VERSATILE EQUIPMENT
TO PRODUCE, TEST AND PROGRAM

Your smart objects: Cards, Passports, SMD & eSIMs
BG INGENIERIE is a privately owned family run company. Our parents started in 1999 with the aim to be active on smart card market for small card production and small equipment (production, test). The result is what BG INGENIERIE is today: a worldwide leading supplier in particular in test equipment for cards and passports.

Through the years, BG INGENIERIE got recognition from the card and passport actors to become a leader in equipment development, following norms (cards, passports) or following specific customer requirements (laboratory card production, specific vision inspection, inlay modification, RFID robot tester, and most recently personalization equipment).

Getting the name BG INGENIERIE known worldwide was a real challenge but we achieved it in particular thanks to our partners and customers.

We thank you all for your trust in our products, for your trust in our developments, and as we always say: Future is linked with our customers and their new requirements.... yours.

Warmest regards

Joël BESNIER
Nicolas BESNIER
YOUR KEY PARTNER around cards and passports technologies

BG Ingénierie is created and starts with smartcard production services

1999

2001
First manual chip implanting production line

2003
CQM and ISO card testing equipment released

2006
Launch of the Specific requirements program

2008
Passport testing equipment to answer ICAO specification

2010
Joël & Nicolas become directors

2011
BG Ingénierie joins ICMA Association
First automatic chip implanting equipment installed

2013

2016
BG Ingénierie receives the National French “Stars & Métiers: Prix de l’innovation Technologique”

2017
850th equipment sold
First SMD & eSIMs perso & laser engraving equipment

850 equipment installed
In more than 50 countries

Customizable equipment
18 years of experience

MADE IN FRANCE
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Card milling, Chip implanting, Chip punching, GSM-SIM punching, Module test handler, Card programming, SMD and eSIMs personalization and laser engraving...
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PRODUCTION & PERSONALIZATION EQUIPMENT
In 1999, BG INGENIERIE entered the card market supplying chip implanting services for small productions. Through the years, we developed manual and automatic equipment to meet customer requirements.

- Manual solution (from 500 to 3 000 units/h)
  - Prototypes and process validation (plastic, glue, chip, other elements...)
  - Small production throughput (up to 1 million cards per year)
- Automatic solution (from 1 000 to 10 000 units/h)
  - Intermediate production throughput (banking, ID, loyalty, GSM...)

In 2014, BG INGENIERIE released a first personalization equipment for chips on reels, for contact chips but also dual interface and pure RFID chips and cobs.

NEW: Since 2016, we propose multi form factor pick & place, programming and LASER engraving units, working with JEDEC trays and tapes, on secure elements such as μSD cards, QFN, DFN, MFF2, eMMc....

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Feature & Description

The BGI139 is a ready to use stand-alone desktop manual equipment. This equipment laminates hotmelt tape on reels of chips.
Lamination pressor can be changed in few minutes to swap from one dimension to another.
- Manual unrolling of the reel
- Manual positioning of the reel under the lamination tool
- Step by step indexing by pins
- Pressor in brass
- Lamination system for standard 35 mm width reels
- Equipment supplied with 1 set of lamination pressor
- Pressor dimensions: 11.8x13mm, 10.8x13mm, 8.32x11mm, others...
- Hotmelt laminating equipment for memory, microprocessor...

Advantages

- Used for low runs, prototypes, lab process tests, material validation ...
- Throughput of up to 3000 units per hour
- Compact and easy to use
- Used for contact chip lamination (2 modules front), specific chip shapes...

<table>
<thead>
<tr>
<th>Description</th>
<th>Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width: 410mm</td>
<td>Power: 100-240V AC</td>
</tr>
<tr>
<td>Depth: 300mm</td>
<td>Frequency: 50-60Hz single phase</td>
</tr>
<tr>
<td>Height: 350mm</td>
<td>Power consumption: 250W maximum</td>
</tr>
<tr>
<td>Weight: 15kg</td>
<td>Pneumatic characteristics: 6 bars</td>
</tr>
</tbody>
</table>

Throughput

- Up to 3000 units/hour

Environmental conditions

- Operating temperature: +10°C to +40°C
Feature & Description

The BGI062 is a ready to use stand-alone desktop manual chip punching equipment for smart card manufacturing. Punching tool can be changed in few minutes to swap from one dimension to another.

- Manual unrolling of the reel
- Manual positioning of the reel under the punching tool
- Step by step indexing by pins
- Punching secured by manual commands
- Punching tool in hardened steel
- Punching system for standard 35 mm width reels
- Equipment supplied with 1 set of punching tool
- Punching dimensions: 11.8x13mm, 10.8x13mm, 8.32x11mm, others...
- Chip punch equipment for memory, microprocessor, contactless chips...

Advantages

- Used for low runs, prototypes, lab process tests, material validation ...
- Throughput of up to 3000 units per hour
- Compact and easy to use
- Used for contact chip punch (2 modules front), RFID cob (3 modules front), RFID inlays (2 modules front)

Description

- Width: 650mm
- Depth: 300mm
- Height: 400mm
- Weight: 12kg

Facilities

- Pneumatic characteristics: 6 bars

Environmental conditions

- Operating temperature: +10°C to +40°C

Throughput

- Up to 3000 units/hour
Feature & Description

The BGI051U is a desktop manual card milling machine for smart card manufacturing. The milling machine realises cavity where the contact chip will be inserted.

- Stand-alone equipment
- Manual card feeding
- Internal control system: no computer required
- Programming and navigation by screen touch

Advantages

- Card milling following ISO7816: milling reference from ISO point and from the top of the card
- Milling not dependant of the thickness of the card
- All chip sizes: 8.32 x 11mm, 10.8 x 13mm, 11.8 x 13mm, other...
- Throughput of 1000 units per hour depending on configuration
- Screen touch interface to jump from one production to another
- Used for production of small runs, prototypes, lab process tests, material validation...
- Suitable for dual interface cards

Market

- Banking, GSM
- Telecom
- e-ID card
- Health card
- Prepaid card
- Gift card
- Loyalty card ...

OPTIONS: - Full card milling
# Manual card milling

## Description
- Width: 660mm
- Depth: 570mm
- Height: 610mm
- Weight: 40kg

## Facilities
- Power: 110 or 220V AC
- Frequency: 50-60Hz single phase
- Power consumption: 650W maximum
- Pneumatic characteristics: 6 bars

## Throughput
- Up to 1000 units/hour

## Environmental conditions
- Operating temperature: +10°C to +40°C

## Accuracy
- X, Y: 0.025mm
- Z: 0.015mm

## Card materials
- PVC, PC, ABS, PET...
- ID1 format or other on demand
Manual chip implanting

The BGI051H is a desktop manual chip implanting machine. The equipment realises the insertion of the chip onto the card. It uses the hotmelt technology.

- Stand-alone equipment
- Manual card feeding
- Internal control system: no computer required
- Programming and navigation by screen touch
- Manual chip feeding onto an ISO reference card
- Up to 6 heads
- Customization possible (potting, etc)

**Advantages**

- Used for low runs, prototypes, lab process tests, material validation ...
- Throughput of 600 units per hour depending on configuration
- Chip implanting following ISO7816
- Implanting not dependant of the thickness of the card
- Implanting solution for memory, microprocessor chips: dimensions 11.8x13mm, 10.8x13mm, 8.32x11mm, etc...
- Suitable for thicker cards
- Screen touch interface
- Suitable for dual interface cards

**Market**

- Banking, GSM
- Telecom
- e-ID card
- Health card
- Prepaid card
- Gift card
- Loyalty card ...
Manual chip implanting

OTHER VERSION AVAILABLE: cold glue implanting for smart objects

Description
- Width: 570mm
- Depth: 660mm
- Height: 610mm
- Weight: 40kg

Facilities
- Power: 100-240V AC
- Frequency: 50-60Hz single phase
- Power consumption: 350W maximum + 200W/head
- Pneumatic characteristics: 6 bars

Throughput
- Up to 600 units/hour

Environmental conditions
- Operating temperature: +10°C to +40°C

Accuracy
- X, Y: 0.025mm

Card materials
- PVC, PC, ABS, PET...
- ID1 format or other on demand

Option: All surface embedding
Possibility to embed other elements: battery, display, button...

Option: Glue - resine dispensing
Possibility to add potting glue dispensing system
# BGI100

Automatic glue tape lamination

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## Feature & Description

The BGI100 is an automatic glue tape lamination equipment (dimension 35mm width).

**Option BGI100a : punch of glue tape.** This option allows to punch the glue tape in order to reduce deformation behind the card during the implanting of the chip.

- Stand alone equipment with automatic hotmelt and chip feeding
- Programming and navigation by screen touch interface

## Advantages

- Used for memory, microprocessor chips...
- Throughput of 10 000 units per hour
- Compact and easy to use with adjustment of time, pressure, temperature...

## Description

<table>
<thead>
<tr>
<th>Description</th>
<th>Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width: 1500mm</td>
<td>Power: 100-240V AC</td>
</tr>
<tr>
<td>Depth: 560mm</td>
<td>Frequency: 50-60Hz single phase</td>
</tr>
<tr>
<td>Height: 1700mm</td>
<td>Power consumption: 250W maximum</td>
</tr>
<tr>
<td>Weight: 95kg</td>
<td>Pneumatic characteristics: 6 bars</td>
</tr>
</tbody>
</table>

## Throughput

- Up to 10 000 units/hour

## Environmental conditions

- Operating temperature: +10°C to +40°C

## Order reference number

- BGI100a

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### Designation option

- Option punching of glue tape

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The BGI154 is a compact automatic chip punch equipment. It accepts reels of chips with a width of 35mm and is suitable for reels with 2 chips upfront (contact, dual interface, pure RFID chips) or 3 chips upfront (COB and small components).

- Detection of failed chip in entrance
- Internal control system: no computer required
- Programming and navigation by screen touch interface
- Specific tray to collect chips

Advantages

- Used for medium and large runs
- Throughput of 10 000 units per hour (2 chips upfront) and 15 000 units per hour (3 chips upfront)
- Compact and easy to use
- Option: other dimension and RFID tag punch possible

### Description
- Width: 1100mm
- Depth: 450mm
- Height: 850mm
- Weight: 64kg

### Throughput
- Up to 15 000 units/hour

### Facilities
- Power: 100-240V AC
- Frequency: 50-60Hz single phase
- Power consumption: 100W maximum
- Pneumatic characteristics: 6 bars

### Environmental conditions
- Operating temperature: +10°C to +40°C
The BGI134 is an automatic card milling equipment.

- Input and output of 500 card stackers with no need to stop the production
- Programming and navigation by screen touch, no computer required
- Automatic milling tip calibration and adjustment of milling depth
- Throughput up to 1500 units per hour depending on configuration, used for medium runs

Advantages

- Card milling following ISO7816: milling reference from ISO point and from the top of the card
- Milling not dependant of the thickness of the card

Feature & Description

Description

- Width: 1600mm
- Depth: 500mm
- Height: 1650mm
- Weight: 150kg

Throughput

- Up to 1500 units/hour

Accuracy

- X, Y: 0.025mm
- Z: 0.015mm

Facilities

- Power: 110 or 220V AC
- Frequency: 50-60Hz single phase
- Power consumption: 1500W maximum
- Pneumatic characteristics: 6 bars

Environmental conditions

- Operating temperature: +10°C to +40°C

Card materials

- PVC, PC, ABS, PET...
- ID1 format or other on demand
The BGI118 is an automatic chip implanting equipment.
- Input and output of 500 card stackers with no need to stop the production
- Programming and navigation of the machine by screen touch, no computer required
- Throughput of up to 1500 units per hour depending on configuration, used for medium runs

Advantages
- Chip implanting following ISO7816
- Suitable for dual interface chip implanting and implanting not dependant of the thickness of the card
- Can be supplied with optionnal chip programming and camera
- Options: ATR checking, mutli heads, paste dispensing, chip positioning verification by camera

<table>
<thead>
<tr>
<th>Description</th>
<th>Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width: 1330mm</td>
<td>Power: 100-240V AC</td>
</tr>
<tr>
<td>Depth: 700mm</td>
<td>Frequency: 50-60Hz single phase</td>
</tr>
<tr>
<td>Height: 1650mm</td>
<td>Power consumption: 750W maximum</td>
</tr>
<tr>
<td>Weight: 200kg</td>
<td>Pneumatic characteristics: 6 bars</td>
</tr>
</tbody>
</table>

Accuracy
- X, Y: 0.025mm

Throughput
- Up to 1500 units/hour

Environmental conditions
- Operating temperature: +10°C to +40°C

Card materials
- PVC, PC, ABS, PET...
- ID1 format or other on demand
BGI136

Automatic GSM-SIM punch

The BGI136 is a compact automatic card punch equipment. Punching tool can be changed to swap from one specific punching shape to another.

- Stacker of 500 cards in input and output
- Internal control system: no computer required
- Programming and navigation by screen touch
- Card materials: PVC, PET, ABS, ID1 format or other on demand

Advantages

- Used for standard production, medium runs and bigger production
- Throughput of up to 2500 units per hour depending on configuration
- Supplied with customer specific punch shape requirement (ex: tri-cards, hole punch, SIM)
- Screen touch interface

Feature & Description

Description

- Width: 910mm
- Depth: 470mm
- Height: 1300mm
- Weight: 90kg

Throughput

- Up to 2500 units/hour

Facilities

- Power: 110 or 220V AC
- Frequency: 50-60Hz 3 phasis
- Power consumption: 1700W maximum
- Pneumatic characteristics: 6 bars

Environmental conditions

- Operating temperature: +10°C to +40°C
The BGI137 is a small automatic desktop machine. It can be used for different tasks and supplied with different featured functionalities such as:

- ATR contact and RFID chip validation, card programming
- Reading and control (barcode, number and data capture by camera, specific customer camera for data recording and comparison, vision inspection...)
- Stacker of 500 cards in input and output
- Internal control system: no computer required
- Programming and navigation by screen touch
- Card materials: PVC, PET, ABS, ID1 format or other on demand
- Controlled by external computer on software (optional)

**Advantages**

- Used for medium runs
- Throughput of 2000 units per hour depending on configuration
- Input and output of 500 card stackers with no need to stop the production to feed the cards in and out
- Compact and easy to use

### Description

- **Width:** 610mm
- **Depth:** 530mm
- **Height:** 670mm
- **Weight:** 20kg

### Throughput

- Up to 2000 units/hour

### Facilities

- **Power:** 100-240V AC
- **Frequency:** 50-60Hz single phase
- **Power consumption:** 100W maximum
- **Pneumatic characteristics:** 6 bars

### Environmental conditions

- **Operating temperature:** +10°C to +40°C
## Feature & Description

The BGI132 is a module handler / chip programming unit for pre-personalisation.

- Automatic unrolling of the reel
- Automatic positioning of the reel under the programming pins
- Punching secured by security sensors
- Punching tool in hardened steel for the optional punching of failed chips
- Programming interface not included

## Advantages

- Throughput of up to 16 chips at the same time (20,000 chips per hour, depending on cycle time)
- Compact and easy to use
- Can realise ATR test and program chips
- Size of the reel of chips: up to Ø460mm
- Punching of failed chips (optional)
- 32 heads version (optional)
- Programming interface (optional)

<table>
<thead>
<tr>
<th>Description</th>
<th>Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width: 770mm</td>
<td>Power: 100-240V AC</td>
</tr>
<tr>
<td>Depth: 360mm</td>
<td>Frequency: 50-60Hz single phase</td>
</tr>
<tr>
<td>Height: 600mm</td>
<td>Power consumption: 100W maximum</td>
</tr>
<tr>
<td>Weight: 45kg</td>
<td>Pneumatic characteristics: 6 bars</td>
</tr>
</tbody>
</table>

### Throughput

- Up to 20,000 units/hour

### Designation

- Option punching of failed chips

### Order reference number

BGI132a
SMD & eSIMs pick & place programming

The BGI173 is a multi form factor, IC pick & place handler and programming equipment.

- I/O: JEDEC trays (tape solution available)
- 8 programming sockets (up to 32)
- IC functionality test, programming and control
- Moves 8 devices at once
- Accepts various form factor of SMD: µSD, BGA, QFN, SOIC, PLCC...

Advantages

- Continuous programming thanks to JEDEC swapping plate solution
- Intuitive touch screen automate color interface
- Quick socket and pickup heads changeover
- Easy machine access for troubleless maintenance
- Specific lockable safe for JEDEC trays stocking
- Automatic rework in case of failed programming
- Gestion of sequentiality of chips numbers

Description

- Width: 1110mm
- Depth: 1000mm
- Height: 920mm
- Weight: 255kg

Throughput

- Depending on configuration:
  - 8 heads: 1500u/h with 10s prog
  - 16 heads: 2000u/h with 20s prog

Facilities

- Power: 100-240V AC
- Frequency: 50-60Hz single phase
- Power consumption: 100W maximum

Environmental conditions

- Operating temperature: +10°C to +40°C
The BGI169 is a multi form factor, IC and smart objects pick & place handler and programming equipment, fitted with LASER engraving and visual validation, for your SMD & eSIMs

- I/O: JEDEC trays and tapes
- 8 programming sockets (up to 32 + optional 8 check sockets)
- IC functionality test, programming and control
- Moves 8 devices at once
- Accepts various form factor of SMD: µSD, BGA, QFN, DFN, QFP, MFF2, SOIC, SSOP, PLCC...
- LASER engraving unit for text and datamatrix
- Optical character recognition and verification
- Vision inspection with possibility of picture storage
- Dedicated rejection bin for fails
Advantages

The BGI169 equipment has been developed to answer customer requirements in terms of usability, accessibility, and versatility. It offers the following advantages:

- Continuous programming thanks to JEDEC swapping plate solution
- Intuitive touch screen automate color interface
- Easy and quick socket and pickup heads changeover
- Easy machine access for troubleless maintenance
- Smart interface with stop, fail, tray replacement alerts
- Throughput depending on configuration (examples):
  - 8 heads: 1000u/h with 10s prog with LASER + vision
  - 16 heads: 2400u/h with 10s prog
  - 16 heads: 1000u/h with 40s prog with LASER + vision
- Automatic rework
- Management of sequentiality of chip numbers

Markets

Electronic components and smart objects are daily used for different applications such as:

- Embedded objects, M2M and IoT
- Automotive and electromobility
- Wearables, healthcare and medical electronics

Options

- Up to 32 programming sockets + 8 for quality check
- Form factors on demand
- Cost effective solution for new form factors
- Fume extractor

Description

- Width: 1280mm
- Depth: 1080mm
- Height: 2000mm
- Weight: 650kg

Throughput

- Depending on configuration (examples):
  - 8 heads: 1000u/h with 10s prog with LASER + vision
  - 16 heads: 2400u/h with 10s prog

Facilities

- Power: 110-220V AC
- Frequency: 50-60Hz single phase
- Power consumption: 1000W maximum
- Pneumatic characteristics: 6 bars

Environmental conditions

- Operating temperature: +10°C to +40°C
CARD TESTING EQUIPMENT
Through the years, BG Ingénierie has developed more than 40 equipment to answer CQM, ISO, ANSI and specific customer requirements.

Card manufacturers, test labs, government institutions..., all trust BG Ingénierie devices for their quality requirements and the possibility to test cards further than the norm for process characterisation.

The test equipment supplied by BG INGENIERIE follow the norm at date of printing. Specifications of the norms and tests could have been updated since the printing.

<table>
<thead>
<tr>
<th>Equipment Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiline tester : torsion, bending, three wheels, abrasion</td>
<td>26</td>
</tr>
<tr>
<td>Dynamic torsional and dynamic bending stress</td>
<td>30</td>
</tr>
<tr>
<td>Bending and shortened bending ultra tester (25-50 cards)</td>
<td>31</td>
</tr>
<tr>
<td>Three wheels (1 axis, 2 axes, ID1, ID3)</td>
<td>32</td>
</tr>
<tr>
<td>Peel strength and pre-cutting tool</td>
<td>34</td>
</tr>
<tr>
<td>Backside spot pressure and driller tool</td>
<td>35</td>
</tr>
<tr>
<td>Embossed character relief height retention pressure</td>
<td>36</td>
</tr>
<tr>
<td>IC card with contacts micromodules adhesion</td>
<td>37</td>
</tr>
<tr>
<td>Rotary stress</td>
<td>38</td>
</tr>
<tr>
<td>Three roller IC card test</td>
<td>39</td>
</tr>
<tr>
<td>Wrapping (manual &amp; automatic)</td>
<td>40</td>
</tr>
<tr>
<td>Resistance to corner impact</td>
<td>41</td>
</tr>
<tr>
<td>Card impact fixture</td>
<td>41</td>
</tr>
<tr>
<td>Resistance to impact (ball impact)</td>
<td>41</td>
</tr>
<tr>
<td>Card static stress</td>
<td>41</td>
</tr>
<tr>
<td>Bending stiffness &amp; cantilver</td>
<td>42</td>
</tr>
<tr>
<td>Overall card warpage (embossed - non embossed card)</td>
<td>42</td>
</tr>
<tr>
<td>Informative card template checking</td>
<td>43</td>
</tr>
<tr>
<td>Pass or fail ID1 length and width</td>
<td>43</td>
</tr>
<tr>
<td>Pass or fail ID1 corner radius</td>
<td>44</td>
</tr>
<tr>
<td>Default ICC holder</td>
<td>44</td>
</tr>
<tr>
<td>Width, height, thickness</td>
<td>45</td>
</tr>
<tr>
<td>Inside tool for adhesion or blocking</td>
<td>45</td>
</tr>
<tr>
<td>Durability of tipping &amp; adhesion of stripe to card</td>
<td>46</td>
</tr>
<tr>
<td>Resonance frequency &amp; Q factor</td>
<td>47</td>
</tr>
</tbody>
</table>

To match the norms with our equipment, refer to page 70-71
Multiline card tester

Option: - Connectivity features

Up to 4 test modules per equipment, to choose from 7 different tests

Feature & Description

The BGI110 is a multifunction testing equipment for ID1 cards. It offers the possibility to use up to 4 lines, each line corresponding to a test and controlled individually.

Advantages

- Tests for contact cards, magstripe cards, RFID cards, dual cards, combi cards
- Possibility to test up to 40 cards simultaneously
- Possibility to order 4 lines on the same equipment
- Possibility to test the cards further than the norm changing only parameters on the interface (number of cycles, frequency, angle...)
- All lines can be removed and replaced by other lines, making a universal interchangeable testing solution
- Easy to use thanks to a screen touch interface in order to create and modify program
- For bending, jaws open more at the end of the test to release totally the cards and help for the insertion
- Independant lines : we can run a test while another one is opened for card insertion

Environmental conditions

- Operating temperature: +10°C to +40°C

Facilities

- Power: 100-240V AC
- Frequency: 50-60Hz single phase
- Power consumption: 250W maximum (4 lines)
### Multiline card tester

<table>
<thead>
<tr>
<th>Designation</th>
<th>Dimensions and weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base of the equipment</td>
<td>440x390x230mm (WxDxH), weight: 9kg</td>
</tr>
<tr>
<td>Multiline card tester - torsion</td>
<td>440x300x210mm (WxDxH), weight: 14kg</td>
</tr>
<tr>
<td>Multiline card tester - bending (CQM)</td>
<td>440x300x210mm (WxDxH), weight: 20kg</td>
</tr>
<tr>
<td>Multiline card tester - shortened bending flexure</td>
<td>440x300x210mm (WxDxH), weight: 20kg</td>
</tr>
<tr>
<td>Multiline card tester - 3 wheels 1 axis x 2</td>
<td>440x300x210mm (WxDxH), weight: 17kg</td>
</tr>
<tr>
<td>Multiline card tester - soft eraser rub test</td>
<td>440x300x210mm (WxDxH), weight: 15.5kg</td>
</tr>
<tr>
<td>Multiline card tester - bending flexure (ANSI)</td>
<td>440x300x210mm (WxDxH), weight: 20kg</td>
</tr>
<tr>
<td>Multiline card tester - Sandpaper rub test</td>
<td>440x300x210mm (WxDxH), weight: 15.5kg</td>
</tr>
</tbody>
</table>

### Ordering examples

<table>
<thead>
<tr>
<th>Torsion + bending + 3 wheels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full bending</td>
</tr>
<tr>
<td>Soft eraser + Sandpaper (for printing companies)</td>
</tr>
</tbody>
</table>

### Order reference number

- BGI110A-BCE
- BGI110A-CCCC
- BGI110A-FH

**BGI110A-B: Dynamic torsional stress**

Torsion (twisting) - 10 cards on 1 test line
This equipment tests the mechanical or electrical effects on a card submitted to repeated torsional stress.
Test for contact cards, magstripe cards, RFID cards, dual cards, combi cards

**NORMS:**
- CQM 2016: TM-415
- ISO: ISO7810, ISO 10373-1

Option: live antenna detection for 5 cards
## Multiline card tester

### BGI110A-C: Dynamic bending stress

Bending - 10 cards on 1 test line  
This equipment tests the mechanical or functional effects on a card submitted to bending stress. Test for contact cards, magstripe cards, RFID cards, dual cards, combi cards

**NORMS:**  
CQM 2016: TM-414  
ISO: ISO 10373-1, ISO 7810

- **Option:** live antenna detection for 6 cards

### BGI110A-D: Shortened bending flexure

Shortened bending flexure - 10 cards on 1 test line.  
Test for contact cards, magstripe cards, RFID cards, dual cards, combi cards

**NORMS:**  
ISO: ISO 24789-2 annex A

### BGI110A-E: Three wheels

3 wheels 1 axis - 2 cards on 1 test line  
This equipment tests the physical or electrical effects on a card submitted to repeated mechanical stress conditions with force applied of 3N, 8N, 10N or 15N (ISO: 8N). Test for contact cards, magstripe cards, RFID cards, dual cards, combi cards

**NORMS:**  
CQM 2016: TM-421  
ISO: ISO 10373-1
Multiline card tester

BGI110A-F: Soft eraser rub test

CARD ABRASION «soft eraser rub test» allows to test 2 cards on 1 test line, on the all surface of the card. Linear test for contact cards, magstripe cards, RFID cards, dual cards, combi cards.
Weight of 10N and 15N supplied
Soft eraser not supplied

NORMS:
CQM 2016: TM-B04-2

BGI110A-G: ID1 Card Flexure (bending flexure)

Bending flexure - 10 cards on 1 test line
This test simulates a repeatedly full card flexure.
Test for contact cards, magstripe cards, RFID cards, dual cards, combi cards

NORMS:
ISO: ISO 10373-1
ANSI 322 2015 : 5.3, 5.13, 6.2, 6.5

Option: live antenna detection for 6 cards

BGI110A-H: Sandpaper rub test

This line of the BGI110 realises the sandpaper rub test.
It allows to test 2 cards on 1 test line
Test for contact cards, magstripe cards, RFID cards, dual cards, combi cards.
Soft eraser not supplied

NORMS:
CQM 2016: TM-B04-1
Feature & Description

The BGI071 tests the resistance to torsion (twisting) and bending of ID1 card bodies.

- Stand alone desktop equipment with programming and menu navigation by screen touch
- Testing equipment for ID1 cards, with one test performed at a time from:
  - 6 spots for length bending
  - 4 spots for width bending
  - 4 spots for torsion

Advantages

- Tests for contact cards, magstripe cards, RFID cards, dual cards, combi cards
- Possibility to test the cards further than the norm changing only parameters on the interface (number of cycles, frequency, angle...)
- Jaws open more at the end of the test to release totally the cards and help for the insertion

Description

- Width: 390mm
- Depth: 450mm
- Height: 480mm
- Weight: 16.5kg

Facilities / Environmental conditions

- Power: 100-240V AC
- Frequency: 50-60Hz single phase
- Power consumption: 100W maximum
- Operating temperature: +10°C to +40°C

Test characteristics

- Bending length: Adjustable
- Bending width: Adjustable
- Torsion angle: 5 to 25° (ISO: +/- 15°)
- Frequency: From 0.1Hz to 1Hz (ISO: 0.5Hz)

Norms references

- CQM 2016: TM-414, TM-415
- ISO: 10373 5.8, 5.9
BGI161

Dynamic torsional & bending stress

Bending / shortened bending (25-50 cards)

This NEW EQUIPMENT is for needs of mass bending and shortened bending test requirements.

With a possibility to test 25 of 50 cards together, this solution allows simple and quick swap from standard bending to shortened bending by adding small adapters.

- Stand alone desktop equipment
- Programming and menu navigation by screen touch
- Internal control system: no computer required

**Advantages**

- Tests for contact cards, magstripe cards, RFID cards, dual cards, combi cards
- Possibility to **test the cards further than the norm** changing parameters on the interface (number of cycles, frequency)
- Easy to use thanks to a screen touch interface in order to create and modify program
- Jaws open more at the end of the test to release totally the cards and help for the insertion
- Independant stages : One can run while another one is charged with cards

**Description**

- Width: 800mm
- Depth: 400mm
- Height (25 cards): 580mm
- Height (50 cards): 880mm
- Weight: 103Kg (25 cards), 187kg (50 cards)

**Facilities / Environmental conditions**

- Power: 100-240V AC
- Frequency: 50-60Hz single phase
- Power consumption: 250W maximum
- Operating temperature: +10°C to +40°C

**Test characteristics**

- Bending length: 20mm (deflexion adjustable)
- Bending width: 10mm (deflexion adjustable)
- Shortened bending: adjustable
- Frequency: From 0.1Hz to 1Hz (ISO: 0.5Hz)
- Minimum deflexion adjustable

**Norms references**

- CQM 2016: TM-414

**OPTION:**

- Live antenna detection for 15 cards only
- Connectivity features
**BGI058**

**ID1 - Three wheels 1 axis (x1)**

**OPTION:**
- live antenna detection
- Connectivity features

**Feature & Description**
The 3 wheels equipment tests the resistance of the contact or dual interface chip when crushed between 3 wheels and along 1 axis, for 6 and 8 PINS chips.

**Advantages**
- Tests for contact cards, dual interface cards, combi cards with ISO chip position
- Possibility to test further than the norm (frequency, number of cycles, extra weights)
- Stand alone desktop equipment, easy to use thanks to screentouch interface

<table>
<thead>
<tr>
<th>Description</th>
<th>Norms references</th>
</tr>
</thead>
<tbody>
<tr>
<td>475x290x450mm (WxDxH)</td>
<td>CQM 2016:TM-421</td>
</tr>
<tr>
<td>Weight: 16kg</td>
<td>ISO10373 5.22</td>
</tr>
</tbody>
</table>

**BGI138**

**ID1 - Three wheels 2 axes (x6)**

**OPTION:**
- Live antenna detection
- Connectivity features

**Feature & Description**
Same equipment than BGI058 above but testing 6 cards together and along 2 axes, for 6 and 8 PINS chips or non-standard chip position (RFID chips, sensors, ...).

<table>
<thead>
<tr>
<th>Description</th>
<th>Norms references</th>
</tr>
</thead>
<tbody>
<tr>
<td>610x440x470mm (WxDxH)</td>
<td>CQM 2016:TM-421</td>
</tr>
<tr>
<td>Weight: 45kg</td>
<td>ISO10373 5.22</td>
</tr>
</tbody>
</table>
Feature & Description

Same equipment than BGI058 but testing the card along 2 axes, and accepting both ID1 (card) and ID3 (passport) credentials.

Advantages

- Tests for contact cards, dual interface cards, combi cards, passports
- Test other features on the cards: display screen, button, batteries, sensors...
- Stand alone desktop equipment, easy to use thanks to screen touch interface

<table>
<thead>
<tr>
<th>Description</th>
<th>Norms references</th>
</tr>
</thead>
<tbody>
<tr>
<td>450x460x515mm (WxDxH)</td>
<td>CQM 2016: TM-421</td>
</tr>
<tr>
<td>Weight: 27kg</td>
<td>ISO10373 5.22</td>
</tr>
</tbody>
</table>

OPTION:
- Live antenna detection
- Connectivity features

ID1/ID3 - Three wheels 2 axes (x5)

Feature & Description

Same equipment than BGI103 above but testing 5 cards / passports together along 2 axes.

<table>
<thead>
<tr>
<th>Description</th>
<th>Norms references</th>
</tr>
</thead>
<tbody>
<tr>
<td>1044x472x515mm (WxDxH)</td>
<td>CQM 2016: TM-421</td>
</tr>
<tr>
<td>Weight: 60kg</td>
<td>ISO10373 5.22</td>
</tr>
</tbody>
</table>

OPTION:
- Live antenna detection
- Connectivity features
The peel strength testing equipment realises the resistance test of card’s overlay on ID1 card bodies.
- Stand alone desktop equipment with programming and menu navigation by screen touch
- Graphical return of the test session on the screen
- Possibility to export data on a SD card
- Movement: From 10 to 110 mm
- Dimensions: 210x340x480mm (WxDxH), weight: 14kg
- Gauge force of 100N

**Advantages**
- Tests for contact cards, magstripe cards, dual cards, combi cards, RFID cards and e-passports
- Possibility to **test the cards further than the norm**

**Facilities / Environmental conditions**
- Power: 100-240V AC
- Frequency: 50-60Hz single phase
- Power consumption: 100W maximum
- Operating temperature: +10°C to +40°C

**Norms references**
- CQM 2016: TM-412, TM-424
- ISO 10373-1 5.3, ISO 7810
- ANSI 322 2015: 5.1, 6.2, 6.3, 6.4, 6.5

**Option: BGI076C - Peel strength pre-cutting tool**

The BGI076C precut tool is used to prepare the card before the peel strength test is performed on BGI175A.
- Stand alone and easy to use desktop equipment
- Tests for contact cards, dual cards, combi cards
- Safe tool compared to cutter
- Dimensions: 100x100x8mm (WxDxH)
- Weight: 0.3kg
Feature & Description

The backside spot pressure card testing equipment realises gluing resistance of chip with ID1 card bodies.

- Stand alone desktop equipment with programming and menu navigation by screen touch
- Graphical return of the test session on the screen with maximum value
- Possibility to export data on a SD card
- Pressure: up to 250N
- Needs to realise a hole on the back of the card, made by BGI120C: Driller tool
- Dimensions: 210x340x480mm (WxDxH), weight: 14kg

Advantages

- Tests for contact cards, dual cards, combi cards and customized cards
- Possibility to test the cards further than the norm

Facilities / Environmental conditions

- Power: 100-240V AC
- Frequency: 50-60Hz single phase
- Power consumption: 100W maximum
- Operating temperature: +10°C to +40°C

Norms references

- CQM 2016: TM-423

Option: BGI120C - Driller tool

The driller tool is used to drill the back of the card before backside spot pressure test is performed on BGI175B.

- Stand alone and easy to use desktop equipment
- Tests for contact cards, dual cards, combi cards
- Safe tool compared to cutter
- Hole diameter: 6 mm or different with additional tools
- Dimensions: 230x440x390mm (WxDxH)
- Weight: 13,50kg
The BGI175D is an equipment which checks embossed character resistance.

- Stand alone desktop equipment
- Programming and menu navigation by screen touch
- Internal control system: no computer required

The BGI177 tool is used to check the card after the embossed character resistance test and follow the requirement of the ANSI 322 2015 5.17 norm. It determines the change in embossed character relief height after application of pressure.

**Advantages**
- Tests for contact, magstripe, dual, combi and customized cards with embossed characters
- Possibility to **test the cards further than the norm**
- Easy to use thanks to a screen touch interface in order to create and modify program

### Description

<table>
<thead>
<tr>
<th>BGI175</th>
<th>210mmx340mmx480mm (W, D, H)</th>
<th>Weight: 14kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>BGI177</td>
<td>57mmx47mmx115mm (W, D, H)</td>
<td>Weight: 0.200kg</td>
</tr>
</tbody>
</table>

### Test characteristics
- Pressure: up to 500N, adjustable

### Facilities / Environmental conditions
- Power: 100-240V AC
- Frequency: 50-60Hz single phase
- Power consumption: 100W maximum
- Operating temperature: +10°C to +40°C

### Norms references
- CQM 2016: TM-B02
- ISO 10373-1 5.14, ISO 7811-1
- ANSI 322 2015 5.17 (with the option BGI177)
The BGI175E performs module adhesion test stated in ANSI 5.22 2015 5.21 norm paper.

- Stand alone desktop equipment
- Programming and menu navigation by screen touch
- Possibility to export data on a SD card

**Advantages**

- Tests for contact cards, dual cards and combi cards
- Possibility to test the cards further than the norm
- Easy to use thanks to a screen touch interface in order to create and modify program

**Facilities / Environmental conditions**

- Power: 100-240V AC
- Frequency: 50-60Hz single phase
- Power consumption: 100W maximum
- Operating temperature: +10°C to +40°C

**Test characteristics**

- Up to 500N

**Norms references**

- ANSI 322 2015 5.21
### Feature & Description

The rotary stress equipment tests the stress and impact on a card in order to evaluate the resistance of the contactless card which may have been weakened during the laminating processes.

- Stand alone desktop equipment
- Programming and menu navigation by screen touch
- Internal control system: no computer required

### Advantages

- Tests for RFID cards, dual cards, combi cards, non homogeneous cards (display cards...) and e-passports
- Designed to test 6 cards simultaneously (or 6 passports)
- Possibility to **test the cards further than the norm** changing only parameters on the interface (number of cycles, frequency,...)

<table>
<thead>
<tr>
<th>Description</th>
<th>Facilities / Environmental conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width: 440mm</td>
<td>Power: 100-240V AC</td>
</tr>
<tr>
<td>Depth: 610mm</td>
<td>Frequency: 50-60Hz single phase</td>
</tr>
<tr>
<td>Height: 470mm</td>
<td>Power consumption: 100W maximum</td>
</tr>
<tr>
<td>Weight: 17kg</td>
<td>Operating temperature: +10°C to +40°C</td>
</tr>
</tbody>
</table>

- Rotary speed: from 10 to 500 rpm
- Not part of the new CQM norm

**OPTION:**
- Connectivity features
# Three roller IC Card test (tensile)

The BGI128 follows the norms references ANSI 322:2008 5.25 (38.1N) and CQM P-34 (180N) in order to test the card through 3 rolls.

- Stand alone desktop equipment

## Advantages
- Tests for contact cards, magstripe cards, dual cards, combi cards and customized cards
- Possibility to **test the cards further than the norm**

## Description
- Width: 210mm
- Depth: 440mm
- Height: 370mm
- Weight: 28kg

## Facilities / Environmental conditions
- Power: 100-240V AC
- Frequency: 50-60Hz single phase
- Power consumption: 100W maximum
- Operating temperature: +10°C to +40°C

## Test characteristics
- Pressure: 180N (CQM)
- Pressure: 38.1N (ANSI)

## Norms references
- CQM 2009 norm: P-34
- ANSI 322 2015 5.24
Manual wrapping test

The wrapping card testing equipment checks chip gluing resistance on ID1 card bodies with a radius test of 20mm and 25mm on the same equipment.

- Tests for contact cards, display cards, dual cards, combi cards
- 2 radius tests on the same equipment for the BGI083 only (other available: 20 or 25)
- Test both «x» and «y» direction

<table>
<thead>
<tr>
<th>Description</th>
<th>Norms references</th>
</tr>
</thead>
<tbody>
<tr>
<td>BGI083: 75x60x115mm (WxDxH); 0.85Kg</td>
<td>CQM 2016: TM-422</td>
</tr>
<tr>
<td>BGI083B: 400x200x60mm (WxDxH); 4.30Kg</td>
<td></td>
</tr>
</tbody>
</table>

Automatic wrapping test

Same equipment as BGI083 but fully automated with 5 cards tested simultaneously and with the possibility to add live antenna detection.

<table>
<thead>
<tr>
<th>Description</th>
<th>Norms references</th>
</tr>
</thead>
<tbody>
<tr>
<td>640x440x380mm (WxDxH)</td>
<td>CQM 2016: TM-422</td>
</tr>
<tr>
<td>Weight: 35Kg</td>
<td></td>
</tr>
</tbody>
</table>
BGI055V2-A: Corner impact

**Description:**
It tests the resistance to impact corner for the different layers of ID1 card bodies. It has a dropping height of up to 700mm and an impact weight of 13.3N (others parameters possible).

**Norms:**
- CQM 2016: TM-417
- ANSI 322 2015: 5.19, 6.1, 6.6

**Characteristics:**
- 200x200x950mm (WxDxH)  
  Weight: 2.70kg

BGI055V2-B: Card impact fixture

**Description:**
It tests the resistance of a card that is under stress, and then receives an impact. It has a dropping height of up to 550mm and an impact force of 13.3N (others parameters possible).

**Norms:**
- ANSI 322 2015: 5.4

**Characteristics:**
- 200x200x950mm (WxDxH)  
  Weight: 4.00kg

BGI055V2-C: Resistance to impact (ball impact)

**Description:**
It tests the resistance to ball impact on ID1 card bodies. It has a dropping height of up to 600mm, an impact weight of 18N and a ball radius of 7.93mm (others parameters possible).

**Norms:**
- CQM 2016: TM-416
- ANSI 322 2015 5.6, 6.1
- ISO7811-1

**Characteristics:**
- 200x200x950mm (WxDxH)  
  Weight: 3.60kg

BGI055V2-D: ID-1 Card Static Stress

**Description:**
The BGI055V2-D tool is used to prepare the card before card impact fixture test BGI055V2-B. The card must be inserted for 24 hours in the tool BGI055V2-D to performed the test: ANSI 322 2015 5.4.

The BGI055V2-D determines the resistance of the card to cracking while under a combination of mechanical stress and plasticizer exposure. This test follow the norm ANSI 322 2015 5.5

**Characteristics:**
- 70x100x10mm (WxDxH)  
  Weight: 0.106kg
- 100x60x10mm (WxDxH)  
  Weight: 0.085kg
**BGI078**

**Bending stiffness & cantilever**

**Test with 3 positions available**

**Feature & Description**

The BGI078 checks the stiffness of ID1 card bodies with a force applied of 0.7 N.
- Stand alone desktop equipment, easy to use
- Force applied: 0.7 N (other force in option)
- Tests for contact cards, magstripe cards, dual cards, combi cards

<table>
<thead>
<tr>
<th>Description</th>
<th>Norms references</th>
</tr>
</thead>
<tbody>
<tr>
<td>125x105x70mm (HxDxW)</td>
<td>CQM 2016 : TM-408</td>
</tr>
<tr>
<td>Weight: 0.800kg</td>
<td>ISO 10373-1 5.7, ISO 7810</td>
</tr>
</tbody>
</table>

**BGI077-2**

**Overall card warpage**

1 single tool for:
- Embossed & Non embossed

**Feature & Description**

The BGI077 checks the warpage of a card after production with a test height of 1.5mm and 2.5mm.
- Stand alone desktop equipment, easy to use
- Height of 1.5mm non embossed card
- Height of 2.5mm embossed card
- Tests for contact cards, magstripe cards, dual cards, combi cards

<table>
<thead>
<tr>
<th>Description</th>
<th>Norms references</th>
</tr>
</thead>
<tbody>
<tr>
<td>100x60x35mm (WxDxH)</td>
<td>CQM 2016 : TM-410</td>
</tr>
<tr>
<td>Weight: 0.340kg</td>
<td>ISO 10373-1 5.1, ISO 7810</td>
</tr>
</tbody>
</table>
Informative card template checking

Feature & Description

This Equipment BGI141 is a tool to check quickly the position of different elements on the cards. As it is a visual control, its accuracy is limited. In case the elements to control are approaching too many lines of the templates, an additional control with a measuring tool is necessary to certify the respect of the norm.

- Stand alone desktop equipment, easy to use, supplied with 5 templates checking
- Tests for chip contact position, magstripe position, SIM plug position, embossed characters position

<table>
<thead>
<tr>
<th>Description</th>
<th>Norms references</th>
</tr>
</thead>
<tbody>
<tr>
<td>100x60x10mm (WxDxH)</td>
<td>Not compliant with the norm. Information only</td>
</tr>
<tr>
<td>Weight: 0.110kg</td>
<td>ISO 7811-6, 7816-2, 10373-1, 10373-2</td>
</tr>
</tbody>
</table>

Pass or fail ID1 length & width

Feature & Description

This Equipment BGI141 is a tool to check quickly the length and width of a ID1 card. As it is a pass or fail control device, it doesn’t answer a norm and cannot replace, an additional control with a measuring tool is necessary to certify the respect of the norm.

<table>
<thead>
<tr>
<th>Description</th>
<th>Norms references</th>
</tr>
</thead>
<tbody>
<tr>
<td>120x200x10mm (WxDxH)</td>
<td>Not compliant with the norm. Information only</td>
</tr>
<tr>
<td>Weight: 0.560kg</td>
<td>ISO 7810, 10373-1</td>
</tr>
</tbody>
</table>
Feature & Description

The BGI160 checks if the radius of ID1 cards is within the tolerances of the norm.
- Stand alone desktop equipment, easy to use
- Tests for contact cards, magstripe cards, dual cards, combi cards

<table>
<thead>
<tr>
<th>Description</th>
<th>Norms references</th>
</tr>
</thead>
<tbody>
<tr>
<td>20x50x50mm (HxDxW)</td>
<td>ISO: 7810</td>
</tr>
<tr>
<td>Weight: 0.120kg</td>
<td></td>
</tr>
</tbody>
</table>

Feature & Description

The BGI162 is an inserting device to perform the test using the default ICC holder.
- Stand alone desktop equipment, easy to use
- Tests for contact cards, magstripe cards, dual cards, combi cards

<table>
<thead>
<tr>
<th>Description</th>
<th>Norms references</th>
</tr>
</thead>
<tbody>
<tr>
<td>15x95x130mm (HxDxW)</td>
<td>Apparatus for CQM</td>
</tr>
<tr>
<td>Weight: 0.300kg</td>
<td>ISO 10373-1</td>
</tr>
</tbody>
</table>
**Height, width & thickness**

**BGI146B**

The BGI146 enables to verify the height, width and thickness of the card.

- Stand alone desktop equipment, easy to use for contact cards, magstripe cards, dual cards, combi cards and customized cards.
- Informative tool only, it doesn’t replace a specific card dimension tool.

<table>
<thead>
<tr>
<th>Feature &amp; Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
</tr>
<tr>
<td>190x170x40mm (HxDxW), 1.0Kg</td>
</tr>
<tr>
<td>Guide to following norms</td>
</tr>
<tr>
<td>CQM 2016: TM-403, TM-404, TM-405 TM-B02, TM-B03</td>
</tr>
<tr>
<td>ISO7810, 7811, 10373</td>
</tr>
</tbody>
</table>

**Inside tool for adhesion or blocking**

**BGI133a**

The BGI133a is a set of calibrated weights for the adhesion or blocking test (climatic chamber not supplied). Weights supplied to perform a 2.5kPa, 5kPa and 7.5kPa.

- Stand alone desktop equipment, easy to use
- Possibility to add extra weights to test further than the norm

<table>
<thead>
<tr>
<th>Feature &amp; Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
</tr>
<tr>
<td>Weights following 2.5kPa and 5kPa</td>
</tr>
<tr>
<td>Norms references</td>
</tr>
<tr>
<td>CQM 2016: TM-413</td>
</tr>
<tr>
<td>ISO 7810, 10373-1</td>
</tr>
</tbody>
</table>
The BGI125-2 is a small desktop device used to realise 4 tests on the same device:

- Adhesion of magstripe
- Durability of tipping (adhesion between the card body and the tipping material put on top of the embossed characters)
- Adhesion crosshatch tape test
- Tape pull test

### Feature & Description

The BGI125-2 is a small desktop device used to realise 4 tests on the same device:

- Adhesion of magstripe
- Durability of tipping (adhesion between the card body and the tipping material put on top of the embossed characters)
- Adhesion crosshatch tape test
- Tape pull test

### Advantages

- Stand alone desktop equipment
- Use of a specific adhesive tape (not supplied)

### Description

- 200x150x122mm (HxDxW)
- Weight: 0.950kg

### Facilities / Environmental conditions

- Operating temperature: +10°C to +40°C

### Test characteristics

- **Durability of tipping:**
  - Pulling angle: 60°

- **Adhesion of magstripe:**
  - Pulling angle: 90°

### Norms references

- **Durability of tipping:**
  - CQM 2016: TM-B01
  - ISO: 7811-6

- **Adhesion of magstripe:**
  - CQM 2016 TM-312,
  - ISO 10373-2 5.7, ISO 7811-6 6.3

- **Adhesion crosshatch Tape:**
  - ANSI 322 2015: 5.2

- **Tape pull test:**
  - CQM 2016: TM-B04-3
The BGI137 is a small automatic desktop machine. It can be used for different testing tasks and supplied with different featured functionalities such as:
- Resonance frequency and Q factor for RFID cards
- ATR contact and RFID chip validation, card programming
- Reading and control (barcode, number and data capture by camera, specific customer camera for data recording and comparison, vision inspection...)
- Control with external software (optional)

**Feature & Description**

**Advantages**
- Used for medium runs, throughput of 2000 units per hour depending on configuration
- Input and output of 500 card stackers with no need to stop the production to feed the cards in and out
- Card materials: PVC, PET, ABS, ID1 format or other on demand

**Description**
- Width: 610mm
- Depth: 530mm
- Height: 670mm
- Weight: 20kg

**Facilities / Environmental conditions**
- Power: 100-240V AC
- Frequency: 50-60Hz single phase
- Power consumption: 100W maximum
- Pneumatic characteristics: 6 bars
- Operating temperature: +10°C to +40°C

**Throughput**
- Up to 2000 units/hour

**Norms references**
- CQM 2016: TM-123, TM-124
PASSPORT TESTING EQUIPMENT
In 2006, BG Ingénierie started development of passport testing equipment to follow ICAO regulations. Nine years later, our test equipment are compliant with latest ISO18745 paper and allows to perform tests further than the norm.

Another set of passport testing equipment (not part of ICAO or ISO18745 norm), has been developed following manufacturers particular demands.

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<th>Stamp - Pen- Abrasion</th>
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</tbody>
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The BGI085 is a single equipment that performs ICAO or ISO stamp, pen and abrasion tests.

- Stand alone desktop equipment
- Programming and menu navigation by screen touch
- Internal control system: no computer required

The 3 tests can be purchased individually or all together on 1 single machine

Possibility to **test the passports further than the norm** changing only parameters on the interface (number of cycles, surface to test...)

Easy to use thanks to a screen touch interface in order to create and modify program

### Feature & Description

The BGI085 is a single equipment that performs ICAO or ISO stamp, pen and abrasion tests.

- Stand alone desktop equipment
- Programming and menu navigation by screen touch
- Internal control system: no computer required

### Advantages

- The 3 tests can be purchased individually or all together on 1 single machine
- Possibility to **test the passports further than the norm** changing only parameters on the interface (number of cycles, surface to test...)
- Easy to use thanks to a screen touch interface in order to create and modify program

### Description

- Width: 520mm
- Depth: 650mm
- Height: 590mm
- Weight: 37kg

### Facilities / Environmental conditions

- Power: 100-240V AC
- Frequency: 50-60Hz single phase
- Power consumption: 200W maximum
- Pneumatic characteristics: 6 bars
- Operating temperature: +10°C to +40°C

### Test characteristics

- ICAO or ISO test, configurable test by menu
- X and Y test zone choices
- Movement speed: from 5 to 200 mm/s
- Impact strength from 0.004 to 0.02 Kg.m
- Number of cycles for passport: from 1 to 9999

### Norms references:

- ICAO V3.2 5.5, 5.11, 5.12
- ISO 18745 8.5, 8.11, 8.12
BGI085A: Stamp stress

ICAO V3.2 5.5, ISO 18745 8.5:

ICAO or ISO test that realises stamp (impact) test. Follows ICAO or ISO norm (default program 1), but allows to test further than the norm (example: test zone of 2 x 2 cm)

Test for e-passports

**OPTION:**

**live antenna detection**

BGI085B: Pen stress

ICAO V3.2, ISO 18745 8.12:

ICAO or ISO test that realises pen test for e-passports. Follows ICAO or ISO norm (default program 1), but allows to test further than the norm (example: test zone of 2 x 2 cm)

**OPTION:**

**live antenna detection**

BGI085C: Abrasion

ICAO V3.2 5.11, ISO 18745 8.11:

ICAO or ISO test that realises abrasion test on the MRZ. Follows ICAO or ISO norm (default program 1), but allows to test further than the norm.

Test for passports and e-passports
The BGI086 is a stand alone equipment. This test reproduces the stress of sitting on a passport kept inside of the back pocket.

- Stand alone desktop equipment
- Internal control system: no computer required
- Base made in “foam rubber” following ICAO or ISO requirement
- Passport inserted in a «pocket»

**Advantages**

- Possibility to test the passports further than the norm changing only parameters on the interface (number of cycles, pressure time...)
- Easy to use thanks to a screen touch interface in order to create and modify program

**Description**

- Width: 615mm
- Depth: 560mm
- Height: 595mm
- Weight: 60kg

**Facilities / Environmental conditions**

- Power: 100-240V AC
- Frequency: 50-60Hz single phase
- Power consumption: 50W maximum
- Pneumatic characteristics: 6 bars
- Operating temperature: +10°C to +40°C

**Test characteristics**

- ICAO or ISO test, configurable test by menu
- Strength stress: from 150 to 500N (ICAO/ISO 350N)
- X and Y static position
- Pressing time: from 1s to 3600s
- Number of cycles: from 1 to 999 999.

**Norms references:**

- ICAO V3.2 5.6
- ISO 18745 8.6
Dynamic bend

The BGI087 is a stand alone equipment. It tests the bending fatigue resistance of the booklet.
- Stand alone desktop equipment
- Internal control system: no computer required
- Optional calibration tool provided in order to prepare passport for test (electrical version available)

Advantages
- Tests 5 e-passports simultaneously (same run course)
- Possibility to test the passports further than the norm changing only parameters on the interface (number of cycles, frequency, length...)
- Easy to use thanks to a screen touch interface in order to create and modify program

Description
- Width: 580mm
- Depth: 320mm
- Height: 480mm
- Weight: 33kg

Facilities / Environmental conditions
- Power: 100-240V AC
- Frequency: 50-60Hz single phase
- Power consumption: 100W maximum
- Operating temperature: +10°C to +40°C

Test characteristics
- ICAO or ISO test, configurable test by menu
- Frequency: from 0.1 Hz to 1 Hz (ICAO/ISO is 0.5 Hz)
- Mobile run axis from +/- 42 mm, adjustable
- Number of cycles: from 1 to 999 999.

Norms references:
- ICAO V3.2 5.7
- ISO 18745 8.7

Designation
- Dynamic bend
- Dynamic bend mechanical calibration tool
- Dynamic bend electrical calibration tool

Order reference number
- BGI087
- BGI087a
- BGI087b
### Feature & Description

The BGI088 is a stand alone equipment. This test applies torsional stress to the e-passport.

- Stand alone desktop equipment
- Internal control system: no computer required
- E-passport clamped with a 0.5 mm gap adjustable due to different e-passport thickness (ICAO/ISO) or strongly maintained for thinner documents
- Optional calibration tool provided in order to prepare passport for test

#### Advantages

- Tests 5 e-passports simultaneously (same run course)
- Possibility to **test the passports further than the norm** changing only parameters on the interface (number of cycles, frequency, angle...)
- Easy to use thanks to a screen touch interface in order to create and modify program

<table>
<thead>
<tr>
<th>Description</th>
<th>Facilities / Environmental conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width: 480mm</td>
<td>Power: 100-240V AC</td>
</tr>
<tr>
<td>Depth: 375mm</td>
<td>Frequency: 50-60Hz single phase</td>
</tr>
<tr>
<td>Height: 520mm</td>
<td>Power consumption: 100W maximum</td>
</tr>
<tr>
<td>Weight: 22kg</td>
<td>Operating temperature: +10°C to +40°C</td>
</tr>
</tbody>
</table>

### Test characteristics

- ICAO or ISO test, configurable test by menu
- Rotating angle selected by menu (+/- 20 ° max, by step of +/- 0.5°)
- Frequency: from 0.1 Hz to 1 Hz (ICAO/ISO is 0.5 Hz)
- Number of cycles: from 1 to 999 999.

### Norms references:

- ICAO V3.2 5.8
- ISO 18745 8.8

### Designation

- Passport torsion x 5
- Passport torsion calibration tool

### Order reference number

- BGI088
- BGI088a
Passport torsion x 10

Feature & Description

The BGI08810 is a stand alone equipment. This test applies torsional stress to the e-passport.

- Stand alone desktop equipment
- Internal control system: no computer required
- e-Passport clamped with a 0.5 mm gap adjustable due to different e-passport thickness (ICAO/ISO) or strongly maintained for thinner documents
- Optional calibration tool provided in order to prepare passport for test

Advantages

- Tests 10 e-passports simultaneously (same run course)
- Possibility to test the passports further than the norm changing only parameters on the interface (number of cycles, frequency, angle...)
- Easy to use thanks to a screen touch interface in order to create and modify program

Description

- Width: 960mm
- Depth: 375mm
- Height: 510mm
- Weight: 39kg

Facilities / Environmental conditions

- Power: 100-240V AC
- Frequency: 50-60Hz single phase
- Power consumption: 100W maximum
- Operating temperature: +10°C to +40°C

Test characteristics

- ICAO or ISO test, configurable test by menu
- Rotating angle selected by menu (+/- 20° max, by step of +/- 0.5°)
- Frequency: from 0.1 Hz to 1 Hz (ICAO/ISO is 0.5 Hz)
- Number of cycles: from 1 to 999,999.

Norms references:

- ICAO V3.2 5.8
- ISO 18745 8.8

Designation

Passport torsion x 10
Passport torsion calibration tool

Order reference number

BGI08810
BGI088a

OPTION:

- Live antenna detection
- Connectivity features
The BGI089 is a stand alone equipment. This equipment tests the folding passport sheet resistance at the spine.

- Stand alone desktop equipment
- Internal control system: no computer required
- Clamp designed to maintain sheet only or full passport,
- Traction of the sheet, rotation of the sheet

**Advantages**

- Tests 5 e-passports simultaneously (same run course)
- Possibility to **test the passports further than the norm** changing only parameters on the interface (number of cycles, frequency, angle...), or adding extra weight
- Easy to use thanks to a screen touch interface in order to create and modify program

**Description**

- Width: 690mm
- Depth: 375mm
- Height: 520mm
- Weight: 36kg

**Facilities / Environmental conditions**

- Power: 100-240V AC
- Frequency: 50-60Hz single phase
- Power consumption: 100W maximum
- Operating temperature: +10°C to +40°C

**Test characteristics**

- ICAO or ISO test, configurable test by menu
- Rotating angle (ICAO/ISO +/- 90°) from -90° to 90°
- Frequency: from 0.2 Hz to 1.4 Hz (ICAO/ISO:0.5 Hz)
- Number of cycles: from 1 to 999 999.

**Norms references:**

- ICAO V3.2 5.9
- ISO 18745 8.9
The BGI090 is a stand alone equipment. This equipment tests the pages tearing resistance and the sewing part resistance.

- Stand alone desktop equipment
- Internal control system: no computer required
- Clamp designed to maintain sheet only or full passport
- Sheet pulling along the e-Passport axis

### Advantages

- Possibility to **test the passports further than the norm** changing only parameters on the interface (strength, speed)
- Easy to use thanks to a screen touch interface

### Description

- Width: 202mm
- Depth: 251mm
- Height: 480mm
- Weight: 14kg

### Test characteristics

- ICAO or ISO test, configurable test by menu
- Pulling force: from 1 N to 200 N (ICAO/ISO 60N)
- Pulling speed: from 0.05 mm/s à 0.5 mm/s

### Facilities / Environmental conditions

- Power: 100-240V AC
- Frequency: 50-60Hz single phase
- Power consumption: 100W maximum
- Operating temperature: +10°C to +40°C

### Norms references:

- ICAO V3.2 5.10
- ISO 18745 8.10
Passport warpage

Feature & Description
The BGI123 is a stand alone equipment. This equipment measures the MRP warpage extent.
- Stand alone desktop equipment
- Programming and menu navigation by screen touch
- Internal control system: no computer required

Advantages
- 1 machine for 2 tests: datapage warpage evaluation and book warpage evaluation
- Quick result
- Contactless measure (use of a laser): no mechanical impact on the result

<table>
<thead>
<tr>
<th>Description</th>
<th>Facilities / Environmental conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width: 250mm</td>
<td>Power: 100-240V AC</td>
</tr>
<tr>
<td>Depth: 495mm</td>
<td>Frequency: 50-60Hz single phase</td>
</tr>
<tr>
<td>Height: 650mm</td>
<td>Power consumption: 100W maximum</td>
</tr>
<tr>
<td>Weight: 32.30kg</td>
<td>Operating temperature: +10°C to +40°C</td>
</tr>
</tbody>
</table>

Test characteristics
- ICAO or ISO test

Norms references:
- ICAO V3.2 6.5 & 6.6
- ISO 18745 9.5, 9.6
Passport peel strength

Feature & Description

The peel strength testing equipment realises the resistance test of passport overlay.

- Stand alone desktop equipment
- Programming and menu navigation by screen touch
- Software included to get graphical return of the test session (computer not supplied)
- Possibility to export data

Advantages

- Tests for e-passports, contact cards, magstripe cards, dual cards, combi cards and RFID cards
- Possibility to test the passports further than the norm changing only parameters on the interface (strength, speed)
- Easy to use thanks to a screen touch interface

<table>
<thead>
<tr>
<th>Description</th>
<th>Facilities / Environmental conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width: 210mm</td>
<td>Power: 100-240V AC</td>
</tr>
<tr>
<td>Depth: 340mm</td>
<td>Frequency: 50-60Hz single phase</td>
</tr>
<tr>
<td>Height: 480mm</td>
<td>Power consumption: 100W maximum</td>
</tr>
<tr>
<td>Weight: 14kg</td>
<td>Operating temperature: +10°C to +40°C</td>
</tr>
</tbody>
</table>

Test characteristics

- ICAO or ISO test, configurable test by menu

Norms references:

- ICAO V3.2 6.3
- ISO 18745 9.3
The BGI104 is a stand alone equipment. This is not a testing device but still required by ICAO or ISO in order to put e-passport to rest position before starting a test session.

- Stand alone desktop equipment

### Advantages

- 10 e-passports per holder
- Can be topped-up to save some space on test bench

### Description

- Width: 460mm
- Depth: 130mm
- Height: 130mm
- Weight: 0.830kg

### Facilities / Environmental conditions

- Operating temperature: +10°C to +40°C

### Test characteristics

- 10 e-passports per holder

### Norms references:

- ICAO V3.2
- ISO 18745
BGI107 Passport wrapping

Feature & Description
The BGI107 testing equipment is not part of ICAO or ISO paper norm but was developed by BG INGENIERIE following demands of passport manufacturers. It was developed from standard CQM wrapping for smartcards (BGI083) and adapted to ID3 e-passport document size.
- Stand alone desktop equipment

Advantages
- Tests for e-passports
- Radius of test: 20mm and 25mm, other radius available on demand

Description
- Width: 170mm
- Depth: 160mm
- Height: 136mm
- Weight: 3.5kg

Facilities / Environmental conditions
- Operating temperature: +10°C to +40°C

Test characteristics
- Radius of test: 20mm and 25mm

Norms references:
- Not part of ICAO V3.2 & ISO 18745
The BGI103 testing equipment is not part of ICAO or ISO paper norm but was developed by BG INGENIERIE following demands of passport manufacturers. It allows to realise the test on the all card or e-passport surface, on «x» and «y» axes.

- Stand alone desktop equipment
- Internal control system: no computer required

**Feature & Description**

**Advantages**

- Tests e-passports and ID1 cards
- Developed from the standard EMV 3 wheels but adapted to ID3 dimensions
- Possibility to **test the cards further than the norm** changing only parameters on the interface (number of cycles, pressure time...)
- Easy to use thanks to a screen touch interface in order to create and modify program

**Description**

- Width: 450mm
- Depth: 460mm
- Height: 515mm
- Weight: 27kg

**Facilities / Environmental conditions**

- Power: 100-240V AC
- Frequency: 50-60Hz single phase
- Power consumption: 100W maximum
- Operating temperature: +10°C to +40°C

**Test characteristics**

- Configurable test by menu
- Displacement: adjustable
- Frequency: from 0.35Hz to 0.8Hz (ISO: 0.5Hz)
- Force applied: 3N, 8N, 10N or 15N (ISO: 8N)
- Number of cycles: from 1 to 999 999
- Test front and back simply turning the passport holder (no adjustment)
- Test along the 2 axis by rotation of the 3 wheels

**Norms references:**

- Not part of ICAO V3.2 & ISO 18745
The BGI098 testing equipment is not part of ICAO or ISO paper norm but was developed by BG INGENIERIE following demands of passport manufacturers. It allows to realise the test on the all card or e-passport surface, on "x" and "y" axes.

- Stand alone desktop equipment
- Internal control system: no computer required

Description
- Width: 1044mm
- Depth: 472mm
- Height: 515mm
- Weight: 60kg

Test characteristics
- Configurable test by menu
- Displacement: adjustable
- Frequency: from 0.1Hz to 1Hz (ISO: 0.5Hz)
- Force applied: 3N, 8N, 10N or 15N (ISO: 8N)
- Number of cycles: from 1 to 999,999
- Test front and back simply turning the passport holder (no adjustment)
- Test along the 2 axis by rotation of the 3 wheels

Facilities / Environmental conditions
- Power: 100-240V AC
- Frequency: 50-60Hz single phase
- Power consumption: 200W maximum
- Operating temperature: +10°C to +40°C

Norms references:
- Not part of ICAO V3.2 & ISO 18745
### Feature & Description

The BGI108 testing equipment is not part of ICAO or ISO paper norm but was developed by BG INGENIERIE following demands of passport manufacturers. A wheel comes over the all passport surface, on «x» and «y» axes.

- **Stand alone desktop equipment**

### Advantages

- For e-passport, cards, inlays, ...
- Customisable programs
- All parameters adjustable by embedded software (force, speed, number of cycles)
- Easy to use thanks to a screen touch interface in order to create and modify program

### Description

<table>
<thead>
<tr>
<th>Facilities / Environmental conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power: 100-240V AC</td>
</tr>
<tr>
<td>Frequency: 50-60Hz single phase</td>
</tr>
<tr>
<td>Power consumption: 100W maximum</td>
</tr>
<tr>
<td>Operating temperature: +10°C to +40°C</td>
</tr>
<tr>
<td>Pneumatic characteristics: 6 bars</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width: 375mm</td>
</tr>
<tr>
<td>Depth: 554.5mm</td>
</tr>
<tr>
<td>Height: 530mm</td>
</tr>
<tr>
<td>Weight: 40kg</td>
</tr>
</tbody>
</table>

### Test characteristics

- Configurable test by menu
- Force applied: from 5 to 70 kg
- Speed adjustable from 10 to 200 mm/s
- Insertion and length of run adjustable
- Strength electronically adjustable from 5 to 70 kg
- Number of cycles: from 1 to 999 999

### Norms references:

- Not part of ICAO V3.2 & ISO 18745
BGI127

Roller pressure

Rotary stress

OPTION:
- Connectivity features

Feature & Description

The BGI127 testing equipment is not part of ICAO or ISO paper norm but was developed by BG INGENIERIE following demands of passport and card manufacturers. The equipment is based on card CQM requirements 16.4.3, reference P33 (p.41). It tests the stress and impact on 6 cards or passport in order to evaluate their resistance.

- Stand alone desktop equipment

Advantages

- Tests for e-passports, contact, dual, combi, RFID and non homogeneous cards (display cards...)
- Designed to test 6 passports simultaneously (or 6 cards)
- Possibility to **test the passports further than the norm** changing only parameters on the interface (number of cycles, frequency...)
- Easy to use thanks to a screen touch interface in order to create and modify program

<table>
<thead>
<tr>
<th>Description</th>
<th>Facilities / Environmental conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width: 440mm</td>
<td>Power: 100-240V AC</td>
</tr>
<tr>
<td>Depth: 610mm</td>
<td>Frequency: 50-60Hz single phase</td>
</tr>
<tr>
<td>Height: 470mm</td>
<td>Power consumption: 100W maximum</td>
</tr>
<tr>
<td>Weight: 45kg</td>
<td>Operating temperature: +10°C to +40°C</td>
</tr>
</tbody>
</table>

Test characteristics

- Rotary speed: from 10 to 150 rpm

Norms references:

- Not part of ICAO & ISO 18745
SPECIFIC DEVELOPMENT
In 2008, BG Ingénierie started to realize specific customer demands based around product modification, testing, validation of cards, passports, inlays, etc...

BG Ingénierie gives a good example of its capability and competence to develop customizable equipment:
- LASER engraving development for multi form factors...
- Desktop lamination unit
- Dual interface desktop solution
- Card vision inspection, combined with chip reading/programming
- RFID robot tester for card and e-passport reading distance
- Specific auto punching equipment
- Inlay curvature rectifier
- Cold glue chip implanting solution for smart objects

In 2013, BG INGENIERIE has been awarded the National French “Stars & Métiers: Prix de l’Innovation Technologique” submitting a equipment developed under this activity.

Every year, BG INGENIERIE integrates some of the specific developments to the general equipment list in order to propose you an better and up to date offer.

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RFID robot tester......................................................................................... 68
Inlay curvature rectifier.................................................................................. 68
Vision inspection equipment.......................................................................... 69
Yours............................................................................................................. 69
Specific development

BGI112: Desktop lamination and punching unit

The desktop lamination and punching unit is a small, compact and easy to use laminator.

It can be used for lab purposes in order to validation inks, plastic material, inlays... or directly to card production for instant issuance.

A punch unit is feated in the machine in order to get ID1 card dimension.

Dimensions : 290 x 420 x 510 mm
Weight : 42 kg

BGI116: RFID robot tester

The RFID robot tester has been developed to realize card, passport, reader, smartphone tests in order to check reading distances and compliance of those different credentials.

This equipment is a 3D tester developed with great care not to have metallic parts in testing field.

It can also be used to interoperability tests between cards/readers or passports/readers

Dimensions : 800 x 720 x 1400 mm
Weight : 82 kg

BGI105: Inlay curvature rectifier

The inlay curvature rectifier has been developed specially for inlay manufacturers. For some productions, inlay leaves manufacturing process not fully flat which causes problem for sheet lamination. This equipment applies a counter force to get the inlay flat.

Dimensions : 1200 x 1100 x 1200 mm
Weight : 216 kg
Specific development

BGI113: Vision inspection equipment

The vision inspection equipment has been developed to test cards after production, personalization or after their lifetime use, or mistakes found by end user (problem with photo, name, numbering, non functional chip...).

Dimensions: 980 x 880 x 1500 mm
Weight: 110 kg

Future developments

YOURS...
ENTRUST US YOUR PROJECT
GLOSSARY

(Card testing equipment)

CQM Requirements: Version 2.16, November 2016

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM-123</td>
<td>BGI1137 Resonance (Carrier frequency)</td>
</tr>
<tr>
<td>TM-124</td>
<td>BGI1137 Resonance (Carrier amplitude)</td>
</tr>
<tr>
<td>TM-312</td>
<td>BGI125-2 Security devices adhesion</td>
</tr>
<tr>
<td>TM-403</td>
<td>BGI146 Height, width, thickness (A, B or C)</td>
</tr>
<tr>
<td>TM-404</td>
<td>BGI146 Card thickness outside add-on areas</td>
</tr>
<tr>
<td>TM-405</td>
<td>BGI146 Thickness within add-on areas</td>
</tr>
<tr>
<td>TM-408</td>
<td>BGI078 Bending stiffness</td>
</tr>
<tr>
<td>TM-410</td>
<td>BGI077-2 Overall card warpage (non embossed / embossed card)</td>
</tr>
<tr>
<td>TM-412</td>
<td>BGI175A Peel strength and pre-cutting tool</td>
</tr>
<tr>
<td>TM-413</td>
<td>BGI133a Inside tool for adhesion or blocking</td>
</tr>
<tr>
<td>TM-414</td>
<td>BGI071 Dynamic bending stress</td>
</tr>
<tr>
<td>TM-415</td>
<td>BGI110C Dynamic bending (Multiline tester)</td>
</tr>
<tr>
<td>TM-416</td>
<td>BGI055C Impact resistance</td>
</tr>
<tr>
<td>TM-417</td>
<td>BGI055A Corner impact</td>
</tr>
<tr>
<td>TM-418</td>
<td>BGI058 3 wheel test (1 axis ID1)</td>
</tr>
<tr>
<td>TM-419</td>
<td>BGI110E 3 wheel test (Multiline tester)</td>
</tr>
<tr>
<td>TM-420</td>
<td>BGI083 Wrapping test (manual and automatic)</td>
</tr>
<tr>
<td>TM-421</td>
<td>BGI175B Back of card spot pressure</td>
</tr>
<tr>
<td>TM-424</td>
<td>BGI175A Advanced peel strength</td>
</tr>
<tr>
<td>TM-425</td>
<td>BGI125-2 Durability of tipping</td>
</tr>
<tr>
<td>TM-426</td>
<td>BGI175D Embossed character relief height retention pressure</td>
</tr>
<tr>
<td>TM-427</td>
<td>BGI146 Control tool (height, width, thickness)</td>
</tr>
<tr>
<td>TM-428</td>
<td>BGI146 Control tool (height, width, thickness)</td>
</tr>
<tr>
<td>TM-429</td>
<td>BGI110H Sand paper rub test</td>
</tr>
<tr>
<td>TM-430</td>
<td>BGI110F Soft eraser rub test</td>
</tr>
<tr>
<td>TM-431</td>
<td>BGI110C Dynamic torsional (Multiline tester)</td>
</tr>
<tr>
<td>TM-432</td>
<td>BGI110B Dynamic torsional stress</td>
</tr>
<tr>
<td>TM-433</td>
<td>BGI110D Dynamic torsional stress</td>
</tr>
<tr>
<td>TM-434</td>
<td>BGI146 Dynamic torsional stress (Multiline tester)</td>
</tr>
<tr>
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**ISO24789, April 2012**

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