Test Certificate

A sample of the following product received on June 26, 2018 and tested on June 26, 28 and 29, 2018 complied with the requirements of,

- **IEC 61000-6-2:2005 Generic standards - Immunity for industrial environments**
- **EN 61000-6-2:2005/AC:2005 Generic standards - Immunity for industrial environments**
- **IEC 61000-6-4:2006 + A1:2010 Generic standards - Emission standard for industrial environments**
- **EN 61000-6-4:2007 + A1:2011 Generic standards - Emission standard for industrial environments**

given the measurement uncertainties detailed in National Technical Systems report FR-082478.01-EN Rev 0.

Malema Engineering Corp
Model Fluid Flow Valve

Wayne Fisher
EMC and Wireless Department Manager

David Guidotti
Preparer

Gary Izard
Quality Assurance Delegate

National Technical Systems 41039 Boyce Road 510-578-3500 Phone
www.nts.com Fremont, CA. 94538 510-440-9525 Fax

EMC Test Report

IEC 61000-6-2:2005
EN 61000-6-2:2005/AC:2005
IEC 61000-6-4:2006 + A1:2010
EN 61000-6-4:2007 + A1:2011

Model: Fluid Flow Valve

COMPANY:	Malema Engineering Corp 2392 Zanker Road San Jose, CA 95131
TEST SITE(S):	National Technical Systems 41039 Boyce Road. Fremont, CA. 94538-2435
PROJECT NUMBER:	PR082478
REPORT DATE:	July 10, 2018
FINAL TEST DATES:	June 26, 28 and 29, 2018
TOTAL NUMBER OF PAGES:	66

ACCREDITED
Testing Cert #0214.26

VALIDATING SIGNATORIES

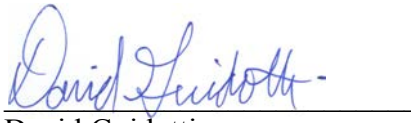
PROGRAM MGR

Wayne Fisher
EMC and Wireless Department Manager

TECHNICAL REVIEWER:

Wayne Fisher
EMC and Wireless Department Manager

FINAL REPORT PREPARER:



David Guidotti
Senior Technical Writer

QUALITY ASSURANCE DELEGATE

Gary Izard
Technical Writer

REVISION HISTORY

Rev#	Date	Comments	Modified By
-	July 10, 2018	First release	

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SCOPE

Governments and standards organizations around the world have published requirements regarding the electromagnetic compatibility (EMC) of electronic equipment. Testing has been performed on the Malema Engineering Corp model Fluid Flow Valve, to establish compliance with these requirements.

Standard	Title	Standard Date
IEC 61000-6-2	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments	2005
EN 61000-6-2	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments	2005/AC:2005
IEC 61000-6-4	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments	2006/A1:2010
EN 61000-6-4	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments	2007/A1:2011

All measurements and evaluations have been in accordance with these specifications, test procedures, and measurement guidelines as outlined in National Technical Systems test procedures, and in accordance with the standards referenced therein (refer to Appendix C). National Technical Systems is accredited by the A2LA, certificate number 0214.26, to perform the test(s) listed in this report, except where noted otherwise.

OBJECTIVE

The objective of Malema Engineering Corp is to declare conformity with the essential requirements of the EMC directive 2004/108/EC.

STATEMENT OF COMPLIANCE

The tested sample of Malema Engineering Corp model Fluid Flow Valve complied with the requirements of:

Standard/Regulation	Equipment Type/Class	Standard Date
IEC 61000-6-2	Heavy Industrial	2005
EN 61000-6-2	Heavy Industrial	2005
IEC 61000-6-4	Heavy Industrial	2006/A1:2010
EN 61000-6-4	Heavy Industrial	2007/A1:2011

The test results recorded herein are based on a single type test of the Malema Engineering Corp model Fluid Flow Valve and therefore apply only to the tested sample. The sample was selected and prepared by Claus Knudsen of Malema Engineering Corp.

Maintenance of compliance is the responsibility of the company. Any modification of the product that could result in increased emissions or susceptibility should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different enclosure, different line filter or power supply, harnessing and/or interface cable changes, etc.).

DEVIATIONS FROM THE STANDARDS

No deviations were made from the published requirements listed in the scope of this report.

EN 61000-6-4 and IEC 61000-6-4 TEST RESULTS

The following emissions tests were performed on the Malema Engineering Corp model Fluid Flow Valve. The complete test results are contained within an appendix of this report.

Port	Test	Standard/Section	Requirement	Measurement Margin	Status
Enclosure	Radiated Electric Field, 30-1000 MHz	IEC 61000-6-4 EN 61000-6-4 Table 1 (1)	30 – 230, 40 dBµV/m 230 – 1000, 47 dBµV/m (10m limit)	20.7 dBµV/m @ 182.61 MHz (-19.3 dB)	Complied
	Radiated Electric Field, 1000-6000 MHz		1-3 GHz 50 dBµV/m Av 70 dBµV/m Pk 3-6 GHz 54 dBµV/m Av 74 dBµV/m Pk (3 m limit)	34.1 dBµV/m @ 2787.7 MHz (-21.9 dB)	Complied
AC Power	Conducted Emissions 0.15-30 MHz	IEC 61000-6-4 EN 61000-6-4 Table 1 (2)	0.15-0.5 MHz: 79 dBµV QP 66 dBµV Av 0.5-30 MHz: 73 dBµV QP 60 dBµV Av	Not applicable as the device does not have an AC power port	
Tele-communications ports	Conducted Emissions 0.15-30 MHz (Voltage)	IEC 61000-6-4 EN 61000-6-4 Table 1 (3)	0.15-0.5 MHz, 97-87 dBµV QP 84-74 dBµV Av 0.5-30.0 MHz: 87 dBµV QP 74 dBµV Av	Not applicable as the device does not have any ports that would connect to long distance telecommunications cables	
	Conducted Emissions 0.15-30 MHz (Current)		0.15-0.5 MHz 53-43 dBµA QP 40-30 dBµA Av 0.5-30.0 MHz: 43 dBµA QP 30 dBµA Av	Not applicable as the device does not have any ports that would connect to long distance telecommunications cables	

EN 61000-6-2 and IEC 61000-6-2 TEST RESULTS

The following immunity tests were performed on the Malema Engineering Corp model Fluid Flow Valve. The complete test results are contained within an appendix of this report.

Port	Test	Basic Standard	Test Level	Criterion Required/Met	Status
Enclosure	Electrostatic Discharge	EN 61000-4-2 IEC 61000-4-2	4 kV CD, 8 kV AD	B / A	Complied
	RF Electromagnetic Field, 80% 1 KHz AM	EN 61000-4-3 IEC 61000-4-3	80 – 1000 MHz, 10V/m 1.4 - 2.0 GHz, 3 V/m 2.0 - 2.7 GHz, 3 V/m	A / A	Complied Note 1
	Magnetic Fields	EN 61000-4-8 IEC 61000-4-8	30 A/m 50Hz and 60Hz	A / A	Complied
Signal Ports	Fast Transients	EN 61000-4-4 IEC 61000-4-4	2.0 kV	B / A	Complied Note 1
	Surges	EN 61000-4-5 IEC 61000-4-5	Not applicable because Malema Engineering Corp stated that the EUT's signal ports are not intended to connect to cables that exceed 30 meters in length		
	RF Common Mode	EN 61000-4-6 IEC 61000-4-6	0.15-80 MHz, 10 Vrms 80% 1 KHz AM	A / A	Complied
AC Mains Ports	Fast Transients	EN 61000-4-4 IEC 61000-4-4	Testing was not performed as the EUT is DC powered.		
	Surges	EN 61000-4-5 IEC 61000-4-5			
	RF Common Mode	EN 61000-4-6 IEC 61000-4-6			
	Voltage Dips and interruptions	EN 61000-4-11 IEC 61000-4-11			
DC Power Ports	Fast Transients	EN 61000-4-4 IEC 61000-4-4	2 kV	B / A	Complied
	Surges	EN 61000-4-5 IEC 61000-4-5	The port was not tested as it is not intended for permanent connection to cables longer than 30m.		
	RF Common Mode	EN 61000-4-6 IEC 61000-4-6	0.15-80 MHz, 10 Vrms, 80% 1 KHz AM	A / A	Complied Note 2

Notes / Abbreviations
AD: Air Discharge CM: Common Mode (line to ground)
CD: Contact Discharge DM: Differential Mode (line to line)
Note 1 The level tested exceeds the test level required by the standard. Testing was performed at the higher severity level at the client's request in order to meet requirements of other standards or to ensure adequate margins.
Note 2 Conducted Immunity was tested at 10Vrms instead of 3Vrms in the ITU bands at clients request.

MEASUREMENT UNCERTAINTIES

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below were calculated using the approach described in CISPR 16-4-2:2003 using a coverage factor of k=2, which gives a level of confidence of approximately 95%. The levels were found to be below levels of *U*cispr and therefore no adjustment of the data for measurement uncertainty is required.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
Conducted Emissions	dBuV or dBuA	150kHz – 30MHz	± 2.2 dB
Radiated Electric Field	dBuV/m	30 – 1000 MHz	± 3.6 dB
		1000 – 40,000 MHz	± 6.0 dB
Radiated Immunity	V/m	80 – 1000 MHz	- 26.3%, + 29.97%
ESD	KV	N/A	± 8.6%
Fast Transients	Voltage	N/A	± 5.98 %
	Timing	N/A	± 8.60 %
Surge	Voltage	N/A	± 4.92 %
RF Common Mode (CDN method)	Vrms	N/A	-12.64 %, +13.33 %
RF Common Mode (BCI method)	Vrms	N/A	-13.45 %, +15.32 %
Voltage Dips	Voltage	N/A	± 2.32 %
Voltage Dips	Timing	N/A	± 0.08mS
Magnetic Immunity	Amps	N/A	± 0.8%
Pulsed Magnetic Immunity	Amps	N/A	±9.87%

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Malema Engineering Corp model Fluid Flow Valve is a stepper motor based device used to control fluid flow in plastic tubes. Since the EUT would be placed on a tabletop during operation, the EUT was treated as tabletop equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 24 Volts, 0 Hz, and 0.2 Amps.

The sample was received on June 26, 2018 and tested on June 26, 28 and 29, 2018. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Malema Engineering Corp	BCV980	Manual or automatic control valve	CE-20180615-001	NA

ENCLOSURE

The EUT enclosure is primarily constructed of metal. It measures approximately 8.5 cm wide by 23 cm deep by 9 cm high.

MODIFICATIONS

No modifications were made to the EUT during the time the product was at National Technical Systems.

SUPPORT EQUIPMENT

No local support equipment was used during emissions testing.

The following equipment was used as remote support equipment for emissions testing:

Company	Model	Description	Serial Number	FCC ID
Malema	Test Box #1	Power & control device	NA	NA
HQ Power	PS3003U	DC power supply	NA	None

EUT INTERFACE PORTS

The I/O cabling configuration during emissions testing was as follows:

EUT

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
P0 (main power)	Test box P1	Multiwire	Shielded	30
RP1	Test box RP1			
RP2	Test box RP2			
RP3	Test box RP3			
Chassis	Ground	1 wire	Unshielded	2

Additional on Support Equipment

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
DC in (test box)	DC supply	2 wire	Unshielded	2
Chassis (test box)	Ground	1 wire	Unshielded	2
AC in (DC supply)	AC mains	3 wire	Unshielded	2

EUT OPERATION

During emissions testing the EUT was fully operating, moving the pinch bar in and out controlled by the DSP.

During immunity testing the EUT was fully operating, moving the pinch bar in and out controlled by the DSP.

The performance criteria applied during immunity testing were:

Criterion A: During and after testing the EUT shall continue to move the pinch bar in and out controlled by the DSP.
Criterion B: During application of the transient test, degradation of performance including cessation of movement is allowed provided that the EUT self-recovers to normal operation after testing without any operator intervention.
Criterion C: Loss of function is allowed provided that normal operation can be restored by operator intervention.

EMISSIONS TESTING

GENERAL INFORMATION

Final test measurements were taken at the National Technical Systems Anechoic Chamber(s) listed below. The test sites contain separate areas for radiated and conducted emissions testing. The sites conform to the requirements of CISPR 16-1-4:2007 - *Specification for radio disturbance and immunity measuring apparatus and methods Part 1-4: Radio disturbance and immunity measuring apparatus Ancillary equipment Radiated disturbances*. They are registered with the VCCI and are on file with the FCC and Industry Canada.

Site	Registration Numbers			Location
	VCCI	FCC	Canada	
Chamber 7	R-3389 G-235 C-3759 T-1915	A2LA accredited	IC 2845B-7	41039 Boyce Road Fremont, CA 94538-2435

Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements.

Emissions measurements were made with the EUT powered from a supply voltage within the expected tolerances of each nominal operating voltage/frequency for each geographical regions covered by the scope of the standards referenced in this report.

RADIATED EMISSIONS CONSIDERATIONS

Radiated measurements are performed in an Open Area Test Site or semi-anechoic chamber, as defined in CISPR 16, CISPR 11 (EN 55011) and CISPR 22 (EN 55022).

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1-1:2006 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 7 GHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000 MHz are performed on the spectrum analyzer using a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde & Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer runs automated data collection programs that control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted emission measurements utilize a 50 µH Line Impedance Stabilization Network (LISN) as the measurement point. The LISN used may also contain an additional 250 µH inductor. This network provides for calibrated radio-frequency noise measurements by the design of the internal low-pass and high-pass filters on the EUT and measurement ports, respectively.

IMPEDANCE STABILIZATION NETWORK (ISN)

Telecommunication port conducted emission measurements utilize an Impedance Stabilization Network with a 150 ohm termination impedance and specific longitudinal conversion loss as the voltage monitoring point. This network provides for calibrated radio-frequency noise measurements by the design of the internal circuitry on the EUT and measurement ports, respectively. For current measurements, a current probe with a uniform frequency response and less than 1 ohm insertion impedance is used.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high-amplitude transient events.

ANTENNAS

Measurements below 30 MHz, where necessary, are made using a loop antenna as detailed in CISPR 16-1. A combination of a biconical antenna and a log periodic antenna, or a bi-log antenna, is utilized from 30 MHz to 1000 MHz. Above 1000 MHz, a horn antenna is used. The antenna calibration factors are included in site factors that are programmed into the test receivers.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor drive to vary the antenna height.

The test height above ground for table-mounted devices shall be 80 centimeters. Floor-mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material up to 12 mm thick if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the company's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An appendix of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES

EUT AND CABLE PLACEMENT

The standards require that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst-case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied and the worst-case orientation is used for final measurements.

RADIATED EMISSIONS (SEMI-ANECHOIC and/or OATS TEST ENVIRONMENT)

Radiated emissions measurements in a semi-anechoic environment are performed in two phases (preliminary scan and final maximization). Final maximization may be performed on an OATS.

Preliminary Scan

A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. Scans are performed between 30 MHz and 1000 MHz with the antenna polarized vertically and with the antenna polarized horizontally. For measurements below 30MHz scans are made with the antenna loop parallel and perpendicular to the line between antenna and center of the turntable.

During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied from 1 – 4m (for measurements below 30Mhz the antenna height is fixed) and cable positions are varied to determine the highest emission relative to the limit. A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions if required. Other methods used during the preliminary scan for EUT emissions involve scanning with near-field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final Maximization

During final maximization, the highest-amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth that results in the highest emission is then maintained while varying the antenna height from one to four meters. The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain. Emissions that have values close to the specification limit may also be measured with a tuned dipole antenna to determine compliance.

SAMPLE CALCULATIONS

SAMPLE CALCULATIONS - RADIATED EMISSIONS

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements. A distance factor, when used for electric field measurements, is calculated by using the following formula:

$$F_d = 20*LOG_{10} (D_m/D_s)$$

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_s = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

IMMUNITY TESTING

GENERAL INFORMATION

Final tests were performed at the National Technical Systems Test Sites located at 41039 Boyce Road, Fremont, CA 94538-2435. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent CENELEC and IEC standards.

MEASUREMENT INSTRUMENTATION

ELECTROSTATIC DISCHARGE TEST SYSTEM

An ESD generator is used for all testing. It is capable of applying electrostatic discharges in both contact discharge mode to 8 kV and air discharge mode to 16.5 kV in both positive and negative polarities in accordance with the IEC / EN 61000-4-2 basic EMC publication.

ELECTROMAGNETIC FIELD TEST SYSTEM

A signal generator and power amplifiers are used to provide a signal at the appropriate power and frequency to an antenna to obtain the required electromagnetic field at the position of the EUT in accordance with the IEC / EN 61000-4-3 basic EMC publication.

ELECTRICAL FAST TRANSIENT/BURST TEST SYSTEM

An electrical fast transient/burst generator is used for all testing. It is capable of applying the required fast transient immunity test levels to the mains at any phase angle with respect to the mains voltage waveform and to attached cables via a capacitive coupling clamp in accordance with the IEC / EN 61000-4-4 basic EMC publication.

CONDUCTED INTERFERENCE TEST SYSTEM

A signal generator and power amplifier are used to provide a signal at the appropriate power and frequency through a coupling network to obtain the required electromagnetic signal on the power cord and attached cables of the EUT in accordance with the IEC / EN 61000-4-6 basic immunity standard.

MAGNETIC TEST SYSTEM

A single turn, 1m x 1m square coil is used to generate the magnetic field from a 50 Hz power source via a high-current transformer. A voltmeter and AC current probe are used to determine the drive current flowing through the coil. The field generated is calculated from the drive current using the loop factor as described in IEC / EN 61000-4-8. If necessary, coils of different dimensions are constructed to test larger systems.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the company's specifications. An appendix of this report contains the list of test equipment used and calibration information.

IMMUNITY TEST PROCEDURES

EQUIPMENT PLACEMENT

IEC / EN 61000-4-2 specifies that a tabletop EUT shall be placed on a non-conducting table 80 centimeters above a ground reference plane and that floor-mounted equipment shall be placed on a insulating support approximately 10 centimeters above a ground plane. During the tests, the EUT is positioned over a ground reference plane in conformance with this requirement. For tabletop equipment, a 1.6 by 0.8 meter metal sheet is placed on the table and connected to the ground plane via a metal strap with two 470 kΩ resistors in series. The EUT and attached cables are isolated from this metal sheet by 0.5 millimeter thick insulating material.

IEC / EN 61000-4-3 specifies that a tabletop EUT be placed on a non-conducting table 80 centimeters above a ground reference plane and that floor-mounted equipment shall be placed on an insulating support approximately 10 centimeters above a ground plane. During the radiated immunity tests, the EUT is positioned in a shielded anechoic test chamber to reduce reflections from the internal surfaces of the chamber. The EUT is positioned over a ground reference plane or in a shielded chamber in conformance with this requirement.

IEC / EN 61000-4-4 specifies that the EUT and attached cables be placed on an insulating support 10 centimeters above a ground reference plane. During the tests, the EUT was positioned on a table with a ground reference plane or on the floor in conformance with this requirement.

IEC / EN 61000-4-6 specifies that the EUT be placed on an insulating support 10 centimeters above a ground reference plane and that the attached cables be maintained between 30 and 50 millimeters above this plane where possible. During the tests, the EUT was positioned on a table with a ground reference plane or on the floor in conformance with this requirement.

IEC / EN 61000-4-8 specifies that the EUT be placed on an insulating support above a ground reference plane and that the attached cables be maintained between 30 and 50 millimeters above this plane where possible. During the tests, the EUT was positioned on a table with a ground reference plane or on the floor in conformance with this requirement.

APPLICATION OF ELECTROSTATIC DISCHARGES

The points of application of the test discharges directly to the EUT are determined after consideration of the parts of the EUT that are accessible to the operator during normal operation. Contact and air discharges are applied to the EUT, contact discharges to conducting surfaces and air-gap discharges to insulating surfaces. Contact discharges are also applied to the coupling planes to simulate nearby ESD events.

APPLICATION OF ELECTROMAGNETIC FIELD

The electromagnetic field is established at the front edge of the EUT. The frequency range is swept through the frequency range of the test using a power level necessary to obtain the required field strength at the EUT. The field is amplitude modulated using a 1 kHz sine wave to a depth of 80% for the swept frequency test.

The test is repeated with each of the four sides of the EUT facing the field-generating antenna. For small, portable products the test is also performed with the top and bottom sides of the EUT facing the antenna.

APPLICATION OF ELECTRICAL FAST TRANSIENTS

The application of the test voltage to the EUT is made through the power cable and through a capacitive coupling clamp in the case of cables attached to the unit.

APPLICATION OF CONDUCTED INTERFERENCE

The application of the test voltage to the EUT is made through either a coupling-decoupling network (CDN), by direct injection, or through an inductive coupling clamp as appropriate to the cable being tested. The frequency range is swept from 0.15 to 80 MHz using a power level necessary to obtain the specified interference voltage.

APPLICATION OF POWER FREQUENCY MAGNETIC FIELD

The application of the magnetic field to the EUT is made using an induction coil. The test level is gradually increased from 0 A/m to the specified test level, maintained at the 30 A/m test level for a period of not less than 1 minute, and then reduced gradually back to 0 A/m. If the cycle time of the EUT exceeds one minute then the test field is maintained at the required level for the cycle time of the EUT. The test is performed with the loop oriented in each of the three orthogonal axes. If the dimensions of the sides of the EUT exceed 50% of the shortest side of the loop then the induction coil is placed at different positions along the sides of the EUT in order to test the entire volume of the EUT.

Appendix A Test Equipment Calibration Data

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
Radiated Emissions, 30 - 6,000 MHz, 21-Jun-18					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	0		N/A
EMCO	Antenna, Horn, 1-18GHz	3115	868	6/30/2016	6/30/2018
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1548	10/12/2016	10/12/2018
Com-Power	Preamplifier, 30-1000 MHz	PA-103	1632	1/30/2018	1/30/2019
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB 7	1756	7/8/2017	7/8/2018
Hewlett Packard	Spectrum Analyzer QA 9kHz-40GHz non-radio 3dB BW	8564E	2190	8/22/2017	8/22/2018
Hewlett Packard	Preamplifier, 1-26.5GHz	8449B	WC062 438	11/22/2017	11/22/2018
Radiated Emissions, 30 - 6,500 MHz, 02-Jul-18					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	0		N/A
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	7/8/2016	7/8/2018
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	7/27/2016	7/27/2018
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	2199	8/30/2017	8/30/2018
Hewlett Packard	Spectrum Analyzer (SA40) Purple 9 kHz - 40 GHz,	8564E (84125C)	2415	2/16/2018	2/16/2019
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESI 40	2493	3/22/2018	3/22/2019
Hewlett Packard	9KHz-1300MHz pre-amp	8447F	2777	12/27/2017	12/27/2018
EFT, 26-Jun-18					
EM Test	EFT/B Capacitive Coupling clamp	HFK	1583	9/6/2017	9/6/2018
EM Test AG	EFT Generator (FT SEV)	UCS 500 M6	1585	10/25/2017	10/25/2018
FCC	Decoupling Network	F-203I-DCN-23mm	2458		N/A
Conducted Immunity (IEC/EN/KN 61000-4-6), 26-Jun-18					
Fischer Custom Comm.	M3 Network, 150 kHz-230 MHz (CDN)	FCC-801-M3-25A	1276	3/16/2018	3/16/2019
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1290	10/30/2017	10/30/2018
Rohde & Schwarz	Signal Generator, 9 kHz-1.04 GHz	SMY01	1450	9/6/2017	9/6/2018
Instruments For Industry IFI	Amplifier, Wideband, 0.01-230MHz	M75	1531	9/5/2017	9/5/2018
Fischer Custom Comm.	M2 Network, 150 kHz-230 MHz (CDN)	FCC-801-M2-25A	1580	5/30/2018	5/30/2019
Bird Technologies	6 dB, 100 W Attenuator	100-A-FFN-06	1596	9/5/2017	9/5/2018
Rohde & Schwarz	Attenuator, 20 dB, 10W, DC-18 GHz	20dB, 10W, Type N	1795	10/23/2017	10/23/2018
Rohde & Schwarz	Power Sensor 100 uW - 10 Watts	NRV-Z53	1796	10/23/2017	10/23/2018
FCC	Decoupling Network	F-203I-DCN-23mm	2458		N/A
Fischer Custom Comm.	150-50 ohm adapter, 1/2, 0.15 to 80 MHz (CDN)	FCC-801-150-50	2670	4/23/2018	4/23/2019
Power Frequency Magnetic Fields, 26-Jun-18					

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
California Instruments	Harmonics & Flicker Test System	5001ix , AC Power Source	1221	4/30/2018	4/30/2019
California Instruments	Harmonics & Flicker Power Unit	CTS-LR1-PCI (PACS-1)	1222	4/30/2018	4/30/2019
National Technical Systems	Magnetic Immunity Power Source	None	1995	8/28/2017	8/28/2018
National Technical Systems	1m, Magnetic Immunity Coil, Horizontal (4-sided)	None, for EN61000-4-8	2090		N/A
Radiated Immunity, 80 - 2700 MHz, 28-Jun-18					
Werlatone	Directional Coupler, 80-1000 MHz, 40dB, 200W	C3910	917		N/A
Hewlett Packard	Signal Generator (sweep) 0.01 - 26.5 GHz	8340A	1244	1/10/2018	1/10/2019
Amplifier Research	Amplifier, 0.8-4.2GHz, 50Watts	50S1G4A	1493		N/A
Instruments For Industry IFI	IFI Amplifier 80 - 1000 MHz (200W CW)	CMC-200	1546		N/A
Rohde & Schwarz	Power Meter, Dual Channel, DC to 40 GHz, 100 pW to 30 W, 9 kHz to 3 GHz, 200µV to 1000V	NRVD	1786	3/13/2018	3/13/2019
HP Agilent Keysight	Function / Arbitrary waveform generator 80 MHz	33250A	3265	3/20/2018	3/20/2020
Rohde & Schwarz	Peak Power Sensor 1uW - 20mW	NRV-Z31	3428	2/9/2018	2/9/2019
EMCO	Antenna, Biconilog Transmitting	3143	180		N/A
EMCO	Antenna, Horn, 1-18 GHz	3115	2732	12/6/2016	12/6/2018
ESD, 29-Jun-18					
Fischer Custom Comm.	Decoupling Network,.15 - 230 MHz	F-203I-DCN	1399		N/A
National Technical Systems	ESD, Vertical Plane, 19-3/4 x 19-3/4	ESD, VP, 19-3/4 x 19-3/4	1664		N/A
Teseq Schaffner	ESD Gun (Red), 100pF-1500 ohm & 150pF-330 ohm tips	NSG-438	3010	10/30/2017	10/30/2018

Appendix B EMC Test Data

TL082478 Pages 25 – 62

Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
System Configuration:		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Emissions Standard(s):	FCC 15B, EN 61000-6-4	Class:	A
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

EMC Test Data

For The

Malema Engineering Corp

Product

Fluid Flow Valve

Date of Last Test: 7/2/2018

Client:	Malema Engineering Corp	PR Number:	PR082478
Model:	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Standard:	FCC 15B, EN 61000-6-4	Class:	A

Radiated Emissions

(NTS Silicon Valley, Fremont Facility, Semi-Anechoic Chamber)

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 7/2/2018
Test Engineer: David Flores
Test Location: Fremont Chamber #7

Config. Used: 1
Config Change: None
EUT Voltage: 24 VDC

General Test Configuration

The EUT and any local support equipment were located on the turntable for radiated emissions testing. Any remote support equipment was located outside the semi-anechoic chamber. Any cables running to remote support equipment were routed through metal conduit and when possible passed through a ferrite clamp upon exiting the chamber.

Radiated emissions tests above 1 GHz to FCC Part 15 were performed with floor absorbers in place in accordance with the test methods of ANSI C63.4 and CISPR 16-1-4.

The test distance and extrapolation factor (if applicable) are detailed under each run description.

Note, preliminary testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. Maximized testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Ambient Conditions:

Temperature: 29 °C
Rel. Humidity: 39 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	Radiated Emissions 30 - 1000 MHz, Preliminary	Class A	Eval	Refer to individual runs
2	Radiated Emissions 30 - 1000 MHz, Maximized	Class A	Pass	20.7 dBµV/m @ 182.61 MHz (-19.3 dB)
3a	Radiated Emissions 1 GHz - 6 GHz Maximized	EN 55022/32 Class A	Pass	34.1 dBµV/m @ 2787.7 MHz (-21.9 dB)
3b	Radiated Emissions 1 GHz - 6 GHz Maximized	FCC Class A	Pass	34.1 dBµV/m @ 2787.7 MHz (-25.9 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

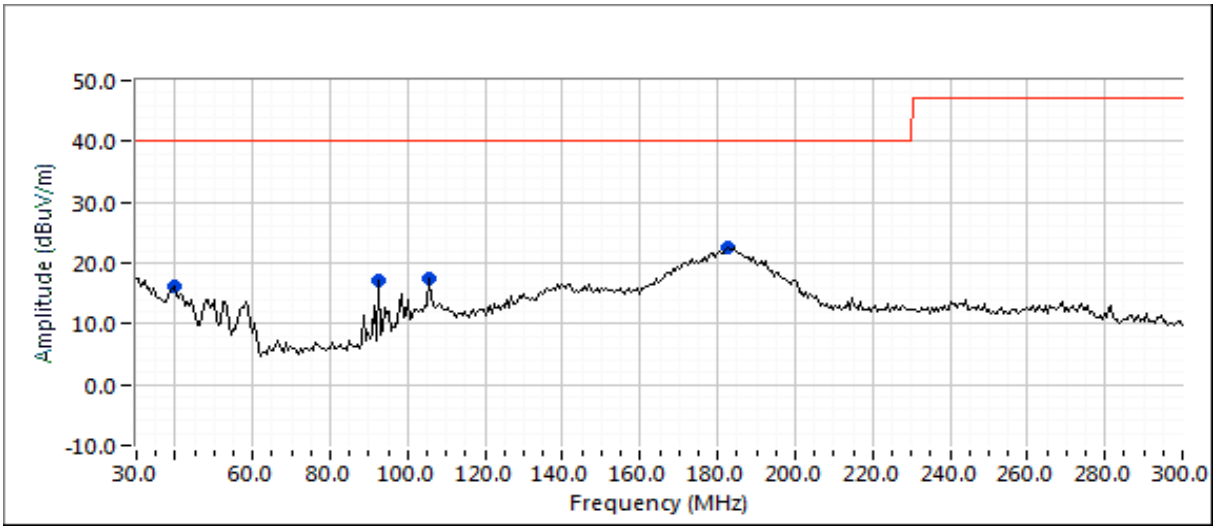
Deviations From The Standard

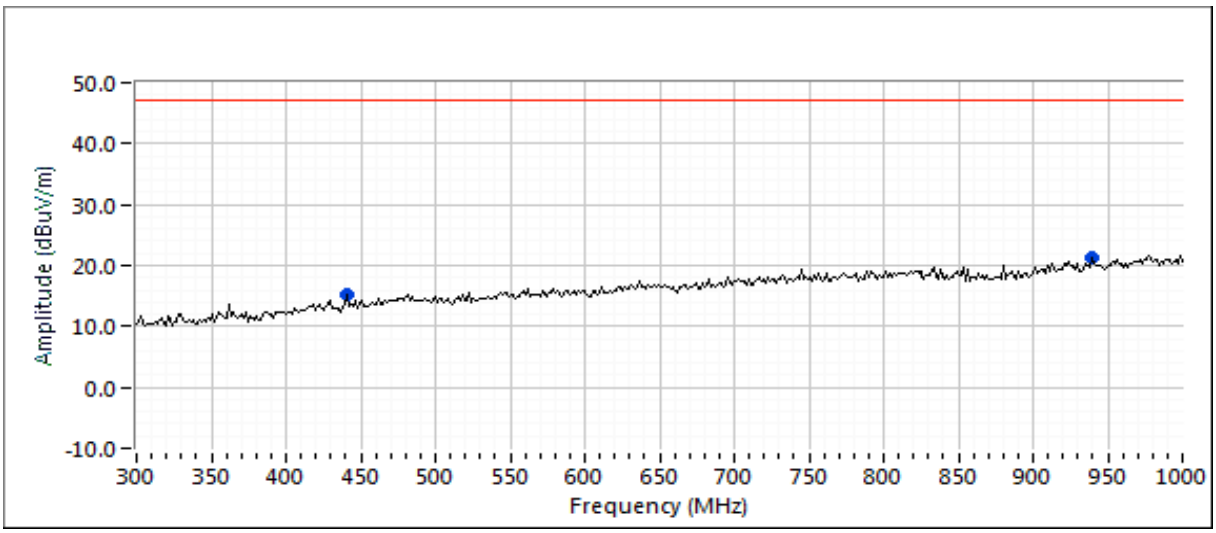
No deviations were made from the requirements of the standard.

Client:	Malema Engineering Corp	PR Number:	PR082478
Model:	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Standard:	FCC 15B, EN 61000-6-4	Class:	A

Run #1: Preliminary Radiated Emissions, 30 - 1000 MHz

Test Parameters for Preliminary Scan(s)			
Frequency Range (MHz)	Prescan Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 1000	5	10	-6.0





Client:	Malema Engineering Corp	PR Number:	PR082478
Model:	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Standard:	FCC 15B, EN 61000-6-4	Class:	A

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	EN 55022/32 Class A		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
39.550	16.2	V	40.0	-23.8	Peak	30	1.0	
92.316	17.1	V	40.0	-22.9	Peak	80	1.5	
105.716	17.3	H	40.0	-22.7	Peak	266	4.0	
182.606	22.4	H	40.0	-17.6	Peak	46	2.0	
440.963	15.1	H	47.0	-31.9	Peak	289	1.0	Signal within noise floor
941.023	21.4	V	47.0	-25.6	Peak	25	3.5	Signal within noise floor

Preliminary quasi-peak readings (no manipulation of EUT interface cables)

Frequency	Level	Pol	EN 55022/32 Class A		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
39.550	9.7	V	40.0	-30.3	QP	29	1.0	QP (1.00s)
92.316	12.4	V	40.0	-27.6	QP	80	2.0	QP (1.00s)
105.716	15.5	H	40.0	-24.5	QP	266	4.0	QP (1.00s)
182.606	20.7	H	40.0	-19.3	QP	85	2.2	QP (1.00s)
440.963	9.0	H	47.0	-38.0	QP	289	1.0	QP (1.00s)
941.023	16.9	V	47.0	-30.1	QP	3	4.0	QP (1.00s)

Run #2: Maximized Readings From Run #1

Test Parameters for Maximized Reading(s)			
Frequency Range (MHz)	Test Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 1000	5	10	-6.0

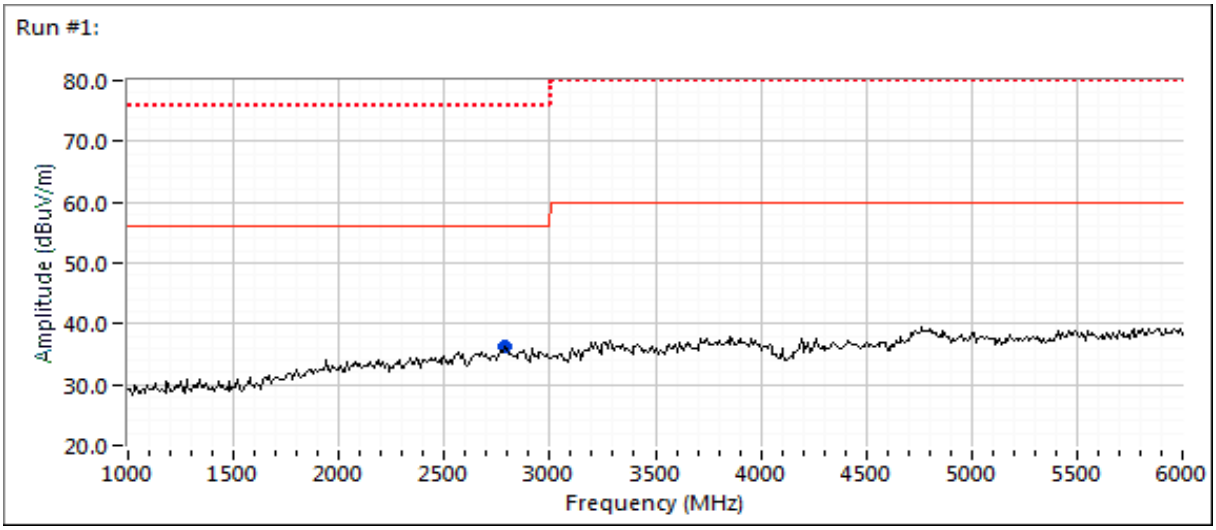
Maximized quasi-peak readings (includes manipulation of EUT interface cables)

Frequency	Level	Pol	EN 55022/32 Class A		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
182.606	20.7	H	40.0	-19.3	QP	85	2.2	QP (1.00s)
105.716	15.5	H	40.0	-24.5	QP	266	4.0	QP (1.00s)
92.316	12.4	V	40.0	-27.6	QP	80	2.0	QP (1.00s)
941.023	16.9	V	47.0	-30.1	QP	3	4.0	QP (1.00s)
39.550	9.7	V	40.0	-30.3	QP	29	1.0	QP (1.00s)
440.963	9.0	H	47.0	-38.0	QP	289	1.0	QP (1.00s)

Client:	Malema Engineering Corp	PR Number:	PR082478
Model:	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Standard:	FCC 15B, EN 61000-6-4	Class:	A

Run #3: Maximized Readings, 1000 - 6000 MHz
Single pre-scan covering both EN 55022/32 and FCC Part 15 requirements
Antenna height scan performed during pre-scan to satisfy FCC requirements

Test Parameters for Preliminary Scan(s)			
Frequency Range (MHz)	Prescan Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
1000 - 6000	3	3	0.0



Preliminary peak readings captured during pre-scan (peak readings vs. average limit)
EN 55022/32 limit used for pre-scan (i.e. worst case of EN 55022/32 and FCC)

Frequency	Level	Pol	EN 55022/32 Class A		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2785.270	36.4	V	56.0	-19.6	Peak	173	1.9	Signal within noise floor

Final peak and average readings (vs. EN 55022/32 limits)
All final readings collected at 3 meters test distance, unless otherwise noted

Frequency	Level	Pol	EN 55022/32 Class A		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2787.680	34.1	V	56.0	-21.9	AVG	206	1.9	RB 1 MHz;VB 10 Hz;Peak
2788.030	46.0	V	76.0	-30.0	PK	206	1.9	RB 1 MHz;VB 3 MHz;Peak

Client:	Malema Engineering Corp	PR Number:	PR082478
Model:	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Standard:	FCC 15B, EN 61000-6-4	Class:	A

MAXIMIZED final peak and average readings (vs. EN 55022/32 limits, including cable manipulation)

All final readings collected at 3 meters test distance, unless otherwise noted

Frequency	Level	Pol	EN 55022/32 Class A		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2787.680	34.1	V	56.0	-21.9	AVG	206	1.9	RB 1 MHz;VB 10 Hz;Peak
2788.030	46.0	V	76.0	-30.0	PK	206	1.9	RB 1 MHz;VB 3 MHz;Peak

Final peak and average readings (vs. FCC limits)

All final readings collected at 3 meters test distance, unless otherwise noted

**FCC Class A limit (when applicable) converted to 3m limit (by adding 10.5 dB to 10m limit)*

Frequency	Level	Pol	FCC Class A		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2787.680	34.1	V	60.0	-25.9	AVG	206	1.9	RB 1 MHz;VB 10 Hz;Peak
2788.030	46.0	V	80.0	-34.0	PK	206	1.9	RB 1 MHz;VB 3 MHz;Peak

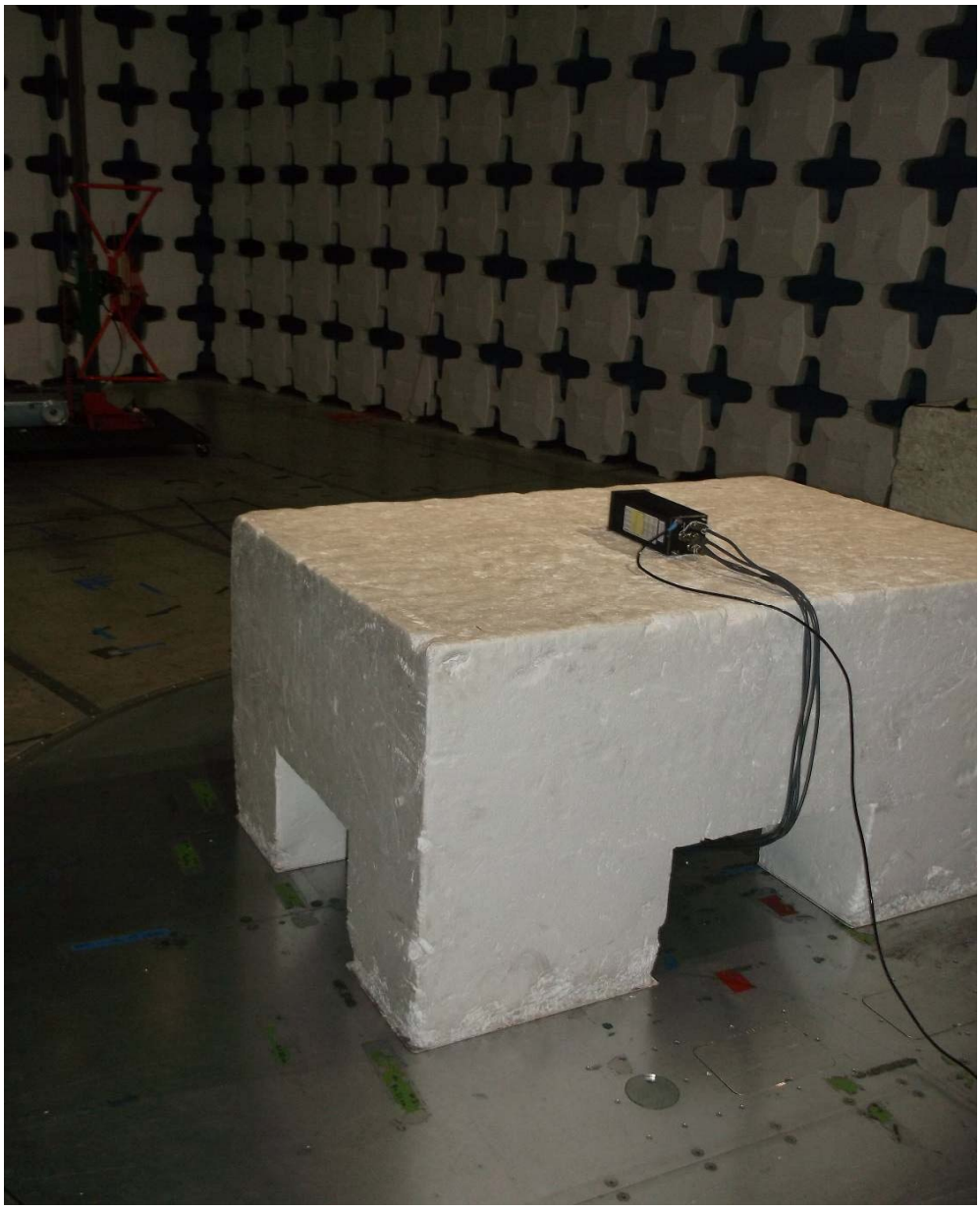
Note 1:	For FCC testing above 1 GHz, the limit is based on an average measurement. In addition, the peak reading of any emission above 1 GHz can not exceed the average limit by more than 20 dB.

Client:	Malema Engineering Corp	PR Number:	PR082478
Model:	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Standard:	FCC 15B, EN 61000-6-4	Class:	A

Test Configuration Photograph #1
(Radiated Emissions)

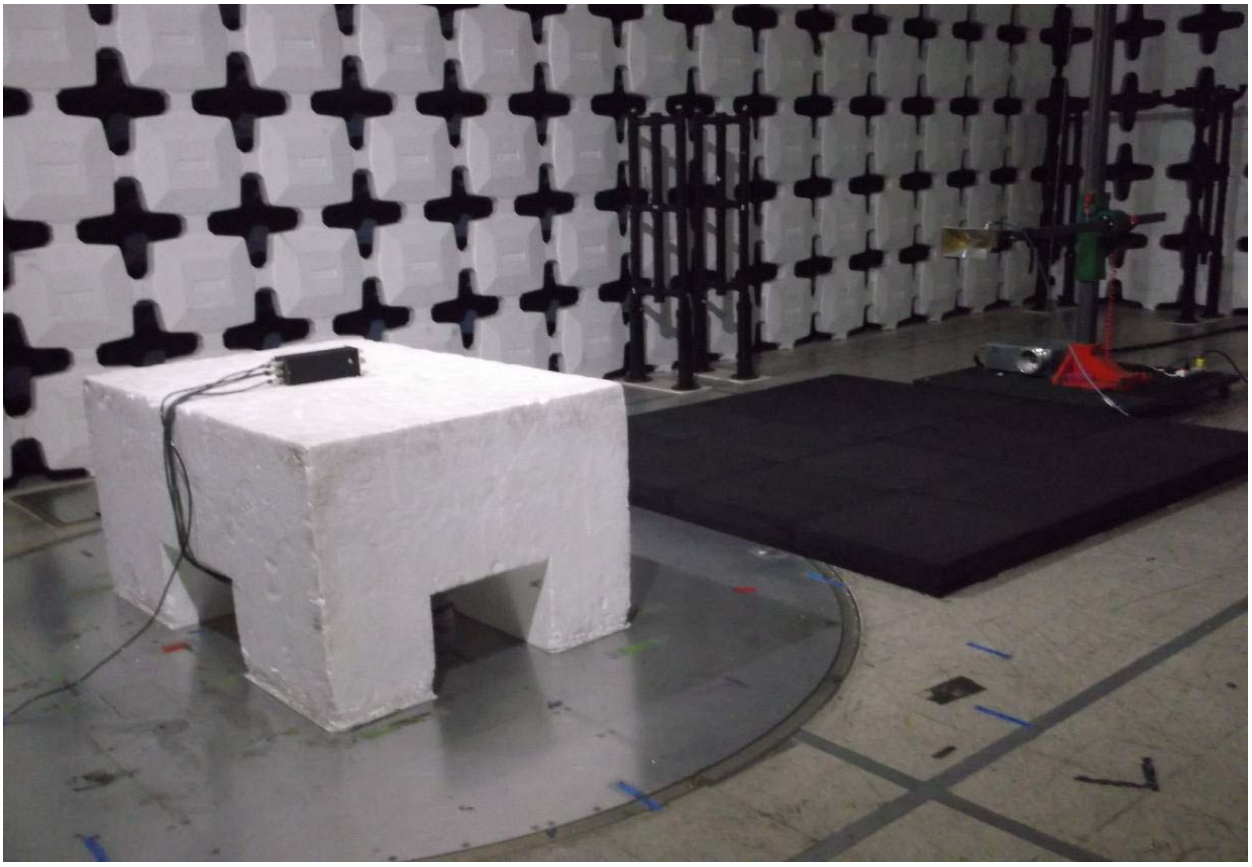
Client:	Malema Engineering Corp	PR Number:	PR082478
Model:	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Standard:	FCC 15B, EN 61000-6-4	Class:	A

Test Configuration Photograph #2
(Radiated Emissions)



Client:	Malema Engineering Corp	PR Number:	PR082478
Model:	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Standard:	FCC 15B, EN 61000-6-4	Class:	A

Test Configuration Photograph #3
(Radiated Emissions)



Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Electrostatic Discharge (EN 61000-4-2)

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 6/29/2018 8:08
Test Engineer: Chris Groat
Test Location: Fremont EMC Lab #3
Config. Used: 1
Config Change: N/A
EUT Voltage: 24Vdc

General Test Configuration

For tabletop equipment, the EUT and all local support equipment were located on a 0.5-mm thick insulating layer above a horizontal coupling plane, 80 cm above a ground reference plane.

Unless otherwise stated, ten discharges at each voltage, and polarity, were applied to each test point listed. Contact discharges (CD) were applied to coupling planes and conductive surfaces of the EUT. Air discharges (AD) were applied to any non-conductive surfaces of the EUT. The VCP was located on the tabletop for tabletop devices and 80cm above the ground plane for floor-standing equipment.

The determination as to the test point being a part of a conductive or non-conductive surface was based on the manufacturer's declaration.

Ambient Conditions:

Temperature: 23 °C
Relative Humidity: 42 %
Pressure: 1017 mb

Summary of Results - Electrostatic Discharges

Run #	Port	Test Level		Performance Criteria		Comments
		Required	Applied	Required	Met / Result	
1	Enclosure	4 kV CD 8 kV AD	4 kV CD 8 kV AD	B	A / Pass	Refer to Individual Run

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Run #1: Electrostatic Discharge

Indirect Discharges (To Coupling Planes)	Positive Polarity (kV)				Negative Polarity (kV)			
Contact Mode	Level 1 2	Level 2 4	Level 3 6	Level 4 8	Level 1 2	Level 2 4	Level 3 6	Level 4 8
Vertical Coupling Plane (VCP) located 10cm from the front, rear, left and right sides of the EUT	X	X			X	X		
Horizontal Coupling Plane (HCP) located 10cm from the front, rear, left and right sides of the EUT	X	X			X	X		

Direct Discharges (To the EUT)	Positive Polarity (kV)				Negative Polarity (kV)			
Contact Mode	Level 1 2	Level 2 4	Level 3 6	Level 4 8	Level 1 2	Level 2 4	Level 3 6	Level 4 8
Top Side(x6)	X	X			X	X		
Top Side Screws(x3)	X	X			X	X		
Left Side(x4)	X	X			X	X		
Right Side(x4)	X	X			X	X		
Left Side Screws(x6)	X	X			X	X		
Right Side Screws(x6)	X	X			X	X		
Back Side(x3)	X	X			X	X		
RP1	X	X			X	X		
RP2	X	X			X	X		
RP3	X	X			X	X		
P0 Main Power	X	X			X	X		
Front Side(x4)	X	X			X	X		
Bar(Front)	X	X			X	X		
Hinges Front(x2)	X	X			X	X		
Air Discharge Mode	Level 1 2	Level 2 4	Level 3 8	Level 4 15	Level 1 2	Level 2 4	Level 3 8	Level 4 15
Status LED	ND	ND	ND		ND	ND	ND	

Note:	The EUT continued to operate as intended. The valve moved in & out without interruption, both during & after the test. The front LED cycled from green to blue.
Note:	ND: No discharge was possible due to the lack of a discharge path to ground from the test point. HCP: Horizontal Coupling Plane. VCP: Vertical Coupling Plane

Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

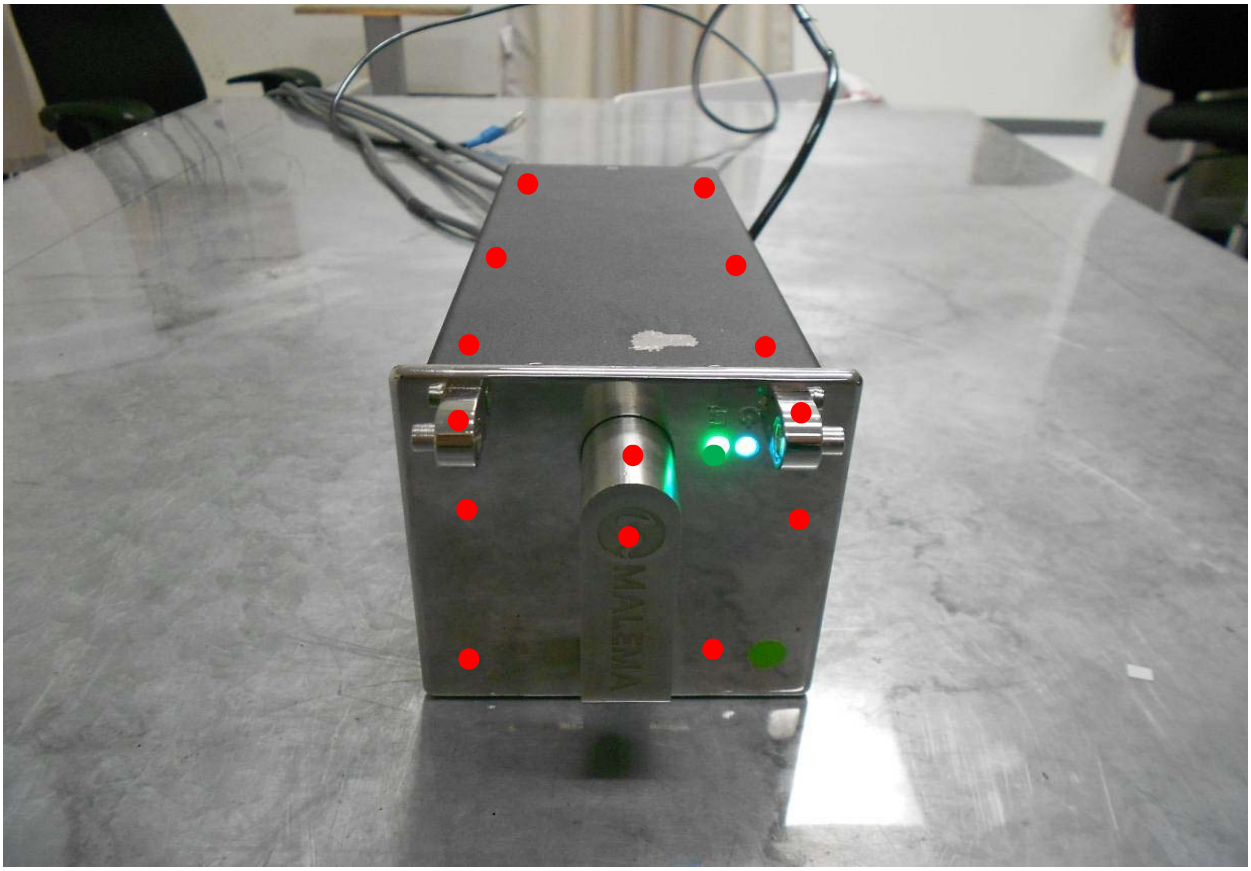
Test Configuration Photograph [General View of Test Setup]
(Electrostatic Discharge, EN 61000-4-2)

Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Test Configuration Photograph [General View of Test Setup - Alternate View]
(Electrostatic Discharge, EN 61000-4-2)

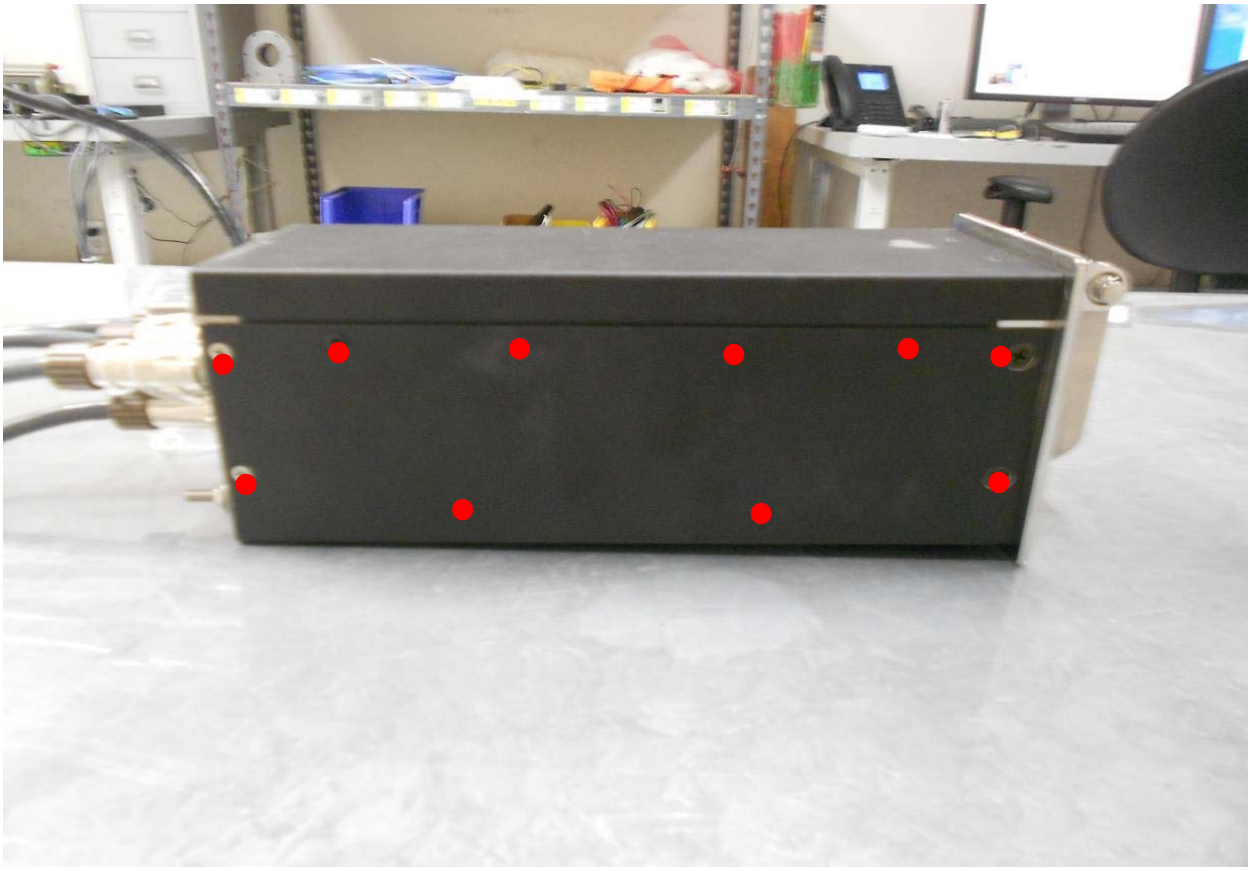
Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Detailed Photo(s) of ESD Test Locations



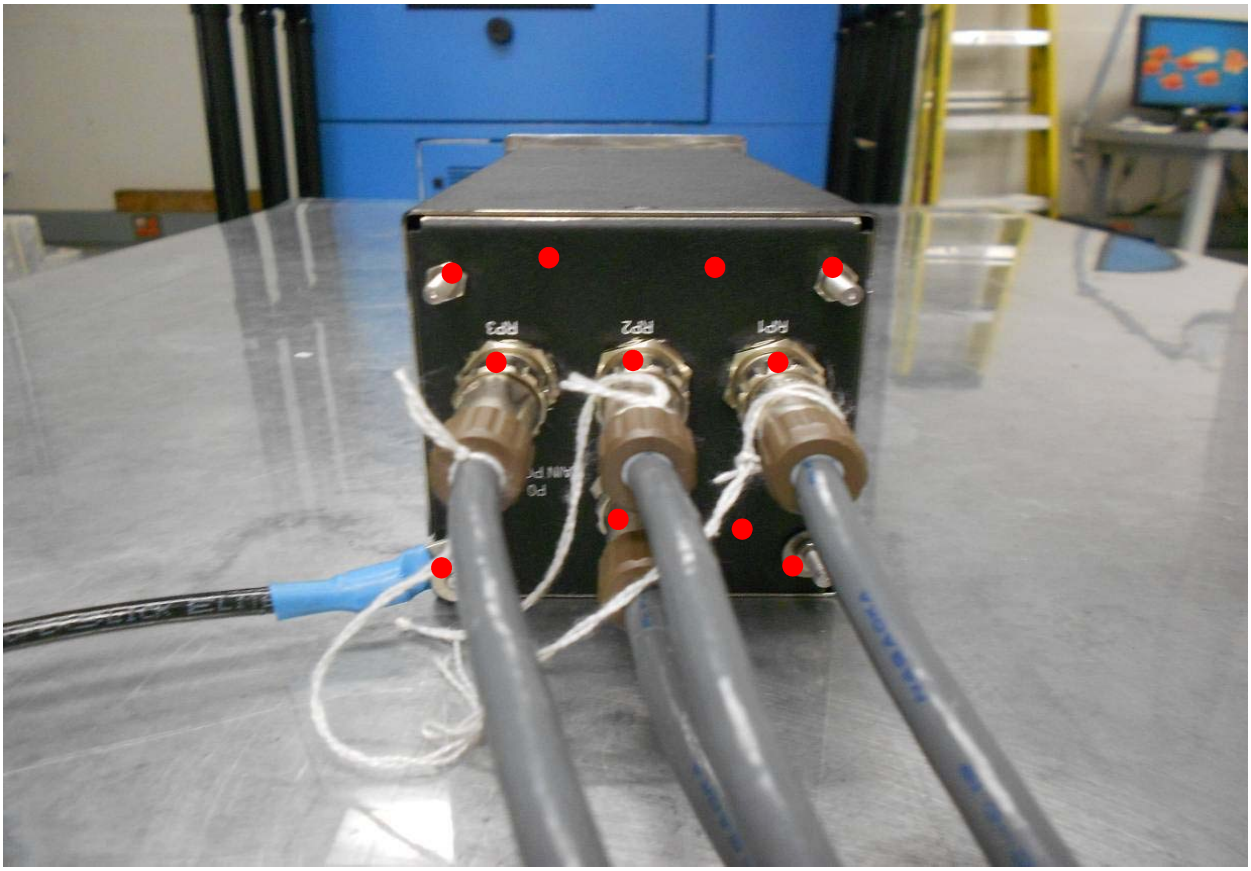
Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Detailed Photo(s) of ESD Test Locations



Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Detailed Photo(s) of ESD Test Locations



Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Detailed Photo(s) of ESD Test Locations

Legend

- Contact Discharge
- Air Discharge

Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Radiated Immunity (EN 61000-4-3)

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 6/28/2018 8:20
Test Engineer: BaoTri Nguyen
Test Location: Fremont Chamber #1
Config. Used: 1
Config Change: None
EUT Voltage: 24Vdc

General Test Configuration

The EUT and all local support equipment were located on a turntable in an anechoic chamber. All remote support equipment was located outside the chamber. Interface cabling to the remote support equipment was routed along the floor and, where possible, passed through ferrite clamps at the exit point from the chamber.

Unless otherwise noted, the "right side" of the EUT is considered the side on the right when standing behind the EUT and the "left side" of the EUT is considered the side on the left when standing behind the EUT.

Ambient Conditions:

Temperature: 20-25 °C
Rel. Humidity: 30-33 %

Summary of Results-Radiated Immunity

Run #	Port	Test Level		Performance Criteria		Comments
		Required	Applied	Required	Met / Result	
EN/IEC 61000-6-2:2005 requirements						
1	Enclosure	80-1000 MHz 1kHz 80% AM 10 V/m	80-1000 MHz 1kHz 80% AM 10 V/m	A	A / Pass	
		1.4-2.0 GHz 1kHz 80% AM 3 V/m	1.4-2.0 GHz 1kHz 80% AM 3 V/m	A	A / Pass	
		2.0-2.7 GHz 1kHz 80% AM 1 V/m	2.0-2.7 GHz 1kHz 80% AM 3 V/m	A	A / Pass	

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

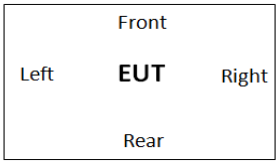
No deviations were made from the requirements of the standard.

Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Run #1: Radiated Immunity, 80-2700 MHz (EN61000-4-3)

Frequency:	80-1000 MHz	1-2.7 GHz	
Step Size:	1 %	1 %	
Dwell time:	2874 ms	2874 ms	
Field Uniformity:	1.5m x 1.5m	1.0m x 1.0m	
Test Distance:	2.5m	2m	

Modulation Details	
Modulating Frequency:	1 kHz
Modulation:	AM
Depth / Deviation:	80%



Frequency	Level	Front		Left Side		Rear		Right		Top		Bottom	
Range (MHz)	V/m	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.
80-1000	10	X	X	X	X	X	X	X	X	N/A	N/A	N/A	N/A
1000-2000	3	X	X	X	X	X	X	X	X	N/A	N/A	N/A	N/A
2000-2700	3	X	X	X	X	X	X	X	X	N/A	N/A	N/A	N/A

Note:	The EUT continued to operate as intended. The valve moved in & out without interruption, both during & after the test. The front LED cycled from green to blue.

The following calibration files from U:\EMC Stuff\Radiated Immunity Playback Files\CH1\Current\CH1 80-1000MHz (Jan 2018)\ were used:

1.55m high, 2.5m to the tip of antenna 80 MHz - 1000 MHz H 10Vm.crf

1.55m high, 2.5m to the tip of antenna 80 MHz - 1000 MHz V 10Vm.crf

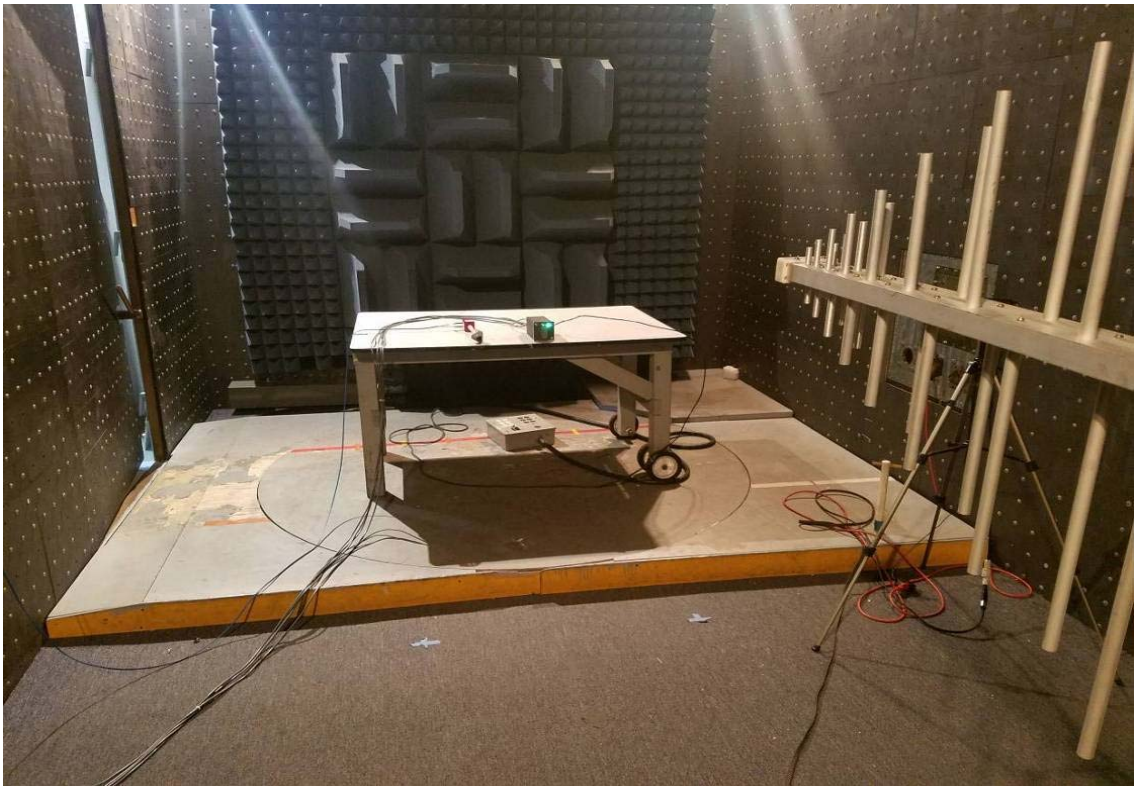
The following calibration files from U:\EMC Stuff\Radiated Immunity Playback Files\CH1\Current\CH1 1.0-4.2 GHz (Sept 2016)\ were used:

2.0m from UFA, 1.4m high 1000 MHz - 4200 MHz H 3Vm.crf

2.0m from UFA, 1.4m high 1000 MHz - 4200 MHz V 3Vm.crf

Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Test Configuration Photograph #1
(Radiated Immunity, EN 61000-4-3)



Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Test Configuration Photograph #2
(Radiated Immunity, EN 61000-4-3)

Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Electrical Fast Transient/Burst (EFT/B) (EN 61000-4-4)

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 6/26/2018 8:01 Config. Used: 1
Test Engineer: John Caizzi Config Change: none
Test Location: Fremont EMC Lab #5 EUT Voltage: 24 VDC

General Test Configuration (EN 61000-4-4)

*The EUT and all cables to the EUT were located on an insulating support 10 cm above a ground reference plane
*The distance between any coupling devices and the EUT was 0.5 m (-0m /+0.1m) for tabletop equipment testing

Ambient Conditions:

Temperature: 26 °C
Rel. Humidity: 26 %

Summary of Results

Run #	Port	Test Level		Performance Criteria		Comments
		Required	Applied	Required	Met / Result	
1	DC Power	± 2 kV	± 2 kV	B	A / Pass	
1	Signal	± 1 kV	± 2 kV	B	A / Pass	

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Run #1: EFT/B Testing (Test Method: EN 61000-4-4)

Test Parameters	
Waveform: 5 ns / 50 ns	Burst Period: 300 ms
Repetition Frequency: 5 kHz	Burst Width: 15 ms

Applied Location	Positive Polarity (kV)				Negative Polarity (kV)			
Power Line DC Power Port	Level 1	Level 2	Level 3	Level 4	Level 1	Level 2	Level 3	Level 4
	0.5	1.0	2.0	4.0	0.5	1.0	2.0	4.0
DC Send + DC Return *(2-Wire DC Power Port)*			X				X	

I/O Port	Level 1	Level 2	Level 3	Level 4	Level 1	Level 2	Level 3	Level 4
	0.25	0.5	1.0	2.0	0.25	0.5	1.0	2.0
RP1				X				X
RP2				X				X
RP3				X				X
P0				X				X

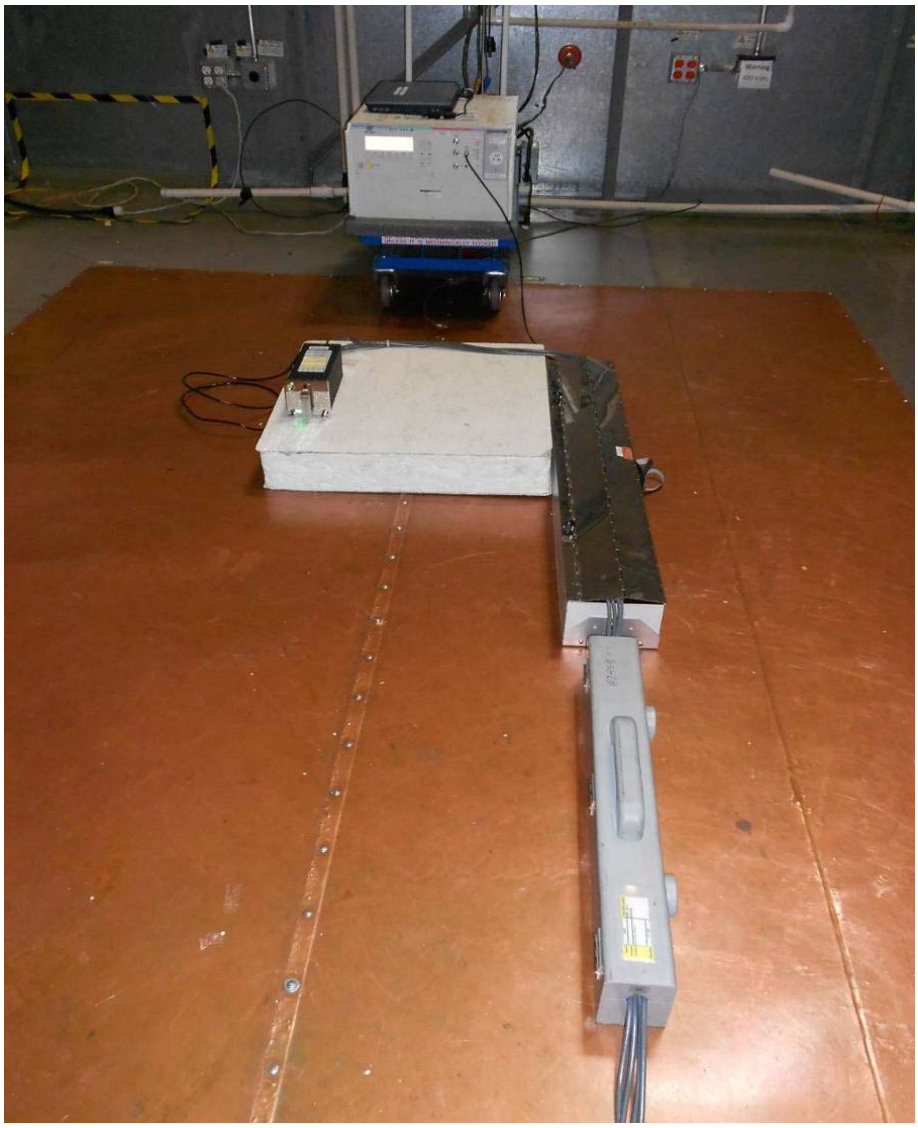
Note 1	An "X" indicates that the EUT continued to operate as intended. The valve moved in & out without interruption, both during & after the test. The front LED cycled from green to blue.
Note 2	The interface cables for the I/O ports tested were routed through the capacitive trench and tested simultaneously.
Note 3	The DC power cable also carries signal lines, & these cannot be separated. Therefore, DC power was tested in the capacitive trench along with the signal cables, at the level called out in the standard. The signal lines were tested above the level called out in the standard.

The following interface ports were not tested:

Port(s)	Reason
Ground	The ports are intended to connect to cables less than 3m in length and the product standard only requires the test to be performed on cables exceeding 3m in length.

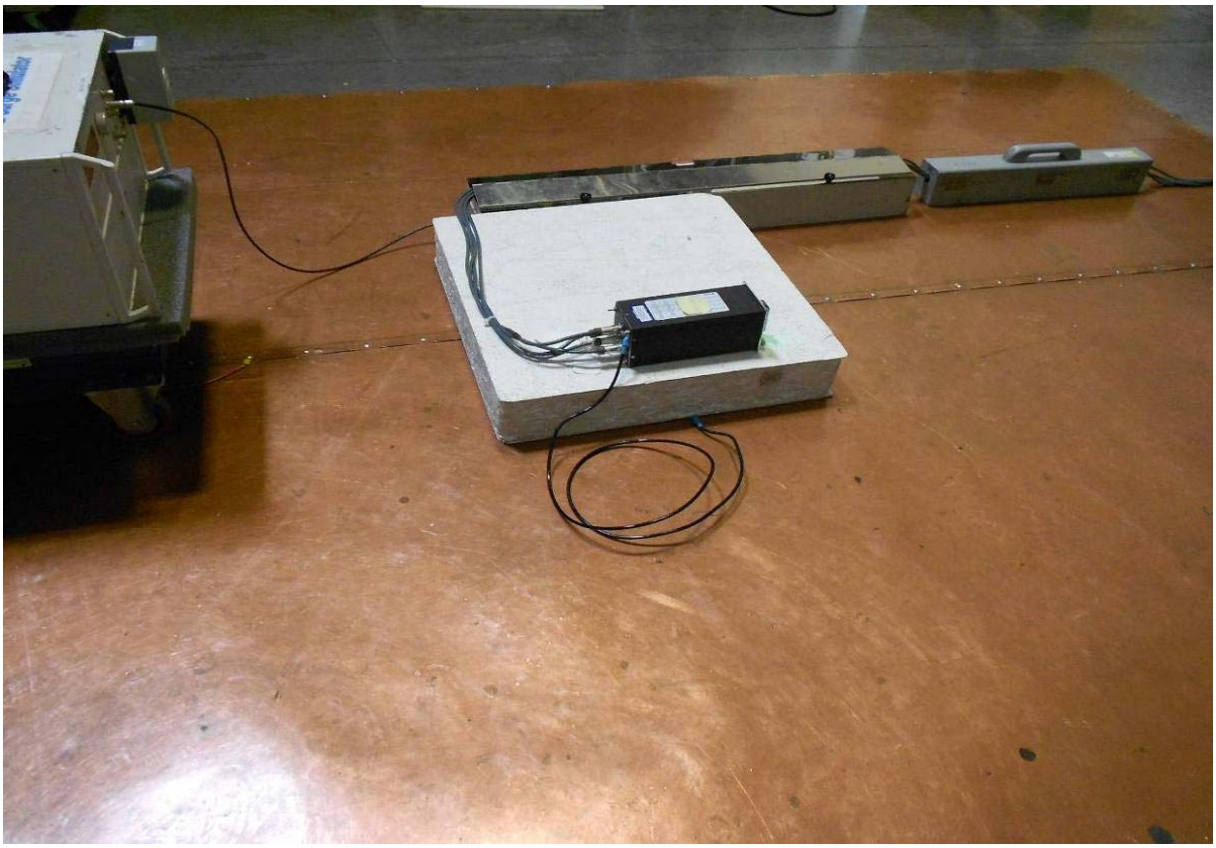
Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Test Configuration Photograph #1



Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Test Configuration Photograph #2



Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Test Configuration Photograph #3

Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Conducted Immunity (EN 61000-4-6)

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 6/26/2018 8:01 Config. Used: 1
Test Engineer: John Caizzi Config Change: none
Test Location: Fremont EMC Lab #5 EUT Voltage: 24 VDC

General Test Configuration

The EUT was placed on an insulating support 10 cm above a ground reference plane. All interface cables between parts of the EUT (for equipment comprising several units) and to local support equipment were also placed on the insulating support. All interface cabling between the EUT and the coupling and decoupling networks were located 3 to 5 cm above the ground reference plane. All coupling and decoupling networks were located between 10 to 30 cm from the geometric projection of the EUT on to the ground reference plane.

Ambient Conditions:

Temperature: 26 °C
Rel. Humidity: 26 %

Summary of Results - Conducted Immunity

Run #	Port	Test Level		Performance Criteria		Comments
		Required	Applied	Required	Met / Result	
1	DC Power	0.15-80MHz 1kHz 80% AM 10 Vrms	0.15-80MHz 1kHz 80% AM 10 Vrms	A	A / Pass	
	Signal				A / Pass	

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

The following deviation were made from the requirements of the standard: 10V, instead of 3V, was used in the ITU bands.

Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Run #1: Conducted Susceptibility (EN 61000-4-6)

Test Level:	10 Vrms
Step Size:	1 %
Dwell time:	2874 ms

Modulation Details	
Modulating Frequency:	1 kHz
Modulation:	AM
Depth / Deviation:	80%

Frequency Range MHz	Port Under Test	Injection Method	Comments
0.15 - 80	P0	Direct	Note 1
	RP2		Note 1

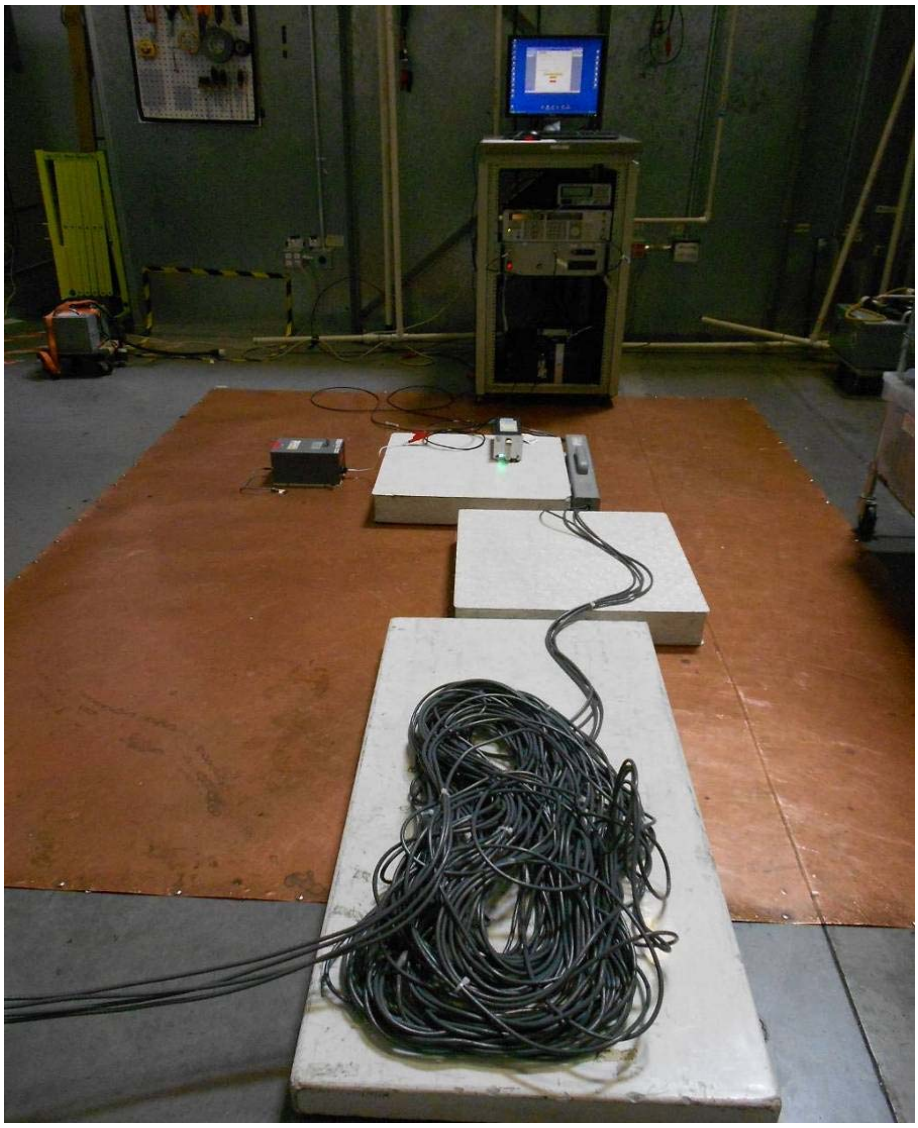
Note 1	The EUT continued to operate as intended. The valve moved in & out without interruption, both during & after the test. The front LED cycled from green to blue.
Note 2:	The shielded DC power cable, P0, also carries signal lines, & these cannot be separated. Therefore, DC power and signal were tested at the same time, using the direct injection method.

The following interface ports were not tested:

Port(s)	Reason
Ground	The ports are intended to connect to cables less than 3m in length and the product standard only requires the test to be performed on cables exceeding 3m in length.
RP1, RP3	Identical to RP1.

Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Test Configuration Photograph #1



Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Test Configuration Photograph #2

Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Test Configuration Photograph #3

Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Power Frequency Magnetic Field (EN 61000-4-8)

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 6/26/2018 8:01 Config. Used: 1
Test Engineer: John Caizzi Config Change: none
Test Location: Fremont EMC Lab #5 EUT Voltage: 24 VDC

General Test Configuration

The EUT and all local support equipment were located above a conductive ground plane. The EUT was positioned inside the 1m field-generating loop during the test.

Ambient Conditions

Temperature: 26 °C
Rel. Humidity: 26 %

I-THD(%): 2.2 % 50 Hz
1.9 % 60 Hz

Note: *I-THD must be less than or equal too 8%*

Summary of Results

Run #	Port	Test Level		Performance Criteria		Comments
		Required	Applied	Required	Met / Result	
1	Enclosure	30 A/m 50Hz	30 A/m 50Hz	A	A / Pass	
2		30 A/m 60Hz	30 A/m 60Hz		A / Pass	

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Run #1: Power Frequency Magnetic Field Immunity (EN61000-4-8)

Power Frequency of Applied Field: 50 Hz
EUT Voltage During Test: 120V

Frequency (Hz)	Level	EUT Orientation		
	A/m	"X" Axis	"Y" Axis	"Z" Axis
50 (relay closed	30.0	P	P	P
50 (relay open)	30.0	P	P	P
50 (normal)	30.0	P	P	P

Run #2: Power Frequency Magnetic Field Immunity (EN61000-4-8)

Power Frequency of Applied Field: 60 Hz
EUT Voltage During Test: 120V

Frequency (Hz)	Level	EUT Orientation		
	A/m	"X" Axis	"Y" Axis	"Z" Axis
60 (relay closed	30.0	P	P	P
60 (relay open)	30.0	P	P	P
60 (normal)	30.0	P	P	P

Note 1	The EUT contains a reed relay, activated by DC current. At startup, a door covering the valve should be closed. If it is, the relay is closed, both LEDs are green, & normal startup proceeds. If the door is open, the relay is open, one LED turns red, & normal startup does not occur. To determine the effect of the magnetic field, it was necessary to look at 3 cases: 1) when the relay is closed, does the field cause it to open? 2) when the relay is open, does the field cause it to close? 3) when the EUT is operating normally, does the field cause any abnormal behavior? That is why there are 3 entries in each table.
Note 2	"P" indicates that the EUT continued to operate as intended. The closed or open state of the reed relay did not change, and the valve moved in & out without interruption, both during & after the test.

Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

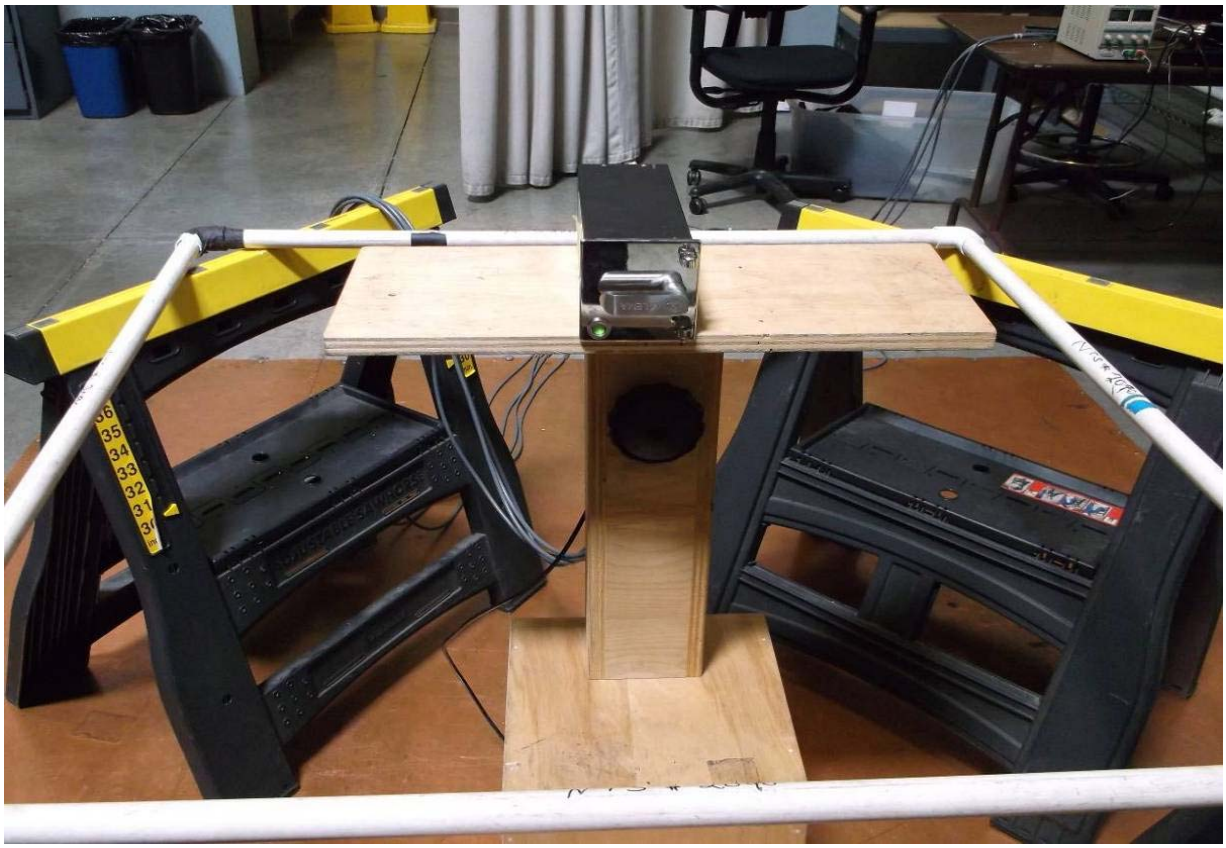
Test Configuration Photograph #1

Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Test Configuration Photograph #2

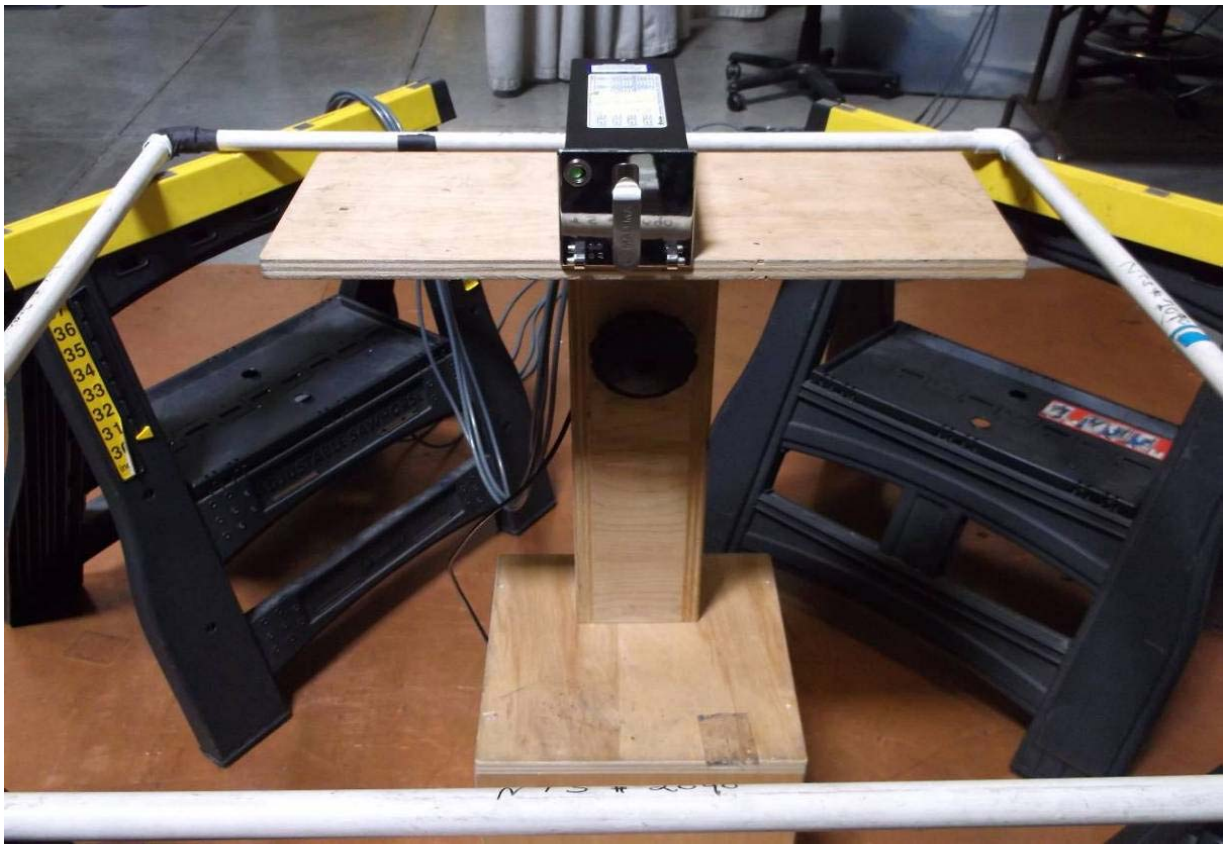
Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Test Configuration Photograph #3, X-axis



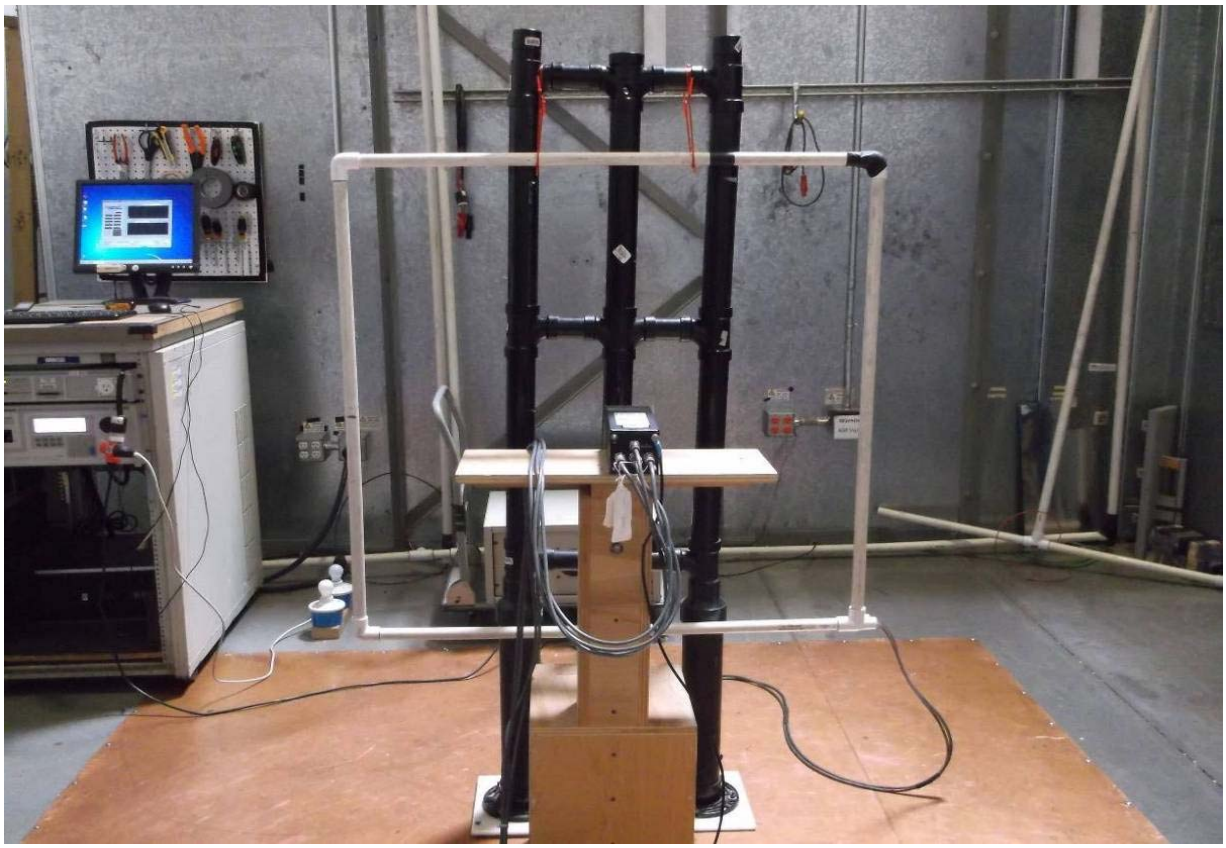
Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Test Configuration Photograph #4, Z-axis



Client:	Malema Engineering Corp	PR Number:	PR082478
Product	Fluid Flow Valve	T-Log Number:	TL082478
		Project Manager:	Deepa Shetty
Contact:	Claus Knudsen	Project Engineer:	Len Goldschmidt
Immunity Standard(s):	EN 61000-6-2	Environment:	ITE

Test Configuration Photograph #5, Y-axis



Appendix C Basic and Reference Standards

EN 55011 / CISPR 11

EN 55011:2009/A1:2010 and CISPR 11:2009/A1:2010 make reference to various CISPR 16-x-x standards for measurement apparatus and test methods. The specific standards used are detailed below, as referenced by EN 55011:2009/A1:2010 and CISPR 11:2009/A1:2010.

International and EN equivalent standard	Description	Standard Used
CISPR 16-1-1:2006 / A1:2006 /A2:2007 EN 55016-1-1:2007/ A1:2007 /A2:2008	Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus	CISPR 16-1-1:2006 / A1:2006 /A2:2007 EN 55016-1-1:2007/ A1:2007 /A2:2008
CISPR 16-1-2:2003 /A1:2004 / A2:2007 EN 55016-1-2:2004 /A1:2005 /A2:2006	Specification for radio disturbance and immunity measuring apparatus and methods Part 1-2: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Conducted disturbances	CISPR 16-1-2:2003 /A1:2004 / A2:2007 EN 55016-1-2:2004 /A1:2005 /A2:2006
CISPR 16-1-4:2007 /A1:2007 /A2:2008 EN 55016-1-4:2007 /A1:2008 /A2:2009	Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-4: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Radiated disturbances	CISPR 16-1-4:2007 /A1:2007 /A2:2008 EN 55016-1-4:2007 /A1:2008 /A2:2009
CISPR 16-2-3:2006 EN 55016-2-3: 2006	Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements	CISPR 16-2-3:2006 EN 55016-2-3: 2006
CISPR 16-4-2:2003 EN 55016-4-2 2004	Specification for radio disturbance and immunity measuring apparatus and methods Part 4-2: Uncertainties, statistics and limit modelling - Uncertainty in EMC measurements	CISPR 16-4-2 2003 EN 55016-4-2 2004
Unless the international publication has been modified by common modifications, indicated by ***(mod)***, either the intentional or the EN standard may be used. Where the EN standard differs from the intentional standard then the EN version is used. For all of the standards listed above there are no common modifications therefore National Technical Systems makes use of the international version of all standards listed.		

IEC / EN 61000-6-4

The IEC generic standard references the IEC versions of the basic standards listed below, while the EN version references the European (EN) versions of the basic standards. When the referenced standard is cited by version (date or revision) then that version is used except where noted. In instances where the standards are referenced without citing the version to be used, the current versions (or its international equivalent) are used.

International and EN equivalent standard	Description	Standard Used
IEC 60050-161	International Electrotechnical Vocabulary – Chapter 161: Electromagnetic Compatibility	IEC 60050-161
IEC 61000-4-20:2010	Electromagnetic compatibility (EMC) – Part 4-20: Testing and measurement techniques – Emissions and immunity testing in transverse electromagnetic (TEM) waveguide	IEC 61000-4-20:2010
CISPR 14-1:2005 + A1:2008	Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission	CISPR 14-1:2005 + A1:2008
CISPR 16-1-1:2010	Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus	CISPR 16-1-1:2010
CISPR 16-1-4:2007 + A1:2007	Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Radiated disturbances	CISPR 16-1-4:2007 + A1:2007
CISPR 11 EN 55011	Information Technology Equipment – Radio disturbance characteristics - Limits and methods of measurement	CISPR 11:2009/A1:2010 EN55011:2009/A1:2010
CISPR 16-1-2 2003 EN 55016-1-2 2004	Specification for radio disturbance and immunity measuring apparatus and methods Part 1-2: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Conducted disturbances	CISPR 16-1-2 2003 + A1 2004 EN 55016-1-2 2004 + A1 2005
CISPR 16-2-1 2008 EN 55016-2-1 2004	Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements	CISPR 16-2-1 2008 EN 55016-2-1 2004
CISPR 16-2-3:2006 EN 55016-2-3: 2006	Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements	CISPR 16-2-3:2006 EN 55016-2-3: 2006
CISPR 16-4-2"2003 EN 55016-4-2 2004	Specification for radio disturbance and immunity measuring apparatus and methods Part 4-2: Uncertainties, statistics and limit modelling - Uncertainty in EMC measurements	CISPR 16-4-2 2003 EN 55016-4-2 2004
CISPR 22:2008 EN 55022:2006	Information Technology Equipment – Radio disturbance characteristics - Limits and methods of measurement	CISPR 22:2008 EN 55022:2006
Unless the international publication has been modified by common modifications, indicated by ***(mod)***, either the intentional or the EN standard may be used. Where the EN standard differs from the intentional standard then the EN version is used. For all of the standards listed above there are no common modifications therefore National Technical Systems makes use of the international version of all standards listed.		

IEC / EN 61000-6-2

The 2005 IEC standard references the IEC versions of the basic standards listed below without dates. The 2005 EN version references the European (EN) standards. When the referenced standard is cited by version (date or revision) then that version is used except where noted. In instances where the standards are referenced without citing the version to be used, the current versions (or its international equivalent) are used.

International and EN equivalent standard	Description	Standard Used
IEC 61000-4-2 EN 61000-4-2:1995	Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques -" Section 2: Electrostatic discharge immunity test	IEC 61000-4-2:2008 EN 61000-4-2:2009
IEC 61000-4-3 EN 61000-4-3:2002	Section 3: Radiated, radio-frequency, electromagnetic field immunity test	IEC 61000-4-3:2006 A1:2007 + A2:2010 EN 61000-4-3:2006 A1:2008 + A2:2010
IEC 61000-4-4 EN 61000-4-4:2004	Section 4: Electrical fast transient/burst immunity test	IEC 61000-4-4:2012 EN 61000-4-4:2012
IEC 61000-4-5 EN 61000-4-5:1995	Section 5: Surge immunity test	IEC 61000-4-5:2005 EN 61000-4-5:2006
IEC 61000-4-6 EN 61000-4-6	Section 6: Immunity to conducted disturbances, induced by radio-frequency fields	IEC 61000-4-6:2008 EN 61000-4-6:2009
IEC 61000-4-8 EN 61000-4-8:1993	Section 8: Power frequency magnetic field immunity test	IEC 61000-4-8:2009 EN 61000-4-8:2010
IEC 61000-4-11 EN 61000-4-11:2004	Section 11: Voltage dips, short interruptions and voltage variations immunity tests	IEC 61000-4-11:2004 EN 61000-4-11:2004
Although all of the references to the standards are dated references, all of the basic EN 61000-4-x standards referenced by EN 61000-6-1 have been superseded by more recent versions. As the date of withdrawal has passed for the older versions of standards, the international IEC versions of these basic standards as detailed in the third column are used.		

End of Report

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