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SPECIFICATION FOR DIELECTRIC WITHSTANDING VOLTAGE (DWV) FOR CABLE ASSEMBLIES

APPROVAL*	DATE MO/DAY/YR
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1 [-] PURPOSE AND SCOPE

The purpose of this standard is to provide guidance when it is appropriate to reduce the dielectric withstanding voltage (DWV) for Class 3 cable assemblies tested per IPC/WHMA-A-620A.

The dielectric withstanding voltage (DWV) test is a high voltage test, either AC or DC, used to validate that the components can operate safely at their rated voltage and withstand momentary spikes in voltage due to switching, surges or other causes. It assures that insulating materials and spacing in the component parts are adequate. When a component part is faulty in theses respects, application of the test voltage will result in either disruptive discharge (arc-over) or deterioration (dielectric breakdown). This is most effectively done using modern equipment which applies high voltage, low current to unveil defects in cable construction or processing.

It is inappropriate to apply 1500 VDC or equivalent peak AC voltage to all cable assemblies. Creepage distance within connectors must be considered when performing DWV to ensure false positives are avoided and connectors are not over tested based on de-ratings established at the time of connector qualification. The 1500 VDC or equivalent peak AC voltage can cause disruptive discharge (arc-over) if the spacing between contacts or creepage distance is small enough.

Creepage is often difficult to determine. Creepage is defined as the path across the surface of a dielectric between two contacts or a contact and a metal part. Creepage is not the distance though the insulation. The intent of this document is to provide a reference table wherein cable builders can appropriately reduce the DWV when appropriate. This standard establishes the "Other Defined Value" referenced in IPC/WHMA-A-620A Table 19-4 for connectors commonly used by L3.

2 [-] APPLICABLE DOCUMENTS

The following documents, of the issue in effect on date of use, form a part of this document to the extent specified in IPC/WHMA-A620A and Table 1.

2.1 [-] Order of Precedence

In the event of conflict between the documents referenced herein and the contractual requirements, the requirements of the contract shall be considered superseding requirements. If the conflict is between a contractually binding document and a document referenced herein, the contractually cited document shall govern. In the case of conflict between documents referenced herein and the contents of this standard, the contents of this standard shall be considered a superseding requirement.

3 [-] VOLTAGE REQUIREMENTS

3.1 [-] General

The DWV for L3 cables are derived from Connector Detail Specifications, Connector Manufactures, IPC/WHMA-A620A or L3 Engineering which have basis in Paschen's Law. The intent is to locate defects in the cable construction or components used. It is not intended to qualify connectors or other components used in the cable assembly.

3.2 [-] Interface Cables

All interface cables shall be functional and capable of withstanding repeated test voltages.

3.3 [-] Voltage Tolerances

When min/max voltage values are not provided, the tolerance for the specified voltage shall be ±5%.

3.4 [-] Test Net Voltage

Connector or conductor type will be used to determine the test net voltage. A net is defined as two or more connections that are electrically connected. Unused connections are also defined as a net.

3.5 [-] Multifunction Cables

Voltage values for cables with varying types of connectors shall be tested at the appropriate voltage for the connector(s) of the net under test. The connector with the lowest DWV shall establish the voltage value for that specific net.

3.6 [-] Test Potential

The test potential shall be applied between the following:

1) Each conductor and all other conductors in the cable or harness assembly
2) Each conductor and connector shell
3) Each conductor and shield
4) Shields that are not electrically common
5) Shields and connector shell/ground, except when shields are connected to ground

3.7 [-] Test Sequence

The test sequence is as follows:

1) Continuity test (low voltage DC)
2) Shorts (low voltage DC)
3) Dielectric Withstanding Voltage (high AC or high DC voltage)
4) Insulation Resistance (high DC voltage)

3.8 [-] Maximum Dielectric Withstanding Voltage (DWV)

In cases where the Connector Detail Specification or Connector Manufacture DWV exceeds IPC/WHMA-A620A, IPC/WHMA-A620A shall govern. In the event the cable under test has active or other components, L3 engineering shall be contacted prior to testing.

3.9 [-] Voltage Ramp Rates

When using manually operated equipment, voltage ramp rates shall be 100 to 500 volts per second.

3.10 [A] Voltage Dwell Time

Once the required test voltage is reached, the minimum dwell time shall be 1.0 second per net or 10 milliseconds minimum when using a Cirris CH2. The maximum dwell time shall be 10.0 seconds per net.

3.11 [-] Maximum Leakage

The maximum leakage current shall not exceed 1mA for any given net per IPC/WHMA-A620A 19.5.3 unless otherwise specified on the drawing.

3.12 [-] Test Environment

All tests shall be conducted between 0-6000 feet MSL, between 15°-30°C, non-condensing with a maximum relative humidity of 78%.

3.13 [-] Test Data

Pass/Fail test results shall be retained with the cable builder and made available upon request. Actual test values may be recorded when practical.

Table 1 [A]: Dielectric Withstanding Test Voltages

Specification or Part Number	Type or Series	Class or Service Rating	VAC	VDC	Notes
MIL-DTL-38999	All	All	1000	1500	MIL-DTL-38999
MS27466	I	All	1000	1500	MIL-DTL-38999
MS27467	I	All	1000	1500	MIL-DTL-38999
MS27468	I	All	1000	1500	MIL-DTL-38999
MS27469	I	All	1000	1500	MIL-DTL-38999
MS27470	I	All	1000	1500	MIL-DTL-38999
MS27471	I	All	1000	1500	MIL-DTL-38999
MS27496	I	All	1000	1500	MIL-DTL-38999
MS27505	I	All	1000	1500	MIL-DTL-38999
MS27515	I	All	1000	1500	MIL-DTL-38999
MS27652	I	All	1000	1500	MIL-DTL-38999
MS27653	I	All	1000	1500	MIL-DTL-38999
MS27654	I	All	1000	1500	MIL-DTL-38999
MS27655	I	All	1000	1500	MIL-DTL-38999

Specification or Part Number	Type or Series	Class or Service Rating	VAC	VDC	Notes
MS27656	I	All	1000	1500	MIL-DTL-38999
MS27661	I	All	1000	1500	MIL-DTL-38999
MS27662	II	All	1000	1500	MIL-DTL-38999
MS27472	II	All	1000	1500	MIL-DTL-38999
MS27473	II	All	1000	1500	MIL-DTL-38999
MS27474	II	All	1000	1500	MIL-DTL-38999
MS27475	II	All	1000	1500	MIL-DTL-38999
MS27476	II	All	1000	1500	MIL-DTL-38999
MS27477	II	All	1000	1500	MIL-DTL-38999
MS27478	II	All	1000	1500	MIL-DTL-38999
MS27479	II	All	1000	1500	MIL-DTL-38999
MS27480	II	All	1000	1500	MIL-DTL-38999
MS27481	II	All	1000	1500	MIL-DTL-38999
MS27484	II	All	1000	1500	MIL-DTL-38999
MS27497	II	All	1000	1500	MIL-DTL-38999
MS27499	II	All	1000	1500	MIL-DTL-38999
MS27500	II	All	1000	1500	MIL-DTL-38999
MS27504	II	All	1000	1500	MIL-DTL-38999
MS27513	II	All	1000	1500	MIL-DTL-38999
MIL-DTL-26482/ALL	I	All	1000	1500	MIL-DTL-26482
MS3110	I	All	1000	1500	MIL-DTL-26482
MS3111	I	All	1000	1500	MIL-DTL-26482
MS3112	I	All	1000	1500	MIL-DTL-26482
MS3113	I	All	1000	1500	MIL-DTL-26482
MS3114	I	All	1000	1500	MIL-DTL-26482
MS3116	I	All	1000	1500	MIL-DTL-26482
MS3119	I	All	1000	1500	MIL-DTL-26482
MS3120	I	All	1000	1500	MIL-DTL-26482
MS3121	I	All	1000	1500	MIL-DTL-26482
MS3122	I	All	1000	1500	MIL-DTL-26482

Specification or Part Number	Type or Series	Class or Service Rating	VAC	VDC	Notes
MS3124	I	All	1000	1500	MIL-DTL-26482
MS3126	I	All	1000	1500	MIL-DTL-26482
MS3127	I	All	1000	1500	MIL-DTL-26482
MS3128	I	All	1000	1500	MIL-DTL-26482
MS3440	II	All	1000	1500	MIL-DTL-26482
MS3442	II	All	1000	1500	MIL-DTL-26482
MS3443	II	All	1000	1500	MIL-DTL-26482
MS3449	II	All	1000	1500	MIL-DTL-26482
MS3470	II	All	1000	1500	MIL-DTL-26482
MS3471	II	All	1000	1500	MIL-DTL-26482
MS3472	II	All	1000	1500	MIL-DTL-26482
MS3473	II	All	1000	1500	MIL-DTL-26482
MS3474	II	All	1000	1500	MIL-DTL-26482
MS3475	II	All	1000	1500	MIL-DTL-26482
MS3476	II	All	1000	1500	MIL-DTL-26482
MS3477	II	All	1000	1500	MIL-DTL-26482
MS3479	II	All	1000	1500	MIL-DTL-26482
MIL-DTL-5015/ALL			1000	1500	MIL-DTL-5015
MS3100			1000	1500	MIL-DTL-5015
MS3101			1000	1500	MIL-DTL-5015
MS3102			1000	1500	MIL-DTL-5015
MS3103			1000	1500	MIL-DTL-5015
MS3106			1000	1500	MIL-DTL-5015
MS3107			1000	1500	MIL-DTL-5015
MS3108			1000	1500	MIL-DTL-5015
MS3116			1000	1500	MIL-DTL-5015
MS3142			1000	1500	MIL-DTL-5015
MS3400			1000	1500	MIL-DTL-5015
MS3401			1000	1500	MIL-DTL-5015
MS3402			1000	1500	MIL-DTL-5015

Specification or Part Number	Type or Series	Class or Service Rating	VAC	VDC	Notes
MS3406			1000	1500	MIL-DTL-5015
MS3404			1000	1500	MIL-DTL-5015
MS3408			1000	1500	MIL-DTL-5015
MS3409			1000	1500	MIL-DTL-5015
MS3412			1000	1500	MIL-DTL-5015
MS3436			1000	1500	MIL-DTL-5015
MS3441			1000	1500	MIL-DTL-5015
MS3450			1000	1500	MIL-DTL-5015
MS3451			1000	1500	MIL-DTL-5015
MS3452			1000	1500	MIL-DTL-5015
MS3454			1000	1500	MIL-DTL-5015
MS3456			1000	1500	MIL-DTL-5015
MS3459			1000	1500	MIL-DTL-5015
MS3507			1000	1500	MIL-DTL-5015
MS25183			1000	1500	MIL-DTL-5015
MIL-DTL-28840/ALL			1000	1500	MIL-DTL-28840
MIL-DTL-24308	I & II	G,D,M,N	1000	1500	MIL-DTL-24308
MIL-DTL-24308	III	G	500	750	MIL-DTL-24308
85040 (Combo-D)			1000	1500	MIL-DTL-24308
85041 (Combo-D)			1000	1500	MIL-DTL-24308
85043 (Combo-D)			1000	1500	MIL-DTL-24308
85044 (Combo-D)			1000	1500	MIL-DTL-24308
85045 (Combo-D)			1000	1500	MIL-DTL-24308
85047 (Combo-D)			1000	1500	MIL-DTL-24308
85047 (Combo-D)			1000	1500	MIL-DTL-24308
85048 (Combo-D)			1000	1500	MIL-DTL-24308
85054 (Combo-D)			1000	1500	MIL-DTL-24308
89074 (Combo-D)			1000	1500	MIL-DTL-24308
89075 (Combo-D)			1000	1500	MIL-DTL-24308
89076 (Combo-D)			1000	1500	MIL-DTL-24308

Specification or Part Number	Type or Series	Class or Service Rating	VAC	VDC	Notes
89077 (Combo-D)			1000	1500	MIL-DTL-24308
89078 (Combo-D)			1000	1500	MIL-DTL-24308
89079 (Combo-D)			1000	1500	MIL-DTL-24308
89080 (Combo-D)			1000	1500	MIL-DTL-24308
89081 (Combo-D)			1000	1500	MIL-DTL-24308
89082 (Combo-D)			1000	1500	MIL-DTL-24308
89083 (Combo-D)			1000	1500	MIL-DTL-24308
MIL-DTL-55116/ALL			500	750	MIL-DTL-55116
MIL-DTL-83513/ALL	All	All	600	900	MIL-DTL-83513
MIL-DTL-32139/ALL			250	375	MIL-DTL-32139
MIL-DTL-83733			1000	1500	MIL-DTL-83733
MIL-DTL-83723/ALL			1000	1500	MIL-DTL-83723
SAE-AS81659	All	All	1000	1500	SAE-AS81659
40006966-ALL			1000	1500	D-Sub
40007625-ALL	801 (#23)		500	750	Mighty Mouse
40011139-ALL	801 (#23)		500	750	Mighty Mouse
45001065-ALL	801 (#23)		500	750	Mighty Mouse
45001066-ALL	801 (#23)		500	750	Mighty Mouse
40006612-ALL	805 (#23)		500	750	Mighty Mouse
40010936-ALL	805 (#23)		500	750	Mighty Mouse
40009908-ALL	805 (#23)		500	750	Mighty Mouse
40010350-ALL	805 (#23)		500	750	Mighty Mouse
40010630-ALL	805 (#23)		500	750	Mighty Mouse
40011382-ALL	805 (#23)		500	750	Mighty Mouse
40011619-ALL	805 (#23)		500	750	Mighty Mouse
40011631-ALL	805 (#23)		500	750	Mighty Mouse
40006352-ALL	807 (#23)		500	750	Mighty Mouse
40006357-ALL	807 (#23)		500	750	Mighty Mouse
40006359-ALL	807 (#23)		500	750	Mighty Mouse

Specification or Part Number	Type or Series	Class or Service Rating	VAC	VDC	Notes
40006360-ALL	807 (#23)		500	750	Mighty Mouse
40006364-ALL	807 (#23)		500	750	Mighty Mouse
40010554-ALL	807 (#23)		500	750	Mighty Mouse
40011599-ALL	807 (#23)		500	750	Mighty Mouse
40011554-000:-005	805 (#16)		1000	1500	Mighty Mouse
40011554-006:-017	805 (#23)		500	750	Mighty Mouse
40011554-018:-023	805 (#12)		1000	1500	Mighty Mouse
40011554-024:-035	805 (#23)		500	750	Mighty Mouse
40011554-036:-041	805 (#16)		1000	1500	Mighty Mouse
40011554-042:-053	805 (#23)		500	750	Mighty Mouse
40011554-054:-059	805 (#12)		1000	1500	Mighty Mouse
40011554-060:-078	805 (#23)		500	750	Mighty Mouse
40011619-000:-005	805 (#16)		1000	1500	Mighty Mouse
40011619-006:-017	805 (#23)		500	750	Mighty Mouse
40011619-018:-023	805 (#12)		1000	1500	Mighty Mouse
40011619-024:-035	805 (#23)		500	750	Mighty Mouse
40011619-036:-041	805 (#16)		1000	1500	Mighty Mouse
40011619-042:-045	805 (#23)		500	750	Mighty Mouse
40011619-046	805 (#16)		1000	1500	Mighty Mouse
40011619-047:-053	805 (#23)		500	750	Mighty Mouse
40011619-054:-059	805 (#12)		1000	1500	Mighty Mouse
40011619-060:-078	805 (#23)		500	750	Mighty Mouse
40011631-000:-005	805 (#16)		1000	1500	Mighty Mouse
40011631-006:017	805 (#23)		500	750	Mighty Mouse
40011631-018:-023	805 (#12)		1000	1500	Mighty Mouse
40011631-024:-035	805 (#23)		500	750	Mighty Mouse
40011631-036:-041	805 (#16)		1000	1500	Mighty Mouse
40011631-042:-047	805 (#23)		500	750	Mighty Mouse
40011631-048	805 (#16)		1000	1500	Mighty Mouse
40011631-049:-053	805 (#23)		500	750	Mighty Mouse

Specification or Part Number	Type or Series	Class or Service Rating	VAC	VDC	Notes
40011631-054:-059	805 (#12)		1000	1500	Mighty Mouse
40011631-060:-077	805 (#23)		500	750	Mighty Mouse
40006768-ALL			1000	1500	EIA-364-20
40011928-ALL			200	300	Tyco Ribbon Cable
40006980-000			1000	1500	MATE-N-LOK
40007720-ALL			550	875	Tyco HSDP Connectors
40010456-ALL			500	750	MOUSER
40011631-036:-041	805 (#16)		1000	1500	Mighty Mouse
40011631-042:-047	805 (#23)		500	750	Mighty Mouse
40011631-048	805 (#16)		1000	1500	Mighty Mouse
40011631-049:-053	805 (#23)		500	750	Mighty Mouse
40011631-054:-059	805 (#12)		1000	1500	Mighty Mouse
40011631-060:-077	805 (#23)		500	750	Mighty Mouse
40006768-ALL			1000	1500	EIA-364-20
40011928-ALL			200	300	Tyco Ribbon Cable
40006980-000			1000	1500	MATE-N-LOK
40007720-ALL			550	875	Tyco HSDP Connectors
40010456-ALL			500	750	MOUSER
40008467-000			500	750	SMK P.C. Jack, Stereo/Audio
7186382-ALL			1000	1500	RJ-11
7183832-ALL			700	1000	RJ-45 JACK
40008197-ALL			1000	1500	RJ-45 PLUG
7183591-ALL			500	750	Nanominiature DUALOBE
7183508-ALL			200	300	Filtered Micro D MIL-C-83513
7187121-ALL			1000	1500	MOLEX
40009087-000			500	750	Abrams Electronics (Thor)
40009408-000:-005			500	750	Abrams Electronics (Thor)
7182648-ALL			1000	1500	MOLEX
40011928-ALL			200	300	AMPLATCH System 50

Specification or Part Number	Type or Series	Class or Service Rating	VAC	VDC	Notes

4 [-] QUALITY ASSURANCE PROVISIONS

4.1 [-] Revision Control

This document is under control of L3 CSW and will be maintained current and accurate. Control revisions to this document and subsequent redistribution shall be per Policy Y-001 and Procedure P-001.

4.2 [-] Equipment Calibration and Functionally

All test equipment covered by this standard shall be calibrated at the time of use. All test harnesses covered by this standard shall be functional at the time of use. It is the responsibility of the person initiating measurements or tests to ensure that this requirement is met. If functionally is not evident, equipment cannot be used for measurement, test, and/or acceptance of product. Equipment in question should be removed from the area and taken to the calibration laboratory. Calibration personnel must be notified if equipment cannot be removed from the area.

4.3 [-] Voltage Values

Unless otherwise specified, such as in the drawing notes, all connections shall be tested to the voltage values listed in Table 1.

Omitted Connectors

If the connector called out on the parts list is not found on Table 1 but it belongs to a connector family found on Table 1, the test voltage for that connector family shall be used. If the connector called out on the parts list is not found on Table 1 nor belongs to a connector family, the test voltage may be obtained from one of three sources listed below. A connector family is defined as a connector or group of connectors which have the same contact size and pitch (creepage) outlined in a Detail or Manufacture Specification.

1. Detail Specification

   Example: MIL-DTL-38999, MIL-DTL-24308, SAE-AS81659, etc.

2. Manufacture Specification

Contact connector manufacture.

3. L3 Engineering

   Contact L3 buyer with test voltage request.

4.4 [-] Personnel Responsibilities

4.4.1 [-] Engineering Personnel

It shall be the responsibility of engineering to ensure test equipment is properly programmed to test all nets outlined on the cable drawing and this document.

4.4.2 [-] Test Personnel

Test personnel shall be responsible for performing the test as programmed.

4.4.3 [-] Quality Personnel

Quality personnel may survey any test at any point during the testing of L3 CSW products.

5 [A] REVISION HISTORY

The revision levels and the corresponding changes affecting this document are as follows:

Rev.	Date	Change Author	Description
[00]	11/10/2011	Kenneth Bockholt	Initial Release
[A]	5/01/2019	Kenneth Bockholt	Added 10 millisecond minimum when using Cirris CH2 in section 3.10. Lowered DWV for RJ-45 Jacks. Deleted MIL-DTL-XXXXX place holders. Updated Title page.
[B]	6/2/2021	David Riley	Updated logo and proprietary statements