

# Physikalisch-Technische Bundesanstalt

Braunschweig and Berlin

## Bewertungs- und Prüfbericht

*Assessment and Test Report*

**PTB Ex 10-50015**

**Gegenstand:** Five pieces of advertising media for the new generation of pump nozzles,  
*Object* ZVA Slimline2

**Hersteller:** ALVERN Media GmbH  
*Manufacturer*

**Anschrift:** Heimhuder Straße 70, 20148 Hamburg, Deutschland  
*Address*

**Eingangsdatum:** January 20, 2010  
*Date of application*

**Prüfspezifikation:** EN 13463-1:2009, Appendix D.2, D.3, D.4.2.4  
*Test specification* DIN EN 60079-0:2009, Section 26.13, 26.14  
DIN IEC 60167:1993  
TRBS 2153:2009, Section 2, 3, 8.3.5, Appendix A  
Draft IEC R60079-32:2009

**Explosion Protection Test Lab**

**[Signature/Stamp]**  
p.p.  
Michael Esslinger, graduated engineer

Braunschweig, February 09, 2010

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## Test Specimen Details

The object of the test are five pieces of advertising media for the new generation of pump nozzles, ZVA Slimline2

- A.) Advertising media in green
- B.) Advertising media in yellow
- C.) Advertising media in red
- D.) Advertising media in blue (light)
- E.) Advertising media in blue (dark)



Fig. 1 — Test specimens A, B, C, D, E



Fig. 2 — Test specimen **A** while mounted on nozzle

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## 2. Test Specification Details

The following limit values apply:

Max. transferable charge and chargeable area for zone 0:

Explosion group I	max. 60 nC,	limit value	100 cm <sup>2</sup>
Explosion group IIA	max. 60 nC,	limit value	50 cm <sup>2</sup>
Explosion group IIB	max. 30 nC,	limit value	25 cm <sup>2</sup>
Explosion group IIC	max. 10 nC,	limit value	4 cm <sup>2</sup>

Max. transferable charge and chargeable area for zone 1, zone 2:

Explosion group I	max. 60 nC,	limit value	100 cm <sup>2</sup>
Explosion group IIA	max. 60 nC,	limit value	100 cm <sup>2</sup>
Explosion group IIB	max. 30 nC,	limit value	100 cm <sup>2</sup>
Explosion group IIC	max. 10 nC,	limit value	20 cm <sup>2</sup>

Brush discharges are considered incapable of igniting dust/air atmospheres (see Draft IEC R60079-32:2009; TRBS 2153:2009, Section 3.2).

Max. transferred charge in zone 20, 21, and 22 amounts to 200 nC.

Max. ungrounded capacity in zone 0, zone 1:

Explosion group I	max. 10 pF
Explosion group IIA	max. 10 pF
Explosion group IIB	max. 10 pF
Explosion group IIC	max. 3 pF

Max. ungrounded capacity in zone 2:

Explosion group I	max. 10 pF
Explosion group IIA	max. 10 pF
Explosion group IIB	max. 10 pF
Explosion group IIC	max. 10 pF

Max. capacity in zone 20, 21, and 22 amounts to 10 pF.

(See TRBS 2153:2009, Section 8.3.5; Draft IEC R60079-32:2009.)

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### 3. Test Results

#### 3.1 General

Ambient conditions were determined with the alarm hygrometer testo 608-H2, test equipment number PL-Ex-5-71313.

The experimental measurements were taken 24 h after storage in a standard climate (rel. humidity < 30 % and  $T = 23^{\circ}\text{C} \pm 2 \text{ K}$ ).

The test was conducted on January 08, 2010.

Ambient conditions:  $\text{Rel.}_{\text{hum}} = 11.3\% \pm 2\%$ ,  $T = 21.5^{\circ}\text{C} \pm 2 \text{ K}$ ,  $p = 1007 \text{ hPa} \pm 2 \text{ hPa}$

The test specimens were tested while mounted to the grounded pump nozzles.

#### 3.2 Determining Surface Resistance

The surface resistance was measured with the terra ohmmeter Megger MIT 1020, test equipment number PL-Ex-5-61551 (meas. range:  $0 \Omega$  to  $\infty \Omega$ ; range of indication:  $10 \text{ k}\Omega$  to  $3 \text{ T}\Omega$ ) and a strip electrode  $10 \text{ mm} \times 100 \text{ mm}$  acc. to DIN IEC 60167.

The surface resistance was determined at three different points of the test specimen (measured with  $1000 \text{ V}$  measurement voltage, measurement duration  $> 1 \text{ min}$ ).

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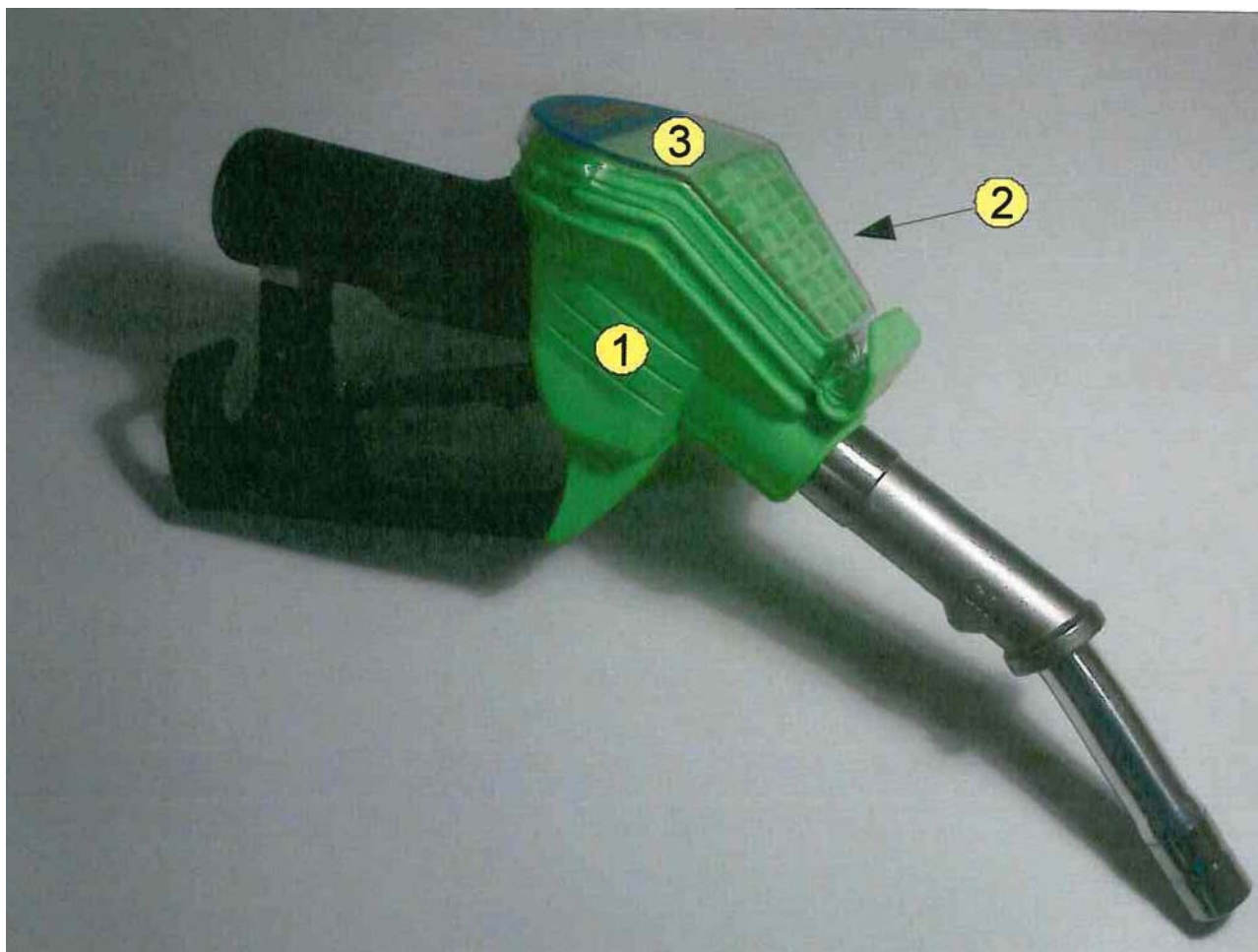


Fig. 3 — Measuring points to determine surface resistance

Table 1 — Test specimen surface resistance

	Measuring point 1	Measuring point 2	Measuring point 3
Test specimen A	340 $\Omega$	460 $\Omega$	> 3 $\Omega$
Test specimen B	140 $\Omega$	330 $\Omega$	> 3 $\Omega$
Test Specimen C	160 $\Omega$	237 $\Omega$	> 3 $\Omega$
Test specimen D	295 $\Omega$	410 $\Omega$	> 3 $\Omega$
Test specimen E	225 $\Omega$	240 $\Omega$	> 3 $\Omega$

The uncertainty of measurement of the Megger MIT 1020 is negligible concerning the fluctuations of the surface resistance. The total uncertainty of measurement is for the great part derived from the different resistance values of the product.

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## 3.3 Determining Transferred Charge

The measurement of the transferred charge was conducted with the "SCHNIER" coulombmeter HMG 11/02, test equipment number PL-Ex-5-61539 (measuring range 0 nC to 200 nC, range of indication 8 nC to 200 nC, uncertainty of measurement  $\pm 3$  nC).

Notes concerning the tables:

- "b.d.l." means that discharges were audible but below the detection limit of the coulombmeter of 8 nC.
- "n. d." means no discharges were detected.
- "- " means that a measurement was not carried out.

The following charge-generating processes were carried out to determine the transferred charge.

- The test specimen is charged ten times by rubbing with a cloth made from felted animal hair (long).
- The test specimen is charged ten times by rubbing with a cloth made from polyamide.
- The test specimen is charged ten times by rubbing with a cloth made from cotton.
- The test specimen is charged ten times by rubbing with a cloth made from polyester.
- The test specimen is charged ten times by beating with a leather gloves.
- The test specimen is charged ten times with the ERO-FLOCK -70 kV "Fakir electrode."

Table 2 - Transferred charge after various charge-generating processes

Felted animal hair (long)	PA cloth	Cotton cloth	Polyester cloth	Leather glove	Fakir electrode
nC	nC	nC	nC	nC	nC
n.d.	n.d.	n.d.	n.d.	b.d.l.	20
n.d.	n.d.	n.d.	n.d.	b.d.l.	19
n.d.	n.d.	n.d.	n.d.	b.d.l.	n.d.
n.d.	n.d.	n.d.	n.d.	b.d.l.	n.d.
b.d.l.	n.d.	n.d.	n.d.	b.d.l.	n.d.
n.d.	n.d.	n.d.	n.d.	b.d.l.	n.d.
n.d.	n.d.	n.d.	n.d.	b.d.l.	b.d.l.
b.d.l.	n.d.	n.d.	n.d.	b.d.l.	b.d.l.
b.d.l.	n.d.	n.d.	n.d.	b.d.l.	n.d.
b.d.l.	n.d.	n.d.	n.d.	b.d.l.	n.d.

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Table 3 - Transferred charge on test specimen B after various charge-generating processes

Felted animal hair (long)	PA cloth	Cotton cloth	Polyester cloth	Leather glove	Fakir electrode
nC	nC	nC	nC	nC	nC
n.d.	n.d.	n.d.	n.d.	n.d.	b.d.l.
n.d.	n.d.	n.d.	n.d.	n.d.	21
n.d.	n.d.	n.d.	n.d.	b.d.l.	43
n.d.	n.d.	n.d.	n.d.	b.d.l.	b.d.l.
n.d.	n.d.	n.d.	n.d.	b.d.l.	22
n.d.	n.d.	n.d.	n.d.	n.d.	19
n.d.	n.d.	n.d.	n.d.	n.d.	14
n.d.	n.d.	n.d.	n.d.	n.d.	20
n.d.	n.d.	n.d.	n.d.	b.d.l.	b.d.l.
n.d.	n.d.	n.d.	n.d.	n.d.	b.d.l.

Table 4 - Transferred charge on test specimen C after various charge-generating processes

Felted animal hair (long)	PA cloth	Cotton cloth	Polyester cloth	Leather glove	Fakir electrode
nC	nC	nC	nC	nC	nC
b.d.l.	n.d.	n.d.	n.d.	n.d.	b.d.l.
b.d.l.	n.d.	n.d.	n.d.	n.d.	28
b.d.l.	n.d.	n.d.	n.d.	n.d.	10
n.d.	n.d.	n.d.	n.d.	b.d.l.	21
b.d.l.	n.d.	n.d.	n.d.	n.d.	10
b.d.l.	n.d.	n.d.	n.d.	b.d.l.	16
b.d.l.	n.d.	n.d.	n.d.	n.d.	17
b.d.l.	n.d.	n.d.	n.d.	n.d.	b.d.l.
b.d.l.	n.d.	n.d.	n.d.	b.d.l.	b.d.l.
b.d.l.	n.d.	n.d.	n.d.	n.d.	b.d.l.



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Table 5 - Transferred charge on test specimen D after various charge-generating processes

Felted animal hair (long)	PA cloth	Cotton cloth	Polyester cloth	Leather glove	Fakir electrode
nC	nC	nC	nC	nC	nC
n.d.	n.d.	n.d.	n.d.	n.d.	48
n.d.	n.d.	n.d.	n.d.	n.d.	25
n.d.	n.d.	n.d.	n.d.	n.d.	38
n.d.	n.d.	n.d.	n.d.	n.d.	29
n.d.	n.d.	n.d.	n.d.	n.d.	20
n.d.	n.d.	n.d.	n.d.	n.d.	25
n.d.	n.d.	n.d.	n.d.	n.d.	17
n.d.	n.d.	n.d.	n.d.	n.d.	36
n.d.	n.d.	n.d.	n.d.	n.d.	56
n.d.	n.d.	n.d.	n.d.	n.d.	64

Table 6 - Transferred charge on test specimen E after various charge-generating processes

Felted animal hair (long)	PA cloth	Cotton cloth	Polyester cloth	Leather glove	Fakir electrode
nC	nC	nC	nC	nC	nC
n.d.	n.d.	n.d.	n.d.	n.d.	12
n.d.	n.d.	n.d.	n.d.	n.d.	32
n.d.	n.d.	n.d.	n.d.	n.d.	39
n.d.	n.d.	n.d.	n.d.	b.d.l.	35
n.d.	n.d.	n.d.	n.d.	n.d.	33
n.d.	n.d.	n.d.	n.d.	n.d.	57
n.d.	n.d.	n.d.	n.d.	n.d.	46
n.d.	n.d.	n.d.	n.d.	n.d.	38
n.d.	n.d.	n.d.	n.d.	n.d.	31
n.d.	n.d.	n.d.	n.d.	n.d.	12

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## 4. Manufacturing and Operation Notes

Changes of the utilized raw materials and/or the manufacturing process, as well as environmental effects may result in product property changes.

## 5. Technical Evaluation and Assessment

The described results refer only to the respectively submitted test specimen at the time the test was conducted.

These tests refer only to electrostatic ignition hazards. No statements are made concerning other ignition sources.

Test specimen A

Brush discharges were provoked at measuring point 3 (see Fig. 3). Discharges could not be provoked at measuring points 1 and 2.

The measured max. transferred charge for processes generating a high charge (e.g. electrons of high-voltage electrodes, flowing powder particles, or liquids) amounted to 20 nC.

The measured max. transferred charge for processes generating low charges (e.g. manual friction) was below the detection limit of the coulombmeter of 8 nC.

From an electrostatic point of view, if processes generating high charges are excluded, the advertising media (green) are suitable for the following uses:

- Zone 1 with the restriction of only for explosion group I, IIA and IIB.
- Zone 2 with the restriction of only for explosion group I, IIA and IIB.
- Zone 20, zone 21, and zone 22.

If processes generating a high charge (e.g. electrons of high-voltage electrodes, flowing powder particles, or liquids) cannot be excluded, the test specimen is suitable for the following uses:

- Zone 1 with the restriction of only for explosion group I, IIA and IIB.
- Zone 2 with the restriction of only for explosion group I, IIA and IIB.
- Zone 20, zone 21, and zone 22.

These usage restrictions must be pointed out in the operating instructions.

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Test specimen B

Brush discharges were provoked at measuring point 3 (see Fig. 3). Discharges could not be provoked at measuring points 1 and 2.

The measured max. transferred charge for processes generating a high charge (e.g. electrons of high-voltage electrodes, flowing powder particles, or liquids) amounted to 43 nC.

Brush discharges could not be provoked for processes generating low charges (e.g. manual friction).

From an electrostatic point of view, if processes generating high charges are excluded, the advertising media (yellow) are suitable for the following uses:

- Zone 1
- Zone 2
- Zone 20, zone 21, and zone 22

If processes generating a high charge (e.g. electrons of high-voltage electrodes, flowing powder particles, or liquids) cannot be excluded, the test specimen is suitable for the following uses:

- Zone 1 with the restriction of only for explosion group I and IIA.
- Zone 2 with the restriction of only for explosion group I and IIA.
- Zone 20, zone 21, and zone 22.

These usage restrictions must be pointed out in the operating instructions.

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Test specimen C

Brush discharges were provoked at measuring point 3 (see Fig. 3). Discharges could not be provoked at measuring points 1 and 2.

The measured max. transferred charge for processes generating a high charge (e.g. electrons of high-voltage electrodes, flowing powder particles, or liquids) amounted to 28 nC.

The measured max. transferred charge with processes generating low charges (e.g. manual friction) was below the detection limit of the coulombmeter of 8 nC.

From an electrostatic point of view, if processes generating high charges are excluded, the advertising media (red) are suitable for the following uses:

- Zone 1 with the restriction of only for explosion group I, IIA and IIB.
- Zone 2 with the restriction of only for explosion group I, IIA and IIB.
- Zone 20, zone 21, and zone 22.

If processes generating a high charge (e.g. electrons of high-voltage electrodes, flowing powder particles, or liquids) cannot be excluded, the test specimen is suitable for the following uses:

- Zone 1 with the restriction of only for explosion group I, IIA and IIB.
- Zone 2 with the restriction of only for explosion group I, IIA and IIB.
- Zone 20, zone 21, and zone 22.

These usage restrictions must be pointed out in the operating instructions.

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Test specimen D

Brush discharges were provoked at measuring point 3 (see Fig. 3). Discharges could not be provoked at measuring points 1 and 2.

The measured max. transferred charge for processes generating a high charge (e.g. electrons of high-voltage electrodes, flowing powder particles, or liquids) amounted to 64 nC.

Brush discharges could not be provoked for processes generating low charges (e.g. manual friction).

From an electrostatic point of view, if processes generating high charges are excluded, the advertising media (light blue) are suitable for the following uses:

- Zone 1
- Zone 2
- Zone 20, zone 21, and zone 22

If processes generating a high charge (e.g. electrons of high-voltage electrodes, flowing powder particles, or liquids) cannot be excluded, the test specimen is suitable for the following uses:

- Zone 20, zone 21, and zone 22

These usage restrictions must be pointed out in the operating instructions.

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Test specimen E

Brush discharges were provoked at measuring point 3 (see Fig. 3). Discharges could not be provoked at measuring points 1 and 2.

The measured max. transferred charge for processes generating a high charge (e.g. electrons of high-voltage electrodes, flowing powder particles, or liquids) amounted to 57 nC.

The measured max. transferred charge with processes generating low charges (e.g. manual friction) was below the detection limit of the coulombmeter of 8 nC.

From an electrostatic point of view, if processes generating high charges are excluded, the advertising media (dark blue) are suitable for the following uses:

- Zone 1 with the restriction of only for explosion group I, IIA and IIB.
- Zone 2 with the restriction of only for explosion group I, IIA and IIB.
- Zone 20, zone 21, and zone 22.

If processes generating a high charge (e.g. electrons of high-voltage electrodes, flowing powder particles, or liquids) cannot be excluded, the test specimen is suitable for the following uses:

- Zone 1 with the restriction of only for explosion group I and IIA.
- Zone 2 with the restriction of only for explosion group I and IIA.
- Zone 20, zone 21, and zone 22.

These usage restrictions must be pointed out in the operating instructions.

Gasoline-air mixtures acc. to DIN EN 228:2008 occurring at gas stations corresponds with explosion group IIA. Diesel fuel acc. to EN 590:2009 does not generate an explosive atmosphere at gas stations. Processes generating heavy charges usually do not occur at pump nozzles. From an electrostatic point of view, all advertising media are suitable for use on gasoline and diesel pump nozzles.