Electromagnetic Compatibility (EMC)

TEST REPORT

TR_2024771_1

SGS Supervise
Gözetme Etüd
Kontrol Servisleri A.Ş.

Baglar Mah. Osmanpasa Cad. No:95 Is Istanbul Plaza E Girişi Gunesli-34209
t +90 212 368 40 00 **f** +90 212 296 47 82-83
www.tr.sgs.com
Member of SGS Group (Société Générale de Surveillance)

Test Report

Electromagnetic Compatibility (EMC)

Report Number	:	TR_2024771_1
Date of issue	:	08.10.2024
Date of receipt of test item	:	09.09.2024
Date (s) of performance of tests	:	11.09.2020-12.09.2024
Total number of pages	:	36
Test item description	:	Minibar Cooler
Model/Type reference	:	MNK 40C
Trademark	:	MN BAR, MN COOLING
Manufacturer	:	MN MINIBAR INOVASYON YATIRIM LTD ŞTİ.
Address		KAYSERI OSB MAH 19.CAD. NO:8
Applicant's name	:	Same as manufacturer
Address		

Tested by (name + signature)	**Approved by (name + signature)**	**Reviewed by (name + signature)**
Mesut Yıldız	Güleç Gökçe Özutku	Füsun Aksaz
Eldaş A.Ş.	SGS Turkey	SGS Turkey

The report was signed electronically

1 DOCUMENTATION

1.1 Test Standards

The Equipment Under Test Complies with Following Standard(s)

Title of the standard	Reference standard	Publication Year	Amendment(s) of the standard
Emission-Product family standard -Household appliances, electric tools and similar apparatus	EN IEC 55014-1	2021	
	CISPR 14-1	2020	
Immunity-Product family standard -Household appliances, electric tools and similar apparatus	EN IEC 55014-2	2021	
	CISPR 14-2	2020	
Product family standard -Harmonic current emissions	EN IEC 61000-3-2	2019	A1:2021 + A2:2024
	IEC 61000-3-2	2018	A1:2020 + A2:2024
Product family standard -Voltage fluctuations and flicker sensation	EN 61000-3-3	2013	A1:2019 + A2:2021
	IEC 61000-3-3	2013	A1:2017 + A2:2021

1.2 Overview of Test Results

Emission Tests	Result
Conducted Emissions In The Frequency Range	**Pass**
Radiated Power In The Frequency Range	**Pass**
Discontinuous Interference (click)	**Pass**
Harmonic Currents Emissions	**N/A**
Voltage Fluctuation And Flicker Sensation	**Pass**

*According to the clause 7.1 of EN IEC 61000-3-2 standard, limits are not specified for equipment with a rated power of 75W or less. This reason, test was not applied to EUT.

Immunity Tests	Result
Electrostatic Discharge Immunity (ESD)	**Pass**
Electrical Fast Transient Immunity (EFT)	**Pass**
Surge Immunity	**Pass**
RF-Electromagnetic Conducted Immunity	**Pass**
Voltage Dips And Short Interruptions Immunity	**Pass**
Radiated, Radio Frequency, Electromagnetic Field Immunity	**N/A**

Possible test case verdicts:		
- test case does not apply to the test object	**:**	N/A (Not Applicable)
- test object does meet the requirement	**:**	P (Pass)
- test object does not meet the requirement	**:**	F (Fail)

1.3 Testing Location/Address

Note: All tests have been performed Eldaş Test ve Kalibrasyon Elektrik Sanayi Ticaret A.Ş. under supervision of SGS Engineer. The address of test location as below;

Organize Sanayi Bölgesi
Büyük Selçuklu Blv. No:2 06930
Sincan / ANKARA / TURKEY
Türkak Accreditation Number: AB-1532-T

2 PRODUCT DESCRIPTION

2.1 Equipment Under Test (EUT) Information

Test Item Description : Minibar Cooler

Model/Type Reference : MNK 40C

Rated Voltage : 220-240 V_{AC}

Rated Frequency : 50 Hz

Rated Power/Current : 68 W

The model MNK 40C has been tested. The appliance tests were carried out at a frequency of 50 Hz. Appliance cannot used for outdoor. The appliance is a minibar incorporated with electric circuit and compressor.

Models	Ref Gas	Mass of Ref Gas	Voltage Frequency	Rated Power	Volume
MNK 40C	R600a	17 g	220-240V 50 Hz	68 W	40 L
MNK 30C	R600a	17 g	220-240V 50 Hz	68 W	30 L
MNK 60C	R600a	17 g	220-240V 50 Hz	68 W	60 L

Classification of EUT according to CISPR 14-2:

The EUT is classified as
- Category I ☐
- Category II ☒
- Category III ☐
- Category IV ☐
- Category V ☐

3 TEST CONDITIONS

3.1 Performance Criteria A for Immunity Testing

During testing the EUT shall operate without any degradation of performance.

3.2 Performance Criteria B for Immunity Testing

During testing temporary degradation of performance or loss of function, which is self-recovered are allowed.

3.3 Performance Criteria C for Immunity Testing

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

3.4 EUT Test Conditions During EMC-Testing

Configuration of the EUT will be made corresponding and actual assembling conditions as far as possible. During tests the thermostat will be set to middle position. Before the tests EUT will be pre-cooled until the steady state has been reached. Behaviour of the EUT will be monitored during the immunity tests.

3.5 Environmental Conditions

Tests have been performed in a controlled laboratory environment, where the environmental conditions are maintained with in the applicable ranges.

Ambient temperature	15 °C - 35 °C
Relative Humidity	30% - 60%

4 TEST RESULTS AND CONDITIONS

4.1 Emission Test Results

4.1.1 Conducted Emissions In The Frequency Range

Standard	EN IEC 55014-1 / CISPR 14-1

Frequency [MHz]	QP [dB(µV)]	AV [dB(µV)]
0,15 – 0,50	66 – 56	59 – 46
0,50 – 5	56	46
5 – 30	60	50

Test Plan/Test Description

Conducted disturbance voltage will be measured with an artificial main network from 150 kHz to 30 MHz with 5 kHz steps and a resolution bandwidth of 9 kHz. Measurements will be carried out with Peak- and Average-detectors from Phase-line and Neutral-line.

If the Peak-values are more than 6 dB below the Quasi Peak-limit no final Quasi Peak-measurement will be made otherwise Quasi Peak-values and Average-values will be recorded from the worst points. Rest of the sub ranges will be measured by using the same procedure.

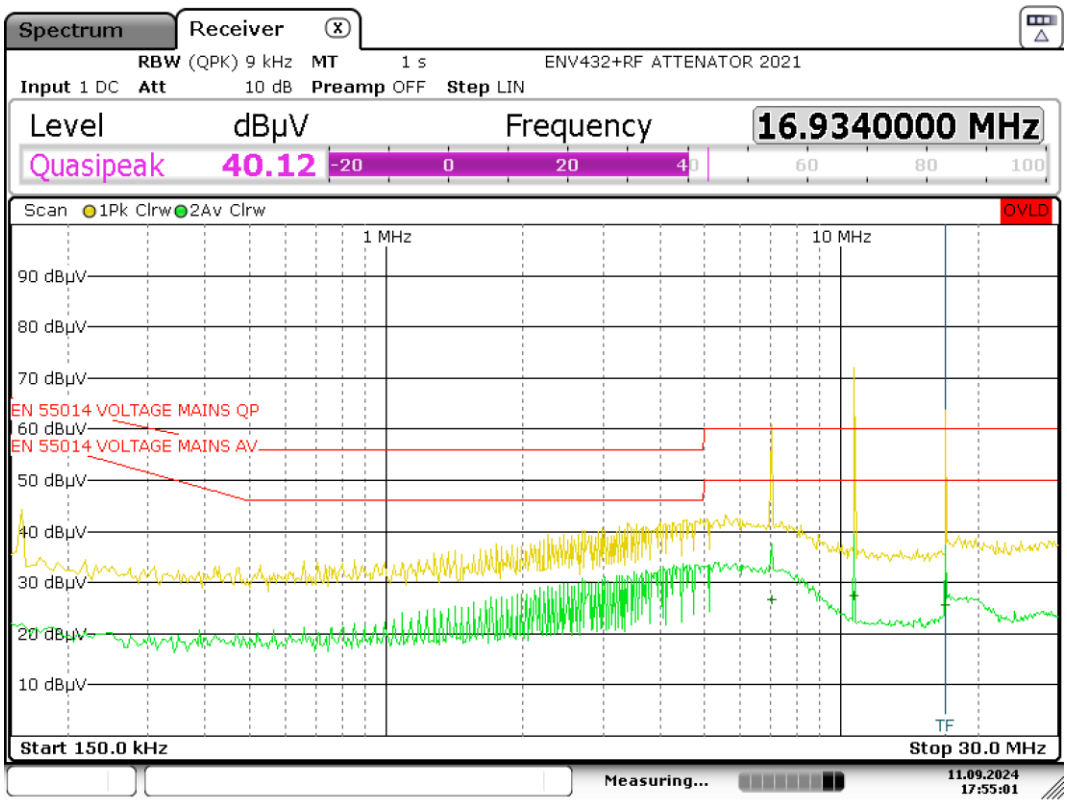
This measurement will be made from the AC-mains lines. The EUT is working as described in the section “EUT Test Conditions”. Test results are presented at the next page.

Operating mode

Measurements were performed at thermostat middle position.

Test Results

Line Port



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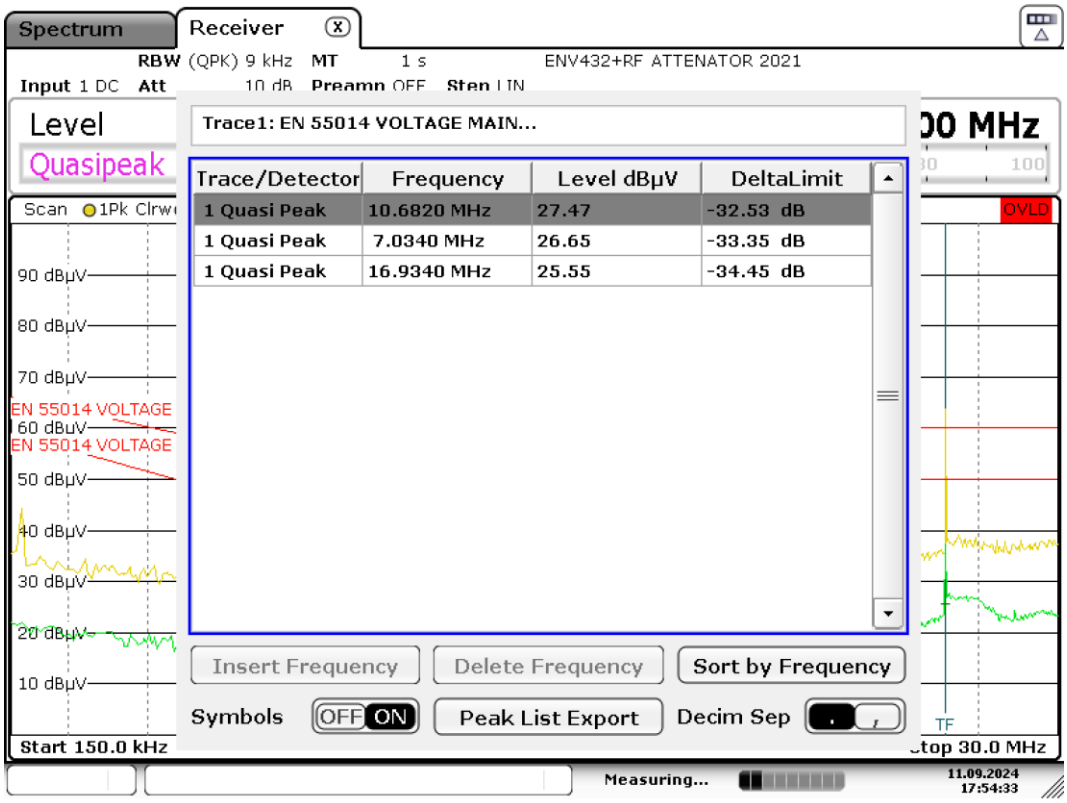

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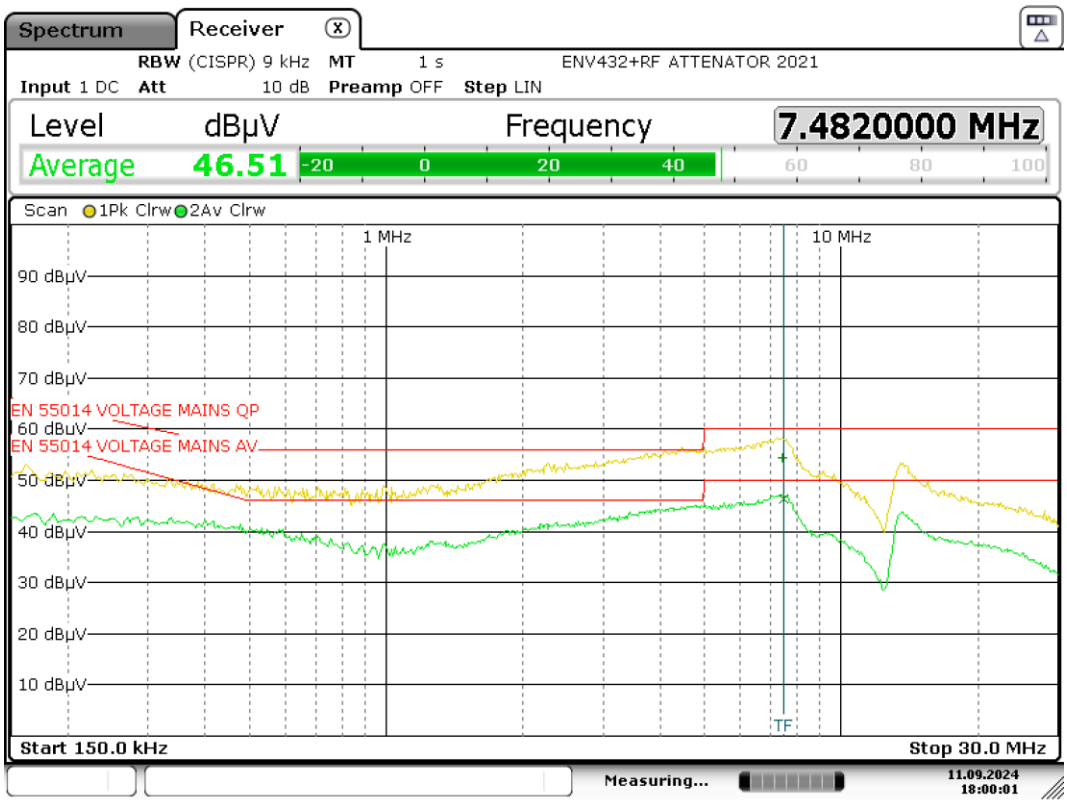
Neutral Port



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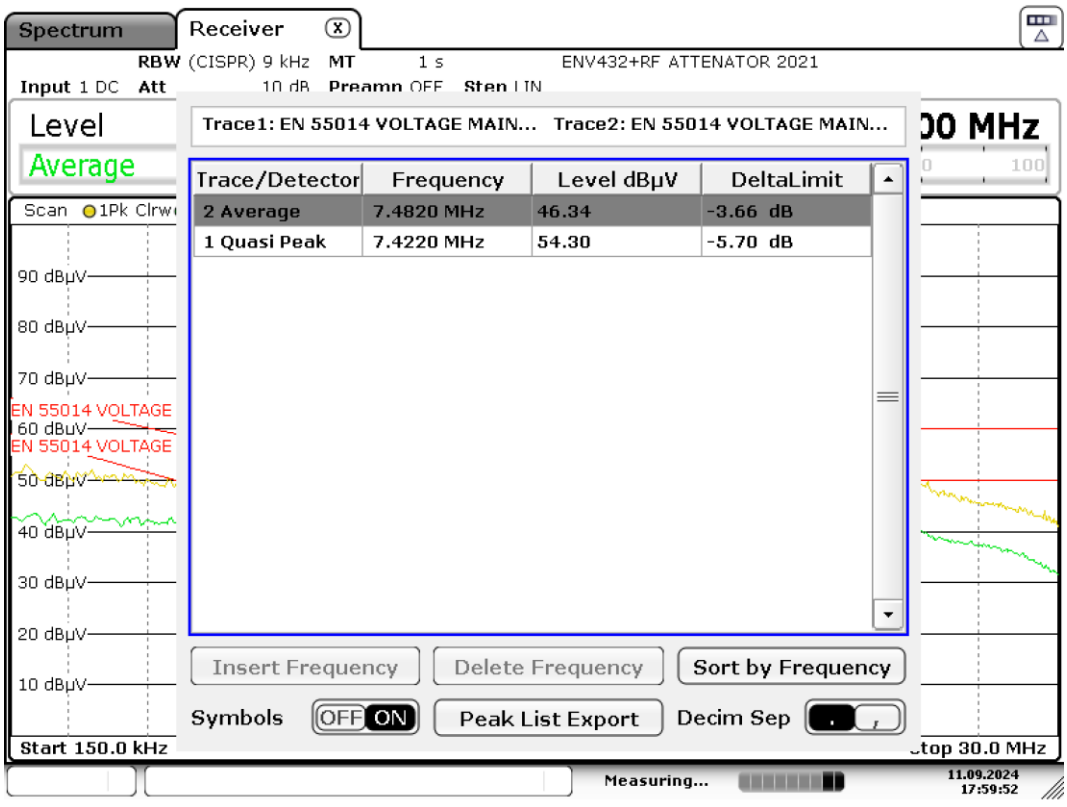

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Test setup : Conducted Emissions In The Frequency Range

TEST SUMMARY P

The EUT fulfills the requirements of the EN IEC 55014-1 Conducted Emission part.

4.1.2 Radiated Power In The Frequency Range

Standard	EN IEC 55014-1 / CISPR 14-1

Frequency [MHz]	QP [dB(pW)]	AV [dB(pW)]
30 – 300	45 – 55	35 – 45
Margin		
200 - 300	0 – 10	-

Test Plan/Test Description

Radiated absorbing power will be measured with an absorbing clamp from 30 MHz to 300 MHz with 100 kHz steps using the resolution bandwidth of 120 kHz. The maximum interference level will be found by moving the clamp along the cable. Final measurements will be made from the worst peaks only with QuasiPeak-detector and Average-detector. No QuasiPeak- or Average-measurements will be made if the Peak-values are more than 10 dB below the QP-limit.

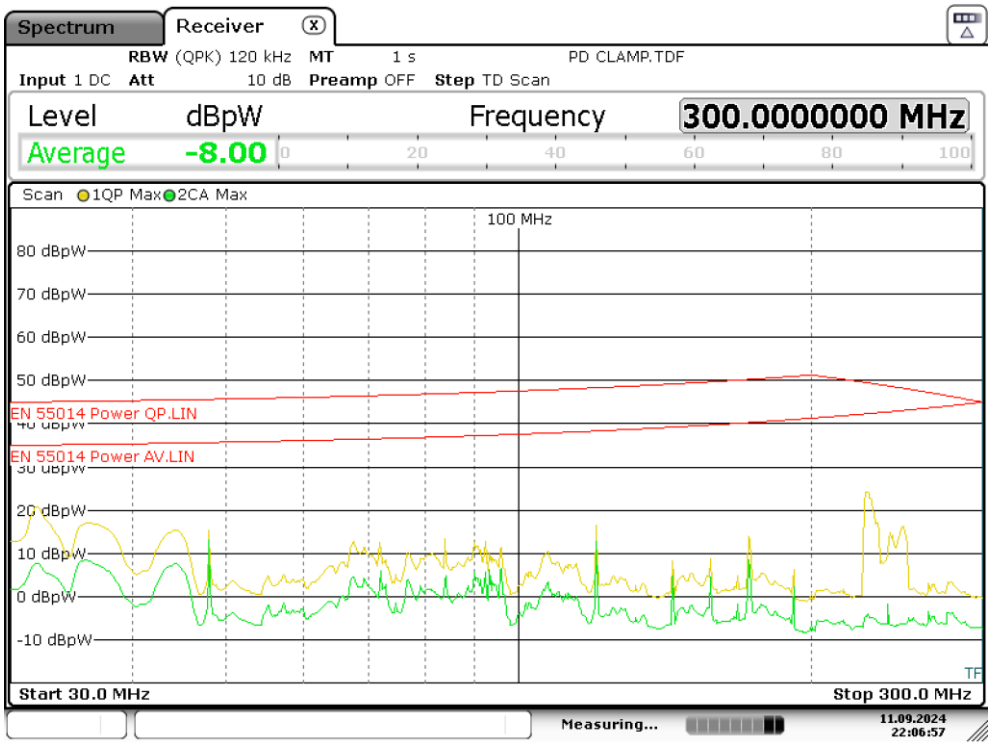
This measurement will be made from the AC-mains.

The EUT is working as described in the section “EUT Test Conditions”.

Operating mode

Measurements were performed at thermostat middle position.

Test Result



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According to clause 4.3.4.2 procedure (a) of the EN IEC 55014-1 standard the EUT is deemed to comply in the frequency range from **300 MHz to 1000 MHz** without further measurements.

Test setup : Radiated Power In The Frequency Range

TEST SUMMARY P

The EUT fulfills the requirements of the EN IEC 55014-1 Radiated Power part.

4.1.3 Discontinuous Interference (Click)

Standard	EN IEC 55014-1 / CISPR 14-1

Frequency [MHz]	QP [dB(µV)]
0,15	66
0,50	56
1,40	56
30,00	60

Test Plan/Test Description

The EUT will be exercised as intended for. The click rate analysis will be made with four frequencies and with different continuous interference limits (e.g. sensitivity (dBµV)). Measured frequencies will be 0.15 MHz, 0.55 MHz, 1.40 MHz and 30 MHz. The limits are 66 dBµV for 0.15 MHz, 56 dBµV for both 0.55 MHz and 1.40 MHz and 60 dBµV for 30 MHz at the first test run (Run A).

The test time (T) is 120 min. If the total number of switching operations (n_2) is measured to be 40 before the time of 120 min is passed, the test shall be interrupted and the test time will be recorded. After that the test will be repeated with the new sensitivity limits. If the click rate $N \leq 5$, all click durations are $\leq$ 20 ms and 90 % of the click durations are $\leq$ 10 ms, repeating the test is not necessary.

The sensitivity of the second test run will be calculated from the following formula:

Sensitivity (Run B) = Run A + 20 * log (30/(Run A switching operations * 0.5)).

The time for second test run will be the same as the time taken for the first test run.

If the total number of the counted clicks (run B) will be $\leq 0.25 \times n_1$ and the click duration will not exceed 200 ms during the test, EUT fulfils the requirements of the standard.

Test will be made with all the operations of the EUT, which are controlled by either the thermostat or the energy regulators. Different operations will be tested separately. Both lines (neutral and phase L) will be tested separately.

The click rate N is half of the number of switching operations per minute for duty cycle 50 ±10% of the control devices.

The test results are shown on the following pages.

Operating mode

Measurements were performed at thermostat middle position.

Test Results

Test results, measured phase L

Table 3. Run A

Used frequencies [MHz]:	0,15	0,5	1,4	30
Sensitivity [dB(μV)]:	66	56	56	60
Number of counted clicks, (short):	0	0	0	0
Number of counted clicks, (long):	0	0	0	0
Total number of clicks ($\mathbf{n_1}$):	0	0	0	0

Duration over 200 ms [s]	0	0	0	0

Switching operations rate 0
Total time of run (T): 120 minutes

Table 4. Run B

Sensitivity dB(μV) ($L+L_q$)	-	-	-	-
Number of clicks allowed above permitted limits:	-	-	-	-
Number of counted clicks, (short):	-	-	-	-
Number of counted clicks, (long):	-	-	-	-
Total number of clicks ($\mathbf{n_1}$):	-	-	-	-

Click rate used: -
Total time of run (T): -

Test result: PASS

Remarks: No click emission detected.

Test results, measured phase N

Table 5. Run A

Used frequencies [MHz]:	0,15	0,5	1,4	30
Sensitivity [dB(μV)]:	66	56	56	60
Number of counted clicks, (short):	0	0	0	0
Number of counted clicks, (long):	0	0	0	0
Total number of clicks ($\mathbf{n_1}$):	0	0	0	0

Duration over 200 ms [s]	0	0	0	0

Switching operations rate 0
Total time of run (T): 120 minutes

Table 6. Run B

Sensitivity dB(μV) ($L+L_q$)	-	-	-	-
Number of clicks allowed above permitted limits:	-	-	-	-
Number of counted clicks, (short):	-	-	-	-
Number of counted clicks, (long):	-	-	-	-
Total number of clicks ($\mathbf{n_1}$):	-	-	-	-

Click rate used: -
Total time of run (T): -

Test result: PASS

Remarks: No click emission detected.

Test setup : Discontinuous Interference (Click)

TEST SUMMARY P

The EUT fulfills the requirements of the EN IEC 55014-1 Discontinuous Interference part.

4.1.4 Harmonic Currents Emissions

Standard	**EN IEC 61000-3-2 / IEC 61000-3-2**

Test Plan/Test Description

Depending on the type of EUT, the test class will be determined by the test engineer.

Concerning all products the maximum peak current A (pk), the fundamental current and power factor (PF) will be measured prior to measurement. These values are used in order to set the limits in actual test depending on the class.

Preliminary measurements will be made in order to find out the state, which produces the maximum amount of harmonics. Harmonics up to 40 will be measured.

Test Time	-	Minutes
Equipment Class	-	

Operating mode

Test Result

Test setup : Harmonic Current Emissions

TEST SUMMARY **N/A**
According to the clause 7.1 of EN IEC 61000-3-2 standard, limits are not specified for equipment with a rated power of 75W or less. This reason, test was not applied to EUT.

4.1.5 Voltage Fluctuation And Flicker Sensation

Standard	EN 61000-3-3 / IEC 61000-3-3

Test plan/Test Description

The EUT will be exercised as intended for. Relative steady-state voltage change d_c, maximum relative change d_{max} and the value of d(t) shall be measured with a flicker meter.

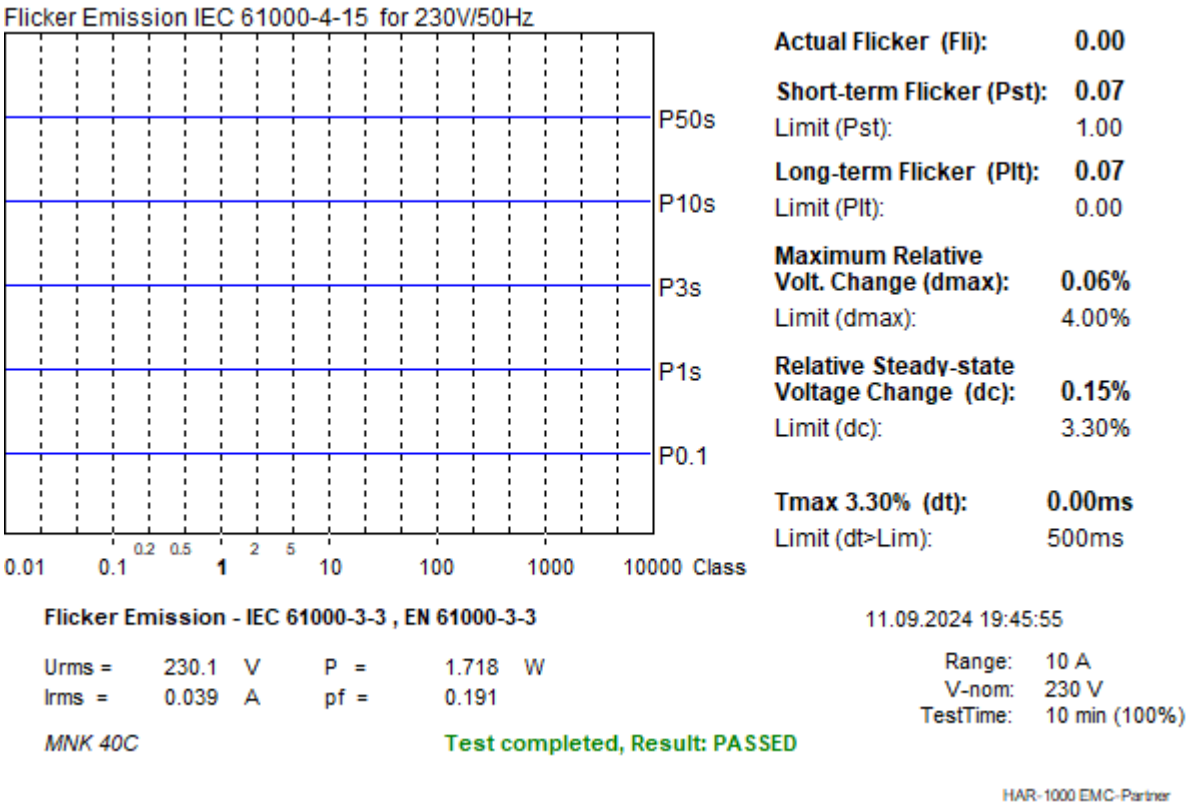
Limits

P_{ST}	N/A
P_{LT}	N/A
d_C	≤ 3,3 %
d_{MAX}	≤ 4 %

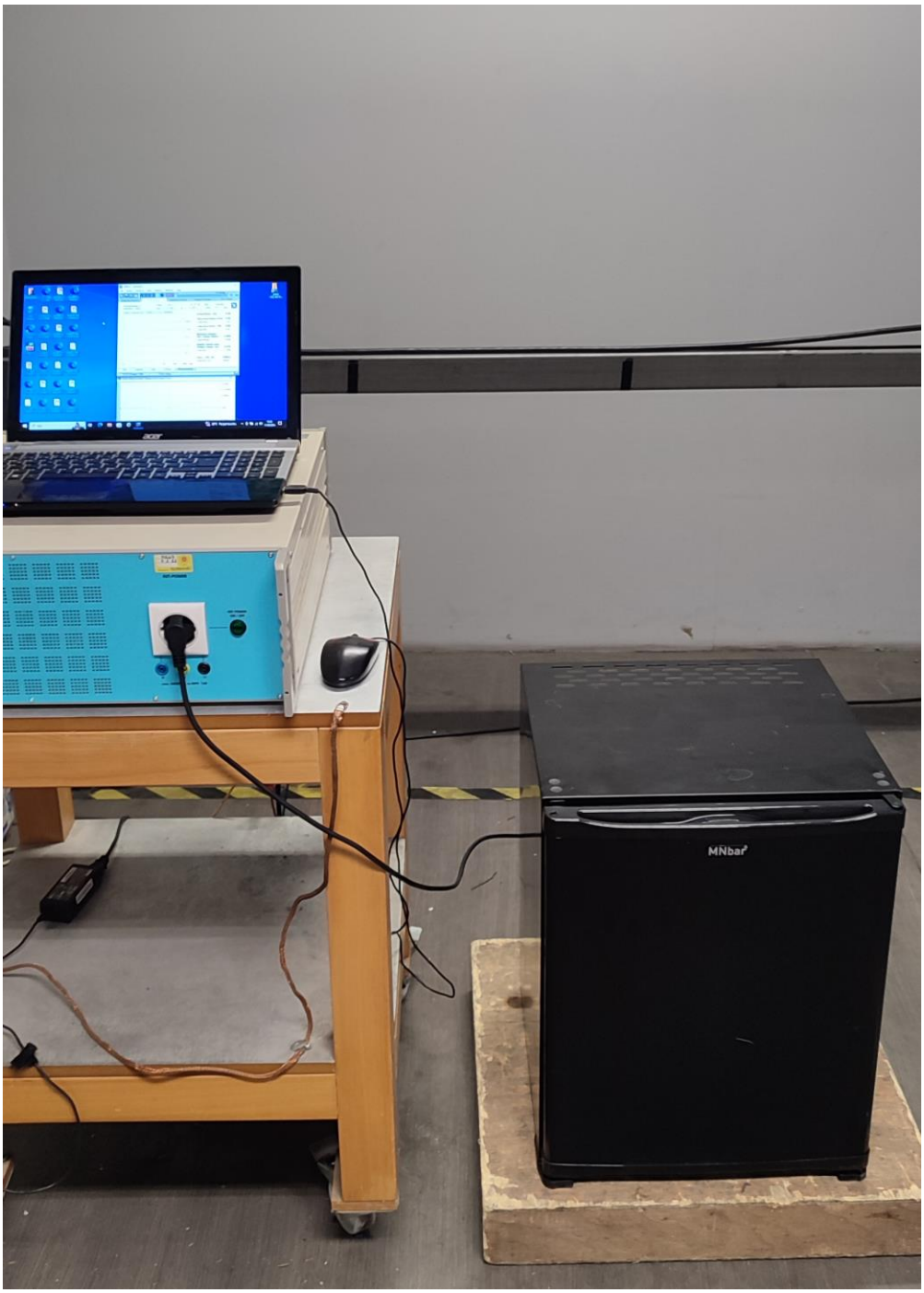
Operating mode

Measurements were performed at thermostat middle position.

Test Result



Test setup : Voltage Fluctuation And Flicker Sensation



TEST SUMMARY **P**

The EUT fulfill the requirements of the EN 61000-3-3.

4.2 Immunity Test Results

4.2.1 Electrostatic Discharge Immunity (ESD)

Standard	**EN IEC 55014-2 / CISPR 14-2**
Basic standard	**EN 61000-4-2**

Test Plan/Test Description

Tests will be done using the air discharge on non-conductive parts of the EUT. The contact discharge will be given to all conductive parts of the EUT. Also the indirect contact discharges will be given to vertical coupling planes in order to simulate the objects placed near the EUT. All four sides and the top of the EUT will be tested with both polarities.

At least ten discharges will be given with both polarities to the selected points.

The air discharge will be given with ± 8 kV test levels.

The contact and the indirect contact discharge will be given with ± 4 kV test levels.

Operating mode

Test Results

Discharge method:	Air Discharge
Test levels:	± 8 kV
EUT test point:	At insulating surfaces
Test remarks:	No degradation in the performance of the EUT was observed

Discharge method:	Contact Discharge
Test levels:	± 4 kV
EUT test point:	At conductive surfaces
Test remarks:	No degradation in the performance of the EUT was observed

Discharge method:	Indirect contact discharge
Test level:	± 4 kV
EUT test side:	At conductive surfaces
Test remarks:	No degradation in the performance of the EUT was observed

Test setup : Electrostatic Discharge Immunity (ESD)

TEST SUMMARY P

The EUT fulfills the requirements of the EN 61000-4-2 with Criteria B.

4.2.2 Electrical Fast Transient Immunity (EFT)

Standard	**EN IEC 55014-2 / CISPR 14-2**
Basic standard	**EN 61000-4-4**

Test Plan/Test Description

Tests will be done to the AC-power supply port with the voltage level of ± 1 kV and 5 kHz. First the level will be tested with both polarities. After both polarities have been tested, the coupling path will be changed. Phase line, neutral will be tested separately. Both polarities will be tested with 60 seconds duration time and with 5 seconds recovery time between the tests.

Operating mode

Measurements were performed at thermostat middle position.

Test Results

Test cable:	AC power supply
Coupling path:	L, N, PE, L-N, N-PE, L-PE, L-N-PE
Test level:	± 1 kV
Test remarks:	No loss of function was observed.

Test setup : Electrical Fast Transient Immunity (EFT)

TEST SUMMARY **P**

The EUT fulfills the requirements of the EN 61000-4-4 with Criteria B.

4.2.3 Surge Immunity

Standard	**EN IEC 55014-2 / CISPR 14-2**
Basic standard	**EN 61000-4-5**

Test Plan/Test Description

Test will be done to the AC power supply port with step by step voltage levels starting at:

± 1 kV between phase and phase, Output impedance: 2ohm

± 1 kV between phase and neutral, Output impedance: 2ohm

± 2 kV between phase and protective earth, Output impedance: 12ohm

± 2 kV between neutral and protective earth, Output impedance: 12ohm

Positive and negative pulses will be given with 90° and 270° phase angles. Each pulse will be given five times with 60 seconds repetition rate. First the positive and the negative pulse will be given to the selected coupling path, then the phase angle will be changed and after that the voltage level will be increased to the next test level.

Operating mode

Test Results

Test cable:	AC-power supply
Coupling mode:	Differential mode
Test level:	± 1 kV, Line to line ± 2 kV, Line to ground
Phase angle:	90° (positive pulses) and 270° (negative pulses)
Test remarks:	No loss of function was observed

Test setup : Surge Immunity

TEST SUMMARY **P**

The EUT fulfills the requirements of the EN 61000-4-5 with Criteria B.

4.2.4 RF-Electromagnetic Conducted Immunity

Standard	**EN IEC 55014-2 / CISPR 14-2**
Basic standard	**EN IEC 61000-4-6**

Test Plan/Test Description

Test will be done from 150 kHz to 230 MHz. The calibration is done with 1 % logarithmic step size with an unmodulated signal. In the calibration setup the signal is fed to coupling network. The required power levels are recorded over the whole frequency range.

The EUT is placed 10 cm above the reference ground plane.

Test will be carried out with a voltage level of 3 V_{rms} (80% AM-unmodulated, 1 kHz sine signal). Test will be performed to AC-power supply port.

Operating mode

-

Test Results

Tested cable:	AC-power supply
Frequency range:	150 kHz – 230 MHz
Modulation:	80% AM with 1 kHz unmodulated frequency
Test level:	3 V_{rms}
Test remark:	No loss of performance was observed

Test setup : RF-Electromagnetic Conducted Immunity

TEST SUMMARY **P**

The EUT fulfills the requirements of the EN 61000-4-6 with Criteria A.

4.2.5 Voltage Dips And Short Interruptions Immunity

Standard	**EN IEC 55014-2 / CISPR 14-2**
Basic standard	**EN IEC 61000-4-11**

Test Plan/Test Description

Test will be done to the AC-power supply port with the following voltage percentage dips of the rated voltage: 30% and 60%. Test will be also done with 100% voltage interruptions of the rated voltage.

Operating mode

-

Test Results

Test cable:	AC-power supply
Test level:	Interruption (% 0 of rated voltage)
Duration:	0,5 periods of the rated frequency
Performance criteria:	C

Test cable:	AC-power supply
Test level:	60% dips of the rated voltage (%40 of rated voltage)
Duration:	10 periods of the rated frequency
Performance criteria	C

Test cable:	AC-power supply
Test level:	30% dips of the rated voltage (%70 of rated voltage)
Duration:	25 periods of the rated frequency
Performance criteria	C

Test setup : Voltage Dips And Short Interruptions Immunity

TEST SUMMARY **P**

The EUT fulfills the requirements of the EN 61000-4-11 with Criteria C.

4.2.6 Radiated, Radio Frequency, Electromagnetic Field Immunity

Standard	**EN IEC 55014-2 / CISPR 14-2**
Basic standard	**EN IEC 61000-4-3**

Test Plan/Test Description

The EUT has been supplied with 230 Vac in Full-Anechoic Chamber on a wooden table that was above 10 cm height from floor. The test has been made by turning EUT four dimensions on vertical and horizontal polarizations of the antenna.

Test Result

Operating mode

Test setup : Radiated, Radio Frequency, Electromagnetic Field Immunity

TEST SUMMARY	**N/A**

5 PHOTOS OF EQUIPMENT UNDER TEST

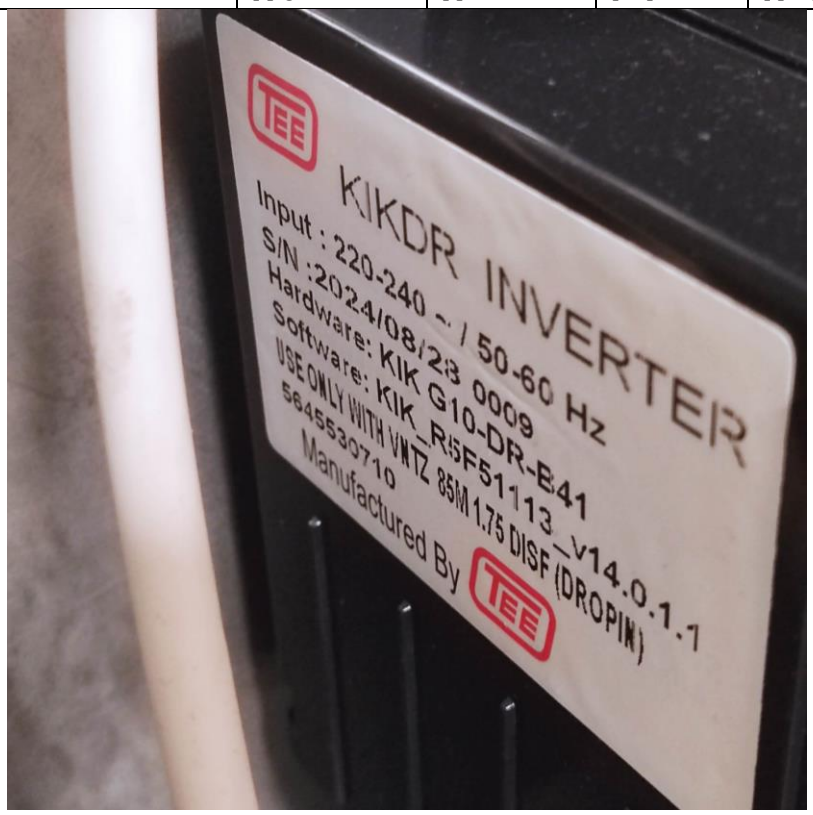
Details of view :	MNK 40C	[ ] general	[x] front	[ ] rear	[ ] right	[ ] inside

Details of view :	MNK 40C	[ ] general	[ ] front	[x] rear	[ ] right	[ ] inside

Details of view :	MNK 40C	[ ] general	[ ] front	[ ] rear	[ ] right	[x] inside

Details of view :	MNK 40C	[x] general	[ ] front	[ ] rear	[ ] right	[ ] inside

Details of view :	MNK 40C	[ ] general	[ ] front	[x] rear	[ ] right	[ ] inside



Details of view :	MNK 40C	[ ] general	[ ] front	[x] rear	[ ] right	[ ] inside

Details of view :	MNK 40C	[ ] general	[ ] front	[x] rear	[ ] right	[ ] inside

Details of view :	MNK 40C	[x] general	[ ] front	[ ] rear	[ ] right	[ ] inside

6 LIST OF TEST EQUIPMENT USED

Equipment Name	Brand	Model	Serial No	Calibration Due Date
EMI Test Receiver	Rohde&Schwarz	ESR7	101817	08.2025
Solid State Power Amplifier 15 W	Bonn Elektronik	BSA012515	035357A	N/A
Signal Generator	Rohde&Schwarz	SMB100B	101649	11.2024
ESD Simulator	TESEQ	NSG 437	1152	02.2025
Harmonics 1000	EMC PARTNER	HAR1000-1P	HAR1000-1P 230V-0232	02.2025
LISN	Rohde&Schwarz	ENV432	101489	11.2024
Coupling Decoupling	TESEQ	CDN M316	43158	02.2025
Transient Limiter	EMC Elektronik	TL10K30M	121404	11.2024
RF Attenuator	BIRD ELEKTRONIC	8341-200	2382	11.2024
AMETEK SURGE-BURST	EM TEST	Compact NX5 bsp-1-300-16	P1602169864	02.2025
Em Measurement P.D Clamp	EMC Elektronik	EL1000M	1024040602	12.2024

Validation is done on all devices, per six month

7 MEASUREMENT UNCERTAINTIES

Equipment	Uncertainty
Harmonic current emission	± 5,42 %
Voltage fluctuation	± 7,31 %
Mains conducted disturbance voltage	± 3,28 dB 9kHz-150 kHz ± 2,52 dB 150kHz-30 MHz
Discontinuous Interference (clicks)	± 3,93 dB
Disturbance Power	± 3,11 dB
Radiated Emission	± 3,43 dB 30MHz-1000MHz
Electrostatic Discharges (ESD)	Interference generator fulfils basic requirements
Electrical fast transient (EFT)	Interference generator fulfils basic requirements
Surge transients	Interference generator fulfils basic requirements
Power supply voltage interruptions & dips	Interference generator fulfils basic requirements

This report relates only to the actual item/items tested.

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End of the Report