Current(A)	24.7	29	36.3	43.5
Max. cont. current (A)	30	32	40	48
Max. cont. Power (kW)	17	20	25	30
Rated Apparent Power (kVA)	17	20	25	30
Max. cont. Apparent Power (kVA)	17	20	25	30
Power factor	1.0			
Others				
Ingress protection (IP)	IP65			
Protective class	Class I			
Temperature (°C)	-25°C to +60°C (Derating 45°C)			
Inverter Isolation	Non-isolated (PV-AC-BAT)			
Overvoltage category	OVC III (AC Main), OVC II (PV)			
Firmware	1.01			
	V01			

Specifications table				
Model	AF3K-THA	AF4K-THA	AF5K-THA	AF6K-THA
PV input				
P pv Max(kW)	5	6	7.5	9
Vmax PV (Vdc) (absolute Max.)	1000	1000	1000	1000
Isc PV (absolute Max.) (A)	30*2	30*2	30*2	30*2
Number MPP trackers	2	2	2	2
Number input strings	1/1	1/1	1/1	1/1
Max. PV input current (A)	20*2	20*2	20*2	20*2
MPPT voltage range (Vdc)	150-850	150-850	150-850	150-850
Vdc range @ full power (Vdc)	200-850	200-850	200-850	200-850
Battery (charge/discharge)				
Battery type	Li-ion/Lead-acid			
Battery Normal Voltage Range (Vdc)	150-600(Field adapt battery voltage range)			
Max charge/discharge Current(A)	30	30	30	30
Max charge/discharge Power(kW)	3	4	5	6
AC Grid (input and output)				
Normal AC Voltage (VAC)	3P+PE/3P 133/230			
Frequency (Hz)	50			
Normal AC Current (A)	7.6	10.1	12.6	15.1
Max. cont. input/output current (A)	16 / 10.5	20 / 13.5	26 / 17	32 / 21.5
Rated Power (kW)	3	4	5	6
Rated Apparent Power (kVA)	3	4	5	6
Max. cont. input/output Power (kW)	4.5 / 3.3	6 / 4.4	7.5 / 5.5	9 / 6.6
Max. cont. Apparent input/output Power (kVA)	4.5 / 3.3	6 / 4.4	7.5 / 5.5	9 / 6.6
Power factor(adjustable)	1.0(-0.8~ +0.8)			
AC Load output (stand alone)				
Normal Voltage (VAC)	3P+PE/3P 133/230			
Frequency (Hz)	50			
Nominal Current (A)	7.6	10.1	12.6	15.1
Max. cont. current (A)	10.5	13.5	17	21.5
Max. cont. Power (kW)	3	4	5	6
Rated Apparent Power (kVA)	3	4	5	6
Max. cont. Apparent Power (kVA)	3	4	5	6
Others				
Ingress protection (IP)	IP65			
Protective class	Class I			
Temperature (°C)	-25°C to +60°C (Derating 45°C)			
Inverter Isolation	Non-isolated (PV - AC - BAT)			
Overvoltage category	OVC III (AC Main), OVC II (PV)			
Firmware	1.01			
Software Version	V01			

Specifications table				
Model	AF3K-THC	AF4K-THC	AF5K-THC	AF6K-THC
PV input				
P pv Max(kW)	5	6	7.5	9
Vmax PV (Vdc) (absolute Max.)	1000	1000	1000	1000
Isc PV (absolute Max.) (A)	30*2	30*2	30*2	30*2
Number MPP trackers	2	2	2	2
Number input strings	1/1	1/1	1/1	1/1
Max. PV input current (A)	20*2	20*2	20*2	20*2
MPPT voltage range (Vdc)	150-850	150-850	150-850	150-850
Vdc range @ full power (Vdc)	200-850	200-850	200-850	200-850
Battery (charge/discharge)				
Battery type	Li-ion/Lead-acid			
Battery Normal Voltage Range (Vdc)	80-600(Field adapt battery voltage range)			
Max charge/discharge Current(A)	50	50	50	50
Max charge/discharge Power(kW)	3	4	5	6
AC Grid (input and output)				
Normal AC Voltage (VAC)	3P+PE/3P 133/230			
Frequency (Hz)	50			
Normal AC Current (A)	7.6	10.1	12.6	15.1
Max. cont. input/output current (A)	16 / 10.5	20 / 13.5	26 / 17	32 / 21.5
Rated Power (kW)	3	4	5	6
Rated Apparent Power (kVA)	3	4	5	6
Max. cont. input/output Power (kW)	4.5 / 3.3	6 / 4.4	7.5 / 5.5	9 / 6.6
Max. cont. Apparent input/output Power (kVA)	4.5 / 3.3	6 / 4.4	7.5 / 5.5	9 / 6.6
Power factor(adjustable)	1.0(-0.8~ +0.8)			
AC Load output (stand alone)				
Normal Voltage (VAC)	3P+PE/3P 133/230			
Frequency (Hz)	50			
Nominal Current (A)	7.6	10.1	12.6	15.1
Max. cont. current (A)	10.5	13.5	17	21.5
Max. cont. Power (kW)	3	4	5	6
Rated Apparent Power (kVA)	3	4	5	6
Max. cont. Apparent Power (kVA)	3	4	5	6
Others				
Ingress protection (IP)	IP65			
Protective class	Class I			
Temperature (°C)	-25°C to +60°C (Derating 45°C)			
Inverter Isolation	Non-isolated (PV - AC - BAT)			
Overvoltage category	OVC III (AC Main), OVC II (PV)			
Firmware	1.01			
Software Version	V01			

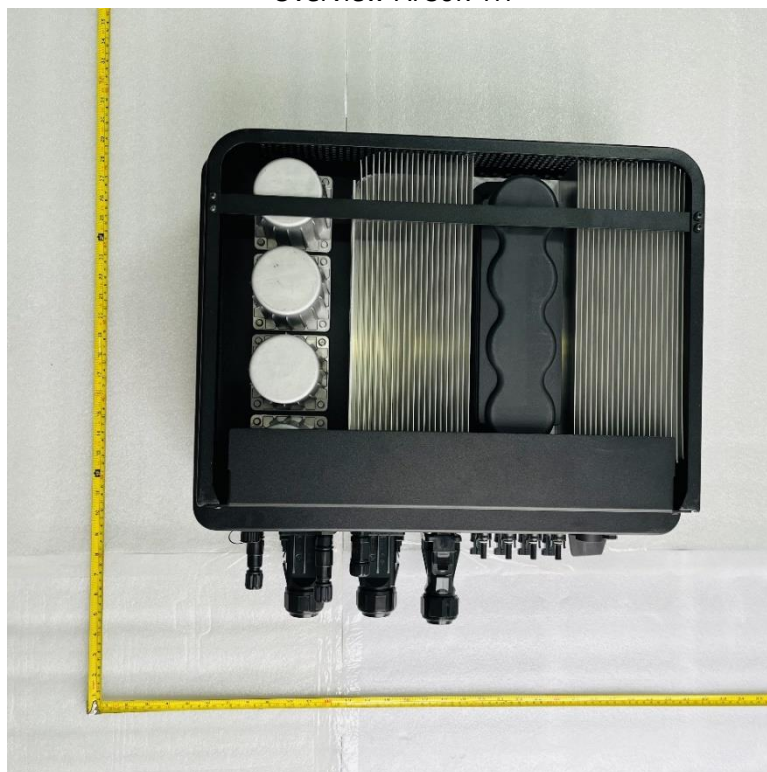
Specifications table					
Model	AF8K-THA	AF10K-THA	AF12K-THA	AF15K-THA	AF17K-THA
PV input					
P pv Max(kW)	12	15	18	22.5	25.5
Vmax PV (Vdc) (absolute Max.)	1000	1000	1000	1000	1000
Isc PV (absolute Max.) (A)	30+48	48*2	48*2	60*2	60*2
Number MPP trackers	2	2	2	2	2
Number input strings	1/2	2/2	2/2	2/2	2/2
Max. PV input current (A)	20+32	32*2	32*2	40*2	40*2
MPPT voltage range (Vdc)	150-850	150-850	150-850	150-850	150-850
Vdc range @ full power (Vdc)	200-850	200-850	250-850	300-850	300-850
Battery (charge/discharge)					
Battery type	Li-ion/Lead-acid				
Battery Normal Voltage Range (Vdc)	150-600(Field adapt battery voltage range)				
Max charge/discharge Current(A)	50	50	50	60	60
Max charge/discharge Power(kW)	8	10	12	15	17
AC Grid (input and output)					
Normal AC Voltage (VAC)	3P+PE/3P 133/230				
Frequency (Hz)	50				
Normal AC Current (A)	20.1	25.1	30.1	37.6	42.7
Max. cont. input/output current (A)	40.5 / 27	45 / 30	48 / 32	60 / 40	72 / 48
Rated Power (kW)	8	10	12	15	17
Rated Apparent Power (kVA)	8	10	12	15	17
Max. cont. input/output Power (kW)	12 / 8.8	15 / 11	18 / 13.2	22.5 / 16.5	25.5 / 18.7
Max. cont. Apparent input/output Power (kVA)	12 / 8.8	15 / 11	18 / 13.2	22.5 / 16.5	25.5 / 18.7
Power factor(adjustable)	1.0(-0.8~ +0.8)				
AC Load output (stand alone)					
Normal Voltage (VAC)	3P+PE/3P 133/230				
Frequency (Hz)	50				
Nominal Current (A)	20.1	25.1	30.1	37.6	42.7
Max. cont. current (A)	27	30	32	40	48
Max. cont. Power (kW)	8	10	12	15	17
Rated Apparent Power (kVA)	8	10	12	15	17
Max. cont. Apparent Power (kVA)	8	10	12	15	17
Others					
Ingress protection (IP)	IP65				
Protective class	Class I				
Temperature (°C)	-25°C to +60°C (Derating 45°C)				
Inverter Isolation	Non-isolated (PV - AC - BAT)				
Overvoltage category	OVC III (AC Main), OVC II (PV)				
Firmware	1.01				
Software Version	V01				

Appendix II: Photograph of equipment under test

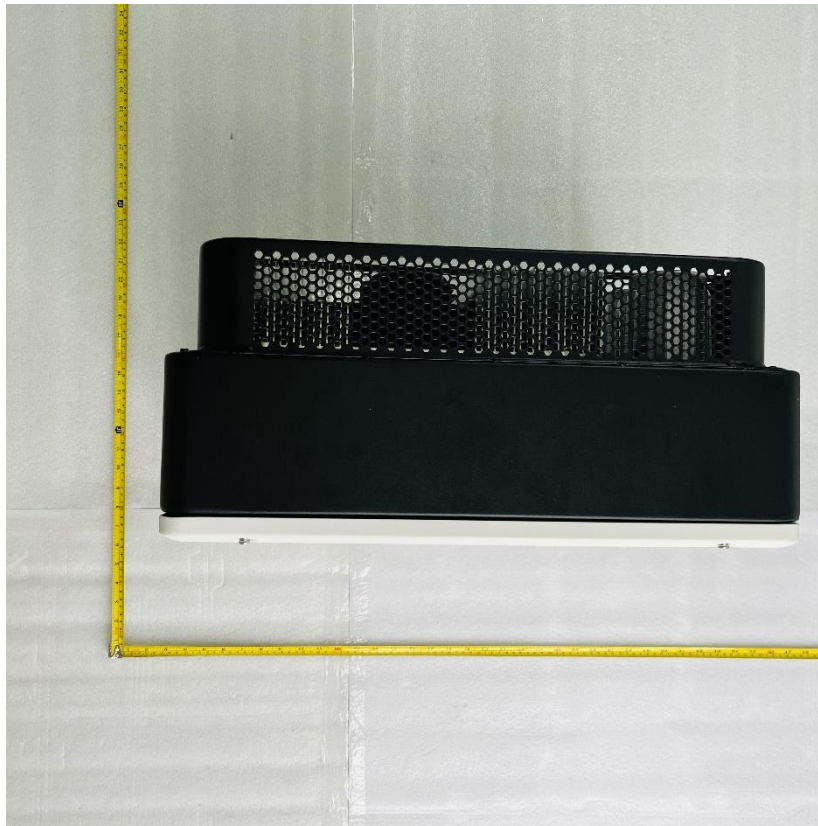
Overview-AF30K-TH



Overview-AF30K-TH



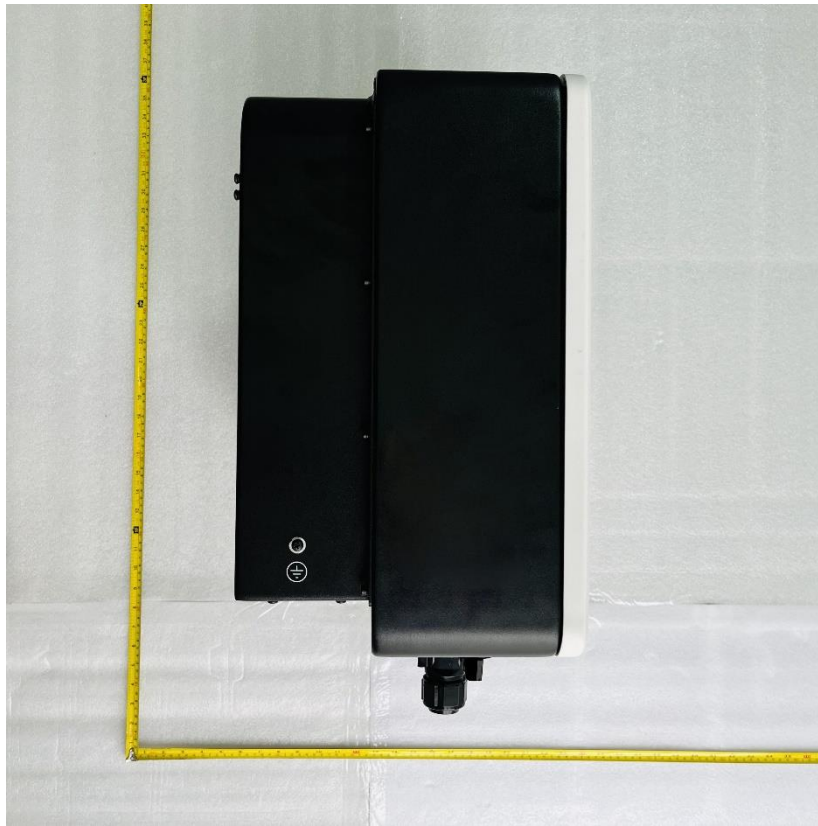
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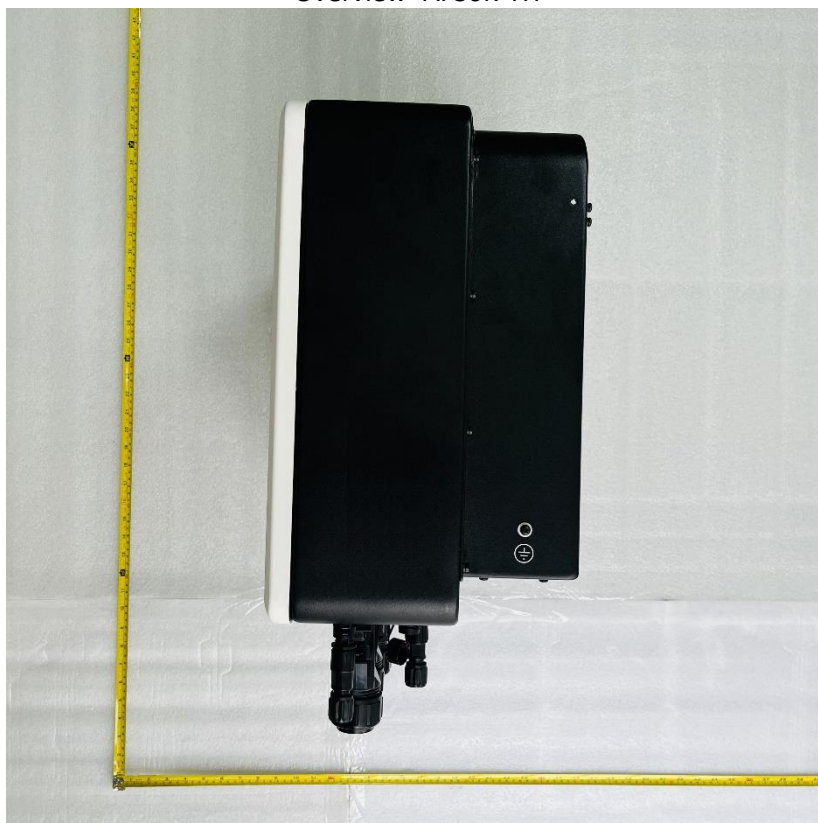
Overview- AF30K-TH



Overview- AF30K-TH



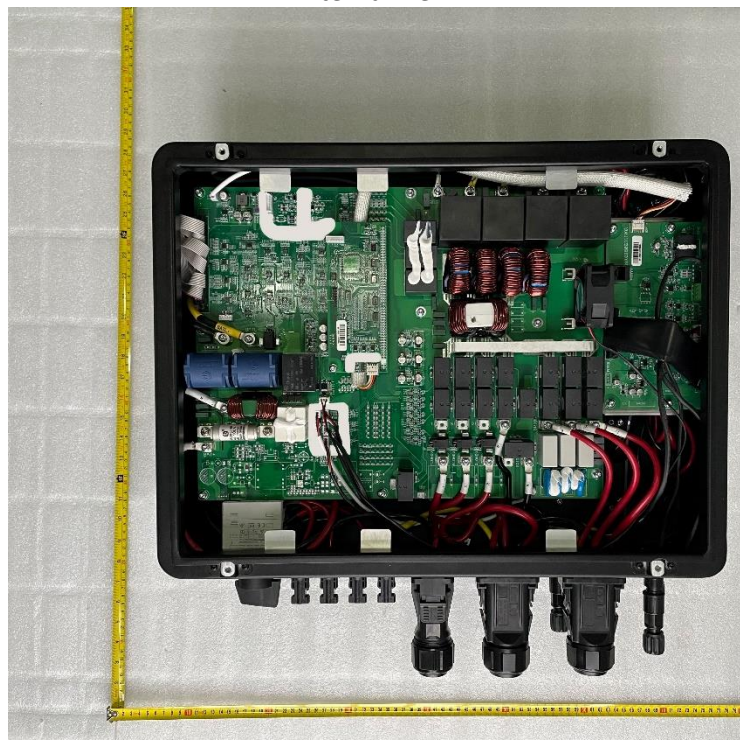
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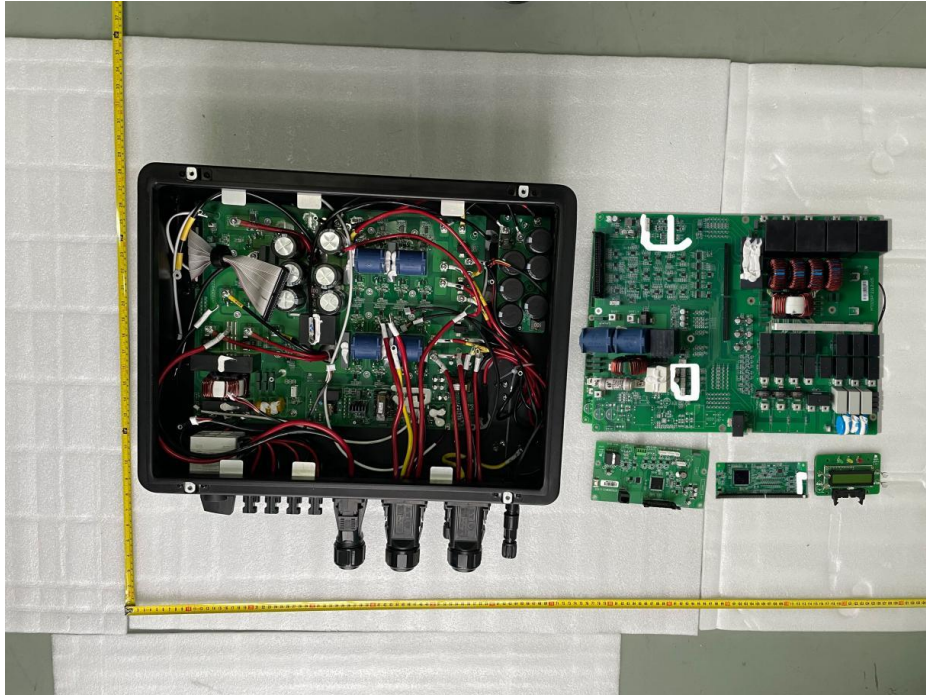
Internal view- AF30K-TH



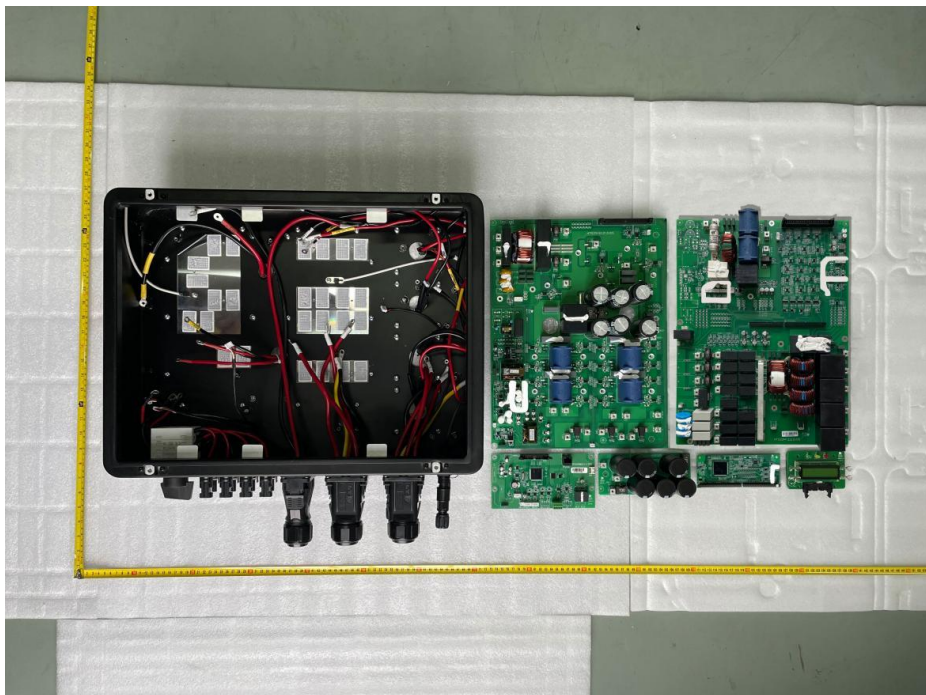
Internal view-



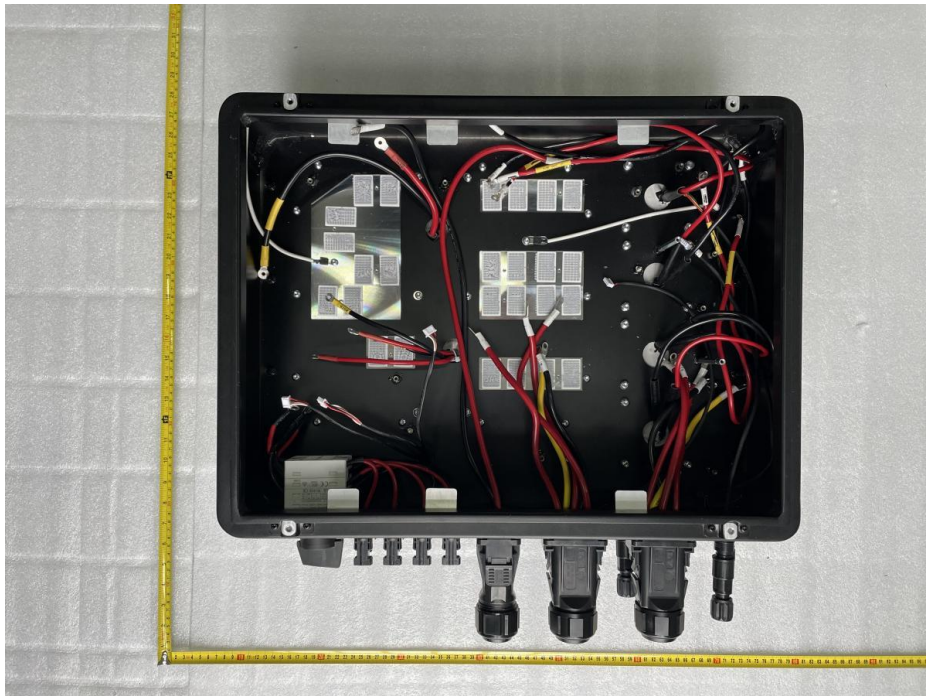
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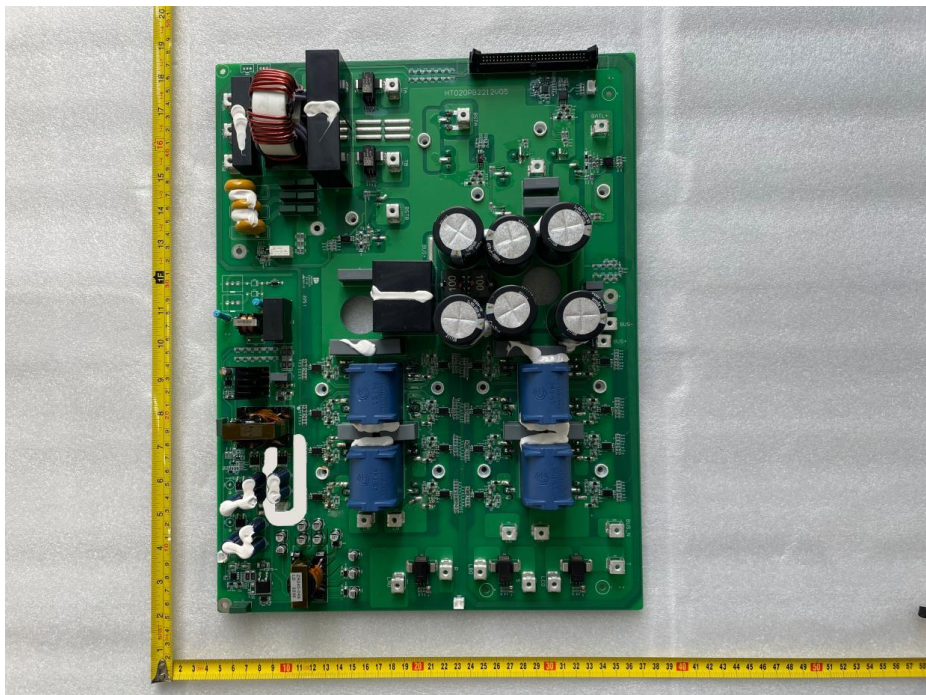
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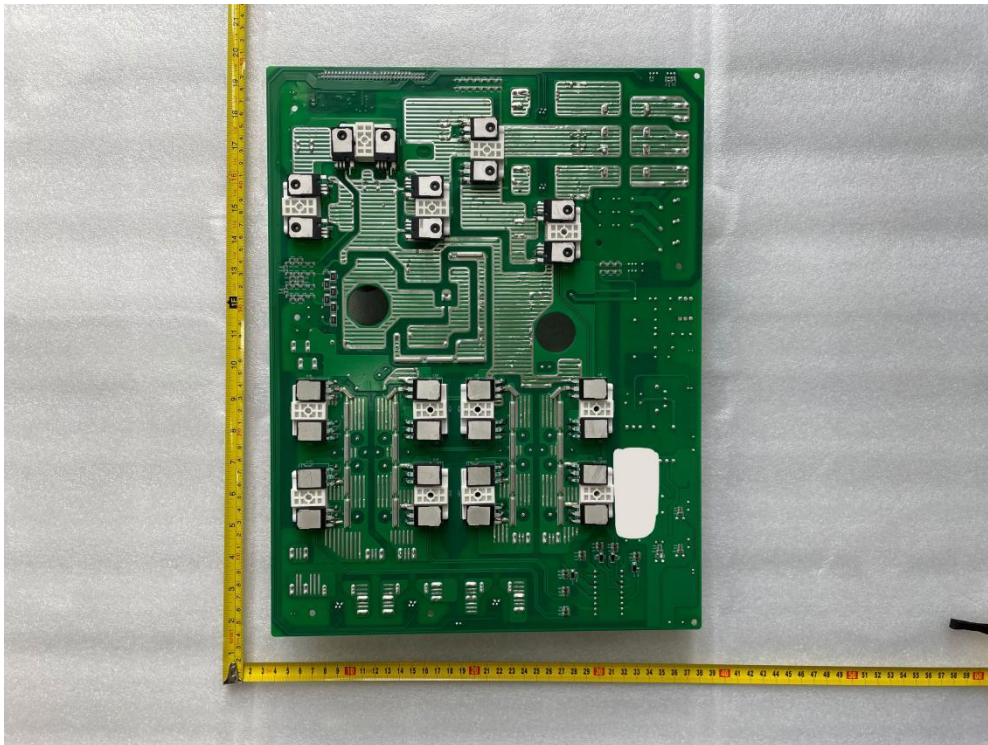
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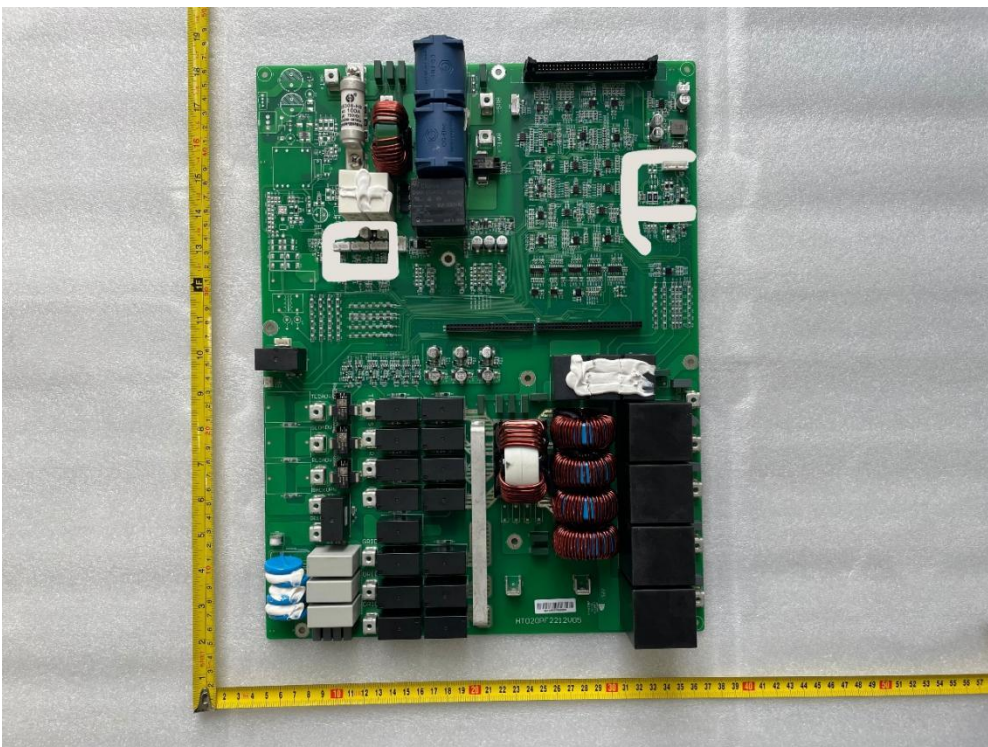
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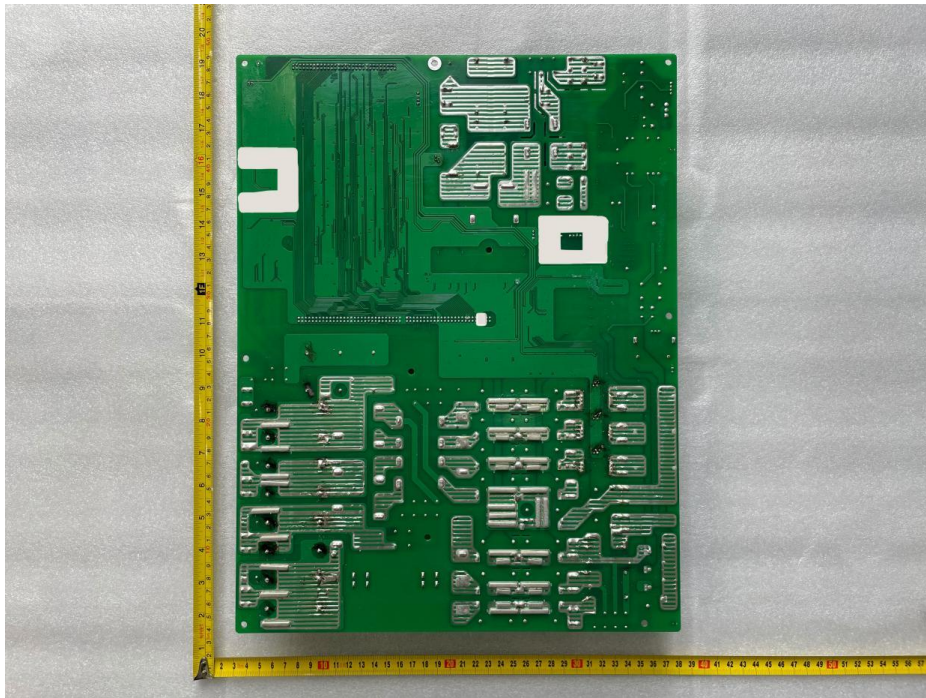
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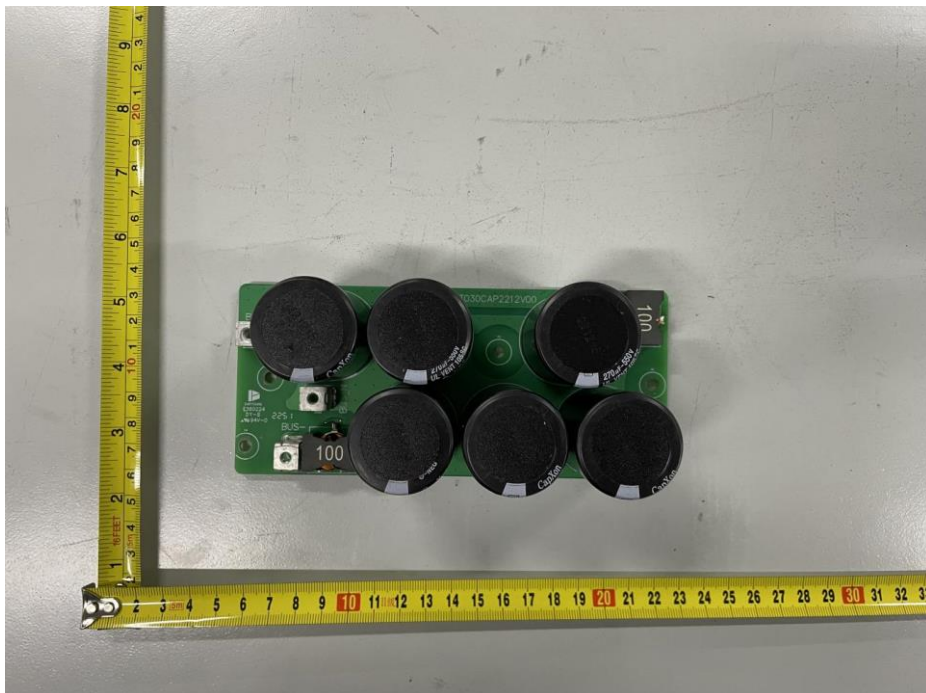
Internal view



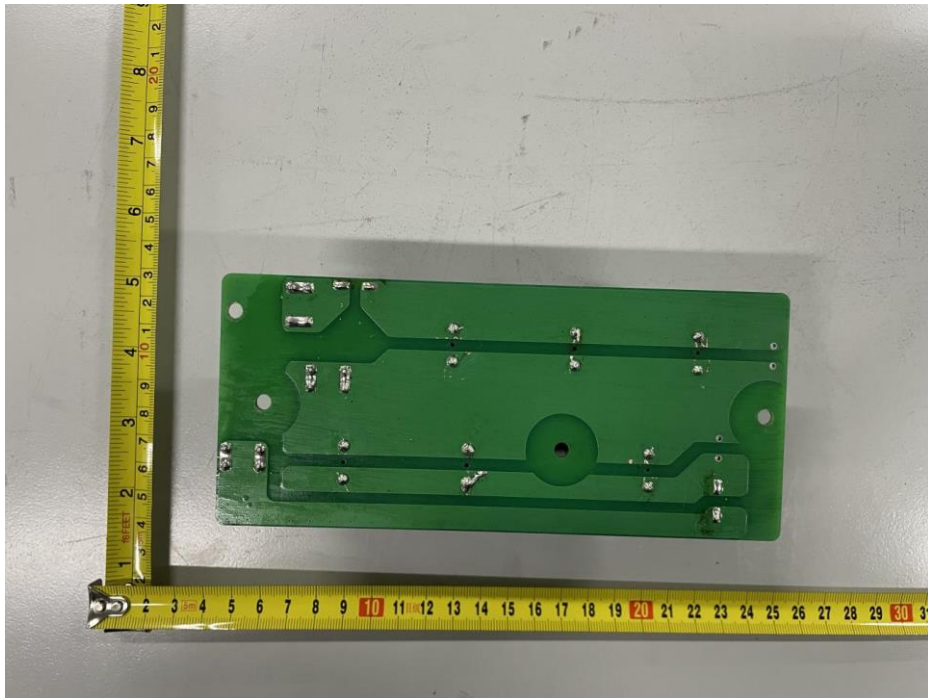
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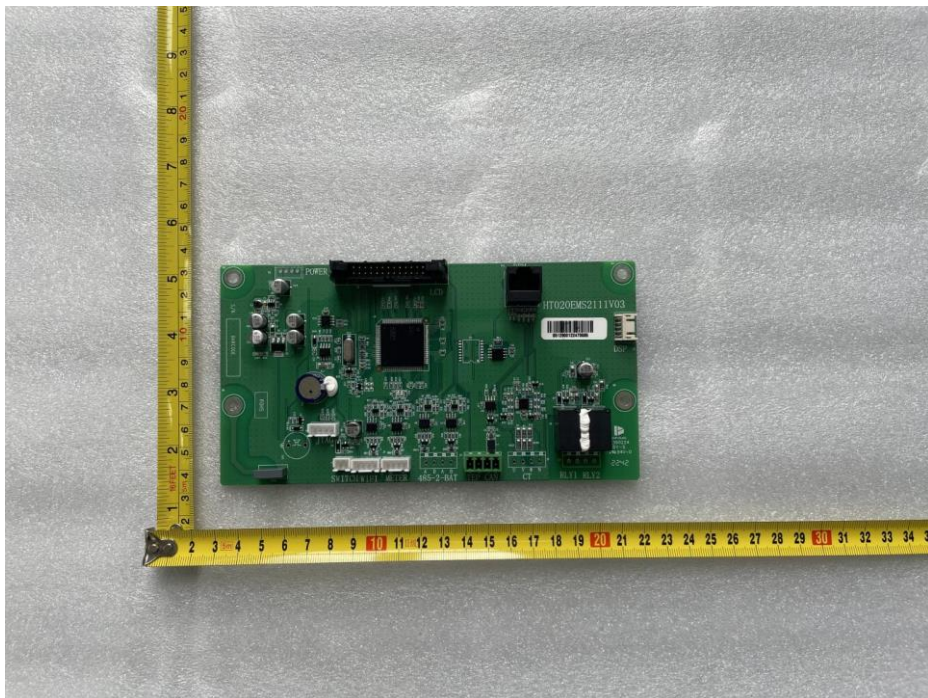
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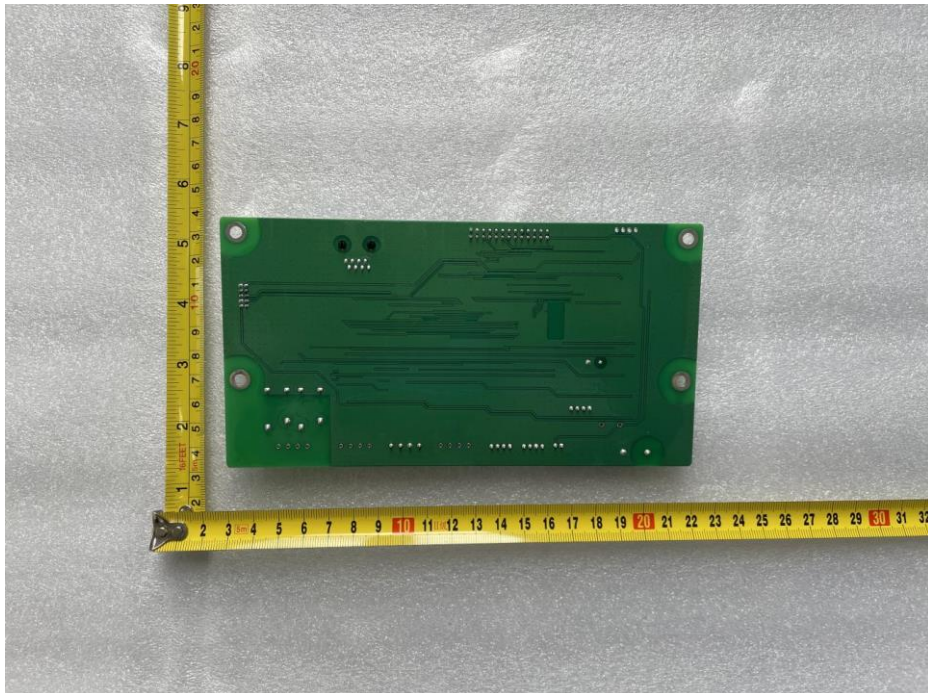
Internal view



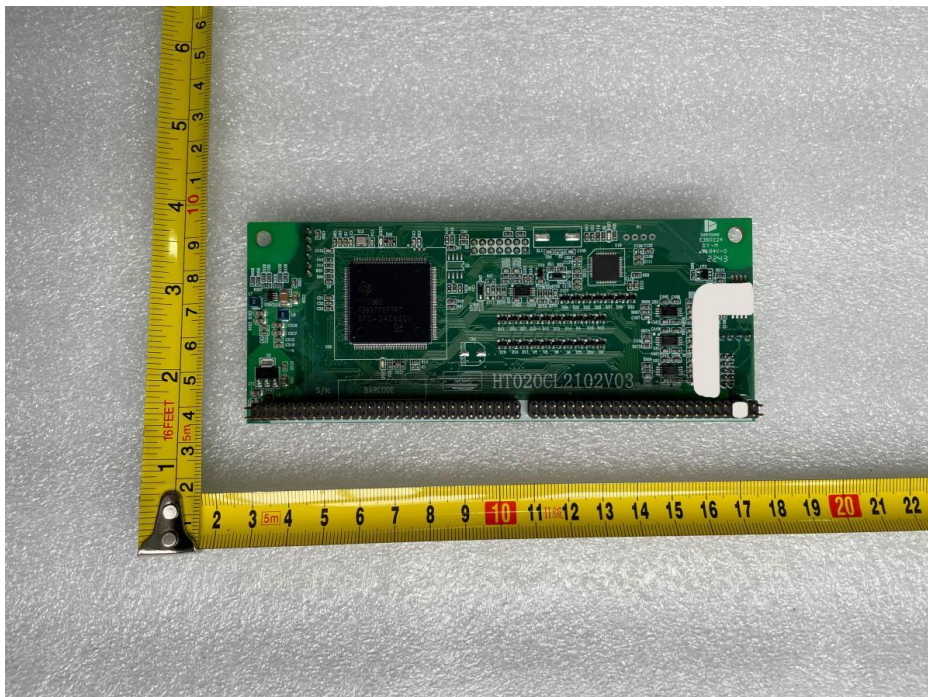
Internal view-



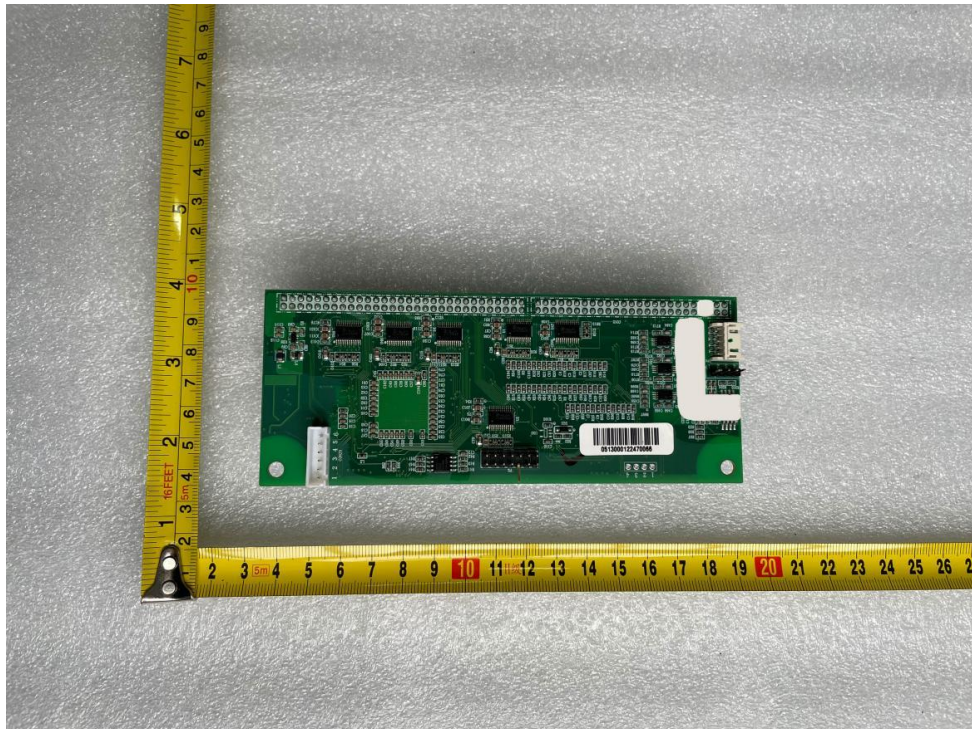
Internal view



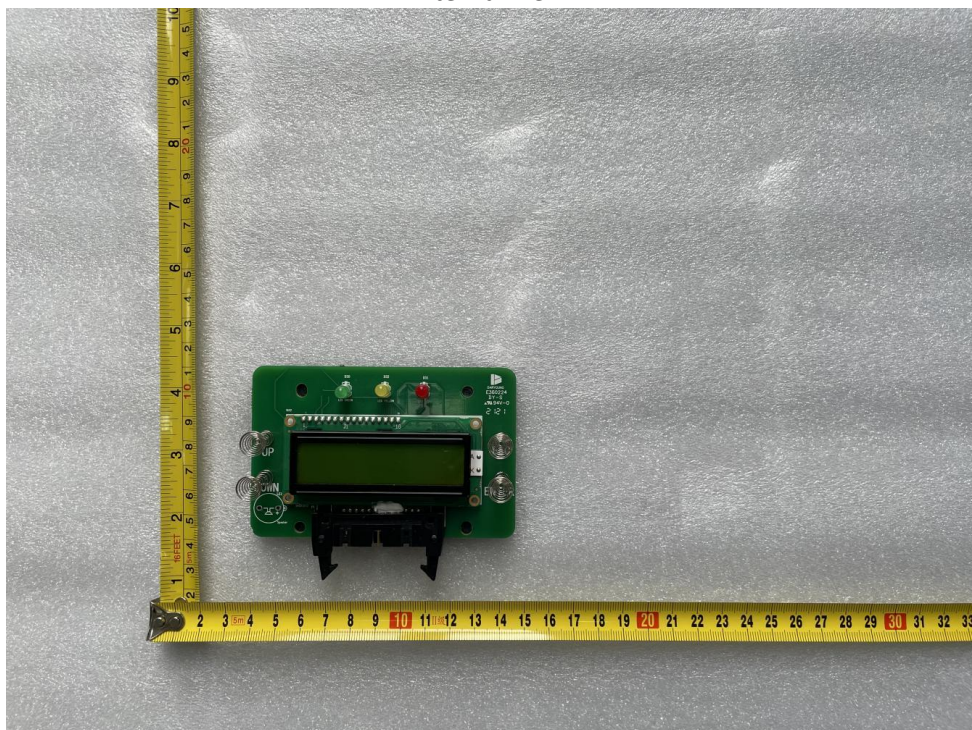
Internal view-



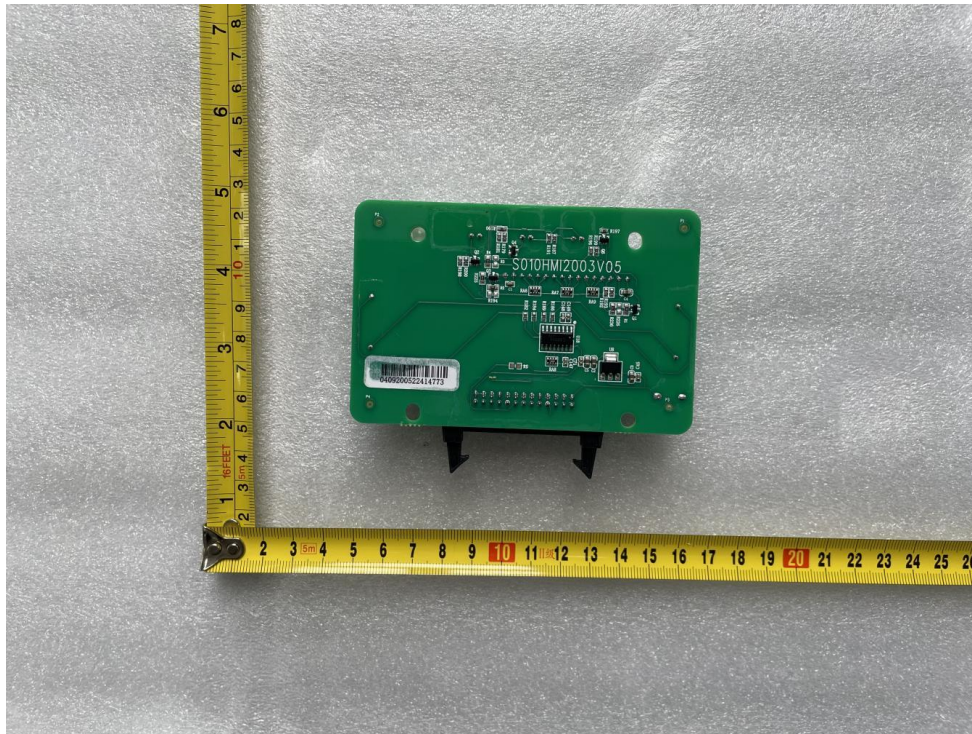
Internal view



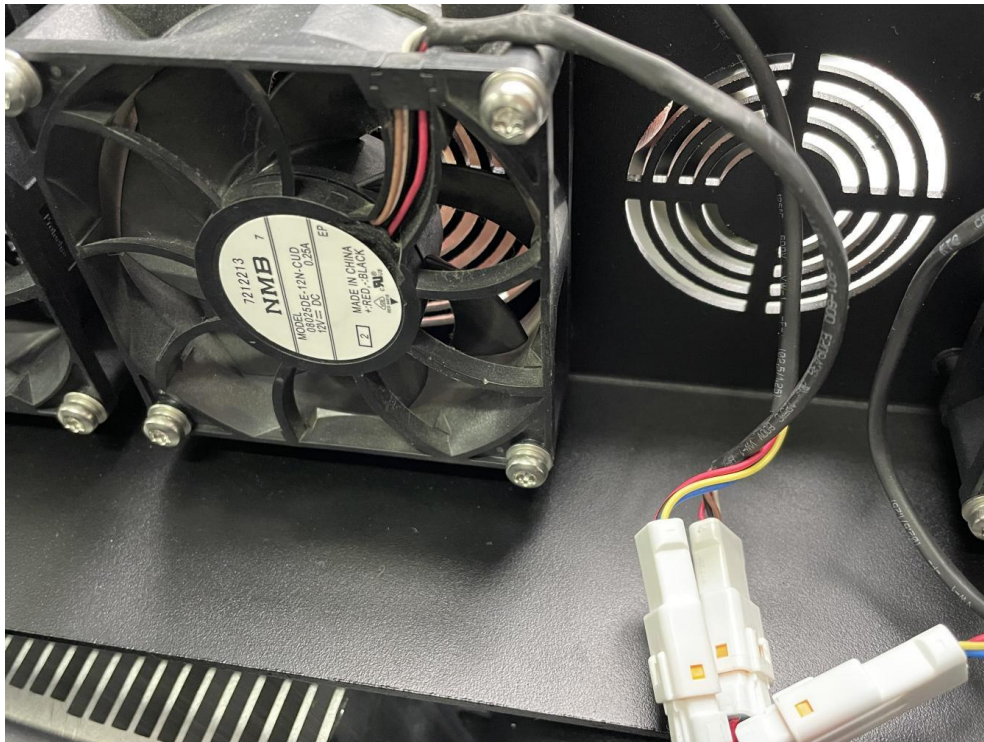
Internal view-



Internal view



Internal view-



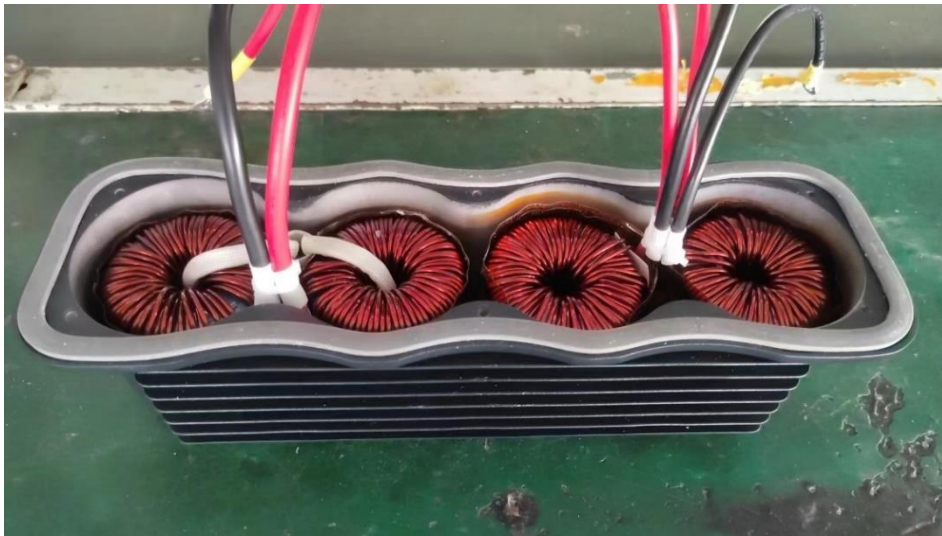
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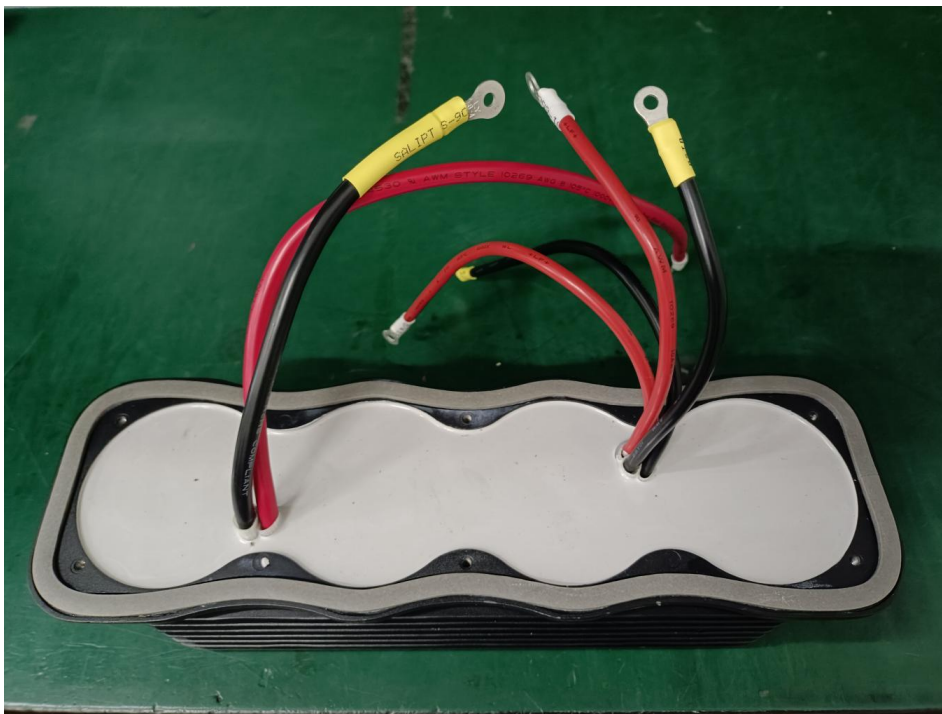
Internal view-



Internal view



Internal view-



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