3158754.50

# EMC Test report for HVLP Turbine Sprayer

## Models: T328; HVLP-3000; HT3; T1428; HT4; HT5; HT6; HT7; HT8; GR-T328; Q-T3; 113110-1; 113240-1; 890 Z SERIES; 680599; 680500; 450 000 55; ST3283; 45125

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B  22 pages  0 annexes  (sec)



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# 1 CONCLUSION

The equipment under test (EUT) does meet the essential requirements of the EMC Directive 2004/108/EC (until 19 April 2016), 2014/30/EU (from 20 April 2016).

The report is issued to base on original test report Ref. No. 3119915.50 dated on 2012-01-19 including the following modifications:

- Update the standard to EN 55014-1:2006+A1:2009+A2:2011; EN 61000-3-2:2014; EN 61000-3-3:2013;.

After review, no test is considered necessary.

The tests described in this report do not result in the right to use any approval mark as conferred by DEKRA. As far as the tests were based on certain specifications, these are mentioned in the report.

The conclusion and results stated in this test report are based on a non-recurrent examination of sample(s) provided by the applicant.

## 1.1 Model description

The apparatus as supplied for the test is a HVLP turbine sprayer, model T328 intended for residential use. The EUT has electronic control circuit and earth connection.

According to the declaration from manufacturer, all models are identical except the model name.

Due to the similarity between them, model T328 was selected for the full tests and the corresponding data is representative for other models as well.

Figure 1 Overview

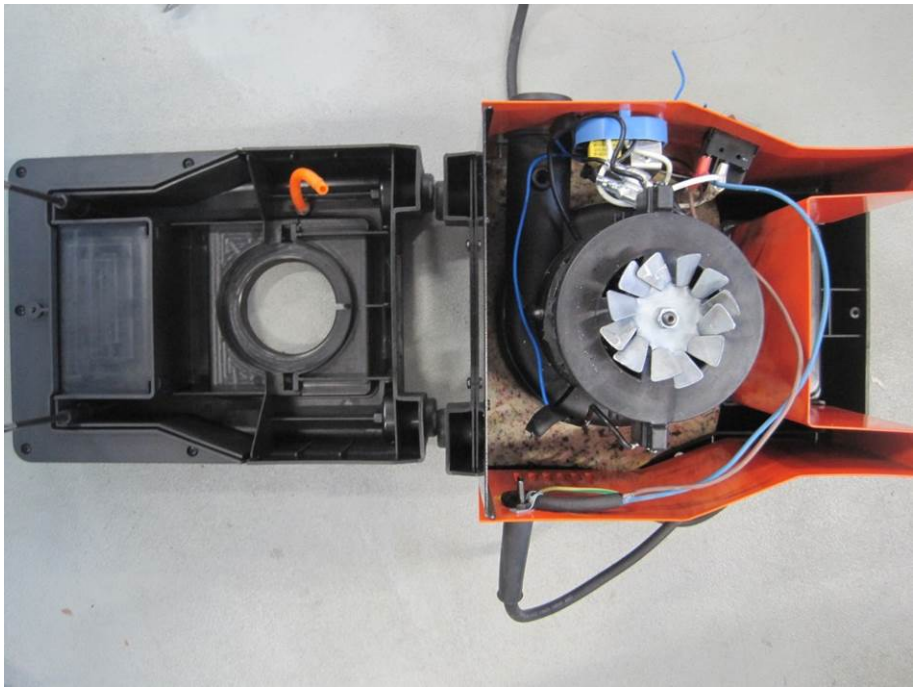


Figure 2 Internal view

## 1.2 Environment

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

| | |
|---|---|
| ✓ | Residential (domestic) environment |
| | Commercial and light-industrial environment |
| | Industrial environment |
| | Medical environment |

## 1.3 Classification

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

| | | |
|---|---|---|
| | **Category 1** | Apparatus containing no electronic control circuitry |
| ✓ | **Category 2** | Apparatus containing electronic control circuitry with no internal clock or oscillator frequency higher than 15 MHz. |
| | **Category 3** | Battery powered apparatus containing electronic control circuitry with no internal clock higher than 15 MHz. |
| | **Category 4** | All other apparatus. |

# 2 SUMMARY

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

## 2.1 Applied standards

| Standard | Year | Title |
|---|---|---|
| EN 55014-1 | 2006 | Emission – Electrical motor-operated and thermal appliances for household and similar purposes, electrical tools and similar electrical apparatus |
| A1 | 2009 | |
| A2 | 2011 | |
| EN 55014-2 | 1997 | Immunity - Household appliances, electric tools and similar |
| A1 | 2001 | |
| A2 | 2008 | |
| EN 61000-3-2 | 2014 | Limits for harmonic currents emissions |
| EN 61000-3-3 | 2013 | Limitation of voltage fluctuations and flicker |

## 2.2 Overview of results

| Emission tests | Result |
|---|---|
| Mains conducted disturbance voltage | **PASS** |
| Disturbance Power | **PASS** |
| Harmonic current emission | **PASS** |
| Limitation of voltage fluctuations (flicker) | **PASS** |

| Immunity tests | Result |
|---|---|
| Electrostatic Discharges (ESD) | **PASS** |
| Radiated EM Field | **PASS** |
| Electrical fast transient (EFT) | **PASS** |
| Surge transients | **PASS** |
| Conducted RF disturbances | **PASS** |
| Power supply voltage interruptions & dips | **PASS** |

# 3 GENERAL INFORMATION

## 3.1 Product Information

| | |
|---|---|
| Equipment under test | HVLP Turbine Sprayer |
| Trade mark | AGP |
| Tested Type | T328 |
| Representative types | HVLP-3000; HT3; T1428; HT4; HT5; HT6; HT7; HT8; GR-T328; Q-T3; 113110-1; 113240-1; 890 Z SERIES; 680599; 680500; 450 000 55; ST3283; 45125 |
| Ratings | 110-120 Vac or 220-240 Vac;50-60 Hz; 1400 W; Class I |

## 3.2 Customer Information

| | |
|---|---|
| Applicant | Lee Yeong Industrial Co., Ltd. |
| Address | No.2, Kejia Road, Douliu City, Yunlin County 64057, Taiwan |

| | |
|---|---|
| Manufacturer | Lee Yeong Industrial Co., Ltd. |
| Address | No.2, Kejia Road, Douliu City, Yunlin County 64057, Taiwan |

| | |
|---|---|
| Factory | Lee Yeong Industrial Co., Ltd. |
| Address | No.2, Kejia Road, Douliu City, Yunlin County 64057, Taiwan |

## 3.3 Test data

| | |
|---|---|
| Location | Global Certification Corp. |
| Address | No.146, Sec. 2, Xiangzhang Rd., Xizhi Dist., New Taipei City 221, Taiwan |
| Date | Sep. 2011 |
| Supervised by | Richie Tang |

## 3.4 Environmental conditions

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

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

## 3.5 Measurement Uncertainty

Conducted Emission Expanded Uncertainty: U = 3.38 dB
Disturbance Power Expanded Uncertainty: U = 3.92 dB

# 4 EMISSION TEST RESULTS

## 4.1 Mains conducted disturbance voltage

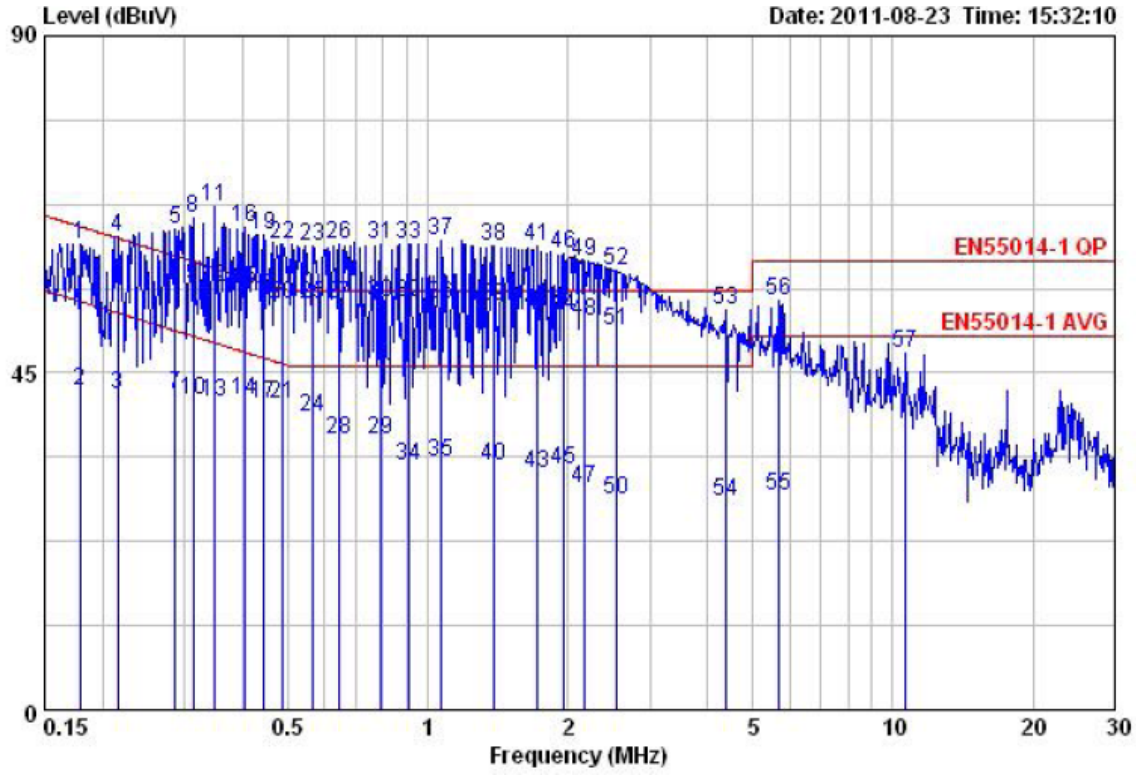
| Standard | EN 55014-1 | |
|---|---|---|
| Frequency [MHz] | QP [dB(µV)] | AV [dB(µV)] |
| 0,15 – 0,50 | 66 – 56 *) | 59 – 46 *) |
| 0,50 – 5 | 56 | 46 |
| 5 – 30 | 60 | 50 |

*) Limits decreasing linearly with the logarithm of the frequency

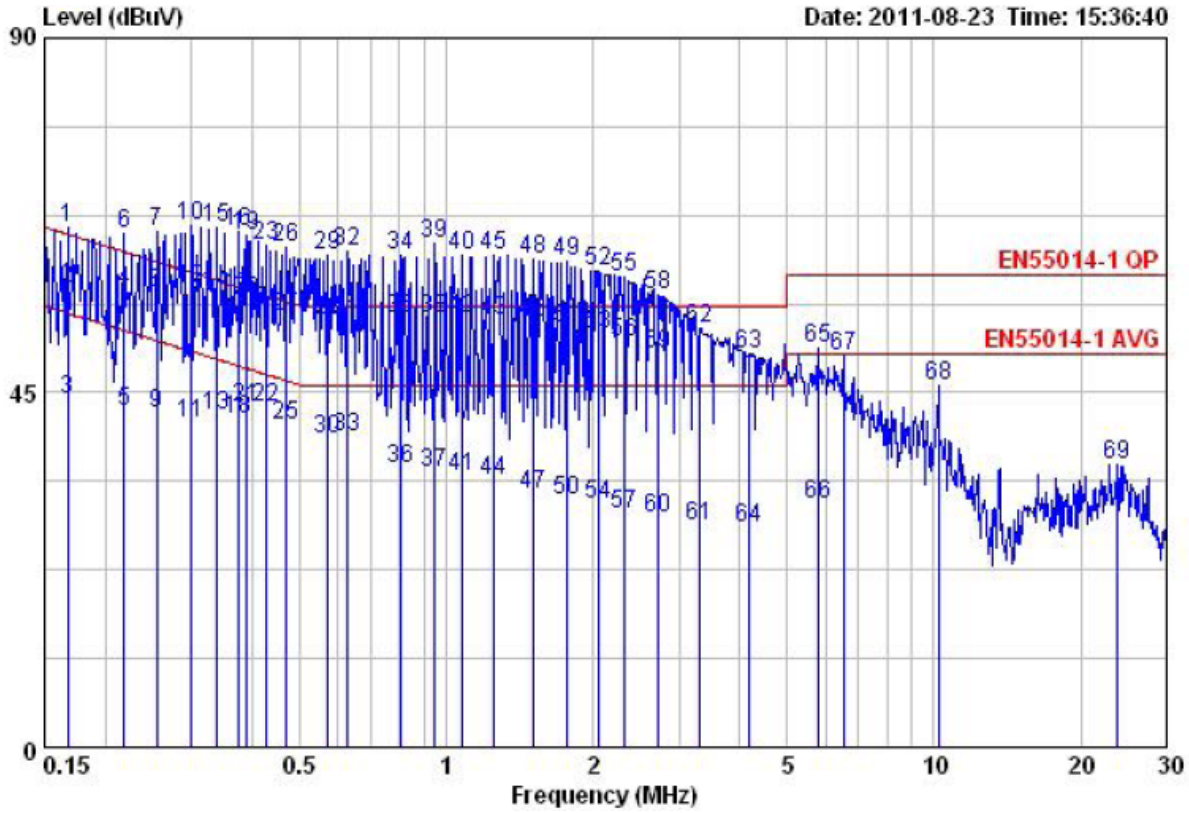
| Port | AC mains |
|---|---|
| Test method | LISN |
| Mode | On mode |

**Results**

**Line**



## Neutral


Level (dBuV)
Date: 2011-08-23 Time: 15:36:40
90
45
0
EN55014-1 QP
EN55014-1 AVG
0.15
0.5
1
2
5
10
20
30
Frequency (MHz)

| Frequency [MHz] | QP [dB(μV)] | | AV [dB(μV)] | |
|---|---|---|---|---|
| | Level | Limit | Level | Limit |
| 0,170 | 58,08 | 65,08 | 44,16 | 57,65 |
| 0,220 | 57,91 | 62,88 | 42,51 | 54,86 |
| **0,340** | **57,68*** | **59,27** | 42,00 | 50,16 |
| **0,390** | **56,64*** | **58,08** | 43,10 | 48,68 |
| **0,490** | **54,29*** | **56,23** | 40,96 | 46,22 |
| **0,570** | **54,24*** | **56,00** | 39,16 | 46,00 |
| **0,650** | **54,14*** | **56,00** | 36,05 | 46,00 |
| **0,790** | **54,44*** | **56,00** | 36,05 | 46,00 |
| **0,910** | **54,32*** | **56,00** | 32,56 | 46,00 |
| **1,070** | **54,21*** | **56,00** | 33,01 | 46,00 |
| **1,390** | **53,81*** | **56,00** | 32,64 | 46,00 |
| **1,720** | **53,12*** | **56,00** | 31,55 | 46,00 |
| 2,050 | 52,44 | 56,00 | 30,95 | 46,00 |
| 2,180 | 51,92 | 56,00 | 29,55 | 46,00 |
| 2,540 | 50,57 | 56,00 | 28,15 | 46,00 |
| 2,720 | 49,95 | 56,00 | 29,01 | 46,00 |

"QP" and "AV" are levels and limits referring to measurements with the quasi-peak and average detector. If the measured level "QP" does not exceed the limit for "AV", then no average measurement is necessary.

* Notice that the disturbance reaches the limits and at these frequencies precautions are advised.

No significant emissions were measured at the frequency range of interest employing both the QP and AV detectors.

Refer to chapter 6 for the test set-up.

**Conclusion:**

# PASS

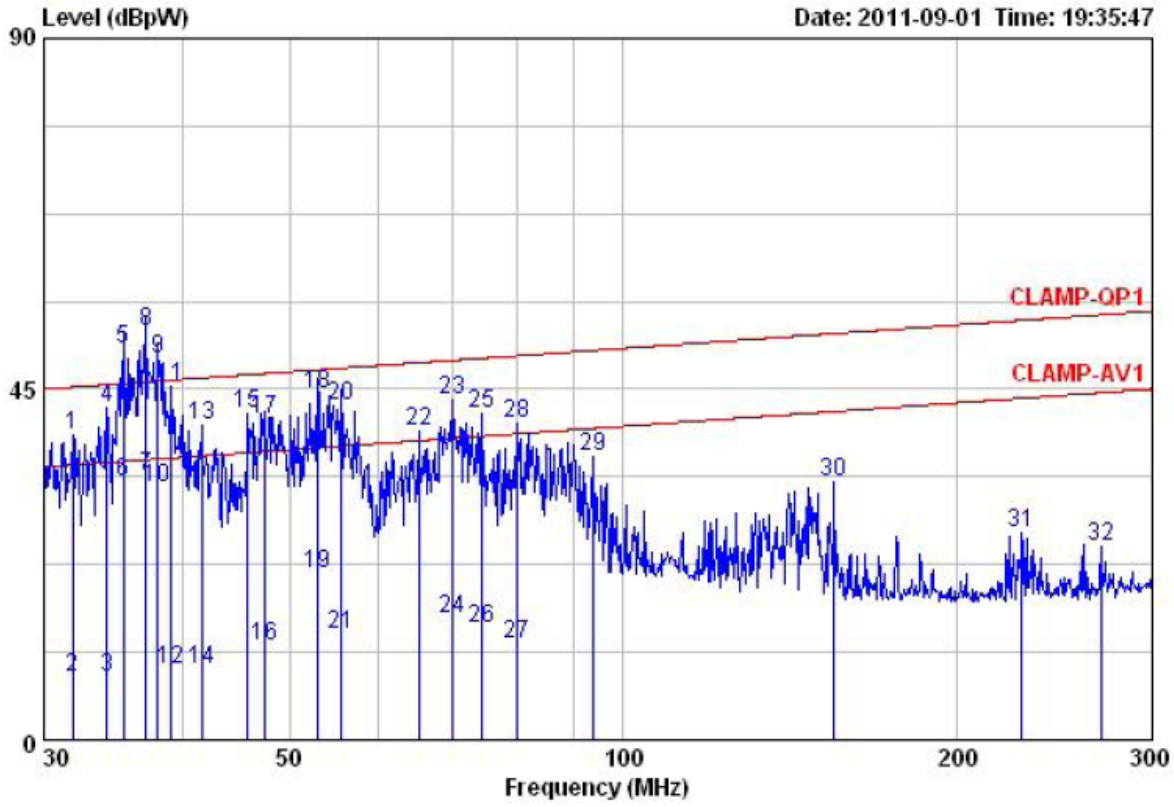
## 4.2 Disturbance power

| Standard | EN 55014-1 | |
|---|---|---|
| Frequency [MHz] | QP [dB(pW)] | AV [dB(pW)] |
| 30 – 300 | 45 – 55 *) | 35 – 45 *) |

*) Limits increasing linearly with the frequency

| Port | AC Mains |
|---|---|
| Mode | On mode |

**Results**



| Frequency [MHz] | QP [dB(pW)] | | AV [dB(pW)] | |
|---|---|---|---|---|
| | Level | Limit | Level | Limit |
| 35,41 | 33,11 | 45,73 | More than 20dB Below the limit | |
| 37,08 | 33,96 | 45,93 | | |
| 38,03 | 32,32 | 46,04 | | |
| 41,60 | 33,21 | 46,43 | | |

"QP" and "AV" are levels and limits referring to measurements with the quasi-peak and average detector. If the measured level "QP" does not exceed the limit for "AV", then no average measurement is necessary.

No other significant emissions were measured at the frequency range of interest employing both the QP and AV detectors.

Refer to chapter 6 for the test set-up.

According to clause 4.1.2.3.2 (EN 55014-1):

Appliances are deemed to comply in the frequency range from 300 MHz to 1 000 MHz if both of the following conditions (1) and 2)) are fulfilled:

1) all emission readings from the equipment under test shall be lower than the applicable limits (Table 2a) reduced by the margin (Table 2b);

2) the maximum clock frequency shall be less than 30 MHz.

**Conclusion:**

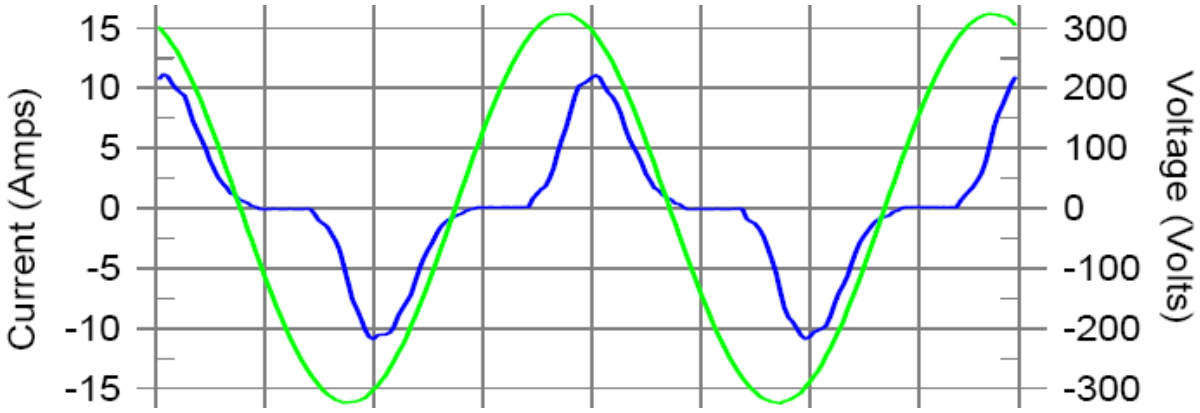
# PASS

## 4.3 Harmonic currents

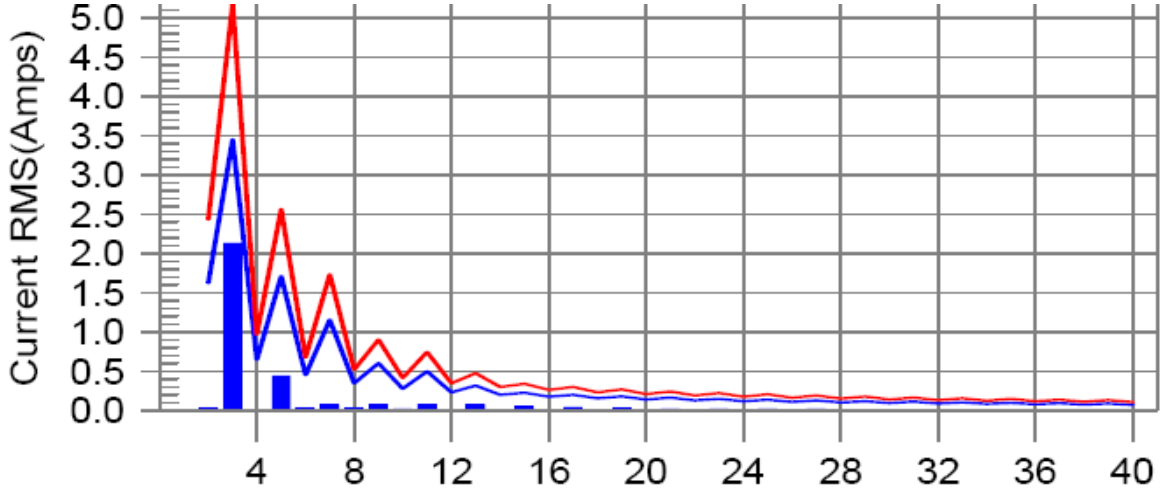
| | |
|---|---|
| Standard | EN 61000-3-2 |
| Port | AC Mains supply |
| Rated power | 1400 W |
| Mode | On mode |

| | | |
|---|---|---|
| ✓ | Class A | All apparatus not classified as Class B, C or D |
| | Class B | Portable tools |
| | Class C | Lighting equipment |
| | Class D | Personal computers, television receivers |

**Current & voltage waveforms**




**Harmonics and Class A limit line European Limits**



Test Result: Pass  Source qualification: Distorted
THC(A): 2.14  I-THD(%): 47.11  POHC(A): 0.000  POHC Limit(A): 0.480
Highest parameter values during test:

| | | | |
|---|---|---|---|
| V_RMS (Volts): | 229.25 | Frequency(Hz): | 50.00 |
| I_Peak (Amps): | 11.190 | I_RMS (Amps): | 5.386 |
| I_Fund (Amps): | 4.607 | Crest Factor: | 2.211 |
| Power (Watts): | 955.4 | Power Factor: | 0.836 |

| Harm# | Harms(avg) | 100%Limit | %of Limit | Harms(max) | 150%Limit | %of Limit | Status |
|---|---|---|---|---|---|---|---|
| 2 | 0.009 | 1.620 | 0.0 | 0.021 | 2.430 | 0.00 | Pass |
| 3 | 2.101 | 3.450 | 60.9 | 2.129 | 5.175 | 41.14 | Pass |
| 4 | 0.005 | 0.645 | 0.0 | 0.014 | 0.968 | 0.00 | Pass |
| 5 | 0.408 | 1.710 | 23.9 | 0.438 | 2.565 | 17.07 | Pass |
| 6 | 0.005 | 0.450 | 0.0 | 0.025 | 0.675 | 0.00 | Pass |
| 7 | 0.055 | 1.155 | 4.7 | 0.064 | 1.733 | 3.72 | Pass |
| 8 | 0.005 | 0.345 | 0.0 | 0.027 | 0.518 | 0.00 | Pass |
| 9 | 0.072 | 0.600 | 12.1 | 0.079 | 0.900 | 8.77 | Pass |
| 10 | 0.004 | 0.276 | 0.0 | 0.014 | 0.414 | 0.00 | Pass |
| 11 | 0.038 | 0.495 | 7.6 | 0.077 | 0.743 | 10.41 | Pass |
| 12 | 0.004 | 0.230 | 0.0 | 0.013 | 0.344 | 0.00 | Pass |
| 13 | 0.050 | 0.315 | 15.8 | 0.072 | 0.473 | 15.26 | Pass |
| 14 | 0.004 | 0.197 | 0.0 | 0.013 | 0.296 | 0.00 | Pass |
| 15 | 0.034 | 0.225 | 15.2 | 0.045 | 0.338 | 13.39 | Pass |
| 16 | 0.002 | 0.173 | 0.0 | 0.006 | 0.259 | 0.00 | Pass |
| 17 | 0.021 | 0.199 | 10.7 | 0.038 | 0.297 | 12.95 | Pass |
| 18 | 0.002 | 0.153 | 0.0 | 0.005 | 0.230 | 0.00 | Pass |
| 19 | 0.017 | 0.178 | 0.0 | 0.028 | 0.266 | 0.00 | Pass |
| 20 | 0.002 | 0.138 | 0.0 | 0.004 | 0.207 | 0.00 | Pass |
| 21 | 0.013 | 0.161 | 0.0 | 0.017 | 0.241 | 0.00 | Pass |
| 22 | 0.001 | 0.125 | 0.0 | 0.004 | 0.188 | 0.00 | Pass |
| 23 | 0.011 | 0.147 | 0.0 | 0.016 | 0.220 | 0.00 | Pass |
| 24 | 0.001 | 0.115 | 0.0 | 0.003 | 0.173 | 0.00 | Pass |
| 25 | 0.009 | 0.135 | 0.0 | 0.016 | 0.203 | 0.00 | Pass |
| 26 | 0.001 | 0.106 | 0.0 | 0.003 | 0.159 | 0.00 | Pass |
| 27 | 0.008 | 0.125 | 0.0 | 0.014 | 0.188 | 0.00 | Pass |
| 28 | 0.002 | 0.099 | 0.0 | 0.004 | 0.148 | 0.00 | Pass |
| 29 | 0.008 | 0.116 | 0.0 | 0.013 | 0.175 | 0.00 | Pass |
| 30 | 0.001 | 0.092 | 0.0 | 0.006 | 0.138 | 0.00 | Pass |
| 31 | 0.008 | 0.110 | 0.0 | 0.014 | 0.163 | 0.00 | Pass |
| 32 | 0.003 | 0.086 | 0.0 | 0.012 | 0.129 | 0.00 | Pass |
| 33 | 0.007 | 0.102 | 0.0 | 0.013 | 0.153 | 0.00 | Pass |
| 34 | 0.002 | 0.081 | 0.0 | 0.008 | 0.122 | 0.00 | Pass |
| 35 | 0.005 | 0.096 | 0.0 | 0.011 | 0.145 | 0.00 | Pass |
| 36 | 0.001 | 0.077 | 0.0 | 0.005 | 0.115 | 0.00 | Pass |
| 37 | 0.005 | 0.092 | 0.0 | 0.009 | 0.137 | 0.00 | Pass |
| 38 | 0.001 | 0.073 | 0.0 | 0.004 | 0.109 | 0.00 | Pass |
| 39 | 0.005 | 0.087 | 0.0 | 0.008 | 0.130 | 0.00 | Pass |
| 40 | 0.001 | 0.069 | 0.0 | 0.003 | 0.104 | 0.00 | Pass |

**Conclusion:**

# PASS

## 4.4 Voltage fluctuations (Flicker)

| | |
|---|---|
| Standard | EN 61000-3-3 |
| Port | AC Mains supply |
| Voltage | 230 $V_{AC}$ |
| Mode | On mode |

Equipment intended to be connected to 230/400 $V_{AC}$ 50 Hz supply systems may not produce voltage fluctuations in the supply systems due to variation of the input current above the limits as stated below.

| | |
|---|---|
| $P_{ST}$ | ≤ 1 |
| $P_{LT}$ | Not applicable* |
| Tmax (dt > 3,3%) | ≤ 500 ms |
| $d_C$ | ≤ 3,3% |
| $d_{MAX}$ | ≤ 4% |

**Results**

| | |
|---|---|
| Tmax (dt > 3,3%) | 0,0 ms |
| Maximum voltage change $d_{MAX}$ | 0,120% |
| Relative Voltage change $d_C$ | <0,050% |
| Short term flicker $P_{ST}$ | 0,160 |
| Long term flicker $P_{LT}$ | Not applicable* |

**Tests and mode of operation**

The measurements were performed with the following mode of operation: on mode

**Conclusion:**

# PASS

# 5 IMMUNITY TEST RESULTS

## 5.1 Electrostatic discharge immunity

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

**Requirements**

| | |
|---|---|
| Standard | EN 55014-2 |
| Basic standard | EN 61000-4-2 |
| Port | Enclosure |
| Performance criterion | B; During the test degradation is allowed.<br>No change of operating state or stored data is allowed. |
| Air discharges | 8 kV |
| Contact discharges | 4 kV |
| Mode | On mode |

**Performed tests**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Air discharges | ✓ | 4 kV | ✓ | 8 kV | | 15 kV | | |
| Contact discharges | ✓ | 2 kV | ✓ | 4 kV | | 8 kV | | |
| Via coupling planes | ✓ | Horizontal | | | ✓ | Vertical | | |
| Polarity | ✓ | Positive | | | ✓ | Negative | | |
| Set-up | ✓ | Table-top | | | | Floor standing | | |
| Ambient temperature | 21 °C | | | | | | | |
| Relative Humidity air | 48% | | | | | | | |

**Observations**

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

**Conclusion:**

**PASS**

## 5.2 Electrical Fast Transient immunity

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

**Requirements**

| | | | | |
|---|---|---|---|---|
| Standard | EN 55014-2 | | | |
| Basic standard | EN 61000-4-4 | | | |
| Performance criterion | B; During the test degradation is allowed.<br>No change of operating state or stored data is allowed. | | | |
| Pulse characteristics | 5/50 ns | | | |
| Peak Voltage; Port | 1 kV; AC input power port | | | |
| Repetition frequency | ✓ | 5 kHz | | 2,5 kHz |

**Performed tests**

| | | | | |
|---|---|---|---|---|
| Tested Voltage; Port | 1 kV; AC input power port | | | |
| Mode | On mode | | | |
| Injection method | ✓ | CDN | | Capacitive clamp |
| Polarity | ✓ | Positive | ✓ | Negative |
| Set-up | ✓ | Table-top | | Floor standing |

**Observations**

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

**Conclusion:**

# PASS

## 5.3 Surge transient immunity

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

**Requirements**

| | |
|---|---|
| Standard | EN 55014-2 |
| Basic standard | EN 61000-4-5 |
| Performance criterion | B; During the test degradation is allowed.<br>No change of operating state or stored data is allowed. |
| Pulse characteristics | 1,2/50 µs |
| Peak Voltage; Port | 1 kV; AC input power port (Line to line)<br>2 kV; AC input power port (Line to earth) |

**Performed tests**

| | | | | |
|---|---|---|---|---|
| Tested Voltage; Port | 1 kV; AC input power port (Line to line)<br>2 kV; AC input power port (Line to earth) | | | |
| Mode | On mode | | | |
| Polarity | ✓ | Positive | ✓ | Negative |

**Observations**

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

**Conclusion:**

# PASS

## 5.4 RF Conducted immunity

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

**Requirements**

| | |
|---|---|
| Standard | EN 55014-2 |
| Basic standard | EN 61000-4-6 |
| Performance criterion | A; Operation as intended |
| Frequency range | 0,15 – 230 MHz |
| Modulation | 1 kHz – 80% AM |
| Test level; Port | 3 V; AC input power port |

**Performed tests**

| | | | | |
|---|---|---|---|---|
| Tested level; Port | 3 V; AC input power port | | | |
| Mode | On mode | | | |
| Frequency range | 0,15 – 230 MHz | | | |
| Dwell time | 3 seconds | | | |
| Injection method | ✓ | CDN-M3 | | EM clamp |

**Observations**

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

**Conclusion:**

# PASS

## 5.5 Power supply interruptions and dips

**Requirements**

| | |
|---|---|
| Basic standard | EN 61000-4-11 |
| Performance criterion | B; During the test degradation is allowed.<br>No change of operating state or stored data is allowed.<br>C; Temporary, self-recoverable loss of function is allowed. |

| Standard | | | 50 Hz | 60 Hz |
|---|---|---|---|---|
| AC input power port | C | $U_{NOM}$ – 30% | (50 periods) | (60 periods) |
| | C | $U_{NOM}$ – 60% | (10 periods) | (12 periods) |
| | C | $U_{NOM}$ – 100% | (0,5 period) | (0,5 period) |

**Performed tests**

| Tested voltage | AC input power port, 240 $V_{AC}$ | |
|---|---|---|
| Mode | On mode | |
| AC input power port | 50 Hz | 60 Hz |
| | $U_{NOM}$ – 30% (50 periods) | $U_{NOM}$ – 30% (60 periods) |
| | $U_{NOM}$ – 60% (10 periods) | $U_{NOM}$ – 60% (12 periods) |
| | $U_{NOM}$ – 100% (0,5 period) | $U_{NOM}$ – 100% (0,5 period) |

**Observations**

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

**Conclusion:**

# PASS

# 6 IDENTIFICATION OF THE EQUIPMENT UNDER TEST

The photograph shows the tested device.


Figure 3 Conducted Emission test setup


Figure 4 Disturbance power test setup

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