



Testing Labels to BS5609:1986, Section 3 Durability of the Printed Label

The following products were tested:

1. FLEXcon Drumcal 21023 printed on Durst Tau 330 – Conditions of print printer setting of High Definition UV1 UV2 Pinning Corona - -70 (70%), 70(705), P0(0)/00)0)%
2. FLEXcon Drumcal 41023 printed on Durst Tau 330 – Conditions of the printer of High Definition UV1 UV2 Pinning Corona – 50(50%), 50(50% P0(0)/ 30(30%) C2.3 min square ft.

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Introduction: FLEXcon sample materials were provided to Durst-Duce American for test printing on their Durst Tau 330 in April of 2017. Materials were then tested at FLEXcon in accordance with BS5609 Section 3:1986 testing. In addition to the BS5609 Testing FLEXcon has added a 128-B 2 pixel barcode to each test print to remove human element FLEXcon assumes a positive scan after the testing to constitute a FLEXcon “pass” which is referenced in the report below. The additional FLEXcon testing is NOT part of the BS5609 testing for GHS requirements.

Summary of Testing Conducted:

1. FLEXcon Drumcal 21023 Printed on the Durst Tau – Passes Requirements
2. FLEXcon Drumcal 41023 Printed on the Durst Tau – Passes Requirements

Performance Requirements:

8.1 Print Key Effectiveness

Measurement:

- a. The ink shall not be removed from more than 5% of the printed area of each color.
- b. Despite removal of the ink, the maximum change in color intensity shall not be more than three when compared with an untested label.

Method

1. Affix printed label to a smooth flat rigid surface
2. Condition the sample at 23+2° for a minimum of 24 hours
3. Tested in accordance with appendix H*

<u>Sample</u>	<u>Color</u>	<u>Greyscale Rating</u>	<u>Observations</u>	<u>Pass / Fail</u>
Sample 1	Black / Red	5	Ink Removal – 0	Pass
Sample 2	Black / Red	5	Ink Removal – 0	Pass

8.2 Abrasion Resistance

Measurement: The color shall remain recognizable as the original hue and the color fastness shall not be less than two when compared to the unabraded specimen and any text / symbol shall remain legible and identifiable.

Method: Prepared and abraded in accordance with appendix J*.

<u>Sample</u>	<u>Color</u>	<u>Greyscale Rating</u>	<u>Observations</u>	<u>BS5609 Pass / Fail</u>	<u>FLEXcon Pass / Fail</u>
Sample 1	Black / Red	4.5	Min print removal	Pass	Fails
Sample 2	Black / Red	4.5	Min print removal	Pass	Pass

8.3 Permanence of Print: Color fastness and residual contrast

Measurement: The color shall remain recognizable as the original hue and color fastness shall not be less than two when compared to the nonweathered specimen and any text / symbol shall remain legible and identifiable.

Method

- a. Condition the sample at 23+2° for a minimum of 24 hours
- b. Applied to test panels suitable for use with the apparatus described in appendix E*
- c. Conditioned when adhered to the test panels for forty-eight hours at 23+2°
- d. Submitted to artificial weathering in accordance with appendix E*

<u>Sample</u>	<u>Color</u>	<u>Greyscale Rating</u>	<u>Observations</u>	<u>BS5609 Pass / Fail</u>	<u>FLEXcon Pass / Fail</u>
Sample 1	Black / Red	4.5	Min Color Change	Pass	Pass
Sample 2	Black / Red	4.5	Min Color Change	Pass	Pass

Conclusions: All materials described above have met the requirements specified in BS5609:1986. Sample 1 has been noted to not remain permanently adhered to the mandrel during testing however adhesion is not part of Section 3 testing the ink utilized passed the specification.

Testing Details and Equipment utilized to conduct the testing:

Appendix E Weathering (resistance to light and saline solution)

E.1 Apparatus :

E.1.1 Blue wool standard BS1006: Sec B01

E.1.2 Means of exposure to daylight or to a recognized equivalent artificial light of the Xenon...for accelerated testing

E.1.3 Salt spray cabinet

E.2 Method of operation

Operate the apparatus so that the following conditions are observed

- a) Salt spray. The salt spray is prevented by the baffle from impinging directly on the test faces of the panels.
- b) Solution level. The salt solution in the tank is maintained between the maximum (3L) and minimum (1L) levels.
- c) Spray selection. The salt solution drained from the panels is collected in the tray and is emptied at regular intervals to prevent recirculation with the panels.
- d) Supporting & spacing of panels. The panels are positioned not less than 30 mm apart and in the case of the outermost panels so as to ensure that they do not touch the side of the tank. The short edges of the panels are parallel to the longer dimensions of the tank with the test faces uppermost at an angle of about 15% to the vertical.
- e) Air pressure. The air pressure to the jet spray is maintained at 70 ± 7 kPa

E3 Reagents

E.3.1 General.

The reagents shall be of a recognized analytical quality. Distilled water or water otherwise produced of equal purity shall be used.

E.3.2 Saline solution of the following composition:

Sodium Chloride	26.5g
Magnesium Chloride	2.4g
Magnesium Sulfate	3.3g
Potassium Chloride	0.73g
Sodium Hydrogen Carbonate	0.20g

Appendix G Legibility /Section A02C

G.1 Colour fastness

Compare a tested specimen of the label with an untested specimen according to the following procedure. Place untested and tested specimens side by side in the same plane and oriented in the same direction. Place a grey scale complying with BS 1006-A02C nearby on the same plane. The surrounding field should be a uniform grey, slightly darker than that of the darkest member of the grey scale. Illuminate the surfaces with north skylight or equivalent source. Compare the visual difference between untested and tested specimens with the differences represented by the grey scale. A rating of 5 is only given when there is no difference.

G.2 Residual contrast

Visually inspect any text &/or symbol for legibility.

Appendix H Print key effectiveness

H.1 Apparatus

H.1.1 Transparent PS tape 25 mm wide with typical adhesion values in the range 3.4 N per 25 MM to 5.4 N per 25 mm when tested in accordance with Appendix B of BS 3887:1984

*Please Note: We downloaded new data sheets for 600, 610, and 810 tapes. Their adhesion strength to SS is:

600 Tape ~ 11.75 N/25mm

610 Tape ~ 11.75 N/25mm

810 Tape ~ 6.25 N/25MM

The 810 tape has the closest value to the specification requirement, but is still over the max value required. As a safety precaution, we tested all three tapes which should be a worst case scenario.

H.2 Procedure

- H.2.1 Apply at a 90° to each other two strips of 25 mm wide transparent PS tape to the extent of printed area of each colour and tonal gradation of the label.
- H.2.2 Press the tape firmly to the label and leave for 15 s
- H.2.3 Remove the tape by pulling quickly from one end at an angle of 90° to the label surface

Appendix J. Abrasion Resistance

J.1 Apparatus

J.1.1 Wide mouthed jar

J.1.2 Two mild steel rods of diameter 25 ± 0.6 mm with a length such that they are 5 mm shorter than the straight-sided length of the container

J.1.3 Means of rotating cylinder...at a speed of 20 r/min to 25 r/min

J.1.4 A supply of washed foundry sand with an AFS number in the range of 55 to 65

J.1.5 Saline test solution as described in E.3

J.2 Procedure

J.2.1 Cut the printed label material to be tested to a length of 85 mm and to a width not less than 50 mm and apply circumferentially to one of the rods with a 5 mm overlap. Cover the entire surface of the rod except for the 15 mm at each end with identical label material. Leave the 15 mm at each end of the rod uncovered

J.2.2 Condition the labelled rod for 24 h at $23 \pm 2^\circ\text{C}$ and $50 \pm 5\%$ RH and then immerse in saline test solution for 24 h at a temp. of $23 \pm 2^\circ\text{C}$

J.2.3 Place one labelled and one unlabeled rod in the container so that when they roll as the container rotates, the overlap on the material on the labelled rod will be trailing

Position the rods so that the unlabeled rod is leading, in the direction of rotation of the container

J.2.4 Prepare a mixture of the sand (20 parts by volume) with saline test solution (80 parts by volume) equal to half the volume of the container.

Secure the lid in place and rotate the container at 20 r/min to 25 r/min for 500 revolutions

J.2.5 At the end of the cycle remove, rinse and dry the rods and then compare the labels with non-abraded samples

J.2.6 Discard the sand/saline solution mixture