



# SMART CARD PRODUCTION TECHNOLOGY

PRODUCT OVERVIEW



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# MÜHLBAUER GROUP AT A GLANCE

## MÜHLBAUER'S BUSINESS UNITS AND SITES

Founded in 1981 in the heart of Bavaria, the Mühlbauer Group has ever since grown to a leading global player in the fields of Parts & Systems, Semiconductor Related Products, Document Solutions & Equipment for Security Systems, and innovative Technologies for Electromobility and Flexible Solar Solutions. With around 4,000 employees, technology centers in Germany, Malaysia, Slovakia, the U.S. and Serbia, and 35 sales and service locations worldwide, Mühlbauer created a strong competence network around the globe.

Our global corporation continuously invests in the most modern innovations and creative ideas in order to enhance our competences and to provide you with optimized solutions. We aim to protect the environment with our advanced technologies and make life easier for countless people.

Our in-house precision part production **MPS** – Mühlbauer Parts & Systems – guarantees unlimited flexibility and highest customer satisfaction.

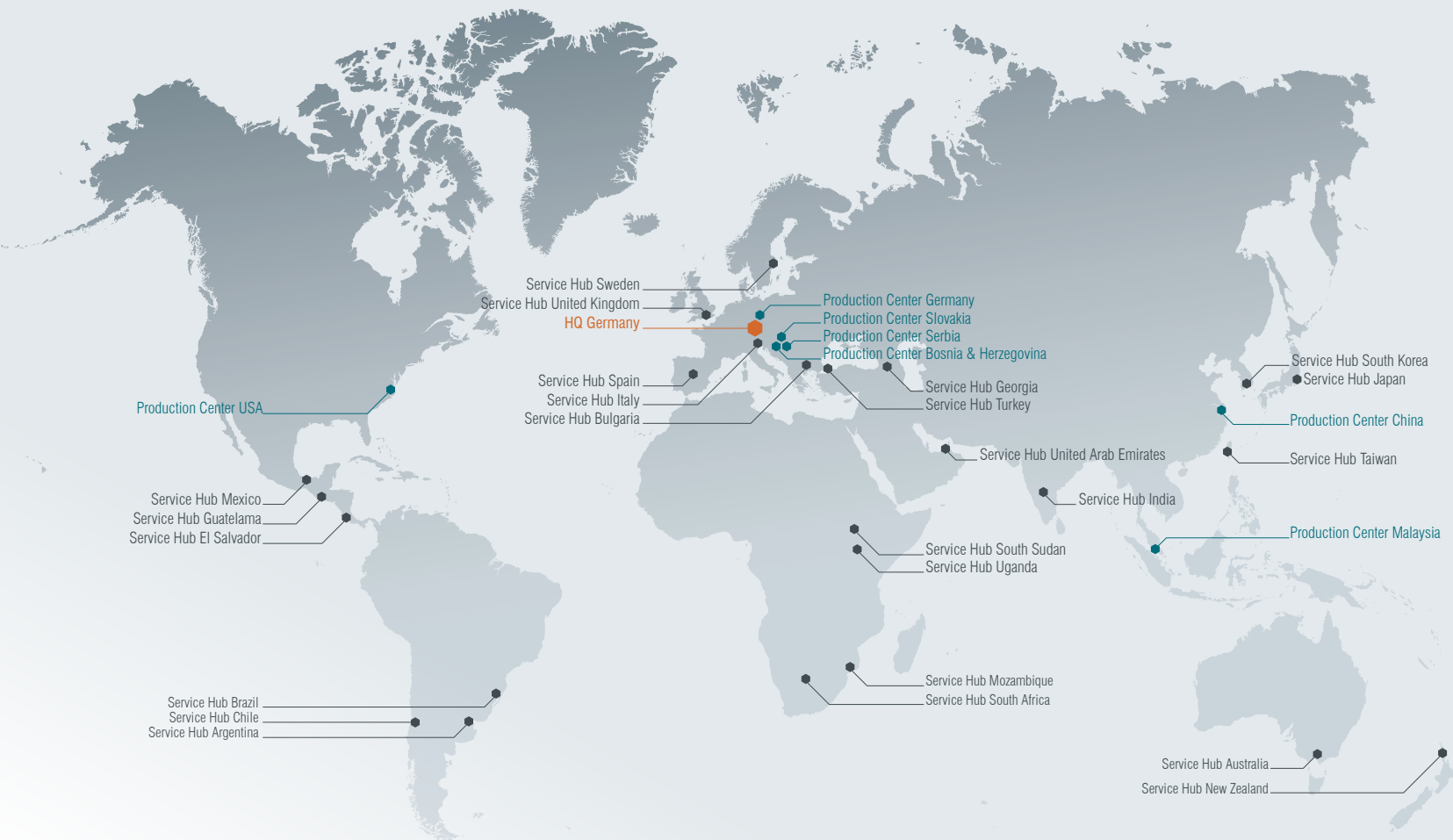
Our business unit **AUTOMATION** does not only develop and assemble individually customized production systems, but also offers intelligent software solutions for production automation

(Industry 4.0). Vision inspection technologies as well as semi-conductor and RFID applications complete our comprehensive portfolio.

Our youngest and currently most dynamic division **ATECH** – **Advanced Energy Technologies** – brings unique machinery requirements to series production. For the eMobility industry, we have been offering highly efficient production lines for the manufacture of pouch- and prismatic cells for lithium-ion batteries, as well as MEA's & stacks for fuel cells since 2022. Another promising area in this business field is our expertise in precise reel to reel material handling, which enables us to provide innovative production concepts for flexible solar cells and panels.

Our business unit **SECURITY®** is established as a competent partner for the implementation of security systems for identifying and verifying both documents and individuals. Our clients benefit from more than three decades experiential value which we have gained during the realization of over 300 ID projects worldwide.

**There is no “can’t do” at Muehlbauer. We tailor your solution!**



Mühlbauer  
Bosnia & Herzegovina



Mühlbauer  
China



Mühlbauer  
Germany



Mühlbauer  
Malaysia



Mühlbauer  
Serbia



Mühlbauer  
Slovakia



Mühlbauer  
USA



**MPS**  
Precision Parts & Surface Engineering



**AUTOMATION**  
Production Equipment & Systems



**MB ATECH**  
Battery & Fuel Cell Technologies



**WORLD OF SECURITY®**  
Government & Technology Solutions



# MANUFACTURING EXECUTION SYSTEMS



## MB MCES PERSONALIZATION MANAGEMENT SYSTEM

MB MCES is a personalization management software, which integrates incoming data with product definitions and controls the associated physical and electrical personalization processes. MB MCES handles personalization data from a variety of different input methods and formats.



## MB INCAPE INTEGRATED PRODUCTION MANAGEMENT SOFTWARE

MB INCAPE is Mühlbauer's Production Management Software for the production and personalization of electronic cards and documents (e.g. ID cards, ePassports, Driver's Licenses, EMV or GSM cards). Combining data management, production control and material management, the system allows for highly automated processes. It processes customer- and application-specific production, personalization, quality control and document delivery scenarios with highest solution flexibility.



## MB PALAMAX® TOTAL PROCESS TRANSPARENCY

MB PALAMAX®, Mühlbauer's Smart Factory solution, is developed for card, tag or booklet productions, personalization factories and semiconductor backend shop floors to set and collect process data to monitor and improve the efficiency of production and personalization for later processing, visualization and statistical analysis.



## MB TOOL LEADER CONNECTOR BETWEEN SYSTEMS

MB TOOL LEADER is a software package which consists of several applications and serves as a reliable link between the individual systems involved in the production process. By means of MB TOOL LEADER, the entire process chain – from the incoming order to the final precision part – can easily be monitored and controlled. This real-time machine monitoring guarantees an automated production process. Production errors can be detected and solved at an early stage. Thus, MB TOOL LEADER reduces the machine downtimes, which in turn leads to an increase of the machine's productivity by up to 20 percent.

### FEATURES & ADVANTAGES



Configurable workflow steps regarding personalization, quality assurance & issuance



Fully-automated processing & production management



Scalability regarding different documents, machines & personalization locations



Flawless integration of Mühlbauer's material management system (MB INCAPE WAREHOUSE)



Connection to card / document management systems via web service, database, file-based interface



Standard interface to personalization machines with integration of third-party machines possible



Integration of MB USER MANAGEMENT



Full coverage of production control requirements (security industry & EMV standards)



Seamless connection to MB PALAMAX® & MB DATA PREPARATION



Simplified administration due to web-based operator clients



Monitoring of real-time performance of the production



Seamless tracking of documents from point of production to issuance



Statistical tool analyze collected data & deliver customized statistics on OEE



Tool which enables the remote operation of machines on the shop floor from a control centre



Tool which increases effectiveness & efficiency so that production becomes more profitable



Enables production engineering to prepare & test a repeatable factory set-up. Factories can switch between products within minutes.





# CMT 200

## CHIP MODULE TESTING SYSTEM

Designed as an open platform, the test handling system CMT 200 is suitable for the counting and testing of IC Modules. Built on a compact basis with integrated spoolers, the (reel-to-reel principle) CMT 200 can be used for input quality measurement for card manufacturers. The modules can be tested mechanically as well as electronically with 4-fold contact. Optionally, contactless modules can be tested using a 6-fold contact-based head. Identified reject modules are marked by means of reject punching.



### KEY MODULES



Spooling unit  
(IC Module)



Electrical test station



Reject punching unit

## FEATURES & ADVANTAGES

### KEY FEATURES

- Automatic test handler for contact & contactless IC Modules on (super) 35 mm tapes
- Easily accessible control electronics & pneumatics
- Automatic spooling systems for module tape & spacer tape
- SPS-driven operation system
- Fully automatic processing of test procedures
- Contact & contactless test systems available
- MB MCES / MB INCAPE ready

### PRODUCTIVITY / PROCESS UNITS

- Integrated spooling systems for module tape & spacer tape
- Highly flexible testing solution for various IC Module applications
- 4-fold test heads for 9.5 & 14.25 mm pitch contact IC Modules
- 6-fold test heads for 9.5 mm pitch contactless IC Modules
- Availability: up to 95%
- Yield: up to 99.7%
- Environmental conditions:
  - » Room temperature: 23°C; +/-3°
  - » Humidity: 50%; +/-10%

### TECHNICAL DATA

- Module tape: 35 mm / super 35 mm; reel diameter: max. 500 mm
- Module pitch: 9.5; 14.25 mm
- Spacer tape: 35 mm; reel diameter: max. 500 mm
- Typical test time / ATR (ATS) test: ca. 1.0 sec
- Throughput: Contact-IC up to 11,000 UPH & Contactless-IC up to 16,000 UPH based on 1.0 sec ATR (ATS) test

CHIP MODULE TESTING

PRE-PERSONALIZATION

GLUE TAPE LAMINATION

MILLING

DUAL INTERFACE

IMPLANTING

MILLING & IMPLANTING

CHIP MODULE PUNCHING



# CMT 2280

## CHIP MODULE PRE-PERSONALIZATION SYSTEM

The new generation of Mühlbauer's high-speed IC Module pre-personalization and initialization system CMT 2280 is designed for test / pre-personalization of Smart Card IC Modules, especially for GSM and banking applications. Integrated high-end reader technologies such as Mühlbauer's MCES (also used in card personalization equipments, smartware or micropross) guarantee the fastest personalization performance. A mechanical thickness measurement and optical quality control can optional-

ly be chosen to ensure 100% good quality of the personalized modules. Faulty modules are automatically marked by the reject punch, which can move in x- and y-direction, is freely programmable and can mark IC Modules on any position of the module tape without decreasing the throughput. The final counting of the IC Modules takes place after the whole process is finished. This enables the pre-personalization of a determined quantity of IC Modules and the generation of a total report.



### KEY MODULES



Spooling unit  
(IC Module)



Pre-personalization  
& initialization



Reject punching unit

## FEATURES & ADVANTAGES

### KEY FEATURES

- Compact & cost-efficient
- Easily accessible control electronics & pneumatics
- Automatic spooling systems for module tape & spacer tape
- Fully automatic processing of test & pre-personalization procedures
- Contact- (dual interface) & contactless interface test systems available
- User-friendly operator interface ETS
- MB MCES / MB INCAPE ready

### PRODUCTIVITY / PROCESS UNITS

- Integrated spooling systems for module tape & spacer tape
- Highly flexible testing solution for various IC Module applications
- Vision module counting system
- Up to 16- or 32-fold test / encoding heads
- Programmable positioning of reject punch location in x/y
- Printer for reporting & statistics (reel report)
- Spooling systems TS 1150/I,0 for IC Module tape & spacer tape
- UPS (uninterruptable power supply)
- Full performance personalization through Mühlbauer's coding system MB MCES
- Smartware or even micropross compatible capability
- Availability: up to 95%
- Yield: up to 99.7%
- Environmental conditions:
  - » Room temperature: 23°C; +/-3°C
  - » Humidity: 50%; +/-10%

### TECHNICAL DATA

- Module tape: 35 mm / super 35 mm; reel diameter: max. 700 mm
- Module pitch: 9.5; 14.25 mm (others on request)
- Spacer tape: 35 mm; reel diameter: max. 500 mm
- Typical test time / ATR test: Ca. 2 sec
- Throughput: up to 34,000 UPH based on 2 sec. ATR test

CHIP MODULE TESTING

PRE-PERSONALIZATION

GLUE TAPE LAMINATION

MILLING

DUAL INTERFACE

IMPLANTING

MILLING & IMPLANTING

CHIP MODULE PUNCHING

UPH

5000 10000 15000 20000 25000 30000 35000





# CMT 6560

## CHIP MODULE PRE-PERSONALIZATION SYSTEM

Mühlbauer's chip module encoding and testing system CMT 6560 is designed for counting, testing and initializing IC Modules on standard 35 mm tapes. High-speed test handling or module counting with up to 65,000 modules per hour can be realized through the synchronization of test and pre-personalization. The testing of contact, contactless,

dual interface and single or multirow modules is achieved with the best performance and yield in the market by using Mühlbauer's MB MCES, the same high-end reader systems such as Mühlbauer's card personalization systems. Alternatively smartware and even micropross readers are available upon request.



### KEY MODULES



Spooling unit  
(IC Module)



Pre-personalization  
& initialization



Reject punching unit

## FEATURES & ADVANTAGES

### KEY FEATURES

- Most flexible & suitable for high volumes, especially for long coding procedures
- Easily accessible control electronics & pneumatics
- Automatic spooling systems for module spacer tape
- Fully automatic processing of test & pre-personalization procedures
- Contact, contactless & dual interface test systems available
- User friendly operator interface ETS
- MB MCES / MB INCAPE ready

### PRODUCTIVITY / PROCESS UNITS

- Integrated spooling systems for module & spacer tape
- Highly flexible testing solution for various IC Module applications
- Vision module counting system
- 16- or 32-fold test & encoding heads
- Up to 2 test stations for 64-fold parallel tests
- With extension module EM/600 up to 128 fold parallel test
- Programmable positioning of reject punch location in x/y
- Printer for reporting & statistics (reel report)
- Spooling systems TS 1150/I,0 for IC Module & spacer tape
- UPS (Uninterruptable Power Supply)
- Full performance personalization through Mühlbauer's coding system MB MCES
- Smartware or even micropross compatible
- Availability: up to 95%
- Yield: up to 99.7%
- Environmental conditions:
  - » Room temperature: 23°C; +/-3°C
  - » Humidity: 50%; +/-10%

### TECHNICAL DATA

- Module tape: 35 mm / super 35 mm; reel diameter: max. 700 mm
- Module pitch: 9.5; 14.25 mm; others on request
- Spacer tape: 35 mm; reel diameter: max. 500 mm
- Typical test time / ATR test: ca. 2 sec
- Throughput: up to 65,000 UPH based on 2 sec., ATR test; customized throughput (optional)

- CHIP MODULE TESTING
- PRE-PERSONALIZATION
- GLUE TAPE LAMINATION
- MILLING
- DUAL INTERFACE
- IMPLANTING
- MILLING & IMPLANTING
- CHIP MODULE PUNCHING



# CML 202

## GLUE TAPE LAMINATION SYSTEM

The CML 202 is Mühlbauer's highly reliable and efficient glue tape lamination system. A standardized set-up, produced in large lots results in a very competitive price. This machine is suitable for a wide range of IC Module tapes – standard as well as dual interface. A short product changeover and highest autonomy times lead to a great cost of ownership value. Automatic spooling units as well as easy-to-handle operation allow for a throughput of up to 9,000 modules per hour.



### KEY MODULES

-  Spooling unit (IC Module)
-  Tape application (Glue tape)
-  Punching unit (Glue tape)
-  Lamination (IC Module – glue tape)

## FEATURES & ADVANTAGES

### KEY FEATURES

- Easily accessible control electronics & pneumatics
- Automatic spooling systems for module & spacer tape
- SPS-driven operation system
- Locked production cabinet
- Best process ability with heating from top & bottom for 100% bubble-free glue lamination
- Sensor & mechanically controlled tape transport guarantees accurate glue film placement
- Tool change within seconds (without removal of module tape)
- Highest automatic production time
- Best cost-of-ownership ratio

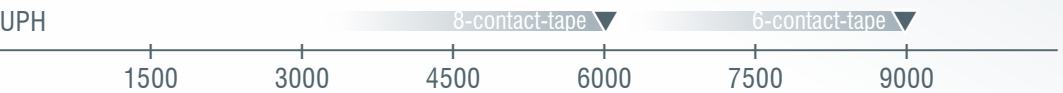
### PRODUCTIVITY / PROCESS UNITS

- Integrated spooling systems for module tape, spacer tape & glue tape
- Highly flexible solution for various IC Module applications
- 4-, 6-fold lamination & glue tape punching tools
- Dual interface module tools
- Customized tool designs (optional)
- Glue tape position control vision system (optionally available)
- Availability: up to 95%
- Yield: up to 99.7%
- Environmental conditions:
  - » Room temperature: 23°C; +/-3°C
  - » Humidity: 50%; +/-10%

### TECHNICAL DATA

- Module tape: 35 mm / super 35 mm; reel diameter: max. 500 mm
- Module pitch: 9.5; 14.25 mm
- Spacer tape: 35 mm; reel diameter: max. 500 mm
- Throughput:
  - » up to 6,000 UPH (8-contact module tape)
  - » up to 9,000 UPH (6-contact module tape), in case of pressing process time of 1,500 ms

CHIP MODULE TESTING	●
PRE-PERSONALIZATION	●
GLUE TAPE LAMINATION	●
MILLING	●
DUAL INTERFACE	●
IMPLANTING	●
MILLING & IMPLANTING	●
CHIP MODULE PUNCHING	●











# SCM 501

## SMART CARD MILLING SYSTEM

Mühlbauer's Smart Card milling system SCM 501 is used for automatic milling of cavities for IC Modules in plastic cards. This system provides a very economical card milling process for small and medium sized production tasks. Flexibility and modularity are the main benefits of this system which provides a variety of options including dual interface production. Producing standard cavities, the SCM 501 can reach a throughput of up to 3,500 cards per hour.



### KEY MODULES

-  Magazine card input
-  Card cleaning
-  Reject bin
-  CNC milling station
-  Cavity depth measurement
-  Magazine card output

## FEATURES & ADVANTAGES

### KEY FEATURES

- Fully automatic milling of cavities for IC Modules into plastic cards
- Operator-friendly, flexible & modular system design
- Scratch-free handling of card bodies due to vacuum card separation
- Graphic based milling design programming
- Highly accurate milling system with cooled spindle drive
- Excellent cavity cleaning by efficient suction system
- Fast milling tool changing & fully automatic calibration
- MB INCAPE ready

### PRODUCTIVITY / PROCESS UNITS

- Card feeding & stacking based on Mühlbauer magazine system
- Automatic magazine changer
- Magazine handlers with magazine buffer (optional)
- Card orientation & thickness measurement system (optional)
- 1 CNC-controlled weight optimized milling system
- Patented MB Antenna Touch System (ATS) for dual interface card production (optional)
- In-line antenna quality measurement station (optional)
- Cavity cleaning station
- Cavity measurement station with in-line feedback loop
- Electrical & optical antenna pad control systems (optional)
- Reject & sampling station (up to 3 fold max., optional)
- Availability: up to 95%
- Yield: up to 99.5%

### TECHNICAL DATA

- Card types: ID-1 cards; PC, PVC, ABS, PET; other materials on request
- CNC milling heads: 1
- Programmable milling axis: 3 (x-, y-, z-axis)
- Dynamic drive accuracy: x- / y-axis:  $\pm 15 \mu\text{m}$ , z-axis:  $\pm 10 \mu\text{m}$
- Measurement system accuracy:  $\pm 2.5 \mu\text{m}$
- Throughput: up to 3,500 UPH; depending on cavity design & material

- CHIP MODULE TESTING
- PRE-PERSONALIZATION
- GLUE TAPE LAMINATION
- MILLING
- DUAL INTERFACE
- IMPLANTING
- MILLING & IMPLANTING
- CHIP MODULE PUNCHING



# SCM 5001







## SMART CARD MILLING SYSTEM

The Smart Card milling system SCM 5001 is used for automatic milling of cavities for IC Modules in plastic cards. The system is perfectly suitable for all contact cards, dual interface cards and multi-SIM cards. It features a highly economical card milling process for medium to large production tasks. Flexibility and modu-

larity are main benefits of this system which provides a variety of options, including dual interface production. With a standard milling configuration, the SCM 5001 reaches a throughput of up to 5,000 cards per hour.



### KEY MODULES

-  Magazine card input
-  2x cleaning modules
-  Reject bin
-  CNC milling station
-  2x cavity depth measurement
-  Magazine card output

## FEATURES & ADVANTAGES

### KEY FEATURES

- Fully automatic milling of cavities for IC Modules into plastic cards
- Best accuracy, process ability & flexibility due to 2 independent milling stations (6 axis)
- Operator-friendly, flexible & modular system design
- Scratch-free handling of card bodies due to vacuum card separation
- Graphical based milling design programming
- High accurate milling system with cooling spindle drive
- Excellent cavity cleaning by efficient suction system
- Fast milling tool changing & fully automatic calibration
- MB INCAPE ready

### PRODUCTIVITY / PROCESS UNITS

- Card feeding & stacking based on the Mühlbauer magazine system
- Automatic magazine changer
- Magazine handlers with magazine buffer (optional) – close to 1 hour system autonomy
- Card orientation & thickness measurement system (optional)
- 2 CNC-controlled independent milling systems
- Patented MB ANTENNA TOUCH SYSTEM (ATS) for dual interface card production (optional)
- In-line antenna quality measurement station (optional)
- 2 cavity cleaning stations
- 2 cavity measurement stations with in-line feedback loop
- Electrical & optical antenna pad control systems (optional)
- Reject & sampling station (up to 3 fold max., optional)
- Availability: up to 95%
- Yield: up to 99.5%

### TECHNICAL DATA

- Card types: ID-1 cards; PC, PVC, ABS, PET; other materials on request
- CNC milling heads: 2
- Programmable milling axis: 3 (x-, y-, z-axis)
- Dynamic drive accuracy: x- / y-axis: +/- 15 µm, z-axis: +/- 10 µm
- Measurement system accuracy: +/- 2.5 µm
- Throughput: up to 5,000 UPH; depending on cavity design & material

- CHIP MODULE TESTING
- PRE-PERSONALIZATION
- GLUE TAPE LAMINATION
- MILLING
- DUAL INTERFACE
- IMPLANTING
- MILLING & IMPLANTING
- CHIP MODULE PUNCHING





# MFB 2500











## SYSTEM FOR DUAL INTERFACE CARD PRODUCTION

Mühlbauer's Flexible Bump technology offers a well-proven system that guarantees an absolutely secure connection between chip and antenna for dual interface cards. The unique and patented Flexible Bump process ensures electrical connection even when the card is intensively used. The latest generation of Mühlbauer's MFB 2500 offers even more state-of-the-art ingenuity and the flexibility to be integrated

into existing production lines without any additional upgrades. The MFB 2500 combines the unique antenna touch milling technology and the Flexible Bump process in one system. It offers the lowest costs per card, especially for high production volumes with a throughput of up to 2,500 cards per hour. Thanks to a vision system as well as the possibility of re-working, this system guarantees 100% good cards and a maximized yield.



### KEY MODULES

- |   |   |   |
|---|---|---|
|  Magazine card input   |  Flexible Bump dispensing station                    |  Magazine card output            |
|  Cavity check  |  Vision inspection (bump size & position inspection) |  Sample box                      |
|  CNC milling station with automatic antenna detection system |  Pre-curing station                                  |  Vision inspection (bump height) |
|  Electrical test station (antenna resistance)                |   |   |

## FEATURES & ADVANTAGES

### KEY FEATURES

- Fully automatic preparation of dual interface card bodies with the patented MB Flexible Bump technology
  - » Highly reliable with a long life connection of DI-IC Module with antenna in the card body
  - » Test certificates for Flexible Bump process by independent test laboratories
  - » International references in banking & ID for almost 15 years
- Automatic milling of antenna connection pads with the patented MB Antenna Touch System (ATS)
- Graphical based dosing design programming
- Automatic in-line quality control ensuring highest yield & quality
- The Mühlbauer dual interface process – Flexible Bump:
- MB INCAPE ready

### PRODUCTIVITY / PROCESS UNITS

- Card feeding & stacking based on the Mühlbauer magazine system
- Magazine handlers with magazine buffer for high system autonomy (optional)
- Input cavity detection (optional)
- Antenna resistance measurement station (optional)
- NC-controlled milling system with patented ATS for dual interface card production
- Vision system for antenna pad control (optional)
- Up to 2 highly accurate Flexible Bump dosing systems
- In-line quality control of Flexible Bump
- Reject & sampling station (up to 3 fold max., optional)
- Availability: up to 95%
- Yield: up to 99.5%

### TECHNICAL DATA

- Card types: ID-1 cards; PC, PVC, ABS, PET; other materials on request
- NC milling head optional: 1
- CNC dosing heads: up to 2
- Programmable milling / dosing axis: 3 (x-, y-, z-axis), x-/y-axis: +/- 15 µm, z-axis: +/- 10 µm
- Measurement system accuracy: +/- 2.5 µm
- Throughput: up to 2,500 UPH; depending on cavity design / materials & 2 dosing heads

- CHIP MODULE TESTING
- PRE-PERSONALIZATION
- GLUE TAPE LAMINATION
- MILLING
- DUAL INTERFACE
- IMPLANTING
- MILLING & IMPLANTING
- CHIP MODULE PUNCHING


















# CMFB 2500

## ADVANCED SYSTEM FOR DUAL INTERFACE CARD PRODUCTION

Mühlbauer's CMFB 2500 combines the superior and economic Mühlbauer cavity milling system with the patented ATS milling and Flexible Bump application technology in one manufacturing step. Highest accuracy and proven Mühlbauer technology ensure an efficient and high-quality production of dual interface cards. An output of 100% flawless cards is guaranteed by integrated measurement systems of the cavity depth and antenna resistance, as well as optional features such as thickness measurements and orientation checks of cards. With a number of optional upgrades, the CMFB 2500 adjusts flexibly to any requirements, thus achieving a throughput of up to 2,500 cards per hour.



### KEY MODULES

- |  |  |   |
|--|--|---|
|  Magazine card input                    |  Milling station for ATS milling  |  Vision inspection (bump size & position inspection) |
|  Card orientation check                 |  Antenna resistance measurement   |  Pre-curing station                                  |
|  CNC milling station for cavity milling |  Flexible Bump dispensing station |  Magazine card output                                |
|  Cleaning station                       |  Vision inspection (bump height)  |  Reject box  |
|  Cavity depth measurement               |  |   |

## FEATURES & ADVANTAGES

### KEY FEATURES

- Fully automatic preparation of dual interface card bodies with the patented MB Flexible Bump technology
  - » Highly reliable with a long life connection of DI-IC Module with antenna in the card body
  - » Test certificates for Flexible Bump process by independent test laboratories
  - » International references in banking & ID for almost 15 years
- Automatic milling of module cavity & antenna connection pads with the patented MB Antenna Touch System (ATS)
- Graphical based milling & dosing design programming
- Automatic in-line quality control ensuring highest yield & quality
- MB INCAPE ready

### PRODUCTIVITY / PROCESS UNITS

- Card feeding & stacking based on the Mühlbauer magazine system
- Magazine handlers with magazine buffer for high system autonomy (optional)
- Antenna resistance measurement station (optional)
- 1 CNC-controlled milling system
- 1 NC-controlled milling system with patented MB Antenna Touch System (ATS)
- Vision system for antenna pad control (optional)
- Up to 2 highly accurate Flexible Bump dosing systems
- In-line quality control of Flexible Bump
- Availability: up to 95%
- Yield: up to 99.5%

### TECHNICAL DATA

- Card types: ID-1 cards; PC, PVC, ABS, PET; other materials on request
- NC milling head: 1
- CNC milling head: 1
- CNC dosing heads: up to 2
- Programmable milling / dosing axis: 3 (x-, y-, z-axis )
- Dynamic drive accuracy: x- / y-axis: +/- 15 µm, z-axis: +/- 10 µm
- Measurement system accuracy: +/- 2.5 µm
- Throughput: up to 2,500 UPH; depending on cavity design / materials & 2 dosing heads

- CHIP MODULE TESTING
- PRE-PERSONALIZATION
- GLUE TAPE LAMINATION
- MILLING
- DUAL INTERFACE
- IMPLANTING
- MILLING & IMPLANTING
- CHIP MODULE PUNCHING



# DICL 5000

## DUAL INTERFACE CARD LINE

DICL 5000 is an effective in-line production system for long-life dual interface cards, as well as standard ID-1 Smart Cards. The system is designed for large production tasks and provides an economic and flexible design that guarantees extremely high

accuracy. It excels in providing the highest yield with a throughput of up to 5,000 cards per hour. The DICL 5000 provides the continuously proven Mühlbauer technology and quality, which is known in the Smart Card business for decades.



### KEY MODULES

- |                                     |  |                                     |
|-------------------------------------|--|-------------------------------------|
| Magazine card input                 | Dosing station for solder bump         | Electrical test station contact     |
| 2x CNC milling station              | Optical inspection of solder bump      | Electrical test station contactless |
| Patented Antenna Touch System (ATS) | Implanting station                     | Resonance frequency measurement     |
| 2x cleaning module                  | 3x hot press                           | Magazine card output                |
| 2x cavity depth measurement         | Cold press & module height measurement | Reject box                          |
| Antenna resistance measurement      | Optical module inspection              |                                     |

## FEATURES & ADVANTAGES

### KEY FEATURES

- Compact system for in-line production of dual interface cards
- MB TE-CONNECT® technology, developed for longest life time & easy handling
- Equipment also suitable for milling & implanting of standard contact cards
- Operator-friendly, flexible & modular system design

### PRODUCTIVITY / PROCESS UNITS

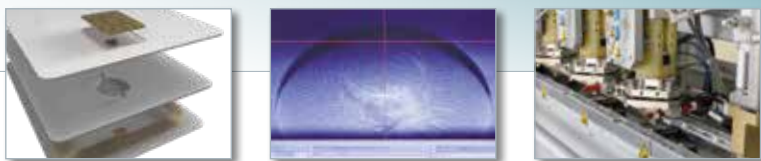
- Card feeding & stacking based on Mühlbauer magazine system
- 2 independent CNC-controlled milling systems (6 axis)
- Patented MB Antenna Touch System (ATS) for dual interface card production
- Additional cleaning station for highest process stability
- Cavity depth measurement with closed loop feedback to milling head
- Quality check of antenna pad by electrical resistance measurement and/or optical inspection
- Unique loop-back functionality keeps the volume of the glue stable
- Double dosing unit for MB TE-CONNECT® solder paste or customized glue (optional)
- Inspection of dosing volume by 3D vision system
- IC module tape feeding high precision punching system with reject handling
- Pick & place system with position & force controlled z-axis to avoid damaged chips
- Up to 4 hot press stations possible
- IC Module inspection by vision system (optional)
- Electrical test of contact (ATR) and/or contactless (ATS) cards
- 100% resonance frequency measurement for dual interface or hybrid cards (optional)
- In-line multi encoding system for pre-personalization & initialization with up to 6 coding heads

### TECHNICAL DATA

- IC Modules: 35 mm / super 35 mm tapes; 9.5 / 14.25 mm pitch
- Card types: ID-1 cards from PC, PVC, ABS, PET; other materials on request
- CNC milling heads: 2
- Programmable milling axis: 3 (x-, y-, z-axis)
- Dynamic drive accuracy: x- / y-axis:  $\pm 15 \mu\text{m}$ , z-axis:  $\pm 10 \mu\text{m}$
- Measurement system accuracy:  $\pm 2.5 \mu\text{m}$
- Implanting accuracy: X, Y =  $\pm 30 \mu\text{m}$
- Implanting pressure / temperature: up to 200 N / up to 300 °C
- Throughput: up to 5,000 UPH (standard Smart Cards), up to 2,200 UPH (dual interface cards with MB TE-CONNECT®)
- Availability: up to 95%
- Yield: up to 98%



- CHIP MODULE TESTING
- PRE-PERSONALIZATION
- GLUE TAPE LAMINATION
- MILLING
- DUAL INTERFACE
- IMPLANTING
- MILLING & IMPLANTING
- CHIP MODULE PUNCHING












# SCI 202

## SMART CARD IMPLANTING SYSTEM

Mühlbauer's SCI 202 is a cost-efficient IC Module implanting system for ID-1 Smart Cards. The system is designed for start-up and medium-size production tasks. It offers minimum footprint, an economic but flexible design, as well as extremely high accuracy. It excels with an outstanding uptime providing the highest yield at a throughput of up to 3,500 cards per hour.



### KEY MODULES

-  Magazine card input
-  Cold press
-  Reject bin
-  Implanting station
-  Electrical test station
-  Magazine card output
-  Hot press

## FEATURES & ADVANTAGES

### KEY FEATURES

- Fully automatic implanting of IC Modules into plastic cards
- Suitable for contact & dual interface card production
- Operator-friendly, flexible & modular system design
- Scratch-free handling of card bodies due to vacuum card separation
- Operator-friendly & fast tool changing
- In-house tool manufacturing & customizing
- MB INCAPE ready

### PRODUCTIVITY / PROCESS UNITS

- Card feeding & stacking based on Mühlbauer magazine system
- Cavity detection
- Automatic card & IC Module tape transport & indexing system
- Up to 2 hot press units
- 1 cold press unit with integrated module height difference measurement
- IC Module inspection by vision system (optional)
- Electrical contact station for IC Module check after implanting (ATR)
- Contactless test for dual interface or hybrid cards (optional)
- Resonance frequency measurement for dual interface or hybrid cards (optional)
- Optional multi encoding system up to 6 stations for pre-personalization & initialization
- Customized system extension (optional)
- Reject & sampling station (up to 2 fold max., optional)
- Availability: up to 95%
- Yield: up to 99.7%

### TECHNICAL DATA

- IC Modules: u35 mm / super 35 mm tapes; 9.5 / 14.25 mm pitch
- Card types: ID-1 cards; PC, PVC, ABS, PET; other materials on request
- Implanting accuracy: x, y = +/- 30 µm
- Implanting pressure / temperature: up to 200 N / up to 300°C
- Throughput: up to 3,500 UPH; depending on material

- CHIP MODULE TESTING
- PRE-PERSONALIZATION
- GLUE TAPE LAMINATION
- MILLING
- DUAL INTERFACE
- IMPLANTING
- MILLING & IMPLANTING
- CHIP MODULE PUNCHING





# SCI 5001

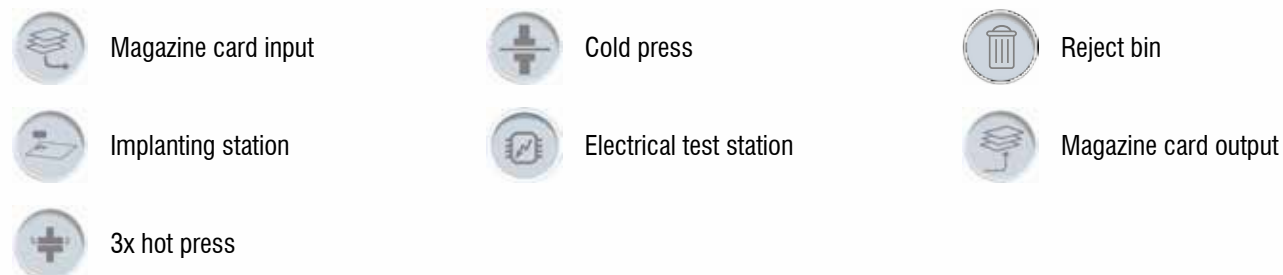
## SMART CARD IMPLANTING SYSTEM

Mühlbauer's SCI 5001 is a high-speed IC Module implanting system for ID-1 Smart Cards. The system is designed for medium to large-sized production tasks.

With its economical implanting process, flexible design and extremely high accuracy the SCI 5001 guarantees an outstanding uptime providing the highest yield with a throughput of up to 5,000 cards per hour.



### KEY MODULES



## FEATURES & ADVANTAGES

### KEY FEATURES

- Fully automatic implanting of IC Modules into plastic cards
- Suitable for contact & dual interface card production
- Operator-friendly, flexible & modular system design
- Up to 4 hot press stations for maximum speed
- Scratch-free handling of card bodies due to vacuum card separation
- Operator-friendly & fast tool changing
- In-house tool manufacturing & customizing
- MB INCAPE ready

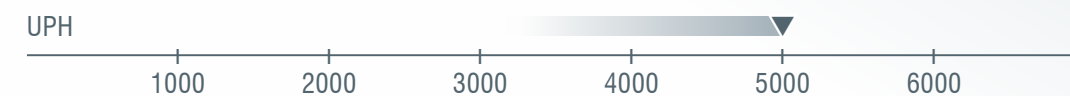
### PRODUCTIVITY / PROCESS UNITS

- Card feeding & stacking based on the Mühlbauer magazine system
- Magazine buffer for high system autonomy (optional)
- Fully automatic card & IC Module tape transport & indexing system
- Up to 4 hot press units
- 1 cold press unit with integrated module height difference measurement
- IC Module inspection by vision system (optional)
- Electrical contact station for IC Module check after implanting (ATR)
- Contactless test for dual interface or hybrid cards (optional)
- Resonance frequency measurement for dual interface or hybrid cards (optional)
- Multi-encoding system: up to 6 stations for pre-personalization & initialization
- Customized system extension (optional)
- Reject & sampling station (up to 3 fold max., optional)
- Availability: up to 95%
- Yield: up to 99.7%

### TECHNICAL DATA

- IC Modules: 35 mm / super 35 mm tapes; 9.5 / 14.25 mm pitch
- Card types: ID-1 cards; PC, PVC, ABS, PET; other materials (optional)
- Implanting accuracy: x, y =  $\pm 30 \mu\text{m}$
- Implanting pressure / temperature: up to 200 N / up to 300°C
- Throughput: up to 5,000 UPH; depending on material

CHIP MODULE TESTING	●
PRE-PERSONALIZATION	●
GLUE TAPE LAMINATION	●
MILLING	●
DUAL INTERFACE	●
IMPLANTING	●
MILLING & IMPLANTING	●
CHIP MODULE PUNCHING	●



# CMI 202


## COMBINED MILLING & IMPLANTING SYSTEM FOR MEDIUM VOLUMES

Mühlbauer's CMI 202 is a combined milling and implanting system for standard ID-1 Smart Card applications. The system is designed for small to medium-sized production tasks, offering a minimum footprint and economic, yet flexible design with extremely high accuracy.

Customers benefit from an excellent uptime, providing a very high yield with a throughput of up to 3,500 cards per hour. The CMI 202 provides all the proven Mühlbauer technology and quality, which is known in the Smart Card business for decades.



### KEY MODULES

- |   |  |   |
|---|--|---|
|  Magazine card input |  Implanting station |  Electrical test station |
|  CNC milling station |  Hot press          |  Reject bin              |
|  Cleaning            |  Cold press         |  Magazine card output    |
|  Depth measurement   |  |   |

## FEATURES & ADVANTAGES

### KEY FEATURES

- Fully automatic cavity milling & implanting of IC Modules into plastic cards
- Graphical based milling design programming
- Highly accurate milling system with cooling spindle drive
- Fast tool changing
- In-house tool manufacturing & customizing
- Operator-friendly, flexible & modular system design
- MB MCES / MB INCAPE ready

### PRODUCTIVITY / PROCESS UNITS

- Card feeding & stacking based on Mühlbauer magazine system
- Card orientation & thickness measurement system (optional)
- Fully automatic card & IC Module tape transport & indexing system
- CNC-controlled milling system
- Cavity cleaning measurement station with in-line feedback loop
- Up to 2 hot press stations
- IC Module inspection by vision system (optional)
- Electrical contact station for IC Module check after implanting (ATR)
- Contactless test for dual interface or hybrid cards (optional)
- Resonance frequency measurement for dual interface or hybrid cards (optional)
- Optional Multi encoding system up to 6 stations for pre-personalization & initialization
- Availability: up to 95%
- Yield: up to 99.7%

### TECHNICAL DATA

- IC Modules: 35 mm / super 35 mm tapes; 9.5 / 14.25 mm pitch
- Card types: ID-1 cards; PC, PVC, ABS, PET; other materials (optional)
- CNC milling heads: 1
- Programmable milling axis: 3 (x-, y-, z-axis)
- Dynamic drive accuracy: x- / y-axis: +/- 15 µm, z-axis: +/- 10 µm
- Measurement system accuracy: +/- 2.5 µm
- Implanting accuracy: x, y = +/- 30 µm
- Implanting pressure / temperature: up to 200 N / up to 300°C
- Throughput: up to 3,500 UPH; depending on material

- CHIP MODULE TESTING
- PRE-PERSONALIZATION
- GLUE TAPE LAMINATION
- MILLING
- DUAL INTERFACE
- IMPLANTING
- MILLING & IMPLANTING
- CHIP MODULE PUNCHING





# CMI 5001








## COMBINED MILLING & IMPLANTING SYSTEM FOR HIGH VOLUMES

Mühlbauer's CMI 5001 is an efficiently combined milling and implanting system for standard ID-1 Smart Card applications. The system is designed for large-sized production tasks offering an economic, yet flexible design with extremely high accuracy.

It excels at providing the highest yield with a throughput of up to 5,000 cards per hour. The CMI 5001 provides the continuously proven Mühlbauer technology and quality, which is known in the Smart Card business for decades.



### KEY MODULES

- |   |  |   |
|---|--|---|
|  Magazine card input         |  Implanting station |  Electrical test station |
|  2x CNC milling station      |  3x hot press       |  Reject bin              |
|  2x cleaning module          |  Cold press         |  Magazine card output    |
|  2x cavity depth measurement |  |   |

## FEATURES & ADVANTAGES

### KEY FEATURES

- Fully automatic cavity milling & implanting of IC Modules into plastic cards
- Suitable for contact & dual interface card production
- Operator-friendly, flexible & modular system design
- MB MCES / MB INCAPE ready

### PRODUCTIVITY / PROCESS UNITS

- Card feeding & stacking based on Mühlbauer magazine system
- Magazine handlers with magazine buffer (optional)
- Card orientation & card thickness measurement system (optional)
- Fully automatic card & IC Module tape transport & indexing system
- 2 independent CNC-controlled milling systems (6 axis)
- Patented MB Antenna Touch System (ATS) for dual interface card production (optional)
- Up to 4 hot press stations (optional)
- IC Module inspection by vision system (optional)
- Electrical contact station for IC Module check after implanting (ATR)
- Contactless test for dual interface or hybrid cards (optional)
- Resonance frequency measurement for dual interface or hybrid cards (optional)
- Multi encoding system up to 6 stations for pre-personalization & initialization (optional)
- Customized system extension (optional)
- Reject & sampling station (up to 3 fold max., optional)
- Availability: up to 95%
- Yield: up to 99.7%

### TECHNICAL DATA

- IC Modules: 35 mm / super 35 mm tapes; 9.5 / 14.25 mm pitch
- Card types: ID-1 cards; PC, PVC, ABS, PET; other materials on request
- CNC milling heads:2
- Programmable milling axis: 3 (x-, y-, z-axis)
- Dynamic drive accuracy: x- / y-axis: +/- 15 µm, z-axis: +/- 10 µm
- Measurement system accuracy: +/- 2.5 µm
- Implanting accuracy: x, y = +/- 30 µm
- Implanting pressure / temperature: up to 200 N / up to 300°C
- Throughput: up to 5,000 UPH; depending on material

- CHIP MODULE TESTING
- PRE-PERSONALIZATION
- GLUE TAPE LAMINATION
- MILLING
- DUAL INTERFACE
- IMPLANTING
- MILLING & IMPLANTING
- CHIP MODULE PUNCHING





# CMP 2000/M

## SEMI-AUTOMATIC CHIP MODULE PUNCHING SYSTEM

Mühlbauer's manual table top chip module punching system CMP 2000/M is designed for punching and cutting of SIM cards in compliance with ISO standards. ID-1 cards are manually placed under the punching respectively cutting unit. Then the hydro-pneumatic punching process is activated by a foot switch. The combined tool simultaneously punches and cuts the SIM format (ID-000) which is then ready to be pushed out of the ID-1 card. The throughput per hour depends on the operator.



### KEY MODULES



GSM punching tool



GSM cutting tool



Waste box

## FEATURES & ADVANTAGES

### KEY FEATURES

- Semi-automatic system for punching & pre-cutting of:
  - » GSM plugs in formats 2FF, 3FF, 4FF
  - » Mini Visa
  - » DUAL-SIM
  - » Customized shapes
- 1 punching / cutting unit
- Manual card handling
- Operator-friendly
- In-house tool manufacturing and customizing
- Quick tool change
- Customized punching die

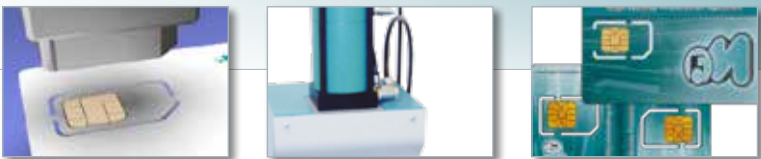
### PRODUCTIVITY / PROCESS UNITS

- Punch cycle is started with foot switch
- Hydro-pneumatic punch drive

### TECHNICAL DATA

- Card types: ID-1 cards; PVC, ABS, PET; other materials on request
- Punching / cutting system : Hydro-pneumatic
- Punching speed: Manually adjustable
- Punching / cutting force: Max. 31 KN
- Punching accuracy: +/- 0.1 mm
- Punching / cutting geometry: 2FF, 3FF, 4FF; special shapes on request
- Throughput: up to 2,000 UPH

CHIP MODULE TESTING	●
PRE-PERSONALIZATION	●
GLUE TAPE LAMINATION	●
MILLING	●
DUAL INTERFACE	●
IMPLANTING	●
MILLING & IMPLANTING	●
CHIP MODULE PUNCHING	●



# CMP 2020








## FULLY AUTOMATIC CHIP MODULE PUNCHING SYSTEM

Mühlbauer's CMP 2020 is designed for the pre-cutting and punching of GSM Cards (SIM Cards) or other shapes out of an ID-1 plastic card according to ISO standards or individual customer requirements. The new replug technology offers highest flexibility for different configurations of the tools. The CMP 2020 can be set up with up to 3 punching tools which make the sys-

tem the ideal equipment to punch half-cut SIM, Mini SIM, Mini Visa and paper GSM cards in one run. The cards are handled from magazine to magazine. A pick-and-place system automatically feeds the incoming cards to the punching and pre-cutting stations. An optional vision system checks the punch position and the complete removal of waste.



### KEY MODULES

-  Magazine card input
-  GSM punching tool
-  GSM cutting tool
-  3rd punching / stamping tool (optional)
-  Vision system (optional)
-  Reject box
-  Card output

## FEATURES & ADVANTAGES

### KEY FEATURES

- Fully automatic system for punching & pre-cutting of:
  - » GSM plugs in format 2FF, 3FF, 4FF
  - » Mini Visa
  - » DUAL-SIM incl. half-cut
  - » Customized shapes
- New MB replug tool generation for punching of multiple DUAL-SIM or all SIM sizes of one card in one step
- Up to 3 independent punching / cutting units
- Single- & DUAL-SIM handling
- Operator-friendly, flexible & modular system design
- In-house tool manufacturing & customizing
- MB INCAPE ready

### PRODUCTIVITY / PROCESS UNITS

- Card feeding & stacking based on Mühlbauer magazine system
- Magazine handler with magazine buffer for high system autonomy (optional)
- Up to 3 punching / pre-cutting stations
- Card orientation & card thickness measurement system (optional)
- Inspection system for punching quality control (optional)
- Reject & sampling station (up to 3 fold max., optional)
- Availability: up to 95%
- Yield: up to 99.7%

### TECHNICAL DATA

- Card types: ID-1 cards; PVC, ABS, PET, paper; other materials on request
- Punching system: Hydraulic driven
- Pre-cutting system: Hydraulic driven
- Punching speed: Adjustable
- Punching / cutting force: 23,5 kN
- Punching accuracy: +/- 0.1 mm
- Punching / cutting geometry: 2FF, 3FF, 4FF; special shapes on request
- Throughput:
  - » SINGLE-SIM: up to 5,000 UPH;
  - » DUAL-SIM: up to 7,000 UPH; depending on material

- CHIP MODULE TESTING
- PRE-PERSONALIZATION
- GLUE TAPE LAMINATION
- MILLING
- DUAL INTERFACE
- IMPLANTING
- MILLING & IMPLANTING
- CHIP MODULE PUNCHING



# QUALITY ASSURANCE

## TESTING EQUIPMENT

### CARD BODY TESTING EQUIPMENT



### SMART CARD TESTING EQUIPMENT



### CARD PERSONALIZATION TESTING EQUIPMENT



# PRODUCT PORTFOLIO

## YOUR ONE-STOP-SHOP TECHNOLOGY PARTNER

### AUTOMATION

#### CARDS & ePASSPORTS

- IC Module Production
- Card Body & Smart Card Production
- Holderpage & Booklet Production
- Card & ePassport Personalization
- Packaging & Mailing

#### RFID / SMART LABEL

- Antenna Production & Inlay Assembly
- Converting
- Personalization

#### SEMICONDUCTOR BACKEND

- IC Module Production
- Carrier Tape Production
- Die Sorting

#### INDUSTRIAL INSPECTION SYSTEMS

- Packaging
- Metal Working
- Special Solutions

#### FUTURE TECHNOLOGIES

- Concentrator Solar Technology
- Flexible Solar Cell Technology
- Solar Panel Technology
- E-SIM PERSONALIZATION
- LED Technology

### TECURITY®

- ID Card Solution
- ePassport Solution
- MB IDVERSO® Border Management Solution
- Driver's License & Vehicle Registration Solution
- Production Facilities

### PARTS & SYSTEMS

- Precision Parts
- Surface Engineering

#### CONSULTING

- Identification of Customer Requirements
- Planning & Design
- Implementation
- Ongoing Operations

#### SERVICE

- Worldwide Locations for Service & Support
- Worldwide Spare Parts Supply
- Reaction Time & Full Service Contracts
- Service & Maintenance Management
- Updates & Upgrades
- Teleservice, Remote Access & Hotline (24 hours)
- Training & Support on Different Levels
- Production & Administration Support

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