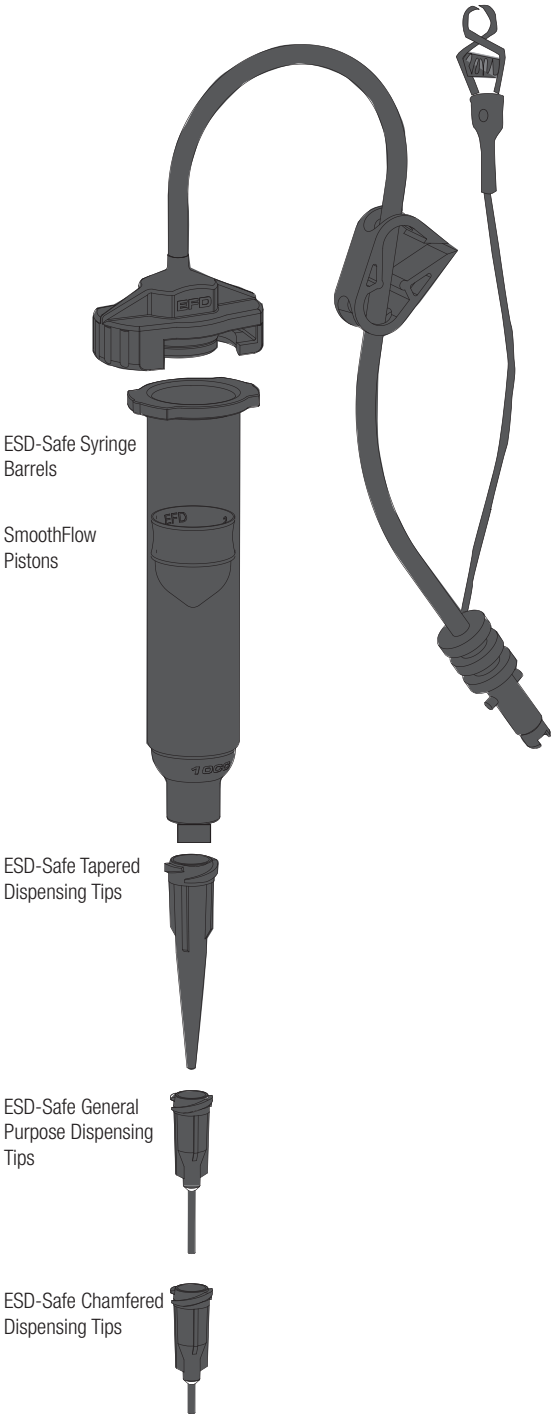
ESD Static Dissipative Dispensing Components

Test Report



All EFD dispensing components are produced silicone-free.

Introduction

This test report provides both the methods for measuring and the results obtained during tests performed on EFD static dissipative dispensing components. The objective of the tests was to prove compliance with industry standards for static dissipative components.

EFD static dissipative dispensing components utilize a proprietary additive specially formulated for electro conductive applications as the means for static dissipation.

Results Summary

Static Decay

All parts, when tested individually or as part of the final assembly, had static decay times of less than 0.08 seconds and met the requirements of the specifications.

Surface Resistance

The samples had measurements which were consistent within each group. All samples met the requirements of a static dissipative material with measurements less than the 1×10^{11} ohms upper limit of the specifications.

End-to-End Resistance

All specimens met the resistance requirements and should be acceptable for use in static safe applications. The average tip to ground clip resistance of the 3cc and 55cc assemblies of 1.25×10^{7} ohms and 3.96×10^{8} ohms respectively are in the dissipative range.

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Static Decay Test Report

Test Equipment

An ETS Model 506A/514 Humidity Control Chamber or ETS Series 5000 Controller and 5500 Chamber was used to provide the controlled environment to condition and test the samples at the specified relative humidity. The systems are capable of controlling the humidity to within 0.5%-1.0% of the desired level with an accuracy of ±2% R.H. and is calibrated to standards traceable to N.I.S.T.

An ETS Model 406C or ETS Model 4406 Static Decay Meter was used to perform static decay measurements. A System Test Module (STM) was used to verify the calibration of the Static Decay Meter.

Test Methods

Prior to testing, the samples were preconditioned for a period of 48 to 72 hours at a relative humidity of 12% and a temperature of 71° F and tested under these conditions.

The static decay test is based on the test method described in Federal Test Method (FTM) Standard 101C, Method 4046 “Electrostatic Properties of Materials.” This test method requires that a 3 x 5" test specimen be placed between a pair of electrodes electrically connected together and be conductively charged to both plus and minus 5kV. After the sample has accepted the applied charge, the charging voltage is removed, the electrodes are grounded and the time for the charge to bleed down to a specified cutoff level measured.

Calibration Check

Prior to the static decay evaluation a performance system check is made using the System Test Module (STM). The STM is placed in the Faraday Test Cage in lieu of a test specimen. It produces a known decay time when plus and minus 5kV is applied.

This test checks both the accuracy of the decay time measurement and the balance in decay times between positive and negative charging voltage polarities.

Test Results

The samples were charged to ±5kV, and the time to dissipate 99% of the charge (1% cutoff level) when grounded was measured. The static decay times ranged from 0.01 to 0.08 seconds. No initial charges were recorded, and the full 5kV was accepted.

Component	Initial charge volts	Accepted charge volts	Cutoff level	Decay at +5kV seconds			Decay at -5kV seconds		
Adapter head	0	5000	1%	0.01	0.01	0.01	0.01	0.01	0.01
Adapter tubing	0	5000	1%	0.07	0.05	0.07	0.07	0.08	0.07
Adapter quick-connect	0	5000	1%	0.01	0.01	0.01	0.02	0.02	0.01
Syringe barrel (3cc)	0	5000	1%	0.01	0.01	0.01	0.01	0.01	0.01
Syringe barrel (55cc)	0	5000	1%	0.01	0.01	0.01	0.01	0.01	0.01
Tapered tip (18 ga/20 ga/25 ga)	0	5000	1%	0.01	0.01	0.01	0.01	0.01	0.01
Tapered tip (27 ga)	0	5000	1%	0.01	0.01	0.01	0.01	0.01	0.01
General purpose tip (30 ga)	0	5000	1%	0.01	0.01	0.01	0.01	0.01	0.01
Chamfered tip (33 ga)	0	5000	1%	0.01	0.01	0.01	0.01	0.01	0.01

Conclusions

According to packaging material specifications such as Mil-PRF-81705E and other methods which reference MILSTD-3010C, Method 4046 (formerly FTM 101C, Method 4046), a material that has been preconditioned at 12% R.H. for a minimum of 48 hours should have a static decay time of less than 2.0 seconds when measured to a 1% (50 volt) cutoff level to be considered acceptable for use in Static Safe applications.

All parts, when tested individually or as a part of the final assembly, had static decay times of less than 0.08 seconds and met the requirements of the specifications.

Surface Resistance Test Report

Test Equipment

Surface resistance and surface resistivity measurements of the material were performed using an ETS Model 871 Wide Range Resistance Meter in conjunction with an ETS Model 824 Surface/Volume Resistivity Probe.

Test Methods

Surface resistance per ESD STM 11.12 is used to evaluate static dissipative material. This resistance is equal to the actual resistance measured with the Model 804 Probe. A test voltage of 10 volts is specified for resistances between 10^4 and 10^6 ohms. A test voltage of 100 volts is required for resistances between 10^6 and 10^{11} ohms. Surface resistance is express in ohms. Resistance measurements below or above these values may require different test voltages. Conductive materials (those materials with surface resistances below 10^4 ohms) are measured using either a current source (cs) or voltages equal to less than 10 volts.

Test Results

The surface resistance measurements were as follows:

Component	Minimum ohms	Maximum ohms
Adapter head	2.80×10^6	4.60×10^6
Adapter tubing	7.40×10^{10}	7.80×10^{10}
Syringe barrel (3cc)	1.04×10^6	2.72×10^7
Syringe barrel (55cc)	5.91×10^4	3.66×10^6
Tapered tip (18 ga/20 ga/25 ga)	8.00×10^3	1.10×10^4
Tapered tip (27 ga)	2.92×10^3	4.45×10^4

Conclusions

According to industry packaging material specifications such as ESD S.541 (formerly EIA-541) and Test Method ESD STM 11.11, material having a surface resistance measurement of less than 1 x 10^4 ohms is considered conductive, between 1 x 10^4 and 1 x 10^{11} ohms is considered dissipative and readings greater than 1 x 10^{11} ohms would classify the material as insulative.

All samples met the requirements of a static dissipative material with measurements less than the 1 x 10^{11} ohms upper limit of the specifications.

Surface Resistance

Conductive	<1 x 10^4 ohms
Dissipative	1 x 10^4 to 1 x 10^{11} ohms
Insulative	>1 x 10^{11} ohms

End-to-End Resistance Test Report

Test Equipment

Resistance measurements were performed using an ETS Model 871 Wide Range Resistance Meter in conjunction with an ETS Model 832 Clamping Resistance Electrode.

Test Methods

The test consists of connecting the tip of the assembly to the isolated 20pF plate of the Charge Plate Monitor, charging the plate to a voltage in excess of the desired measurement dissipation range such as 1000V to 10V or 5000 to 50V, then grounding the ground clip and measuring the time for the charge on the isolated plate to bleed down to the cutoff point.

Test Results

Assemblies were measured from the tip to the grounding clip.

Component	Minimum ohms	Maximum ohms	Average ohms
Syringe barrel (3cc)	1.04 x 10^6	2.72 x 10^7	1.25 x 10^7
Syringe barrel (55cc)	1.51 x 10^4	1.64 x 10^6	3.96 x 10^6

Testing was performed using a test voltage of 100V.

Conclusions

All specimens met the resistance requirements and should be acceptable for use in static safe applications. The average tip to ground clip resistance of the 3cc and 55cc assemblies of 1.25 x 10^7 ohms and 3.96 x 10^8 ohms respectively are in the dissipative range.

Tested Components

Part #	Description
7016095	ESD-safe adapter assembly, 3cc
7362856	ESD-safe syringe barrel, 3cc
7362864	ESD-safe syringe barrel, 55cc
7018150	ESD-safe tapered tip, 18 ga
7018211	ESD-safe tapered tip, 20 ga
7018373	ESD-safe tapered tip, 25 ga
7363483	ESD-safe tapered tip, 27 ga
7018448	ESD-safe general purpose tip, 30 ga
7018477	ESD-safe chamfered tip, 33 ga

Nordson EFD

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