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TEST REPORT

Amp Annealing 001 Induction Heater

tested to

47 Code of Federal Regulations

Part 18 – Industrial, Scientific and Medical Equipment

for

Amp Annealing Ltd

This Test Report is issued with the authority of:

Andrew Cutler - General Manager

IANZ ACCREDITED LABORATORY

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

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1. STATEMENT OF COMPLIANCE

The **Amp Annealing 001 Induction Heater** complies with FCC Part 18 when the methods as described in ANSI C63.4 – 2003 are applied.

2. RESULTS SUMMARY

The results of testing carried out in October and November 2015 are summarised below.

Clause	Parameter	Result
18.203	Equipment authorisation requirement	The equipment is Consumer ISM equipment. The Certification procedure will need to be applied.
18.301	Operating frequencies	Complies. Device operates on a nominal frequency of 110.0 kHz
18.303	Prohibited frequency bands	Noted.
18.305	Field Strength Limits	Complies
18.307	Conducted limits	Complies
18.309	Frequency range of measurements	Noted
18.311	Methods of measurement	Tested in accordance with ANSI C63.4 2003.

3. INTRODUCTION

This report describes the tests and measurements performed for the purpose of determining compliance with the specification.

The client selected the test sample.

This report relates only to the sample tested.

This report contains no corrections or erasures.

Measurement uncertainties with statistical confidence intervals of 95% are shown below test results. Both Class A and Class B uncertainties have been accounted for, as well as influence uncertainties where appropriate.

All compliance statements have been made with respect of the specification limit with no reference to the measurement uncertainty.

4. CLIENT INFORMATION

Company Name	Amp Annealing Ltd
Address	40 Mile Rd, Bombay
City	Auckland 2675
Country	New Zealand
Contact	Alex Findlay

5. DESCRIPTION OF TEST SAMPLE

Brand Name	Amp Annealing
Model	001
Product	Induction Heater
Manufacturer	Amp Annealing Ltd
Country of Origin	New Zealand
Serial Number	001
FCC ID	2AGVJ-ANNEALING1

The device contains an induction heater that operates on a nominal frequency of 116 kHz.

The device is used for the sealing ammunition cartridges with the induction heater operating on demand for short periods of time.

6. STANDARD, SETUPS AND PROCEDURES

Standard

The sample was tested in accordance with FCC Part 18.

Methods and Procedures

The measurement methods and procedures used, as described in ANSI C63.4 – 2003.

7. RESULTS

Section 18.203: Equipment Authorisation

The device that has been tested would be classed as Consumer ISM equipment.

Therefore the Declaration of Conformity or Certification procedures should be applied to this device.

As the device has been tested in New Zealand the Certification procedure will to be applied.

Section 18.301: Operating frequencies

The device operates on a nominal frequency of 116.0 kHz.

This frequency is above 9 kHz

This frequency is not one of the specific ISM frequencies listed in the table detailed in section 18.301.

This frequency does not fall into any of the prohibited frequency bands described in section 18.303.

Result: Complies.

Section 18.305: Field strength limits

Below 30 MHz results:

The device tested operated on a nominal frequency 116 kHz

The device tested is an Induction Heater that is used for the annealing of ammunition cartridges.

The Induction Heater operates on demand for short periods of time during the annealing process.

The device has been classified as Consumer ISM equipment with the client declaring a power output of 500 watts.

The limits from the table detailed in section 18.305(b) have been applied for:

Any type of equipment, Any non-ISM frequency, RF Power generated 500 watts or more

A field strength limit of 15 x SQRT (800/500) uV/m at a distance of 300 metres.

This equates to an average limit of 19 uV/m or 25.5 dBuV/m at 300 metres.

The peak limit will be the average limit + 20 dB.

Measurements were made at a distance of 10 metres as measurements could not be made at 300 metres.

In order to determine the applicable limit measurements were made at distances of 10 metres and 30 metres with the device being rotated to determine the major lobes of radiation.

Using these levels the recorded levels at 10 metres have been extrapolated to 300 metres and compared against the 300 metre limit.

The following levels were recorded at 10 metres and 30 metres.

Frequency (MHz)	10 m Level (dBµV/m)	30 m Level (dBµV/m)	300 m Level (dBµV/m)	300 m Limit (dBµV/m)	Detector
0.067	74.0	56.0	18.3	45.2	Peak
0.067	55.0	37.0	-1.0	25.2	Average
0.116	76.3	58.3	20.5	45.2	Peak
0.116	71.1	53.1	15.3	25.2	Average
0.232	-	-	-	45.2 / 25.2	Peak / Average
0.348	-	-	-	45.2 / 25.2	Peak / Average
0.464	-	-	-	45.2 / 25.2	Peak / Average
0.580	-	-	-	25.2	Quasi Peak
0.696	-	-	-	25.2	Quasi Peak
0.812	-	-	-	25.2	Quasi Peak

No emissions detected from the device above 116 kHz

Only noise floor observed

Below is a sample calculation for the Peak detector at 67 kHz:

10 metre to 30 metre roll off = 18 dB
10 metres to 30 metres is 0.477 of a decade
30 metres to 300 metres is 1 decade
Therefore 10 metres to 300 metres is 1.477 of a decade
10 metres to 300 metres roll off is 18.0 dB x (1.477 / 0.477) = 55.7 dB
10 metre measurement of 74.0 dBuV/m – roll off of 55.7 dB = 18.3 dBuV/m extrapolated level at 300 metres

Above 30 MHz results:

The FCC Part 15 Class B limits have been applied which are more extreme than the Part 18 limits above 30 MHz.

Standby

Frequency (MHz)	Vertical (dBµV/m)	Horizontal (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result	Antenna
35.928	19.1		40.0	20.9	Pass	Vertical
42.000	18.9		40.0	21.1	Pass	Vertical

Operating

Frequency (MHz)	Vertical (dBµV/m)	Horizontal (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result	Antenna
33.000	29.0	27.3	40.0	11.0	Pass	Vertical
36.000	32.1	24.1	40.0	7.9	Pass	Vertical

No further emissions were observed when testing was attempted up to 1000 MHz in both vertical and horizontal polarisations.

General Test set up

Testing was carried out at the laboratory's open area test site that is located at 670 Kawakawa Orere Rd, RD5 Papakura, New Zealand.

Before testing was carried out, a receiver self test and internal calibration was undertaken along with a check of all connecting cables and programmed antenna factors.

The device was placed on the test tabletop, which was a total of 0.8 m above the test site ground plane.

The device was powered from a 120 Vac mains supply and was tested both in standby mode and when annealing ammunition cases.

Measurements below 30 MHz were made at a distance of 10 m.

Between 100 kHz and 30 MHz testing was carried out using a magnetic loop antenna, the centre of which was placed 1 metre above the ground plane.

The device was rotated using a turntable with various orientations of the loop antenna to give the worst case result.

Measurements between 10 - 500 kHz were carried out using a peak and average detector with a bandwidth of 10 kHz.

Above 500 kHz and below 30 MHz a quasi peak detector with 9 kHz bandwidth was used.

Between 30 and 1000 MHz testing is carried out by manually scanning in 100 kHz steps while aurally and visually monitoring for emissions.

Measurements above 30 MHz were made at a distance of 3 m.

When an emission is located, it is positively identified and its maximum level is found by rotating the automated turntable, and by varying the antenna height with an automated antenna tower.

The emission is measured in both vertical and horizontal antenna polarisations using a Quasi Peak detector with a bandwidth of 120 kHz.

The emission level is determined in field strength by taking the following into consideration:

Level (dBµV/m) = Receiver Reading (dBµV) + Antenna Factor (dB/m) + Coax Loss (dB)

Result: Complies.
Measurement uncertainty with a confidence interval of 95% is:
(0.010 – 1000 MHz) ± 4.1 dB

Section 18.307: Conducted limits

Conducted emissions testing was carried out over the frequency range of 150 kHz to 30 MHz at the Laboratory's MacKelvie Street premises in a 2.4 m x 2.4 m x 2.4 screened room.

Measurements on both the phase and neutral lines were made using either a Quasi Peak or an Average detector with a 9 kHz bandwidth.

The supplied conducted emission plot is a combined plot showing the worst case of the Peak, Quasi Peak and Average levels for both phase and neutral.

The device was placed on top of the emissions table, which is 1 m x 1.5 m, 80 cm above the screened room floor which acts as the horizontal ground plane.

In addition the device was positioned 40 cm away from the screened room wall which acts as the vertical ground plane.

The artificial mains network was bonded to the screened room floor.

At all times the device was kept more than 80 cm from the artificial mains network.

The limits described in Section 18.307 (b) have been applied as this device is a Part 18 consumer device.

A scan was performed when the device was operating in the "Ready" state.

Final measurements were made manually during the "Annealing" process using a bullet casing in the appropriate port.

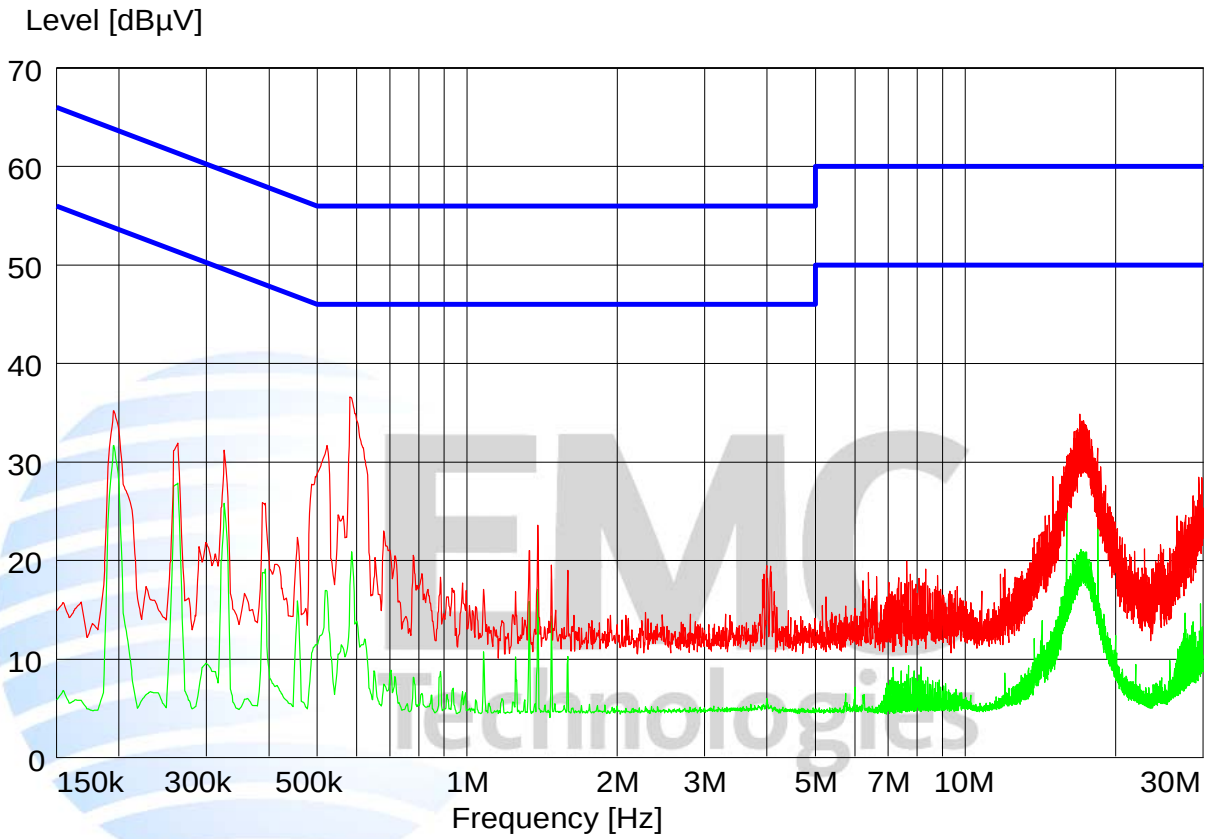
Result: Complies

Measurement uncertainty with a confidence interval of 95% is:
- Mains terminal tests (0.15 - 30 MHz) ± 2.2 dB

Conducted Emissions – AC Input Power Port

Setup:	Powered from 120 V 60 Hz supply. Scan performed on unit in "Ready" state. Final results obtained during "Annealing" process, using bullet casing in port.

Peak ---	Average --	Quasi Peak X	Average +



Final Quasi-Peak Measurements

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Phase	Rechecks (dBµV)
0.195000	36.3	63.9	27.6	L1	
0.228444	53.7	62.5	8.8	L1	
0.586000	35.4	56.0	20.6	L1	
16.000000	52.6	60.0	7.4	L1	
17.351800	44.9	60.0	15.1	L1	
30.000000	45.6	60.0	14.4	L1	

Final Average Measurements

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Phase	Rechecks (dBµV)
0.195000	33.0	53.9	20.9	L1	
0.228444	49.6	52.5	2.9	L1	
0.586000	26.1	46.0	19.9	L1	
16.000000	44.2	50.0	5.8	L1	
17.351800	37.0	50.0	13.0	L1	
30.000000	36.1	50.0	13.9	L1	

8. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial No	Asset Ref	Period	Cal Due
Aerial Controller	EMCO	1090	9112-1062	RFS 3710	Not applic	Not applic
Aerial Mast	EMCO	1070-1	9203-1661	RFS 3708	Not applic	Not applic
Biconical Antenna	Schwarzbeck	BBA 9106	9594	3680	3 years	3 Feb 2018
Log Periodic	Schwarzbeck	VUSLP 9111	9111-228	3785	3 years	1 Dec 2017
Loop Antenna	EMCO	6502	9003-2485	3798	3 years	4 Jul 2017
Receiver	Rohde & Schwarz	ESIB 40	100171	EMC 4003	1 year	16 Apr 2016
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709	Not applic	Not applic
VHF Balun	Schwarzbeck	VHA 9103	9594	3696	3 years	3 Feb 2018

All test equipment was within calibration at the time of testing.

9. ACCREDITATIONS

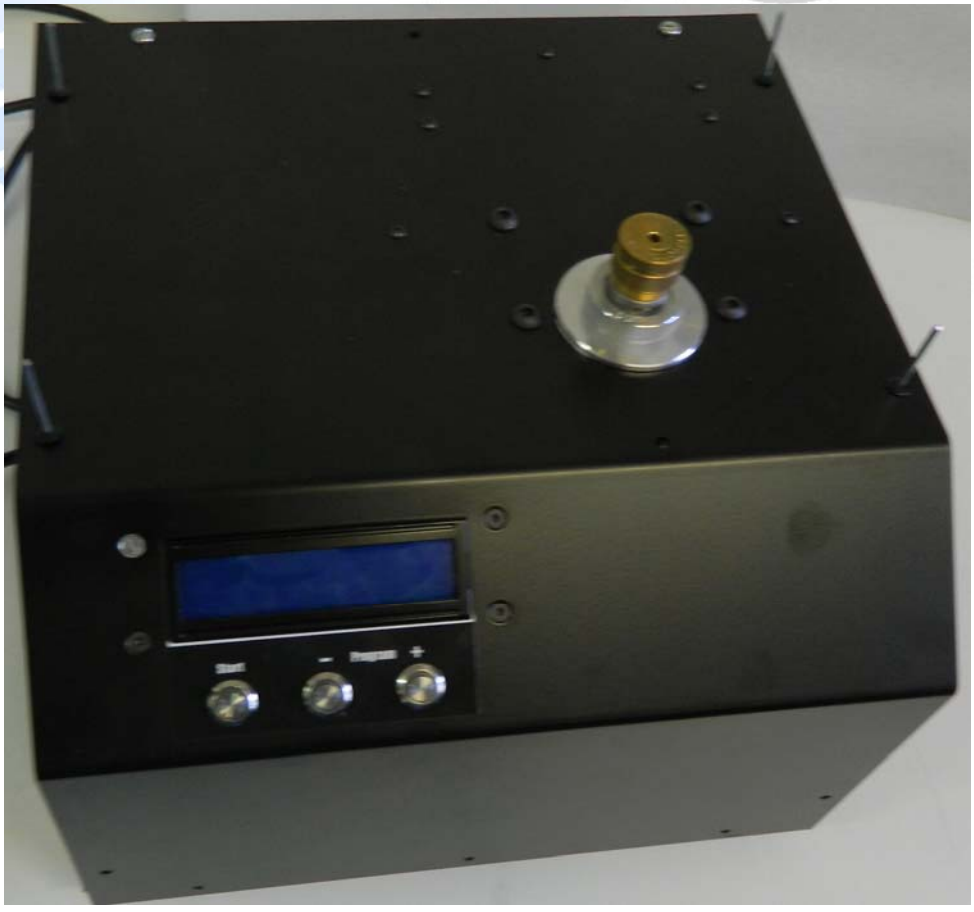
Testing was carried out in accordance with EMC Technologies NZ Ltd registration with the Federal Communications Commission as a listed facility, Registration Number: 90838, which was updated in June 2014.

In addition testing was carried out in accordance with the terms of EMC Technologies (NZ) Ltd's International Accreditation New Zealand (IANZ) Accreditation to NZS/IEC/ISO 17025.

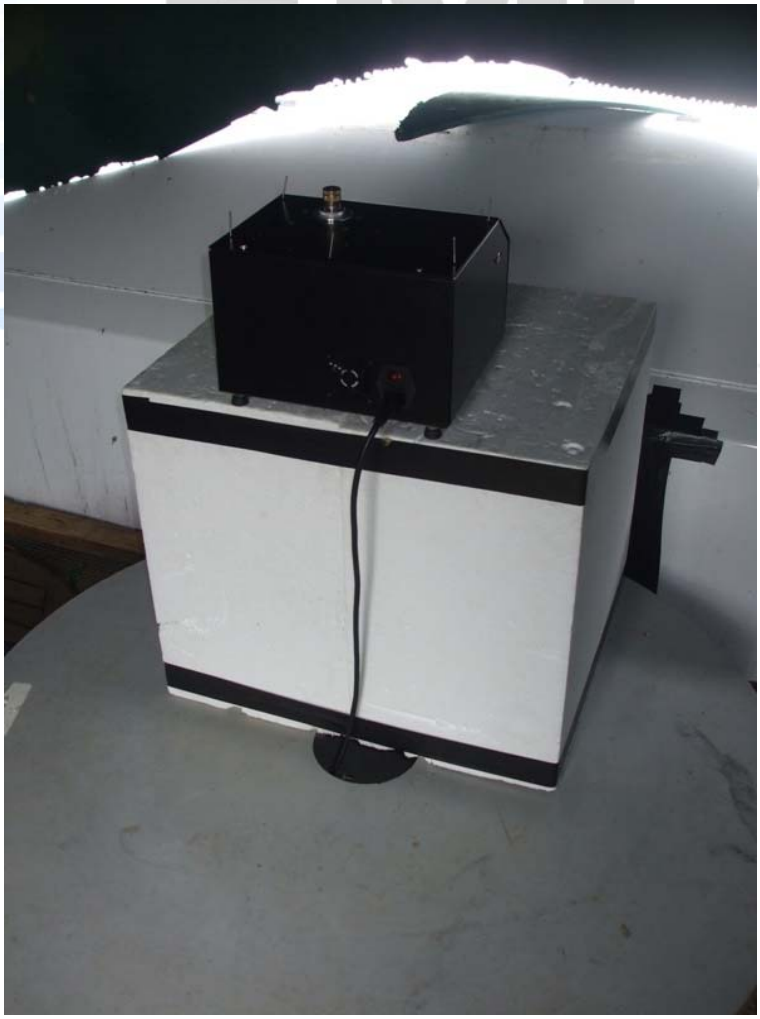
All measurement equipment has been calibrated in accordance with the terms of EMC Technologies (NZ) Ltd's International Accreditation New Zealand (IANZ) Accreditation to NZS/IEC/ISO 17025.

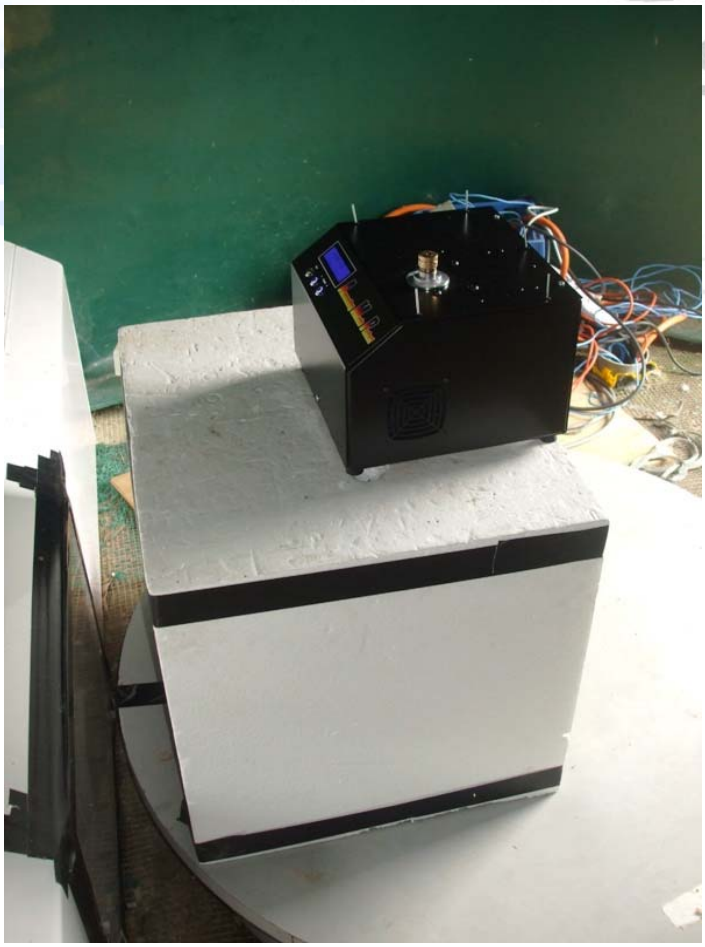
International Accreditation New Zealand has Mutual Recognition Arrangements for testing and calibration with a number of accreditation bodies in various economies. This includes NATA (Australia), UKAS (UK), SANAS (South Africa), NVLAP (USA), A2LA (USA), SWEDAC (Sweden). Further details can be supplied on request.

10. PHOTOGRAPHS



Radiated Emissions Test Setup





Conducted emissions test set up