

CardMaster® One Personalisation System

Reliable and secure personalisation – Scalable in
functionality and speed.



The CardMaster® One System

This document provides a brief description of all possible functionalities and operations available on the CardMaster® One system. Please refer to your Project Quotation for the customised CardMaster® One system as chosen.

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Introduction

The CardMaster® One system is an automated, high volume card personalisation system supplied by IAI industrial systems B.V. The system can process different types of ID-1 sized cards.



Figure 1 - The CardMaster® One system

THE CARDMASTER® ONE CHARACTERISTICS:

- High volume card personalisation system
- Scalable in speed up to approximately 1500 cards/hour
- Modular design
- Field upgradable
- Easy to operate and maintain
- Open software platform

Functional description

The CardMaster® One system has a modular set-up. You can customise your CardMaster® One system with functional units as required. Within each functional unit, there are several options to choose from. Functional units can be added or exchanged at a later stage.

OVERVIEW

An overview of available functionalities is given in the table below:

Functional units	Options
Input	Choose number of input cassettes (2-8) Lockable cassettes
Card identification	Pre-printed number, barcode or QR code Check if card layout is correct
Magstripe encoding	LoCo and HiCo
Chip encoding	Contact and/or contactless readers 4, 8 or 16 readers Multiple encoding units (up to 48 readers)
Cleaning	Possible at multiple positions in the system
Laser engraving	CLI and/or MLI SLI (3D photo)
Colour inkjet printing	Clear Varnish, CMY printed, black by laser engraving
ImagePerf®	/TLI and /REV features
Verification	Choose the elements to be checked
Output	Choose number of output cassettes (2-8) Lockable cassettes

Table 1 – Functional units of the CardMaster® One system

INPUT

The blank cards are placed in the input cassettes by operator. Each cassette can contain up to 500 cards (based on approx. 0.8 mm card thickness). Optionally, the input cassettes are lockable. A maximum of eight cassettes can be placed in the input section.

When producing one type of card, multiple input cassettes can be used to maximise the volume of cards that can be processed without operator assistance.

In case of producing multiple types of cards, each input cassette can contain different card type, which allows processing of different card types in one batch run.

A card will be taken from one of the cassettes and placed into the transport system. The design of the cassettes in the input unit allows operator to add cards into the cassettes with ease and also refilling the empty cassettes while the system is running. Additional cassettes can be supplied for easy offline loading of cards.

CARD IDENTIFICATION

In case pre-numbered cards need to be identified, the CardMaster® One can be equipped with an identification unit. The camera reads a number, barcode or QR code pre-printed on the card, and this information is linked back to the personal data on the host computer.

The identification camera can also be used to identify the pre-printed design of cards.

Alternatively, pre-programmed number from the chip are able to identify in the chip encoding unit.

CHIP ENCODING

The chip encoding unit can perform high speed encoding of the embedded electronic chip. The system can perform both contact and contactless encoding. To increase the available encoding time with high throughput, multiple chip encoding positions are used in

parallel. The CardMaster® One system can be equipped with up to 48 chip readers.

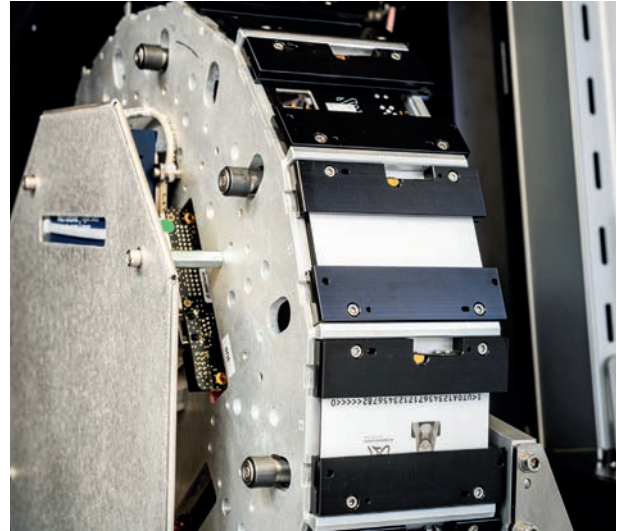


Figure 2 – Chip encoding wheel with multiple chip readers

The CardMaster® One system has a well defined communication interface, allowing customer to run their own chip encoding software. The chip encoding software is not included in the delivery. Following functionalities can be performed by the customer's chip encoding software:

- Chip-alive-check: In case the chip is reported as not ok, CardMaster® One sends the card to the reject bin without further processing.
- Reading a number from the chip in order to identify the card: The corresponding personal data is then retrieved from the host computer for the personalisation process.
- Encoding of the contact and/or contactless chips: For ICAO compliant cards, the encoding unit supports among others Active Authentication and Basic and Extended Access Control, following ICAO's 9303 recommendations.
- Verifying applied data after encoding: In case the chip is reported as unidentified, the CardMaster® One sends rejects to the reject bin without further processing. Optionally the card can be marked in the laser engrave unit with text "reject".

MAGSTRIPE ENCODING

The CardMaster® One System offers an optional magstripe encoding unit. This unit provides LoCo and HiCo functionality and meets ISO 7811 standards. The CardMaster® One System has a compatible interface, allowing the customer to run their own encoding software.

CLEANING

The cleaning unit cleans the card from dust and other particles in the photo area to be able to engrave and/or print non-disturbed images, text and other elements. The unit cleans both front and back side of the card.

LASER ENGRAVING

The laser engraving unit applies the personal data into both sides of the card using laser technology. This unit can contain multiple laser units in order to obtain a high throughput.

Every laser unit can apply subsurface and tactile engraving. The lasers can engrave different elements such as holder's photograph, holder's signature and personal data using different character font sets. The photograph and holder's signature are created using grey scale levels.



Figure 3 – Laser engraving ID card

The personal data and optionally the MRZ data are created in black. The photograph, holder's signature and personal data can be aligned relative to the background print. In case MRZ data must be engraved, this information is positioned on the back side of the card and printed at the bottom of the card as specified by ICAO.

Optionally, the laser engraving unit can apply Multiple Laser Image (MLI) and/or Changeable Laser Image (CLI) feature and/or Stereo Laser Image (SLI) feature. The card is turned around the axis which is in parallel with the short side of the card in order to apply the CLI or SLI feature, an optical element is used to apply the MLI feature.



Figure 4a – Example of CLI feature



Figure 4b – Example of MLI feature

COLOUR INKJET PRINTING

The CardMaster® One System can apply a Laser Colour Inkjet (LCI) image where a full colour image is created using a black (K) laser engraved image in combination with a printed image that applies the photograph in cyan (C), magenta (M) and yellow (Y) colours. The colour printed image is applied with inkjet printing technology .

The inkjet printing unit is equipped with three industrial piezo electric printing heads and uses UV curable inks in large containers. After the image is printed in a single move with high-speed, the ink is completely cured with a high power UV light.

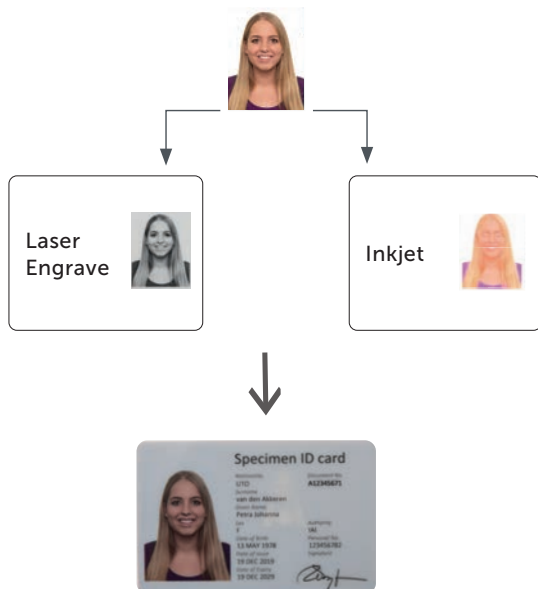


Figure 5 – The Laser Colour Inkjet (LCI) image

Optionally, a varnish unit applies a varnish ink on top of the image to increase surface abrasion resistance, which is also completely cured with a high power UV light.

Highlights of Laser Colour Inkjet:

- It creates a secure image, as the hardening of the ink by UV light is irreversible.

- With the transparent varnish layer, LCI technology provides durable colour photo IDs.
- The inks hardens instantly under UV light, allowing high speed personalisation of cards.
- The inkjet unit requires little maintenance, as the ink only hardens under UV light. This prevents clogging of the nozzles in the print heads.
- The ink containers in the CardMaster® One system allow many weeks of printing and easy to refill. The inks are supplied in large bottles with very competitively price compared to cartridge alternatives.

IMAGEPERF®

The ImagePerf unit applies ImagePerf or ImagePerf/TLI security feature into the card. The ImagePerf security feature is a repetition of the holder's photograph used to authenticate the laser engraved holder's photograph and is reserved exclusively for governmental cards, such as ID-cards, residence permit and driving licenses.

ImagePerf is a special laser technology which is used to create minute holes right through the card substrate. The holes are arranged to form an image of the holder's photograph that becomes clearly visible to the naked eye when the card is held to the light. The photo background is removed by special background removal software. This increases the processing speed as there are fewer holes to apply, but also able to provide better picture.



Figure 6 – ImagePerf in an ID-card

As the laser evaporates the substrate material locally, it is virtually impossible to imitate ImagePerf or to remove it from the document. The polycarbonate card is irrevocably marked with this unique perforation.

As an addition, a country prefix defined by ICAO as a three-letter-code can be applied in the lower right corner of the ImagePerf or next to ImagePerf. An extra security element can be incorporated in the three-letter-code, called Tilted Laser Image (TLI). The letter code is then perforated under two different angles and becomes gradually visible under different viewing angles. TLI is therefore an optically variable feature and poses an extra threshold against fraud.

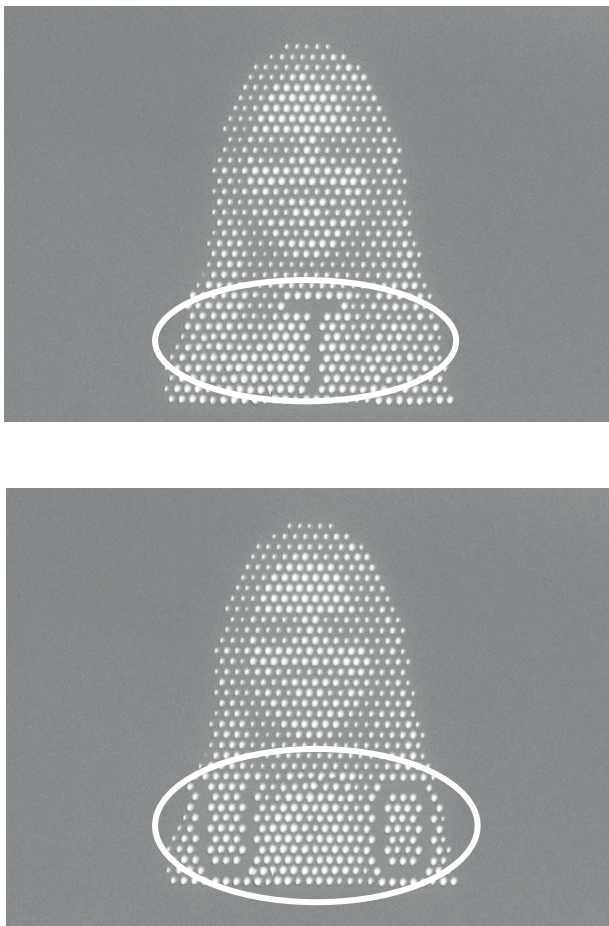


Figure 7a and 7b – The TLI feature under two different viewing angles

The ImagePerf can be matched with a second laser engraved image on the backside of the card to form the so called ImagePerf/REV feature, where REV stands for REVERSE. This feature protects against manipulation of the main photograph especially when attacked from the reverse side of the card. When the card is compromised in order to change the main photograph, the forger has to replace the ImagePerf which authenticates this main photo, and also this laser engraved reversed image on the back. These elements match closely together and are virtually impossible to change without being noticed. Therefore ImagePerf/REV allows easy authentication of the main photo on the card and connects the back side of the card carrying the REV image to its front.



Figure 8a, 8b and 8c – The REV feature on the back side of the card

VERIFICATION

The verification unit checks the applied features on the front and back sides of the card and verifies if all applied data corresponds with each other. This unit performs an integral inspection which means that graphical data, electronic data and applied features are checked all at the same time in one position in the CardMaster® One system. The following can be verified:

Applied feature	Inspection description
Photo	The inspection system compares the image from the camera with the original image file received from the host computer.
ImagePerf®	The inspection system compares the image from the camera with the original image file received from the host computer.
MRZ	The MRZ-data read by the camera is compared with the original MRZ file received from the host computer.
Document number	The document number read by the camera is compared with the document number from host file.
Chip programmed content	Data checks can be performed in the verification unit in combination with checks in the chip encoding unit to offer high speed and reliable checking of the chip content. For ICAO compliant cards, the verification unit compares data (group 1) read from the integrated chip with the data file (group 1) received from the host computer.
Number integrity host files	The document numbers in the host files (document number in text and in MRZ) are compared to each other to ensure number integrity in the host files.
MRZ integrity host files	The MRZ data in the host files (text file and chip data file) are compared to ensure MRZ integrity in the host files.

Table 2 – Applied features for verification

If a card fails the checks, it is conveyed into the reject bin or designated output cassette. Approved cards are sent to an output cassette. The results are reported back to the customer's host computer. The visual inspection can be performed under two different light conditions. Available options for the lighting are: White light, 365 nm and 900 nm.

OUTPUT

In the output unit the cards are brought from the system-transport to the output cassettes. Each output cassette can contain up to 500 cards (based on cards being approx. 0.8 mm thick). The design of the output cassettes allows easy removal of cards (from above the finger guard) or complete cassettes while the system is running. Optionally, the cassettes can be lockable.

The reject position can be an output cassette or a separate tray inside the system. The system will stop if more than a configurable amounts of cards are rejected in succession for the same reason and signal the operator for attention. Also suspect and rework cards can be sent to a specific output cassette. Destinations for rejects, suspect and rework cards can be defined in the job files for more flexibility.

Optionally, a sorting function can be added to the system. In the job it is specified for each card from which input cassette it has to be taken and to what output cassette it has to be sent. A coloured card can be used to separate the different jobs in the output stacker. It is possible to run rework jobs on the systems.

Additional cassettes can be supplied for easy offline unloading of cards. The input and output cassettes are identical and can be exchanged.

SYSTEM CONTROLLER

The System Controller consists of an industrial computer with software, which controls all activities within the CardMaster® One system. It can be equipped with a

power backup unit (UPS), which shuts down the system in a controlled way in case of a power outage. The CardMaster® One system is equipped with an emergency stop button. In case of an emergency the operator can stop the system immediately by pressing this button.

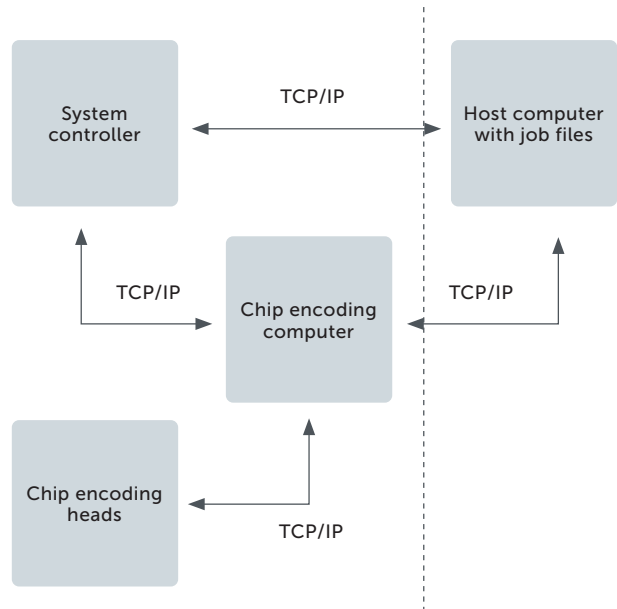


Figure 9 – Schematic overview System Controller

The CardMaster® One system is connected to the customer's host computer. This host computer prepares all data needed for the personalization of the card. The CardMaster® One system retrieves the personal data from the host computer.

The CardMaster® One system is equipped with a designated industrial PC which is connected to the programming heads in the chip encoding unit and has a network interface card for connection with the customer's host computer, the PKI server, and the CardMaster® One System Controller. This PC is reserved for the customer to run its chip programming software for programming, digital signing and verification of the data in the chip(s).

For interfacing with the CardMaster® One system, a well defined and documented interface is available based on a TCP/IP client-server protocol. The host computer, its application software and the network infrastructure are not part of the delivery.



Figure 10 – CardMaster® One units overview

AUXILIARY EQUIPMENT

CardMaster® One system uses an internal cooling unit. The application of the ImagePerf laser perforation requires an external cooling and filter unit. In case many engrave lasers are installed on the system, also an external cooling unit may be required.

It is recommended to place the cooling unit and filter unit in a separate room in the vicinity of the system to keep heat and noise level to a minimum.

The cooling unit cools the lasers. It employs a closed circuit water cooling system and transfers the heat produced by the lasers to the ambient air.

The filter unit comprises an exhaust pump, a coater unit and a mechanical filter. The perforation of material produces gasses and dust particles that have to be removed from the processing area. The exhaust pump

sucks away the gasses and dust from the perforation area, through the mechanical filter that intercepts the dust particles.

The mechanical filter collects the dust particles. The filter material has to be replaced occasionally. The coater unit renews this material inside the mechanical filter. The mechanical filter uses chalk as filter material, which is a consumable. The mechanical filter does not need continuous maintenance but occasionally requires refilling of chalk filter material by the operator.

Operating the CardMaster® One

Operating the CardMaster® One is easy and safe. The CardMaster® One system complies with the European safety standards and is equipped with the CE-mark. The CardMaster® One system also complies with class I requirements of the EN80625 standard on radiation safety, which means that:

- The system operator does not need special training on laser safety.
- The system operator does not have to wear any means for personal protection.
- In normal operation, no additional measures for the safety of persons in the environment of the system are necessary.

USER INTERFACE

The CardMaster® One system is controlled by the operator through an operator interface using a touch screen display. The menu driven design of the software offers flexible and easy operation of the system. The operator interface shows the activities performed in the system and allows the operator to control the system.

Among others, the operator can select one or more jobs to be processed on the system and start and stop the production. The CardMaster® One system can automatically handle multiple jobs:

- Normal Jobs: the Normal Jobs are handled one after the other and the finished cards are sent to the output cassette indicated in each job.
- Priority card: a priority card can be produced immediately or after a running job is finished.

The menus for the operator are available in English or in another language. The operator has to log-on in order to perform any actions on the CardMaster® One system. Operator log-on is secured by a password. Optionally, a fingerprint or smart card scanner is available. Several

access levels are available (administrator, operator, service, IAI).

The CardMaster® One system logs information of the processed cards, the operator log-on/log-off and error messages that have been displayed. All data is logged on the system controller's hard disk and when a certain maximum is reached the oldest data is removed automatically. All logged data can be sent to the host computer as files if needed. The CardMaster® One system offers several standard reports: Production overview report; Card detail report; Log-on/log-off report and Error message report.



Figure 11 - Operating CardMaster® One System

OPERATOR HANDLING

The operator handling consists of the following tasks:

- Operating the user interface,
- Adding new cards to the input cassettes,
- Inserting the cassettes in the system,
- Removing the output cassettes from the system
- Removing processed cards from the output cassettes,
- Emptying the reject bin and
- Giving assistance when a card causes a problem in the system.

In case a card obstructs the CardMaster® One system, the operator can easily remove the particular card which caused the problem. The rest of the cards remain in the CardMaster® One system and the operator can resume the processing of the batch immediately. In most cases unfinished cards can be completed in the CardMaster® One system in order to reduce wastage even further. Also regular cleaning of the system and replacement of consumables will be necessary.

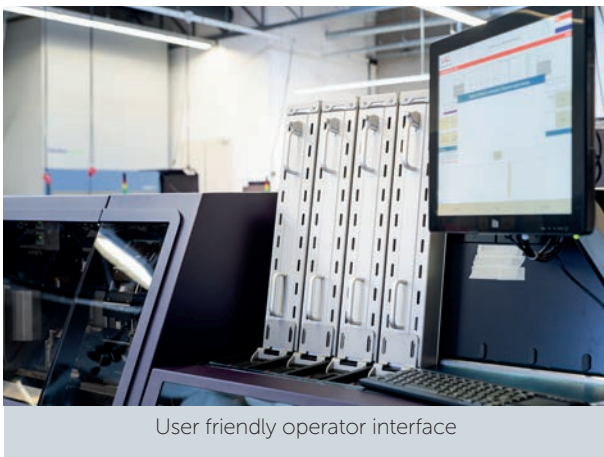


Figure 12 – CardMaster® One user interface



Easy docking, loading and unloading.

Figure 13 – CardMaster® One operator handling

TRAINING AND MANUAL

An operator training, an operator manual and an exploded parts catalogue are parts of the delivery. During the operator training, the operators will be instructed on how to operate the system and how to perform the first-line maintenance activities.

Optionally, second-line maintenance training and other training can be provided upon request.

Datasheet

Functional units	Options
Document specifications	ID-1 sized cards (ISO 7810/ICAO 9303)
Card material (1)	Polycarbonate
Electronic chip	Contactless chip: ISO 14443 compliant, type A/B Contact chip: ISO 7816 compliant
Software platform	Defined communication protocol
Production rate (2)	Up to 1500 cards per hour Mechanical speed (transport only) up to 4000 cards/hr.
Dimensions (3)	120 cm (W) x 170 cm (H) x 340 cm (L)
Weight (3)	Approximately 1050 Kg
Power consumption (3)	Approximately 2.5 kW
Compressed air	External compressed air required.
Network requirements	UTP (100 Mbs) and TCP/IP
Temperature range	18-30 °C
Humidity range	45-60 % (non condensing)
Floor requirements	Dust free, e.g. coated concrete

(1) Other laserable materials, please contact our sales team.

(2) Depending on application and configuration.

(3) Depending on configuration, given data is for following configuration: Input with 8 cassettes, card identification, chip encoding, laser engraving, verification and output with 8 cassettes.

Personalisation range

The CardMaster® One system is a versatile system platform. It can be customised in order to reach almost all project requirements. However, we strive to make the CardMaster® One system as flexible as we possibly can, there are some technical limitations with regard to the described functionalities. Please refer to figure 14 for the personalisation range of laser engraving including the MLI and CLI features and ImagePerf. MLI and ImagePerf® are set at fixed positions once,

whereas the CLI position can vary per card type. The personalisation range for special features is available on request. You can find information about other limitations in the further documentation, which is available on request.

We would very much like to discuss the possibilities in regard to lay-out and the available production speed with you when you plan your project.

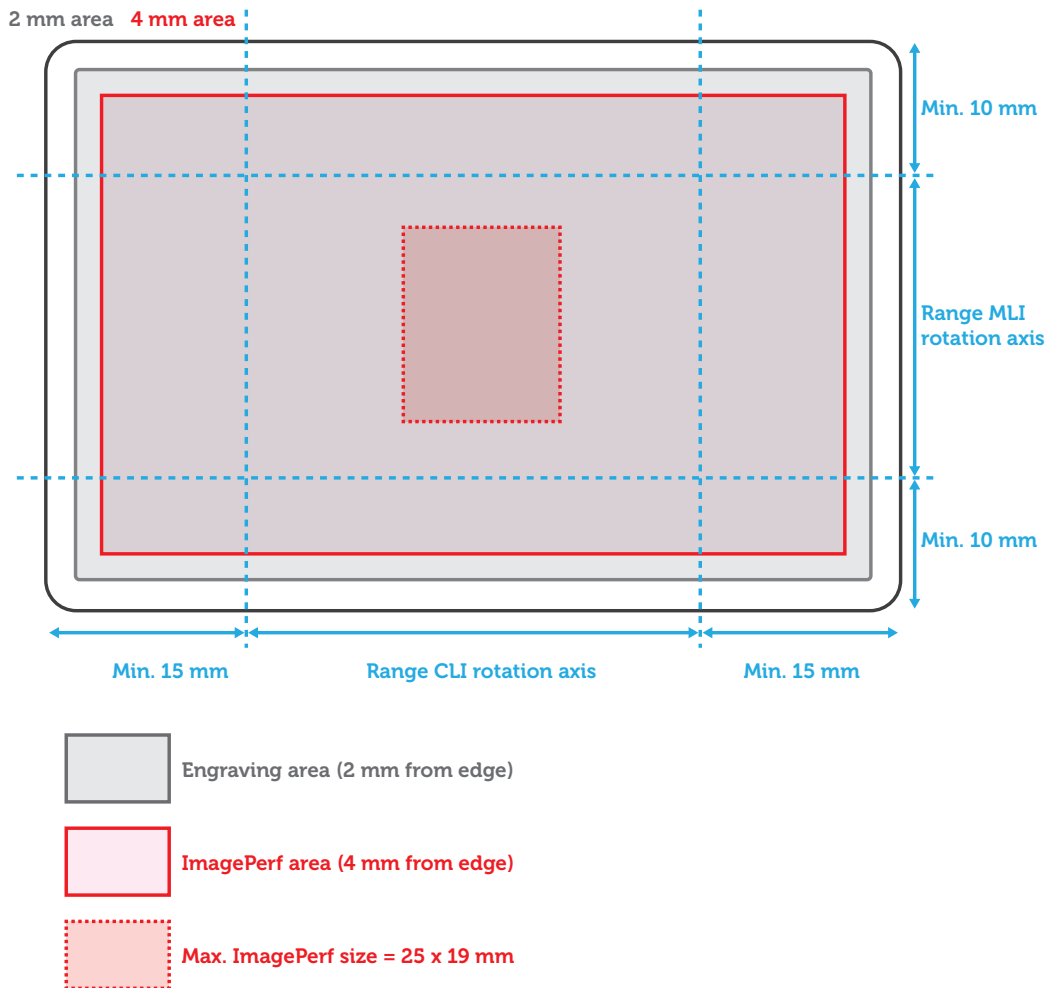


Figure 14- Personalisation range of laser engraving

Further documentation

More specific technical information is available on request. A list of topics on which we have documentation available is given below:

- Chip encoding Interface
- Host protocol
- Installation requirements
- Example of operator manual
- Example of spare parts list

General remarks

The processing time of the card depends among others on the amount of data to be printed on the card, the amount of data to be programmed in the contact and contactless chips and the security features which are applied. Also the system can be delivered in various configurations to optimize the system to the desired throughput. Upon request, we can specify what performance can be obtained for your specific card designs and system configurations.

Special laser engraving features may be subject to Intellectual Property Rights (IPR) owned by third parties. Although the CardMaster One system is technically capable to apply these features, the procurement of the CardMaster One system does not grant license for the use of such features covered by IPR and licenses must be procured separately from the respective IPR owners.

The composition of the gasses created during laser perforation depends entirely on the materials used in the card. Samples of gasses should be analysed for toxic components. If present, appropriate extra filtering must be foreseen to eliminate these components. Such additional filtering is not part of the delivery.

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