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TEST REPORT

# Testing of static electric discharge characteristics of material used in the MBX Bristle Blaster according to EN 13463-1:2009, Annex D


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Classification

Confidential (F)

Title

**Testing of static electric discharge characteristics of material used in the MBX Bristle Blaster according to EN 13463-1:2009, Annex D.**

Extract

The polyamid/fibreglass material used in the MBX Bristle Blaster has been tested at GexCon's test laboratory. The objective of the tests was to study the static electric charging and discharging characteristics of the material, in terms of its intended use in potentially explosive atmospheres, according to the European standard EN 13463-1:2009, Annex D.

## Project Info

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| | | | | | |

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# 1 Background

As part of an Ignition Hazard Analysis the electrostatic properties of the polyamid/fibreglass material used in the MBX Bristle has been tested in accordance with the European standard EN 13463-1:2009 Annex D [1].

This test report describes the results from the laboratory tests that have been performed.

# 2 Test Samples

The material was tested on the tool itself. Figure 1 shows pictures of the tool and the test equipment used for the tests.

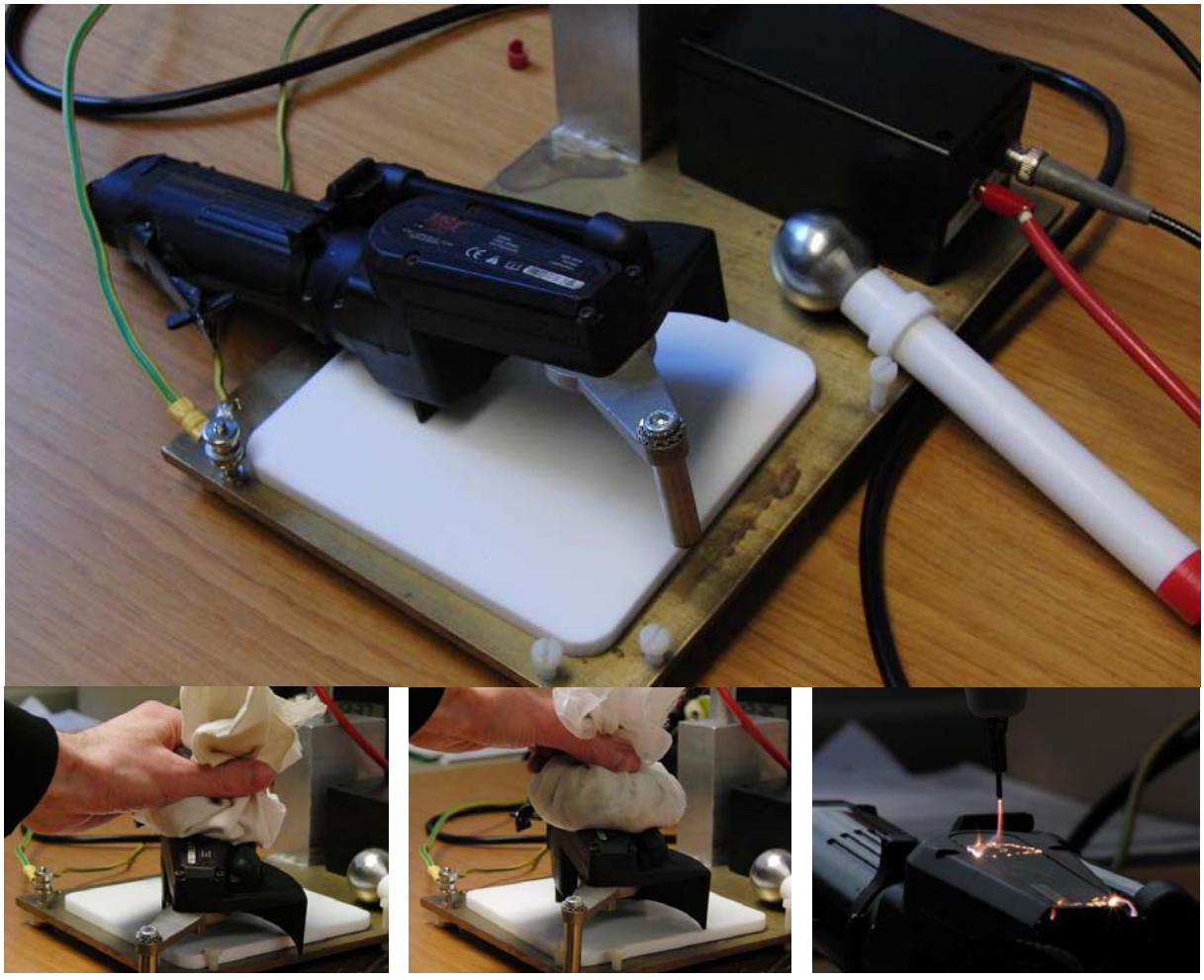

***Figure 1*** ***Photographs of the experimental set up. The tool was rubbed with cotton, nylon and sprayed with electrons using high voltage.***

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## 2.1 Sample conditioning

The test sample was prepared and conditioned prior to and during testing according to the procedure described in EN 13463-1:2009, Annex D and the information given in Table 1.

***Table 1. Conditioning prior to and during testing***

| | **Value** | **Remark, clause in EN 13463-1:2009** |
|---|---|---|
| Temperature during testing: | 22 ºC – 23 ºC | D.4.1 |
| Relative humidity during testing: | 30% RH | D.4.1 |
| Conditioning of samples prior to testing: | Stored in room for 24 hours with relative humidity around 30% and temperature at 22ºC. | D.4.1 |

## 2.2 Deviations from standard conditions and procedures

Deviations of the present tests from the standard test requirements referred to in EN 13463-1:2009 Annex D are listed in Table 2.

***Table 2. Deviations from standard test conditions and test procedures***

| **Description of requirement** | **Deviation** | **Remark, clause in EN 13463-1:2009** |
|---|---|---|
| Sample to have dimensions: 150mm x 150mm x 6mm | The material was tested as received in form of the tool itself. | D.3 |

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# 3 Test Apparatus

The test samples were tested at GexCon′s test laboratory for the determination of brush discharge properties. The tests were performed as closely as possible to the procedures given in EN 13463-1:2009, Annex D [1] and described above in section 2.

The tests were performed using the following equipment:

- HDV 30 kVDC high voltage source. (Type: HML 421, Serial No.: 82218)
- GexCon charge amplifier with 100 nF capacitor
- Digital oscilloscope, (Type: Tektronix TDS2002, Serial No.: C012149)

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# 4 Results and Discussion

Experiments with static electricity are very sensitive and can be influenced by atmospheric conditions and the operators' perspiration, it shall be demonstrated by a calibration or reference experiment with a reference material of PTFE that the transferred charge is at least 60 nC using the test apparatus.

The average transferred charge, during a series of tests with such a reference test performed prior to testing the test sample, was 84.8 nC when rubbing with a cotton cloth. The test apparatus and procedure was thus deemed acceptable and the tests using the MBX Bristle Blaster were performed.

## 4.1 Reference tests

Table 3 shows a summary of the test conditions and discharge results obtained during reference tests using the PTFE material and the materials specified in the standard [1] under standard test conditions of approximately 30 % relative humidity. The significant discharge values, with many discharges over 60 nC indicate valid test data.

***Table 3. Test conditions and discharge values (nC) for tests performed with the reference material at approximately 30%RH.***

| **Rubbings: 10** | **Reference** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Material with PTFE** | **Cotton** | | | **Nylon** | | | **DC high voltage** | | |
| **Rep no** | **nC** | **%RH** | **Temp.** | **nC** | **%RH** | **Temp.** | **nC** | **%RH** | **Temp.** |
| 1 | 67.2 | 32 | 25.8 | 56 | 33 | 25.9 | 30.4 | 33 | 25.9 |
| 2 | 76 | 32 | 25.8 | 71.2 | 33 | 25.9 | 19.2 | 33 | 25.9 |
| 3 | 89.6 | 32 | 25.8 | 100.8 | 33 | 25.9 | 0.8 | 33 | 25.9 |
| 4 | 76.8 | 32 | 25.9 | 74.4 | 33 | 25.9 | 17.6 | 33 | 25.9 |
| 5 | 64 | 32 | 25.9 | 86.4 | 33 | 25.9 | 27.6 | 33 | 25.9 |
| 6 | 84 | 32 | 25.9 | 79.2 | 33 | 25.9 | 16.8 | 33 | 25.9 |
| 7 | 66.4 | 32 | 25.9 | 75.2 | 33 | 25.9 | 14.4 | 33 | 25.9 |
| 8 | 80.8 | 32 | 25.9 | 72 | 33 | 26 | 1.6 | 33 | 26 |
| 9 | 115.2 | 32 | 25.9 | 100.8 | 33 | 26 | 11.2 | 33 | 26 |
| 10 | 98.4 | 32 | 25.9 | 100.5 | 33 | 26 | 22.4 | 33 | 26 |
| **Average** | **84.84** | **32** | **25.9** | **75.2** | **33** | **25.9** | **16.2** | **33** | **25.9** |

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## 4.2 Maximum discharge values

The resulting charge values obtained from all the test methods for the sample are given in Table 4, while the maximum charge values allowed for the various gas groups are given in Table 5. To determine whether the test is passed or not, the maximum discharge value obtained during the repeated tests is compared to the limiting value given in Table 5 for the different gas groups.

***Table 4. Maximum measured discharge values.***

| Test no | Rubbing with a nylon cloth | Rubbing with a cotton cloth | Charging with a 30kV high voltage source |
|---|---|---|---|
| | **Discharge, nC** | **Discharge, nC** | **Discharge, nC** |
| 1 | 1.28 | 0.32 | No discharge |
| 2 | 0.88 | 3.08 | No discharge |
| 3 | 0.56 | 2.00 | No discharge |
| 4 | 12.64 | 3.56 | No discharge |
| 5 | 0.64 | 3.16 | No discharge |
| 6 | 14.56 | 2.84 | No discharge |
| 7 | 6.00 | 2.96 | No discharge |
| 8 | 2.48 | 2.84 | No discharge |
| 9 | 1.68 | 2.44 | No discharge |
| 10 | 2.16 | 2.00 | No discharge |
| **Maximum** | **14.56** | **3.56** | **No discharge** |

## 4.3 Acceptance criteria in terms of gas group

The maximum charge values allowed (according to EN 13463-1:2009) for the various gas groups are shown in Table 5. The table also shows whether the test is passed or not in terms of whether or not use of the material is allowable in hazardous areas for the various gas groups.

***Table 5. Acceptance criteria and verdict for performed tests***

| Gas Group | I or IIC | I or IIB | I or IIA |
|---|---|---|---|
| **Limit [nC]** | 10 | 30 | 60 |
| **Verdict** | Failed | Passed | Passed |

The charge levels obtained in the current work, being below 30 nC, would indicate that use of the current materials is permissible in hazardous areas for gas groups IIA and IIB.

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# 5 Conclusion

The MBX Bristle Blaster tool was tested for electrostatic discharges according to the standard EN 13463-1:2009, Annex D [1]. When provoking electrostatic discharges, small discharges were measured. Some of these discharges were sufficiently strong to ignite gasses with low minimum ignition energy of the gas group IIC. The charge level was below 30 nC and indicate that the material of the tool is permissible in hazardous areas for gas groups IIA and IIB. It should however be emphasised that the materials are only usable in hazardous environment as long as the material properties, in terms of surface roughness, surface resistivity, material content, thickness and surface types/coatings are exactly identical to those tested here.

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# 6 References

[1] European Standard: EN 13463-1, “Non-electrical equipment for potentially explosive atmospheres – Part 1 – Basic method and requirements”, January 2009.

[2] European Standard: EN 1127-1, “Explosive atmospheres – Explosion prevention and protection – Part 1 – Basic concepts and methodology”, November 2007.

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