
FIME®
Enabling Business with IC Testing Solutions

# Test Report

# Specific Tests

ORIGINAL

**Reference: C10RAP05-10-2 - Version: 2.0**
**Form: 06FOR10-18-1 – Version: 0.2**
**Including 41 pages**

**Date: 23/06/2010**

**Product : JSC “LODVILA” plastic card**
**Company : JSC “Lodvila”**
**Address : Sėlių 3A,**
**LT-08125 Vilnius,**
**Lithuania**

**Dates of the session: from May 10 to June 23, 2010**

| Owned by : | Aproved by : |
|---|---|
| Gildas BEHUE 2010.06.24 13:24:09 + 02'00' Test Operator | Eric Piassale 2010.06.24 15:33:15 + 02'00' Reviewer |

## *REVISION HISTORY*

| Date | Version | Author | Comments |
|---|---|---|---|
| 11/06/2010 | 1.0 | GBE | Initial Version |
| 23/06/2010 | 2.0 | GBE | Edde and Location of Contacts tests updated |

# Table of Contents

# 1 - TEST SITE INFORMATION

## 1.1 - Identification of the testing laboratory

The laboratory editing this report is:

**Silicomp Management**
Immeuble Le Phoenix 1
24, rue Emile Baudot
91120 PALAISEAU - FRANCE
Tel.: +33. (0) 1.64.53.95.00

The tests described in this report were conducted at the following premises:

**FIME Test Centre**
8 rue Commodore J.H. HALLET
14000 CAEN
FRANCE
Tel.: +33. (0) 2.31.44.08.07
Fax: +33. (0) 2.31.44.44.77
E-mail: fime@fime.com

## 1.2 - Test personnel

The following persons have collaborated to the preparation, execution or reporting of these tests:

L. Morcel, Test Operator
G. Béhue, Test Operator
Y. Briard, Test Operator
Y. Linot, Project Manager

### *1.3 - FIME Operating Procedures*

Procedures used for these tests are described in **PAQ Specific Tests, réf : 06PAQ10-18-1**. The PAQ version to be used is identified in PAQ chrono, *reference*: Chrono_PAQ

### *1.4 - References*

Tests performed according to the specifications described in:

- ISO/IEC 10373-1 'General Characteristics tests' from 15 December 1998.
- ISO/IEC 10373-3 'Integrated circuit(s) cards with contacts and related interface devices' from 15 February 2001.
- ISO/IEC 7810 'Physical characteristics' from 01 November 2003.
- ISO/IEC 7816-1 'Physical characteristics' from 15 October 1998.
- ISO/IEC 7816-2 'Dimensions an location of the contacts' from 01 March 1999.
- GIE Carte Bancaire 'Support Plastique' Version 3.1 from 04 April 2000.
- MIL STD 883 E 'Test Method Standard – Microcircuits'
- ANSI INCITS 322 – 2002 'Card Durability Test Methods'
- Mastercard CQM IQR v1.9D – 'Card Quality Management : Infrastructure Quality Requirements'

### *1.5 - Subcontractors*

- Test Toxicity

Name: SGS Multilab
Address: 65, rue Ettore Bugatti, BP90014
76801 Saint Etienne du Rouvray, France
Tel.: 02 35 07 91 91
Fax: 02 35 07 91 90

- Test Salt Mist and Light Fastness

Name: SERCOVAM
Address: 10, Chemin de Marticot, 33611 Cestas, France
Tel.: 05 57 97 02 33
Fax: 05 57 83 53 73

- Test X-Ray

Name: SERMA Technologies
Address: 30, Avenue Gustave Eiffel, 33608 Pessac, France
Tel.: 05 57 26 08 88
Fax: 05 57 26 08 98

## 2 - PROVIDER’S INFORMATION

### 2.1 - Card Provider Identification

The card provider that requested the tests described in this report is identified as:

Company : JSC “LODVILA”
Address : Sėlių 3A,
LT-08125 Vilnius,
Lithuania

Contact.: Jurgis Rakstelis
Tel.: (+370 5) 2790795
Fax.: (+370 5) 2790893
Email.: lodvila@lodvila.lt

### 2.2 - Cards Identification

First batch: The samples have been received on May 10, 2010.
Second batch: The samples have been received on June 22, 2010.

***Samples Identification :***

| Item Description | Quantity | Identification |
|---|---|---|
| JSC LODVILA plastic card | 200 | 1L422 to 200L422 |
| JSC LODVILA plastic card | 9 | 1L430 to 9L430 |

***Photo of the Tested Cards :***


## 3 - TEST RESULTS SUMMARY

The report concerns only the tested samples.

| N° | Test Description | Part | Test Method | Nb of Card | Nb of Failure | Verdict |
|---|---|---|---|---|---|---|
| 1 | Dimensions of cards (thickness) | 7810 § 5.1 | 10373-1 § 5.2 | 199 | 0 | PASS |
| 2 | Dimensions of cards (Height & Width) | 7810 § 5.1 | 10373-1 § 5.2 | 10 | 0 | PASS |
| 3 | Dimensions of cards (Edge & Corners) | 7810 § 5.1 | 10373-1 § 5.2 | 9 | 0 | PASS |
| 4 | Bending stiffness | 7810 § 8.1 | 10373-1 § 5.7 | 10 | 0 | PASS |
| 5 | Toxicity | 7810 § 8.3 | EN 71-3 | 10 | 0 | PASS |
| 6A | Resistance to chemicals | 7810 § 8.4 | 10373-1 § 5.4 | 16 | 0 | PASS |
| 6B | Salt Mist | 7810 § 8.4 | 9227:1990 | 5 | 0 | PASS |
| 7 | Card dimensional stability | 7810 § 8.5 | 10373-1 § 5.5 | 10 | 0 | PASS |
| 8 | Delamination (90°) | 7810 § 8.8 | 10373-1 § 5.3 | 10 | 0 | PASS |
| 9 | Adhesion or blocking | 7810 § 8.9 | 10373-1 § 5.6 | 10 | 0 | PASS |
| 10 | Opacity | 7810 § 8.10 | 10373-1 § 5.10 | 10 | 0 | PASS |
| 11 | Card Warpage | 7810 § 8.11 | 10373-1 § 5.1 | 199 | 0 | PASS |
| 12 | Ultraviolet Light | 7816-1 § 4.2.1 | 10373-1 § 5.11 | 6 | 0 | PASS |
| 13 | X-Rays | 7816-1 § 4.2.2 | 10373-1 § 5.12 | 10 | 0 | PASS |
| 14 | Surface profile of contacts | 7816-1 § 4.2.3 | 10373-3 § 5.4 | 10 | 0 | PASS |
| 15 | Mechanical Test | 7816-1 § 4.2.4 | - | 10 | 0 | PASS |
| 16 | Electrical resistance of contact | 7816-1 § 4.2.5 | 10373-3 § 5.3 | 10 | 0 | PASS |
| 17 | Static Electricity | 7816-1 § 4.2.7 | 10373-3 § 5.2 | 10 | 0 | PASS |
| 18 | Operating Temperature | 7816-1 § 4.2.8 | - | 4 | 0 | PASS |
| 19 | Dynamic Bending stress | 7816-1 § 4.2.9 | 10373-1 § 5.8 | 10 | 0 | PASS |
| 20 | Dynamc Torsional stress | 7816-1 § 4.2.10 | 10373-1 § 5.9 | 10 | 0 | PASS |
| 21 | Location of contacts | 7816-2 § 4 | 10373-3 § 5.1 | 9 | 0 | PASS |
| 22 | Light Fastness | ISO 105 A2 | ISO 105 A2 | 5 | 0 | PASS |

## 4 - DETAILED TESTS RESULTS

**COMMENTS :**

For most of the tests FIME verifies on one hand the visual aspect of the card and on the other hand the functionality of the microcircuit.

The visual aspect is checked by observing absence of :

- Initial detachment of the protection coat,
- Initial break,
- Failing of coloration,

The functionality of the microcircuit is checked by verifying if the microcircuit has survived the action of potentially destructive influence to the extent that :

- Any integrated circuit present on the card continues to show an Answer to Reset response after powering on all the contacts.

# Test N°1 – Dimensions of the cards (thickness) 1/4

**OBJECTIVE :**
The purpose of this test is to measure the thickness of the card.

**REFERENCE :**
ISO 10373-1 / ISO 7810 § 5.1.2

**TEST BENCH :**
- A micrometer Mitutoyo:
  Precision of the measure: +/- 3 µm (K=2)
  Force of the measure: 3.5 N

- A load of 2.20 ± 0.01 N.

**PROCEDURE :**
Use the micrometer to measure the thickness of the card in the four quadrants. The measurements shall be made at locations on the card that do not include signature panels, magnetic stripes or contacts (integrated circuits cards), or any other raised area. The micrometer force shall be between 3.5N to 5.9N.
Graphic shows repartition for quadrant n°1.

| | |
|---|---|
| Quadrant 1 | Quadrant 2 |
| Quadrant 3 | Quadrant 4 |

Disposition of the quadrants

**CRITERIA :**
The thickness of the card shall be 760 µm ± 80 µm.

**RESULTS: (Cards tested : N°1 to 199L422)**
Nb of Failure : 0 (6 measurements are in the uncertainty area of the micrometer)

| Item | Quadrant N°1 | Quadrant N°2 | Quadrant N°3 | Quadrant N°4 |
|---|---|---|---|---|
| Mean (µm) | 826 | 826 | 826 | 828 |
| Max (µm) | 840 | 839 | 842 | 843 |
| Min (µm) | 805 | 811 | 808 | 809 |
| Standard Deviation (µm) | 6.2 | 5.8 | 5.9 | 6.3 |

**OBSERVATIONS :**

Tested samples are compliant with the specifications.

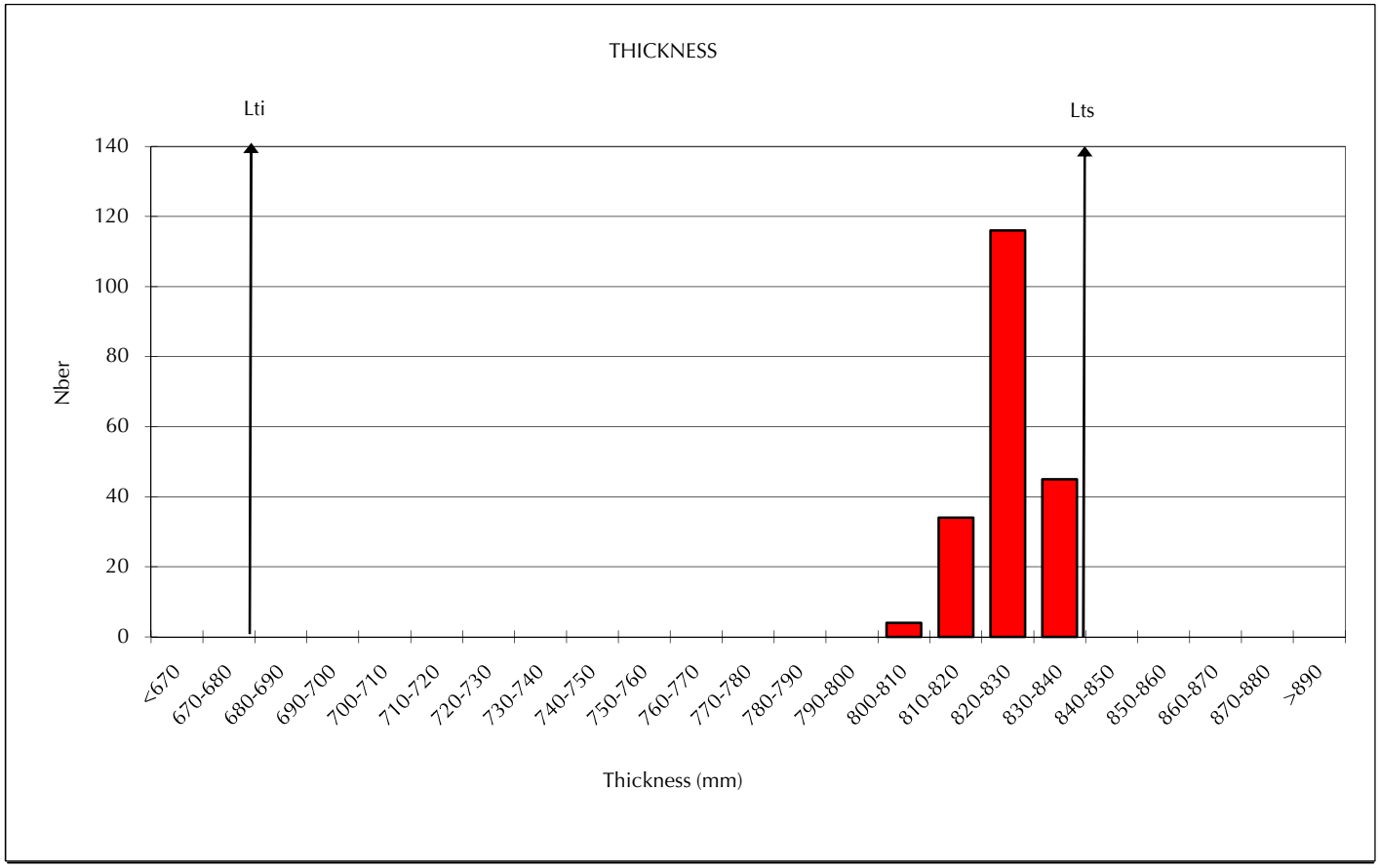
## Test N°1 – Dimensions of the cards (thickness) 2/4

| Card Nber | Quadrant N°1 | Quadrant N°2 | Quadrant N°3 | Quadrant N°4 | Card Nber | Quadrant N°1 | Quadrant N°2 | Quadrant N°3 | Quadrant N°4 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 821 | 819 | 819 | 820 | 51 | 828 | 825 | 829 | 830 |
| 2 | 821 | 828 | 820 | 828 | 52 | 839 | 839 | 839 | 842 |
| 3 | 832 | 827 | 833 | 828 | 53 | 835 | 834 | 839 | 842 |
| 4 | 831 | 827 | 829 | 829 | 54 | 829 | 826 | 828 | 828 |
| 5 | 824 | 832 | 826 | 837 | 55 | 829 | 827 | 829 | 830 |
| 6 | 829 | 831 | 829 | 832 | 56 | 817 | 818 | 818 | 818 |
| 7 | 829 | 830 | 828 | 830 | 57 | 816 | 817 | 817 | 821 |
| 8 | 830 | 830 | 830 | 839 | 58 | 818 | 825 | 817 | 818 |
| 9 | 824 | 824 | 825 | 828 | 59 | 819 | 822 | 825 | 824 |
| 10 | 831 | 833 | 834 | 836 | 60 | 816 | 818 | 814 | 819 |
| 11 | 825 | 828 | 826 | 828 | 61 | 831 | 829 | 830 | 832 |
| 12 | 830 | 838 | 833 | 838 | 62 | 829 | 831 | 832 | 835 |
| 13 | 823 | 829 | 825 | 832 | 63 | 832 | 836 | 830 | 835 |
| 14 | 829 | 831 | 831 | 832 | 64 | 830 | 831 | 831 | 836 |
| 15 | 832 | 832 | 833 | 833 | 65 | 827 | 821 | 825 | 825 |
| 16 | 823 | 823 | 825 | 829 | 66 | 827 | 827 | 826 | 828 |
| 17 | 834 | 832 | 835 | 833 | 67 | 825 | 823 | 826 | 825 |
| 18 | 830 | 830 | 829 | 827 | 68 | 819 | 821 | 818 | 827 |
| 19 | 823 | 824 | 824 | 828 | 69 | 825 | 825 | 822 | 827 |
| 20 | 824 | 823 | 824 | 824 | 70 | 826 | 825 | 830 | 834 |
| 21 | 823 | 822 | 823 | 823 | 71 | 826 | 822 | 822 | 831 |
| 22 | 820 | 822 | 818 | 820 | 72 | 827 | 824 | 823 | 827 |
| 23 | 816 | 819 | 817 | 818 | 73 | 830 | 825 | 826 | 831 |
| 24 | 821 | 821 | 821 | 819 | 74 | 829 | 832 | 829 | 829 |
| 25 | 820 | 819 | 818 | 818 | 75 | 834 | 832 | 836 | 834 |
| 26 | 833 | 835 | 832 | 836 | 76 | 828 | 826 | 826 | 829 |
| 27 | 810 | 815 | 815 | 820 | 77 | 833 | 834 | 832 | 834 |
| 28 | 821 | 818 | 820 | 820 | 78 | 835 | 833 | 834 | 833 |
| 29 | 822 | 823 | 822 | 819 | 79 | 829 | 831 | 828 | 831 |
| 30 | 828 | 829 | 828 | 831 | 80 | 831 | 829 | 829 | 830 |
| 31 | 820 | 827 | 825 | 830 | 81 | 822 | 825 | 824 | 826 |
| 32 | 828 | 829 | 826 | 828 | 82 | 826 | 825 | 828 | 823 |
| 33 | 825 | 818 | 818 | 833 | 83 | 828 | 827 | 830 | 828 |
| 34 | 828 | 827 | 828 | 830 | 84 | 822 | 823 | 824 | 824 |
| 35 | 821 | 819 | 821 | 827 | 85 | 832 | 832 | 833 | 832 |
| 36 | 822 | 824 | 825 | 825 | 86 | 825 | 823 | 826 | 823 |
| 37 | 835 | 828 | 832 | 832 | 87 | 818 | 823 | 823 | 822 |
| 38 | 828 | 817 | 826 | 827 | 88 | 826 | 823 | 828 | 827 |
| 39 | 814 | 812 | 816 | 816 | 89 | 829 | 830 | 833 | 831 |
| 40 | 825 | 827 | 828 | 831 | 90 | 830 | 828 | 831 | 830 |
| 41 | 827 | 831 | 828 | 835 | 91 | 831 | 832 | 832 | 832 |
| 42 | 832 | 827 | 831 | 829 | 92 | 829 | 831 | 834 | 835 |
| 43 | 828 | 831 | 824 | 832 | 93 | 832 | 830 | 835 | 835 |
| 44 | 821 | 824 | 820 | 822 | 94 | 835 | 836 | 834 | 836 |
| 45 | 814 | 817 | 819 | 813 | 95 | 832 | 831 | 830 | 832 |
| 46 | 828 | 828 | 828 | 830 | 96 | 834 | 836 | 832 | 834 |
| 47 | 826 | 819 | 829 | 825 | 97 | 839 | 838 | 840 | 841 |
| 48 | 831 | 830 | 832 | 832 | 98 | 836 | 835 | 842 | 840 |
| 49 | 816 | 819 | 821 | 822 | 99 | 828 | 829 | 830 | 833 |
| 50 | 816 | 815 | 817 | 822 | 100 | 833 | 835 | 835 | 835 |

## Test N°1 – Dimensions of the cards (thickness) 3/4

| Card Nber | Quadrant N°1 | Quadrant N°2 | Quadrant N°3 | Quadrant N°4 | Card Nber | Quadrant N°1 | Quadrant N°2 | Quadrant N°3 | Quadrant N°4 |
|---|---|---|---|---|---|---|---|---|---|
| 101 | 819 | 814 | 820 | 809 | 151 | 827 | 829 | 826 | 830 |
| 102 | 828 | 825 | 827 | 829 | 152 | 829 | 825 | 827 | 831 |
| 103 | 834 | 834 | 833 | 835 | 153 | 838 | 818 | 831 | 833 |
| 104 | 826 | 826 | 829 | 827 | 154 | 831 | 829 | 832 | 833 |
| 105 | 840 | 836 | 834 | 834 | 155 | 829 | 828 | 830 | 831 |
| 106 | 832 | 834 | 837 | 836 | 156 | 829 | 823 | 831 | 829 |
| 107 | 827 | 824 | 826 | 825 | 157 | 823 | 825 | 821 | 829 |
| 108 | 824 | 828 | 822 | 826 | 158 | 832 | 827 | 832 | 825 |
| 109 | 825 | 824 | 825 | 828 | 159 | 828 | 828 | 830 | 829 |
| 110 | 818 | 824 | 821 | 825 | 160 | 829 | 832 | 821 | 828 |
| 111 | 812 | 811 | 816 | 812 | 161 | 830 | 831 | 826 | 824 |
| 112 | 824 | 819 | 821 | 820 | 162 | 824 | 827 | 826 | 829 |
| 113 | 833 | 831 | 830 | 836 | 163 | 821 | 821 | 825 | 824 |
| 114 | 825 | 824 | 826 | 823 | 164 | 826 | 822 | 825 | 824 |
| 115 | 832 | 831 | 830 | 835 | 165 | 824 | 824 | 827 | 829 |
| 116 | 830 | 831 | 829 | 833 | 166 | 826 | 828 | 828 | 830 |
| 117 | 831 | 832 | 832 | 833 | 167 | 832 | 832 | 829 | 829 |
| 118 | 831 | 831 | 832 | 833 | 168 | 832 | 832 | 833 | 834 |
| 119 | 820 | 820 | 821 | 827 | 169 | 826 | 826 | 820 | 822 |
| 120 | 826 | 826 | 827 | 829 | 170 | 828 | 832 | 829 | 836 |
| 121 | 831 | 832 | 832 | 833 | 171 | 816 | 817 | 811 | 810 |
| 122 | 833 | 835 | 837 | **841** | 172 | 805 | 814 | 811 | 814 |
| 123 | 827 | 827 | 825 | 829 | 173 | 818 | 822 | 821 | 822 |
| 124 | 823 | 826 | 827 | 824 | 174 | 820 | 825 | 825 | 823 |
| 125 | 821 | 820 | 821 | 830 | 175 | 814 | 815 | 817 | 820 |
| 126 | 823 | 824 | 825 | 824 | 176 | 810 | 812 | 808 | 810 |
| 127 | 822 | 824 | 825 | 823 | 177 | 809 | 812 | 809 | 810 |
| 128 | 825 | 824 | 826 | 828 | 178 | 816 | 819 | 814 | 820 |
| 129 | 819 | 827 | 820 | 820 | 179 | 815 | 820 | 818 | 819 |
| 130 | 828 | 830 | 829 | 826 | 180 | 817 | 819 | 819 | 818 |
| 131 | 829 | 830 | 830 | 833 | 181 | 818 | 820 | 817 | 822 |
| 132 | 826 | 820 | 830 | 825 | 182 | 824 | 819 | 825 | 825 |
| 133 | 826 | 821 | 825 | 827 | 183 | 822 | 822 | 825 | 822 |
| 134 | 830 | 827 | 830 | 827 | 184 | 822 | 823 | 823 | 832 |
| 135 | 830 | 828 | 829 | 828 | 185 | 825 | 827 | 822 | 824 |
| 136 | 830 | 828 | 832 | 829 | 186 | 827 | 826 | 825 | 828 |
| 137 | 832 | 829 | 829 | 826 | 187 | 830 | 827 | 824 | 821 |
| 138 | 828 | 829 | 827 | 833 | 188 | 829 | 832 | 828 | 828 |
| 139 | 827 | 828 | 828 | 829 | 189 | 825 | 824 | 830 | 827 |
| 140 | 818 | 818 | 820 | 824 | 190 | 813 | 813 | 820 | 822 |
| 141 | 821 | 823 | 821 | 821 | 191 | 828 | 832 | 830 | **843** |
| 142 | 828 | 824 | 832 | 826 | 192 | 821 | 828 | 826 | 832 |
| 143 | 824 | 823 | 828 | 826 | 193 | 829 | 833 | 828 | 834 |
| 144 | 825 | 825 | 825 | 826 | 194 | 832 | 830 | 831 | 835 |
| 145 | 817 | 819 | 823 | 824 | 195 | 832 | 833 | 828 | 828 |
| 146 | 814 | 818 | 814 | 820 | 196 | 828 | 835 | 830 | 836 |
| 147 | 820 | 825 | 818 | 828 | 197 | 831 | 834 | 827 | 832 |
| 148 | 816 | 821 | 828 | 832 | 198 | 831 | 829 | 833 | 832 |
| 149 | 824 | 821 | 823 | 827 | 199 | 828 | 833 | 826 | 837 |
| 150 | 829 | 823 | 829 | 820 | | | | | |

## Test N°1 – Dimensions of the cards (thickness) 4/4



## Test N°2 – Dimensions of the cards (height & width) 1/2

**OBJECTIVE :**
The purpose of this test is to measure the height and the width of the card.

**REFERENCE :**
ISO 10373-1 / ISO 7810 5.1.1

**TEST BENCH :**
- A profile projector NIKON.
  Precision: +(4+L/25) µm; -(4+L/50) µm with L in mm
  Measure uncertainty : ± 16 µm
- A load of 2.2 N ± 0.2 N

**PROCEDURE :**
Place the sample card on the level horizontal rigid surface and flatten it under the 2.2N ± 0.2N load. Use the profile projector to measure the height and width of the card.

**CRITERIA :**
All the points on the edges of the card in the finished state, except for the rounded corners, shall fall between two concentric, similarly aligned rectangles which are dimensioned as follows :

Unembossed card:
Outer rectangle: Width : 85,72 mm Height : 54,03 mm
Inner rectangle : Width : 85,47 mm Height : 53,92 mm

**RESULTS : (Cards tested : N°181 to 190L422)**
Nb of Failure : 0

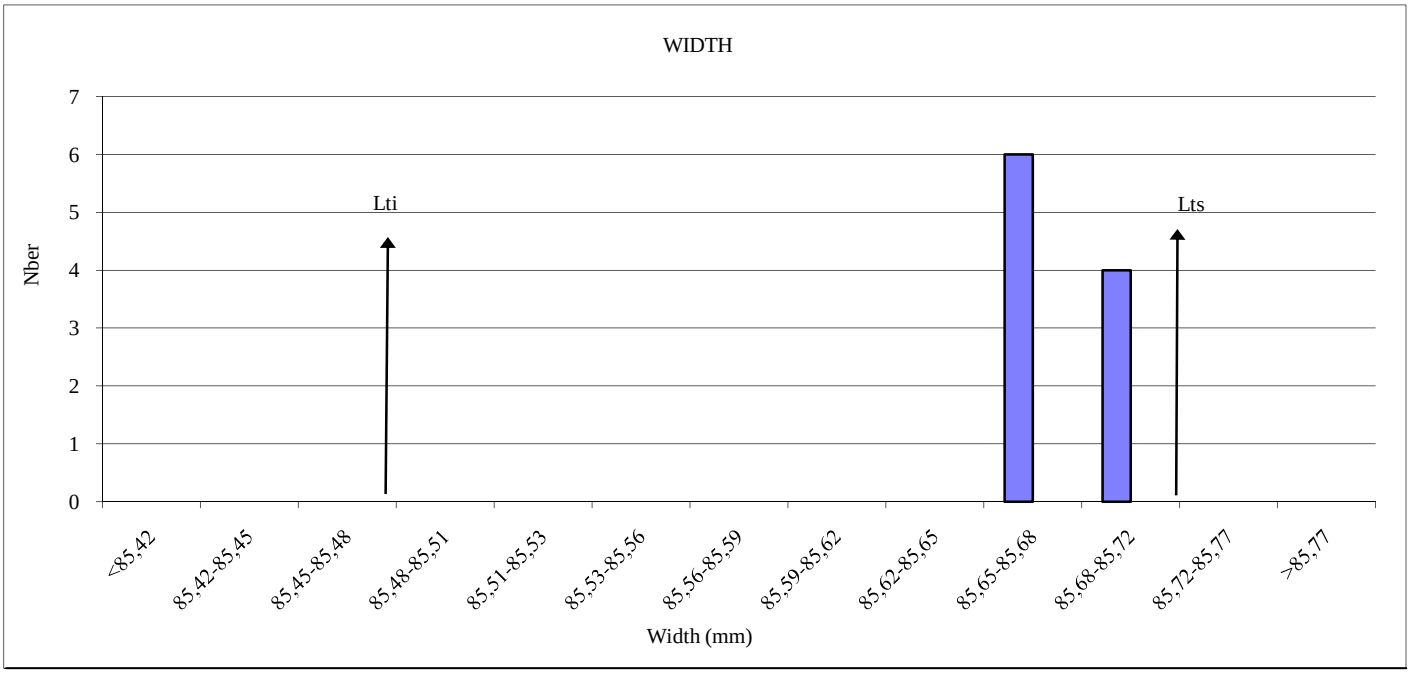
| Card Nber | Width | Height |
|---|---|---|
| 181 | 85,683 | 53,951 |
| 182 | 85,673 | 53,969 |
| 183 | 85,7 | 53,993 |
| 184 | 85,656 | 53,978 |
| 185 | 85,711 | 53,975 |
| 186 | 85,686 | 53,979 |
| 187 | 85,661 | 53,962 |
| 188 | 85,672 | 53,989 |
| 189 | 85,677 | 54,026 |
| 190 | 85,661 | 53,976 |

**OBSERVATIONS :**

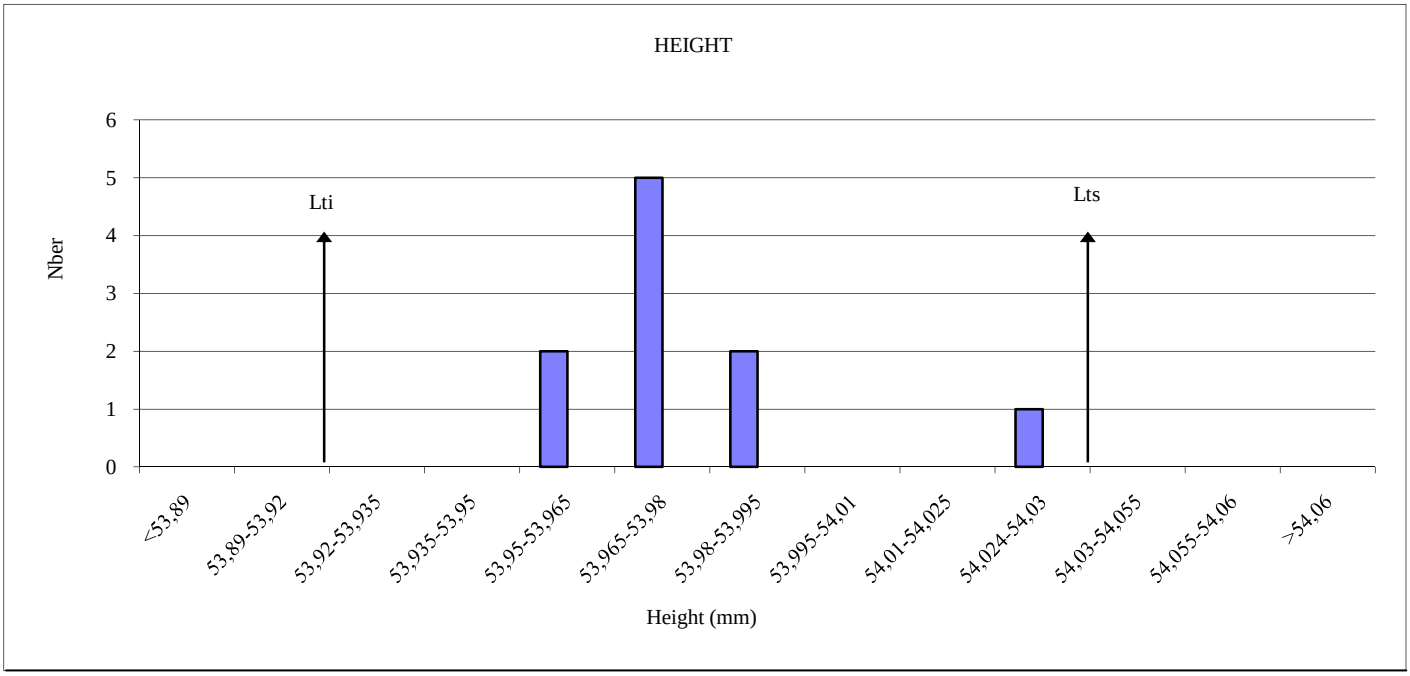
Tested samples are compliant with the specifications.

## Test N°2 – Dimensions of the cards (height & width) 2/2

**WIDTH** :




**HEIGHT :**



## Test N°3 – Dimensions of the cards (edges & corners ) 1/1

**OBJECTIVE :**
The purpose of this test is to veriy the compliancy to the standard of the edges and corners of the card.

**REFERENCE :**
ISO 10373-1 / ISO 7810 5.1.1 & 5.1.2

**TEST BENCH :**
- Profile projector NIKON.
  Precision: +(4+L/25) µm; -(4+L/50) µm with L in mm
  Measure uncertainty : ± 16 µm
- Corner template
- Load of 2.2 N ± 0.2 N

**PROCEDURE :**
Corner: Place the sample card on the level horizontal rigid surface and flatten it under the 2.2N ± 0.2N load. Place the corner template on the screen. Determine if each samples’s corner fits between the minimum and maximum radius curves.
Edge: Place the sample card on the level horizontal rigid surface and flatten it under the 2.2N ± 0.2N load. On one edge, determine the edge limit and set the micrometer. Check the height of every burrs present on this edge. Repeat previous operations with the other edges.

**CRITERIA :**
Card corners shall have a radius included between 2.88 mm and 3.48 mm.
Edge burrs shall not exceed 0.08 mm above the card surface.

**RESULTS : (Cards tested: N°1 to 9L430)**
Nber of Corner failure: 0
Nber of Edge failure: 0

**OBSERVATIONS :**

Tested samples are compliant with the specifications.

# Test N°4 – Bending stiffness



**OBJECTIVE :**
The purpose of this test is to determine whether the bending stiffness of a card test sample lies within the limits set by the base standard.

**SPECIFICATIONS :**
ISO 7810 § 8.1 / ISO 10373-1 § 5.7

**TEST BENCH:**
- A clamping device :
  Measure uncertainty: ± 0.5 mm

**PROCEDURE :**
Mount the sample card in the apparatus such that it is clamped along the entire left side, front surface upwards. Measure the h1. Apply a load equivalent to 0.7 N within 3 mm along the entire right side of the card for 1 min. Measure h2. Dismount the load and let the card return to its original position. After one minute, measure h3.

**CRITERIA :**
The stiffness amplitude (h2-h1) shall be between :
- Minimum superior at 13 mm,
- Maximum inferior at 35 mm.

The sample card shall return within 1.5mm of its original position.

**RESULTS : (Cards tested : N°11 to 20L422)**
Amplitude Min : 16 mm
Amplitude Max : 17 mm
Amplitude Mean : 17 mm
Nb of Failure : 0

| Card N° | Deflection (mm) | H1 (cm) | H2 (cm) | H3 (cm) | Warpage (mm) | Verdict |
|---|---|---|---|---|---|---|
| 11L422 | 17 | 17,4 | 15,7 | 17,3 | 1 | PASS |
| 12L422 | 17 | 17,5 | 15,8 | 17,4 | 1 | PASS |
| 13L422 | 17 | 17,4 | 15,7 | 17,4 | 0 | PASS |
| 14L422 | 17 | 17,4 | 15,7 | 17,3 | 1 | PASS |
| 15L422 | 17 | 17,5 | 15,8 | 17,5 | 0 | PASS |
| 16L422 | 17 | 17,4 | 15,7 | 17,3 | 1 | PASS |
| 17L422 | 17 | 17,5 | 15,8 | 17,5 | 0 | PASS |
| 18L422 | 17 | 17,5 | 15,8 | 17,5 | 0 | PASS |
| 19L422 | 17 | 17,5 | 15,8 | 17,4 | 1 | PASS |
| 20L422 | 16 | 17,4 | 15,8 | 17,4 | 0 | PASS |

**OBSERVATIONS :**
Tested samples are compliant with the specifications.

# Test N°5 – Toxicity

1/1

**OBJECTIVE :**
The purpose of this test is to determine the toxicity of the card.

**REFERENCE :**
ISO 7810 § 8.3 / EN 71-3 (Components migration)

**TEST BENCH :**
- Sub-contractor equipment.

**PROCEDURE :**
Proceed to sampling according to EN 71-3.

**CRITERIA :**
Analysis results shall not show quantity superior to the maximum quantity defined below.

**RESULTS : (Cards tested : N°21 to 30L422)**

| Component | Antimony | Arsenic | Barium | Cadnium | Chromium | Lead | Mercury | Selenium |
|---|---|---|---|---|---|---|---|---|
| Maximum | 60 mg/kg | 25 mg/kg | 1000 mg/kg | < 75 mg/kg | 60 mg/kg | 90 mg/kg | 60 mg/kg | 500 mg/kg |
| Measurement | <2.5 mg/Kg | <0.5 mg/Kg | <0.5 mg/Kg | <0.25 mg/Kg | 0.4 mg/Kg | <2.5 mg/Kg | <0.3 mg/Kg | <0.5 mg/Kg |

**OBSERVATIONS :**

**Test Sub-Contracted**

Tested samples are compliant with the specification.

## Test N°6a – Resistance to chemicals



**OBJECTIVE :**
The purpose of this test is to determine any adverse effects of a range of chemical contamination on a card test sample.

**REFERENCE :**
ISO 7810 § 8.4 / ISO 10373-1 § 5.4

**TEST BENCH :**
- A chronometer.
- A thermometer.

**Solutions :**
a) 5% salt water
b) 5 % acetic acid water
c) 5 % carbonated sodium water
d) Aqueous solution containing 60 % of ethyl alcohol
e) Sugared water (10 % solution)
f) Fuel B (According to ISO 1817 :1985)
g) Ethylene Glycol (50 % solution)
h) Alkaline artificial perspiration
i) Acid artificial perspiration

**Precision :**
± 1 s for the short time.
± 1 min for the long time.

- A terminal TODOS Argos Mini II.

**PROCEDURE :**
Expose the card to the appropriate short term or long term contamination described before. Immediately after removal from the solution, wash the card in distilled water and dry it with absorbent tissue.
Perform any post-exposure measurements required by the base standard.

**Short term contamination :**
The card is exposed during one minute to the solutions as follow, at a temperature between 20°C and 25 °C.
a) 5% salt water (Card N°31 and 32)
b) 5 % acetic acid water(Card N°33 and 34)
c) 5 % carbonated sodium water (Card N°35 and 36)
d) Aqueous solution containing 60 % of ethyl alcohol (Card N°37 and 38)
e) Sugared water (10 % solution) (Card N°39 and 40)
f) Fuel B (According to ISO 1817 :1985) (Card N°41 and 42)
g) Ethylene Glycol (50 % solution) (Card N°43 and 44).

## Test N°6a – Resistance to chemicals 2/2

**Long term contamination:**
Artificial perspiration. (Card N°45 to 46L422)

Two solutions are used: alkaline solution and acid solution. The card is exposed to each solution during 24 hours. Both solutions shall be prepared in accordance with ISO 105-E, 04-1978, « Textiles - Tests for colour fastness to perspiration ».

**CRITERIA :**
The card shall resist degradation of its performance and appearance as a result of exposure to commonly encountered chemicals.

**RESULTATS : (Cards tested : N°31 to 46L422)**

| | |
|---|---|
| Nb of Aspect Failure : | 0 |
| Nb of Microcircuit Failure : | 0 |

**OBSERVATIONS :**

Tested samples are compliant with the specifications.

## Test N°6b – Salt mist

1/1

**OBJECTIVE :**
Verify the quality of the surface protection of the contacts on electrical resistance and impedance of contacts characteristics.

**REFERENCE :**
ISO 7810 / ISO 10373-1 §5.4.1.2a / ISO 7816 / ISO 9227:1990

**TEST BENCH :**
- A salt mist chamber : BS3
- A terminal TODOS Argos Mini II.

**PROCEDURE :**
Put the test card sample in a test chamber with parameters set to :
- Concentration of sodium's chlorate : 5.0% +/- 0.5%
- Density of the solution : $1030<\rho(Kg/m^3)<1040$
- Ph of the salt solution : 6.50<Ph<7.20.

After 24 hours of testing in the salt mist the control of the parameters done :
- Ph of the salt solution : 7.10
- Density of the solution : $\rho=1034\ Kg/m^3$
- Pressure : 1.0 bars
- Testing temperature : 35°C +/- 1°C.

**CRITERIA :**
After the test check the aspect and the functionality of the test card sample.

**RESULTATS : (Cards tested : N°171 to 175L422)**
Nb of Aspect Failure : 0
Nb of Microcircuit Failure : 0

**OBSERVATIONS :**

**Test Sub-Contracted**

Tested samples are compliant with the specifications.

# Test N°7 – Card dimensional stability and warpage w ith Temperature and Humidity exposure



**OBJECTIVE :**
The purpose of this test is to establish whether the dimensions and flatness of a card test sample remain within the requirements of the base standard after exposure to the specified environmental temperature and humidity.

**SPECIFICATIONS :**
ISO 10373-1 / ISO 7810 § 8.1.5

**TEST BENCH :**.
- Two climatic chambers VC2020 Votsch & Fryka.
  Precision : A climatic chamber FRYKA: ± 5°C
  A climatic chamber VOTSCH: ± 2°C
- A profile projector NIKON.
  Precision : +(4+L/25) µm; -(4+L/50) µm with L in mm
  Measure uncertainty : ± 16 µm
- A micrometer Mitutoyo:
  Resolution: 1 µm
  Precision of the measure: ± 3 µm
  Force of the measure: 0.8 N
- A load of 2.20 ± 0.01 N

**PROCEDURE :**
Place the sample card on a horizontal flat surface and expose it to each of the environments in the sequence listed below for 60 min :

Step 1 :
- Low temperature : -35°C ± 3%;
- Humidity: 50% ± 5%;
- Delay: 1 Hour;
- Maximum transfer delay: 15 seconds;

Step 2 :
- High temperature : +50°C ± 3%;
- Humidity: 50% -3% +2%;
- Delay: 1 Hour;
- Maximum transfer delay: 15 seconds;

Following each exposure in the sequence, return the sample card to the default test environment and retain it in this environment for 24 hours before measuring its dimensional stability and warpage.

**RESULTS : (Cards tested : N°50 to 59L422)**
Nb of Thickness Failure : 0 (2 measurements are in the uncertainty area of the micrometer)
Nb of Width Failure : 0
Nb of Height Failure : 0 (1 measurement is in the uncertainty area of the micrometer)
Nb of Card Warpage Failure : 0

## Test N°7 – Cards dimensional stability and warpage with Temperature and Humidity exposure



| | N° | Thickness (µm) | Width (mm) | Height (mm) | Warpage |
|---|---|---|---|---|---|
| Before Test | 50L422 | 824 | 85,72 | 54,005 | 0,836 |
| | 51L422 | 830 | 85,683 | 54,025 | 0,91 |
| | 52L422 | 840 | 85,712 | 54,014 | 0,843 |
| | 53L422 | 840 | 85,714 | 54,001 | 0,862 |
| | 54L422 | 827 | 85,688 | 53,997 | 0,924 |
| | 55L422 | 829 | 85,717 | 53,985 | 0,926 |
| | 56L422 | 818 | 85,645 | 54,024 | 0,939 |
| | 57L422 | 820 | 85,629 | 54,027 | 0,909 |
| | 58L422 | 823 | 85,617 | 54,004 | 0,97 |
| | 59L422 | 824 | 85,712 | 53,994 | 0,826 |

| | N° | Thickness (µm) | Width (mm) | Height (mm) | Warpage |
|---|---|---|---|---|---|
| After Test | 50L422 | 823 | 85,694 | 53,986 | 1,012 |
| | 51L422 | 830 | 85,655 | 54,01 | 1,116 |
| | 52L422 | 842 | 85,696 | 53,991 | 1,033 |
| | 53L422 | 842 | 85,689 | 53,977 | 1,091 |
| | 54L422 | 828 | 85,701 | 53,966 | 1,135 |
| | 55L422 | 829 | 85,676 | 53,976 | 1,149 |
| | 56L422 | 820 | 85,685 | 54,017 | 1,142 |
| | 57L422 | 822 | 85,672 | 54,04 | 1,14 |
| | 58L422 | 823 | 85,681 | 54,019 | 1,099 |
| | 59L422 | 825 | 85,707 | 53,989 | 0,97 |

| | N° | Thickness (µm) | Width (mm) | Height (mm) |
|---|---|---|---|---|
| Statistics | 50L422 | 0,12 | 0,04 | 0,04 |
| | 51L422 | 0 | 0,03 | 0,03 |
| | 52L422 | 0,24 | 0,02 | 0,04 |
| | 53L422 | 0,24 | 0,03 | 0,04 |
| | 54L422 | 0,12 | 0,02 | 0,06 |
| | 55L422 | 0 | 0,05 | 0,02 |
| | 56L422 | 0,24 | 0,05 | 0,01 |
| | 57L422 | 0,24 | 0,05 | 0,02 |
| | 58L422 | 0 | 0,07 | 0,03 |
| | 59L422 | 0,12 | 0,01 | 0,01 |

**OBSERVATIONS :**

Tested samples are compliant with the specifications.

## Test N°8 – Delamination (90°) 1/1

**OBJECTIVE:**
The purpose of this test is to measure resistance to delamination in terms of the peel strength of projective over-laminates applied to a printed card test sample.

**REFERENCE:**
ISO 7810 § 8.8 / ISO 10373-1 § 5.3

**TEST BENCH :**
- A measuring device DY30.

**PROCEDURE :**
Cut the card, or score through the layer, to produce sections of width 10mm ± 0.1 mm (0.39 in ± 0.04 in). Using a sharp knife, cut the layer back from the core approximately 10 mm (0.4 in) and apply the clamp or adhesive tape to the cut back edge of the layer and core. If the peeling angle cannot be kept at 90° during the measurement, attach the stabilising plate to the core in advance. Place the prepared specimen in the tensile tester fixture. The card shall be fixed on the apparatus. Operate the tensile tester according to the manufacturers instructions 300 mm/min (11.8 in/min) to determine the peel strength in Newton’s per centimeters.

**CRITERIA :**
The minimum peel strength on one millimeter is 3,5 N/cm.

**RESULTS : (Cards tested : N°60 to 69L422)**
Nb of Failure : 0

**OBSERVATIONS :**
For all the cards test sample, it is impossible to prepare the cards for the test due to the adherence for the surface, The ISO standards says “a tearing of the overlay during the test signifies that the bond is stronger than the overlay, which is automatically deemed acceptable”.
So the cards tested are compliant with the test specifications.

# Test N°9 – Adhesion or blocking



**OBJECTIVE:**
The purpose of this test is to determine any adverse effects when card test samples (finished cards) are stacked together.

**SPECIFICATIONS :**
ISO 7810 § 8.9 / ISO 10373-1 § 5.6

**TEST BENCH :**

- A climatic chamber VC2020 Vostch.
  Precision : Temperature : ± 2°C
  Humidity: ± 3 %

- A rigid metallic board which applies a force of 2,5 kPa ( 11,54 N +/-0.02 N).

**PROCEDURE :**
Stack the samples cards in group of five, all in the same orientation with the back sides of the cards down. Apply a uniform pressure of 2.5 Kpa (± 0.13 Kpa) over the top card surface. The environment shall be at a temperature of 40°C (± 3°C) and a relative humidity between 40% and 60% f or 48 hours.

**CRITERIA :**
The cards shall be easily separated by hand and any aspects defaults should be observed.

**RESULTS : (Cards tested : N°70 to 79L422)**
Nb of Aspect Failure : 0

***Nb of Separation Failure : 0***

**OBSERVATIONS :**

Tested samples are compliant with the specifications.

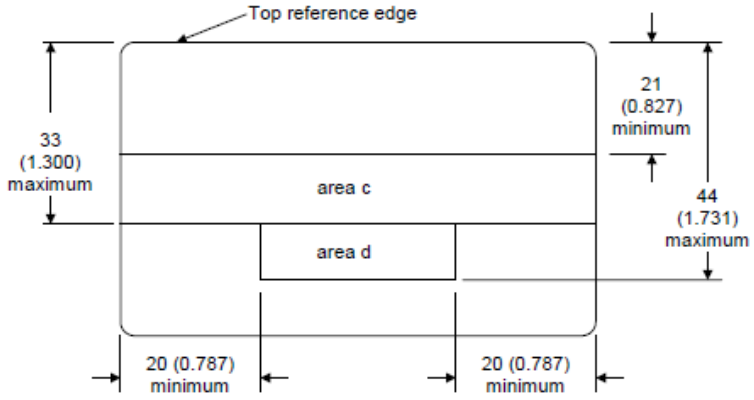
# Test N°10 –Opacity (IR Led method) 1/2

**OBJECTIVE:**
The purpose of this test is to determine the opacity/light transmittance density over a spectral range of 400 nm to 1000 nm.

**REFERENCE :**
ISO 10373-1 / ISO 7810.

**TEST BENCH:**
- Apparatus described in ISO 1.373-1 §5.10.2 with a LED at 860 nm and a LED at 950 nm
- reference : 5% densitometric screen (ORM 7810)

**PROCEDURE:**
Two spots are chosen for measurements. Spots shall be anywhere on the card excepted in area 'c' and area 'd', and there shall be at least one spot per printed colour in each area measured.




**CRITERIA :**
The light transmittance shall be greater than 1.3 form 450 nm to 950 nm and greater than 1.1 from 950 nm to 1000 nm.

**RESULTS :** (In optical density) **(Cards tested : N°80 to 89L422)**
Nb of Failure : 0

Ratio of IR led current between sample and reference card

| Item | 860 nm led | 950 nm led |
|---|---|---|
| BOCR (reference black) | 0.0 | 0.0 |
| ORM 7810 (reference material) | 5.0 | 4.7 |

## Test N°10 – Opacity (IR Led method) 2/2

| Item | 860 nm led | 950 nm led | Verdict (< 1) |
|---|---|---|---|
| 80L422 | 0.0 | 0.0 | PASS |
| 81L422 | 0.0 | 0.0 | PASS |
| 82L422 | 0.0 | 0.0 | PASS |
| 83L422 | 0.0 | 0.0 | PASS |
| 84L422 | 0.0 | 0.0 | PASS |
| 85L422 | 0.0 | 0.0 | PASS |
| 86L422 | 0.0 | 0.0 | PASS |
| 87L422 | 0.0 | 0.0 | PASS |
| 88L422 | 0.0 | 0.0 | PASS |
| 89L422 | 0.0 | 0.0 | PASS |

**OBSERVATIONS :**

Tested samples are compliant with the specifications.

# Test N°11 – Card Warpage



**OBJECTIVE:**
The purpose of this test is to measure degree of warpage of a card test sample.

**REFERENCE :**
ISO 7810 § 8.11 / ISO 10373-1 § 5.1

**TEST BENCH :**

- A profile projector NIKON.

Precision: profile projector: +(4+L/25) µm; -(4+L/50) µm with L in mm
Measure uncertainty : ± 16 µm

- A measuring device.

**PROCEDURE :**
Place the card on the level rigid plate of the measuring apparatus. The card edges shall rest on the plate (warpage of the card in convex form to plate). Read the extent of warpage on the measuring device at the greatest point of the displacement, measured from the front surface of the card.

**CRITERIA :**
The maximum warpage of a card shall be less than 1,5 mm.

**RESULTS : (Cards tested : N°1 to 199L422)**

| | |
|---|---|
| Nb of Failure : | 0 |
| Mean : | 0.970 mm |
| Max : | 1.159 mm |
| Min : | 0.794 mm |
| Standard Deviation : | 0.085 mm |

**OBSERVATIONS :**

Tested samples are compliant with the specifications.

# Test N°11 – Card Warpage



| Card Nber | Warpage | Card Nber | Warpage | Card Nber | Warpage | Card Nber | Warpage |
|---|---|---|---|---|---|---|---|
| 1 | 0,962 | 51 | 1,029 | 101 | 1,02 | 151 | 0,93 |
| 2 | 0,972 | 52 | 0,917 | 102 | 0,829 | 152 | 1,082 |
| 3 | 0,855 | 53 | 0,962 | 103 | 0,918 | 153 | 1,064 |
| 4 | 1,013 | 54 | 0,963 | 104 | 0,816 | 154 | 1,056 |
| 5 | 1,139 | 55 | 0,997 | 105 | 0,971 | 155 | 1,011 |
| 6 | 0,916 | 56 | 1,074 | 106 | 0,978 | 156 | 0,939 |
| 7 | 1,008 | 57 | 1,057 | 107 | 0,892 | 157 | 0,944 |
| 8 | 0,931 | 58 | 1,106 | 108 | 0,899 | 158 | 0,952 |
| 9 | 1,035 | 59 | 0,905 | 109 | 0,847 | 159 | 0,929 |
| 10 | 0,993 | 60 | 0,923 | 110 | 1,03 | 160 | 0,929 |
| 11 | 1,098 | 61 | 0,942 | 111 | 0,91 | 161 | 0,93 |
| 12 | 0,935 | 62 | 0,984 | 112 | 1,073 | 162 | 0,923 |
| 13 | 1,046 | 63 | 0,954 | 113 | 0,892 | 163 | 0,908 |
| 14 | 1,05 | 64 | 0,961 | 114 | 0,995 | 164 | 0,927 |
| 15 | 0,93 | 65 | 1,086 | 115 | 0,927 | 165 | 0,925 |
| 16 | 1,041 | 66 | 1,088 | 116 | 0,967 | 166 | 1,097 |
| 17 | 0,913 | 67 | 1,089 | 117 | 0,954 | 167 | 0,943 |
| 18 | 0,958 | 68 | 1,042 | 118 | 0,889 | 168 | 0,919 |
| 19 | 0,941 | 69 | 1,019 | 119 | 0,905 | 169 | 0,911 |
| 20 | 0,929 | 70 | 0,827 | 120 | 0,912 | 170 | 1,049 |
| 21 | 0,932 | 71 | 1,134 | 121 | 0,894 | 171 | 0,929 |
| 22 | 0,809 | 72 | 1,093 | 122 | 0,938 | 172 | 0,86 |
| 23 | 0,802 | 73 | 1,016 | 123 | 0,915 | 173 | 0,833 |
| 24 | 0,884 | 74 | 1,005 | 124 | 1,095 | 174 | 0,828 |
| 25 | 0,834 | 75 | 0,868 | 125 | 1,073 | 175 | 0,84 |
| 26 | 0,826 | 76 | 0,947 | 126 | 1,033 | 176 | 0,804 |
| 27 | 0,812 | 77 | 0,887 | 127 | 1,096 | 177 | 0,815 |
| 28 | 0,816 | 78 | 0,99 | 128 | 1,039 | 178 | 0,825 |
| 29 | 1,02 | 79 | 0,976 | 129 | 1,085 | 179 | 0,831 |
| 30 | 0,84 | 80 | 0,939 | 130 | 1,059 | 180 | 0,849 |
| 31 | 1,026 | 81 | 0,956 | 131 | 0,908 | 181 | 0,886 |
| 32 | 1,058 | 82 | 1,031 | 132 | 0,954 | 182 | 1,038 |
| 33 | 1,086 | 83 | 1,076 | 133 | 0,939 | 183 | 1,04 |
| 34 | 0,916 | 84 | 1,069 | 134 | 1,082 | 184 | 1,117 |
| 35 | 0,927 | 85 | 1,066 | 135 | 0,876 | 185 | 0,901 |
| 36 | 1,02 | 86 | 0,964 | 136 | 1,073 | 186 | 0,974 |
| 37 | 0,942 | 87 | 1,072 | 137 | 1,02 | 187 | 1,033 |
| 38 | 1,126 | 88 | 0,929 | 138 | 1,107 | 188 | 1,031 |
| 39 | 0,941 | 89 | 1,076 | 139 | 0,898 | 189 | 0,912 |
| 40 | 1 | 90 | 1,003 | 140 | 0,936 | 190 | 0,94 |
| 41 | 0,99 | 91 | 1,016 | 141 | 0,947 | 191 | 1,065 |
| 42 | 0,932 | 92 | 1,088 | 142 | 1,043 | 192 | 1,075 |
| 43 | 1,037 | 93 | 0,907 | 143 | 1,026 | 193 | 1,08 |
| 44 | 0,977 | 94 | 0,91 | 144 | 0,868 | 194 | 1,052 |
| 45 | 1,159 | 95 | 0,912 | 145 | 0,984 | 195 | 1,063 |
| 46 | 0,922 | 96 | 0,927 | 146 | 0,896 | 196 | 1,014 |
| 47 | 1,083 | 97 | 0,794 | 147 | 1,062 | 197 | 1,023 |
| 48 | 0,962 | 98 | 0,849 | 148 | 1,017 | 198 | 1,079 |
| 49 | 0,988 | 99 | 0,817 | 149 | 0,937 | 199 | 0,988 |
| 50 | 0,947 | 100 | 0,915 | 150 | 0,93 | | |

# Test N°12 – Ultraviolet Light



**OBJECTIVE:**
The purpose of this test is to determine any adverse effects arising from exposure of a card test sample to ultraviolet light.

**REFERENCE :**
7816-1 § 4.2.1 / ISO 10373-1 §5.11

**TEST BENCH :**
- A test equipment with :
  Power : 10 W
  Wavelength : 2537 A°
  Irradiation : 12 000 µW/cm²

- A terminal TODOS Argos Mini II.

**PROCEDURE :**
Expose the test sample card to monochromatic light at a wavelength of 254 nm, ensuring that the test environment conditions are maintained. Expose the front of the card to a total energy of 0.15 Ws/mm$^2$, and then repeat the process for the back of the card. The irradiance at the surface of the card shall correspond to an exposure time of 10 minutes to 30 minutes, according to the formula :

$$\text{Time (seconds)} = \frac{0.15 \text{ ( W.sec/mm}^2\text{ )}}{\text{Irradiation (µW/mm}^2\text{)}}$$

For example with irradiance of 0.12 mW/mm², the exposure time is 20min, 50 sec.

**CRITERIA :**
After the test check the aspect and the functionality of the test card sample.

**RESULTS : (Cards tested : N°90 to 96L422)**
Nb of Aspect Failure : 0
Nb of Microcircuit Failure : 0

**OBSERVATIONS :**
The exposure time is 20min, 50 sec.

Tested samples are compliant with the specifications.

# Test N°13 – X-Rays



**OBJECTIVE:**
The purpose of this test is to determine any adverse effects arising from exposure of a card test sample to X-rays.

**REFERENCE :**
ISO 7816-1 § 4.2.2 / ISO 10373-1 § 5.12

**TEST BENCH:**
- A chamber for X-rays.
- A terminal TODOS Argos Mini II.

**PROCEDURE:**
Expose both side of the card to X-ray radiation about 0.1 Gy by side with an acceleration voltage of 110 kV.

**CRITERIA :**
After the test check the aspect and the functionality of the test card sample.

**RESULTS : (Cards tested : N°97 to 106L422)**
Nb of Aspect Failure : 0
Nb of Microcircuit Failure : 0

**OBSERVATIONS :**

**Test Sub-Contracted**

Tested samples are compliant with the specifications.

# Test N°14 – Surface profile of contacts

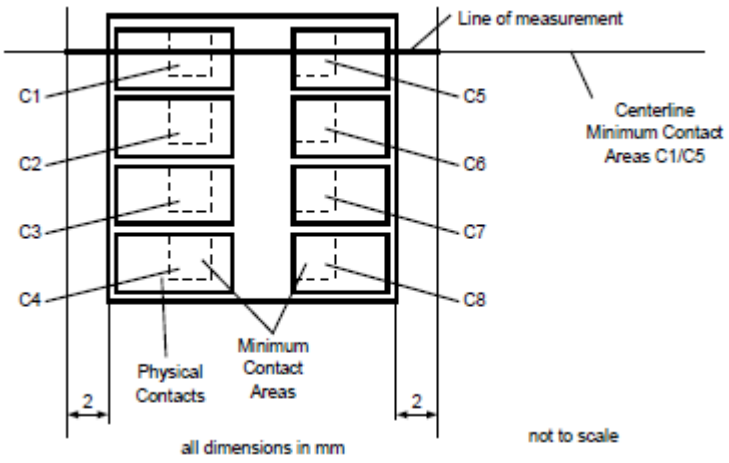


**OBJECTIVE :**
The purpose of this test is to determine the difference in thickness between the ICC’s contacts and the adjacent ICC surface.

**REFERENCE :**
ISO 7816-1 § 4.2.3 / ISO 10373-3 § 5.4

**TEST BENCH :**
- A micrometer Mitutoyo:
  - Resolution: 1 µm
  - Precision of the measure: ± 3 µm
  - Force of the measure: 0.8 N

**PROCEDURE :**
Apply the card test sample on a plate surface.
Construct a measurement line on the surface of the ICC along the centreline of the minimum contact areas C1 and C5, beginning and ending at a distance of 2mm of the metallized contact surface.




Measure the distance between the level rigid plate and the start and endpoint of the measurement line and calculate the arithmetic average of the two distances, subsequently called ‘base thickness’.
Determine the minimum and maximum distance between the level rigid plate and all points on the surface of the ICC along the measurement line.
Calculate the difference between the base thickness and the minimum and the maximum distance determined previously.
Reapeat for the centrelines of the contacts C2 and C6, C3 and C7 and, if present, C4 and C8.

**CRITERIA :**
The difference between the body card and the contacts shall be inferior to 0.10mm.

## Test N°14 – Surface Profile of Contacts 2/2

**RESULTS : (Cards tested : N°107 to 116L422)**
Nb of Failure : 0

| Card N° | C1 – C5 | | C2 – C6 | | C3 – C7 | | C4 – C8 | |
|---|---|---|---|---|---|---|---|---|
| | min | max | min | max | min | max | min | max |
| 107L422 | -53 | -36 | -69 | -47 | -64 | -59 | -51 | -41 |
| 108L422 | -69 | -44 | -97 | -55 | -97 | -52 | -51 | -50 |
| 109L422 | -67 | -55 | -83 | -63 | -70 | -67 | -44 | -39 |
| 110L422 | -53 | -37 | -75 | -54 | -68 | -58 | -39 | -37 |
| 111L422 | -51 | -49 | -63 | -58 | -69 | -57 | -28 | -26 |
| 112L422 | -52 | -21 | -51 | -30 | -52 | -36 | -38 | -23 |
| 113L422 | -83 | -77 | -82 | -74 | -89 | -69 | -41 | -36 |
| 114L422 | -58 | -50 | -66 | -57 | -66 | -59 | -41 | -33 |
| 115L422 | -69 | -65 | -87 | -80 | -100 | -86 | -68 | -44 |
| 116L422 | -70 | -61 | -69 | -59 | -70 | -59 | -62 | -51 |

**OBSERVATIONS :**

Tested samples are compliant with the specifications.

# Test N°15 – Mechanical test



**OBJECTIVE :**
The purpose of this test is to verify the behavirou of the card to the stockage and the handling.

**REFERENCE :**
ISO7816-1 § 4.2.4

**TEST BENCH :**
- A tool DY30.
- A terminal TODOS Argos Mini II.

**PROCEDURE :**

- The embedded card (module side up) is positioned on a plate
- Determine the center of chip module
- Apply a force of 1.5N to the center of IC module (front side) for 1 minute.

**CRITERIA :**
After the test check the aspect and the functionality of the test card sample.

**RESULTS : (Cards tested : N°117 to 126L422)**
Nb of Failure : 0

**OBSERVATIONS :**

Tested samples are compliant with the specifications.

# Test N°16 – Electrical surface resistance of contac ts



**OBJECTIVE :**
The purpose of this test is to measure the electrical resistance between card-contact surface and card-connector contacts using a test card connector.

**REFERENCE :**
ISO 10373-3 / ISO7816-1.

**TEST BENCH :**
- One HP 34401 A.
- A terminal TODOS Argos Mini II.

**PROCEDURE :**
Apply the two test probes to the card contact with a force of 0.5N +/-0.1N. The applied voltage shall not exceed the voltage drop caused by the maximum permitted test current across the maximum resistance. Measure the contact resistance and impedance by the voltage drop across two connections in series. Perform the test for each minimum rectangular surface area.

**CRITERIA :**
The measurement of resistance on each contact shall be inferior to 500 mΩ.

**RESULTS : (In mΩ) (Cards tested : N°127 to 136L422)**
Nb of Failure : 0

| Card N° | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 |
|---|---|---|---|---|---|---|---|---|
| 127L422 | 54 | 59 | 57 | 63 | 58 | 56 | 73 | 52 |
| 128L422 | 61 | 81 | 64 | 78 | 63 | 65 | 63 | 74 |
| 129L422 | 62 | 63 | 64 | 62 | 57 | 63 | 65 | 70 |
| 130L422 | 53 | 62 | 65 | 55 | 52 | 55 | 50 | 57 |
| 131L422 | 64 | 63 | 60 | 62 | 54 | 56 | 55 | 61 |
| 132L422 | 64 | 66 | 68 | 60 | 57 | 59 | 69 | 61 |
| 133L422 | 60 | 52 | 59 | 51 | 56 | 59 | 62 | 60 |
| 134L422 | 60 | 75 | 65 | 61 | 54 | 51 | 57 | 70 |
| 135L422 | 63 | 53 | 62 | 64 | 64 | 60 | 59 | 61 |
| 136L422 | 63 | 55 | 60 | 51 | 52 | 53 | 57 | 63 |

**OBSERVATIONS :**

Tested samples are compliant with the specifications.

# Test N°17 – Static Electricity



**OBJECTIVE :**
The purpose of this test is to determine any adverse effects of a electrostatic discharge on the component.

**REFERENCE :**
ISO7816-1 § 4.2.7 / ISO 10373-3 § 5.2

**TEST BENCH :**
- A static discharge simulator.
- A terminal TODOS Argos Mini II.

**PROCEDURE :**
A discharge with a capacity of 100 pF is sent behind a resistor of 1500 Ohms. This discharge is successively sent on each contact of the card with a normal and inverse polarity. The tension of discharge is 4000 V. The time between each pulse must be set to 5 seconds minimum.

**CRITERIA :**
After the test check the aspect and the functionality of the test card sample.

**RESULTS : (Cards tested : N°137 to 146L422)**
Nb of Aspect Failure : 0
Nb of Microcircuit Failure : 0

**OBSERVATIONS :**

Tested samples are compliant with the specifications.

# Test N°18 – Operating temperature



**OBJECTIVE:**
The purpose of this test is to check that the samples are operating as intended when submitted to an ambient temperature ranging from 0℃ to 50℃.

**REFERENCE :**
ISO 10373-6 / ISO 14443-1 §4.3.9.

**TEST BENCH:**
- Climatic chamber: 02/03

| | |
|---|---|
| Brand: | SERVATHIN |
| Model or Type: | SAPRATIN |
| Serial Number: | 95/20793 |
| Certificate of calibration: | 1-1597 21/05/2008 |

- A terminal TODOS Argos Mini II.

**PROCEDURE:**
The PICC under test and a terminal are placed under a temperature during 30 minutes. The functionality of the sample is then checked, within the climate chamber, by verifying the answer to ATR. The ambient temperatures of the thermal chamber verified are 0°C, 25℃ and 50℃.

**CRITERIA :**
After the test check the aspect and the functionality of the test card sample.

**RESULTS : (Cards tested : N°147 to 150L422)**

| | |
|---|---|
| Nb of Aspect Failure : | 0 |
| Nb of Microcircuit Failure : | 0 |

**OBSERVATIONS :**

Tested samples are compliant with the specifications.

# Test N°19 – Dynamic bending stress



**OBJECTIVE:**
The purpose of this test is to determine any adverse mechanical or functional effects of bending stress in a card test sample.

**REFERENCE :**
ISO 7816-1 § 4.2.9 / ISO 10373-1 §5.8

**TEST BENCH :**

- A test machine for unilateral bending Cybernetix.
  Precision : Flexion Amplitude: ± 1 mm
  Flexion Frequency: ± 0.05 Hz

- A terminal TODOS Argos Mini II.

**PROCEDURE :**
Place the card test sample between the jaws of the test machine, positioned such that the bend occurs by curvature of the width. Apply one quarter the total number of bendings specified by the base standard or, if no such number is specified, 250 bendings.
Reposition the card such that the opposite face of the card is uppermost but the bend still occurs by curvature of the width. Apply the same number of bendings as before.
Reposition the card and reset the test machine such that the same face of the card is uppermost but the bend still occurs by curvature of the height. Apply the same number of bendings as before.
Reposition the card such that the opposite face of the card is uppermost but the bend still occurs by curvature of the height. Apply the same number of bendings as before.

**CRITERIA :**
After the test check the aspect and the functionality of the test card sample.

**RESULTS : (Cards tested : N°151 to 160L422)**
Nb of Aspect Failure : 0
Nb of Microcircuit Failure : 0

**OBSERVATIONS :**

Tested samples are compliant with the specifications.

# Test N°20 – Dynamic torsional stress



**OBJECTIVE:**
The purpose of this test is to determine any adverse mechanical or functional effects of torsional stress in a card test sample.

**REFERENCE :**
ISO 7816-1 § 4.2.10 / ISO 10373-1 § 5.9

**TEST BENCH :**
- A torsional apparatus Cybernetix.
  Precision : Angle of torsion: ± 1 °
  Frequency of torsion: ± 0.05 Hz

- A terminal TODOS Argos Mini II.

**PROCEDURE :**
Place the card under test in the torsional apparatus.
Set the frequency to 0,5 Hz and the angle $\alpha$ to 15°.
Apply the number of torsion specified, here 1000 torsions.

**CRITERIA :**
After the test check the aspect and the functionality of the test card sample.

**RESULTS : (Cards tested : N°161 to 170L422)**
Nb of Aspect Failure : 0
Nb of Microcircuit Failure : 0

**OBSERVATIONS :**

Tested samples are compliant with the specifications.

# Test N°21 – Location of contacts



**OBJECTIVE :**
The purpose of this test is to measure the location of the contacts on the card.

**REFERENCE :**
ISO 7816-2 § 4 / ISO 10373-3 §5.1

**TEST BENCH :**
- A profil projector NIKON
  Precision: +(4+L/25) µm; -(4+L/50) µm, with L in mm
  Measure uncertainty : ± 16 µm

- A tracing at the minimum dimensions.

- A load of 2.2 N ± 0.2 N

**PROCEDURE :**
Place the card to be tested, contact side up, on a flat hard surface. The card shall be held down by a load of 2.2N ± 0.2N.
Verify that the contacts are placed in the tracing minimum dimensions.

**CRITERIA :**

| Contact | A | B | C | D |
|---|---|---|---|---|
| C1 | 10.25 | 12.25 | 19.23 | 20.93 |
| C2 | 10.25 | 12.25 | 21.77 | 23.47 |
| C3 | 10.25 | 12.25 | 24.31 | 26.01 |
| C4 | 10.25 | 12.25 | 26.85 | 28.55 |
| C5 | 17.87 | 19.87 | 19.23 | 20.93 |
| C6 | 17.87 | 19.87 | 21.77 | 23.47 |
| C7 | 17.87 | 19.87 | 24.31 | 26.01 |
| C8 | 17.87 | 19.87 | 26.85 | 28.55 |

A and C are the maximum values, B and D are the minimum values.

**RESULTS : (Cards tested : N°1 to 9L430)**
Nb of Failure : 0

**OBSERVATIONS :**

Tested samples are compliant with the specifications.

# Test N°22 –Light fastness



**OBJECTIVE :**
Verify the resistance of the card body to the exposure to a light source.

**REFERENCE :**
ISO 105-B02 (09-94) / DIN54004 Method 2.

**TEST BENCH :**
- A XENOTEST 150S.

**PROCEDURE :**
The cards are placed in a test chamber. They are exposed to the light source (Xenon Arc) during a period of 168 hours. In same time that the cards, a blue scale is placed in the chamber, this one is constituted with four talon N°4, N°5, N°6 and N°7. After the 168 hou rs, the evaluation of the colour is made by the way of a chamber which simulate the day light.

**CRITERIA :**
The degradation of the cards are compared to the grey scale (method ISO 105 A2) and to the blue scale (method NFG 07 012.2). Blue scale index shall be superior or equal to 3.

**RESULTS : (Cards tested : N°176 to 180L422)**

| N° | Location | Cotation Grey scale | Cotation Blue scale | Observations - Aspect |
|---|---|---|---|---|
| 176L422 | Blue Arrow | 5 | >4 | PASS |
| | Chip | 5 | >4 | PASS |
| | Green Background | 5 | >4 | PASS |
| | Yellow Background | 5 | >4 | PASS |
| 177L422 | Blue Arrow | 5 | >4 | PASS |
| | Chip | 5 | >4 | PASS |
| | Green Background | 5 | >4 | PASS |
| | Yellow Background | 5 | >4 | PASS |
| 178L422 | Blue Arrow | 5 | >4 | PASS |
| | Chip | 5 | >4 | PASS |
| | Green Background | 5 | >4 | PASS |
| | Yellow Background | 5 | >4 | PASS |

## Test N°22 – Light fastness 2/2

| N° | Location | Cotation Grey scale | Cotation Blue scale | Observations - Aspect |
|---|---|---|---|---|
| 179L422 | Blue “UTO” logo | 4/5 | 4 | PASS |
| | Red “UTO” logo | 5 | >4 | PASS |
| | Blue printings | 4/5 | 4 | PASS |
| | Hologram | 5 | >4 | PASS |
| | Lodvila logo Yellow area | 4/5 | 4 | PASS |
| | Lodvila logo White area | 4/5 | 4 | PASS |
| | Lodvila logo Green & Blue areas | 5 | >4 | PASS |
| | Yellow background | 4/5 | 4 | PASS |
| | Green background | 5 | >4 | PASS |
| 180L422 | Blue “UTO” logo | 4/5 | 4 | PASS |
| | Red “UTO” logo | 5 | 4 | PASS |
| | Blue printings | 4/5 | >4 | PASS |
| | Hologram | 5 | 4 | PASS |
| | Lodvila logo Yellow area | 4/5 | >4 | PASS |
| | Lodvila logo White area | 4/5 | 4 | PASS |
| | Lodvila logo Green & Blue areas | 5 | >4 | PASS |
| | Yellow background | 4/5 | 4 | PASS |
| | Green background | 5 | >4 | PASS |

Tested samples are compliant with the specifications.

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