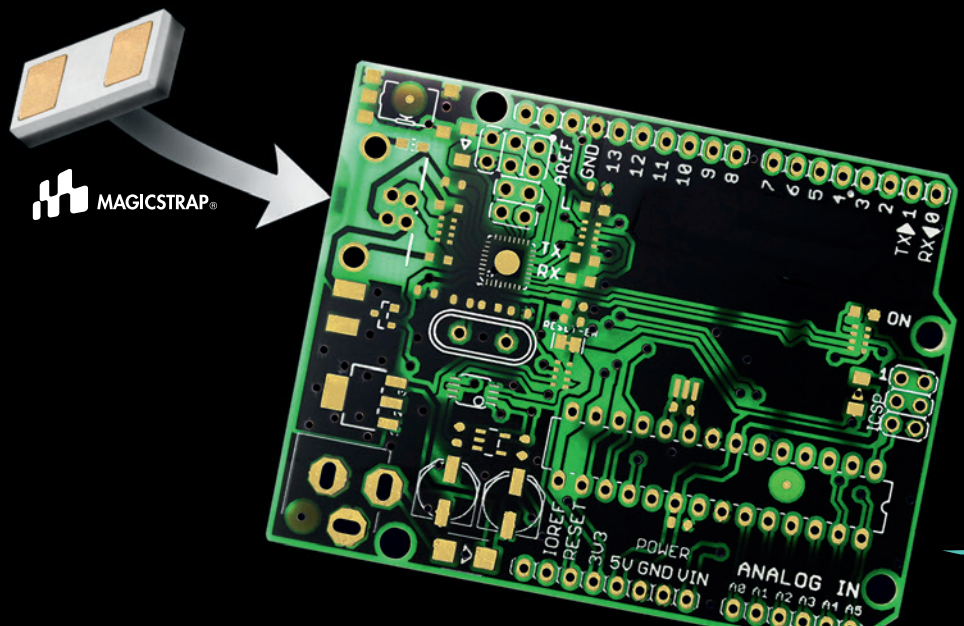
MAGIC-PCB®

Beta LAYOUT

RFID Embedding

Simple
Affordable
Available



Patent US 8459563 B2
JP 5683431
EP 2448379 B1

Beta LAYOUT
create:electronics

Location Germany

Location Ireland

Location USA

Beta LAYOUT

create : electronics

We manufacture and assemble high-quality PCB prototypes; laser stencils; mill and print front panels as well as create rapid 3D prototypes.

The Beta Group has a customer base of over 30,000, employs over 150 people, and generates annual revenues of over €20 million.

Our clients include major companies such as Siemens, Bosch, Infineon, ABB, Hella, Porsche Engineering, Texas Instruments, EADS, and Lufthansa Technik.

We have developed a technology that allows electronic products to be clearly identified and traced: MAGIC-PCB®.
Tomorrow's PCB will always carry its ID with it!

This is achieved by embedding an RFID component into the PCB.
From outside you cannot see anything, but the PCB is capable of storing all the relevant data:
the component's bill of materials, the revision information, the firmware version, circuit diagrams and layout information, the manufacturing site, the manufacturing process, warranty/return information, the product's repair and upgrade history, and so on.

An invisible RFID chip holds all this data and can therefore be used to prove the product's authenticity.
This PCB containing the outwardly invisible RFID chip is known as the Magic PCB®.

We developed this technology because industry is finding it increasingly useful to be able to identify and trace its components and products.

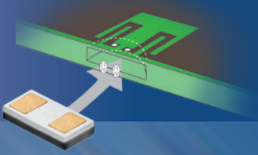
A consortium comprising detego, Kathrein, Murata, Brooks and Beta LAYOUT is satisfying a need that you perhaps identified a long while ago: using RFID in the very first stages of product development.

This solution will now enable you to generate added value throughout the entire subsequent product development process.

RFID: The Facts

RFID: The Advantage

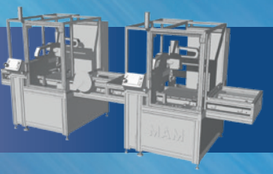
Design & Embedding Technology



Reader/Writer

RFID Service Centre

Applicator



RFID: The Facts

The Facts:	Solution offered by an embedded RFID chip:
Anti-Counterfeit / Brand Protection	
• 118 counterfeit products were confiscated at the 2010 „Light and Building Show" in Frankfurt. • €2.4 million counterfeit products in Germany worth €96 million were confiscated by customs authorities in 2010. • Product piracy results in a €20 billion profit loss in Germany every year.	• Hidden product protection is provided by the embedded RFID, which is only removable by destroying the PCB. • Easily distinguish the original from the fake throughout the whole supply chain without any special knowledge. • Embedded RFID enables discrete field tests with mobile Bluetooth readers at fairs, suppliers, etc.
Traceability	
• The recall of 15 million vehicles in the USA led to a company losing 7 % of its value (2011, NHTSA). • A mobile phone manufacturer's supplier cost for the recall of 46 million batteries was about €100 million. • The recall of mainboards with wrong bridge ICs was estimated to have cost US$1 billion.	• RFID enables easy and continuous traceability throughout the supply chain so that the final location of each product is known (POS scan). • Recalls can be selective, discrete and therefore cost-effective. • The RFID stores valuable historic information about previous product repairs/modifications in the chip.
Logistics	
• An original mobile phone was recalled from a retailer because it was bundled with counterfeit chargers at the distribution centre. • Research shows that experiencing delays or delivery problems just twice or more would convince 87% of people to switch to another supplier.	• Reading data through the package of a product ready for shipment results in a reduction of up to 100% in incorrect shipments. • Writing information onto the RFID chip even through the package creates vast opportunities and savings (i.e. programming the country code/language without unpacking the electronic device (I^2C)). • Increased speed on goods incoming/outgoing processes via RFID (Carrier Corp. experienced a 33 % improvement in shipping productivity and an 80% reduction in shipping errors since incorporating RFID).
Recycling	
• Currently 50 million tonnes of electronic waste are created worldwide every year, with year-on-year increases of over 5%. Illegal shipments of e-waste to Ghana added up to 71,000 tonnes in 2009. • A major difficulty in the context of electronic waste is identification – Who is responsible, who has to pay? (WEEE) – What is the composition of materials (recyclables / hazardous substances)?	• A virtually indestructible chip in each PCB allows the responsible producer and the substances to be identified anytime, anywhere in the world. Thanks to a simple and mobile reader technology that even works outdoors!

RFID: The Advantage

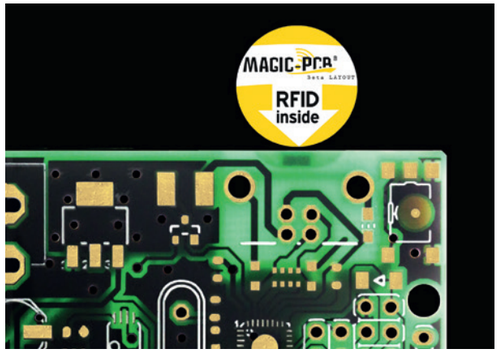
Space-saving:
- RFID chips can be embedded into PCBs
- Takes up less space on the PCB than barcodes or dot matrix codes
- Works even without an antenna, so no space is needed on the front or rear of the PCB

Cost-saving:
- Fast data acquisition (very short read time)
- Simultaneous reading of multiple tags (over 100 tags per second)

Reliable:
- High reading accuracy
- Small number of manual operations
- Invisible copy protection

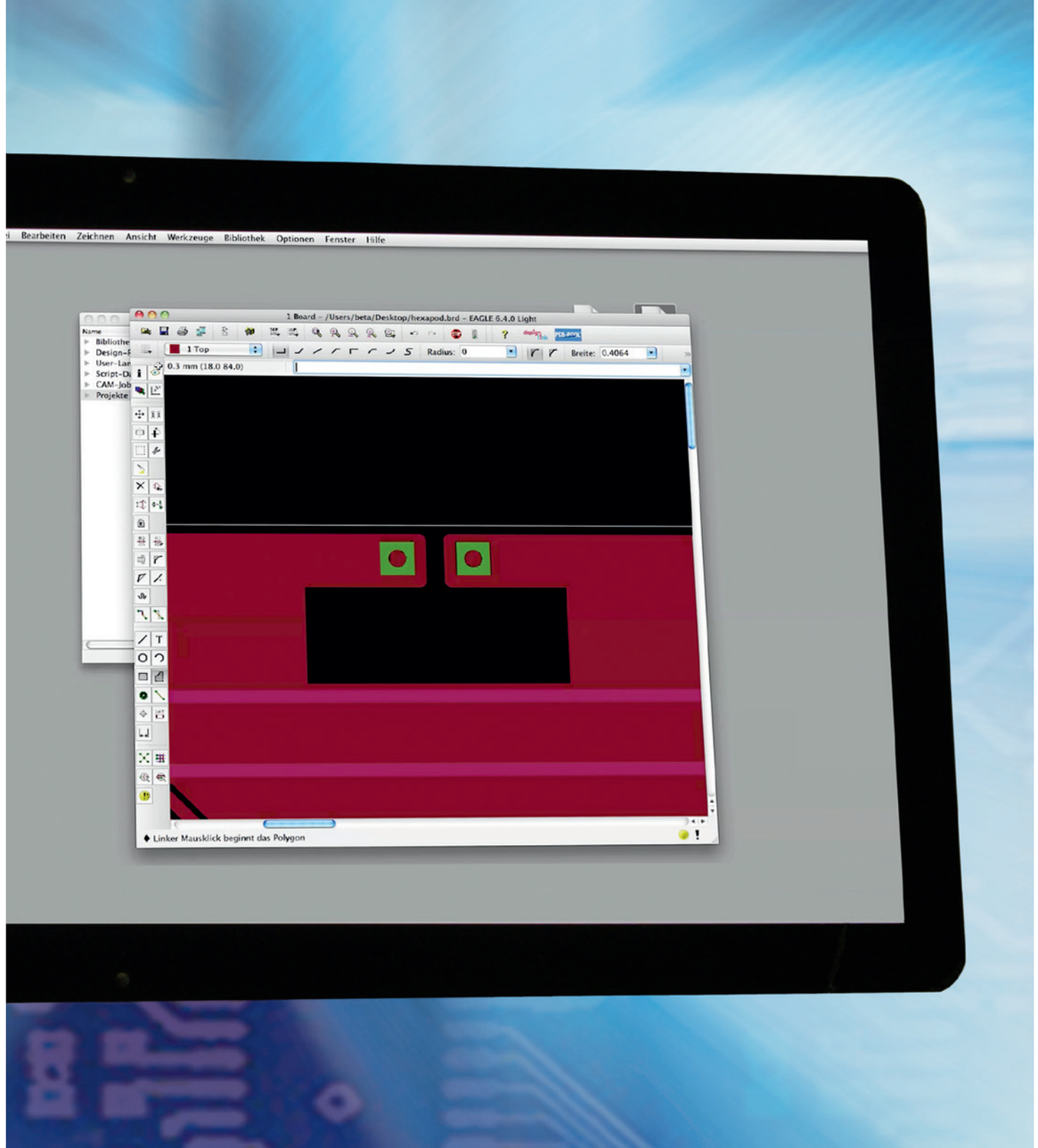
Versatile:
- No optical contact necessary: reads and writes through enclosures and packaging
- Additional user memory (e.g. for software version, maintenance information, etc.)
- Wide reading angle

International standard:
- EPCglobal; covers EU, US and Japan



Imagine: Your bare PCB invisibly contains the following information without requiring a single mm of space:

- bill of material
- revision information
- firmware version
- schematics and layout file information
- documentation link
- date code
- manufacturing plant
- manufacturing process
- end-product type
- warranty/return information
- repair and upgrade history
- customer information
- anti-tamper information
- .... your idea?....



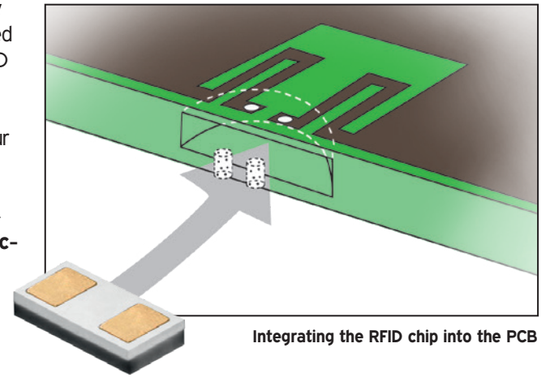
Design & Embedding Technology

The main benefit of the MAGIC-PCB® is that the stored data can be read and written even without an antenna.

Wide ranges of up to five metres can be achieved by integrating an antenna in your layout. There is no need to design your own antenna in order to use your RFID chip.

Simply connect the existing PCB ground plane to your RFID chip.

Free download of design examples including the connection layout: **https://de.beta-layout.com/rfid/magic-pcb/**



Integrating the RFID chip into the PCB

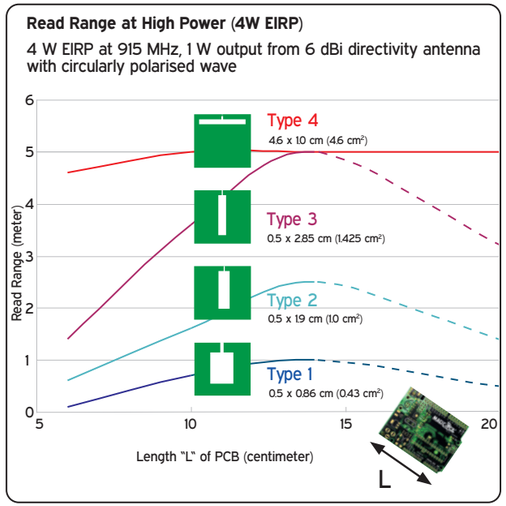
Range

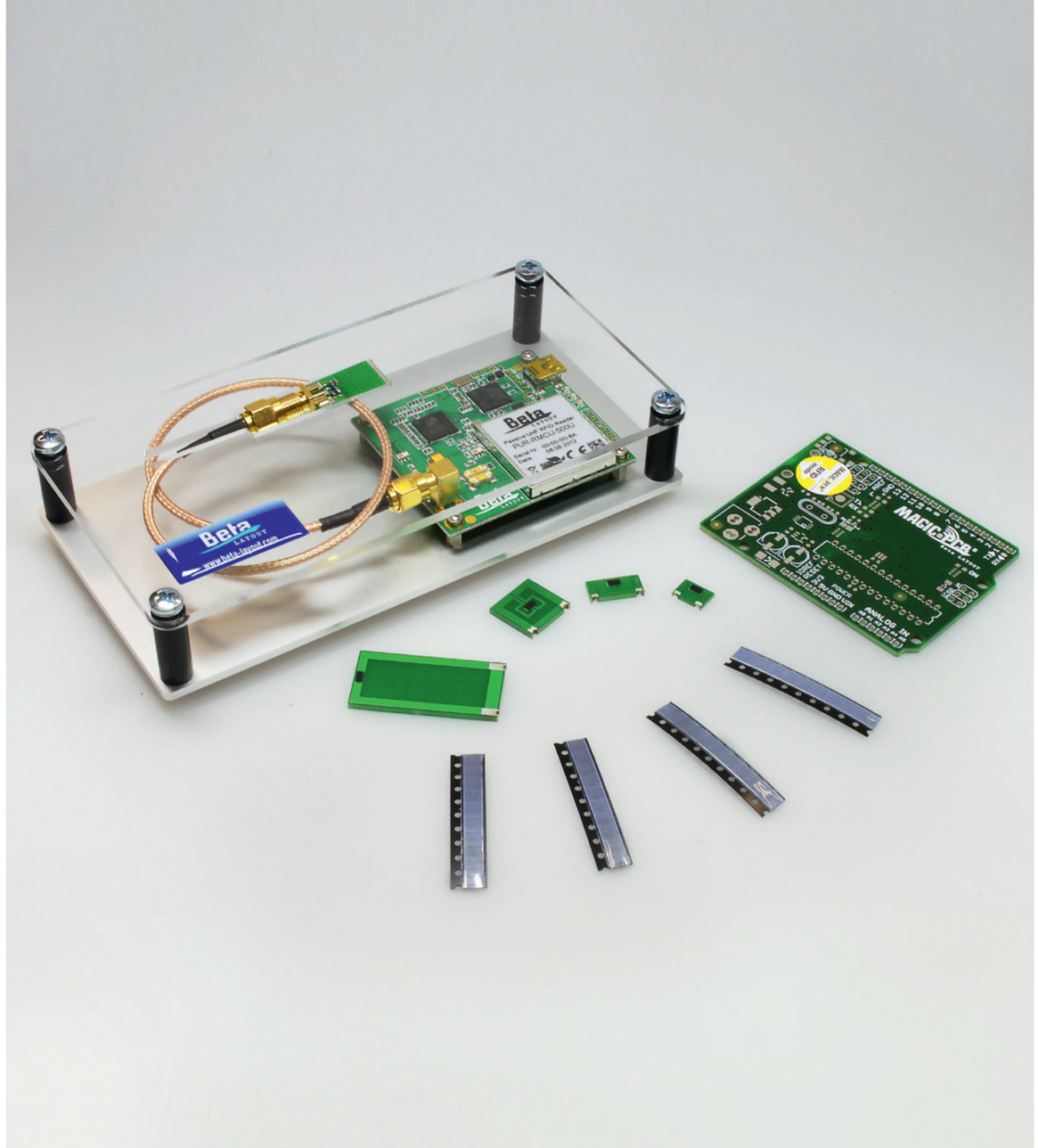
Up to 5 mm*
Without an antenna

Up to several meters*
Electrical connection to an existing ground plane as an antenna: the RFID is readable - and writeable even through housing and packaging

Go to **https://de.beta-layout.com/rfid/magic-pcb/** for brief instructions on how to integrate antenna designs into your layout using EAGLE und Target 3001.

* Depending on the following parameters:
PCB/ground plane • read/write device • antenna • environment



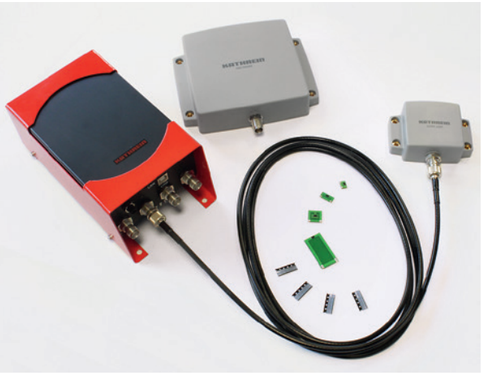


Reader/Writer

Go to our Beta eSTORE at www.beta-estore.com/rfid where you can purchase a selection of readers/writers.

Our range includes everything from simple write/read modules to our UHF RFID basic kit (see diagram to the left) and handheld devices such as Blueberries to carry in your pocket.

You can also read and write on the embedded RFID chips using existing industrial UHF RFID readers.

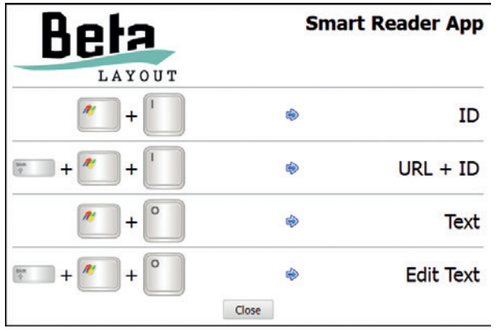


Software

In addition to the read/write module, antennas, chips, and MAGIC-PCB®s, our UHF RFID Kit includes an extraordinary software package:

Smart Reader App

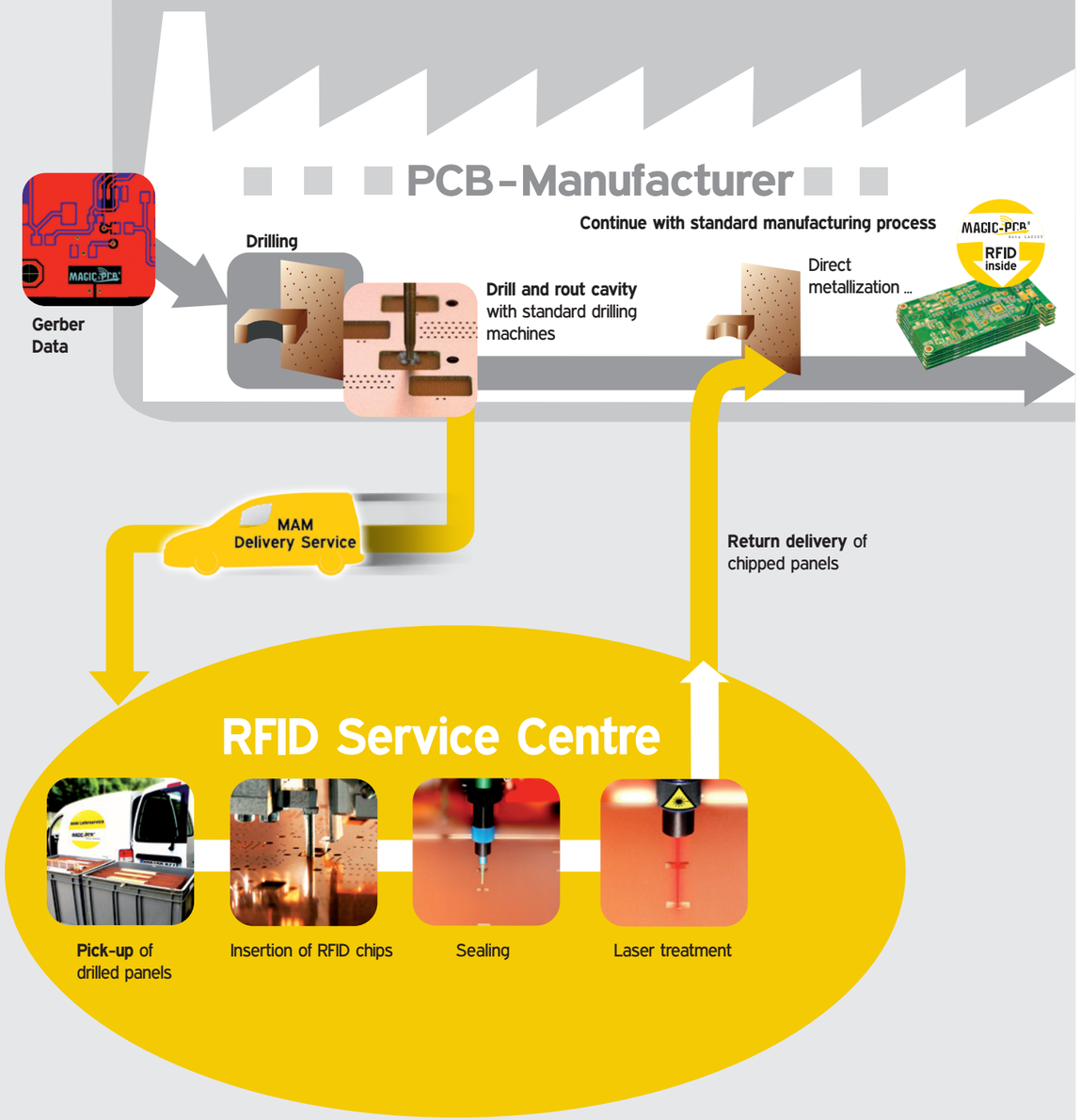
- Read/write alphanumeric characters with a simple key stroke
- Compatibility with software such as Excel, WordPad, or your ERP system, without requiring any additional middleware
- Easy to link a tag memory with any website



Reader Suite

Intuitive configuration tools for testing and installing of RFID hardware.
The reader can record up to 255 transponders in bulk.
The required software (WIN XP/Vista/8) and further information are available for download at:
www.beta-estore.com/rfid

Technical data for the RFID-Reader PUR-RMCU-500U Beta (Reader Kit) and other readers can be found on our website:
www.beta-estore.com/rfid



RFID Service Centre

How can every PCB become a Magic-PCB®?

The RFID chips are embedded into the panel at a very early production stage and then sealed.

These steps are carried out by the RFID Service Centre.

As a PCB manufacturer you deliver your drilled panels to the RFID Service Centre.

The RFID Service Centre will then install the chips and clean the blind vias that are needed in case of an antenna connection.

The completely assembled panels will be delivered back to you immediately so you can proceed with production.

Your own RFID embedding machine?

As an alternative to using our RFID embedding service, you can purchase your own RFID embedding machine (MAM - Magic Application Machine).

Are you a PCB manufacturer?
Invest in your own RFID embedding machine and produce MAGIC-PCB®s under licence for your customers.

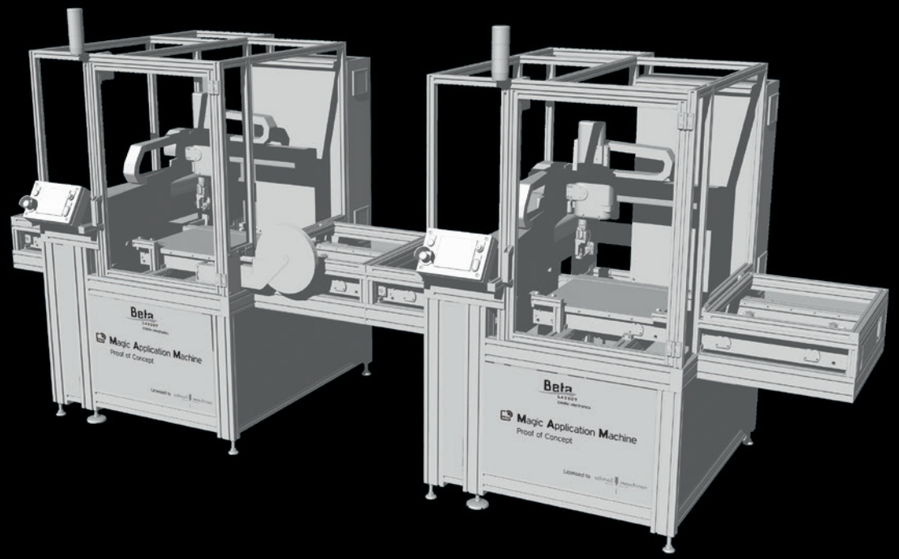
Are you a manufacturer of electronic products?
The RFID embedding machine, purchased and owned by you, is installed in your preferred PCB shop.
Under licence, your PCB supplier exclusively embeds the RFID chips in your manufactured PCBs.

In either case, your RFID embedding machine will be designed and individually custom-built to suit your capacity needs and will be slotted into the PCB manufacturer's production line.

Please send requests to: **info@rfid-service.com**

Technical Parameters

All specifications such as job ID and panel size will be defined individually with the PCB manufacturer.



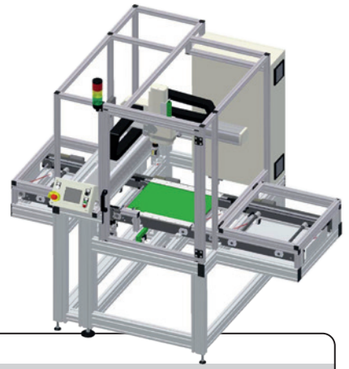
Applicator

We call her MAM: MAGIC Application Machine.

A narrow slot is cut into the edge of a PCB.

The RFID chip provided by Murata is embedded into this slot by the MAM and then sealed. The MAM has been developed by Beta LAYOUT and is supported by Bundesministerium für Wirtschaft (Federal Ministry of Economics and Technology).

The machine shown here is a prototype.
Serial production by: schmoll maschinen



MAM Technical Parameters (Prototype)

Machine	Dispenser	RFID-Chip-Inserter
Machine dimensions Width x height x depth, approx.	2190 mm x 1900 mm x 1350 mm	2190 mm x 1900 mm x 1550 mm
Panel dimensions Min. length x width x thickness Max. length x width x thickness	450 mm x 380 mm x 1.6 mm 500 mm x 415 mm x 1.6 mm	450 mm x 380 mm x 1.6 mm 500 mm x 415 mm x 1.6 mm
Weight (approx.)	350 kg	350 kg
Power	Voltage: 230 V AC, 50 Hz Power: 1.6 kVA Control Voltage: 24 V Backup Fuse: 20 A	Voltage: 230 V AC, 50 Hz Power: 1.6 kVA Control Voltage: 24 V Backup Fuse: 20 A
Compressed air	Conduit: PU-Tubing Outer diameter of connector: ∅ 8 mm Air consumption: < 2 l / Panel at 20°C Operating pressure: 5-6 bar	Conduit: PU-Tubing Outer diameter of connector: ∅ 8 mm Air consumption: < 2 l / Panel at 20°C Operating pressure: 5-6 bar
Panel weight (max.)	2 kg	2 kg
Processing time	max. 4 secs per PCB Time needed to feed a panel, read the job number, calculate the offset value and loading coordinates: 12 secs	max. 6 secs per PCB Time needed to feed a panel, read the job number, calculate the offset value and loading coordinates: 12 secs
Operating temperature	+10 - +40 °C	+10 - +40 °C
Noise emissions	during operation < 72 dB (A)	during operation < 72 dB (A)

Development/Licence by:

Beta LAYOUT
create : electronics

RFID chips by:

muRata
Innovator in Electronics

MAM is manufactured by:

schmoll maschinen

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